DS #: 4896

APN: 164-01-110-013

PROJECT: Spruce Park Drive Roadway Improvements

SUBMITTAL: 1st Submittal

SCANNED BY/DATE:

CHECKED BY/DATE:

CITY OF LAS VEGAS NEVADA

CITY OF LAS VEGAS INTER-OFFICE MEMORANDUM				DATE: June 14, 2017
TO: **Land Development Services** Department of Building & Safety				FROM: Albert Sung, P.E. Flood Control Project Engineer Department of Public Works
SUBJECT:	Drainage Study for: **Spruce Park Drive Roadway Improvements** **(Project in Clark County for City of Las Vegas Concurrence)**			**COPIES TO:** Atkins
Cross Streets:	SWC of Charleston Blvd. & Town Center Dr.			Howard Hughes Properties, Inc.
File Number:	F:\Depot\DSMemos\DS4896A.doc			Bart Anderson, P.E., DevCo
Parcel Number:	164-01-110-013			CCPW
Zoning Action:	N/A			
FEMA Flood Zone	YES	NO	X	
Proposed Storm Drain	YES	NO	X	

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Payment Trn #
1st Submittal	6/7/2017	6/14/2017	See Comments Below	$400.00	487634: $400
			TOTAL FEES (LDDRS):	**$400.00**	**----**

REMARKS:

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

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

City of Las Vegas Flood Control staff has reviewed the *Technical Drainage Study*, including *Addendum #1* and *Addendum #2* for the subject development "***Summerlin Village 13 West - Spruce Park Drive Roadway Improvements***" within the jurisdiction of the ***Clark County***. ***City of Las Vegas*** concurs with the acceptance of the drainage study by the ***Clark County Public Works Department***. The review of this project was limited to issues of flood control significance to the ***City of Las Vegas***.

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

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

END OF REMARKS

ays

T/R/S: T21S/R59E/01

AREA P-01

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

Drainage Study Approval Letter

Date: May 15, 2017
Firm: Atkins
Engineer: Vance A. Skidmore, P.E.
Address: 2270 Corporate Circle, Ste 200, Henderson, NV 89074
Phone: (702) 551-0309
Fax: (702) 263-7200
E-mail: vance.skidmore@atkinsglobal.com

Subject: Technical Drainage Study for Summerlin Village 13 West (Spruce Park from Griffith Peak Drive to Charleston Boulevard)
Location: SW of Charleston Boulevard and Town Center Drive
APN: 164-01-110-013
Sec, Township, Range: S01, T21S, R59E
Flood Zone & Panel: Zone X, 2150E, Dated September 27, 2002
Application Number: 17-5386

Submittals	Date Received	Date Returned	Reviewer	Miscellaneous
Technical	02/03/2017	03/02/2017	WG	
Addendum #1	03/16/2017	04/17/2017	WG	
Addendum #2	04/28/2017	05/15/2017	WG	

Concurrence Required: (Must be obtained prior to permit issuance)		Reason Concurrence is Required
	Boulder City	Adjacent to or Impacts Jurisdiction
	City of Mesquite	Adjacent to or Impacts Jurisdiction
	City of Henderson	Adjacent to or Impacts Jurisdiction
X	City of Las Vegas	Adjacent to or Impacts Jurisdiction
	City of North Las Vegas	Adjacent to or Impacts Jurisdiction
X	Nevada Department of Transportation	Adjacent to or Impacts NDOT Facility
	Union Pacific Rail Road	Adjacent to or Impacts a UPRR Facility
	US Army Corps of Engineers	Impacts a USACE Facility
	Clark County Regional Flood Control District	Regional Significance, Adjacent to or Impacts CCRFCD MPU Facility or in a SFHA

BOARD OF COUNTY COMMISSIONERS
STEVE SISOLAK, Chairman • CHRIS GIUNCHIGLIANI, Vice Chair
SUSAN BRAGER • LARRY BROWN • MARILYN KIRKPATRICK • MARY BETH SCOW • LAWRENCE WEEKLY
YOLANDA T. KING, County Manager

The referenced **Technical Drainage Study** has been reviewed and is accepted as complying with minimum improvement standards. As set forth in the subject drainage study, the following measures will be taken to mitigate flood hazards.

The site shall be graded with respect to drainage as shown on "**Summerlin Village 13 West Spruce Park Roadway Improvements Griffith Peak Drive to Charleston Boulevard**", grading plan sheets 1, 2, 3, 8, 9, 12, 13, signed and sealed by Paul A. Bates, P.E., on April 27, 2017.

Check appropriate conditions

	Retaining/screen wall combination may be in excess of current **Clark County Unified Development Code, Chapter 30.64.050.**
	A FEMA Elevation Certificate, completed by a licensed surveyor, must be submitted to and approved by CCPW Development Review Plan Check prior to the issuance of Certificates of Occupancy for those structures.
X	Mylars of the grading plan must be submitted to the CCPW Development Review Plan Check for approval signatures prior to map recordation (residential) or permit issuance (commercial).
	An administrative variance to allow the finished floor elevation(s) to be set below the current Clark County criteria must be approved. The finished floor variance must be submitted to CCPW Development Review front counter after drainage study approval and prior to offsite final review.
	The grading plan will be reviewed by the Building Office Operations Division to ensure compliance with the ADA access requirements. Revisions to the grading plan may be required if the site accessibility design does not comply with the requirements set forth in the Accessibility Chapter of the Clark County Building Code.
	The plans show work is proposed on another property. Notarized written permission must be obtained **prior to** plan approval. A grading permit must be obtained from Building Dept prior to grading.
X	Right-of-way dedication must be verified.
	Any previously approved drainage easements that are not being used must be vacated.
	Per *Regional Flood Control District policies and Procedures manual, Section VIII. D. 13. Uniform Regulations for the Control of Drainage*, the Engineer of Record shall provide As-Built plans or record drawings to the District after completion and final inspection of such privately installed flood control facilities that have regional flood control significance.
	Structural calculations are required. The structural calculations, plans, and details must be approved prior to "Offsite" submittal and prior to CCRFCD submittal, if applicable.
X	Plan revisions can be found on the red-lined plans and must be addressed.
	Prepare drainage easement documents as shown on the grading plans.

Additional Conditions:

1. Any improvements not depicted on the above mentioned grading plans will require an Update to this Technical Drainage Study.

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.

Wade Gerstenkorn
Associate
Development Review
wade@ClarkCountyNV.gov

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

TDS for Summerlin Village 13 West

Spruce Park Drive Roadway Improvements

Prepared for Howard Hughes Properties, Inc

February 2, 2017

HYDROLOGIC CRITERIA AND DRAINAGE MANUAL

DRAINAGE STUDY INFORMATION FORM

Name of Development: TDS for Summerlin Village 13 West Spruce Park Drive Roadway Date: February 2, 2017

Location of Development: a) Descriptive (Cross Streets) North/South: Between Pavilion Center Drive and Town Center Drive

East/West: Between Griffith Peak Drive and Charleston Boulevard

b) Section: 1 Township: 21 South Range: 59 East

c) APN : 164-01-110-011

Name of Owner: Howard Hughes Properties, Inc

Telephone No.: (702) 791-4000 Fax No.: (702) 791-4450 E-Mail Address: Chris.Anderson@howardhughes.com

Address: 10801 West Charleston Blvd, Ste 300, NV 89135

Contact Person-Name: Vance Skidmore, PE **Telephone No.:** (702) 551-0309

* **E-Mail Address:** vance.skidmore@atkinsglobal.com **Fax No.:** (702) 263-7200

Firm: Atkins

Address: 2270 Corporate Circle, Ste. 200, Henderson, NV 89074

Type of Land Development/Land Disturbance Process:

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

1. Total Owned Land Area: At Site: +/- 174 Acres Being Developed/Disturbed: +/- 10 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.): Public - Roadway Improvements
5. Approximate upstream land area which drains to the subject site:
6. Has the site drainage been evaluated in the past? ☒ **YES** ☐ **NO** If yes, please identify documentation: Master Drainage Study for Summerlin Village 13 West, July 2016 (HTE #16-7211)
7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: The flow collected by the facilities within Griffith Peak Drive is combined into a single larger storm water facility located in Town Center Drive approximately 600 feet south of Griffith Peak Drive. This larger storm water facility conveys the discharge to the Faith Lutheran Detention Basin.
8. Briefly describe your proposed schedule for the subject project: ASAP

PROFESSIONAL ENGINEER STATE OF NEVADA
VANCE A. SKIDMORE
Exp: 6/30/18
CIVIL
No. 19690
Jan 31, 2017

Engineer's Seal

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

*New Required Field

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

Revision	Date

Local Entity File No.

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008

Department of Public Works
Development Review Division • Drainage Study Team
500 S Grand Central Pky | Box 554000 | Las Vegas NV 89155-4000
(702) 455-4600 | Fax (702) 388-2550
www.ClarkCountyNV.gov/PubWorks

DRAINAGE STUDY MINIMUM CRITERIA CHECKLIST

Project Name: TDS for Summerlin Village 13 West Spruce Park Drive Roadway Improvements
Engineer: Vance Skidmore, P.E. **Company :** Atkins
Address: 2270 Corporate Circle, Suite 200
City: Henderson **State:** Nevada **Zip:** 89074
E-mail: Vance.Skidmore@atkinsglobal.com
Phone Number: 702-551-0309 **Fax Number:** 702-263-7200
Property Owner: Howard Hughes Properties, Inc
Address: 10801 West Charleston Blvd., Suite 300
City: Las Vegas **State:** Nevada **Zip:** 89135
Phone Number: 702-791-4000 **Fax Number:** 702-791-4453
E-mail: Chris.Anderson@howardhughes.com

The following information is intended as a guide to the engineer for providing the minimum information required for a Technical Drainage Study submittal prior to the County performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) *Hydrologic Criteria and Drainage Design Manual* (Design Manual).

This document is intended as an aid in preparing Technical Drainage Studies for Clark County. 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, and exhibits which may be necessary to properly evaluate the intended land use.

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

DRAINAGE STUDY MINIMUM CRITERIA CHECKLIST

I. GENERAL REQUIREMENT

Yes	No	
X		Design Manual Standard Form 1 with the engineer's seal
X		Design Manual Standard Form 4
X		2 copies of the 24" x 36" drainage plan with the engineer's seal
	X	A notarized letter from adjacent property owner(s) allowing off-site grading or discharge

II. DRAINAGE PLAN INFORMATION

Yes	No	
X		Sheet size: 24" x 36"
X		Minimum Scale: 1" = 50'
X		Project Name
X		Vicinity Map
X		Revision Box
X		North Arrow and Bar Scale
X		Professional Engineer's signature, seal, and date
X		Engineer's/Consultant's address and phone number
X		Elevation Datum and Benchmark
X		Legend for symbols and abbreviations
X		Cut/fill scarps, where applicable
X		Street Names, Grades, and Widths
X		Spot grades for top of curbs and street crowns at lot lines, grad breaks, and along curb returns
X		Existing contours encompassing the site and 100 feet beyond with spot elevations for important, excess of 100 feet where appropriate
	N/A	Minimum finish floor elevations
X		Typical street sections
X		Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes
X		Property lines
X		Right-of-way lines and widths, existing and proposed
X		Existing improvements and their elevations
X		Delineation of proposed onsite drainage basins indicating area and 10-year and 100- year storm peak flows at basin concentration points
X		Drainage flow direction with Q100 and V100
	N/A	Cross-sectional detail for channels, including cutoff wall locations

Yes	No	
	N/A	Existing and proposed drainage easements and widths shown with sufficient detail
	N/A	Existing and proposed drainage easements and widths shown with sufficient detail
	N/A	Location and detail of existing, proposed, and future block wall openings
	N/A	Detail of flood walls illustrating depth of flow, proposed grouting height, etc.
	N/A	Retaining wall locations
	N/A	Building and/or lot numbers
	N/A	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site
	N/A	Limits of existing floodplain based on current FIRM
	N/A	For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table

III. HYDROLOGIC ANALYSIS

Yes	No	
X		Appropriate soil information
X		Input and output information for computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models
X		Use of correct precipitation values in and outside the McCarran Airport rainfalls area
X		A discussion in the text of the hydrologic analysis justifying basin boundaries and cutoffs, supporting assumptions and calculations
X		A summary table of stormwater flows showing basin area, Q10 and Q100 for both individual basins and combined basin flows where applicable
X		Copies of supporting technical information referenced from a previously approved study and a comment accepting these flows
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners

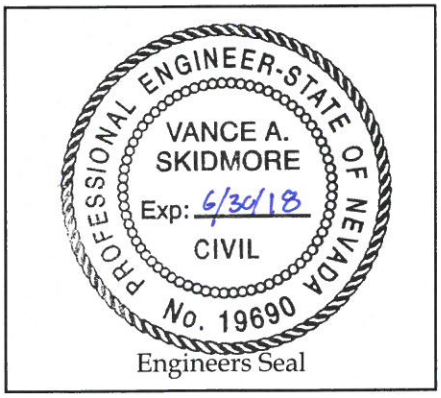
IV. HYDRAULIC ANALYSIS

Yes	No	
	N/A	Flow split calculations and supporting documentation for the method of flow split calculations used
X		Normal depth street flow calculations and cross sections for all interior and perimeter streets (address dry lane criteria)
X		Provide depth x velocity "D x V" products for flows in interior and exterior streets $Q_{10}(D \times V \leq 6)$ $Q_{100}(D \times V \leq 8)$
	N/A	Appropriate hydraulic calculations for block wall opening assuming a 50% vertical clogging factor (Assume the lower half of the opening is plugged)
	N/A	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set first floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses where appropriate
	N/A	Provide necessary freeboard requirements to set the finished floor elevations
X		On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners

Yes	No	
	N/A	A complete water surface profile analysis (HEC-2, WSPG, etc.) for channel flows and FEMA Zone A flood zones · Field survey data · Input and output information · Plotted cross-sections based on survey with proper encroachments · A map showing the location of the cross-sections · Analysis of both sub and supercritical flow segments · A summary table and a discussion of the results in the text of the report
	N/A	Provide a 50% clogging factor in the capacity calculation for drop inlets
	N/A	Hydraulic calculations for culverts and storm drains

V. MAPS AND EXHIBITS

Yes	No	
X		A Flood Insurance Rate Map (FIRM) with the site delineated
X		The CCRFCD Master Plan Update Figures (F&H) with the site delineated
X		A soils map with the site and the upstream sub-basins delineated
X		Off-site drainage basin map for existing, interim and future conditions showing the basin boundaries, concentration points, existing topo and flows in cfs
X		On-site drainage basin map for existing and proposed conditions showing the basin boundaries, concentration points, existing topo and flows in cfs
X		Vicinity Map with local and major cross streets identified



Engineers Seal

Submitted By: Vance Skidmore

Date: Jan 31, 2017

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Master Drainage Study Appendix: Existing Condition Hydrologic Modeling and Figures

Appendix B
Spruce Park Drive Technical Drainage Study Appendix

Appendix C
Spruce Park Drive Improvement Plans

Appendix D
Electronic CD

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Appendix A. Master Drainage Study Appendix: Existing Condition Hydrologic Modelling and Figures

Appendix B. Spruce Park Drive Technical Drainage Study Appendix

- Appendix B-1: Interim Condition Hydrologic Model
- Appendix B-2: Interim Condition Normal Depth Calculations
- Appendix B-3: Ultimate Condition Hydrologic Model
- Appendix B-4: Ultimate Condition Normal Depth Calculations
- Appendix B-5: Hydraulic Calculations based on Reference Studies

Appendix C. Spruce Park Drive Improvement Plans

Appendix D. Electronic CD

1. Introduction

1.1. Purpose

This Technical Drainage Study, prepared on behalf of Howard Hughes Properties, Inc., represents the hydrologic and hydraulic analysis for the Spruce Park Drive roadway improvements of the Summerlin Village 13 West development. Summerlin Village 13 West is located in the northwest Las Vegas Valley and is bounded by Charleston Boulevard on the north, Sahara Avenue on the south, Pavilion Center Drive on the West, and Town Center Drive on the east. A vicinity map is provided in **Figure 1**. The Spruce Park Drive development is located between Charleston Boulevard and Griffith Peak Drive and is shown on the location map on **Figure 2**.

A Master Drainage Study for Summerlin Village 13 West (HTE 16-7211) was submitted in February 2016. Addendum #1 was submitted June 9, 2016. The Master Drainage Study was approved July 5, 2016. The proposed Spruce Park Drive development is located within Parcel X in the northeast corner of the Master Drainage Study area. In the ultimate condition, Spruce Park Drive will bisect Parcel X and connect Charleston Boulevard to Griffith Peak Drive. Portions of the proposed study are directly referenced from the Master Drainage Study and the relevant parts have been included in **Appendix A.**

2. Hydrologic Analysis

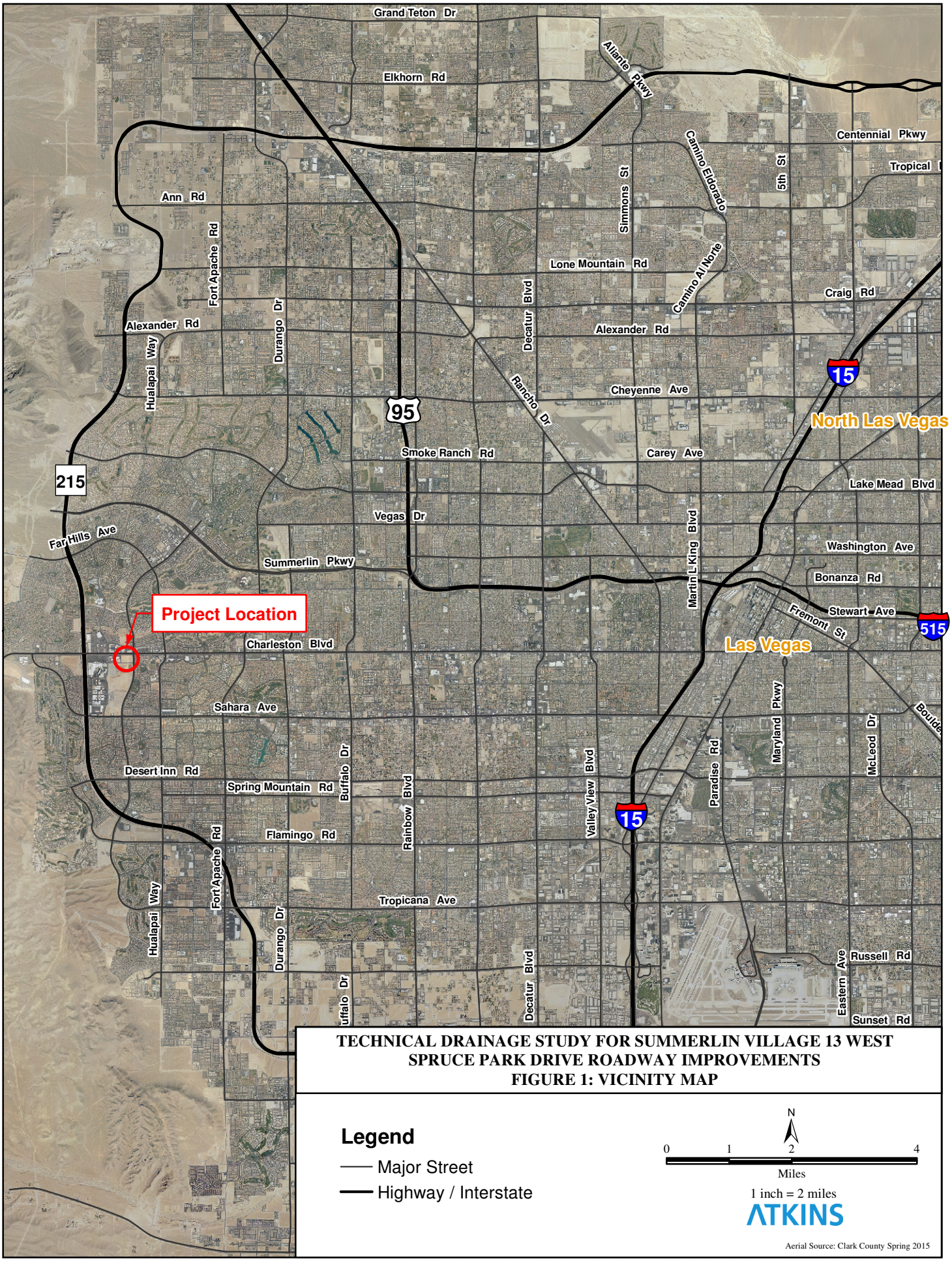
2.1. Existing Condition

As established in the Master Drainage Study, there is one existing downstream storm drain facility that collects runoff from the proposed street improvements. In the existing condition, the tributary watershed includes offsite subbasins EX-OFF1 and EX-OFF2 (see **Figure 3** and **Figure 8** in **Appendix A**). There are three existing main line storm water facilities that collect runoff from this area: the existing Griffith Peak Drive storm drain and two onsite stubs. The existing Griffith Peak Drive storm drain extends from the Red Rock Casino to Town Center Drive. It collects flow from the north half of the Red Rock Casino and all runoff between Griffith Peak Drive and Charleston Boulevard (HEC-1 Combination Point CP1A). In the existing condition only the southern portion of Parcel X drains to Griffith Peak Drive (Subbasin EX-OFF2). The runoff from the southern half of Parcel X drains onto Griffith Peak Drive and is collected by the existing drop inlets prior to Town Center Drive (HEC-1 Combination Point CP1A). The northern portion of Parcel X (Subbasin EX-OFF1) drains east and is conveyed under Town Center Drive via an existing culvert just south of the intersection of Town Center and Charleston Boulevard. Note that in the ultimate condition, all the runoff from Parcel X and the proposed Spruce Park Drive improvements will drain south into the Griffith Peak Drive storm drain via the two existing stubs provided for this area. The overall watershed drains to the existing Faith Lutheran Detention Basin.

The existing condition HEC-1 model prepared for the Master Drainage Study was directly referenced for the existing condition hydrologic model for the proposed improvements. The runoff curve number and time of concentration calculations for the existing subbasins are provided in **Appendix A**. **Table 1** summarizes the HEC-1 results from the existing condition hydrologic model.

Table 1: Existing Condition Hydrologic Model Results

HEC-1 Node	Tributary Area (mi^2)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
EX-OFF1	0.0157	11	26
EX-OFF2	0.0058	4	10
CP1A	0.11	107	208



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
FIGURE 1: VICINITY MAP

Legend

- Major Street
- Highway / Interstate

N

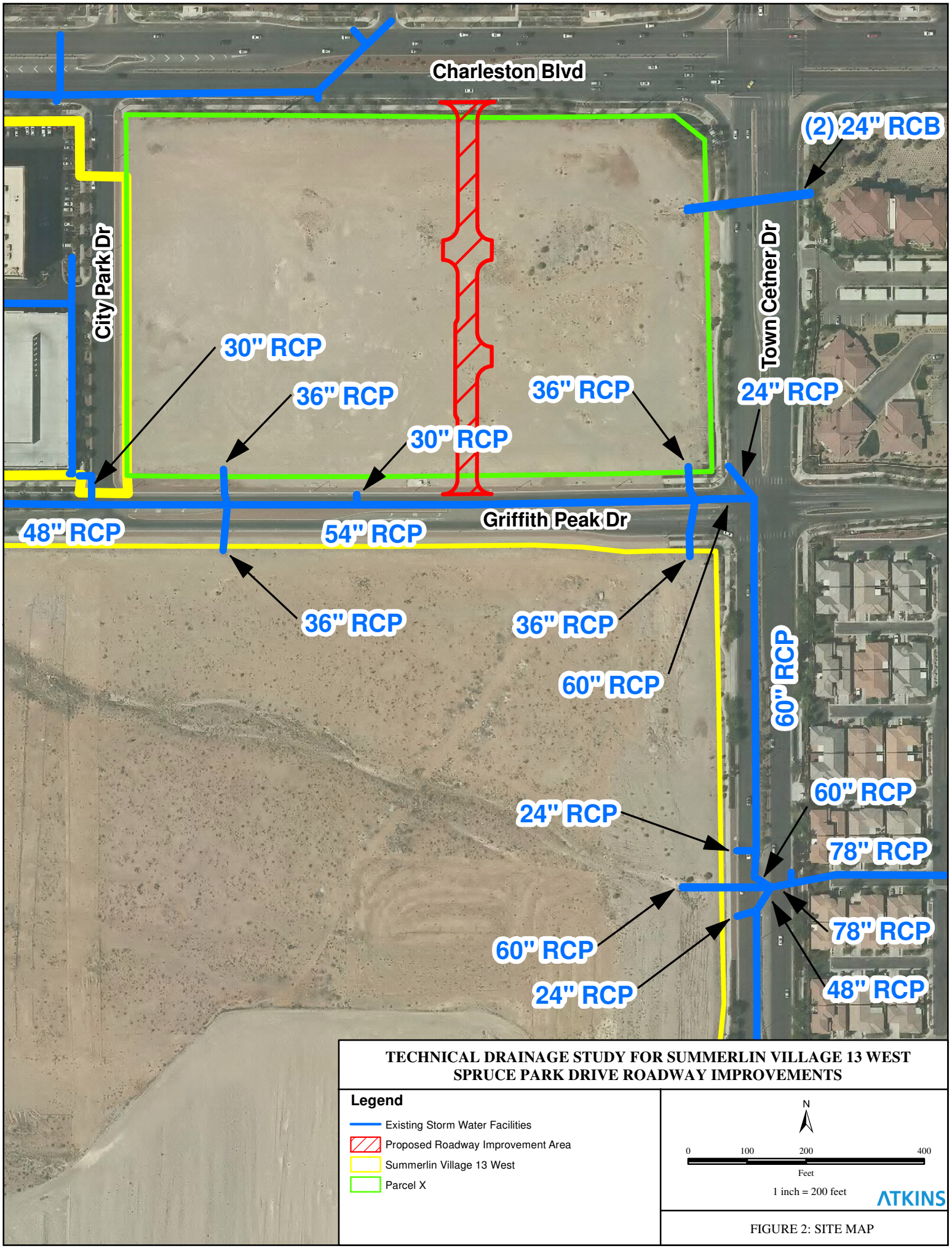
0 1 2 4

Miles

1 inch = 2 miles

ATKINS

Aerial Source: Clark County Spring 2015



TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS

Legend

- Existing Storm Water Facilities
- Proposed Roadway Improvement Area
- Summerlin Village 13 West
- Parcel X

N

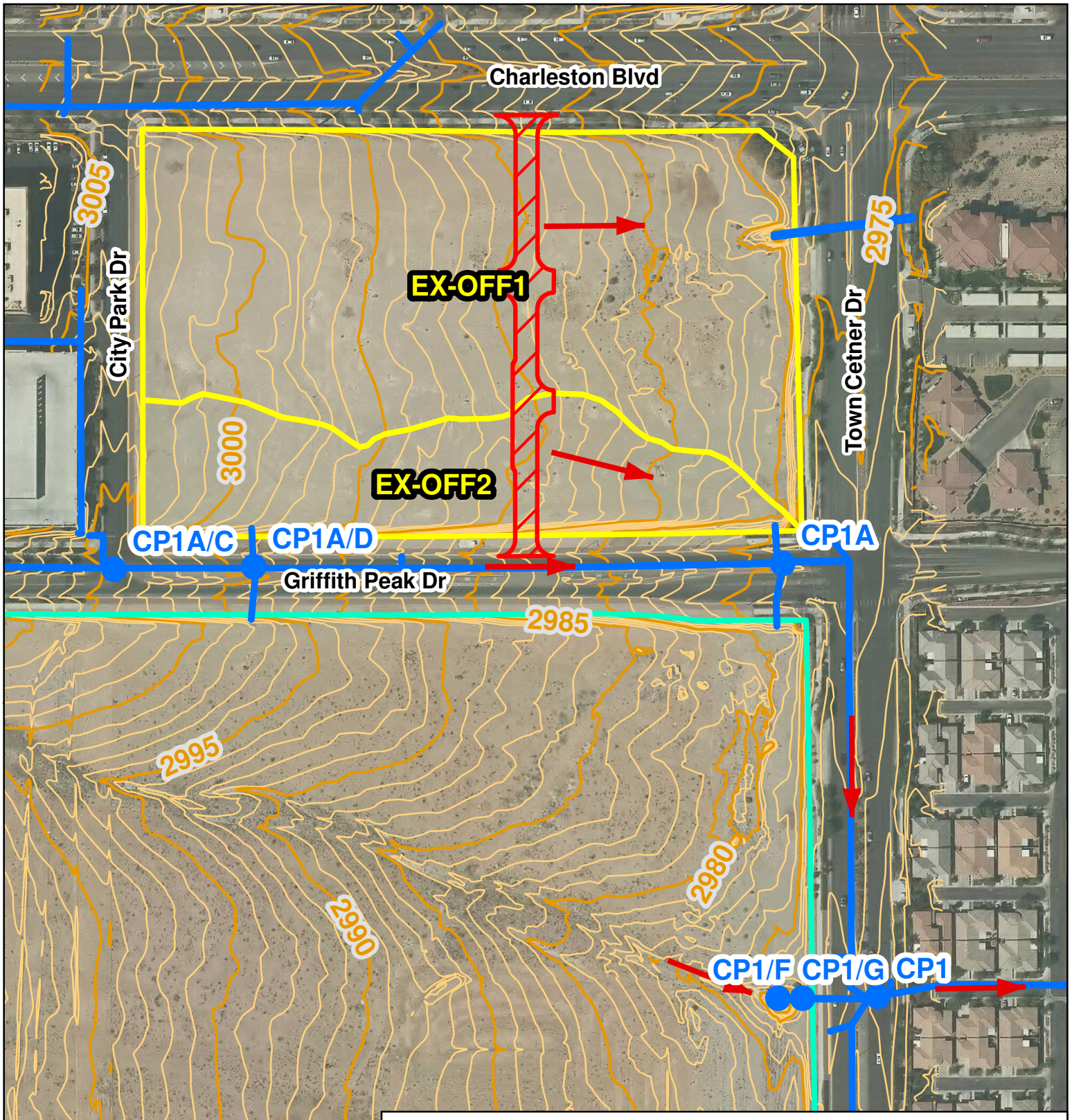
0 100 200 400

Feet

1 inch = 200 feet

ATKINS

FIGURE 2: SITE MAP



HEC-1 Node	Tributary Area (acre)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
EX-OFF1	10.0	11	26
EX-OFF2	3.7	4	10
CP1A	70.4	107	208

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS

Legend

- Combination Point
- Existing Condition Flow Direction
- Proposed Roadway Improvement Area
- Existing Storm Water Facilities
- Summerlin Village 13 West
- Existing Condition Subbasin
- 5' contour
- 1' contour

N

0 100 200 400

Feet

1 inch = 200 feet

ATKINS

FIGURE 3:
EXISTING CONDITION SUBBASINS MAP

2.2. Interim Condition

The proposed Spruce Park Drive improvements will be constructed prior to the adjacent Parcel X. As a result, an interim condition exists for the proposed improvements. In the interim condition, runoff from the west half of Parcel X (INT-OFFA1), flows east to Spruce Park Drive. The proposed street will convey surface stormwater runoff to an existing 15-foot drop inlet in Griffith Peak Drive near Town Center Drive. The existing curb inlet will prevent surface runoff from entering Town Center Drive.

Runoff from the northeast portion of Parcel X (INT-OFF1) flows east under Town Center Drive via an existing culvert just south of the intersection of Town Center and Charleston Boulevard. Runoff from the southeast corner of Parcel X (INT-OFF2) drains southeast and discharges to CP1A. Interim condition hydrologic analysis results are summarized in **Table 2** and shown on **Figure 4**.The interim condition HEC-1 model output and all associated hydrologic parameter calculations is provided in **Appendix B**. The proposed Spruce Park Drive Improvement Plans are provided in **Appendix C**. The HEC-1 model is included on the CD in **Appendix D**.

In the interim and ultimate conditions, stormwater runoff in West Charleston Boulevard travels east across the proposed Spruce Park Drive. A proposed valley gutter placed at the north end of the Spruce Park Drive prevents the runoff from entering Spruce Park Drive. See **Section 2.3** for detailed description.

Table 2: Interim Condition Hydrologic Model Results

HEC-1 Node	Tributary Area (mi^2)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
INT-OFFA1	0.01204	9	21
INT-SPDr	0.00187	2	5
INT-OFF2	0.00160	1	3
CP1A	0.12	115	226
INT-OFF1	0.00593	4	10

2.3. Ultimate Condition

In the ultimate condition, runoff from the proposed Spruce Park Drive improvements flows south within the roadway to Griffith Peak, where it is picked up in the existing storm drain system at CP1. Runoff from Parcel X (Subbasins OFF-A1 and OFF-A15) is collected by the two existing 36-inch stubs previously constructed to collect runoff from Parcel X in the ultimate condition. These stubs convey the flow into the existing Griffith Peak Drive storm water facility to the south. Redirecting the entire Parcel X south in the ultimate is based on the previously approved drainage study for Parcel X. The total discharge in the Griffith Peak Drive storm drain at Town Center Drive in the proposed ultimate condition is 243 cfs (HEC-1 Combination Point CP1A). The approved ultimate condition discharge in the Griffith Peak Drive storm drain at this location is 299 cfs based on the TDS for the Town Center Drive Improvements (HTE# 00-21026). Ultimate condition hydrologic analysis results are summarized in **Table 3** and shown in **Figure 5**. The hydrologic model is located in **Appendix B**.

Table 3: Ultimate Condition Hydrologic Model Results

HEC-1 Node	Tributary Area (mi^2)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
OFF-A1	0.01204	13	25
OFF-A15	0.00753	8	16
OFF-SPDr	0.00187	2	5
CP1A	0.12	126	243

Street flow within Charleston Boulevard was analyzed in Flowmaster to demonstrate that the flow is not routed along Spruce Park Drive. The maximum 100-year flow depth at the intersection is 0.38 feet above the flow

line. The elevation at the flow line is 2987.05 feet. The high point of the proposed Spruce Park Drive Roadway improvements is 2987.54 feet. Therefore, no runoff along Charleston Boulevard flows along the proposed roadway improvements. FlowMaster calculations and a reference exhibit from HTE #07-33087 can be found in **Appendix B**.

The interim condition flow rates along Spruce Park Drive to Griffith Peak Drive are higher than the ultimate condition peak flow rates. The interim condition 100-year peak flow rate along Spruce Park Drive is 25 cfs. Referencing the Summerlin Village 13 Parcel X Technical Drainage Study (HTE #00-18645), the existing condition 100-year peak flow rate along Griffith Peak Drive is 9 cfs. The interim condition 100-year peak flow of 34 cfs was modeled in FlowMaster and is included in the calculations in **Appendix B**.

HEC-1 Node	Tributary Area (acre)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
INT-OFFA1	7.7	9	21
INT-OFF2	1.0	1	3
INT-SPDr	1.2	2	5
CP1A	76.8	115	226
INT-OFF1	3.8	4	10

Spruce Park Drive Roadway Improvement Plans Interim Condition (100-Year) Street Flow Summary Table

XS ID	Improvement Plans Station (ft)	Total Discharge (cfs)	Total Discharge Source	Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 8)
XS1	11+00	25	INT-OFFA1 & INT-SPDr	0.46	3.73	1.72

Spruce Park Drive Roadway Improvement Plans Interim Condition (10-Year) Street Flow Summary Table

XS ID	Improvement Plans Station (ft)	Total Discharge (cfs)	Total Discharge Source	Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 6)
XS1	11+00	11	INT-OFFA1 & INT-SPDr	0.37	2.76	1.02

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS

Legend

- Combination Point
- Street Cross Section
- Interim Condition Flow Direction
- Existing Storm Water Facilities
- Interim Condition Subbasins
- Proposed Roadway Improvements
- Summerlin Village 13 West

N

0 100 200 400

Feet

1 inch = 200 feet

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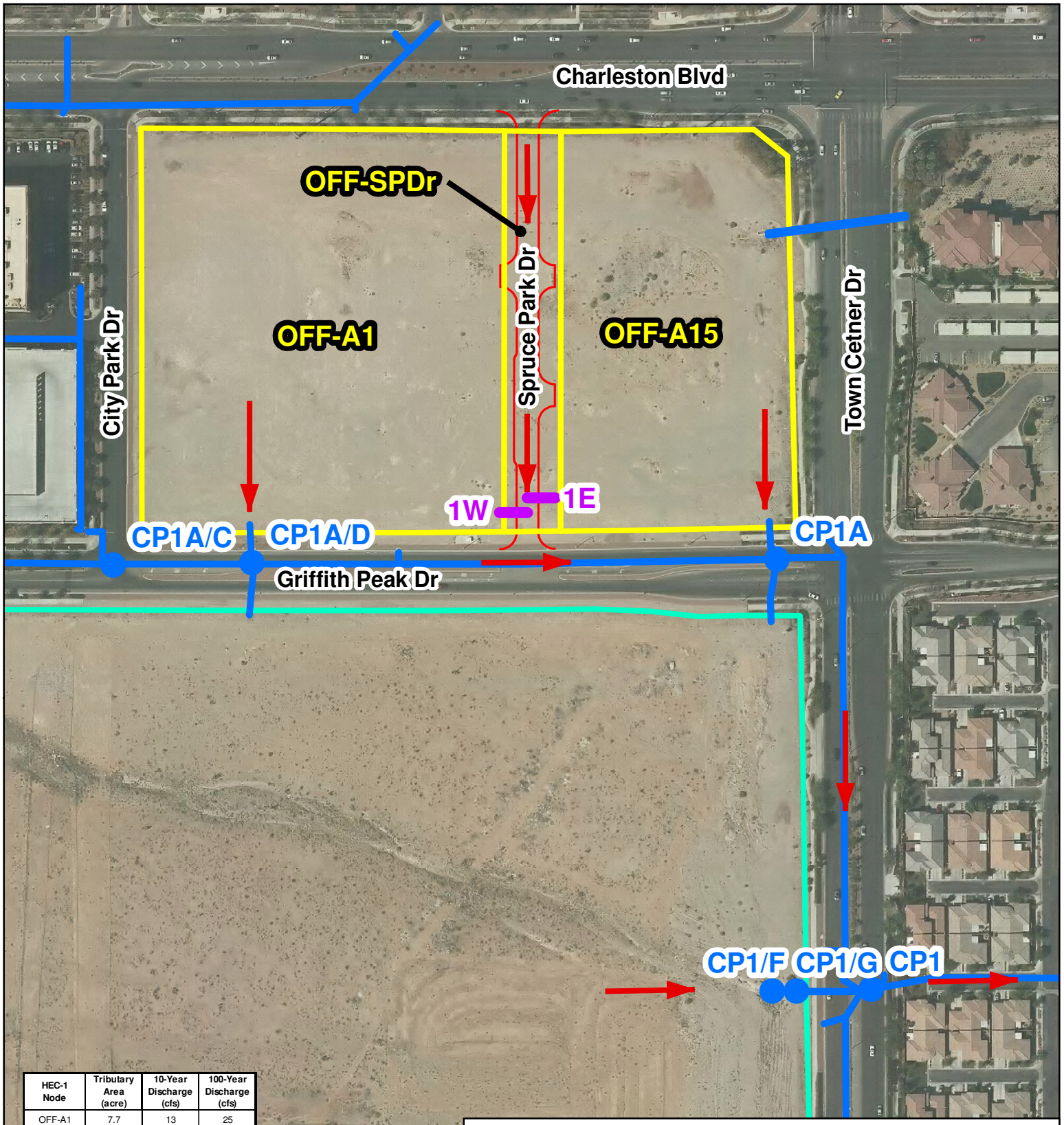
FIGURE 4:
INTERIM CONDITION WORKMAP



HEC-1 Node	Tributary Area (acre)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
OFF-A1	7.7	13	25
OFF-A15	4.8	8	16
OFF-SPDr	1.2	2	5
CP1A	76.8	126	243

Spruce Park Drive Roadway Improvement Plans Ultimate Condition (100-Year) Street Flow Summary Table

XS ID	Improvement Plans Station (ft)	Total Discharge (cfs)	Total Discharge Source	Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 8)
1W	11+00	2.5	West half of OFF-SPDr	0.31	2.00	0.62
1E	11+00	2.5	East half of OFF-SPDr	0.31	2.00	0.62

Spruce Park Drive Roadway Improvement Plans Ultimate Condition (10-Year) Street Flow Summary Table

XS ID	Improvement Plans Station (ft)	Total Discharge (cfs)	Total Discharge Source	Flow Depth in Street (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (must be less than 6)
1W	11+00	1	West half of OFF-SPDr	0.25	1.63	0.41
1E	11+00	1	East half of OFF-SPDr	0.25	1.63	0.41

TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS

Legend

- Combination Point
- Street Cross Section
- Ultimate Condition Flow Directions
- Existing Storm Water Facilities
- Ultimate Condition Subbasins
- Proposed Roadway Improvements
- Summerlin Village 13 West

N

0 100 200 400

Feet

1 inch = 200 feet

ATKINS

FIGURE 5:
ULTIMATE CONDITION WORKMAP

3. Hydraulic Analysis

3.1. Interim Condition

The interim condition analysis utilizes the hydrologic analysis results from **Section 2.2** of this TDS. In the interim condition, runoff from the west half of Parcel X (INT-OFFA1), flows east to Spruce Park Drive. The proposed street will convey surface stormwater runoff to an existing 15-foot drop inlet in Griffith Peak Drive near Town Center Drive. Normal depth calculations were performed at the cross section location shown on **Figure 4**. Interim condition hydraulic analysis results are summarized in **Table 4**. The hydraulic calculations are located in **Appendix B**.

