Flood Hazard Area Delineation
Goldsmith Gulch

October 2022

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MHFD
MILE HIGH FLOOD DISTRICT

Southeast Metro Stormwater Authority

DENVER
THE MILE HIGH CITY

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October 28, 2022

Mr. Jim Watt, PE, CFM
Watershed Manager
Mile High Flood District
2480 W. 26th Ave., Suite 156-B
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RE: Goldsmith Gulch Flood Hazard Area Delineation Report
Agreement No. 18-01.20

Dear Mr. Watt:

Matrix Design Group, Inc. is pleased to submit the enclosed *Goldsmith Gulch Flood Hazard Area Delineation Report*. This report provides a description of the watershed, updated hydrologic modeling, detailed new hydraulic modeling, floodplain mapping and assessment of potential flood damage. The report format and submittal follow the requirements of the Mile High Flood District guidelines for Flood Hazard Area Delineation (FHAD) studies.

Goldsmith Gulch mainstem, along with Goldsmith West Tributary and Southmoor Park Tributary, drain an area of approximately 4,954 acres (7.74 square miles) from Arapahoe Road to the confluence with Cherry Creek. The major drainageway includes 7.6 miles of mainstem channel corridor, which is based upon 5.1 miles in Denver, 1.3 miles in Greenwood Village, and 1.1 miles in SEMSWA (Arapahoe County and City of Centennial). In addition, the two tributaries add 1.2 miles of stream corridor along the Goldsmith Gulch West Tributary in Greenwood Village (a short reach less than 400-feet in the unincorporated area of Arapahoe County) and 0.8 miles of stream corridor along Southmoor Park Tributary in Denver.

A total of 10.4 miles of drainageway were studied with a detailed HEC-RAS hydraulic model. Topography was based upon the USGS mapping from the fall of 2013. The U.S. Army Corps of Engineer's step backwater program HEC-RAS, Version 5.0.5, was used for the subcritical floodplain analysis of the drainageway. Cross sections for use in the HEC-RAS model were developed electronically by cutting the triangulated irregular network (TIN) developed from the one-foot, LIDAR-derived topographic contour data collected by the USGS in the fall of 2013. A total of 566 cross sections were used in the Goldsmith Gulch hydraulics analysis. Fifty-one crossing structures were physically coded in the hydraulic model using field survey data. Existing drainage facilities within the project area consist of natural channel sections, on-line and off-line detention, four roadway bridges, twenty-one roadway culverts, thirty-four pedestrian bridges/culverts, and four piped drainageway culverts. 67 grade control structures exist within the study reach. Each drop structure was modeled using at least two cross-sections to define the drop structure hydraulics. Floodway analysis was based upon a maximum rise of elevation of the hydraulic grade line (HGL) and/or the energy grade line (EGL) of no more than 0.50-foot.

Ten regional flood control detention facilities within the Goldsmith Gulch watershed have been modeled to reduce flood hazards. These facilities constructed along the main stem channel at Silo Park, Orchard Hills Park, Wallace Park North and South, Bible Park and at Iliff & Monaco, and along the West Tributary at Caley Avenue, Tommy David Park and Boston Peakview, and Southmoor Park Tributary at Southmoor Park and are included in the existing conditions hydrologic model. Hydrology is based upon existing conditions since the basin is considered to be fully developed.

This study updates the previous Goldsmith Gulch *Flood Hazard Area Delineation* that was originally published in 1976 and was updated in 1997 with a Letter of Map Revision (LOMR) in the City and County of Denver to incorporate the impact of regional detention facilities. In addition, this study also updates the 2005 FHAD completed for the upper basin reach that is upstream of Belleview Avenue.

A total of 24 habitable building structures may be impacted by a 100-year flood event. The Goldsmith Gulch watershed was generally developed after floodplain regulations were enacted so Goldsmith Gulch has relatively few buildings within the 100-year floodplain compared to other watersheds in the area. However, the lower reach within the City & County of Denver has some notable encroachments and systems with less than 100-year capacity. Underground piped sections with less than 100-year capacity result in overland spilling with wide surface flow floodplains. Within the upper reaches of Goldsmith Gulch where the channel takes on a more natural character and floodplains have been preserved, there are fewer structures within the 100-year floodplain. An exception to this is the Arapahoe Lake Subdivision in the upper watershed, which may have four structures impacted by a 100-year flood. Nine structures around the perimeter of Arapahoe Lake appear to be inundated per the LiDAR topographic contours; however, five of the nine structures have been shown by Elevation Certificates to have their finished floors at least one foot above the spillway.

The information contained in this report provides the Mile High Flood District as project sponsor along with the stakeholders of the City and County of Denver, City of Greenwood Village and Southeast Metro Stormwater Authority with updated floodplain mapping to regulate the waterway.

We appreciate the opportunity to provide this watershed analysis for management of the waterway.

Sincerely,
Matrix Design Group, Inc.

Robert Krehbiel, PE
Project Manager

Benjamin Liu, PE
Project Engineer

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1.0 INTRODUCTION

1.1 Authorization

Matrix Design Group, Inc. (Matrix) was retained by the Mile High Flood District (MHFD), formerly the Urban Drainage and Flood Control District (UDFCD), to complete this Flood Hazard Area Delineation (FHAD) for Goldsmith Gulch. The City & County of Denver (Denver), the City of Greenwood Village (Greenwood Village), Southeast Metro Stormwater Authority (SEMSWA), City of Centennial and Arapahoe County are communities impacted by this FHAD. The Agreement regarding the FHAD study for Goldsmith Gulch was executed on January 13, 2018 (Agreement No. 18-01.20).

1.2 Purpose and Scope

The purpose and scope of this project is to identify the flood hazards for the major drainageways of the Goldsmith Gulch watershed, which includes the tributaries of Goldsmith Gulch West Tributary and Southmoor Tributary (Study Area).

The Goldsmith Gulch watershed has previously been studied and multiple stormwater detention improvements have already been implemented to reduce flood hazards. In June 1976, the *Flood Hazard Area Delineation (FHAD), Goldsmith Gulch and Tributaries* was published by Gingery Associates, Inc. for UDFCD, Denver, Greenwood Village, and Arapahoe County. In 2005, the upper watershed was studied which resulted in a FHAD and Outfall Systems Plan (2005 OSP) for the upper Goldsmith Gulch watershed (south of Belleview Avenue) by Moser & Associates.

The following tasks have been completed as part of this study:

- Collect the best available and updated base topographic mapping for existing conditions.
- Collect as-built drawings for previous channel improvements.
- Solicit input from the project sponsor and stakeholders at the kickoff meeting and individual meetings.
- Obtain GIS information from City and County of Denver, Greenwood Village, SEMSWA, Arapahoe County, and DRCOG.
- Obtain land use mapping and parcel data from the City and County of Denver and Arapahoe County.
- Establish sub-watershed boundaries and parameters in accordance with the MHFD criteria to develop updated hydrology.
- Develop existing (fully developed) conditions hydrologic models using CUHP 2005, version 2.0.0, and EPA SWMM 5.1, version 5.1.012.
- Develop HEC-RAS floodplain and floodway models, Version 5.0.5, for the major drainageways.
- Map the 100-year, 500-year, and floodways for the major drainageways.
- Identify existing flood hazards.

1.3 Planning Process

The project sponsor for this study is MHFD, along with the stakeholders of the City & County of Denver, Greenwood Village, and SEMSWA. Arapahoe County and City of Centennial are also a stakeholders to this study represented by SEMSWA. This FHAD is being completed concurrently with the Master Drainageway Plan (MDP). Project goals were to update the flood hazard area, program capital improvements, and identify water quality improvement opportunities and channel stabilization opportunities.

Project sponsor and stakeholder participants are listed in Section 1.6 Acknowledgements. A project advisory committee consisting of representatives from the sponsoring jurisdictions held a kickoff meeting on March 12, 2018 at the offices of MHFD (see enclosed Meeting Minutes in Appendix A: Project Correspondence). Input and additional resources provided at this meeting were incorporated into this MDP. A meeting was held May 7, 2018 to review comments on the Baseline Hydrology Report. The kickoff meeting for the Alternatives Analysis was held August 22, 2019. A draft Alternatives Analysis Report was issued November 12, 2020. A meeting was held December 30, 2019 to discuss comment to the draft report. An updated Alternatives Analysis report was issued January 31, 2020. A conference call was held March 25, 2020 with the Goldsmith Gulch Metropolitan District to discuss Wallace Park. A meeting was held June 3, 2020 to discuss next steps. A follow-up meeting was held July 8, 2020 to prepare for the public meeting. A post card mailing was sent out in August 2021 notifying residents along Goldsmith Gulch of the website link for the narrated Goldsmith Gulch Major Drainageway Plan presentation and Flood Hazard Area Delineation viewer tutorial. MHFD and stakeholders issued the selected plan letter February 3, 2022 with directives for the Conceptual Design.

1.4 Mapping and Surveys

Mapping information for this project was obtained from several sources. Given the multi-jurisdictional makeup of the watershed, attempts were made to use the best available data. The following describes the various mapping components and their sources.

Topography

One-foot, LIDAR-derived topographic contour data, collected in the fall of 2013, was used to delineate drainage basin boundaries. The Federal Emergency Management Agency (FEMA), the United States Geological Survey (USGS), and the Denver Regional Council of Governments (DRCOG) partnered to provide this data. The data was compiled in 2014 and is herein referred to as the 2014 LiDAR mapping. The 2014 LiDAR mapping provides full coverage for Goldsmith Gulch watershed.

Aerial Photography

4-band, true color ortho-imagery, collected in the spring of 2016, was available for the watershed through DRCOG's Denver Regional Aerial Photography Project (DRAPP) at a resolution of 3-inches.

Hydrologic Soil Groups

Soils information was obtained from the Natural Resources Conservation Service (NRCS) for Arapahoe County with a publication date of October 10, 2017. Soils information is not available for Denver County.

Base Mapping

Base mapping information including street centerlines, roof footprints, impervious surfaces, storm drainage infrastructure, parcels, existing land use, future land use, zoning, parks, and jurisdictional boundaries were provided by the City and County of Denver, Greenwood Village, SEMSWA, Arapahoe County, and DRCOG. Wetlands data was available through the National Wetlands Inventory (NWI).

Crossing Structure Survey

On April 4th and June 13th, 2018, MHFD provided survey of 34 existing roadway crossing structures, 35 existing pedestrian crossing structures, and 56 existing drop structures, as shown in **Table 2-2** (Wilson & Company Structure Survey 2018). The survey was conducted by Wilson & Company, Inc. on April 2, 2018 and June 12, 2018. In addition, Denver provided a tabulation inventory of roadway crossings and sufficiency ratings for the bridges within their jurisdiction, which is included in the Appendix.

Coordinate System and Datum

All GIS mapping and data for this study were developed using the Colorado State Plane, Central Zone coordinate system in U.S. feet. The horizontal datum is NAD83 and the vertical datum is NAVD88.

1.5 Data Collection

Existing drainage studies and construction documents were collected from MHFD, City & County of Denver, SEMSWA and Greenwood Village. Flood Insurance Rate Maps (FIRMs) of the City & County of Denver and Arapahoe County were obtained from the Federal Emergency Management Agency (FEMA). The previous Goldsmith Gulch Flood Hazard Area Delineation (FHAD) studies were obtained from MHFD. The primary references used for this study are as follows:

- Flood Hazard Area Delineation: Goldsmith Gulch and Tributaries, Gingery Assoc., June 1976
- Goldsmith Gulch Major Drainageway Planning, Gingery Associates, Inc., November 1977
- Hydrology Study for the Goldsmith Gulch Drainage Basin, October 5, 1989 (1989 Study)
- Hydrology Study Appendix, Design Computations, Sellards & Grigg, 1994
- Evaluation of Debris and Flood Control, I-225 to Iliff Avenue, December 2004
- Flood Hazard Area Delineation: Upper Goldsmith Gulch, Moser & Associates, April 2005
- Outfall Systems Planning Conceptual Design Report Upper Goldsmith Gulch, Moser & Associates, November 2005
- Upper Goldsmith Gulch: Condition Assessment, CH2MHILL, October 2007
- City and County of Denver Storm Drainage Master Plan, adopted September 22, 2014
- Flood Insurance Study: City and County of Denver, Colorado, FEMA, September 4, 2020 (2020 FIS)
- Flood Insurance Study: Arapahoe County, Colorado and Incorporated Areas, September 4, 2020 (2020 FIS)
- Design Report; Goldsmith Gulch East Caley Avenue Culvert Improvements, March 11, 2011
- Design Report; Goldsmith Gulch Channel Improvements downstream of Peakview Ave, June 28, 2013
- Design Report; Goldsmith Gulch West Tributary at Orchard Road and Tommy Davis Park 2011
- As-Built Upper Goldsmith Gulch Channel Stabilization Project, March 1989
- As-built Caley Square Regional Detention Pond Phase III Construction Plans, 2004
- As-built Drainageway Maintenance on Goldsmith Gulch in Bible Park, 1997
- As-built Goldsmith Gulch – Cook Park Channel Improvements, 2011
- As-built Goldsmith Gulch Flood Control Project Phase II, Schedule II, 1994
- As-built Goldsmith Gulch Flood Control Project Phase III, Schedule II, 1994
- As-built Goldsmith Gulch Flood Control Project Phase III, Schedule III, 1994
- As-built Goldsmith Gulch Flood Control Project Phase III, Schedule IIIB, 1995
- As-built Goldsmith Gulch Phase 1 Improvements Yale to Iliff, 2006
- As-built Goldsmith Gulch Trail, 2017
- As-built Goldsmith Gulch – West Tributary Tommy Davis Park Phase I Improvements, 2008
- As-built Southmoor Tributary at Hutchinson Park, 2011
- As-built Boston Peakview Detention Pond and Village Development, 2018

1.6 Acknowledgements

A Technical Advisory Committee made up of the project sponsors, other stakeholders, and agencies provided guidance during the study process. The Technical Advisory Committee met regularly during the course of the project study. Additional agencies and individuals were also involved during the planning process. Representatives who were directly involved with this study are listed in **Table 1-1**.

Table 1-1 Project Participants

Name	Representing	Project Role
Jim Watt	MHFD	Sponsor
Stacey Thompson	MHFD (previously SEMSWA)	Sponsor
Hung-Teng Ho	MHFD (previously Matrix Design Group)	Sponsor
Morgan Lynch	City and County of Denver (previously MHFD)	Stakeholder
Jennifer Williams	City and County of Denver	Stakeholder
Sarah Anderson	City and County of Denver	Stakeholder
Jeremy Hamer	City and County of Denver	Stakeholder
David Morrisey	City and County of Denver	Stakeholder
Kevin Lewis	City and County of Denver	Stakeholder
Cincere Eades	City and County of Denver	Stakeholder
Suzanne Moore	Greenwood Village	Stakeholder
Wanda Devargas	Greenwood Village	Stakeholder
Ann Woods	Greenwood Village	Stakeholder
Alexis Cook	Greenwood Village	Stakeholder
Tiffany Clark	SEMSWA	Stakeholder
Cynthia Love	SEMSWA	Stakeholder
Robert Krehbiel	Matrix Design Group	Project Manager
Ben Liu	Matrix Design Group	Project Engineer
Chris Martin	Matrix Design Group	GIS Manager

2.0 STUDY AREA DESCRIPTION

2.1 Project Area

The study area is highlighted in **Figure 2-0, Vicinity Map** below and includes the entire Goldsmith Gulch watershed as shown in **Figure 2-1, Study Area Map**. The 1976 FHAD and 1977 MDP evaluated the entire Goldsmith Gulch watershed. Subsequent studies sub-divide the watershed into a lower basin (northern portion) and an upper basin (southern portion) along Belleview Avenue, in accordance with MHFD's watershed delineations (Basins 4601-01 and 4601-02, respectively) along jurisdictional boundaries. The Upper Goldsmith Gulch was analyzed in the *Upper Goldsmith Gulch Outfall Systems Planning Conceptual Design Repo*rt by Moser & Associates for the UDFCD, November 2005 (2005 OSP).

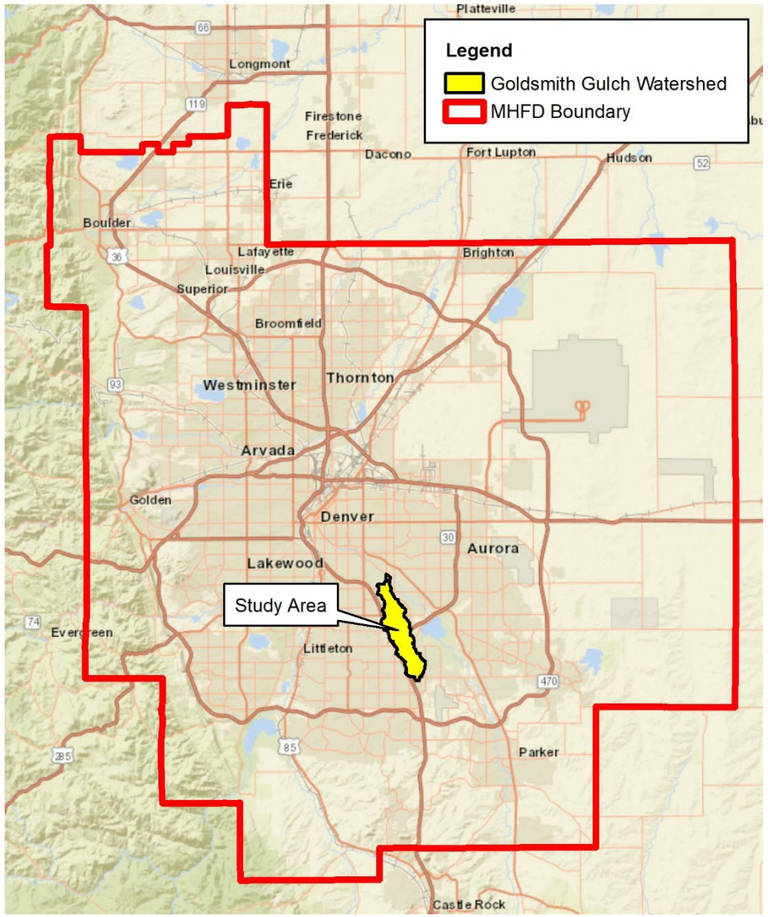


Figure 2-0 Vicinity Map

Hydrologic reaches were delineated for the upper and lower basin. Reaches 1 through 5 are within the lower basin, and Reaches 6 through 12 are within the upper basin. A map of the hydrologic reaches for the entire Goldsmith Gulch watershed is provided in **Figure 2-2, Hydrologic Reaches Map**.

Goldsmith Gulch watershed encompasses an area of 7.74 square miles (4,954 acres) from Arapahoe Road northwest to the confluence with Cherry Creek. The highest watershed elevation is 5,826 feet in the vicinity of South Clinton Street and East Costilla Avenue. The lowest watershed elevation is 5,382 feet at the outfall of the watershed into Cherry Creek. The average watershed slope is approximately 1% (0.97 percent measured following the topographic thalweg). Many channel improvements have been completed along Goldsmith Gulch to reduce the potential of flood damage. The channel has been stabilized in many areas and regional parks have been constructed along the floodplain where development is prohibited by local regulation.

2.1.1 Lower Basin – 4601-01 (City & County of Denver)

This portion of Goldsmith Gulch basin has a total drainage area of about 5.27 square miles. The lower portion of Goldsmith Gulch extends 5.1 miles from Belleview Avenue to the confluence with Cherry Creek near South Monaco Street Parkway. The Southmoor Park Tributary extends 0.82 miles from S. Oneida Way to the confluence with Goldsmith Gulch near E. Dartmouth Avenue. The basin is located in the southeast Denver metropolitan area within the City and County of Denver. Thirty-one roads and highways cross the main stem gulch in the lower basin, as shown in **Table 2-1** and **Figure 2-12**. All existing pedestrian and roadway crossings, as well as drop structures in the lower basin are shown in **Figure 2-12**.

Notable parks located along the lower basin include: Cook Park, Bible Park, Wallace Park, Southmoor Park, Hutchinson Park, and Rosamond Park (see **Figure 2-18**).

Detention facilities have also been constructed along the channel at Iliff and Monaco (off-line), Bible Park, Wallace Park north and south of E Temple Drive, and at Southmoor Park along the Southmoor Tributary. Channel slopes are generally mild with several drop structures along the reach (see **Figure 2-1**).

The High Line Canal bisects Goldsmith Gulch at E. Cornell Avenue. Goldsmith Gulch passes underneath the High Line Canal and E. Cornell Avenue through a concrete box culvert (see **Figure 2-1**).

The southern portion of the lower basin includes the I-25 Transportation Expansion (T-REX) project. New storm and detention facilities drain the I-225 and I-25 interchange to Goldsmith Gulch.

2.1.2 Upper Basin – 4601-02 (Greenwood Village, City of Centennial, SEMSWA, Arapahoe County)

This portion of Goldsmith Gulch basin has a total drainage area of about 2.47 square miles. The upper portion of Goldsmith Gulch extends 2.4 miles from Arapahoe Road to Belleview Avenue. West Goldsmith Gulch extends 1.2 miles from E. Peakview Avenue to the confluence with Goldsmith Gulch near E. Berry Avenue. The upper basin is located within City of Greenwood Village and SEMSWA (Arapahoe County and City of Centennial).

The channels along Goldsmith Gulch and the West Tributary consist of a variety of geometries and composition including concrete-lined channels, grass-lined channels, grass-lined channels with concrete

trickle channels, and wetland vegetated channels. The street crossing culverts consist of corrugated metal pipes, reinforced concrete pipes, concrete box culverts, and bridges (see **Figure 2-12**). All existing pedestrian and roadway crossings, as well as drop structures in the upper basin are shown in **Figure 2-12**.

Notable parks located along the upper basin include: Orchard Hills Park, Silo Park, and Tommy Davis Park (see **Figure 2-18**).

Detention facilities have also been constructed along the channel at Orchard Hills Park, Silo Park, Tommy Davis Park, E. Caley Avenue and Yosemite Street, and S. Boston Street and E. Peakview Avenue. Arapahoe Lake is privately owned and therefore not considered in the baseline hydrology (see **Figure 2-1**).

2.2 Land Use

In 1976, the Goldsmith Gulch FHAD noted that "For the purposes of this study, the drainage basin was considered to be fully developed." This basin can certainly be considered at this time to be fully developed; however, some areas are expected to redevelop. Therefore, *Future Condition* land use is approximated as *Existing Condition* land use. Since the basin is fully developed, only the *Existing Condition* hydrologic model was studied for this MDP.

The latest GIS land use zoning data is derived from the City and County of Denver Land Use layer (2012) and Arapahoe County Parcels layer (2018). **Section 3.3.2** provides the detailed description of watershed imperviousness. **Figure B-1 Interactive Hydrology Map** in **Appendix B** shows the land use map, sub-basin boundaries and associated percent imperviousness.

Table 2-1 Surveyed Crossing Structures.

Reach Number	River Station	Structure Number	Description	Location	No. of Spans/ Barrels	Span/ Width (feet)[1]	Rise/ Length (feet)[2]	Shape / Material	Notes	Capacity per Baseline Hydrology (cfs)
GG-1	00+32	69	Pedestrian Crossing	Cherry Creek Greenway Trail at the confluence with Cherry Creek	2	12.3	4.3	Rectangular RCP	Within the floodway of Cherry Creek	10-Year
	01+25	68	Roadway Crossing Culvert	E. Cherry Creek S. Drive	3	12.5	8.2	Elliptical CMP		100-Year
	04+51	67	Pedestrian Bridge	Cook Park Walkway	1	20	9.7	Steel Truss		< 10-Year
	09+75	66	Pedestrian Bridge	Cook Park Walkway	1	30.5	9.7	Steel Truss		< 10-Year
	17+52	65	Roadway Crossing Culvert	E. Mexico Avenue	2	9	6	Rectangular RCP	Also, 10’ x 5’ pedestrian underpass	10-Year
	25+54	64	Roadway Crossing Culvert	S. Monaco Street Parkway	1	9	6	Rectangular RCP		10-Year
	28+28	63	Pedestrian Bridge	Skyline Acres Swim and Tennis Club	1	12	5	Single Span/ Concrete Arch		10-Year
	30+55	62	Pedestrian Bridge	Skyline Acres Swim and Tennis Club	1	9.7	8	Single Span/ Concrete		10-Year
	34+59	61	Roadway Crossing Culvert	E. Jewell Avenue	2	16	4.6	Rectangular RCP	Restrictor plates installed inside the culverts	Restricted capacity of approximate 550 cfs
	63+07	60	Roadway Crossing Culvert	E. Iliff Avenue/ E. Evans Avenue*	2	14	4.6	Rectangular RCP	* Southwest of E. Evans Avenue and S. Monaco Street Parkway at edge of parking lot (Milo’s Sports Tavern)	10-Year
GG-2	70+12	59	Pedestrian Low Flow Crossing Bridge	Goldsmith Gulch Trail	1	11	1.6	Single Span/ Concrete		< 10-Year
	93+50	58	Roadway Crossing Culverts	E. Yale Avenue	1	7.4	6.9	Rectangular RCP	Left opening	100-year
					1	17.8	8.5	Rectangular RCP	Right opening	100-Year
	101+16	57	Pedestrian Low Flow Crossing Bridge	Bible Park Walkway	1	15	16	Single Span/ Concrete	Walkway connects to Highline Canal Trail	< 10-Year
	126+16	56	Roadway Crossing Culvert	E. Cornell Avenue	4	14	4.5	Rectangular RCP	E. Cornell Avenue	≈ 50-Year
					1	10	4.5			
GG-3	135+87	55	Pedestrian Bridge	Hutchinson Park Walkway	2-spans	148	4.9	Steel Truss	Walkway connects to Goldsmith Gulch Trail	100-year
	139+96	53	Roadway Crossing Bridge	E. Eastman Avenue	4-spans	48.2	73.5	Concrete	Pier widths: 2’, 0.9’, 0.9’	100-year
	142+12	51	Pedestrian Low Flow Crossing Bridge	U/S E. Eastman Avenue	1-span	16	15	Single Span/ Concrete	Connects business areas	< 10-Year
	143+90	50	Pedestrian Bridge	U/S E. Eastman Avenue	1-span	5.9	87.2	Steel Truss	Connects business areas	100-year
	147+89	49	Pedestrian Bridge	U/S E. Eastman Avenue	1-span	77.5	5.9	Steel Truss	Connects business areas	100-year
	161+14	48	Roadway Crossing Culvert and Piped Drainageway	Hampden Avenue to parking lot of the Tiffany Plaza	1	20.3	7.9	Rectangular RCP	Approximately 600’ south of S. Tamarac Drive and E. Hampden Avenue	≈ 50-Year
	170+97	47	Roadway Crossing Culvert	S. Rosemary Way	2	15.5	5.2	Rectangular Concrete		10-Year
	194+50	46	Roadway Crossing Culvert	E. Princeton Avenue	2	15.5	5.1	Rectangular Concrete		≈ 100-Year
	198+54	45	Pedestrian Bridge	Rosamond Park Trail	1-span	18	5.7	Steel Truss		< 10-Year
	202+66	44	Pedestrian Bridge	Rosamond Park Trail	1-span	28	6	Steel Truss		< 10-Year

Reach Number	River Station	Structure Number	Description	Location	No. of Spans/ Barrels	Span/ Width (feet)[1]	Rise/ Length (feet)[2]	Shape / Material	Notes	Capacity per Baseline Hydrology (cfs)
GG-4	212+61	43	Roadway Crossing Culvert	E. Quincy Avenue	2	12.5	8.2	Squashed CMP		100-year
	223+05	42	Detention Outlet/ Culvert	Wallace Park North at I-225	2	12	6.1	Rectangular Concrete w/ Restrictor Plate	3.0’ from invert to height of restrictor plate	100-year
	239+84	41	Detention Outlet/ Culvert	Wallace Park South at E. Temple Drive	2	7	-	Round Concrete w/ Restrictor Plate	3.5’ from invert to height of restrictor plate	≈ 100-Year
	242+50	40	Concrete lid of the rectangular concrete low flow channel	Wallace Park South	1	3.5	1.1	Rectangular RCP	No trail connection.	< 10-Year
	245+70	39	Concrete lid of the rectangular concrete low flow channel	Wallace Park South	1	3.4	1.2	Rectangular RCP	No trail connection.	< 10-Year
	260+70	38	Low Flow Culvert	Drop structure 200’ south of E. Monmouth Place and S. Wabash Street	2	2.5	-	Round w/ Plate RCP	1.05’ from invert to height of restrictor plate; Part of drop structure	< 10-Year
GG-5	268+87	37	Roadway Crossing Bridge	E. Belleview Avenue	1-span	59.5	130.9	Single Span/ Concrete		500-year
	273+25	36	Roadway Crossing Bridge	E. Crescent Parkway	1	60	14.9	Arched Concrete		500-year
	284+83	35	Roadway Crossing Bridge	E. Prentice Avenue	1	62.2	11.5	Arched Concrete		500-year
	289+63	34	Pedestrian Low Flow Crossing Bridge	Access to Greenwood Village Trails	2	10	2	Arched RCP		< 10-Year
GG-6	295+15	33	Roadway Crossing Culvert	S. Yosemite Street	2	13.4	4.5	Rectangular RCP		50-year
	298+90	32	Pedestrian Low Flow Crossing Culvert	Yosemite East Trail	1	3	-	Round CMP		< 10-Year
	300+60	31	Pedestrian Low Flow Crossing Bridge	Yosemite East Trail	1-span	17.9	29.3	Single Span/ Concrete		< 10-Year
	305+63	30	Roadway Crossing Culvert	E. Berry Avenue	1	15.9	7	Arched CMP		50-year
	314+40	29	Detention Outlet/ Culvert	**Orchard Hills Park**	1	1.5	-	Circular RCP	Vertical standpipe in Orchard Hills Detention	< 10-Year
GG-7	321+10	15	Pedestrian Bridge	Orchard Hills Park Trail	1-span	14.6	8.2	Steel Truss	PVC conduit running parallel 1.1’ below the bridge low cord.	< 10-Year
	327+68	14	Pedestrian Bridge	Orchard Hills Park Trail	1-span	14.7	8	Steel Truss		< 10-Year
	335+80	13	Roadway Crossing Culvert	E. Orchard Road	1	3	-	Round CMP	Silo Park Detention outlet pipe	< 10-Year
	337+21	12	Low Flow Board Walk Bridge	**Silo Park**	5-span	60	5.5	Wooden board walk		< 10-Year
	342+32	11	Pedestrian Low Flow Crossing Bridge	Silo Park Trail	1-span	13	5.7	Wooden board walk		< 10-Year

Reach Number	River Station	Structure Number	Description	Location	No. of Spans/ Barrels	Span/ Width (feet)[1]	Rise/ Length (feet)[2]	Shape / Material	Notes	Capacity per Baseline Hydrology (cfs)
GG-8	353+80	10	Roadway Crossing Culvert and Piped Drainageway	Arapahoe Lake to Silo Park	1	9.8	4.2	Rectangular RMP	Resident's Backyard	10-Year
	359+29	9	Pedestrian Bridge	Arapahoe Lake	3-span	50.2	5.9	Cable stayed wooden bridge		500-year
	363+43	8	Pedestrian Low Flow Crossing Culvert	Arapahoe Lake	1	6	1.9	Rectangular RCP		< 10-Year
	368+40	7	Roadway Crossing Culverts	E. Caley Avenue	1	4	-	Round Concrete	Left opening	500-year
					1	5.9	4	Octagonal Concrete	Right opening	
	369+65	6	Pedestrian Bridge	U/S E. Caley Avenue	1-span	10.6	7.9	Steel Truss		< 10-Year
	372+15	5	Pedestrian Low Flow Crossing Culvert	U/S E. Caley Avenue	1	2	-	Round RCP		< 10-Year
	375+78	4	Pedestrian Culvert	Between Appletree Apartment and Avery Park Apartments	1	15	3	Rectangular Concrete		500-year
	384+00	3	Roadway Crossing Culverts	E. Peakview Avenue	1	2.8	-	Round Concrete	Left opening	500-year
					1	5.5	3.1	Elliptical Concrete	Right opening	
WG-1	00+79	28	Pedestrian Low Flow Crossing Culvert	Orchard Hills Park Trail	1	3	-	Round RCP		< 10-Year
	07+00	27	Pedestrian Bridge	Big Canyon Trail	1-span	15	7.7	Steel Truss		10-Year
	12+62	26	Pedestrian Low Flow Crossing Bridge	Big Canyon Trail	1-span	15.6	21.6	Single Span/ Concrete		< 10-Year
	13+98	25	Roadway Crossing Culverts	E. Orchard Road	1	12	8.8	Rectangular Concrete	Left portion of opening (bike path)	500-year
					1	9.8	4	Rectangular Concrete	Right portion of opening (low flow channel)	
	15+10	24	Detention Outlet/ Culvert	Tommy Davis Park	2	2	-	Round RCP	Tommy Davis Park Trail	< 10-Year
	21+28	23	Pedestrian Bridge	Tommy Davis Park Trail	1-span	27	10	Steel Truss		< 10-Year
WG-1	27+22	22	Pedestrian Bridge	Tommy Davis Park Trail at E. Maplewood Ave.	1-span	43.9	14	Steel Truss		100-Year
WG-2	34+95	21	Trail Crossing Culverts	Access to Fair North Trail	3	4	-	Round RCP		10-Year
	39+50	20	Pedestrian Low Flow Crossing Bridge	U/S E. Fair Avenue	1	13.2	-	Single span/ Concrete		50-Year
WG-3	45+25	18	Roadway Crossing Culverts	E. Caley Avenue	2	6	4	Octagonal Concrete		500-Year
	50+00	17	Roadway Crossing Culverts	E. Caley Way/ Caley Pond Trail	1	14	5	Octagonal Concrete	Inlet to Caley Detention	500-Year
	53+20	16	Roadway Crossing Culverts	Unnamed Road	1	6.9	6.8	Rectangular Concrete		500-Year
ST-1	15+40	54	Roadway Crossing Culverts	E. Eastman Avenue	1	8.2	5.7	Rectangular Concrete		10-Year
	20+96	52	Roadway Crossing Culvert and Piped Drainageway	E. Hamilton Place & Parking Lot	1	7.5	4.5	Elliptical RCP		10-Year

Source: Wilson & Company Structure Survey 2018

Notes:

1. *Span for culverts, bridge opening width for bridges. All surveyed values rounded to the nearest tenth.*
2. *Rise (Diameter) for culverts, bridge opening length for bridges. All surveyed values rounded to the nearest tenth.*

Table 2-2 Surveyed Drop Structures.

Reach	River Station	Structure Number	Description	Location	U/S Crest Elevation	D/S Toe Elevation	Drop Height (ft)	Length (ft)	U/S Survey Point	D/S Survey Point	Survey Number
GG-1	04+38	D-1	Grouted boulder drop structure	Cook Park, d/s pedestrian bridge	5392.41	5390.27	2.1	8	328397	328398	FL59
	07+97	D-2	Grouted boulder drop structure	Cook Park	5396.01	5394.67	1.3	10	328386	328387	FL60
	10+11	D-3	Grouted boulder drop structure	Cook Park, u/s pedestrian bridge	5398.10	5395.68	2.4	8	328370	328371	FL50
GG-2	94+94	D-4	Grouted boulder drop structure (Multiple Tiers)	Bible Park u/s E. Yale Avenue	5445.21	5443.57	1.6	1	328200	328201	FL65
	95+04	D-5			5446.44	5444.00	2.4	1	328198	328199	FL64
	95+36	D-6			5447.52	5445.91	1.6	2	328196	328197	FL63
	100+65	D-7	Grouted boulder drop structure (Multiple Tiers)	Bible Park, d/s pedestrian bridge	5451.53	5449.71	1.8	2	328194	328195	FL62
	100+82	D-8			5453.66	5450.66	3.0	3	328192	328193	FL61
	100+94	D-9			5455.38	5453.02	2.4	2	328190	328191	FL60
	101+37	D-10	Concrete check structure with boulders	Bible Park, u/s pedestrian bridge	5455.96	5454.55	1.4	2	328194	328195	FL56
	107+50	D-11	Concrete cap for 21" S.S.; no survey	Bible Park	-	-	-	-	-	-	-
	111+25	D-12	Broken concrete cap for 21" S.S., a portion was washed away; no survey	Bible Park	-	-	-	-	-	-	-
	113+40	D-13	Diagonal loose rock drop structure; no survey	Bible Park	-	-	-	-	-	-	-
	117+50	D-14	Grouted boulder drop structure	Bible Park	5461.64	5458.83	2.8	3	328172	328173	FL55
GG-3	128+79	D-15	Sculpted concrete drop structure	Hutchinson Park u/s E. Cornell Avenue	5473.58	5470.38	3.2	35	328143	328144	FL4
	134+33	D-16	Sculpted concrete drop structure	Hutchinson Park d/s pedestrian bridge	5476.96	5474.14	2.8	30	328139	328142	FL3
	143+13	D-17	Sculpted concrete drop structure	U/S E. Eastman Avenue between pedestrian bridges	5483.04	5480.94	2.1	4	328043	328044	FL1
	145+58	D-18	Broken concrete check structure with loose rock; no survey	U/S E. Eastman Avenue between pedestrian bridges	-	-	-	-	-	-	-
	148+42	D-19	Concrete check structure with loose rocks; no survey	D/S Hampden Avenue	-	-	-	-	-	-	-
	151+13	D-20	Concrete check structure with loose rocks; no survey	D/S Hampden Avenue	-	-	-	-	-	-	-
	162+47	D-21	Baffled concrete drop structure	South of Tiffany Plaza	5495.88	5490.06	5.8	NM	323239	323240	FL50
	176+47	D-22	Concrete check structure with loose rocks	U/S S. Rosemary Way, at approximate E Kenyon Pl	5502.80	5502.29	0.5	NM	323206	323207	FL49
	178+75	D-23	Concrete check structure with loose rocks	U/S S. Rosemary Way, at approximate E Lehigh Ave.	5504.34	5503.44	0.9	NM	323204	323205	FL48
	181+56	D-24	Concrete check structure with grouted/loose rocks	U/S S. Rosemary Way, at approximate E Lehigh Dr.	5506.44	5505.62	0.8	NM	323202	323203	FL47
	186+81	D-25	Concrete check structure with grouted/loose rocks	U/S S. Rosemary Way, at approximate S Tamarac Ct	5509.28	5508.70	0.6	NM	323200	323201	FL46
	189+79	D-26	Concrete check structure with loose rocks	D/S E. Princeton Ave. at approximate E Oxford Ave.	5511.19	5510.58	0.6	NM	323198	323199	FL45
	190+81	D-27	Concrete check structure with grouted/loose rocks	D/S E. Princeton Ave. at approximate E Oxford Ave.	5514.71	5511.88	2.8	NM	323196	323197	FL44
	194+93	D-28	Concrete check structure with boulders; no survey	U/S E. Princeton Ave.	-	-	-	-	-	-	-
	195+85	D-29	Concrete check structure with boulders; no survey	U/S E. Princeton Ave.	5523.57	5521.53	2.0	NM	323160	323161	FL43

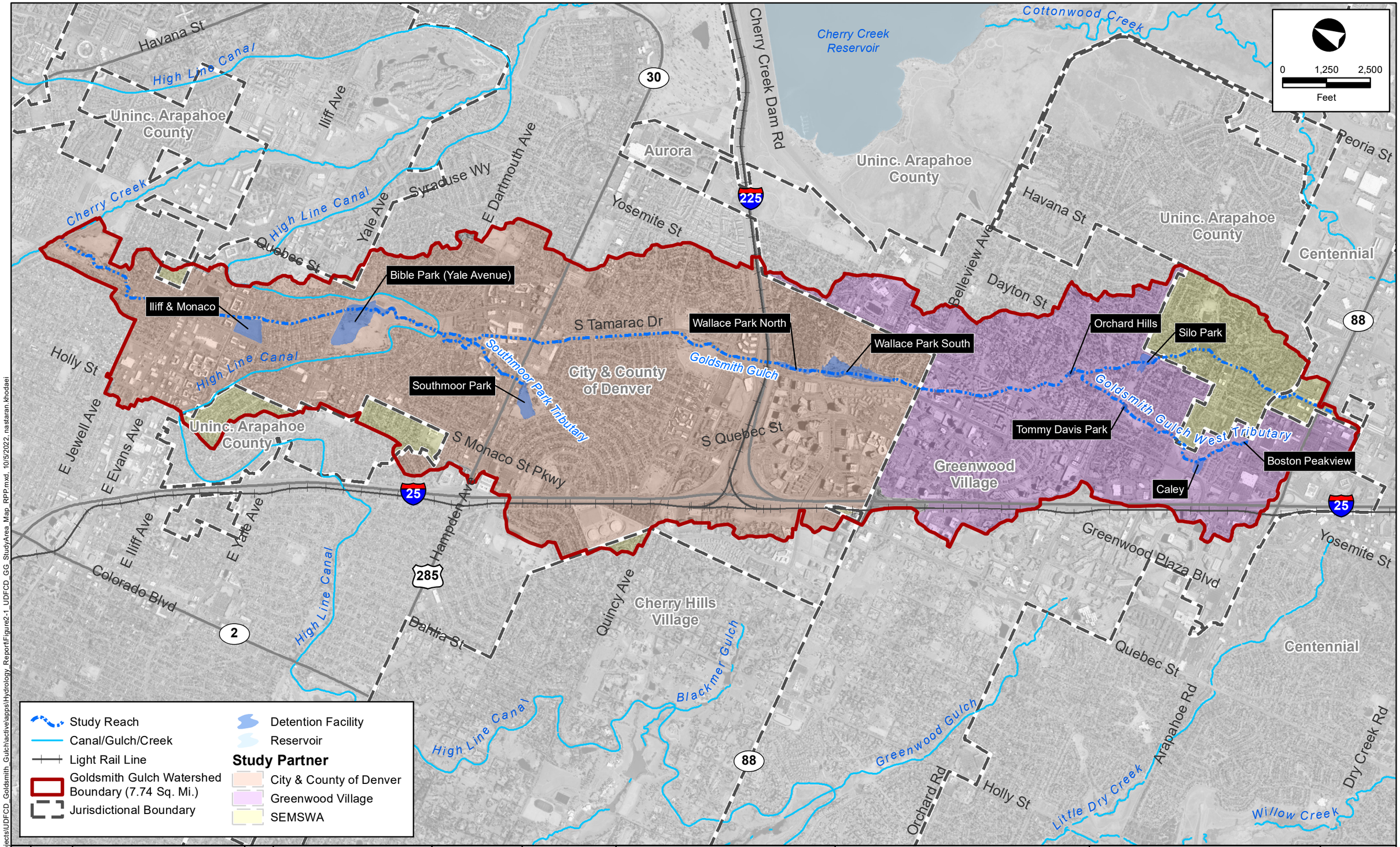
Reach	River Station	Structure Number	Description	Location	U/S Crest Elevation	D/S Toe Elevation	Drop Height (ft)	Length (ft)	U/S Survey Point	D/S Survey Point	Survey Number
GG-4	242+18	D-30	Concrete drop structure	George Wallace Park	5555.95	5554.87	1.1	NM	316328	316329	FL41
	245+55	D-31	Concrete drop structure	George Wallace Park	5557.77	5557.13	0.6	NM	316313	316314	FL40
	246+03	D-32	Concrete drop structure	George Wallace Park	5558.25	5557.68	0.6	NM	316298	316299	FL39
	250+40	D-33	Concrete drop structure (Multiple Tiers)	George Wallace Park at approximate E. Layton Ave.	5563.00	5559.42	3.6	NM	316291	316293	FL38
					5564.65	5563.08	1.6	NM	316289	316290	FL38
					5565.37	5564.91	0.5	NM	316283	316284	FL37
	261+17	D-34	Concrete drop structure (Multiple Tiers)	George Wallace Park at approximate E. Monmouth Pl.	5576.49	5575.71	0.8	NM	316252	316253	FL35
					5570.47	5569.78	0.7	NM	316249	316250	FL34
					5573.72	5571.28	2.4	NM	316247	316248	FL33
					5577.66	5573.85	3.8	NM	316245	316246	FL32
	267+87	D-35	Concrete drop structure	D/S E. Belleview Ave	5583.76	5580.70	3.1	0.37	316239	316240	FL31
GG-5	274+57	D-36	Concrete drop structure (Multiple Tiers)	U/S E. Crescent Pkwy	5592.90	5586.76	6.1	51.8	316123	316131	FL30
	283+49	D-37	Loose rock drop structure	D/S E. Prentice Ave.	5600.74	5597.75	3.0	9.75	316121	316122	FL29
	289+91	D-38	Grouted boulder drop structure	U/S E. Prentice Ave., u/s of pedestrian bridge	5606.72	5604.35	2.4	NM	316060	316061	FL28
	290+59	D-39	Unknown material	U/S E. Prentice Ave., u/s of pedestrian bridge	5607.04	5606.51	0.5	NM	316058	316059	FL27
GG-6	309+15	D-40	Concrete check structure with boulders (2-Tier)	U/S E. Berry Ave.	5619.28	5616.63	2.6	11.31	309544	309546	FL25
	310+34	D-41	Concrete check structure with boulders (2-Tier)	U/S E. Berry Ave.	5621.26	5618.7	2.56	13.43	309541	309543	FL24
	312+49	D-42	Concrete check structure with boulders (2-Tier)	U/S E. Berry Ave.	5622.66	5620.18	2.48	12.9	309538	309540	FL23
	314+07	D-43	Concrete check structure with boulders (2-Tier)	Silo Park Detention spillway	5630.7	5623.61	7.09	53.8	309517	309519	FL22
GG-7	331+45	D-44	Concrete check structure with loose rocks (2-Tier)	D/S E. Orchard Rd	5646.85	5644.99	1.86	22.92	309006	309008	FL9
	332+81	D-45	Concrete check structure with loose rocks (2-Tier)	D/S E. Orchard Rd	5648.69	5646.6	2.09	25.22	309003	309005	FL8
	333+68	D-46	Concrete check structure with loose rocks (2-Tier)	D/S E. Orchard Rd	5649.84	5648.73	1.11	27.38	309000	309002	FL7
GG-8	355+29	D-47	Concrete drop structure (Multiple Tiers)	Arapahoe Lake spillway	5696.38	5674.05	22.33	96.2	308212	308216	FL6
	373+58	D-48	Concrete check structure with grouted boulders	U/S E. Caley Ave.	5713	5709.31	3.69	14.44	308114	308115	FL4
	376+34	D-49	Grouted boulders drop structure	D/S Peakview Ave. at Appletree/Avery Park Apartment	5720.47	5716.01	4.46	17.6	308096	308097	FL3
	379+90	D-50	Grouted boulders drop structure	D/S Peakview Ave. at Appletree/Avery Park Apartment	5728.81	5724.69	4.12	20.45	308094	308095	FL2
	389+93	D-51	Concrete/grouted boulder drop structure (Multiple Tiers)	U/S Peakview Ave.	5754.94	5742.9	12.04	64.37	308047	308051	FL1

Reach	River Station	Structure Number	Description	Location	U/S Crest Elevation	D/S Toe Elevation	Drop Height (ft)	Length (ft)	U/S Survey Point	D/S Survey Point	Survey Number
WG-1	01+02	D-52	Boulder drop structure	Orchard Hill Park	5632.21	5631.04	1.17	1	309479	309480	FL21
	04+10	D-53	Boulder drop structure	Orchard Hill Park	5635.24	5633.81	1.43	2.73	309454	309465	FL20
	08+87	D-54	Boulder drop structure	D/S E. Orchard Rd	5640.53	5638.85	1.68	2.53	309436	309437	FL19
	10+76	D-55	Boulder drop structure	D/S E. Orchard Rd	5642.18	5641.49	0.69	4.36	309434	309435	FL18
	11+96	D-56	Loose rock drop structure	D/S E. Orchard Rd	5644.29	5641.71	2.58	29.76	309432	309433	FL17
	21+87	D-57	Concrete check structure (Multiple Tiers)	Tommy Davis Park	5657.24	5656.73	0.51	12.33	309305	309308	FL16
	24+81	D-58	Concrete check structure with grouted boulders	Tommy Davis Park	5659.59	5658.38	1.21	3.3	309303	309304	FL15
	25+52	D-59	Concrete check structure with grouted boulders	Tommy Davis Park	5660.51	5659.7	0.81	3.03	309301	309302	FL14
	26+29	D-60	Concrete check structure with grouted boulders	Tommy Davis Park	5662.21	5661.44	0.77	2.24	309299	309300	FL13
	27+30	D-61	Concrete check structure	Tommy Davis Park at Maplewood Ave.	5663.45	5662.64	0.81	0.84	309297	309298	FL12
WG-2	28+70	D-62	Grouted Boulder drop structure (assumed per aerial imagery); no survey	Tommy Davis Park at Maplewood Ave.	-	-	-	-	-	-	-
	35+24	D-63	Concrete check structure	U/S E. Fair Ave	5674.37	5672.08	2.29	1	As-built	As-built	As-built
	43+56	D-64	Concrete drop structure (Multiple Tiers)	D/S E. Caley Ave.	5686.82	5681.2	5.62	35.2	As-built	As-built	As-built
WG-3	46+06	D-65	Loose boulder drop structure	U/S E. Caley Ave. at d/s of the outlet structure	5694.12	5689.2	4.92	NM	309158	309171	FL11
	50+56	D-66	Grouted boulders drop structure	U/S E. Caley Way	5700.04	5693.28	6.76	8.47	309081	309082	FL10
ST-1	07+90	D-67	Grouted boulders drop structure; no survey	Hutchinson Park	-	-	-	-	-	-	-

1. Source: Mile High Flood District Survey 2018 & Goldsmith Gulch West Tributary Channel Improvement As-built Survey.

2. River stations are in feet measured along the river centerline from the confluences.

3. Locations of each structure are shown in the Flood Maps (Appendix G).



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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: _____
drawn by: RP
checked by: RK
project no.: 18.155.035
date: 11/12/2019

MHFD MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY
AND TRIBUTARIES

STUDY AREA MAP

FIGURE
2-1

GG-1
Cherry Creek Confluence to Iliff Avenue
(1.2 mi.)

GG-2
Iliff Avenue to E Cornell Avenue at Hutchinson Park
(1.2 mi.)

GG-3
E Cornell Avenue at Hutchinson Park to Quincy Avenue
(1.6 mi.)

GG-4
Quincy Avenue to Belleview Avenue
(1.1 mi.)

GG-5
Belleview Avenue to Yosemite Street
(0.5 mi.)

GG-6
Yosemite Street to Goldsmith Gulch West Tributary Confluence
(0.5 mi.)

GG-7
Goldsmith Gulch West Tributary Confluence to S Dayton Street at Silo Park
(0.5 mi.)

GG-8
S Dayton Street at Silo Park to Arapahoe Road
(1 mi.)

ST-1
E Cornell Avenue at Hutchinson Park to S Oneida Way at Southmoor Park
(0.8 mi.)

WG-1
Goldsmith Gulch West Tributary Confluence to Tommy Davis Park at Maplewood Avenue
(0.5 mi.)

WG-2
Tommy Davis Park at Maplewood Avenue to Caley Avenue
(0.3 mi.)

WG-3
Caley Avenue to Peakview Avenue
(0.4 mi.)

Canal/Gulch/Creek
Highway
Light Rail Line
Goldsmith Gulch Watershed Boundary (7.74 Sq. Mi.)
Jurisdictional Boundary
Detention Facility

Study Partner
City & County of Denver
Greenwood Village
SEMSWA

0 1,250 2,500
Feet

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by:
drawn by: RP
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project no.: 18.155.035
date: 11/12/2019

MHFD MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY AND TRIBUTARIES

REACH MAP

FIGURE 2-2

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2.3 Reach Descriptions

Reach GG-1 – Cherry Creek Confluence to E Iliff Avenue

Reach GG-1 of Goldsmith Gulch generally consists of 0.92 miles of open channel drainageway and 0.27 miles of piped conveyance along the mainstem (1.2 miles total) from E. Iliff Avenue to Cherry Creek near S. Monaco Street Parkway within the City and County of Denver.

From E. Iliff Avenue to E. Evans Avenue, concrete box culverts ranging from 14-feet by 4.6-feet (at the upstream end) to 30-feet by 4-feet (at the downstream end). Currently, these culverts are undersized, resulting in frequent flooding of the vacant lot adjacent to the former Kmart site (2150 S. Monaco Street Parkway) as well as flooding of S. Monaco St Pkwy and E. Iliff Avenue. In addition, the culverts are reaching the end of their life span and are exhibiting some spalling of the concrete.

From E. Evans Avenue to E. Jewell Avenue, the concrete low flow channel with grassy overbanks is currently undersized, resulting in bank sloughing and sediment build up near E. Jewell Avenue.

At E. Jewell Avenue, the mainstem splits into a low flow channel and overflows through box culverts underneath S. Monaco Street Parkway. On the east side of S. Monaco Street Parkway (approximately 100-feet north of E. Colorado Drive), the low flow and overflow flow paths converge and flow through an open channel to Cook Park at E. Mexico Avenue. Low flows are directed north underneath E. Jewell Avenue through two 16-feet by 4.6-feet concrete box culverts (Crossing No. 61) to a natural drainageway on the west side of S. Monaco Street Parkway. At approximately the same latitude as E. Colorado Drive, the low flow channel makes a right angle turn and flows under S. Monaco Street Parkway through a 9-feet wide by 6-ft high culvert (Not Surveyed). From E. Jewell Avenue, Goldsmith Gulch overflows enter a dual-cell reinforced concrete box culvert (Crossing No. 64). Each cell is 120-inches wide by 72-inch high. The box culvert starts on the southwest corner of E. Jewell Avenue and S. Monaco Street Parkway, then flows north under S. Monaco Street Parkway until it daylights on the east side of S. Monaco Street Parkway and converges with the low flow channel.

From E. Mexico Avenue to the confluence with Cherry Creek, the gulch flows through Cook Park. Two 9-ft wide by 6-ft high concrete box culverts convey flows underneath E. Mexico Avenue. Three drop structures and two pedestrian bridges are located within Cook Park. At the downstream end of Cook Park, the mainstem flows underneath E. Cherry Creek S. Drive through three 12.5-ft wide by 8.2-ft high elliptical corrugated metal pipes followed by a pedestrian crossing at Cherry Creek Greenway Trail. In 2011, channel improvements, including riprap lining and installation of one drop structure, were completed (*As-Built: Goldsmith Gulch – Cook Park Channel Improvements, 2011*). Since Goldsmith Gulch is piped in some segments, trail connectivity is sporadic. There is an opportunity to extend Goldsmith Gulch Trail from E. Iliff Avenue to E. Mexico Avenue to improve trail connectivity by improvements of a greenbelt corridor. Existing drainage facilities in this area are undersized, and flooding of S. Monaco Street Parkway is shown on current FEMA maps.

Reach GG-2 – E. Iliff Avenue to Southmoor Tributary Confluence

Reach GG-2 of Goldsmith Gulch generally consists of 1.2 miles of open channel drainageway along the mainstem from the Southmoor Tributary confluence in Hutchinson Park to E. Iliff Avenue.

From the Southmoor Tributary confluence in Hutchinson Park, the gulch crosses E. Dartmouth Avenue and High Line Canal through a five-cell concrete box culvert with four 14-ft wide, and one 10-ft wide by 4.5-ft high to Bible Park (*As-Built: Goldsmith Gulch Flood Control Project Phase III, Schedule IIIB, 1995*).

In 1997, drainageway improvements were completed for the channel through Bible Park, including installation of concrete and riprap-lined low flow channels and two drop structures (As-Built: *Drainageway Maintenance on Goldsmith Gulch in Bible Park, 1997*). In total, eight drop structures are located in Bible Park. In addition, one pedestrian crossing is located within the park.

The crossing at E. Yale Avenue consists of a 6-feet by 6.25-feet (low flow) and 14-feet by 8.5-feet (pedestrian underpass/ high flow) concrete box culverts (As-built: Goldsmith Gulch Flood Control Project Phase III, Schedule II, 1994). This crossing is also the outlet for Bible Park Detention, which provides detention only.

Between E. Yale Avenue and E. Iliff Avenue, the gulch flows through an open channel drainageway. During high flow conditions (approximately the 10-year event), flows spill laterally through five 4-feet by 2-feet concrete box culverts into the off-line Iliff & Monaco Detention (see **Figure 2-3**). The basin is drained by a network of inlets and storm drain pipes located around the perimeter of the basin which convey detained flood water to an outlet is controlled by a pump station (because the detention pond bottom is lower than the channel invert and cannot be gravity drained), which ties-in to the existing concrete box culvert at E. Iliff Avenue (*As-Built: Goldsmith Gulch Flood Control Project Phase III, Schedule III, 1994*). Photos of the Iliff & Monaco basin are shown in **Figure 2-3**. In 2006, the channel from E. Yale Avenue to E. Iliff Avenue was stabilized with riprap lining and revegetated with wetland plantings, riparian prairie grasses, and trees within the floodplain. Goldsmith Gulch Trail, which is located adjacent to the channel, was completed between E. Yale Avenue and E. Iliff Avenue in 2017 (*As-Builts: Goldsmith Gulch Trail, 2017*).

Basin inlet looking northwest.

Basin looking southeast, outlet pump at left corner

Figure 2-3 Iliff & Monaco Detention.

Reach GG-3 – Southmoor Tributary Confluence to E. Quincy Avenue

Reach GG-3 of Goldsmith Gulch generally consists of 1.3 miles of open channel drainageway and 0.31 miles of piped conveyance along the mainstem (1.6 miles total) from E. Quincy Avenue to the Southmoor Tributary confluence in Hutchinson Park within the City and County of Denver.

From E. Quincy Avenue to E. Princeton Avenue, the gulch flows through Rosamond Park. The Denver SDMP illustrated the potential for new stormwater detention at this park location within the figures only. No known studies include modeled detention at this location and the outlet (two 19-feet by 5-feet concrete box culverts) is too large to provide significant detention of flows. Detention in Rosamond Park was not considered in the baseline hydrology analysis but is evaluated as part of the alternatives analysis.

From E. Princeton Avenue to E. Jarvis Place, the gulch flows within a grassy drainageway parallel to S. Tamarac Drive through a residential area. At E. Jarvis Place, the gulch flows through a drop structure before entering a 0.31 mile, 20-feet by 8-feet box culvert under a commercial lot. This transitions to three 12-feet by 9-feet concrete box culverts crossing E. Hampden Avenue. Denver Parks constructed trail improvements along this reach in 2017.

From E. Hampden Avenue to Hutchinson Park, the grassy drainageway flows through five drop structures. Within Hutchinson Park, the mainstem flows through two drop structures before converging with Southmoor Tributary directly upstream of E. Cornell Avenue. An Alert gage station is located on Goldsmith Gulch at Eastman Avenue.

Reach GG-4 – E. Quincy Avenue to Belleview Avenue

Reach GG-4 of Goldsmith Gulch generally consists of 1.1 miles of open channel drainageway along the mainstem from the Belleview Avenue to E. Quincy Avenue. This reach is located within Denver and is maintained by Goldsmith Metropolitan District as part of the Transportation Expansion (TREX) development. The TREX improvements include construction and widening of the northbound and southbound I-25 and I-225 highway/ ramps and a new light rail system as well as associated drainage upgrades and replacement.

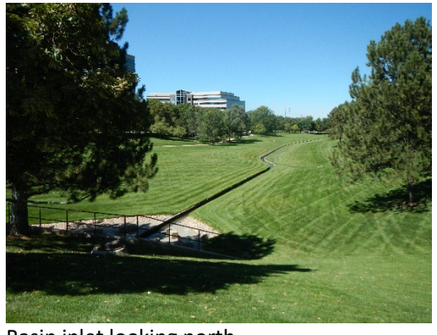
From Belleview Avenue to E. Temple Drive, the gulch flows through Wallace Park South, which also acts as a detention. The Wallace Park South Detention Basin (see **Figure 2-4**) outlet consists of two 7-feet diameter concrete pipes with restrictor plates extending 2.75-feet from the top of pipe (4.25-feet opening), providing detention only. Six drop structures are located within this section.

Basin looking south from the outlet.

Basin outlet looking north.

Figure 2-4 Wallace Park South Detention.

From E. Temple Drive to I-225, the gulch flows through Wallace Park North, which also acts as a detention basin. The Wallace Park North Detention (see **Figure 2-5**) outlet consists of two 12-feet by 6-feet concrete box culverts with restrictor plates extending 3-feet from the top of pipe (3-feet opening), providing detention only.



Basin inlet looking north.

Basin outlet looking north.

Figure 2-5 Wallace Park North Detention.

The gulch crosses I-225 through two 12-feet by 6-feet concrete box culverts. The 2003 Drainage Report for the TREX site was utilized to ensure runoff was correctly routed through this area (SECC 2003). In general, there are two primary flow paths within TREX.

- Runoff from basins L-140 and L-150 (in this study) flows to the detention basin within the JD Edwards Complex, north of E. Union Avenue, southwest of S. Ulster Street, and east of I-25. This private detention basin outlets across S. Ulster Street to Stanford Detention Basin (private). A 60-inch outlet pipe conveys flows from the Stanford basin across I-225 and through a commercial lot to the outfall in Goldsmith Gulch North Middle Park, south of E. Quincy Avenue. Runoff from basin L-330 (in this study) is also discharged at this location. This area is a potential location for formalized detention.
- Runoff from basin L-180 (in this study) is conveyed to the Interchange Detention Basin located within the I-25 / I-225 interchange. Flow from the detention basin is conveyed parallel to I-225 in a trapezoidal swale to the outfall at the intersection of DTC Boulevard and I-225. This facility is owned/ maintained by CDOT, however, due to maintenance needs, this detention was not included in the baseline hydrology. Formalizing regional detention at this CDOT facility is evaluated as part of the alternatives analysis.

Reach ST-1 – Southmoor Park at S. Oneida Way to Southmoor Tributary Confluence

Reach ST-1 of Goldsmith Gulch generally consists of 0.21 miles of open channel drainageway and 0.61 miles of piped conveyance (0.82 miles total) from Southmoor Park at S. Oneida Way to Southmoor Tributary Confluence within the City and County of Denver.

From S. Oneida Way to the alley between E. Hampden Avenue and E. Hamilton Place, the Southmoor Tributary flows through a 72-inch diameter RCP through Southmoor Park. The basin outlet consists of a Valley Inlet Type 13, which conveys surface flows from the park and contributing area to the 72-inch pipe via a 24-inch diameter pipe, which provides detention within the park (see **Figure 2-7**). Formal inlet and outlet structures could be added to this park to increase inflows to this facility as well as detention storage. Downstream, the gulch briefly daylights and flows through a concrete trapezoidal channel before flowing through another culvert crossing a parking lot and E. Hamilton Place into Hutchinson Park.

Through Hutchinson Park, the gulch consists of natural drainageway with dense overbank vegetation. One drop structure is located on Southmoor Tributary within Hutchinson Park (*As-Built: Southmoor Tributary at Hutchinson Park, 2011*). Existing emergent and forested/ shrub wetlands (see **Figure E-1**) are located along Southmoor Park Tributary and within Hutchinson Park, which provides water quality benefits and opportunities.

Basin inlet looking east (surface flow).

Basin outlet and spillway looking north.

Figure 2-6 Southmoor Park Detention.

Reach GG-5 – Belleview Avenue to Yosemite Street

Reach GG-5 of Goldsmith Gulch generally consists of 0.5 miles of open channel drainageway Yosemite Street to Belleview Avenue within Greenwood Village. In general, the gulch consists of a grassy trapezoidal channel. Downstream of approximately E. Crescent Parkway the gulch becomes channelized and flows through a concrete low flow channel with grassy overbanks.

Reach GG-6 – Yosemite Street to West Fork Goldsmith Gulch Confluence

Reach GG-6 of Goldsmith Gulch generally consists of 0.48 miles of open channel drainageway from Yosemite Street to West Fork Goldsmith Gulch Confluence within Greenwood Village.

The confluence of West Fork Goldsmith Gulch and Goldsmith Gulch is located in Orchard Hills Park directly upstream of Orchard Hills Detention Basin (see **Figure 2-7**). This basin includes a permanent wet pool. An 18-inch stand pipe conveys low flows downstream creates permanent wet pool. Larger flows spill over a pedestrian trail. Increasing storage volume at this location is evaluated as part of the alternatives analysis.

Basin outlet looking north.

Basin spillway looking east.

Figure 2-7 Orchard Hills Detention.

Reach GG-7 – West Fork Goldsmith Gulch Confluence to S. Dayton Street at Silo Park

Reach GG-7 of Goldsmith Gulch generally consists of 0.5 miles of open channel drainageway from West Fork Goldsmith Gulch Confluence to S. Dayton Street at Silo Park within Greenwood Village.

Downstream of S. Dayton Street, the channel consists of a grassy low flow channel and overbanks. Two drop structures and two pedestrian crossings are located within this reach.

Reach GG-8 – Orchard Road at Silo Park to Arapahoe Road

Reach GG-8 of Goldsmith Gulch generally consists of 1.1 miles of open channel drainageway from Orchard Road at Silo Park to Arapahoe Road. The reach is located within City of Centennial and unincorporated Arapahoe County as well as a small portion in Greenwood Village.

From Arapahoe Road to E. Peakview Avenue, the mainstem consists of a concrete trapezoidal channel through the Hyundai and Subaru car dealerships, which transitions to a concrete bottom with grassy side slopes where the channel turns west parallel to Peakview Street.

Directly downstream of E. Peakview Avenue, there is a series of three drop structures. Through this section, the channel consists of an engineered riprap low flow channel with grassy overbanks. The channel consists of a concrete low flow channel and grassy overbanks from the last drop structure to Arapahoe Lake.

Arapahoe Lake dampens peak flows in the upper basin, but the lake is privately owned and maintained so its function as a regional stormwater detention facility has not been included in the Baseline Hydrology. Houses have been constructed along the shoreline making them susceptible to flood hazards. To account for this detention occurring at Arapahoe Lake, an Adequate Assurance Agreement would be necessary to document that no changes would be made to the lake without approval. The Alternatives Analysis will consider the merits of making this lake a regional detention facility. The Homeowner's Association previously indicated they are willing to consider formalizing detention if there is a benefit to the system. The lake outlet consists of an approximately 7-foot diameter RCP pipe and spillway. Downstream of the Arapahoe Lake spillway, the gulch is conveyed through 4-feet by 8-feet RCBC to Silo Park.

The Silo Park Detention Basin (see **Figure 2-8**) is currently being redesigned. The existing basin outlet structure consists of one 36-inch CMP pipe and provides detention only. The proposed design increases the size of the culvert under Orchard Road to reduce overtopping and thus will also integrate a spillway berm upstream of Orchard Road to mimic existing detention, similar to Tommy Davis Park. The implementation of the proposed Silo Park Drainage Improvement Project is scheduled to be constructed by 2022.

Basin looking north.

Basin outlet looking north.

Figure 2-8 Silo Park Detention.

Reach WG-1 – West Fork Goldsmith Gulch Confluence to Tommy Davis Park at Maplewood Avenue

Reach WG-1 of West Fork Goldsmith Gulch generally consists of 0.52 miles of open channel drainageway from West Fork Goldsmith Gulch to Tommy Davis Park at Maplewood Avenue within Greenwood Village.

A concrete low flow channel extends from Maplewood Avenue to the Tommy Davis Park Detention Basin at Orchard Road and includes three drop structures. The Tommy Davis Park Detention Basin (see **Figure 2-9**) was constructed in 2008 and the 16-feet by 10-feet RCBC and pedestrian crossing at Orchard Road was completed in 2009. Both phases are documented in as-builts (*As-Builts: Goldsmith Gulch – West Tributary Tommy Davis Park Phase I Improvements, 2008, and Phase II Improvements, 2009*). The basin is designed for detention only and includes a permanent wet pool below the outlet. The basin outlet structure consists of two 24-inch pipes and spillway berm, both located upstream of the Orchard Road culvert.

Downstream of Orchard Road, the channel is relatively stable and consists of a partial boulder wall on the east bank, engineered riprap low flow channel, and vegetated overbanks. One drop structure is located within this reach.

Basin and inlet looking north.

Basin outlet looking north.

Figure 2-9 Tommy Davis Park Detention.

Reach WG-2 – Tommy Davis Park at Maplewood Avenue to E. Caley Avenue

Reach WG-2 of West Fork Goldsmith Gulch generally consists of 0.31 miles of natural drainageway from Tommy Davis Park at Maplewood Avenue to E. Caley Avenue within Greenwood Village and a small portion in unincorporated Arapahoe County.

Downstream of Caley Basin, a natural channel corridor project is under construction (2018) from E. Caley Avenue to E. Fair Avenue. The project includes a 6-foot drop structure and a void filled riprap channel with pools. HEC-RAS from this project will be incorporated into the FHAD hydraulic model.

From E. Fair Avenue to approximately Maplewood Avenue, a channel reconstruction project was constructed in 2020. The as-built conditions have been included in the FHAD hydraulic model.

Reach WG-3 – E. Caley Avenue to E. Peakview Avenue

Reach WG-3 of West Fork Goldsmith Gulch generally consists of 0.36 miles of natural drainageway from E. Caley Avenue to E. Peakview Avenue within Greenwood Village. Several projects are currently underway and have recently been completed within this reach.

The Boston Peakview Detention Basin (see **Figure 2-10**) was constructed in 2004/ 2005 to provide water quality via a 100-inch high by 15-inch-wide orifice plate located 20-inch above grade. The orifice plate consists of 24 rows and two columns of approximately 2-inch orifices. A 170-inch long by 7-inch high (vertical) spillway is located 120-inch from the basin bottom. The basin was designed with a micro-pool, which resulted in several citizen complaints about standing water from the adjacent Brookdale Greenwood Village. In 2018, a 3-inch orifice and a concrete pan were added to the base of the outlet structure to eliminate the micro-pool. The original as-builts and drainage report were unable to be located for this basin, but there is a Memorandum for the added orifice design (Muller 2018).

Downstream of S. Boston Street, there are a series of two wet ponds upstream of the Caley detention basin inlet. A drop structure between the two wet ponds failed and currently requires channel regrading to remove an adjacent structure from the floodplain. A capital improvement project is currently underway to rehabilitate the Bridgwater Upper Pond to include water quality, as well as drop structures, and channel improvements. As of completion of this report, LOMR 21-08-0598P issued 2/25/22 and effective 7/15/22 was completed to remove the Bridgwater Apartments from the floodplain.

Caley Detention Basin (see **Figure 2-11**) was constructed in 2004 to provide regional detention and water quality and is documented in as-builts. The adjacent pedestrian underpass was completed in 2017. The basin outlet structure consists of multi-level weirs with an orifice plate in the lowest weir to provide water quality. Once water overtops the weir structure, it is conveyed through two 6-foot by 4-foot RCBC across E. Caley Avenue. A LOMR is complete for the recently installed box culvert at the inlet to Caley basin. Caley Detention Basin is not designed to spill into the pedestrian underpass, however, since the wall is not considered a levee, the regulatory floodplain extends into this underpass. A drop structure was located at the current inlet of Caley Detention Basin and served as energy dissipation at the inlet. The project removed the drop structure and replaced it with a roadway crossing culvert. The drop structure was relocated immediately upstream at the entrance of the roadway crossing culvert and serves as energy dissipation for flow into the detention basin.

Basin and outlet looking north.

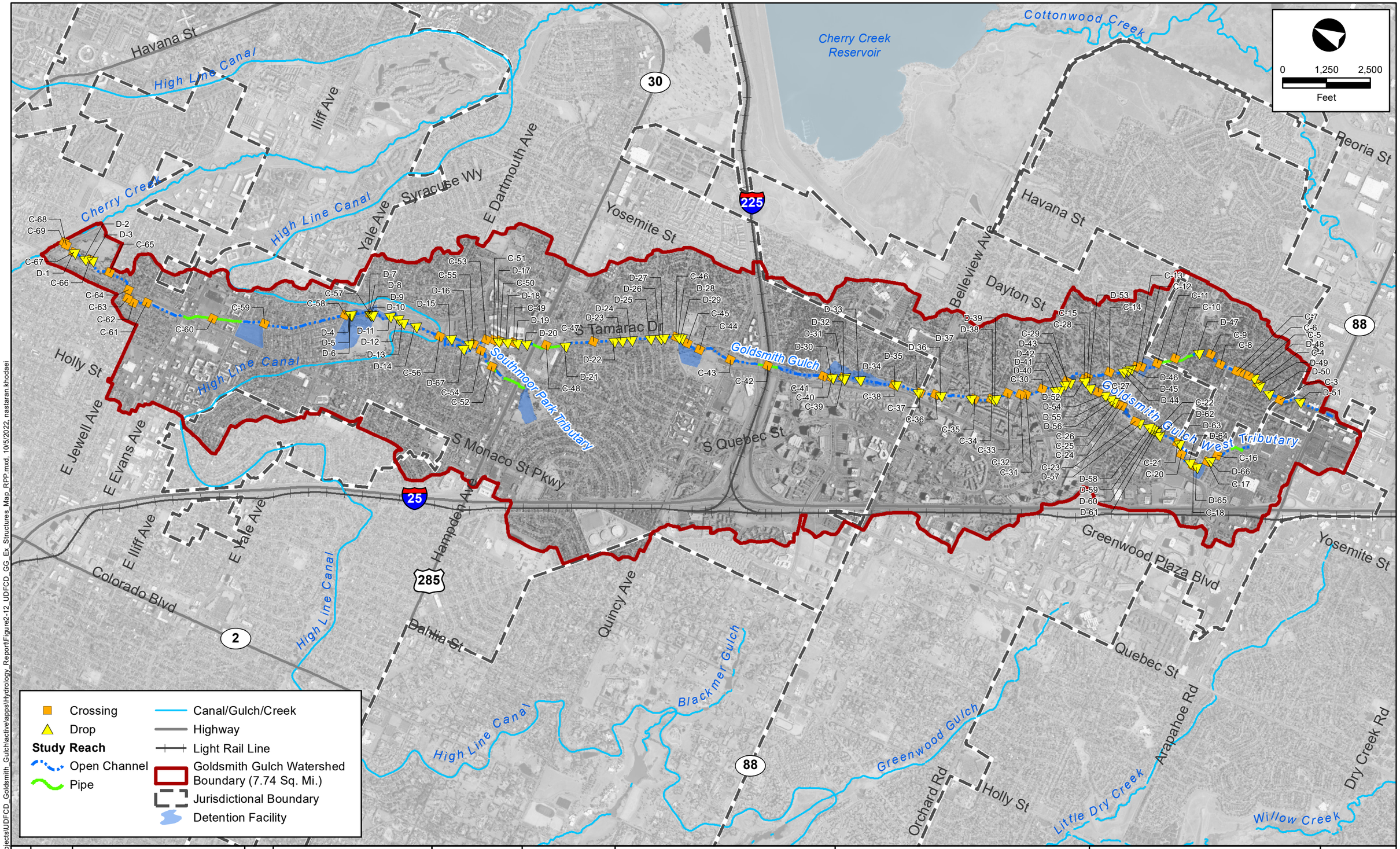
Basin outlet looking north.

Figure 2-10 Boston Peakview Detention.

Basin inlet looking south.

Basin outlet looking south.

Figure 2-11 Caley Detention.



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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: _____
drawn by: RP
checked by: RK
project no.: 18.155.035
date: 11/12/2019

MHFD MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY
AND TRIBUTARIES

EXISTING STRUCTURES
MAP

FIGURE
2-12

2.4 Flood History

The waterway has generally functioned adequately in the recent past without major flood damage. Three MHFD Alert flood warning stream gages have flood records on Goldsmith Gulch and its tributaries. The gages are located at Wallace Park South Detention Basin (Temple Pond) (1987), Goldsmith Gulch at Eastman Avenue (Goldsmith @ Eastman) (1989), and Iliff & Monaco Detention Basin (Goldsmith @ Iliff Pond and Iliff Pond) (2004). All of the gages are active stream peak flow gages and are operated by MHFD. These gages are primarily for flood warning with limited calibration; therefore the reported discharge values are approximate and the exact values should be used with caution. Limited flooding history is known prior to the 1976 FHAD due to lack of recordkeeping and gage records.

On May 5 and 6, 1973, a large storm causing heavy rainfall and local flooding along the mainstem of Goldsmith Gulch. The estimated flood frequency resulting from this long duration storm was approximately 5-year to 10-year. Capacities of the crossings at Dartmouth and Yale Avenues were exceeded. Photos from the 1973 flood are shown in **Figure 2-14.**

On May 23, 1991, a hailstorm with heavy rain occurred in Arapahoe County near Goldsmith and Harvard Gulch in the afternoon between 2:00 pm and 3:00 pm. A total of 1.75 inches of rain fell causing increased runoff and localized flooding in both Goldsmith and Harvard Gulch.

On July 27, 1997, Goldsmith Gulch was hit by heavy rains with 1.66 inches falling at the Denver Tech Center. Downstream floodwaters approached 10-year levels causing the side-channel detention facility, constructed a year earlier in 1996 near Iliff Avenue and Monaco, to activate and was credited with preventing damages downstream. A minor glitch did occur, however, when the pump that drains the facility failed to start.

On July 28, 1997 Goldsmith Gulch was hit hard for the second consecutive day, exceeding the prior day's peak at Eastman Avenue by one foot and setting a new record of 2,040 cfs. Upstream at Temple Pond, Goldsmith floodwaters pooled to a depth of 9.5 feet releasing 500 cfs. Downstream of Eastman at Yale Avenue, the peak flow was estimated at 1,850 cfs (see **Figure 2-15**) and classified as a 10-year event. According to the Goldsmith Gulch design hydrology model, the discharge at Eastman approached the 50-year mark.

On July 16, 2000, strong thunderstorms developed between 7:30 pm and 9:00 pm. Very moist and unstable conditions, combined with upslope during the late afternoon and evening hours, triggered widespread urban and small stream flooding in and around the Denver metropolitan area. Rainfall amounts generally ranged from 1 to 3 inches, with the heaviest rainfall occurring during the evening hours. In Greenwood Village however, near Peoria and Belleview, the road was closed for several hours as 2 feet of standing water covered the roadway.

On July 8, 2001, significant flooding again occurred. Up to 4.5 inches of rain fell across portions of western Arapahoe County. The underpass of Interstate I-225 and Parker Road was inundated with 5 feet of water. **Figure 2-16** illustrates conditions at Goldsmith Gulch upstream of Mexico Avenue during the 2001 flood.

On July 13, 2001, three inches of rain reportedly fell near the Greenwood Village Police Department in a span of 15 minutes.

On July 19, 2003, heavy thunderstorms caused flash flooding across parts of western Arapahoe and southern Denver Counties. Automated rain gages indicated 2 to 3 inches of rain fell in less than one hour. The heavy runoff caused many intersections and underpasses to flood, stranding motorists. As a result, sections of Interstate 25 and Interstate 225 were closed.

On August 18, 2004, several intersections in southern Aurora were impassable due to flood waters. Two feet of water covered portions of the roadway near Park Meadows Mall. One person had to be rescued near the intersection of Arapahoe Road and Liverpool.

A storm on June 3, 2005, resulted in significant flooding in the parking lot of apartment complex on the north side of Iliff Avenue (see **Figure 2-17**). While this flooding occurred, the Iliff & Monaco detention basin was less than a quarter full. Up to 3 feet of standing water was reported over East Orchard Road. Several motorists were stranded in their vehicles and needed to be rescued.

On August 1, 2006, high water inundated Arapahoe Road between Holly and Quebec. Flooding of Park Meadows Mall and areas of Greenwood Village was reported.

On July 3, 2009, flooding was reported at the intersection of Monaco & Evans. UDFCD ALERT gage at Iliff Detention Basin two blocks south indicates 1.22 inches rain fell in approximately 25 minutes.

A major event occurred on September 12, 2013 (**Figure 2-19**). According to the UDFCD 2013 Flood Peak Estimate Interactive Map, flows reached 420 cfs at Wallace Park South Detention Basin, 752 cfs at Goldsmith Gulch at Eastman Avenue, and 461 cfs at Iliff & Monaco Detention Basin.

Flooding was also noted on August 13, 2006, May 12, 2011 (**Figure 2-18**), July 13-14, 2011, and June 11, 2015 (**Figure 2-19**), according to the gage records, but no specific information is available regarding flood impacts.

Annual peak flows from the Alert gages for the Temple Pond, Goldsmith @ Eastman, and Goldsmith @ Iliff Pond are presented in **Figure 2-21**. Comparison of annual peak stage within Iliff Pond and Goldsmith @ Iliff Pond is presented in **Figure 2-22** (these stages do not necessarily occur at the same time or day).

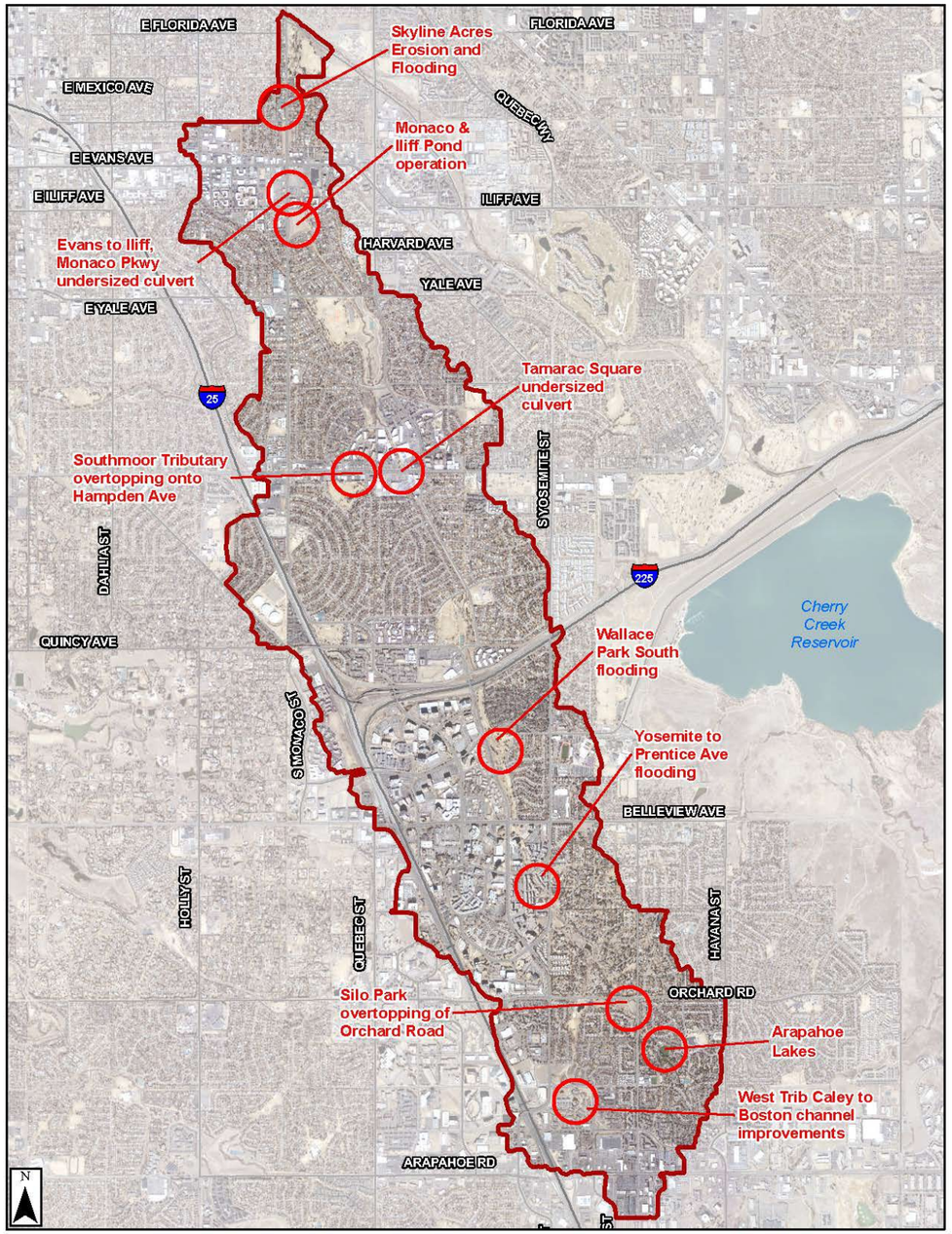
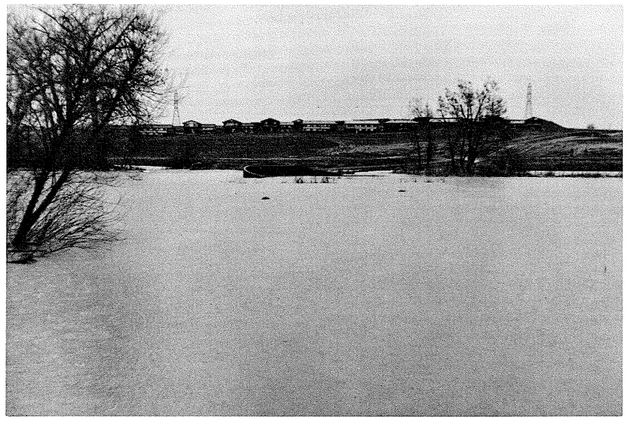


Figure 2-13 Major Drainageway Problem Areas within Goldsmith Gulch



Goldsmith Gulch at Dartmouth Avenue and High Line Canal, May 6, 1973. View looking downstream.

Goldsmith Gulch at Yale Avenue, May 6, 1973. View looking west along Yale Avenue.

Photographs from 1976 FHAD (Source: Leonard Rice Consulting Water Engineers).

Figure 2-14 1973 Flooding Event

Figure 2-15 Goldsmith Gulch downstream of Yale Avenue on July 28, 1997

Figure 2-16 Goldsmith Gulch upstream of Mexico Avenue on July 8, 2001

Goldsmith Gulch at Iliff Avenue looking west along Iliff Avenue towards the detention basin.

Goldsmith Gulch upstream of Iliff Avenue looking west towards the detention basin.

Goldsmith Gulch in the parking lot of the apartment complex on the north side of Iliff Avenue.

Water level in apartment complex parking lot.

Figure 2-17 June 3, 2005 Flooding Event.

Tommy Davis Park detention outlet (on south side of berm) looking west.

Tommy Davis Park detention outlet (on north side of berm in underpass) looking south.

Orchard Hills Park.

Orchard Hills detention spillway looking east.

Figure 2-18 May 12, 2011 Flooding Event.

Orchard Hills Park

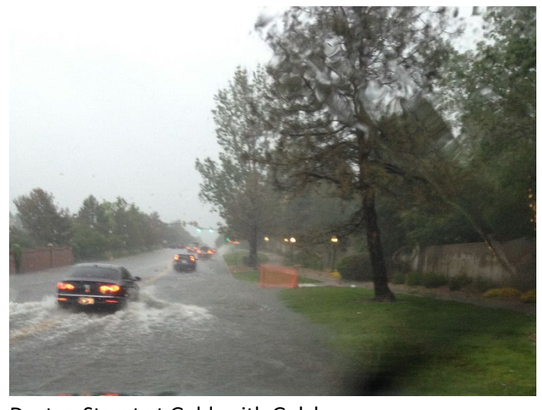
Orchard Hills Park

Downstream of Berry Stables

Silo Park Basin

Figure 2-19 September 12, 2013 Flooding Event.

Orchard Road Under Crossing at West Tributary



Dayton Street at Goldsmith Gulch

Figure 2-20 June 11, 2015 Flooding Event.

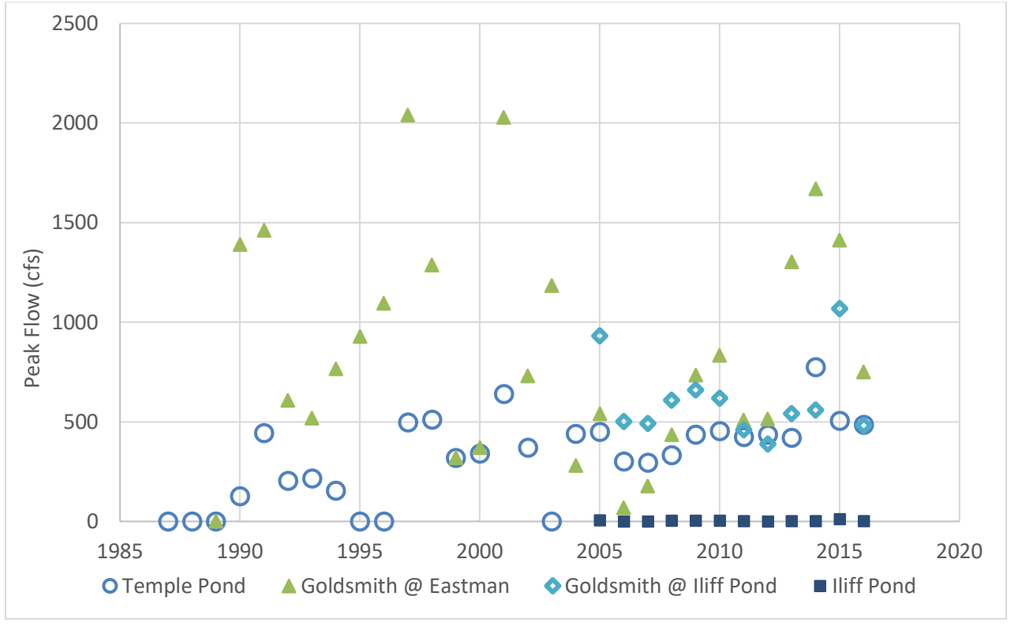


Figure 2-21 ALERT Gage Annual Peak Flows.

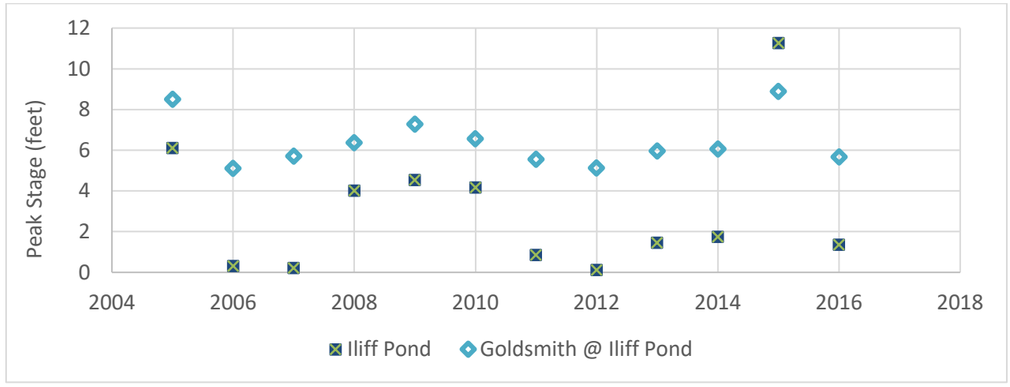


Figure 2-22 ALERT Gage Annual Peak Stage at E. Iliff Avenue.

Note: These stages do not necessarily occur at the same time or day.

2.5 Environmental Assessment

Parks and Open Space

Figure 2-23 identifies city-owned land. **Figure 2-23** identifies Parks and Open Space. **Figure 2-24** also identifies existing trail systems to highlight gaps in connectivity. Trail connectivity is a prioritization criterion considered in the alternatives analysis.

Wetlands and Riparian Zones

The vegetation along the mainstem, Southmoor Tributary, and West Tributary drainageways consists of a mix of turf grass, prairie grassland, and riparian vegetation communities with some wetlands directly adjacent to the low-flow channel. The streambanks and floodplains along the drainageway are well vegetated. Some areas are heavily vegetated, particularly along Goldsmith Gulch between Yosemite Street and Prentice Avenue. A formal Wetland and Riparian Zone inventory was not conducted for this study; however, **Figure E-1** in **Appendix E** illustrates the general location of wetland and riparian zone vegetation based on National Wetlands Inventory (NWI) datasets.

Threatened and Endangered Species

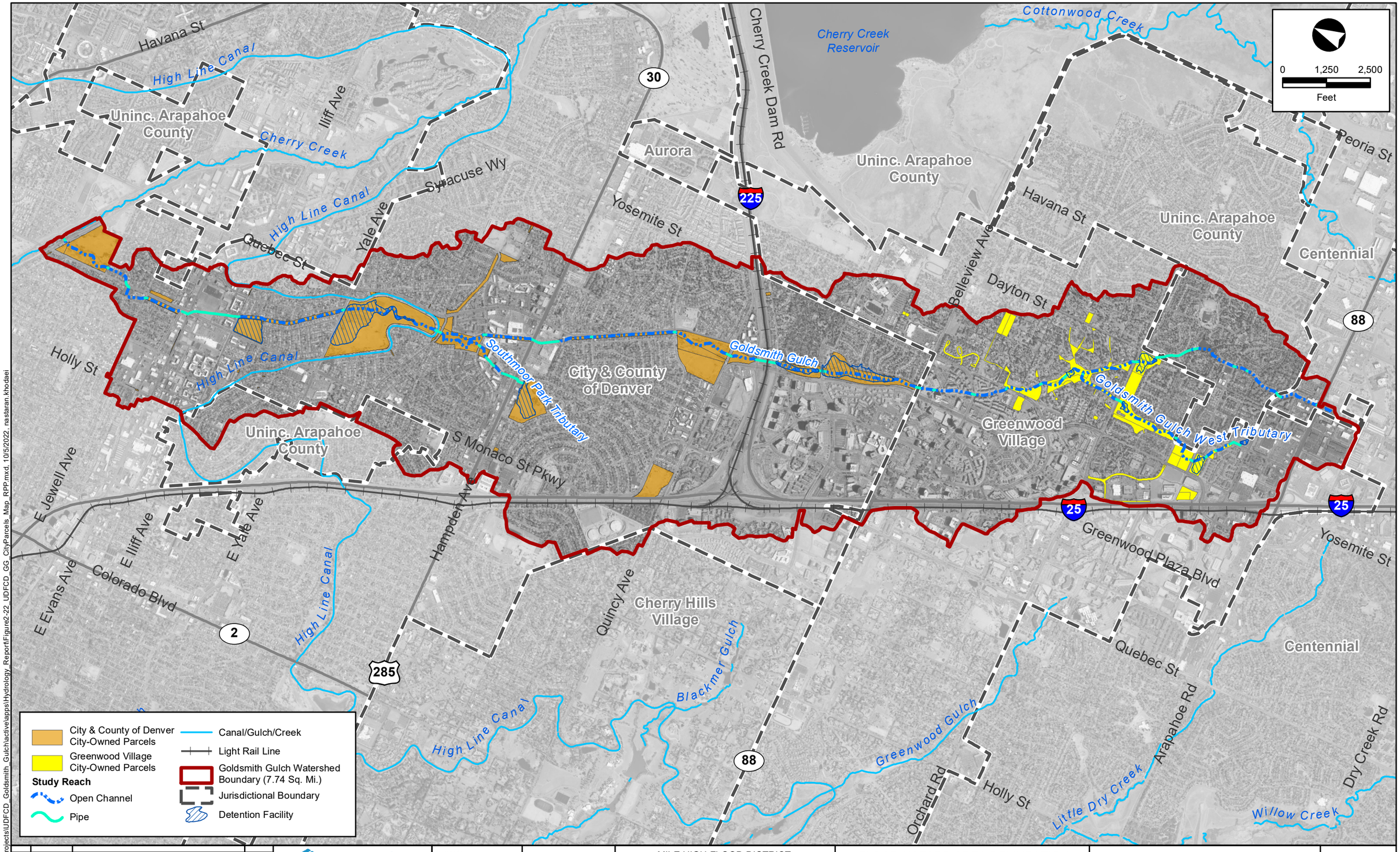
The U.S. Fish and Wildlife Service (USFWS) currently lists the Mexican spotted owl, Ute ladies'-tresses orchid, western prairie fringed orchid, and Preble's jumping mouse as threatened, and the Least tern as endangered species for Denver County and Arapahoe County per the listing on http://www.fws.gov/endangered/. These species should not be a concern for projects within the Goldsmith Gulch watershed. The entirety of the Goldsmith Gulch watershed is outside of the Denver metropolitan Block Clearance. Future design projects will require more detailed assessments of any potential threatened and endangered species habitat resources within the project limits.

Landfills

Approximate areas of known or suspected areas of landfill zones were identified and provided by the City & County of Denver. **Figure D-1** in **Appendix D** shows the approximate boundaries of landfill areas. Known landfills exist along Southmoor Tributary downstream of Southmoor Park to the confluence with Goldsmith Gulch and along Goldsmith Gulch from E. Kenyon Avenue to the confluence with Southmoor Tributary. Another known landfill is located at E. Dartmouth Avenue and S. Ulster Street.

Water Quality

Goldsmith Gulch mainstream is a Category 5 303(d)-listed waterbody for E. Coli and Selenium, according to the Colorado Department of Public Health and Environment (CDPHE) WQCD dataset, last updated April 8, 2016 (CDPHE 2012). The waterbody identification for Goldsmith Gulch is COSPCH04a and the unique assessment unit identification is COSPCH04a_B. Currently, reach-scale TMDLs are not required for Cherry Creek or Goldsmith Gulch.



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No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by:
drawn by: RP
checked by: RK
project no.: 18.155.035
date: 11/12/2019

MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY
AND TRIBUTARIES

CITY-OWNED PARCELS

FIGURE
2-23

Old Cavalcade Trail
Cook (Judge Joseph E) Park
Highline Canal (Colorado to Parker)
Bible (James A) Park
Hampden Heights West Park
Hutchinson East Park
Goldsmith Gulch
Goldsmith Gulch North
Wallace (George M) Park
Chenago Park
Hoffman Park
Sundance Park
Orchard Hills Park
Silo Park
Tommy Davis Park
Huntington Acres Park
Highline Canal (Colorado to Parker)
Hutchinson (Theodore A) Park
Southmoor Park
Eastmoor Park
Jefferson Square Park
Rosamond Park
Wallace (George M) Park North
Goldsmith Gulch North Middle
Greenwood Village Open Space

Havana St
High Line Canal
Uninc. Arapahoe County
Iliff Ave
Cherry Creek
Cherry Creek Reservoir
Cherry Creek Dam Rd
Cottonwood Creek
Aurora
Yosemite St
Peoria St
Centennial
Belleview Ave
Dayton St
Quebec St
Yale Ave
Holly St
City & County of Denver
Southmoor Park Tributary
Goldsmith Gulch
Goldsmith Gulch West Tributary
Greenwood Village
S Monaco St Pkwy
Hampden Ave
E Jewell Ave
E Iliff Ave
E Yale Ave
E Evans Ave
Colorado Blvd
Greenwood Plaza Blvd
Quincy Ave
Cherry Hills Village
Blackmer Gulch
Greenwood Gulch
Orchard Rd
Little Dry Creek
Arapahoe Rd
Dry Creek Rd
Willow Creek

30
225
88
25
2
285

0 1,250 2,500
Feet

Trail
Study Reach
Open Channel
Pipe
Canal/Gulch/Creek
Light Rail Line
Goldsmith Gulch Watershed Boundary (7.74 Sq. Mi.)
Park
Jurisdictional Boundary
Detention Facility

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by:
drawn by: RP
checked by: RK
project no.: 18.155.035
date: 11/12/2019

MHFD MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY AND TRIBUTARIES

PARKS AND OPEN SPACE

FIGURE 2-24

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3.0 HYDROLOGIC ANALYSES

3.1 Overview

Goldsmith Gulch along with Goldsmith Gulch West Tributary and Southmoor Park Tributary drain an area of approximately 4,954 acres (7.74 square miles) from Arapahoe Road to the confluence with Cherry Creek. The major drainageway includes 7.6 miles of mainstem channel corridor, which is based upon 5.1 miles in Denver, 1.3 miles in Greenwood Village, and 1.1 miles in SEMSWA (Arapahoe County and City of Centennial). In addition, 1.2 miles of tributary stream corridor along Goldsmith Gulch West Tributary in Greenwood Village (a short reach less than 400-feet in the unincorporated area of Arapahoe County) and 0.8 miles of tributary stream corridor along Southmoor Park Tributary in Denver. The purpose of this study is to update the major drainageway design flood flows based upon current criteria for the entirety of the Goldsmith Gulch watershed, including Goldsmith Gulch West Tributary and Southmoor Park Tributary. The updated peak discharge rates along the major drainageway will be used by project sponsors and communities as a base for regulating future development, re-development, floodplain management and infrastructure design. The hydrologic calculations were approved by MHFD on August 17, 2018. The following sections depict the detailed study and findings.

3.1.1 Previous/Concurrent Studies and Hydrologic Models

As described in the previous sections, there are several completed studies for the Goldsmith Gulch Drainageway. However, the model inputs and modeling methodology do not meet the current criteria.

In 1989, a *Hydrology Study for the Goldsmith Gulch Drainage Basin* (**1989 Study**) was developed by James C.Y. Guo in collaboration with Hydrosystems Engineering Consulting Services (HECS) (Guo 1989). This study updated the hydrology of the 1976 FHAD and MDP (Gingery Associates Inc 1976 and 1977, respectively) based on the changing land use conditions and additional detention facilities at Wallace Park North and South and Bible Park. In 1994, an appendix to the 1989 Study was completed by Sellards & Grigg (**1989 Study Appendix)** (Sellards & Grigg 1994). This appendix added on-line detention at Wallace Park (North and South) and Bible Park to the 1989 Study model. In addition, the off-line detention at Iliff & Monaco was modeled using an Interconnected Pond Routing model. The 1989 Study Report and Appendix are the basis of the **2020 FIS** at Goldsmith Gulch. In 2005, a FHAD and OSP was developed for the upper basin (south of Belleview Avenue) by Moser and Associates (**2005 OSP**) (Moser 2005).

The lower Goldsmith Gulch watershed (north of Belleview Avenue) within the City and County of Denver was studied in the Denver Storm Drainage Master Plan basin to model the storm drain system but not the drainageway (**2014 SDMP**) (Matrix 2014). The hydrologic models were run with CUHP 2000 and UDSWMM 2000 for each sub-watershed or local drainage system. However, the hydrographs for each sub-watershed were not routed through the Goldsmith Gulch major drainageway. The hydrologic models for the Denver Storm Drainage Plan were not used directly as the basis for developing this study's hydrologic model for the lower basin due to lack of modeling continuity, but the sub-basin delineation was incorporated into this study.

The Upper Goldsmith Gulch OSP in 2005 was analyzed with the hydrologic models CUHP 2000 and UDSWMM 2000. The hydrologic models from the 2005 OSP were provided by MHFD and converted into CUHP 2.0 and EPA SWMM 5.1 to be used as the base for hydrologic analysis for the upper watershed (south of Belleview Avenue).

The TREX Drainage Report included two detention basins: a CDOT facility and a private facility near I-25 and I-225. Privately owned facilities cannot be considered in the Baseline Hydrology. The CDOT detention is primarily a water quality treatment facility and was designed based on 50-year return period. City and County of Denver staff confirmed that water quality detention is inspected and maintained at a regular basis. However, use of the facility for 100-year flood control has not been confirmed. The TREX drainage schematics were used to identify the sub-basin delineation and routing, however, the CDOT and private detention were not incorporated into the Baseline Hydrologic model.

There is a concurrent study to evaluate Silo Park for drainage improvements. As described in Section 2.3, the implementation of the proposed Silo Park Drainage Improvement Project is scheduled to be constructed by 2022. However, the design is not complete at the time of this study and there is not a detention rating curve for the proposed Silo Park improvements. Therefore, the existing condition detention rating curve, refined by the study, was used in the Baseline Hydrologic model.

Arapahoe Lake physically acts to reduce downstream hydrology but is privately owned so the resulting detention storage and resulting reduction in hydrology is not considered in the Baseline Hydrology analysis. To include Arapahoe Lake in the baseline hydrology would require that SEMSWA or Arapahoe County obtain an Adequate Assurance Agreement documenting that no changes will be made to the lake without approval.

The 2005 OSP and 2014 SDMP were used as the framework for the upper and lower basins, respectively, in study. In addition, the 1989 Study was used to supplement information where needed, particularly for the lower basin. The following sections describe the major changes to previous models.

3.1.2 General Changes to Hydrology

The major changes to hydrology from previous studies include:

- Rainfall depth was updated to use NOAA 14.
- Percent imperviousness was updated for all sub-basins based on current data. Percent imperviousness difference is shown for the upper basin compared to the 2005 OSP in **Figure 3-1.** Percent difference is not provided for the lower basin due to substantial changes in sub-basin delineation.
- MHFD criteria was recently updated to require DARFs for watersheds between 2 and 15 square miles for the 2- to 10-year events.
- CUHP, version 2.0.0, and SWMM, version 5.1, were utilized.

3.1.3 Revisions to Upper Basin Model

Major revisions to the upper basin model from the 2005 study include:

- Sub-basin numbering was updated to be consistent with the lower basin while still maintaining a reference to the 2005 OSP numbering. A "U-" was added to the beginning of the numbering and a "0" was appended to the end of the 2005 OSP number (i.e. 77 is now U-770).
- One of the sub-basins from the 2005 OSP model were merged into an adjacent sub-basin to conform with current MHFD guidelines for basin geometry. Sub-basins 64 and 65 were merged into U-640. Sub-basin parameters, such as length, slope, and area were updated for this basin.
- Several sub-basin boundaries were slightly revised based on current topology and storm data, including: U-310, U-440, U-450, U-460, and U-770. Sub-basin parameters, such as length, slope, and area were updated for these basins.
- The 2005 OSP model included a design point for each sub-basin with a dummy link to an on-line design point. Redundant nodes and links were merged into the downstream design point.
- The 2005 OSP model did not include design point elevations. Design point elevations were added to each design point based on current topography. Outlet offset was used to adjust the slope to remove sudden elevation changes due to drop structures.
- Detention curves were updated to reflect current best available information. More detail is provided in subsequent sections.
- The Boston Peakview detention node was added to the model.

3.1.4 Revisions to Lower Basin Model

- Sub-basins, design points, and conveyance links within the 2014 SDMP model were delineated based on the storm system versus the drainageway. Significant revisions were made to the sub-basins to reflect current topography, storm system, existing detention, and the TREX drainage report. The 1989 Study sub-basins were too large and coarse and did not meet current MHFD guidelines.
- The 2014 SDMP model did not include any detention. Existing detention identified in the 1989 Study Appendix was included in this Baseline Study model. The 1989 Study Appendix detention curves were updated to reflect current best available information.

3.1.5 Hydrologic Modeling Methodology

The objective of the existing condition hydrologic analysis is to study the Upper and Lower Goldsmith Gulch basins using the Colorado Unit Hydrograph Procedure (CUHP), Version 2.0.0 to generate hydrographs for each sub-watershed. Hydrographs for the sub-watersheds were routed through the drainage network using the Environmental Protection Agency Stormwater Management Model (EPA SWMM), Version 5.1.012, to determine peak discharge rates along the major drainageway at key design points.

High Line Canal flows across the Goldsmith Gulch watershed and intercepts some storm flows from the headwaters. *Section 3.3.4.1 of the City & County of Denver's Storm Drainage Design and Technical Criteria Manual* states that "Irrigation facilities such as ditches and reservoirs shall not be used as drainage facilities…" Therefore, initial storm flows were modeled as being conveyed across the High Line Canal to the downstream storm drain network. In the High Line Canal Master Plan, which is currently in development, stormwater inflow into the canal is allowed with analysis and approval. Use of the High Line Canal for stormwater interception for water quality purposes only is evaluated in the Major Drainageway Plan, but does not affect the Flood Hazard Area Delineation hydrology.

3.2 Design Rainfall

Rainfall depth and distribution has been updated to current MHFD criteria for use in the baseline hydrologic model. Precipitation from NOAA Atlas 14 was used in this study per the Urban Storm Drainage Criteria Manual (USDCM) revised March 2017. Depth-area reduction factors (DARF's) applied to point rainfall depths used within CUHP vary with the size of the watershed being analyzed. The total contributing drainage area for the Goldsmith Gulch watershed to the Cherry Creek is 7.74 square miles. For watersheds less than 15 square miles, the MHFD-USDCM stipulates that the 1-hour point precipitation depth be used for the 25-, 50-, 100-, and 500-year events without applying a DARF. For watersheds between 2 and 15 square miles, the MHFD-USDCM stipulates that the 1-hour point precipitation depth be applied for the 2-, 5-, and 10-year events with the DARFs from Table 5-3 in Volume 1 of the MHFD-USDCM. Based on the MHFD-USDCM criteria, DARFs were applied for the 2-, 5-, and 10-year events only.

The one-hour point rainfall depths for the 2-, 5-, 10-, 25-, 50-, 100- and 500-year events were obtained from *NOAA Atlas 14 at Cherry Creek Dam (Site ID: 05-1547).* Selected one-hour and six-hour point rainfall depths for these design events are given in **Table 3-1** below. **Table B-1** in **Appendix B** shows the detailed rainfall temporal distributions for each event.

Table 3-1 One-Hour and Six-Hour Point Rainfall Depths (Inches)

Duration	2-Year	5-Year	10-Year	25-Year	50-Year	100-Year	500-Year
1-hour	0.87	1.12	1.36	1.72	2.02	2.35	3.20
6-hour	1.41	1.78	2.13	2.67	3.14	3.64	4.97

3.3 Subwatershed Characteristics

A summary of the CUHP model parameters can be found in **Appendix B, Table B-2**. For the subwatersheds within the study area, 1-foot contour topography was used to determine the existing conditions flow path lengths, slopes and distance to the centroid from outfall following the drainage path.

3.3.1 Subwatershed Delineation

The subwatersheds within the study area were delineated based on the 2005 Upper Goldsmith Gulch FHAD & Outfall Systems Planning (Moser 2005) and Denver Storm Drainage Master Plan (2014). Minor revisions were made to the upper subwatershed delineations, including merging subwatershed U-650 into U-640 to mitigate unacceptable basin length-to-area relationships in CUHP. More extensive revisions were made to the lower subwatershed delineations since the original delineations were created to model pipes during minor events.

Three subwatersheds, L-340, L-450, and L-700, in the lower watershed exceed 130-acres in area because further sub-division of these areas is not appropriate. The subwatersheds averaged no more than 100 acres per standard guidance from MHFD. A total of 110 subwatersheds were delineated in this Goldsmith Gulch study area. The minimum, maximum and average sizes of the subwatersheds are summarized in **Table 3-2**.

The highest watershed elevation is 5,826 feet at the southernmost watershed boundary, in the vicinity of South Clinton Street and East Costilla Avenue. The lowest watershed elevation is 5,382 feet on Cherry Creek at the northwest corner of the watershed. The average watershed slope is 0.97 percent measured following the topographic thalweg.

Table 3-2 Summary of Subwatersheds Delineation

Watershed	Total Area (sq. mi.)	Sub-basin Area (acre)			Total No. of Sub-basins
		Average	Minimum	Maximum	
Lower Watershed (North of Belleview Ave)	5.27	56.2	8.96	158	60
Upper Watershed (South of Belleview Ave)	2.47	31.6	5.76	81.9	50
Total Watershed	7.74	45.0	5.76	158	110

3.3.2 Watershed Imperviousness

A GIS-based approach was used to calculate the percent of imperviousness within the watershed based upon an impervious surface dataset. DRCOG collected planimetric data in the spring of 2016 for the entire watershed. By merging impervious surfaces available in the driveways, edge of pavement, parking, roof footprints, and sidewalks datasets, a compiled impervious surfaces dataset was created. GIS data representing the impervious surfaces were intersected with subwatershed polygons to calculate percent imperviousness for each subwatershed. Since the watershed is fully developed, existing and future imperviousness are assumed to be equivalent. The percent imperviousness used for each land use is shown in **Table 3-3**. Percent impervious values for existing conditions are shown in **Figure B-1 Interactive Hydrology Map**. The average percent impervious for the entire watershed is 50%.

Table 3-3 Imperviousness by Land Use

Existing/Future Land Use	Percent Imperviousness*
Cemetery	10%
Park	10%
Residential: Single-family, 0.75 - 2.5 acres	20%
Residential: Single-family, 0.25 - 0.75 acres	30%
Residential: Single-family, 0.25 acres or less	45%
Residential: Apartments	75%
Business: Suburban Areas	75%
Business: Downtown Areas	95%
Streets: Paved	100%
Right-of-way	90%
Water	100%

* Percent imperviousness were determined using MHFD-USDCM Table 6-3

3.3.3 Depression Loss

Depression losses were determined using Table 6-6 in Volume 1 of the MHFD-USDCM. The pervious depression loss of 0.35 inches and impervious depression loss of 0.1 inches were used for the watershed.

3.3.4 Infiltration

The soil in the watershed was assumed to be hydrologic soils group (HSG) C / D, as defined by the NRCS. The soils are generally characterized by below average (0.05-0.15 in/hr) to low (≤ 0.05 in/hr) infiltration rates. For HSG C soils, the initial infiltration rate was 3.0 inches per hour, the final infiltration rate was 0.5 inches per hour. The decay coefficient was calibrated to 0.0018. NRCS HSGs (2017), are shown on **Figure B-1 Interactive Hydrology Map** in **Appendix B**.

3.4 Detention

MHFD's policy is to model only regional, publicly-owned and maintained detention facilities. Inadvertent detention areas are not modeled since their use and function cannot be predicted in the future.

The following ten detention basin facilities were included in the hydrologic model:

Name	Ownership
Iliff & Monaco (off-line)	Denver
Bible Park	Denver
Wallace Park North	Denver
Wallace Park South	Denver
Southmoor Park	Denver
Caley (includes water quality)	Greenwood Village
Tommy Davis Park	Greenwood Village
Orchard Hills	Greenwood Village
Silo Park	Greenwood Village
Boston Peakview (includes water quality)	Greenwood Village

Previous studies have simulated detention in SWMM using a storage (ac-ft)-discharge (cfs) rating curve. Due to the importance of detention in this watershed, the stage-storage-discharge curves were re-evaluated and modeled using stage-surface area curves and outlet depth-discharge rating curves. The stage-surface area curves were derived from the latest topography data as described in Section 1.4, as-built plans, and survey. The detention rating curves and calculation are included in **Table B-3** in **Appendix B**.

3.4.1 Detention Rating Curves

Eight detention basins were included in the 1989 Study Appendix to manage the hydrology of Goldsmith Gulch watershed at the confluence with Cherry Creek at a peak discharge of 2,200 cfs, which was reduced from 5,300 cfs in the 1976 FHAD. The rating curves in the previous modeling were based on the relationship between storage and discharge. The current versions of the hydrologic model require a more sophisticated relationship between the storage depth versus storage area and discharge. The detention volume and discharge were re-investigated as a part of this hydrologic update. The detention surface areas were re-measured using the contours generated from the 2014 LiDAR. As-built plans and Wilson & Company Structure Survey 2018 information were used to update the outlet structure and calculate discharge through outlet structure. Nomographs of the Federal Highway Administration HDS 5 *Hydraulic Design of Highway Culverts* and UD_Detention worksheet were the tool used to establish the relationship between the hydraulic head versus discharge. In addition, the Caley Detention and Boston/Peakview Detention were added as new detention facilities after the 1994 Study which are included into the hydrologic model for this study.

A detailed hydrologic modeling approach to establish the baseline hydrology is described in Sections 3.2 to 3.5.

3.5 Hydrograph Routing

Parameters for the SWMM model conveyance elements were determined using the mapping and existing storm GIS layers described in Section 1.4. Manning's roughness values were determined based on the 2016 aerial imagery and supplemented by field observation. **Table 3-4** provides the Manning's ***n*** values selected for use in the Baseline Hydrology Model and also provides the 1976 FHAD study and 2005 OSP values for comparison. In the SWMM routing model, the Manning's ***n*** values were increased by 25 percent per MHFD criteria.

Storm drains routing upland subwatershed flows to the mainstems of Goldsmith Gulch, Goldsmith Gulch West Tributary, and Southmoor Park Tributary were modeled, as well as major storm system facilities greater than 36-inches in diameter, or equivalent. All underground storm system facilities were modeled with parallel overflow elements to route surface flows exceeding the capacity of the storm pipes without causing inadvertent detention. These overflow elements were modeled as shallow trapezoidal channels in the SWMM model.

Table 3-4 Manning's Roughness Coefficient & Comparison

Goldsmith Gulch Hydrologic Model (this study)		
Routing Element Description	**Original 'n'**	**Increase 'n' by 25%***
Reinforced Concrete Pipe	0.013 – 0.015	0.016 – 0.019
Asphalt Pavement	0.016	0.020
Concrete Open Channel	0.013 – 0.015	0.016 – 0.019
Grassy Drainageway	0.033	0.045
Natural Drainageway with Intermittent Shrubs/ Trees	0.045 – 0.055	-
Natural Drainageway with Dense Shrubs/ Trees	0.055 – 0.07	-
Engineered Channel, Riprap	0.038	0.054
2005 OSP - Upper Goldsmith Gulch		
Concrete Open Channel	0.016	N/A
Natural Open Channel	0.045 – 0.054	N/A
Overbank	0.045	N/A
1976 FHAD – Goldsmith Gulch and Its Tributaries		
Channel	0.030 – 0.045	N/A
Overbank	0.035 – 0.055	N/A

* Per CUHP Guidance Document for routing elements

Split flows result where the storm system contravenes topography. Specifically, pipes are routed down streets and do not follow surface flows based upon topography and diversions to off-line detention. There are four split flows in the model. The first occurs at JUNCT_U-540 along E. Peakview Avenue on the West Tributary. Major event flow is directed down E. Peakview Avenue and low flow is directed to Boston Peakview Detention Basin for water quality treatment per Boston Street and Peakview Avenue Pond Drainage Letter by Muller Engineering Company, November 20, 2018. The second occurs at JUNCT_L-460. Pipe flow is directed along E. Yale Avenue and overflows are directed to Bible Park Detention Basin. The third occurs at JUNCT_L-706 into Southmoor Detention Basin. Overflows at this node are directed into the basin, however, pipe flow will enter Goldsmith Gulch downstream of Southmoor Park without treatment. The fourth occurs at the Iliff & Monaco Detention

Basin. A diversion rating curve is used to divert flows into the off-line detention Basin, as shown in **Table B-3** in **Appendix B**.

EPA SWMM 5.1 model elements, including subwatersheds, design points and conveyance elements are shown on **Figure B-1 Interactive Hydrology Map** in **Appendix B**.

3.6 FEMA Floodplains

Flood Insurance Studies exist within the Goldsmith Gulch watershed for the City and County of Denver (2020 FIS) and Arapahoe County, CO and Incorporated Areas (2020 FIS). FEMA mapped floodplains and floodways include AE, AO, and X (shaded) designations. The map panel numbers for Arapahoe County and Incorporated Areas panels include: 08005C0457K, and 08005C0476L. The map panel numbers for City and County of Denver include: 0800460208H, 0800460216H, 0800460217J, and 0800460219H.

3.7 Result of Analysis

The computed baseline peak discharges and volumes for the 2-, 5-, 10-, 25-, 50-, 100- and 500-year storm events for all of the EPA SWMM 5.0 design points can be found in **Tables B-4** in Appendix B. A summary of peak flow rates and runoff volumes at key design points are provided in **Table 3-10.**

The modeled peak discharges were compared with previous studies at the key locations as shown in the **Table 3-5** below. In addition, peak flows at two interim model revision stages are included.

- **"Interim 1"** corresponds to the upper basin results using the unmodified 2005 OSP model using the updated CUHP, version 2.0.0, hydrologic model (changed model version and rainfall to current values).
- **"Interim 2"** corresponds to baseline model framework, but with the 1989 Study Appendix and 2005 detention curves (changed model version and rainfall and updated model input, but no change to rating curves). As a result, Boston Peakview Detention, which was not included in previous models was not modelled in Interim 2.
- **"Baseline"** updates the hydrologic model and rainfall to current conditions, updates hydrologic input and updates all detention rating curves. Results established the hydrology for this report.

In general, the flow rates resulting from this analysis are higher than the effective flows of the 2020 FIS at the outfall, but are lower at upstream locations. The upper basin flow comparison to the 2005 OSP also shows a consistent reduction in peak flows. The causes of the differences were further investigated in this study and depicted below.

Table 3-5 100-Year Peak Flow Comparison with Previous Studies

River	Jurisdiction	Location	Design Point	This Study			2005 OSP	1989 Study Appendix	2020 FIS Denver	2020 FIS Arapahoe
				Baseline	Interim 1	Interim 2				
Goldsmith Gulch West Tributary	Greenwood Village	Orchard Road (Tommy Davis Park downstream)	U-411	632	812	655	965	1,202	-	1,000
		Orchard Road (Silo Park downstream)	U-621	578	519	584	756	501	-	-
Goldsmith Gulch	Greenwood Village	Confluence with Goldsmith Gulch West Tributary	U-601	1,270	1,404	1,290	1,993	1,594	-	-
		Orchard Hills Park downstream	U-215	1,275	1,472	1,327	1,939	1,353	-	-
		E Belleview Ave	U-100	1,499	1,924	1,522	2,555	1,760	1,760	2,250
	Denver	E Temple Drive	L-055	830	-	820	-	811	-	-
		I-225	L-115	846	-	821	-	1,104	-	-
		E Quincy Avenue	L-335	1,451	-	1,393	-	1,470	-	-
		E Hampden Avenue	L-405	2,280	-	2,407	-	2,332	-	-
		E Cornell Avenue (d/s of confluence with Southmoor Tributary)	L-445	3,290	-	3,195	-	3,224	-	-
		Bible Park at E Yale Avenue	Bible Park	3,443	-	3,480	-	3,572	-	-
		E Yale Avenue downstream	L-505	2,642	-	2,373	-	2,420	-	-
		Iliff-Monaco Detention upstream	L-580	2,704	-	2,409	-	2,464	-	-
		E Iliff Avenue	L-565	2,220	-	2,027	-	2,077	-	-
		E Jewell Avenue	L-635	2,368	-	2,119	-	2,247	-	-
		Confluence with Cherry Creek	Outfall_Goldsmith	2,400	-	2,135	-	2,200	2,200	-
Southmoor Tributary	Denver	Hutchinson Park (u/s of confluence with Goldsmith Gulch)	L-436	699	-	700	-	1,320	500	-

Notes:

- **"Interim 1"** corresponds to the Upper Basin results using the unmodified 2005 OSP model using the updated CUHP, version 2.0.0, hydrologic model (changed model version and rainfall to current values). Shows a reduction from the 2005 OSP.
- **"Interim 2"** updated model input. Corresponds to final baseline model framework, but with the 1989 Study Appendix and 2005 detention curves (changed model version and rainfall and updated model input, but no change to rating curves). As a result, Boston Peakview Detention, which was not included in previous models was not modelled in Interim 2.
- **"Baseline"** updates the hydrologic model and rainfall to current conditions, updates hydrologic input and updates all detention rating curves. Results for the Final version established the hydrology for this report.

3.7.1 One-hour Point Rainfall Depths

The new hydrology utilizes lower rainfall depths than previous effective hydrology and 2005 OSP. The new one-hour point rainfall depths are based on NOAA Atlas 14 data (versus NOAA Atlas 2). **Table 3-6** shows a comparison of the one-hour point rainfall depths used for each study. The decrease of one-hour point rainfall depth, approximate 9% of reduction, helped to reduce runoff at the Belleview Avenue design point by comparison to the 2005 OSP.

Table 3-6 1-Hour 100-Year Rainfall Depth Comparison with Previous Studies

Study	Rainfall Depth (in)
This Study with NOAA Atlas 14	2.35
2005 OSP NOAA Atlas 2	2.58
1989 Study Report and Appendix	2.58

Notes:

1. *Approximately 9% of reduction on the 100-year one-hour point rainfall depth.*

3.7.2 Increased Density in Land Use

The percent imperviousness based on land use has been increased largely from the 1989 Study Appendix which generates higher runoff from the upper watershed. **Table 3-7** shows comparison of percent imperviousness between each study. **Figure 3-1** shows percent differences in imperviousness compared to the 2005 OSP for the upper watershed only (south of Belleview Avenue). According to the 2005 OSP, "The watershed imperviousness was determined only for the existing land-use condition due to the area's fully-developed state. The mapping provided by the District along with site reviews was used to identify levels of existing imperviousness. Seven different categories of imperviousness were identified and ranged from 5 percent to 95 percent." This study also assumes existing and future percent imperviousness are equivalent due to built-out conditions, but takes a more detailed approach to calculating percent imperviousness using current information (see Section 3.3.2).

Table 3-7 Watershed Land Use

Watershed	% Imperviousness		
	This Study	2005 OSP	1989 Study Appendix
Lower Watershed (North of Belleview Ave)	48.8	-	41.8
Upper Watershed (South of Belleview Ave)	52.6	61.0	38.7

3.7.3 New Hydrologic Modeling Methodology

The current CUHP Version 2.0.0 hydrologic model has been updated to mitigate the impact from sub-basin delineation discretization that usually generates higher peak flows for further detailed sub-division of watershed. However, the peak discharge at Belleview Avenue was reduced approximately 28% from the values reported in the 2005 OSP, due to the impact from the reduction of the one-hour point rainfall depth). In addition, DARFs were applied for the 2- to 10-year events per Table 5-3 in Volume 1 of the MHFD-USDCM, although this does not impact the 100-year comparison.

3.7.4 Differences of Detention Rating Curves

As discussed in the previous section, the detention basins within the Goldsmith Gulch watershed play a significant role in the hydrologic control on the Goldsmith Gulch major drainageway. As a result of the updated detention rating curves, the hydrology shown in this study differs from previous studies. In general, previous studies over-estimated the available detention volume which was also reported in 2005 OSP, as shown in **Table 3-8**. The detention rating curves and calculations included in **Table B-3** in **Appendix B** also show the comparison of storage-discharge curves between this study versus previous studies wherever applicable.

Table 3-8 Maximum 100-Year Detention Storage Volume (Acre-feet)

Reach Number	Detention Name	This Study (acre-feet)	2005 OSP (acre-feet/% change)	1989 Study (acre-feet/% change)
GG-2	Iliff & Monaco	66.3	-	84.5 (22%)
GG-2	Bible Park	56.3	-	93.8 (40%)
GG-4	Wallace Park North	7.1	-	19.1 (63%)
GG-4	Wallace Park South	122.3	-	122.4 (0%)
GG-6	Orchard Hills	7.4	12 (38%)	30.2 (75%)
GG-8	Silo Park	22.6	26.2 (14%)	35 (35%)
WG-1	Tommy Davis Park	15.3	17.2 (11%)	22.6 (32%)
WG-3	Caley Detention	10.8	15.1 (29%)	-
WG-3	Boston Peakview	3.3	-	-
ST-1	Southmoor Park	19.8	-	47.8 (58%)

Notes:

- *Numbers in parentheses indicate the percent difference between the previous study and current result, (Old – New)/ Old.*

Table 3-9 shows a more detailed comparison of the impact from the existing detention basins. In general, the new detention curves differ from previous studies by eliminating surcharge elevations that previously showed detention storage above the spillway elevations. Survey from MHFD was used to verify and determine the bottom, outlet, and spillway elevations for each detention basin to ground truth this study's rating curves. The final detention rating curves for this study are compared to previous study rating curves in **Figure 3-2**. The Wallace Park North detention's 1989 Study rating curve had a significant peak storage because of an erroneous spillway crest elevation that has been confirmed with the Wilson & Company Structure Survey 2018. The same error was corrected for the Orchard Hills and Southmoor Park detention basin rating curves.

3.7.5 Differences of Detention Routing

There are ten existing detention facilities in this baseline analysis as listed above in Table 3-7. Previous studies did not account for Boston Peakview detention (2004 / 2005) or the improvements to Tommy Davis Park Detention (2008 / 2009). In addition, the 1989 Study Appendix did not include Caley Detention (2004).

The Southmoor Park Tributary is piped from north of E. Hampden Avenue, through Southmoor Park and extends to S. Monaco Parkway/I-25 and S. Niagara Way, consisting of pipe sizes from 54-inch to 84-inch diameter. In the previous study, the hydrograph generated from the upper Southmoor Park Tributary watershed was completely routed into the Southmoor Park detention and ignored the diversion of the pipe capacity. However, the capacity of the storm drainage system is not negligible, and the Southmoor Park detention basin has not been reported as storing stormwater in the past several decades per City and County of Denver Wastewater staff. The hydrograph routing was revised to count the diversion for the storm drainage system and the overflow was routed into the Southmoor Park Detention.

At the Iliff/Monaco Detention basin, the outflow was routed out of the hydrologic modeling system instead of returning to Goldsmith Gulch per the 1989 Study Appendix. The return flow was added in the hydrologic model for this study.

3.7.6 Inadvertent Detention

The 1989 Study Appendix added an inadvertent detention design point in the sub-basin which represents the neighborhood of the Denver Technical Center in the hydrologic model. A conveyance element was provided in the hydrologic model to choke the runoff from this sub-basin and created approximate 15.5 ac-ft of storage volume at this design point. No documentation explained the modeling setup could be found for this study. The inadvertent detention was removed for this study.

3.7.7 Detention Findings

Of the ten detention facilities, the most effective detention basins for reducing flows on the main stem of Goldsmith Gulch are in order of importance:

1. Wallace Park South
2. Bible Park
3. Iliff and Monaco

Legend

- Study Reach
- Canal/Gulch/Creek
- Light Rail Line
- Goldsmith Gulch Watershed Boundary (7.74 Sq. Mi.)
- Subbasin
- Jurisdictional Boundary
- Detention Facility

% Impervious Difference

- < 50% decrease
- 25% to 50% decrease
- 25% to 0% decrease
- 0% to 5% increase
- > 5% increase

U-330 Sub-basin Number
64% Imperviousness for this study
11% Change from 2005 OSP

0 500 1,000 Feet

Centennial

Dayton St

Belleview Ave

Goldsmith Gulch West Tributary

Greenwood Village

DTC Pkwy

Greenwood Plaza Blvd

Yosemite St

88

25

U-100 64% 11%
U-110 67% 8%
U-120 61% 14%
U-130 48% 18%
U-140 67% 2%
U-150 25% 4%
U-160 59% 1%
U-170 29% 11%
U-180 45% 2%
U-190 23% 12%
U-200 29% 13%
U-210 25% 11%
U-300 63% 12%
U-320 69% 6%
U-330 64% 11%
U-340 68% 6%
U-350 67% 18%
U-400 31% 4%
U-410 36% 5%
U-420 66% 13%
U-430 46% 6%
U-440 42% 13%
U-450 18% 63%
U-460 60% 15%
U-470 85% 3%
U-480 72% 13%
U-490 78% 17%
U-500 69% 26%
U-510 59% 29%
U-520 90% 5%
U-530 71% 14%
U-540 79% 16%
U-600 26% 9%
U-610 31% 10%
U-620 44% 7%
U-630 41% 3%
U-640 46% 1%
U-660 40% 5%
U-670 46% 0%
U-680 42% 3%
U-690 46% 0%
U-700 46% 2%
U-710 47% 2%
U-720 59% 10%
U-730 59% 15%
U-740 79% 8%
U-750 83% 12%
U-760 80% 15%
U-770 86% 9%

FILE: G:\gis_projects\UDFCD_Goldsmith_Gulch\active\apps\Hydrology_Report\Figure3-1_UDFCD_GG_OSP_Impervious_Future_Difference_Map_RPP.mxd, 4/14/2022, alex.trout

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by: _____
drawn by: RP
checked by: RK
project no.: 18.155.035
date: 11/12/2019

MHFD MILE HIGH FLOOD DISTRICT

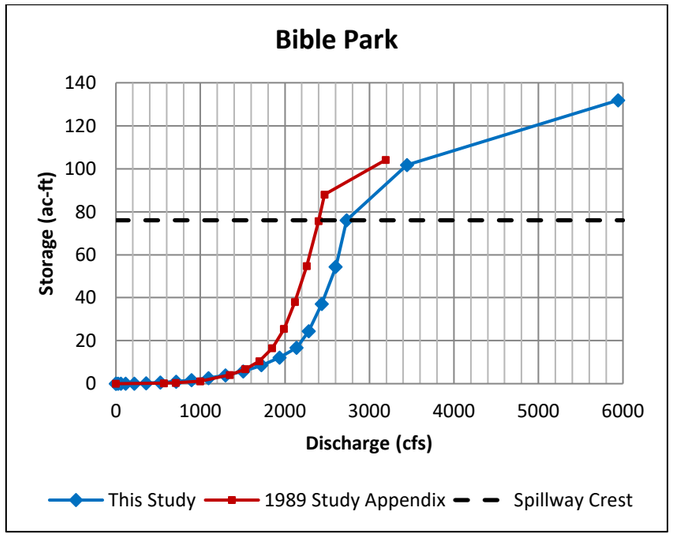
MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

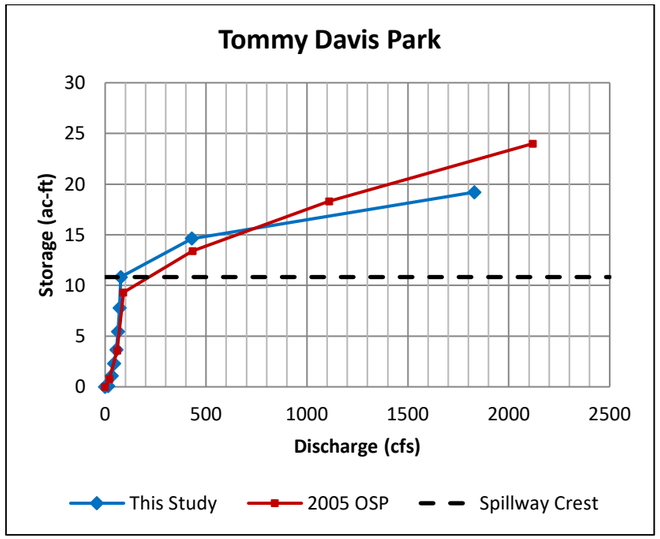
FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY
AND TRIBUTARIES

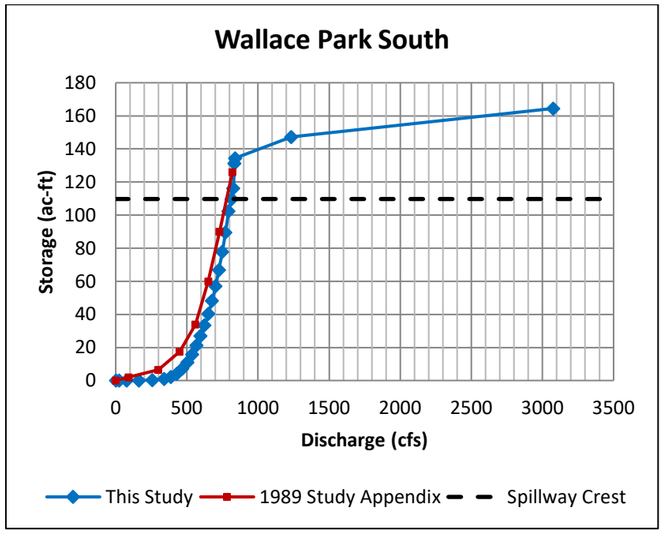
PERCENT IMPERVIOUS DIFFERENCE
FUTURE CONDITIONS MAP

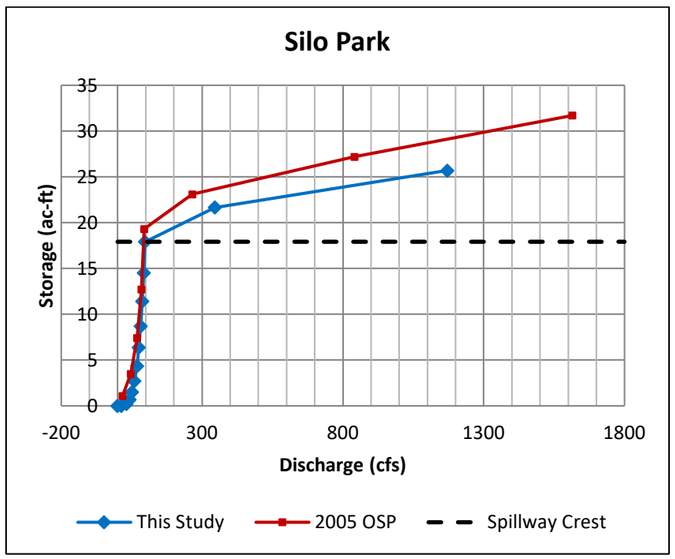
FIGURE
3-1

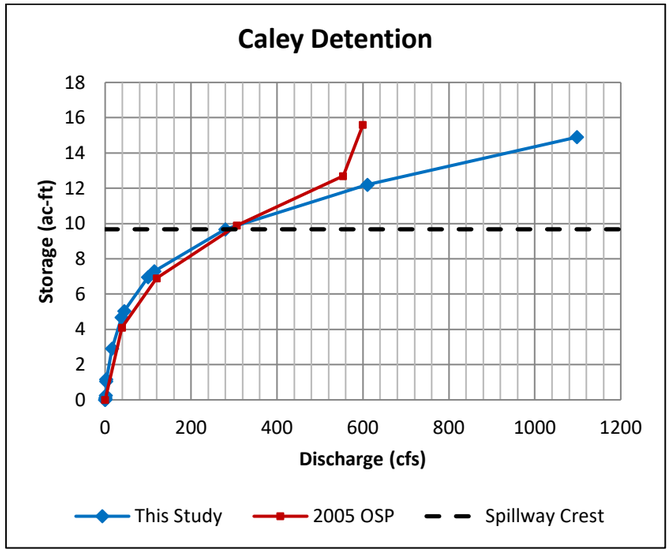
Figure 3-2 Detention Rating Curve Comparison.

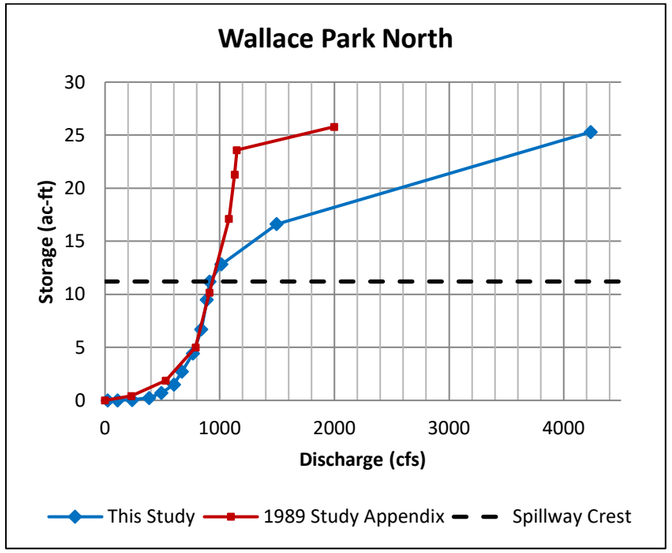


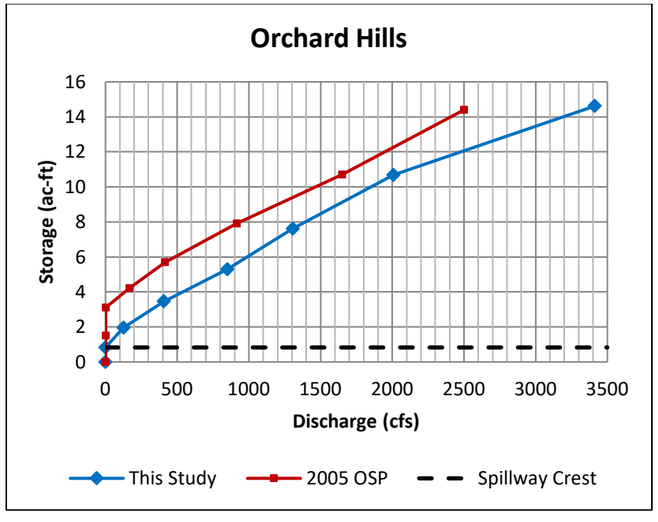


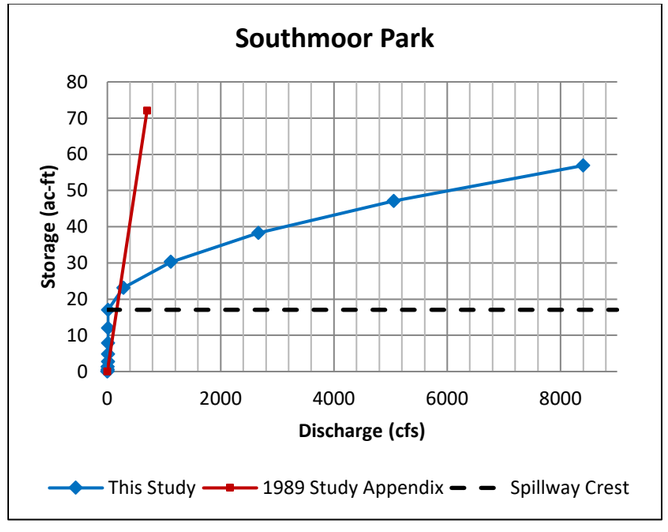


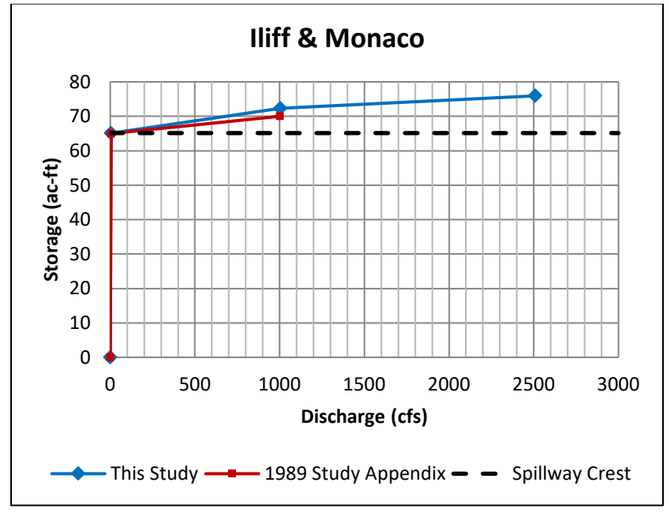












Note: Dashed black line is 2018 Spillway Crest elevation.

Table 3-9 Comparison of 100-Year Detention at Select Locations

River	Reach Number	Detention	This Study			2005 Study			1989 Study Appendix		
			Inflow (cfs)	Outflow (cfs)	Storage (ac-ft)	Inflow (cfs)	Outflow (cfs)	Storage (ac-ft)	Inflow (cfs)	Outflow (cfs)	Storage (ac-ft)
Goldsmith Gulch	GG-2	Iliff & Monaco	487	150	66.3	-	-	-	386	-	84.5
	GG-2	Bible Park	3,443	2,612	56.3	-	-	-	3,572	2,423	93.8
	GG-4	Wallace Park North	897	846	7.1	-	-	-	1,690	1,104	19.1
	GG-4	Wallace Park South	2,143	830	122.3	-	-	-	1,849	812	122.4
	GG-6	Orchard Hills	1,328	1,275	7.4	1,993	1,939	12.0	1,594	1,353	30.2
	GG-8	Silo Park	731	536	22.6	1004	756	26.2	932	500	35.0
Goldsmith Gulch West Tributary	WG-1	Tommy Davis Park	650	632	15.3	1026	965	17.2	1,370	1,290	22.6
	WG-3	Caley Detention	452	412	10.8	883	593	15.1	-	-	-
	WG-3	Boston Peakview	114	101	3.3	-	-	-	-	-	-
Southmoor Tributary	ST-1	Southmoor Park	444	138	19.8	-	-	-	1,320	465	47.8

Table 3-10 Peak Flow and Runoff Volumes (Existing Conditions)

Hydrologic Reach	Locations (Downstream to Upstream)	Design Points/ Conveyance Elements	River Station	Total Drainage Area		U100 (cfs/ acre)[1]	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (ac-ft)						
				(acres)	(mi2)		Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
Goldsmith Gulch																				
GG-1	Confluence with Cherry Creek	Outfall_Goldsmith	0+00	4954	7.7	0.5	782	903	1144	1959	2245	2400	4094	146.4	201.1	267.7	478.9	601.7	733.7	1111.3
GG-2	E Iliff Avenue (D/S Iliff & Monaco Detention)	JUNCT_L-565	63+40	4522	7.1	0.5	667	857	1069	1846	2102	2220	4075	127.4	179.6	239.8	426.7	537.3	657.0	1003.9
	Iliff & Monaco Split Flow (Diversion)	JUNCT_L-580	66+50	4522	7.1	0.6	667	911	1197	2212	2502	2704	4395	127.7	180.8	246.8	460.5	586.4	718.4	1065.3
	E Yale Avenue (D/S Bible Detention)	OUTLET_BiblePark	94+50	4338	6.8	0.6	649	883	1153	2136	2415	2612	4234	-	-	-	-	-	-	-
	Bible Detention Inflow	DP_Bible	94+50	4338	6.8	0.8	650	885	1161	2360	2983	3443	5207	121.3	171.9	234.2	435.9	558.7	681.5	1016.2
GG-3	Confluence with Southmoor Tributary (E Dartmouth Avenue)	JUNCT_L-445	126+50	4031	6.3	0.8	659	889	1157	2339	2934	3290	4927	117.0	165.5	224.7	414.5	528.0	644.7	954.8
	E Hampden Avenue	JUNCT_L-405	153+13	3086	4.8	0.7	534	689	853	1661	2125	2280	3485	90.9	128.3	174.1	319.3	408.3	494.3	733.7
GG-4	E Quincy Avenue	JUNCT_L-335	213+30	2519	3.9	0.6	465	576	679	1074	1237	1451	3372	76.8	108.1	145.8	261.6	328.5	405.2	601.7
	I-225 (D/S Wallace Park N Detention)	OUTLET_Wallace_N	226+60	2134	3.3	0.4	378	457	525	709	777	846	2768	-	-	-	-	-	-	-
	Wallace Park N Detention Inflow	DP_Wallace_N	226+60	2134	3.3	0.4	379	458	527	721	796	897	2789	65.7	92.4	124.6	222.6	278.1	343.8	503.5
	E Temple Drive (D/S Wallace Park S Detention)	OUTLET_Wallace_S	240+90	1988	3.1	0.4	348	416	473	655	743	830	2744	-	-	-	-	-	-	-
	Wallace Park S Detention Inflow	DP_Wallace_S	240+90	1988	3.1	1.1	372	506	646	1351	1696	2143	3230	61.1	86.0	115.7	207.2	259.1	319.3	469.7
GG-5	Belleview Avenue	JUNCT_U-100	269+50	1579	2.5	0.9	232	307	373	816	1025	1499	2787	46.7	66.3	89.6	162.4	203.8	252.4	371.5
GG-6	Yosemite Street	JUNCT_U-155	292+60	1235	1.9	1.1	129	171	221	546	880	1392	2519	33.5	47.6	65.4	122.2	154.7	192.8	284.3
	Pedestrian Trail (D/S Orchard Hills Detention)	OUTLET_Orchard	314+35	977	1.5	1.3	110	142	169	503	802	1275	2218	-	-	-	-	-	-	-
	Orchard Hills Detention West Fork Goldsmith Gulch	DP_Orchard	314+35	977	1.5	1.4	111	142	169	508	811	1328	2247	28.0	39.6	53.7	98.9	124.6	154.4	226.9
GG-7	Upstream of West Fork Confluence	JUNCT_U-600	321+00	442	0.7	1.4	66	82	97	196	366	625	1081	11.9	16.7	22.8	42.7	54.6	67.8	100.1
GG-8	Orchard Road at Silo Park (D/S Silo Park Detention)	OUTLET_Silo	336+00	349	0.55	1.5	58	70	79	168	309	536	911	-	-	-	-	-	-	-
	Silo Park Detention	DP_Silo	336+00	349	0.55	2.1	106	150	206	492	626	731	1081	10.2	14.2	19.2	34.7	44.5	54.6	79.8
	E Maplewood Avenue	JUNCT_U-660	356+00	234	0.4	2.2	80	112	151	336	419	521	760	7.3	10.1	13.5	23.8	29.6	36.5	53.4
	E Caley Avenue	JUNCT_U-710	369+10	108	0.2	2.7	55	74	96	193	237	290	414	4.3	5.9	7.6	12.3	15.1	18.3	26.2
	Arapahoe Road	JUNCT_U-770	395+90	22	0.03	2.2	12	15	19	33	40	48	67	1.2	1.6	2.0	3.0	3.5	4.2	5.9
Off-line Detention	Iliff & Monaco Detention Inflow	DP_Iliff	66+50	4522	7.1	0.1	0	54	129	369	402	487	1904	0.0	2.7	9.8	39.0	55.0	76.1	212.1
	Iliff & Monaco Detention Outflow	Iliff_OUTLET	63+40	4522	7.1	0.1	0	1	2	4	4	150	1584	-	-	-	-	-	-	-

Hydrologic Reach	Locations (Downstream to Upstream)	Design Points/ Conveyance Elements	River Station	Total Drainage Area		U100 (cfs/ acre)[1]	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (ac-ft)						
				(acres)	(mi2)		Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
Southmoor Tributary																				
ST-1	Confluence with Goldsmith Gulch	JUNCT_L-425	0+00	558	0.9	1.1	147	209	275	527	549	596	1143	15.3	21.7	29.9	56.5	71.2	87.8	129.9
	E Hampton Road	JUNCT_L-755	15+20	501	0.8	1.2	131	186	242	471	479	588	1071	12.8	18.5	25.7	49.7	62.9	78.0	115.7
	Southmoor Outlet (D/S Southmoor Detention)	OUTLET_Southmoor	21+00	471	0.74	0.3	4	6	7	10	12	138	622	-	-	-	-	-	-	-
	Southmoor Detention Inflow	DP_Southmoor	21+00	471	0.74	0.9	7	10	16	132	264	444	860	0.8	1.3	2.0	7.6	14.6	26.0	54.0
	Southmoor Park at S Oneida Way	JUNCT_L-706	31+50	416	0.65	1.9	114	165	215	500	624	787	1171	10.5	15.1	21.1	40.8	51.6	64.8	96.1
West Fork Goldsmith Gulch																				
WG-1	Confluence with Goldsmith Gulch	JUNCT_U-400	0+00	469	0.7	1.4	41	56	72	290	416	649	1091	15.4	21.7	29.0	51.0	63.2	77.7	113.0
	Orchard Road at Tommy Davis Park (D/S Tommy Davis Detention)	OUTLET_Tommy	14+55	441	0.69	1.4	39	56	71	283	402	632	1050	-	-	-	-	-	-	-
	Tommy Davis Detention Inflow	DP_Tommy	19+00	441	0.69	1.5	62	86	113	311	437	650	1060	15.0	21.0	28.0	48.5	59.9	73.7	106.8
	Tommy Davis Park at Maplewood Avenue	JUNCT_U-430	27+70	327	0.51	1.6	31	59	95	264	365	526	858	11.3	15.8	21.0	35.9	44.2	54.3	78.9
WG-2	E Fair Avenue	JUNCT_U-440	35+00	285	0.45	1.7	30	56	90	244	334	476	774	10.3	14.3	18.9	31.9	39.3	48.2	69.4
WG-3	E Caley Avenue (D/S Caley Detention)	OUTLET_Caley	45+90	237	0.37	1.7	28	52	82	214	291	412	672	-	-	-	-	-	-	-
	Caley Detention Inflow	DP_Caley	49+40	237	0.37	1.9	80	108	137	279	366	452	713	9.6	13.3	17.3	28.0	34.4	41.4	59.3
	S Boston Street (D/S Boston Peakview)	JUNCT_U-515	57+10	97	0.15	2.0	22	41	55	117	152	196	298	4.2	5.9	7.6	12.0	14.6	17.6	25.0
	Boston Peakview Detention Outflow	OUTLET_Peakview	62+20	97	0.15	1.0	22	41	55	78	88	101	133	-	-	-	-	-	-	-
	Boston Peakview Detention Inflow	DP_Boston_Peakview	63+50	97	0.15	1.2	47	61	70	92	102	114	141	4.5	6.1	7.7	9.7	10.9	12.0	14.9
	E Peakview Avenue Split Flow	JUNCT_U-540	65+00	68	0.11	2.3	37	46	57	105	127	154	218	3.5	4.8	6.0	9.2	11.0	13.1	18.4

Notes:

1. *Unit runoff (100-Year Peak Flow / Drainage Area)*
2. *Peak discharges versus channel stations are included in Figure B-3 of Appendix B*

4.0 HYDRAULIC ANALYSIS

Flood Insurance Studies exist within the Goldsmith Gulch watershed for the City and County of Denver (2020 FIS) and Arapahoe County, CO and Incorporated Areas (2020 FIS). The 2020 FIS defined two distinct flow paths of Goldsmith Gulch from E. Iliff Avenue to the confluence with Cherry Creek. Three independent flood profiles were used to define the water surface elevation in these two distinct flow paths. These flood profiles are Goldsmith Gulch (downstream of E. Evans Avenue to the confluence with Cherry Creek), Goldsmith Gulch (upstream of Iliff Avenue) and South Monaco Street Parkway Overflow (from E. Iliff Avenue to E. Florida Avenue). The river centerlines of the main stem are discontinued between E. Iliff Avenue and E. Evans Avenue and crossing the river centerline of the overland flow. This study updated the flood profiles with three independent flood profiles: a continuous flood profile for Goldsmith Gulch main stem and separate South Monaco Street Parkway Overflows at E. Colorado Drive and E. Iliff Avenue. The updated Monaco Street Parkway Overflow starts from a point at the Monaco Street Parkway Culvert at Skyline Acres Swim and Tennis Club to E. Florida Avenue. The updated Goldsmith Gulch main stem hydraulic model becomes a continuous hydraulic model which includes the overland flow reach from E. Iliff Avenue to Skyline Acres Club. The hydraulics analysis, assumptions, and decision to support the development of the HEC-RAS hydraulic model is included in **Appendix C**.

A total of 10.4 miles of drainageway were studied with a detailed HEC-RAS hydraulic model including Goldsmith Gulch Main Stem from E. Arapahoe Road to the confluence with Cherry Creek, Goldsmith Gulch West Tributary from the S. Boston St./E. Peakview Ave detention to the confluence with Goldsmith Gulch at Orchard Hills Park and Southmoor Park Tributary from S. Oneida Way to the confluence with Goldsmith Gulch at Hutchinson Park, and three overflow reaches, Monaco Pkwy Overflow at E. Colorado Drive, Monaco Pkwy Overflow at E. Iliff Avenue, and Hampden Avenue Overflow. The reaches studied with the detailed method are summarized in Table 4-1.

The U.S. Army Corps of Engineer's step backwater program HEC-RAS, Version 5.0.5, was used for the subcritical floodplain analysis of the drainageway. Cross sections for use in the HEC-RAS model were developed electronically by cutting the triangulated irregular network (TIN) developed from the one-foot, LIDAR-derived topographic contour data collected by the USGS in the fall of 2013. The TINs were processed from contour data to facilitate splicing in as-built contours at multiple locations, and because efforts to use LiDAR points (LAS files) in previous studies resulted in too much extraneous data.

Floodplain maps were developed showing the detailed 100-year and 500-year floodplain and floodway delineations. The purpose of the Flood Hazard Area Delineation (FHAD) mapping was to identify areas, building structures, and properties which have the potential of being inundated in a 100-year flood event. A floodway has been defined along the drainageway to establish the portion of the channel that must remain free from obstructions and new development to preserve conveyance of the 100-year flood. A maximum of 0.5-foot rise on both hydraulic grade line (HGL) and energy grade line (EGL) was utilized in this study to define the floodway, in accordance with the updated Colorado Water Conservation Board Rules and Regulations. The floodplain mapping and channel profiles show the location of cross-sections for the channel and all hydraulic structures.

Table 4-1 Summary of HEC-RAS Hydraulic Models

River Name	Reach Length (ft)	River Station (ft)	Reference Location	Jurisdiction
Goldsmith Gulch Main Stem	26,875	0+00 - 268+75	Confluence with Cherry Creek to E. Belleview Ave.	Denver
	7,550	268+75 - 344+25	E Belleview Avenue to S. Dayton St.	Greenwood Village
	5,160	344+25 - 395+85	S. Dayton St. to E. Arapahoe Rd.	SEMSWA
Goldsmith Gulch West Tributary	6,354	0+00 - 63+85	Confluence with Goldsmith Gulch at Orchard Hills Park to S. Boston St./E. Peakview Ave. detention	Greenwood Village
Monaco Pkwy Overflow	2,499	0+00 - 24+99	Confluence with Cherry Creek to E. Colorado Dr.	Denver
Monaco Pkwy Overflow @ Iliff	385	0+00 - 6+74	Confluence with Goldsmith Gulch at Private Rd. to E. Iliff Ave.	Denver
Southmoor Park Tributary	4,249	0+00 - 42+49	Confluence with Goldsmith Gulch at Hutchinson Park to S. Oneida Way	Denver
Hampden Avenue Overflow	1,186	0+00 - 11+86	Confluence with Goldsmith Gulch to S. Poplar St.	Denver

A total of 566 cross sections were used in the Goldsmith Gulch hydraulics analysis. 401 cross-sections were used in the Goldsmith Gulch *Main Stem* hydraulic model, 119 cross-sections were used in the Goldsmith Gulch West Tributary, 21 cross-sections were used in the Monaco Street Parkway Overflow and 25 cross-sections were used in the Southmoor Park Tributary including Hampden Avenue Overflow hydraulic model. The junction option in the HEC-RAS program was used to connect the split flow reaches with the main stem reach. A total of 3 junctions were used in the hydraulic model. One of the junctions is in Goldsmith Gulch at the confluence with Goldsmith Gulch West Tributary. One junction is in Southmoor Park Tributary at the confluence with the Hampden Avenue Overflow. The last junction is in Goldsmith Gulch at the confluence with Monaco Pkwy Overflow at Iliff. Details of the hydraulic analyses, such as model setup, flow data, geometry and parameters, are described in the following sections. Input data for the model is summarized in **Table 4-2** below:

Table 4-2 Summary of Geometry Input

River Name	Reach Length (ft)	Culvert	Bridge	Lateral Structure	Number of Cross-section	Average Spacing (ft)	Average Slope (%)
Goldsmith Gulch	39,585	15	23	7	399	99	0.97%
Goldsmith Gulch West Tributary	6,354	6	5	1	109	58	1.52%
Monaco Pkwy Overflow	2,499	-	-	4	16	156	0.85%
Monaco Pkwy Overflow @ Iliff	385	-	-	-	5	77	0.70%
Southmoor Park Tributary	4,249	2	-	-	22	193	1.04%
Hampden Avenue Overflow	1,186	-	-	1	3	395	1.73%

Estimates of channel roughness for existing conditions were made from aerial photographs and field observation. The Manning's ***n*** values were established based upon dense growth of natural areas for a healthy stream corridor, and not a regularly mowed turf grass. Refer to **Appendix C** for pictures illustrating the Manning's ***n*** values for sample cross-sections. Estimates of overbank roughness are based upon the impact of the obstructions from buildings, landscape features and privacy fences. Recommended Manning's n values are summarized in **Table 4-3** below:

Table 4-3 Recommended Manning's n

Manning's n	Channel	Overbank Floodplain
0.015	Smooth concrete	Smooth concrete, bare land
0.02	Roadway asphalt, aged concrete low flow channel including grass low flow bank area	Roadway asphalt including curbs
0.03	Clean straight, smooth water, pond	Mowed lawn areas/parks/detention
0.035	Grass lined/riprapped/loose rock in low flow channel	Parking space/asphalt with curbs, vehicles and obstacles
0.04	Grouted boulder, some weeds,	Mowed lawn areas/parks with trees, landscapes, etc.
0.045	Rock and some weeds in low flow channel, high grass at low flow bank area	High grass, scattered brush
0.05	Same as above but weedier	Scattered brush, trees, heavy weeds
0.06	Weedy, deep pool	Light brush and trees, in summer
0.07	Weedy, deep pool and few brush	Medium to dense brush and trees, in summer
0.08	Tall weeds and brush	Dense brush and trees in summer
0.1	Very weedy reaches, deep pools, or floodway with heavy stands of timber and brush	Dense weeds, brush and trees in summer
0.15	N/A	Residential areas with building, shrubs, trees, landscapes and fences

Flow data in the HEC-RAS model was derived from the results of the EPA SWMM 5.0 hydrograph routing for the future land-use /existing conditions topographic and infrastructure model. A steady flow analysis was utilized to determine the flood profiles for the 10-, 50-, 100-, and 500-year storm events. Flow change locations were established at critical design points where there are significant changes in hydrology as determined by the EPA SWMM model. Between flow change locations, steady flow is maintained for defined channel segments along the reach. The capacity of the existing storm drain was subtracted from the peak flows derived from the results of the EPA SWMM 5.0 hydrograph routing. Where the entire flow is conveyed in storm drain or culverts, a placeholder discharge of 0.1 cfs was used for the overland cross sections. The flow changes, flow change locations, relevant hydrologic design points of the EPA SWMM model and flow diversions (including overland flow by subtraction of the capacity of existing storm drains), are included in the **HEC-RAS Flows and Flow Change Locations** table in **Appendix C**.

Lateral Structures in the HEC-RAS hydraulic model were used to calculate the flow split from the main stem to the receiving water body. The flow optimization option in the steady flow analysis was used to allow the program to subtract the amount of flow from the main channel and add the discharge to the receiving water body. However, the discharges in the main stem were not subtracted from the main stem unless the flows splits into a formalized known drainageway or detention facility. A lateral structure was used in Cook Park to separate the riverine flood hazard of the main channel from the shallow overland flow hazard in the athletic fields.

Table 4-4 summarizes the hydrology used in the hydraulic model and the model cross sections where the flow change has been applied.

Table 4-4 Steady Flow Input in HEC-RAS Model

HEC -RAS Flow Change Locations		Flood Profile Names and Flow Rates (cfs)			
Reference Locations	**River Station**	**Q10**	**Q50**	**Q100**	**Q500**
Goldsmith Gulch					
D/S of E Arapahoe Road	395+85	19	40	48	67
Approx. 450' U/S of E Peakview Avenue	389+24	59	127	155	216
Avery Park Apartment/ Appletree Apartment	376+71	78	180	219	311
U/S of E Caley Avenue	369+99	100	248	304	435
Arapahoe Lake	360+98	151	419	521	760
D/S of E Maplewood Ave.	353+77	0.1	29	116	333
E Pinewood Avenue	345+44	37	179	252	543
D/S of S Dayton St	342+61	206	626	731	1081
U/S Orchard Road	336+54	79	309	536	911
Orchard Road	335+96	0.1	205	430	803
D/S Orchard Road	334+96	86	336	578	989
Goldsmith Drive	327+75	97	366	625	1081
Downstream of West Fork Confluence	319+83	159	774	1270	2141
Upstream of Orchard Hills Detention	317+37	169	811	1328	2247
Pedestrian Trail (Berm of Orchard Hills Detention)	314+34	169	802	1275	2218
D/S of Orchard Hills Detention	309+15	175	816	1295	2264
U/S of Yosemite Street	295+42	193	853	1351	2382
D/S of Yosemite Street	292+57	221	880	1392	2519

HEC -RAS Flow Change Locations		Flood Profile Names and Flow Rates (cfs)			
Reference Locations	**River Station**	**Q10**	**Q50**	**Q100**	**Q500**
Goldsmith Gulch					
U/S E Prentice Avenue	285+38	243	901	1421	2592
U/S Belleview Avenue	269+83	373	1025	1499	2787
D/S Belleview Avenue	268+01	433	1180	1547	2891
E Chenango Avenue	255+24	470	1282	1620	2956
E Layton Avenue	249+59	511	1377	1741	2977
George Wallace Park S Detention	241+56	646	1696	2143	3230
U/S E Temple Drive	240+92	473	743	830	2744
E Temple Drive (D/S Wallace Park S Detention)	240+29	0.1	0.1	0.1	1872
D/S E Temple Drive	238+70	473	743	830	2744
Wallace Park N Detention	234+66	527	796	897	2789
I-225 (D/S Wallace Park N Detention)	226+58	525	777	846	2768
D/S I-225	220+32	525	777	846	2768
U/S of E Quincy Avenue	216+36	680	1238	1453	3390
U/S of E Princeton Ave/ E Mansfield Ave	200+67	739	1466	1763	3390
E Nassau Ave/ E Lehigh Dr.	181+56	763	1553	1879	3403
S Rosemary Way/ E Kenyon Ave	171+34	798	1680	2050	3434
U/S of Tiffany Plaza Culvert	161+91	824	1763	2165	3448
Tiffany Plaza Southeast Corner	160+86	0.1	0.1	317	1442
U/S E Hampden Avenue	154+49	0.1	0.1	0.1	877
D/S E Hampden Avenue	153+09	860	2137	2418	3805
	144+36	860	2137	2418	3752
	143+95	860	2137	2418	3687
	143+33	860	2137	2418	3676
	143+13	860	2137	2418	3668
	143+06	860	2137	2418	3659
	142+79	860	2137	2418	3621
	142+31	860	2137	2418	3544
U/S E Eastman Avenue	140+76	885	2192	2501	3371
U/S E Eastman Avenue	140+76	885	2192	2501	3805
	140+43	885	2192	2501	3347
D/S of Hutchinson Park Pedestrian Bridge	134+89	1157	2934	3290	4927
Bible Park (Approx. E Cornell Ave)	113+65	1174	2986	3370	5044
U/S of Bible Park Low Flow Crossing	101+37	1161	2983	3443	5207
Bible Park Outlet Structure	94+66	1153	2415	2612	4234

HEC -RAS Flow Change Locations		Flood Profile Names and Flow Rates (cfs)			
Reference Locations	**River Station**	**Q10**	**Q50**	**Q100**	**Q500**
Goldsmith Gulch					
U/S of Yale Ave	94+26	0.1	0.1	0.1	1316
D/S E Yale Avenue	92+77	1171	2446	2642	4296
Approx. E Harvard Ave/E La Salle Pl	75+04	1197	2502	2704	4395
Approx. E Iliff Pl	65+92	1069	2102	2220	4075
D/S of E Iliff Avenue	63+40	0.1	760	880	2710
	59+57	0.1	758	877	2688
	58+99	0.1	743	858	2618
	58+10	0.1	718	825	2419
	57+19	0.1	641	735	2159
	56+60	0.1	641	735	2153
Memorial Way	54+31	0.1	760	880	2710
U/S of E Evans Avenue	48+88	0.1	793	914	2719
Outlet of Iliff/Evans Culvert	45+70	1118	2182	2308	4156
U/S of E Jewell Avenue	37+71	1141	2226	2368	4156
E Jewell Avenue	34+53	0.1	73	169	1803
D/S of E Jewell Avenue (Skyline Acres Club	34+10	195	568	679	2375
D/S of Monaco Culvert at Skyline Acres Club	24+39	1142	2126	2167	2557
D/S Mexico Avenue	17+15	1142	2134	2189	2842
	14+67	1142	2134	2189	2996
	9+17	1142	2134	2189	3248

HEC -RAS Flow Change Locations		Flood Profile Names and Flow Rates (cfs)			
Reference Locations	**River Station**	**Q10**	**Q50**	**Q100**	**Q500**
Goldsmith Gulch West Tributary					
Boston Peakview Detention Inflow	63+72	70	102	114	141
Boston Peakview Detention Outflow	62+38	0.1	33	46	78
S Boston Street (D/S Boston Peakview Detention)	57+25	55	152	196	298
Caley Detention Inflow	49+59	137	366	452	713
U/S E Caley Avenue	46+24	82	291	412	672
D/S E Caley Avenue	44+72	84	306	433	706
E Fair Avenue	35+73	90	334	476	774
Tommy Davis Park at Maplewood Avenue	27+47	95	365	526	858
Tommy Davis Detention Inflow	18+96	113	437	650	1060

Orchard Road at Tommy Davis Park (Tommy Davis Detention)	16+00	71	402	632	1050
Confluence with Goldsmith Gulch	7+09	72	416	649	1091

HEC -RAS Flow Change Locations		Flood Profile Names and Flow Rates (cfs)			
Reference Locations	**River Station**	**Q10**	**Q50**	**Q100**	**Q500**
Monaco Pkwy Overflow					
Monaco Pkwy Culvert at Skyline Acre Club	24+99	0.1	103	206	1863
D/S Monaco Pkwy Culvert at Skyline Acre Club	24+29	0.1	103	206	1636
	23+51	0.1	103	206	1601
U/S E Mexico Ave	19+94	8	127	236	1646
D/S E Mexico Ave	19+39	8	127	236	1643
	17+91	8	119	214	1361
	16+07	8	119	214	1318
	15+10	8	119	214	1210
D/S E Iowa Avenue	14+58	8	119	214	1205
	11+32	8	119	214	1068
Monaco Pkwy Overflow at Iliff					
D/S E Iliff Ave	3+85	0.1	2	3	22
	3+65	0.1	17	22	92
	3+26	0.1	42	55	291
	2+36	0.1	119	145	551
	1+52	0.1	119	145	557
Southmoor Tributary					
Southmoor Detention Inflow	42+49	16	264	444	860
Southmoor Outlet (D/S Southmoor Detention)	34+36	7	12	138	622
Poplar St D/S (north) of the intersection of Hampden Ave and Poplar St	29+37	0.1	0.1	0.1	302
At the end of Southmoor Park Detention outlet pipe (north of E Hampton Ave.)	25+70	242	442	479	745
U/S Eastman Avenue	16+87	242	442	479	1006
Confluence with Goldsmith Gulch	12+89	275	541	580	1268
Hampden Avenue Overflow					
Southmoor Outlet (D/S Southmoor Detention)	10+16	7	12	138	320

The downstream hydraulic control for the HEC-RAS model of Goldsmith Gulch was set at the corresponding 10-, 50- and 100-year known water surface elevations in Cherry Creek. The 100-year known water surface elevation was also used for the 500-year model downstream hydraulic control because the Cherry Creek FHAD did not define a 500-year flood profile. The downstream hydraulic controls for the HEC-RAS model of the Goldsmith Gulch West Tributary and Monaco Pkwy Overflow at Iliff were controlled by the junction condition at each respective confluence with Goldsmith Gulch. The downstream hydraulic control for the HEC-RAS model of Southmoor Park Tributary was set at the known water surface elevation of Goldsmith Gulch for each recurrence interval (i.e., 10, 50, 100 and 500). The downstream hydraulic control for the HEC-RAS model of Hampden Avenue Overflow was set at normal depth with the downstream slope of 0.028 ft/ft. A rating curve was used for the downstream hydraulic control for the HEC-RAS model of Monaco Pkwy Overflow, developed by analyzing inlet capacities at Monaco Pkwy and Florida Ave (analysis included in **Appendix C**). Since the model was run in the subcritical mode, no upstream boundary was specified within the model.

Fifteen rating curves were developed as a part of this study because the HEC-RAS hydraulic model cannot properly model the complex hydraulic conditions of detention outlet structures, long culverts with bends and varied dimension and culvert groups including restrictor plates and diversion culverts. Nine rating curves were developed for the detention basins as a part of the Baseline Hydrology analysis. Detailed analysis of the rating curves is included in **Appendix B**. Four rating curves were developed for the long culverts and two rating curves were developed for the inlets of major storm drainage systems at Florida Avenue and Tiffany Plaza at E. Hampden Avenue. Detailed analysis of the rating curves is included in **Appendix C**. The rating curve of Arapahoe Lake was not included in the hydraulic model because the lake is not a publicly owned and maintained storm facility. Arapahoe Lake was modeled as an open channel with the channel invert set at the normal operating pool elevation. The rating curves used in the hydraulic model are summarized in **Table 4-5** below:

Table 4-5 Rating Curves for Hydraulics Control

River	River Station	Sources/ Types of Rating Curve	Reference Location
Goldsmith Gulch	35+10	Culvert capacity rating curve	E. Jewel Avenue
	63+81	Culvert capacity rating curve	Iliff/Evans Culvert at E. Iliff Avenue
	94+66	Detention rating curve	Bible Park at E. Yale Avenue
	154+49	Inlet capacity rating curve	Tiffany Plaza at E. Hampden Avenue
	161+21	Culvert capacity rating curve	Tiffany Plaza Culvert Entrance
	226+58	Detention rating curve	Wallace Park North at I-225
	240+92	Detention rating curve	Wallace Park South at E. Temple Drive
	314+53	Detention rating curve	Orchard Hills Park
	336+54	Detention rating curve	Silo Park at E. Orchard Road
	353+85	Culvert Capacity rating curve	Downstream of Arapahoe Lake
Goldsmith Gulch West Tributary	16+00	Detention rating curve	Tommy Davis Park
	46+06	Detention rating curve	Caley Detention at E. Caley Avenue
	63+54	Detention rating curve	Boston/Peakview Detention at S. Boston Street
Southmoor Tributary	34+36	Detention rating curve	Southmoor Park
Monaco Pkwy Overflow	5+59	Inlet capacity rating curve	E. Florida Avenue

Fifty-one crossing structures were physically coded in the hydraulic model using field survey data. When flow overtops the structures, the *High Flow* methods of the *Bridge Modeling Approach* were carefully examined in

the HEC-RAS model, and engineering judgment was used to determine the most appropriate modeling approach for each bridge. Twelve roadway/trail crossing structures including outlet structures of detention basins and long culverts were modeled with rating curves instead of being physically coded in the hydraulic model. Surface cross sections were sometimes defined at underground crossings to delineate the 500-year flood hazard and provide better detail for surface flow over the structure.

Ineffective flow was utilized to account for flow areas with little or no flow conveyance. Blocked obstructions were utilized to block out the non-realistic flow distribution areas in sump conditions within overbank areas.

The hydraulic analysis for this study was based upon unobstructed flow through the openings of all bridge and culvert structures. The model was set up to assume that all bridges and channels remain free of silt and debris. Flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

Normal depth calculations were utilized to determine the overland shallow flooding of the 100- and/or 500-year event of Cook Park from Cherry Creek to E. Mexico Ave., Locust Street Overflow from E. Minnesota Dr. to E. Florida Ave., Southmoor Tributary Overland along S. Poplar St. and near E. Hamilton Pl., Hampden Avenue Overflow between Goldsmith Gulch and S. Poplar St., and Goldsmith Gulch West Tributary Overflow between E. Caley Way and S. Boston St. The details of calculations for overland shallow flow are provided in **Appendix C**.

Floodways were defined for Goldsmith Gulch from E. Cherry Creek S. Drive to the upstream study limit at E. Arapahoe Road; for Goldsmith Gulch West Tributary from Orchard Hills Park to the upstream study limit at S. Boston Street/E. Peakview Avenue detention; for Southmoor Park Tributary from Hutchinson Park to the upstream study limit at S. Oneida Way, for Monaco Pkwy Overflow from E. Florida Avenue to the upstream study limit at E. Colorado Drive, and for Monaco Pkwy Overflow from Private Drive to the upstream study limit near E. Iliff Avenue. A floodway was not defined for Hampden Avenue Overflow. The floodway defines the highest hazard area of the floodplain that must be preserved for flood conveyance. Floodway analysis was based upon either a rise of elevation of the hydraulic grade line (HGL) or the energy grade line (EGL) to be no more than 0.50-foot. Floodways were defined utilizing an approach of equal conveyance reduction of left and right overbanks. In certain isolated locations, equal encroachment is not appropriate where one bank is dramatically steeper than the other. Along cross sections such as these, the encroachment of the floodway is based upon encroaching more on the milder slope bank having shallower flow. The goal is to define a floodway for the area of the cross section with the greatest flood conveyance, having the deepest and highest velocity flow (see figure below for an example cross section without equal encroachment). Per FEMA criteria, encroachment is limited to the overbank areas only and is not allowed within the main channel conveyance area.

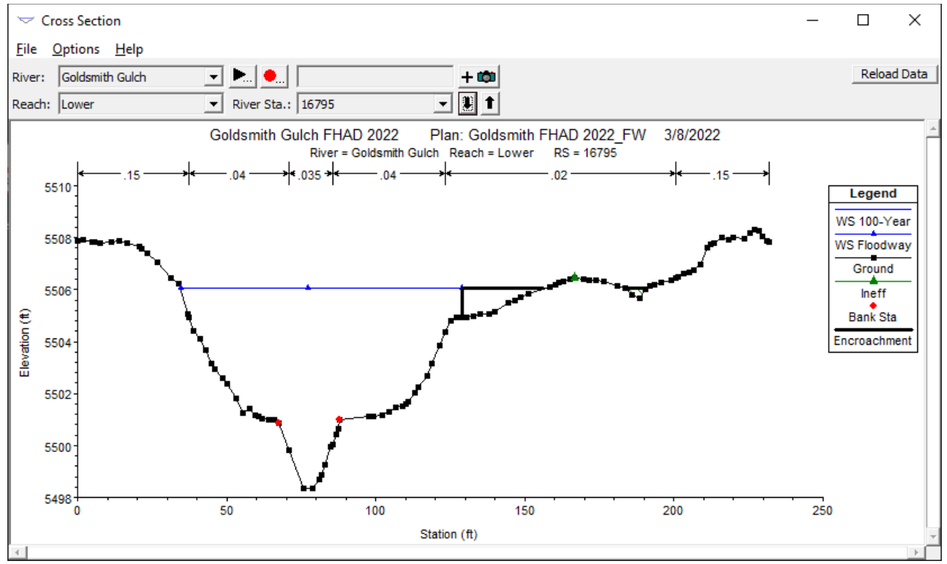


Figure 4-1 Example floodway encroachment

The floodway was set to be coincident with the floodplain where an engineered channel confined the 100-year event flow or the floodplain in the park and detention is dedicated for preservation already.

4.1 Evaluation of Existing Facilities

Existing drainage facilities within the project area consist of natural channel sections, on-line and off-line detention, four roadway bridges, twenty-one roadway culverts, thirty-four pedestrian bridges/culverts, and four piped drainageway culverts. An existing infrastructure inventory (**Table 2-1**) along the drainageways was compiled based on the detailed survey information and field measurements provided by MHFD. **Table 2-1** also includes the hydraulic capacities of the existing infrastructure based on the Baseline Hydrology. Half of these roadway crossing structures can pass 10-year event flow, and a few can pass up to 50-year event flow. The other half of these roadway crossing structures have 100-year event flow capacity and higher. Most of the pedestrian crossing bridges and culverts are less than 10-year capacity.

A total of 67 grade control structures (**Table 2-2**) including concrete check structures, grouted/non-grouted boulder drop structures and sculpted concrete drop structures exist within the study reach. Each drop structure was modeled using at least two cross-sections to define the drop structure hydraulics. The standard four cross-sections were used for the drop structures that have significant impact to the 100-year event flood elevation.

Figure 2-12 identifies the location and type of all existing roadway crossings (bridges and culverts) and hydraulic structures along the channels of Goldsmith Gulch, Goldsmith Gulch West Tributary and Southmoor Park Tributary within the study area. Pictures of the existing crossing structures are shown in the Existing Structure Inventory in **Appendix C**.

4.2 Flood Hazards

The Goldsmith Gulch, Goldsmith Gulch West Tributary and Southmoor Park Tributary are fully developed. Approximately 24 inundated habitable buildings in the 100-year floodplain were identified by this study. **Table 4-6** lists the inundated structures within each reach per jurisdiction, and **Figure 4-2** shows an overview of the locations of these structures.

Table 4-6 Habitable Structures in 100-Year Floodplain

Denver (15 Buildings)			
Flood Sources	**Reach**	**Inundated Buildings**	**Reference Location**
Goldsmith Gulch	**GG-1**	3	Skyline Acres Swim & Tennis Club
		6	E. Iliff Ave. to E. Evans Ave.
	GG-2	2	E. Iliff Ave.
	GG-4	1	South Wallace Park Detention
Southmoor Park Tributary	**ST-1**	3	E. Hampden Ave./ S. Poplar St.
Greenwood Village (5 Buildings)			
Flood Sources	**Reach**	**Inundated Buildings**	**Reference Location**
Goldsmith Gulch	**GG-5**	4	D/S S. Yosemite St.
	GG-6	1	U/S E. Berry Ave.
	WG-3	0	Per LOMR 21-08-0598P*
SEMSWA (4 Buildings)			
Flood Sources	**Reach**	**Inundated Buildings**	**Reference Location**
Goldsmith Gulch	**GG-8**	4	Perimeter of Arapahoe Lake**

** A capital improvement project was completed to rehabilitate the Bridgwater Upper Pond to include water quality, as well as drop structures, and channel improvements. As of completion of this report, LOMR 21-08-0598P issued February 25, 2022 and effective July 15, 2022 removed the Bridgwater Apartments from the floodplain.*

*** FIRM does not include inundated structures around Arapahoe Lake. However, there are two structures reportedly with basements below the 100-year flood elevation*. Elevation Certificates are necessary to confirm the actual number of buildings within the Special Flood Hazard Area.

Two buildings of the Bridgwater Apartments are shown to be located within the 100-year flood hazard area downstream of S. Boston Street. The FHAD HEC-RAS hydraulic modeling shows 7 cfs overtopping the channel banks into Bridgwater Apartments in a 100-year event. During the writing of this FHAD study, improvements were made to the open channel to achieve 100-year capacity and minimize flood hazards. A capital improvement project rehabilitated the Bridgwater Upper Pond to include water quality, as well as drop structures, and channel improvements. As of completion of this report, LOMR 21-08-0598P issued February 25, 2022 and effective July 15, 2022 was completed to remove the multi-family Bridgwater Apartments from the floodplain. The LOMR supersedes this FHAD study and will be included in the Physical Map Revision (PMR) adoption process.

Nine structures around the perimeter of Arapahoe Lake appear to be inundated per the LiDAR topographic contours; however, five of the nine structures have been shown by Elevation Certificates to have their finished floors at least one foot above the spillway. Two structures have walk-out basements at the same elevation of the spillway and may be susceptible to flooding. This study uses the same approach as used in the 2005 FHAD by not recognizing flood attenuation and downstream peak flow reduction at Arapahoe Lake since there is not a public drainage easement covering the lake area.

The Arapahoe Lake subdivision was designed in 1976 per the drainage study completed by J.W. Williams & Associates. The 100-year design flow used in the 1976 study is lower than the current hydrology shown in both the 2005 FHAD and this study. An excerpt from the Moser and Associates Engineering, *Goldsmith Gulch Improvements – Arapahoe Lake*, October 26, 2007 prepared for SEMSWA states, *"Based on the original design, the dam relied on the roadway overtopping by 1.0 foot to attain a total release rate of 220 cfs."* **Table 4-7** compares the flow rates and spillway overtopping of the previous studies with this study.

Table 4-7 Arapahoe Lake Discharges and Spillway Overtopping

Item	1976 Drainage Study	2005 OSP	This Study
100-year Peak flow at Spillway	462 cfs	767 cfs	521 cfs
100-year Release Rate	220 cfs	627 cfs	521 cfs
Spillway Overtopping Depth	1 ft	1.4 ft	1.46 ft

4.3 Previous Analyses

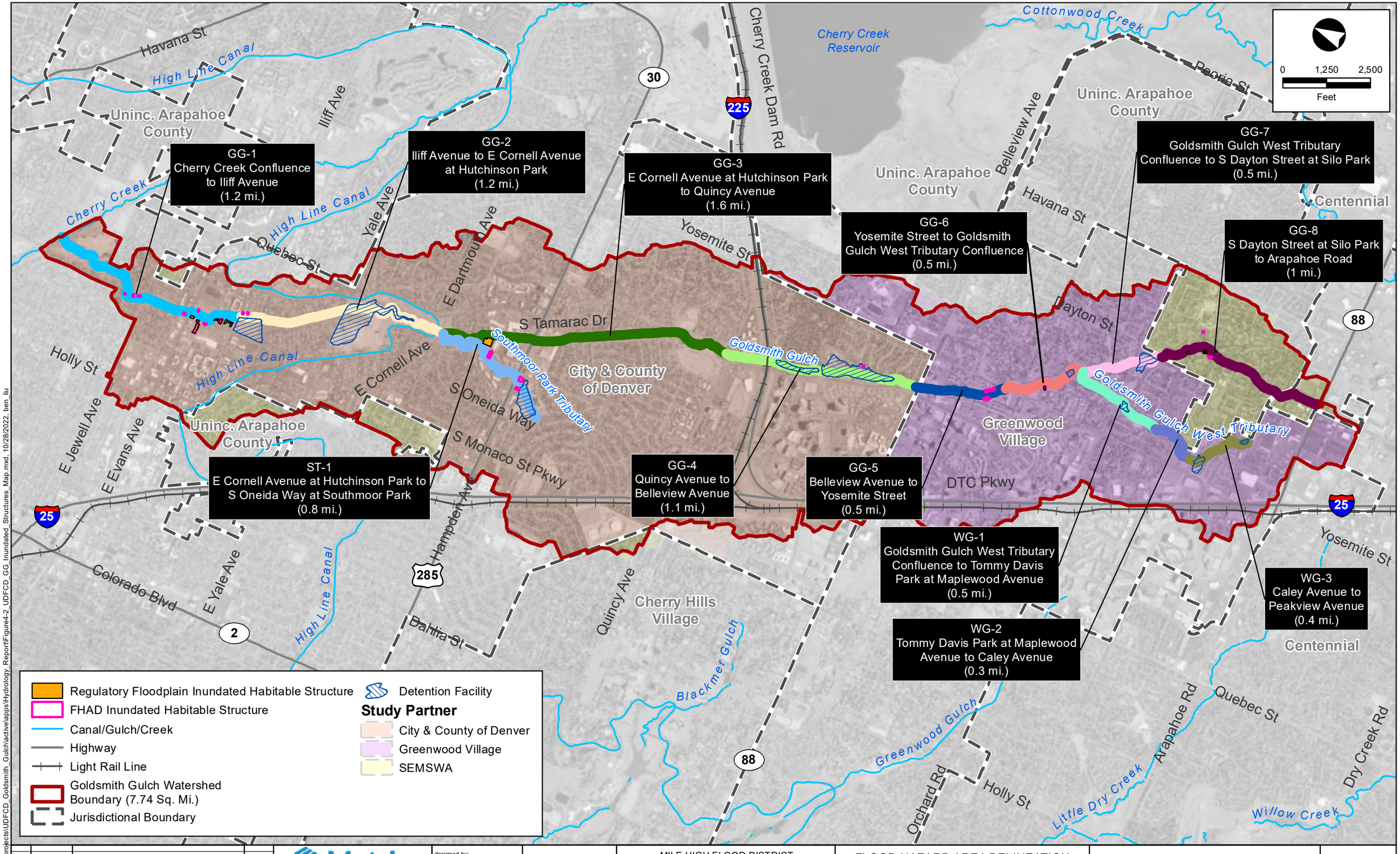
Flood Insurance Studies exist within the Goldsmith Gulch watershed for the City and County of Denver (2020 FIS) and Arapahoe County, CO and Incorporated Areas (2020 FIS). FEMA mapped floodplains and floodways include AE, AO, and X (shaded) designations. The 2020 FIS for Goldsmith Gulch and Southmoor Park Tributary within the City and County of Denver was based on the Goldsmith Gulch Letter of Map Revision (LOMR) Case Number 97-08-009P, effective date January 8, 1997. The 2020 FIS for the upper Goldsmith Gulch upstream of Belleview Avenue in Arapahoe County is based upon the 2005 Urban Drainage and Flood Control District Flood Hazard Area Delineation. A Letter of Map Revision Case Number 15-08-0521P revised FIRM panels for a bridge and channelization project within Cook Park (effective December 28, 2018), but this and other LOMRs were incorporated into the effective 2020 FIS (Denver) and 2020 FIS (Arapahoe County). The map panel numbers for Arapahoe County and Incorporated Areas panels include: 08005C0457K, and 08005C0476L. The map panel numbers for City and County of Denver include: 0800460208H, 0800460216H, 0800460217J, 0800460218G and 0800460219H.

A comparison was made between the information presented in the FEMA FIS and this floodplain study. In general, the 100-year floodplain delineation along Goldsmith Gulch, Goldsmith Gulch West Tributary and Southmoor Park Tributary are similar but smaller; however, there are some areas where the floodplain is larger compared to the effective FIS floodplain. The differences between the regulatory and study floodplains were caused by the updated hydrology, new topography and new hydraulic model. The 2013 topographic mapping provides a higher resolution of ground information than that used for the 1997 LOMR and 2005 FHAD. In the City and County of Denver, the regulatory floodplain was analyzed using a HEC-2 hydraulic model; however, HEC-RAS was used for this study, which has an updated hydraulic module. HEC-RAS usually calculates very different water surface elevations at hydraulic structures than HEC-2.

There were 9 structures in the FEMA Effective floodplains of Goldsmith Gulch, West Tributary and Southmoor Tributary (see Table 4-8 below). There are 13 building features in the GIS layer that intersect the effective floodplain mapping, but only 9 are habitable structures (1 structure is a parking structure and 3 are at Arapahoe Lake that have Elevation Certificates).

Table 4-8 Floodplain Inundated Structures this FHAD compared to the 2020 FEMA Effective

Reaches	This Study Structure Count	Regulatory Floodplain Structure Count
GG-1	9	6
GG-2	2	0
GG-3	0	0
GG-4	1	0
GG-5	4	0
GG-6	1	1
GG-7	0	0
GG-8	4	2
ST-1	3	0
WG-1	0	0
WG-2	0	0
Total	**24**	**9**



FILE: G:\gis_projects\UDFCD_Goldsmith_Gulch\active\apps\Hydrology_Report\Figure4-2_UDFCD_GG_Inundated_Structures_Map.mxd, 10/28/2022, ben_liu

No.	DATE	DESCRIPTION	APPR.

Matrix Excellence by Design

designed by:
drawn by: CM
checked by: RK
project no.: 18.155.035
date: 10/26/2022

MHFD MILE HIGH FLOOD DISTRICT

MILE HIGH FLOOD DISTRICT
CITY AND COUNTY OF DENVER
GREENWOOD VILLAGE
SEMSWA

FLOOD HAZARD AREA DELINEATION
GOLDSMITH GULCH DRAINAGEWAY AND TRIBUTARIES

INUNDATED STRUCTURES MAP

FIGURE 4-2

5.0 REFERENCES

Alpert Corporation, *Arapahoe Lake Dam Design Criteria and Report*, March 28, 1974.

City & County of Denver, *Gulch Master Plan*, Matrix Design Group, Inc., October 2009.

City & County of Denver, *Storm Drainage Master Plan*, Matrix Design Group, Inc., Olsson Associates, ICON Engineering, Inc. and Enginuity Engineering Solutions, September 2014.

City & County of Denver, *Stormwater Quality Prioritization and BMP Opportunity Analysis*, Matrix Design Group, Inc., June 2015.

CH2MHILL, Goldsmith Gulch Condition Assessment: Orchard Road to Yosemite Street, Prepared for Urban Drainage Flood Control District and City of Greenwood Village, October 2007.

Colorado Department of Public Health and Environment (CDPHE), WQCD 2016 303(d) list of Impaired Waters, Last Updated April 8, 2016.

Federal Emergency Management Agency, *Flood Insurance Study, Arapahoe County, Colorado, and Incorporated Areas, Volume 1 of 6*, revised September 4, 2020.

Federal Emergency Management Agency, *Flood Insurance Study, City & County of Denver, Colorado, Volume 1 of 3*, revised September 4, 2020.

Federal Emergency Management Agency, *Flood Insurance Rate Map* - FIRM Panel Nos. 0800460208H, effective September 4, 2020; 0800460216H, effective September 4, 2020; 0800460217J, effective September 4, 2020; 0800460218G, effective November 17, 2005; 0800460219H, effective November 20, 2013; 08005C0457K, effective December 17, 2010; and 08005C0476L, effective February 17, 2017.

Federal Emergency Management Agency, Letter of Map Revision (LOMR) Case Number 15-08-0521P, Goldsmith Gulch at Cook Park, Revisions to FIRM Nos. 0800460208G, effective November 17, 2005; 0800460216G, effective November 17, 2005, LOMR Effective December 28, 2015.

Gingery Associates Inc, Flood Hazard Area Delineation Goldsmith Gulch and Tributaries, Prepared for Urban Drainage Flood Control District, City and County of Denver, City of Greenwood Village, and Arapahoe County, June 1976.

Gingery Associates Inc, Goldsmith Gulch Major Drainageway Planning, Prepared for Urban Drainage Flood Control District, City and County of Denver, City of Greenwood Village, and Arapahoe County, November 1977.

Guo, James C.Y. 1989. Hydrology Study for Goldsmith Gulch Drainage Basin- A comparison between the current existing condition versus 1976 condition. Also submitted by Hydrosystems Engineering Consulting Services (HECS) October 5, 1989.

Moser & Associates, Upper Goldsmith Gulch Flood Hazard Delineation, Prepared for Urban Drainage and Flood Control District, Arapahoe County, and City of Greenwood Village, April 2005.

Moser & Associates, Upper Goldsmith Gulch Outfall Systems Planning Conceptual Design Report, Prepared for Urban Drainage and Flood Control District, Arapahoe County, and City of Greenwood Village, November 2005.

Muller Engineering, Boston Street & Peakview Avenue Pond Drainage Letter, City of Greenwood Village Public Works, March 16, 2018.

Muller Engineering, Goldsmith Gulch Trail Caley Underpass Improvements, Project No. STU M580-013, City of Greenwood Village Public Works, February 2017.

Muller Engineering, Goldsmith Gulch at Skyline Acres Swim and Tennis Club, May 25, 2017.

Respec, *High Line Canal Feasibility Study for Stormwater Runoff Reduction & Treatment*, dated August 2014.

Sellards & Grigg. 1994. Appendix to Hydrology Study for the Goldsmith Gulch Drainage Basin. Prepared for Urban Drainage and Flood Control District and Denver Wastewater Management Division. March 23, 1994.

Southeast Corridor Constructors (SECC), I-25/ LRT Southeast Corridor Area 2.2 Drainage Report (100% Final), Prepared for TREX Metro Denver, April 21, 2003.

Urban Drainage & Flood Control District, *Goldsmith Gulch and Harvard Gulch Flood Warning Plan*, April 2009.

Urban Drainage & Flood Control District, *Colorado Urban Hydrograph Procedure, Version 2.0.0,* Revised September 2016.

Urban Drainage & Flood Control District, *Urban Storm Drainage Criteria Manual*, Revised March 2018.

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U.S. Environmental Protection Agency, *Storm Water Management Model, Version 5.1.012*.

U.S. Environmental Protection Agency, *Storm Water Management Model User's Manual, Version 5.1,* 2018.

Wilson & Company, Inc. Structure Survey, April 2, 2018 and June 12, 2018.

As-built, Boston Street/ Caley Ave. & Boston Street/ Peakview Avenue Intersection Improvements and Pond, City of Greenwood Village, May 2005.

As-built, Caley Square Regional Detention Pond Phase III Construction Plans, City of Greenwood Village, Prepared by Water & Waste Engineering, Inc, January 2004.

As-built, Drainageway Maintenance on Goldsmith Gulch in Bible Park, Project No. 97-07.09, City and County of Denver and Urban Drainage Flood Control District, November 1997.

As-built, Goldsmith Gulch – Cook Park Channel Improvements, City and County of Denver and Urban Drainage Flood Control District, Prepared by ICON Engineering INC, September 2011.

As-built, Goldsmith Gulch Flood Control Project Phase II, Schedule II, Project No. 93039-21, City and County of Denver and Urban Drainage Flood Control District, Prepared by Sellards & Grigg INC, July 1994.

As-built, Goldsmith Gulch Flood Control Project Phase III, Schedule II, Project No. 93039-21, City and County of Denver and Urban Drainage Flood Control District, Prepared by Sellards & Grigg INC, July 1994.

As-built, Goldsmith Gulch Flood Control Project Phase III, Schedule III, Project No. 93039-21, City and County of Denver and Urban Drainage Flood Control District, Prepared by Sellards & Grigg INC, July 1994.

As-built, Goldsmith Gulch Flood Control Project Phase III, Schedule IIIB, Project No. W75-104C(3B), City and County of Denver and Urban Drainage Flood Control District, Prepared by Sellards & Grigg INC, September 1995.

As-built, Goldsmith Gulch Phase 1 Improvements Yale to Iliff, Project No. 07-01.16, City and County of Denver and Urban Drainage Flood Control District, December 2006.

As-built, Goldsmith Gulch Trail, Denver Parks & Recreation, August 2017.

As-built, Goldsmith Gulch – West Tributary Tommy Davis Park Phase I Improvements, UDFSC Contract No. 08-06.12, Greenwood Village and Urban Drainage and Flood Control District, Prepared by Moser Engineering, September 2008.

As-built, Southmoor Tributary at Hutchinson Park, City and County of Denver and Urban Drainage Flood Control District, Prepared by SEH INC, September 2011.

Appendix A – Project Correspondence

Meeting Minutes

Matrix Design Group Inc.
Integrated Design Solutions

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MEETING MINUTES
Goldsmith Gulch
Major Drainageway Plan and Flood Hazard Area Delineation
Monday March 12, 2018, 2:30pm – 4:00pm at UDFCD

Attendees:

Shea Thomas	UDFCD	303-455-6277	sthomas@udfcd.org
Morgan Lynch	UDFCD	303-455-6277	mlynch@udfcd.org
Rich Borchardt	UDFCD	303-455-6277	rbhorchardt@udfcd.org
Jennifer Williams	Denver	720-913-0655	Jennifer.williams@denvergov.org
Sarah Anderson	Denver Water Quality	720-865-2670	Sarah.anderson@denvergov.org
Jeremy Hamer	Denver Floodplains	720-913-0720	Jeremy.Hamer@denvergov.org
David Morrisey	Denver Floodplains	720-913-8518	David.Morrisey@denvergov.org
Kevin Lewis	Denver	303-446-3658	Donald.Lewis@denvergov.org
Cincere Eades	Denver Parks Natural Areas	720-913-0655	Cincere.Eades@denvergov.org
Wanda Devargas	Greenwood Village	303-708-6140	wdevargas@greenwoodvillage.com
Suzanne Moore	Greenwood Village	303-708-6142	smoore@greenwoodvillage.com
Stacey Thompson	SEMSWA	303-858-8844	sthompson@semswa.org
Angela Howard	SEMSWA	303-858-8844	ahoward@semswa.org
Robert Krehbiel	Matrix Design Group	303-572-0200	robertk@matrixdesigngroup.com
Chris Martin	Matrix Design Group	303-572-0200	chris_martin@matrixdesigngroup.com
HungTeng Ho	Matrix Design Group	303-572-0200	hungteng_ho@matrixdesigngroup.com
Caitlyn Echterling	Matrix Design Group	303-572-0200	caitlyn_echterling@matrixdesigngroup.com

1. Project Schedule

a. 84 weeks by contract, concurrent FHAD
b. NTP January 13, 2018
c. Structures survey to be completed in approximately 2 weeks (~3/26)
d. FHAD to be completed prior to alternatives analysis
e. Completion September 9, 2019

APPROXIMATE MDP & FHAD SCHEDULE

	Draft / First	Comments	Final/Second	Public Meeting	Selected Plan
Baseline Hydrology Report	4/9/2018	4/30/2018	5/21/2018		
Alternatives Analysis	3/11/2019	4/22/2019	5/13/2019	4/22/2019	6/3/2019
Concept Design	7/29/2019	8/19/2019	9/9/2019		
FHAD	6/2/2018	on-going	1/14/2019		

2. Project Coordination

a. Meet as needed – typically every 6 weeks
b. Website is currently online and will be a source of draft/ final version reports, meeting minutes, general mapping, and question/ answer.

3. Project Deliverables

a. Baseline Hydrology Report
b. Flood Hazard Area Delineation (5 submittals)
c. Alternatives Evaluation Report
d. Concept Design Report
e. Public Meeting

4. Project Metrics

a. 5,000 acre watershed
b. 7.6 mile stream corridor (main stem only)
   i. 5.1 miles in Denver
   ii. 1.4 miles in Greenwood Village
   iii. 1.1 miles in SEMSWA
c. West Tributary and Southmoor Tributary being added to the contract study area
d. Ten Existing Regional Detention Basins
   i. Iliff & Monaco 84.5 AF
   ii. Bible Park 93.8 AF – detention only, no water quality
   iii. Wallace Park North 19.1 AF
   iv. Wallace Park South 122.4 AF
   v. Southmoor 47.8 AF
   vi. Caley 18.6 AF
   vii. Tommy Davis Park 17.5 AF
   viii. Orchard Hills 11.2 AF
   ix. Silo Park 27.3 AF
   x. Boston Peakview Pond (near Design Point U-510)

Note: No formalized detention modeled in Rosamond Park. Outlet consists of large culverts.

5. Hydrology

a. Q100 = 2,200 cfs at Cherry Creek per FIS
b. Without detention ~ 6,955 cfs; Detention is key to the watershed hydrology

6. Preliminary Model

a. The model consists of an upper and a lower basin. Belleview Ave is the divide between the two basins.
   i. 2005 OSP Model is used as the framework for the upper basin. Some minor revisions were made to the sub-basin delineations.
   ii. Denver SDMP sub-basins are used as the starting point for the lower basin.
b. Based on preliminary model results, the upper basin peak flow rates decreased due to decreases in rainfall depths. However, the peak discharge in the lower basin increased. This may be due to under utilized detention volumes in the model. As-builts and survey will be utilized to improve modeled detention rating curves.
   i. Tommy Davis Park was modified post-2005 in a redesign by RESPEC.
   ii. Silo Park detention pond is currently being re-designed. The project is approximately in 30% design with construction beginning in 2020 - Greenwood Village to provide as-builts.
      a. Arapahoe Lakes is not being counted towards detention in the model. SEMSWA currently doesn't plan to formalize this detention. If additional detention is needed, improvements can be coordinated with the Silo Parks project.
   iii. Caley Avenue detention is currently being reconfigured.
c. Work has been conducted on the following channel segments. As-builts should be utilized in these areas:
   a. North of Orchard Hills – obtain as-builts from Greenwood Village
   b. From approximately Design Point U-440 to Caley Pond - obtain as-builts from Greenwood Village
   c. Bridgewater apartments near Design Point U-510 - obtain as-builts from Greenwood Village
   d. ICON project at upstream study limit of mainstem Goldsmith Gulch (near Design Point U-740) – Rich to send as-builts
   e. Goldsmith Park Trail project – obtain as-builts from Denver for channel contours

7. Flood History

a. May 5 and 6, 1973 (approximately 5- to 10-year event). Capacities of the crossings at Dartmouth and Yale Avenues were exceeded.
b. July 27-28, 1997 (2,040 cfs roughly 10- to 50-year event)
c. July 8, 2001
d. June 3, 2005 - significant flooding in the parking lot of the apartment complex on the north side of Illiff. At the same time while this flooding occurred, the detention pond never got more than ¼ full.
e. August 13, 2006
f. July 3, 2009 - Flooding reported at the intersection of Monaco & Evans. UDFCD ALERT gage at Iliff Detention pond two blocks south indicates 1.22 inches rain fell in approximately 25 minutes.
g. July 13-14, 2011
h. September 12, 2013
i. No specific dates, but we are told that two properties within Arapahoe Lake flood frequently when the spillway overtops and during heavy rains.

8. Project Goals

a. Updated flood hazard area
b. Program capital improvements
c. Water quality improvement opportunities
d. Channel stabilization opportunities

9. Project Opportunities

a. From Iliff Avenue to Cook Park there is a gap in the trail network.
b. At Monaco and Evans, there is a vacant lot near the Kmart that is frequently flooded. The conveyance system includes a 5' high by 22' wide single cell culvert. This culvert is reaching the end of its life.
c. The channel downstream of Iliff and Evans is currently undersized resulting in bank sloughing and sediment build up near Jewell Ave.
d. Turf conversion is a topic of interest within City of Denver to conserve water
e. There may be an opportunity to provide a more natural solution and detention at the Southmoor confluence.
f. In the past, proposed modifications to detention at Bible Park have met public resistance, but there may be some opportunities in the eastern and southern area of the park. The storage volume could be expanded by raising Yale Avenue.
g. Potential opportunity to provide off-line water quality or detention near Southmoor confluence (Design Point L-450) in the vacant parcel.
h. Opportunity for channel stabilization to mitigate head cuts near Silo Park.
i. Bridgewater Apartments – look for opportunities to take the buildings out of the floodplain
j. Caley Avenue detention – opportunities to add forebays
k. Opportunity to revisit formalizing detention within Arapahoe Lake.

With the decrease in peak flow rates in the upper basin, structure(s) may be removed from the floodplain.

10. Deficiencies

a. Flooding due to limited conveyance capacity (flood history/flooding complaints)
b. Condition of existing drainage infrastructure
c. Channel stabilization, erosion and sedimentation/maintenance
d. Water quality - the main stem of Goldsmith Gulch is listed on the WQCD's 303(d) list for E. Coli.
e. Open space programming and trail connectivity

11. Data Gathering

a. 2016 aerial and topographic base mapping (DRCOG LiDAR 2014)
b. Assume existing land use equals future land use. As part of the 1st Submittal review, stakeholders will review composite imperviousness values to ensure they are representative of future planned values.
c. Percent imperviousness is calculated based on DRCOG 2016 planimetrics dataset.

d. Land use – displayed for reference, but not used in percent imperviousness calculations.
e. Structure survey information in process for the hydraulic model.
f. Reference Materials:
   i. Flood Hazard Area Delineation: Goldsmith Gulch and Tributaries, Gingery Assoc., June 1976.
   ii. Goldsmith Gulch Major Drainageway Planning, Gingery Associates, Inc., November 1977.
   iii. Hydrology Study for the Goldsmith Gulch Drainage Basin, October 5th, 1989.
   iv. Hydrology Study Appendix, Design Computations, Sellards & Grigg, 1994.
   v. Evaluation of Debris and Flood Control, I-225 to Iliff Avenue, December 2004.
   vi. Flood Hazard Area Delineation: Upper Goldsmith Gulch, Moser & Associates, April 2005.
   vii. Upper Goldsmith Gulch: Outfall Systems Planning Conceptual Design Report, Moser & Associates, November 2005.
   viii. Upper Goldsmith Gulch: Condition Assessment, 2007.
   ix. City and County of Denver Storm Drainage Master Plan, adopted September 22, 2014.
   x. Flood Insurance Study: City and County of Denver, Colorado, FEMA, November 20, 2013
   xi. Flood Insurance Study: Arapahoe County, CO and Incorporated Areas, February 17, 2017
   xii. Design Report; Goldsmith Gulch East Caley Avenue Culvert Improvements, March 11, 2011
   xiii. Design Report; Goldsmith Gulch Channel Improvements downstream of Peakview Ave, approved June 28, 2013
   xiv. Design Report; Goldsmith Gulch West Tributary at Orchard Road and Tommy Davis Park 2011As-Built Upper Goldsmith Gulch Channel Stabilization Project, March 1989
   xv. As-Built Goldsmith Gulch West Tributary at Orchard Road Drainage Improvements
   xvi. As-Built Goldsmith Gulch West Tributary Tommy Davis Park 2010
   xvii. As-Built Goldsmith Gulch Channel Improvements downstream of Peakview Avenue
   xviii. As-Built Goldsmith Gulch downstream of Dayton Street
   xix. As-Built Goldsmith Gulch East Caley Avenue Culvert Improvements
   xx. As-Built Upper Goldsmith Gulch at Arapahoe Lake – Cove WQ Improvements; approved October 2012
   xxi. As-Built Goldsmith Gulch Upstream of Caley Avenue Drop Structure Replacement
   xxii. Alternatives Evaluation Report; Arapahoe Lake (9828 and 9838 E Maplewood Cir), October 2007

12. Stakeholders

a. High Line Canal (Denver Water)
   a. Operational Model Master Plan draft planned for April
b. High Line Conservancy
   a. Framework Plan in parallel with the Operational Model Master Plan planned for July
c. Arapahoe Lake HOA
d. Possible stakeholder: Arapahoe County Open Spaces

13. Action Items

a. Greenwood Village to provide as-builts of Silo Park detention pond and other relevant projects within the basin.
b. Denver to provide as-builts of Goldsmith Park Trail project
c. Team to provide known flooding event dates not listed. Morgan to follow up with Kevin regarding additional flooding events, if applicable, including the date of the 2015 event.
d. Rich to provide ICON as-builts for project near upstream study limit of mainstem Goldsmith Gulch.

Responses to 1st Submittal Comments Received on 05/04/2018 & 5/7/2018 Meeting Minutes
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
1	general	general	Grammar, typo, and other minor corrections, including applicable jurisdictions.	To be addressed.
2	6	Denver	Do the topographic contours cover the entire watershed?	Yes, we have full contour coverage.
3	7	Denver	Add more detail on the crossing structure survey, including company, method, and dates.	To be addressed.
4	7	UDFCD	Recommend providing a narrative referencing the Table 1-1.	To be addressed.
5	7	Denver, UDFCD	Table 1-1: Change all of Denver to 'City and County of Denver' to align with Greenwood Village and SEMSWA. Kevin Lewis is with Denver Public Works.	To be addressed.
6	7	Denver	*"The latest GIS land use zoning data is derived from the City and County of Denver Land Use layer (2012) and Arapahoe County Parcels layer."* - Please double check. I believe you have more recent GIS layers.	This is correct. The most authoritative existing land use layer for CCD comes from the Existing Land Use layer compiled from the Assessor's parcel records in 2012. The existing land use categories were matched to the UDFCD land use values in Table 6-3 of the UDFCD Criteria Manual. The Arapahoe County Parcels layer is from 2018. Revise text to state *"...and Arapahoe County Parcels layer (2018)."*
7	7	UDFCD, sthomas	Land Use Analysis: Were comp plans or zoning plans used for the areas that are slated for redevelopment? (Optional) It might be interesting to just document what was assumed fully developed (percent impervious) in 1976 to now. To just give a snapshot in time.	This first draft just uses existing land use in order to determine where this may be necessary. Potential areas to incorporate future development/ redevelopment, include the development near Caley Detention. Within Denver, some redevelopment is likely to occur, but is unlikely to be extensive and is currently undefined.
8	8	Denver, UDFCD	Figure 2-1. Please identify(label) detention facilities on this map. Please set layers so that detention facilities are not obscured by other features. Is it possible to label some of the notable features mentioned on this map?	To be addressed. Detention will be labeled in Figure 2-1. Notable features described in the text will include references to applicable figures.
9	10	sthomas	Figure 2-2, Reach 6: I would call this Reach 5 - keep the reaches increasing along the mainstem, then go to the tribs. That made up barrier between upper and lower doesn't mean anything to most people.	To be addressed. Use continuous reach numbering for mainstem, then call out tributaries with independent reach numbering.
10	10	Denver	Figure 2-2: Can jurisdictional information be kept on for this sheet? Please set layers so that detention facilities are not obscured by other features.	To provide visual clarification, the color coding with high transparency will be added to Figure 2-2.
11	11	Denver	Please include more discussion about trails, locations where there are existing trails, and where there are gaps. Describe trail geometry where trails exist. Discuss challenges to connectivity where there are gaps in trail "system." Please look into whether any trails master planning documents exist. The possibility of trail improvements will be a major consideration in the master planning phase of this effort.	Add GIS trail layers from Denver and Arapahoe County to the Figure 2-18 Parks and Open Space to highlight gaps in the system. A short description was also added to the text in Section 2.5.
12	11	Denver	Add the following paragraph to complete the missing segment from E. Jewell Avenue to the open channel located on the east side of S. Monaco Blvd. approximately 100-feet north of E Colorado Drive: "From E. Jewell Avenue, Goldsmith Gulch enters dual-cell reinforced box culvert. Each cell is 120-inches wide x 72-inch high. The box culvert starts on the southwest corner of E. Jewell Ave. & S. Monaco Blvd., and goes north under S. Monaco Blvd. until it daylights on the east side of S. Monaco approximately 100-feet north of E. Colorado Drive is located beneath S. Monaco Avenue."	To be addressed.
13	11	Denver	Goldsmith Gulch Trail described in Reach 2: Does this belong in Reach 3?	Goldsmith Gulch Trail is located in Reach 2.
14	11	Denver	Yale to Iliff channel stabilization: Were these improvements ever modeled, or flood maps revised based on these improvements?	These improvements do not impact hydrology and therefore will be incorporated into Chapter 4 - Hydraulics.
15	11	137820	E Princeton Ave to E Jarvis Place paragraph in Reach 3 description: This is the area where Denver Parks constructed trail improvements in 2017.	This will be noted in the text.
16	11	Denver	"An additional drop structure is located directly upstream of E. Yale Avenue." Correct overlay.	Text was updated to be consistent with the structures figure.

Responses to 1st Submittal Comments Received on 05/04/2018 & 5/7/2018 Meeting Minutes
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
17	11	Denver	Rosamond Park: Please elaborate and provide information based on any available design plans for recent improvements (if any) and discuss whether storage had been assumed to occur. FEMA maps show an area of inundation that appears to be a storage area (pool). Please discuss whether the use of this area for detention is possible with modification of the outlet. If it had been intended as a detention area and does not function as intended because of the outlet configuration, it makes sense that it should be modified.	The Rosamond Park Detention was only called out in Denver SDMP figures, however, there are no known hydrologic models that include this as detention. Also, at this time, there are no known improvements to this outlet. This explanation will be added to the baseline analysis. In addition, this location can be evaluated for detention as part of the alternatives analysis.
18	11	Denver	"During high flow conditions, flows spill through five 4-feet by 2-feet concrete box culverts into the Iliff & Monaco Detention Pond." The culverts that are the inlet into the Iliff & Monaco detention pond are perched and do not activate until the flood flows are above the approximately 10-year event level. The detention is off line.	The "10-year level" will be added to the text for clarity.
19	12	Denver	Reach 4 - Please verify. Does Denver maintain TREX facilities? Is some of this area in CDOT owned property? Verify whether Reach 4 is in Greenwood Village or Denver.	This should be "Goldsmith Metropolitan District". This update did not make it into the submitted version. We did not include the CDOT detention in the baseline analysis. This will be included in the Alternatives Analysis.
20	12	Denver	Reach 4 - CCD boundary extends to Belleview and Greenwood Village maps (dated 1/18) show their boundary is Belleview. Are those maps inaccurate?	Reach 4 is located entirely within Denver. We will change the text to reflect this.
21	12	Denver	Are the basin numbers referenced the TREX section numbering from the report or this study?	The basin numbers are from this report.
22	12	Denver	Was Goldsmith Gulch North Middle Park mentioned in previous studies as a location for detention? Does this area serve as a detention facility?	No, the Goldsmith Gulch North Middle Park was not identified as detention in the previous study. However, this is a potential location to be formalized as a detention facility.
23	12	Denver	Reach 5: Can this be renamed to (Reach 5 of) Southmoor Tributary?	To be addressed with comment No. 9.
24	12	Denver	Southmoor Park: Please note that although this is a Denver Park, that there are no programmed uses or activities in this park. (It may be worth laying the foundation for the possibility of expanding detention in this location as grades appear to be conducive.)	We will incorporate the note and describe the potential opportunity of expanding detention in alternative analysis.
25	12	Denver	Reach 5: Please also mention the wetlands in this reach and the potential water quality benefits achieved in the natural space.	To be addressed.
26	13	Denver	"In addition, houses are located along the shoreline and on pilings within the lake, which complicates formalization and acquisition of the lakes for public detention." - there is a parcel for this house (Eckstein & Darlak)is defined in Arapamap, separate from lake parcel	The text well be revised to note that one of the houses owns a parcel within the ponded area of the lake.
27	13	Denver	Who owns the detention facility on the east side of Cherry Creek Academy. It appears to be online, on the drainageway. If GV owned, does this help reduce flood peaks?	SEMSWA will verify if there is detention and whether it is private.
28	13	Denver	Reach 6: Any formal detention in this area? It looked like there might be a sub-regional detention pond at Belleview and DTC Blvd (ds of E Crescent Pkwy).	These ponds are decorative only.
29	13	SEMSWA	SEMSWA is not actively pursuing acquisition of the easement for Arapahoe Lake, but is willing to have the discussions with the Arapahoe Lake HOA if the HOA would like to revisit the subject. (Previous discussions were not successful.) We agree that public detention should be considered as an alternative.	Noted.
30	13	Denver	Orchard Hills Detention: Is there a possibility of modification/retrofit to achieve previously recognized detention volume? Do grades allow for additional storage with only a need for adjustment of outlet configuration? If so, please discuss what prevents full utilization for detention.	The potential of expanding Orchard Hills Detentions will be researched as part of the alternative analysis.
31	13	Denver	Silo Park Detention: Please expand on proposed improvements, current level of design and intended storage volume.	Existing conditions will be considered in the baseline analysis. The existing condition survey received from Muller was compared to the 2014 Lidar contours and the two match very closely, therefore, the rating curve was not revised.

Responses to 1st Submittal Comments Received on 05/04/2018 & 5/7/2018 Meeting Minutes
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
32	13	Denver	Please discuss whether GV is considering or in discussions with the LL community regarding such an agreement. Please note the approximate combined surface area of the lakes. Elsewhere in this report, please discuss to what extent the peaks are dampened. It is reasonable to incorporate reductions in peak discharges due to the effects of such a large reservoir even if not a formal detention facility, assuming that there is no potential to fill in the lakes and pipe the drainaway through that area.	Incorporation of Arapahoe Lake will be considered in the alternatives analysis.
33	14	SEMSWA	Reach 12: A small section of West Trib is within Arapahoe County through The Enclave at DTC condominium complex.	To be added to Reach 11.
34	16	Denver, UDFCD	Table 2-1: Can be expanded to include type (culvert, bridge, etc.) and sizes of structures, length and diameter or rise and span of culverts, width of span(s) and number of spans of bridges, etc. Should this table be placed before the reach descriptions since it is referenced in an earlier section? Might worth referencing the survey number? I would add a footnote documenting the source of this information	To be addressed.
35	19	Denver	Flood History - Alert gages - Some of these are not within the GG watershed area. Please include in a section or in an appendix, the gage records and discussion regarding the relevance of that data to this study.	A figure showing historic gage records was added to the report. All of the Alert gages appear to be located in the watershed.
36	24	Denver	Highline Canal - Agree with this methodology for existing conditions; however, we may want to look at this during alternatives.	Reference HLC master plan and discuss as part of the alternatives analysis.
37	24	sthomas	Reference HLC master plan that's in progress which allows for stormwater inflow into canal upon analysis and approval.	
38	24, 27	sthomas	The 1994 study hasn't been explained, only shown in the list in section 1. I'm so confused by all the previous studies. Can we list them in 3.1.1 with an explanation of how they are used for hydrology?	Add narrative for 1994 Study.
39	24	rborchardt	TREX CDOT and Private Detention: Can we look at whether these basins help out in the alternatives?	The impact on hydrology from TREX CDOT and private detention will be assessed in alternatives analysis.
40	25	sthomas	"However, the **DARF's were not applied** with this study because the total contributing drainage area for the Goldsmith Gulch watershed to the Cherry Creek is 7.74 square miles." - What about for the smaller storm events?	DARFs will be applied as per current criteria.
41	25	UDFCD	Watershed Imperviousness: Can we state the average percent impervious in the narrative?	To be addressed.
42	26	sthomas	Shouldn't be increasing n for natural streams.	To be addressed.
43	26	Denver	Is there any need for adjustment to slopes of conveyance elements to account for grade control structures along the channel length?	Will look into the impact from adjustment to slope of conveyance elements to account for grade control.
44	27	Denver	Clarifications to the "Previous Studies" section	To be addressed.
45	27	Denver	FEMA floodplain maps: and City and County of Denver panels (CCD panels are 080046)	To be addressed.
46	27	UDFCD, Denver	Table 3-6: Provide a table showing what percent impervious was assumed for what landuse and source. Please elaborate on what assumptions have changed in planning since 2005 to show the decrease in % impervious. Include an overall watershed %I. Note percent difference.	To be addressed. Provide basin by basin comparison of percent impervious for this study compared to the 2005 OSP to identify areas that differ the most. Also, identify differences in calculation method/ assumptions.
47	27	sthomas	Table 3-4: Include more points, this doesn't tell me much as is. Compare to 2013 Cherry Creek FHAD inflow at outfall? Swap +/-.	To be addressed.
48	28	Denver	Table 3-8, Wallace Park North: Nearly no peak reduction! Can this be fixed?	The neighborhood to north is not located high enough and needs a berm for protection. This site constraint will limit the opportunity for providing more detention.
49	28	sthomas, Denver	Table 3-8: Note that this table is for the 100-year event. I'd like to see this table for all ponds.	To be addressed.
50	28	UDFCD	"In general, previous studies over-estimated the available detention volume which was also reported in 2005 OSP, as shown in Table 3-7." Overestimated how? The stage storage curve was incorrect? This section might need to be expand to clearly document the change in volume and why.	A section will be added to further justify these changes.

Responses to 1st Submittal Comments Received on 05/04/2018 & 5/7/2018 Meeting Minutes
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
51	28	sthomas, Denver	Table 3-7: I don't understand why these are so different than before - particularly when compared to the 2005 study. This is representing maximum volume stored in a 100-yr event? Not max vol available? So reduced inflow might explain the decrease for some, but Bible Park inflow increased yet the volume decreased significantly? Same with Wallace Park South. Orchard Hills inflow is similar to before, yet volume way reduced. Add a column for Reach, and then order them by Reach logically. Please add Rosamond Park to identify how much storage was assumed in previous studies, versus none in our study.	A detailed comparison to previous models will be described in the text. In addition, survey of the detention low point and overflow elevations will be conducted for Caley, Peakview, Tommy Davis, Wallace Park North and South, and Orchard Hills to help ground-truth storage volumes. Datums for Caley and Tommy Davis will be reviewed to ensure they are accounted for in current volume/ outlet structure assumptions. A column will be added for reach and the data will be sorted logically. See Comment No. 17 for Rosamond Park.
52	28	sthomas	"However, the capacity of the significant storm drainage system is negligible and the Southmoor Park detention basin has not been reported as storing stormwater in the past several decades per City and County of Denver Wastewater staff." - It's a significant system with negligible capacity?	It is a typo. We wanted to note that it is not negligible.
53	28	sthomas	"The hydrograph routing was revised to count the diversion for the storm drainage system and the overflow was routed into the Southmoor Park Detention." - Did this have an impact on the mainstem?	Yes and no, the previous study routed all of the runoff into Southmoor Park detention then released it slowly which had better chance to add peak discharge to the mainstem where the peak discharges are controlled by detention in series upstream. The impact needs to be quantified.
54	28	rborchardt	Include discussion: Even though the storage volume was reduced, the outflows from the basins were still lower than the 1994 except for Wallace Park North.	Discussion will be added to the text.
55	29	Denver	1. The effect of Arapahoe Lakes would logically be that flood peaks are dampened. Even if not regarded as formal detention, the large reservoir would have the effect of attenuating flood peaks so that whatever the inflow peak is, the outflow peak would be altered, with a lower peak flow rate, but a longer duration. There would of course be no reduction in flood volume passing through that element. It may be worthwhile to apply a modeling/analysis methodology to determine what attenuation can be expected to occur, whether Modified Puls or other. 2. Investigate what impact to hydrology the storage area on the east side of S Monaco St Pkwy, north of E Evans Ave has on flood peaks. What is intended by design at that location? 3. Because of the fact that estimated flood peaks were not reduced in the current analysis by comparison with the previous analysis, it is worthwhile to tabulate results of incremental model changes to determine the magnitude of change due to each of those changes. Producing this additional information is believed to be of some importance to the District as well as providing important data for understanding what the differences in flood peaks may be attributed to. The additional model runs that area suggested are the following: • Modify current (original) hydrologic model by changing only the storage-discharge relationships using newly developed stage-discharge relationships with no change to the version of CUHP. • Convert current hydrologic model to CUHP 2.0 with no other changes. The information from this additional analysis will provide insight into the degree to which the change to CUHP 2.0 lowers peak discharges, if any, and helps clarify the degree to which a reduction in detention storage is responsible for increased peak discharges. This additional analysis should only be completed for the 100-year flood event. 4. Some additional tabular data should be included in the report (unit runoff,	The text will be revised to include some piecewise modeling revisions, including: 1. Upper basin using 2005 detention curves and hydrology (convert to 2.0). 2. Entire basin using 2005 and 1994 detention curves.
56	29	sthomas	Table 3-9 Southmoor Park Detention: Inflow less but outflow greater?	The comparison needs clarification. The Table 3-9 compared inflow/outflow upstream and downstream of Southmoor Park detention but not at detention facility.

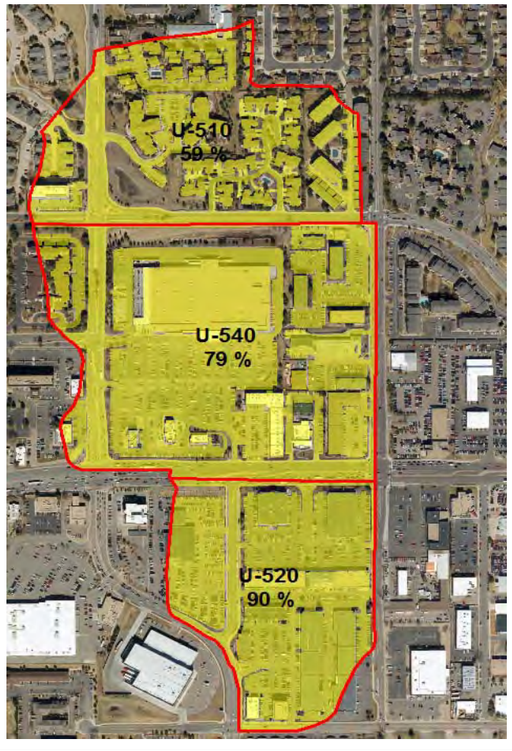
Responses to 1st Submittal Comments Received on 05/04/2018 & 5/7/2018 Meeting Minutes
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
57	29	sthomas	"The return flow was added in the hydrologic model for this study." Did that have an impact on the mainstem?	Yes, it does, but we do not have clear/ complete analysis from 1994 study about how the return flow was modeled and its impact on mainstem.
58	29	UDFCD	Inadvertant Detention: "A conveyance element was provided in the hydrologic model to choke the runoff from this sub-basin and created approximate 15.5 ac-ft of storage volume at this design point. No documentation explained the modeling setup could be found for this study." Was this removed as part of this study?	Yes, this study does not count the Inadvertent detention.
59	30	Denver, rborchardt	Table 3-10: It would be nice to have unit runoff shown somewhere for the 100-year event. It sounds like most basins lost volume, because of more detailed analysis of volume. Are there any that have any unused storage (i.e. built bigger, and aren't fully utilized)?	Add a column for 100-year unit runoff.
60	38	SEMSWA, Denver	Figure B-1: Several routing-related comments and suggested revisions.	* Contours were added to the existing land use map link. * NRCS soils are not available within Denver. * The boundary near S. Havana Street and E. Caley Avenue was revised slightly to account for existing storm sewer catchments. * The boundary near S. Havana Street and E. Peakview Avenue was not revised. The water quality pond has an estimated storage of 0.2 ac-ft which collects minor event through 12" and 18" storm drain. The major event runoff flows in street and curb and gutter in E. Peak View Avenue into Cottonwood Creek. * Link 1590 should not route to L-565 because Iliff Detention does not receive stormwater from neighborhood basins, only from Goldsmith Gulch. * Link 615 is not routed through a pipe because the existing pipe shown in GIS is 6" HDPE. * Link 1152 is a 60" pipe as per the TREX Drainage Report and meeting with Denver. * Link 425 flows into Tommy Davis Detention via the GIS pipes shown parallel to Orchard Road. All inflows to this detention are at U-410 and then routed through a dummy element to the storage node. * Link 1030 was modeled as surface flows only. The drainage system is comprised of 42" storm pipe and street conveyance. It was was not modeled because it's diameter is less than 48". The model approach of surface flow only can provide reasonable result for this hydrologic study. * Link 345 was modeled as surface flows only. The major flow through 2-48" RCP daylight at north side of E. Prentice Avenue and flows through sub-basin U-320 in an open channel. The local storm drains consist of 24" to 36" collect and convey on-site storm runoff to design point U-320 was not modeled.
61	39-41	Denver, sthomas	Figure B-2: Check hydrograph pulse for JUNCT_L-405. Please replace with a more descriptive id (than the design point number) (typ). For detention hydrographs label which lines are inflow versus outflow. There is little attenuation at Tommy Davis Park. Wallace Park North: Table 3-8 shows that this detention facility only reduces peak 100-year discharge by 13 cfs, storing 9.2 ac-ft. That's very litte attenuation for this much area. It would be worth looking at whether that is the intent (design), or whether there is a problem with the outlet, and to consider (for MDP) what can be done to modify to improve performance. Wallace Park South: This L-055 shape is weird (and unstable). What does the outlet structure look like here?	The outlet for Wallace Park South consists of 2-7ft (diameter) culverts with 2.75ft (H) restrictor plates. The rating table was checked with the UDFCD spreadsheet calculators for circular conduits and circular orfices with restrictor plates. The outlet for Wallace Park North consists of 2-6ft (H) by 12ft (W) rectangular culverts with a 3ft (H) restrictor plate. Hydrograph comments to be researched and addressed.

Responses to 1st Submittal Comments Received on 05/04/2018 & 5/7/2018 Meeting Minutes
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
62	43	Denver	Figure B-3: Probably worth adding a design point to the SWMM model on tribs, near confluence.	Updated stationing to be more consistent with the model for the tributaries.
63	45	UDFCD	Table B-2: Why not round these values in CUHP workbook? Currently .034999, and 0.100000001 Recommend removing extra rows	To be addressed.
64	49	Denver	Iliff & Monaco Detention Curves: Incorrect label; values are different than Silo Park, so I assume it was just a label error.	To be addressed.
65	52	UDFCD	Caley Detention Curves: Label-related comments.	To be addressed.
66	56	UDFCD	Southmoor Detention Curves: Include area for 5528 and 5529?	To be addressed.
67	92	SEMSWA	Figure E-2: There was a dry cleaner who dumped/spilled cleaning agent in this area (see markup).	A note will be added to the figure.

Responses to Final Submittal Comments Received on 07/18/2018 & 09/07/2018
Baseline Hydrology - Goldsmith Gulch

Comment No.	PDF Page No.	Reviewer	Comments	Responses
1	19	UDFCD	Who owns the detention facility on the east side of Cherry Creek Academy. It appears to be online, on the drainageway. If GV owned, does this help reduce flood peaks?	SEMSWA confirms that this is a private owned and maintained detention which should not be included in the baseline hydrology.
2	20	GWV	Energy dissipations will be considered in the alternatives analysis improve sediment and trash removal at this location.	The drop structure at the inlet to Caley Detention was relocated to upstream at the entrance of the roadway crossing culvert as a part of the LOMR. Additional engery dissipation is not necessary.
3	26	GWV	Goldsmith Gulch is a Category 5 303(d)-listed waterbody for E. Coli and Selenium, … (mainstream only?)	Revised to mainstream.
4	59	UDFCD, sthomas	This L-055 shape is weird (and unstable). What does the outlet structure look like here?	Utilize smaller calculation time interval in EPA-SWMM to smooth out the oscillation on the hydrographs. Attached email includes detailed discussion and resolution for the numerical instability issue.
5	65	Denver	Area for U-680 does not match CUHP file	Revised
6	65	GWV	For U-510 the majority of the basin is residential, recommend a higher % impervious value similar to U-540 and U-520. 75%?	Matrix's methodology uses the existing % impervious values as determined from DRCOG's impervious surfaces layer. We are not using land use information with assigned impervious values. Our methodology should be more accurate for existing condition as the other method is overestimating the values in this case. Attached here is a screenshot with the impervious surfaces in yellow for those sub-basins that shows the percentages make sense. 
7	79	UDFCD	Orchard Hill Detention: Confirm the area for Stage 0 and Stage 1 matches the model.	Revised

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MEETING MINUTES
Goldsmith Gulch
Major Drainageway Plan and Flood Hazard Area Delineation
Thursday August 22, 2019, 1:00pm – 2:30pm at MHFD

ttendees: X=indicates attendance; A=absence

X	Morgan Lynch	MHFD – FHAD Study PM	303-455-6277	mlynch@udfcd.org
X	Kurt Bauer	MHFD – Alt Anal. Study PM	303-455-6277	kbauer@udfcd.org
X	Jennifer Williams	Denver	720-913-0655	Jennifer.williams@denvergov.org
X	Jeremy Hamer	Denver Floodplains	720-913-0720	Jeremy.Hamer@denvergov.org
X	David Morrisey	Denver Floodplains	720-913-8518	David.Morrisey@denvergov.org
X	Kevin Lewis	Denver	303-446-3658	Donald.Lewis@denvergov.org
X	Cincere Eades	Denver Parks Planning	720-913-0655	Cincere.Eades@denvergov.org
A	Sarah Anderson	Denver Water Quality	720-865-2670	Sarah.anderson@denvergov.org
X	Wanda DeVargas	Greenwood Village	303-708-6140	wdevargas@greenwoodvillage.com
X	Suzanne Moore	Greenwood Village	303-708-6142	smoore@greenwoodvillage.com
X	Stacey Thompson	SEMSWA	303-858-8844	sthompson@semswa.org
X	Nicole Harwell	SEMSWA	303-858-8844	nharwell@semswa.org
X	Robert Krehbiel	Matrix Design Group	303-572-0200	robertk@matrixdesigngroup.com
X	Drew Beck	Matrix Design Group	303-572-0200	Drew_beck@matrixdesigngroup.com
X	HungTeng Ho	Matrix Design Group	303-572-0200	hungteng_ho@matrixdesigngroup.com

1. Study Schedule and Alternatives Analysis Kickoff

a. Matrix to update the project schedule on the website. The schedule below is a rough approximation of the schedule based upon contract durations. However, the team noted that the public process discussed below may delay these dates.

ALTERNATIVES ANALYSIS	DURATION	APPROXIMATE MILESTONE DATES
Kickoff	0	8/22/19
Submit Draft Alternatives Analysis	9	10/24/19
Review Draft Alternatives Analysis	3	11/14/19
Correct Draft Alternatives Analysis	3	12/5/19
Arrange and Hold Public Meeting	5	1/9/20
Select Best Alternative Plan	3	1/30/20

- Alternatives Analysis will likely take longer than shown above but still completed in parallel with the FHAD.
- Contracting with UDFCD has changed so until this meeting Matrix was not contracted for the Alternatives Analysis portion of this study. The new process is to complete the FHAD and then start on Alternatives Analysis. However, there is a lot of interest to proceed with the Alternatives Analysis in parallel with the FHAD. According to the District, the FHAD is in good shape and likely will not have major changes affecting the number of structures in the floodplain moving forward.
- Contracting is now complete, and Matrix will begin the Alternatives Analysis.

2. Public Meeting

- Public Meeting date is anticipated in January 2020.
- Denver would like to incorporate their new public process into the MDP. The first meeting could be an informative meeting (i.e. goals and objectives), follow up meeting to get community input, a third to review the alternatives. First meeting could include education on flood risk. Jennifer Williams could take responsibility fo the 2 additional public meetings. Greenwood only needs one meeting since there are few houses in the floodplain. The public meetings should have a brief presentation followed by an open house format for questions.
- SEMSWA has been in contact with Arapahoe Lakes HOA and could collect input from them directly.

3. Data Gathering

a. Denver (Kevin Lewis) to provide Denver's repetitive complaint locations of flooding in GIS.
b. SEMSWA and Greenwood Village have fewer and less significant complaints.
c. Goldsmith Metro District could inform maintenance issue locations.

4. Additional Stakeholders

a. High Line Canal (Denver Water)
b. Skyline Acres Swim & Tennis Club - – hot topic; Kurt to keep Councilman Kashmann up to date. Club has requested MHFD and Denver to provide assistance. MHFD needs to understand the benefit of acquiring an easement from the Club.
c. Forum – potential developers of the former Kmart site at Monaco & Evans. This study will help inform land use.
d. Arapahoe Lakes Homeowners – key topic for SEMSWA
e. Goldsmith Metro District
f. HOA at Iliff Avenue

5. Project Metrics

a. 5,000 acre watershed (7.74 square miles)
b. 7.6 mile stream corridor (main stem only)
   - 5.1 miles in Denver
   - 1.4 miles in Greenwood Village
   - 1.1 miles in SEMSWA
c. Existing Regional Detention Basins. Less detention volume than shown in previous studies by not accounting for the surcharge volume.
   1. Iliff & Monaco 66.3 AF
   2. Bible Park 56.3 AF – this is about half of the previously identified volume because of surcharge
   3. Wallace Park North 7.1 AF
   4. Wallace Park South 122.3 AF
   5. Orchard Hills 7.4 AF
   6. Silo Park 22.6 AF
   7. Tommy Davis Park 15.3 AF
   8. Caley 10.8 AF
   9. Boston Peakview 3.3 AF
   10. Southmoor 19.8 AF

6. Alternatives Analysis Categories

a. Flood hazard reduction

Preliminary Estimation of Inundated Structures

Denver (19 Buildings)		
Flood Sources	Inundated Buildings	Reference Location
Goldsmith Gulch	2	South Wallace Park Detention
	3	Eastman Ave
	9	Iliff Ave to Evans Ave
	2	Skyline Acre Club
Southmoor Park Tributary	3	E Hampden Ave/ S Poplar St
Greenwood Village (18 Buildings)		
Flood Sources	Inundated Buildings	Reference Location
Goldsmith Gulch	9	Arapahoe Lake
	1	D/S Arapahoe Lake
	1	U/S E. Berry Ave
	5	D/S S. Yosemite St
West Tributary	2	Bridgwater Apartment

Complete a sensitivity analysis "heat map" to understand the sensitivity to Manning's n roughness
FHAD study is showing no major surprises on structures that could be mapped into the floodplain, split flows, etc.

b. Hydrology reduction – additional detention (new and enlarge existing) Bible Park and Wallace South for potential expansion.
c. Channel stabilization – erosion and sedimentation problems. Protect utilities and infrastructure
d. Culverts and bridges capacity
e. Right-of-way needs
    a. Arapahoe Lakes – SEMSWA is in contact with HOA and will weigh the pros/cons of making Arapahoe Lakes a regional detention facility and therefore maintenance eligible.
f. Water quality enhancement
    a. S. Wallace Park could provide regional water quality for the Metro District.
        i. Per Denver City Attorney, it may not be possible to use existing parks for stormwater runoff water quality. Above and beyond WQ treatment in the current agreement would not serve a park service, thus City would deny the use of the park for upstream private development.
        ii. However, if alternatives reveal that additional detention alternatives could be co-achieved, there could be an opportunity for cost sharing.
g. Ecology, open space and wildlife
    a. Landscape typology to be provided by Cincere Eades to show opportunities to expand in channel and bank stabilization. Evans to Jewel potential turf conversion project.
h. Flood warning
    a. No needs identified
i. Maintenance
    a. Matrix to review changes in n-value sensitivity and how it relates to impacts to structures in the floodplain
    b. Erosion control
    c. Cleaning and removal of debris and sediment accumulations
    d. Repair of structures
    e. Pipe outfall armoring
    f. Re-seeding, restoration, and planting of grassed areas
    g. Bank stabilization
    h. Riprap
    i. Access to drainageway

7. Alternatives Analysis – Reach by Reach for 12 Reaches

Starting Upstream to Downstream

Greenwood Village reach:

- West tributary in Greenwood Village. Bridgater Apartments only area noted as flood hazard. Lateral weir only shows 7 cfs overtopping. Topography doesn't pick up enough detail to define this minor spill. CIP project underway to rehab pond to include WQ as well as drop structure and channel improvements.
- Caley Road detention holds 100-yr flows but includes a non-certified levee where floodwater could spill into the pedestrian underpass.
- Mainstem starting at Arapahoe Road – flows confined to channel, no inundated structures.
- Arapahoe Lake – some structures have first floor elevation certification, but don't have elevation yet. About 500 cfs coming into Lake but not counted as detention. If Arapahoe Lakes is regulated, there may be an opportunity to remove the one house downstream out of floodplain.
- Silo Park – 100-yr overtops Orchard Rd, about 2-ft deep. Muller is reviewing preliminary analysis to address overtopping.
- Downstream of Yosemite St – high roughness due to thick wetland vegetation (between Prentice and Arapahoe). May warrant aggressive maintenance which could limit floodplain spills.
- Downstream of Prentice get complaints on smells due to stagnant water.

Denver reach:

- S Wallace Detention – 2 potential houses in floodplain
- Southmoor Trib – 138 cfs out of detention pond and confined to Hampden Ave
- Mainstem split flow just downstream of confluence with Southmoor Trib
- Bible Park 100 WSEL almost overtops at entrance road from Yale Ave. Need to consider alternatives that may not impact Bible too much. About to start Master Plan process for Bible Park.
- Lower reaches have numerous spills conveyed by streets.
- Monaco overflow about 200 cfs but no structures impacted.

8. Action Items

a. Matrix to update project schedule on website
b. Matrix to analyze the sensitivity of Manning's n to the floodplain delineation
c. Kevin Lewis to provide GIS file of complaints database
d. Cincere Eades to provide information on turf conversion Jewell to Evans

Website Sample Content

https://www.matrixdesigngroup.com/UDFCD/GoldsmithGulch/home.html

8/31/2021 Home

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Project Information
Project Maps
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Contact

Goldsmith Gulch Major Drainageway Plan (MDP) and Flood Hazard Area Delineation (FHAD)

Project Summary:

Goldsmith Gulch, a tributary to Cherry Creek, drains an area of approximately 5,000 acres from Arapahoe Road to the confluence with Cherry Creek near Monaco Boulevard. The study will evaluate 7.6 miles of stream corridor, which is based upon 5.1 miles within Denver, 1.4 miles within Greenwood Village, and 1.1 miles within the SEMSWA District. The two major tributaries to Goldsmith Gulch are the Southmoor Tributary, joining the mainstem in Hutchinson Park, and the Goldsmith West Gulch Tributary, joining the mainstem in Orchard Hills Park. The watershed was last studied, in its entirety, by the Urban Drainage & Flood Control District in 1977, although the upper watershed was studied in 2005.

The waterway has generally functioned adequately in the recent past without major flood damage. Many channel improvements have been completed along Goldsmith Gulch to reduce the potential of flood damage. The channel has been stabilized and regional parks have been constructed in the floodplain. Detention facilities have been constructed along the channel at Bible Park, Wallace Park, Rosamond Park, and Iliff & Monaco. Channel slopes are generally mild with several newer drop structures along the reach. The High Line Canal bisects Goldsmith Gulch at East Cornell Avenue. Goldsmith Gulch passes underneath the High Line Canal and East Cornell Avenue through a concrete box culvert. Upper Goldsmith Gulch includes the I-25 TREX storm and detention facilities that drain the I-225 and I-25 interchange to Goldsmith Gulch.

This project will remap the floodplain of Goldsmith Gulch using updated hydrology and current topographic mapping. The study will identify flood hazards and develop alternatives to reduce those hazards. In addition, the project will look for opportunities to enhance the waterway and improve water quality.

This Project is Sponsored By:

MILE HIGH FLOOD DISTRICT
DENVER TRANSPORTATION & INFRASTRUCTURE
GREENWOOD VILLAGE COLORADO
Southeast Metro Stormwater Authority

In Cooperation With:

Matrix

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Review Comments

1601 Blake Street, Suite 200
Denver, Colorado 80202
(303) 572-0200

MEMORANDUM

To: Ms. Terri Fead, P.E., CFM
Shea Thomas, P.E.

From: Hung-Teng Ho, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: January 14, 2019

RE: Flood Hazard Area Delineation
Goldsmith Gulch: 1st Submittal _ Model Review

Matrix Design Group, Inc. (Matrix) is pleased to deliver the Goldsmith Gulch FHAD 1st Submittal for Model Review. This memo is to document the hydraulic analysis, assumptions, and engineer decisions. The following materials are included as a part of the 1st Submittal Model Review.

Deliverables include:

- Baseline Hydrology including report and hydrologic model (CUHP 2.0 and EPA-SWMM)
- HEC-RAS model files: GoldsmithFHAD.prj
  Goldsmith Gulch: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Monaco Pkwy Overflow: Plan: p02; Geometry: g02; Flow: f02 (Hardwired)
  Southmoor Park Tributary: Plan: p03; Geometry: g03; Flow: f03
  Goldsmith Gulch: Plan: P04; Geometry: g01; Flow: f04 (Original for optimization)
  Monaco Pkwy Overflow: Plan: p05; Geometry: g02; Flow: f05 (Original for optimization)
  Goldsmith Gulch _ Support Calculation: Plan: P06; Geometry: g06; Flow: f06
- GIS shapefiles for river centerlines, cross sections, 100- and 500-year raw floodplain delineation
- PDFs of raw 100- and 500-year floodplain map (3 sheets)
- Goldsmith Gulch HEC-RAS Flow Tables
- Appendix C _ hydraulic analysis, assumptions and decisions, and supporting materials

The following depicts some key hydraulic modeling issues that need special attention or will be addressed after soliciting input from the project sponsors and reviewers.

1. Manning's n for this preliminary HEC-RAS hydraulic model is based on a field reconnaissance in September 2018. The vegetation is fully grown during the period of time. This watershed has adopted a "no-mow" policy with maintenance. The assumption of Manning's n and typical photos are included in the Appendix C. An album with Google Earth KMZ file is included in the digital files. The following shows a comparison of the roughness.

   The direction was to estimate the Manning's n and review the model/mapping to determine sensitivity. The roughness can be adjusted if needed to appropriately show the true risks to the community.

Manning's n used for the 2005 FHAD

Channel	Overbank
0.015 – 0.06	0.015 – 0.035

Proposed Manning's n for the existing condition

Channel	Overbank
0.015 – 0.1	0.015 – 0.15

An example of high Manning's n and impact is at river station 285+26 to 294+25 on Goldsmith Gulch between E Prentice Avenue and S Yosemite St in Greenwood Village. This is an area where overbank flooding may be controlled in part by the roughness of the channel.

2. At Florida Avenue and Monaco Street Parkway, the new hydraulic analysis indicates that the flows spilling into Florida Avenue are 28 cfs and 425 cfs for the 100-year and 500-year events, respectively, which are an increase from the FIS flows of 8 cfs and 58 cfs for 100-year and 500-year events. A discussion of the split flow overland hydraulics analysis is necessary. The team should comment on whether a HEC-RAS hydraulic model is warranted for this spill, or if a normal depth calculation will suffice.

3. The hydraulic modeling approach for the Cook Park LOMR was adopted for this FHAD. The extent of 100-year shallow flooding and 500-year floodplain will be supplemented with a normal depth calculation. A discussion is welcomed if a common cross-section modeling approach is preferred.

4. The FIS defined two distinct flow paths of Goldsmith Gulch downstream of E. Iliff Avenue with three independent flood profiles:
   - Goldsmith Gulch (Downstream of Iliff Avenue),
   - Goldsmith Gulch (Upstream of Iliff Avenue), and
   - South Monaco Street Parkway Overflow.

   This study proposed two independent flood profiles, one continuous flood profile for Goldsmith Gulch and a shortened South Monaco Street Parkway Overflow, instead of the current three independent flood profiles. Details of model assumptions and decisions are included in Appendix C.

5. The shallow flooding depths and extents of flooding in Monaco Street Parkway between E. Colorado Drive and E. Evans Avenue will be supplemented with normal depth calculations.

6. At river station 131+46 to 137+44 on Goldsmith Gulch, the extents of 100-year shallow flooding and the 500-year floodplain will be determined with a normal depth calculation.

7. At river station 140+43 to 147+09 on Goldsmith Gulch, a lateral structure was used to define the spillover for 500-year flood. However, a discussion of hydraulic modeling approach is necessary because a levee condition exists between station 140+43 to 144+36 for 100-yeaer flood.

8. At river station 213+28 to 239+35 on Goldsmith Gulch (from E. Quincy Avenue to E. Temple Drive), the 500-year floodplain in S. DTC Blvd will be supplemented with normal depth calculations.

9. A levee condition exists at station 389+47 to 388+65 on Goldsmith Gulch. A discussion of the hydraulic modeling approach is necessary.

10. At river station 19+30 to 27+52 on Southmoor Park Tributary, the 500-year floodplain will be supplemented with a normal depth calculation.

11. In Hampden Avenue Overflow, the 100-year floodplain can be confined in the eastbound (south) lanes. However, the HEC-RAS hydraulic model does not calculate both 100- and 500-year flood elevations correctly in a single model. We tried to use blocked obstructions to remove the unrealistic 100-year floodplain in the westbound lanes, however, the model cannot calculate the correct flood elevation for the 500-year event. The IEFA was used instead of blocked obstructions and the 100-year floodplain mapping will be manually revised. The 500-year will spill into the office area north through the driveway opening. A lateral structure will be added to represent the spillover and utilize a normal depth calculation to define the 500-year floodplain once the modeling approach is accepted.

12. Between river station 36+13 to 38+24 on Goldsmith Gulch West Tributary, a grate pedestrian bridge is located in the low flow channel. A discussion is necessary regarding the hydraulic modeling approach for this bridge. We recommend using blocked obstructions at each cross-section which intersect with the bridge because the bridge is located approximate eight inches above the ground.

13. On Goldsmith Gulch West Tributary, the as-built contours and hydraulic model of Caley Detention LOMR were incorporated in this study.

14. A lateral structure may be necessary at station 55+75 on Goldsmith Gulch West Tributary once the roughness has been determined.

Goldsmith Gulch FHAD – 1st Submittal *January 14, 2019*

Hydrology:

1. A model numerical instability was found at the culvert under Tiffany Plaza in the baseline hydrology EPA-SWMM during the development of the HEC-RAS hydraulic model. The calculation of flow diversion was not reasonable that added extra inflows at the design point at E. Hampden Avenue. The Manning's n of 0.019 was used for existing culvert in general, however, the EPA-SWMM could not balance conduit flow and overland flow at the Tiffany Plaza Culvert that numerically added extra flow at design point L-405. The numerical instability at the culvert can be removed by either increasing or decreasing the Manning's n for the culvert for the 100-year event model. However, decreasing Manning's n caused numerical instability for the 500-year event model. This model revision increased the Manning's n to 0.022 for a concrete culvert.

Node Inflow	Node Type	Maximum Total Inflow (cfs)	Hour of Maximum Inflow (hr:min)	Note
JUNCT_L-375	DIVIDER	2165	1:04	Design point on main stream at the entrance of 20'x8' CBC
JUNCT_L-390	JUNCTION	109	0:40	Inflow from sub-basin 390
JUNCT_L-400	JUNCTION	89	0:35	Inflow from sub-basin 400
JUNCT_L-405	JUNCTION	2677	1:05	Design point on main stream at downstream of 20'x8' CBC shows unexpected higher flow then the sum of all upstream inflows of 2,363 cfs.
Link Flow	**Link Type**	**(cfs)**	**(hr:min)**	**Note**
1375	CONDUIT	1899	1:04	SWMM could not balance the conduit flow and overland flow that numerically added extra flow at downstream design point than the inflow at the upstream design point L-375 of 2,165 cfs.
1375-OVERFLOW	CONDUIT	663	1:06	

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MEMORANDUM

To: Ms. Morgan Lynch, PE, CFM
Terri Fead, P.E., CFM
Shea Thomas, P.E.

From: Hung-Teng Ho, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: July 30, 2019

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 2nd Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 1st HEC-RAS Submittal on March 28, 2019. This memo is to document the responses to the review comments and assumptions in the hydraulic modeling. The following materials are included as a part of the 2nd submittal for HEC-RAS Hydraulic Model Review.

Deliverables include:

- HEC-RAS model files: GoldsmithFHAD.prj
  Goldsmith Gulch: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Monaco Pkwy Overflow: Plan: p02; Geometry: g02; Flow: f02 (Hardwired)
  Southmoor Park Tributary: Plan: p03; Geometry: g03; Flow: f03
  Goldsmith Gulch: Plan: P04; Geometry: g01; Flow: f04 (Original for optimization)
  Monaco Pkwy Overflow: Plan: p05; Geometry: g02; Flow: f05 (Original for optimization)
  Goldsmith Gulch _ Support Calculation: Plan: P06; Geometry: g06; Flow: f06
- Tables of Responses to Review Comments on March 28, 2019
- GIS files for review comments and responses to review comments
- GIS files for river centerlines, cross sections, 100- and 500-year raw floodplain delineation
- Goldsmith Gulch HEC-RAS Flows and Flow Change Locations Table
- Table of Cross-section Station Comparison
- Appendix C _ hydraulic analysis, assumptions and decisions, and supporting materials

The following summarizes review comments and our responses. Tables of Responses to Review Comments on March 28, 2019 includes all detailed responses.

1. In general, there were many comments on the geometry file for the model submittal. Although the split flows, ponds and lateral structures were reviewed at a basic level, we intend to look at these areas in detail in future submittals.
   Response: We concur. The hydraulics of split flows, ponds and lateral structures were reviewed and revised as deem necessary.

2. There appears to be some inconsistency with the modeling approach for developed areas along the overbank. In some areas blocked obstructions are used for structures, in other areas high manning's n values are being used. The approach should be consistent throughout the model. Please use the same approach from the Sloan's Lake and Harvard Gulch FHAD, where higher manning's n values where applied in developed areas.
   Response: We concur. The Manning's n in the hydraulic models have been revised consistently per review comments. A general thumb of rule for applying Manning's n is listed in the table below. However, the application of Manning's n might be adjusted specifically per field reconnaissance. In general, the high Manning's n of 0.15 is only applied at dense residential area where fence, landscape and vegetation dominate the surface roughness. At some residential apartment area and commercial area, where the overland flood water can flow freely in the open space between the buildings. The obstruction due to buildings becomes hydraulically significant. So, the buildings were coded as blocked obstruction and the general Manning's n was applied at these overland flow areas.

Description	Manning's n
Asphalt, parking lot, concrete channel	0.02
Mowed area short grass	0.03 to 0.035
Mowed area with more trees	0.035 to 0.04
Dense residential area with fences, shrubs, brushes, trees and landscapes	0.15
Heavy vegetation	0.05 to 0.1

3. The placement of bank stations is not consistent throughout the model. Some of these areas are called out in the attached shapefile, but the entire model should be evaluated for consistency.
   Response: We concur. The entire model was reviewed and adjusted as needed. In general, the bank stations were located at approximate 10-year water surface elevation or low flow area along the vegetation line. However, the bank stations may be site-specific.

4. Some detention ponds with defined rating curves from the hydrologic model are not incorporated into the hydraulic model. It is unclear if there is a reason for this. Please explain why some rating curves are not used or incorporate all curves into the hydraulic model.
   Response: We concur. All rating curves have been applied consistently in the hydraulic model. Additional cross-sections were added at berm or roadway to describe the overland flow condition.

5. It is unclear why some drop structures or crossings were not included. These areas are identified in the attached shapefile.

Response: We concur. All surveyed drop structures were modeled with at least two cross-sections. Two surveyed crossings at Wallace Park South Detention are concrete pad over rectangular concrete trickle flow channel without railing and connecting trails. The crossings were modeled as lidded channel.

6. Please confirm the appropriate number of cross-sections are being used to model a crossing or bridge (4) and drop structure (3 typical, 2 minimum). Ineffective flows at the crossings were not reviewed in detail at this time.
   Response: We concur. The entire model was reviewed and adjusted as needed. In general, the drop height less than 3 feet were modeled with two cross-sections at minimum. Drop structures with height greater than 3 feet were modeled with four cross-sections at minimum. Ineffective flow areas have been reviewed and adjusted as needed.

7. Please confirm the junctions are modeled appropriately.
   Response: We concur. The junction has been reviewed and revised.

8. The use of contraction and expansion ratios were not consistent throughout the model. Some of these areas are identified in the attached shapefile, but this should be reviewed for consistency throughout the model.
   Response: We concur. In general, the contraction/expansion coefficients of 0.3/0.5 have been applied at cross-sections encompassing the crossing structures. The higher coefficients were also applied at the cross-sections where adverse flood profile happens due to rapid change in flow velocity and flow area.

Denver Comments:

9. It is important to ensure that any existing structure that may have 100-year flood risk is properly identified... Flows in excess of drainage system capacity, that flow overland, should be contained in the right of way, or investigated for potential impacts to insurable structures, ...
   Response: A normal depth analysis will be preformed to determine the extent of overland flow and identify no insurable structure is impacted by the 100-year overland overflow.

10. Quite likely, the entire structure west of GG, south of E Eastman is inundated. This low area west of the high point along the creek left bank should be mapped using the 100-year WSELs from either GG or SPT.
    Response: The low area will be investigated for both 100-year WSELs from Goldsmith Gulch and Southmoor Park Tributary. The dominate 100-year WSELs from either Goldsmith Gulch or Southmoor Park Tributary will be used for inundation mapping.

11. It appears that 100-year flooding from the detention pond in Southmoor Park spills onto E Hampden and flows east along the street, toward GG. Is it clear that 100-year discharges are

Goldsmith Gulch FHAD – Model Review 2nd Submittal July 30, 2019

contained in the eastbound lanes? Can a single HR model that has a levee defined along the centerline of E Hampden be used for both the 100- and 500-year?
Response: The half street capacity is 160 cfs which is greater than the 100-year overland flow from Southmoor Park Tributary. The 100-year overland flow will be contained in the eastbound lanes. The street flow was modeled in the HEC-RAS hydraulic model.

Hydraulic Modeling Assumption:

12. Flows in HEC-RAS model may not be directly related to the design flows in the Baseline Hydrology Report due to flow diversion by street or overtopping. Please see detailed description in the HEC-RAS Flows and Flow Change Locations table.
13. Lateral structures and flow optimization in the Cook Park were used to quantify the overland flows only. Flow diversion in Cook Park was not subtracted from the main stem because there are not flow exchanges with other flood sources. All flood flows will be confined within the Cook Park and return Goldsmith Gulch at the culverts under E. Cherry Creek South Drive.
14. At the newly constructed park south of E Fair Avenue on Goldsmith Gulch West Tributary, a gate board walks meanders in the wetland area and crosses the channel at an extremely large skew which cannot be modeled with standard bridge protocol. The top of the grate board walks is generally 12” above the ground inside the wet land area. The future fully grown wetland vegetation will exceed the height of the board walks, therefore, the Manning’s n of 0.045 for fully established wetland vegetation was used. The grate board walks were not modeled assuming hidden by wetland vegetation. A discussion of the modeling approach might be necessary.
15. Caley Detention as-built plans and contours were compared to the survey information provided by UDFCD. The survey data provided by UDFCD are consistently approximate 1-foot lower than the as-built information. Per discussion with UDFCD and Greenwood Village, the survey data provided by UDFCD was deemed appropriate. The HEC-RAS channel geometry at Caley Pond were updated with the adjusted as-built contours (adjusted down 1-foot) and supplemented with the survey points. The 500-year flood event overtops the concrete wall at east of the detention. The overland floodplain will be supplement with a normal depth flow analysis.
16. The same vertical datum discrepancy might also exist at the newly constructed channel downstream E Caley Avenue to E Fair Avenue. However, there are not enough survey points that can be used for clarification. We want to request an as-built contours for both Caley Detention and the new channel that are on the same vertical datum as the survey provided by UDFCD.

