Drainage Reports

Preliminary Drainage Report for

WOLF SPRINGS RANCH

Scottsdale, AZ

June 26, 2018

Prepared For:

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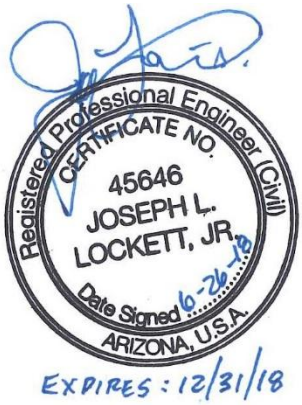

1. Introduction

The Empire Group, LLC has retained Slater Hanifan Group (SHG) to prepare preliminary construction documents for a proposed 40 lot residential development known as Wolf Springs Ranch, herein referred to as the Site. The Site is located west of 94th Street and north of Cactus Road in Scottsdale, Arizona. Figure 1A shows a Site Vicinity Map.

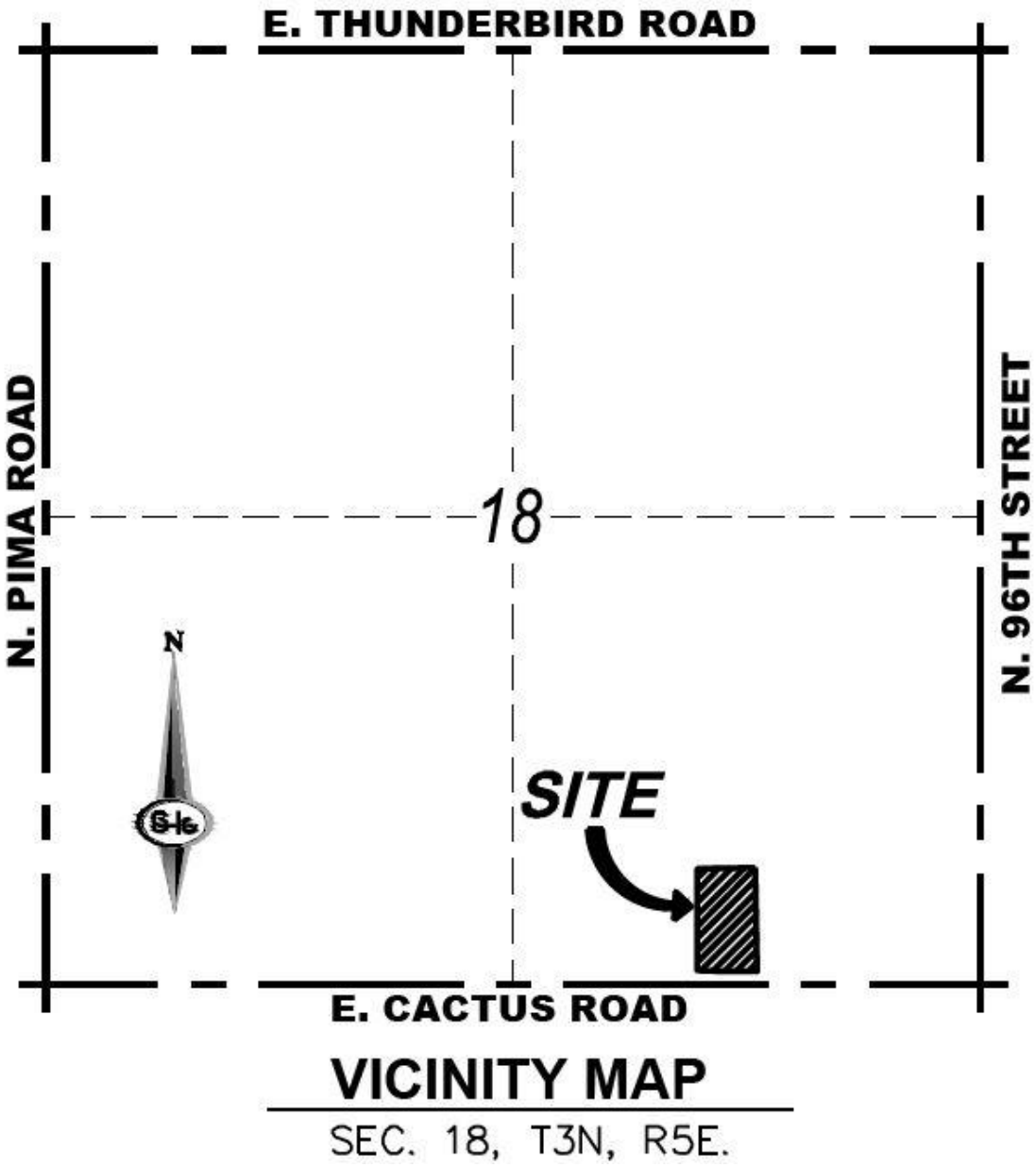

Figure 1A – Vicinity Map

The purpose of this report is to document the preliminary drainage requirements and supporting design calculations for the proposed Wolf Springs Ranch development.

2. Location

The Site is currently developed land located at the northwest corner of Cactus Road and 94th Street in Scottsdale, Arizona. The Site drains from north to south. The Site lies immediately south of the existing Sweetwater Ranch development. Figure 1B shows a portion of the USGS Quad map on which the Site falls. The Site is within the southeast quarter of Section 18 in Township 3 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona.

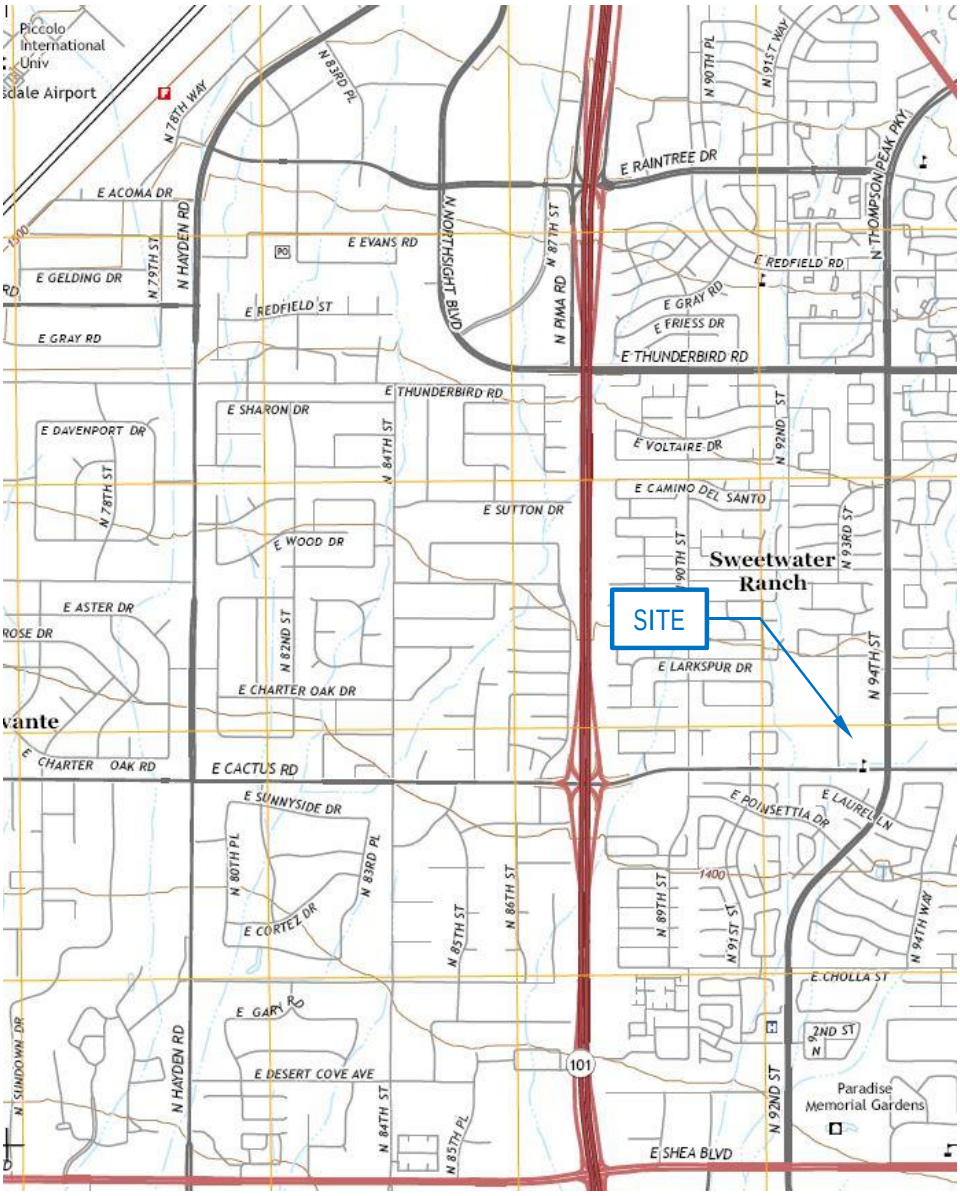

Figure 1B – USGS Quad Map

3. Site Description & Proposed Development

The Site encompasses approximately 20 acres of developed land on ground that slopes generally to the south and west. The existing Site is used as residential, an equestrian facility, and school. The existing low site outfall is located at the southwest corner of the project at the corner of 93rd Street and Cactus.

Figure 2 – Existing Site

As shown in Figure 2, drainage across the existing Site is characterized by grades that begin at the north end of the Site and drain to the south and southwest.

3.1. Existing Studies

At the time of drafting this Drainage Report, no existing drainage studies have been located that support the design of the developments surrounding the Site.

However, the basis of design for the existing Cactus Road stormdrain is needed to determine the feasibly of the onsite drainage outfall of the first-flush basin.

3.2. Purpose of Report

The purpose of this report is to document the preliminary drainage requirements for the proposed Wolf Springs Ranch development. This preliminary drainage report follows the drainage standards as established by the City of Scottsdale.

4. FEMA Floodplain Classification

The proposed Wolf Springs Ranch Site is located within the Federal Emergency Management Agency's (FEMA) Special Flood Hazard Area (SFHA) "Zone X (Shaded)" as shown on the FEMA Flood Insurance Rate Map (FIRM) Panel 04013C1760L (Figure 3, below). The effective date for this FIRM Panel was October 16, 2013.

The definition of "Zone X (Shaded)" is:

> "Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or within drainage areas less than 1 square mile; and areas protected by levees from the 1% annual chance flood."

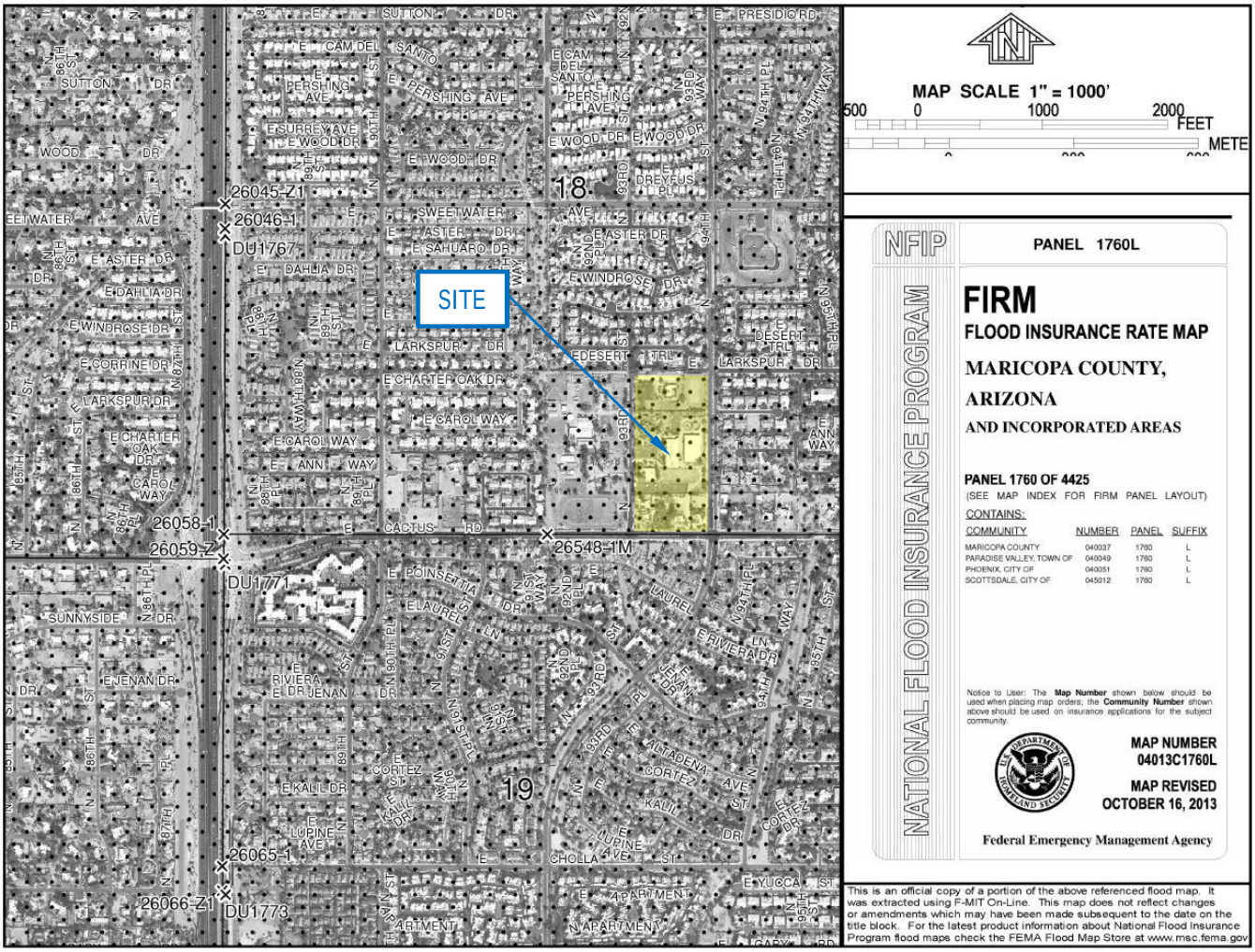

Figure 3 – FEMA FIRMette

5. Drainage Design

5.1. Proposed Development

The Empire Group, LLC proposes a 40-lot residential development on a net 16.8 -acre site. The project work includes lot grading, roadway infrastructure and basin grading for a development with proposed R1-18 PRD zoning. A portion of the onsite stormwater is collected in catch basins in the local streets and directed to a first-flush retention basin provided at the southwest corner of the Site.

Stormwater retention design for the Site has been granted the option by the City of Scottsdale to retain the greater of either the first-flush volume or the pre-vs-post C Value based 100-year volume, while also maintaining project outfall discharges for the 10 and 100 year events to be less than the pre-development condition discharges for the same frequencies.

5.2. Design Standards

Onsite drainage for the proposed Site will be designed to conform to the *City of Scottsdale Design Standards and Policies Manual* and the *Flood Control District of Maricopa County's Drainage Design Manual for Maricopa County*, *Arizona*, *Volume 1*, *Hydrology* and *Volume II*, *Hydraulics*.

6. Offsite Drainage

The Site is bounded to the north by several developments, some of which have existing retention storage (for reference, see Exhibit 3A - Offsite Drainage Map). However, the two developments immediately north of the Site, Sagewood and Sweetwater Ranch Estates do not appear to have retention provided onsite. Therefore, it is estimated that the 100-year flow from these two developments outfalls into 93rd Street at the northwest corner of the Site. 93rd Street, west of the Site is partially improved and does not have curb and gutter with the exception of a short reach at the far south end near Cactus Road.

Minor offsite flows also impact the Site from the north-east corner at 94th Street and Larkspur. The existing section of Larkspur between 94th Street and 93rd Way is believed to receive a minor amount of offsite flow because of the existing catch basin and storm drain system in 94th Street. The catch basin on the north curb return of Larkspur and 94th Street is believed to intercept a majority of the flow that would otherwise turn the corner onto Larkspur and drain west. Currently, flows that may bypass the 94th Street catch basin and runoff generated on Larkspur drain west to a valley gutter at the intersection of Larkspur and 93rd Way. This flow then crosses the Larkspur/93rd Way intersection via the valley gutter and enters the above mentioned concrete alley/channel. The channel drains to the west toward 93rd Street.

Larkspur (north): The proposed realignment of Larkspur along the northern boundary of Wolf Springs will be designed to have capacity to convey the bypass from the 94th Street catch basin as well as the runoff generated on Larkspur itself. With the Larkspur realignment, the existing valley gutter is to be removed and replaced such that flows are directed down the new roadway north gutter line and not toward the concrete channel. The conveyance capacity of the new Larkspur roadway section is to provide the same as that of the existing concrete channel. Therefore, the proposed plan is to remove the concrete channel from the back of lots 42-44 while maintaining that portion of the channel that abuts Lot 41 (on account of the non-authorization from that property owner). At the downstream end of Lot 41's portion of the channel, the channel will be terminated and what residual flows that collect there are to be routed out (south) to the new roadway ROW though a curb-cut/scupper. Further, where the channel is to be removed, this area will be graded/landscaped to drain toward the new roadway ROW.

93rd Street (northwest corner): Flows that reach 93rd Street from Sweetwater Ranch Estates and Sagewood, both north of the Site, are partially conveyed within the street corridor between private properties on the east and west sides of the street. The properties to the west have a view fence that aligns roughly 7 feet west of the west ROW line. The properties on the east (subject Site) have similar walls and some have no wall, but in general are higher than the existing street grade. The existing 10 and 100-year flows do not appear to be contained in the 50-foot street ROW but are contained within the overall corridor. For reference, see Exhibit 3C, Sheets 1 and 2 and Appendix D for normal depth calculations showing the existing and proposed 10 and 100-year flow depths in 93rd Street (Sections A-A through H-H). It is important to note that any improvements made to the east side of 93rd Street in support of the Wolf Springs development will not diminish the existing capacity of the street corridor to convey flows. Further, the finished floor elevations on the west side of the Site will be required to be elevated sufficiently to be at least 1- foot above the estimated 100-yr water surface in the 93rd Street corridor.

Through technical discussions regarding 93rd Street offsite flows, the City of Scottsdale is not requiring this project to mitigate existing 100-year flow depths in 93rd Street that exceed 8-inches. A copy of the letter of justification and communication from the City is included in this report and should be included in the design drainage report for this project as well.

94th Street (east): The Site is bounded to the east by 94th Street which appears to have stormdrain infrastructure in place that intercepts flows in the roadway. Preliminarily, it is assumed that the stormdrain has capacity for approximately the 10-yr storm. The finished floor elevations on the east side of the Site will be required to be above the estimated 100-yr flow depth in 94th Street.

7. Onsite Hydrology

7.1. Methodology

The Rational Method was used to generate peak discharges for the on-site areas and will be used for inlet design in final design. Sub-basins were delineated based on the preliminary Site layout. The Flood Control District of Maricopa County (FCDMC) DDMSW program was used to estimate peak flows for this report.

7.2. Parameters

Tc: Times of concentration were set to a minimum of 10 minutes.

Land Use: The proposed Site consists of R1-18 residential land use and local roadway with retention areas at the south and west edges of the project along 93rd Street and Cactus Road. The Rational method C values used for the project are:

Table 1 – Rational Method C Values

Land Use	C_{10}	C_{100}
Existing Condition		
R1-35 PRD	0.40	0.62
Proposed Condition		
R1-18 PRD	0.43	0.64
Paved/Hardscape	0.95	0.95
Landscape/Basins	0.20	0.30

Rainfall: The 10-year and 100-year return frequency rainfall intensities are based on the NOAA Atlas 14 rainfall data in the localized area.

Based on this data, peak discharges were determined for each of the drainage areas. The rainfall used as the basis for the Hydrologic data are provided in Appendix A. Exhibit 3B – Existing Condition Drainage Map indicates the existing condition drainage patterns and existing peak discharges for the Site. Exhibit 4- Proposed Condition Drainage Map shows the overall proposed drainage concept for the site, including the contributing drainage areas, flow patterns, peak discharges, and required/provided storage volumes for the retention basin.

8. Hydraulics

8.1. Methodology

A spreadsheet was used to estimate the street capacity of the proposed local streets. The spreadsheet takes into account the proposed typical street width from face of curb to face of curb, the depth of flow to top of curb (for 4 or 6-inch curbs), cross-slope, and assumed Manning's n value for pavement. The output tabulates the street capacity based on varying longitudinal slope of the roadway. The capacity assumes a water surface at the specified top of curb height (4 or 6-inches). The calculation is attached in Appendix B.

For this preliminary design, an AutoCAD Storm and Sanitary Analysis (SSA) model was assembled to roughly depict the routing of 10 and 100 year flows through the Site. The model routes flows through inlets, conveying them through various pipe systems (18-inch minimum) and small swales to the two retention areas (Basins 1 and 2-3) on the Site. The stormwater storage basins store the first-flush volume in the first foot of the basin. An orifice was placed at the outlet of each basin, above the first-flush volume elevation, that bleeds off the 10 and 100-year volumes that collect in the basins. The basins are sized in an attempt to attenuate the incoming 10 and 100-year volumes to allow for lower discharges to be drained out to the Cactus Road storm drain. Output for the 10 and 100-year storm models is included in Appendix B. The output includes a schematic of the system and 10 and 100-year tabular output for each node of the model.

The existing condition hydrology and preliminary SSA analysis for the proposed condition 10 and 100-year frequencies were compared. The following table summarizes the discharges for the existing and proposed condition:

Table 2 - Pre-vs-Post 10 and 100-year Discharges at Site Outfall

Contributing Area(s)	Q_{10} (cfs)	Q_{100} (cfs)
Existing Condition at SW Corner of Site	25	50
Proposed Condition Bleed-off at SW Corner of Site	1	21

The above results indicate that the first-flush retention basin and its bleed-off structure at the outlet of the retention basin sufficiently reduces the combined proposed condition 10 and 100-year peak discharges such that they are less than the existing condition peak discharges for the same frequencies.

Based upon preliminary review of available storm drain infrastructure information for Cactus Road, the Site may be able to bleed off to the existing Cactus Road catch basin at the southwest corner of the Site. The preliminary stormdrain design contained herein supports gravity bleed-off to the existing catch-basin on Cactus Road and 93rd Street.

The final hydraulic calculations to assess sizing of inlets, stormdrains, basin emergency spillway weir, etc. will be provided with the final drainage report.

As described in Section 6, normal depth hydraulic calculations for the existing and proposed condition 10 and 100-year offsite flows in 93rd Street were prepared for this study. The output is included in Appendix D and is shown graphically on Exhibit 3C. The calculations demonstrate that the existing conditions flow depths at each cross section exceed 8-inches in depth in most cases. The proposed condition calculations, with an improved east side of 93rd Street, show that the flow depth will be reduced and in some cases remains the same, but not reduced to the typical 8-inch depth that the City would normally require. Reducing the offsite flow depth to 8-inches would require a substantial stormdrain system be put in place in 93rd Street; intercepting and conveying approximately 100 of the existing 170 cfs offsite 100-year flow.

Through technical discussions regarding this, the City of Scottsdale is not requiring this project to mitigate existing 100-year flow depths in 93rd Street that exceed 8-inches. A copy of a letter of justification and email communication from the City is also included in Appendix D and should be included in the design drainage report for this project as well.

9. Storm Water Storage

This project is a redevelopment project located within the City of Scottsdale. The City has granted the option to retain the larger either the first-flush volume or the pre-vs-post C Value based 100-year volume.

Comparison of Volumes: The first-flush and differential C volumes were calculated for each area of the Site. The first-flush volume was calculated by the following equation, where A is the area of the subbasin and P is the first one-half inch of rainfall:

$$V_{FF} = A(\frac{P}{12})$$

The differential 100-year volume (V_{PP}) was also calculated for the where C is the difference between the weighted C value for the proposed development condition and the existing condition C value. A 100-year C for the existing condition Site was estimated as rural residential (C_{100}= 0.53) and the overall proposed development C value, weighted by land use, was estimated as C_{100}= 0.63. Therefore, the differential C is 0.63 – 0.53 = 0.10. The V_{PP} was estimated by the following equation where P is the rainfall depth in inches, A is the area, and C is the differential C, as described above:

$$V_{PP} = CA(\frac{P}{12})$$

See Appendix C for the calculations. A summary of the compared first-flush and 100-year volume is summarized in Table 3, below:

Table 3 - On-Site First Flush vs Pre-vs-Post C 100-Yr, 2-Hr Retention Comparison

Contributing Area(s)	Area (ac)	FF Volume (ac-ft)	Pre-vs-Post C Volume (ac-ft)
DA-1	2.57	0.11	0.07
DA-2	4.65	0.19	0.11
DA-3	2.84	0.12	0.05
DA-4	2.66	0.11	0.04
DA-5	3.37	0.14	0.00
DA-LARK	0.77	0.03	0.04
Total	16.85	0.70	0.27

As noted in the above table, the greater of the first-flush and pre-vs-post volume is the first-flush. Therefore, the first-flush is to be retained on-site.

As noted in the hydraulics section, based upon review of the as-built Cactus Road storm drain improvements plans, it appears that the retention basin can bleed-off to the existing catch basin at the southwest corner of the Site. The catch basin is located at the northeast curb return of Cactus Road and 93rd Street.

10. Minimum Finished Floors

All finished floors are to be set at least 14 inches above the Site outfall and 12 inches above the 100-year water surface of adjacent retention basins and 100-year conveyances. The ultimate outfall for the Site is to be considered for design based upon the emergency spillway crest elevation of the retention basins.

11. Maintenance

Ongoing maintenance of the drainage systems are required to preserve the design integrity and function. Failure to provide adequate maintenance can prevent the drainage systems from performing in accordance with their design intent. It is the responsibility of the Wolf Springs Ranch Community Association to provide maintenance and to ensure the drainage structures on the Site are functioning as intended. A regular maintenance program is required for the drainage system to function and maintain the level of protection provided with the intent of the design presented herein.

12. Conclusions

The following conclusions have been reached as a result of this preliminary drainage investigation, in support of the proposed Wolf Springs Ranch development:

- This preliminary drainage report was prepared in accordance with the recommendations and design parameters from the *City of Scottsdale DS&PM* and the *Flood Control District of Maricopa County's Drainage Design Manual for Maricopa County, Arizona, Volume 1, Hydrology* and *Volume II, Hydraulics*.

- The first-flush volume is greater than the pre-vs-post C volume for the Site. Therefore, the required first-flush retention volume for all of the Wolf Springs Ranch development is to be held within Retention Basin 1.

- The 10 and 100-year onsite storm runoff will be designed to be conveyed through inlets, swales, and storm drains to Retention Basin 1.

- A considerable offsite flow exists in 93rd Street today. The east half of 93rd Street is proposed to be improved with pavement, curb and gutter, sidewalk, and landscaping. It has been demonstrated in this report that the improvements to 93rd Street will not increase the 10 or 100-year water surface elevations that exist today. While the existing and proposed condition *depth* exceeds 8-inches in many cases, the proposed condition *water surface elevations (WSELs)* will either meet the existing condition WSELs or be below them based upon the overall reduction in composite Manning's n value on the east half of the street and as a result improved conveyance provided in the proposed condition.

  The City of Scottsdale is not requiring this project to reduce the existing flow depth condition in 93rd Street. However, the improvements to the east half of the street will reduce the flow depth mildly, so that the proposed condition is not worse than the existing condition.

  The 93rd Street offsite flows are not to flow into the Site. Proposed grading along the west edge of the Site, east of 93rd Street, is to prevent the estimated 170 cfs from intermingling with onsite drainage.

- The final design of hydraulic structures and systems will be based on generally accepted engineering practices and in accordance with the City of Scottsdale requirements.

13. References

1. City of Scottsdale, *Cactus Road Improvements - Loop 101 to 96th Street, (As-built plans)*, January 2008.

2. City of Scottsdale, *City of Scottsdale Design Standards and Policies Manual*, January 2010.

3. Federal Emergency Management Agency (FEMA), *Flood Insurance Rate Map, Panel 04013C1760L*, October 16, 2013.

4. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume I - Hydrology*, 2011.

5. Flood Control District of Maricopa County, *Drainage Design Manual for Maricopa County, Arizona, Volume I - Hydraulics*, 2011.

Appendix A: Hydrology

Rainfall (NOAA14)

On-Site Rational Method

Existing Conditions

Proposed Conditions

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ID	Method	Duration	2 Yr	5 Yr	10 Yr	25 Yr	50 Yr	100 Yr
DEFAULT	NOAA14	5 MIN	0.248	0.335	0.403	0.493	0.563	0.635
	NOAA14	10 MIN	0.378	0.511	0.613	0.751	0.857	0.966
	NOAA14	15 MIN	0.469	0.633	0.760	0.931	1.063	1.198
	NOAA14	30 MIN	0.631	0.852	1.024	1.253	1.431	1.613
	NOAA14	1 HOUR	0.781	1.055	1.267	1.551	1.771	1.996
	NOAA14	2 HOUR	0.905	1.206	1.437	1.752	1.990	2.238
	NOAA14	3 HOUR	0.992	1.297	1.540	1.879	2.148	2.427
	NOAA14	6 HOUR	1.176	1.503	1.764	2.120	2.396	2.684
	NOAA14	12 HOUR	1.307	1.652	1.921	2.285	2.565	2.854
	NOAA14	24 HOUR	1.536	1.985	2.343	2.837	3.227	3.635

Weighted C Calculations

$C_{Landscaping}$	C_{lots}	C_{paved}	P (100-Yr, 2-hr) (in)
0.30	0.64	0.95	2.256

Drainage Area Number	Total Area	Total Area	Landscaping/ Basin Area	Lot Area	Paving Area	Weighted C
DA-1	111986	2.57	9398	80644	21944	0.67
DA-2	202693	4.65	37423	111922	53348	0.66
DA-3	123540	2.84	21753	81799	19988	0.63
DA-4	115654	2.66	26206	70182	19266	0.61
DA-5	146580	3.37	69661	54727	22192	0.53
DA-LARK	33719	0.77	7762	0	25957	0.80
Total		734172 16.9	172203	399274	162695	**0.63** PROJECT WEIGHTED C
						0.53 PRE-PROJECT C

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: TEG-1603-000

1/25/2018

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
CP23	COS TRANS	8.80	100.0	0.034	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		8.800	**100.0**								
CP34	COS TRANS	11.80	100.0	0.033	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		11.800	**100.0**								
DA-1	COS LS	0.22	8.6	0.074	0.20	0.20	0.20	0.20	0.25	0.30	City of Scottsdale, Landscaping
	COS R1-18	1.85	72.0	0.074	0.43	0.43	0.43	0.43	0.58	0.64	City of Scopttsdale, R1-18
	COS TRANS	0.50	19.5	0.037	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		2.570	**100.1**								
DA-1 E	110	16.08	100.0	0.032	0.42	0.42	0.42	0.46	0.50	0.53	Rural Residential (<= 1/5 du per acre)
		16.080	**100.0**								
DA-2	COS LS	0.86	18.5	0.071	0.20	0.20	0.20	0.20	0.25	0.30	City of Scottsdale, Landscaping
	COS R1-18	2.57	55.3	0.071	0.43	0.43	0.43	0.43	0.58	0.64	City of Scopttsdale, R1-18
	COS TRANS	1.22	26.2	0.036	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		4.650	**100.0**								
DA-3	COS LS	0.50	17.6	0.074	0.20	0.20	0.20	0.20	0.25	0.30	City of Scottsdale, Landscaping
	COS R1-18	1.88	66.2	0.074	0.43	0.43	0.43	0.43	0.58	0.64	City of Scopttsdale, R1-18
	COS TRANS	0.46	16.2	0.037	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		2.840	**100.0**								
DA-4	COS LS	0.60	22.6	0.074	0.20	0.20	0.20	0.20	0.25	0.30	City of Scottsdale, Landscaping

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: TEG-1603-000

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
	COS R1-18	1.61	60.8	0.074	0.43	0.43	0.43	0.43	0.58	0.64	City of Scopttsdale, R1-18
	COS TRANS	0.44	16.6	0.037	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		2.650	**100.0**								
DA-5	COS LS	1.60	47.5	0.073	0.20	0.20	0.20	0.20	0.25	0.30	City of Scottsdale, Landscaping
	COS R1-18	1.26	37.4	0.073	0.43	0.43	0.43	0.43	0.58	0.64	City of Scopttsdale, R1-18
	COS TRANS	0.51	15.1	0.037	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		3.370	**100.0**								
DA-LAR	COS LS	0.18	23.1	0.082	0.20	0.20	0.20	0.20	0.25	0.30	City of Scottsdale, Landscaping
	COS TRANS	0.60	76.9	0.041	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		0.780	**100.0**								
OFF-1	COS R1-18	3.70	9.9	0.058	0.43	0.43	0.43	0.43	0.58	0.64	City of Scopttsdale, R1-18
	COS R1-7	33.60	90.1	0.030	0.51	0.51	0.51	0.51	0.64	0.94	City of Scottsdale, R1-7
		37.300	**100.0**								
OFF-2	COS TRANS	5.50	100.0	0.035	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		5.500	**100.0**								
OFF-3	COS TRANS	3.30	100.0	0.037	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement
		3.300	**100.0**								
OFF-4	COS TRANS	3.00	100.0	0.037	0.95	0.95	0.95	0.95	0.95	0.95	City of Scottsdale, pavement

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
LAND USE
Project Reference: TEG-1603-000

Sub Basin	Land Use Code	Area (acres)	Area (%)	Kb	Runoff Coefficient C						Description
					2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	
Major Basin ID: 01											
		3.000	**100.0**								

* Non default value

Flood Control District of Maricopa County
Drainage Design Management System
SUB BASINS
Project Reference: TEG-1603-000

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
DA-1 E	16.1	1,328	1,421.00	1,408.00	51.7	0.032	Q (cfs)	13.6	19.7	24.4	33.4	41.4	49.5
							C	0.42	0.42	0.42	0.46	0.50	0.53
							CA (ac)	6.75	6.75	6.75	7.40	8.04	8.52
							Volume (ac-ft)	0.3226	0.4057	0.4621	0.6142	0.7613	0.9102
							Tc (min)	13	11	10	10	10	10
							i (in/hr)	2.02	2.92	3.62	4.51	5.15	5.81
DA-LAR	0.8	565	1,421.00	1,417.00	37.4	0.050	Q (cfs)	1.3	1.8	2.2	2.7	3.1	3.6
							C	0.78	0.78	0.78	0.78	0.79	0.80
							CA (ac)	0.60	0.60	0.60	0.60	0.61	0.62
							Volume (ac-ft)	0.0273	0.0331	0.0405	0.0496	0.0570	0.0662
							Tc (min)	11	10	10	10	10	10
							i (in/hr)	2.14	3.05	3.67	4.51	5.15	5.81
DA-1	2.6	535	1,420.00	1,416.00	39.5	0.067	Q (cfs)	2.6	3.8	4.7	5.9	8.2	10.0
							C	0.51	0.51	0.51	0.51	0.62	0.67
							CA (ac)	1.31	1.31	1.31	1.31	1.59	1.72
							Volume (ac-ft)	0.0622	0.0790	0.0899	0.1085	0.1508	0.1839
							Tc (min)	13	11	10	10	10	10
							i (in/hr)	2.01	2.91	3.61	4.51	5.15	5.81
DA-2	4.7	1,060	1,418.00	1,410.00	39.8	0.062	Q (cfs)	4.1	5.9	7.3	9.5	13.4	16.5
							C	0.52	0.52	0.52	0.52	0.62	0.66
							CA (ac)	2.42	2.42	2.42	2.42	2.88	3.07
							Volume (ac-ft)	0.1410	0.1768	0.2014	0.2376	0.3129	0.3641
							Tc (min)	19	16	15	14	13	12
							i (in/hr)	1.69	2.44	3.03	3.93	4.65	5.38
DA-3	2.8	490	1,418.00	1,415.00	32.3	0.068	Q (cfs)	2.6	3.8	4.7	6.0	8.5	10.4
							C	0.47	0.47	0.47	0.47	0.58	0.63