Table 4: Interim Condition Normal Depth Calculations

Cross Section ID	Flow (cfs)	Slope (%)	Flow Depth (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (<8 for 100-yr, <6 for 10-yr)
100-year					
XS1	25	0.83	0.46	3.73	1.72
10-year					
XS1	11	0.83	0.37	2.76	1.02

3.2. Ultimate Condition

The ultimate condition analysis utilizes the hydrologic analysis results from **Section 2.3** of this TDS. In the ultimate condition, runoff from the proposed Spruce Park Drive improvements flows south within the roadway to Griffith Peak, where it is picked up in the existing storm drain system at CP1. Runoff from Parcel X (Subbasins OFF-A1 and OFF-A15) is collected by the two existing 36-inch stubs previously constructed to collect runoff from Parcel X in the ultimate condition. These stubs convey the flow into the existing Griffith Peak Drive storm water facility to the south.

Normal depth calculations were performed at the cross section locations shown on **Figure 5**. The ultimate condition hydraulic analysis consists of two half-street models because the only runoff conveyed through the street sections is from the proposed roadway and the surrounding right-of-way. Ultimate condition hydraulic analysis results are summarized in **Table 5**. The hydraulic calculations are located in **Appendix B**.

Future driveway curb, constructed by on-site developer, requires flowline high point a minimum of 0.81’ above the flowline of the valley gutter for drainage considerations. This will contain the flow to 0.5' above the maximum water surface elevation. The improvement plans can be referenced in **Appendix C**.

Table 5: Ultimate Condition Normal Depth Calculations

Cross Section ID	Flow (cfs)	Slope (%)	Flow Depth (ft)	Velocity of Flow in Street (ft/s)	Depth*Velocity (<8 for 100-yr, <6 for 10-yr)
100-year					
1W	2.5	0.83	0.31	2.00	0.62
1E	2.5	0.83	0.31	2.00	0.62
10-year					
1W	1	0.83	0.25	1.63	0.41
1E	1	0.83	0.25	1.63	0.41

Appendices

Appendix A

Master Drainage Study Appendix: Existing Condition Hydrologic Modeling and Figures

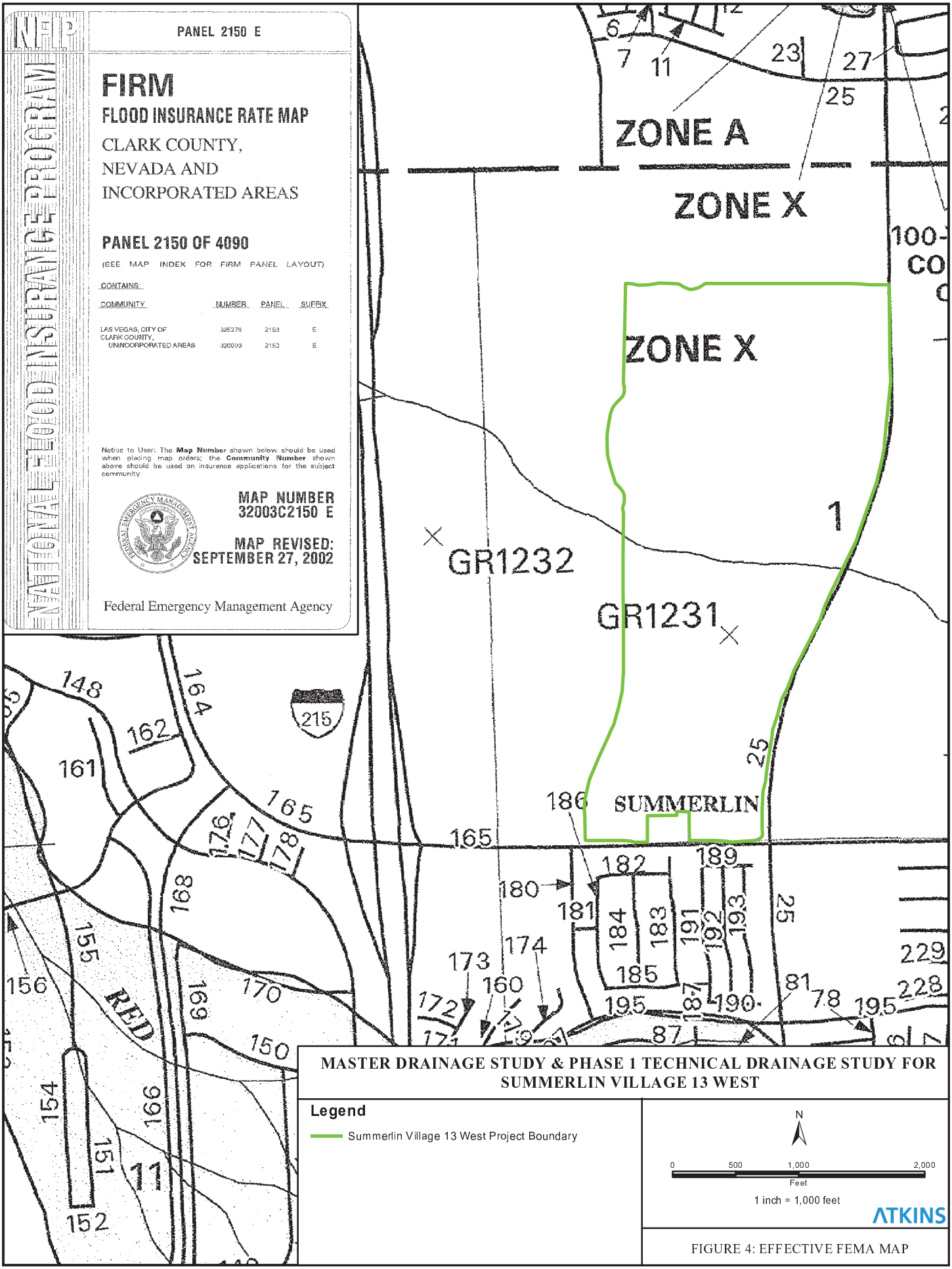


FIGURE 4: EFFECTIVE FEMA MAP

REGIONAL FLOOD CONTROL DISTRICT

2008
LAS VEGAS VALLEY
FLOOD CONTROL
MASTER PLAN UPDATE

FIGURE F-29
FLOOD CONTROL FACILITIES

LEGEND

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

Master Drainage Study Boundary

N

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

Scale: 1 inch = 2,000 feet

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

US95 I-15 I-215

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

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Figure 5A: 2008 CCRFCD Master Plan Update Facility Inventory Map

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
APAD		**ANGEL PARK - ALTA DRIVE BRANCH**						
0000	E	2: 12' X 8' RCB	944	3140	CSWAA-3	ALLGOW4	8.26	6.00
0018	E	10' X 8' RCB	1392	3140	CSWAA-3	ALLGOW4	8.26	4.53
0044	E	11' X 8' RCAP	1565	3140	CSWAA-3	ALLGOW4	8.26	4.24
0073	E	11' X 8' RCAP	2220	2917	CSWAA-2	ALLGOW3	7.68	3.50
0115	E	10' X 8' RCB	1632	2917	CSWAA-2	ALLGOW3	7.68	2.20
0146	E	10' X 8' RCB	3010	2220	CSWAA-1	ALLGOW3	6.98	4.40
0203	E	2: 7' X 5.5' RCB	1136	2220	CSWAA-1	ALLGOW3	6.98	5.28
0225	E	2: 7' X 5.5' RCB Outlet	360	2149	SUM5DB	ALLGOW3	6.74	3.40
APBE		**ANGEL PARK - BELTWAY BRANCH**						
0000	E	3: 12' X 8' RCB	712	4060	CSWFH-9	ALLGOW3	2.65	0.82
0013	E	3: 12' X 8' RCB	489	4060	CSWFH-9	ALLGOW3	2.65	6.50
0022	E	Conc Chnl 20'W 7'D 2:1 SS	1556	4060	CSWFH-9	ALLGOW3	2.65	1.81
APCB		**ANGEL PARK - CHARLESTON BLVD BRANCH**						
0000	E	2: 10' X 6' RCB	833	1622	CSW18	ALLGOW3	1.35	1.54
0001	E	12' X 6' RCB	988	1622	CSW18	ALLGOW3	1.35	3.13
0019	E	11' X 6' RCB	1616	1196	CSW17	ALLGOW3	0.94	1.39
0050	E	8' X 7' RCB	757	1196	CSW17	ALLGOW3	0.94	1.00
0064	E	8' X 7' RCB	849	1196	CSW17	ALLGOW3	0.94	2.08
0080	E	7' X 7' RCB	1489	743	SW11	ALLGOW3	0.59	1.67
APD2		**ANGEL PARK - DESERT FOOTHILLS 2 BRANCH**						
0000	E	7' X 7' RCB	96	948	SWAA-2	ALLGOW3	0.70	3.62
0002	P0	7' X 7' RCB	964	948	SWAA-2	ALLGOW3	0.70	2.00
APD3		**ANGEL PARK - DESERT FOOTHILLS 3 BRANCH**						
0000	E	7' X 7' RCB	1090	743	SW11	ALLGOW3	0.59	1.67
0021	E	7' X 7' RCB	749	743	SW11	ALLGOW3	0.59	2.75
APM5		**ANGEL PARK - MIDDLE 5 BRANCH**						
0000	E	384 ac-ft Detention Basin #5		7001	SUM5IN	ALLGOW3	6.74	
0001	E	12,153 cfs PMF Spillway		12153	SUM5IN	ALLGOW3	6.74	
0009	P0	Conc Chnl 50'W 4.5'D 2:1 SS	4180	3624	CDB55-8	ALLGOW3	2.45	5.80
APMD		**ANGEL PARK - MIDDLE BRANCH**						
0133	E	Natural Wash	3015	6048	C11A-3*	ALLGOW4	11.31	3.00
0190	E	3: 12'X8' RCBC @ Town Center	236	6048	C11A-3	ALLGOW4	11.31	3.53
0195	E	Transition Structure	145	6048	C11A-3	ALLGOW4	11.31	3.59
0198	E	Conc Chnl 62'-68'W 5.5'-7.5'D 2:1 SS	500	6048	C11A-3	ALLGOW4	11.31	3.59
0208	E	Conc Chnl 62'-68'W 6.5'-7.5'D 2:1 SS	550	6048	C11A-3	ALLGOW4	11.31	2.81
0218	E	Conc Chnl 66'-69'W 6.5'-7.0'D 2:1 SS	500	6048	C11A-3	ALLGOW4	11.31	2.00
0227	E	Transition Structure	134	6048	C11A-3	ALLGOW4	11.31	2.00
0230	E	3: 12' X 8' RCBC @ Pavilion Center Dr	133	5889	C11A-1	ALLGOW4	11.12	2.00
0233	E	Transition Structure	207	5889	C11A-1	ALLGOW4	11.12	4.00
0237	E	Conc Chnl 76' W 6.5'-9.0'D 2:1 SS	516	5889	C11A-1	ALLGOW4	11.12	4.00
0247	E	3: 12' X 8' RCBC @ Access Rd	52	5889	C11A-1	ALLGOW4	11.12	4.00
0248	E	Transition Structure	128	5889	C11A-1	ALLGOW4	11.12	4.00
0253	E	Conc Chnl 76'W 6.5'D 2:1 SS	283	5889	C11A-1	ALLGOW4	11.12	4.00
0258	E	Transition Structure	100	5788	CRCSWFH9	ALLGOW4	10.91	0.82
APSO		**ANGEL PARK - SOUTH BRANCH**						
0205	E	Natural Wash	2380	2056	C12B	ALLGOW3	2.00	3.46
0254	E	2: 8' X 8' RCBC @ Town Center Dr.	190	1932	C12A	ALLGOW3	1.74	3.00
0255	E	24' X 12' RCAC @ Town Center Dr.	140	1932	C12A	ALLGOW3	1.74	3.00
0258	E	Natural Wash	3235	1932	C12A	ALLGOW3	1.74	1.36
0345	E	2: 8' X 8' RCBC @ Pavilion Center	120	1622	CSW18	ALLGOW3	1.35	2.00
0346	E	Natural Wash	880	1622	CSW18	ALLGOW3	1.35	1.40
RRBW		**RED ROCK CHANNEL - BELTWAY LATERAL**						
0000	E	6' X 6' RCB	1300	500	USACE	USACE	0.72	0.67
RRR4		**R4 CHANNEL**						
0000	E	Conc Chnl 16'W 10'D 0:1 SS	260	2400	USACE	USACE	7.08	3.15
0007	E	16' X 10' RCBC	80	2400	USACE	USACE	7.08	4.25
0008	E	Conc Chnl 16'W 7.5'D 0:1 SS	2200	2400	USACE	USACE	7.08	2.88
RRWA		**RED ROCK CHANNEL**						
0395	E	Conc Chnl 19'W 10'D 0:1 SS	1180	4800	USACE	USACE	4.61	1.75
0425	E	19' X 10' RCBC @ Town Center	230	4800	USACE	USACE	4.61	1.75

ID / River Mile	Status	Facility Description	Length (ft.)	Flow (cfs)	HEC-1 Node	HEC-1 Model	Tributary Area (sq.mi.)	Channel Slope (%) **
RRWA		**RED ROCK CHANNEL**						
0430	E	Conc Chnl 14'W 13'D 0:1 SS	230	2300	USACE	USACE	2.19	3.15
0435	E	14' X 10' RCBC	50	2300	USACE	USACE	2.19	3.15
0436	E	Conc Chnl 14'W 8'D 0:1 SS	800	2300	USACE	USACE	2.19	3.15
0440	E	Conc Chnl 10'W 7.5'D 2:1 SS	2660	2300	USACE	USACE	2.19	2.14
0490	E	Conc Chnl 13'W 10'D 0:1 SS	200	2300	USACE	USACE	2.19	1.00
0500	E	13' X 10' RCBC @ Desert Inn	190	1900	USACE	USACE	1.75	1.00
0502	E	Conc Chnl 10'W 7'D 2:1 SS	1580	1900	USACE	USACE	1.75	2.60
0534	E	Conc Chnl 16'W 7'D 0:1 SS	400	1500	USACE	USACE	1.07	1.24
0541	E	Conc Chnl 10'W 7'D 2:1 SS	2120	1500	USACE	USACE	1.07	0.80
0581	E	13' X 9' RCB	1040	1000	USACE	USACE	1.07	0.60
0606	E	10' X 9' RCB	450	750	USACE	USACE	0.72	0.60
0607	E	10' X 9' RCB	450	750	USACE	USACE	0.72	0.60
0608	E	96" RCP	4930	460	USACE	USACE	0.72	0.55
0692	E	96" CIPCP	195	180	USACE	USACE	0.19	1.40
0695	E	96" RCP	290	180	USACE	USACE	0.19	0.50
0701	E	72" RCP	125	180	USACE	USACE	54.74	0.50
0709	E	Riprap Chnl 10'W 6'D 2:1 SS	830	180	USACE	USACE	54.74	0.80
0714	E	2.25' X 2.25' RCBC Outlet	445	180	USACE	USACE	54.74	
0715	E	110,000 cfs PMF Spillway		110000	USACE	USACE	54.74	
0716	E	2,007 ac-ft Red Rock Detention Basin		12800	USACE	USACE	54.74	
0777	E	2 Span Bridge 200'W 17'D @ SR 159	50	1998	CRD3	FLAM3A	1.24	2.50

** 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).

USACE - Refer to "Las Vegas Wash & Tributaries (Tropicana and Flamingo Washes) Hydrologic Basis for Design" prepared by U.S. Army Corps of Engineers, Los Angeles District, June 1993. See Figure S-6 for USACE Boundary.

REGIONAL FLOOD CONTROL DISTRICT

2008 LAS VEGAS VALLEY FLOOD CONTROL MASTER PLAN UPDATE

FACILITY INVENTORY FIGURE F - 29

LEGEND

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

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

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

Construction Features

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

PBS&J PB

Figure 5B: 2008 CCRFCD Master Plan Update Facility Inventory Summery Table

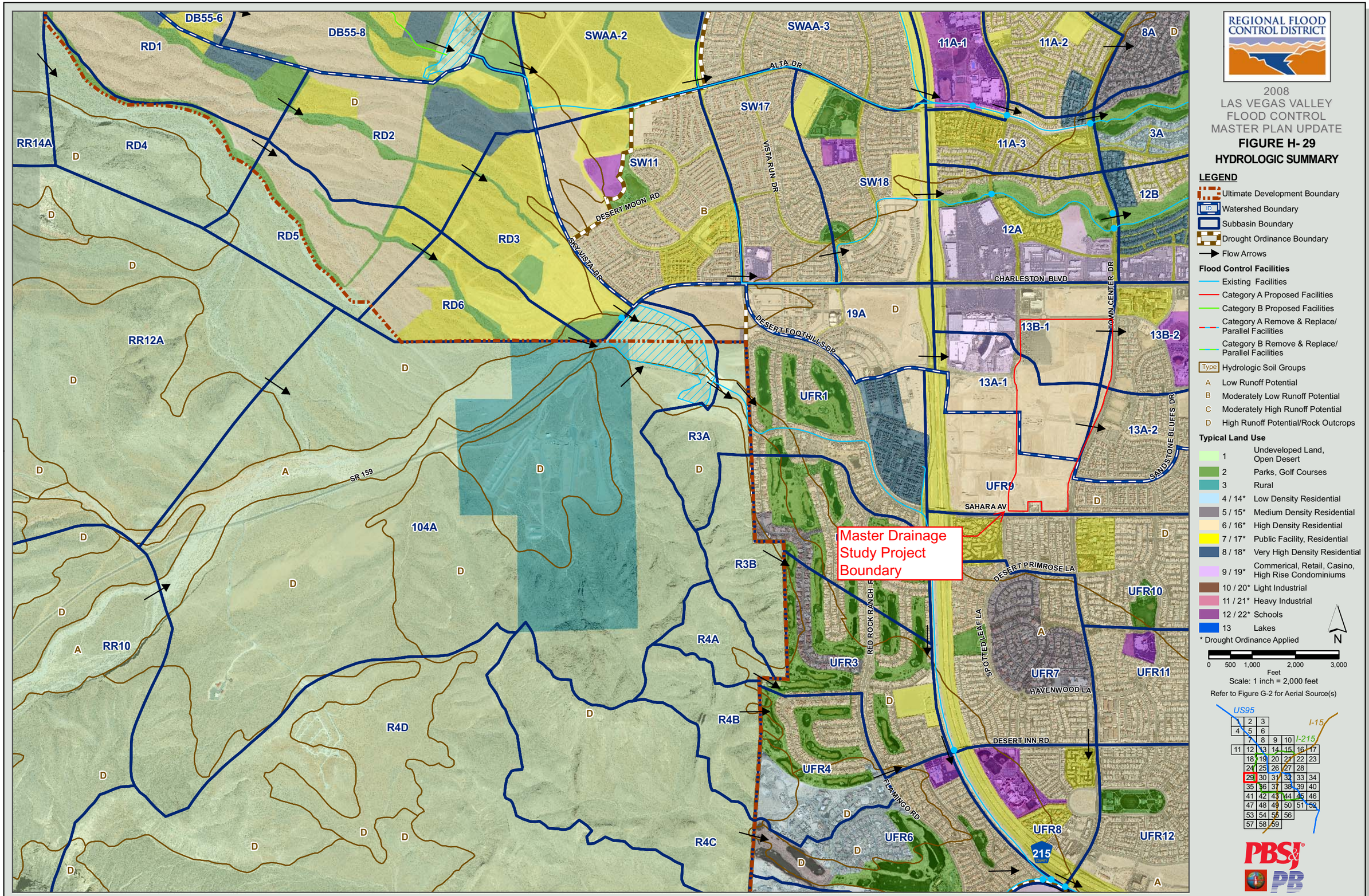
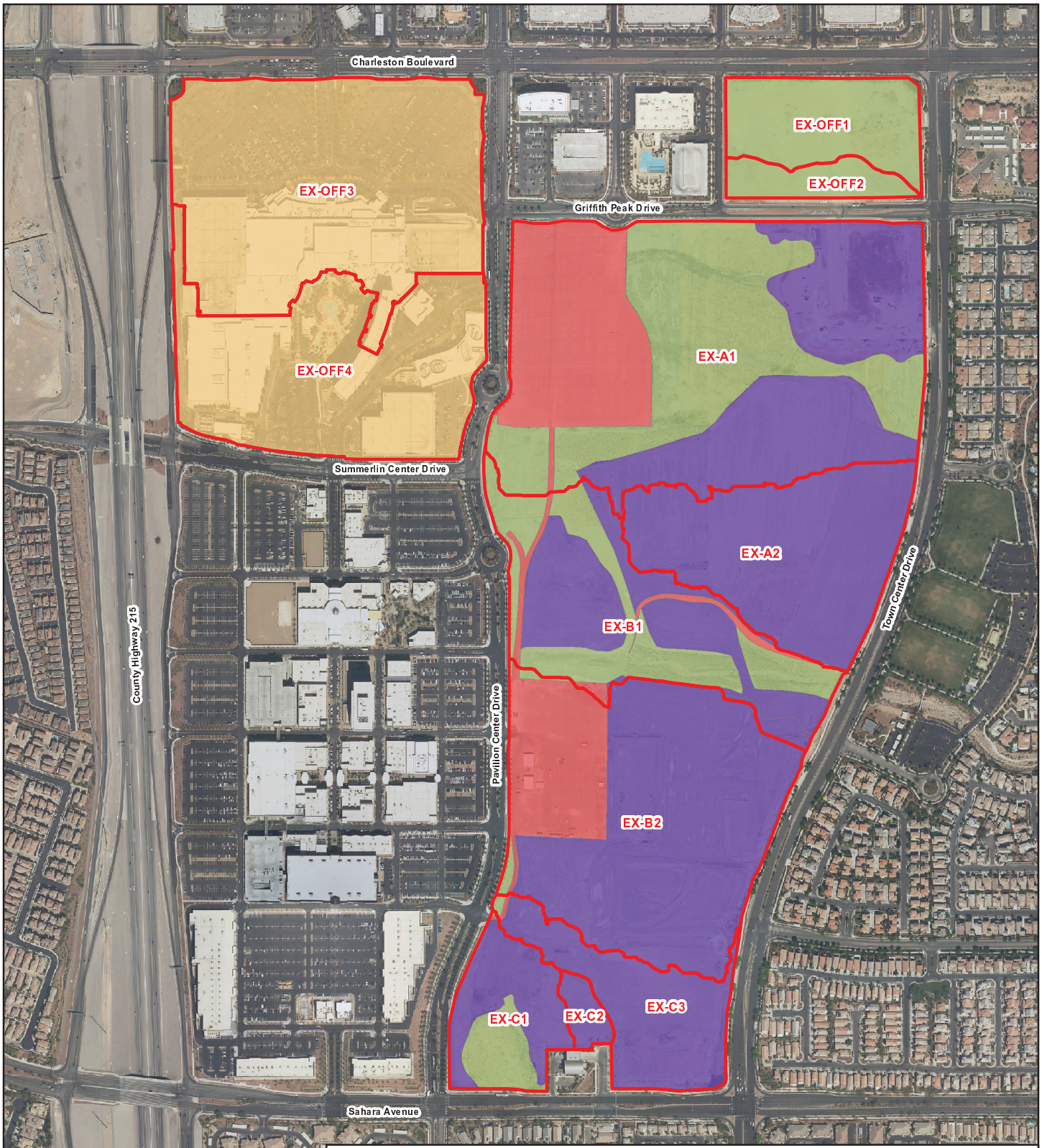


Figure 6: 2008 CCRFCD MASTER PLAN UPDATE HYDROLOGIC SUMMARY MAP



MASTER DRAINAGE STUDY & PHASE 1 TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST

Legend

- Existing Condition Subbasins (Not Referenced)

Existing Condition Landuse

- Commercial, Retail, High Rise Condominiums
- Natural Desert Landscaping
- Newly Graded Areas
- Streets and Roads (including ROW)

Aerial Source: Clark County Spring 2015

N

0 350 700 1,400

Feet

1 inch = 700 feet

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FIGURE A1: EXISTING CONDITION LANDUSE

MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
Existing Condition

BASIN ID	LAND USE INDEX NUMBER	LAND USE DESCRIPTION	SOIL MAP UNIT #	SUBREGION CN	SUBREGION AREA (SQ FT)	SUBBASIN AREA (SQ FT)	SUBREGION AREA (ACRE)	SUBBASIN AREA (ACRE)	PERCENT OF SUBBASIN	CUMULATIVE PERCENT	AREAL WEIGHTED CN	CUMULATIVE CN	COMPOSITE CN
EX-A1	1	Streets and Roads (including ROW)	152	98	686697	2805403	15.76	64.40	24.5%	24.5%	23.99	23.99	
EX-A1	6	Natural Desert Landscaping	152	88	1067018	2805403	24.50	64.40	38.0%	62.5%	33.47	57.46	
EX-A1	7	Newly Graded Areas	152	94	1051690	2805403	24.14	64.40	37.5%	100.0%	35.24	92.70	**92.7**
EX-A2	1	Streets and Roads (including ROW)	152	98	1273	974516	0.03	22.37	0.1%	0.1%	0.13	0.13	
EX-A2	6	Natural Desert Landscaping	152	88	32	974516	0.00	22.37	0.003%	0.1%	0.00	0.13	
EX-A2	7	Newly Graded Areas	152	94	973211	974516	22.34	22.37	99.9%	100.0%	93.87	94.01	**94.0**
EX-B1	1	Streets and Roads (including ROW)	152	98	70432	1095251	1.62	25.14	6.4%	6.4%	6.30	6.30	
EX-B1	6	Natural Desert Landscaping	152	88	458413	1095251	10.52	25.14	41.9%	48.3%	36.83	43.13	
EX-B1	7	Newly Graded Areas	152	94	566405	1095251	13.00	25.14	51.7%	100.0%	48.61	91.75	**91.7**
EX-B2	1	Streets and Roads (including ROW)	152	98	391590	1743615	8.99	40.03	22.5%	22.5%	22.01	22.01	
EX-B2	6	Natural Desert Landscaping	152	88	21582	1743615	0.50	40.03	1.2%	23.7%	1.09	23.10	
EX-B2	7	Newly Graded Areas	152	94	1330445	1743615	30.54	40.03	76.3%	100.0%	71.73	94.82	**94.8**
EX-C1	1	Streets and Roads (including ROW)	152	98	838	393372	0.02	9.03	0.2%	0.2%	0.21	0.21	
EX-C1	6	Natural Desert Landscaping	152	88	127696	393372	2.93	9.03	32.5%	32.7%	28.57	28.78	
EX-C1	7	Newly Graded Areas	152	94	264839	393372	6.08	9.03	67.3%	100.0%	63.29	92.06	**92.1**
EX-C2	7	Newly Graded Areas	152	94	69058	69058	1.59	1.59	100.0%	100.0%	94.00	94.00	**94.0**
EX-C3	1	Streets and Roads (including ROW)	152	98	2990	503162	0.07	11.55	0.6%	0.6%	0.58	0.58	
EX-C3	6	Natural Desert Landscaping	152	88	5093	503162	0.12	11.55	1.0%	1.6%	0.89	1.47	
EX-C3	7	Newly Graded Areas	152	94	495079	503162	11.37	11.55	98.4%	100.0%	92.49	93.96	**94.0**
EX-OFF1	6	Natural Desert Landscaping	152	88	437154	437155	10.04	10.04	100.0%	100.0%	88.00	88.00	**88.0**
EX-OFF2	6	Natural Desert Landscaping	152	88	160586	160587	3.69	3.69	100.0%	100.0%	88.00	88.00	**88.0**
EX-OFF3	5	Commercial, Retail, High Rise Condominiums	152	95	1697986	1697986	38.98	38.98	100.0%	100.0%	95.00	95.00	**95.0**
EX-OFF4	5	Commercial, Retail, High Rise Condominiums	152	95	1229618	1229618	28.23	28.23	100.0%	100.0%	95.00	95.00	**95.0**

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

ATKINS
File: FORM4.XLS

MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
EXISTING CONDITION

BY: MLD
DATE: 2/11/16

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag	
DESIG: (1)	DEV./EX. (D or E)	CN	K (2)	AREA Ac (3)	AREA Mi^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Min (13)	Min (14)	Tlag= 0.6Tc/60 Hours	
EX-A1	E	92.7	0.834	64.40	0.1006	244	1.3	6.9	2696	2.1	2.1	4.3	12.5	19.3	N/A	**0.193**	
EX-A2	E	94.0	0.851	22.37	0.0350	111	2.0	3.8	2442	1.6	1.9	3.7	13.2	16.9	N/A	**0.169**	
EX-B1	E	91.7	0.820	25.14	0.0393	71	1.4	3.8	2640	1.7	1.9	3.8	13.6	17.4	N/A	**0.174**	
EX-B2	E	94.8	0.861	40.03	0.0625	141	2.1	4.0	2377	1.9	2.0	4.1	11.8	15.8	N/A	**0.158**	
EX-C1	E	92.1	0.826	9.03	0.0141	124	6.5	2.9	1009	3.6	2.8	5.6	4.5	7.4	N/A	**0.100**	*
EX-C2	E	94.0	0.851	1.59	0.0025	35	2.7	1.9	466	4.5	3.1	6.2	2.5	4.4	N/A	**0.100**	*
EX-C3	E	94.0	0.851	11.55	0.0180	79	5.1	2.3	1746	2.5	2.3	4.6	8.0	10.3	N/A	**0.103**	
EX-OFF1	E	88.0	0.772	10.04	0.0157	109	0.5	7.8	1049	2.7	2.4	4.8	5.3	13.1	N/A	**0.131**	
EX-OFF2	E	88.0	0.772	3.69	0.0058	40	1.2	3.5	1042	2.5	2.3	4.6	5.5	9.0	N/A	**0.100**	*
EX-OFF3	D	95.0	0.864	38.98	0.0609	100	1.0	4.2	2309	1.6	2.6	3.9	11.1	15.3	23.4	**0.153**	
EX-OFF4	D	95.0	0.864	28.23	0.0441	100	1.0	4.2	1940	2.4	3.1	4.7	7.7	12.0	21.3	**0.120**	

Tc = Ti + Tt Tlag = 0.6 Tc
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3
K = 0.0132 (CN) - 0.39
Tc Check = L/180+10

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2
V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE : **STANDARD FORM 4**

*Minimum recommended Tc for undeveloped subbasins is 10 mins. A value of 0.10 was use for the Tlag where the calculated Tc was less than 10 mins.

W Charleston Boulevard

Pavilion Center Drive

Spruce Goose Street

City Park Drive

Griffith Peak Drive

Summerlin Center Drive

Oval Park Drive

Rosemary Park Drive

Marketwalk Place

Sage Peak Drive

Sahara Avenue

Town Center Drive

La Madre Mountain Dr

EX-OFF1

EX-OFF2

EX-OFF3

EX-OFF4

EX-A1

EX-A2

EX-B1

EX-B2

EX-C1

EX-C2

EX-C3

CP1A/A

CP1A/B

CP1A/C

CP1A

CP1B

CP1

CB7A

CB7

CP2

CC3

CC4

CP3

CP3/A

CP3/B

Existing 100-Year Discharge =
208 cfs (HEC-1 Combination Point CP1A)
Approved 100-Year Discharge =
299 cfs (Ultimate Condition)
Referenced from TDS for Summerlin Village 13:
Town Center Drive Improvments
HTE# 00-26582

Existing 100-Year Discharge =
430 cfs (HEC-1 Combination Point CP1B)
Approved 100-Year Discharge =
514 cfs (Ultimate Condition)
Referenced from TDS for Summerlin Village 13:
Town Center Drive Improvments
HTE# 00-26582

Existing 100-Year Discharge = 66 cfs (HEC-1 Subbasin EX-A2)
Approved 100-Year Discharge = 142 cfs (Ultimate Condition)
Referenced from TDS for Summerlin Village 13: Town Center
Drive Improvments
HTE# 00-26582

Existing 100-Year Discharge = 429 cfs (HEC-1 Combination Point CP2)
Approved 100-Year Discharge = 527 cfs (Ultimate Condition)
Refeneced from TDS for Summerlin Village 13 West Preliminary Grading
HTE# 08-9087

Existing 100-Year Discharge = 122 cfs (HEC-1 Basin EX-B2)
Approved 100-Year Discharge = 151 cfs (Ultimate Condition)
Referenced from TDS for Summerlin Village 13: Town Center
Drive Improvments
HTE# 00-26582

Existing 100-Year Discharge = 392 cfs (HEC-1 Combination Point CP3/B)
Approved 100-Year Discharge = 399 cfs (Ultimate Condition)
Referenced from the Response to Comments to the TDS for Summerlin
Village 13 East: Phase 2 Improvements
HTE# 00-3937

HEC-1 Node	Tributary Area (mi^2)	Tributary Area (acres)	10-Year Discharge (cfs)	100-Year Discharge (cfs)
CB7	0.33	211.20	228	362
CB7A	0.29	185.60	187	286
CC3	0.13	83.20	144	270
CC4	0.14	89.60	156	292
CP1	0.14	89.60	117	233
CP1A	0.11	70.40	107	208
CP1A/A	0.07	44.80	69	132
CP1A/B	0.08	51.20	82	158
CP1A/C	0.1	64.00	98	190
CP1B	0.24	153.60	222	430
CP2	0.37	236.80	261	429
CP2B	0.43	275.20	324	548
CP3	0.01	6.40	8	15
CP3/A	0.17	108.80	185	348
CP3/B	0.19	121.60	208	392
EX-A1	0.1006	64.40	84	173
EX-A2	0.0350	22.37	33	66
EX-B1	0.0393	25.14	32	69
EX-B2	0.0625	40.03	63	122
EX-C1	0.0141	9.03	13	28
EX-C2	0.0025	1.59	3	5
EX-C3	0.0180	11.55	19	37
EX-OFF1	0.0157	10.04	11	26
EX-OFF2	0.0058	3.69	4	10
EX-OFF3	0.0609	38.98	63	120
EX-OFF4	0.0441	28.23	47	89

MASTER DRAINAGE STUDY & PHASE 1 TECHNICAL DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST

FIGURE 8: EXISTING CONDITION SUBBASIN MAP

Legend

- Combination Points*
- 1-ft Contours (2015)
- 1-ft Contours (2012)
- Flow Directions
- Existing Storm Water Facilities
- Existing Condition Subbasins*
- Topography Boundary
- Onsite Area Tributary to Faith Lutheran Detention Basin
- Onsite Area Tributary to Existing Downstream Wash
- Onsite Area Tributary to Sahara Avenue

N

0 100 200 400 Feet

1 inch = 200 feet

Aerial Source: Clark County Spring 2015

*Only modified and onsite subbasins/combination points are shown. All other subbasins/combination points were directly referenced from previously approved drainage studies (Refer to Figure 6: Reference Studies Map and Appendix C for applicable reference material).