Goldsmith Gulch FHAD _ Responses to the 1st Review Comments dated March 28, 2019

OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
1	Goldsmith Gulch	Lower	10+11	Manning's n - Main channel Manning's n is 0.035 at top of grouted drop. Should be 0.045?	Revised
2	Goldsmith Gulch	Lower	10+11	Manning's n - Top of grouted boulder drop, should be 0.045 in main channel?	Revised
3	Goldsmith Gulch	Lower	27+96	Please be consistent with IEFA in this reach	Add IEFA
4	Goldsmith Gulch	Lower	28+76	Manning's n - Vary n value to account for street and lawn/park area	Revised
5	Goldsmith Gulch	Lower	47+77	Manning's n - Should be 0.02 for asphalt	Addressed
6	Goldsmith Gulch	Lower	45+91	Manning's n - Should be 0.02 for asphalt to be consistent with adjacent parking lots	Manning's n was increased to represent obstruction from the wooden fence immediately downstream. No action
7	Goldsmith Gulch	Lower	48+88	Obstruction - Model building obstruction?	Add building
8	Goldsmith Gulch	Lower	53+43	Obstruction - Remove obstruction here and add obstruction over building to the right?	Addressed, add BO for building and keep BO for removing 100-year floodplain
9	Goldsmith Gulch	Lower	53+43	Blocked obstruction?	Addressed per comment
10	Goldsmith Gulch	Lower	53+43	Manning's n - It is unclear the difference between 0.02 and 0.035 for asphalt parking lots.	Addressed per comment
11	Goldsmith Gulch	Lower	59+57	Manning's n - Why 0.15 instead of 0.035 like adjacent area?	Manning's n was increased to represent obstruction due to the wooden fence across the main overland flow path. Note has been provided in the model description of the cross-section 5957. No action
12	Goldsmith Gulch	Lower	62+12	Manning's n - Model mowed lawn area (0.03)?	Addressed per comment
13	Goldsmith Gulch	Lower	70+24	Is it redundant to have the high Manning's N and blocked obstruction?	Addressed
14	Goldsmith Gulch	Lower	71+42	Is it redundant to have the high Manning's N and blocked obstruction?	Addressed
15	Goldsmith Gulch	Lower	94+66	Manning's n - Why not 0.04 like adjacent XS?	Addressed per comment
16	Southmoor Trib	Lower	16+87	Manning's n - Seems high based on conditions	Revised
17	Goldsmith Gulch	Lower	147+09	Manning's n - 0.15 to model building obstruction?	Addressed per comment
18	Goldsmith Gulch	Lower	147+77	Manning's n - 0.15 to model building obstruction?	Addressed per comment
19	Goldsmith Gulch	Lower	147+95	Manning's n - 0.15 to model building obstruction?	Addressed per comment
20	Goldsmith Gulch	Lower	148+42	Manning's n - 0.15 to model building obstruction?	Addressed per comment
21	Goldsmith Gulch	Lower	151+13	Manning's n - 0.035 for parking asphalt?	Addressed per comment
22	Goldsmith Gulch	Lower	152+21	Manning's n - 0.02 for roadway asphalt?	Addressed per comment
23	Goldsmith Gulch	Lower	153+09	Manning's n - 0.02 for roadway asphalt?	Addressed per comment
24	Goldsmith Gulch	Lower	260+49	Manning's n - 0.04 for landscaped area?	Concrete blocks for energy dissipation No action
25	Goldsmith Gulch	Lower	260+77	Manning's n - 0.04 for landscaped area?	Concrete blocks for energy dissipation No action
26	Goldsmith Gulch	Lower	273+69	Manning's n/Obstruction - Model building with high n value or obstruction?	Updated with more variation
27	Goldsmith Gulch	Lower	274+70	Manning's n/Obstruction - Model building with high n value or obstruction?	Updated with more variation
28	Goldsmith Gulch	Lower	307+17	Manning's n - Residential area, n should be 0.15 or 0.1?	Updated with more variation
29	Goldsmith Gulch	Upper	329+27	Manning's n - Residential area, n should be 0.15 or 0.1?	Manning's n is based on field reconnaissance. Large parcel with open space and trees. No action
30	Goldsmith Gulch	Upper	333+08	Manning's n - Residential area, n should be 0.15 or 0.1?	Manning's n is based on field reconnaissance. Large parcel with open space and trees. No action
31	Goldsmith Gulch	Upper	334+00	Manning's n - Residential area, n should be 0.15 or 0.1?	Manning's n is based on field reconnaissance. Large parcel with open space and trees. No action
32	Goldsmith Gulch	Upper	340+64	Manning's n - Confirm the use of 0.1	Manning's n is based on field reconnaissance. No action
33	Goldsmith Gulch	Upper	379+31	Manning's n - Residential area, n should be 0.15 or 0.1?	Addressed per comment
34	Goldsmith Gulch	Upper	379+61	Manning's n - Residential area, n should be 0.15 or 0.1?	Addressed per comment
35	Goldsmith Gulch	Upper	381+23	Manning's n - Residential area, n should be 0.15 or 0.1?	Addressed per comment
36	Goldsmith Gulch	Upper	379+06	IEFA - Model building conveyance shadow with IEFA?	Addressed per comment
37	Goldsmith Gulch	Upper	379+61	IEFA - Model building conveyance shadow with IEFA?	Addressed per comment
38	GG West Trib	Reach 1	50+56	Manning's n - Residential area, n should be 0.15 or 0.1?	Revised
39	GG West Trib	Reach 1	48+76	IEFA - Model building conveyance shadow with IEFA?	Add IEFA
40	GG West Trib	Reach 1	48+66	IEFA - Model building conveyance shadow with IEFA?	Add IEFA
41	GG West Trib	Reach 1	55+75	Manning's n - Residential area, n should be 0.15 or 0.1?	Addressed per comment
42	GG West Trib	Reach 1	57+07	Manning's n - Lower n value in low flow channel? (.035?)	High Manning's is used to represent the vegetation condition at immediately upstream. No Action
43	Goldsmith Gulch	Lower	16+97	Verify Contraction and Expansion Ratios	Revised

Goldsmith Gulch FHAD _ Responses to the 1st Review Comments dated March 28, 2019

OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
44	Goldsmith Gulch	Lower	18+81	Verify Contraction and Expansion Ratios	Revised
45	Goldsmith Gulch	Lower	37+71	Verify Contraction and Expansion Ratios	Revised
46	Goldsmith Gulch	Lower	44+48	Verify Contraction and Expansion Ratios	Revised
47	Goldsmith Gulch	Lower	44+95	Verify Contraction and Expansion Ratios	Revised
48	Goldsmith Gulch	Lower	45+44	Verify Contraction and Expansion Ratios	This is a flow velocity rapid changing zone due to the drawdown of overland flood flow. No Action
49	Goldsmith Gulch	Lower	45+91	Verify Contraction and Expansion Ratios	This is a flow velocity rapid changing zone due to the drawdown of overland flood flow. No Action
50	Goldsmith Gulch	Lower	48+88	Verify Contraction and Expansion Ratios	Revised
51	Goldsmith Gulch	Lower	63+81	Verify Contraction and Expansion Ratios	The hydraulics is controlled by rating curve. No Action
52	Goldsmith Gulch	Lower	94+90	Verify Contraction and Expansion Ratios	Addressed
53	Goldsmith Gulch	Lower	139+01	Verify Contraction and Expansion Ratios	Increase contraction/expansion coefficients to smooth water surface profiles because of rapid change in flow area (300 sq.ft. to 700 sq. ft.) and flow velocity (14 fps to 8 fps). No Action
54	Goldsmith Gulch	Lower	147+77	Verify Contraction and Expansion Ratios	Clear span bridge without interaction with the floodplain. No Action
55	Goldsmith Gulch	Lower	147+95	Verify Contraction and Expansion Ratios	Clear span bridge without interaction with the floodplain. No Action
56	Goldsmith Gulch	Lower	153+09	Verify Contraction and Expansion Ratios	Adjusted
57	Goldsmith Gulch	Lower	154+61	Verify Contraction and Expansion Ratios	Adjusted
58	Goldsmith Gulch	Lower	190+81	Verify Contraction and Expansion Ratios	Contraction/Expansion Coefficients increased due to drop structure and smooth adverse WSEL. No Action
59	Goldsmith Gulch	Lower	269+83	Verify Contraction and Expansion Ratios	Reviewed, coefficients were increased to smooth adverse water surface profiles. No Action
60	Goldsmith Gulch	Lower	283+37	Verify Contraction and Expansion Ratios	Contraction/Expansion Coefficients increased due to drop structure No Action
61	GG West Trib	Reach 1	6+93	Verify Contraction and Expansion Ratios	We concur. Addressed
62	GG West Trib	Reach 1	7+09	Verify Contraction and Expansion Ratios	We concur. Addressed
63	GG West Trib	Reach 1	12+42	Verify Contraction and Expansion Ratios	We concur. Addressed
64	GG West Trib	Reach 1	12+84	Verify Contraction and Expansion Ratios	We concur. Addressed
65	GG West Trib	Reach 1	13+41	Verify Contraction and Expansion Ratios	We concur. Addressed
66	GG West Trib	Reach 1	14+55	Verify Contraction and Expansion Ratios	We concur. Addressed
67	GG West Trib	Reach 1	20+93	Verify Contraction and Expansion Ratios	We concur. Addressed
68	GG West Trib	Reach 1	21+09	Verify Contraction and Expansion Ratios	We concur. Addressed
69	GG West Trib	Reach 1	35+24	Verify Contraction and Expansion Ratios	Contraction/Expansion Coefficients increased due to drop structure and smooth WSEL. No Action
70	GG West Trib	Reach 1	35+30	Verify Contraction and Expansion Ratios	Contraction/Expansion Coefficients increased due to drop structure and smooth WSEL. No Action
71	GG West Trib	Reach 1	37+33	Verify Contraction and Expansion Ratios	The gate board walks were ignored in the HEC-RAS assuming the gate board walks will be hidden by fully grown wetland vegetation. A discussion of modeling approach might be necessary.
72	GG West Trib	Reach 1	37+58	Verify Contraction and Expansion Ratios	The gate board walks were ignored in the HEC-RAS assuming the gate board walks will be hidden by fully grown wetland vegetation. A discussion of modeling approach might be necessary.
73	GG West Trib	Reach 1	44+53	Verify Contraction and Expansion Ratios	Addressed
74	GG West Trib	Reach 1	45+92	Verify Contraction and Expansion Ratios	Addressed
75	GG West Trib	Reach 1	46+14	Verify Contraction and Expansion Ratios	As-built surface and geometry were adjusted and updated per survey points
76	GG West Trib	Reach 1	49+35	Confirm expansion location for application of IEFA	As-built surface and geometry were adjusted and updated per survey points
77	GG West Trib	Reach 1	49+22	Verify Contraction and Expansion Ratios	As-built surface and geometry were adjusted and updated per survey points
78	GG West Trib	Reach 1	49+15	Verify Contraction and Expansion Ratios	As-built surface and geometry were adjusted and updated per survey points
79	GG West Trib	Reach 1	50+49	Verify Contraction and Expansion Ratios	As-built surface and geometry were adjusted and updated per survey points
80	GG West Trib	Reach 1	52+99	Verify Contraction and Expansion Ratios	Addressed
81	Goldsmith Gulch	Upper	342+01	Verify Contraction and Expansion Ratios	Revised
82	Goldsmith Gulch	Upper	353+25	Verify Contraction and Expansion Ratios	Contraction/Expansion Coefficients have been revised for consistency concern.

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OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
83	Goldsmith Gulch	Upper	354+94	Verify Contraction and Expansion Ratios	Addressed
84	Goldsmith Gulch	Upper	355+38	Verify Contraction and Expansion Ratios	Velocity increase from 1 fps to 5 fps, flow area reduce from 800 sq ft to 105 sq ft
85	Southmoor Trib	Lower	19+30	Verify Contraction and Expansion Ratios	Revised
86	Southmoor Trib	Lower	23+17	Verify Contraction and Expansion Ratios	Increase due to drop and culvert.
87	Goldsmith Gulch	Upper	342+52	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse slope is the nature of surface overland flow where there is not a defined flow path (channel). No Action
88	Goldsmith Gulch	Lower	319+23	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Revised
89	Goldsmith Gulch	Lower	311+81	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is due to concrete check structure per survey. No Action
90	Goldsmith Gulch	Lower	309+67	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is due to concrete check structure per survey. No Action
91	Goldsmith Gulch	Lower	307+17	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action
92	Goldsmith Gulch	Lower	284+14	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action
93	Goldsmith Gulch	Lower	261+95	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action
94	Goldsmith Gulch	Lower	143+33	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action
95	Goldsmith Gulch	Lower	142+79	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action
96	Goldsmith Gulch	Lower	134+89	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action
97	Goldsmith Gulch	Lower	58+10	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse slope is the nature of surface overland flow path where there is not a defined flow path (channel). No Action
98	Goldsmith Gulch	Lower	9+17	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey and has been noted in model description of cross-section. No Action.
99	Goldsmith Gulch	Lower	8+68	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action.
100	Goldsmith Gulch	Lower	8+18	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Adverse channel invert is per survey. No Action.
101	GG West Trib	Reach 1	50+56	Channel Invert - Cross section geometry does not appear to match proposed contours. Please fix.	As-built surface and geometry were adjusted and updated per survey points
102	GG West Trib	Reach 1	50+39	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	As-built surface and geometry were adjusted and updated per survey points

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OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
103	GG West Trib	Reach 1	39+38	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Revised, however, slightly adverse slope per channel as-built survey by Power Surveying Company, Inc., December 2018.
104	GG West Trib	Reach 1	38+63	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise..	Revised, however, slightly adverse slope per channel as-built survey by Power Surveying Company, Inc., December 2018.
105	GG West Trib	Reach 1	27+46	In areas where the channel profile shows adverse grade moving downstream, matches field conditions. Where survey points exist, the profile should be adjusted between survey data unless field conditions confirm otherwise.	Channel invert per survey. The adverse slope is due to downstream drop structure. No Action
106	Goldsmith Gulch	Lower	140+43	Lateral Structure - 500-yr event uncontained at this cross section - extend lateral structure downstream to next cross section?	Extend lateral structure to contain 500-year event.
107	Goldsmith Gulch	Lower	137+44	Lateral Structure - All events are contained within the cross sections related to this lateral structure. Is this needed?	It is correct. There is a sag at high bank area. No Action
108	Goldsmith Gulch	Lower	15+65	Lateral structure, 1696, is not located at the end of the impacted cross sections.	Trim cross-sections at lateral structures
109	Goldsmith Gulch	Lower	11+11	IEFA - What does this ineffective area represent?	Revised
110	Goldsmith Gulch	Lower	7+77	Lateral structure, 1215, is not located at the end of the impacted cross sections	Trim cross-sections at lateral structures
111	Goldsmith Gulch	Lower	2+94	Lateral Structure - 500-yr event uncontained at this cross section - extend lateral structure upstream to next cross section?	Extend lateral structure to contain 500-year event.
112	Monaco Overflow	Reach 1	19+94	Lateral Structure - Lateral structure is not located at the end of the cross section.	Trim cross-sections at lateral structures
113	Monaco Overflow	Reach 1	17+91	Lateral Structure - Lateral structure is not located at the end of the cross section.	Trim cross-sections at lateral structures
114	Goldsmith Gulch	Lower	16+49	Optimized Flows - 500-yr flow in hardwired model does not match optimized flow.	Hydrology includes return flows from Monaco Pkwy Overflow Channel. See Row No. 75 to 77 in HEC-RAS Flows and Flow Change Locations table for details.
115	Goldsmith Gulch	Lower	14+67	All flows in hardwired model do not match optimized flows. XS 1467 to 1168	Hydrology includes return flows from Monaco Pkwy Overflow Channel. See Row No. 75 to 77 in HEC-RAS Flows and Flow Change Locations table for details.
116	Goldsmith Gulch	Lower	7+19	Optimized Flows - 500-yr flow in hardwired model does not match optimized flow.	Hydrology includes return flows from Monaco Pkwy Overflow Channel. See Row No. 75 to 77 in HEC-RAS Flows and Flow Change Locations table for details.
117	Goldsmith Gulch	Lower	6+69	Optimized Flows - 500-yr flow in hardwired model does not match optimized flow.	Hydrology includes return flows from Monaco Pkwy Overflow Channel. See Row No. 75 to 77 in HEC-RAS Flows and Flow Change Locations table for details.
118	Goldsmith Gulch	Lower	5+95	Optimized Flows - 500-yr flow in hardwired model does not match optimized flow.	Hydrology includes return flows from Monaco Pkwy Overflow Channel. See Row No. 75 to 77 in HEC-RAS Flows and Flow Change Locations table for details.
119	Goldsmith Gulch	Lower	154+49	Flows - HEC-RAS Table shows 0.1 (2418 from culvert excluded) for 100-yr and 877 (2928 from culvert excluded) for 500-yr. Does not match Hydro table for corresponding Design Point.	Baseline hydrology report does not include split flow at Hampden Ave. Supplement analysis was provided in Appendix C and will be included in report text at final. No Action
120	Goldsmith Gulch	Lower	153+09	Flows - HEC-RAS Table shows 2418 for 100-yr and 3805 for 500-yr. Does not match Hydro table for corresponding Design Point.	Baseline hydrology report does not include split flow at Hampden Ave. See Row No. 49 to 59 in the HEC-RAS Flows and Flow Change Locations table for details. No Action
121	Goldsmith Gulch	Lower	140+43	Flows - The error at XS 15309 impacts hard-wired flows along this lateral structure for 100-yr and 500-yr.	Baseline hydrology report does not include split flow at Hampden Ave. See Row No. 49 to 59 in the HEC-RAS Flows and Flow Change Locations table for details. No Action
122	Goldsmith Gulch	Lower	139+53	Flows - The error at XS 15309 impacts hard-wired flows along this lateral structure for 100-yr and 500-yr.	Baseline hydrology report does not include split flow at Hampden Ave. See Row No. 49 to 59 in the HEC-RAS Flows and Flow Change Locations table for details. No Action
123	Goldsmith Gulch	Lower	63+40	Flows - 100-yr flow should be 881, not 880.	It is correct and matches HEC-RAS Flows and Flow Change Locations Table. No Action
124	Southmoor Trib	Lower	16+87	Flows - Values do not match for 50-yr event - either Hydro table shows incorrect value (479), or SWMM output in Appendix C shows the incorrect value (449).	Baseline hydrology report does not include split flow at Hampden Ave. See Row No. 90 to 93 in the HEC-RAS Flows and Flow Change Locations table for details. No Action
125	Southmoor Trib	Lower	25+70	Flows - Values do not match for 50-yr event - either Hydro table shows incorrect value (479), or SWMM output in Appendix C shows the incorrect value (449).	Baseline hydrology report does not include split flow at Hampden Ave. See Row No. 90 to 93 in the HEC-RAS Flows and Flow Change Locations table for details. No Action
126	Southmoor Trib	Lower	16+42	Flows - River station of flow change does not appear to match hydrology. Flow change described as confluence with Goldsmith Gulch in Flow Change Table and Hydro Table.	Baseline hydrology report does not include split flow at Hampden Ave. See Row No. 90 to 93 in the HEC-RAS Flows and Flow Change Locations table for details. No Action
127	Southmoor Trib	Upper	42+49	Cross section geometry appears too detailed, please verify consistency with contour information	Smoothed
128	Southmoor Trib	Upper	37+92	Verify Bank Stations	XS was extended at LOB and ROB for 500-year and revised bank station.
129	Southmoor Trib	Upper	34+36	Verify Bank Station and provide smooth transistion between cross-sections	Revised
130	Southmoor Trib	Upper	33+14	Verify Bank Station and provide smooth transistion between cross-sections	Revised

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OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
131	Southmoor Trib	Lower	29+37	Verify Bank Stations	Revised
132	Southmoor Trib	Lower	27+52	Verify Bank Station	Revised
133	Southmoor Trib	Lower	23+17	Verify Bank Stations between cross sections 2317 and 1396	Revised
134	Monaco Overflow	Reach 1	24+29	Verify Bank Stations	Revised
135	Monaco Overflow	Reach 1	17+91	Verify Bank Stations	Revised
136	Monaco Overflow	Reach 1	17+01	Verify Bank Stations	Revised
137	Monaco Overflow	Reach 1	12+57	Verify Bank Stations	Revised
138	Monaco Overflow	Reach 1	5+59	Verify Bank Stations	Revised
139	GG West Trib	Reach 1	53+70	Verify Bank Stations	Addressed
140	GG West Trib	Reach 1	50+56	Verify Bank Stations between cross sections 5056 and 4866	As-built surface and geometry were adjusted and updated per survey points
141	GG West Trib	Reach 1	46+14	Verify Bank Stations	As-built surface and geometry were adjusted and updated per survey points
142	GG West Trib	Reach 1	46+06	Bank Station - Bank stations do not smoothly transition relative to previous cross section.	Addressed
143	GG West Trib	Reach 1	39+38	Verify Bank Stations between cross sections 3938 and 3613 for consistency	Addressed
144	GG West Trib	Reach 1	29+77	Bank Station - Bank stations do not smoothly transition relative to previous cross section.	We concur. Addressed.
145	GG West Trib	Reach 1	18+96	Verify Bank Stations	We concur. Addressed.
146	GG West Trib	Reach 1	14+61	Verify Bank Stations	We concur. Addressed
147	GG West Trib	Reach 1	14+55	Verify Bank Stations	We concur. Addressed
148	GG West Trib	Reach 1	11+96	Verify Bank Stations between cross sections 1196 and 407 for consistency	We concur. Addressed
149	Goldsmith Gulch	Upper	379+06	Verify Bank Stations	Addressed
150	Goldsmith Gulch	Upper	378+79	Verify Bank Stations	Addressed
151	Goldsmith Gulch	Upper	354+69	Very cross-section placement is appropriate for crossing.	Two cross-sections were used for modeling the top of the embankment. This cross-section represents the downstream side control of the embankment of the dam.
152	Goldsmith Gulch	Upper	353+17	Verify Bank Station	Bank stations were determined based on field reconnaissance and survey information due to poor LiDAR at this location. Revised
153	Goldsmith Gulch	Lower	319+23	Verify Bank Stations between cross sections 31923 and 31677	Revised
154	Goldsmith Gulch	Lower	313+02	Verify Bank Station	Addressed
155	Goldsmith Gulch	Lower	294+90	Verify Bank Stations	Address
156	Goldsmith Gulch	Lower	294+25	Verify Bank Stations	Address
157	Goldsmith Gulch	Lower	289+79	Verify Bank Stations	Address
158	Goldsmith Gulch	Lower	287+32	Verify Bank Stations	Address
159	Goldsmith Gulch	Lower	269+83	Verify Bank Station	Address
160	Goldsmith Gulch	Lower	269+53	Verify Bank Station	Address
161	Goldsmith Gulch	Lower	267+87	Verify Bank Station	Address
162	Goldsmith Gulch	Lower	226+58	Verify Bank Stations between cross sections 22658 and 19493	Addressed
163	Goldsmith Gulch	Lower	162+32	Verify Bank Station	Addressed
164	Goldsmith Gulch	Lower	161+91	Verify Bank Station	Addressed
165	Goldsmith Gulch	Lower	154+61	Verify Bank Station	Addressed
166	Goldsmith Gulch	Lower	139+53	Verify Bank Stations	Addressed
167	Goldsmith Gulch	Lower	100+94	Verify Bank Stations	Addressed
168	Goldsmith Gulch	Lower	58+99	Verify Bank Stations	Addressed
169	Goldsmith Gulch	Lower	45+70	Verify Bank Stations	Addressed
170	Goldsmith Gulch	Lower	34+53	Verify Bank Stations	Addressed
171	Goldsmith Gulch	Lower	34+10	Verify Bank Stations between cross sections 3410 and 2876	Addressed
172	Goldsmith Gulch	Lower	16+97	Verify Bank Stations	Addressed
173	Goldsmith Gulch	Lower	9+80	Verify Bank Stations between cross sections 980 and 438	Bank stations have been reviewed and revised accordingly.
174	GG West Trib	Reach 1	16+00	Please use a rating curve for the Tommy Davis Park Detention Pond	Use rating curve
175	Goldsmith Gulch	Lower	314+00	Please use a rating curve for the Orchard Hills Detention Pond	Use rating curve

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OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
176	Goldsmith Gulch	Lower	94+66	Please use a rating curve for the Bible Park Detention Pond	We concur. The hydraulic model has been revised to use rating curve instead of culverts at the outlet of Bible Park. New cross-section 9313, 9356, 9377 and 9426 were added to describe the overland flow across E. Yale Avenue.
177	Goldsmith Gulch	Lower	240+92	XS 24092: Discuss source of rating curve for Wallace Park South detention/include in Appendix C	Source has been provided in description and will be document in final report text. Addressed
178	Goldsmith Gulch	Lower	226+58	XS 22658: Discuss source of rating curve for Wallace Park North detention/include in Appendix C	Source has been provided in description and will be document in final report text. Addressed
179	Goldsmith Gulch	Lower	242+17	Include obstruction for Crossing 40	Model Crossing 40
180	Goldsmith Gulch	Lower	246+03	Confirm there a enough cross-sections to model the drop and crossing at this location.	Add XS for drop structure
181	Goldsmith Gulch	Upper	320+40	Include Crossing 15 in hydraulic model	Include Crossing 15 in hydraulic model
182	Goldsmith Gulch	Lower	25+54	Verify culvert length and deck high chord. Length: survey 218.68', model 229.36' (2554 S Monaco Pkwy)	Culvert length per 1997 LOMR Design Report. Add description to culvert input data in the model.
183	Goldsmith Gulch	Lower	30+65	Verify bridge low chord vs. survey (3065 Ped Bridge)	Addressed
184	Goldsmith Gulch	Lower	101+19	Verify inlet invert. Survey 54.72', model 54.54' (10119 Ped Bridge)	Channel invert is correct per survey point and was noted in the description of the bridge modeling inputs. The survey field book reports different invert elevation than the surveyed flowline in the CAD file. No action
185	Goldsmith Gulch	Lower	126+16	Burn in culverts vs. terrain data? (12616 Cornell)	Culverts and terrain data per survey points. No action
186	Goldsmith Gulch	Lower	139+96	Burn in culverts vs. terrain data? (13996 Eastman)	Culverts and terrain data per survey points. No action
187	Goldsmith Gulch	Lower	143+90	Verify inlet and outlet inverts vs. survey (14390 Ped Bridge)	Addressed
188	Goldsmith Gulch	Lower	147+89	Verify inlet and outlet inverts. Model is lower than survey. (14789 Ped Bridge)	Addressed
189	Goldsmith Gulch	Lower	170+96	Burn in culverts vs. terrain data? (17096 S Rosemary Way)	Culverts and terrain data per survey points. No action
190	Goldsmith Gulch	Lower	194+70	Burn in culverts vs. terrain data? (19470 Mansfield Av)	Culverts and terrain data per survey points. No action
191	Goldsmith Gulch	Lower	198+54	Verify inlet and outlet inverts, high and low chords vs. survey. (19854 Ped Bridge)	Addressed, Invert revised per survey; high chords and low chords are per survey points
192	Goldsmith Gulch	Lower	202+66	Verify inlet and outlet inverts, high and low chords, span vs. survey (20266 Ped Bridge)	Addressed, Invert revised per survey; high chords and low chords are per survey points
193	Goldsmith Gulch	Lower	212+61	Verify culvert length (21261 E Quincy Av)	Culvert length 96 feet per survey is correct. No action
194	Goldsmith Gulch	Lower	268+87	Verify inlet and outlet inverts vs. survey (26887 E Belleview Av)	Addressed
195	Goldsmith Gulch	Lower	273+69	Verify length, inlet invert, outlet invert vs. survey (27320 E Crescent Pkwy)	Addressed
196	Goldsmith Gulch	Lower	289+50	Burn in culverts vs. terrain data? (28950 Ped Bridge)	Culverts and terrain data per survey points. No action
197	Goldsmith Gulch	Lower	294+60	Burn in culverts vs. terrain data? (29460 S Yosemite St)	Culverts and terrain data per survey points. No action
198	Goldsmith Gulch	Lower	298+38	Adverse slope (29838 Ped Bridge)	Slightly adverse slope per survey. No action
199	Goldsmith Gulch	Lower	300+08	Verify low chord and skew (30008 Ped Bridge)	Skew was manually adjusted by projecting bridge opening to be perpendicular to flow direction. Low chord elevation is correct that was based on bridge survey points. No action
200	Goldsmith Gulch	Upper	327+05	Verify length, inlet and outlet inverts, note adverse slope in survey (32705 Ped Bridge)	Addressed
201	Goldsmith Gulch	Upper	341+71	Adverse slope (34171 Ped Bridge)	Slightly adverse slope per survey. No action
202	Goldsmith Gulch	Upper	369+08	Verify inlet invert (36903 Ped Bridge)	Addressed
203	Goldsmith Gulch	Upper	383+40	Burn in culverts vs. terrain data? (38340 Peakview Av)	No change, XS 38422 has been verified with survey points in front of the culvert entrance. LiDAR generated contours match survey points closely.
204	GG West Trib	Reach 1	0+78	Include Crossing 28 in hydraulic model	Include Crossing 28 in hydraulic model
205	GG West Trib	Reach 1	7+00	Verify inlet, outlet inverts (700 Ped Bridge)	We concur. Addressed
206	GG West Trib	Reach 1	14+10	Remove 1' depth blocked from culvert, 8.8 w/ 1' blocked depth discounts culvert rise	1-foot deep low flow channel was ignored from culvert opening with blocked obstruction. The rise of culvert has been revised to reflect the correct crown elevation.
207	GG West Trib	Reach 1	15+19	Crossing 24 not modeled.	Crossing 24 was included as a part of the rating curve.
208	GG West Trib	Reach 1	27+58	Verify deck/roadway width.	Survey reports bridge width of 10 feet that was measured diagonally across the bridge deck. The correct bridge deck width is 8 feet. No Action
209	GG West Trib	Reach 1	34+95	Verify road elevation.	It was a typo and revised.
210	GG West Trib	Reach 1	37+58	Discuss source of structure data in App. C if not from survey.	The gate board walks were ignored in the HEC-RAS assuming the gate board walks will be hidden by fully grown wetland vegetation. A discussion of modeling approach might be necessary.

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OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
211	GG West Trib	Reach 1	39+50	Discuss source of structure data in App. C if not from 3/2018 survey.	Low flow channel geometry and invert are based on Muller Design Hydraulic Model and supplemented with field reconnaissance, measurement and as-built survey by Power Surveying Company, Inc., December 2018.
212	GG West Trib	Reach 1	50+00	Verify inlet and outlet inverts, top of railing (5000 E Caley Way)	As-built surface and geometry were adjusted and updated per survey points
213	GG West Trib	Reach 1	63+54	Discuss source of rating curve for Boston Detention	Rating curve source was provided in description of cross-section geometry. The same description will be documented in the report text at final.
214	Goldsmith Gulch	Upper	372+00	Why not 0.035 in mowed areas similar to upstream	Revised to 0.035
215	Goldsmith Gulch	Upper	365+86	Why not 0.02 in concrete lined channel	The 3' wide concrete lined trickle flow channel is not hydraulic significant and was not used for defining main channel. A composite Manning's n of 0.03 is deem hydraulically adequate. No Action
216	Goldsmith Gulch	Upper	322+52	0.035 in the channel seems low based on the photos, winding	At this area, the bank stations were used to defined low flow channel and the Manning's n is reasonable. No Action
217	Goldsmith Gulch	Lower	308+62	0.035 in the channel seems low based on the photos, winding	Manning's n is defined for low flow channel only and adequate. No Action
218	Goldsmith Gulch	Lower	255+24	Why not 0.035 in mowed areas similar to upstream	Mowed short grass park area with very few tree. No Action
219	Goldsmith Gulch	Lower	232+10	Why not 0.035 in mowed areas similar to upstream	Mowed short grass park area with very few tree. No Action
220	Goldsmith Gulch	Lower	171+33	Please have the stream centerline follow the contours	Revised to follow the contours.
221	Goldsmith Gulch	Lower	280+00	Please have the stream centerline follow the contours	Revised to follow the contours.
222	Goldsmith Gulch	Lower	292+42	Please have the stream centerline follow the contours	Revised to follow the contours.
223	Goldsmith Gulch	Lower	316+77	Please have the stream centerline follow the contours	Revised to follow the contours.
224	GG West Trib	Reach 1	7+09	Please have the stream centerline follow the contours	Revised to follow the contours.
225	Southmoor Trib	Upper	32+26	Set downstream length to zero at junction?	Revised
226	Goldsmith Gulch	Upper	321+51	Set downstream length to zero at junction?	Revised
227	GG West Trib	Reach 1	1+98	Set downstream length to zero at junction?	Revised
228	Goldsmith Gulch	Lower	228+89	Extend cross-section to contain all profiles	Add lateral structure
229	Goldsmith Gulch	Lower	226+58	Extend cross-section to contain all profiles	Add lateral structure
230	Goldsmith Gulch	Lower	4+38	Extend cross-section to contain all profiles	Confirmed acceptable. No action
231	Goldsmith Gulch	Lower	131+46	Add cross-section to model constriction?	The overbank flow is minimum and was blocked with IEFA at the upstream and downstream neighboring cross-sections. Additional cross-section will not improve hydraulics. No Action
232	Goldsmith Gulch	Lower	167+95	Add additional cross-section.	Additional cross-section will not improve hydraulic results. The current cross-section spacing is 468 feet, no fast change in geometry and no insurable structure is impacted. No Action
233	Goldsmith Gulch	Lower	189+79	Please confirm a minimum of 2 cross-sections are used to model a drop structure.	Add cross-section
234	Goldsmith Gulch	Upper	333+08	Confirm there a enough cross-sections to model the drop at this location	Add cross-section
235	Goldsmith Gulch	Upper	363+49	Add additional cross-section.	It is hydraulically minor due to completely confined flow and no insurable structure is impacted. No Action
236	Goldsmith Gulch	Upper	371+35	Add additional cross-section.	Additional cross-section will not improve the hydraulics because channel geometry does not change abruptly and locates at backwater area from structure. No Action
237	Goldsmith Gulch	Upper	377+50	Add additional cross-section.	Add Cross-section
238	Goldsmith Gulch	Upper	390+93	Add additional cross-section.	The current cross-section spacing is less than 500 feet. This is an engineered trapezoidal uniform concrete channel without grade break. Additional cross-section will not improve hydraulics. No Action.
239	Goldsmith Gulch	Upper	34+04	Add additional cross-section.	Additional cross-section will not improve hydraulic results. The current cross-section spacing is 240 feet, no fast change in geometry and no insurable structure is impacted. No Action
240	Goldsmith Gulch	Upper	375+10	Additional cross-section downstream of crossing at end of expansion	Add Cross-section
241	Goldsmith Gulch	Upper	338+30	Add additional cross-section.	Additional cross-section will not improve hydraulic results due to ponding water. No action
242	Goldsmith Gulch	Lower	298+27	Add additional cross-section.	Add Cross-section
243	Goldsmith Gulch	Lower	277+74	Place cross-section at location of channel bottom to capture material change	Add Cross-section
244	Goldsmith Gulch	Lower	2+94	Please confirm ROB value for XS294	Confirmed acceptable. No action

Goldsmith Gulch FHAD _ Responses to the 1st Review Comments dated March 28, 2019

OBJECT ID	River	Reach	River_Station (Old)	UDFCD Comments	Final Responses/Actions
245	GG West Trib	Reach 1	55+75	Extend cross-section to contain all profiles	Add lateral structure
246	Goldsmith Gulch	Upper	389+47	This area appears to have a non-levee embankment	Trim XS 38947 and 39093 at the in ROB
247	Goldsmith Gulch	Upper	325+25	Add additional cross-section.	Additional cross-section will not improve hydraulic results. The current cross-section spacing is 255 feet and no insurable structure is impacted. No action
248	Goldsmith Gulch	Upper	327+65	Add additional cross-section.	Add cross-section
249	Goldsmith Gulch	Lower	160+86	Verify Bank Stations	Addressed
250	Goldsmith Gulch	Lower	100+94	Confirm geometry for XS 10094 in the ROB	The jagged ground is a natural outfall of a concentrated surface runoff from the tennis court in the Bible Park. No action
251	Goldsmith Gulch	Upper	353+17	Confirm cross-section is located off the culvert embankment	This cross-section represents the 1st and critical overland flow cross-section after flow overtopping. Detailed hydraulic modeling assumption was provided on Page 66 of Appendix C.
252	Goldsmith Gulch	Upper	342+52	Realign cross-sections to follow contours	Revised ROB alignment at cross-section 34484, 34401 and 34252.
253	Goldsmith Gulch	Upper	344+01	Realign cross-sections to be perpendicular to flow, as is the model may be over estimating flow area	Revised ROB alignment at cross-section 34484 and 34401.

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Upper	39585	432.93	432.81	433.81	Goldsmith Gulch	Upper	39525	432.93	432.81	433.81	-60	0	0	0
Goldsmith Gulch	Upper	39152	146.02	146.02	146.04	Goldsmith Gulch	Upper	39093	146.02	146.02	146.04	-59	0	0	0
Goldsmith Gulch	Upper	39006	13.35	13.32	13.3	Goldsmith Gulch	Upper	38947	13.35	13.32	13.3	-59	0	0	0
Goldsmith Gulch	Upper	38993	71.43	68.54	65.99	Goldsmith Gulch	Upper	38933	71.43	68.54	65.99	-60	0	0	0
Goldsmith Gulch	Upper	38924	33.13	34.07	35.12	Goldsmith Gulch	Upper	38865	33.13	34.07	35.12	-59	0	0	0
Goldsmith Gulch	Upper	38890	173.12	180.86	187.52	Goldsmith Gulch	Upper	38831	173.12	180.86	187.52	-59	0	0	0
Goldsmith Gulch	Upper	38709	172.76	171.84	170.97	Goldsmith Gulch	Upper	38650	172.76	171.84	170.97	-59	0	0	0
Goldsmith Gulch	Upper	38538	61.77	56.01	47.69	Goldsmith Gulch	Upper	38478	61.77	56.01	47.69	-60	0	0	0
Goldsmith Gulch	Upper	38482	206.91	198.76	184.74	Goldsmith Gulch	Upper	38422	206.91	198.76	184.74	-60	0	0	0
Goldsmith Gulch	Upper	38441	Bridge			Goldsmith Gulch	Upper	38340	Culvert			-101	#VALUE!	0	0
Goldsmith Gulch	Upper	38283	95.73	100.06	105.22	Goldsmith Gulch	Upper	38223	95.73	100.06	105.22	-60	0	0	0
Goldsmith Gulch	Upper	38183	162.75	162.47	162.06	Goldsmith Gulch	Upper	38123	162.75	162.47	162.06	-60	0	0	0
Goldsmith Gulch	Upper	38020	30.02	30	30.01	Goldsmith Gulch	Upper	37961	30.02	30	30.01	-59	0	0	0
Goldsmith Gulch	Upper	37990	24.67	24.57	24.6	Goldsmith Gulch	Upper	37931	24.67	24.57	24.6	-59	0	0	0
Goldsmith Gulch	Upper	37966	27.17	27.48	27.8	Goldsmith Gulch	Upper	37906	27.17	27.48	27.8	-60	0	0	0
Goldsmith Gulch	Upper	37938	170.31	166.63	161.87	Goldsmith Gulch	Upper	37879	170.31	166.63	161.87	-59	0	0	0
Goldsmith Gulch	Upper	37772	99.75	100.21	100.79	Goldsmith Gulch	Upper	37712	99.75	100.21	100.79	-60	0	0	0
Goldsmith Gulch	Upper	37671	39.08	37.7	37.17	Goldsmith Gulch	Upper	37612	39.08	37.7	37.17	-59	0	0	0
Goldsmith Gulch	Upper	37634	20.21	20.19	20.82	Goldsmith Gulch	Upper	37574	20.21	20.19	20.82	-60	0	0	0
Goldsmith Gulch	Upper	37614	27.22	26.48	25.75	Goldsmith Gulch	Upper	37554	27.22	26.48	25.75	-60	0	0	0
Goldsmith Gulch	Upper	37587	18.65	17.88	17.95	Goldsmith Gulch	Upper	37527	18.65	17.88	17.95	-60	0	0	0
Goldsmith Gulch	Upper	37584	Bridge			Goldsmith Gulch	Upper	37520	Culvert			-64	#VALUE!	0	0
Goldsmith Gulch	Upper	37569	31.73	29.4	26.67	Goldsmith Gulch	Upper	37510	31.73	29.4	26.67	-59	0	0	0
Goldsmith Gulch	Upper	37540	44.93	46.39	48.31	Goldsmith Gulch	Upper	37480	44.93	46.39	48.31	-60	0	0	0
Goldsmith Gulch	Upper	37493	110.55	114.75	119.88	Goldsmith Gulch	Upper	37434	110.55	114.75	119.88	-59	0	0	0
Goldsmith Gulch	Upper	37379	18.93	20.63	21.94	Goldsmith Gulch	Upper	37319	18.93	20.63	21.94	-60	0	0	0
Goldsmith Gulch	Upper	37358	15.21	16.91	17.18	Goldsmith Gulch	Upper	37298	15.21	16.91	17.18	-60	0	0	0
Goldsmith Gulch	Upper	37341	20.52	21.08	21.46	Goldsmith Gulch	Upper	37281	20.52	21.08	21.46	-60	0	0	0
Goldsmith Gulch	Upper	37320	86.8	86.89	86.85	Goldsmith Gulch	Upper	37260	86.8	86.89	86.85	-60	0	0	0
Goldsmith Gulch	Upper	37233	18.94	18.16	17.37	Goldsmith Gulch	Upper	37173	18.94	18.16	17.37	-60	0	0	0
Goldsmith Gulch	Upper	37215	20.6	20.63	20.7	Goldsmith Gulch	Upper	37155	20.6	20.63	20.7	-60	0	0	0
Goldsmith Gulch	Upper	37194	192.67	195.66	198.4	Goldsmith Gulch	Upper	37135	192.67	195.66	198.4	-59	0	0	0
Goldsmith Gulch	Upper	36999	28.42	30.59	32.14	Goldsmith Gulch	Upper	36939	28.42	30.59	32.14	-60	0	0	0
Goldsmith Gulch	Upper	36968	12.24	11.44	10.97	Goldsmith Gulch	Upper	36908	12.24	11.44	10.97	-60	0	0	0
Goldsmith Gulch	Upper	36965	Bridge			Goldsmith Gulch	Upper	36903	Bridge			-62	#VALUE!	0	0
Goldsmith Gulch	Upper	36957	48.46	48.16	48.46	Goldsmith Gulch	Upper	36897	48.46	48.16	48.46	-60	0	0	0
Goldsmith Gulch	Upper	36909	134.64	130.69	126.65	Goldsmith Gulch	Upper	36849	134.64	130.69	126.65	-60	0	0	0
Goldsmith Gulch	Upper	36880	Bridge			Goldsmith Gulch	Upper	36780	Culvert			-100	#VALUE!	0	0
Goldsmith Gulch	Upper	36778	92.84	93.03	93.43	Goldsmith Gulch	Upper	36718	92.84	93.03	93.43	-60	0	0	0
Goldsmith Gulch	Upper	36685	38.82	38.83	38.82	Goldsmith Gulch	Upper	36625	38.82	38.83	38.82	-60	0	0	0
Goldsmith Gulch	Upper	36646	236.93	236.84	236.8	Goldsmith Gulch	Upper	36586	236.93	236.84	236.8	-60	0	0	0
Goldsmith Gulch	Upper	36409	63.88	58.31	51.09	Goldsmith Gulch	Upper	36349	63.88	58.31	51.09	-60	0	0	0

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Upper	36351	15.23	14.29	14.22	Goldsmith Gulch	Upper	36291	15.23	14.29	14.22	-60	0	0	0
Goldsmith Gulch	Upper	36343	Bridge			Goldsmith Gulch	Upper	36285	Culvert			-58	#VALUE!	0	0
Goldsmith Gulch	Upper	36337	124	135.24	146.82	Goldsmith Gulch	Upper	36277	124	135.24	146.82	-60	0	0	0
Goldsmith Gulch	Upper	36201	101.46	103.28	108.53	Goldsmith Gulch	Upper	36142	101.46	103.28	108.53	-59	0	0	0
Goldsmith Gulch	Upper	36098	150.94	146.93	137.89	Goldsmith Gulch	Upper	36038	150.94	146.93	137.89	-60	0	0	0
Goldsmith Gulch	Upper	35951	16.94	16.28	16.27	Goldsmith Gulch	Upper	35891	16.94	16.28	16.27	-60	0	0	0
Goldsmith Gulch	Upper	35935	20.6	20.53	21.16	Goldsmith Gulch	Upper	35875	20.6	20.53	21.16	-60	0	0	0
Goldsmith Gulch	Upper	35929	Bridge			Goldsmith Gulch	Upper	35865	Bridge			-64	#VALUE!	0	0
Goldsmith Gulch	Upper	35914	23.45	23.14	23.38	Goldsmith Gulch	Upper	35855	23.45	23.14	23.38	-59	0	0	0
Goldsmith Gulch	Upper	35891	119.38	129.62	146.74	Goldsmith Gulch	Upper	35831	119.38	129.62	146.74	-60	0	0	0
Goldsmith Gulch	Upper	35762	150.67	163.91	199.15	Goldsmith Gulch	Upper	35702	150.67	163.91	199.15	-60	0	0	0
Goldsmith Gulch	Upper	35598	42.58	43.44	40.59	Goldsmith Gulch	Upper	35538	42.58	43.44	40.59	-60	0	0	0
Goldsmith Gulch	Upper	35554	38.85	25.35	21.91	Goldsmith Gulch	Upper	35494	38.85	25.35	21.91	-60	0	0	0
Goldsmith Gulch	Upper	35529	37.31	47.65	71.93	Goldsmith Gulch	Upper	35469	37.31	47.65	71.93	-60	0	0	0
Goldsmith Gulch	Upper	35481	15.28	20.42	18.62	Goldsmith Gulch	Upper	35421	15.28	20.42	18.62	-60	0	0	0
Goldsmith Gulch	Upper	35461	23.4	25.2	20.07	Goldsmith Gulch	Upper	35401	23.4	25.2	20.07	-60	0	0	0
Goldsmith Gulch	Upper	35436	80.85	50.67	29.71	Goldsmith Gulch	Upper	35376	80.85	50.67	29.71	-60	0	0	0
Goldsmith Gulch	Upper	35385	12.86	8.22	17.06	Goldsmith Gulch	Upper	35325	12.86	8.22	17.06	-60	0	0	0
Goldsmith Gulch	Upper	35377	11.89	29.52	65.19	Goldsmith Gulch	Upper	35317	11.89	29.52	65.19	-60	0	0	0
Goldsmith Gulch	Upper	35347	70.83	59.99	47.91	Goldsmith Gulch	Upper	35287	70.83	59.99	47.91	-60	0	0	0
Goldsmith Gulch	Upper	35287	93.93	129.69	168.38	Goldsmith Gulch	Upper	35227	93.93	129.69	168.38	-60	0	0	0
Goldsmith Gulch	Upper	35157	361.31	339.57	319.87	Goldsmith Gulch	Upper	35098	361.31	339.57	319.87	-59	0	0	0
Goldsmith Gulch	Upper	34818	237.98	273.68	344.59	Goldsmith Gulch	Upper	34758	237.98	273.68	344.59	-60	0	0	0
Goldsmith Gulch	Upper	34544	66.25	83.12	63.35	Goldsmith Gulch	Upper	34484	66.25	83.12	63.35	-60	0	0	0
Goldsmith Gulch	Upper	34461	144.9	149.24	176.32	Goldsmith Gulch	Upper	34401	144.9	149.24	176.32	-60	0	0	0
Goldsmith Gulch	Upper	34312	79.65	46.64	48.18	Goldsmith Gulch	Upper	34252	79.65	46.64	48.18	-60	0	0	0
Goldsmith Gulch	Upper	34265	10.24	4.03	3.86	Goldsmith Gulch	Upper	34206	10.24	4.03	3.86	-59	0	0	0
Goldsmith Gulch	Upper	34261	29.14	24.78	21.64	Goldsmith Gulch	Upper	34201	29.14	24.78	21.64	-60	0	0	0
Goldsmith Gulch	Upper	34236	11.79	11.08	10.6	Goldsmith Gulch	Upper	34177	11.79	11.08	10.6	-59	0	0	0
Goldsmith Gulch	Upper	34232	Bridge			Goldsmith Gulch	Upper	34171	Bridge			-61	#VALUE!	0	0
Goldsmith Gulch	Upper	34225	111.16	101.28	72.99	Goldsmith Gulch	Upper	34166	111.16	101.28	72.99	-59	0	0	0
Goldsmith Gulch	Upper	34124	109.31	77	68	Goldsmith Gulch	Upper	34064	109.31	77	68	-60	0	0	0
Goldsmith Gulch	Upper	34047	323.67	319.43	316.01	Goldsmith Gulch	Upper	33987	323.67	319.43	316.01	-60	0	0	0
Goldsmith Gulch	Upper	33728	15.95	15.13	15.12	Goldsmith Gulch	Upper	33668	15.95	15.13	15.12	-60	0	0	0
Goldsmith Gulch	Upper	33721	Bridge			Goldsmith Gulch	Upper	33660	Bridge			-61	#VALUE!	0	0
Goldsmith Gulch	Upper	33712	92.11	58.39	54.4	Goldsmith Gulch	Upper	33653	92.11	58.39	54.4	-59	0	0	0
Goldsmith Gulch	Upper	33654	56.99	58.41	46.62	Goldsmith Gulch	Upper	33594	56.99	58.41	46.62	-60	0	0	0
Goldsmith Gulch	Upper	33596	29.22	30.99	32.01	Goldsmith Gulch	Upper	33536	29.22	30.99	32.01	-60	0	0	0
Goldsmith Gulch	Upper	33565	14.59	16.12	17.05	Goldsmith Gulch	Upper	33505	14.59	16.12	17.05	-60	0	0	0
Goldsmith Gulch	Upper	33549	37.82	53.04	62.12	Goldsmith Gulch	Upper	33489	37.82	53.04	62.12	-60	0	0	0
Goldsmith Gulch	Upper	33496	26.18	35.34	45.1	Goldsmith Gulch	Upper	33436	26.18	35.34	45.1	-60	0	0	0
Goldsmith Gulch	Upper	33460	93.1	92.19	97.68	Goldsmith Gulch	Upper	33400	93.1	92.19	97.68	-60	0	0	0

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Upper	33368	28.95	28.81	28.54	Goldsmith Gulch	Upper	33308	28.95	28.81	28.54	-60	0	0	0
Goldsmith Gulch	Upper	33339	57.91	58.25	60.64	Goldsmith Gulch	Upper	33279	57.91	58.25	60.64	-60	0	0	0
Goldsmith Gulch	Upper	33281	29.57	29.65	29.55	Goldsmith Gulch	Upper	33221	29.57	29.65	29.55	-60	0	0	0
Goldsmith Gulch	Upper	33251	106.69	105.95	103.8	Goldsmith Gulch	Upper	33192	106.69	105.95	103.8	-59	0	0	0
Goldsmith Gulch	Upper	33145	24.37	23.18	21.12	Goldsmith Gulch	Upper	33086	24.37	23.18	21.12	-59	0	0	0
Goldsmith Gulch	Upper	33122	139	135.68	129.05	Goldsmith Gulch	Upper	33062	139	135.68	129.05	-60	0	0	0
Goldsmith Gulch	Upper	32986	178.31	173.35	165.55	Goldsmith Gulch	Upper	32927	178.31	173.35	165.55	-59	0	0	0
Goldsmith Gulch	Upper	32813	37.14	37.99	36.22	Goldsmith Gulch	Upper	32753	37.14	37.99	36.22	-60	0	0	0
Goldsmith Gulch	Upper	32775	14.81	15.38	15.17	Goldsmith Gulch	Upper	32715	14.81	15.38	15.17	-60	0	0	0
Goldsmith Gulch	Upper	32768	Bridge			Goldsmith Gulch	Upper	32705	Bridge			-63	#VALUE!	0	0
Goldsmith Gulch	Upper	32760	57.11	72.45	82.41	Goldsmith Gulch	Upper	32700	57.11	72.45	82.41	-60	0	0	0
Goldsmith Gulch	Upper	32687	265.77	254.27	247.31	Goldsmith Gulch	Upper	32628	265.77	254.27	247.31	-59	0	0	0
Goldsmith Gulch	Upper	32433	120.76	121.77	122.5	Goldsmith Gulch	Upper	32373	120.76	121.77	122.5	-60	0	0	0
Goldsmith Gulch	Upper	32311	92.92	100.82	108.75	Goldsmith Gulch	Upper	32252	92.92	100.82	108.75	-59	0	0	0
Goldsmith Gulch	Upper	32210	99.87	90.82	76.46	Goldsmith Gulch	Upper	32151	99.87	90.82	76.46	-59	0	0	0
Goldsmith Gulch	Upper	32120	16.23	16.25	16.22	Goldsmith Gulch	Upper	32060	16.23	16.25	16.22	-60	0	0	0
Goldsmith Gulch	Upper	32110	Bridge			Goldsmith Gulch	Upper	32050	Bridge			-60	#VALUE!	0	0
Goldsmith Gulch	Upper	32103	132.44	120.64	105.14	Goldsmith Gulch	Upper	32044	132.44	120.64	105.14	-59	0	0	0
Goldsmith Gulch	Lower	31983	68.58	71.6	70.95	Goldsmith Gulch	Lower	31923	68.58	71.6	70.95	-60	0	0	0
Goldsmith Gulch	Lower	31911	93.2	174.53	193.01	Goldsmith Gulch	Lower	31851	93.2	174.53	193.01	-60	0	0	0
Goldsmith Gulch	Lower	31737	269.4	283.89	275.05	Goldsmith Gulch	Lower	31677	269.4	276.89	275.05	-60	0	-7	0
Goldsmith Gulch	Lower	31453	14.28	18.85	36.8	Goldsmith Gulch	Lower	31400	14.28	18.85	36.8	-53	0	0	0
Goldsmith Gulch	Lower	31434	37.23	26.46	22.89	Goldsmith Gulch	Lower	31381	37.23	26.46	22.89	-53	0	0	0
Goldsmith Gulch	Lower	31407	71.52	52.5	30.09	Goldsmith Gulch	Lower	31355	71.52	52.5	30.09	-52	0	0	0
Goldsmith Gulch	Lower	31355	92.96	105.76	108.36	Goldsmith Gulch	Lower	31302	92.96	105.76	108.36	-53	0	0	0
Goldsmith Gulch	Lower	31249	15.71	15.72	15.78	Goldsmith Gulch	Lower	31196	15.71	15.72	15.78	-53	0	0	0
Goldsmith Gulch	Lower	31233	209.8	199.71	169.58	Goldsmith Gulch	Lower	31181	209.8	199.71	169.58	-52	0	0	0
Goldsmith Gulch	Lower	31034	14.27	14.39	14.49	Goldsmith Gulch	Lower	30981	14.27	14.39	14.49	-53	0	0	0
Goldsmith Gulch	Lower	31019	121.13	104.71	82.5	Goldsmith Gulch	Lower	30967	121.13	104.71	82.5	-52	0	0	0
Goldsmith Gulch	Lower	30915	12.29	12.2	12.2	Goldsmith Gulch	Lower	30862	12.29	12.2	12.2	-53	0	0	0
Goldsmith Gulch	Lower	30902	133.99	132.43	129.56	Goldsmith Gulch	Lower	30850	133.99	132.43	129.56	-52	0	0	0
Goldsmith Gulch	Lower	30770	158.95	165.43	182.2	Goldsmith Gulch	Lower	30717	158.95	165.43	182.2	-53	0	0	0
Goldsmith Gulch	Lower	30605	85.19	81.36	81.06	Goldsmith Gulch	Lower	30552	85.19	81.36	81.06	-53	0	0	0
Goldsmith Gulch	Lower	30563	Bridge			Goldsmith Gulch	Lower	30510	Culvert			-53	#VALUE!	0	0
Goldsmith Gulch	Lower	30523	168.96	172.1	175.95	Goldsmith Gulch	Lower	30470	168.96	172.1	175.95	-53	0	0	0
Goldsmith Gulch	Lower	30351	126.84	123.09	120.01	Goldsmith Gulch	Lower	30298	126.84	123.09	120.01	-53	0	0	0
Goldsmith Gulch	Lower	30228	166.69	149.81	134.38	Goldsmith Gulch	Lower	30175	166.69	149.81	134.38	-53	0	0	0
Goldsmith Gulch	Lower	30078	47.87	47.35	47.34	Goldsmith Gulch	Lower	30025	47.87	47.35	47.34	-53	0	0	0
Goldsmith Gulch	Lower	30060	Bridge			Goldsmith Gulch	Lower	30008	Bridge			-52	#VALUE!	0	0
Goldsmith Gulch	Lower	30031	126.73	129.64	125.96	Goldsmith Gulch	Lower	29978	126.73	129.64	125.96	-53	0	0	0
Goldsmith Gulch	Lower	29901	21.16	21.5	21.05	Goldsmith Gulch	Lower	29848	21.16	21.5	21.05	-53	0	0	0
Goldsmith Gulch	Lower	29890	Bridge			Goldsmith Gulch	Lower	29838	Culvert			-52	#VALUE!	0	0

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Lower	29880	73.23	73.22	71.88	Goldsmith Gulch	Lower	29827	73.23	73.22	71.88	-53	0	0	0
Goldsmith Gulch	Lower	29806	233.21	264.09	314.68	Goldsmith Gulch	Lower	29754	233.21	264.09	314.68	-52	0	0	0
Goldsmith Gulch	Lower	29542	61.74	64.82	62.83	Goldsmith Gulch	Lower	29490	61.74	64.82	62.83	-52	0	0	0
Goldsmith Gulch	Lower	29525	Bridge			Goldsmith Gulch	Lower	29460	Culvert			-65	#VALUE!	0	0
Goldsmith Gulch	Lower	29478	220.72	220.69	177.01	Goldsmith Gulch	Lower	29425	220.72	182.98	177.01	-53	0	-37.71	0
Goldsmith Gulch	Lower	29257	154.91	161.39	155.06	Goldsmith Gulch	Lower	29242	154.91	158.73	155.06	-15	0	-2.66	0
Goldsmith Gulch	Lower	29095	38.32	36.59	34.39	Goldsmith Gulch	Lower	29083	38.32	36.59	34.39	-12	0	0	0
Goldsmith Gulch	Lower	29059	70.02	67.42	65.89	Goldsmith Gulch	Lower	29047	70.02	67.42	65.89	-12	0	0	0
Goldsmith Gulch	Lower	28991	3.28	3.01	3.02	Goldsmith Gulch	Lower	28979	3.28	3.01	3.02	-12	0	0	0
Goldsmith Gulch	Lower	28988	18.15	15.86	16.66	Goldsmith Gulch	Lower	28976	18.15	15.86	16.66	-12	0	0	0
Goldsmith Gulch	Lower	28973	20.99	20.68	21.49	Goldsmith Gulch	Lower	28960	20.99	20.68	21.49	-13	0	0	0
Goldsmith Gulch	Lower	28963	Bridge			Goldsmith Gulch	Lower	28950	Culvert			-13	#VALUE!	0	0
Goldsmith Gulch	Lower	28952	219.42	208.03	197.84	Goldsmith Gulch	Lower	28940	219.42	208.03	197.84	-12	0	0	0
Goldsmith Gulch	Lower	28744	208.33	205.8	201.83	Goldsmith Gulch	Lower	28732	208.33	205.8	201.83	-12	0	0	0
Goldsmith Gulch	Lower	28538	113.5	112.07	110.73	Goldsmith Gulch	Lower	28526	113.5	112.07	110.73	-12	0	0	0
Goldsmith Gulch	Lower	28483	Bridge			Goldsmith Gulch	Lower	28470	Bridge			-13	#VALUE!	0	0
Goldsmith Gulch	Lower	28426	81.64	77.17	74.15	Goldsmith Gulch	Lower	28414	81.64	77.17	74.15	-12	0	0	0
Goldsmith Gulch	Lower	28349	14.53	10.8	11.03	Goldsmith Gulch	Lower	28337	14.53	10.8	11.03	-12	0	0	0
Goldsmith Gulch	Lower	28338	315.45	333.07	333.55	Goldsmith Gulch	Lower	28326	315.45	325.71	333.55	-12	0	-7.36	0
Goldsmith Gulch	Lower	28005	222.48	231.39	230.39	Goldsmith Gulch	Lower	28000	222.48	226.45	230.39	-5	0	-4.94	0
Goldsmith Gulch	Lower	27774	33.65	33.47	34.14	Goldsmith Gulch	Lower	27774	33.65	33.47	34.14	0	0	0	0
Goldsmith Gulch	Lower	27740	98.29	97.28	98.74	Goldsmith Gulch	Lower	27740	98.29	97.28	98.74	0	0	0	0
Goldsmith Gulch	Lower	27643	173.34	172.45	171.56	Goldsmith Gulch	Lower	27643	173.34	172.45	171.56	0	0	0	0
Goldsmith Gulch	Lower	27470	13.93	13.24	12.76	Goldsmith Gulch	Lower	27470	13.93	13.24	12.76	0	0	0	0
Goldsmith Gulch	Lower	27457	14.32	17.49	13.98	Goldsmith Gulch	Lower	27457	14.32	17.49	13.98	0	0	0	0
Goldsmith Gulch	Lower	27440	37.39	35.16	35.24	Goldsmith Gulch	Lower	27440	37.39	35.16	35.24	0	0	0	0
Goldsmith Gulch	Lower	27404	34.36	35.69	43.93	Goldsmith Gulch	Lower	27404	34.36	35.69	43.93	0	0	0	0
Goldsmith Gulch	Lower	27369	92.63	93.18	90.9	Goldsmith Gulch	Lower	27369	92.63	93.18	90.9	0	0	0	0
Goldsmith Gulch	Lower	27338	Bridge			Goldsmith Gulch	Lower	27320	Bridge			-18	#VALUE!	0	0
Goldsmith Gulch	Lower	27276	110.34	102.33	99	Goldsmith Gulch	Lower	27276	110.34	102.33	99	0	0	0	0
Goldsmith Gulch	Lower	27173	156.5	154.78	153.26	Goldsmith Gulch	Lower	27173	156.5	154.78	153.26	0	0	0	0
Goldsmith Gulch	Lower	27019	38.16	35.35	32.59	Goldsmith Gulch	Lower	27018	38.16	35.35	32.59	-1	0	0	0
Goldsmith Gulch	Lower	26983	37.21	29.71	27.84	Goldsmith Gulch	Lower	26983	37.21	29.71	27.84	0	0	0	0
Goldsmith Gulch	Lower	26953	154.41	152.02	151.57	Goldsmith Gulch	Lower	26953	154.41	152.02	151.57	0	0	0	0
Goldsmith Gulch	Lower	26887	Bridge			Goldsmith Gulch	Lower	26887	Bridge			0	#VALUE!	0	0
Goldsmith Gulch	Lower	26801	14.3	14.06	15.33	Goldsmith Gulch	Lower	26801	14.3	14.06	15.33	0	0	0	0
Goldsmith Gulch	Lower	26787	6.63	6.51	6.81	Goldsmith Gulch	Lower	26787	6.63	6.51	6.81	0	0	0	0
Goldsmith Gulch	Lower	26781	22.94	22.5	29.09	Goldsmith Gulch	Lower	26781	22.94	22.5	29.09	0	0	0	0
Goldsmith Gulch	Lower	26758	245.41	245.03	247.21	Goldsmith Gulch	Lower	26758	245.41	245.03	247.21	0	0	0	0
Goldsmith Gulch	Lower	26513	310.6	318.23	319.76	Goldsmith Gulch	Lower	26513	310.6	318.23	319.76	0	0	0	0
Goldsmith Gulch	Lower	26195	73.23	77.96	77.32	Goldsmith Gulch	Lower	26195	73.23	77.96	77.32	0	0	0	0
Goldsmith Gulch	Lower	26117	9.9	12.08	12.64	Goldsmith Gulch	Lower	26117	9.9	12.08	12.64	0	0	0	0

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Lower	26105	27.82	27.85	20.99	Goldsmith Gulch	Lower	26105	27.82	27.85	20.99	0	0	0	0
Goldsmith Gulch	Lower	26077	25.72	28.33	24.06	Goldsmith Gulch	Lower	26077	25.72	28.33	24.06	0	0	0	0
Goldsmith Gulch	Lower	26049	17.51	18.92	17.64	Goldsmith Gulch	Lower	26049	17.51	18.92	17.64	0	0	0	0
Goldsmith Gulch	Lower	26030	123.45	123.12	121.58	Goldsmith Gulch	Lower	26030	123.45	123.12	121.58	0	0	0	0
Goldsmith Gulch	Lower	25907	135.06	135.12	135.6	Goldsmith Gulch	Lower	25907	135.06	135.12	135.6	0	0	0	0
Goldsmith Gulch	Lower	25772	248.2	247.99	246.29	Goldsmith Gulch	Lower	25772	248.2	247.99	246.29	0	0	0	0
Goldsmith Gulch	Lower	25524	239.21	237.86	235.83	Goldsmith Gulch	Lower	25524	239.21	237.86	235.83	0	0	0	0
Goldsmith Gulch	Lower	25286	166.12	165.05	163.46	Goldsmith Gulch	Lower	25286	166.12	165.05	163.46	0	0	0	0
Goldsmith Gulch	Lower	25121	74.08	80.9	78.45	Goldsmith Gulch	Lower	25121	74.08	80.9	78.45	0	0	0	0
Goldsmith Gulch	Lower	25040	29.34	26.26	22.95	Goldsmith Gulch	Lower	25040	29.34	26.26	22.95	0	0	0	0
Goldsmith Gulch	Lower	25014	35.06	24.64	24.98	Goldsmith Gulch	Lower	25014	35.06	24.64	24.98	0	0	0	0
Goldsmith Gulch	Lower	24989	29.64	29.56	29.8	Goldsmith Gulch	Lower	24989	29.64	29.56	29.8	0	0	0	0
Goldsmith Gulch	Lower	24959	50.33	50.08	49.56	Goldsmith Gulch	Lower	24959	50.33	50.08	49.56	0	0	0	0
Goldsmith Gulch	Lower	24909	257.91	264.78	265.46	Goldsmith Gulch	Lower	24909	257.91	264.78	265.46	0	0	0	0
Goldsmith Gulch	Lower	24645	34.33	41.63	41.36	Goldsmith Gulch	Lower	24645	34.33	41.63	41.36	0	0	0	0
Goldsmith Gulch	Lower	24603	2.88	7.03	4.89	Goldsmith Gulch	Lower	24603	2.88	7.03	4.89	0	0	0	0
Goldsmith Gulch	Lower	24596	1.02	1.09	1.01	Goldsmith Gulch	Lower	24596	1.02	1.09	1.01	0	0	0	0
Goldsmith Gulch	Lower	24595	31.32	39.63	20.35	Goldsmith Gulch	Lower	24595	31.32	39.63	20.35	0	0	0	0
Goldsmith Gulch	Lower	24555	1.06	1.28	1.27	Goldsmith Gulch	Lower	24555	1.06	1.28	1.27	0	0	0	0
Goldsmith Gulch	Lower	24554	194.35	182.57	188.31	Goldsmith Gulch	Lower	24554	194.35	182.57	188.31	0	0	0	0
Goldsmith Gulch	Lower	24371	82.43	82.16	83.3	Goldsmith Gulch	Lower	24371	82.43	82.16	83.3	0	0	0	0
Goldsmith Gulch	Lower	24289	34.57	34.29	34.47	Goldsmith Gulch	Lower	24289	34.57	34.29	34.47	0	0	0	0
Goldsmith Gulch	Lower	24255	10.09	10.04	10.01	Goldsmith Gulch	Lower	24255	10.09	10.04	10.01	0	0	0	0
Goldsmith Gulch	Lower	24245	21.99	27.35	18.92	Goldsmith Gulch	Lower	24245	21.99	27.35	18.92	0	0	0	0
Goldsmith Gulch	Lower	24218	6.94	6.98	6.92	Goldsmith Gulch	Lower	24217	6.94	6.98	6.92	-1	0	0	0
Goldsmith Gulch	Lower	24211	65.47	54.76	53.12	Goldsmith Gulch	Lower	24210	65.47	54.76	53.12	-1	0	0	0
Goldsmith Gulch	Lower	24156	67.62	64.2	63.47	Goldsmith Gulch	Lower	24156	67.62	64.2	63.47	0	0	0	0
Goldsmith Gulch	Lower	24092	62.97	62.64	66.75	Goldsmith Gulch	Lower	24092	62.97	62.64	66.75	0	0	0	0
Goldsmith Gulch	Lower	24029	44.39	45.22	46.71	Goldsmith Gulch	Lower	24029	44.39	45.22	46.71	0	0	0	0
Goldsmith Gulch	Lower	23984	48.34	48.81	49.12	Goldsmith Gulch	Lower	23984	48.34	48.81	49.12	0	0	0	0
Goldsmith Gulch	Lower	23935	66.56	65.11	61.78	Goldsmith Gulch	Lower	23935	66.56	65.11	61.78	0	0	0	0
Goldsmith Gulch	Lower	23870	97.34	96.71	96.19	Goldsmith Gulch	Lower	23870	97.34	96.71	96.19	0	0	0	0
Goldsmith Gulch	Lower	23773	133.61	134.82	131.21	Goldsmith Gulch	Lower	23773	133.61	134.82	131.21	0	0	0	0
Goldsmith Gulch	Lower	23638	172.38	172.41	171.83	Goldsmith Gulch	Lower	23638	172.38	172.41	171.83	0	0	0	0
Goldsmith Gulch	Lower	23466	257.21	255.76	252.58	Goldsmith Gulch	Lower	23466	257.21	255.76	252.58	0	0	0	0
Goldsmith Gulch	Lower	23210	122.41	120.18	113.87	Goldsmith Gulch	Lower	23210	122.41	120.18	113.87	0	0	0	0
Goldsmith Gulch	Lower	23090	195.74	201.17	202.79	Goldsmith Gulch	Lower	23090	195.74	201.17	202.79	0	0	0	0
Goldsmith Gulch	Lower	23089	Lat Struct			Goldsmith Gulch	Lower	23089	Lat Struct			0	#VALUE!	0	0
Goldsmith Gulch	Lower	22889	230	230.67	229.46	Goldsmith Gulch	Lower	22889	230	230.67	229.46	0	0	0	0
Goldsmith Gulch	Lower	22658	627.08	626	629.82	Goldsmith Gulch	Lower	22658	627.08	626	629.82	0	0	0	0
Goldsmith Gulch	Lower	22032	156.95	156.42	157.43	Goldsmith Gulch	Lower	22032	156.95	156.42	157.43	0	0	0	0
Goldsmith Gulch	Lower	21876	246.44	239.39	235.18	Goldsmith Gulch	Lower	21876	246.44	239.39	235.18	0	0	0	0

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Lower	21636	179.72	171.99	166.19	Goldsmith Gulch	Lower	21636	179.72	171.99	166.19	0	0	0	0
Goldsmith Gulch	Lower	21464	129	136.56	145.81	Goldsmith Gulch	Lower	21464	129	136.56	145.81	0	0	0	0
Goldsmith Gulch	Lower	21328	141.28	143.7	143.89	Goldsmith Gulch	Lower	21328	141.28	143.7	143.89	0	0	0	0
Goldsmith Gulch	Lower	21261	Bridge			Goldsmith Gulch	Lower	21261	Culvert			0	#VALUE!	0	0
Goldsmith Gulch	Lower	21184	181.72	174.65	171.92	Goldsmith Gulch	Lower	21184	181.72	174.65	171.92	0	0	0	0
Goldsmith Gulch	Lower	21009	131.36	138.44	143.07	Goldsmith Gulch	Lower	21009	131.36	138.44	143.07	0	0	0	0
Goldsmith Gulch	Lower	20871	105.33	126.52	131.05	Goldsmith Gulch	Lower	20871	105.33	126.52	131.05	0	0	0	0
Goldsmith Gulch	Lower	20744	149.24	178.63	173.39	Goldsmith Gulch	Lower	20744	149.24	178.63	173.39	0	0	0	0
Goldsmith Gulch	Lower	20566	112.38	124.74	128.87	Goldsmith Gulch	Lower	20566	112.38	124.74	128.87	0	0	0	0
Goldsmith Gulch	Lower	20441	59.5	62.78	66.69	Goldsmith Gulch	Lower	20441	59.5	62.78	66.69	0	0	0	0
Goldsmith Gulch	Lower	20378	39.1	42.31	37.52	Goldsmith Gulch	Lower	20378	39.1	42.31	37.52	0	0	0	0
Goldsmith Gulch	Lower	20336	64.16	55.05	46.61	Goldsmith Gulch	Lower	20336	64.16	55.05	46.61	0	0	0	0
Goldsmith Gulch	Lower	20281	33.78	34.3	32.57	Goldsmith Gulch	Lower	20281	33.78	34.3	32.57	0	0	0	0
Goldsmith Gulch	Lower	20266	Bridge			Goldsmith Gulch	Lower	20266	Bridge			0	#VALUE!	0	0
Goldsmith Gulch	Lower	20247	33.27	32.28	33.12	Goldsmith Gulch	Lower	20247	33.27	32.28	33.12	0	0	0	0
Goldsmith Gulch	Lower	20214	63.15	62.39	61.63	Goldsmith Gulch	Lower	20214	63.15	62.39	61.63	0	0	0	0
Goldsmith Gulch	Lower	20152	92.12	84.84	73.55	Goldsmith Gulch	Lower	20152	92.12	84.84	73.55	0	0	0	0
Goldsmith Gulch	Lower	20067	149.74	146.08	134.83	Goldsmith Gulch	Lower	20067	149.74	146.08	134.83	0	0	0	0
Goldsmith Gulch	Lower	19921	68.13	56.82	53.73	Goldsmith Gulch	Lower	19921	68.13	56.82	53.73	0	0	0	0
Goldsmith Gulch	Lower	19864	23.11	21.72	20.88	Goldsmith Gulch	Lower	19864	23.11	21.72	20.88	0	0	0	0
Goldsmith Gulch	Lower	19854	Bridge			Goldsmith Gulch	Lower	19854	Bridge			0	#VALUE!	0	0
Goldsmith Gulch	Lower	19842	26.35	23.77	21.62	Goldsmith Gulch	Lower	19842	26.35	23.77	21.62	0	0	0	0
Goldsmith Gulch	Lower	19819	113.7	140	144.77	Goldsmith Gulch	Lower	19819	113.7	140	144.77	0	0	0	0
Goldsmith Gulch	Lower	19679	93.23	93.86	94.12	Goldsmith Gulch	Lower	19679	93.23	93.86	94.12	0	0	0	0
Goldsmith Gulch	Lower	19585	5.08	5.07	5.07	Goldsmith Gulch	Lower	19585	5.08	5.07	5.07	0	0	0	0
Goldsmith Gulch	Lower	19580	76.81	87.02	90.61	Goldsmith Gulch	Lower	19580	76.81	87.02	90.61	0	0	0	0
Goldsmith Gulch	Lower	19493	9.16	9.28	9.56	Goldsmith Gulch	Lower	19493	9.16	9.28	9.56	0	0	0	0
Goldsmith Gulch	Lower	19483	88.65	87.97	88.21	Goldsmith Gulch	Lower	19483	88.65	87.97	88.21	0	0	0	0
Goldsmith Gulch	Lower	19470	Bridge			Goldsmith Gulch	Lower	19470	Culvert			0	#VALUE!	0	0
Goldsmith Gulch	Lower	19396	258.89	260.12	261.28	Goldsmith Gulch	Lower	19395	258.89	260.12	261.28	-1	0	0	0
Goldsmith Gulch	Lower	19135	54.35	54.35	54.35	Goldsmith Gulch	Lower	19135	54.35	54.35	54.35	0	0	0	0
Goldsmith Gulch	Lower	19081	2.81	2.81	2.81	Goldsmith Gulch	Lower	19081	2.81	2.81	2.81	0	0	0	0
Goldsmith Gulch	Lower	19078	98.95	98.95	98.94	Goldsmith Gulch	Lower	19078	98.95	98.95	98.94	0	0	0	0
Goldsmith Gulch	Lower	18979	2	2	2	Goldsmith Gulch	Lower	18979	2	2	2	0	0	0	0
Goldsmith Gulch	Lower	18977	295.97	295.96	295.95	Goldsmith Gulch	Lower	18977	295.97	295.96	295.95	0	0	0	0
Goldsmith Gulch	Lower	18681	2	2	2	Goldsmith Gulch	Lower	18681	2	2	2	0	0	0	0
Goldsmith Gulch	Lower	18679	295.58	295.35	295.18	Goldsmith Gulch	Lower	18679	295.58	295.35	295.18	0	0	0	0
Goldsmith Gulch	Lower	18384	227.79	228.01	228.15	Goldsmith Gulch	Lower	18384	227.79	228.01	228.15	0	0	0	0
Goldsmith Gulch	Lower	18156	2	2	2	Goldsmith Gulch	Lower	18156	2	2	2	0	0	0	0
Goldsmith Gulch	Lower	18154	279.34	279.32	279.33	Goldsmith Gulch	Lower	18154	279.34	279.32	279.33	0	0	0	0
Goldsmith Gulch	Lower	17875	2	2	2	Goldsmith Gulch	Lower	17875	2	2	2	0	0	0	0
Goldsmith Gulch	Lower	17873	225.85	225.83	225.92	Goldsmith Gulch	Lower	17873	225.85	225.83	225.92	0	0	0	0

HEC-RAS Cross-section River Stations and Reach Lengths Comparison

Note: This table only shows the areas impacted by the revision of river centerline.

Revised Cross-section River Station and Reach Length						Old Cross-section River Station and Reach Length						Comparison			
River	Reach	River Station	Reach Length to D/S cross-section			River	Reach	River Station	Reach Length to D/S cross-section			Station	Reach Length to D/S cross-section		
			LOB	Channel	ROB				LOB	Channel	ROB		LOB	Channel	ROB
Goldsmith Gulch	Lower	17647	2	2	2	Goldsmith Gulch	Lower	17647	2	2	2	0	0	0	0
Goldsmith Gulch	Lower	17645	260.96	261.31	261.75	Goldsmith Gulch	Lower	17645	260.96	261.31	261.75	0	0	0	0
Goldsmith Gulch	Lower	17384	183.53	183.26	182.89	Goldsmith Gulch	Lower	17383	183.53	183.26	182.89	-1	0	0	0
Goldsmith Gulch	Lower	17200	66.62	66.62	66.62	Goldsmith Gulch	Lower	17200	66.62	66.81	66.62	0	0	0.19	0
Goldsmith Gulch	Lower	17134	78.81	78.72	78.68	Goldsmith Gulch	Lower	17133	78.81	78.72	78.68	-1	0	0	0
Goldsmith Gulch	Lower	17097	Bridge			Goldsmith Gulch	Lower	17096	Culvert			-1	#VALUE!	0	0
Goldsmith Gulch	Lower	17055	104.22	104.47	104.19	Goldsmith Gulch	Lower	17055	104.22	104.23	104.19	0	0	-0.24	0

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MEMORANDUM

To: Morgan Lynch, P.E., CFM
Terri Fead, P.E., CFM
Shea Thomas, P.E.

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: March 12, 2020

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 3rd Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 2nd HEC-RAS Submittal on September 12, 2019. This memo is to document the responses to the previous review comments and provide floodway modeling. The following materials are included as a part of the 3rd submittal for HEC-RAS Hydraulic Model Review.

Deliverables include:

- HEC-RAS model files (new plans in *italics*): GoldsmithFHAD.prj
  Goldsmith Gulch: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Monaco Pkwy Overflow: Plan: p02; Geometry: g02; Flow: f02 (Hardwired)
  Southmoor Park Tributary: Plan: p03; Geometry: g03; Flow: f03
  Goldsmith Gulch: Plan: P04; Geometry: g01; Flow: f04 (Original for optimization)
  Monaco Pkwy Overflow: Plan: p05; Geometry: g02; Flow: f05 (Original for optimization)
  Goldsmith Gulch _ Support Calculation: Plan: P06; Geometry: g06; Flow: f06
  Southmoor Park Tributary Floodway: Plan: P07; Geometry: g03; Flow: f07
  Goldsmith Gulch Floodway: Plan: P08; Geometry: g01; Flow: f08
  Monaco Pkwy Overflow Floodway: Plan: P11; Geometry: g02; Flow: f10
- GIS files for review comments and responses to review comments
- GIS files for cross sections, 100- and 500-year raw floodplain delineation
- GIS files for raw floodway delineation
- Partial Agreement Table (includes floodway notes)
- Goldsmith Gulch HEC-RAS Flows and Flow Change Locations Table

All of our responses to comments are included in the GIS geodatabase. Note that in addition to addressing comments, the updated model includes proposed improvements to the Goldsmith West Tributary – Huntington Acres to Tommy Davis within the City of Greenwood Village.

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(303) 572-0200

MEMORANDUM

To: Morgan Lynch, P.E., CFM
Terri Fead, P.E., CFM
Shea Thomas, P.E.

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: October 5, 2020

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 4th Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 2nd HEC-RAS Submittal on June 23, 2020. This memo is to document the responses to the previous review comments and provide floodway modeling. The following materials are included as a part of the 4th submittal for HEC-RAS Hydraulic Model Review.

Deliverables include:

- HEC-RAS model files (new plans in *italics*): GoldsmithFHAD.prj
  Goldsmith Gulch: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Monaco Pkwy Overflow: Plan: p02; Geometry: g02; Flow: f02 (Hardwired)
  Southmoor Park Tributary: Plan: p03; Geometry: g03; Flow: f03
  Goldsmith Gulch: Plan: P04; Geometry: g01; Flow: f04 (Original for optimization)
  Monaco Pkwy Overflow: Plan: p05; Geometry: g02; Flow: f05 (Original for optimization)
  Goldsmith Gulch _ Support Calculation: Plan: P06; Geometry: g06; Flow: f06
  Southmoor Park Tributary Floodway: Plan: P07; Geometry: g03; Flow: f07
  Goldsmith Gulch Floodway: Plan: P08; Geometry: g01; Flow: f08
  Monaco Pkwy Overflow Floodway: Plan: P11; Geometry: g02; Flow: f10
  Monaco Pkwy @ Iliff Overflow: Plan: p12; Geometry: g07; Flow: f02 (Hardwired)
  Monaco Pkwy @ Iliff Overflow: Plan: p13; Geometry: g01; Flow: f04 (Original for optimization)
  Monaco Pkwy @ Iliff Overflow Floodway: Plan: p14; Geometry: g07; Flow: f12
- GIS files for review comments and responses to review comments
- GIS files for cross sections, raw floodway delineation
- Partial Agreement Table (includes floodway notes)
- Goldsmith Gulch HEC-RAS Flows and Flow Change Locations Table

All of our responses to comments are included in the GIS geodatabase. We also attempted to rectify the floodway notes in Morgan Lynch's July 16 and September 12 emails. please refer to the *FW_Notes* worksheet in the Partial Agreement Table for modeling notes on where atypical encroachments were utilized or where the floodway was set equal to the floodplain limits.

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MEMORANDUM

To: Morgan Lynch, P.E., CFM
Shea Thomas, P.E.

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: February 5, 2021

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 5th Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 4th HEC-RAS Submittal on November 19, 2020. This memo is to document the responses to the previous review comments.

Deliverables include:

- HEC-RAS model: GoldsmithFHAD.prj (FHAD model)
  Floodplain: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Floodway: Plan: P08; Geometry: g01; Flow: f08
- HEC-RAS model: GG_Optimiz.prj (Flow split optimizations model)
  Monaco Pkwy Overflow: Plan: p05; Geometry: g02; Flow: f05
  Goldsmith Gulch _ Support Calculation: Plan: P06; Geometry: g06; Flow: f06
  Goldsmith Gulch: Plan: p04; Geometry: g01; Flow: f04
  Monaco Pkwy @ Iliff Overflow: Plan: p13; Geometry: g01; Flow: f04
- GIS files for cross sections, river baselines, 500-year floodplain delineation, 100-year floodplain delineation, floodway delineation, and project contours
- Flood Profiles
- Agreement Tables (includes floodway notes)
- Goldsmith Gulch HEC-RAS Flows and Flow Change Locations Table

The previous review comments are listed below in blue, with our responses in black:

1) I reviewed the remaining Hydraulic Model comments and those were all addressed. Thank you!
2) As I mentioned to you, I had some issues running some of the models. I tried them all again today, and only had an issue with the Goldsmith Gulch (Main) Floodway Run. I tried re-saving the plan, flow, and geo files – and that did the trick! So I think we're okay there, but I am still attaching the error that popped up when I ran it, for your information.
   Noted. We have also encountered this issue but the resaving fix seems to always work.

3) I checked the two 100-yr model run results (in the hydraulic model and in the floodway model), and I did find some inconsistencies. I added a tab to the front of my edited QAQC table worksheet to highlight the inconsistencies. Please review these and see what's going on.
   The floodway 100-yr reference plan was recreated from a new copy of the 100-yr floodplain plan.

The two plans matched WSELs exactly at first, but after adding the floodway profile some of the 100-yr profile WSELS seemed to change by +/- 0.01 ft. I am not sure how to remedy this since no changes have been made to the 100-yr profile, but I was able to adjust the encroachments to still avoid negative surcharges at all locations except the downstream-most XS of Monaco Pkwy Overflow. Please take a look and let me know your suggestions.

4) Please review the checks within the FPFWDT tabs and try to fix the negative surcharges as we discussed. I wanted to note – I believe there is also one surcharge over 0.50 (0.51), which resulted from my check on the WSE of 100yr and FW runs when I looked at outputs.
   The checks have each been reviewed and encroachments adjusted to remove the minor negative surcharges and the one noted surcharge over 0.50-ft. Note your check columns have been removed for this official submittal, and results transferred to the new FHAD Tables template we received from you on January 27, 2020.

5) I have a few comments on the new Monaco Pkwy Overflow at Iliff Reach, but they are all minor:
   a. Please place bank stations below the 100-yr WSE.
      Bank stations have been lowered.

   b. XS 385 – right side manning's n is 0.15. Is this correct? Looks like previous condition was 0.035.
      N=0.15 is correct, a very high roughness is used to simulate an existing wall that is not reflected in the contours. The same roughness is used in the matching mainstream XS 5957.

   c. Please put the full flow in the Main Stem, regardless of the flow leaving Lateral Structure 6112 to be conservative.
      Full flows have been restored in the main steam.

   d. Please also check that the flows used in this reach are representative of the results from the optimized model. I'm showing different results when I look at structure 6112 in the optimized model.
      The Monaco Pkwy Overflow_Hardwired discharges have been updated to match the latest run of the MonacoIliff_Opt_SF plan. Note we consolidated the various rivers/reaches into one floodplain plan and one floodway plan as requested in your November 4, 2020 email; the split flow optimization runs are now in a separate model.

We acknowledge that there are a number of locations where the proper way to represent flood risk is highly subjective, and look forward to discussing the mapping at these areas with you.

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MEMORANDUM

To: Morgan Lynch, P.E., CFM
Mark Schutte, P.E., CFM

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: May 28, 2021

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 6th Submittal INTERIM Comments Response

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Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 6th HEC-RAS INTERIM Submittal on May 26, 2021. This memo is to document our responses to these comments (in blue). Note the included draft hydraulic model is for reference only, the Goldsmith Gulch West Tributary calculations are still in development.

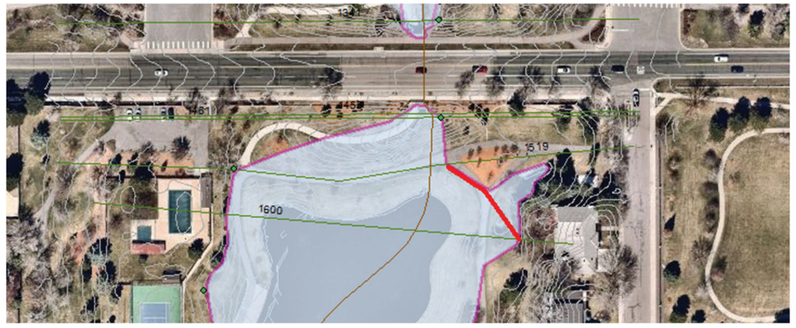
Deliverables include:

- HEC-RAS model: GoldsmithFHAD.prj (FHAD model)
  Floodplain: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Floodway: Plan: P08; Geometry: g01; Flow: f08
  Previous: Plan: P02; Geometry: g02; Flow: f01 (Hardwired)
- GIS files for floodway delineation

Informal May 26, 2021 MHFD Comments:

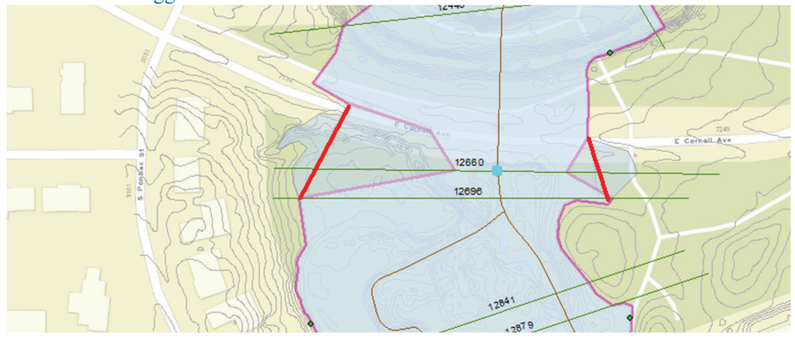
1. Southmoor Trib XS 1396 – FW should be refined to more gradually expand
   Adjusted left encroachments at XS 1396 to expand FW gradually
2. West Trib XS 1600 – in an ineffective area in the delineation Excluded ineffective area as suggested in screenshot

a.



3. Please adjust encroachments (if necessary and possible) at the following cross sections to ensure structures are not in the floodway. Understood that some may already be out of floodway, so please verify and update only as needed:
   a. XS 4715 – 4641 (6495 E Evans Ave) Adjusted encroachments at XS 4715 to exclude structure
   b. XS 5899 – 5719 (2250 Monaco St) Adjusted encroachments at XS 5810 to exclude structure
   c. XS 6593 – 6281 (6821 E Iliff Pl) Adjusted encroachments at XS 6725-6592 to exclude structure
   d. XS 3110 – 3075 (6451 E Jewell Ave) Adjusted encroachments at XS 3110-3075 to exclude structure
4. XS 35526 to 34265 – Verify structures are not in floodway for overflow path downstream of Arapahoe Lake. No structures are within downstream overflow floodway
5. FW=FP in Silo Park. Smooth floodway over Orchard Road. Relaxed encroachments XS 33654-33728 through Silo Park to result in FW=FP, and increased encroachments XS 33565-33596 to smooth FW transition.
6. Upstream of Iliff: Include FW for the entire pond (FW=FP on left side) and remove FW from road on right side (smooth floodway). And if possible, narrow FW downstream of Iliff as well. Relaxed left encroachments XS 6312-6962 to result in FW=FP, and increased encroachments XS 6250-6284 to smooth/narrow FW transition across Iliff. Note these revisions cause some negative floodway surcharges up to -0.04'; it is our understanding that this is acceptable.
7. XS 19483/19493 – adjust encroachments to model full conveyance floodway (remove IEFAs from FW). Adjusted encroachments at XS 19396-19493 to exclude IEFAs from FW. Note that right overbank at XS 19396 is effective flow so the floodway was not changed there.
8. XS 3771/3510 – adjust encroachments to model full conveyance floodway (remove IEFA from FW). Ensure there is a smooth floodway transition to downstream cross sections. Adjusted right encroachments at XS 3771-3510 to exclude low area east of Monaco Pkwy. Also adjusted right encroachment at XS 3453 to provide smooth FW transition across Jewell Ave.
9. Adjust the floodway in Cook Park appears to be full conveyance floodway (remove IEFAs) Adjusted right encroachments at XS 294-595 to exclude IEFAs.
10. Please adjust the Floodway at Cornell: Adjusted encroachments at XS 12660 to provide smoother transition as suggested in screenshot

a.



11. Potential to get Tamarac out of the floodway with -0.04 surcharge (THIS IS ROUGH BUT CAN BE DONE): Adjusted right encroachments at XS 17647-17134 as suggested to exclude roadway

Lower	18154	100-Year	67.21	228.57	8.22	5513.41	5513.41	
Lower	18154	Floodway	67.21	228.86	8.21	5513.42	5513.41	0.00
Lower	17875	100-Year	72.99	277.80	6.76	5512.32	5512.32	
Lower	17875	Floodway	72.99	282.15	6.66	5512.38	5512.32	0.06
Lower	17873	100-Year	73.11	282.47	6.65	5512.29	5512.29	
Lower	17873	Floodway	73.11	286.54	6.56	5512.34	5512.29	0.06
Lower	17647	100-Year	89.12	351.70	5.34	5511.71	5511.71	
Lower	17647	Floodway	72.40	336.95	5.58	5511.70	5511.71	0.00
Lower	17645	100-Year	89.21	357.91	5.25	5511.71	5511.71	
Lower	17645	Floodway	72.40	343.58	5.47	5511.72	5511.71	0.00
Lower	17384	100-Year	93.37	271.17	6.93	5509.90	5509.90	
Lower	17384	Floodway	85.70	266.04	7.06	5509.86	5509.90	-0.04
Lower	17200	100-Year	93.41	291.82	6.44	5508.54	5508.54	
Lower	17200	Floodway	79.00	326.37	5.76	5509.02	5508.54	0.48
Lower	17134	100-Year	128.30	383.76	6.03	5508.42	5508.42	
Lower	17134	Floodway	84.38	411.18	5.56	5508.92	5508.42	0.50
Lower	17097		Culvert					
Lower	17055	100-Year	77.80	300.92	6.81	5506.56	5506.56	
Lower	17055	Floodway	77.97	302.75	6.77	5506.58	5506.56	0.02
Lower	16950	100-Year	92.89	331.07	6.19	5506.27	5506.27	

148	18154	1	79.96	147.17
149	17875	1	77.6	150.59
150	17873	1	77.06	150.17
151	17647	1	77.6	150
152	17645	1	77.6	150
153	17384	1	129.3	215
154	17200	1	41	120
155	17134	1	30.62	115
156	17097 Culv			
157	17055	1	35.43	115
158	16950	1	34.49	136.33

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MEMORANDUM

To: Morgan Lynch, P.E., CFM
Mark Schutte, P.E., CFM

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: June 4, 2021

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 6th Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 5th HEC-RAS Submittal on March 9, 2021. This memo is to document the responses to the previous review comments. This submittal includes a major revision to approximately 3,800 linear feet of the West Tributary, from the Bridgwater development to Orchard Road – model geometry, floodway encroachments, and mapping were revised to reflect updated drone topography flown in April 2021. We also made an interim mapping submittal to expedite the public meeting preparation, resolved comments from this May 2021 interim submittal are attached.

Deliverables include:

- HEC-RAS model: GoldsmithFHAD.prj (FHAD model)
  Floodplain: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Floodway: Plan: P08; Geometry: g01; Flow: f08
- GIS files for review comments and responses to review comments
- GIS files for cross sections, river baselines, modeled levees, 500-year floodplain delineation, 100-year floodplain delineation, floodway delineation, and project contours
- Flood Profiles
- Agreement Tables (includes floodway notes)

General Comments: *Review Step 3 – Flood Hazard Review*

1. High level comments are provided in the comment geodatabase for the floodway, 100-yr floodplain, and 500-yr floodplain.
   Specific comment responses are included in the attached geodatabase.

2. Please verify that floodplain equals floodway in all online detention ponds. This is prioritized over full conveyance floodway, where IEFAs would otherwise cause encroachments to constrict the floodway.
   Floodway encroachments have been set to floodplain limits within online detention ponds.

3. More detailed comments are also provided in the geodatabase for the 100-yr floodplain and in some instances for the floodway and 500-yr floodplain. Most of these 100-yr comments recur frequently throughout the delineation. Please review both the floodway and 500-yr floodplain and resolve the same typical comments where applicable.
   We have attempted to apply the commented revisions to the floodway and 500-yr floodplain delineations.

4. The City and County of Denver was given an opportunity to provide review comments on this submittal. MHFD reviewed and provided comment responses to these. These comments and comment responses have been attached. Red comments should be addressed, blue comments require additional explanation from CCD, yellow comments do not need to be addressed.
   The red comments have been reproduced below and responses provided.

Reproduced relevant CCD comments (dated February 24, 2021)

1. **General:** •

- The GIS files do not include lateral structures. Can those be included in future submittals?

We will include lateral structures in future submittals.

2. **GG Lower, 669-1697:** Right overbank lateral structures defined between cross sections 669 and 1216 and between cross sections 1467 and 1697 show a spill that is not mapped. Some of the area of Cook Park had been mapped as SFHA in previous iterations of this FHAD, but the current mapping submittal shows much of the park area free of flooding. Please check and map flooding using normal depth or some other method. A number of GG lower cross sections are vertically extended on the right overbank, indicating that flooding is not contained in the section as defined. Please fix the floodplain boundary accordingly.
We delineated the Cook Park shallow flooding with normal depth methods.

3. **GG Lower, 2669-3453:** The mapping through reach of GG (lower) that runs through Skyline Acres is concerning because it is much more expansive than effective mapping and shows structures inundated. It is necessary to determine if the 679 cfs modeled in this reach does in fact go through the channel through this property. The flow split occurs at the upstream end of the culvert that starts in the south side of E Jewell Ave. Some of the 2368 cfs discharge upstream of the culvert entrance does to into the culvert, but the portion that does not, that flows overland may or may not go into the channel running through Skyline Acres. Is there some documentation of an analysis to show that all 670 cfs goes into that channel? It appears that at least some portion of the overland flow is conveyed in the roadway section of S Monaco St Pkwy. In comment responses, please note the discharge that had been modeled through this area in the effective hydraulic model. A 0.5' rise floodway needs to be defined through this reach. It is recommended to also incorporate ineffective flow areas into the base model. Revise floodway.
S Monaco Street is included within the right overbank of the modeled cross sections; there is not significant high ground between the channel and the street so it is appropriate (at base flood discharge) to use a single reach instead of trying to separate flows. The revised project flows are higher than effective at this location, particularly the 500-year event which is almost 70% higher than effective. The detailed discussion of this flow split analyses will be included in the report. We have added ineffective flow areas for the northbound lanes of the street. We have revised encroachments to create a 0.5' rise floodway though this area.

4. **GG Lower, 5343-5431:** Please revise floodplain boundary to not map the Wendy's in the floodplain. Visual inspect reveals that it is unlikely that the structure is inundated.
We adjusted the floodplain delineation between cross sections as requested.

6. **GG Lower, 13576-13901:** The floodplain is dramatically expanded upstream of the pedestrian bridge in Hutchinson Park, now nearly reaching the structure at 7395 E Eastman Ave, apparently due to a sharp increase in WSEL upstream of the bridge opening. The cross sections appear to show that there is capacity for the 100-year discharge. It is worth double-checking all model input to ensure this flooding is correct. The floodplain boundary is close enough to this building that it may be important to check the elevation at the base of the structure to determine if it's inundated. Otherwise, the mapping appears to be consistent with model output.
We have checked the model inputs and they are consistent with modeling approaches through this reach. The structure is outside the 100-year mapped floodplain limits.

7. **GG Lower, 15309-16121:** Please explain the modeling approach at E Hampden Ave along GG (lower). Upstream of the culvert under the parking lot, there are 2165 cfs, of which 317 continue overland (presumably the other portion goes into the culvert). On the south side of E Hampden Ave, the 317 cfs disappears. Explain. Is it believed that the culvert has additional capacity at this middle location and the 317 cfs is captured by the inlets? Do the inlets also capture the 138 cfs from Southmoor Trib (upper) that is conveyed in the E Hampden Ave reach? The model has 0.1 cfs in cross sections 15499, 15384 and 15326. The mapping indicates that E Hampden Ave is overtopped, but the cross sections have essentially no flow. If there is (effectively) no flow in the three cross sections, then there should be no flooding across E Hampden Ave. The only reason for that, is due to the cross sections having a forced WSEL above the DS and US WSELs. This is erroneous. There should be a better way to model this area, or to at least define the floodplain appropriately. It is worth making clear whether E Hampden Ave is overtopped, and the modeling appears to indicate that it isn't. Please consider changing the modeling to use inline structures with rating curves at the crossings of E Yale Ave, E Hampden Ave, E Temple Dr. Enter rating tables from the baseline hydrology report. Include notes in HEC-RAS model to indicate source of rating table data. It may be possible to enter culvert geometry, but to prevent conveyance through them. This may be useful as a way of incorporating that graphical representation of the culverts.
As noted, the model shows that Hampden Ave does not overtop due to Goldsmith Gulch flooding. However, overflows from Southmoor Trib run east within Hampden Ave during the base flood. These overflows will collect in the sag point of the roadway, which is located above the Goldsmith Gulch alignment. The floodplain delineations were joined graphically to show combined flood risks.
We have already accounted for the rating tables at these crossings.

10. **GG Lower, 22658:** At the downstream end of Wallace Park North (22658), the WSEL is 5256.13. According to the baseline hydrology report, the min weir elevation is 5557.53. There is a headwall that passes through the area behind the culvert entrance, running along the Interstate 225 onramp. The baseline hydrology report states that the "pond does not appear to overflow." And, the stage-discharge table indicates that at the WSEL of 5556.13, the culvert has capacity for the 846 cfs. So, it is unclear why the area "downstream" of the culvert entrance is being mapped as floodplain. There is clearly low ground beyond the culvert entrance and headwall. Mapping shows much of the northbound travel lane of S DTC Blvd (and the I-225 onramp) as being flooded, with flooding that extends through the I-225 bridge over S DTC Blvd, down to cross section 22032, where the surface flows return to GG. There is no information to indicate what discharge flows overland through this area, or how the limits of the flooding were determined. It appears that at the upstream end of this area, just DS of cross section 22658, that the flooded area is based on the WSEL of 5556.13. Please verify. Did the structure survey include data along the "weir crest" or top of the wall? Is there a need to map the area west of the area shown as flooded due to the fact that it is hydraulically connected by storm sewers?

Our apologies this was a mapping error: the base flood does not overtop the wall and the floodplain delineation along S DTC Blvd (between XS 22658 and 22032) will be removed. Mapping storm drain connected low spots is outside the scope of this FHAD.

11. **GG Lower, 22658:** Just upstream of cross section 22658, the floodplain boundary expands abruptly out into the right overbank area, crossing a number of contours, mapping an area of high ground. This does not make sense. Please check. It does not look possible for flood flows to jump up into that area unless it is considered to be hydraulically connected by the storm sewer pipes, or that the area should be mapped due to the higher intermediate ground being a non-levee feature. If that is the case, then it might be better to map the area "behind" the non-levee feature as being flooded, but not the intermediate high ground, so a "disconnected" flood hazard area.
This disconnected ineffective flow area in the right overbank has an average base flood depth of less than 6 inches and has been excluded from the floodplain (and floodway) delineation.

13. **GG Lower, 24909-25524:** The structure located on east side of Wallace Park South that is being mapped into floodplain, should not be in the floodway. Revise floodway. While it is important to protect detention storage and so the flood pool would otherwise be mapped as floodway, in this case, it is advisable to set the encroachment stations along the west edge of the street.
We have restricted the floodway encroachments as suggested. Note that we incorporated more recent survey of this area to more accurately define flood risks to these homes and streets.

15. **Southmoor Trib Upper, 3436:** Southmoor Trib (upper), cross section 3436 has blocked obstruction up to the elevation of the top of wall(?) (5224), but does not reach to the top of the fence. Explain model input for this location. Modify if necessary, to include full height of wooden privacy fence. Add notes to HEC-RAS model to provide information about the blocked obstruction. The floodway encroachment stations (rt) at this location appear to be too dramatic. The right floodway encroachment station is 20'-30' east of the end of the fence and may not be appropriate. It may be that Denver requires removal of the fence (TBD). Cross section geometry is not correct, does not match topographic data (contours). It is critical for the modeling to be accurate and precise at this location to ensure that the structure is only mapped into the floodplain if it is subject to flood risk. It may be beneficial to add cross section this area. It is not clear that there is a low point in the right side of the section. This affects whether there is flooding in the isolated low point in the next downstream cross section (3314). It may be necessary to use ineffective flow for the area on the right side of cross section 3314 (sta. 265.23-sta. 300.99) and not map that area as inundated. It does appear possible that this structure (Walgreens) is inundated. Check Manning's n values on cross sections along Southmoor Trib (upper) DS of Southmoor Park – all-paved surfaces may warrant lower Manning's n values, but must also recognize surface features such as light poles, landscaping, etc. Provide justification and include information in HEC-RAS model notes.
We removed the floodway delineation through the parking lot. We believe the cross section geometry matches the contours. We added ineffective flow area to XS 3314 as suggested. However, please note that XS 3436 and 3314 are not intended to model open channel flow, these locations are within influence of the detention pond and water surface elevations are controlled by a rating curve (associated with the pond outlet). Adding additional cross sections, ineffective flow areas, or changing the geometry would not change the results or provide additional guidance. Buildings have been modeled as n=0.15 at this location, and parking lots modeled as n=0.035 to reflect minor obstructions such as parked cars, islands, fences and light poles.

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MEMORANDUM

To: Morgan Lynch, P.E., CFM
Mark Schutte, P.E., CFM

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: August 31, 2021

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Model Review _ 7th Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 6th HEC-RAS Submittal on August 5, 2021. This memo is to document the responses to the previous review comments. We are providing the Draft FHAD report and report checklist for your review.

Deliverables include:

- HEC-RAS model: GoldsmithFHAD.prj (FHAD model)
  Floodplain: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Floodway: Plan: P08; Geometry: g01; Flow: f08
- GIS files for review comments and responses to review comments
- GIS files for cross sections, river baselines, modeled levees, 500-year floodplain delineation, 100-year floodplain delineation, floodway delineation, and project contours
- Agreement Tables (includes floodway notes)
- GSG_FHAD_Tables_MHFD Check.xlsx (includes responses)
- Goldsmith Gulch Flood Hazard Area Delineation DRAFT report
- Exhibit D – DFHAD Studies Report Checklist

General Comments: ***Review Step 3 – Flood Hazard Review***

1. Please review the "GSG_FHAD_Tables_MHFD Check.xlsx" spreadsheet provided. Conditional formatting has been table values do not possess expected values based on the model or map.

We have gone through all the highlighted discrepancies and provided responses in cell notes (see attached file). Almost all of the Map Agreement Table discrepancies were already noted and explained in the Comments field of the previously submitted Agreement Tables. The most common discrepancy is where we intend to set Floodway = 100-year Floodplain but omitted encroachments in the floodway model to avoid negative surcharges. There were also some locations where the model used to perform these checks was not the same as the submitted model (it probably contained revisions made to inform other comments). We did revise the FPFWDT floodway width formulas to use Sta W.S. output instead of Enc Sta output (like the check uses), this addresses many locations where the spreadsheet was showing zero width due to no encroachments or incorrect widths where encroachments had been set at IEFA beyond the FP100 limits. Note the check spreadsheet also highlighted a large number of very small (+/- 0.01 ft) variances in the HGL Surcharge and EGL Surcharge fields, we believe this is due to HEC-RAS rounding differences between the Prof Delta WS/EG output and manually subtracting the W.S./E.G. Elev

between plans. We were previously directed by MHFD to use the subtraction method; we have kept this method in the FPFWDT since the rounding variances are insignificant.

2. In general the 500-yr floodplain delineation appears to have been updated appropriately. Some comments were supplied in the file geodatabase impacting that delineation, but the entire delineation should be reviewed again to ensure comments like those provided are addressed everywhere.

We addressed the comments in the geodatabase and tried to apply a consistent level of detailed mapping throughout the study.

707 17th Street, Suite 3150
Denver, Colorado 80202
(303) 572-0200

MEMORANDUM

To: Morgan Lynch, P.E., CFM
Mark Schutte, P.E., CFM

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: March 8, 2022

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Flood Hazard Review _ 8th Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 7th Submittal (HEC-RAS, mapping, and report) on October 14, 2021. This memo is to document the responses to the previous review comments. We are providing the revised FHAD report, mapping, and report checklist for your review.

Deliverables include:

- HEC-RAS model: GoldsmithFHAD.prj (FHAD model)
  Floodplain: Plan: P01; Geometry: g01; Flow: f01 (Hardwired)
  Floodway: Plan: P08; Geometry: g01; Flow: f08
- GIS files for review comments and responses to review comments
- GIS files for cross sections, river baselines, modeled levees, 500-year floodplain delineation, 100-year floodplain delineation, 100-year shallow flooding delineation, floodway delineation, and project contours
- Agreement Tables (includes floodway notes)
- Goldsmith Gulch Flood Hazard Area Delineation report
- Exhibit D – DFHAD Studies Report Checklist

General Comments: ***Review Step 3 – Flood Hazard Review***

1. Outside of the comments provided in the comment geodatabase, redlined comments have been provided in the FHAD report.

We addressed the open comments in the geodatabase and the report pdf. Responses are provided in each respective document.

2. Comments from Greenwood Village and Denver have also been provided at the above link. Please review and address all comments unless you feel discussion is warranted.

We addressed the municipality comments and provided responses in each respective document.

Goldsmith Gulch FHAD DRAFT_MHFD comments.pdf Markup Summary

Highlight (49)

Subject: Highlight
Page Label: 6
Author: hho
Date: 10/13/2021 10:11:37 AM
Status: Completed set by ben_liu on 3/4/2022 at 4:53:49 PM
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Please remove the website link because this is not a permanent website. The project website will be closed out approximate 6 months after the acceptance from CWCB.

Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
Date: 2/8/2022 2:39:36 PM
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tory of roadwa
in **Table B-7**.

Subject: Highlight
Page Label: 7
Author: hho
Date: 10/13/2021 10:19:55 AM
Status: Completed set by ben_liu on 3/4/2022 at 5:20:03 PM
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It is slightly strange to keep this table in Appendix B Hydrology while discussing crossing survey which is included in Appendix C.
Please finish the column "Baseline Hydrology Report Capacity" or delete it.

Subject: Sticky Note
Page Label: 7
Author: ben_liu
Date: 3/4/2022 5:20:00 PM
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Moved table to Appendix C and deleted capacity column

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gery Assoc., June 1976
c., November 1977
1989 (1989 Study)
994 (1989 Study Appendix)
er 2004
ociates, April 2005
nith Gulch Moser & Associ

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Author: hho
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Status: Completed set by ben_liu on 3/4/2022 at 5:20:42 PM
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Is this correct?

Subject: Sticky Note
Page Label: 7
Author: robert_krehbiel
Date: 2/8/2022 2:47:15 PM
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Goldsmith Gulch, Moser & Associates,

tober 2007
ed September 22, 2014
EMA, September 14, 2018 (2018 FIS)
porated Areas, February 17, 2017 (2017

provements, March 11, 2011
stream of Peakview Ave, June 28, 2013

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Page Label: 7
Author: hho
Date: 10/13/2021 10:29:20 AM
Status: Completed set by ben_liu on 3/4/2022 at 5:21:33 PM
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Shall the latest, September 4, 2020, be referenced?

Subject: Sticky Note
Page Label: 7
Author: robert_krehbiel
Date: 2/8/2022 2:48:36 PM
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Subject: Highlight
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Date: 10/13/2021 10:30:58 AM
Status: Completed set by ben_liu on 3/4/2022 at 5:21:36 PM
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Shall the latest, September 4, 2020, be referenced?

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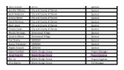

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Author: hho
Date: 10/13/2021 10:36:56 AM
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Do know where should be putting this guy?
It may be okay to be here.

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Page Label: 7
Author: robert_krehbiel
Date: 2/8/2022 2:49:33 PM
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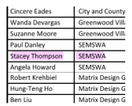

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Date: 10/13/2021 10:38:29 AM
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It is likely okay to be here.

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Author: robert_krehbiel
Date: 2/8/2022 2:47:53 PM
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Subject: Highlight
Page Label: 16
Author: hho
Date: 10/13/2021 10:41:35 AM
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Do we want the figure title to be named FHAD, or it is okay as is?

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Page Label: 17
Author: hho
Date: 10/13/2021 10:41:56 AM
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Do we want the figure title to be named FHAD, or it is okay as is?

Subject: Highlight
Page Label: 23
Author: hho
Date: 10/13/2021 10:43:23 AM
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Do we want the figure title to be named FHAD, or it is okay as is?

Subject: Highlight
Page Label: 29
Author: hho
Date: 10/13/2021 10:45:47 AM
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Do we want the figure title to be named FHAD, or it is okay as is?

Subject: Highlight
Page Label: 30
Author: hho
Date: 10/13/2021 10:45:56 AM
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Do we want the figure title to be named FHAD, or it is okay as is?

Subject: Highlight
Page Label: 39
Author: hho
Date: 10/13/2021 10:47:07 AM
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Do we want the figure title to be named FHAD, or it is okay as is?

Subject: Highlight
Page Label: 31
Author: hho
Date: 10/13/2021 10:52:52 AM
Status: Completed set by ben_liu on 3/5/2022 at 8:05:05 PM
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Do we have approved the hydrology when the baseline hydrology report submittal?

Subject: Sticky Note
Page Label: 31
Author: robert_krehbiel
Date: 2/8/2022 2:59:47 PM
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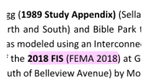
Changed to August 17, 2018



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Author: hho
Date: 10/13/2021 10:58:28 AM
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Shall the latest, September 4, 2020, be referenced?

Subject: Sticky Note
Page Label: 31
Author: robert_krehbiel
Date: 2/8/2022 3:03:27 PM
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Subject: Highlight
Page Label: 31
Author: hho
Date: 10/13/2021 11:04:43 AM
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Do we want to include this statement in FHAD report?

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Author: robert_krehbiel
Date: 2/8/2022 2:54:20 PM
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Subject: Highlight
Page Label: 31
Author: hho
Date: 10/13/2021 11:14:10 AM
Status: Completed set by ben_liu on 3/5/2022 at 8:05:27 PM
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Do we want to include this statement in FHAD report, or reword it to provide the condition for eligible inclusion in baseline hydrology?
“To include Arapahoe Lake in the baseline hydrology, it would …”

Subject: Sticky Note
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Author: robert_krehbiel
Date: 2/8/2022 3:02:50 PM
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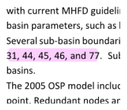

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Author: hho
Date: 10/13/2021 11:30:59 AM
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Shall the new sub-basin numbering be used, or it is okay as is? The future user will reference to the update schematic.

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Page Label: 32
Author: ben_liu
Date: 3/5/2022 8:12:38 PM
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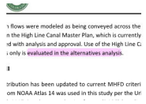
Revised



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Subject: Sticky Note
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Author: robert_krehbiel
Date: 2/8/2022 3:05:54 PM
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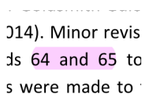

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Page Label: 32
Author: hho
Date: 10/13/2021 11:54:12 AM
Status: Completed set by ben_liu on 3/5/2022 at 8:14:19 PM
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merge into ? sub-basin number

Subject: Sticky Note
Page Label: 32
Author: ben_liu
Date: 3/5/2022 8:14:16 PM
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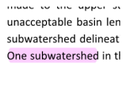
Revised



Subject: Highlight
Page Label: 32
Author: hho
Date: 10/13/2021 11:56:15 AM
Status: Completed set by ben_liu on 3/5/2022 at 8:20:17 PM
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It would be better to be able to know which sub-basin.

Subject: Sticky Note
Page Label: 32
Author: ben_liu
Date: 3/5/2022 8:20:13 PM
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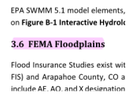
Revised



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Author: hho
Date: 10/13/2021 12:40:09 PM
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Update or good as is?

Subject: Sticky Note
Page Label: 35
Author: ben_liu
Date: 3/5/2022 8:21:49 PM
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Did not update the heading, but the listed map panels were revised per Denver comments.

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Page Label: 38
Author: hho
Date: 10/13/2021 1:27:38 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:27:46 PM
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Detention rating curve has nothing to do with the timing of upstream detention.
The Wallace Park North detention's 1989 Study rating curve has a significant peak storage because of erroneous spillway crest that has been confirmed with the MHFD Survey 2018. The same error has been corrected to the rating curves for Orchard Hills and Southmoor Park Detentions.

Subject: Sticky Note
Page Label: 38
Author: robert_krehbiel
Date: 2/8/2022 3:24:43 PM
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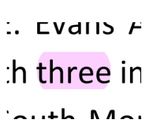
corrected



Subject: Highlight
Page Label: 45
Author: hho
Date: 10/13/2021 1:40:18 PM
Status: Rejected set by ben_liu on 3/5/2022 at 8:31:24 PM
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two or three? The depiction indicates two.

Subject: Sticky Note
Page Label: 45
Author: ben_liu
Date: 3/5/2022 8:31:19 PM
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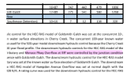
Three: we counted 2 profiles for the separate reaches of Monaco Pkwy (they are not contiguous)



Subject: Highlight
Page Label: 48
Author: hho
Date: 10/13/2021 1:58:23 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:48:48 PM
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Please confirm that two junctions were described in the previous sections which do not include this Manaco Pkwy Overflow at Iliff.

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Page Label: 48
Author: ben_liu
Date: 3/5/2022 8:48:45 PM
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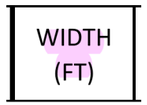
3rd junction description added to previous section.



Subject: Highlight
Page Label: 398
Author: hho
Date: 10/13/2021 2:32:45 PM
Status: Completed set by ben_liu on 3/5/2022 at 9:07:08 PM
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Round to the nearest whole number.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/5/2022 9:07:01 PM
Status: Completed set by ben_liu on 3/5/2022 at 9:07:08 PM
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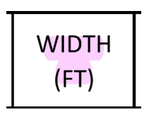
Revised



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Round to the nearest whole number.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/5/2022 9:06:57 PM
Status: Completed set by ben_liu on 3/5/2022 at 9:07:08 PM
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Revised

Subject: Highlight
Page Label: 398
Author: hho
Date: 10/13/2021 2:33:12 PM
Status: Completed set by ben_liu on 3/5/2022 at 9:07:08 PM
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Round to the nearest whole number.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/5/2022 9:06:50 PM
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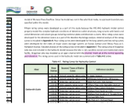
Revised



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Author: hho
Date: 10/13/2021 2:39:49 PM
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Please add the similar note on the flood profile sheet.

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Author: mschutte
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stakeholders (typical). MHFD is the only sponsor, the impacted communities are stakeholders.

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Author: robert_krehbiel
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Page Label: 6
Author: mschutte
Date: 10/13/2021 9:47:57 PM
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Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
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Subject: Highlight
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Author: mschutte
Date: 10/13/2021 9:51:26 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:51:57 PM
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MHFD is the sponsor, all others are impacted communities or stakeholders.

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Page Label: 6
Author: robert_krehbiel
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Subject: Highlight
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Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
Date: 2/8/2022 2:35:33 PM
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of the watershed, attempts
mapping components and th
Topographic Contours
One-foot, LIDAR-derive
drainage basin bound
Geological Survey (US

Subject: Highlight
Page Label: 6
Author: mschutte
Date: 10/13/2021 9:52:23 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:54:13 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
Date: 2/8/2022 2:42:55 PM
Status:
Color:
Layer:
Space:

Changed to Topography

9.7

Subject: Highlight
Page Label: 10
Author: mschutte
Date: 10/13/2021 10:03:04 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:33:44 PM
Color:
Layer:
Space:

verify

Subject: Sticky Note
Page Label: 10
Author: ben_liu
Date: 3/4/2022 5:33:33 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:33:44 PM
Color:
Layer:
Space:

Verified length

9.7

Subject: Highlight
Page Label: 10
Author: mschutte
Date: 10/13/2021 10:03:47 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:33:44 PM
Color:
Layer:
Space:

verify

Subject: Sticky Note
Page Label: 10
Author: ben_liu
Date: 3/4/2022 5:33:36 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:33:44 PM
Color:
Layer:
Space:

Verified length

5

Subject: Highlight
Page Label: 10
Author: mschutte
Date: 10/13/2021 10:08:48 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:33:44 PM
Color:
Layer:
Space:

verify

Subject: Sticky Note
Page Label: 10
Author: ben_liu
Date: 3/4/2022 5:33:39 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:33:44 PM
Color:
Layer:
Space:

Verified length

x	Rise/ Length (feet)^2

Subject: Highlight
Page Label: 10
Author: mschutte
Date: 10/13/2021 10:08:48 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:32:45 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 10
Author: ben_liu
Date: 3/4/2022 5:33:18 PM
Status:
Color:
Layer:
Space:

Removed x column, Rise/length is explained in note 2

5%*

Subject: Highlight
Page Label: 34
Author: mschutte
Date: 10/13/2021 10:33:01 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:20:46 PM
Color:
Layer:
Space:

Explain what the asterisk means?

Subject: Sticky Note
Page Label: 34
Author: robert_krehbiel
Date: 2/8/2022 3:12:32 PM
Status:
Color:
Layer:
Space:

Per CUHP Guidance Document for routing elements

Subject: Sticky Note
Page Label: 34
Author: ben_liu
Date: 3/5/2022 8:20:43 PM
Status:
Color:
Layer:
Space:

Revised

208G and 08
3). All other LC

Subject: Highlight
Page Label: 35
Author: mschutte
Date: 10/13/2021 10:36:43 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:25:08 PM
Color:
Layer:
Space:

verify this is accurate, there are several LOMRs representing the effective model in the lower section

Subject: Sticky Note
Page Label: 35
Author: ben_liu
Date: 3/5/2022 8:25:05 PM
Status:
Color:
Layer:
Space:

Removed the LOMR discussion since the 2020 FIS incorporates 15-08-0521P also.

modelled
"Final" u
updates a

Subject: Highlight
Page Label: 35
Author: mschutte
Date: 10/13/2021 10:42:14 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:22:00 PM
Color:
Layer:
Space:

Baseline

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 2/8/2022 3:14:12 PM
Status:
Color:
Layer:
Space:

changed

Subject: Highlight
Page Label: 37
Author: mschutte
Date: 10/13/2021 10:47:10 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:26:49 PM
Color:
Layer:
Space:

Is the change in density limited to the upper basin?

Subject: Sticky Note
Page Label: 37
Author: robert_krehbiel
Date: 2/8/2022 3:19:31 PM
Status:
Color:
Layer:
Space:

Yes, only upper watershed south of Belleview Avenue

Subject: Sticky Note
Page Label: 37
Author: ben_liu
Date: 3/5/2022 8:26:46 PM
Status:
Color:
Layer:
Space:

Revised previous sentence to say upper watershed.

of 549 cr

Subject: Highlight
Page Label: 45
Author: mschutte
Date: 10/13/2021 11:01:32 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:37:21 PM
Color:
Layer:
Space:

verify

Subject: Sticky Note
Page Label: 45
Author: ben_liu
Date: 3/5/2022 8:37:28 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Highlight
Page Label: 49
Author: mschutte
Date: 10/13/2021 11:01:32 PM
Status: Completed set by ben_liu on 3/5/2022 at 9:05:06 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 49
Author: ben_liu
Date: 3/5/2022 9:05:04 PM
Status:
Color:
Layer:
Space:

Revised

on of the hydraul
ere delineated uti
l locations, equal

Subject: Highlight
Page Label: 49
Author: mschutte
Date: 10/13/2021 11:03:58 PM
Status: Completed set by ben_liu on 3/5/2022 at 9:05:23 PM
Color:
Layer:
Space:

developed?

Subject: Sticky Note
Page Label: 49
Author: robert_krehbiel
Date: 2/8/2022 3:32:02 PM
Status:
Color:
Layer:
Space:

defined

Inserted Text (8)

atrix) was retained b
District (UDFCD) to
: is ~~co-sponsored~~ by
od Village), Southea
rding the FHAD stud

Subject: Inserted Text
Page Label: 6
Author: hho
Date: 10/13/2021 10:01:50 AM
Status: Completed set by ben_liu on 3/4/2022 at 4:53:03 PM
Color:
Layer:
Space:

sponsored
MHFD is the sole sponsor.

Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
Date: 2/8/2022 2:37:12 PM
Status:
Color:
Layer:
Space:

changed

Subject: Inserted Text
Page Label: 6
Author: hho
Date: 10/13/2021 9:28:28 AM
Status: Completed set by ben_liu on 3/4/2022 at 4:52:52 PM
Color:
Layer:
Space:

and

Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
Date: 2/8/2022 2:37:01 PM
Status:
Color:
Layer:
Space:

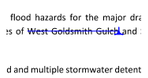
changed

Subject: Inserted Text
Page Label: 6
Author: hho
Date: 10/13/2021 9:33:34 AM
Status: Completed set by ben_liu on 3/4/2022 at 4:53:16 PM
Color:
Layer:
Space:

are communities impacted by this FHAD.

Subject: Sticky Note
Page Label: 6
Author: robert_krehbiel
Date: 2/8/2022 2:42:21 PM
Status:
Color:
Layer:
Space:

changed



Subject: Inserted Text
Page Label: 6
Author: hho
Date: 10/13/2021 9:36:35 AM
Status: Completed set by ben_liu on 3/4/2022 at 4:53:33 PM
Color:
Layer:
Space:

Goldsmith Gulch West Tributary

Subject: Inserted Text
Page Label: 31
Author: hho
Date: 10/13/2021 10:48:18 AM
Status: Completed set by ben_liu on 3/5/2022 at 8:04:32 PM
Color:
Layer:
Space:

Gulch

Subject: Sticky Note
Page Label: 31
Author: robert_krehbiel
Date: 2/8/2022 2:53:42 PM
Status:
Color:
Layer:
Space:

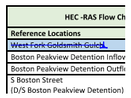
added

Subject: Inserted Text
Page Label: 31
Author: hho
Date: 10/13/2021 10:58:02 AM
Status: Completed set by ben_liu on 3/5/2022 at 8:05:39 PM
Color:
Layer:
Space:

hydrology of

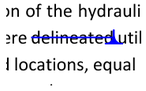
Subject: Sticky Note
Page Label: 31
Author: robert_krehbiel
Date: 2/8/2022 3:03:19 PM
Status:
Color:
Layer:
Space:

added



Subject: Inserted Text
Page Label: 47
Author: hho
Date: 10/13/2021 1:48:46 PM
Status: Completed set by ben_liu on 3/5/2022 at 8:38:01 PM
Color:
Layer:
Space:

Goldsmith Gulch West Tributary



Subject: Inserted Text
Page Label: 49
Author: hho
Date: 10/13/2021 2:08:06 PM
Status: Rejected set by ben_liu on 3/5/2022 at 9:05:37 PM
Color:
Layer:
Space:

encroached?

Rectangle (1)

Subject: Rectangle
Page Label: 7
Author: hho
Date: 10/13/2021 10:34:31 AM
Status: Completed set by ben_liu on 3/4/2022 at 5:20:22 PM
Color:
Layer:
Space:

Do we want call them sponsors?

Subject: Sticky Note
Page Label: 7
Author: robert_krehbiel
Date: 2/8/2022 2:46:05 PM
Status:
Color:
Layer:
Space:

Stakeholder

Sticky Note (1)

Subject: Sticky Note
Page Label: 7
Author: mschutte
Date: 10/13/2021 9:55:39 PM
Status: Completed set by ben_liu on 3/4/2022 at 5:20:55 PM
Color:
Layer:
Space:

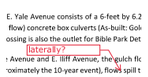
Stakeholder

Subject: Sticky Note
Page Label: 7
Author: robert_krehbiel
Date: 2/8/2022 2:47:21 PM
Status:
Color:
Layer:
Space:

changed

Goldsmith Gulch FHAD DRAFT - CCD Review 20211011_MHFD comments.pdf Markup Summary

Callout (62)



Subject: Callout
Page Label: 18
Author: 137820
Date: 10/7/2021 4:09:00 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:17:15 PM
Color:
Layer:
Space:

laterally?

Subject: Sticky Note
Page Label: 18
Author: robert_krehbiel
Date: 2/8/2022 2:18:55 PM
Status:
Color:
Layer:
Space:

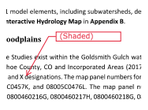
added

Subject: Callout
Page Label: 18
Author: 137820
Date: 10/7/2021 4:11:14 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:17:04 PM
Color:
Layer:
Space:

(because the detention pond bottom is lower than the channel invert and cannot be gravity drained)

Subject: Sticky Note
Page Label: 18
Author: robert_krehbiel
Date: 2/8/2022 2:18:49 PM
Status:
Color:
Layer:
Space:

added

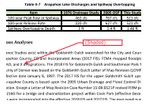


Subject: Callout
Page Label: 35
Author: 137820
Date: 10/7/2021 4:31:28 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:18:40 PM
Color:
Layer:
Space:

(Shaded)

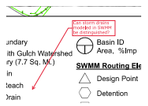
Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 2/8/2022 2:21:14 PM
Status:
Color:
Layer:
Space:

added



Subject: Callout
Page Label: 50
Author: 137820
Date: 10/7/2021 5:37:46 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:51:33 AM
Color:
Layer:
Space:

(Shaded)



Subject: Callout
Page Label: 95
Author: 137820
Date: 10/7/2021 5:43:17 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:37:53 AM
Color:
Layer:
Space:

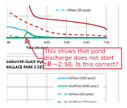
Can storm drains modeled in SWMM be distinguished?

Subject: Sticky Note
Page Label: 95
Author: mschutte
Date: 10/14/2021 2:28:39 PM
Status: Accepted set by ben_liu on 3/2/2022 at 11:37:49 AM
Color:
Layer:
Space:

I don't think this is worth the effort.

Subject: Sticky Note
Page Label: 95
Author: ben_liu
Date: 3/2/2022 11:39:40 AM
Status:
Color:
Layer:
Space:

Agreed. Baseline Hydrology, including this figure, was already approved in 2018.



Subject: Callout
Page Label: 98
Author: 137820
Date: 10/7/2021 5:45:34 PM
Status: Accepted set by ben_liu on 3/2/2022 at 11:40:35 AM
Color:
Layer:
Space:

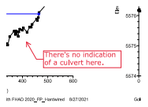
This shows that pond discharge does not start till ~2:50. Is this correct?

Subject: Sticky Note
Page Label: 98
Author: mschutte
Date: 10/14/2021 2:33:52 PM
Status:
Color:
Layer:
Space:

Drained by a pump. This is okay.

Subject: Sticky Note
Page Label: 98
Author: ben_liu
Date: 3/2/2022 11:40:30 AM
Status:
Color:
Layer:
Space:

Correct



Subject: Callout
Page Label: 210
Author: 137820
Date: 10/7/2021 6:13:53 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:39:14 PM
Color:
Layer:
Space:

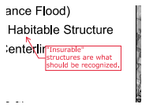
There's no indication of a culvert here.

Subject: Sticky Note
Page Label: 210
Author: mschutte
Date: 10/14/2021 2:49:11 PM
Status:
Color:
Layer:
Space:

Temple Dr culvert. Adjust C-41 callout to be more visible.

Subject: Sticky Note
Page Label: 210
Author: ben_liu
Date: 3/2/2022 2:39:02 PM
Status:
Color:
Layer:
Space:

Agree



Subject: Callout
Page Label: 417
Author: 137820
Date: 10/7/2021 7:02:48 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:09:20 AM
Color:
Layer:
Space:

"Insurable" structures are what should be recognized.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 9:09:17 AM
Status:
Color:
Layer:
Space:

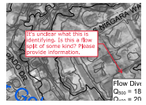
Revised

Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 1:25:19 PM
Status: Accepted set by ben_liu on 3/4/2022 at 9:00:20 AM
Color:
Layer:
Space:

This labeling convention is very difficult to recognize/comprehend.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 9:00:15 AM
Status:
Color:
Layer:
Space:

This is a standard convention used in other FHADs. Reaches like Monaco Overflow that have so many flow diversion/changes are challenging to display with discrete labels.

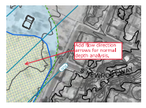


Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 1:27:42 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:47:50 AM
Color:
Layer:
Space:

It's unclear what this is identifying. Is this a flow split of some kind? Please provide information.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:47:47 AM
Status:
Color:
Layer:
Space:

This is the flow that overflows into Monaco Pkwy. Will revise the arrow direction to help illustrate



Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 1:28:38 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:39:48 AM
Color:
Layer:
Space:

Add flow direction arrows for normal depth analysis.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:39:45 AM
Status:
Color:
Layer:
Space:

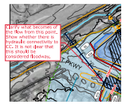
Revised

Subject: Callout
Page Label: 417
Author: 137820
Date: 10/10/2021 5:47:03 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:40:51 AM
Color:
Layer:
Space:

Lateral spill not labeled for this "structure."

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:40:47 AM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 1:38:15 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:40:36 AM
Color:
Layer:
Space:

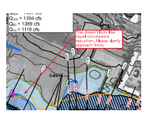
Clarify what becomes of the flow from this point. Show whether there is hydraulic connectivity to CC. It is not clear that this should be considered floodway.

Subject: Sticky Note
Page Label: 417
Author: mschutte
Date: 10/14/2021 3:18:03 PM
Status:
Color:
Layer:
Space:

Floodway is accurate and the delineation provided is appropriate. This FW terminates in the same fashion as the effective.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:40:30 AM
Status:
Color:
Layer:
Space:

Agree



Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 1:48:24 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:56:35 AM
Color:
Layer:
Space:

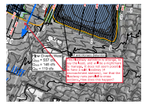
This doesn't look like equal conveyance reduction. Please clarify approach here.

Subject: Sticky Note
Page Label: 417
Author: mschutte
Date: 10/14/2021 3:26:35 PM
Status:
Color:
Layer:
Space:

intended to keep floodway in roadway

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:56:32 AM
Status:
Color:
Layer:
Space:

Agree



Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 1:51:10 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:06:52 AM
Color:
Layer:
Space:

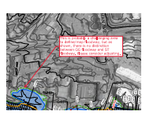
This floodway definition is strange, to say the least, and will be a nightmare to manage. It does not seem possible to have a split floodway (4 encroachment stations), nor that the floodway runs parallel to cross sections. How does this happen?

Subject: Sticky Note
Page Label: 417
Author: mschutte
Date: 10/14/2021 3:25:15 PM
Status:
Color:
Layer:
Space:

See previous comment - if the split flow is subtracted from the main stem, then we are acknowledging the lateral flow and the floodway is appropriate. If the full flow is maintained in the main stem, then we can eliminate the floodway from the split flow reach.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 9:03:23 AM
Status:
Color:
Layer:
Space:

Full flow is maintained in the main stem, will remove the split flow floodway in Monaco Pkwy



Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 2:14:42 PM
Status: Rejected set by ben_liu on 3/4/2022 at 9:10:14 AM
Color:
Layer:
Space:

This is probably a challenging area to define/map floodway, but as shown, there is no distinction between GG floodway and ST floodway. Please consider adjusting.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:29:10 PM
Status:
Color:
Layer:
Space:

1289 is the downstream most ST cross section. Downstream of this location, the entire floodway is in the GG reach.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:10:08 AM
Status:
Color:
Layer:
Space:

Agree

Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 2:26:57 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:36:10 AM
Color:
Layer:
Space:

I'd like to discuss the approach here. This is a bit of an anomaly - if flood hazards are based on normal depth calculation, then this cannot be mapped as SFHA with a newly mapped structure. I don't think that stands up to the rigor necessary when newly mapping a structure into the SFHA. For the purpose of using this study as the basis of a PMR, we may need a more standard approach, a stronger, more defensible process.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:32:15 PM
Status:
Color:
Layer:
Space:

Do not show as shallow flooding, show as 100-yr floodplain and use the overtopping flow in the normal depth calculation. This should provide an accurate delineation and keep the structure out of the floodplain.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:36:06 AM
Status:
Color:
Layer:
Space:

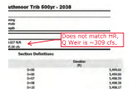
Using overtopping flows only does not have much effect on FP100 delineation, but can exclude backwater area as noted in previous comment

Subject: Callout
Page Label: 321
Author: 137820
Date: 10/8/2021 3:17:54 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:43:58 PM
Color:
Layer:
Space:

Does not match HR. Q Weir is 65 cfs.

Subject: Sticky Note
Page Label: 321
Author: ben_liu
Date: 3/2/2022 4:43:55 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 323
Author: 137820
Date: 10/8/2021 3:24:33 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:44:23 PM
Color:
Layer:
Space:

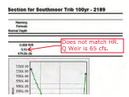
Does not match HR. Q Weir is ~309 cfs.

Subject: Sticky Note
Page Label: 323
Author: mschutte
Date: 10/14/2021 3:00:26 PM
Status:
Color:
Layer:
Space:

That is correct. Total flow should not be used, use the Q Weir from the culvert output for normal depth calc.

Subject: Sticky Note
Page Label: 323
Author: ben_liu
Date: 3/2/2022 4:44:26 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 326
Author: 137820
Date: 10/8/2021 3:26:09 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:44:44 PM
Color:
Layer:
Space:

Does not match HR. Q Weir is 65 cfs.

Subject: Sticky Note
Page Label: 326
Author: mschutte
Date: 10/14/2021 3:00:31 PM
Status:
Color:
Layer:
Space:

That is correct. Total flow should not be used, use the Q Weir from the culvert output for normal depth calc.

Subject: Sticky Note
Page Label: 326
Author: ben_liu
Date: 3/2/2022 4:44:46 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Callout
Page Label: 328
Author: 137820
Date: 10/8/2021 3:26:17 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:45:00 PM
Color:
Layer:
Space:

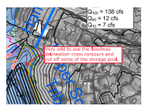
Does not match HR. Q Weir is ~309 cfs.

Subject: Sticky Note
Page Label: 328
Author: mschutte
Date: 10/14/2021 3:03:40 PM
Status:
Color:
Layer:
Space:

That is correct. Total flow should not be used, use the Q Weir from the culvert output for normal depth calc.

Subject: Sticky Note
Page Label: 328
Author: ben_liu
Date: 3/2/2022 4:44:57 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 3:57:49 PM
Status: Completed set by ben_liu on 3/4/2022 at 1:08:38 PM
Color:
Layer:
Space:

Very odd to see the floodway delineation cross contours and cut off some of the storage pool.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 1:08:34 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 3:50:54 PM
Status: Rejected set by ben_liu on 3/4/2022 at 1:09:39 PM
Color:
Layer:
Space:

It seems we would want to map floodway through here.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/8/2022 2:23:02 PM
Status:
Color:
Layer:
Space:

We previously agreed to exclude the downstream overflow areas of the parking lot and Hampden Avenue from the floodway. This area, including two structures, is shown within the mapped 100-yr floodplain. If recommended detention basin improvements are implemented the 100-yr overflow could be eliminated.

Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 4:01:06 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:24:55 AM
Color:
Layer:
Space:

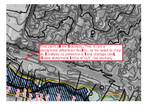
Not floodway.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:34:50 PM
Status:
Color:
Layer:
Space:

Agree. Remove backwater area from floodway if possible.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:24:52 AM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 4:05:27 PM
Status: Rejected set by ben_liu on 3/4/2022 at 9:19:51 AM
Color:
Layer:
Space:

This can't all be floodway. This is not a recognized detention facility, so no need to map as floodway to preserve a flood storage pool. Please determine limits of 0.5' rise section.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:13:11 PM
Status:
Color:
Layer:
Space:

Stakeholders originally agreed to FP=FW at this location.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:19:48 AM
Status:
Color:
Layer:
Space:

Agree

Subject: Callout
Page Label: 418
Author: 137820
Date: 10/8/2021 4:10:09 PM
Status: Rejected set by ben_liu on 3/4/2022 at 9:54:29 AM
Color:
Layer:
Space:

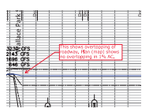
It is preferable to only show flooding where surface is inundated, not on bridge deck surface.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:11:20 PM
Status:
Color:
Layer:
Space:

This is the 500-yr only. 100-yr not delineated here.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:54:25 AM
Status:
Color:
Layer:
Space:

Agree



Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:22:49 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:19:06 PM
Color:
Layer:
Space:

This shows overtopping of roadway. Plan (map) shows no overtopping in 1% AC.

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:45:57 PM
Status:
Color:
Layer:
Space:

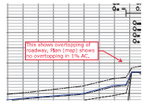
Treat same as previous.

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:46:55 PM
Status:
Color:
Layer:
Space:

Treat same previous.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 4:19:02 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:32:02 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:07:24 PM
Color:
Layer:
Space:

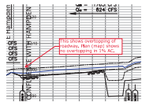
This shows overtopping of roadway. Plan (map) shows no overtopping in 1% AC.

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:43:44 PM
Status:
Color:
Layer:
Space:

Only 500yr overtops, Disconnect profile for lower events. Add note that 100-yr is contained in the culvert.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:07:20 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:33:57 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:29:07 PM
Color:
Layer:
Space:

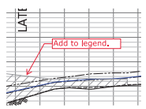
This shows overtopping of roadway. Plan (map) shows no overtopping in 1% AC.

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:44:14 PM
Status:
Color:
Layer:
Space:

Same as previous.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 2:29:03 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:28:04 PM
Status: Rejected set by ben_liu on 3/4/2022 at 3:01:21 PM
Color:
Layer:
Space:

Add to legend.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:01:18 PM
Status:
Color:
Layer:
Space:

All lateral structures are explicitly labeled, large unique polygons are not appropriate for the legend

---

Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 5:07:19 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:52:31 PM
Color:
Layer:
Space:

Move to back (typ).

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 2:52:28 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:42:24 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:13:49 PM
Color:
Layer:
Space:

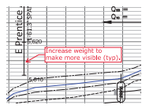
Does not match plan (map). Through this stretch, only 0.2% AC flooding is shown. Through this stretch, 10-, 50- and 100-year flows are 0.

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:45:49 PM
Status:
Color:
Layer:
Space:

Treat same as previous.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 4:13:46 PM
Status:
Color:
Layer:
Space:

Revised

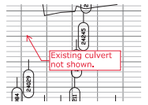


Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:48:08 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:31:08 PM
Color:
Layer:
Space:

Increase weight to make more visible (typ).

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:31:05 PM
Status:
Color:
Layer:
Space:

Revised

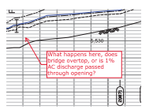


Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:49:14 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:22:25 PM
Color:
Layer:
Space:

Existing culvert not shown.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 4:22:22 PM
Status:
Color:
Layer:
Space:

Revised

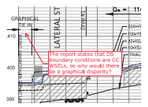


Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:52:28 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:24:57 PM
Color:
Layer:
Space:

What happens here, does bridge overtop, or is 1% AC discharge passed through opening?

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 4:24:53 PM
Status:
Color:
Layer:
Space:

100-yr flows over ped bridge approaches, profile as shown is correct



Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:54:57 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:17:02 PM
Color:
Layer:
Space:

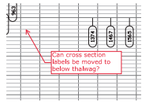
The report states that DS boundary conditions are CC WSELs, so why would there be a graphical disparity?

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:40:13 PM
Status:
Color:
Layer:
Space:

Remove graphical tie in label.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:16:58 PM
Status:
Color:
Layer:
Space:

Revised

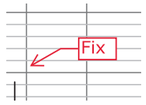


Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 4:56:53 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:27:21 PM
Color:
Layer:
Space:

Can cross section labels be moved to below thalweg?

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:27:18 PM
Status:
Color:
Layer:
Space:

Revised

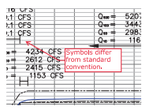


Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 5:03:52 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:09:08 PM
Color:
Layer:
Space:

Fix

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:09:04 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 421
Author: 137820
Date: 10/8/2021 5:08:52 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:55:59 PM
Color:
Layer:
Space:

Symbols differ from standard convention.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 2:55:56 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Callout
Page Label: 398
Author: 137820
Date: 10/8/2021 5:17:36 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:37 PM
Color:
Layer:
Space:

Necessary?

Subject: Sticky Note
Page Label: 398
Author: mschutte
Date: 10/14/2021 3:04:22 PM
Status:
Color:
Layer:
Space:

Table is standard.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/2/2022 5:06:34 PM
Status:
Color:
Layer:
Space:

Agree

Subject: Callout
Page Label: 398
Author: 137820
Date: 10/8/2021 5:22:24 PM
Status: Rejected set by ben_liu on 3/2/2022 at 4:47:30 PM
Color:
Layer:
Space:

May be better for this info to be in "floodplain" columns.

Subject: Sticky Note
Page Label: 398
Author: mschutte
Date: 10/14/2021 3:04:10 PM
Status:
Color:
Layer:
Space:

Table is standard.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/2/2022 4:47:27 PM
Status:
Color:
Layer:
Space:

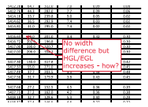
Agree

Subject: Callout
Page Label: 398
Author: 137820
Date: 10/8/2021 5:25:28 PM
Status:
Rejected set by ben_liu on 3/2/2022 at 4:58:06 PM
Completed set by ben_liu on 3/2/2022 at 5:02:01 PM
None set by ben_liu on 3/2/2022 at 5:02:16 PM
Rejected set by ben_liu on 3/2/2022 at 5:03:11 PM
Color:
Layer:
Space:

Giant width differences for hardly any HGL difference.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/2/2022 4:58:00 PM
Status:
Color:
Layer:
Space:

XS 159 reflects channelized flow immediately upstream of the culvert, the other XSs include large ineffective flow areas of Cook Park (IEFA not included in floodway)



Subject: Callout
Page Label: 398
Author: 137820
Date: 10/8/2021 5:27:17 PM
Status: Completed set by ben_liu on 3/2/2022 at 5:05:25 PM
Color:
Layer:
Space:

No width difference but HGL/EGL increases - how?

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/2/2022 5:05:20 PM
Status:
Color:
Layer:
Space:

Channelized flow through this area, HGL/EGL increases due to thalweg increases

---

Subject: Callout
Page Label: 398
Author: 137820
Date: 10/8/2021 5:31:10 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:47:10 PM
Color:
Layer:
Space:

Obviously, there are negative surcharges. What's the allowable?

Subject: Sticky Note
Page Label: 398
Author: mschutte
Date: 10/14/2021 3:04:02 PM
Status:
Color:
Layer:
Space:

-0.04. These values are acceptable.

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/2/2022 4:47:07 PM
Status:
Color:
Layer:
Space:

Agree

Subject: Callout
Page Label: 418
Author: 137820
Date: 3/4/2022 9:12:59 AM
Status: Completed set by ben_liu on 3/4/2022 at 9:19:29 AM
Color:
Layer:
Space:

This auto-delineation is not ideal. Floodway should transition more smoothly. It may be that floodway across the roadway section is full width till the northern roadway embankment, then necks down.

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:19:26 AM
Status:
Color:
Layer:
Space:

Will adjust left floodway limits as suggested

Subject: Callout
Page Label: 417
Author: 137820
Date: 10/8/2021 5:47:12 PM
Status: Rejected set by ben_liu on 3/4/2022 at 9:01:35 AM
Color:
Layer:
Space:

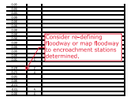
Upstream of flood storage pool (detention), no need for FP=FW.

Subject: Sticky Note
Page Label: 417
Author: mschutte
Date: 10/14/2021 3:27:35 PM
Status:
Color:
Layer:
Space:

This is still a park, so FW=FP is appropriate. The Stakeholders also already agreed to FP=FW approach here.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 9:01:32 AM
Status:
Color:
Layer:
Space:

Agree

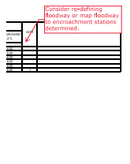


Subject: Callout
Page Label: 400
Author: 137820
Date: 10/8/2021 5:55:59 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:17:24 AM
Color:
Layer:
Space:

Consider re-defining floodway or map floodway to encroachment stations determined.

Subject: Sticky Note
Page Label: 400
Author: ben_liu
Date: 3/4/2022 8:17:19 AM
Status:
Color:
Layer:
Space:

Floodway was mapped to encroachment limits, note FW=FP through the park.



Subject: Callout
Page Label: 401
Author: 137820
Date: 10/8/2021 5:56:15 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:18:18 AM
Color:
Layer:
Space:

Consider re-defining floodway or map floodway to encroachment stations determined.

Subject: Sticky Note
Page Label: 401
Author: ben_liu
Date: 3/4/2022 8:18:14 AM
Status:
Color:
Layer:
Space:

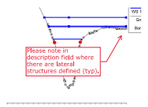
Floodway was mapped to encroachment limits, note FW=FP through the park.

Subject: Callout
Page Label: 401
Author: 137820
Date: 10/8/2021 5:54:58 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:25:25 AM
Color:
Layer:
Space:

Consider re-defining floodway or map floodway to encroachment stations determined.

Subject: Sticky Note
Page Label: 401
Author: ben_liu
Date: 3/4/2022 8:25:18 AM
Status:
Color:
Layer:
Space:

Floodway was mapped to encroachment limits, note FW=FP through the park with the exception where the FP100 encroaches into Tamarac Pkwy.

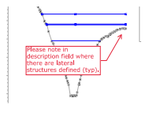


Subject: Callout
Page Label: 247
Author: 137820
Date: 10/8/2021 6:04:22 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:29:38 PM
Color:
Layer:
Space:

Please note in description field where there are lateral structures defined (typ).

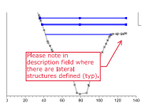
Subject: Sticky Note
Page Label: 247
Author: ben_liu
Date: 3/2/2022 4:29:34 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Callout
Page Label: 248
Author: 137820
Date: 10/8/2021 6:04:48 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:29:53 PM
Color:
Layer:
Space:

Please note in description field where there are lateral structures defined (typ).



Subject: Callout
Page Label: 249
Author: 137820
Date: 10/8/2021 6:05:03 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:30:00 PM
Color:
Layer:
Space:

Please note in description field where there are lateral structures defined (typ).

Subject: Callout
Page Label: 51
Author: 137820
Date: 10/10/2021 3:12:51 PM
Status:
Completed set by ben_liu on 3/2/2022 at 10:54:55 AM
Rejected set by ben_liu on 3/2/2022 at 10:55:08 AM
Color:
Layer:
Space:

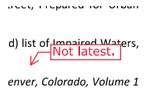
This one or the 2019?

Subject: Sticky Note
Page Label: 51
Author: robert_krehbiel
Date: 2/8/2022 4:00:14 PM
Status:
Color:
Layer:
Space:

This one. No change

Subject: Sticky Note
Page Label: 51
Author: robert_krehbiel
Date: 2/8/2022 4:03:54 PM
Status:
Color:
Layer:
Space:

Used for baseline hydrology which was approved in 2018

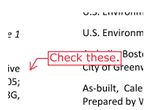


Subject: Callout
Page Label: 51
Author: 137820
Date: 10/10/2021 3:14:10 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:36:25 AM
Color:
Layer:
Space:

Not latest.

Subject: Sticky Note
Page Label: 51
Author: ben_liu
Date: 3/2/2022 11:36:34 AM
Status:
Color:
Layer:
Space:

revised

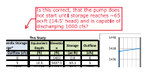


Subject: Callout
Page Label: 51
Author: 137820
Date: 10/10/2021 3:15:08 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:36:52 AM
Color:
Layer:
Space:

Check these.

Subject: Sticky Note
Page Label: 51
Author: ben_liu
Date: 3/2/2022 11:36:48 AM
Status:
Color:
Layer:
Space:

revised



Subject: Callout
Page Label: 117
Author: 137820
Date: 10/10/2021 3:22:51 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:45:29 AM
Color:
Layer:
Space:

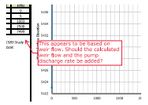
Is this correct, that the pump does not start until storage reaches ~65 ac-ft (14.5' head) and is capable of discharging 1000 cfs?

Subject: Sticky Note
Page Label: 117
Author: mschutte
Date: 10/14/2021 2:38:27 PM
Status:
Color:
Layer:
Space:

The pump's purpose is to drain the pond, not necessarily to do so quickly. This rating curve is taken from the pond's design in the LOMR, so we don't want to change it.

Subject: Sticky Note
Page Label: 117
Author: ben_liu
Date: 3/2/2022 11:43:21 AM
Status:
Color:
Layer:
Space:

Agreed



Subject: Callout
Page Label: 117
Author: 137820
Date: 10/10/2021 3:25:29 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:43:09 AM
Color:
Layer:
Space:

This appears to be based on weir flow. Should the calculated weir flow and the pump discharge rate be added?

Subject: Sticky Note
Page Label: 117
Author: mschutte
Date: 10/14/2021 2:35:43 PM
Status:
Color:
Layer:
Space:

Capacity of the pump is minimal relative to the spillway.

Subject: Sticky Note
Page Label: 117
Author: ben_liu
Date: 3/2/2022 11:43:04 AM
Status:
Color:
Layer:
Space:

Agreed

Subject: Callout
Page Label: 117
Author: 137820
Date: 10/10/2021 3:36:39 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:44:22 AM
Color:
Layer:
Space:

These H:V values are significantly different, but the angles are very close. Is the slope of the street profile on the left side (west) that much steeper than the east side (right)?

Subject: Sticky Note
Page Label: 117
Author: mschutte
Date: 10/14/2021 2:41:13 PM
Status:
Color:
Layer:
Space:

These are the correct values.

Subject: Sticky Note
Page Label: 117
Author: ben_liu
Date: 3/2/2022 11:44:34 AM
Status:
Color:
Layer:
Space:

Agreed

Subject: Callout
Page Label: 150
Author: 137820
Date: 10/10/2021 3:43:23 PM
Status:
Completed set by ben_liu on 3/2/2022 at 11:46:46 AM
Rejected set by ben_liu on 3/2/2022 at 11:46:58 AM
Color:
Layer:
Space:

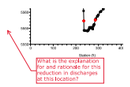
Even if we're confident that the "flood peak" has passed through the system, wouldn't we want to use this as a check on the system. The continuity error of 2.5% is not nothing. The duration of the analysis could be extended to verify that there is no "lost" volume that might otherwise show up in a peak discharge somewhere. The analysis only runs for 20.5 hours.

Subject: Sticky Note
Page Label: 150
Author: mschutte
Date: 10/14/2021 2:43:48 PM
Status:
Color:
Layer:
Space:

2.5% error is actually very good (we tend to begin examining more closely for error in excess of 5%). Also, this is approved hydrology, so we find this to be acceptable. We are certain the flood peak is past, which is the goal of the hydrology analysis. A longer run time doesn't change our results.

Subject: Sticky Note
Page Label: 150
Author: ben_liu
Date: 3/2/2022 11:46:43 AM
Status:
Color:
Layer:
Space:

Agreed



Subject: Callout
Page Label: 209
Author: 137820
Date: 10/10/2021 4:23:29 PM
Status: Completed set by ben_liu on 3/2/2022 at 2:37:15 PM
Color:
Layer:
Space:

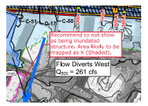
What is the explanation for and rationale for this reduction in discharges at this location?

Subject: Sticky Note
Page Label: 209
Author: mschutte
Date: 10/14/2021 2:46:20 PM
Status:
Color:
Layer:
Space:

Flow change for culvert vs overland flow.

Subject: Sticky Note
Page Label: 209
Author: ben_liu
Date: 3/2/2022 2:39:08 PM
Status:
Color:
Layer:
Space:

Agree



Subject: Callout
Page Label: 418
Author: 137820
Date: 10/10/2021 5:14:26 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:22:02 AM
Color:
Layer:
Space:

Recommend to not show as being inundated structure. Area likely to be mapped as X (Shaded).

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:32:39 PM
Status:
Color:
Layer:
Space:

Disagree - show as 100-yr floodplain (not shallow flooding)

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:34:31 AM
Status:
Color:
Layer:
Space:

Will revise FP100 limits to exclude structure (it is a backwater area)

Subject: Callout
Page Label: 417
Author: 137820
Date: 10/10/2021 5:46:27 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:32:38 AM
Color:
Layer:
Space:

Please adjust limits to show separation from structure.

Subject: Sticky Note
Page Label: 417
Author: mschutte
Date: 10/14/2021 3:19:41 PM
Status:
Color:
Layer:
Space:

Please verify this is accurate (and that the correct flow is used for the normal depth calculations). If the structure is in, it's in, but if it can be included, that's okay.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:32:33 AM
Status:
Color:
Layer:
Space:

Adjusted FP100 limits to exclude building

Cross-Out (11)

r (~~2018~~

Subject: Cross-Out
Page Label: 35
Author: 137820
Date: 10/7/2021 4:30:40 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:22:29 PM
Color:
Layer:
Space:

2020 current

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 2/8/2022 2:21:30 PM
Status:
Color:
Layer:
Space:

added

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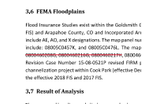
ve ~~2018~~ Fl

Subject: Cross-Out
Page Label: 35
Author: 137820
Date: 10/7/2021 4:31:54 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:26:28 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 2/8/2022 2:22:42 PM
Status:
Color:
Layer:
Space:

done


3.6 FEMA Floodplains

Flood Insurance Studies exist within the Goldsmith G
FIS) and Arapahoe County, CO and Incorporated Ar
include AE, AO, and X designations. The map panel nur
include: 08005C0457K, and 08005C0476L. The map
08004A0208G, 08004A0216G, 08004A0217H, 08006
Revision Case Number: 15-08-0521P revised FIRM p
channelization project within Cook Park (effective De
the effective 2018 FIS and 2017 FIS.

3.7 Result of Analysis

Subject: Cross-Out
Page Label: 35
Author: 137820
Date: 10/7/2021 4:33:34 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:22:42 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 2/8/2022 2:21:36 PM
Status:
Color:
Layer:
Space:

done

ias (2017 FIS). FEMA mapped floodplains and
mbers for Arapahoe County and Incorporated A
panel numbers for City and County of Denv
0218G, 08004602191, and 0800460282G. A Le
anels 08004602080 and 08004602166) for a
ember 28, 2018). All other LOMRs were incorp

Subject: Cross-Out
Page Label: 35
Author: 137820
Date: 10/7/2021 4:34:11 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:25:04 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 35
Author: ben_liu
Date: 3/1/2022 4:25:43 PM
Status:
Color:
Layer:
Space:

removed the LOMR sentences since it has been incorporated into effective FIRM

of ~~2018~~ Fl

Subject: Cross-Out
Page Label: 35
Author: 137820
Date: 10/7/2021 4:34:51 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:26:20 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 2/8/2022 2:22:17 PM
Status:
Color:
Layer:
Space:

assume 2020

~~2018~~ Fl
Denve

Subject: Cross-Out
Page Label: 36
Author: 137820
Date: 10/7/2021 4:35:18 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:26:51 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 36
Author: robert_krehbiel
Date: 2/8/2022 2:23:29 PM
Status:
Color:
Layer:
Space:

done

n Gulch was set a
he ~~concurrent~~ 10
raulic control beca

Subject: Cross-Out
Page Label: 48
Author: 137820
Date: 10/7/2021 4:59:48 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:52:37 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 48
Author: robert_krehbiel
Date: 2/8/2022 3:47:09 PM
Status:
Color:
Layer:
Space:

done

r (~~2018~~

Subject: Cross-Out
Page Label: 50
Author: 137820
Date: 10/7/2021 5:37:29 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:51:58 AM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 50
Author: robert_krehbiel
Date: 2/8/2022 3:57:17 PM
Status:
Color:
Layer:
Space:

changed

Subject: Cross-Out
Page Label: 50
Author: 137820
Date: 10/7/2021 5:38:26 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:54:05 AM
Color:
Layer:
Space:

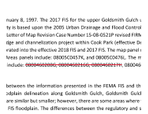
Subject: Sticky Note
Page Label: 50
Author: robert_krehbiel
Date: 2/8/2022 3:58:20 PM
Status:
Color:
Layer:
Space:

done

Subject: Cross-Out
Page Label: 50
Author: 137820
Date: 10/7/2021 5:38:34 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:54:13 AM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 50
Author: robert_krehbiel
Date: 2/8/2022 3:58:34 PM
Status:
Color:
Layer:
Space:

done



Subject: Cross-Out
Page Label: 50
Author: 137820
Date: 10/7/2021 5:38:46 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:54:23 AM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 50
Author: robert_krehbiel
Date: 2/8/2022 3:58:44 PM
Status:
Color:
Layer:
Space:

done

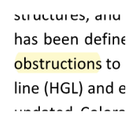
Highlight (8)

Subject: Highlight
Page Label: 45
Author: 137820
Date: 10/7/2021 4:53:46 PM
Status: Rejected set by ben_liu on 3/1/2022 at 4:29:53 PM
Color:
Layer:
Space:

As we've discussed previously, our preference (in general) is to use a surface that is created from source data, LiDAR points (LAS files), rather than from contours created from source data. Creating a TIN from contours introduces error and inconsistency with 2014 LiDAR derived contours.

Subject: Sticky Note
Page Label: 45
Author: ben_liu
Date: 3/1/2022 4:32:24 PM
Status:
Color:
Layer:
Space:

We processed the TINs from contour data to facilitate splicing in as-built contours at multiple locations, and because efforts to use LAS data in previous studies resulted in too much noise/data.



Subject: Highlight
Page Label: 45
Author: 137820
Date: 10/7/2021 4:55:01 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:46:04 PM
Color:
Layer:
Space:

and new development

Subject: Sticky Note
Page Label: 45
Author: robert_krehbiel
Date: 2/8/2022 3:43:27 PM
Status:
Color:
Layer:
Space:

added

Subject: Highlight
Page Label: 46
Author: 137820
Date: 10/7/2021 4:57:03 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:51:45 PM
Color:
Layer:
Space:

Except that at several crossings, the discharges have been artificially set to 0.1 cfs.

Subject: Sticky Note
Page Label: 46
Author: robert_krehbiel
Date: 2/8/2022 3:45:14 PM
Status:
Color:
Layer:
Space:

added

Lateral Structures in the HEC-RAS hydraulic
the receiving water body. The flow optimi
program to subtract the amount of flow fro
body. However, the discharges in the main st
into a formalized known drainageway.

Table 4-4 summarizes the hydrology used in
change has been applied.

Table 4-4 St

Subject: Highlight
Page Label: 46
Author: 137820
Date: 10/7/2021 4:58:08 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:52:04 PM
Color:
Layer:
Space:

or detention facility

Subject: Sticky Note
Page Label: 46
Author: robert_krehbiel
Date: 2/8/2022 3:45:54 PM
Status:
Color:
Layer:
Space:

added

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he concurrent 10
year known wate

Subject: Highlight
Page Label: 48
Author: 137820
Date: 10/7/2021 4:59:40 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:52:19 PM
Color:
Layer:
Space:

corresponding?

Subject: Sticky Note
Page Label: 48
Author: robert_krehbiel
Date: 2/8/2022 3:46:50 PM
Status:
Color:
Layer:
Space:

changed

RAS model of Han
. A rating curve wa

Subject: Highlight
Page Label: 48
Author: 137820
Date: 10/7/2021 5:01:41 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:51:09 AM
Color:
Layer:
Space:

Note source of rating curve.

Subject: Highlight
Page Label: 48
Author: 137820
Date: 10/7/2021 5:20:03 PM
Status: Rejected set by ben_liu on 3/1/2022 at 4:58:43 PM
Color:
Layer:
Space:

As previously discussed, crossing structures that cannot be modeled based on actual geometry should be modeled using the inline structure option instead of an artificial flow rate of 0.1 cfs that is modeled over the roadway crown. Even if these structures overtop, this method is not the correct approach to identifying flood hazards at these locations.

Subject: Sticky Note
Page Label: 48
Author: ben_liu
Date: 3/1/2022 4:58:22 PM
Status:
Color:
Layer:
Space:

Added additional explanation of selected method.

---

floodway was not defined for Hampde
elevation of the hydraulic grade line (H
ways were delineated utilizing an approa
isolated locations, equal encroachment
ther. Along those cross sections, the
the milder slope bank. However, encro
the main channel conveyance area.

t to be coincident with the floodplain wh

Subject: Highlight
Page Label: 49
Author: 137820
Date: 10/10/2021 3:11:13 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:51:15 AM
Color:
Layer:
Space:

Where? Specify locations.

Subject: Sticky Note
Page Label: 49
Author: robert_krehbiel
Date: 2/8/2022 3:55:37 PM
Status:
Color:
Layer:
Space:

Over-riding the automated routine. Not sure where this occurred but changed to a more general statement

---

Inserted Text (2)

ch. T

Subject: Inserted Text
Page Label: 48
Author: 137820
Date: 10/7/2021 5:00:52 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:59:34 PM
Color:
Layer:
Space:

for each recurrence interval (i.e., 10, 50, 100 and 500)

Subject: Sticky Note
Page Label: 48
Author: robert_krehbiel
Date: 2/8/2022 3:53:15 PM
Status:
Color:
Layer:
Space:

added

Subject: Inserted Text
Page Label: 50
Author: 137820
Date: 10/7/2021 5:37:55 PM
Status: Completed set by ben_liu on 3/2/2022 at 10:52:07 AM
Color:
Layer:
Space:

2020

Line (25)

Subject: Line
Page Label: 39
Author: 137820
Date: 10/7/2021 4:43:35 PM
Status:
Color:
Layer:
Space:

Subject: Line
Page Label: 393
Author: 137820
Date: 10/7/2021 6:56:24 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:46:40 PM
Color:
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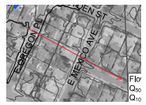
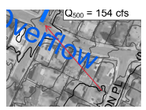
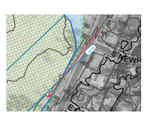


Subject: Line
Page Label: 417
Author: 137820
Date: 10/8/2021 1:25:27 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:00:41 AM
Color:
Layer:
Space:

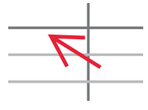


Subject: Line
Page Label: 417
Author: 137820
Date: 10/8/2021 1:25:36 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:56:09 AM
Color:
Layer:
Space:

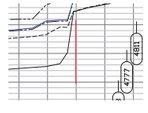


Subject: Line
Page Label: 417
Author: 137820
Date: 10/8/2021 1:28:51 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:40:14 AM
Color:
Layer:
Space:

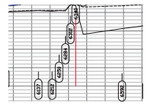
Subject: Line
Page Label: 417
Author: 137820
Date: 10/8/2021 1:28:57 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:40:10 AM
Color:
Layer:
Space:



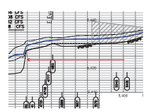
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:27:57 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:09:16 PM
Color:
Layer:
Space:



Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:28:50 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:10:00 PM
Color:
Layer:
Space:

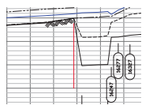


Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:29:07 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:10:00 PM
Color:
Layer:
Space:

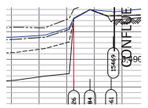


Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:29:36 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:10:00 PM
Color:
Layer:
Space:

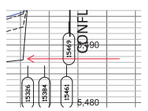
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:29:41 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:10:00 PM
Color:
Layer:
Space:



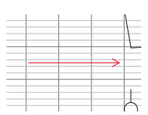
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:35:58 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:34:14 PM
Color:
Layer:
Space:



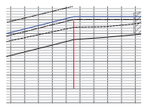
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:35:53 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:34:15 PM
Color:
Layer:
Space:



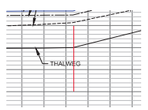
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:36:40 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:51:19 PM
Color:
Layer:
Space:



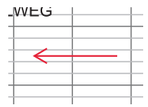
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:36:30 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:51:19 PM
Color:
Layer:
Space:



Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:43:00 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:21:59 PM
Color:
Layer:
Space:



Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:42:55 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:22:47 PM
Color:
Layer:
Space:



Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:43:32 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:25:33 PM
Color:
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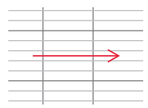
Space:



Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 4:43:27 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:25:33 PM
Color:
Layer:
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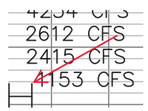


Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 5:08:47 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:56:05 PM
Color:
Layer:
Space:

Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 5:10:43 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:23:41 PM
Color:
Layer:
Space:

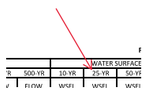
Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:24:00 PM
Status:
Color:
Layer:
Space:

Revised

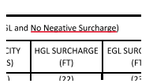
Subject: Line
Page Label: 421
Author: 137820
Date: 10/8/2021 5:11:03 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:23:46 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:23:51 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Line
Page Label: 398
Author: 137820
Date: 10/8/2021 5:17:56 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:49 PM
Color:
Layer:
Space:



Subject: Line
Page Label: 398
Author: 137820
Date: 10/8/2021 5:30:05 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:05:54 PM
Color:
Layer:
Space:

Subject: Line
Page Label: 51
Author: 137820
Date: 10/10/2021 3:12:14 PM
Status: Rejected set by ben_liu on 3/2/2022 at 10:55:20 AM
Color:
Layer:
Space:

Oval (29)

Subject: Oval
Page Label: 16
Author: 137820
Date: 10/7/2021 4:02:54 PM
Status:
Color:
Layer:
Space:

Subject: Oval
Page Label: 16
Author: 137820
Date: 10/7/2021 4:03:00 PM
Status:
Color:
Layer:
Space:

Subject: Oval
Page Label: 16
Author: 137820
Date: 10/7/2021 4:03:18 PM
Status:
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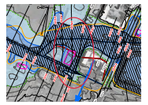
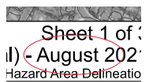


Subject: Oval
Page Label: 417
Author: 137820
Date: 10/8/2021 1:49:04 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:00:42 AM
Color:
Layer:
Space:

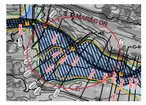
Subject: Oval
Page Label: 418
Author: 137820
Date: 10/8/2021 2:23:27 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:36:30 AM
Color:
Layer:
Space:



Subject: Oval
Page Label: 417
Author: 137820
Date: 10/8/2021 3:45:24 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:09:55 AM
Color:
Layer:
Space:

Subject: Oval
Page Label: 418
Author: 137820
Date: 10/8/2021 3:50:00 PM
Status:
Color:
Layer:
Space:

Subject: Oval
Page Label: 418
Author: 137820
Date: 10/8/2021 4:00:28 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:22:07 AM
Color:
Layer:
Space:



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Page Label: 418
Author: 137820
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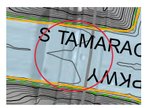
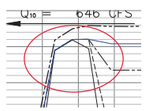
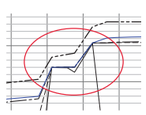
Space:



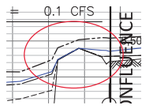
Subject: Oval
Page Label: 418
Author: 137820
Date: 10/8/2021 4:09:59 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:54:16 AM
Color:
Layer:
Space:



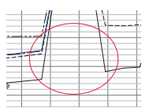
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:22:04 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:21:58 PM
Color:
Layer:
Space:



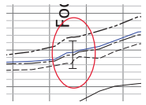
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:31:40 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:07:29 PM
Color:
Layer:
Space:



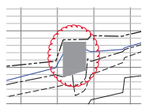
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:33:51 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:29:13 PM
Color:
Layer:
Space:



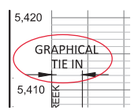
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:48:48 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:21:59 PM
Color:
Layer:
Space:



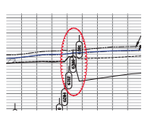
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:50:28 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:24:11 PM
Color:
Layer:
Space:



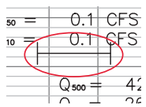
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:52:59 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:25:34 PM
Color:
Layer:
Space:



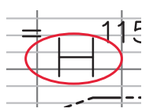
Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 4:53:43 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:16:49 PM
Color:
Layer:
Space:



Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 5:01:53 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:09:16 PM
Color:
Layer:
Space:



Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 5:07:47 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:55:50 PM
Color:
Layer:
Space:

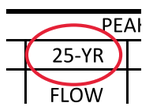


Subject: Oval
Page Label: 421
Author: 137820
Date: 10/8/2021 5:07:53 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:01:34 PM
Color:
Layer:
Space:

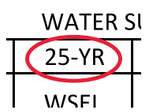
Subject: Oval
Page Label: 398
Author: 137820
Date: 10/8/2021 5:14:10 PM
Status: Completed set by ben_liu on 3/2/2022 at 5:08:22 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 398
Author: ben_liu
Date: 3/2/2022 5:08:19 PM
Status:
Color:
Layer:
Space:

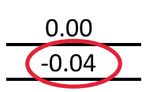
Revised



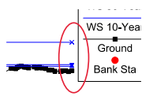
Subject: Oval
Page Label: 398
Author: 137820
Date: 10/8/2021 5:14:44 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:54 PM
Color:
Layer:
Space:



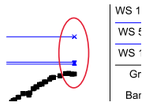
Subject: Oval
Page Label: 398
Author: 137820
Date: 10/8/2021 5:14:52 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:43 PM
Color:
Layer:
Space:



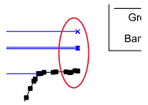
Subject: Oval
Page Label: 398
Author: 137820
Date: 10/8/2021 5:29:36 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:04 PM
Color:
Layer:
Space:



Subject: Oval
Page Label: 247
Author: 137820
Date: 10/8/2021 6:03:06 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:29:44 PM
Color:
Layer:
Space:



Subject: Oval
Page Label: 248
Author: 137820
Date: 10/8/2021 6:04:42 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:29:49 PM
Color:
Layer:
Space:

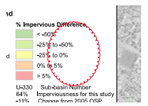


Subject: Oval
Page Label: 249
Author: 137820
Date: 10/8/2021 6:04:58 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:29:57 PM
Color:
Layer:
Space:

Subject: Oval
Page Label: 36
Author: 137820
Date: 10/10/2021 3:09:17 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:26:43 PM
Color:
Layer:
Space:

Subject: Sticky Note
Page Label: 36
Author: robert_krehbiel
Date: 2/8/2022 2:23:22 PM
Status:
Color:
Layer:
Space:

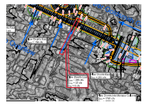
done



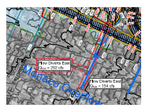
Subject: Oval
Page Label: 39
Author: 137820
Date: 10/10/2021 3:09:59 PM
Status:
Color:
Layer:
Space:

Polygon (6)

Subject: Polygon
Page Label: 417
Author: 137820
Date: 10/8/2021 1:23:24 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:51:14 AM
Color:
Layer:
Space:

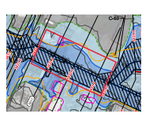


Subject: Polygon
Page Label: 417
Author: 137820
Date: 10/8/2021 1:23:07 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:51:15 AM
Color:
Layer:
Space:

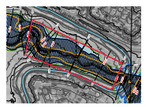


Subject: Polygon
Page Label: 417
Author: 137820
Date: 10/8/2021 1:24:12 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:51:14 AM
Color:
Layer:
Space:

Subject: Polygon
Page Label: 417
Author: 137820
Date: 10/8/2021 1:26:48 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:51:15 AM
Color:
Layer:
Space:

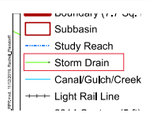


Subject: Polygon
Page Label: 417
Author: 137820
Date: 10/8/2021 1:47:32 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:00:42 AM
Color:
Layer:
Space:

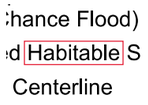


Subject: Polygon
Page Label: 417
Author: 137820
Date: 10/8/2021 5:44:37 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:00:42 AM
Color:
Layer:
Space:

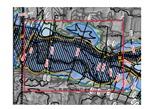
Rectangle (24)



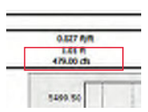
Subject: Rectangle
Page Label: 95
Author: 137820
Date: 10/7/2021 5:42:00 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:39:50 AM
Color:
Layer:
Space:



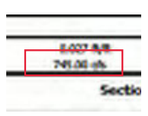
Subject: Rectangle
Page Label: 417
Author: 137820
Date: 10/7/2021 7:02:19 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:09:08 AM
Color:
Layer:
Space:



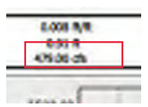
Subject: Rectangle
Page Label: 418
Author: 137820
Date: 10/8/2021 2:13:10 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:19:41 AM
Color:
Layer:
Space:



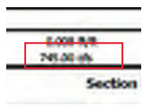
Subject: Rectangle
Page Label: 321
Author: 137820
Date: 10/8/2021 3:16:51 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:44:18 PM
Color:
Layer:
Space:



Subject: Rectangle
Page Label: 323
Author: 137820
Date: 10/8/2021 3:18:08 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:44:40 PM
Color:
Layer:
Space:

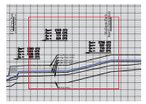


Subject: Rectangle
Page Label: 326
Author: 137820
Date: 10/8/2021 3:25:42 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:44:50 PM
Color:
Layer:
Space:

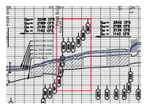


Subject: Rectangle
Page Label: 328
Author: 137820
Date: 10/8/2021 3:26:17 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:45:04 PM
Color:
Layer:
Space:

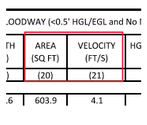
Subject: Rectangle
Page Label: 421
Author: 137820
Date: 10/8/2021 4:26:40 PM
Status: Rejected set by ben_liu on 3/4/2022 at 2:59:57 PM
Color:
Layer:
Space:



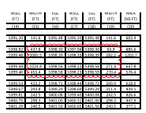
Subject: Rectangle
Page Label: 421
Author: 137820
Date: 10/8/2021 4:39:45 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:19:13 PM
Color:
Layer:
Space:



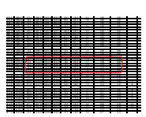
Subject: Rectangle
Page Label: 421
Author: 137820
Date: 10/8/2021 4:56:01 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:10:00 PM
Color:
Layer:
Space:



Subject: Rectangle
Page Label: 398
Author: 137820
Date: 10/8/2021 5:21:25 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:19 PM
Color:
Layer:
Space:



Subject: Rectangle
Page Label: 398
Author: 137820
Date: 10/8/2021 5:24:25 PM
Status: Rejected set by ben_liu on 3/2/2022 at 5:06:25 PM
Color:
Layer:
Space:



Subject: Rectangle
Page Label: 398
Author: 137820
Date: 10/8/2021 5:26:31 PM
Status: Completed set by ben_liu on 3/2/2022 at 5:01:55 PM
Color:
Layer:
Space:

Subject: Rectangle
Page Label: 401
Author: 137820
Date: 10/8/2021 5:56:27 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:25:29 AM
Color:
Layer:
Space:

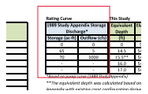
Subject: Rectangle
Page Label: 401
Author: 137820
Date: 10/8/2021 5:56:30 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:25:33 AM
Color:
Layer:
Space:

Subject: Rectangle
Page Label: 400
Author: 137820
Date: 10/8/2021 5:55:24 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:17:30 AM
Color:
Layer:
Space:

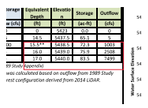
Subject: Rectangle
Page Label: 51
Author: 137820
Date: 10/10/2021 3:11:55 PM
Status: Rejected set by ben_liu on 3/2/2022 at 10:55:04 AM
Color:
Layer:
Space:

Subject: Rectangle
Page Label: 51
Author: 137820
Date: 10/10/2021 3:13:15 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:36:42 AM
Color:
Layer:
Space:

Subject: Rectangle
Page Label: 51
Author: 137820
Date: 10/10/2021 3:14:48 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:36:58 AM
Color:
Layer:
Space:

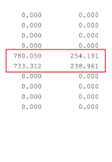


Subject: Rectangle
Page Label: 117
Author: 137820
Date: 10/10/2021 3:20:37 PM
Status: Completed set by ben_liu on 3/2/2022 at 11:45:49 AM
Color:
Layer:
Space:

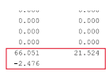


Subject: Rectangle
Page Label: 117
Author: 137820
Date: 10/10/2021 3:23:45 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:45:37 AM
Color:
Layer:
Space:

Subject: Rectangle
Page Label: 117
Author: 137820
Date: 10/10/2021 3:25:52 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:45:56 AM
Color:
Layer:
Space:



Subject: Rectangle
Page Label: 150
Author: 137820
Date: 10/10/2021 3:38:29 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:47:06 AM
Color:
Layer:
Space:



Subject: Rectangle
Page Label: 150
Author: 137820
Date: 10/10/2021 3:39:24 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:47:15 AM
Color:
Layer:
Space:

Sticky Note (7)

Subject: Sticky Note
Page Label: 45
Author: mschutte
Date: 10/14/2021 2:20:17 PM
Status: Rejected set by ben_liu on 3/1/2022 at 4:33:23 PM
Color:
Layer:
Space:

Was the TIN developed from the contours or from the LAS files? Please check with your GIS team, I think this sentence just needs to be re-phrased.

Subject: Sticky Note
Page Label: 45
Author: ben_liu
Date: 3/1/2022 4:32:56 PM
Status:
Color:
Layer:
Space:

We used contours, see response above.

Subject: Sticky Note
Page Label: 45
Author: mschutte
Date: 10/14/2021 2:22:17 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:45:28 PM
Color:
Layer:
Space:

Add a statement referencing the appendix.

Subject: Sticky Note
Page Label: 48
Author: mschutte
Date: 10/14/2021 2:24:17 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:57:53 PM
Color:
Layer:
Space:

The use of cross sections is to delineate 500-yr flood hazard and also provides better detail for the surface flow profile over the structure. Perhaps provide this explanation in the text to clarify.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 2:55:15 PM
Status: Rejected set by ben_liu on 3/4/2022 at 9:54:06 AM
Color:
Layer:
Space:

Map as 100-yr floodplain (not shallow flooding)

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 9:54:02 AM
Status:
Color:
Layer:
Space:

Shallow flooding seems more appropriate

Subject: Sticky Note
Page Label: 321
Author: mschutte
Date: 10/14/2021 3:00:23 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:44:12 PM
Color:
Layer:
Space:

That is correct. Total flow should not be used, use the Q Weir from the culvert output for normal depth calc.

Subject: Sticky Note
Page Label: 418
Author: mschutte
Date: 10/14/2021 3:37:20 PM
Status: Completed set by ben_liu on 3/4/2022 at 10:02:10 AM
Color:
Layer:
Space:

Delineate 500-yr FP in road between XS 23935 and connect to downstream 500-yr fp

Subject: Sticky Note
Page Label: 418
Author: ben_liu
Date: 3/4/2022 10:02:06 AM
Status:
Color:
Layer:
Space:

Revised

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:46:32 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:21:15 PM
Color:
Layer:
Space:

Label Highway.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 4:21:19 PM
Status:
Color:
Layer:
Space:

Revised

Text Box (27)

**Difference
decrease
-50%

Subject: Text Box
Page Label: 39
Author: 137820
Date: 10/7/2021 4:41:06 PM
Status:
Color:
Layer:
Space:

decrease

% decrease

Subject: Text Box
Page Label: 39
Author: 137820
Date: 10/7/2021 4:41:16 PM
Status:
Color:
Layer:
Space:

decrease

decrease

Subject: Text Box
Page Label: 39
Author: 137820
Date: 10/7/2021 4:41:23 PM
Status:
Color:
Layer:
Space:

decrease

increas
e

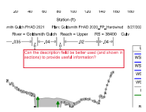
Subject: Text Box
Page Label: 39
Author: 137820
Date: 10/7/2021 4:41:29 PM
Status:
Color:
Layer:
Space:

increase

increas
e

Subject: Text Box
Page Label: 39
Author: 137820
Date: 10/7/2021 4:41:36 PM
Status:
Color:
Layer:
Space:

increase



Subject: Text Box
Page Label: 175
Author: 137820
Date: 10/10/2021 3:45:10 PM
Status: Completed set by ben_liu on 3/2/2022 at 2:36:43 PM
Color:
Layer:
Space:

Can the description field be better used (and shown in sections) to provide useful information?

Subject: Sticky Note
Page Label: 175
Author: ben_liu
Date: 3/2/2022 2:36:36 PM
Status:
Color:
Layer:
Space:

Will display in cross section plots

Subject: Text Box
Page Label: 295
Author: 137820
Date: 10/7/2021 6:50:45 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:36:54 PM
Color:
Layer:
Space:

The visual quality of these could be much improved (typ).

Subject: Sticky Note
Page Label: 295
Author: ben_liu
Date: 3/2/2022 4:36:57 PM
Status:
Color:
Layer:
Space:

Yes this happened when we consolidated to the 11"x17" format ... will try another method.

Subject: Text Box
Page Label: 393
Author: 137820
Date: 10/7/2021 6:57:36 PM
Status: Completed set by ben_liu on 3/2/2022 at 4:46:48 PM
Color:
Layer:
Space:

s

Subject: Sticky Note
Page Label: 393
Author: ben_liu
Date: 3/2/2022 4:46:45 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Text Box
Page Label: 417
Author: 137820
Date: 10/7/2021 7:01:10 PM
Status: Completed set by ben_liu on 3/4/2022 at 9:09:46 AM
Color:
Layer:
Space:

Include note that flood hazards based on analysis using 1' contour interval.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 9:09:44 AM
Status:
Color:
Layer:
Space:

Revised

Subject: Text Box
Page Label: 23
Author: 137820
Date: 10/8/2021 8:48:00 AM
Status:
Color:
Layer:
Space:

Show street names.

Subject: Text Box
Page Label: 45
Author: 137820
Date: 10/10/2021 3:10:12 PM
Status: Completed set by ben_liu on 3/1/2022 at 4:45:23 PM
Color:
Layer:
Space:

There's no discussion about the use of lateral structures or the use of normal depth calculations to determine flood hazards in Cook Park.

Subject: Sticky Note
Page Label: 45
Author: ben_liu
Date: 3/1/2022 4:45:18 PM
Status:
Color:
Layer:
Space:

Cook Park references have been added to the lateral structure discussion on pg 41 and the normal depth discussion on pg 44.

Subject: Text Box
Page Label: 417
Author: 137820
Date: 10/8/2021 1:30:37 PM
Status: Rejected set by ben_liu on 3/4/2022 at 8:52:09 AM
Color:
Layer:
Space:

Label reach IDs.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:52:06 AM
Status:
Color:
Layer:
Space:

Reach IDs were already labeled, note "Monaco Overflow" ID is below the other labels due to the tight workspace

---

Subject: Text Box
Page Label: 417
Author: 137820
Date: 10/8/2021 1:32:49 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:49:51 AM
Color:
Layer:
Space:

Please show direction of flow across lateral structures.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:49:46 AM
Status:
Color:
Layer:
Space:

Sorry, this lateral structure should not be displayed (it was an interim check of flow diversions down Florida Ave)

Subject: Text Box
Page Label: 417
Author: 137820
Date: 10/8/2021 1:41:17 PM
Status: Completed set by ben_liu on 3/4/2022 at 8:55:59 AM
Color:
Layer:
Space:

Note that there appear to be multiple lines along the boundaries of the flood hazard areas. This diminishes the clarity of the boundaries.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 8:54:54 AM
Status:
Color:
Layer:
Space:

Are you referring to lateral structure lines? This cannot be helped, but we will try to move WSEL labels off the boundaries when possible

---

Subject: Text Box
Page Label: 417
Author: 137820
Date: 10/8/2021 2:12:04 PM
Status: Rejected set by ben_liu on 3/4/2022 at 9:09:33 AM
Color:
Layer:
Space:

None of the layers on this figure can be toggled in Adobe.

Subject: Sticky Note
Page Label: 417
Author: mschutte
Date: 10/14/2021 3:20:23 PM
Status:
Color:
Layer:
Space:

These are not meant to be interactive maps.

Subject: Sticky Note
Page Label: 417
Author: ben_liu
Date: 3/4/2022 9:09:29 AM
Status:
Color:
Layer:
Space:

Agree

Subject: Text Box
Page Label: 421
Author: 137820
Date: 10/8/2021 4:30:26 PM
Status: Completed set by ben_liu on 3/4/2022 at 3:16:41 PM
Color:
Layer:
Space:

Culvert not modeled

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:41:29 PM
Status:
Color:
Layer:
Space:

Add callout and label that flow is in culvert.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 3:16:38 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Text Box
Page Label: 421
Author: 137820
Date: 10/8/2021 4:37:25 PM
Status: Completed set by ben_liu on 3/4/2022 at 2:34:05 PM
Color:
Layer:
Space:

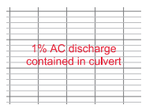
Culvert not modeled

Subject: Sticky Note
Page Label: 421
Author: mschutte
Date: 10/14/2021 3:44:21 PM
Status:
Color:
Layer:
Space:

Same as previous.

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 2:33:55 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Text Box
Page Label: 421
Author: 137820
Date: 10/8/2021 4:44:29 PM
Status: Completed set by ben_liu on 3/4/2022 at 4:25:14 PM
Color:
Layer:
Space:

1% AC discharge contained in culvert

Subject: Sticky Note
Page Label: 421
Author: ben_liu
Date: 3/4/2022 4:25:11 PM
Status:
Color:
Layer:
Space:

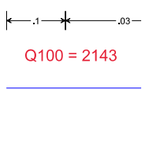
Revised

Subject: Text Box
Page Label: 174
Author: 137820
Date: 10/10/2021 3:44:14 PM
Status: Completed set by ben_liu on 3/2/2022 at 2:36:12 PM
Color:
Layer:
Space:

Please populate the Node Names Table with short entries that identify the location.

Subject: Sticky Note
Page Label: 174
Author: ben_liu
Date: 3/2/2022 2:36:09 PM
Status:
Color:
Layer:
Space:

We used the Node Descriptions fields for this information



Subject: Text Box
Page Label: 209
Author: 137820
Date: 10/8/2021 6:19:04 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:37:42 PM
Color:
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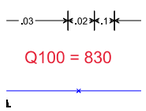
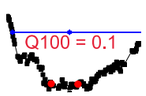
Space:

Q100 = 2143



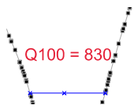
Subject: Text Box
Page Label: 209
Author: 137820
Date: 10/8/2021 6:18:56 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:37:33 PM
Color:
Layer:
Space:

Q100 = 830



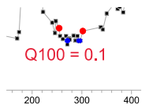
Subject: Text Box
Page Label: 210
Author: 137820
Date: 10/8/2021 6:20:45 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:39:56 PM
Color:
Layer:
Space:

Q100 = 0.1



Subject: Text Box
Page Label: 210
Author: 137820
Date: 10/8/2021 6:21:27 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:39:56 PM
Color:
Layer:
Space:

Q100 = 830



Subject: Text Box
Page Label: 210
Author: 137820
Date: 10/8/2021 6:20:51 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:39:56 PM
Color:
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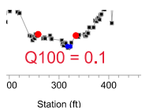
Space:

Q100 = 0.1

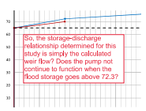


Subject: Text Box
Page Label: 210
Author: 137820
Date: 10/8/2021 6:21:01 PM
Status: Rejected set by ben_liu on 3/2/2022 at 2:39:18 PM
Color:
Layer:
Space:

Q100 = 0.1

Subject: Text Box
Page Label: 1
Author: 137820
Date: 10/10/2021 10:50:08 AM
Status:
Color:
Layer:
Space:

CCD Review
Floodplain Administration
October 11, 2021



Subject: Text Box
Page Label: 117
Author: 137820
Date: 10/10/2021 3:31:03 PM
Status: Rejected set by ben_liu on 3/2/2022 at 11:42:43 AM
Color:
Layer:
Space:

So, the storage-discharge relationship determined for this study is simply the calculated weir flow? Does the pump not continue to function when the flood storage goes above 72.3?

Subject: Sticky Note
Page Label: 117
Author: mschutte
Date: 10/14/2021 2:35:28 PM
Status:
Color:
Layer:
Space:

Capacity of the pump is minimal relative to the spillway.

Subject: Sticky Note
Page Label: 117
Author: ben_liu
Date: 3/2/2022 11:42:39 AM
Status:
Color:
Layer:
Space:

Agreed

FHAD - Greenwood Village Comments - 10-8-21.pdf Markup Summary

Callout (3)

Subject: Callout
Page Label: 5
Author: JMorin
Date: 10/6/2021 9:41:09 AM
Status:
Color:
Layer:
Space:

Structures at 27+60 and 21+00 replaced by project completed in 2020/2021 - The new structures are represented in the FHAD RAS modeling

---

Subject: Sticky Note
Page Label: 5
Author: ben_liu
Date: 3/6/2022 8:58:53 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Callout
Page Label: 1
Author: JMorin
Date: 10/6/2021 9:45:14 AM
Status:
Color:
Layer:
Space:

Bridges replaced as part of 2020/2021 project. See W. Trib Sections 2722 and 2128 in RAS modeling for new structure dimensions. New bridge at RS 2722 passes the 100-year event.

Subject: Sticky Note
Page Label: 1
Author: ben_liu
Date: 3/6/2022 8:51:11 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Callout
Page Label: 3
Author: JMorin
Date: 10/6/2021 9:49:08 AM
Status:
Color:
Layer:
Space:

Project is complete and as-built conditions have been included in the FHAD hydraulic modeling

---

Subject: Sticky Note
Page Label: 3
Author: ben_liu
Date: 3/6/2022 8:52:43 PM
Status:
Color:
Layer:
Space:

Revised

Line (2)

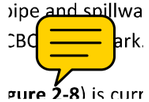
Subject: Line
Page Label: 5
Author: JMorin
Date: 10/6/2021 9:40:45 AM
Status:
Color:
Layer:
Space:

Subject: Line
Page Label: 1
Author: JMorin
Date: 10/6/2021 9:45:23 AM
Status:
Color:
Layer:
Space:

Sticky Note (3)

Subject: Sticky Note
Page Label: 4
Author: ben_liu
Date: 3/6/2022 8:59:08 PM
Status:
Color:
Layer:
Space:

Revised



Subject: Sticky Note
Page Label: 2
Author: ben_liu
Date: 3/6/2022 8:59:18 PM
Status:
Color:
Layer:
Space:

Revised

Subject: Sticky Note
Page Label: 2
Author: ben_liu
Date: 3/6/2022 8:59:23 PM
Status:
Color:
Layer:
Space:

Revised

707 17th Street, Suite 3150
Denver, Colorado 80202
(303) 572-0200

MEMORANDUM

To: Morgan Lynch, P.E., CFM
Hung-Teng Ho, P.E.

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: May 13, 2022

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Flood Hazard Review _ Final Submittal

Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 7th Submittal (HEC-RAS, mapping, and report) on April 7 and April 27, 2022. This memo is to document the responses to the previous review comments: MHFD directions are in red, Matrix responses are in blue. We are providing the revised FHAD report, mapping, modeling and checklists for your review.

Deliverables include:

- Goldsmith Gulch Flood Hazard Area Delineation report (full pdf and report Word doc)
- HEC-RAS models: GoldsmithFHAD.prj (FHAD model); GG_Optimiz.prj (Split Flow Optimizations)
- AutoCAD Files: FHAD Profiles and XREFs
- GIS files: cross sections, river baselines, modeled levees, 500-year floodplain delineation, 100-year floodplain delineation, 100-year shallow flooding delineation, floodway delineation, and project contours, FHAD Maps packages
- Agreement Tables (includes floodway notes)
- Exhibit D – DFHAD Studies Report Checklist
- Exhibit E – Technical Appendix Checklist

MHFD General Comments: *Review Step 4 – Full Review*

1. All comments in the previous geodatabase were addressed.
   Acknowledged.

2. There are outstanding comments from the previous report review. These comments have been summarized in the provided document "Goldsmith Gulch FHAD_MHFD comments."
   Please see responses to these comments in the pdf file.

3. Comments from SEMSWA have also been provided. To date we have not received Denver or Greenwood Village comments. Please review and address all comments unless you feel discussion is warranted.
   Please see responses to these comments in the pdf file.

4. Once any remaining data deliverable comments are addressed, please provide the data layers in their final data structure (using the geodatabase template) and FHAD symbology available on MHFD's website: https://mhfd.org/services/floodplain-management/.
   We will comply, see attached files.

5. Please provide documentation for the Hydrology and FHAD in the file format and structure provided in the Technical Appendix Checklist, Exhibit E from the original agreement. This checklist has been provided again. Sections 1 and 12 should be provided at this time. Please be aware that all supporting models and calculations should be provided, even if they have been provided previously in past reviews. The goal is to get your final versions of all information associated with the Hydrology and FHAD.
   We will comply, see attached files.

Denver Comments (April 11, 2022 letter to MHFD)

1. Once again, prior comments were not addressed:
   - In GIS geodatabase, please define index contours using 5' interval (currently defined by 10' interval).
     MHFD's response that was provided to Matrix: FHAD Guidelines set the major contour minimum at 10', therefore no change is required. 5' contours would decrease readability on flood maps.

   - Please consider changing the modeling to use inline structures with rating curves at the crossings of E Yale Ave, E Hampden Ave, E Temple Dr. Enter rating tables from the baseline hydrology report.
     MHFD's response that was provided to Matrix: The flooding in Hampden is a result of the Southmoor Tributary flows heading east along Hampden, not overtopping from the Goldsmith Gulch culvert. In addition, we need to model the 500-yr overflow, which requires overland flow cross sections on Hampden to model the overtopping. This is the same reason as for the other locations mentioned. The modeling approach sufficiently represents the flooding present.

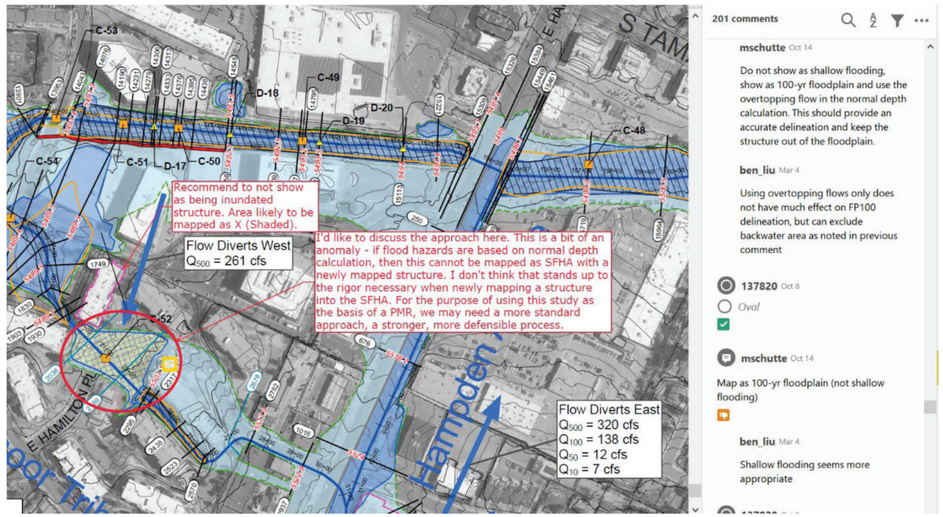
2. At cross sections 24029-23984 - do not show as floodway. The flooding shown in the street is not effective anyway (nor detention or park) and would hinder any improvements of the roadway in that location.
   I will ask Ben to make this update.
   We will remove the floodplain delineation here.

3. The mapping of flooding along Lower Southmoor Tributary at the crossing of E Hamilton Place seems to be in flux. We had asked for one of the structures at 6980 E Girard Ave to be shown as not inundated. Upon further inspection using Google Street View (see below), the structure is in fact subject to inundation and should be identified as such in the FHAD. There is however, an issue with the latest iteration of the mapping. The floodplain boundary shows the floodplain boundary having been modified to not touch the structure. It is appropriate to revert back to the prior mapping which shows the structure being touched by the floodplain (see second image below).
   If you would like, we can revert back to the previous delineation.
   We will revert the floodplain boundary to the previous delineation. Note that Matrix and MHFD discussed the previous Denver request to remove this structure from the floodplain and agreed to make the requested change since the shallow flooding could conceivably bypass this backwater area.

Some back and forth in comments suggested that the flooding be shown as 100-year floodplain, not shallow flooding (see image below). GIS files include "mapping" as both 100-year floodplain and shallow flooding. Both have the same shape. A final decision should be made whether to map as 100-year or shallow flooding. If mapped as 100-year, then the area would logically become Zone AE on a FIRM. If mapped as shallow flooding, it could be shown as AH or X (Shaded) on a FIRM. Our preference is to show it as shallow flooding if the basis of the delineation is based on a normal depth calculation (which it currently is on the FHAD flood maps). We would anticipate showing as AH on a FIRM (eventually). If area will be shown as shallow flooding, it may be appropriate to remove the area from 100-year floodplain layer in GIS.

Matrix and MHFD discussed the flooding in this location extensively. After further review together, MHFD agreed that shallow flooding was appropriate, and as such we felt comfortable removing the small section from the mapping.

We had all the mapped Special Flood Hazard Areas in one GIS file, with a field that described the type (AH or AE). We will remove the shallow flooding areas from the primary 100-year floodplain GIS file to avoid confusion.



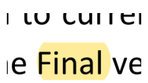
In regard to the floodplain and floodway around the Kmart property:

- Extensive discussion of this area has occurred between Matrix, MHFD, and Denver. The stream alignment and cross sections were agreed upon collectively by this group with the review of previous submittals. The floodplain delineation follows the contour information cut along these cross sections and this stream centerline.
- Given that the flow path is not a natural alignment, it would not be surprising, given the street capacity, for flow to follow the street alignments.
- I will let Matrix speak to the method of determining the floodway, but I do not see a preferential treatment for the floodway, given that the floodplain has been reduced on both sides.

We have revised the text in Section 4.0 to better explain our encroachments approach: “Floodways were defined utilizing an approach of equal conveyance reduction of left and right overbanks. In certain isolated locations, equal encroachment is not appropriate where one bank is dramatically steeper than the other. Along cross sections such as these, the encroachment of the floodway is based upon encroaching more on the milder slope bank having shallower flow. The goal is to define a floodway for the area of the cross section with the greatest flood conveyance, having the deepest and highest velocity flow.”

Goldsmith Gulch FHAD_MHFD comments response.pdf Markup Summary

Highlight (6)

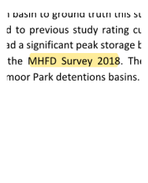


Subject: Highlight
Page Label: 35
Author: mschutte
Date: 3/21/2022 9:47:47 AM
Status:
Color:
Layer:
Space:

baseline?

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 4/22/2022 3:00:58 PM
Status:
Color:
Layer:
Space:

Changed to remove "final version". Same above for Interim 2 to remove "final"

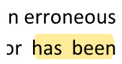


Subject: Highlight
Page Label: 38
Author: mschutte
Date: 3/21/2022 10:01:42 AM
Status:
Color:
Layer:
Space:

properly reference the structure survey

Subject: Sticky Note
Page Label: 38
Author: robert_krehbiel
Date: 4/22/2022 3:12:00 PM
Status:
Color:
Layer:
Space:

Changed to Wilson & Company, Inc. structure survey 2018



Subject: Highlight
Page Label: 38
Author: mschutte
Date: 3/21/2022 10:02:39 AM
Status:
Color:
Layer:
Space:

was

Subject: Sticky Note
Page Label: 38
Author: robert_krehbiel
Date: 4/22/2022 3:12:41 PM
Status:
Color:
Layer:
Space:

changed as noted

Subject: Highlight
Page Label: 38
Author: mschutte
Date: 3/21/2022 10:50:48 AM
Status:
Color:
Layer:
Space:

for the Orchard Hills and Southmoor Park detention basin rating curves.

Subject: Sticky Note
Page Label: 38
Author: robert_krehbiel
Date: 4/22/2022 3:13:36 PM
Status:
Color:
Layer:
Space:

changed as noted

Subject: Highlight
Page Label: 35
Author: mschutte
Date: 3/21/2022 1:37:44 PM
Status:
Color:
Layer:
Space:

Please confirm - these panels cover the areas for SEMSWA and GV?

Subject: Sticky Note
Page Label: 35
Author: robert_krehbiel
Date: 4/22/2022 2:57:36 PM
Status:
Color:
Layer:
Space:

Yes, they cover SEMSWA and Arapahoe County. Denver panels corrected.

Subject: Highlight
Page Label: 49
Author: mschutte
Date: 3/21/2022 1:55:21 PM
Status:
Color:
Layer:
Space:

Verify this is acceptable to CCD. They may want specific cross sections provided, or perhaps at least an example?

Subject: Sticky Note
Page Label: 49
Author: robert_krehbiel
Date: 4/22/2022 4:31:26 PM
Status:
Color:
Layer:
Space:

Added clarifying language that a floodway is the area with the highest conveyance.

Sticky Note (10)

Subject: Sticky Note
Page Label: 5
Author: mschutte
Date: 3/21/2022 11:06:05 AM
Status:
Color:
Layer:
Space:

Appendix E and F here are shown as Appendix G and H in bookmarks/on pages later. please fix so that references match.

Subject: Sticky Note
Page Label: 5
Author: ben_liu
Date: 5/14/2022 9:54:47 PM
Status:
Color:
Layer:
Space:

List of Appendices revised to match bookmarks/appendices titles.

Subject: Sticky Note
Page Label: 5
Author: mschutte
Date: 3/21/2022 11:06:35 AM
Status:
Color:
Layer:
Space:

please provide links for appendices as was done for report sections, figures, and tables

Subject: Sticky Note
Page Label: 5
Author: ben_liu
Date: 5/14/2022 9:53:46 PM
Status:
Color:
Layer:
Space:

Hyperlinks added.

Subject: Sticky Note
Page Label: 16
Author: mschutte
Date: 3/21/2022 1:29:11 PM
Status:
Color:
Layer:
Space:

CCD's comments were addressed, but appears there was a drawing error.

Subject: Sticky Note
Page Label: 16
Author: ben_liu
Date: 5/14/2022 9:56:24 PM
Status:
Color:
Layer:
Space:

Replotted exhibit to fix aerial display.

Subject: Sticky Note
Page Label: 17
Author: mschutte
Date: 3/21/2022 1:29:20 PM
Status:
Color:
Layer:
Space:

CCD's comments were addressed, but appears there was a drawing error.

Subject: Sticky Note
Page Label: 17
Author: ben_liu
Date: 5/14/2022 9:56:31 PM
Status:
Color:
Layer:
Space:

Replotted exhibit to fix aerial display.

Subject: Sticky Note
Page Label: 39
Author: mschutte
Date: 3/21/2022 1:40:50 PM
Status:
Color:
Layer:
Space:

Addressed CCD's comment, but the negative sign should be removed to avoid confusion

Subject: Sticky Note
Page Label: 39
Author: ben_liu
Date: 5/14/2022 9:57:30 PM
Status:
Color:
Layer:
Space:

Removed negative sign.

Subject: Sticky Note
Page Label: 45
Author: mschutte
Date: 3/21/2022 1:43:54 PM
Status:
Color:
Layer:
Space:

I think it would be useful to add the explanation you gave to CCD in your comment response to the paragraph here to further explain.

Subject: Sticky Note
Page Label: 45
Author: robert_krehbiel
Date: 4/22/2022 3:30:34 PM
Status:
Color:
Layer:
Space:

Added responses from last review. The TINs were processed from contour data to facilitate splicing in as-built contours at multiple locations, and because efforts to use LiDAR points (LAS files) in previous studies resulted in too much extraneous data.

Subject: Sticky Note
Page Label: 471
Author: mschutte
Date: 3/21/2022 4:27:58 PM
Status:
Color:
Layer:
Space:

symbology for shallowing flooding does not match legend

Subject: Sticky Note
Page Label: 471
Author: ben_liu
Date: 5/14/2022 10:23:52 PM
Status:
Color:
Layer:
Space:

Map symbology matches legend.

Subject: Sticky Note
Page Label: 474
Author: mschutte
Date: 3/22/2022 8:49:47 AM
Status:
Color:
Layer:
Space:

move XS label below

Subject: Sticky Note
Page Label: 474
Author: ben_liu
Date: 5/12/2022 9:45:51 PM
Status:
Color:
Layer:
Space:

Moved label.

Subject: Sticky Note
Page Label: 474
Author: mschutte
Date: 3/22/2022 9:13:06 AM
Status:
Color:
Layer:
Space:

Use offset leaders where cross sections are tight?

Subject: Sticky Note
Page Label: 474
Author: ben_liu
Date: 5/12/2022 10:02:36 PM
Status:
Color:
Layer:
Space:

Revised leaders in tight areas as suggested.

Subject: Sticky Note
Page Label: 5
Author: mschutte
Date: 3/28/2022 3:27:17 PM
Status:
Color:
Layer:
Space:

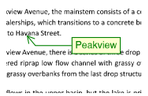
The maps and profiles are incredibly difficult to view due to their size... is there a way to make them more viewable? perhaps we could flatten those pages in the overall report and provide the unflattened profiles and maps as separate PDFs as well? Let's discuss if you'd like.

Subject: Sticky Note
Page Label: 5
Author: ben_liu
Date: 5/14/2022 10:02:58 PM
Status:
Color:
Layer:
Space:

These were already flattened, but we have decreased the output resolution of the FHAD maps to reduce file size and improve performance. Note that the profiles were already small size, suggest closing the page thumbnails pane to avoid displaying the FHAD maps while navigating the profiles.

Goldsmith Gulch FHAD_SEMSWA comments response.pdf Markup Summary

Callout (5)

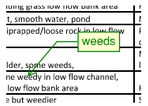


Subject: Callout
Page Label: 21
Author: clove
Date: 3/29/2022 4:01:07 PM
Status:
Color:
Layer:
Space:

Peakview

Subject: Sticky Note
Page Label: 21
Author: robert_krehbiel
Date: 4/22/2022 4:34:22 PM
Status:
Color:
Layer:
Space:

changed

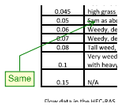


Subject: Callout
Page Label: 46
Author: clove
Date: 3/29/2022 4:02:07 PM
Status:
Color:
Layer:
Space:

weeds

Subject: Sticky Note
Page Label: 46
Author: robert_krehbiel
Date: 4/22/2022 4:35:30 PM
Status:
Color:
Layer:
Space:

changed



Subject: Callout
Page Label: 46
Author: clove
Date: 3/29/2022 4:02:37 PM
Status:
Color:
Layer:
Space:

Same

Subject: Sticky Note
Page Label: 46
Author: robert_krehbiel
Date: 4/22/2022 4:36:06 PM
Status:
Color:
Layer:
Space:

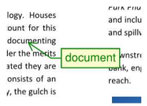
changed

Subject: Callout
Page Label: 46
Author: clove
Date: 3/29/2022 4:03:13 PM
Status:
Color:
Layer:
Space:

weeds

Subject: Sticky Note
Page Label: 46
Author: robert_krehbiel
Date: 4/22/2022 4:36:47 PM
Status:
Color:
Layer:
Space:

changed



Subject: Callout
Page Label: 21
Author: clove
Date: 3/29/2022 4:04:43 PM
Status:
Color:
Layer:
Space:

document

Subject: Sticky Note
Page Label: 21
Author: robert_krehbiel
Date: 4/22/2022 4:34:45 PM
Status:
Color:
Layer:
Space:

changed

Stamp (1)

Subject: Stamp
Page Label: 1
Author: clove
Date: 3/29/2022 4:07:02 PM
Status:
Color:
Layer:
Space:

707 17th Street, Suite 3150
Denver, Colorado 80202
(303) 572-0200

MEMORANDUM

To: Jim Watt, P.E., CFM
Hung-Teng Ho, P.E.

From: Ben Liu, P.E.
Drew Beck, P.E.
Robert Krehbiel, P.E.

Date: October 28, 2022

RE: Flood Hazard Area Delineation
Goldsmith Gulch: Final Review _ 10th Submittal

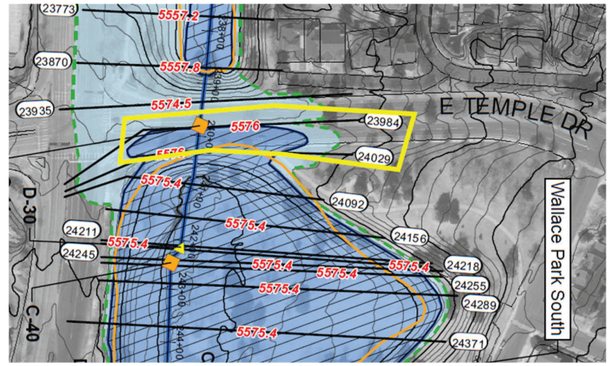
Matrix Design Group, Inc. (Matrix) received review comments for the Goldsmith Gulch FHAD 9th Submittal (HEC-RAS, mapping, and report) on October 4, 2022. This memo is to document the responses to the previous review comments, Matrix responses are in blue. We are providing the revised FHAD report, mapping, modeling and checklists for your review.

Deliverables include:

- Goldsmith Gulch Flood Hazard Area Delineation report (full pdf and report Word doc)
- HEC-RAS models: GoldsmithFHAD.prj (FHAD model); GG_Optimiz.prj (Split Flow Optimizations)
- AutoCAD Files: FHAD Profiles and XREFs
- GIS files: cross sections, river baselines, modeled levees, 500-year floodplain delineation, 100-year floodplain delineation, 100-year shallow flooding delineation, floodway delineation, and project contours
- Agreement Tables (includes floodway notes)
- Exhibit D – DFHAD Studies Report Checklist
- Exhibit E – Technical Appendix Checklist

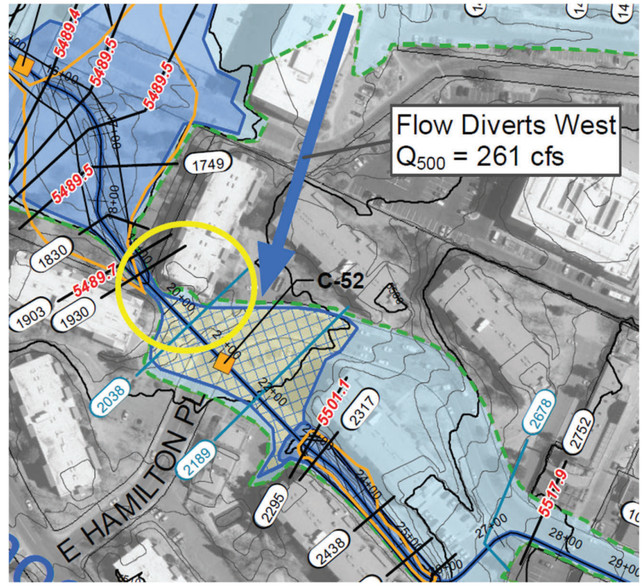
MHFD General Comments: *Review Step 5 – Final Review*

1. Previous Denver Comments (April 11, 2022, letter to MHFD) that were not addressed.
   a. At cross sections 24029-23984 - do not show as floodway.
   New Comment: The Temple Dr is still within the floodway that should not account for any detention volume.



We removed XS 24029-23984 from the floodway mapping.

b. The mapping of flooding along Lower Southmoor Tributary at the crossing of E Hamilton Place seems to be in flux…… It is appropriate to revert to the prior mapping which shows the structure being touched by the floodplain.
New Comment: The floodplain delineation did not revert to the prior mapping to show inundation for the building.

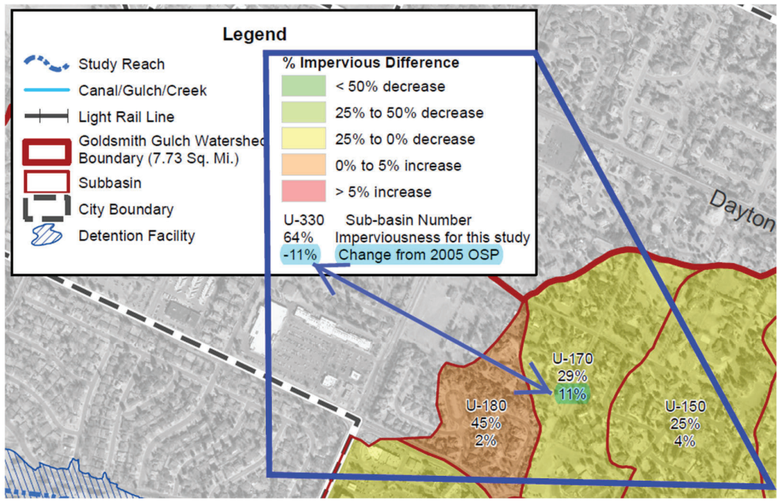


We reverted the floodplain delineation, note that the structure just barely touches the floodplain.

2. City of Greenwood Village comments:
   a. Please update table 1-1 to Include Alexis Cook and Ann Woods as City of Greenwood Village Stakeholders.
   Revised.

   b. The City of Greenwood Village would like to recognize the LOMR that has recently been completed in the area of the Bridgewater Apartments. In lieu of completely updating the FHAD, please add an * to Table 7-1 in the Bridgewater Apartments area. Add a comment below indicating that LOMR 21-08-0598P issued 2/25/22 and effective 7/15/22 was completed to remove the Bridgewater Apartments from the floodplain. The LOMR should be included in future PMR adoption. The same approach should be taken for the Habitable Structures in the 100-Year Floodplain table. Consider if this table should have a table id.
   The FHAD Report does not have a Chapter 7, but we revised Table 4-6 to exclude the Bridgwater structures and added your suggested LOMR text to Section 2.3.

3. The previous comment requested removing the negative sign in the legend, however it seems to cause more confusion. Please see the screenshot below.



We removed the last negative sign from the legend.

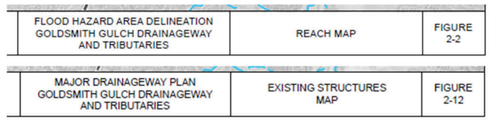
4. Please clean up the HEC-RAS files to remove any files that are irrelevant.

Name	Date modified	Type	Size
GoldsmithFHAD.f01	5/16/2022 11:51 AM	F01 File	14 KB
GoldsmithFHAD.f08	5/16/2022 11:51 AM	F08 File	10 KB
GoldsmithFHAD.g01	5/16/2022 11:51 AM	G01 File	2,197 KB
GoldsmithFHAD.g01.hdf	5/16/2022 11:51 AM	HDF File	1,567 KB
GoldsmithFHAD.g02.hdf	5/16/2022 11:51 AM	HDF File	1,567 KB
GoldsmithFHAD.O01	5/16/2022 11:51 AM	O01 File	2,150 KB
GoldsmithFHAD.O02	5/16/2022 11:51 AM	O02 File	2,150 KB
GoldsmithFHAD.O08	5/16/2022 11:51 AM	O08 File	1,094 KB
GoldsmithFHAD.p01	5/16/2022 11:51 AM	P01 File	5 KB
GoldsmithFHAD.p01.hdf	5/16/2022 11:51 AM	HDF File	2,217 KB
GoldsmithFHAD.p02.hdf	5/16/2022 11:51 AM	HDF File	2,216 KB
GoldsmithFHAD.p08	5/16/2022 11:51 AM	P08 File	44 KB
GoldsmithFHAD.p08.hdf	5/16/2022 11:51 AM	HDF File	2,108 KB
GoldsmithFHAD.prj	5/16/2022 11:51 AM	PRJ File	2 KB
GoldsmithFHAD.r01	5/16/2022 11:51 AM	R01 File	1,983 KB
GoldsmithFHAD.r02	5/16/2022 11:51 AM	R02 File	1,982 KB
GoldsmithFHAD.r08	5/16/2022 11:51 AM	R08 File	2,022 KB
GoldsmithFHAD.rasmap	5/16/2022 11:51 AM	RASMAP File	3 KB

We deleted the suggested files.

5. Please use consistent study name and date.

   a. Please use consistent title for the figures inserted in the report at minimum.

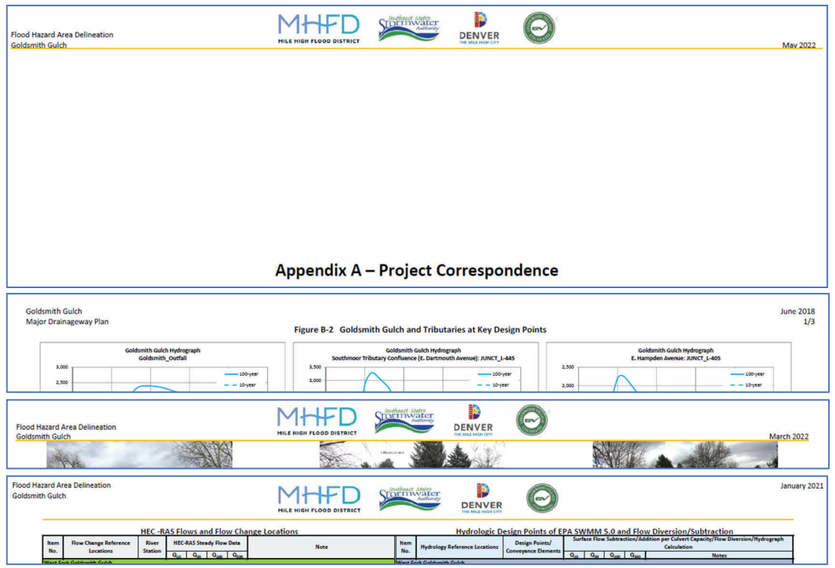


We renamed all report figures to FHAD instead of MDP.

   b. Excerpt below is from flood profile sheets. Please remove “DIGITAL”

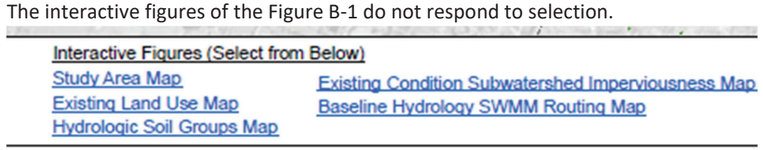
We deleted DIGITAL from the sheet titles.

   c. The titles and dates are not consistent in the appendices, screenshots below. It’s okay to keep as is, however, it’s preferred to have consistent titles and dates for future studies.



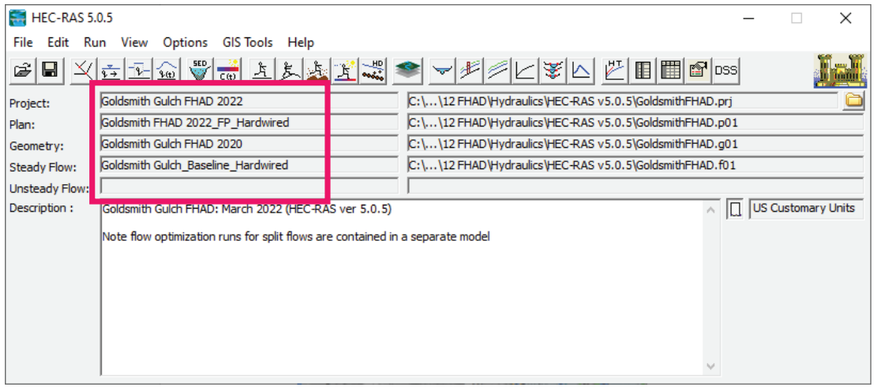
We agree that multiple dates or project types can be confusing, and suggest omitting these items from future appendix headers. This project spanned multiple years, and it does not make sense to update dates for previously completed sections (like Appendix B) with every subsequent submittal.

6. The interactive figures of the Figure B-1 do not respond to selection.



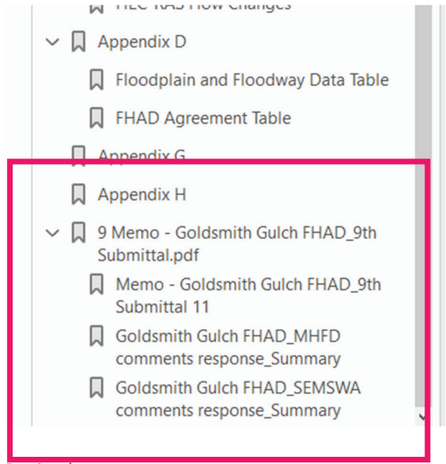
We're not sure why those hyperlinks stopped working, but this map has the largest file size of the entire report. We will attach it to the overall report pdf instead of simply inserting it, hopefully that will preserve the functionality better.

7. Please confirm the different year for the project name and geometry name that was intentional and provide an explanation in the model description for the future users.
Please provide the following information in the description field where appropriate in addition to the information provided.
   - Project brief and date
   - Coordinate system and Projection
   - Consultant, modeler & contact Information
   - Any pertinent information.



This was intentional, the Project and Plan were updated to 2022 to match the report date. The Geometry kept 2020 since that reflects the last date of topographic data collection. We added the requested information into the description fields.

8. Please organize the bookmarks.



Revised.

9. Please stamped by professional engineers per FHAD Report Checklist.

	REPORT SECTIONS	DRAFT REPORT	FINAL REPORT	NOTE #
PRELIMINARIES	**Cover Sheet**	☐	☐	
	Project Title "Flood Hazard Area Delineation, [*Drainageway Name*]"	☐	☐	
	Project Sponsors List, including logos	☐	☐	
	Engineer's Name/Address	☐	☐	
	Date (Month & Year)	☐	☐	
	"DRAFT" stamp (on all except Final Report)	☐	☐	
	Transmittal Letter	☐	☐	
	Signed and sealed by Engineer transmitting report to District	☐	☐	
	Table of Contents	☐	☐	
	Section titles and page numbers	☐	☐	
	List of Tables (number, title, and location in report)	☐	☐	
	List of Figures (number, title, and location in report)	☐	☐	
	List of Appendices	☐	☐	

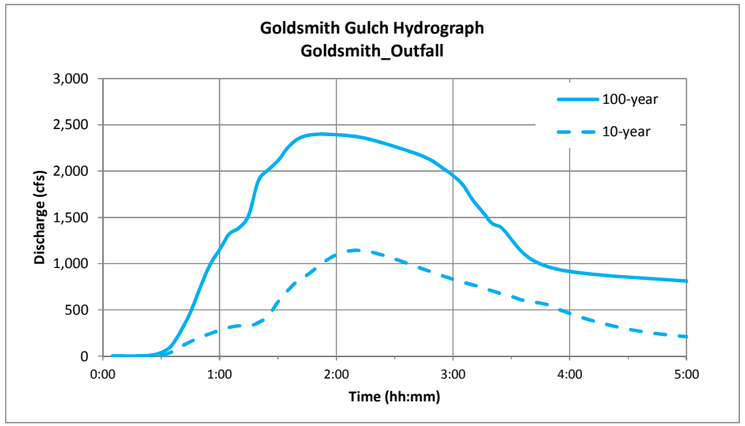
Revised.

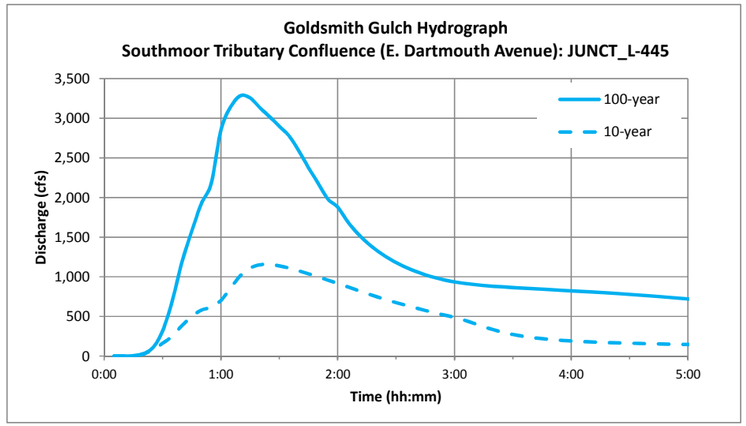
10. At the notice from MHFD, please prepare final technical appendix that shall include report word document, supporting calculations spreadsheets, all other hydraulic models, etc. Please refer to the Technical Appendix Checklist for Flood Hazard Area Delineation provided in Exhibit E from the original agreement.
    Revised.

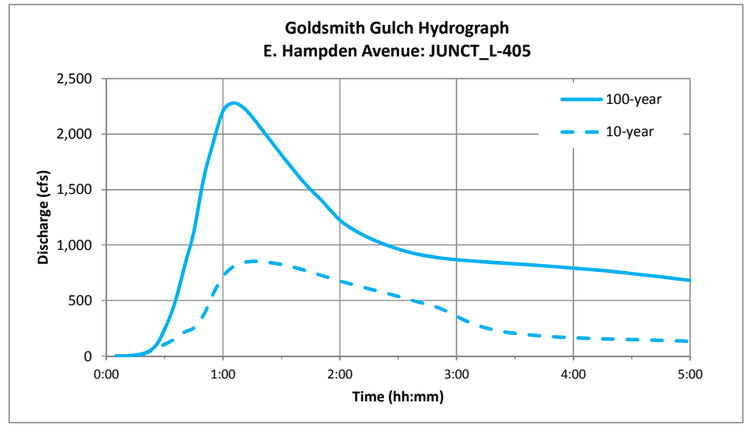
Appendix B – Hydrologic Analysis

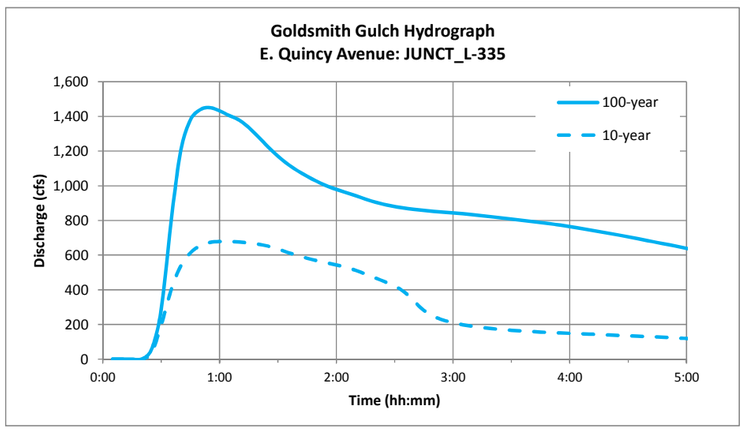
Click here for Figure B-1 Hydrology Map

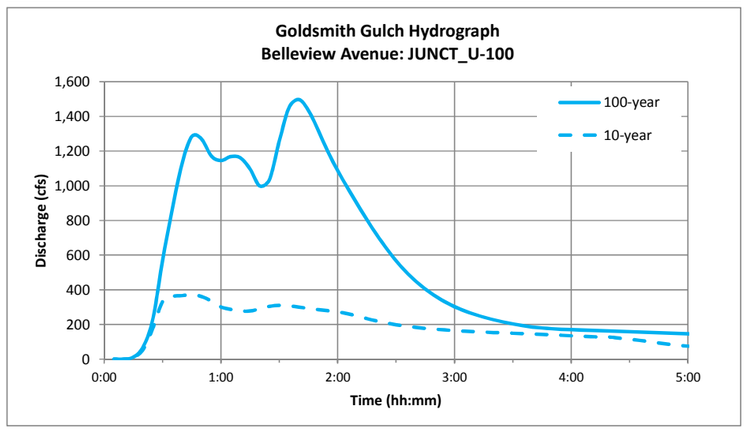
Figure B-2 Goldsmith Gulch and Tributaries at Key Design Points

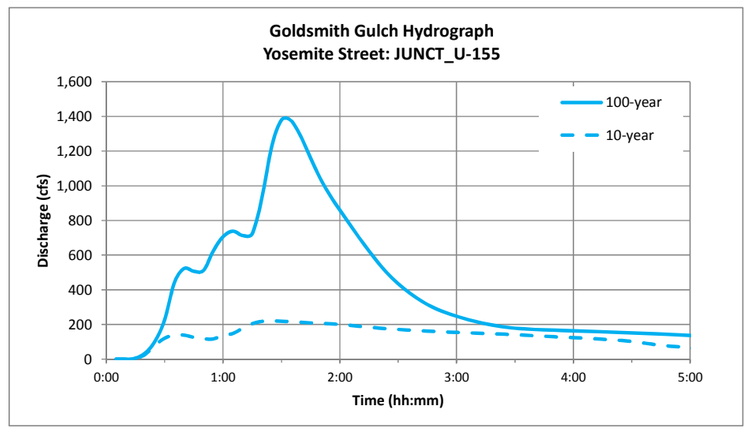


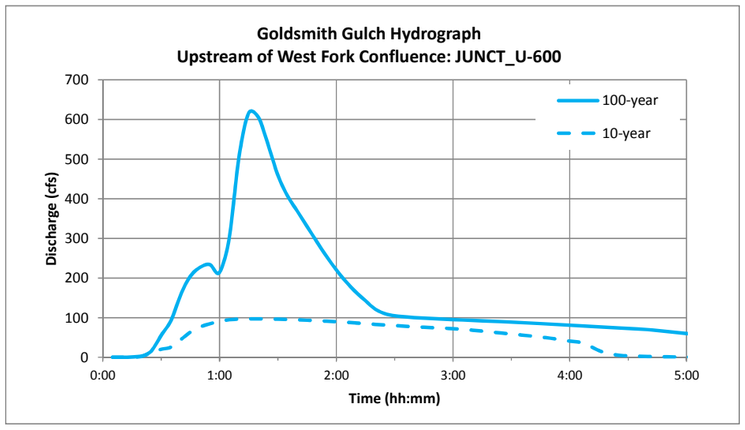


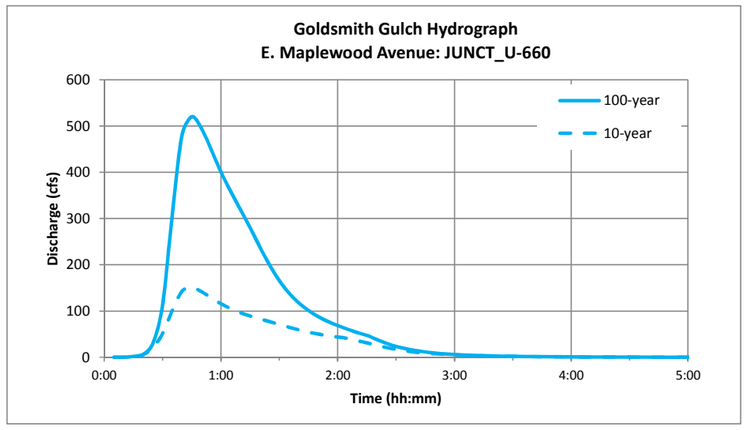












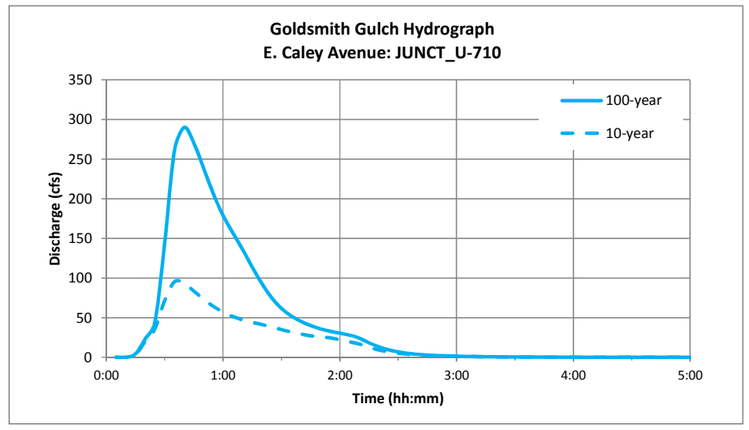
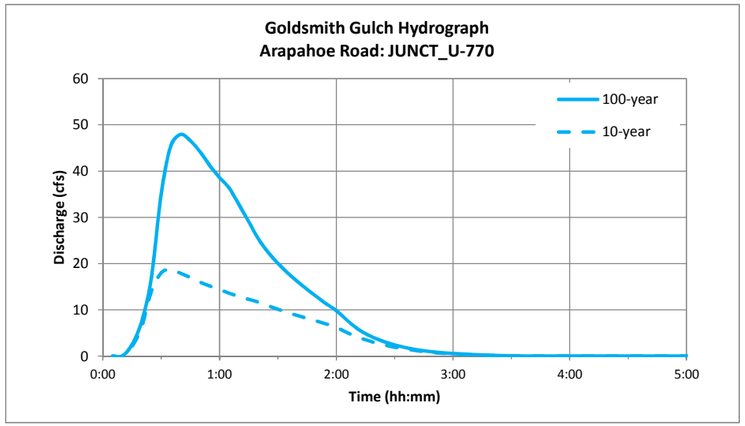
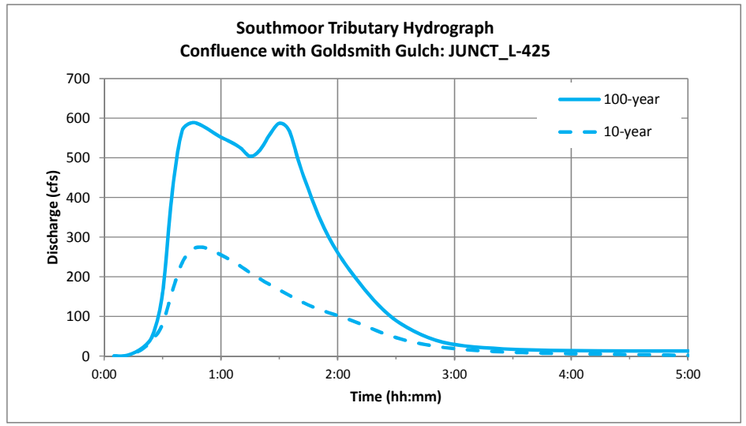
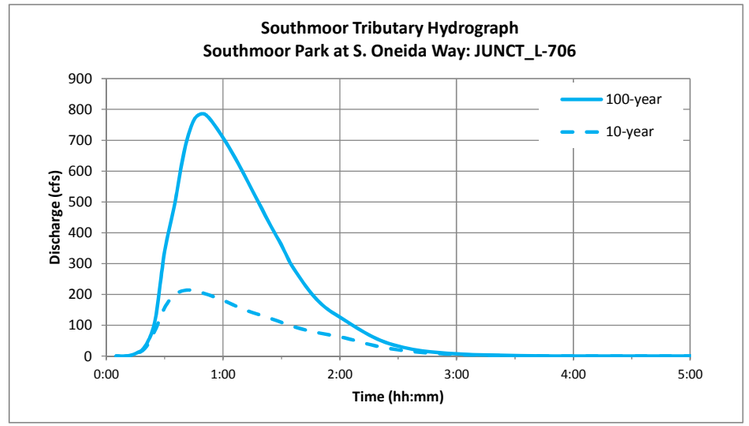
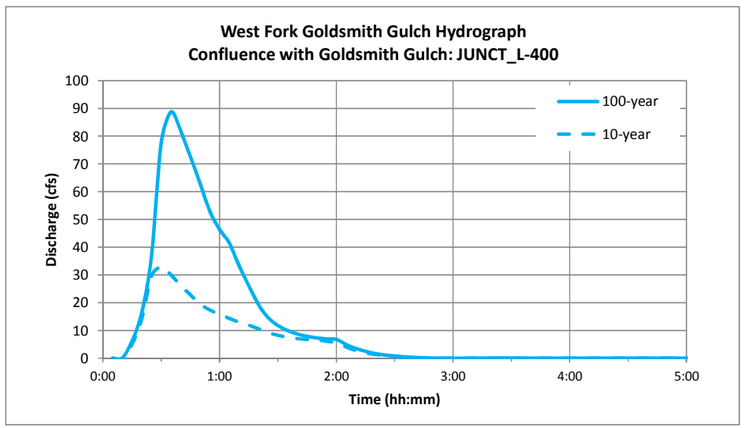


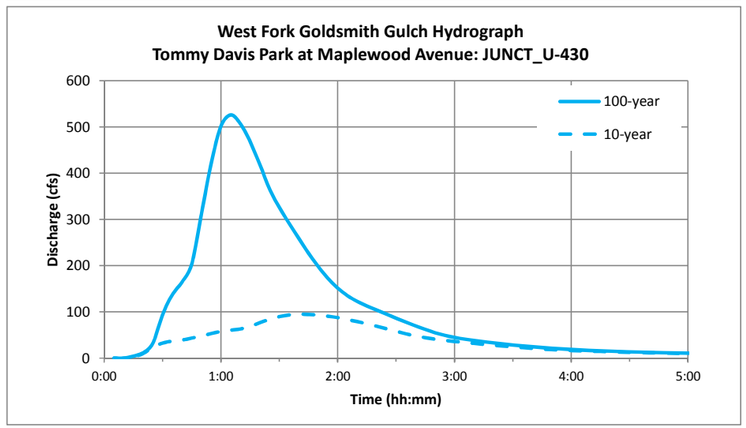
Figure B-2 Goldsmith Gulch and Tributaries at Key Design Points

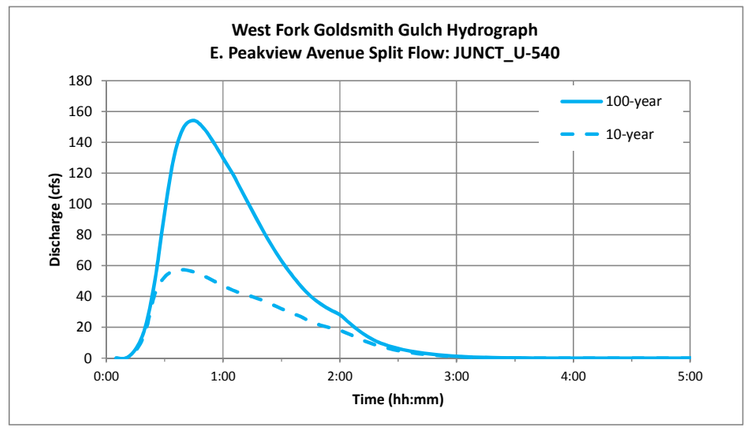


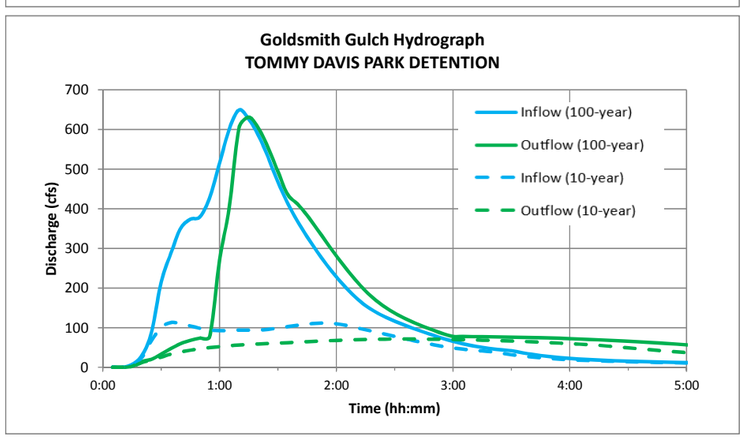


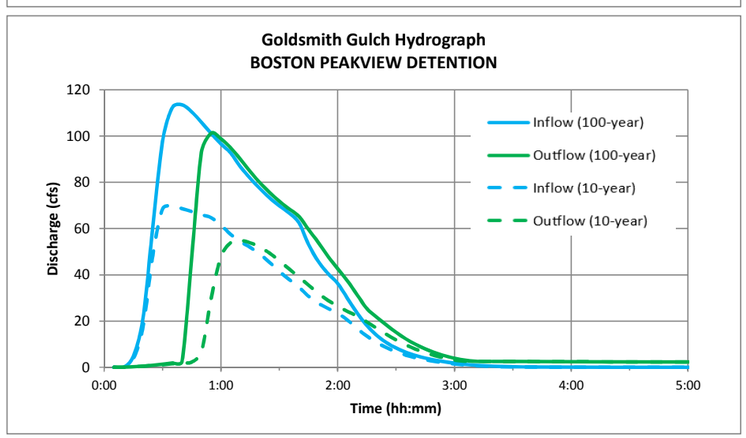












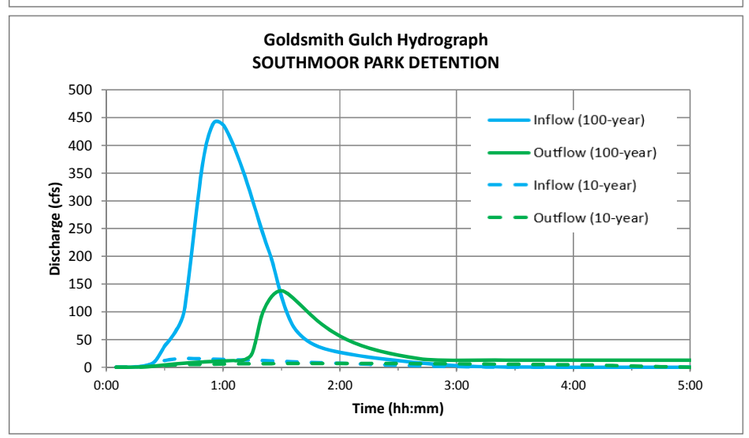
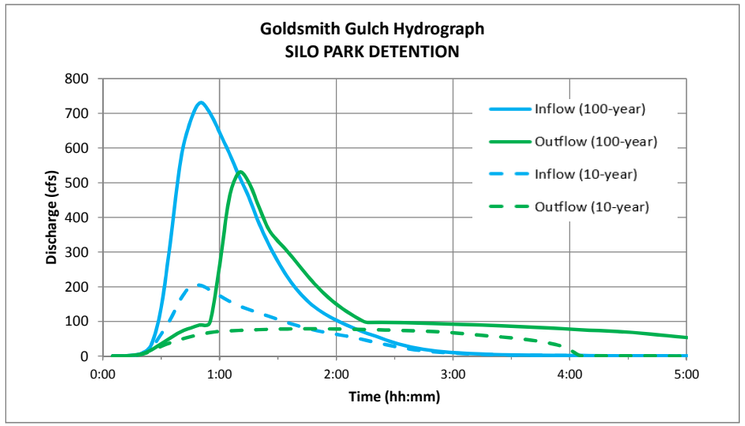
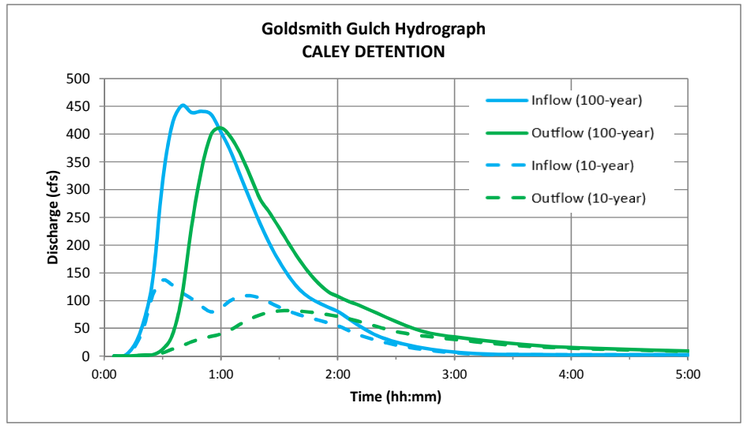
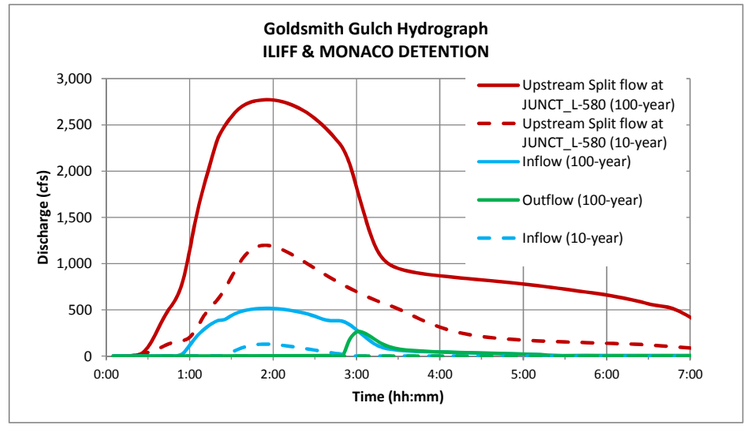
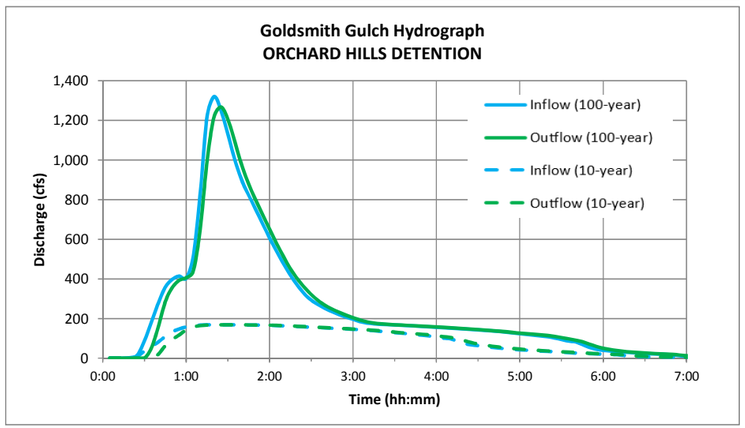


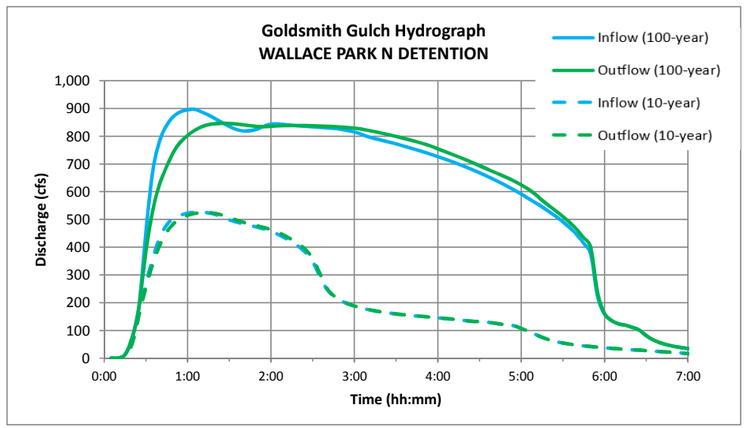
Figure B-2 Goldsmith Gulch and Tributaries at Key Design Points

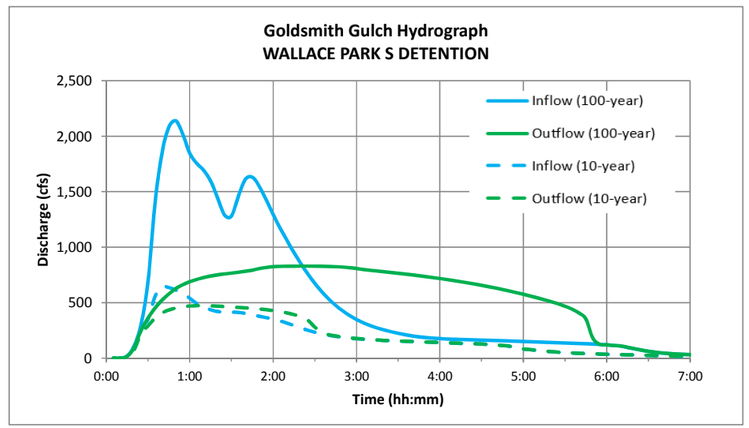












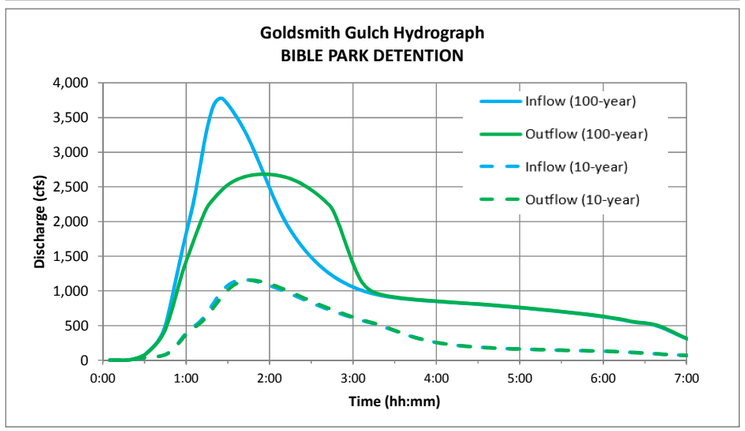


Figure B-3 Goldsmith Gulch Peak Discharges vs. Channel Stations - Existing Conditions

Figure B-3A Goldsmith Gulch Peak Profile

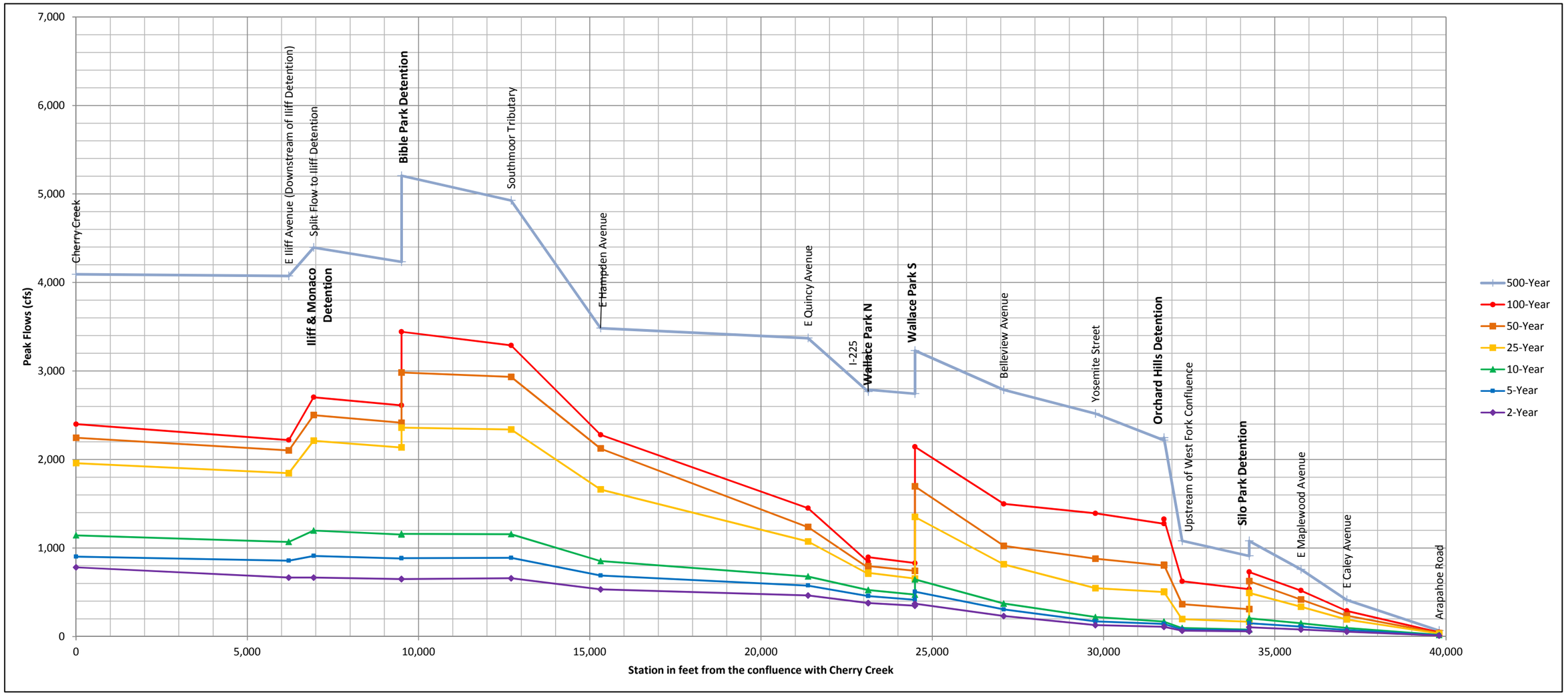


Figure B-3 Goldsmith Gulch Peak Profiles Along Goldsmith Gulch (3A), Southmoor Tributary (3B), & West Fork Goldsmith Gulch (3C) Continued

Figure B-3B Southmoor Tributary Peak Profile

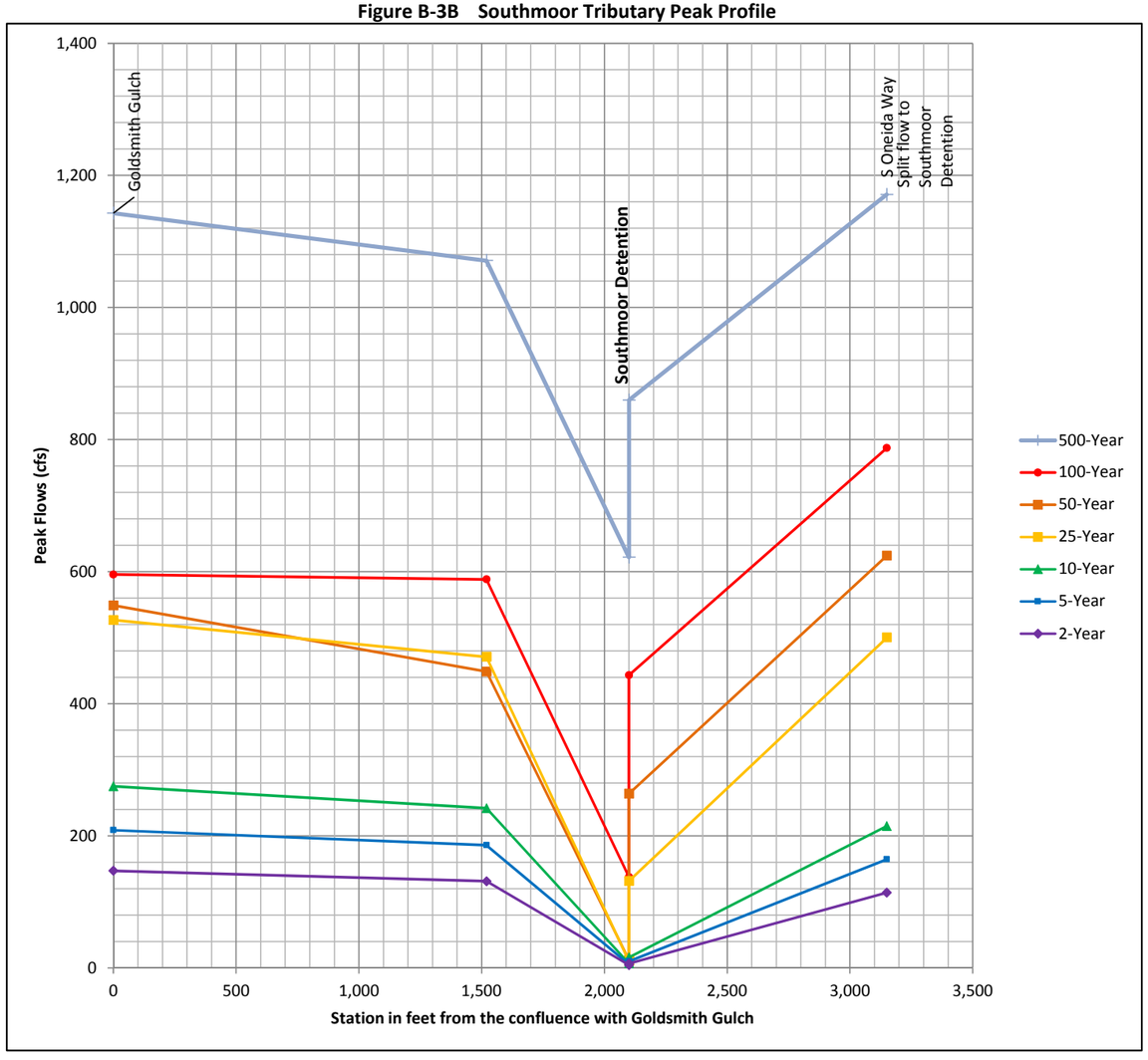


Figure B-3C West Fork Goldsmith Gulch Peak Profile

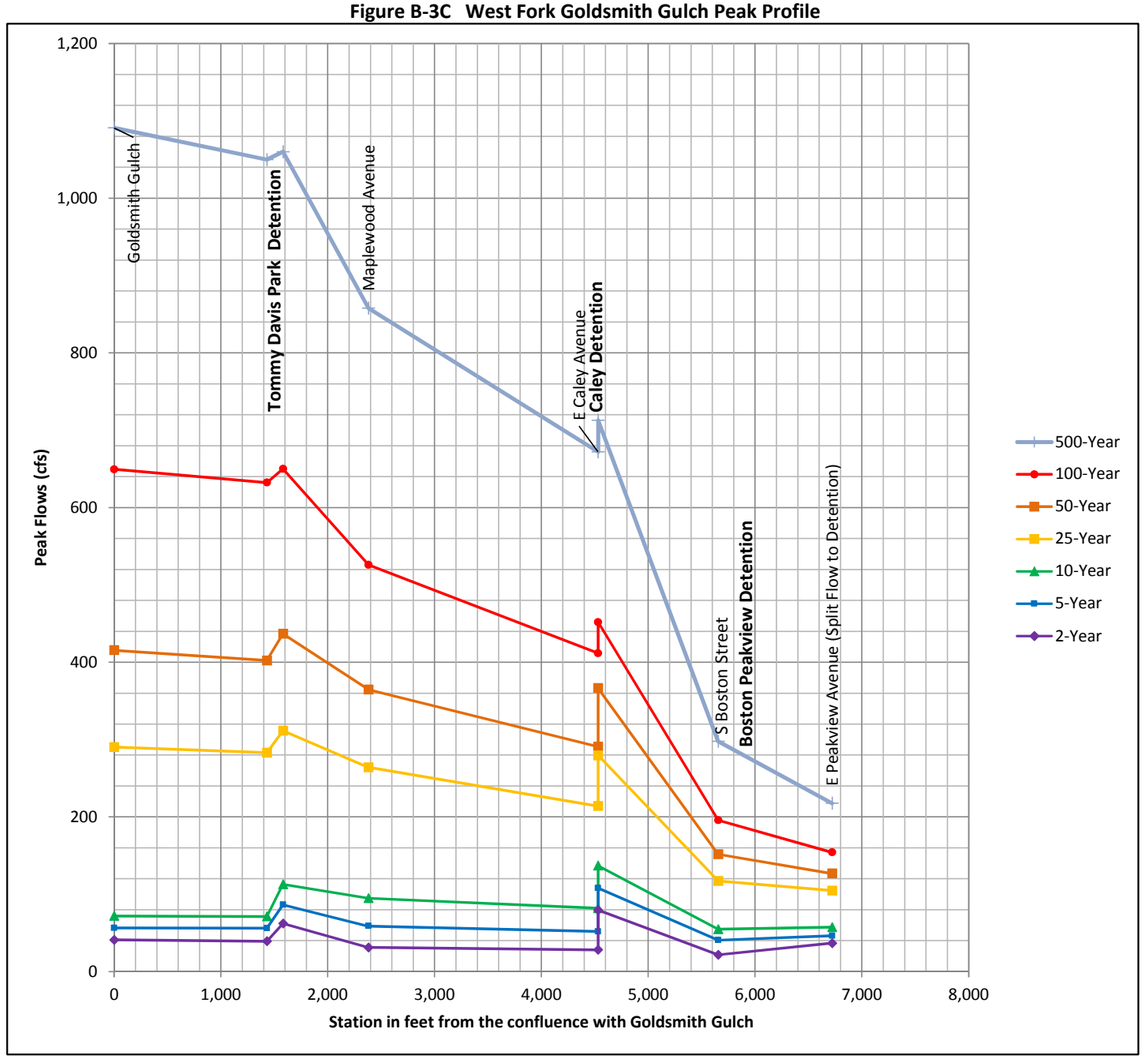


Table B-1 Rainfall Distribution (1-hour Distribution)

Return Period	2-Year
1Hr Depth	0.87
6Hr Depth	1.41
Area Adjust	7.74 sq. mi.
Time	Depth
0:05	0.02
0:10	0.03
0:15	0.07
0:20	0.11
0:25	0.17
0:30	0.10
0:35	0.05
0:40	0.04
0:45	0.03
0:50	0.03
0:55	0.03
1:00	0.03
1:05	0.03
1:10	0.02
1:15	0.02
1:20	0.02
1:25	0.02
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.01
2:00	0.01
2:05	0.00
Total Depth	**0.90 (in)**

Return Period	5-Year
1Hr Depth	1.12
6Hr Depth	1.78
Area Adjust	7.74 sq. mi.
Time	Depth
0:05	0.02
0:10	0.04
0:15	0.09
0:20	0.14
0:25	0.22
0:30	0.12
0:35	0.06
0:40	0.05
0:45	0.04
0:50	0.04
0:55	0.03
1:00	0.03
1:05	0.03
1:10	0.03
1:15	0.03
1:20	0.02
1:25	0.02
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.02
2:00	0.01
2:05	0.00
Total Depth	**1.17 (in)**

Return Period	10-Year
1Hr Depth	1.36
6Hr Depth	2.13
Area Adjust	7.74 sq. mi.
Time	Depth
0:05	0.03
0:10	0.05
0:15	0.11
0:20	0.16
0:25	0.27
0:30	0.13
0:35	0.07
0:40	0.06
0:45	0.05
0:50	0.04
0:55	0.04
1:00	0.04
1:05	0.04
1:10	0.04
1:15	0.04
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.02
2:00	0.02
2:05	0.00
Total Depth	**1.42 (in)**

Return Period	25-Year
1Hr Depth	1.72
6Hr Depth	2.67
Area Adjust	0 sq. mi.
Time	Depth
0:05	0.02
0:10	0.06
0:15	0.09
0:20	0.14
0:25	0.26
0:30	0.43
0:35	0.21
0:40	0.14
0:45	0.09
0:50	0.09
0:55	0.06
1:00	0.06
1:05	0.06
1:10	0.04
1:15	0.04
1:20	0.03
1:25	0.03
1:30	0.02
1:35	0.02
1:40	0.02
1:45	0.02
1:50	0.02
1:55	0.02
2:00	0.02
2:05	0.00
Total Depth	**1.99 (in)**

Return Period	50-Year
1Hr Depth	2.02
6Hr Depth	3.14
Area Adjust	0 sq. mi.
Time	Depth
0:05	0.03
0:10	0.07
0:15	0.10
0:20	0.16
0:25	0.30
0:30	0.51
0:35	0.24
0:40	0.16
0:45	0.10
0:50	0.10
0:55	0.06
1:00	0.06
1:05	0.06
1:10	0.05
1:15	0.05
1:20	0.04
1:25	0.04
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth	**2.34 (in)**

Return Period	100-Year
1Hr Depth	2.35
6Hr Depth	3.64
Area Adjust	0 sq. mi.
Time	Depth
0:05	0.02
0:10	0.07
0:15	0.11
0:20	0.19
0:25	0.33
0:30	0.59
0:35	0.33
0:40	0.19
0:45	0.15
0:50	0.12
0:55	0.09
1:00	0.09
1:05	0.09
1:10	0.05
1:15	0.05
1:20	0.03
1:25	0.03
1:30	0.03
1:35	0.03
1:40	0.03
1:45	0.03
1:50	0.03
1:55	0.03
2:00	0.03
2:05	0.00
Total Depth	**2.72 (in)**

Return Period	500-Year
1Hr Depth	3.20
6Hr Depth	4.97
Area Adjust	0 sq. mi.
Time	Depth
0:05	0.03
0:10	0.10
0:15	0.15
0:20	0.26
0:25	0.45
0:30	0.80
0:35	0.45
0:40	0.26
0:45	0.20
0:50	0.16
0:55	0.13
1:00	0.13
1:05	0.13
1:10	0.06
1:15	0.06
1:20	0.04
1:25	0.04
1:30	0.04
1:35	0.04
1:40	0.04
1:45	0.04
1:50	0.04
1:55	0.04
2:00	0.04
2:05	0.00
Total Depth	**3.70 (in)**

Table B-2 CUHP Input Parameters

Catchment Name	Area	Area	Distance to Centroid	Length	Slope	Existing Percent Imperviousness	Future Percent Imperviousness	Depression Storage on Pervious	Depression Storage on Impervious	Initial Infiltration Rate	Horton's Decay Coefficient	Final Infiltration Rate
	acres	mi2	mi	mi	ft/ft	%	%	in	in	in/hr	1/seconds	in/hr
L-010A	30	0.0475	0.2740	0.4780	0.0277	62	62	0.35	0.10	3.00	0.0018	0.50
L-020	16	0.0246	0.2770	0.5710	0.0202	73	73	0.35	0.10	3.00	0.0018	0.50
L-030	24	0.0379	0.0890	0.4330	0.0166	71	71	0.35	0.10	3.00	0.0018	0.50
L-040	57	0.0886	0.1160	0.4080	0.0223	59	59	0.35	0.10	3.00	0.0018	0.50
L-050A	52	0.0805	0.3090	0.5950	0.0303	42	42	0.35	0.10	3.00	0.0018	0.50
L-050B	36	0.0568	0.2040	0.4900	0.0263	42	42	0.35	0.10	3.00	0.0018	0.50
L-060	35	0.0539	0.2830	0.4190	0.0308	60	60	0.35	0.10	3.00	0.0018	0.50
L-070	53	0.0828	0.2120	0.4240	0.0196	72	72	0.35	0.10	3.00	0.0018	0.50
L-080	28	0.0438	0.1260	0.3250	0.0356	61	61	0.35	0.10	3.00	0.0018	0.50
L-090	57	0.0898	0.2200	0.5450	0.0205	71	71	0.35	0.10	3.00	0.0018	0.50
L-100	60	0.0940	0.2890	0.4830	0.0286	58	58	0.35	0.10	3.00	0.0018	0.50
L-110	86	0.1346	0.2960	0.6000	0.0319	47	47	0.35	0.10	3.00	0.0018	0.50
L-120	27	0.0419	0.4850	0.6820	0.0211	54	54	0.35	0.10	3.00	0.0018	0.50
L-130	43	0.0666	0.3840	0.6880	0.0504	53	53	0.35	0.10	3.00	0.0018	0.50
L-140	32	0.0498	0.1920	0.3610	0.0100	67	67	0.35	0.10	3.00	0.0018	0.50
L-150	60	0.0941	0.2290	0.4800	0.0217	58	58	0.35	0.10	3.00	0.0018	0.50
L-180	115	0.1791	0.3470	0.7700	0.0170	41	41	0.35	0.10	3.00	0.0018	0.50
L-330	108	0.1688	0.4390	0.9500	0.0148	52	52	0.35	0.10	3.00	0.0018	0.50
L-340	138	0.2157	0.3550	0.7140	0.0302	39	39	0.35	0.10	3.00	0.0018	0.50
L-350A	76	0.1180	0.2330	0.7120	0.0231	45	45	0.35	0.10	3.00	0.0018	0.50
L-350B	76	0.1195	0.1710	0.8070	0.0197	37	37	0.35	0.10	3.00	0.0018	0.50
L-360	116	0.1817	0.3670	0.7620	0.0263	42	42	0.35	0.10	3.00	0.0018	0.50
L-370	80	0.1252	0.3490	0.6060	0.0291	46	46	0.35	0.10	3.00	0.0018	0.50
L-390	53	0.0824	0.3200	0.6030	0.0298	51	51	0.35	0.10	3.00	0.0018	0.50
L-400	28	0.0445	0.1380	0.4970	0.0312	77	77	0.35	0.10	3.00	0.0018	0.50
L-410	64	0.1004	0.3920	0.7530	0.0259	66	66	0.35	0.10	3.00	0.0018	0.50
L-420	57	0.0892	0.2290	0.6310	0.0216	68	68	0.35	0.10	3.00	0.0018	0.50
L-430	51	0.0797	0.2830	0.6430	0.0194	49	49	0.35	0.10	3.00	0.0018	0.50
L-435	14	0.0222	0.1110	0.2590	0.0168	9	9	0.35	0.10	3.00	0.0018	0.50
L-440A	56	0.0867	0.2750	0.6800	0.0167	40	40	0.35	0.10	3.00	0.0018	0.50
L-440B	62	0.0972	0.2900	0.5600	0.0179	52	52	0.35	0.10	3.00	0.0018	0.50
L-450	140	0.2195	0.4380	0.9600	0.0185	47	47	0.35	0.10	3.00	0.0018	0.50
L-460	73	0.1133	0.2760	0.7550	0.0120	57	57	0.35	0.10	3.00	0.0018	0.50
L-470	57	0.0890	0.0870	0.3730	0.0076	47	47	0.35	0.10	3.00	0.0018	0.50
L-480	42	0.0662	0.2040	0.4730	0.0336	46	46	0.35	0.10	3.00	0.0018	0.50
L-490	45	0.0708	0.1600	0.5330	0.0139	45	45	0.35	0.10	3.00	0.0018	0.50
L-500	89	0.1398	0.1980	0.5740	0.0119	10	10	0.35	0.10	3.00	0.0018	0.50
L-520	96	0.1505	0.6200	1.0900	0.0122	51	51	0.35	0.10	3.00	0.0018	0.50
L-530	32	0.0495	0.2200	0.5010	0.0163	33	33	0.35	0.10	3.00	0.0018	0.50

Table B-2 CUHP Input Parameters

Catchment Name	Area	Area	Distance to Centroid	Length	Slope	Existing Percent Imperviousness	Future Percent Imperviousness	Depression Storage on Pervious	Depression Storage on Impervious	Initial Infiltration Rate	Horton's Decay Coefficient	Final Infiltration Rate
	acres	mi2	mi	mi	ft/ft	%	%	in	in	in/hr	1/seconds	in/hr
L-540	28	0.0439	0.0930	0.2960	0.0262	44	44	0.35	0.10	3.00	0.0018	0.50
L-550	42	0.0653	0.2210	0.5990	0.0250	40	40	0.35	0.10	3.00	0.0018	0.50
L-560	33	0.0518	0.2070	0.4370	0.0260	43	43	0.35	0.10	3.00	0.0018	0.50
L-570	49	0.0764	0.3030	0.4980	0.0194	42	42	0.35	0.10	3.00	0.0018	0.50
L-600	42	0.0649	0.2410	0.4390	0.0164	80	80	0.35	0.10	3.00	0.0018	0.50
L-610	78	0.1212	0.2980	0.6430	0.0135	76	76	0.35	0.10	3.00	0.0018	0.50
L-630	90	0.1400	0.4550	0.8250	0.0129	58	58	0.35	0.10	3.00	0.0018	0.50
L-640A	34	0.0538	0.1980	0.4260	0.0200	54	54	0.35	0.10	3.00	0.0018	0.50
L-640B	9	0.0143	0.0980	0.3420	0.0116	38	38	0.35	0.10	3.00	0.0018	0.50
L-650	15	0.0230	0.0630	0.2270	0.0183	38	38	0.35	0.10	3.00	0.0018	0.50
L-660	9	0.0142	0.0560	0.2220	0.0077	40	40	0.35	0.10	3.00	0.0018	0.50
L-670	21	0.0327	0.2100	0.5150	0.0132	43	43	0.35	0.10	3.00	0.0018	0.50
L-680	39	0.0610	0.1880	0.4580	0.0128	13	13	0.35	0.10	3.00	0.0018	0.50
L-700	158	0.2472	0.3980	0.9390	0.0117	48	48	0.35	0.10	3.00	0.0018	0.50
L-710	29	0.0461	0.1830	0.4690	0.0210	52	52	0.35	0.10	3.00	0.0018	0.50
L-720	53	0.0825	0.1570	0.4590	0.0132	26	26	0.35	0.10	3.00	0.0018	0.50
L-740	109	0.1696	0.2820	0.6870	0.0163	52	52	0.35	0.10	3.00	0.0018	0.50
L-750	55	0.0861	0.2350	0.5860	0.0116	31	31	0.35	0.10	3.00	0.0018	0.50
L-760	30	0.0470	0.3550	0.6350	0.0149	84	84	0.35	0.10	3.00	0.0018	0.50
L-800	66	0.1038	0.1480	0.3830	0.0282	43	43	0.35	0.10	3.00	0.0018	0.50
U-010B	20	0.0309	0.1310	0.3680	0.0324	38	38	0.35	0.10	3.00	0.0018	0.50
U-100	41	0.0639	0.1490	0.3660	0.0300	64	64	0.35	0.10	3.00	0.0018	0.50
U-110	49	0.0765	0.1910	0.4210	0.0250	67	67	0.35	0.10	3.00	0.0018	0.50
U-120	20	0.0320	0.1170	0.3920	0.0210	61	61	0.35	0.10	3.00	0.0018	0.50
U-130	57	0.0888	0.1740	0.4030	0.0300	48	48	0.35	0.10	3.00	0.0018	0.50
U-140	53	0.0824	0.2030	0.4860	0.0220	67	67	0.35	0.10	3.00	0.0018	0.50
U-150	53	0.0822	0.2220	0.5280	0.0380	25	25	0.35	0.10	3.00	0.0018	0.50
U-160	17	0.0272	0.1690	0.3700	0.0330	59	59	0.35	0.10	3.00	0.0018	0.50
U-170	34	0.0534	0.2760	0.5300	0.0310	29	29	0.35	0.10	3.00	0.0018	0.50
U-180	16	0.0253	0.1930	0.3380	0.0400	45	45	0.35	0.10	3.00	0.0018	0.50
U-190	22	0.0346	0.1110	0.2830	0.0480	23	23	0.35	0.10	3.00	0.0018	0.50
U-200	22	0.0337	0.1340	0.3130	0.0440	29	29	0.35	0.10	3.00	0.0018	0.50
U-210	66	0.1039	0.3140	0.6200	0.0290	25	25	0.35	0.10	3.00	0.0018	0.50
U-300	14	0.0211	0.0980	0.4890	0.0250	63	63	0.35	0.10	3.00	0.0018	0.50
U-310	7	0.0116	0.0980	0.2330	0.0276	65	65	0.35	0.10	3.00	0.0018	0.50
U-320	62	0.0965	0.2860	0.5390	0.0290	69	69	0.35	0.10	3.00	0.0018	0.50
U-330	6	0.0092	0.1080	0.2580	0.0250	64	64	0.35	0.10	3.00	0.0018	0.50
U-340	82	0.1278	0.3700	0.6920	0.0220	68	68	0.35	0.10	3.00	0.0018	0.50

Table B-2 CUHP Input Parameters

Catchment Name	Area	Area	Distance to Centroid	Length	Slope	Existing Percent Imperviousness	Future Percent Imperviousness	Depression Storage on Pervious	Depression Storage on Impervious	Initial Infiltration Rate	Horton's Decay Coefficient	Final Infiltration Rate
	acres	mi2	mi	mi	ft/ft	%	%	in	in	in/hr	1/seconds	in/hr
U-350	48	0.0752	0.0780	0.4310	0.0170	67	67	0.35	0.10	3.00	0.0018	0.50
U-400	28	0.0444	0.1950	0.4240	0.0250	31	31	0.35	0.10	3.00	0.0018	0.50
U-410	44	0.0682	0.1230	0.3940	0.0310	36	36	0.35	0.10	3.00	0.0018	0.50
U-420	44	0.0683	0.1620	0.3790	0.0160	66	66	0.35	0.10	3.00	0.0018	0.50
U-430	42	0.0652	0.1060	0.4820	0.0270	46	46	0.35	0.10	3.00	0.0018	0.50
U-440	29	0.0446	0.1610	0.4370	0.0304	42	42	0.35	0.10	3.00	0.0018	0.50
U-450	20	0.0313	0.1520	0.4230	0.0255	18	18	0.35	0.10	3.00	0.0018	0.50
U-460	76	0.1192	0.2950	0.6540	0.0243	60	60	0.35	0.10	3.00	0.0018	0.50
U-470	14	0.0226	0.1090	0.2010	0.0280	85	85	0.35	0.10	3.00	0.0018	0.50
U-480	7	0.0112	0.0900	0.1350	0.0250	72	72	0.35	0.10	3.00	0.0018	0.50
U-490	14	0.0221	0.1780	0.3820	0.0350	78	78	0.35	0.10	3.00	0.0018	0.50
U-500	27	0.0428	0.0570	0.2590	0.0230	69	69	0.35	0.10	3.00	0.0018	0.50
U-510	29	0.0446	0.2100	0.4190	0.0180	59	59	0.35	0.10	3.00	0.0018	0.50
U-520	24	0.0372	0.3100	0.4390	0.0170	90	90	0.35	0.10	3.00	0.0018	0.50
U-530	27	0.0423	0.1640	0.4010	0.0130	71	71	0.35	0.10	3.00	0.0018	0.50
U-540	45	0.0699	0.3690	0.4710	0.0170	79	79	0.35	0.10	3.00	0.0018	0.50
U-600	39	0.0607	0.1400	0.3570	0.0290	26	26	0.35	0.10	3.00	0.0018	0.50
U-610	18	0.0288	0.1160	0.2830	0.0280	31	31	0.35	0.10	3.00	0.0018	0.50
U-620	43	0.0679	0.2780	0.5430	0.0290	44	44	0.35	0.10	3.00	0.0018	0.50
U-630	35	0.0552	0.2380	0.4440	0.0250	41	41	0.35	0.10	3.00	0.0018	0.50
U-640	71	0.1106	0.2280	0.6250	0.0315	46	46	0.35	0.10	3.00	0.0018	0.50
U-660	26	0.0411	0.1140	0.2660	0.0210	40	40	0.35	0.10	3.00	0.0018	0.50
U-670	30	0.0462	0.1940	0.3680	0.0350	46	46	0.35	0.10	3.00	0.0018	0.50
U-680	41	0.0640	0.2200	0.4130	0.0140	42	42	0.35	0.10	3.00	0.0018	0.50
U-690	17	0.0262	0.1780	0.3090	0.0180	46	46	0.35	0.10	3.00	0.0018	0.50
U-700	7	0.0106	0.1090	0.1890	0.0420	46	46	0.35	0.10	3.00	0.0018	0.50
U-710	20	0.0320	0.1210	0.2450	0.0340	47	47	0.35	0.10	3.00	0.0018	0.50
U-720	9	0.0145	0.1160	0.2430	0.0140	59	59	0.35	0.10	3.00	0.0018	0.50
U-730	24	0.0379	0.1090	0.3090	0.0220	59	59	0.35	0.10	3.00	0.0018	0.50
U-740	19	0.0299	0.0940	0.2240	0.0370	79	79	0.35	0.10	3.00	0.0018	0.50
U-750	6	0.0095	0.0520	0.1430	0.0320	83	83	0.35	0.10	3.00	0.0018	0.50
U-760	6	0.0088	0.0590	0.1300	0.0320	80	80	0.35	0.10	3.00	0.0018	0.50
U-770	22	0.0342	0.1970	0.6250	0.0106	86	86	0.35	0.10	3.00	0.0018	0.50

Table B-3 Detention Rating Curves

Bible Park Detention

Based on 2014 LiDAR and Goldsmith Gulch Phase III Schedule II, As-built 1996, and field survey.