* Non default value

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
							CA (ac)	1.33	1.33	1.33	1.33	1.65	1.79
							Volume (ac-ft)	0.0641	0.0811	0.0925	0.1103	0.1563	0.1912
							Tc (min)	13	12	11	10	10	10
							i (in/hr)	1.98	2.87	3.57	4.51	5.15	5.81
DA-4	2.7	510	1,417.00	1,413.00	41.4	0.068	Q (cfs)	2.5	3.6	4.5	5.5	7.8	9.4
							C	0.46	0.46	0.46	0.46	0.57	0.61
							CA (ac)	1.22	1.22	1.22	1.22	1.52	1.62
							Volume (ac-ft)	0.0575	0.0722	0.0827	0.1011	0.1434	0.1729
							Tc (min)	13	11	10	10	10	10
							i (in/hr)	2.05	2.95	3.67	4.51	5.15	5.81
DA-5	3.4	435	1,411.00	1,406.00	60.7	0.067	Q (cfs)	3.1	4.1	5.0	6.1	8.3	10.4
							C	0.40	0.40	0.40	0.40	0.48	0.53
							CA (ac)	1.35	1.35	1.35	1.35	1.62	1.79
							Volume (ac-ft)	0.0570	0.0754	0.0919	0.1122	0.1526	0.1912
							Tc (min)	10	10	10	10	10	10
							i (in/hr)	2.26	3.05	3.67	4.51	5.15	5.81
OFF-1	37.3	2,170	1,430.00	1,417.00	31.6	0.033	Q (cfs)	29.3	42.9	53.7	68.6	102.0	171.4
							C	0.50	0.50	0.50	0.50	0.63	0.91
							CA (ac)	18.65	18.65	18.65	18.65	23.50	33.94
							Volume (ac-ft)	1.1530	1.4594	1.6787	1.9426	2.7196	4.3179
							Tc (min)	21	19	17	15	15	14
							i (in/hr)	1.57	2.30	2.88	3.68	4.34	5.05
OFF-2	5.5	970	1,437.00	1,430.00	38.1	0.035	Q (cfs)	10.7	15.4	19.1	23.6	26.9	30.4
							C	0.95	0.95	0.95	0.95	0.95	0.95
							CA (ac)	5.23	5.23	5.23	5.23	5.23	5.23
							Volume (ac-ft)	0.2479	0.3115	0.3547	0.4340	0.4946	0.5590
							Tc (min)	13	11	10	10	10	10
							i (in/hr)	2.04	2.94	3.65	4.51	5.15	5.81

ID	Sub Basin Data							Sub Basin Hydrology Summary					
	Area (acres)	Length (ft)	USGE	DSGE	Slope (ft/mi)	Kb		2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
Major Basin ID: 01													
OFF-3	3.3	1,310	1,430.00	1,422.00	32.2	0.037	Q (cfs)	5.6	8.1	10.2	13.1	15.4	17.8
							C	0.95	0.95	0.95	0.95	0.95	0.95
							CA (ac)	3.14	3.14	3.14	3.14	3.14	3.14
							Volume (ac-ft)	0.1709	0.2145	0.2476	0.2891	0.3200	0.3502
							Tc (min)	17	14	13	12	11	11
							i (in/hr)	1.79	2.58	3.25	4.18	4.90	5.66
OFF-4	3.0	1,280	1,422.00	1,410.00	49.5	0.037	Q (cfs)	5.5	8.0	10.0	12.8	14.7	16.6
							C	0.95	0.95	0.95	0.95	0.95	0.95
							CA (ac)	2.85	2.85	2.85	2.85	2.85	2.85
							Volume (ac-ft)	0.1416	0.1780	0.2041	0.2377	0.2703	0.3052
							Tc (min)	14	12	11	10	10	10
							i (in/hr)	1.94	2.82	3.52	4.49	5.15	5.81
CP23	8.8	2,225	1,437.00	1,422.00	35.6	0.034	Q (cfs)	13.2	19.3	24.2	30.8	36.4	42.4
							C	0.95	0.95	0.95	0.95	0.95	0.95
							CA (ac)	8.36	8.36	8.36	8.36	8.36	8.36
							Volume (ac-ft)	0.5146	0.6495	0.7476	0.8665	0.9638	1.0604
							Tc (min)	21	18	17	15	14	14
							i (in/hr)	1.58	2.31	2.89	3.69	4.36	5.07
CP34	11.8	3,510	1,437.00	1,410.00	40.6	0.033	Q (cfs)	15.4	23.0	29.1	37.7	44.4	51.3
							C	0.95	0.95	0.95	0.95	0.95	0.95
							CA (ac)	11.21	11.21	11.21	11.21	11.21	11.21
							Volume (ac-ft)	0.7561	0.9685	1.1184	1.3102	1.4533	1.5848
							Tc (min)	27	23	21	19	18	17
							i (in/hr)	1.37	2.05	2.60	3.36	3.96	4.58

Appendix B: Hydraulics

Street Capacity

Preliminary 10 and 100-year SSA model output

SLATER HANIFAN GROUP

"The Benchmark of Our Profession."

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS

Street Capacity Computations *4" Curb*

Description: Calculation of Street Flow Conveyance Capacity

Date: 03/13/17

References: Federal Highway Administration, Hydraulic Engineering Circular No. 12, "Drainage of Highway Pavements", March 1984

10 Year Flows

Known Values:

Depth of Flow =	0.33	ft
Cross Slope =	0.02	ft/ft
Street Width (F/C to F/C) =	28	ft
Manning's "n" Value=	0.015	

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; S_x = cross slope, ft/ft; S = longitudinal slope, ft/ft; T = width of flow, ft; A = conveyance area, sq ft; R = hydraulic radius, ft

Longitudinal Slope (ft/ft)	Conveyance Area (ft^2)	Velocity (fps)	Hydraulic Capacity (cfs)	Half-Street Hydraulic Capacity (cfs)
0.0020	5.32	1.43	8	4
0.0025	5.32	1.60	9	5
0.0030	5.32	1.76	9	5
0.0035	5.32	1.90	10	6
0.0040	5.32	2.03	11	6
0.0045	5.32	2.15	11	6
0.0050	5.32	2.27	12	7
0.0055	5.32	2.38	13	7
0.0060	5.32	2.48	13	7
0.0065	5.32	2.58	14	8
0.0070	5.32	2.68	14	8
0.0075	5.32	2.78	15	8
0.0080	5.32	2.87	15	9
0.0085	5.32	2.96	16	9
0.0090	5.32	3.04	16	9
0.0095	5.32	3.12	17	9
0.0100	5.32	3.21	17	10
0.0105	5.32	3.28	17	10
0.0110	5.32	3.36	18	10
0.0115	5.32	3.44	18	10
0.0120	5.32	3.51	19	11
0.0125	5.32	3.58	19	11
0.0130	5.32	3.65	19	11
0.0135	5.32	3.72	20	11
0.0140	5.32	3.79	20	11
0.0145	5.32	3.86	21	12
0.0150	5.32	3.93	21	12
0.0155	5.32	3.99	21	12
0.0160	5.32	4.05	22	12
0.0165	5.32	4.12	22	12
0.0170	5.32	4.18	22	13
0.0175	5.32	4.24	23	13
0.0180	5.32	4.30	23	13
0.0185	5.32	4.36	23	13
0.0190	5.32	4.42	24	13
0.0195	5.32	4.48	24	14
0.0200	5.32	4.53	24	14
0.0205	5.32	4.59	24	14
0.0210	5.32	4.64	25	14
0.0215	5.32	4.70	25	14
0.0220	5.32	4.75	25	14
0.0225	5.32	4.81	26	15
0.0230	5.32	4.86	26	15
0.0235	5.32	4.91	26	15
0.0240	5.32	4.97	26	15
0.0245	5.32	5.02	27	15
0.0250	5.32	5.07	27	15

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Street Capacity Computations *4" Curb*

Description: Calculation of Street Flow Conveyance Capacity

Date: 03/13/17

References: Federal Highway Administration, Hydraulic Engineering Circular No. 12, "Drainage of Highway Pavements", March 1984

100 Year Flows

Known Values:

Depth of Flow =	0.67	ft
Cross Slope =	0.02	ft/ft
Street Width (F/C to F/C) =	28	ft
Manning's "n" Value=	0.015	

Calculated Values:

Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; S_x = cross slope, ft/ft; S = longitudinal slope, ft/ft; T = width of flow, ft; A = conveyance area, sq ft; R = hydraulic radius, ft

Longitudinal Slope (ft/ft)	Conveyance Area (ft^2)	Velocity (fps)	Hydraulic Capacity (cfs)	Half-Street Hydraulic Capacity (cfs)
0.0020	14.84	2.81	42	29
0.0025	14.84	3.14	47	32
0.0030	14.84	3.44	51	35
0.0035	14.84	3.71	55	38
0.0040	14.84	3.97	59	41
0.0045	14.84	4.21	62	43
0.0050	14.84	4.44	66	45
0.0055	14.84	4.65	69	48
0.0060	14.84	4.86	72	50
0.0065	14.84	5.06	75	52
0.0070	14.84	5.25	78	54
0.0075	14.84	5.43	81	55
0.0080	14.84	5.61	83	57
0.0085	14.84	5.78	86	59
0.0090	14.84	5.95	88	61
0.0095	14.84	6.11	91	62
0.0100	14.84	6.27	93	64
0.0105	14.84	6.43	95	66
0.0110	14.84	6.58	98	67
0.0115	14.84	6.73	100	69
0.0120	14.84	6.87	102	70
0.0125	14.84	7.01	104	72
0.0130	14.84	7.15	106	73
0.0135	14.84	7.29	108	74
0.0140	14.84	7.42	110	76
0.0145	14.84	7.55	112	77
0.0150	14.84	7.68	114	78
0.0155	14.84	7.81	116	80
0.0160	14.84	7.94	118	81
0.0165	14.84	8.06	120	82
0.0170	14.84	8.18	121	84
0.0175	14.84	8.30	123	85
0.0180	14.84	8.42	125	86
0.0185	14.84	8.53	127	87
0.0190	14.84	8.65	128	88
0.0195	14.84	8.76	130	89
0.0200	14.84	8.87	132	91
0.0205	14.84	8.98	133	92
0.0210	14.84	9.09	135	93
0.0215	14.84	9.20	137	94
0.0220	14.84	9.31	138	95
0.0225	14.84	9.41	140	96
0.0230	14.84	9.51	141	97
0.0235	14.84	9.62	143	98
0.0240	14.84	9.72	144	99
0.0245	14.84	9.82	146	100
0.0250	14.84	9.92	147	101

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Street Capacity Computations

6" Curb

Description: Calculation of Street Flow Conveyance Capacity

Date: 03/13/17

References: Federal Highway Administration, Hydraulic Engineering Circular No. 12, "Drainage of Highway Pavements", March 1984

10 Year Flows

Known Values:

Depth of Flow =	0.5	ft
Cross Slope =	0.02	ft/ft
Street Width (F/C to F/C) =	28	ft
Manning's "n" Value=	0.015	

Calculated Values:

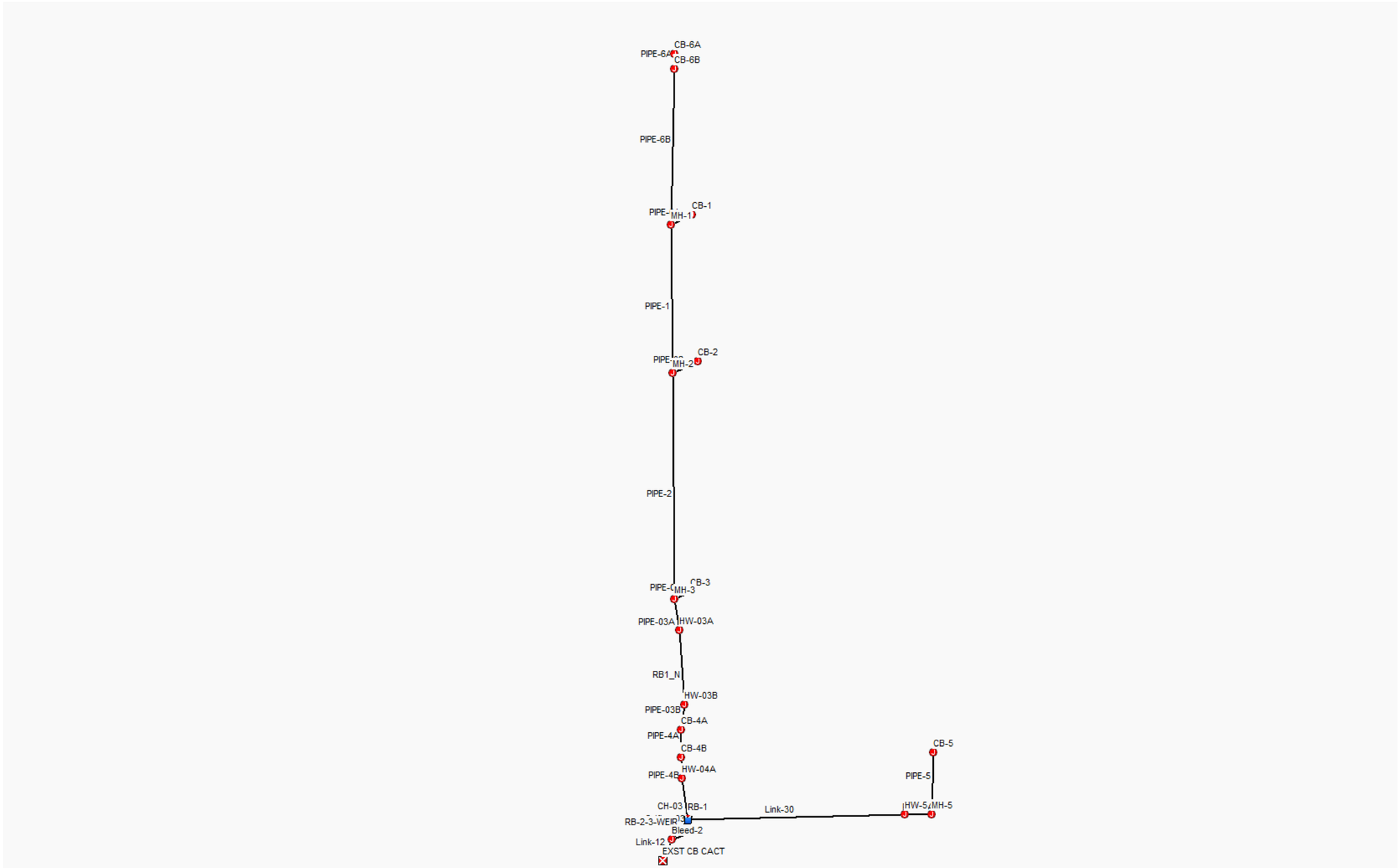
Referenced Equations:

$Q = 0.56 * (S_x^{1.67}) * (S^{0.5}) * (T^{2.67}) / n$ for flow below crown (FHWA Procedure)

$Q = 1.486 * A * (R^{0.67}) * (S^{0.5}) / n$ for flow above crown (Manning's equation)

where Q = flow rate, cfs; S_x = cross slope, ft/ft; S = longitudinal slope, ft/ft; T = width of flow, ft; A = conveyance area, sq ft; R = hydraulic radius, ft

Longitudinal Slope (ft/ft)	Conveyance Area (ft^2)	Velocity (fps)	Hydraulic Capacity (cfs)	Half-Street Hydraulic Capacity (cfs)
0.0020	10.08	2.18	22	13
0.0025	10.08	2.44	25	15
0.0030	10.08	2.67	27	16
0.0035	10.08	2.89	29	17
0.0040	10.08	3.09	31	19
0.0045	10.08	3.27	33	20
0.0050	10.08	3.45	35	21
0.0055	10.08	3.62	36	22
0.0060	10.08	3.78	38	23
0.0065	10.08	3.93	40	24
0.0070	10.08	4.08	41	25
0.0075	10.08	4.23	43	25
0.0080	10.08	4.36	44	26
0.0085	10.08	4.50	45	27
0.0090	10.08	4.63	47	28
0.0095	10.08	4.76	48	29
0.0100	10.08	4.88	49	29
0.0105	10.08	5.00	50	30
0.0110	10.08	5.12	52	31
0.0115	10.08	5.23	53	31
0.0120	10.08	5.35	54	32
0.0125	10.08	5.46	55	33
0.0130	10.08	5.56	56	33
0.0135	10.08	5.67	57	34
0.0140	10.08	5.77	58	35
0.0145	10.08	5.88	59	35
0.0150	10.08	5.98	60	36
0.0155	10.08	6.08	61	37
0.0160	10.08	6.17	62	37
0.0165	10.08	6.27	63	38
0.0170	10.08	6.36	64	38
0.0175	10.08	6.46	65	39
0.0180	10.08	6.55	66	39
0.0185	10.08	6.64	67	40
0.0190	10.08	6.73	68	40
0.0195	10.08	6.81	69	41
0.0200	10.08	6.90	70	41
0.0205	10.08	6.99	70	42
0.0210	10.08	7.07	71	43
0.0215	10.08	7.15	72	43
0.0220	10.08	7.24	73	44
0.0225	10.08	7.32	74	44
0.0230	10.08	7.40	75	44
0.0235	10.08	7.48	75	45
0.0240	10.08	7.56	76	45
0.0245	10.08	7.64	77	46
0.0250	10.08	7.72	78	46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MH-2
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CB-3
MH-3
PIPE-03A
HW-03A
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HW-03B
PIPE-03B
CB-4A
PIPE-4A
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PIPE-4B
CB-5
PIPE-5
CH-03
RB-1
Link-30
MH-5
RB-2-3-WEIR
Bleed-2
Link-12
EXST CB CACT

WOLF SPRINGS RANCH 10-YEAR STORMDRAIN DESIGN

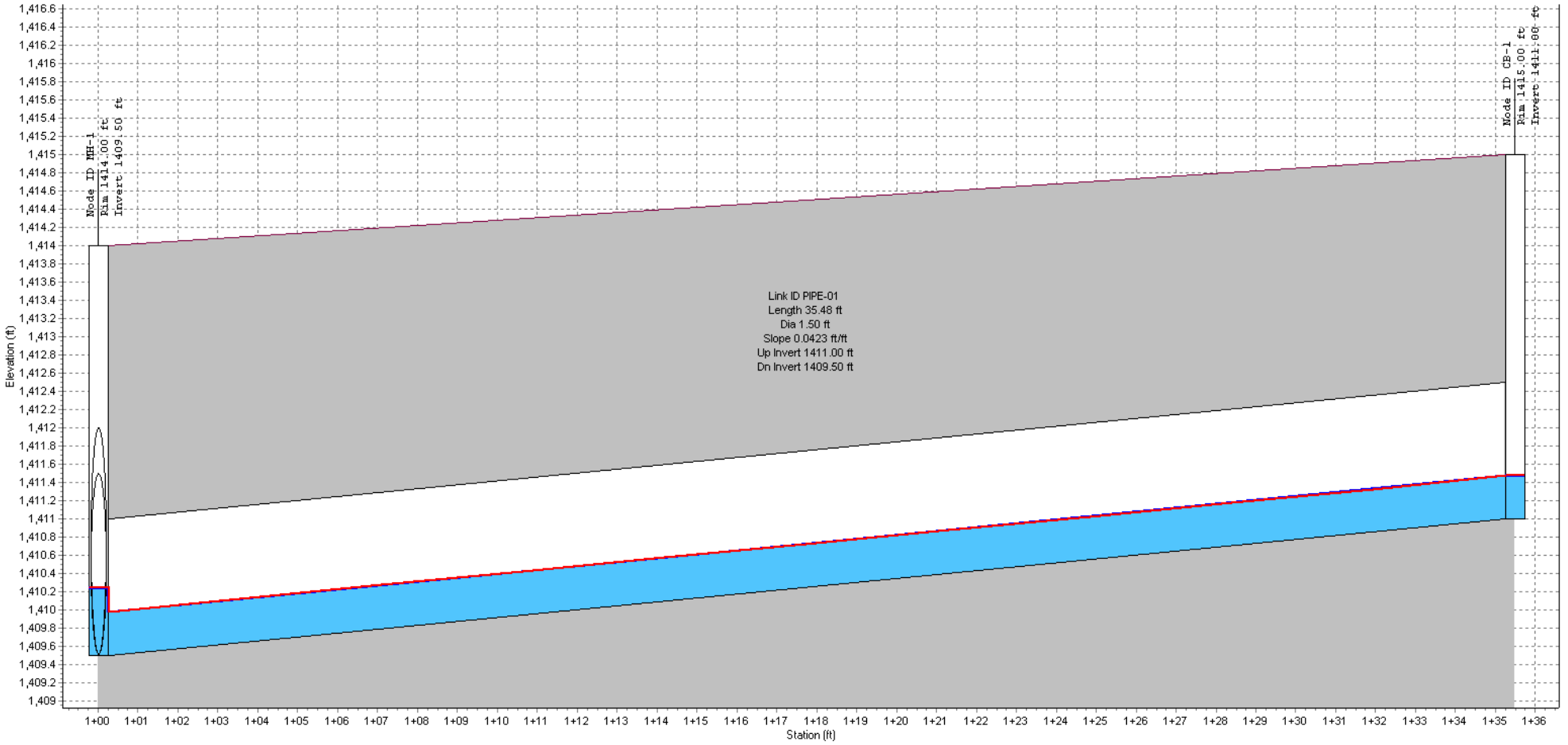
SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Inlet Invert Offset	Outlet Invert Elevation	Outlet Invert Offset	Total Drop	Average Slope	Channel Type	Channel Height	Channel Width	Channel Manning's Roughness	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth	Reported Condition
					(ft)	(ft)	(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)		(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)	
1	CH-03		HW-04A	RB-1	64.89	1403.60	0.00	1403.50	0.00	0.10	0.1500	Trapezoidal	3.000	44.00	0.0250	19.56	0 00:12	1.52	0.71	372.67	0.05	0.19	0.00	0.58	Calculated
2	Link-30		HW-5	RB-1	19.60	1403.60	0.00	1403.50	0.00	0.10	0.5100	Trapezoidal	3.000	50.00	0.0320	6.94	0 00:12	1.28	0.26	566.49	0.01	0.08	0.00	0.25	Calculated
3	RB1_N		HW-03A	HW-03B	106.11	1404.50	0.00	1404.00	0.00	0.50	0.4700	Trapezoidal	3.000	60.00	0.0250	15.15	0 00:11	1.72	1.03	939.38	0.02	0.09	0.00	0.28	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Depth (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)	Minimum Pipe Cover (inches)	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Maximum HGL Elevation Attained (ft)	Maximum HGL Depth Attained (ft)	Maximum Surcharge Depth Attained (ft)	Minimum Freeboard Attained (ft)	Average HGL Elevation Attained (ft)
1	Bleed-2	711158.21	944996.66		1403.50	1406.50	3.00	-1403.50	0.00	-1406.50	0.00	0.49	0.00	1403.66	0.16	0.00	2.84	1403.64
2	CB-1	711188.84	945972.94		1411.00	1415.00	4.00	-1411.00	6.00	-1409.00	30.00	5.00	5.00	1411.47	0.47	0.00	3.53	1411.01
3	CB-2	711199.11	945744.04		1408.70	1412.70	4.00	-1408.70	6.00	-1406.70	30.00	5.00	5.00	1409.31	0.61	0.00	3.39	1408.71
4	CB-3	711186.98	945384.74		1406.00	1410.20	4.20	-1406.00	0.00	-1410.20	32.40	4.00	4.00	1406.49	0.49	0.00	3.71	1406.01
5	CB-4A	711172.36	945167.77		1403.80	1407.00	3.20	-1403.80	0.00	-1407.00	8.40	17.39	2.50	1404.41	0.61	0.00	2.59	1403.81
6	CB-4B	711172.36	945124.62		1403.70	1407.00	3.30	-1403.70	0.00	-1407.00	9.60	19.62	2.50	1404.65	0.95	0.00	2.35	1403.72
7	CB-5	711565.75	945132.42		1405.50	1409.50	4.00	-1405.50	0.00	-1409.50	24.00	7.00	7.00	1406.14	0.64	0.00	3.36	1405.51
8	CB-6A	711162.18	946224.54		1411.00	1415.00	4.00	-1411.00	0.00	-1415.00	30.00	1.00	1.00	1411.35	0.35	0.00	3.65	1411.01
9	CB-6B	711161.69	946201.07		1410.80	1415.00	4.20	-1410.80	0.00	-1415.00	26.40	1.99	1.00	1411.25	0.45	0.00	3.75	1410.81
10	HW-03A	711169.74	945324.69		1404.50	1406.50	2.00	-1404.50	1.08	-1405.42	0.00	15.27	0.00	1405.56	1.06	0.00	1.94	1404.52
11	HW-03B	711177.34	945207.12		1404.00	1406.50	2.50	-1404.00	0.00	-1406.50	0.00	15.15	0.00	1404.43	0.43	0.00	2.57	1404.01
12	HW-04A	711174.05	945092.46		1403.60	1406.50	2.90	-1403.60	0.00	-1406.50	0.00	19.62	0.00	1404.55	0.95	0.00	2.05	1403.62
13	HW-5	711521.74	945035.69		1403.60	1411.00	7.40	-1403.60	2.40	-1408.60	52.80	6.92	0.00	1404.22	0.62	0.00	6.78	1403.61
14	MH-1	711157.12	945957.05		1409.50	1414.00	4.50	-1409.50	6.00	-1408.00	24.00	6.81	0.00	1410.24	0.74	0.00	3.76	1409.51
15	MH-2	711158.90	945726.49		1408.00	1412.50	4.50	-1408.00	6.00	-1406.50	24.00	11.65	0.00	1408.91	0.91	0.00	3.59	1408.02
16	MH-3	711162.38	945371.93		1405.00	1410.00	5.00	-1405.00	1.68	-1408.32	30.00	15.27	0.00	1406.06	1.06	0.00	3.94	1405.02
17	MH-5	711563.15	945036.55		1404.00	1411.00	7.00	-1404.00	0.00	-1411.00	60.00	6.92	0.00	1404.64	0.64	0.00	6.36	1404.01

SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (inches)	Pipe Width (inches)	Manning's Roughness	Entrance Losses	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Max Flow Velocity (ft/sec)	Travel Time (min)	Design Flow Capacity (cfs)	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged (min)	Max Flow Depth (ft)	Reported Condition
1	Link-12		Bleed-2	EXST CB CACT	35.43	1403.50	1402.22	1.28	3.6100	CIRCULAR	24.000	24.00	0.0150	0.5000	0.49	0 00:35	4.14	0.14	37.27	0.01	0.08	0.00	0.16	Calculated
2	PIPE-01		CB-1	MH-1	35.48	1411.00	1409.50	1.50	4.2300	CIRCULAR	18.000	18.00	0.0120	1.0000	4.98	0 00:10	10.51	0.06	23.40	0.21	0.31	0.00	0.47	Calculated
3	PIPE-02		CB-2	MH-2	43.87	1408.70	1408.00	0.70	1.6000	CIRCULAR	18.000	18.00	0.0120	0.5000	4.96	0 00:10	7.38	0.10	14.37	0.35	0.41	0.00	0.61	Calculated
4	PIPE-03		CB-3	MH-3	27.74	1406.00	1405.00	1.00	3.6000	CIRCULAR	18.000	18.00	0.0150	0.5000	3.98	0 00:10	7.93	0.06	17.28	0.23	0.33	0.00	0.49	Calculated
5	PIPE-03A		MH-3	HW-03A	59.38	1405.00	1404.50	0.50	0.8400	CIRCULAR	30.000	30.00	0.0120	0.5000	15.27	0 00:11	7.70	0.13	40.77	0.37	0.42	0.00	1.06	Calculated
6	PIPE-03B		HW-03B	CB-4A	39.66	1404.00	1403.80	0.20	0.5000	Rectangular	30.000	48.00	0.0120	0.5000	15.16	0 00:12	4.40	0.15	147.65	0.10	0.17	0.00	0.43	Calculated
7	PIPE-1		MH-1	MH-2	230.57	1409.50	1408.00	1.50	0.6500	CIRCULAR	30.000	30.00	0.0120	0.5000	6.78	0 00:11	5.64	0.68	35.84	0.19	0.29	0.00	0.74	Calculated
8	PIPE-2		MH-2	MH-3	354.58	1408.00	1405.00	3.00	0.8500	CIRCULAR	30.000	30.00	0.0120	0.5000	11.51	0 00:11	7.20	0.82	40.87	0.28	0.36	0.00	0.91	Calculated
9	PIPE-4A		CB-4A	CB-4B	43.16	1403.80	1403.70	0.10	0.2300	Rectangular	30.000	48.00	0.0120	0.5000	17.39	0 00:12	3.58	0.20	100.08	0.17	0.24	0.00	0.61	Calculated
10	PIPE-4B		CB-4B	HW-04A	32.20	1403.70	1403.60	0.10	0.3100	Rectangular	30.000	48.00	0.0120	0.5000	19.62	0 00:12	5.15	0.10	57.94	0.34	0.38	0.00	0.95	Calculated
11	PIPE-5		CB-5	MH-5	91.00	1405.50	1404.00	1.50	1.6500	CIRCULAR	24.000	24.00	0.0120	0.5000	6.92	0 00:12	8.07	0.19	31.46	0.22	0.32	0.00	0.64	Calculated
12	PIPE-5A		MH-5	HW-5	22.00	1404.00	1403.60	0.40	1.8200	CIRCULAR	24.000	24.00	0.0120	0.5000	6.92	0 00:12	8.33	0.04	33.05	0.21	0.31	0.00	0.62	Calculated
13	PIPE-6A		CB-6A	CB-6B	23.48	1411.00	1410.80	0.20	0.8500	CIRCULAR	18.000	18.00	0.0150	0.5000	0.99	0 00:10	3.19	0.12	8.40	0.12	0.23	0.00	0.35	Calculated
14	PIPE-6B		CB-6B	MH-1	244.06	1410.80	1409.50	1.30	0.5300	CIRCULAR	24.000	24.00	0.0120	0.5000	1.95	0 00:11	4.15	0.98	17.89	0.11	0.22	0.00	0.45	Calculated

CB-1 TO MH-1 (10-YR)

WOLFSPRINGS RANCH

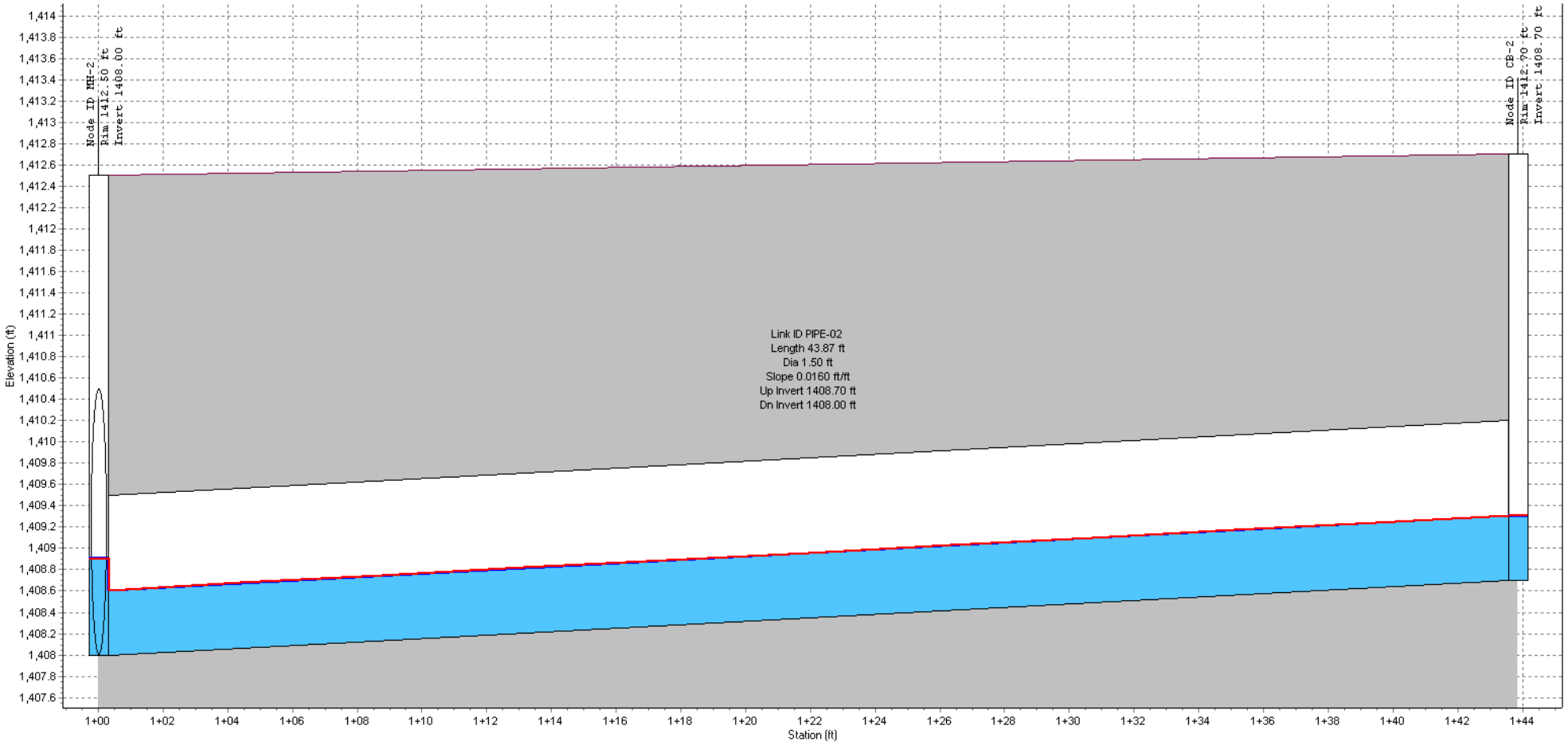


Node ID:	MH-1	CB-1
Rim (ft):	1414.00	1415.00
Invert (ft):	1409.50	1411.00
Min Pipe Cover (ft):	2.00	2.50
Max HGL (ft):	1410.24	1411.47

Link ID:	PIPE-01
Length (ft):	35.48
Dia (ft):	1.50
Slope (ft/ft):	0.0423
Up Invert (ft):	1411.00
Dn Invert (ft):	1409.50
Max Q (cfs):	4.98
Max Vel (ft/s):	10.51
Max Depth (ft):	0.47