**Where applicable, the approved 100-year discharge for a specific combination point has been included on the map for comparison. The approved discharges are shown in the GREEN call-outs. The associated drainage study name and HTE# have also been provided.

```
1****************************************
*                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *
*             JUN  1998                *
*           VERSION 4.1                *
*                                      *
*  RUN DATE   11FEB16  TIME  21:25:18  *
*                                      *
****************************************
```

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

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

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

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


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

                        *DIAGRAM
 *** FREE ***
             1          ID  * ************************************************************
             2          ID  *
             3          ID  *     MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
             4          ID  *     EXISTING CONDITION
             5          ID  *
             6          ID  *     CLIENT_ _ _ _ _ _ _ THE HOWARD HUGHES CORP
             7          ID  *     RETURN PERIOD_ _ _ _100-YEAR AND 10-YEAR
             8          ID  *     DISTRIBUTION_ _ _ _ _ 6-HOUR SDN3
             9          ID  *     PROJECT NO_ _ _ _ _ _ 100047977
            10          ID  *     FILENAME_ _ _ _ _ _ EXIST2016.PRN
            11          ID  *     DATE_ _ _ _ _ _ _ _ 02/11/16
            12          ID  *
            13          ID  *     JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            14          ID  *     AREA (SQUARE MILES)            100 YR DARF
            15          ID  *               0 - 0.13               1.00
            16          ID  *            0.13 - 0.5                0.98
            17          ID  *
            18          ID  *               10-YEAR                 0.57
            19          ID  *
            20          ID  * ************************************************************
            21          ID
            22          ID
            23          IT       5       0       0     300
            24          IO       5       0       0
            25          IN       5       0       0
            26          JR    PREC       1    0.98    0.57
                        *
                        *
                        * ********************************************************************
                        *      START OF REFERENCED SUMMERLIN VILLAGE 19 HEC-1 MODEL
                        *      TDS FOR SUMMERLIN VILLAGE 19 DETENTION BASIN PARK DATED 08/08
                        *      HTE #08-24428
                        *      ULTIMATE CONDITION MODEL DATED 03/12/08
                        * ********************************************************************
                        *
                        *
            27          KK      3B
            28          KM  SINGLE FAMILY 8 UNITS PER ACRE
            29          BA  .01641
            30          PB    3.15
            31          PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
            32          PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
            33          PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
            34          PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            35          PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            36          PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
            37          PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
            38          PC   0.998   0.999   1.000
            39          LS       0      95
            40          UD   0.108
                        *
```



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


            41          KK      3A
            42          KM  SINGLE FAMILY 8 UNITS PER ACRE
            43          BA 0.03828
            44          LS       0      95
            45          UD   0.123
                        *

            46          KK      3C
            47          KM  SINGLE FAMILY 6 UNITS PER ACRE
            48          BA  .01109
            49          LS       0      95
            50          UD   0.110
                        *

            51          KK     CB1
            52          KM  COMBINE 3A AND 3C
            53          HC       2
                        *

            54          KK      4F
            55          KM  SINGLE FAMILY 8 UNITS PER ACRE
            56          BA  .00328
            57          LS       0      95
            58          UD   0.076
                        *

            59          KK     CB2
            60          KM  COMBINE 4F AND CB2
            61          HC       2
                        *
```

```
   62          KK      4B
   63          KM  SINGLE FAMILY UNITS PER ACRE
   64          BA  .00391
   65          LS        0      95
   66          UD   0.076
               *

   67          KK     CB3
   68          KM  COMBINE 4B AND CB2
   69          HC        2
               *

   70          KK    R/CB2
   71          KM  ROUTE FLOWS TO 36 INCH SD
   72          RD     400    0.02   0.013       0    CIRC       3
               *

   73          KK     PLA
   74          KM  STREET
   75          BA  .00259
   76          LS        0    93.0
   77          UD   0.057
               *
1                                        HEC-1 INPUT                                                PAGE  3

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

   78          KK     CB4
   79          KM  COMBINE CB3 AND VISTA
   80          HC        2
               *

   81          KK     CB5
   82          KM  COMBINE CB4 AND 3B
   83          HC        2
               *

   84          KK      4E
   85          KM  SINGLE FAMILY 10 UNITS PER ACRE
   86          BA  .00234
   87          LS        0      95
   88          UD   0.070
               *

   89          KK     CB6
   90          KM  COMBINE 4E AND CB5
   91          HC        2
               *

   92          KK      2A
   93          KM  SINGLE FAMILY 12 UNITS PER ACRE
   94          BA 0.01344
   95          LS        0      95
   96          UD   0.102
               *

   97          KK     CB7
   98          KM  COMBINE 2A AND CB6
   99          HC        2
               *

  100          KK    R/CB3
  101          KM  ROUTE FLOWS TO DETENTION BASIN
  102          RD    1100    0.02   0.013       0    CIRC       4
               *

  103          KK      4A
  104          KM  SINGLE FAMILY UNITS PER ACRE
  105          BA  .00797
  106          LS        0      95
  107          UD    .089
               *

  108          KK     CB8
  109          KM  COMBINE 4A AND CB7
  110          HC        2
               *
1                                        HEC-1 INPUT                                                PAGE  4

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

  111          KK      2C
  112          KM  SINGLE FAMILY UNITS PER ACRE
  113          BA  .01375
  114          LS        0      95
  115          UD   0.099
               *

  116          KK      2B
  117          KM  SINGLE FAMILY UNITS PER ACRE
  118          BA  .01453
  119          LS        0      95
  120          UD   0.090
               *

  121          KK     CB9
  122          KM  COMBINE 2C AND 2B
  123          HC        2
               *

  124          KK     SMD
  125          KM  STREET
  126          BA  .00839
  127          LS        0      95
  128          UD   0.113
               *

  129          KK    CB10
  130          KM  COMBINE SAGE CB8 AND CB9
  131          HC        3
               *

  132          KK      4D
  133          KM  SINGLE FAMILY UNITS PER ACRE
  134          BA  .00547
  135          LS        0      95
  136          UD   0.078
               *

  137          KK      4C
  138          KM  SINGLE FAMILY UNITS PER ACRE
  139          BA  .00594
  140          LS        0      95
  141          UD   0.081
               *
```

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  142          KK    CB11
  143          KM  COMBINE 4E AND 4D
  144          HC       2
               *
1                                        HEC-1 INPUT                                                PAGE  5

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

  145          KK     3F
  146          KM  SINGLE FAMILY UNITS PER ACRE
  147          BA  .00828
  148          LS       0      95
  149          UD   0.084
               *

  150          KK    CB12
  151          KM  COMBINE 3F AND CB11
  152          HC       2
               *

  153          KK     3D
  154          KM  SINGLE FAMILY UNITS PER ACRE
  155          BA  .01500
  156          LS       0      95
  157          UD   0.111
               *

  158          KK     3E
  159          KM  SINGLE FAMILY UNITS PER ACRE
  160          BA  .01125
  161          LS       0      95
  162          UD   0.116
               *

  163          KK    CB13
  164          KM  COMBINE 3D 3E AND CB12
  165          HC       3
               *

  166          KK     NP
  167          KM  SINGLE FAMILY UNITS PER ACRE
  168          BA  .00338
  169          LS       0      95
  170          UD    0.05
               *

  171          KK    CB14
  172          KM  COMBINE NP AND CB13
  173          HC       2
               *

  174          KK     DB
  175          KM  SINGLE FAMILY UNITS PER ACRE
  176          BA  .01375
  177          LS       0      81
  178          UD   0.188
               *
1                                        HEC-1 INPUT                                                PAGE  6

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

  179          KK    D.IN
  180          KM  COMBINE COMBINE CB14 DB CB9 AND CB13
  181          HC       3
               *

  182          KK   D.OUT
  183          KM  PROPOSED PARK/DETENTION BASIN
  184          KM
  185          KO       3
  186          RS       1    STOR      -1
  187          SV       0    .000    0.22    0.63    1.13    1.68    2.37    3.55    5.61     7.3
  188          SV   11.14   14.26      17
  189          SE   48.62    56.5    58.0    59.0    60.0    61.0    62.0    63.0    64.0    65.0
  190          SE    66.0    67.0    69.6
  191          SQ     0.0    80.4    89.0    94.2    99.2   104.0   108.5   112.9   117.1   121.1
  192          SQ   125.0   128.8   650.0
               *

  193          KK     PCD
  194          KM  STREET
  195          BA  .00416
  196          LS       0      95
  197          UD   0.062
               *

  198          KK    CB15
  199          KM  COMBINE PARK AND D.OUT
  200          HC       2
               *
               *
               * ************************************************************************
               *      END OF REFERENCED SUMMERLIN VILLAGE 19 HEC-1 MODEL
               * ************************************************************************
               *
               *
               *
               * ************************************************************************
               *      START OF REFERENCED PAVILION CENTER DRIVE HEC-1 MODEL
               *      UPDATE TO TDS FOR SUMMERLIN VILLAGE 13 PAVILION CENTER DRIVE DATED 11/02
               *      HTE #02-37860
               *      ULTIMATE CONDITION MODEL DATED 10/04/02
               * ************************************************************************
               *
               *

  201          KK    B13A
  202          KM  HUGHES PARK DRIVE
  203          BA   .0073
  204          LS       0      89
  205          UD   0.093
               *
1                                        HEC-1 INPUT                                                PAGE  7

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

  206          KK    CB4A
  207          KM  COMBINE CB15 AND B13A
  208          HC       2
               *

  209          KK    B13B
  210          KM  HUGHES PARK DRIVE
  211          BA  .00609
  212          LS       0      87
```

```
 213          UD   0.078
              *

 214          KK    CB4B
 215          KM  COMBINE CB4A AND B13B
 216          HC       2
              *

 217          KK  R/CB4B
 218          KM  ROUTE FLOW THRU B14 TO CB5A
 219          RD     530    0.02   0.016       0    TRAP       0      50
              *

 220          KK     B14
 221          KM  STREET
 222          BA  .00286
 223          LS       0    95.0
 224          UD   0.093
              *

 225          KK    CB5A
 226          KM  COMBINE CB4 AND CB4B AT CB5A
 227          HC       2
              *

 228          KK     B15
 229          KM  SUMMERLIN CENTER DRIVE
 230          BA  .00592
 231          LS       0    92.0
 232          UD   0.099
              *

 233          KK     B16
 234          KM  SUMMERLIN CENTER DRIVE
 235          BA  .00609
 236          LS       0    89.0
 237          UD   0.087
              *

 238          KK    CB5B
 239          KM  COMBINE CB5A B15 AND B16 AT CB5B
 240          HC       3
              *
1                                        HEC-1 INPUT                                                    PAGE  8

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

 241          KK   R/CB5
 242          KM  ROUTE FLOW THRU B17 TO CB5B
 243          RD    1300   0.017   0.016       0    TRAP       0      50
              *

 244          KK    B17A
 245          KM  PARK CENTER DRIVE
 246          BA  .00411
 247          LS       0    95.0
 248          UD   0.069
              *

 249          KK    CB6A
 250          KM  COMBINE CB5B AND B17A AT CB6A
 251          HC       2
              *

 252          KK    B17B
 253          KM  PARK CENTER DRIVE
 254          BA  .00244
 255          LS       0    95.0
 256          UD   0.085
              *
              *
              * ************************************************************************
              *      END OF REFERENCED SUMMERLIN PAVILION CENTER DRIVE HEC-1 MODEL
              * ************************************************************************
              *
              *

 257          KK EX-OFF4
 258          KM  SOUTHEREN PORTION OF RED ROCK CASINO
 259          BA   .0441
 260          LS       0    95.0
 261          UD    0.12
              *
              *
              * ************************************************************************
              *      START OF REFERENCED PAVILION CENTER DRIVE HEC-1 MODEL
              *      UPDATE TO TDS FOR SUMMERLIN VILLAGE 13 PAVILION CENTER DRIVE DATED 11/02
              *      HTE #02-37860
              *      ULTIMATE CONDITION MODEL DATED 10/04/02
              * ************************************************************************
              *
              *

 262          KK    CB6B
 263          KM  COMBINE CB6A B17B AND R-B18A AT CB6B
 264          HC       3
              *
1                                        HEC-1 INPUT                                                    PAGE  9

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

 265          KK     B19
 266          KM  STREET AND PARK CENTER
 267          BA  .00969
 268          LS       0    92.0
 269          UD   0.208
              *

 270          KK    CB7A
 271          KM  COMBINE CB6B AND B19 AND EX-OFF AT CB7A
 272          HC       2
              *
              *
              * ************************************************************************
              *      END OF REFERENCED SUMMERLIN PAVILION CENTER DRIVE HEC-1 MODEL
              * ************************************************************************
              *
              *

 273          KK      M1
 274          KM  NORTHERN PORTION OF THE SHOPS AT SUMMERLIN
 275          KM  REFERENCED FROM TDS FOR THE SHOPS AT SUMMERLIN DATED 07/12
 276          KM  HTE# 12-28773
 277          KM  PROPOSED CONDITION HEC-1 MODEL DATED 05/17/12
 278          BA   .0398
 279          LS       0    95.0
```

```
 280          UD   0.098
              *

 281          KK     CB7
 282          KM  COMBINE CB7A AND M1 AT CB7
 283          KM  REFERENCED FROM SUMMERLIN PAVILION CENTER DRIVE HEC-1 MODEL
 284          KM  UPDATE TO TDS FOR SUMMERLIN VILLAGE 13 PAVILION CENTER DRIVE DATED 11/02
 285          KM  HTE #02-37860
 286          KM  ULTIMATE CONDITION MODEL DATED 10/04/02
 287          HC       2
              *

 288          KK    EX-B1
 289          KM  ONSITE SUMMERLIN VILLAGE 13 WEST BASIN EX-B1
 290          BA   .0393
 291          LS       0    91.7
 292          UD   0.174
              *

 293          KK     CP2
 294          KM  COMBINED CB7 AND EX-B1 AT CP2
 295          KM  REFERENCED FROM SUMMERLIN VILLAGE 13 WEST PRELIMINARY GRADING
 296          KM  TDS FOR SUMMERLIN VILLAGE 13 WEST PRELIMINARY GRADING DATED 03/08
 297          KM  HTE# 08-9087
 298          KM  PROPOSED CONDITIONS HEC-1 MODEL DATED 03/21/08
 299          HC       2
              *
1                                        HEC-1 INPUT                                                PAGE 10

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

 300          KK    EX-B2
 301          KM  ONSITE SUMMERLIN VILLAGE 13 WEST BASIN EX-B2
 302          BA   .0625
 303          LS       0    94.8
 304          UD   0.158
              *

 305          KK     CP2B
 306          HC       2
              *

 307          KK      M2
 308          KM  CENTER PORTION OF THE SHOPS AT SUMMERLIN
 309          KM  REFERENCED FROM TDS FOR THE SHOPS AT SUMMERLIN DATED 07/12
 310          KM  UPDATE TO TDS FOR SUMMERLIN VILLAGE 13 PAVILION CENTER DRIVE DATED 11/02
 311          KM  HTE #02-37860
 312          KM  PROPOSED CONDITION HEC-1 MODEL DATED 05/17/12
 313          BA   .1092
 314          LS       0    95.0
 315          UD   0.115
              *

 316          KK      C3
 317          KM  STREET
 318          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 319          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 320          KM  HTE#98-31194
 321          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 322          BA  .00609
 323          LS       0    96.0
 324          UD   0.114
              *

 325          KK     CC2
 326          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 327          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 328          KM  HTE#98-31194
 329          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 330          HC       2
              *

 331          KK      M3
 332          KM  SOUTHERN PORTION OF THE SHOPS AT SUMMERLIN
 333          KM  REFERENCED FROM TDS FOR THE SHOPS AT SUMMERLIN DATED 07/12
 334          KM  HTE #02-37860
 335          KM  PROPOSED CONDITION HEC-1 MODEL DATED 05/17/12
 336          BA   .0142
 337          LS       0    95.0
 338          UD   0.088
              *
1                                        HEC-1 INPUT                                                PAGE 11

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

 339          KK      C6
 340          KM  STREET
 341          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 342          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 343          KM  HTE#98-31194
 344          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 345          BA  .00375
 346          LS       0    95.0
 347          UD   0.051
              *

 348          KK     CC3
 349          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 350          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 351          KM  HTE#98-31194
 352          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 353          HC       3
              *
              *
              * ********************************************************************
              *      START OF REFERENCED SUMMERLIN VILLAGE 13 1998 HEC-1 MODEL
              *      ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY DATED 12/98
              *      HTE# 98-31194
              *      PROPOSED CONDITION MODEL DATED 10/07/98
              * ********************************************************************
              *
              *

 354          KK      C7
 355          KM  SAHARA AVE (REVISED FROM APPROVED DS FOR SAHARA FROM WESTERN BELTWAY TO ST F
 356          BA  .00609
 357          LS       0    97.0
 358          UD   0.069
              *

 359          KK    R/C7
 360          KM  ROUTE FLOW THRU B17 TO CC4
 361          RD     615   0.025   0.016       0    TRAP       0      50
              *

 362          KK      C8
```

```
 363          KM  SAHARA AVE (REVISED FROM APPROVED DS FOR SAHARA FROM WESTERN BELTWAY TO ST F
 364          BA  .00328
 365          LS       0    98.0
 366          UD   0.053
              *

 367          KK     CC4
 368          KM  COMBINE CC3 C7 AND C8 AT CC4
 369          HC       3
              *
              *
              * ************************************************************************
              *      END OF REFERENCED SUMMERLIN VILLAGE 13 1998 HEC-1 MODEL
              * ************************************************************************
              *
              *
1                                       HEC-1 INPUT                                     PAGE 12

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

 370          KK      FS
 371          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 372          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 373          KM  HTE#98-31194
 374          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 375          BA  .00234
 376          LS       0    95.0
 377          UD    0.05
              *

 378          KK      F1
 379          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 380          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 381          KM  HTE#98-31194
 382          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 383          BA  .00141
 384          LS       0    98.0
 385          UD   0.035
              *

 386          KK   EX-C2
 387          KM  ONSITE SUMMERLIN VILLAGE BASIN EX-C2
 388          BA   .0025
 389          LS       0    94.0
 390          UD     0.1
              *

 391          KK     CP3
 392          KM  REFERENCED FROM SUMMERLIN VILLAGE 13 WEST PRELIMINARY GRADING
 393          KM  TDS FOR SUMMERLIN VILLAGE 13 WEST PRELIMINARY DATED 03/08GRADING
 394          KM  HTE# 08-9087
 395          KM  PROPOSED CONDITIONS HEC-1 MODEL DATED 03/21/08
 396          HC       3
              *

 397          KK   EX-C1
 398          KM  ONSITE SUMMERLIN VILLAGE 13 WEST BASIN EX-C1
 399          BA   .0141
 400          LS       0    92.1
 401          UD     0.1
              *

 402          KK      S1
 403          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 404          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 405          KM  HTE#98-31194
 406          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 407          BA  .00578
 408          LS       0    98.0
 409          UD   0.084
              *
1                                       HEC-1 INPUT                                     PAGE 13

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

 410          KK   CP3/A
 411          KM  MATCHES COM1 FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 412          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 413          KM  HTE#98-31194
 414          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 415          HC       4
              *

 416          KK      S2
 417          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 418          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 419          KM  HTE#98-31194
 420          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 421          BA   .0035
 422          LS       0      95
 423          UD   0.075
              *

 424          KK   EX-C3
 425          KM  ONSITE SUMMERLIN VILLAGE BASIN EX-C3
 426          BA    .018
 427          LS       0    94.0
 428          UD   0.103
              *

 429          KK   CP3/B
 430          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 431          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 432          KM  HTE#98-31194
 433          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 434          HC       3
              *

 435          KK   EX-A1
 436          KM  ONSITE SUMMERLIN VILLAGE 13 BASIN EX-A1
 437          BA   .1006
 438          LS       0    92.7
 439          UD   0.193
              *

 440          KK   EX-A2
 441          KM  ONSITE SUMMERLIN VILLAGE 13 BASIN EX-A2
 442          BA   .0350
 443          LS       0    94.0
 444          UD   0.169
              *

 445          KK     CP1
 446          HC       2
              *
1                                       HEC-1 INPUT                                     PAGE 14
```

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

 447          KK EX-OFF3
 448          KM  NORTHERN PORTION OF RED ROCK CASINO
 449          BA   .0609
 450          LS      0    95.0
 451          UD   0.153
              *

 452          KK    A2A
 453          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 454          KM  PARCEL X IMPROVEMENTS DATED 06/00
 455          KM  HTE# 00-18645
 456          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 457          BA  .00272
 458          LS      0    95.0
 459          UD   0.066
              *

 460          KK    A2B
 461          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 462          KM  PARCEL X IMPROVEMENTS DATED 06/00
 463          KM  HTE# 00-18645
 464          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 465          BA  .00398
 466          LS      0    95.0
 467          UD   0.093
              *

 468          KK  CP1A/A
 469          HC      3
              *

 470          KK    A9A
 471          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 472          KM  PARCEL X IMPROVEMENTS DATED 06/00
 473          KM  HTE# 00-18645
 474          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 475          BA  .00184
 476          LS      0    95.0
 477          UD   0.036
              *

 478          KK   OFF1
 479          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 480          KM  SPRUCE GOOSE STREET IMPROVEMENTS DATED 08/04
 481          KM  HTE# 04-41239
 482          KM  ULTIMATE CONDITION MODEL DATED 1/16/04
 483          BA  .01036
 484          LS      0    95.0
 485          UD   0.094
              *
1                                        HEC-1 INPUT                                        PAGE 15

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

 486          KK    ST1
 487          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 488          KM  SPRUCE GOOSE STREET IMPROVEMENTS DATED 08/04
 489          KM  HTE# 04-41239
 490          KM  ULTIMATE CONDITION MODEL DATED 1/16/04
 491          BA  .00152
 492          LS      0    94.6
 493          UD   0.084
              *

 494          KK  CP1A/B
 495          HC      4
              *

 496          KK    A9B
 497          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 498          KM  PARCEL X IMPROVEMENTS DATED 06/00
 499          KM  HTE# 00-18645
 500          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 501          BA  .00409
 502          LS      0    95.0
 503          UD   0.056
              *

 504          KK    OF1
 505          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 506          KM  STREET Y IMPROVEMENTS DATED 07/07
 507          KM  HTE# 07-33087
 508          KM  ULTIMATE CONDITION MODEL DATED 7/05/07
 509          BA   .0097
 510          LS      0    95.0
 511          UD   0.108
              *

 512          KK    ON1
 513          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 514          KM  STREET Y IMPROVEMENTS DATED 07/07
 515          KM  HTE# 07-33087
 516          KM  ULTIMATE CONDITION MODEL DATED 7/05/07
 517          BA   .0015
 518          LS      0    93.8
 519          UD   0.054
              *

 520          KK  CP1A/C
 521          HC      4
              *

 522          KK EX-OFF2
 523          KM  SOUTHERN PROTION OF PARCEL X
 524          BA   .0058
 525          LS      0    88.0
 526          UD    0.10
              *
1                                        HEC-1 INPUT                                        PAGE 16

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

 527          KK    A9C
 528          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 529          KM  PARCEL X IMPROVEMENTS DATED 06/00
 530          KM  HTE# 00-18645
 531          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 532          BA  .00358
 533          LS      0    95.0
 534          UD   0.084
              *
```

```
535          KK     CP1A
536          HC        3
             *

537          KK     CP1B
538          HC        2
             *

539          KK EX-OFF1
540          KM  NORTHERN PROTION OF PARCEL X
541          BA   .0157
542          LS        0    88.0
543          UD   0.131
             *

544          ZZ
```

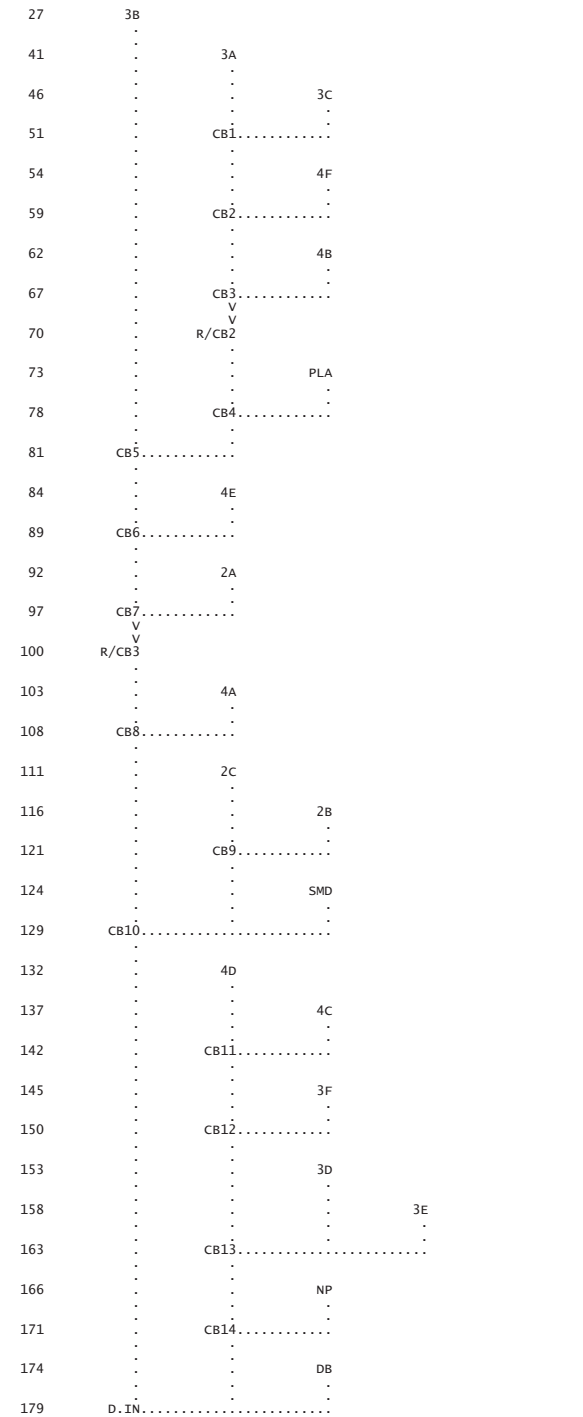
1

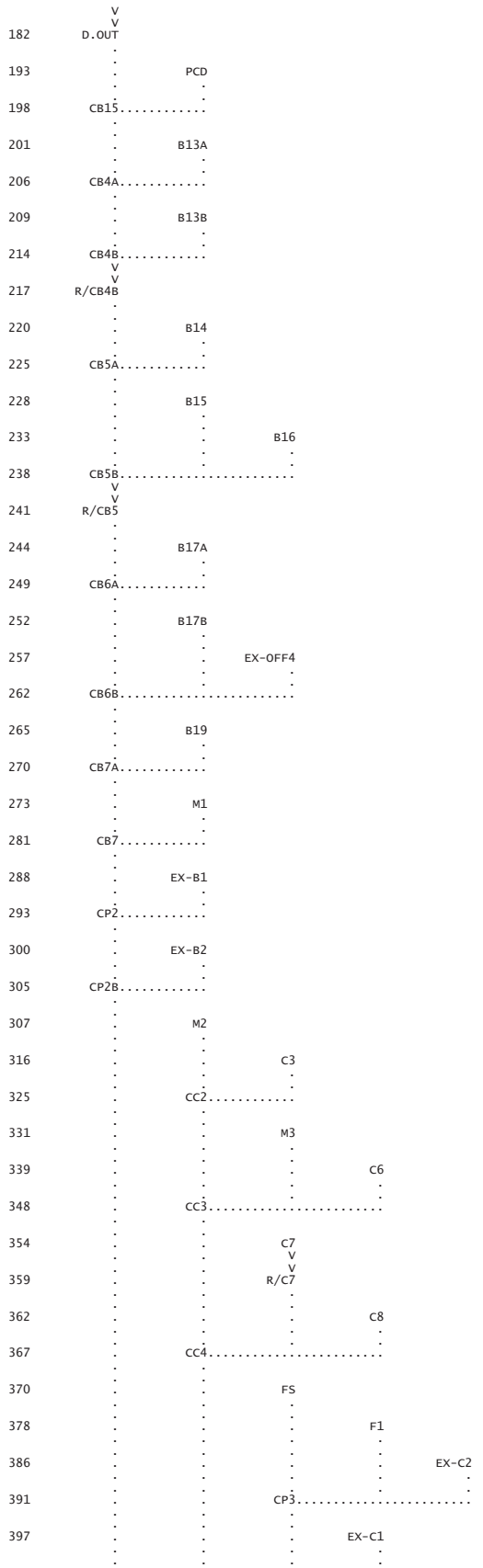
SCHEMATIC DIAGRAM OF STREAM NETWORK

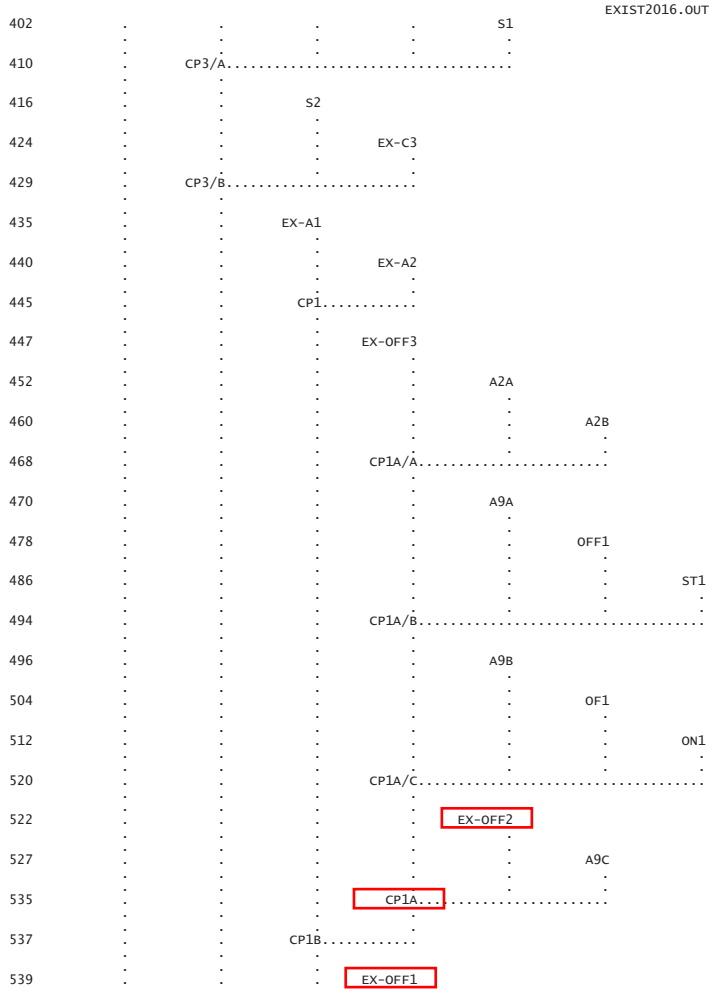
INPUT LINE NO.

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

(.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW




D.OUT
PCD
CB15
B13A
CB4A
B13B
CB4B
R/CB4B
B14
CB5A
B15
B16
CB5B
R/CB5
B17A
CB6A
B17B
EX-OFF4
CB6B
B19
CB7A
M1
CB7
EX-B1
CP2
EX-B2
CP2B
M2
C3
CC2
M3
C6
CC3
C7
R/C7
C8
CC4
FS
F1
EX-C2
CP3
EX-C1



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
 *                                       *
 *   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
 *             JUN  1998                 *
 *           VERSION 4.1                 *
 *                                       *
 *  RUN DATE   11FEB16  TIME  21:25:18   *
 *                                       *
 *****************************************
```

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

```
* ***************************************************************
*
*     MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
*     EXISTING CONDITION
*
*     CLIENT_ _ _ _ _ _ _ THE HOWARD HUGHES CORP
*     RETURN PERIOD_ _ _ _100-YEAR AND 10-YEAR
*     DISTRIBUTION_ _ _ _ 6-HOUR SDN3
*     PROJECT NO_ _ _ _ _ 100047977
*     FILENAME_ _ _ _ _ _ EXIST2016.PRN
*     DATE_ _ _ _ _ _ _ _ 02/11/16
*
*     JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
*     AREA (SQUARE MILES)            100 YR DARF
*              0 - 0.13                1.00
*              0.13 - 0.5              0.98
*
*              10-YEAR                 0.57
*
* ***************************************************************
```

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

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

                 COMPUTATION INTERVAL      .08 HOURS
                      TOTAL TIME BASE   24.92 HOURS
```

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

     JP          MULTI-PLAN OPTION
                      NPLAN           1  NUMBER OF PLANS

     JR          MULTI-RATIO OPTION
                     RATIOS OF PRECIPITATION
                    1.00       .98       .57


*** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** *** ***


           ***************
           *             *
 182 KK    *     D.OUT   *
           *             *
           ***************

 185 KO          OUTPUT CONTROL VARIABLES
                      IPRNT           3  PRINT CONTROL
                      IPLOT           0  PLOT CONTROL
                      QSCAL          0.  HYDROGRAPH PLOT SCALE

               HYDROGRAPH ROUTING DATA

 186 RS          STORAGE ROUTING
                      NSTPS           1  NUMBER OF SUBREACHES
                       ITYP        STOR  TYPE OF INITIAL CONDITION
                     RSVRIC       -1.00  INITIAL CONDITION
                          X         .00 WORKING R AND D COEFFICIENT

 187 SV            STORAGE          .0        .0        .2        .6       1.1       1.7       2.4       3.5       5.6       7.3
                                   11.1      14.3      17.0

 189 SE            ELEVATION       48.62     56.50     58.00     59.00     60.00     61.00     62.00     63.00     64.00     65.00
                                   66.00     67.00     69.60

 191 SQ            DISCHARGE         0.       80.       89.       94.       99.      104.      109.      113.      117.      121.
                                   125.      129.      650.

                                                                  ***

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    D.OUT
                          FOR PLAN 1, RATIO = 1.00

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                  (CFS)
+     122.      3.83                54.          13.         13.          13.
                (INCHES)          2.515       2.518       2.518        2.518
                 (AC-FT)            27.          27.         27.          27.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                    6-HR        24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
        8.      3.83                 2.           0.          0.           0.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                    6-HR        24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
     65.22      3.83               55.07       50.23       50.17        50.17

                        CUMULATIVE AREA =     .20 SQ MI

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    D.OUT
                          FOR PLAN 1, RATIO =  .98

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                  (CFS)
+     122.      3.83                52.          13.         13.          13.
                (INCHES)          2.431       2.434       2.434        2.434
                 (AC-FT)            26.          26.         26.          26.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                    6-HR        24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
        8.      3.83                 2.           1.          1.           1.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                    6-HR        24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
     65.14      3.83               57.70       55.05       54.86        54.86

                        CUMULATIVE AREA =     .20 SQ MI

      ***             ***             ***             ***             ***

                        HYDROGRAPH AT STATION    D.OUT
                          FOR PLAN 1, RATIO =  .57

  PEAK FLOW     TIME                          MAXIMUM AVERAGE FLOW
                                    6-HR        24-HR       72-HR     24.92-HR
+   (CFS)       (HR)
                  (CFS)
+     108.      3.75                27.           7.          6.           6.
                (INCHES)          1.242       1.243       1.243        1.243
                 (AC-FT)            13.          13.         13.          13.

 PEAK STORAGE   TIME                         MAXIMUM AVERAGE STORAGE
                                    6-HR        24-HR       72-HR     24.92-HR
+  (AC-FT)      (HR)
        2.      3.75                 0.           0.          0.           0.

  PEAK STAGE    TIME                          MAXIMUM AVERAGE STAGE
                                    6-HR        24-HR       72-HR     24.92-HR
+   (FEET)      (HR)
     61.81      3.75               51.18       49.26       49.24        49.24