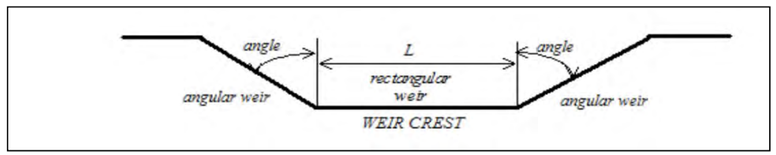
Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Discharge (cfs)	Note
0	5443.74	0	0	0	At invert of low flow culvert
0.26	5444	167	0.0	2	
1.26	5445	440	0.01	25	
2.26	5446	750	0.02	61	
3.26	5447	1931	0.1	115	
4.26	5448	3382	0.1	217	
5.26	5449	8101	0.2	356	
6.26	5450	17265	0.5	529	
7.26	5451	24609	1.0	712	
8.26	5452	33820	1.7	894	
9.26	5453	46455	2.6	1095	
10.26	5454	66015	3.9	1297	
11.26	5455	104809	5.8	1506	
12.26	5456	136503	8.6	1724	
13.26	5457	172014	12.1	1936	
14.26	5458	234568	16.8	2140	
15.26	5459	450136	24.5	2282	
16.26	5460	657358	37.1	2438	
17.26	5461	857152	54.5	2602	
18.26	5462	1024293	76.0	2730	At crest of spillway
19.26	5463	1227077	101.8	3445	Surcharging storage
20.26	5464	1394349	131.9	5946	Surcharging storage

1989 Study Appendix

Storage (ac-ft)	Discharge (cfs)
0.0	0
0.2	570
0.4	710
1.2	1000
4.0	1350
6.7	1530
10.5	1700
16.5	1850
25.6	1990
38.0	2120
54.8	2260
75.6	2400
88.0	2470
104.1	3191

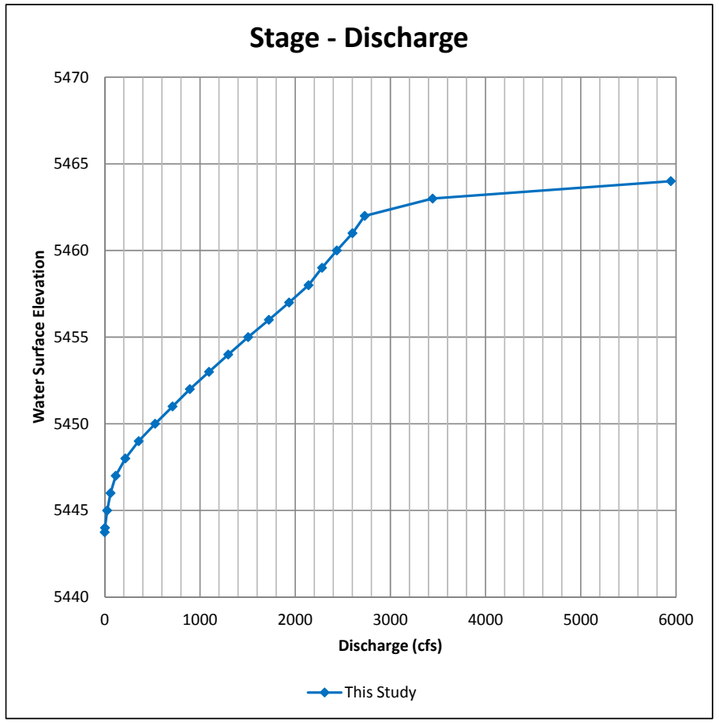
Spillway Capacity Calculation

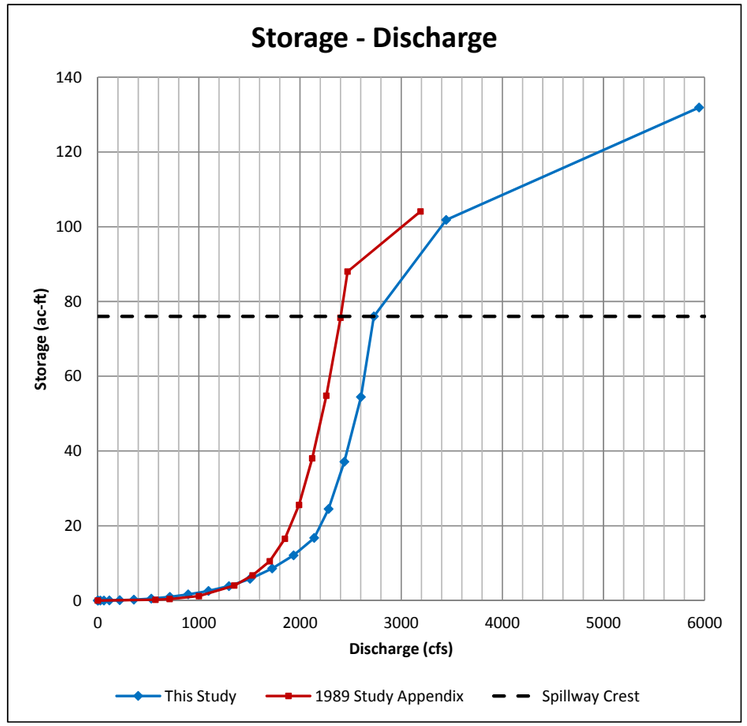
STRUCTURE: E Yale Avenue (Broad Crested Weir)



Bottom Length of Weir	L =	200.00		
Angle of Side Slope Weir (Left)	Left Angle =	89.77	H:V =	250.00
Angle of Side Slope Weir (Right)	Right Angle =	87.14	H:V =	20.00
Elev. for Weir Crest	EL. Crest =	5,462.27		
Coef. for Rectangular Weir	C_w =	3.00		
Coef. for Trapezoidal Weir	C_t =	3.00		

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5462.00	0	0	0	0
5463.00	374	171	14	559
5464.00	1365	1476	118	2960





Bible Park Detention

					W.S.E.	(ft)	5444	5445	5446	5447	5448	5449	5450	5451	5452	5453	5454	5455	5456	5457	5458	5459	5460	5461	5462	5463	5464
					Total Q	(cfs)	2	25	61	115	217	356	529	712	894	1,095	1,297	1,506	1,724	1,936	2,140	2,282	2,438	2,602	2,730	2,886	2,986
	Culvert ID	Culvert Dimension																									
Main Stem	Low Flow	Invert	5443.74	(ft)	HW	(ft)	0.26	1.26	2.26	3.26	4.26	5.26	6.26	7.26	8.26	9.26	10.26	11.26	12.26	13.26	14.26	15.26	16.26	17.26	18.26	19.26	20.26
		Width	6	(ft)	HW/D	(ft/ft)	0	0.20	0.36	0.52	0.68	0.84	1.00	1.16	1.32	1.48	1.64	1.80	1.96	2.12	2.28	2.44	2.60	2.76	2.92	3.08	3.24
		Height (D)	6.25	(ft)	q	(cfs/ft)	0.4	4.2	10.2	17.7	25	34	45	55	65	74	82	90	96	101	107	112	117	121	126	131	136
					Q-inlet	(cfs)	2	25	61	106	150	204	270	330	390	444	492	540	576	606	642	672	702	726	756	786	816
	Pedestrian Underpass	Invert	5446.64	(ft)	HW	(ft)	0	0	0	0.36	1.36	2.36	3.36	4.36	5.36	6.36	7.36	8.36	9.36	10.36	11.36	12.36	13.36	14.36	15.36	16.36	17.36
		Width	14	(ft)	HW/D	(ft/ft)	0	0.00	0.00	0.04	0.16	0.28	0.40	0.51	0.63	0.75	0.87	0.98	1.10	1.22	1.34	1.45	1.57	1.69	1.81	1.92	2.04
		Height (D)	8.5	(ft)	q	(cfs/ft)	0.0	0.0	0.0	0.6	4.8	11	18	27	36	47	58	69	82	95	107	115	124	134	141	150	155
					Q-inlet	(cfs)	0	0	0	9	67	152	259	382	504	651	805	966	1,148	1,330	1,498	1,610	1,736	1,876	1,974	2,100	2,170

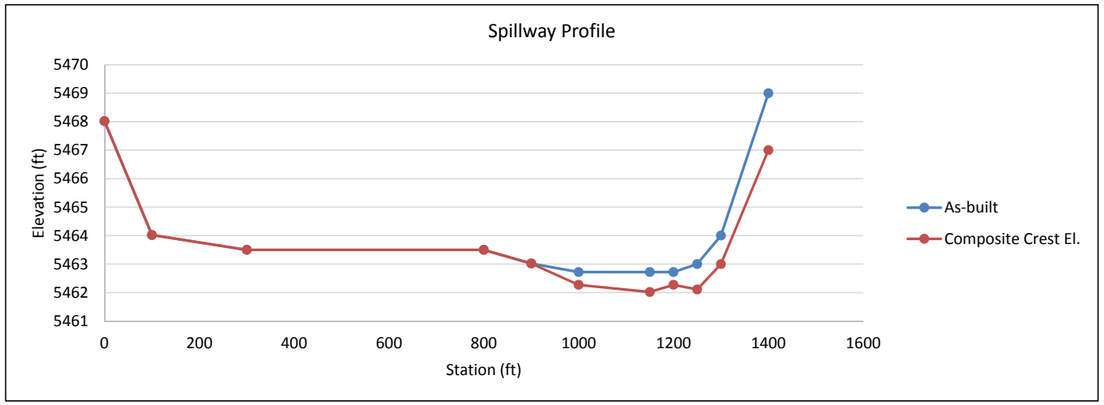
For HW/D < 0.5, discharge calculated using rectangular weir equation due to off the Chart 11B.

For HW/D > 0.5, discharge derived using nomograph Chart 11B of HDS 5 Hydraulic Design of Highway Culverts, FHWA, Revised May 2005

Bible Park Detention_Spillway Profile at Yale Avenue

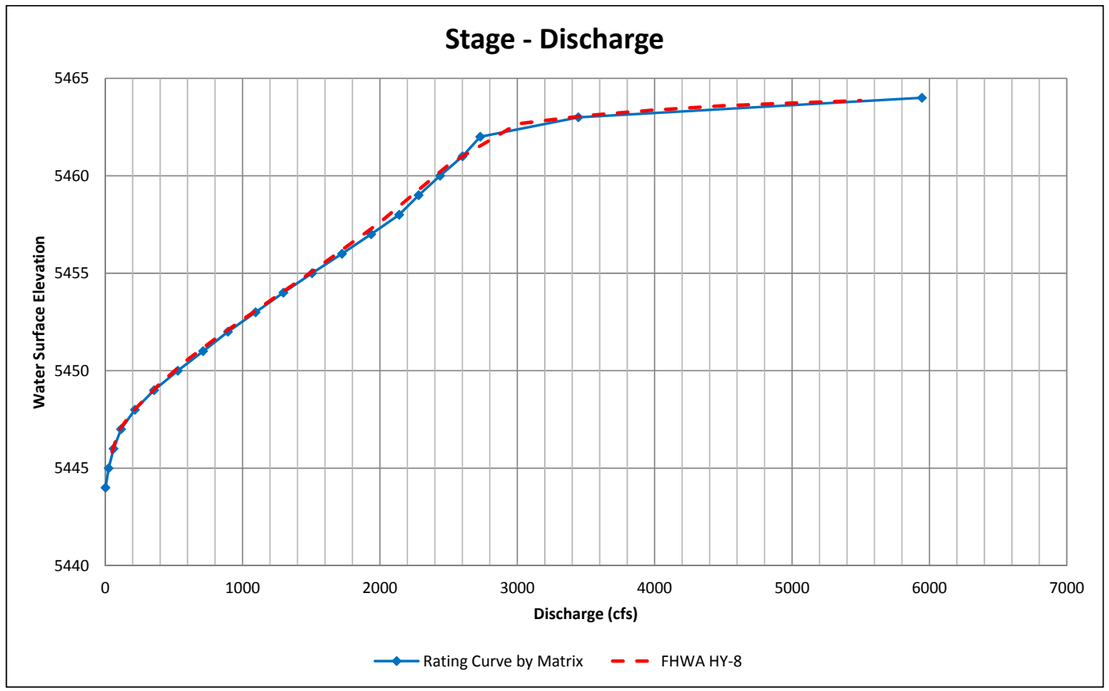
Based on April 2018 crossing structure survey, 2014 LiDAR and Goldsmith Gulch Phase III Schedule II, As-built 1996.

As-built Station	Station used in HY8	Crest Elevtion of Spillway				Note
		As-built	Survey	2014 LiDAR	Composite Crest El.	
200	0	5468.02	-	-	5468.02	
300	100	5464.02	-	-	5464.02	
500	300	5463.5	-	-	5463.5	
1000	800	5463.5	-	-	5463.5	
1100	900	5463.02	-	-	5463.02	
1200	1000	5462.72	-	-	5462.27	Adjusted according to survey
1350	1150	5462.72	5462.02	-	5462.02	
1400	1200	5462.72	5462.27	-	5462.27	
1450	1250	5463	5462.11	-	5462.11	
1500	1300	5464	-	5463	5463	
1600	1400	5469	-	5467	5467	

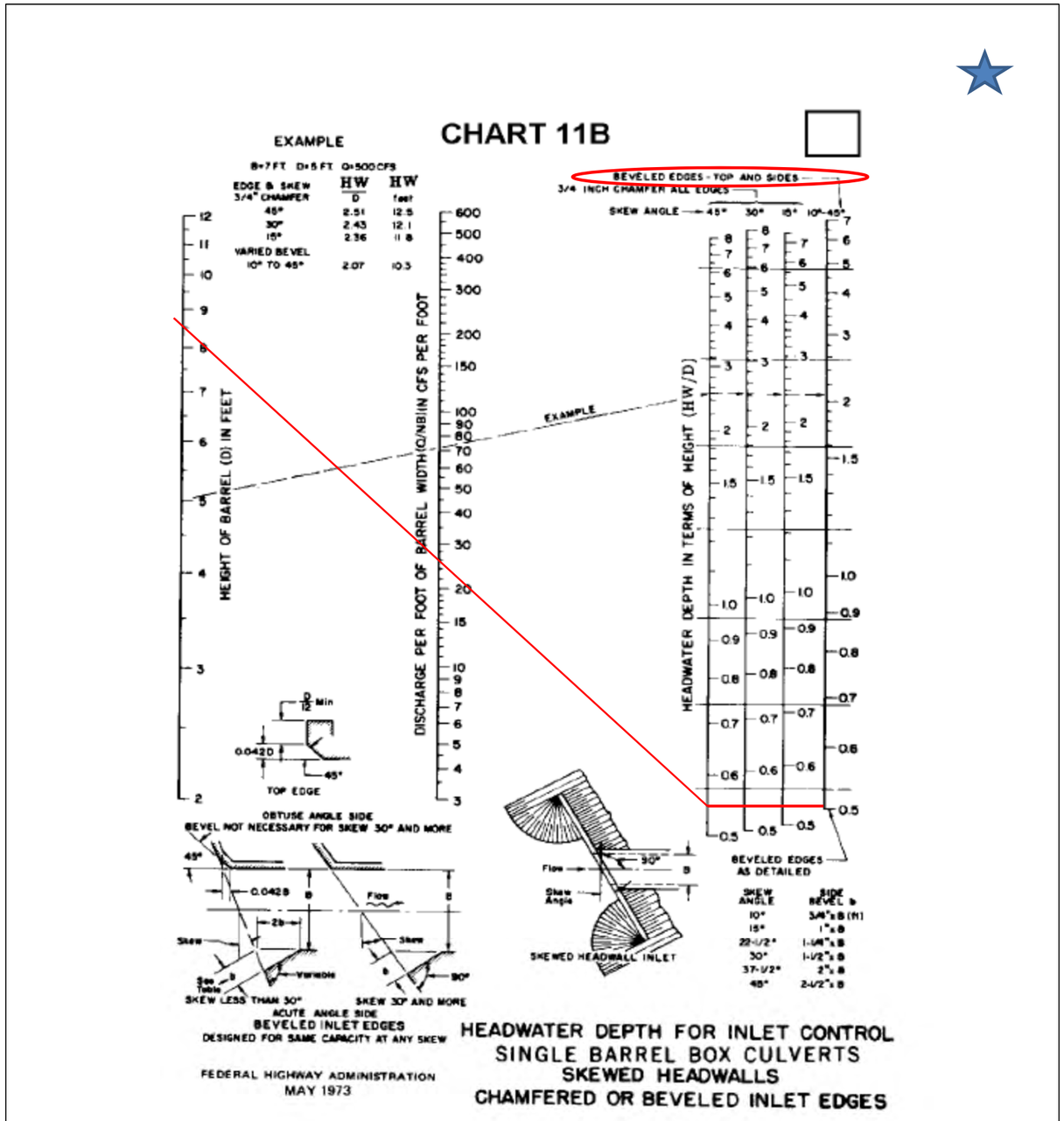


Bible Park Detention
Raitng Curve Calculated Using FHWA HY-8 Culvert Analysis Program

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Low Flow Culvert Discharge (cfs)	Pedestrian Underpass Discharge (cfs)	Roadway Discharge (cfs)
5445.84	1	50	50	0	0
5446.93	2	100	94	6	0
5447.91	3	200	145	55	0
5449.35	4	400	229	171	0
5450.57	5	600	301	299	0
5451.63	6	800	362	438	0
5452.62	7	1000	414	586	0
5455.05	8	1500	527	973	0
5457.61	9	2000	626	1374	0
5460.57	10	2500	724	1776	0
5462.66	11	3000	785	2021	192
5463.09	12	3500	796	2068	634
5463.37	13	4000	803	2099	1096
5463.59	14	4500	808	2122	1568
5463.73	15	5000	812	2138	2048
5463.86	16	5500	815	2151	2530



Bible Park Detention



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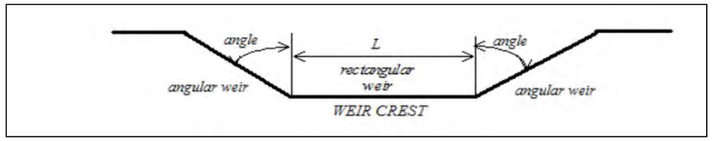
Boston Street & Peakview Avenue Detention

Based on 2014 LiDAR, City of Greenwood Villlage, Boston St./Peakview Ave. Intersection Improvements Pond As-built Elevation, February 22, 2005, Muller Engineering *Boston Street and Peakview Avenue Pond Drainage Letter* , March 16, 2018, field measurement and field survey.

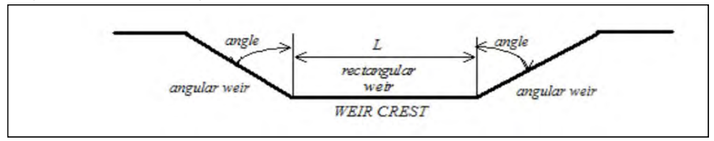
STRUCTURE: Outlet Structure
(Sharp Crested Weir)



Bottom Length of Weir	L =	14.17		
Angle of Side Slope Weir (Left)	Left Angle =	0.00	H:V =	0.00
Angle of Side Slope Weir (Right)	Right Angle =	0.00	H:V =	0.00
Elev. for Weir Crest	EL. Crest =	5,734.33		
Coef. for Rectangular Weir	C_w =	2.80		
Coef. for Trapezoidal Weir	C_t =	2.80		
Width of Outlet Opening	W =	3.00		
Coef. for Orifice	C_o =	0.60		

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Weir Flow (cfs)	Orifice Flow (cfs)	Total Discharge (cfs)
5734.33	0	0	0	0	0	0
5735.00	22	0	0	22	168	22
5735.62	58	0	0	58	232	58
5736.00	86	0	0	86	264	86
5737.00	173	0	0	173	334	173

Emergency Spillway Capacity Calculation
(Broad Crested Weir)

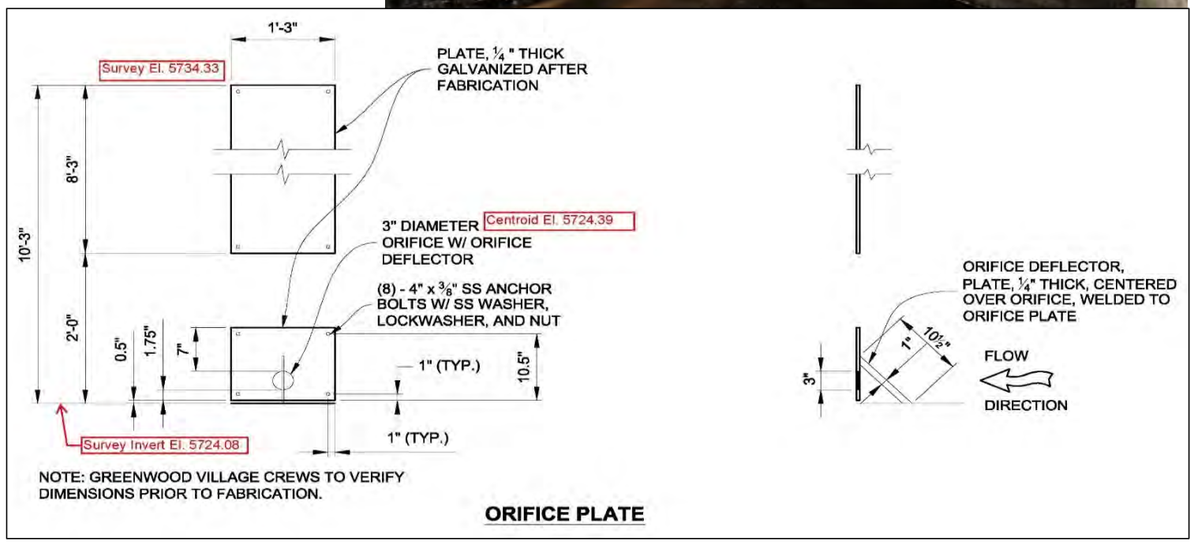


Bottom Length of Weir	L =	35.00		
Angle of Side Slope Weir (Left)	Left Angle =	78.69	H:V =	5.00
Angle of Side Slope Weir (Right)	Right Angle =	78.69	H:V =	5.00
Elev. for Weir Crest	EL. Crest =	5,735.62		
Coef. for Rectangular Weir	C_w =	3.00		
Coef. for Trapezoidal Weir	C_t =	3.00		
Width of Outlet Opening	W =	3.00		
Coef. for Orifice	C_o =	0.60		

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Weir Flow (cfs)
5734.33	0	0	0	0
5735.00	0	0	0	0
5735.62	0	0	0	0
5736.00	25	1	1	26
5737.00	170	17	17	204

Depth	Elevation	Perforated Plate ∑ Qo (cfs)	Outlet Structure (cfs)	Emergency Spillway (cfs)	Total Discharge (cfs)	Surface Area (SF)	Volume Increment (AF)	Accumulated Volume (AF)	Note:
0	5724.08	0.0	0	0	0.0	11	0	0	At invert of detention
0.92	5725	0.2	0	0	0.2	261	0.00	0.00	
1.92	5726	0.3	0	0	0.3	759	0.01	0.01	
2.92	5727	0.4	0	0	0.4	2081	0.03	0.04	
3.92	5728	0.6	0	0	0.6	8169	0.11	0.15	
4.92	5729	0.9	0	0	0.9	11602	0.23	0.38	
5.92	5730	1.1	0	0	1.1	13886	0.29	0.67	
6.92	5731	1.4	0	0	1.4	15833	0.34	1.01	
7.92	5732	1.7	0	0	1.7	17607	0.38	1.40	
8.92	5733	2.1	0	0	2.1	19296	0.42	1.82	
9.92	5734	2.4	0	0	2.4	20972	0.46	2.28	
10.25	**5734.33**	**2.6**	**0**	**0**	**2.6**	**21551**	**0.16**	**2.44**	At crest of outlet structure
10.92	5735	2.8	22	0	24.5	22727	0.34	2.78	
11.54	**5735.62**	**3.0**	**58**	**0**	**61.1**	**24040**	**0.33**	**3.12**	At crest of emergency spillway
11.92	5736	3.1	86	26	114.6	24845	0.21	3.33	Surcharge storage
12.92	5737	3.3	173	204	380.1	27242	0.60	3.93	Surcharge storage

Where ∑ Qo = Co * Ao * [2 * g * H]0.5 is the sum of all orifices with varying H below Elevation



Boston Street & Peakview Avenue Detention

Based on 2014 LiDAR, City of Greenwood Villlage, Boston St./Peakview Ave. Intersection Improvements Pond As-built Elevation, February 22, 2005, Muller Engineering *Boston Street and Peakview Avenue Pond Drainage Letter* , March 16, 2018, field measurement and field survey.

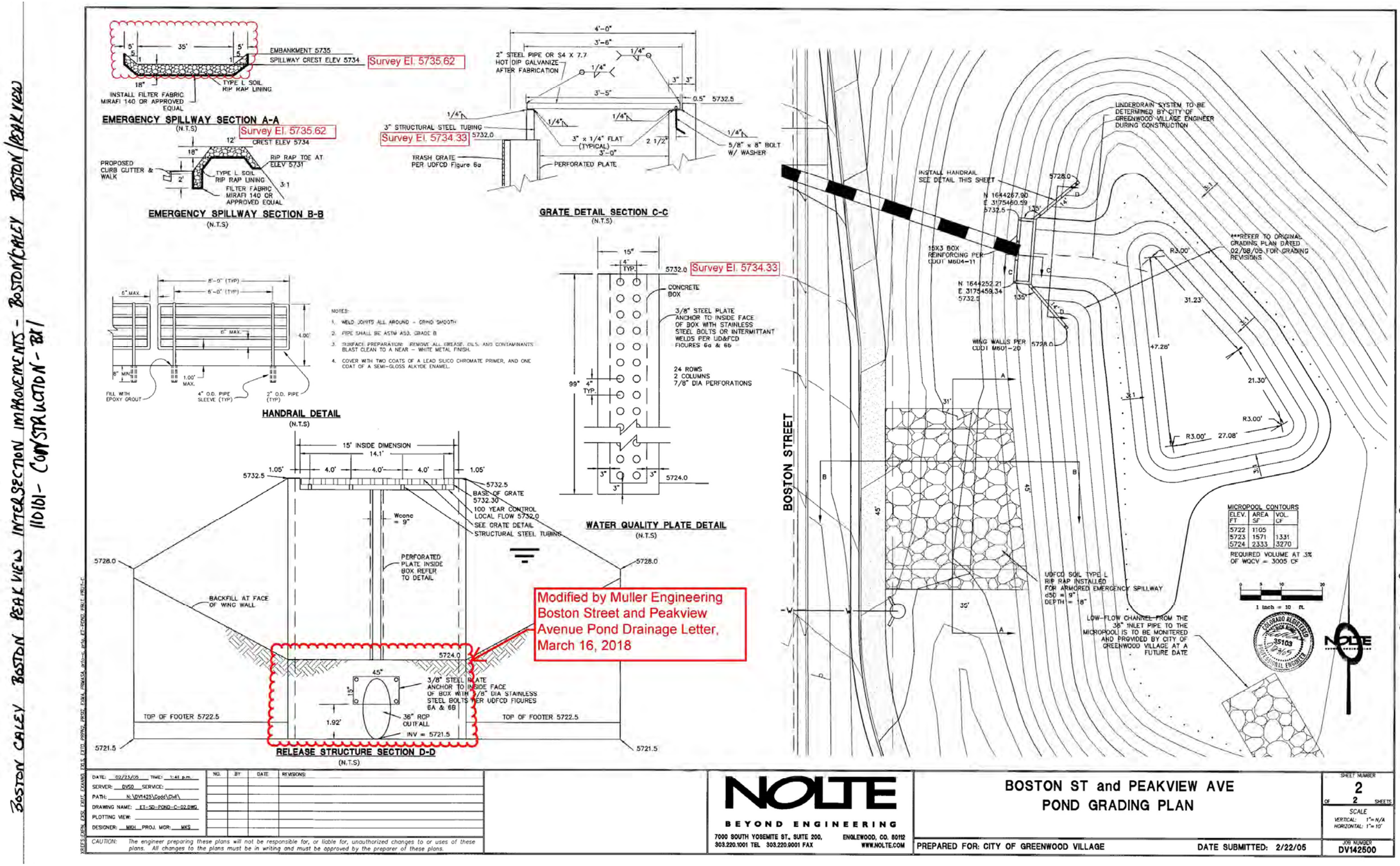
Boston Peakview Detention _ Perforated Plate Capacity Calculation

Number of orifices in vertical directio	=	24	EA
Orifice diameter (in)	=	0.875	(in)
Orifice area, A_o (sf)	=	0.0042	(sf)
Total plate length (in)	=	99	(in)
Spacing of centroids (ft)	=	0.333	(ft)
Orifice coefficient, C_o	=	0.6	
Low flow orifice	=	3	(in)
Orifice area, A_o (sf)	=	0.0491	(sf)

Count	Elevation	Head (H) at Elevation															Cumulative Discharge (Q) at Elevation															
		5724	5725	5726	5727	5728	5729	5730	5731	5732	5733	5734	5734.33	5735	5735.62	5736	5737	5724	5725	5726	5727	5728	5729	5730	5731	5732	5733	5734	5734.33	5735	5735.62	5736	5737
Low Flow	5724.39	0.0	0.6	1.6	2.6	3.6	4.6	5.6	6.6	7.6	8.6	9.6	9.9	10.6	11.2	11.6	12.6	0.00	0.18	0.30	0.38	0.45	0.51	0.56	0.61	0.65	0.69	0.73	0.75	0.77	0.79	0.81	0.84
1	5726.50	0.0	0.0	0.0	0.5	1.5	2.5	3.5	4.5	5.5	6.5	7.5	7.8	8.5	9.1	9.5	10.5	0.00	0.00	0.00	0.03	0.05	0.06	0.08	0.09	0.09	0.10	0.11	0.11	0.12	0.12	0.12	0.13
2	5726.83	0.0	0.0	0.0	0.2	1.2	2.2	3.2	4.2	5.2	6.2	7.2	7.5	8.2	8.8	9.2	10.2	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.11	0.11	0.12	0.12	0.13
3	5727.16	0.0	0.0	0.0	0.0	0.8	1.8	2.8	3.8	4.8	5.8	6.8	7.2	7.8	8.5	8.8	9.8	0.00	0.00	0.00	0.00	0.04	0.05	0.07	0.08	0.09	0.10	0.11	0.11	0.11	0.12	0.12	0.13
4	5727.50	0.0	0.0	0.0	0.0	0.5	1.5	2.5	3.5	4.5	5.5	6.5	6.8	7.5	8.1	8.5	9.5	0.00	0.00	0.00	0.00	0.03	0.05	0.06	0.08	0.09	0.09	0.10	0.11	0.11	0.11	0.12	0.12
5	5727.83	0.0	0.0	0.0	0.0	0.2	1.2	2.2	3.2	4.2	5.2	6.2	6.5	7.2	7.8	8.2	9.2	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.11	0.12
6	5728.16	0.0	0.0	0.0	0.0	0.0	0.8	1.8	2.8	3.8	4.8	5.8	6.2	6.8	7.5	7.8	8.8	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.07	0.08	0.09	0.10	0.10	0.11	0.11	0.11	0.12
7	5728.50	0.0	0.0	0.0	0.0	0.0	0.5	1.5	2.5	3.5	4.5	5.5	5.8	6.5	7.1	7.5	8.5	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.06	0.08	0.09	0.09	0.10	0.10	0.11	0.11	0.12
8	5728.83	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.2	3.2	4.2	5.2	5.5	6.2	6.8	7.2	8.2	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.08	0.09	0.09	0.10	0.10	0.11	0.11
9	5729.16	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.8	2.8	3.8	4.8	5.2	5.8	6.5	6.8	7.8	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.07	0.08	0.09	0.09	0.10	0.10	0.11	0.11
10	5729.50	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5	2.5	3.5	4.5	4.8	5.5	6.1	6.5	7.5	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.06	0.08	0.09	0.09	0.09	0.10	0.10	0.11
11	5729.83	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.2	3.2	4.2	4.5	5.2	5.8	6.2	7.2	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.08	0.09	0.09	0.10	0.10	0.11
12	5730.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.8	2.8	3.8	4.2	4.8	5.5	5.8	6.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.07	0.08	0.08	0.09	0.09	0.10	0.11
13	5730.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5	2.5	3.5	3.8	4.5	5.1	5.5	6.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.06	0.08	0.08	0.09	0.09	0.09	0.10
14	5730.83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.2	3.2	3.5	4.2	4.8	5.2	6.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.08	0.08	0.09	0.09	0.10
15	5731.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.8	2.8	3.2	3.8	4.5	4.8	5.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.07	0.07	0.08	0.08	0.09	0.10
16	5731.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5	2.5	2.8	3.5	4.1	4.5	5.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.06	0.07	0.08	0.08	0.09	0.09
17	5731.83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	2.2	2.5	3.2	3.8	4.2	5.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.06	0.07	0.08	0.08	0.09
18	5732.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.8	2.2	2.8	3.5	3.8	4.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.06	0.07	0.07	0.08	0.09
19	5732.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	1.5	1.8	2.5	3.1	3.5	4.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.05	0.05	0.06	0.07	0.08	0.09
20	5732.83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	1.2	1.5	2.2	2.8	3.2	4.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.05	0.06	0.07	0.07	0.08
21	5733.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	1.2	1.8	2.5	2.8	3.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.04	0.05	0.06	0.07	0.08
22	5733.50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.8	1.5	2.1	2.5	3.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.04	0.05	0.06	0.06	0.08
23	5733.83	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	1.2	1.8	2.2	3.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.04	0.05	0.06	0.07
24	5734.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.8	1.5	1.8	2.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.05	0.05	0.07

Boston Street & Peakview Avenue Detention

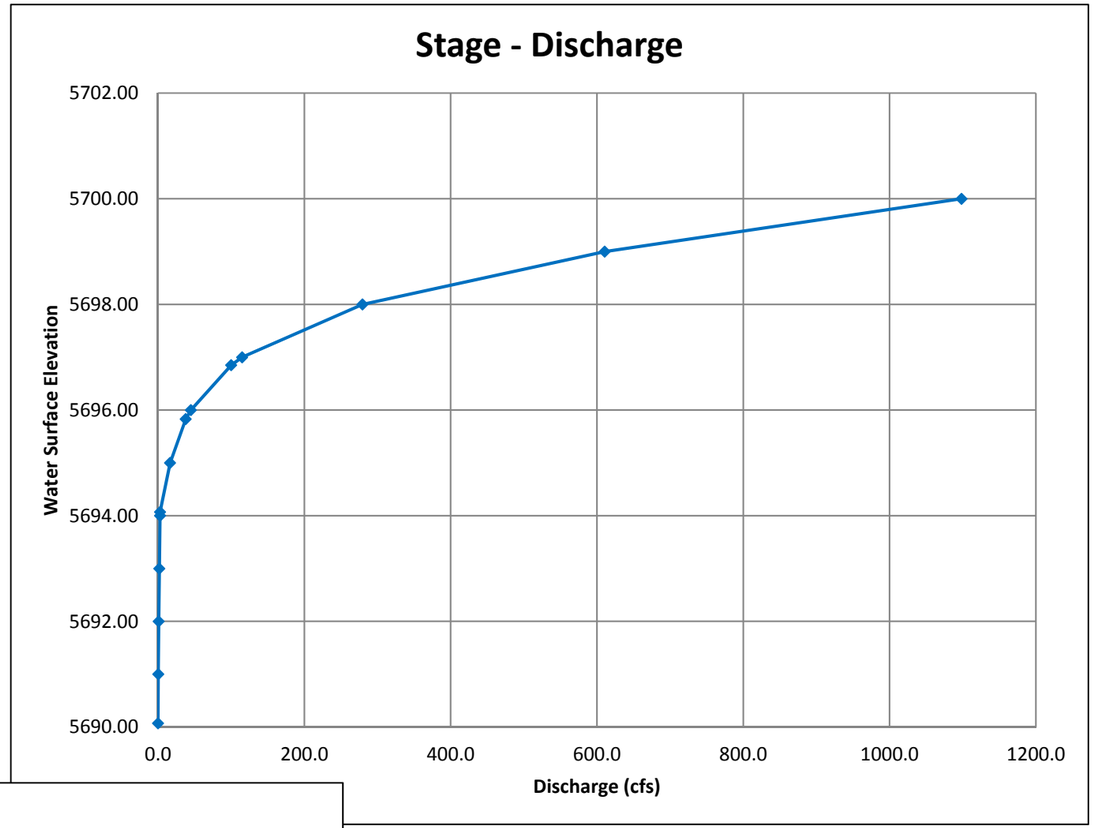
Based on 2014 LiDAR, City of Greenwood Villlage, Boston St./Peakview Ave. Intersection Improvements Pond As-built Elevation, February 22, 2005, Muller Engineering *Boston Street and Peakview Avenue Pond Drainage Letter* , March 16, 2018, field measurement and field survey.



Caley Square Regional Detention Pond

Based on 2014 LiDAR, Caley Square Regional Detention As-built, 1/16/2004 and Goldsmith Trail-Caley Underpass Improvements As-built, February 2017 and field survey.

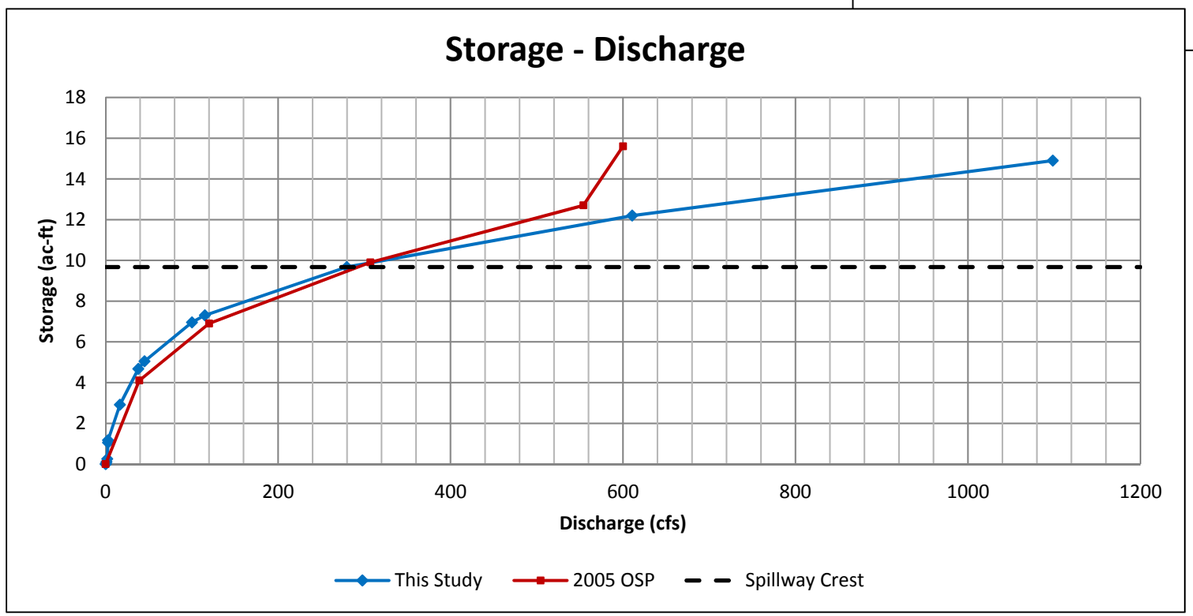
Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Weir Discharge (cfs)	Perforated Plate Discharge (cfs)	Total Discharge (cfs)	Note
0	5690.07	0	0.00	0	0.0	0.0	At center of lowest perforation
0.93	5691	2504	0.02	0	0.4	0.4	Area was interpolated.
1.93	5692	5197	0.10	0	1.0	1.0	Area was interpolated.
2.93	5693	7890	0.25	0	1.8	1.8	Area's estimated from 2014 LiDAR.
3.93	5694	72569	1.05	0	2.8	2.8	Top of WQCV
4.00	5694.07	73767	1.17	0	2.8	2.8	At crest of the 1st stage weir
4.93	5695	89676	2.91	13	3.5	17	
5.76	5695.83	94991	4.67	34	3.9	38	At crest of the 2nd stage weir
5.93	5696	96080	5.04	41	4.0	45	
6.78	5696.85	99899	6.96	96	4.4	100	At crest of the 3rd stage weir
6.93	5697	100573	7.30	111	4.5	115	
7.93	5698	106070	9.67	275	4.9	280	At crest of the 4th stage weir
8.93	5699	113964	12.20	605	5.3	611	Surcharge storage
9.93	5700	121297	14.90	1093	5.7	1098	Surcharge storage
10.93	5701	198513	18.53	1723	6.0	1729	Surcharge storage



2005 OSP

Storage (ac-ft)	Discharge (cfs)
0	0
4.1	39
6.9	120
9.9	307
12.7	554
15.6	600

Caley (18.6 AF per 1994 Study)



Caley Square Regional Detention Pond _ Spillway Capacity Calculation

STRUCTURE: Outlet Structure (Sharp Crested Weir)

Notes: Pond is designed not to spill into pedestrian underpass.

Stage 1

	H:V =	0.00
	H:V =	0.00
Bottom Length of Weir	L =	5.50
Angle of Side Slope Weir (Left)	Left Angle =	0.00
Angle of Side Slope Weir (Right)	Right Angle =	0.00
Elev. for Weir Crest	EL. Crest =	5,694.07
Coef. for Rectangular Weir	C_w =	2.65
Coef. for Trapezoidal Weir	C_t =	2.65

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5694.07	0	0	0	0
5695.00	13	0	0	13
5695.83	34	0	0	34
5696.00	39	0	0	39
5696.85	68	0	0	68
5697.00	73	0	0	73
5698.00	114	0	0	114
5699.00	160	0	0	160
5700.00	210	0	0	210
5701.00	266	0	0	266

Stage 2

	H:V =	0.00
	H:V =	0.00
Bottom Length of Weir	L =	10.30
Angle of Side Slope Weir (Left)	Left Angle =	0.00
Angle of Side Slope Weir (Right)	Right Angle =	0.00
Elev. for Weir Crest	EL. Crest =	5,695.83
Coef. for Rectangular Weir	C_w =	2.65
Coef. for Trapezoidal Weir	C_t =	2.65

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5694.07				
5695.00				
5695.83	0	0	0	0
5696.00	2	0	0	2
5696.85	28	0	0	28
5697.00	35	0	0	35
5698.00	87	0	0	87
5699.00	154	0	0	154
5700.00	232	0	0	232
5701.00	321	0	0	321

Stage 3

	H:V =	4.00
	H:V =	4.00
Bottom Length of Weir	L =	18.00
Angle of Side Slope Weir (Left)	Left Angle =	75.96
Angle of Side Slope Weir (Right)	Right Angle =	75.96
Elev. for Weir Crest	EL. Crest =	5,696.85
Coef. for Rectangular Weir	C_w =	2.65
Coef. for Trapezoidal Weir	C_t =	2.65

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5694.07				
5695.00				
5695.83				
5696.00				
5696.85	0	0	0	0
5697.00	3	0	0	3
5698.00	59	8	8	74
5699.00	150	36	36	222
5700.00	267	93	93	453
5701.00	403	186	186	775

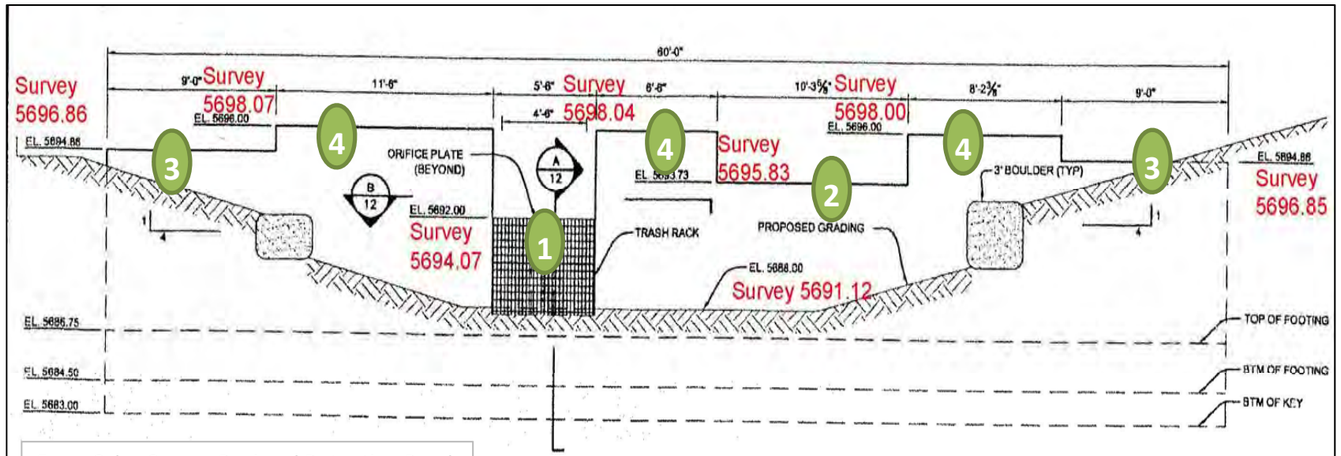
Caley Square Regional Detention Pond _ Spillway Capacity Calculation Continued

Stage 4

	H:V =	0.00
	H:V =	0.00
Bottom Length of Weir	L =	26.20
Angle of Side Slope Weir (Left)	Left Angle =	0.00
Angle of Side Slope Weir (Right)	Right Angle =	0.00
Elev. for Weir Crest	EL. Crest =	5,698.00
Coef. for Rectangular Weir	C_w =	2.65
Coef. for Trapezoidal Weir	C_t =	2.65

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5694.07				
5695.00				
5695.83				
5696.00				
5696.85				
5697.00				
5698.00	0	0	0	0
5699.00	69	0	0	69
5700.00	196	0	0	196
5701.00	361	0	0	361

W.S.E.	Total Discharge (cfs)
5694.07	0
5695.00	13
5695.83	34
5696.00	41
5696.85	96
5697.00	111
5698.00	275
5699.00	605
5700.00	1093
5701.00	1723



From Caley Square Regional Detention Pond Phase III Construction Plans (2003) As-Built

Caley Square Regional Detention Pond

Perforated Plate Capacity Calculation

Number of orifices in vertical directio	=	12	EA
Rectangular Orifice Hight (in)	=	2	(in)
Rectangular Orifice Width (in)	=	2.5	(in)
Orifice area, A_o (sf)	=	0.0347	(sf)
Total plate length (in)	=	48	(in)
Spacing of centroids (in)	=	4.000	(in)
Orifice coefficient, C_o	=	0.6	

Count	Elevation	Head (H) at Elevation														
		5690.07	5691	5692	5693	5694	5694.07	5695	5695.83	5696	5696.85	5697	5698	5699	5700	5701
1	5690.07	0.0	0.9	1.9	2.9	3.9	4.0	4.9	5.8	5.9	6.8	6.9	7.9	8.9	9.9	10.9
2	5690.40	0.0	0.6	1.6	2.6	3.6	3.7	4.6	5.4	5.6	6.4	6.6	7.6	8.6	9.6	10.6
3	5690.74	0.0	0.3	1.3	2.3	3.3	3.3	4.3	5.1	5.3	6.1	6.3	7.3	8.3	9.3	10.3
4	5691.07	0.0	0.0	0.9	1.9	2.9	3.0	3.9	4.8	4.9	5.8	5.9	6.9	7.9	8.9	9.9
5	5691.40	0.0	0.0	0.6	1.6	2.6	2.7	3.6	4.4	4.6	5.4	5.6	6.6	7.6	8.6	9.6
6	5691.74	0.0	0.0	0.3	1.3	2.3	2.3	3.3	4.1	4.3	5.1	5.3	6.3	7.3	8.3	9.3
7	5692.07	0.0	0.0	0.0	0.9	1.9	2.0	2.9	3.8	3.9	4.8	4.9	5.9	6.9	7.9	8.9
8	5692.40	0.0	0.0	0.0	0.6	1.6	1.7	2.6	3.4	3.6	4.4	4.6	5.6	6.6	7.6	8.6
9	5692.74	0.0	0.0	0.0	0.3	1.3	1.3	2.3	3.1	3.3	4.1	4.3	5.3	6.3	7.3	8.3
10	5693.07	0.0	0.0	0.0	0.0	0.9	1.0	1.9	2.8	2.9	3.8	3.9	4.9	5.9	6.9	7.9
11	5693.40	0.0	0.0	0.0	0.0	0.6	0.7	1.6	2.4	2.6	3.4	3.6	4.6	5.6	6.6	7.6
12	5693.74	0.0	0.0	0.0	0.0	0.3	0.3	1.3	2.1	2.3	3.1	3.3	4.3	5.3	6.3	7.3

Count	Total Discharge	Cumulative Discharge (Q) at Elevation														
		0.00	**0.38**	**1.01**	**1.81**	**2.77**	**2.82**	**3.46**	**3.93**	**4.02**	**4.43**	**4.50**	**4.93**	**5.33**	**5.69**	**6.04**
	Elevation	5690.07	5691	5692	5693	5694	5694.07	5695	5695.83	5696	5696.85	5697	5698	5699	5700	5701
1	5690.07	0.00	0.16	0.23	0.29	0.33	0.33	0.37	0.40	0.41	0.44	0.44	0.47	0.50	0.53	0.55
2	5690.40	0.00	0.13	0.21	0.27	0.32	0.32	0.36	0.39	0.40	0.42	0.43	0.46	0.49	0.52	0.54
3	5690.74	0.00	0.09	0.19	0.25	0.30	0.31	0.35	0.38	0.38	0.41	0.42	0.45	0.48	0.51	0.54
4	5691.07	0.00	0.00	0.16	0.23	0.29	0.29	0.33	0.36	0.37	0.40	0.41	0.44	0.47	0.50	0.53
5	5691.40	0.00	0.00	0.13	0.21	0.27	0.27	0.32	0.35	0.36	0.39	0.40	0.43	0.46	0.49	0.52
6	5691.74	0.00	0.00	0.09	0.19	0.25	0.26	0.30	0.34	0.35	0.38	0.38	0.42	0.45	0.48	0.51
7	5692.07	0.00	0.00	0.00	0.16	0.23	0.24	0.29	0.32	0.33	0.37	0.37	0.41	0.44	0.47	0.50
8	5692.40	0.00	0.00	0.00	0.13	0.21	0.22	0.27	0.31	0.32	0.35	0.36	0.40	0.43	0.46	0.49
9	5692.74	0.00	0.00	0.00	0.09	0.19	0.19	0.25	0.29	0.30	0.34	0.35	0.38	0.42	0.45	0.48
10	5693.07	0.00	0.00	0.00	0.00	0.16	0.17	0.23	0.28	0.29	0.33	0.33	0.37	0.41	0.44	0.47
11	5693.40	0.00	0.00	0.00	0.00	0.13	0.14	0.21	0.26	0.27	0.31	0.32	0.36	0.40	0.43	0.46
12	5693.74	0.00	0.00	0.00	0.00	0.09	0.10	0.19	0.24	0.25	0.29	0.30	0.35	0.38	0.42	0.45

Iliff & Monaco Detention

Based on 2014 LiDAR and Goldsmith Gulch Phase III Schedule III, July 1994.

Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Note
0	5423	30	0	
1	5424	8949	0.1	
2	5425	44280	0.6	
3	5426	95930	2.2	
4	5427	192214	5.4	
5	5428	202513	10.0	
6	5429	212813	14.7	
7	5430	223350	19.8	
8	5431	233739	25.0	
9	5432	244139	30.5	
10	5433	254735	36.2	
11	5434	265289	42.2	
12	5435	276070	48.4	
13	5436	287222	54.9	
14	5437	298919	61.6	
14.51	5437.51	306485	65.1	At crest of spill point
15	5438	313755	68.6	Surcharging storage
16	5439	323708	75.9	Surcharging storage
17	5440	332382	83.5	Surcharging storage

Rating Curve / **This Study**

1989 Study Appendix Storage - Discharge*		Equivalent Depth	Elevation	Storage	Outflow
Storage (ac-ft)	Outflow (cfs)	(ft)	(ft)	(ac-ft)	(cfs)
0	0	0	5423	0.0	0
65	5	14.5	5437.5	65.1	5
70	1000	15.5**	5438.5	72.3	1003
-	-	16.0	5439.0	75.9	2508
-	-	17.0	5440.0	83.5	7499

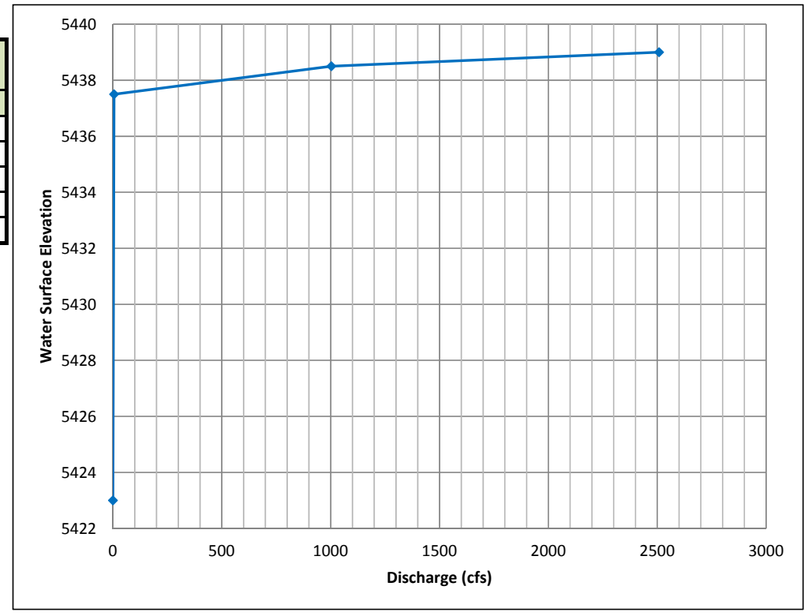
**Based on pump curve (1989 Study Appendix)*

***The equivalent depth was calculated based on outflow from 1989 Study Appendix with existing crest configuration derived from 2014 LiDAR.*

Diversion Curve***

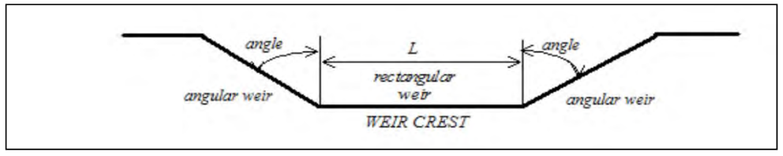
Channel Flows		Diversion to Detention
Inflow (ft)	Outflow (cfs)	(cfs)
760	745	15
1446	1252	194
1727	1465	262
2269	1888	381
2464	2078	386
3178	2491	687

****Off-line detention diversion curve from 1989 Study Appendix*



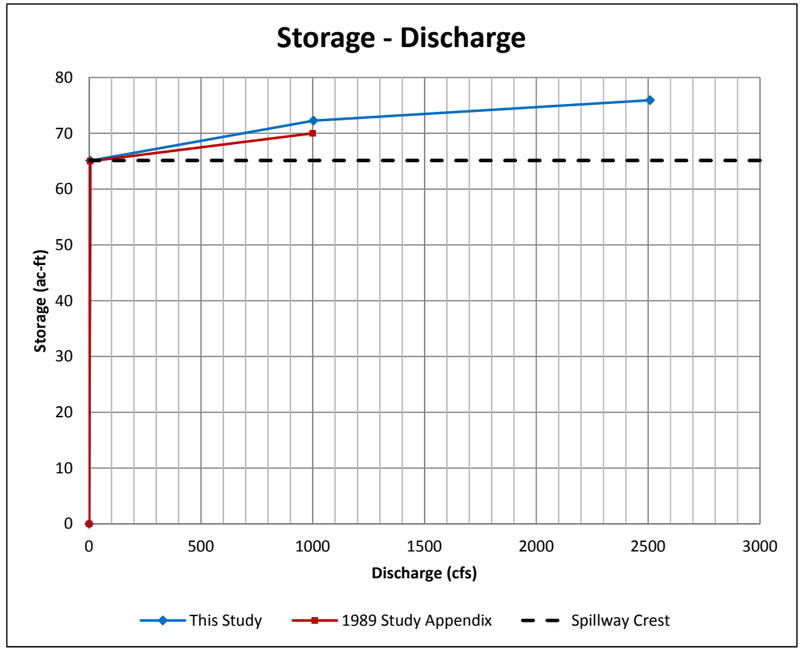
Spillway Capacity Calculation

STRUCTURE: E. Iliff Avenue (Broad Crested Weir)



Bottom Length of Weir	L =	480.00		
Angle of Side Slope Weir (Left)	Left Angle =	89.73	H:V =	215.00
Angle of Side Slope Weir (Right)	Right Angle =	88.73	H:V =	45.00
Elev. for Weir Crest	EL. Crest =	5,437.80	Average of surveyed weir El.	
Coef. for Rectangular Weir	C_w =	3.00		
Coef. for Trapezoidal Weir	C_t =	3.00		

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5438.00	129	6	1	136
5438.50	843	132	28	1003
5439.00	1893	509	106	2508
5440.00	4699	2315	485	7499



Orchard Hills Detention

18-inch culvert is considered negligible.
Based on 2014 LiDAR and field measurement.

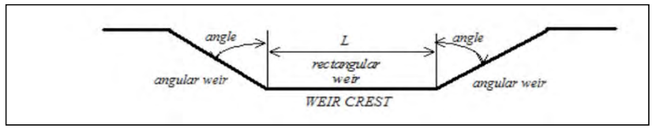
Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Discharge (cfs)	Note
0	5630	32900	0	0	At permanent pool
1	5631	39320	0.8	0	At crest of spillway
2	5632	58950	1.9	125	Surcharging storage
3	5633	72523	3.5	407	Surcharging storage
4	5634	87401	5.3	850	Surcharging storage
5	5635	115259	7.6	1306	Surcharging storage
6	5636	153976	10.7	2008	Surcharging storage
7	5637	188710	14.6	3410	Surcharging storage

2005 OSP

Storage (ac-ft)	Discharge (cfs)
0	0
1.5	1
3.1	2
4.2	166
5.7	416
7.9	916
10.7	1650
14.4	2500

Spillway Capacity Calculation

STRUCTURE: Pedestrian Trail (Broad Crested Weir)



Stage 1 _ Elevation 5631 to 5634

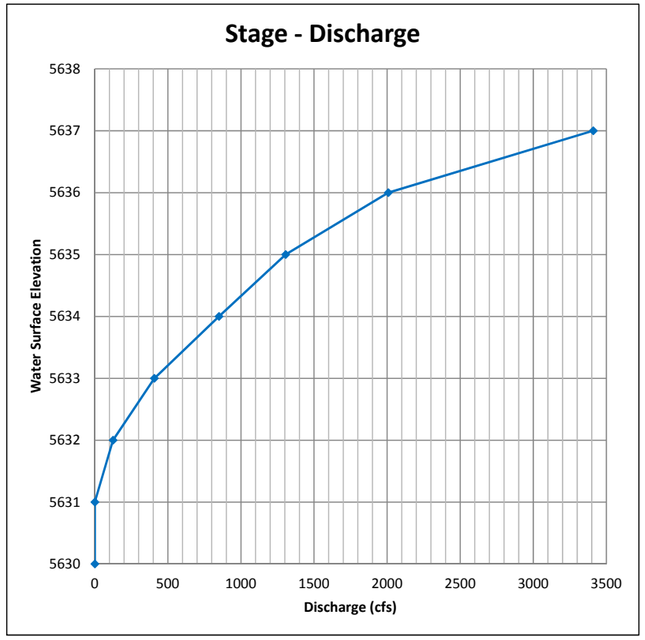
Bottom Length of Weir	L =	35.00		
Angle of Side Slope Weir (Left)	Left Angle =	81.87	H:V =	7.00
Angle of Side Slope Weir (Right)	Right Angle =	80.54	H:V =	6.00
Elev. for Weir Crest	EL. Crest =	5,631.00		
Coef. for Rectangular Weir	C_w =	3.00		
Coef. for Trapezoidal Weir	C_t =	3.00		

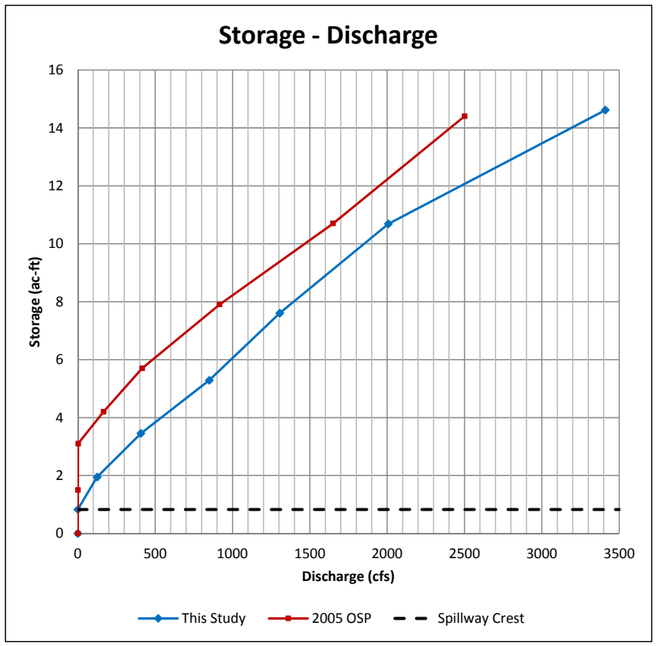
W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5630.00	0	0	0	0
5631.00	0	0	0	0
5632.00	105	11	9	125
5633.00	297	59	51	407
5634.00	546	164	140	850
5635.00	-	-	-	
5636.00	-	-	-	
5637.00	-	-	-	

Stage 2 _ Elevation 5634 to 5635

Bottom Length of Weir	L =	90.00		
Angle of Side Slope Weir (Left)	Left Angle =	85.91	H:V =	14.00
Angle of Side Slope Weir (Right)	Right Angle =	89.48	H:V =	110.00
Elev. for Weir Crest	EL. Crest =	5,634.00		
Coef. for Rectangular Weir	C_w =	3.00		
Coef. for Trapezoidal Weir	C_t =	3.00		

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5630.00	0	0	0	0
5631.00	0	0	0	0
5632.00	0	0	0	0
5633.00	0	0	0	0
5634.00	0	0	0	0
5635.00	270	21	165	456
5636.00	-	-	-	
5637.00	-	-	-	

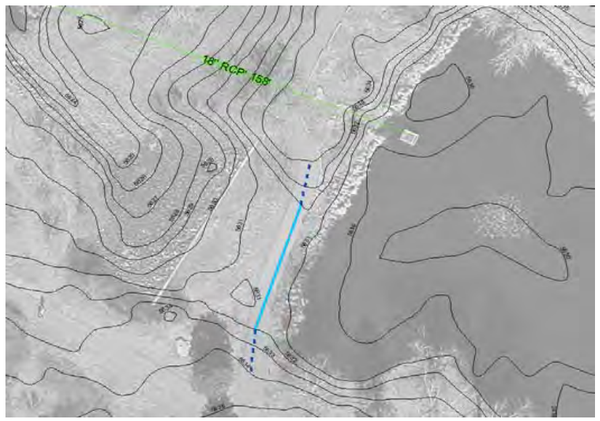




Stage 3 _ Elevation 5635 to 5637

Bottom Length of Weir	L =	220.00		
Angle of Side Slope Weir (Left)	Left Angle =	85.91	H:V =	14.00
Angle of Side Slope Weir (Right)	Right Angle =	85.91	H:V =	14.00
Elev. for Weir Crest	EL. Crest =	5,635.00		
Coef. for Rectangular Weir	C_w =	3.00		
Coef. for Trapezoidal Weir	C_t =	3.00		

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)	Composite Discharge (cfs)
5630.00	0	0	0	0	0
5631.00	0	0	0	0	0
5632.00	0	0	0	0	125
5633.00	0	0	0	0	407
5634.00	0	0	0	0	850
5635.00	0	0	0	0	1306
5636.00	660	21	21	702	2008
5637.00	1867	119	119	2104	3410



18-inch culvert is considered negligible.

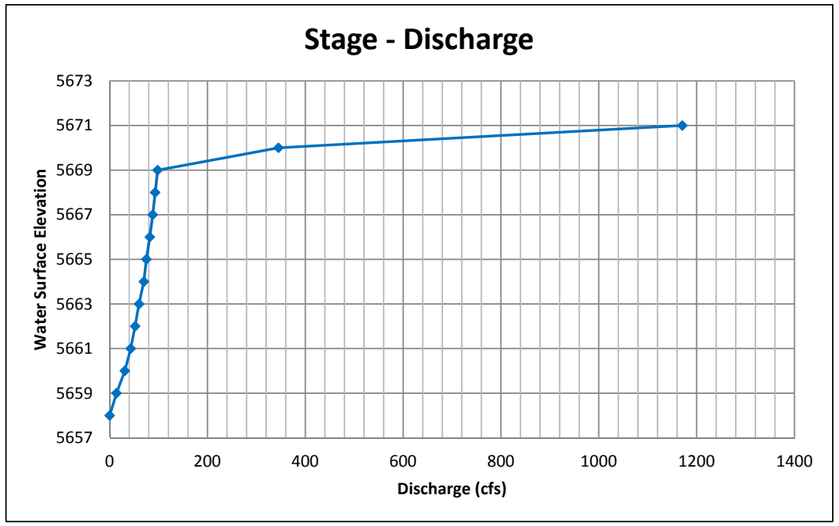
Silo Park Detention

Based on 2014 LiDAR, existing survey for Silo Park redesign project, and field measurement.

Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Discharge (cfs)	Note
0	5657.29	0	0	0	At invert of 36-inch outlet
0.71	5658	50	0	0	
1.71	5659	2885	0.0	14	
2.71	5660	14927	0.2	31	
3.71	5661	29053	0.7	43	
4.71	5662	42759	1.5	52	
5.71	5663	61606	2.7	60	
6.71	5664	80426	4.3	70	
7.71	5665	95562	6.4	75	
8.71	5666	110411	8.7	82	
9.71	5667	126156	11.4	88	
10.71	5668	141250	14.5	93	
11.71	5669	156067	17.9	98	At crest of spillway
12.71	5670	169858	21.7	345	Surcharge storage
13.71	5671	182658	25.7	1171	Surcharge storage

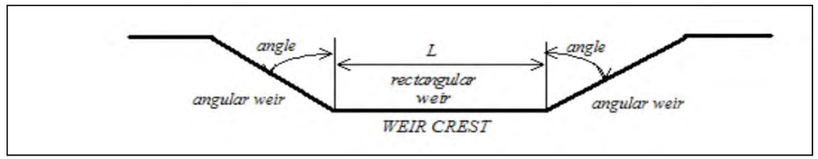
2005 OSP

Storage (ac-ft)	Discharge (cfs)
0	0
1.1	18
3.5	47
7.4	70
12.7	85
19.3	95
23.1	266
27.2	842
31.7	1615



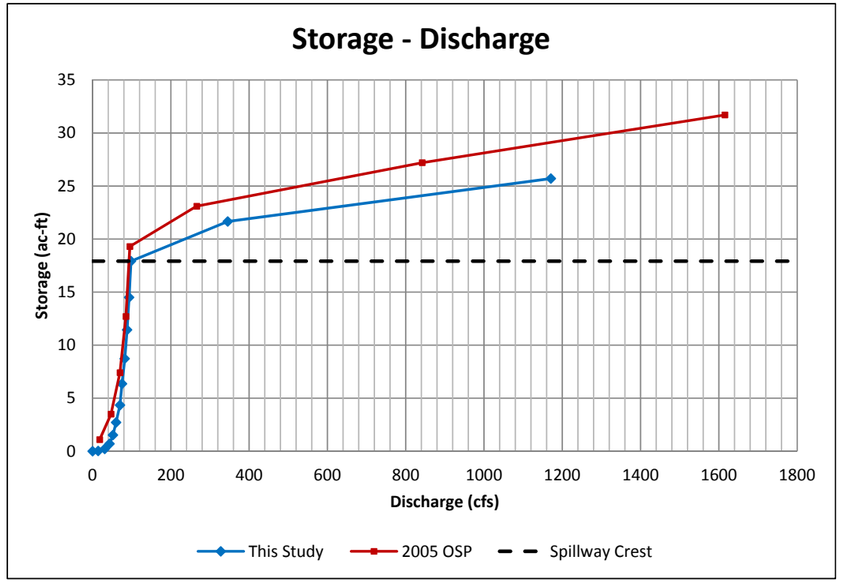
Spillway Capacity Calculation

STRUCTURE: Orchard Avenue (Broad Crested Weir)



Bottom Length of Weir	L =	35.00	
Angle of Side Slope Weir (Left)	Left Angle =	88.73	H:V = 45.00
Angle of Side Slope Weir (Right)	Right Angle =	88.73	H:V = 45.00
Elev. for Weir Crest	EL. Crest =	5,669.00	
Coef. for Rectangular Weir	C_w =	3.00	
Coef. for Trapezoidal Weir	C_t =	3.00	

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5668.00	0	0	0	0
5669.00	0	0	0	0
5670.00	105	67	67	240
5671.00	297	382	382	1061



					W.S.E.	(ft)	5658	5659	5660	5661	5662	5663	5664	5665	5666	5667	5668	5669	5670	5671
					Total Q	(cfs)	0	14	31	43	52	60	70	75	82	88	93	98	105	110
	Culvert ID	Culvert Dimension																		
Main Stem	N/A	Invert	5657.29	(ft)	HW	(ft)	0.71	1.71	2.71	3.71	4.71	5.71	6.71	7.71	8.71	9.71	10.71	11.71	12.71	13.71
		Diameter (D)	3	(ft)	HW/D	(ft/ft)	0.2	0.57	0.90	1.24	1.57	1.90	2.24	2.57	2.90	3.24	3.57	3.90	4.24	4.57
					Q-inlet	(cfs)	0	14	31	43	52	60	70	75	82	88	93	98	105	110

Discharge derived using nomograph Chart 2B of HDS 5 Hydraulic Design of Highway Culverts, FHWA, Revised May 2005

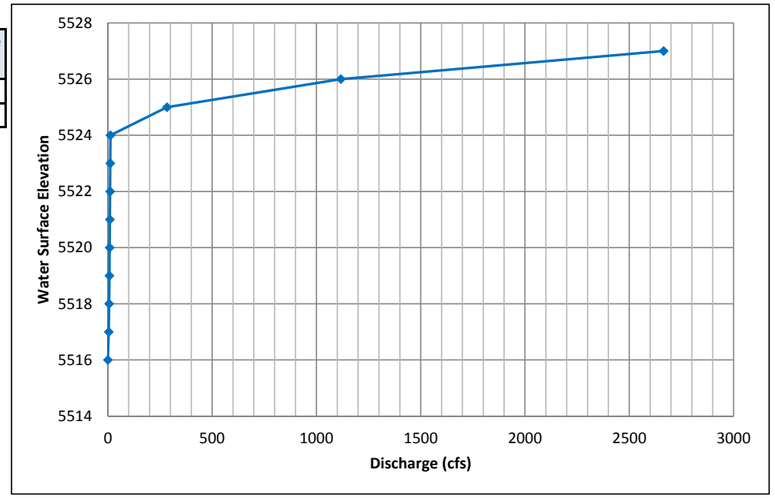
Southmoor Park

Based on 2014 LiDAR and field measurement.

Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Discharge (cfs)	Note
0	5516	1005	0	0	
1	5517	10514	0.1	4	
2	5518	24748	0.5	6	
3	5519	46012	1.3	8	
4	5520	73650	2.7	9	
5	5521	109835	4.8	10	
6	5522	158472	7.8	11	
7	5523	201655	11.9	12	
8	5524	243425	17.0	13	At crest of spill point
9	5525	286183	23.1	283	Surcharge storage
10	5526	334685	30.2	1117	Surcharge storage
11	5527	366638	38.3	2665	Surcharge storage
12	5528	401601	47.1	5056	Surcharge storage
13	5529	452297	56.9	8401	Surcharge storage

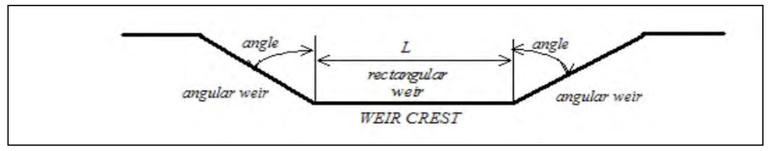
1989 Study Appendix

Storage (ac-ft)	Discharge (cfs)
0	0
72	700



Spillway Capacity Calculation

STRUCTURE: Parking Lot Overflow (Broad Crested Weir)



Bottom Length of Weir	L =	50.00	
Angle of Side Slope Weir (Left)	Left Angle =	88.09	H:V = 30.00 .
Angle of Side Slope Weir (Right)	Right Angle =	88.85	H:V = 50.00
Elev. for Weir Crest	EL. Crest =	5,524.00	
Coef. for Rectangular Weir	C_w =	3.00	
Coef. for Trapezoidal Weir	C_t =	3.00	

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5523.00	0	0	0	0
5524.00	0	0	0	0
5525.00	150	45	75	270
5526.00	424	255	424	1103
5527.00	779	701	1169	2650
5528.00	1200	1440	2400	5040
5529.00	1677	2516	4193	8385

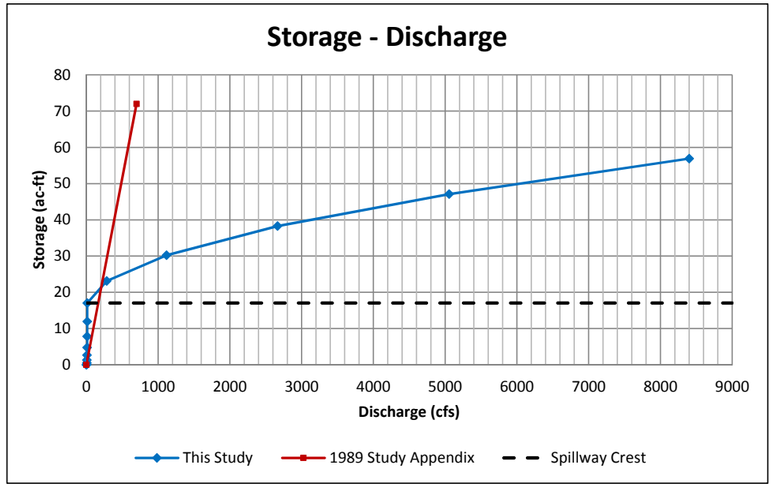


Table 7-7. Coefficients for various inlets in sumps

Inlet Type	N_w	C_w	N_o	C_o	C_m
CDOT Type 13 Grate	0.70	3.30	0.43	0.60	0.93
Denver No. 16 Grate	0.73	3.60	0.31	0.60	0.90
Curb Opening for Type 13 / No. 16 Combination	1.0	3.70	1.0	0.66	0.86
CDOT Type R Curb Opening	1.0	3.60	1.0	0.67	0.93

Outlet Capacity Calculation

Stage	1	2	3	4	5	6	7	8	9	10	11	12	13
Elevation	5517	5518	5519	5520	5521	5522	5523	5524	5525	5526	5527	5528	5529
Qo	4.5	6.3	7.8	9.0	10.0	11.0	11.8	12.7	13.4	14.2	14.9	15.5	16.1
Qw	14.5	40.9	75.1	115.6	161.6	212.4	267.7	327.1	390.3	457.1	527.3	600.8	677.5
Qm	7.2	14.5	21.7	29.0	36.2	43.4	50.7	57.9	65.2	72.4	79.6	86.9	94.1
Q	4	6	8	9	10	11	12	13	13	14	15	16	16

Tommy Davis Park Detention

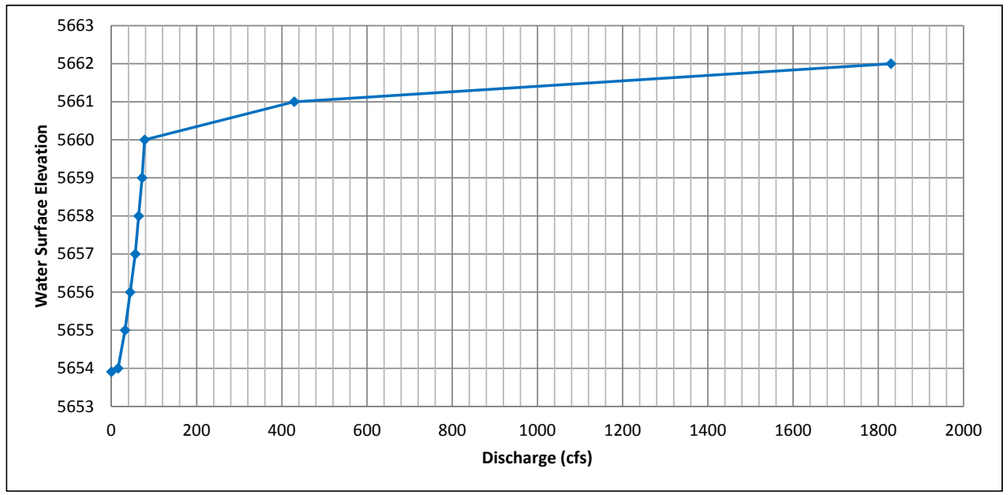
Based on 2014 LiDAR, field survey and field measurement.

Stage (ft)	Elevation (ft)	Surface Area (ft2)	Storage Volume (ac-ft)	Discharge (cfs)	Note
0	5653.91	41900	0	0	At crest of concrete weir
0.09	5654	41926	0.1	16	
1.09	5655	47499	1.1	32	
2.09	5656	55089	2.3	44	
3.09	5657	66371	3.7	56	
4.09	5658	87956	5.4	64	
5.09	5659	116573	7.8	72	
6.09	5660	149322	10.8	78	At crest of emergency spillway
7.09	5661	182259	14.6	429	Surcharge storage
8.09	5662	216967	19.2	1829	Surcharge storage
9.09	5663	261784	24.7	4695	Surcharge storage

Tommy Davis Park (17.5 AF in 1994 Study)

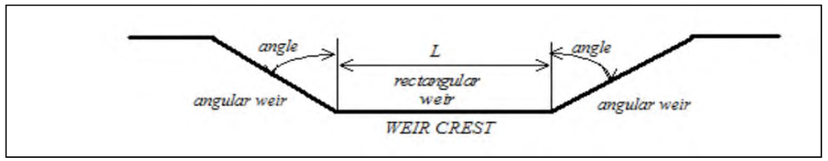
2005 OSP

Storage Volume (ac-ft)	Discharge (cfs)
0	0
0.8	21
3.6	60
9.3	90
13.4	433
18.3	1110
24	2120



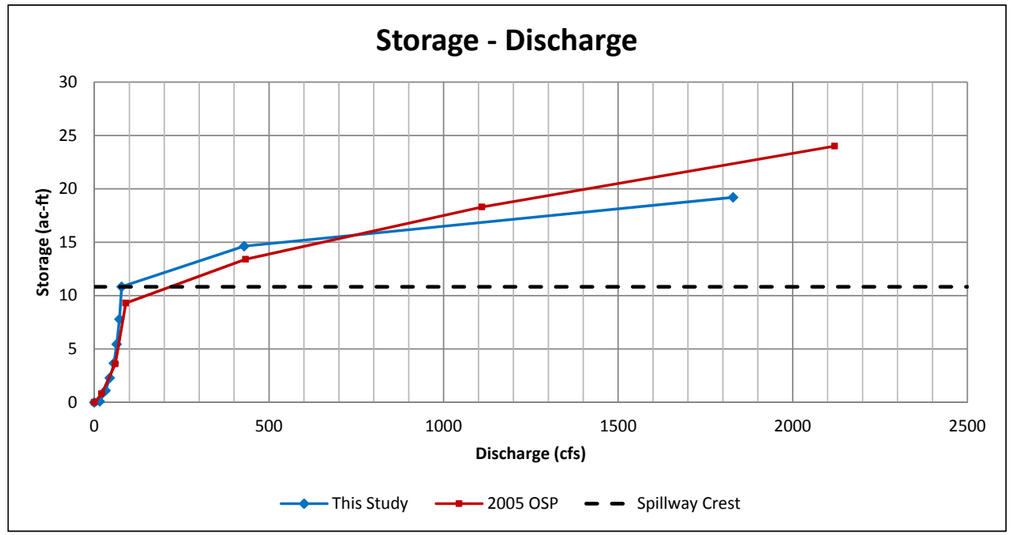
Spillway Capacity Calculation

STRUCTURE: Pedestrian Trail (Broad Crested Weir)



Bottom Length of Weir	L =	25.00	
Angle of Side Slope Weir (Left)	Left Angle =	89.28	H:V = 80.00
Angle of Side Slope Weir (Right)	Right Angle =	89.43	H:V = 100.00
Elev. for Weir Crest	EL. Crest =	5,660.00	
Coef. for Rectangular Weir	C_w =	3.00	
Coef. for Trapezoidal Weir	C_t =	3.00	

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5660.00	0	0	0	0
5661.00	75	150	120	345
5662.00	212	849	679	1739
5663.00	390	2338	1871	4599



Culvert Capacity Calculation

					W.S.E.	(ft)	5653	5654	5655	5656	5657	5658	5659	5660	5661	5662	5663
					Total Q	(cfs)	0	16	32	44	56	64	72	78	84	90	96
	Culvert ID	Culvert Dimension															
Main Stem	N/A	Invert	5652.58	(ft)	HW	(ft)	0.42	1.42	2.42	3.42	4.42	5.42	6.42	7.42	8.42	9.42	10.42
		Diameter (D)	2	(ft)	HW/D	(ft/ft)	0.21	0.71	1.21	1.71	2.21	2.71	3.21	3.71	4.21	4.71	5.21
					Q-inlet*	(cfs)	0	7.8	16	22	28	32	36	39	42	45	48
					Q * 2	(cfs)	0	16	32	44	56	64	72	78	84	90	96

*Discharge derived using nomograph Chart 1B of HDS 5 Hydraulic Design of Highway Culverts, FHWA, Revised May 2005

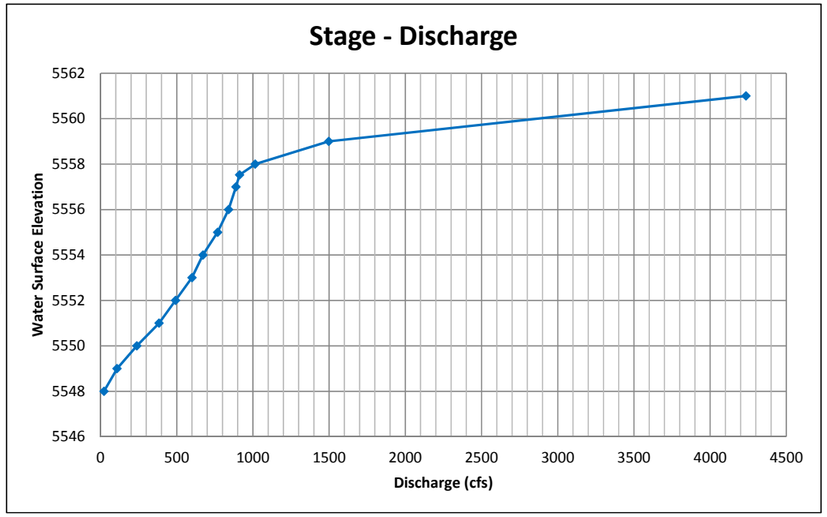
Wallace Park North

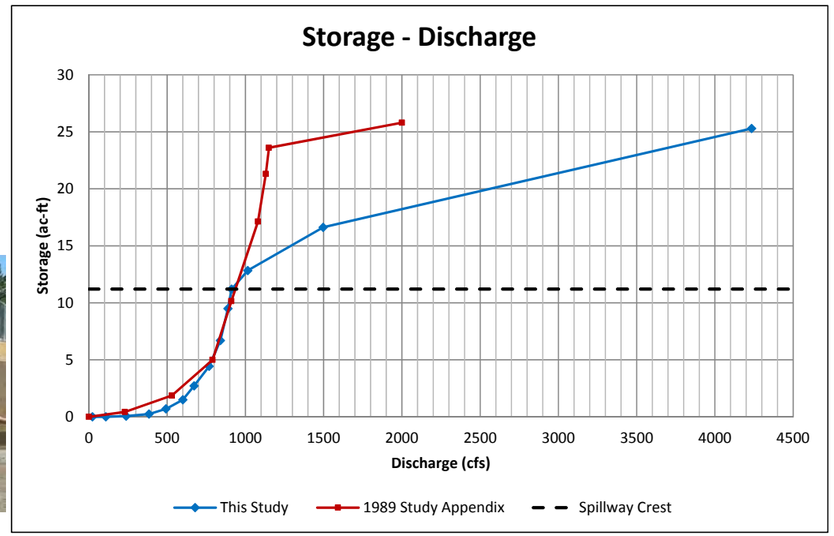
Based on 2014 LiDAR and field measurement.

Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Discharge (cfs)	Note
0	5547.54	0	0	0	At invert of outlet culvert
0.46	5548	100	0.0	22	
1.46	5549	862	0.0	108	
2.46	5550	3761	0.1	238	
3.46	5551	13543	0.2	384	
4.46	5552	26564	0.7	492	
5.46	5553	44076	1.5	600	
6.46	5554	62648	2.7	672	
7.46	5555	87210	4.4	768	
8.46	5556	110170	6.7	840	
9.46	5557	134669	9.5	888	
9.99	5557.53	145912	11.2	912	At crest of spillway
10.46	5558	155882	12.8	1015	Surcharging storage
11.46	5559	174216	16.6	1497	Surcharging storage
13.46	5561	204076	25.3	4235	Surcharging storage

1989 Study Appendix

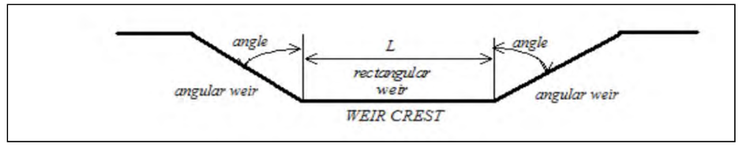
Storage (ac-ft)	Discharge (cfs)
0.00	0
0.43	230
1.87	530
5.00	790
10.15	910
17.13	1080
21.30	1130
23.60	1150
25.80	2000





Spillway Capacity Calculation

STRUCTURE: S DTC Blvd (Broad Crested Weir) - Pond does not appear to overflow



Bottom Length of Weir	L =	40.00	
Angle of Side Slope Weir (Left)	Left Angle =	88.36	H:V = 35.00
Angle of Side Slope Weir (Right)	Right Angle =	88.36	H:V = 35.00
Elev. for Weir Crest	EL. Crest =	5,557.53	
Coef. for Rectangular Weir	C_w =	3.00	
Coef. for Trapezoidal Weir	C_t =	3.00	

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5556.00	0	0	0	0
5557.00	0	0	0	0
5557.53	0	0	0	0
5558.00	39	8	8	55
5559.00	214	138	138	489
5561.00	776	1178	1178	3131

					W.S.E.	(ft)	5548	5549	5550	5551	5552	5553	5554	5555	5556	5557	5557.53	5558	5559	5561
					Total Q	(cfs)	22	108	238	384	492	600	672	768	840	888	912	960	1,008	1,104
	Culvert ID	Culvert Dimension																		
Main Stem	N/A	Invert	5547.54	(ft)	HW	(ft)	0.46	1.46	2.46	3.46	4.46	5.46	6.46	7.46	8.46	9.46	9.99	10.46	11.46	13.46
		Height (D)	6	(ft)	HW/Yo	(ft/ft)	0.15	0.49	0.82	1.15	1.49	1.82	2.15	2.49	2.82	3.15	3.33	3.49	3.82	4.49
		Width	12	(ft)	Area	(sf)	5.5	17.5	29.5	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0	36.0
		Restrictor (Y_o)	3	(ft)	q	(cfs/ft)	1	4.5	9.9	16	21	25	28	32	35	37	38	40	42	46
					Q	(cfs)	11	54	119	192	246	300	336	384	420	444	456	480	504	552
					Q * 2	(cfs)	22	108	238	384	492	600	672	768	840	888	912	960	1,008	1,104

For HW/D < 0.3, discharge calculated using rectangular weir equation due to off the Chart 8B.

Discharge derived using nomograph Chart 8B of HDS 5 Hydraulic Design of Highway Culverts, FHWA, Revised May 2005

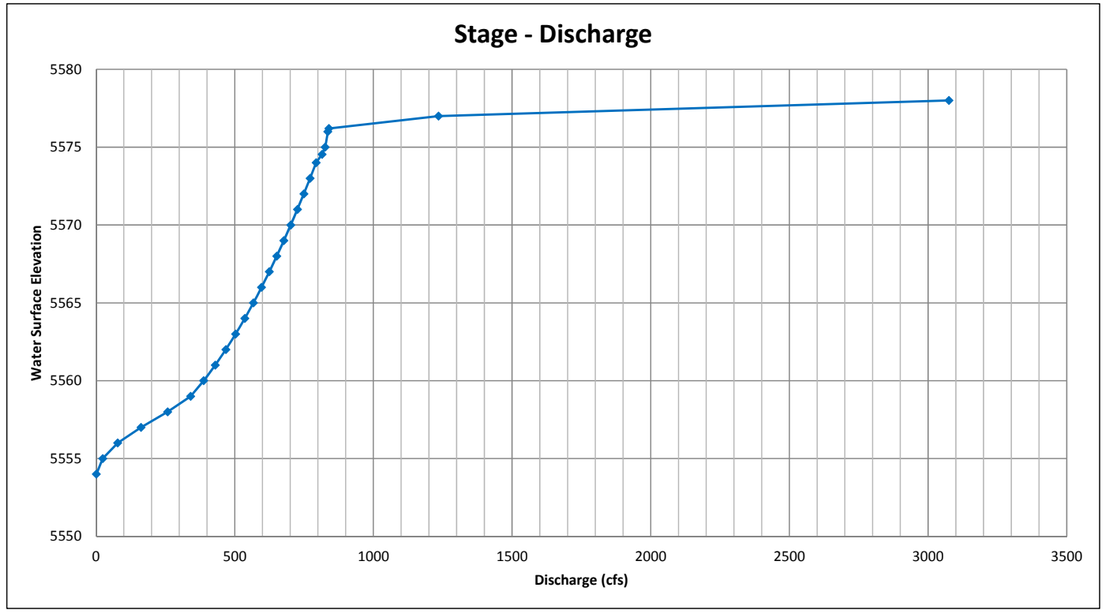
Wallace Park South

Based on 2014 LiDAR and field measurement.

Stage (ft)	Elevation (ft)	Area (ft2)	Storage (ac-ft)	Discharge (cfs)	Note
0	5553.85	0	0	0	At invert of outlet culvert
0.15	5554	13	0.0	1	
1.15	5555	1376	0.0	24	
2.15	5556	2455	0.1	78	
3.15	5557	6047	0.1	162	
4.15	5558	15500	0.4	258	
5.15	5559	34805	1.0	341	
6.15	5560	67789	2.1	388	
7.15	5561	109366	4.1	430	
8.15	5562	150795	7.1	468	
9.15	5563	192511	11.0	503	
10.15	5564	224523	15.8	536	
11.15	5565	244244	21.2	567	
12.15	5566	264305	27.0	597	
13.15	5567	285142	33.3	625	
14.15	5568	321948	40.3	651	
15.15	5569	362957	48.2	677	
16.15	5570	405877	57.0	702	
17.15	5571	454175	66.8	726	
18.15	5572	493023	77.7	749	
19.15	5573	535959	89.5	772	
20.15	5574	581844	102.3	794	
20.69	5574.54	609915	109.7	815	At crest of weir
21.15	5575	633827	116.3	826	Surcharge storage in Temple Rd
22.15	5576	673326	131.3	836	Surcharge storage in Temple Rd
22.35	5576.2	681384	134.4	840	At high point of road centerline
23.15	5577	713614	147.2	1235	Surcharging storage
24.15	5578	790610	164.5	3075	Surcharging storage

1989 Study Appendix

Storage (ac-ft)	Discharge (cfs)
0	**0**
2	90
6.6	300
17.4	450
34	560
60	650
90	730
126	820

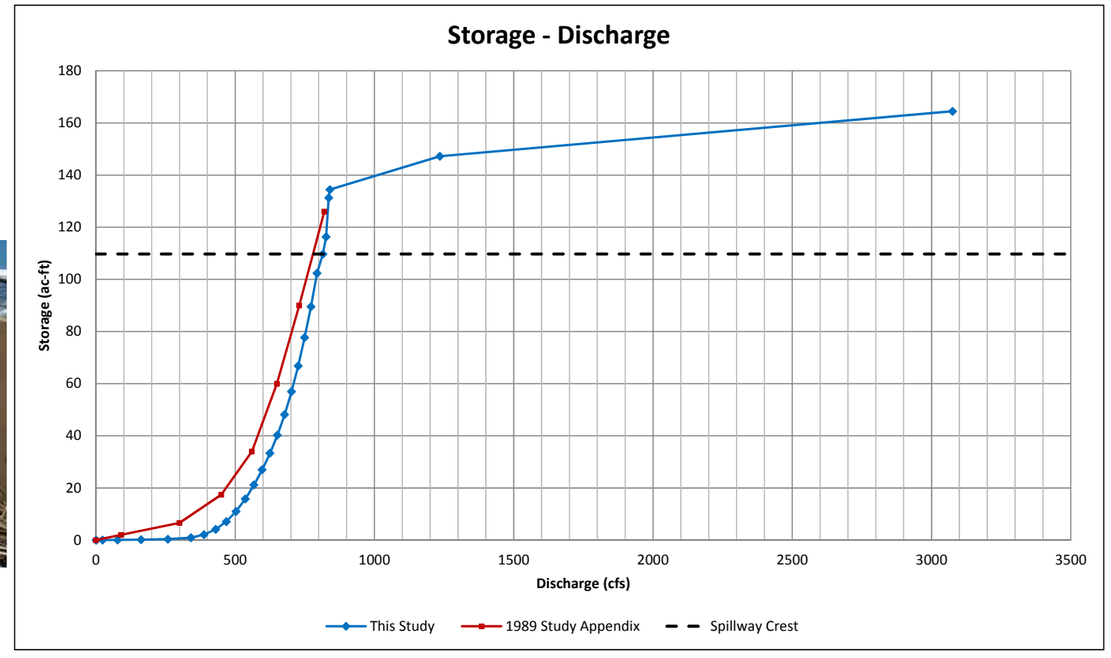


Spillway Capacity Calculation

STRUCTURE: E Temple Road (Broad Crested Weir)

Bottom Length of Weir	L =	75.00	
Angle of Side Slope Weir (Left)	Left Angle =	89.52	H:V = 120.00
Angle of Side Slope Weir (Right)	Right Angle =	89.57	H:V = 134.00
Elev. for Weir Crest	EL. Crest =	5,576.20	
Coef. for Rectangular Weir	C_w =	3.00	
Coef. for Trapezoidal Weir	C_t =	3.00	

W.S.E.	Rectangular Weir (cfs)	Left Triangular Weir (cfs)	Right Triangular Weir (cfs)	Total Discharge (cfs)
5575.00	0	0	0	0
5576.00	0	0	0	0
5577.00	161	103	115	379
5578.00	543	782	874	2200



Culvert Capacity Calculation

Gravity	**=**	**32.174**	**ft/s/s**
Slope	**=**	**0.0072**	**ft/ft**
Manning n	**=**	**0.016**	**(RCP + 25%)** For RCP pipe
Flow Area, A_o	**=**	**19.22**	From UD-Detention, Version 2.34
H_o	**=**	**5555.6**	Centroid Elevation of Equivalent Rectangular Vertical Orifice (UD-Detention, Version 2.34)
Orifice Coefficient, C_o	**=**	**0.6**	

Wallace Park South

					W.S.E.	(ft)	5554	5555	5556	5557	5558	5559	5560	5561	5562	5563	5564	5565	5566	5567	5568	5569	5570	5571	5572	5573	5574	5575	5575.54	5576	5576.2	5577	5578
					Total Q	(cfs)	1	24	78	162	258	341	388	430	468	503	536	567	597	625	651	677	702	726	749	772	794	815	826	836	840	856	876
	Culvert ID	Culvert Dimension																															
Main Stem	N/A	Invert	5553.85	(ft)	HW	(ft)	0.15	1.15	2.15	3.15	4.15	5.15	6.15	7.15	8.15	9.15	10.15	11.15	12.15	13.15	14.15	15.15	16.15	17.15	18.15	19.15	20.15	21.15	21.69	22.15	22.35	23.15	24.15
		Diameter (D)	7.0	(ft)	HW/Y_o	(ft/ft)	0.04	0.33	0.61	0.90	1.19	1.47	1.76	2.04	2.33	2.61	2.90	3.19	3.47	3.76	4.04	4.33	4.61	4.90	5.19	5.47	5.76	6.04	6.20	6.33	6.39	6.61	6.90
		Restrictor (Y_o)	3.5	(ft)	Area	sf	0.20	4.13	10.03	16.80	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22	19.22
					Q-inlet	(cfs)	0.5	12	39	81	129	171	194	215	234	252	268	284	298	312	326	339	351	363	375	386	397	407	413	418	420	428	438
					Q * 2	(cfs)	1.0	24	78	162	258	341	388	430	468	503	536	567	597	625	651	677	702	726	749	772	794	815	826	836	840	856	876

Discharge calculated using FHWA HY-8
Discharge is minimum of inlet capacity and orifice capacity.
Discharge calculated using orifice equation, $Q_o = C_o * A_o * [2 * g * (HW - H_o)]^{0.5}$

Clear Worksheet

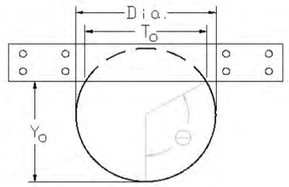
RESTRICTOR PLATE SIZING FOR CIRCULAR VERTICAL ORIFICES

Project: _____

Basin ID: _____

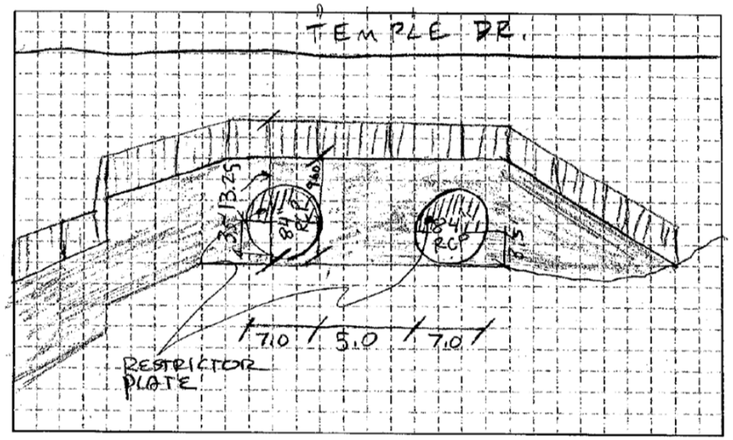
UDFCD:
A restrictor plate is placed over the upper portion of an outlet pipe or circular vertical orifice to limit the flow at a prescribed headwater depth.

The remaining open area is then evaluated as an equivalent rectangular vertical orifice.



		#1 Vertical Orifice	#2 Vertical Orifice	
Sizing the Restrictor Plate for Circular Vertical Orifices or Pipes (Input)				
Water Surface Elevation at Design Depth	Elev: WS =	5,577.00		feet
Pipe/Vertical Orifice Entrance Invert Elevation	Elev: Invert =	5,553.85		feet
Required Peak Flow through Orifice at Design Depth	Q =	428.00		cfs
Pipe/Vertical Orifice Diameter (inches)	Dia =	84.0		inches
Orifice Coefficient	C_o =	0.60		
Full-flow Capacity (Calculated)				
Full-flow area	Af =	38.48		sq ft
Half Central Angle in Radians	Theta =	3.14		rad
Full-flow capacity	Qf =	821.4		cfs
	Percent of Design Flow =	192%		
Calculation of Orifice Flow Condition				
Half Central Angle (0<Theta<3.1416)	Theta =	1.57		rad
Flow area	A_o =	19.22		sq ft
Top width of Orifice (inches)	T_o =	84.00		inches
Height from Invert of Orifice to Bottom of Plate (feet)	Y_o =	3.500		feet
Elevation of Bottom of Plate	Elev Plate Bottom Edge =	5,557.35		feet
Resultant Peak Flow Through Orifice at Design Depth	Q_o =	428.2		cfs
Width of Equivalent Rectangular Vertical Orifice	**Equivalent Width =**	5.49		feet
Centroid Elevation of Equivalent Rectangular Vertical Orifice	**Equiv. Centroid El. =**	5,555.6000		feet

Copy #1 Vert. Orifice to Outlet Sheet | Copy #2 Vert. Orifice to Outlet Sheet



Low flow condition calculated by FHWA HY-8		Low Flow at desired elevation	
Headwater Elevation (ft)	Total Discharge (cfs)	Goal Elevation (ft)	Seek Discharge (cfs)
5554.18	1	5554	
5554.32	2		
5554.42	3		
5554.67	6		
5554.91	10		
5555.37	20	5555	12.0
5555.72	30		
5556.03	40	5556	39.0
5556.30	50		
5556.54	60		
5556.77	70		
5556.99	80		
5557.19	90	5557	80.5
5557.40	100		
5558.43	150	5558	129.1
5559.32	200	5559	182.0
5560.14	250		
5560.96	300		
5562.83	400		
5568.11	600		

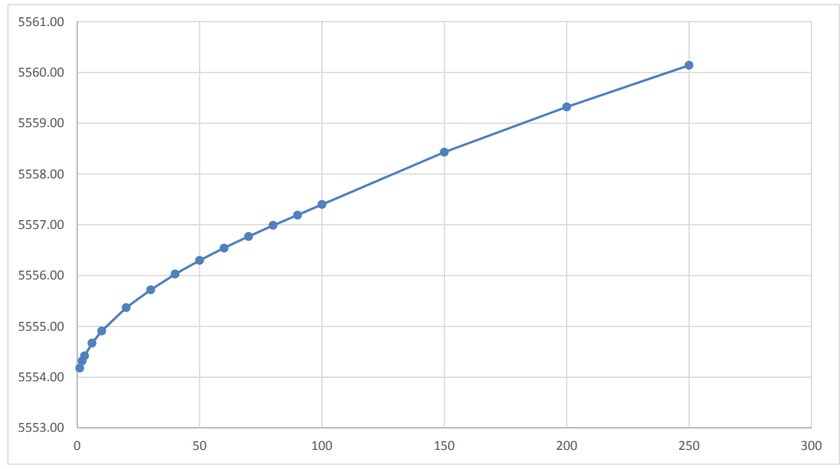


Table B-4 Peak Discharges and Runoff Volumes (All Design Points)

Design Point		Drainage Area	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (acre-ft)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
JUNCT_U-301	JUNCTION	218	119	162	206	406	498	607	873	8.7	12.0	15.7	25.5	31.3	38.1	54.6
JUNCT_U-320	JUNCTION	191	108	146	186	364	447	545	783	7.7	10.7	13.8	22.5	27.5	33.5	48.2
JUNCT_U-330	JUNCTION	6	2	3	4	9	11	13	19	0.2	0.3	0.4	0.7	0.8	1.0	1.4
JUNCT_U-111	JUNCTION	1,320	138	184	243	560	901	1,421	2,592	36.5	51.9	70.9	131.7	166.4	207.2	304.9
JUNCT_U-110	JUNCTION	1,283	134	178	233	553	890	1,403	2,548	35.3	50.3	68.8	128.0	161.8	201.1	296.3
JUNCT_U-155	JUNCTION	1,235	129	171	221	546	880	1,392	2,519	33.5	47.6	65.4	122.2	154.7	192.8	284.3
JUNCT_U-151	JUNCTION	1,125	118	155	193	529	853	1,351	2,382	29.7	42.7	58.6	110.5	140.0	174.7	257.9
JUNCT_U-170	JUNCTION	34	4	6	9	26	34	44	67	0.5	0.7	1.2	2.8	3.6	4.7	7.2
JUNCT_U-150	JUNCTION	1,074	114	149	182	517	832	1,317	2,313	28.6	41.1	56.5	105.9	134.2	167.0	246.2
JUNCT_U-210	JUNCTION	977	111	142	169	508	811	1,328	2,247	28.0	39.6	53.7	98.9	124.6	154.4	226.9
JUNCT_U-601	JUNCTION	911	107	136	159	486	774	1,270	2,141	27.3	38.4	51.9	93.6	117.9	145.5	213.1
JUNCT_U-600	JUNCTION	442	66	82	97	196	366	625	1,081	11.9	16.7	22.8	42.7	54.6	67.8	100.1
JUNCT_U-610	JUNCTION	19	3	4	7	20	26	33	50	0.3	0.4	0.7	1.5	2.0	2.6	3.9
JUNCT_U-620	JUNCTION	349	106	150	206	492	626	731	1,081	10.2	14.2	19.2	34.7	44.5	54.6	79.8
JUNCT_U-640	JUNCTION	305	97	137	188	490	569	657	970	9.1	12.7	17.1	30.7	39.3	47.9	70.0
JUNCT_U-670	JUNCTION	29	9	13	18	42	54	67	99	0.8	1.1	1.5	2.9	3.6	4.5	6.8
JUNCT_U-680	JUNCTION	46	14	19	27	68	83	104	155	1.4	2.0	2.7	5.4	6.9	8.7	13.1
JUNCT_U-700	JUNCTION	115	56	77	100	202	248	304	435	4.5	6.1	8.0	13.0	15.9	19.3	27.7
JUNCT_U-750	JUNCTION	12	10	13	16	29	35	42	58	0.5	0.7	0.9	1.4	1.7	2.1	2.9
JUNCT_U-760	JUNCTION	6	5	6	8	14	17	20	27	0.3	0.3	0.4	0.7	0.8	1.0	1.4
JUNCT_U-770	JUNCTION	22	12	15	19	33	40	48	67	1.2	1.6	2.0	3.0	3.5	4.2	5.9
JUNCT_U-400	JUNCTION	469	41	56	72	290	416	649	1,091	15.4	21.7	29.0	51.0	63.2	77.7	113.0
JUNCT_U-411	JUNCTION	441	39	56	71	283	402	632	1,050	15.0	21.0	28.0	48.5	59.9	73.7	106.8
JUNCT_U-410	JUNCTION	441	62	86	113	311	437	650	1,060	15.0	21.0	28.0	48.5	59.9	73.7	106.8
JUNCT_U-440	JUNCTION	285	30	56	90	244	334	476	774	10.3	14.3	18.9	31.9	39.3	48.2	69.4
JUNCT_U-450	JUNCTION	257	29	53	84	225	306	433	706	9.6	13.4	17.6	29.2	35.9	43.9	62.9
JUNCT_U-461	JUNCTION	237	28	52	82	214	291	412	672	9.5	13.2	17.1	27.8	34.1	41.1	58.9
JUNCT_U-460	JUNCTION	140	80	108	137	268	334	400	570	5.4	7.5	9.7	16.0	19.6	23.8	34.1
JUNCT_U-515	JUNCTION	97	22	41	55	117	152	196	298	4.2	5.9	7.6	12.0	14.6	17.6	25.0
JUNCT_U-510	JUNCTION	29	11	15	20	42	52	64	91	1.0	1.4	1.8	3.1	3.8	4.7	6.9
JUNCT_U-160	JUNCTION	17	7	10	13	27	33	41	59	0.6	0.8	1.1	1.9	2.3	2.9	4.2
JUNCT_U-100	JUNCTION	1,579	232	307	373	816	1,025	1,499	2,787	46.7	66.3	89.6	162.4	203.8	252.4	371.5
JUNCT_L-045	JUNCTION	1,797	301	402	511	1,097	1,377	1,741	2,977	54.0	76.4	103.5	186.0	233.0	288.6	423.7
JUNCT_L-050A	JUNCTION	52	12	17	24	60	76	95	140	1.2	1.7	2.4	4.8	6.1	7.8	11.6
JUNCT_L-080	JUNCTION	28	16	21	28	57	70	87	124	1.0	1.3	1.8	3.0	3.7	4.6	6.6
JUNCT_L-093	JUNCTION	111	68	93	117	222	271	331	481	4.7	6.4	8.3	13.3	16.2	19.6	28.3
JUNCT_L-060	JUNCTION	35	14	20	25	53	66	81	117	1.2	1.7	2.2	3.8	4.7	5.7	8.4
JUNCT_L-100	JUNCTION	60	26	37	48	102	127	156	225	2.0	2.8	3.7	6.5	8.1	9.9	14.5
JUNCT_L-110	JUNCTION	86	29	40	55	128	161	201	294	2.3	3.2	4.5	8.4	10.6	13.3	19.7
JUNCT_L-125	JUNCTION	27	6	8	11	24	30	39	52	0.8	1.2	1.6	2.8	3.5	4.4	6.5
JUNCT_L-145	JUNCTION	2,519	466	577	680	1,077	1,238	1,453	3,390	76.8	108.1	145.8	261.3	328.5	405.2	601.7

Table B-4 Peak Discharges and Runoff Volumes (All Design Points)

Design Point		Drainage Area	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (acre-ft)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
JUNCT_L-330	JUNCTION	108	31	42	57	128	160	200	290	3.2	4.5	6.1	11.1	13.9	17.3	25.5
JUNCT_L-130	JUNCTION	43	13	18	24	54	68	84	122	1.3	1.8	2.4	4.4	5.5	6.8	10.1
JUNCT_L-335	JUNCTION	2,519	465	576	679	1,074	1,237	1,451	3,372	76.8	108.1	145.8	261.6	328.5	405.2	601.7
JUNCT_L-345	JUNCTION	2,733	487	613	739	1,244	1,466	1,763	3,384	81.7	115.1	155.6	281.5	353.1	439.0	650.8
JUNCT_L-355	JUNCTION	2,809	497	630	763	1,310	1,553	1,879	3,403	83.5	117.9	159.3	288.9	362.3	448.2	669.3
JUNCT_L-350A	JUNCTION	76	22	31	42	103	129	162	237	1.9	2.7	3.7	7.2	9.1	11.5	17.2
JUNCT_L-340	JUNCTION	138	34	48	69	180	229	289	428	2.9	4.2	6.0	12.5	16.0	20.4	30.7
JUNCT_L-365	JUNCTION	2,925	511	653	798	1,406	1,680	2,050	3,434	86.0	121.6	164.9	299.6	374.5	466.6	693.8
JUNCT_L-360	JUNCTION	116	29	42	58	147	187	234	346	2.6	3.8	5.4	10.8	13.8	17.4	26.2
JUNCT_L-390	JUNCTION	52	16	23	31	70	88	109	159	1.5	2.1	2.9	5.3	6.7	8.4	12.3
JUNCT_L-400	JUNCTION	28	20	27	33	60	73	89	125	1.3	1.8	2.3	3.6	4.3	5.2	7.3
JUNCT_L-405	JUNCTION	3,086	534	689	853	1,661	2,125	2,280	3,485	90.9	128.3	174.1	319.3	408.3	494.3	733.7
JUNCT_L-370	JUNCTION	80	24	33	46	109	138	172	252	2.1	3.0	4.1	7.8	9.8	12.4	18.4
JUNCT_L-410	JUNCTION	64	28	38	49	98	120	146	209	2.5	3.5	4.5	7.5	9.2	11.2	16.1
JUNCT_L-415	JUNCTION	3,150	543	706	878	1,668	2,180	2,363	3,468	93.3	132.0	178.7	325.4	417.5	506.6	749.1
JUNCT_L-440A	JUNCTION	56	11	16	22	56	71	91	134	1.2	1.8	2.5	5.1	6.5	8.3	12.4
JUNCT_L-445	JUNCTION	4,031	659	889	1,157	2,339	2,934	3,290	4,927	117.0	165.5	224.7	414.5	528.0	644.7	954.8
JUNCT_L-425	JUNCTION	558	147	209	275	527	549	596	1,143	15.3	21.7	29.9	56.5	71.2	87.8	129.9
JUNCT_L-420	JUNCTION	57	30	42	53	103	126	154	219	2.3	3.2	4.1	6.8	8.2	10.0	14.3
JUNCT_L-436	JUNCTION	623	159	225	300	590	634	699	1,240	16.7	23.8	32.8	62.6	78.9	97.6	144.3
JUNCT_L-450	JUNCTION	140	37	52	71	167	210	264	387	3.7	5.3	7.3	13.8	17.4	21.9	32.5
JUNCT_L-491	JUNCTION	4,119	664	899	1,174	2,374	2,986	3,370	5,044	119.1	168.5	229.3	423.7	537.3	657.0	973.2
JUNCT_L-475	JUNCTION	4,338	650	885	1,161	2,360	2,983	3,443	5,207	121.3	171.9	234.2	435.9	558.7	681.5	1,016.2
JUNCT_L-500	JUNCTION	90	3	6	14	65	87	116	180	0.3	0.6	1.4	5.7	7.9	10.8	17.3
JUNCT_L-505	JUNCTION	4,338	658	895	1,171	2,165	2,446	2,642	4,296	123.7	175.0	238.8	442.1	564.9	690.8	1,025.4
JUNCT_L-480	JUNCTION	42	13	19	25	61	76	95	141	1.1	1.5	2.1	4.1	5.2	6.5	9.7
JUNCT_L-540	JUNCTION	28	10	14	20	48	61	77	113	0.7	1.0	1.3	2.6	3.3	4.2	6.2
JUNCT_L-545	JUNCTION	4,366	658	896	1,173	2,167	2,449	2,645	4,294	124.3	175.9	240.1	445.2	568.0	693.8	1,031.5
JUNCT_L-570	JUNCTION	49	11	16	22	55	70	87	129	1.1	1.6	2.3	4.6	5.8	7.4	11.0
JUNCT_L-575	JUNCTION	4,456	663	905	1,188	2,195	2,481	2,680	4,354	126.2	179.0	244.1	454.4	580.2	709.2	1,049.9
JUNCT_L-555	JUNCTION	4,408	660	900	1,180	2,179	2,463	2,661	4,321	125.3	177.4	241.9	451.3	574.1	700.0	1,040.7
JUNCT_L-550	JUNCTION	42	9	12	18	46	58	73	109	0.9	1.3	1.9	3.8	4.9	6.2	9.3
JUNCT_L-560	JUNCTION	33	8	12	17	41	52	65	96	0.8	1.1	1.6	3.1	3.9	5.0	7.5
JUNCT_L-520	JUNCTION	96	21	29	40	89	112	140	204	2.8	4.0	5.4	9.8	12.3	15.4	22.6
JUNCT_L-610	JUNCTION	77	45	60	75	140	170	204	289	3.5	4.8	6.2	9.7	11.7	14.1	20.0
JUNCT_L-600	JUNCTION	42	27	36	45	82	99	119	167	2.0	2.7	3.5	5.4	6.5	7.7	10.9
JUNCT_L-635	JUNCTION	4,870	788	903	1,141	2,180	2,226	2,368	4,143	144.3	198.6	264.3	472.8	592.5	721.5	1,096.0
JUNCT_L-630	JUNCTION	90	29	40	53	111	138	171	246	3.0	4.2	5.6	9.8	12.1	14.9	21.7
JUNCT_L-645	JUNCTION	44	14	19	26	58	73	91	143	1.2	1.8	2.4	4.4	5.5	6.9	10.4
JUNCT_L-640A	JUNCTION	35	13	17	23	51	63	78	114	1.1	1.5	2.0	3.6	4.5	5.5	8.1

Table B-4 Peak Discharges and Runoff Volumes (All Design Points)

Design Point		Drainage Area	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (acre-ft)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
JUNCT_L-650	JUNCTION	15	4	6	8	22	28	35	52	0.3	0.4	0.6	1.3	1.7	2.1	3.2
JUNCT_L-665	JUNCTION	4,893	787	903	1,142	2,004	2,229	2,373	4,125	145.5	199.9	265.9	475.9	595.6	724.5	1,099.1
JUNCT_L-660	JUNCTION	9	2	3	4	11	14	18	26	0.2	0.3	0.4	0.8	1.0	1.3	2.0
JUNCT_L-685	JUNCTION	4,932	781	901	1,140	1,953	2,238	2,389	4,083	145.8	200.2	266.5	478.9	598.7	730.7	1,108.3
JUNCT_L-670	JUNCTION	21	4	6	8	19	24	30	45	0.5	0.7	1.0	2.0	2.5	3.2	4.8
JUNCT_L-680	JUNCTION	39	2	3	6	25	33	44	67	0.2	0.4	0.7	2.6	3.5	4.8	7.6
JUNCT_L-020	JUNCTION	16	6	8	10	19	24	29	41	0.7	0.9	1.2	1.9	2.4	2.8	4.1
JUNCT_L-010A	JUNCTION	30	12	17	22	45	55	68	97	1.1	1.5	2.0	3.4	4.2	5.2	7.5
JUNCT_L-755	JUNCTION	501	131	186	242	471	449	588	1,071	12.8	18.5	25.7	49.7	62.9	78.0	115.7
JUNCT_L-760	JUNCTION	30	15	19	24	43	52	62	87	1.5	2.1	2.6	4.0	4.8	5.7	8.0
JUNCT_L-720	JUNCTION	53	6	9	15	47	61	79	120	0.6	1.0	1.6	4.1	5.4	7.1	11.0
JUNCT_L-740	JUNCTION	109	40	56	74	167	208	259	375	3.2	4.5	6.1	11.1	13.9	17.3	25.5
JUNCT_L-700	JUNCTION	158	43	59	81	189	237	298	435	4.2	6.0	8.3	15.6	19.7	24.7	36.5
JUNCT_L-530	JUNCTION	32	4	6	10	27	34	44	66	0.5	0.8	1.2	2.7	3.5	4.5	6.8
JUNCT_L-180	JUNCTION	115	26	38	53	134	170	214	317	2.6	3.7	5.3	10.6	13.5	17.2	25.7
JUNCT_L-150	JUNCTION	60	27	38	49	105	130	161	232	2.0	2.8	3.7	6.5	8.0	9.9	14.4
JUNCT_L-030	JUNCTION	24	15	21	26	50	60	74	105	1.0	1.4	1.8	2.9	3.5	4.3	6.1
JUNCT_L-050B	JUNCTION	36	9	13	18	45	57	72	105	0.9	1.2	1.7	3.4	4.3	5.5	8.2
JUNCT_L-350B	JUNCTION	76	17	24	35	92	118	149	222	1.5	2.2	3.2	6.8	8.7	11.2	16.9
JUNCT_U-010B	JUNCTION	20	5	6	9	24	31	39	57	0.4	0.6	0.9	1.8	2.3	2.9	4.4
JUNCT_L-750	JUNCTION	55	7	10	16	45	59	76	114	0.8	1.3	2.0	4.5	5.9	7.7	11.8
JUNCT_L-800	JUNCTION	67	24	35	48	118	150	190	279	1.6	2.2	3.1	6.2	7.9	9.9	14.9
JUNCT_L-435	JUNCTION	14	0	1	2	9	13	17	26	0.0	0.1	0.2	0.9	1.2	1.7	2.7
JUNCT_L-490	JUNCTION	45	13	18	25	60	76	95	139	1.1	1.6	2.3	4.4	5.5	6.9	10.3
TREX	JUNCTION	207	67	93	126	287	359	447	666	5.8	8.3	11.2	20.8	26.0	32.5	48.8
Outfall_Goldsmith	OUTFALL	4,954	782	903	1,144	1,959	2,245	2,400	4,094	146.4	201.1	267.7	478.9	601.7	733.7	1,111.3
JUNCT_U-215	DIVIDER	977	110	142	169	503	802	1,275	2,218	27.2	38.7	53.1	97.9	123.7	153.8	226.0
JUNCT_U-520	DIVIDER	24	15	19	23	40	48	57	79	1.3	1.8	2.2	3.3	4.0	4.7	6.5
JUNCT_U-115	DIVIDER	1,320	138	184	243	560	901	1,421	2,592	36.5	51.9	70.9	131.7	166.4	207.2	304.9
JUNCT_U-415	DIVIDER	441	39	56	71	283	402	632	1,050	15.0	21.0	28.0	48.5	59.9	73.7	106.8
JUNCT_U-524	DIVIDER	68	0	0	7	55	77	104	168	0.0	0.0	0.2	2.6	3.9	5.8	10.3
JUNCT_L-580	DIVIDER/ Split Flow	4,522	667	911	1,197	2,212	2,502	2,704	4,395	127.7	180.8	246.8	460.5	586.4	718.4	1,065.3
JUNCT_L-616	DIVIDER	4,737	785	981	1,118	2,067	2,182	2,308	4,156	140.0	192.5	256.0	457.4	574.1	700.0	1,062.2
JUNCT_L-055	DIVIDER	1,988	348	416	473	655	743	830	2,744	61.1	86.0	115.7	207.2	259.1	319.3	469.7
JUNCT_L-065	DIVIDER	1,740	284	374	470	1,022	1,282	1,620	2,956	52.2	73.7	99.8	179.9	225.3	279.1	408.3
JUNCT_L-040	DIVIDER	57	33	45	59	122	151	188	269	1.9	2.7	3.5	6.1	7.5	9.3	13.5
JUNCT_L-640B	DIVIDER	9	2	2	3	8	10	13	20	0.2	0.3	0.4	0.8	1.0	1.3	2.0
JUNCT_L-460	DIVIDER/ Split Flow	72	26	36	47	101	125	154	222	2.4	3.4	4.5	7.8	9.7	12.0	17.5
JUNCT_L-470	DIVIDER	57	22	32	43	101	128	161	235	1.5	2.1	2.9	5.5	7.0	8.7	13.0
JUNCT_L-375	DIVIDER	3,005	521	669	824	1,468	1,763	2,165	3,448	88.1	124.6	168.9	307.0	386.8	478.9	712.2
JUNCT_L-090	DIVIDER	58	34	47	59	113	138	168	238	2.4	3.3	4.3	6.9	8.4	10.2	14.6

Table B-4 Peak Discharges and Runoff Volumes (All Design Points)

Design Point		Drainage Area	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (acre-ft)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
JUNCT_L-070	DIVIDER	53	35	47	59	111	135	165	233	2.3	3.1	4.0	6.4	7.8	9.5	13.5
JUNCT_L-091	DIVIDER	111	69	93	118	224	273	333	474	4.7	6.4	8.3	13.4	16.3	19.7	28.1
JUNCT_L-092	DIVIDER	111	68	93	117	222	272	331	482	4.7	6.4	8.3	13.3	16.2	19.6	28.2
JUNCT_L-151	DIVIDER	92	41	56	74	154	190	234	332	3.3	4.5	6.0	10.2	12.6	15.4	22.7
JUNCT_L-430	DIVIDER	51	14	20	27	62	78	97	142	1.4	2.0	2.7	5.1	6.4	8.0	11.9
JUNCT_L-645A	DIVIDER	44	14	19	26	58	73	91	132	1.2	1.8	2.4	4.4	5.5	6.9	10.2
JUNCT-L-525	DIVIDER	#N/A	776	899	1,091	1,885	2,149	2,275	4,147	134.5	184.8	246.2	435.9	552.6	675.4	1,028.5
JUNCT_L-565	DIVIDER	4,522	667	857	1,069	1,846	2,102	2,220	4,075	127.4	179.6	239.8	426.7	537.3	657.0	1,003.9
JUNCT_L-440B	DIVIDER	62	21	29	39	87	109	135	196	1.8	2.6	3.5	6.4	8.0	9.9	14.6
JUNCT_L-120	DIVIDER	27	6	8	11	24	30	37	54	0.8	1.2	1.6	2.8	3.5	4.4	6.4
JUNCT_L-655	DIVIDER	4,884	787	902	1,141	2,002	2,228	2,370	4,123	144.6	198.9	264.9	472.8	592.5	724.5	1,099.1
JUNCT_U-300	DIVIDER	205	114	154	196	385	472	576	828	8.3	11.4	14.7	24.0	29.4	35.6	51.3
JUNCT_L-706	DIVIDER	416	114	165	215	500	624	787	1,171	10.5	15.1	21.1	40.8	51.6	64.8	96.1
JUNC_L-745	DIVIDER	#N/A	40	56	74	167	208	259	375	3.2	4.5	6.1	11.1	13.9	17.3	25.5
JUNCT_L-705	DIVIDER	241	57	81	113	275	336	422	626	5.7	8.3	11.5	22.7	29.0	36.8	55.0
JUNCT_L-725	DIVIDER	83	16	23	33	88	112	142	216	1.5	2.2	3.3	7.1	9.2	11.8	18.0
JUNCT_L-115	DIVIDER	2,134	378	457	525	709	777	846	2,768	65.4	92.4	124.3	222.3	278.1	343.8	503.5
JUNCT_L-011	DIVIDER	1,669	268	355	433	941	1,180	1,547	2,891	50.0	70.6	95.5	172.5	216.1	267.7	393.0
JUNCT_U-660	DIVIDER	234	80	112	151	336	419	521	760	7.3	10.1	13.5	23.8	29.6	36.5	53.4
JUNCT_L-485	DIVIDER	88	26	36	50	121	152	190	278	2.2	3.2	4.4	8.4	10.7	13.4	20.0
JUNCT_L-140	DIVIDER	32	15	21	27	53	65	79	113	1.3	1.7	2.3	3.7	4.6	5.6	8.0
JUNCT_U-740	DIVIDER	53	36	48	59	106	127	155	216	2.6	3.5	4.4	6.7	8.1	9.6	13.5
JUNCT_U-730	DIVIDER	77	45	61	78	148	180	219	311	3.4	4.6	6.0	9.3	11.3	13.6	19.3
JUNCT_U-720	DIVIDER	10	4	5	6	13	16	20	29	0.3	0.4	0.6	1.0	1.2	1.5	2.2
JUNCT_U-710	DIVIDER	108	55	74	96	193	237	290	414	4.3	5.9	7.6	12.3	15.1	18.3	26.2
JUNCT_U-690	DIVIDER	17	4	6	8	20	25	31	46	0.4	0.6	0.8	1.6	2.0	2.6	3.8
JUNCT_U-630	DIVIDER	35	8	12	16	41	52	66	97	0.8	1.1	1.6	3.3	4.1	5.3	7.9
JUNCT_U-623	DIVIDER	403	64	78	90	187	346	594	1,013	11.3	15.9	21.6	39.6	50.7	62.6	91.8
JUNCT_U-200	DIVIDER	999	112	144	172	506	810	1,286	2,241	27.6	39.3	54.0	99.8	126.2	156.9	230.6
JUNCT_U-190	DIVIDER	1,021	112	145	175	509	816	1,295	2,264	27.9	39.9	54.6	101.3	128.3	159.6	235.2
JUNCT_U-180	DIVIDER	16	4	6	8	20	25	32	46	0.4	0.6	0.8	1.6	2.0	2.5	3.7
JUNCT_U-120	DIVIDER	20	9	13	17	35	43	53	77	0.7	1.0	1.3	2.3	2.8	3.4	4.9
JUNCT_U-310	DIVIDER	8	4	5	6	13	15	19	27	0.3	0.4	0.5	0.8	1.0	1.2	1.8
JUNCT_U-340	DIVIDER	130	74	100	128	249	306	373	546	5.2	7.2	9.3	15.2	18.5	22.5	32.5
JUNCT_U-350	DIVIDER	48	34	46	58	114	141	172	243	1.9	2.6	3.4	5.5	6.8	8.2	11.8
JUNCT_U-420	DIVIDER	70	36	48	61	123	151	185	266	2.9	4.0	5.2	8.4	10.2	12.4	17.8
JUNCT_U-530	DIVIDER	27	14	20	25	47	58	71	100	1.1	1.6	2.0	3.3	4.0	4.8	6.9
JUNCT_U-430	DIVIDER	327	31	59	95	264	365	526	858	11.3	15.8	21.0	35.9	44.2	54.3	78.9
JUNCT_U-470	DIVIDER	22	17	22	27	49	59	72	101	1.0	1.4	1.8	2.7	3.2	3.9	5.5
JUNCT_U-480	DIVIDER	7	5	6	8	15	18	22	31	0.3	0.4	0.5	0.8	1.0	1.2	1.7
JUNCT_U-490	DIVIDER	42	30	40	50	96	118	141	198	1.7	2.4	3.1	4.9	5.9	7.2	10.2
JUNCT_U-500	DIVIDER	28	21	30	38	75	92	108	153	1.1	1.5	1.9	3.1	3.8	4.6	6.5
JUNCT_U-621	DIVIDER	384	62	76	86	183	336	578	989	11.0	15.4	20.8	38.1	48.8	59.9	87.8

Table B-4 Peak Discharges and Runoff Volumes (All Design Points)

Design Point		Drainage Area	Existing/ Future Conditions Peak Flow (cfs)							Existing/ Future Conditions Peak Volume (acre-ft)						
Number	Type	(acres)	Q_2	Q_5	Q_{10}	Q_{25}	Q_{50}	Q_{100}	Q_{500}	V_2	V_5	V_{10}	V_{25}	V_{50}	V_{100}	V_{500}
JUNCT_U-140	DIVIDER	52	31	42	53	104	128	156	222	2.1	2.9	3.8	6.2	7.6	9.2	13.2
JUNCT_U-540	DIVIDER/ Split Flow	68	37	46	57	105	127	154	218	3.5	4.8	6.0	9.2	11.0	13.1	18.4
JUNCT_U-130	DIVIDER	109	53	74	96	204	254	314	453	3.7	5.1	6.8	11.8	14.6	18.1	26.3
JUNCT_L-710	DIVIDER	29	10	14	18	41	51	63	92	0.9	1.2	1.7	3.0	3.8	4.7	6.9
DP_Caley	STORAGE	237	80	108	137	279	366	452	713	9.6	13.3	17.3	28.0	34.4	41.4	59.3
DP_Tommy	STORAGE	441	62	86	113	311	437	650	1,060	15.0	21.0	28.0	48.5	59.9	73.7	106.8
DP_Orchard	STORAGE	977	111	142	169	508	811	1,328	2,247	28.0	39.6	53.7	98.9	124.6	154.4	226.9
DP_Silo	STORAGE	349	106	150	206	492	626	731	1,081	10.2	14.2	19.2	34.7	44.5	54.6	79.8
DP_Wallace_S	STORAGE	1,988	372	506	646	1,351	1,696	2,143	3,230	61.1	86.0	115.7	207.2	259.1	319.3	469.7
DP_Bible	STORAGE	4,338	650	885	1,161	2,360	2,983	3,443	5,207	121.3	171.9	234.2	435.9	558.7	681.5	1,016.2
DP_Southmoor	STORAGE	471	7	10	16	132	264	444	860	0.8	1.3	2.0	7.6	14.6	26.0	54.0
DP_Wallace_N	STORAGE	2,134	379	458	527	721	796	897	2,789	65.7	92.4	124.6	222.6	278.1	343.8	503.5
DP_Iliff	STORAGE	4,522	0	54	129	369	402	487	1,904	0.0	2.7	9.8	39.0	55.0	76.1	212.1
DP_Boston_Peakview	STORAGE	97	47	61	70	92	102	114	141	4.5	6.1	7.7	9.7	10.9	12.0	14.9

Table B-5 Baseline Hydrology Model

SWMM Input – 100-year (Existing)

```
[TITLE]
;;Project Title/Notes
GOLDSMITH GULCH MAJOR DRAINAGEWAY PLAN
MATRIX DESIGN GROUP, INC., June 2018
Scenario ID = 6_Ex_100yr_0mi^2_Goldsmith_2018

[OPTIONS]
;;Option             Value
FLOW_UNITS           CFS
INFILTRATION         HORTON
FLOW_ROUTING         KINWAVE
LINK_OFFSETS         DEPTH
MIN_SLOPE            0
ALLOW_PONDING        NO
SKIP_STEADY_STATE    NO

START_DATE           01/01/2005
START_TIME           00:00:00
REPORT_START_DATE    01/01/2005
REPORT_START_TIME    00:00:00
END_DATE             01/01/2005
END_TIME             20:50:00
SWEEP_START          01/01
SWEEP_END            12/31
DRY_DAYS             0
REPORT_STEP          00:05:00
WET_STEP             00:05:00
DRY_STEP             00:05:00
ROUTING_STEP         0:00:05

INERTIAL_DAMPING     PARTIAL
NORMAL_FLOW_LIMITED  BOTH
FORCE_MAIN_EQUATION  H-W
VARIABLE_STEP        0.75
LENGTHENING_STEP     0
MIN_SURFAREA         12.557
MAX_TRIALS           8
HEAD_TOLERANCE       0.005
SYS_FLOW_TOL         5
LAT_FLOW_TOL         5
MINIMUM_STEP         0.5
THREADS              1

[FILES]
;;Interfacing Files
USE INFLOWS "R:\18.155.035 (Goldsmith Gulch)\Drainage\Hydrology\Final_Goldsmith Baseline
Hydrology_2018\CUHP2.0\6_Ex_100yr_0mi^2_GG_2018.txt"

[EVAPORATION]
;;Data Source    Parameters
;;-------------- ----------
CONSTANT         0.0
DRY_ONLY         NO

[JUNCTIONS]
;;Name           Elevation  MaxDepth   InitDepth  SurDepth   Aponded
;;-------------- ---------- ---------- ---------- ---------- ----------
;The names are derived from the swmm element IDs
JUNCT_U-301      5586       0          0          0          0
JUNCT_U-320      5605       0          0          0          0
JUNCT_U-330      5617       0          0          0          0
JUNCT_U-111      5601       0          0          0          0
JUNCT_U-110      5602       0          0          0          0
JUNCT_U-155      5612       0          0          0          0
JUNCT_U-151      5612.1     0          0          0          0
JUNCT_U-170      5613       0          0          0          0
JUNCT_U-150      5612.15    0          0          0          0
JUNCT_U-210      5630.2     0          0          0          0
JUNCT_U-601      5631       0          0          0          0
JUNCT_U-600      5632       0          0          0          0
JUNCT_U-610      5690       0          0          0          0
JUNCT_U-620      5658.5     0          0          0          0
JUNCT_U-640      5662.1     0          0          0          0
JUNCT_U-670      5700       0          0          0          0
JUNCT_U-680      5699.1     0          0          0          0
JUNCT_U-700      5697.1     0          0          0          0
JUNCT_U-750      5752       0          0          0          0
JUNCT_U-760      5755       0          0          0          0
JUNCT_U-770      5775       0          0          0          0
```

JUNCT_U-400	5632	0	0	0	0	JUNCT_L-450	5490	0	0	0	0
JUNCT_U-411	5646.5	0	0	0	0	JUNCT_L-491	5461	0	0	0	0
JUNCT_U-410	5654.5	0	0	0	0	JUNCT_L-475	5451	0	0	0	0
JUNCT_U-440	5673.1	0	0	0	0	JUNCT_L-500	5460	0	0	0	0
JUNCT_U-450	5682.1	0	0	0	0	JUNCT_L-505	5443.74	0	0	0	0
JUNCT_U-461	5687	0	0	0	0	JUNCT_L-480	5485	0	0	0	0
JUNCT_U-460	5694.15	0	0	0	0	JUNCT_L-540	5440	0	0	0	0
JUNCT_U-515	5713	0	0	0	0	JUNCT_L-545	5437	0	0	0	0
JUNCT_U-510	5730	0	0	0	0	JUNCT_L-570	5455	0	0	0	0
JUNCT_U-160	5619	0	0	0	0	JUNCT_L-575	5434	0	0	0	0
JUNCT_U-100	5585.9	0	0	0	0	JUNCT_L-555	5436	0	0	0	0
JUNCT_L-045	5554.5	0	0	0	0	JUNCT_L-550	5440	0	0	0	0
JUNCT_L-050A	5580	0	0	0	0	JUNCT_L-560	5435	0	0	0	0
JUNCT_L-080	5555	0	0	0	0	JUNCT_L-520	5431	0	0	0	0
JUNCT_L-093	5565	0	0	0	0	JUNCT_L-610	5424.2	0	0	0	0
JUNCT_L-060	5585	0	0	0	0	JUNCT_L-600	5424.8	0	0	0	0
JUNCT_L-100	5550	0	0	0	0	JUNCT_L-635	5414	0	0	0	0
JUNCT_L-110	5550	0	0	0	0	JUNCT_L-630	5415	0	0	0	0
JUNCT_L-125	5545.9	0	0	0	0	JUNCT_L-645	5417.1	0	0	0	0
JUNCT_L-145	5541	0	0	0	0	JUNCT_L-640A	5418	0	0	0	0
JUNCT_L-330	5575	0	0	0	0	JUNCT_L-650	5408	0	0	0	0
JUNCT_L-130	5541.5	0	0	0	0	JUNCT_L-665	5406.4	0	0	0	0
JUNCT_L-335	5540	0	0	0	0	JUNCT_L-660	5406.8	0	0	0	0
JUNCT_L-345	5520	0	0	0	0	JUNCT_L-685	5386	0	0	0	0
JUNCT_L-355	5506	0	0	0	0	JUNCT_L-670	5387	0	0	0	0
JUNCT_L-350A	5515	0	0	0	0	JUNCT_L-680	5390	0	0	0	0
JUNCT_L-340	5525	0	0	0	0	JUNCT_L-020	5580.5	0	0	0	0
JUNCT_L-365	5500	0	0	0	0	JUNCT_L-010A	5582	0	0	0	0
JUNCT_L-360	5505	0	0	0	0	JUNCT_L-755	5498.51	0	0	0	0
JUNCT_L-390	5495	0	0	0	0	JUNCT_L-760	5499.9	0	0	0	0
JUNCT_L-400	5495	0	0	0	0	JUNCT_L-720	5610	0	0	0	0
JUNCT_L-405	5488	0	0	0	0	JUNCT_L-740	5570	0	0	0	0
JUNCT_L-370	5495	0	0	0	0	JUNCT_L-700	5550	0	0	0	0
JUNCT_L-410	5490	0	0	0	0	JUNCT_L-530	5435	0	0	0	0
JUNCT_L-415	5481	0	0	0	0	JUNCT_L-180	5566	0	0	0	0
JUNCT_L-440A	5500	0	0	0	0	JUNCT_L-150	5625	0	0	0	0
JUNCT_L-445	5470	0	0	0	0	JUNCT_L-030	5658	0	0	0	0
JUNCT_L-425	5483	0	0	0	0	JUNCT_L-050B	5580	0	0	0	0
JUNCT_L-420	5490	0	0	0	0	JUNCT_L-350B	5525	0	0	0	0
JUNCT_L-436	5477.6	0	0	0	0	JUNCT_U-010B	5626	0	0	0	0

```
JUNCT_L-750     5530       0          0          0          0
JUNCT_L-800     5525       0          0          0          0
JUNCT_L-435     5478       0          0          0          0
JUNCT_L-490     5485       0          0          0          0
TREX            5541.5     0          0          0          0

[OUTFALLS]
;;Name           Elevation  Type       Stage Data       Gated    Route To
;;-------------- ---------- ---------- ---------------- -------- ----------------
Outfall_Goldsmith 5384       FREE                        NO

[DIVIDERS]
;;Name           Elevation  Diverted Link    Type       Parameters
;;-------------- ---------- ---------------- ---------- ----------
JUNCT_U-215     5629       215-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-520     5784       525-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-115     5600.9     115-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-415     5646       415-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-524     5744       524-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_L-580     5431.5     1580             TABULAR    Iliff&Monaco     0          0          0          0
JUNCT_L-616     5419       1616-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-055     5553       1055-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-065     5566       1065-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-040     5611.9     1040-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-640B    5418.71    1640B-OVERFLOW   OVERFLOW   0          0          0          0
JUNCT_L-460     5465.75    1460-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-470     5469.7     1470-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-375     5490.94    1375-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-090     5602.0     1090-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-070     5591.2     1070-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-091     5589.3     1091-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-092     5571.2     1092-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-151     5598       1152-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-430     5480.6     1430-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-645A    5417.37    1645A-OVERFLOW   OVERFLOW   0          0          0          0
JUNCT-L-525     5430.37    1595-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-565     5430.5     1565-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-440B    5516.16    1440B-OVERFLOW   OVERFLOW   0          0          0          0
JUNCT_L-120     5589.4     1120-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-655     5407.9     1655-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_U-300     5593       300-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_L-706     5523.45    1706-OVERFLOW    OVERFLOW   0          0          0          0
JUNC_L-745      5551.56    1745-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-705     5547.7     1705-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-725     5590.76    1725_OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-115     5547.54    1115-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-011     5580       1011-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_U-660     5695       655-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_L-485     5466.3     1485-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_L-140     5644.87    1140-OVERFLOW    OVERFLOW   0          0          0          0
JUNCT_U-740     5736       745-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-730     5720       735-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-720     5735       725-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-710     5706.1     715-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-690     5722       695-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-630     5685       635-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-623     5642       626-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-200     5620       205-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-190     5617       195-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-180     5620       185-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-120     5648       125-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-310     5657       315-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-340     5632       345-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-350     5685       355-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-420     5691       425-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-530     5713       535-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-430     5659.1     435-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-470     5710.1     475-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-480     5735       485-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-490     5715       495-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-500     5739.1     505-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-621     5652       625-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_U-140     5665       145-OVERFLOW     OVERFLOW   0          0          0          0
;30-inch RCP diverts approximately 50 cfs of storm runoff from DP U-540 into the Boston Street and Peakview
Avenue Water Quality Pond.
;Pipe slope of the 30-inch RCP was assumed from the surface slope at 1.5% because pipe slope is not
available on the GIS layer.
JUNCT_U-540     5745       540_DIV          CUTOFF     50         0          0          0          0
JUNCT_U-130     5659       135-OVERFLOW     OVERFLOW   0          0          0          0
JUNCT_L-710     5598.76    1710-OVERFLOW    OVERFLOW   0          0          0          0
```

```
[STORAGE]
;;Name           Elev.    MaxDepth   InitDepth  Shape      Curve Name/Params            N/A      Fevap
Psi      Ksat     IMD
;;-------------- -------- ---------- ---------- ---------- ---------------------------- -------- --------
-------- --------
DP_Caley          5690.07  10.93      0          TABULAR    DET_Caley                    0        0
DP_Tommy          5653.91  10         0          TABULAR    DET_Tommy                    0        0
DP_Orchard        5630     7          0          TABULAR    DET_Orchard                  0        0
DP_Silo           5657.29  13.71      0          TABULAR    DET_Silo                     0        0
DP_Wallace_S      5553.85  24.15      0          TABULAR    DET_Wallace_S                0        0
DP_Bible          5443.74  20.26      0          TABULAR    DET_Bible                    0        0
DP_Southmoor      5516     13         0          TABULAR    DET_Southmoor                0        0
DP_Wallace_N      5547.54  12.46      0          TABULAR    DET_Wallace_N                0        0
DP_Iliff          5431     17         0          TABULAR    DET_Iliff                    0        0
DP_Boston_Peakview 5724.08  13         0          TABULAR    DET_Peakview                 0        0

[CONDUITS]
;;Name           From Node        To Node          Length     Roughness  InOffset   OutOffset  InitFlow
MaxFlow
;;-------------- ---------------- ---------------- ---------- ---------- ---------- ---------- ---------- --
--------
;Slope was adjusted to account for drop structures using the outlet offset field.
155              JUNCT_U-155      JUNCT_U-110      1040       0.055      0          2.9        0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
;Node 215 is not measured from top of berm, so outlet offset was adjusted accordingly.
215              JUNCT_U-215      JUNCT_U-200      495        0.045      0          8          0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
;Node 215 is not measured from top of berm, so outlet offset was adjusted accordingly.
215-OVERFLOW     JUNCT_U-215      JUNCT_U-200      495        0.06       0          8          0          0
495              JUNCT_U-490      JUNCT_U-460      550        0.016      0          0          0          0
495-OVERFLOW     JUNCT_U-490      JUNCT_U-460      550        0.045      0          0          0          0
300              JUNCT_U-300      JUNCT_U-301      340        0.016      0          0          0          0
125              JUNCT_U-120      JUNCT_U-111      1125       0.016      0          0          0          0
125-OVERFLOW     JUNCT_U-120      JUNCT_U-111      1125       0.02       0          0          0          0
626              JUNCT_U-623      JUNCT_U-600      795        0.045      0          0          0          0
626-OVERFLOW     JUNCT_U-623      JUNCT_U-600      795        0.07       0          0          0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
745              JUNCT_U-740      JUNCT_U-730      880        0.04       0          8.6        0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
745-OVERFLOW     JUNCT_U-740      JUNCT_U-730      880        0.05       0          8.6        0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
400              JUNCT_U-400      JUNCT_U-601      100        .01        0          1.4        0          0
485              JUNCT_U-480      JUNCT_U-470      1600       0.016      0          0          0          0
485-OVERFLOW     JUNCT_U-480      JUNCT_U-470      1600       0.02       0          0          0          0
211              JUNCT_U-210      DP_Orchard       400        .01        0          0          0          0
601              JUNCT_U-601      JUNCT_U-210      350        0.07       0          0          0          0
540_DIV          JUNCT_U-540      JUNCT_U-524      400        .01        0          0          0          0
445              JUNCT_U-440      JUNCT_U-430      1160       0.07       0          0          0          0
345              JUNCT_U-340      JUNCT_U-320      890        0.048      0          0          0          0
345-OVERFLOW     JUNCT_U-340      JUNCT_U-320      890        0.045      0          0          0          0
145              JUNCT_U-140      JUNCT_U-130      590        0.016      0          0          0          0
145-OVERFLOW     JUNCT_U-140      JUNCT_U-130      590        0.02       0          0          0          0
425              JUNCT_U-420      JUNCT_U-410      1130       0.016      0          0          0          0
425-OVERFLOW     JUNCT_U-420      JUNCT_U-410      1130       0.02       0          0          0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
775              JUNCT_U-770      JUNCT_U-740      1100       0.02       0          12.0       0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
655              JUNCT_U-660      JUNCT_U-640      1250       0.016      0          22.3       0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
655-OVERFLOW     JUNCT_U-660      JUNCT_U-640      1250       0.02       0          22.3       0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
111              JUNCT_U-111      JUNCT_U-115      400        .01        0          3.0        0          0
525              JUNCT_U-520      JUNCT_U-540      2610       0.016      0          0          0          0
525-OVERFLOW     JUNCT_U-520      JUNCT_U-540      2610       0.02       0          10         0          0
460              JUNCT_U-460      DP_Caley         400        .01        0          0          0          0
355              JUNCT_U-350      JUNCT_U-340      2530       0.016      0          0          0          0
355-OVERFLOW     JUNCT_U-350      JUNCT_U-340      2530       0.045      0          0          0          0
645              JUNCT_U-640      JUNCT_U-620      625        0.055      0          0          0          0
725              JUNCT_U-720      JUNCT_U-710      810        0.016      0          0          0          0
725-OVERFLOW     JUNCT_U-720      JUNCT_U-710      810        0.02       0          0          0          0
465              JUNCT_U-461      JUNCT_U-450      410        0.05       0          0          0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
115              JUNCT_U-115      JUNCT_U-100      1630       0.016      0          6.1        0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
115-OVERFLOW     JUNCT_U-115      JUNCT_U-100      1630       0.055      0          6.1        0          0
635              JUNCT_U-630      JUNCT_U-621      385        0.016      0          0          0          0
635-OVERFLOW     JUNCT_U-630      JUNCT_U-621      385        0.02       0          0          0          0
685              JUNCT_U-680      JUNCT_U-660      790        0.045      0          0          0          0
135              JUNCT_U-130      JUNCT_U-155      1790       0.016      0          0          0          0
135-OVERFLOW     JUNCT_U-130      JUNCT_U-155      1790       0.02       0          0          0          0
;Slope was adjusted to account for drop structures using the outlet offset field.
```

415	JUNCT_U-415	JUNCT_U-400	1430	0.035	0	1.7	0	0	330	JUNCT_U-330	JUNCT_U-301	400	.01	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									151	JUNCT_U-151	JUNCT_U-155	400	.01	0	0	0	0
415-OVERFLOW	JUNCT_U-415	JUNCT_U-400	1430	0.055	0	1.7	0	0	170	JUNCT_U-170	JUNCT_U-151	400	.01	0	0	0	0
301	JUNCT_U-301	JUNCT_U-100	400	.01	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
195	JUNCT_U-190	JUNCT_U-150	1070	0.045	0	0	0	0	100	JUNCT_U-100	JUNCT_L-011	200	.01	0	3.1	0	0
195-OVERFLOW	JUNCT_U-190	JUNCT_U-150	1070	0.06	0	0	0	0	150	JUNCT_U-150	JUNCT_U-151	400	.01	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									;Slope was adjusted to account for drop structures using the outlet offset field.								
411	JUNCT_U-411	JUNCT_U-415	400	.01	0	3.3	0	0	735	JUNCT_U-730	JUNCT_U-710	760	0.02	0	3.7	0	0
715	JUNCT_U-710	JUNCT_U-700	475	0.02	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
715-OVERFLOW	JUNCT_U-710	JUNCT_U-700	475	0.045	0	0	0	0	735-OVERFLOW	JUNCT_U-730	JUNCT_U-710	760	0.045	0	3.7	0	0
535	JUNCT_U-530	JUNCT_U-420	1810	0.016	0	0	0	0	615	JUNCT_U-610	JUNCT_U-623	1000	0.04	0	0	0	0
535-OVERFLOW	JUNCT_U-530	JUNCT_U-420	1810	0.02	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
705	JUNCT_U-700	JUNCT_U-660	820	0.045	0	0	0	0	205	JUNCT_U-200	JUNCT_U-190	375	0.045	0	2.6	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									;Slope was adjusted to account for drop structures using the outlet offset field.								
435	JUNCT_U-430	JUNCT_U-410	930	0.02	0	4.1	0	0	205-OVERFLOW	JUNCT_U-200	JUNCT_U-190	375	0.06	0	2.6	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									;Slope was adjusted to account for drop structures using the outlet offset field.								
435-OVERFLOW	JUNCT_U-430	JUNCT_U-410	930	0.045	0	4.1	0	0	515	JUNCT_U-515	DP_Caley	1125	0.05	0	11.7	0	0
755	JUNCT_U-750	JUNCT_U-740	430	0.02	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
695	JUNCT_U-690	JUNCT_U-680	1360	0.02	0	0	0	0	625	JUNCT_U-621	JUNCT_U-623	825	0.045	0	5.1	0	0
695-OVERFLOW	JUNCT_U-690	JUNCT_U-680	1360	0.045	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
505	JUNCT_U-500	JUNCT_U-490	1080	0.016	0	0	0	0	625-OVERFLOW	JUNCT_U-621	JUNCT_U-623	825	0.055	0	5.1	0	0
505-OVERFLOW	JUNCT_U-500	JUNCT_U-490	1080	0.02	0	0	0	0	765	JUNCT_U-760	JUNCT_U-750	250	0.02	0	0	0	0
185	JUNCT_U-180	JUNCT_U-111	670	0.016	0	0	0	0	1080	JUNCT_L-080	DP_Wallace_S	400	0.01	0	0	0	0
185-OVERFLOW	JUNCT_U-180	JUNCT_U-111	670	0.02	0	0	0	0	1093	JUNCT_L-093	DP_Wallace_S	400	0.01	0	0	0	0
524	JUNCT_U-524	JUNCT_U-515	665	0.016	0	0	0	0	1050A	JUNCT_L-050A	DP_Wallace_S	400	0.01	0	0	0	0
524-OVERFLOW	JUNCT_U-524	JUNCT_U-515	665	0.02	10	0	0	0	1060	JUNCT_L-060	JUNCT_L-065	400	0.01	0	0	0	0
475	JUNCT_U-470	JUNCT_U-460	220	0.016	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
475-OVERFLOW	JUNCT_U-470	JUNCT_U-460	220	0.02	0	0	0	0	1011	JUNCT_L-011	JUNCT_L-065	1205	0.02	0	7.7	0	0
JUNCT_U-515	JUNCT_U-510	DP_Boston_Peakview	400	.01	0	0	0		;Slope was adjusted to account for drop structures using the outlet offset field.								
0																	
315	JUNCT_U-310	JUNCT_U-301	2610	0.016	0	0	0	0	1065	JUNCT_L-065	JUNCT_L-045	850	0.02	0	5.6	0	0
315-OVERFLOW	JUNCT_U-310	JUNCT_U-301	2610	0.045	0	0	0	0	1040	JUNCT_L-040	JUNCT_L-045	1520	0.019	0	0	0	0
620	JUNCT_U-620	DP_Silo	400	.01	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
110	JUNCT_U-110	JUNCT_U-111	400	.01	0	0	0	0	1045	JUNCT_L-045	DP_Wallace_S	822	0.045	0	4.4	0	0
410	JUNCT_U-410	DP_Tommy	400	.01	0	0	0	0	1092	JUNCT_L-092	JUNCT_L-093	320	0.019	0	0	0	0
160	JUNCT_U-160	JUNCT_U-151	200	.01	0	0	0	0	1091	JUNCT_L-091	JUNCT_L-092	930	0.019	0	0	0	0
320	JUNCT_U-320	JUNCT_U-300	390	0.048	0	0	0	0	1090	JUNCT_L-090	JUNCT_L-091	80	0.019	0	0	0	0
455	JUNCT_U-450	JUNCT_U-440	580	0.05	0	0	0	0	1070	JUNCT_L-070	JUNCT_L-091	120	0.019	0	0	0	0
675	JUNCT_U-670	JUNCT_U-660	510	0.045	0	0	0	0	1055	JUNCT_L-055	DP_Wallace_N	1440	0.02	0	0	0	0
600	JUNCT_U-600	JUNCT_U-601	400	.01	0	0	0	0	1055-OVERFLOW	JUNCT_L-055	DP_Wallace_N	1440	0.045	0	0	0	0
									1100	JUNCT_L-100	DP_Wallace_N	400	0.01	0	0	0	0

1110	JUNCT_L-110	DP_Wallace_N	400	0.01	0	0	0	0	1475	JUNCT_L-475	DP_Bible	400	0.01	0	5.7	0	0
1115	JUNCT_L-115	JUNCT_L-145	620	0.016	0	0	0	0	1500	JUNCT_L-500	JUNCT_L-475	400	0.01	0	0	0	0
1120	JUNCT_L-120	JUNCT_L-125	2460	0.016	0	0	0	0	1485	JUNCT_L-485	JUNCT_L-491	505	0.019	0	0	0	0
1125	JUNCT_L-125	JUNCT_L-145	400	0.01	0	0	0	0	1490	JUNCT_L-490	JUNCT_L-485	500	0.016	0	0	0	0
1330	JUNCT_L-330	JUNCT_L-145	400	0.01	0	0	0	0	1480	JUNCT_L-480	JUNCT_L-485	400	0.01	0	0	0	0
1130	JUNCT_L-130	JUNCT_L-145	400	0.01	0	0	0	0	1460	JUNCT_L-460	JUNCT_L-505	1845	0.019	0	5.84	0	0
1145	JUNCT_L-145	JUNCT_L-335	735	0.045	0	0	0	0	1540	JUNCT_L-540	JUNCT_L-545	400	0.01	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									1505	JUNCT_L-505	JUNCT_L-545	1300	0.06	0	0	0	0
1335	JUNCT_L-335	JUNCT_L-345	1910	0.07	0	2.8	0	0	1545	JUNCT_L-545	JUNCT_L-555	440	0.06	0	0	0	0
1340	JUNCT_L-340	JUNCT_L-345	400	0.01	0	0	0	0	1555	JUNCT_L-555	JUNCT_L-575	580	0.06	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									1570	JUNCT_L-570	JUNCT_L-575	735	0.02	0	6	0	0
1345	JUNCT_L-345	JUNCT_L-355	1310	0.045	0	2.0	0	0	1575	JUNCT_L-575	JUNCT_L-580	380	0.06	0	0	0	0
1350A	JUNCT_L-350A	JUNCT_L-355	400	0.01	0	0	0	0	1580	JUNCT_L-580	JUNCT_L-565	295	0.06	0	0	0	0
1360	JUNCT_L-360	JUNCT_L-365	400	0.01	0	0	0	0	1560	JUNCT_L-560	JUNCT_L-580	400	0.01	0	0	0	0
;SSlope was adjusted to account for drop structures using the outlet offset field.									1550	JUNCT_L-550	JUNCT_L-555	400	0.01	0	0	0	0
1355	JUNCT_L-355	JUNCT_L-365	1070	0.045	0	1.4	0	0	1565	JUNCT_L-565	JUNCT-L-525	140	0.019	0	0	0	0
1370	JUNCT_L-370	JUNCT_L-375	400	0.01	0	0	0	0	1590	JUNCT_L-520	JUNCT-L-525	400	0.01	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									1610	JUNCT_L-610	JUNCT_L-616	400	0.01	0	0	0	0
1365	JUNCT_L-365	JUNCT_L-375	950	0.045	0	5.8	0	0	1600	JUNCT_L-600	JUNCT_L-616	400	0.01	0	0	0	0
1400	JUNCT L-400	JUNCT L-405	400	0.01	0	0	0	0	1595	JUNCT-L-525	JUNCT L-616	1330	0.019	0	0	0	0
1390	JUNCT_L-390	JUNCT_L-405	400	0.01	0	0	0	0	1630	JUNCT_L-630	JUNCT_L-635	400	0.01	0	0	0	0
1375	JUNCT_L-375	JUNCT_L-405	830	0.022	0	0	0	0	1645	JUNCT_L-645	JUNCT_L-635	400	0.01	0	0	0	0
1410	JUNCT_L-410	JUNCT_L-415	400	0.01	0	0	0	0	1640A	JUNCT_L-640A	JUNCT_L-645A	400	0.01	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									1645A	JUNCT_L-645A	JUNCT_L-645	175	0.019	0	0	0	0
1405	JUNCT_L-405	JUNCT_L-415	1295	0.045	0	2.1	0	0	1640B	JUNCT_L-640B	JUNCT_L-645A	630	0.019	0	0	0	0
1440A	JUNCT_L-440A	JUNCT_L-445	400	0.01	0	0	0	0	1616-OVERFLOW	JUNCT_L-616	JUNCT_L-635	1330	0.045	2	2	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									1616	JUNCT_L-616	JUNCT_L-635	1330	0.02	0	0	0	0
1415	JUNCT_L-415	JUNCT_L-445	1405	0.07	0	6	0	0	1635	JUNCT_L-635	JUNCT_L-655	820	0.07	0	0	0	0
1420	JUNCT_L-420	JUNCT_L-425	400	0.01	0	0	0	0	1650	JUNCT_L-650	JUNCT_L-655	400	0.01	0	0	0	0
1430	JUNCT_L-430	JUNCT_L-436	170	0.019	0	0	0	0	1660	JUNCT_L-660	JUNCT_L-665	400	0.01	0	0	0	0
1425	JUNCT_L-425	JUNCT_L-436	590	0.07	0	0	0	0	1655	JUNCT_L-655	JUNCT_L-665	240	0.019	0	0	0	0
1436	JUNCT_L-436	JUNCT_L-445	400	0.07	0	0	0	0	1680	JUNCT_L-680	JUNCT_L-685	400	0.01	0	0	0	0
1440B	JUNCT_L-440B	JUNCT_L-445	2840	0.019	0	0	0	0	1670	JUNCT_L-670	Outfall_Goldsmith	400	0.01	0	0	0	0
1450	JUNCT_L-450	JUNCT_L-445	400	0.01	0	0	0	0	1685	JUNCT_L-685	Outfall_Goldsmith	400	0.01	0	0	0	0
1470	JUNCT_L-470	JUNCT_L-475	1810	0.019	0	0	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
;Slope was adjusted to account for drop structures using the outlet offset field.									1665	JUNCT_L-665	JUNCT_L-685	2410	0.055	0	5.9	0	0
1445	JUNCT_L-445	JUNCT_L-491	1250	0.06	0	2.8	0	0	1020	JUNCT_L-020	JUNCT_L-011	400	0.01	0	0	0	0
;Slope was adjusted to account for drop structures using the outlet offset field.									1010A	JUNCT_L-010A	JUNCT_L-011	400	0.01	0	0	0	0
1491	JUNCT_L-491	JUNCT_L-475	1900	0.07	0	5	0	0	;Slope was adjusted to account for drop structures using the outlet offset field.								
;Slope was adjusted to account for drop structures using the outlet offset field.									1065-OVERFLOW	JUNCT_L-065	JUNCT_L-045	850	0.045	0	5.6	0	0

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1040-OVERFLOW    JUNCT_L-040    JUNCT_L-045    1520    0.02    0    0    0    0
1640B-OVERFLOW   JUNCT_L-640B   JUNCT_L-645A   630     0.02    4.2  4.2  0    0
1485-OVERFLOW    JUNCT_L-485    JUNCT_L-491    505     0.035   12   0    0    0
1460-OVERFLOW    JUNCT_L-460    JUNCT_L-475    1845    0.04    18   10   0    0
1470-OVERFLOW    JUNCT_L-470    JUNCT_L-475    1810    0.045   15   0    0    0
1375-OVERFLOW    JUNCT_L-375    JUNCT_L-405    830     0.02    9    10   0    0
1090-OVERFLOW    JUNCT_L-090    JUNCT_L-091    80      0.02    21   21   0    0
1070-OVERFLOW    JUNCT_L-070    JUNCT_L-091    120     0.02    21   21   0    0
1091-OVERFLOW    JUNCT_L-091    JUNCT_L-092    930     0.02    21   9    0    0
1092-OVERFLOW    JUNCT_L-092    JUNCT_L-093    320     0.02    9    9    0    0
1430-OVERFLOW    JUNCT_L-430    JUNCT_L-436    170     0.035   5.4  4    0    0
1645A-OVERFLOW   JUNCT_L-645A   JUNCT_L-645    175     0.02    4    4    0    0
1595-OVERFLOW    JUNCT-L-525    JUNCT_L-616    1330    0.02    6.5  9    0    0
1565-OVERFLOW    JUNCT_L-565    JUNCT-L-525    140     0.02    6.5  6.5  0    0
1440B-OVERFLOW   JUNCT_L-440B   JUNCT_L-445    2840    0.02    12   6    0    0
1120-OVERFLOW    JUNCT_L-120    JUNCT_L-125    2460    0.02    0    0    0    0
1655-OVERFLOW    JUNCT_L-655    JUNCT_L-665    240     0.02    8    8    0    0
1115-OVERFLOW    JUNCT_L-115    JUNCT_L-145    620     0.02    0    0    0    0
300-OVERFLOW     JUNCT_U-300    JUNCT_U-301    340     0.02    0    0    0    0
1755             JUNCT_L-755    JUNCT_L-425    1520    0.06    0    0    0    0
1760             JUNCT_L-760    JUNCT_L-755    400     0.01    0    1.4  0    0
;Manning's n was adjusted to force pipe full flow condition during 100-year storm.
1706             JUNCT_L-706    JUNCT_L-755    1940    0.016   0    0    0    0
1706-OVERFLOW    JUNCT_L-706    DP_Southmoor   3240    0.02    11   0    0    0
1745             JUNC_L-745     JUNCT_L-706    3240    0.019   0    1.4  0    0
1745-OVERFLOW    JUNC_L-745     JUNCT_L-706    3240    0.02    8.5  11   0    0
1705             JUNCT_L-705    JUNCT_L-706    1560    0.016   0    0.4  0    0
1705-OVERFLOW    JUNCT_L-705    JUNCT_L-706    1560    0.02    8    11   0    0
1725             JUNCT_L-725    JUNCT_L-705    2620    0.019   0    0    0    0
1725_OVERFLOW    JUNCT_L-725    JUNCT_L-705    2620    0.02    4    8    0    0
1720             JUNCT_L-720    JUNCT_L-725    400     0.01    0    0    0    0
1700             JUNCT_L-700    JUNCT_L-705    400     0.01    0    0    0    0
1740             JUNCT_L-740    JUNC_L-745     400     0.01    0    0    0    0
;Slope was adjusted to account for drop structures using the outlet offset field.
1011-OVERFLOW    JUNCT_L-011    JUNCT_L-065    1205    0.045   0    7.7  0    0
1530             JUNCT_L-530    JUNCT_L-580    400     0.01    0    0    0    0
1710             JUNCT_L-710    JUNCT_L-725    1280    0.019   0    3    0    0
1150             JUNCT_L-150    JUNCT_L-151    400     0.01    0    0    0    0
1140             JUNCT_L-140    JUNCT_L-151    2425    0.019   0    0    0    0
1180             JUNCT_L-180    TREX           400     0.045   0    0    0    0
1152             JUNCT_L-151    TREX           2610    0.016   0    0    0    0
1030             JUNCT_L-030    JUNCT_L-011    2935    0.02    0    0    0    0
1050B            JUNCT_L-050B   JUNCT_L-065    400     0.01    0    0    0    0
1350B            JUNCT_L-350B   JUNCT_L-345    400     0.01    0    0    0    0
1010B            JUNCT_U-010B   JUNCT_L-011    1290    0.016   0    0    0    0
1750             JUNCT_L-750    DP_Southmoor   400     0.01    0    0    0    0
1800             JUNCT_L-800    JUNCT_L-706    400     0.01    0    0    0    0
1435             JUNCT_L-435    JUNCT_L-436    400     0.01    0    0    0    0
Iliff_Div        JUNCT_L-580    DP_Iliff       400     0.01    0    0    0    0
1152-OVERFLOW    JUNCT_L-151    TREX           2610    0.045   0    0    0    0
1140-OVERFLOW    JUNCT_L-140    JUNCT_L-151    2425    0.045   0    0    0    0
TREX_OUT         TREX           JUNCT_L-145    400     0.01    0    0    0    0
540              JUNCT_U-540    DP_Boston_Peakview 1175  0.016   0    3    0
0
1710-OVERFLOW    JUNCT_L-710    JUNCT_L-725    1280    0.02    0    0    0    0


[OUTLETS]
;;Name           From Node      To Node        Offset    Type            QTable/Qcoeff    Qexpon
Gated
;;-------------- -------------- -------------- ---------- --------------- ---------------- ---------- --
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;These define our stage/discharge curves for the system.
;Note that 1 ft of stage exactly equals 1 acre-ft of
;volume. Thus this curve is the exact curve from the original
;UDSWMM input file.
OUTLET_Caley     DP_Caley       JUNCT_U-461    0         TABULAR/DEPTH   RC_Caley                  NO
OUTLET_Tommy     DP_Tommy       JUNCT_U-411    0         TABULAR/HEAD    RC_Tommy                  NO
OUTLET_Orchard   DP_Orchard     JUNCT_U-215    0         TABULAR/HEAD    RC_Orchard                NO
OUTLET_Silo      DP_Silo        JUNCT_U-621    0         TABULAR/DEPTH   RC_Silo                   NO
OUTLET_Wallace_S DP_Wallace_S   JUNCT_L-055    0         TABULAR/DEPTH   RC_Wallace_S              NO
OUTLET_BiblePark DP_Bible       JUNCT_L-505    0         TABULAR/DEPTH   RC_Bible                  NO
OUTLET_Southmoor DP_Southmoor   JUNCT_L-755    0         TABULAR/HEAD    RC_Southmoor              NO
OUTLET_Wallace_N DP_Wallace_N   JUNCT_L-115    0         TABULAR/DEPTH   RC_Wallace_N              NO
Iliff_OUTLET     DP_Iliff       JUNCT_L-565    0         TABULAR/DEPTH   RC_Iliff                  NO
OUTLET_Peakview  DP_Boston_Peakview JUNCT_U-515    0         TABULAR/DEPTH   RC_Peakview
NO


[XSECTIONS]
;;Link           Shape        Geom1          Geom2      Geom3      Geom4      Barrels    Culvert
;;-------------- ------------ -------------- ---------- ---------- ---------- ---------- ----------
155              TRAPEZOIDAL  10             50         5          5          1
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215	TRAPEZOIDAL	1	2	1	1	1	635-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
215-OVERFLOW	TRAPEZOIDAL	10	50	10	10	1	685	TRAPEZOIDAL	10	50	5	5	1
495	CIRCULAR	3	0	0	0	1	135	CIRCULAR	3	0	0	0	1
495-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	135-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
300	RECT_CLOSED	5	8	0	0	2	415	TRAPEZOIDAL	2	2	2	2	1
125	CIRCULAR	3	0	0	0	1	415-OVERFLOW	TRAPEZOIDAL	5	30	7	7	1
125-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	301	DUMMY	0	0	0	0	1
626	TRAPEZOIDAL	1	2	1	1	1	195	TRAPEZOIDAL	2	5	3	3	1
626-OVERFLOW	TRAPEZOIDAL	5	10	10	15	1	195-OVERFLOW	TRAPEZOIDAL	10	20	10	10	1
745	TRAPEZOIDAL	1	2	1	1	1	411	DUMMY	0	0	0	0	1
745-OVERFLOW	TRAPEZOIDAL	5	10	5	5	1	715	TRAPEZOIDAL	1	2	1	1	1
400	DUMMY	0	0	0	0	1	715-OVERFLOW	TRAPEZOIDAL	5	10	6	6	1
485	CIRCULAR	4	0	0	0	1	535	CIRCULAR	1.5	0	0	0	1
485-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	535-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
211	DUMMY	0	0	0	0	1	705	TRAPEZOIDAL	10	50	5	5	1
601	TRAPEZOIDAL	10	10	7	20	1	435	TRAPEZOIDAL	2	5	1	1	1
540_DIV	DUMMY	0	0	0	0	1	435-OVERFLOW	TRAPEZOIDAL	10	10	20	20	1
445	TRAPEZOIDAL	10	5	14	14	1	755	TRAPEZOIDAL	10	2	50	50	1
345	TRAPEZOIDAL	5	5	4	4	1	695	TRAPEZOIDAL	1	2	1	1	1
345-OVERFLOW	TRAPEZOIDAL	10	45	6	6	1	695-OVERFLOW	TRAPEZOIDAL	10	5	5	5	1
145	CIRCULAR	48	0	0	0	1	505	CIRCULAR	4	0	0	0	1
145-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	505-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
425	CIRCULAR	3	0	0	0	1	185	CIRCULAR	2	0	0	0	1
425-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	185-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
775	TRAPEZOIDAL	10	5	2	2	1	524	CIRCULAR	4	0	0	0	1
655	RECT_CLOSED	4	8	0	0	1	524-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
655-OVERFLOW	TRAPEZOIDAL	10	2	50	50	1	475	CIRCULAR	4	0	0	0	1
111	DUMMY	0	0	0	0	1	475-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
525	CIRCULAR	1.5	0	0	0	1	JUNCT_U-515	DUMMY	0	0	0	0	1
525-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	315	CIRCULAR	2	0	0	0	1
460	DUMMY	0	0	0	0	1	315-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
355	CIRCULAR	4.5	0	0	0	1	620	DUMMY	0	0	0	0	1
355-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	110	DUMMY	0	0	0	0	1
645	TRAPEZOIDAL	10	30	10	10	1	410	DUMMY	0	0	0	0	1
725	CIRCULAR	2	0	0	0	1	160	DUMMY	0	0	0	0	1
725-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1	320	TRAPEZOIDAL	10	5	5	15	1
465	TRAPEZOIDAL	10	10	6	6	1	455	TRAPEZOIDAL	10	10	13	13	1
115	TRAPEZOIDAL	2	5	1	1	1	675	TRAPEZOIDAL	10	50	5	5	1
115-OVERFLOW	TRAPEZOIDAL	10	10	10	10	1	600	DUMMY	0	0	0	0	1
635	CIRCULAR	2	0	0	0	1	330	DUMMY	0	0	0	0	1

151	DUMMY	0	0	0	0	1	1355	TRAPEZOIDAL	10	5	5	10	1
170	DUMMY	0	0	0	0	1	1370	DUMMY	0	0	0	0	1
100	DUMMY	0	0	0	0	1	1365	TRAPEZOIDAL	10	5	5	15	1
150	DUMMY	0	0	0	0	1	1400	DUMMY	0	0	0	0	1
735	TRAPEZOIDAL	1	2	1	1	1	1390	DUMMY	0	0	0	0	1
735-OVERFLOW	TRAPEZOIDAL	5	10	6	6	1	1375	RECT_CLOSED	8	20	0	0	1
615	TRAPEZOIDAL	10	15	8	8	1	1410	DUMMY	0	0	0	0	1
205	TRAPEZOIDAL	2	5	2	2	1	1405	TRAPEZOIDAL	10	5	25	5	1
205-OVERFLOW	TRAPEZOIDAL	10	20	10	10	1	1440A	DUMMY	0	0	0	0	1
515	TRAPEZOIDAL	10	20	20	20	1	1415	TRAPEZOIDAL	10	10	5	15	1
625	TRAPEZOIDAL	1	2	1	1	1	1420	DUMMY	0	0	0	0	1
625-OVERFLOW	TRAPEZOIDAL	5	10	10	40	1	1430	CIRCULAR	2.5	0	0	0	1
765	TRAPEZOIDAL	10	2	50	50	1	1425	TRAPEZOIDAL	10	10	5	15	1
1080	DUMMY	0	0	0	0	1	1436	TRAPEZOIDAL	10	10	5	15	1
1093	DUMMY	0	0	0	0	1	1440B	CIRCULAR	3.5	0	0	0	1
1050A	DUMMY	0	0	0	0	1	1450	DUMMY	0	0	0	0	1
1060	DUMMY	0	0	0	0	1	1470	CIRCULAR	2.5	0	0	0	1
1011	TRAPEZOIDAL	2	5	1	1	1	1445	TRAPEZOIDAL	10	10	15	25	1
1065	TRAPEZOIDAL	2	5	1	1	1	1491	TRAPEZOIDAL	10	5	15	35	1
1040	CIRCULAR	2.25	0	0	0	1	1475	DUMMY	0	0	0	0	1
1045	DUMMY	0	0	0	0	1	1500	DUMMY	0	0	0	0	1
1092	CIRCULAR	6	0	0	0	1	1485	CIRCULAR	3	0	0	0	1
1091	CIRCULAR	6	0	0	0	1	1490	DUMMY	0	0	0	0	1
1090	CIRCULAR	3.5	0	0	0	1	1480	DUMMY	0	0	0	0	1
1070	CIRCULAR	5	0	0	0	1	1460	CIRCULAR	3.5	0	0	0	1
1055	TRAPEZOIDAL	2	5	1	1	1	1540	DUMMY	0	0	0	0	1
1055-OVERFLOW	TRAPEZOIDAL	10	10	10	5	1	1505	TRAPEZOIDAL	15	10	5	5	1
1100	DUMMY	0	0	0	0	1	1545	TRAPEZOIDAL	15	10	5	5	1
1110	DUMMY	0	0	0	0	1	1555	TRAPEZOIDAL	15	10	5	5	1
1115	RECT_CLOSED	6	12	0	0	2	1570	TRAPEZOIDAL	10	35	20	20	1
1120	CIRCULAR	2.25	0	0	0	1	1575	TRAPEZOIDAL	11	10	5	5	1
1125	DUMMY	0	0	0	0	1	1580	TRAPEZOIDAL	10	10	4	6	1
1330	DUMMY	0	0	0	0	1	1560	DUMMY	0	0	0	0	1
1130	DUMMY	0	0	0	0	1	1550	DUMMY	0	0	0	0	1
1145	TRAPEZOIDAL	10	15	30	5	1	1565	RECT_CLOSED	5	14	0	0	2
1335	TRAPEZOIDAL	10	15	30	10	1	1590	DUMMY	0	0	0	0	1
1340	DUMMY	0	0	0	0	1	1610	DUMMY	0	0	0	0	1
1345	TRAPEZOIDAL	10	5	5	5	1	1600	DUMMY	0	0	0	0	1
1350A	DUMMY	0	0	0	0	1	1595	RECT_CLOSED	5.33	18	0	0	1
1360	DUMMY	0	0	0	0	1	1630	DUMMY	0	0	0	0	1

1645	DUMMY	0	0	0	0	1
1640A	DUMMY	0	0	0	0	1
1645A	RECT_CLOSED	2	4	0	0	6
1640B	RECT_CLOSED	2	3.2	0	0	1
1616-OVERFLOW	TRAPEZOIDAL	13	10	5	35	1
1616	TRAPEZOIDAL	2	5	2	2	1
1635	TRAPEZOIDAL	10	10	2	45	1
1650	DUMMY	0	0	0	0	1
1660	DUMMY	0	0	0	0	1
1655	RECT_CLOSED	6	9	0	0	1
1680	DUMMY	0	0	0	0	1
1670	DUMMY	0	0	0	0	1
1685	DUMMY	0	0	0	0	1
1665	TRAPEZOIDAL	12	10	5	2	1
1020	DUMMY	0	0	0	0	1
1010A	DUMMY	0	0	0	0	1
1065-OVERFLOW	TRAPEZOIDAL	10	10	10	5	1
1040-OVERFLOW	TRAPEZOIDAL	5	2	20	20	1
1640B-OVERFLOW	TRAPEZOIDAL	5	2	20	20	1
1485-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1460-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1470-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1375-OVERFLOW	TRAPEZOIDAL	5	2	20	20	1
1090-OVERFLOW	TRAPEZOIDAL	5	1	20	20	1
1070-OVERFLOW	TRAPEZOIDAL	5	1	20	20	1
1091-OVERFLOW	TRAPEZOIDAL	5	1	20	20	1
1092-OVERFLOW	TRAPEZOIDAL	5	1	20	20	1
1430-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1645A-OVERFLOW	TRAPEZOIDAL	5	2	20	20	1
1595-OVERFLOW	TRAPEZOIDAL	10	2	50	50	1
1565-OVERFLOW	TRAPEZOIDAL	10	2	50	50	1
1440B-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1120-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1655-OVERFLOW	TRAPEZOIDAL	10	2	20	20	1
1115-OVERFLOW	TRAPEZOIDAL	10	2	50	50	1
300-OVERFLOW	TRAPEZOIDAL	10	2	50	50	1
1755	TRAPEZOIDAL	10	10	15	5	1
1760	DUMMY	0	0	0	0	1
1706	CIRCULAR	6	0	0	0	1
1706-OVERFLOW	TRAPEZOIDAL	10	2	20	20	1
1745	CIRCULAR	3.25	0	0	0	1
1745-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1705	CIRCULAR	4.5	0	0	0	1
1705-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1725	CIRCULAR	3.5	0	0	0	1
1725_OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1720	DUMMY	0	0	0	0	1
1700	DUMMY	0	0	0	0	1
1740	DUMMY	0	0	0	0	1
1011-OVERFLOW	TRAPEZOIDAL	10	10	5	5	1
1530	DUMMY	0	0	0	0	1
1710	CIRCULAR	4.5	0	0	0	1
1150	DUMMY	0	0	0	0	1
1140	CIRCULAR	3.5	0	0	0	1
1180	TRAPEZOIDAL	10	2	20	20	1
1152	CIRCULAR	5	0	0	0	1
1030	TRAPEZOIDAL	10	1	20	20	1
1050B	DUMMY	0	0	0	0	1
1350B	DUMMY	0	0	0	0	1
1010B	CIRCULAR	2.5	0	0	0	1
1750	DUMMY	0	0	0	0	1
1800	DUMMY	0	0	0	0	1
1435	DUMMY	0	0	0	0	1
Iliff_Div	DUMMY	0	0	0	0	1
1152-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
1140-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1
TREX_OUT	DUMMY	0	0	0	0	1
540	CIRCULAR	3	0	0	0	1
1710-OVERFLOW	TRAPEZOIDAL	5	2	50	50	1

[CURVES]

;;Name	Type	X-Value	Y-Value
;;--------------	----------	----------	----------
Iliff&Monaco	Diversion	760	745
Iliff&Monaco		1446	1252
Iliff&Monaco		1727	1465
Iliff&Monaco		2269	1888
Iliff&Monaco		2464	2078
Iliff&Monaco		3178	2491

;

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;Curves are named using RATINGCURVE_ for rating (outflow) curves
;and DIVCURVE_ for diversion curves.
RC_Caley        Rating    0         0.0
RC_Caley                  0.93      0.4
RC_Caley                  1.93      1.0
RC_Caley                  2.93      1.8
RC_Caley                  3.93      2.8
RC_Caley                  4.00      2.8
RC_Caley                  4.93      17
RC_Caley                  5.76      38
RC_Caley                  5.93      45
RC_Caley                  6.78      100
RC_Caley                  6.93      115
RC_Caley                  7.93      280
RC_Caley                  8.93      611
RC_Caley                  9.93      1098
RC_Caley                  10.93     1729
;
RC_Tommy        Rating    0         0
RC_Tommy                  0.09      16
RC_Tommy                  1.09      32
RC_Tommy                  2.09      44
RC_Tommy                  3.09      56
RC_Tommy                  4.09      64
RC_Tommy                  5.09      72
RC_Tommy                  6.09      78
RC_Tommy                  7.09      429
RC_Tommy                  8.09      1829
RC_Tommy                  9.09      4695
;
RC_Orchard      Rating    0         0
RC_Orchard                1         0
RC_Orchard                2         125
RC_Orchard                3         407
RC_Orchard                4         850
RC_Orchard                5         1306
RC_Orchard                6         2008
RC_Orchard                7         3410
;
RC_Silo         Rating    0         0
RC_Silo                   0.71      0
RC_Silo                   1.71      14
RC_Silo                   2.71      31
RC_Silo                   3.71      43
RC_Silo                   4.71      52
RC_Silo                   5.71      60
RC_Silo                   6.71      70
RC_Silo                   7.71      75
RC_Silo                   8.71      82
RC_Silo                   9.71      88
RC_Silo                   10.71     93
RC_Silo                   11.71     98
RC_Silo                   12.71     345
RC_Silo                   13.71     1171
;
;Wallace Park (Node 211 from Sellards & Grigg 1994)
RC_Wallace_S    Rating    0         0
RC_Wallace_S              0.15      1
RC_Wallace_S              1.15      24
RC_Wallace_S              2.15      78
RC_Wallace_S              3.15      162
RC_Wallace_S              4.15      258
RC_Wallace_S              5.15      341
RC_Wallace_S              6.15      388
RC_Wallace_S              7.15      430
RC_Wallace_S              8.15      468
RC_Wallace_S              9.15      503
RC_Wallace_S              10.15     536
RC_Wallace_S              11.15     567
RC_Wallace_S              12.15     597
RC_Wallace_S              13.15     625
RC_Wallace_S              14.15     651
RC_Wallace_S              15.15     677
RC_Wallace_S              16.15     702
RC_Wallace_S              17.15     726
RC_Wallace_S              18.15     749
RC_Wallace_S              19.15     772
RC_Wallace_S              20.15     794
RC_Wallace_S              20.69     815
RC_Wallace_S              21.15     826
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RC_Wallace_S                22.15       836
RC_Wallace_S                22.35       840
RC_Wallace_S                23.15       1235
RC_Wallace_S                24.15       3075
;
;Bible Park (Node 204 in Sellards & Grigg 1994)
RC_Bible          Rating    0           0
RC_Bible                    0.26        2
RC_Bible                    1.26        25
RC_Bible                    2.26        61
RC_Bible                    3.26        115
RC_Bible                    4.26        217
RC_Bible                    5.26        356
RC_Bible                    6.26        529
RC_Bible                    7.26        712
RC_Bible                    8.26        894
RC_Bible                    9.26        1095
RC_Bible                    10.26       1297
RC_Bible                    11.26       1506
RC_Bible                    12.26       1724
RC_Bible                    13.26       1936
RC_Bible                    14.26       2140
RC_Bible                    15.26       2282
RC_Bible                    16.26       2438
RC_Bible                    17.26       2602
RC_Bible                    18.26       2730
RC_Bible                    19.26       3445
RC_Bible                    20.26       5946
;
;Iliff & Monaco (check curve)
RC_Iliff          Rating    0           0
RC_Iliff                    14.5        5
RC_Iliff                    15.5        1003
RC_Iliff                    16.0        2508
RC_Iliff                    17.0        7499
;
;Southmoor Park (Node 215 in Sellards & Grigg 1994)
RC_Southmoor      Rating    0           0
RC_Southmoor                1           4
RC_Southmoor                2           6
RC_Southmoor                3           8
RC_Southmoor                4           9
RC_Southmoor                5           10
RC_Southmoor                6           11
RC_Southmoor                7           12
RC_Southmoor                8           13
RC_Southmoor                9           283
RC_Southmoor                10          1117
RC_Southmoor                11          2665
RC_Southmoor                12          5056
RC_Southmoor                13          8401
;
;Wallace Park North (Node 212 in Sellard & Grigg 1994)
RC_Wallace_N      Rating    0           0
RC_Wallace_N                0.46        22
RC_Wallace_N                1.46        108
RC_Wallace_N                2.46        238
RC_Wallace_N                3.46        384
RC_Wallace_N                4.46        492
RC_Wallace_N                5.46        600
RC_Wallace_N                6.46        672
RC_Wallace_N                7.46        768
RC_Wallace_N                8.46        840
RC_Wallace_N                9.46        888
RC_Wallace_N                9.99        912
RC_Wallace_N                10.46       1015
RC_Wallace_N                11.46       1497
RC_Wallace_N                13.46       4235
;
;From Mueller project
RC_Peakview       Rating    0           0.0
RC_Peakview                 0.92        0.2
RC_Peakview                 1.92        0.3
RC_Peakview                 2.92        0.4
RC_Peakview                 3.92        0.6
RC_Peakview                 4.92        0.9
RC_Peakview                 5.92        1.1
RC_Peakview                 6.92        1.4
RC_Peakview                 7.92        1.7
RC_Peakview                 8.92        2.1
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RC_Peakview                 9.92        2.4
RC_Peakview                 10.25       2.6
RC_Peakview                 10.92       24.5
RC_Peakview                 11.54       61.1
RC_Peakview                 11.92       114.6
RC_Peakview                 12.92       380.1
;
;Based on 2014 1ft contours
DET_Iliff       Storage     0           30
DET_Iliff                   1           8949
DET_Iliff                   2           44280
DET_Iliff                   3           95930
DET_Iliff                   4           192214
DET_Iliff                   5           202513
DET_Iliff                   6           212813
DET_Iliff                   7           223350
DET_Iliff                   8           233739
DET_Iliff                   9           244139
DET_Iliff                   10          254735
DET_Iliff                   11          265289
DET_Iliff                   12          276070
DET_Iliff                   13          287222
DET_Iliff                   14          298919
DET_Iliff                   14.51       306485
DET_Iliff                   15          313755
DET_Iliff                   16          323708
DET_Iliff                   17          332382
;
;Based on 2014 1ft contours
DET_Bible       Storage     0           0
DET_Bible                   0.26        167
DET_Bible                   1.26        440
DET_Bible                   2.26        750
DET_Bible                   3.26        1931
DET_Bible                   4.26        3382
DET_Bible                   5.26        8101
DET_Bible                   6.26        17265
DET_Bible                   7.26        24609
DET_Bible                   8.26        33820
DET_Bible                   9.26        46455
DET_Bible                   10.26       66015
DET_Bible                   11.26       104809
DET_Bible                   12.26       136503
DET_Bible                   13.26       172014
DET_Bible                   14.26       234568
DET_Bible                   15.26       450136
DET_Bible                   16.26       657358
DET_Bible                   17.26       857152
DET_Bible                   18.26       1024293
DET_Bible                   19.26       1227077
DET_Bible                   20.26       1394349
;
;Based on 2014 1ft contours
DET_Silo        Storage     0           0
DET_Silo                    0.71        50
DET_Silo                    1.71        2885
DET_Silo                    2.71        14927
DET_Silo                    3.71        29053
DET_Silo                    4.71        42759
DET_Silo                    5.71        61606
DET_Silo                    6.71        80426
DET_Silo                    7.71        95562
DET_Silo                    8.71        110411
DET_Silo                    9.71        126156
DET_Silo                    10.71       141250
DET_Silo                    11.71       156067
DET_Silo                    12.71       169858
DET_Silo                    13.71       182658
;
;Based on 2014 1ft contours
DET_Tommy       Storage     0           41900
DET_Tommy                   0.09        41926
DET_Tommy                   1.09        47499
DET_Tommy                   2.09        55089
DET_Tommy                   3.09        66371
DET_Tommy                   4.09        87956
DET_Tommy                   5.09        116573
DET_Tommy                   6.09        149322
DET_Tommy                   7.09        182259
DET_Tommy                   8.09        216967
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DET_Tommy                   9.09        261784
;
;Based on 2014 1ft contours
DET_Caley        Storage    0           0
DET_Caley                   0.93        2504
DET_Caley                   1.93        5197
DET_Caley                   2.93        7890
DET_Caley                   3.93        72569
DET_Caley                   4.00        73767
DET_Caley                   4.93        89676
DET_Caley                   5.76        94991
DET_Caley                   5.93        96080
DET_Caley                   6.78        99899
DET_Caley                   6.93        100573
DET_Caley                   7.93        106070
DET_Caley                   8.93        113964
DET_Caley                   9.93        121297
DET_Caley                   10.93       198513
;
;Based on 2014 1ft contours
DET_Peakview     Storage    0           11
DET_Peakview                0.92        261
DET_Peakview                1.92        759
DET_Peakview                2.92        2081
DET_Peakview                3.92        8169
DET_Peakview                4.92        11602
DET_Peakview                5.92        13886
DET_Peakview                6.92        15833
DET_Peakview                7.92        17607
DET_Peakview                8.92        19296
DET_Peakview                9.92        20972
DET_Peakview                10.25       21551
DET_Peakview                10.92       22727
DET_Peakview                11.54       24040
DET_Peakview                11.92       24845
DET_Peakview                12.92       27242
;
;From 2014 1ft contours
DET_Wallace_S    Storage    0           0
DET_Wallace_S               0.15        13
DET_Wallace_S               1.15        1376
DET_Wallace_S               2.15        2455
DET_Wallace_S               3.15        6047
DET_Wallace_S               4.15        15500
DET_Wallace_S               5.15        34805
DET_Wallace_S               6.15        67789
DET_Wallace_S               7.15        109366
DET_Wallace_S               8.15        150795
DET_Wallace_S               9.15        192511
DET_Wallace_S               10.15       224523
DET_Wallace_S               11.15       244244
DET_Wallace_S               12.15       264305
DET_Wallace_S               13.15       285142
DET_Wallace_S               14.15       321948
DET_Wallace_S               15.15       362957
DET_Wallace_S               16.15       405877
DET_Wallace_S               17.15       454175
DET_Wallace_S               18.15       493023
DET_Wallace_S               19.15       535959
DET_Wallace_S               20.15       581844
DET_Wallace_S               20.69       609915
DET_Wallace_S               21.15       633827
DET_Wallace_S               22.15       673326
DET_Wallace_S               22.35       681384
DET_Wallace_S               23.15       713614
DET_Wallace_S               24.15       790610
;
DET_Wallace_N    Storage    0           0
DET_Wallace_N               0.46        100
DET_Wallace_N               1.46        862
DET_Wallace_N               2.46        3761
DET_Wallace_N               3.46        13543
DET_Wallace_N               4.46        26564
DET_Wallace_N               5.46        44076
DET_Wallace_N               6.46        62648
DET_Wallace_N               7.46        87210
DET_Wallace_N               8.46        110170
DET_Wallace_N               9.46        134669
DET_Wallace_N               9.99        145912
DET_Wallace_N               10.46       155882
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DET_Wallace_N               11.46       174216
DET_Wallace_N               13.46       204076
;
DET_Orchard      Storage    0           32900
DET_Orchard                 1           39320
DET_Orchard                 2           58950
DET_Orchard                 3           72523
DET_Orchard                 4           87401
DET_Orchard                 5           115259
DET_Orchard                 6           153976
DET_Orchard                 7           188710
;
DET_Southmoor    Storage    0           1005
DET_Southmoor               1           10514
DET_Southmoor               2           24748
DET_Southmoor               3           46012
DET_Southmoor               4           73650
DET_Southmoor               5           109835
DET_Southmoor               6           158472
DET_Southmoor               7           201655
DET_Southmoor               8           243425
DET_Southmoor               9           286183
DET_Southmoor               10          334685
DET_Southmoor               11          366638
DET_Southmoor               12          401601
DET_Southmoor               13          452297

[REPORT]
;;Reporting Options
INPUT      NO
CONTROLS   NO
SUBCATCHMENTS ALL
NODES ALL
LINKS ALL

[TAGS]

[MAP]
DIMENSIONS 3157265.022 1639237.198 3182525.438 1679341.364
Units      None

[COORDINATES]
;;Node           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
JUNCT_U-301      3171895.711        1652710.465
JUNCT_U-320      3171630.014        1652131.926
JUNCT_U-330      3171472.802        1652529.268
JUNCT_U-111      3172528.848        1651278.030
JUNCT_U-110      3172583.902        1651107.862
JUNCT_U-155      3172964.279        1650547.307
JUNCT_U-151      3173154.467        1650437.198
JUNCT_U-170      3173398.631        1650986.780
JUNCT_U-150      3173257.090        1650402.110
JUNCT_U-210      3174397.228        1648947.359
JUNCT_U-601      3174432.285        1648723.302
JUNCT_U-600      3174551.407        1648628.609
JUNCT_U-610      3175771.591        1648482.161
JUNCT_U-620      3175446.736        1647203.998
JUNCT_U-640      3175857.142        1646813.611
JUNCT_U-670      3176974.447        1645992.439
JUNCT_U-680      3176959.505        1645365.349
JUNCT_U-700      3176377.657        1645267.081
JUNCT_U-750      3176522.801        1642889.728
JUNCT_U-760      3176908.182        1642894.733
JUNCT_U-770      3176332.982        1642095.136
JUNCT_U-400      3174308.640        1648663.950
JUNCT_U-411      3174220.176        1647377.111
JUNCT_U-410      3174028.962        1647144.954
JUNCT_U-440      3173852.576        1645427.344
JUNCT_U-450      3173506.737        1645117.031
JUNCT_U-461      3173437.974        1644855.078
JUNCT_U-460      3173417.634        1644569.223
JUNCT_U-515      3174256.812        1644128.597
JUNCT_U-510      3174849.245        1644059.397
JUNCT_U-160      3172981.280        1649814.959
JUNCT_U-100      3172072.455        1652707.976
JUNCT_L-045      3171522.852        1655136.849
JUNCT_L-050A     3172118.450        1655291.496
JUNCT_L-080      3170962.297        1655196.909
JUNCT_L-093      3171342.431        1655203.345
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JUNCT_L-060	3171273.960	1653578.882
JUNCT_L-100	3170654.551	1656089.456
JUNCT_L-110	3171784.269	1656475.020
JUNCT_L-125	3171417.719	1657343.980
JUNCT_L-145	3170892.905	1657350.095
JUNCT_L-330	3169526.868	1657551.899
JUNCT_L-130	3171354.629	1657720.350
JUNCT_L-335	3170704.783	1657960.723
JUNCT_L-345	3170652.355	1659743.265
JUNCT_L-355	3169980.047	1660868.918
JUNCT_L-350A	3169590.381	1660175.445
JUNCT_L-340	3171304.079	1659569.801
JUNCT_L-365	3169468.106	1661895.884
JUNCT_L-360	3170643.376	1661627.614
JUNCT_L-390	3169328.151	1663086.853
JUNCT_L-400	3168269.781	1663062.799
JUNCT_L-405	3168731.034	1663388.531
JUNCT_L-370	3168585.563	1661930.436
JUNCT_L-410	3168852.354	1664215.293
JUNCT_L-415	3168218.964	1664593.122
JUNCT_L-440A	3166353.646	1665375.352
JUNCT_L-445	3167721.353	1665766.455
JUNCT_L-425	3167899.351	1664640.733
JUNCT_L-420	3167177.735	1664207.764
JUNCT_L-436	3167793.514	1665213.215
JUNCT_L-450	3168731.615	1665684.671
JUNCT_L-491	3167691.095	1666860.494
JUNCT_L-475	3167608.121	1667775.895
JUNCT_L-500	3166509.037	1667705.197
JUNCT_L-505	3167157.756	1668638.290
JUNCT_L-480	3168856.695	1666619.836
JUNCT_L-540	3166179.209	1669227.298
JUNCT_L-545	3166324.701	1669655.956
JUNCT_L-570	3165194.771	1670176.734
JUNCT_L-575	3165973.643	1670607.496
JUNCT_L-555	3166161.708	1670001.723
JUNCT_L-550	3166844.252	1669756.707
JUNCT_L-560	3166271.090	1670771.772
JUNCT_L-520	3164906.151	1671082.330
JUNCT_L-610	3164249.235	1671938.420
JUNCT_L-600	3165948.021	1672524.107
JUNCT_L-635	3165140.969	1673802.885
JUNCT_L-630	3164255.063	1673267.144
JUNCT_L-645	3165213.828	1673636.350
JUNCT_L-640A	3165562.510	1673516.653
JUNCT_L-650	3164851.579	1674515.084
JUNCT_L-665	3165448.017	1674666.784
JUNCT_L-660	3165520.876	1674557.496
JUNCT_L-685	3165703.024	1676696.428
JUNCT_L-670	3165216.653	1676364.341
JUNCT_L-680	3165781.087	1676581.936
JUNCT_L-020	3170546.886	1652964.699
JUNCT_L-010A	3173459.769	1652954.690
JUNCT_L-755	3167431.263	1663657.728
JUNCT_L-760	3166168.110	1663277.746
JUNCT_L-720	3164734.829	1659185.350
JUNCT_L-740	3164345.077	1661819.319
JUNCT_L-700	3167419.088	1659971.141
JUNCT_L-530	3165534.082	1670629.051
JUNCT_L-180	3168239.602	1656698.395
JUNCT_L-150	3168562.326	1655108.838
JUNCT_L-030	3168820.534	1652743.706
JUNCT_L-050B	3172292.627	1653921.949
JUNCT_L-350B	3170269.074	1659423.607
JUNCT_U-010B	3173159.472	1652624.363
JUNCT_L-750	3166328.844	1662668.200
JUNCT_L-800	3166005.159	1661654.391
JUNCT_L-435	3167702.296	1664997.304
JUNCT_L-490	3168394.861	1667553.127
TREX	3170641.980	1657213.905
Outfall_Goldsmith	3165345.819	1677053.229
JUNCT_U-215	3174122.872	1649063.198
JUNCT_U-520	3175568.444	1642063.608
JUNCT_U-115	3172433.753	1651498.248
JUNCT_U-415	3174223.554	1647489.105
JUNCT_U-524	3175022.788	1643420.887
JUNCT_L-580	3165899.051	1670852.113
JUNCT_L-616	3165219.553	1672538.677
JUNCT_L-055	3171344.286	1655577.425
JUNCT_L-065	3171708.035	1654406.126

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JUNCT_L-040      3173258.320        1654636.190
JUNCT_L-640B     3165765.474        1673880.948
JUNCT_L-460      3165493.964        1668553.768
JUNCT_L-470      3166533.091        1666797.835
JUNCT_L-375      3168977.753        1662651.460
JUNCT_L-090      3169326.264        1654673.171
JUNCT_L-070      3170246.252        1653806.519
JUNCT_L-091      3170539.623        1654738.106
JUNCT_L-092      3171114.558        1655036.822
JUNCT_L-151      3168624.267        1656003.539
JUNCT_L-430      3167299.633        1665013.656
JUNCT_L-645A     3165395.975        1673568.695
JUNCT-L-525      3165718.637        1671367.312
JUNCT_L-565      3165770.679        1671205.981
JUNCT_L-440B     3165253.425        1665275.756
JUNCT_L-120      3173159.715        1658053.002
JUNCT_L-655      3165146.173        1674416.982
JUNCT_U-300      3171733.060        1652364.105
JUNCT_L-706      3166522.950        1662155.507
JUNC L-745       3165372.179        1662328.369
JUNCT_L-705      3167217.926        1660643.777
JUNCT_L-725      3165457.756        1659185.350
JUNCT_L-115      3171022.356        1656843.539
JUNCT_L-011      3172053.554        1652946.064
JUNCT_U-660      3176462.741        1645972.779
JUNCT_L-485      3168207.241        1666916.230
JUNCT_L-140      3167819.036        1654296.724
JUNCT_U-740      3176177.459        1643225.059
JUNCT_U-730      3176332.612        1644060.887
JUNCT_U-720      3175646.720        1644763.769
JUNCT_U-710      3176452.731        1644761.580
JUNCT_U-690      3177618.987        1644274.955
JUNCT_U-630      3175917.201        1647589.379
JUNCT_U-623      3174851.146        1647984.770
JUNCT_U-200      3173827.123        1649254.878
JUNCT_U-190      3173719.214        1649641.552
JUNCT_U-180      3173119.339        1651629.119
JUNCT_U-120      3171796.205        1650945.191
JUNCT_U-310      3169236.070        1652604.332
JUNCT_U-340      3171125.279        1651278.942
JUNCT_U-350      3169530.031        1650199.232
JUNCT_U-420      3173113.288        1647361.871
JUNCT_U-530      3172075.188        1646602.970
JUNCT_U-430      3173919.639        1646492.885
JUNCT_U-470      3173091.106        1644531.495
JUNCT_U-480      3172223.530        1644274.538
JUNCT_U-490      3173007.958        1644101.418
JUNCT_U-500      3172480.397        1643464.904
JUNCT_U-621      3175281.572        1647514.305
JUNCT_U-140      3172126.019        1648582.384
JUNCT_U-540      3175579.438        1643427.436
JUNCT_U-130      3171993.318        1649461.232
JUNCT_L-710      3165897.798        1657953.231
DP_Caley         3173559.128        1644652.064
DP_Tommy         3174105.742        1647253.482
DP_Orchard       3174245.570        1649031.952
DP_Silo          3175361.651        1647294.087
DP_Wallace_S     3171417.350        1655385.064
DP_Bible         3167248.014        1668241.705
DP_Southmoor     3167018.967        1662826.989
DP_Wallace_N     3171092.426        1656583.281
DP_Iliff         3165543.216        1670890.822
DP_Boston_Peakview 3174564.371        1643738.505

[VERTICES]
;;Link           X-Coord            Y-Coord
;;-------------- ------------------ ------------------
215-OVERFLOW     3173944.025        1649102.007
495-OVERFLOW     3173281.922        1644270.154
125-OVERFLOW     3172370.350        1651026.037
626-OVERFLOW     3174830.039        1648401.060
745-OVERFLOW     3176150.085        1643844.618
485-OVERFLOW     3172895.163        1644285.089
345-OVERFLOW     3171261.458        1652027.931
145-OVERFLOW     3171843.169        1649005.781
425-OVERFLOW     3173895.339        1647298.461
655-OVERFLOW     3176158.185        1646297.387
525-OVERFLOW     3175047.801        1643143.845
355-OVERFLOW     3170074.749        1651064.946
645              3175504.289        1647025.368
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725-OVERFLOW	3176126.179	1644577.709
115-OVERFLOW	3172348.773	1652486.424
635-OVERFLOW	3175493.665	1647800.179
135-OVERFLOW	3172447.489	1650236.434
415-OVERFLOW	3174125.378	1648123.980
195-OVERFLOW	3173611.305	1650118.150
715-OVERFLOW	3176320.721	1645038.898
535-OVERFLOW	3173102.720	1646801.754
435-OVERFLOW	3173831.929	1646928.573
695-OVERFLOW	3177442.875	1645046.849
505-OVERFLOW	3172807.469	1643943.907
185-OVERFLOW	3172759.435	1651687.481
524	3174403.925	1643414.338
524-OVERFLOW	3174482.511	1643542.040
475-OVERFLOW	3173284.435	1644591.842
315-OVERFLOW	3169705.261	1652423.698
735-OVERFLOW	3176620.219	1644418.342
205-OVERFLOW	3173899.063	1649515.658
625-OVERFLOW	3175226.518	1647874.662
1055-OVERFLOW	3171383.259	1656088.746
1616-OVERFLOW	3164948.413	1673209.604
1635	3165031.680	1674016.257
1635	3164953.617	1674312.898
1635	3165036.884	1674375.348
1665	3165432.405	1675286.086
1665	3165546.897	1675692.015
1665	3165552.102	1676535.098
1065-OVERFLOW	3171788.114	1654556.275
1040-OVERFLOW	3172594.860	1654727.037
1640B-OVERFLOW	3165641.968	1673703.309
1485-OVERFLOW	3167944.534	1667009.598
1460-OVERFLOW	3166648.550	1668327.661
1470-OVERFLOW	3166942.007	1667505.019
1375-OVERFLOW	3168769.419	1662948.789
1090-OVERFLOW	3170062.672	1655017.286
1070-OVERFLOW	3170681.541	1654228.205
1091-OVERFLOW	3170962.836	1654820.278
1092-OVERFLOW	3171319.060	1655030.979
1430-OVERFLOW	3167299.633	1665265.108
1645A-OVERFLOW	3165279.986	1673576.517
1595-OVERFLOW	3165336.332	1671870.170
1565-OVERFLOW	3165798.095	1671311.062
1440B-OVERFLOW	3166128.986	1665843.427
1120-OVERFLOW	3172560.953	1658073.648
1655-OVERFLOW	3165384.870	1674526.236
1115-OVERFLOW	3171050.302	1657085.536
300-OVERFLOW	3171767.138	1652630.063
1706	3167360.975	1663040.744
1706-OVERFLOW	3166634.208	1662619.341
1745-OVERFLOW	3165935.217	1662130.812
1705-OVERFLOW	3166537.767	1661414.667
1725_OVERFLOW	3165878.939	1660140.871
1011-OVERFLOW	3172071.015	1653746.527
1140	3167715.801	1655198.308
1140	3168011.741	1655852.128
1180	3169981.326	1656928.623
1152	3168994.992	1656306.088
1152	3169871.217	1657123.816
1152-OVERFLOW	3169816.163	1657268.960
1140-OVERFLOW	3168072.817	1655573.077
1710-OVERFLOW	3165340.015	1658555.985

[BACKDROP]

FILE "R:\18.155.035 (Goldsmith Gulch)\Drainage\Hydrology\Background\Goldsmith_Gulch_SWMM_Background.jpg"

DIMENSIONS 3157246.158 1639281.332 3182631.960 1679354.634

Table B-6 Baseline Hydrology Model

SWMM Output – 100-year (Existing)

```
EPA STORM WATER MANAGEMENT MODEL - VERSION 5.1 (Build 5.1.012)
--------------------------------------------------------------

GOLDSMITH GULCH MAJOR DRAINAGEWAY PLAN
MATRIX DESIGN GROUP, INC., June 2018
Scenario ID = 6_Ex_100yr_0mi^2_Goldsmith_2018

*******************************************************
NOTE: The summary statistics displayed in this report are
based on results found at every computational time step,
not just on results from each reporting time step.
*******************************************************

****************
Analysis Options
****************
Flow Units ............... CFS
Process Models:
  Rainfall/Runoff ........ NO
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ NO
  Water Quality .......... NO
Flow Routing Method ...... KINWAVE
Starting Date ............ 01/01/2005 00:00:00
Ending Date .............. 01/01/2005 20:50:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:05:00
Routing Time Step ........ 5.00 sec


*************************        Volume        Volume
Flow Routing Continuity        acre-feet      10^6 gal
*************************     ---------     ---------
Dry Weather Inflow .......         0.000         0.000
Wet Weather Inflow .......         0.000         0.000
Groundwater Inflow .......         0.000         0.000
RDII Inflow ..............         0.000         0.000
External Inflow ..........       780.050       254.191
External Outflow .........       733.312       238.961
Flooding Loss ............         0.000         0.000
Evaporation Loss .........         0.000         0.000
Exfiltration Loss ........         0.000         0.000
Initial Stored Volume ....         0.000         0.000
Final Stored Volume ......        66.051        21.524
Continuity Error (%) .....        -2.476


*******************************
Highest Flow Instability Indexes
*******************************
Link 1115 (58)
Link 1145 (58)
Link OUTLET_Wallace_N (58)
Link 1335 (58)
Link 1345 (58)


*************************
Routing Time Step Summary
*************************
Minimum Time Step           :     4.00 sec
Average Time Step           :     5.00 sec
Maximum Time Step           :     5.00 sec
Percent in Steady State     :     0.00
Average Iterations per Step :     1.01
Percent Not Converging      :     0.00


******************
Node Depth Summary
******************
```

Node	Type	Average Depth Feet	Maximum Depth Feet	Maximum HGL Feet	Time of Max Occurrence days	Time of Max Occurrence hr:min	Reported Max Depth Feet
JUNCT_U-301	JUNCTION	0.11	2.16	5588.16	0	00:38	2.15
JUNCT_U-320	JUNCTION	0.18	2.92	5607.92	0	00:38	2.91
JUNCT_U-330	JUNCTION	0.00	0.00	5617.00	0	00:00	0.00
JUNCT_U-111	JUNCTION	0.10	1.82	5602.82	0	00:43	1.66
JUNCT_U-110	JUNCTION	3.51	7.00	5609.00	0	01:34	7.00
JUNCT_U-155	JUNCTION	0.64	4.11	5616.11	0	01:32	4.09
JUNCT_U-151	JUNCTION	0.00	0.00	5612.10	0	00:00	0.00
JUNCT_U-170	JUNCTION	0.00	0.00	5613.00	0	00:00	0.00
JUNCT_U-150	JUNCTION	1.05	5.07	5617.22	0	01:33	5.05
JUNCT_U-210	JUNCTION	1.16	6.14	5636.34	0	01:19	6.14
JUNCT_U-601	JUNCTION	1.87	6.15	5637.15	0	01:17	6.12
JUNCT_U-600	JUNCTION	0.44	3.25	5635.25	0	01:17	3.23
JUNCT_U-610	JUNCTION	0.03	0.43	5690.43	0	00:40	0.43
JUNCT_U-620	JUNCTION	0.22	3.17	5661.67	0	00:50	3.17
JUNCT_U-640	JUNCTION	22.54	26.30	5688.40	0	00:40	26.30
JUNCT_U-670	JUNCTION	0.03	0.58	5700.58	0	00:35	0.58
JUNCT_U-680	JUNCTION	0.08	1.00	5700.10	0	00:32	1.00
JUNCT_U-700	JUNCTION	0.15	2.12	5699.22	0	00:40	2.12
JUNCT_U-750	JUNCTION	0.02	0.39	5752.39	0	00:35	0.39
JUNCT_U-760	JUNCTION	0.02	0.36	5755.36	0	00:35	0.36
JUNCT_U-770	JUNCTION	0.06	0.83	5775.83	0	00:40	0.83
JUNCT_U-400	JUNCTION	2.62	4.55	5636.55	0	01:19	4.55
JUNCT_U-411	JUNCTION	0.00	0.00	5646.50	0	00:00	0.00
JUNCT_U-410	JUNCTION	5.00	8.17	5662.67	0	01:14	8.17
JUNCT_U-440	JUNCTION	0.58	3.08	5676.18	0	01:01	3.07

JUNCT_U-450	JUNCTION	0.45	3.02	5685.12	0	01:00	3.02	JUNCT_L-645	JUNCTION	4.00	4.00	5421.10	0	00:00	4.00
JUNCT_U-461	JUNCTION	0.45	3.02	5690.02	0	00:59	3.02	JUNCT_L-640A	JUNCTION	0.00	0.00	5418.00	0	00:00	0.00
JUNCT_U-460	JUNCTION	0.13	3.00	5697.15	0	00:30	3.00	JUNCT_L-650	JUNCTION	0.00	0.00	5408.00	0	00:00	0.00
JUNCT_U-515	JUNCTION	0.20	1.79	5714.79	0	00:45	1.79	JUNCT_L-665	JUNCTION	8.65	11.31	5417.71	0	01:49	11.31
JUNCT_U-510	JUNCTION	0.00	0.00	5730.00	0	00:00	0.00	JUNCT_L-660	JUNCTION	0.00	0.00	5406.80	0	00:00	0.00
JUNCT_U-160	JUNCTION	0.00	0.00	5619.00	0	00:00	0.00	JUNCT_L-685	JUNCTION	8.84	15.08	5401.08	0	01:54	15.08
JUNCT_U-100	JUNCTION	7.08	11.31	5597.21	0	01:40	11.31	JUNCT_L-670	JUNCTION	0.00	0.00	5387.00	0	00:00	0.00
JUNCT_L-045	JUNCTION	6.68	10.95	5565.45	0	00:51	10.94	JUNCT_L-680	JUNCTION	0.00	0.00	5390.00	0	00:00	0.00
JUNCT_L-050A	JUNCTION	0.00	0.00	5580.00	0	00:00	0.00	JUNCT_L-020	JUNCTION	0.00	0.00	5580.50	0	00:00	0.00
JUNCT_L-080	JUNCTION	0.00	0.00	5555.00	0	00:00	0.00	JUNCT_L-010A	JUNCTION	0.00	0.00	5582.00	0	00:00	0.00
JUNCT_L-093	JUNCTION	9.00	9.00	5574.00	0	00:00	9.00	JUNCT_L-755	JUNCTION	1.68	6.00	5504.51	0	00:35	6.00
JUNCT_L-060	JUNCTION	0.00	0.00	5585.00	0	00:00	0.00	JUNCT_L-760	JUNCTION	0.00	0.00	5499.90	0	00:00	0.00
JUNCT_L-100	JUNCTION	0.00	0.00	5550.00	0	00:00	0.00	JUNCT_L-720	JUNCTION	0.00	0.00	5610.00	0	00:00	0.00
JUNCT_L-110	JUNCTION	0.00	0.00	5550.00	0	00:00	0.00	JUNCT_L-740	JUNCTION	0.00	0.00	5570.00	0	00:00	0.00
JUNCT_L-125	JUNCTION	0.18	2.10	5548.00	0	01:06	1.98	JUNCT_L-700	JUNCTION	0.00	0.00	5550.00	0	00:00	0.00
JUNCT_L-145	JUNCTION	1.46	5.39	5546.39	0	00:50	5.39	JUNCT_L-530	JUNCTION	0.00	0.00	5435.00	0	00:00	0.00
JUNCT_L-330	JUNCTION	0.00	0.00	5575.00	0	00:00	0.00	JUNCT_L-180	JUNCTION	0.10	1.27	5567.27	0	00:40	1.27
JUNCT_L-130	JUNCTION	0.00	0.00	5541.50	0	00:00	0.00	JUNCT_L-150	JUNCTION	0.00	0.00	5625.00	0	00:00	0.00
JUNCT_L-335	JUNCTION	1.46	5.39	5545.39	0	00:54	5.38	JUNCT_L-030	JUNCTION	0.05	0.74	5658.74	0	00:35	0.74
JUNCT_L-345	JUNCTION	3.94	6.99	5526.99	0	01:02	6.98	JUNCT_L-050B	JUNCTION	0.00	0.00	5580.00	0	00:00	0.00
JUNCT_L-355	JUNCTION	3.71	8.52	5514.52	0	01:01	8.52	JUNCT_L-350B	JUNCTION	0.00	0.00	5525.00	0	00:00	0.00
JUNCT_L-350A	JUNCTION	0.00	0.00	5515.00	0	00:00	0.00	JUNCT_U-010B	JUNCTION	0.09	1.42	5627.42	0	00:40	1.42
JUNCT_L-340	JUNCTION	0.00	0.00	5525.00	0	00:00	0.00	JUNCT_L-750	JUNCTION	0.00	0.00	5530.00	0	00:00	0.00
JUNCT_L-365	JUNCTION	3.20	8.15	5508.15	0	01:03	8.15	JUNCT_L-800	JUNCTION	0.00	0.00	5525.00	0	00:00	0.00
JUNCT_L-360	JUNCTION	0.00	0.00	5505.00	0	00:00	0.00	JUNCT_L-435	JUNCTION	0.00	0.00	5478.00	0	00:00	0.00
JUNCT_L-390	JUNCTION	0.00	0.00	5495.00	0	00:00	0.00	JUNCT_L-490	JUNCTION	0.00	0.00	5485.00	0	00:00	0.00
JUNCT_L-400	JUNCTION	0.00	0.00	5495.00	0	00:00	0.00	TREX	JUNCTION	0.19	3.23	5544.73	0	00:40	3.23
JUNCT_L-405	JUNCTION	10.13	12.98	5500.98	0	01:06	12.98	Outfall_Goldsmith	OUTFALL	0.00	0.00	5384.00	0	00:00	0.00
JUNCT_L-370	JUNCTION	0.00	0.00	5495.00	0	00:00	0.00	JUNCT_U-215	DIVIDER	1.23	5.06	5634.06	0	01:24	5.06
JUNCT_L-410	JUNCTION	0.00	0.00	5490.00	0	00:00	0.00	JUNCT_U-520	DIVIDER	0.15	1.50	5785.50	0	00:20	1.50
JUNCT_L-415	JUNCTION	3.65	7.98	5488.98	0	01:08	7.98	JUNCT_U-115	DIVIDER	3.11	5.24	5606.14	0	01:34	5.24
JUNCT_L-440A	JUNCTION	0.00	0.00	5500.00	0	00:00	0.00	JUNCT_U-415	DIVIDER	3.30	3.30	5649.30	0	00:00	3.30
JUNCT_L-445	JUNCTION	8.02	13.96	5483.96	0	01:14	13.96	JUNCT_U-524	DIVIDER	10.00	10.00	5754.00	0	00:00	10.00
JUNCT_L-425	JUNCTION	0.86	3.77	5486.77	0	01:30	3.75	JUNCT_L-580	DIVIDER	2.93	9.30	5440.80	0	01:54	9.30
JUNCT_L-420	JUNCTION	0.00	0.00	5490.00	0	00:00	0.00	JUNCT_L-616	DIVIDER	9.19	10.94	5429.94	0	01:55	10.94
JUNCT_L-436	JUNCTION	4.02	4.60	5482.20	0	00:41	4.60	JUNCT_L-055	DIVIDER	1.40	4.53	5557.53	0	02:21	4.53
JUNCT_L-450	JUNCTION	0.00	0.00	5490.00	0	00:00	0.00	JUNCT_L-065	DIVIDER	8.90	14.01	5580.01	0	01:41	14.00
JUNCT_L-491	JUNCTION	4.53	9.09	5470.09	0	01:16	9.09	JUNCT_L-040	DIVIDER	0.15	2.25	5614.15	0	00:21	2.25
JUNCT_L-475	JUNCTION	10.12	12.08	5463.08	0	01:24	12.08	JUNCT_L-640B	DIVIDER	4.20	4.20	5422.91	0	00:00	4.20
JUNCT_L-500	JUNCTION	0.00	0.00	5460.00	0	00:00	0.00	JUNCT_L-460	DIVIDER	18.03	18.85	5484.60	0	00:40	18.85
JUNCT_L-505	JUNCTION	6.24	9.34	5453.08	0	00:31	9.34	JUNCT_L-470	DIVIDER	15.03	15.95	5485.65	0	00:35	15.95
JUNCT_L-480	JUNCTION	0.00	0.00	5485.00	0	00:00	0.00	JUNCT_L-375	DIVIDER	9.43	12.40	5503.34	0	01:04	12.40
JUNCT_L-540	JUNCTION	0.00	0.00	5440.00	0	00:00	0.00	JUNCT_L-090	DIVIDER	21.00	21.00	5623.00	0	00:00	21.00
JUNCT_L-545	JUNCTION	3.23	10.84	5447.84	0	01:55	10.84	JUNCT_L-070	DIVIDER	21.00	21.00	5612.20	0	00:00	21.00
JUNCT_L-570	JUNCTION	0.03	0.40	5455.40	0	00:40	0.40	JUNCT_L-091	DIVIDER	21.00	21.00	5610.30	0	00:00	21.00
JUNCT_L-575	JUNCTION	6.37	9.98	5443.98	0	01:56	9.98	JUNCT_L-092	DIVIDER	9.00	9.00	5580.20	0	00:00	9.00
JUNCT_L-555	JUNCTION	3.24	10.84	5446.84	0	01:56	10.84	JUNCT_L-151	DIVIDER	0.19	3.24	5601.24	0	00:38	3.23
JUNCT_L-550	JUNCTION	0.00	0.00	5440.00	0	00:00	0.00	JUNCT_L-430	DIVIDER	5.42	6.00	5486.60	0	00:40	6.00
JUNCT_L-560	JUNCTION	0.00	0.00	5435.00	0	00:00	0.00	JUNCT_L-645A	DIVIDER	4.20	4.20	5421.57	0	00:00	4.20
JUNCT_L-520	JUNCTION	0.00	0.00	5431.00	0	00:00	0.00	JUNCT-L-525	DIVIDER	7.11	9.78	5440.15	0	01:56	9.78
JUNCT_L-610	JUNCTION	0.00	0.00	5424.20	0	00:00	0.00	JUNCT_L-565	DIVIDER	7.11	9.78	5440.28	0	01:55	9.78
JUNCT_L-600	JUNCTION	0.00	0.00	5424.80	0	00:00	0.00	JUNCT_L-440B	DIVIDER	12.01	12.47	5528.63	0	00:40	12.47
JUNCT_L-635	JUNCTION	3.28	7.09	5421.09	0	01:56	7.09	JUNCT_L-120	DIVIDER	0.18	2.25	5591.65	0	00:38	2.25
JUNCT_L-630	JUNCTION	0.00	0.00	5415.00	0	00:00	0.00	JUNCT_L-655	DIVIDER	8.65	11.31	5419.21	0	01:49	11.31

JUNCT_U-300	DIVIDER	0.16	2.59	5595.59	0	00:38	2.58
JUNCT_L-706	DIVIDER	11.08	12.86	5536.31	0	00:48	12.86
JUNC_L-745	DIVIDER	8.54	9.48	5561.04	0	00:40	9.48
JUNCT_L-705	DIVIDER	8.04	8.91	5556.61	0	00:46	8.91
JUNCT_L-725	DIVIDER	4.07	5.90	5596.66	0	00:42	5.87
JUNCT_L-115	DIVIDER	0.69	2.52	5550.06	0	01:26	2.52
JUNCT_L-011	DIVIDER	3.34	6.32	5586.32	0	01:38	6.32
JUNCT_U-660	DIVIDER	0.24	4.00	5699.00	0	00:35	4.00
JUNCT_L-485	DIVIDER	12.03	12.79	5479.09	0	00:40	12.79
JUNCT_L-140	DIVIDER	0.14	2.42	5647.29	0	00:35	2.42
JUNCT_U-740	DIVIDER	12.06	12.83	5748.83	0	00:41	12.83
JUNCT_U-730	DIVIDER	8.76	10.70	5730.70	0	00:38	10.69
JUNCT_U-720	DIVIDER	0.07	1.10	5736.10	0	00:35	1.09
JUNCT_U-710	DIVIDER	3.84	5.70	5711.80	0	00:40	5.70
JUNCT_U-690	DIVIDER	0.08	1.00	5723.00	0	00:29	1.00
JUNCT_U-630	DIVIDER	0.12	2.00	5687.00	0	00:33	2.00
JUNCT_U-623	DIVIDER	5.48	7.82	5649.82	0	01:14	7.82
JUNCT_U-200	DIVIDER	9.23	13.06	5633.06	0	01:26	13.04
JUNCT_U-190	DIVIDER	4.04	9.58	5626.58	0	01:28	9.57
JUNCT_U-180	DIVIDER	0.10	2.00	5622.00	0	00:36	2.00
JUNCT_U-120	DIVIDER	0.08	1.47	5649.47	0	00:35	1.47
JUNCT_U-310	DIVIDER	0.06	1.15	5658.15	0	00:35	1.15
JUNCT_U-340	DIVIDER	0.17	2.93	5634.93	0	00:36	2.91
JUNCT_U-350	DIVIDER	0.13	2.89	5687.89	0	00:35	2.89
JUNCT_U-420	DIVIDER	0.20	3.00	5694.00	0	00:28	3.00
JUNCT_U-530	DIVIDER	0.14	1.50	5714.50	0	00:18	1.50
JUNCT_U-430	DIVIDER	0.90	4.15	5663.25	0	01:05	4.15
JUNCT_U-470	DIVIDER	0.07	1.30	5711.40	0	00:35	1.30
JUNCT_U-480	DIVIDER	0.05	1.05	5736.05	0	00:35	1.05
JUNCT_U-490	DIVIDER	0.13	3.00	5718.00	0	00:28	3.00
JUNCT_U-500	DIVIDER	0.09	2.28	5741.38	0	00:30	2.27
JUNCT_U-621	DIVIDER	0.39	2.73	5654.73	0	01:11	2.73
JUNCT_U-140	DIVIDER	0.09	1.50	5666.50	0	00:35	1.50
JUNCT_U-540	DIVIDER	10.03	10.50	5755.50	0	00:51	10.50
JUNCT_U-130	DIVIDER	0.20	3.00	5662.00	0	00:24	3.00
JUNCT_L-710	DIVIDER	0.18	2.91	5601.67	0	00:40	2.91
DP_Caley	STORAGE	4.09	8.33	5698.40	0	00:59	8.33
DP_Tommy	STORAGE	1.35	7.24	5661.15	0	01:13	7.23
DP_Orchard	STORAGE	1.41	4.93	5634.93	0	01:24	4.93
DP_Silo	STORAGE	2.75	12.94	5670.23	0	01:11	12.93
DP_Wallace_S	STORAGE	4.46	21.55	5575.40	0	02:21	21.54
DP_Bible	STORAGE	3.85	17.34	5461.08	0	01:55	17.34
DP_Southmoor	STORAGE	5.89	8.46	5524.46	0	01:29	8.46
DP_Wallace_N	STORAGE	2.02	8.59	5556.13	0	01:26	8.59
DP_Iliff	STORAGE	12.95	14.65	5445.65	0	03:07	14.64
DP_Boston_Peakview	STORAGE	7.49	11.83	5735.91	0	00:54	11.83

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Node Inflow Summary
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Node	Type	Lateral Inflow CFS	Total Inflow CFS	Time of Max Occurrence days hr:min	Inflow Volume 10^6 gal	Inflow Volume 10^6 gal	Balance Error Percent
JUNCT_U-301	JUNCTION	0.00	607.15	0 00:38	0	12.4	0.000
JUNCT_U-320	JUNCTION	176.96	544.54	0 00:37	3.54	10.9	0.000
JUNCT_U-330	JUNCTION	12.92	12.92	0 00:35	0.325	0.325	0.000
JUNCT_U-111	JUNCTION	0.00	1421.31	0 01:34	0	67.5	0.000
JUNCT_U-110	JUNCTION	151.39	1402.69	0 01:34	2.75	65.5	0.000
JUNCT_U-155	JUNCTION	0.00	1391.90	0 01:32	0	62.8	0.000
JUNCT_U-151	JUNCTION	0.00	1350.93	0 01:32	0	56.9	0.000
JUNCT_U-170	JUNCTION	43.96	43.96	0 00:45	1.53	1.53	0.000
JUNCT_U-150	JUNCTION	79.85	1316.56	0 01:32	2.31	54.4	0.000
JUNCT_U-210	JUNCTION	87.90	1327.73	0 01:19	2.92	50.3	0.000
JUNCT_U-601	JUNCTION	0.00	1270.49	0 01:17	0	47.4	0.000
JUNCT_U-600	JUNCTION	69.08	624.83	0 01:16	1.71	22.1	0.000
JUNCT_U-610	JUNCTION	33.06	33.06	0 00:40	0.832	0.832	0.000
JUNCT_U-620	JUNCTION	82.83	730.51	0 00:50	2.16	17.8	0.000
JUNCT_U-640	JUNCTION	163.33	656.51	0 00:48	3.54	15.6	0.000
JUNCT_U-670	JUNCTION	66.99	66.99	0 00:35	1.48	1.48	0.000
JUNCT_U-680	JUNCTION	77.06	104.39	0 00:44	2	2.85	0.000
JUNCT_U-700	JUNCTION	14.75	304.35	0 00:40	0.333	6.3	0.000
JUNCT_U-750	JUNCTION	22.10	41.54	0 00:35	0.351	0.67	0.000
JUNCT_U-760	JUNCTION	19.65	19.65	0 00:35	0.32	0.32	0.000
JUNCT_U-770	JUNCTION	47.98	47.98	0 00:40	1.37	1.37	0.000
JUNCT_U-400	JUNCTION	42.91	649.43	0 01:19	1.3	25.3	0.000
JUNCT_U-411	JUNCTION	0.00	632.38	0 01:13	0	24	0.000
JUNCT_U-410	JUNCTION	103.70	650.00	0 01:09	2.04	24	0.000
JUNCT_U-440	JUNCTION	58.55	475.65	0 01:01	1.39	15.7	0.000
JUNCT_U-450	JUNCTION	23.26	433.46	0 00:59	0.833	14.3	0.000
JUNCT_U-461	JUNCTION	0.00	411.78	0 00:59	0	13.4	0.000
JUNCT_U-460	JUNCTION	189.23	399.69	0 00:36	4.15	7.76	0.000
JUNCT_U-515	JUNCTION	0.00	195.92	0 00:52	0	5.72	0.000
JUNCT_U-510	JUNCTION	63.53	63.53	0 00:40	1.54	1.54	0.000
JUNCT_U-160	JUNCTION	40.92	40.92	0 00:35	0.937	0.937	0.000
JUNCT_U-100	JUNCTION	130.30	1499.06	0 01:39	2.23	82.2	0.000
JUNCT_L-045	JUNCTION	0.00	1740.93	0 00:50	0	94	0.000
JUNCT_L-050A	JUNCTION	94.78	94.78	0 00:40	2.53	2.53	0.000
JUNCT_L-080	JUNCTION	86.70	86.70	0 00:35	1.49	1.49	0.000
JUNCT_L-093	JUNCTION	0.00	330.56	0 00:36	0	6.4	0.000
JUNCT_L-060	JUNCTION	81.01	81.01	0 00:35	1.87	1.87	0.000
JUNCT_L-100	JUNCTION	155.73	155.73	0 00:35	3.24	3.24	0.000
JUNCT_L-110	JUNCTION	201.28	201.28	0 00:40	4.34	4.34	0.000
JUNCT_L-125	JUNCTION	0.00	39.15	0 01:06	0	1.44	0.000
JUNCT_L-145	JUNCTION	0.00	1453.44	0 00:50	0	132	0.000
JUNCT_L-330	JUNCTION	199.73	199.73	0 00:45	5.63	5.63	0.000
JUNCT_L-130	JUNCTION	83.97	83.97	0 00:40	2.23	2.23	0.000
JUNCT_L-335	JUNCTION	0.00	1451.28	0 00:54	0	132	0.000
JUNCT_L-345	JUNCTION	0.00	1763.14	0 00:58	0	143	0.000
JUNCT_L-355	JUNCTION	0.00	1879.16	0 01:00	0	146	0.000
JUNCT_L-350A	JUNCTION	161.77	161.77	0 00:40	3.76	3.76	0.000
JUNCT_L-340	JUNCTION	288.92	288.92	0 00:40	6.64	6.64	0.000
JUNCT_L-365	JUNCTION	0.00	2050.46	0 01:01	0	152	0.000
JUNCT_L-360	JUNCTION	234.36	234.36	0 00:40	5.68	5.68	0.000

	Maximum	Maximum	Lateral	Total	Flow

JUNCT_L-390	JUNCTION	109.39	109.39	0	00:40	2.72	2.72	0.000	JUNCT_L-490	JUNCTION	94.61	94.61	0	00:40	2.26	2.26	0.000
JUNCT_L-400	JUNCTION	88.93	88.93	0	00:35	1.69	1.69	0.000	TREX	JUNCTION	0.00	446.78	0	00:41	0	10.6	0.000
JUNCT_L-405	JUNCTION	0.00	2279.77	0	01:05	0	161	0.000	Outfall_Goldsmith	OUTFALL	0.00	2399.53	0	01:52	0	239	0.000
JUNCT_L-370	JUNCTION	171.96	171.96	0	00:40	4.03	4.03	0.000	JUNCT_U-215	DIVIDER	0.00	1274.88	0	01:24	0	50.1	0.000
JUNCT_L-410	JUNCTION	146.44	146.44	0	00:40	3.64	3.64	0.000	JUNCT_U-520	DIVIDER	57.32	57.32	0	00:40	1.53	1.53	0.000
JUNCT_L-415	JUNCTION	0.00	2362.61	0	01:08	0	165	0.000	JUNCT_U-115	DIVIDER	0.00	1421.31	0	01:34	0	67.5	0.000
JUNCT_L-440A	JUNCTION	90.76	90.76	0	00:45	2.69	2.69	0.000	JUNCT_U-415	DIVIDER	0.00	632.38	0	01:13	0	24	0.000
JUNCT_L-445	JUNCTION	0.00	3289.57	0	01:11	0	210	-0.000	JUNCT_U-524	DIVIDER	0.00	104.18	0	00:44	0	1.9	0.000
JUNCT_L-425	JUNCTION	0.00	595.92	0	01:30	0	28.6	0.000	JUNCT_L-580	DIVIDER	0.00	2703.87	0	01:54	0	234	-0.000
JUNCT_L-420	JUNCTION	153.54	153.54	0	00:35	3.26	3.26	0.000	JUNCT_L-616	DIVIDER	0.00	2308.19	0	01:52	0	228	0.000
JUNCT_L-436	JUNCTION	0.00	698.56	0	00:46	0	31.8	0.000	JUNCT_L-055	DIVIDER	0.00	829.96	0	02:21	0	104	0.000
JUNCT_L-450	JUNCTION	264.42	264.42	0	00:45	7.12	7.12	0.000	JUNCT_L-065	DIVIDER	0.00	1619.70	0	00:49	0	90.9	0.000
JUNCT_L-491	JUNCTION	0.00	3369.95	0	01:14	0	214	0.000	JUNCT_L-040	DIVIDER	188.38	188.38	0	00:35	3.02	3.02	0.000
JUNCT_L-475	JUNCTION	0.00	3443.17	0	01:23	0	222	0.000	JUNCT_L-640B	DIVIDER	13.34	13.34	0	00:45	0.437	0.437	0.000
JUNCT_L-500	JUNCTION	116.00	116.00	0	00:45	3.52	3.52	0.000	JUNCT_L-460	DIVIDER	153.68	153.68	0	00:40	3.9	3.9	0.000
JUNCT_L-505	JUNCTION	0.00	2641.86	0	01:52	0	225	0.000	JUNCT_L-470	DIVIDER	161.07	161.07	0	00:35	2.85	2.85	0.000
JUNCT_L-480	JUNCTION	95.44	95.44	0	00:35	2.12	2.12	0.000	JUNCT_L-375	DIVIDER	0.00	2165.10	0	01:04	0	156	0.000
JUNCT_L-540	JUNCTION	76.96	76.96	0	00:35	1.36	1.36	0.000	JUNCT_L-090	DIVIDER	167.93	167.93	0	00:35	3.33	3.33	0.000
JUNCT_L-545	JUNCTION	0.00	2645.08	0	01:55	0	226	0.000	JUNCT_L-070	DIVIDER	165.16	165.16	0	00:35	3.08	3.08	-0.000
JUNCT_L-570	JUNCTION	87.29	87.29	0	00:40	2.4	2.4	0.000	JUNCT_L-091	DIVIDER	0.00	332.88	0	00:35	0	6.41	0.000
JUNCT_L-575	JUNCTION	0.00	2680.33	0	01:55	0	231	0.000	JUNCT_L-092	DIVIDER	0.00	330.69	0	00:36	0	6.4	0.000
JUNCT_L-555	JUNCTION	0.00	2660.56	0	01:55	0	228	0.000	JUNCT_L-151	DIVIDER	0.00	234.22	0	00:38	0	5.03	0.000
JUNCT_L-550	JUNCTION	73.43	73.43	0	00:40	2.01	2.01	0.000	JUNCT_L-430	DIVIDER	97.36	97.36	0	00:40	2.61	2.61	0.000
JUNCT_L-560	JUNCTION	65.47	65.47	0	00:40	1.63	1.63	0.000	JUNCT_L-645A	DIVIDER	0.00	90.61	0	00:40	0	2.24	0.000
JUNCT_L-520	JUNCTION	140.06	140.06	0	00:50	5	5	0.000	JUNCT-L-525	DIVIDER	0.00	2274.72	0	01:53	0	220	-0.000
JUNCT_L-610	JUNCTION	204.48	204.48	0	00:35	4.6	4.6	0.000	JUNCT_L-565	DIVIDER	0.00	2219.77	0	01:55	0	214	0.000
JUNCT_L-600	JUNCTION	118.96	118.96	0	00:35	2.52	2.52	0.000	JUNCT_L-440B	DIVIDER	134.85	134.85	0	00:40	3.24	3.24	0.000
JUNCT_L-635	JUNCTION	0.00	2368.07	0	01:46	0	235	0.000	JUNCT_L-120	DIVIDER	37.13	37.13	0	00:50	1.42	1.42	0.000
JUNCT_L-630	JUNCTION	171.13	171.13	0	00:45	4.85	4.85	0.000	JUNCT_L-655	DIVIDER	0.00	2370.13	0	01:49	0	236	0.000
JUNCT_L-645	JUNCTION	0.00	90.54	0	00:40	0	2.24	0.000	JUNCT_U-300	DIVIDER	32.03	575.92	0	00:38	0.744	11.6	0.000
JUNCT_L-640A	JUNCTION	78.11	78.11	0	00:40	1.8	1.8	0.000	JUNCT_L-706	DIVIDER	0.00	787.36	0	00:48	0	21.1	0.000
JUNCT_L-650	JUNCTION	35.31	35.31	0	00:35	0.688	0.688	0.000	JUNC_L-745	DIVIDER	0.00	258.60	0	00:40	0	5.65	0.000
JUNCT_L-665	JUNCTION	0.00	2373.04	0	01:49	0	236	0.000	JUNCT_L-705	DIVIDER	0.00	421.83	0	00:46	0	12	0.000
JUNCT_L-660	JUNCTION	17.50	17.50	0	00:40	0.433	0.433	0.000	JUNCT_L-725	DIVIDER	0.00	141.74	0	00:42	0	3.85	0.000
JUNCT_L-685	JUNCTION	0.00	2388.71	0	01:53	0	238	0.000	JUNCT_L-115	DIVIDER	0.00	846.45	0	01:26	0	112	0.000
JUNCT_L-670	JUNCTION	30.49	30.49	0	00:45	1.04	1.04	0.000	JUNCT_L-011	DIVIDER	0.00	1547.07	0	01:38	0	87.2	0.000
JUNCT_L-680	JUNCTION	43.60	43.60	0	00:50	1.57	1.57	0.000	JUNCT_U-660	DIVIDER	63.08	520.56	0	00:44	1.26	11.9	0.000
JUNCT_L-020	JUNCTION	28.58	28.58	0	00:45	0.924	0.924	0.000	JUNCT_L-485	DIVIDER	0.00	189.85	0	00:40	0	4.38	0.000
JUNCT_L-010A	JUNCTION	67.99	67.99	0	00:40	1.68	1.68	0.000	JUNCT_L-140	DIVIDER	78.93	78.93	0	00:35	1.81	1.81	0.000
JUNCT_L-755	JUNCTION	0.00	588.37	0	01:28	0	25.4	-0.000	JUNCT_U-740	DIVIDER	71.01	154.53	0	00:35	1.1	3.14	0.000
JUNCT_L-760	JUNCTION	62.30	62.30	0	00:40	1.87	1.87	0.000	JUNCT_U-730	DIVIDER	70.85	219.41	0	00:37	1.29	4.44	0.000
JUNCT_L-720	JUNCTION	79.49	79.49	0	00:45	2.32	2.32	0.000	JUNCT_U-720	DIVIDER	20.22	20.22	0	00:35	0.5	0.5	0.000
JUNCT_L-740	JUNCTION	258.60	258.60	0	00:40	5.65	5.65	0.000	JUNCT_U-710	DIVIDER	54.86	290.12	0	00:39	1.01	5.96	-0.000
JUNCT_L-700	JUNCTION	298.03	298.03	0	00:45	8.04	8.04	0.000	JUNCT_U-690	DIVIDER	31.09	31.09	0	00:40	0.837	0.837	0.000
JUNCT_L-530	JUNCTION	44.22	44.22	0	00:45	1.47	1.47	0.000	JUNCT_U-630	DIVIDER	65.62	65.62	0	00:40	1.72	1.72	0.000
JUNCT_L-180	JUNCTION	213.78	213.78	0	00:40	5.59	5.59	0.000	JUNCT_U-623	DIVIDER	0.00	593.64	0	01:14	0	20.4	0.000
JUNCT_L-150	JUNCTION	160.55	160.55	0	00:35	3.23	3.23	0.000	JUNCT_U-200	DIVIDER	39.24	1285.65	0	01:26	0.968	51.1	0.000
JUNCT_L-030	JUNCTION	74.14	74.14	0	00:35	1.39	1.39	0.000	JUNCT_U-190	DIVIDER	39.64	1295.17	0	01:28	0.945	52	0.000
JUNCT_L-050B	JUNCTION	71.57	71.57	0	00:40	1.78	1.78	0.000	JUNCT_U-180	DIVIDER	31.69	31.69	0	00:40	0.806	0.806	0.000
JUNCT_L-350B	JUNCTION	149.20	149.20	0	00:40	3.64	3.64	0.000	JUNCT_U-120	DIVIDER	53.39	53.39	0	00:35	1.11	1.11	0.000
JUNCT_U-010B	JUNCTION	38.73	38.73	0	00:40	0.941	0.941	0.000	JUNCT_U-310	DIVIDER	19.03	19.03	0	00:35	0.405	0.405	0.000
JUNCT_L-750	JUNCTION	75.70	75.70	0	00:45	2.51	2.51	0.000	JUNCT_U-340	DIVIDER	205.80	373.11	0	00:36	4.68	7.34	0.000
JUNCT_L-800	JUNCTION	190.19	190.19	0	00:35	3.24	3.24	0.000	JUNCT_U-350	DIVIDER	172.19	172.19	0	00:35	2.68	2.68	0.000
JUNCT_L-435	JUNCTION	16.81	16.81	0	00:45	0.553	0.553	0.000	JUNCT_U-420	DIVIDER	132.56	185.23	0	00:39	2.46	4.04	0.000