CB-2 TO MH-2 (10-YR)

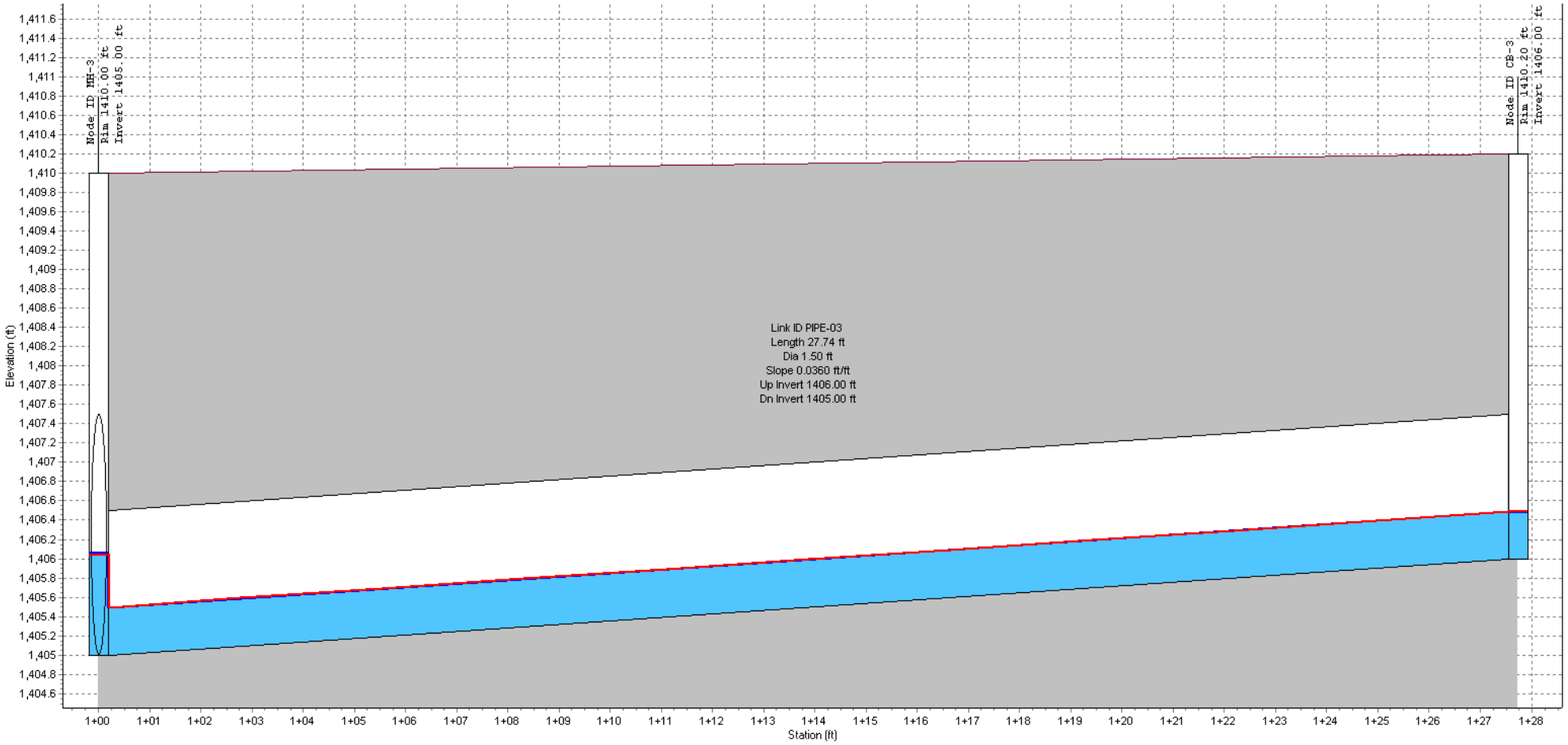
WOLFSPRINGS RANCH



Node ID:	MH-2		CB-2
Rim (ft):	1412.50		1412.70
Invert (ft):	1408.00		1408.70
Min Pipe Cover (ft):	2.00		2.50
Max HGL (ft):	1408.91		1409.31
Link ID:		PIPE-02	
Length (ft):		43.87	
Dia (ft):		1.50	
Slope (ft/ft):		0.0160	
Up Invert (ft):		1408.70	
Dn Invert (ft):		1408.00	
Max Q (cfs):		4.96	
Max Vel (ft/s):		7.38	
Max Depth (ft):		0.61	

CB-3 TO MH-3 (10-YR)

WOLFSPRINGS RANCH

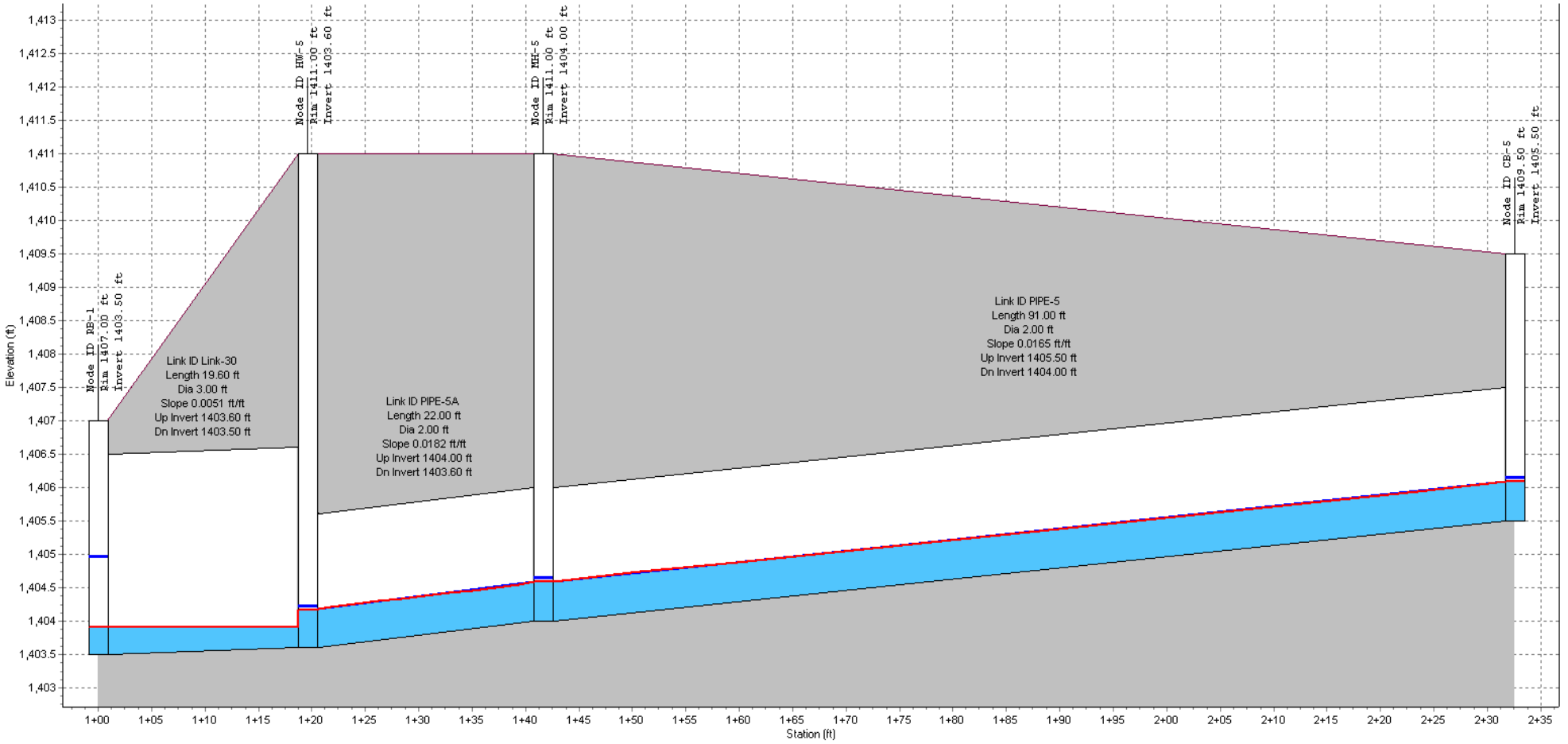


Node ID:	MH-3	CB-3
Rim (ft):	1410.00	1410.20
Invert (ft):	1405.00	1406.00
Min Pipe Cover (ft):	2.50	2.70
Max HGL (ft):	1406.06	1406.49

Link ID:	PIPE-03
Length (ft):	27.74
Dia (ft):	1.50
Slope (ft/ft):	0.0360
Up Invert (ft):	1406.00
Dn Invert (ft):	1405.00
Max Q (cfs):	3.98
Max Vel (ft/s):	7.93
Max Depth (ft):	0.49

CB-5 TO RB-1 (10-YR)

WOLFSPRINGS RANCH

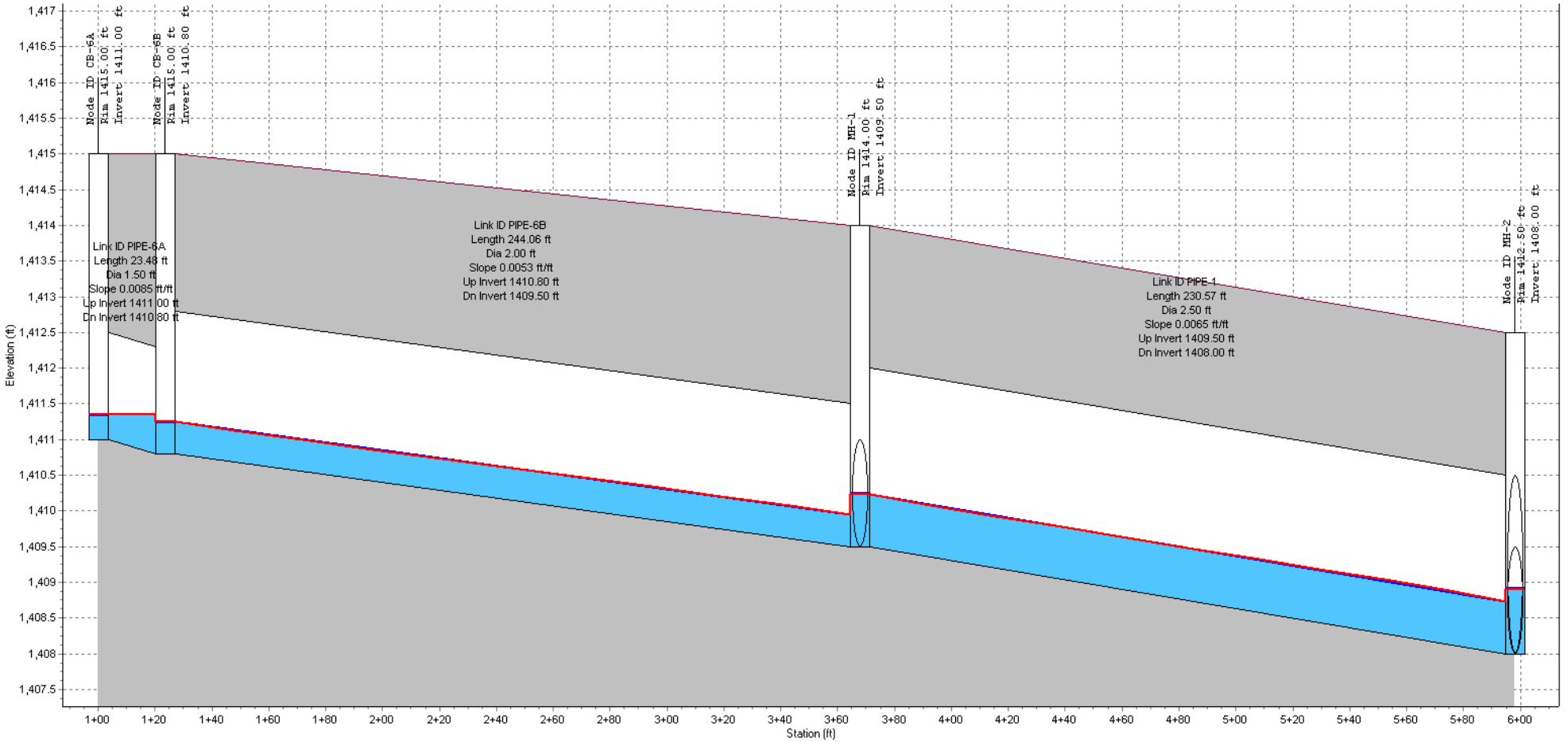


Node ID:	RB-1	HW-5	MH-5	CB-5
Rim (ft):	1407.00	1411.00	1411.00	1409.50
Invert (ft):	1403.50	1403.60	1404.00	1405.50
Min Pipe Cover (ft):		4.40	5.00	2.00
Max HGL (ft):	1404.96	1404.22	1404.64	1406.14

Link ID:	Link-30	PIPE-5A	PIPE-5
Length (ft):	19.60	22.00	91.00
Dia (ft):	3.00	2.00	2.00
Slope (ft/ft):	0.0051	0.0182	0.0165
Up Invert (ft):	1403.60	1404.00	1405.50
Dn Invert (ft):	1403.50	1403.60	1404.00
Max Q (cfs):	6.94	6.92	6.92
Max Vel (ft/s):	1.28	8.33	8.07
Max Depth (ft):	0.25	0.62	0.64

CB-6A TO MH-2 (10-YR)

WOLFSPRINGS RANCH

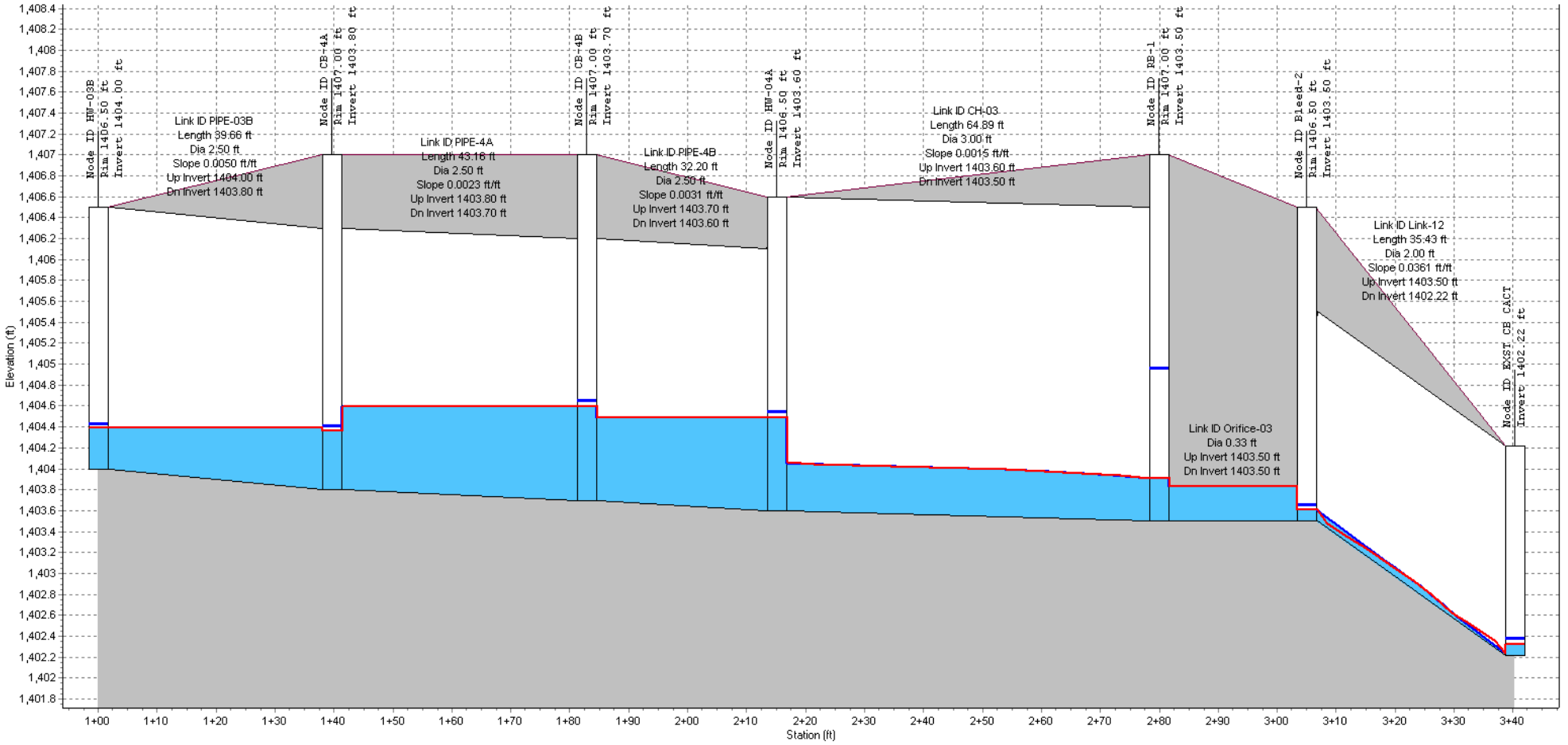


Node ID:	CB-6A	CB-6B	MH-1	MH-2
Rim (ft):	1415.00	1415.00	1414.00	1412.50
Invert (ft):	1411.00	1410.80	1409.50	1408.00
Min Pipe Cover (ft):	2.50	2.20	2.00	2.00
Max HGL (ft):	1411.35	1411.25	1410.24	1408.91

Link ID:	PIPE-6A	PIPE-6B	PIPE-1
Length (ft):	23.48	244.06	230.57
Dia (ft):	1.50	2.00	2.50
Slope (ft/ft):	0.0085	0.0053	0.0065
Up Invert (ft):	1411.00	1410.80	1409.50
Dn Invert (ft):	1410.80	1409.50	1408.00
Max Q (cfs):	0.99	1.95	6.78
Max Vel (ft/s):	3.19	4.15	5.64
Max Depth (ft):	0.35	0.45	0.74

HW-3B TO EXST CB CACT (10-YR)

WOLFSPRINGS RANCH

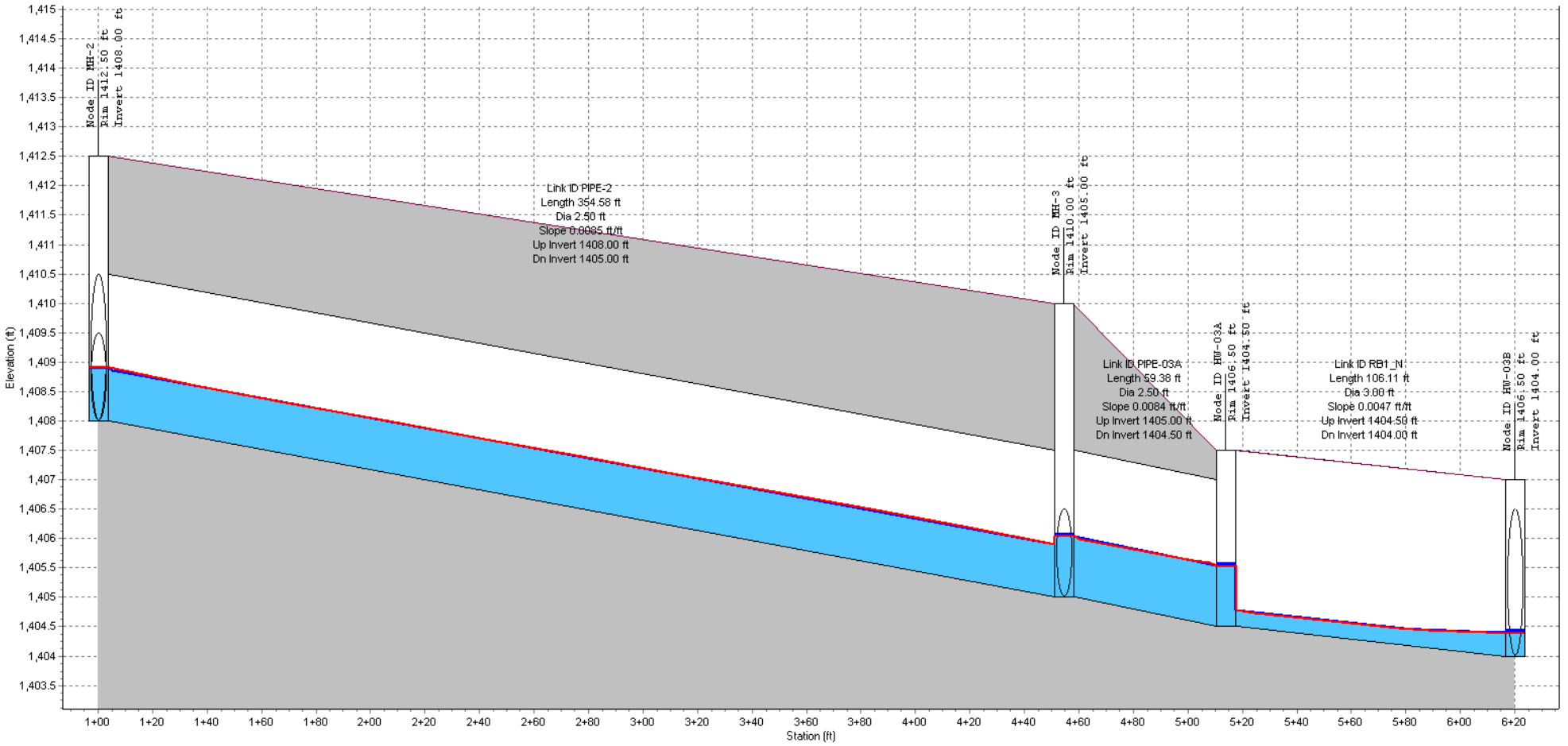


Node ID:	HW-03B	CB-4A	CB-4B	HW-04A	RB-1	Bleed-2	EXST CB CACT
Rim (ft):	1406.50	1407.00	1407.00	1406.50	1407.00	1406.50	
Invert (ft):	1404.00	1403.80	1403.70	1403.60	1403.50	1403.50	1402.22
Min Pipe Cover (ft):	0.00	0.70	0.80	0.00		0.00	
Max HGL (ft):	1404.43	1404.41	1404.65	1404.55	1404.96	1403.66	1402.38

Link ID:	PIPE-03B	PIPE-4A	PIPE-4B	CH-03	Orifice-03	Link-12
Length (ft):	39.66	43.16	32.20	64.89		35.43
Dia (ft):	2.50	2.50	2.50	3.00	0.33	2.00
Slope (ft/ft):	0.0050	0.0023	0.0031	0.0015		0.0361
Up Invert (ft):	1404.00	1403.80	1403.70	1403.60	1403.50	1403.50
Dn Invert (ft):	1403.80	1403.70	1403.60	1403.50	1403.50	1402.22
Max Q (cfs):	15.16	17.39	19.62	19.56	0.49	0.49
Max Vel (ft/s):	4.40	3.58	5.15	1.52	0.00	4.14
Max Depth (ft):	0.43	0.61	0.95	0.58	0.00	0.16

MH-2 TO HW-3B (10-YR)

WOLFSPRINGS RANCH



Node ID:	MH-2	MH-3	HW-03A	HW-03B
Rim (ft):	1412.50	1410.00	1406.50	1406.50
Invert (ft):	1408.00	1405.00	1404.50	1404.00
Min Pipe Cover (ft):	2.00	2.50	0.00	0.00
Max HGL (ft):	1408.91	1406.06	1405.56	1404.43

Link ID:	PIPE-2	PIPE-03A	RB1_N
Length (ft):	354.58	59.38	106.11
Dia (ft):	2.50	2.50	3.00
Slope (ft/ft):	0.0085	0.0084	0.0047
Up Invert (ft):	1408.00	1405.00	1404.50
Dn Invert (ft):	1405.00	1404.50	1404.00
Max Q (cfs):	11.51	15.27	15.15
Max Vel (ft/s):	7.20	7.70	1.72
Max Depth (ft):	0.91	1.06	0.28

WOLF SPRINGS RANCH 100-YEAR STORMDRAIN DESIGN

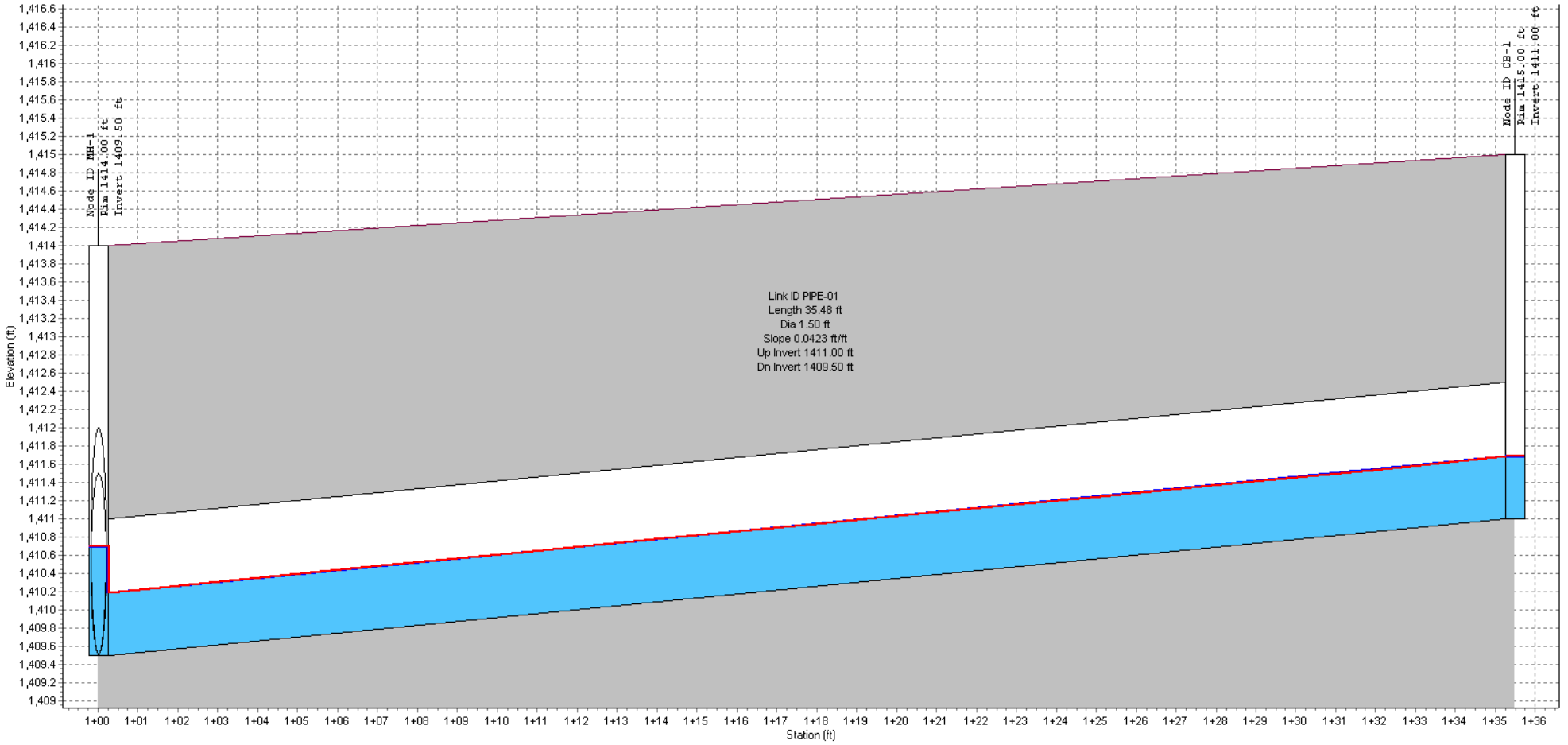
SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Total Drop	Average Slope	Channel Type	Channel Height	Channel Width	Channel Manning's Roughness	Entrance Losses	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth	Reported Condition
					(ft)	(ft)	(ft)	(ft)	(%)		(ft)	(ft)			(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)	
1	CH-03		HW-04A	RB-1	64.89	1403.60	1403.50	0.10	0.1500	Trapezoidal	3.000	44.00	0.0250	0.5000	43.39	0 00:12	2.00	0.54	372.67	0.12	0.31	0.00	0.92	Calculated
2	Link-30		HW-5	RB-1	19.60	1403.60	1403.50	0.10	0.5100	Trapezoidal	3.000	50.00	0.0320	0.5000	16.86	0 00:12	1.77	0.18	566.49	0.03	0.14	0.00	0.43	Calculated
3	RB1_N		HW-03A	HW-03B	106.11	1404.50	1404.00	0.50	0.4700	Trapezoidal	3.000	60.00	0.0250	0.5000	34.41	0 00:11	2.33	0.76	939.38	0.04	0.15	0.00	0.46	Calculated

SN	Element ID	X Coordinate	Y Coordinate	Description	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Ground/Rim (Max) Offset (ft)	Initial Water Depth (ft)	Surcharge Depth (ft)	Minimum Pipe Cover (inches)	Peak Inflow (cfs)	Peak Lateral Inflow (cfs)	Maximum HGL Elevation Attained (ft)	Maximum HGL Depth Attained (ft)	Minimum Freeboard Attained (ft)	Average HGL Elevation Attained (ft)
1	Bleed-2	711158.21	944996.66		1403.50	1406.50	3.00	-1403.50	-1406.50	0.00	21.11	0.00	1404.58	1.08	1.92	1403.69
2	CB-1	711188.84	945972.94		1411.00	1415.00	4.00	-1411.00	-1409.00	30.00	10.00	10.00	1411.69	0.69	3.31	1411.01
3	CB-2	711199.11	945744.04		1408.70	1412.70	4.00	-1408.70	-1406.70	30.00	10.00	10.00	1409.62	0.92	3.08	1408.71
4	CB-3	711186.98	945384.74		1406.00	1410.20	4.20	-1406.00	-1410.20	32.40	9.00	9.00	1406.77	0.77	3.43	1406.01
5	CB-4A	711172.36	945167.77		1403.80	1407.00	3.20	-1403.80	-1407.00	8.40	38.96	5.00	1404.85	1.05	2.15	1403.82
6	CB-4B	711172.36	945124.62		1403.70	1407.00	3.30	-1403.70	-1407.00	9.60	43.51	5.00	1405.38	1.68	1.62	1403.73
7	CB-5	711565.75	945132.42		1405.50	1409.50	4.00	-1405.50	-1409.50	24.00	17.00	17.00	1406.55	1.05	2.95	1405.52
8	CB-6A	711162.18	946224.54		1411.00	1415.00	4.00	-1411.00	-1415.00	30.00	5.00	5.00	1411.83	0.83	3.17	1411.01
9	CB-6B	711161.69	946201.07		1410.80	1415.00	4.20	-1410.80	-1415.00	26.40	6.97	2.00	1411.67	0.87	3.33	1410.81
10	HW-03A	711169.74	945324.69		1404.50	1406.50	2.00	-1404.50	-1405.42	0.00	34.53	0.00	1406.27	1.77	1.23	1404.53
11	HW-03B	711177.34	945207.12		1404.00	1406.50	2.50	-1404.00	-1406.50	0.00	34.41	0.00	1404.74	0.74	2.26	1404.01
12	HW-04A	711174.05	945092.46		1403.60	1406.50	2.90	-1403.60	-1406.50	0.00	43.50	0.00	1405.28	1.68	1.32	1403.63
13	HW-5	711521.74	945035.69		1403.60	1411.00	7.40	-1403.60	-1408.60	52.80	16.81	0.00	1404.61	1.01	6.39	1403.62
14	MH-1	711157.12	945957.05		1409.50	1414.00	4.50	-1409.50	-1408.00	24.00	16.62	0.00	1410.70	1.20	3.30	1409.52
15	MH-2	711158.90	945726.49		1408.00	1412.50	4.50	-1408.00	-1406.50	24.00	26.28	0.00	1409.46	1.46	3.04	1408.03
16	MH-3	711162.38	945371.93		1405.00	1410.00	5.00	-1405.00	-1408.32	30.00	34.58	0.00	1406.77	1.77	3.23	1405.03
17	MH-5	711563.15	945036.55		1404.00	1411.00	7.00	-1404.00	-1411.00	60.00	16.84	0.00	1405.04	1.04	5.96	1404.02

SN	Element ID	Description	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Total Drop	Average Slope	Pipe Shape	Pipe Diameter or Height	Pipe Width	Manning's Roughness	Entrance Losses	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Max Flow Depth	Reported Condition
					(ft)	(ft)	(ft)	(ft)	(%)		(inches)	(inches)			(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(ft)	
1	Link-12		Bleed-2	EXST CB CACT	35.43	1403.50	1402.22	1.28	3.6100	CIRCULAR	24.000	24.00	0.0150	0.5000	21.11	0 00:24	12.23	0.05	37.27	0.57	0.54	1.08	Calculated
2	PIPE-01		CB-1	MH-1	35.48	1411.00	1409.50	1.50	4.2300	CIRCULAR	18.000	18.00	0.0120	1.0000	9.97	0 00:10	12.69	0.05	23.40	0.43	0.46	0.68	Calculated
3	PIPE-02		CB-2	MH-2	43.87	1408.70	1408.00	0.70	1.6000	CIRCULAR	18.000	18.00	0.0120	0.5000	9.94	0 00:10	8.78	0.08	14.37	0.69	0.61	0.92	Calculated
4	PIPE-03		CB-3	MH-3	27.74	1406.00	1405.00	1.00	3.6000	CIRCULAR	18.000	18.00	0.0150	0.5000	8.97	0 00:10	9.86	0.05	17.28	0.52	0.51	0.77	Calculated
5	PIPE-03A		MH-3	HW-03A	59.38	1405.00	1404.50	0.50	0.8400	CIRCULAR	30.000	30.00	0.0120	0.5000	34.53	0 00:11	9.32	0.11	40.77	0.85	0.71	1.77	Calculated
6	PIPE-03B		HW-03B	CB-4A	39.66	1404.00	1403.80	0.20	0.5000	Rectangular	30.000	48.00	0.0120	0.5000	34.40	0 00:11	5.82	0.11	147.65	0.23	0.30	0.74	Calculated
7	PIPE-1		MH-1	MH-2	230.57	1409.50	1408.00	1.50	0.6500	CIRCULAR	30.000	30.00	0.0120	0.5000	16.50	0 00:11	7.20	0.53	35.84	0.46	0.48	1.19	Calculated
8	PIPE-2		MH-2	MH-3	354.58	1408.00	1405.00	3.00	0.8500	CIRCULAR	30.000	30.00	0.0120	0.5000	26.10	0 00:11	8.89	0.66	40.87	0.64	0.58	1.45	Calculated
9	PIPE-4A		CB-4A	CB-4B	43.16	1403.80	1403.70	0.10	0.2300	Rectangular	30.000	48.00	0.0120	0.5000	38.95	0 00:11	4.64	0.16	100.08	0.39	0.42	1.05	Calculated
10	PIPE-4B		CB-4B	HW-04A	32.20	1403.70	1403.60	0.10	0.3100	Rectangular	30.000	48.00	0.0120	0.5000	43.50	0 00:11	6.49	0.08	57.94	0.75	0.67	1.68	Calculated
11	PIPE-5		CB-5	MH-5	91.00	1405.50	1404.00	1.50	1.6500	CIRCULAR	24.000	24.00	0.0120	0.5000	16.84	0 00:12	10.21	0.15	31.46	0.54	0.52	1.04	Calculated
12	PIPE-5A		MH-5	HW-5	22.00	1404.00	1403.60	0.40	1.8200	CIRCULAR	24.000	24.00	0.0120	0.5000	16.81	0 00:12	10.56	0.03	33.05	0.51	0.51	1.01	Calculated
13	PIPE-6A		CB-6A	CB-6B	23.48	1411.00	1410.80	0.20	0.8500	CIRCULAR	18.000	18.00	0.0150	0.5000	4.97	0 00:10	4.95	0.08	8.40	0.59	0.55	0.83	Calculated
14	PIPE-6B		CB-6B	MH-1	244.06	1410.80	1409.50	1.30	0.5300	CIRCULAR	24.000	24.00	0.0120	0.5000	6.86	0 00:10	6.25	0.65	17.89	0.38	0.43	0.86	Calculated