                        CUMULATIVE AREA =     .20 SQ MI
```

1

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

OPERATION	STATION	AREA	PLAN		RATIOS APPLIED TO PRECIPITATION RATIO 1	RATIO 2	RATIO 3
					1.00	.98	.57
HYDROGRAPH AT	3B	.02	1	FLOW	34.	34.	18.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	3A	.04	1	FLOW	77.	76.	41.
+				TIME	3.58	3.58	3.58
HYDROGRAPH AT	3C	.01	1	FLOW	23.	22.	12.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB1	.05	1	FLOW	100.	97.	52.
+				TIME	3.58	3.58	3.58
HYDROGRAPH AT	4F	.00	1	FLOW	8.	7.	4.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB2	.05	1	FLOW	107.	104.	55.
+				TIME	3.50	3.50	3.58
HYDROGRAPH AT	4B	.00	1	FLOW	9.	9.	5.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB3	.06	1	FLOW	116.	113.	60.
+				TIME	3.50	3.50	3.50
ROUTED TO	R/CB2	.06	1	FLOW	114.	112.	59.
+				TIME	3.50	3.50	3.58
HYDROGRAPH AT	PLA	.00	1	FLOW	6.	6.	3.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB4	.06	1	FLOW	120.	118.	62.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB5	.08	1	FLOW	155.	151.	80.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	4E	.00	1	FLOW	6.	5.	3.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB6	.08	1	FLOW	160.	157.	83.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	2A	.01	1	FLOW	29.	28.	15.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB7	.09	1	FLOW	189.	185.	98.
+				TIME	3.50	3.50	3.50
ROUTED TO	R/CB3	.09	1	FLOW	182.	178.	95.
+				TIME	3.50	3.50	3.58
HYDROGRAPH AT	4A	.01	1	FLOW	18.	17.	9.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB8	.10	1	FLOW	200.	196.	103.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	2C	.01	1	FLOW	30.	29.	15.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	2B	.01	1	FLOW	32.	32.	17.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB9	.03	1	FLOW	62.	61.	32.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	SMD	.01	1	FLOW	17.	17.	9.
+				TIME	3.50	3.50	3.50
3 COMBINED AT	CB10	.14	1	FLOW	279.	273.	144.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	4D	.01	1	FLOW	13.	12.	7.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	4C	.01	1	FLOW	14.	13.	7.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB11	.01	1	FLOW	26.	26.	14.
+				TIME	3.50	3.50	3.50
HYDROGRAPH AT	3F	.01	1	FLOW	19.	18.	10.
+				TIME	3.50	3.50	3.50
2 COMBINED AT	CB12	.02	1	FLOW	45.	44.	24.
+				TIME	3.50	3.50	3.50

HYDROGRAPH AT							
+	3D	.01	1	FLOW	31.	30.	16.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	3E	.01	1	FLOW	23.	22.	12.
				TIME	3.50	3.50	3.58
3 COMBINED AT							
+	CB13	.05	1	FLOW	99.	97.	51.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	NP	.00	1	FLOW	9.	8.	5.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB14	.05	1	FLOW	107.	105.	56.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	DB	.01	1	FLOW	15.	15.	5.
				TIME	3.58	3.58	3.67
3 COMBINED AT							
+	D.IN	.20	1	FLOW	399.	390.	204.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	D.OUT	.20	1	FLOW	122.	122.	108.
				TIME	3.83	3.83	3.75
			** PEAK STAGES IN FEET **				
			1	STAGE	65.22	65.14	61.81
				TIME	3.83	3.83	3.75
HYDROGRAPH AT							
+	PCD	.00	1	FLOW	10.	10.	5.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB15	.20	1	FLOW	125.	125.	110.
				TIME	3.75	3.75	3.75
HYDROGRAPH AT							
+	B13A	.01	1	FLOW	14.	13.	6.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB4A	.21	1	FLOW	137.	136.	113.
				TIME	3.50	3.50	3.58
HYDROGRAPH AT							
+	B13B	.01	1	FLOW	11.	11.	5.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB4B	.22	1	FLOW	148.	147.	117.
				TIME	3.50	3.50	3.58
ROUTED TO							
+	R/CB4B	.22	1	FLOW	146.	144.	116.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	B14	.00	1	FLOW	6.	6.	3.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB5A	.22	1	FLOW	151.	150.	119.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	B15	.01	1	FLOW	12.	12.	6.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	B16	.01	1	FLOW	12.	11.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CB5B	.23	1	FLOW	174.	172.	129.
				TIME	3.50	3.50	3.58
ROUTED TO							
+	R/CB5	.23	1	FLOW	174.	172.	127.
				TIME	3.58	3.58	3.67
HYDROGRAPH AT							
+	B17A	.00	1	FLOW	10.	10.	5.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB6A	.24	1	FLOW	181.	179.	131.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	B17B	.00	1	FLOW	6.	5.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	EX-OFF4	.04	1	FLOW	89.	87.	47.
				TIME	3.58	3.58	3.58
3 COMBINED AT							
+	CB6B	.28	1	FLOW	275.	270.	180.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	B19	.01	1	FLOW	16.	15.	7.
				TIME	3.58	3.58	3.67
2 COMBINED AT							
+	CB7A	.29	1	FLOW	291.	286.	187.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	M1	.04	1	FLOW	86.	84.	45.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CB7	.33	1	FLOW	369.	362.	228.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	EX-B1	.04	1	FLOW	69.	67.	32.
				TIME	3.58	3.58	3.58

2 COMBINED AT							
+	CP2	.37	1	FLOW	437.	429.	261.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	EX-B2	.06	1	FLOW	122.	119.	63.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP2B	.43	1	FLOW	559.	548.	324.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	M2	.11	1	FLOW	223.	218.	116.
				TIME	3.50	3.50	3.58
HYDROGRAPH AT							
+	C3	.01	1	FLOW	13.	12.	7.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CC2	.12	1	FLOW	235.	230.	122.
				TIME	3.50	3.50	3.58
HYDROGRAPH AT							
+	M3	.01	1	FLOW	32.	31.	17.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	C6	.00	1	FLOW	9.	9.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CC3	.13	1	FLOW	277.	270.	144.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	C7	.01	1	FLOW	15.	15.	8.
				TIME	3.50	3.50	3.50
ROUTED TO							
+	R/C7	.01	1	FLOW	14.	14.	7.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	C8	.00	1	FLOW	9.	8.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CC4	.14	1	FLOW	299.	292.	156.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	FS	.00	1	FLOW	6.	6.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	F1	.00	1	FLOW	4.	4.	2.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	EX-C2	.00	1	FLOW	5.	5.	3.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP3	.01	1	FLOW	15.	15.	8.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	EX-C1	.01	1	FLOW	28.	27.	13.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	S1	.01	1	FLOW	14.	13.	8.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP3/A	.17	1	FLOW	356.	348.	185.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	S2	.00	1	FLOW	8.	8.	4.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	EX-C3	.02	1	FLOW	37.	36.	19.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP3/B	.19	1	FLOW	401.	392.	208.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	EX-A1	.10	1	FLOW	173.	169.	84.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	EX-A2	.04	1	FLOW	66.	64.	33.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.14	1	FLOW	239.	233.	117.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	EX-OFF3	.06	1	FLOW	120.	117.	63.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A2A	.00	1	FLOW	7.	6.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	A2B	.00	1	FLOW	9.	9.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP1A/A	.07	1	FLOW	132.	129.	69.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A9A	.00	1	FLOW	5.	5.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF1	.01	1	FLOW	23.	22.	12.
				TIME	3.50	3.50	3.50

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 HYDROGRAPH AT
+                    ST1        .00     1   FLOW           3.       3.       2.
                                            TIME          3.50     3.50     3.50

  4 COMBINED AT
+                  CP1A/B       .08     1   FLOW         158.     154.      82.
                                            TIME          3.58     3.58     3.58

 HYDROGRAPH AT
+                    A9B        .00     1   FLOW          10.      10.       5.
                                            TIME          3.50     3.50     3.50

 HYDROGRAPH AT
+                    OF1        .01     1   FLOW          20.      20.      11.
                                            TIME          3.50     3.50     3.50

 HYDROGRAPH AT
+                    ON1        .00     1   FLOW           4.       4.       2.
                                            TIME          3.50     3.50     3.50

  4 COMBINED AT
+                  CP1A/C       .10     1   FLOW         190.     185.      98.
                                            TIME          3.50     3.50     3.50

 HYDROGRAPH AT
+                 EX-OFF2       .01     1   FLOW          10.      10.       4.
                                            TIME          3.50     3.50     3.50

 HYDROGRAPH AT
+                    A9C        .00     1   FLOW           8.       8.       4.
                                            TIME          3.50     3.50     3.50

  3 COMBINED AT
+                   CP1A        .11     1   FLOW         208.     203.     107.
                                            TIME          3.50     3.50     3.50

  2 COMBINED AT
+                   CP1B        .24     1   FLOW         440.     430.     222.
                                            TIME          3.58     3.58     3.58

 HYDROGRAPH AT
+                 EX-OFF1       .02     1   FLOW          26.      25.      11.
                                            TIME          3.58     3.58     3.58
1
                          SUMMARY OF KINEMATIC WAVE - MUSKINGUM-CUNGE ROUTING
                              (FLOW IS DIRECT RUNOFF WITHOUT BASE FLOW)
                                                                                INTERPOLATED TO
                                                                               COMPUTATION INTERVAL
            ISTAQ    ELEMENT      DT        PEAK     TIME TO      VOLUME       DT        PEAK     TIME TO      VOLUME
                                                       PEAK                                          PEAK
                                   (MIN)      (CFS)      (MIN)      (IN)      (MIN)      (CFS)      (MIN)       (IN)

          FOR PLAN = 1  RATIO=  .00
             R/CB2  MANE           .36    115.55    210.43      2.60       5.00    114.14    210.00        2.60

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7831E+01 EXCESS= .0000E+00 OUTFLOW= .7831E+01 BASIN STORAGE= .3636E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB2  MANE           .36    113.05    210.65      2.53       5.00    111.60    210.00        2.54

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .7645E+01 EXCESS= .0000E+00 OUTFLOW= .7645E+01 BASIN STORAGE= .3595E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB2  MANE           .41     60.04    210.73      1.29       5.00     59.12    215.00        1.29

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3888E+01 EXCESS= .0000E+00 OUTFLOW= .3888E+01 BASIN STORAGE= .3714E-04 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB3  MANE           .87    188.09    211.35      2.59       5.00    182.45    210.00        2.59

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1262E+02 EXCESS= .0000E+00 OUTFLOW= .1262E+02 BASIN STORAGE= .1094E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB3  MANE           .87    183.91    211.43      2.53       5.00    178.38    210.00        2.53

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1232E+02 EXCESS= .0000E+00 OUTFLOW= .1232E+02 BASIN STORAGE= .1069E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB3  MANE           .99     97.56    211.45      1.28       5.00     94.84    215.00        1.29

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .6259E+01 EXCESS= .0000E+00 OUTFLOW= .6259E+01 BASIN STORAGE= .1059E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            R/CB4B  MANE          1.23    147.71    212.36      2.48       5.00    145.57    215.00        2.49

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2871E+02 EXCESS= .0000E+00 OUTFLOW= .2871E+02 BASIN STORAGE= .2141E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            R/CB4B  MANE          1.23    146.53    211.58      2.40       5.00    144.33    215.00        2.40

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2776E+02 EXCESS= .0000E+00 OUTFLOW= .2776E+02 BASIN STORAGE= .2228E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
            R/CB4B  MANE          1.30    116.68    216.18      1.22       5.00    116.17    215.00        1.22

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .1406E+02 EXCESS= .0000E+00 OUTFLOW= .1406E+02 BASIN STORAGE= .2458E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB5  MANE          3.07    174.49    214.98      2.47       5.00    174.46    215.00        2.47

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .3052E+02 EXCESS= .0000E+00 OUTFLOW= .3052E+02 BASIN STORAGE= .7974E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
             R/CB5  MANE          3.08    172.40    215.64      2.39       5.00    171.92    215.00        2.39

 CONTINUITY SUMMARY (AC-FT) - INFLOW= .2953E+02 EXCESS= .0000E+00 OUTFLOW= .2953E+02 BASIN STORAGE= .6525E-03 PERCENT ERROR=    .0
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          FOR PLAN = 1  RATIO=  .00
             R/CB5  MANE          3.31    128.20    218.62      1.21      5.00    127.20    220.00        1.21

CONTINUITY SUMMARY (AC-FT) - INFLOW= .1489E+02 EXCESS= .0000E+00 OUTFLOW= .1489E+02 BASIN STORAGE= .6245E-03 PERCENT ERROR=    .0

          FOR PLAN = 1  RATIO=  .00
              R/C7  MANE          2.32     14.31    211.33      2.81      5.00     13.73    210.00        2.80

CONTINUITY SUMMARY (AC-FT) - INFLOW= .9115E+00 EXCESS= .0000E+00 OUTFLOW= .9117E+00 BASIN STORAGE= .2791E-03 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R/C7  MANE          2.33     14.28    212.44      2.75      5.00     13.54    210.00        2.75

CONTINUITY SUMMARY (AC-FT) - INFLOW= .8922E+00 EXCESS= .0000E+00 OUTFLOW= .8924E+00 BASIN STORAGE= .2932E-03 PERCENT ERROR=   -.1

          FOR PLAN = 1  RATIO=  .00
              R/C7  MANE          2.70      7.89    213.10      1.47      5.00      7.42    210.00        1.48

CONTINUITY SUMMARY (AC-FT) - INFLOW= .4784E+00 EXCESS= .0000E+00 OUTFLOW= .4786E+00 BASIN STORAGE= .2483E-03 PERCENT ERROR=   -.1


*** NORMAL END OF HEC-1 ***
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Appendix B

Spruce Park Drive Technical Drainage Study Appendix

Appendix B-1: Interim Condition Hydrologic Model

Appendix B-2: Interim Condition Normal Depth Calculations

Appendix B-3: Ultimate Condition Hydrologic Model

Appendix B-4: Ultimate Condition Normal Depth Calculations

Appendix B-5: Hydraulic Calculations based on Reference Studies

Appendix B-1:

Interim Condition Hydrologic Model

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

ATKINS
File: FORM4.XLS

TDS for SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
INTERIM CONDITION

BY: MMA
DATE: 2/2/17

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag
DESIG: (1)	DEV./EX. (D or E)	CN	K (2)	AREA Ac (3)	AREA Mi^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Min (13)	Min (14)	Tlag= 0.6Tc/60 Hours
INT-OFFA1	E	88.0	0.772	7.70	0.01204	100	1.5	5.2	482	2.4	2.3	4.5	3.5	8.7	N/A	**0.100***
INT-SPDr	D	95.0	0.864	1.20	0.00187	20	2.0	1.5	505	0.8	1.8	2.8	4.6	6.1	12.9	**0.061**
INT-OFF2	E	88.0	0.772	1.03	0.00160	20	2.5	1.9	301	4.6	3.2	6.3	1.6	3.5	N/A	**0.100***
INT-OFF1	E	88.0	0.772	3.80	0.00593	100	2.5	4.4	278	3.8	2.9	5.7	1.6	6.0	N/A	**0.100***

Tc = Ti + Tt Tlag = 0.6 Tc
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3
K = 0.0132 (CN) - 0.39
Tc Check = L/180+10

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2
V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE : **STANDARD FORM 4**

*Minimum recommended Tc for undeveloped subbasins is 10 mins. A value of 0.10 was use for the Tlag where the calculated Tc was less than 10 mins.

**Minimum recommended Tc for developed subbasins is 5 mins. A value of 0.05 was use for the Tlag where the calculated Tc was less than 5 mins.

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1****************************************                                  ****************************************
*                                      *                                  *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                  *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                  *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1               *                                  *          609 SECOND STREET           *
*                                      *                                  *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   02FEB17  TIME  09:30:10  *                                  *          (916) 756-1104              *
*                                      *                                  *                                      *
****************************************                                  ****************************************

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

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

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


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

                    *DIAGRAM
 *** FREE ***
             1      ID  * ************************************************************
             2      ID  *
             3      ID  *     MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
             4      ID  *     INTERIM CONDITION
             5      ID  *
             6      ID  *     CLIENT_ _ _ _ _ _ _ HOWARD HUGHES PROPERTIES, INC
             7      ID  *     RETURN PERIOD_ _ _ _100-YEAR AND 10-YEAR
             8      ID  *     DISTRIBUTION_ _ _ _ 6-HOUR SDN3
             9      ID  *     PROJECT NO_ _ _ _ _ 100047977
            10      ID  *     FILENAME_ _ _ _ _ _ INTERIM.PRN
            11      ID  *     DATE_ _ _ _ _ _ _ _ 10/26/16
            12      ID  *
            13      ID  *     JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            14      ID  *     AREA (SQUARE MILES)            100 YR DARF
            15      ID  *               0 - 0.13               1.00
            16      ID  *               0.13 - 0.5             0.98
            17      ID  *
            18      ID  *               10-YEAR                0.57
            19      ID  *
            20      ID  * ************************************************************
            21      ID
            22      ID
            23      IT       5       0       0     300
            24      IO       5       0       0
            25      IN       5       0       0
            26      JR    PREC       1    0.98    0.57
                    *
                    *
                    * ********************************************************************
                    *      START OF REFERENCED SUMMERLIN VILLAGE 19 HEC-1 MODEL
                    *      TDS FOR SUMMERLIN VILLAGE 19 DETENTION BASIN PARK DATED 08/08
                    *      HTE #08-24428
                    *      ULTIMATE CONDITION MODEL DATED 03/12/08
                    * ********************************************************************
                    *
                    *

            27      KK      FS
            28      KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
            29      KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
            30      KM  HTE#98-31194
            31      KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
            32      BA  .00234
            33      PB    3.15
            34      PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
            35      PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
            36      PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
            37      PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            38      PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            39      PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
            40      PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
            41      PC   0.998   0.999   1.000
            42      LS       0    95.0
```



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

```
 43          UD    0.05
             *

 44          KK      F1
 45          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 46          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 47          KM  HTE#98-31194
 48          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 49          BA  .00141
 50          LS       0    98.0
 51          UD   0.035
             *

 52          KK   EX-C2
 53          KM  ONSITE SUMMERLIN VILLAGE BASIN EX-C2
 54          BA   .0025
 55          LS       0    94.0
 56          UD     0.1
             *

 57          KK     CP3
 58          KM  REFERENCED FROM SUMMERLIN VILLAGE 13 WEST PRELIMINARY GRADING
 59          KM  TDS FOR SUMMERLIN VILLAGE 13 WEST PRELIMINARY DATED 03/08GRADING
 60          KM  HTE# 08-9087
 61          KM  PROPOSED CONDITIONS HEC-1 MODEL DATED 03/21/08
 62          HC       3
             *

 63          KK   EX-C1
 64          KM  ONSITE SUMMERLIN VILLAGE 13 WEST BASIN EX-C1
 65          BA   .0141
 66          LS       0    92.1
 67          UD     0.1
             *

 68          KK      S1
 69          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 70          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 71          KM  HTE#98-31194
 72          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 73          BA  .00578
 74          LS       0    98.0
 75          UD   0.084
             *

 76          KK   CP3/A
 77          KM  MATCHES COM1 FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 78          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 79          KM  HTE#98-31194
 80          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 81          HC       3
             *
```



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

 82          KK      S2
 83          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 84          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 85          KM  HTE#98-31194
 86          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 87          BA   .0035
 88          LS       0      95
 89          UD   0.075
             *

 90          KK   EX-C3
 91          KM  ONSITE SUMMERLIN VILLAGE BASIN EX-C3
 92          BA    .018
 93          LS       0    94.0
 94          UD   0.103
             *

 95          KK   CP3/B
 96          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 97          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 98          KM  HTE#98-31194
 99          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
100          HC       3
             *

101          KK   EX-A1
102          KM  ONSITE SUMMERLIN VILLAGE 13 BASIN EX-A1
103          BA   .1006
104          LS       0    92.7
105          UD   0.193
             *

106          KK   EX-A2
107          KM  ONSITE SUMMERLIN VILLAGE 13 BASIN EX-A2
108          BA   .0350
109          LS       0    94.0
110          UD   0.169
             *

111          KK     CP1
```

```
 112          HC       2
              *

 113          KK EX-OFF3
 114          KM  NORTHERN PORTION OF RED ROCK CASINO
 115          BA   .0609
 116          LS       0    95.0
 117          UD   0.153
              *
1                                        HEC-1 INPUT                                                PAGE  4

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


 118          KK     A2A
 119          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 120          KM  PARCEL X IMPROVEMENTS DATED 06/00
 121          KM  HTE# 00-18645
 122          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 123          BA  .00272
 124          LS       0    95.0
 125          UD   0.066
              *

 126          KK     A2B
 127          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 128          KM  PARCEL X IMPROVEMENTS DATED 06/00
 129          KM  HTE# 00-18645
 130          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 131          BA  .00398
 132          LS       0    95.0
 133          UD   0.093
              *

 134          KK  CP1A/A
 135          HC       3
              *

 136          KK     A9A
 137          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 138          KM  PARCEL X IMPROVEMENTS DATED 06/00
 139          KM  HTE# 00-18645
 140          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 141          BA  .00184
 142          LS       0    95.0
 143          UD   0.036
              *

 144          KK    OFF1
 145          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 146          KM  SPRUCE GOOSE STREET IMPROVEMENTS DATED 08/04
 147          KM  HTE# 04-41239
 148          KM  ULTIMATE CONDITION MODEL DATED 1/16/04
 149          BA  .01036
 150          LS       0    95.0
 151          UD   0.094
              *

 152          KK     ST1
 153          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 154          KM  SPRUCE GOOSE STREET IMPROVEMENTS DATED 08/04
 155          KM  HTE# 04-41239
 156          KM  ULTIMATE CONDITION MODEL DATED 1/16/04
 157          BA  .00152
 158          LS       0    94.6
 159          UD   0.084
              *
1                                        HEC-1 INPUT                                                PAGE  5

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


 160          KK  CP1A/B
 161          HC       4
              *

 162          KK     A9B
 163          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 164          KM  PARCEL X IMPROVEMENTS DATED 06/00
 165          KM  HTE# 00-18645
 166          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 167          BA  .00409
 168          LS       0    95.0
 169          UD   0.056
              *

 170          KK     OF1
 171          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 172          KM  STREET Y IMPROVEMENTS DATED 07/07
 173          KM  HTE# 07-33087
 174          KM  ULTIMATE CONDITION MODEL DATED 7/05/07
 175          BA   .0097
 176          LS       0    95.0
 177          UD   0.108
              *

 178          KK     ON1
```

```
            179           KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
            180           KM  STREET Y IMPROVEMENTS DATED 07/07
            181           KM  HTE# 07-33087
            182           KM  ULTIMATE CONDITION MODEL DATED 7/05/07
            183           BA   .0015
            184           LS       0    93.8
            185           UD   0.054
                          *

            186           KK  CP1A/C
            187           HC       4
                          *

            188           KKINT-OFFA1
            189           KM  PARCEL WEST OF SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            190           BA  .01204
            191           LS       0    88.0
            192           UD    0.10
                          *

            193           KKINT-OFF2
            194           KM  SOUTHERN PORTION OF PARCEL EAST OF SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            195           BA  .00160
            196           LS       0    88.0
            197           UD    0.10
                          *
1                                                  HEC-1 INPUT                                                PAGE  6

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

            198           KKINT-SPDr
            199           KM  SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            200           BA  .00187
            201           LS       0    95.0
            202           UD   0.061
                          *

            203           KK     A9C
            204           KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
            205           KM  PARCEL X IMPROVEMENTS DATED 06/00
            206           KM  HTE# 00-18645
            207           KM  PROPOSED CONDITION MODEL DATED 6/12/00
            208           BA  .00358
            209           LS       0    95.0
            210           UD   0.084
                          *

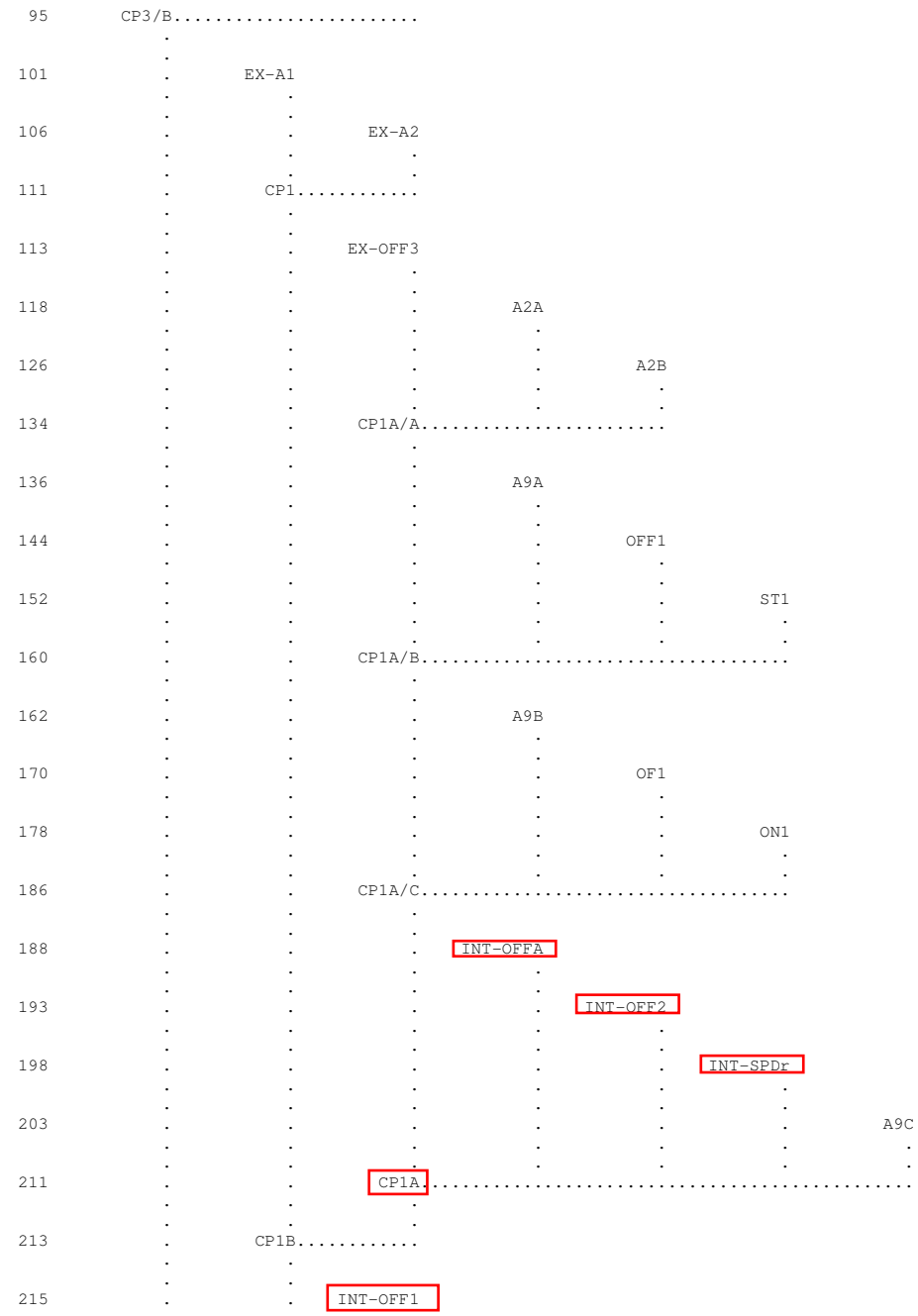
            211           KK    CP1A
            212           HC       5
                          *

            213           KK    CP1B
            214           HC       2
                          *

            215           KKINT-OFF1
            216           KM  NORTHERN PORTION OF PARCEL EAST OF SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            217           BA  .00593
            218           LS       0    88.0
            219           UD   0.100
                          *
            220           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

    27          FS
                 .
                 .
    44           .          F1
                 .           .
                 .           .
    52           .           .       EX-C2
                 .           .           .
                 .           .           .
    57         CP3.........................
                 .
                 .
    63           .       EX-C1
                 .           .
                 .           .
    68           .           .          S1
                 .           .           .
                 .           .           .
    76        CP3/A.........................
                 .
                 .
    82           .          S2
                 .           .
                 .           .
    90           .           .       EX-C3
                 .           .           .
                 .           .           .
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   02FEB17  TIME  09:30:10   *
*                                       *
*****************************************
```

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

```
* ************************************************************
*
*     MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
*     INTERIM CONDITION
*
*     CLIENT_ _ _ _ _ _ _ HOWARD HUGHES PROPERTIES, INC
*     RETURN PERIOD_ _ _ _100-YEAR AND 10-YEAR
*     DISTRIBUTION_ _ _ _ 6-HOUR SDN3
*     PROJECT NO_ _ _ _ _ 100047977
*     FILENAME_ _ _ _ _ _ INTERIM.PRN
*     DATE_ _ _ _ _ _ _ _ 10/26/16
*
*     JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
*     AREA (SQUARE MILES)            100 YR DARF
```

```
                        *              0 - 0.13               1.00
                        *              0.13 - 0.5             0.98
                        *
                        *              10-YEAR                0.57
                        *
                        * ************************************************************


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

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

                     COMPUTATION INTERVAL     .08 HOURS
                          TOTAL TIME BASE   24.92 HOURS

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

      JP          MULTI-PLAN OPTION
                        NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                      RATIOS OF PRECIPITATION
                     1.00       .98       .57
1

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


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2  RATIO 3
                                                        1.00      .98      .57

 HYDROGRAPH AT
+                    FS       .00     1   FLOW           6.       6.       3.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                    F1       .00     1   FLOW           4.       4.       2.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-C2      .00     1   FLOW           5.       5.       3.
                                          TIME         3.50     3.50     3.50

  3 COMBINED AT
+                   CP3       .01     1   FLOW          15.      15.       8.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-C1      .01     1   FLOW          28.      27.      13.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                    S1       .01     1   FLOW          14.      13.       8.
                                          TIME         3.50     3.50     3.50

  3 COMBINED AT
+                  CP3/A      .03     1   FLOW          57.      56.      29.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                    S2       .00     1   FLOW           8.       8.       4.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-C3      .02     1   FLOW          37.      36.      19.
                                          TIME         3.50     3.50     3.50

  3 COMBINED AT
+                  CP3/B      .05     1   FLOW         102.     100.      52.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-A1      .10     1   FLOW         173.     169.      84.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
```

+	EX-A2	.04	1	FLOW	66.	64.	33.
				TIME	3.58	3.58	3.58
2 COMBINED AT							
+	CP1	.14	1	FLOW	239.	233.	117.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	EX-OFF3	.06	1	FLOW	120.	117.	63.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A2A	.00	1	FLOW	7.	6.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	A2B	.00	1	FLOW	9.	9.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP1A/A	.07	1	FLOW	132.	129.	69.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A9A	.00	1	FLOW	5.	5.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF1	.01	1	FLOW	23.	22.	12.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST1	.00	1	FLOW	3.	3.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP1A/B	.08	1	FLOW	158.	154.	82.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A9B	.00	1	FLOW	10.	10.	5.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OF1	.01	1	FLOW	20.	20.	11.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON1	.00	1	FLOW	4.	4.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP1A/C	.10	1	FLOW	190.	185.	98.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	INT-OFFA	.01	1	FLOW	21.	20.	9.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	INT-OFF2	.00	1	FLOW	3.	3.	1.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	INT-SPDr	.00	1	FLOW	5.	4.	2.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	A9C	.00	1	FLOW	8.	8.	4.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	CP1A	.12	1	FLOW	226.	221.	115.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CP1B	.25	1	FLOW	456.	445.	229.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	INT-OFF1	.01	1	FLOW	10.	10.	4.
				TIME	3.50	3.50	3.50

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

Appendix B-2:

Interim Condition Normal Depth Calculations

Interim Condition Spruce Park Dr (full street) 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Discharge	25.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+42.50	1.04
-0+15.50	0.50
-0+15.00	0.50
-0+15.00	0.00
-0+13.50	0.13
0+00.00	0.39
0+13.50	0.13
0+15.00	0.00
0+15.00	0.50
0+15.50	0.50
0+42.50	1.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+42.50, 1.04)	(-0+15.50, 0.50)	0.016
(-0+15.50, 0.50)	(-0+15.00, 0.00)	0.016
(-0+15.00, 0.00)	(0+15.00, 0.00)	0.013
(0+15.00, 0.00)	(0+15.50, 0.50)	0.016
(0+15.50, 0.50)	(0+42.50, 1.04)	0.050

Options

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

Interim Condition Spruce Park Dr (full street) 100-yr

Results

Normal Depth		0.46	ft
Elevation Range	0.00 to 1.04 ft		
Flow Area		6.70	ft²
Wetted Perimeter		30.94	ft
Hydraulic Radius		0.22	ft
Top Width		30.00	ft
Normal Depth		0.46	ft
Critical Depth		0.53	ft
Critical Slope		0.00409	ft/ft
Velocity		3.73	ft/s
Velocity Head		0.22	ft
Specific Energy		0.68	ft
Froude Number		1.39	
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	0.46	ft
Critical Depth	0.53	ft
Channel Slope	0.00830	ft/ft
Critical Slope	0.00409	ft/ft

Interim Condition Spruce Park Dr (full street) 100-yr

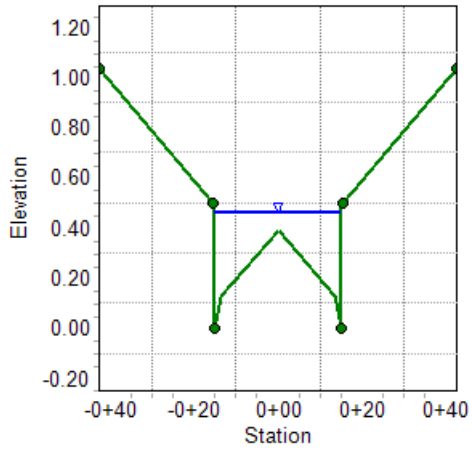
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Normal Depth	0.46	ft
Discharge	25.00	ft³/s

Cross Section Image



Interim Condition Spruce Park Dr (full street) 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Discharge	11.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
-0+42.50	1.04
-0+15.50	0.50
-0+15.00	0.50
-0+15.00	0.00
-0+13.50	0.13
0+00.00	0.39
0+13.50	0.13
0+15.00	0.00
0+15.00	0.50
0+15.50	0.50
0+42.50	1.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(-0+42.50, 1.04)	(-0+15.50, 0.50)	0.016
(-0+15.50, 0.50)	(-0+15.00, 0.00)	0.016
(-0+15.00, 0.00)	(0+15.00, 0.00)	0.013
(0+15.00, 0.00)	(0+15.50, 0.50)	0.016
(0+15.50, 0.50)	(0+42.50, 1.04)	0.050

Options

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

Interim Condition Spruce Park Dr (full street) 10-yr

Results

Normal Depth		0.37	ft
Elevation Range	0.00 to 1.04 ft		
Flow Area		3.99	ft²
Wetted Perimeter		28.99	ft
Hydraulic Radius		0.14	ft
Top Width		28.23	ft
Normal Depth		0.37	ft
Critical Depth		0.40	ft
Critical Slope		0.00475	ft/ft
Velocity		2.76	ft/s
Velocity Head		0.12	ft
Specific Energy		0.49	ft
Froude Number		1.29	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.37	ft
Critical Depth	0.40	ft
Channel Slope	0.00830	ft/ft
Critical Slope	0.00475	ft/ft

Interim Condition Spruce Park Dr (full street) 10-yr

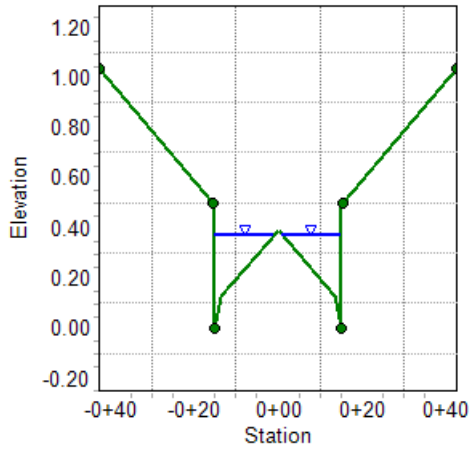
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Normal Depth	0.37	ft
Discharge	11.00	ft³/s

Cross Section Image



Appendix B-3:

Ultimate Condition Hydrologic Model

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

TIME OF CONCENTRATION

ATKINS
File: FORM4.XLS

TDS for SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
ULTIMATE CONDITION

BY: MMA
DATE: 2/2/17

SUB-BASIN DATA						INITIAL / OVERLAND TIME (Ti)			TRAVEL TIME (Tt)					Tc	Tc Check	Tlag
DESIG: (1)	DEV./EX. (D or E)	CN	K (2)	AREA Ac (3)	AREA Mi^2	INITIAL LENGTH Feet (4)	SLOPE % (5)	Ti Min (6)	TRAVEL LENGTH Feet (7)	SLOPE % (8)	V1 VELOCITY FPS (9a)	V2 VELOCITY FPS (9b)	Tt Min (10)	Min (13)	Min (14)	Tlag= 0.6Tc/60 Hours
OFF-A1	D	95.0	0.864	7.70	0.01204	100	1.0	4.2	1174	1.6	2.6	3.9	6.2	10.4	17.1	**0.104**
OFF-A15	D	95.0	0.864	4.82	0.00753	100	1.0	4.2	988	1.0	2.0	3.1	6.8	11.0	16.0	**0.110**
OFF-SPDr	D	95.0	0.864	1.20	0.00187	20	2.0	1.5	505	0.8	1.8	2.8	4.6	6.1	12.9	**0.061**

Tc = Ti + Tt Tlag = 0.6 Tc
Ti = 1.8 (1.1 - K) L^1/2 / S^1/3
K = 0.0132 (CN) - 0.39
Tc Check = L/180+10

For the travel time (Tt) calculations,
V1 applies to the first 500 feet of travel distance;
V2 applies to the remaining travel distance.

V1 = 14.8*(S/100)^1/2 Developed V1 = 20.2*(S/100)^1/2
V2 = 29.4*(S/100)^1/2 Developed V2 = 30.6*(S/100)^1/2

REFERENCE : **STANDARD FORM 4**

*Minimum recommended Tc for undeveloped subbasins is 10 mins. A value of 0.10 was use for the Tlag where the calculated Tc was less than 10 mins.

**Minimum recommended Tc for developed subbasins is 5 mins. A value of 0.05 was use for the Tlag where the calculated Tc was less than 5 mins.

```
1****************************************                                  ****************************************
*                                      *                                  *                                      *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)  *                                  *    U.S. ARMY CORPS OF ENGINEERS      *
*              JUN   1998              *                                  *    HYDROLOGIC ENGINEERING CENTER     *
*            VERSION 4.1               *                                  *          609 SECOND STREET           *
*                                      *                                  *       DAVIS, CALIFORNIA 95616        *
*  RUN DATE   02FEB17  TIME  09:35:46  *                                  *          (916) 756-1104              *
*                                      *                                  *                                      *
****************************************                                  ****************************************

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

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

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


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

                    *DIAGRAM
 *** FREE ***
             1      ID  * ************************************************************
             2      ID  *
             3      ID  *     MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
             4      ID  *     INTERIM CONDITION
             5      ID  *
             6      ID  *     CLIENT_ _ _ _ _ _ _ HOWARD HUGHES PROPERTIES, INC
             7      ID  *     RETURN PERIOD_ _ _ _100-YEAR AND 10-YEAR
             8      ID  *     DISTRIBUTION_ _ _ _ 6-HOUR SDN3
             9      ID  *     PROJECT NO_ _ _ _ _ 100047977
            10      ID  *     FILENAME_ _ _ _ _ _ ULTIMATE.PRN
            11      ID  *     DATE_ _ _ _ _ _ _ _ 10/26/16
            12      ID  *
            13      ID  *     JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
            14      ID  *     AREA (SQUARE MILES)            100 YR DARF
            15      ID  *               0 - 0.13               1.00
            16      ID  *               0.13 - 0.5             0.98
            17      ID  *
            18      ID  *               10-YEAR                0.57
            19      ID  *
            20      ID  * ************************************************************
            21      ID
            22      ID
            23      IT       5       0       0     300
            24      IO       5       0       0
            25      IN       5       0       0
            26      JR    PREC       1    0.98    0.57
                    *
                    *
                    * ********************************************************************
                    *      START OF REFERENCED SUMMERLIN VILLAGE 19 HEC-1 MODEL
                    *      TDS FOR SUMMERLIN VILLAGE 19 DETENTION BASIN PARK DATED 08/08
                    *      HTE #08-24428
                    *      ULTIMATE CONDITION MODEL DATED 03/12/08
                    * ********************************************************************
                    *
                    *

            27      KK      FS
            28      KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
            29      KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
            30      KM  HTE#98-31194
            31      KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
            32      BA  .00234
            33      PB    3.15
            34      PC   0.000   0.020   0.057   0.070   0.087   0.108   0.124   0.130   0.130   0.130
            35      PC   0.130   0.130   0.130   0.133   0.140   0.142   0.148   0.158   0.172   0.181
            36      PC   0.190   0.197   0.199   0.200   0.201   0.204   0.214   0.229   0.241   0.249
            37      PC   0.251   0.256   0.270   0.278   0.281   0.283   0.295   0.322   0.352   0.409
            38      PC   0.499   0.590   0.710   0.744   0.781   0.812   0.819   0.835   0.851   0.856
            39      PC   0.860   0.868   0.876   0.888   0.910   0.926   0.937   0.950   0.970   0.976
            40      PC   0.982   0.985   0.987   0.989   0.990   0.993   0.993   0.994   0.995   0.998
            41      PC   0.998   0.999   1.000
            42      LS       0    95.0
```



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

```
 43          UD    0.05
             *

 44          KK      F1
 45          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 46          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 47          KM  HTE#98-31194
 48          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 49          BA  .00141
 50          LS       0    98.0
 51          UD   0.035
             *

 52          KK   EX-C2
 53          KM  ONSITE SUMMERLIN VILLAGE BASIN EX-C2
 54          BA   .0025
 55          LS       0    94.0
 56          UD     0.1
             *

 57          KK     CP3
 58          KM  REFERENCED FROM SUMMERLIN VILLAGE 13 WEST PRELIMINARY GRADING
 59          KM  TDS FOR SUMMERLIN VILLAGE 13 WEST PRELIMINARY DATED 03/08GRADING
 60          KM  HTE# 08-9087
 61          KM  PROPOSED CONDITIONS HEC-1 MODEL DATED 03/21/08
 62          HC       3
             *

 63          KK   EX-C1
 64          KM  ONSITE SUMMERLIN VILLAGE 13 WEST BASIN EX-C1
 65          BA   .0141
 66          LS       0    92.1
 67          UD     0.1
             *

 68          KK      S1
 69          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 70          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 71          KM  HTE#98-31194
 72          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 73          BA  .00578
 74          LS       0    98.0
 75          UD   0.084
             *