JUNCT_U-530	DIVIDER	70.55	70.55	0	00:35	1.57	1.57	0.000
JUNCT_U-430	DIVIDER	112.12	526.09	0	01:05	2.08	17.7	0.000
JUNCT_U-470	DIVIDER	50.87	71.91	0	00:35	0.867	1.26	0.000
JUNCT_U-480	DIVIDER	22.09	22.09	0	00:35	0.395	0.395	0.000
JUNCT_U-490	DIVIDER	37.28	140.72	0	00:35	0.847	2.33	0.000
JUNCT_U-500	DIVIDER	108.10	108.10	0	00:30	1.49	1.49	0.000
JUNCT_U-621	DIVIDER	0.00	578.18	0	01:11	0	19.5	0.000
JUNCT_U-140	DIVIDER	156.33	156.33	0	00:35	3	3	0.000
JUNCT_U-540	DIVIDER	111.23	154.18	0	00:44	2.71	4.27	0.000
JUNCT_U-130	DIVIDER	160.50	314.43	0	00:35	2.88	5.88	0.000
JUNCT_L-710	DIVIDER	63.25	63.25	0	00:40	1.53	1.53	0.000
DP_Caley	STORAGE	0.00	451.81	0	00:40	0	13.5	0.032
DP_Tommy	STORAGE	0.00	650.00	0	01:09	0	24	0.019
DP_Orchard	STORAGE	0.00	1327.73	0	01:19	0	50.3	0.026
DP_Silo	STORAGE	0.00	730.51	0	00:50	0	17.8	0.027
DP_Wallace_S	STORAGE	0.00	2143.44	0	00:48	0	104	0.004
DP_Bible	STORAGE	0.00	3443.17	0	01:23	0	222	0.008
DP_Southmoor	STORAGE	0.00	443.53	0	00:57	0	8.46	0.002
DP_Wallace_N	STORAGE	0.00	897.06	0	01:04	0	112	0.044
DP_Iliff	STORAGE	0.00	487.12	0	01:54	0	24.8	-0.000
DP_Boston_Peakview	STORAGE	0.00	113.53	0	00:40	0	3.91	0.029

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 ft3	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 ft3	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow CFS
DP_Caley	81.625	10	0	0	470.292	58	0 00:58	411.78
DP_Tommy	100.008	7	0	0	665.519	50	0 01:13	632.38
DP_Orchard	59.972	9	0	0	324.480	51	0 01:24	1274.88
DP_Silo	120.904	11	0	0	985.632	88	0 01:11	535.67
DP_Wallace_S	741.143	10	0	0	5325.387	74	0 02:21	829.96
DP_Bible	150.245	3	0	0	2454.557	43	0 01:55	2612.03
DP_Southmoor	391.858	16	0	0	864.339	35	0 01:29	137.95
DP_Wallace_N	50.497	6	0	0	308.838	34	0 01:25	846.45
DP_Iliff	2469.410	68	0	0	2886.790	79	0 03:07	150.29
DP_Boston_Peakview	58.634	34	0	0	143.263	82	0 00:54	101.24

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow CFS	Max Flow CFS	Total Volume 10^6 gal
Outfall_Goldsmith	99.19	429.39	2399.53	238.943
System	99.19	429.39	2399.53	238.943

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Link Flow Summary
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Link	Type	Maximum |Flow| CFS	Time of Max Occurrence days hr:min	Maximum |Veloc| ft/sec	Max/ Full Flow	Max/ Full Depth
155	CONDUIT	1387.81	0 01:34	4.83	0.18	0.41
215	CONDUIT	3.24	0 00:34	1.09	1.00	1.00
215-OVERFLOW	CONDUIT	1267.71	0 01:26	2.51	0.23	0.51
495	CONDUIT	114.19	0 00:30	17.62	1.08	1.00
495-OVERFLOW	CONDUIT	34.69	0 00:37	7.69	0.00	0.10
300	CONDUIT	575.88	0 00:38	16.69	0.41	0.43
125	CONDUIT	52.98	0 00:36	15.52	0.48	0.49
125-OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
626	CONDUIT	8.09	0 00:28	2.99	1.00	1.00
626-OVERFLOW	CONDUIT	581.11	0 01:17	3.62	0.35	0.65
745	CONDUIT	7.44	0 00:18	2.62	1.00	1.00
745-OVERFLOW	CONDUIT	144.43	0 00:38	3.42	0.15	0.42
400	DUMMY	649.43	0 01:19			
485	CONDUIT	21.75	0 00:36	8.41	0.15	0.26
485-OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
211	DUMMY	1327.73	0 01:19			
601	CONDUIT	1266.51	0 01:19	2.23	0.29	0.61
540_DIV	DUMMY	104.18	0 00:44			
445	CONDUIT	471.04	0 01:06	3.26	0.05	0.31
345	CONDUIT	371.73	0 00:38	7.65	0.28	0.58
345-OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
145	CONDUIT	155.30	0 00:35	9.26	0.00	0.03
145-OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00
425	CONDUIT	105.41	0 00:29	16.45	1.08	1.00
425-OVERFLOW	CONDUIT	86.99	0 00:42	12.69	0.00	0.11
775	CONDUIT	47.77	0 00:41	8.63	0.01	0.08
655	CONDUIT	416.94	0 01:09	14.69	1.26	1.00
655-OVERFLOW	CONDUIT	181.59	0 00:49	10.99	0.00	0.09
111	DUMMY	1421.31	0 01:34			
525	CONDUIT	11.28	0 01:58	7.29	1.08	1.00
525-OVERFLOW	CONDUIT	42.60	0 00:51	7.18	0.00	0.10
460	DUMMY	399.69	0 00:36			
355	CONDUIT	171.23	0 00:36	16.19	0.74	0.64
355-OVERFLOW	CONDUIT	0.00	0 00:00	0.00	0.00	0.00

645	CONDUIT	654.39	0	00:50	3.37	0.08	0.32	205	CONDUIT	23.02	0	00:32	1.29	1.00	1.00
725	CONDUIT	20.20	0	00:38	11.49	0.58	0.55	205-OVERFLOW	CONDUIT	1258.98	0	01:28	2.02	0.42	0.70
725-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00	515	CONDUIT	190.88	0	00:57	2.81	0.01	0.14
465	CONDUIT	411.61	0	01:00	4.85	0.06	0.30	625	CONDUIT	5.56	0	00:21	3.69	1.00	1.00
115	CONDUIT	115.25	0	00:27	8.26	1.00	1.00	625-OVERFLOW	CONDUIT	567.60	0	01:14	3.76	0.21	0.54
115-OVERFLOW	CONDUIT	1287.49	0	01:40	4.08	0.19	0.52	765	CONDUIT	19.66	0	00:35	2.72	0.00	0.04
635	CONDUIT	58.33	0	00:35	20.13	1.08	1.00	1080	DUMMY	86.70	0	00:35			
635-OVERFLOW	CONDUIT	11.47	0	00:41	8.59	0.00	0.04	1093	DUMMY	330.56	0	00:36			
685	CONDUIT	103.79	0	00:48	2.12	0.01	0.09	1050A	DUMMY	94.78	0	00:40			
135	CONDUIT	94.97	0	01:19	15.19	1.08	1.00	1060	DUMMY	81.01	0	00:35			
135-OVERFLOW	CONDUIT	217.09	0	00:39	14.89	0.01	0.16	1011	CONDUIT	90.22	0	00:22	6.48	1.00	1.00
415	CONDUIT	50.24	0	00:40	4.23	1.00	1.00	1065	CONDUIT	103.95	0	00:23	7.48	1.00	1.00
415-OVERFLOW	CONDUIT	572.11	0	01:19	4.08	0.32	0.57	1040	CONDUIT	44.54	0	01:13	12.64	1.08	1.00
301	DUMMY	607.15	0	00:38				1045	DUMMY	1740.93	0	00:50			
195	CONDUIT	56.65	0	00:39	2.66	1.00	1.00	1092	CONDUIT	330.56	0	00:36	15.92	0.82	0.69
195-OVERFLOW	CONDUIT	1226.97	0	01:33	3.48	0.20	0.51	1091	CONDUIT	330.69	0	00:36	15.99	0.82	0.69
411	DUMMY	632.38	0	01:13				1090	CONDUIT	167.93	0	00:35	30.07	0.61	0.56
715	CONDUIT	22.34	0	00:20	7.52	1.00	1.00	1070	CONDUIT	164.96	0	00:35	12.49	0.74	0.64
715-OVERFLOW	CONDUIT	267.54	0	00:40	5.56	0.15	0.42	1055	CONDUIT	76.83	0	00:21	5.61	1.00	1.00
535	CONDUIT	10.18	0	00:22	6.50	1.08	1.00	1055-OVERFLOW	CONDUIT	753.08	0	02:25	4.45	0.14	0.45
535-OVERFLOW	CONDUIT	57.29	0	00:44	7.01	0.00	0.11	1100	DUMMY	155.73	0	00:35			
705	CONDUIT	297.94	0	00:44	2.45	0.05	0.20	1110	DUMMY	201.28	0	00:40			
435	CONDUIT	28.93	0	00:28	2.10	1.00	1.00	1115	CONDUIT	846.44	0	01:26	13.99	0.39	0.42
435-OVERFLOW	CONDUIT	475.63	0	01:14	1.54	0.10	0.41	1120	CONDUIT	36.20	0	01:07	9.91	1.08	0.94
755	CONDUIT	41.57	0	00:35	5.00	0.00	0.04	1125	DUMMY	39.15	0	01:06			
695	CONDUIT	21.06	0	00:32	7.12	1.00	1.00	1330	DUMMY	199.73	0	00:45			
695-OVERFLOW	CONDUIT	8.95	0	00:48	4.30	0.00	0.05	1130	DUMMY	83.97	0	00:40			
505	CONDUIT	106.51	0	00:31	14.60	0.61	0.56	1145	CONDUIT	1451.28	0	00:54	2.48	0.21	0.54
505-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00	1335	CONDUIT	1435.72	0	01:02	3.49	0.11	0.42
185	CONDUIT	33.37	0	00:43	11.56	1.08	0.92	1340	DUMMY	288.92	0	00:40			
185-OVERFLOW	CONDUIT	0.54	0	00:43	4.37	0.00	0.01	1345	CONDUIT	1761.40	0	01:01	7.20	0.34	0.65
524	CONDUIT	104.18	0	00:45	19.12	0.41	0.45	1350A	DUMMY	161.77	0	00:40			
524-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00	1360	DUMMY	234.36	0	00:40			
475	CONDUIT	71.87	0	00:35	20.29	0.23	0.32	1355	CONDUIT	1876.63	0	01:03	5.01	0.37	0.68
475-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00	1370	DUMMY	171.96	0	00:40			
JUNCT_U-515	DUMMY	63.53	0	00:40				1365	CONDUIT	2047.63	0	01:04	4.39	0.34	0.66
315	CONDUIT	18.51	0	00:40	10.26	0.61	0.56	1400	DUMMY	88.93	0	00:35			
315-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00	1390	DUMMY	109.39	0	00:40			
620	DUMMY	730.51	0	00:50				1375	CONDUIT	1666.88	0	00:54	11.65	1.29	1.00
110	DUMMY	1402.69	0	01:34				1410	DUMMY	146.44	0	00:40			
410	DUMMY	650.00	0	01:09				1405	CONDUIT	2271.25	0	01:09	4.24	0.24	0.58
160	DUMMY	40.92	0	00:35				1440A	DUMMY	90.76	0	00:45			
320	CONDUIT	544.21	0	00:38	6.81	0.03	0.26	1415	CONDUIT	2345.05	0	01:14	3.36	0.56	0.79
455	CONDUIT	433.03	0	01:01	4.52	0.03	0.24	1420	DUMMY	153.54	0	00:35			
675	CONDUIT	66.56	0	00:40	2.19	0.01	0.06	1430	CONDUIT	40.28	0	00:27	8.92	1.08	1.00
600	DUMMY	624.83	0	01:16				1425	CONDUIT	592.68	0	01:34	3.36	0.09	0.38
330	DUMMY	12.92	0	00:35				1436	CONDUIT	698.34	0	00:48	4.54	0.07	0.35
151	DUMMY	1350.93	0	01:32				1440B	CONDUIT	94.96	0	01:10	11.16	1.08	1.00
170	DUMMY	43.96	0	00:45				1450	DUMMY	264.42	0	00:45			
100	DUMMY	1499.06	0	01:39				1470	CONDUIT	30.84	0	01:24	7.40	1.08	1.00
150	DUMMY	1316.56	0	01:32				1445	CONDUIT	3274.10	0	01:16	3.87	0.30	0.63
735	CONDUIT	18.80	0	00:21	6.36	1.00	1.00	1491	CONDUIT	3288.77	0	01:24	2.62	0.40	0.71
735-OVERFLOW	CONDUIT	199.39	0	00:40	4.56	0.13	0.40	1475	DUMMY	3443.17	0	01:23			
615	CONDUIT	32.78	0	00:42	4.15	0.00	0.04	1500	DUMMY	116.00	0	00:45			

1485	CONDUIT	50.53	0	00:26	7.90	1.08	1.00
1490	DUMMY	94.61	0	00:40			
1480	DUMMY	95.44	0	00:35			
1460	CONDUIT	69.68	0	01:27	8.14	1.08	1.00
1540	DUMMY	76.96	0	00:35			
1505	CONDUIT	2641.52	0	01:55	5.18	0.29	0.61
1545	CONDUIT	2644.99	0	01:56	3.80	0.45	0.72
1555	CONDUIT	2660.45	0	01:56	4.45	0.36	0.67
1570	CONDUIT	86.83	0	00:42	5.12	0.00	0.04
1575	CONDUIT	2680.28	0	01:56	5.68	0.57	0.80
1580	CONDUIT	2216.72	0	01:55	4.22	0.84	0.93
1560	DUMMY	65.47	0	00:40			
1550	DUMMY	73.43	0	00:40			
1565	CONDUIT	647.78	0	06:45	4.98	1.29	1.00
1590	DUMMY	140.06	0	00:50			
1610	DUMMY	204.48	0	00:35			
1600	DUMMY	118.96	0	00:35			
1595	CONDUIT	1485.70	0	01:13	17.38	1.32	1.00
1630	DUMMY	171.13	0	00:45			
1645	DUMMY	90.54	0	00:40			
1640A	DUMMY	78.11	0	00:40			
1645A	CONDUIT	90.54	0	00:40	2.70	0.80	0.70
1640B	CONDUIT	13.30	0	00:46	2.98	0.80	0.70
1616-OVERFLOW	CONDUIT	2210.83	0	01:56	3.96	0.09	0.39
1616	CONDUIT	97.22	0	00:25	5.45	1.00	1.00
1635	CONDUIT	2367.89	0	01:49	3.52	0.18	0.51
1650	DUMMY	35.31	0	00:35			
1660	DUMMY	17.50	0	00:40			
1655	CONDUIT	601.69	0	07:02	11.88	1.22	1.00
1680	DUMMY	43.60	0	00:50			
1670	DUMMY	30.49	0	00:45			
1685	DUMMY	2388.71	0	01:53			
1665	CONDUIT	2372.02	0	01:54	6.13	0.53	0.77
1020	DUMMY	28.58	0	00:45			
1010A	DUMMY	67.99	0	00:40			
1065-OVERFLOW	CONDUIT	1513.21	0	00:51	5.68	0.21	0.53
1040-OVERFLOW	CONDUIT	144.48	0	00:36	15.10	0.01	0.17
1640B-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1485-OVERFLOW	CONDUIT	142.79	0	00:40	7.00	0.01	0.16
1460-OVERFLOW	CONDUIT	78.02	0	00:53	6.83	0.01	0.16
1470-OVERFLOW	CONDUIT	114.59	0	00:45	7.34	0.01	0.18
1375-OVERFLOW	CONDUIT	868.22	0	01:06	9.44	0.26	0.60
1090-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1070-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1091-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1092-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1430-OVERFLOW	CONDUIT	59.82	0	00:41	4.23	0.00	0.12
1645A-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1595-OVERFLOW	CONDUIT	1152.71	0	01:55	13.11	0.01	0.19
1565-OVERFLOW	CONDUIT	1718.38	0	01:56	3.43	0.05	0.33
1440B-OVERFLOW	CONDUIT	39.25	0	00:50	11.95	0.00	0.09
1120-OVERFLOW	CONDUIT	3.03	0	01:06	6.49	0.00	0.03
1655-OVERFLOW	CONDUIT	1876.06	0	01:49	8.30	0.05	0.33
1115-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
300-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1755	CONDUIT	565.97	0	01:32	4.01	0.07	0.34
1760	DUMMY	62.30	0	00:40			
1706	CONDUIT	421.86	0	00:35	16.50	1.08	1.00
1706-OVERFLOW	CONDUIT	372.70	0	00:57	15.43	0.01	0.18
1745	CONDUIT	55.50	0	01:39	8.01	1.08	1.00
1745-OVERFLOW	CONDUIT	183.29	0	00:51	10.87	0.01	0.19
1705	CONDUIT	213.56	0	01:30	14.87	1.08	1.00
1705-OVERFLOW	CONDUIT	222.40	0	00:51	12.82	0.01	0.18
1725	CONDUIT	95.48	0	01:18	11.16	1.08	1.00
1725_OVERFLOW	CONDUIT	48.10	0	00:53	11.40	0.00	0.10
1720	DUMMY	79.49	0	00:45			
1700	DUMMY	298.03	0	00:45			
1740	DUMMY	258.60	0	00:40			
1011-OVERFLOW	CONDUIT	1452.39	0	01:41	5.58	0.33	0.63
1530	DUMMY	44.22	0	00:45			
1710	CONDUIT	62.71	0	00:42	5.85	0.75	0.64
1150	DUMMY	160.55	0	00:35			
1140	CONDUIT	78.23	0	00:41	11.22	0.82	0.69
1180	CONDUIT	213.25	0	00:41	6.18	0.00	0.13
1152	CONDUIT	233.80	0	00:40	17.54	0.75	0.65
1030	CONDUIT	69.16	0	00:41	6.48	0.00	0.07
1050B	DUMMY	71.57	0	00:40			
1350B	DUMMY	149.20	0	00:40			
1010B	CONDUIT	38.66	0	00:40	13.50	0.61	0.57
1750	DUMMY	75.70	0	00:45			
1800	DUMMY	190.19	0	00:35			
1435	DUMMY	16.81	0	00:45			
Iliff_Div	DUMMY	487.12	0	01:54			
1152-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
1140-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
TREX_OUT	DUMMY	446.78	0	00:41			
540	CONDUIT	50.20	0	01:38	10.52	0.75	0.64
1710-OVERFLOW	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
OUTLET_Caley	DUMMY	411.78	0	00:59			
OUTLET_Tommy	DUMMY	632.38	0	01:13			
OUTLET_Orchard	DUMMY	1274.88	0	01:24			
OUTLET_Silo	DUMMY	535.67	0	01:11			
OUTLET_Wallace_S	DUMMY	829.96	0	02:21			
OUTLET_BiblePark	DUMMY	2612.03	0	01:55			
OUTLET_Southmoor	DUMMY	137.95	0	01:29			
OUTLET_Wallace_N	DUMMY	846.45	0	01:26			
Iliff_OUTLET	DUMMY	150.29	0	03:07			
OUTLET_Peakview	DUMMY	101.24	0	00:54			

****
Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited

215	8.15	8.15	8.15	8.17	8.15
495	0.25	0.25	0.25	0.26	0.25
626	5.27	5.27	5.27	5.26	5.27
745	2.00	2.00	2.00	1.97	2.00
425	0.68	0.68	0.68	0.69	0.68
655	0.55	0.55	0.55	0.57	0.55
525	1.56	1.56	1.56	1.61	1.56
115	5.26	5.26	5.26	0.01	5.26
635	0.42	0.42	0.42	0.06	0.42
135	0.88	0.88	0.88	0.04	0.88
415	4.65	4.65	4.65	4.62	4.65
195	5.59	5.59	5.59	5.51	5.59
715	1.86	1.86	1.86	1.85	1.86
535	1.40	1.40	1.40	1.44	1.40
435	3.08	3.08	3.08	0.01	3.08
695	0.67	0.67	0.67	0.65	0.67
185	0.12	0.12	0.12	0.11	0.12
735	1.80	1.80	1.80	0.01	1.80
205	6.27	6.27	6.27	6.23	6.27
625	5.29	5.29	5.29	5.24	5.29
1011	5.81	5.81	5.81	0.01	5.81
1065	5.80	5.80	5.80	5.78	5.80
1040	0.84	0.84	0.84	0.86	0.84
1055	6.07	6.07	6.07	0.01	6.07
1120	0.47	0.47	0.47	0.47	0.47
1375	1.07	1.07	1.07	1.09	1.07
1430	1.07	1.07	1.07	0.02	1.07
1440B	0.62	0.62	0.62	0.64	0.62
1470	1.00	1.00	1.00	1.02	1.00
1485	1.15	1.15	1.15	1.17	1.15
1460	0.95	0.95	0.95	0.99	0.95
1565	6.10	6.10	6.10	6.10	6.10
1595	2.25	2.25	2.25	0.23	2.25
1616	8.08	8.08	8.08	8.06	8.08
1655	6.44	6.44	6.44	6.44	6.44
1706	0.93	0.93	0.93	0.95	0.93
1745	1.19	1.19	1.19	1.23	1.19
1705	0.97	0.97	0.97	0.99	0.97
1725	0.74	0.74	0.74	0.09	0.74

Analysis begun on: Tue Dec 04 08:25:47 2018
Analysis ended on: Tue Dec 04 08:25:49 2018
Total elapsed time: 00:00:02

Table B-7 Crossing Structure Table from City & County of Denver

MDP Station	GIS Structure Number	Location	Description	Primary Use	Year Built	Category: Major or Minor Structure	Total Length (ft)	Total Width (ft)	Structure NBI (1 worst; 9 best)	Comments from Bridge Group	Baseline Hydrology Report Capacity
	D-11-GG-003	Monaco Pkwy and Cherry Creek South Dr.	Cherry Creek Trail over Outfall	Pedestrian	2007	MINOR	--	--	8		
	D-11-GG-005	Monaco Pkwy and Cherry Creek South Dr.	Cherry Creek South Drive over Outfall	Vehicular	1995	MAJOR	26	72	7		
	D-11-GG-008	Monaco Pkwy and Cherry Creek South Dr.	Cherry Creek Trail over Goldsmith Gulch	Pedestrian	2007	MINOR	--	--	8		
	D-11-GG-010A	Monaco Pkwy and Cherry Creek South Dr.	Cherry Creek South Drive over Goldsmith Gulch	Vehicular	1960	MAJOR	44.8	66.5	5		
	D-11-GG-020A	Monaco Pkwy and Florida Ave	Cook Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	2004	MINOR	24	10.8	8		
	D-11-GG-030A	Monaco Pkwy and Iowa Ave	Cook Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	2004	MINOR	34	10.8	7		
	D-11-GG-040	Monaco Pkwy and Mexico Ave	Mexico Avenue over Goldsmith Gulch	Vehicular	1966	MAJOR	33	60.7	7		
	D-11-GG-050A	Monaco Pkwy and Colorado Dr	Monaco Parkway (North) over Goldsmith Gulch	Vehicular	1965	MAJOR	44.5	126.5	5		
	D-11-GG-070	Monaco Pkwy and Jewell Ave	Jewell Avenue over Goldsmith Gulch	Vehicular	1972	MAJOR	33.1	52.3	6		
	D-11-GG-075	Monaco Pkwy and Jewell Ave	Monaco Parkway over Outfall	Vehicular	1996	MAJOR	28.5	106.3	7	Functionally Obsolete	
	D-11-GG-080	Monaco Pkwy and Evans Ave	Monaco Parkway (South) over Goldsmith Gulch	Vehicular	1966	MAJOR	44.5	197	5		
	D-11-GG-090	Monaco Pkwy and Iliff Ave	Iliff Avenue over Goldsmith Gulch	Vehicular	1971	MAJOR	30.5	77	6		
	D-11-GG-095	Dickenson Pl and Newport St	Pedestrian Bridge over Goldsmith Gulch	Pedestrian	2000	MINOR	13.8	10.5	7		
	D-11-GG-100A	Yale Ave and Oneida St	Yale Avenue over Goldsmith Gulch	Vehicular	1995	MAJOR	26.5	109.9	6		
	D-11-GG-110	Quebec St and Amherst Ave	Bible Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	1996	MINOR	--	--	7		
	D-11-GG-120A	Cornell Ave and Quebec St	Cornell Avenue over Goldsmith Gulch	Vehicular	1971	MAJOR	71	186	6		
	D-11-GG-130	Eastman Ave and Tamarac Dr	Eastman Avenue over Goldsmith Gulch	Vehicular	1978	MAJOR	48	70.3	6		
	D-11-GG-132	Oneida Way and Pontiac St	Hutchinson Park Pedestrian Walkway over Wetlands	Pedestrian	2002	MINOR	--	--	7		
	D-11-GG-133	Pontiac St and Eastman Ave	Hutchinson Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	2004	MINOR	150	6	6		
	D-11-GG-135	Pontiac St and Eastman Ave	Eastman Avenue over Tributary	Vehicular	1998	MINOR	7	70	7		

MDP Station	GIS Structure Number	Location	Description	Primary Use	Year Built	Category: Major or Minor Structure	Total Length (ft)	Total Width (ft)	Structure NBI (1 worst; 9 best)	Comments from Bridge Group	Baseline Hydrology Report Capacity
	D-11-GG-170A	Rosemary Way and Tamarac Dr	Rosemary Way over Goldsmith Gulch	Vehicular	1985	MAJOR	33.7	57.5	6		
	D-11-GG-180A	Princeton Ave and Tamarac Dr	Princeton Avenue over Goldsmith Gulch	Vehicular	1985	MAJOR	33.5	63.3	6		
	D-11-GG-183	Tamarac Dr.and Oxford Dr	Rosamund Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	1972	MINOR	20	6.8	7		
	D-11-GG-185	Tamarac Dr.and Oxford Dr	Rosamund Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	1972	MINOR	30	6.8	7		
	D-11-GG-190	Quincy Ave and Tamarac Dr	Quincy Avenue over Goldsmith Gulch	Vehicular	1972	MAJOR	29.9	120.8	6		
	D-11-GG-195	Union Ave and DTC Blvd	Union Avenue over Goldsmith Gulch	Vehicular	1985	MINOR	24	198.9	7		
	D-11-GG-196	Union Ave and DTC Blvd	DTC Boulevard over Outfall	Vehicular	1983	MINOR	22	250	6		
	D-11-GG-200	Belleview Ave and DTC Blvd	Belleview Avenue over Goldsmith Gulch	Vehicular	1986	MAJOR	63.7	128.3	6	Functionally Obsolete	
	D-11-GG-205	Wabash St and Layton Ave	Wallace Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	1990	MINOR	--	--	8		
	D-11-GG-210	Wabash St and Layton Ave	Wallace Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	1990	MINOR	--	--	4		
	D-11-GG-215	Wabash St and Monmouth Pl	Wallace Park Pedestrian Bridge over Goldsmith Gulch	Pedestrian	1990	MINOR	--	--	5		

Appendix C – Hydraulic Analysis

Typical Manning's n

Goldsmith Gulch Station 2+00 (Approx.)
Channel 0.035; Overbank 0.04 to 0.07

Goldsmith Gulch Station 75+00 (Approx.)
Channel 0.035; Overbank 0.04 to 0.15 (tall grass to dense residential)

Goldsmith Gulch Station 261+00 (Approx.)
Concrete Channel 0.02; Overbank 0.03 (mowed short grass)

Goldsmith Gulch Station 18+80 (Approx.)
Channel 0.035; Overbank 0.1 to 0.15

Goldsmith Gulch Station 139+00 (Approx.)
Channel 0.035; Overbank 0.04 to 0.1

Goldsmith Gulch Station 294+00 (Approx.)
Channel 0.1; Overbank 0.1 to 0.15

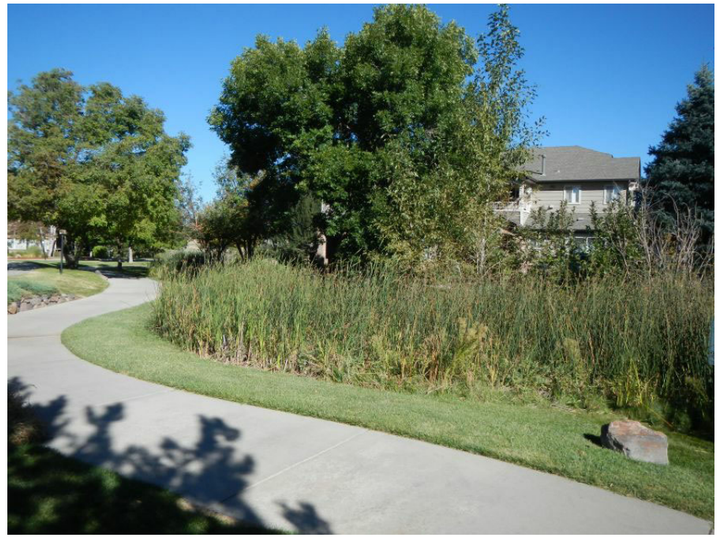
Goldsmith Gulch West Tributary Station 8+90 (Approx.)
Channel 0.035; Overbank 0.05 to 0.07

Goldsmith Gulch West Tributary Station 27+30 (Approx.)
Channel 0.03; Overbank 0.035 to 0.05

Goldsmith Gulch West Tributary Station 53+00 (Approx.)
Channel 0.1; Overbank 0.02 to 0.04

Goldsmith Gulch West Tributary Station 21+00 (Approx.)
Channel 0.02; Overbank 0.035 (mowed lawn few trees)

Goldsmith Gulch West Tributary Station 34+60 (Approx.)
Channel 0.045; Overbank 0.05 to 0.15



Goldsmith Gulch West Tributary Station 55+60 (Approx.)
Channel 0.06; Overbank 0.02 to 0.04

Existing Structure Inventory

E. Cherry Creek South Dr.
Goldsmith Gulch River Station 1+20

E. Mexico Avenue
Goldsmith Gulch River Station 17+50

Pedestrian Bridge (Skyline Acre Club)
Goldsmith Gulch River Station 30+65

Pedestrian Bridge at Cook Park
Goldsmith Gulch River Station 4+50

Monaco St Pkwy Culvert (Skyline Acre Club)
Goldsmith Gulch River Station 26+55

Jewell Avenue & Monaco St Pkwy Culvert
Goldsmith Gulch River Station 34+50

Pedestrian Bridge at Cook Park
Goldsmith Gulch River Station 9+70

Pedestrian Bridge (Skyline Acre Club)
Goldsmith Gulch River Station 28+25

Iliff Avenue Culvert
Goldsmith Gulch River Station 63+60

Pedestrian Bridge
Goldsmith Gulch River Station 70+15

E. Cornell Avenue
Goldsmith Gulch River Station 126+15

Pedestrian Bridge
Goldsmith Gulch River Station 142+10

E. Yale Avenue
Goldsmith Gulch River Station 93+70

Pedestrian Bridge (Hutchinson Park)
Goldsmith Gulch River Station 135+90

Pedestrian Bridge
Goldsmith Gulch River Station 143+85

Pedestrian Bridge
Goldsmith Gulch River Station 101+15

E. Eastman Avenue
Goldsmith Gulch River Station 140+00

Pedestrian Bridge
Goldsmith Gulch River Station 147+85

E. Hampden Avenue (Downstream End)
Goldsmith Gulch River Station 153+85

S Rosemary Way
Goldsmith Gulch River Station 171+00

Pedestrian Bridge
Goldsmith Gulch River Station 202+65

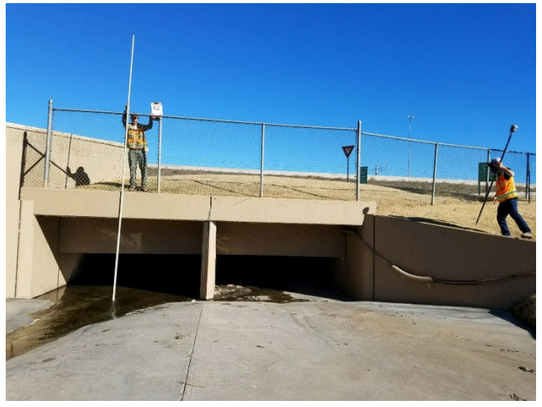
Special Inlet Structure (Tiffany Plaza)
Goldsmith Gulch River Station 154+60

E Princeton Avenue
Goldsmith Gulch River Station 194+50

E Quincy Avenue
Goldsmith Gulch River Station 212+55

Tiffany Plaza Culvert
Goldsmith Gulch River Station 161+00

Pedestrian Bridge
Goldsmith Gulch River Station 101+15



I-25 (North Wallace Park Detention)
Goldsmith Gulch River Station 226+50

E Temple Drive (South Wallace Park Detention)
Goldsmith Gulch River Station 239+85

Low Flow Culverts (South Wallace Park Detention)
Goldsmith Gulch River Station 260+80

E Prentice Avenue
Goldsmith Gulch River Station 284+75

Footbridge (Wallace Park)
Goldsmith Gulch River Station 242+50

E Belleview Avenue
Goldsmith Gulch River Station 268+90

Pedestrian Bridge
Goldsmith Gulch River Station 286+50

Footbridge (Wallace Park)
Goldsmith Gulch River Station 245+70

E Crescent Pkwy
Goldsmith Gulch River Station 273+20

S Yosemite Street
Goldsmith Gulch River Station 294+60

Pedestrian Crossing Culvert
Goldsmith Gulch River Station 298+35

Orchard Hill Detention
Goldsmith Gulch River Station 313+90

E Orchard Road
Goldsmith Gulch River Station 335+20

Pedestrian Bridge
Goldsmith Gulch River Station 300+00

Pedestrian Bridge
Goldsmith Gulch River Station 320+50

Pedestrian Bridge
Goldsmith Gulch River Station 336+60

E Berry Avenue
Goldsmith Gulch River Station 305+10

Pedestrian Bridge
Goldsmith Gulch River Station 327+10

Pedestrian Bridge
Goldsmith Gulch River Station 341+70

Arapahoe Lake Downstream Pipe
Goldsmith Gulch River Station 353+20

E Caley Avenue
Goldsmith Gulch River Station 367+80

Pedestrian Bridge
Goldsmith Gulch River Station 375+20

Pedestrian Bridge
Goldsmith Gulch River Station 358+65

Pedestrian Bridge
Goldsmith Gulch River Station 369+05

E Peakview Avenue
Goldsmith Gulch River Station 383+40

Pedestrian Bridge
Goldsmith Gulch River Station 362+85

Pedestrian Crossing Culvert
Goldsmith Gulch River Station 371+55

E Arapahoe Avenue (Beyond upstream study limit)
Goldsmith Gulch River Station 395+90

Pedestrian Crossing Culverts
Goldsmith Gulch West Tributary River Station 0+75

E Orchard Avenue
Goldsmith Gulch West Tributary River Station 14+00

Pedestrian Bridge
Goldsmith Gulch West Tributary River Station 27+22

Pedestrian Bridge
Goldsmith Gulch West Tributary River Station 7+00

Tommy Davis Park Detention
Goldsmith Gulch West Tributary River Station 15+10

E Fair Avenue
Goldsmith Gulch West Tributary River Station 34+95

Pedestrian Bridge
Goldsmith Gulch West Tributary River Station 12+65

Pedestrian Bridge
Goldsmith Gulch West Tributary River Station 21+28

Gate Pedestrian Bridge
Goldsmith Gulch West Tributary River Station 37+00

Pedestrian Bridge
Goldsmith Gulch West Tributary River Station 39+50

Private Road (Bridgewater Apartment)
Goldsmith Gulch West Tributary River Station 53+35

E. Eastman Avenue
Southmoor Tributary River Station 15+40

E Caley Avenue
Goldsmith Gulch West Tributary River Station 45+25

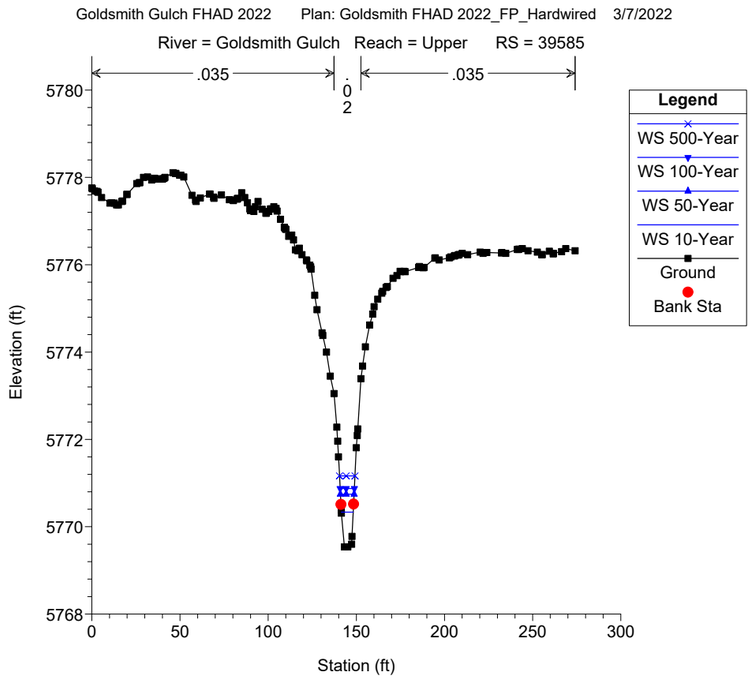
S Boston Street (Peakview-Boston Detention)
Goldsmith Gulch West Tributary River Station 62+20

E. Hamilton Pl/S Poplar Street
Southmoor Tributary River Station 21+00

E Caley Way
Goldsmith Gulch West Tributary River Station 50+05

HEC-RAS Sections

Goldsmith Gulch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.035
.02
.035
Legend
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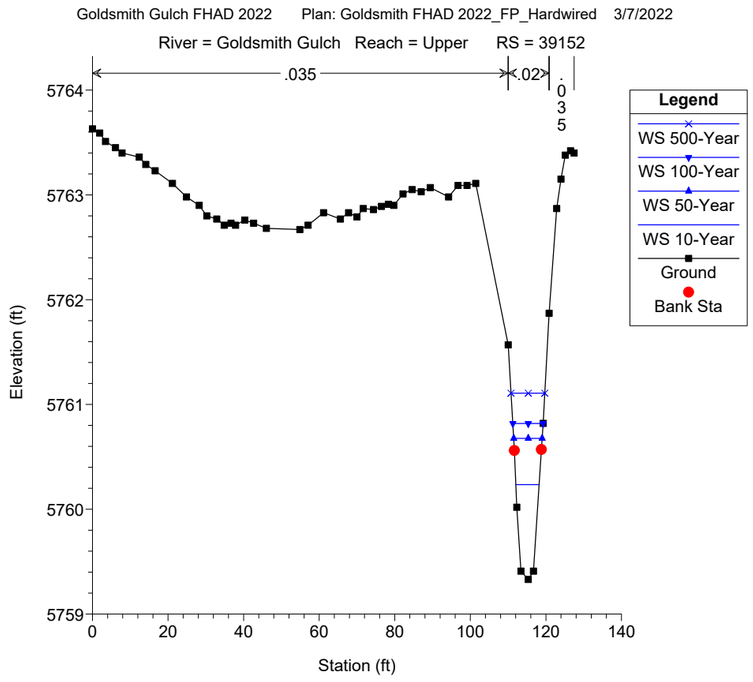
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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.02
.035
Legend
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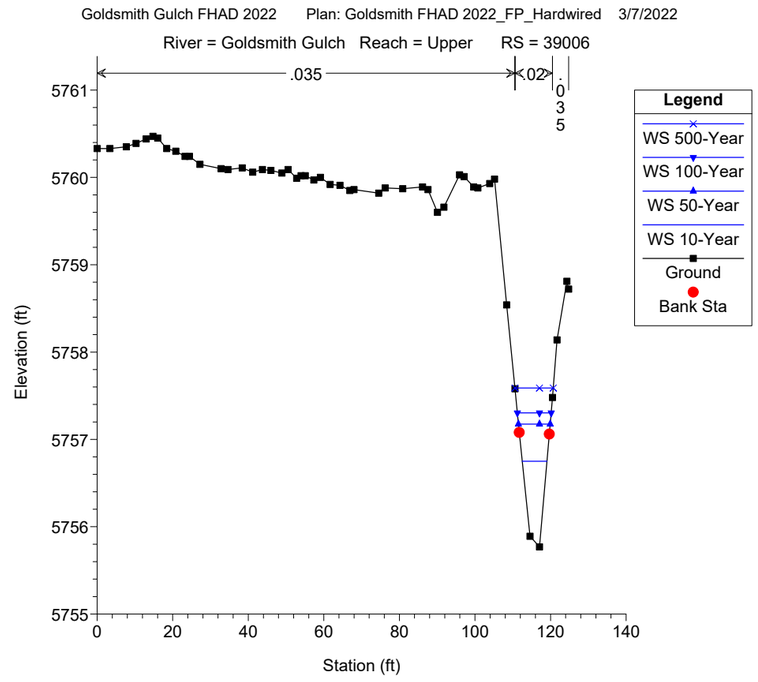
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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.035
.02
.035
Legend
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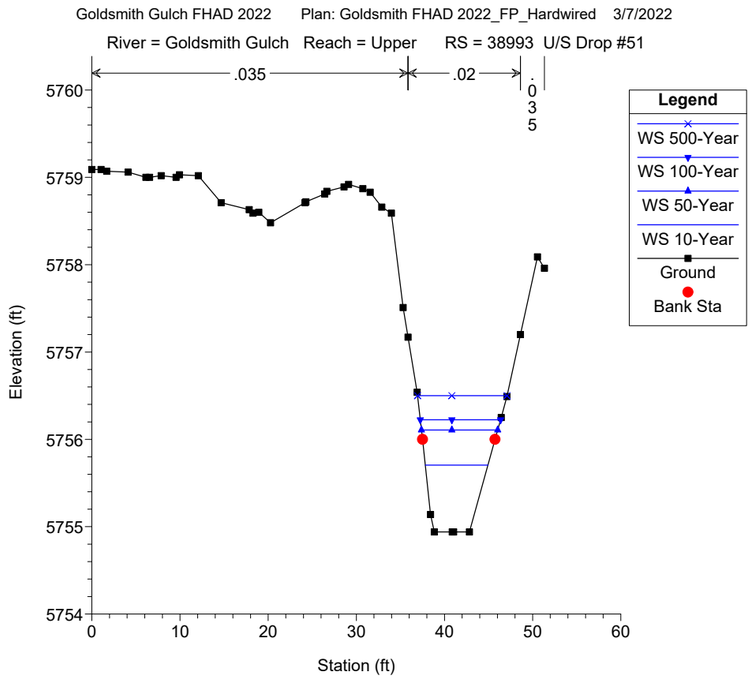
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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.02
.035
Legend
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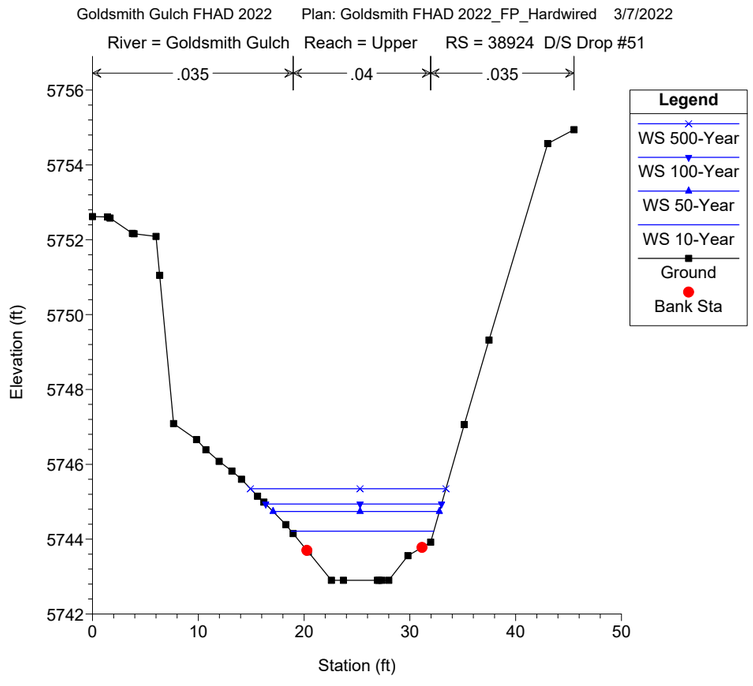
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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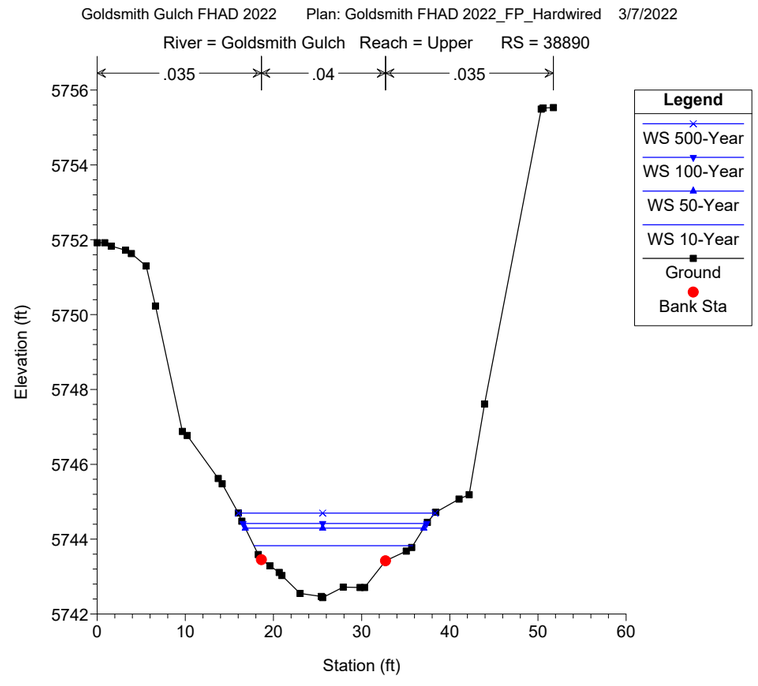
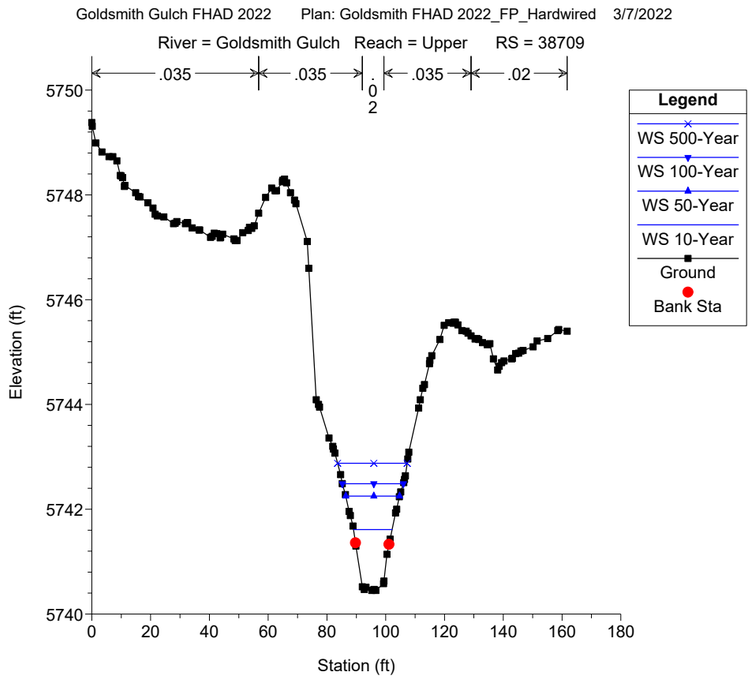
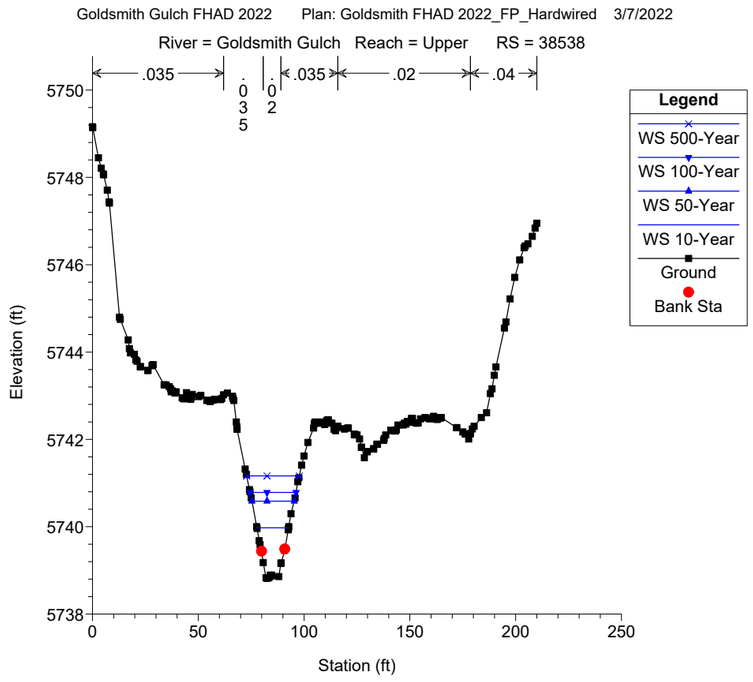
.035
.04
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38890
.035
.04
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38709
.035
.035
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38538
.035
.035
.02
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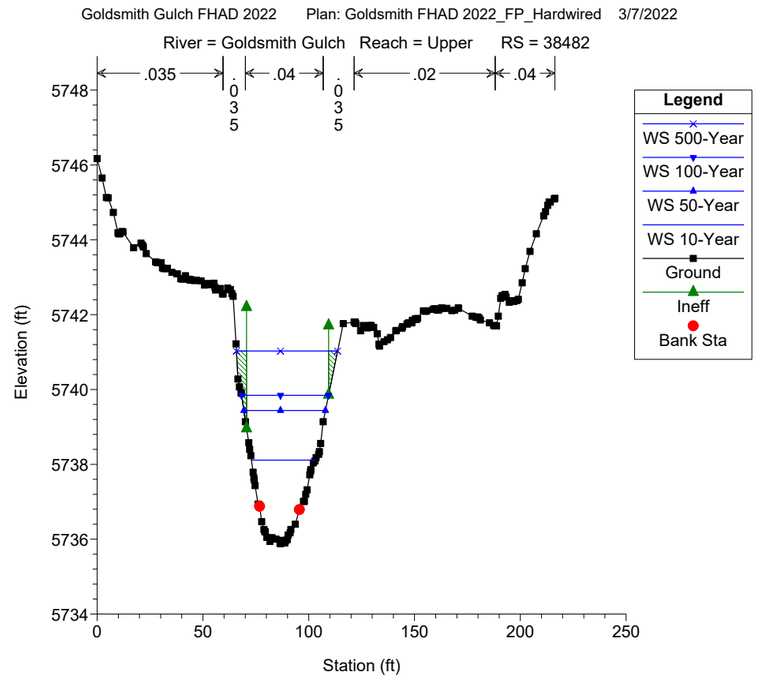
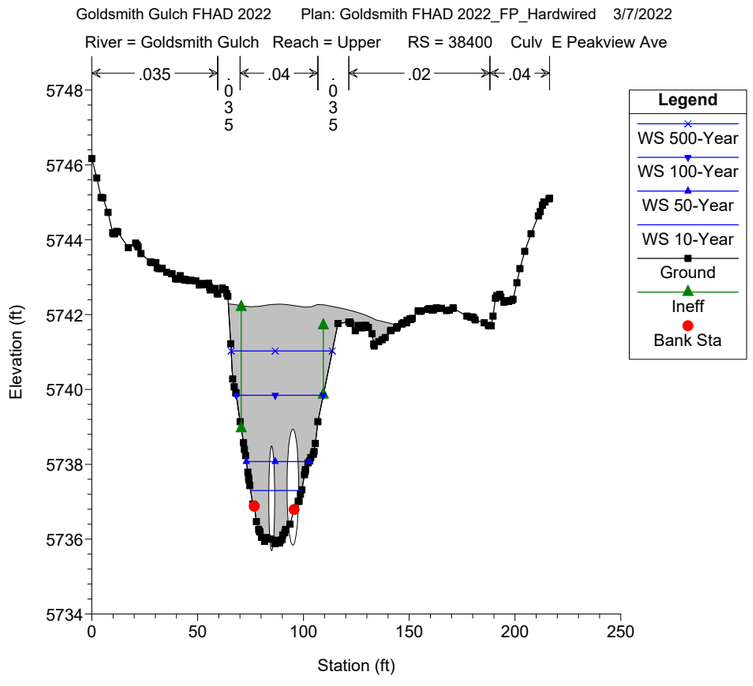
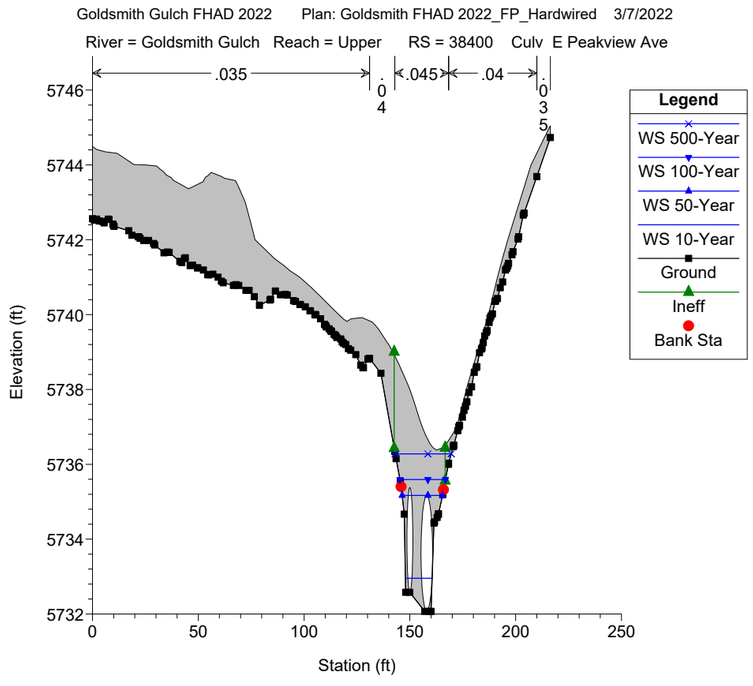
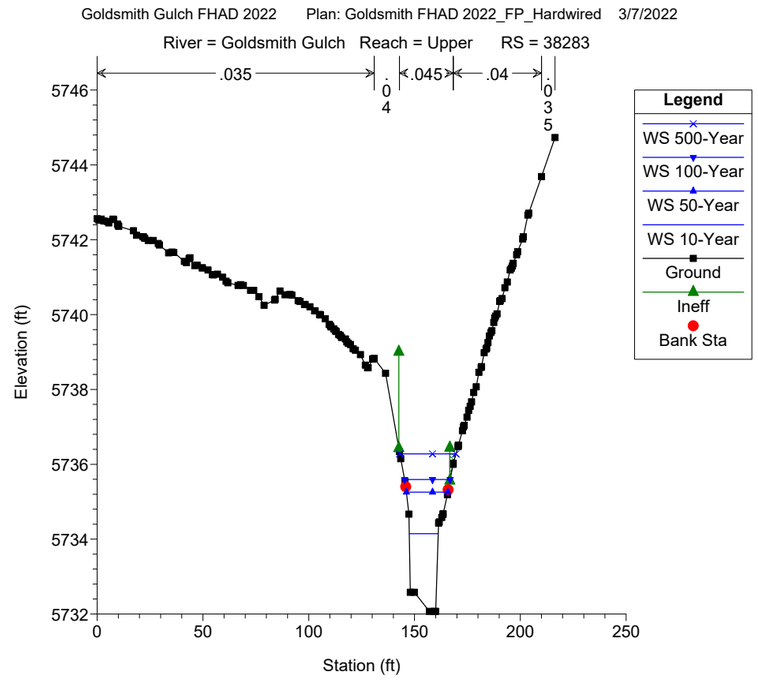
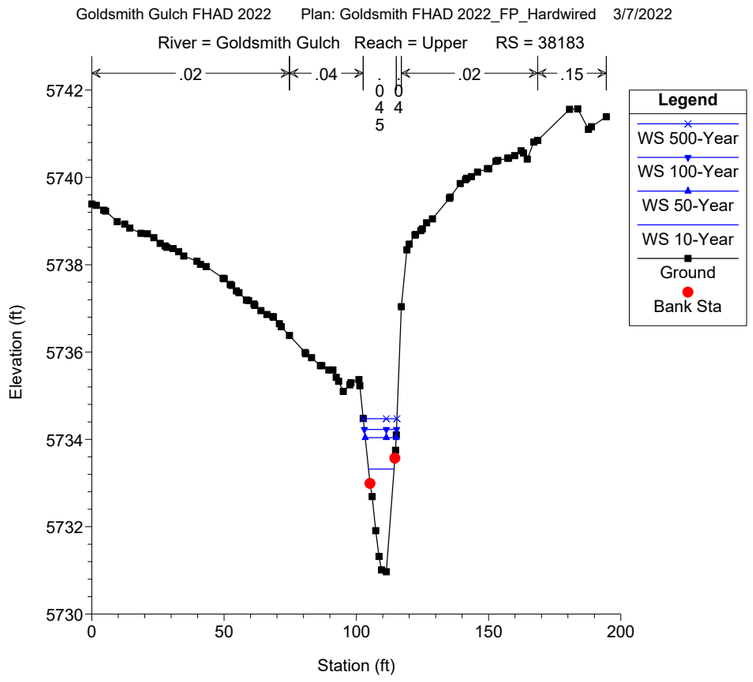
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38482
.035
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38400 Culv E Peakview Ave
.035
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38400 Culv E Peakview Ave
.035
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38283
.035
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38183
.02
.04
.045
.04
.02
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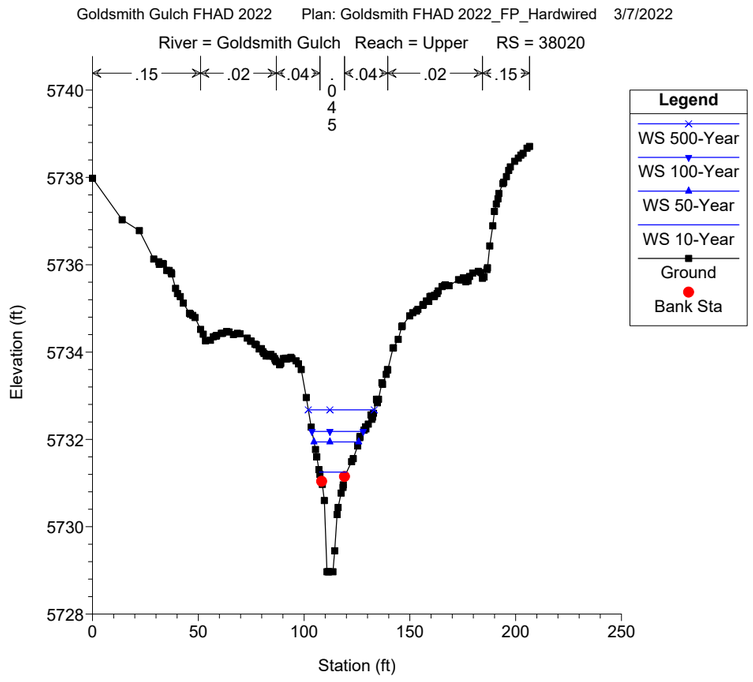
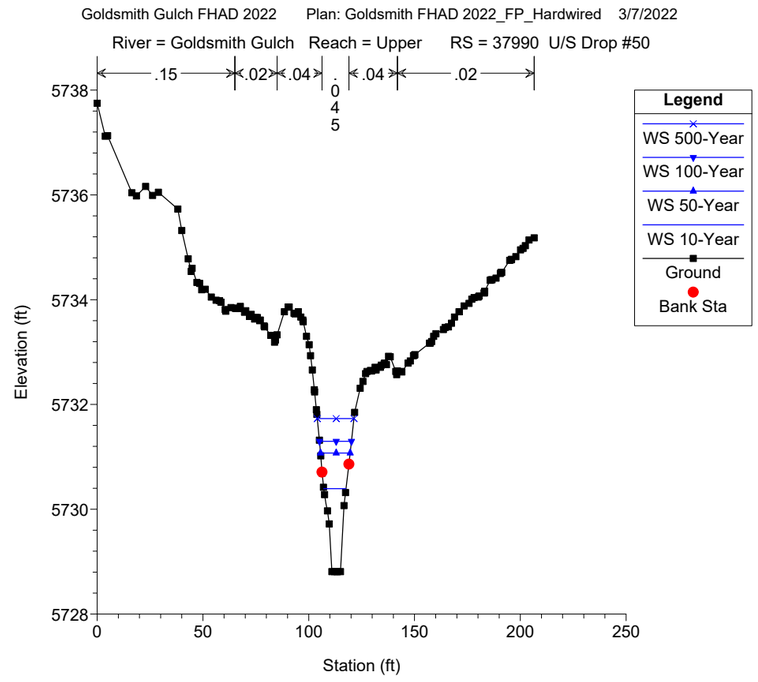
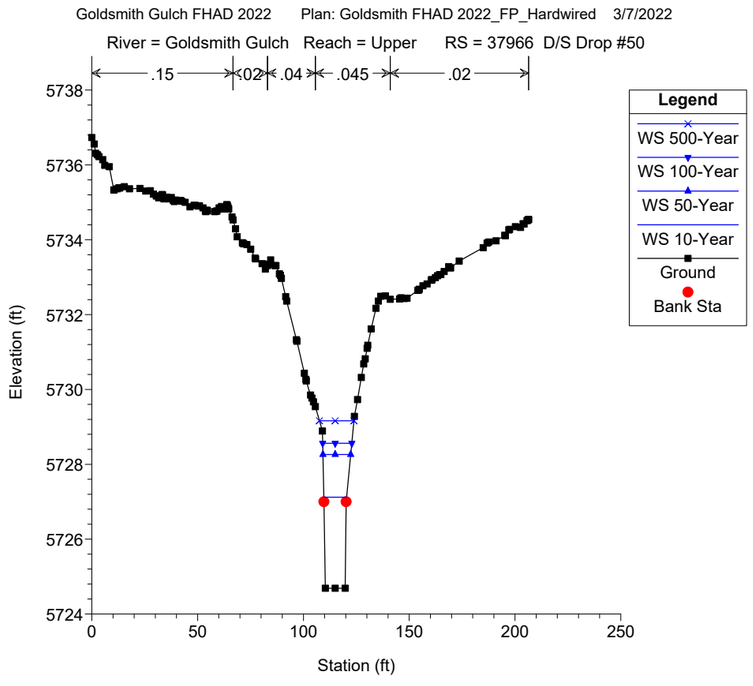
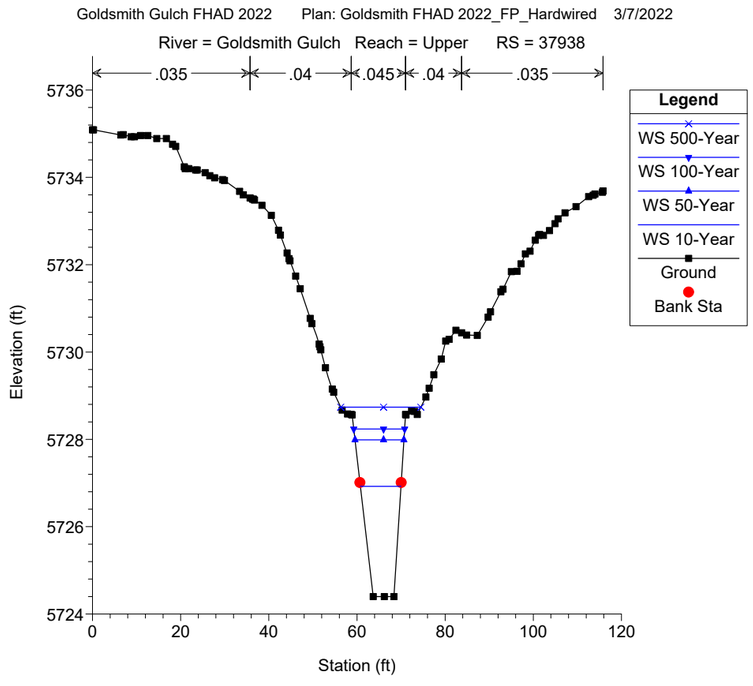
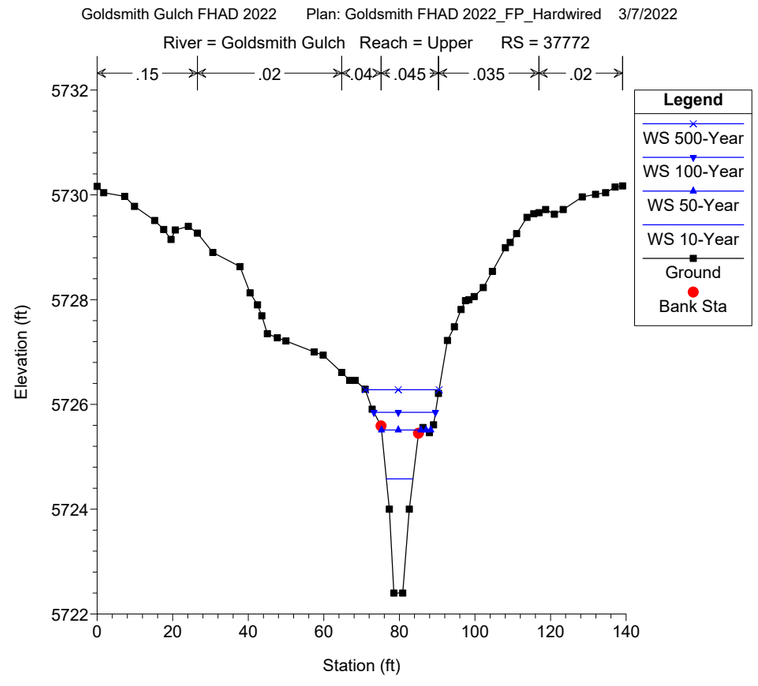
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

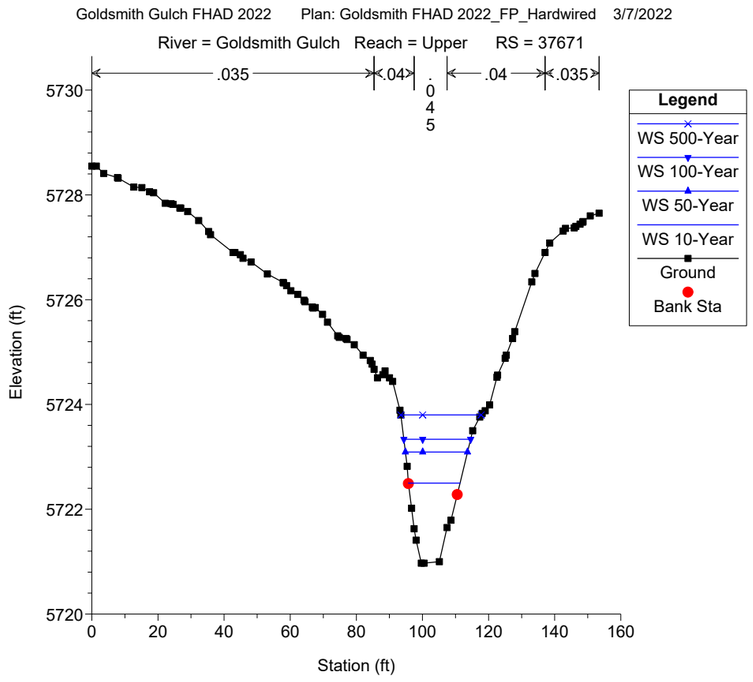

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 38020
.15
.02
.04
.045
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

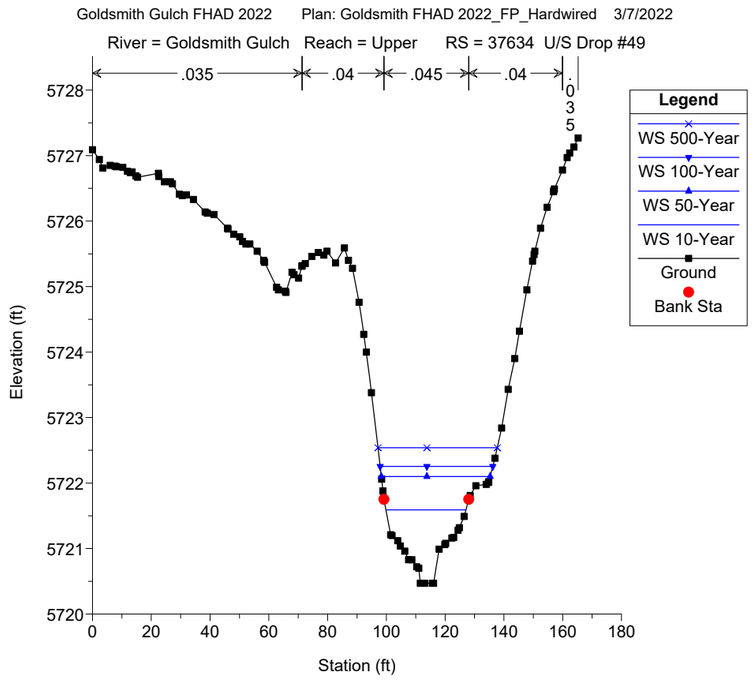

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37990 U/S Drop #50
.15
.02
.04
.045
.04
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

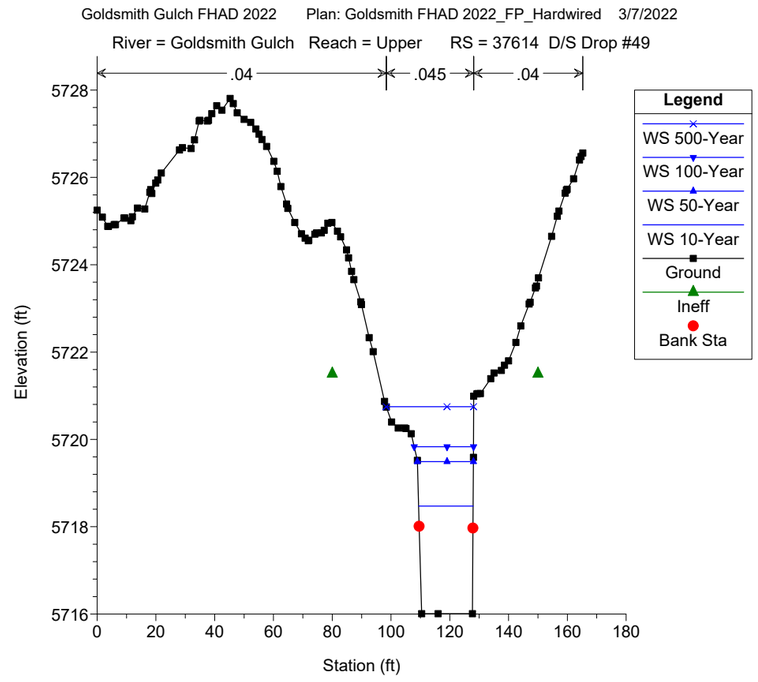

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37966 D/S Drop #50
.15
.02
.04
.045
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

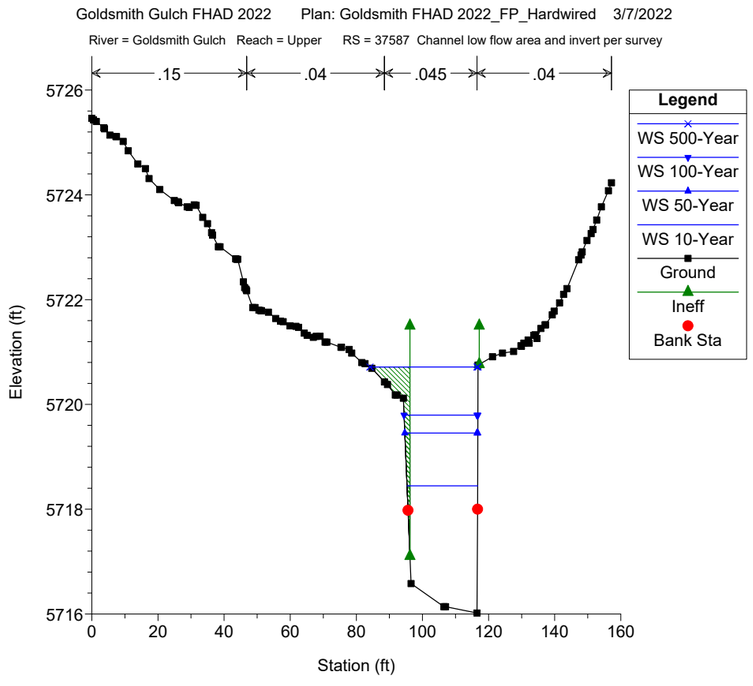

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37938
.035
.04
.045
.04
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

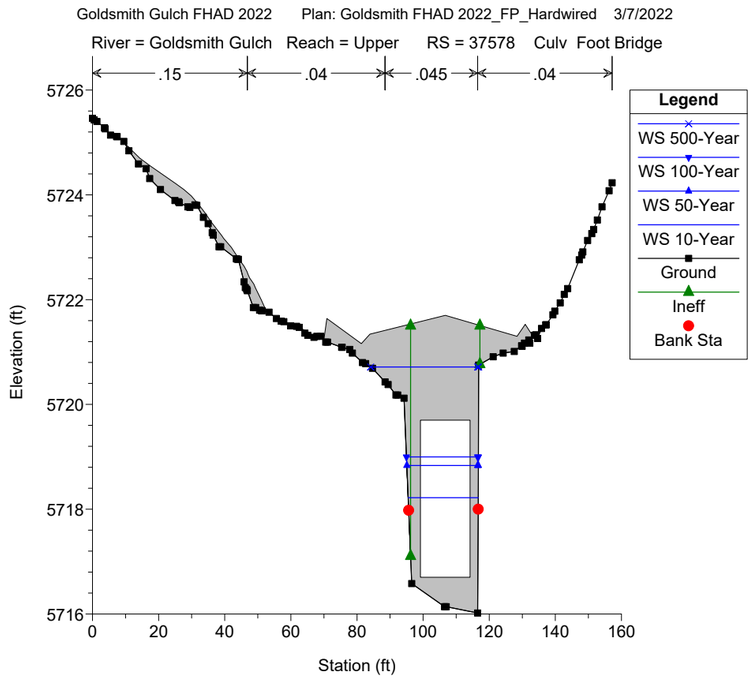

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37772
.15
.02
.04
.045
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

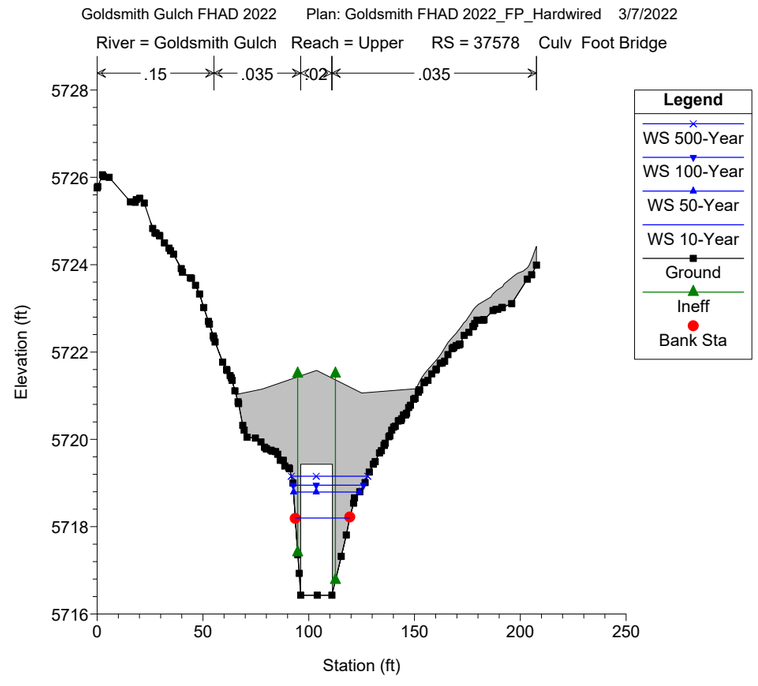

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37671
.035
.04
.045
.04
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

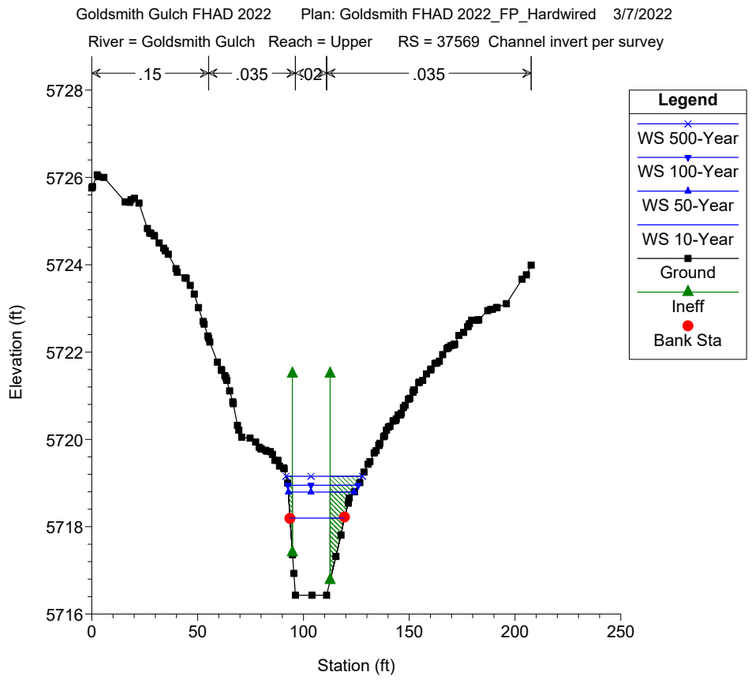

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37634 U/S Drop #49
.035
.04
.045
.04
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37614 D/S Drop #49
.04
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37587 Channel low flow area and invert per survey
.15
.04
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37578 Culv Foot Bridge
.15
.04
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37578 Culv Foot Bridge
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37569 Channel invert per survey
.15
.035
.02
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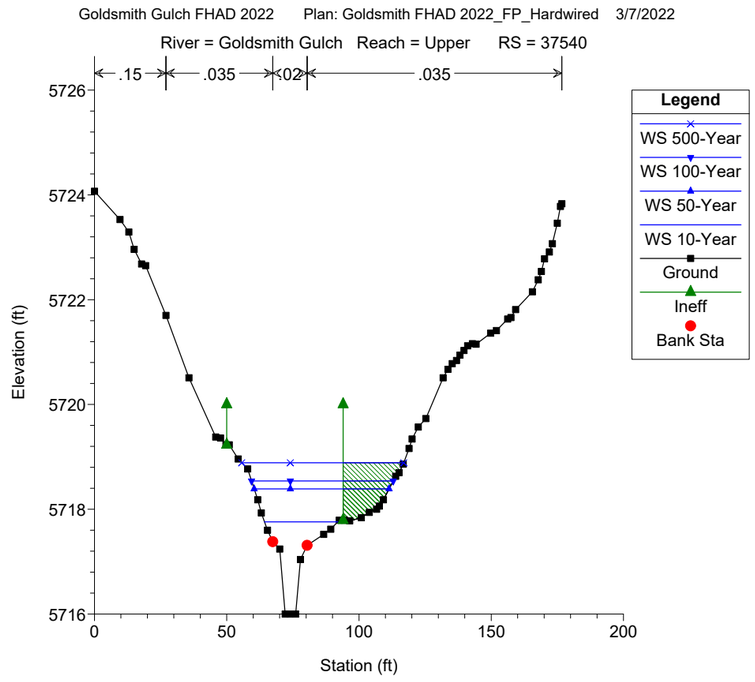
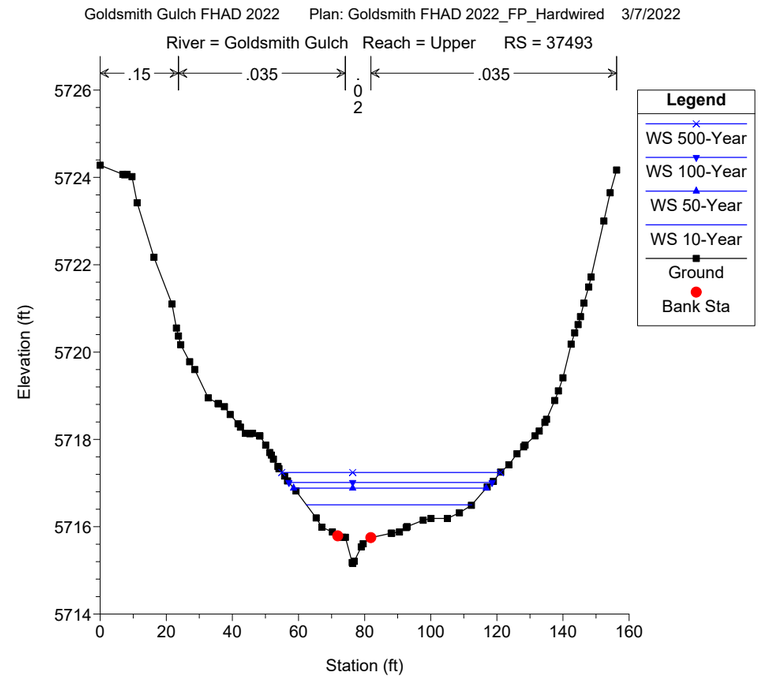
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37540
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37493
.15
.035
.02
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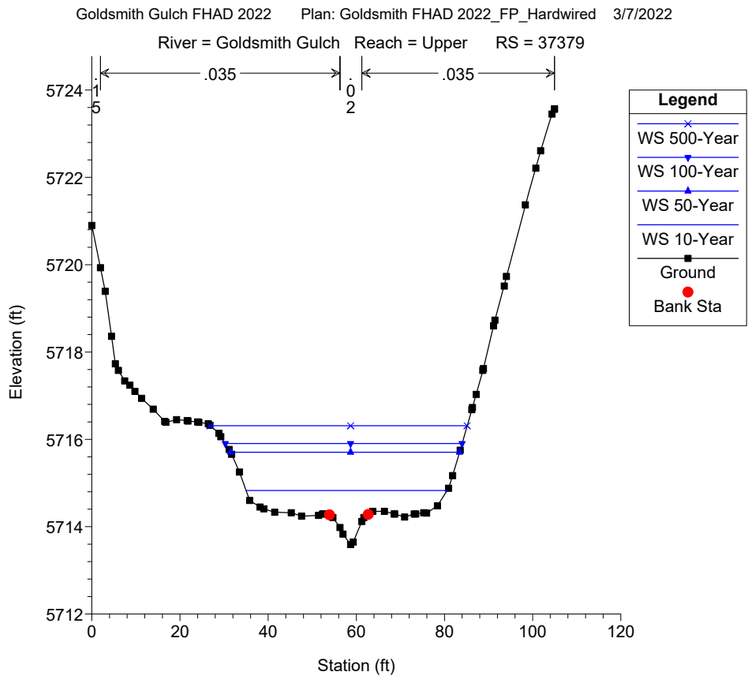
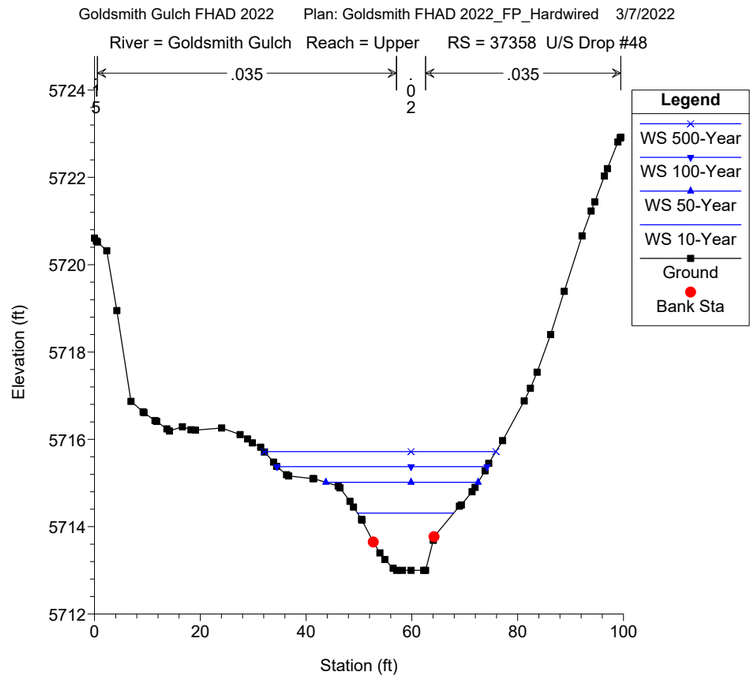
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37379
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37358 U/S Drop #48
.15
.035
.02
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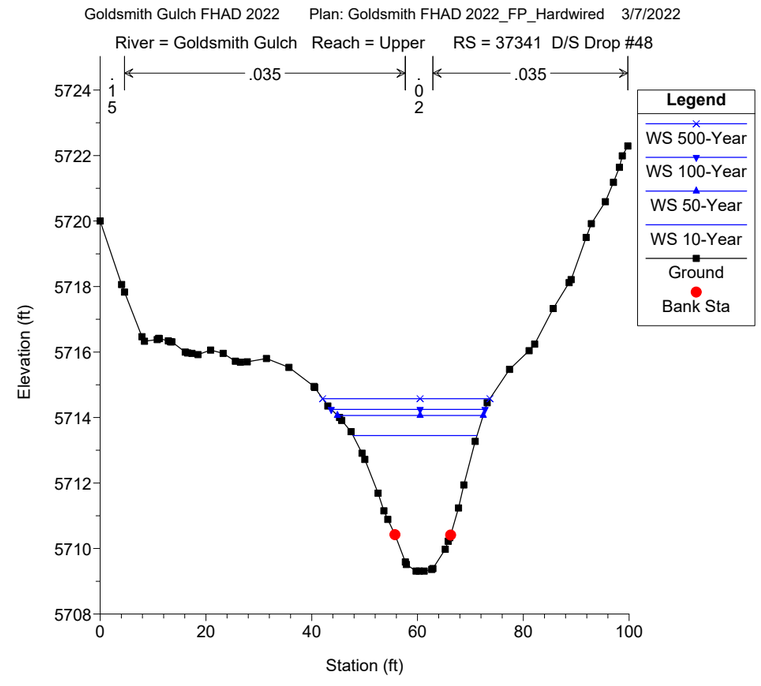
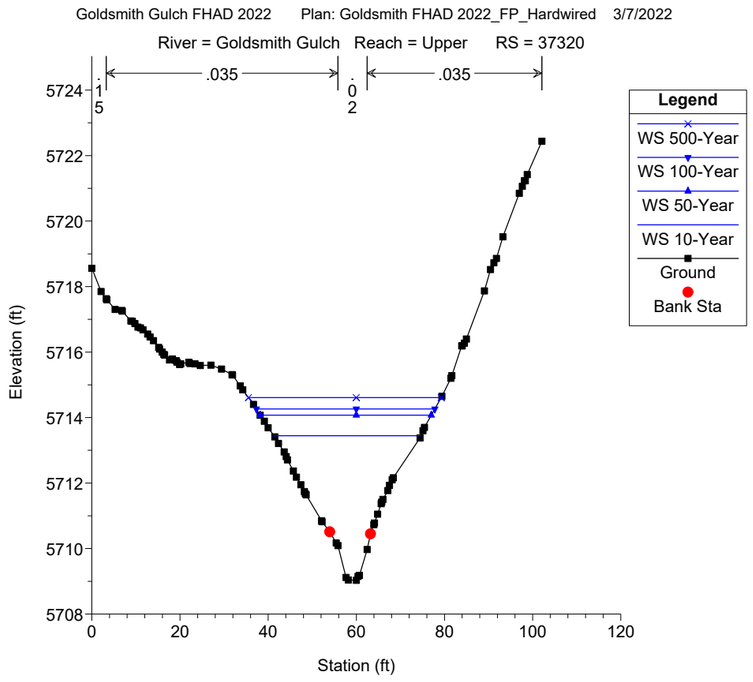
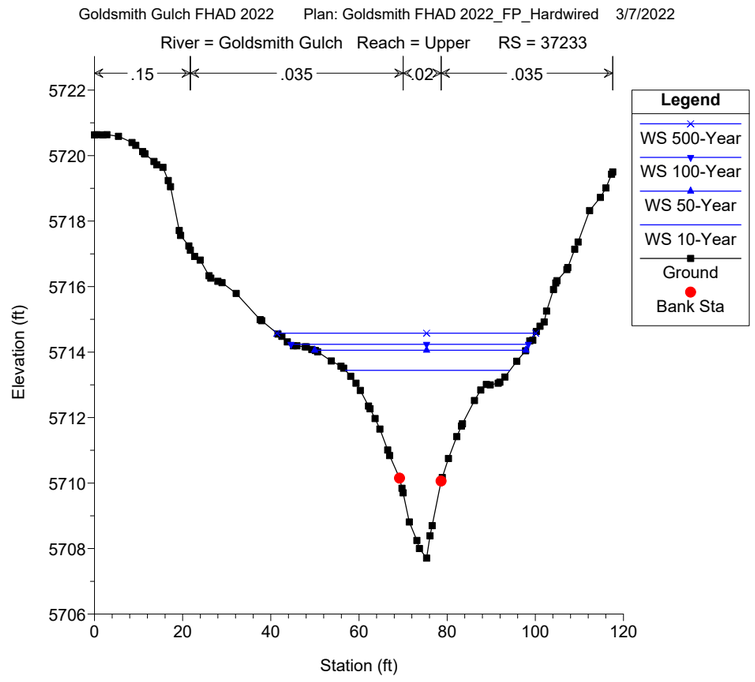
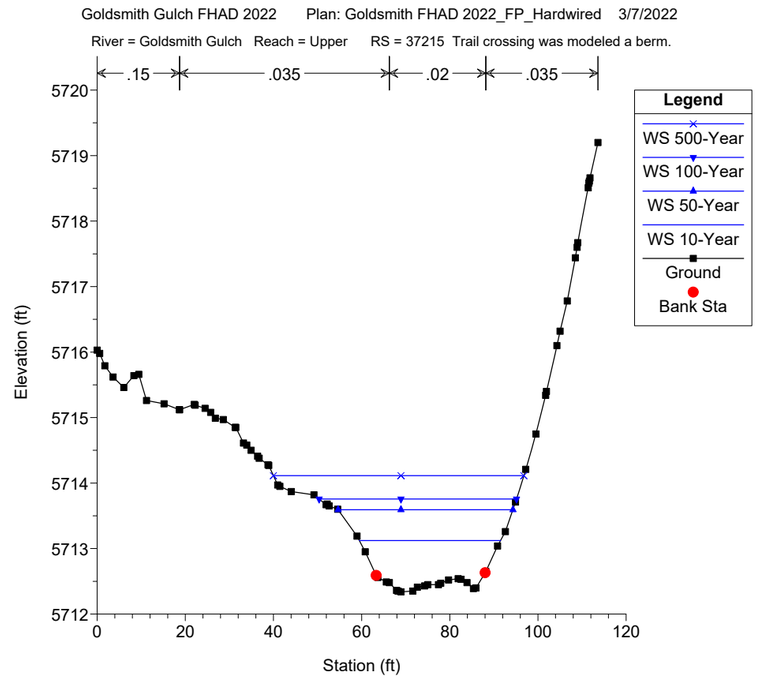
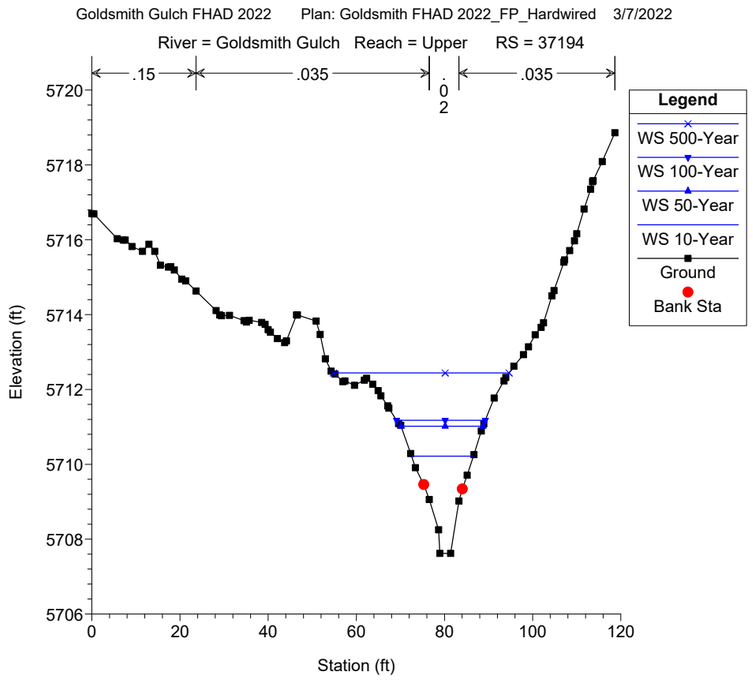
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

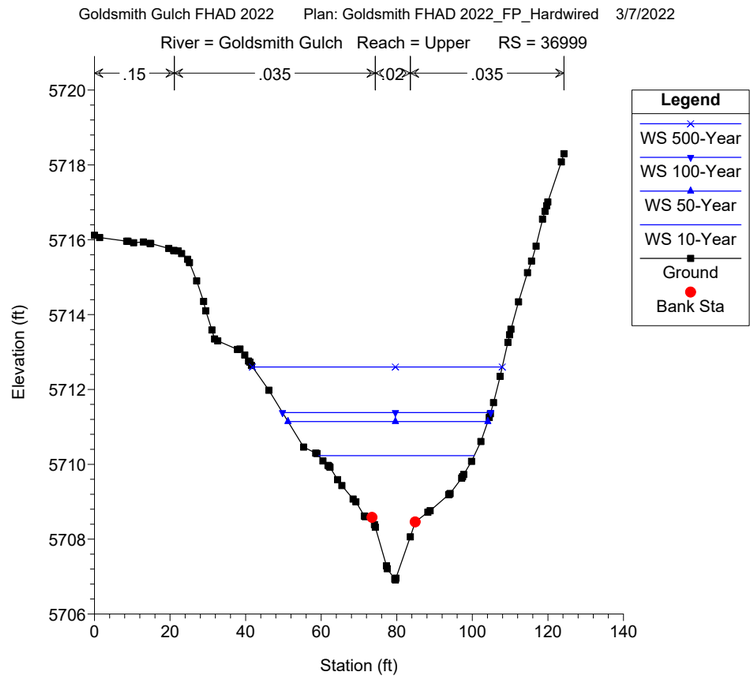

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37341 D/S Drop #48
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

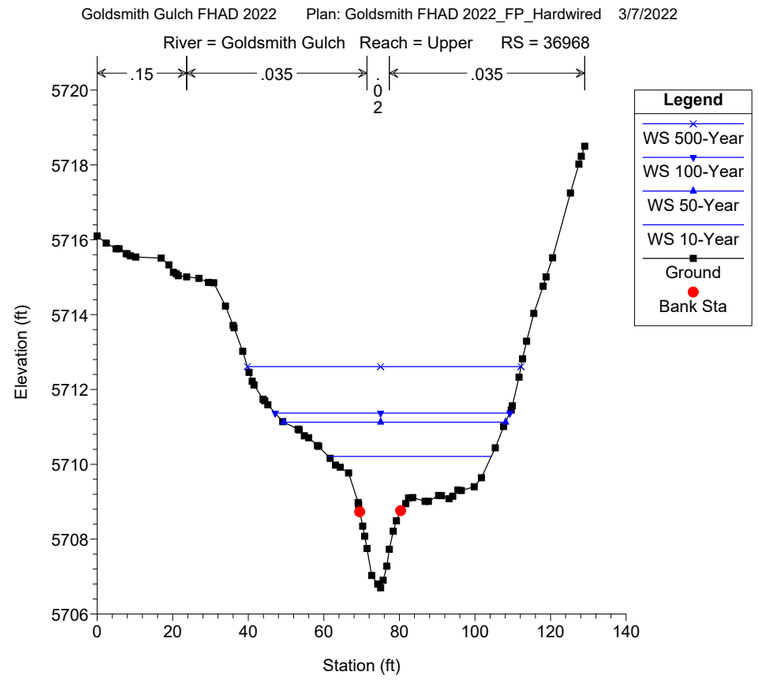

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37320
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

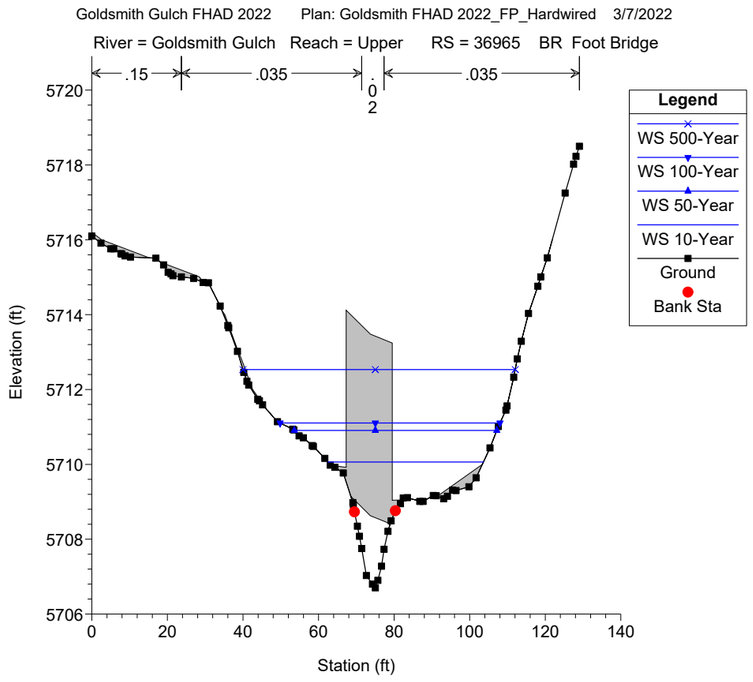

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37233
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

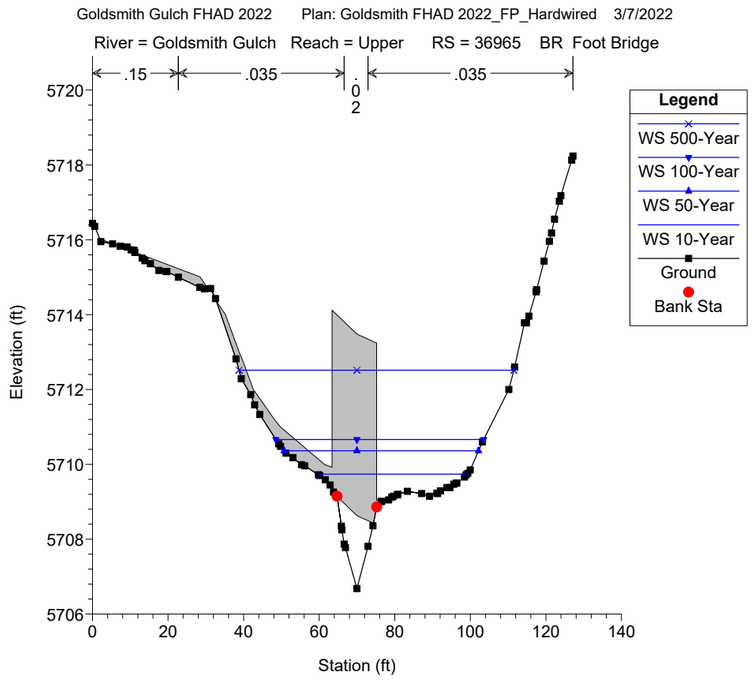

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37215 Trail crossing was modeled a berm.
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

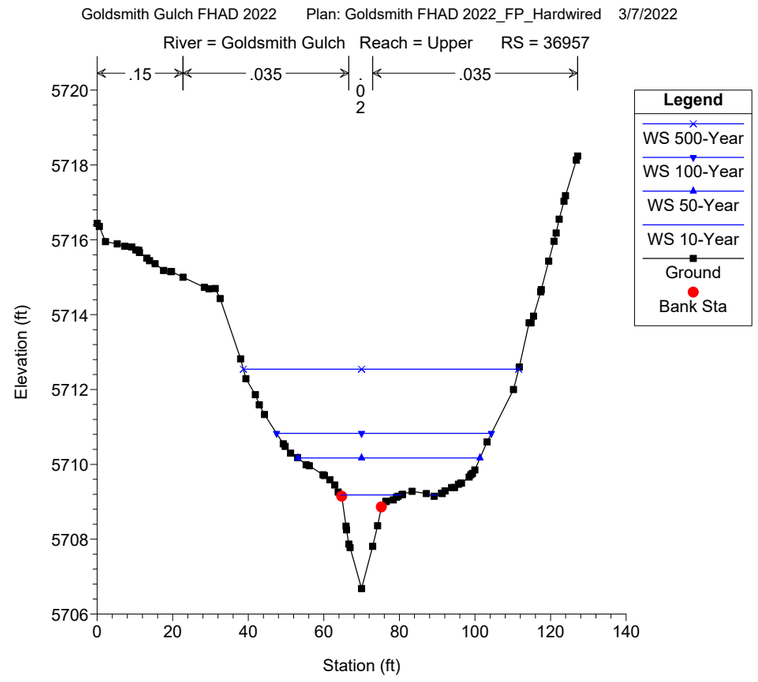

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 37194
.15
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

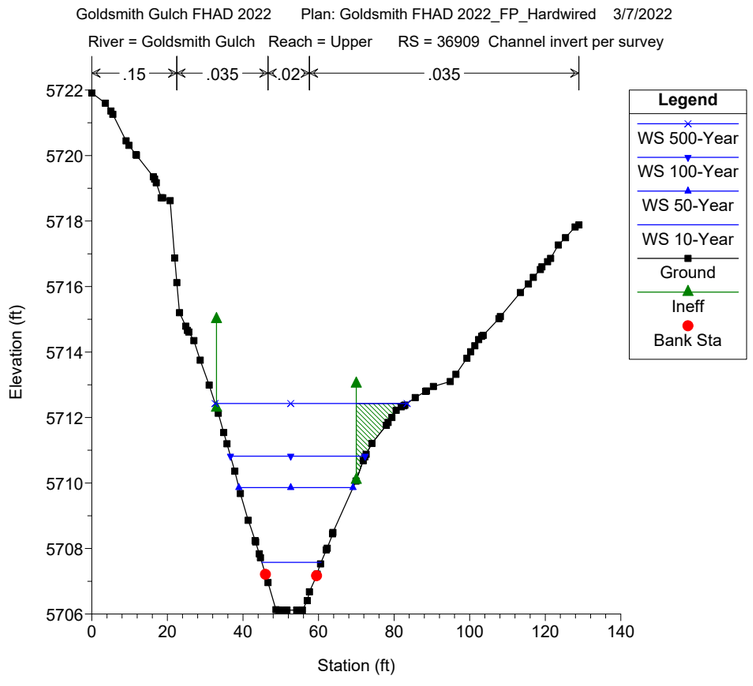

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36999
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

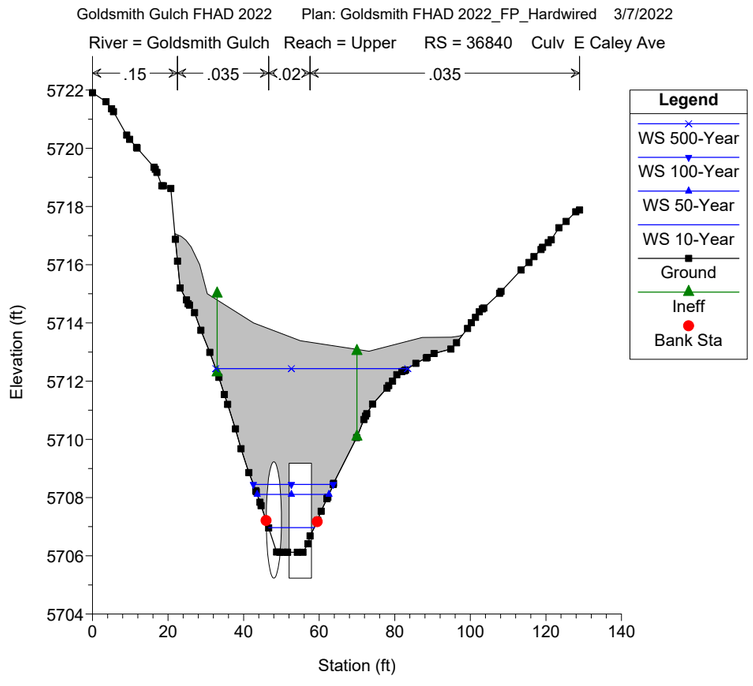

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36968
.15
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

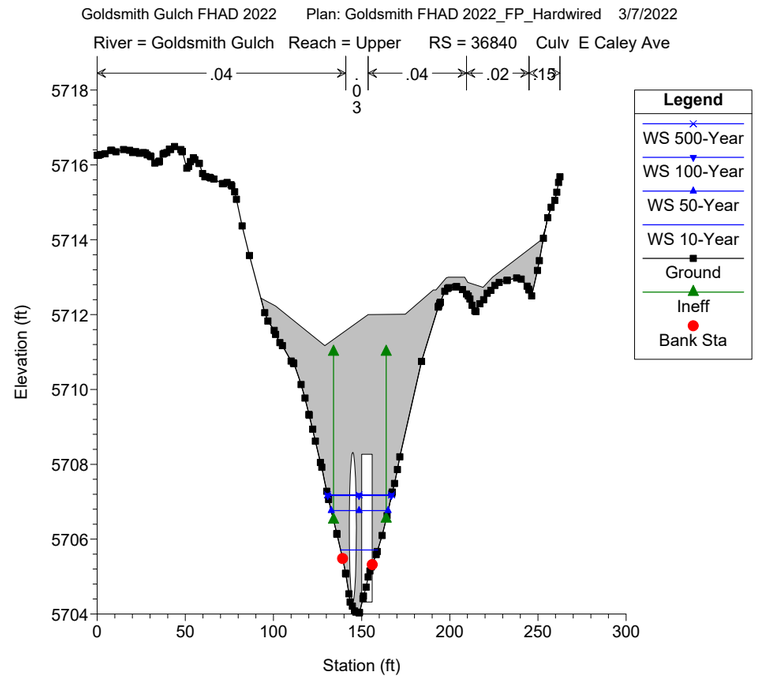

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36965 BR Foot Bridge
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

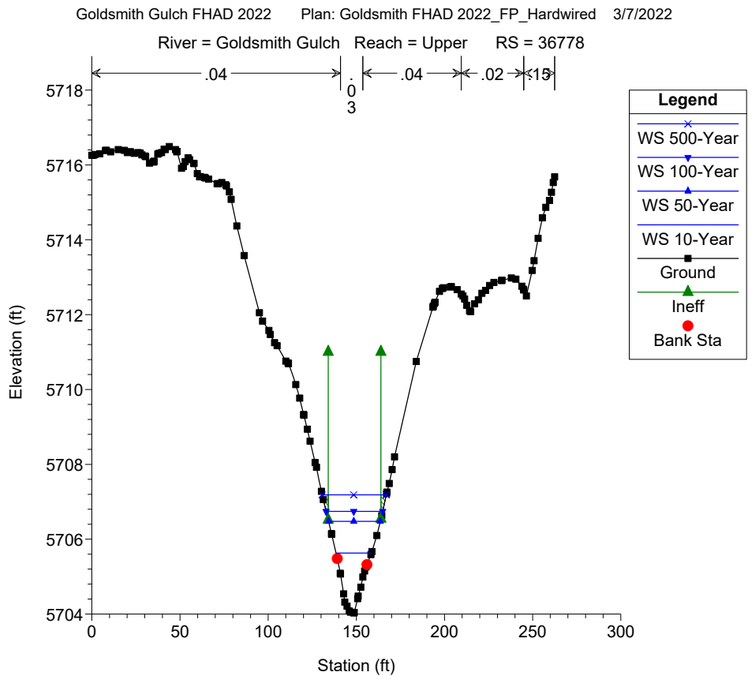

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36965 BR Foot Bridge
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

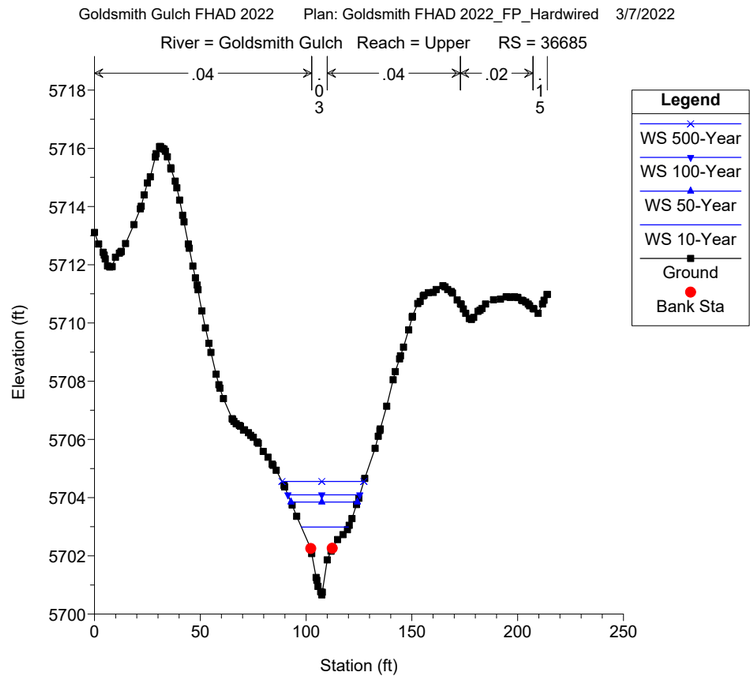

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36957
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

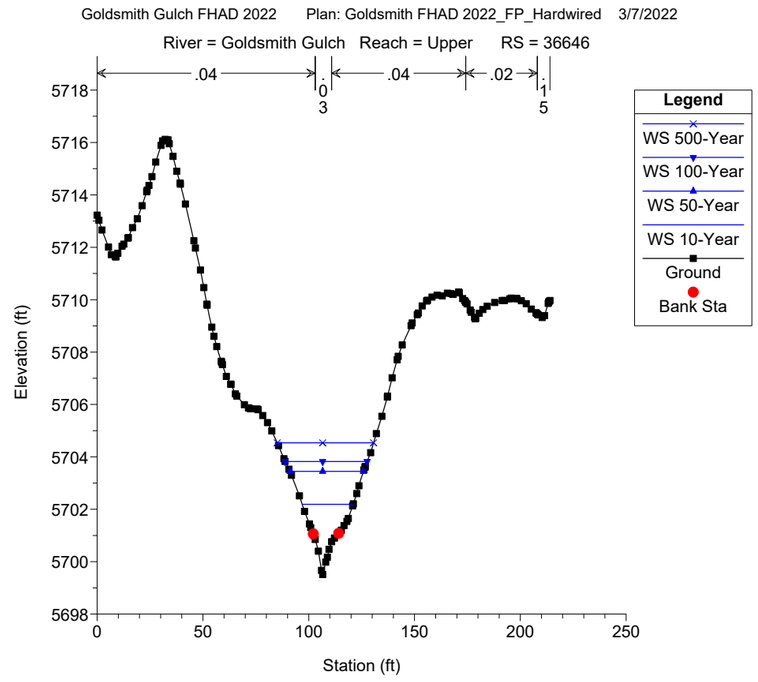

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36909 Channel invert per survey
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

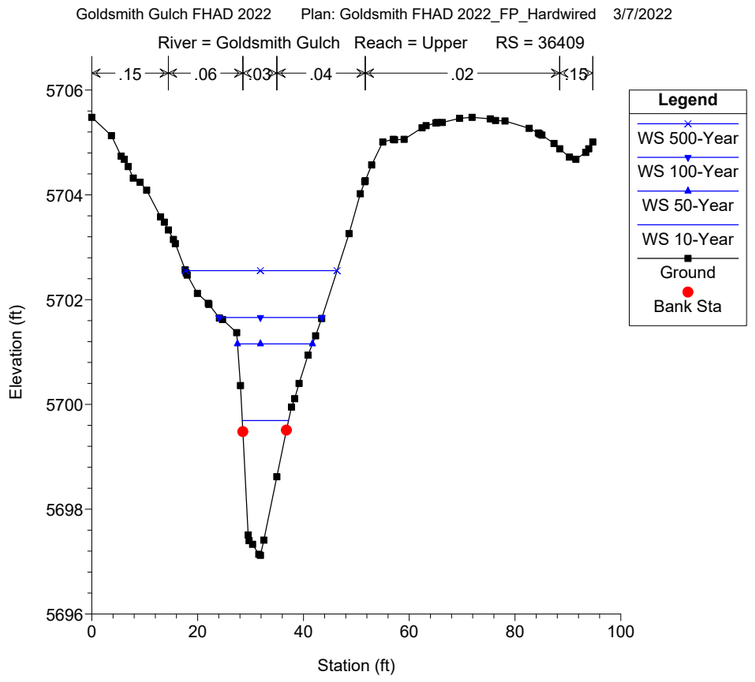

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36840 Culv E Caley Ave
.15
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

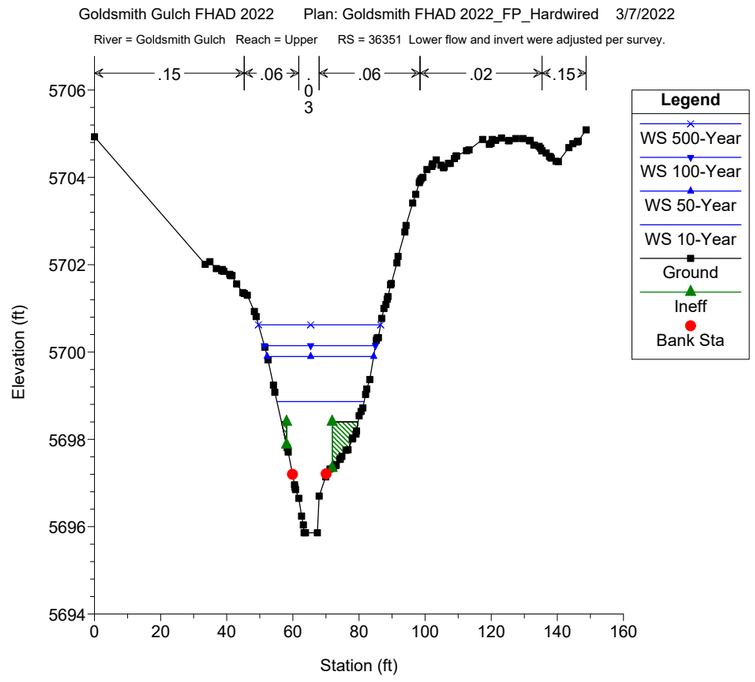

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36840 Culv E Caley Ave
.04
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

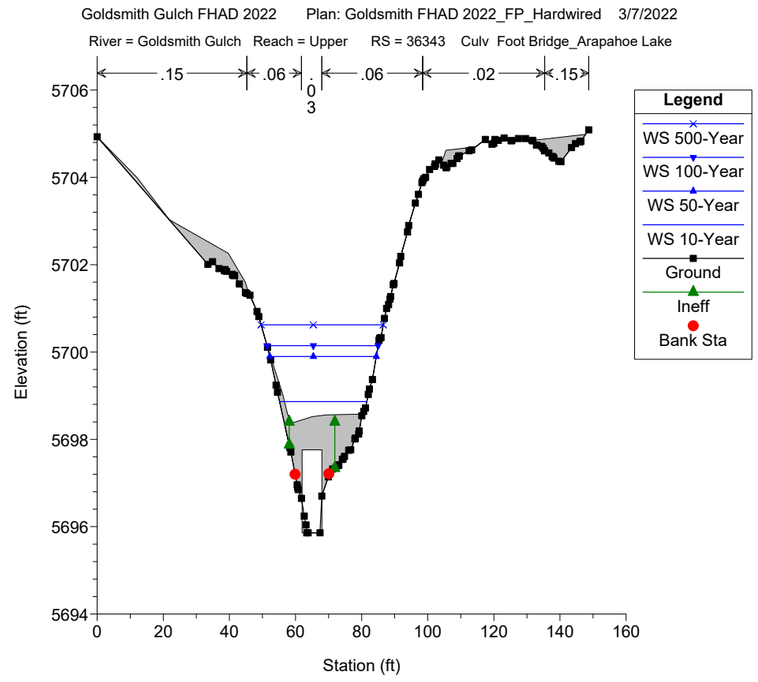

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36778
.04
.03
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

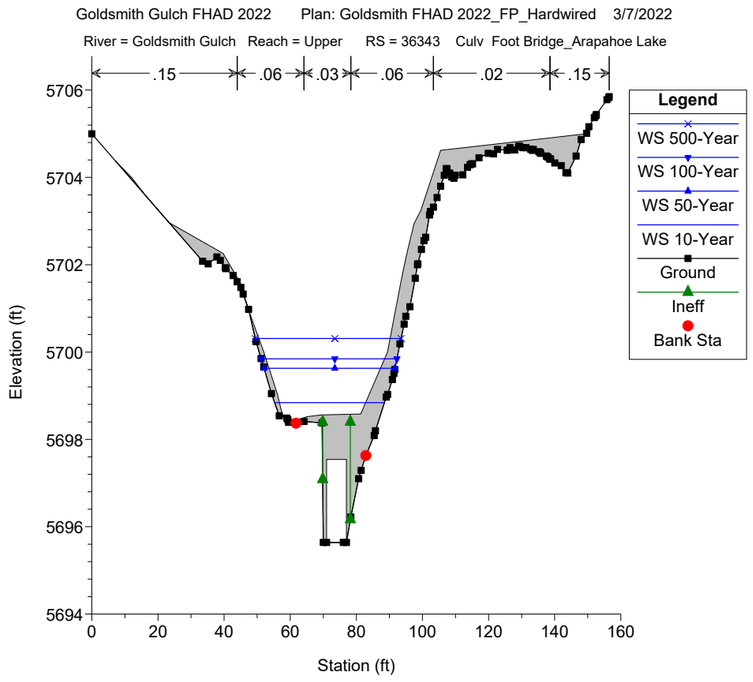

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36685
.04
.03
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

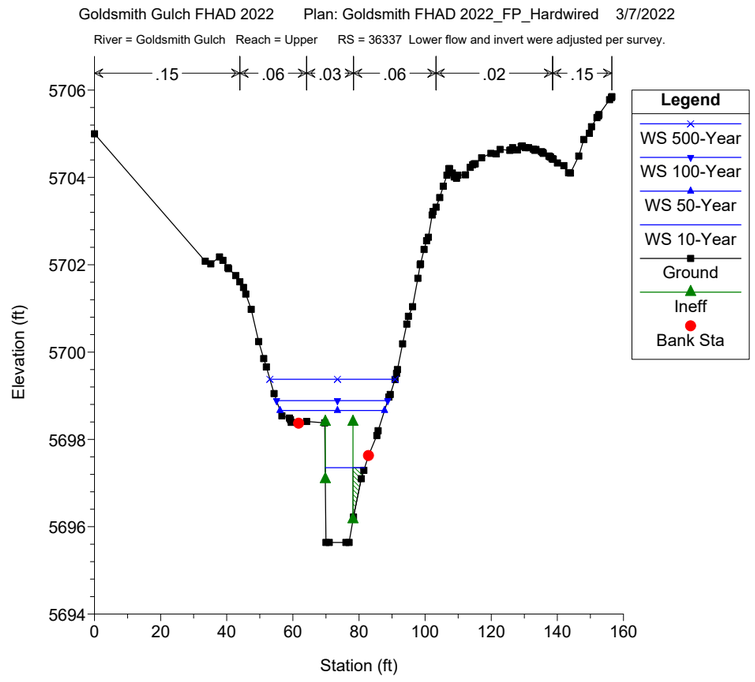

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36646
.04
.03
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

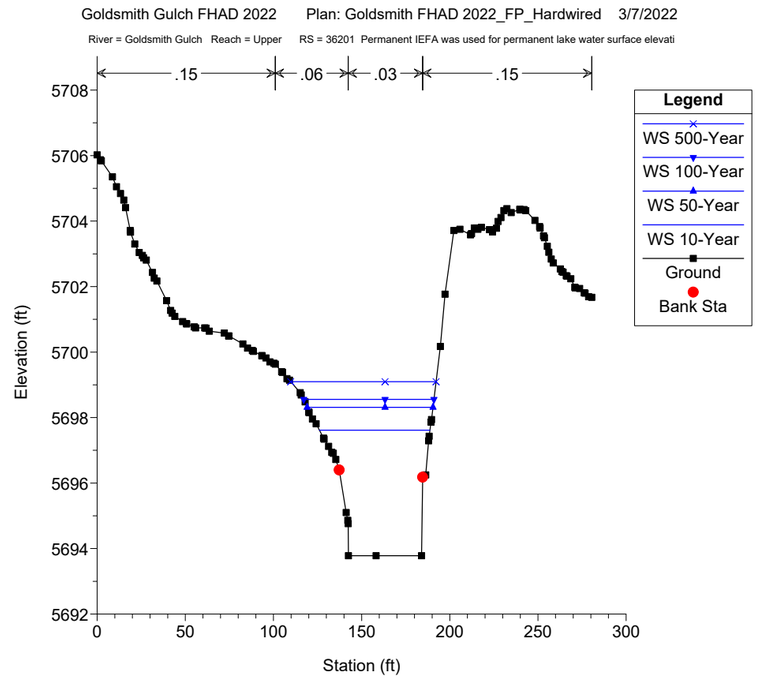

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36409
.15
.06
.03
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

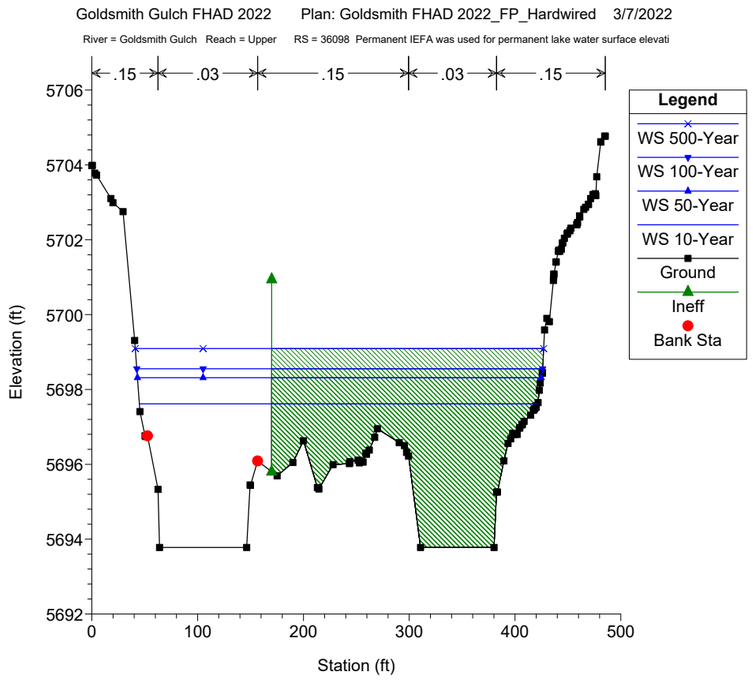

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36351 Lower flow and invert were adjusted per survey.
.15
.06
.03
.06
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

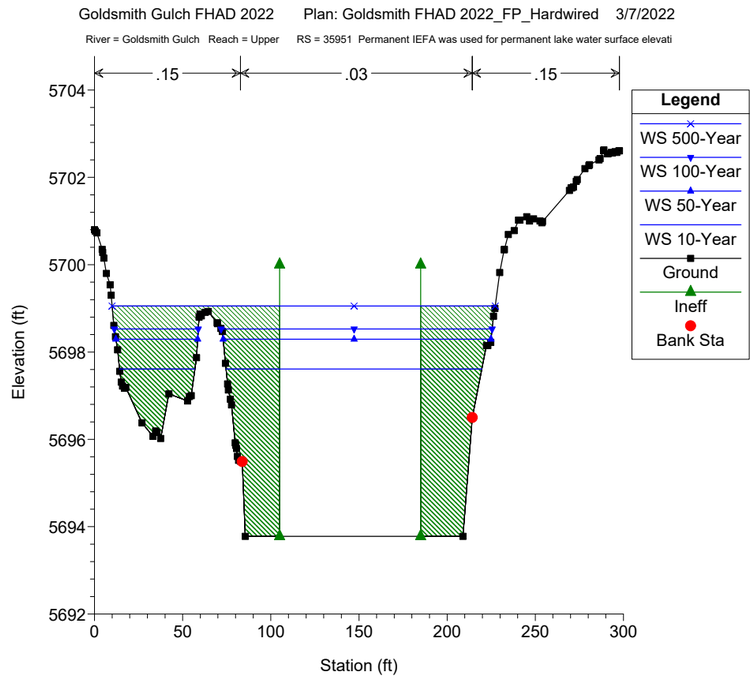

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36343 Culv Foot Bridge_Arapahoe Lake
.15
.06
.03
.06
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

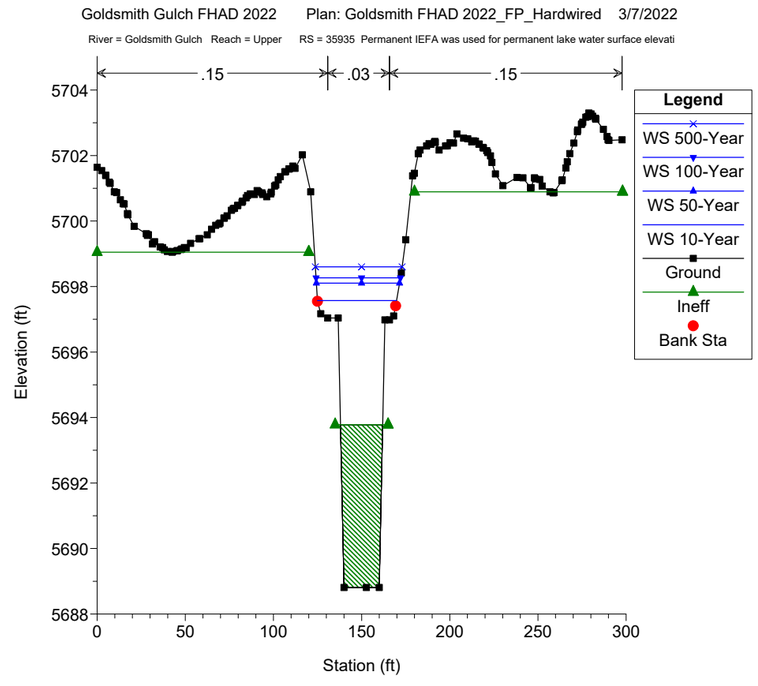

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36343 Culv Foot Bridge_Arapahoe Lake
.15 .06 .03 .06 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

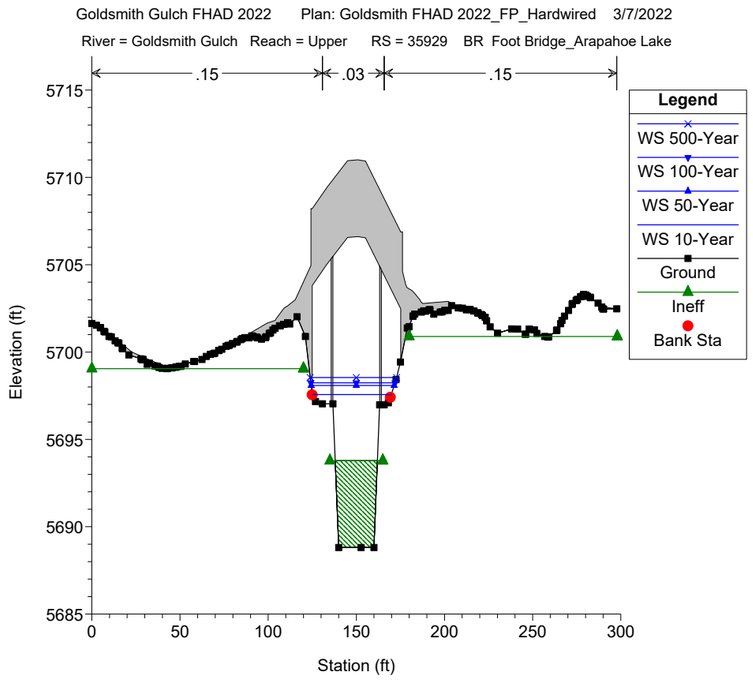

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36337 Lower flow and invert were adjusted per survey.
.15 .06 .03 .06 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

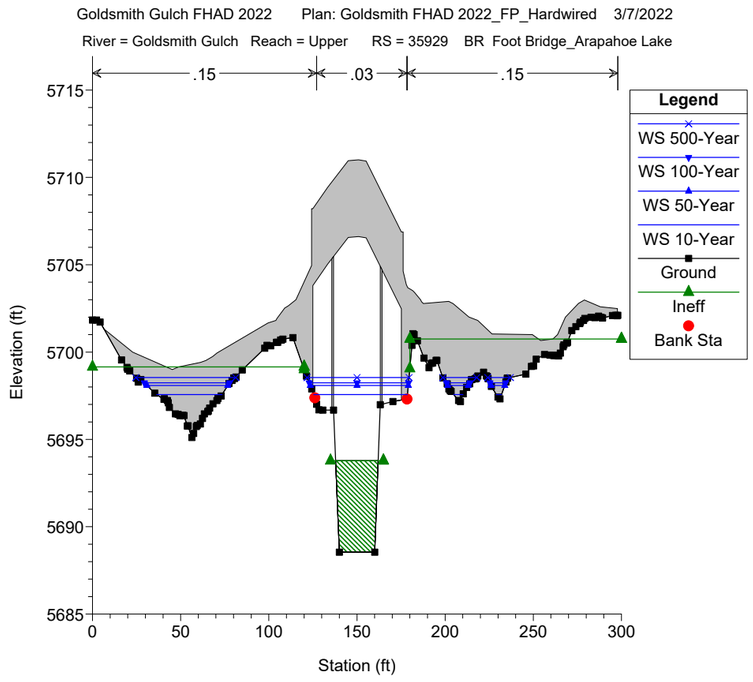

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36201 Permanent IEFA was used for permanent lake water surface elevati
.15 .06 .03 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

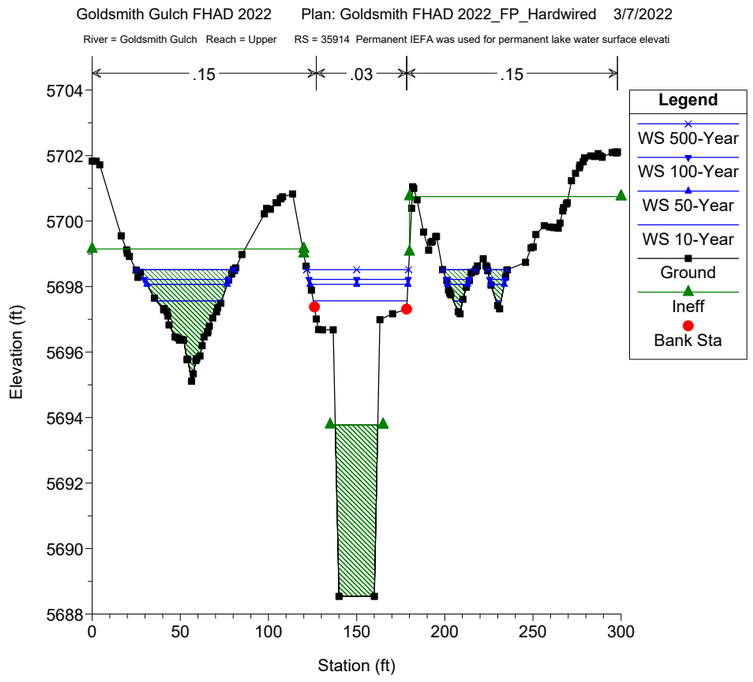

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 36098 Permanent IEFA was used for permanent lake water surface elevati
.15 .03 .15 .03 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

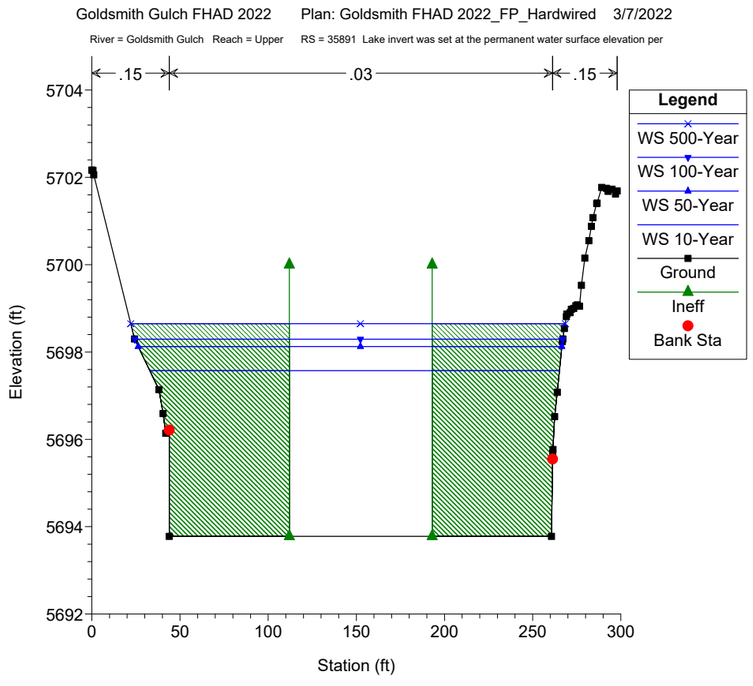

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35951 Permanent IEFA was used for permanent lake water surface elevati
.15 .03 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

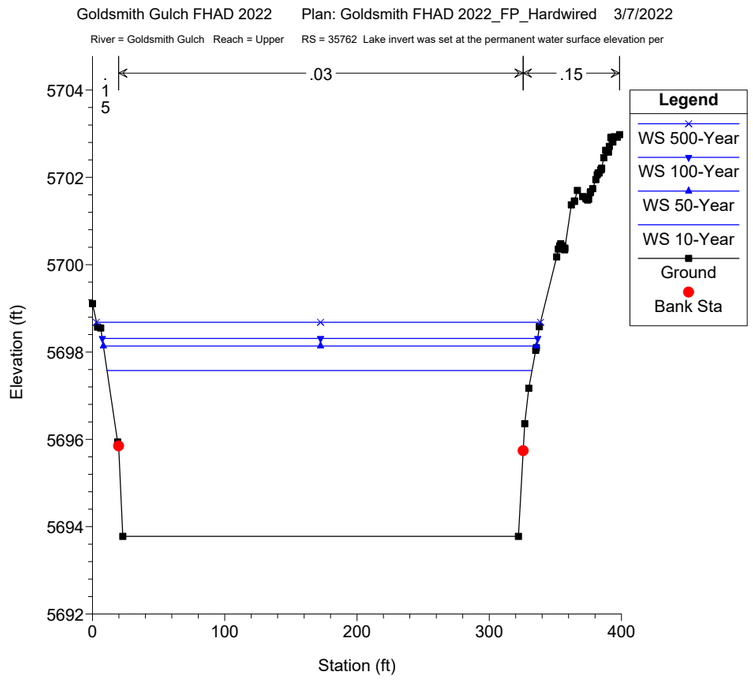

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35935 Permanent IEFA was used for permanent lake water surface elevati
.15 .03 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

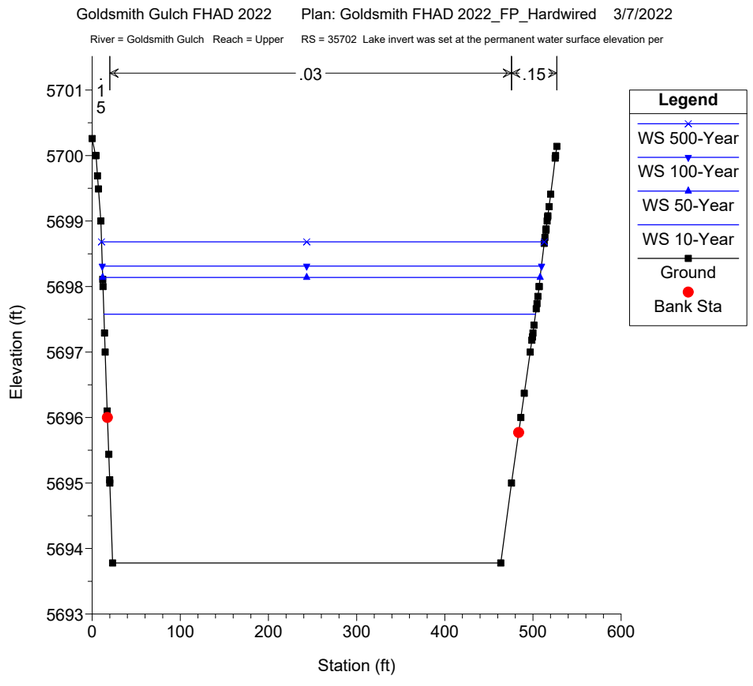

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35929 BR Foot Bridge_Arapahoe Lake
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

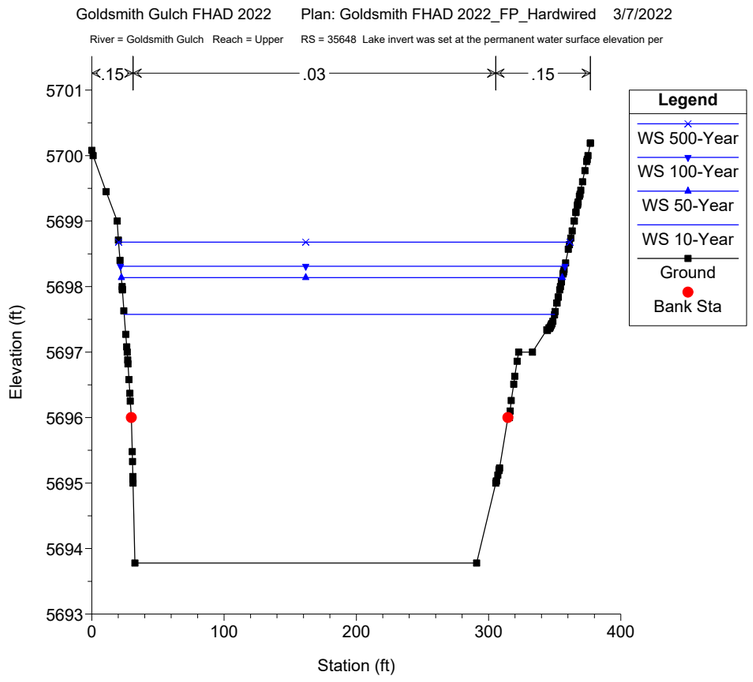

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35929 BR Foot Bridge_Arapahoe Lake
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

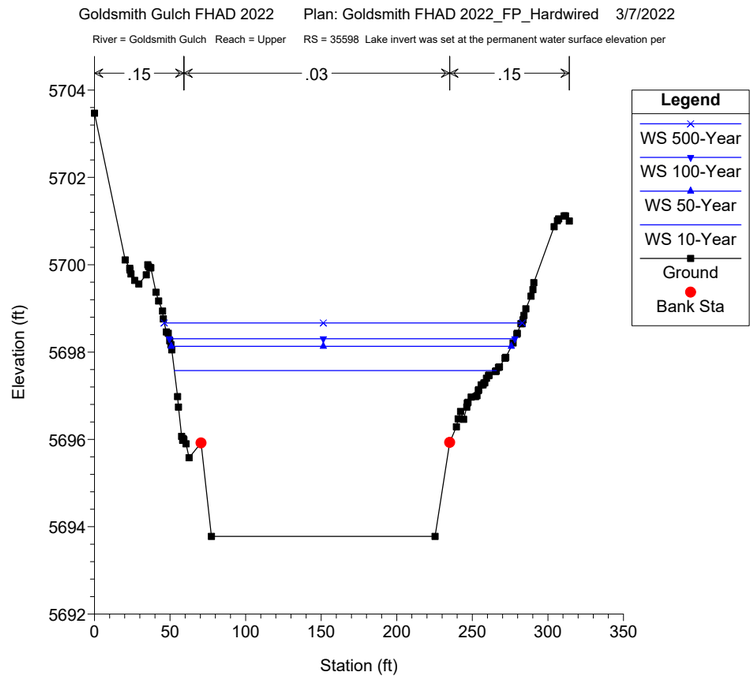

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35914 Permanent IEFA was used for permanent lake water surface elevati
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

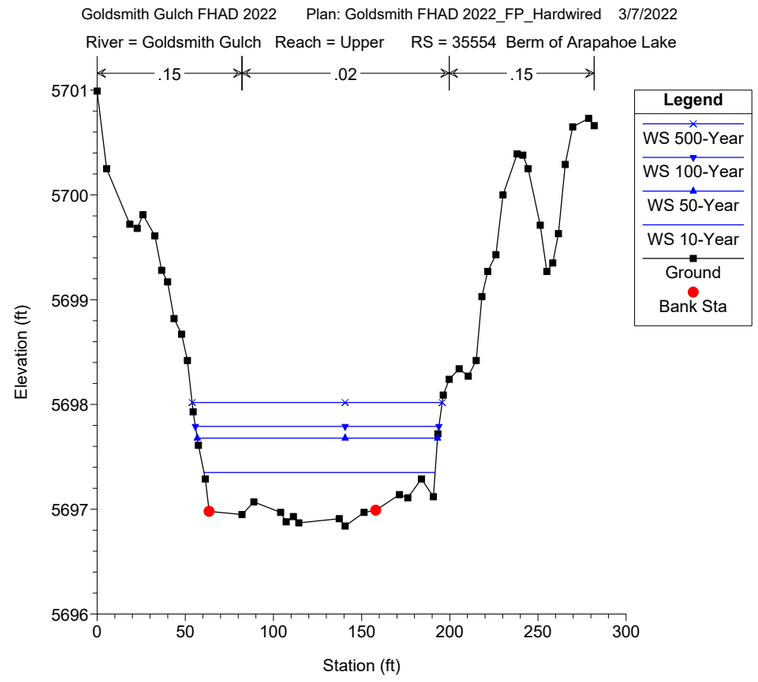

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35891 Lake invert was set at the permanent water surface elevation per
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

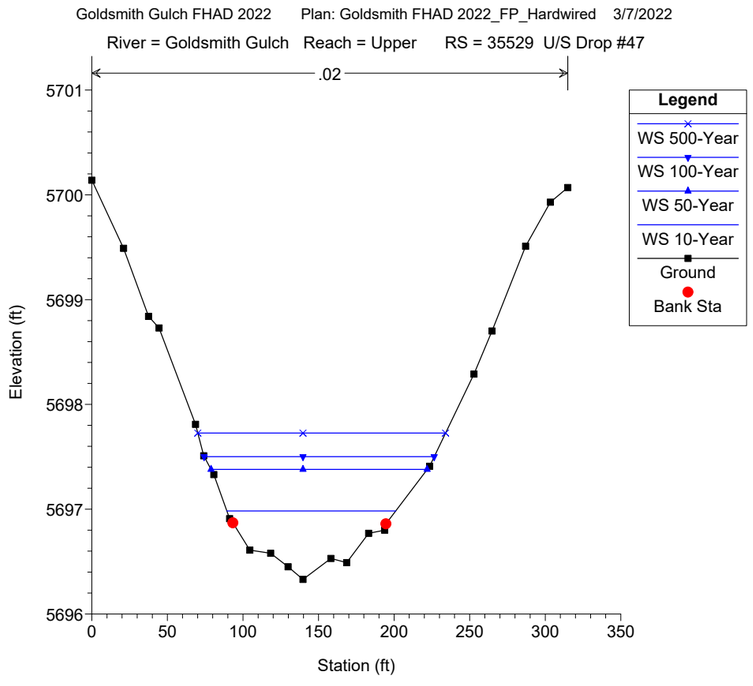

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35762 Lake invert was set at the permanent water surface elevation per
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

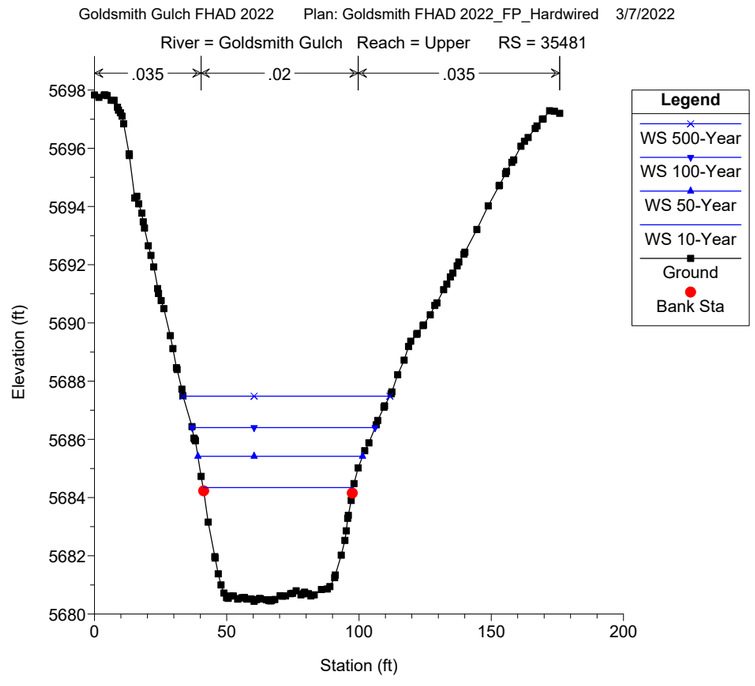

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35702 Lake invert was set at the permanent water surface elevation per
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

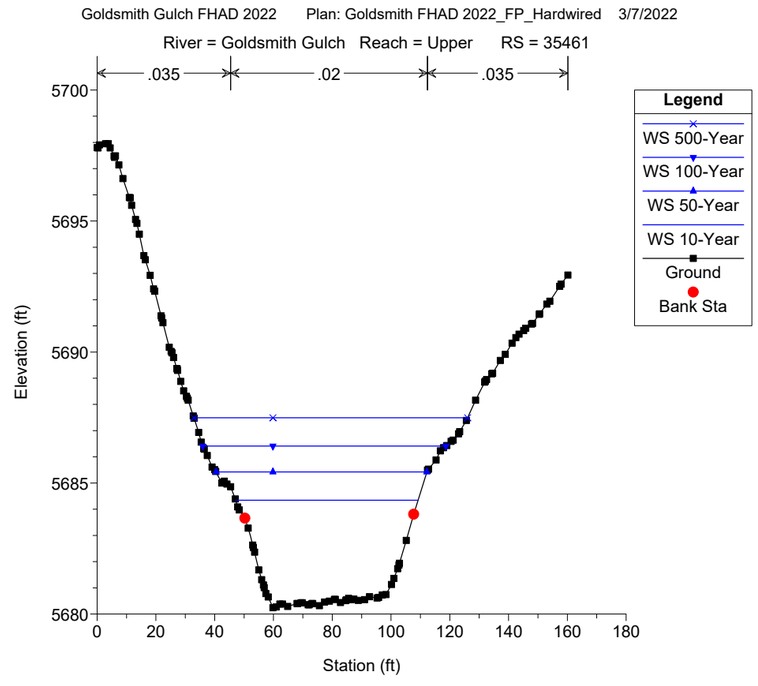

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35648 Lake invert was set at the permanent water surface elevation per
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

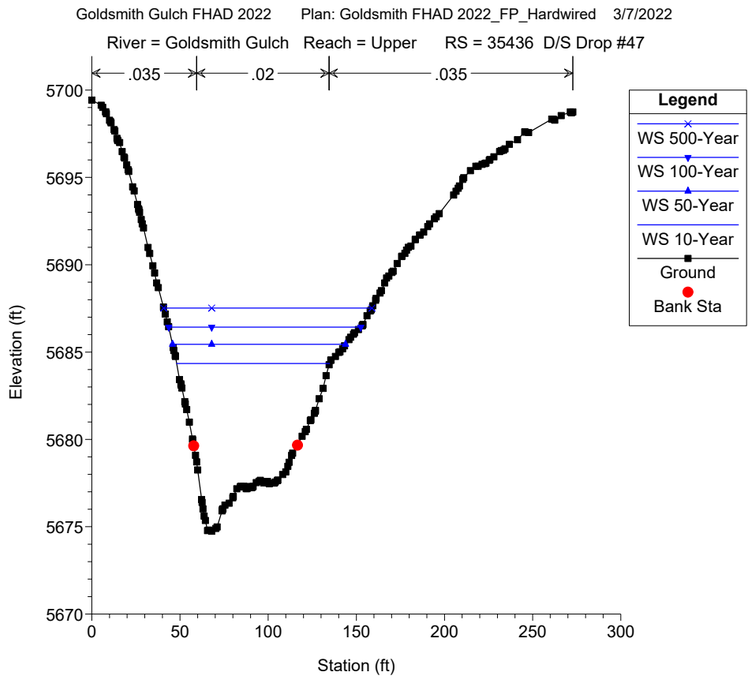

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35598 Lake invert was set at the permanent water surface elevation per
.15
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

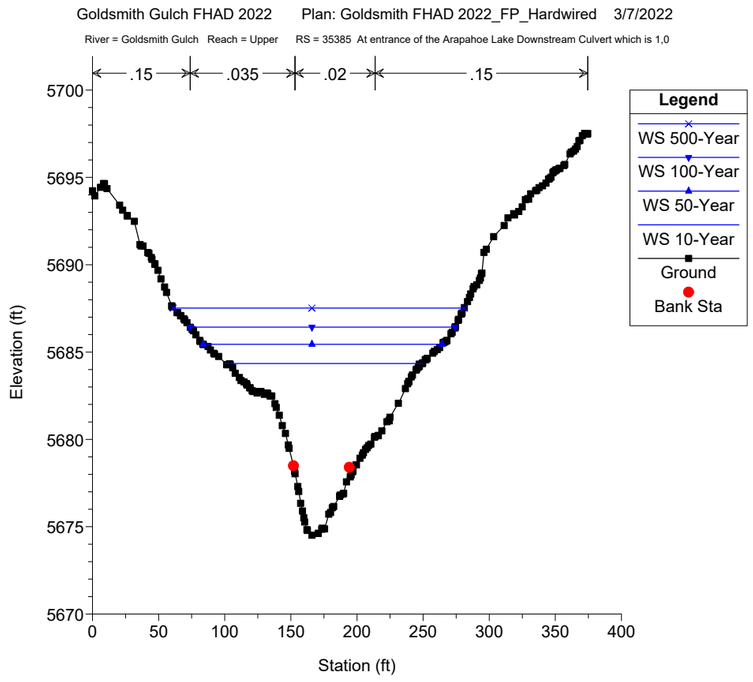

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35554 Berm of Arapahoe Lake
.15
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

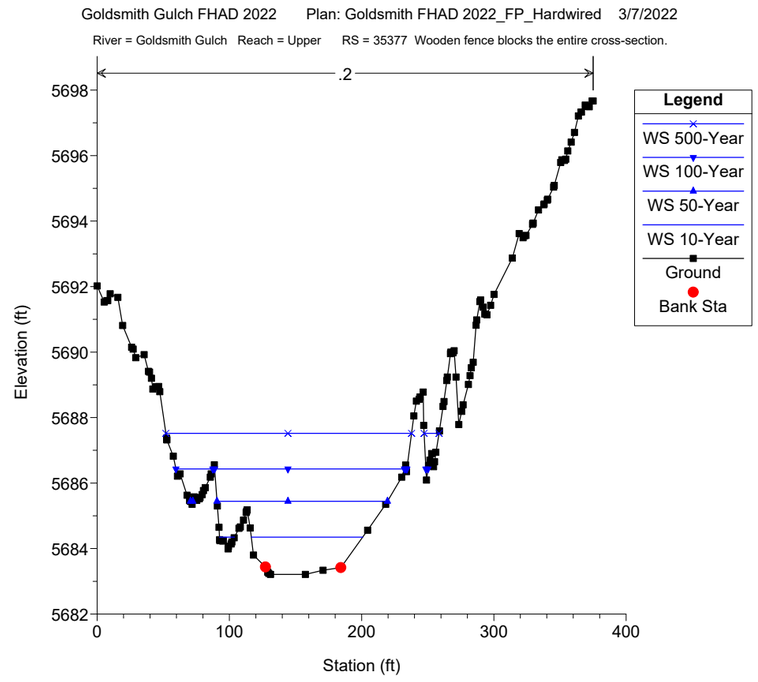

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35529 U/S Drop #47
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

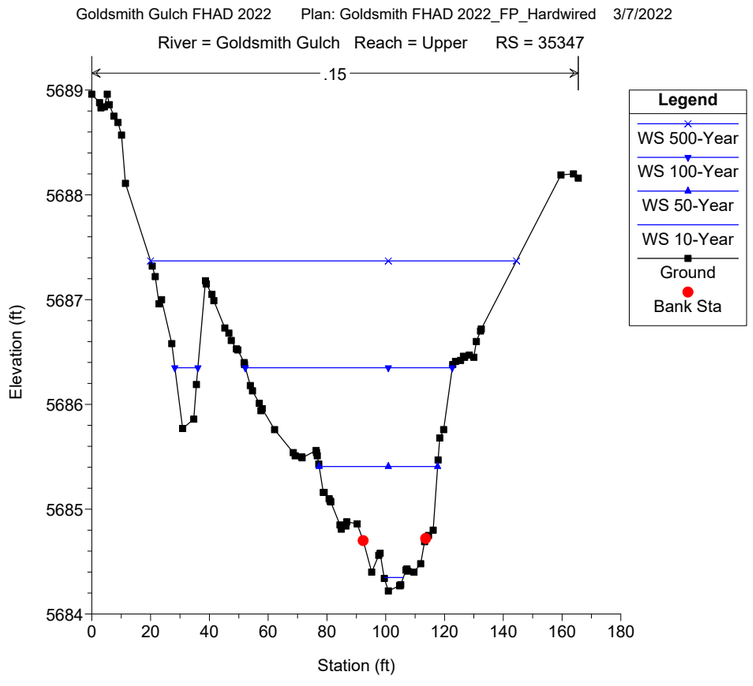

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35481
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

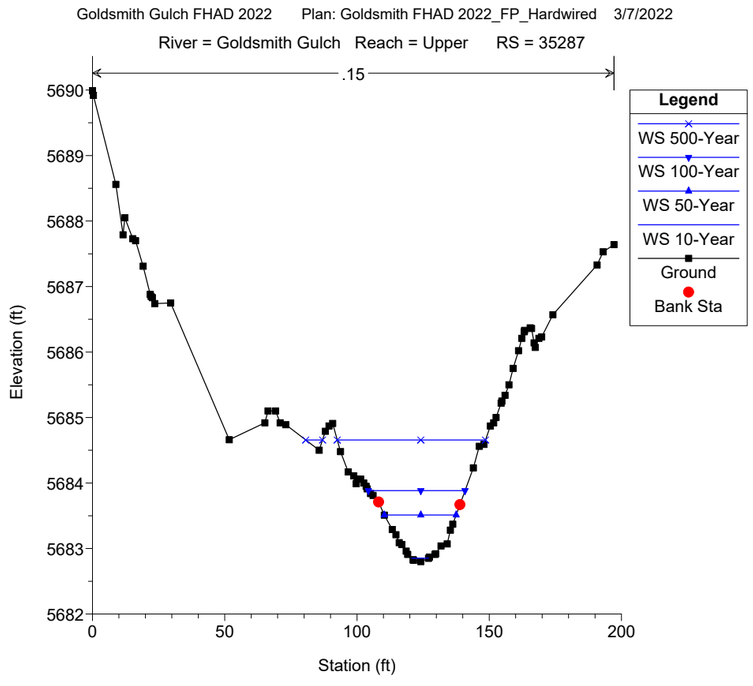

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35461
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

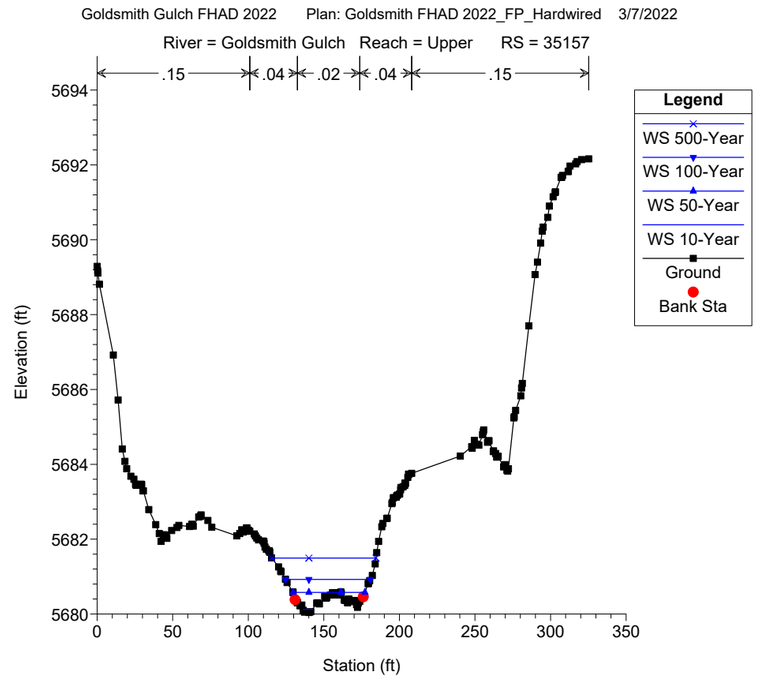

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35436 D/S Drop #47
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

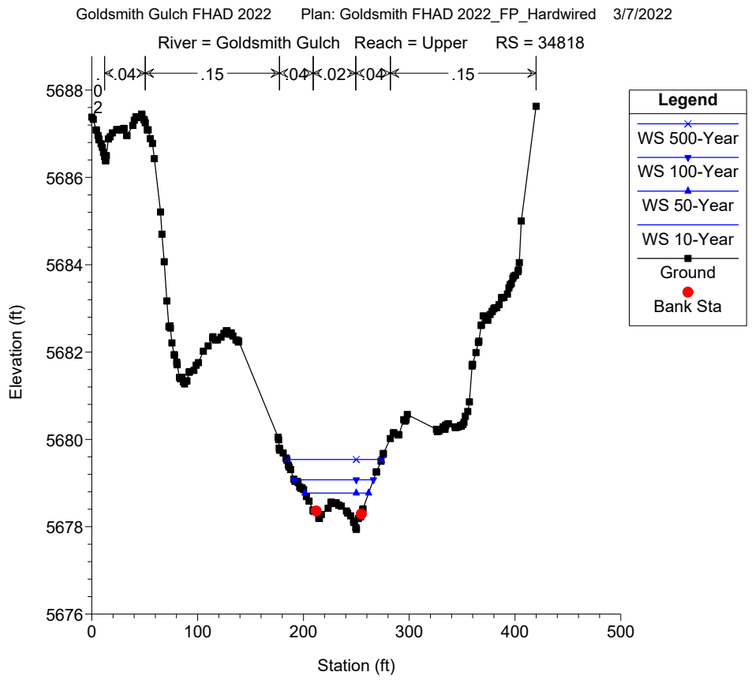

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35385 At entrance of the Arapahoe Lake Downstream Culvert which is 1,0
.15
.035
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

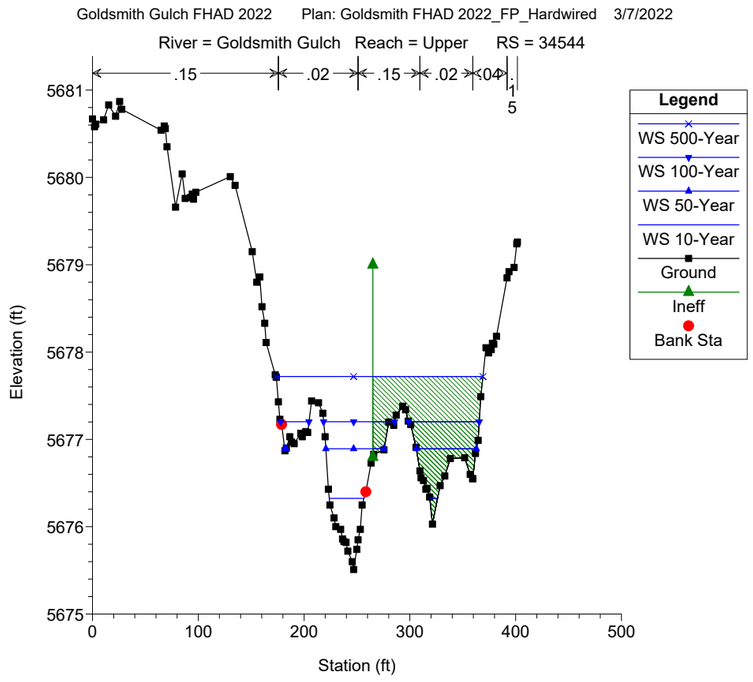

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35377 Wooden fence blocks the entire cross-section.
.2
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

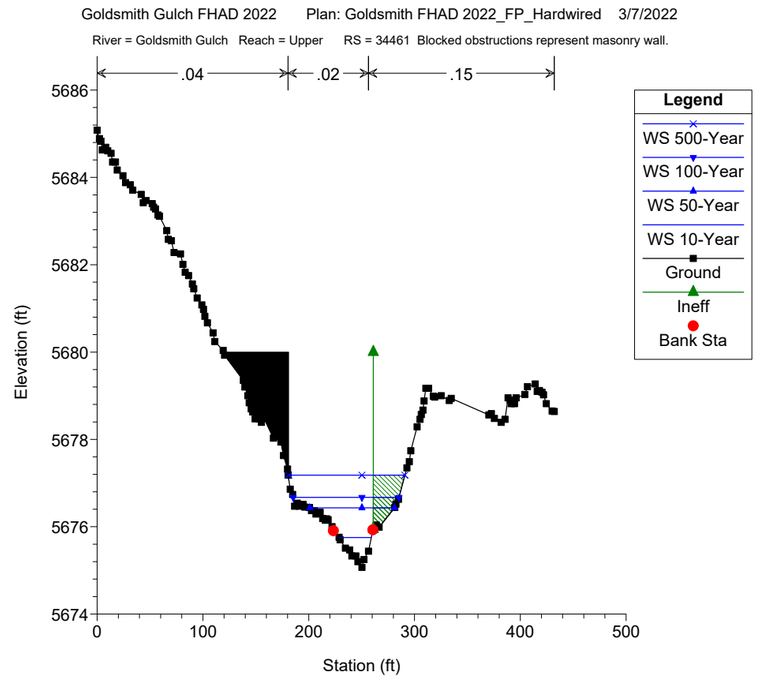

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35347
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

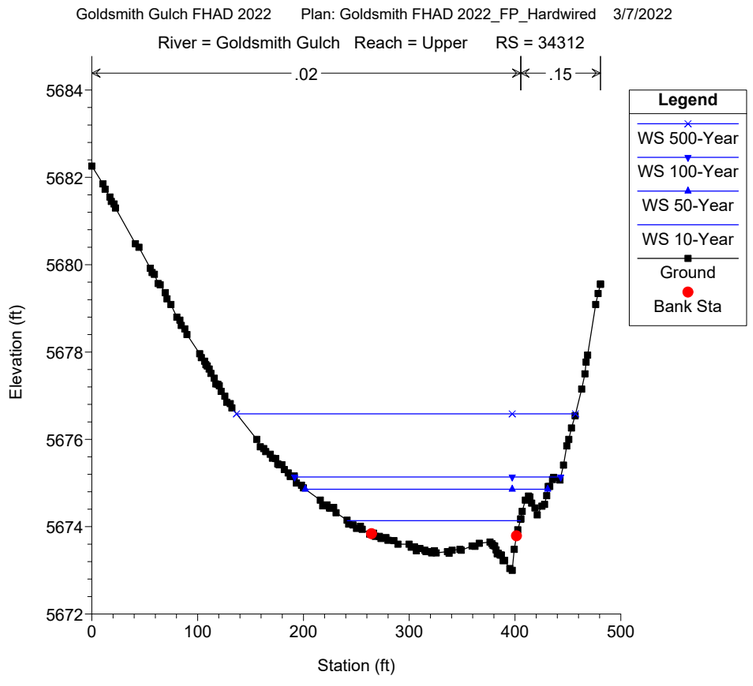

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35287
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

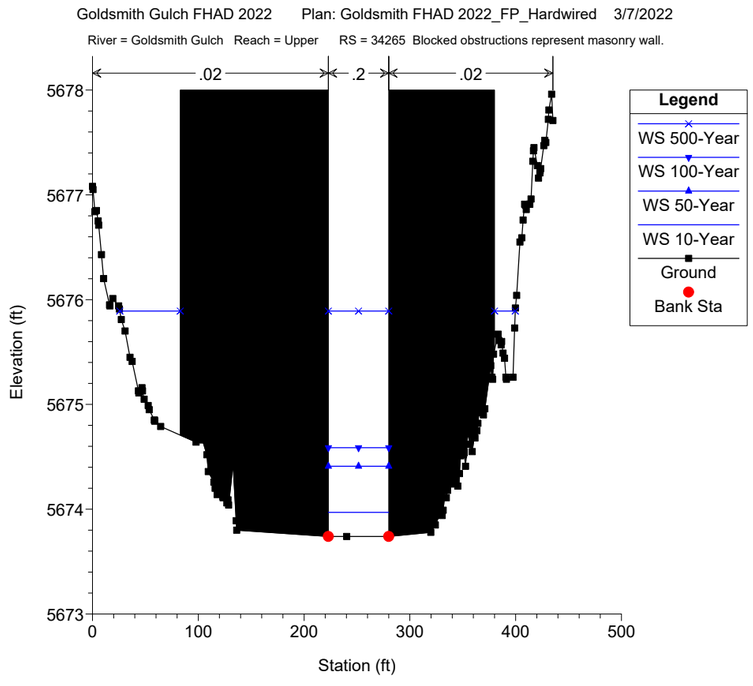

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 35157
.15
.04
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

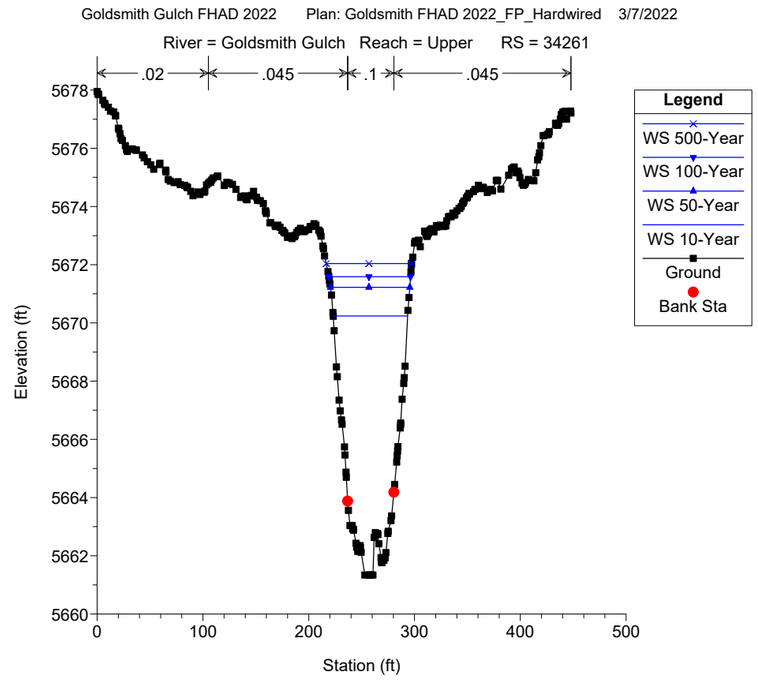

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34818
.04
.15
.04
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

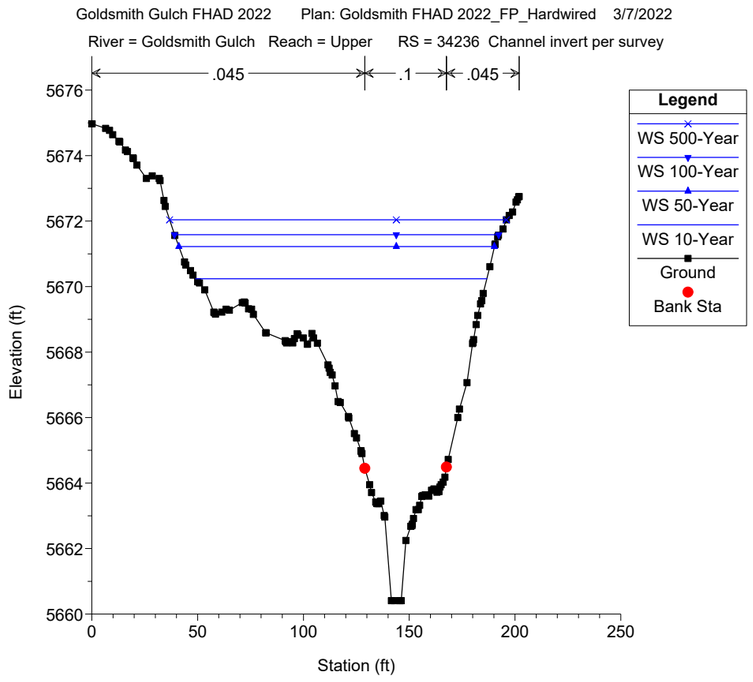

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34544
.15
.02
.15
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

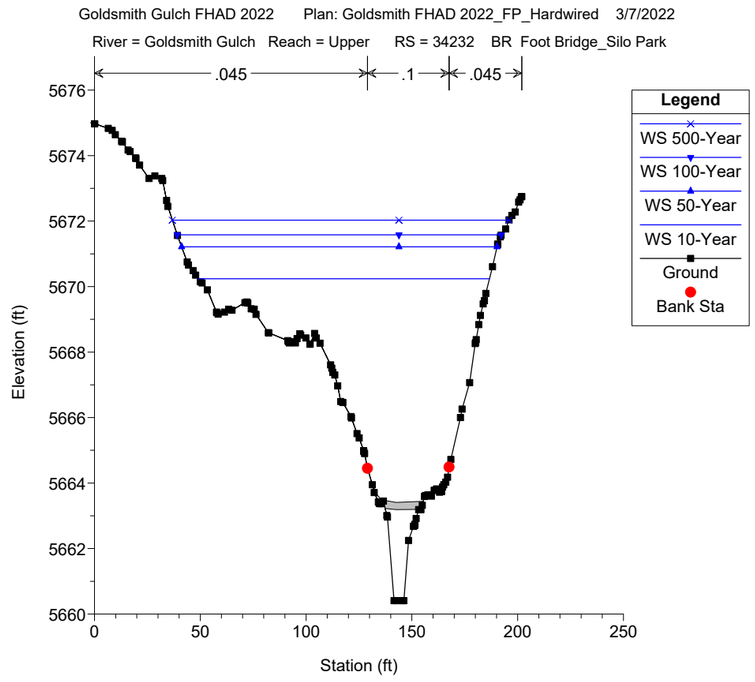

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34461 Blocked obstructions represent masonry wall.
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

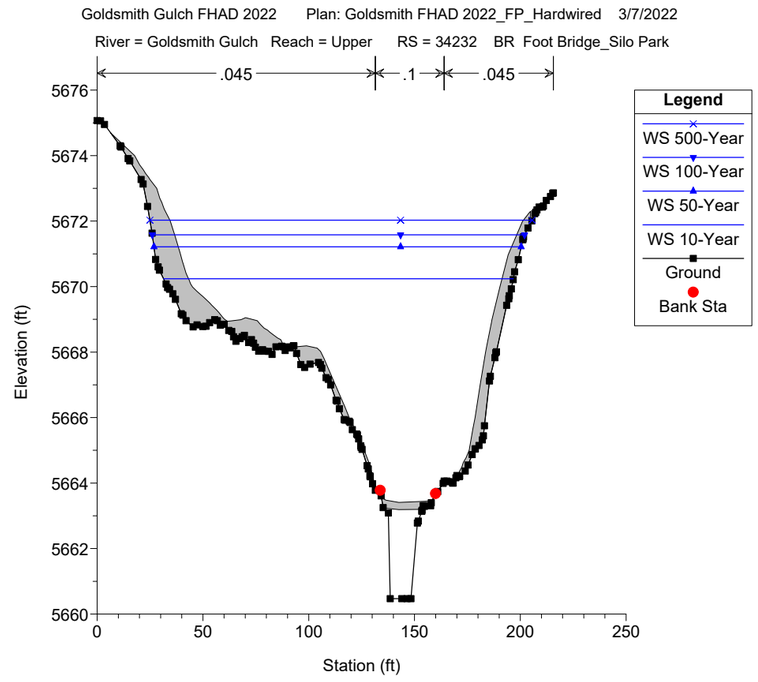

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34312
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

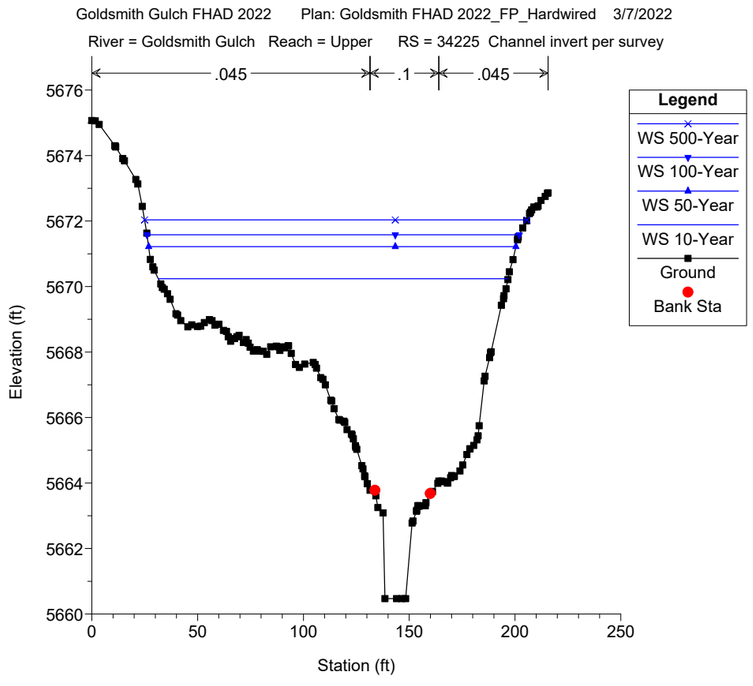

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34265 Blocked obstructions represent masonry wall.
.02
.2
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

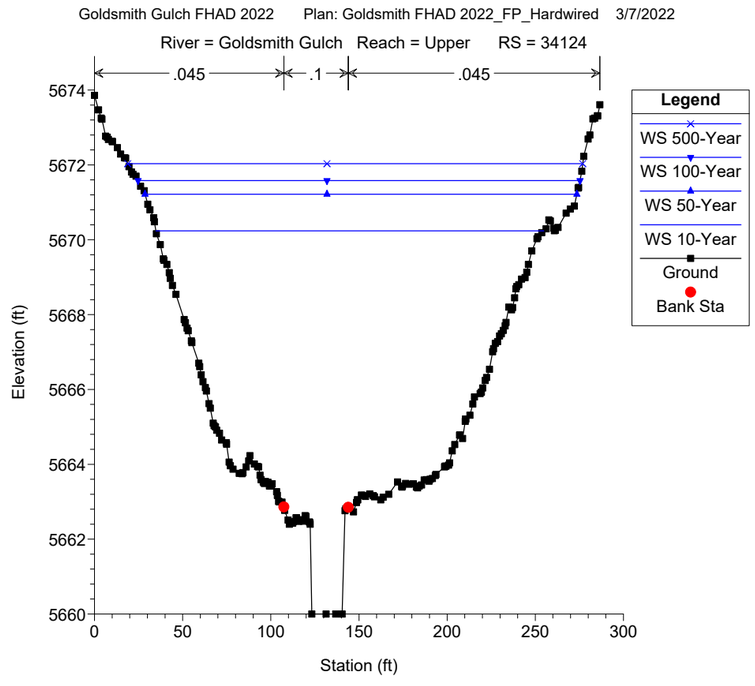

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34261
.02
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

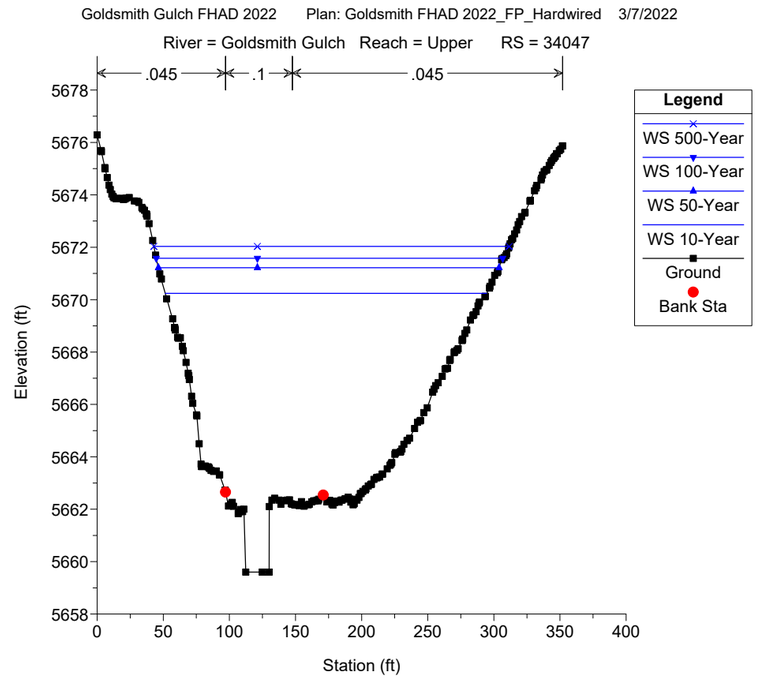

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34236 Channel invert per survey
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

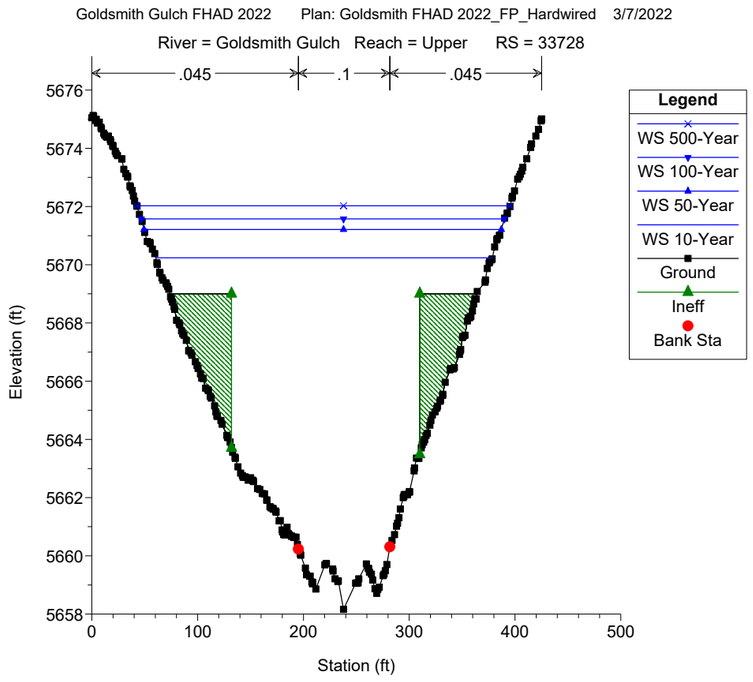

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34232 BR Foot Bridge_Silo Park
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

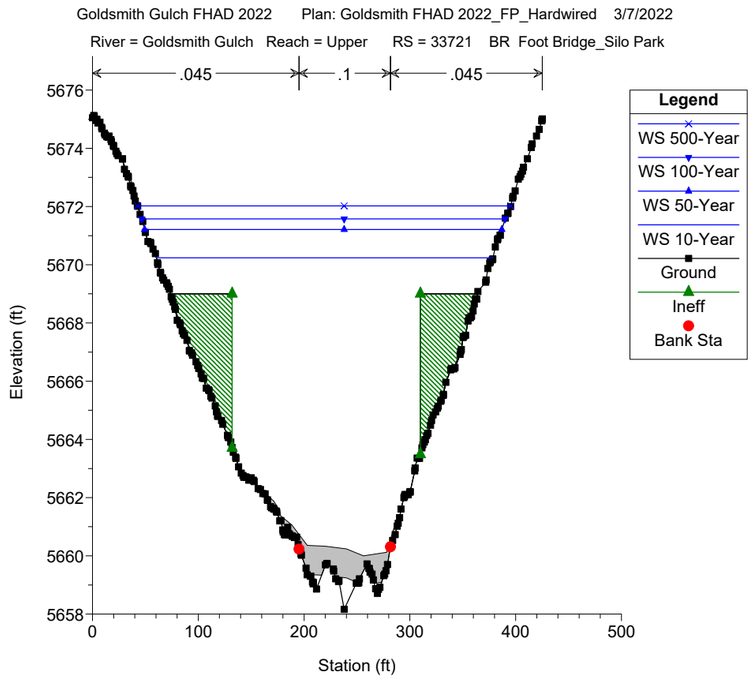

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34232 BR Foot Bridge_Silo Park
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

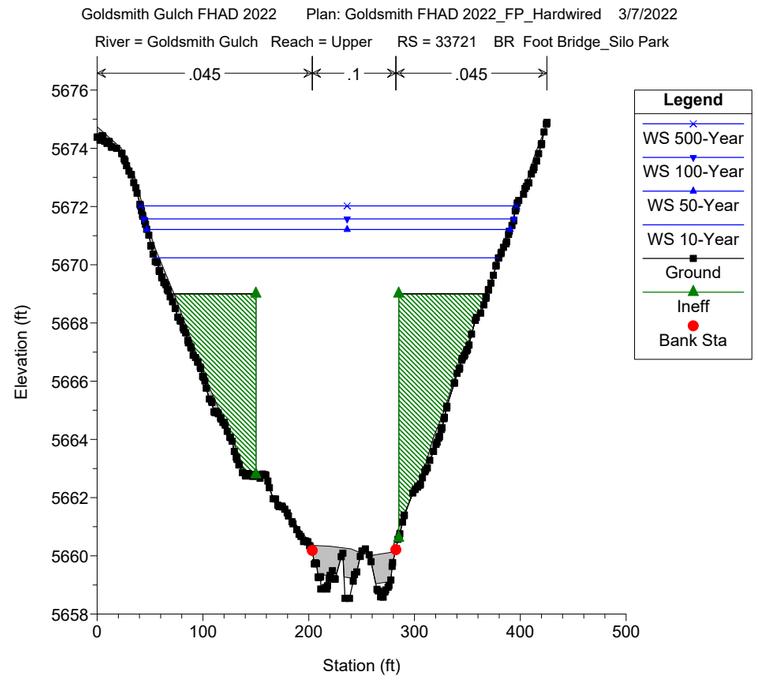

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34225 Channel invert per survey
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

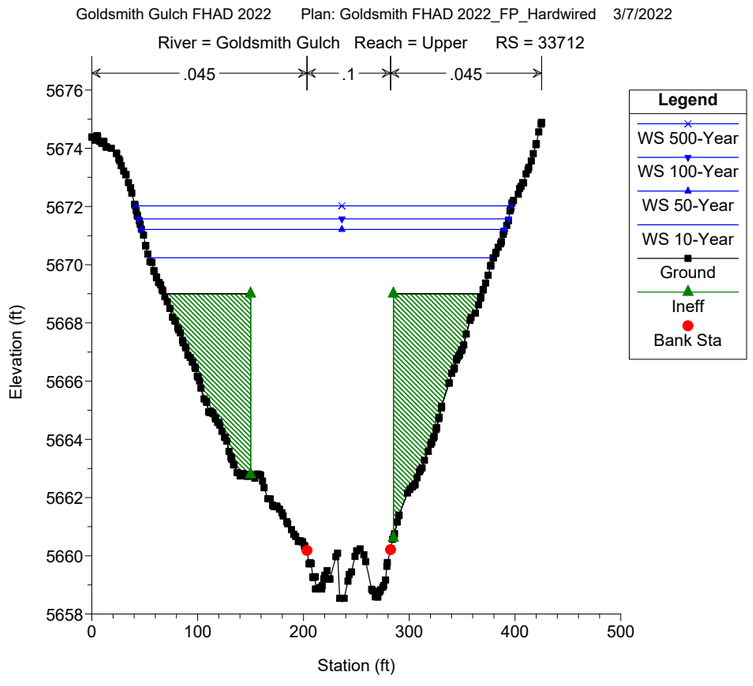

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34124
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

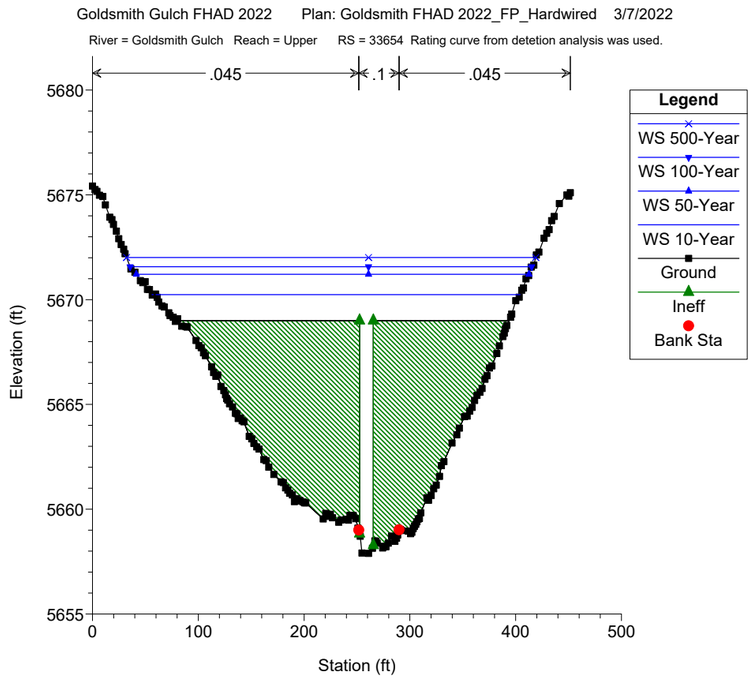

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 34047
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

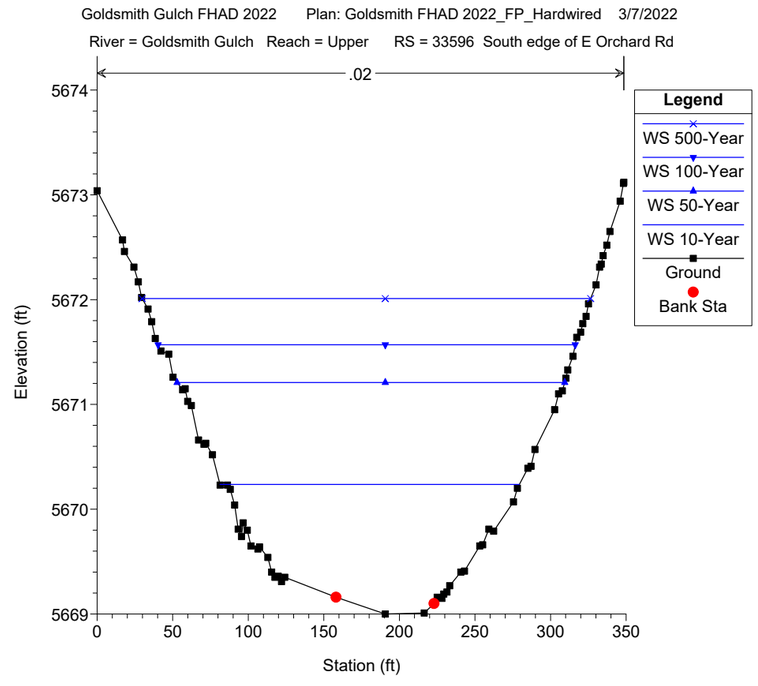

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33728
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

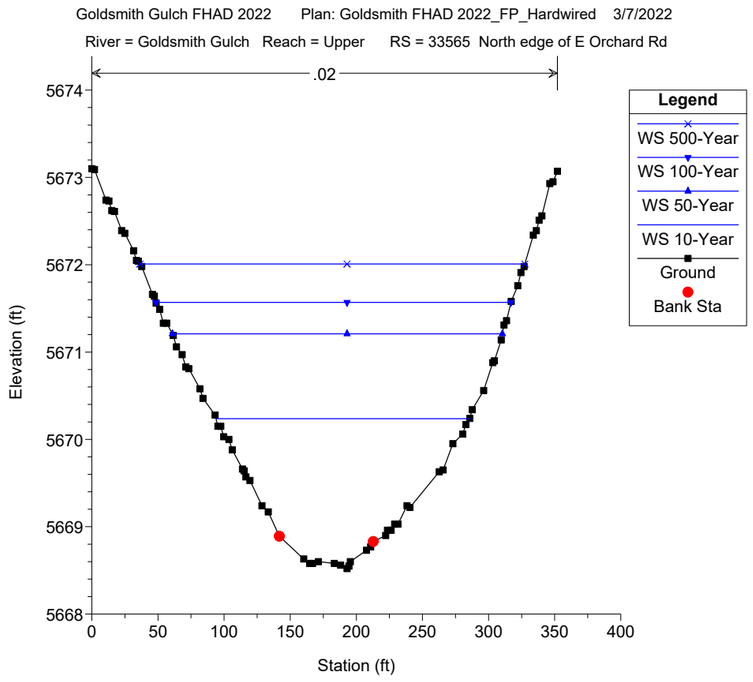

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33721 BR Foot Bridge_Silo Park
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

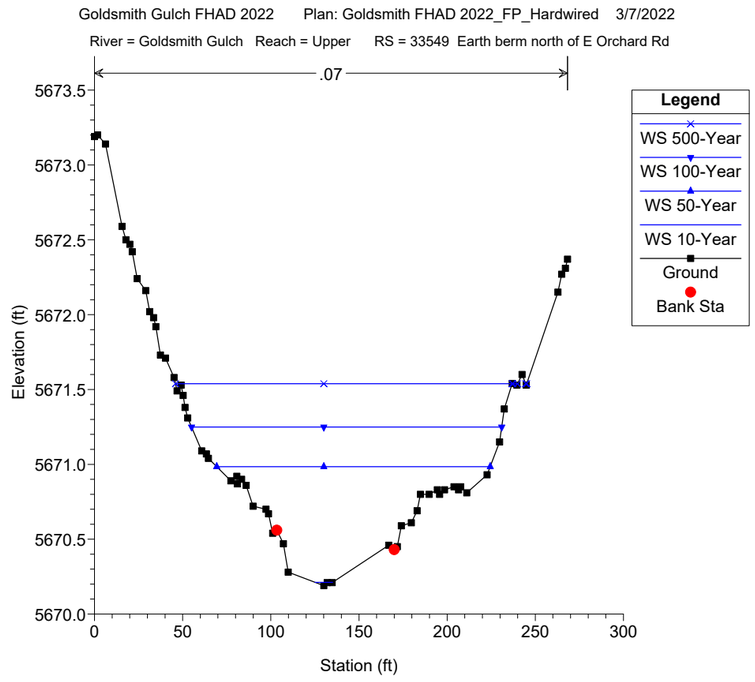

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33721 BR Foot Bridge_Silo Park
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

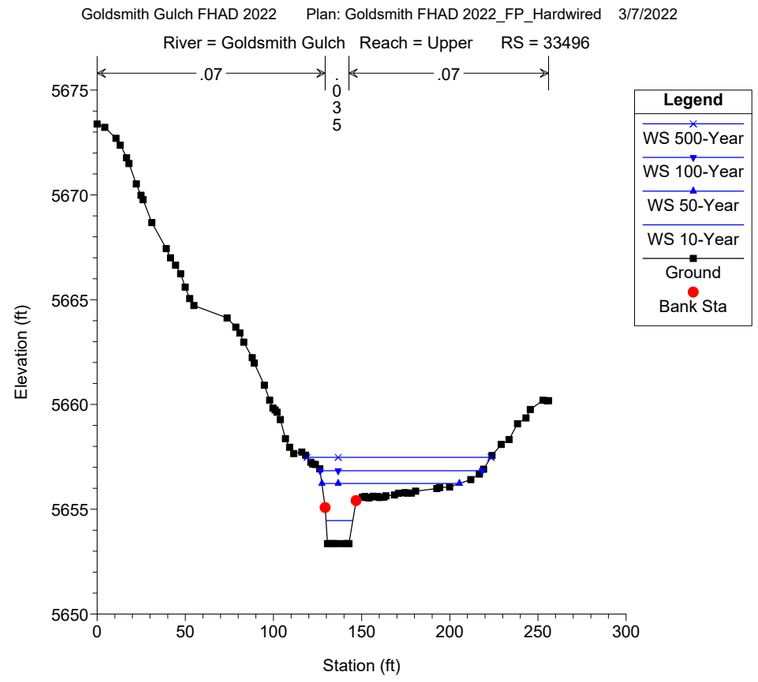

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33712
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

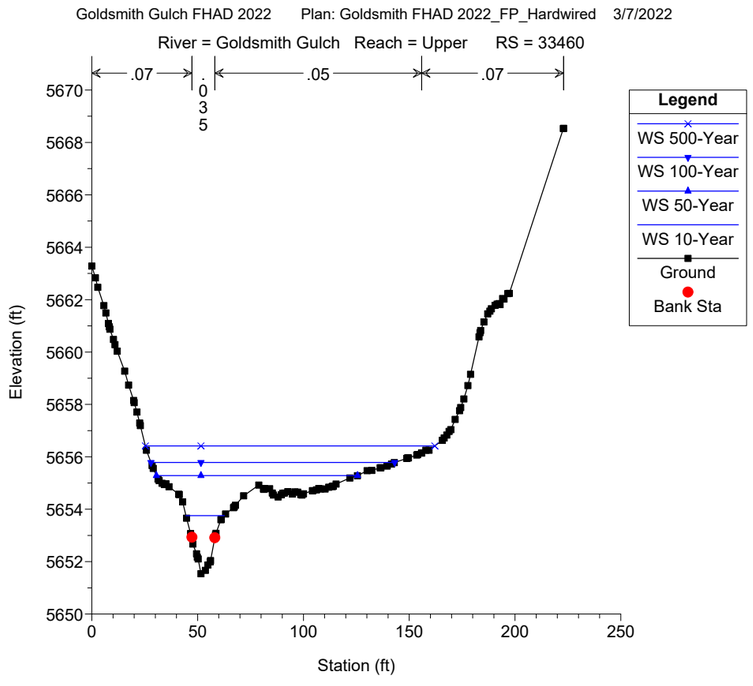

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33654 Rating curve from detetion analysis was used.
.045
.1
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

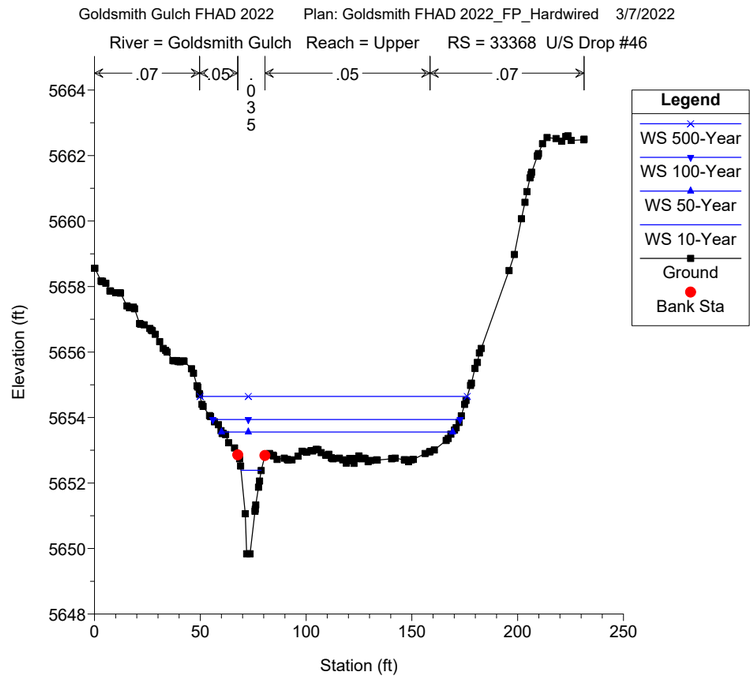

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33596 South edge of E Orchard Rd
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

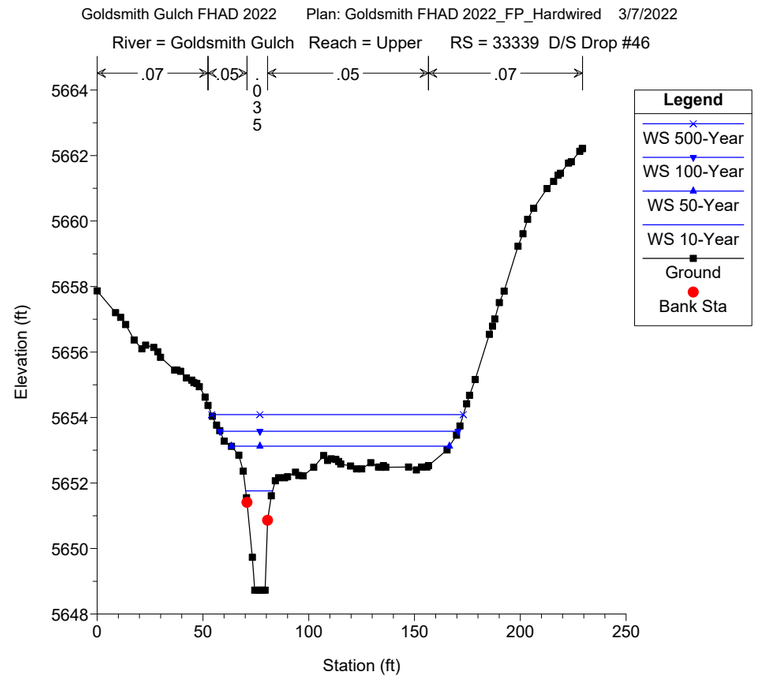

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33565 North edge of E Orchard Rd
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

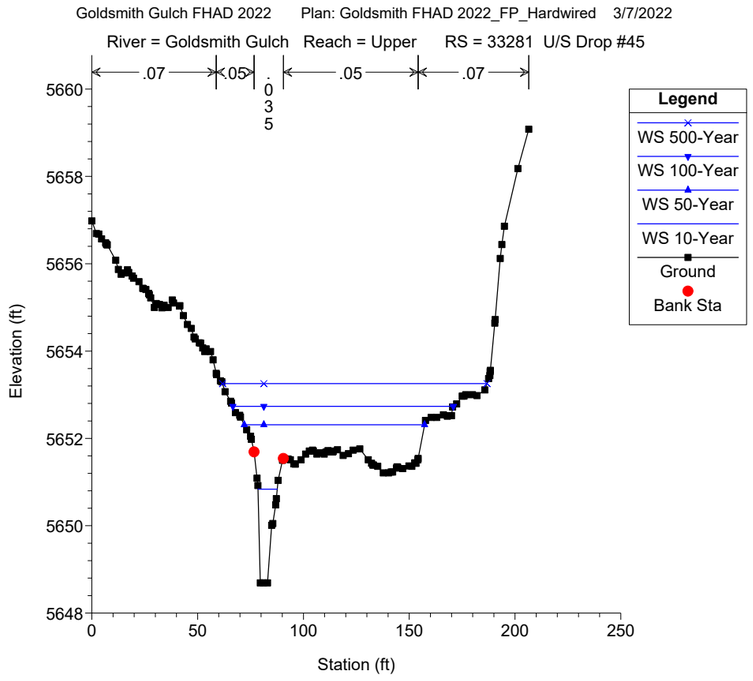

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33549 Earth berm north of E Orchard Rd
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

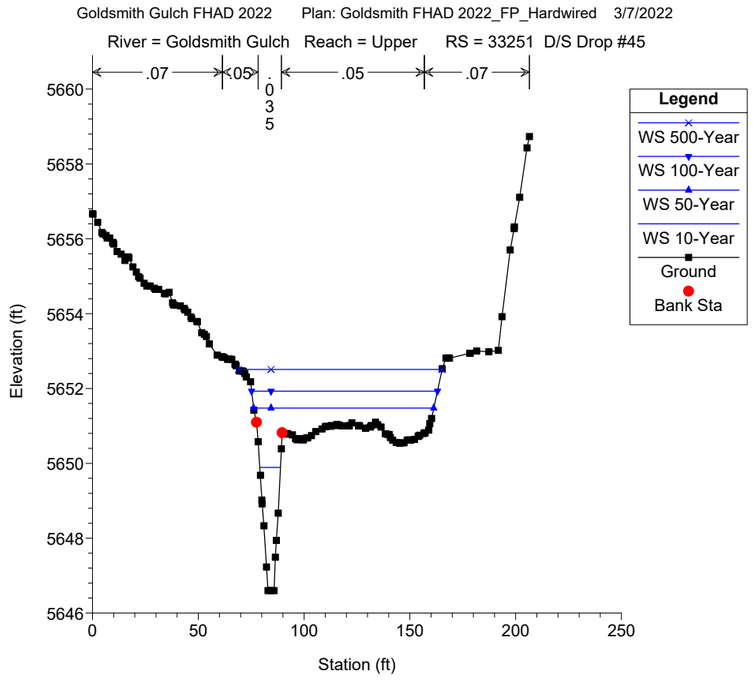

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33496
.07
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

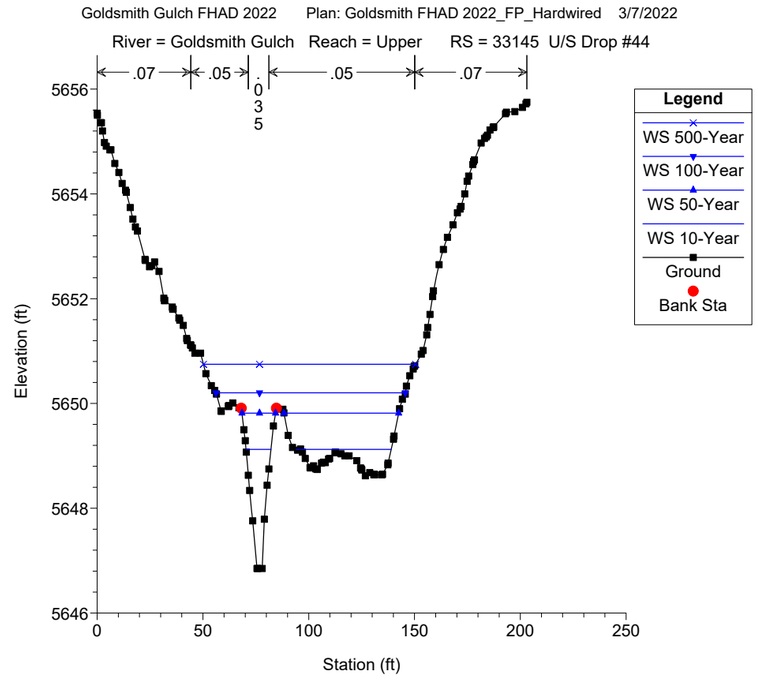

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33460
.07
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

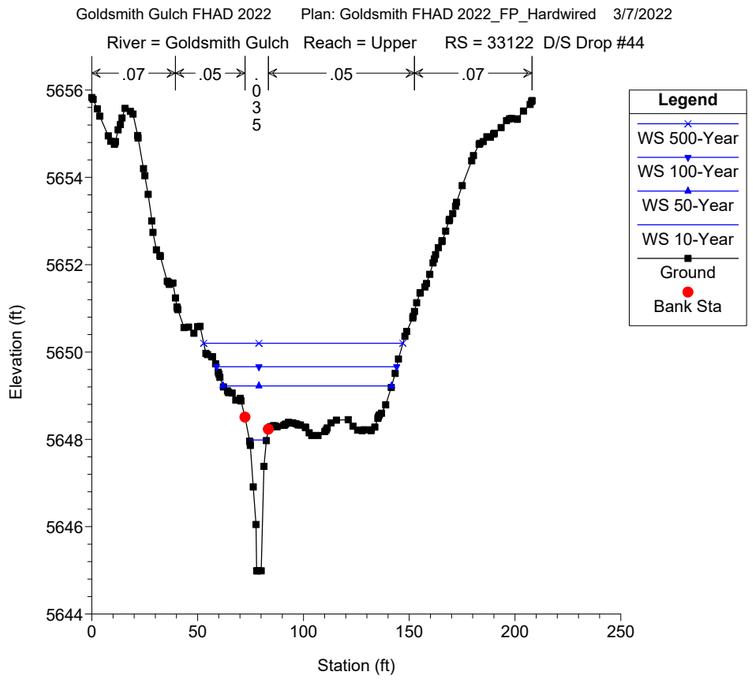

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33368 U/S Drop #46
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

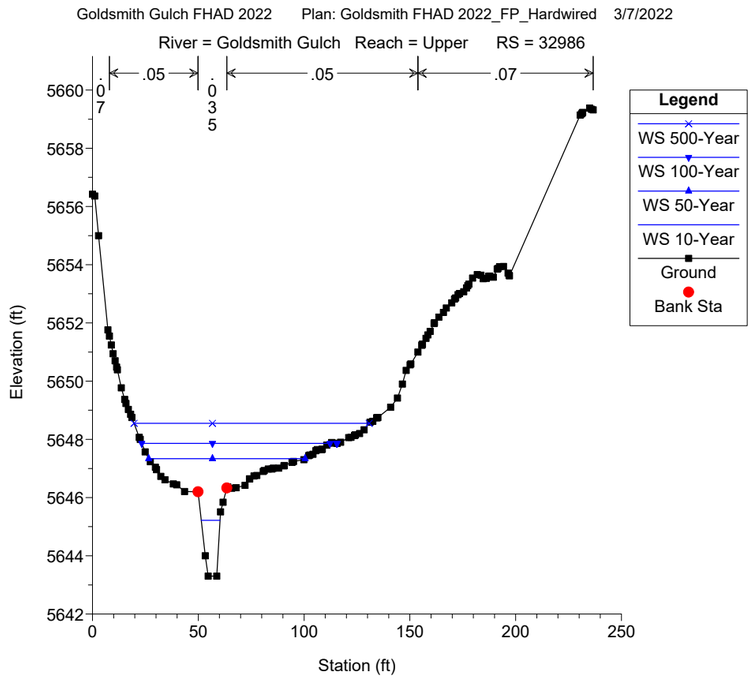

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33339 D/S Drop #46
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

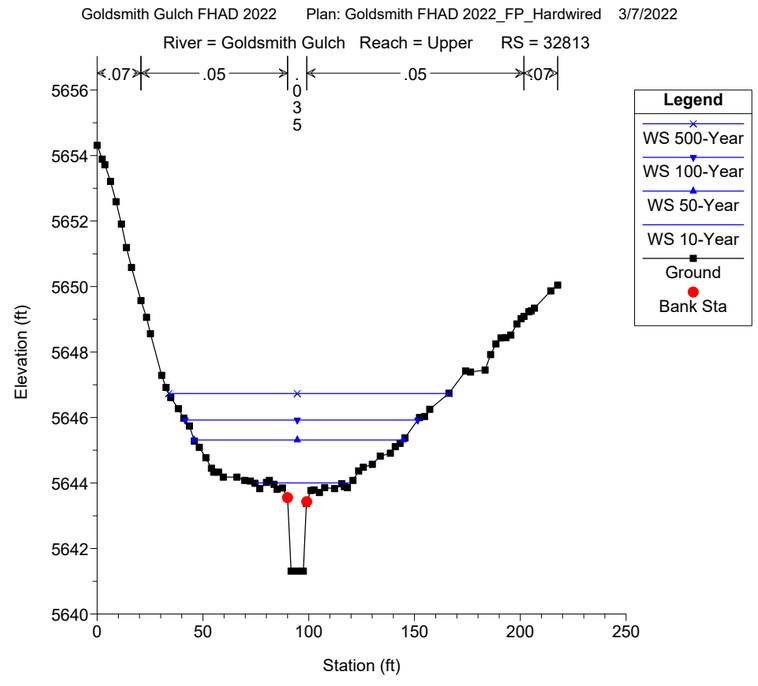

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33281 U/S Drop #45
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

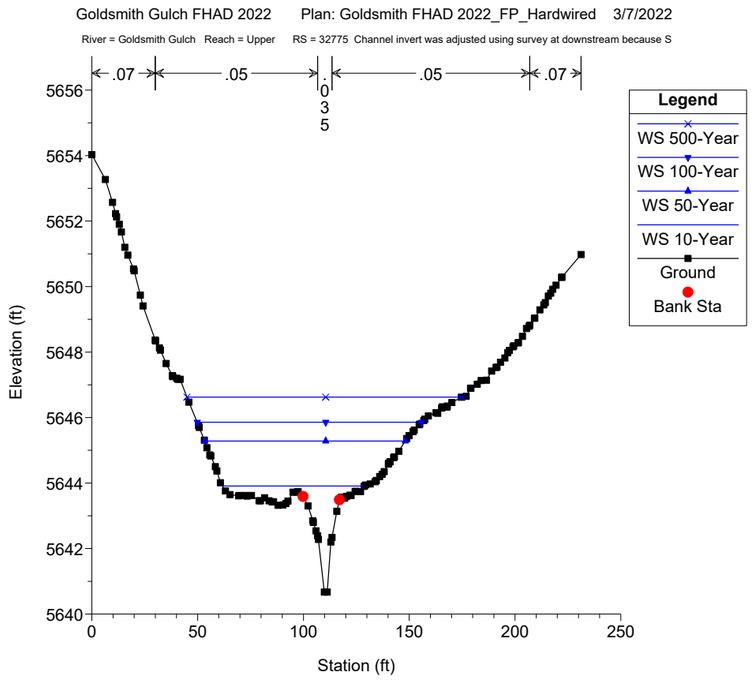

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33251 D/S Drop #45
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

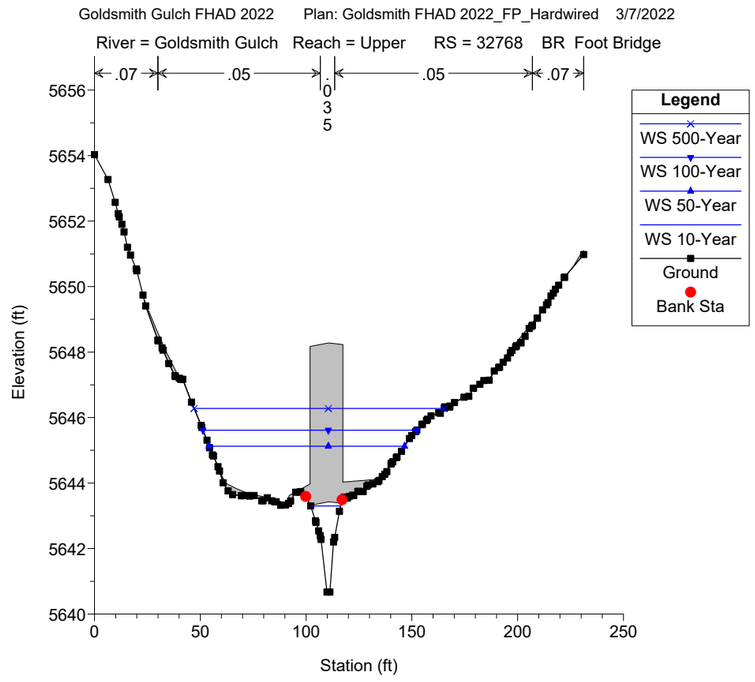

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33145 U/S Drop #44
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

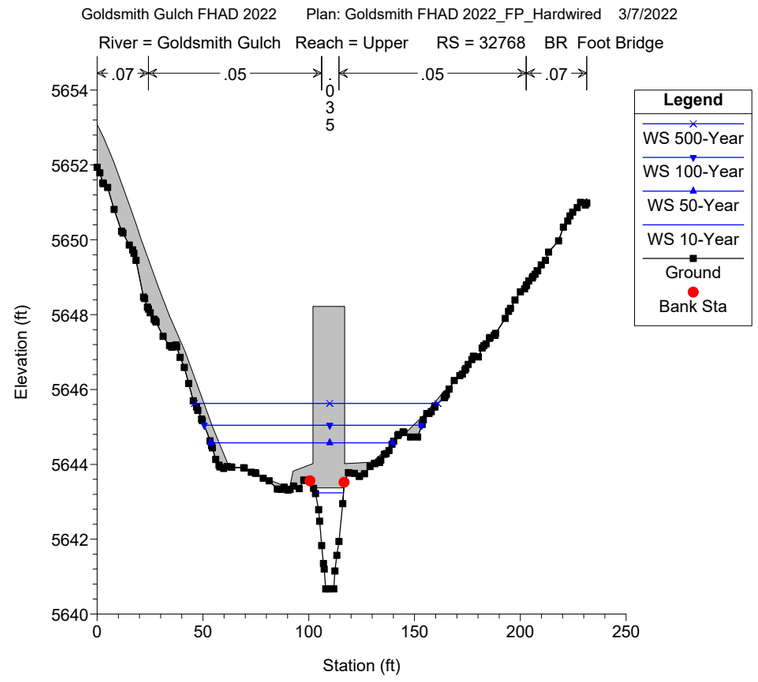

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 33122 D/S Drop #44
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

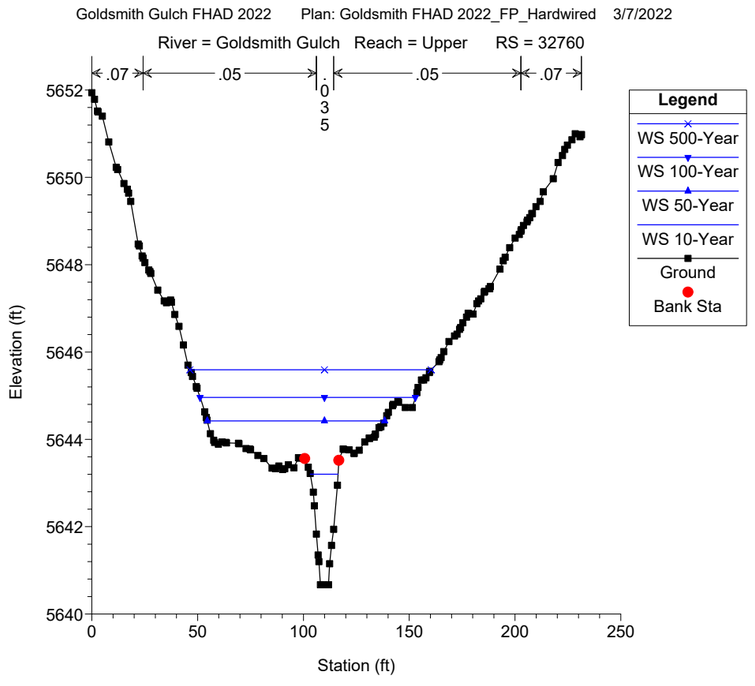

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32986
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

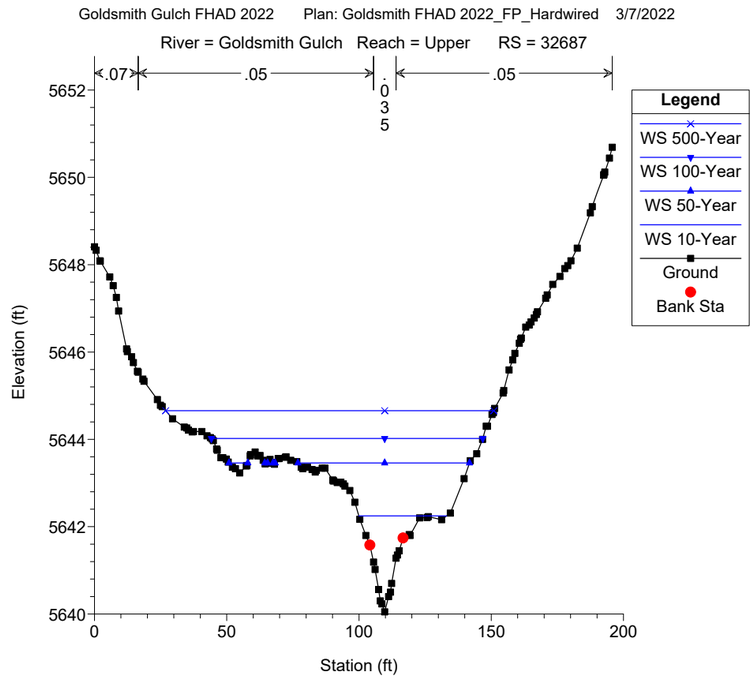

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32813
.07
.05
.035
.05
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

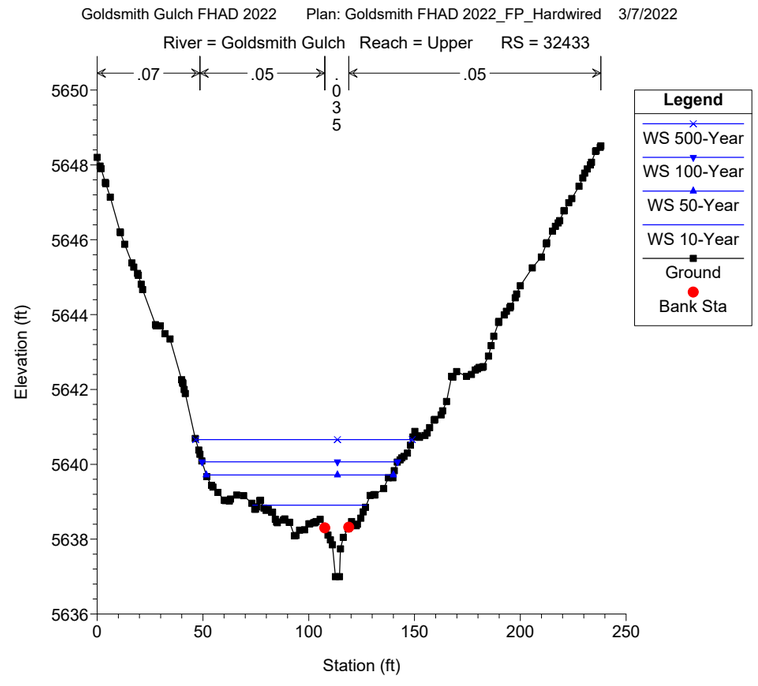

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32775 Channel invert was adjusted using survey at downstream because S
.07
.05
.05
.07
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

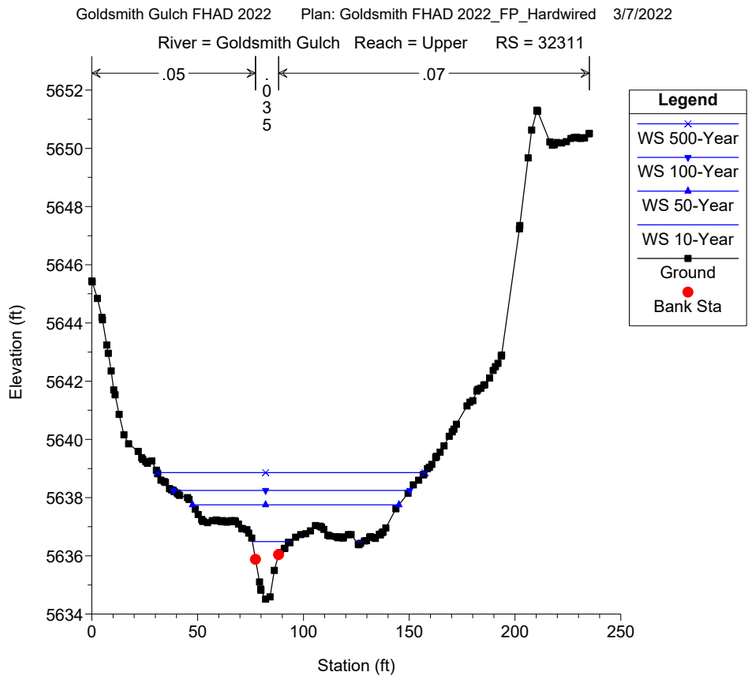

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32768 BR Foot Bridge
.07
.05
.05
.07
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

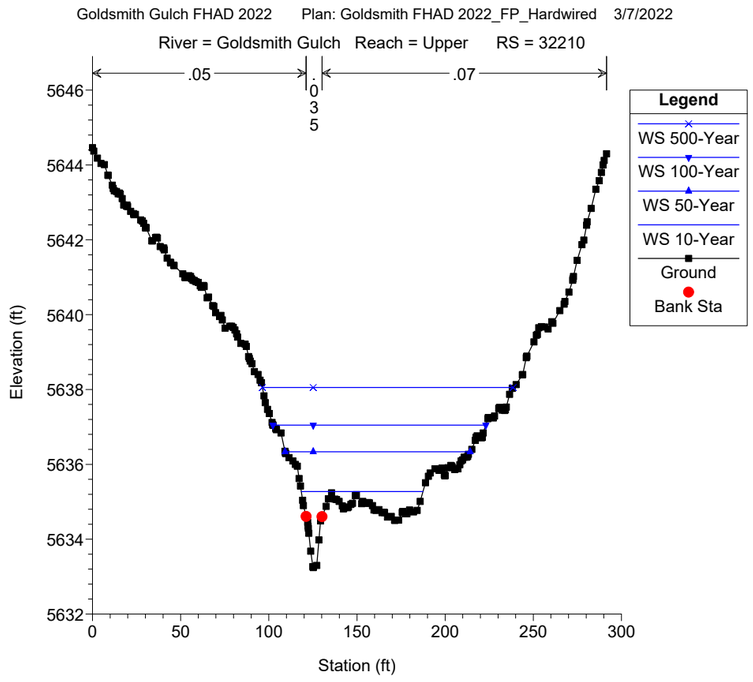

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32768 BR Foot Bridge
.07
.05
.05
.07
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

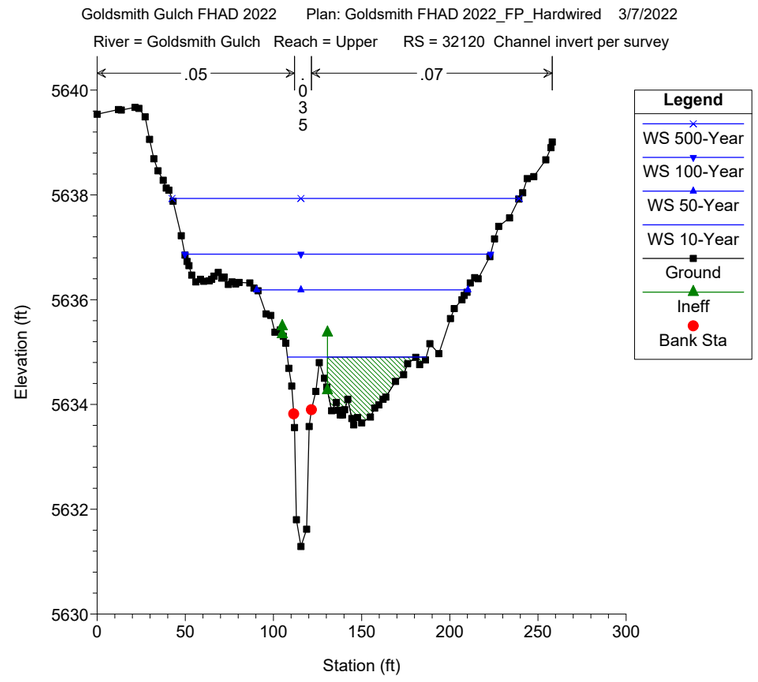

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32760
.07
.05
.05
.07
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

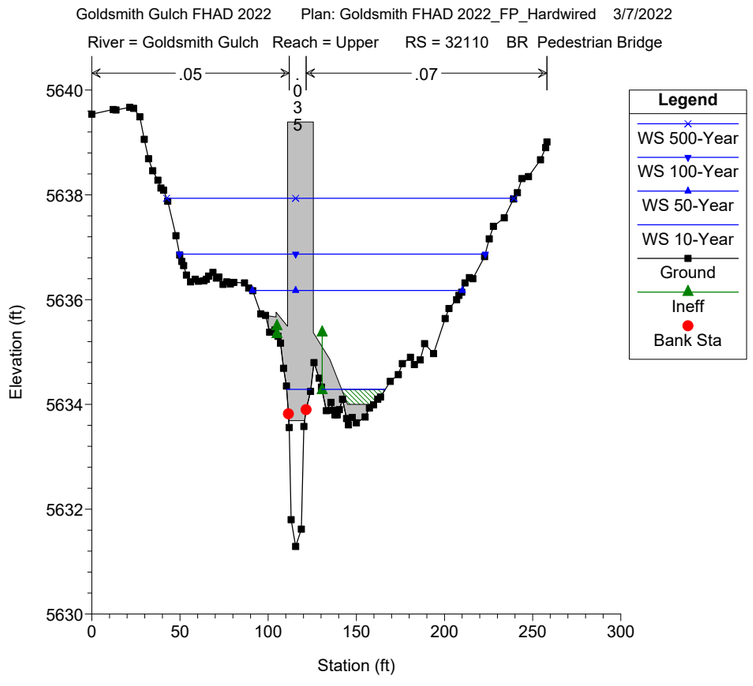

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32687
.07
.05
.05
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

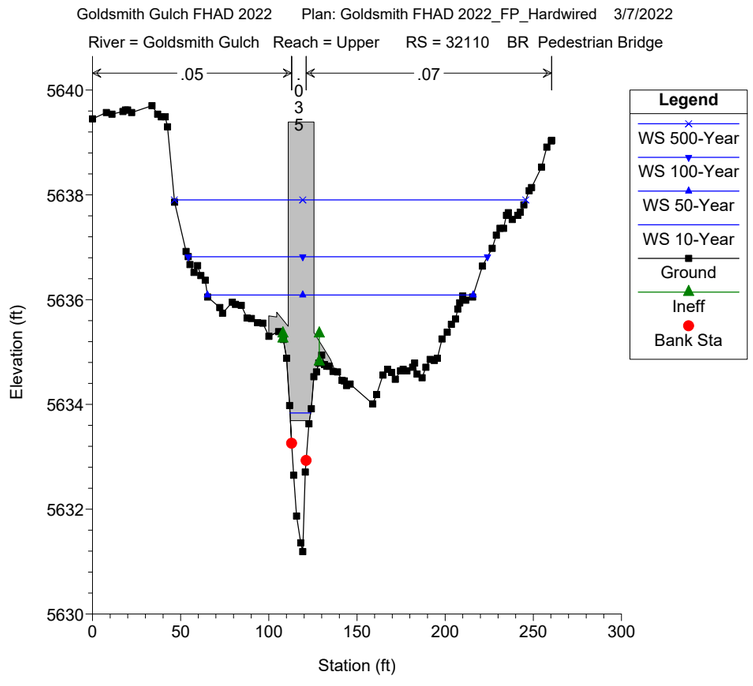

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32433
.07
.05
.05
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

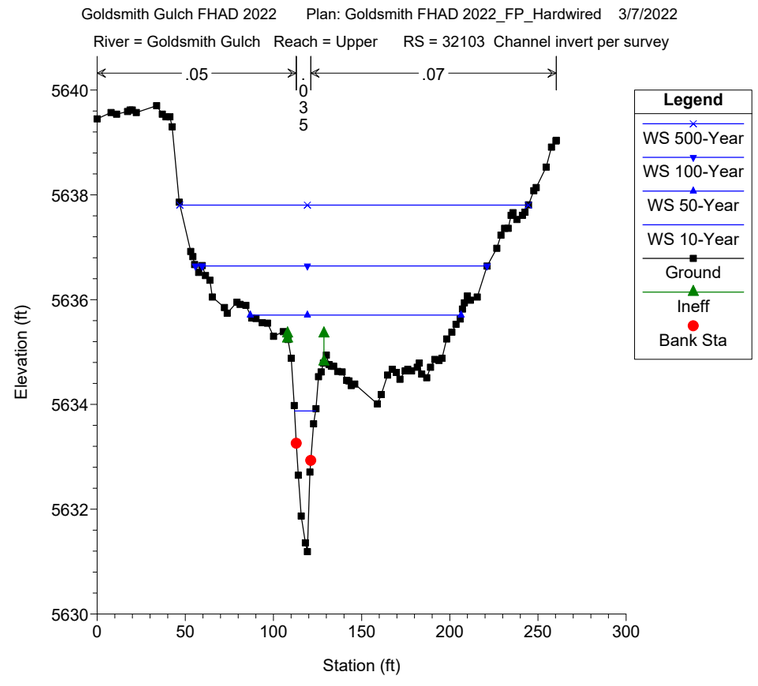

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32311
.05
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

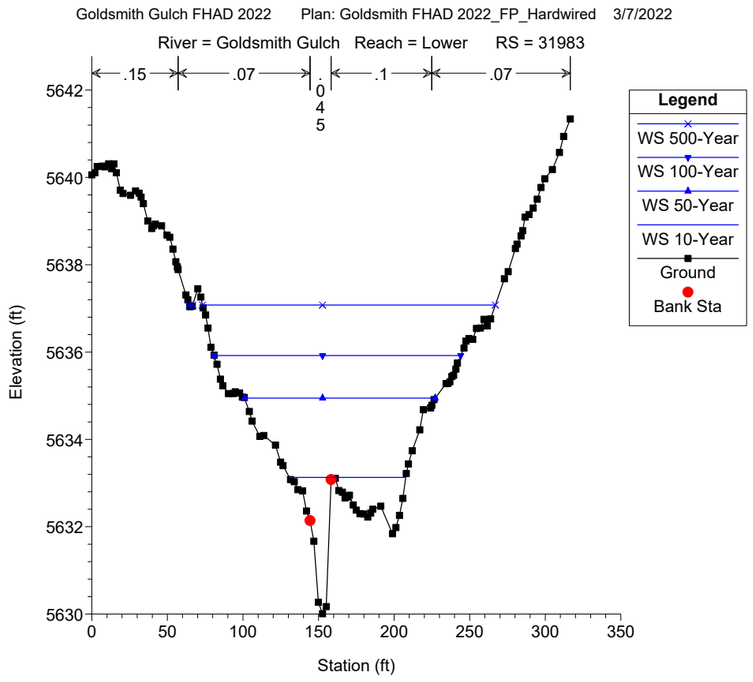

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32210
.05
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

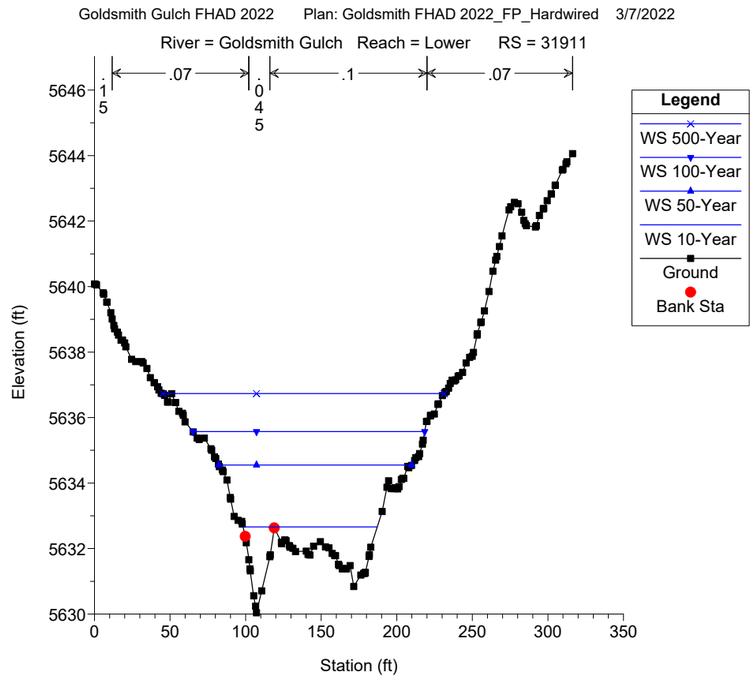

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32120 Channel invert per survey
.05
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

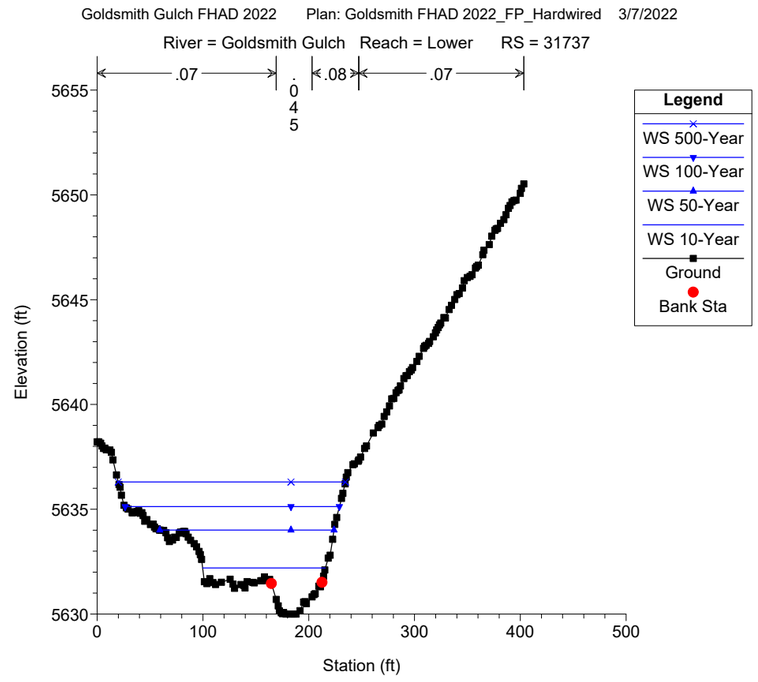

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32110 BR Pedestrian Bridge
.05
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

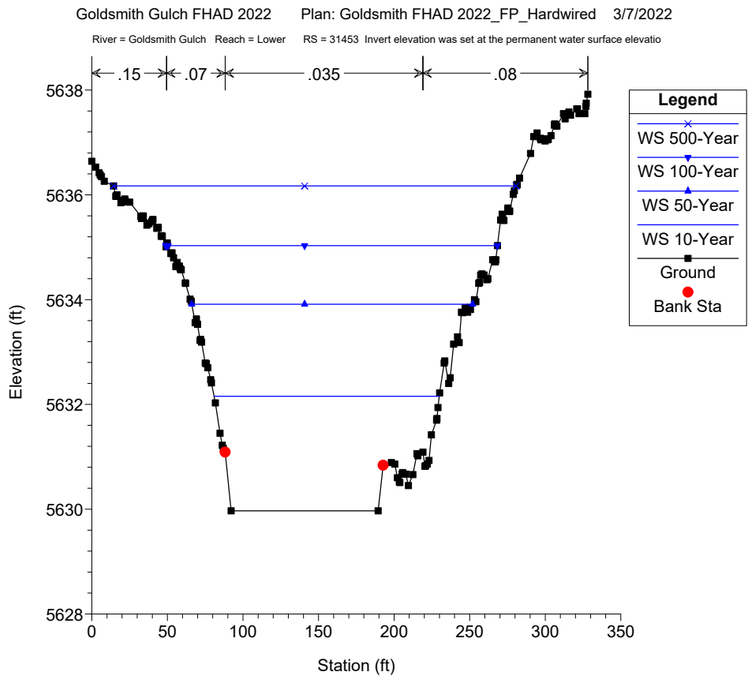

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32110 BR Pedestrian Bridge
.05
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

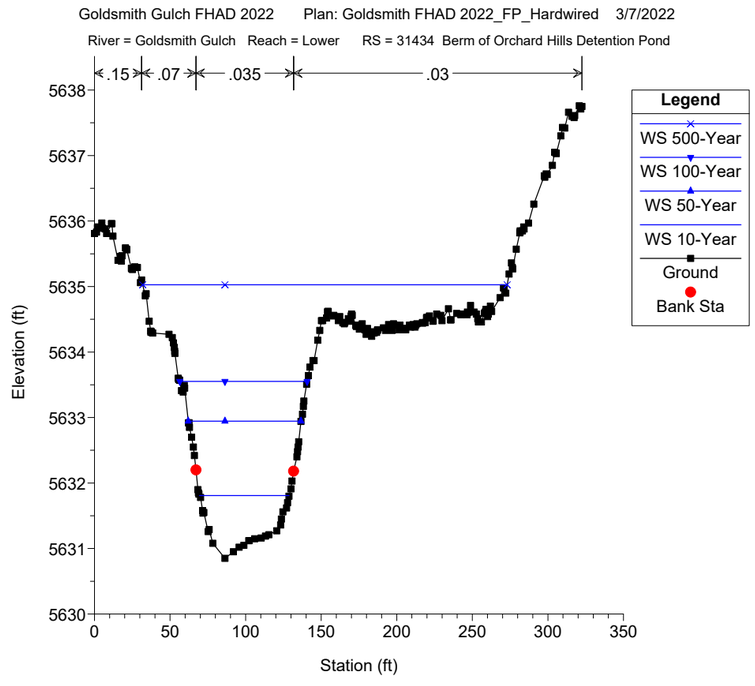

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Upper RS = 32103 Channel invert per survey
.05
.035
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

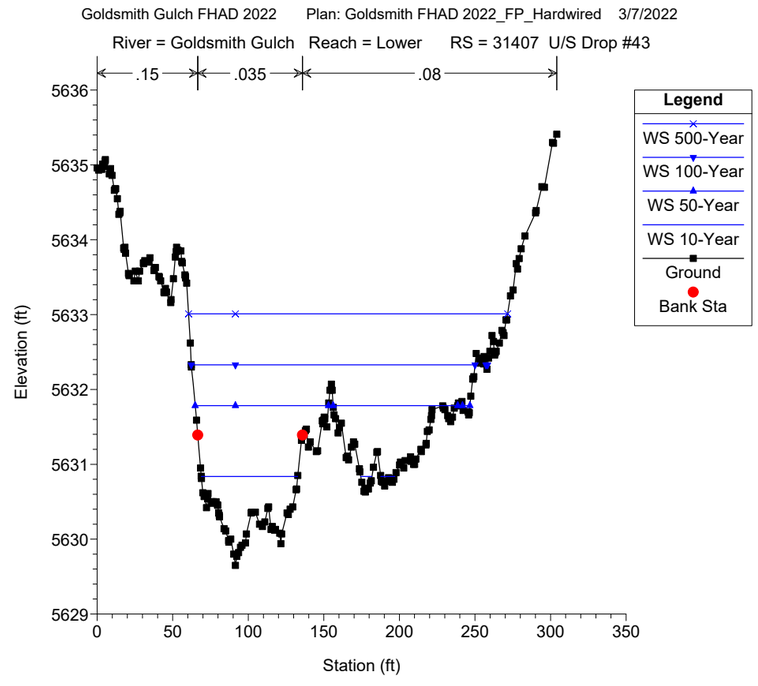

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31983
.15
.07
.045
.1
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

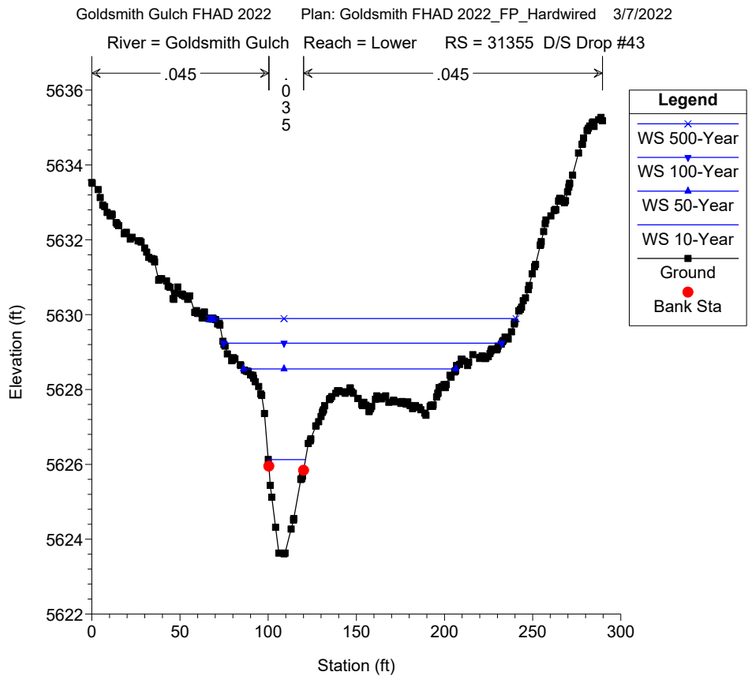

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31911
.15
.07
.045
.1
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

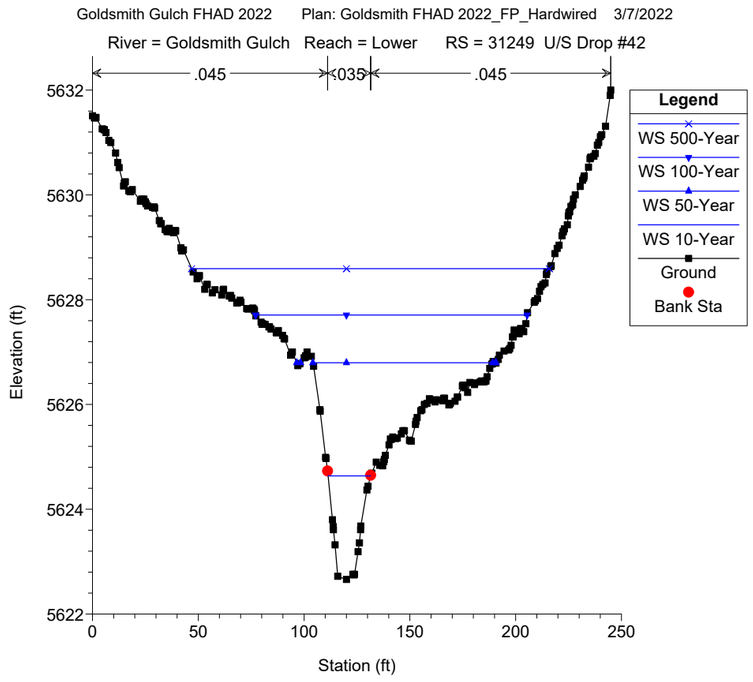

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31737
.07
.045
.08
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

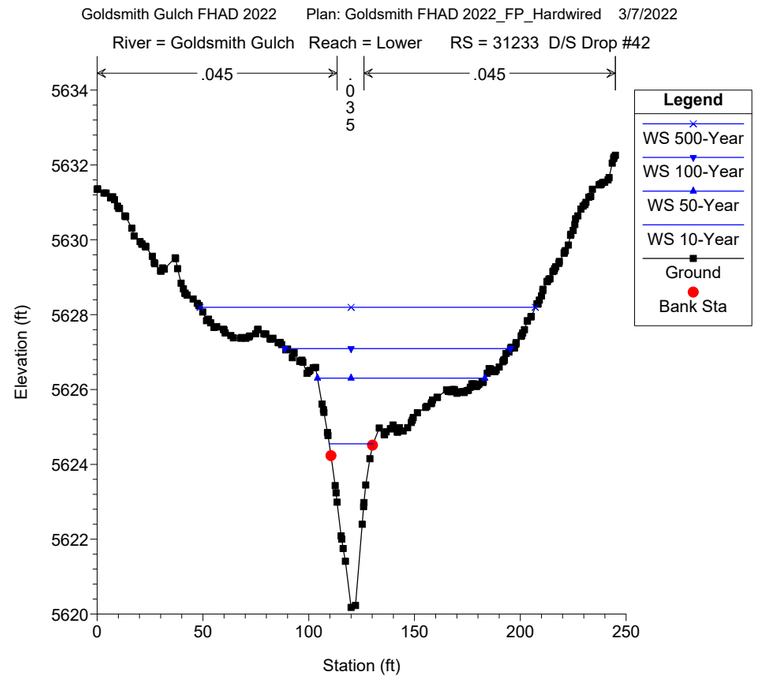

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31453 Invert elevation was set at the permanent water surface elevatio
.15
.07
.035
.08
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

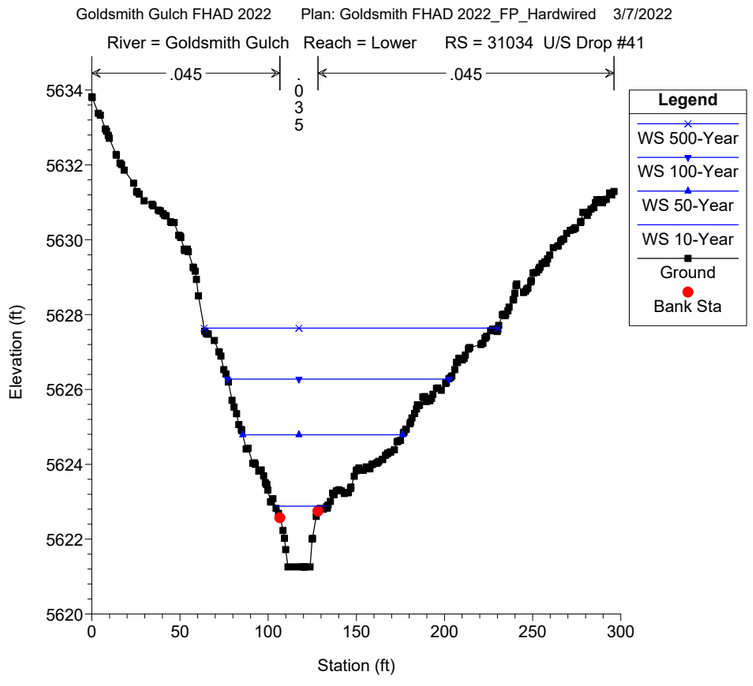

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31434 Berm of Orchard Hills Detention Pond
.15
.07
.035
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

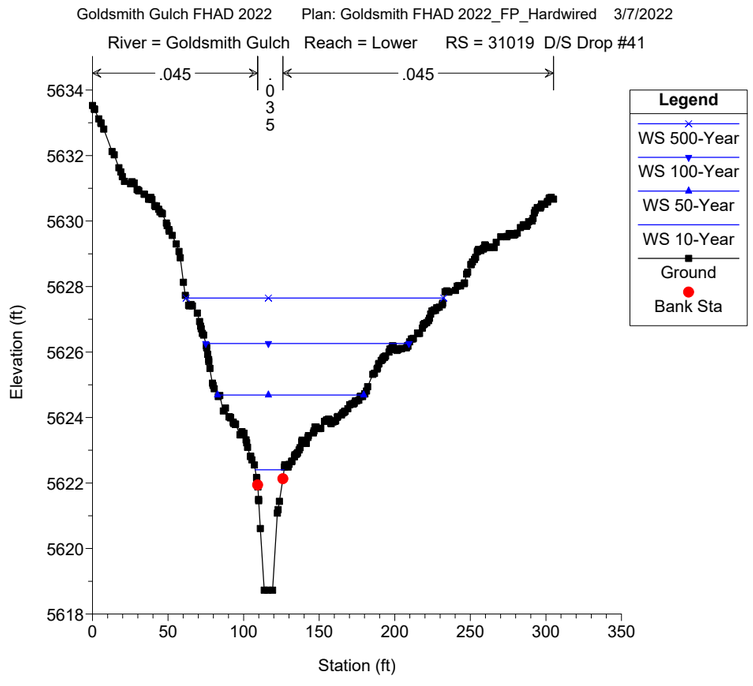

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31407 U/S Drop #43
.15
.035
.08
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

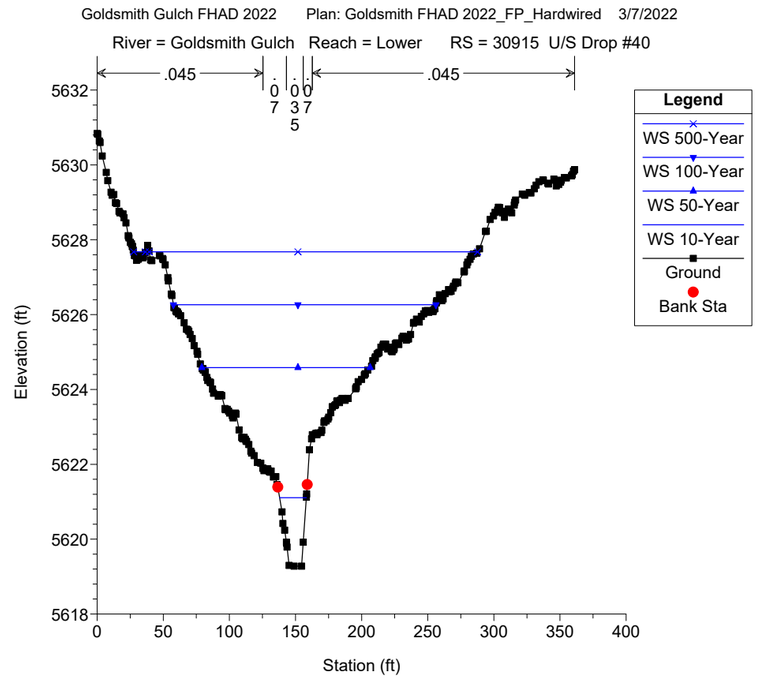

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31355 D/S Drop #43
.045
.035
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

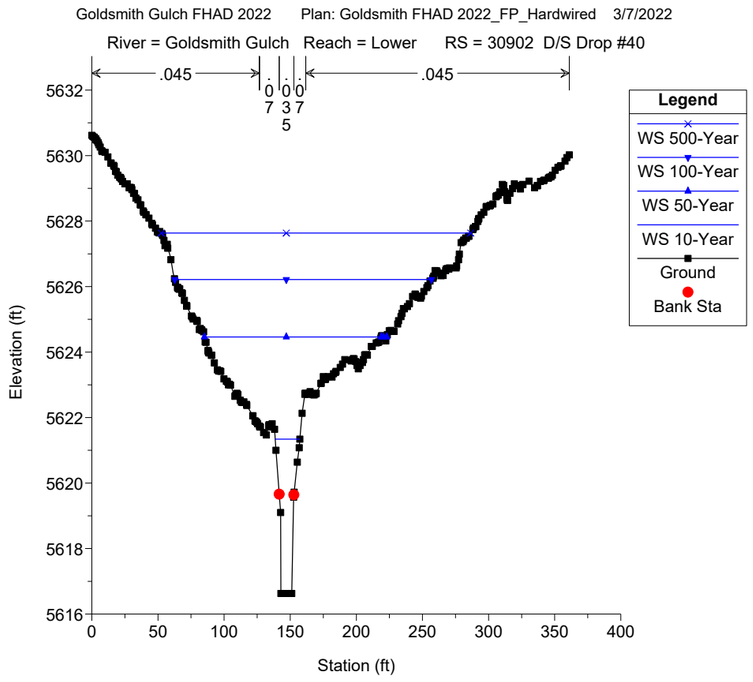

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31249 U/S Drop #42
.045
.035
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

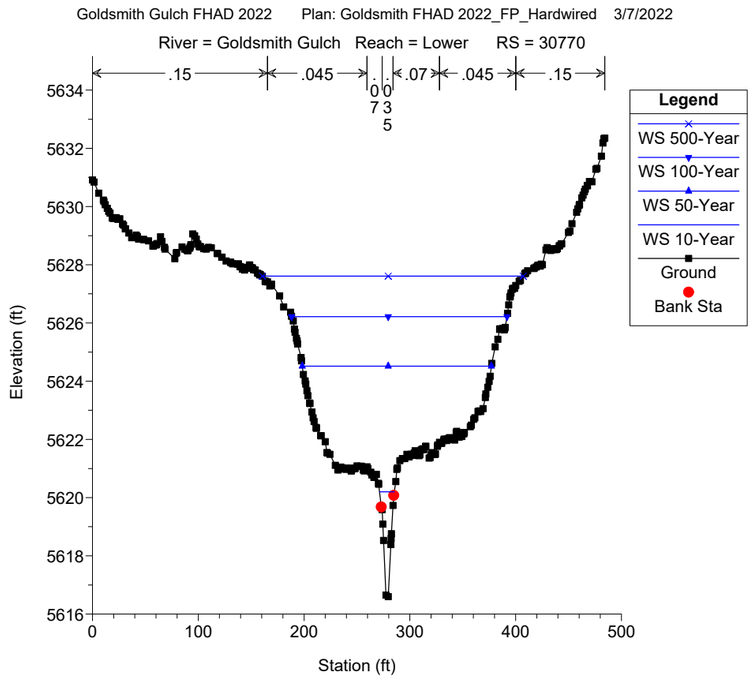

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31233 D/S Drop #42
.045
.035
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

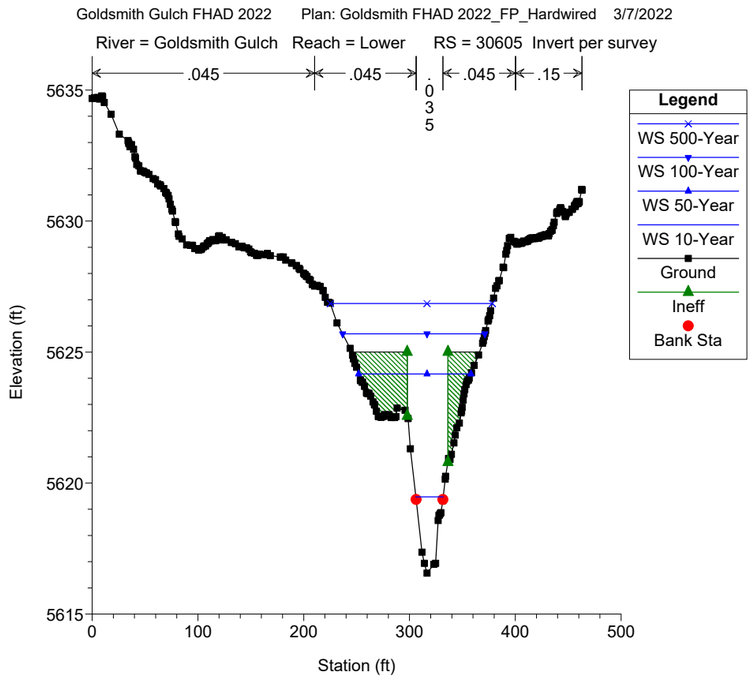

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31034 U/S Drop #41
.045
.035
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