CB-1 TO MH-1 (100-YR)

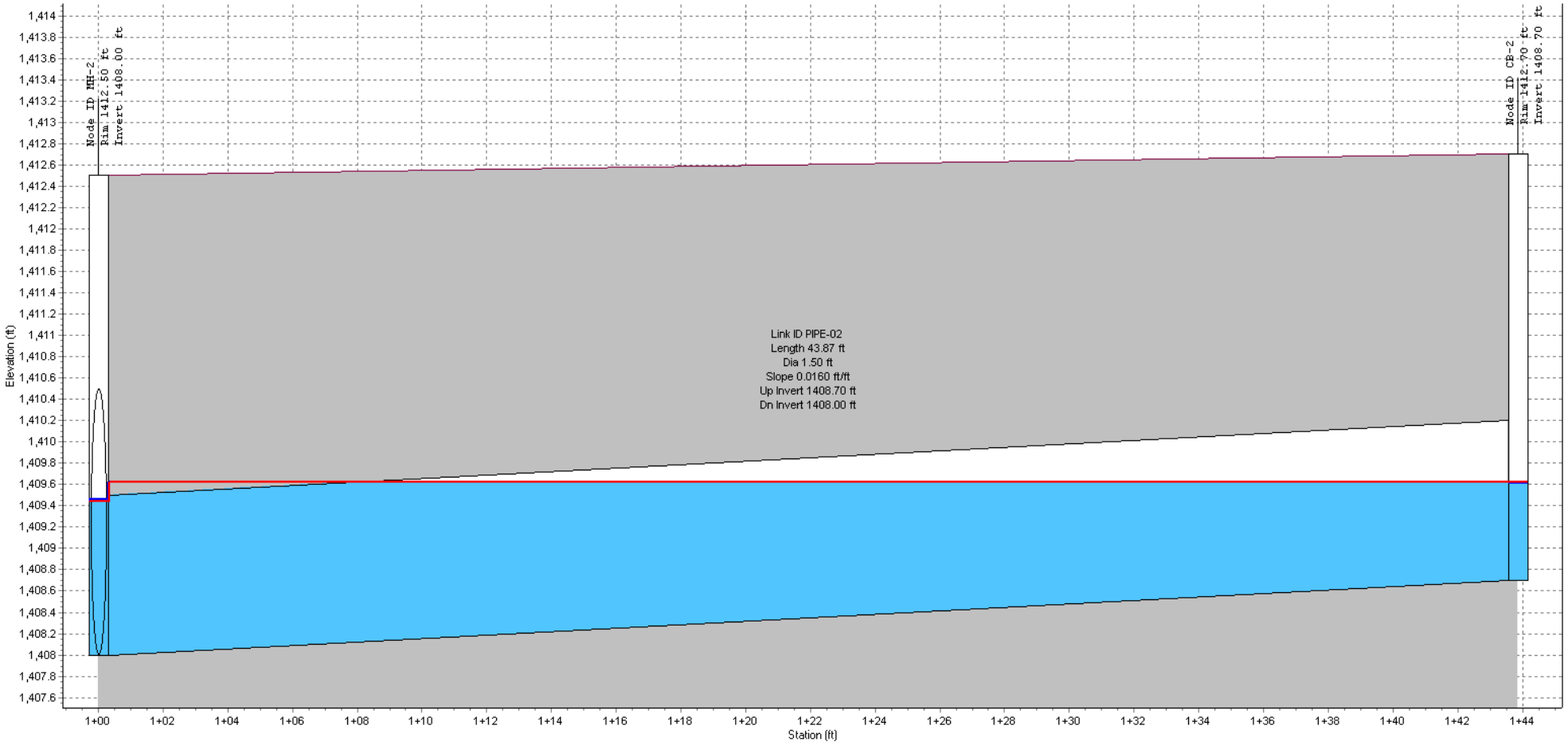
WOLFSPRINGS RANCH



Node ID:	MH-1	CB-1
Rim (ft):	1414.00	1415.00
Invert (ft):	1409.50	1411.00
Min Pipe Cover (ft):	2.00	2.50
Max HGL (ft):	1410.70	1411.69
Link ID:	PIPE-01	
Length (ft):	35.48	
Dia (ft):	1.50	
Slope (ft/ft):	0.0423	
Up Invert (ft):	1411.00	
Dn Invert (ft):	1409.50	
Max Q (cfs):	9.97	
Max Vel (ft/s):	12.69	
Max Depth (ft):	0.68	

CB-2 TO MH-2 (100-YR)

WOLFSPRINGS RANCH

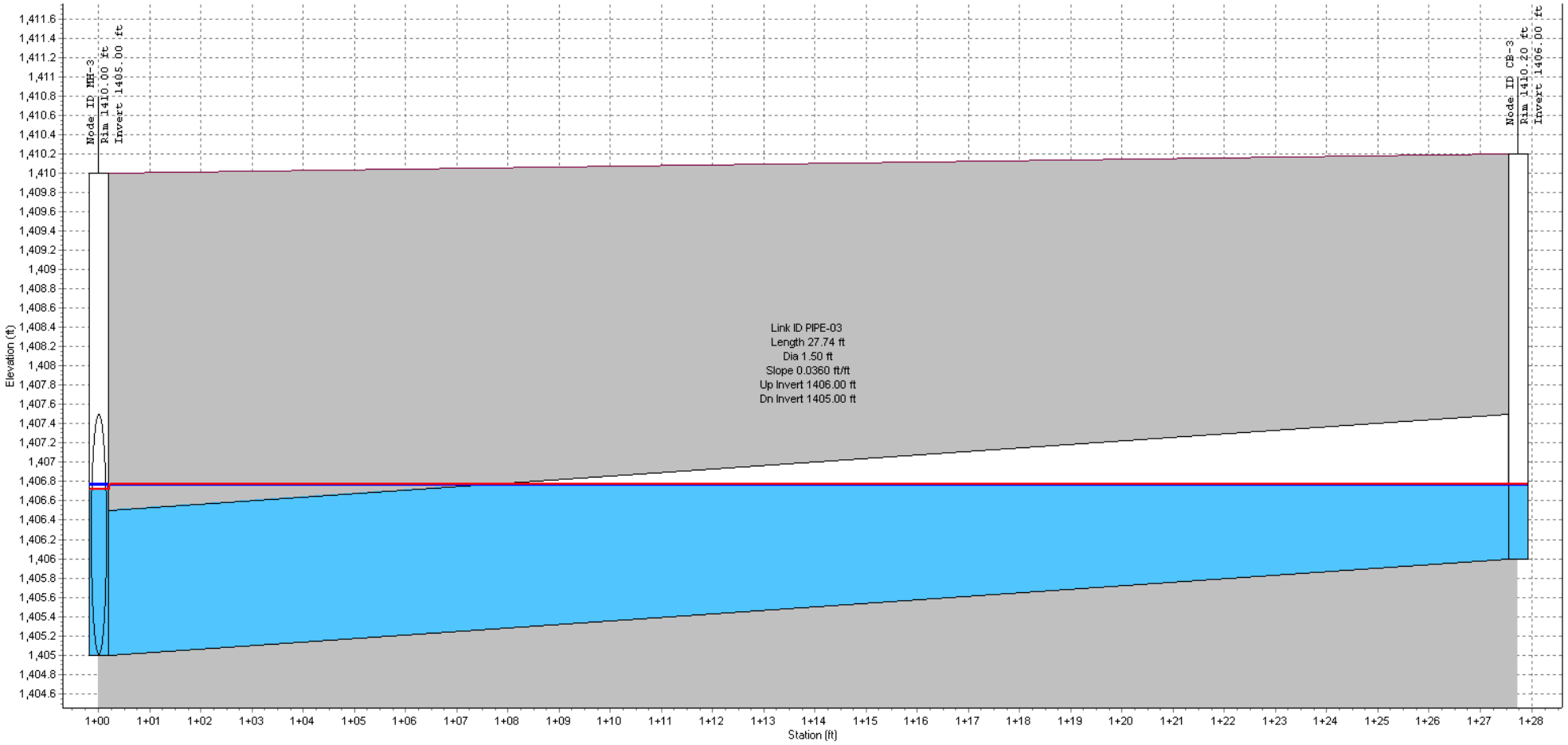


Node ID:	MH-2	CB-2
Rim (ft):	1412.50	1412.70
Invert (ft):	1408.00	1408.70
Min Pipe Cover (ft):	2.00	2.50
Max HGL (ft):	1409.46	1409.62

Link ID:	PIPE-02
Length (ft):	43.87
Dia (ft):	1.50
Slope (ft/ft):	0.0160
Up Invert (ft):	1408.70
Dn Invert (ft):	1408.00
Max Q (cfs):	9.94
Max Vel (ft/s):	8.78
Max Depth (ft):	0.92

CB-3 TO MH-3 (100-YR)

WOLFSPRINGS RANCH

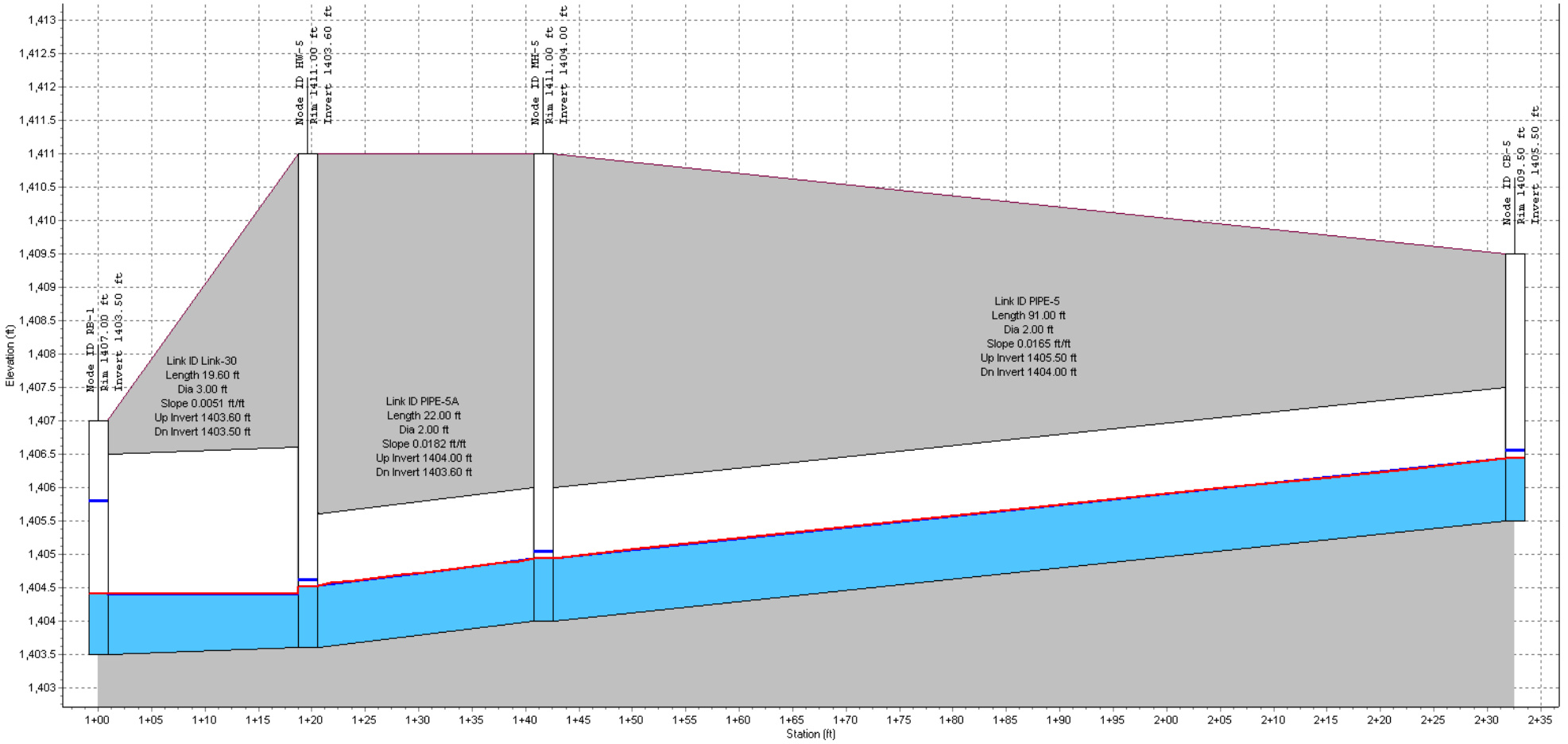


Node ID:	MH-3	CB-3
Rim (ft):	1410.00	1410.20
Invert (ft):	1405.00	1406.00
Min Pipe Cover (ft):	2.50	2.70
Max HGL (ft):	1406.77	1406.77

Link ID:	PIPE-03
Length (ft):	27.74
Dia (ft):	1.50
Slope (ft/ft):	0.0360
Up Invert (ft):	1406.00
Dn Invert (ft):	1405.00
Max Q (cfs):	8.97
Max Vel (ft/s):	9.86
Max Depth (ft):	0.77

CB-5 TO RB-1 (100-YR)

WOLFSPRINGS RANCH

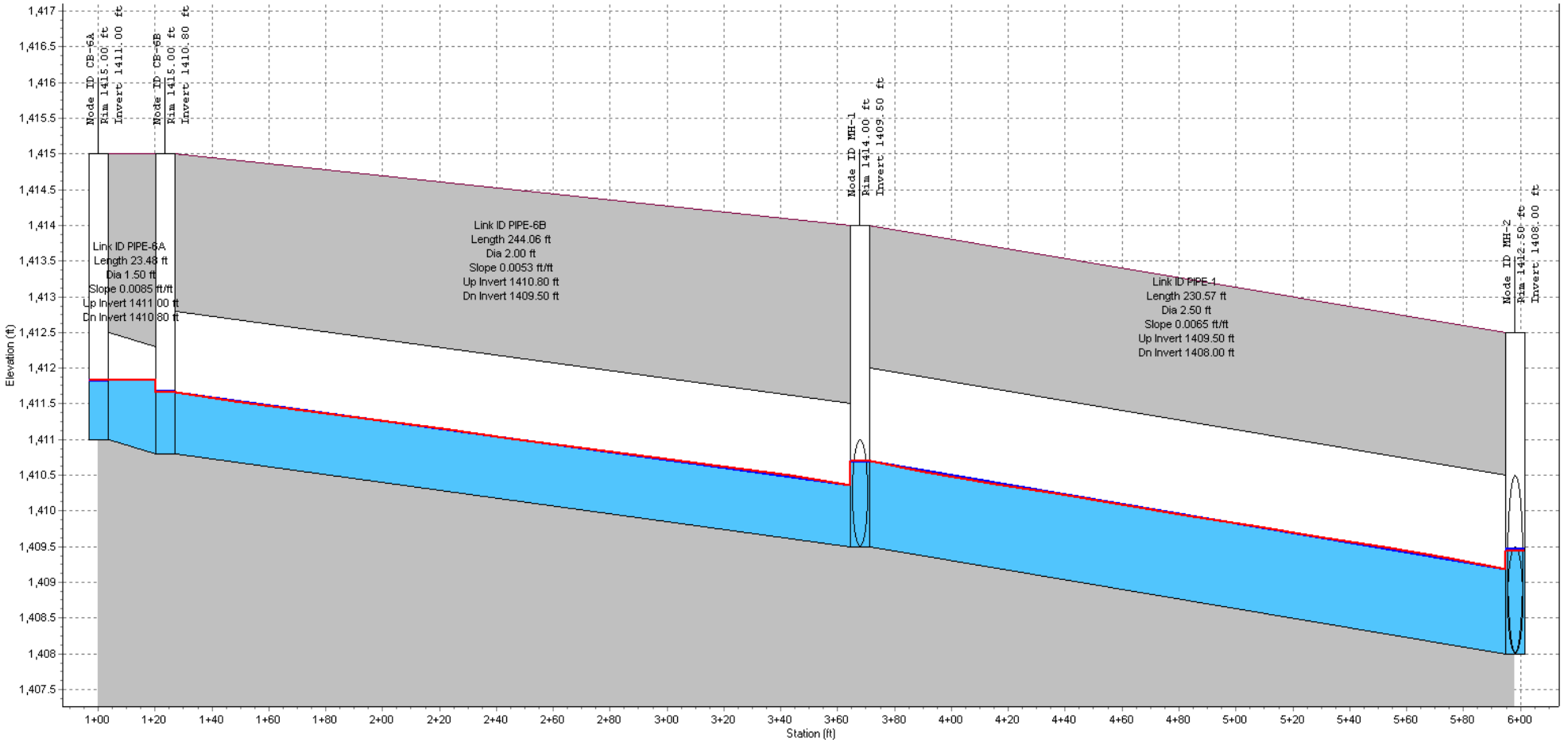


Node ID:	RB-1	HW-5	MH-5	CB-5
Rim (ft):	1407.00	1411.00	1411.00	1409.50
Invert (ft):	1403.50	1403.60	1404.00	1405.50
Min Pipe Cover (ft):		4.40	5.00	2.00
Max HGL (ft):	1405.80	1404.61	1405.04	1406.55

Link ID:	Link-30	PIPE-5A	PIPE-5
Length (ft):	19.60	22.00	91.00
Dia (ft):	3.00	2.00	2.00
Slope (ft/ft):	0.0051	0.0182	0.0165
Up Invert (ft):	1403.60	1404.00	1405.50
Dn Invert (ft):	1403.50	1403.60	1404.00
Max Q (cfs):	16.86	16.81	16.84
Max Vel (ft/s):	1.77	10.56	10.21
Max Depth (ft):	0.43	1.01	1.04

CB-6A TO MH-2 (100-YR)

WOLFSPRINGS RANCH

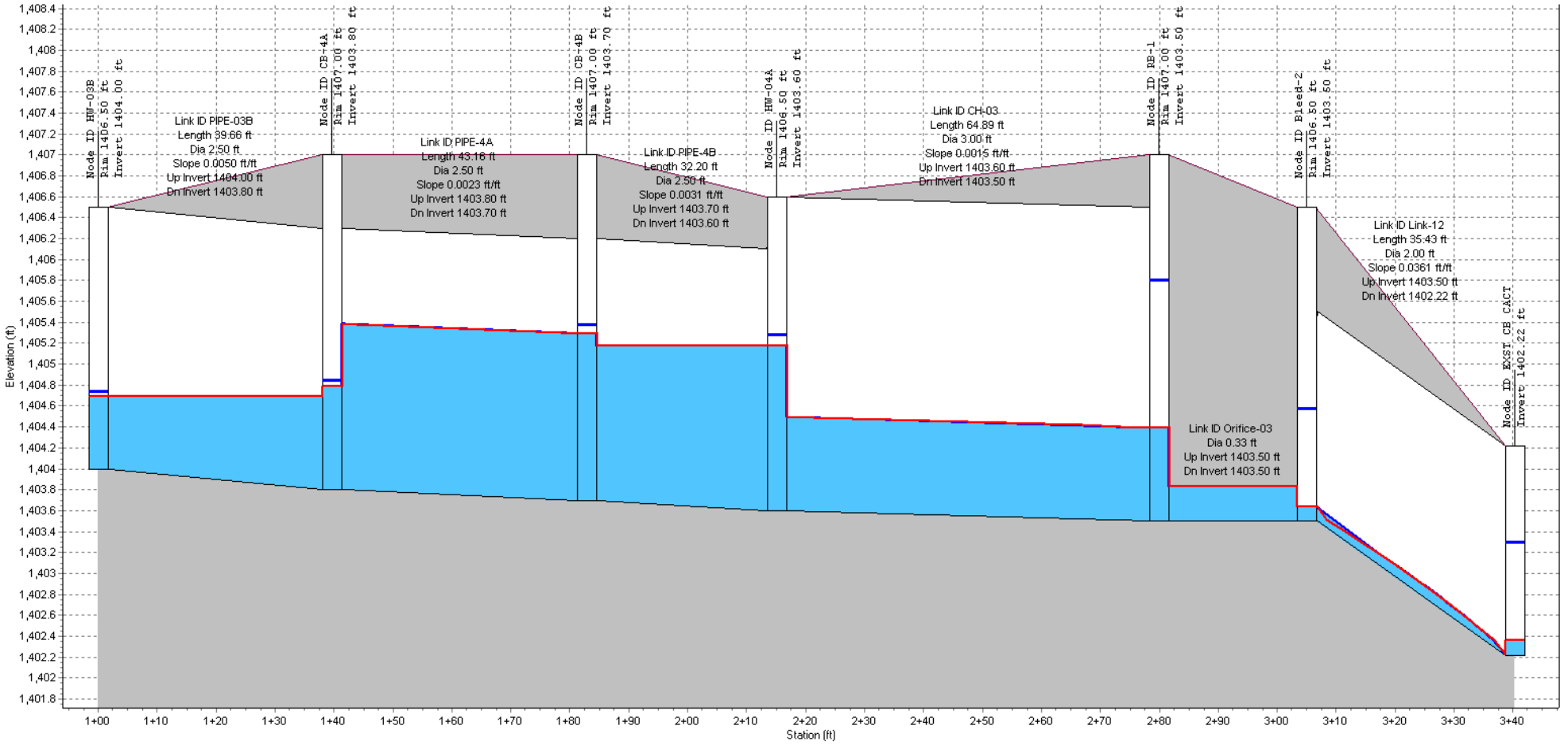


Node ID:	CB-6A	CB-6B	MH-1	MH-2
Rim (ft):	1415.00	1415.00	1414.00	1412.50
Invert (ft):	1411.00	1410.80	1409.50	1408.00
Min Pipe Cover (ft):	2.50	2.20	2.00	2.00
Max HGL (ft):	1411.83	1411.67	1410.70	1409.46

Link ID:	PIPE-6A	PIPE-6B	PIPE-1
Length (ft):	23.48	244.06	230.57
Dia (ft):	1.50	2.00	2.50
Slope (ft/ft):	0.0085	0.0053	0.0065
Up Invert (ft):	1411.00	1410.80	1409.50
Dn Invert (ft):	1410.80	1409.50	1408.00
Max Q (cfs):	4.97	6.86	16.50
Max Vel (ft/s):	4.95	6.25	7.20
Max Depth (ft):	0.83	0.86	1.19

HW-3B TO EXST CB CACTUS (100-YR)

WOLFSPRINGS RANCH

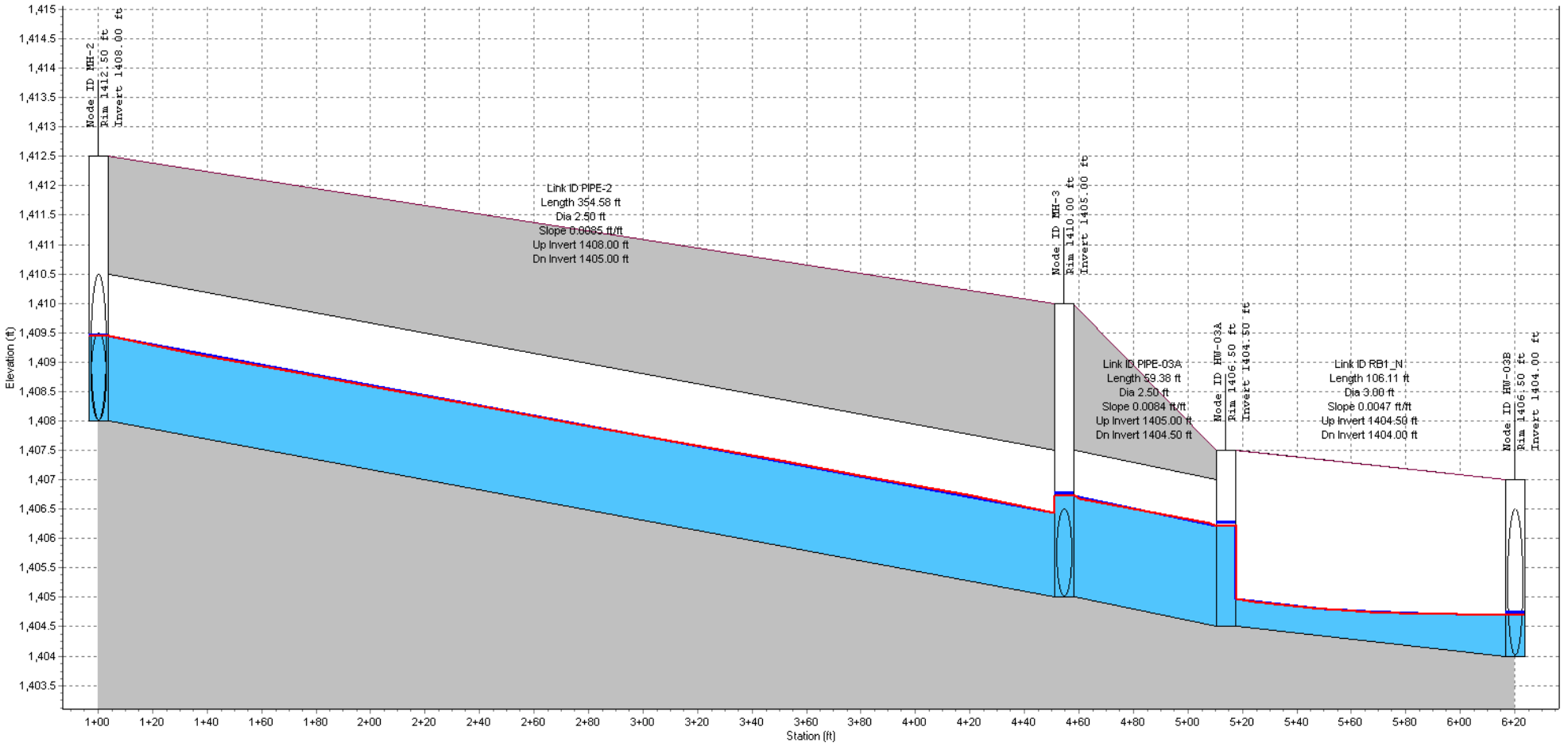


Node ID:	HW-03B	CB-4A	CB-4B	HW-04A	RB-1	Bleed-2	EXST CB CACT
Rim (ft):	1406.50	1407.00	1407.00	1406.50	1407.00	1406.50	
Invert (ft):	1404.00	1403.80	1403.70	1403.60	1403.50	1403.50	1402.22
Min Pipe Cover (ft):	0.00	0.70	0.80	0.00		0.00	
Max HGL (ft):	1404.74	1404.85	1405.38	1405.28	1405.80	1404.58	1403.30

Link ID:	PIPE-03B	PIPE-4A	PIPE-4B	CH-03	Orifice-03	Link-12
Length (ft):	39.66	43.16	32.20	64.89		35.43
Dia (ft):	2.50	2.50	2.50	3.00	0.33	2.00
Slope (ft/ft):	0.0050	0.0023	0.0031	0.0015		0.0361
Up Invert (ft):	1404.00	1403.80	1403.70	1403.60	1403.50	1403.50
Dn Invert (ft):	1403.80	1403.70	1403.60	1403.50	1403.50	1402.22
Max Q (cfs):	34.40	38.95	43.50	43.39	0.63	21.11
Max Vel (ft/s):	5.82	4.64	6.49	2.00	0.00	12.23
Max Depth (ft):	0.74	1.05	1.68	0.92	0.00	1.08

MH-2 TO HW-3B (100-YR)

WOLFSPRINGS RANCH



Node ID:	MH-2	MH-3	HW-03A	HW-03B
Rim (ft):	1412.50	1410.00	1406.50	1406.50
Invert (ft):	1408.00	1405.00	1404.50	1404.00
Min Pipe Cover (ft):	2.00	2.50	0.00	0.00
Max HGL (ft):	1409.46	1406.77	1406.27	1404.74

Link ID:	PIPE-2	PIPE-03A	RB1_N
Length (ft):	354.58	59.38	106.11
Dia (ft):	2.50	2.50	3.00
Slope (ft/ft):	0.0085	0.0084	0.0047
Up Invert (ft):	1408.00	1405.00	1404.50
Dn Invert (ft):	1405.00	1404.50	1404.00
Max Q (cfs):	26.10	34.53	34.41
Max Vel (ft/s):	8.89	9.32	2.33
Max Depth (ft):	1.45	1.77	0.46

Weighted C Calculations

$C_{Landscaping}$	C_{lots}	C_{paved}	P (100-Yr, 2-hr) (in)
0.30	0.64	0.95	2.256

Drainage Area Number	Total Area	Total Area	Landscaping/ Basin Area	Lot Area	Paving Area	Weighted C
DA-1	111986	2.57	9398	80644	21944	0.67
DA-2	202693	4.65	37423	111922	53348	0.66
DA-3	123540	2.84	21753	81799	19988	0.63
DA-4	115654	2.66	26206	70182	19266	0.61
DA-5	146580	3.37	69661	54727	22192	0.53
DA-LARK	33719	0.77	7762	0	25957	0.80
Total		734172 16.9	172203	399274	162695	**0.63** PROJECT WEIGHTED C
						0.53 PRE-PROJECT C

Wolf Springs Ranch
Required Retention Volume

P (100-Yr, 2-hr) (in)[1] =	2.256
Existing Condition 100-yr C value	0.53
Prop Cond Weighted 100-yr C value	0.63

FIRST FLUSH VOLUME VS. DIFFERENTIAL C VOLUME						
DRAINAGE AREA	TOTAL AREA (AC)	WEIGHTED C[2]	FIRST FLUSH VOLUME (AC-FT)	FIRST FLUSH VOLUME (FT^3)	DIFFERENTIAL C VOLUME $(AC\text{-}FT)^3$	DIFFERENTIAL C VOLUME (FT^3)
DA-1	2.57	0.67	0.11	4666	0.05	2105
DA-2	4.65	0.66	0.19	8446	0.09	3811
DA-3	2.84	0.63	0.12	5148	0.05	2323
DA-4	2.66	0.61	0.11	4819	0.05	2174
DA-5	3.37	0.53	0.14	6108	0.06	2756
DA-LARK	0.77	0.80	0.03	1405	0.01	634
		Total[2]	0.70	30591	0.32	13802

Notes: 1. Point 100-yr, 2-Hr rainfall depth per NOAA14 (FCDMC).

2. Weighted C based upon proportion of lotting, paving, and landscaping in each subbasin.

3. 100-year volume based on City of Scottsdale redevelopnet policy where volume is based upon the difference in C values for post-development vs pre-development.

4. Based upon comparision of the first-flush volume and the pre-vs-post "C" volume, the first flush will be provided on the Site because it is greater.

Wolf Springs Ranch
Provided Retention Volume

Provided Volume - Stage-Storage
Retention Basin 1

Elevation	Area	Incremental Vol	Cumulative Vol	Cumulative Vol	Depth
ft	ft^2	ac-ft	ac-ft	ft^3	
1403.5	17992				0
1404.5	25161	0.495	0.50	21577	1
1405.5	32732	0.665	1.16	50523	2
1406.5	40729	0.843	2.00	87254	3

Notes: 1. At the weir crest elevation of 1405.1, the basin stores 38,944 cu-ft. The required first-flush volume is 30,591 cu-ft.

Worksheet for Basin-1 - 4-inch Bleed-off

Project Description

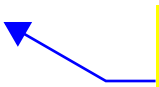
Solve For	Discharge

Input Data

Headwater Elevation	1.50	ft
Centroid Elevation	0.17	ft
Tailwater Elevation	1.00	ft
Discharge Coefficient	0.60	
Diameter	0.33	ft

Results

Discharge	0.29	ft^3/s
Headwater Height Above Centroid	1.33	ft
Tailwater Height Above Centroid	0.83	ft
Flow Area	0.09	ft^2
Velocity	3.40	ft/s



At 0.29 cfs, the required volume (30591 cu-ft) will bleed-off in approximately 29 hours.

Appendix D: 93rd Street Normal Depth Calculations

93rd Street Justification Letter
Email communication from City of Scottsdale

Sections A-A through H-H:
Existing Condition 10-year Normal depth
Proposed Condition 10-year Normal depth
Existing Condition 100-year Normal depth
Proposed Condition 100-year Normal depth

SLATER HANIFAN GROUP

"The Benchmark of Our Profession."

June 26, 2018

Ashley Couch
Drainage and Flood Control Program Manager
City of Scottsdale
3939 North Drinkwater Blvd.
Scottsdale, AZ 85251

Re: Wolf Springs Ranch
Letter of Justification
Scottsdale, AZ

Dear Ashley,

Slater Hanifan (SHG) has been in contact with City staff to discuss the drainage condition of 93rd Street as it relates to the proposed Wolf Springs Ranch development. The purpose of this letter is to formalize the results of the discussions SHG has had with the City that deal specifically with the offsite drainage on 93rd Street. Specifically, this letter discusses the existing condition offsite flow that enters the 93rd Street corridor and flows along the west side of the Site. The existing condition of 93rd Street is a partially paved-on-grade roadway with no curb and gutter for a majority of its length from Larkspur to Cactus Road. The existing corridor conveys the offsite 100-year flow of 170 cfs at a depth that exceeds normal City standards of 8-inches or less. Therefore, the existing 93rd Street does not meet the City's 100-year flow depth requirement.

The proposed development of Wolf Springs Ranch accommodates onsite drainage per City guidelines including stormwater storage, interception and conveyance, freeboard to adjacent 100-year flow elevations, as well as bleed-off to the existing stormdrain in Cactus Road. The Site is designed to fully capture the onsite flows and route them to the retention basin at the SW corner of the Site. The basin stores the first-flush, while the freeboard in the basin provides enough attenuation to reduce the peak 10 and 100-year discharges such that post development peak discharges are less than the existing condition peak discharges before draining into the Cactus Road system. The first-flush storage bleeds off into the existing Cactus Road stormdrain system. In addition, flows offsite to the project have been demonstrated to be conveyed within the surrounding streets and do not enter the Site; nor do onsite flows intermingle with offsite flows other than the reduced peaks discharging at the Site outfall.