 76          KK   CP3/A
 77          KM  MATCHES COM1 FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 78          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 79          KM  HTE#98-31194
 80          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 81          HC       3
             *
```



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

 82          KK      S2
 83          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 84          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 85          KM  HTE#98-31194
 86          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
 87          BA   .0035
 88          LS       0      95
 89          UD   0.075
             *

 90          KK   EX-C3
 91          KM  ONSITE SUMMERLIN VILLAGE BASIN EX-C3
 92          BA    .018
 93          LS       0    94.0
 94          UD   0.103
             *

 95          KK   CP3/B
 96          KM  REFERENCED FROM ADDENDUM TO THE CONCEPTUAL DRAINAGE STUDY
 97          KM  FOR SUMMERLIN VILLAGE 13 EAST DATED 12/98
 98          KM  HTE#98-31194
 99          KM  PROPOSED CONDITION HEC-1 MODEL DATED 10/07/98
100          HC       3
             *

101          KK   EX-A1
102          KM  ONSITE SUMMERLIN VILLAGE 13 BASIN EX-A1
103          BA   .1006
104          LS       0    92.7
105          UD   0.193
             *

106          KK   EX-A2
107          KM  ONSITE SUMMERLIN VILLAGE 13 BASIN EX-A2
108          BA   .0350
109          LS       0    94.0
110          UD   0.169
             *

111          KK     CP1
```

```
 112          HC       2
              *

 113          KK EX-OFF3
 114          KM  NORTHERN PORTION OF RED ROCK CASINO
 115          BA   .0609
 116          LS       0    95.0
 117          UD   0.153
              *
1                                        HEC-1 INPUT                                                PAGE  4

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


 118          KK     A2A
 119          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 120          KM  PARCEL X IMPROVEMENTS DATED 06/00
 121          KM  HTE# 00-18645
 122          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 123          BA  .00272
 124          LS       0    95.0
 125          UD   0.066
              *

 126          KK     A2B
 127          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 128          KM  PARCEL X IMPROVEMENTS DATED 06/00
 129          KM  HTE# 00-18645
 130          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 131          BA  .00398
 132          LS       0    95.0
 133          UD   0.093
              *

 134          KK  CP1A/A
 135          HC       3
              *

 136          KK     A9A
 137          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 138          KM  PARCEL X IMPROVEMENTS DATED 06/00
 139          KM  HTE# 00-18645
 140          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 141          BA  .00184
 142          LS       0    95.0
 143          UD   0.036
              *

 144          KK    OFF1
 145          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 146          KM  SPRUCE GOOSE STREET IMPROVEMENTS DATED 08/04
 147          KM  HTE# 04-41239
 148          KM  ULTIMATE CONDITION MODEL DATED 1/16/04
 149          BA  .01036
 150          LS       0    95.0
 151          UD   0.094
              *

 152          KK     ST1
 153          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 154          KM  SPRUCE GOOSE STREET IMPROVEMENTS DATED 08/04
 155          KM  HTE# 04-41239
 156          KM  ULTIMATE CONDITION MODEL DATED 1/16/04
 157          BA  .00152
 158          LS       0    94.6
 159          UD   0.084
              *
1                                        HEC-1 INPUT                                                PAGE  5

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


 160          KK  CP1A/B
 161          HC       4
              *

 162          KK     A9B
 163          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
 164          KM  PARCEL X IMPROVEMENTS DATED 06/00
 165          KM  HTE# 00-18645
 166          KM  PROPOSED CONDITION MODEL DATED 6/12/00
 167          BA  .00409
 168          LS       0    95.0
 169          UD   0.056
              *

 170          KK     OF1
 171          KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
 172          KM  STREET Y IMPROVEMENTS DATED 07/07
 173          KM  HTE# 07-33087
 174          KM  ULTIMATE CONDITION MODEL DATED 7/05/07
 175          BA   .0097
 176          LS       0    95.0
 177          UD   0.108
              *

 178          KK     ON1
```

```
            179           KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13 WEST
            180           KM  STREET Y IMPROVEMENTS DATED 07/07
            181           KM  HTE# 07-33087
            182           KM  ULTIMATE CONDITION MODEL DATED 7/05/07
            183           BA   .0015
            184           LS       0    93.8
            185           UD   0.054
                          *

            186           KK  CP1A/C
            187           HC       4
                          *

            188           KK  OFF-A1
            189           KM  PARCEL WEST OF SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            190           BA  .01204
            191           LS       0    95.0
            192           UD   0.104
                          *

            193           KK OFF-A15
            194           KM  PARCEL EAST OF SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            195           BA  .00753
            196           LS       0    95.0
            197           UD   0.110
                          *
1                                                HEC-1 INPUT                                                PAGE  6

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


            198           KKOFF-SPDr
            199           KM  SPRUCE PARK DRIVE ROADWAY IMPROVEMENTS
            200           BA  .00187
            201           LS       0    95.0
            202           UD   0.061
                          *

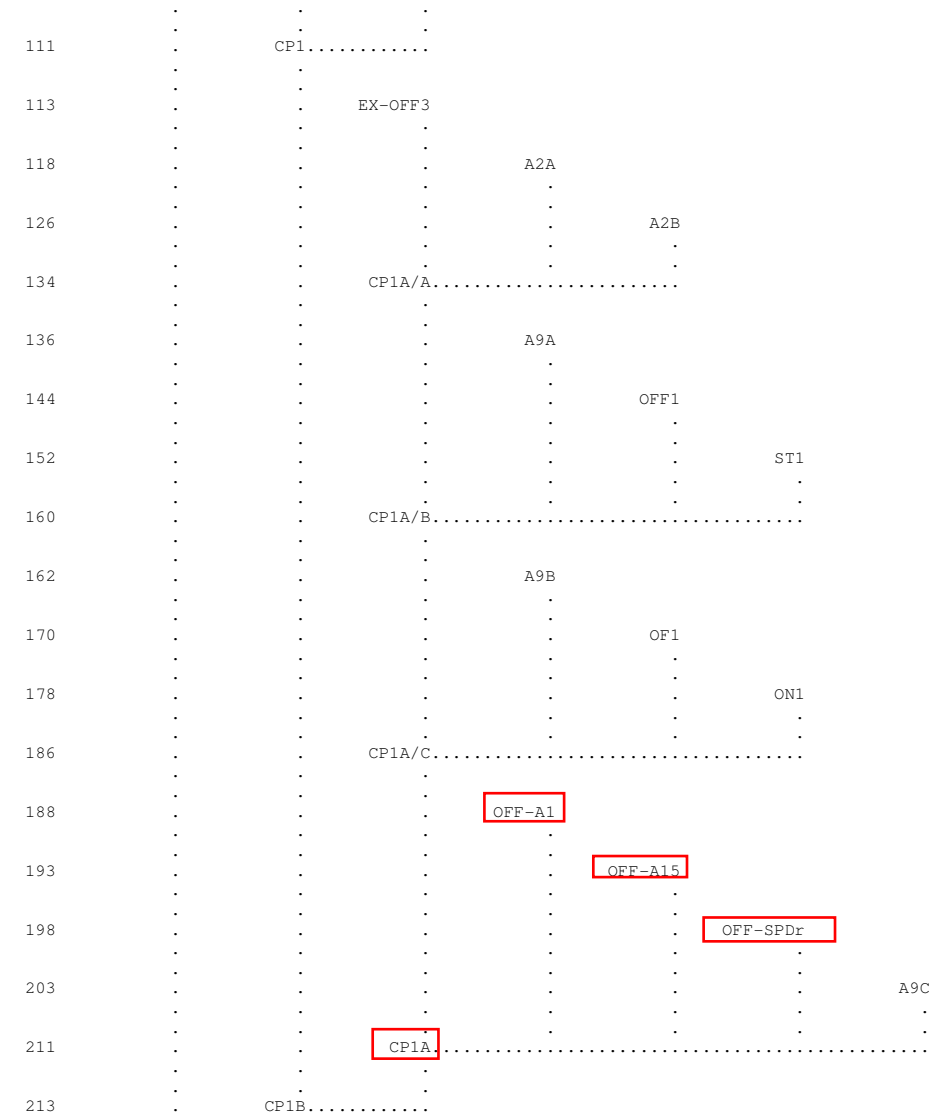
            203           KK     A9C
            204           KM  REFERENCED FROM THE TDS FOR SUMMERLIN VILLAGE 13
            205           KM  PARCEL X IMPROVEMENTS DATED 06/00
            206           KM  HTE# 00-18645
            207           KM  PROPOSED CONDITION MODEL DATED 6/12/00
            208           BA  .00358
            209           LS       0    95.0
            210           UD   0.084
                          *

            211           KK   CP1A
            212           HC       5
                          *

            213           KK    CP1B
            214           HC       2
                          *
            215           ZZ
1
                SCHEMATIC DIAGRAM OF STREAM NETWORK
 INPUT
  LINE      (V) ROUTING          (---->) DIVERSION OR PUMP FLOW

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

     27          FS
                  .
                  .
     44           .          F1
                  .           .
                  .           .
     52           .           .       EX-C2
                  .           .           .
                  .           .           .
     57         CP3.........................
                  .
                  .
     63           .       EX-C1
                  .           .
                  .           .
     68           .           .          S1
                  .           .           .
                  .           .           .
     76        CP3/A.........................
                  .
                  .
     82           .          S2
                  .           .
                  .           .
     90           .           .       EX-C3
                  .           .           .
                  .           .           .
     95        CP3/B.........................
                  .
                  .
    101           .       EX-A1
                  .           .
                  .           .
    106           .           .       EX-A2
```



(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```
1*****************************************
*                                       *
*   FLOOD HYDROGRAPH PACKAGE  (HEC-1)   *
*               JUN   1998              *
*            VERSION 4.1                *
*                                       *
*  RUN DATE   02FEB17  TIME  09:35:46   *
*                                       *
*****************************************
```

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

```
* ************************************************************
*
*     MASTER DRAINAGE STUDY FOR SUMMERLIN VILLAGE 13 WEST
*     INTERIM CONDITION
*
*     CLIENT_ _ _ _ _ _ _ HOWARD HUGHES PROPERTIES, INC
*     RETURN PERIOD_ _ _ _100-YEAR AND 10-YEAR
*     DISTRIBUTION_ _ _ _ 6-HOUR SDN3
*     PROJECT NO_ _ _ _ _ 100047977
*     FILENAME_ _ _ _ _ _ ULTIMATE.PRN
*     DATE_ _ _ _ _ _ _ _ 10/26/16
*
*     JR CARDS CONTAIN DARFS BASED ON THE FOLLOWING VALUES:
*     AREA (SQUARE MILES)            100 YR DARF
*              0 - 0.13                1.00
*              0.13 - 0.5              0.98
*
*              10-YEAR                 0.57
*
* ************************************************************
```

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

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

                  COMPUTATION INTERVAL     .08 HOURS
                       TOTAL TIME BASE   24.92 HOURS

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

      JP          MULTI-PLAN OPTION
                     NPLAN           1  NUMBER OF PLANS

      JR          MULTI-RATIO OPTION
                   RATIOS OF PRECIPITATION
                  1.00       .98       .57
1

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


                                                                    RATIOS APPLIED TO PRECIPITATION
 OPERATION       STATION     AREA    PLAN            RATIO 1  RATIO 2  RATIO 3
                                                        1.00      .98      .57

 HYDROGRAPH AT
+                    FS       .00     1   FLOW           6.       6.       3.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                    F1       .00     1   FLOW           4.       4.       2.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-C2      .00     1   FLOW           5.       5.       3.
                                          TIME         3.50     3.50     3.50

  3 COMBINED AT
+                    CP3      .01     1   FLOW          15.      15.       8.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-C1      .01     1   FLOW          28.      27.      13.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                    S1       .01     1   FLOW          14.      13.       8.
                                          TIME         3.50     3.50     3.50

  3 COMBINED AT
+                  CP3/A      .03     1   FLOW          57.      56.      29.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                    S2       .00     1   FLOW           8.       8.       4.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-C3      .02     1   FLOW          37.      36.      19.
                                          TIME         3.50     3.50     3.50

  3 COMBINED AT
+                  CP3/B      .05     1   FLOW         102.     100.      52.
                                          TIME         3.50     3.50     3.50

 HYDROGRAPH AT
+                  EX-A1      .10     1   FLOW         173.     169.      84.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                  EX-A2      .04     1   FLOW          66.      64.      33.
                                          TIME         3.58     3.58     3.58

  2 COMBINED AT
+                    CP1      .14     1   FLOW         239.     233.     117.
                                          TIME         3.58     3.58     3.58

 HYDROGRAPH AT
+                 EX-OFF3     .06     1   FLOW         120.     117.      63.
                                          TIME         3.58     3.58     3.58
```

HYDROGRAPH AT							
+	A2A	.00	1	FLOW	7.	6.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	A2B	.00	1	FLOW	9.	9.	5.
				TIME	3.50	3.50	3.50
3 COMBINED AT							
+	CP1A/A	.07	1	FLOW	132.	129.	69.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A9A	.00	1	FLOW	5.	5.	3.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF1	.01	1	FLOW	23.	22.	12.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ST1	.00	1	FLOW	3.	3.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP1A/B	.08	1	FLOW	158.	154.	82.
				TIME	3.58	3.58	3.58
HYDROGRAPH AT							
+	A9B	.00	1	FLOW	10.	10.	5.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OF1	.01	1	FLOW	20.	20.	11.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	ON1	.00	1	FLOW	4.	4.	2.
				TIME	3.50	3.50	3.50
4 COMBINED AT							
+	CP1A/C	.10	1	FLOW	190.	185.	98.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF-A1	.01	1	FLOW	25.	25.	13.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF-A15	.01	1	FLOW	16.	15.	8.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	OFF-SPDr	.00	1	FLOW	5.	4.	2.
				TIME	3.50	3.50	3.50
HYDROGRAPH AT							
+	A9C	.00	1	FLOW	8.	8.	4.
				TIME	3.50	3.50	3.50
5 COMBINED AT							
+	CP1A	.12	1	FLOW	243.	238.	126.
				TIME	3.50	3.50	3.50
2 COMBINED AT							
+	CP1B	.26	1	FLOW	472.	462.	240.
				TIME	3.58	3.58	3.58

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

Appendix B-4:

Ultimate Condition Normal Depth Calculations

Ultimate Condition Spruce Park Dr (west) 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Discharge	2.50	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.39
0+13.50	0.13
0+15.00	0.00
0+15.00	0.50
0+15.50	0.50
0+42.50	1.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.39)	(0+13.50, 0.13)	0.016
(0+13.50, 0.13)	(0+15.50, 0.50)	0.013
(0+15.50, 0.50)	(0+42.50, 1.04)	0.050

Options

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

Results

Normal Depth	0.31	ft
Elevation Range	0.00 to 1.04 ft	
Flow Area	1.25	ft²
Wetted Perimeter	11.36	ft
Hydraulic Radius	0.11	ft

Ultimate Condition Spruce Park Dr (west) 100-yr

Results

Top Width		11.04	ft
Normal Depth		0.31	ft
Critical Depth		0.32	ft
Critical Slope		0.00753	ft/ft
Velocity		2.00	ft/s
Velocity Head		0.06	ft
Specific Energy		0.38	ft
Froude Number		1.05	
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	0.31	ft
Critical Depth	0.32	ft
Channel Slope	0.00830	ft/ft
Critical Slope	0.00753	ft/ft

Ultimate Condition Spruce Park Dr (west) 100-yr

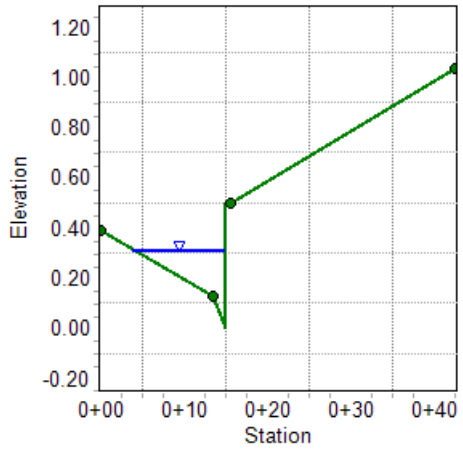
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Normal Depth	0.31	ft
Discharge	2.50	ft³/s

Cross Section Image



Ultimate Condition Spruce Park Dr (east) 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Discharge	2.50	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.04
0+27.00	0.50
0+27.50	0.50
0+27.50	0.00
0+29.00	0.13
0+42.50	0.39

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.04)	(0+27.00, 0.50)	0.050
(0+27.00, 0.50)	(0+29.00, 0.13)	0.013
(0+29.00, 0.13)	(0+42.50, 0.39)	0.016

Options

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

Results

Normal Depth	0.31	ft
Elevation Range	0.00 to 1.04 ft	
Flow Area	1.25	ft²
Wetted Perimeter	11.36	ft
Hydraulic Radius	0.11	ft

Ultimate Condition Spruce Park Dr (east) 100-yr

Results

Top Width		11.04	ft
Normal Depth		0.31	ft
Critical Depth		0.32	ft
Critical Slope		0.00753	ft/ft
Velocity		2.00	ft/s
Velocity Head		0.06	ft
Specific Energy		0.38	ft
Froude Number		1.05	
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	0.31	ft
Critical Depth	0.32	ft
Channel Slope	0.00830	ft/ft
Critical Slope	0.00753	ft/ft

Ultimate Condition Spruce Park Dr (east) 100-yr

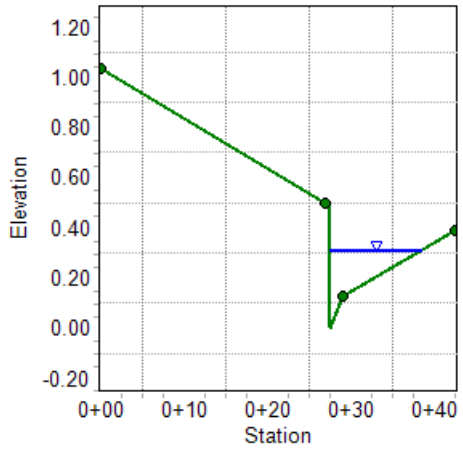
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Normal Depth	0.31	ft
Discharge	2.50	ft³/s

Cross Section Image



Ultimate Condition Spruce Park Dr (west) 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.39
0+13.50	0.13
0+15.00	0.00
0+15.00	0.50
0+15.50	0.50
0+42.50	1.04

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.39)	(0+13.50, 0.13)	0.016
(0+13.50, 0.13)	(0+15.50, 0.50)	0.013
(0+15.50, 0.50)	(0+42.50, 1.04)	0.050

Options

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

Results

Normal Depth	0.25	ft
Elevation Range	0.00 to 1.04 ft	
Flow Area	0.61	ft²
Wetted Perimeter	7.73	ft
Hydraulic Radius	0.08	ft

Ultimate Condition Spruce Park Dr (west) 10-yr

Results

Top Width		7.48	ft
Normal Depth		0.25	ft
Critical Depth		0.25	ft
Critical Slope		0.00830	ft/ft
Velocity		1.63	ft/s
Velocity Head		0.04	ft
Specific Energy		0.29	ft
Froude Number		1.00	
Flow Type	Critical		

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	0.25	ft
Critical Depth	0.25	ft
Channel Slope	0.00830	ft/ft
Critical Slope	0.00830	ft/ft

Ultimate Condition Spruce Park Dr (west) 10-yr

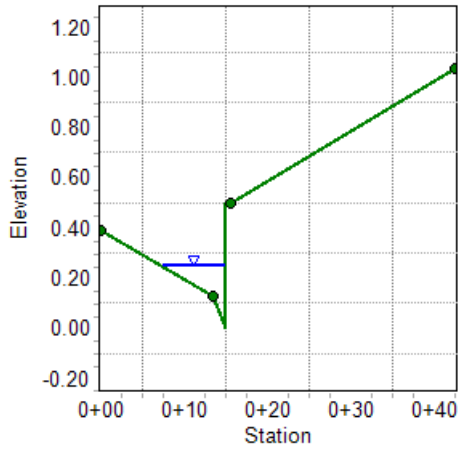
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Normal Depth	0.25	ft
Discharge	1.00	ft³/s

Cross Section Image



Ultimate Condition Spruce Park Dr (east) 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00830	ft/ft
Discharge	1.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.04
0+27.00	0.50
0+27.50	0.50
0+27.50	0.00
0+29.00	0.13
0+42.50	0.39

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.04)	(0+27.00, 0.50)	0.050
(0+27.00, 0.50)	(0+29.00, 0.13)	0.013
(0+29.00, 0.13)	(0+42.50, 0.39)	0.016

Options

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

Results

Normal Depth	0.25	ft
Elevation Range	0.00 to 1.04 ft	
Flow Area	0.61	ft²
Wetted Perimeter	7.73	ft
Hydraulic Radius	0.08	ft

Ultimate Condition Spruce Park Dr (east) 10-yr

Results

Top Width		7.48	ft
Normal Depth		0.25	ft
Critical Depth		0.25	ft
Critical Slope		0.00830	ft/ft
Velocity		1.63	ft/s
Velocity Head		0.04	ft
Specific Energy		0.29	ft
Froude Number		1.00	
Flow Type	Critical		

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	0.25	ft
Critical Depth	0.25	ft
Channel Slope	0.00830	ft/ft
Critical Slope	0.00830	ft/ft

Ultimate Condition Spruce Park Dr (east) 10-yr

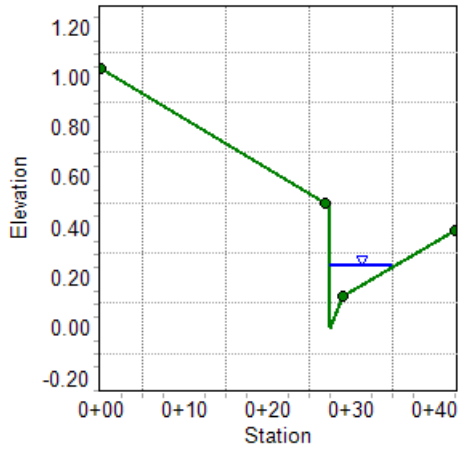
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

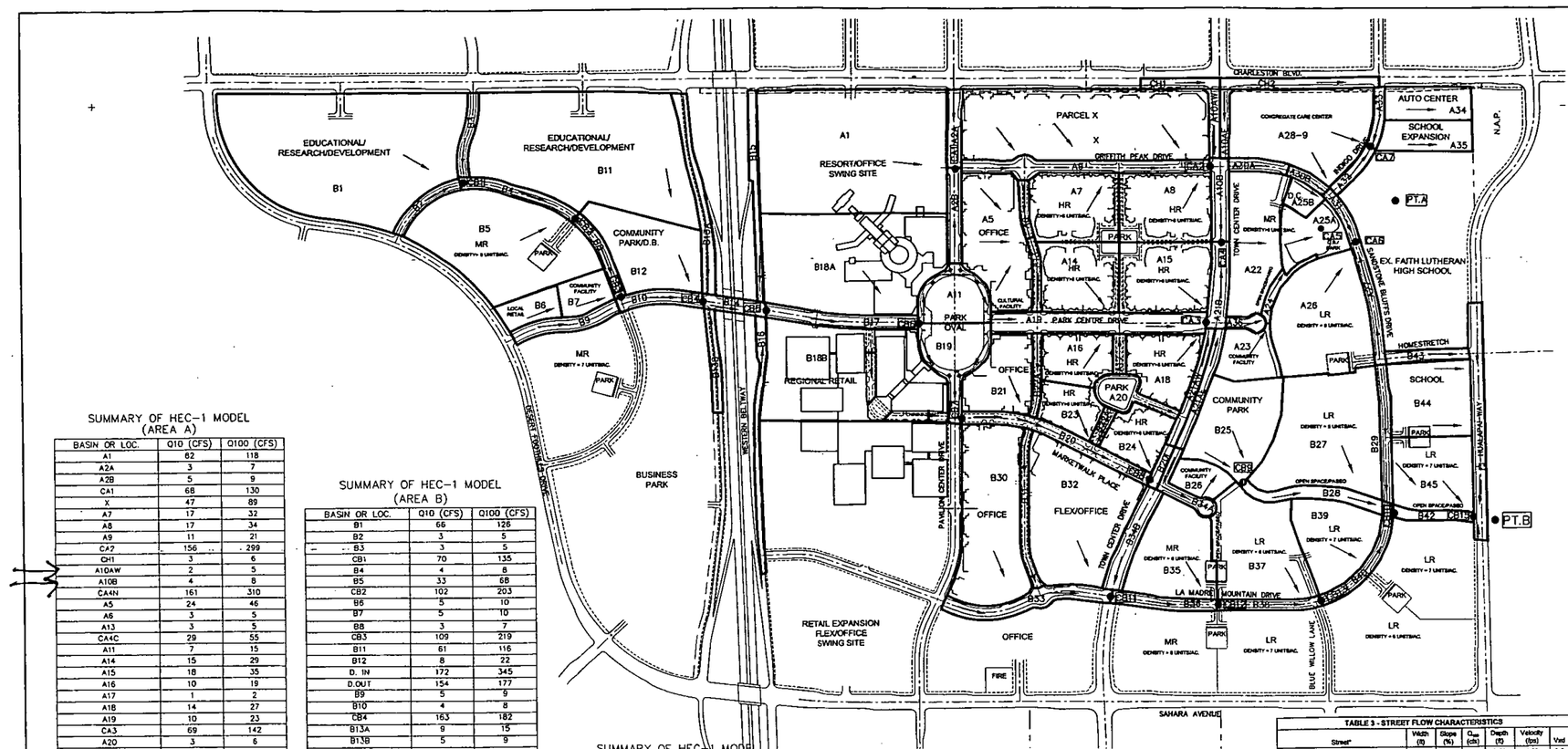
Channel Slope	0.00830	ft/ft
Normal Depth	0.25	ft
Discharge	1.00	ft³/s

Cross Section Image



Appendix B-5:

Hydraulic Calculations Based on Reference Studies



SUMMARY OF HEC-1 MODEL
(AREA A)

BASIN OR LOC.	Q10 (CFS)	Q100 (CFS)
A1	62	118
A2A	3	7
A2B	5	9
CA1	68	130
X	47	89
A7	17	32
A8	17	34
A9	11	21
CA2	156	299
CH1	3	6
A10AW	2	5
A10B	4	8
CA4N	161	310
A5	24	46
A6	3	5
A13	3	5
CA4C	29	55
A11	7	15
A14	15	29
A15	18	35
A16	10	19
A17	1	2
A18	14	27
A19	10	23
CA3	69	142
A20	3	6
A21AW	3	6
A21B	5	10
CA4S	80	160
CA4	267	514
A22	22	42
A23	8	15
A21AE	3	7
A36	2	3
A24	1	3
A25A	4	13
CA5	302	584
DET	183	231
A10AE	3	5
A30A	2	4
A30B	2	4
A28-9	30	57
A25B	3	6
A31	2	4
A27	3	7
A26	21	47
CA6	281	299
A32	3	5
CH2	6	10
A33	2	5
CA7	28	54
PT.A	244	349
A34	8	16
A35	10	17

SUMMARY OF HEC-1 MODEL
(AREA B)

BASIN OR LOC.	Q10 (CFS)	Q100 (CFS)
B1	66	126
B2	3	5
B3	3	5
CB1	70	135
B4	4	8
B5	33	68
CB2	102	203
B6	5	10
B7	5	10
B8	3	7
CB3	109	219
B11	61	116
B12	8	22
D. IN	172	345
D.OUT	154	177
B9	5	9
B10	4	8
CB4	163	182
B13A	9	15
B13B	5	9
B14	3	6
B15	6	10
B16	5	9
CB5	189	222
B17	7	13
B18A	44	85
CB6	237	315
B18B	43	81
B19	7	17
CB7	285	408
B20	8	15
B20I	1	2
B21	13	25
B22A	2	5
B23	9	18
B22B	1	2
B24	10	20
CB8	315	468
B25	8	23
B34A	4	7
B26	5	10
CB9S	9	18
CB9	325	489
B28	3	7
CB10W	324	490
B30	31	58
B31	4	9
B32	33	64

SUMMARY OF HEC-1 MODEL
(AREA B)

BASIN OR LOC.	Q10 (CFS)	Q100 (CFS)
B33	7	14
B34B	6	11
CB11	79	151
SA1	27	53
CB11E	52	98
B35	17	35
B36	3	7
CB12	69	133
B37	19	41
B38	4	7
CB13	87	176
B39	13	28
B40	4	7
CB10S	98	198
B27	22	50
B29	4	8
CB10	445	730
B42	1	4
CB15	442	729
B43	4	7
B44	14	30
B45	13	28
H3	11	19
PT.BN	40	82
PT.B	476	795

TABLE 3 - STREET FLOW CHARACTERISTICS

Street*	Width (ft)	Slope (%)	Q10 (cfs)	Depth (ft)	Velocity (fps)	Vxd
Town Center Dr - east (Griffith Peak)	95	0.43	5	0.50	1.83	0.9
Town Center Dr - west (Griffith Peak)	95	0.43	11	0.66	1.66	1.1
Town Center Dr - northeast (low point)	95	0.43	4	0.47	1.74	0.8
Town Center Dr - northwest (low point)	95	0.43	5	0.50	1.83	0.9
Town Center Dr - south (low point)	95	0.61	10	0.48	2.09	1.0
Town Center Dr - east (Park Centre)	95	0.61	7	0.54	2	1.1
Town Center Dr - west (Park Centre)	95	0.61	13	0.66	2	1.3
Town Center Dr (Marketwalk)	95	0.50	2	0.39	1.57	0.6
Town Center Dr - east (La Madre Mt)	95	0.50	5.5	0.51	1.83	1.0
Town Center Dr - west (La Madre Mt)	95	0.50	7.5	0.58	1.78	1.0
Town Center Dr (Sahara)	95	2.18	8	0.40	3.32	1.3

See Figure 8
*Half-street

NORTH
1" = 400'

GRAPHIC SCALE
(IN FEET)
1 inch = 400 ft.

LEGEND
- B2 DRAINAGE SUBBASIN
- PT.B CONCENTRATION POINT
- SUBBASIN BOUNDARY
- FLOW DIRECTION

SUMMERLIN VILLAGE 13
TOWN CENTER DRIVE
FIGURE 6
DEVELOPED DRAINAGE MAP

G.C. WALLACE, INC.
Engineering/Architecture
1555 SOUTH RAINBOW BLVD.,LAS VEGAS, NEVADA 89146
(702) 804-8000 • FAX: (702) 362-2979

SHEET
SHT OF SHTS

DEPTH OF FLOW AT PT.7 (STA. 874+15)
Worksheet for Irregular Channel

Project Description	
Project File	d:\projects\charl\charl.fm2
Worksheet	CHARLESTON BLVD. (FULL STREET)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

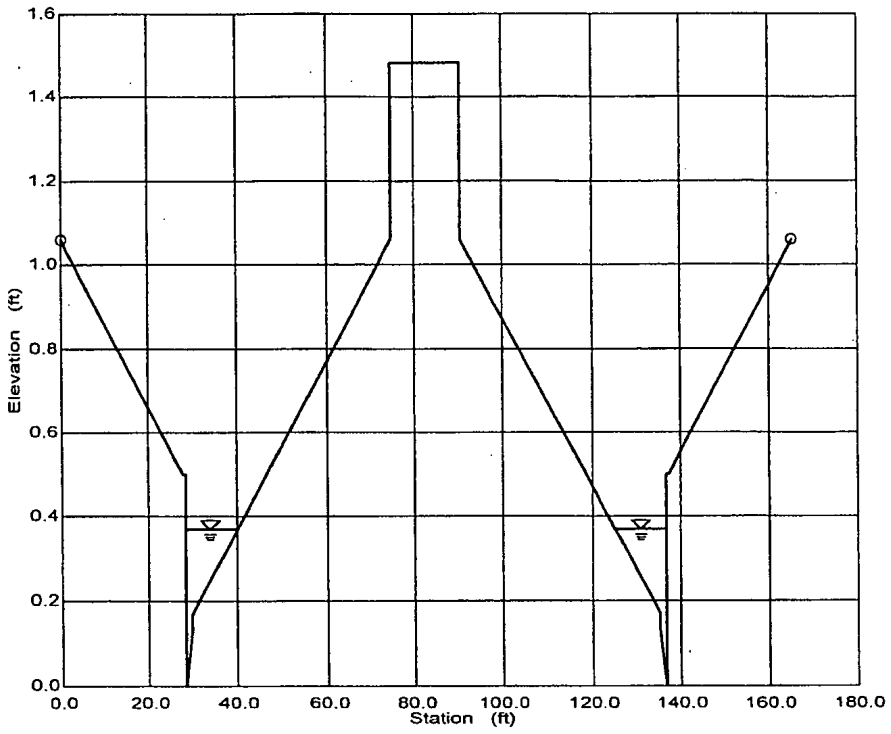
Input Data				
Channel Slope	0.024000 ft/ft			
Elevation range: 0.00 ft to 1.48 ft.				
Station (ft)	Elevation (ft)	Start Station	End Station	Roughness
0.00	1.06	0.00	165.34	0.016
28.00	0.50			
28.50	0.50			
28.50	0.00			
30.00	0.13			
30.00	0.17			
74.67	1.06			
74.67	1.48			
90.67	1.48			
90.67	1.06			
135.34	0.17			
135.34	0.13			
136.84	0.00			
136.84	0.50			
137.34	0.50			
165.34	1.06			
Discharge	10.20 cfs			

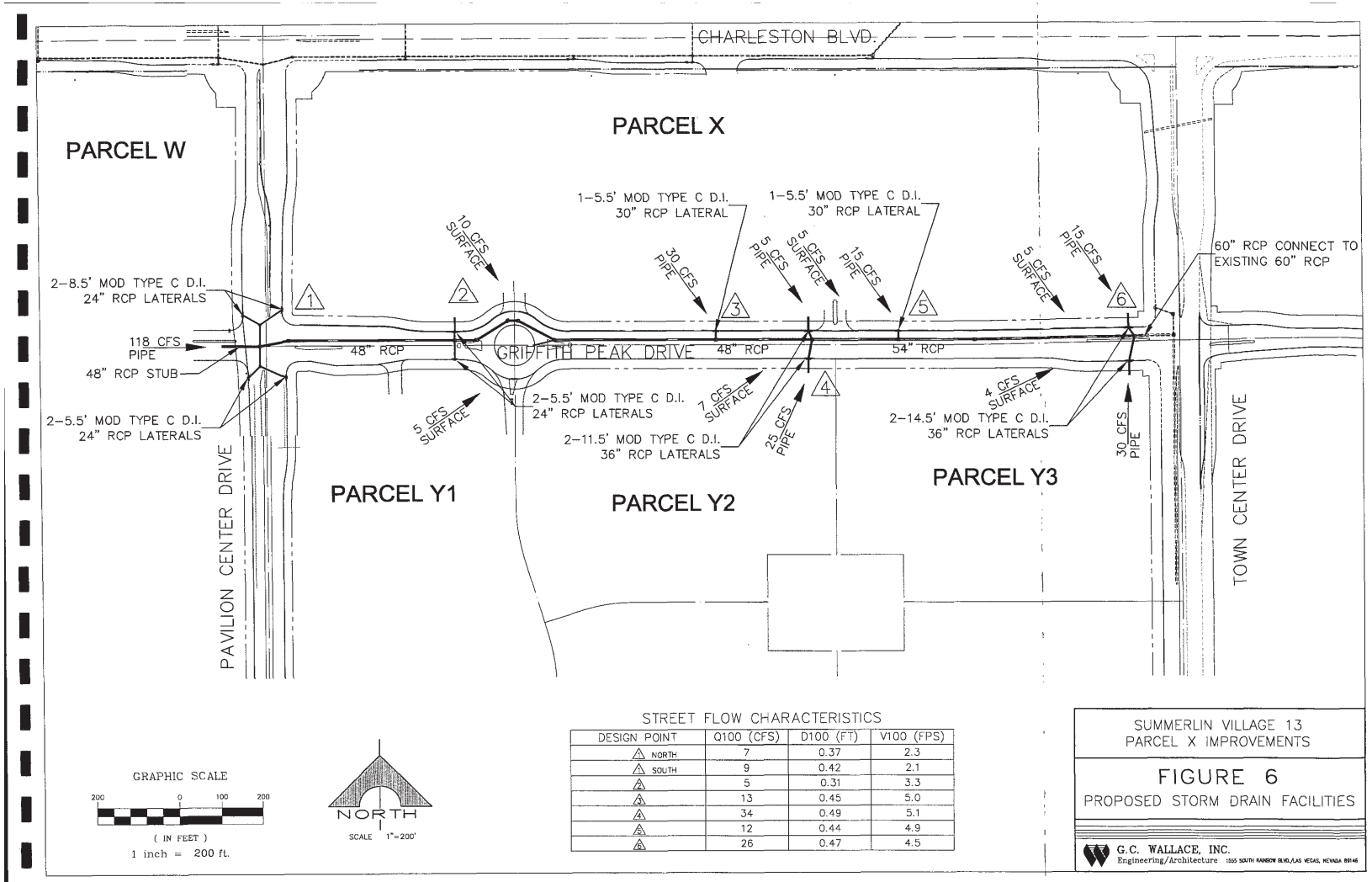
Results		
Wtd. Mannings Coefficient	0.016	
Water Surface Elevation	0.37	ft
Flow Area	2.89	ft²
Wetted Perimeter	23.73	ft
Top Width	22.90	ft
Height	0.37	ft
Critical Depth	0.43	ft
Critical Slope	0.007241	ft/ft
Velocity	3.53	ft/s
Velocity Head	0.19	ft
Specific Energy	0.56	ft
Froude Number	1.75	
Flow is supercritical.		
Flow is divided.		

DEPTH OF FLOW AT PT.7 (STA 874+15)
Cross Section for Irregular Channel

Project Description	
Project File	d:\projects\charl\charl.fm2
Worksheet	CHARLESTON BLVD. (FULL STREET)
Flow Element	Irregular Channel
Method	Manning's Formula
Solve For	Water Elevation

Section Data		
Wtd. Mannings Coefficient	0.016	
Channel Slope	0.024000	ft/ft
Water Surface Elevation	0.37	ft
Discharge	10.20	cfs





GRAPHIC SCALE

200 0 100 200

(IN FEET)

1 inch = 200 ft.

NORTH

SCALE 1"=200'

STREET FLOW CHARACTERISTICS

DESIGN POINT	Q100 (CFS)	D100 (FT)	V100 (FPS)
1 NORTH	7	0.37	2.3
1 SOUTH	9	0.42	2.1
2	5	0.31	3.3
3	13	0.45	5.0
4	34	0.49	5.1
5	12	0.44	4.9
6	26	0.47	4.5

SUMMERLIN VILLAGE 13
PARCEL X IMPROVEMENTS

FIGURE 6

PROPOSED STORM DRAIN FACILITIES

G.C. WALLACE, INC.
Engineering/Architecture 1555 SOUTH RAINBOW BLVD./LAS VEGAS, NEVADA 89146

Charleston Blvd (south) 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Discharge	6.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	1.06
0+28.00	0.50
0+28.50	0.50
0+28.50	0.00
0+30.00	0.13
0+30.00	0.17
0+74.67	1.06
0+74.67	1.48
0+90.67	1.48

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 1.06)	(0+90.67, 1.48)	0.016

Options

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

Results

Normal Depth	0.38	ft
Elevation Range	0.00 to 1.48 ft	
Flow Area	1.64	ft²
Wetted Perimeter	12.71	ft

Charleston Blvd (south) 100-yr

Results

Hydraulic Radius		0.13	ft
Top Width		12.27	ft
Normal Depth		0.38	ft
Critical Depth		0.45	ft
Critical Slope		0.00709	ft/ft
Velocity		3.67	ft/s
Velocity Head		0.21	ft
Specific Energy		0.59	ft
Froude Number		1.77	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.38	ft
Critical Depth	0.45	ft
Channel Slope	0.02400	ft/ft
Critical Slope	0.00709	ft/ft

Charleston Blvd (south) 100-yr

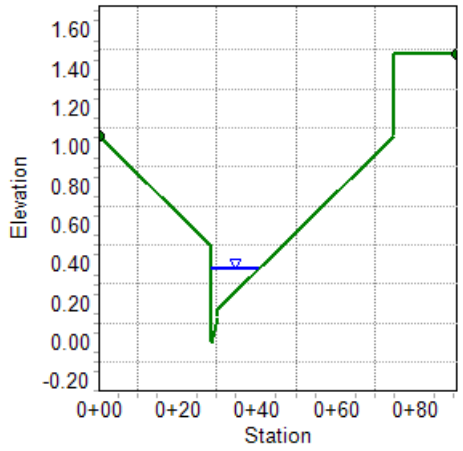
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02400	ft/ft
Normal Depth	0.38	ft
Discharge	6.00	ft³/s

Cross Section Image



Griffith Peak Interim 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02600	ft/ft
Discharge	34.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+00.00	0.98
0+24.00	0.50
0+24.50	0.48
0+24.50	0.00
0+26.00	0.13
0+26.00	0.17
0+58.00	0.81
0+90.00	0.17
0+90.00	0.13
0+91.50	0.00
0+91.50	0.48
0+92.00	0.50
1+16.00	0.98

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.98)	(1+16.00, 0.98)	0.015

Options

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

Griffith Peak Interim 100-yr

Results

Normal Depth		0.50	ft
Elevation Range	0.00 to 0.98 ft		
Flow Area		6.74	ft²
Wetted Perimeter		37.97	ft
Hydraulic Radius		0.18	ft
Top Width		36.91	ft
Normal Depth		0.50	ft
Critical Depth		0.63	ft
Critical Slope		0.00564	ft/ft
Velocity		5.05	ft/s
Velocity Head		0.40	ft
Specific Energy		0.90	ft
Froude Number		2.08	
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	0.50	ft
Critical Depth	0.63	ft
Channel Slope	0.02600	ft/ft
Critical Slope	0.00564	ft/ft

Griffith Peak Interim 100-yr

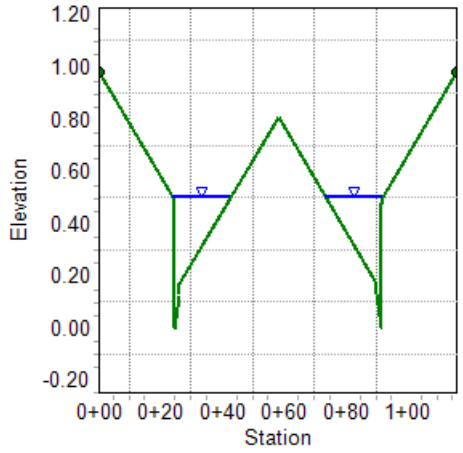
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02600	ft/ft
Normal Depth	0.50	ft
Discharge	34.00	ft³/s

Cross Section Image



Appendix C

Spruce Park Drive Improvement Plans

Sheet List Table

NO.	SHEET	TITLE LINE 1	TITLE LINE 2
1	C-1	COVER SHEET	--
2	C-2	LEGEND AND ABBREVIATIONS	--
3	C-3	GENERAL NOTES	--
4	H-1	HORIZONTAL CONTROL PLAN	--
5	G-1	MASTER GRADING PLAN	--
6	G-2	DRIVEWAY DETAILS	--
7	W-1	MASTER WATER PLAN	--
8	P-1	SPRUCE PARK DRIVE	PLAN AND PROFILE STA 10+00.00 TO STA 13+50.00
9	P-2	SPRUCE PARK DRIVE	PLAN AND PROFILE STA 13+50.00 TO STA 17+50.77
10	D-1	TYPICAL SECTIONS	--
11	D-2	ROADWAY DETAILS	--
12	D-3	WATER DETAILS	--
13	D-4	WATER DETAILS	--
14	D-5	STREETLIGHT DETAILS	--
15	D-6	TRAFFIC CONTROL DETAILS	--
16	D-7	TRAFFIC CONTROL DETAILS	--
17	SL-1	STREETLIGHT PLAN	--
18	T-1	TRAFFIC CONTROL PLAN	--

SUMMERLIN VILLAGE 13 WEST ROADWAY IMPROVEMENT PLANS FOR: SPRUCE PARK DRIVE

GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

SUMMERLIN®

UTILITY NOTE

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

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

THIS PROPERTY MAY HAVE STATIC WATER PRESSURE IN EXCESS OF 80 PSI. THE UNIFORM PLUMBING CODE REQUIRES THAT INDIVIDUAL, ON-SITE (PRIVATE) PRESSURE REDUCING VALVES BE INSTALLED WHENEVER THE PRESSURE EXCEEDS 80 PSI. PRV'S ARE THE DEVELOPER'S RESPONSIBILITY AND WILL NOTE BE INSPECTED OR INCLUDED IN THE ACCEPTANCE OF THE LAS VEGAS VALLEY WATER DISTRICT FACILITIES.