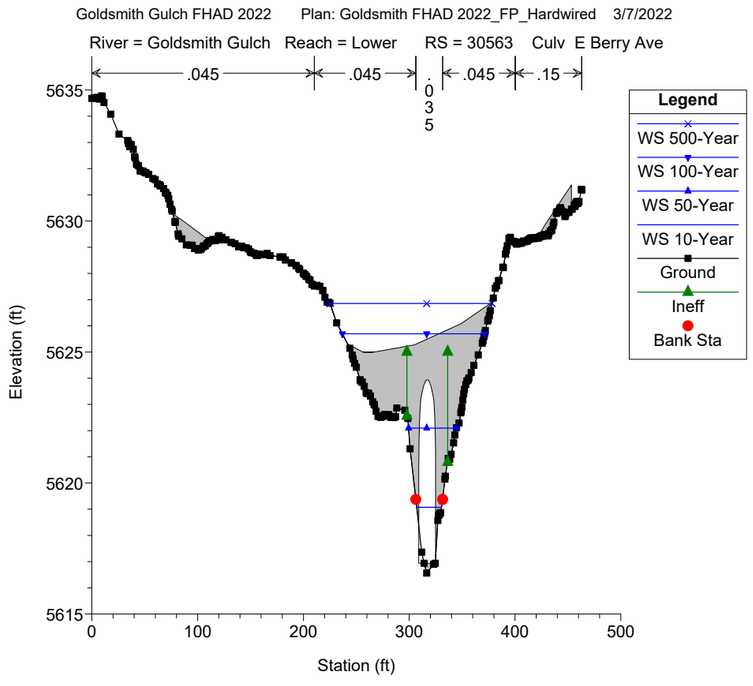

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 31019 D/S Drop #41
.045
.035
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

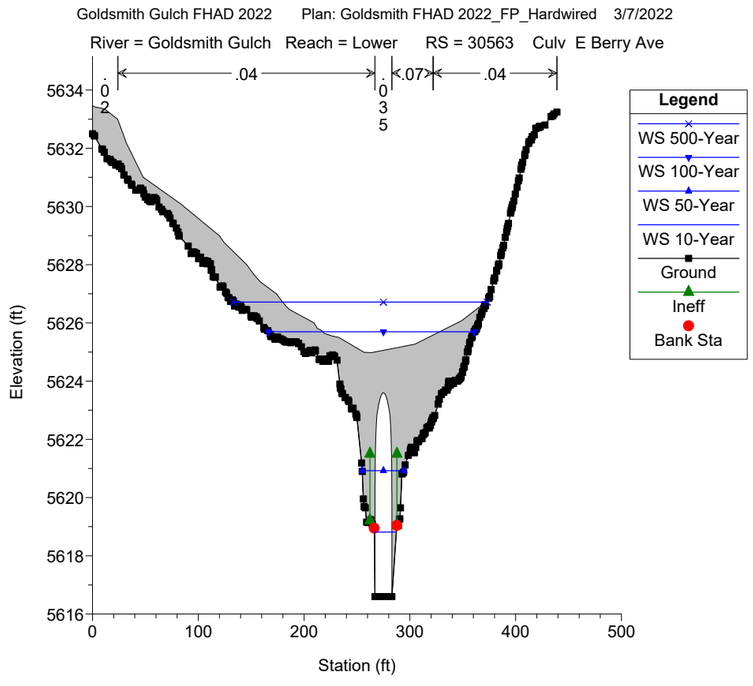

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30915 U/S Drop #40
.045
.007
.035
.007
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

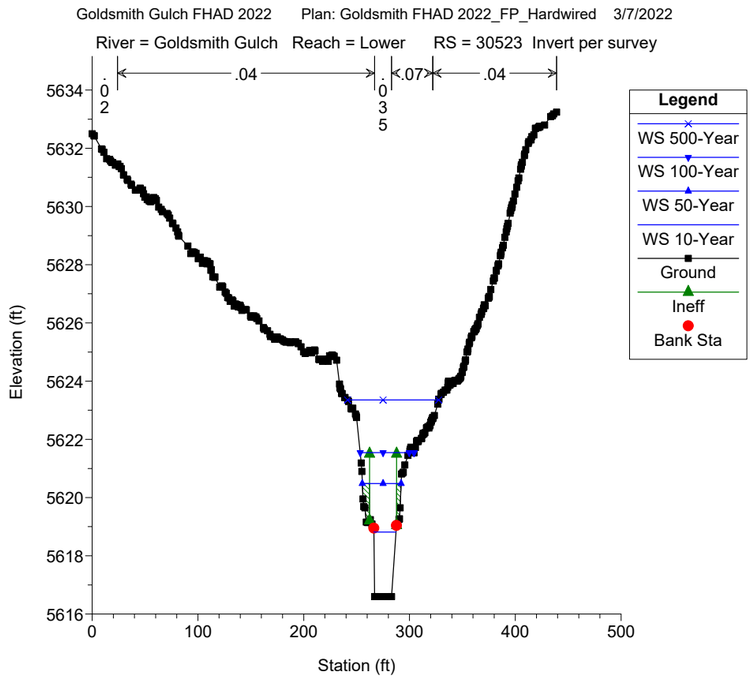

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30902 D/S Drop #40
.045
.045
.045
.07
.03
.07
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

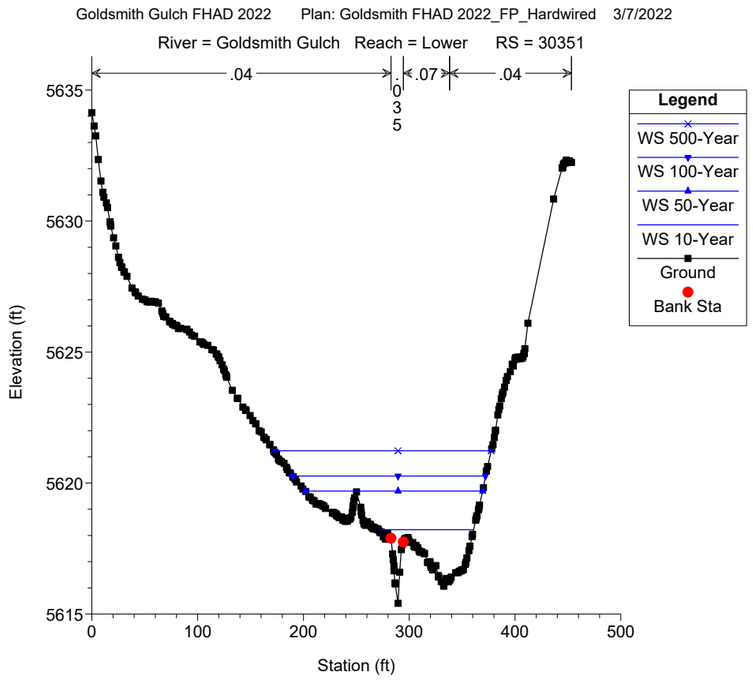

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30770
.15
.045
.07
.045
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

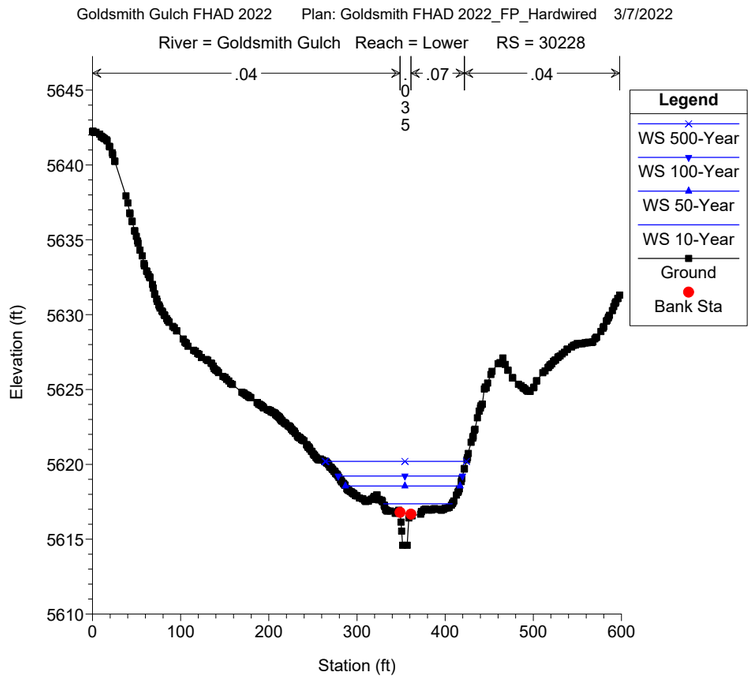

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30605 Invert per survey
.045
.045
.045
.15
.03
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

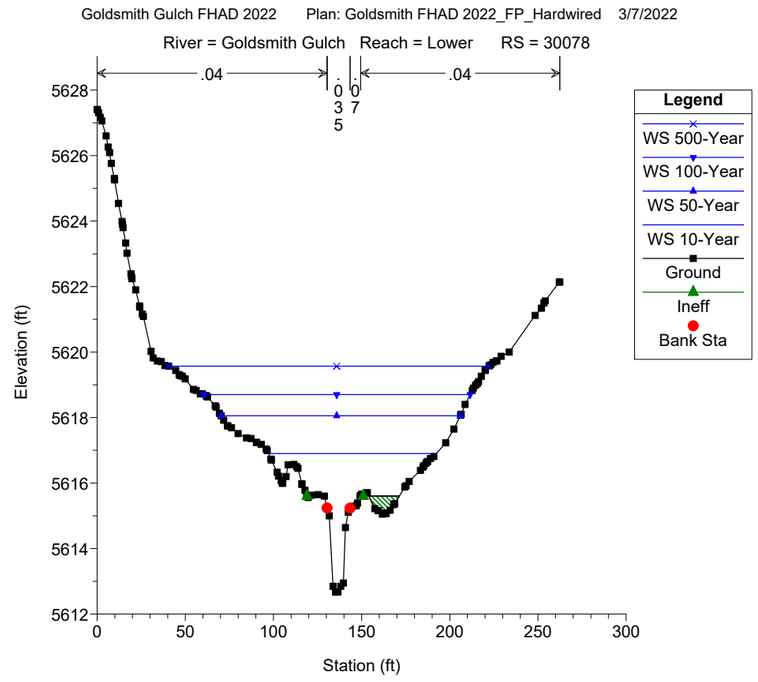

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30563 Culv E Berry Ave
.045
.045
.045
.15
.03
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

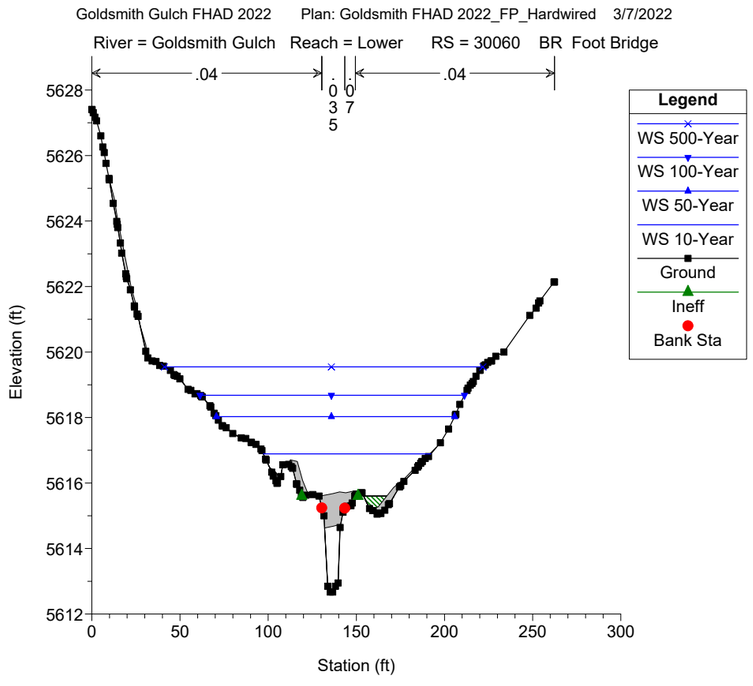

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30563 Culv E Berry Ave
.02
.04
.03
.05
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

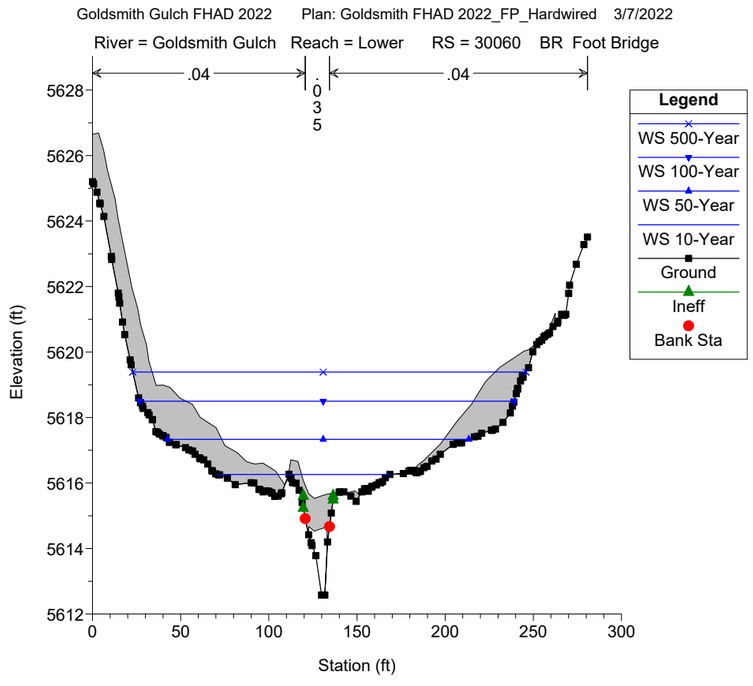

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30523 Invert per survey
.02
.04
.03
.05
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

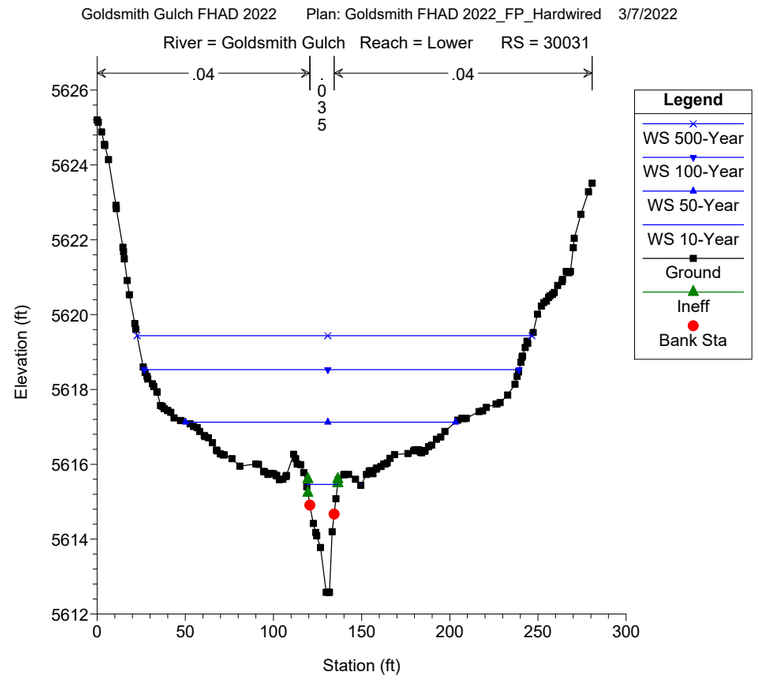

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30351
.04
.035
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

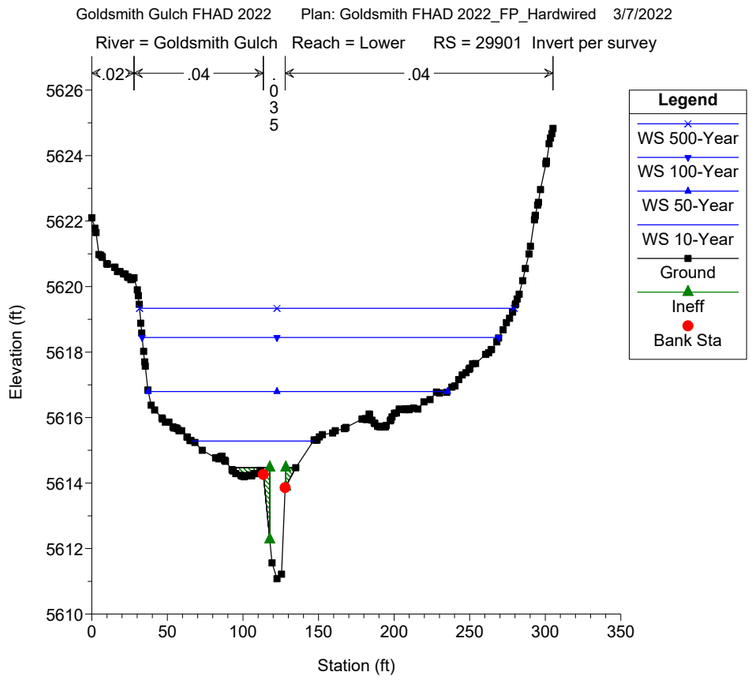

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30228
.04
.035
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

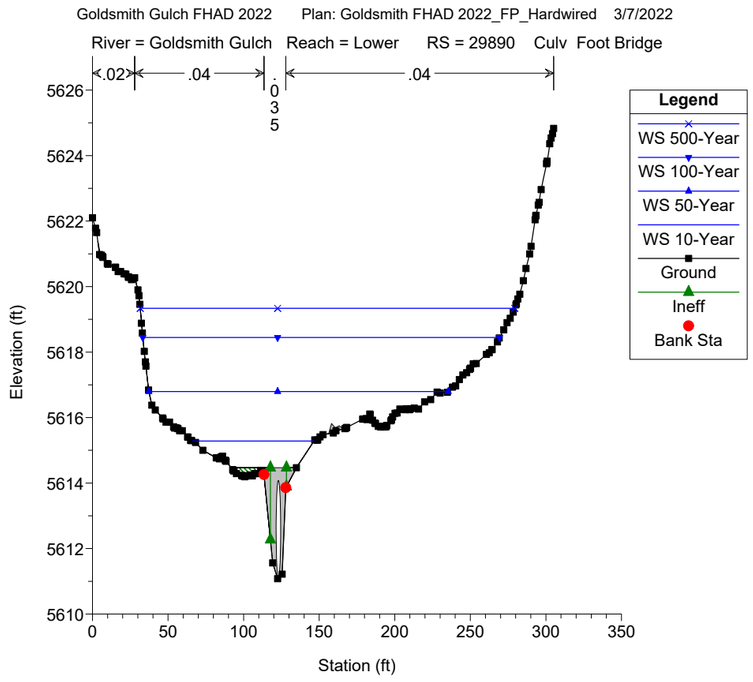

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30078
.04
.035
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

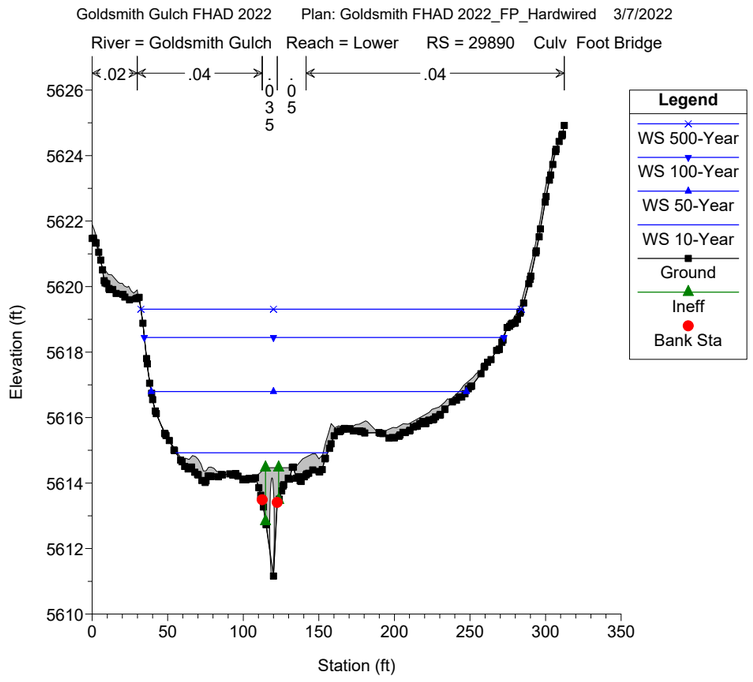

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30060 BR Foot Bridge
.04
.035
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

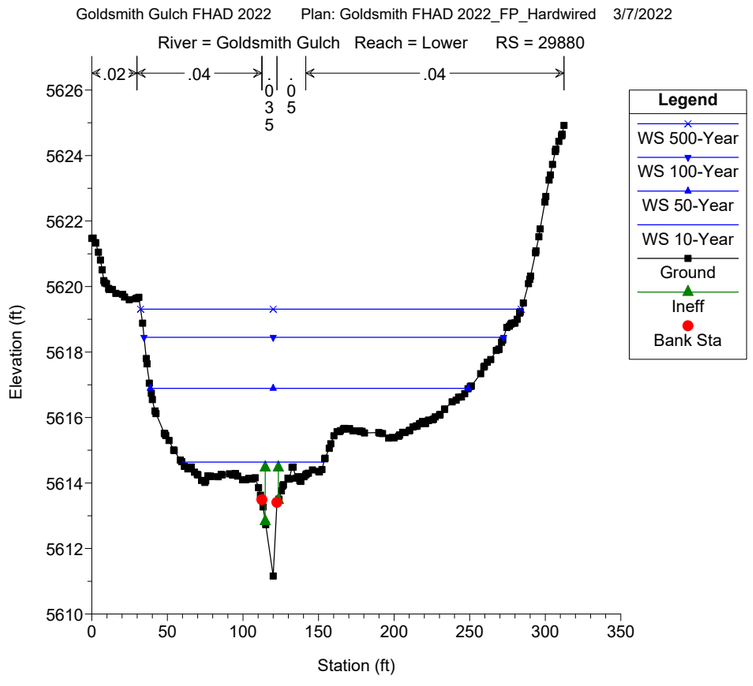

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30060 BR Foot Bridge
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

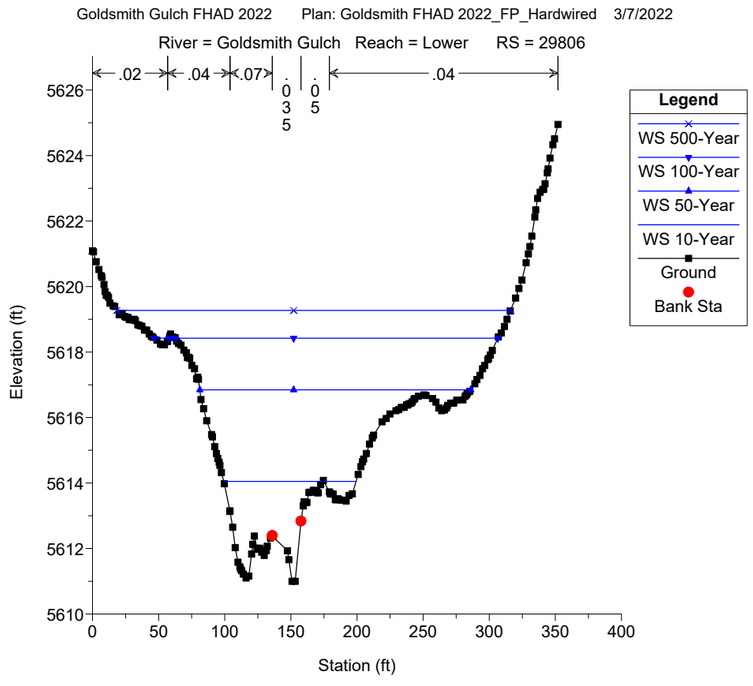

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 30031
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

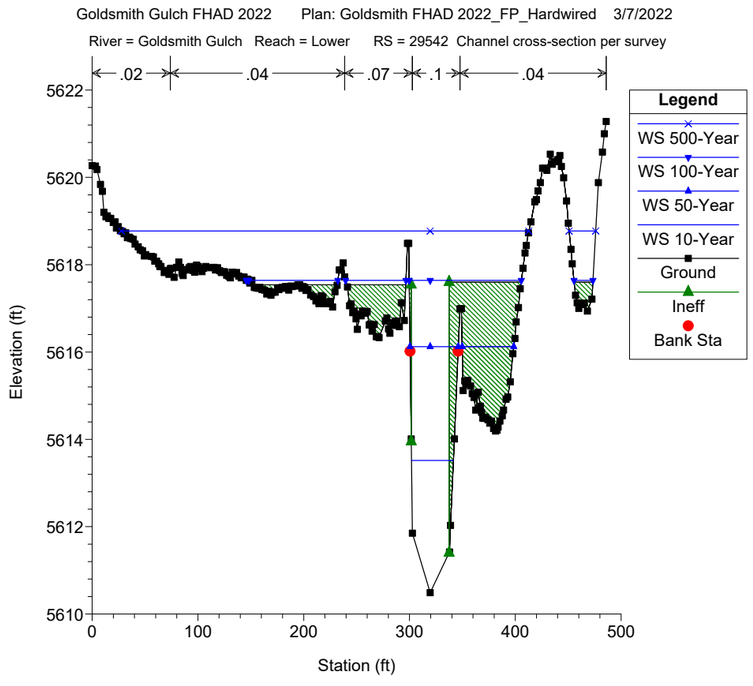

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29901 Invert per survey
.02
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

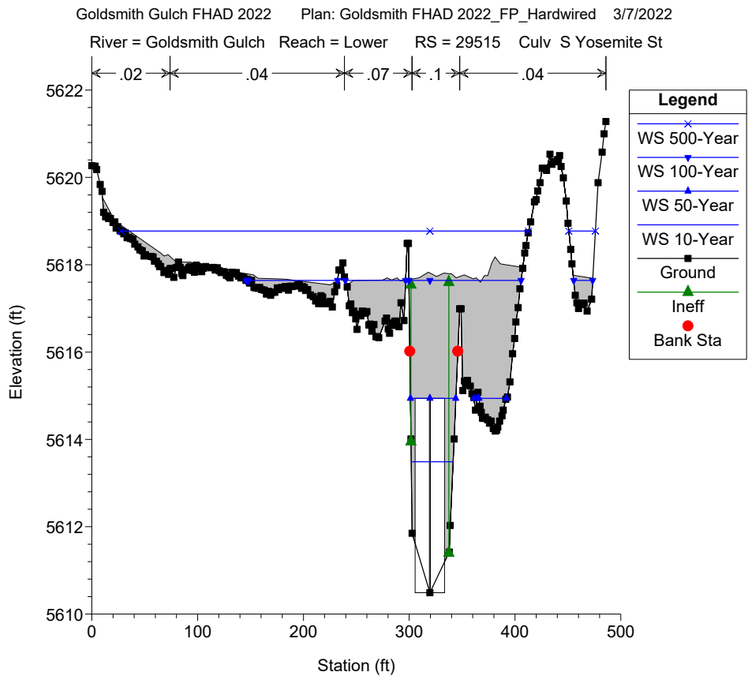

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29890 Culv Foot Bridge
.02
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

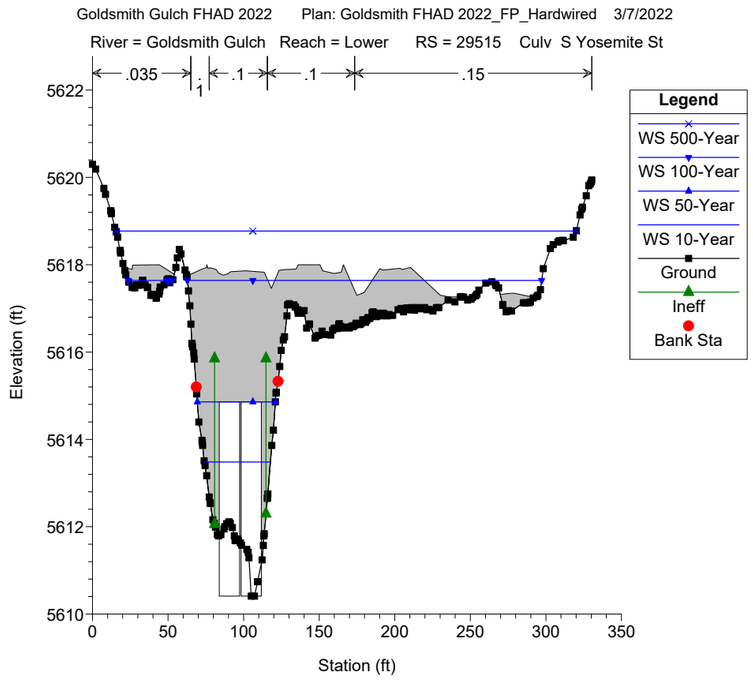

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29890 Culv Foot Bridge
.02
.04
.035
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

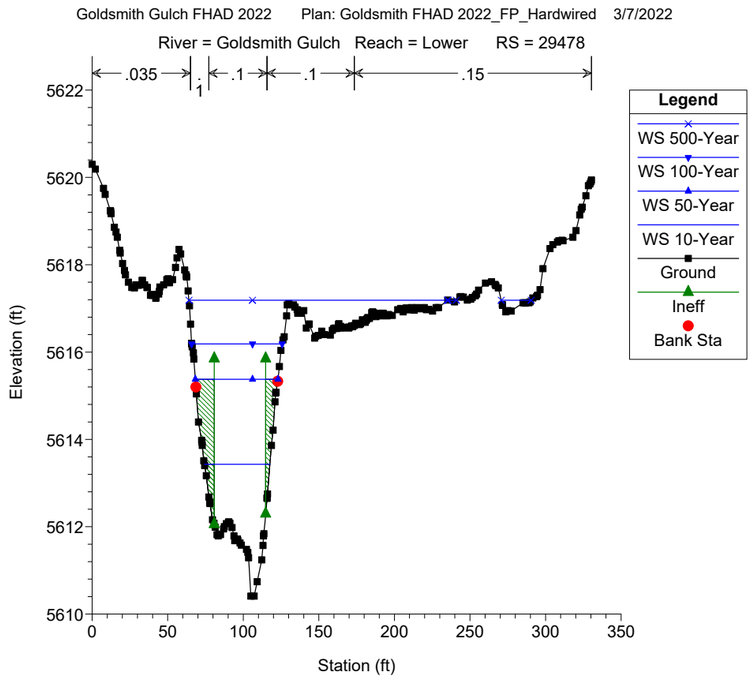

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29880
.02
.04
.035
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

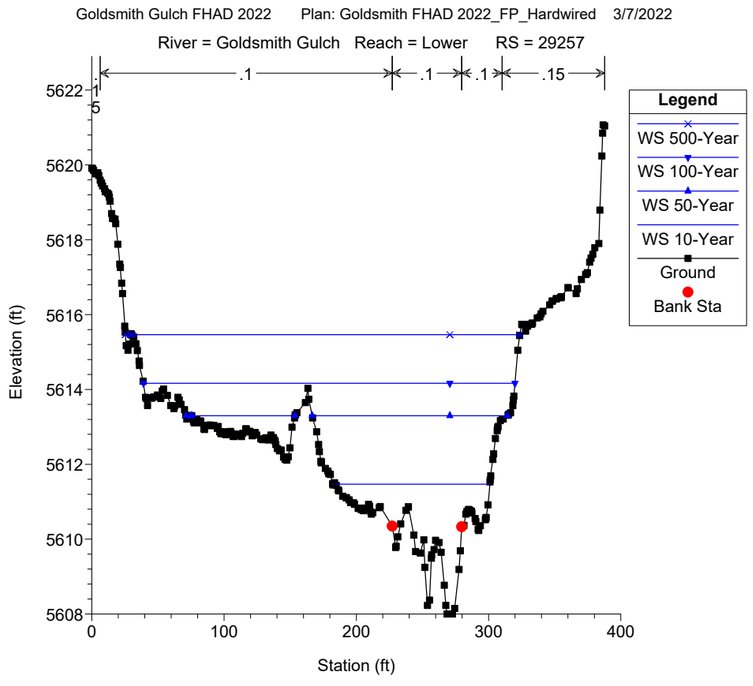

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29806
.02
.04
.07
.035
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

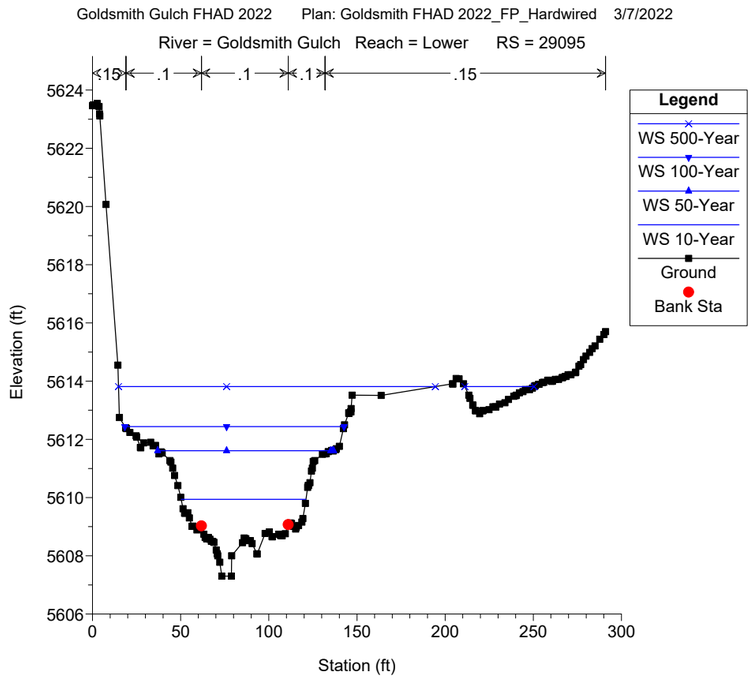

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29542 Channel cross-section per survey
.02
.04
.07
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

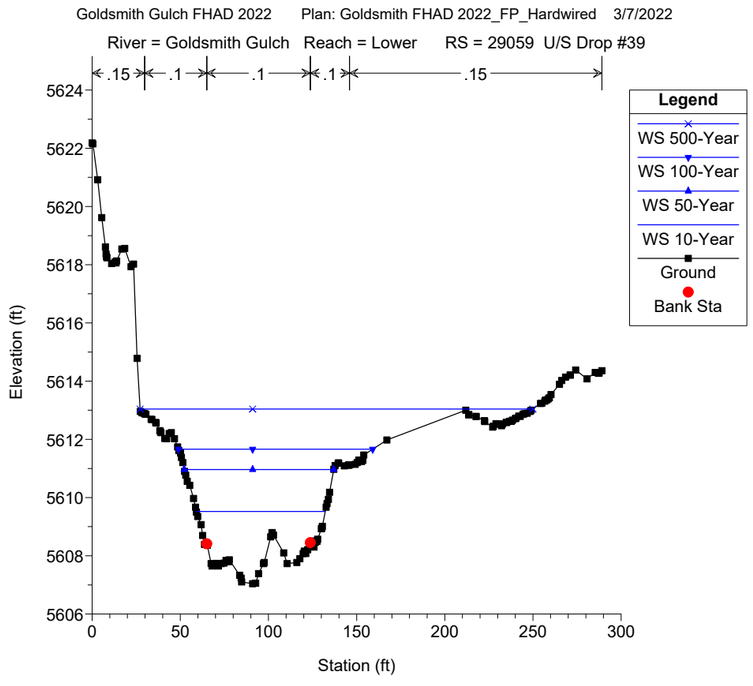

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29515 Culv S Yosemite St
.02
.04
.07
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

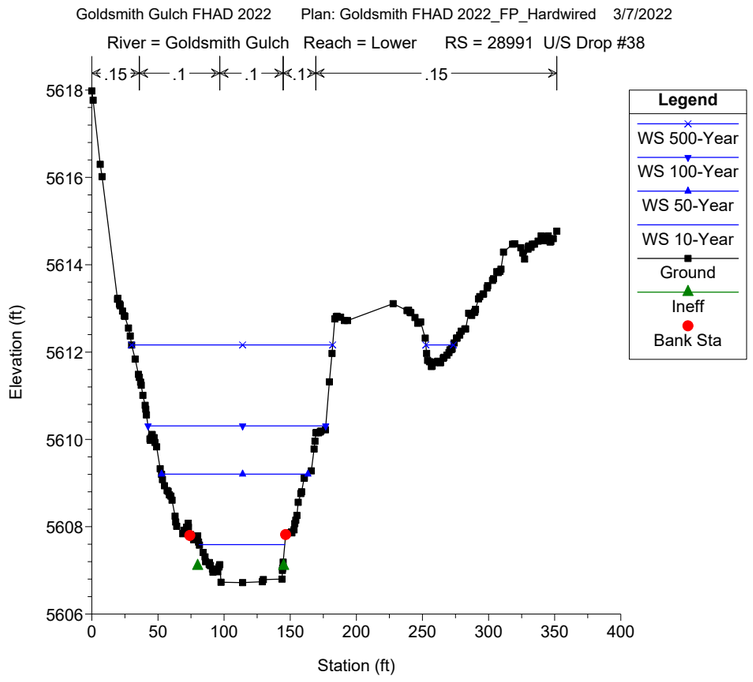

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29515 Culv S Yosemite St
.035
.1
.1
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

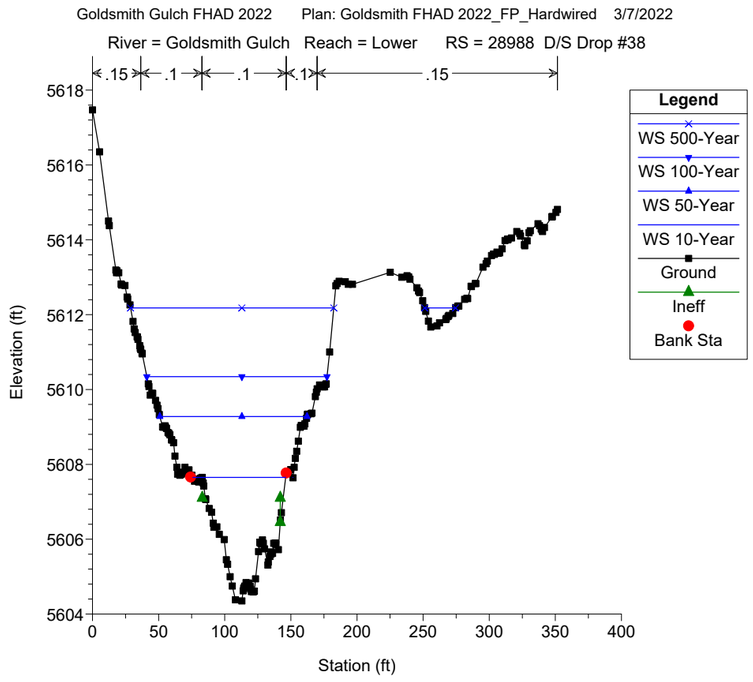

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29478
.035
.1
.1
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

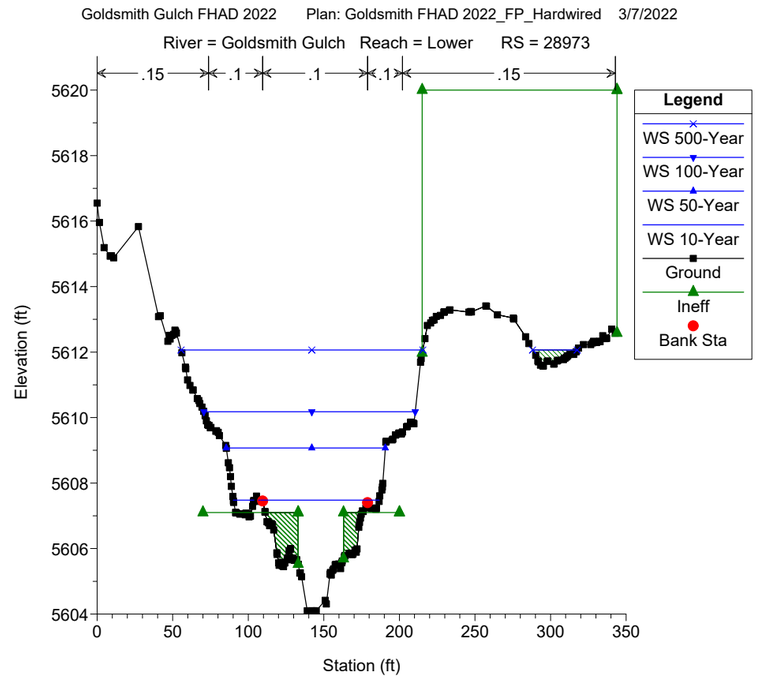

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29257
.1
.1
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

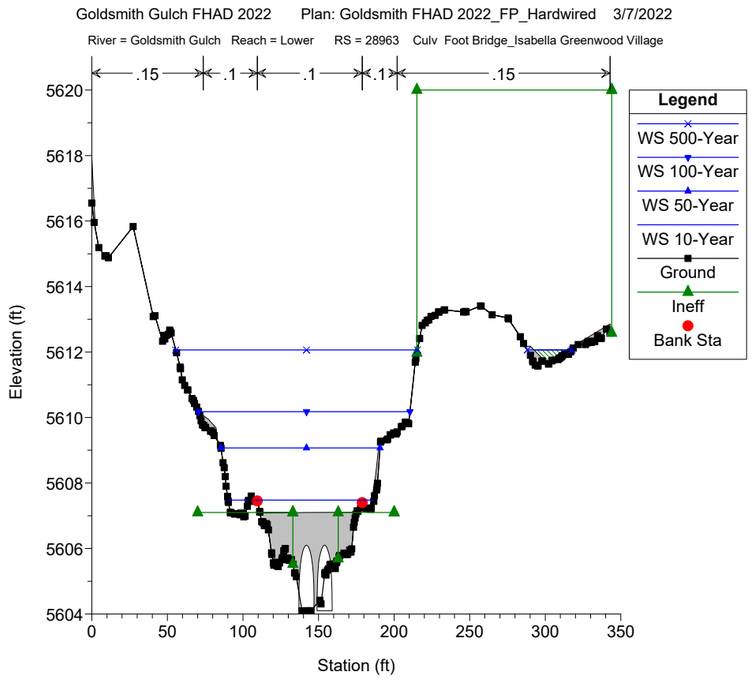

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29095
.15
.1
.1
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

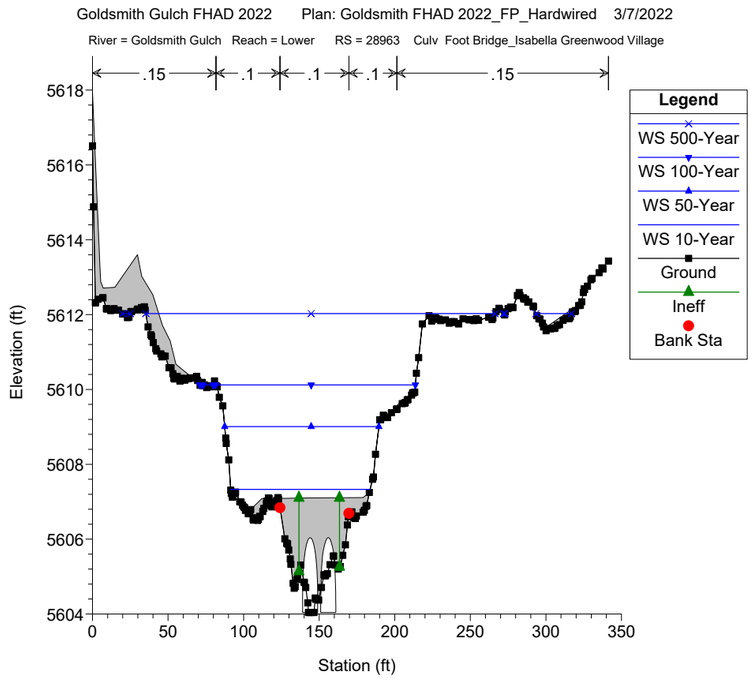

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 29059 U/S Drop #39
.15
.1
.1
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

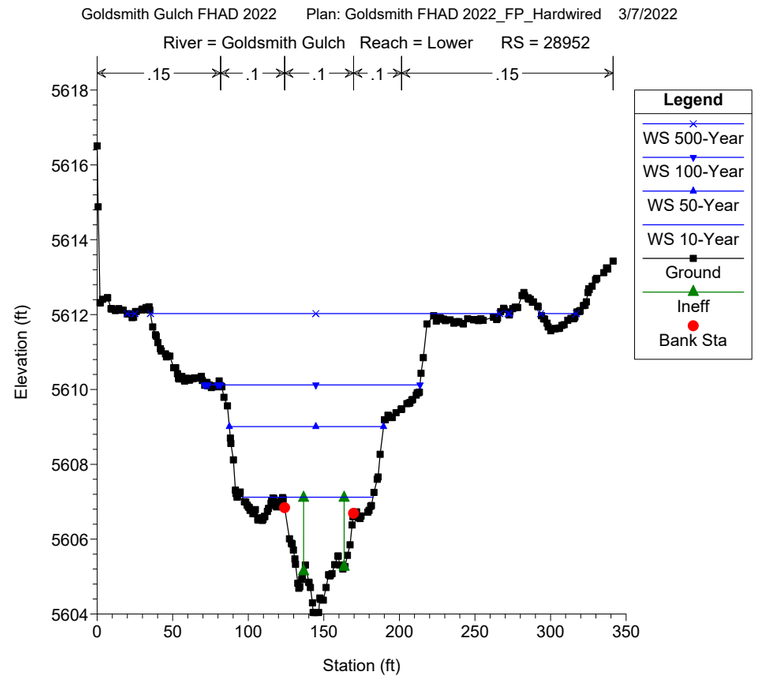

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28991 U/S Drop #38
.15 .1 .1 .1 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

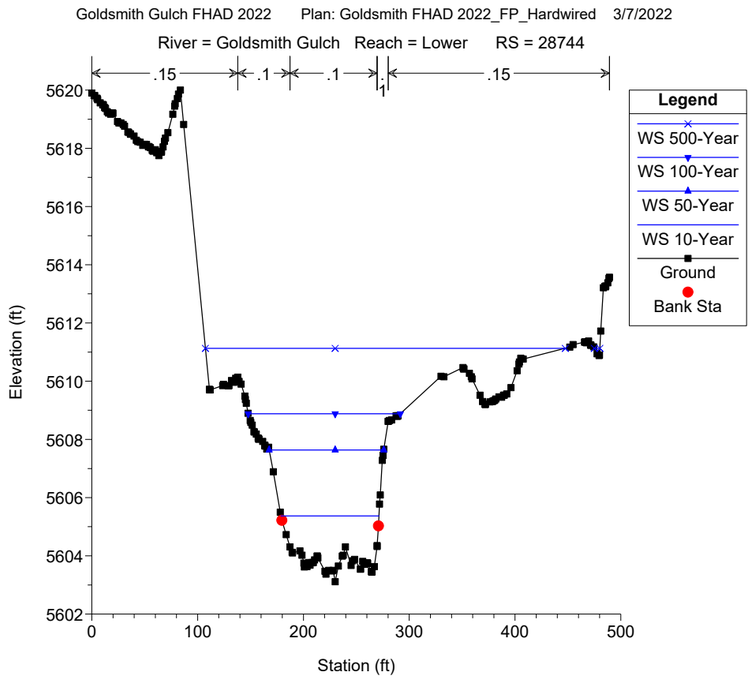

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28988 D/S Drop #38
.15 .1 .1 .1 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

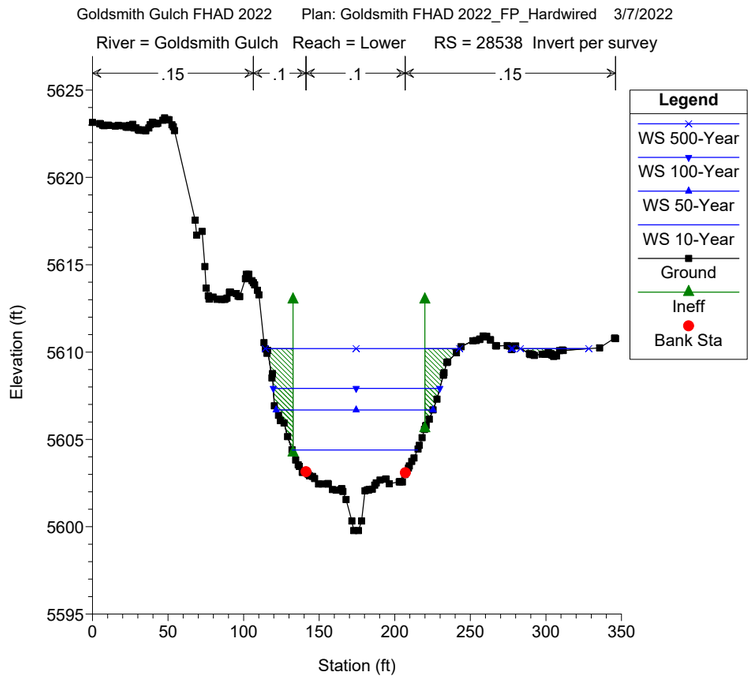

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28973
.15 .1 .1 .1 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

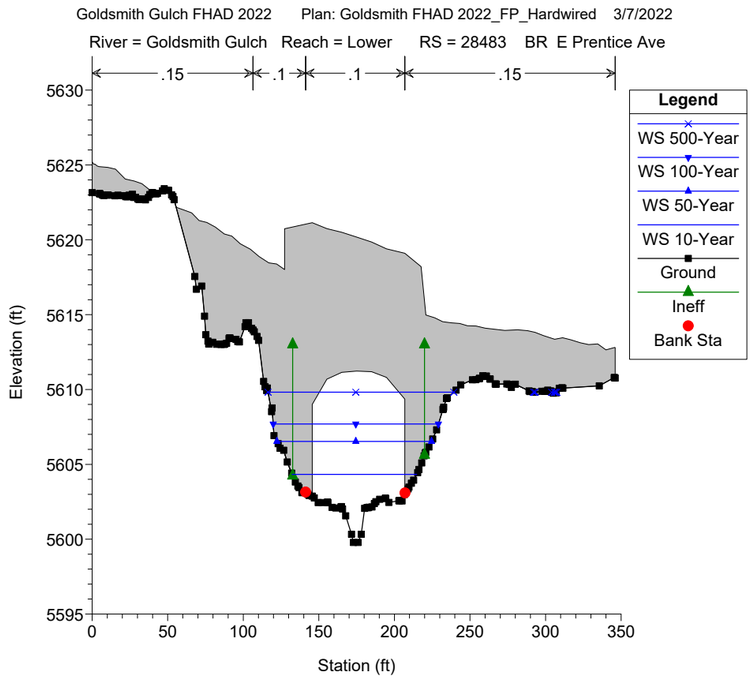

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28963 Culv Foot Bridge_Isabella Greenwood Village
.15 .1 .1 .1 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

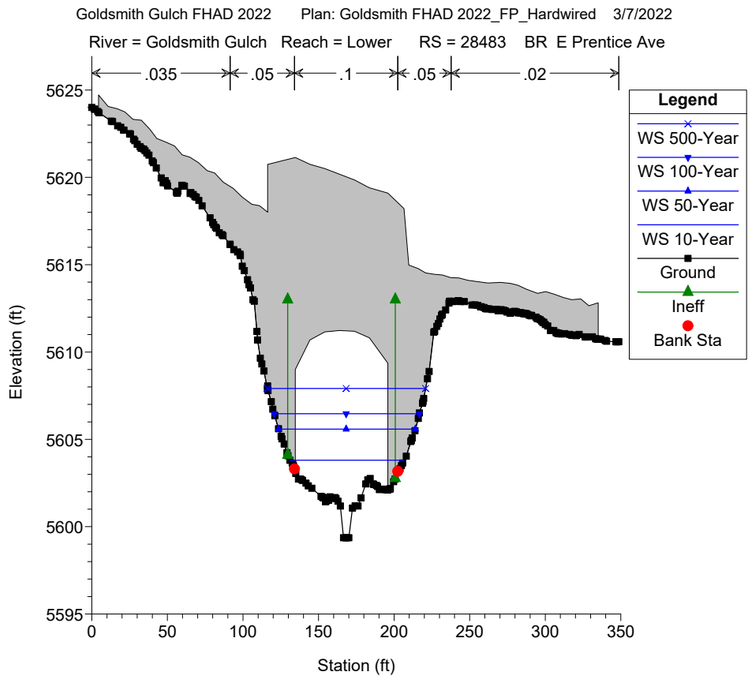

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28963 Culv Foot Bridge_Isabella Greenwood Village
.15 .1 .1 .1 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

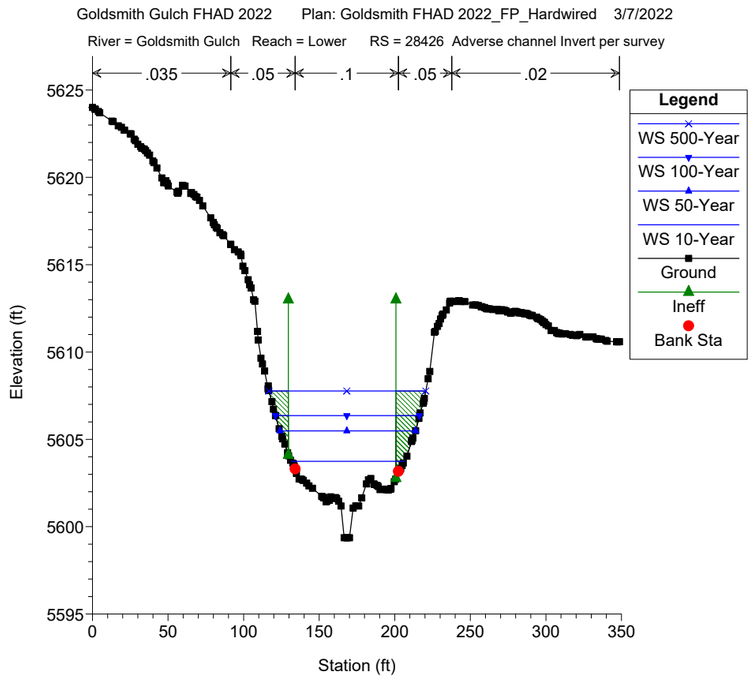

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28952
.15 .1 .1 .1 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

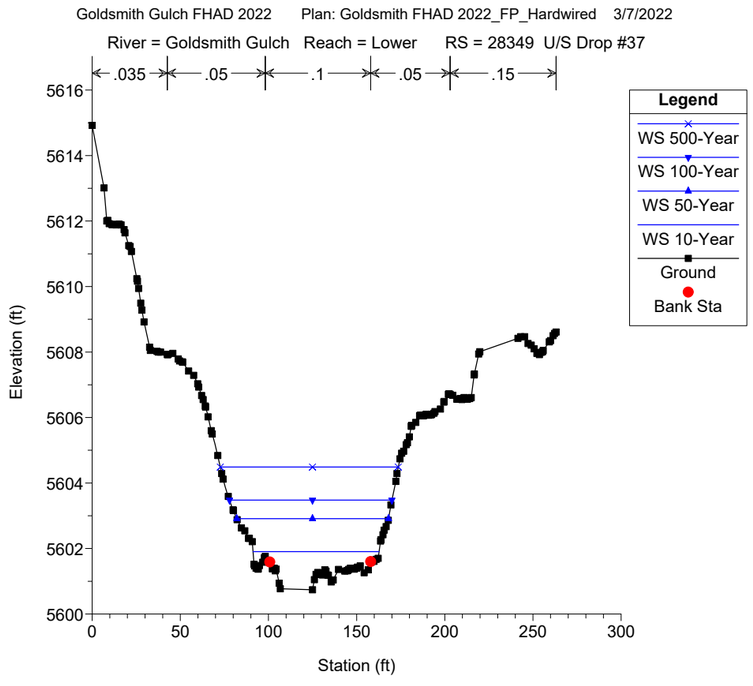

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28744
.15 .1 .1 .1 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

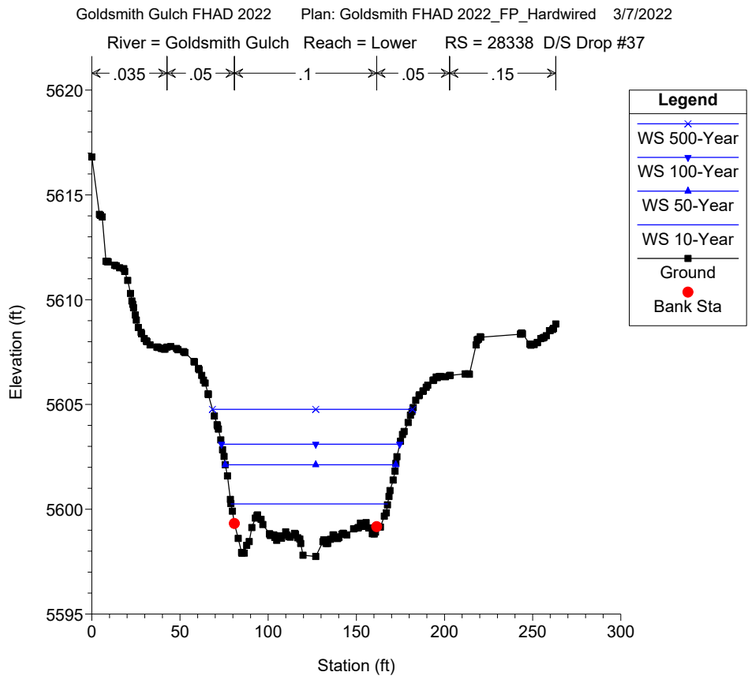

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28538 Invert per survey
.15 .1 .1 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

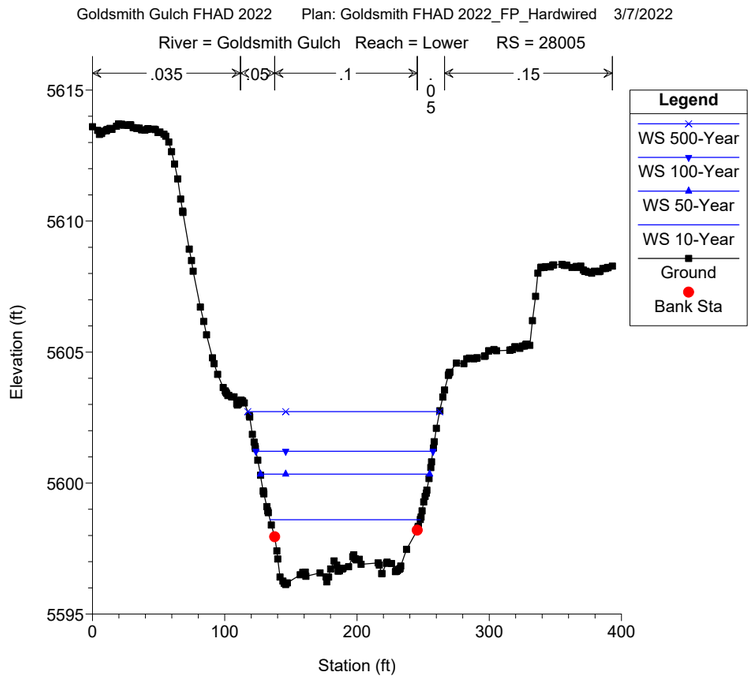

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28483 BR E Prentice Ave
.15 .1 .1 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

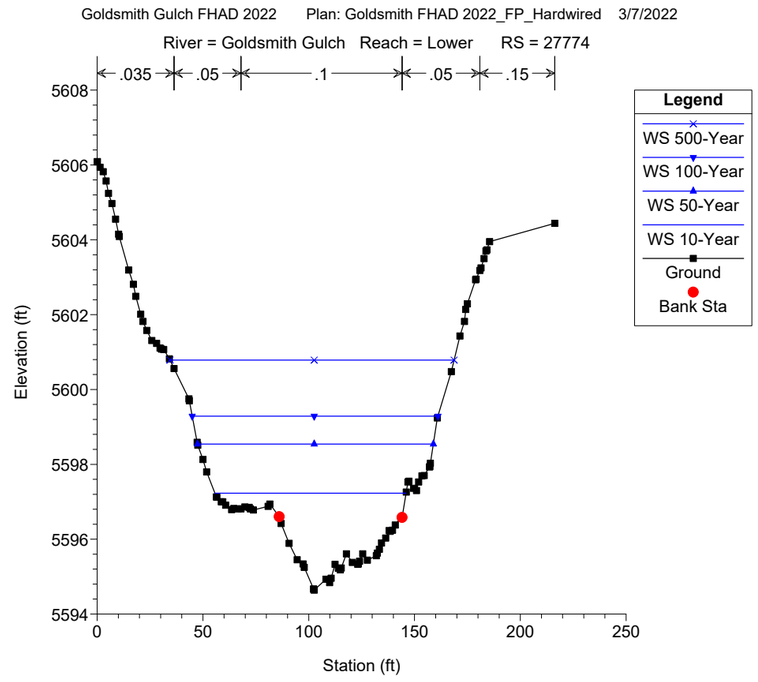

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28483 BR E Prentice Ave
.035 .05 .1 .05 .02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

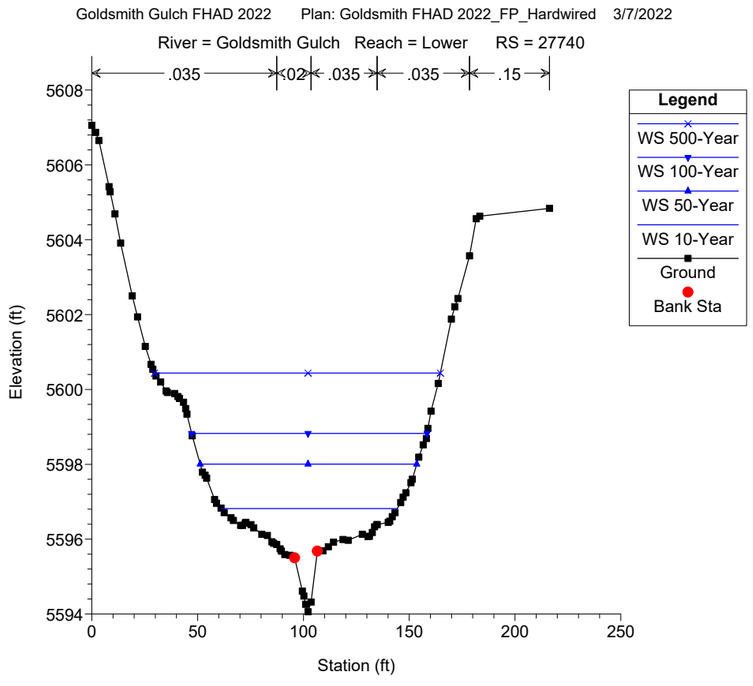

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28426 Adverse channel Invert per survey
.035 .05 .1 .05 .02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

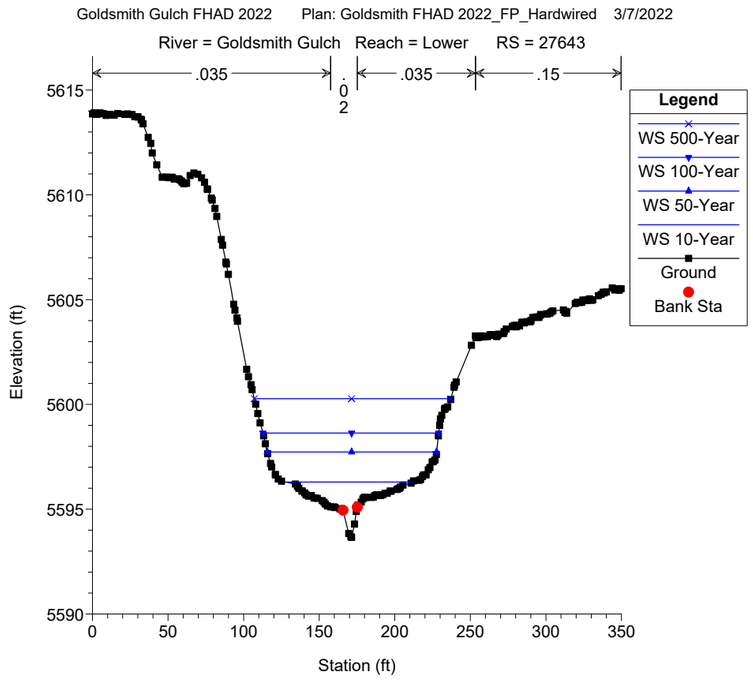

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28349 U/S Drop #37
.035 .05 .1 .05 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

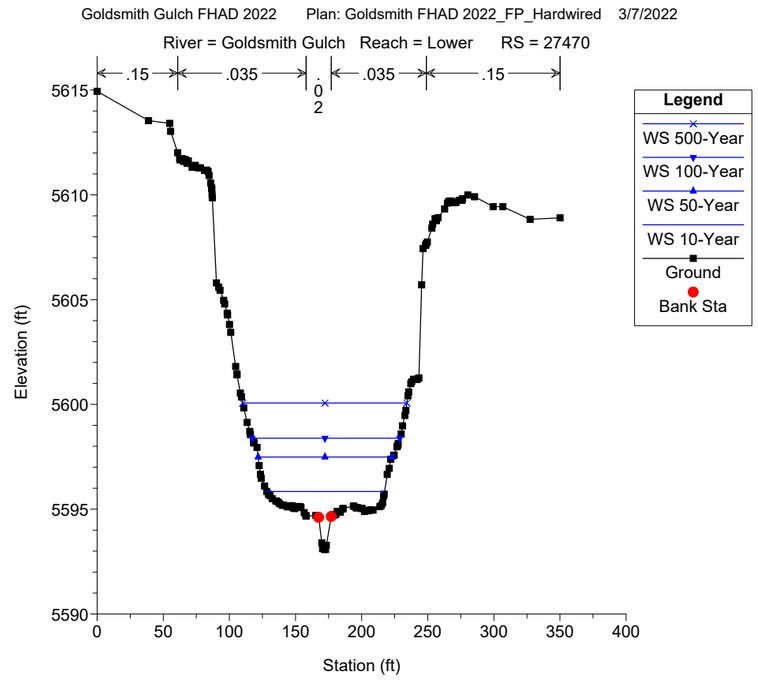

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28338 D/S Drop #37
.035
.05
.1
.05
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

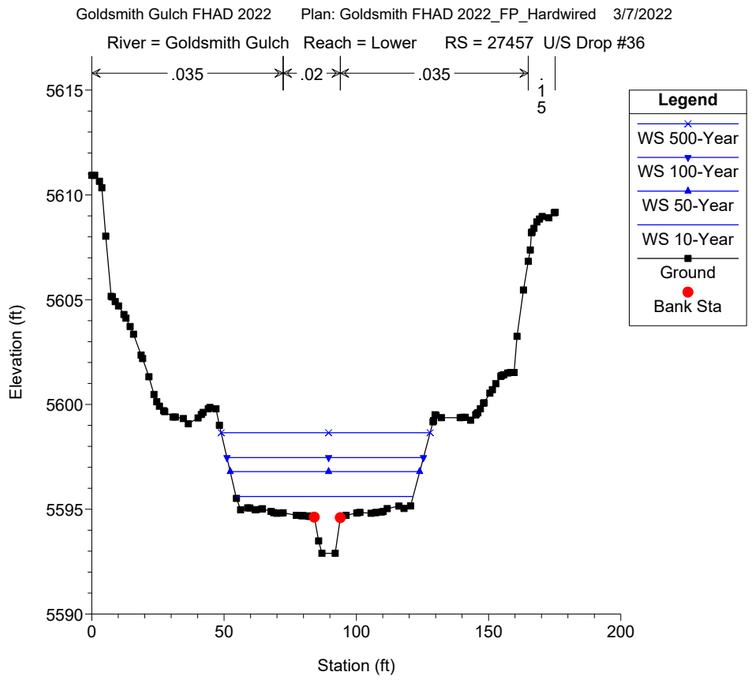

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 28005
.035
.05
.1
.05
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

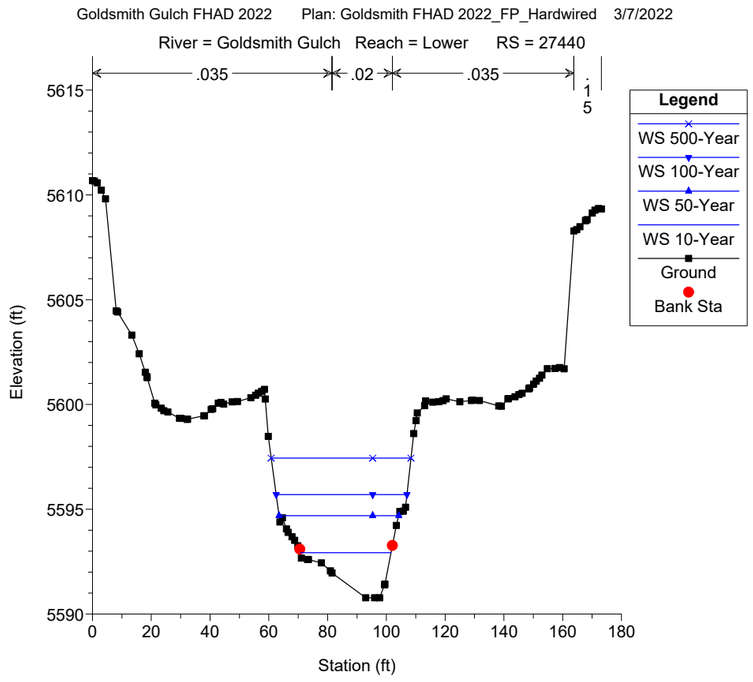

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27774
.035
.05
.1
.05
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

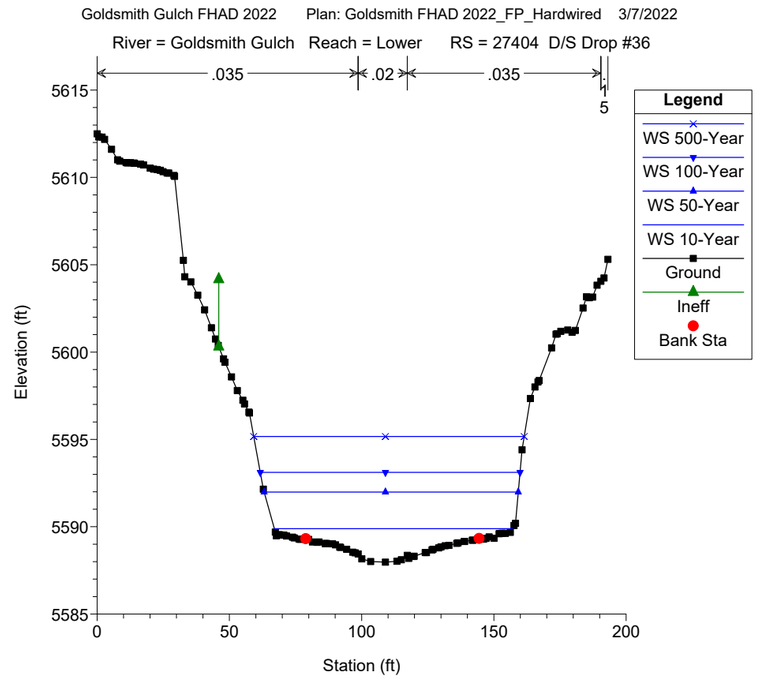

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27740
.035
.02
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

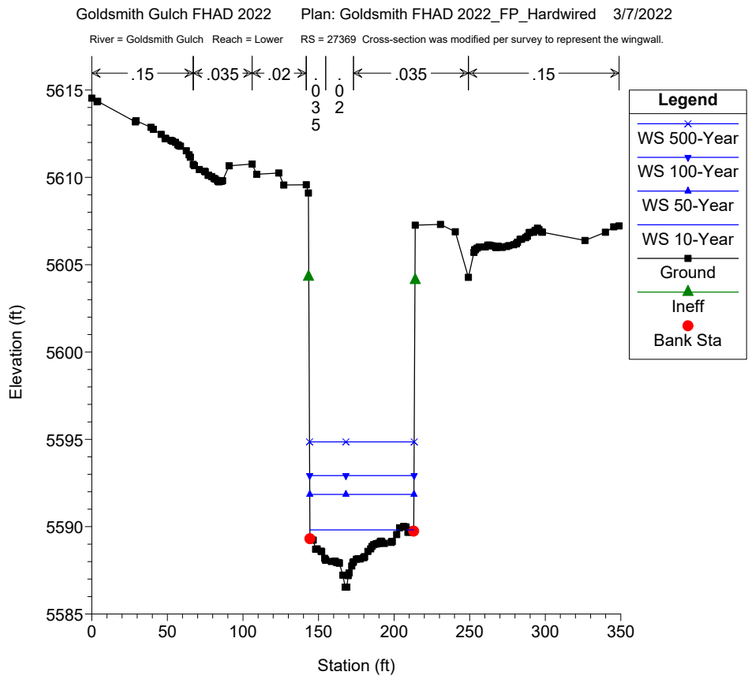

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27643
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

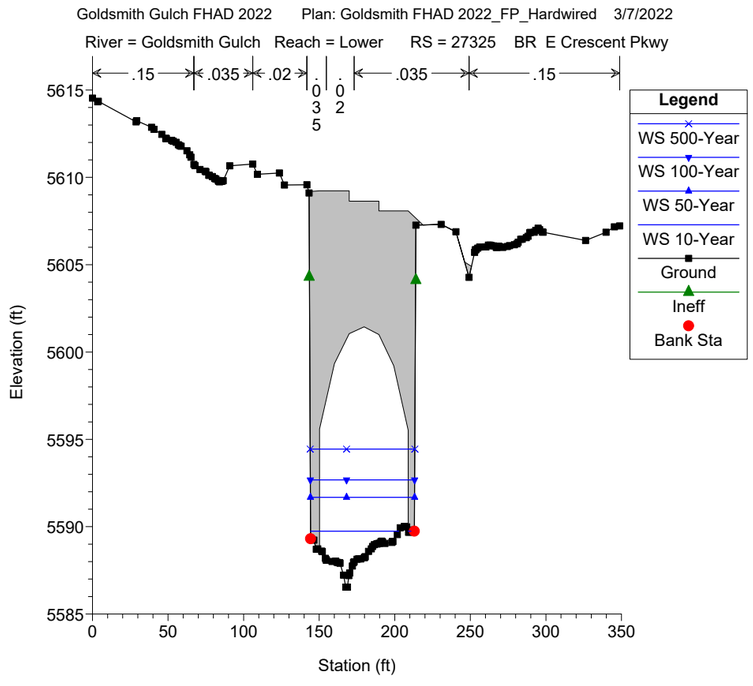

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27470
.15
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

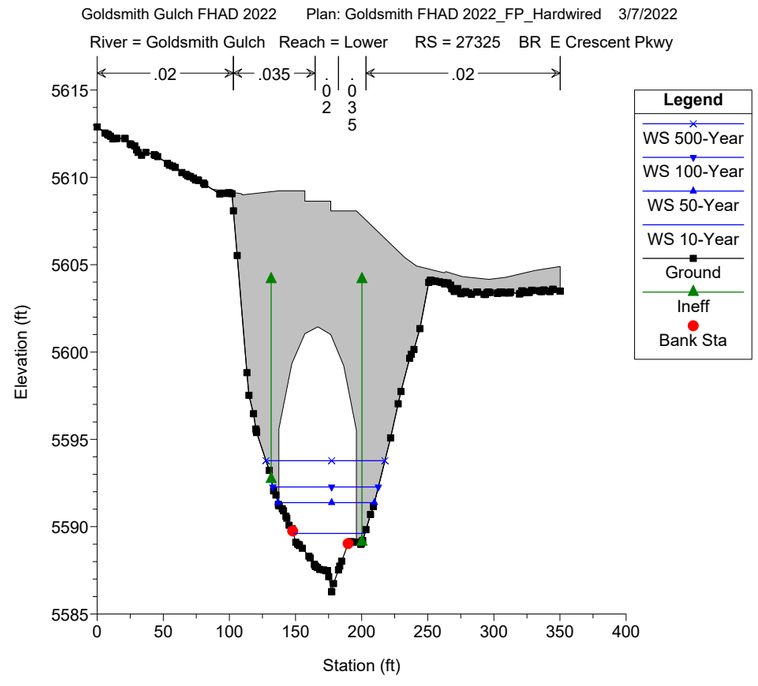

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27457 U/S Drop #36
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

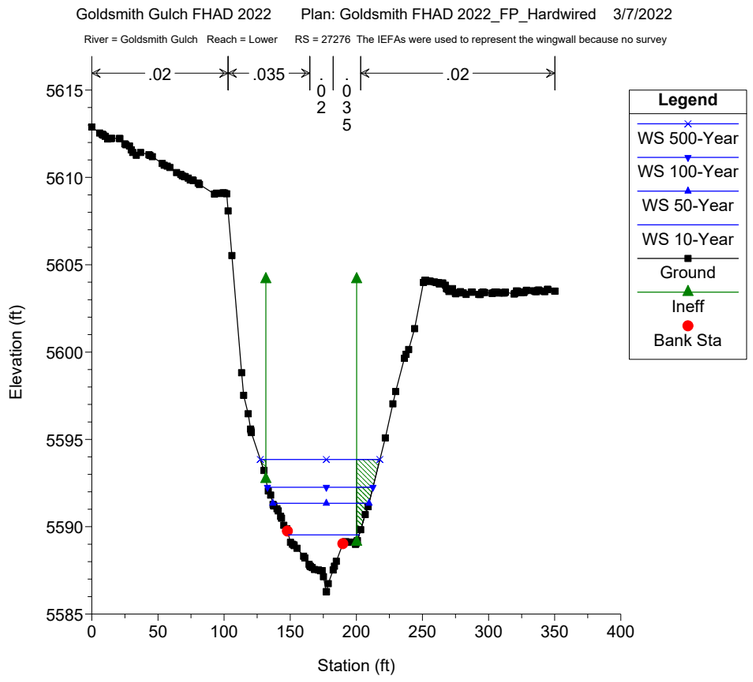

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27440
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

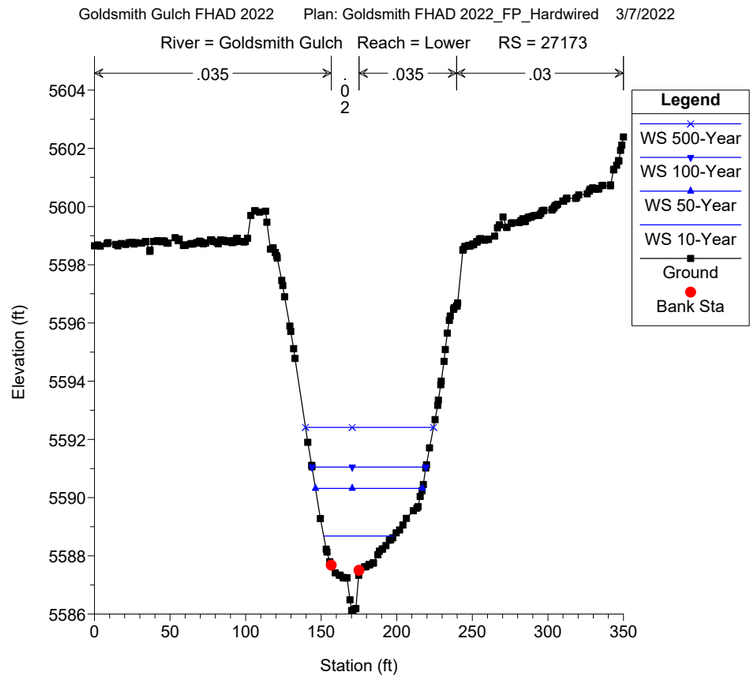

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27404 D/S Drop #36
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

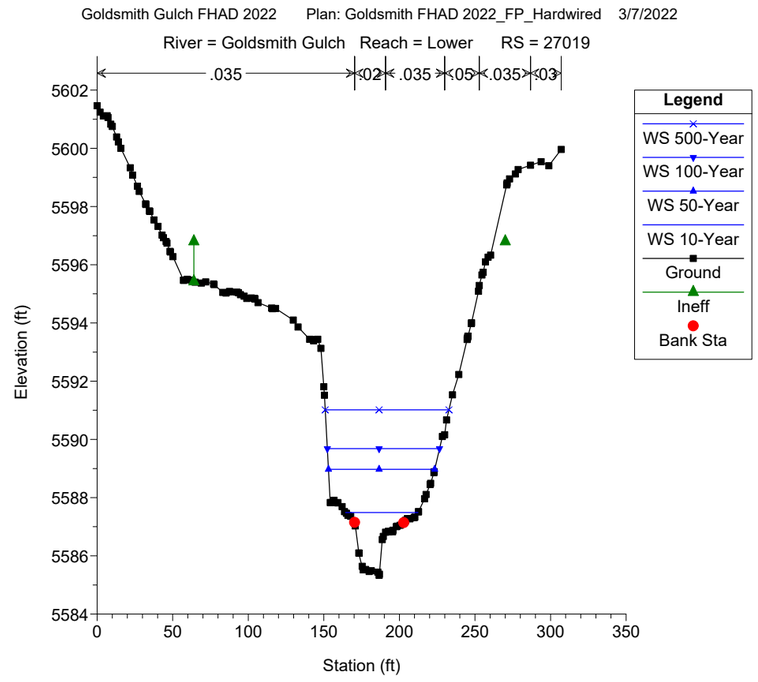

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27369 Cross-section was modified per survey to represent the wingwall.
.15
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

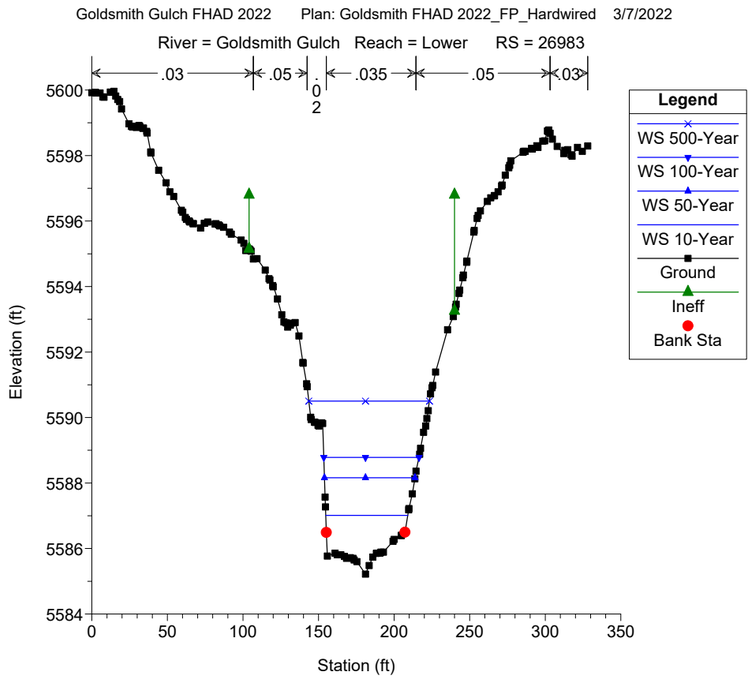

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27325 BR E Crescent Pkwy
.15
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

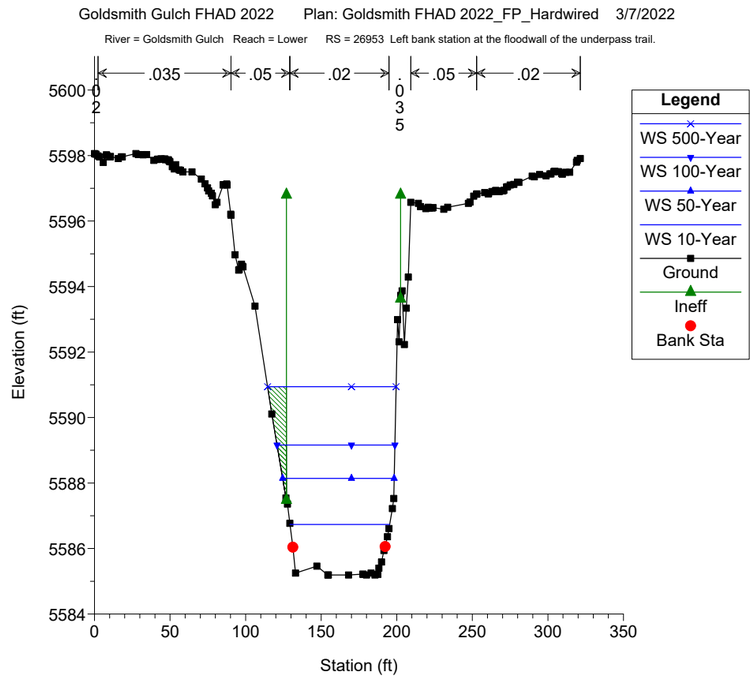

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27325 BR E Crescent Pkwy
.02
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

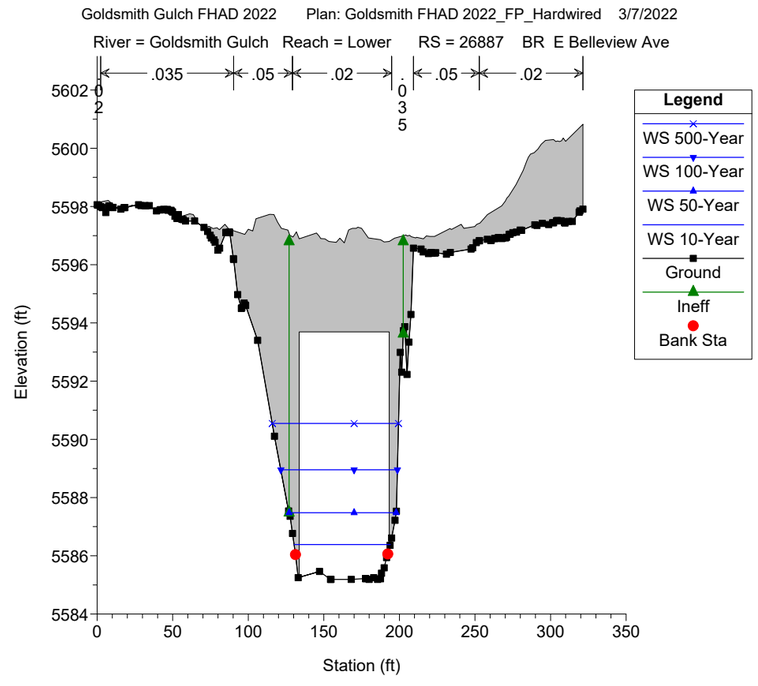

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27276 The IEFAs were used to represent the wingwall because no survey
.02
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

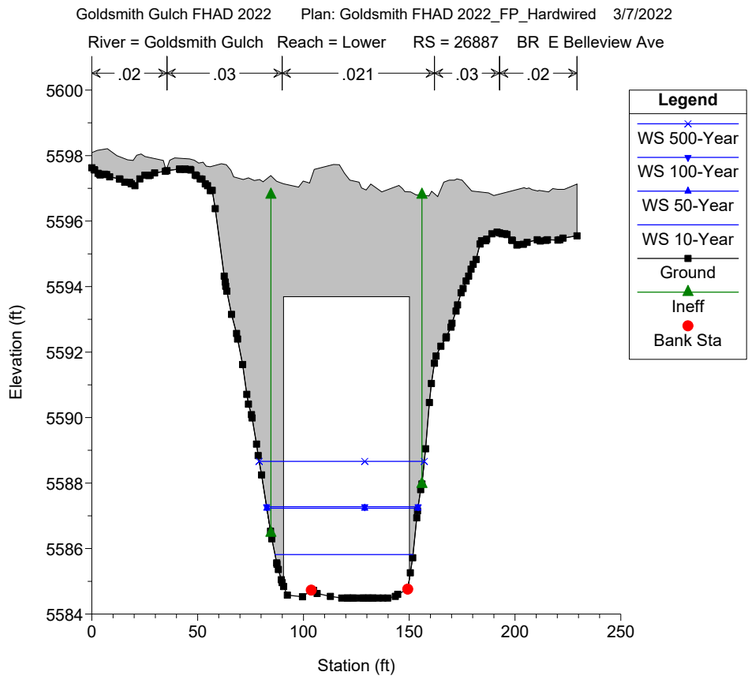

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27173
.035
.035
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

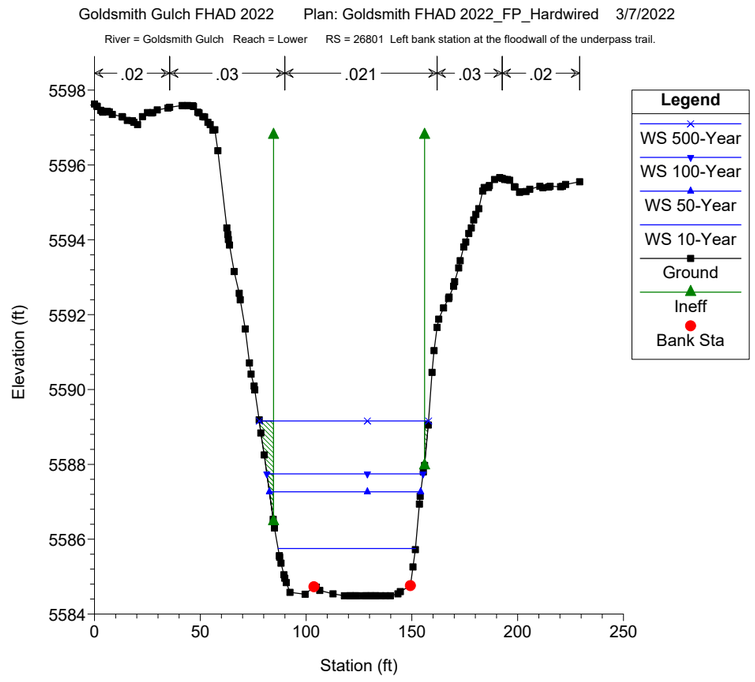

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 27019
.035
.02
.035
.05
.035
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

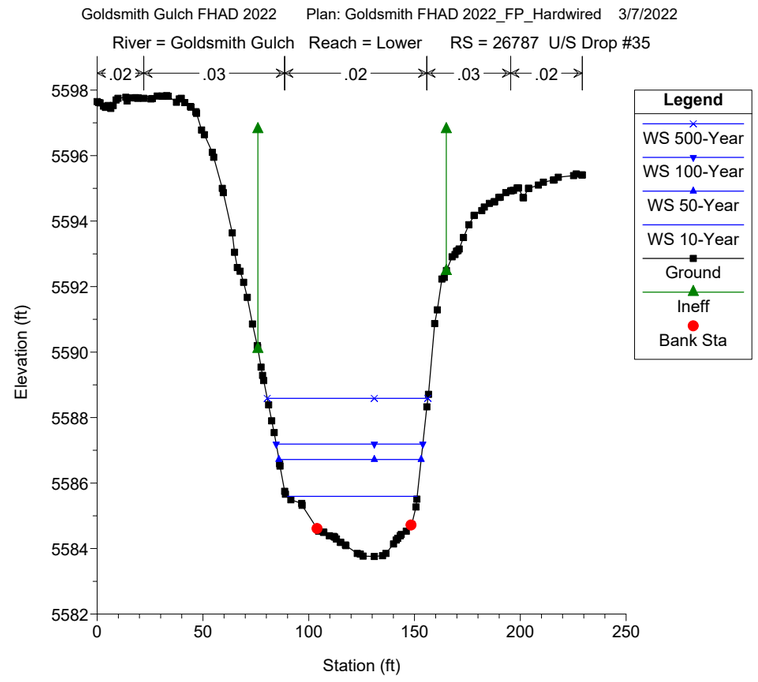

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26983
.03
.05
.035
.05
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

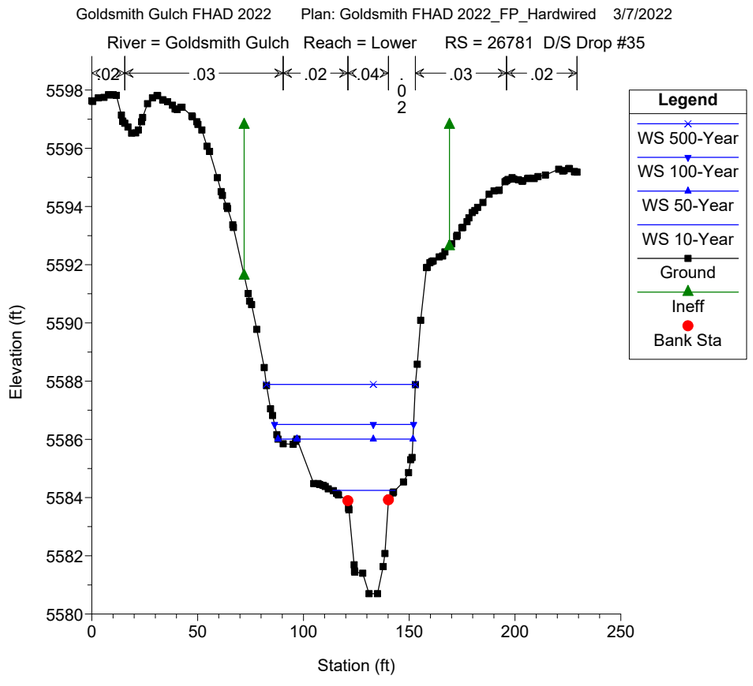

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26953 Left bank station at the floodwall of the underpass trail.
.035
.05
.02
.05
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

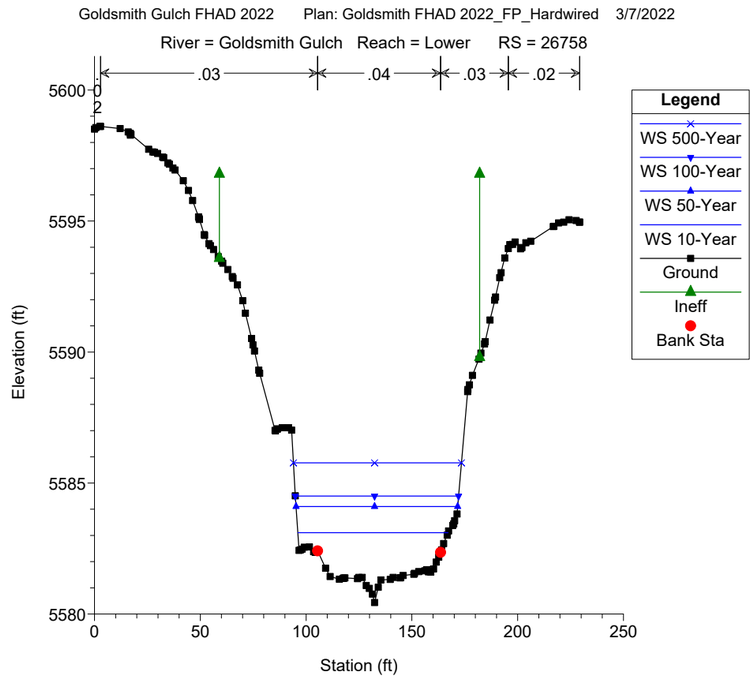

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26887 BR E Belleview Ave
.035
.05
.02
.05
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

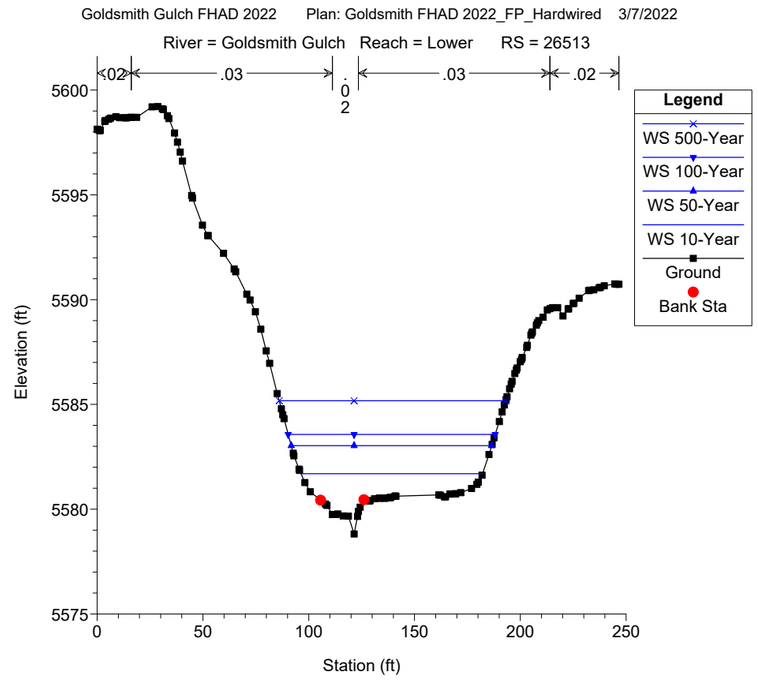

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26887 BR E Belleview Ave
.02
.03
.021
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

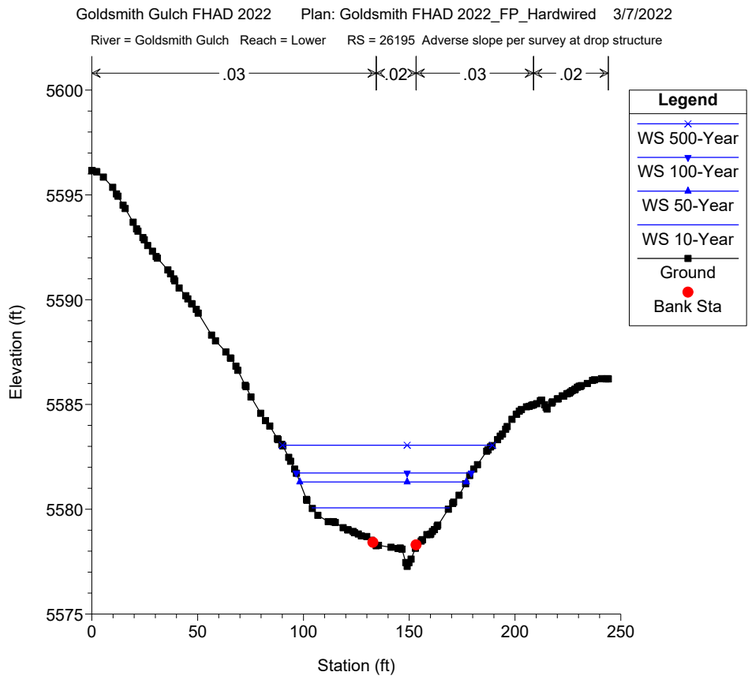

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26801 Left bank station at the floodwall of the underpass trail.
.02
.03
.021
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

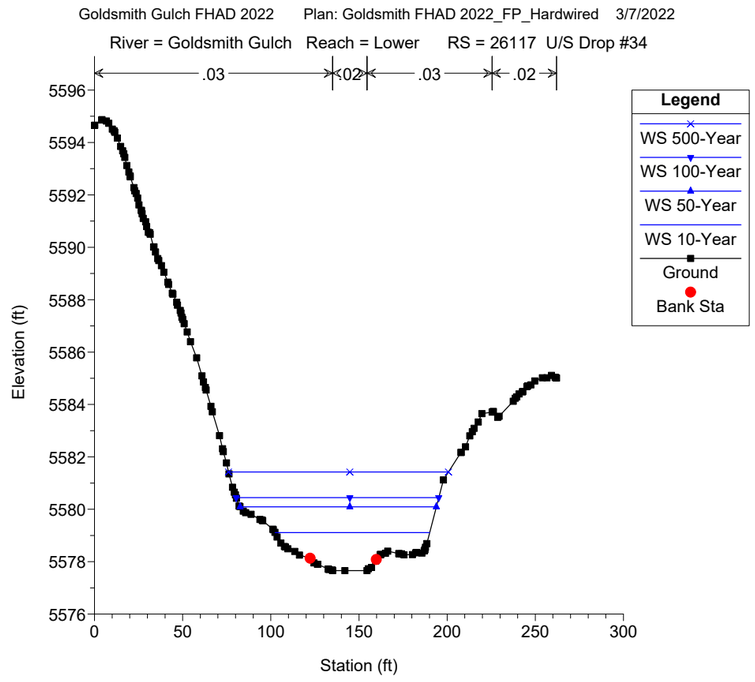

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26787 U/S Drop #35
.02
.03
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

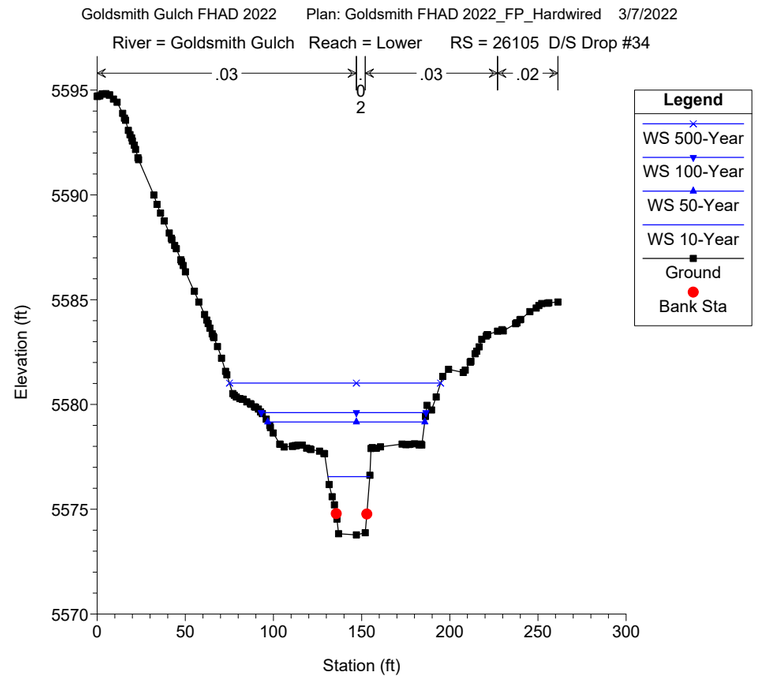

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26781 D/S Drop #35
.02
.03
.02
.04
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

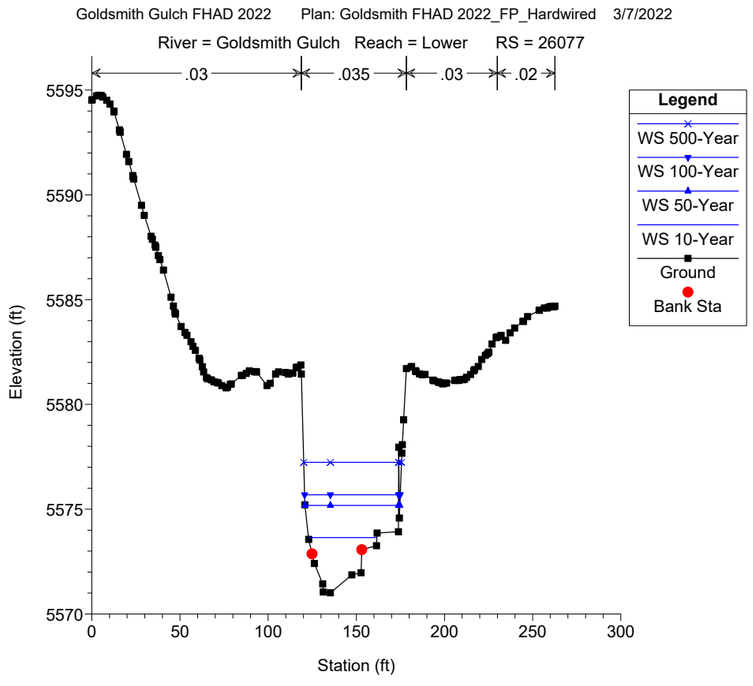

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26758
.02
.03
.04
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

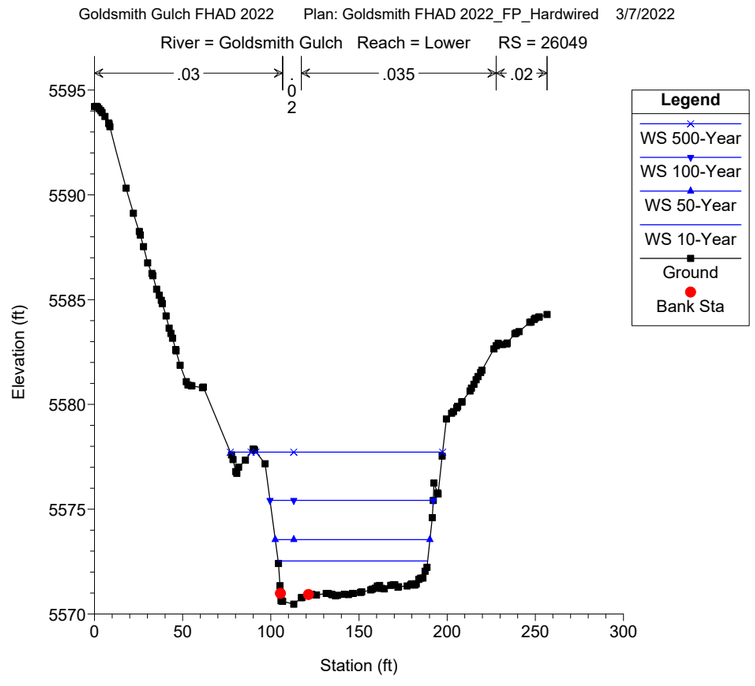

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26513
.02
.03
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

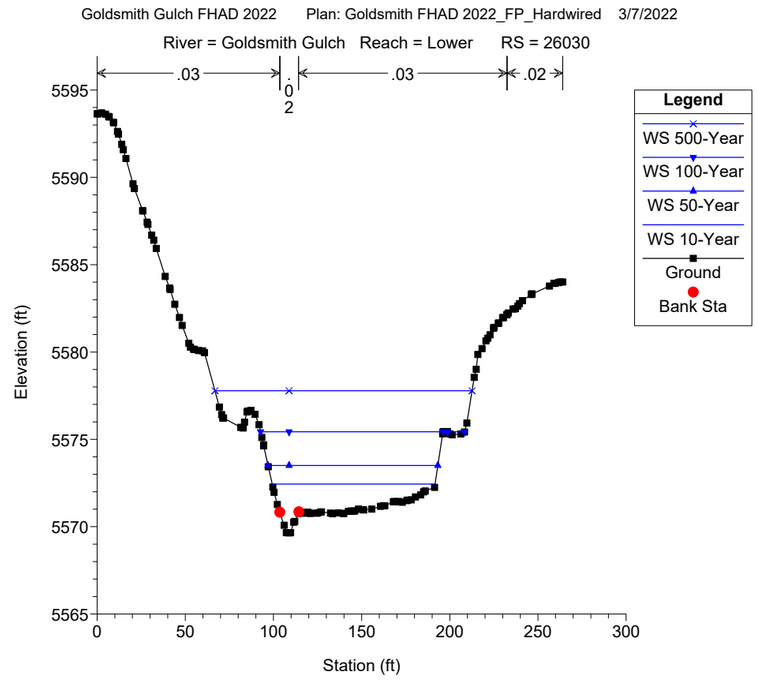

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26195 Adverse slope per survey at drop structure
.03
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

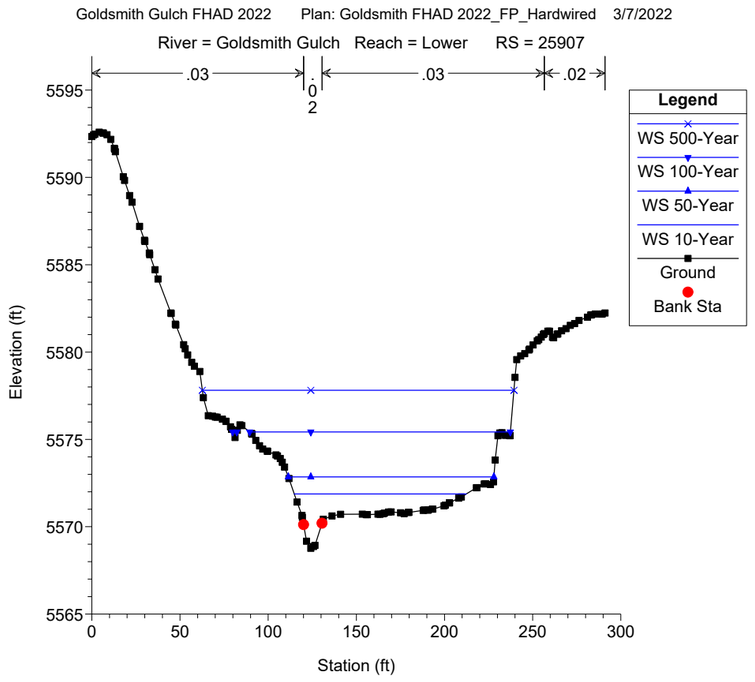

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26117 U/S Drop #34
.03
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

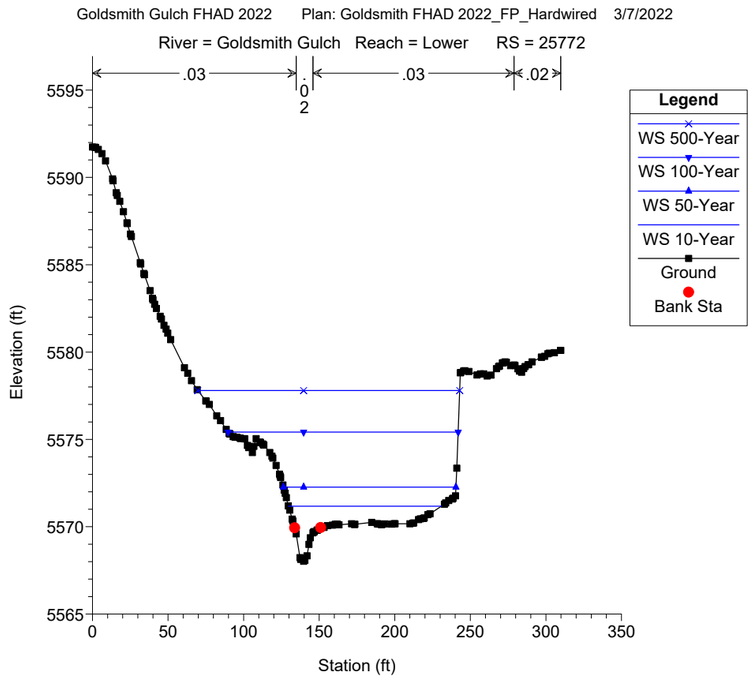

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26105 D/S Drop #34
.03
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

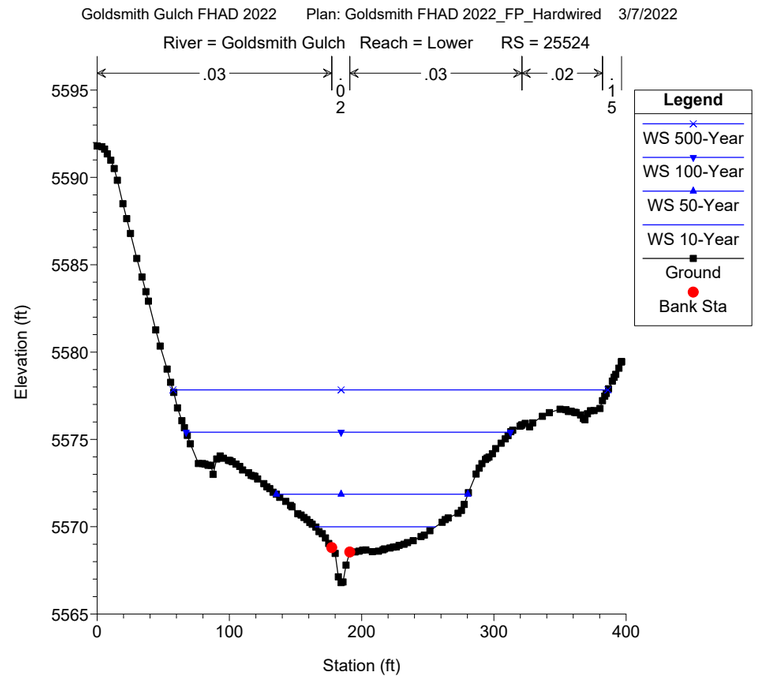

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26077
.03
.035
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

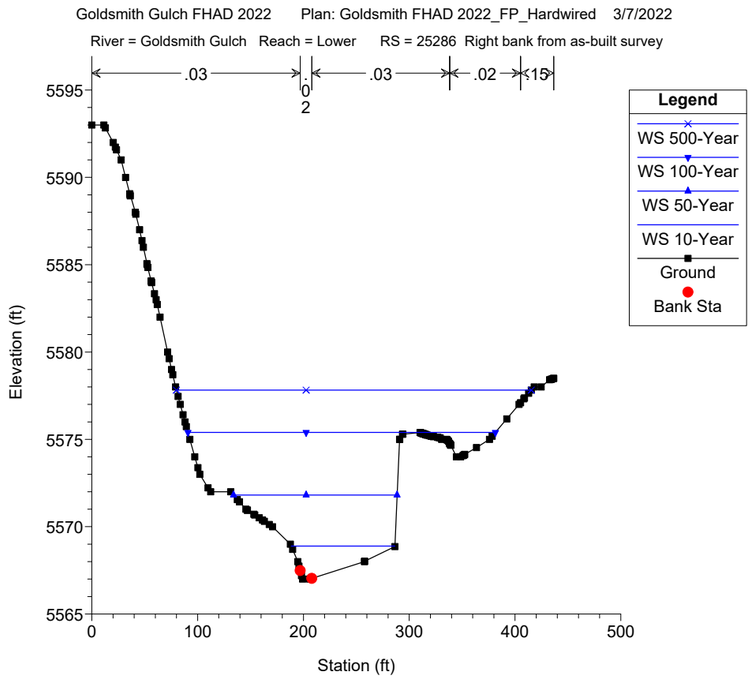

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26049
.03
.02
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

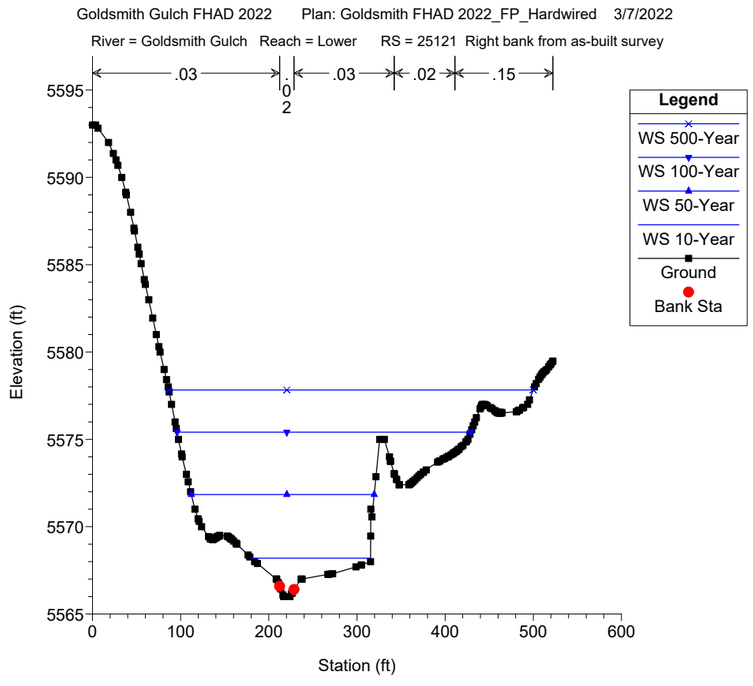

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 26030
.03
.02
.03
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

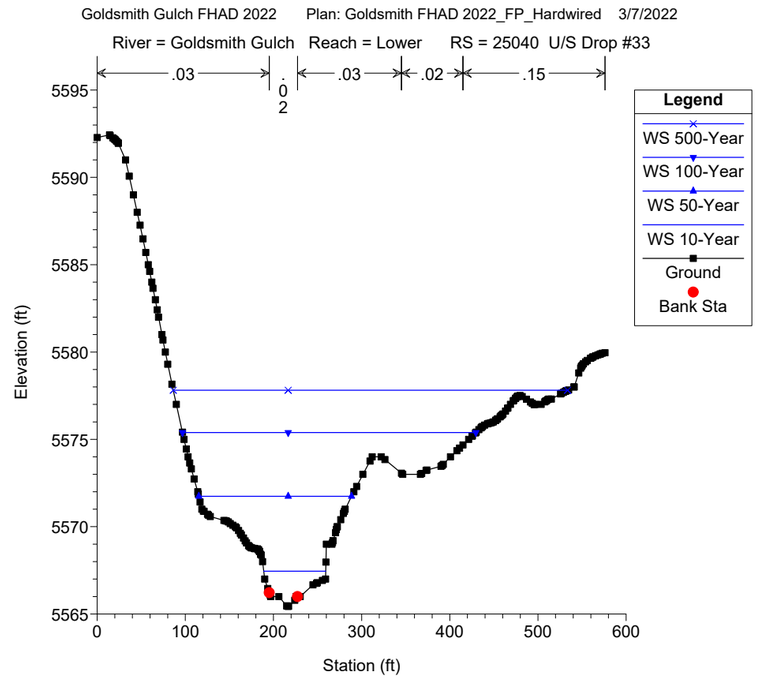

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25907
.03
.03
.02
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

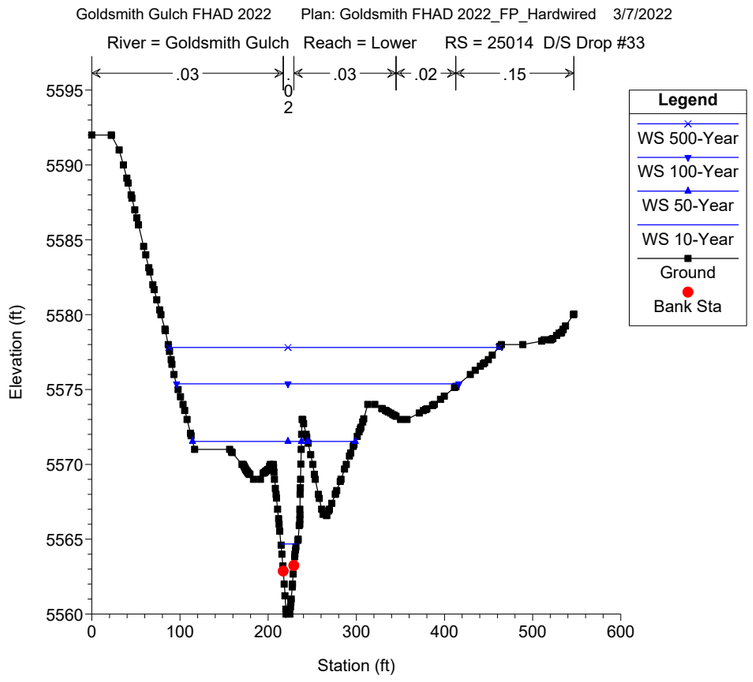

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25772
.03
.03
.02
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

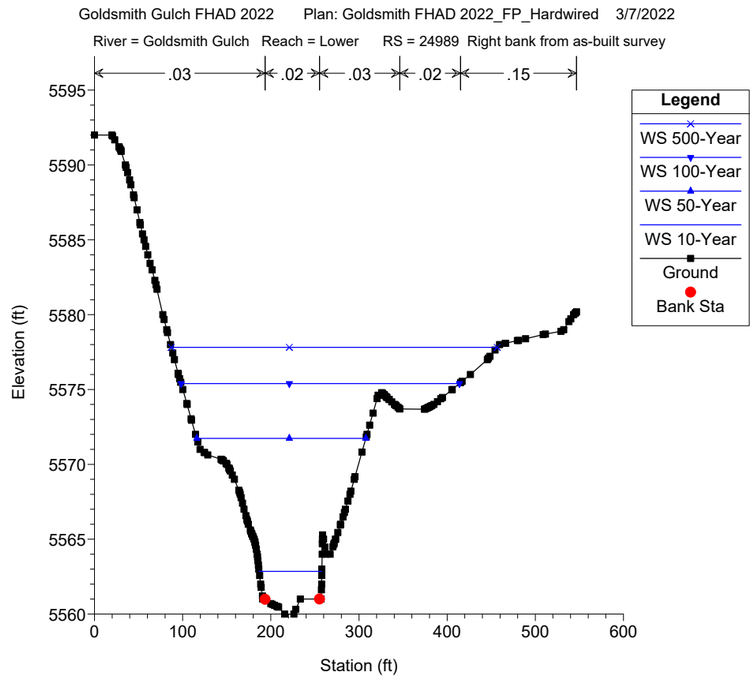

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25524
.03
.03
.02
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

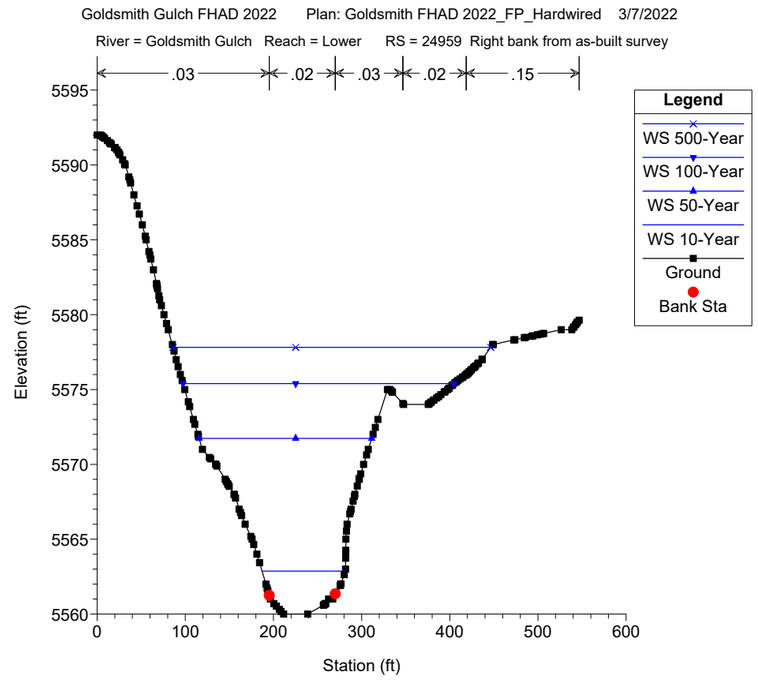

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25286 Right bank from as-built survey
.03
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

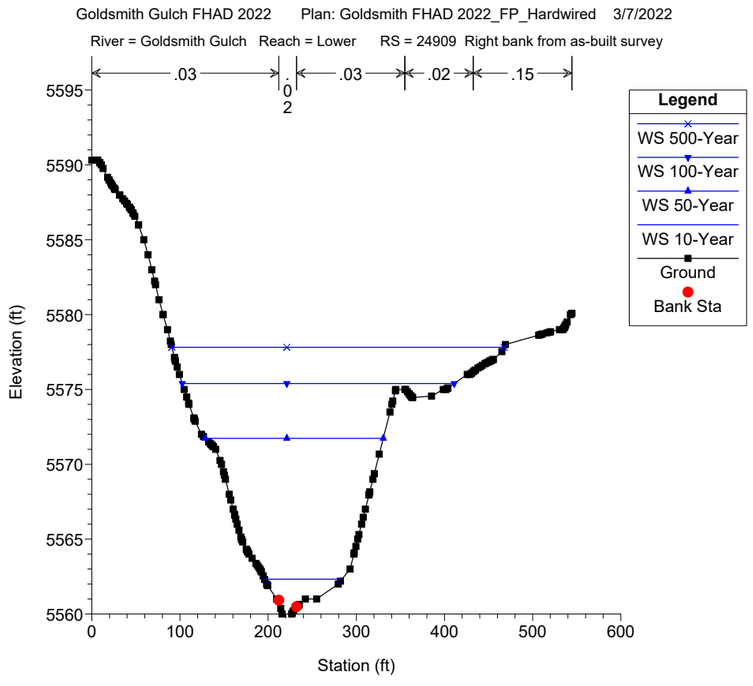

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25121 Right bank from as-built survey
.03
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

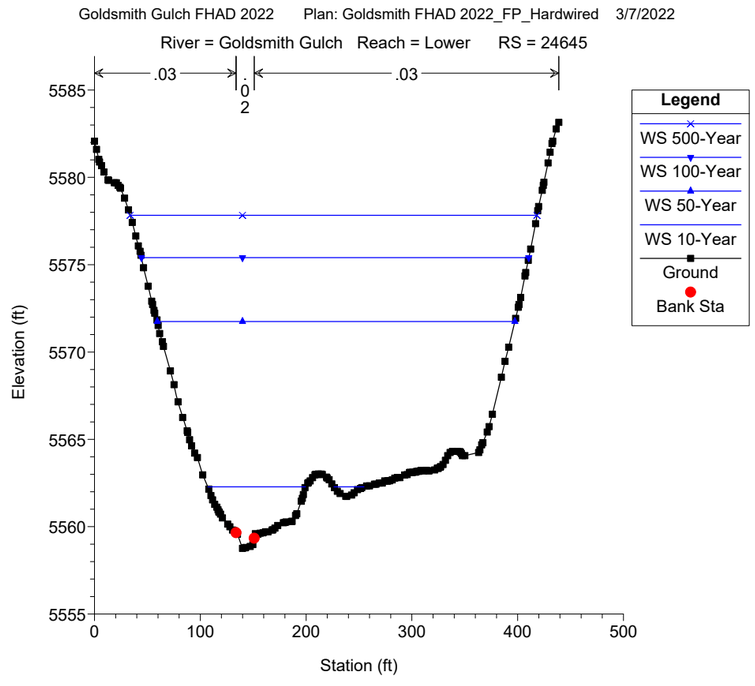

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25040 U/S Drop #33
.03
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

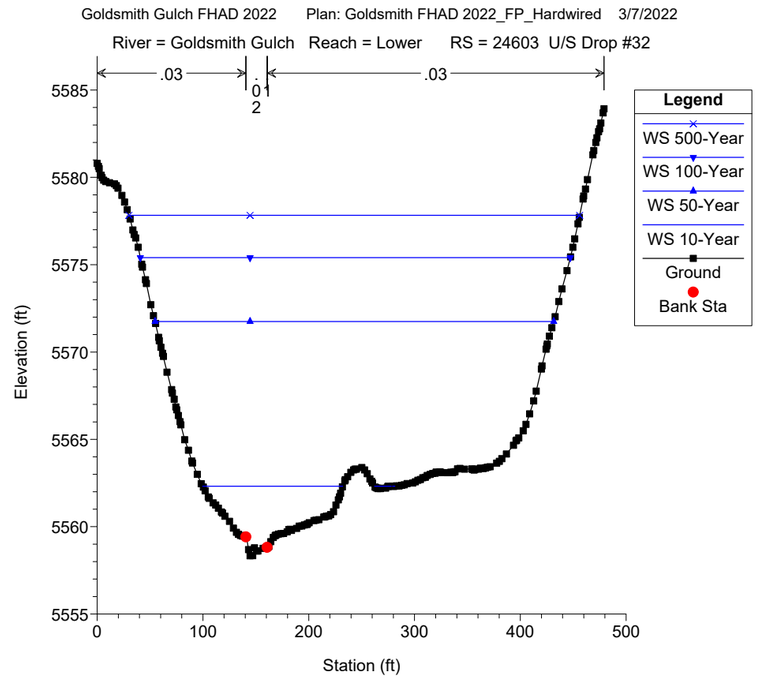

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 25014 D/S Drop #33
.03
.02
.03
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

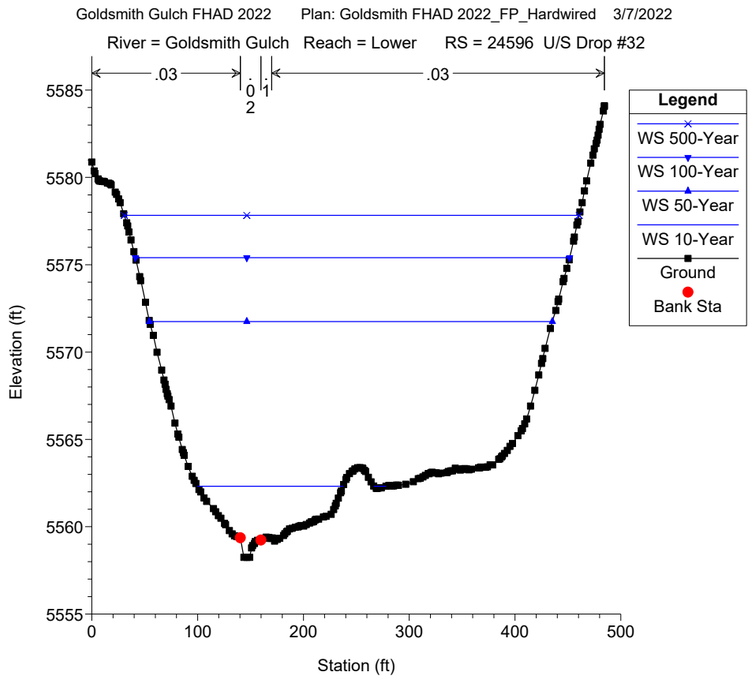

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24989 Right bank from as-built survey
.03
.02
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

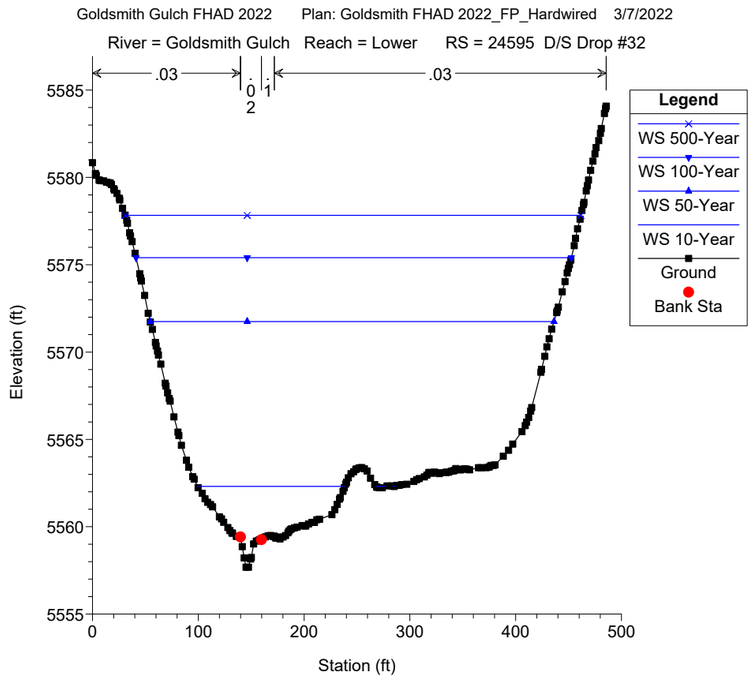

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24959 Right bank from as-built survey
.03
.02
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

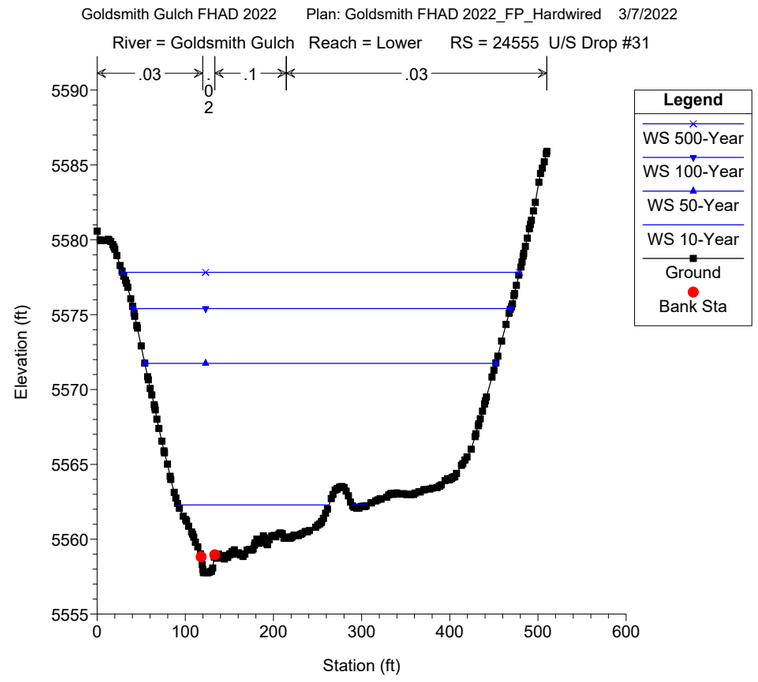

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24909 Right bank from as-built survey
.03
.03
.03
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

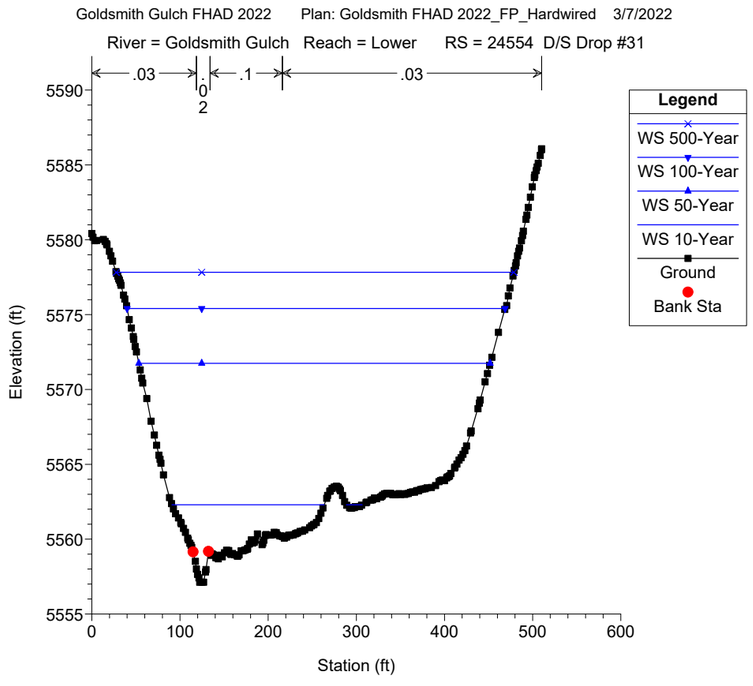

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24645
.03
.03
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

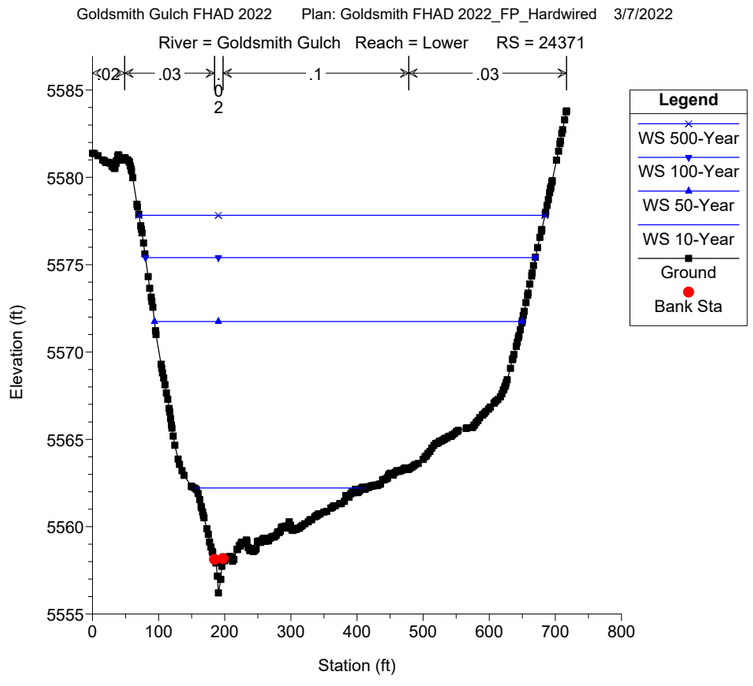

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24603 U/S Drop #32
.03
.03
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

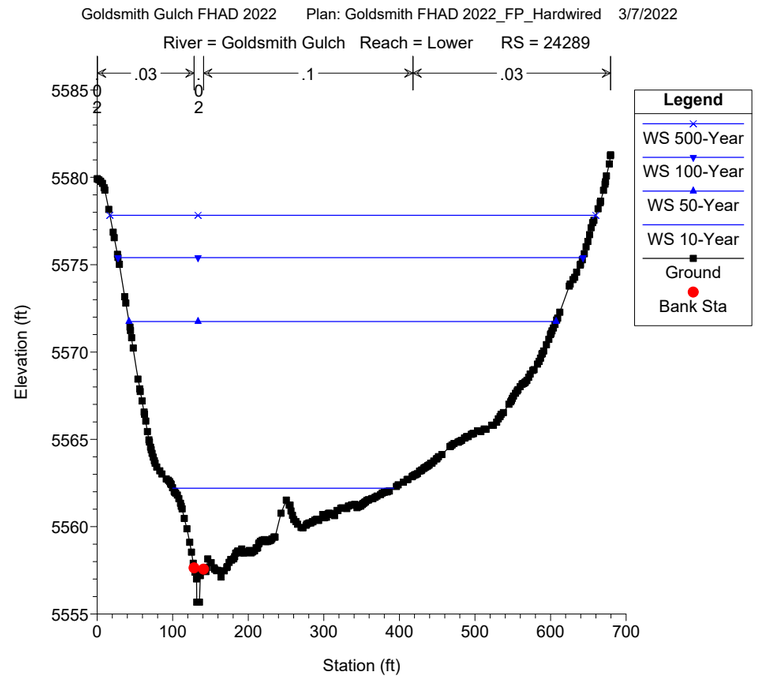

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24596 U/S Drop #32
.03
.02
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

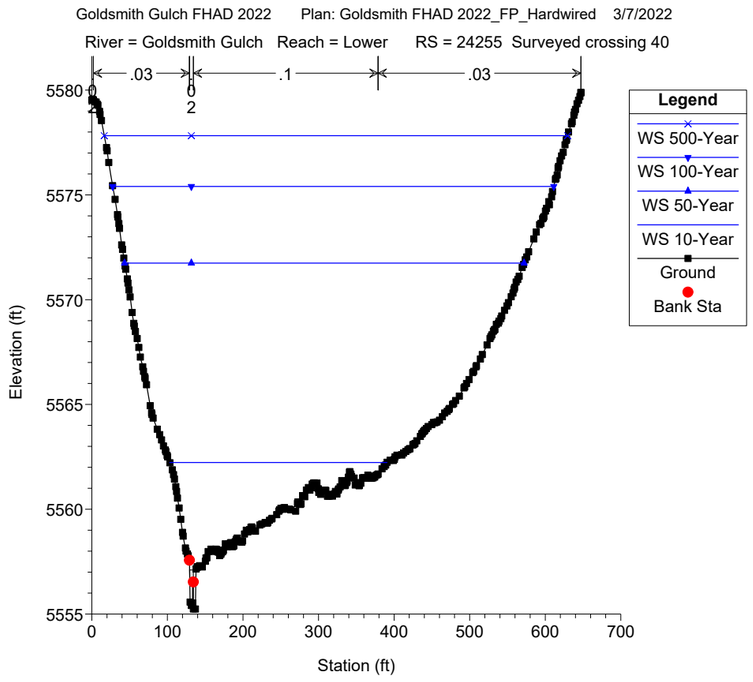

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24595 D/S Drop #32
.03
.02
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

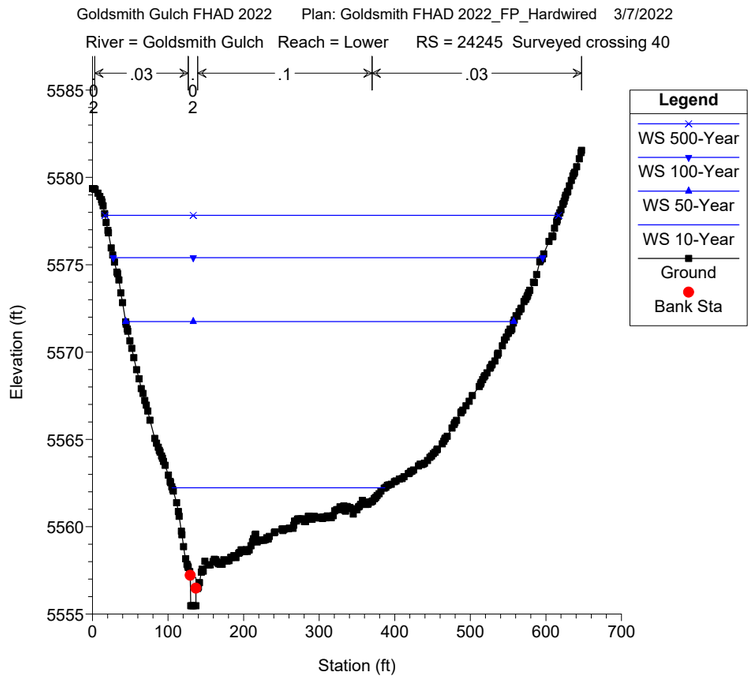

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24555 U/S Drop #31
.03
.02
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

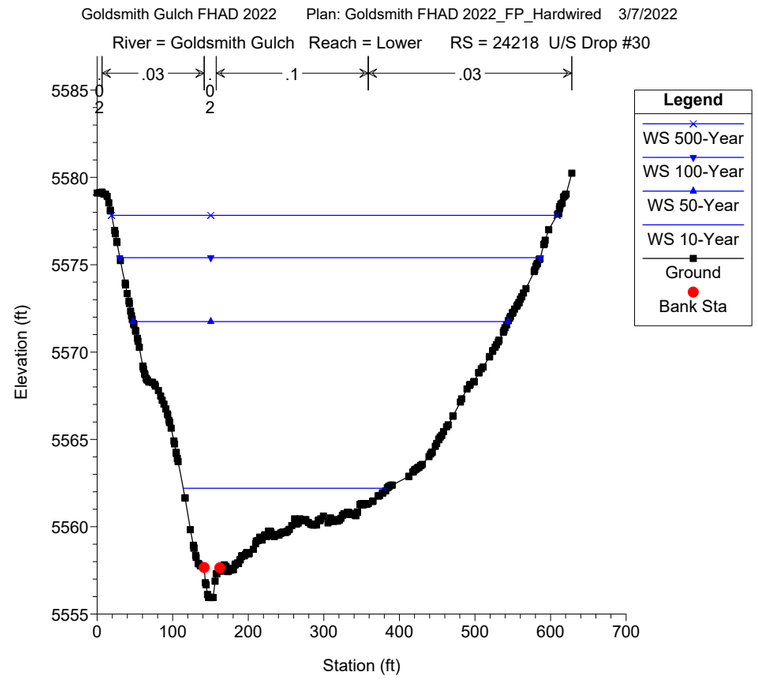

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24554 D/S Drop #31
.03
.02
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

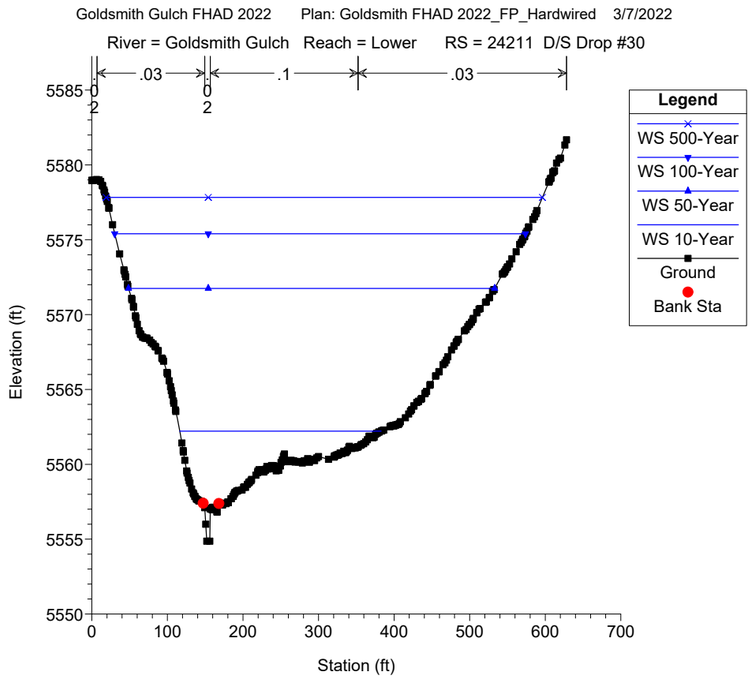

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24371
.02
.03
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

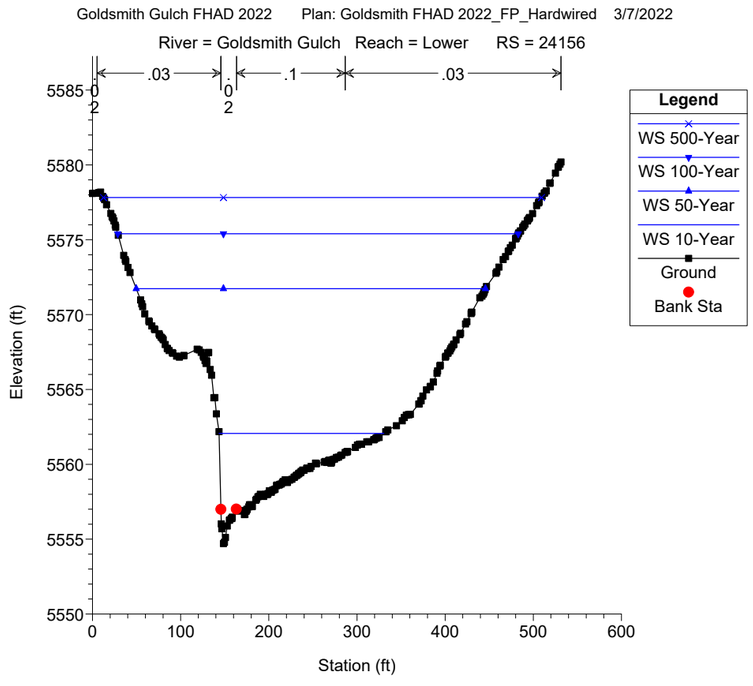

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24289
.03
.02
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

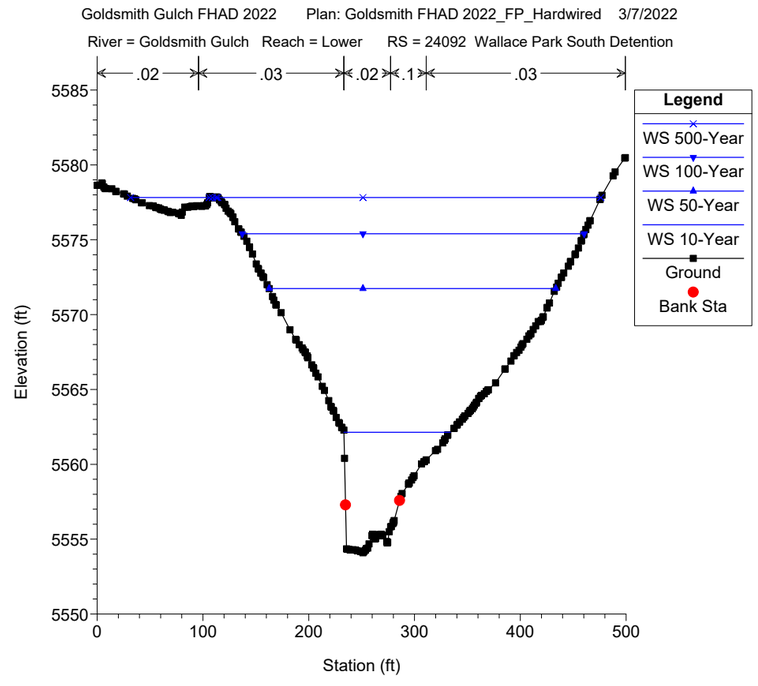

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24255 Surveyed crossing 40
.03
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

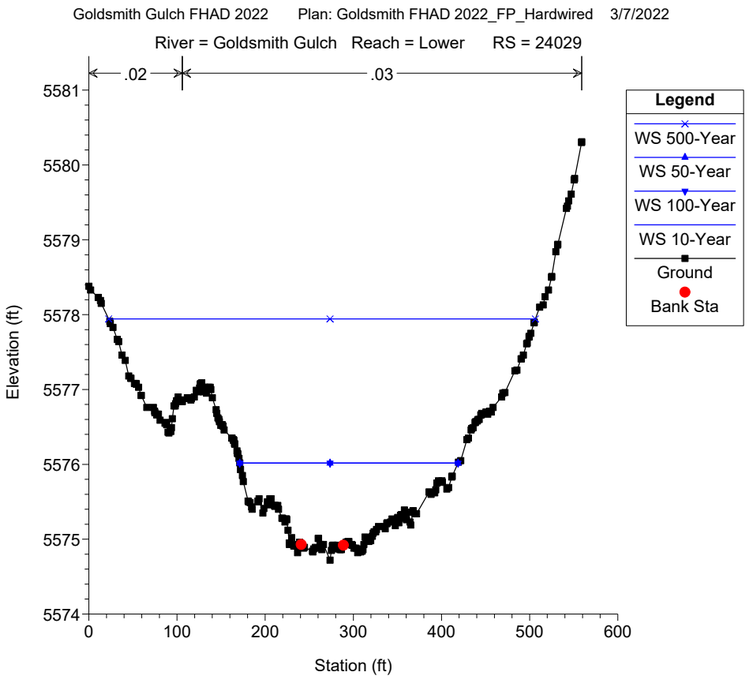

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24245 Surveyed crossing 40
.03
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

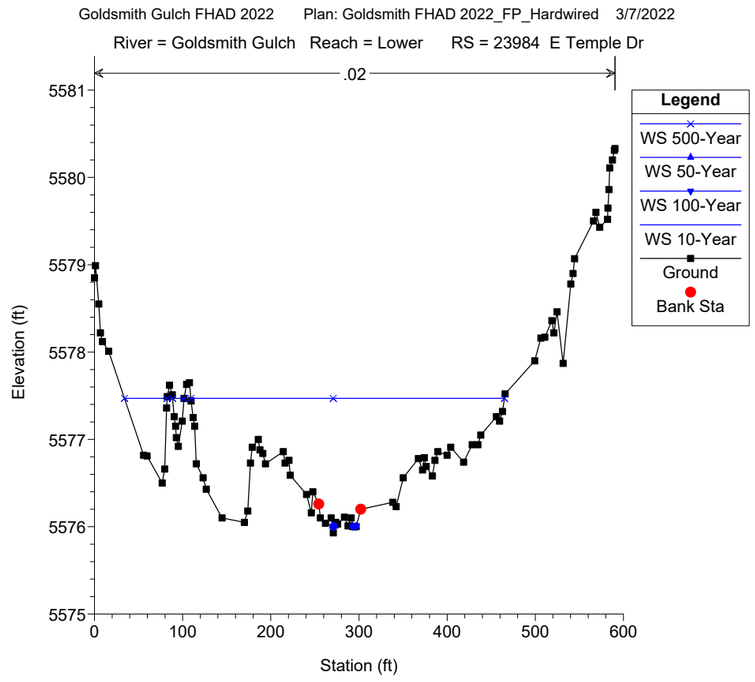

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24218 U/S Drop #30
.03
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

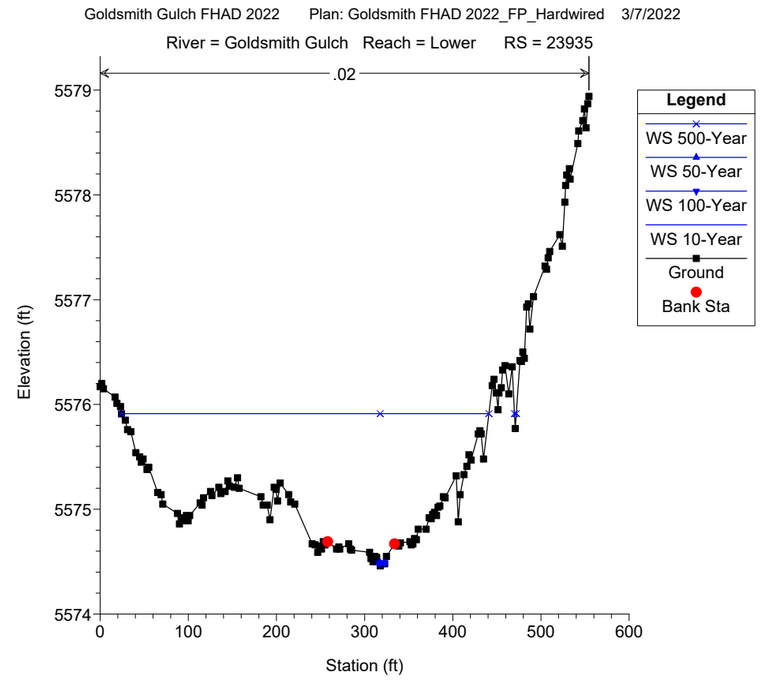

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24211 D/S Drop #30
.03
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

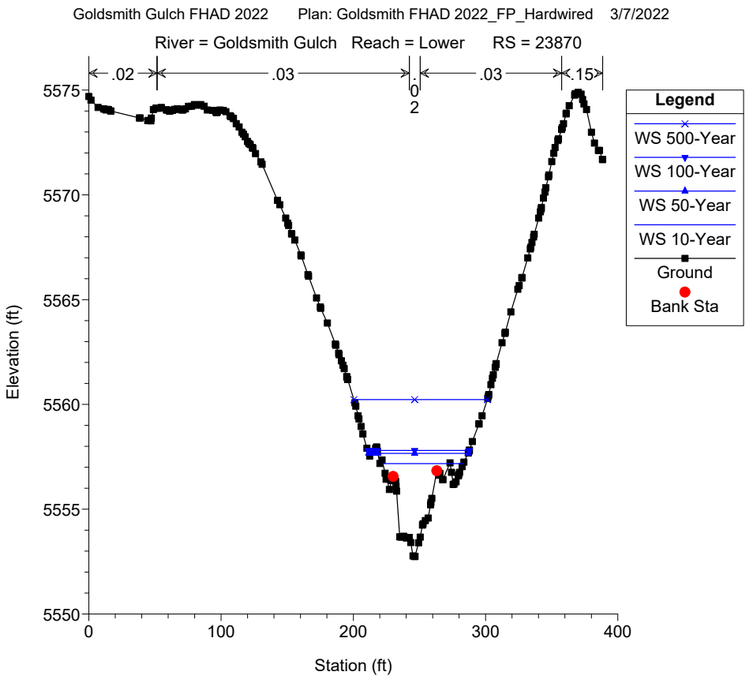

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24156
.03
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

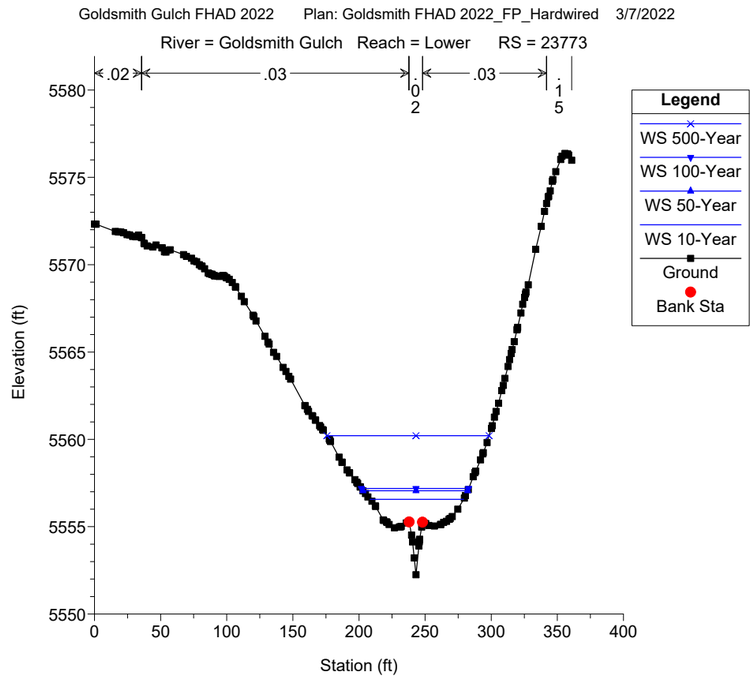

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24092 Wallace Park South Detention
.02
.03
.02
.1
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

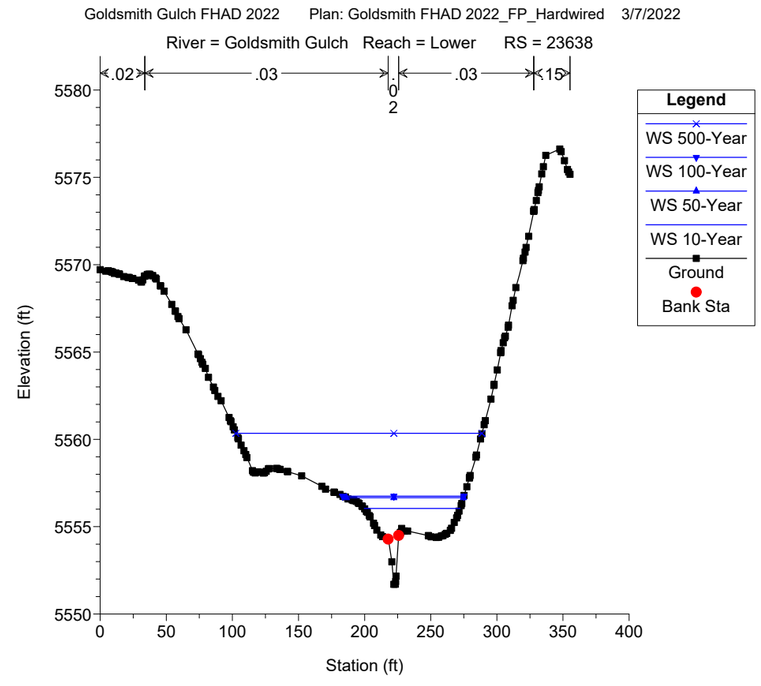

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 24029
.02
.03
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

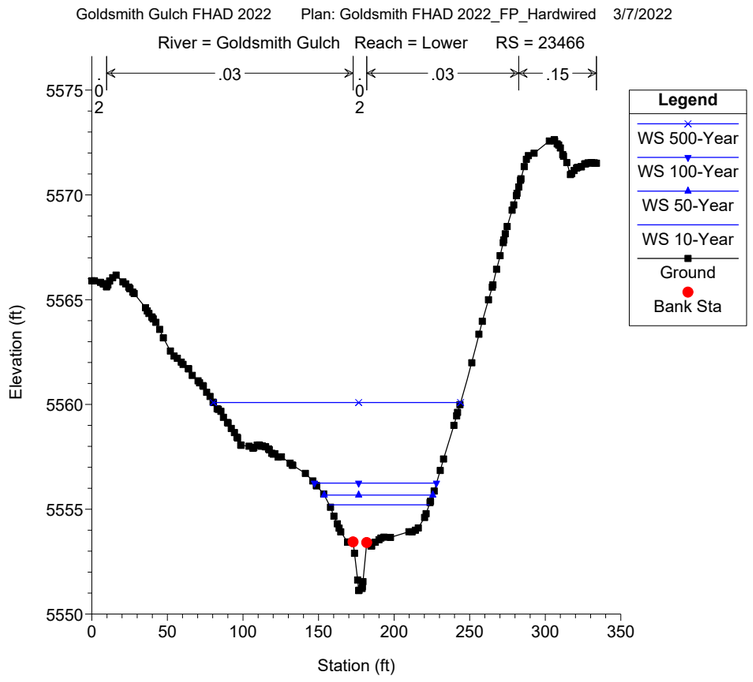

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23984 E Temple Dr
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

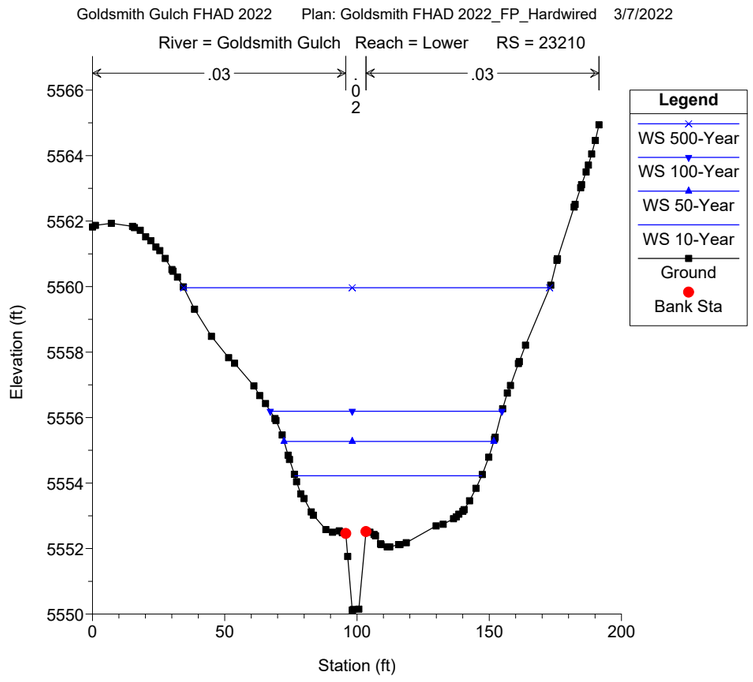

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23935
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

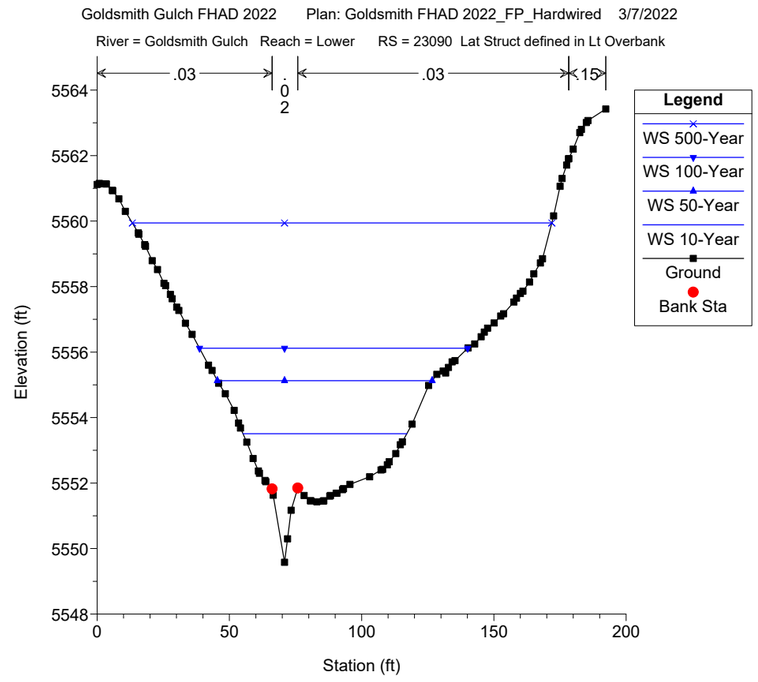

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23870
.02
.03
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

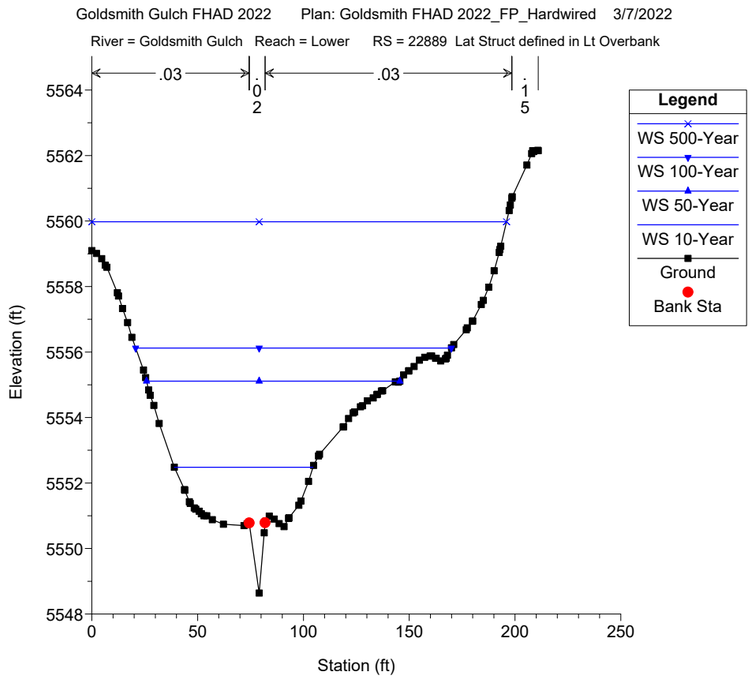

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23773
.02
.03
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

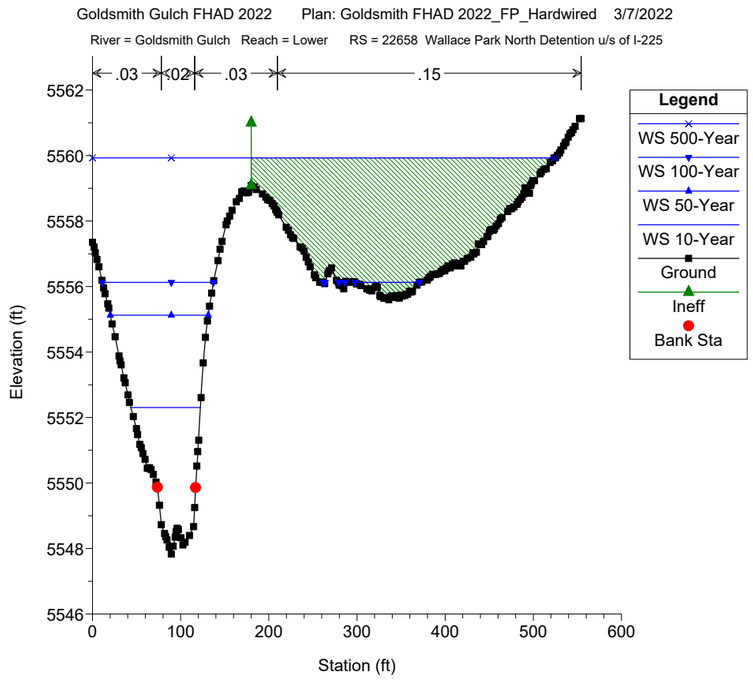

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23638
.02
.03
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

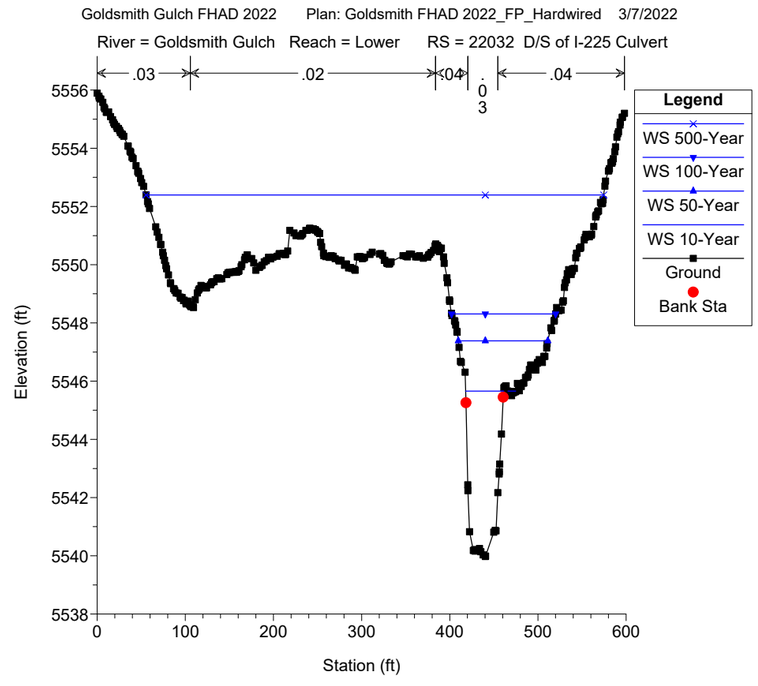

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23466
.03
.02
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

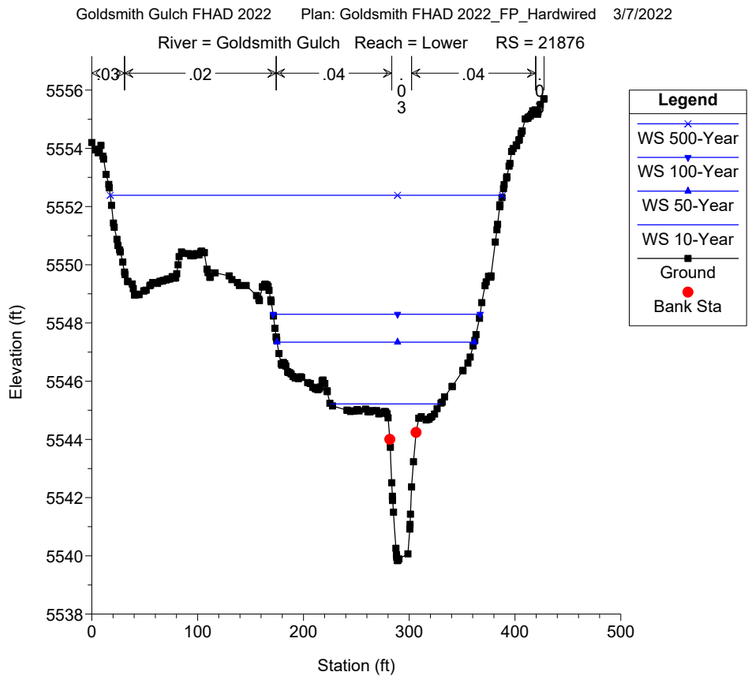

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23210
.03
.02
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

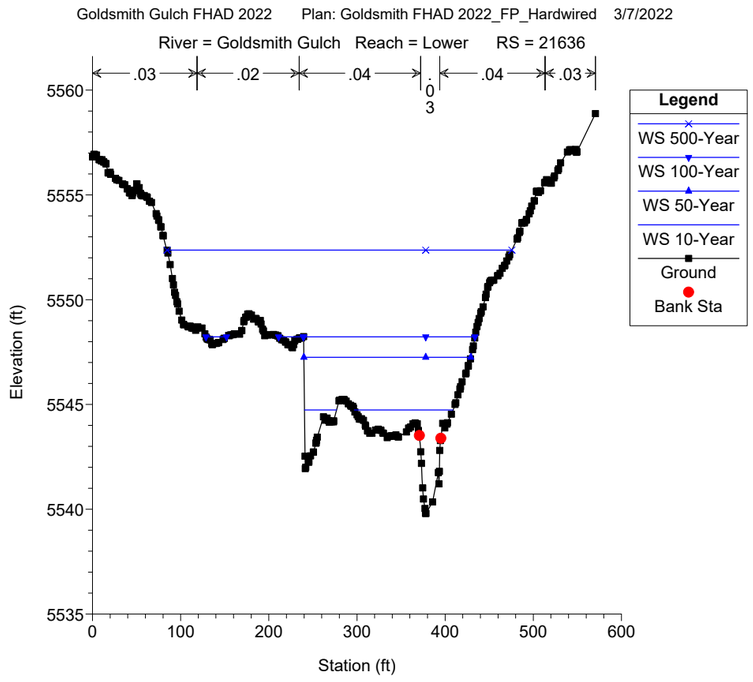

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 23090 Lat Struct defined in Lt Overbank
.03
.02
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

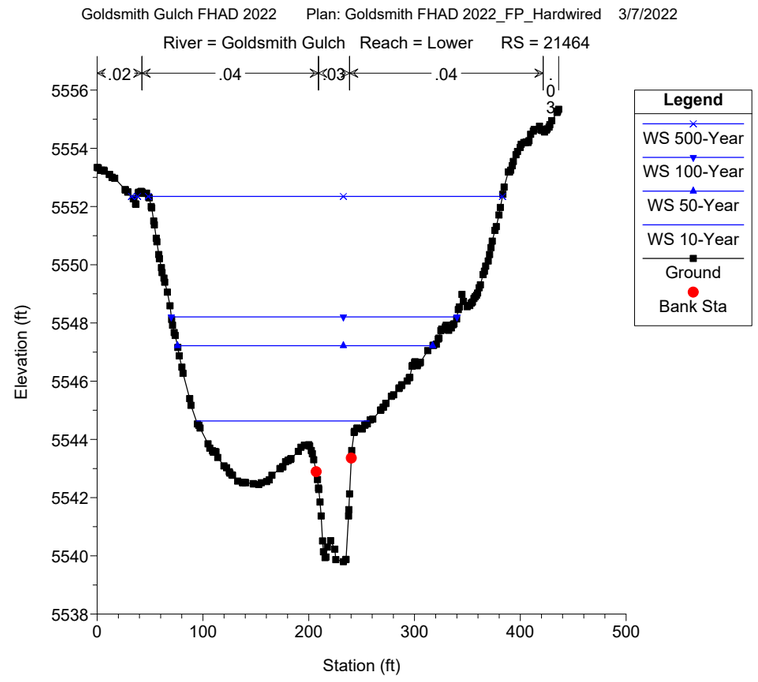

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 22889 Lat Struct defined in Lt Overbank
.03
.02
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

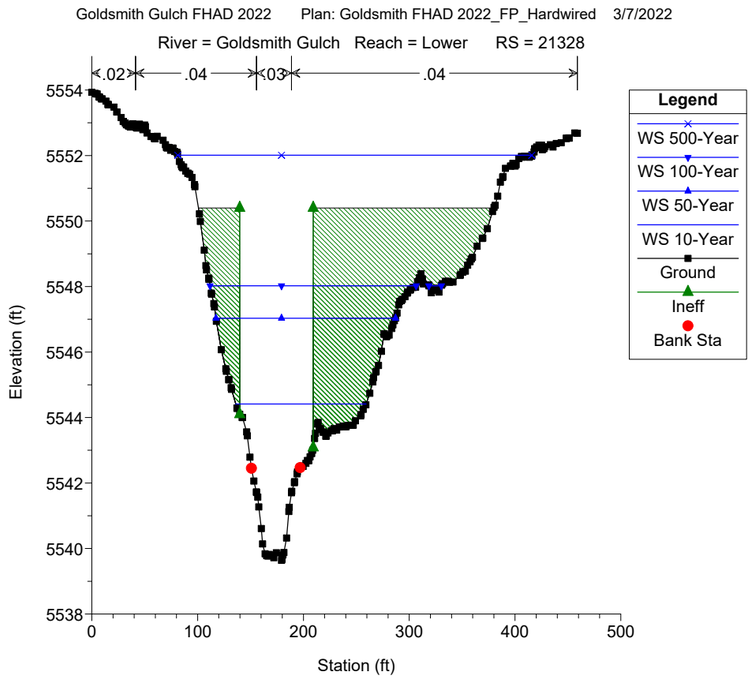

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 22658 Wallace Park North Detention u/s of I-225
.03
.02
.03
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

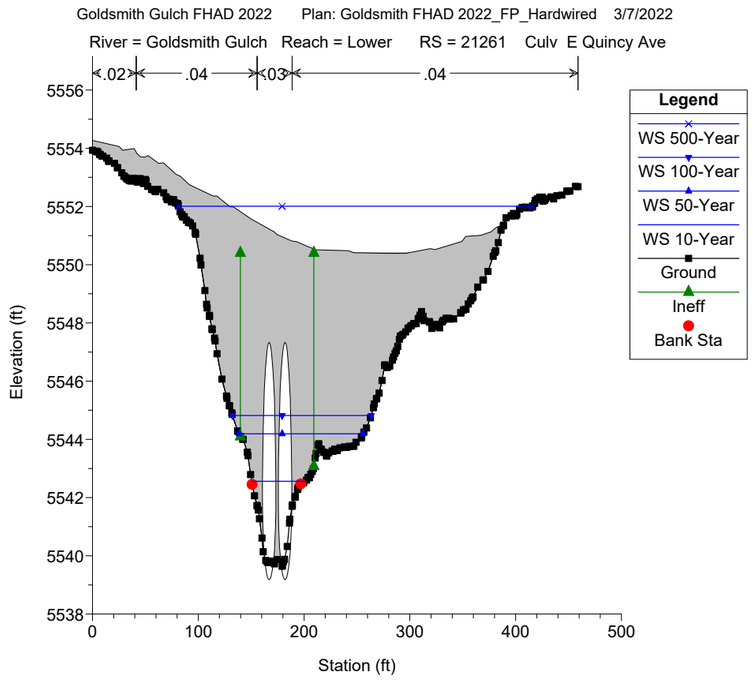

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 22032 D/S of I-225 Culvert
.03
.02
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

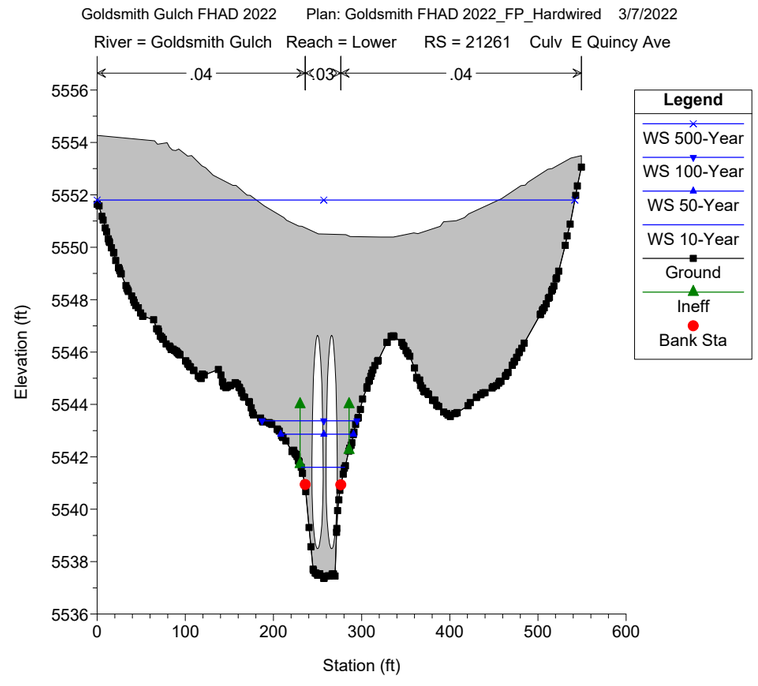

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21876
.03
.02
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

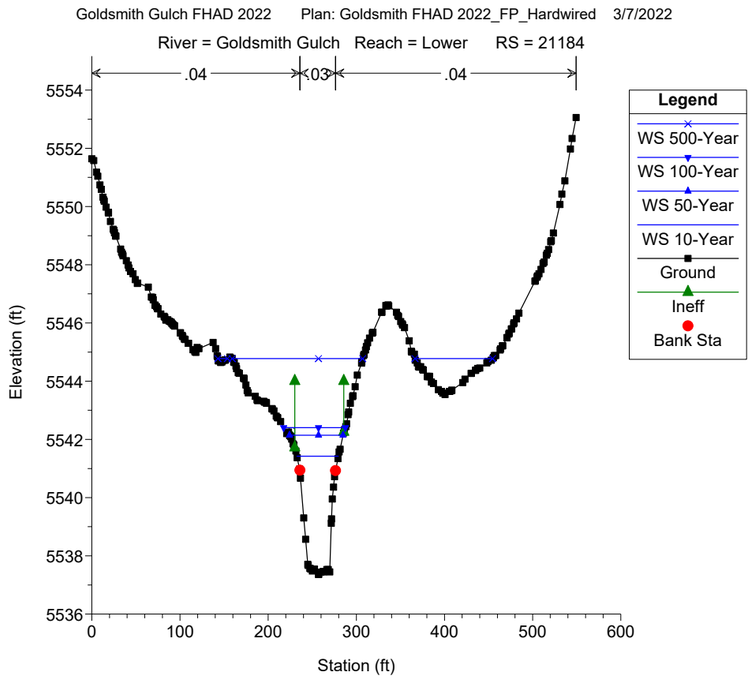

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21636
.03
.02
.04
.04
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

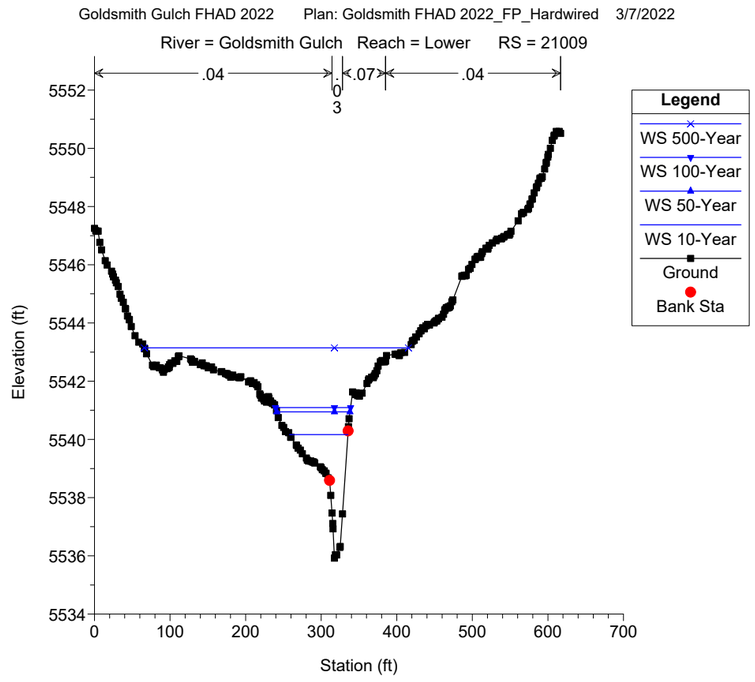

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21464
.02
.04
.03
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

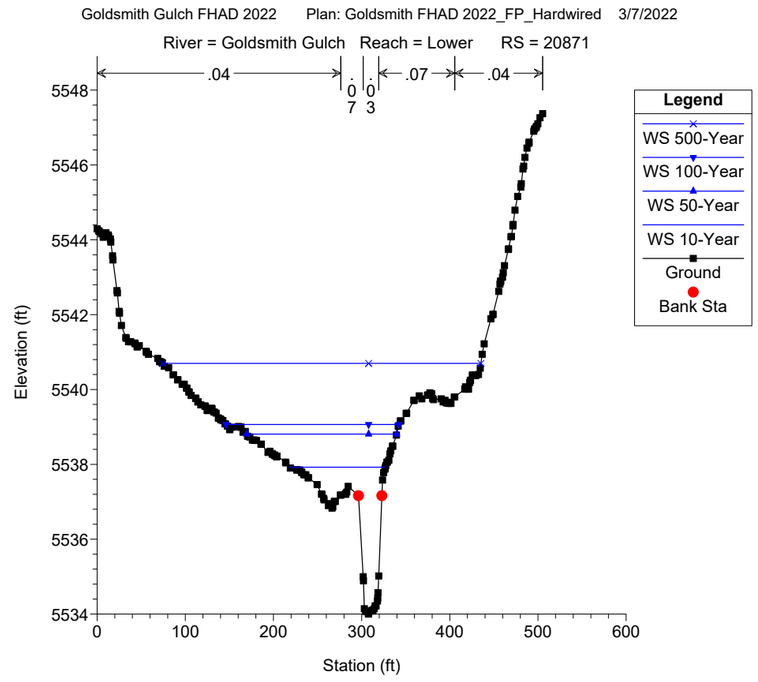

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21328
.02
.04
.03
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

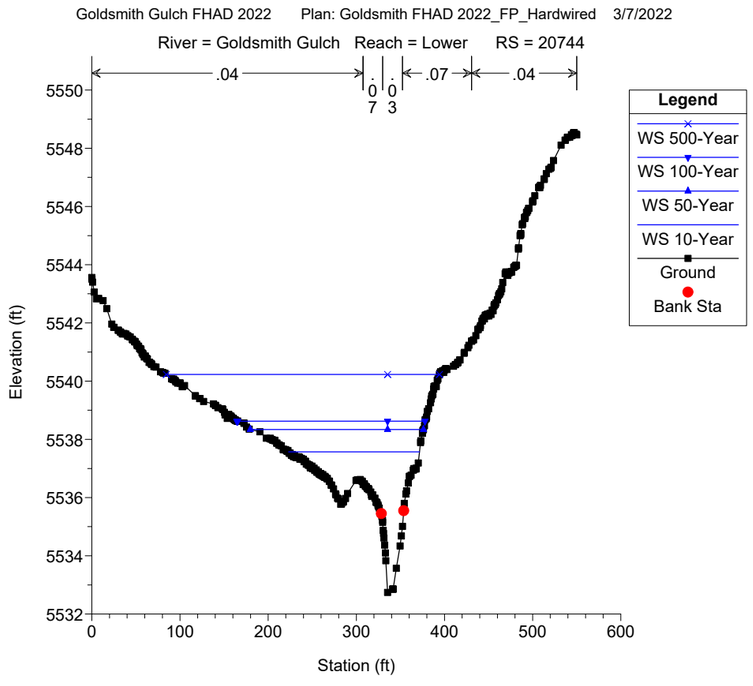

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21261 Culv E Quincy Ave
.02
.04
.03
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

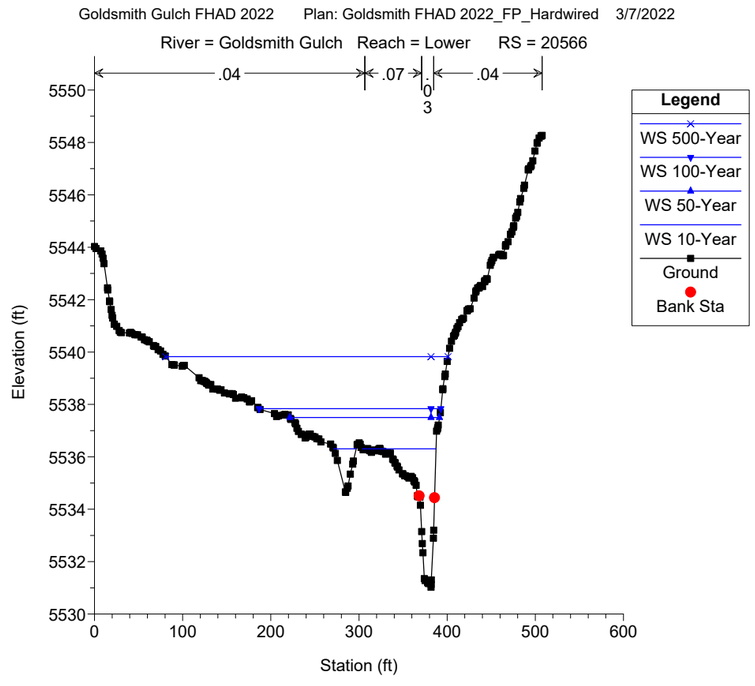

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21261 Culv E Quincy Ave
.04
.03
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

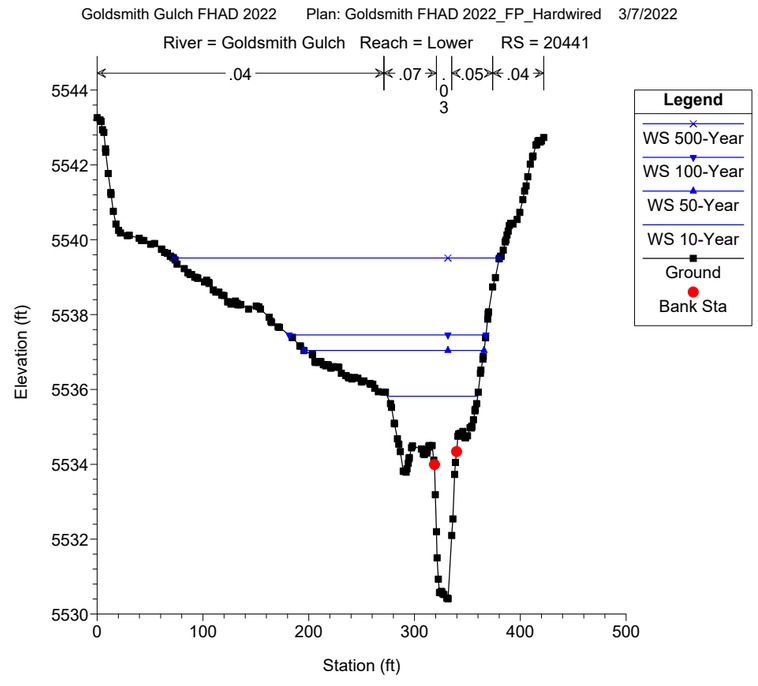

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21184
.04
.03
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

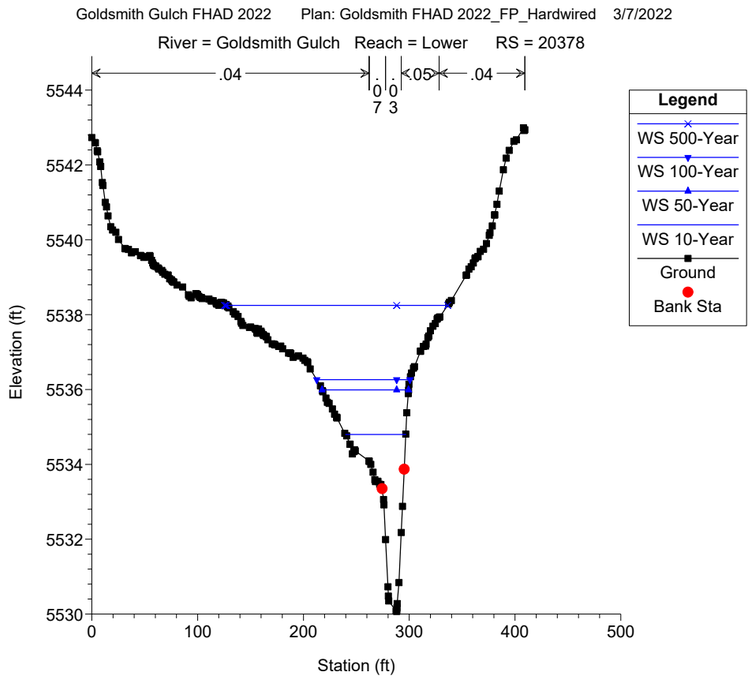

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 21009
.04
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

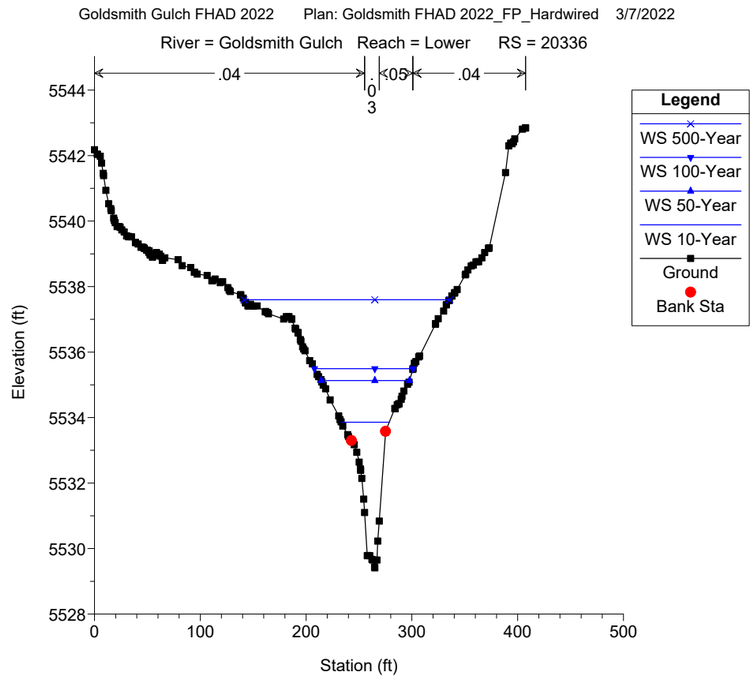

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20871
.04
.07
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

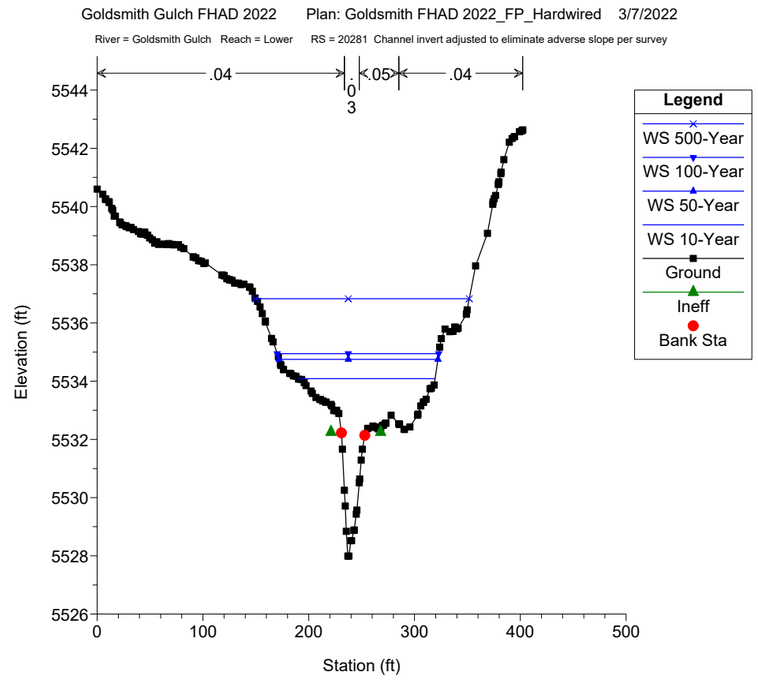

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20744
.04
.07
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

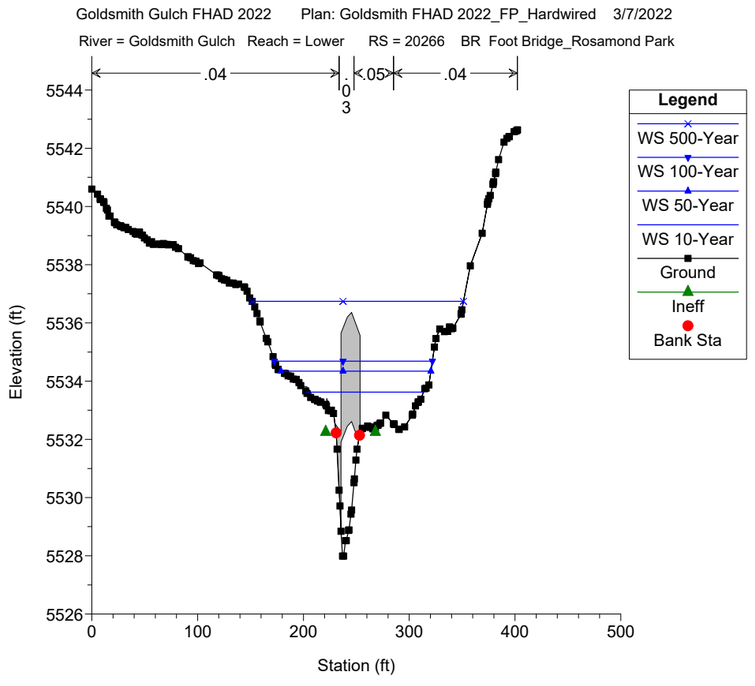

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20566
.04
.07
.03
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

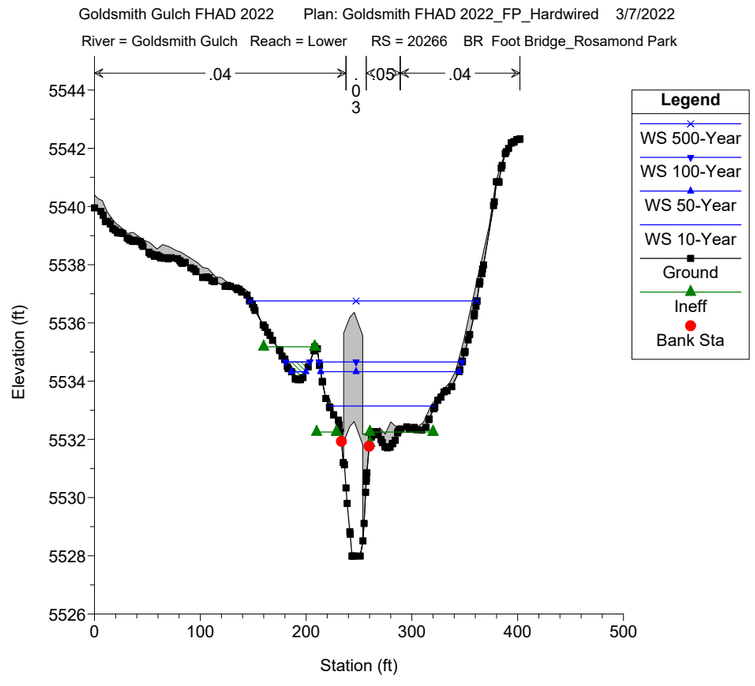

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20441
.04
.07
.03
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

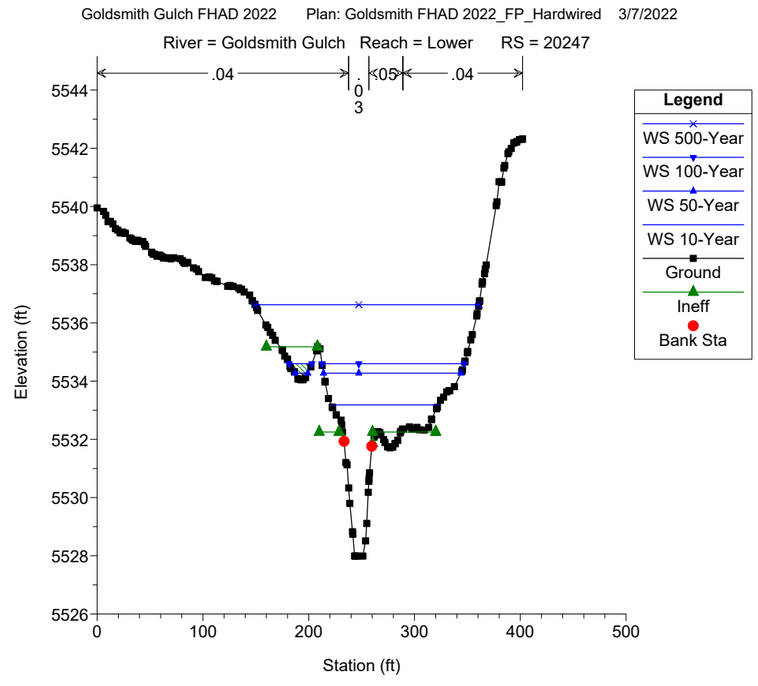

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20378
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

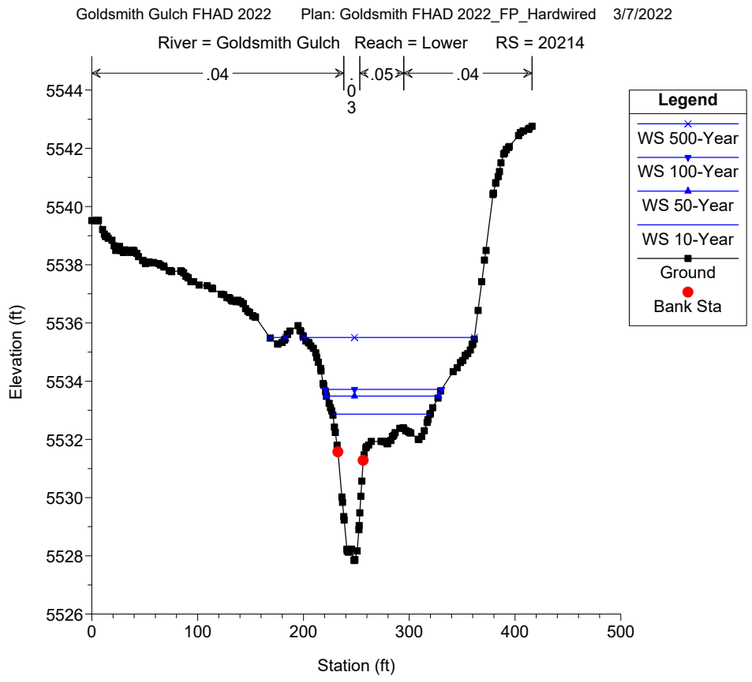

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20336
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

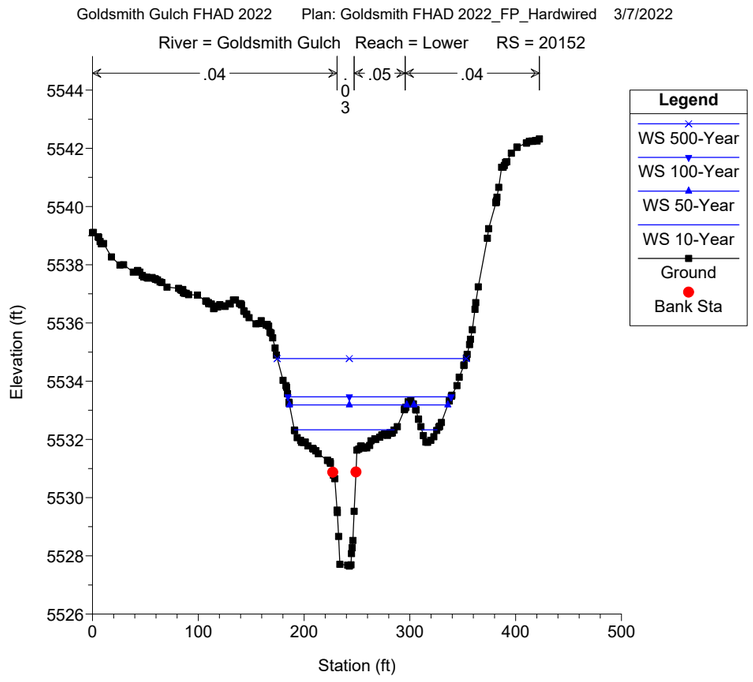

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20281 Channel invert adjusted to eliminate adverse slope per survey
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

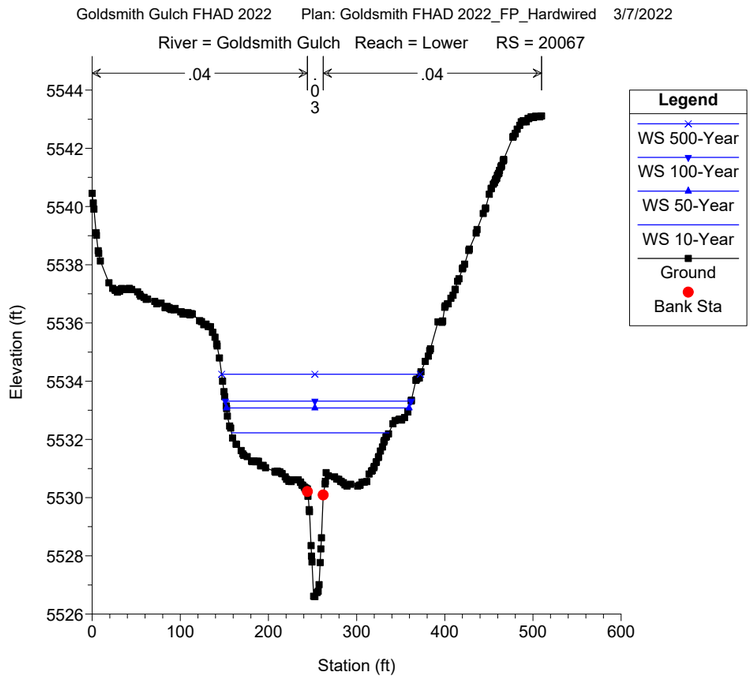

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20266 BR Foot Bridge_Rosamond Park
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

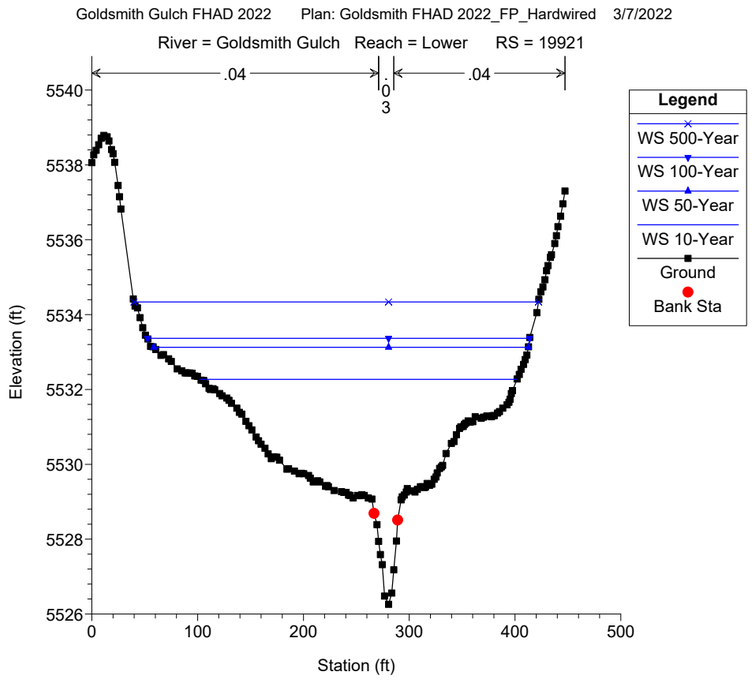

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20266 BR Foot Bridge_Rosamond Park
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

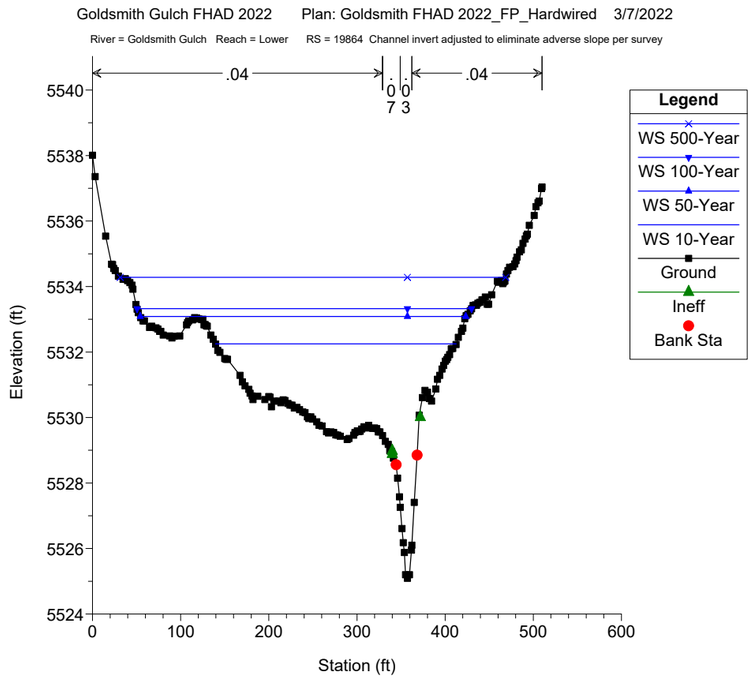

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20247
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

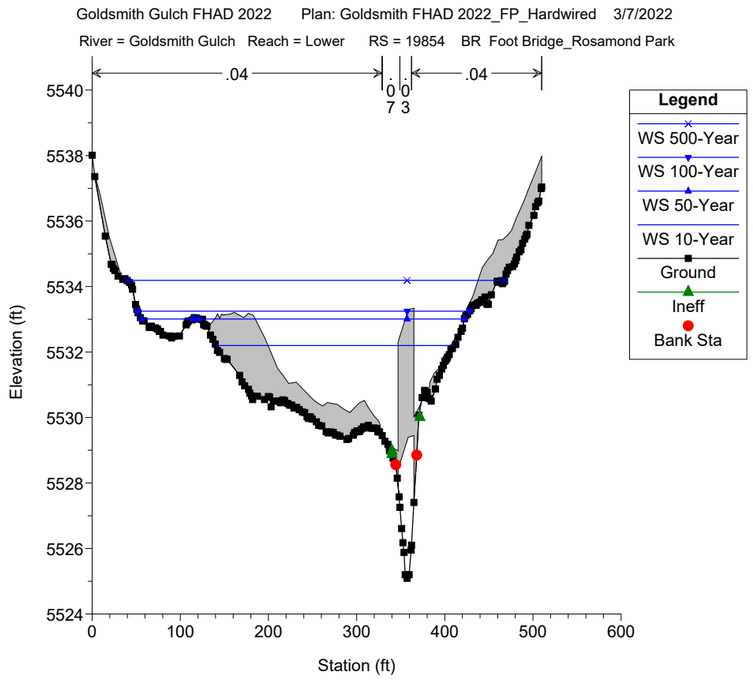

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20214
.04
.05
.04
0
3
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

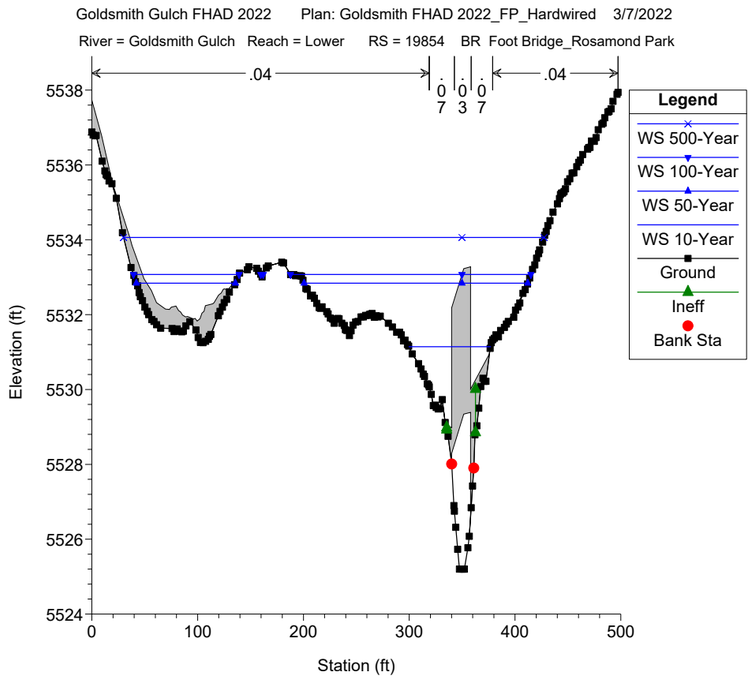

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20152
.04
.05
.04
0
3
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

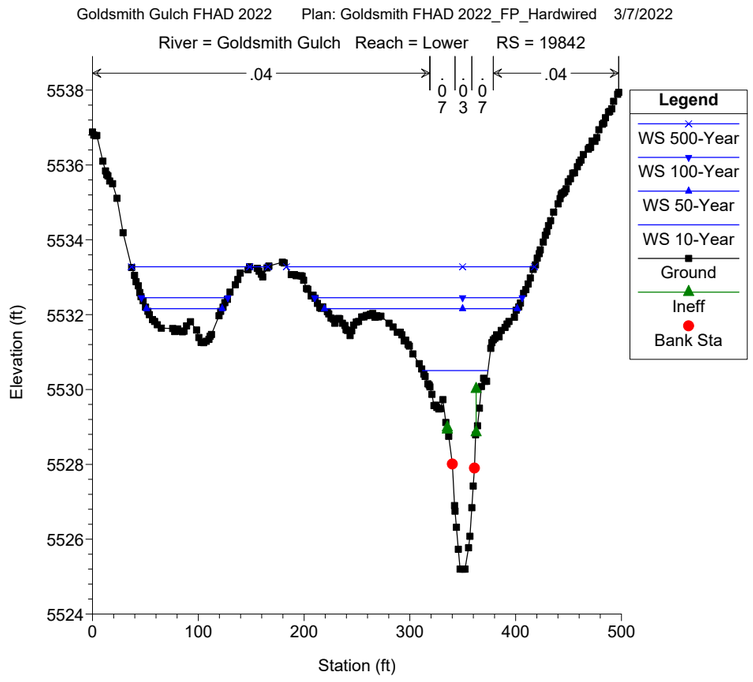

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 20067
.04
.04
0
3
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

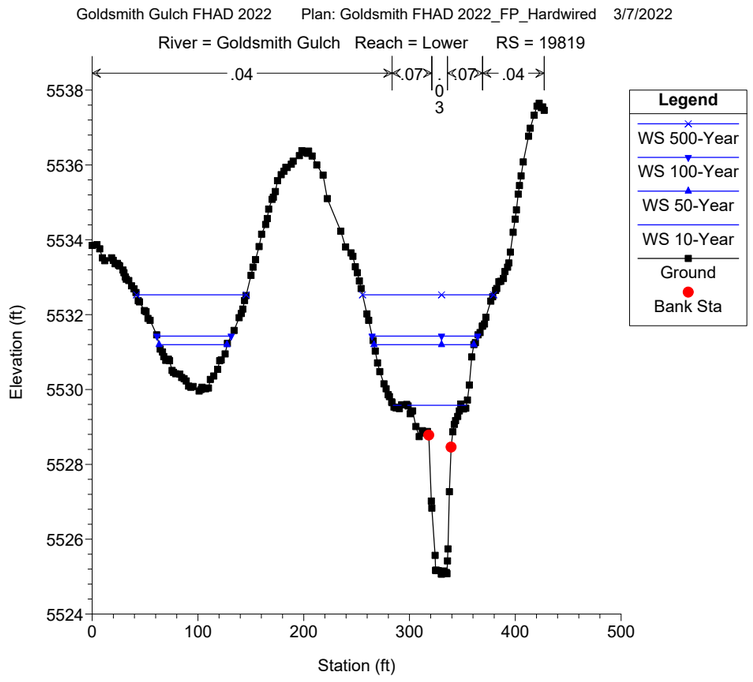

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19921
.04
.04
0
3
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

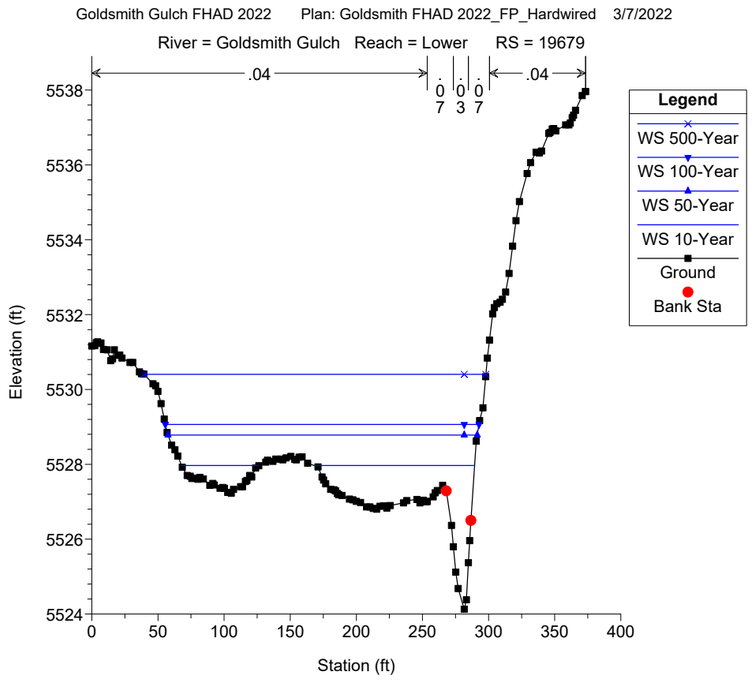

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19864 Channel invert adjusted to eliminate adverse slope per survey
.04
.04
0 0
7 3
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

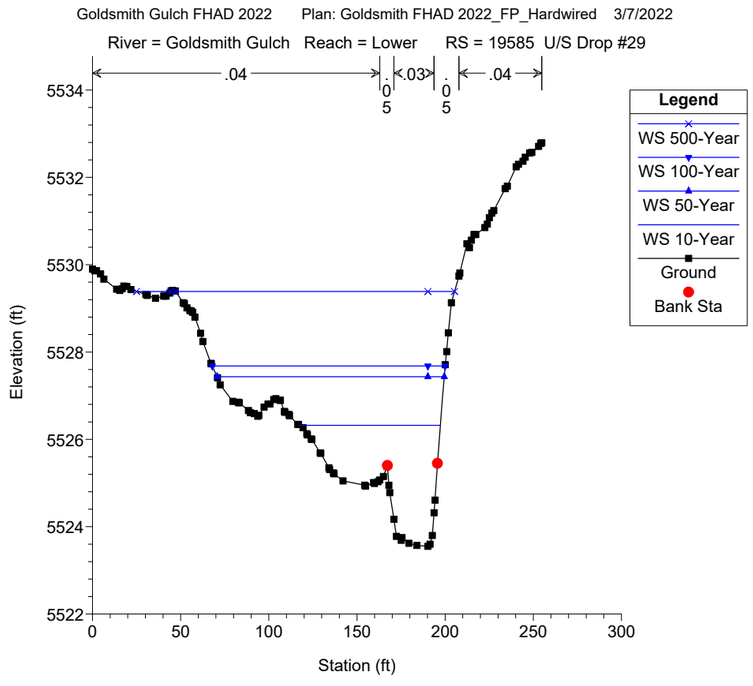

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19854 BR Foot Bridge_Rosamond Park
.04
.04
0 0
7 3
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

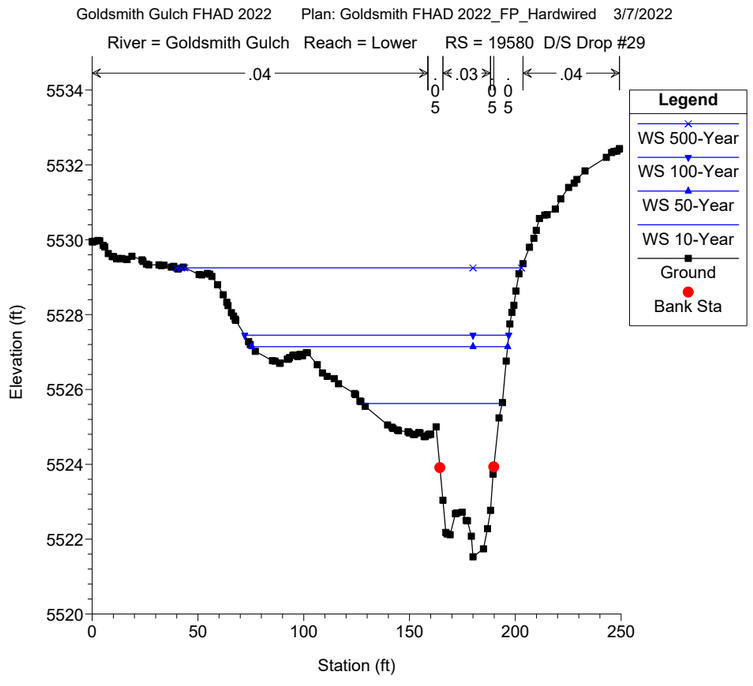

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19854 BR Foot Bridge_Rosamond Park
.04
.07
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

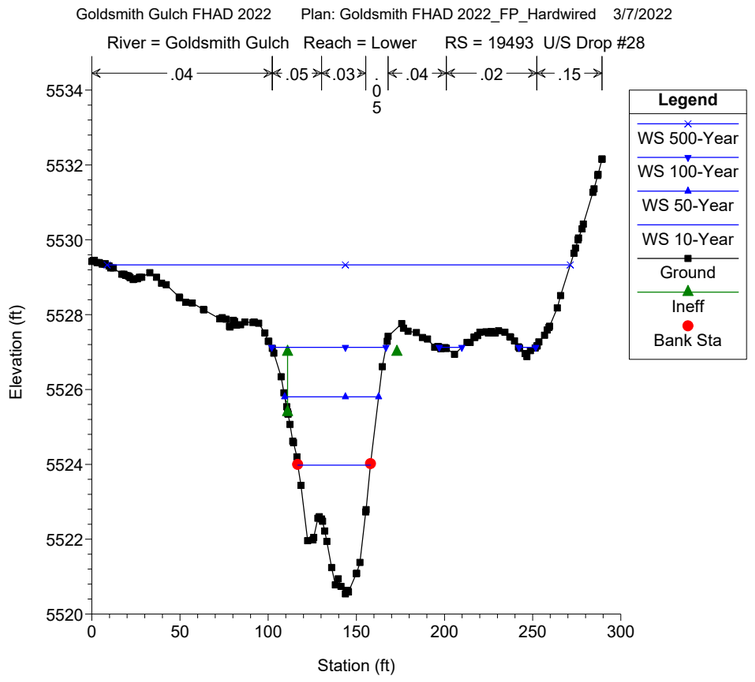

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19842
.04
.07
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

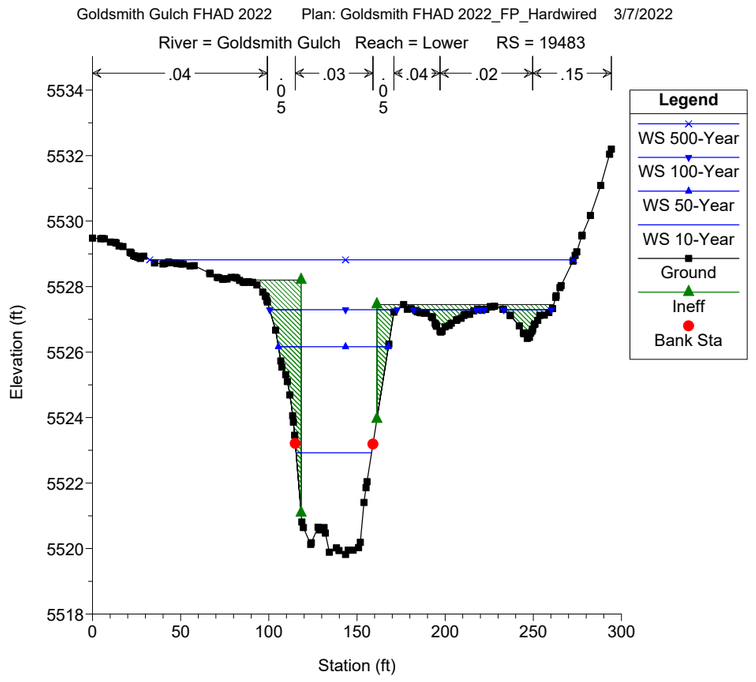

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19819
.04
.07
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

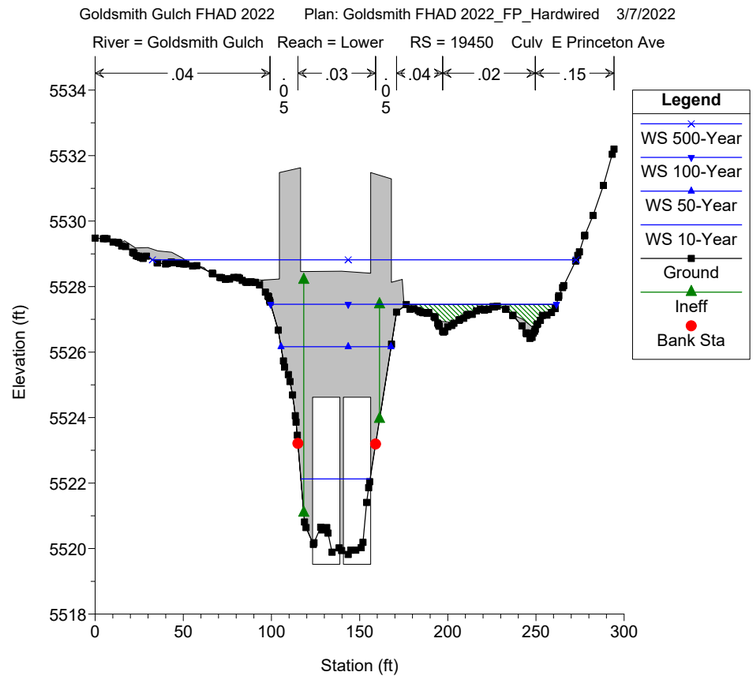

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19679
.04
.07
.03
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

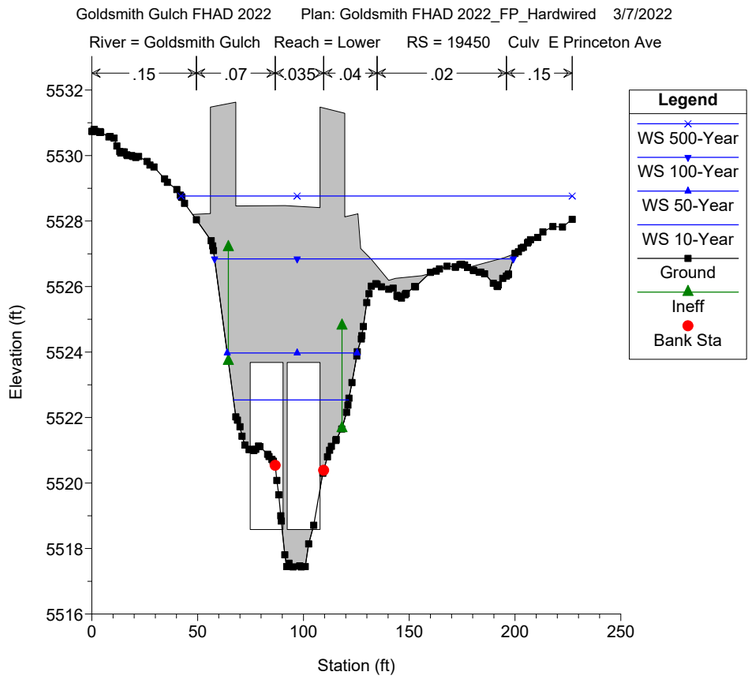

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19585 U/S Drop #29
.04
.05
.03
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

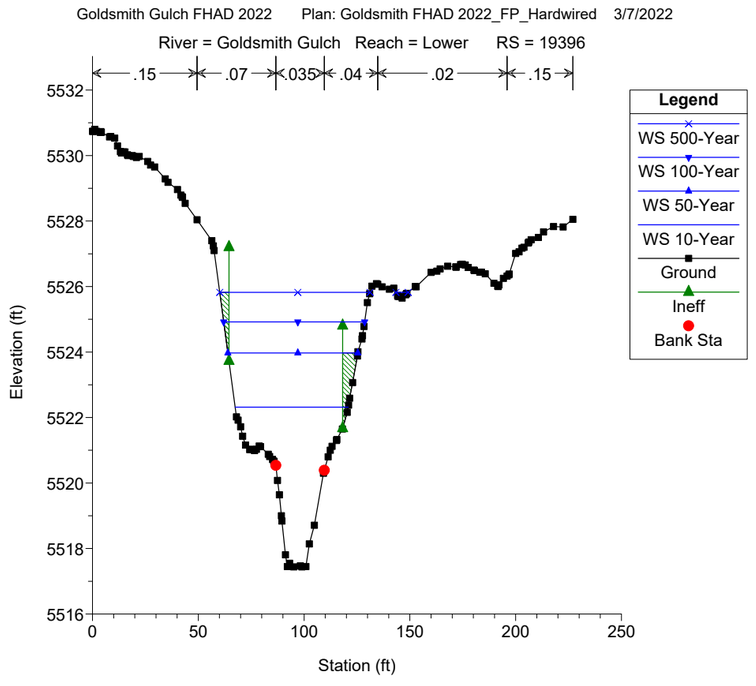

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19580 D/S Drop #29
.04
.05
.03
.05
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

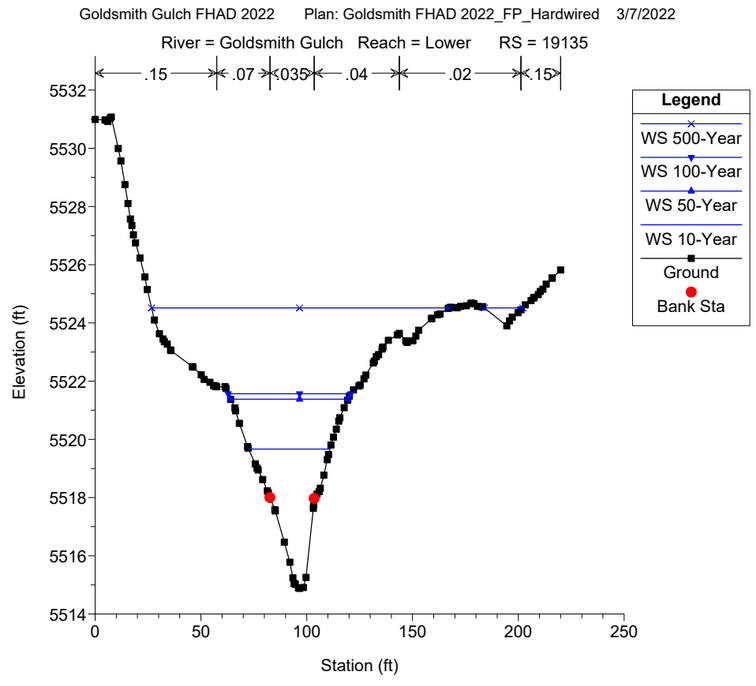

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19493 U/S Drop #28
.04 .05 .03 .05 .04 .02 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

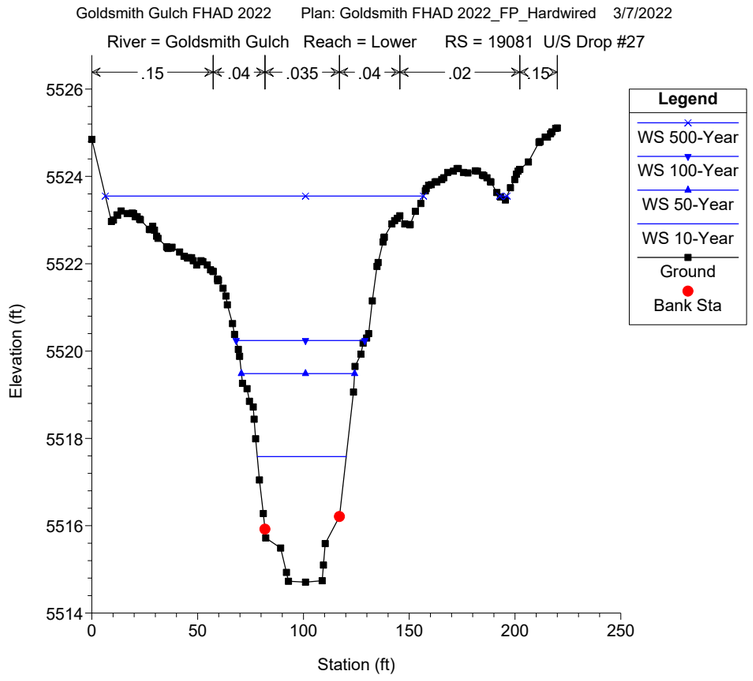

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19483
.04 .05 .03 .05 .04 .02 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

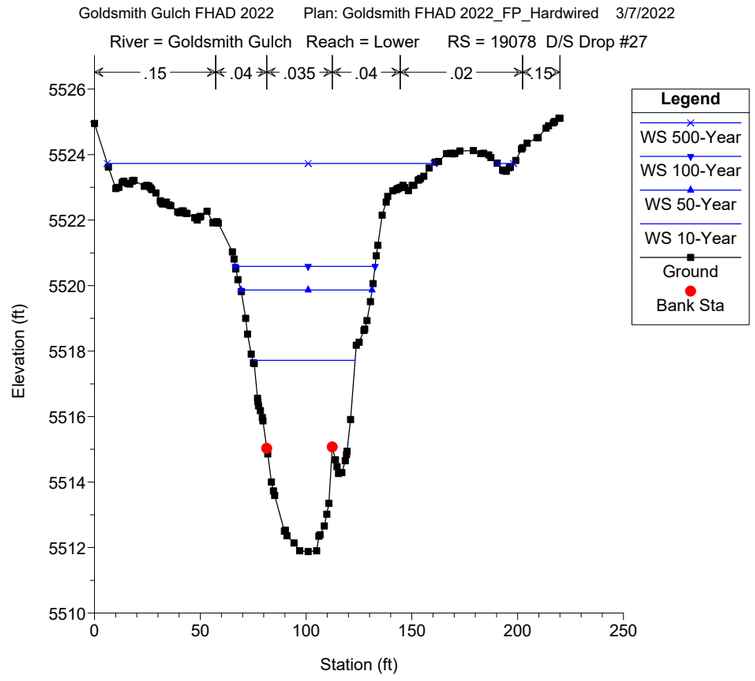

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19450 Culv E Princeton Ave
.04 .05 .03 .05 .04 .02 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

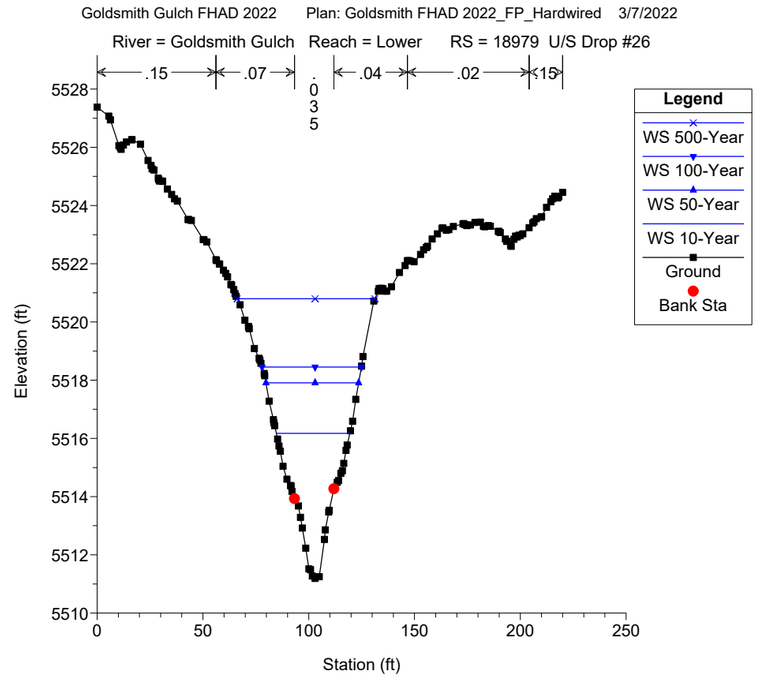

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19450 Culv E Princeton Ave
.15 .07 .035 .04 .02 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

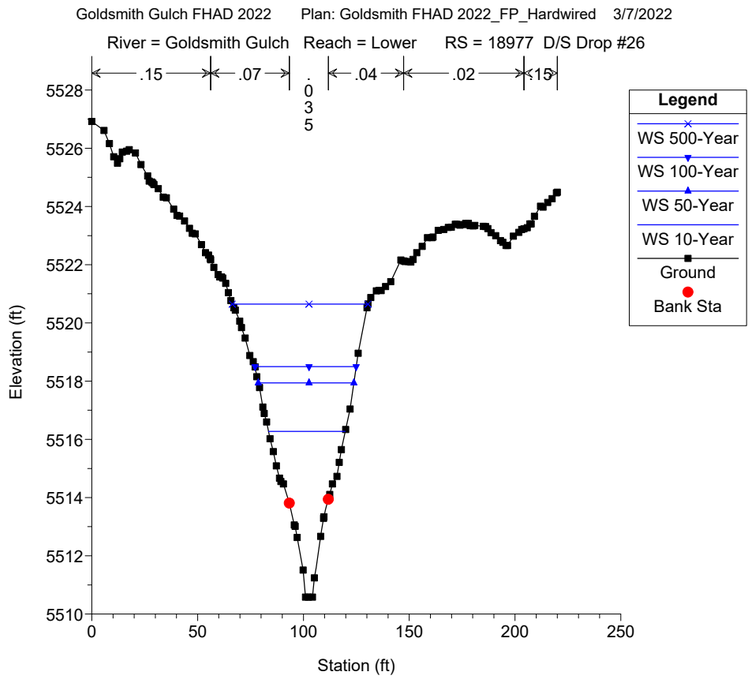

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19396
.15 .07 .035 .04 .02 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

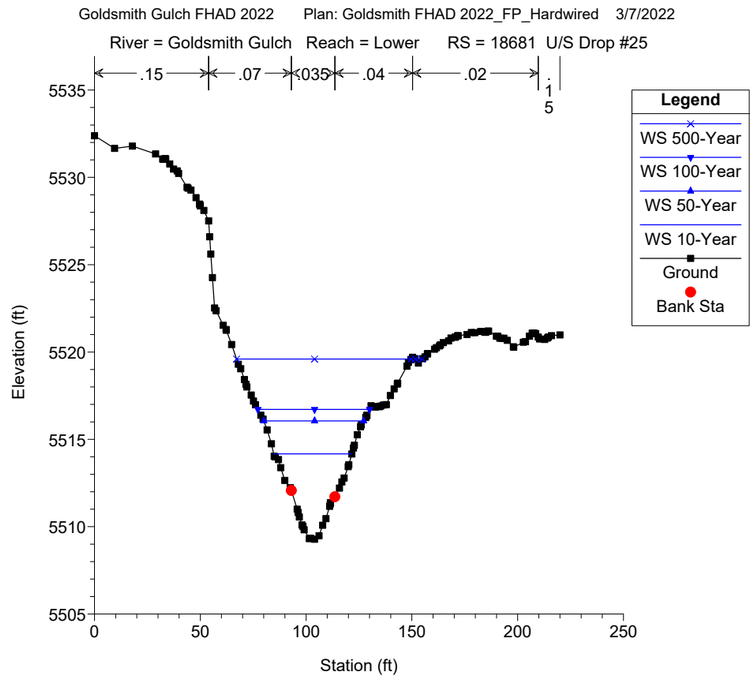

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19135
.15 .07 .035 .04 .02 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

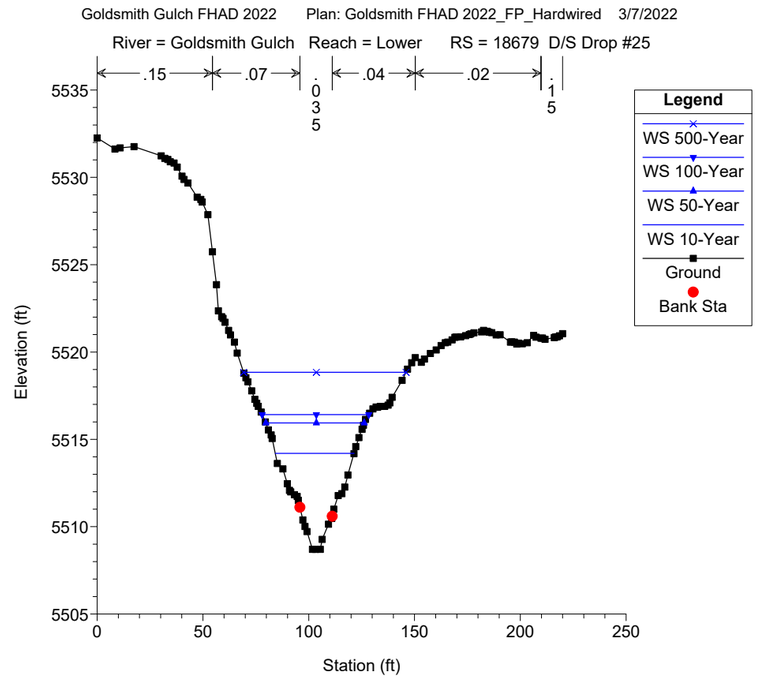

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19081 U/S Drop #27
.15 .04 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

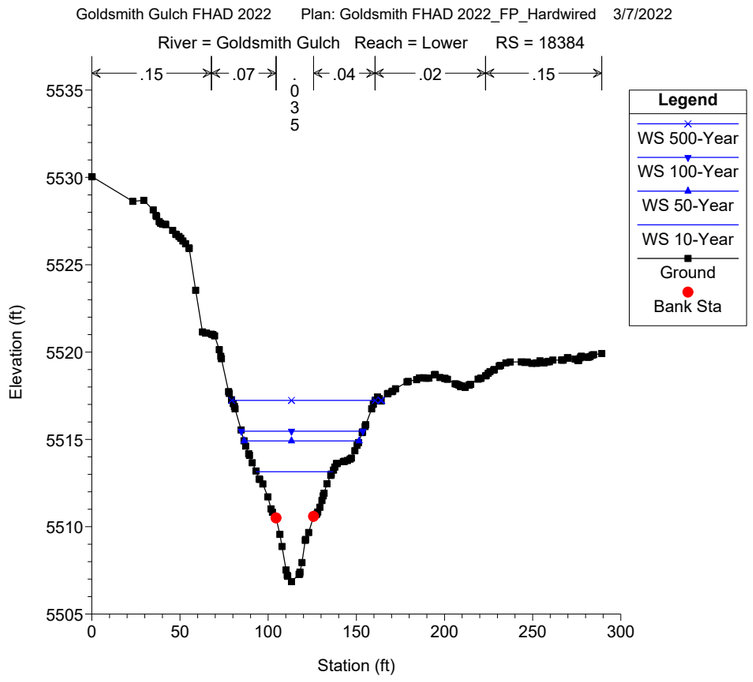

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 19078 D/S Drop #27
.15 .04 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

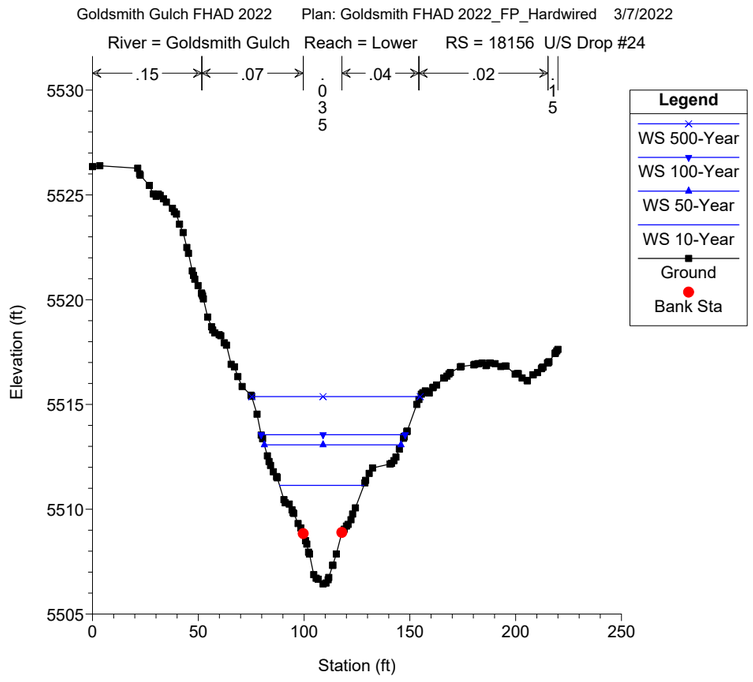

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18979 U/S Drop #26
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

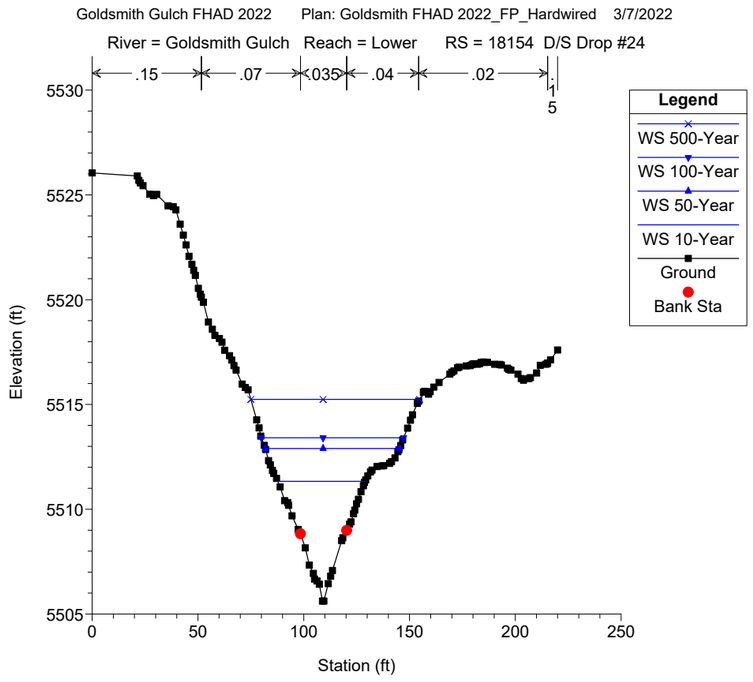

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18977 D/S Drop #26
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

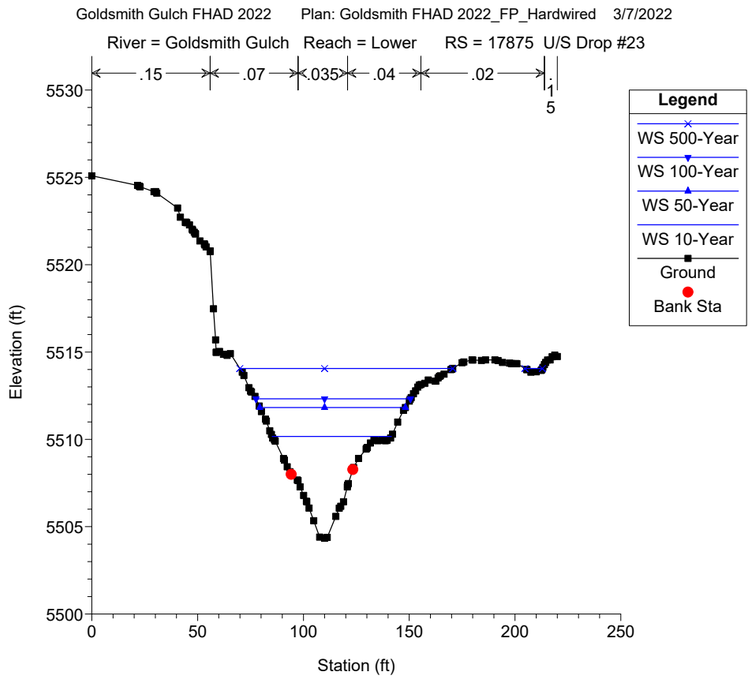

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18681 U/S Drop #25
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

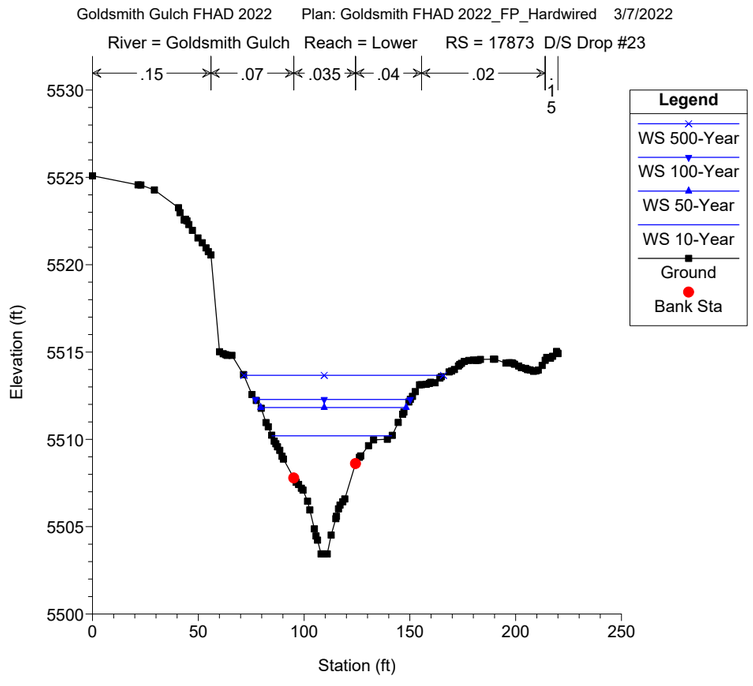

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18679 D/S Drop #25
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

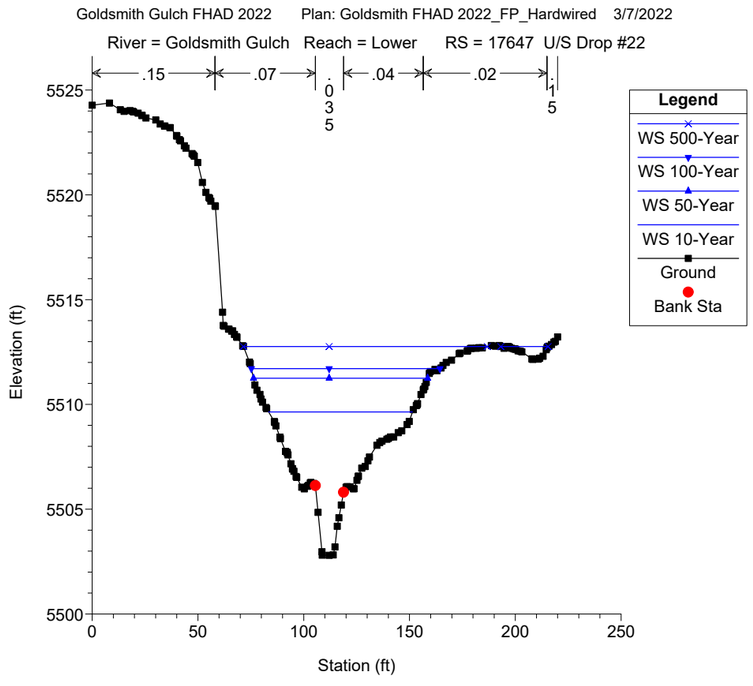

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18384
.15
.07
.035
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

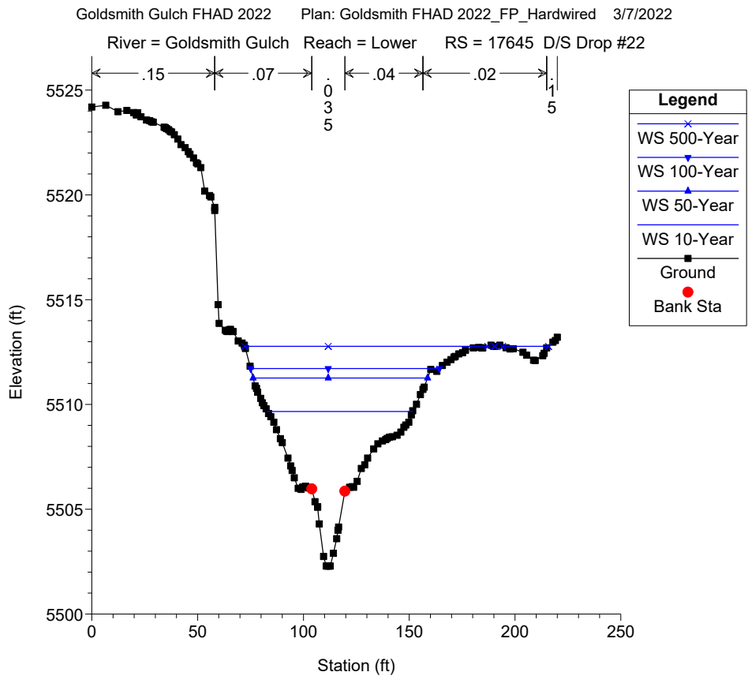

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18156 U/S Drop #24
.15
.07
.035
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

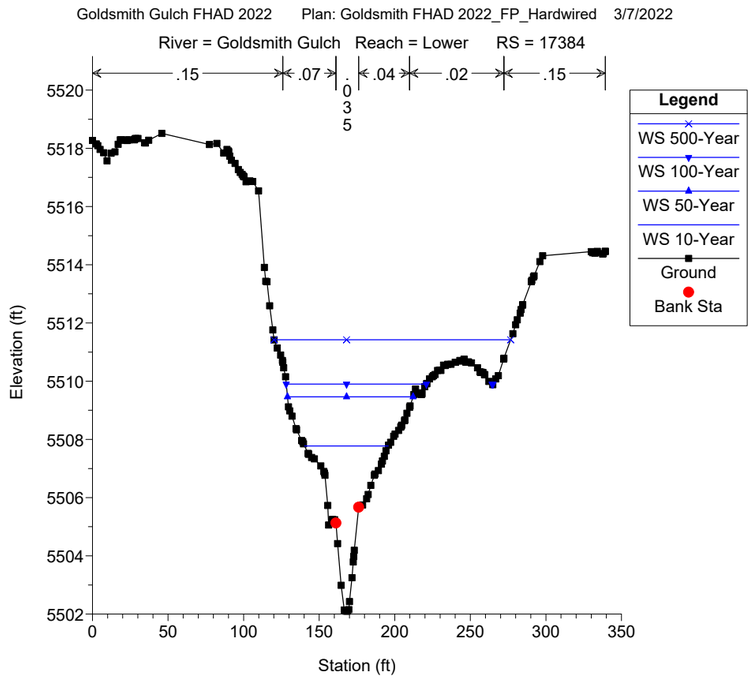

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 18154 D/S Drop #24
.15
.07
.035
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

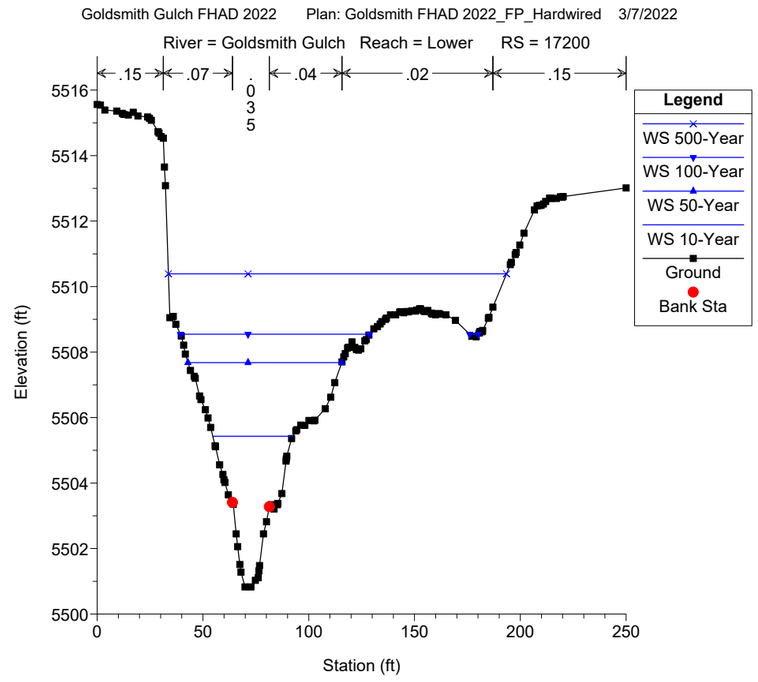

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17875 U/S Drop #23
.15
.07
.035
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

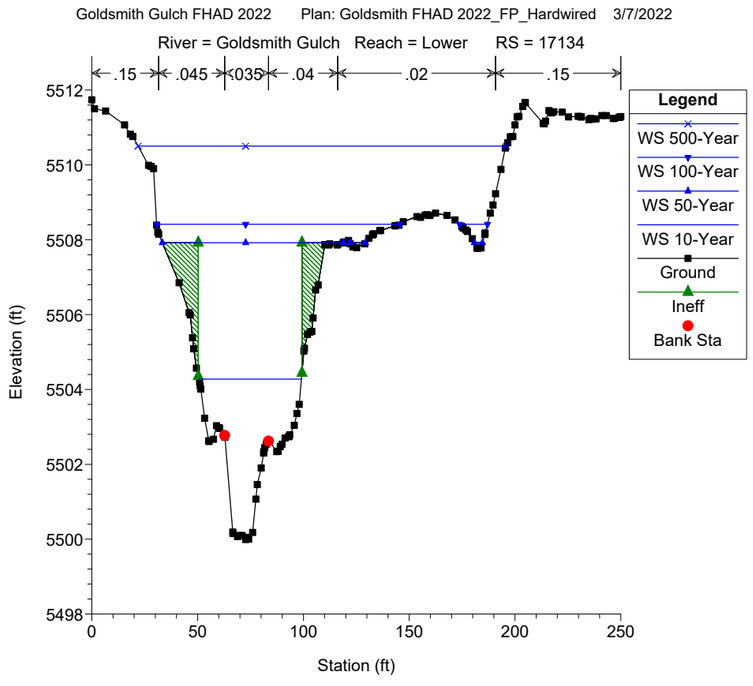

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17873 D/S Drop #23
.15
.07
.035
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

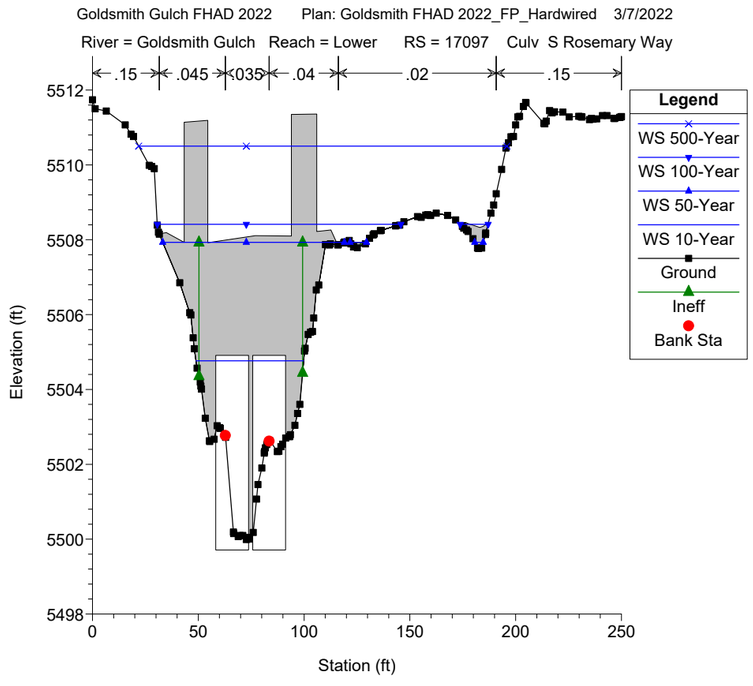

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17647 U/S Drop #22
.15
.07
.035
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

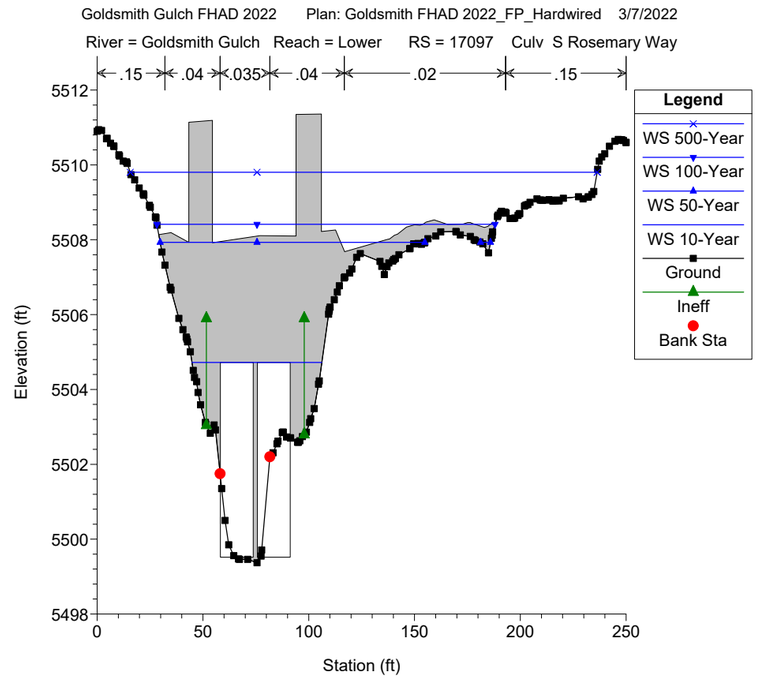

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17645 D/S Drop #22
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