The proposed development is to improve the east half of 93rd Street as part of the overall improvements. Moreover, the improvements would reduce the 100-year flow depth in 93rd. The east half of the street is to include a typical cross-slope, with curb and gutter, and attached sidewalk. Based on these provisions, as well as supporting hydraulic calculations, the proposed condition of 93rd Street has been demonstrated to convey the 170 cfs at a depth that is slightly less than the existing condition, but in some cases still exceeds the typical 8-inch depth requirement.

At the City's request, SHG conducted a test model to see what size of underground piping system would be needed to intercept and convey enough flow to reduce the depth to 8-inches. This would require approximately 100 cfs be intercepted from the roadway and conveyed underground. The stormdrain needed would be on the order of 48-inches in diameter. It does not seem feasible to connect to the existing Cactus Road stormdrain because based upon as-built documents for the Cactus Road system the existing stormdrain is a 48-inch diameter pipe and is assumed to have negligible excess capacity; certainly not enough for an additional 100-cfs. The City also

asked SHG to test connecting a new 48-inch system to the existing catch basin on the west side of 93rd Street. This was modeled and does not work based on the limited capacity of the 18-inch pipe connection to the catch basin. This option would also cause the inlets of the new system to surcharge, negating the intent of the stormdrain. Therefore, we concluded that the ultimate solution for this conceptual stormdrain needs to be autonomous; one that provides full conveyance to the south side of Cactus Road without connection to existing systems. The crossing of Cactus Road alone, with a new separate 48-inch stormdrain system, has significant horizontal and vertical challenges with respect to the existing utilities within Cactus.

The traffic impact analysis (TIA) done for Wolf Springs Ranch demonstrates that there is no increase in traffic on 93rd street as a result of the project. We understand that at least a part of the 8-inch flow depth requirement is in support of traffic safety. Based on the reduction in flow depth as a result of the proposed half-street improvements, we maintain that the proposed condition is an improvement upon the existing condition and that the improvements would not worsen the situation from a traffic safety standpoint.

The development of Wolf Springs Ranch does not contribute to or worsen the existing 100-year flow depth within 93rd Street. While we understand the importance of a long-term drainage solution, we do not believe it is the burden of this project to provide that solution. Therefore, we respectfully ask that the proposed development of Wolf Springs Ranch be released from the 8-inch depth requirement in 93rd Street.

Please contact me at 602-753-4946 with any questions regarding this letter.

Sincerely,

Slater Hanifan Group, Inc.

Joe L. Lockett Jr., P.E., CFM
Slater Hanifan Group, Inc.

Registered Professional Engineer (Civil)
CERTIFICATE NO.
45646
JOSEPH L.
LOCKETT, JR.
Date Signed 6-26-18
ARIZONA, U.S.A.
EXPIRES: 12/31/18

Cc: Ms. Shelby Duplessis – The Empire Group

Joe Lockett

From: Couch, Ashley <ACouch@ScottsdaleAz.Gov>
Sent: Monday, June 25, 2018 5:16 PM
To: Joe Lockett
Cc: Jack Moody; Niederer, Keith; Kercher, Phillip; Anderson, Richard; Rahman, Mohammad
Subject: Wolf Springs Ranch

Stormwater Review Manager Rich Anderson and I have reviewed your draft letter dated June 7, 2018, requesting that the city not require the developer of Wolf Springs Ranch to construct a 48-inch storm drain in 93rd Street in order to reduce the off-site longitudinal surface flow to a maximum depth of 8 inches. The City of Scottsdale agrees with this request based on the justification you made in your letter, and based on the fact that flows will exceed this maximum depth of 8 inches only very rarely, and only for brief periods of time. Therefore, the impacts to mobility in 93rd Street are expected to be minimal and are no worse than the current condition.

Please include a copy of this signed letter in the final drainage report. Please also include it in the case drainage report, if you plan to resubmit the case drainage report. If not, we will stipulate that you include the letter in the final drainage report.

We trust that you are satisfied with the city's response to your letter. Please let us know if we may be of additional assistance.

Best regards,

C. Ashley Couch, P.E., CFM
Drainage and Flood Control Program Manager
Floodplain Administrator
City of Scottsdale, Arizona
(480) 312-4317 (phone)
acouch@scottsdaleaz.gov
Stormwater Management
7447 E. Indian School Road, Suite 125
Scottsdale, AZ 85251

Worksheet for Section A - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68.00	1415.44
0+93.00	1415.44
1+00.00	1415.52
1+05.00	1415.56
1+12.40	1415.27
1+16.00	1415.20
1+24.70	1416.47

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68.00, 1415.44)	(0+93.00, 1415.44)	0.025
(0+93.00, 1415.44)	(1+05.00, 1415.56)	0.015
(1+05.00, 1415.56)	(1+24.70, 1416.47)	0.045

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		0.78	ft
Elevation Range	1415.20 to 1416.47 ft		
Flow Area		27.97	ft²
Wetted Perimeter		53.92	ft

Worksheet for Section A - Exst Cond - 10-yr

Results

Hydraulic Radius		0.52	ft
Top Width		53.32	ft
Normal Depth		0.78	ft
Critical Depth		0.56	ft
Critical Slope		0.02061	ft/ft
Velocity		1.93	ft/s
Velocity Head		0.06	ft
Specific Energy		0.83	ft
Froude Number		0.47	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.78	ft
Critical Depth	0.56	ft
Channel Slope	0.00390	ft/ft
Critical Slope	0.02061	ft/ft

Cross Section for Section A - Exst Cond - 10-yr

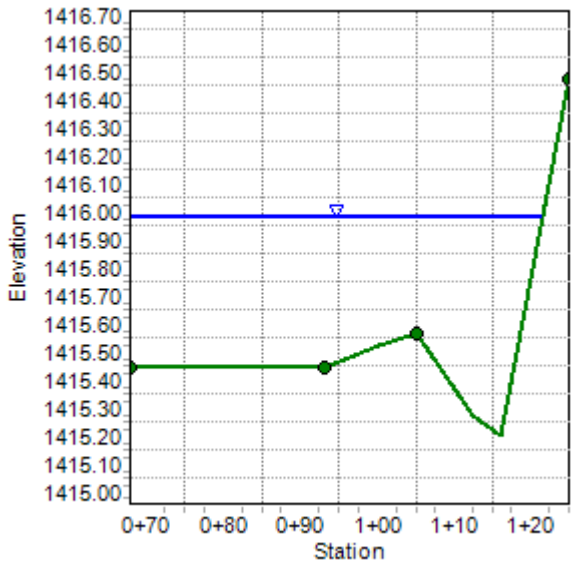
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Normal Depth	0.78	ft
Discharge	54.00	ft^3/s

Cross Section Image



Worksheet for Section A - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68.00	1415.44
0+93.00	1415.44
1+00.00	1415.52
1+19.25	1415.12
1+19.86	1415.09
1+20.40	1415.59
1+22.81	1415.63
1+27.68	1415.59
1+35.38	1415.59
1+39.75	1415.62
1+50.46	1416.68

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68.00, 1415.44)	(1+00.00, 1415.52)	0.025
(1+00.00, 1415.52)	(1+19.25, 1415.12)	0.015
(1+19.25, 1415.12)	(1+27.68, 1415.59)	0.013
(1+27.68, 1415.59)	(1+50.46, 1416.68)	0.040

Options

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

Worksheet for Section A - Prop Cond - 10-yr

Results

Normal Depth		0.75	ft
Elevation Range	1415.09 to 1416.68 ft		
Flow Area		28.39	ft²
Wetted Perimeter		74.63	ft
Hydraulic Radius		0.38	ft
Top Width		74.01	ft
Normal Depth		0.75	ft
Critical Depth		0.62	ft
Critical Slope		0.01516	ft/ft
Velocity		1.90	ft/s
Velocity Head		0.06	ft
Specific Energy		0.81	ft
Froude Number		0.54	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.75	ft
Critical Depth	0.62	ft
Channel Slope	0.00390	ft/ft
Critical Slope	0.01516	ft/ft

Cross Section for Section A - Prop Cond - 10-yr

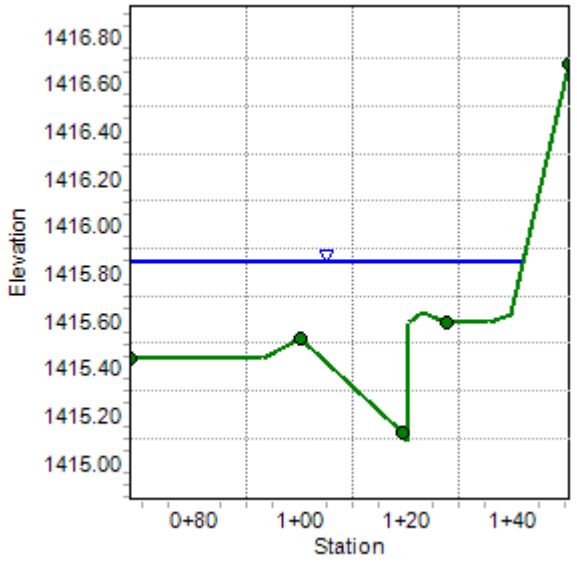
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Normal Depth	0.75	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section A - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68.00	1415.44
0+93.00	1415.44
1+00.00	1415.52
1+05.00	1415.56
1+12.40	1415.27
1+16.00	1415.20
1+24.70	1416.47

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68.00, 1415.44)	(0+93.00, 1415.44)	0.025
(0+93.00, 1415.44)	(1+05.00, 1415.56)	0.015
(1+05.00, 1415.56)	(1+24.70, 1416.47)	0.045

Options

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

Results

Normal Depth	1.33	ft
Elevation Range	1415.20 to 1416.47 ft	
Flow Area	58.52	ft²
Wetted Perimeter	57.95	ft

Worksheet for Section A - Exst Cond - 100-yr

Results

Hydraulic Radius		1.01	ft
Top Width		56.70	ft
Normal Depth		1.33	ft
Critical Depth		0.94	ft
Critical Slope		0.01730	ft/ft
Velocity		2.92	ft/s
Velocity Head		0.13	ft
Specific Energy		1.46	ft
Froude Number		0.51	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.33	ft
Critical Depth	0.94	ft
Channel Slope	0.00390	ft/ft
Critical Slope	0.01730	ft/ft

Cross Section for Section A - Exst Cond - 100-yr

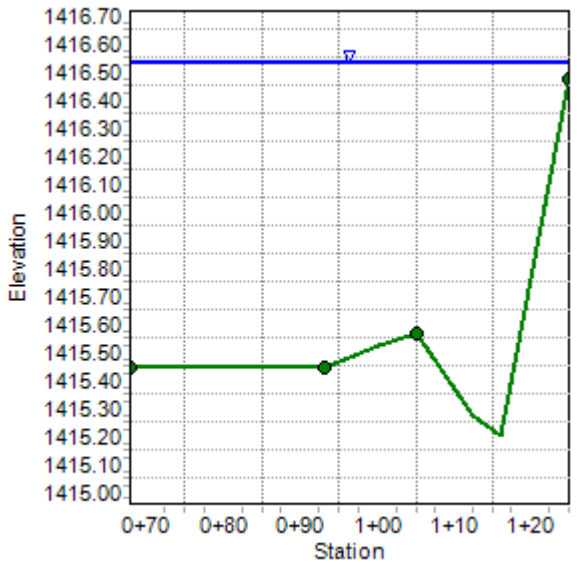
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Normal Depth	1.33	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section A - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68.00	1415.44
0+93.00	1415.44
1+00.00	1415.52
1+19.25	1415.12
1+19.86	1415.09
1+20.40	1415.59
1+22.81	1415.63
1+27.68	1415.59
1+35.38	1415.59
1+39.75	1415.62
1+50.46	1416.68

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68.00, 1415.44)	(0+93.00, 1415.44)	0.025
(0+93.00, 1415.44)	(1+19.25, 1415.12)	0.015
(1+19.25, 1415.12)	(1+27.68, 1415.59)	0.013
(1+27.68, 1415.59)	(1+50.46, 1416.68)	0.040

Options

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

Worksheet for Section A - Prop Cond - 100-yr

Results

Normal Depth		1.15	ft
Elevation Range	1415.09 to 1416.68 ft		
Flow Area		58.34	ft²
Wetted Perimeter		79.02	ft
Hydraulic Radius		0.74	ft
Top Width		77.99	ft
Normal Depth		1.15	ft
Critical Depth		0.92	ft
Critical Slope		0.01212	ft/ft
Velocity		2.93	ft/s
Velocity Head		0.13	ft
Specific Energy		1.28	ft
Froude Number		0.60	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.15	ft
Critical Depth	0.92	ft
Channel Slope	0.00390	ft/ft
Critical Slope	0.01212	ft/ft

Cross Section for Section A - Prop Cond - 100-yr

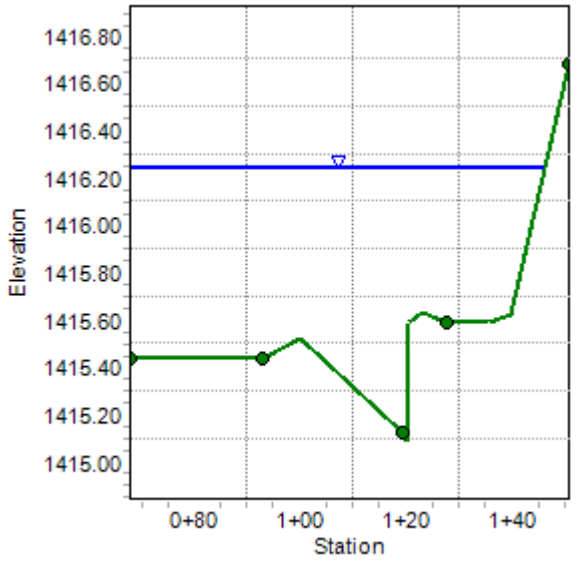
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00390	ft/ft
Normal Depth	1.15	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section B-B - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+67.00	1413.62
0+93.50	1413.63
1+00.00	1413.80
1+05.00	1413.94
1+16.00	1414.10
1+16.30	1414.00
1+25.00	1414.17
1+40.00	1414.47
1+65.00	1414.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+67.00, 1413.62)	(0+93.50, 1413.63)	0.030
(0+93.50, 1413.63)	(1+16.30, 1414.00)	0.015
(1+16.30, 1414.00)	(1+65.00, 1414.50)	0.045

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	0.56	ft
Elevation Range	1413.62 to 1414.50 ft	

Worksheet for Section B-B - Exst Cond - 10-yr

Results

Flow Area		21.82	ft²
Wetted Perimeter		59.00	ft
Hydraulic Radius		0.37	ft
Top Width		58.42	ft
Normal Depth		0.56	ft
Critical Depth		0.47	ft
Critical Slope		0.01758	ft/ft
Velocity		2.48	ft/s
Velocity Head		0.10	ft
Specific Energy		0.65	ft
Froude Number		0.71	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.56	ft
Critical Depth	0.47	ft
Channel Slope	0.00850	ft/ft
Critical Slope	0.01758	ft/ft

Cross Section for Section B-B - Exst Cond - 10-yr

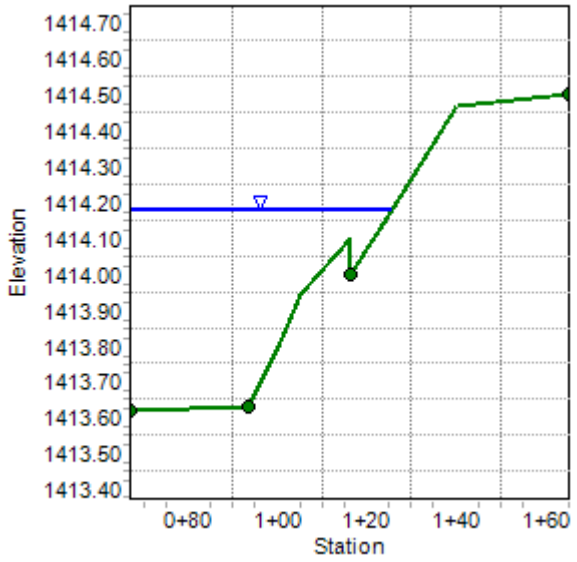
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Normal Depth	0.56	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section B-B - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00790	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+67.00	1413.62
0+93.50	1413.63
1+00.00	1413.80
1+17.00	1413.45
1+18.50	1413.40
1+18.50	1413.90
1+19.00	1413.90
1+25.00	1413.90
1+40.00	1413.83
1+65.00	1415.11

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+67.00, 1413.62)	(0+93.50, 1413.63)	0.030
(0+93.50, 1413.63)	(1+17.00, 1413.45)	0.015
(1+17.00, 1413.45)	(1+25.00, 1413.90)	0.013
(1+25.00, 1413.90)	(1+65.00, 1415.11)	0.040

Options

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

Worksheet for Section B-B - Prop Cond - 10-yr

Results

Normal Depth		0.64	ft
Elevation Range	1413.40 to 1415.11 ft		
Flow Area		24.69	ft²
Wetted Perimeter		77.94	ft
Hydraulic Radius		0.32	ft
Top Width		77.01	ft
Normal Depth		0.64	ft
Critical Depth		0.56	ft
Critical Slope		0.01846	ft/ft
Velocity		2.19	ft/s
Velocity Head		0.07	ft
Specific Energy		0.71	ft
Froude Number		0.68	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.64	ft
Critical Depth	0.56	ft
Channel Slope	0.00790	ft/ft
Critical Slope	0.01846	ft/ft

Cross Section for Section B-B - Prop Cond - 10-yr

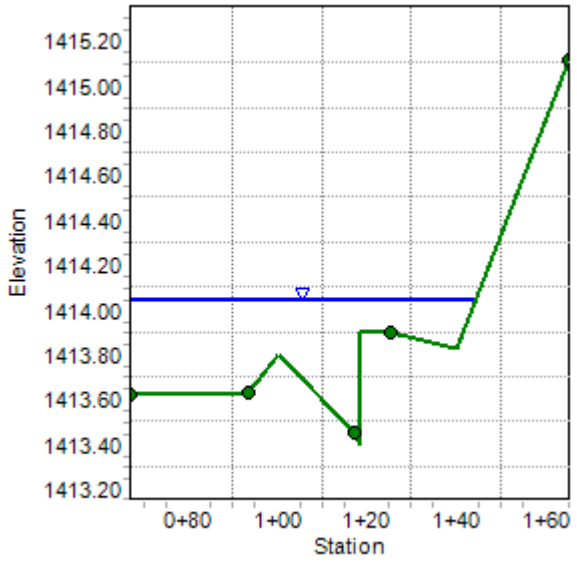
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00790	ft/ft
Normal Depth	0.64	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section B-B - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+67.00	1413.62
0+93.50	1413.63
1+00.00	1413.80
1+05.00	1413.94
1+16.00	1414.10
1+16.30	1414.00
1+25.00	1414.17
1+40.00	1414.47
1+65.00	1414.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+67.00, 1413.62)	(0+93.50, 1413.63)	0.030
(0+93.50, 1413.63)	(1+16.30, 1414.00)	0.015
(1+16.30, 1414.00)	(1+65.00, 1414.50)	0.045

Options

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

Results

Normal Depth	1.07	ft
Elevation Range	1413.62 to 1414.50 ft	

Worksheet for Section B-B - Exst Cond - 100-yr

Results

Flow Area		61.74	ft²
Wetted Perimeter		99.28	ft
Hydraulic Radius		0.62	ft
Top Width		98.00	ft
Normal Depth		1.07	ft
Critical Depth		0.89	ft
Critical Slope		0.02491	ft/ft
Velocity		2.77	ft/s
Velocity Head		0.12	ft
Specific Energy		1.18	ft
Froude Number		0.62	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.07	ft
Critical Depth	0.89	ft
Channel Slope	0.00850	ft/ft
Critical Slope	0.02491	ft/ft

Cross Section for Section B-B - Exst Cond - 100-yr

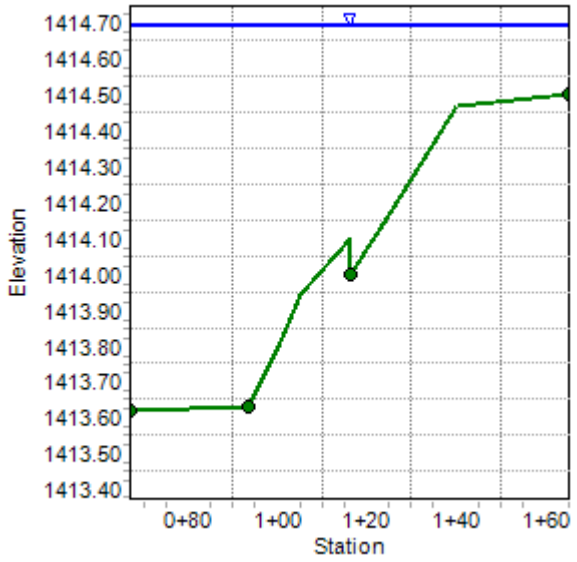
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Normal Depth	1.07	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section B-B - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00790	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+67.00	1413.62
0+93.50	1413.63
1+00.00	1413.80
1+17.00	1413.45
1+18.50	1413.40
1+18.50	1413.90
1+19.00	1413.90
1+25.00	1413.90
1+40.00	1413.83
1+65.00	1415.11

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+67.00, 1413.62)	(0+93.50, 1413.63)	0.030
(0+93.50, 1413.63)	(1+17.00, 1413.45)	0.015
(1+17.00, 1413.45)	(1+25.00, 1413.90)	0.013
(1+25.00, 1413.90)	(1+65.00, 1415.11)	0.040

Options

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

Worksheet for Section B-B - Prop Cond - 100-yr

Results

Normal Depth		0.98	ft
Elevation Range	1413.40 to 1415.11 ft		
Flow Area		52.26	ft²
Wetted Perimeter		84.99	ft
Hydraulic Radius		0.61	ft
Top Width		83.71	ft
Normal Depth		0.98	ft
Critical Depth		0.85	ft
Critical Slope		0.01577	ft/ft
Velocity		3.27	ft/s
Velocity Head		0.17	ft
Specific Energy		1.14	ft
Froude Number		0.73	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.98	ft
Critical Depth	0.85	ft
Channel Slope	0.00790	ft/ft
Critical Slope	0.01577	ft/ft

Cross Section for Section B-B - Prop Cond - 100-yr

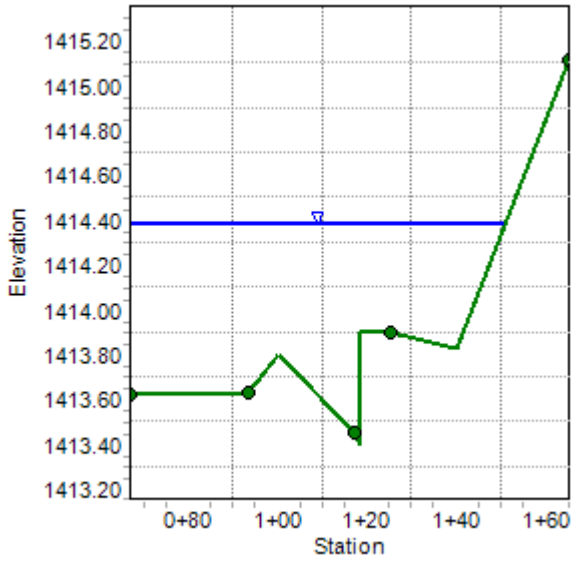
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00790	ft/ft
Normal Depth	0.98	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section C-C - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00970	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1411.75
0+92	1411.75
1+00	1411.81
1+16	1411.93
1+20	1411.04
1+23	1411.44
1+38	1411.96
1+54	1412.99
1+56	1413.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1411.75)	(0+92, 1411.75)	0.030
(0+92, 1411.75)	(1+16, 1411.93)	0.015
(1+16, 1411.93)	(1+56, 1413.00)	0.045

Options

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

Results

Normal Depth	1.04	ft
Elevation Range	1411.04 to 1413.00 ft	

Worksheet for Section C-C - Exst Cond - 10-yr

Results

Flow Area		24.56	ft²
Wetted Perimeter		71.92	ft
Hydraulic Radius		0.34	ft
Top Width		71.46	ft
Normal Depth		1.04	ft
Critical Depth		0.96	ft
Critical Slope		0.02416	ft/ft
Velocity		2.20	ft/s
Velocity Head		0.08	ft
Specific Energy		1.12	ft
Froude Number		0.66	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.04	ft
Critical Depth	0.96	ft
Channel Slope	0.00970	ft/ft
Critical Slope	0.02416	ft/ft

Cross Section for Section C-C - Exst Cond - 10-yr

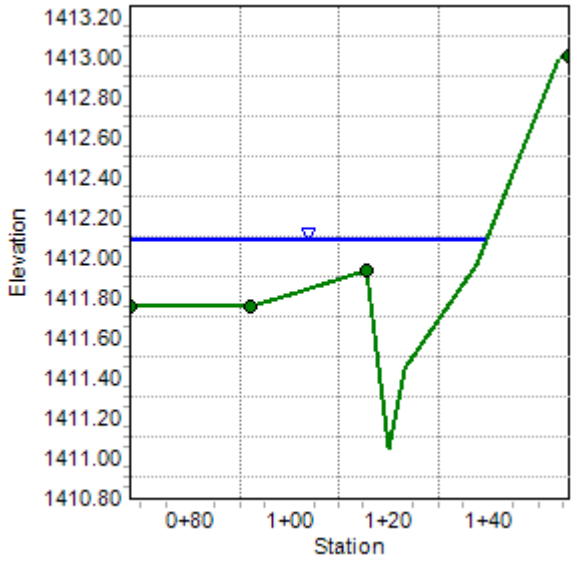
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00970	ft/ft
Normal Depth	1.04	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section C-C - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00980	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1411.75
0+92	1411.75
1+00	1411.81
1+17	1411.47
1+19	1411.41
1+19	1411.90
1+25	1412.00
1+26	1412.09
1+46	1414.60
1+56	1414.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1411.75)	(0+92, 1411.75)	0.030
(0+92, 1411.75)	(1+17, 1411.47)	0.015
(1+17, 1411.47)	(1+25, 1412.00)	0.013
(1+25, 1412.00)	(1+56, 1414.60)	0.040

Options

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

Worksheet for Section C-C - Prop Cond - 10-yr

Results

Normal Depth		0.64	ft
Elevation Range	1411.41 to 1414.60 ft		
Flow Area		18.09	ft²
Wetted Perimeter		58.07	ft
Hydraulic Radius		0.31	ft
Top Width		57.56	ft
Normal Depth		0.64	ft
Critical Depth		0.63	ft
Critical Slope		0.01127	ft/ft
Velocity		2.98	ft/s
Velocity Head		0.14	ft
Specific Energy		0.78	ft
Froude Number		0.94	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.64	ft
Critical Depth	0.63	ft
Channel Slope	0.00980	ft/ft
Critical Slope	0.01127	ft/ft

Cross Section for Section C-C - Prop Cond - 10-yr

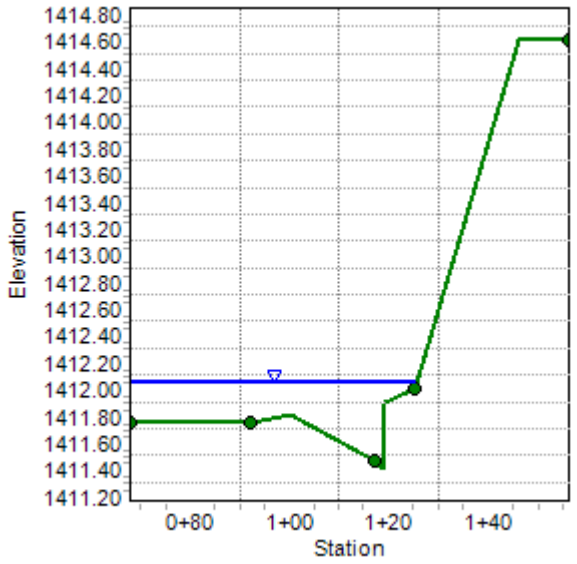
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00980	ft/ft
Normal Depth	0.64	ft
Discharge	54.00	ft^3/s

Cross Section Image



Worksheet for Section C-C - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00970	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1411.75
0+92	1411.75
1+00	1411.81
1+16	1411.93
1+20	1411.04
1+23	1411.44
1+38	1411.96
1+54	1412.99
1+56	1413.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1411.75)	(0+92, 1411.75)	0.030
(0+92, 1411.75)	(1+16, 1411.93)	0.015
(1+16, 1411.93)	(1+56, 1413.00)	0.045

Options

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

Results

Normal Depth	1.41	ft
Elevation Range	1411.04 to 1413.00 ft	

Worksheet for Section C-C - Exst Cond - 100-yr

Results

Flow Area		51.69	ft²
Wetted Perimeter		78.14	ft
Hydraulic Radius		0.66	ft
Top Width		77.30	ft
Normal Depth		1.41	ft
Critical Depth		1.26	ft
Critical Slope		0.02038	ft/ft
Velocity		3.31	ft/s
Velocity Head		0.17	ft
Specific Energy		1.58	ft
Froude Number		0.71	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.41	ft
Critical Depth	1.26	ft
Channel Slope	0.00970	ft/ft
Critical Slope	0.02038	ft/ft

Cross Section for Section C-C - Exst Cond - 100-yr

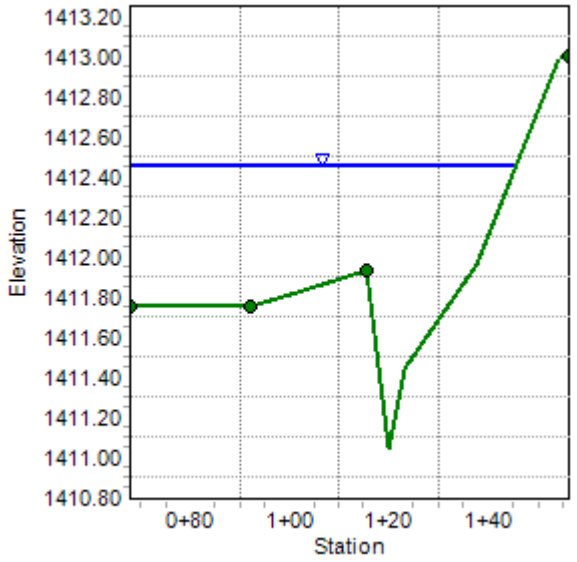
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00970	ft/ft
Normal Depth	1.41	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section C-C - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00980	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1411.75
0+92	1411.75
1+00	1411.81
1+17	1411.47
1+19	1411.41
1+19	1411.90
1+25	1412.00
1+26	1412.09
1+46	1414.60
1+56	1414.60

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1411.75)	(0+92, 1411.75)	0.030
(0+92, 1411.75)	(1+17, 1411.47)	0.015
(1+17, 1411.47)	(1+25, 1412.00)	0.013
(1+25, 1412.00)	(1+56, 1414.60)	0.040

Options

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

Worksheet for Section C-C - Prop Cond - 100-yr

Results

Normal Depth		0.98	ft
Elevation Range	1411.41 to 1414.60 ft		
Flow Area		38.00	ft²
Wetted Perimeter		61.24	ft
Hydraulic Radius		0.62	ft
Top Width		60.37	ft
Normal Depth		0.98	ft
Critical Depth		0.98	ft
Critical Slope		0.00980	ft/ft
Velocity		4.50	ft/s
Velocity Head		0.31	ft
Specific Energy		1.29	ft
Froude Number		1.00	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.98	ft
Critical Depth	0.98	ft
Channel Slope	0.00980	ft/ft
Critical Slope	0.00980	ft/ft

Cross Section for Section C-C - Prop Cond - 100-yr

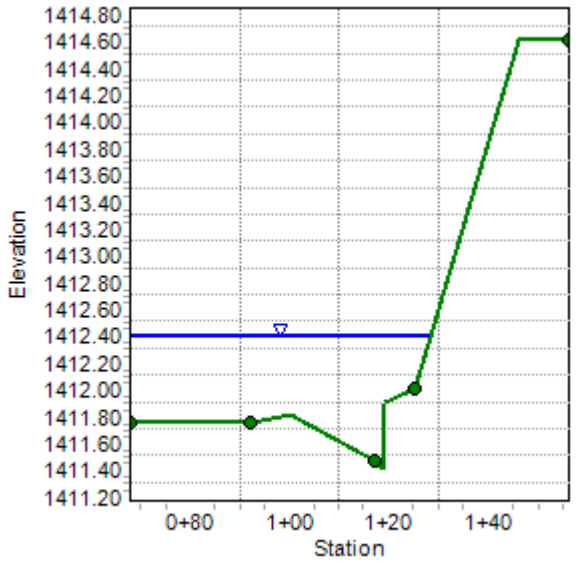
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00980	ft/ft
Normal Depth	0.98	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section D-D - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.62
0+90	1410.62
0+90	1410.66
1+00	1410.79
1+13	1411.01
1+21	1410.44
1+33	1411.96
1+43	1412.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.62)	(0+90, 1410.62)	0.030
(0+90, 1410.62)	(1+13, 1411.01)	0.015
(1+13, 1411.01)	(1+43, 1412.08)	0.040

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	0.86	ft
Elevation Range	1410.44 to 1412.08 ft	
Flow Area	33.48	ft²

Worksheet for Section D-D - Exst Cond - 10-yr

Results

Wetted Perimeter		60.36	ft
Hydraulic Radius		0.55	ft
Top Width		59.60	ft
Normal Depth		0.86	ft
Critical Depth		0.59	ft
Critical Slope		0.01784	ft/ft
Velocity		1.61	ft/s
Velocity Head		0.04	ft
Specific Energy		0.90	ft
Froude Number		0.38	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.86	ft
Critical Depth	0.59	ft
Channel Slope	0.00210	ft/ft
Critical Slope	0.01784	ft/ft

Cross Section for Section D-D - Exst Cond - 10-yr

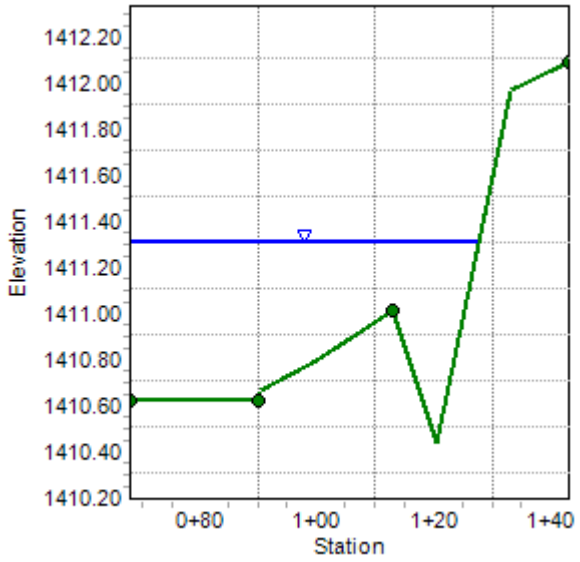
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Normal Depth	0.86	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section D-D - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.62
0+90	1410.62
0+90	1410.66
1+00	1410.79
1+17	1410.42
1+19	1410.36
1+19	1410.86
1+25	1410.95
1+45	1412.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.62)	(0+90, 1410.62)	0.030
(0+90, 1410.62)	(1+17, 1410.42)	0.015
(1+17, 1410.42)	(1+25, 1410.95)	0.013
(1+25, 1410.95)	(1+45, 1412.30)	0.040