NOTICE OF INTENT NOTE

NOTE: ALL LAND SURFACE AREA DISTURBANCES OVER 1 ACRE REQUIRE A STORMWATER DISCHARGE PERMIT ISSUED BY THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP). A PHASED CONSTRUCTION UNIT IN A CONTIGUOUS SUBDIVISION IS CONSIDERED UNDER CONSTRUCTION UNTIL ALL STRIPPED SURFACE AREAS HAVE BEEN COVERED BY PAVING, BUILDING CONSTRUCTION OR PLANTING. A STORMWATER DISCHARGE PERMIT APPLICATION AND ASSOCIATED INFORMATION MAY BE DOWNLOADED FROM THE WEB SITE: HTTP://WWW.STATE.NV.US/BWPC/STORM01.HTM PROJECTS THAT DISTURB MORE THEN ONE ACRE OF LAND MUST SUBMIT TO NDEP A "NOTICE OF INTENT" FOR INCLUSION UNDER STORMWATER PERMIT NO. NVR100000 ALONG WITH APPROPRIATE FILLING FEE.

NPDES PERMIT NOTE

THE ENGINEER SHOULD CONTACT THE NEVADA DIVISION OF ENVIRONMENTAL PROTECTION (NDEP) TO OBTAIN A NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM (NPDES) PERMIT PRIOR TO CONSTRUCTION. ALL CONSTRUCTION PROJECTS ONE ACRE OR LARGER MUST APPLY FOR THE PERMIT THROUGH NDEP. ALL QUESTIONS REGARDING THE NPDES PERMIT REQUIREMENTS SHOULD BE DIRECTED TO THE NDEP AT (775) 687-9429.

DISCLAIMER NOTE

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

FEMA FLOOD ZONE INFORMATION

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE X (UNSHADED) AS DEPICTED ON FLOOD INSURANCE RATE MAP (FIRM) PANEL 32003C2150E, DATED 9/27/2002. A ZONE X (UNSHADED) IS DESCRIBED AS AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.

ROADWAY ACREAGE
GROSS ACREAGE: 1.86 AC.
NET ACREAGE: 0.58 AC.

GEOTECHNICAL ENGINEER
PREPARED BY: NOVA GEOTECHNICAL & INSPECTION SERVICES
4430 W. HACIENDA AVENUE, SUITE 104, LAS VEGAS, NV 89118
PHONE: 702-527-6602
PROJECT NO.: JE-16-047
DATED: SEPTEMBER 6, 2006 WITH UPDATED DATA ON MARCH 31, 2016

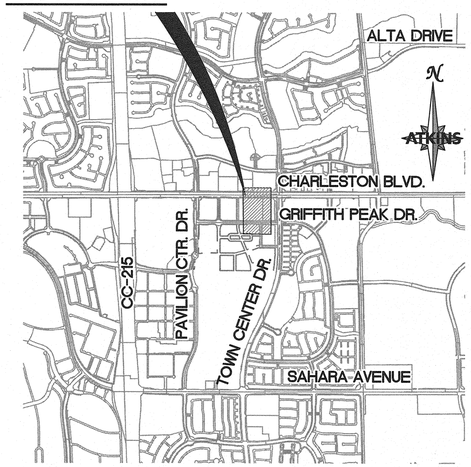
OWNER / DEVELOPER

OWNER

CONTACT: KEVIN ORROCK
HOWARD HUGHES PROPERTIES, INC.
10801 W. CHARLESTON BLVD., 3rd FLOOR
LAS VEGAS, NEVADA 89135

LOCATION MAP

PROJECT SITE

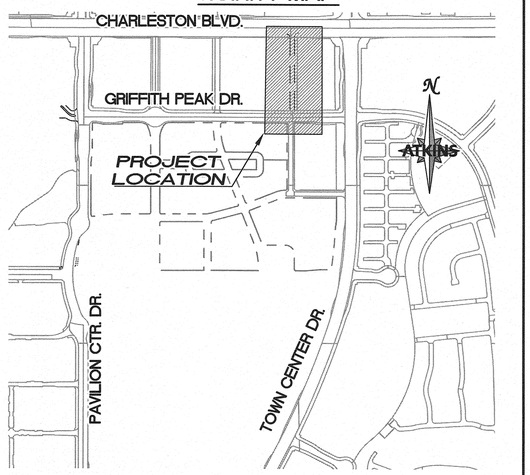


ENGINEER / CONSULTANT

CIVIL

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

VICINITY MAP



APPROVALS

CLARK COUNTY FIRE DEPARTMENT — 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, COUNTY LAWS AND/OR SPECIFICATIONS.

1500 GPM 20 PSI

CLARK COUNTY WATER RECLAMATION DISTRICT

DATE

CCWRD PROJECT CONTROL NUMBER IS:
SIGNATURE ON THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY WATER RECLAMATION DISTRICT RULES, REGULATIONS, OR DESIGN AND CONSTRUCTION STANDARDS.

CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK — DATE

THE AFFIXED CENTRAL TELEPHONE COMPANY d/b/a CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS. RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO LOCAL ORDINANCES, NEVADA REVISED STATUTES, AND/OR PUBLIC UTILITY COMMISSION RULES AND REGULATIONS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER
PROJECT NO. DATE:
LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL
SHEETS:

APPROVAL BY THE FIRE DEPARTMENT HAVING JURISDICTION IS REQUIRED PRIOR TO OBTAINING FINAL APPROVAL FROM LAS VEGAS VALLEY WATER DISTRICT.

NV ENERGY — DATE

NV ENERGY HAS ACKNOWLEDGED WE HAVE RECEIVED YOUR PLANS AND WILL PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA UTILITY COMMISSION'S RULES AND REGULATIONS.

SOUTHWEST GAS CORPORATION — DATE

COX COMMUNICATIONS OF LAS VEGAS, INC — DATE

BASIS OF BEARING

S01°20'49"E-BEING THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA AS SHOWN ON A MAP ON FILE IN THE OFFICE OF THE CLARK COUNTY RECORDER IN FILE 92 OF PARCEL MAPS. PAGE 96, OFFICIAL RECORDS.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 9LV191N4 (RE-OBSERVED 2005-2007)

RIVET AND PLATE IN THE TOP OF CURB AT THE SE CORNER OF CHARLESTON AND TOWN CENTER DR IN PORK CHOP ISLAND.

ELEVATION = 906.956M (NAVD'88)
= 2975.57 FT (NAVD'88)

COORDINATE CONVERSION

LOCAL NORTHING = (GRID x 1.0002330451) - 26,252,779.88
LOCAL EASTING = (GRID x 1.0002330451) - 155,947.10

GRID = (LOCAL NORTHING + 26,252,779.88) x 0.9997670092
GRID = (LOCAL EASTING + 155,947.10) x 0.9997670092

HORIZONTAL GEODETIC DATA BASED ON NAD 83 (2011), EPOCH 2010.00, NEVADA EAST ZONE (2701).

LEGAL DESCRIPTION

BEING A PORTION OF PARCEL 2 AS SHOWN ON THE MAP THEREOF IN FILE 98 OF PARCEL MAPS, PAGE 28, OFFICIAL RECORDS, CLARK COUNTY, NEVADA., AND BEING A PORTION OF THE WEST HALF (W1/2) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA.

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

Call before you Dig AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

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

PROFESSIONAL ENGINEER - STATE OF NEVADA — CARL E. ANDERSON — EXP. 12-31-18 — CIVIL — No. 24394 — TDS — 2 Feb. 2017

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN®

SUMMERLIN VILLAGE 13 WEST
SPRUCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

COVER SHEET

DESIGNED BY: A. SNYDER
DRAWN BY: C. HAFFORD
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 10047977
DATE: FEBRUARY, 2017
DRAWING NO. C-1
SHEET 1 OF 18

\\suspxb1101\projects\Allen\100047977 - SprucePark\47977-01-TITL-C1.dwg Layout: C-1 Feb 02, 2017 - 8:39am

@	AT
#	NUMBER
A	ANODE
A	AMPERES
AB	ABANDONED
AC	ASPHALTIC CONCRETE
ACP	ASBESTOS CEMENT PIPE
AD	ALGEBRAIC DIFFERENCE
AGG	AGGREGATE
AIP	ABANDON IN PLACE
ALT	ALTERNATE
AP	ANGLE POINT
APP	APPROACH
APPROX	APPROXIMATE
ASTM	AMERICAN SOCIETY FOR TESTING AND MATERIALS INTERNATIONAL
AV/AR	AIR VACUUM AIR RELIEF VALVE
AWG	AMERICAN WIRE GAUGE
BC	BACK OF CURB
BCR	BACK OF CURB RADIUS
BLK	BLOCK
BLVD	BOULEVARD
BM	BENCHMARK
BO	BLOW OFF
BOT	BOTTOM
BP	ALIGNMENT BEGINNING
BRG	BRIDGE
BS	BACK SLOPE
BSW	BACK OF SIDEWALK
BVC	BEGIN VERTICAL CURVE
BVCE	BEGINNING OF VERTICAL CURVE ELEVATION
BVCS	BEGINNING OF VERTICAL CURVE STATION
BW	BOTTOM WIDTH
BWC	BASIC WATER COMPANY
C&G	CURB AND GUTTER
C-C	CENTER TO CENTER
CATV	CABLE TELEVISION
CBC	CITY OF BOULDER CITY
CCAUSD	CLARK COUNTY AREA UNIFORM STANDARD DRAWING
CCRFCD	CLARK COUNTY REGIONAL FLOOD CONTROL DISTRICT
CCWRD	CLARK COUNTY WATER RECLAMATION DISTRICT
CCW	COUNTER CLOCKWISE
CF	CUBIC FOOT
CIP	CAST IRON PIPE OR CAST IN PLACE
CL	CENTERLINE
CLR	CLEAR
CLV	CITY OF LAS VEGAS
CM	CONSTRUCTION MANAGER OR CITY OF MESQUITE
CMP	CORRUGATED METAL PIPE
CMU	CONCRETE MASONRY UNIT
CNDT	CONDUIT
CNLV	CITY OF NORTH LAS VEGAS
CO	CLEANOUT
COH	CITY OF HENDERSON
COL	COLUMN
COMM	COMMERCIAL
CONT	CONTINUATION
CONC	CONCRETE
CONST	CONSTRUCT OR CONSTRUCTION
COR	CORNER
CPP	CORRUGATED PLASTIC PIPE
CSAP	CORRUGATED STEEL ARCH PIPE
CSP	CORRUGATED STEEL PIPE
CU	CUBIC
CULV	CULVERT
CW	CLOCKWISE
CY	CUBIC YARD
D	DEPTH
D	DISTANCE
DCSWCS	DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS
DET, DTL	DETAIL
DEPT	DEPARTMENT
DG	DESIGN GRADE
DI	DROP INLET
DIA	DIAMETER
DIAG	DIAGONAL
DMS	DYNAMIC MESSAGE SIGN
DW	DRIVEWAY
DWG	DRAWING
E	EAST
E/o	EAST OF
EA	EACH
EB	EASTBOUND
EC	END OF CURVE
ECR	END CURB RETURN
EF	EACH FACE
EG	EXISTING GROUND
ELEC	ELECTRICAL
ELEV	ELEVATION
EMBK	EMBANKMENT
EOP	EDGE OF PAVEMENT
EP	EDGE OF PAVEMENT ALIGNMENT END
EQ	EQUAL
ESMT	EASEMENT
EVC	END VERTICAL CURVE
EVCS	END VERTICAL CURVE STATION
EW	EACH WAY
EX,EXST	EXISTING
EXP JT	EXPANSION JOINT
FA	FIRE ALARM
FC	FACE OF CURB
FF	FINISHED FLOOR ELEVATION FAR FACE
FG	FINISHED GRADE
FH	FIRE HYDRANT
FL	FLOW LINE
FO	FIBER OPTIC
FT	FOOT OR FEET
G	GAS LINE
G	GRAMS
GALV	GALVANIZED
GB	GRADE BREAK
GL	GRATE LENGTH
GM	GAS METER
GR	GAS PRESSURE REGULATOR
GUT	GUTTER
GV	GATE VALVE
H	HEIGHT
HDPE	HIGH DENSITY POLYETHYLENE PIPE
HDWL	HEADWALL
HE	HORIZONTAL ELLIPTICAL
HGL	HYDRAULIC GRADE LINE
HOR	HORIZONTAL
HP	HIGH POINT HIGH PRESSURE
ID	INSIDE DIAMETER
IN	INCH(ES)
INT	INTERSECTION
INV	INVERT
IQAC	INTERAGENCY QUALITY ASSURANCE COMMITTEE
IRR	IRRIGATION
ISL	ISLAND
JB	JUNCTION BOX
JCT	JUNCTION
JT	JOINT
K	VERTICAL CURVE K VALUE
KIPS	THOUSANDS OF POUNDS PER SQUARE INCH
KP	KNOWN POINT
KRG	KERN RIVER GAS COMPANY
KSI	THOUSANDS OF POUNDS PER SQUARE INCH
KV	KILOVOLT
L	LENGTH
LB	POUND(S)
LF	LINEAR FEET
LIE	LOWER INVERT ELEVATION
LIN	LINEAR
LOC	LENGTH OF CURVE
LOL	LAYOUT LINE
LP	LOW POINT
LT	LEFT
LVVWD	LAS VEGAS VALLEY WATER DISTRICT
MAS	MASONRY
MAX	MAXIMUM
MH	MANHOLE
MIN	MINIMUM
MON	MONOLITHIC
MTL	MATERIAL
MUE	MUNICIPAL UTILITY EASEMENT
N	NORTH OR MANNINGS ROUGHNESS COEFFICIENT
N/o	NORTH OF
NAP	NOT A PART
NDOT	NEVADA DEPARTMENT OF TRANSPORTATION
NF	NEAR FACE
NG	NUMBER OF GRATES OR NATURAL GRADE
NIC	NOT IN CONTRACT
No.	NUMBER
NTS	NOT TO SCALE
OC	ON CENTER
OD	OUTSIDE DIAMETER
OG	OPEN GRADE
OH	OVERHEAD
OHP	OVERHEAD POWER
OS	OFFSET
P	POWER
PB	PULL BOX
PBS	PLANTMIX BITUMINOUS SURFACE
PC	POINT OF CURVATURE
PCC	PORTLAND CEMENT CONCRETE OR POINT OF COMPOUND CURVATURE
PE	POLYETHYLENE
PG	PROPOSED GRADE
PGL	PROFILE GRADE LINE
PH	POT HOLE
PI	POINT OF INTERSECTION
PIP	PROTECT IN PLACE
PL	PROPERTY LINE
PLCS	PLACES
PMF	PAVEMENT MARKING FILM
PP	POWER POLE
PRC	POINT OF REVERSE CURVATURE
PROP	PROPOSED
PSI	POUNDS PER SQUARE INCH
PT	POINT POINT OF TANGENCY
PUE	PUBLIC UTILITY EASEMENT
PVC	POLYVINYL CHLORIDE
PVI	POINT OF VERTICAL INTERSECTION
PVMT	PAVEMENT
QTY	QUANTITY
(R)	RADIAL
R/W,ROW	RIGHT OF WAY
R	RADIUS
RC	REINFORCED CONCRETE
RCA	REINFORCED CONCRETE ARCH
RCB	REINFORCED CONCRETE BOX
RCC	ROLLER COMPACTED CONCRETE
RCP	REINFORCED CONCRETE PIPE
RD	ROAD
REINF	REINFORCED REINFORCEMENT
RELOC	RELOCATE
REV	REVISION
ROW	RIGHT OF WAY
RP	RADIUS POINT
RPM	RAISED PAVEMENT MARKER
RR	RAILROAD
RT	RIGHT
S	SOUTH/SLOPE
S/o	SOUTH OF
SCHED	SCHEDULE
SD	STORM DRAIN
SDMH	STORM DRAIN MANHOLE
SF	SQUARE FOOT/SQUARE FEET
SHLD	SHOULDER
SHT	SHEET
SHP	STEEL HIGH PRESSURE PIPE
SL	STREET LIGHT
SMFO	SINGLE MODE FIBER OPTIC
SNWA	SOUTHERN NEVADA WATER AUTHORITY
SPA	SPACING
SQ	SQUARE
SS	SANITARY SEWER/SIDE SLOPE
SST	STAINLESS STEEL
ST	STREET
STA	STATION
STD	STANDARD
STL	STEEL
STLT	STREETLIGHT
STRUCT	STRUCTURAL OR STRUCTURE
SURV	SURVEY
SW	SIDEWALK
SY	SQUARE YARD
T	TELEPHONE LINE
TAN	TANGENT
TB	TOP OF BOX
TBA	TO BE ADJUSTED
TBC	TOP OF BACK OF CURB
TBR	TO BE REMOVED
TC	TOP OF CURB
TEL	TELEPHONE
TEMP	TEMPORARY
TF	TOP OF FOOTING
THK	THICK
THR	THRUST
THW	TOP OF HEADWALL
TOF	TOP OF FACE
TOW	TOP OF WALL
TP	TOP OF PIPE
TRANS	TRANSITION
TS	TRAFFIC SIGNAL
TSI	TRAFFIC SIGNAL INTERCONNECT
TW	TOP OF WALL
TYP	TYPICAL
UDACS	UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR WATER DISTRIBUTION SYSTEMS
UG	UNDERGROUND
UGP	UNDERGROUND POWER
UIE	UPPER INVERT ELEVATION
UNO	UNLESS NOTED OTHERWISE
UPRR	UNION PACIFIC RAILROAD
USD	UNIFORM STANDARD DRAWING
UTACS	ULTRA THIN ASPHALT CONCRETE SURFACE
V	VOLT
VAR	VARIABLE
VC	VERTICAL CURVE
VCP	VITRIFIED CLAY PIPE
VERT	VERTICAL
VG	VALLEY GUTTER
VOTR	VIDEO OPTICAL TRANSCEIVER
W	WEST/WATER
W/	WITH
W/o	WEST OF
WB	WEST BOUND
WL	WATER LINE
WM	WATER METER
WN	WEAKENED PLANE JOINT
WO/	WITHOUT
WOUS	WATERS OF THE U.S.
WPJ	WEAKENED PLANE JOINT
WV	WATER VALVE
WW	WING WALL
YD	YARD(S)

AERIAL PANEL
AIR-VACUUM VALVE
BENCHMARK
BILLBOARD
BLOWOFF
ANGLE POINT
BOLLARD
CACTUS
CAP
CELL TOWER
CONDUIT RUN NUMBER
COORDINATE
CULVERT
DETECTABLE WARNING DOMES
DISH ANTENNA
DOUBLE POST SIGN
DROP INLET
DROP INLET
DROP INLET – AREA
DROP INLET – OFF ROAD
DRUM
ELEVATION – EXISTING (00.0)
ELEVATION – NEW 00.00 FG
ELEVATION [PROPOSED BY OTHERS] (00.00) FG
FIRE DEPARTMENT CONNECTION
FIRE HYDRANT – EXISTING
FIRE HYDRANT – PROPOSED
GATE – SINGLE – EXISTING
GATE – DOUBLE – EXISTING
GATE – SINGLE – PROPOSED
GATE VALVE – EXISTING
GATE VALVE – PROPOSED
GUY WIRE
HYDRAULIC GRADE LINE
LIGHT POLE
LOOP DETECTOR
MANHOLE
MONUMENT CALCULATED
MONUMENT FOUND
MONUMENT TYPE 1
MONUMENT TYPE 2
MONUMENT TYPE 3
MONUMENT TYPE Z
PALM TREE
PEDESTRIAN SIGNAL
POINT OF VERTICAL INTERSECTION
POST INDICATING VALVE
PULLBOX No. 3 1/2
PULLBOX No. 5
PULLBOX No. 7
PULLBOX No. 9
PULLBOX P-30
PULLBOX T-300
PULLBOX TRAFFIC SIGNAL TS
REDUCED PRESSURE PRINCIPAL ASSEMBLY
REDUCER

SIGN – EXISTING
SIGN – OVERHEAD
SIGN – PROPOSED
SIGN – STREET NAME
SIGNPOST AND DJ
SIGNPOST – EXISTING
SIGNPOST – PROPOSED
SIGNAL POLE LABEL
TEST STATION
TRANSMISSION POLE
TRANSMISSION TOWER
TREE
UTILITY POLE
UTILITY VAULT
WATER METER

FLOWLINE
CENTERLINE
SECTION LINE
PROPERTY BOUNDARY LINE
PROPERTY LINE
RIGHT OF WAY
MATCHLINE
PROPOSED STREETLIGHT CONDUIT
EXISTING STREETLIGHT CONDUIT
PROPOSED 4" INTERCONNECT CONDUIT
PROPOSED 3" INTERCONNECT CONDUIT
TRAFFIC SIGNAL CONDUITS
EXISTING FENCE
PROPOSED FENCE
EXISTING CHAIN LINK FENCE
EXISTING BLOCK WALL
RETAINING WALL
EXISTING OVERHEAD POWER OHP
EXISTING UNDERGROUND POWER UGP
EXISTING SANITARY SEWER SS
EXISTING WATER WATER
EXISTING GAS GAS
EXISTING CABLE T.V. CATV
EXISTING STORM DRAIN SD
EXISTING TELEPHONE TEL
EXISTING CONCRETE ENCASEMENT
EXISTING STREETLIGHT CONDUIT
TRAFFIC SIGNAL CONDUITS
PROPOSED INTERCONNECT
STUB AND CAP
SAWCUT PAVEMENT
LIMITS OF OPEN GRADE
EDGE OF PAVEMENT
GUARD RAIL
LANE LINE 8"
LANE LINE CAT TRACKS
LANE LINE DROP
LANE LINE STORAGE 8"
LANE LINE TYPE 1
LANE LINE TYPE 2
LANE LINE TYPE 3
LANE LINE TYPE 4
NEW STORM DRAIN W/MANHOLE
NEW STORM DRAIN W/PRECAST TEE
EXISTING SCARP
PROPOSED SCARP
PROPOSED CURB AND GUTTER
EXISTING CURB AND GUTTER

SUMMARY OF QUANTITIES

DESCRIPTION	QUANTITIES	UNIT
WATER SYSTEM		
6" C-900 PVC WATER PIPE (PUBLIC)	41	LF
8" C-900 PVC WATER PIPE (PUBLIC)	107	LF
12" C-900 PVC WATER PIPE (PUBLIC)	668	LF
6" GATE VALVE PER UDACS PLATE NO. 30 AND 39	1	EA
8" GATE VALVE PER UDACS PLATE NO. 30 AND 39	2	EA
12" GATE VALVE PER UDACS PLATE NO. 30 AND 39	1	EA
12"X6" TEE PER UDACS PLATE NO. 31	1	EA
12"X8" TEE PER UDACS PLATE NO. 31	2	EA
12" 45° BEND PER UDACS PLATE NO. 31	2	EA
12" 90° BEND PER UDACS PLATE NO. 31	2	EA
6" FIRE HYDRANT ASSEMBLY	1	EA
STREET IMPROVEMENTS		
3" PLANTMIX BITUMINOUS PAVEMENT W/ 4" TYPE II AGGREGATE BASE	2098	SY
STANDARD "L" TYPE CURB & GUTTER PER USD #216 W/ TYPE II AGGREGATE BASE	1393	LF
4" CONCRETE SIDEWALK	134	SF
SIDEWALK RAMP	10	EA
CONCRETE VALLEY GUTTER	5	EA

CLARK COUNTY WATER RECLAMATION DISTRICT.

DATE

CCWRD PROJECT CONTROL NUMBER IS:
SIGNATURE ON THESE PLANS SHALL NOT BE CONSTRUED TO BE A PERMIT FOR OR AN APPROVAL OF ANY VIOLATION OF CLARK COUNTY WATER RECLAMATION DISTRICT RULES, REGULATIONS, OR DESIGN AND CONSTRUCTION STANDARDS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER
PROJECT NO. DATE:
LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL

NOTE TO CONTRACTOR

- QUANTITIES SHOWN ARE ESTIMATES ONLY AND ARE INTENDED TO ILLUSTRATE SCOPE OF WORK. THE CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE EXACT QUANTITIES INVOLVED.
- EXISTING UTILITY LOCATIONS SHOWN HEREIN ARE APPROXIMATE ONLY. IT SHALL BE THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE EXACT VERTICAL AND HORIZONTAL LOCATION OF ALL EXISTING UNDERGROUND UTILITIES PRIOR TO COMMENCING CONSTRUCTION. NO REPRESENTATION IS MADE THAT ALL EXISTING UTILITIES ARE SHOWN HEREON. THE ENGINEER ASSUMES NO RESPONSIBILITY FOR UTILITIES NOT SHOWN OR UTILITIES NOT SHOWN IN THEIR PROPER LOCATIONS. CALL BEFORE YOU DIG: (800) 227-2600

SPECIAL NOTE

IN THE EVENT THAT ANY TEMPORARY CONSTRUCTION ITEM IS REQUIRED WHICH 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 CLARK COUNTY DEPT. OF PUBLIC WORKS. TEMPORARY CONSTRUCTION ITEMS INCLUDE: PAVEMENT TRANSITIONS, PROTECTIVE DITCHES AND BERMS. ROAD SIGNS AND BARRICADES, ETC.

BASIS OF BEARING

SOUTH 01°20'49"EAST, BEING THE BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP THEREOF IN BOOK 146 OF PLATS, PAGE 81, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 9LV191N4 (RE-OBSERVED 2005-2007)

RIVET AND PLATE IN THE TOP OF CURB AT THE SE CORNER OF CHARLESTON AND TOWN CENTER DR IN PORK CHOP ISLAND.

ELEVATION = 906.956M (NAVD'88)
= 2975.57 FT (NAVD'88)

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

Call before you D g AVOID COSTLY UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

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

PROFESSIONAL ENGINEER - STATE OF NEVADA CARL E. ANDERSON EXP. 12-31-18 CIVIL No. 24394 TDS 2 FEB. 2017

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7300

SUMMERLIN

SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

LEGEND AND ABBREVIATIONS

DESIGNED BY: A. SNYDER
DRAWN BY: L. LANGFORD
CHECKED BY: P. BATES
HORIZ.: NONE
VERT.: NONE

JOB NO. 10004797
DATE: FEBRUARY, 2017
DRAWING NO. C-2
SHEET NO. 2
OF 18

P:\Allen\10004797 - SprucePark\47977-02-LEGD-C2.dwg Layout: C-2 Feb 01, 2017 - 3:50pm

CLARK COUNTY TRAFFIC NOTES

1. 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 HEREUNDER, REGARDLESS OF THE STATUS OF COMPLETION OF PAVING OR OTHER OFF-SITE IMPROVEMENTS CALLED FOR BY THESE PLANS.
2. 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 GROUND MOUNTED STOP SIGNS AT ALL NEW STREET ENCROACHMENTS INTO EXISTING COUNTY STREETS IMMEDIATELY AFTER FIRST GRADING WORK IS ACCOMPLISHED AND SHALL MAINTAIN SAID SIGNS UNTIL PERMANENT SIGNS ARE INSTALLED.
3. ALL CONSTRUCTION SIGNING, BARRICADING AND PAVEMENT MARKINGS SHALL CONFORM TO THE NEVADA WORK ZONE TRAFFIC CONTROL HANDBOOK – 1986 AND TO THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES, CURRENT EDITION.
4. 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 COUNTY TRAFFIC MANAGER.
5. THE DEVELOPER SHALL BE RESPONSIBLE TO PROVIDE AND INSTALL ALL PERMANENT SIGNS SHOWN ON THE PLANS. STREET NAME SIGNS SHALL CONFORM IN THEIR ENTIRETY TO CLARK COUNTY AREA STANDARDS. ALL OTHER SIGNS SHALL BE STANDARD SIZE UNLESS OTHERWISE SPECIFIED ON THE PLANS. ALL SIGNPOSTS SHALL BE INSTALLED IN ACCORDANCE WITH CLARK COUNTY AREA STANDARDS. ALL SIGNS SHALL USE CLASS VI SHEETING.
6. IF A PROPOSED STREET LIGHT STANDARD IS FIELD LOCATED TO WITHIN FIVE (5) FEET OF ANY SIGN SHOWN HEREON TO BE MOUNTED ON A SIGN POST, CHANGE SIGN MOUNTING TO ONE ON THE STREETLIGHT STANDARD.
7. PRIOR TO CONSTRUCTION, THE STREET SIGN CONTRACTOR SHALL OBTAIN STREET NAMES AND BLOCK NUMBERING FROM THE CURRENT PLANNING DIVISION OF THE DEPARTMENT OF COMPREHENSIVE PLANNING.
8. ALL TRAFFIC SIGNAL POLE ASSEMBLIES, STEEL PEDESTAL IS FOR CABINETS AND STREET LIGHT POLES SHALL BE GALVANIZED PER ASTM A.123.
9. ALL STREET LIGHTING INSTALLATIONS EXCEPT NOTED ON THE STREET LIGHTING PLANS SHALL CONFORM TO THE UNIFORM STANDARD DRAWINGS AND THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS' CONSTRUCTION OFF-SITE IMPROVEMENTS CLARK COUNTY AREA, NEVADA, LATEST EDITION OF EACH.
10. THE FOLLOWING CLARK COUNTY UNDERGROUND FACILITIES MAY BE LOCATED IN YOUR PROJECT AREA: STREET LIGHTING, TRAFFIC SIGNALS, AND FREEWAY AND ARTERIAL SYSTEM OF TRANSPORTATION (F.A.S.T.) INTERCONNECT CABLE. YOU MUST CONTACT CLARK COUNTY TRAFFIC MANAGEMENT DIVISION, OPERATIONS UNIT AT 455-6000 FOR LOCATIONS AT LEAST 48 HOURS PRIOR TO WORKING IN THE AREA. CLARK COUNTY IS NOT A MEMBER OF "CALL BEFORE YOU DIG"(UNDERGROUND SERVICE ALERT), AND A CALL TO THAT ORGANIZATION DOES NOT RELIEVE YOU OF LIABILITY FOR CLARK COUNTY FACILITIES.
11. F.A.S.T. INTERCONNECT CABLE POLICY IS IN EFFECT. INTERCONNECT CABLE MUST BE MAINTAINED AT ALL TIMES. DEVELOPER/CONTRACTOR SHALL PROVIDE TEMPORARY OVERHEAD INTERCONNECT CABLE WHILE PERMANENT CABLE IS BEING RELOCATED. TEMPORARY AERIAL INSTALLATION MUST BE ACCEPTABLE TO THE COUNTY TRAFFIC MANAGER AND TO F.A.S.T. ANY DAMAGE TO THIS CABLE IS DEEMED AN EMERGENCY BY F.A.S.T., CITY OF LAS VEGAS, CLARK COUNTY AND NDOT AND MUST BE REPAIRED IMMEDIATELY TO F.A.S.T. ACCEPTANCE. $2,500 PER DAY DAMAGES MAY BE ASSESSED AFTER 24 HOURS HAVE ELAPSED FROM TIME OF BREAK OR DAMAGE.
12. ALL NEW OR REPLACEMENT TRAFFIC SIGNAL LOOPS SHALL BE INSTALLED USING CABLE-IN-DUCT WIRING, SHALL HAVE INDEPENDENT LEAD-IN WIRES FOR EACH LOOP FROM THE CONTROLLER TO THE PULL-BOX, AND EACH LEAD-IN SHALL BE INDIVIDUALLY TAGGED.
13. TRAFFIC SIGNAL PEDESTRIAN HEADS SHALL BE THE L.E.D. TYPE.
14. ELECTRICAL POWER SERVICE POINT LOCATION(S) FOR STREET LIGHTING AND TRAFFIC SIGNALS MUST BE INDICATED ON THE PLANS. IF CONNECTING TO AN EXISTING CIRCUIT, INDICATE LOCATION OF EXISTING SERVICE POINT FOR EACH CIRCUIT.
15. WHEN STREETLIGHTS ARE TO BE CONNECTED TO AN EXISTING CIRCUIT, THE ENGINEER MUST CERTIFY THAT THE EXISTING CIRCUIT IS CAPABLE OF HANDLING THE ADDITIONAL CIRCUIT LOAD.
16. CLARK COUNTY RESERVES THE RIGHT TO REJECT STREET LIGHT AND TRAFFIC SIGNAL POLES AND ASSEMBLIES WHICH HAVE A "STRIPED" APPEARANCE.
17. TWO WEEKS PRIOR TO BEGINNING OF CONSTRUCTION, MODIFICATION OR RELOCATION OF ANY TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION OF THE DATE THAT WORK WILL BEGIN.
18. THREE (3) NORMAL WORKING DAYS PRIOR TO TURN-ON OR COMPLETION OF MODIFICATION(S) TO A TRAFFIC SIGNAL SYSTEM, WRITTEN NOTICE SHALL BE SUBMITTED TO THE CLARK COUNTY TRAFFIC MANAGEMENT DIVISION THAT WORK IS BEING COMPLETED AND THE PROPOSED DATE OF COMPLETION.

LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDELINES

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 CLARK COUNTY 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 CLARK COUNTY TITLE 24.40 AND IN THE LAS VEGAS VALLEY CONSTRUCTION SITE BMP GUIDANCE MANUAL.
3. TEMPORARY OR PERMANENT STABILIZATION PRACTICES WILL BE INSTALLED ON DISTURBED AREAS AS SOON AS PRACTICABLE AND NO LATER THAN 14 DAYS AFTER THE CONSTRUCTION ACTIVITY IN THAT PORTION OF THE SITE HAS TEMPORARILY OR PERMANENTLY CEASED. SOME EXCEPTIONS MAY APPLY; REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.5.
4. AT A MINIMUM, THE CONTRACTOR OR HIS AGENT SHALL INSPECT ALL DISTURBED AREAS, AREAS USED FOR STORAGE OF MATERIALS AND EQUIPMENT THAT ARE EXPOSED TO PRECIPITATION, VEHICLE ENTRANCE AND EXIT LOCATIONS, AND ALL BMPS WEEKLY, AND WITHIN 24 HOURS AFTER ANY RAIN EVENT OF 0.5 INCHES OR MORE. THE CONTRACTOR OR HIS AGENT SHALL UPDATE OR MODIFY THE STORMWATER POLLUTION PREVENTION PLAN AS NECESSARY. SOME EXCEPTIONS TO WEEKLY INSPECTIONS MAY APPLY, SUCH AS SUSPENSION OF LAND DISTURBANCE ACTIVITIES. REFER TO THE NEVADA STORMWATER GENERAL PERMIT FOR CONSTRUCTION ACTIVITY NVR100000, SECTION III.A.12.
5. ACCUMULATED SEDIMENT IN BMPS SHALL BE REMOVED WITHIN SEVEN DAYS AFTER A STORMWATER RUNOFF EVENT OR PRIOR TO THE NEXT ANTICIPATED STORM EVENT, WHICHEVER IS EARLIER. SEDIMENT MUST BE REMOVED WHEN BMP DESIGN CAPACITY HAS BEEN REDUCED BY 50 PERCENT OR MORE.

DEVIATION FROM STANDARDS

1. THIS PROJECT IS PART OF THE SUMMERLIN SOUTH DEVELOPMENT AGREEMENT BETWEEN THE COUNTY OF CLARK AND HOWARD HUGHES PROPERTIES, INC./THE HOWARD HUGHES COMPANY LLC.