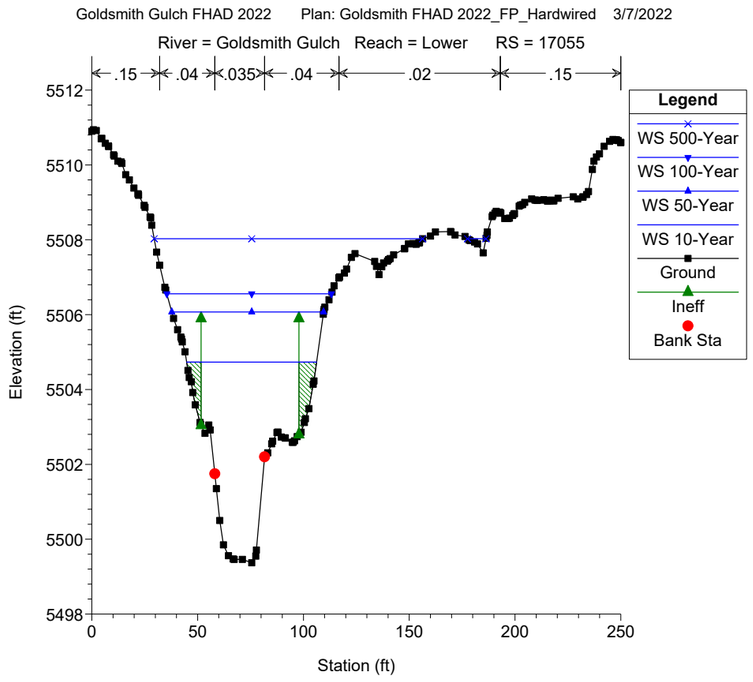

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17384
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

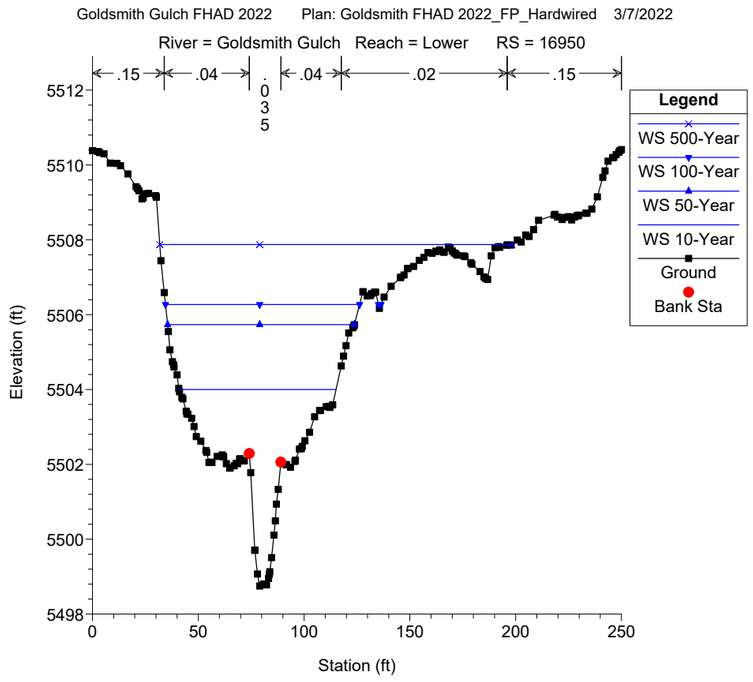

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17200
.15 .07 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

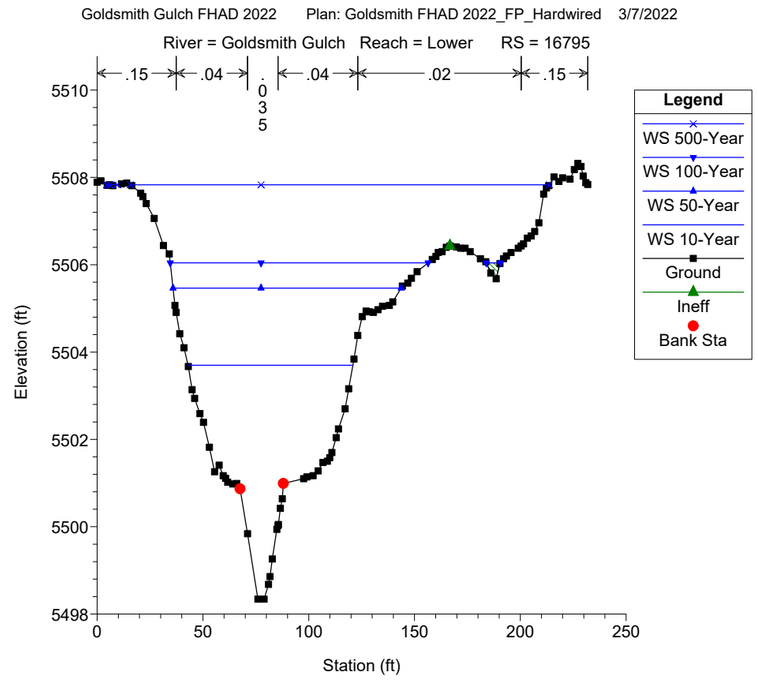

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17134
.15 .045 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

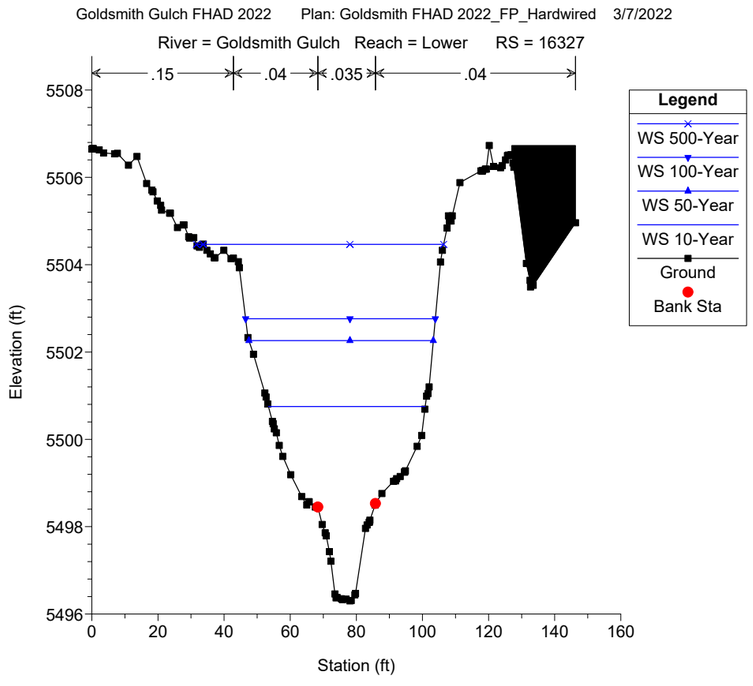

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17097 Culv S Rosemary Way
.15 .045 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

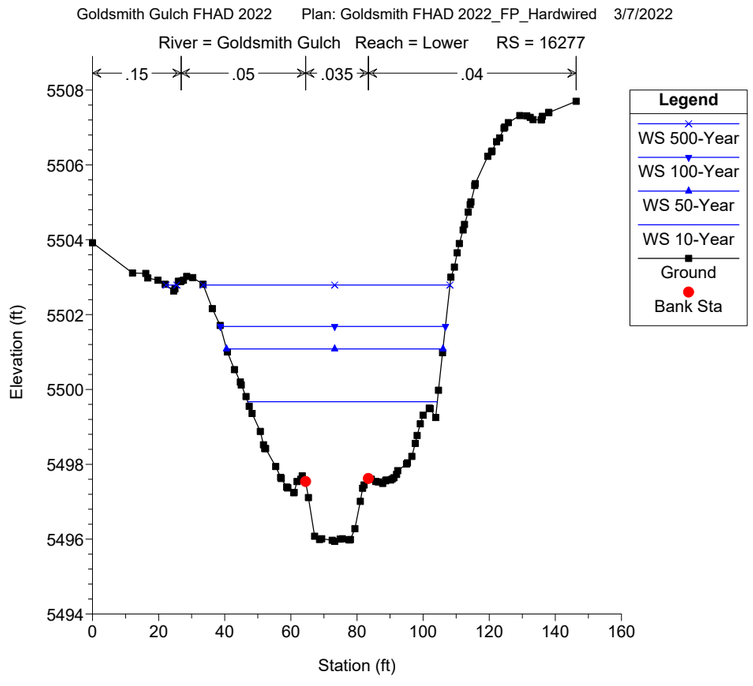

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17097 Culv S Rosemary Way
.15 .04 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

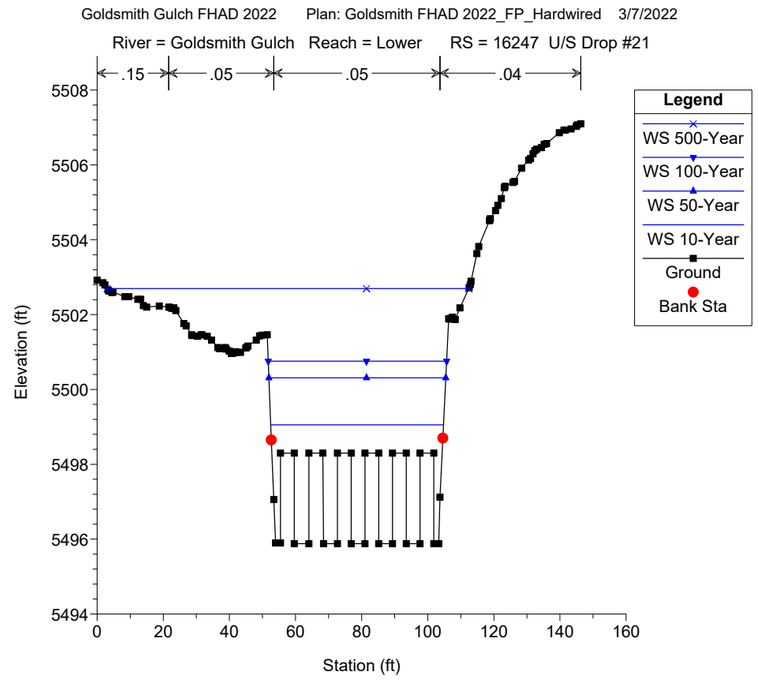

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 17055
.15 .04 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

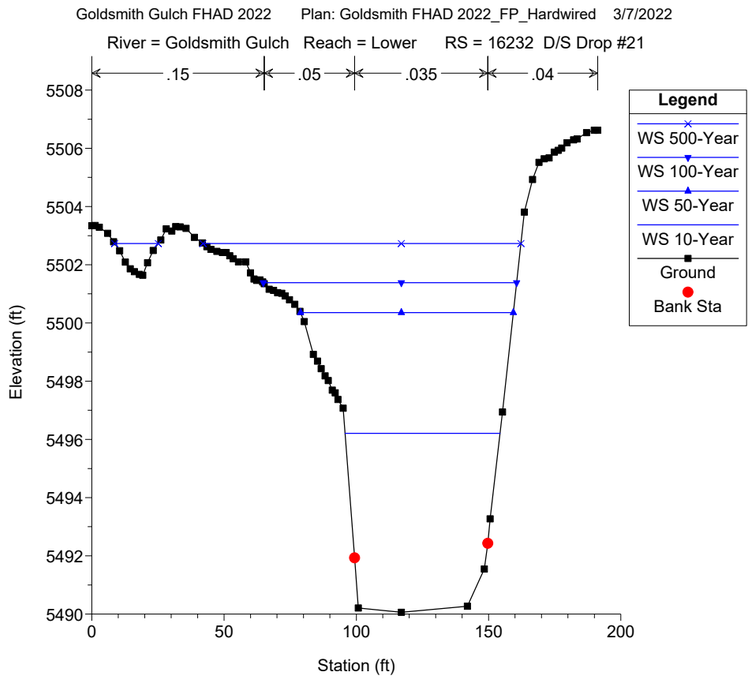

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16950
.15 .04 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

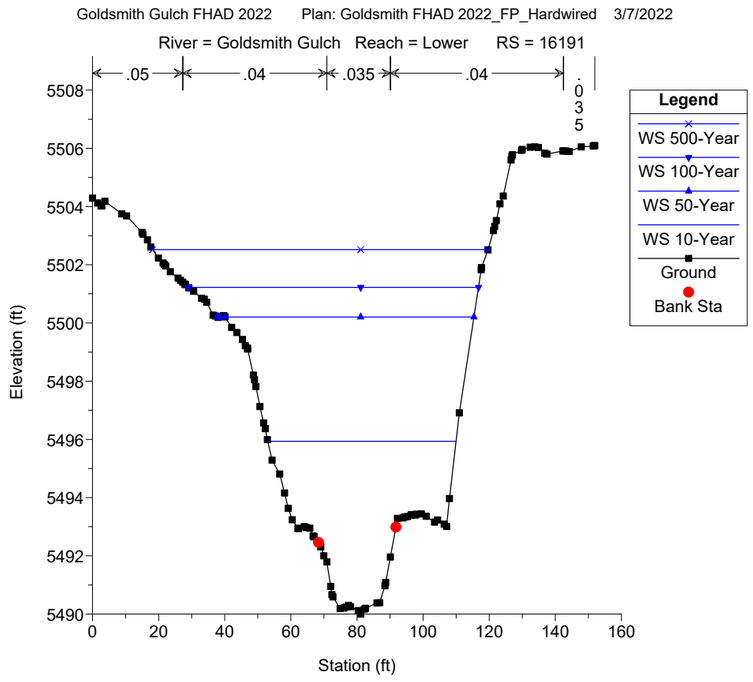

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16795
.15 .04 .035 .04 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

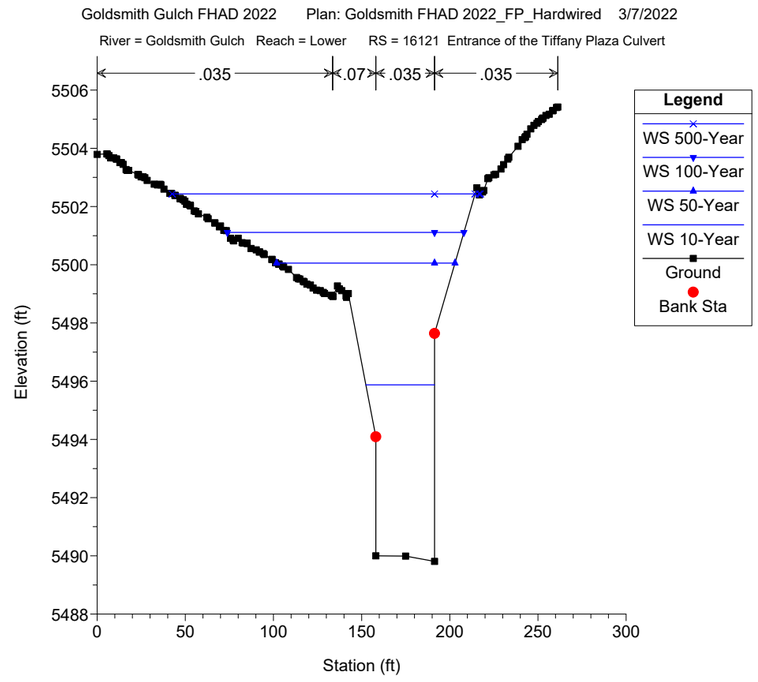

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16327
.15 .04 .035 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

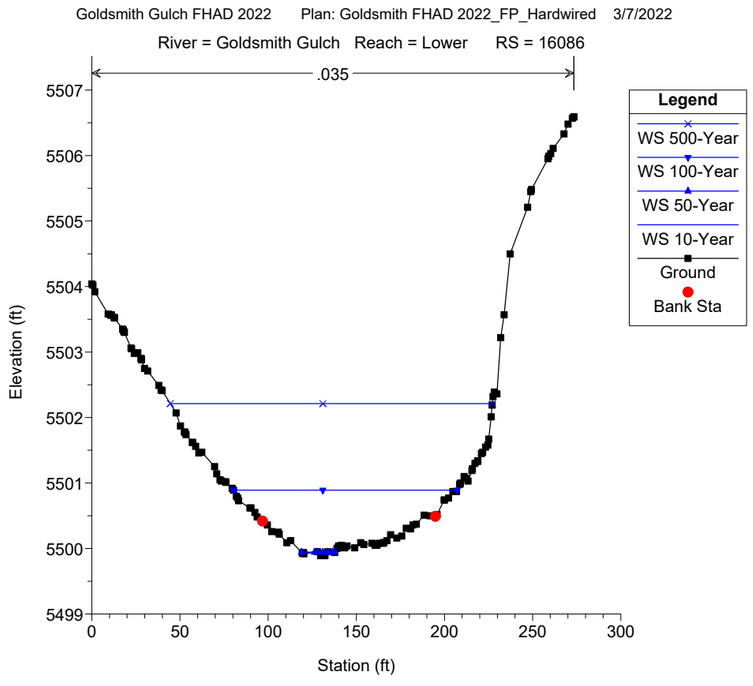

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16277
.15 .05 .035 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

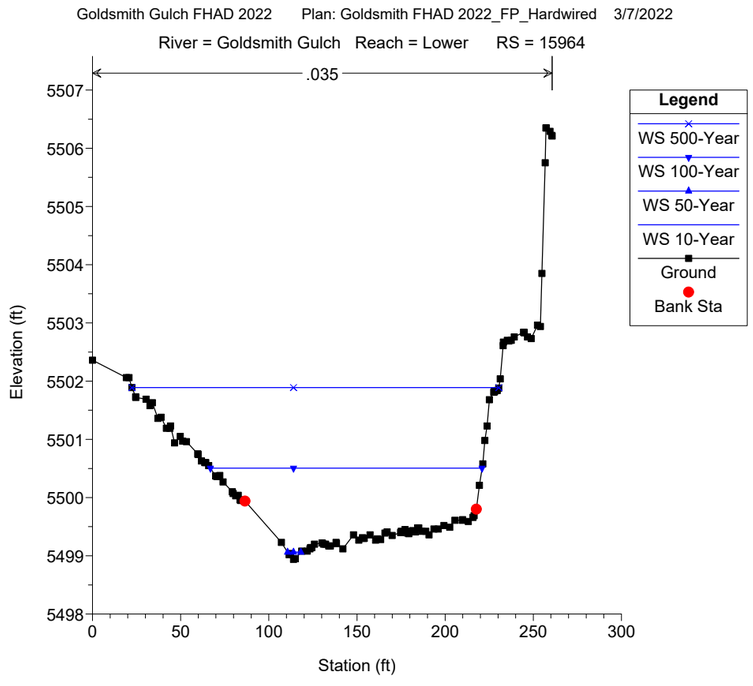

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16247 U/S Drop #21
.15 .05 .05 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

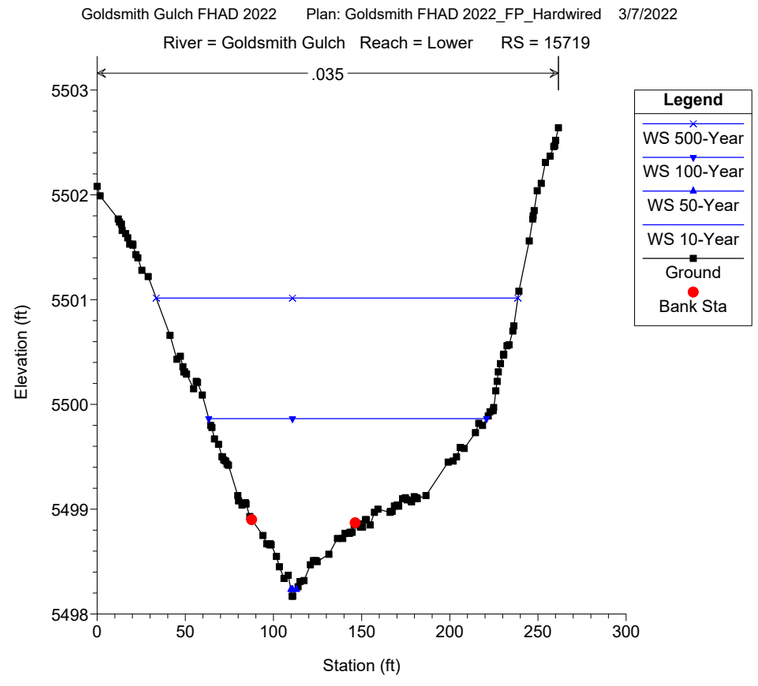

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16232 D/S Drop #21
.15
.05
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

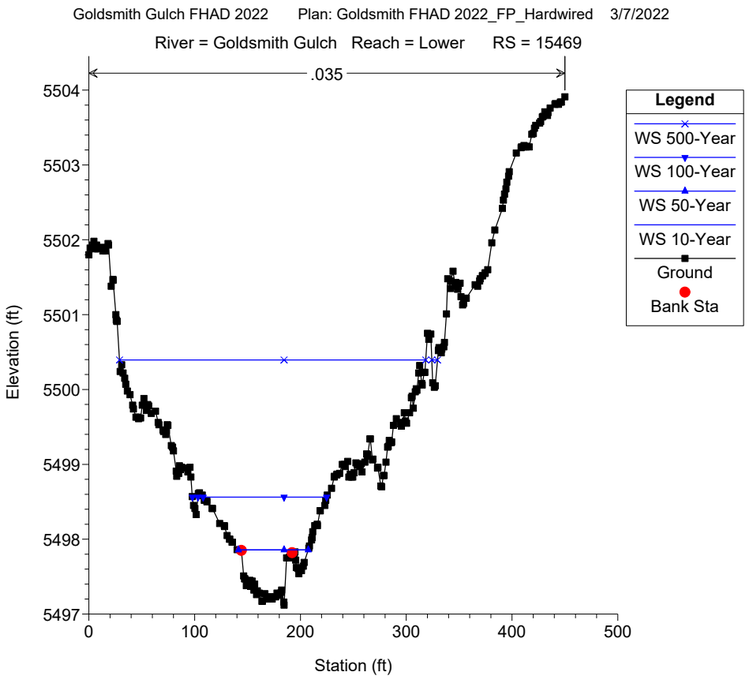

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16191
.05
.04
.035
.04
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

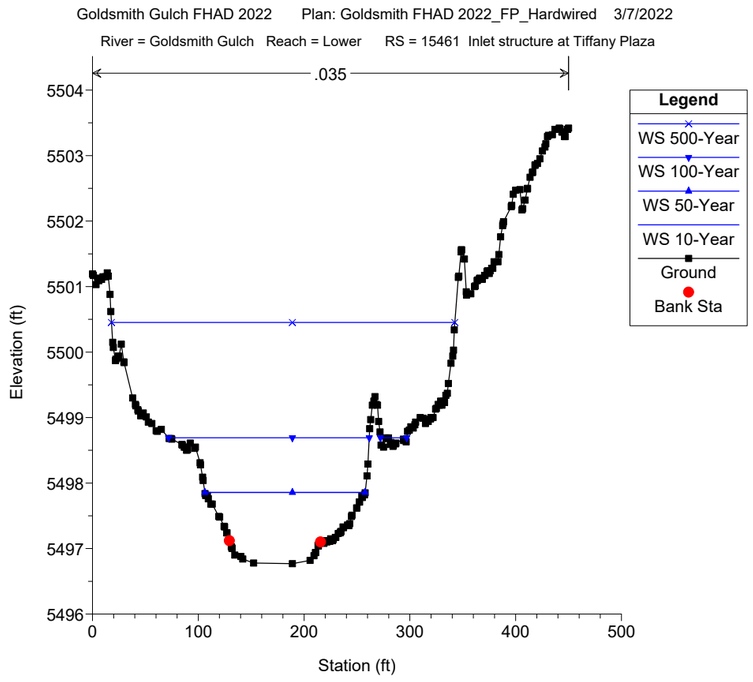

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16121 Entrance of the Tiffany Plaza Culvert
.035
.07
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

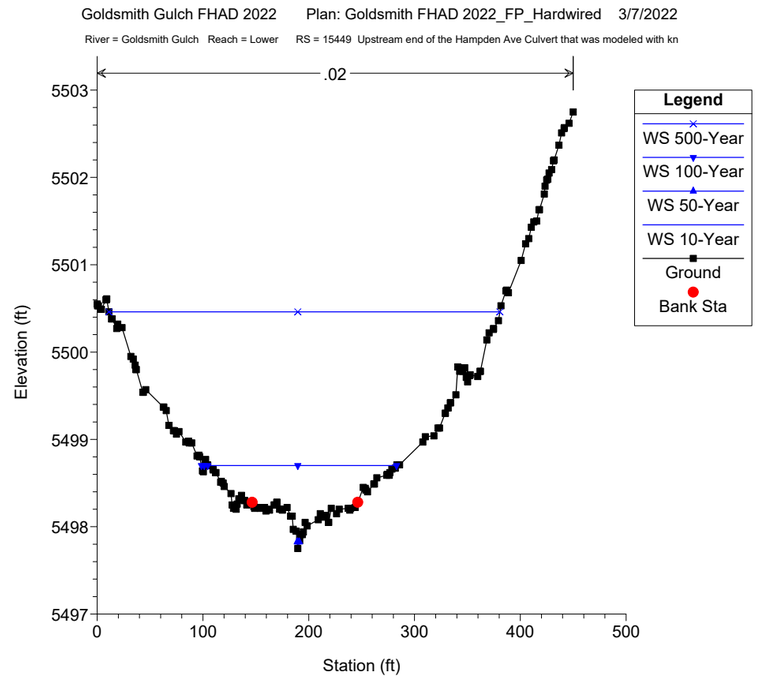

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 16086
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

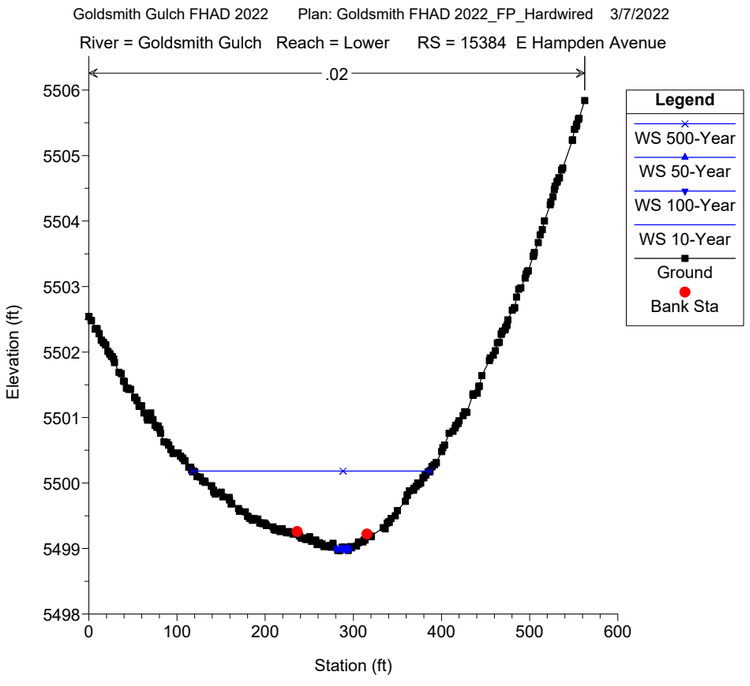

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15964
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

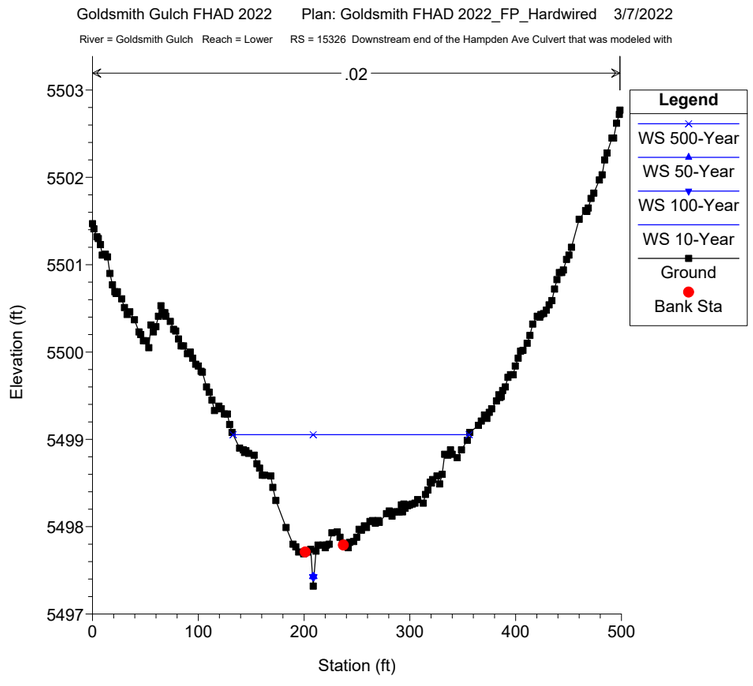

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15719
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

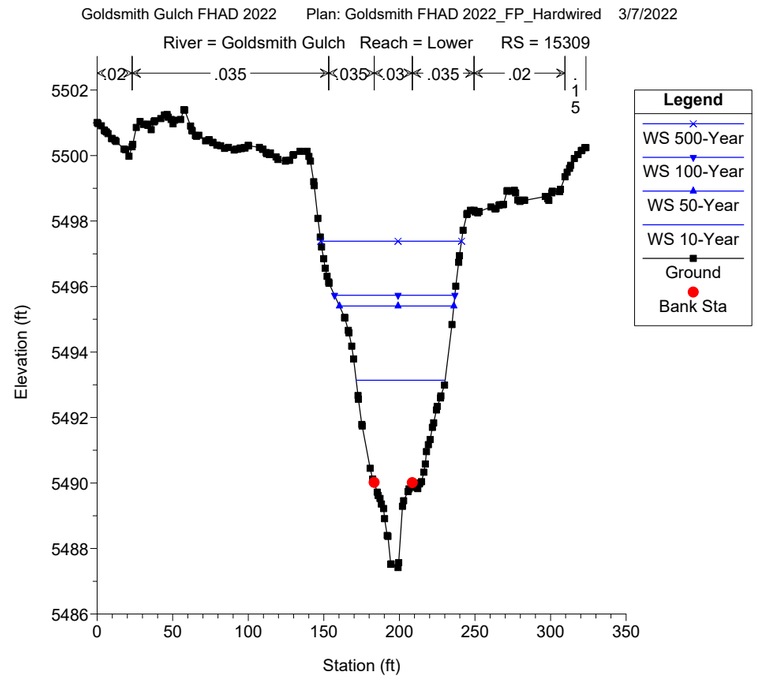

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15469
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

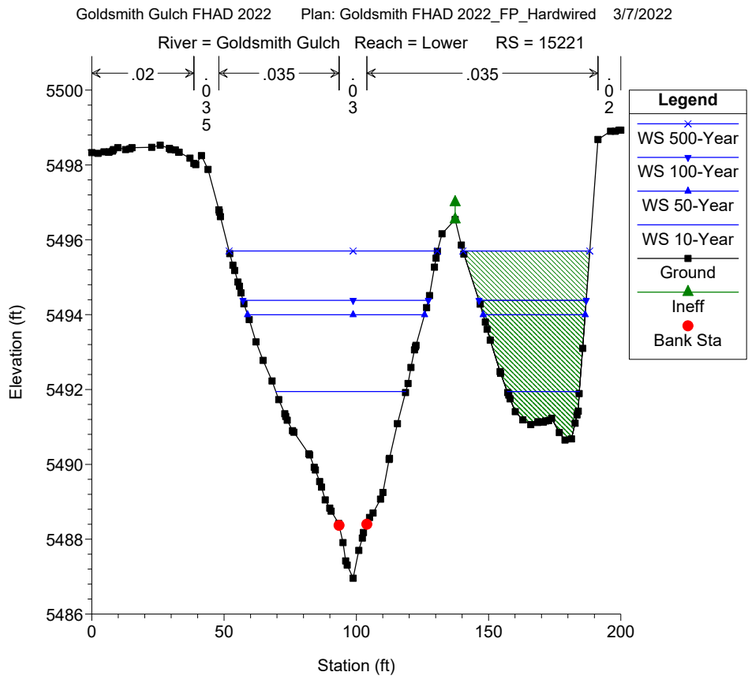

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15461 Inlet structure at Tiffany Plaza
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

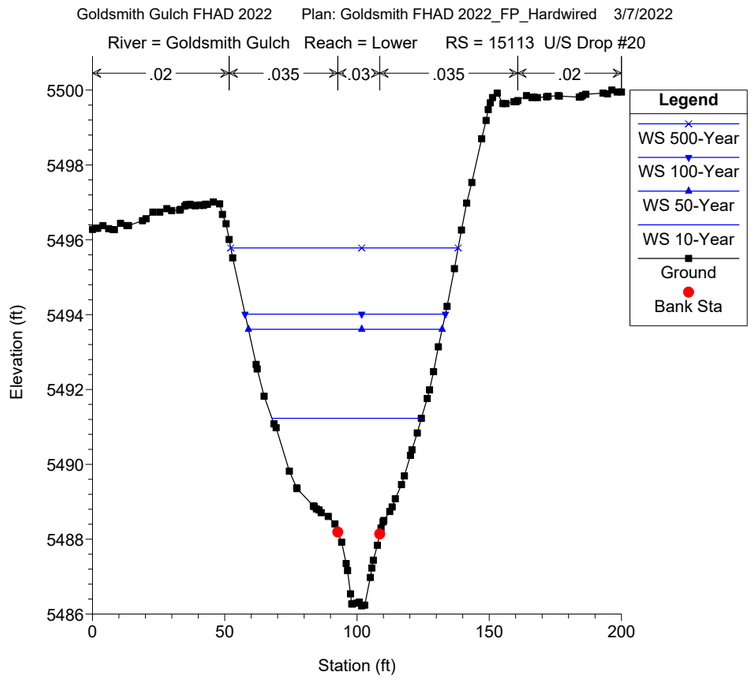

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15449 Upstream end of the Hampden Ave Culvert that was modeled with kn
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

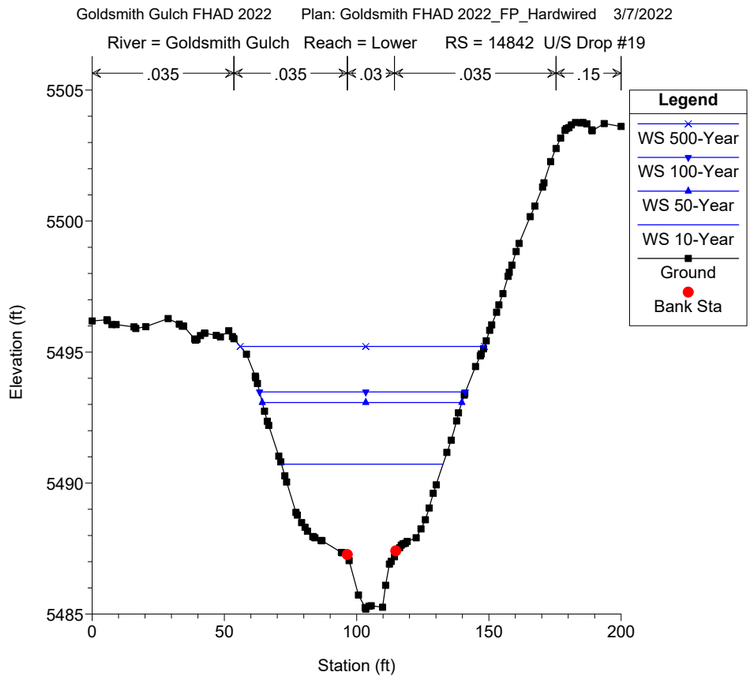

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15384 E Hampden Avenue
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

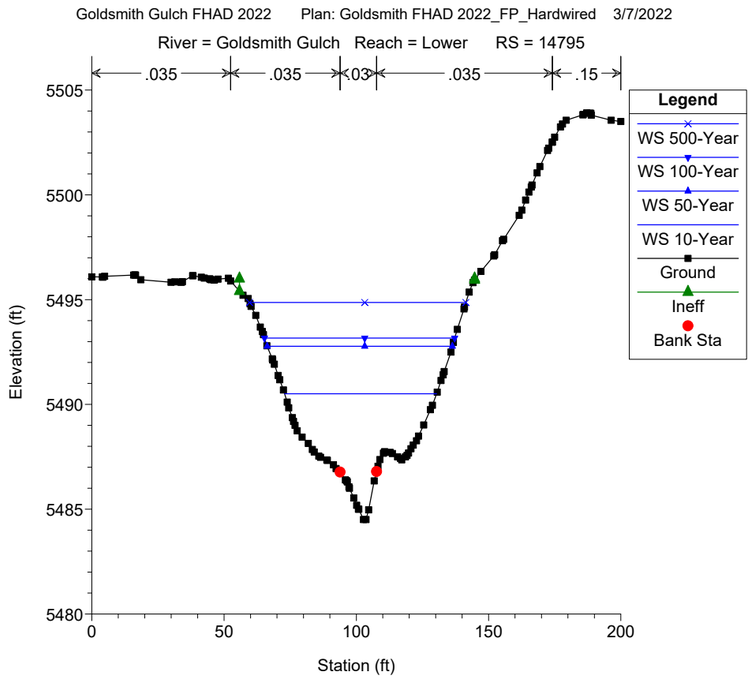

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15326 Downstream end of the Hampden Ave Culvert that was modeled with
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

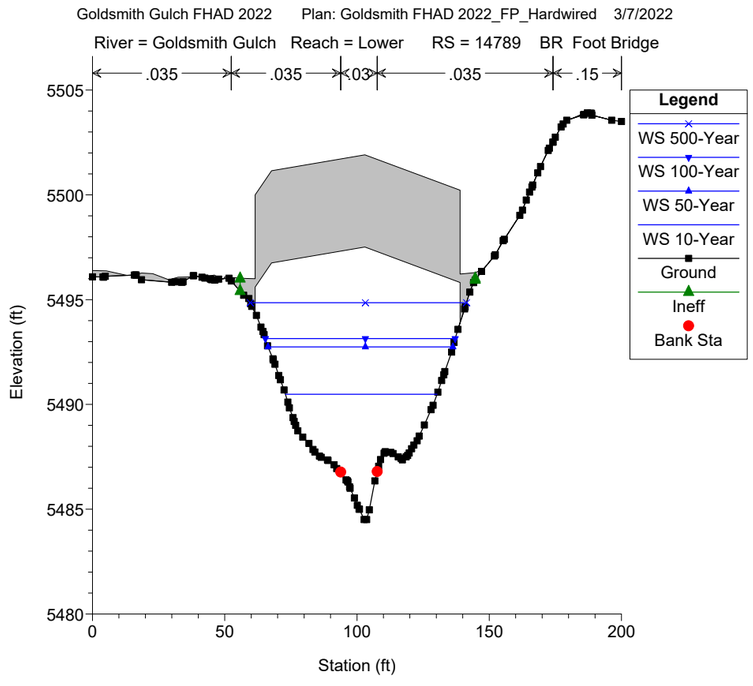

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15309
.02
.035
.035
.03
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

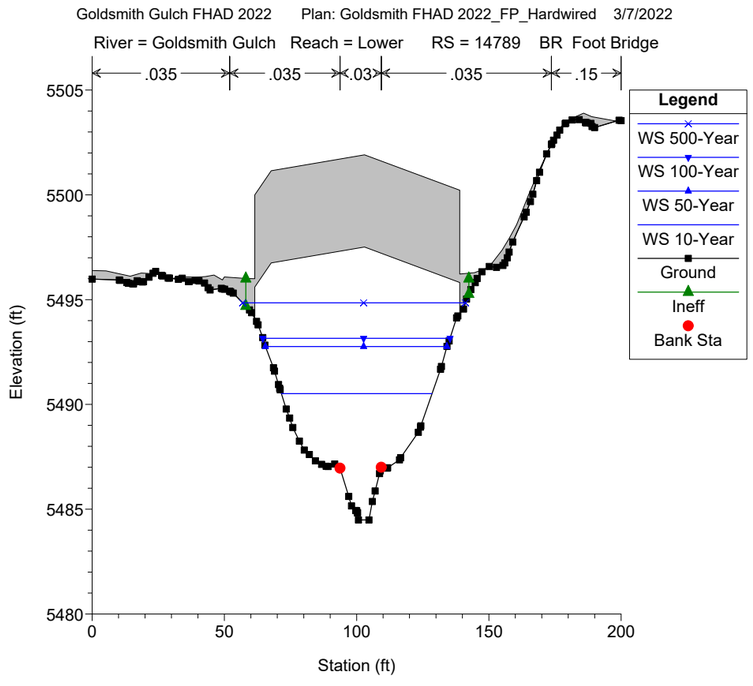

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15221
.02
.035
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

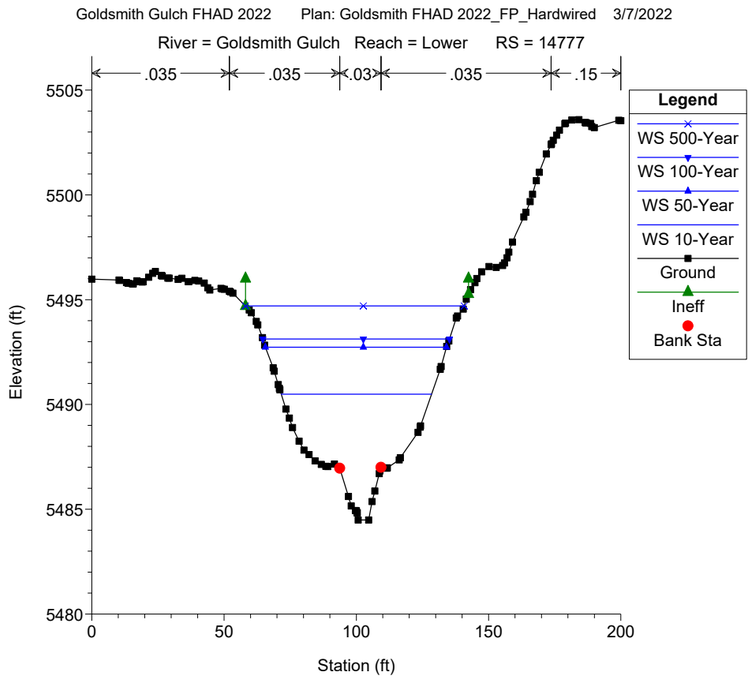

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 15113 U/S Drop #20
.02
.035
.03
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

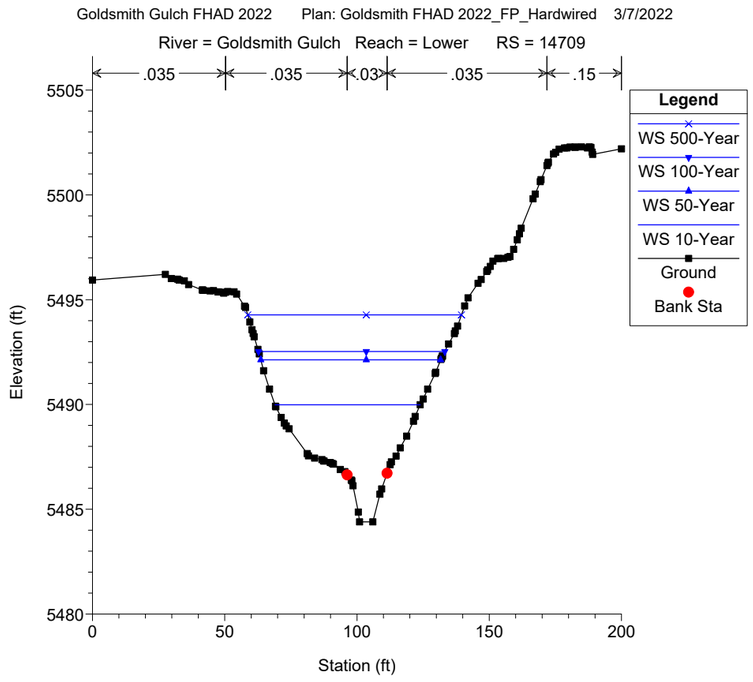

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14842 U/S Drop #19
.035
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

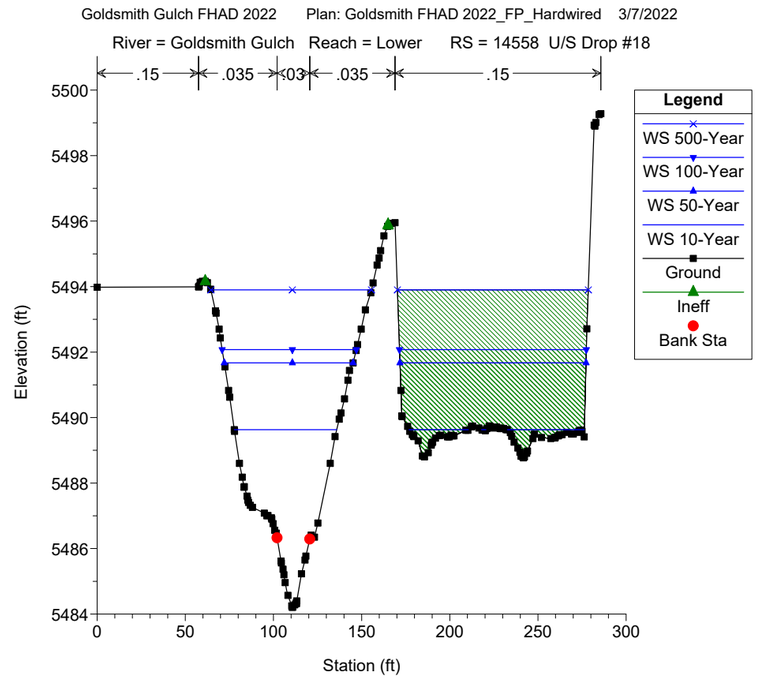

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14795
.035
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

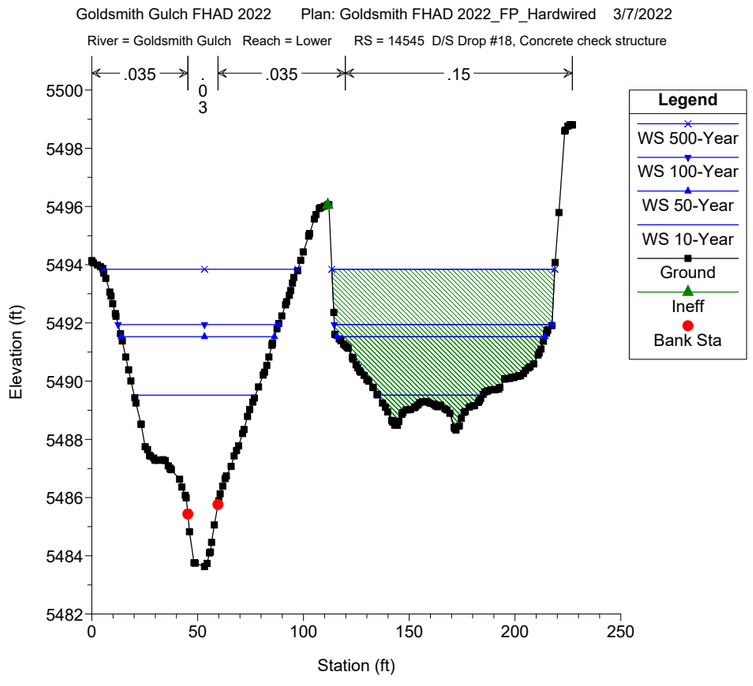

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14789 BR Foot Bridge
.035
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

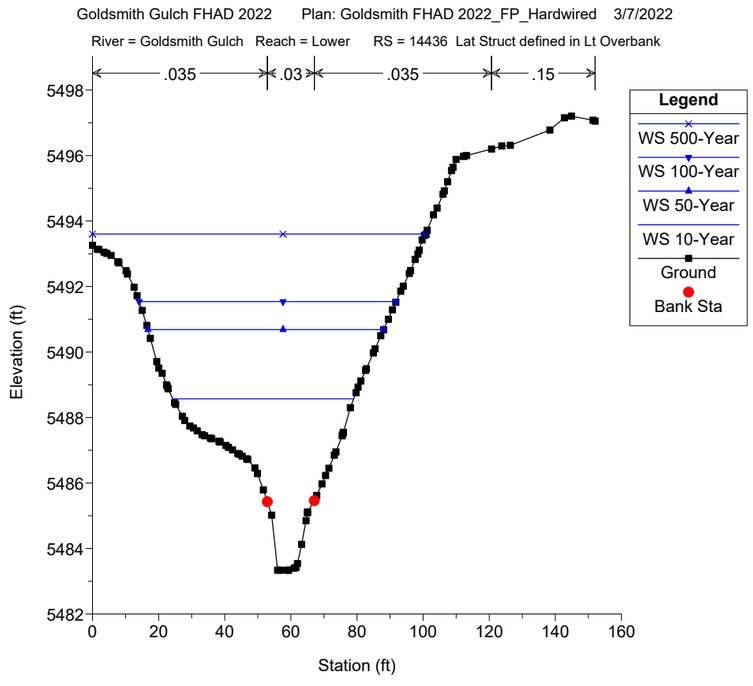

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14789 BR Foot Bridge
.035
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

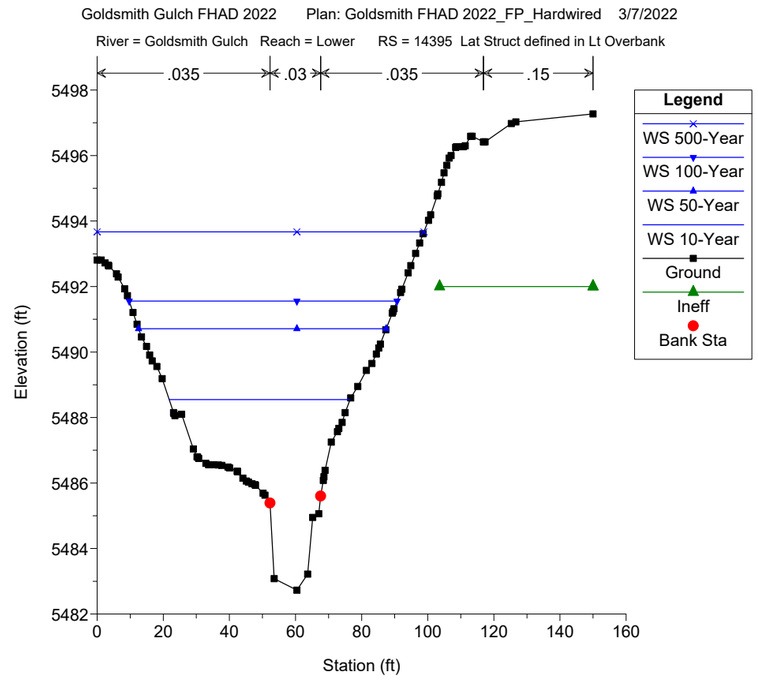

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14777
.035
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

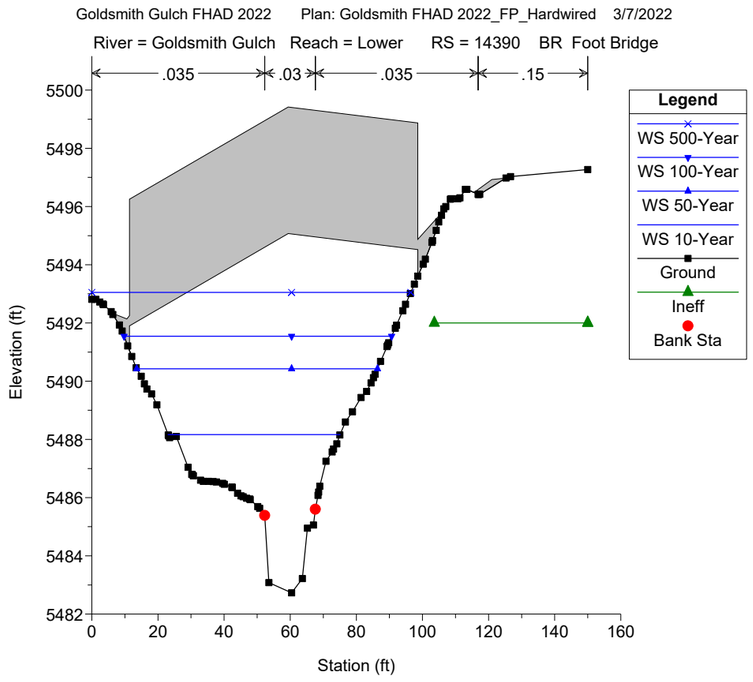

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14709
.035
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

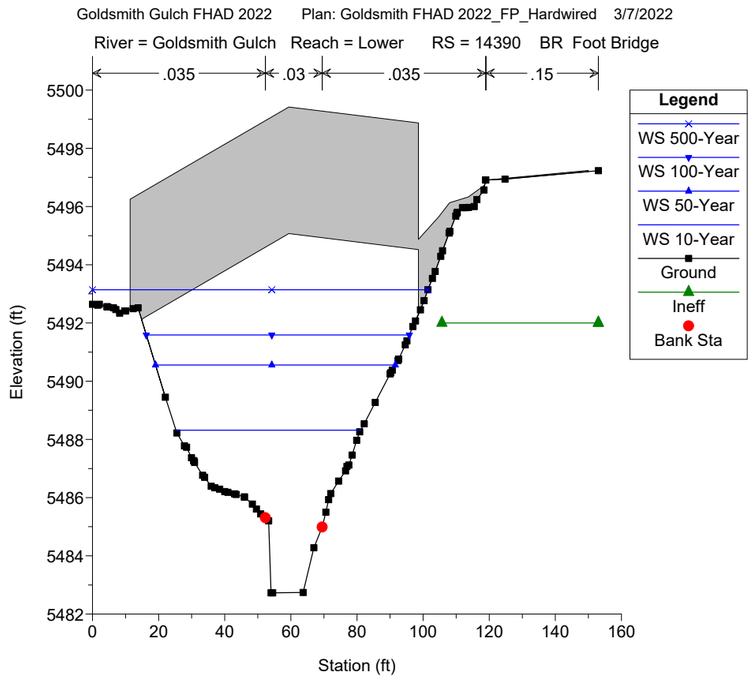

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14558 U/S Drop #18
.15
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

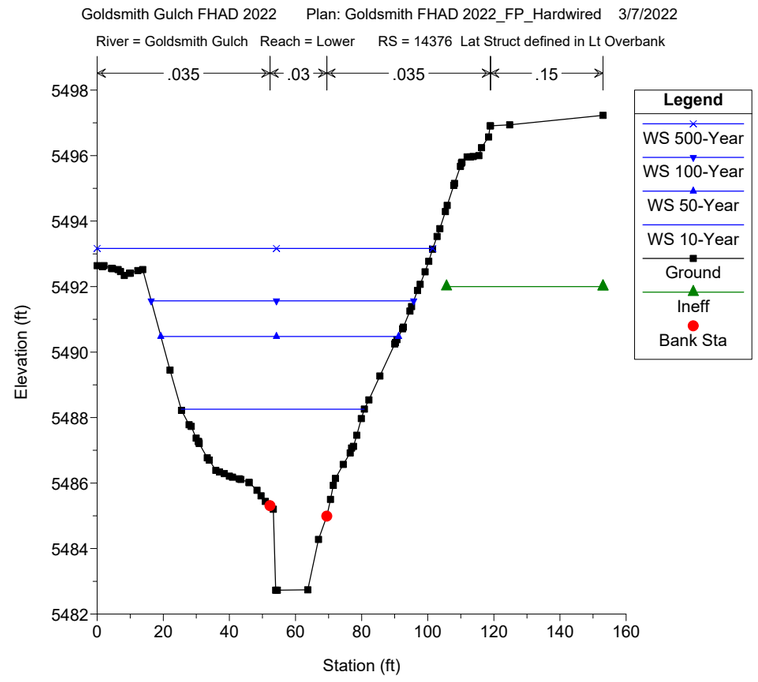

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14545 D/S Drop #18, Concrete check structure
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

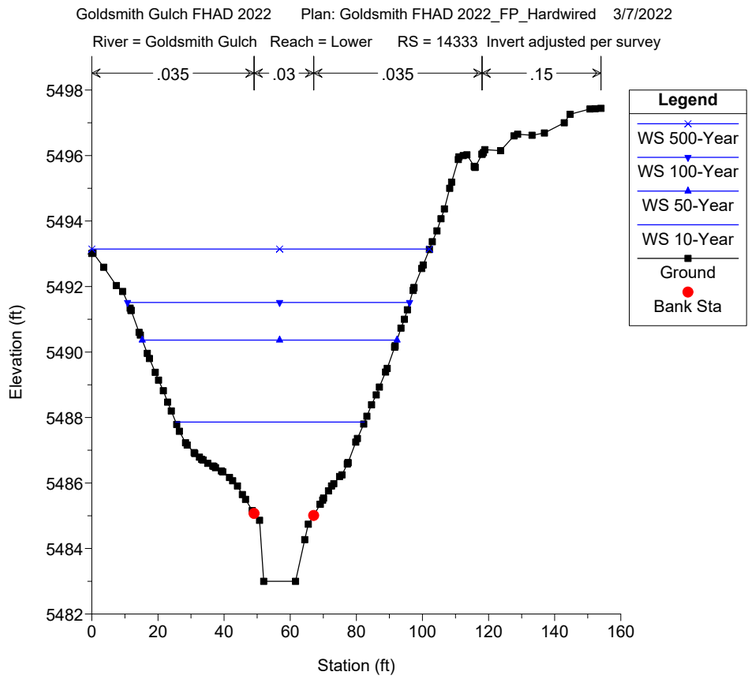

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14436 Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

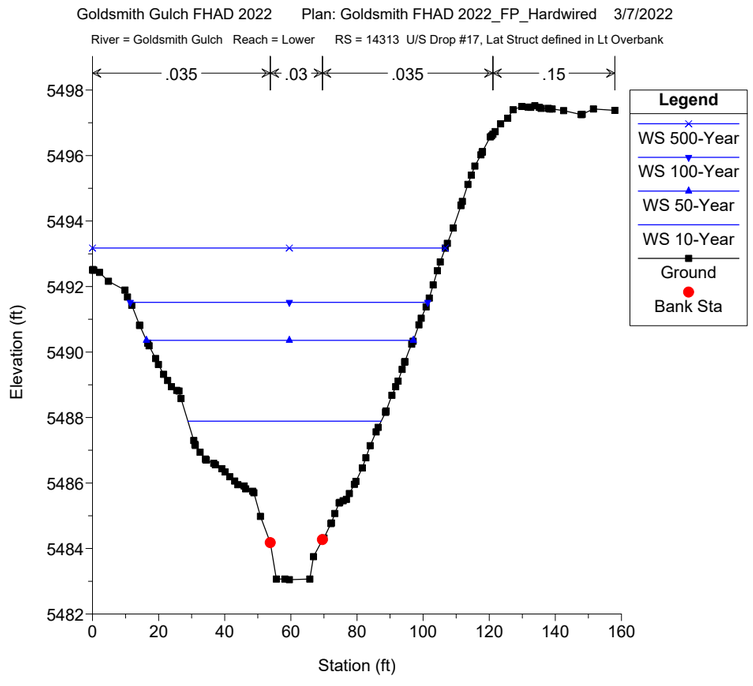

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14395 Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

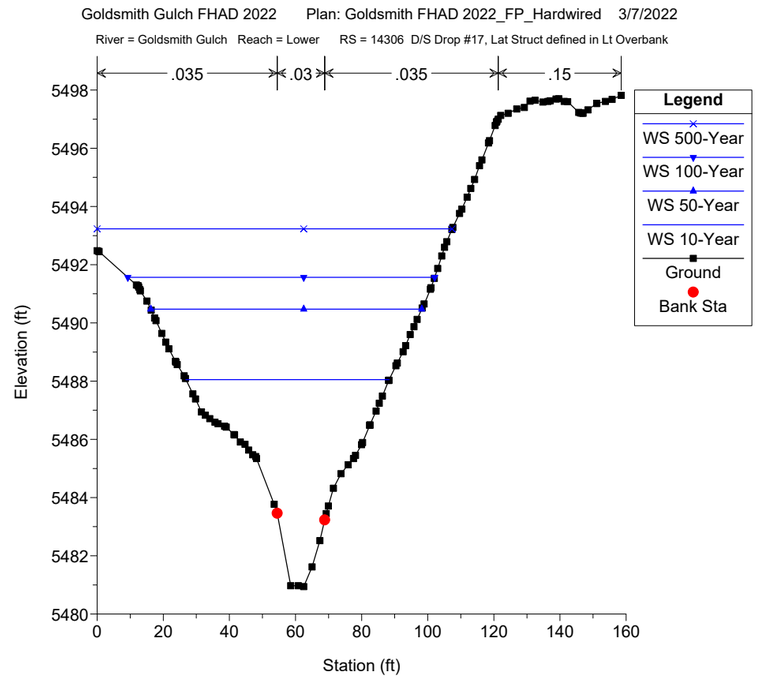

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14390 BR Foot Bridge
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

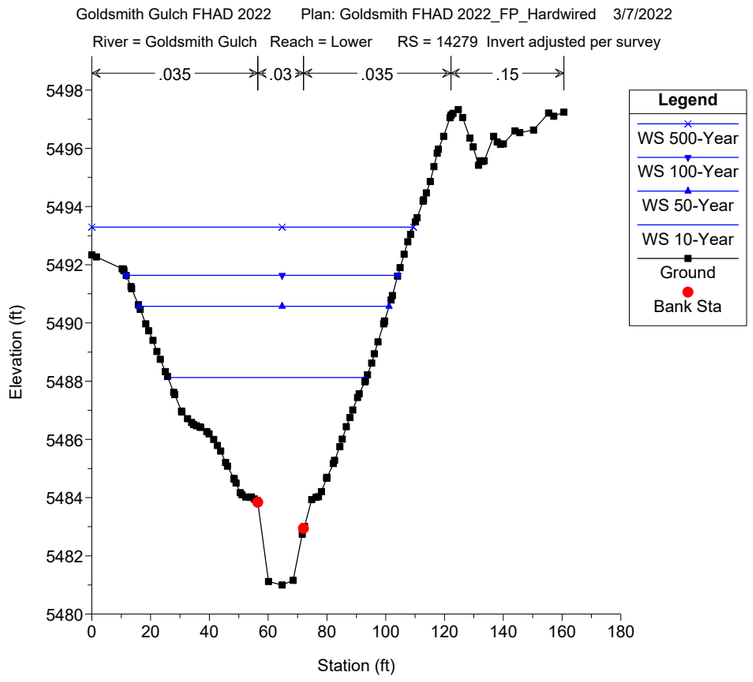

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14390 BR Foot Bridge
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

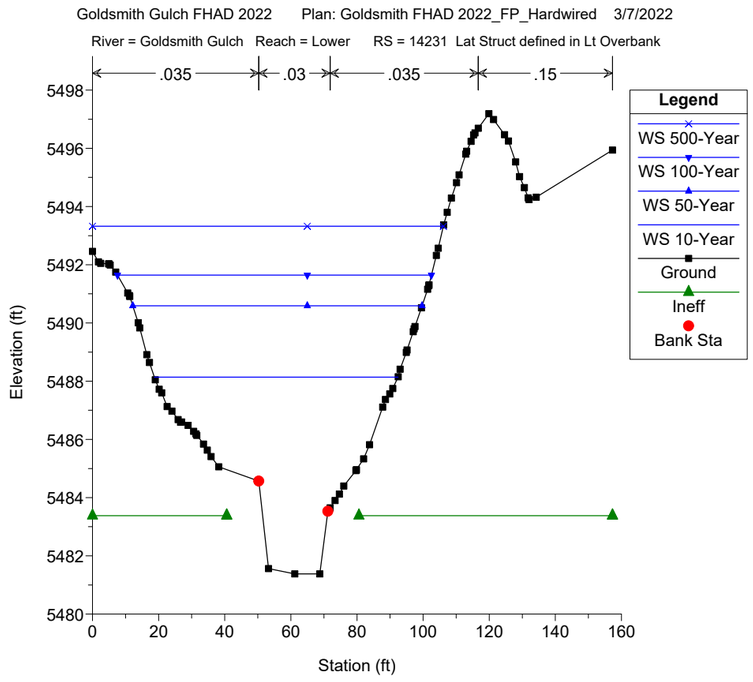

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14376 Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

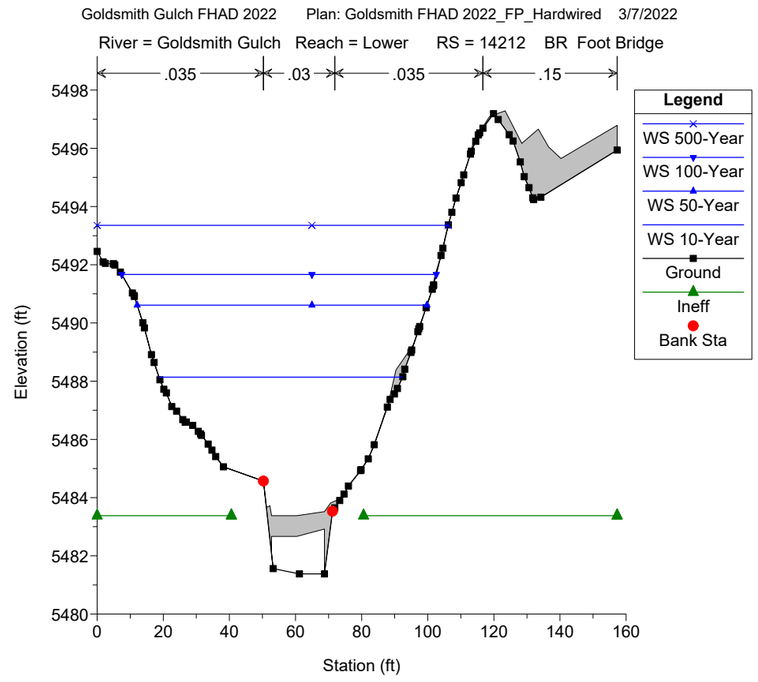

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14333 Invert adjusted per survey
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

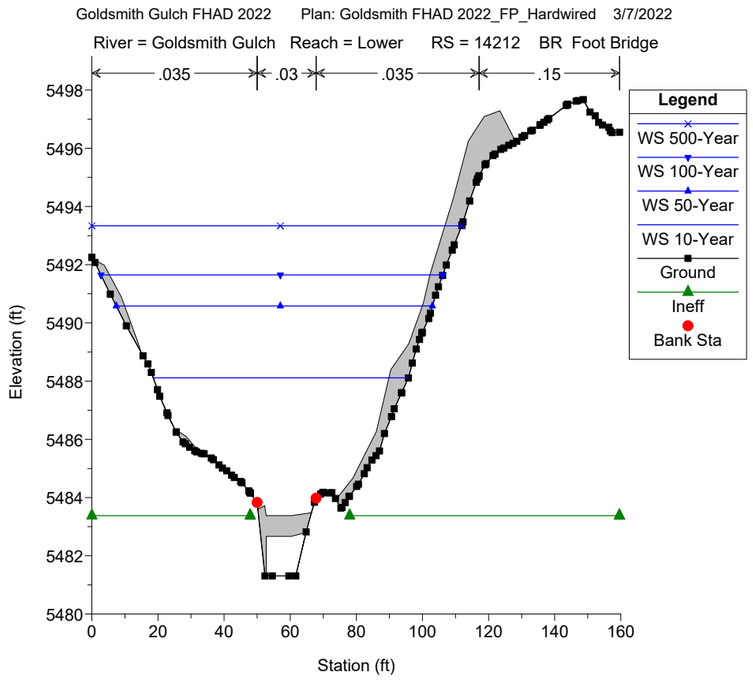

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14313 U/S Drop #17, Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

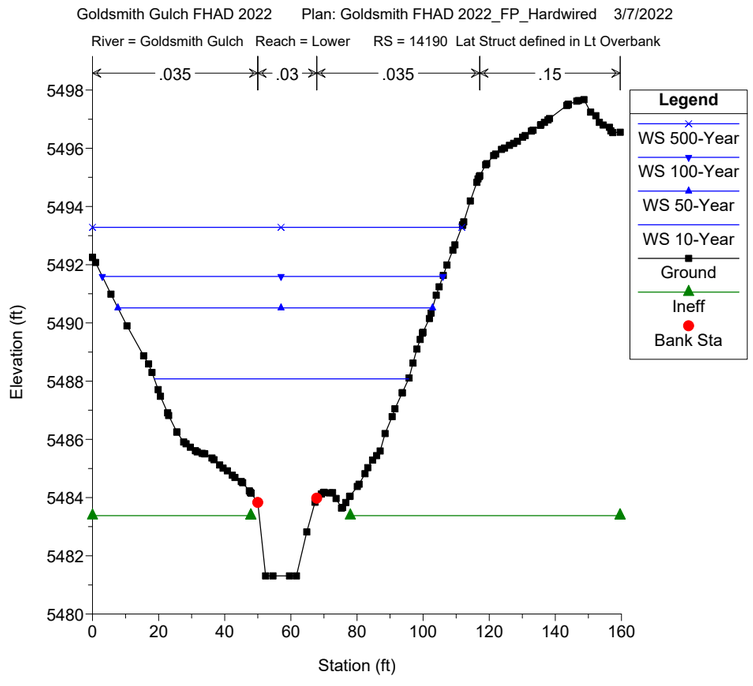

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14306 D/S Drop #17, Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

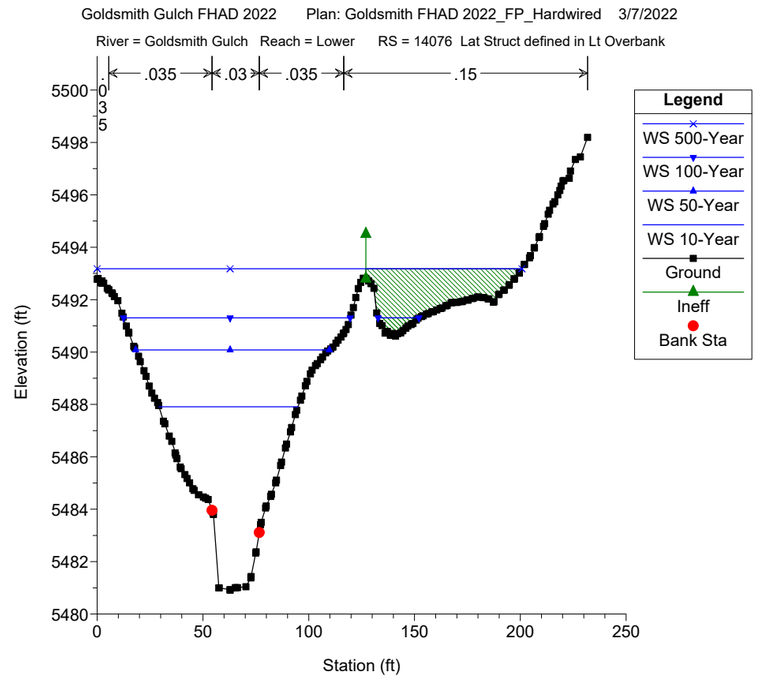

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14279 Invert adjusted per survey
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

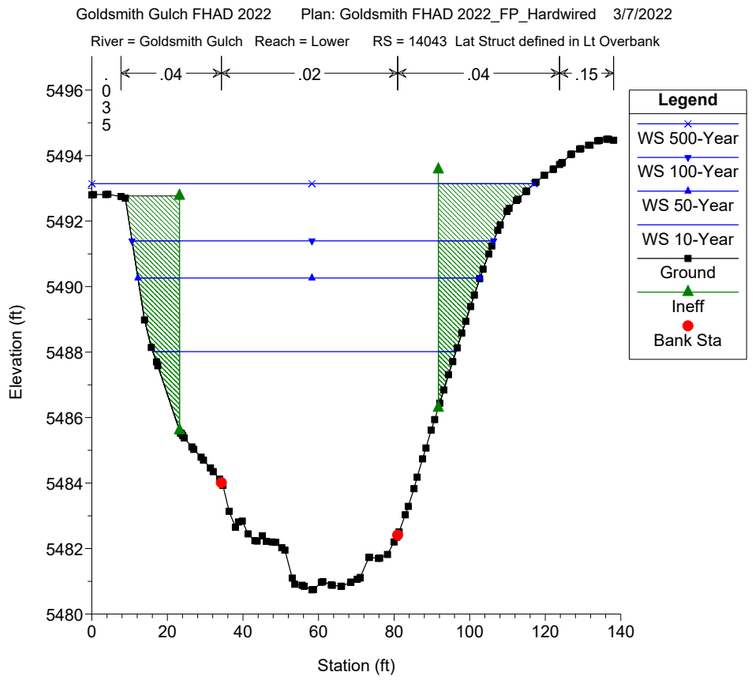

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14231 Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

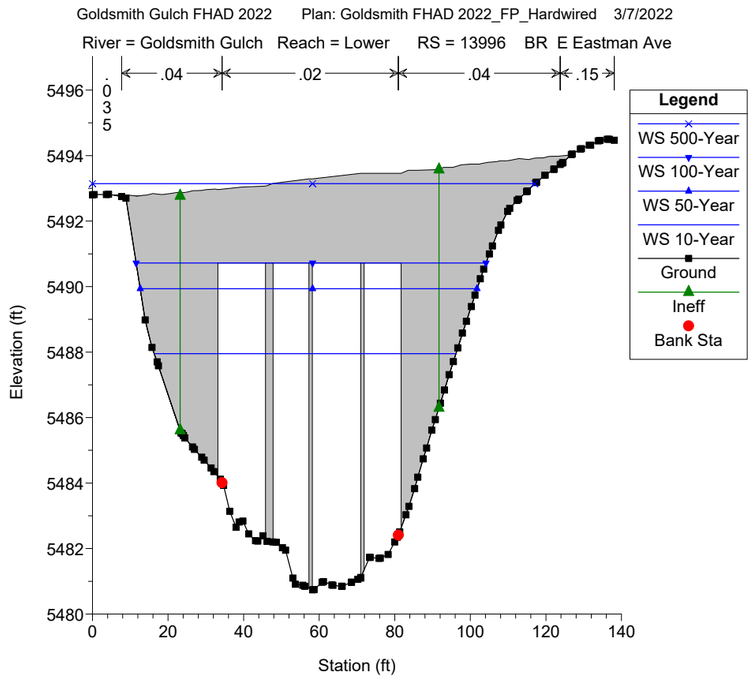

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14212 BR Foot Bridge
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

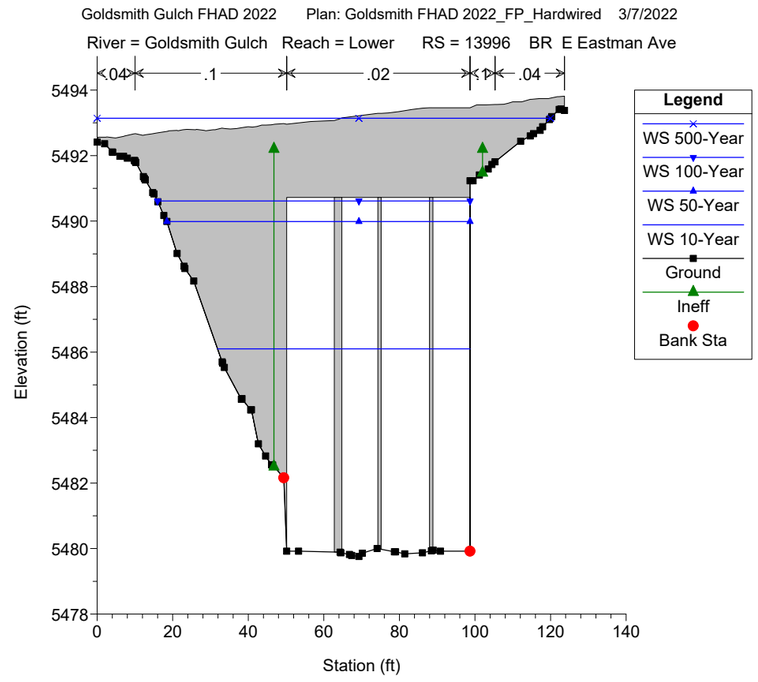

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14212 BR Foot Bridge
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

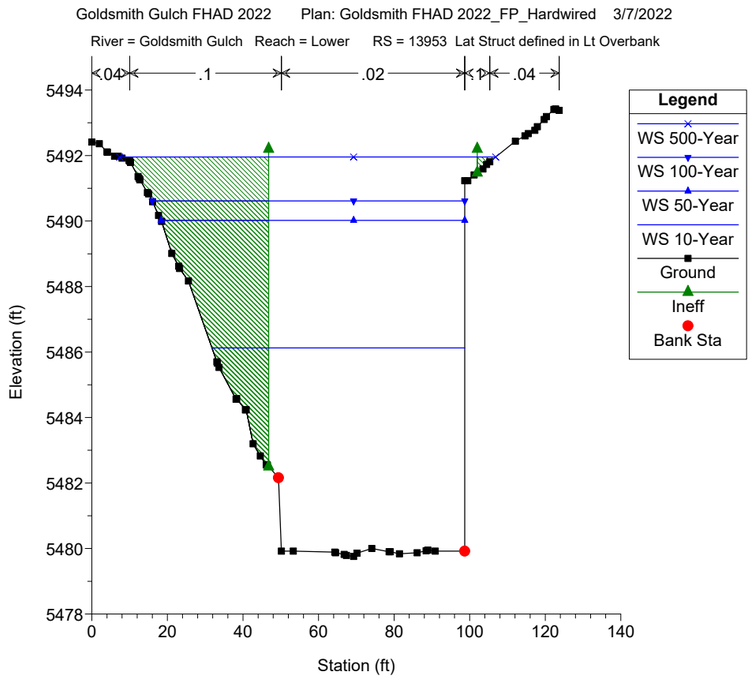

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14190 Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

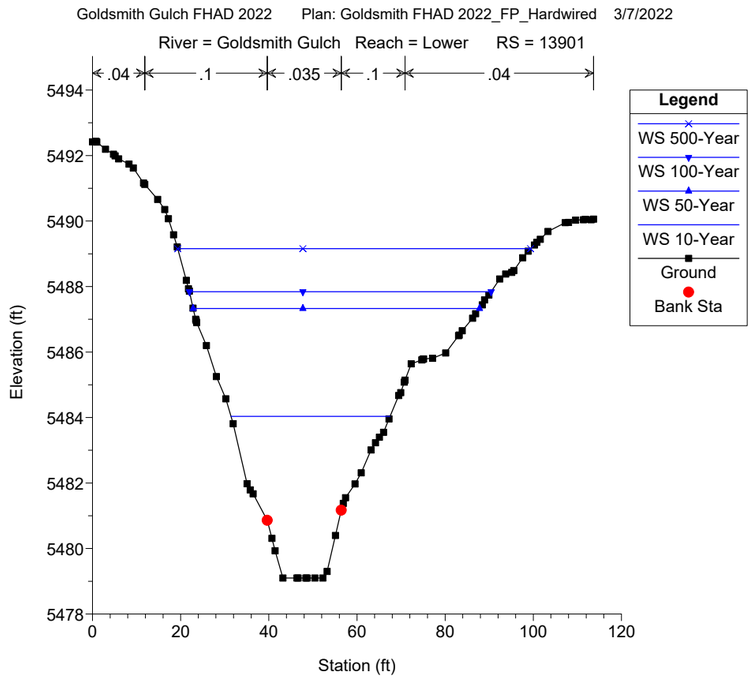

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14076 Lat Struct defined in Lt Overbank
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

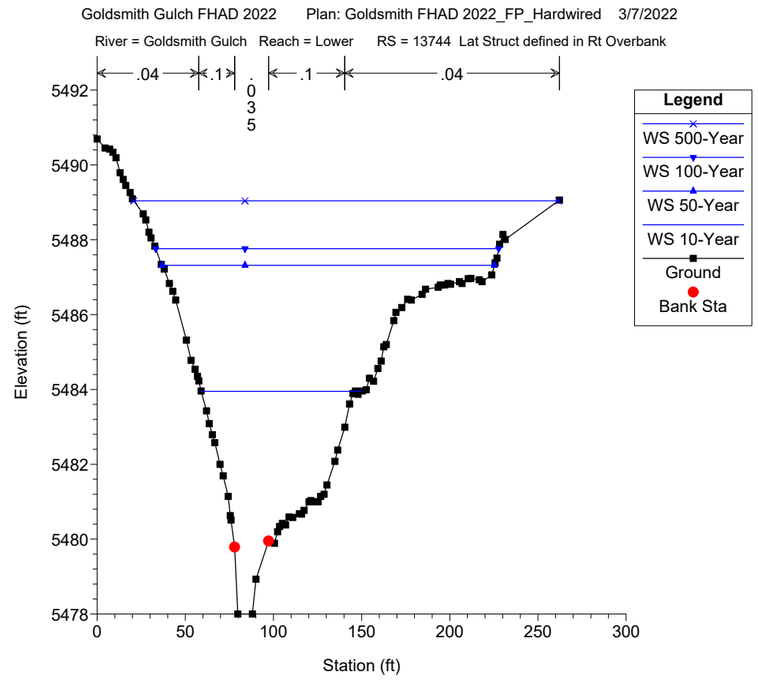

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 14043 Lat Struct defined in Lt Overbank
.04 .1 .02 .04 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

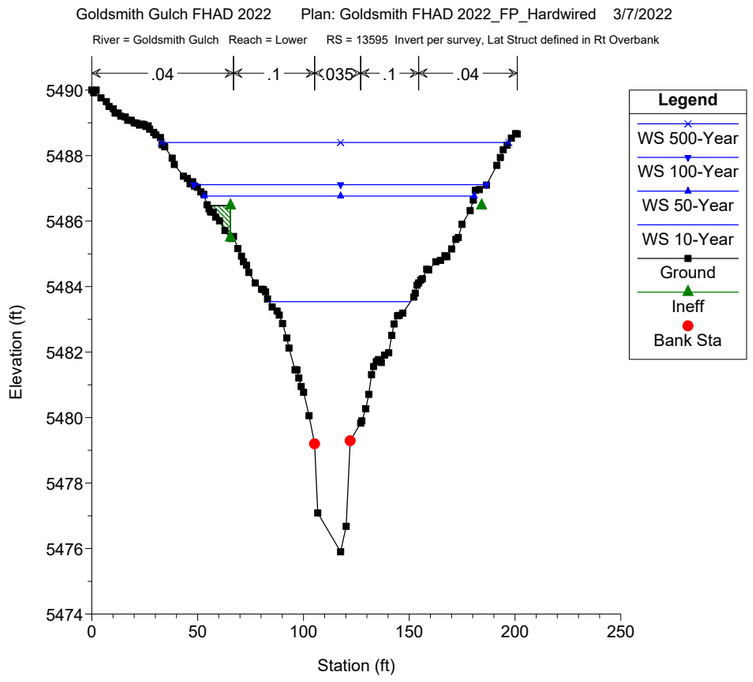

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13996 BR E Eastman Ave
.04 .02 .04 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

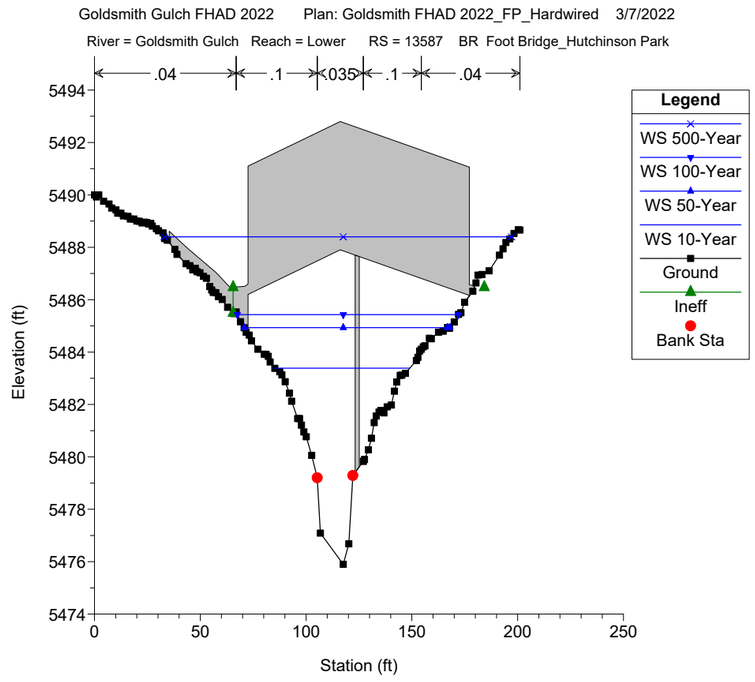

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13996 BR E Eastman Ave
.04 .1 .02 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

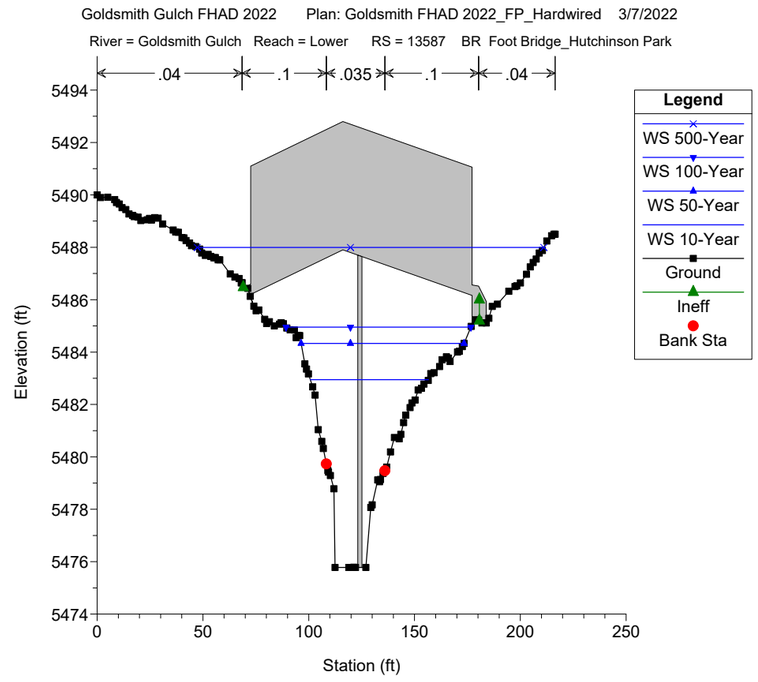

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13953 Lat Struct defined in Lt Overbank
.04 .1 .02 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

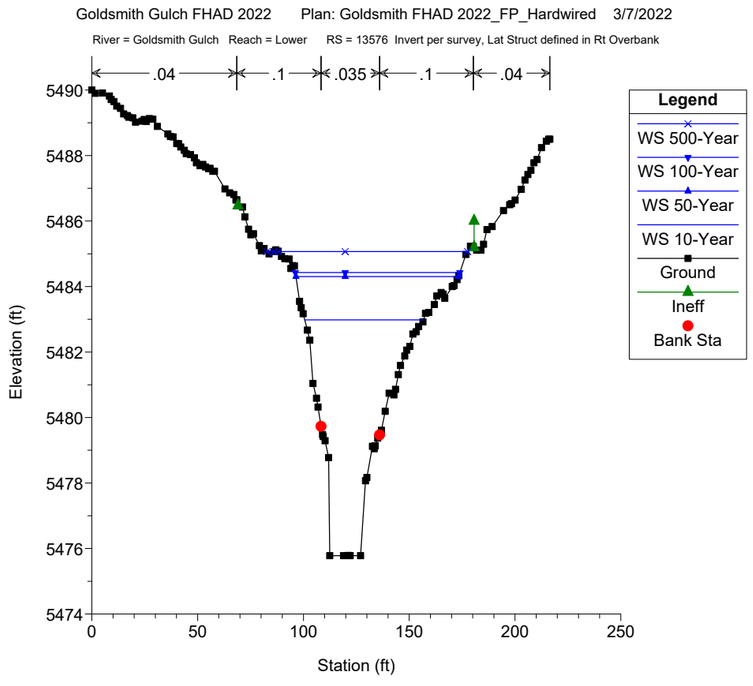

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13901
.04 .1 .035 .1 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

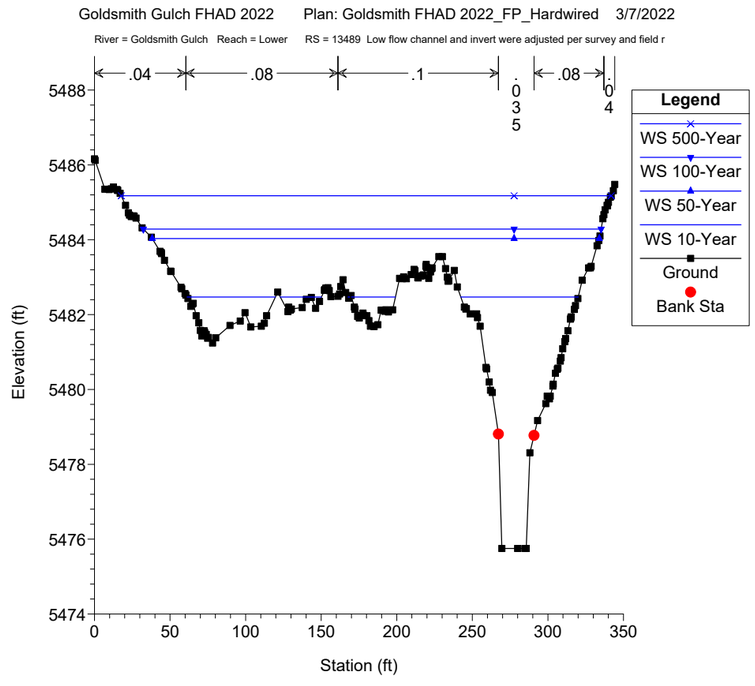

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13744 Lat Struct defined in Rt Overbank
.04 .1 .1 .04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

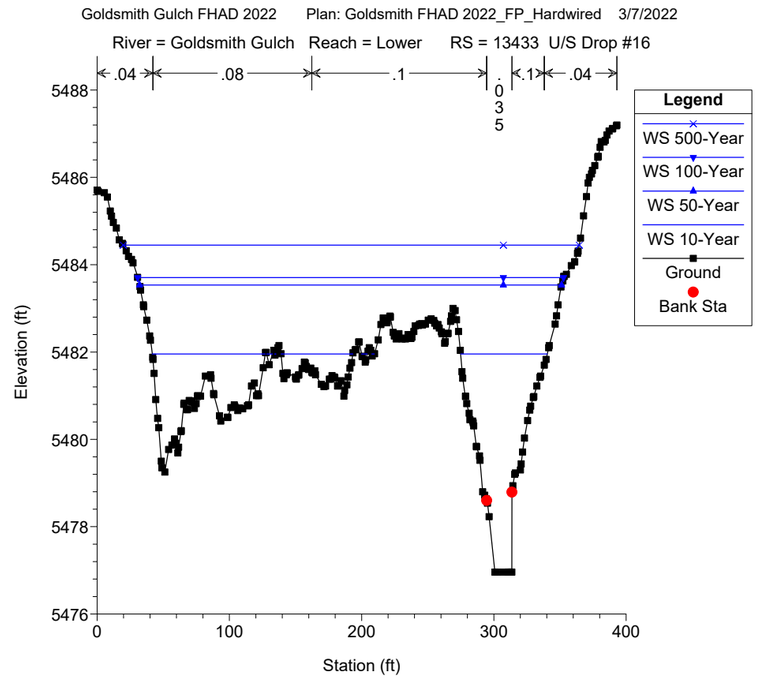

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13595 Invert per survey, Lat Struct defined in Rt Overbank
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

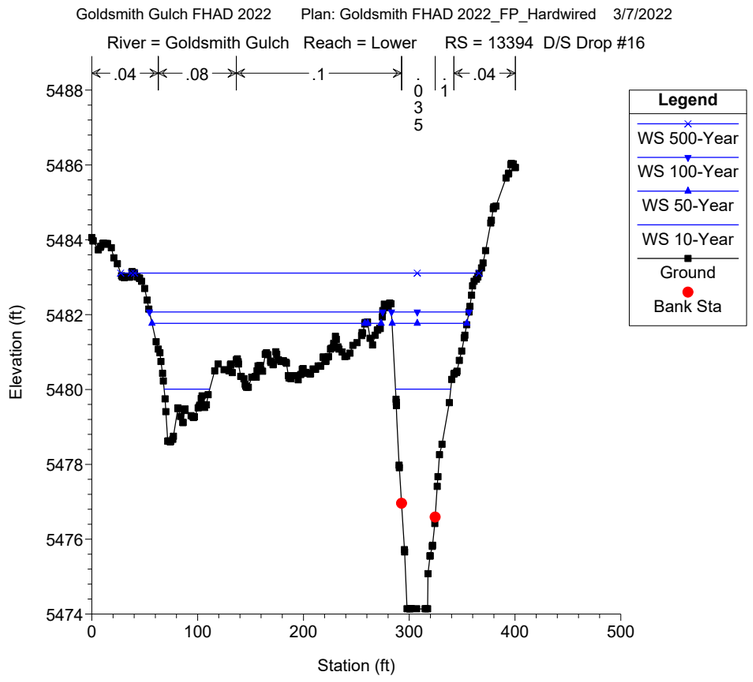

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13587 BR Foot Bridge_Hutchinson Park
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

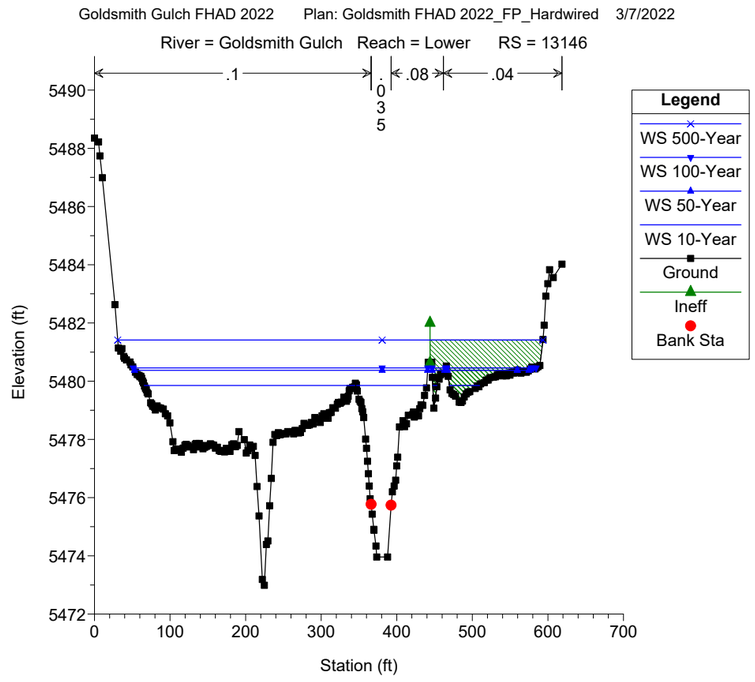

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13587 BR Foot Bridge_Hutchinson Park
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

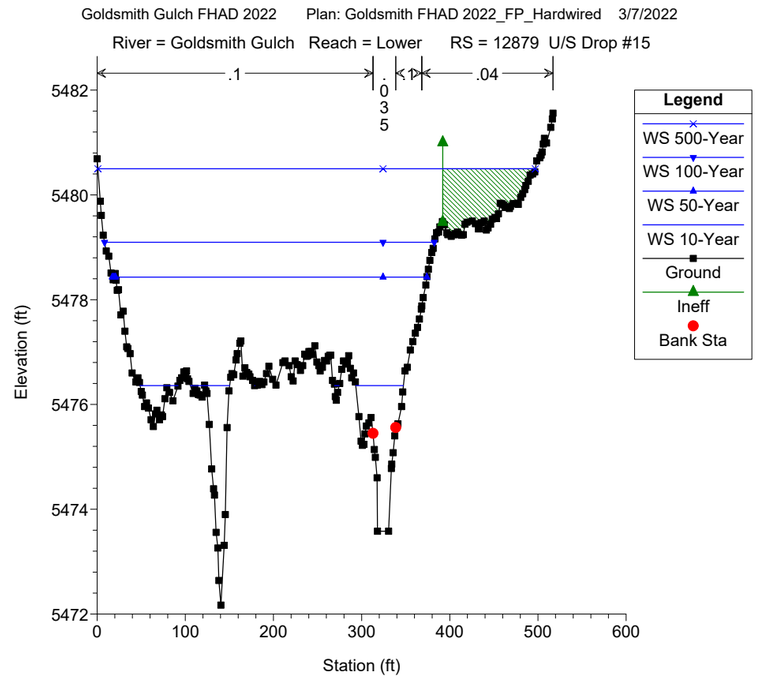

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13576 Invert per survey, Lat Struct defined in Rt Overbank
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

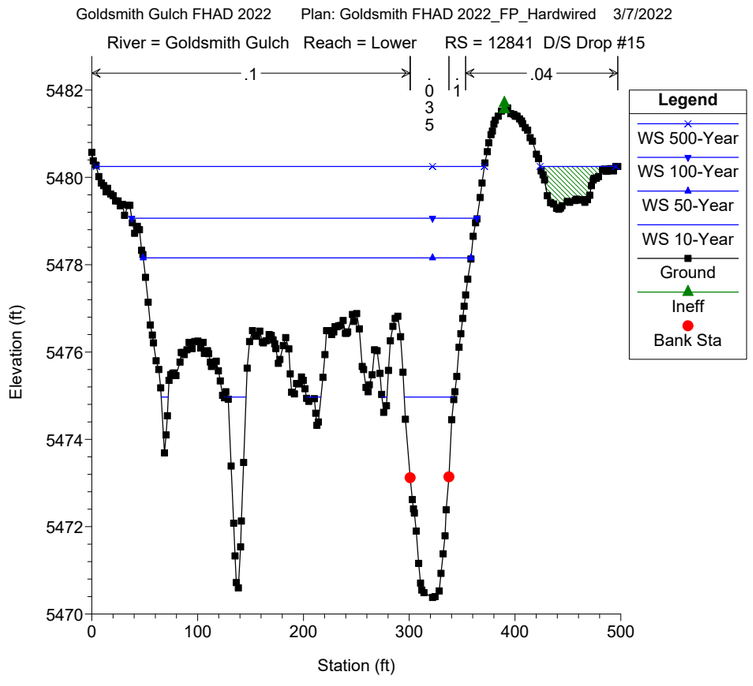

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13489 Low flow channel and invert were adjusted per survey and field r
.04
.08
.1
.035
.08
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

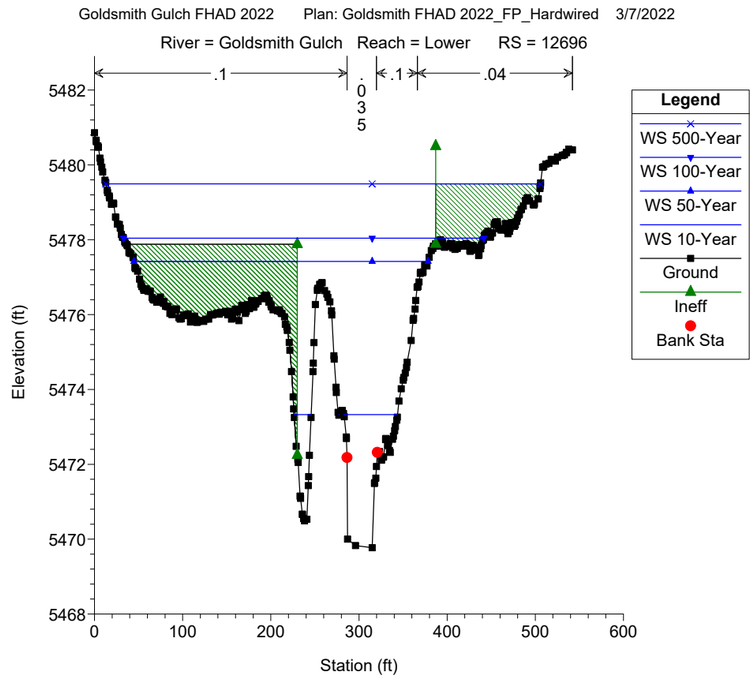

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13433 U/S Drop #16
.04
.08
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

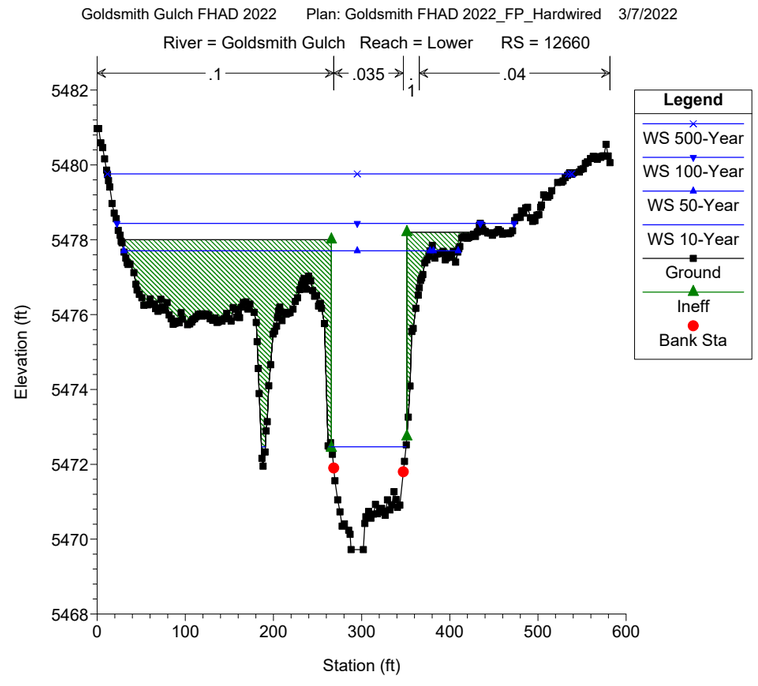

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13394 D/S Drop #16
.04
.08
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

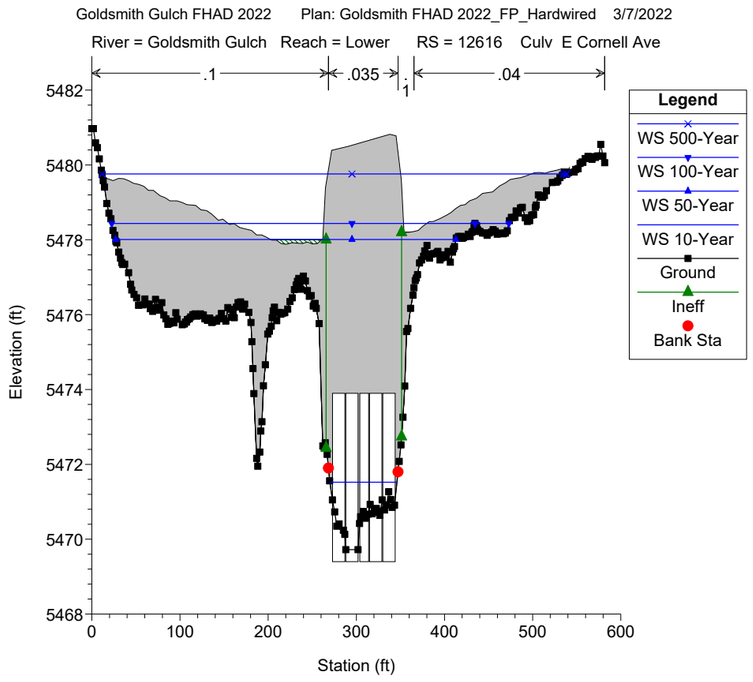

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 13146
.1
.035
.08
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

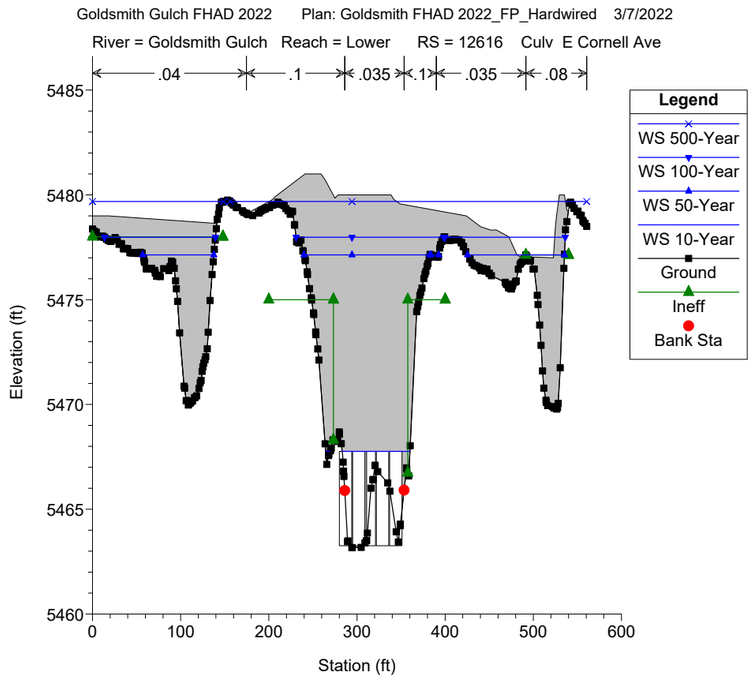

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12879 U/S Drop #15
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

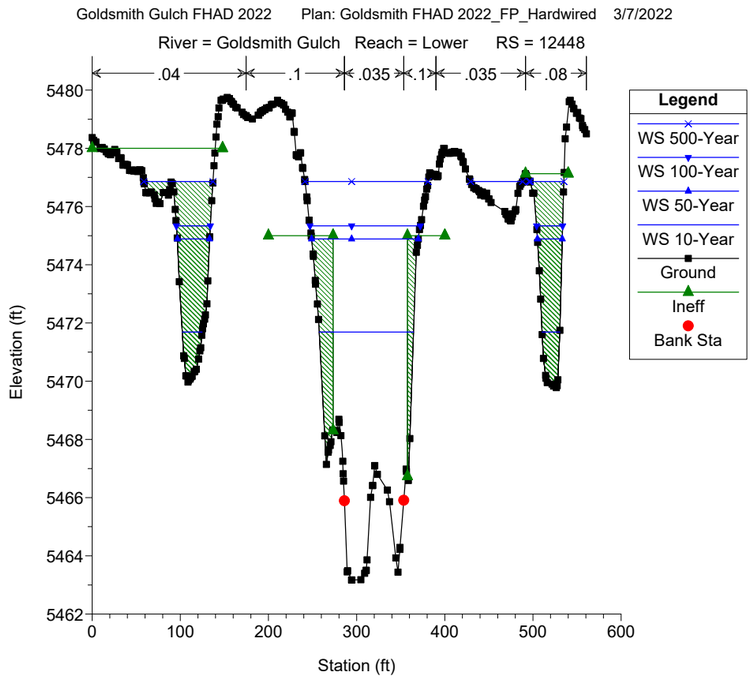

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12841 D/S Drop #15
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

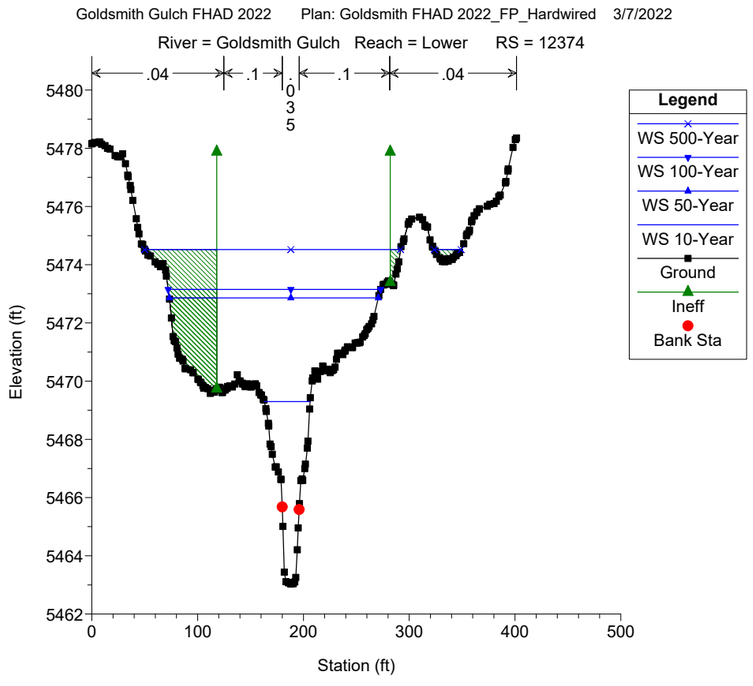

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12696
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

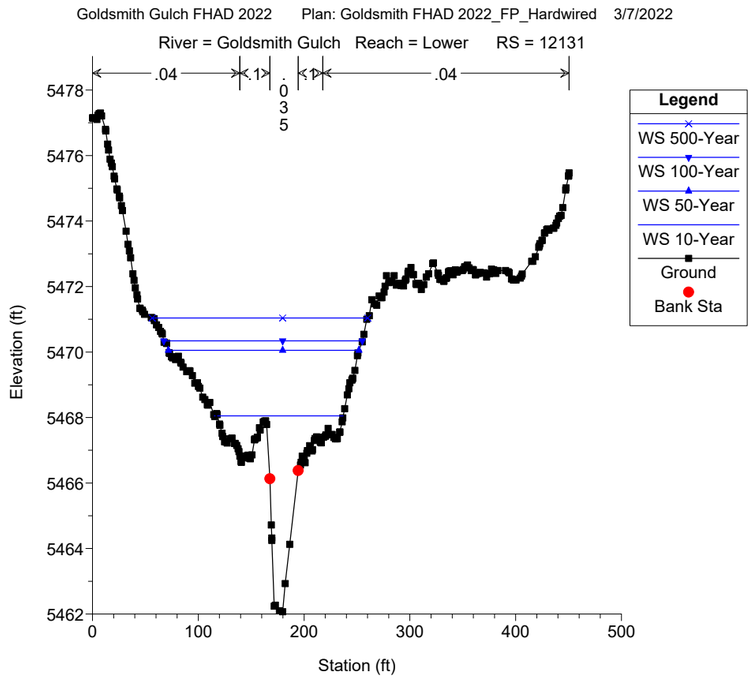

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12660
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

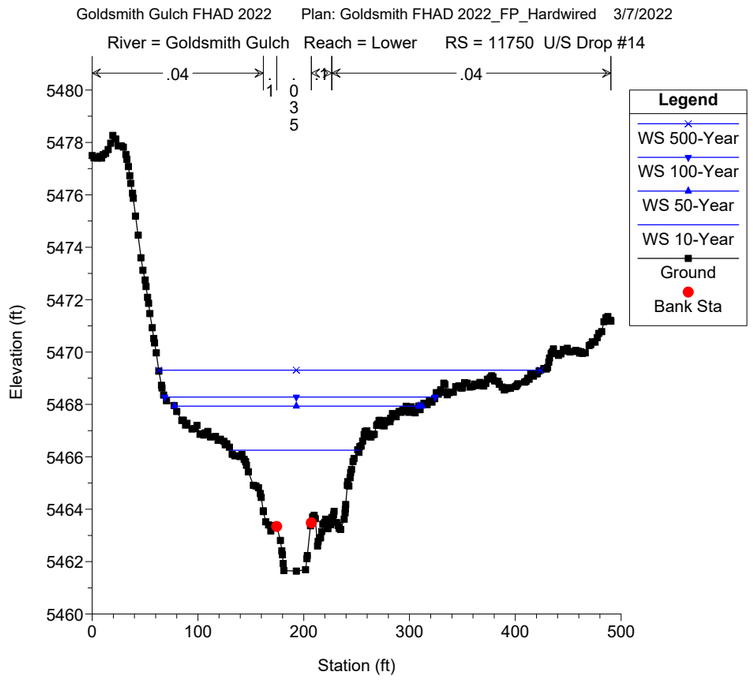

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12616 Culv E Cornell Ave
.1
.035
1
.04
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

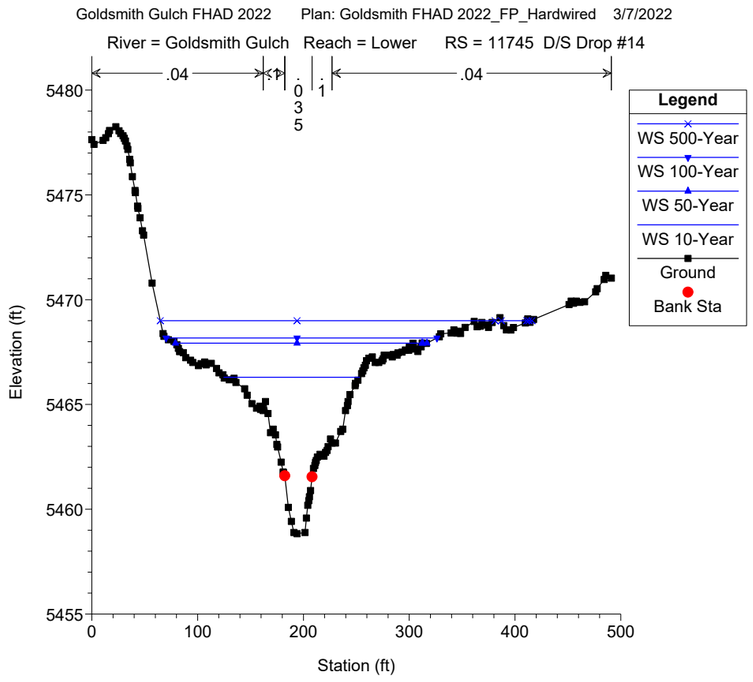

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12616 Culv E Cornell Ave
.04
.1
.035
.1
.035
.08
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

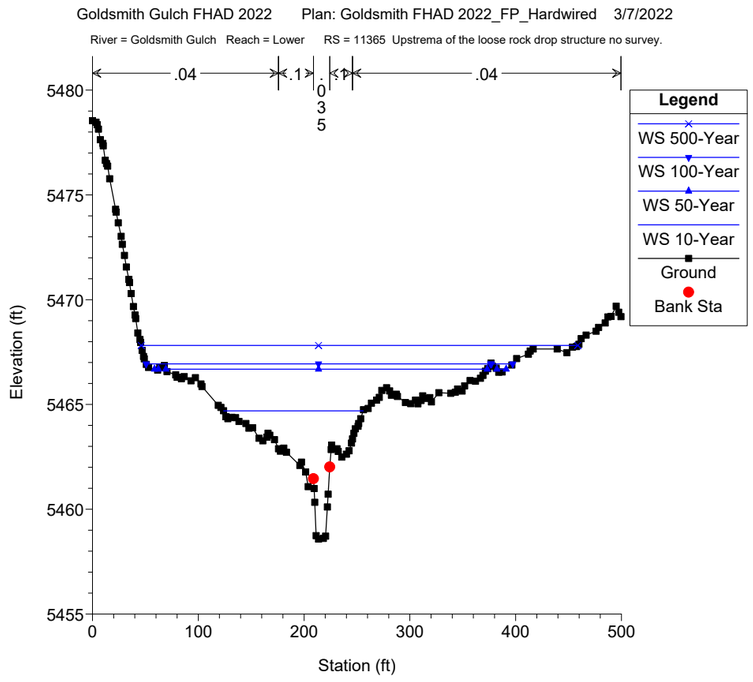

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12448
.04
.1
.035
.1
.035
.08
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

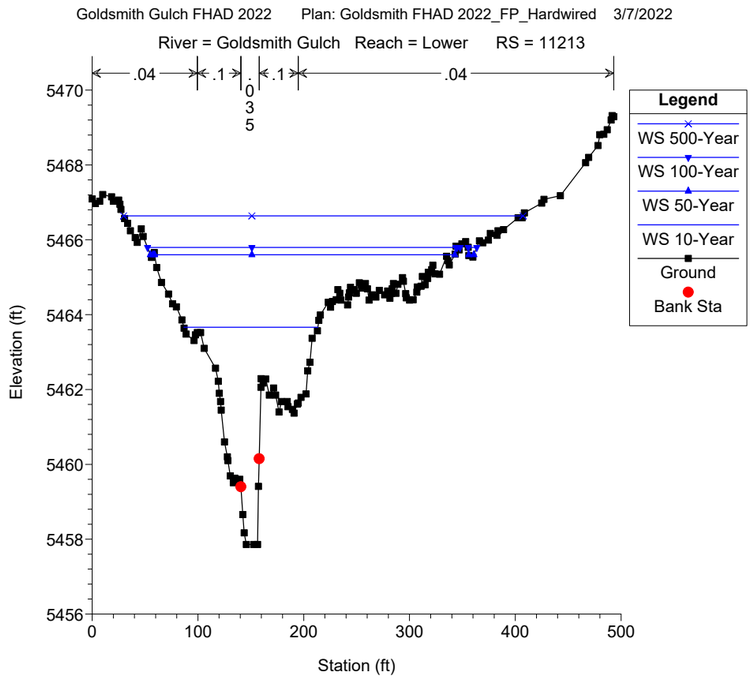

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12374
.04
.1
.035
.1
.04
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

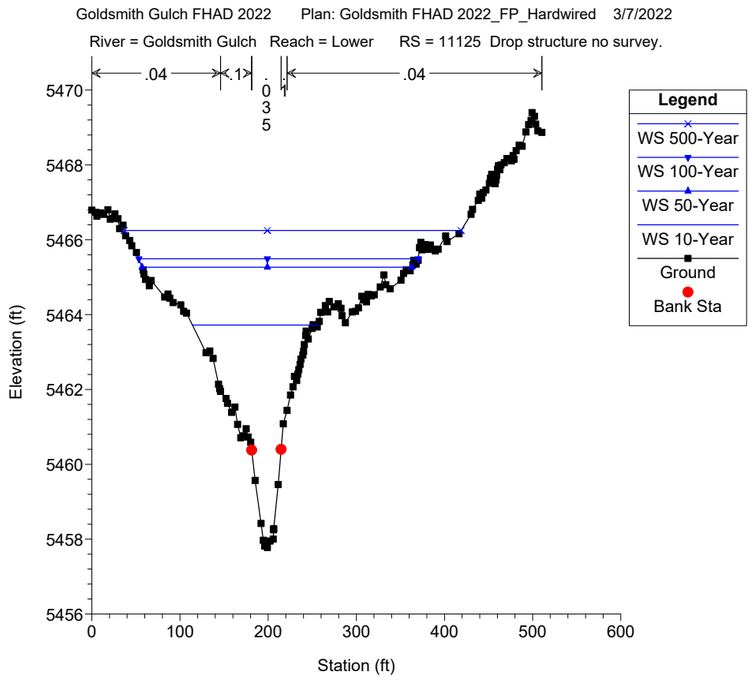

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 12131
.04
.1
.035
.1
.04
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

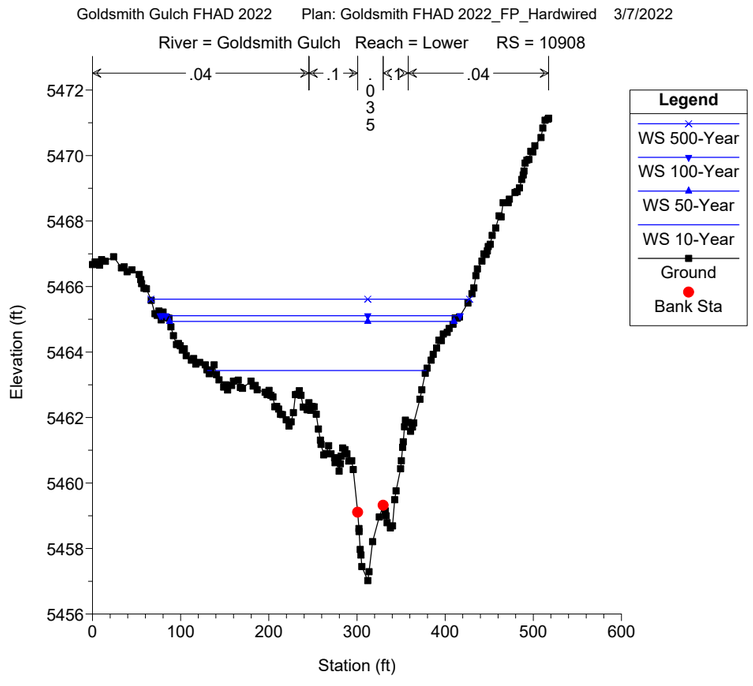

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 11750 U/S Drop #14
.04
.1
.035
.1
.04
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

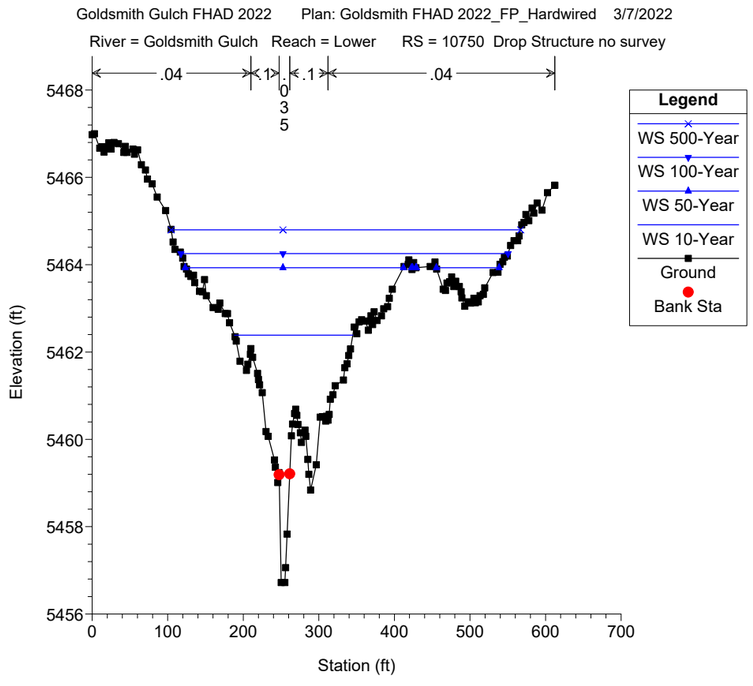

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 11745 D/S Drop #14
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

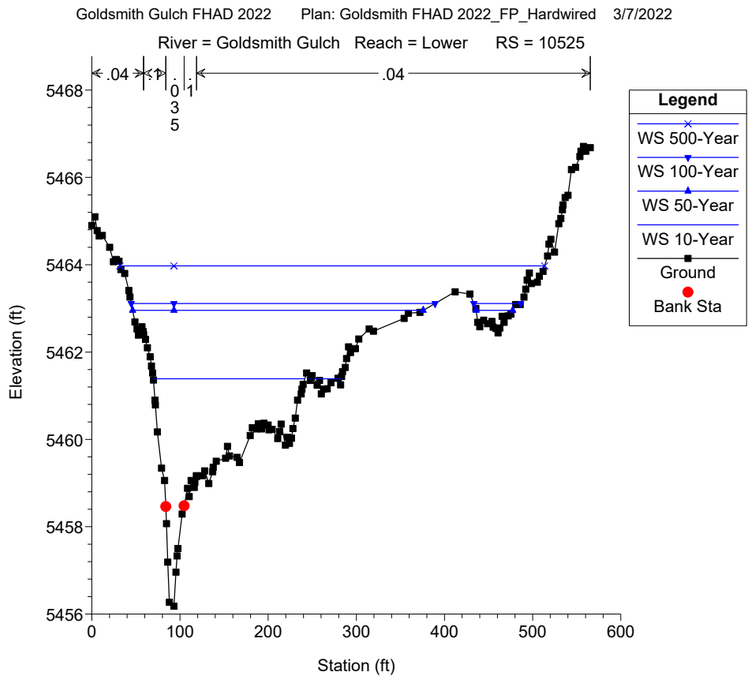

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 11365 Upstrema of the loose rock drop structure no survey.
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

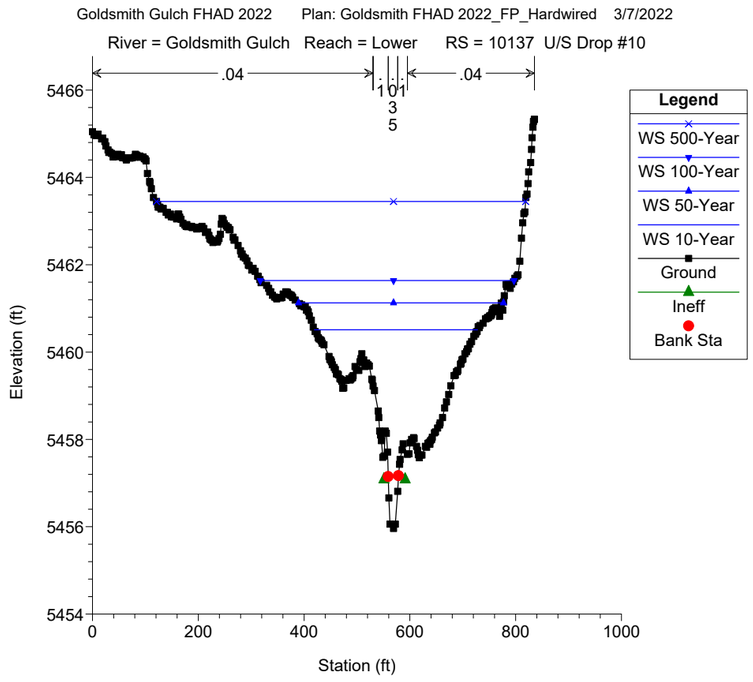

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 11213
.04
.1
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

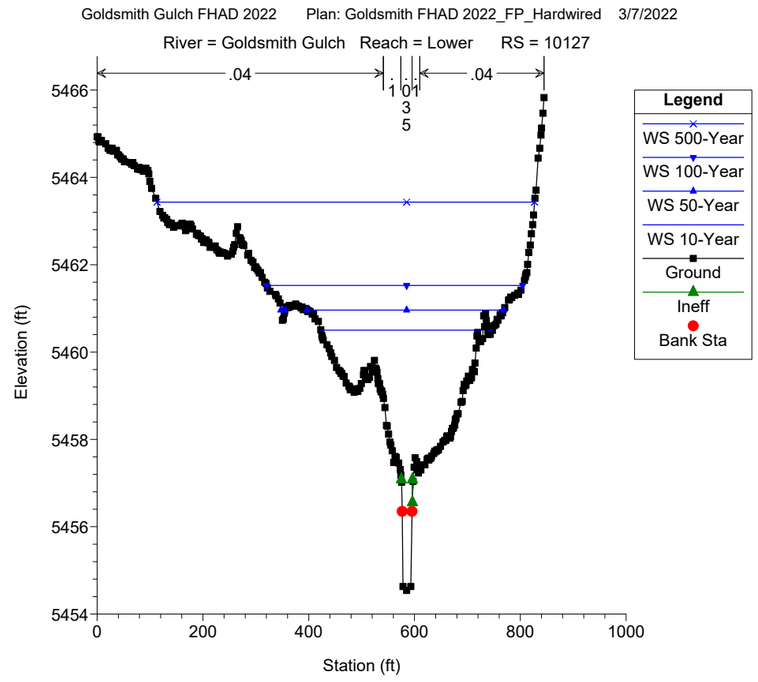

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 11125 Drop structure no survey.
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

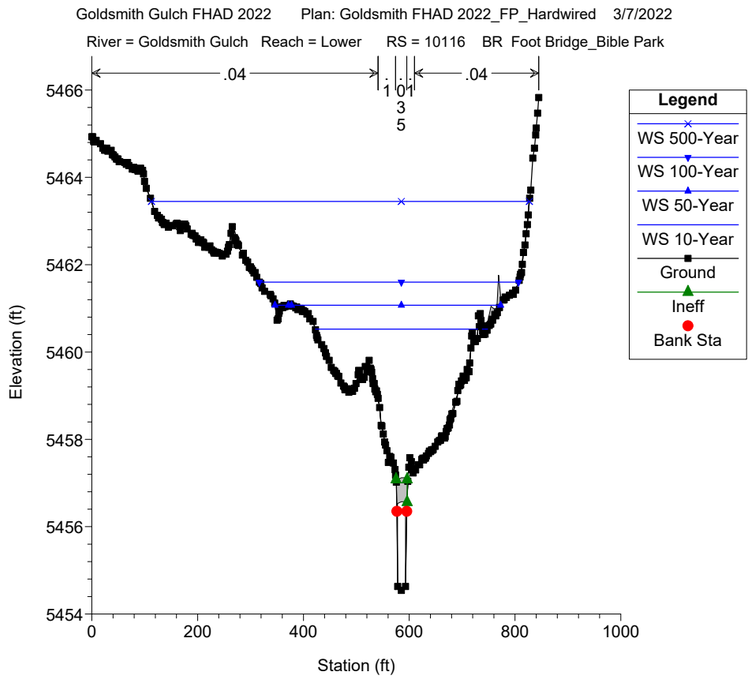

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10908
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

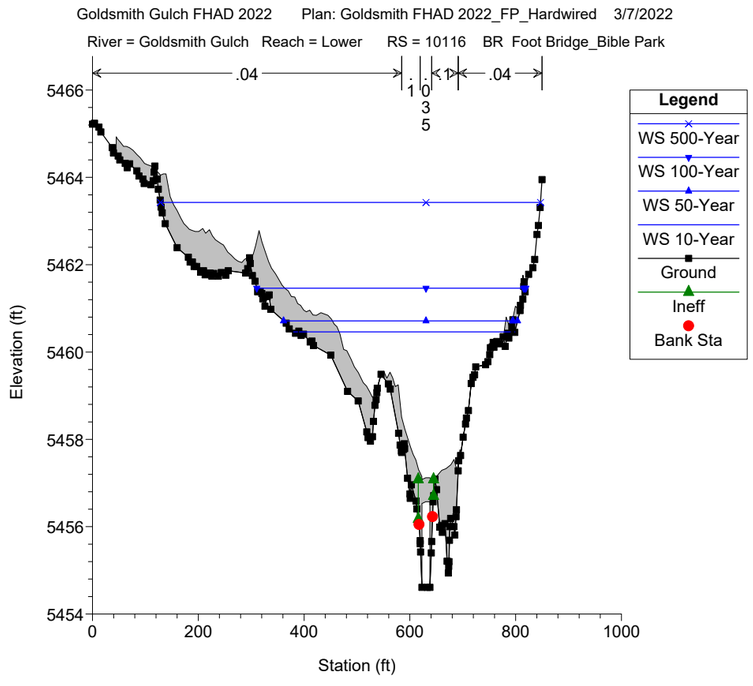

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10750 Drop Structure no survey
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

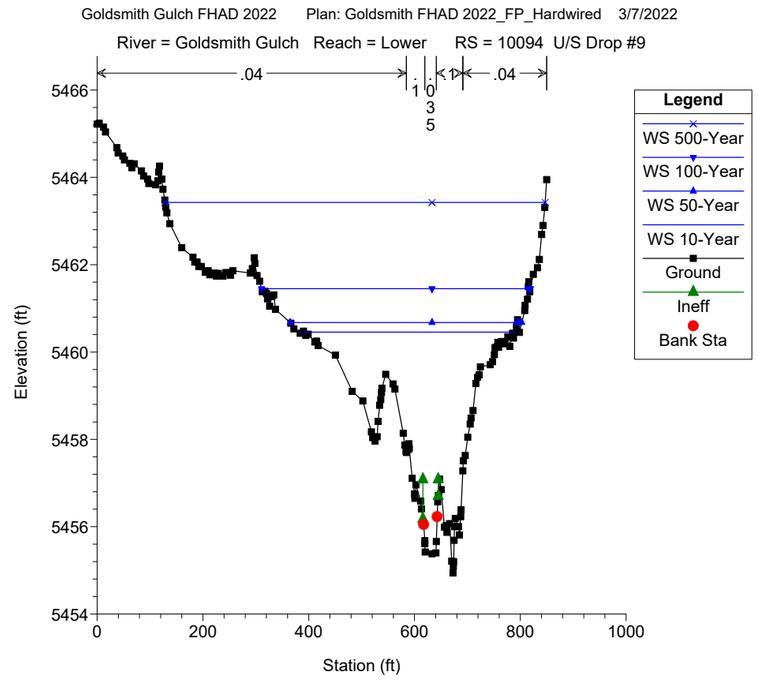

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10525
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

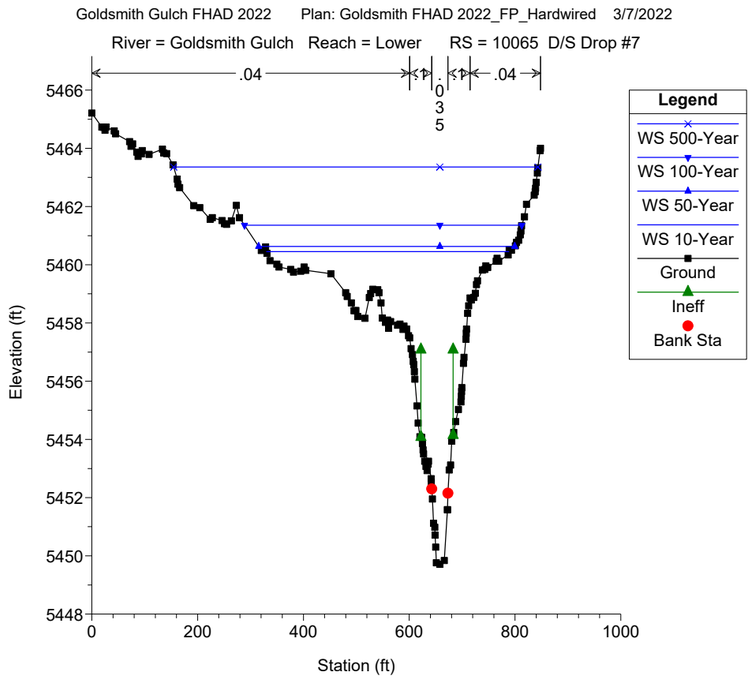

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10137 U/S Drop #10
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

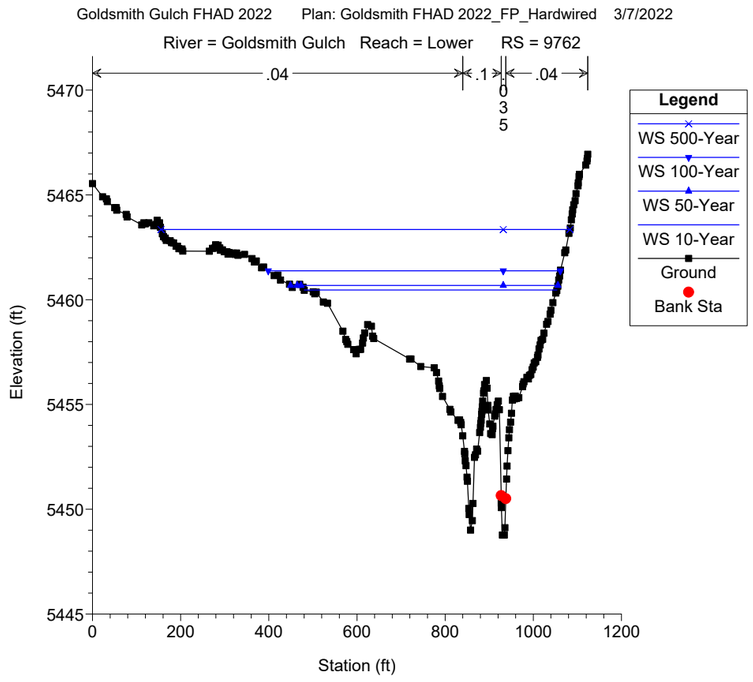

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10127
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

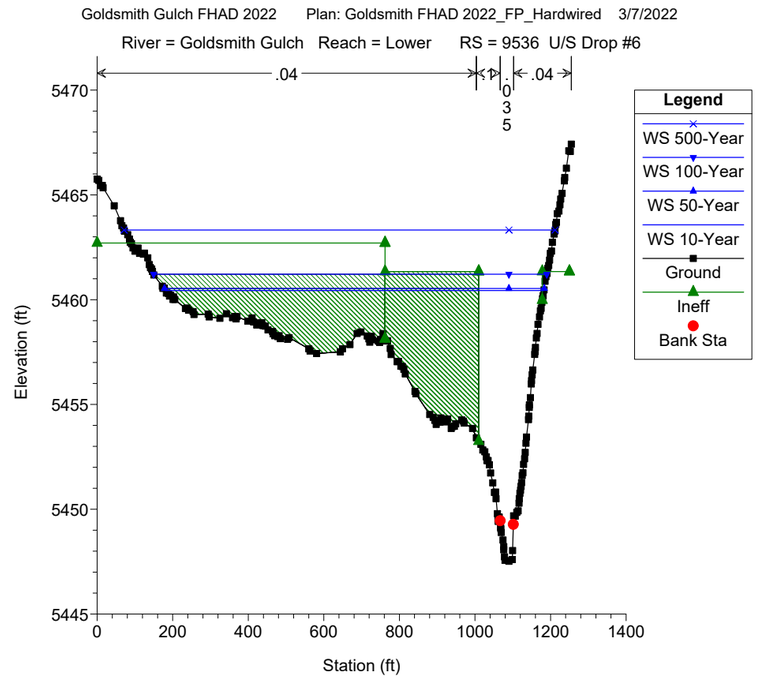

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10116 BR Foot Bridge_Bible Park
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

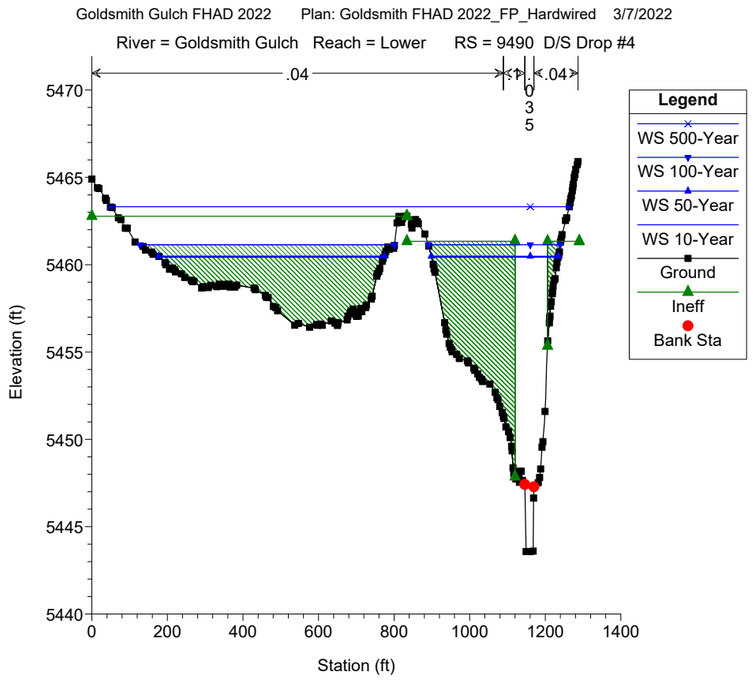

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10116 BR Foot Bridge_Bible Park
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

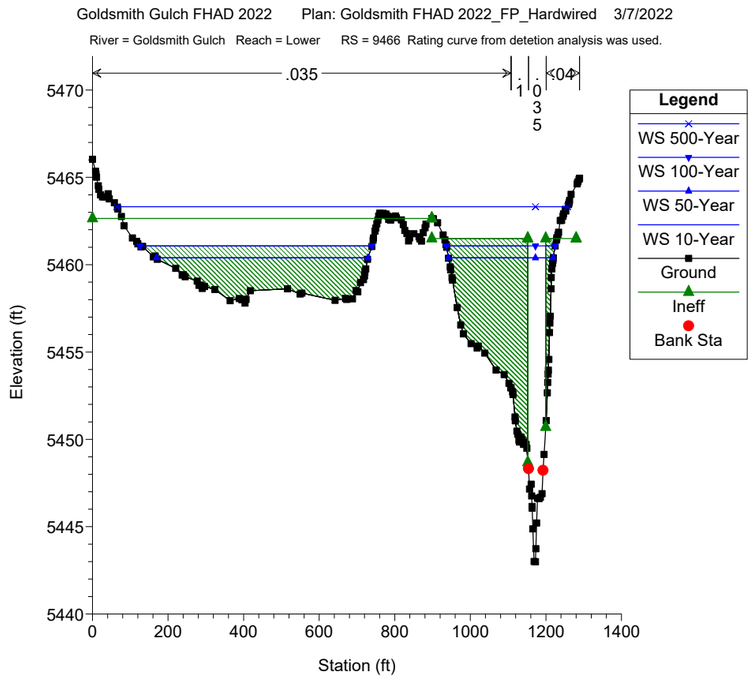

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10094 U/S Drop #9
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

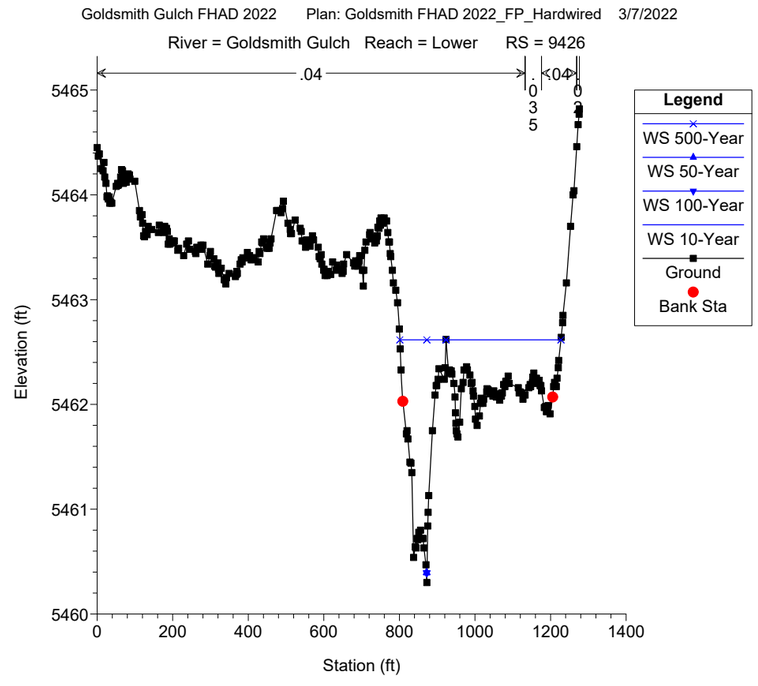

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 10065 D/S Drop #7
.04
.1
.04
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

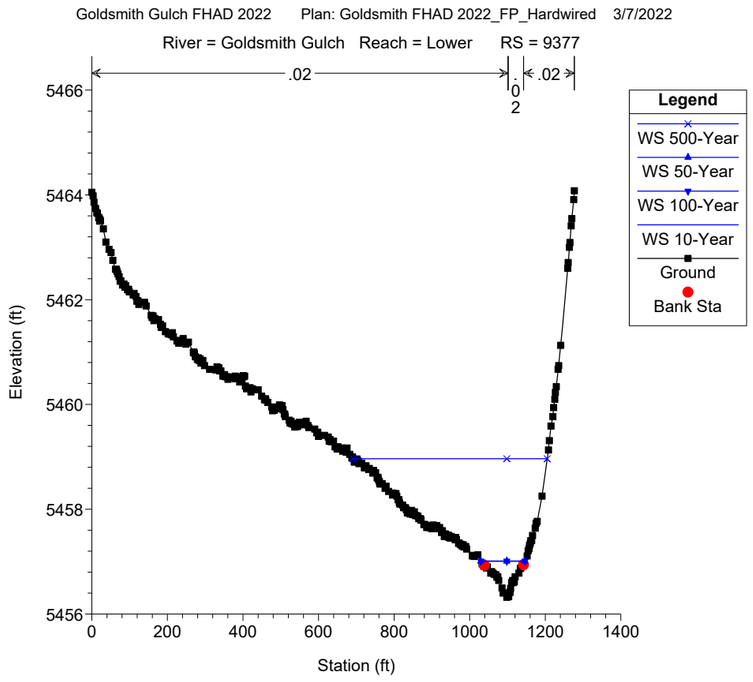

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9762
.04
.1
.04
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

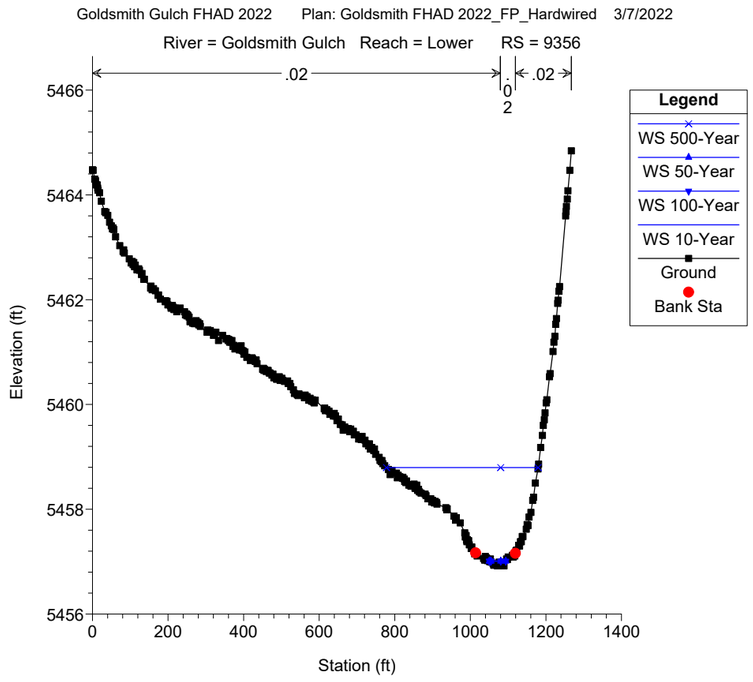

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9536 U/S Drop #6
.04
.1
.04
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

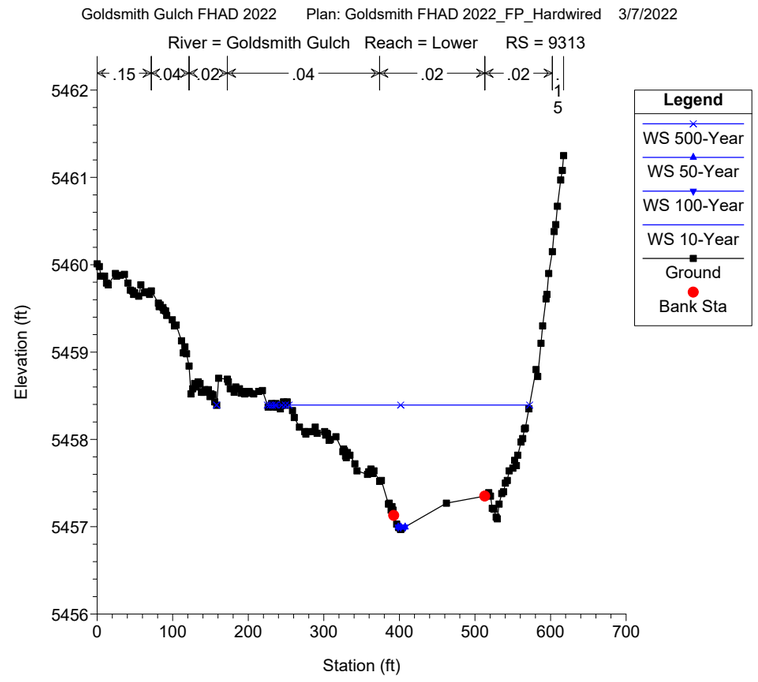

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9490 D/S Drop #4
.04
.1
.04
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

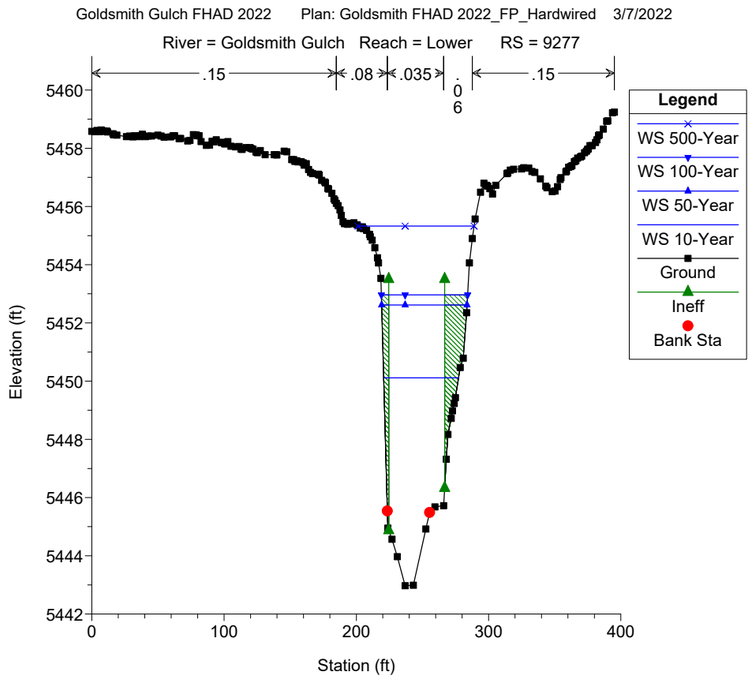

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9466 Rating curve from detetion analysis was used.
.035
.1
.04
0
3
5
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

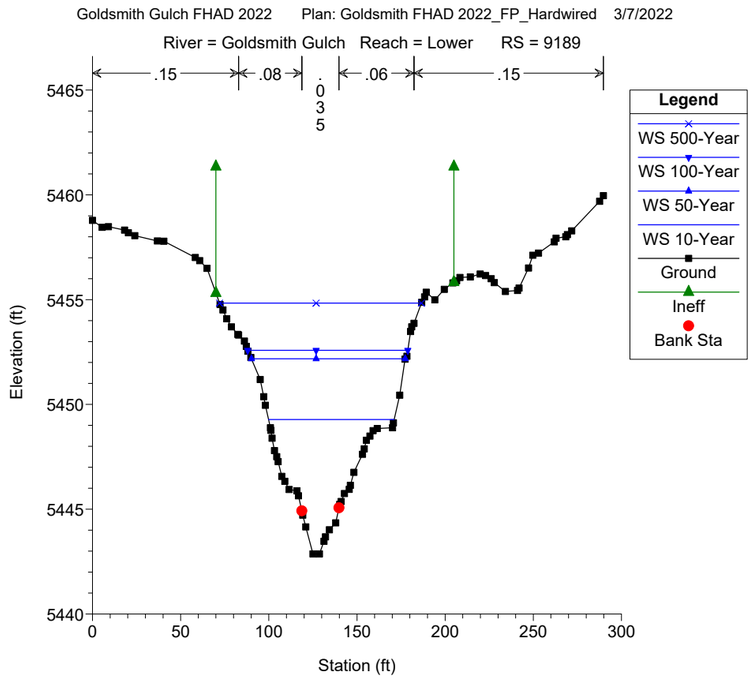

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9426
.04
.04
0
3
5
0
2
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

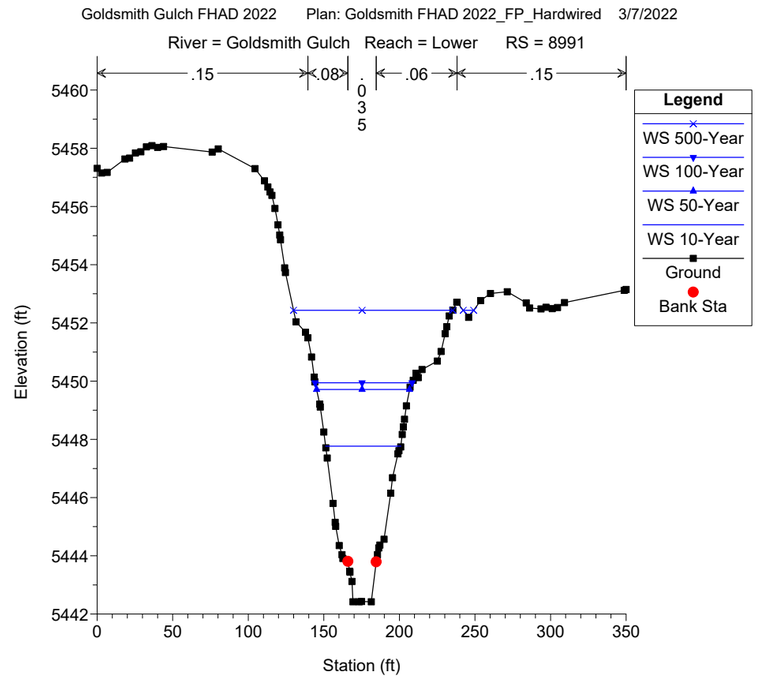

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9377
.02
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

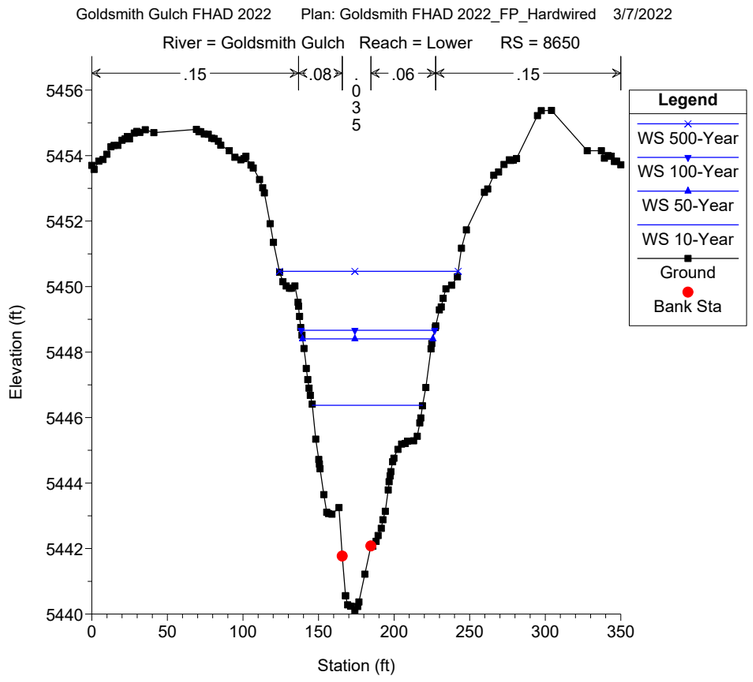

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9356
.02
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

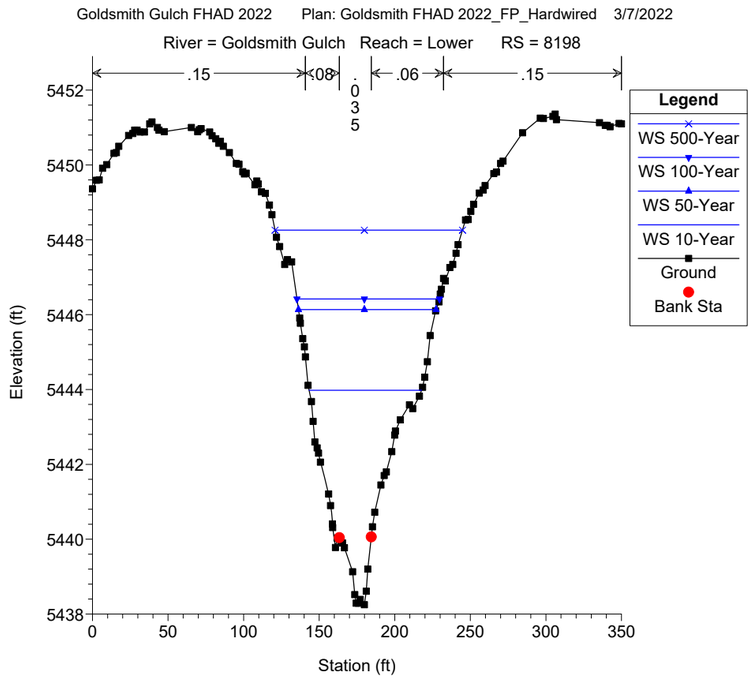

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9313
.15
.04
.02
.04
.02
.02
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

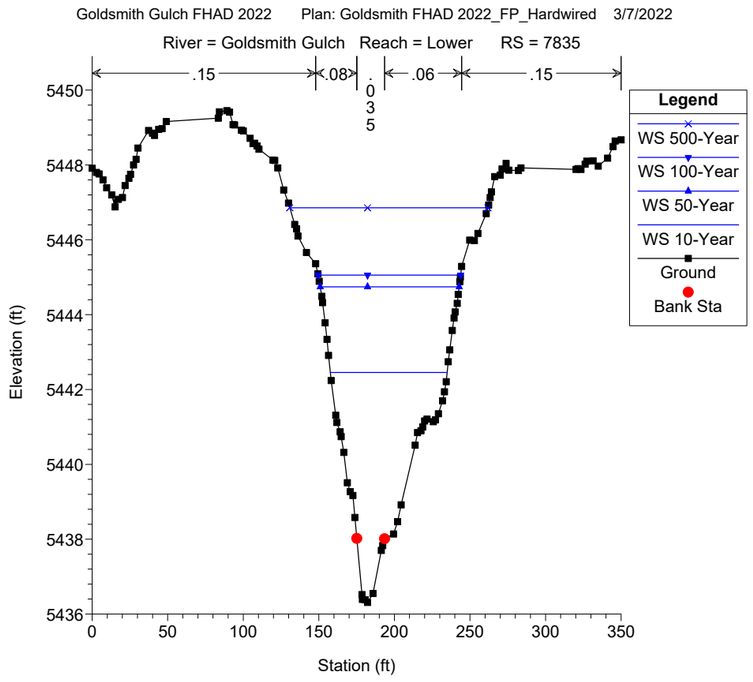

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9277
.15
.08
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

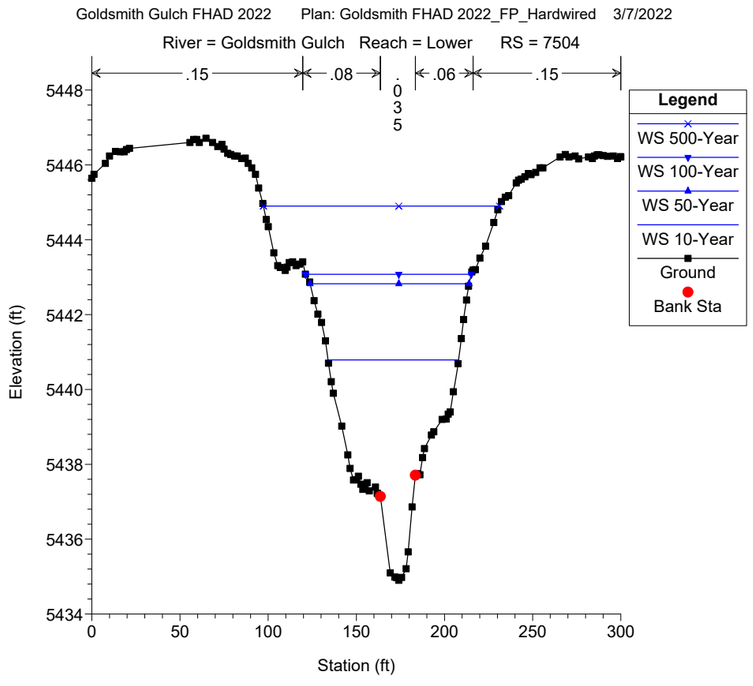

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 9189
.15
.08
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

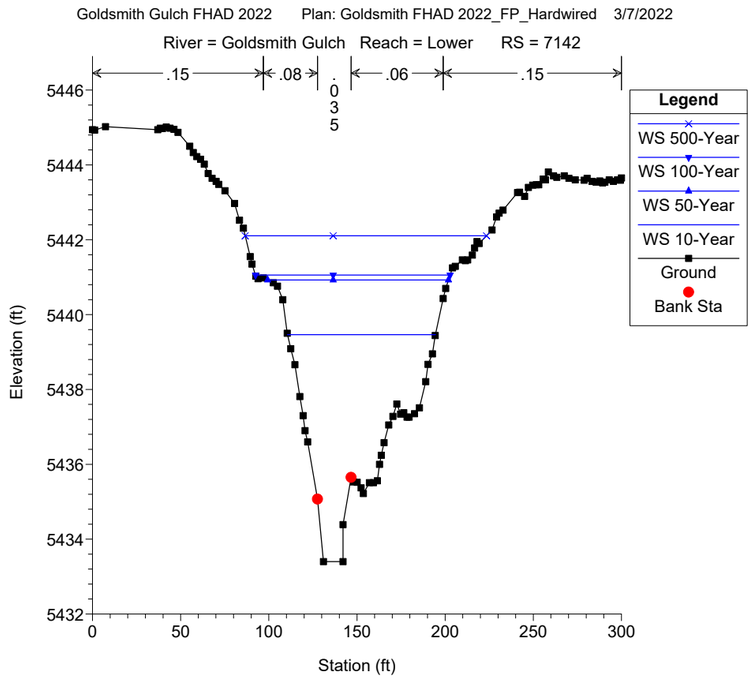

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 8991
.15
.08
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

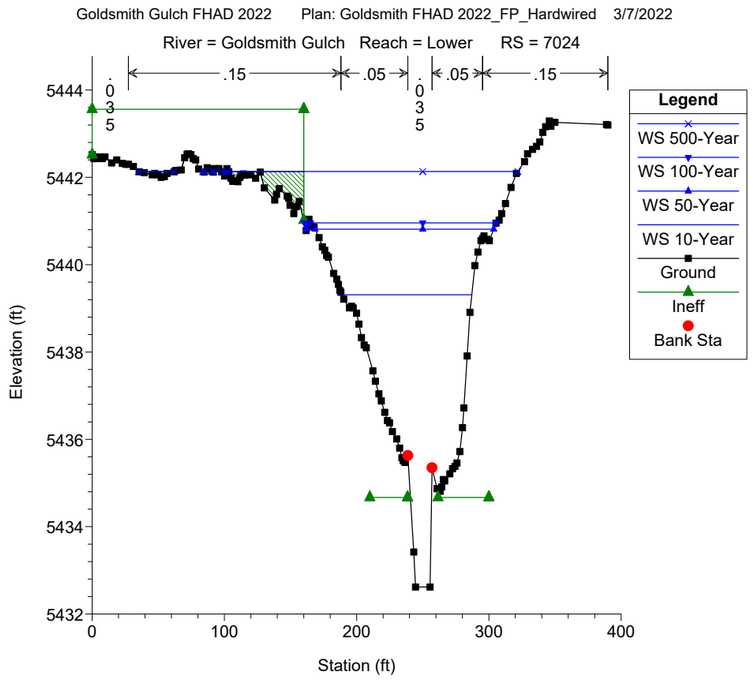

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 8650
.15
.08
.035
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

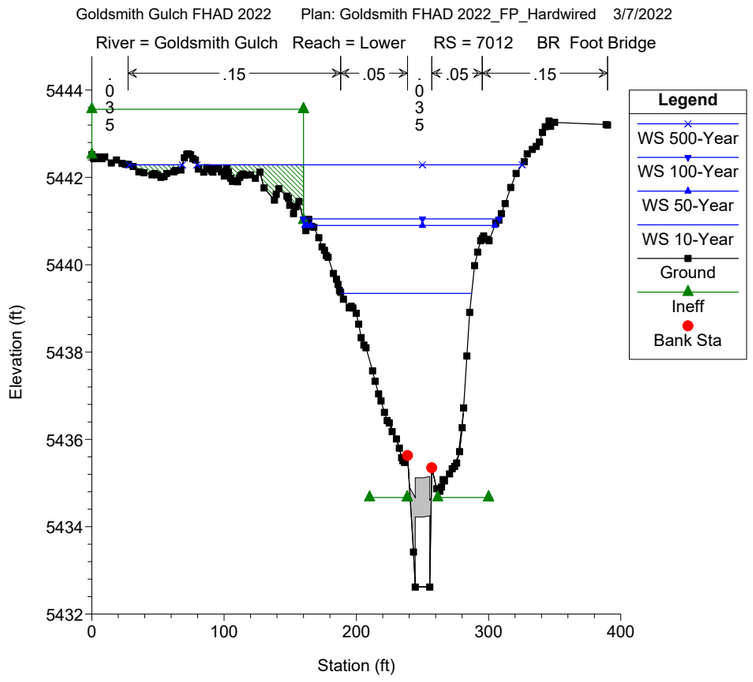

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 8198
.15
.08
.035
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

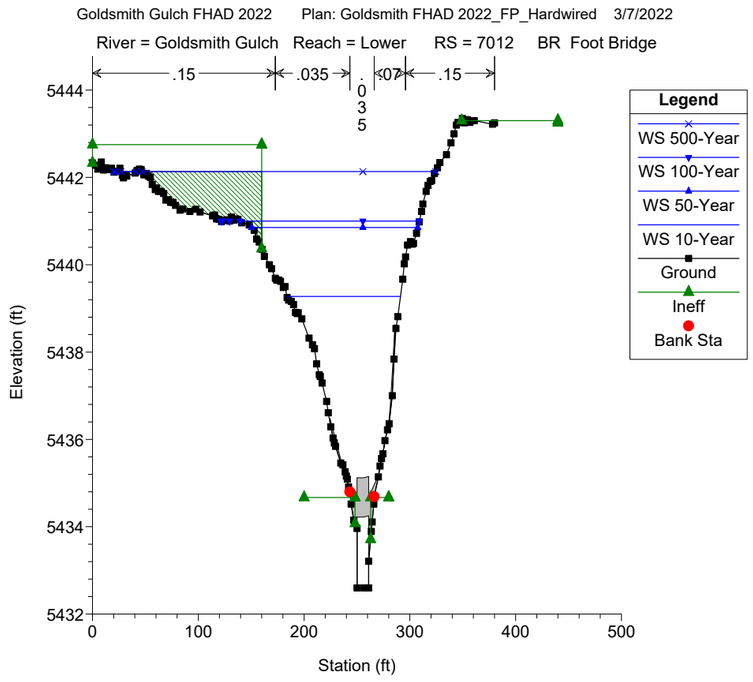

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7835
.15
.08
.035
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

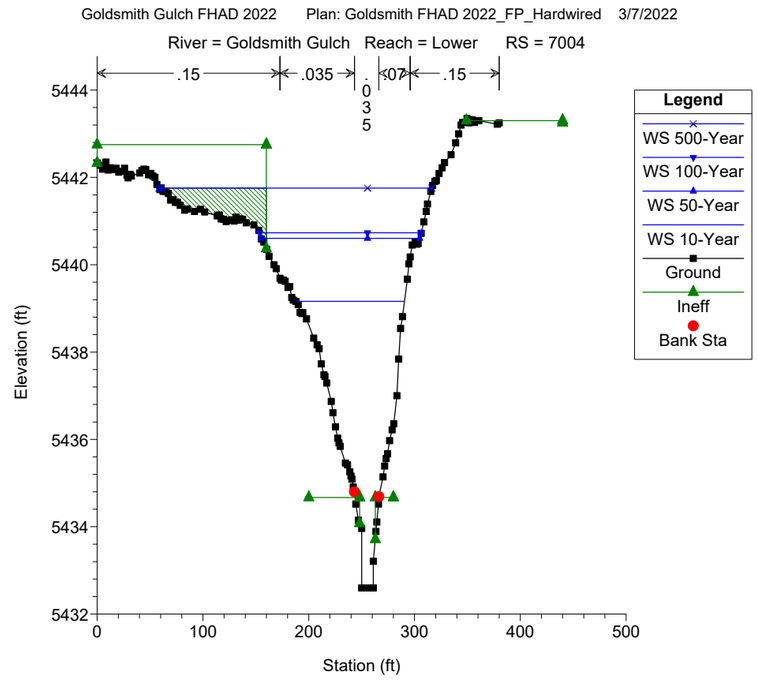

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7504
.15
.08
.035
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

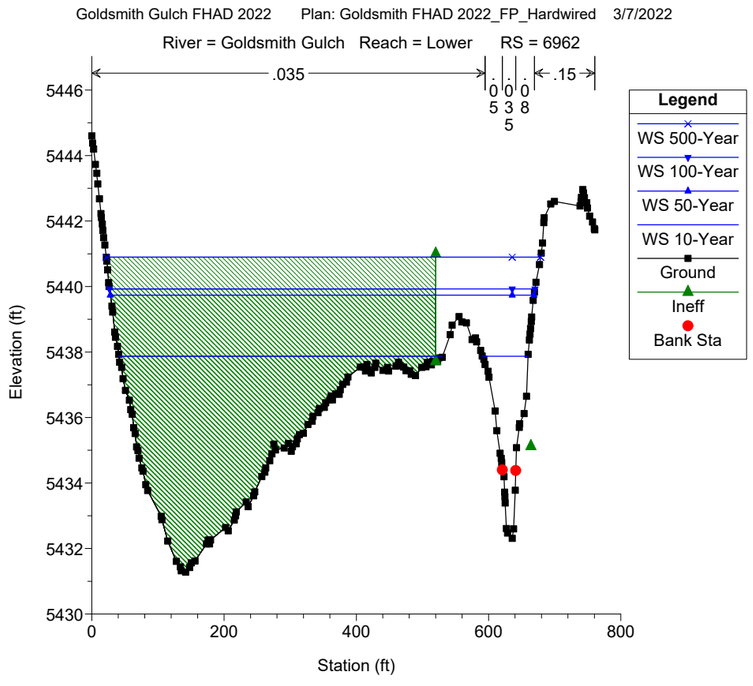

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7142
.15
.08
.035
.06
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

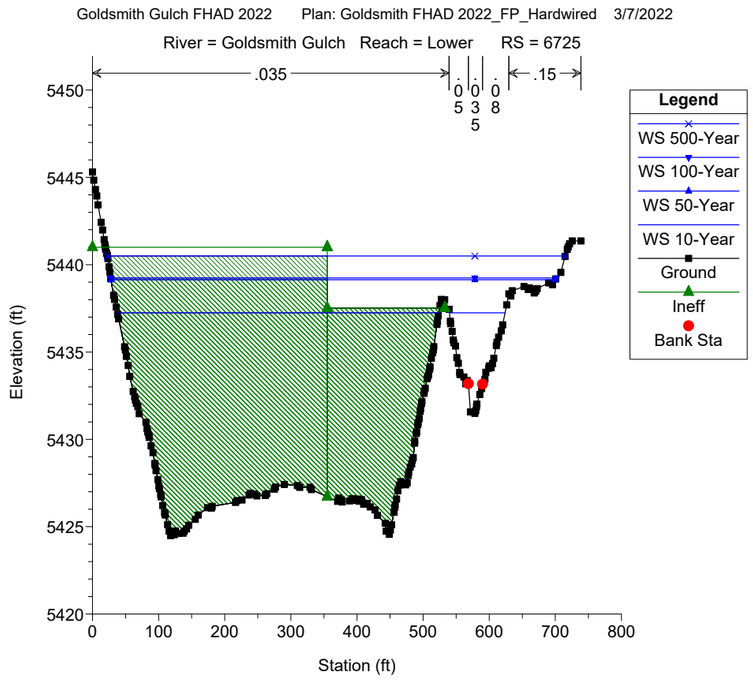

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7024
.035
.15
.05
.035
.05
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

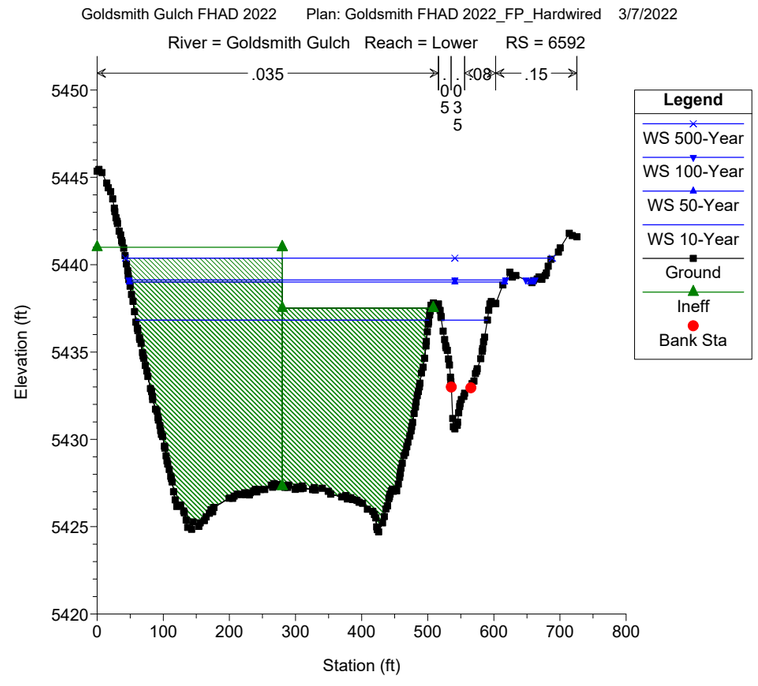

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7012 BR Foot Bridge
.15
.05
.05
.15
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

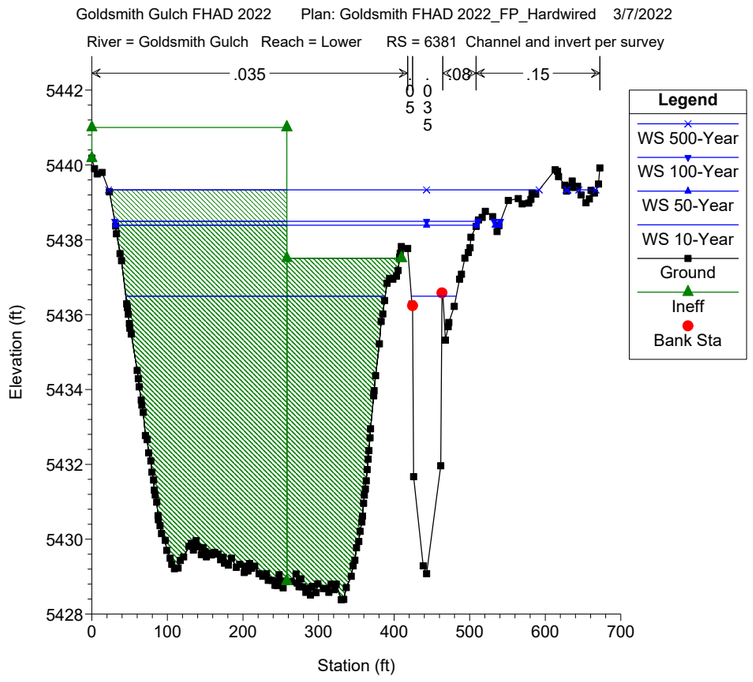

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7012 BR Foot Bridge
.15
.035
.07
.15
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

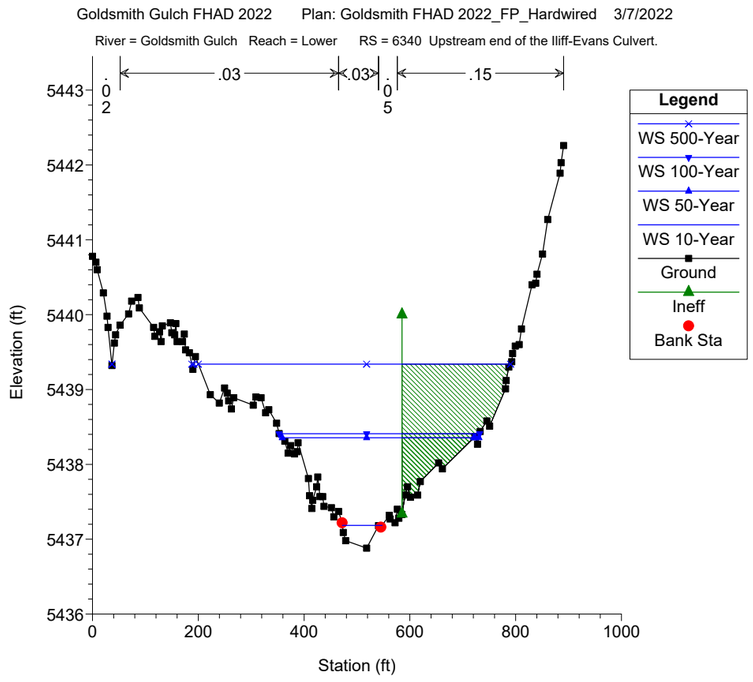

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 7004
.15
.035
.07
.15
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

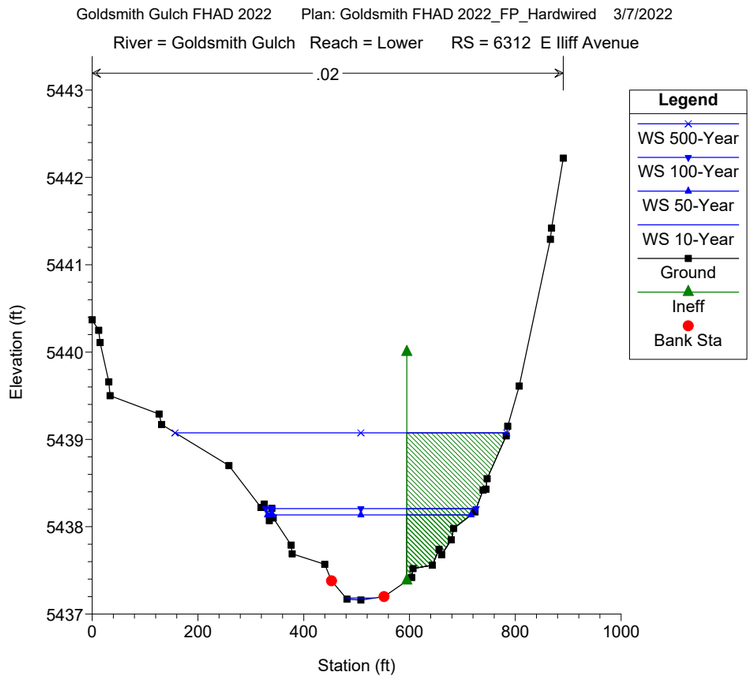

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6962
.035
.15
.035
.035
.08
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

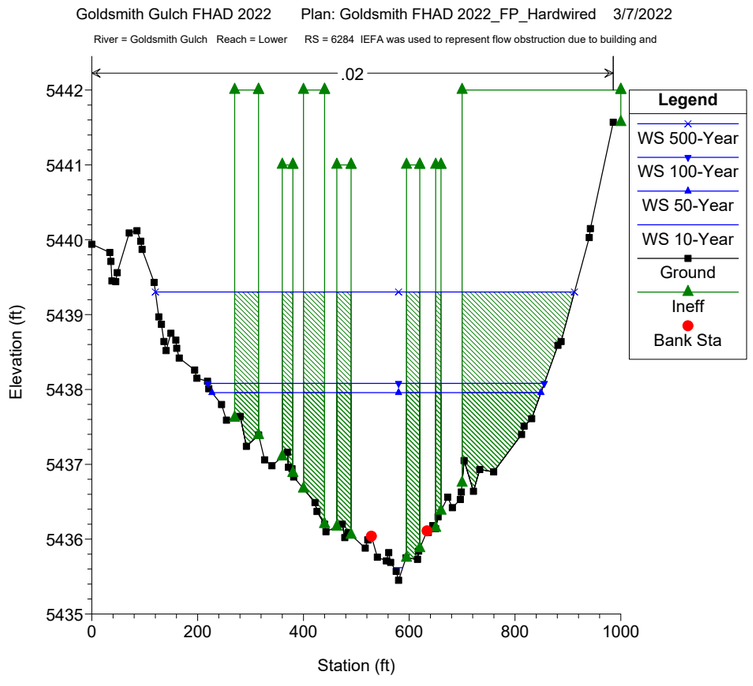

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6725
.035
.15
.035
.035
.08
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

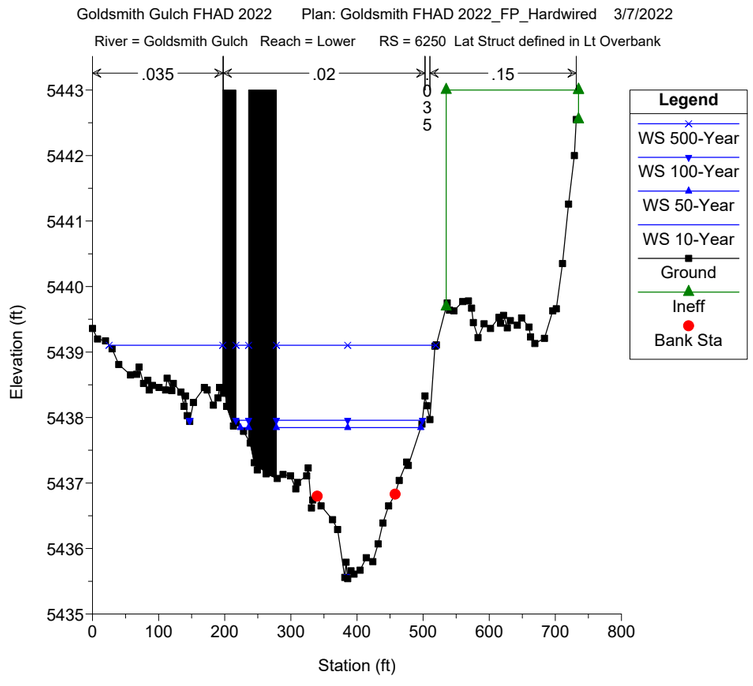

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6592
.035
.08
.15
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

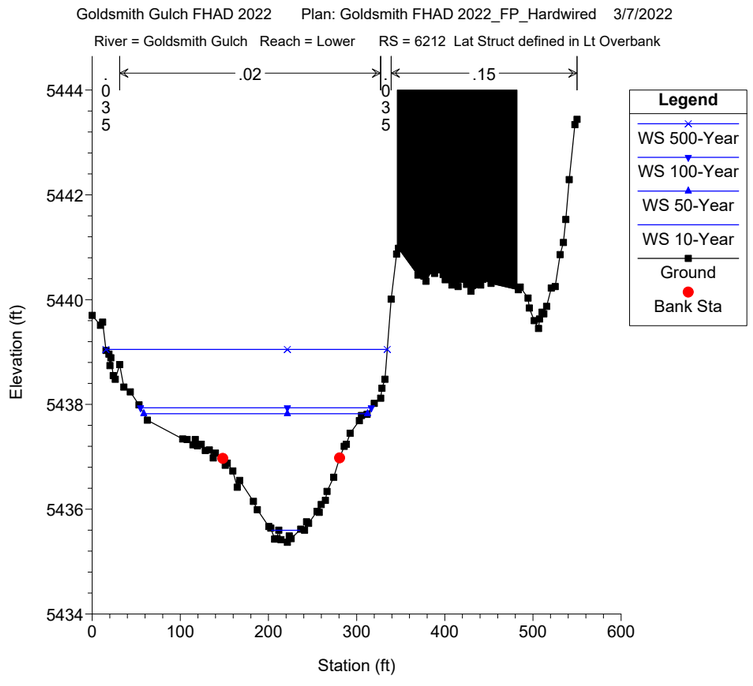

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6381 Channel and invert per survey
.035
.05
.035
.08
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

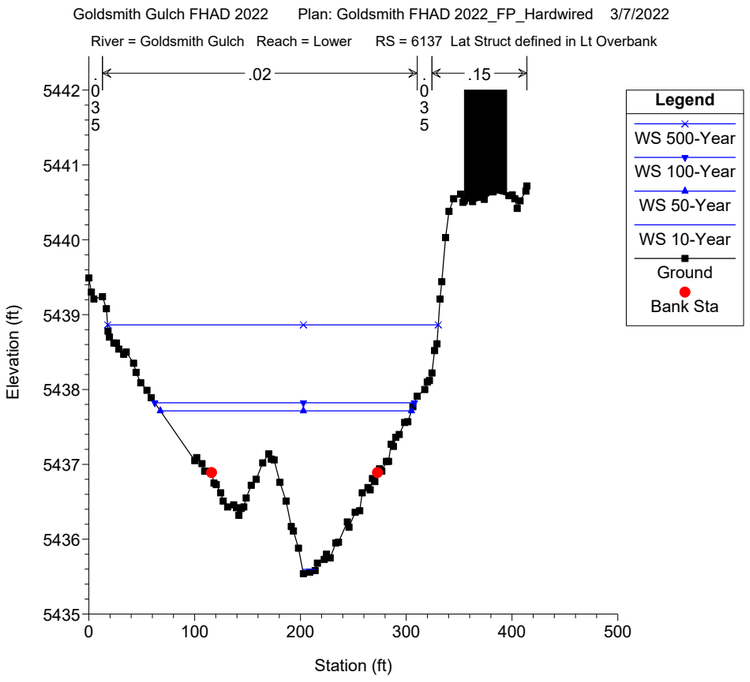

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6340 Upstream end of the Iliff-Evans Culvert.
.02
.03
.03
.05
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

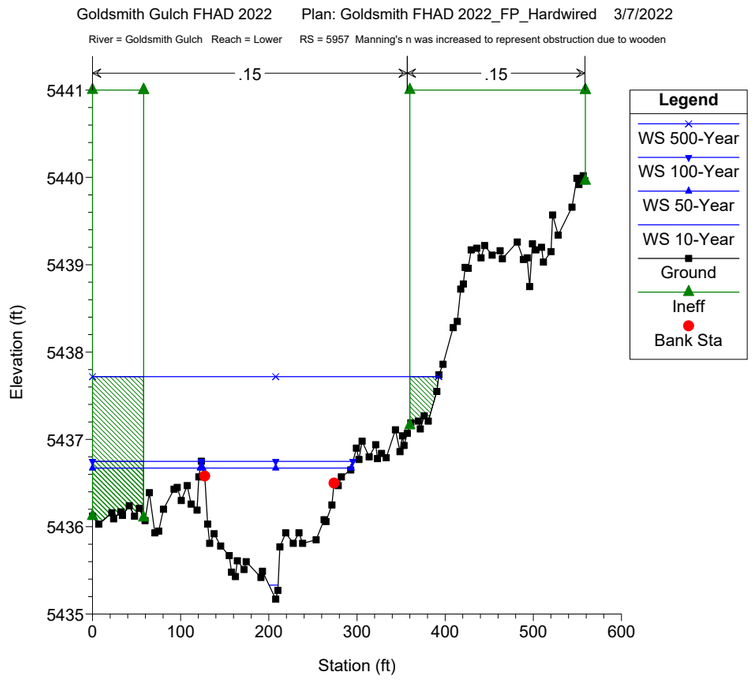

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6312 E Iliff Avenue
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

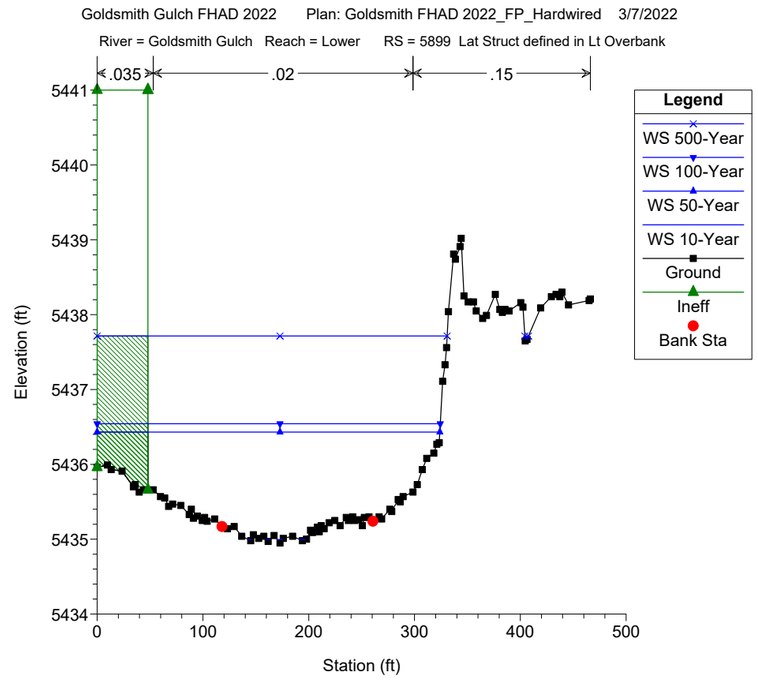

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6284 IEFA was used to represent flow obstruction due to building and
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

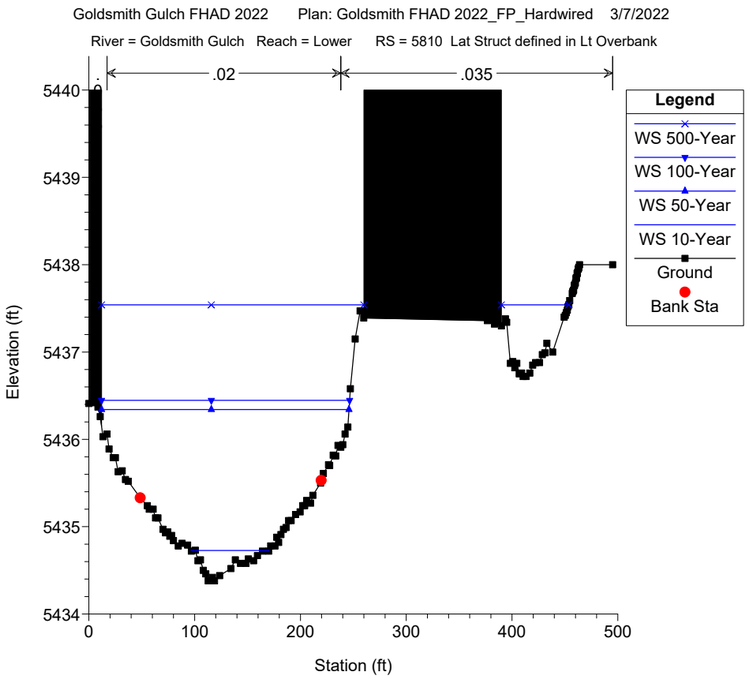

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6250 Lat Struct defined in Lt Overbank
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

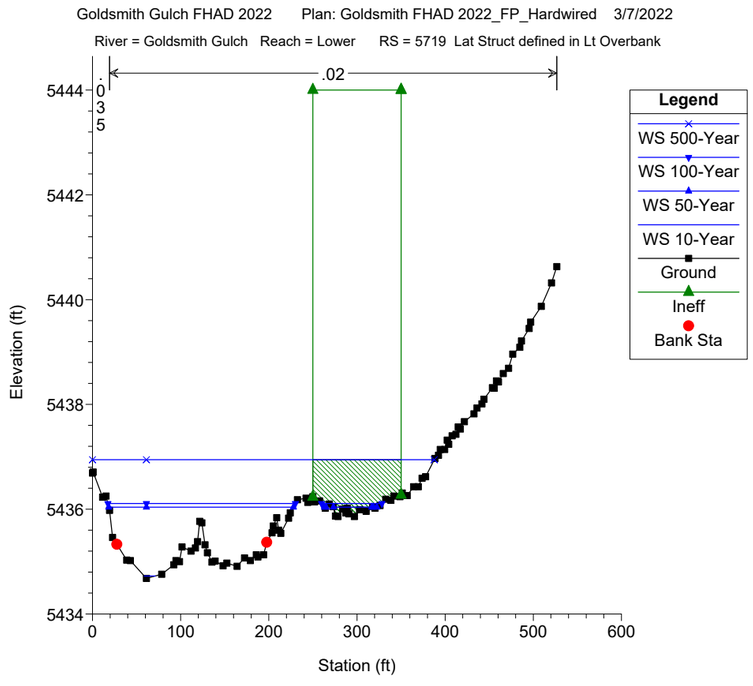

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6212 Lat Struct defined in Lt Overbank
.035
.02
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

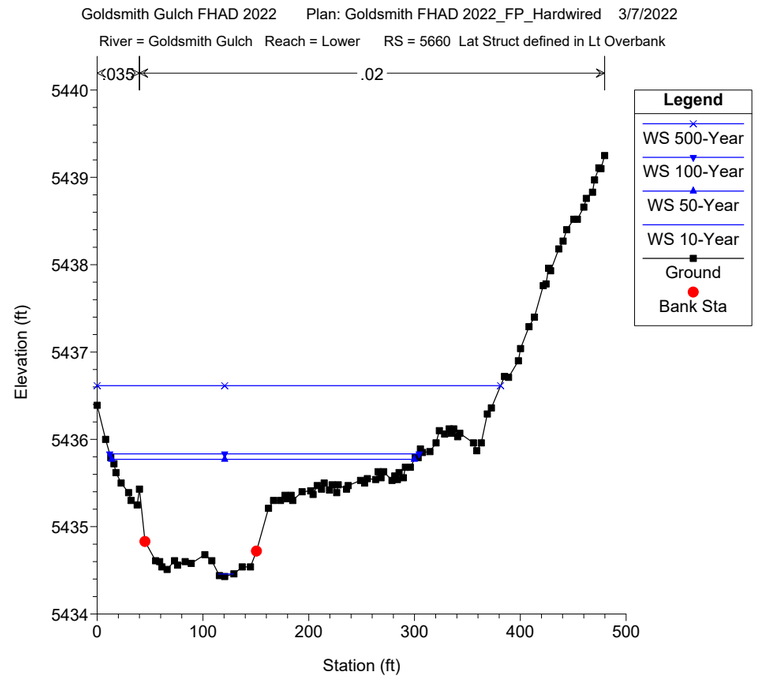

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 6137 Lat Struct defined in Lt Overbank
.035
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

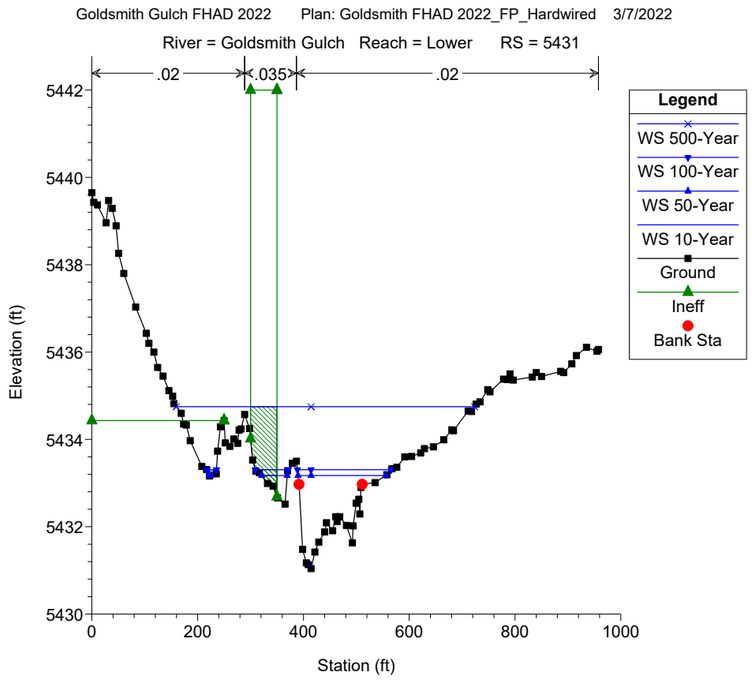

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5957 Manning's n was increased to represent obstruction due to wooden
.15
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

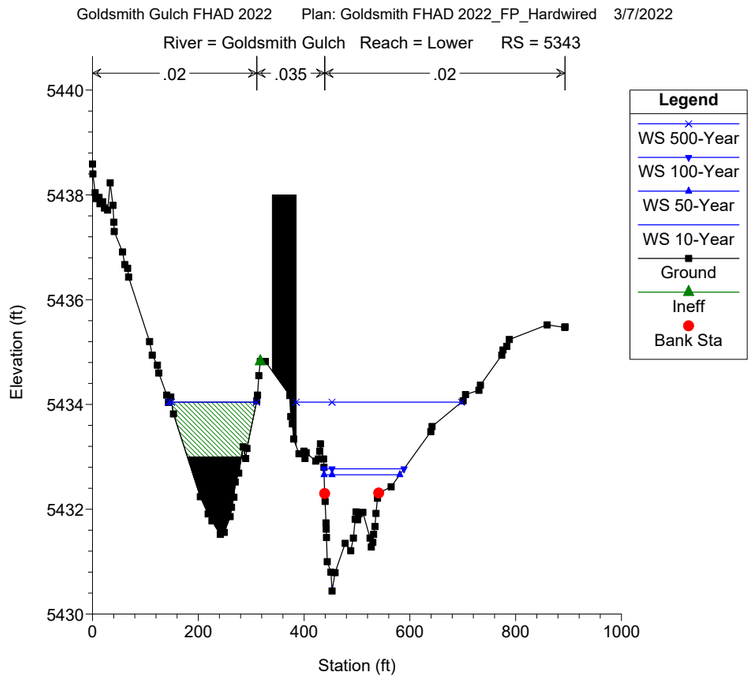

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5899 Lat Struct defined in Lt Overbank
.035
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

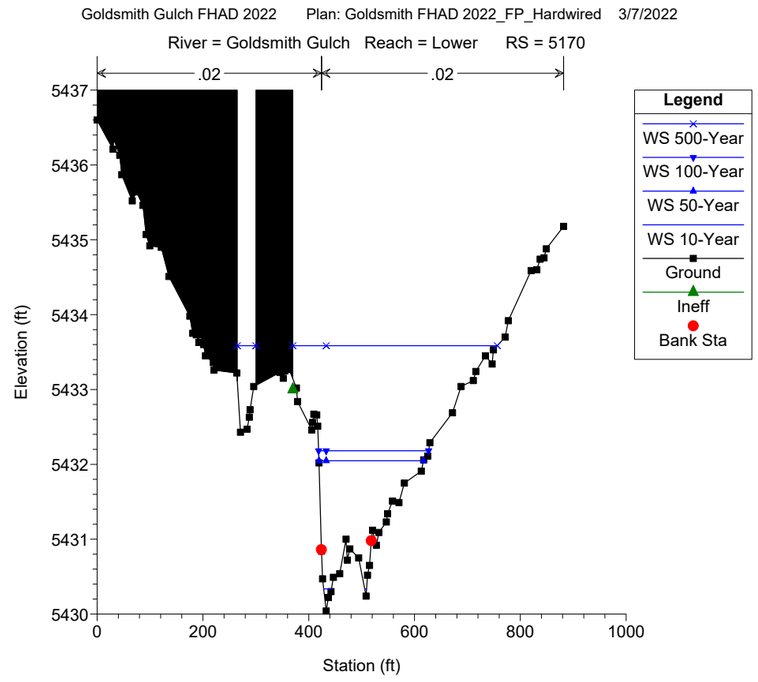

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5810 Lat Struct defined in Lt Overbank
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

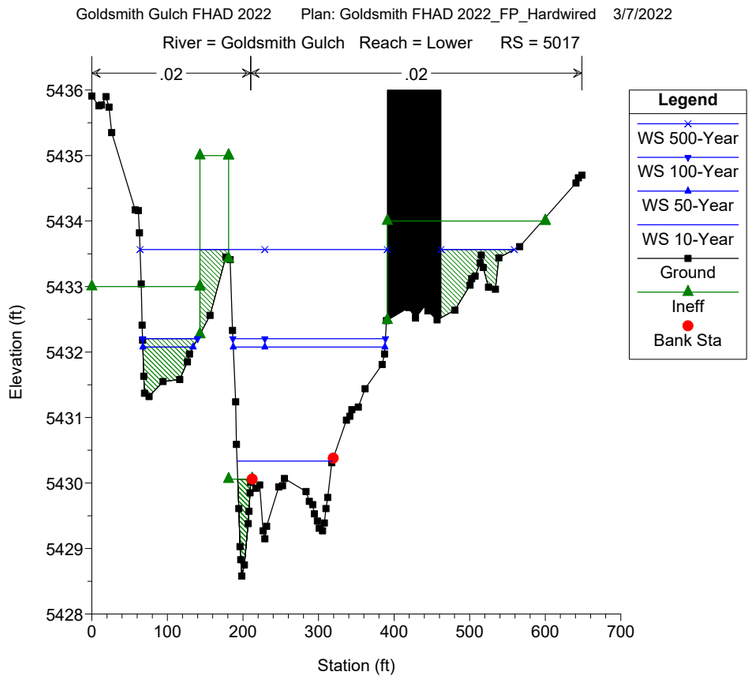

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5719 Lat Struct defined in Lt Overbank
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

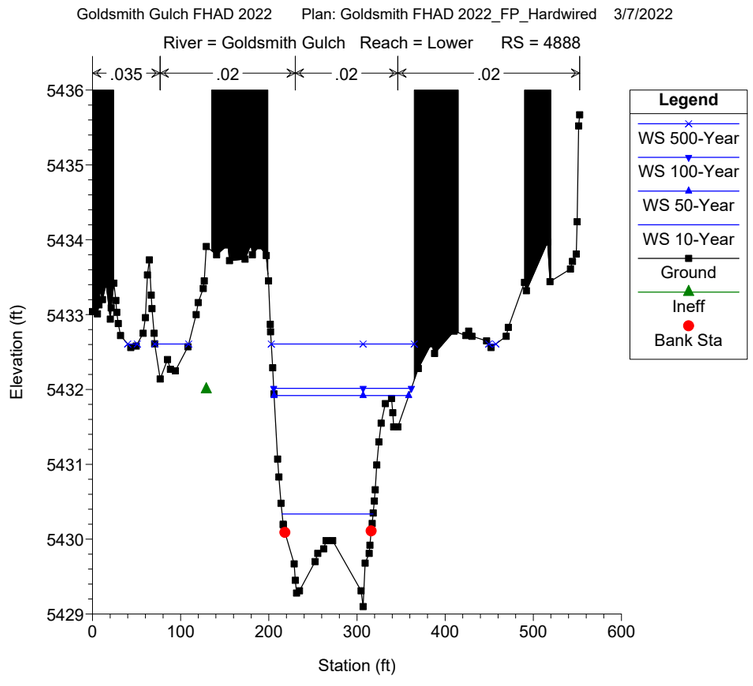

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5660 Lat Struct defined in Lt Overbank
.035
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

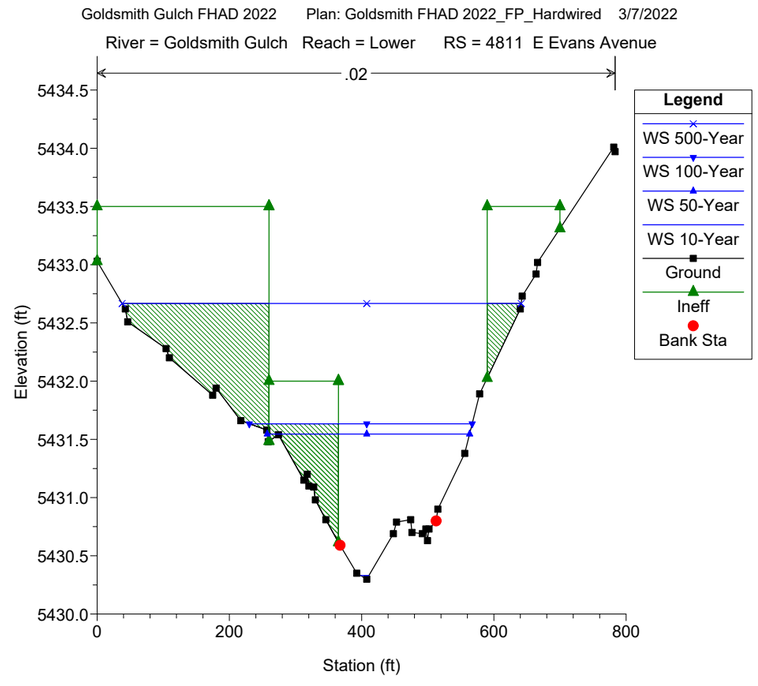

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5431
.02
.035
.02
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

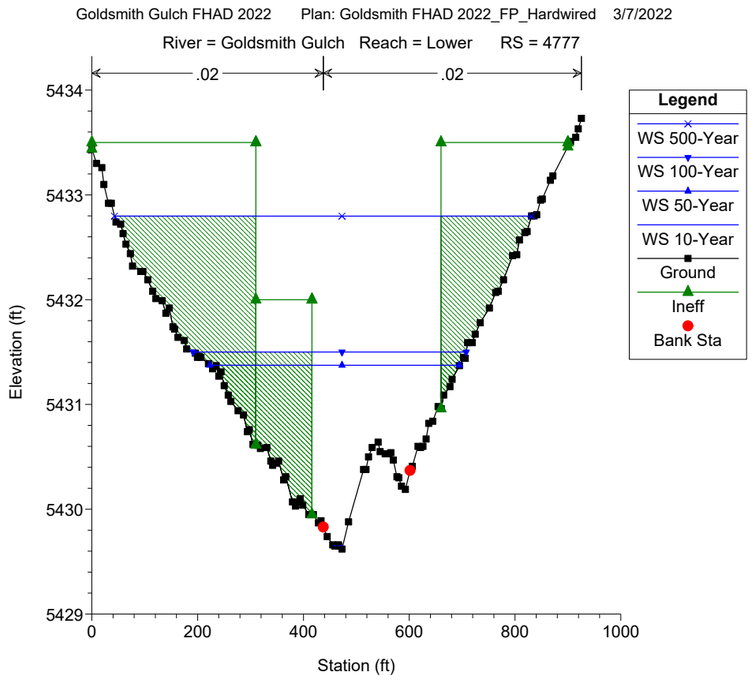

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5343
.02
.035
.02
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

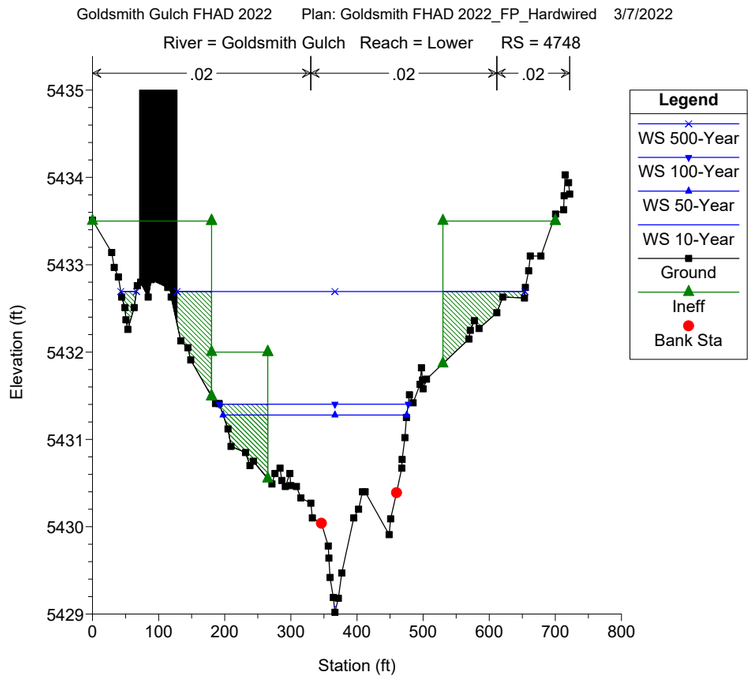

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5170
.02
.02
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

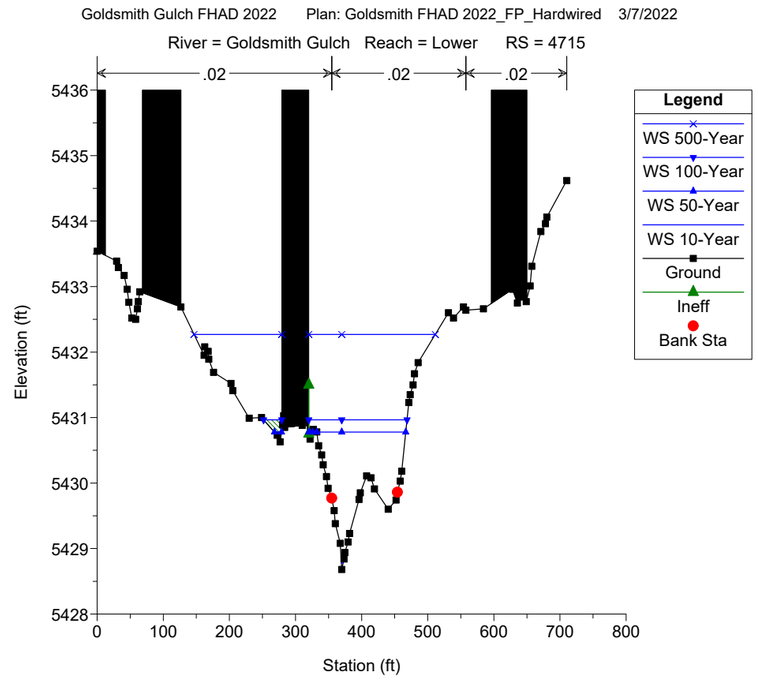

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 5017
.02
.02
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

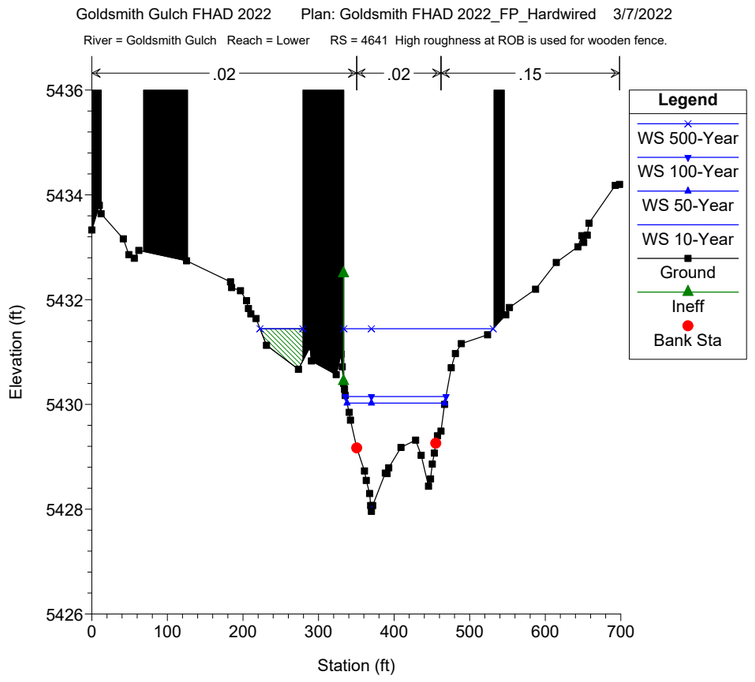

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4888
.035
.02
.02
.02
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

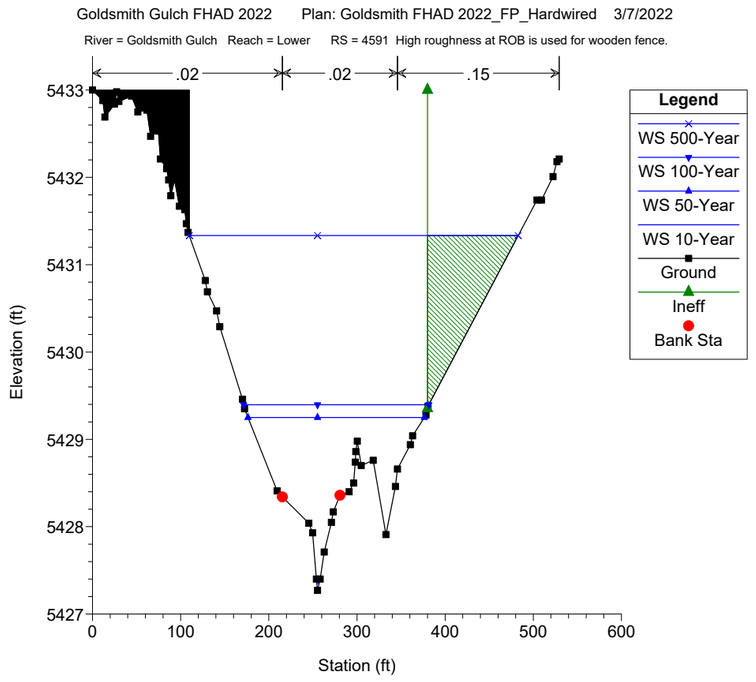

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4811 E Evans Avenue
.02
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

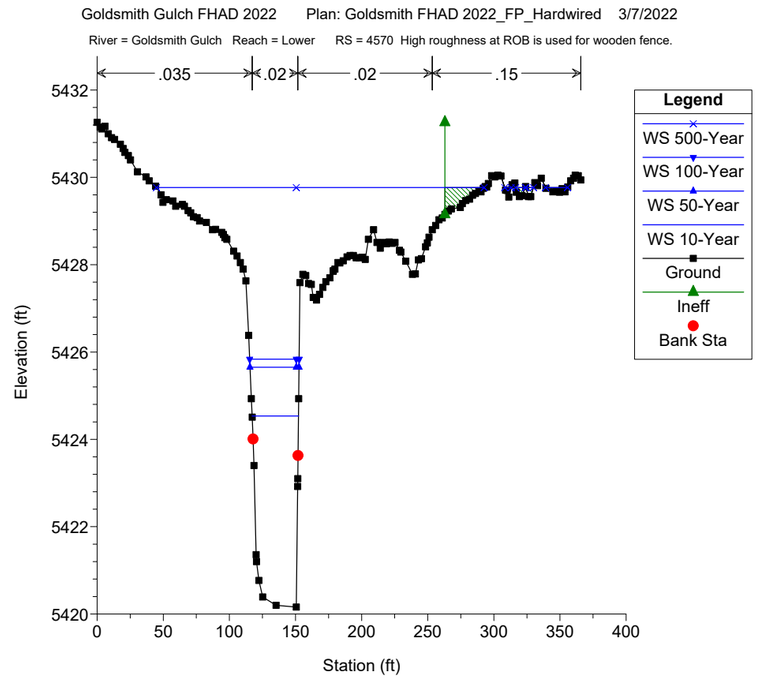

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4777
.02
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

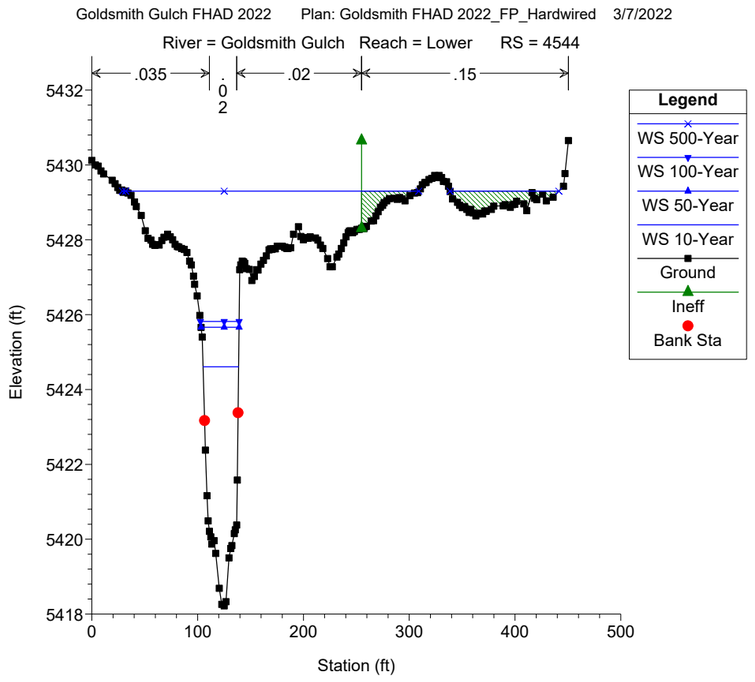

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4748
.02
.02
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

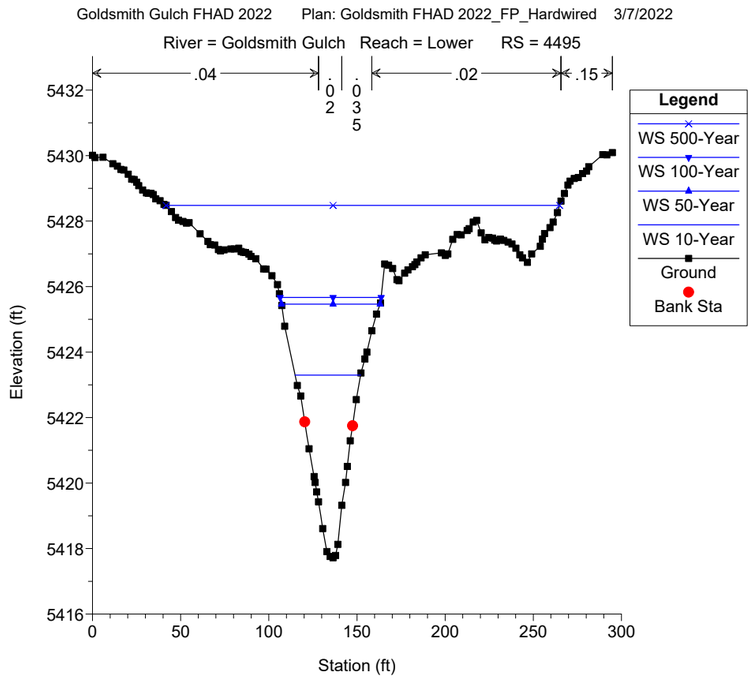

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4715
.02
.02
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

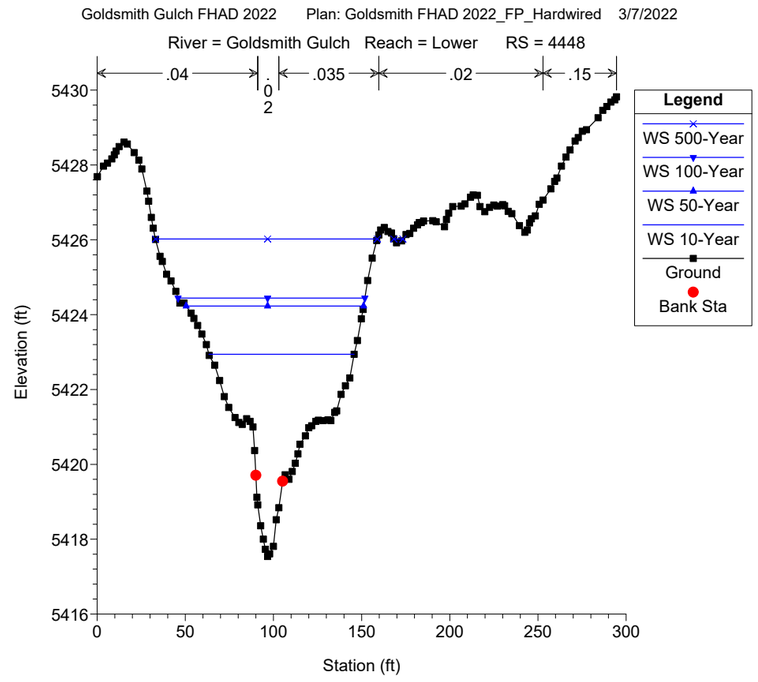

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4641 High roughness at ROB is used for wooden fence.
.02
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

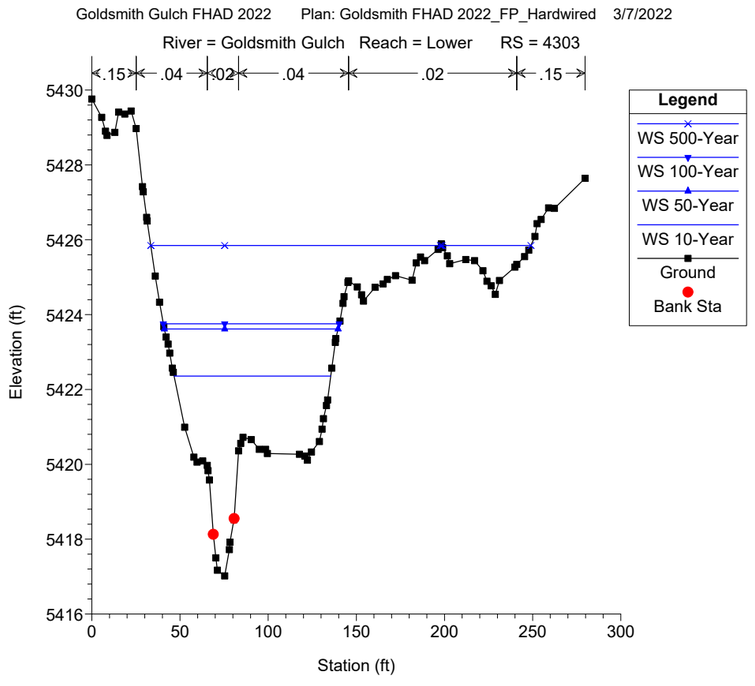

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4591 High roughness at ROB is used for wooden fence.
.02
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

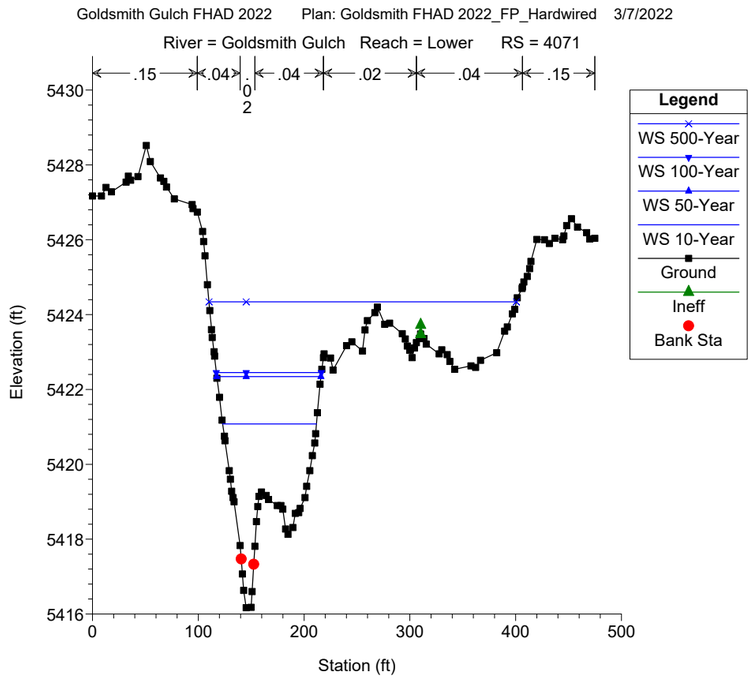

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4570 High roughness at ROB is used for wooden fence.
.035
.02
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

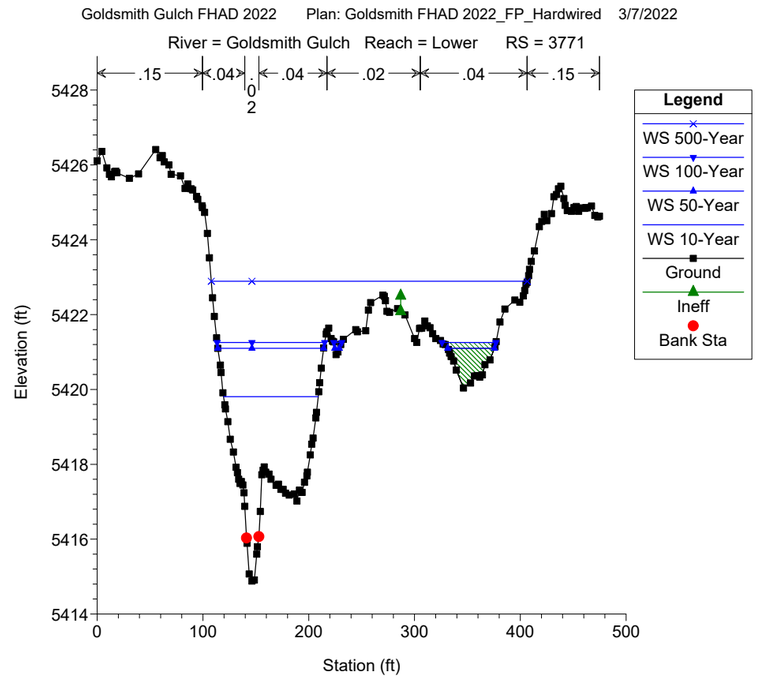

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4544
.035
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

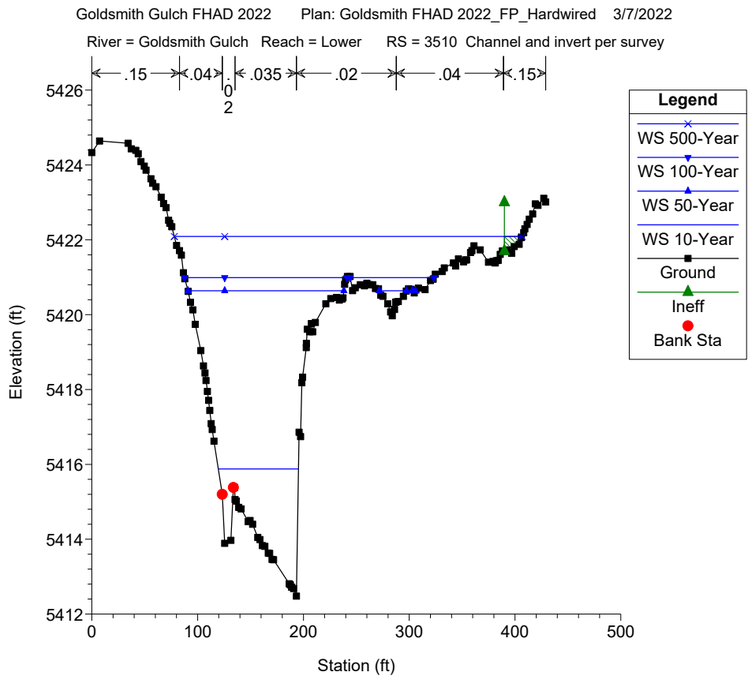

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4495
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

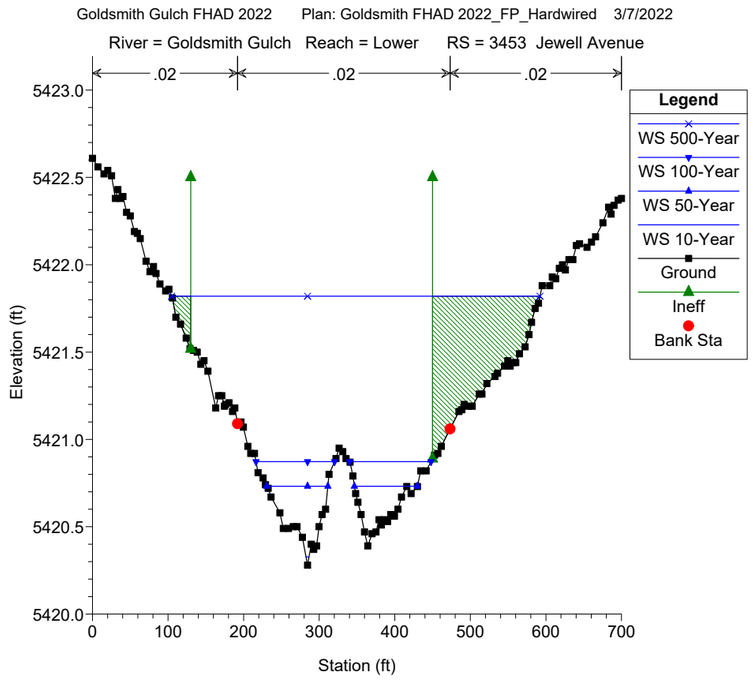

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4448
.04
.035
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

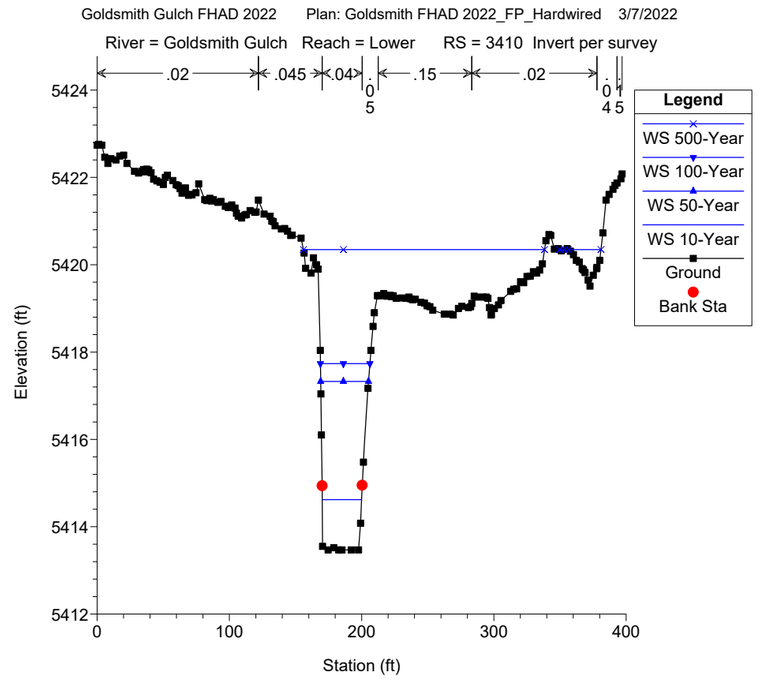

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4303
.15
.04
.02
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

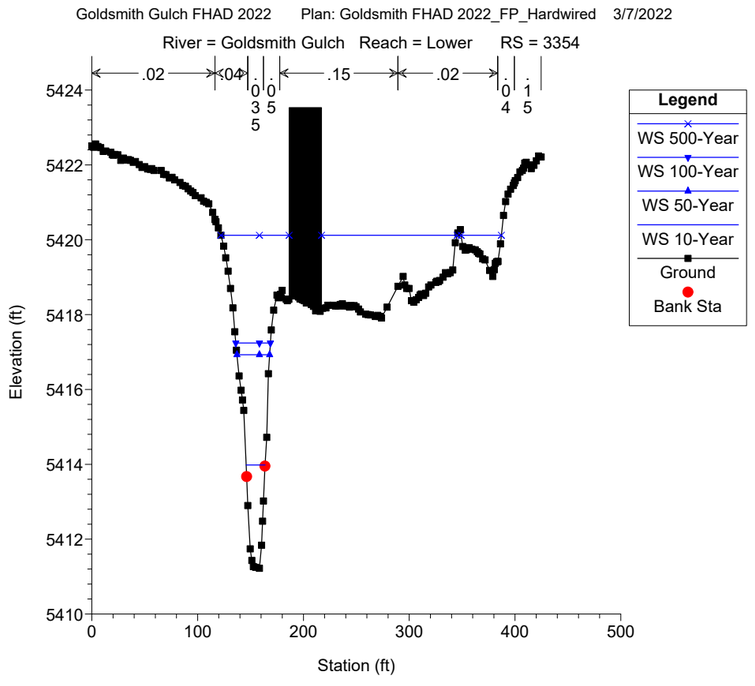

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 4071
.15
.04
.04
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

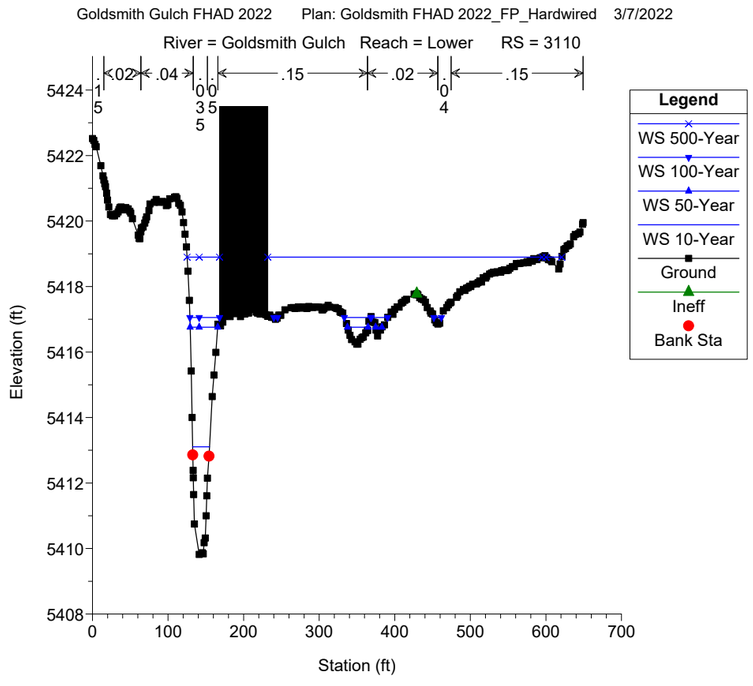

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3771
.15
.04
.04
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

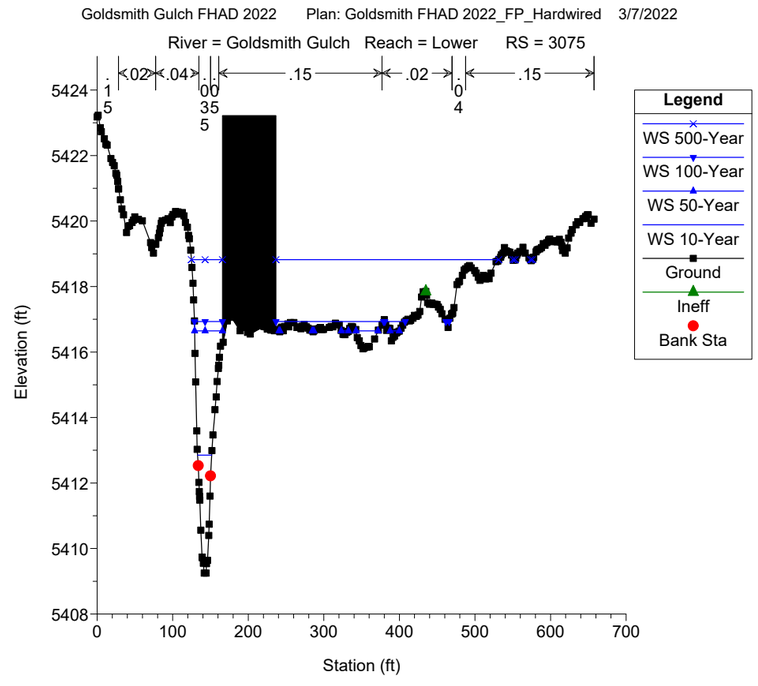

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3510 Channel and invert per survey
.15 .04 .02 .035 .02 .04 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

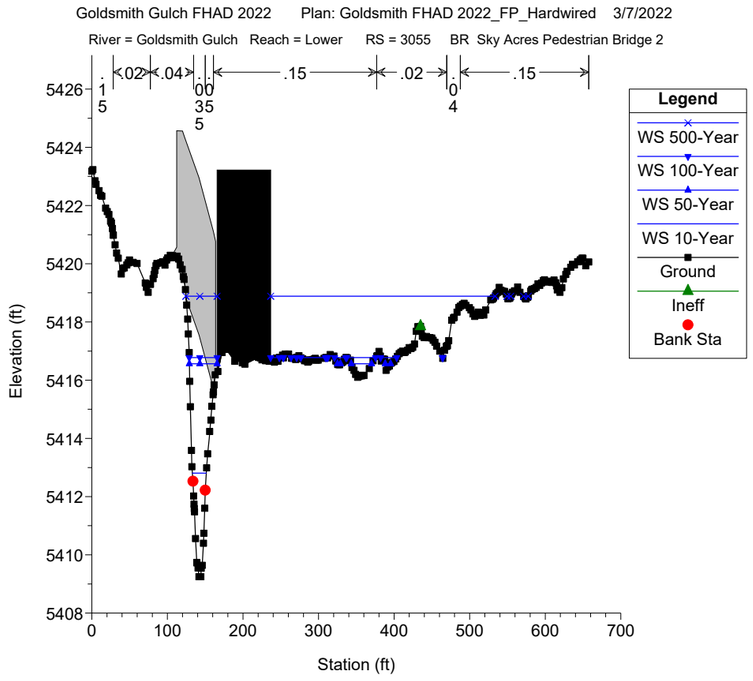

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3453 Jewell Avenue
.02 .02 .02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

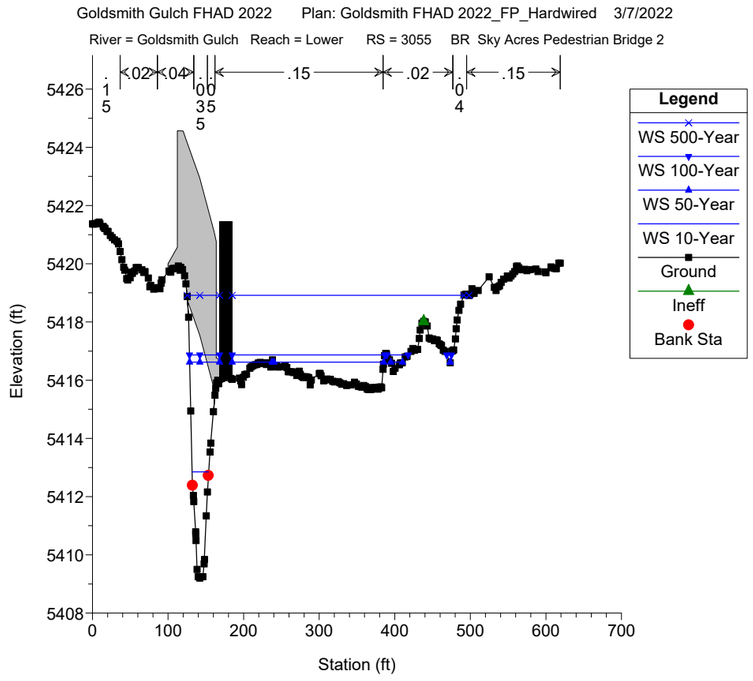

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3410 Invert per survey
.02 .045 .04 .15 .02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

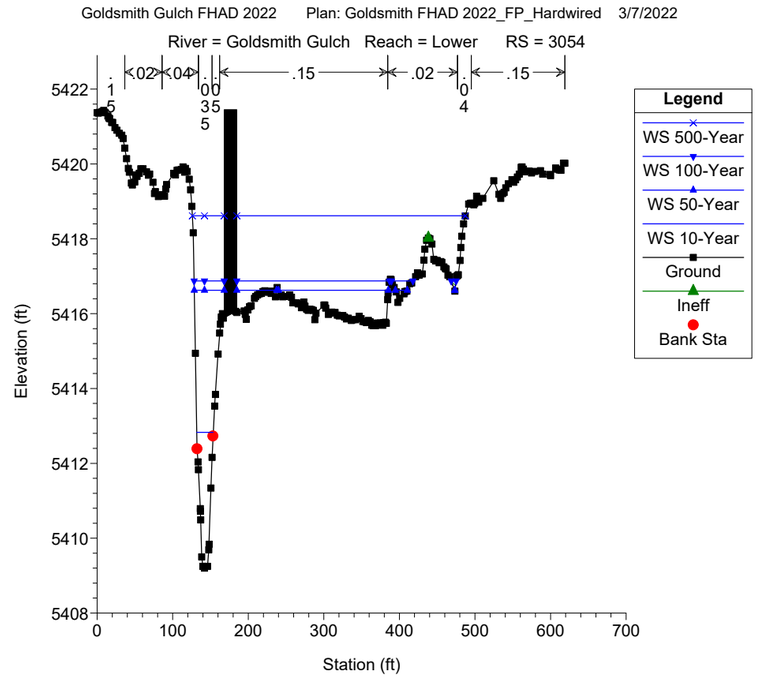

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3354
.02 .04 .15 .02 .04 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

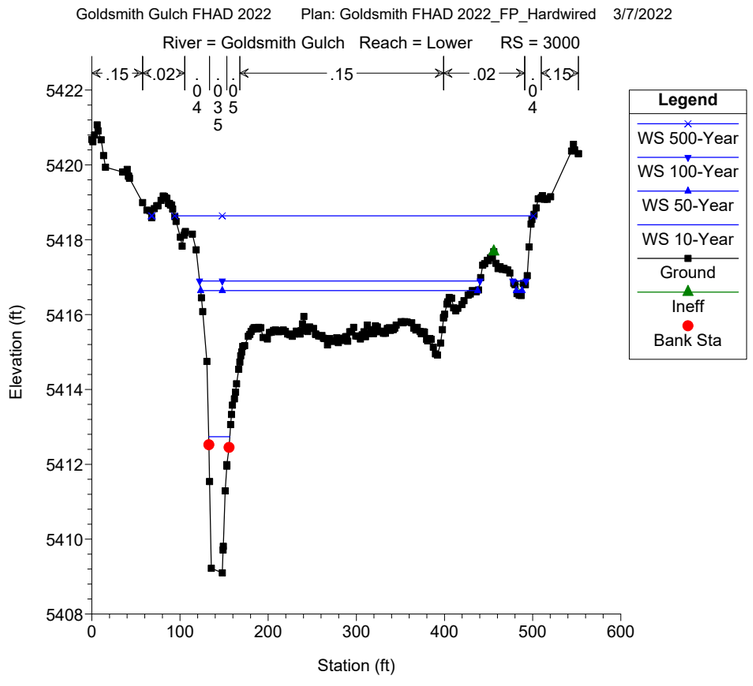

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3110
.02 .04 .15 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

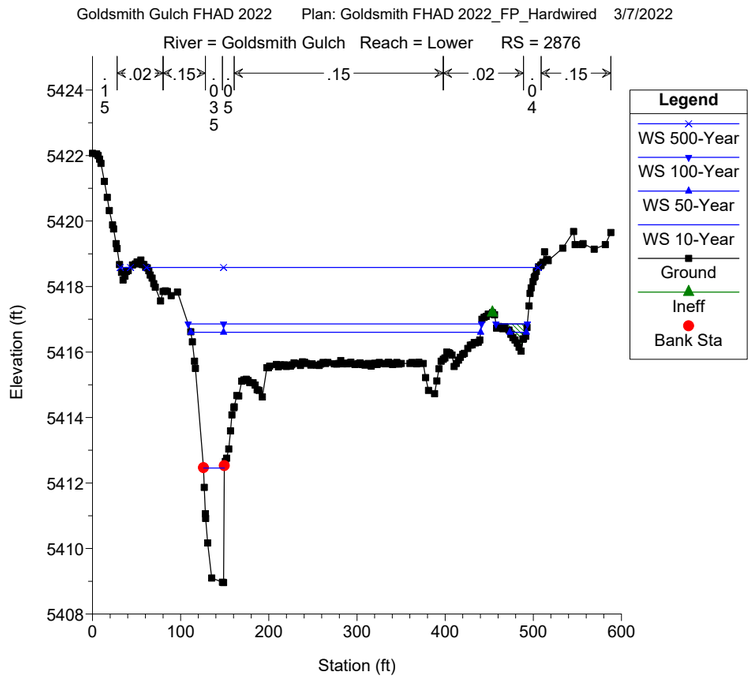

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3075
.02 .04 .15 .02 .15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

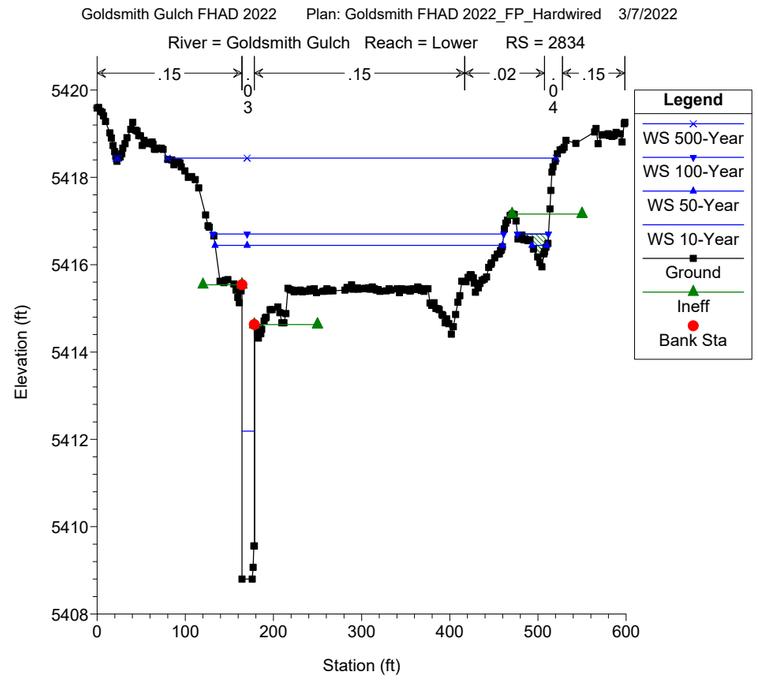

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3055 BR Sky Acres Pedestrian Bridge 2
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

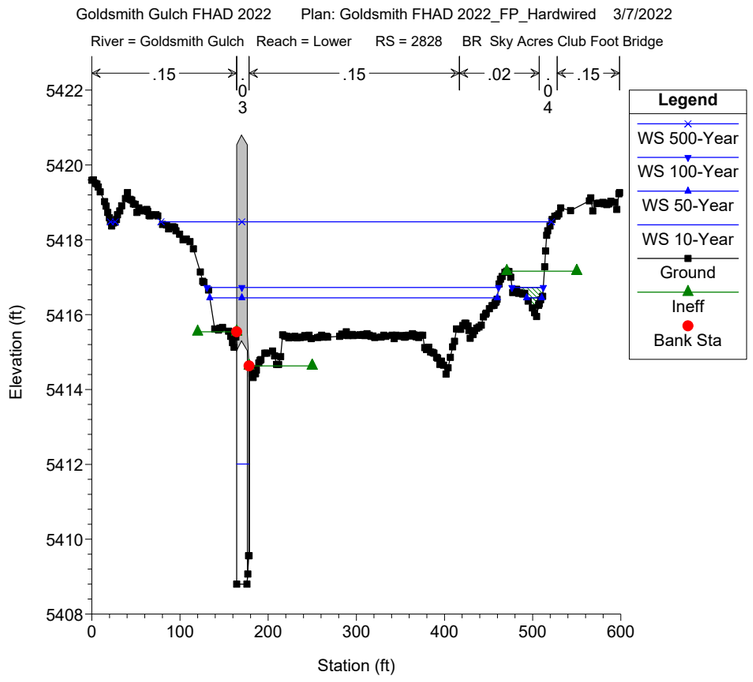

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3055 BR Sky Acres Pedestrian Bridge 2
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

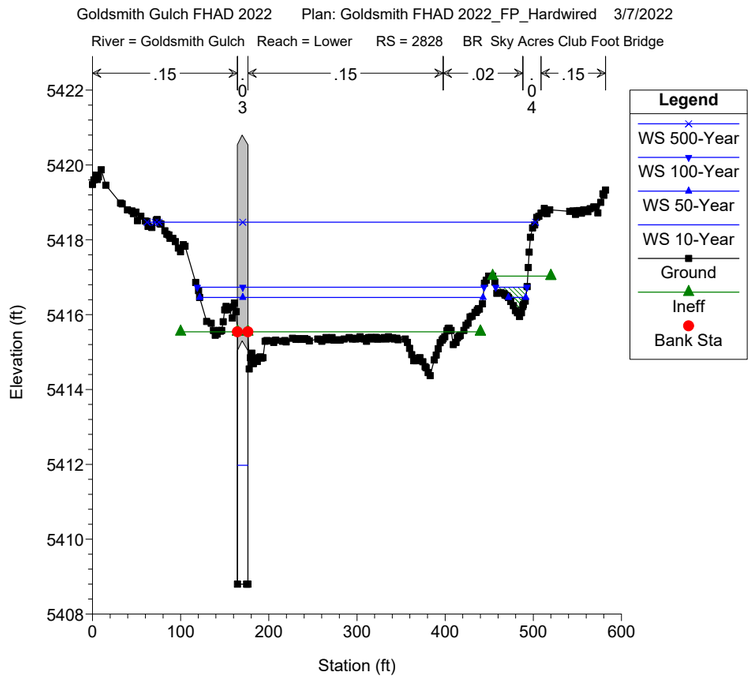

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3054
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

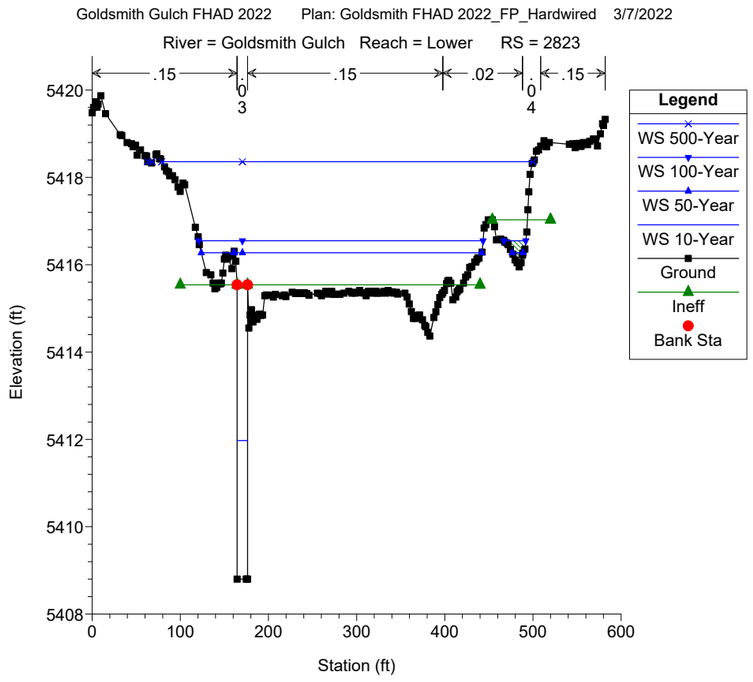

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 3000
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

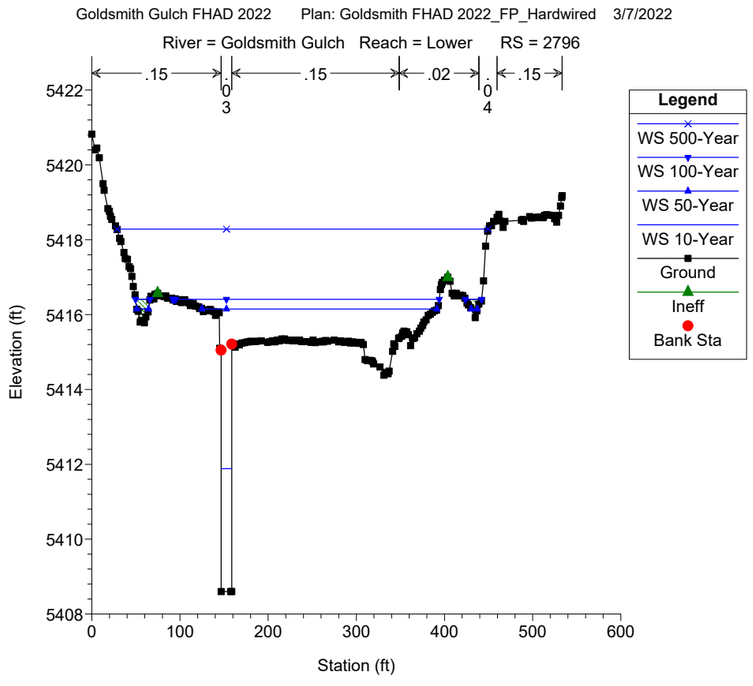

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2876
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

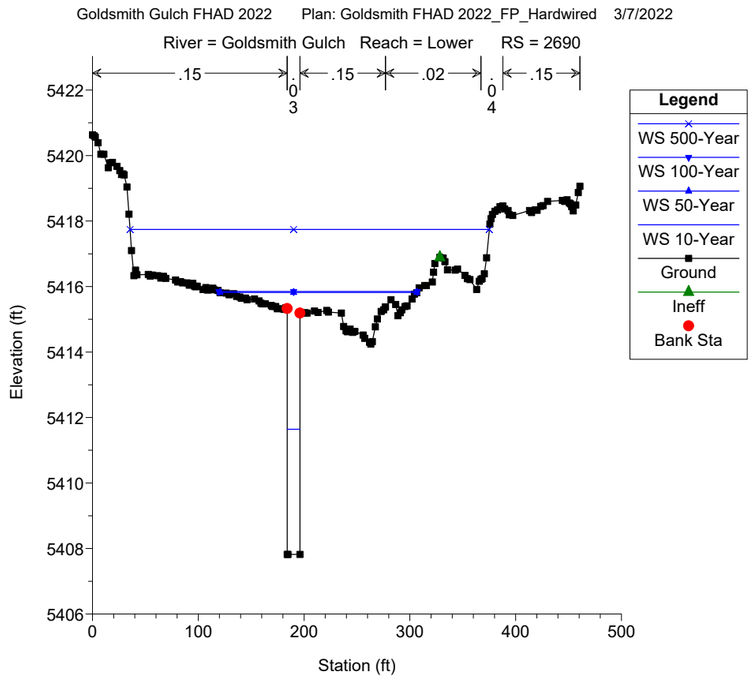

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2834
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

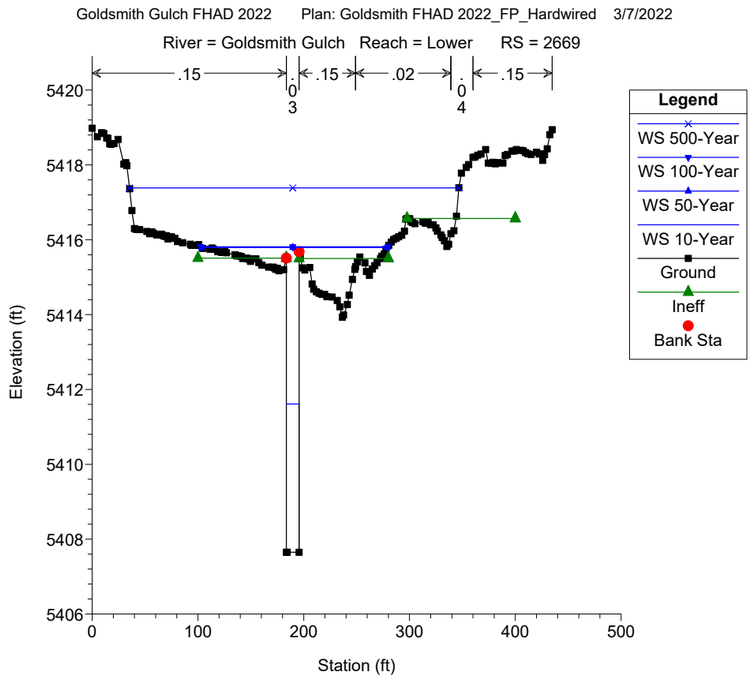

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2828 BR Sky Acres Club Foot Bridge
.15
.15
.02
.15
0
3
0
4
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

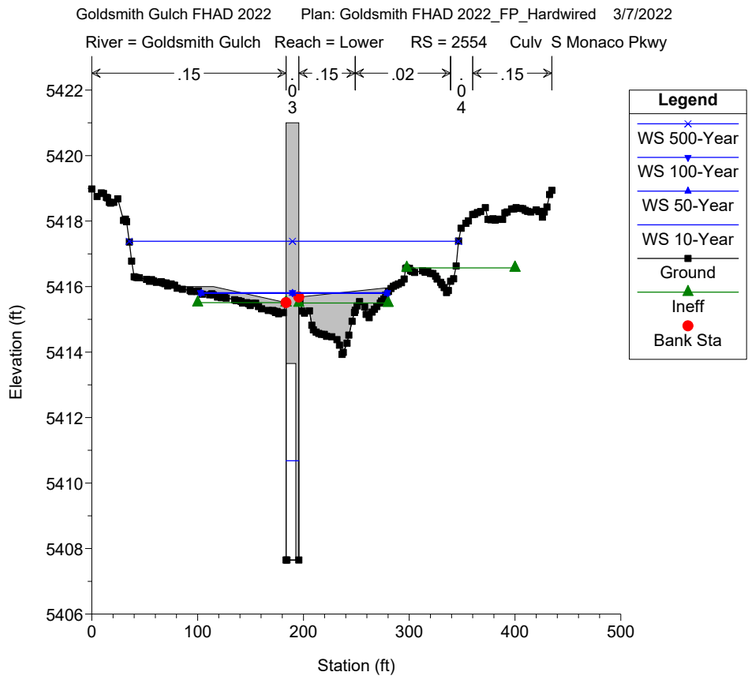

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2828 BR Sky Acres Club Foot Bridge
.15
.15
.02
.15
0
3
0
4
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

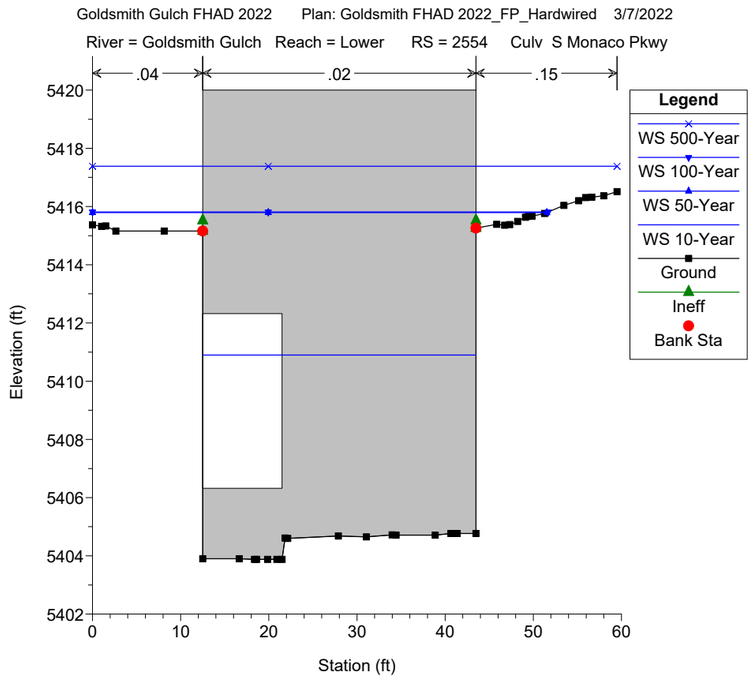

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2823
.15
.15
.02
.15
0
3
0
4
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

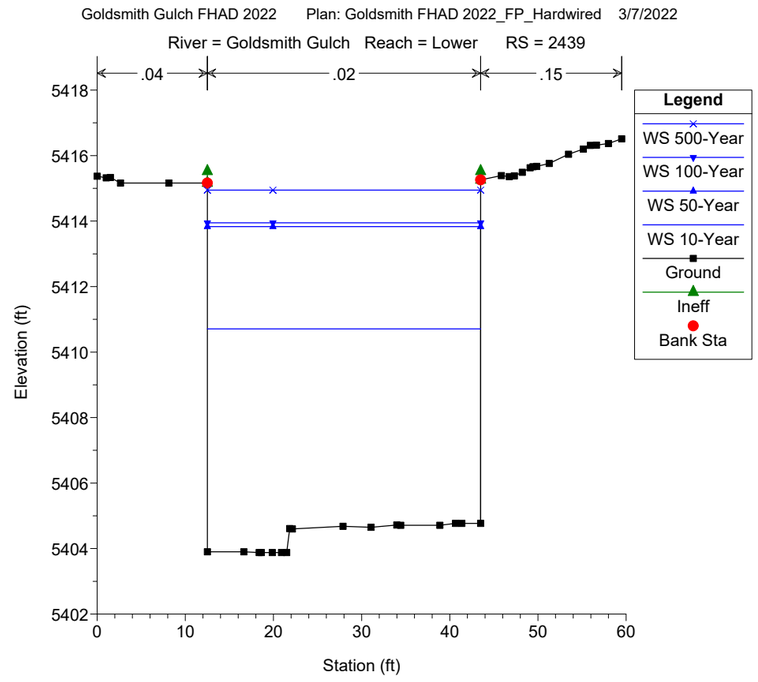

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2796
.15
.15
.02
.15
0
3
0
4
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