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	0.81	ft

Worksheet for Section D-D - Prop Cond - 10-yr

Results

Elevation Range	1410.36 to 1412.30 ft		
Flow Area		29.80	ft²
Wetted Perimeter		61.09	ft
Hydraulic Radius		0.49	ft
Top Width		60.31	ft
Normal Depth		0.81	ft
Critical Depth		0.60	ft
Critical Slope		0.01190	ft/ft
Velocity		1.81	ft/s
Velocity Head		0.05	ft
Specific Energy		0.86	ft
Froude Number		0.45	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.81	ft
Critical Depth	0.60	ft
Channel Slope	0.00210	ft/ft
Critical Slope	0.01190	ft/ft

Cross Section for Section D-D - Prop Cond - 10-yr

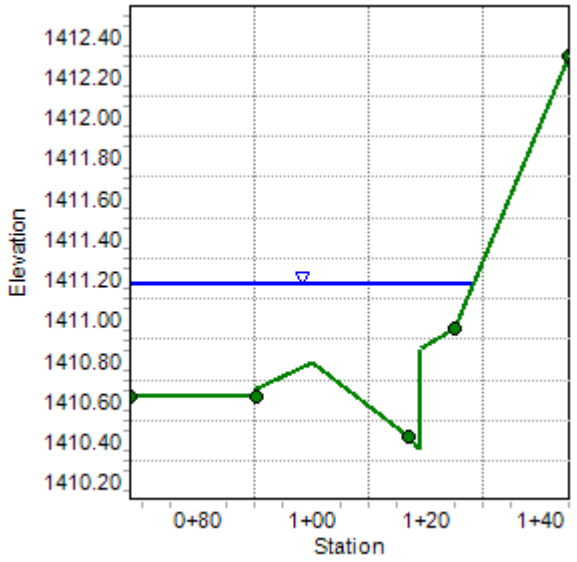
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Normal Depth	0.81	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section D-D - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.62
0+90	1410.62
0+90	1410.66
1+00	1410.79
1+13	1411.01
1+21	1410.44
1+33	1411.96
1+43	1412.08

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.62)	(0+90, 1410.62)	0.030
(0+90, 1410.62)	(1+13, 1411.01)	0.015
(1+13, 1411.01)	(1+43, 1412.08)	0.040

Options

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

Results

Normal Depth	1.46	ft
Elevation Range	1410.44 to 1412.08 ft	
Flow Area	70.77	ft²

Worksheet for Section D-D - Exst Cond - 100-yr

Results

Wetted Perimeter		65.94	ft
Hydraulic Radius		1.07	ft
Top Width		64.54	ft
Normal Depth		1.46	ft
Critical Depth		0.94	ft
Critical Slope		0.01512	ft/ft
Velocity		2.42	ft/s
Velocity Head		0.09	ft
Specific Energy		1.55	ft
Froude Number		0.41	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.46	ft
Critical Depth	0.94	ft
Channel Slope	0.00210	ft/ft
Critical Slope	0.01512	ft/ft

Cross Section for Section D-D - Exst Cond - 100-yr

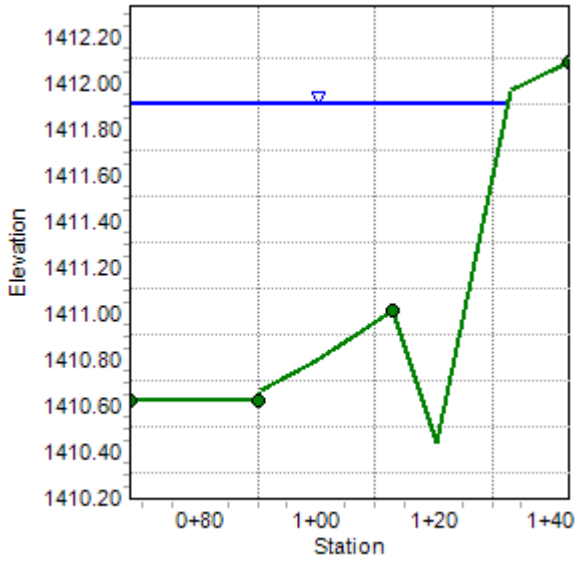
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Normal Depth	1.46	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section D-D - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.62
0+90	1410.62
0+90	1410.66
1+00	1410.79
1+17	1410.42
1+19	1410.36
1+19	1410.86
1+25	1410.95
1+45	1412.30

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.62)	(0+90, 1410.62)	0.030
(0+90, 1410.62)	(1+17, 1410.42)	0.015
(1+17, 1410.42)	(1+25, 1410.95)	0.013
(1+25, 1410.95)	(1+45, 1412.30)	0.040

Options

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

Results

Normal Depth	1.39	ft

Worksheet for Section D-D - Prop Cond - 100-yr

Results

Elevation Range	1410.36 to 1412.30 ft		
Flow Area		67.17	ft²
Wetted Perimeter		70.26	ft
Hydraulic Radius		0.96	ft
Top Width		68.89	ft
Normal Depth		1.39	ft
Critical Depth		0.95	ft
Critical Slope		0.01177	ft/ft
Velocity		2.55	ft/s
Velocity Head		0.10	ft
Specific Energy		1.49	ft
Froude Number		0.45	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.39	ft
Critical Depth	0.95	ft
Channel Slope	0.00210	ft/ft
Critical Slope	0.01177	ft/ft

Cross Section for Section D-D - Prop Cond - 100-yr

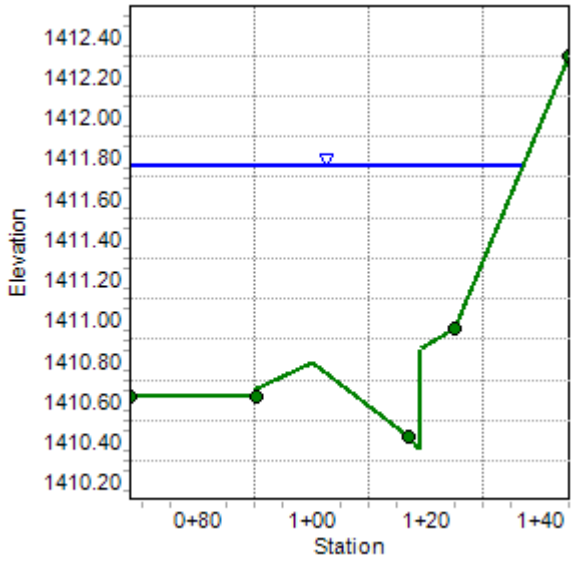
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00210	ft/ft
Normal Depth	1.39	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section E-E - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.06
0+85	1410.06
1+00	1410.00
1+14	1409.91
1+23	1409.50
1+26	1410.00
1+30	1410.10
1+33	1410.50
1+36	1410.40
1+48	1410.35

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.06)	(0+85, 1410.06)	0.030
(0+85, 1410.06)	(1+14, 1409.91)	0.015
(1+14, 1409.91)	(1+48, 1410.35)	0.035

Options

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

Results

Normal Depth	0.85	ft

Worksheet for Section E-E - Exst Cond - 10-yr

Results

Elevation Range	1409.50 to 1410.50 ft		
Flow Area		23.92	ft²
Wetted Perimeter		63.91	ft
Hydraulic Radius		0.37	ft
Top Width		63.54	ft
Normal Depth		0.85	ft
Critical Depth		0.75	ft
Critical Slope		0.01512	ft/ft
Velocity		2.26	ft/s
Velocity Head		0.08	ft
Specific Energy		0.93	ft
Froude Number		0.65	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.85	ft
Critical Depth	0.75	ft
Channel Slope	0.00580	ft/ft
Critical Slope	0.01512	ft/ft

Cross Section for Section E-E - Exst Cond - 10-yr

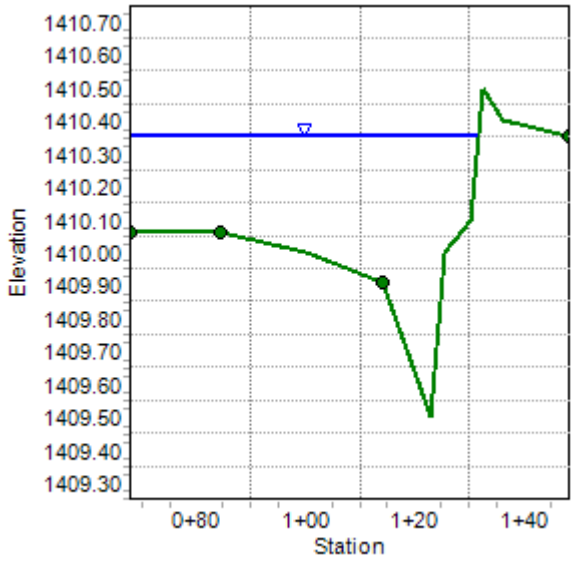
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Normal Depth	0.85	ft
Discharge	54.00	ft^3/s

Cross Section Image



Worksheet for Section E-E - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.06
0+85	1410.06
1+00	1410.00
1+17	1409.63
1+19	1409.60
1+19	1410.06
1+25	1410.15
1+48	1411.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.06)	(0+85, 1410.06)	0.030
(0+85, 1410.06)	(1+17, 1409.63)	0.015
(1+17, 1409.63)	(1+25, 1410.15)	0.013
(1+25, 1410.15)	(1+48, 1411.12)	0.040

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	0.70	ft
Elevation Range	1409.60 to 1411.12 ft	

Worksheet for Section E-E - Prop Cond - 10-yr

Results

Flow Area		18.87	ft²
Wetted Perimeter		60.89	ft
Hydraulic Radius		0.31	ft
Top Width		60.47	ft
Normal Depth		0.70	ft
Critical Depth		0.67	ft
Critical Slope		0.01066	ft/ft
Velocity		2.86	ft/s
Velocity Head		0.13	ft
Specific Energy		0.82	ft
Froude Number		0.90	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.70	ft
Critical Depth	0.67	ft
Channel Slope	0.00850	ft/ft
Critical Slope	0.01066	ft/ft

Cross Section for Section E-E - Prop Cond - 10-yr

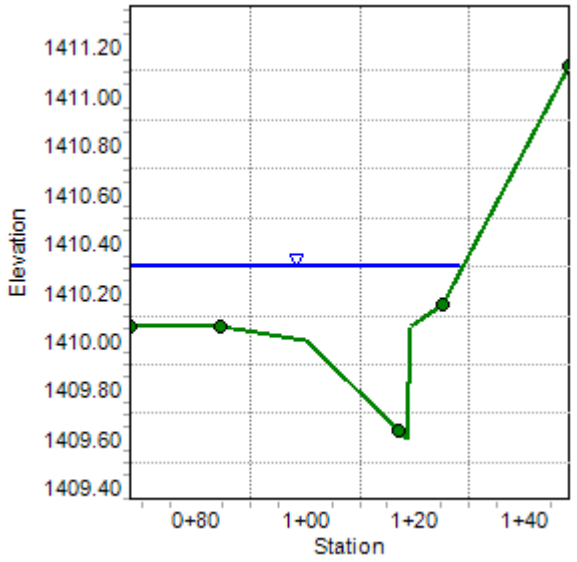
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Normal Depth	0.70	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section E-E - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.06
0+85	1410.06
1+00	1410.00
1+14	1409.91
1+23	1409.50
1+26	1410.00
1+30	1410.10
1+33	1410.50
1+36	1410.40
1+48	1410.35

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.06)	(0+85, 1410.06)	0.030
(0+85, 1410.06)	(1+14, 1409.91)	0.015
(1+14, 1409.91)	(1+48, 1410.35)	0.035

Options

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

Results

Normal Depth	1.25	ft

Worksheet for Section E-E - Exst Cond - 100-yr

Results

Elevation Range	1409.50 to 1410.50 ft		
Flow Area		55.10	ft²
Wetted Perimeter		81.18	ft
Hydraulic Radius		0.68	ft
Top Width		80.00	ft
Normal Depth		1.25	ft
Critical Depth		1.08	ft
Critical Slope		0.01455	ft/ft
Velocity		3.10	ft/s
Velocity Head		0.15	ft
Specific Energy		1.40	ft
Froude Number		0.66	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.25	ft
Critical Depth	1.08	ft
Channel Slope	0.00580	ft/ft
Critical Slope	0.01455	ft/ft

Cross Section for Section E-E - Exst Cond - 100-yr

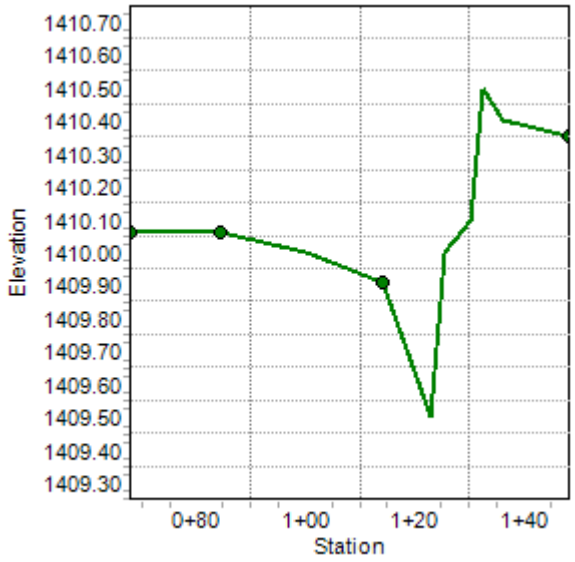
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00580	ft/ft
Normal Depth	1.25	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section E-E - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1410.06
0+85	1410.06
1+00	1410.00
1+17	1409.63
1+19	1409.60
1+19	1410.06
1+25	1410.15
1+48	1411.12

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1410.06)	(0+85, 1410.06)	0.030
(0+85, 1410.06)	(1+17, 1409.63)	0.015
(1+17, 1409.63)	(1+25, 1410.15)	0.013
(1+25, 1410.15)	(1+48, 1411.12)	0.040

Options

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

Results

Normal Depth	1.07	ft
Elevation Range	1409.60 to 1411.12 ft	

Worksheet for Section E-E - Prop Cond - 100-yr

Results

Flow Area		43.15	ft²
Wetted Perimeter		70.15	ft
Hydraulic Radius		0.62	ft
Top Width		69.34	ft
Normal Depth		1.07	ft
Critical Depth		1.02	ft
Critical Slope		0.01108	ft/ft
Velocity		3.96	ft/s
Velocity Head		0.24	ft
Specific Energy		1.31	ft
Froude Number		0.89	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.07	ft
Critical Depth	1.02	ft
Channel Slope	0.00850	ft/ft
Critical Slope	0.01108	ft/ft

Cross Section for Section E-E - Prop Cond - 100-yr

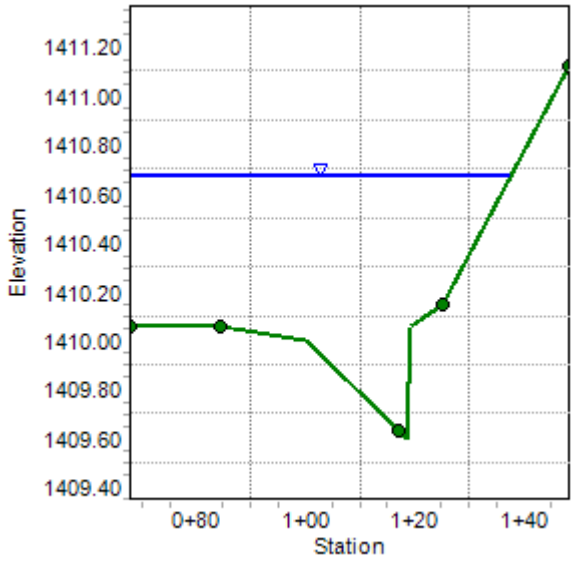
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00850	ft/ft
Normal Depth	1.07	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section F-F - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1407.68
0+83	1407.70
1+00	1408.40
1+17	1408.90
1+25	1409.40

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1407.68)	(0+83, 1407.70)	0.030
(0+83, 1407.70)	(1+17, 1408.90)	0.015
(1+17, 1408.90)	(1+25, 1409.40)	0.025

Options

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

Results

Normal Depth	0.67	ft
Elevation Range	1407.68 to 1409.40 ft	
Flow Area	15.08	ft²
Wetted Perimeter	31.51	ft
Hydraulic Radius	0.48	ft
Top Width	30.82	ft

Worksheet for Section F-F - Exst Cond - 10-yr

Results

Normal Depth		0.67	ft
Critical Depth		0.63	ft
Critical Slope		0.01084	ft/ft
Velocity		3.58	ft/s
Velocity Head		0.20	ft
Specific Energy		0.87	ft
Froude Number		0.90	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.67	ft
Critical Depth	0.63	ft
Channel Slope	0.00870	ft/ft
Critical Slope	0.01084	ft/ft

Cross Section for Section F-F - Exst Cond - 10-yr

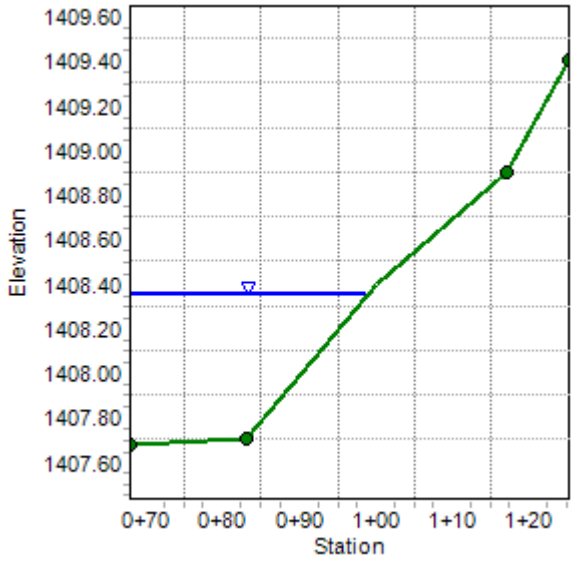
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Normal Depth	0.67	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section F-F - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02460	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1407.70
0+83	1407.70
1+00	1408.40
1+17	1408.10
1+19	1408.00
1+19	1408.50
1+23	1408.55
1+25	1408.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1407.70)	(0+83, 1407.70)	0.030
(0+83, 1407.70)	(1+17, 1408.10)	0.015
(1+17, 1408.10)	(1+23, 1408.55)	0.013
(1+23, 1408.55)	(1+25, 1408.63)	0.040

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	0.51	ft
Elevation Range	1407.70 to 1408.63 ft	

Worksheet for Section F-F - Prop Cond - 10-yr

Results

Flow Area		11.31	ft²
Wetted Perimeter		35.71	ft
Hydraulic Radius		0.32	ft
Top Width		35.10	ft
Normal Depth		0.51	ft
Critical Depth		0.62	ft
Critical Slope		0.01083	ft/ft
Velocity		4.77	ft/s
Velocity Head		0.35	ft
Specific Energy		0.86	ft
Froude Number		1.48	
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	0.51	ft
Critical Depth	0.62	ft
Channel Slope	0.02460	ft/ft
Critical Slope	0.01083	ft/ft

Cross Section for Section F-F - Prop Cond - 10-yr

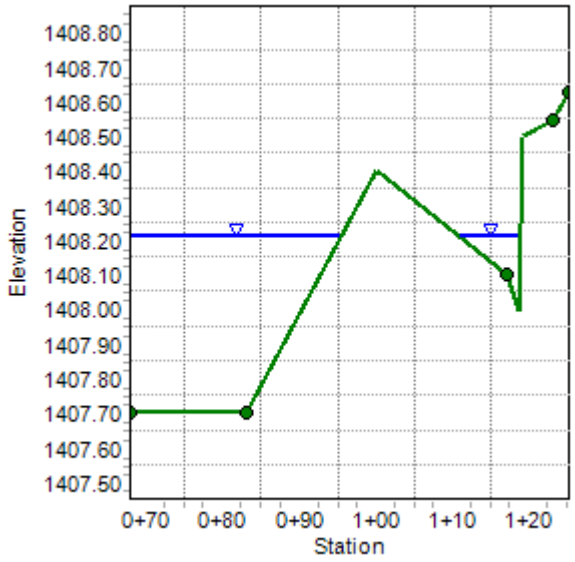
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02460	ft/ft
Normal Depth	0.51	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section F-F - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1407.68
0+83	1407.70
1+00	1408.40
1+17	1408.90
1+25	1409.40

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1407.68)	(0+83, 1407.70)	0.030
(0+83, 1407.70)	(1+17, 1408.90)	0.015
(1+17, 1408.90)	(1+25, 1409.40)	0.025

Options

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

Results

Normal Depth	1.15	ft
Elevation Range	1407.68 to 1409.40 ft	
Flow Area	33.35	ft²
Wetted Perimeter	47.67	ft
Hydraulic Radius	0.70	ft
Top Width	46.51	ft

Worksheet for Section F-F - Exst Cond - 100-yr

Results

Normal Depth		1.15	ft
Critical Depth		1.19	ft
Critical Slope		0.00757	ft/ft
Velocity		5.13	ft/s
Velocity Head		0.41	ft
Specific Energy		1.56	ft
Froude Number		1.07	
Flow Type	Supercritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.15	ft
Critical Depth	1.19	ft
Channel Slope	0.00870	ft/ft
Critical Slope	0.00757	ft/ft

Cross Section for Section F-F - Exst Cond - 100-yr

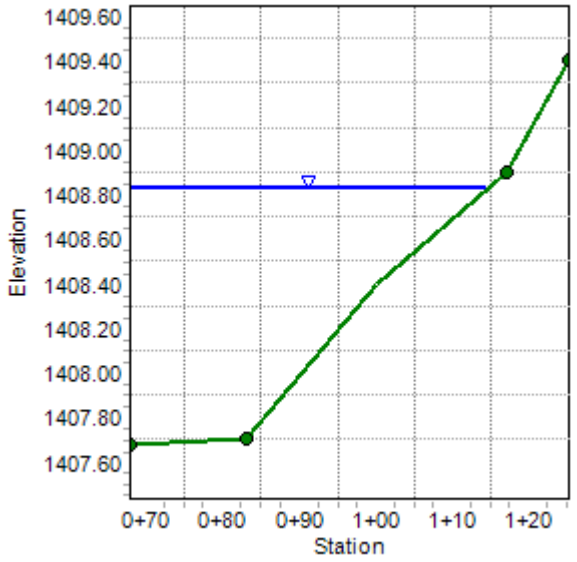
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00870	ft/ft
Normal Depth	1.15	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section F-F - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02460	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1407.70
0+83	1407.70
1+00	1408.40
1+17	1408.10
1+19	1408.00
1+19	1408.50
1+23	1408.55
1+25	1408.63

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1407.70)	(0+83, 1407.70)	0.030
(0+83, 1407.70)	(1+17, 1408.10)	0.015
(1+17, 1408.10)	(1+23, 1408.55)	0.013
(1+23, 1408.55)	(1+25, 1408.63)	0.040

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	0.80	ft
Elevation Range	1407.70 to 1408.63 ft	

Worksheet for Section F-F - Prop Cond - 100-yr

Results

Flow Area		24.87	ft²
Wetted Perimeter		52.29	ft
Hydraulic Radius		0.48	ft
Top Width		51.26	ft
Normal Depth		0.80	ft
Critical Depth		1.03	ft
Critical Slope		0.00738	ft/ft
Velocity		6.88	ft/s
Velocity Head		0.73	ft
Specific Energy		1.54	ft
Froude Number		1.74	
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	0.80	ft
Critical Depth	1.03	ft
Channel Slope	0.02460	ft/ft
Critical Slope	0.00738	ft/ft

Cross Section for Section F-F - Prop Cond - 100-yr

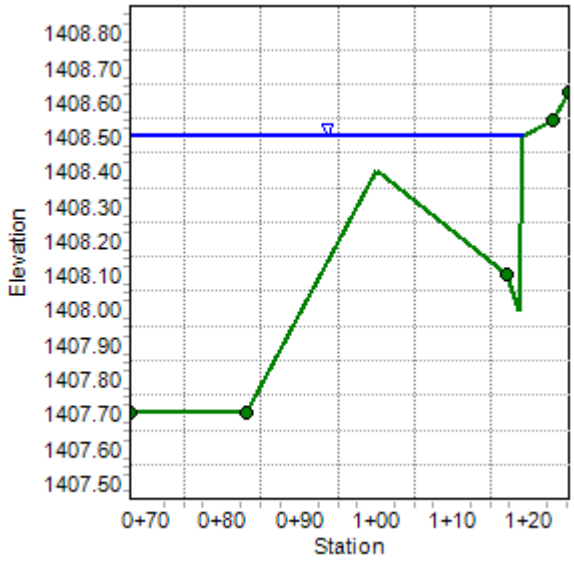
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.02460	ft/ft
Normal Depth	0.80	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section G-G - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00330	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1406.32
0+78	1406.32
0+83	1406.32
0+87	1406.35
0+88	1405.84
0+89	1405.88
1+00	1405.95
1+02	1405.96
1+16	1405.93
1+28	1406.14
1+28	1407.22
1+48	1407.10

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1406.32)	(0+78, 1406.32)	0.035
(0+78, 1406.32)	(0+89, 1405.88)	0.013
(0+89, 1405.88)	(1+16, 1405.93)	0.015
(1+16, 1405.93)	(1+48, 1407.10)	0.035

Options

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

Worksheet for Section G-G - Exst Cond - 10-yr

Results

Normal Depth		0.68	ft
Elevation Range	1405.84 to 1407.22 ft		
Flow Area		26.56	ft²
Wetted Perimeter		60.34	ft
Hydraulic Radius		0.44	ft
Top Width		59.68	ft
Normal Depth		0.68	ft
Critical Depth		0.53	ft
Critical Slope		0.01303	ft/ft
Velocity		2.03	ft/s
Velocity Head		0.06	ft
Specific Energy		0.75	ft
Froude Number		0.54	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.68	ft
Critical Depth	0.53	ft
Channel Slope	0.00330	ft/ft
Critical Slope	0.01303	ft/ft

Cross Section for Section G-G - Exst Cond - 10-yr

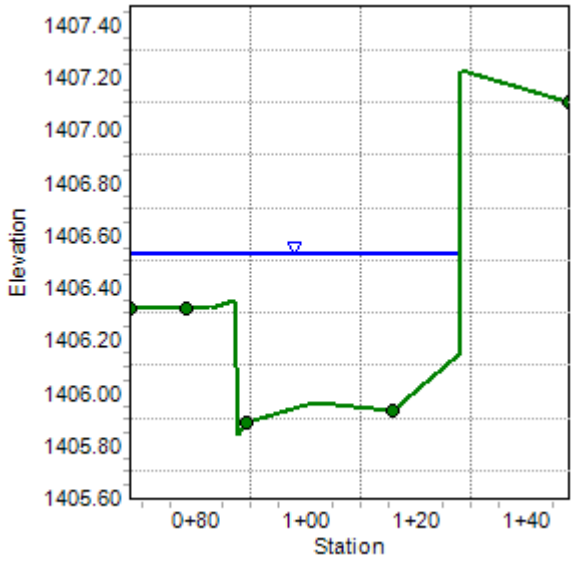
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00330	ft/ft
Normal Depth	0.68	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section G-G - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00540	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1406.32
0+78	1406.32
0+83	1406.32
0+87	1406.35
0+88	1405.84
0+89	1405.88
1+00	1405.95
1+17	1406.10
1+19	1406.10
1+19	1406.60
1+25	1406.65
1+34	1406.85
1+48	1407.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1406.32)	(0+78, 1406.32)	0.035
(0+78, 1406.32)	(0+89, 1405.88)	0.013
(0+89, 1405.88)	(1+17, 1406.10)	0.015
(1+17, 1406.10)	(1+25, 1406.65)	0.013
(1+25, 1406.65)	(1+48, 1407.50)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method

Worksheet for Section G-G - Prop Cond - 10-yr

Options

Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.65	ft
Elevation Range	1405.84 to 1407.50 ft		
Flow Area		19.25	ft²
Wetted Perimeter		51.44	ft
Hydraulic Radius		0.37	ft
Top Width		50.89	ft
Normal Depth		0.65	ft
Critical Depth		0.60	ft
Critical Slope		0.00874	ft/ft
Velocity		2.80	ft/s
Velocity Head		0.12	ft
Specific Energy		0.77	ft
Froude Number		0.80	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.65	ft
Critical Depth	0.60	ft
Channel Slope	0.00540	ft/ft
Critical Slope	0.00874	ft/ft

Cross Section for Section G-G - Prop Cond - 10-yr

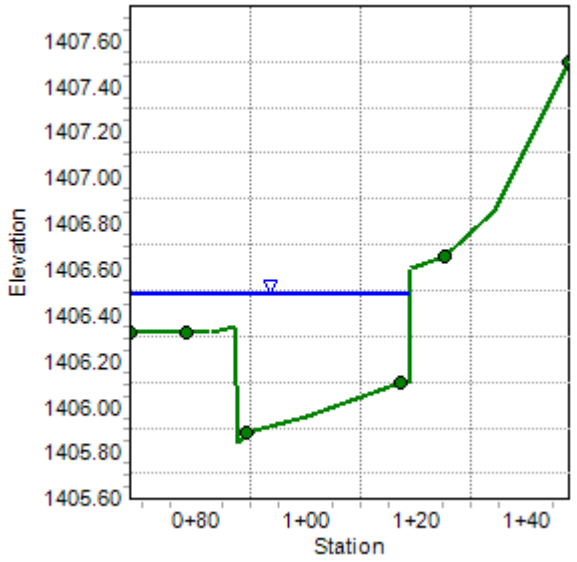
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00540	ft/ft
Normal Depth	0.65	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section G-G - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00330	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1406.32
0+78	1406.32
0+83	1406.32
0+87	1406.35
0+88	1405.84
0+89	1405.88
1+00	1405.95
1+02	1405.96
1+16	1405.93
1+28	1406.14
1+28	1407.22
1+48	1407.10

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1406.32)	(0+78, 1406.32)	0.035
(0+78, 1406.32)	(0+89, 1405.88)	0.013
(0+89, 1405.88)	(1+16, 1405.93)	0.015
(1+16, 1405.93)	(1+48, 1407.10)	0.035

Options

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

Worksheet for Section G-G - Exst Cond - 100-yr

Results

Normal Depth		1.14	ft
Elevation Range	1405.84 to 1407.22 ft		
Flow Area		53.62	ft²
Wetted Perimeter		61.30	ft
Hydraulic Radius		0.87	ft
Top Width		59.89	ft
Normal Depth		1.14	ft
Critical Depth		0.87	ft
Critical Slope		0.01039	ft/ft
Velocity		3.19	ft/s
Velocity Head		0.16	ft
Specific Energy		1.29	ft
Froude Number		0.59	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.14	ft
Critical Depth	0.87	ft
Channel Slope	0.00330	ft/ft
Critical Slope	0.01039	ft/ft

Cross Section for Section G-G - Exst Cond - 100-yr

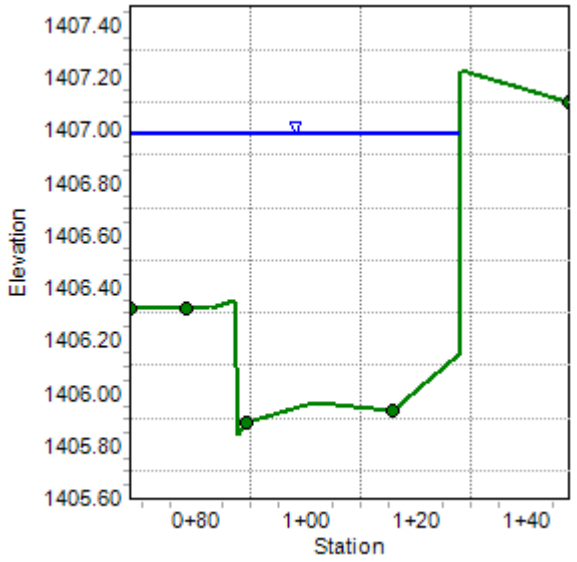
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00330	ft/ft
Normal Depth	1.14	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section G-G - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00540	ft/ft
Discharge	171.00	ft^3/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1406.32
0+78	1406.32
0+83	1406.32
0+87	1406.35
0+88	1405.84
0+89	1405.88
1+00	1405.95
1+17	1406.10
1+19	1406.10
1+19	1406.60
1+25	1406.65
1+34	1406.85
1+48	1407.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1406.32)	(0+78, 1406.32)	0.035
(0+78, 1406.32)	(0+89, 1405.88)	0.013
(0+89, 1405.88)	(1+17, 1406.10)	0.015
(1+17, 1406.10)	(1+25, 1406.65)	0.013
(1+25, 1406.65)	(1+48, 1407.50)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method

Worksheet for Section G-G - Prop Cond - 100-yr

Options

Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.14	ft
Elevation Range	1405.84 to 1407.50 ft		
Flow Area		48.56	ft²
Wetted Perimeter		69.79	ft
Hydraulic Radius		0.70	ft
Top Width		68.70	ft
Normal Depth		1.14	ft
Critical Depth		1.00	ft
Critical Slope		0.01046	ft/ft
Velocity		3.52	ft/s
Velocity Head		0.19	ft
Specific Energy		1.33	ft
Froude Number		0.74	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.14	ft
Critical Depth	1.00	ft
Channel Slope	0.00540	ft/ft
Critical Slope	0.01046	ft/ft

Cross Section for Section G-G - Prop Cond - 100-yr

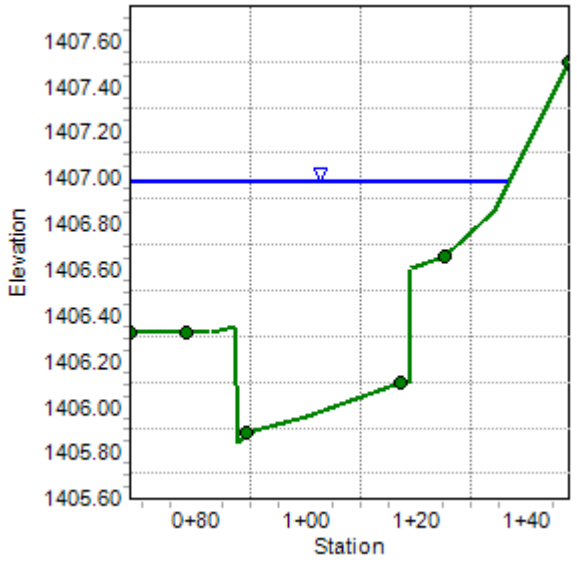
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00540	ft/ft
Normal Depth	1.14	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section H-H - Exst Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00090	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1405.93
0+78	1405.93
0+84	1405.88
0+84	1405.38
0+85	1405.40
1+00	1405.67
1+14	1405.60
1+16	1405.57
1+16	1406.07
1+25	1406.07
1+31	1406.30
1+35	1406.32

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1405.93)	(0+78, 1405.93)	0.035
(0+78, 1405.93)	(0+85, 1405.40)	0.013
(0+85, 1405.40)	(1+14, 1405.60)	0.015
(1+14, 1405.60)	(1+16, 1406.07)	0.013
(1+16, 1406.07)	(1+35, 1406.32)	0.035