LATEST REVISION:	FOURTH AMENDMENT EXECUTED UNDER CLARK COUNTY ORDINANCE NO. 3960 (EFFECTIVE DATE: JULY 22, 2011; INSTRUMENT #201107270003196)
ORIGINAL:	DEVELOPMENT AGREEMENT EXECUTED UNDER CLARK COUNTY ORDINANCE NO. 1781 (EFFECTIVE DATE: SEPTEMBER 10, 1996; INSTRUMENT #199609040001725)

LAS VEGAS VALLEY WATER DISTRICT (LVVWD)

LVVWD PROJECT

1. NO WORK SHALL BEGIN UNTIL THE WATER PLANS HAVE BEEN APPROVED FOR CONSTRUCTION BY THE LVVWD. FOLLOWING WATER PLAN APPROVAL, NOTICE SHALL BE GIVEN TO THE LVVWD COMMUNICATION SUPPORT CENTER (258-7171) TWO (2) WORKING DAYS PRIOR TO THE START OF CONSTRUCTION. FOR FUTURE INSPECTIONS, NOTICE MUST BE GIVEN BY 2:00 P.M. THE BUSINESS DAY PRIOR TO THE REQUESTED LVVWD INSPECTION. WHEN REQUESTING INSPECTIONS, PLEASE REFER TO THE PROJECT # IDENTIFIED ABOVE.
2. ALL WORK SHALL CONFORM TO LVVWD STANDARD PLATES, DRAWINGS, AND SPECIFICATIONS, AND TO THE UNIFORM DESIGN AND CONSTRUCTION STANDARDS FOR POTABLE WATER SYSTEMS (UDACS) 3RD EDITION.
3. ALL WORK, EXCEPT AS MODIFIED BY THESE PLANS OR BY NOTE 2 ABOVE, SHALL BE DONE IN ACCORDANCE WITH THE MOST RECENT DRAFT OR EDITION OF THE UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFFSITE IMPROVEMENT, CLARK COUNTY AREA.
4. A SINGLE PIPE MATERIAL SHALL BE USED THROUGHOUT THE PROJECT UNLESS OTHERWISE APPROVED BY THE LVVWD.
5. ALL SERVICE LATERALS TWO (2) INCHES IN DIAMETER AND SMALLER SHALL BE TYPE K COPPER TUBING WITH LVVWD APPROVED SERVICE SADDLES.
6. ALL WATER METER BOXES SHALL BE LOCATED OUTSIDE OF DRIVEWAY AREAS.
7. ALL VALVES SHALL BE LOCATED OUTSIDE OF DRIVEWAYS, VALLEY AND CURB GUTTERS.
8. ALL WATER AND STORM DRAIN OR SANITARY SEWER CROSSINGS SHALL CONFORM TO SECTION 2.22 OF THE 2010 EDITION OF THE UDACS.
9. ALL WATER FACILITIES SHALL BE FILLED, DISINFECTED, PRESSURE TESTED, FLUSHED, FILLED, AND AN ACCEPTABLE WATER SAMPLE OBTAINED, PRIOR TO CONNECTION TO THE LVVWD DISTRIBUTION SYSTEM.
10. THE CONTRACTOR MUST OBTAIN ALL METERS TWO (2) INCHES AND SMALLER FROM LVVWD CENTRAL STORES. TELEPHONE 258-3152 OR 258-3802 TWO (2) WORKING DAYS PRIOR TO METER PICKUP.
11. ANY INTERRUPTION OF SERVICE MUST BE PERFORMED IN ACCORDANCE WITH UDACS SECTION 3.14.01 AND APPROVED BY THE LVVWD INSPECTION DIVISION PRIOR TO SHUTDOWN. PROPER WRITTEN NOTIFICATION MUST BE GIVEN TO ALL AFFECTED CUSTOMERS.
12. ALL WATER FACILITY CONSTRUCTION MATERIALS USED MUST BE AS LISTED ON THE LVVWD PRE-APPROVED MATERIALS AND MANUFACTURER'S LISTING FOR NEW FACILITIES, LATEST REVISION, OR SPECIFICALLY APPROVED ON THESE PLANS.
13. TELEPHONE "CALL BEFORE YOU DIG" AT 1-800-227-2600 OR 811.
14. THE INSTALLATION OF LAS VEGAS VALLEY WATER DISTRICT (LVVWD) MUNICIPAL WATER FACILITIES WITHIN ALL STREETS IS ASSUMED TO BE IN COMPLIANCE WITH THE UNIFORM STANDARD, INCLUDING THE PLACEMENT OF ASPHALT PAVING STREET SURFACES. ANY REPAIR WORK DONE BY THE LVVWD TO THE MUNICIPAL WATER FACILITIES WILL INCLUDE THE PLACEMENT OF AN APPROPRIATELY SIZED ASPHALT REPAIR PATCH ON THE STREET SURFACE.

   ANY DECORATIVE PAVING SURFACE WITHIN THE STREET IS THE RESPONSIBILITY OF THE OWNER'S ASSOCIATION, OR THE INDIVIDUAL PROPERTY OWNERS IF NO OWNER'S ASSOCIATION IS IN EXISTENCE, OR THE AGENCY HAVING JURISDICTION. DECORATIVE SURFACE MATERIALS PLACED WITHIN THE TEN FOOT EASEMENT ABUTTING A PUBLIC OR PRIVATE STREET, IF DISTURBED BY THE LVVWD DURING THE REPAIR OR OPERATION OF ITS FACILITIES, WILL BE REPLACED BY LVVWD WITH AN APPROPRIATELY SIZED PLAIN FINISH CONCRETE PATCH. THE LVVWD WILL NOT RESTORE, AND WILL NOT BE RESPONSIBLE FOR THE RESTORATION OF, ANY DECORATIVE PAVING SURFACE WITHIN THE STREET. THE LVVWD WILL NOT ATTEMPT TO MATCH COLOR OR FINISH OF ANY ADJACENT MATERIALS.

GRADING NOTES

1. INDICATED GRADES OTHER THAN TC, FG & GUTTER FL ARE ROUGH GRADES.
2. THE ROUGH GRADING PLANS SHALL BE ON THE JOB SITE AT ALL TIMES. THE ROUGH GRADING SHALL BE FINISHED IN CONFORMANCE WITH THE LINES AND GRADES SHOWN ON THE PLANS. THE GRADING QUANTITIES ARE BASED ON THE ELEVATION AND DETAILS SHOWN ON THE PLANS. ANY DEVIATIONS FROM THE PLAN WILL RESULT IN QUANTITY CHANGES.
3. CARE SHALL BE EXERCISED IN GRADING CORNER LOTS.
4. ROUGH PAD ELEVATIONS SHALL BE GRADED WITHIN 0.1' OF THE PAD ELEVATIONS SHOWN ON THE PLANS. WHEN GRADING IS COMPLETE PER PLANS, THE CONTRACTOR SHALL NOTIFY THE ENGINEER SO THAT THE LOTS CAN BE INSPECTED. AT THAT TIME THE ENGINEER SHALL ALSO DECIDE IF ANY ADDITIONAL DITCHES OR BERMS ARE REQUIRED. THE CONTRACTOR IS REQUESTED NOT TO REMOVE ANY OF HIS ROUGH GRADING EQUIPMENT UNTIL HE RECEIVES GRADING APPROVAL FROM THE ENGINEER.
5. SOILS REPORT PREPARED BY: NOVA GEOTECHNICAL & INSPECTION SERVICES 4430 W. HACIENDA AVENUE, SUITE 104, LAS VEGAS, NV 89118, PHONE: 702-873-3478, PROJECT NO. : E-16-047, DATED: SEPTEMBER 6, 2006, WITH UPDATED DATA ON MARCH 31, 2016.
6. EARTHWORK QUANTITIES (RAW):
   -CUT = 9,100 CUBIC YARDS
   -FILL = 64 CUBIC YARDS
   A. THE ABOVE QUANTITIES DO NOT REFLECT LOSSES DUE TO SUBSIDENCE OR SHRINKAGE.
   B. THE ABOVE QUANTITIES DO REFLECT USING NATIVE MATERIAL IN LIEU OF TYPE 1 GRAVEL BASE MATERIAL FOR STREET SECTIONS.
   C. THE ABOVE QUANTITIES DO NOT REFLECT ANY EARTHWORK WHICH MAY BE REQUIRED BY THE ENGINEER TO CONSTRUCT ADDITIONAL PROTECTIVE DITCHES OR BERMS NOT SHOWN ON THESE DRAWINGS.

CLARK COUNTY PUBLIC WORKS DEVELOPMENT REVIEW

1. INSPECTIONS ARE REQUIRED. CALL 24 HOURS IN ADVANCE, 455-4610. YOUR PERMIT, APPROVED PLANS, AND BARRICADE PLANS FOR THIS WORK MUST BE ON THE JOB SITE AT ALL TIMES.
2. EXACT LOCATION OF ALL SAW-CUT LINES SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
3. CURB AND GUTTER WITH A GRADE OF LESS THAT 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
4. FINAL ASPHALTIC CONCRETE (AC) PAVEMENT SURFACES SHALL BE ONE-HALF (1/2") INCH ABOVE THE LIP OF THE GUTTER (INCLUDING OPEN GRADE).
5. ALL OFF-SITE IMPROVEMENT CONSTRUCTION SHALL CONFORM TO THE UNIFORM STANDARD SPECIFICATIONS AND STANDARD DRAWINGS CLARK COUNTY AREA NEVADA AND CLARK COUNTY SUPPLEMENT TO UNIFORM STANDARD DRAWINGS AND SPECIFICATIONS, LATEST REVISION.
6. PRIVATE STREETS, CURB & GUTTER AND VALLEY GUTTERS REFLECTED ON THESE PLANS ARE TO BE INSPECTED BY A CLARK COUNTY INSPECTOR.
7. WHEEL CHAIR RAMPS SHALL BE CONSTRUCTED IN EACH QUADRANT OF AN INTERSECTION PER STANDARD DRAWING 235. EXACT LOCATION OF RAMPS SHALL BE DETERMINED IN THE FIELD BY A CLARK COUNTY INSPECTOR.
8. PROPER SIGNS, BARRIERS, BARRICADES AND LIGHTS SHALL BE PLACED AND MAINTAINED IN ACCORDANCE WITH THE LATEST "MANUAL OF UNIFORM TRAFFIC CONTROL DEVICES FOR STREETS AND HIGHWAYS". TRAFFIC, SCHOOL, OR STREET SIGNS OF ANY KIND ARE NOT TO BE MOVED FOR ANY REASON WITHOUT FIRST COORDINATING WITH THE DEPARTMENT OF PUBLIC WORKS OFF-SITE INSPECTOR @ 702-455-4610.
9. THIS PLAN DOES NOT AUTHORIZE CLOSURE OF ANY ROAD OR STREET.
10. NO OPEN TRENCH SHALL BE ALLOWED ACROSS ANY STREET OR WITHIN TEN FEET (10') OF ANY TRAVEL-WAY, EXCEPT WHEN WORK IS IN ACTUAL PROGRESS. AREAS COVERED BY ACCEPTABLE STEEL PLATE ARE NOT TO BE CONSTRUED AS A TRENCH. NO OPEN TRENCH IS PERMITTED IN EXCESS OF 500 FEET OR LENGTH NECESSARY TO ACCOMMODATE PIPE INSTALLATION IN A SINGLE DAY, WHICH EVER IS GREATER. ALL TRENCH CROSSINGS AND BACKFILL SHALL MEET THE STANDARD SPECIFICATION UNLESS OTHERWISE STATED.
11. A TEMPORARY PATCH IS TO BE IN PLACE AT THE END OF EACH WORK DAY WHERE THE BACKFILL IN THE TRENCH HAS BEEN COMPLETED AND PRIOR TO OPENING THE WORK AREA BACK TO TRAFFIC AND IS TO BE MAINTAINED BY THE PERMITTEE. A PERMANENT PATCH IS TO BE IN PLACE WITHIN THIRTY (30) DAYS AFTER THE INSTALLATION OF THE TEMPORARY PATCH.
12. COMPACTION TESTS ARE REQUIRED.

GENERAL NOTES

1. THE CONTRACTOR SHALL NOTIFY ALL AFFECTED PUBLIC ENTITIES, THE PROJECT ENGINEER AND CLARK COUNTY AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF WORK.
2. ALL CONSTRUCTION SHALL BE AS SHOWN ON THESE CONTRACT DRAWINGS. ANY REVISIONS SHALL HAVE THE PRIOR WRITTEN APPROVAL OF THE PROJECT ENGINEER.
3. ALL CONSTRUCTION AND MATERIALS SHALL BE IN ACCORDANCE WITH THE "UNIFORM STANDARD SPECIFICATIONS FOR PUBLIC WORKS CONSTRUCTION OFF-SITE IMPROVEMENTS, CLARK COUNTY AREA NEVADA", LATEST ISSUE; THE "UNIFORM STANDARD DRAWINGS FOR PUBLIC WORKS CONSTRUCTION, CLARK COUNTY AREA NEVADA", LATEST ISSUE; AND OTHER APPLICABLE APPROVED STANDARDS ISSUED BY THE CONTROLLING AGENCY; THE UNIFORM BUILDING CODE; AND ALL LOCAL CITY CODES AND ORDINANCES APPLICABLE.
4. LOCATIONS OF UNDERGROUND UTILITIES SHOWN ON THE DRAWINGS WERE OBTAINED FROM INFORMATION RECEIVED FROM THE APPLICABLE UTILITY COMPANIES. NEITHER THE OWNER NOR ENGINEER ASSUMES ANY RESPONSIBILITY FOR UTILITIES OR STRUCTURES NOT SHOWN, OR NOT IN THE LOCATION SHOWN ON THE DRAWINGS. CONTRACTOR TO VERIFY EXACT LOCATION OF UTILITIES PRIOR TO START OF CONSTRUCTION. THE CONTRACTOR'S RESPONSIBILITY REGARDING UTILITIES SHALL BE AS REQUIRED UNDER SECTION 107.17 OF THE "UNIFORM STANDARD SPECIFICATIONS FOR CLARK COUNTY AREA, NEVADA" AND AS PROVIDED IN THE SPECIFICATIONS.
5. THE CONTRACTOR SHALL TAKE ALL PRECAUTIONARY MEASURES TO PROTECT EXISTING UTILITY LINES, STRUCTURES, AND STREET IMPROVEMENTS WHICH ARE TO REMAIN IN PLACE, FROM DAMAGE. ALL SUCH IMPROVEMENTS OR STRUCTURES DAMAGED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED OR REPLACED TO THE SATISFACTION OF THE COUNTY ENGINEER OR OWNING UTILITY COMPANY AT THE EXPENSE OF THE CONTRACTOR.
6. THE CONTRACTOR SHALL NOT REMOVE TREES, SHRUBS, LAWNS, WALLS, FENCES, SIGNS, STRUCTURES, LIGHTS, OR ANY OTHER EXISTING IMPROVEMENTS OUTSIDE OF STREET RIGHT-OF-WAY, EXCEPT WHERE REQUIRED TO DO SO BY THE CONTRACT DRAWINGS OR THE PROJECT ENGINEER. REPLACEMENT, RELOCATION OR RECONSTRUCTION OF ALL EXISTING IMPROVEMENTS INCLUDING SPRINKLER SYSTEMS, LAWNS, FENCES, WALLS, SIGNS, STEPS, SIDEWALKS, DRIVEWAYS, LAWN LIGHTS, AND ALL OTHER ITEMS APPLICABLE TO THIS CONTRACT SHALL BE REQUIRED BY THE PROJECT ENGINEER.
7. THE CONTRACTOR SHALL BACKFILL AND FINE GRADE ALL CUT OR FILL SLOPES TO MATCH EXISTING CONDITIONS TO THE SATISFACTION OF THE PROJECT ENGINEER. WHERE EXISTING LAWNS ARE DAMAGED BY THE CONTRACTOR'S OPERATIONS THE CONTRACTOR WILL SOD THE AFFECTED AREA TO A CONDITION EQUAL TO OR BETTER THAN THAT WHICH EXISTED PRIOR TO CONSTRUCTION.
8. THE 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 TRANSITIONS TO BE AS SHOWN PER CONTRACT DRAWINGS.
9. 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. 625.550.
10. THE ACTUAL LOCATIONS OF SAW CUT LINES, LIMITS OF COLD MILLING, LIMITS OF DRIVEWAY TRANSITIONS, AND LANDSCAPE REPAIR SHALL BE DETERMINED IN THE FIELD BY THE RESIDENT PROJECT REPRESENTATIVE.
11. THE ACTUAL LIMITS OF EXISTING OPEN GRADE REMOVAL AND UDACS APPLICATION SHALL BE DETERMINED IN THE FIELD BY THE RESIDENT PROJECT REPRESENTATIVE.
12. ALL STANDARD DRAWINGS REFERENCED IN THIS SET ARE BASED ON THE CURRENT "UNIFORM STANDARD DRAWINGS REVISION SET II-1997 RELEASE".
13. UNLESS OTHERWISE SHOWN ON THE CONTRACT DRAWINGS, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE REMOVAL OR RELOCATION OF ALL WATER SERVICES AND METERS WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS.
14. THE CONTRACTOR SHALL MAINTAIN AN ONGOING REMOVAL PROCESS OF ALL SPILLAGE OF EXCAVATION MATERIAL ON ALL PAVED STREETS.
15. CURB AND GUTTER OF A GRADE OF LESS THAN 4/10 OF ONE PERCENT SHALL BE CONSTRUCTED BY FORMING. EACH JOINT SHALL BE CHECKED FOR GRADE PRIOR TO CONSTRUCTION AND WATER TESTED AS SOON AS POSSIBLE AFTER CONSTRUCTION.
16. THE CONTRACTOR SHALL VERIFY IN THE FIELD ALL DIMENSIONS, EXISTING CONDITIONS AND POINTS OF CONNECTION WITH ADJOINING PROPERTY (PUBLIC AND PRIVATE). ANY DISCREPANCIES SHALL BE CALLED TO THE ATTENTION OF THE PROJECT ENGINEER PRIOR TO PROCEEDING WITH THE WORK.
17. REMOVAL OR RELOCATION OF POWER POLES, TELEPHONE POLES, JOINTLY-OWNED POLES, AND APPURTENANCES WHICH INTERFERE WITH IMPROVEMENTS REQUIRED TO BE CONSTRUCTED UNDER THIS CONTRACT, SHALL BE THE RESPONSIBILITY OF THE RESPECTIVE UTILITY COMPANY. THE CONTRACTOR IS RESPONSIBLE FOR COORDINATION WITH THE UTILITY COMPANIES FAR ENOUGH IN ADVANCE SO AS TO NOT IMPACT THE SCHEDULE.
18. COX COMMUNICATIONS SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL CATV FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON THE CONTRACT DRAWINGS, UNLESS NOTED OTHERWISE.
19. NV ENERGY SHALL BE RESPONSIBLE FOR THE RELOCATION OF UNDERGROUND OR OVERHEAD POWER LINES THAT INTERFERE WITH THE REQUIRED IMPROVEMENTS AS SHOWN ON THE CONTRACT DRAWINGS.
20. EMBARQ SHALL BE RESPONSIBLE FOR THE VERTICAL OR HORIZONTAL ADJUSTMENT OF ALL TELEPHONE FACILITIES WHICH INTERFERE WITH IMPROVEMENTS SHOWN ON CONTRACT DRAWINGS, UNLESS NOTED OTHERWISE.

FIRE DEPARTMENT NOTES

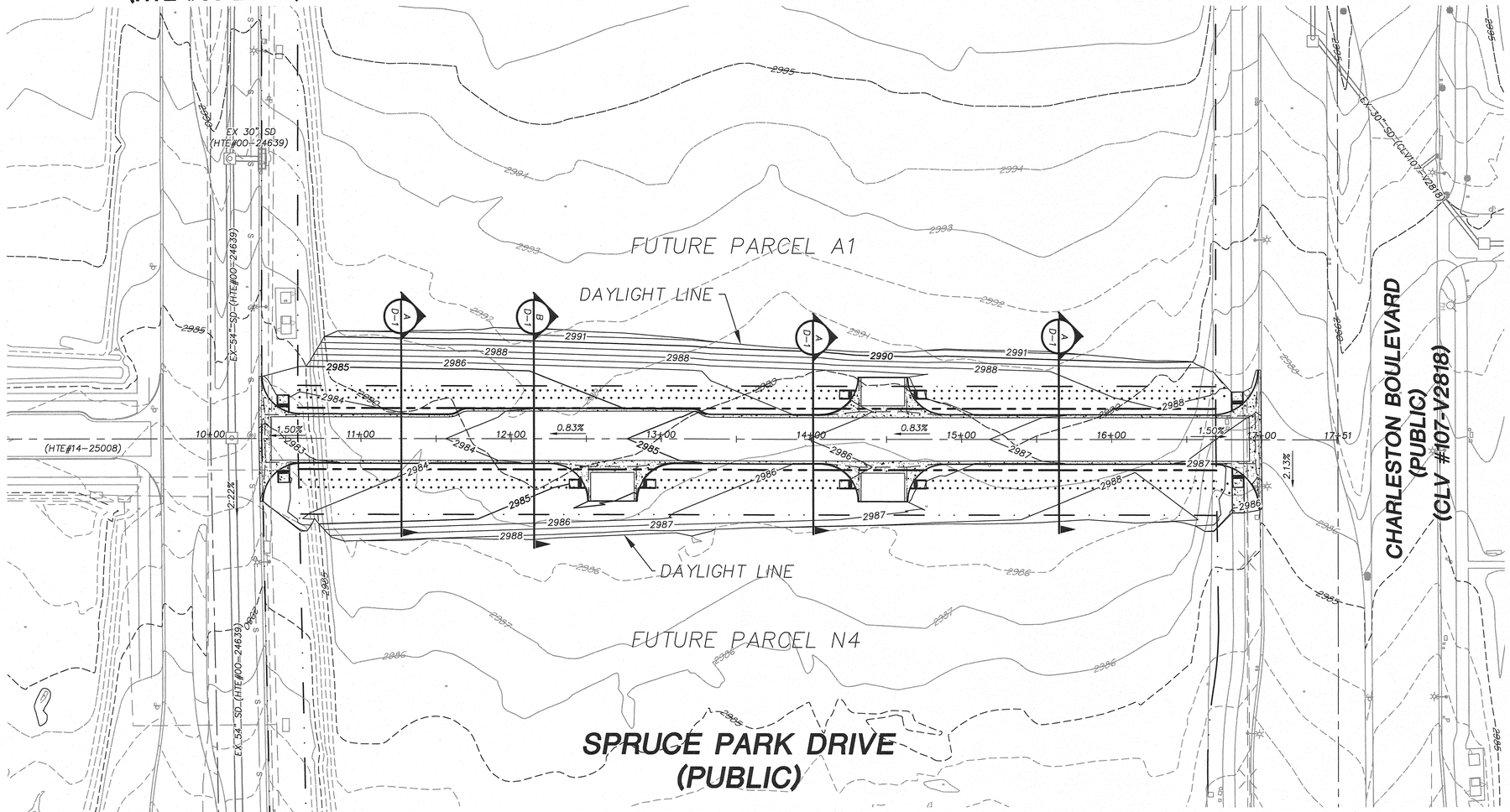
UNIFORM GUIDELINES – INSTALLATION AND SPECIFICATION OF FIRE HYDRANTS

1. ALL WORK SHALL BE DONE IN STRICT ACCORDANCE WITH THE CLARK COUNTY FIRE CODE AS AMENDED, AND THE 2007 EDITION OF NATIONAL FIRE PROTECTION ASSOCIATION PAMPHLET #24.
2. FIRE HYDRANTS AND WATER SUPPLIES FOR FIRE PROTECTION SHALL BE AND MADE SERVICEABLE PRIOR TO AND DURING THE TIME OF CONSTRUCTION IN ACCORDANCE WITH SECTION 1412 OF THE CLARK COUNTY FIRE CODE, AS AMENDED.
3. IF DURING CONSTRUCTION IT BECOMES NECESSARY TO CLOSE ANY CONTROL VALVE OR PLACE A HYDRANT OUT OF SERVICE, APPROVAL SHALL BE OBTAINED FROM THE FIRE DEPARTMENT PRIOR TO PLACING THE HYDRANT OUT OF SERVICE.
4. PAINTING OF CURBS AND/OR STRIPING OF ASPHALT AREAS AND PROTECTION OF HYDRANTS FROM PHYSICAL INJURY SHALL BE PER THE FIRE HYDRANT INSTALLATION SPECIFICATIONS OF THE FIRE PREVENTION DIVISION.
5. NO FIRE HYDRANT SHALL BE LOCATED WITHIN 25 FEET OF ANY STRUCTURE, OR 6 FEET OF A DRIVEWAY, POWER POLE, LIGHT STANDARD, OR ANY OTHER OBSTRUCTION. FOR WALL, FENCE AND PLANTER LOCATIONS, A PERIMETER AROUND THE HYDRANT MEASURING A MINIMUM OF 3 FEET FROM ITS EXTERIOR SHALL BE MAINTAINED CLEAR OF ALL OBSTRUCTION AT ALL TIMES.
6. FIRE APPARATUS ACCESS ROADS SHALL BE DESIGNED AND MAINTAINED TO SUPPORT THE IMPOSED LOADS OF FIRE APPARATUS, WITH A MINIMUM VEHICLE LOAD OF 18,000 POUNDS PER AXLE, AND SHALL BE SURFACED AND PAVED SO AS TO PROVIDE ALL-WEATHER DRIVING CAPABILITIES.

   EXCEPTION: TEMPORARY ACCESS ROADS SERVING ONLY BUILDINGS UNDER CONSTRUCTION SHALL NOT BE REQUIRED TO BE PAVED, BUT SHALL COMPLY WITH ALL OTHER REQUIREMENTS OF SECTION 503.2.3 OF THE CLARK COUNTY CODE.
7. PRIOR TO ACCEPTANCE OF ANY FIRE SERVICE MAIN, A SATISFACTORY HYDROSTATIC TEST WITH PIPING JOINTS UNCOVERED MUST BE CONDUCTED. APPROVED PLANS, AN INSTALLATION PERMIT AND A CONTRACTOR'S MATERIALS AND TEST CERTIFICATE MUST BE PROVIDED AT TIME OF INSPECTION. SCHEDULE INSPECTION AT WWW.CLARKCOUNTYNV.GOV/DEVLOPMENT SERVICES/FIRE PROTECTION.
8. FIRE HYDRANTS SHALL BE LOCATED 4' TO 7' FROM BACK OF CURB AND A MINIMUM OF 6 FEET AWAY FROM TURNS.
9. BLUE REFLECTIVE MARKERS MUST BE INSTALLED BEFORE FINAL HYDRANT ACCEPTANCE CAN BE ATTAINED (SECTION C107 OF THE CLARK COUNTY FIRE CODE, AS AMENDED)
10. HYDRANTS THAT ARE PROPOSED FOR INSTALLATION IN PUBLIC WATER SYSTEMS SHALL BE IN ACCORDANCE WITH APPROVED FIRE HYDRANTS AS ALLOWED BY THE WATER PURVEYOR. HYDRANTS PROPOSED FOR INSTALLATION ON PRIVATE WATER SYSTEMS SHALL BE IN ACCORDANCE WITH APPROVED FIRE HYDRANTS AS ALLOWED BY THE FIRE DEPARTMENT.

CLARK COUNTY WATER RECLAMATION DISTRICT NOTES

1. ALL CONSTRUCTION SHALL CONFORM TO THE DESIGN AND CONSTRUCTION STANDARDS FOR WASTEWATER COLLECTION SYSTEMS, LATEST EDITION AND THE UNIFORM STANDARDS FOR PUBLIC WORKS OFFSITE IMPROVEMENTS, CLARK COUNTY AREA, LATEST EDITION.
2. ANY CONFLICTS BETWEEN THESE DOCUMENTS AND THE STANDARDS REFERENCED IN NOTE 1 MUST BE BROUGHT TO THE ATTENTION OF THE ENGINEER OF RECORD PRIOR TO PERFORMING ANY WORK.
3. ALL REVISIONS OF THE APPROVED PLANS MUST BE SUBMITTED TO THE CLARK COUNTY WATER RECLAMATION DISTRICT (DISTRICT) FOR REVIEW AND BE APPROVED PRIOR TO PROCEEDING WITH THE WORK. ALL WORK CONSTRUCTED WITHOUT THE APPROVAL OF THE DISTRICT MUST BE REMOVED AT THE CONTRACTORS EXPENSE.
4. ALL SANITARY SEWERS SHALL BE PVC SDR-35 SOLID WALL UNLESS OTHERWISE NOTED.
5. ALL SANITARY SEWER MAINS 8-INCHES AND LARGER AND ALL STUBS 8-INCHES AND LARGER ENTIRELY WITHIN THE PUBLIC RIGHT-OF-WAY SHALL BE PUBLIC UNLESS OTHERWISE NOTED. ALL ON-SITE SEWER INFRASTRUCTURE SHALL BE PRIVATE UNLESS OTHERWISE NOTED.
6. ALL SANITARY SEWER MAINS SHALL BE THE SAME MATERIAL, SIZE AND SLOPE BETWEEN MANHOLES.
7. ALL SEWER MAINS SHALL BE IN THEIR OWN TRENCHES. THERE WILL BE NO SHARED TRENCHES ALLOWED.
8. THE MINIMUM SLOPES FOR ALL PIPES SHALL BE IN ACCORDANCE WITH THE DESIGN AND CONST



NOTES:

1. FOR ROADWAY TYPICAL SECTIONS, SEE SHEET D-1.
2. FOR INTERSECTION DETAILS, SEE SHEET G-2.
3. FOR CENTERLINE AND BACK OF CURB HORIZONTAL INFORMATION, SEE SHEET H-1.
4. FOR ROADWAY PLAN AND PROFILES, SEE SHEET P-1 TO P-2.

BASIS OF BEARING

SOUTH 01°20'49" EAST, BEING THE BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP THEREOF IN BOOK 146 OF PLATS, PAGE 81, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 9LV191N4 (RE-OBSERVED 2005-2007)

RIVET AND PLATE IN THE TOP OF CURB AT THE SE CORNER OF CHARLESTON AND TOWN CENTER DR IN PORK CHOP ISLAND.

ELEVATION = 906.956M (NAVD'88)
= 2975.57 FT (NAVD'88)

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

Call before you D g AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 or 1-800-227-2600

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

GRAPHIC SCALE
20 0 20 40 80
HORIZONTAL: 1"=40'

SOILS REPORT

BY: NOVA GEOTECHNICAL & INSPECTION SERVICES
PROJECT NO: IE-16-047
DATED: SEPTEMBER 6, 2006 WITH UPDATED DATA ON MARCH 31, 2016
EARTHWORK QUANTITIES (RAW):
CUT= 9,100 CU YDS
FILL= 64 CU YDS

FLOOD ZONE DESIGNATION

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE X (UNSHADED) AS DEPICTED ON FLOOD INSURANCE RATE MAP (FIRM) PANEL 32003C2150E, DATED 9/27/2002. A ZONE X (UNSHADED) IS DESCRIBED AS AN AREA DETERMINED TO BE OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN.

DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY HTE:# XX-XXXX ON FILE AT CLARK COUNTY FOR THE SUBJECT PROJECT.

CARL E. ANDERSON, P.E. #24364

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW ACCEPTANCE OF PLANS FOR FILING

BY _____

ACCEPTANCE OF THESE PLANS FOR FILING 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 AND/OR SPECIFICATIONS CLARK COUNTY SHALL BE HELD FREE FROM DAMAGES WHICH MAY RESULT FROM THE CONSTRUCTION OF THE IMPROVEMENTS FROM THE ENGINEERING DESIGN DEPICTED HEREIN.

NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

PROFESSIONAL ENGINEER-STATE OF NEVADA
CARL E. ANDERSON
EXP. 12-31-18
CIVIL
No. 24364
2 Feb. 2017

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: 417.736.3725
Fax: 1-702.267.2001

SUMMERLIN

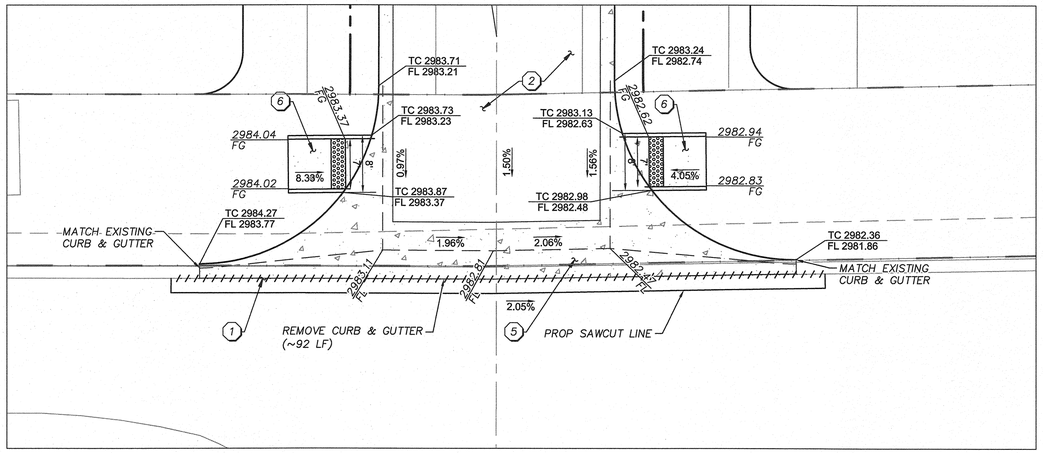
SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

MASTER DRAINAGE PLAN

DESIGNED BY: A. SNYDER
DRAWN BY: C. LANGFORD
CHECKED BY: P. BATES
HORIZ.: 1"=40'
VERT.: N/A

JOB NO. 100047977
DATE: FEBRUARY, 2017
HTE:
DRAWING NO. 5 / 18
G-1

\\suspb1101\projects\Allen\100047977 - SprucePark\47977-05-GRAD-G.dwg Layout: G-1 Feb 02, 2017 - 11:27am



SPRUCE PARK DRIVE AT GRIFFITH PEAK DRIVE
SCALE: 1"=10'

A G-2

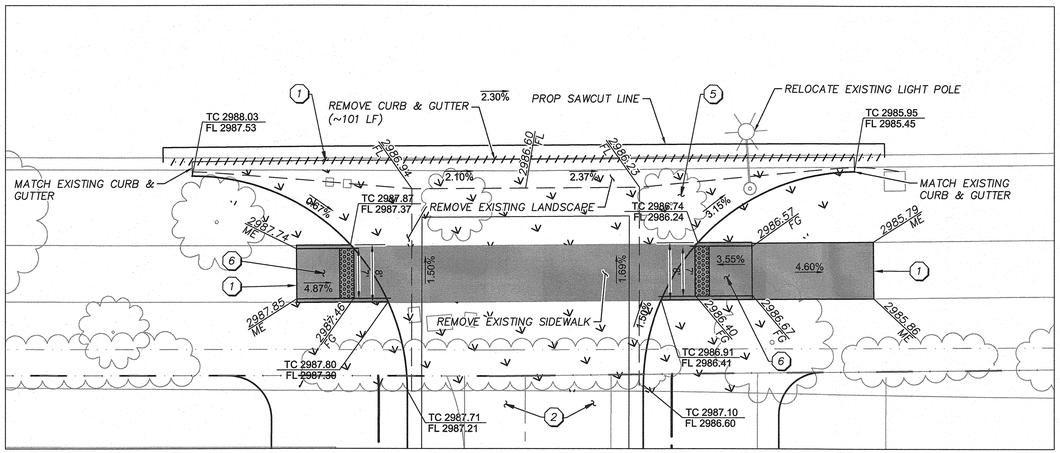
LEGEND

REMOVE EXISTING LANDSCAPING AND IRRIGATION

DEMOLISH AND REMOVE EXISTING SIDEWALK

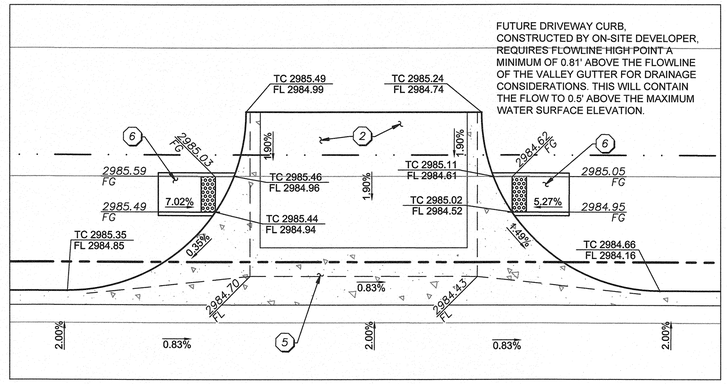
CONSTRUCTION NOTES

1. SAWCUT AND MATCH EXISTING
2. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
5. CONSTRUCT CROSS GUTTER PER USD #228
6. CONSTRUCT SIDEWALK RAMP PER DETAIL ON SHEET D-2



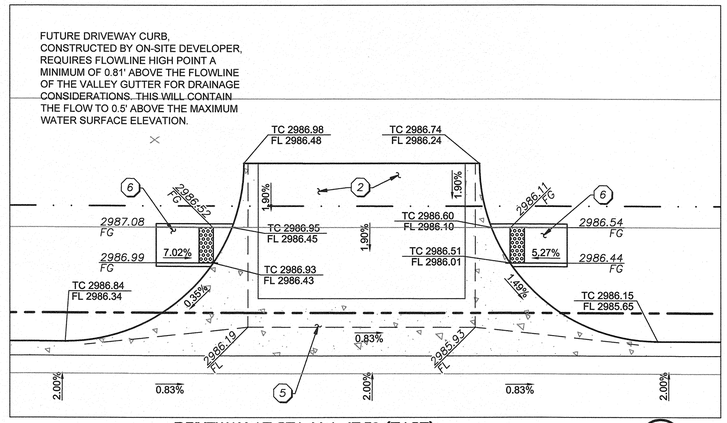
SPRUCE PARK DRIVE AT CHARLESTON BOULEVARD
SCALE: 1"=10'

B G-2



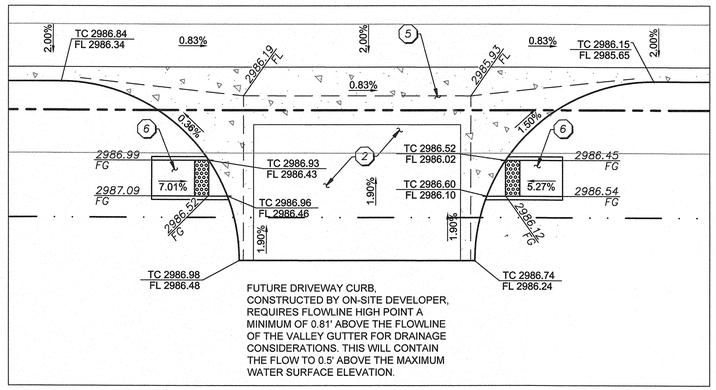
DRIVEWAY AT STA 12 + 67.42 (EAST)
SCALE: 1"=10'

C G-2



DRIVEWAY AT STA 14 + 47.52 (EAST)
SCALE: 1"=10'

D G-2



FUTURE DRIVEWAY CURB, CONSTRUCTED BY ON-SITE DEVELOPER, REQUIRES FLOWLINE HIGH POINT A MINIMUM OF 0.81' ABOVE THE FLOWLINE OF THE VALLEY GUTTER FOR DRAINAGE CONSIDERATIONS. THIS WILL CONTAIN THE FLOW TO 0.5' ABOVE THE MAXIMUM WATER SURFACE ELEVATION.

DRIVEWAY AT STA 14 + 47.52 (WEST)
SCALE: 1"=10'

E G-2

NOTES:

1. FOR ROADWAY PLAN AND PROFILE, SEE SHEET P-1 & P-2.
2. FOR TYPICAL SECTIONS, SEE SHEET D-1.
3. FOR CENTERLINE AND BACK OF CURB INFORMATION, SEE SHEET H-1.

GRAPHIC SCALE
10 0 5 10 20
HORIZONTAL: 1"=10'

BASIS OF BEARING

SOUTH 01°20'49"EAST, BEING THE BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP THEREOF IN BOOK 146 OF PLATS, PAGE 81, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 9LV191N4 (RE-OBSERVED 2005-2007)

RIVET AND PLATE IN THE TOP OF CURB AT THE SE CORNER OF CHARLESTON AND TOWN CENTER DR IN PORK CHOP ISLAND.