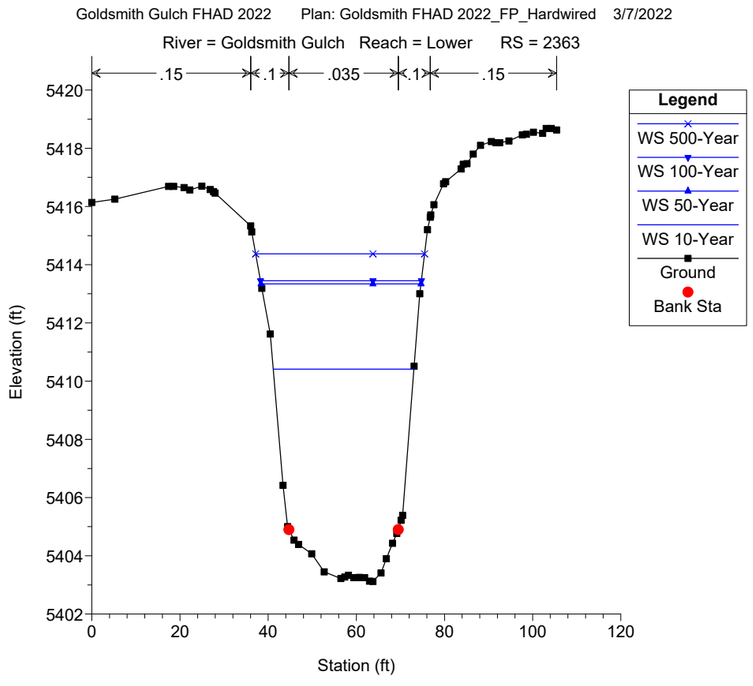

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2690
.15
.15
.02
.15
0
3
0
4
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

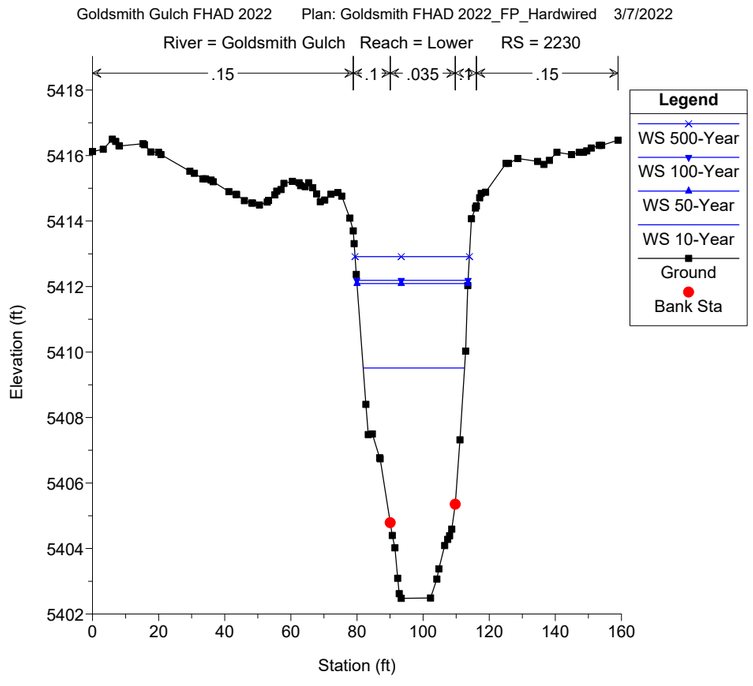

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2669
.15
.15
.02
.15
0
3
0
4
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

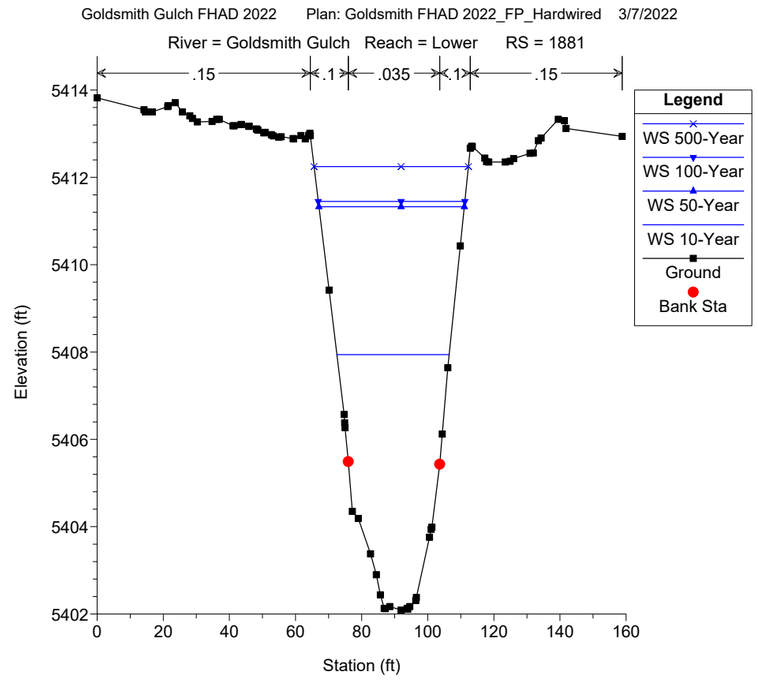

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2554 Culv S Monaco Pkwy
.15
.03
.15
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

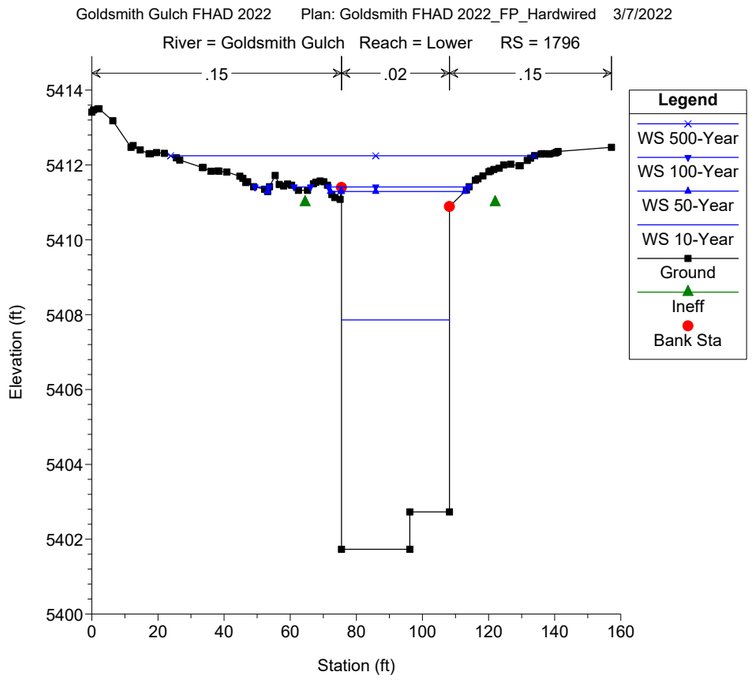

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2554 Culv S Monaco Pkwy
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

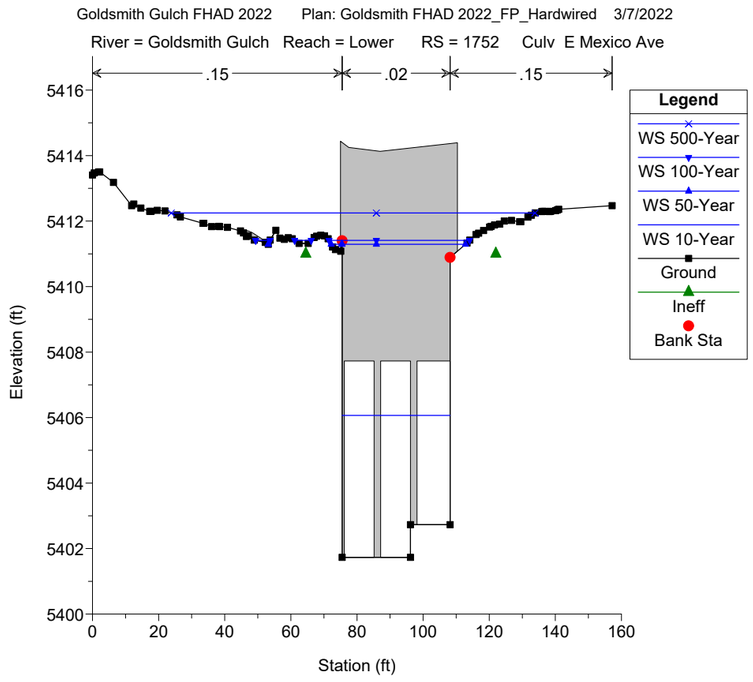

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2439
.04
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

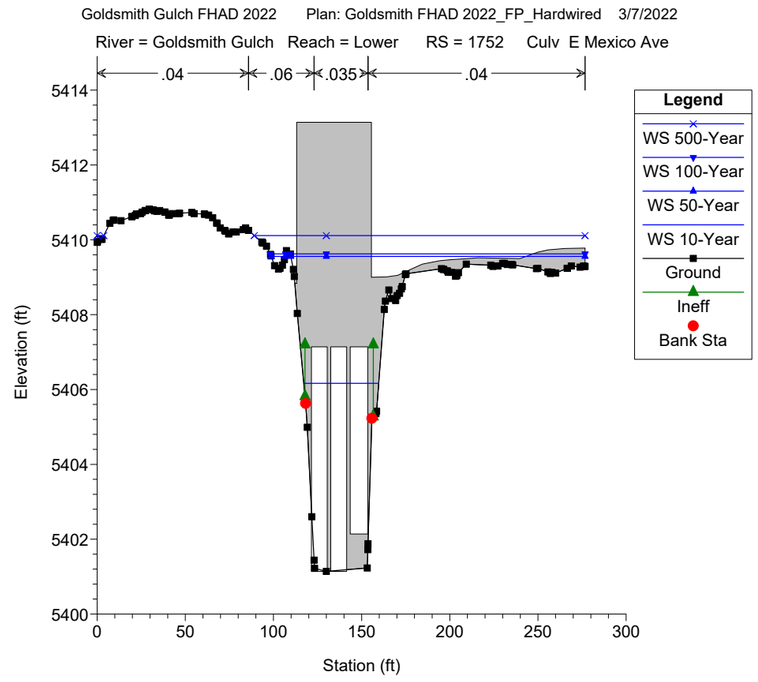

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2363
.15
.1
.035
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

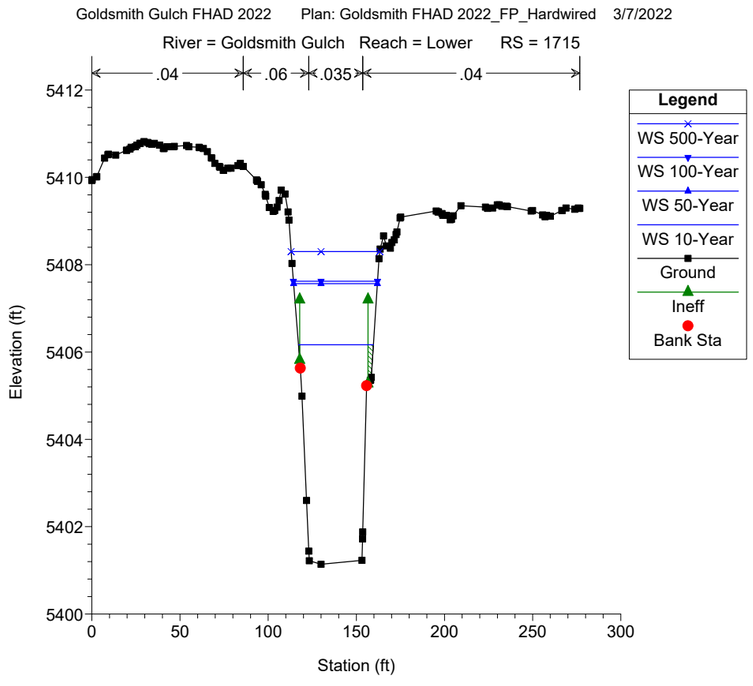

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 2230
.15
.1
.035
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

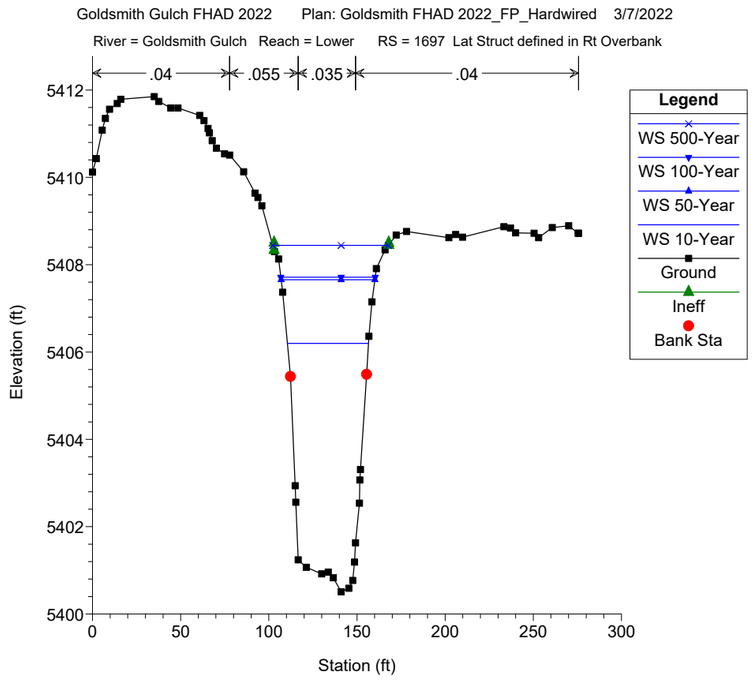

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1881
.15
.1
.035
.1
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

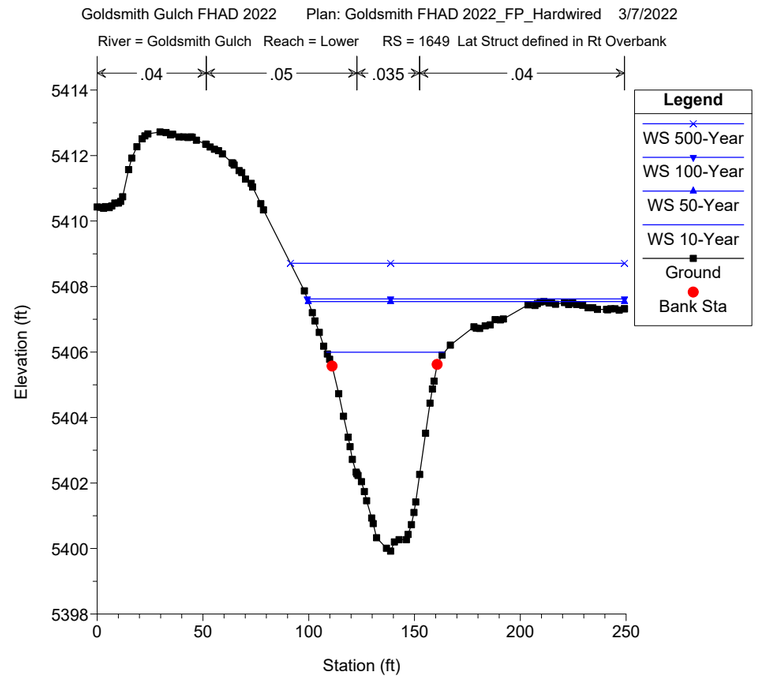

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1796
.15
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

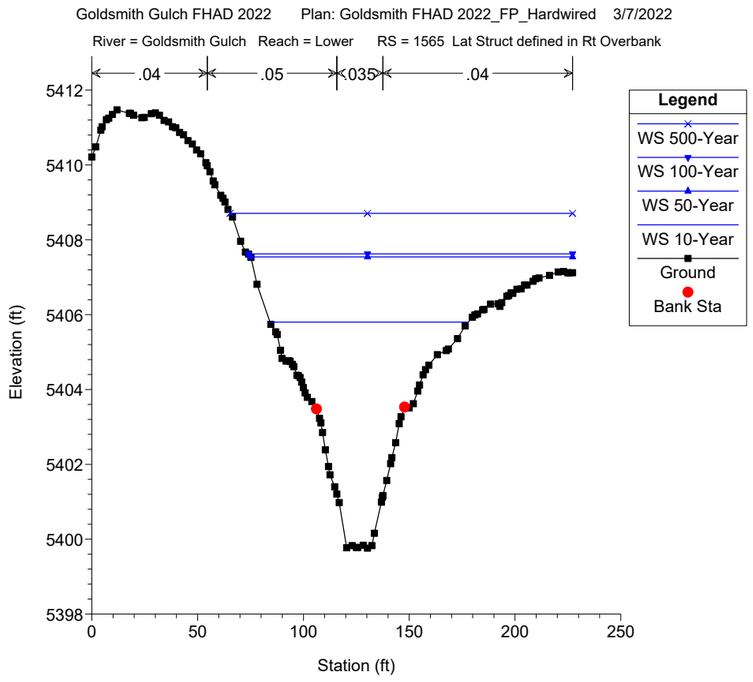

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1752 Culv E Mexico Ave
.15
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

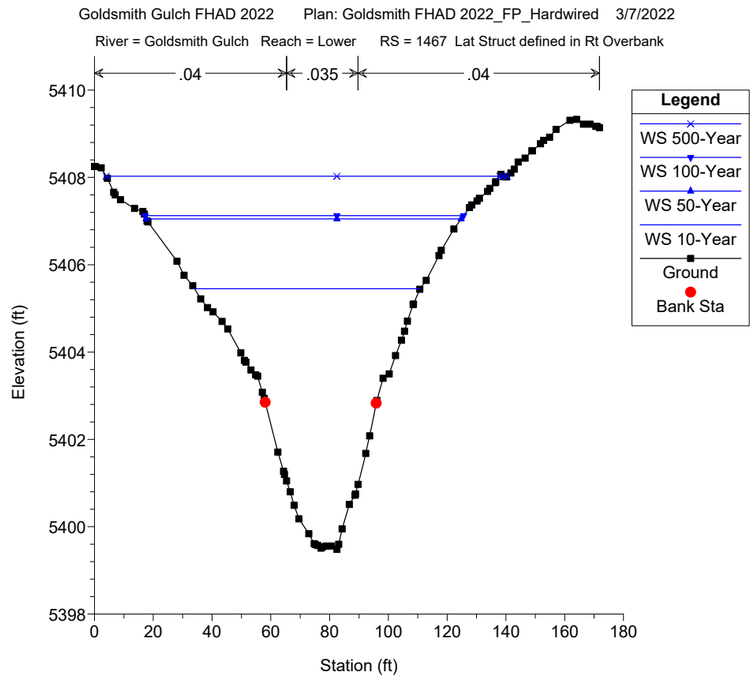

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1752 Culv E Mexico Ave
.04
.06
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

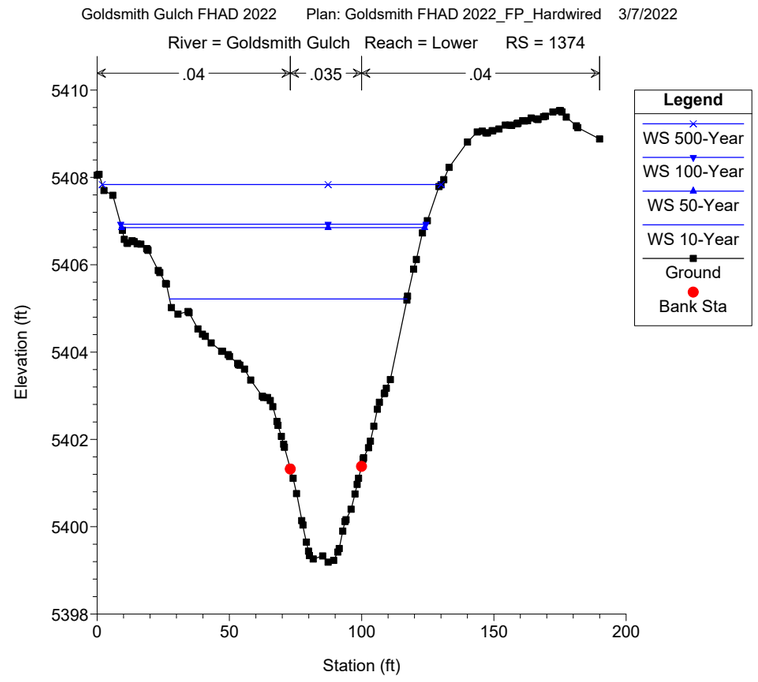

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1715
.04
.06
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

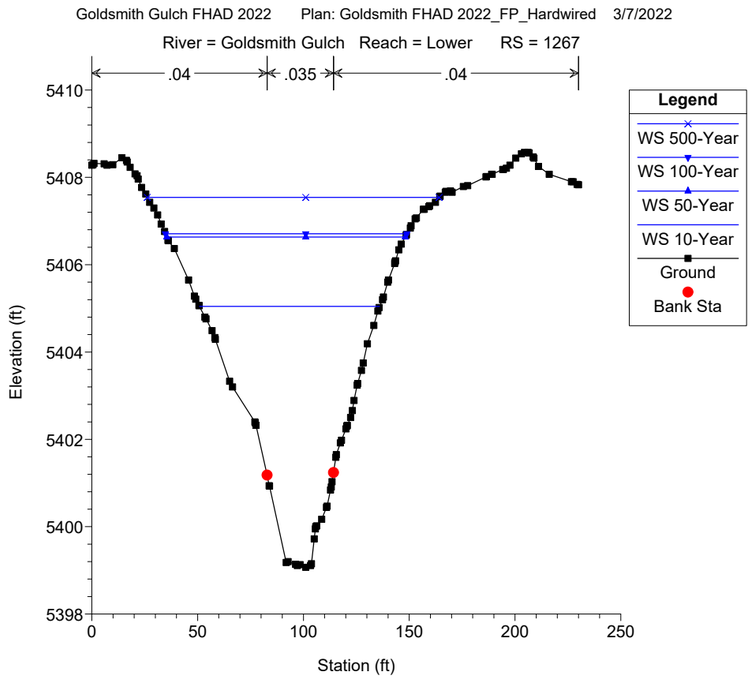

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1697 Lat Struct defined in Rt Overbank
.04
.055
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

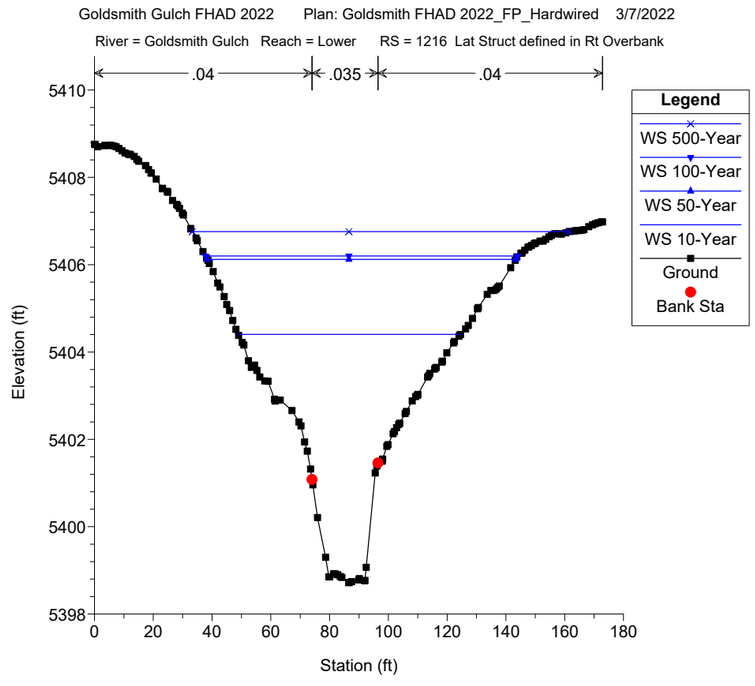

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1649 Lat Struct defined in Rt Overbank
.04
.05
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

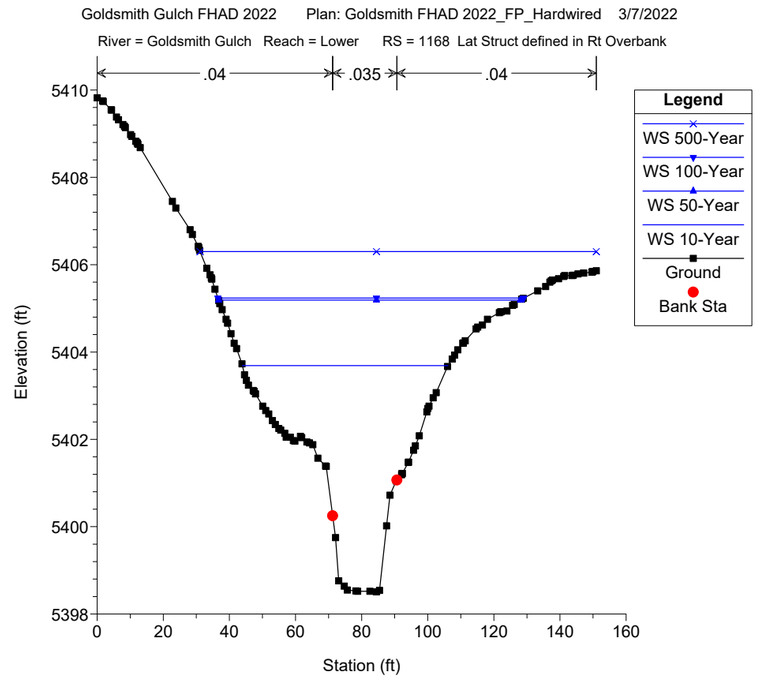

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1565 Lat Struct defined in Rt Overbank
.04
.05
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

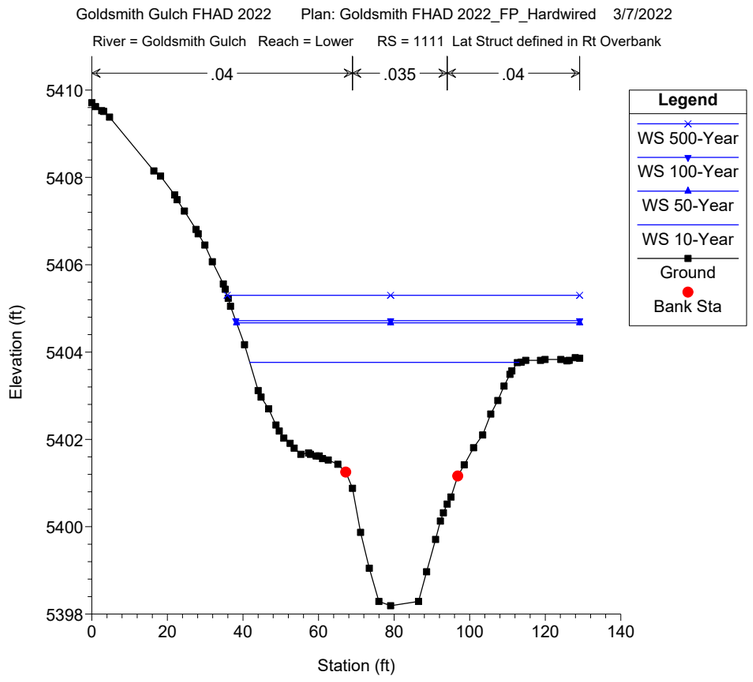

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1467 Lat Struct defined in Rt Overbank
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

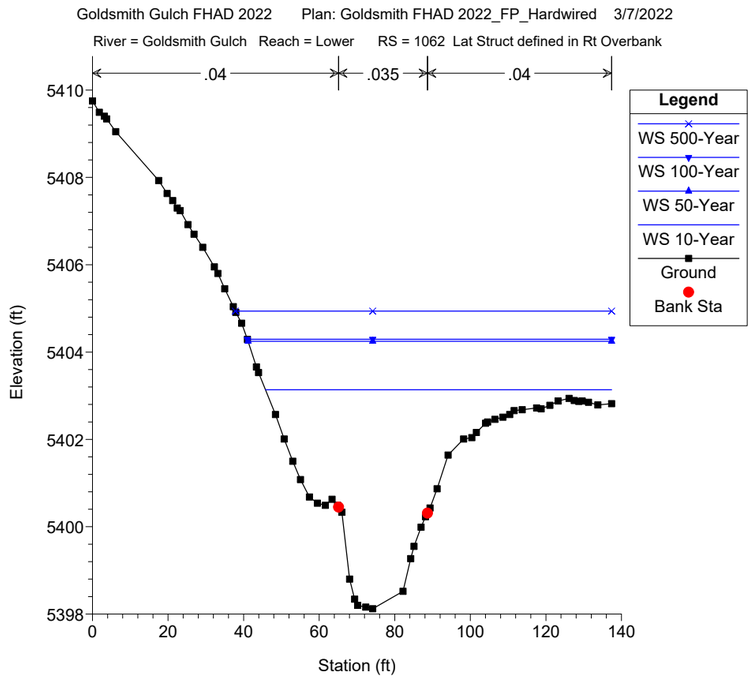

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1374
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

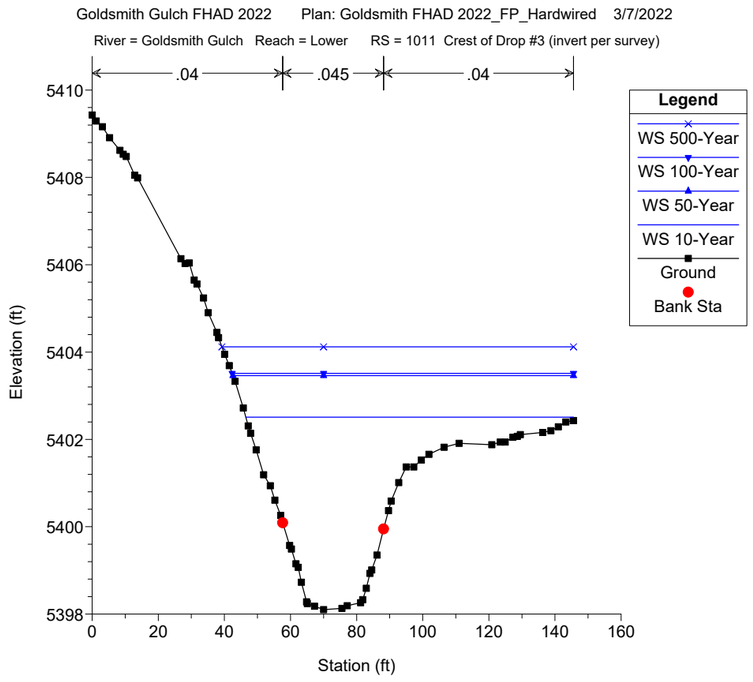

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1267
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

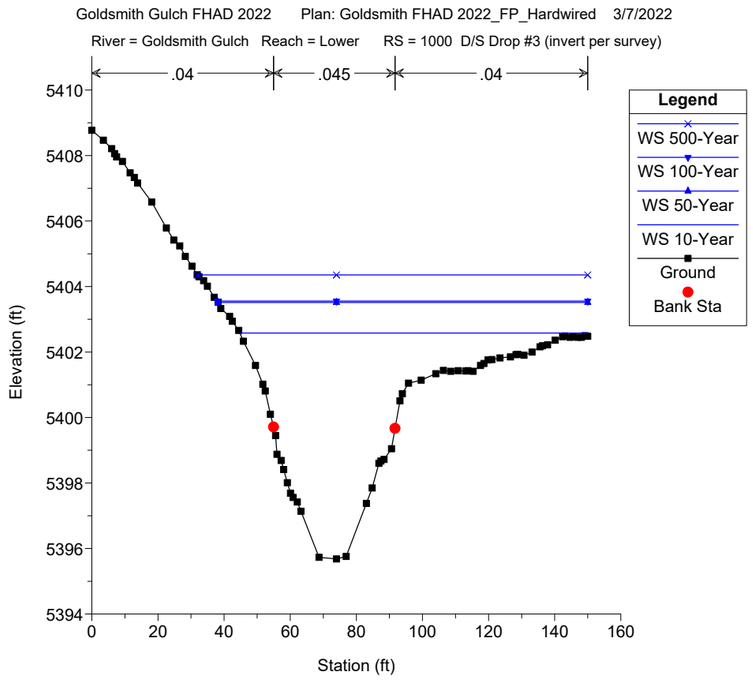

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1216 Lat Struct defined in Rt Overbank
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

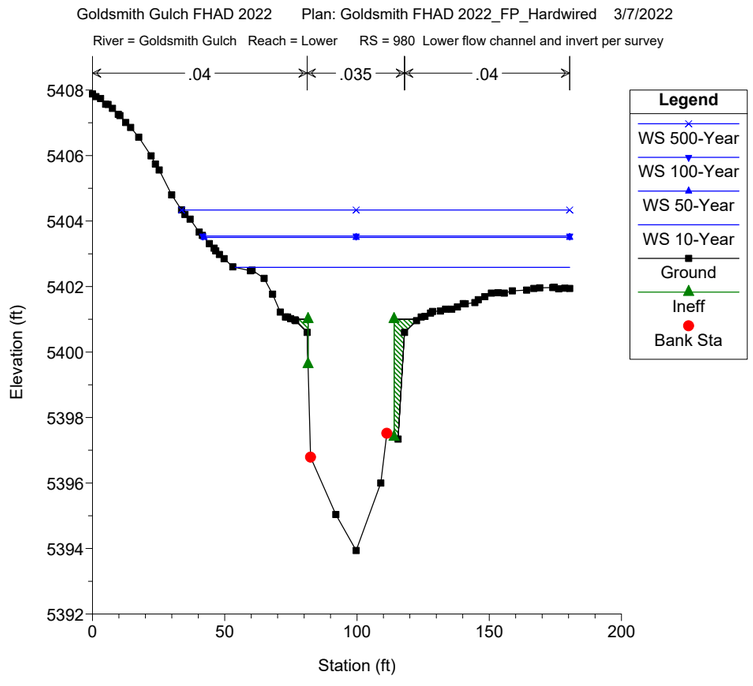

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1168 Lat Struct defined in Rt Overbank
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

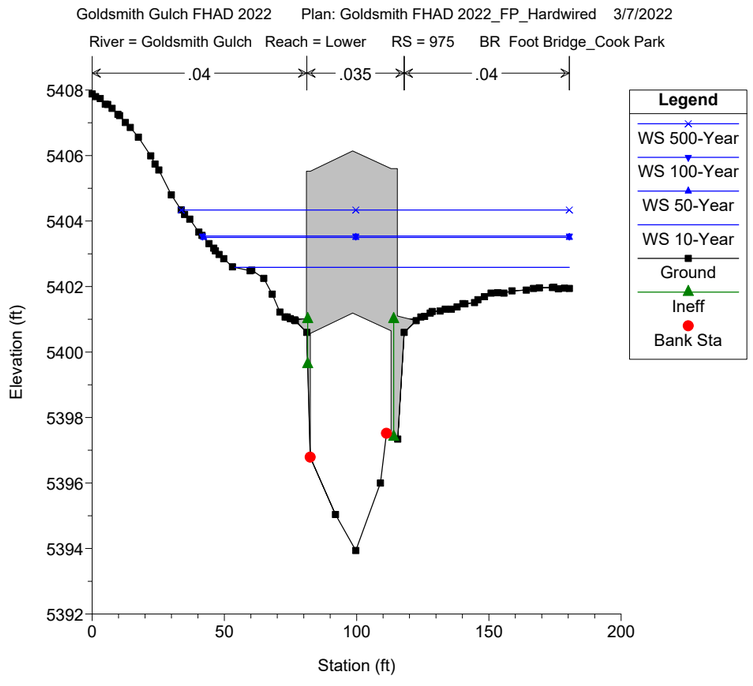

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1111 Lat Struct defined in Rt Overbank
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

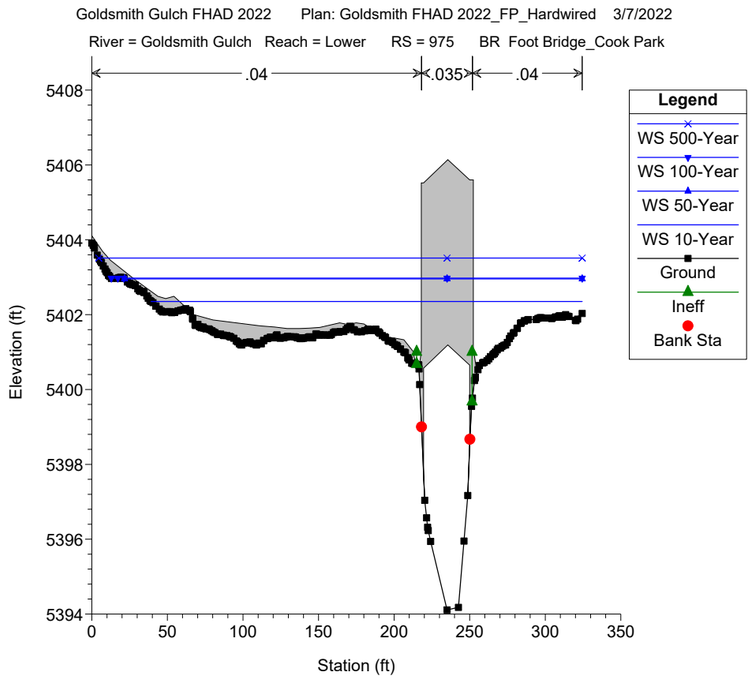

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1062 Lat Struct defined in Rt Overbank
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

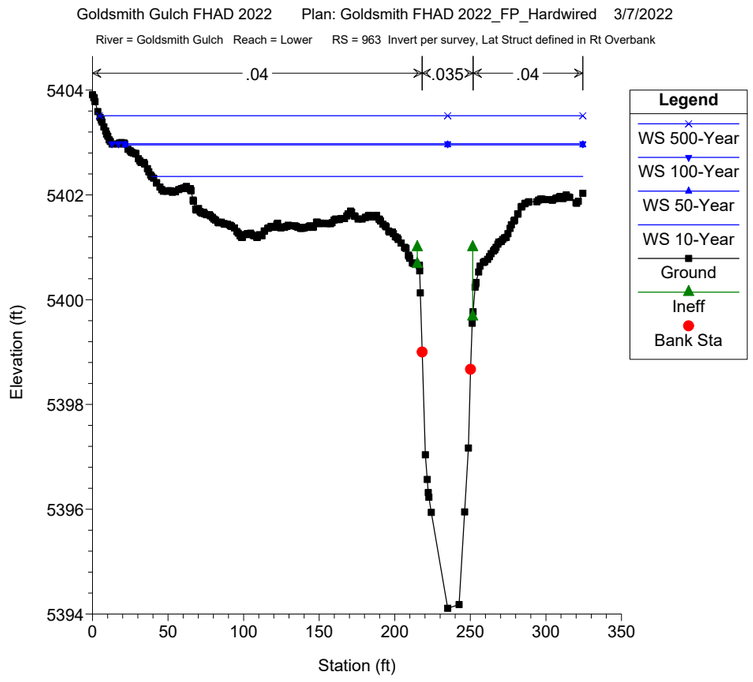

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1011 Crest of Drop #3 (invert per survey)
.04
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

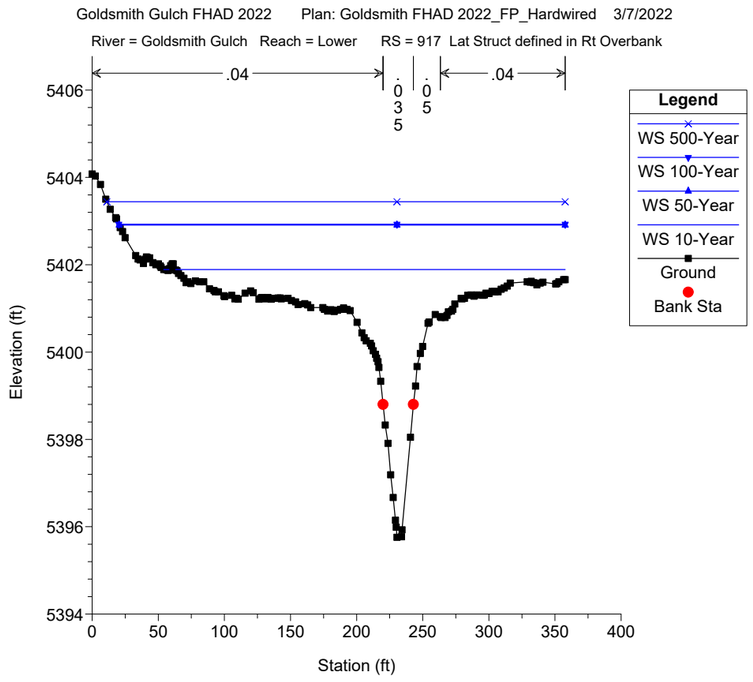

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 1000 D/S Drop #3 (invert per survey)
.04
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

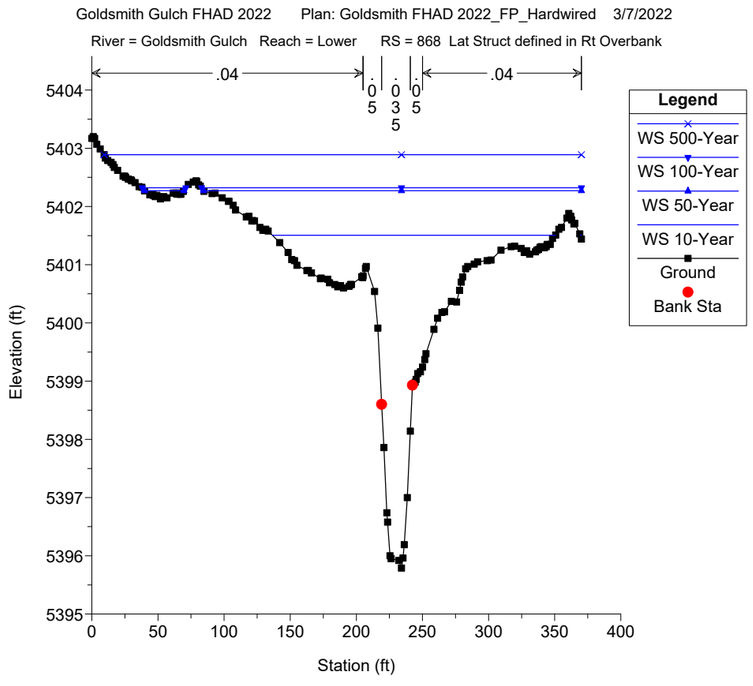

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 980 Lower flow channel and invert per survey
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

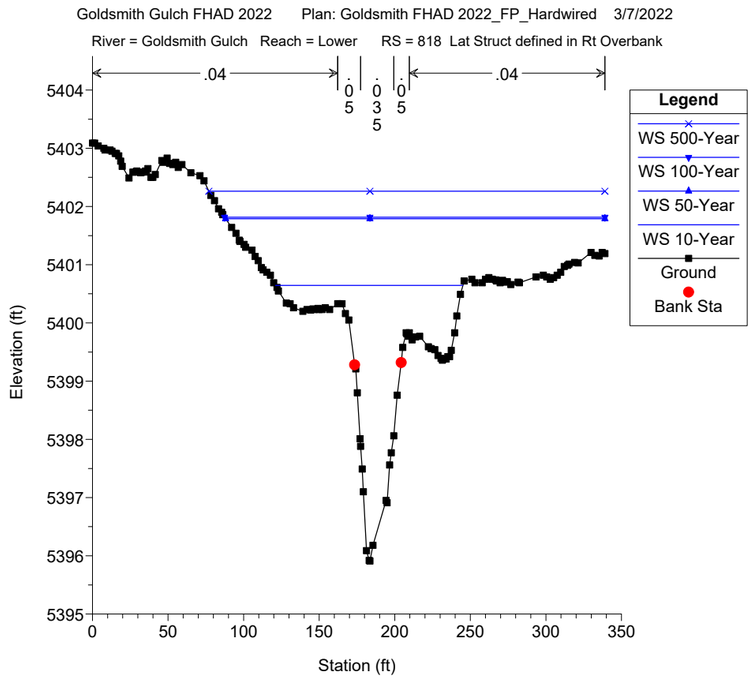

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 975 BR Foot Bridge_Cook Park
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

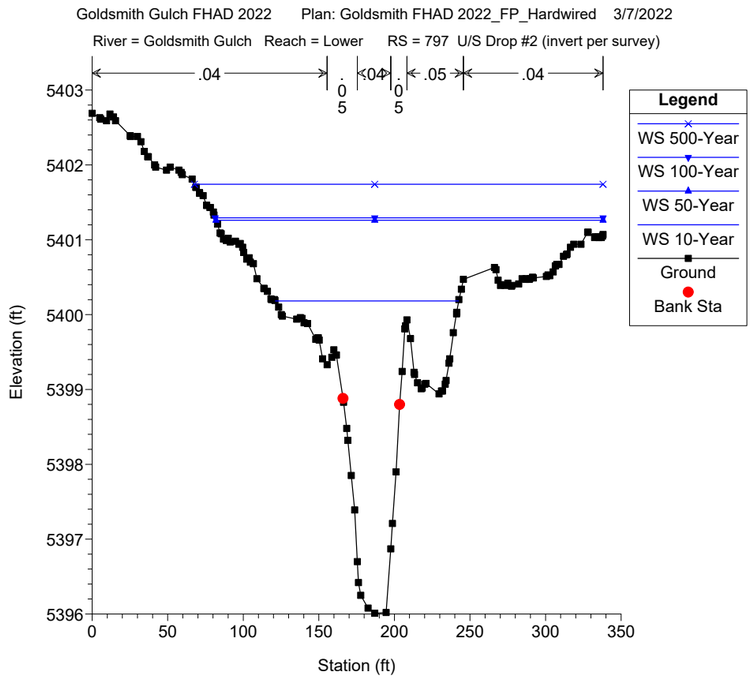

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 975 BR Foot Bridge_Cook Park
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

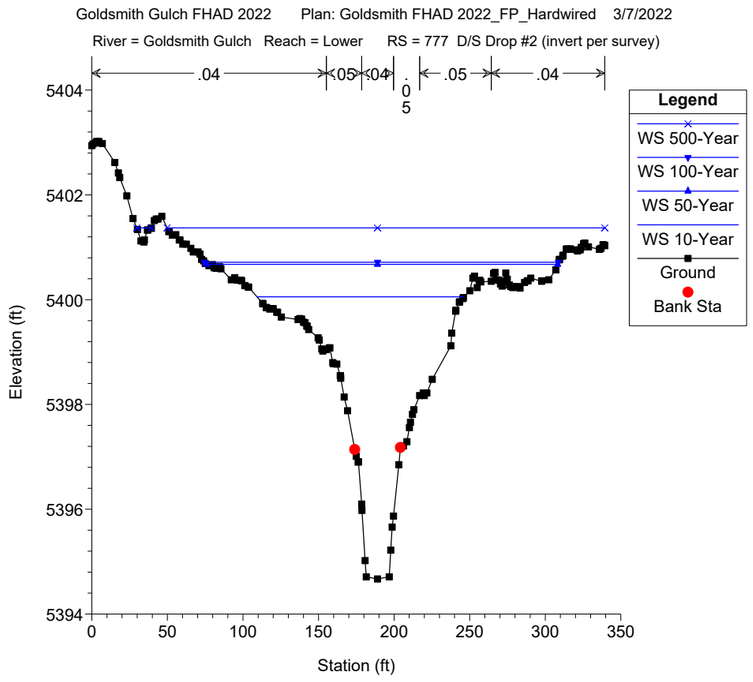

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 963 Invert per survey, Lat Struct defined in Rt Overbank
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

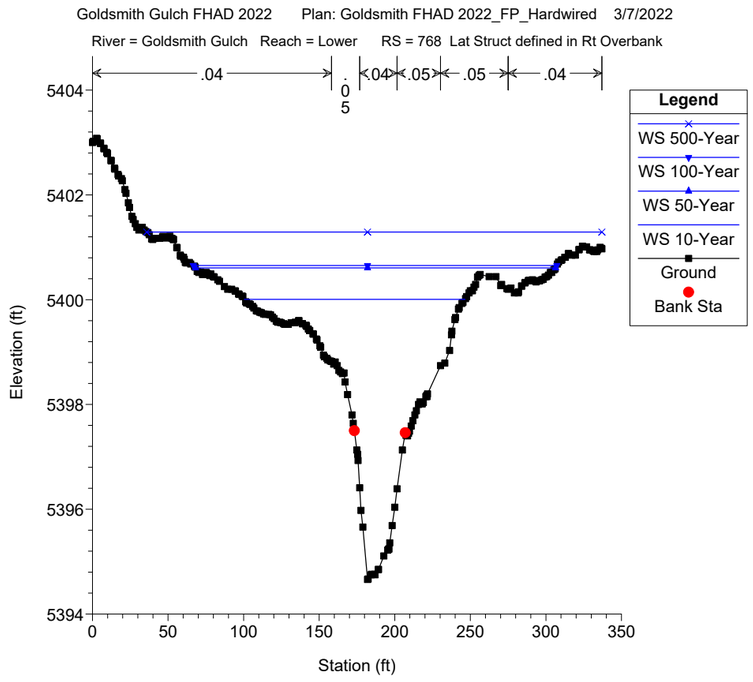

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 917 Lat Struct defined in Rt Overbank
.04
.035
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

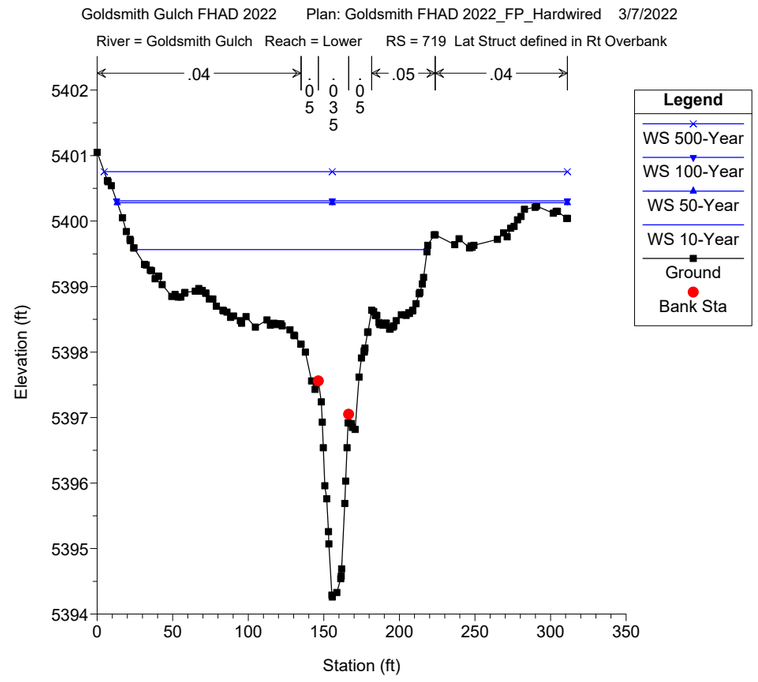

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 868 Lat Struct defined in Rt Overbank
.04
.05
.035
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

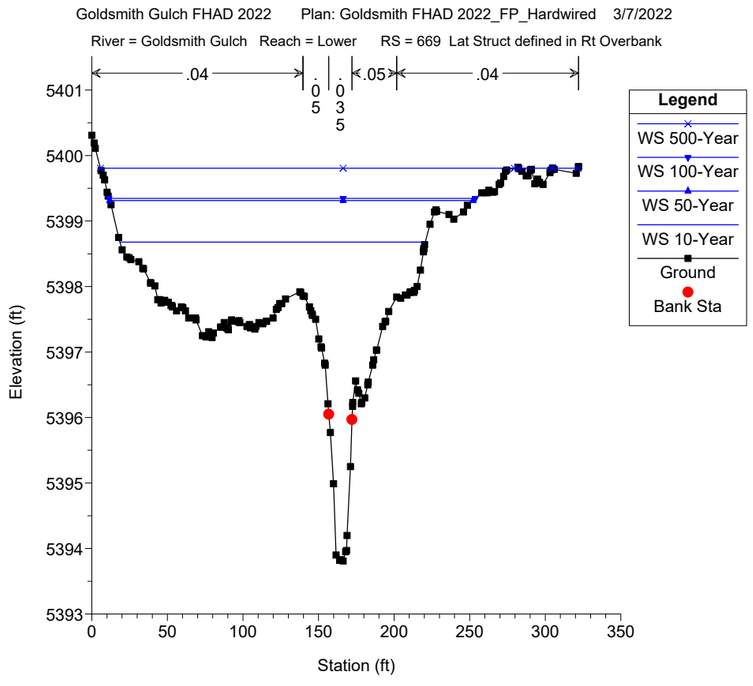

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 818 Lat Struct defined in Rt Overbank
.04
.05
.035
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

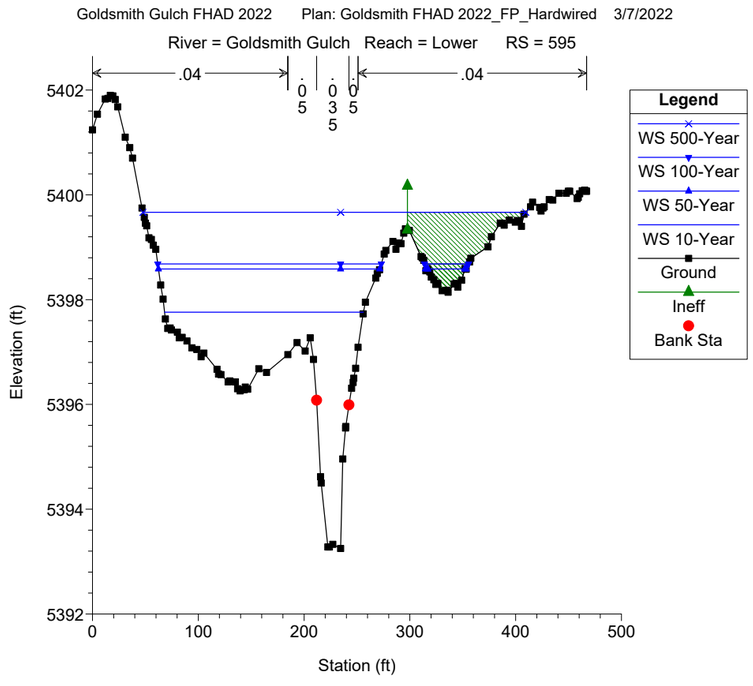

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 797 U/S Drop #2 (invert per survey)
.04
.05
.04
.05
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

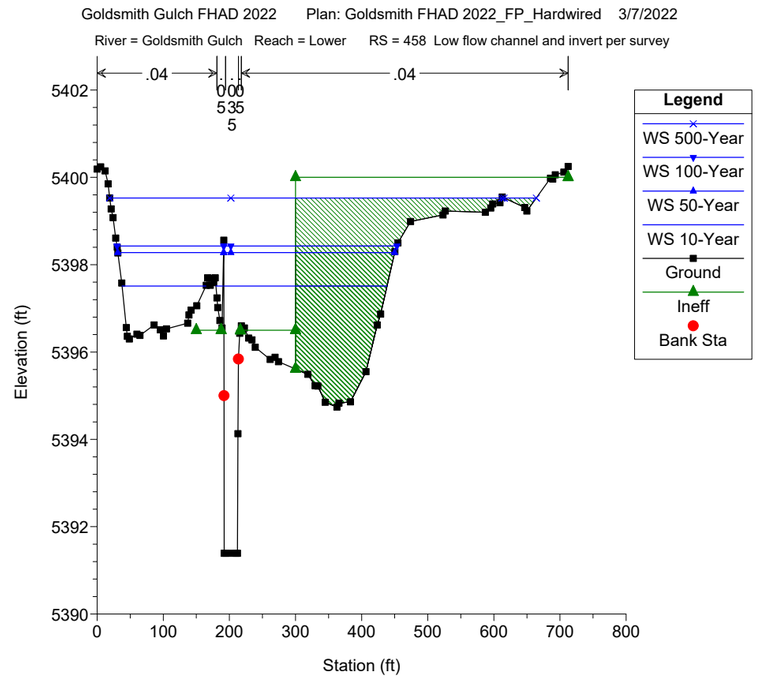

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 777 D/S Drop #2 (invert per survey)
.04
.05
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

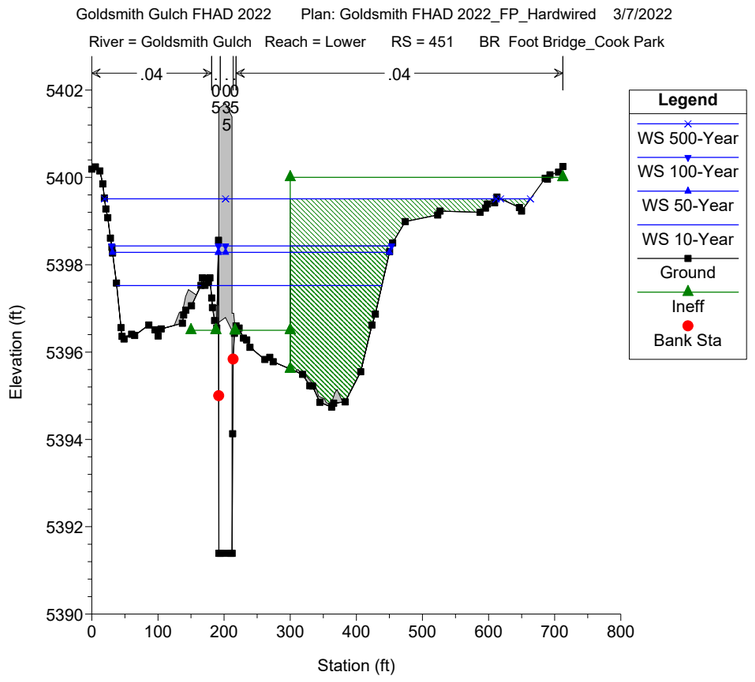

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 768 Lat Struct defined in Rt Overbank
.04
.05
.04
.05
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

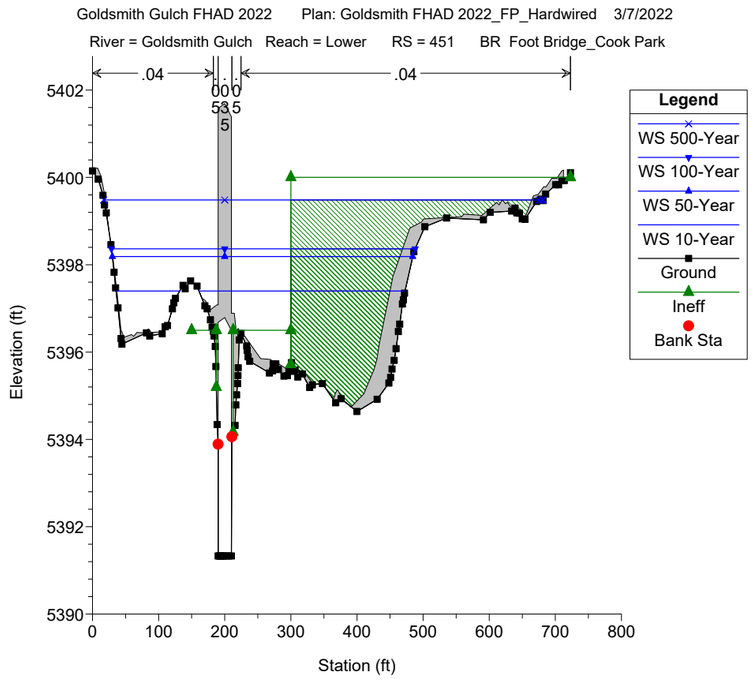

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 719 Lat Struct defined in Rt Overbank
.04
.05
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

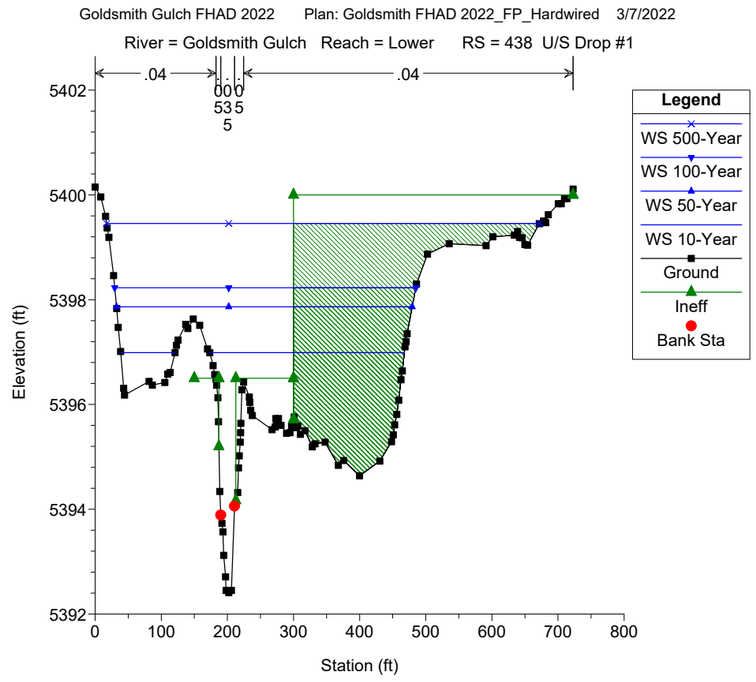

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 669 Lat Struct defined in Rt Overbank
.04
.05
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

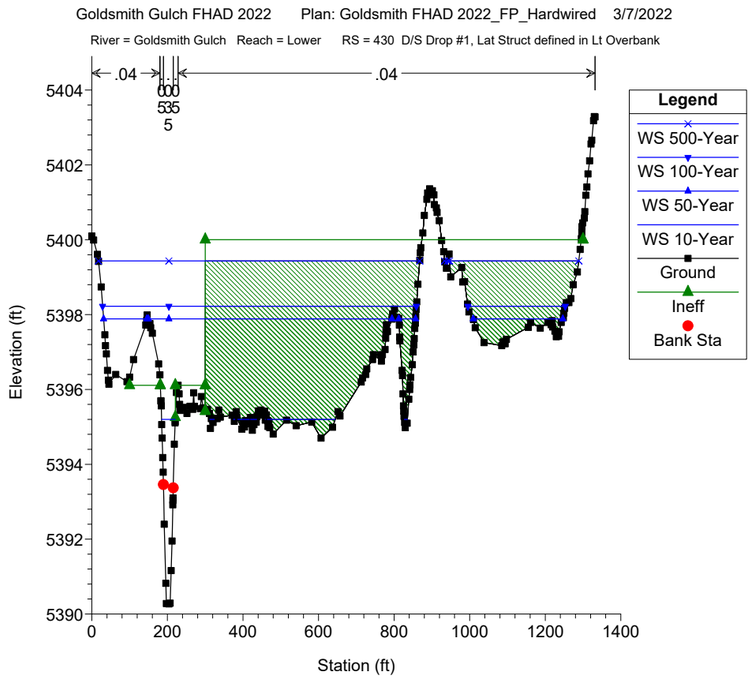

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 595
.04
.05
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

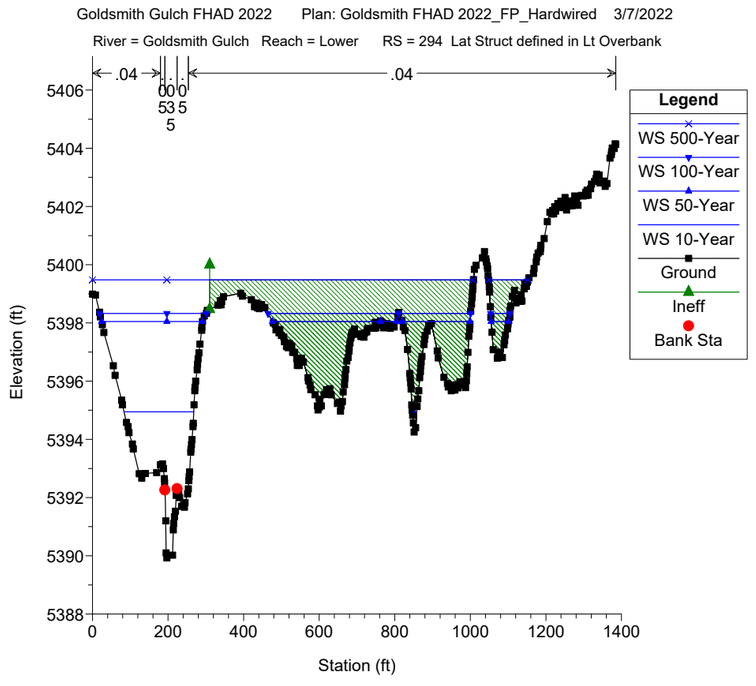

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 458 Low flow channel and invert per survey
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

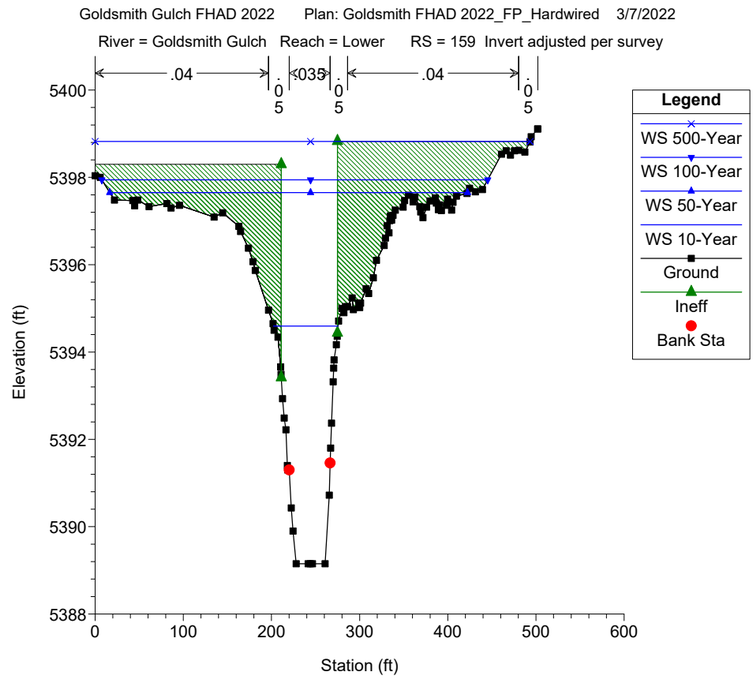

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 451 BR Foot Bridge_Cook Park
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

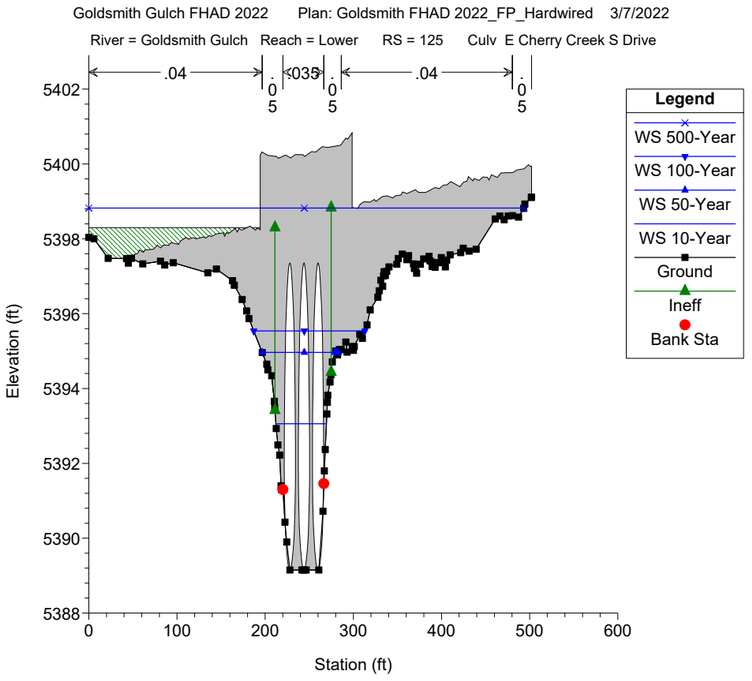

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 451 BR Foot Bridge_Cook Park
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

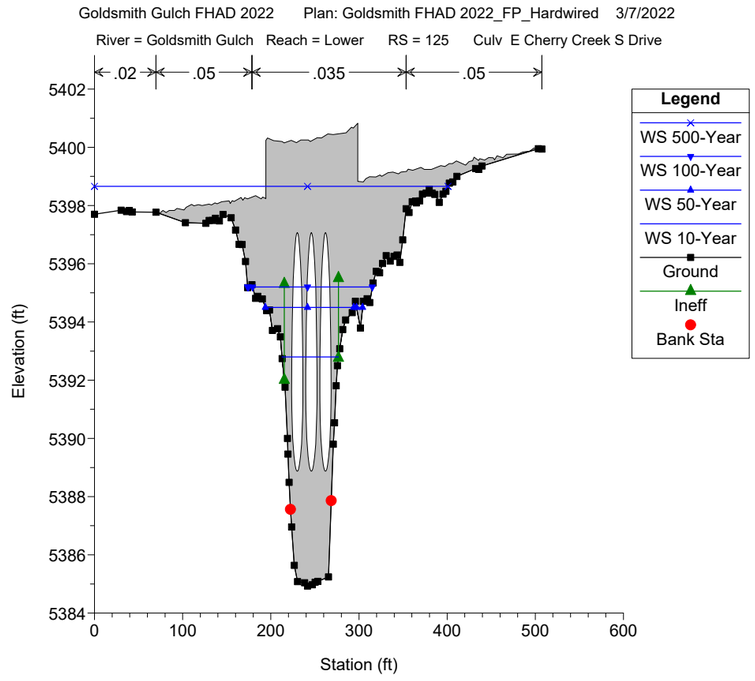

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 438 U/S Drop #1
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

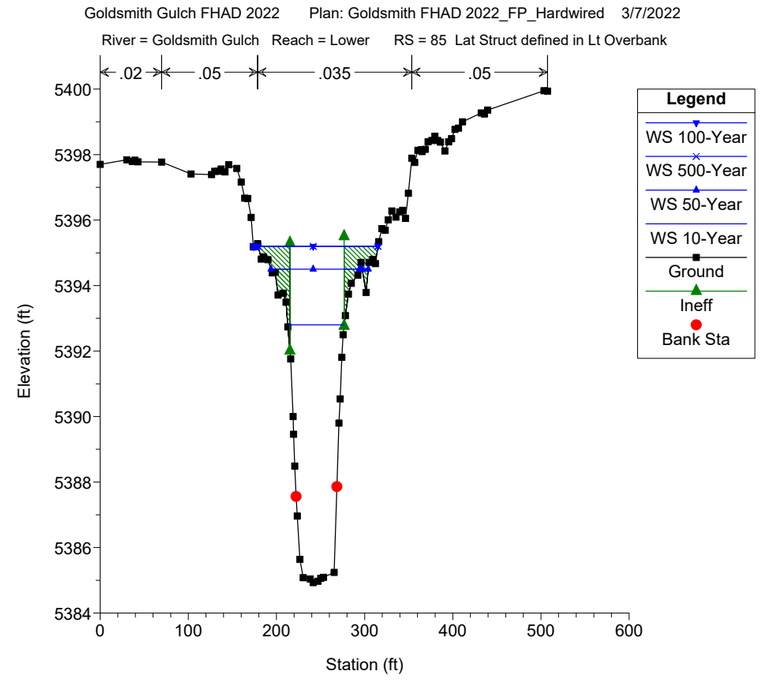

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 430 D/S Drop #1, Lat Struct defined in Lt Overbank
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 294 Lat Struct defined in Lt Overbank
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 159 Invert adjusted per survey
.04
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

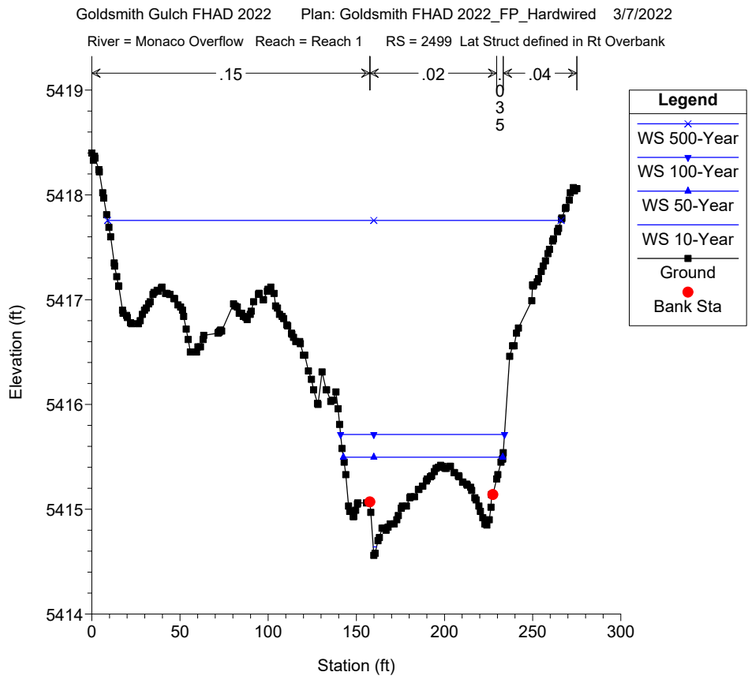

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 125 Culv E Cherry Creek S Drive
.04
.05
.035
.05
.04
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5402
5400
5398
5396
5394
5392
5390
5388
0
100
200
300
400
500
600

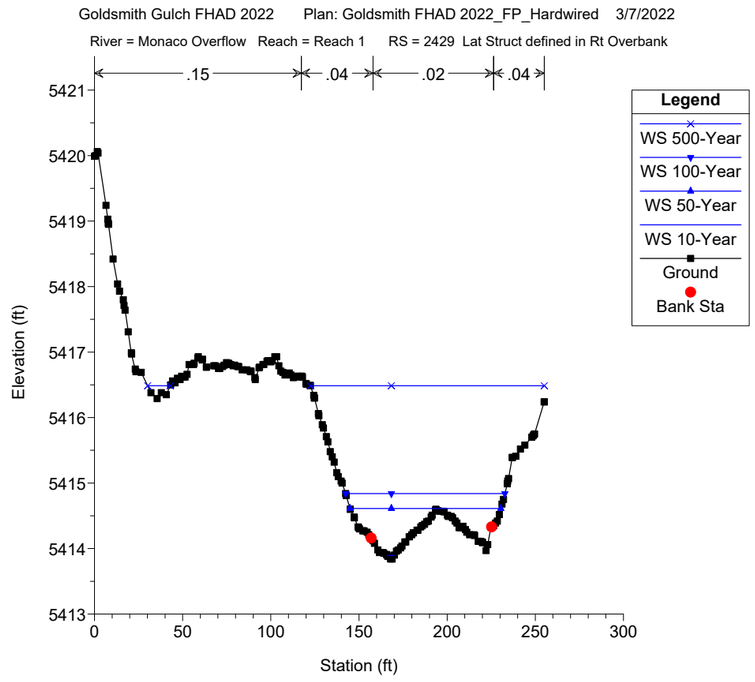

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 125 Culv E Cherry Creek S Drive
.02
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5402
5400
5398
5396
5394
5392
5390
5388
5386
5384
0
100
200
300
400
500
600

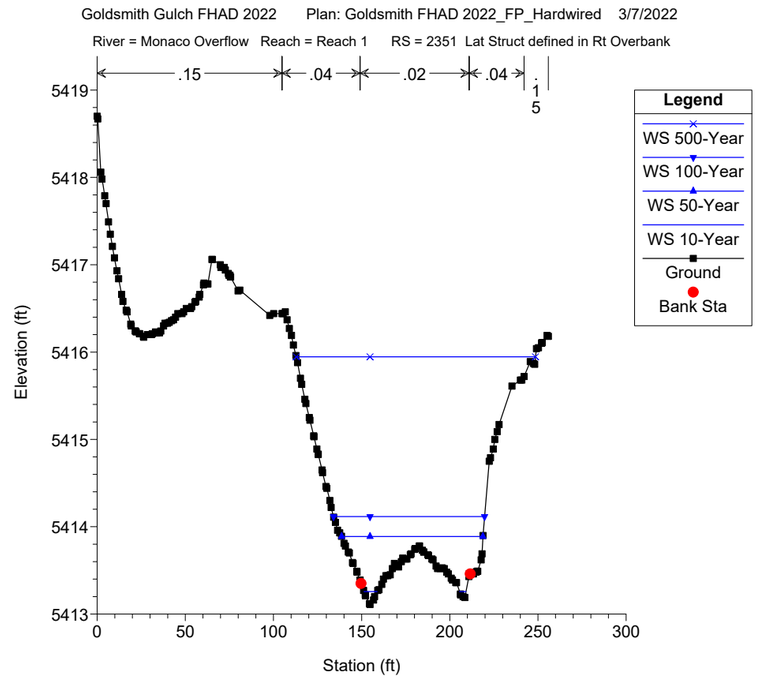

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Goldsmith Gulch Reach = Lower RS = 85 Lat Struct defined in Lt Overbank
.02
.05
.035
.05
Legend
WS 100-Year
WS 500-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5400
5398
5396
5394
5392
5390
5388
5386
5384
0
100
200
300
400
500
600

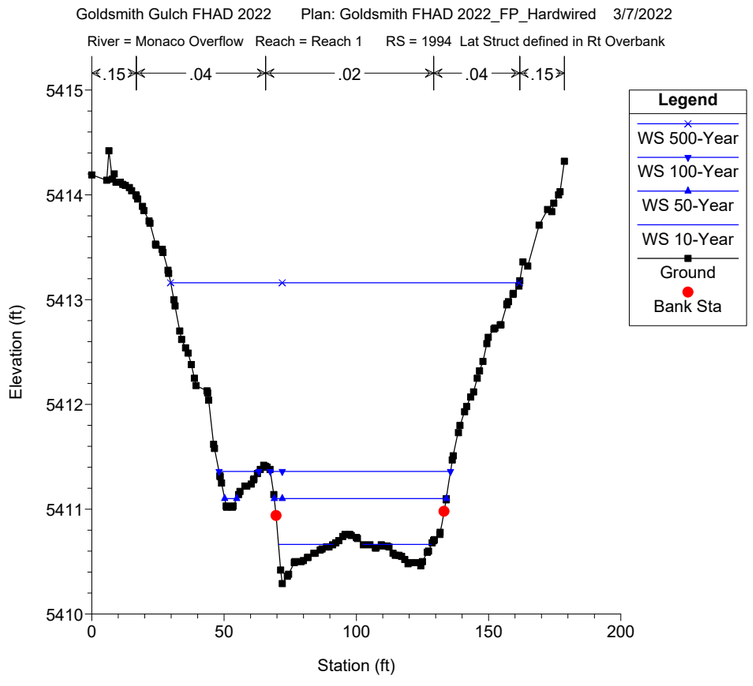
HEC-RAS Sections

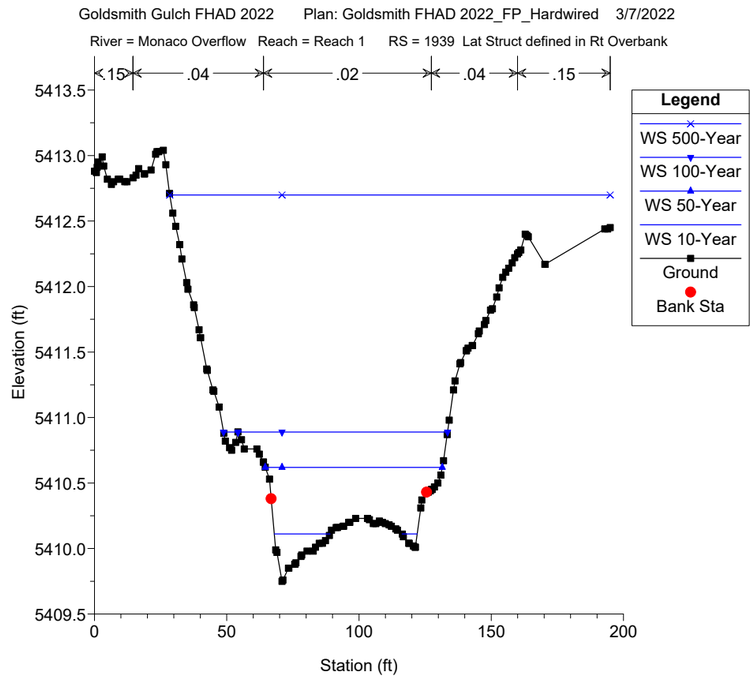
Monaco Pkwy Overflow

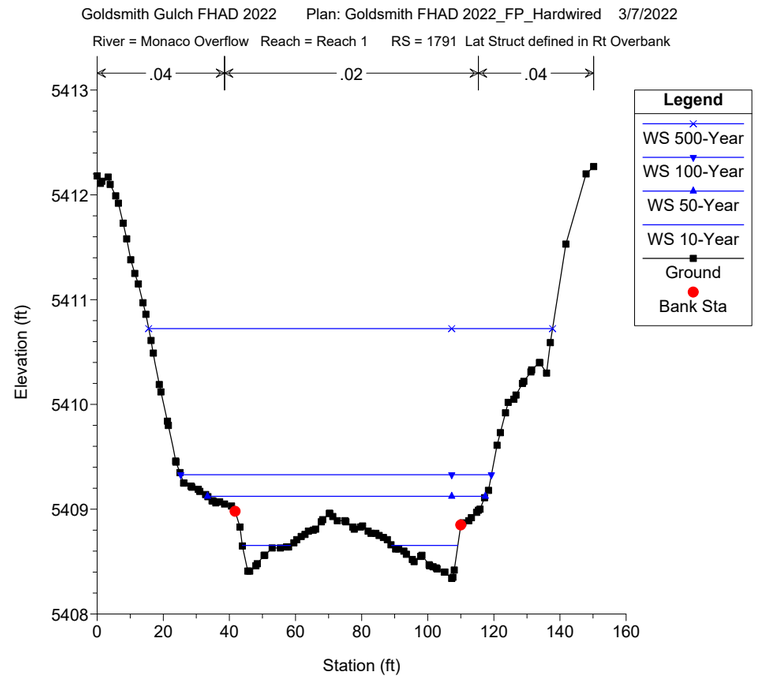

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 2499 Lat Struct defined in Rt Overbank
.15
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

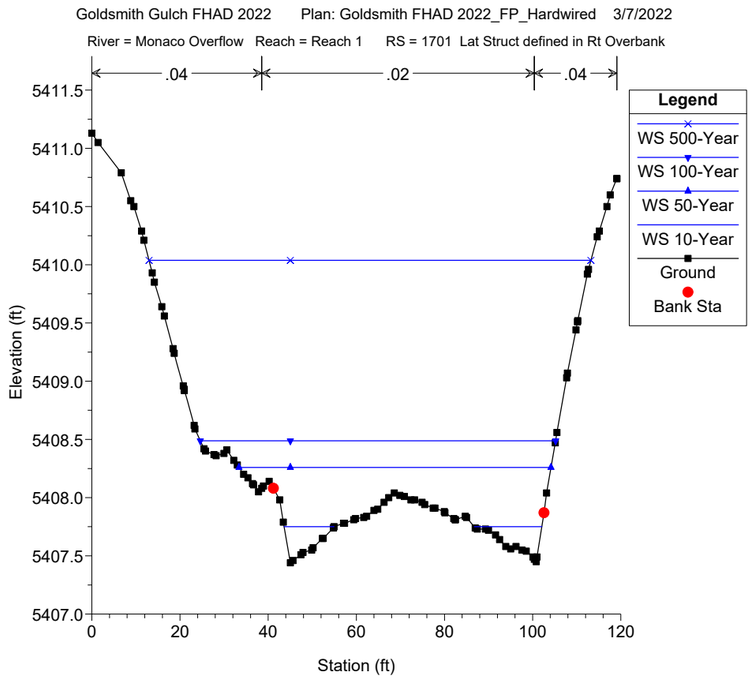

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 2429 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

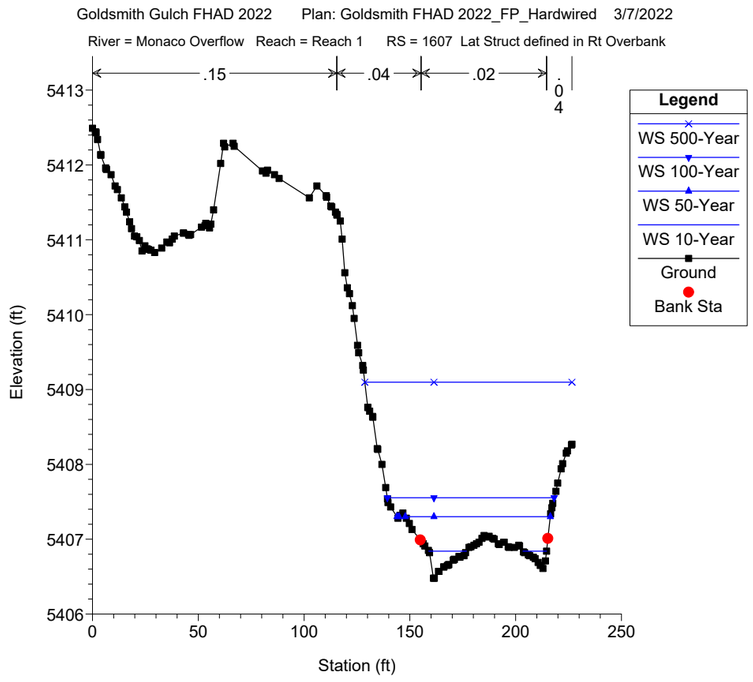

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 2351 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

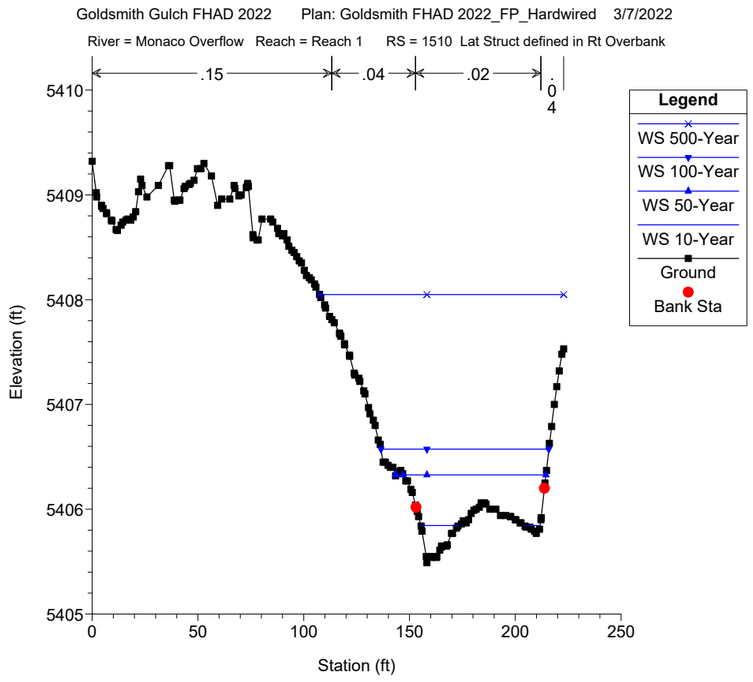

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1994 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

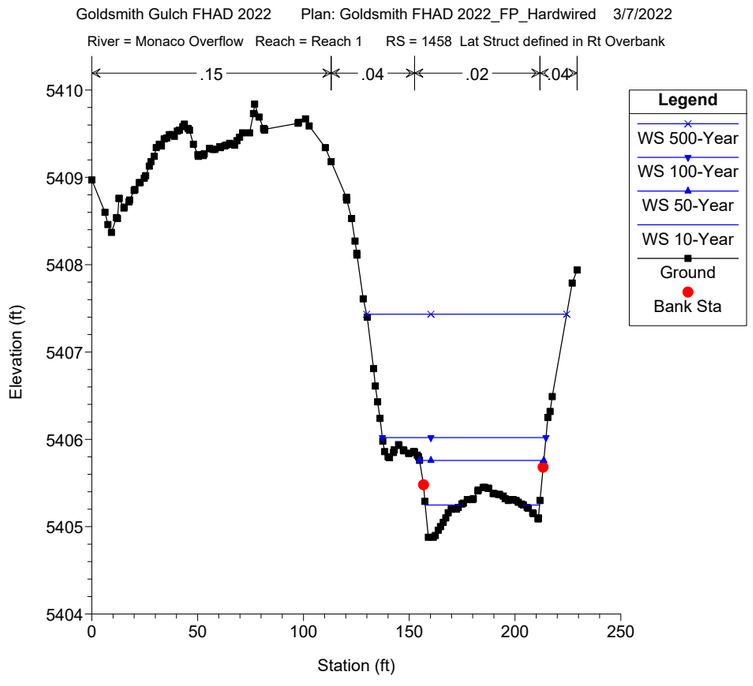

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1939 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

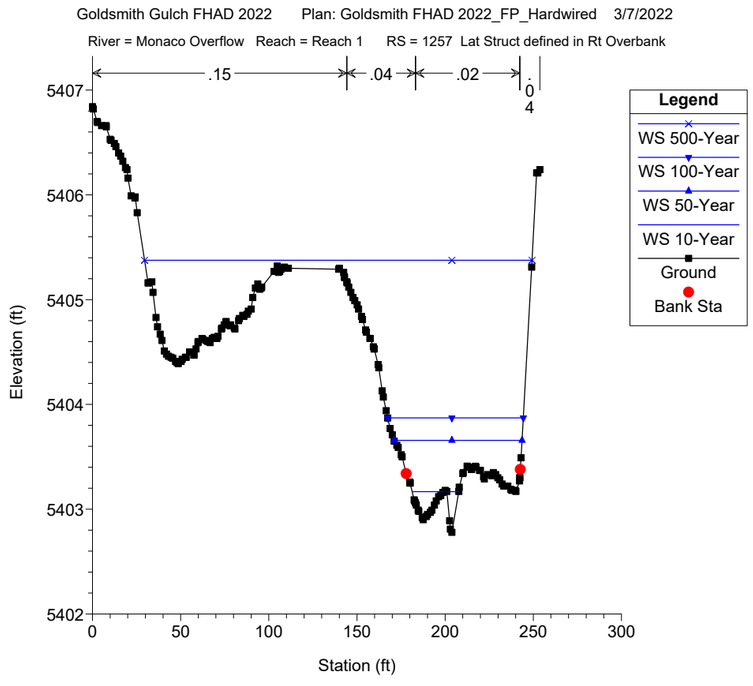

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1791 Lat Struct defined in Rt Overbank
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

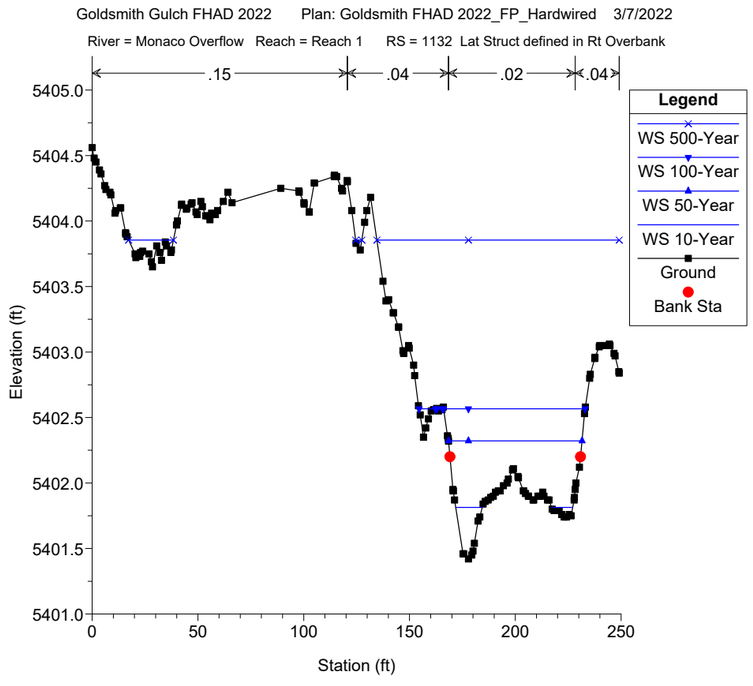

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1701 Lat Struct defined in Rt Overbank
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

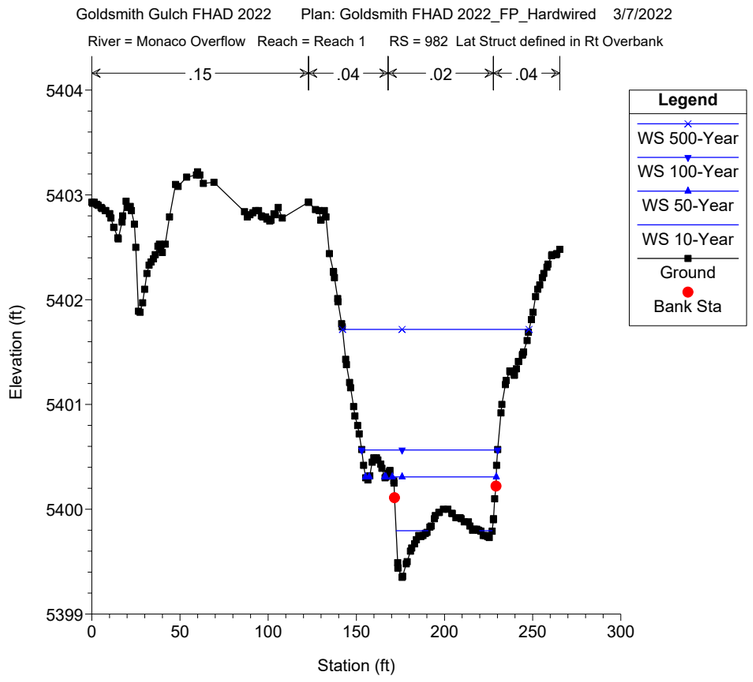

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1607 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

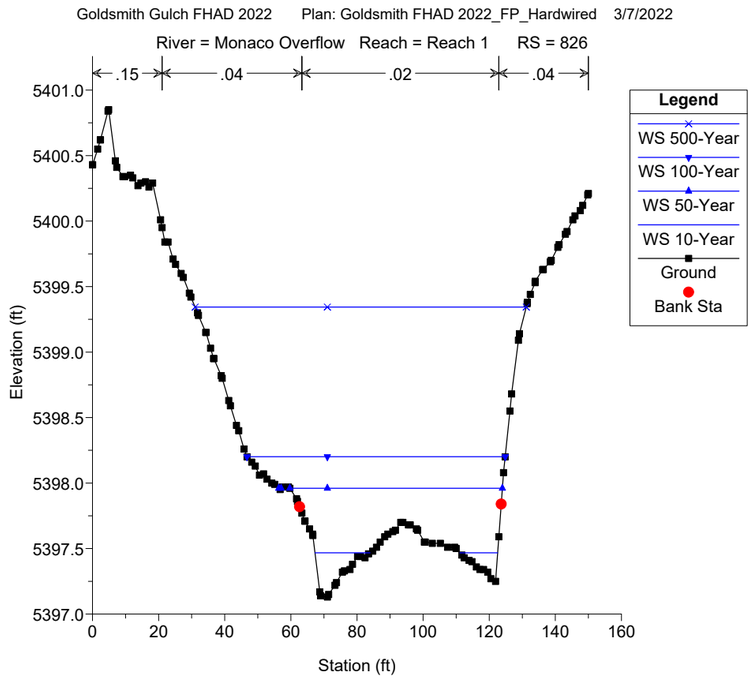

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1510 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

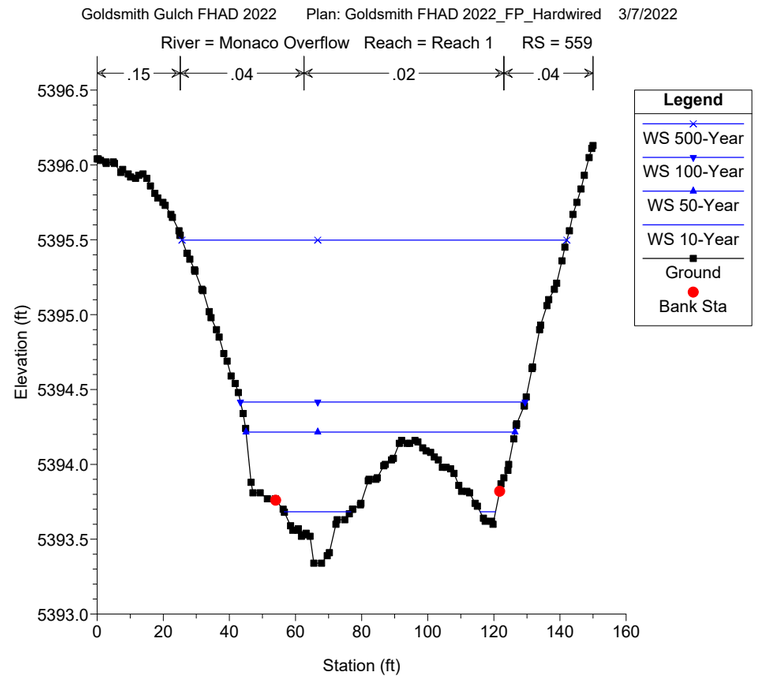

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1458 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

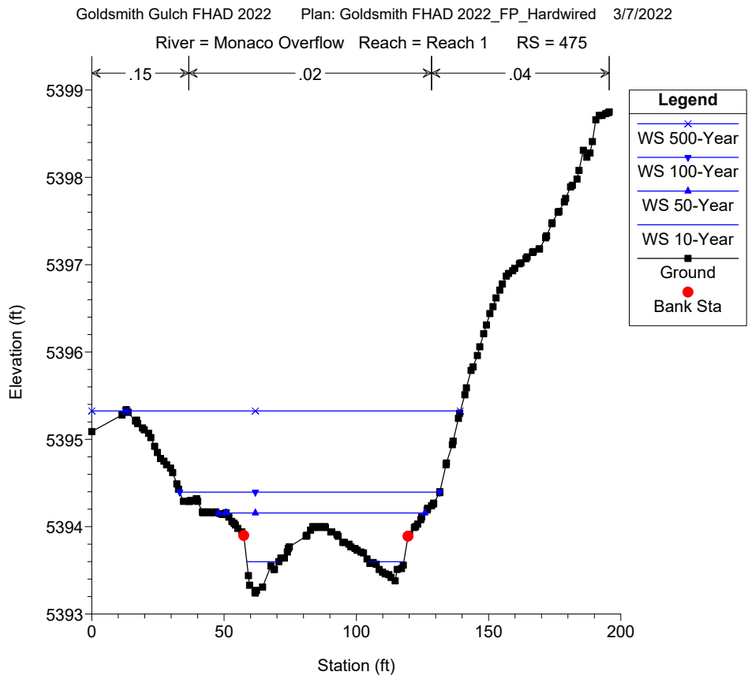

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1257 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 1132 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 982 Lat Struct defined in Rt Overbank
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

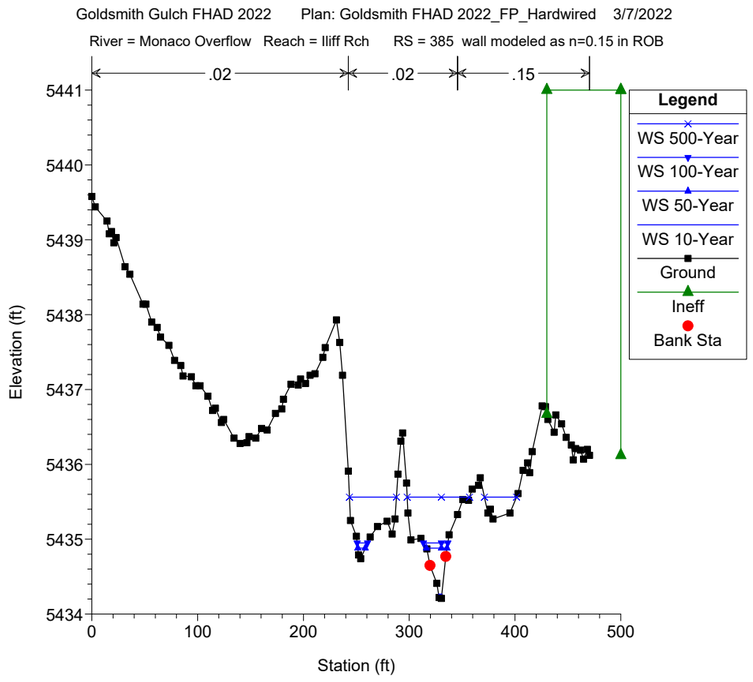

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 826
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

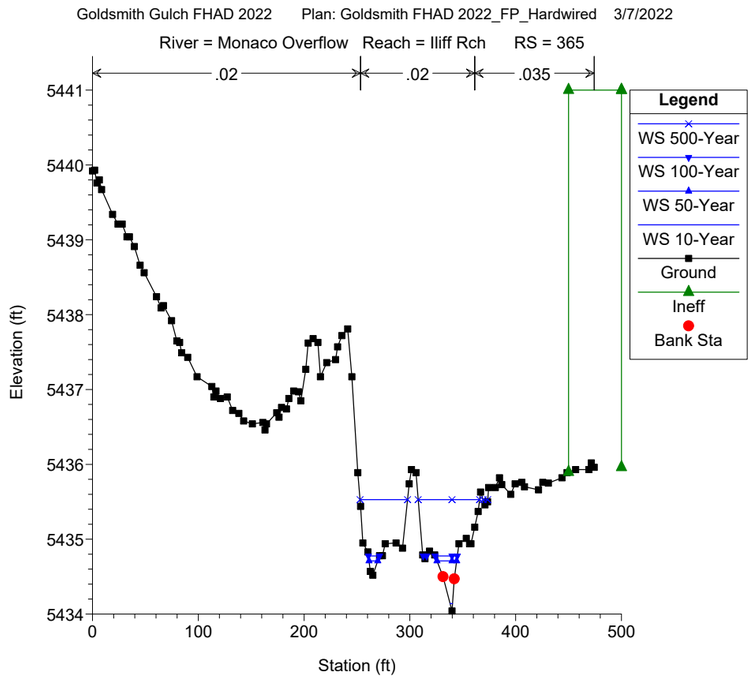

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 559
.15
.04
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

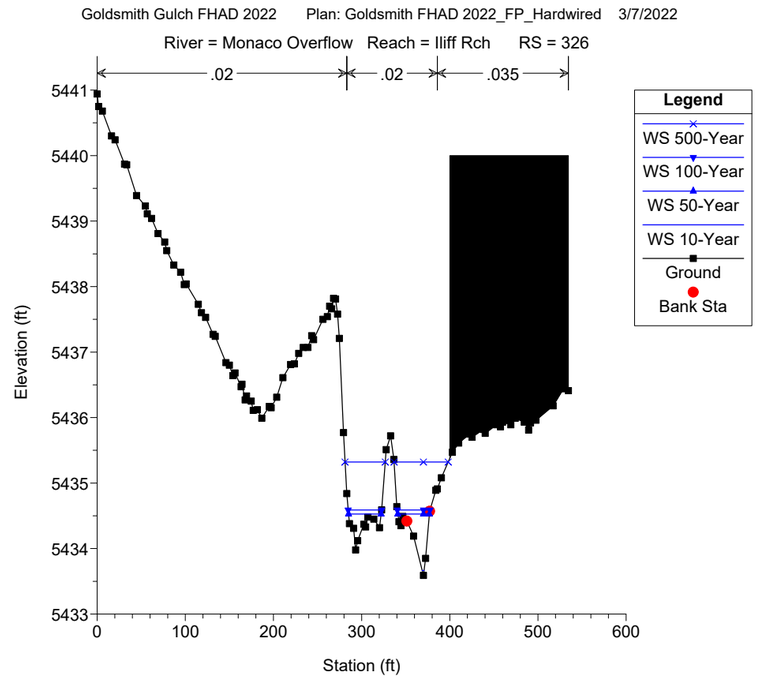

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Reach 1 RS = 475
.15
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

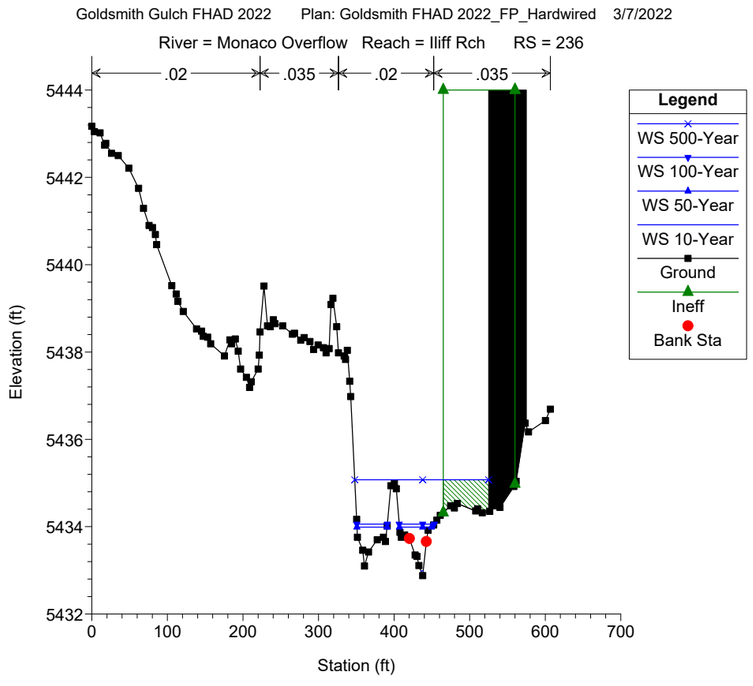
HEC-RAS Sections

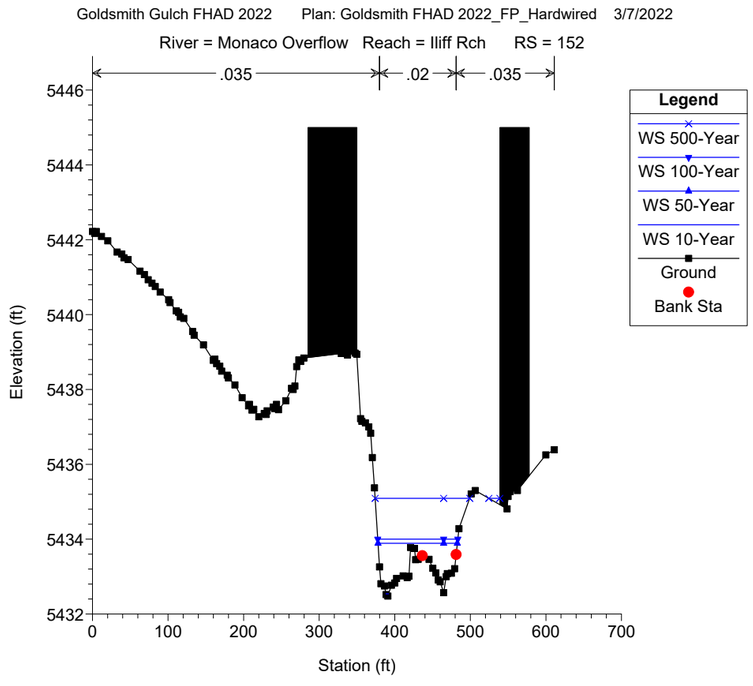
Monaco Pkwy Overflow @ Iliff


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Iliff Rch RS = 385 wall modeled as n=0.15 in ROB
.02
.02
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Iliff Rch RS = 365
.02
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

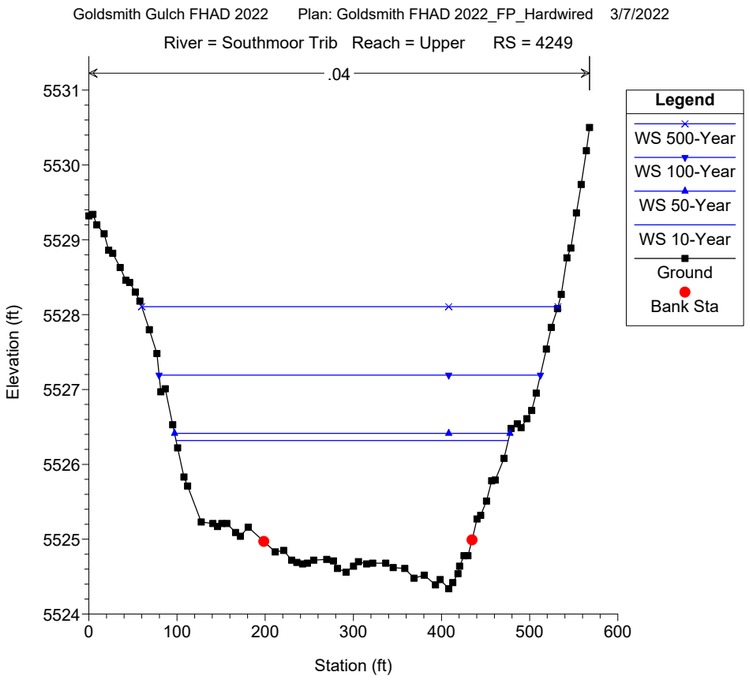

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Iliff Rch RS = 326
.02
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

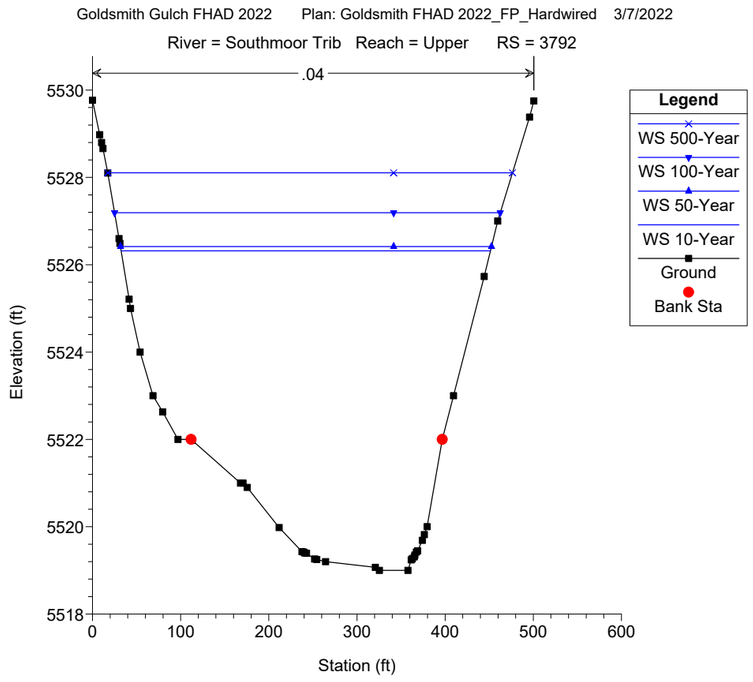

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Iliff Rch RS = 236
.02
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

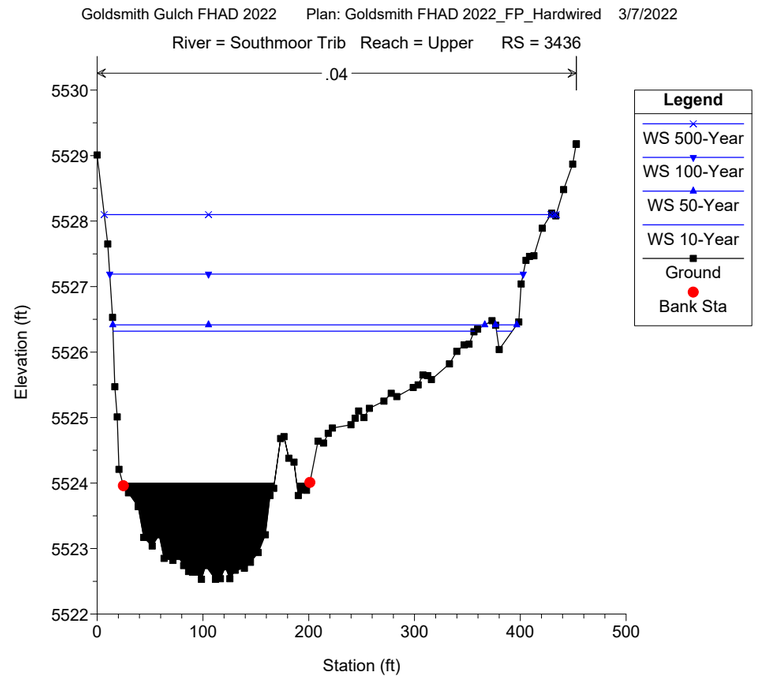

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Monaco Overflow Reach = Iliff Rch RS = 152
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

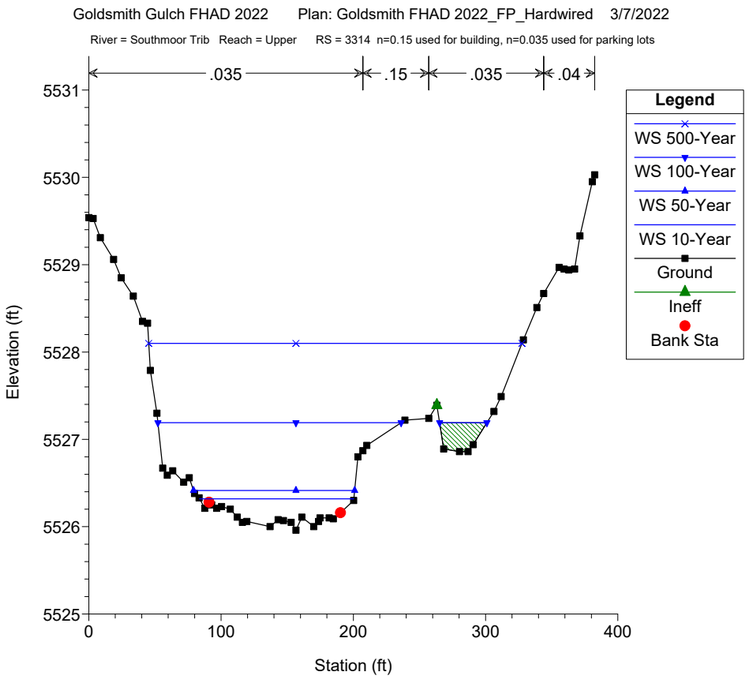
HEC-RAS Sections

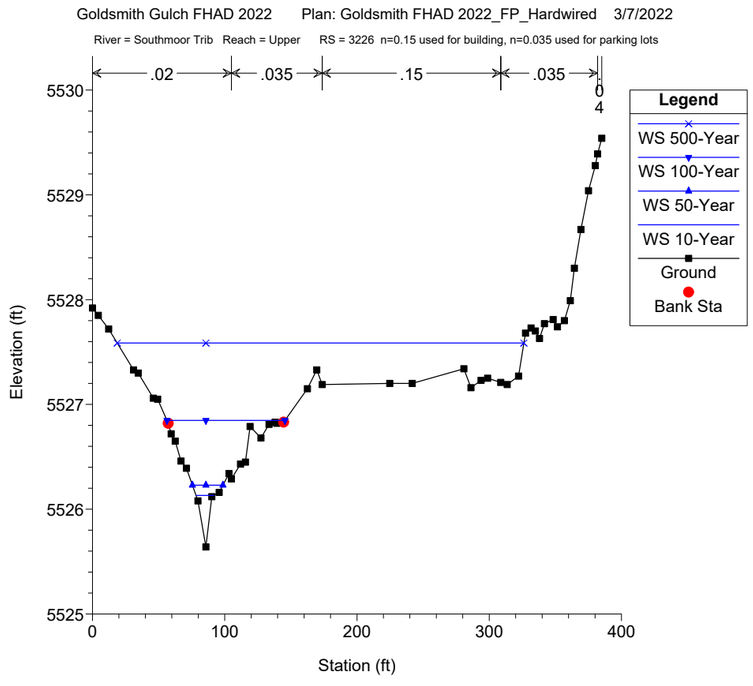
Southmoor Tributary

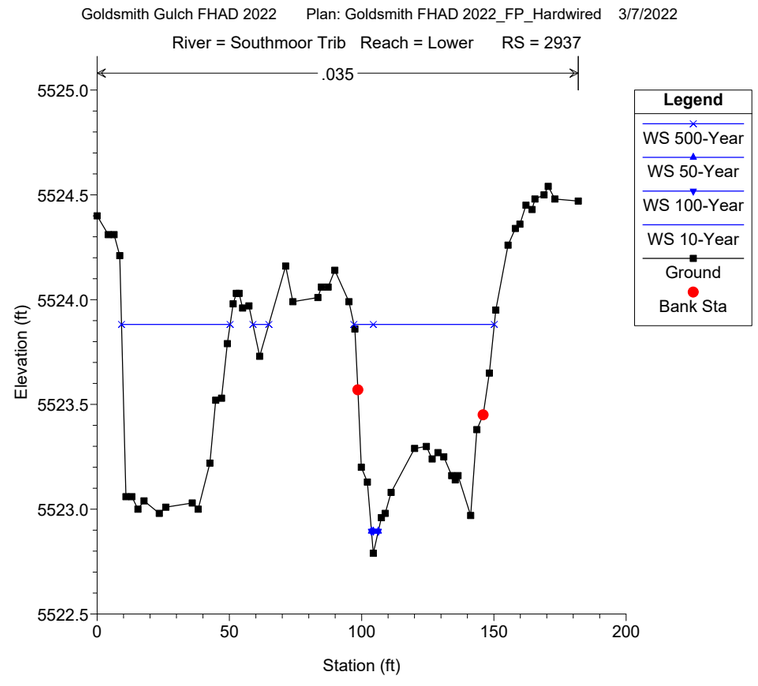

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Upper RS = 4249
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

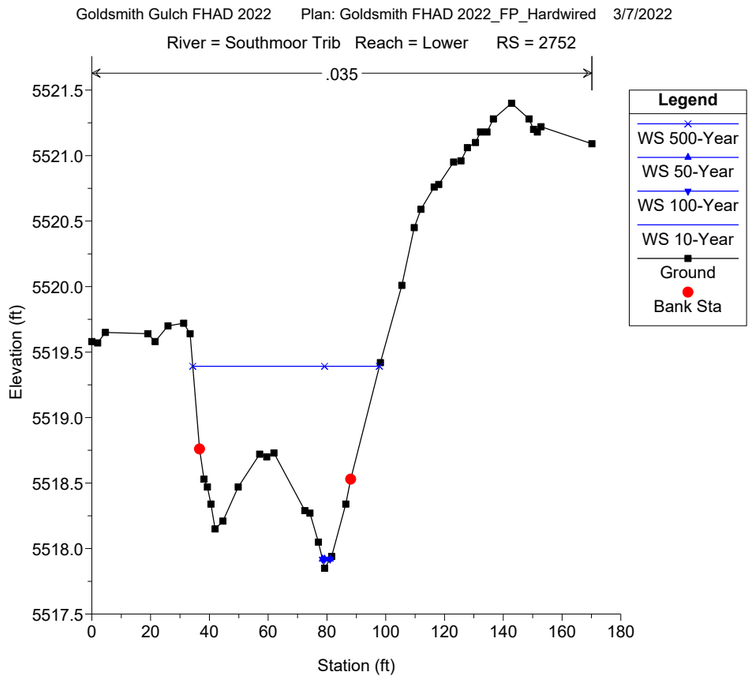

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Upper RS = 3792
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

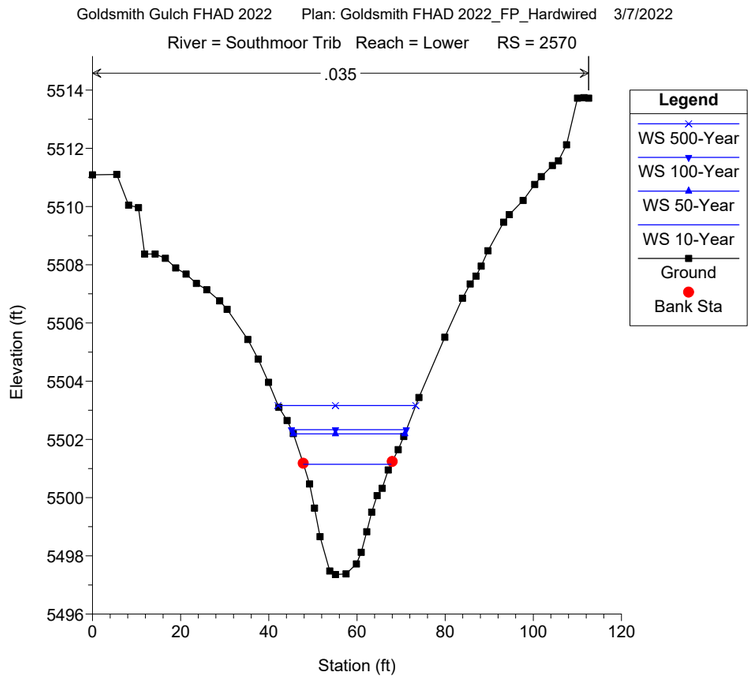

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Upper RS = 3436
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

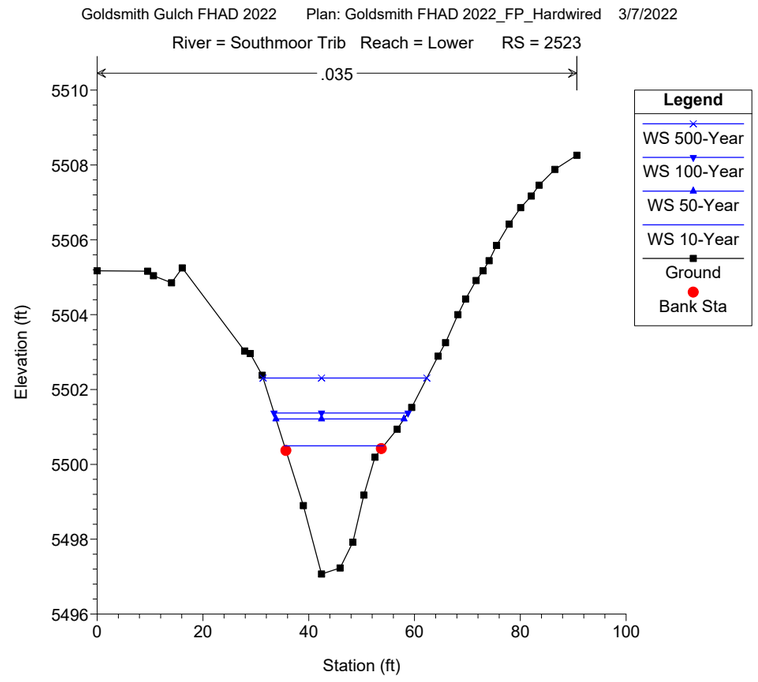

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Upper RS = 3314 n=0.15 used for building, n=0.035 used for parking lots
.035
.15
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Upper RS = 3226 n=0.15 used for building, n=0.035 used for parking lots
.02
.035
.15
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2937
.035
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2752
.035
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2570
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2523
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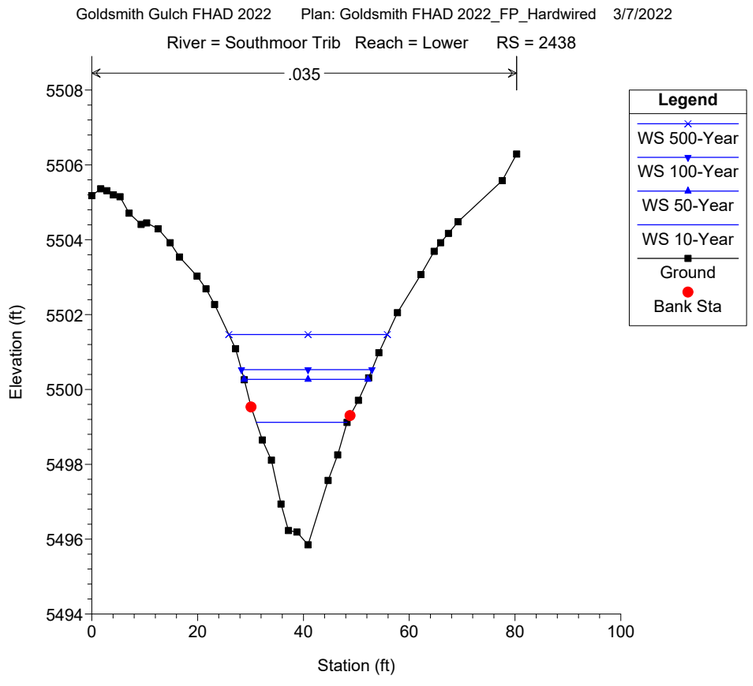
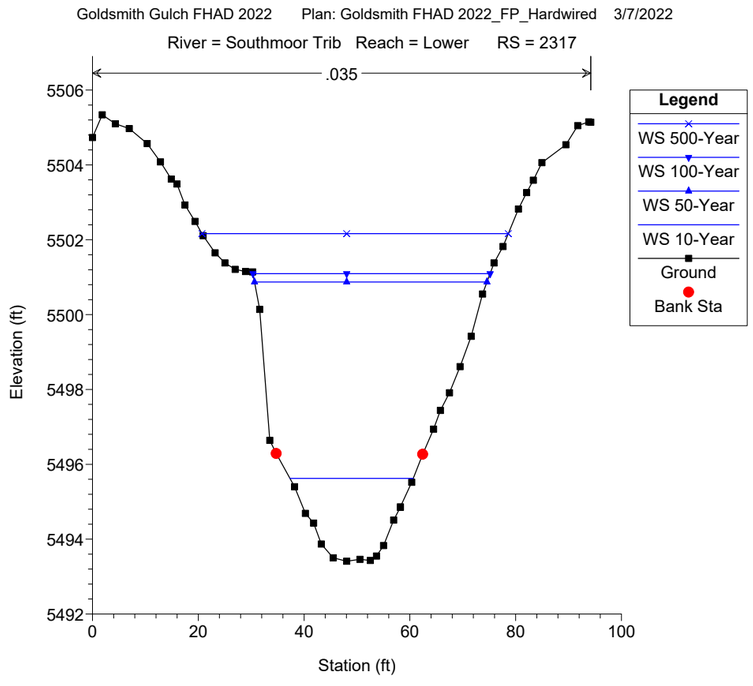
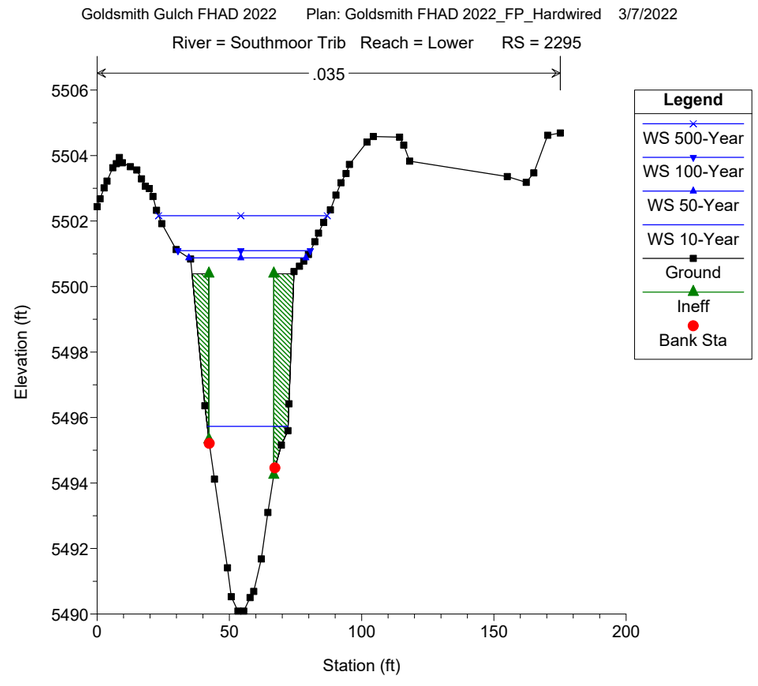
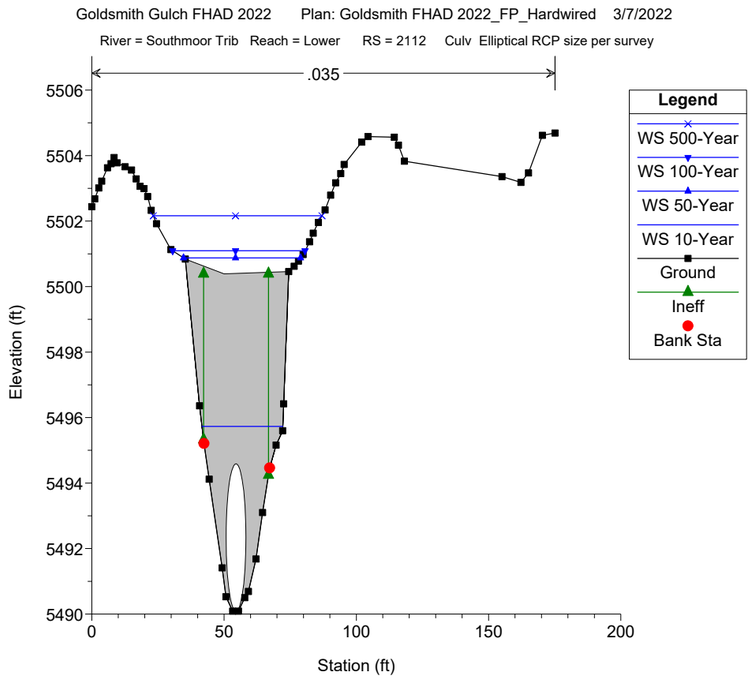
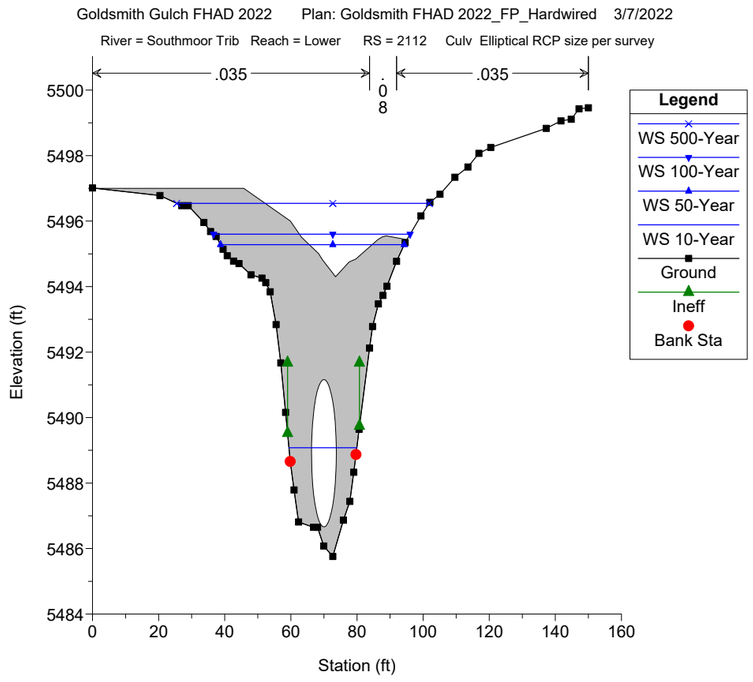
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

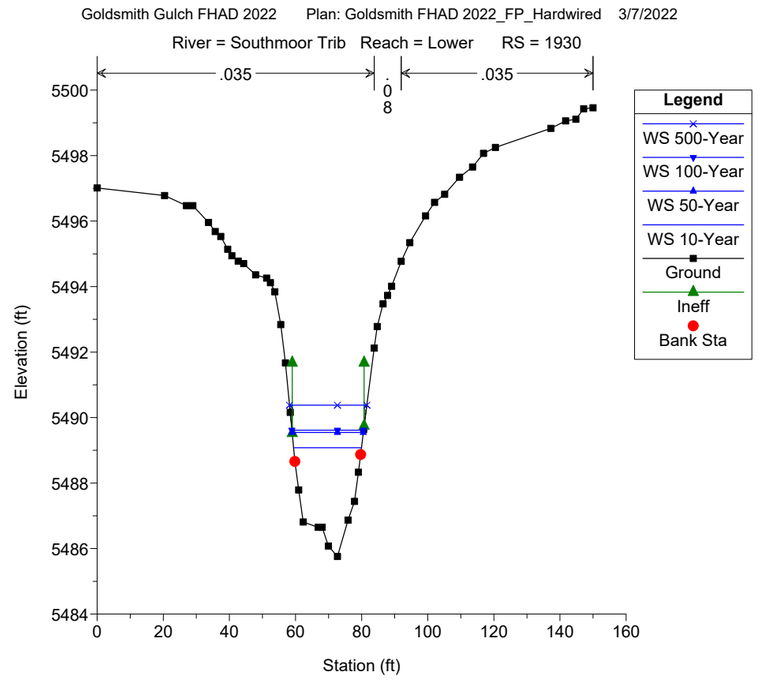

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2438
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

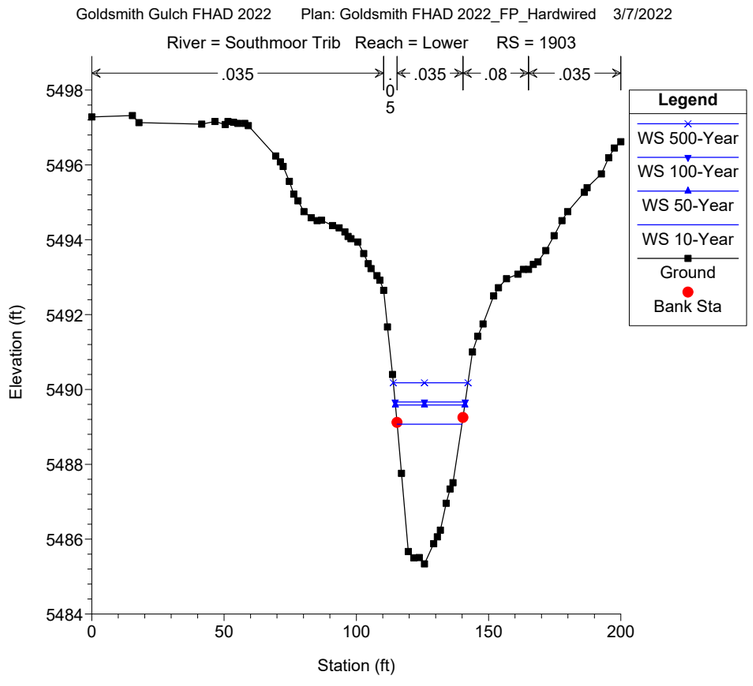

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2317
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

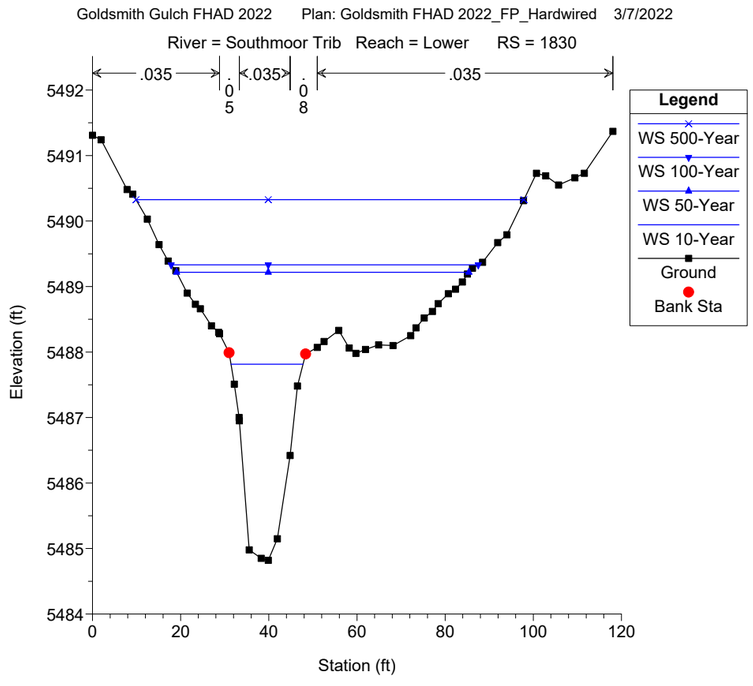

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2295
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

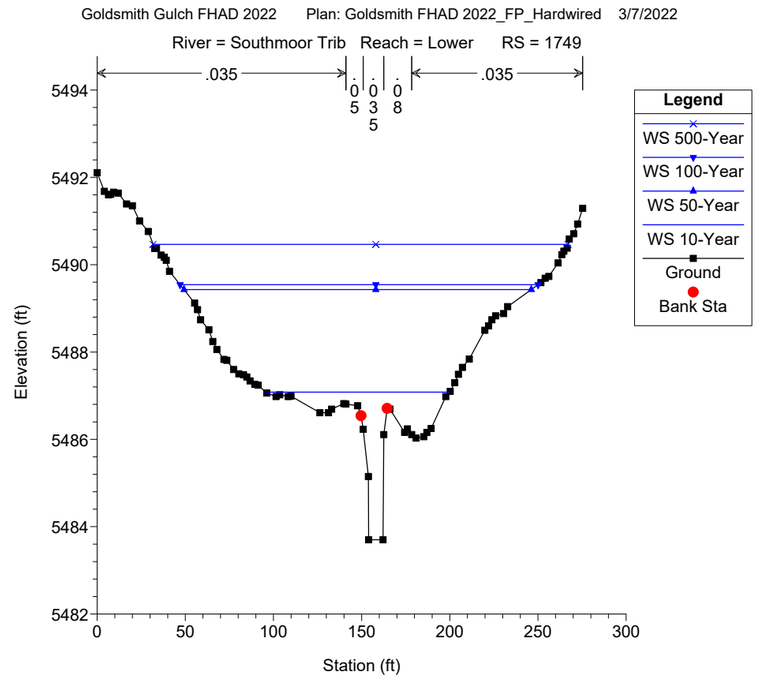

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2112 Culv Elliptical RCP size per survey
.035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

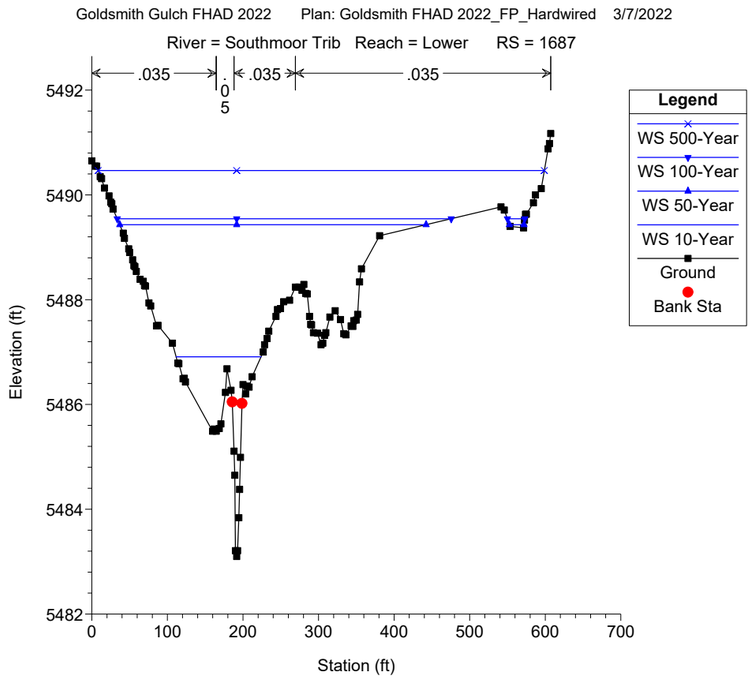

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 2112 Culv Elliptical RCP size per survey
.035
.08
.035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

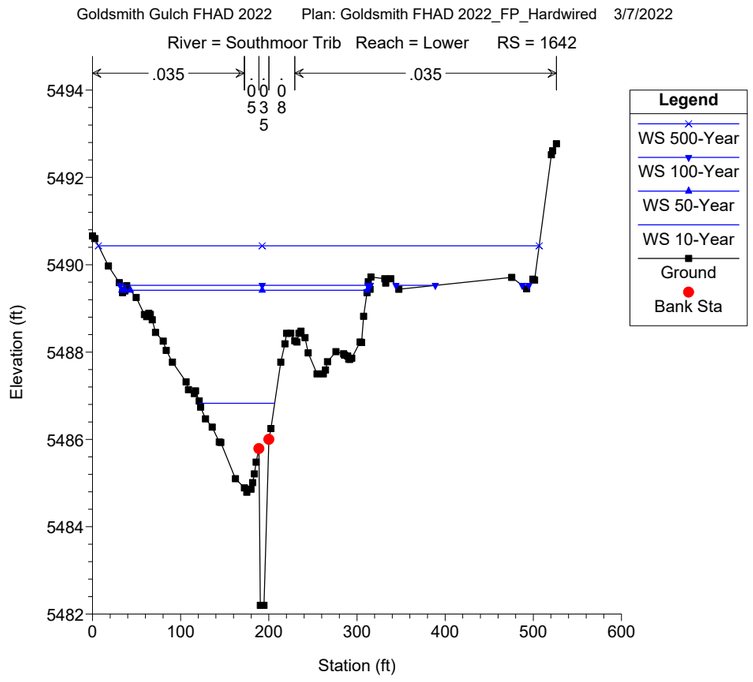

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1930
.035
.08
.035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

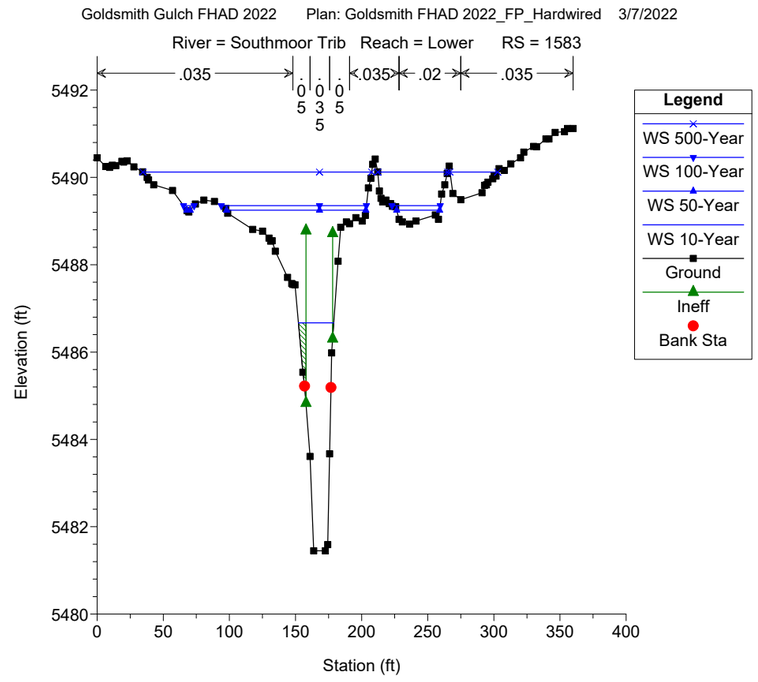

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1903
.035
.05
.035
.08
.035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

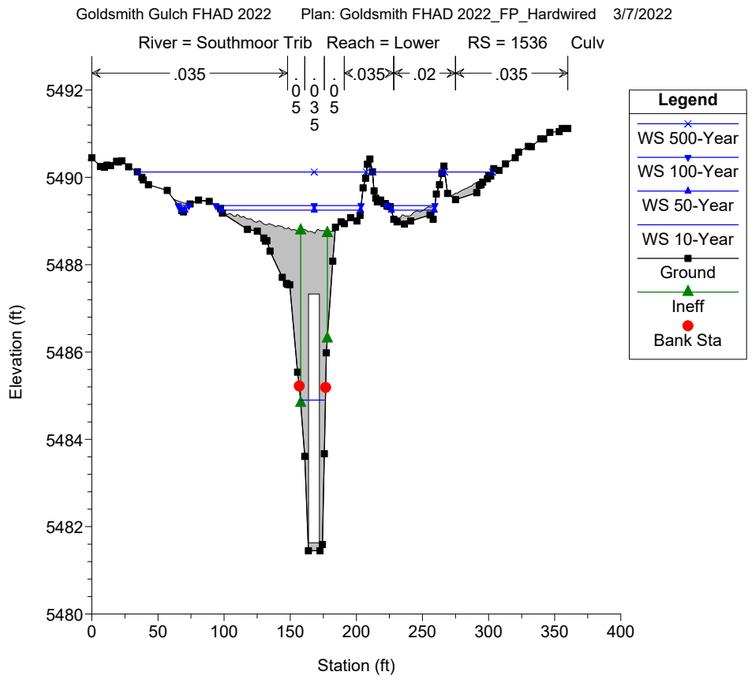

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1830
.035
.05
.035
.08
.035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

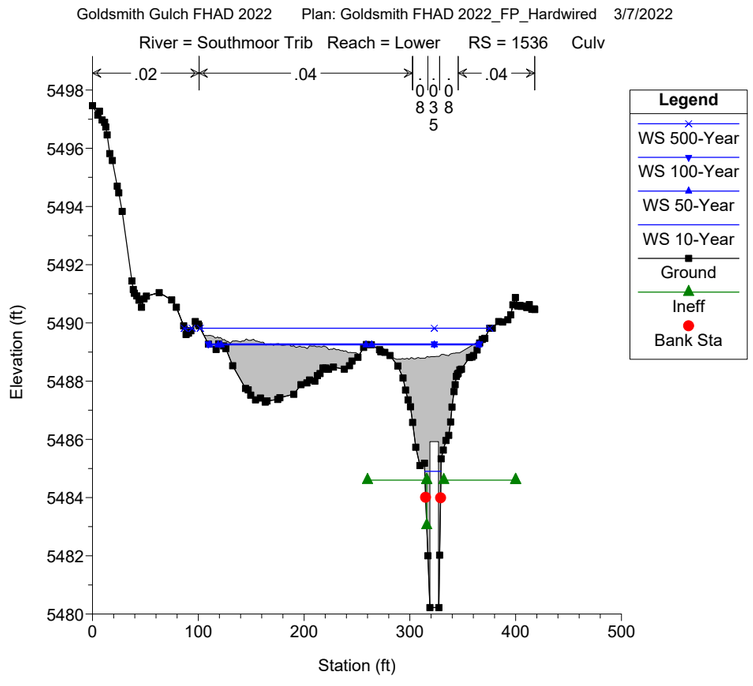

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1749
.035
.05
.035
.08
.035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

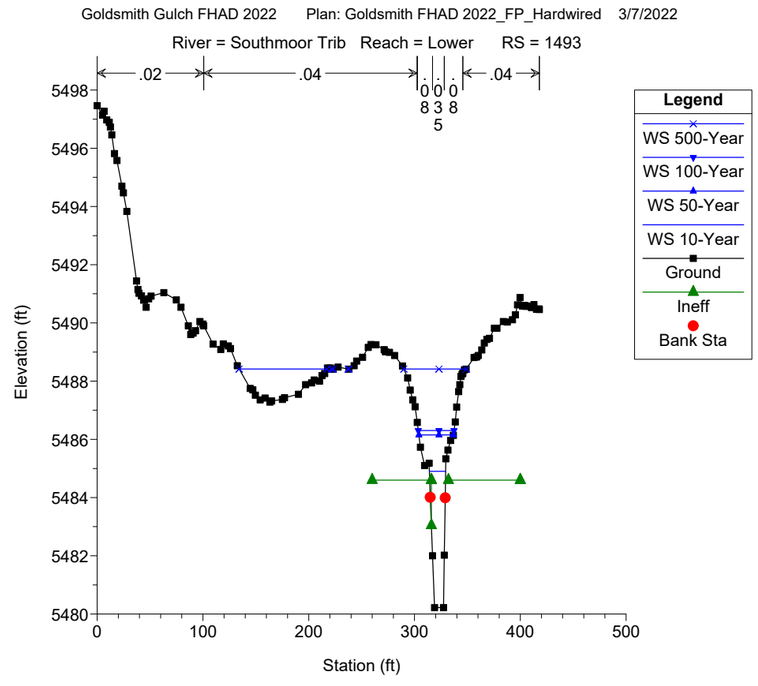

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1687
.035
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

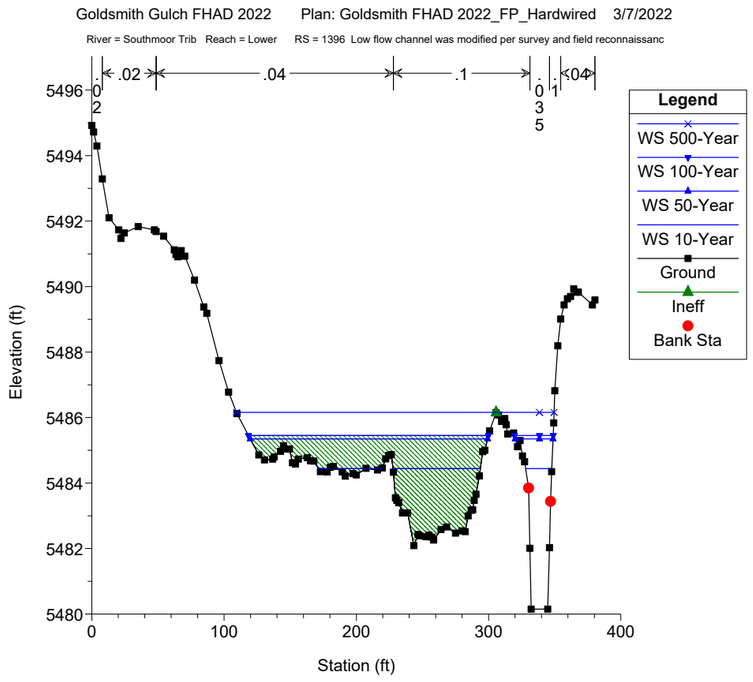

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1642
.035
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

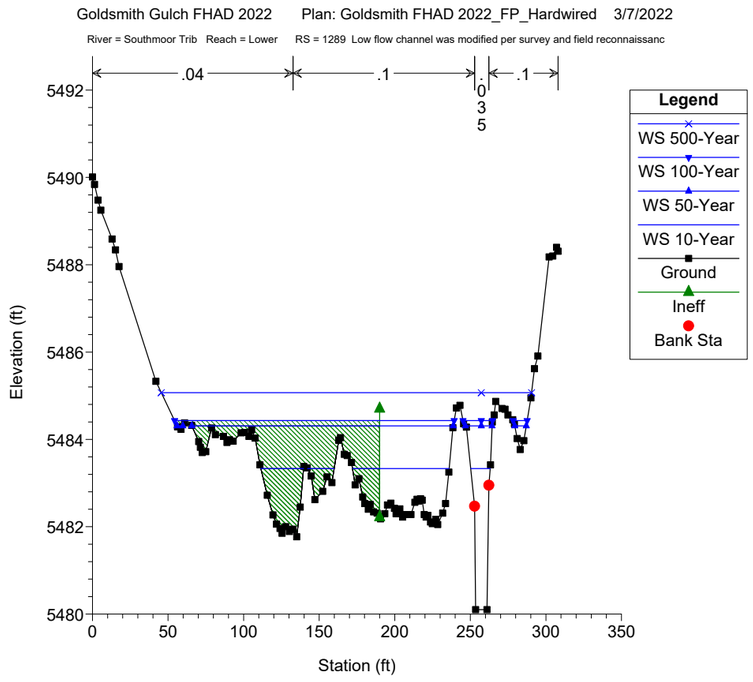

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1583
.035
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1536 Culv
.035
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1536 Culv
.02
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

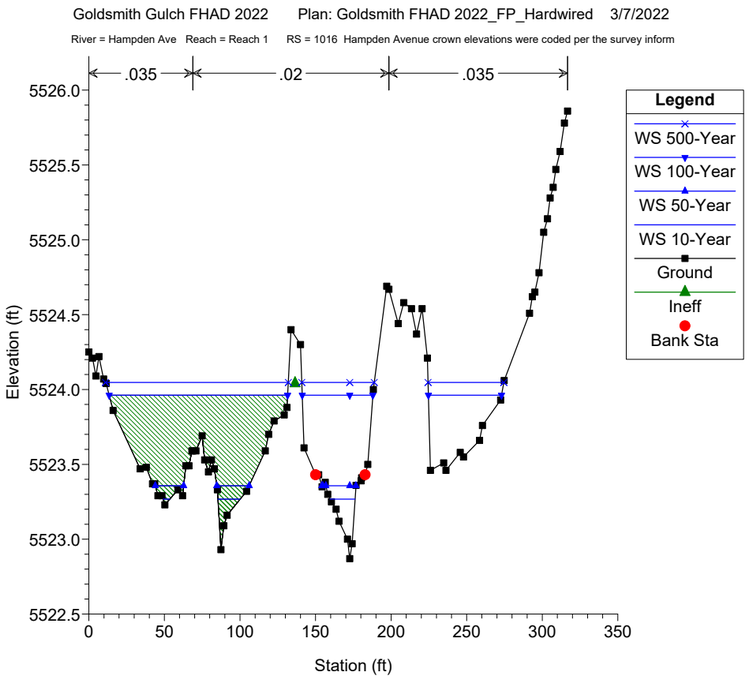

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1493
.02
.04
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

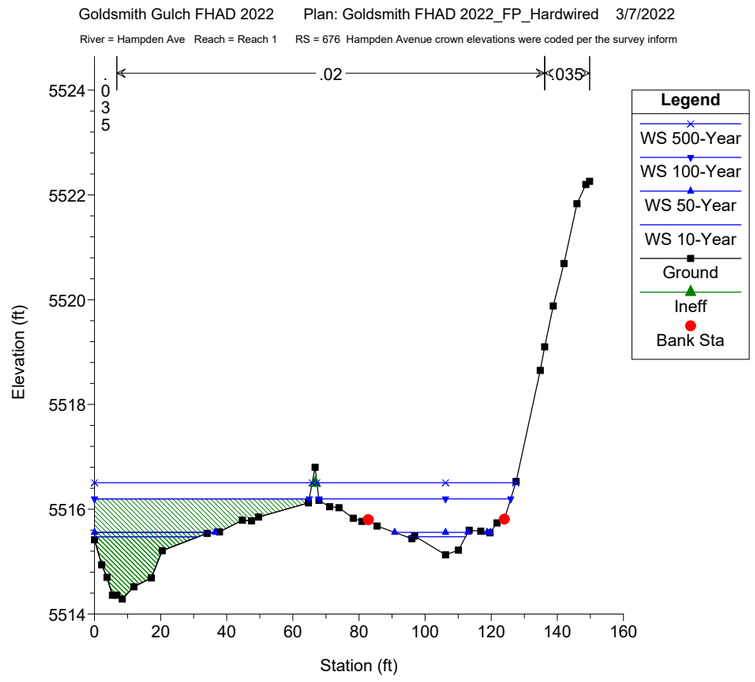

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1396 Low flow channel was modified per survey and field reconnaissanc
.02
.04
.1
.035
.1
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5480
5482
5484
5486
5488
5490
5492
5494
5496
0
100
200
300
400

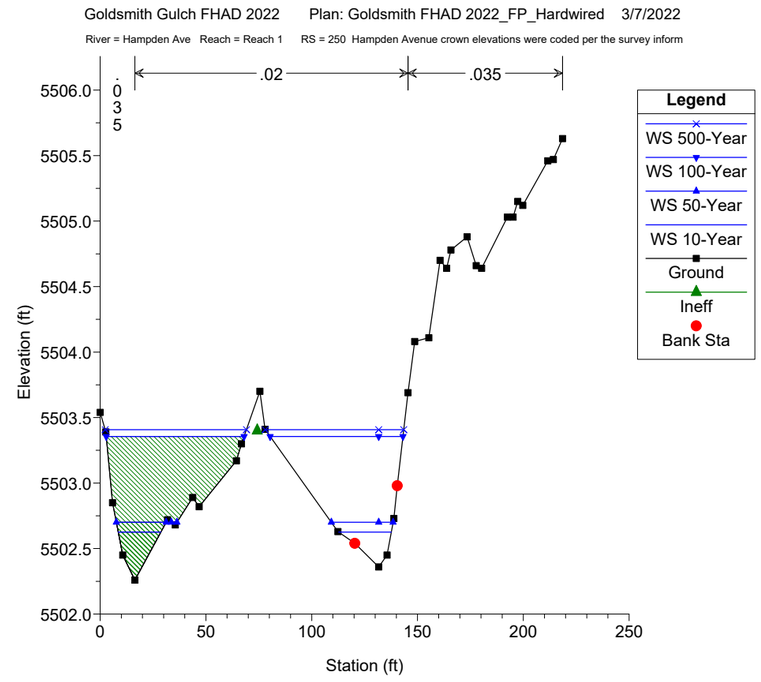

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Southmoor Trib Reach = Lower RS = 1289 Low flow channel was modified per survey and field reconnaissanc
.04
.1
.035
.1
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)
5480
5482
5484
5486
5488
5490
5492
0
50
100
150
200
250
300
350

HEC-RAS Sections

Hampden Avenue Overflow

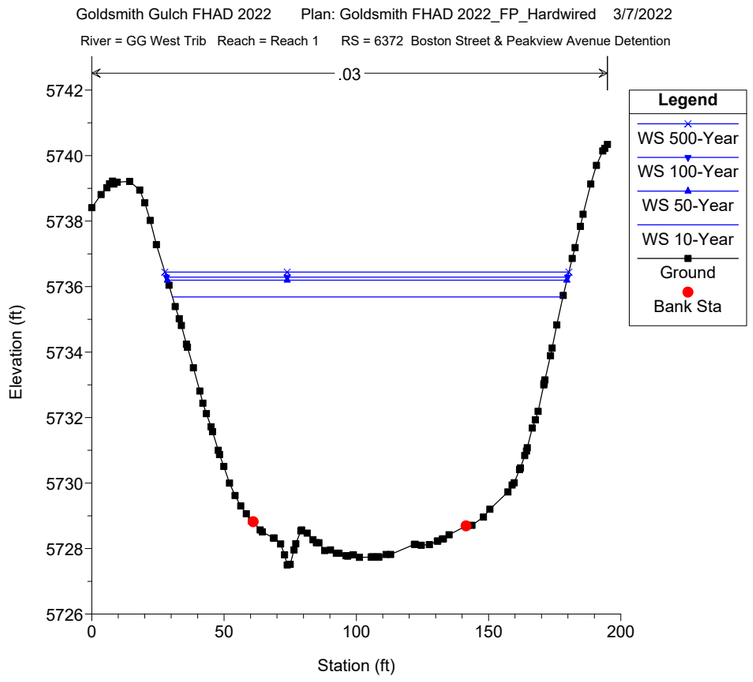

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Hampden Ave Reach = Reach 1 RS = 1016 Hampden Avenue crown elevations were coded per the survey inform
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

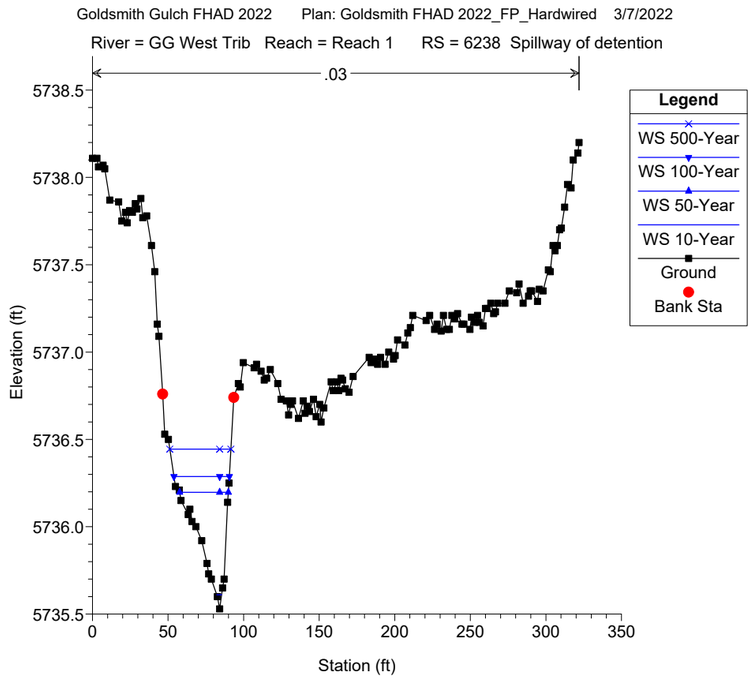

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Hampden Ave Reach = Reach 1 RS = 676 Hampden Avenue crown elevations were coded per the survey inform
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

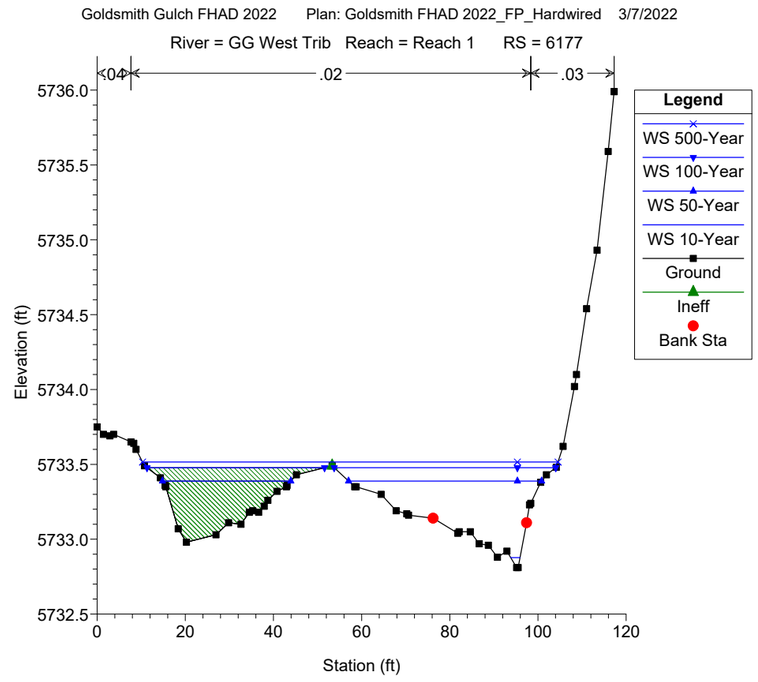

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = Hampden Ave Reach = Reach 1 RS = 250 Hampden Avenue crown elevations were coded per the survey inform
.035
.02
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

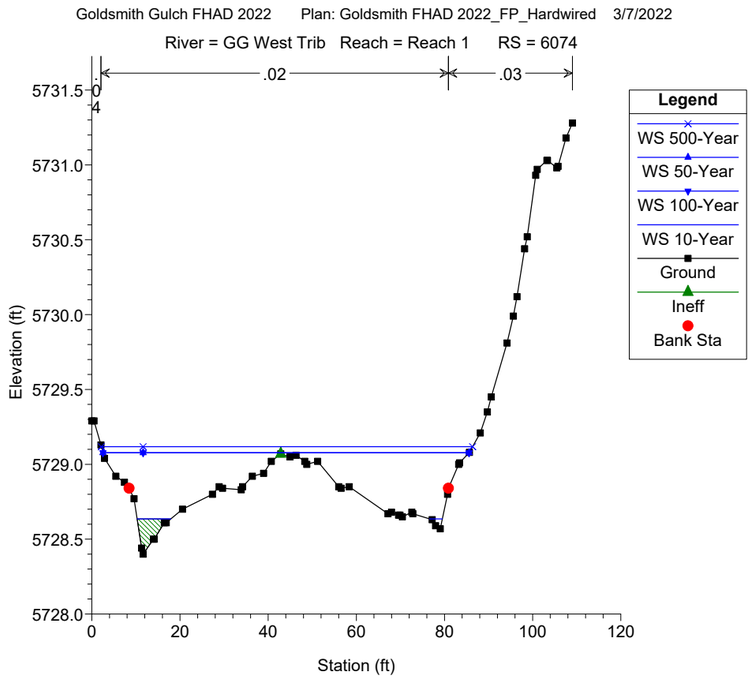
HEC-RAS Sections

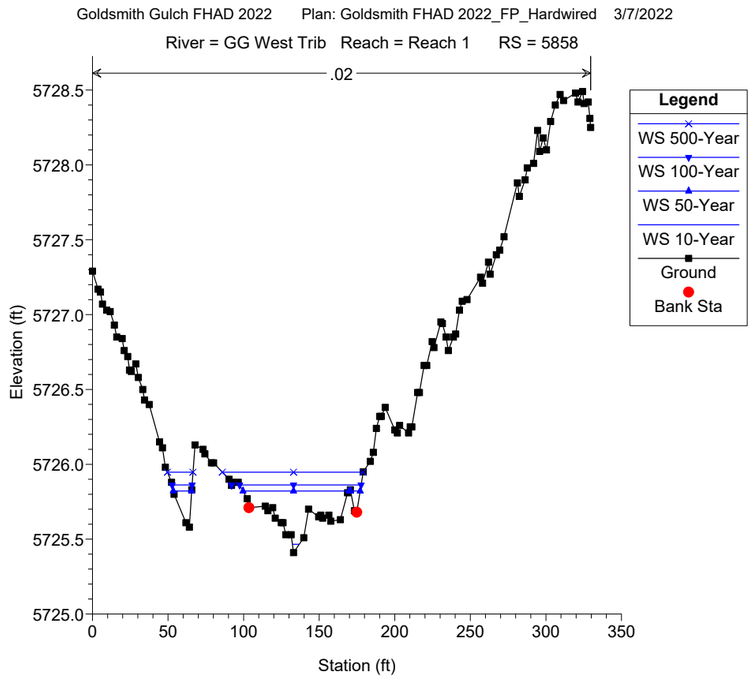
Goldsmith Gulch West Tributary

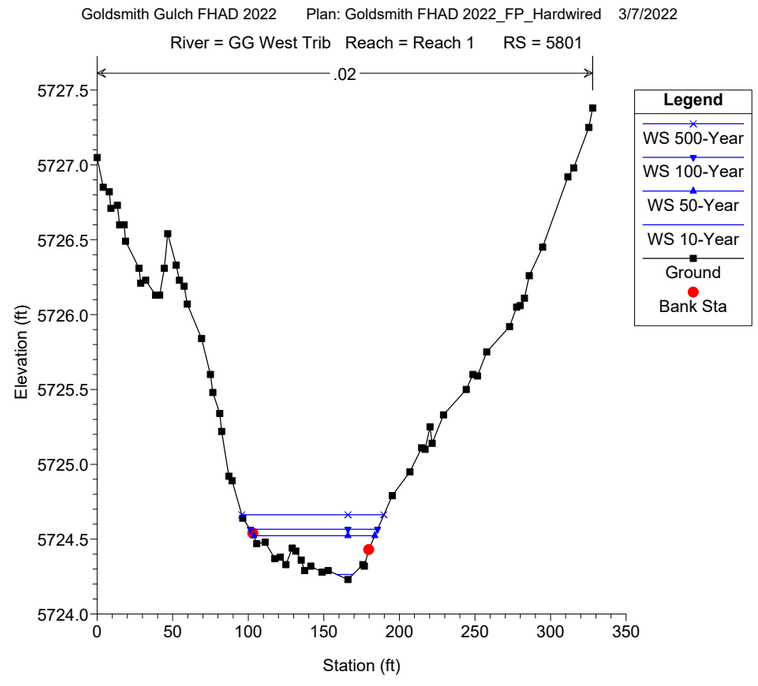

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 6372 Boston Street & Peakview Avenue Detention
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

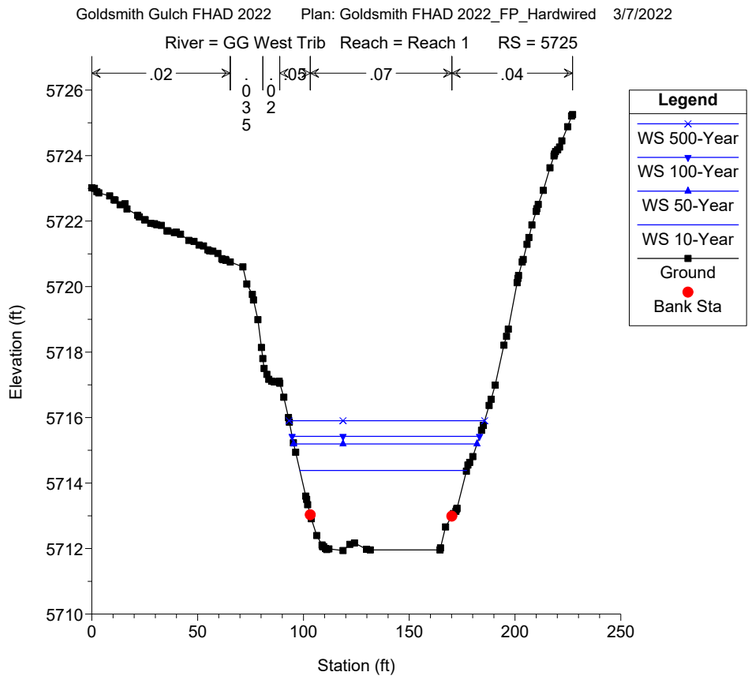

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 6238 Spillway of detention
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

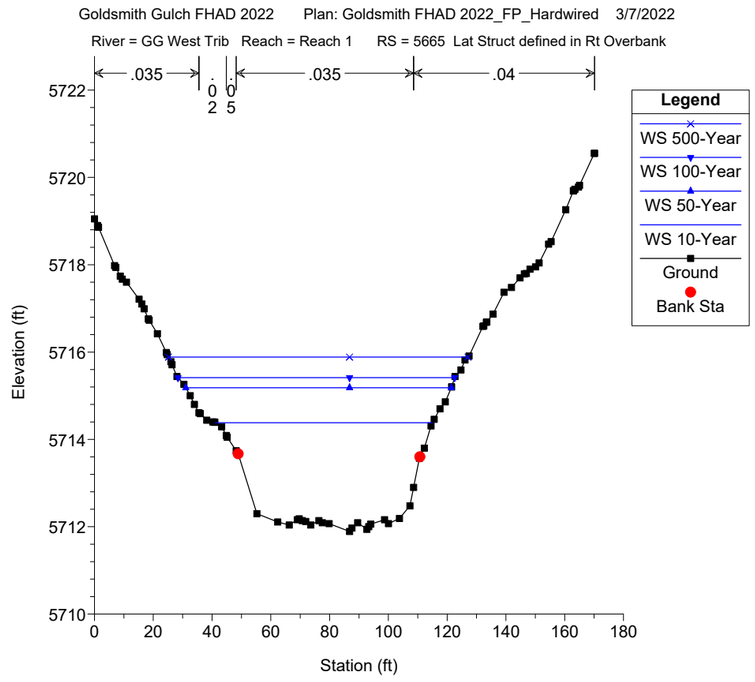

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 6177
.04
.02
.03
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

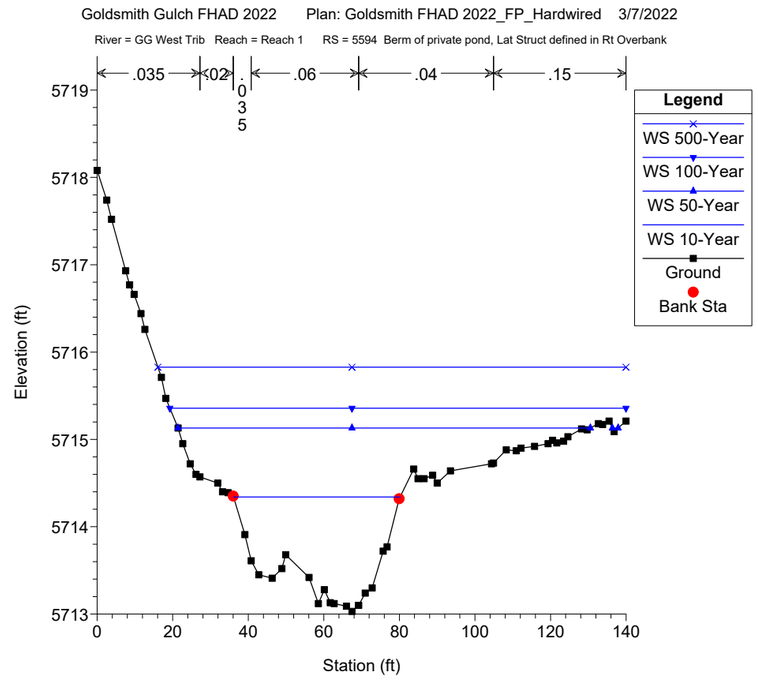

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 6074
.02
.03
Legend
WS 500-Year
WS 50-Year
WS 100-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

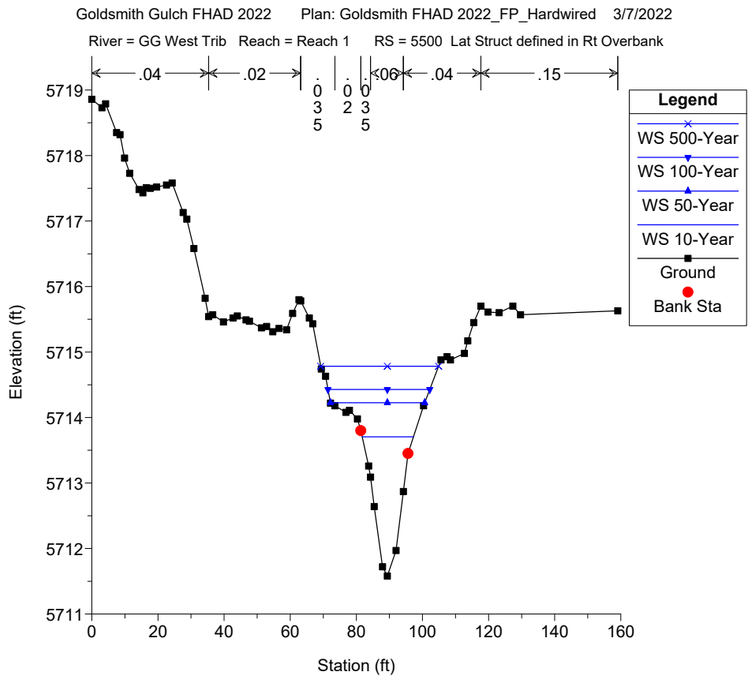

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5858
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

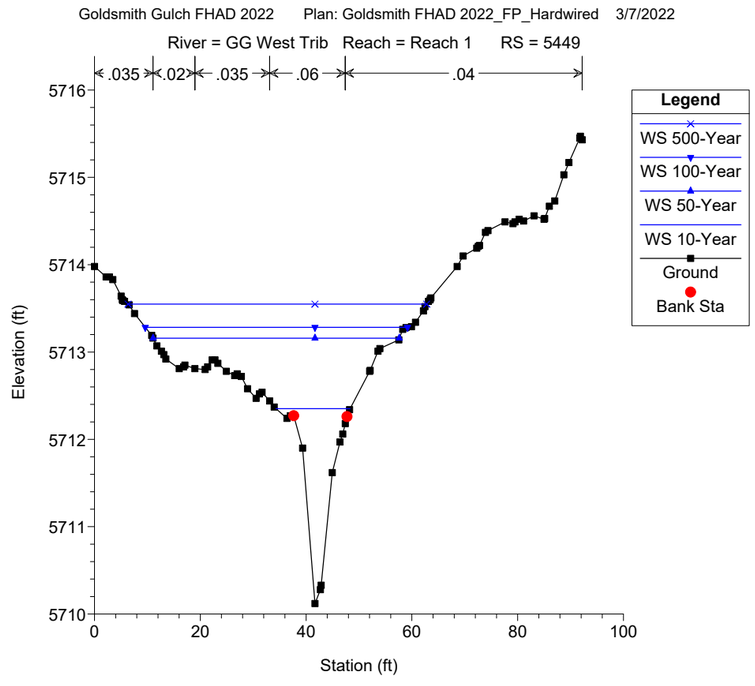

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5801
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

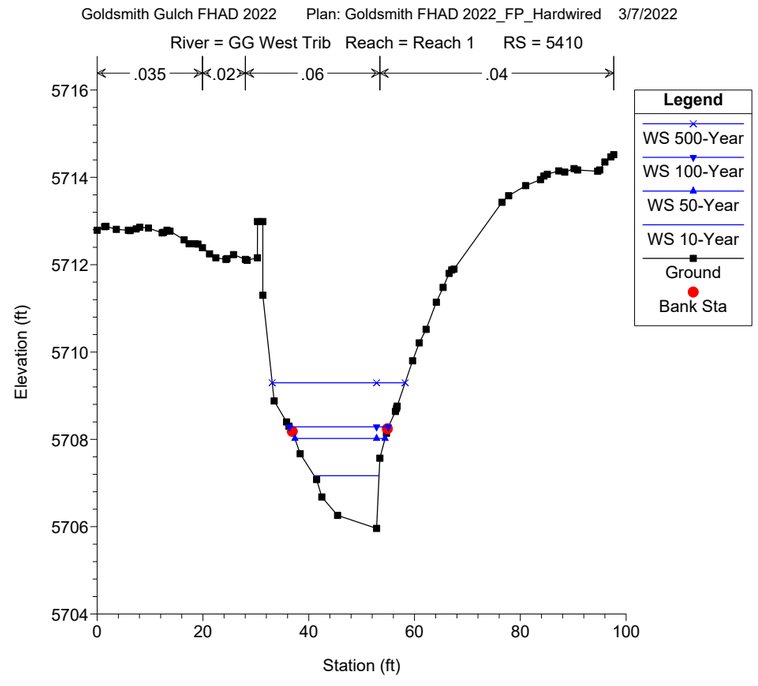

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5725
.02
.035
.02
.05
.07
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

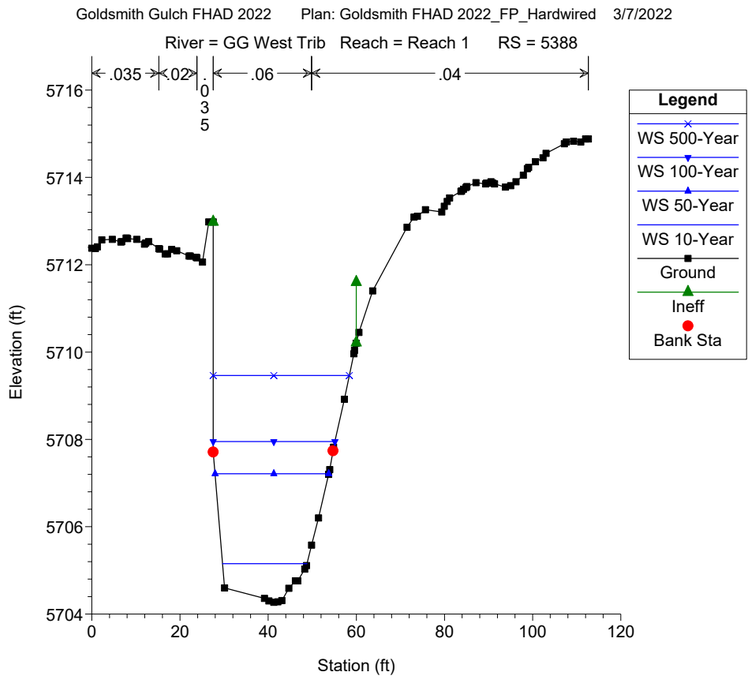

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5665 Lat Struct defined in Rt Overbank
.035
.02
.05
.035
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

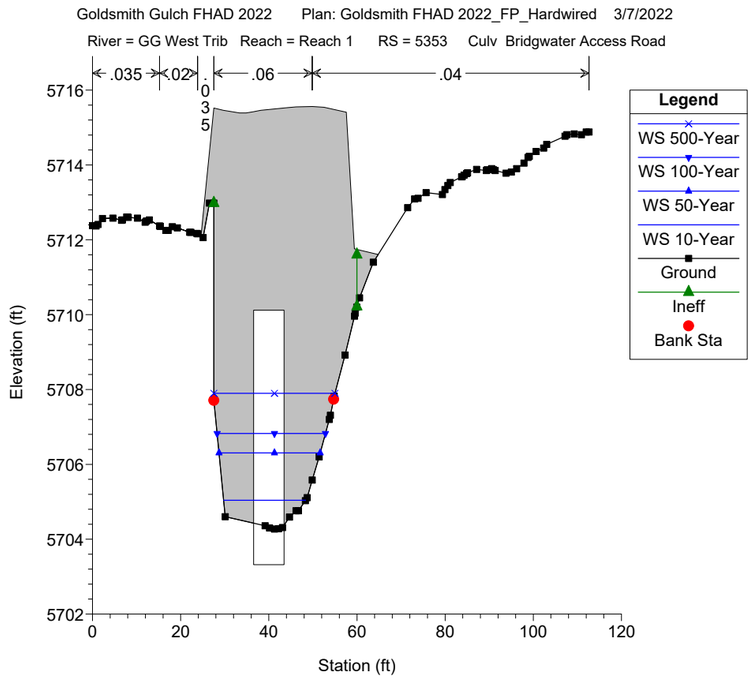

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5594 Berm of private pond, Lat Struct defined in Rt Overbank
.035
.02
.035
.06
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

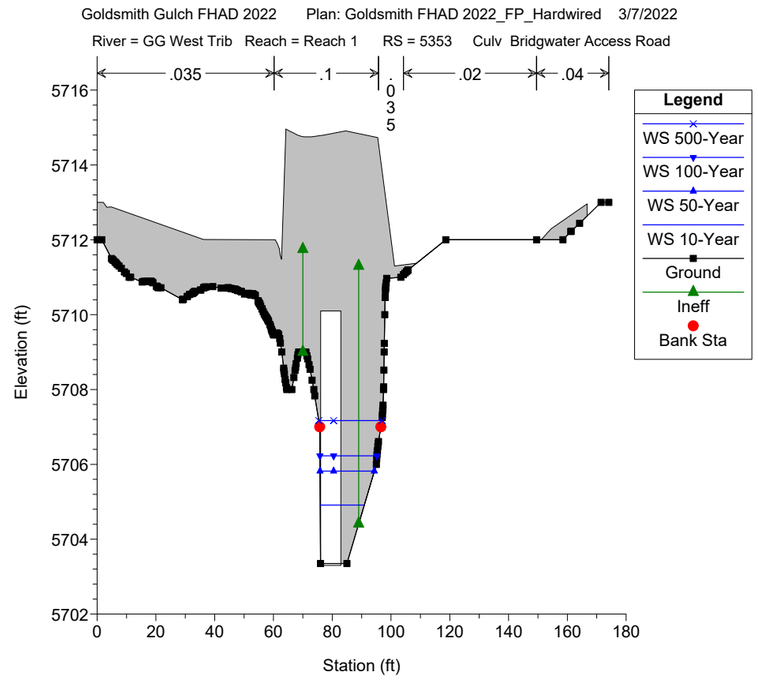

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5500 Lat Struct defined in Rt Overbank
.04
.02
.035
.02
.035
.06
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

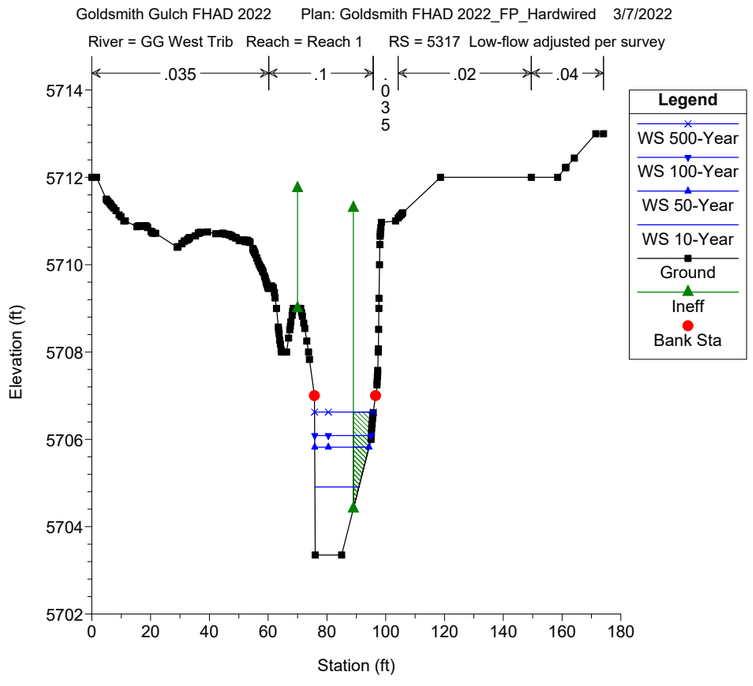

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5449
.035
.02
.035
.06
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

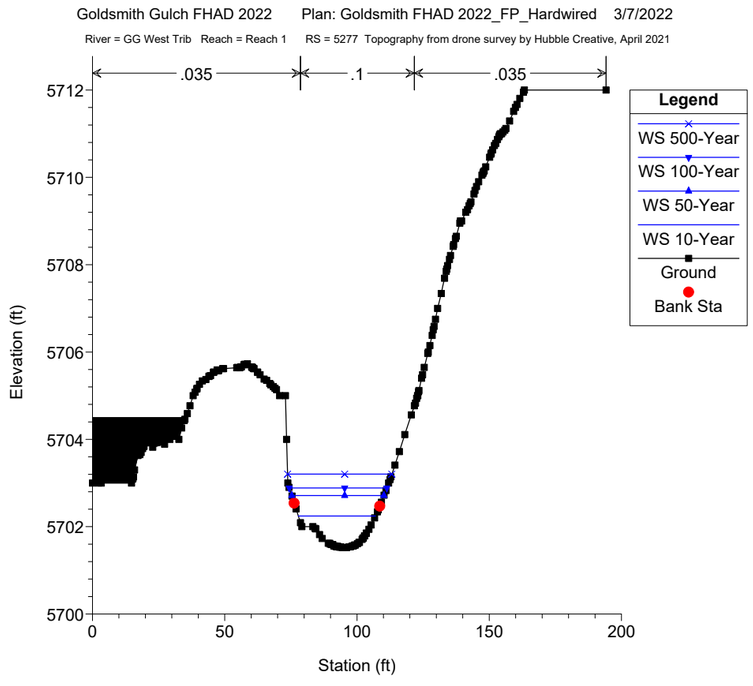

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5410
.035
.02
.06
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

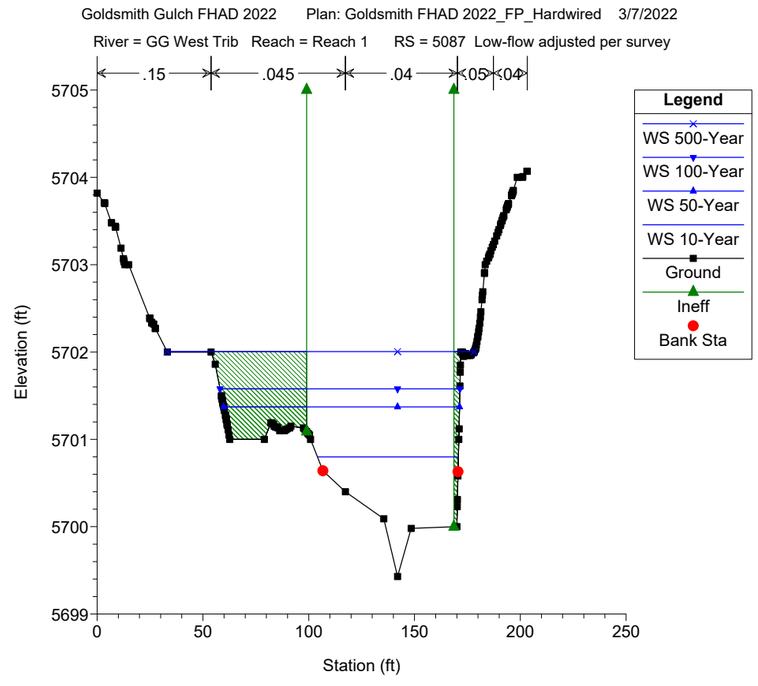

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5388
.035
.02
.06
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

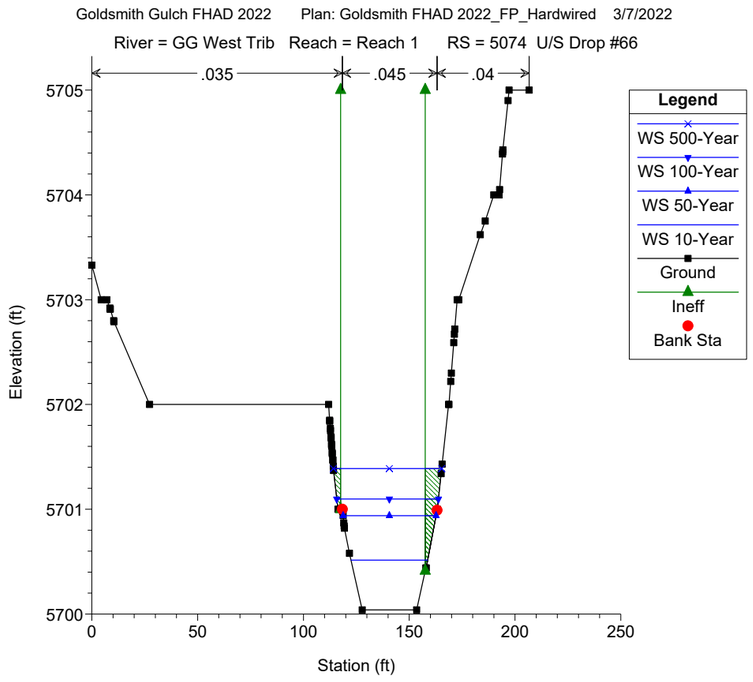

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5353 Culv Bridgwater Access Road
.035
.02
.06
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

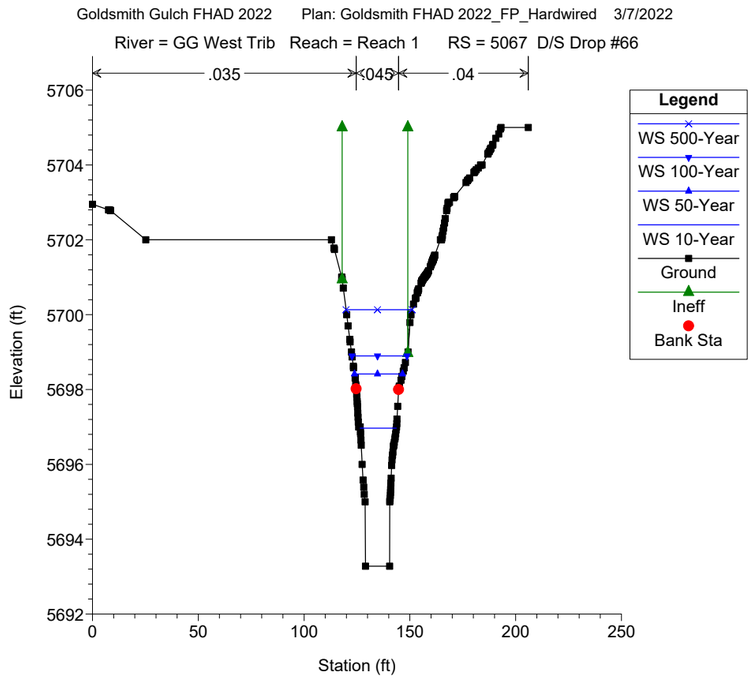

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5353 Culv Bridgwater Access Road
.035
.1
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

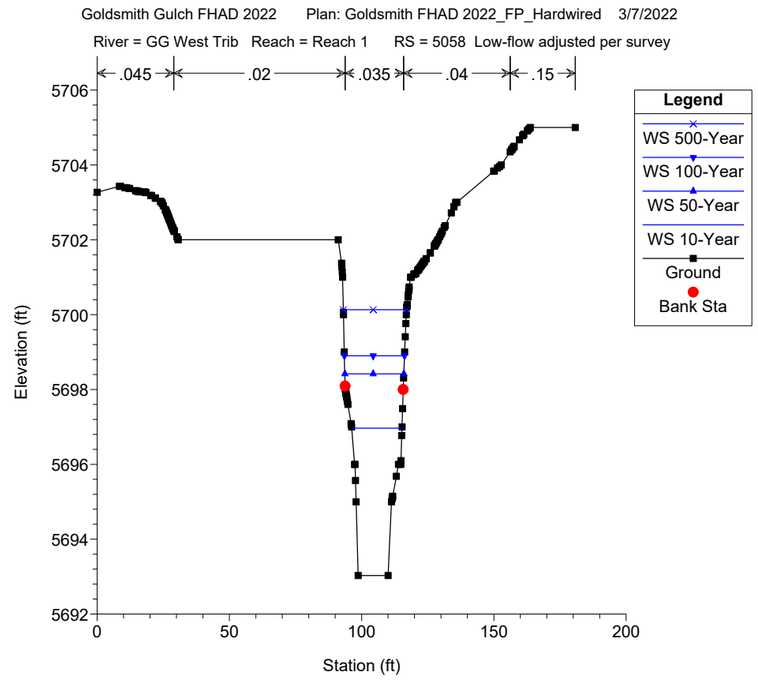

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5317 Low-flow adjusted per survey
.035
.1
.02
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

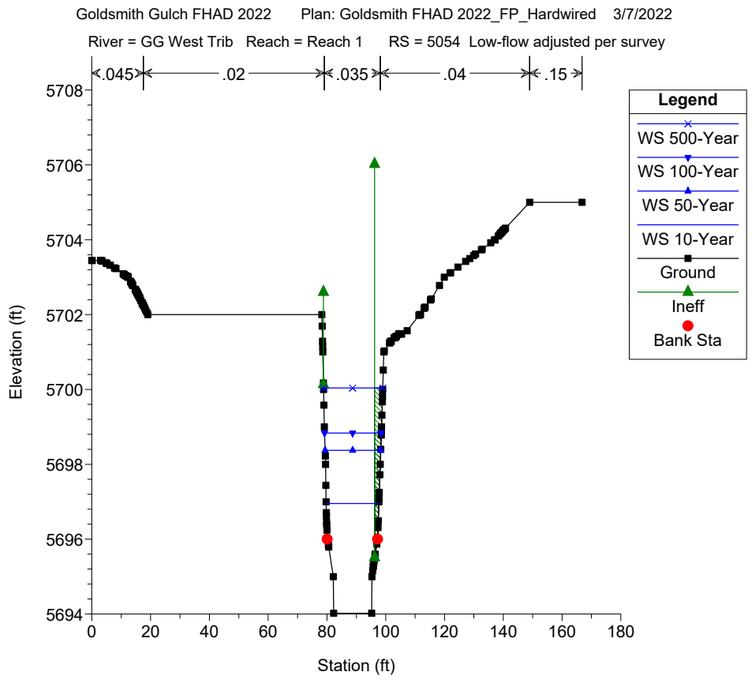

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5277 Topography from drone survey by Hubble Creative, April 2021
.035
.1
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

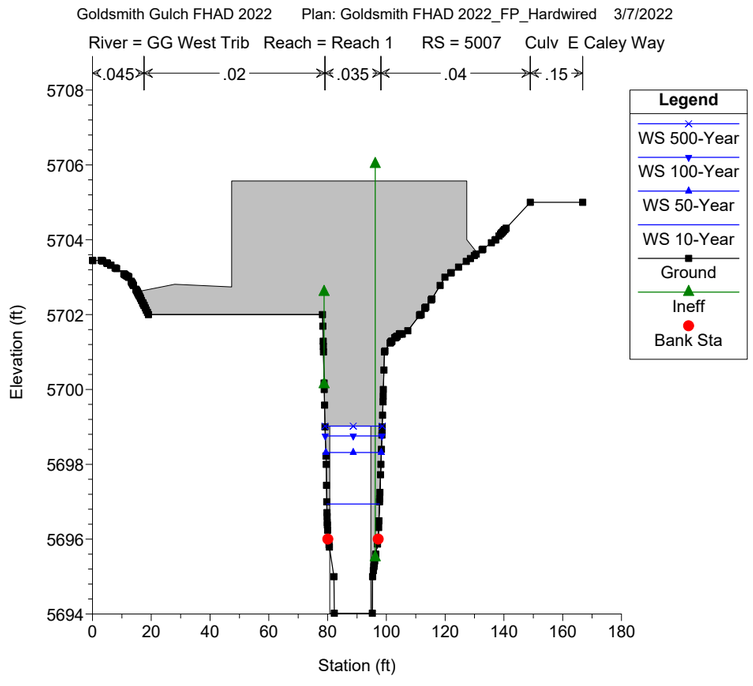

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5087 Low-flow adjusted per survey
.15
.045
.04
.05
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

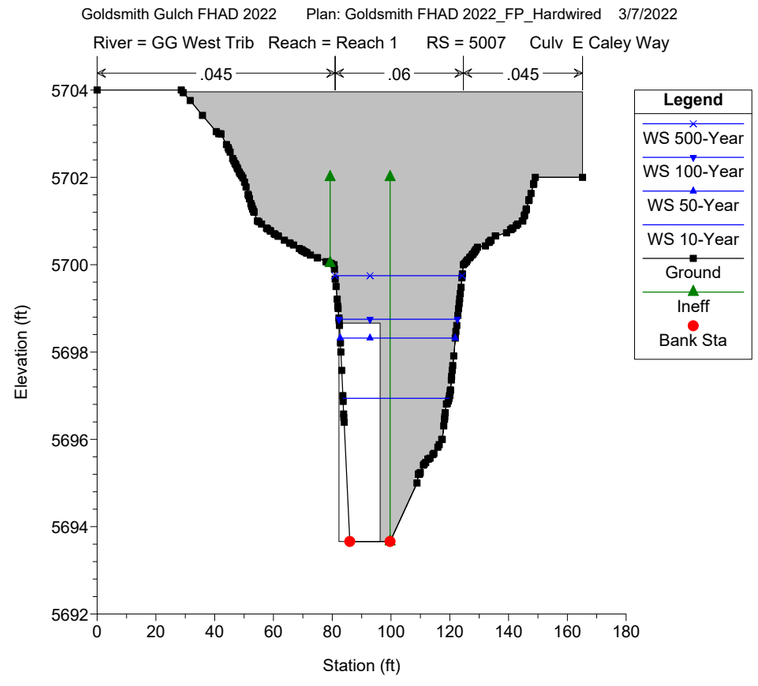

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5074 U/S Drop #66
.035
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

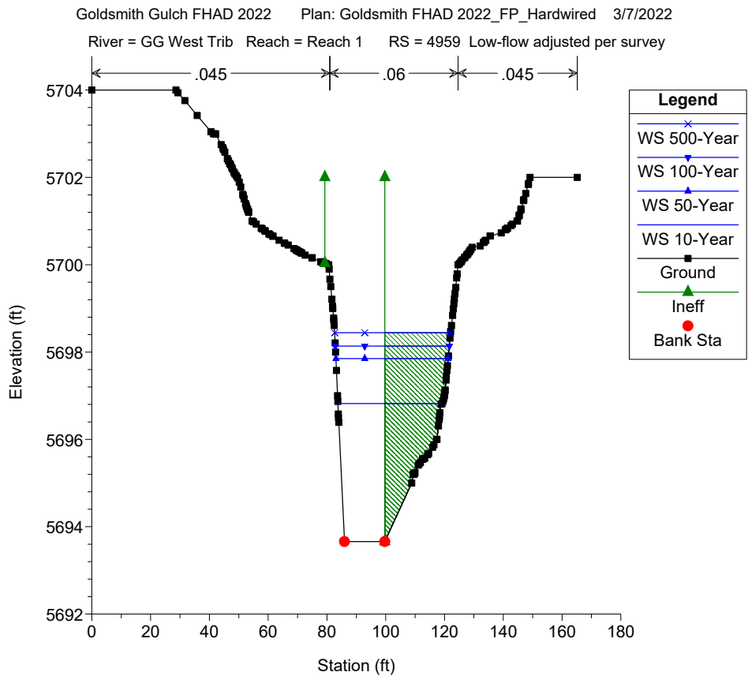

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5067 D/S Drop #66
.035
.045
.04
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

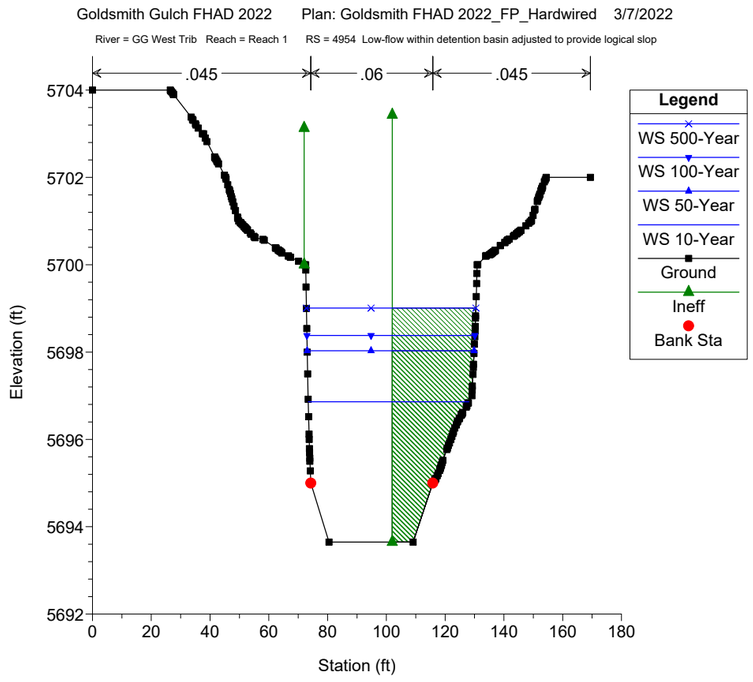

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5058 Low-flow adjusted per survey
.045
.02
.035
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

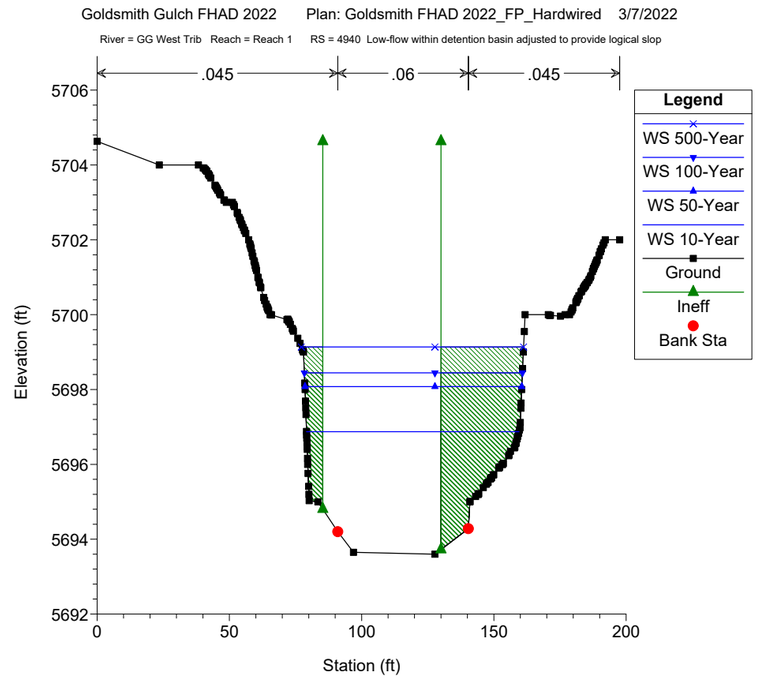

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5054 Low-flow adjusted per survey
.045
.02
.035
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

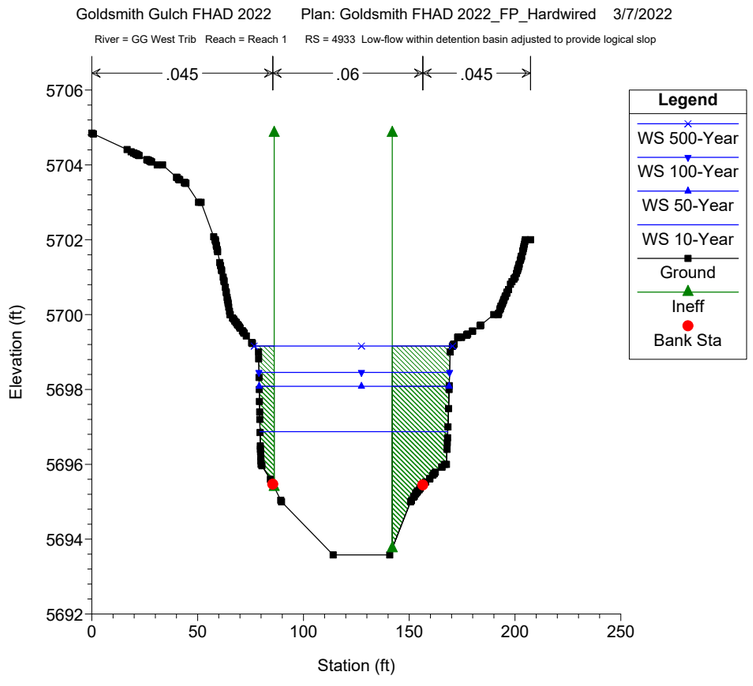

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5007 Culv E Caley Way
.045
.02
.035
.04
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

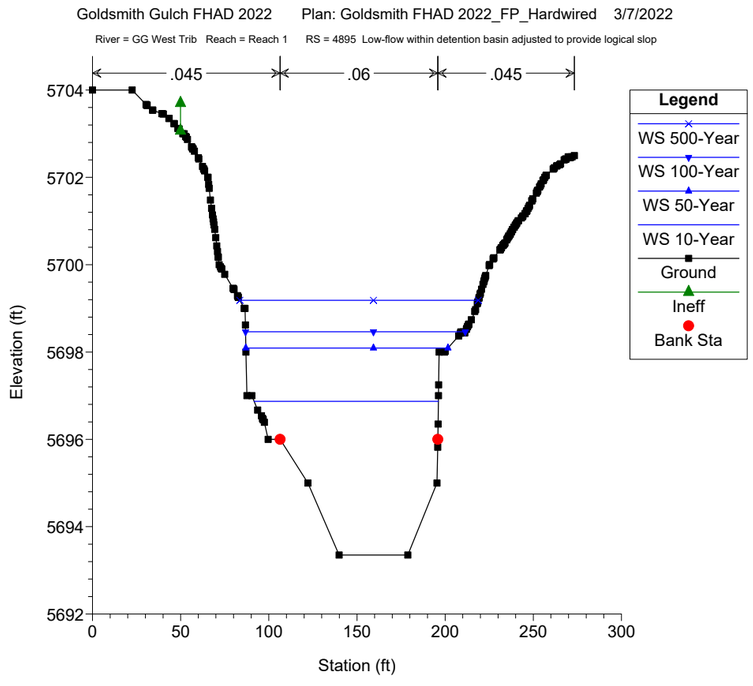

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 5007 Culv E Caley Way
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

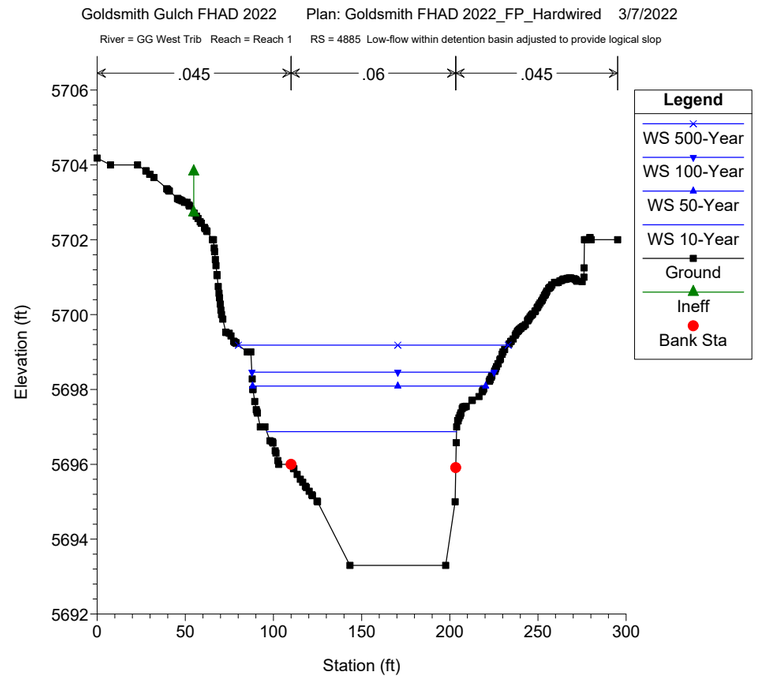

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4959 Low-flow adjusted per survey
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

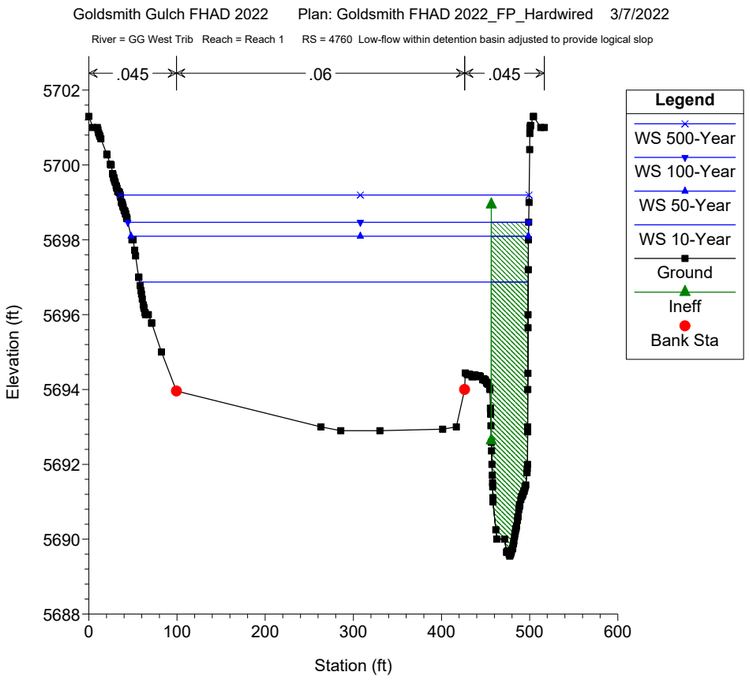

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4954 Low-flow within detention basin adjusted to provide logical slop
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

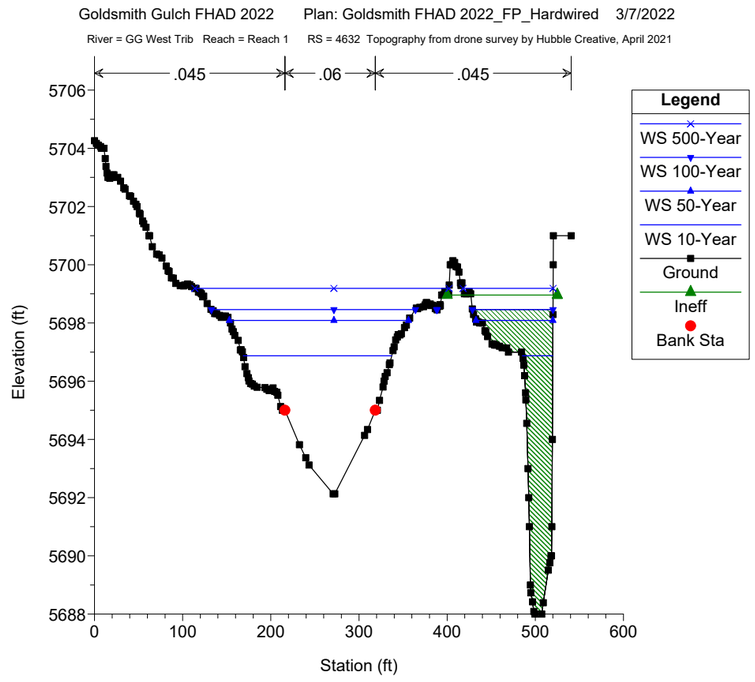

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4940 Low-flow within detention basin adjusted to provide logical slop
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

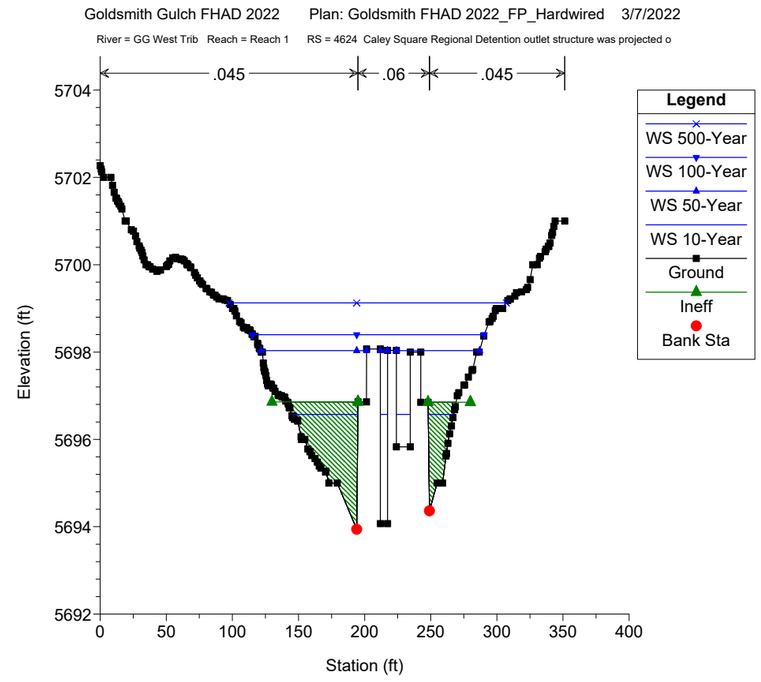

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4933 Low-flow within detention basin adjusted to provide logical slop
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

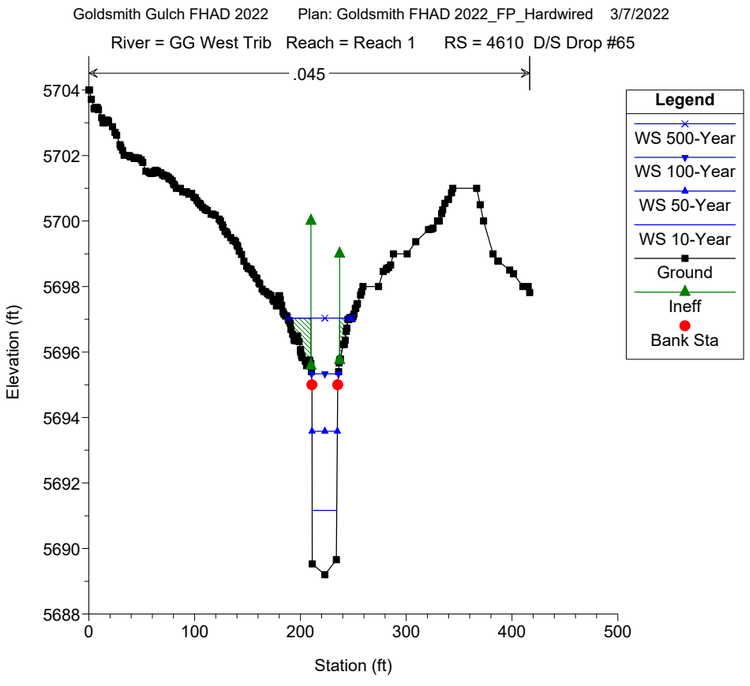

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4895 Low-flow within detention basin adjusted to provide logical slop
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

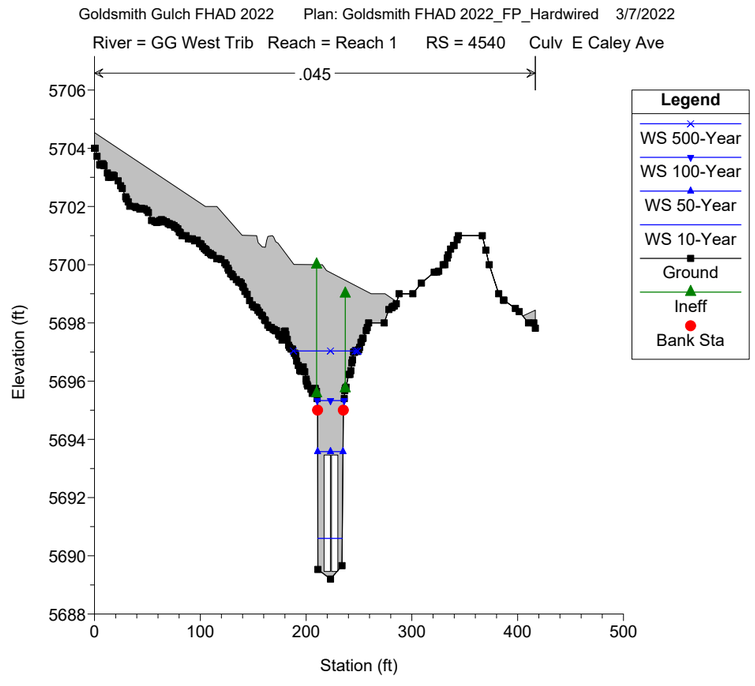

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4885 Low-flow within detention basin adjusted to provide logical slop
.045
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

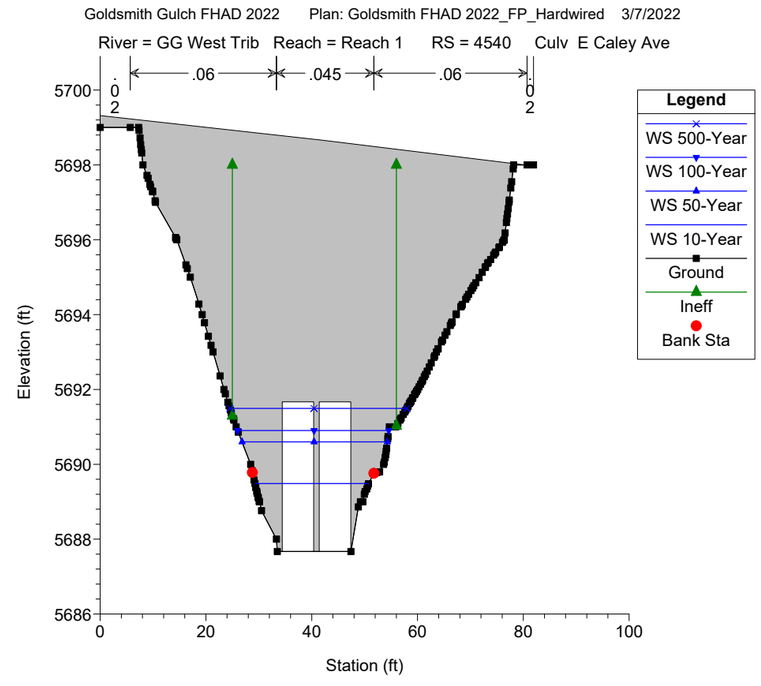

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4760 Low-flow within detention basin adjusted to provide logical slop
.045
.06
.045
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

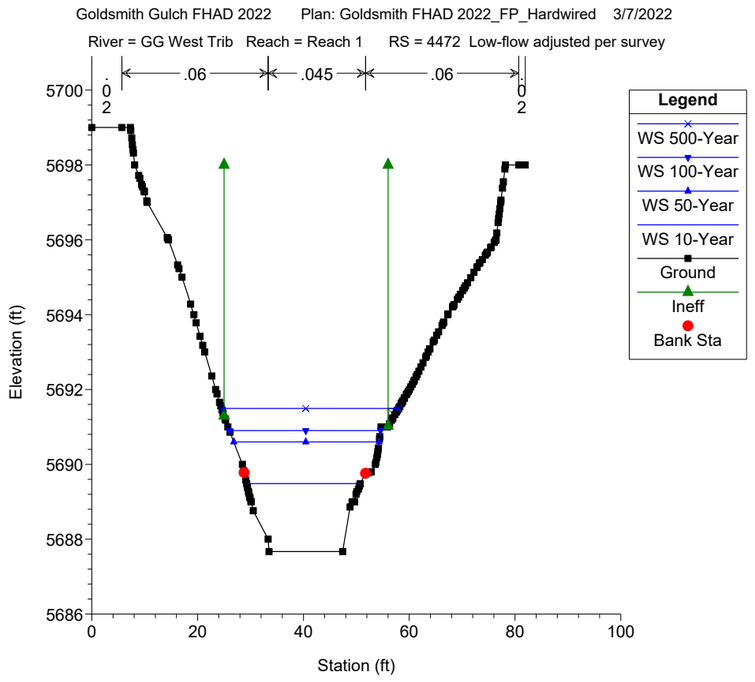

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4632 Topography from drone survey by Hubble Creative, April 2021
.045
.06
.045
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

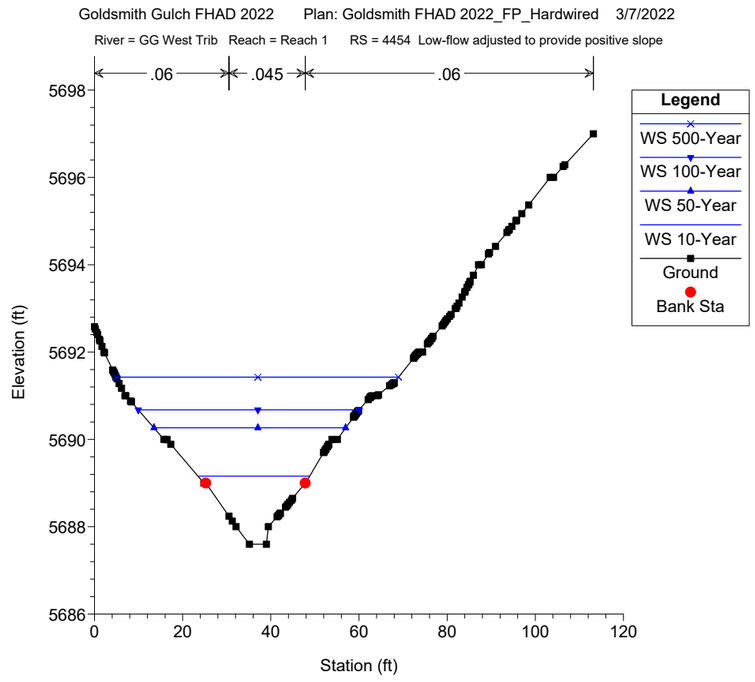

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4624 Caley Square Regional Detention outlet structure was projected o
.045
.06
.045
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

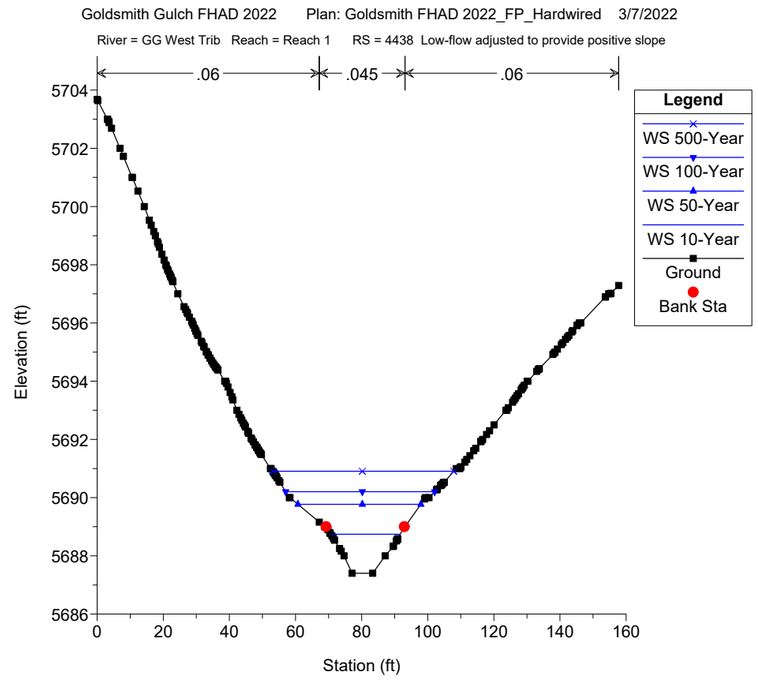

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4610 D/S Drop #65
.045
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

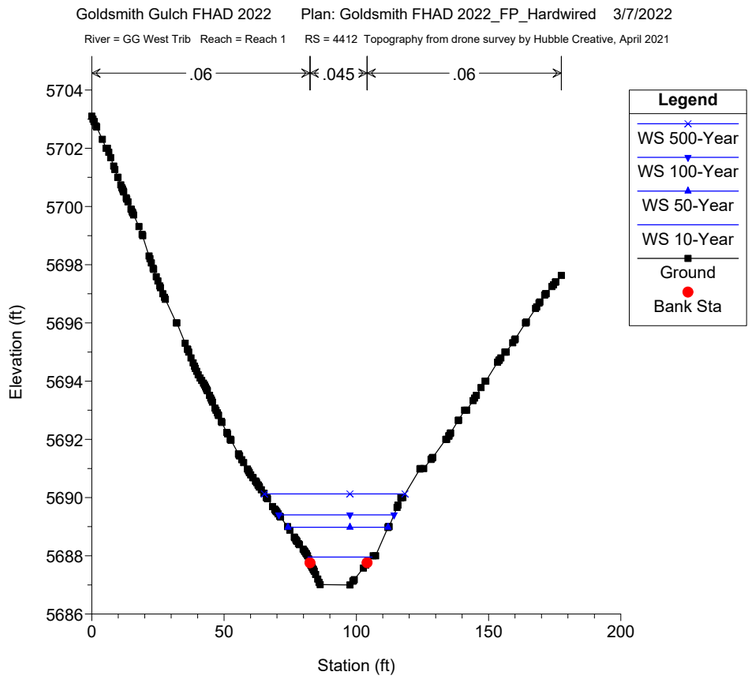

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4540 Culv E Caley Ave
.045
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

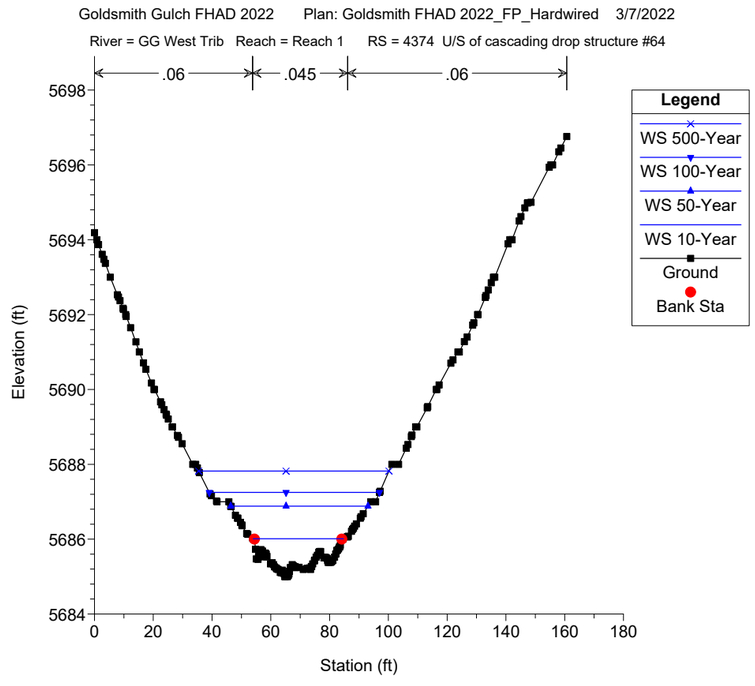

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4540 Culv E Caley Ave
.06
.045
.06
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

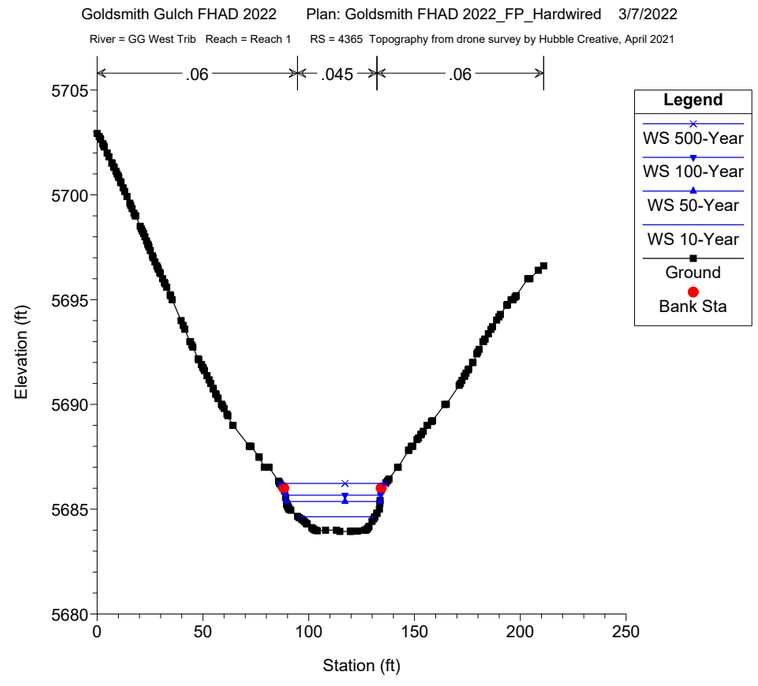

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4472 Low-flow adjusted per survey
.02
.06
.045
.06
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

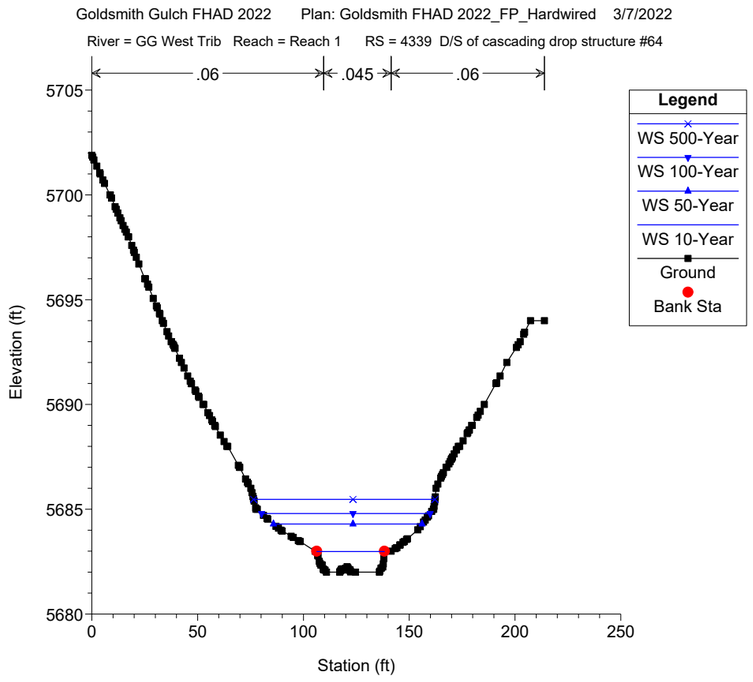

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4454 Low-flow adjusted to provide positive slope
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

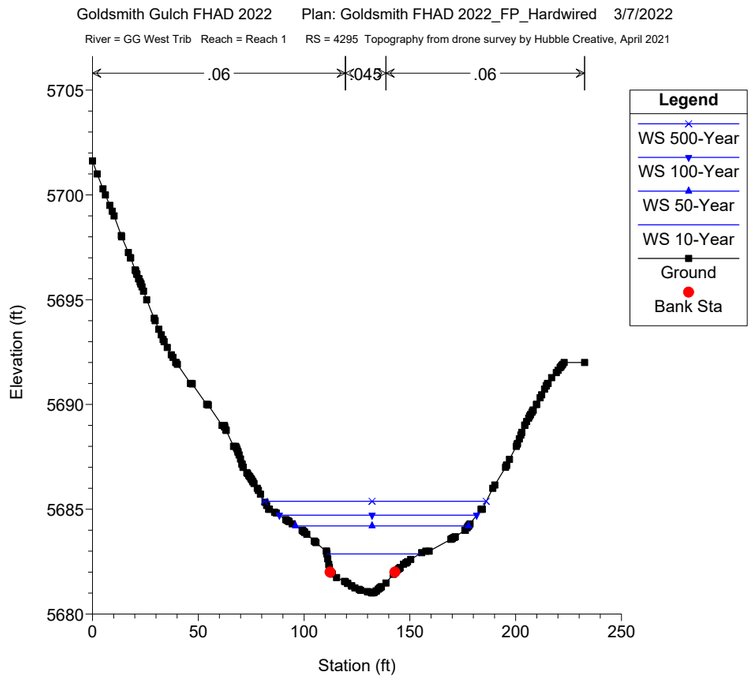

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4438 Low-flow adjusted to provide positive slope
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

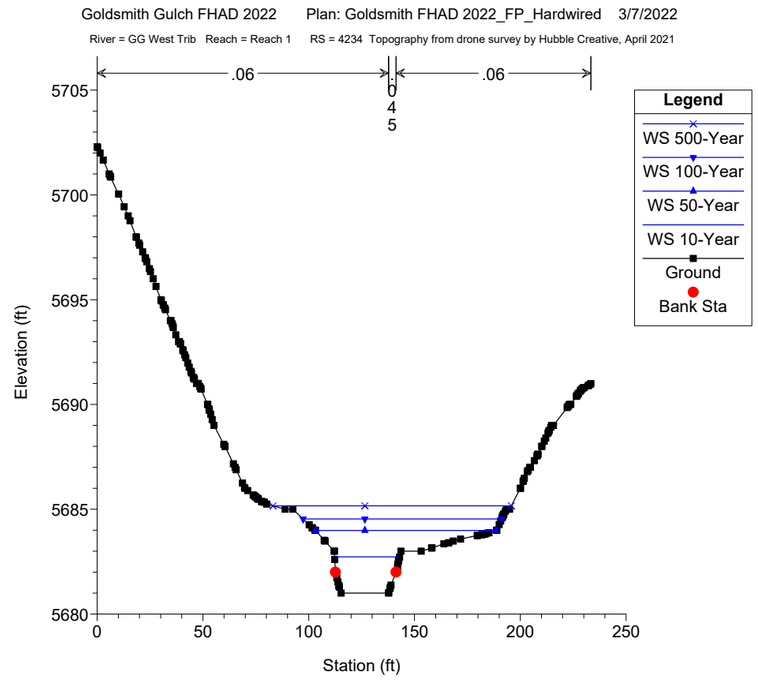

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4412 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

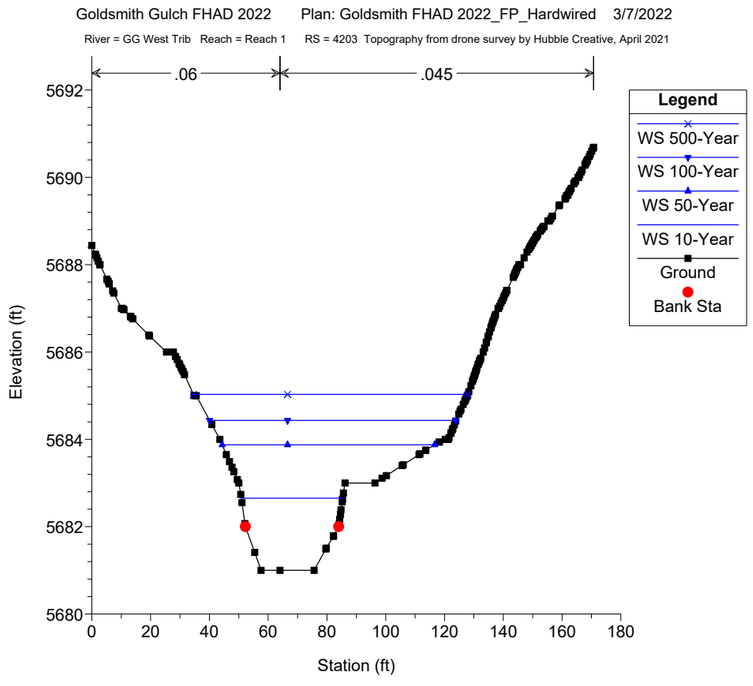

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4374 U/S of cascading drop structure #64
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

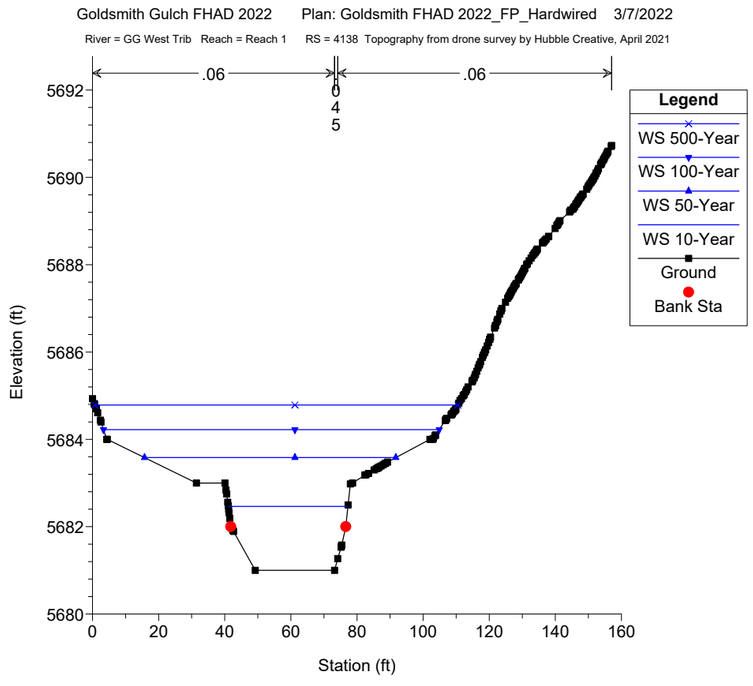

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4365 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

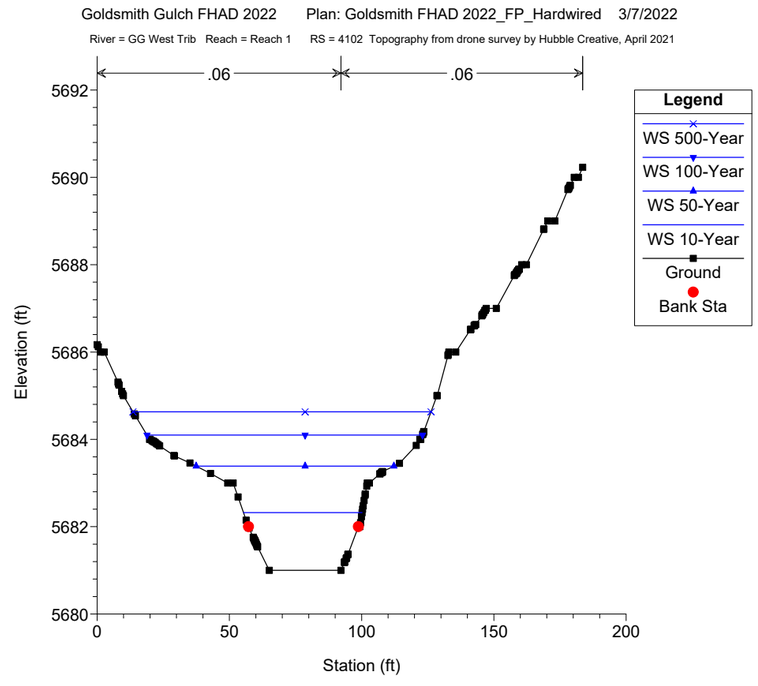

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4339 D/S of cascading drop structure #64
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

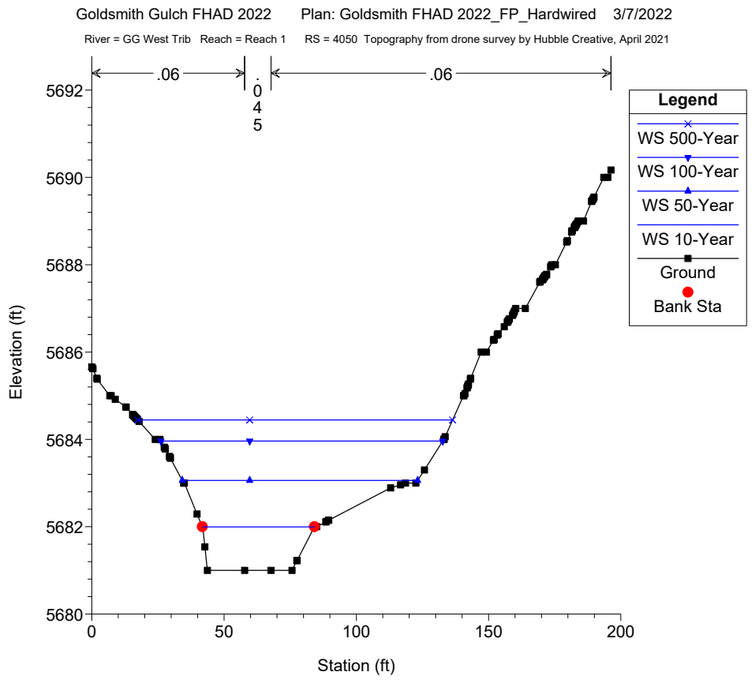

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4295 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

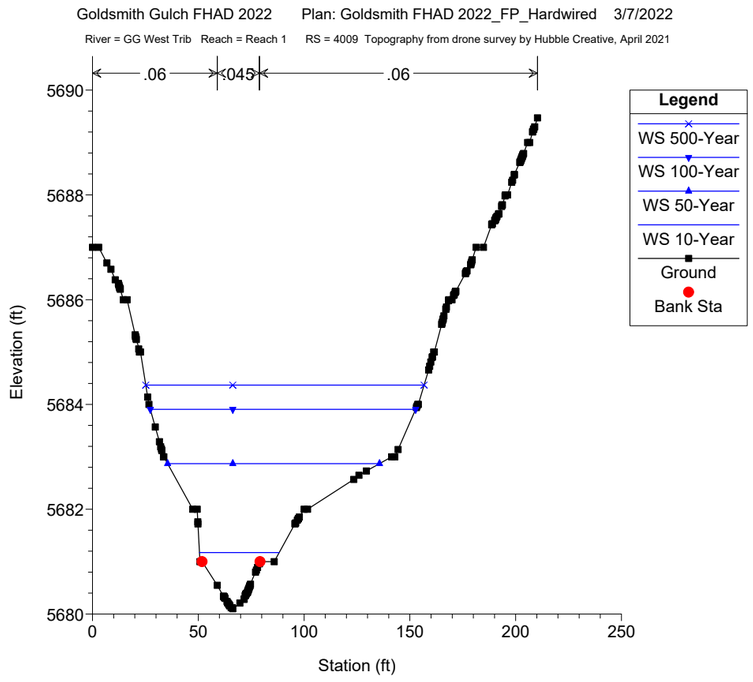

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4234 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

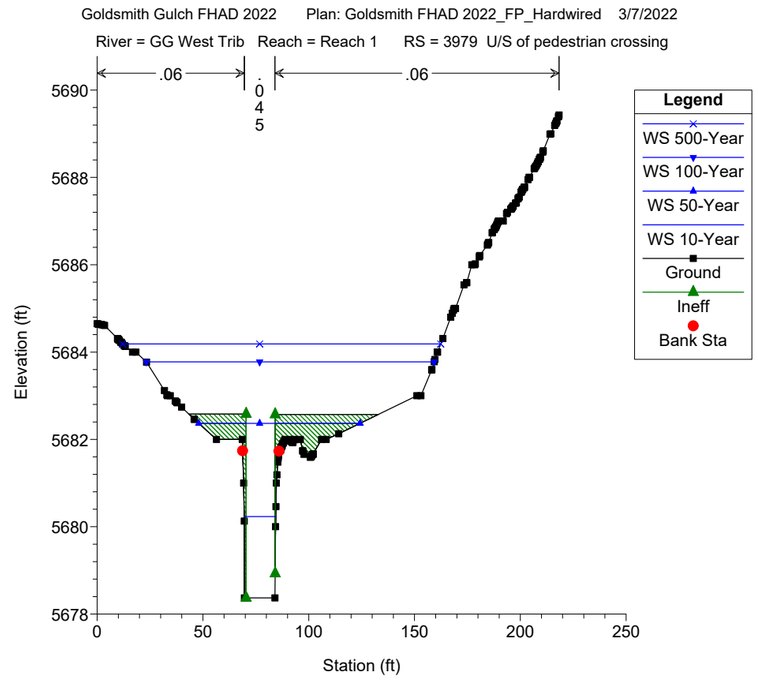

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4203 Topography from drone survey by Hubble Creative, April 2021
.06
.045
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

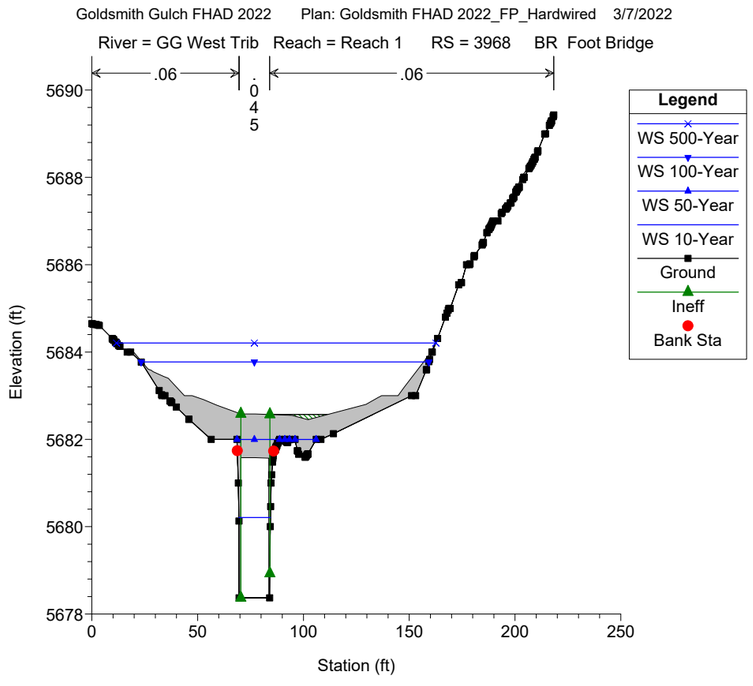

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4138 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

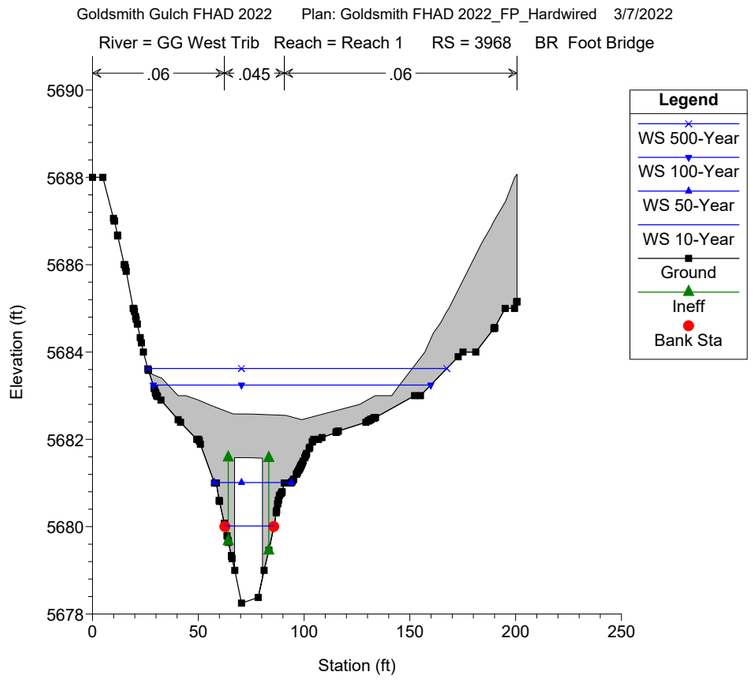

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4102 Topography from drone survey by Hubble Creative, April 2021
.06
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

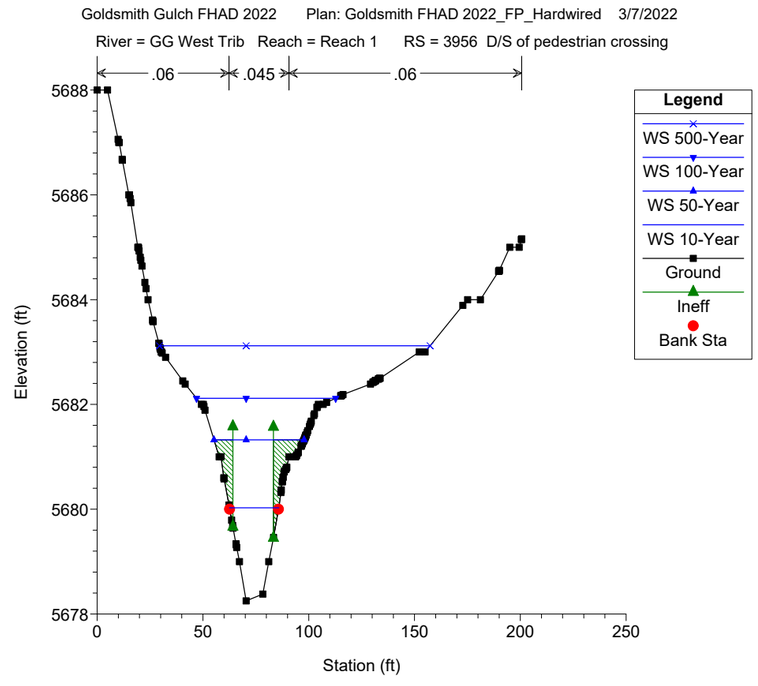

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4050 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

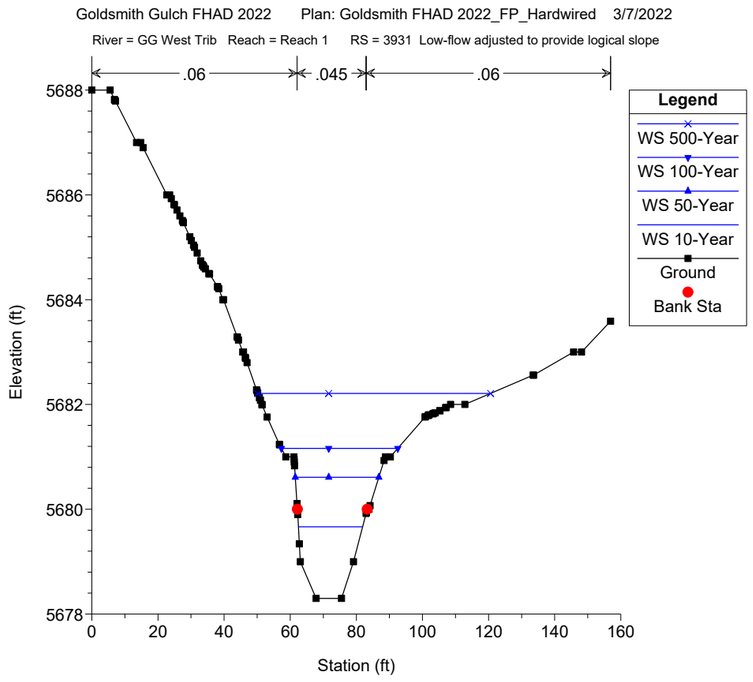

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 4009 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

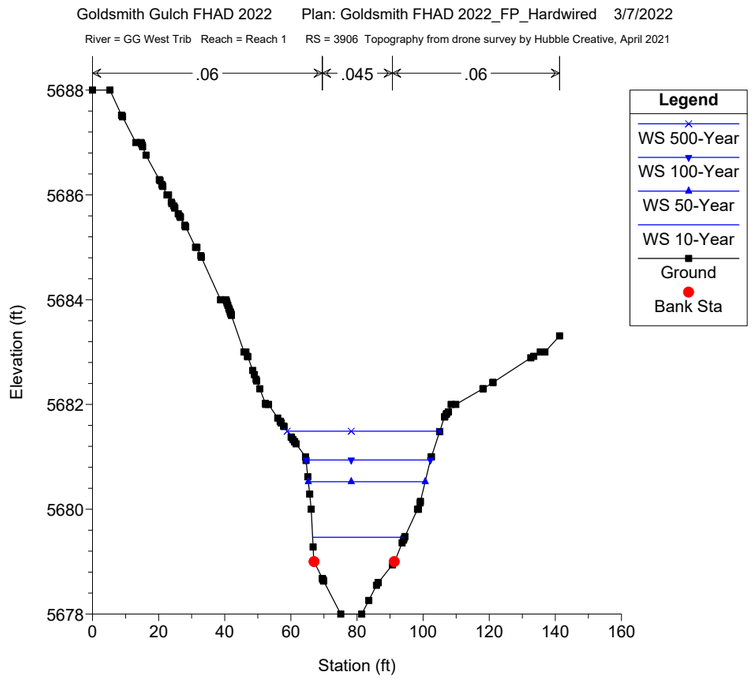

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3979 U/S of pedestrian crossing
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

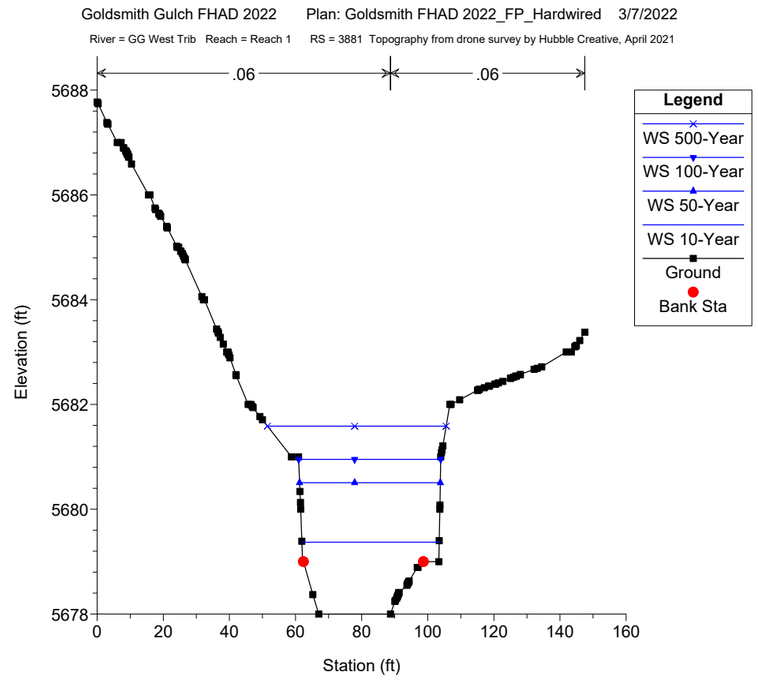

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3968 BR Foot Bridge
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

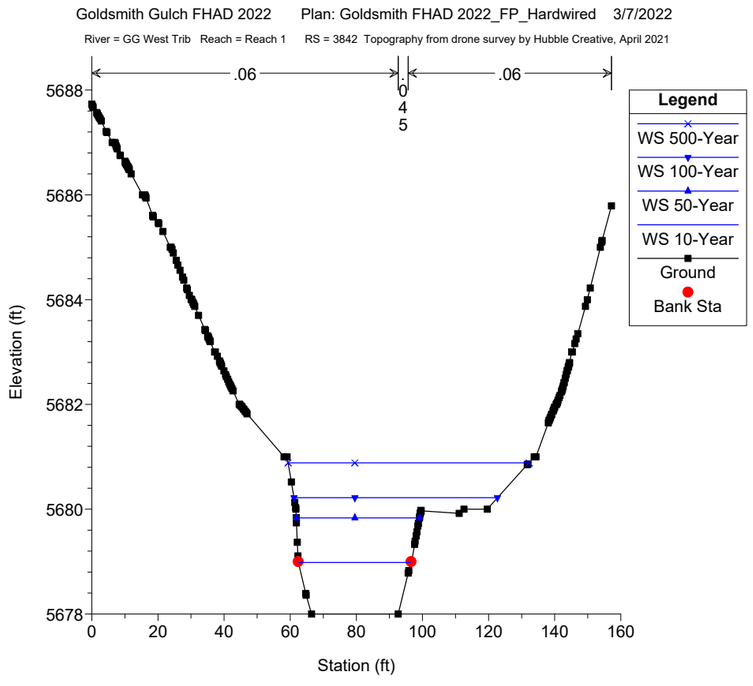

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3968 BR Foot Bridge
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

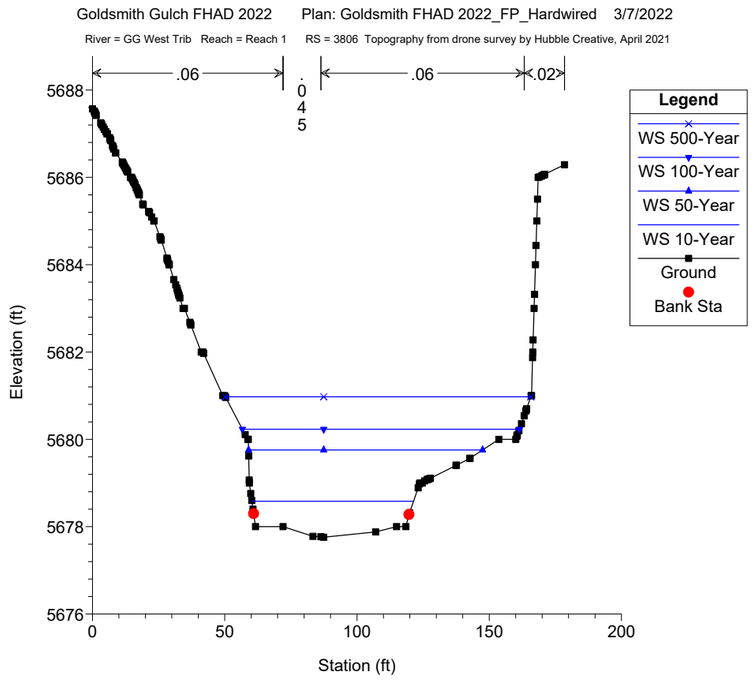

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3956 D/S of pedestrian crossing
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

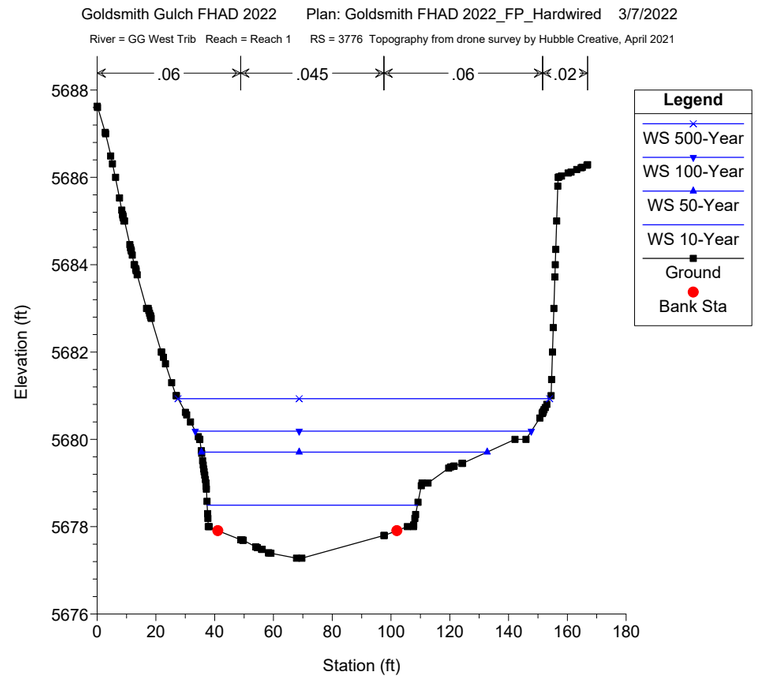

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3931 Low-flow adjusted to provide logical slope
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