Options

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

Worksheet for Section H-H - Exst Cond - 10-yr

Options

Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.08	ft
Elevation Range	1405.38 to 1406.32 ft		
Flow Area		42.58	ft²
Wetted Perimeter		68.38	ft
Hydraulic Radius		0.62	ft
Top Width		67.00	ft
Normal Depth		1.08	ft
Critical Depth		0.65	ft
Critical Slope		0.01398	ft/ft
Velocity		1.27	ft/s
Velocity Head		0.02	ft
Specific Energy		1.10	ft
Froude Number		0.28	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.08	ft
Critical Depth	0.65	ft
Channel Slope	0.00090	ft/ft
Critical Slope	0.01398	ft/ft

Cross Section for Section H-H - Exst Cond - 10-yr

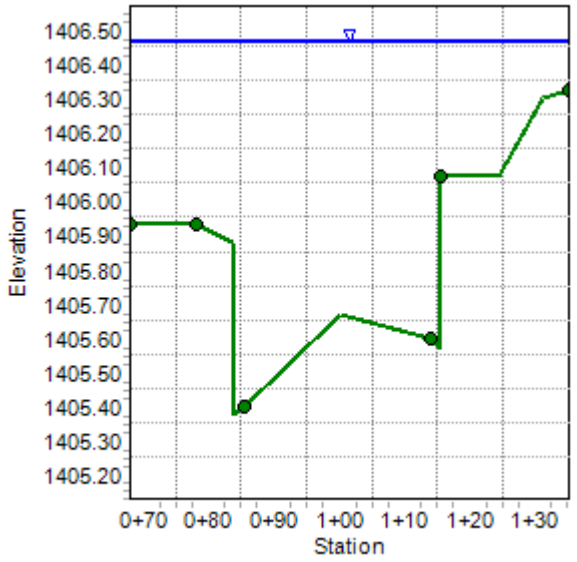
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00090	ft/ft
Normal Depth	1.08	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section H-H - Prop Cond - 10-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00530	ft/ft
Discharge	54.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1405.93
0+78	1405.93
0+84	1405.88
0+84	1405.38
0+85	1405.40
1+00	1405.67
1+10	1405.70
1+17	1405.83
1+19	1405.77
1+19	1406.20
1+25	1406.36
1+36	1406.40
1+39	1407.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1405.93)	(0+78, 1405.93)	0.035
(0+78, 1405.93)	(0+85, 1405.40)	0.013
(0+85, 1405.40)	(1+17, 1405.83)	0.015
(1+17, 1405.83)	(1+25, 1406.36)	0.013
(1+25, 1406.36)	(1+39, 1407.00)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method

Worksheet for Section H-H - Prop Cond - 10-yr

Options

Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		0.72	ft
Elevation Range	1405.38 to 1407.00 ft		
Flow Area		19.41	ft²
Wetted Perimeter		51.40	ft
Hydraulic Radius		0.38	ft
Top Width		50.89	ft
Normal Depth		0.72	ft
Critical Depth		0.67	ft
Critical Slope		0.00882	ft/ft
Velocity		2.78	ft/s
Velocity Head		0.12	ft
Specific Energy		0.84	ft
Froude Number		0.79	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.72	ft
Critical Depth	0.67	ft
Channel Slope	0.00530	ft/ft
Critical Slope	0.00882	ft/ft

Cross Section for Section H-H - Prop Cond - 10-yr

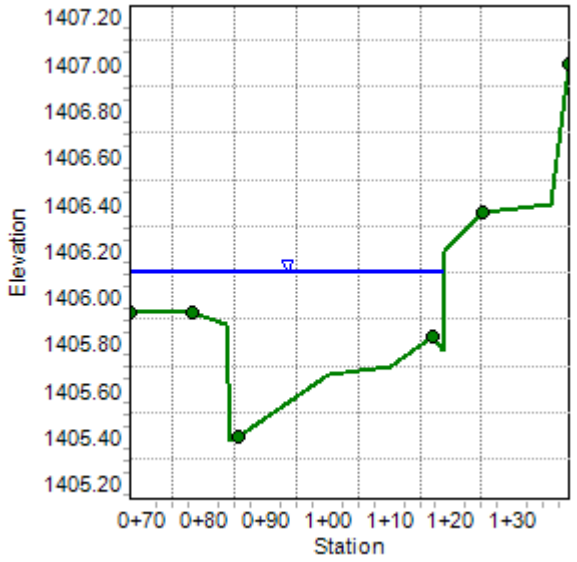
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00530	ft/ft
Normal Depth	0.72	ft
Discharge	54.00	ft³/s

Cross Section Image



Worksheet for Section H-H - Exst Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00090	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1405.93
0+78	1405.93
0+84	1405.88
0+84	1405.38
0+85	1405.40
1+00	1405.67
1+14	1405.60
1+16	1405.57
1+16	1406.07
1+25	1406.07
1+31	1406.30
1+35	1406.32

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1405.93)	(0+78, 1405.93)	0.035
(0+78, 1405.93)	(0+85, 1405.40)	0.013
(0+85, 1405.40)	(1+14, 1405.60)	0.015
(1+14, 1405.60)	(1+16, 1406.07)	0.013
(1+16, 1406.07)	(1+35, 1406.32)	0.035

Options

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

Worksheet for Section H-H - Exst Cond - 100-yr

Options

Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.73	ft
Elevation Range	1405.38 to 1406.32 ft		
Flow Area		86.08	ft²
Wetted Perimeter		69.68	ft
Hydraulic Radius		1.24	ft
Top Width		67.00	ft
Normal Depth		1.73	ft
Critical Depth		1.03	ft
Critical Slope		0.01191	ft/ft
Velocity		1.99	ft/s
Velocity Head		0.06	ft
Specific Energy		1.79	ft
Froude Number		0.31	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.73	ft
Critical Depth	1.03	ft
Channel Slope	0.00090	ft/ft
Critical Slope	0.01191	ft/ft

Cross Section for Section H-H - Exst Cond - 100-yr

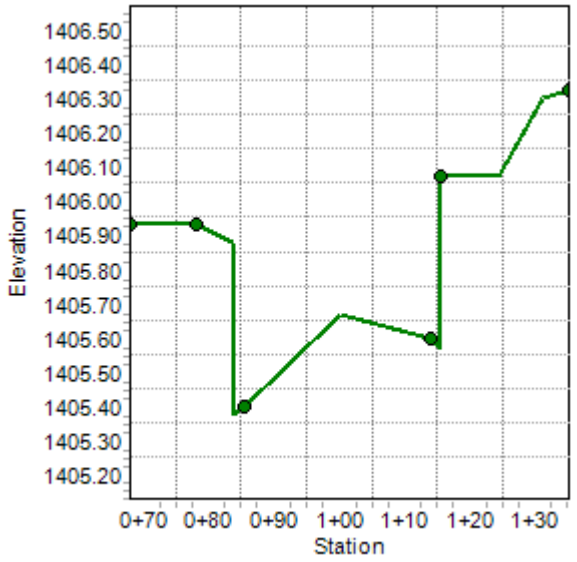
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00090	ft/ft
Normal Depth	1.73	ft
Discharge	171.00	ft³/s

Cross Section Image



Worksheet for Section H-H - Prop Cond - 100-yr

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00530	ft/ft
Discharge	171.00	ft³/s

Section Definitions

Station (ft)	Elevation (ft)
0+68	1405.93
0+78	1405.93
0+84	1405.88
0+84	1405.38
0+85	1405.40
1+00	1405.67
1+10	1405.70
1+17	1405.83
1+19	1405.77
1+19	1406.20
1+25	1406.36
1+36	1406.40
1+39	1407.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+68, 1405.93)	(0+78, 1405.93)	0.035
(0+78, 1405.93)	(0+85, 1405.40)	0.013
(0+85, 1405.40)	(1+17, 1405.83)	0.015
(1+17, 1405.83)	(1+25, 1406.36)	0.013
(1+25, 1406.36)	(1+39, 1407.00)	0.040

Options

Current Roughness Weighted Method	Pavlovskii's Method

Worksheet for Section H-H - Prop Cond - 100-yr

Options

Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth		1.22	ft
Elevation Range	1405.38 to 1407.00 ft		
Flow Area		49.10	ft²
Wetted Perimeter		70.05	ft
Hydraulic Radius		0.70	ft
Top Width		68.99	ft
Normal Depth		1.22	ft
Critical Depth		1.08	ft
Critical Slope		0.01068	ft/ft
Velocity		3.48	ft/s
Velocity Head		0.19	ft
Specific Energy		1.41	ft
Froude Number		0.73	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	1.22	ft
Critical Depth	1.08	ft
Channel Slope	0.00530	ft/ft
Critical Slope	0.01068	ft/ft

Cross Section for Section H-H - Prop Cond - 100-yr

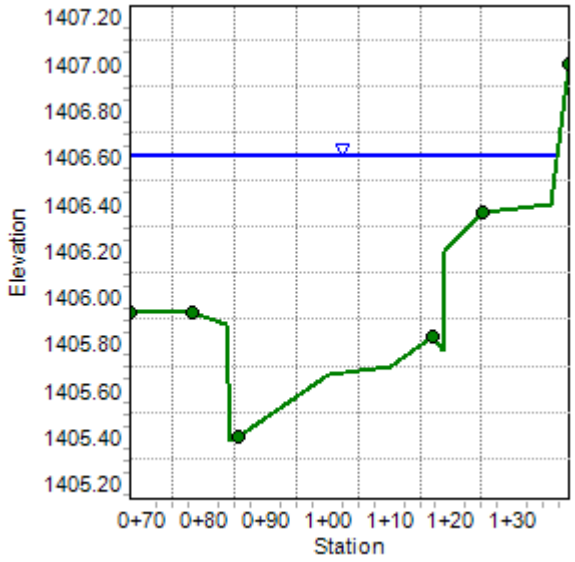
Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.00530	ft/ft
Normal Depth	1.22	ft
Discharge	171.00	ft³/s

Cross Section Image



Exhibits

USGS Quad Map

FEMA FIRMette

Offsite Drainage Map

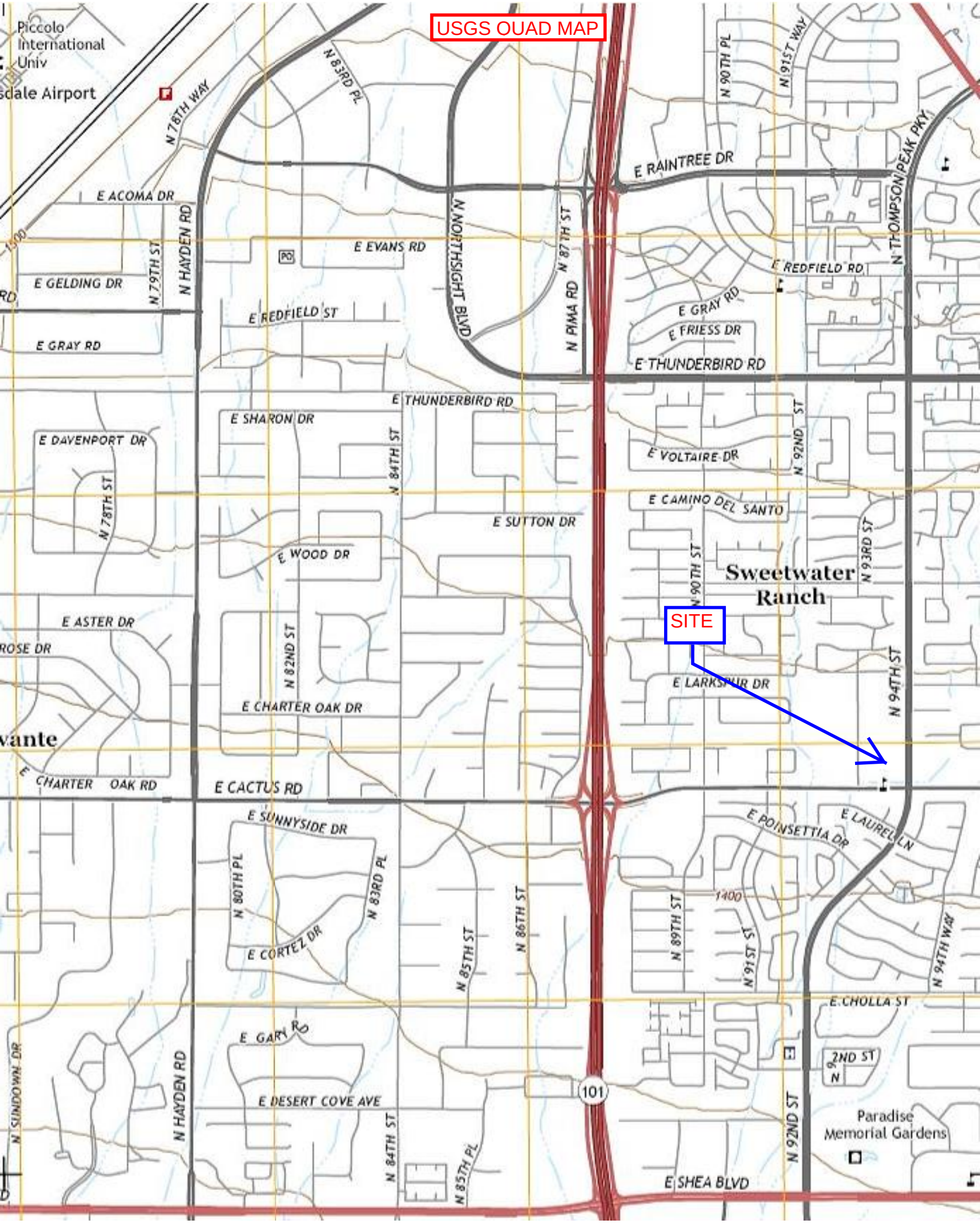
Existing Conditions Drainage Map

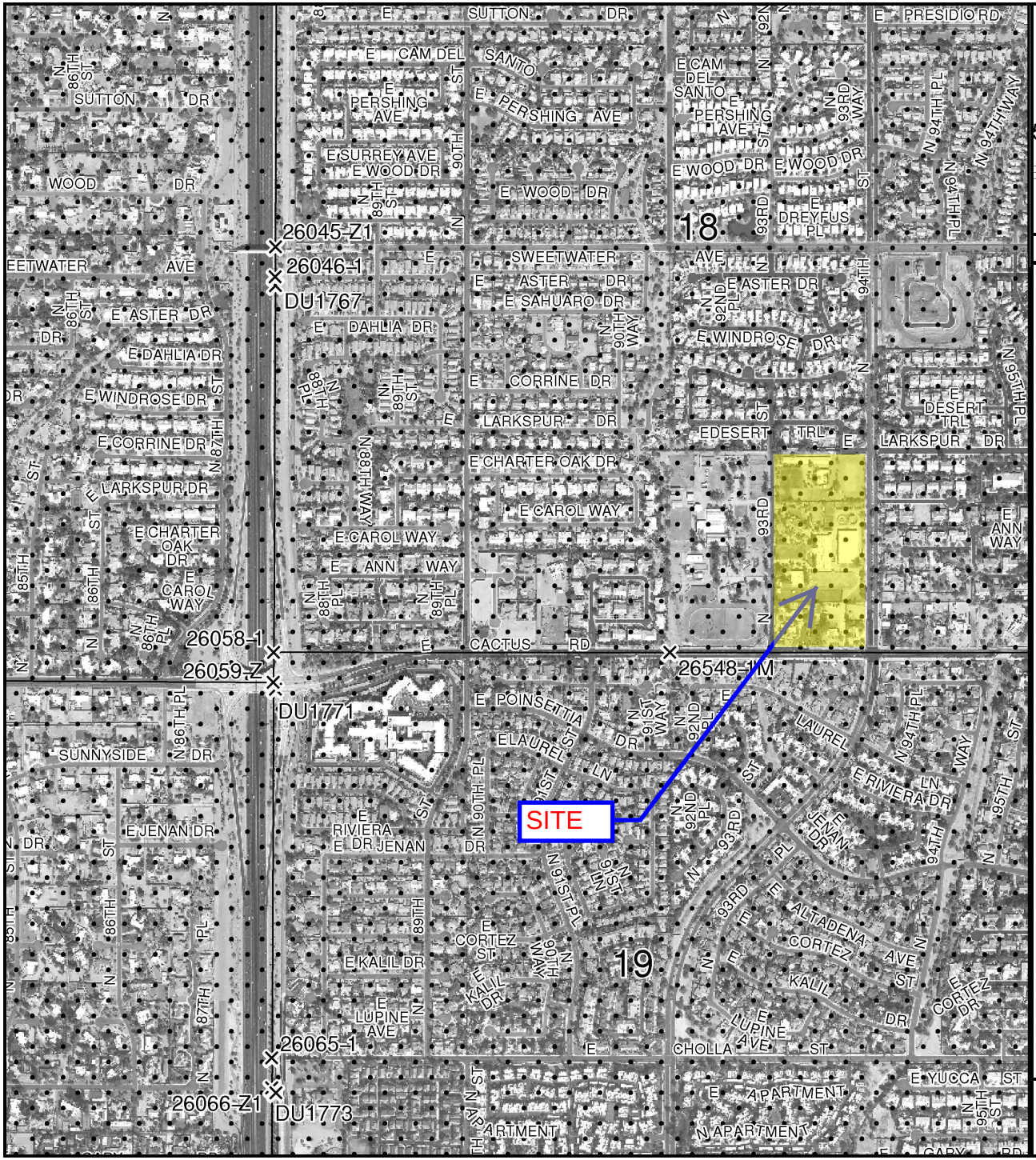
93rd Street Drainage

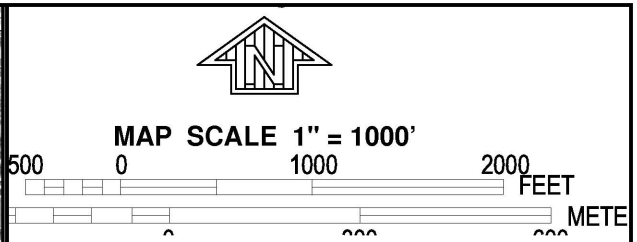
Proposed Conditions Drainage Map

SLATER HANIFAN GROUP

"The Benchmark of Our Profession."


USGS OUAD MAP
Piccolo International Univ
sdale Airport
N 78TH WAY
N 83RD PL
E RAINTREE DR
N 90TH PL
N 91ST WAY
N THOMPSON PEAK PKY
E ACOMA DR
N HAYDEN RD
E EVANS RD
N NORTHSIGHT BLVD
N 87TH ST
N PIMA RD
E REDFIELD RD
E GELDING DR
N 79TH ST
E REDFIELD ST
E GRAY RD
E FRIESS DR
E THUNDERBIRD RD
E SHARON DR
E DAVENPORT DR
N 84TH ST
N 92ND ST
E VOLTAIRE DR
N 78TH ST
E CAMINO DEL SANTO
E SUTTON DR
N 90TH ST
N 93RD ST
E WOOD DR
Sweetwater Ranch
SITE
E ASTER DR
N 82ND ST
E LARKSPUR DR
N 94TH ST
E CHARTER OAK DR
E CHARTER OAK RD
E CACTUS RD
E SUNNYSIDE DR
E POINSETTIA DR
E LAUREL LN
N 80TH PL
N 83RD PL
N 89TH ST
N 91ST ST
N 94TH WAY
E CORTEZ DR
N 85TH ST
N 86TH ST
1400
E CHOLLA ST
E GARY RD
N 92ND ST
N SUNDOWN DR
N HAYDEN RD
E DESERT COVE AVE
101
N 84TH ST
N 85TH PL
E SHEA BLVD
Paradise Memorial Gardens





NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 1760L

FIRM

FLOOD INSURANCE RATE MAP

MARICOPA COUNTY, ARIZONA

AND INCORPORATED AREAS

PANEL 1760 OF 4425

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

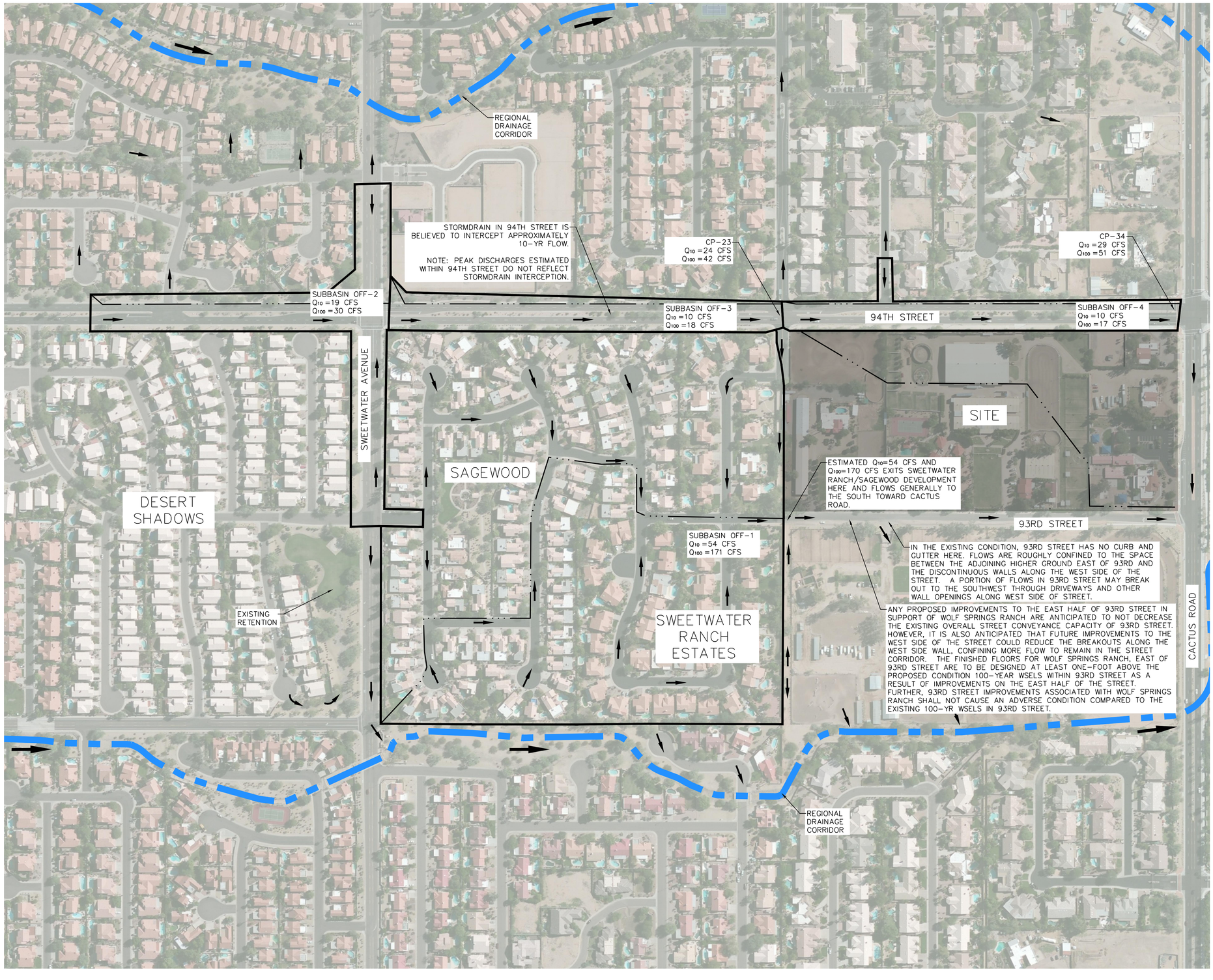
COMMUNITY	NUMBER	PANEL	SUFFIX
MARICOPA COUNTY	040037	1760	L
PARADISE VALLEY, TOWN OF	040049	1760	L
PHOENIX, CITY OF	040051	1760	L
SCOTTSDALE, CITY OF	045012	1760	L

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

MAP NUMBER
04013C1760L

MAP REVISED
OCTOBER 16, 2013

Federal Emergency Management Agency



N

0 150 300
SCALE - 1"=150' FEET

LEGEND

- SUB-BASIN BOUNDARIES
- FLOW DIRECTION
- FLOW PATH

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
11201 N. TATUM BOULEVARD #250, PHOENIX, AZ 85028
PHONE (602) 687-9664

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SCOTTSDALE, AZ

EMPIRE GROUP, LLC

WOLF SPRINGS RANCH

OFFSITE DRAINAGE MAP

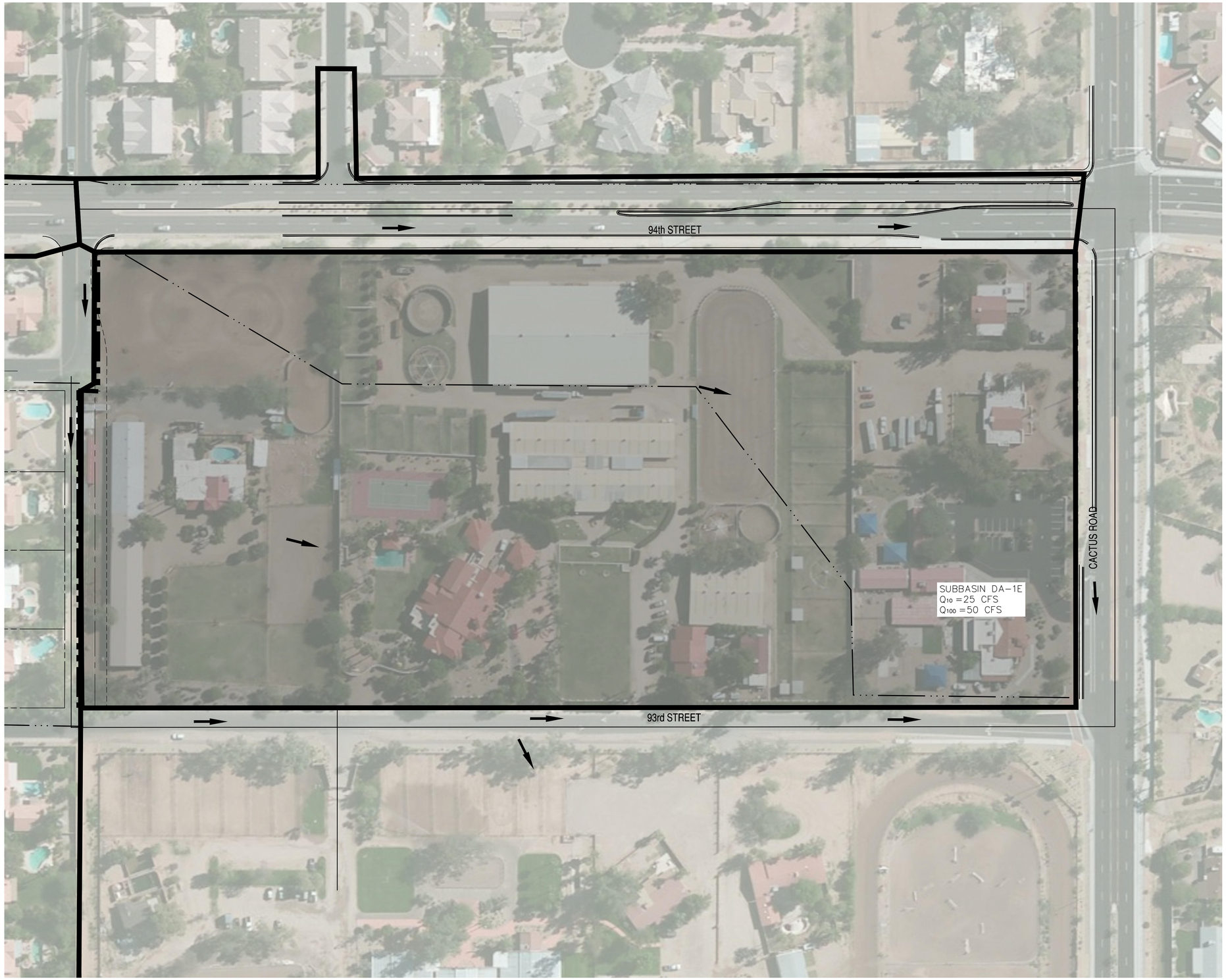
SEC 16
T3N
R5E

DATE: 2-1-18
DRAFTER: JLL
DESIGNER: JLL
CHECKED: PL

PROJECT NO.
TEG1603-000

EX-3A
SHEET 1 OF 1

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com



N

0 60 120

SCALE - 1"=60' FEET

LEGEND

SUB-BASIN BOUNDARIES

FLOW DIRECTION

FLOW PATH

Contact Arizona 811 at least two full working days before you begin excavation

ARIZONA811

Call 811 or click Arizona811.com

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
11201 N. TATUM BOULEVARD #250, PHOENIX, AZ 85028
PHONE (602) 687-9664

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SCOTTSDALE, AZ

EMPIRE GROUP, LLC
WOLF SPRINGS RANCH
EXISTING CONDITION DRAINAGE MAP

SEC 18
T3N
R5E

DATE: 3-12-16

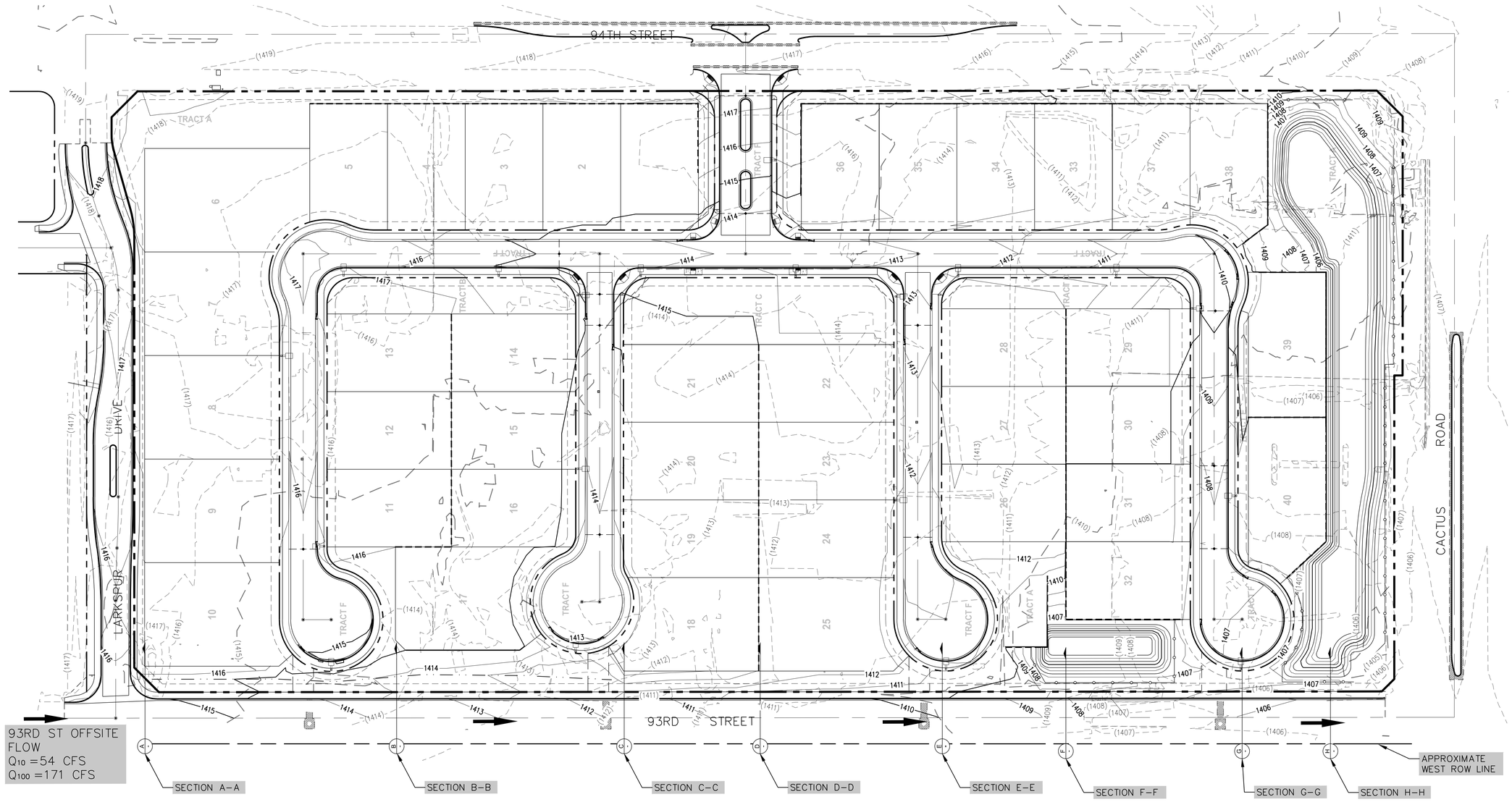
DRAFTER: JLL

DESIGNER: JLL

CHECKED: RT

PROJECT NO.
TEG1603-000

EX-3B
SHEET 1 OF 1



WATER SURFACE ELEVATIONS

	EXST 10–YR	PROP 10–YR	EXST 100–YR	PROP 100–YR
SECTION A–A	1416.0	1415.8	1416.5	1416.2
SECTION B–B	1414.2	1414.0	1414.7	1414.4
SECTION C–C	1412.1	1412.1	1412.5	1412.4
SECTION D–D	1411.3	1411.2	1411.9	1411.8
SECTION E–E	1410.4	1410.3	1410.8	1410.7
SECTION F–F	1408.4	1408.2	1408.8	1408.5
SECTION G–G	1406.5	1406.5	1407.0	1407.0
SECTION H–H	1406.5	1406.1	1407.1	1406.6

N

0 50 100
SCALE – 1"=50' FEET

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
11201 N. TATUM BOULEVARD #250, PHOENIX, AZ 85028
PHONE (602) 687-9664

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SCOTTSDALE, AZ

EMPIRE GROUP, LLC
WOLF SPRINGS RANCH
93RD STREET DRAINAGE - PLAN VIEW

SEC-18
T-3N
R-5E

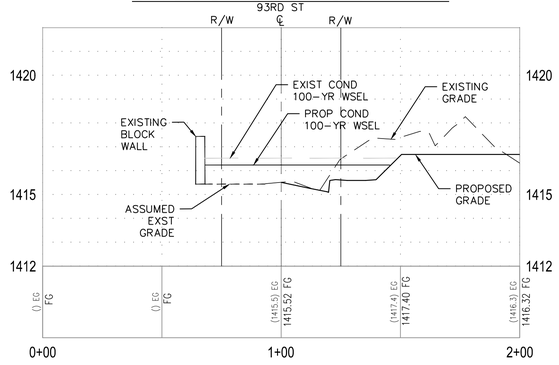
DATE: 6-12-18
DRAFTER: JLL
DESIGNER: JLL
CHECKED: PL

PROJECT NO.
TEG1603-000

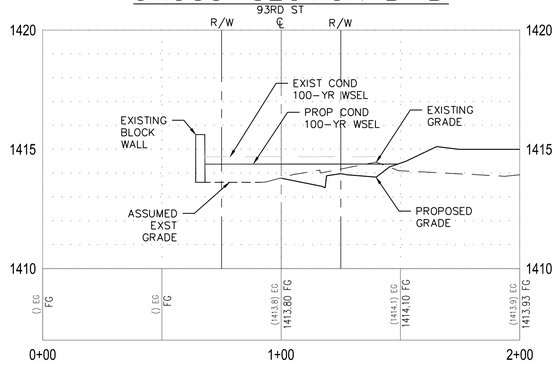
EX-3C
SHEET 1 OF 2

0 15' 30' 60' 90'
1" = 30' HORIZ.
1" = 3' VERT.