ELEVATION = 906.956M (NAVD'88)
= 2975.57 FT (NAVD'88)

FAST Call before you UnderGround 1-702-432-5300 NEVADA 811 SYSTEM OF TRANSPORTATION
Call before you D g AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600
AVOID HITTING OVERHEAD POWER LINES. IT'S COSTLY. CALL BEFORE YOU DIG OVERHEAD 1-702-227-2929

PROFESSIONAL ENGINEER-STATE OF NEVADA
CARL E ANDERSON
EXP. 12-31-18
CIVIL
No. 24394
2. Feb. 2017

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.7275
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

DRIVEWAY DETAILS

DESIGNED BY: A. SNYDER
DRAWN BY: C. LANGFORD
CHECKED BY: P. BATES
HORIZ.: 1"=10'
VERT.: NONE

JOB NO. 100047977
DATE: FEBRUARY, 2017
DRAWING NO. G-2
SHEET NO. 6
OF 18
HTE:

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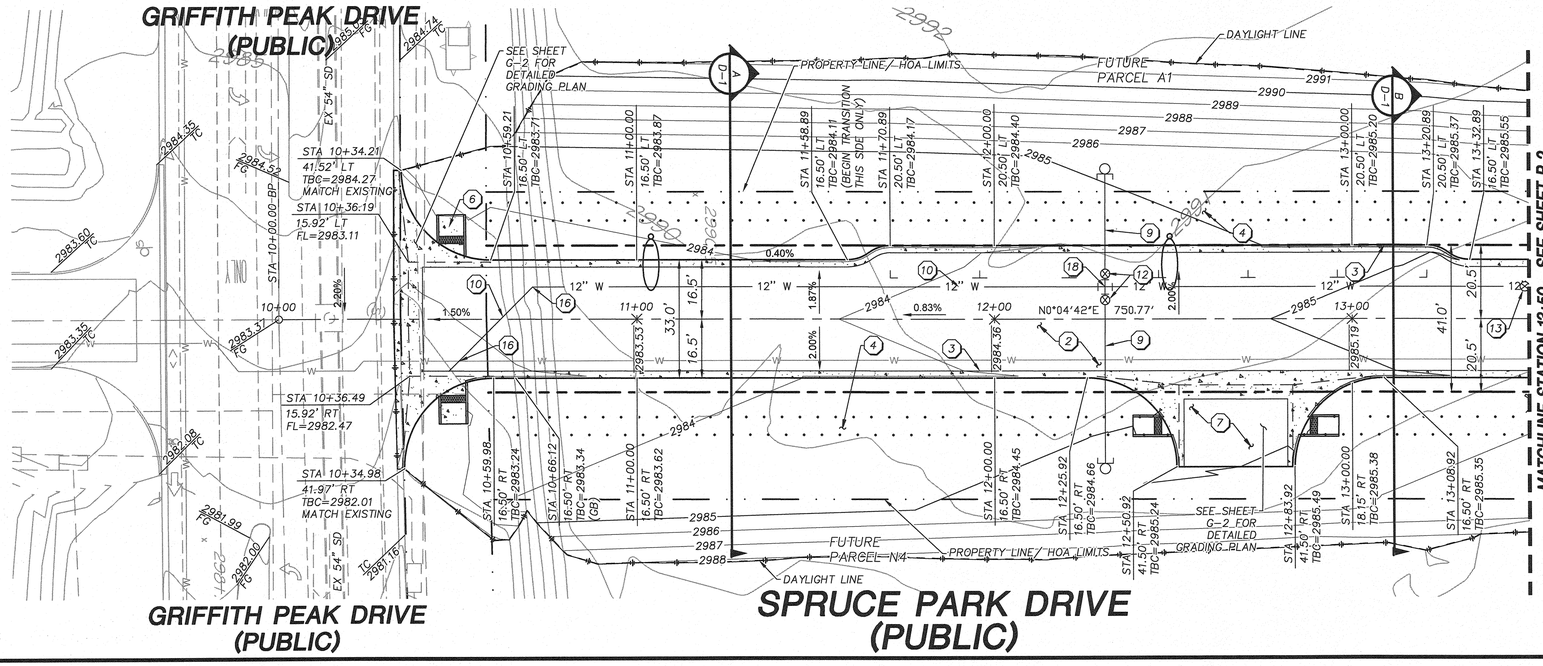

CONSTRUCTION NOTES

1. SAWCUT AND MATCH EXISTING
2. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
3. CONSTRUCT "L" TYPE CURB AND GUTTER PER USD #216
4. FUTURE SIDEWALK BY OTHERS
5. CONSTRUCT CROSS GUTTER PER USD #228
6. CONSTRUCT SIDEWALK RAMP PER DETAIL ON SHEET D-2
7. CONSTRUCT DRIVEWAY PER USD # 222.1, # 225, AND #226.S2
8. INSTALL 6" C-900 PVC WATER PIPE PER UDACS PLATE #17 AND PLATE #19
9. INSTALL 8" C-900 PVC WATER PIPE PER UDACS PLATE #17 AND PLATE #19
10. INSTALL 12" C-900 PVC WATER PIPE PER UDACS PLATE #17 AND PLATE #19
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14. INSTALL FIRE HYDRANT WITH APPURTANANCES (LATERAL, VALVE AND TEE) PER UDACS PLATE #40.
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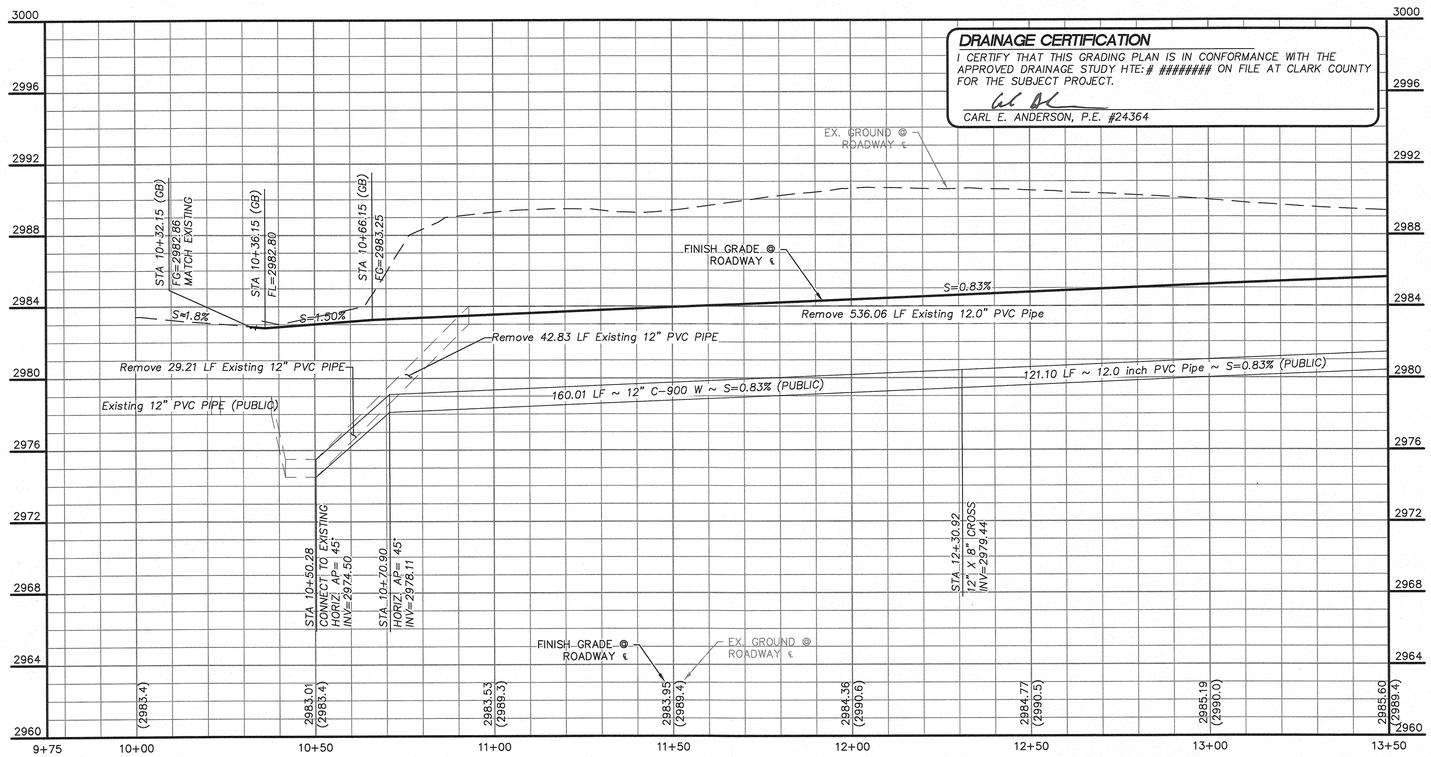
16. INSTALL 12" 45° ELBOW PER UDACS PLATE #31
17. INSTALL 12" 90° ELBOW PER UDACS PLATE #31
18. INSTALL 12" 4WAY CROSS
19. STUB AND CAP WATERLINE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER DATE
PROJECT NO. ##### DATE:
LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL



DRAINAGE CERTIFICATION

I CERTIFY THAT THIS GRADING PLAN IS IN CONFORMANCE WITH THE APPROVED DRAINAGE STUDY HTE:# ######## ON FILE AT CLARK COUNTY FOR THE SUBJECT PROJECT.

CARL E. ANDERSON, P.E. #24364

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW
ACCEPTANCE OF PLANS FOR FILING

BY _____

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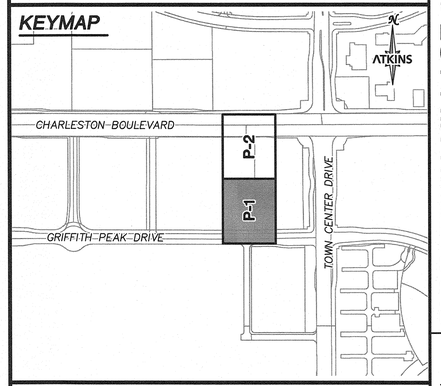
NOTE: POWER POLES AND/OR OTHER EXISTING FACILITIES NOT IN PROPER LOCATION BASED ON PROPOSED IMPROVEMENTS SHOWN HEREON WILL BE RELOCATED AT NO EXPENSE TO CLARK COUNTY.

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
Scale: 1 inch = 20 ft. HORIZ.
1 inch = 4 ft. VERT.

KEYMAP



NOTES:

1. FOR ROADWAY TYPICAL SECTIONS, SEE SHEET D-1.
2. FOR ROADWAY PLAN AND PROFILE, SEE SHEET P-1 & P-2.
3. FOR DRIVEWAY AND INTERSECTION INFORMATION, SEE SHEET G-2.

BASIS OF BEARING

SOUTH 01°20'49"EAST, BEING THE BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP THEREOF IN BOOK 146 OF PLATS, PAGE 81, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 9LV191N4 (RE-OBSERVED 2005-2007)

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

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

PROFESSIONAL ENGINEER - STATE OF NEVADA
CARL E. ANDERSON
EXP. 12-31-18
CIVIL
No. 24364
2 Feb. 2017 TDS

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone: +1.702.263.2727
Fax: +1.702.263.7200

SUMMERLIN

SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD
PLAN AND PROFILE
STA 10+00.00 TO STA 13+50.00

DESIGNED BY: A. SNYDER
DRAWN BY: A. SNYDER
CHECKED BY: B. ELLIS
HORIZ.: 1"=20'
VERT.: 1"=4'

JOB NO. 100047977
DATE: FEBRUARY, 2017
DRAWING NO. P-1
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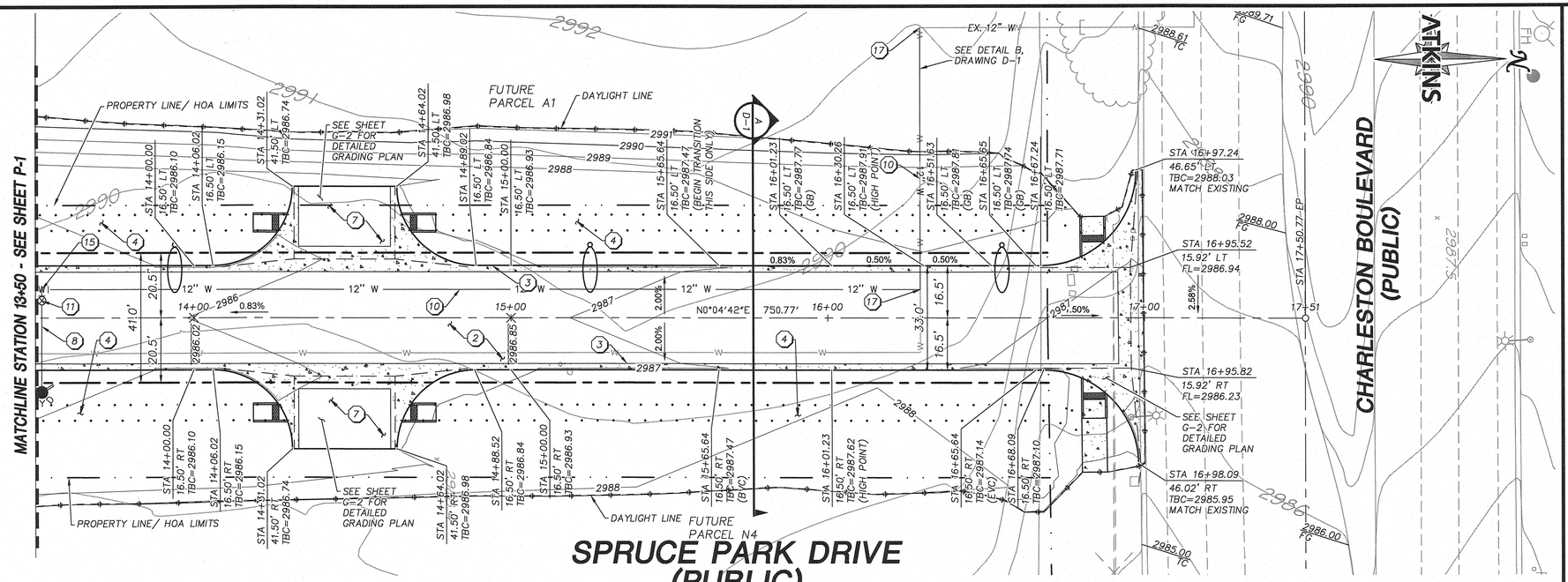
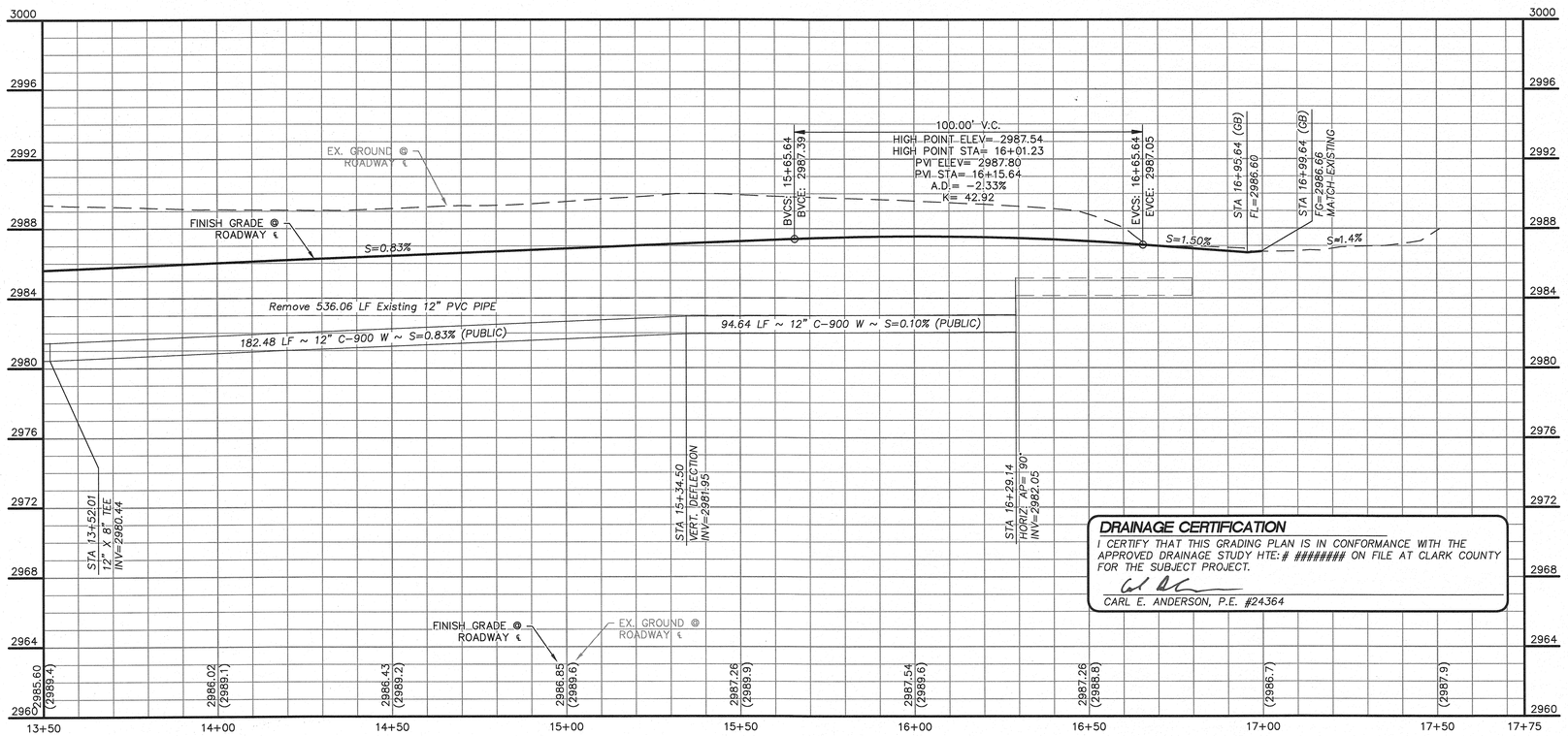
HTE:

\\suspxb1101\projects\Allen\100047977 - SprucePark\47977-09-PLAN-P1.dwg Layout: P-1 Feb 02, 2017 - 11:23am





CONSTRUCTION NOTES

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2. CONSTRUCT PLANTMIX BITUMINOUS SURFACE OVER TYPE II AGGREGATE BASE
3. CONSTRUCT "L" TYPE CURB AND GUTTER PER USD #216
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18. INSTALL 12" 4WAY CROSS
19. STUB AND CAP WATERLINE

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER — DATE
PROJECT NO. ##### DATE:
LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL

CLARK COUNTY DEPARTMENT OF PUBLIC WORKS DEVELOPMENT REVIEW
ACCEPTANCE OF PLANS FOR FILING

BY

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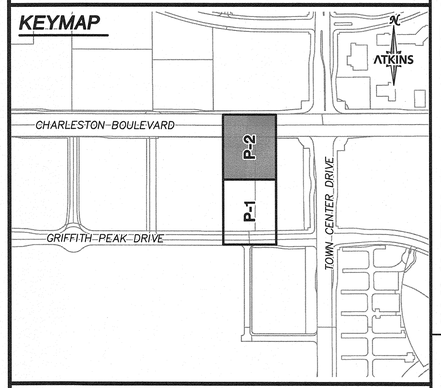
KEYMAP



DRAINAGE CERTIFICATION

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CARL E. ANDERSON, P.E. #24364

NOTES:

1. FOR ROADWAY TYPICAL SECTIONS, SEE SHEET D-1.
2. FOR ROADWAY PLAN AND PROFILE, SEE SHEET P-1 & P-2.
3. FOR DRIVEWAY AND INTERSECTION INFORMATION, SEE SHEET G-2.

NDOT PERMIT REQUIRED

THE APPROVED NDOT OCCUPANCY PERMIT SHALL BE OBTAINED THROUGH THE DISTRICT PRIOR TO ANY CONSTRUCTION WITHIN THE NDOT RIGHT-OF-WAY. PLANS SHOWING WORK IN NDOT RIGHT-OF-WAY MUST SHOW STATIONING. THE DEVELOPER ASSUMES ALL LIABILITY FOR WORK CONDUCTED UNDER THE DISTRICT-OBTAINED PERMIT THROUGH WARRANTY EXPIRATION.

BASIS OF BEARING

SOUTH 01°20'49"EAST, BEING THE BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP THEREOF IN BOOK 146 OF PLATS, PAGE 81, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

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= 2975.57 FT (NAVD'88)

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

Call before you D g AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

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

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

PROFESSIONAL ENGINEER - STATE OF NEVADA
CARL E. ANDERSON
EXP. 12-31-18
CIVIL
No. 24364
TDS
2 FEB. 2017

REV.	DESCRIPTION	BY	DATE	APPROVAL
	REVISIONS			

ATKINS
2270 Corporate Circle Suite 200
Henderson, Nevada 89074
Telephone +1.702.263.3275
Fax: +1.702.263.7200

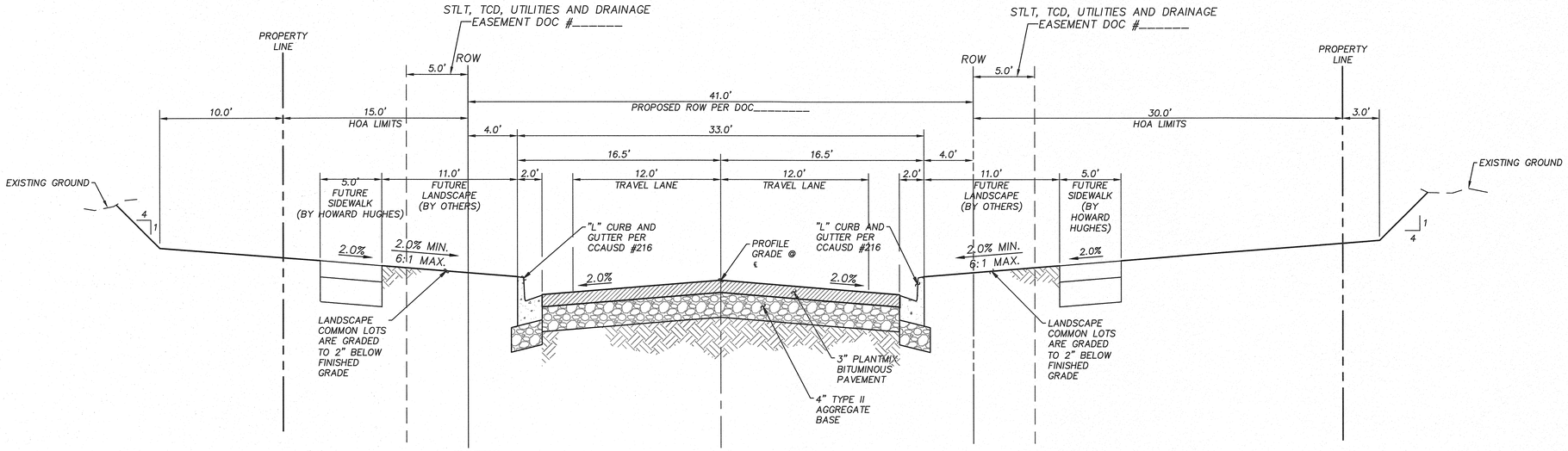
SUMMERLIN

SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD
PLAN AND PROFILE
STA 10+00.00 TO STA 13+50.00

DESIGNED BY: A. SNYDER
DRAWN BY: A. SNYDER
CHECKED BY: C. ANDERSON
P.E. No. 24364
HORIZ.: 1"=20'
VERT.: 1"=4'

JOB NO. 100047977
DATE: FEBRUARY, 2017
DRAWING NO. P-2
SHEET NO. 9
OF 18

\\susprd1101\projects\Allen\100047977 - SprucePark\47977-09-PLAN-P1.dwg Layout: P-2 Feb 02, 2017 - 11:25am



NOTES:

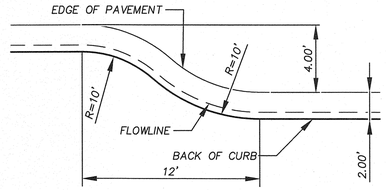
1. ALL AGGREGATE BASES SHALL BE COMPACTED PER GEOTECHNICAL REPORT HTE #16-37145. PRELIMINARY PAVEMENT SECTIONS SHALL BE VERIFIED WITH THE FINAL PAVEMENT SECTION RECOMMENDATION REPORT (MPSR) PRIOR TO CONSTRUCTION. IF FINAL PAVEMENT SECTIONS ARE DIFFERENT, A REVISION TO THE IMPROVEMENT PLANS WILL BE REQUIRED
2. LANDSCAPE WITHIN PUBLIC RIGHT-OF-WAY WILL REQUIRE A LANDSCAPE AND MAINTENANCE AGREEMENT

SPRUCE PARK DRIVE WITH CURB EXTENSION

N.T.S.

STA 10+59.21 TO STA 11+58.89
STA 13+32.89 TO STA 14+06.02
STA 14+89.02 TO STA 16+67.24

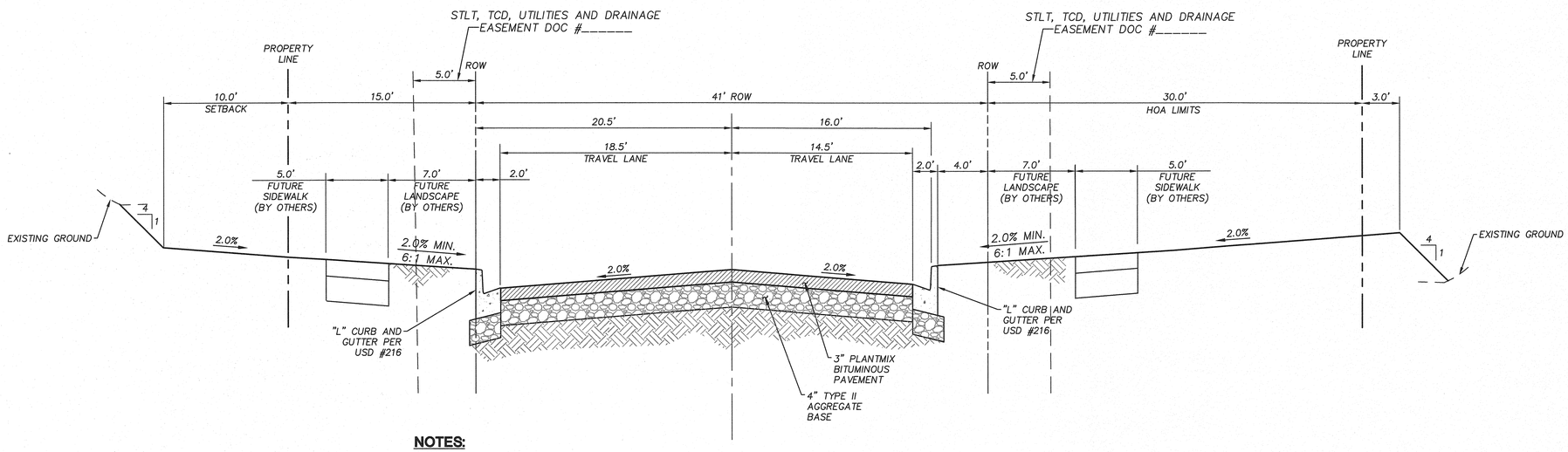
A / D-1



CURB EXTENSION

N.T.S.

C / D-1



NOTES:

1. ALL AGGREGATE BASES SHALL BE COMPACTED PER GEOTECHNICAL REPORT HTE #16-37145. PRELIMINARY PAVEMENT SECTIONS SHALL BE VERIFIED WITH THE FINAL PAVEMENT SECTION RECOMMENDATION REPORT (MPSR) PRIOR TO CONSTRUCTION. IF FINAL PAVEMENT SECTIONS ARE DIFFERENT, A REVISION TO THE IMPROVEMENT PLANS WILL BE REQUIRED
2. LANDSCAPE WITHIN PUBLIC RIGHT-OF-WAY WILL REQUIRE A LANDSCAPE AND MAINTENANCE AGREEMENT

SPRUCE PARK DRIVE WITH PARKING

N.T.S.

STA 11+70.89 TO STA 13+20.89

B / D-1

NOTES:

1. FOR ROADWAY PLAN AND PROFILE, SEE SHEET P-1 & P-2.
2. FOR ROADWAY TYPICAL SECTIONS, SEE SHEET D-1.
3. FOR CENTERLINE AND BACK OF CURB INFORMATION, SEE SHEET H-1.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICE MANAGER
PROJECT NO. DATE:
LVVWD APPROVED FIRE FLOW 1500 GPM AT 20 PSI RESIDUAL

BASIS OF BEARING

SOUTH 01°20'49"EAST, BEING THE BEARING OF THE EAST LINE OF THE SOUTHEAST QUARTER (SE1/4) OF SECTION 1, TOWNSHIP 21 SOUTH, RANGE 59 EAST, M.D.M., CLARK COUNTY, NEVADA, AS SHOWN ON THE MAP THEREOF IN BOOK 146 OF PLATS, PAGE 81, OFFICIAL RECORDS, CLARK COUNTY, NEVADA.

BENCHMARK

CITY OF LAS VEGAS BENCHMARK 9LV191N4 (RE-OBSERVED 2005-2007)

RIVET AND PLATE IN THE TOP OF CURB AT THE SE CORNER OF CHARLESTON AND TOWN CENTER DR IN PORK CHOP ISLAND.

ELEVATION = 906.956M (NAVD'88)
= 2975.57 FT (NAVD'88)

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

Call before you D g AVOID CUTTING UNDERGROUND UTILITY LINES. IT'S COSTLY. Call 811 OR 1-800-227-2600

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

PROFESSIONAL ENGINEER - STATE OF NEVADA - CARL E ANDERSON - EXP. 12-31-18 - CIVIL - No. 24394 - TDS - 7 Feb. 2017

REVISIONS

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SUMMERLIN

SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

TYPICAL SECTIONS

DESIGNED BY: A. SNYDER
DRAWN BY: HUNTER LAWFORD
CHECKED BY: P. BATES
HORZ.: NONE
VERT.: NONE

JOB NO. 100047977
DATE: FEBRUARY, 2017
DRAWING NO. D-1
SHEET NO. 10
OF 18
HTE:

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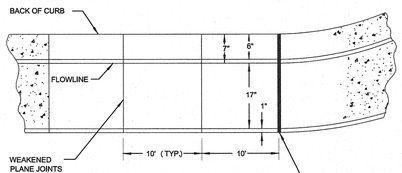
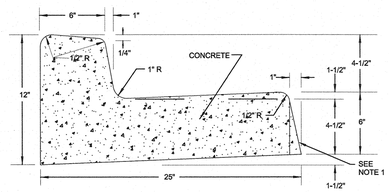


PLAN

NOTES:

1. 1" BATTER ON GUTTER FACE OPTIONAL.
2. WHERE LONGITUDINAL SLOPE IS LESS THAN 0.4%, THE FLOW LINE SHALL BE WATER TESTED.



TYPICAL SECTION

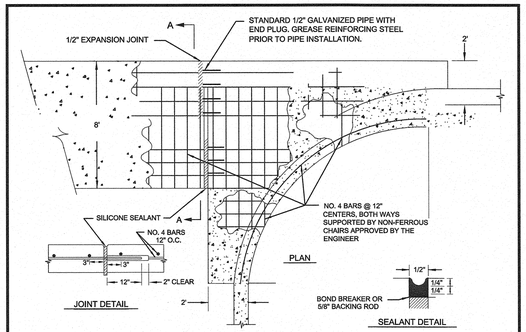
AGENCY APPROVED	B	C	H	L	M	N

SPECIFICATION REFERENCE	
501	CONCRETE
502	CONCRETE STRUCTURES
707	JOINT MATERIAL

UNIFORM STANDARD DRAWINGS
CLARK COUNTY AREA

"L" TYPE
CURB AND GUTTER

DATE 12-14-00 | DWG. NO. 216

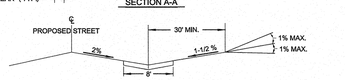


JOINT DETAIL

PLAN

SEALANT DETAIL

SECTION A-A



TYPICAL PROFILE AT LOCAL RESIDENTIAL STREET INTERSECTIONS

NOTES:

1. FINISHED ASPHALT CONCRETE SURFACE TO BE FLUSH WITH CROSS GUTTER LIP.
2. CONSTRUCTION OF CROSS GUTTER IS NOT ALLOWED ACROSS MAJOR COLLECTOR OR ARTERIAL STREETS.
3. ADJACENT SPANDREL SHALL BE 9" THICK P.C.C.

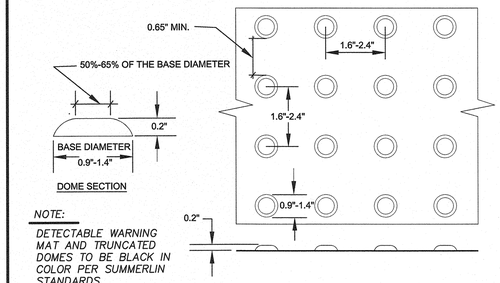
AGENCY APPROVED	B	C	H	L	M	N

SPECIFICATION REFERENCE	
302	AGGREGATE BASE
501	CONCRETE
502	CONCRETE STRUCTURES
505	REINFORCING STEEL
707	EXPANSION JOINT MATERIAL
TT-S-00153A CLASS A SEALANT	

UNIFORM STANDARD DRAWINGS
CLARK COUNTY AREA

CROSS GUTTER

DATE 12-14-00 | DWG. NO. 228



DOME SECTION

NOTE:
DETECTABLE WARNING MAT AND TRUNCATED DOMES TO BE BLACK IN COLOR PER SUMMERLIN STANDARDS

DETECTABLE WARNING DETAILS (TRUNCATED DOMES)

GRADE (%) "B" TO "A"	"A" (FT) MIN.	"B" (FT) MIN.
-6 TO -5.01	4.5	21.5
-5 TO -4.01	4.5	15.0
-4 TO -3.01	4.5	12.0
-3 TO -2.01	4.5	9.5
-2 TO 2	8.0	8.0
2.01 TO 3	9.5	4.5
3.01 TO 4	12.0	4.5
4.01 TO 5	15.0	4.5
5.01 TO 6	21.5	4.5

TABLE 1. TRANSITION LENGTHS FOR 1:12 SIDE SLOPES

GRADE (%) "B" TO "A"	"A" (FT) MIN.	"B" (FT) MIN.
-6 TO -5.01	4.0	12.5
-5 TO -4.01	4.0	10.0
-4 TO -3.01	4.0	8.5
-3 TO -2.01	4.0	7.5
-2 TO 2	6.5	6.5
2.01 TO 3	7.5	4.0
3.01 TO 4	8.5	4.0
4.01 TO 5	10.0	4.0
5.01 TO 6	12.5	4.0

TABLE 2. TRANSITION LENGTHS FOR 1:10 SIDE SLOPES

NOTE:
CHARTS APPLY TO CURB WITH 6" CURB FACE. IF CURB HAS GREATER THAN A 6" CURB FACE, A SPECIAL DESIGN IS REQUIRED.

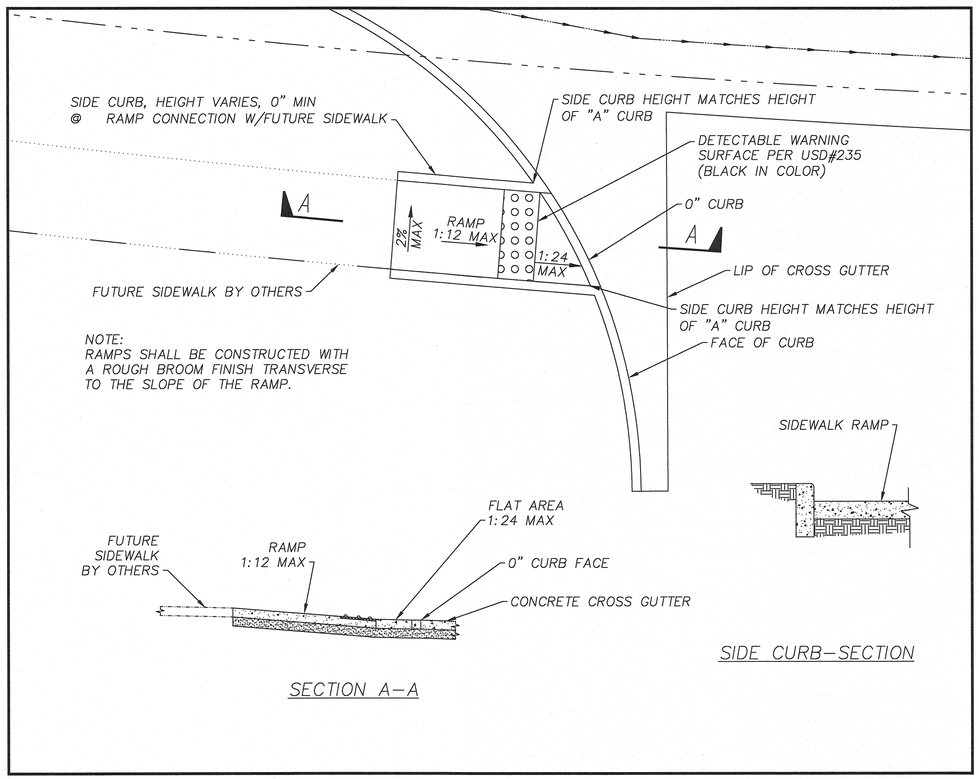
AGENCY APPROVED	B	C	H	L	M	N

SPECIFICATION REFERENCE	
302	AGGREGATE BASE
501	CONCRETE
502	CONCRETE STRUCTURES

UNIFORM STANDARD DRAWINGS
CLARK COUNTY AREA

SIDEWALK RAMP DETAILS

DATE 6-8-06 | DWG. NO. 235 | SHEET 4 OF 4



SECTION A–A

SIDE CURB–SECTION

REVISIONS

REV.	DESCRIPTION	BY	DATE	APPROVAL

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Henderson, Nevada 89074
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Fax: +1.702.453.7200

SUMMERLIN

SUMMERLIN VILLAGE 13 WEST
SPURCE PARK ROADWAY IMPROVEMENTS
GRIFFITH PEAK DRIVE TO CHARLESTON BOULEVARD

ROADWAY DETAILS

PROFESSIONAL ENGINEER-STATE OF NEVADA
CARL E. ANDERSON
EXP. 12-31-18
CIVIL
No. 24364
2 Feb 2017

DESIGNED BY: A. SNYDER
DRAWN BY:
CHECKED BY: C. LANGFORD
HORIZ.: NONE
VERT.: NONE

JOB NO. 100047977
DATE: FEBRUARY, 2017
DRAWING NO. 11 / 18
D-2

\\suspb1101\projects\Allen\100047977 – SprucePark\47977–DETL–RWAY.dwg Layout: D–2 Feb 02, 2017 – 10:09am

Appendix D

Electronic CD

Vance Skidmore, PE

Atkins
2270 Corporate Circle
Suite 200
Henderson, NV 89074-7755

vance.skidmore@atkinsglobal.com
702-551-0309

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