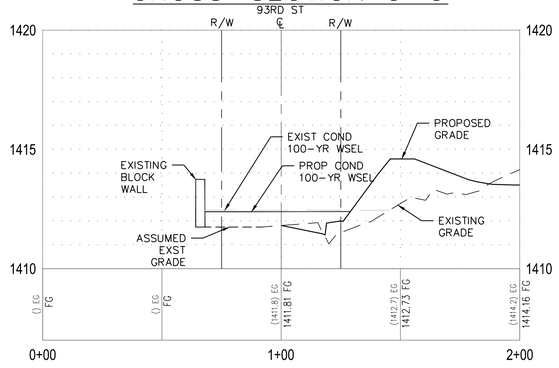
CROSS-SECTION A-A



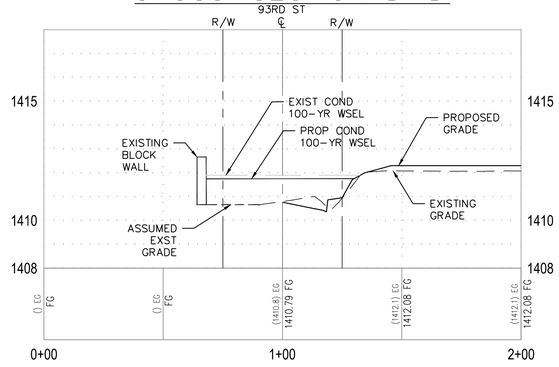
CROSS-SECTION B-B



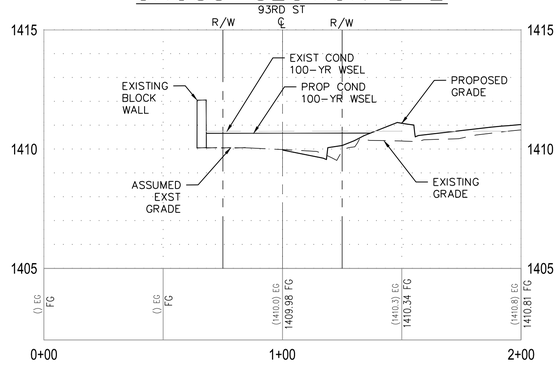
CROSS-SECTION C-C



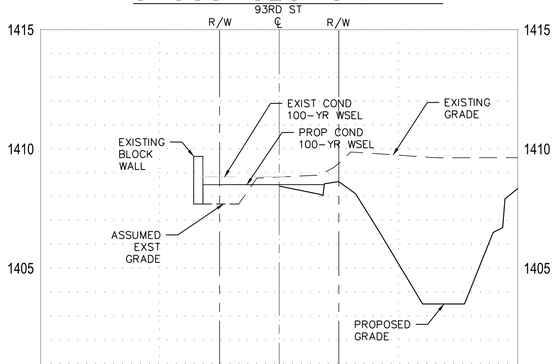
CROSS-SECTION D-D



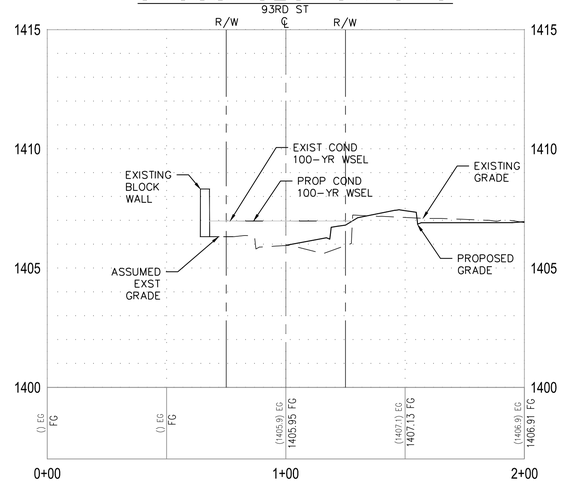
CROSS-SECTION E-E



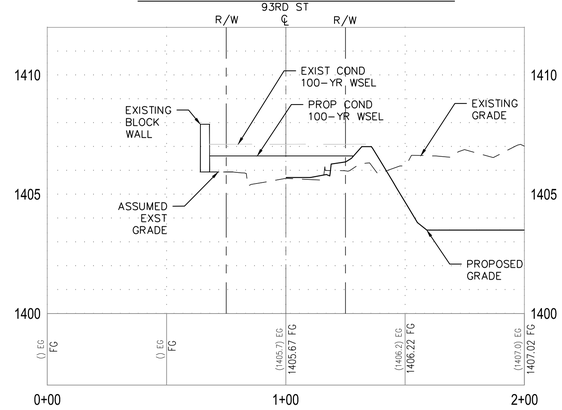
CROSS-SECTION F-F



CROSS-SECTION G-G



CROSS-SECTION H-H



SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
11201 N. TATUM BOULEVARD #250, PHOENIX, AZ 85028
PHONE (602) 687-9664

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP

SCOTTSDALE, AZ

EMPIRE GROUP, LLC

WOLF SPRINGS RANCH

93RD STREET DRAINAGE - CROSS SECTIONS

SEC 18
T3N
R5E

DATE: 6-12-18
DRAFTER: JLL
DESIGNER: JLL
CHECKED: PL

PROJECT NO.
TEG1603-000

EX-3C
SHEET 2 OF 2

Contact Arizona 811 at least two full working days before you begin excavation
ARIZONA811
Call 811 or click Arizona811.com

J:\teg1603-009 wolf springs ranch\drainage\preliminary\dwg\teg1603-009_93rd st cross section map new.dwg 6/12/2018 3:35 PM Joe Lockett

94TH ST FLOWS CONTINUE IN 94TH ST PAST LARKSPUR

EXST 20-FT CB CAPTURES 94TH ST FLOW Q100=18 CFS

EXST VALLEY GUTTER TO BE REMOVED

NEW VALLEY GUTTER TO DIRECT FLOWS ALONG LARKSPUR

EXST CONC CHANNEL TO REMAIN AT LOT 41

EXST CONC CHANNEL TO BE REMOVED ALONG LOTS 42 -44.

PROPOSED INLETS ON IMPROVED LARKSPUR DR

SUBBASIN DA-LARK
Q_{10} =2 CFS
Q_{100} =4 CFS

93RD ST OFFSITE FLOW
Q_{10} =54 CFS
Q_{100} =171 CFS

SUBBASIN DA-1
Q_{10} =5 CFS
Q_{100} =10 CFS

SUBBASIN DA-3
Q_{10} =5 CFS
Q_{100} =10 CFS

SUBBASIN DA-4
Q_{10} =4 CFS
Q_{100} =9 CFS

SUBBASIN DA-2
Q_{10} =7 CFS
Q_{100} =17 CFS

PROPOSED INLET

STORMDRAIN TO CONVEY FLOWS TO BASIN-1

SUBBASIN DA-5
Q_{10} =5 CFS
Q_{100} =10 CFS

PROPOSED INLET

EQUALIZER PIPE

FIRST-FLUSH VOLUME OF 0.70 AC-FT IS HELD BELOW THE 1405.1 WEIR CREST. FF VOLUME BLEEDS OFF THROUGH 4-INCH ORIFICE AT BASE OF THE DROP INLET.

PROPOSED INLET

PIPE TO CONVEY FLOWS TO BASIN

PROPOSED INLET

PROPOSED INLET

RET BASIN 1
SS ADJ TO PUBLIC ROW-6:1, OTHERWISE 4:1
WEIR OUTLET CREST ELEVATION=1405.1
BOTTOM EL=1403.5
TOP ELEVATION=1406.5
VOL REQD(FF)=30,591 CU-FT
VOL PROV(FF)=38,944 CU-FT
HWEL(10-YR)=1405.0
HWEL(100-YR)=1405.8

OUTLET TO EXISTING CACTUS CB COMBINATION OF BASIN WEIR OVERTOPPING FLOW AND 4-IN ORIFICE BLEED-OFF FLOW:
Q_{10}=1 CFS
Q_{100}=21 CFS

94TH STREET

93RD STREET

LARKSPUR DRIVE

CACTUS ROAD

TRACT A

TRACT F

TRACT G

TRACT H

0 60 120
SCALE - 1"=60' FEET

LEGEND

SUB-BASIN BOUNDARIES

FLOW DIRECTION

FLOW PATH

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SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
11201 N. TATUM BOULEVARD #250, PHOENIX, AZ 85028
PHONE (602) 687-9664

NO.	DESCRIPTION	DATE	BY	APP DATE	APP

SCOTTSDALE, AZ

EMPIRE GROUP, LLC

WOLF SPRINGS RANCH

PROPOSED CONDITION DRAINAGE MAP

SEC 18
T3N
R5E

DATE: 6-12-18
DRAFTER: JLL
DESIGNER: JLL
CHECKED: PL
PROJECT NO.
TEG1603-000

EX-4
SHEET 1 OF 1

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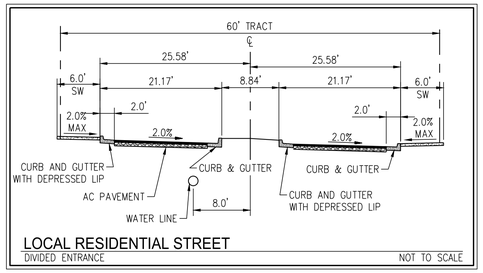
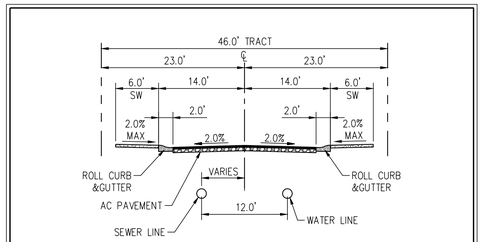
PRELIMINARY GRADING & DRAINAGE PLAN
FOR
WOLF SPRINGS RANCH
SCOTTSDALE, ARIZONA

A PORTION OF THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 3 NORTH, RANGE 5 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY, ARIZONA



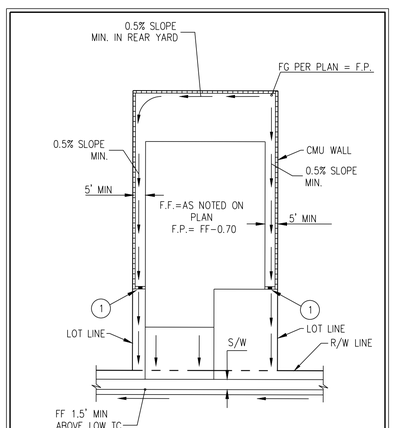
LOCAL RESIDENTIAL STREET

DIVIDED ENTRANCE — NOT TO SCALE



LOCAL RESIDENTIAL STREET

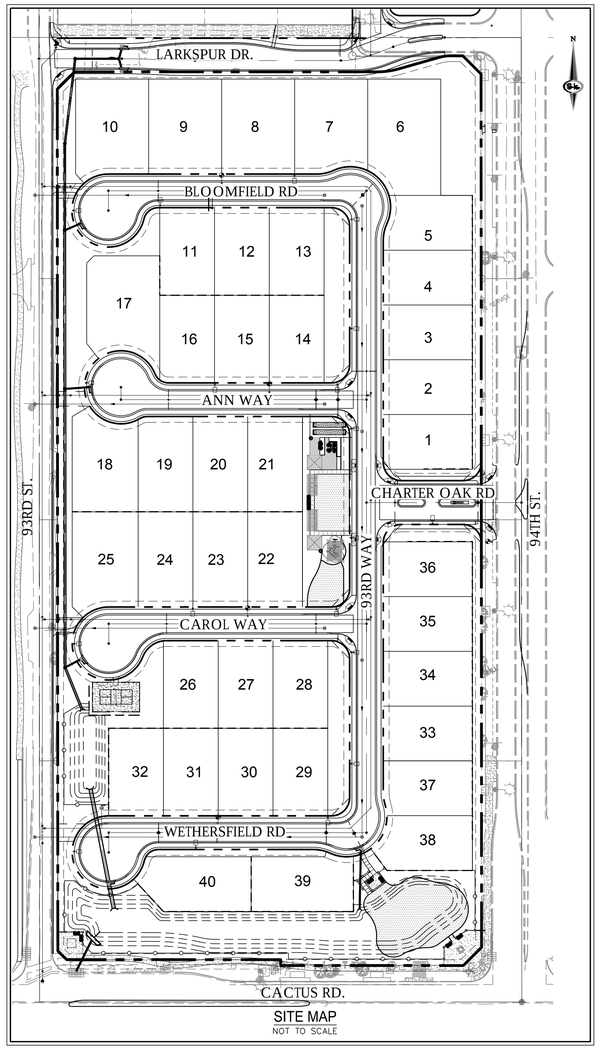
NOT TO SCALE



1 INSTALL WALL OPENING W/ BOTTOM OF OPENING 0.25' BELOW F.P. ELEV., OPENING TO HAVE 32 SQ. IN. MIN CROSS SECTIONAL AREA.

TYPICAL LOT GRADING DETAIL

NOT TO SCALE



SITE MAP

NOT TO SCALE

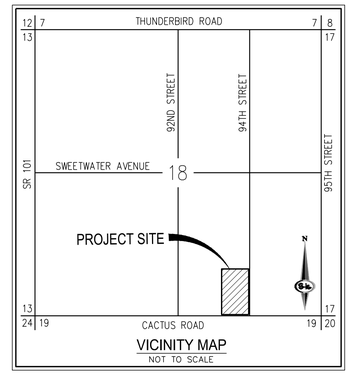
LEGEND

- MATCHLINE
- ROADWAY CENTERLINE
- RIGHT-OF-WAY
- PROPERTY BOUNDARY
- LOT LINE
- CURB AND GUTTER
- ROLL CURB
- EXISTING CURB AND GUTTER
- STORM DRAIN LINE
- STORM DRAIN INLET
- STORM DRAIN HEADWALL
- STORM DRAIN MANHOLE
- PROPOSED SURFACE FLOW
- EXISTING SURFACE FLOW
- 8"W — EXISTING WATER LINE
- 8"S — EXISTING SEWER LINE
- SANITARY SEWER MANHOLE
- SANITARY SEWER FLOW DIRECTION
- (2800) — EXISTING CONTOUR (5-FT)
- (2801) — EXISTING CONTOUR (1-FT)
- 2800 — PROPOSED CONTOUR (5-FT)
- 2801 — PROPOSED CONTOUR (1-FT)
- GRADE BREAK LINE
- FIRE HYDRANT ASSEMBLY
- RETAINING WALL
- X.XX% — PROPOSED SLOPE
- LOT HIGH POINT
- XX.XX P — PROPOSED SPOT ELEVATION
- XX+XX.XX 1400.00 TC — TOP OF CURB ELEV @ LOT LINE
- (XXXX.XX) AC — EXISTING SPOT ELEVATION

SITE DATA

GROSS AREA:	20.11 ACRES
NET AREA:	16.25 ACRES
EXISTING ZONING:	R1-18 PRD
PROPOSED ZONING:	UNCHANGED
LOT COUNTS:	40
GROSS DENSITY:	2.00 DU/AC

APNs: 217-24-006, 217-24-017B, 217-24-017A, 217-24-018, 217-24-019M, 217-24-019N, 217-24-019P, 217-24-019Q



VICINITY MAP

NOT TO SCALE

OWNER / DEVELOPER

EMPIRE RESIDENTIAL COMMUNITIES FUND II, LLC
6617 N. SCOTTSDALE RD.
SCOTTSDALE, AZ 85250
PHONE: 480-951-2207
CONTACT: RICH ZACHER

ENGINEER

SLATER HANIFAN GROUP
11201 N. TATUM BLVD., SUITE 250
PHOENIX, AZ 85028
PHONE: 602-687-9664
CONTACT: PATRICK LOWRY
CONTACT EMAIL: PLOWRY@SHG-INC.COM

FEMA FLOODPLAIN CLASSIFICATION

THE PROPOSED WOLF SPRINGS RANCH IS LOCATED WITHIN THE FEDERAL EMERGENCY MANAGEMENT AGENCY'S (FEMA) SPECIAL FLOOD HAZARD AREA (SFHA) "ZONE X" AS SHOWN ON THE FEMA FLOOD INSURANCE RATE MAP (FIRM) PANEL 04013C1760L, EFFECTIVE DATE OCTOBER 16, 2013

BENCHMARK

ADOT ALUMINUM CAP LOCATED AT THE SW CORNER OF SECTION 18, T3N, R5E, ELEVATION 1390.326 NAVD 88. ACCORDING TO THE RECORD OF SURVEY, RECORDED IN BOOK 763, PAGE 38, MCR

BASIS OF BEARING

ASSUMED BEARING; 89°59'18"W, ALONG THE SOUTH LINE OF THE SOUTHEAST QUARTER OF SECTION 18, TOWNSHIP 3 NORTH, RANGE 5 EAST OF THE GILA AND SALT RIVER BASE AND MERIDIAN, MARICOPA COUNTY ARIZONA

SHEET INDEX

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
11201 N. TATUM BOULEVARD #250, PHOENIX, AZ 85028
PHONE (602) 687-9664

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SCOTTSDALE, AZ

THE EMPIRE GROUP, LLC

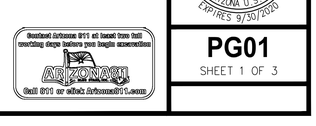
WOLF SPRINGS RANCH

COVER SHEET

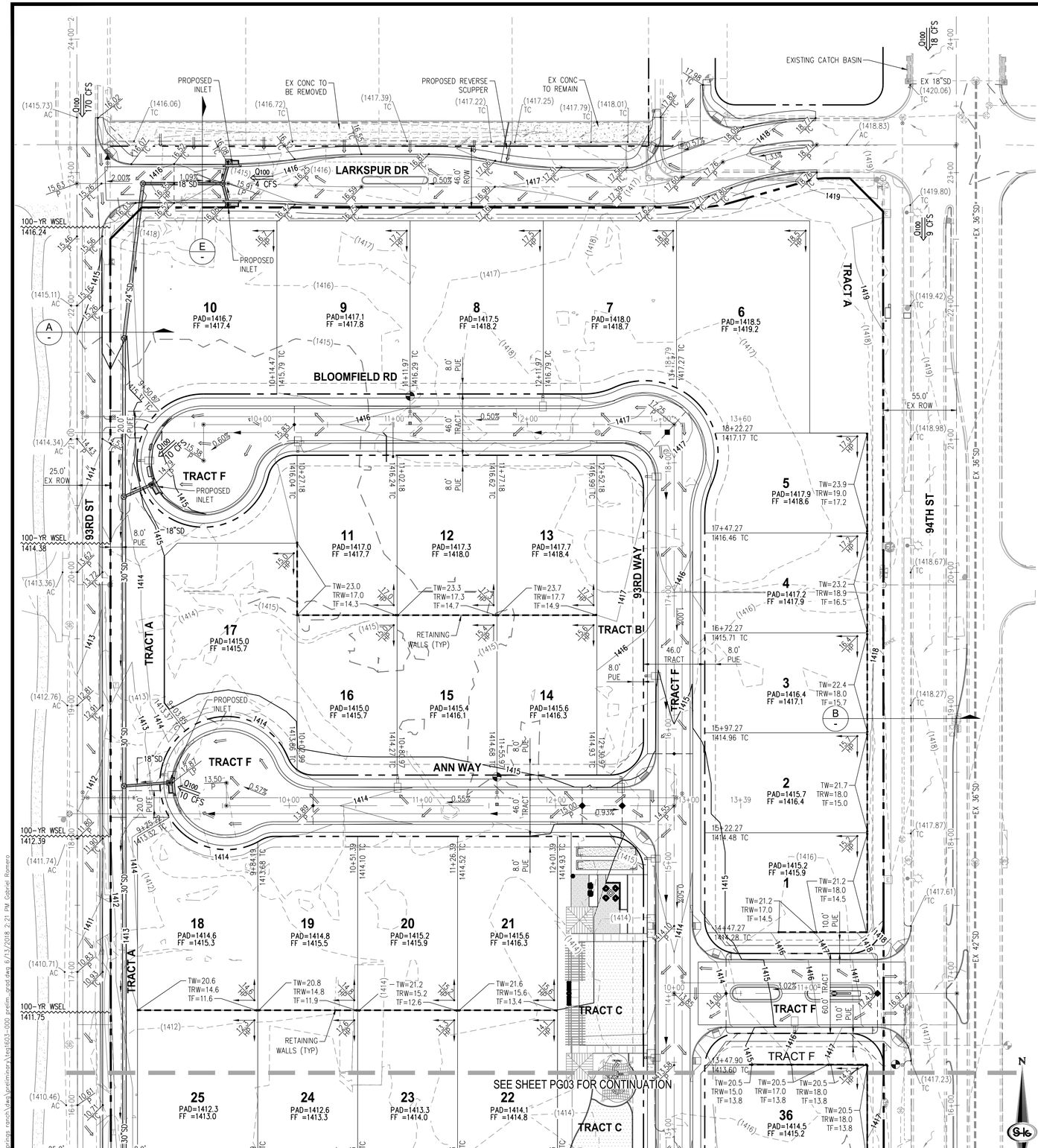
SECTION 18
TOWNSHIP 3 NORTH
RANGE 5 EAST

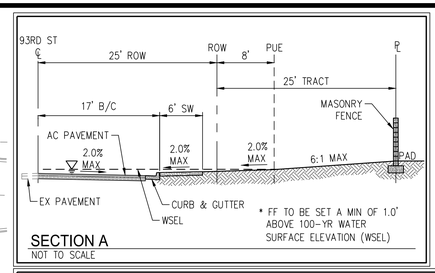
DATE: 06/11/2018
DRAFTER: GGR
DESIGNER: GGR
CHECKED: PEL

PROJECT NO.
TEG1603-000



PG01
SHEET 1 OF 3





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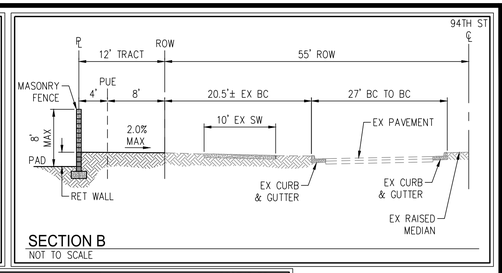

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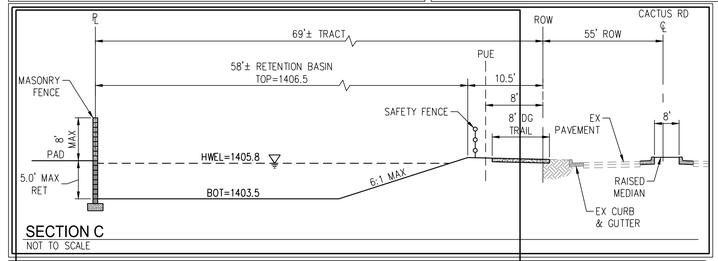
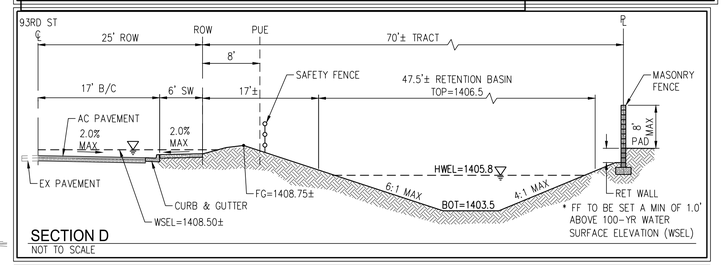


SECTION C
NOT TO SCALE



SECTION D
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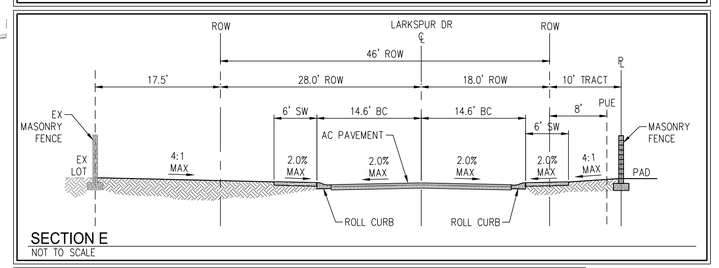

SECTION E
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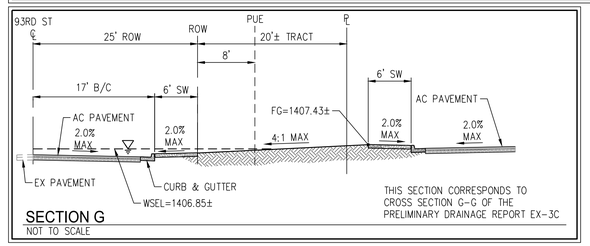

SECTION G
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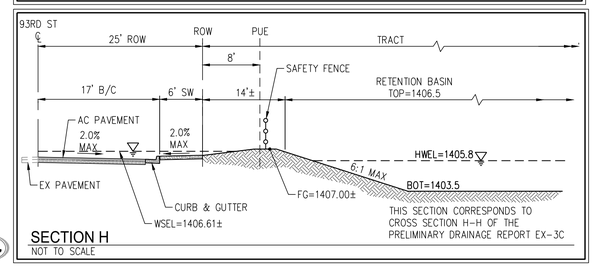


SECTION H
NOT TO SCALE

SLATER HANIFAN GROUP
CONSULTING ENGINEERS & PLANNERS
5740 S. ARVILLE STREET #216, LAS VEGAS, NV 89118
PHONE (702) 284-5300 FAX (702) 284-5399

NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SCOTTSDALE, AZ

SECTION 16
TOWNSHIP 3 NORTH
RANGE 5 EAST

THE EMPIRE GROUP, LLC

WOLF SPRINGS RANCH

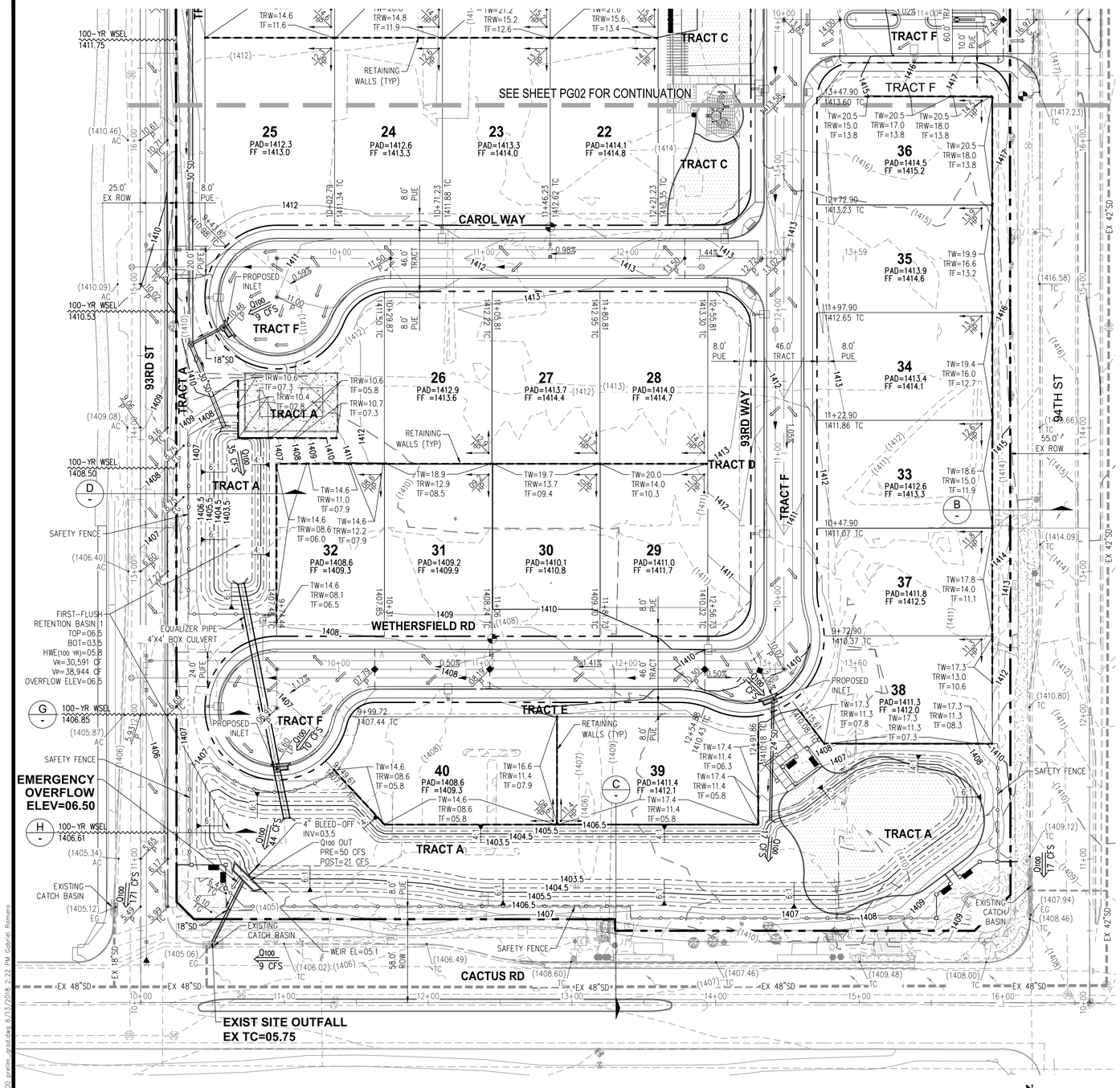
PRELIMINARY GRADING & DRAINAGE PLAN I

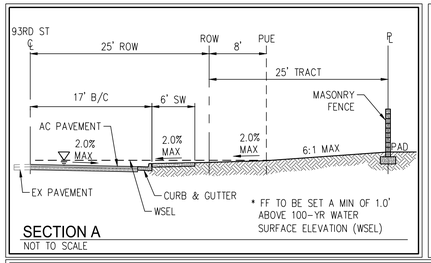
DATE: 06/11/2018
DRAFTER: GGR
DESIGNER: GGR
CHECKED: PEL
PROJECT NO.
TEG1603-000

Registered Professional Engineer (Civil)
CERTIFICATE NO.
33926
Jerry J. Slater
06/11/18
ARIZONA U.S.A.
EXPIRES 9/30/2020

PG02
SHEET 2 OF 3

J:\teg1603-000 wolf springs ranch\dwg\preliminary\teg1603-000 prelim_grad.dwg 6/13/2018 2:21 PM Gabriel Romero





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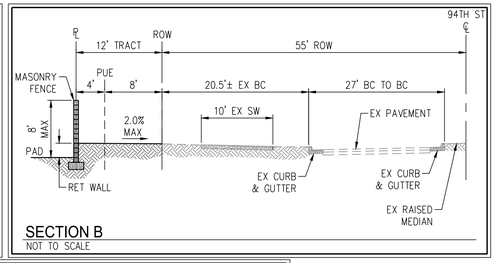

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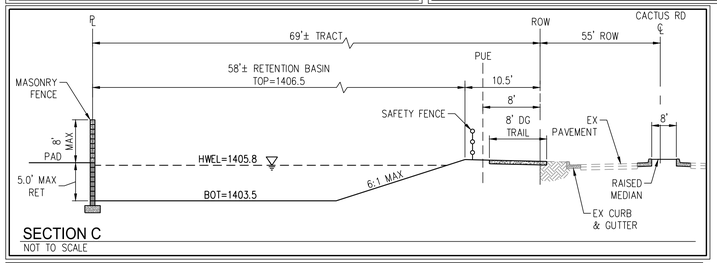

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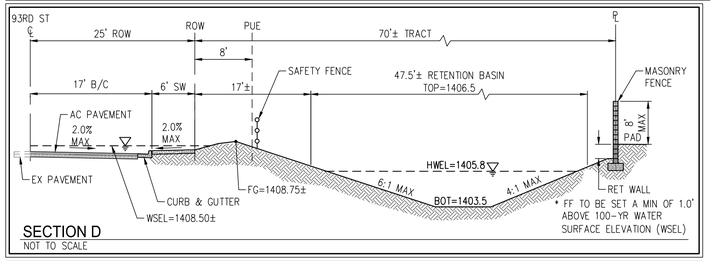

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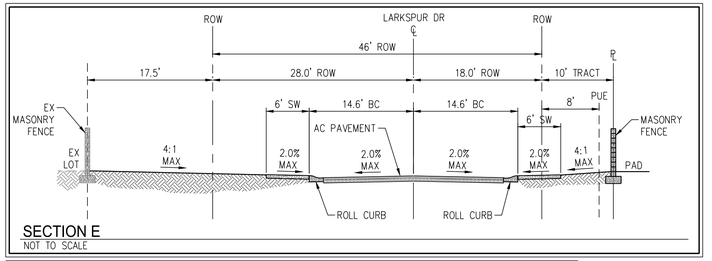

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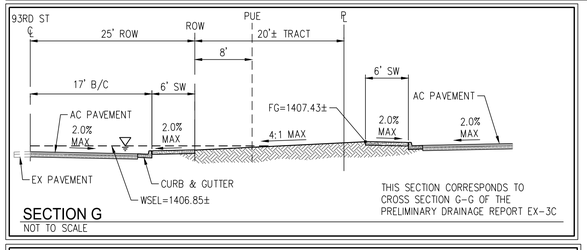

SECTION G
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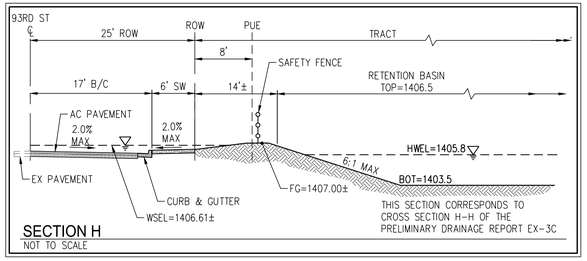

SECTION H
NOT TO SCALE

RETENTION BASIN 1
TOP=1406.5
BOT=1403.5
HWE(100 YR)=1405.8
Vr=30,591 CF
Vp=38,944 CF
OVERFLOW ELEV=1406.5

N

SCALE - 1"=40' FEET

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NO.	DESCRIPTION	DATE	BY	APP. DATE	APP.

SCOTTSDALE, AZ

THE EMPIRE GROUP, LLC

WOLF SPRINGS RANCH

PRELIMINARY GRADING & DRAINAGE PLAN II

SECTION 15
TOWNSHIP 3 NORTH
RANGE 5 EAST

DATE: 06/11/2018
DRAFTER: GGR
DESIGNER: GGR
CHECKED: PEL

PROJECT NO.
TEG1603-000

Registered Professional Engineer (Civil)
CERTIFICATE NO.
33926
Jerry J. Slater
Date Signed 06/11/18
ARIZONA U.S.A.
EXPIRES 9/30/2020

PG03
SHEET 3 OF 3