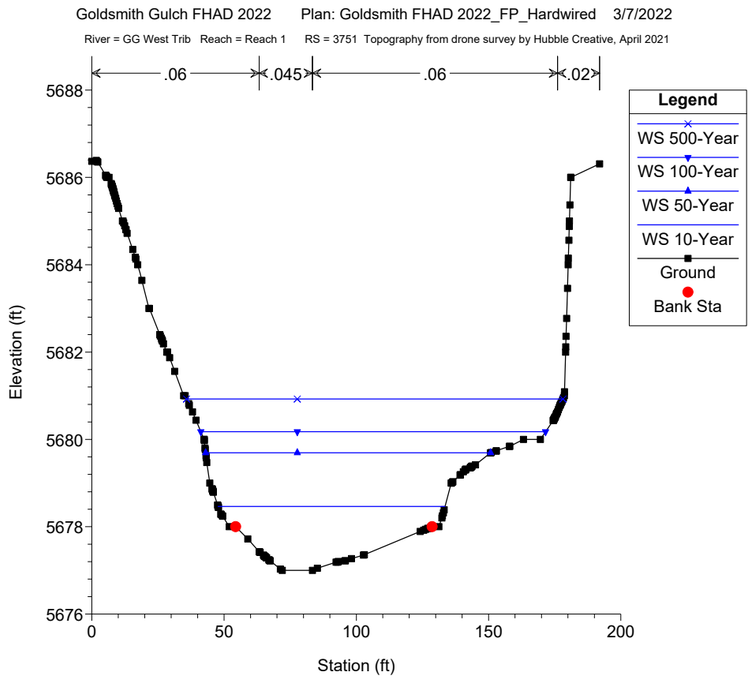

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3906 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

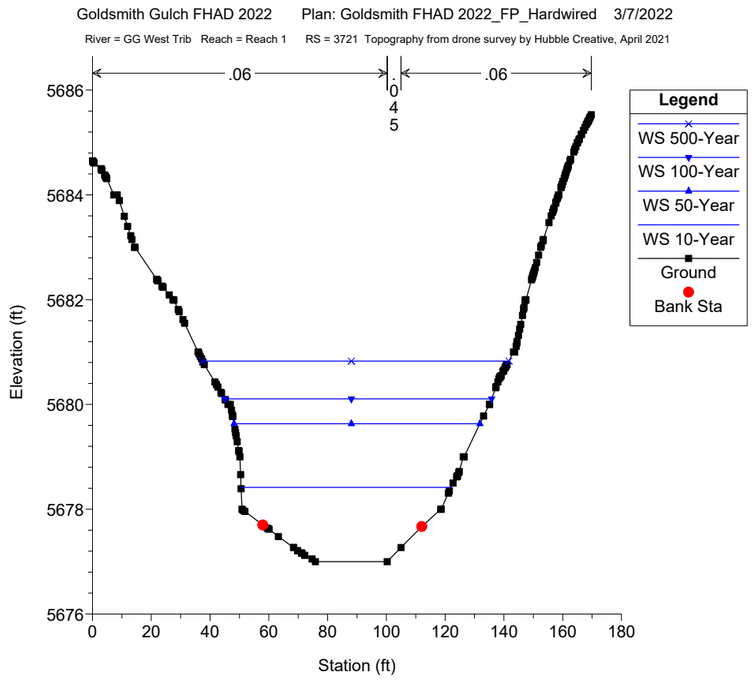

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3881 Topography from drone survey by Hubble Creative, April 2021
.06
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

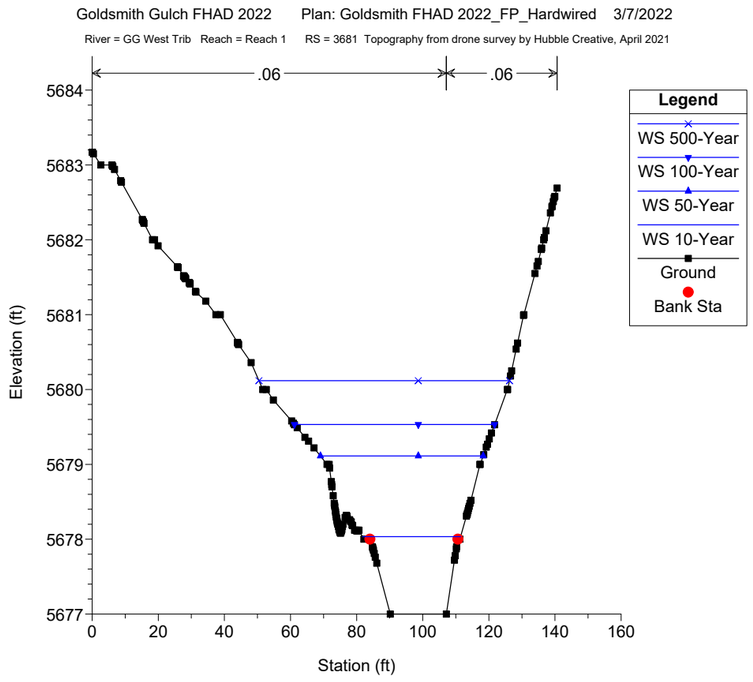

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3842 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

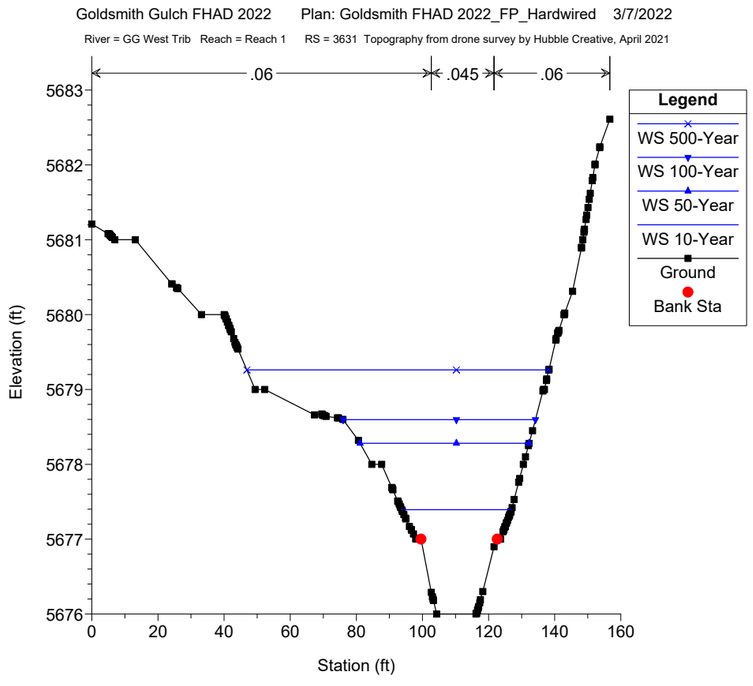

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3806 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

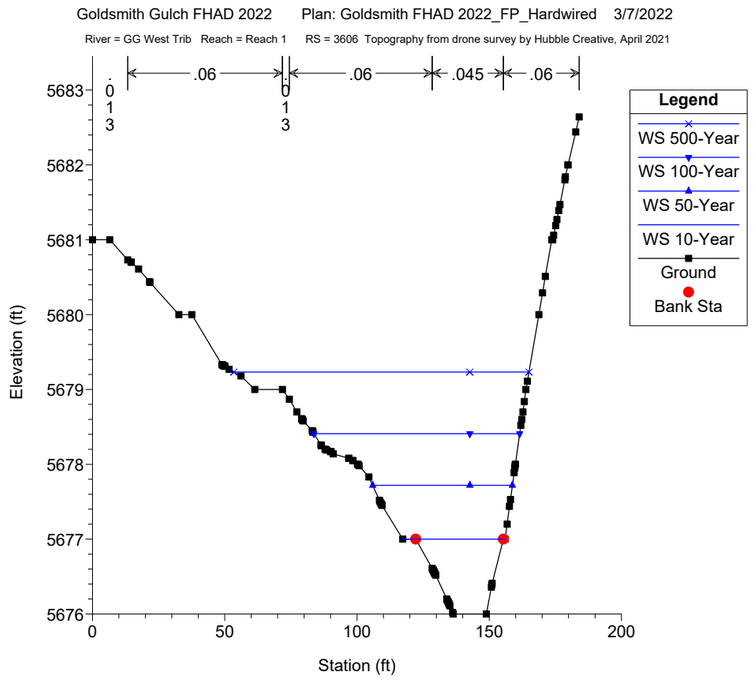

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3776 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

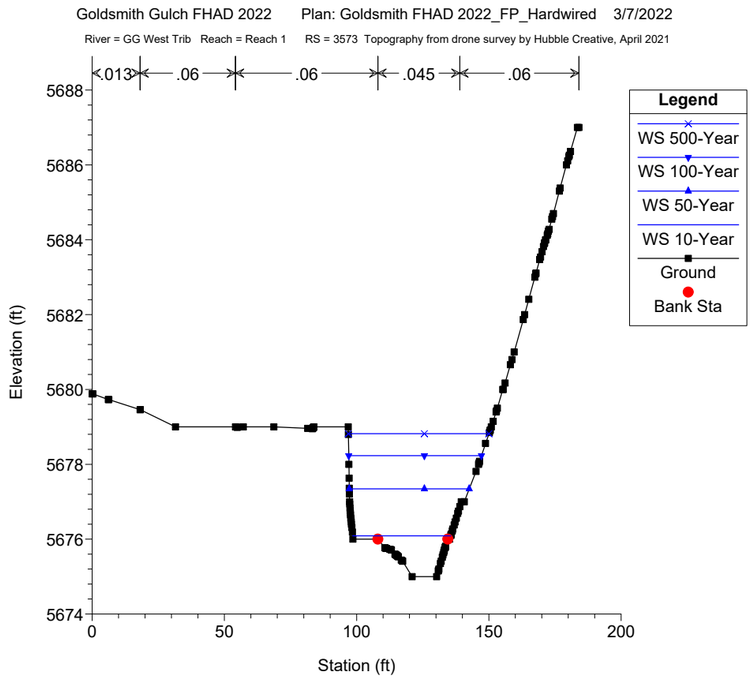

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3751 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
.02
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3721 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3681 Topography from drone survey by Hubble Creative, April 2021
.06
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3631 Topography from drone survey by Hubble Creative, April 2021
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3606 Topography from drone survey by Hubble Creative, April 2021
.013
.06
.013
.06
.045
.06
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3573 Topography from drone survey by Hubble Creative, April 2021
.013
.06
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.045
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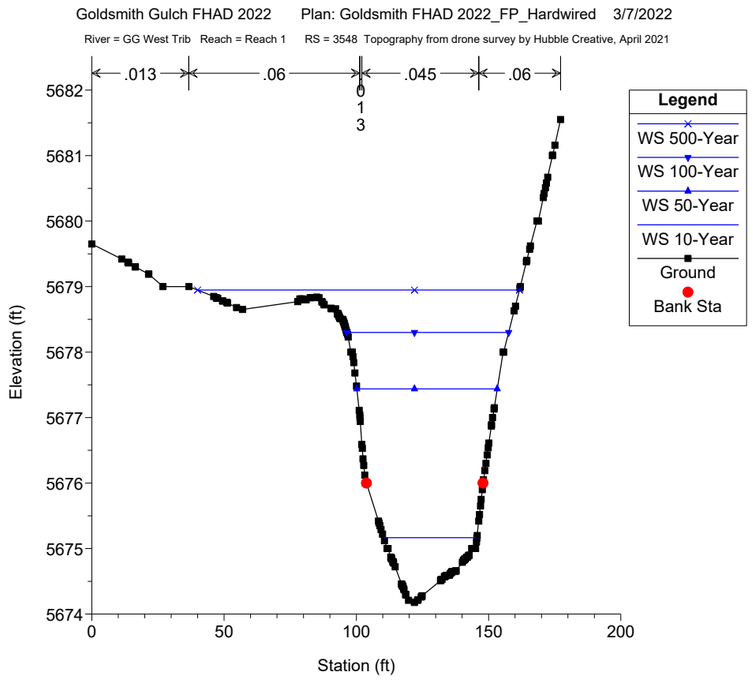
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = GG West Trib Reach = Reach 1 RS = 3548 Topography from drone survey by Hubble Creative, April 2021
.013
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.045
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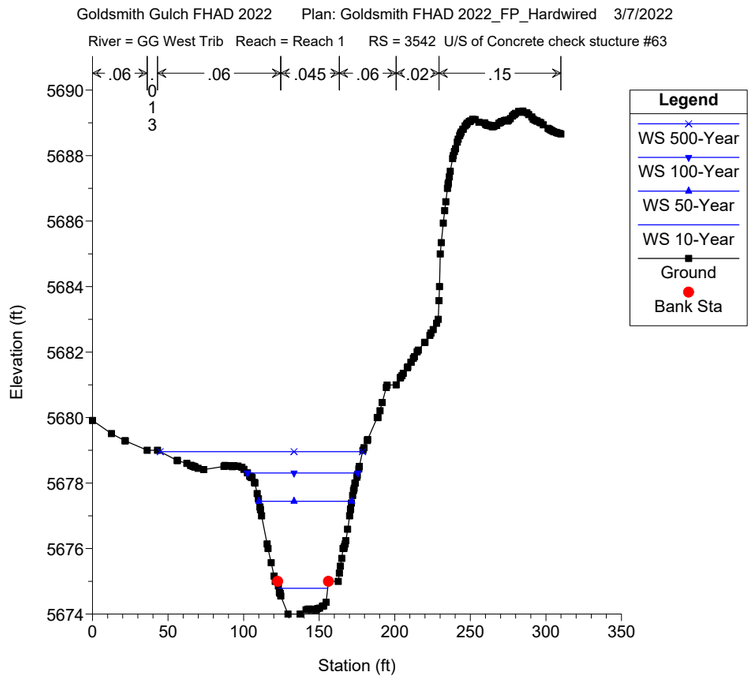
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3542 U/S of Concrete check stucture #63
.06
.06
.045
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.02
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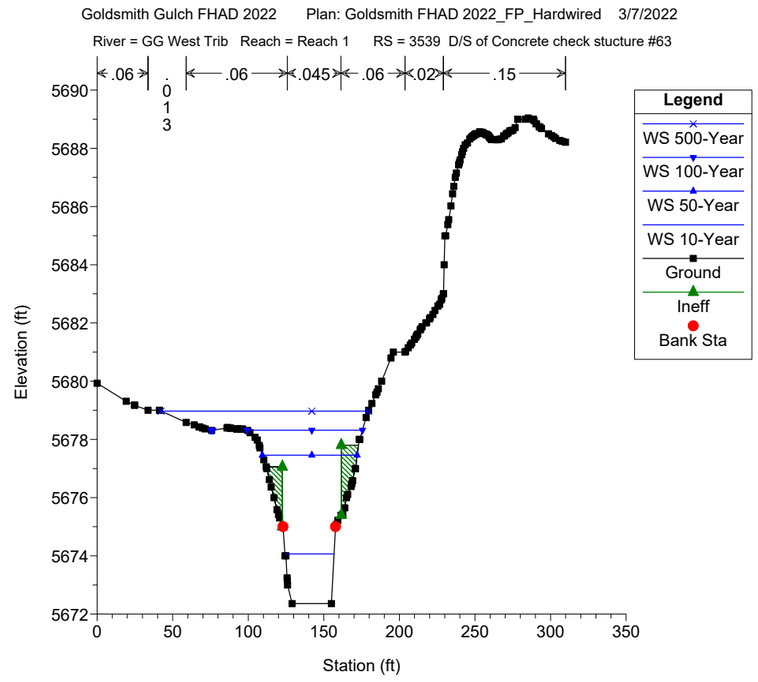
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3539 D/S of Concrete check stucture #63
.06
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.045
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.02
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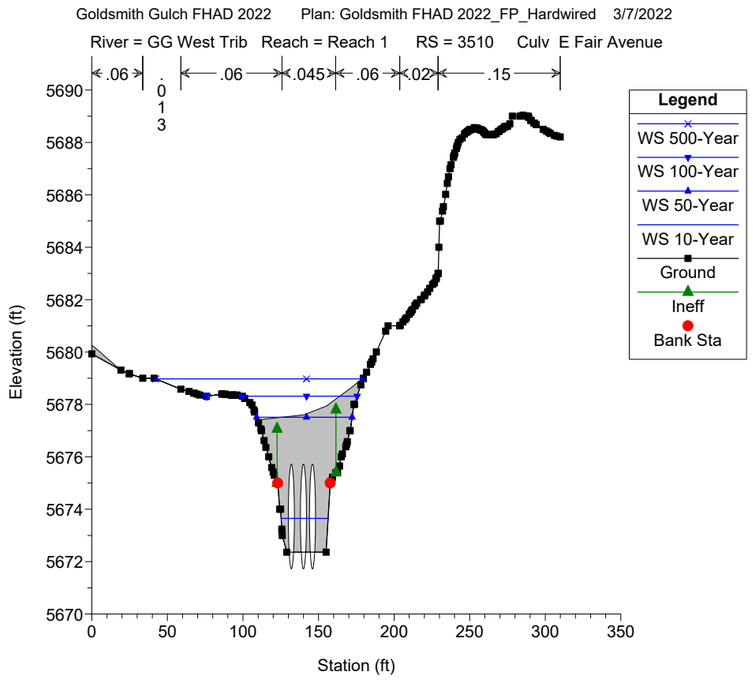
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3510 Culv E Fair Avenue
.06
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.02
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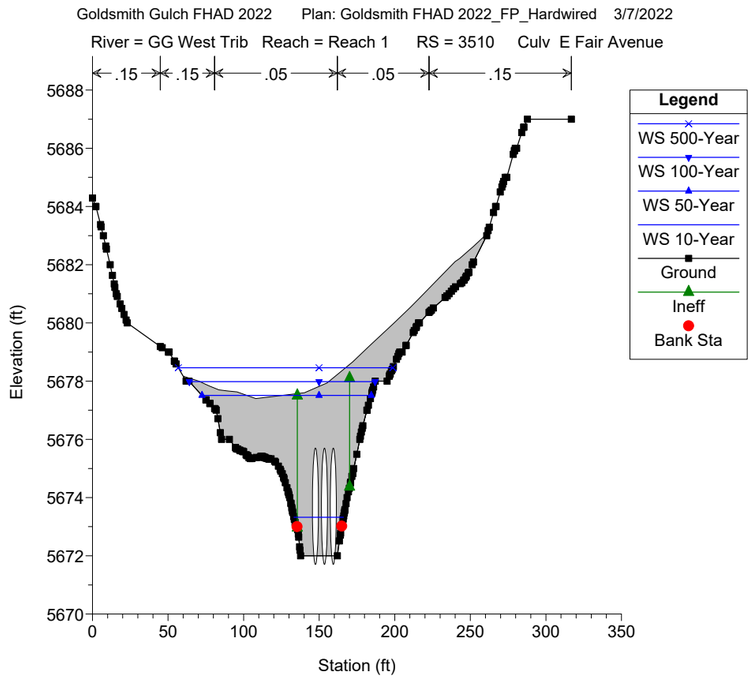
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)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River = GG West Trib Reach = Reach 1 RS = 3510 Culv E Fair Avenue
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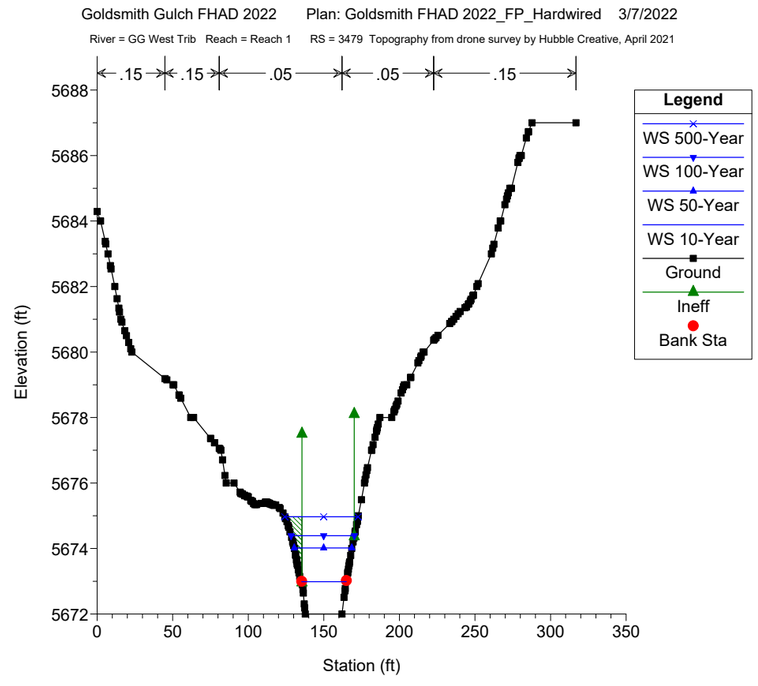
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3479 Topography from drone survey by Hubble Creative, April 2021
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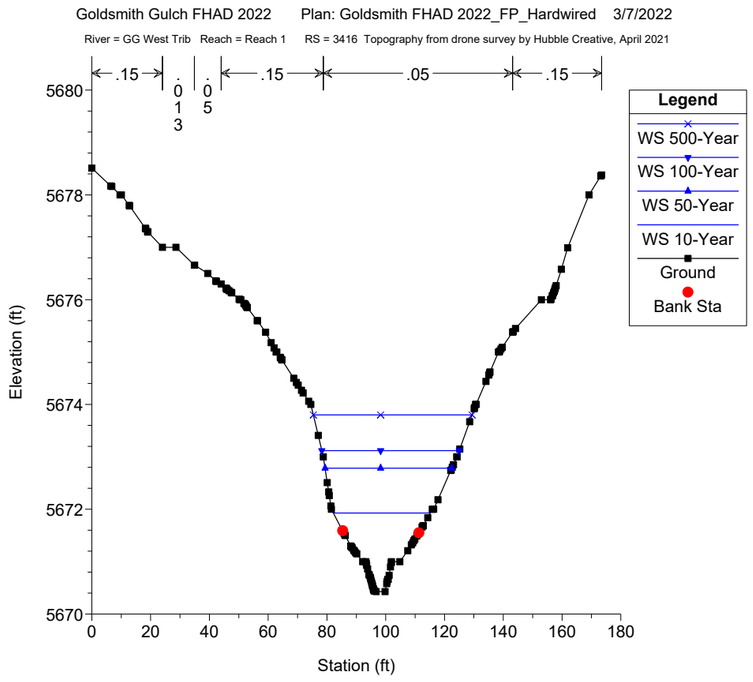
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3416 Topography from drone survey by Hubble Creative, April 2021
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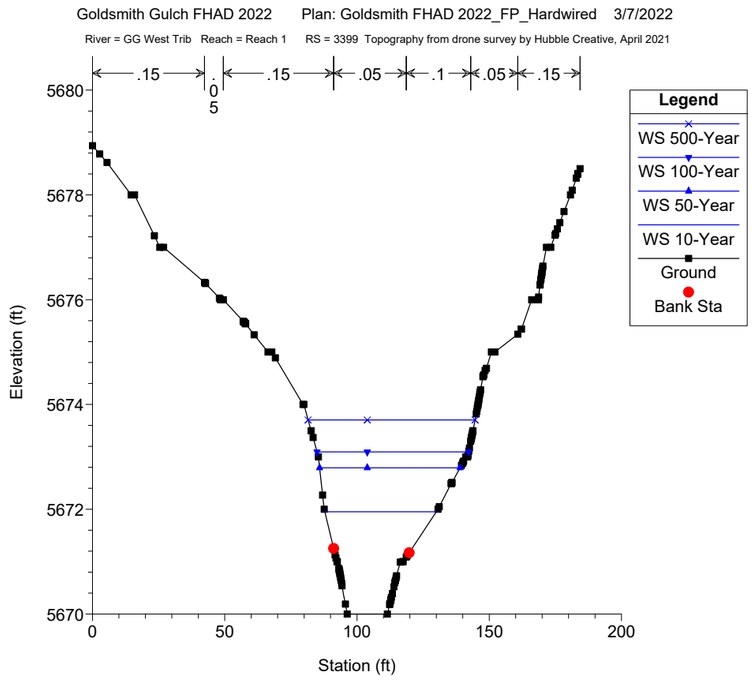
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3399 Topography from drone survey by Hubble Creative, April 2021
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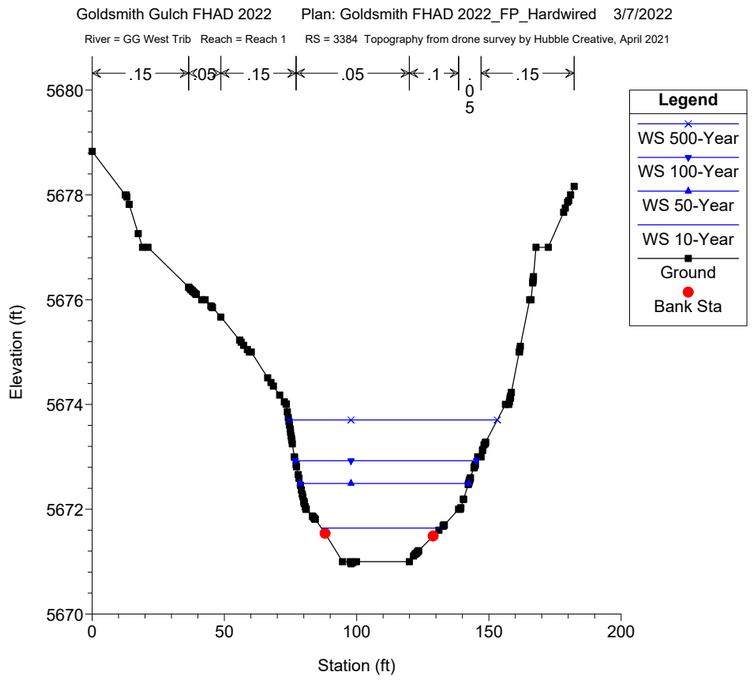
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = GG West Trib Reach = Reach 1 RS = 3384 Topography from drone survey by Hubble Creative, April 2021
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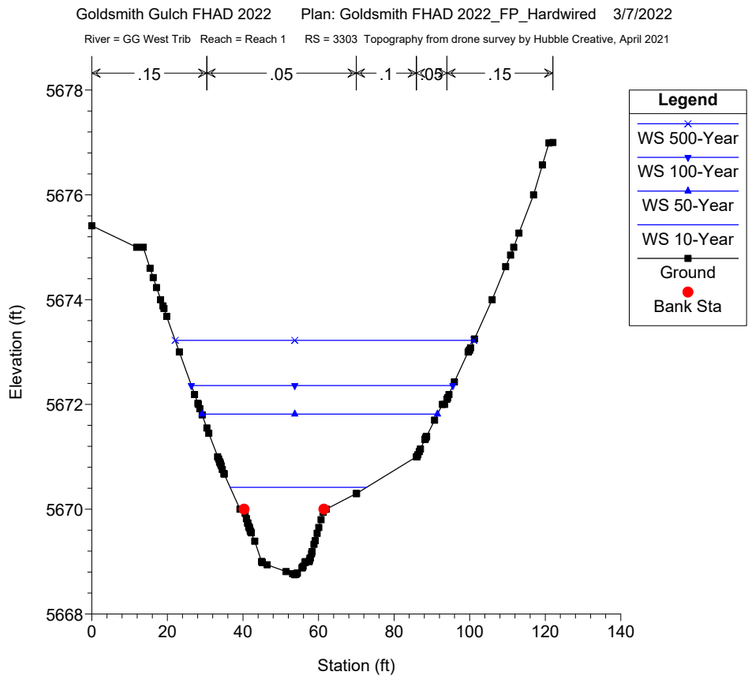
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = GG West Trib Reach = Reach 1 RS = 3303 Topography from drone survey by Hubble Creative, April 2021
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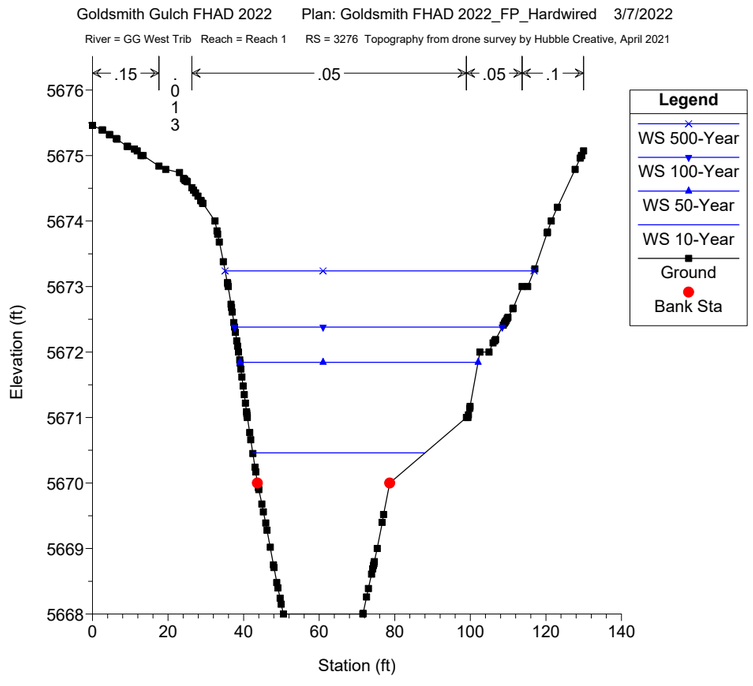
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3276 Topography from drone survey by Hubble Creative, April 2021
.15
.013
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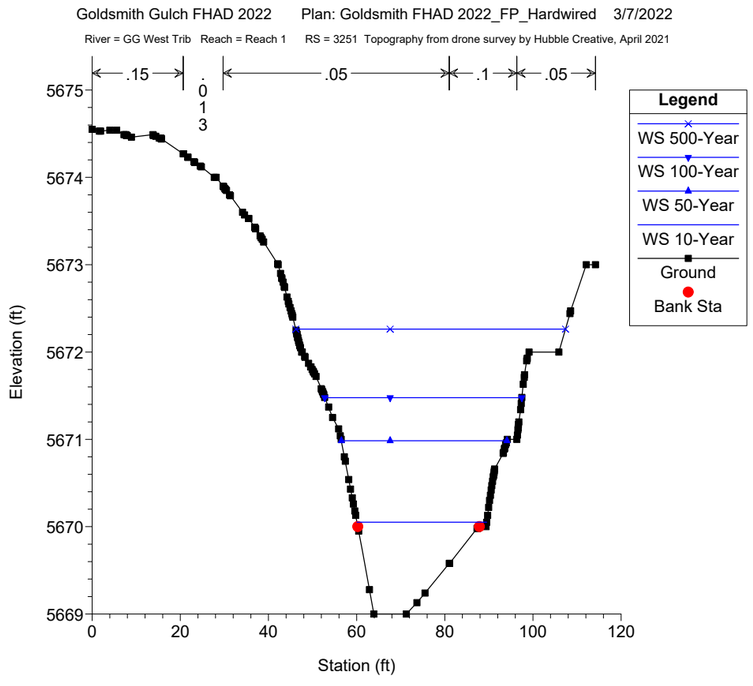
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3251 Topography from drone survey by Hubble Creative, April 2021
.15
.013
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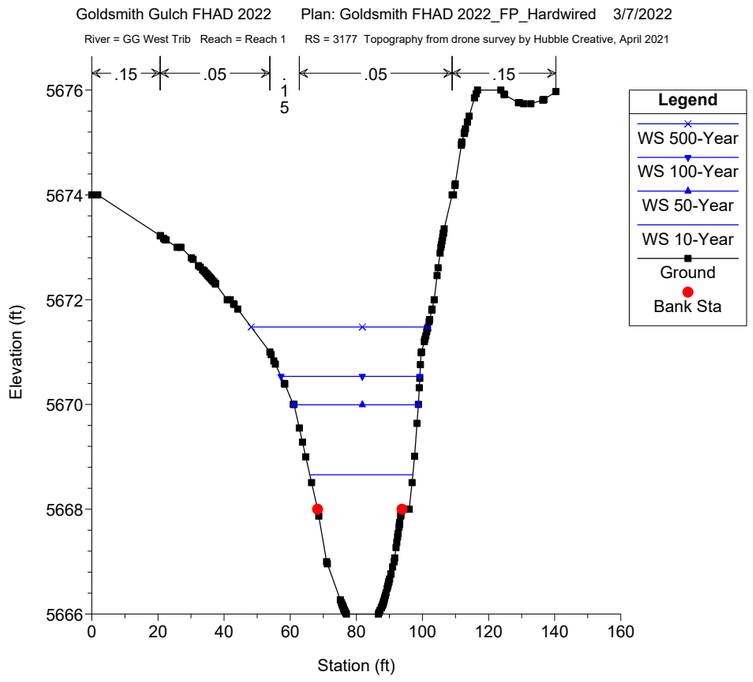
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3177 Topography from drone survey by Hubble Creative, April 2021
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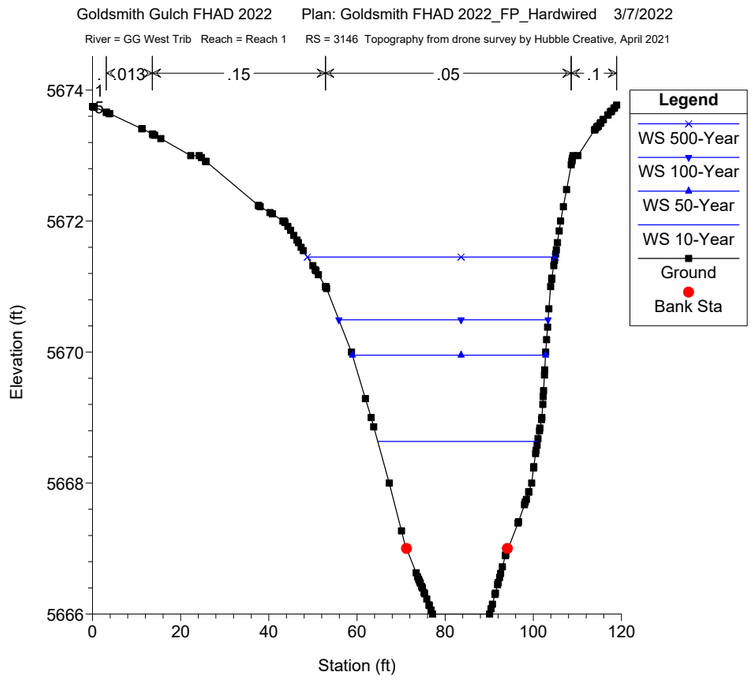
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)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River = GG West Trib Reach = Reach 1 RS = 3146 Topography from drone survey by Hubble Creative, April 2021
.013
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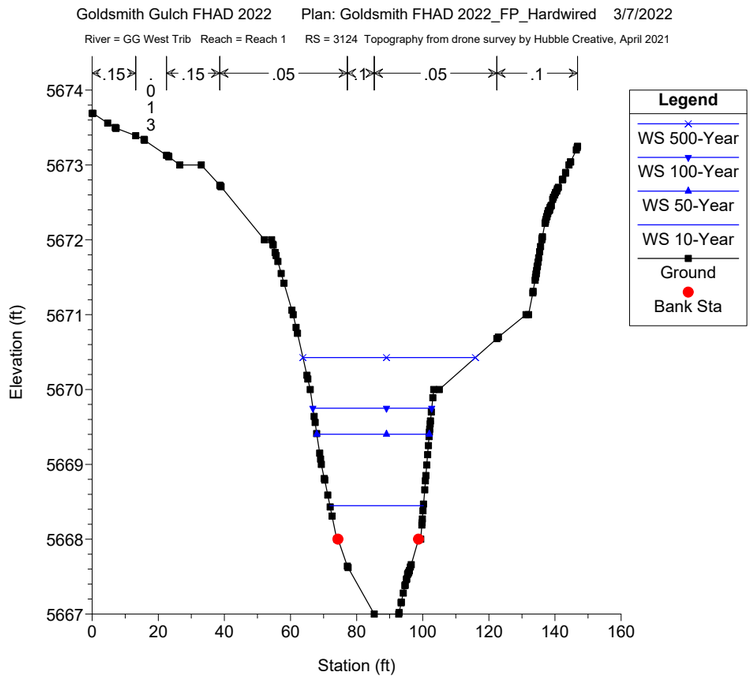
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3124 Topography from drone survey by Hubble Creative, April 2021
.15
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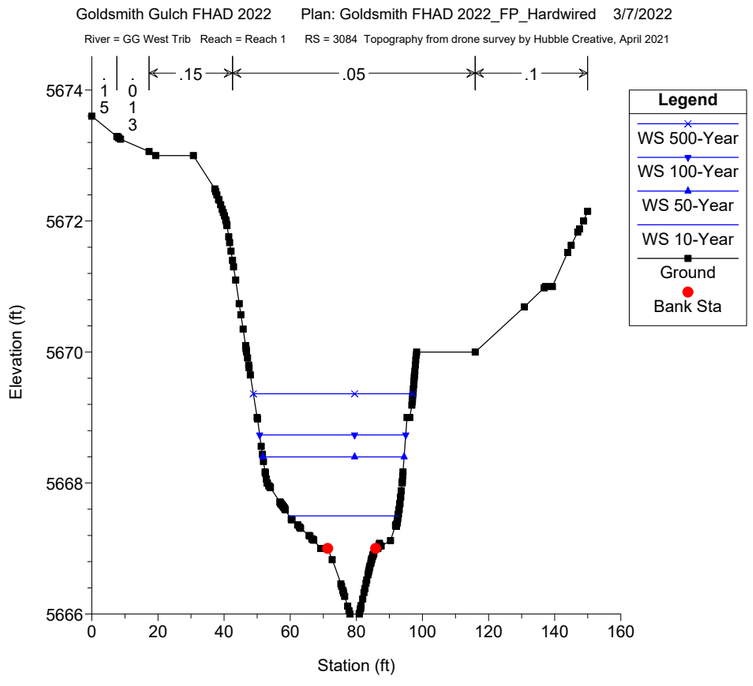
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3084 Topography from drone survey by Hubble Creative, April 2021
.15
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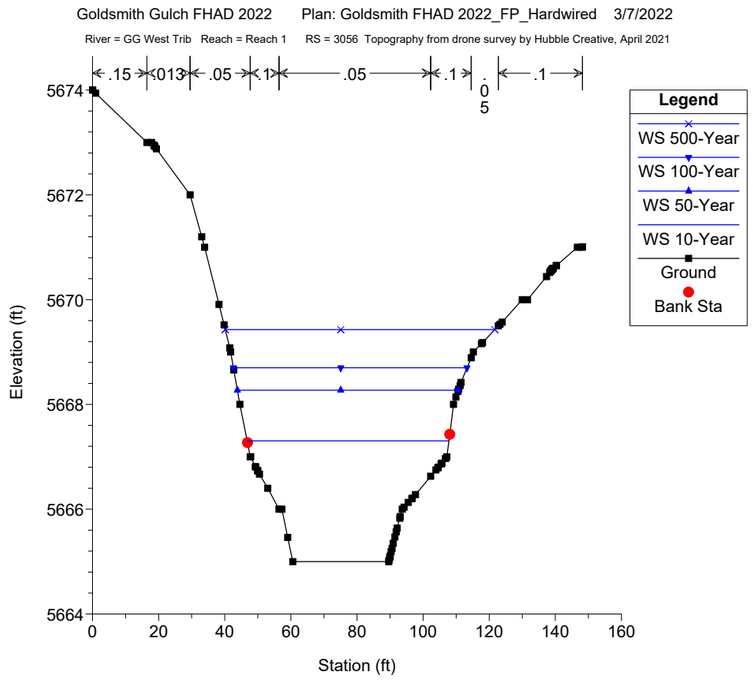
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3056 Topography from drone survey by Hubble Creative, April 2021
.15
.013
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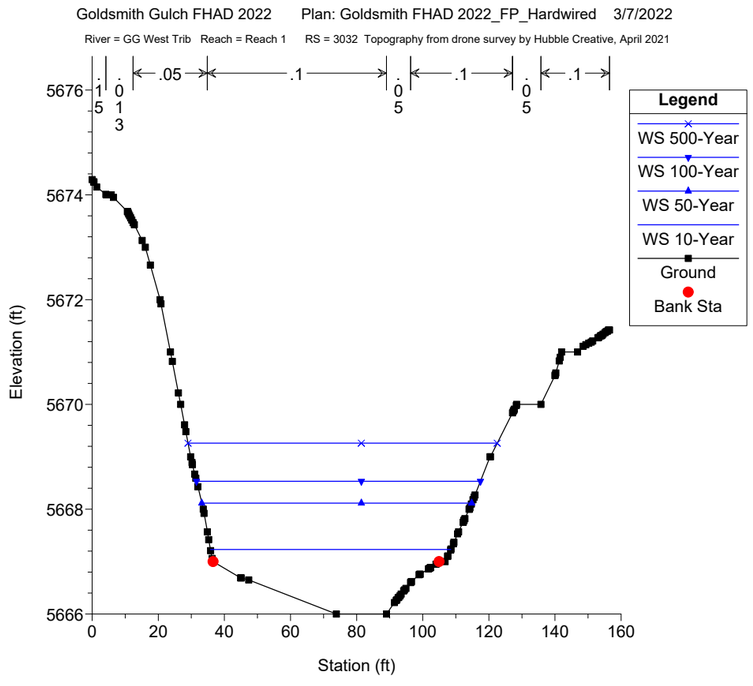
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3032 Topography from drone survey by Hubble Creative, April 2021
.05
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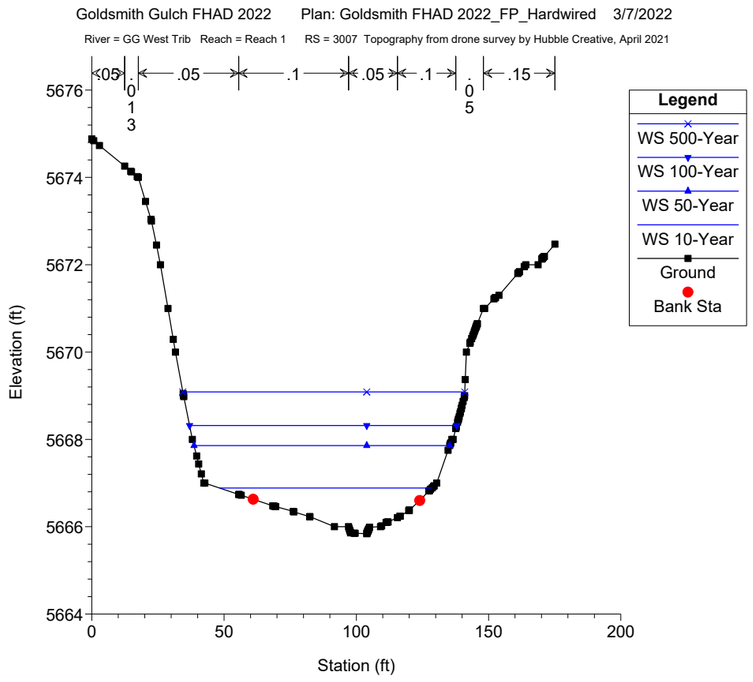
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 3007 Topography from drone survey by Hubble Creative, April 2021
.05
.013
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.05
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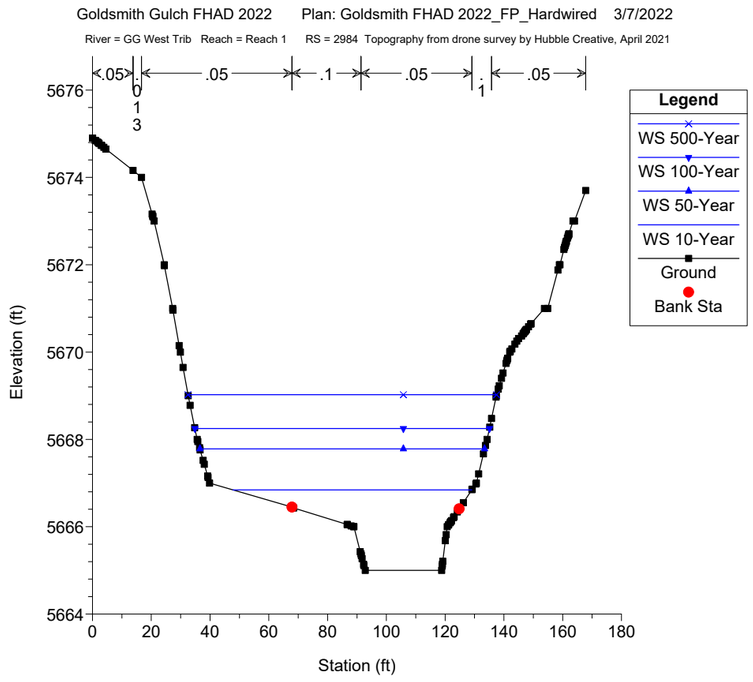
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2984 Topography from drone survey by Hubble Creative, April 2021
.05
.013
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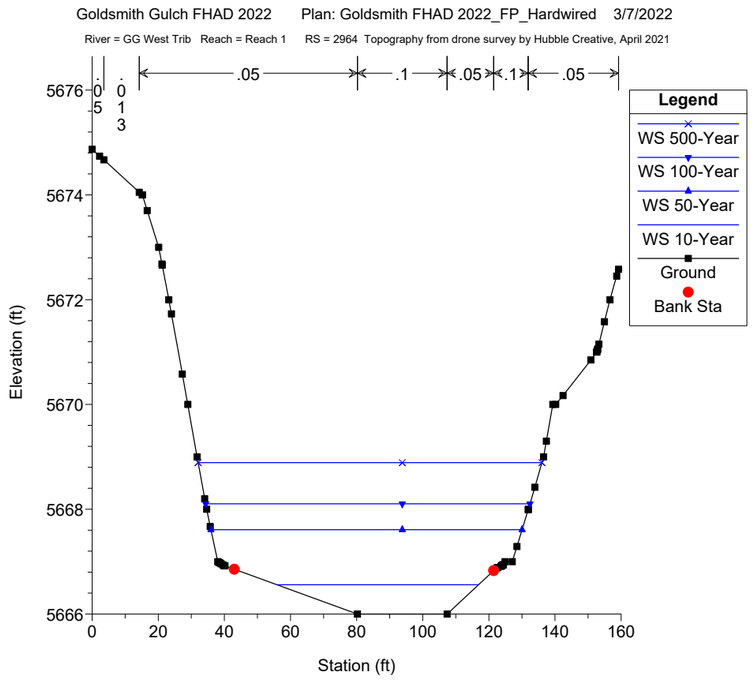
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2964 Topography from drone survey by Hubble Creative, April 2021
.05
.013
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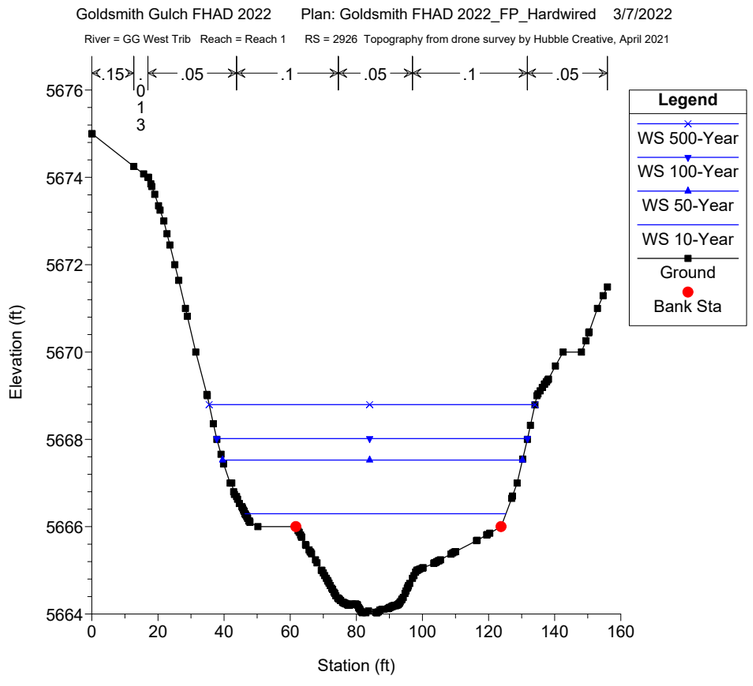
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2926 Topography from drone survey by Hubble Creative, April 2021
.15
.013
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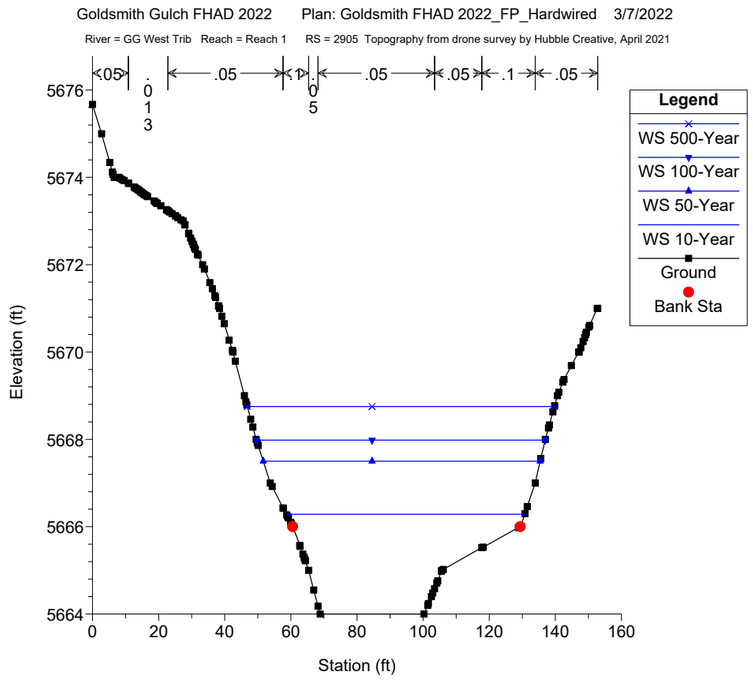
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2905 Topography from drone survey by Hubble Creative, April 2021
.05
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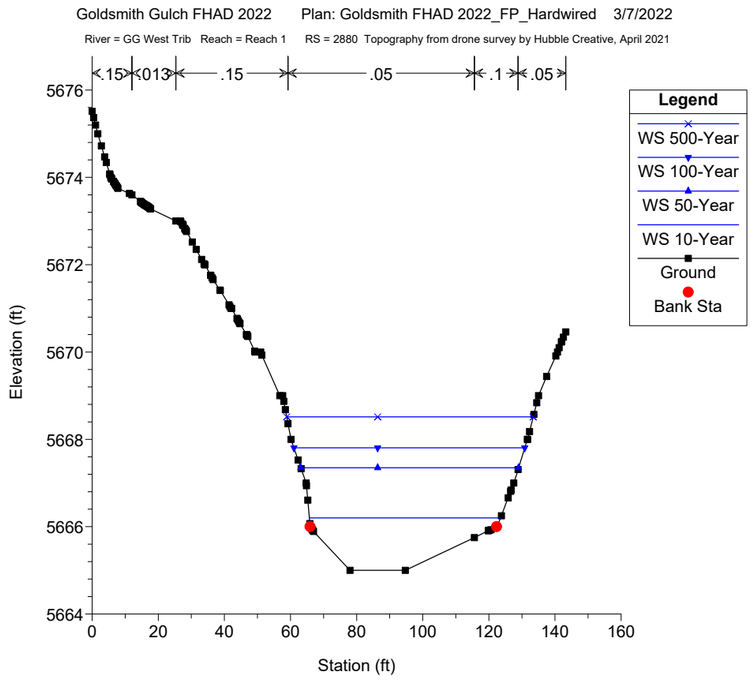
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2880 Topography from drone survey by Hubble Creative, April 2021
.15
.013
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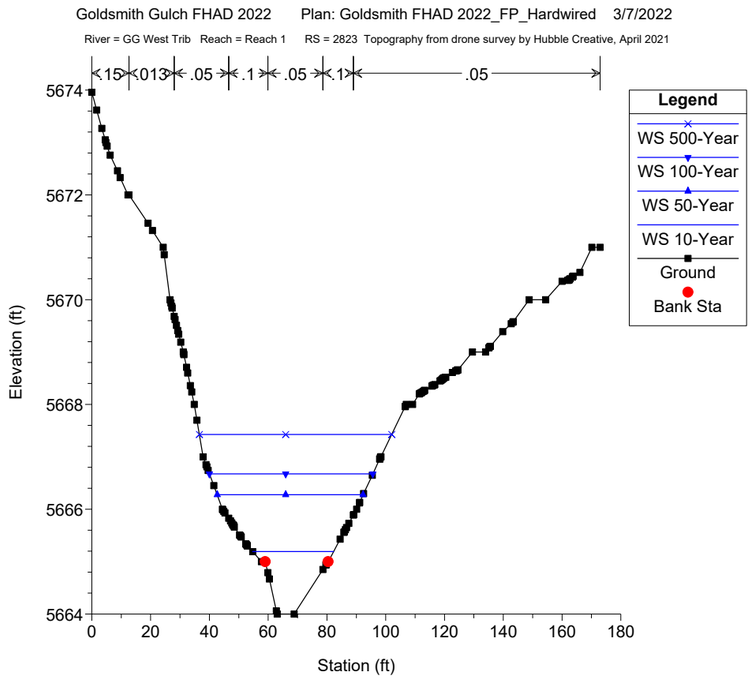
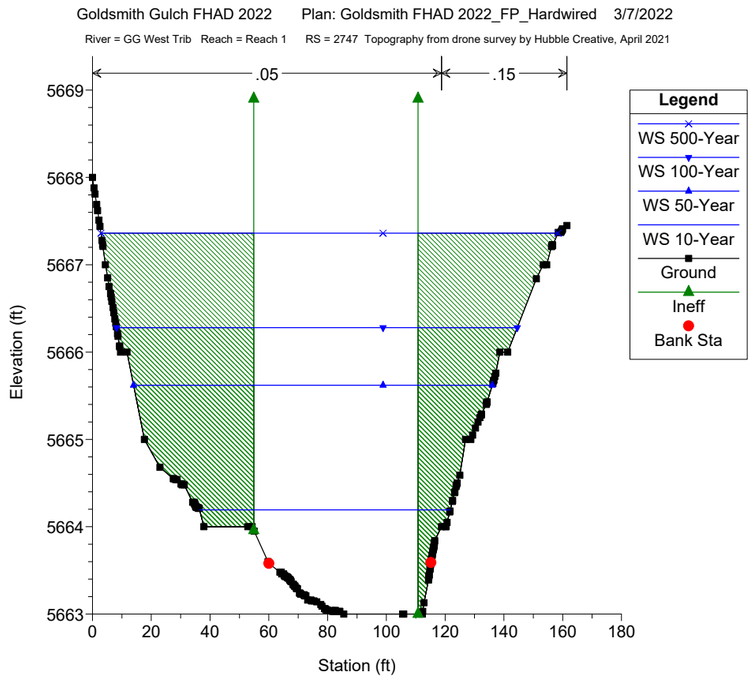
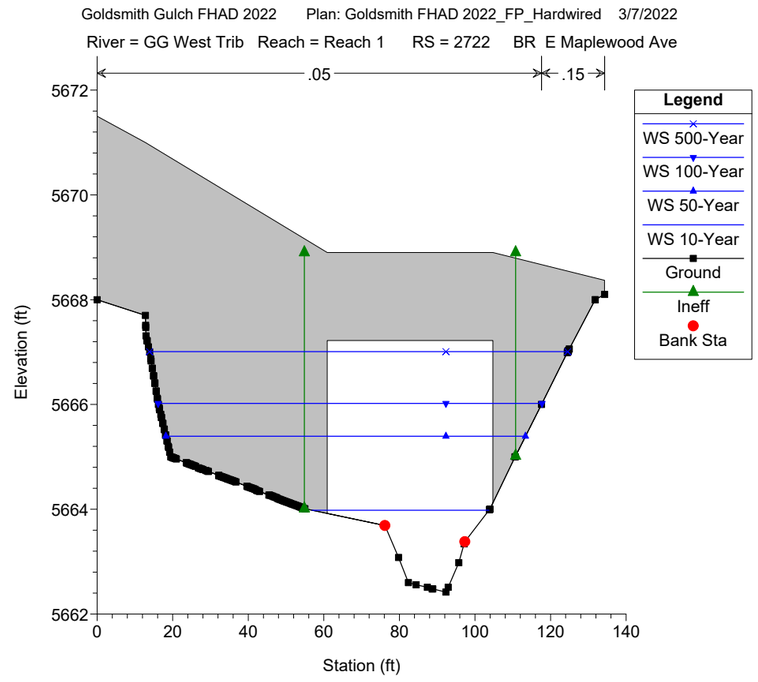
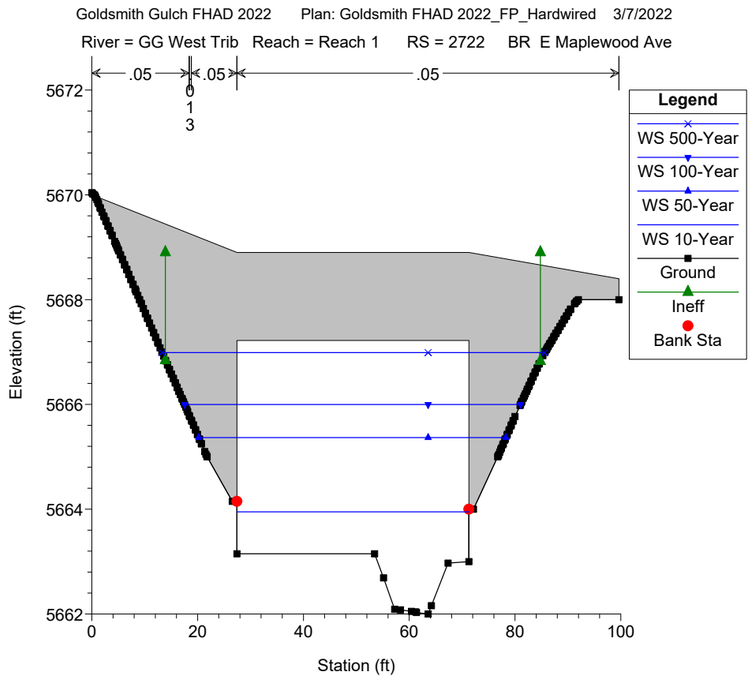
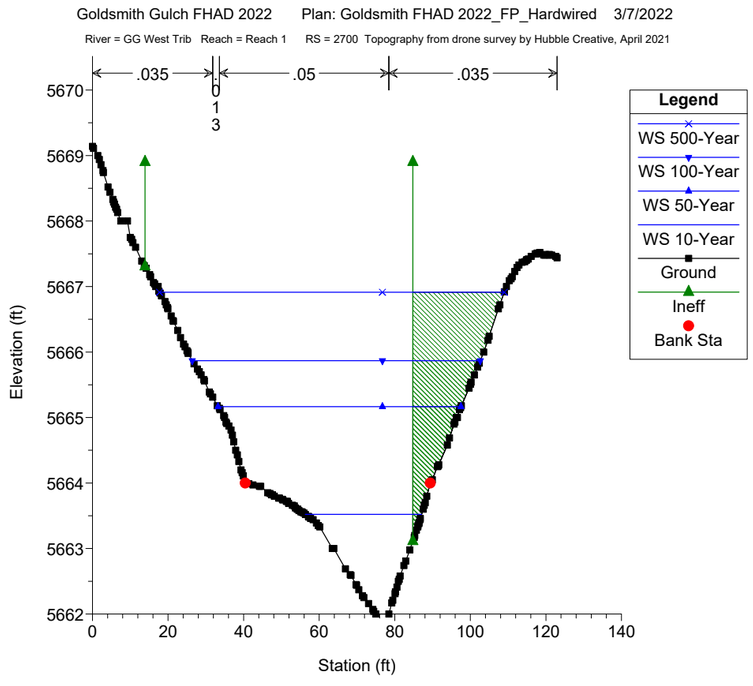
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2823 Topography from drone survey by Hubble Creative, April 2021
.15 .013 .05 .1 .05 .1 .05
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2747 Topography from drone survey by Hubble Creative, April 2021
.05 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2722 BR E Maplewood Ave
.05 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2722 BR E Maplewood Ave
.05 .05 .05
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
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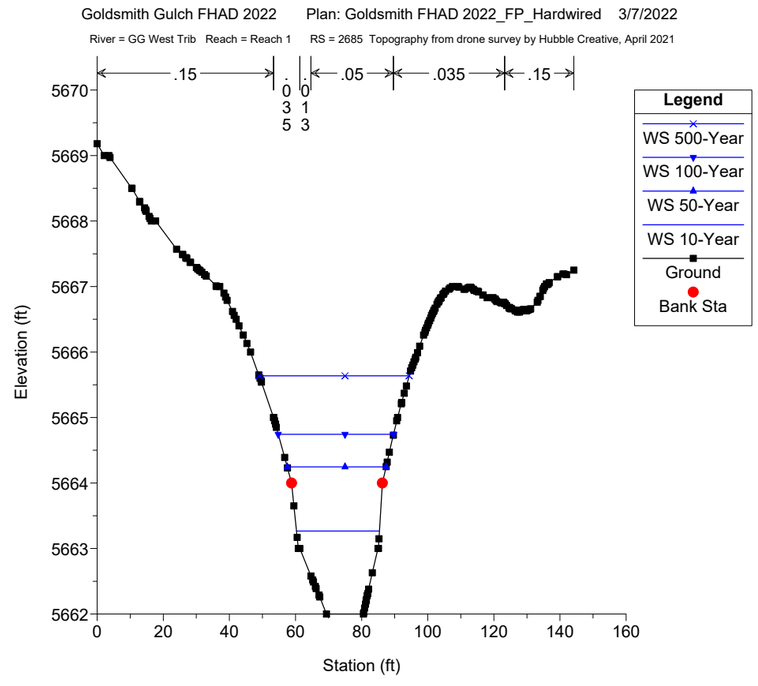
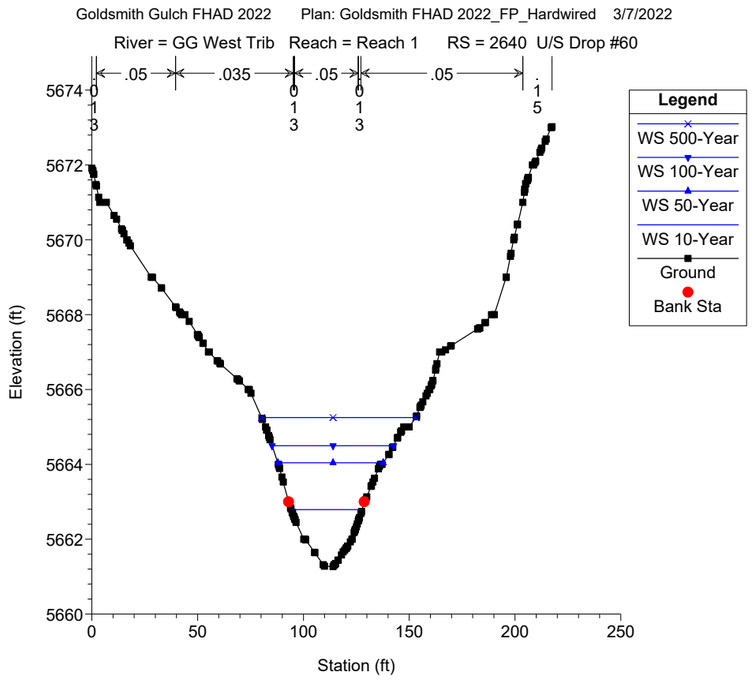
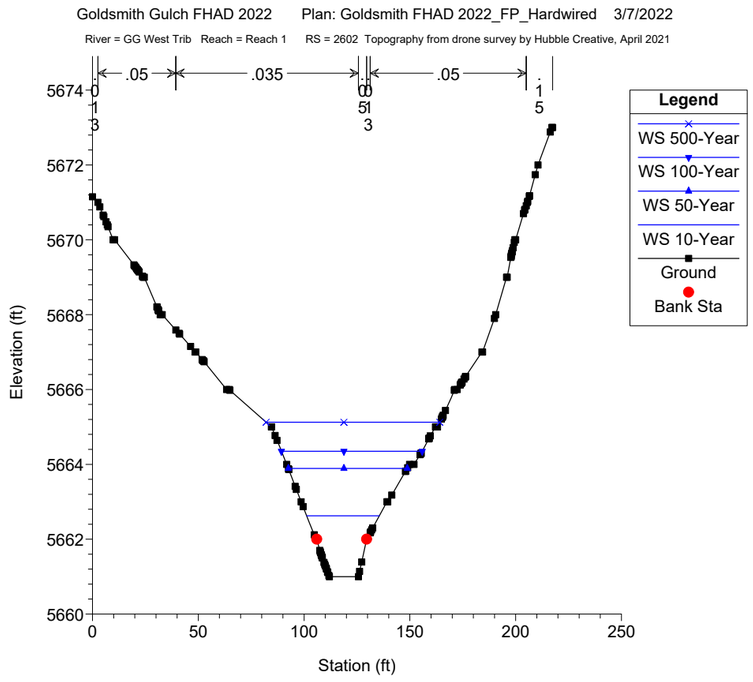
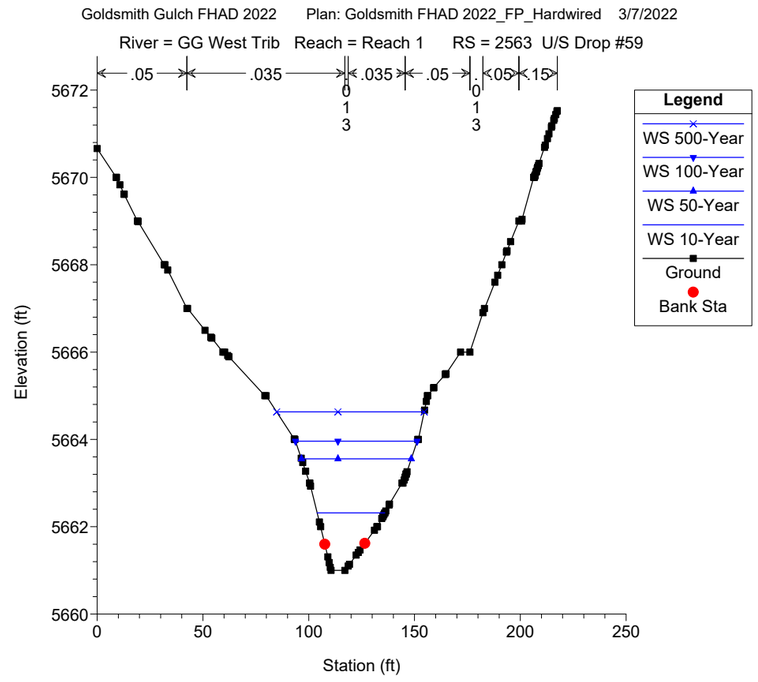
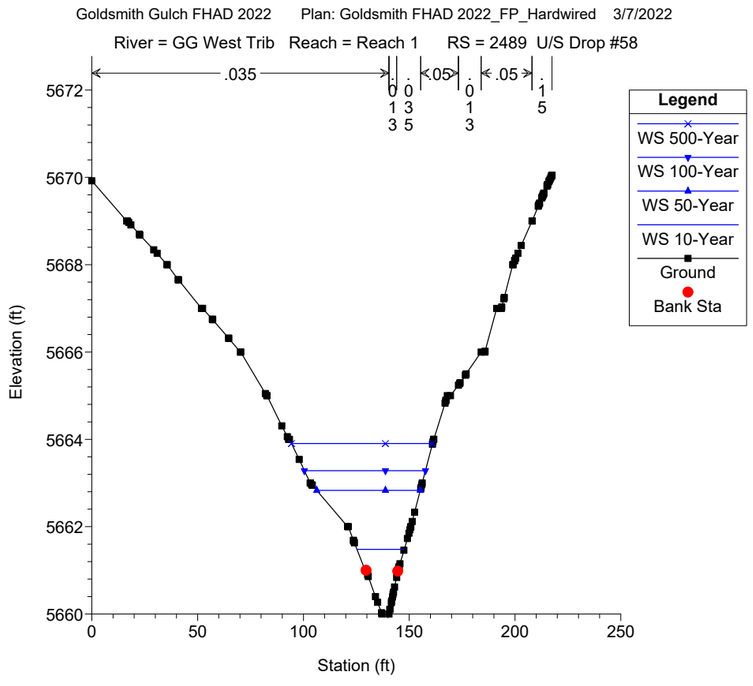
.035 .05 .035
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta

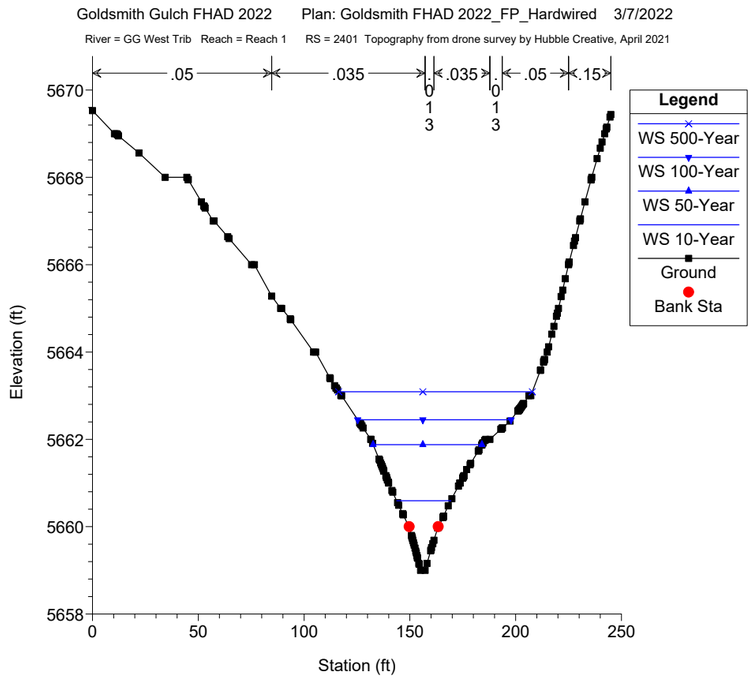

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2685 Topography from drone survey by Hubble Creative, April 2021
.15 .05 .035 .15
Elevation (ft)
Station (ft)
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta

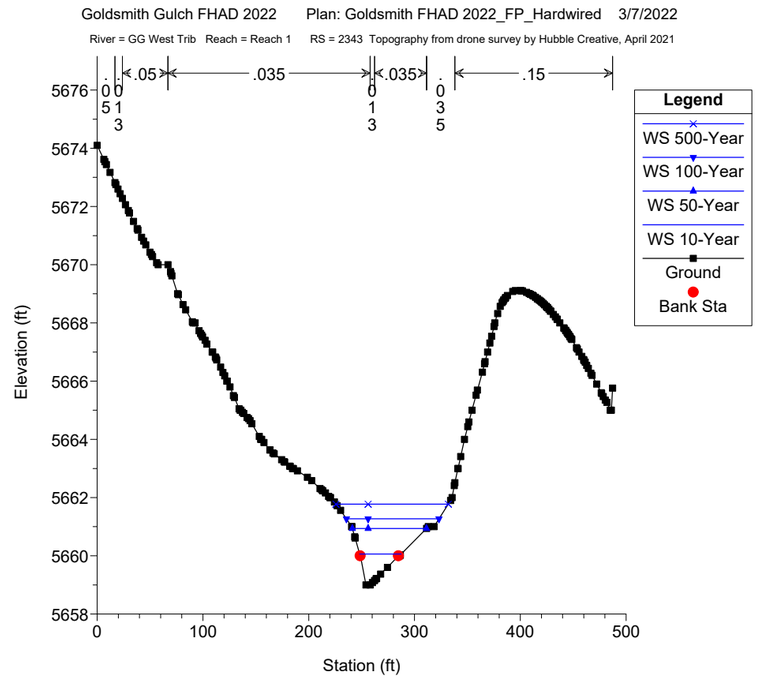

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2640 U/S Drop #60
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

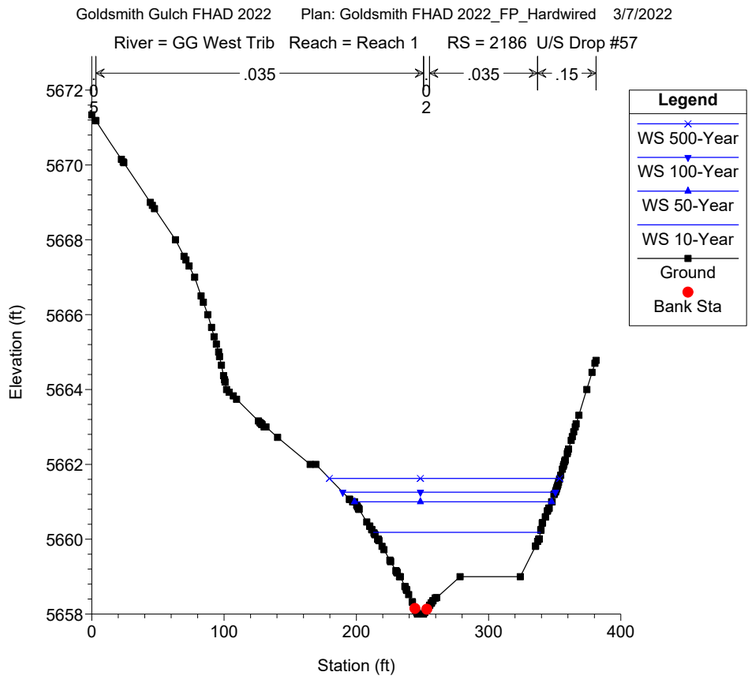

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2602 Topography from drone survey by Hubble Creative, April 2021
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

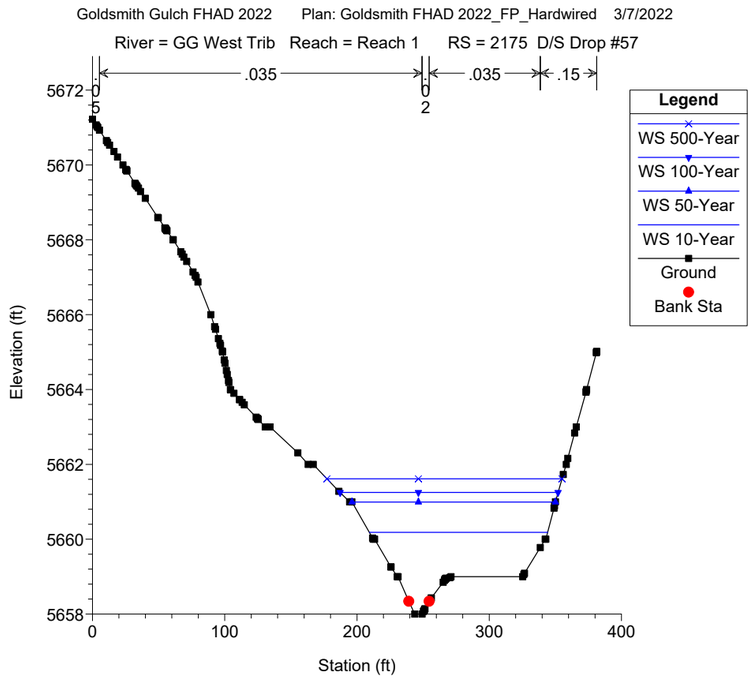

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2563 U/S Drop #59
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

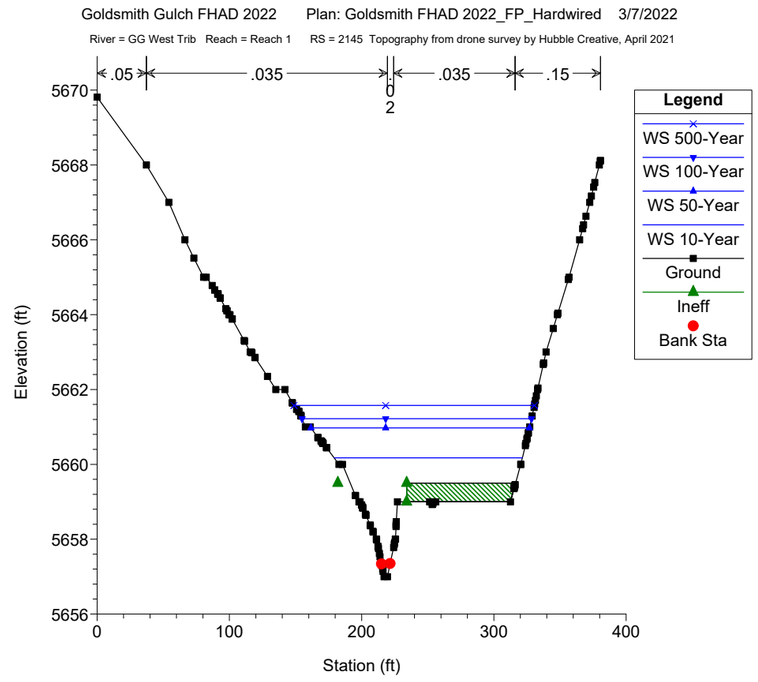

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2489 U/S Drop #58
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

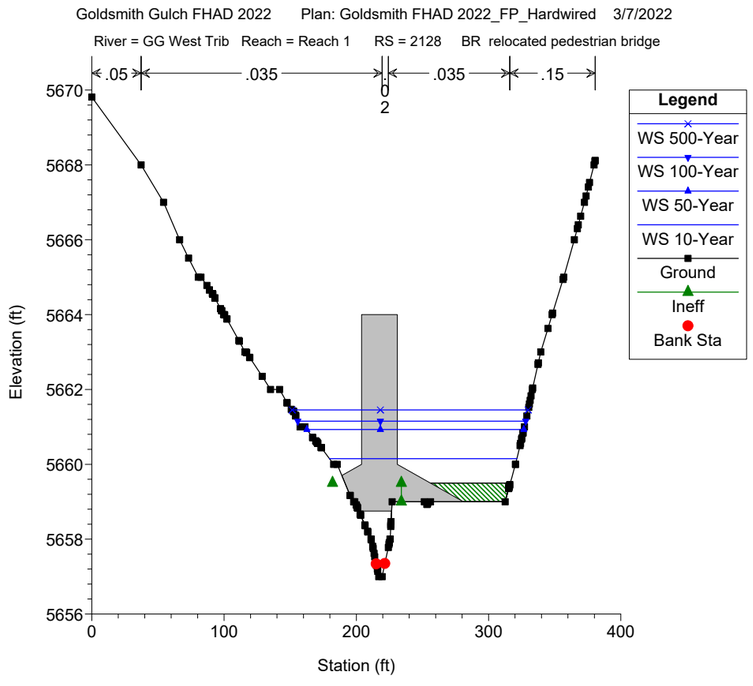

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2401 Topography from drone survey by Hubble Creative, April 2021
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

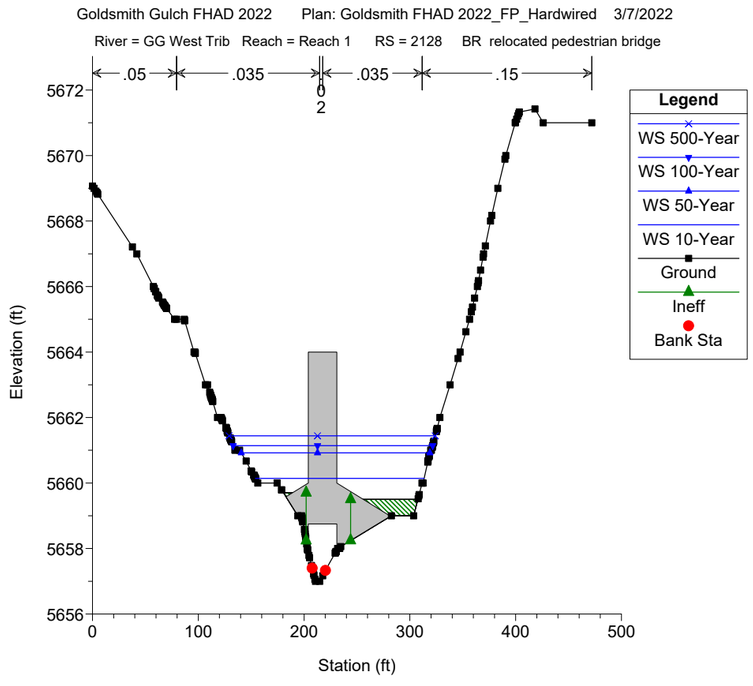

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2343 Topography from drone survey by Hubble Creative, April 2021
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

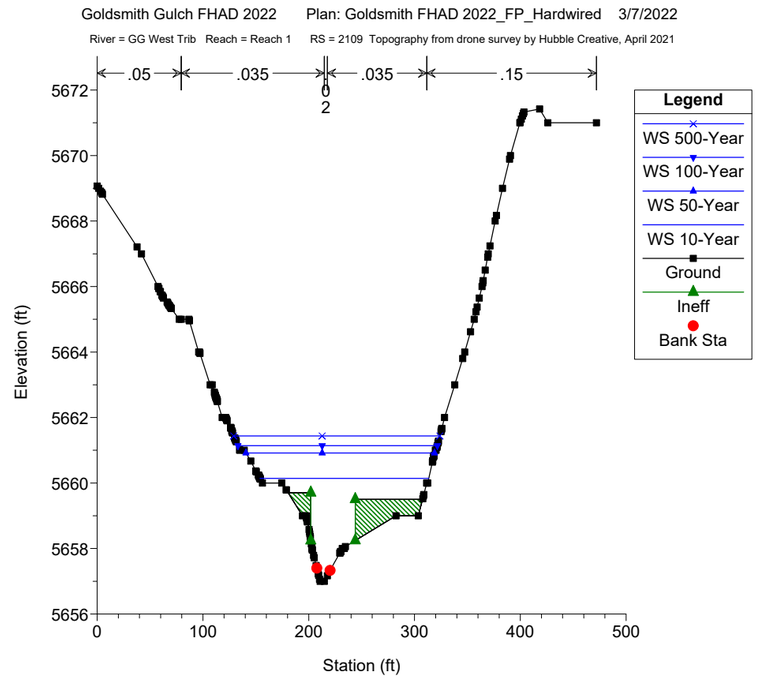

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2186 U/S Drop #57
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

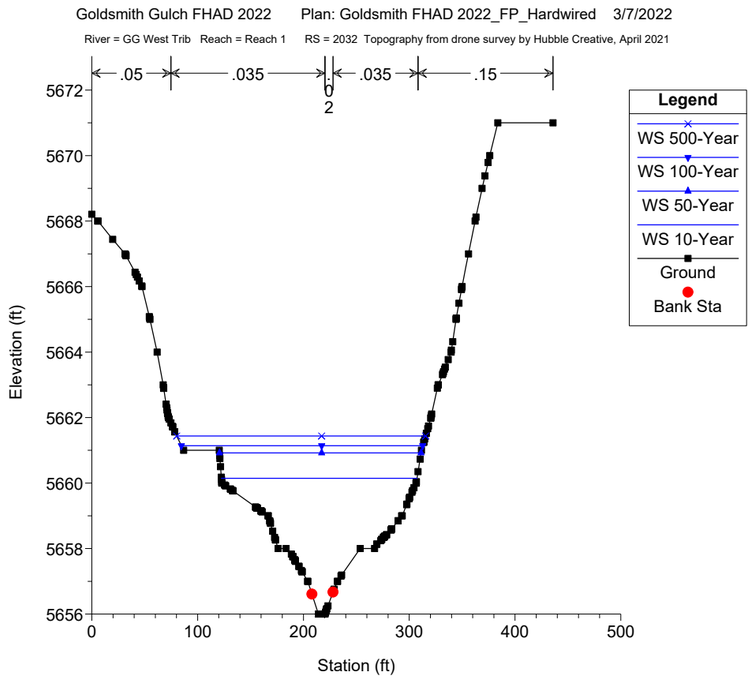

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2175 D/S Drop #57
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

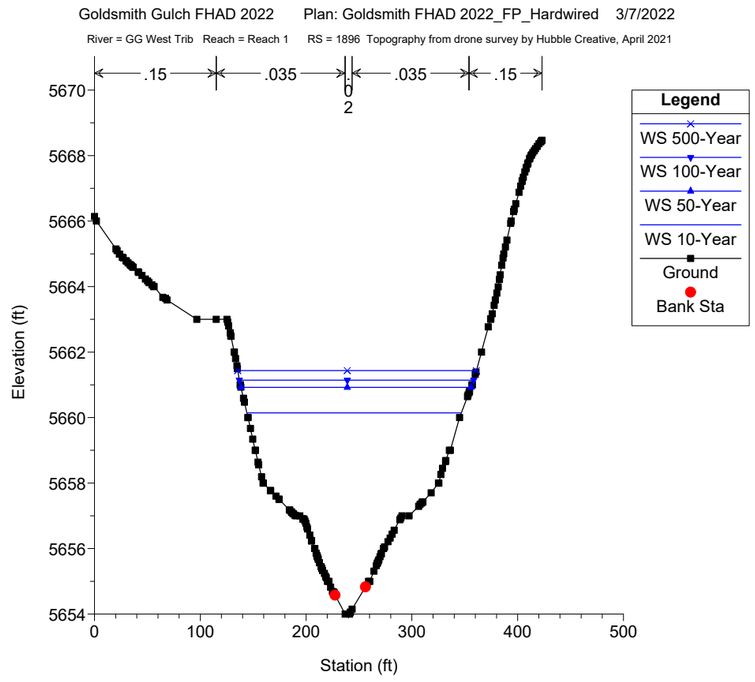

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2145 Topography from drone survey by Hubble Creative, April 2021
.05
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

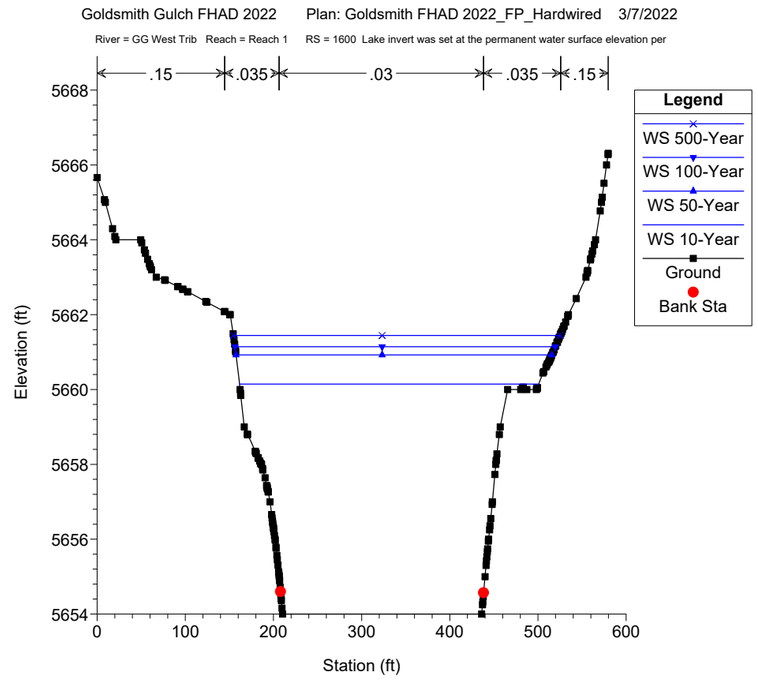

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2128 BR relocated pedestrian bridge
.05
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

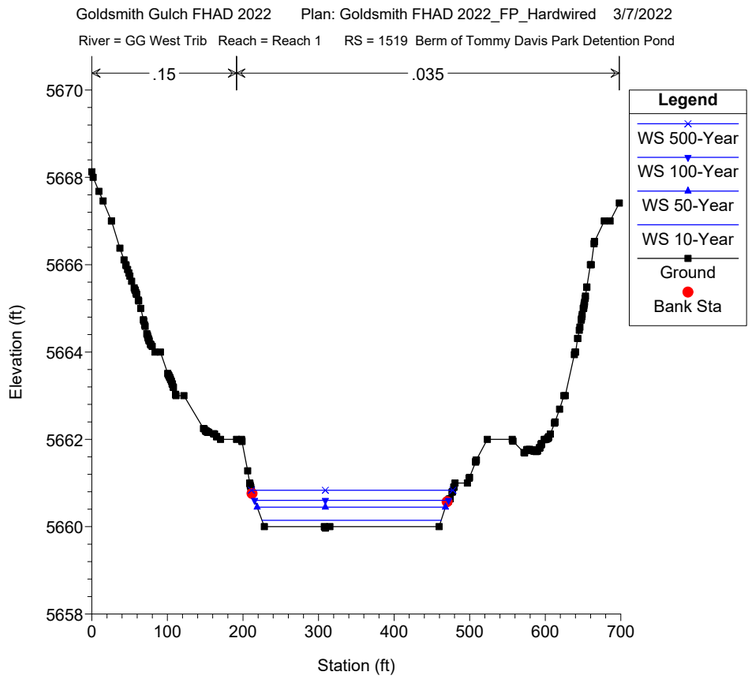

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2128 BR relocated pedestrian bridge
.05
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

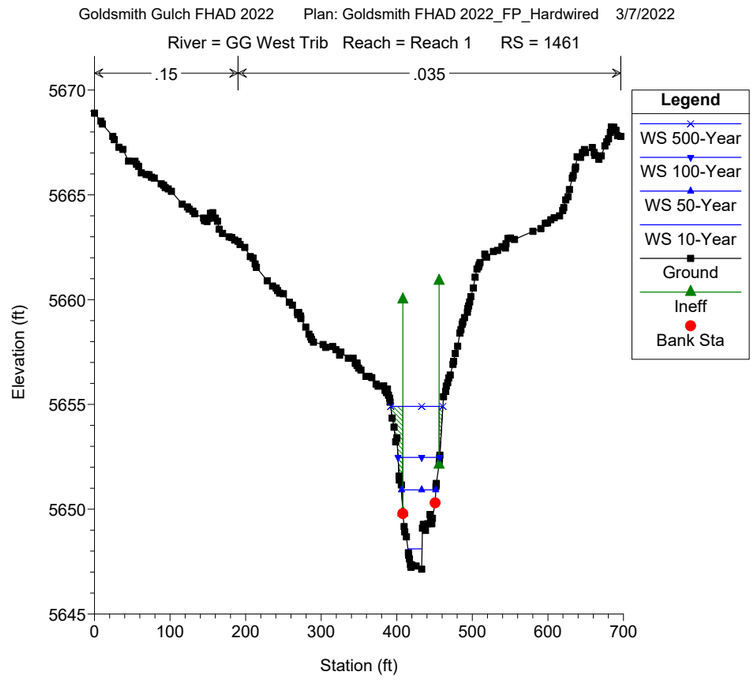

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2109 Topography from drone survey by Hubble Creative, April 2021
.05
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

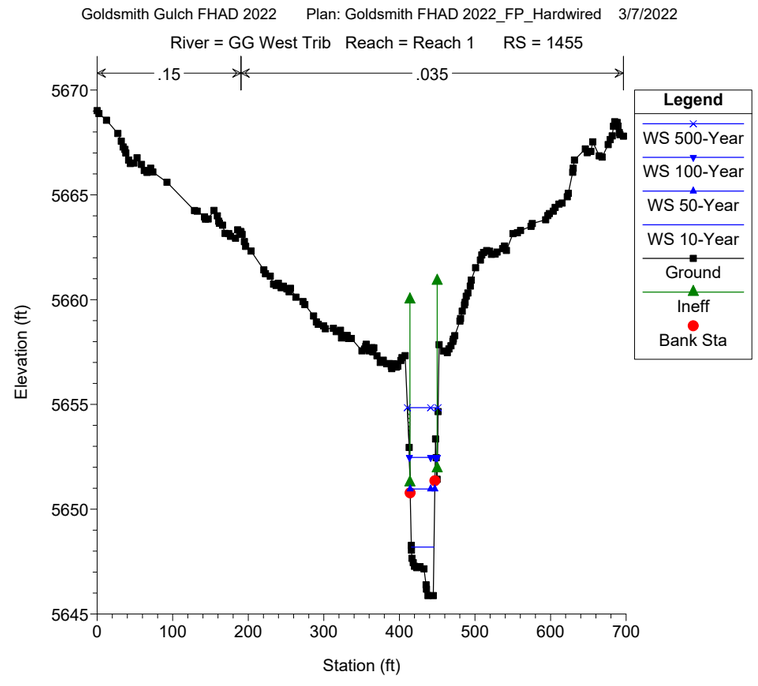

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 2032 Topography from drone survey by Hubble Creative, April 2021
.05
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

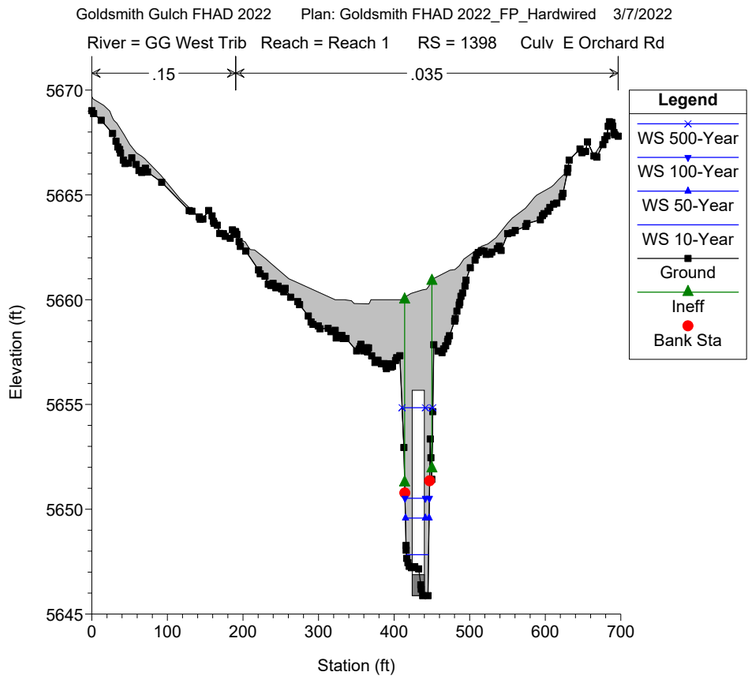

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1896 Topography from drone survey by Hubble Creative, April 2021
.15
.035
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

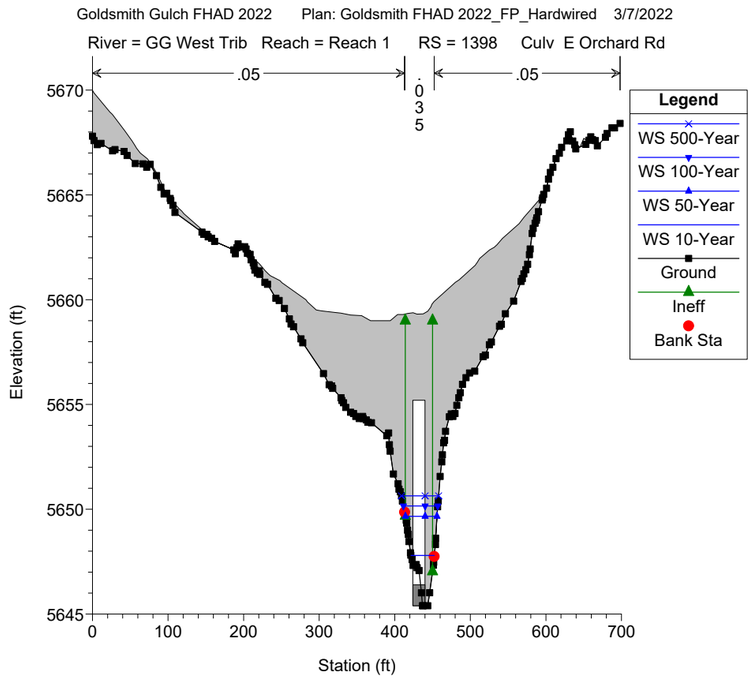

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1600 Lake invert was set at the permanent water surface elevation per
.15
.035
.03
.035
.15
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

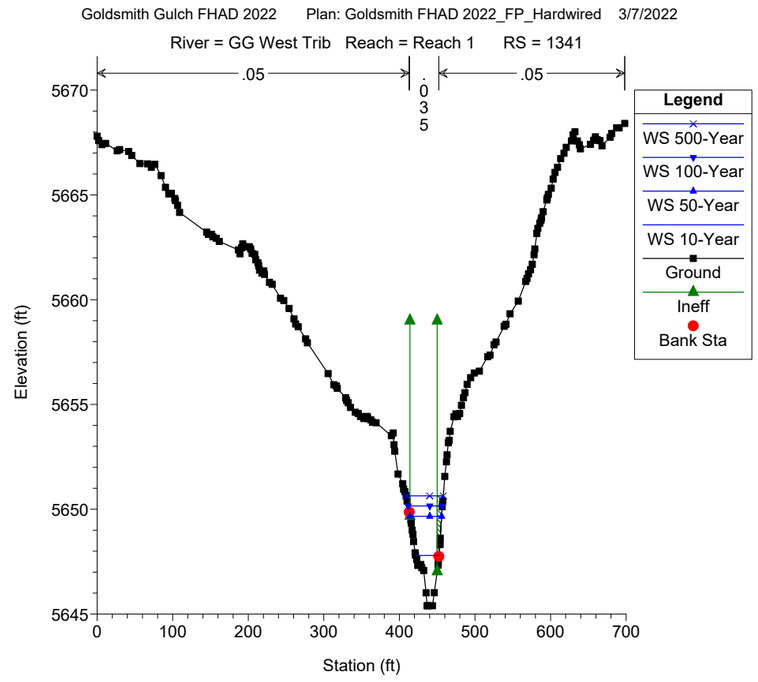

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1519 Berm of Tommy Davis Park Detention Pond
.15
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

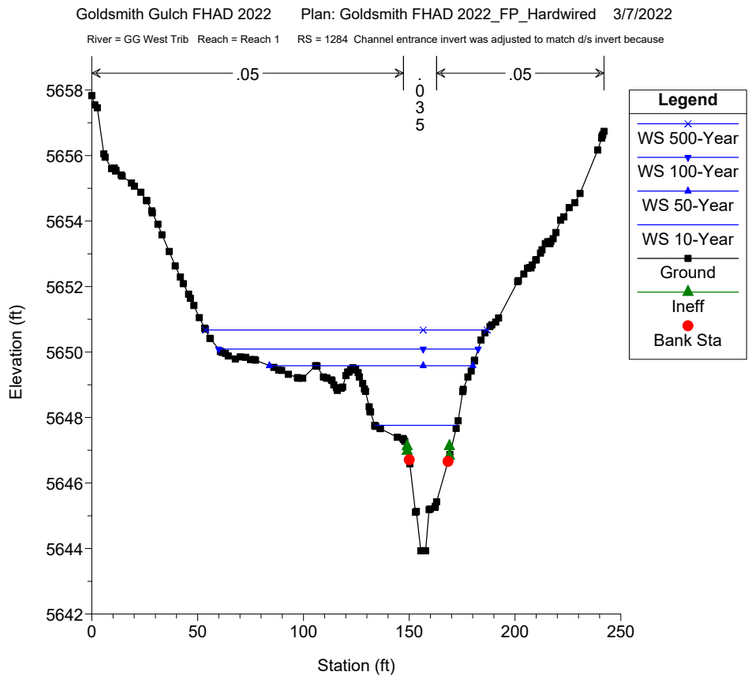

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1461
.15
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

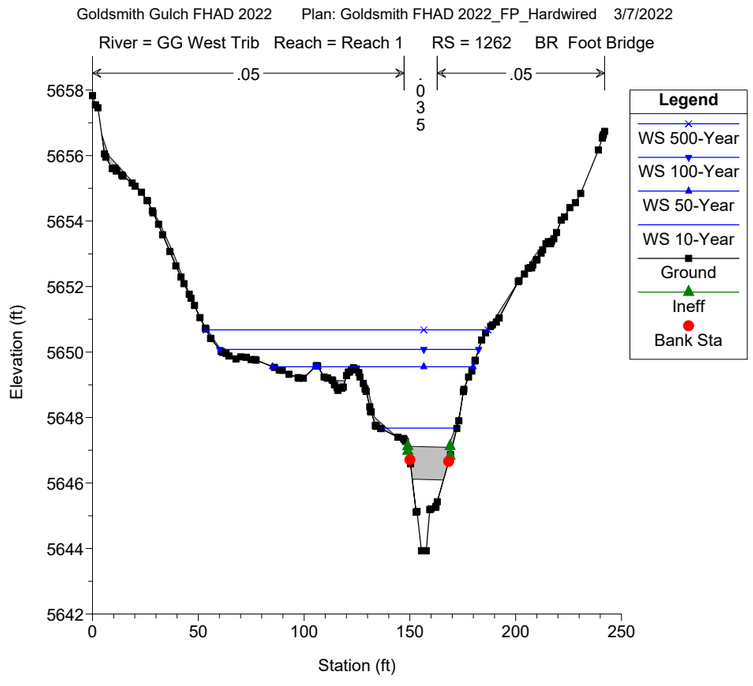

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1455
.15
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

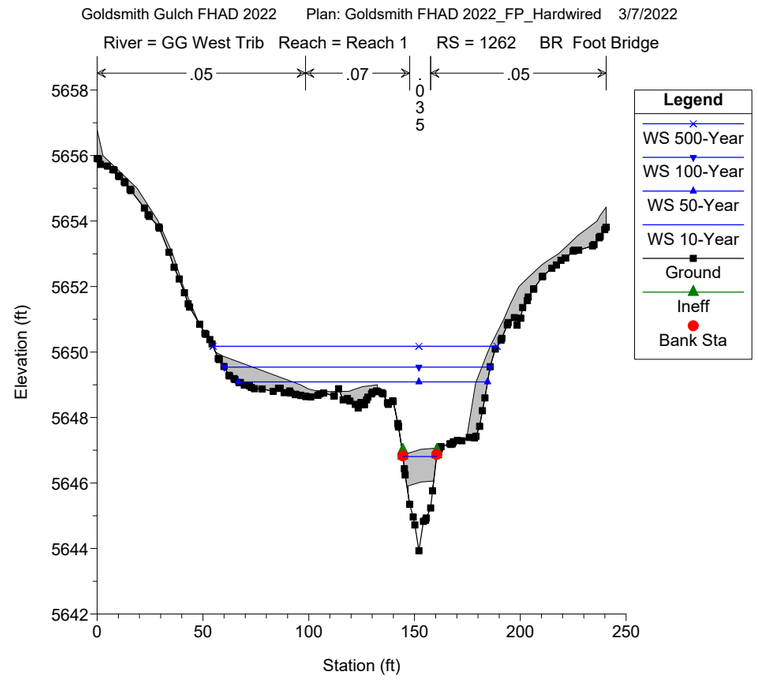

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1398 Culv E Orchard Rd
.15
.035
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

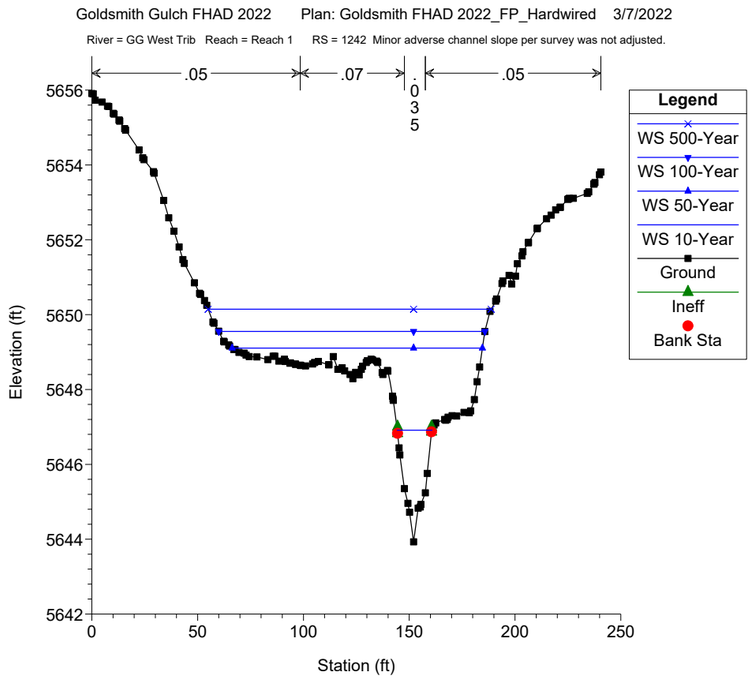

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1398 Culv E Orchard Rd
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

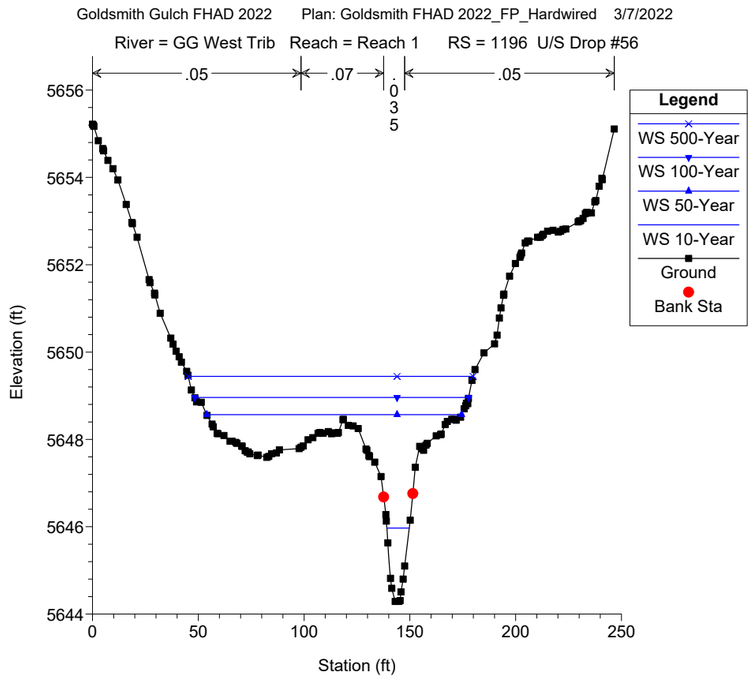

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1341
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

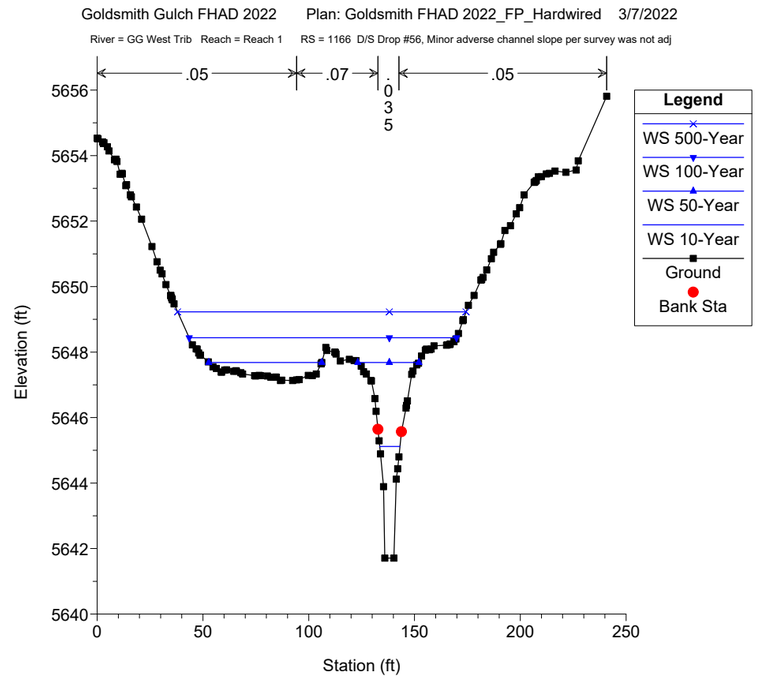

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1284 Channel entrance invert was adjusted to match d/s invert because
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

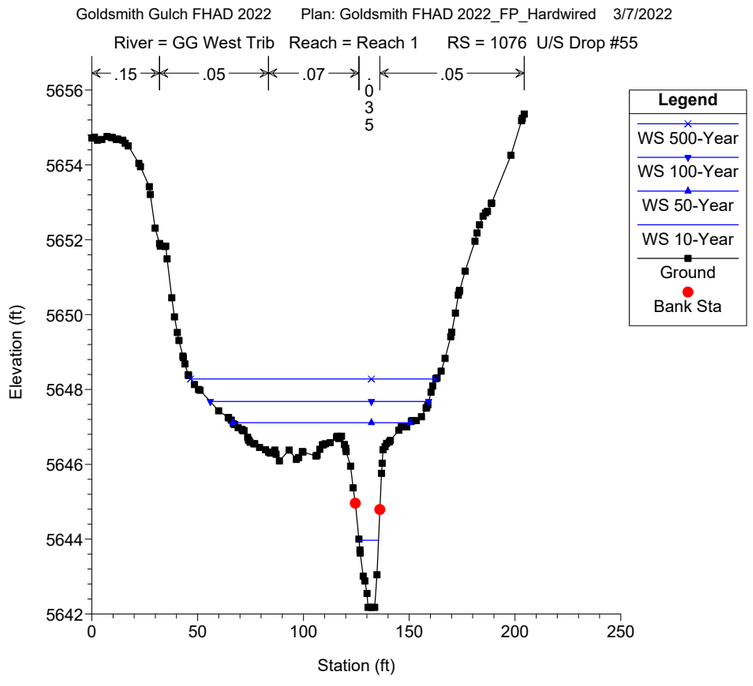

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1262 BR Foot Bridge
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

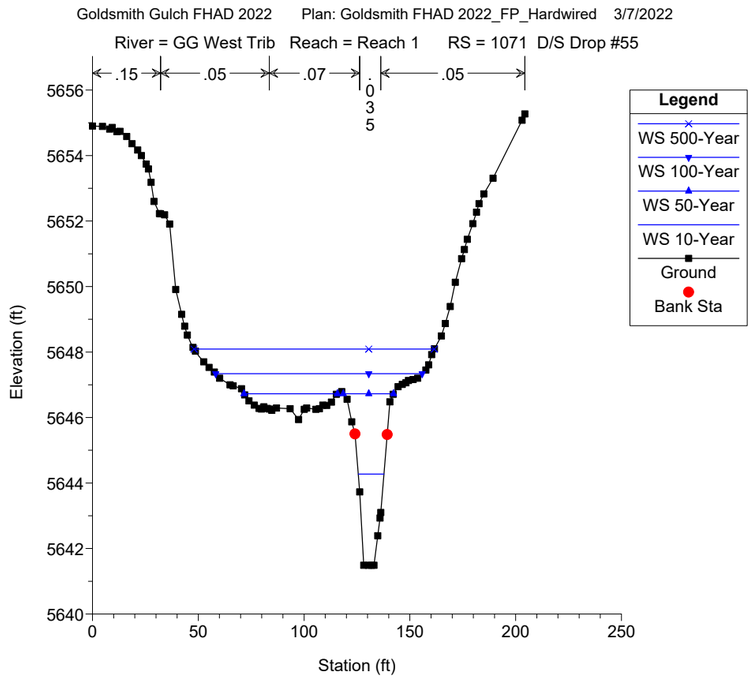

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1262 BR Foot Bridge
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

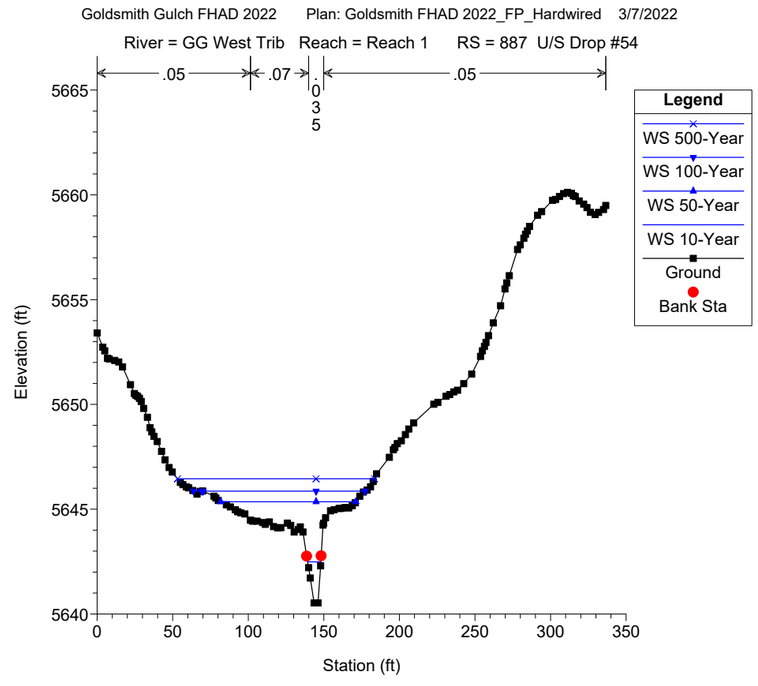

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1242 Minor adverse channel slope per survey was not adjusted.
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

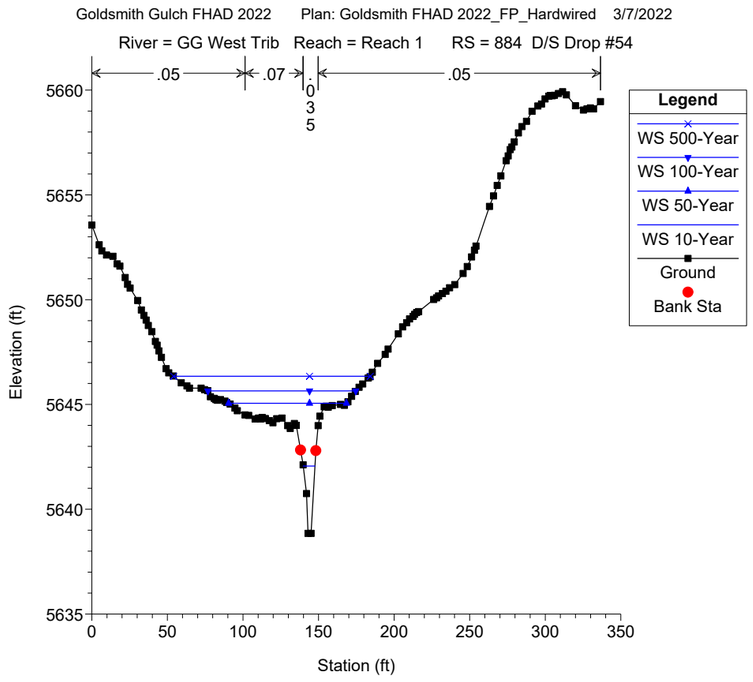

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1196 U/S Drop #56
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

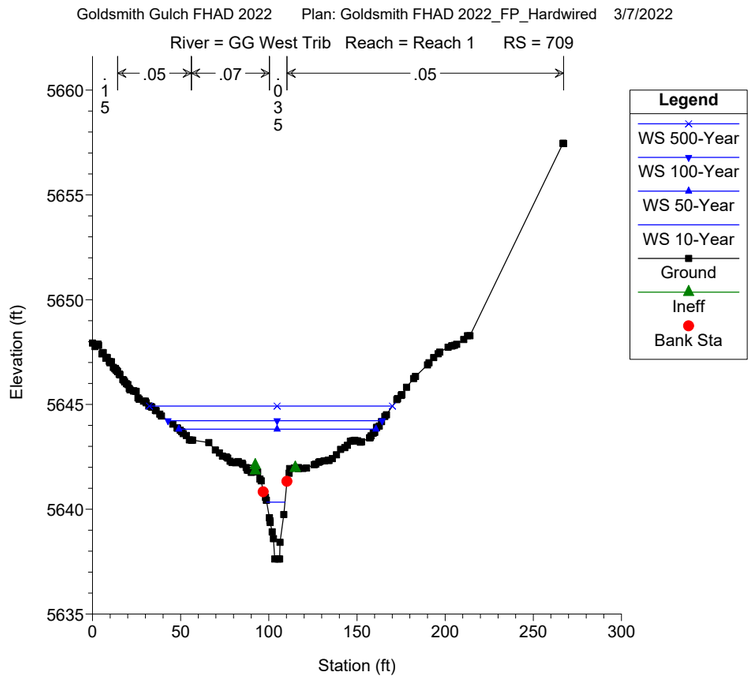

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1166 D/S Drop #56, Minor adverse channel slope per survey was not adj
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

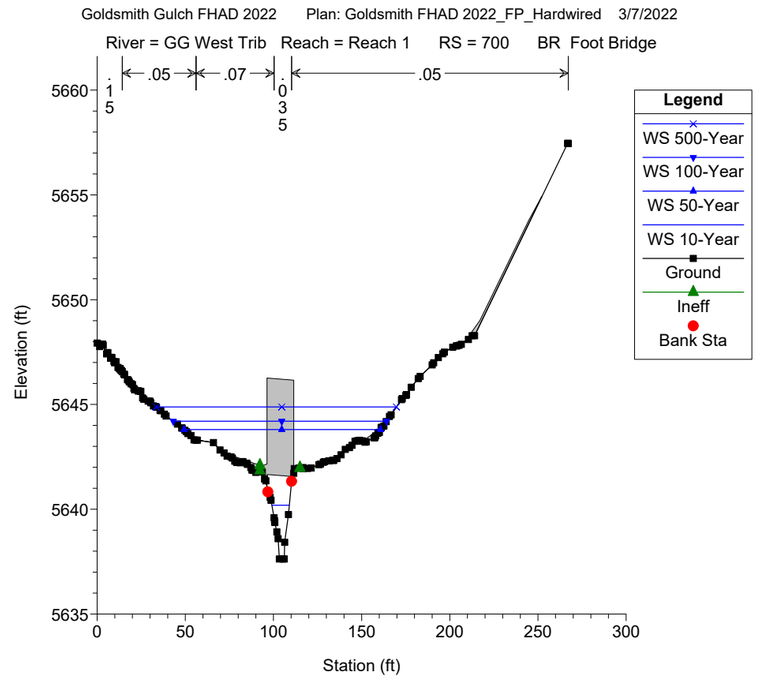

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1076 U/S Drop #55
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

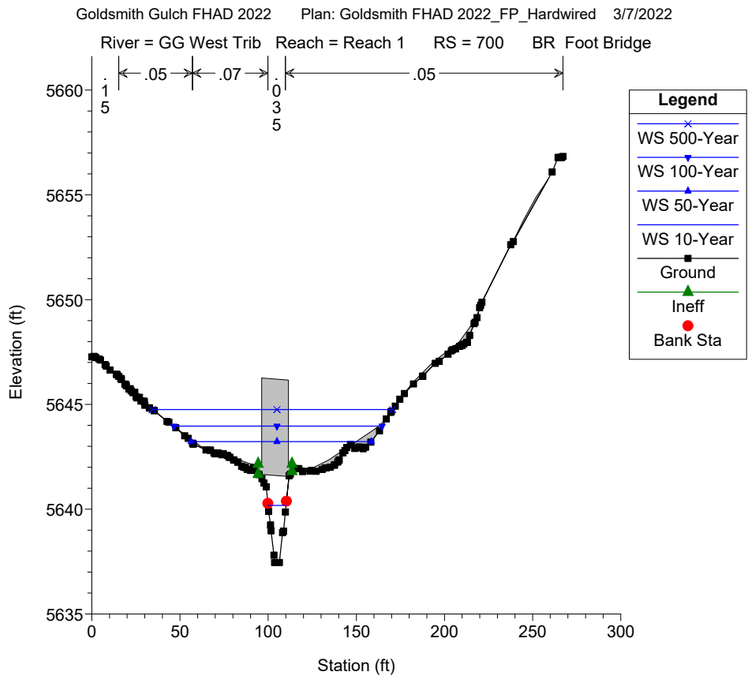

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 1071 D/S Drop #55
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

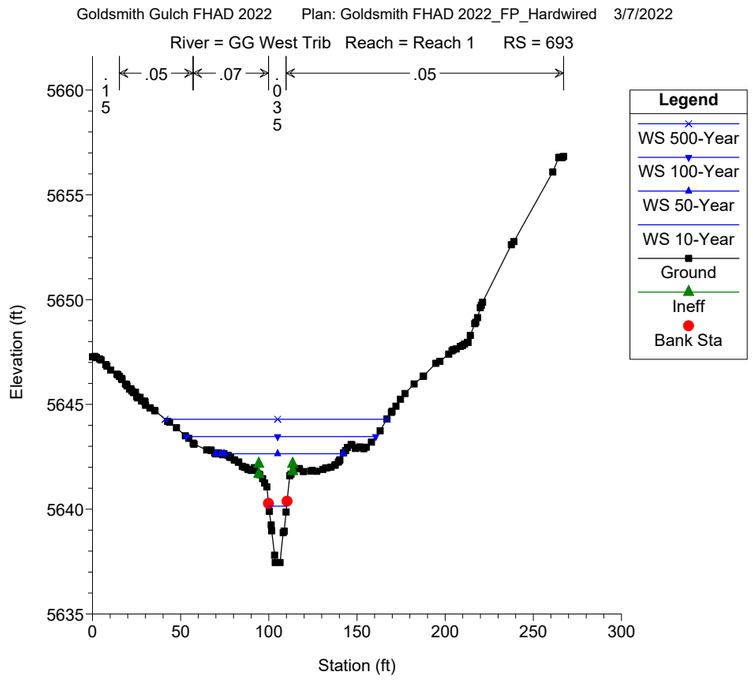

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 887 U/S Drop #54
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

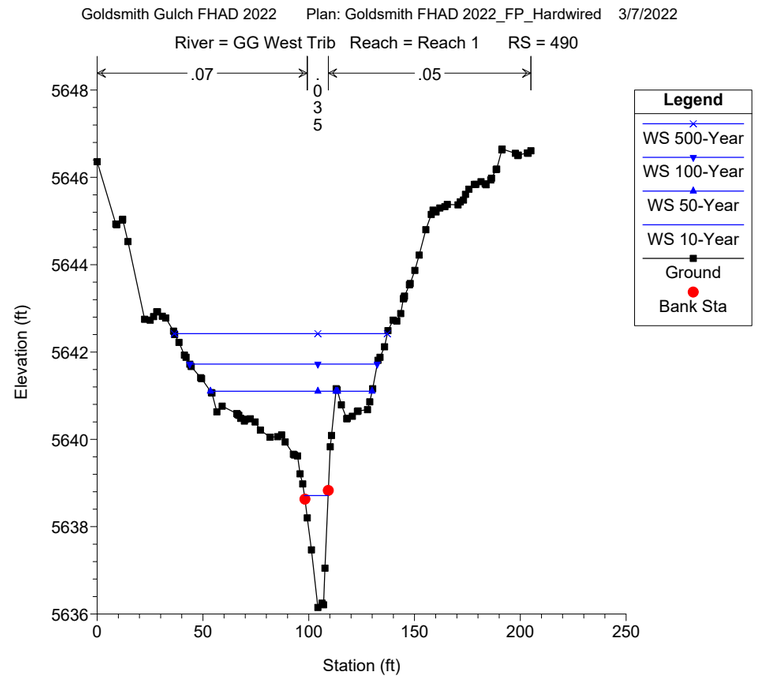

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 884 D/S Drop #54
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

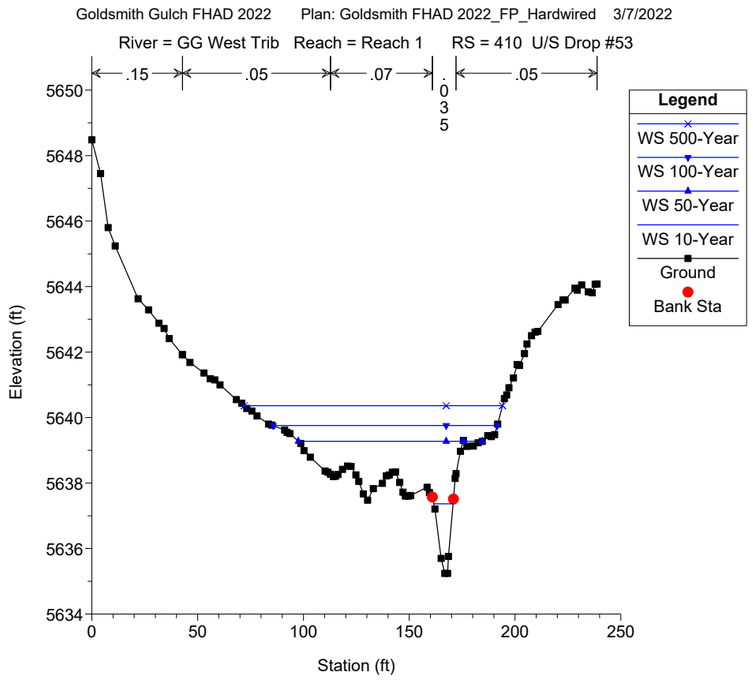

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 709
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

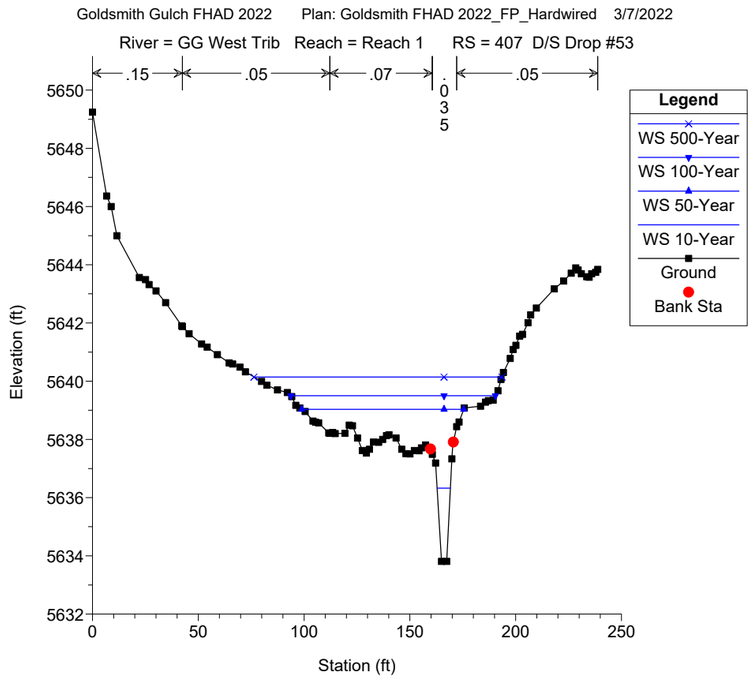

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 700 BR Foot Bridge
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

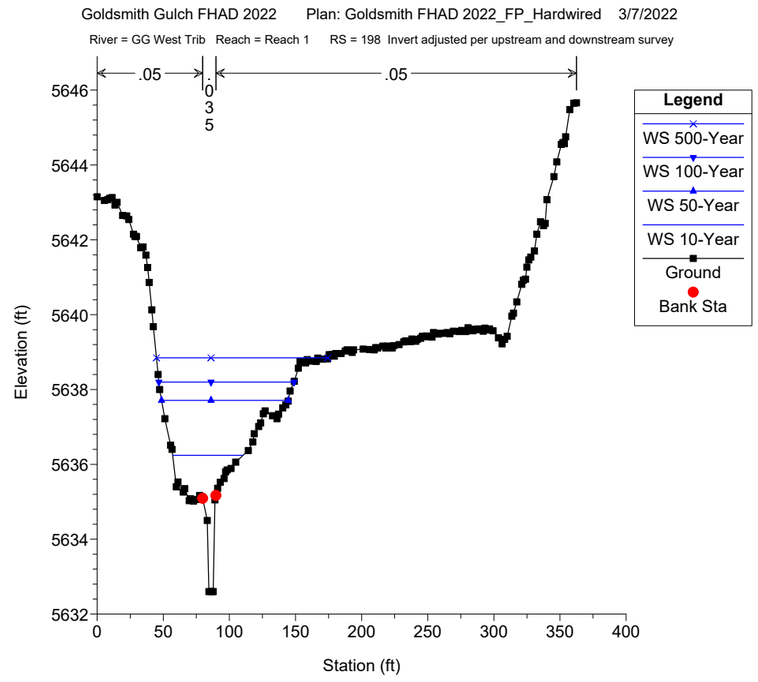

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 700 BR Foot Bridge
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

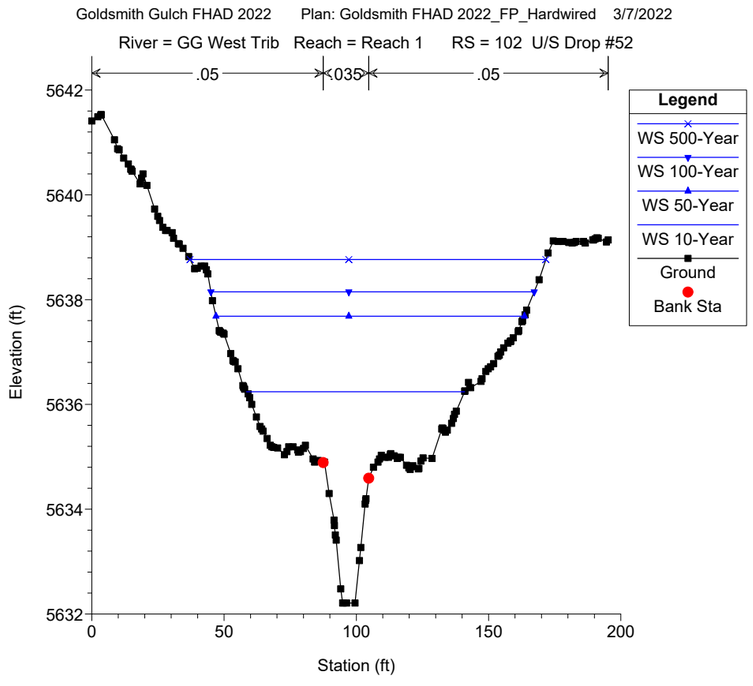

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 693
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

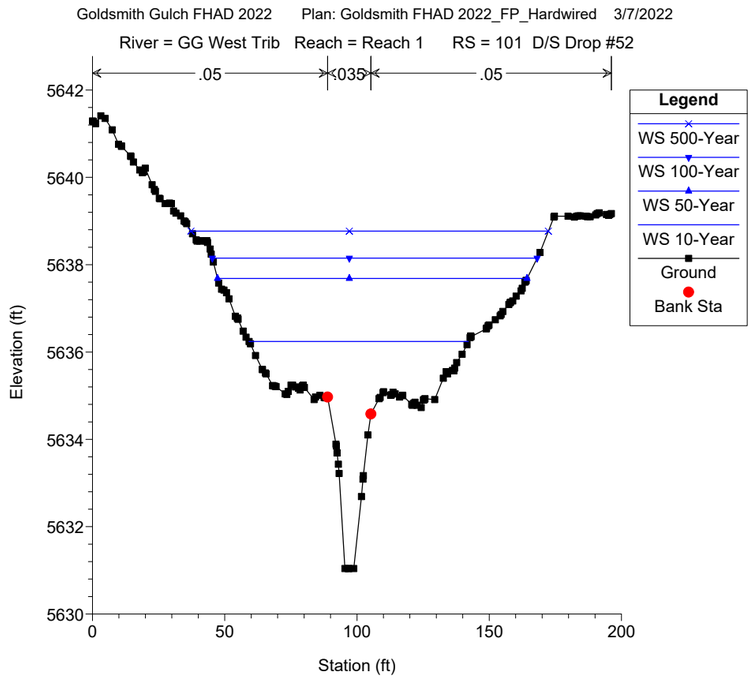

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 490
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

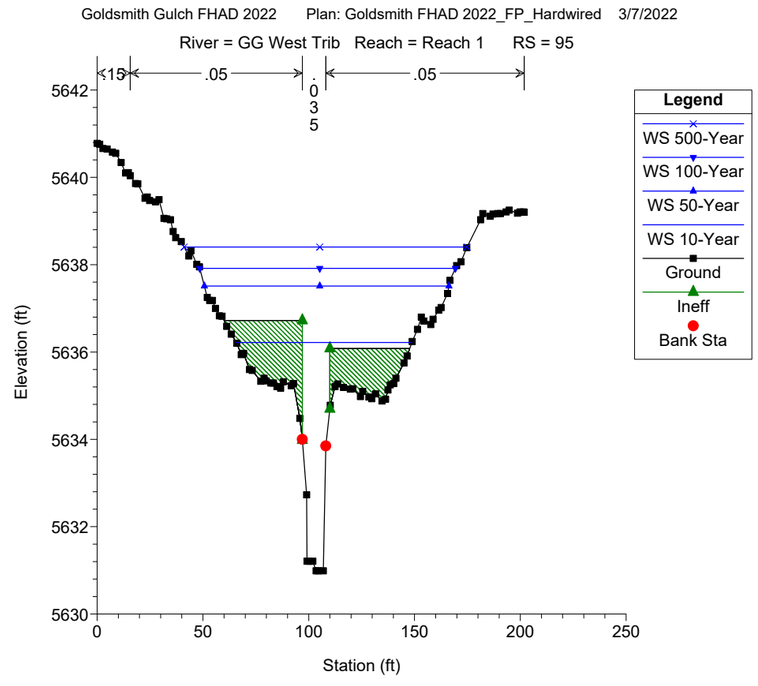

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 410 U/S Drop #53
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

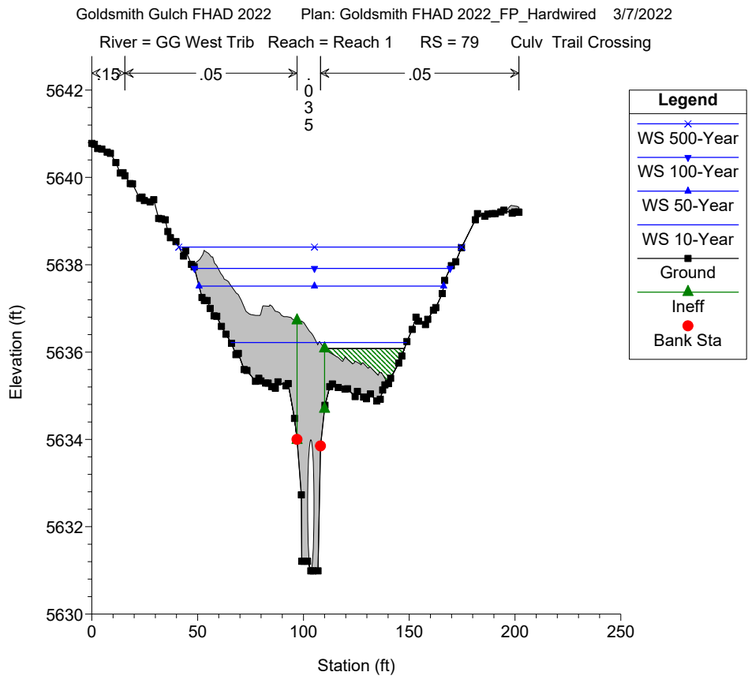

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 407 D/S Drop #53
.15
.05
.07
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

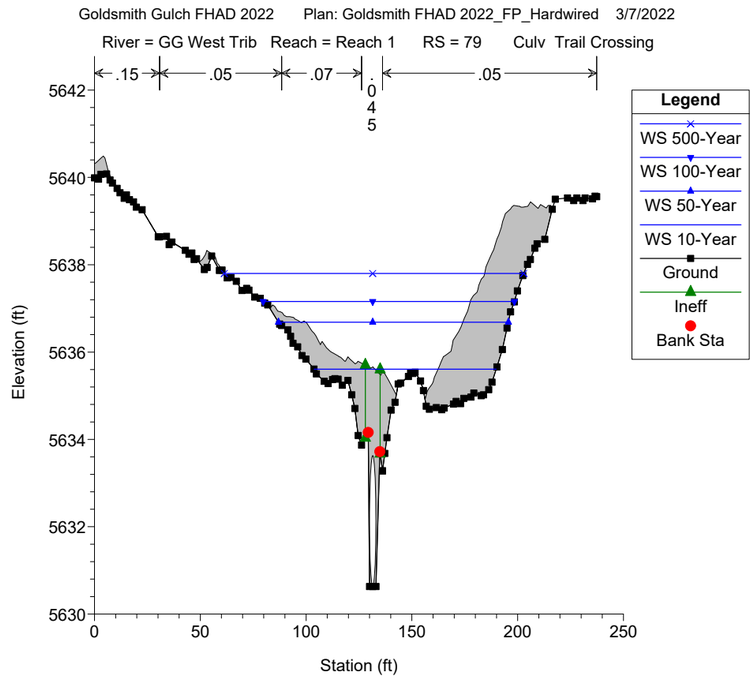

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 198 Invert adjusted per upstream and downstream survey
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)

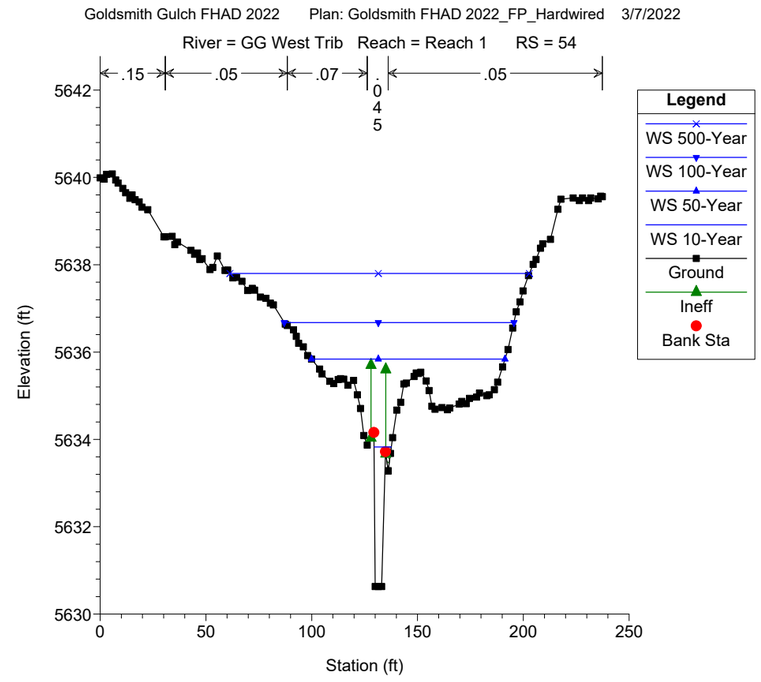

Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 102 U/S Drop #52
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 101 D/S Drop #52
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 95
.15
.05
.035
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 79 Culv Trail Crossing
.15
.05
.05
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 79 Culv Trail Crossing
.15
.05
.07
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)


Goldsmith Gulch FHAD 2022 Plan: Goldsmith FHAD 2022_FP_Hardwired 3/7/2022
River = GG West Trib Reach = Reach 1 RS = 54
.15
.05
.07
.05
Legend
WS 500-Year
WS 100-Year
WS 50-Year
WS 10-Year
Ground
Ineff
Bank Sta
Elevation (ft)
Station (ft)

Shallow Overland Flooding Analysis

(see Appendix G Flood Maps for locations of normal depth sections)

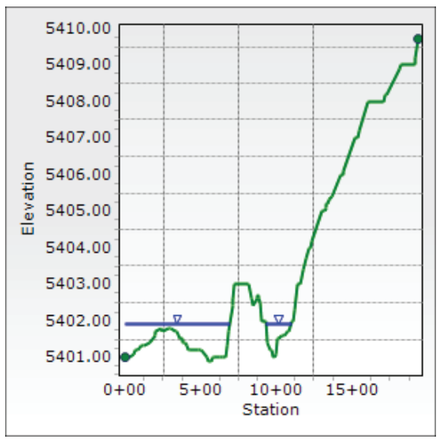
Normal Depth Calculations

Cook Park

Cross Section for Cook Park 100yr - 464

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	1.04 ft
Discharge	1,094.00 cfs



Cook Park 100yr - 464

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	1,094.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,401.00
0+22	5,401.00
0+29	5,401.04
0+33	5,401.04
0+56	5,401.14
0+65	5,401.15
0+82	5,401.20
1+05	5,401.25
1+26	5,401.26
1+59	5,401.40
1+98	5,401.63
2+02	5,401.66
2+34	5,401.75
2+44	5,401.74
2+89	5,401.78
2+94	5,401.80
3+08	5,401.79
3+35	5,401.67
3+43	5,401.65
3+62	5,401.51
3+75	5,401.45
3+79	5,401.44
3+88	5,401.37
3+97	5,401.35
4+03	5,401.29
4+16	5,401.22
4+22	5,401.15
4+82	5,401.21
5+02	5,401.15
5+39	5,401.00
5+44	5,400.95
5+53	5,400.89
5+61	5,400.88
5+67	5,400.91
5+75	5,401.00
5+91	5,401.01
6+29	5,401.03
6+46	5,401.00

Section Definitions

Station (ft)	Elevation (ft)
6+61	5,401.00
6+71	5,401.26
6+83	5,401.65
7+06	5,402.42
7+11	5,402.56
7+23	5,403.00
8+13	5,403.00
8+33	5,402.60
8+49	5,402.42
8+68	5,402.56
8+72	5,402.65
8+79	5,402.66
8+83	5,402.62
8+89	5,402.52
9+01	5,402.00
9+29	5,402.00
9+42	5,401.38
9+62	5,401.16
9+65	5,401.15
9+77	5,401.03
9+78	5,401.00
9+88	5,401.00
9+91	5,401.10
10+08	5,401.48
10+16	5,401.45
10+30	5,401.58
10+32	5,401.57
10+52	5,401.56
10+76	5,401.68
10+83	5,401.74
11+03	5,402.00
11+11	5,402.00
11+21	5,402.25
11+36	5,403.00
11+59	5,403.00
11+79	5,403.36
11+96	5,403.66
12+13	5,404.00
12+20	5,404.00
12+36	5,404.20
13+03	5,405.00
13+16	5,405.00
13+24	5,405.11
13+30	5,405.15
13+35	5,405.21
13+50	5,405.32
13+61	5,405.43
14+18	5,406.00
14+40	5,406.00

Section Definitions

Station (ft)	Elevation (ft)
14+43	5,406.05
15+15	5,407.00
15+39	5,407.00
15+50	5,407.15
16+03	5,408.00
17+10	5,408.00
17+20	5,408.16
17+23	5,408.19
18+11	5,408.92
18+20	5,409.00
19+12	5,409.00
19+19	5,409.22
19+35	5,409.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,401.00)	(19+35, 5,409.69)	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	1.04 ft
Roughness Coefficient	0.040
Elevation	5,401.92 ft
Elevation Range	5,400.9 to 5,409.7 ft
Flow Area	502.8 ft²
Wetted Perimeter	859.0 ft
Hydraulic Radius	0.59 ft
Top Width	858.00 ft
Normal Depth	1.04 ft
Critical Depth	0.78 ft
Critical Slope	0.031 ft/ft
Velocity	2.18 ft/s
Velocity Head	0.07 ft
Specific Energy	1.12 ft
Froude Number	0.501
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.04 ft
Critical Depth	0.78 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.031 ft/ft

Messages:

Water Surface Elevation exceeds lowest end station by 0.924733398373064ft. Flow is divided.

Appendix C – Hydraulic Analysis

Cook Park 500yr - 464

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	2,618.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,401.00
0+22	5,401.00
0+29	5,401.04
0+33	5,401.04
0+56	5,401.14
0+65	5,401.15
0+82	5,401.20
1+05	5,401.25
1+26	5,401.26
1+59	5,401.40
1+98	5,401.63
2+02	5,401.66
2+34	5,401.75
2+44	5,401.74
2+89	5,401.78
2+94	5,401.80
3+08	5,401.79
3+35	5,401.67
3+43	5,401.65
3+62	5,401.51
3+75	5,401.45
3+79	5,401.44
3+88	5,401.37
3+97	5,401.35
4+03	5,401.29
4+16	5,401.22
4+22	5,401.15
4+82	5,401.21
5+02	5,401.15
5+39	5,401.00
5+44	5,400.95
5+53	5,400.89
5+61	5,400.88
5+67	5,400.91
5+75	5,401.00
5+91	5,401.01
6+29	5,401.03
6+46	5,401.00

Section Definitions

Station (ft)	Elevation (ft)
6+61	5,401.00
6+71	5,401.26
6+83	5,401.65
7+06	5,402.42
7+11	5,402.56
7+23	5,403.00
8+13	5,403.00
8+33	5,402.60
8+49	5,402.42
8+68	5,402.56
8+72	5,402.65
8+79	5,402.66
8+83	5,402.62
8+89	5,402.52
9+01	5,402.00
9+29	5,402.00
9+42	5,401.38
9+62	5,401.16
9+65	5,401.15
9+77	5,401.03
9+78	5,401.00
9+88	5,401.00
9+91	5,401.10
10+08	5,401.48
10+16	5,401.45
10+30	5,401.58
10+32	5,401.57
10+52	5,401.56
10+76	5,401.68
10+83	5,401.74
11+03	5,402.00
11+11	5,402.00
11+21	5,402.25
11+36	5,403.00
11+59	5,403.00
11+79	5,403.36
11+96	5,403.66
12+13	5,404.00
12+20	5,404.00
12+36	5,404.20
13+03	5,405.00
13+16	5,405.00
13+24	5,405.11
13+30	5,405.15
13+35	5,405.21
13+50	5,405.32
13+61	5,405.43
14+18	5,406.00
14+40	5,406.00

Section Definitions

Station (ft)	Elevation (ft)
14+43	5,406.05
15+15	5,407.00
15+39	5,407.00
15+50	5,407.15
16+03	5,408.00
17+10	5,408.00
17+20	5,408.16
17+23	5,408.19
18+11	5,408.92
18+20	5,409.00
19+12	5,409.00
19+19	5,409.22
19+35	5,409.69

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,401.00)	(19+35, 5,409.69)	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
Roughness Coefficient	0.040
Elevation	5,402.34 ft
Elevation Range	5,400.9 to 5,409.7 ft
Flow Area	878.2 ft²
Wetted Perimeter	935.0 ft
Hydraulic Radius	0.94 ft
Top Width	933.55 ft
Normal Depth	1.46 ft
Critical Depth	1.13 ft
Critical Slope	0.027 ft/ft
Velocity	2.98 ft/s
Velocity Head	0.14 ft
Specific Energy	1.60 ft
Froude Number	0.542
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.46 ft
Critical Depth	1.13 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.027 ft/ft

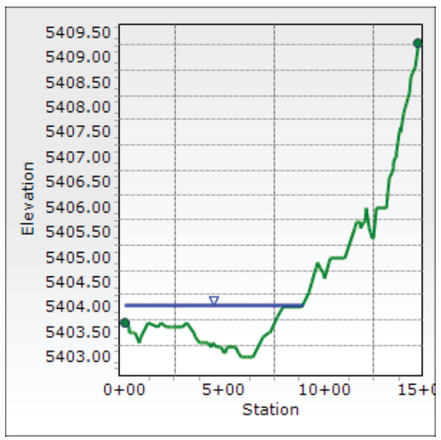
Messages:

Water Surface Elevation exceeds lowest end station by 1.33763411582186ft. Flow is divided.

Cross Section for Cook Park 100yr - 759

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	1.05 ft
Discharge	1,094.00 cfs



Appendix C – Hydraulic Analysis

Cook Park 100yr - 759

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	1,094.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,403.65
0+20	5,403.57
0+24	5,403.52
0+38	5,403.53
0+43	5,403.48
0+51	5,403.47
0+69	5,403.28
0+78	5,403.36
0+81	5,403.42
1+18	5,403.68
1+67	5,403.64
1+80	5,403.66
2+07	5,403.63
2+32	5,403.64
2+38	5,403.62
2+54	5,403.62
2+54	5,403.61
2+85	5,403.60
3+08	5,403.65
3+43	5,403.48
3+54	5,403.41
3+75	5,403.32
3+81	5,403.31
3+97	5,403.32
4+18	5,403.25
4+22	5,403.27
4+34	5,403.24
4+37	5,403.25
4+62	5,403.17
4+77	5,403.17
4+86	5,403.16
4+95	5,403.13
5+05	5,403.13
5+11	5,403.17
5+54	5,403.19
5+69	5,403.09
5+82	5,403.03
5+94	5,403.04

Section Definitions

Station (ft)	Elevation (ft)
6+14	5,403.00
6+45	5,403.00
6+96	5,403.35
7+22	5,403.48
7+27	5,403.52
7+68	5,403.77
7+94	5,404.00
8+91	5,404.00
9+22	5,404.30
9+36	5,404.47
9+52	5,404.66
9+60	5,404.76
9+68	5,404.85
9+81	5,404.81
9+93	5,404.66
10+04	5,404.63
10+28	5,404.88
10+34	5,405.00
11+01	5,405.00
11+57	5,405.63
11+62	5,405.67
11+69	5,405.65
11+72	5,405.68
11+83	5,405.66
11+86	5,405.64
11+98	5,405.68
12+07	5,405.72
12+14	5,406.00
12+26	5,405.56
12+36	5,405.46
12+41	5,405.43
12+49	5,405.43
12+63	5,406.00
13+10	5,406.00
13+21	5,406.30
13+31	5,406.57
13+41	5,406.74
13+46	5,406.78
13+52	5,406.85
13+59	5,407.00
13+63	5,407.00
13+65	5,407.14
13+70	5,407.28
13+75	5,407.50
13+84	5,407.56
13+85	5,407.54
13+94	5,407.67
14+01	5,407.89
14+07	5,408.00

Section Definitions

Station (ft)	Elevation (ft)
14+09	5,408.00
14+11	5,408.08
14+19	5,408.24
14+26	5,408.27
14+29	5,408.30
14+39	5,408.62
14+44	5,408.71
14+46	5,408.71
14+59	5,408.83
14+63	5,409.00
14+65	5,409.00
14+68	5,409.17
14+72	5,409.33

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,403.65)	(14+72, 5,409.33)	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	1.05 ft
Roughness Coefficient	0.040
Elevation	5,404.05 ft
Elevation Range	5,403.0 to 5,409.3 ft
Flow Area	511.5 ft²
Wetted Perimeter	896.2 ft
Hydraulic Radius	0.57 ft
Top Width	895.76 ft
Normal Depth	1.05 ft
Critical Depth	0.79 ft
Critical Slope	0.032 ft/ft
Velocity	2.14 ft/s
Velocity Head	0.07 ft
Specific Energy	1.12 ft
Froude Number	0.499
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.05 ft
Critical Depth	0.79 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.032 ft/ft

Messages:

Water Surface Elevation exceeds lowest end station by 0.398809229268409ft.

Cook Park 500yr - 759

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	2,618.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,403.65
0+20	5,403.57
0+24	5,403.52
0+38	5,403.53
0+43	5,403.48
0+51	5,403.47
0+69	5,403.28
0+78	5,403.36
0+81	5,403.42
1+18	5,403.68
1+67	5,403.64
1+80	5,403.66
2+07	5,403.63
2+32	5,403.64
2+38	5,403.62
2+54	5,403.62
2+54	5,403.61
2+85	5,403.60
3+08	5,403.65
3+43	5,403.48
3+54	5,403.41
3+75	5,403.32
3+81	5,403.31
3+97	5,403.32
4+18	5,403.25
4+22	5,403.27
4+34	5,403.24
4+37	5,403.25
4+62	5,403.17
4+77	5,403.17
4+86	5,403.16
4+95	5,403.13
5+05	5,403.13
5+11	5,403.17
5+54	5,403.19
5+69	5,403.09
5+82	5,403.03
5+94	5,403.04

Section Definitions

Station (ft)	Elevation (ft)
6+14	5,403.00
6+45	5,403.00
6+96	5,403.35
7+22	5,403.48
7+27	5,403.52
7+68	5,403.77
7+94	5,404.00
8+91	5,404.00
9+22	5,404.30
9+36	5,404.47
9+52	5,404.66
9+60	5,404.76
9+68	5,404.85
9+81	5,404.81
9+93	5,404.66
10+04	5,404.63
10+28	5,404.88
10+34	5,405.00
11+01	5,405.00
11+57	5,405.63
11+62	5,405.67
11+69	5,405.65
11+72	5,405.68
11+83	5,405.66
11+86	5,405.64
11+98	5,405.68
12+07	5,405.72
12+14	5,406.00
12+26	5,405.56
12+36	5,405.46
12+41	5,405.43
12+49	5,405.43
12+63	5,406.00
13+10	5,406.00
13+21	5,406.30
13+31	5,406.57
13+41	5,406.74
13+46	5,406.78
13+52	5,406.85
13+59	5,407.00
13+63	5,407.00
13+65	5,407.14
13+70	5,407.28
13+75	5,407.50
13+84	5,407.56
13+85	5,407.54
13+94	5,407.67
14+01	5,407.89
14+07	5,408.00

Section Definitions

Station (ft)	Elevation (ft)
14+09	5,408.00
14+11	5,408.08
14+19	5,408.24
14+26	5,408.27
14+29	5,408.30
14+39	5,408.62
14+44	5,408.71
14+46	5,408.71
14+59	5,408.83
14+63	5,409.00
14+65	5,409.00
14+68	5,409.17
14+72	5,409.33

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,403.65)	(14+72, 5,409.33)	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	1.45 ft
Roughness Coefficient	0.040
Elevation	5,404.45 ft
Elevation Range	5,403.0 to 5,409.3 ft
Flow Area	878.2 ft²
Wetted Perimeter	934.8 ft
Hydraulic Radius	0.94 ft
Top Width	933.96 ft
Normal Depth	1.45 ft
Critical Depth	1.12 ft
Critical Slope	0.027 ft/ft
Velocity	2.98 ft/s
Velocity Head	0.14 ft
Specific Energy	1.59 ft
Froude Number	0.542
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.45 ft
Critical Depth	1.12 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.027 ft/ft

Messages:

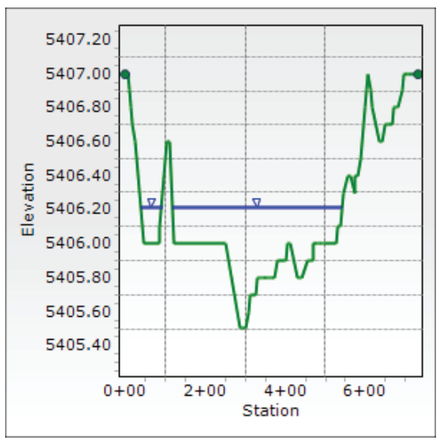
Water Surface Elevation exceeds lowest end station by 0.79917994853713ft.

Appendix C – Hydraulic Analysis

Cross Section for Cook Park 100yr - 1012

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Normal Depth	0.76 ft
Discharge	312.00 cfs



Cook Park 100yr - 1012

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Discharge	312.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,407.00
0+06	5,407.00
0+07	5,406.99
0+11	5,406.87
0+13	5,406.84
0+17	5,406.74
0+23	5,406.61
0+25	5,406.56
0+47	5,406.00
0+86	5,406.00
0+86	5,406.06
1+04	5,406.55
1+10	5,406.60
1+20	5,406.00
2+52	5,406.00
2+88	5,405.45
2+90	5,405.46
2+93	5,405.50
3+00	5,405.54
3+09	5,405.62
3+12	5,405.67
3+17	5,405.68
3+27	5,405.72
3+29	5,405.75
3+31	5,405.77
3+33	5,405.77
3+36	5,405.80
3+38	5,405.79
3+41	5,405.82
3+45	5,405.81
3+53	5,405.81
3+60	5,405.84
3+63	5,405.84
3+66	5,405.83
3+74	5,405.84
3+79	5,405.87
3+84	5,405.87
3+98	5,405.89

Section Definitions

Station (ft)	Elevation (ft)
4+00	5,405.89
4+02	5,405.92
4+07	5,405.95
4+09	5,405.97
4+12	5,405.97
4+13	5,405.95
4+31	5,405.80
4+33	5,405.81
4+36	5,405.81
4+40	5,405.80
4+56	5,405.86
4+60	5,405.89
4+63	5,405.90
4+66	5,405.93
4+69	5,405.94
4+70	5,405.95
4+82	5,405.96
4+85	5,405.97
4+90	5,405.97
4+92	5,405.98
4+94	5,405.97
4+98	5,406.00
5+26	5,406.00
5+28	5,406.04
5+33	5,406.08
5+35	5,406.12
5+37	5,406.13
5+41	5,406.21
5+44	5,406.30
5+58	5,406.43
5+62	5,406.37
5+74	5,406.34
5+75	5,406.35
5+81	5,406.42
5+88	5,406.48
5+96	5,406.72
5+99	5,406.82
6+03	5,406.91
6+06	5,406.95
6+08	5,406.96
6+12	5,406.90
6+16	5,406.82
6+18	5,406.78
6+37	5,406.55
6+37	5,406.56
6+44	5,406.60
6+50	5,406.66
6+53	5,406.67
6+54	5,406.69

Section Definitions

Station (ft)	Elevation (ft)
6+56	5,406.69
6+58	5,406.71
6+66	5,406.74
6+71	5,406.77
6+74	5,406.77
6+76	5,406.78
6+82	5,406.82
6+83	5,406.82
6+93	5,406.91
6+97	5,406.95
7+06	5,406.99
7+08	5,407.00
7+32	5,407.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,407.00)	(7+32, 5,407.00)	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	0.76 ft
Roughness Coefficient	0.040
Elevation	5,406.21 ft
Elevation Range	5,405.5 to 5,407.0 ft
Flow Area	143.4 ft²
Wetted Perimeter	476.4 ft
Hydraulic Radius	0.30 ft
Top Width	476.43 ft
Normal Depth	0.76 ft
Critical Depth	0.69 ft
Critical Slope	0.038 ft/ft
Velocity	2.18 ft/s
Velocity Head	0.07 ft
Specific Energy	0.83 ft
Froude Number	0.699
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.76 ft
Critical Depth	0.69 ft
Channel Slope	0.017 ft/ft
Critical Slope	0.038 ft/ft

Messages:

Flow is divided.

GG_NormalDepthCalcs.fm8
3/7/2022

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Cook Park 500yr - 1012

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.017 ft/ft
Discharge	957.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,407.00
0+06	5,407.00
0+07	5,406.99
0+11	5,406.87
0+13	5,406.84
0+17	5,406.74
0+23	5,406.61
0+25	5,406.56
0+47	5,406.00
0+86	5,406.00
0+86	5,406.06
1+04	5,406.55
1+10	5,406.60
1+20	5,406.00
2+52	5,406.00
2+88	5,405.45
2+90	5,405.46
2+93	5,405.50
3+00	5,405.54
3+09	5,405.62
3+12	5,405.67
3+17	5,405.68
3+27	5,405.72
3+29	5,405.75
3+31	5,405.77
3+33	5,405.77
3+36	5,405.80
3+38	5,405.79
3+41	5,405.82
3+45	5,405.81
3+53	5,405.81
3+60	5,405.84
3+63	5,405.84
3+66	5,405.83
3+74	5,405.84
3+79	5,405.87
3+84	5,405.87
3+98	5,405.89

Section Definitions

Station (ft)	Elevation (ft)
4+00	5,405.89
4+02	5,405.92
4+07	5,405.95
4+09	5,405.97
4+12	5,405.97
4+13	5,405.95
4+31	5,405.80
4+33	5,405.81
4+36	5,405.81
4+40	5,405.80
4+56	5,405.86
4+60	5,405.89
4+63	5,405.90
4+66	5,405.93
4+69	5,405.94
4+70	5,405.95
4+82	5,405.96
4+85	5,405.97
4+90	5,405.97
4+92	5,405.98
4+94	5,405.97
4+98	5,406.00
5+26	5,406.00
5+28	5,406.04
5+33	5,406.08
5+35	5,406.12
5+37	5,406.13
5+41	5,406.21
5+44	5,406.30
5+58	5,406.43
5+62	5,406.37
5+74	5,406.34
5+75	5,406.35
5+81	5,406.42
5+88	5,406.48
5+96	5,406.72
5+99	5,406.82
6+03	5,406.91
6+06	5,406.95
6+08	5,406.96
6+12	5,406.90
6+16	5,406.82
6+18	5,406.78
6+37	5,406.55
6+37	5,406.56
6+44	5,406.60
6+50	5,406.66
6+53	5,406.67
6+54	5,406.69

Section Definitions

Station (ft)	Elevation (ft)
6+56	5,406.69
6+58	5,406.71
6+66	5,406.74
6+71	5,406.77
6+74	5,406.77
6+76	5,406.78
6+82	5,406.82
6+83	5,406.82
6+93	5,406.91
6+97	5,406.95
7+06	5,406.99
7+08	5,407.00
7+32	5,407.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,407.00)	(7+32, 5,407.00)	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	1.06 ft
Roughness Coefficient	0.040
Elevation	5,406.51 ft
Elevation Range	5,405.5 to 5,407.0 ft
Flow Area	298.2 ft²
Wetted Perimeter	552.8 ft
Hydraulic Radius	0.54 ft
Top Width	552.77 ft
Normal Depth	1.06 ft
Critical Depth	0.97 ft
Critical Slope	0.030 ft/ft
Velocity	3.21 ft/s
Velocity Head	0.16 ft
Specific Energy	1.22 ft
Froude Number	0.770
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.06 ft
Critical Depth	0.97 ft
Channel Slope	0.017 ft/ft
Critical Slope	0.030 ft/ft

Appendix C – Hydraulic Analysis

Messages:

Flow is divided.

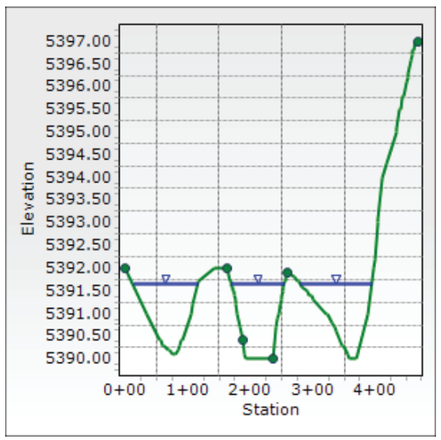
Normal Depth Calculations

Locust Street Overflow

Cross Section for Locust St Ovrflw 500yr - 1515

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.008 ft/ft
Normal Depth	1.64 ft
Discharge	295.00 cfs



Locust St Ovrflw 500yr - 1515

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.008 ft/ft
Discharge	295.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,392.00
0+35	5,391.00
0+35	5,391.00
0+55	5,390.42
0+57	5,390.37
0+59	5,390.34
0+61	5,390.31
0+69	5,390.17
0+70	5,390.15
0+75	5,390.09
0+80	5,390.08
0+81	5,390.10
0+86	5,390.23
0+88	5,390.30
0+89	5,390.36
0+92	5,390.44
1+05	5,391.00
1+06	5,391.00
1+09	5,391.17
1+18	5,391.70
1+18	5,391.71
1+42	5,392.00
1+64	5,392.00
1+69	5,391.70
1+69	5,391.68
1+70	5,391.67
1+70	5,391.62
1+71	5,391.61
1+72	5,391.53
1+73	5,391.51
1+73	5,391.46
1+74	5,391.45
1+75	5,391.38
1+75	5,391.36
1+76	5,391.28
1+76	5,391.27
1+77	5,391.16
1+79	5,391.00

Section Definitions

Station (ft)	Elevation (ft)
1+82	5,390.74
1+88	5,390.35
1+92	5,390.09
1+93	5,390.00
2+36	5,390.00
2+42	5,390.70
2+44	5,390.89
2+45	5,391.00
2+47	5,391.18
2+48	5,391.24
2+49	5,391.33
2+50	5,391.35
2+52	5,391.50
2+53	5,391.58
2+55	5,391.66
2+55	5,391.66
2+57	5,391.72
2+58	5,391.79
2+60	5,391.92
2+60	5,391.91
2+71	5,391.80
2+75	5,391.73
2+79	5,391.67
2+81	5,391.63
2+92	5,391.46
2+95	5,391.42
2+98	5,391.37
3+01	5,391.33
3+22	5,391.00
3+24	5,391.00
3+30	5,390.84
3+31	5,390.80
3+36	5,390.67
3+39	5,390.58
3+47	5,390.34
3+49	5,390.27
3+56	5,390.06
3+58	5,390.00
3+69	5,390.00
3+89	5,391.00
3+98	5,391.95
3+98	5,392.03
3+99	5,392.17
4+04	5,393.00
4+05	5,393.12
4+12	5,394.00
4+18	5,394.34
4+33	5,395.00
4+35	5,395.13

Section Definitions

Station (ft)	Elevation (ft)
4+40	5,395.45
4+41	5,395.51
4+44	5,395.75
4+46	5,395.83
4+49	5,396.05
4+52	5,396.23
4+53	5,396.33
4+58	5,396.59
4+59	5,396.67
4+60	5,396.76
4+62	5,396.84
4+64	5,397.00
4+68	5,397.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,392.00)	(1+64, 5,392.00)	0.150
(1+64, 5,392.00)	(1+88, 5,390.35)	0.040
(1+88, 5,390.35)	(2+36, 5,390.00)	0.020
(2+36, 5,390.00)	(2+60, 5,391.91)	0.040
(2+60, 5,391.91)	(4+68, 5,397.00)	0.150

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	1.64 ft
Roughness Coefficient	0.128
Elevation	5,391.64 ft
Elevation Range	5,390.0 to 5,397.0 ft
Flow Area	292.2 ft²
Wetted Perimeter	303.4 ft
Hydraulic Radius	0.96 ft
Top Width	303.16 ft
Normal Depth	1.64 ft
Critical Depth	0.70 ft
Critical Slope	0.308 ft/ft
Velocity	1.01 ft/s
Velocity Head	0.02 ft
Specific Energy	1.66 ft
Froude Number	0.181

Results	
Flow Type	Subcritical
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.64 ft
Critical Depth	0.70 ft
Channel Slope	0.008 ft/ft
Critical Slope	0.308 ft/ft

Messages:

Flow is divided.

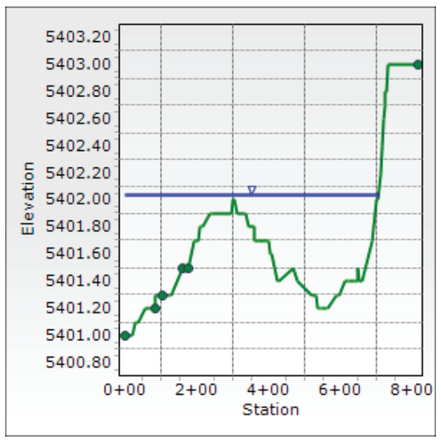
GG_NormalDepthCalcs.fm8
3/7/2022

Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Cross Section for Locust St Ovrflw 500yr - 1761

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.012 ft/ft
Normal Depth	1.04 ft
Discharge	295.00 cfs



Locust St Ovrflw 500yr - 1761

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.012 ft/ft
Discharge	295.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,401.00
0+20	5,401.00
0+29	5,401.05
0+34	5,401.06
0+38	5,401.08
0+57	5,401.17
0+68	5,401.19
0+69	5,401.20
0+72	5,401.20
0+73	5,401.21
0+83	5,401.24
0+85	5,401.25
0+88	5,401.25
0+89	5,401.26
1+05	5,401.30
1+09	5,401.30
1+15	5,401.31
1+23	5,401.31
1+24	5,401.32
1+28	5,401.32
1+58	5,401.46
1+69	5,401.51
1+71	5,401.53
1+74	5,401.54
1+93	5,401.66
1+97	5,401.69
1+98	5,401.69
2+01	5,401.72
2+04	5,401.73
2+08	5,401.76
2+11	5,401.77
2+16	5,401.81
2+34	5,401.87
2+39	5,401.87
2+44	5,401.86
2+95	5,401.93
2+98	5,401.95
3+05	5,401.95

Section Definitions

Station (ft)	Elevation (ft)
3+11	5,401.93
3+30	5,401.87
3+32	5,401.86
3+34	5,401.86
3+35	5,401.85
3+43	5,401.80
3+58	5,401.75
3+60	5,401.74
3+66	5,401.73
3+70	5,401.72
3+74	5,401.69
3+91	5,401.68
3+94	5,401.66
3+98	5,401.66
4+02	5,401.63
4+03	5,401.63
4+04	5,401.61
4+08	5,401.58
4+09	5,401.56
4+25	5,401.39
4+26	5,401.39
4+67	5,401.45
4+70	5,401.45
4+81	5,401.42
5+21	5,401.29
5+31	5,401.25
5+34	5,401.24
5+37	5,401.24
5+38	5,401.23
5+43	5,401.23
5+43	5,401.22
5+49	5,401.22
5+49	5,401.21
5+58	5,401.21
5+64	5,401.19
5+86	5,401.27
5+92	5,401.31
5+94	5,401.31
5+95	5,401.32
6+11	5,401.35
6+19	5,401.38
6+22	5,401.40
6+24	5,401.40
6+26	5,401.42
6+40	5,401.43
6+40	5,401.44
6+46	5,401.44
6+47	5,401.45
6+52	5,401.44

Section Definitions

Station (ft)	Elevation (ft)
6+60	5,401.44
6+86	5,401.68
6+88	5,401.70
7+01	5,402.00
7+05	5,402.00
7+10	5,402.20
7+15	5,402.44
7+20	5,402.62
7+22	5,402.68
7+24	5,402.77
7+26	5,402.83
7+31	5,403.00
8+15	5,403.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,401.00)	(0+83, 5,401.24)	0.150
(0+83, 5,401.24)	(1+05, 5,401.30)	0.040
(1+05, 5,401.30)	(1+58, 5,401.46)	0.020
(1+58, 5,401.46)	(1+74, 5,401.54)	0.040
(1+74, 5,401.54)	(8+15, 5,403.00)	0.150

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
Roughness Coefficient	0.140
Elevation	5,402.04 ft
Elevation Range	5,401.0 to 5,403.0 ft
Flow Area	382.8 ft²
Wetted Perimeter	706.8 ft
Hydraulic Radius	0.54 ft
Top Width	705.78 ft
Normal Depth	1.04 ft
Critical Depth	0.55 ft
Critical Slope	0.462 ft/ft
Velocity	0.77 ft/s
Velocity Head	0.01 ft
Specific Energy	1.05 ft
Froude Number	0.184

Appendix C – Hydraulic Analysis

Results	
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.04 ft
Critical Depth	0.55 ft
Channel Slope	0.012 ft/ft
Critical Slope	0.462 ft/ft

Messages:

Water Surface Elevation exceeds lowest end station by 1.03693204004321ft.

GG_NormalDepthCalcs.fm8
3/7/2022
Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Appendix C – Hydraulic Analysis

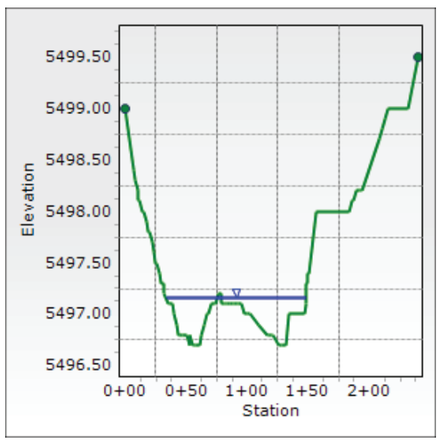
Normal Depth Calculations

Southmoor Tributary Overland

Cross Section for Southmoor Trib 100yr - 2038

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.027 ft/ft
Normal Depth	0.49 ft
Discharge	65.00 cfs



Southmoor Trib 100yr - 2038

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.027 ft/ft
Discharge	65.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,499.00
0+00	5,499.00
0+07	5,498.39
0+08	5,498.28
0+10	5,498.17
0+10	5,498.14
0+12	5,498.05
0+14	5,497.99
0+15	5,497.96
0+17	5,497.88
0+17	5,497.88
0+18	5,497.83
0+18	5,497.83
0+19	5,497.78
0+22	5,497.67
0+23	5,497.62
0+24	5,497.54
0+25	5,497.50
0+28	5,497.35
0+29	5,497.31
0+31	5,497.26
0+32	5,497.22
0+35	5,497.14
0+36	5,497.13
0+38	5,497.05
0+40	5,497.00
0+42	5,496.90
0+44	5,496.84
0+45	5,496.82
0+47	5,496.79
0+51	5,496.77
0+52	5,496.74
0+53	5,496.75
0+55	5,496.70
0+56	5,496.69
0+57	5,496.67
0+61	5,496.73
0+61	5,496.73

Section Definitions

Station (ft)	Elevation (ft)
0+62	5,496.77
0+62	5,496.77
0+65	5,496.90
0+65	5,496.90
0+67	5,497.00
0+68	5,497.03
0+71	5,497.09
0+73	5,497.12
0+74	5,497.14
0+76	5,497.15
0+79	5,497.15
0+79	5,497.14
0+82	5,497.10
0+83	5,497.09
0+83	5,497.08
0+86	5,497.08
0+88	5,497.11
0+88	5,497.10
0+90	5,497.12
0+91	5,497.11
0+92	5,497.11
0+93	5,497.09
0+95	5,497.07
0+96	5,497.06
0+98	5,497.03
1+00	5,497.00
1+02	5,496.98
1+09	5,496.91
1+10	5,496.90
1+17	5,496.84
1+18	5,496.83
1+20	5,496.81
1+20	5,496.80
1+22	5,496.79
1+27	5,496.73
1+28	5,496.72
1+32	5,496.72
1+34	5,497.00
1+47	5,497.00
1+48	5,497.10
1+48	5,497.10
1+49	5,497.25
1+49	5,497.26
1+50	5,497.36
1+50	5,497.38
1+57	5,498.00
1+84	5,498.00
1+87	5,498.09
1+87	5,498.08

Section Definitions

Station (ft)	Elevation (ft)
1+90	5,498.17
1+90	5,498.15
1+92	5,498.20
1+93	5,498.18
1+94	5,498.19
2+09	5,498.67
2+09	5,498.68
2+11	5,498.76
2+11	5,498.77
2+13	5,498.88
2+15	5,499.00
2+32	5,499.00
2+40	5,499.51

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,499.00)	(2+40, 5,499.51)	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	0.49 ft
Roughness Coefficient	0.035
Elevation	5,497.16 ft
Elevation Range	5,496.7 to 5,499.5 ft
Flow Area	25.4 ft²
Wetted Perimeter	114.1 ft
Hydraulic Radius	0.22 ft
Top Width	114.02 ft
Normal Depth	0.49 ft
Critical Depth	0.48 ft
Critical Slope	0.030 ft/ft
Velocity	2.56 ft/s
Velocity Head	0.10 ft
Specific Energy	0.59 ft
Froude Number	0.958
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.49 ft
Critical Depth	0.48 ft
Channel Slope	0.027 ft/ft
Critical Slope	0.030 ft/ft

Southmoor Trib 500yr - 2038

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.027 ft/ft
Discharge	309.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,499.00
0+00	5,499.00
0+07	5,498.39
0+08	5,498.28
0+10	5,498.17
0+10	5,498.14
0+12	5,498.05
0+14	5,497.99
0+15	5,497.96
0+17	5,497.88
0+17	5,497.88
0+18	5,497.83
0+18	5,497.83
0+19	5,497.78
0+22	5,497.67
0+23	5,497.62
0+24	5,497.54
0+25	5,497.50
0+28	5,497.35
0+29	5,497.31
0+31	5,497.26
0+32	5,497.22
0+35	5,497.14
0+36	5,497.13
0+38	5,497.05
0+40	5,497.00
0+42	5,496.90
0+44	5,496.84
0+45	5,496.82
0+47	5,496.79
0+51	5,496.77
0+52	5,496.74
0+53	5,496.75
0+55	5,496.70
0+56	5,496.69
0+57	5,496.67
0+61	5,496.73
0+61	5,496.73

Section Definitions

Station (ft)	Elevation (ft)
0+62	5,496.77
0+62	5,496.77
0+65	5,496.90
0+65	5,496.90
0+67	5,497.00
0+68	5,497.03
0+71	5,497.09
0+73	5,497.12
0+74	5,497.14
0+76	5,497.15
0+79	5,497.15
0+79	5,497.14
0+82	5,497.10
0+83	5,497.09
0+83	5,497.08
0+86	5,497.08
0+88	5,497.11
0+88	5,497.10
0+90	5,497.12
0+91	5,497.11
0+92	5,497.11
0+93	5,497.09
0+95	5,497.07
0+96	5,497.06
0+98	5,497.03
1+00	5,497.00
1+02	5,496.98
1+09	5,496.91
1+10	5,496.90
1+17	5,496.84
1+18	5,496.83
1+20	5,496.81
1+20	5,496.80
1+22	5,496.79
1+27	5,496.73
1+28	5,496.72
1+32	5,496.72
1+34	5,497.00
1+47	5,497.00
1+48	5,497.10
1+48	5,497.10
1+49	5,497.25
1+49	5,497.26
1+50	5,497.36
1+50	5,497.38
1+57	5,498.00
1+84	5,498.00
1+87	5,498.09
1+87	5,498.08

Section Definitions

Station (ft)	Elevation (ft)
1+90	5,498.17
1+90	5,498.15
1+92	5,498.20
1+93	5,498.18
1+94	5,498.19
2+09	5,498.67
2+09	5,498.68
2+11	5,498.76
2+11	5,498.77
2+13	5,498.88
2+15	5,499.00
2+32	5,499.00
2+40	5,499.51

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,499.00)	(2+40, 5,499.51)	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	0.84 ft
Roughness Coefficient	0.035
Elevation	5,497.51 ft
Elevation Range	5,496.7 to 5,499.5 ft
Flow Area	67.5 ft²
Wetted Perimeter	126.8 ft
Hydraulic Radius	0.53 ft
Top Width	126.69 ft
Normal Depth	0.84 ft
Critical Depth	0.88 ft
Critical Slope	0.022 ft/ft
Velocity	4.58 ft/s
Velocity Head	0.33 ft
Specific Energy	1.17 ft
Froude Number	1.107
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft

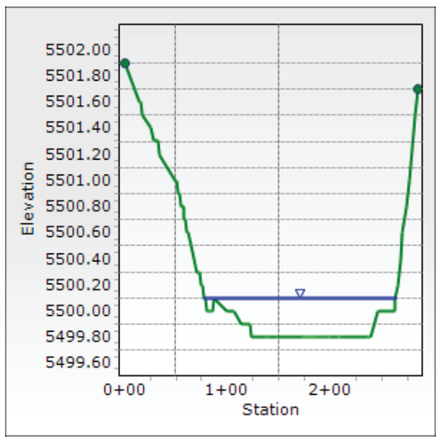
GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.84 ft
Critical Depth	0.88 ft
Channel Slope	0.027 ft/ft
Critical Slope	0.022 ft/ft

Cross Section for Southmoor Trib 100yr - 2189

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.008 ft/ft
Normal Depth	0.35 ft
Discharge	65.00 cfs



Appendix C – Hydraulic Analysis

Southmoor Trib 100yr - 2189

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.008 ft/ft
Discharge	65.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,501.87
0+00	5,501.87
0+13	5,501.59
0+15	5,501.57
0+15	5,501.55
0+16	5,501.54
0+25	5,501.36
0+28	5,501.31
0+29	5,501.30
0+32	5,501.25
0+34	5,501.23
0+48	5,501.00
0+50	5,501.00
0+50	5,500.98
0+52	5,500.93
0+53	5,500.89
0+55	5,500.82
0+57	5,500.76
0+58	5,500.74
0+58	5,500.73
0+61	5,500.64
0+62	5,500.61
0+65	5,500.51
0+70	5,500.33
0+72	5,500.25
0+74	5,500.21
0+75	5,500.17
0+76	5,500.15
0+77	5,500.11
0+77	5,500.11
0+79	5,500.07
0+79	5,500.07
0+80	5,500.04
0+81	5,500.02
0+82	5,500.01
0+83	5,500.02
0+84	5,500.02
0+85	5,500.04

Section Definitions

Station (ft)	Elevation (ft)
0+87	5,500.08
0+87	5,500.09
1+00	5,500.00
1+06	5,500.00
1+14	5,499.91
1+16	5,499.90
1+17	5,499.90
1+19	5,499.88
1+20	5,499.88
1+21	5,499.86
1+24	5,499.83
1+38	5,499.75
1+40	5,499.75
1+48	5,499.78
1+74	5,499.81
1+75	5,499.82
1+76	5,499.81
1+76	5,499.82
1+77	5,499.82
1+77	5,499.81
1+77	5,499.80
1+79	5,499.80
1+79	5,499.79
1+80	5,499.77
1+81	5,499.78
1+81	5,499.77
1+82	5,499.77
1+83	5,499.78
1+83	5,499.77
1+85	5,499.78
1+87	5,499.78
1+89	5,499.79
1+92	5,499.80
1+94	5,499.81
1+98	5,499.82
1+99	5,499.82
1+99	5,499.83
2+00	5,499.83
2+01	5,499.82
2+08	5,499.82
2+08	5,499.81
2+09	5,499.80
2+09	5,499.80
2+10	5,499.78
2+10	5,499.78
2+37	5,499.81
2+38	5,499.82
2+38	5,499.81
2+39	5,499.82

Section Definitions

Station (ft)	Elevation (ft)
2+39	5,499.81
2+40	5,499.82
2+40	5,499.82
2+46	5,500.00
2+64	5,500.00
2+64	5,500.05
2+67	5,500.23
2+69	5,500.38
2+71	5,500.56
2+74	5,500.77
2+78	5,501.00
2+83	5,501.46
2+86	5,501.67

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,501.87)	(2+86, 5,501.67)	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	0.35 ft
Roughness Coefficient	0.035
Elevation	5,500.10 ft
Elevation Range	5,499.8 to 5,501.9 ft
Flow Area	44.6 ft²
Wetted Perimeter	187.5 ft
Hydraulic Radius	0.24 ft
Top Width	187.49 ft
Normal Depth	0.35 ft
Critical Depth	0.26 ft
Critical Slope	0.032 ft/ft
Velocity	1.46 ft/s
Velocity Head	0.03 ft
Specific Energy	0.39 ft
Froude Number	0.526
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.35 ft
Critical Depth	0.26 ft
Channel Slope	0.008 ft/ft
Critical Slope	0.032 ft/ft

Southmoor Trib 500yr - 2189

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.008 ft/ft
Discharge	309.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,501.87
0+00	5,501.87
0+13	5,501.59
0+15	5,501.57
0+15	5,501.55
0+16	5,501.54
0+25	5,501.36
0+28	5,501.31
0+29	5,501.30
0+32	5,501.25
0+34	5,501.23
0+48	5,501.00
0+50	5,501.00
0+50	5,500.98
0+52	5,500.93
0+53	5,500.89
0+55	5,500.82
0+57	5,500.76
0+58	5,500.74
0+58	5,500.73
0+61	5,500.64
0+62	5,500.61
0+65	5,500.51
0+70	5,500.33
0+72	5,500.25
0+74	5,500.21
0+75	5,500.17
0+76	5,500.15
0+77	5,500.11
0+77	5,500.11
0+79	5,500.07
0+79	5,500.07
0+80	5,500.04
0+81	5,500.02
0+82	5,500.01
0+83	5,500.02
0+84	5,500.02
0+85	5,500.04

Section Definitions

Station (ft)	Elevation (ft)
0+87	5,500.08
0+87	5,500.09
1+00	5,500.00
1+06	5,500.00
1+14	5,499.91
1+16	5,499.90
1+17	5,499.90
1+19	5,499.88
1+20	5,499.88
1+21	5,499.86
1+24	5,499.83
1+38	5,499.75
1+40	5,499.75
1+48	5,499.78
1+74	5,499.81
1+75	5,499.82
1+76	5,499.81
1+76	5,499.82
1+77	5,499.82
1+77	5,499.81
1+77	5,499.80
1+79	5,499.80
1+79	5,499.79
1+80	5,499.77
1+81	5,499.78
1+81	5,499.77
1+82	5,499.77
1+83	5,499.78
1+83	5,499.77
1+85	5,499.78
1+87	5,499.78
1+89	5,499.79
1+92	5,499.80
1+94	5,499.81
1+98	5,499.82
1+99	5,499.82
1+99	5,499.83
2+00	5,499.83
2+01	5,499.82
2+08	5,499.82
2+08	5,499.81
2+09	5,499.80
2+09	5,499.80
2+10	5,499.78
2+10	5,499.78
2+37	5,499.81
2+38	5,499.82
2+38	5,499.81
2+39	5,499.82

Section Definitions

Station (ft)	Elevation (ft)
2+39	5,499.81
2+40	5,499.82
2+40	5,499.82
2+46	5,500.00
2+64	5,500.00
2+64	5,500.05
2+67	5,500.23
2+69	5,500.38
2+71	5,500.56
2+74	5,500.77
2+78	5,501.00
2+83	5,501.46
2+86	5,501.67

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,501.87)	(2+86, 5,501.67)	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	0.73 ft
Roughness Coefficient	0.035
Elevation	5,500.48 ft
Elevation Range	5,499.8 to 5,501.9 ft
Flow Area	117.7 ft²
Wetted Perimeter	204.8 ft
Hydraulic Radius	0.57 ft
Top Width	204.76 ft
Normal Depth	0.73 ft
Critical Depth	0.56 ft
Critical Slope	0.024 ft/ft
Velocity	2.63 ft/s
Velocity Head	0.11 ft
Specific Energy	0.83 ft
Froude Number	0.611
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

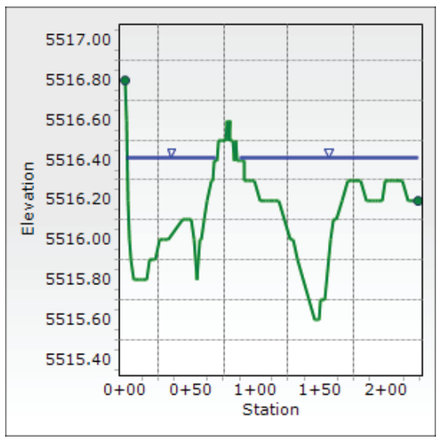
GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.73 ft
Critical Depth	0.56 ft
Channel Slope	0.008 ft/ft
Critical Slope	0.024 ft/ft

Appendix C – Hydraulic Analysis

Cross Section for Southmoor Trib 500yr - 2678

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.050 ft/ft
Normal Depth	0.83 ft
Discharge	302.00 cfs



Southmoor Trib 500yr - 2678

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.050 ft/ft
Discharge	302.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,516.83
0+01	5,516.56
0+02	5,516.19
0+03	5,516.00
0+05	5,515.88
0+06	5,515.82
0+08	5,515.80
0+11	5,515.79
0+13	5,515.81
0+17	5,515.83
0+19	5,515.86
0+22	5,515.92
0+22	5,515.93
0+26	5,515.97
0+30	5,515.98
0+33	5,516.00
0+44	5,516.12
0+46	5,516.12
0+49	5,516.09
0+50	5,516.05
0+53	5,515.99
0+54	5,515.93
0+55	5,515.82
0+57	5,515.95
0+58	5,516.01
0+60	5,516.07
0+60	5,516.09
0+63	5,516.17
0+65	5,516.27
0+67	5,516.30
0+67	5,516.33
0+69	5,516.35
0+70	5,516.42
0+71	5,516.43
0+71	5,516.47
0+73	5,516.49
0+74	5,516.52
0+77	5,516.54

Section Definitions

Station (ft)	Elevation (ft)
0+78	5,516.56
0+79	5,516.54
0+80	5,516.55
0+81	5,516.50
0+81	5,516.48
0+82	5,516.50
0+83	5,516.44
0+84	5,516.48
0+85	5,516.41
0+86	5,516.43
0+87	5,516.43
0+88	5,516.39
0+89	5,516.38
0+90	5,516.35
0+91	5,516.35
0+92	5,516.33
0+93	5,516.34
0+94	5,516.32
0+96	5,516.31
0+99	5,516.25
1+03	5,516.16
1+07	5,516.16
1+10	5,516.15
1+15	5,516.18
1+18	5,516.21
1+27	5,516.00
1+29	5,516.00
1+32	5,515.88
1+32	5,515.88
1+45	5,515.58
1+46	5,515.61
1+47	5,515.59
1+48	5,515.62
1+48	5,515.61
1+50	5,515.66
1+50	5,515.65
1+51	5,515.69
1+51	5,515.68
1+53	5,515.74
1+58	5,516.00
1+60	5,516.06
1+62	5,516.10
1+66	5,516.20
1+71	5,516.29
1+74	5,516.29
1+81	5,516.25
1+85	5,516.21
1+86	5,516.20
1+90	5,516.20

Section Definitions

Station (ft)	Elevation (ft)
1+92	5,516.18
1+94	5,516.19
1+98	5,516.23
2+00	5,516.26
2+02	5,516.28
2+05	5,516.28
2+07	5,516.27
2+07	5,516.26
2+13	5,516.25
2+17	5,516.23
2+18	5,516.24
2+22	5,516.21
2+24	5,516.17

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,516.83)	(2+24, 5,516.17)	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	0.83 ft
Roughness Coefficient	0.035
Elevation	5,516.41 ft
Elevation Range	5,515.6 to 5,516.8 ft
Flow Area	67.1 ft²
Wetted Perimeter	205.3 ft
Hydraulic Radius	0.33 ft
Top Width	204.97 ft
Normal Depth	0.83 ft
Critical Depth	0.91 ft
Critical Slope	0.024 ft/ft
Velocity	4.50 ft/s
Velocity Head	0.31 ft
Specific Energy	1.14 ft
Froude Number	1.387
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft

GVF Input Data	
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.83 ft
Critical Depth	0.91 ft
Channel Slope	0.050 ft/ft
Critical Slope	0.024 ft/ft

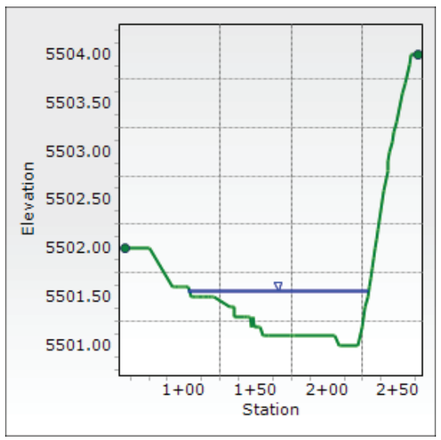
Normal Depth Calculations

Hampden Avenue Overflow

Cross Section for Hampden Overflow 500yr - 452

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.031 ft/ft
Normal Depth	0.56 ft
Discharge	152.00 cfs



Flowmaster ground data truncated at high ground on left side to avoid divided flow

Hampden Overflow 500yr - 452

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.031 ft/ft
Discharge	152.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+59	5,502.00
0+76	5,502.00
0+92	5,501.63
0+93	5,501.62
0+94	5,501.62
0+96	5,501.60
0+97	5,501.60
0+98	5,501.58
0+99	5,501.58
1+00	5,501.57
1+01	5,501.57
1+02	5,501.56
1+03	5,501.56
1+05	5,501.54
1+07	5,501.52
1+08	5,501.52
1+08	5,501.51
1+09	5,501.51
1+10	5,501.50
1+13	5,501.49
1+14	5,501.49
1+14	5,501.48
1+17	5,501.48
1+17	5,501.47
1+19	5,501.47
1+19	5,501.46
1+20	5,501.47
1+21	5,501.47
1+33	5,501.39
1+34	5,501.38
1+34	5,501.36
1+35	5,501.36
1+35	5,501.34
1+43	5,501.32
1+44	5,501.29
1+45	5,501.29
1+46	5,501.27
1+48	5,501.24

Section Definitions

Station (ft)	Elevation (ft)
1+48	5,501.25
1+49	5,501.22
1+52	5,501.18
1+53	5,501.17
1+56	5,501.14
1+56	5,501.14
1+56	5,501.13
1+59	5,501.12
1+74	5,501.10
1+74	5,501.09
1+76	5,501.09
1+77	5,501.10
1+78	5,501.11
2+05	5,501.12
2+08	5,501.03
2+10	5,501.00
2+22	5,501.00
2+25	5,501.21
2+26	5,501.35
2+28	5,501.49
2+30	5,501.62
2+30	5,501.70
2+32	5,501.82
2+32	5,501.86
2+34	5,502.00
2+35	5,502.10
2+36	5,502.23
2+39	5,502.57
2+40	5,502.63
2+42	5,502.83
2+42	5,502.86
2+44	5,503.00
2+45	5,503.09
2+47	5,503.18
2+47	5,503.19
2+48	5,503.28
2+48	5,503.31
2+53	5,503.61
2+54	5,503.73
2+57	5,503.91
2+59	5,504.00
2+63	5,504.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+59, 5,502.00)	(2+63, 5,504.00)	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	0.56 ft
Roughness Coefficient	0.035
Elevation	5,501.56 ft
Elevation Range	5,501.0 to 5,504.0 ft
Flow Area	42.2 ft²
Wetted Perimeter	126.0 ft
Hydraulic Radius	0.33 ft
Top Width	125.95 ft
Normal Depth	0.56 ft
Critical Depth	0.58 ft
Critical Slope	0.025 ft/ft
Velocity	3.60 ft/s
Velocity Head	0.20 ft
Specific Energy	0.76 ft
Froude Number	1.097
Flow Type	Supercritical

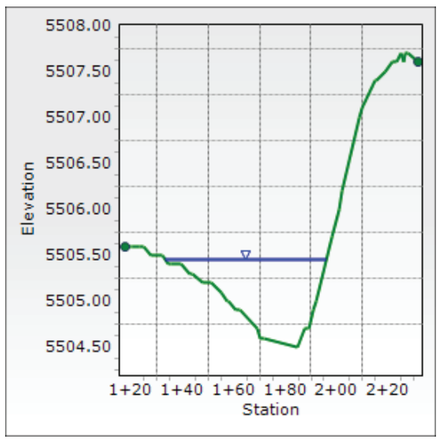
GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.56 ft
Critical Depth	0.58 ft
Channel Slope	0.031 ft/ft
Critical Slope	0.025 ft/ft

Cross Section for Hampden Overflow 500yr - 561

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.031 ft/ft
Normal Depth	0.95 ft
Discharge	152.00 cfs



Flowmaster ground data truncated at high ground on left side to avoid divided flow

Hampden Overflow 500yr - 561

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.031 ft/ft
Discharge	152.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
1+18	5,505.57
1+20	5,505.56
1+21	5,505.57
1+23	5,505.55
1+25	5,505.55
1+28	5,505.53
1+33	5,505.46
1+35	5,505.44
1+36	5,505.44
1+39	5,505.40
1+43	5,505.34
1+44	5,505.33
1+48	5,505.23
1+48	5,505.23
1+51	5,505.15
1+55	5,505.07
1+57	5,505.00
1+58	5,505.00
1+61	5,504.91
1+62	5,504.86
1+69	5,504.66
1+70	5,504.63
1+72	5,504.59
1+85	5,504.50
1+88	5,504.66
1+88	5,504.65
1+89	5,504.72
1+89	5,504.71
1+91	5,504.88
1+92	5,505.00
1+98	5,505.71
2+01	5,506.01
2+02	5,506.20
2+08	5,507.00
2+10	5,507.07
2+15	5,507.35
2+15	5,507.36
2+19	5,507.51

Section Definitions

Station (ft)	Elevation (ft)
2+21	5,507.60
2+23	5,507.62
2+25	5,507.66
2+26	5,507.64
2+26	5,507.66
2+28	5,507.65
2+31	5,507.64

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(1+18, 5,505.57)	(2+31, 5,507.64)	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	0.95 ft
Roughness Coefficient	0.035
Elevation	5,505.45 ft
Elevation Range	5,504.5 to 5,507.7 ft
Flow Area	31.9 ft²
Wetted Perimeter	62.7 ft
Hydraulic Radius	0.51 ft
Top Width	62.66 ft
Normal Depth	0.95 ft
Critical Depth	1.02 ft
Critical Slope	0.022 ft/ft
Velocity	4.76 ft/s
Velocity Head	0.35 ft
Specific Energy	1.30 ft
Froude Number	1.177
Flow Type	Supercritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A

GVF Output Data	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.95 ft
Critical Depth	1.02 ft
Channel Slope	0.031 ft/ft
Critical Slope	0.022 ft/ft

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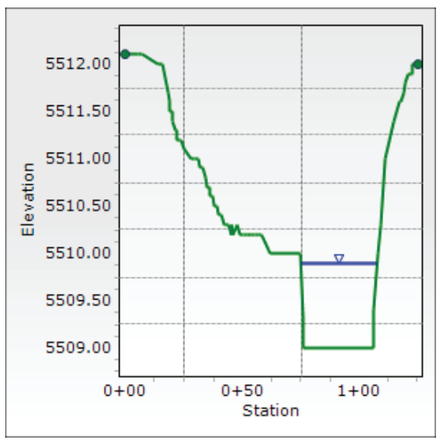
3/7/2022
Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Cross Section for Hampden Overflow 500yr - 665

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.022 ft/ft
Normal Depth	0.89 ft
Discharge	152.00 cfs



Hampden Overflow 500yr - 665

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.022 ft/ft
Discharge	152.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,512.10
0+01	5,512.10
0+05	5,512.10
0+05	5,512.10
0+07	5,512.10
0+14	5,512.00
0+16	5,512.00
0+18	5,511.70
0+18	5,511.70
0+18	5,511.70
0+19	5,511.60
0+19	5,511.50
0+20	5,511.50
0+20	5,511.40
0+21	5,511.30
0+21	5,511.30
0+22	5,511.30
0+22	5,511.20
0+23	5,511.20
0+24	5,511.20
0+24	5,511.20
0+25	5,511.10
0+25	5,511.10
0+25	5,511.10
0+28	5,511.00
0+28	5,511.00
0+29	5,511.00
0+29	5,511.00
0+30	5,511.00
0+30	5,511.00
0+31	5,511.00
0+32	5,510.90
0+32	5,510.90
0+33	5,510.90
0+33	5,510.90
0+34	5,510.80
0+34	5,510.80
0+35	5,510.70

Section Definitions

Station (ft)	Elevation (ft)
0+35	5,510.70
0+36	5,510.70
0+36	5,510.70
0+36	5,510.60
0+37	5,510.60
0+37	5,510.60
0+38	5,510.50
0+39	5,510.50
0+40	5,510.40
0+41	5,510.40
0+41	5,510.40
0+41	5,510.40
0+42	5,510.30
0+42	5,510.30
0+43	5,510.30
0+43	5,510.30
0+43	5,510.30
0+44	5,510.30
0+45	5,510.20
0+45	5,510.30
0+46	5,510.20
0+48	5,510.30
0+49	5,510.20
0+49	5,510.20
0+50	5,510.20
0+50	5,510.20
0+51	5,510.20
0+51	5,510.20
0+52	5,510.20
0+52	5,510.20
0+54	5,510.20
0+55	5,510.20
0+56	5,510.20
0+57	5,510.20
0+57	5,510.20
0+57	5,510.20
0+58	5,510.20
0+58	5,510.20
0+62	5,510.00
0+75	5,510.00
0+76	5,509.30
0+76	5,509.00
1+06	5,509.00
1+06	5,509.40
1+08	5,510.00
1+09	5,510.30
1+11	5,511.00
1+15	5,511.40
1+17	5,511.60
1+18	5,511.60

Section Definitions

Station (ft)	Elevation (ft)
1+19	5,511.70
1+20	5,511.80
1+20	5,511.80
1+21	5,511.90
1+22	5,511.90
1+22	5,511.90
1+22	5,511.90
1+23	5,511.90
1+23	5,511.90
1+23	5,512.00
1+24	5,512.00
1+24	5,512.00
1+24	5,512.00
1+25	5,512.00
1+25	5,512.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,512.10)	(1+25, 5,512.00)	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	0.89 ft
Roughness Coefficient	0.035
Elevation	5,509.89 ft
Elevation Range	5,509.0 to 5,512.1 ft
Flow Area	27.5 ft²
Wetted Perimeter	33.5 ft
Hydraulic Radius	0.82 ft
Top Width	32.50 ft
Normal Depth	0.89 ft
Critical Depth	0.93 ft
Critical Slope	0.019 ft/ft
Velocity	5.53 ft/s
Velocity Head	0.47 ft
Specific Energy	1.37 ft
Froude Number	1.059
Flow Type	Supercritical

Appendix C – Hydraulic Analysis

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	Infinity ft/s
Upstream Velocity	Infinity ft/s
Normal Depth	0.89 ft
Critical Depth	0.93 ft
Channel Slope	0.022 ft/ft
Critical Slope	0.019 ft/ft

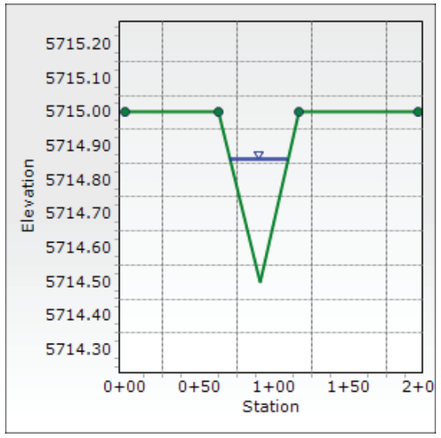
Normal Depth Calculations

Goldsmith Gulch West Tributary Overflow

Cross Section for GG West Overflow 100yr - 392

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Normal Depth	0.36 ft
Discharge	7.00 cfs



GG West Overflow 100yr - 392

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	7.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,714.98
0+62	5,715.00
0+90	5,714.50
1+16	5,715.00
1+96	5,715.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,714.98)	(0+62, 5,715.00)	0.150
(0+62, 5,715.00)	(1+16, 5,715.00)	0.040
(1+16, 5,715.00)	(1+96, 5,715.00)	0.150

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	0.36 ft
Roughness Coefficient	0.040
Elevation	5,714.86 ft
Elevation Range	5,714.5 to 5,715.0 ft
Flow Area	7.0 ft²
Wetted Perimeter	39.0 ft
Hydraulic Radius	0.18 ft
Top Width	39.00 ft
Normal Depth	0.36 ft
Critical Depth	0.25 ft
Critical Slope	0.046 ft/ft
Velocity	0.99 ft/s
Velocity Head	0.02 ft
Specific Energy	0.38 ft

Results	
Froude Number	0.413
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	0.36 ft
Critical Depth	0.25 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.046 ft/ft

GG West Overflow 500yr - 392

Project Description	
Friction Method	Manning Formula
Solve For	Normal Depth

Input Data	
Channel Slope	0.007 ft/ft
Discharge	82.00 cfs

Section Definitions

Station (ft)	Elevation (ft)
0+00	5,714.98
0+62	5,715.00
0+90	5,714.50
1+16	5,715.00
1+96	5,715.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00, 5,714.98)	(0+62, 5,715.00)	0.150
(0+62, 5,715.00)	(1+16, 5,715.00)	0.040
(1+16, 5,715.00)	(1+96, 5,715.00)	0.150

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
Roughness Coefficient	0.130
Elevation	5,715.54 ft
Elevation Range	5,714.5 to 5,715.0 ft
Flow Area	119.4 ft²
Wetted Perimeter	197.2 ft
Hydraulic Radius	0.61 ft
Top Width	196.09 ft
Normal Depth	1.04 ft
Critical Depth	0.60 ft
Critical Slope	0.437 ft/ft
Velocity	0.69 ft/s
Velocity Head	0.01 ft
Specific Energy	1.04 ft

Appendix C – Hydraulic Analysis

Results	
Froude Number	0.155
Flow Type	Subcritical

GVF Input Data	
Downstream Depth	0.00 ft
Length	0.0 ft
Number Of Steps	0

GVF Output Data	
Upstream Depth	0.00 ft
Profile Description	N/A
Profile Headloss	0.00 ft
Downstream Velocity	0.00 ft/s
Upstream Velocity	0.00 ft/s
Normal Depth	1.04 ft
Critical Depth	0.60 ft
Channel Slope	0.007 ft/ft
Critical Slope	0.437 ft/ft

Messages:

Water Surface Elevation exceeds lowest end station by 0.556773898056235ft.

GG_NormalDepthCalcs.fm8
3/7/2022
Bentley Systems, Inc. Haestad Methods Solution Center
27 Siemon Company Drive Suite 200 W
Watertown, CT 06795 USA +1-203-755-1666

Appendix C – Hydraulic Analysis

Hydraulic Analysis and Assumptions
At Select Locations

Hydraulic Analysis and Assumptions

Flood Insurance Studies exist within the Goldsmith Gulch watershed for the City and County of Denver (2018 FIS) and Arapahoe County, CO and Incorporated Areas (2017 FIS). The 2018 FIS for Goldsmith Gulch and Southmoor Park Tributary was based on the Goldsmith Gulch Letter of Map Revision Case Number 97-08-009P, effective January 8, 1997 (1997 LOMR). The 2017 FIS for upper Goldsmith Gulch upstream of Belleview Avenue is based upon the 2005 Urban Drainage and Flood Control District Flood Hazard Area Delineation (2005 FHAD). All LOMRs have been incorporated in the 2018 FIS except the LOMR Case No. 15-08-0521P, effective December 28, 2015 that revised a reach at Cook Park from approximate 440 feet upstream of E. Cherry Creek South Drive to just downstream of E. Mexico Avenue.

The 2018 FIS defined two distinct flow paths of Goldsmith Gulch from E. Iliff Avenue to the confluence with Cherry Creek. An excerpt from the 1997 LOMR described:

"This LOMR requested that FEMA revise the FIRM and FIS report to show the effects of the construction of Phase III of the Goldsmith Gulch Flood Control Project along Goldsmith Gulch. Phase III of this project included the construction of the Florida-South Monaco Street Parkway Storm Sewer System, channel and culvert construction and improvements, construction of an earthen berm at Bible Park, and construction of a detention pond at the comer of Iliff Avenue and South Monaco Street Parkway. The improvements affect the reach of Goldsmith Gulch from its confluence with Cherry Creek to just upstream of Belleview Avenue.

The construction of the Goldsmith Gulch Flood Control Project created two distinct flow paths for Goldsmith Gulch downstream of Iliff Avenue: overland and street flow along South Monaco Street Parkway and flow contained within the channels and culverts of the existing Goldsmith Gulch flow path. The overland and street flow down South Monaco Street Parkway has been renamed the South Monaco Street Parkway Overflow."

2018 FIS used three independent flood profiles to define the water surface elevation in these two distinct flow paths. These flood profiles are Goldsmith Gulch (downstream of E. Evans Avenue to the confluence with Cherry Creek), Goldsmith Gulch (upstream of Iliff Avenue) and South Monaco Street Parkway Overflow (from E. Iliff Avenue to E. Florida Avenue). The river centerlines of main stem are discontinued between E. Iliff Avenue and E. Evans Avenue and crossing the river centerline of the overland flow.

The floodplain hydraulics of the lower Goldsmith Gulch downstream of E. Iliff Avenue is complicated because of the existing piped major storm drainage systems can only intercept the 10-year peak discharge and leave the rest of the runoffs flow overland in different direction. This study updated the baseline hydrology for Goldsmith Gulch. The updated 100-year discharges compared to the 100-year flows of the 2018 FIS are similar but slightly higher. But, the 500-year hydrology is almost 70-percent higher than the FIS 500-year discharge downstream of Iliff Avenue. The updated 500-year discharge was increased to 4,156 cfs from 2,491 cfs of the 2018 FIS. The Floodplain hydraulics responds very differently to the updated hydrology and prompts the need of updating the hydraulic modeling approaches adopted by FEMA through the 1997 LOMR.

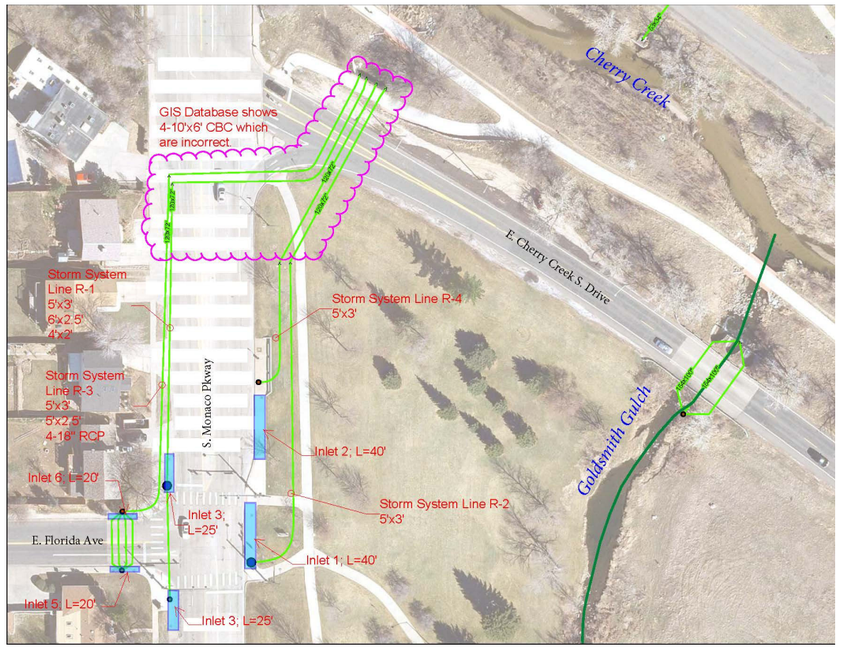
This study analyzed the flow distribution and overland flow pattern using the high-resolution base mapping and structure survey described in the Section 1.4. This study updated the flood profiles with two independent flood profiles, a continuous flood profile for Goldsmith Gulch main stem and a shortened South Monaco Street Parkway Overflow. The updated Monaco Street Parkway Overflow starts from a point at the Monaco Street Parkway Culvert at Skyline Acres Swim and Tennis Club to E. Florida Avenue. The overland flow reach from E. Iliff Avenue to Skyline Acres Club was combined into the Goldsmith Gulch main stem hydraulic model to create a continuous hydraulic model.

The following sections depict the findings and incorporation of the information from the 2018 FIS into this study. And, the hydraulics analysis, assumption and decision to support the development of the HEC-RAS hydraulic model for the reach downstream of Jewell Avenue through the Skyline Acres Swim and Tennis Club and the reach downstream of E. Evans Avenue to E. Jewell Avenue.

Florida-South Monaco Street Parkway Storm Sewer System

This system consists six curb opening inlets with a total inlet length of 170 feet long and 4-5'x3' CBC outfall (the GIS information is incorrect) to Cherry Creek approximate 115 feet upstream of the Monaco Parkway Bridge. The capacity of this system is approximate 250 cfs before spilling occurs at the high point in Florida Avenue per the LOMR. The *Design Computation for Goldsmith Gulch Phase III Schedule I Volume I*, 1994 by Sellards & Grigg, Inc. was reviewed as a part of this study. The calculation of the curb opening inlet and culvert hydraulics is deemed to be reasonable and was adopted as a part of the support calculation for this study. The relevant hydraulic information has been excerpted from the Volume I and included in the **Appendix C** - Hydraulic Analysis.

The capacity of the inlet group of Florida Avenue and Monaco Street Parkway Storm Sewer system was represented by a rating curve in the LOMR. The same rating curve was adopted by this study and was converted to the NAVD 88 vertical datum. However, the rating curve was not adequate because it did not provide a higher flow range for the updated 500-year hydrology. The rating curve was expanded to be able to accommodate the higher flow per the MDP hydrology. The calculation to update the rating curve is included in the **Appendix C**. The rating curve was used for the downstream reach boundary condition and applied to HEC-RAS cross-section 559 for the Goldsmith Gulch Monaco Street Parkway Overflow Channel.



Florida-South Monaco Street Parkway Storm Sewer System

Intersection of Monaco Parkway and Florida Avenue

Florida-South Monaco Parkway Storm System Outfall at Cherry Creek

Jewell Avenue Culverts, Monaco Street Parkway Diversion Culverts and Skyline Acre Club Monaco Parkway Culvert

This storm drainage system was a 100-year system per the LOMR. This system is comprised of three groups of culverts: Jewell Avenue Culverts, Monaco Street Parkway Diversion Culverts and Skyline Acre Club Monaco Parkway Culvert. The hydraulic characteristics of these culverts are summarized in the following table.

Location/Name	Cells - Dimension	Hydraulic Control (100-year)	Note/Description
Jewell Avenue Culvert	2 – 14.5’ x 4.6’	Inlet	• Survey shows 16’ x 4.6’ because of diagonal entrance. • Restrictor plates were installed inside the culverts that provide 14.5’ x 2’ of opening for each culvert.
Monaco Street Parkway Diversion Culvert	2 – 10’ x 6’	Outlet	• Side tapered inlet • Trash grate Inlet
Skyline Acre Club Monaco Parkway Culvert	1 – 9’ x 6’	Outlet	• Side tapered inlet (one-side)

Jewell Avenue Culvert and Monaco Street Parkway Culverts

Skyline Acre Club Rectangular Concrete Channel and Monaco Parkway Culvert

The restrictor plates in the Jewell Avenue Culvert limits the 100-year flow to approximately 510 cfs at the entrance into the open channel at Skyline Acre Club. The open channel enters the Skyline Acre Club Monaco Parkway culvert to daylight at the open channel starting east of the Monaco Street Parkway at the northeast intersection of Monaco Street Parkway and E. Colorado Drive. The Monaco Street Parkway Diversion Culverts intercept and convey the residual 100-year flow to daylight at the same location as the Skyline Acre Club Monaco Parkway Culvert. The combined 100-year capacity of the culvert group is approximately 2, 070 cfs per the LOMR. The *Design Computation for Goldsmith Gulch Phase III Schedule I Volume I*, 1994 by Sellards & Grigg, Inc. was reviewed as a part of this study. The calculation of culvert hydraulics is deemed to be reasonable and was adopted as a part of the support calculation for this study. The relevant hydraulic information has been excerpted from the Volume I and included in the **Appendix C** - Hydraulic Analysis.

The capacity of the culvert group for the Jewell Avenue Culvert and Monaco Street Parkway Culvert was represented by a rating curve in the LOMR. The same rating curve was adopted by this study and converted the NAVD 88 vertical datum. However, the rating curve was not adequate because it did not provide detailed information above the elevation 5420 (spill elevation) and stops at elevation 5421. The rating curve was updated to include more detailed overtopping information and expanded to be able to accommodate the higher flows per the MDP hydrology. The calculation to update the rating curve is included in the **Appendix C**. The rating curve was applied at HEC-RAS cross-section 3510 to establish the downstream control for Goldsmith Gulch upstream of Jewell Avenue.

Development of HEC-RAS hydraulic model for the reach downstream of Jewell Avenue to the Skyline Acre Club Monaco Parkway Culvert

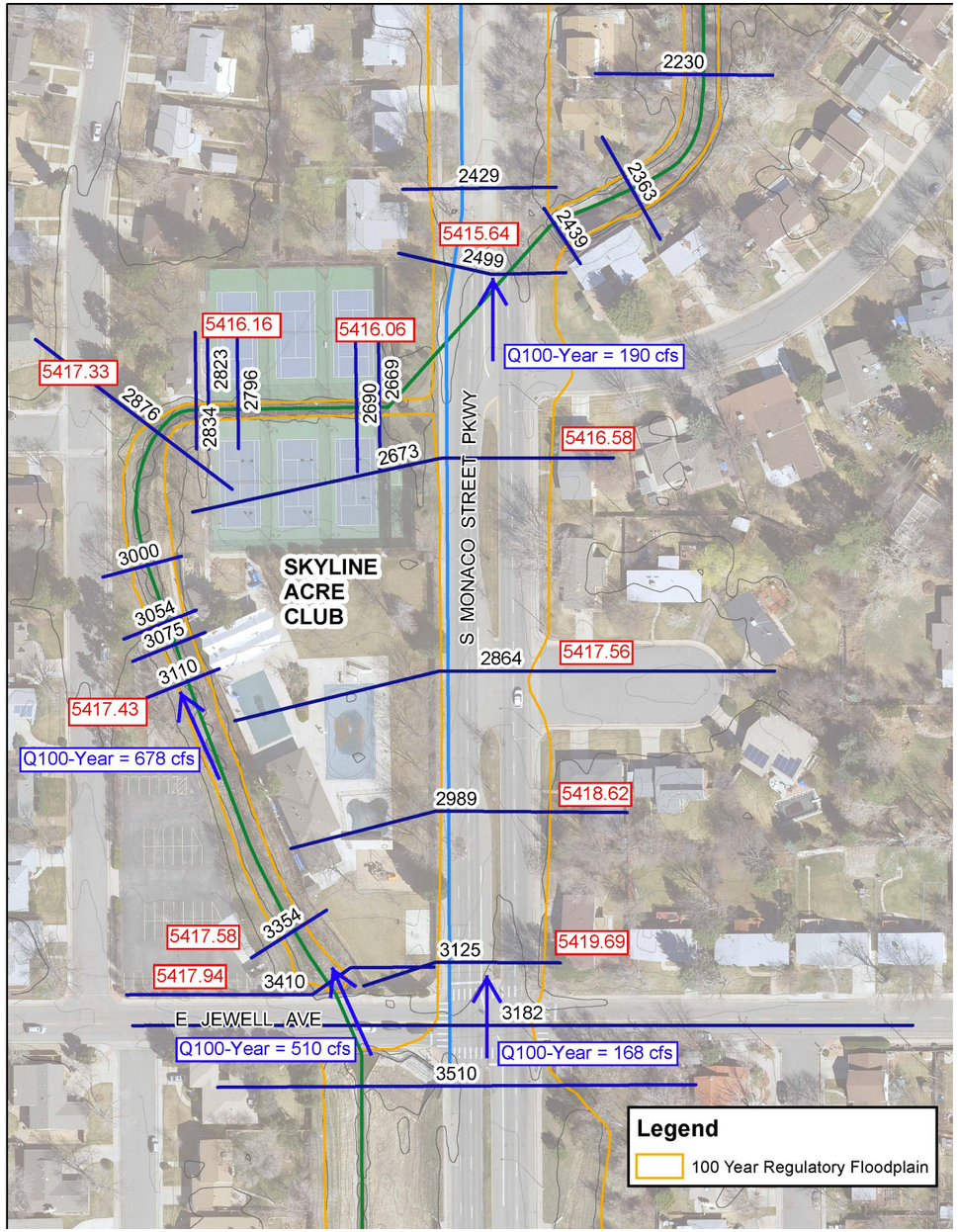
The flow diversion at Jewell Avenue creates two distinct flows paths, open channel flow through Skyline Acre Club and overland flow along Monaco Street Parkway. However, both flood sources comingle shortly downstream of Jewell Avenue because the Monaco Street Parkway roadway profile shows the northbound lanes higher than the southbound lanes and is generally higher than the ground at the Skyline Acre Club. The overland street flow tends to overtop the curb of the Monaco Street Parkway and flows toward Goldsmith Gulch through the Skyline Acre Club except the half street flow in the northbound lanes is trapped by the crown of street. The half street capacity is approximate 63 cfs per UD-Inlet v4.0.5 (Appendix C). The hydraulic analysis approach used in the LOMR included two separated hydraulic models for the open channel and Monaco Parkway Overland flow. This study found that the same hydraulic analysis approach could not describe the floodplain hydraulics appropriately because the floodplain responds to the new hydrology differently.

Intersection of Monaco St Parkway and Jewell Avenue (Looking downstream/north)

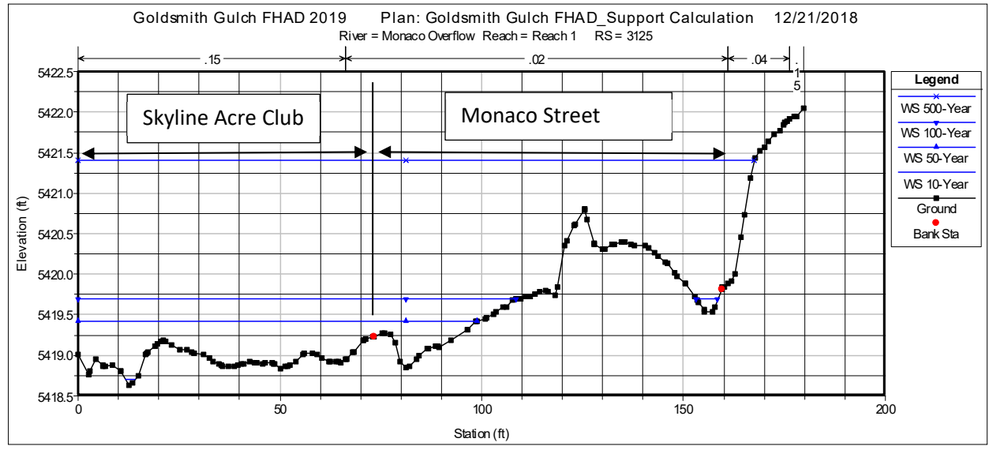
Two separated hydraulic models were initially set up to replicate the hydraulic analysis approach used by the LOMR. However, the extents of the cross-section could not contain the new flows, especially, the 500-year discharge which is approximately 70-percent higher than the 500-year flow of the LOMR. The two flood sources merge downstream shortly after the split location. The floodplain hydraulics seems more appropriate to be analyzed using one hydraulic model with continuous cross-sections across both the 100- and 500-year floodplains. The following hydraulic analyses provide support for using one hydraulic model instead of two separated hydraulic models.

An interim hydraulic model was set up which contains two rivers, Goldsmith Gulch and Monaco Street Parkway Overflow. The plan and geometry's names are "*Goldsmith Gulch FHAD_Support Calculation*" and the flow chart's name is "*Goldsmith Gulch Existing_Support*". This interim hydraulic model calculates the 100-year flood elevations along both rivers independently. The main channel contained full discharge is 678 cfs, including the overland flow of 168 cfs from the Monaco Street Parkway Overflow. The Monaco Street Parkway Overflow only contains the 168 cfs split flow at Jewell Avenue and assumed no flow leaving the gulch. The 100-year water surface elevations of both rivers were compared at similar locations and presented in the following figure. The result supports the hydraulic modeling approach of using one model with common cross-sections for both the 100- and 50-year floodplains, because the water surface elevations are similar at the comparison location. It indicates the flow distribution in the main channel and floodplain can be analyzed with carefully dog-legged common hydraulic cross-sections. The average 100-year floodplain depths along Monaco Parkway Overflow are generally less than 12-inches and does not warrant an individual hydraulic model due to the insignificant risk. Two HEC-RAS crossing-sections show the 100-year floodplain extents and depths.

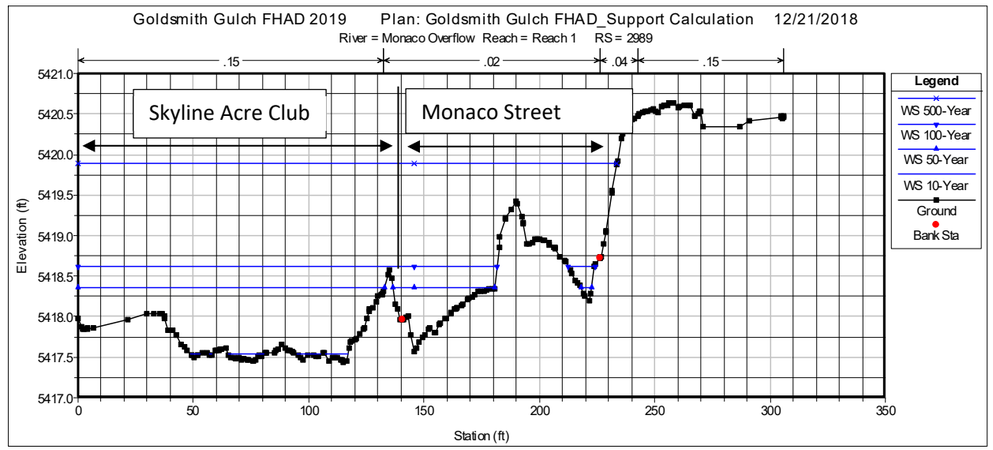
The extent of the Monaco Street Parkway Overflow was revised by this FHAD. This overflow reach starts downstream of the Skyline Acre Club Monaco Parkway culvert along the Monaco Street Parkway to end at Florida Avenue.



Flow Schematic of the Interim Hydraulic Model



Typical Cross-section of Monaco Street Parkway Overflow
(Average 100-year floodplain Depth <12")

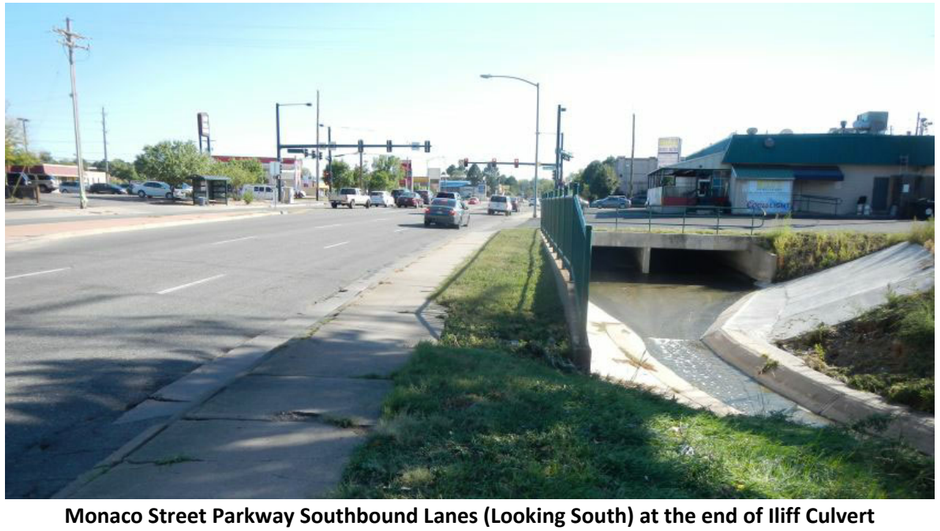


Typical Cross-section of Monaco Street Parkway Overflow
(Average 100-year floodplain Depth <12")

Development of HEC-RAS hydraulic model for the reach downstream of Evans Avenue to Jewell Avenue

The Iliff Avenue Culvert only has 10-year capacity. Overflows split from E. Iliff Avenue and flow overland through Echelon-Monaco South Apartments parking lot, commercial plaza and onto Monaco Street Parkway. At Evans Avenue, the Monaco Street Parkway cross section slopes down to west with the southbound lanes lower than the northbound lanes. The HEC-RAS cross-sections 4591 through 4811 show the transverse slope of Monaco Street Parkway. Therefore, the majority of the surface flows will return to Goldsmith Gulch open channel at a point at the end of the Iliff Culverts, except the surface flows trapped in the northbound lanes by the median will continue to flow in the Monaco Street Parkway.

Monaco Street Parkway Southbound Lanes (Looking North) at the end of Iliff Culvert



Monaco Street Parkway Southbound Lanes (Looking South) at the end of Iliff Culvert

Laid grass and riprap indicate frequent flow overtopping at this return point

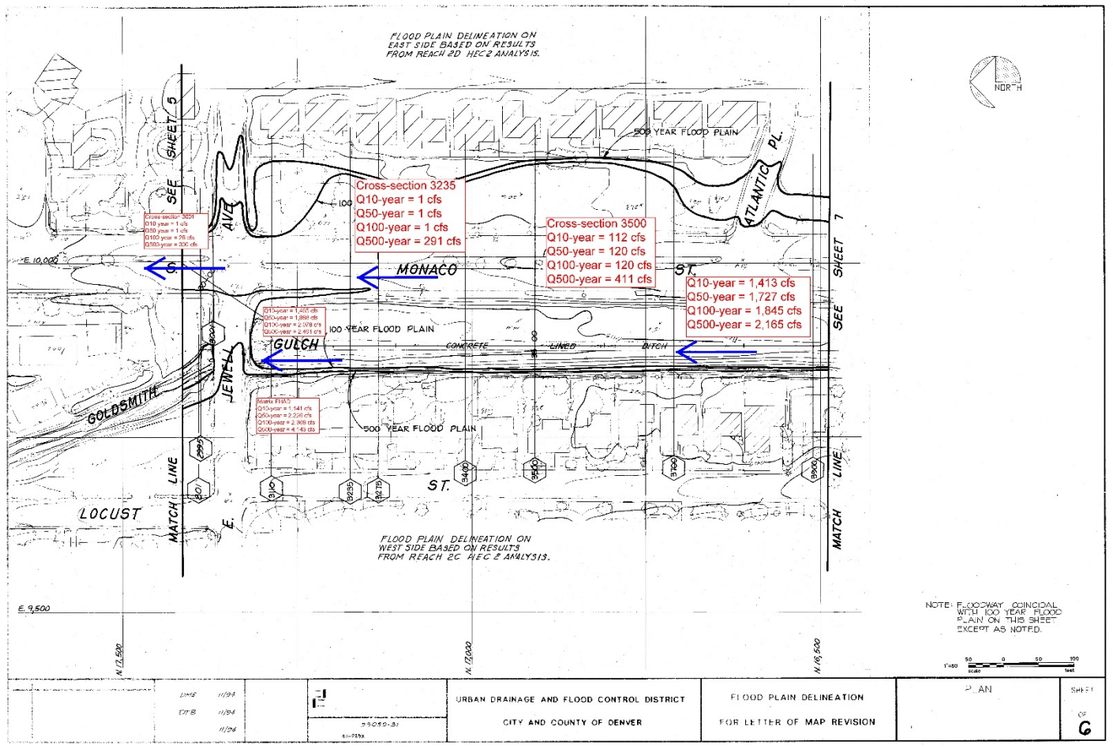
There are four 15-foot long curb opening inlets at each side of the street to drain surface flow into Goldsmith Gulch at east along Monaco Street Parkway. The surface flow collected by the depressed area will go through a culvert group of three 4'x2' CBC's under Monaco Street Parkway to return to Goldsmith Gulch. The drainage system largely reduces the floodplain depth on Monaco Street Parkway, so the 100-year flood risk is insignificant along Monaco Street Parkway.

15-feet long curb opening inlet at each side of Monaco Street Parkway
(Left – southbound lane; Right – northbound lane)

Depressed grass drainage easement

3 - 4’x2’ CBC

The LOMR also confirmed that the overland flood flows in Monaco Street Parkway recede quickly into Goldsmith Gulch and the depressed grass drainage easement. The flood flow distribution from the LOMR was included in the following figure.



LOMR flows and flow distribution

A review of the FIS BFE’s and a comparison to the existing topography at comparable location were performed to understand floodplain hydraulics. The FIS was projected onto the HEC-RAS cross-section at comparable locations that are shown in the following figure. The FIS BFE is deemed physically impossible. The flood flow tends to return Goldsmith Gulch instead of building up a high headwater.

HEC-RAS cross-section at river station 40+71 overlaid with FIS BFE

This study proposes to use a common HEC-RAS cross-section for the hydraulic analysis within the reach from E. Jewell Avenue to E. Evans Avenue. The model approach is deemed sufficient because the HEC-RAS modeling results show the flood depth in Monaco Street Parkway will be less than 12-inches. The normal depth calculation was used to identify the shallow floodplain depth in the northbound lanes of Monaco Street Parkway and supports the shallow floodplain boundary delineation. The flood elevation in the depressed grass drainage easement is controlled by the backwater from Goldsmith Gulch upstream of E. Jewell Avenue.

Iliff Avenue Culverts

From E. Iliff Avenue to E. Evans Avenue, Goldsmith Gulch is piped in the 1,687 feet long concrete box culverts ranging from 14-feet by 4.6-feet (at the upstream end) to 30-feet by 4-feet (at the downstream end). Currently, these culverts are undersized, resulting in frequent flooding of the vacant lot adjacent to the former Kmart site (2150 S. Monaco Street Parkway), as well as flooding of S. Monaco Parkway and E. Iliff Avenue. This culvert system was defined as a 10-year system per the LOMR.

The *Design Computation for Goldsmith Gulch Phase III Schedule III*, 1994 by Sellards & Grigg, Inc. was reviewed as a part of this study. The calculation of culvert hydraulics is deemed to be reasonable and was adopted as a part of the support calculations for this study. The relevant hydraulic information has been excerpted from the Design Computations and included in the **Appendix C** - Hydraulic Analysis.

The capacity of the culvert group of Jewell Avenue Culvert and Monaco Street Parkway Culvert was represented by a rating curve in the LOMR. The same rating curve was adopted by this study and converted to the NAVD 88 vertical datum. However, the rating curve was not adequate because it did not provide a higher flow range for the updated 500-year hydrology. The rating curve was expanded to be able to accommodate the higher flows per the MDP hydrology. The calculation to update the rating curve is included in the **Appendix C**. The rating curve was applied at the HEC-RAS cross-section 6381 to establish the downstream control condition for Goldsmith Gulch upstream of Iliff Avenue.

Entrance of Iliff Avenue Culvert

Downstream End of Iliff Avenue Culvert

Hampden Avenue Culverts and Tiffany Plaza Special Inlet Structure

Drainage Pattern/Issue

Hampden Avenue crossing culvert has 100-year capacity per LOMR Case No. 97-08-009P which is comprised of two 9' x 8' CBC's and one 12' x 8' CBC. The upstream end of this culvert connects directly to a special inlet structure at Tiffany Plaza. The special inlet structure includes a 32 feet wide and 8.5 feet long horizontal grated drop inlet and two 60-foot long curb opening inlets. This special inlet structure collects overland land flows from Goldsmith Gulch and Southmoor Tributary along with storm runoff from the local neighborhood drainage sub-basins.

Hampden Avenue Culverts (Downstream End)

Special Inlet at Tiffany Plaza

Grated Drop Inlet Structure

Goldsmith Gulch is piped through a 20' x 8' CBC under the Tiffany Plaza and connects directly to this special Inlet structure. The Goldsmith Gulch Tiffany Plaza Culvert has approximately 50-year capacity. Flood flows exceeding the capacity of the culvert will flow overland through the parking lot at Tiffany Plaza to the special inlet structure. The 100-year Goldsmith Gulch overflow is 316 cfs. Detention at Southmoor Park on the Southmoor Tributary will be overtopped during a 100-year event storm. The 100-year overflow is 138 cfs from the Southmoor Park Detention. The overflow will flow to the special inlet structure in the eastbound lanes (south side) of Hampden Avenue because the half street capacity is approximate 168 cfs. The 100-year runoff is 116 cfs from the directly connected neighborhood drainage sub-basins. The special inlet structure will need to collect a total of 570 cfs of overland flow to prevent overtopping Hampden Avenue during 100-year event.

Entrance of Tiffany Plaza Culvert (20' x'8')

Hydraulic Analysis

Drainage is complicate at the special inlet structure. The following questions have been addressed before a hydraulic analysis can be performed to determine the capacity of the inlet structure and depth of ponding water.

1. How much is the 100-year overland flow from Goldsmith Gulch?
2. How much is the 100-year overland flow from Southmoor Tributary? Can all the 100-year overland flow reach the special inlet structure?
3. How much is the 100-year runoff from the directly connected neighborhood sub-basins?
4. What is the capacity of Hampden Avenue Culverts? What is the hydraulic control?
5. What is the capacity of the special inlet structure? What is the hydraulic control for a certain event?

The concurrent Goldsmith Gulch Baseline Hydrology Report as a part of the Goldsmith Gulch Major Drainageway Plan prepared by Matrix Design Group, Inc. was used as the base for this drainage study. The Federal Highway Administration Culvert Analysis Program HY-8, version 7.5 was used for culvert capacity and overflow calculation. The UDFCD Xcel workbook UD-Detention, version 2.34 was used for the drop inlet structure hydraulics calculation. The UDFCD Xcel workbook UD-Inlet, version 4.05 was used for street and curb opening inlet hydraulics calculation.

1. Goldsmith Gulch is piped through the Tiffany Plaza within a 20' x 8' CBC. The culvert under the parking lot is 650 feet long and outfalls directly into the special inlet structure. The parameters of the culvert were input into HY-8 for the hydraulics analysis. A rating curve derived from the Hampden Avenue Culvert hydraulics analysis was used for the downstream hydraulic control. The hydraulics of the Tiffany Plaza Culvert is completed for outlet control. A rating curve was calculated to be used at the entrance of the culvert to determine the culvert flow and overflow. The 100-year overflow is 316 cfs to flow overland in the parking lot at Tiffany Plaza. The HY-8 hydraulic analysis is included in the Appendix.
2. The 100-year overflow is 138 cfs from Southmoor Park Detention. The overflow flows overland toward the intersection of E Hampden Avenue and S Poplar Street. E Hampden Avenue slopes downward to the special inlet structure at a 2% longitudinal slope. The street conveyance capacity is 168 cfs based on spread criteria calculated by UD-Inlet workbook. The full 100-year overflow is confined within the south half street of Hampden Avenue. A potential minor spill of the 100-year flow over the crown of E Hampden Avenue is possible at the intersection of Hampden Avenue and Poplar Street. However, the spill should be negligible and can be conveyed within the downstream drainage system. The UD-Inlet hydraulic analysis is included in the Appendix.

Intersection of E Hampden Avenue (SH 30) and Poplar Street (Looking South)

3. Two neighborhood sub-basins with total drainage area of 81 acres drain directly to the special inlet structure. The 100-year runoff is 116 cfs per the Goldsmith Gulch Baseline Hydrology.
4. The Hampden Avenue Culverts consist of two 9' x 8' CBC's and one 12' x 8' CBC. The parameters of the culvert were input into HY-8 for the hydraulics analysis. The downstream control is based on the tailwater calculation from an irregular channel cross-section. The hydraulics of the Hampden Avenue Culvert was completed assuming inlet control. A rating curve was calculated to be used at the entrance of the culvert to determine the culvert flow and overflow. The culvert group has 100-year capacity of 2,418 cfs with the headwater elevation at 5498.5 feet which is approximate one-tenth of a foot below the top of the south sidewalk. The HY-8 hydraulic analysis is included in the Appendix.
5. The special inlet structure at Tiffany Plaza consists of a 32 feet wide and 8.5 feet long horizontal grated drop inlet and two curb opening inlets at both sides of the grated drop box inlet. Each curb opening inlet is 60 feet long. The throat height of the curb opening inlet is 9-inch tall. The parameters of the special inlet structure were input into UD-Detention and UD-Inlet workbook for the hydraulics analysis. The special inlet structure can intercept the 100-year overflow of 570 cfs with maximum ponding elevation at 5498.7 which is below the lowest crown elevation 5499.34 feet on Hampden Avenue. The UD-Detention and UD-Inlet hydraulic analysis are included in the Appendix.

Previous Study

The effective FIRM is based on the LOMR Case No. 97-08-009P. The results of this drainage study were compared to the effective FIRM. Annotated FIRMette 0800460219H, effective November 20, 2013, shows the comparison of hydrology and floodplain elevation.

The 100-year hydrology from both studies is comparable at several locations. The FHAD 100-year flows at the entrance of the Tiffany Plaza is 2,165 cfs which is 157 cfs lower than the effective 100-year flow. However, the FHAD 100-year overland flow at Hampden Avenue is 570 cfs compared to the effective 100-year overflow of 562 cfs. The 100-year floodplain elevation at Hampden Avenue is 5498.7 feet per this drainage study which is comparable with the effective BFE of 5499 feet.

Flood Hazards

The Hampden Avenue Culverts and the special inlet structure can intercept the 100-year discharge of 2,418 cfs without overtopping the Hampden Avenue. The 100-year floodplain elevation is dominated by the special inlet structure. If only the 100-year discharge (1,848 cfs) through the Tiffany Plaza Culvert is considered, the headwater elevation at the entrance of the Hampden Avenue Culvert is 5496.6 feet which is approximate 5-inch below the top of the grated inlet. The special inlet structure can function with no obstruction from the backwater at the entrance of the Hampden Avenue Culverts. The headwater elevation is 5498.5 feet for the full 100-year discharge of 2,418 cfs at the entrance of the Hampden Avenue Culvert. The inlet headwater elevation is slightly higher than the culvert headwater elevation, so the inlet headwater dominates the 100-year floodplain elevation estimated at 5498.7 feet. The 100-year floodplain will spread onto Hampden Avenue and encumbers approximate two lanes of traffic and leave three lanes including one turning lane open. The spread of 100-year floodplain at Tiffany Plaza is narrower than the effective 100-year floodplain. The work map summarizes the drainage pattern, flow distribution and approximate 100-year floodplain.

Florida-South Monaco Street Parkway Storm Sewer System

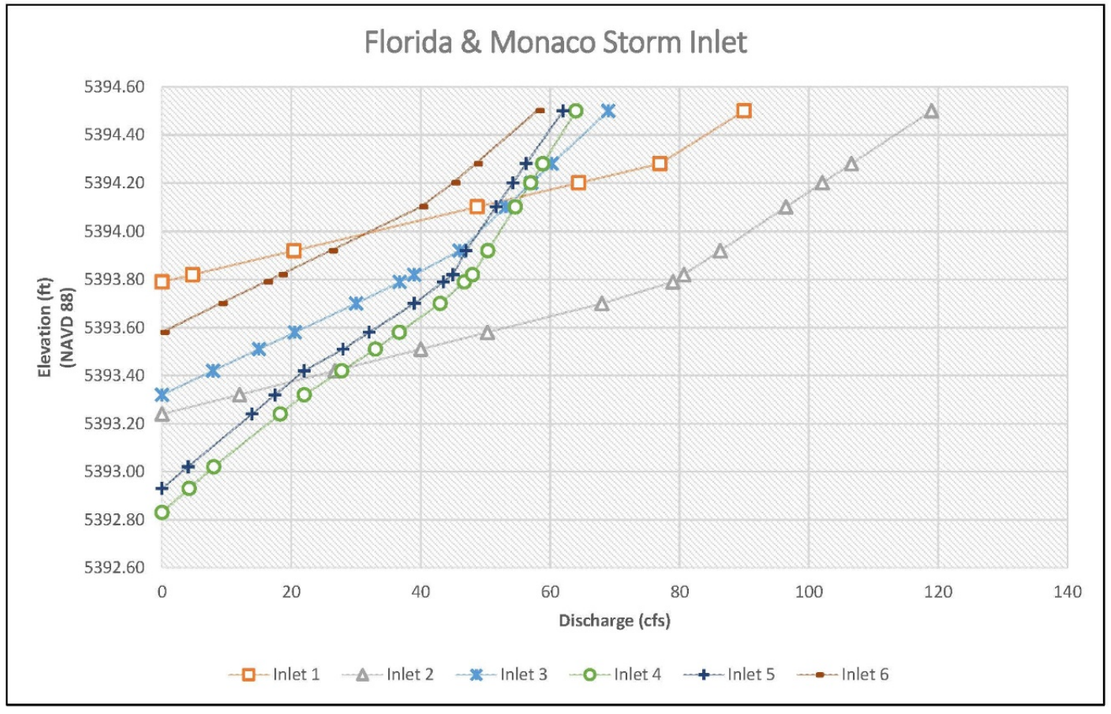
Florida Avenue & Monaco Pkwy Storm System _ Inlet Rating Curves

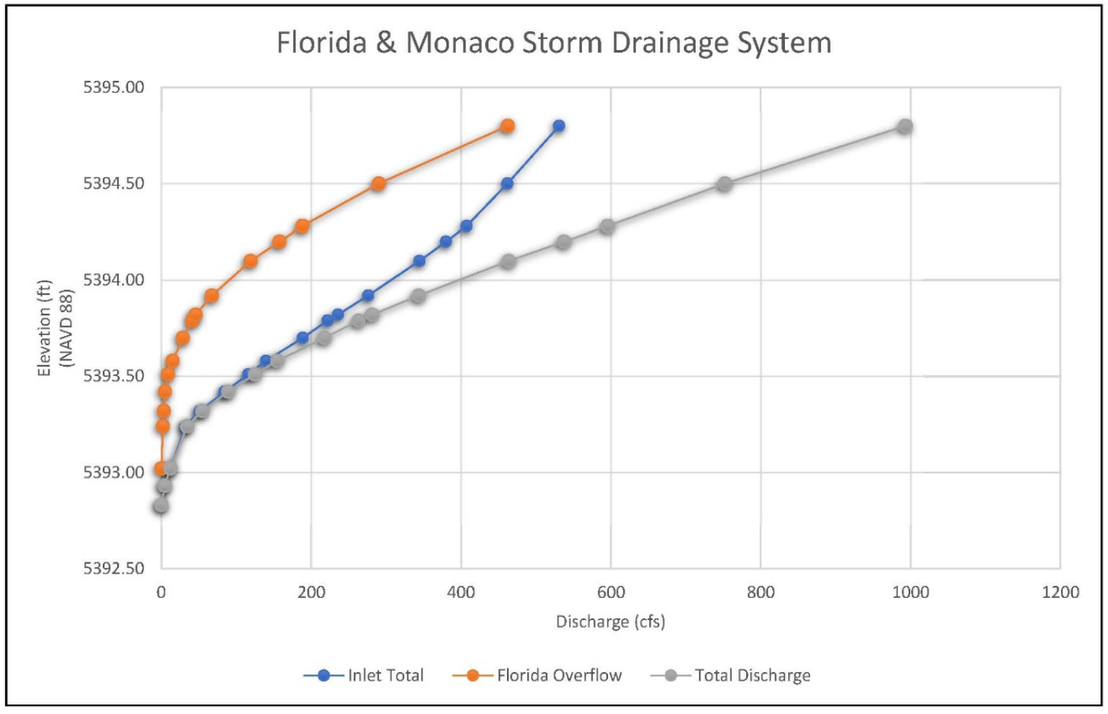
Final Rating Curves

Elevation NAVD 88	Inlet 1	Inlet 2	Inlet 3	Inlet 4	Inlet 5	Inlet 6	Inlet Total	Florida Overflow	Total Discharge	Note
(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	
5392.83	0	0	0	0	0	0	0	0	0	
5392.93	0	0	0	4	0	0	4	0	4	
5393.02	0	0	0	8	4	0	12	0	12	
5393.24	0	0	0	18	14	0	32	2	34	
5393.32	0	12	0	22	18	0	52	3	55	
5393.42	0	27	8	28	22	0	84	5	89	
5393.51	0	40	15	33	28	0	116	9	125	
5393.58	0	50	21	37	32	0	140	15	155	
5393.70	0	68	30	43	39	9	189	29	218	
5393.79	0	79	37	47	44	16	222	41	263	
5393.82	5	81	39	48	45	18	236	46	281	
5393.92	20	86	46	50	47	26	276	67	344	
5394.10	49	96	53	55	52	40	345	119	464	
5394.20	64	102	57	57	54	45	380	158	538	
5394.28	77	107	60	59	56	48	408	188	596	
5394.50	90	119	69	64	62	58	462	290	752	
5394.80	108	135	80	72	68	68	531	463	994	

Search for Flow Distribution

Total Discharge	Elevation NAVD 88	Inlet Total	Florida Overflow	Note
(cfs)	(ft)	(cfs)	(cfs)	
-	-	-	-	
-	-	-	-	
8	5392.974	8	0	10-Year
-	-	-	-	
-	-	-	-	
-	-	-	-	
120	5393.498	112	8	50-Year
-		-	-	
216	5393.697	188	28	100-Year
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
-	-	-	-	
941	5394.735	516	425	500-Year





Florida Avenue & Monaco Pkwy Storm System _ Inlet Rating Curves

Inlet 1

Elevation (ft)		Discharge	Note
NGVD 29	NAVD 88	(cfs)	
5389.83	5392.83	0	
5389.93	5392.93	0	
5390.02	5393.02	0	
5390.24	5393.24	0	
5390.32	5393.32	0	
5390.42	5393.42	0	
5390.51	5393.51	0	
5390.58	5393.58	0	
5390.70	5393.70	0	
5390.79	5393.79	0	Invert
5390.82	5393.82	5	Interpolated
5390.92	5393.92	20	Interpolated
5391.10	5394.10	49	Interpolated
5391.20	5394.20	64	Interpolated
5391.28	5394.28	77	
5391.50	5394.50	90	
5391.80	5394.80	108	

Inlet 2

Elevation (ft)		Discharge	Note
NGVD 29	NAVD 88	(cfs)	
5389.83	5392.83	0	
5389.93	5392.93	0	
5390.02	5393.02	0	
5390.24	5393.24	0	Invert
5390.32	5393.32	12	
5390.42	5393.42	27	Interpolated
5390.51	5393.51	40	Interpolated
5390.58	5393.58	50	Interpolated
5390.70	5393.70	68	
5390.79	5393.79	79	
5390.82	5393.82	81	Interpolated
5390.92	5393.92	86	Interpolated
5391.10	5394.10	96	Interpolated
5391.20	5394.20	102	Interpolated
5391.28	5394.28	107	Interpolated
5391.50	5394.50	119	
5391.80	5394.80	135	

Inlet 3

Elevation (ft)		Discharge	Note
NGVD 29	NAVD 88	(cfs)	
5389.83	5392.83	0	
5389.93	5392.93	0	
5390.02	5393.02	0	
5390.24	5393.24	0	
5390.32	5393.32	0	Invert
5390.42	5393.42	8	Interpolated
5390.51	5393.51	15	
5390.58	5393.58	21	Interpolated
5390.70	5393.70	30	
5390.79	5393.79	37	Interpolated
5390.82	5393.82	39	
5390.92	5393.92	46	
5391.10	5394.10	53	Interpolated
5391.20	5394.20	57	Interpolated
5391.28	5394.28	60	Interpolated
5391.50	5394.50	69	
5391.80	5394.80	80	Extrapolate

Florida Avenue Overflow

Elevation	Discharge	Note
(ft)	(cfs)	
5393.09	0	
5393.44	5	
5393.53	10	
5393.63	20	
5393.71	30	
5393.78	40	
5393.85	50	
5394.05	100	
5394.31	200	
5394.52	300	
5394.70	400	
5394.86	500	
5395.00	600	

Source: HY-8 Culvert Analysis Program was used to calculate roadway embankment discharge rating curve.

Inlet 4

Elevation (ft)		Discharge	Note
NGVD 29	NAVD 88	(cfs)	
5389.83	5392.83	0	Invert
5389.93	5392.93	4	Interpolated
5390.02	5393.02	8	
5390.24	5393.24	18	Interpolated
5390.32	5393.32	22	
5390.42	5393.42	28	Interpolated
5390.51	5393.51	33	
5390.58	5393.58	37	Interpolated
5390.70	5393.70	43	
5390.79	5393.79	47	Interpolated
5390.82	5393.82	48	
5390.92	5393.92	50	Interpolated
5391.10	5394.10	55	Interpolated
5391.20	5394.20	57	
5391.28	5394.28	59	Interpolated
5391.50	5394.50	64	
5391.80	5394.80	72	Extrapolate

Inlet 5

Elevation (ft)		Discharge	Note
NGVD 29	NAVD 88	(cfs)	
5389.83	5392.83	0	
5389.93	5392.93	0	Invert
5390.02	5393.02	4	Interpolated
5390.24	5393.24	14	Interpolated
5390.32	5393.32	18	Interpolated
5390.42	5393.42	22	
5390.51	5393.51	28	
5390.58	5393.58	32	Interpolated
5390.70	5393.70	39	
5390.79	5393.79	44	Interpolated
5390.82	5393.82	45	
5390.92	5393.92	47	
5391.10	5394.10	52	Interpolated
5391.20	5394.20	54	Interpolated
5391.28	5394.28	56	Interpolated
5391.50	5394.50	62	
5391.80	5394.80	68	Extrapolate

Inlet 6

Elevation (ft)		Discharge	Note
NGVD 29	NAVD 88	(cfs)	
5389.83	5392.83	0	
5389.93	5392.93	0	
5390.02	5393.02	0	
5390.24	5393.24	0	
5390.32	5393.32	0	
5390.42	5393.42	0	
5390.51	5393.51	0	
5390.58	5393.58	0	Invert
5390.70	5393.70	9	
5390.79	5393.79	16	Interpolated
5390.82	5393.82	18	Interpolated
5390.92	5393.92	26	Interpolated
5391.10	5394.10	40	
5391.20	5394.20	45	
5391.28	5394.28	48	Interpolated
5391.50	5394.50	58	
5391.80	5394.80	68	

NAVD 88 = NGVD 29 + 3 feet

Source: Design Computation for Goldsmith Gulch - Phase III _ Schedule I _ Volume I, Sellards & Grigg, Inc., 1994

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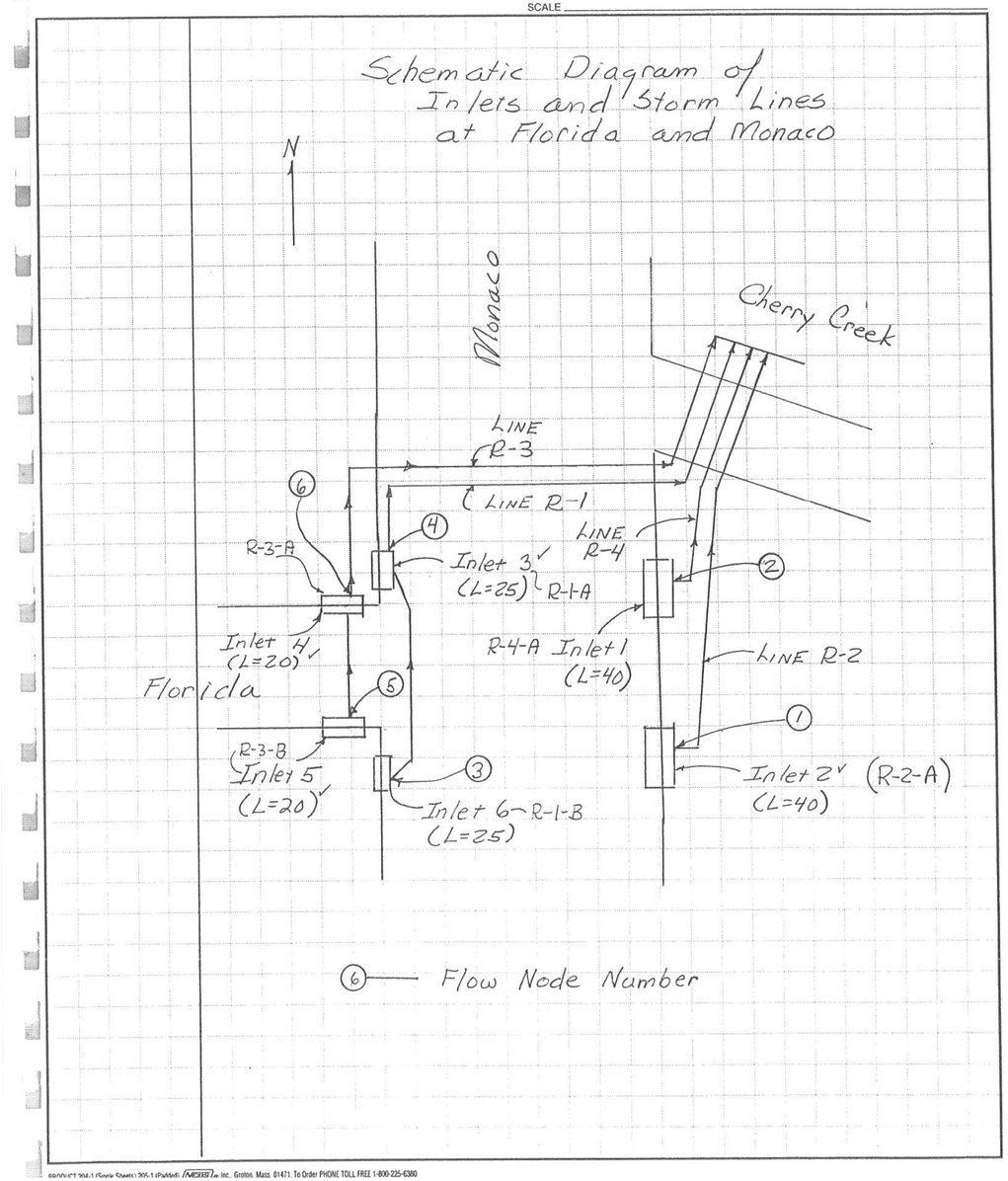

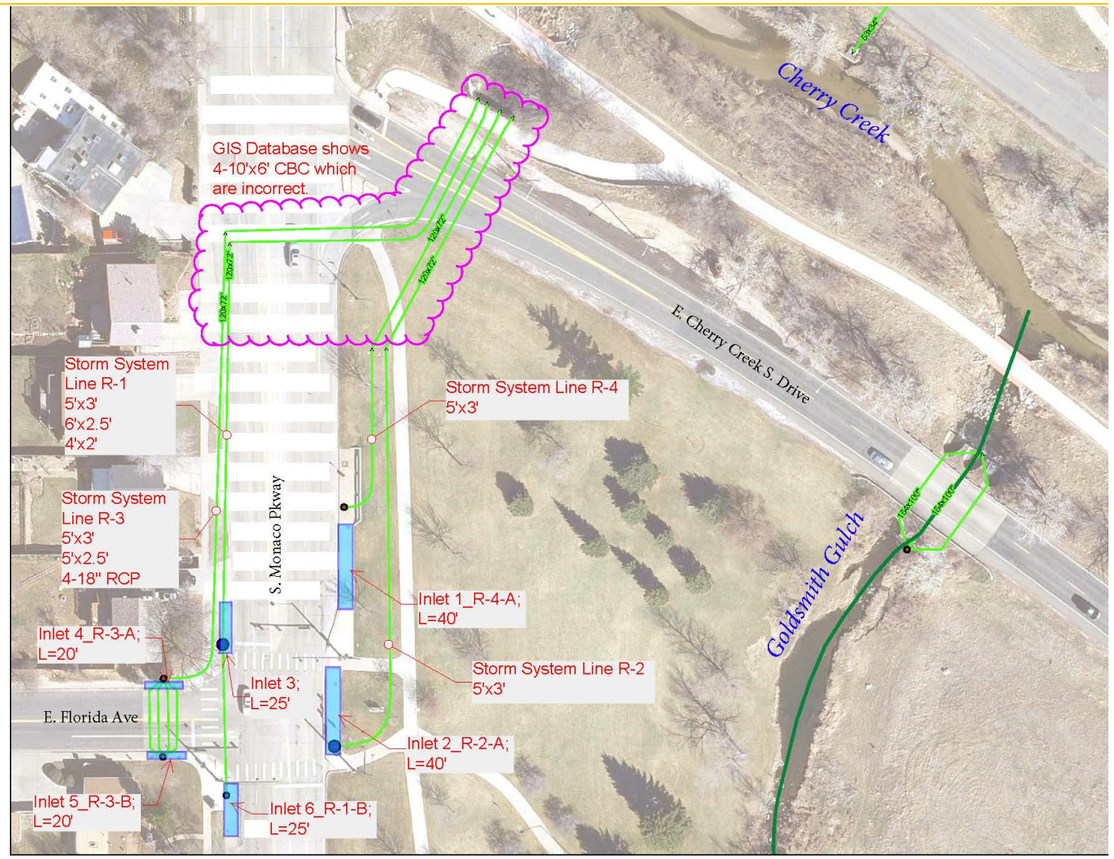

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Summary of Inlet Elevations and Lengths

Design Designation	Inlet No.	Avg. I.E. Elev.	Length (ft.)	Avg. Throat El.
R-4-A	1	391.03	40	390.79
	NAVD	5394.03		5393.79
R-2-A	2	390.49	40	390.24
	NAVD	5393.49		5393.24
R-1-A	3	390.57	25	390.32
	NAVD	5393.57		5393.32
R-3-A	4	390.08	20	389.83
	NAVD	5393.08		5392.83
B-3-B	5	390.15	20	389.91
	NAVD	5393.15		5392.91
R-1-B	6	390.84	25	390.59
	NAVD	5393.84		5393.59

Note:
The Goldsmith Gulch _ Flood Control Project – Phase III was at the NGVD 1929 Vertical Datum. The NGVD 1929 Vertical Datum adds 3 feet to convert to the NAVD 1988 Vertical Datum. The inlet elevations were compared to the 2014 LiDAR generated 1-foot contours. The discrepancy of elevations is within 0.5'.

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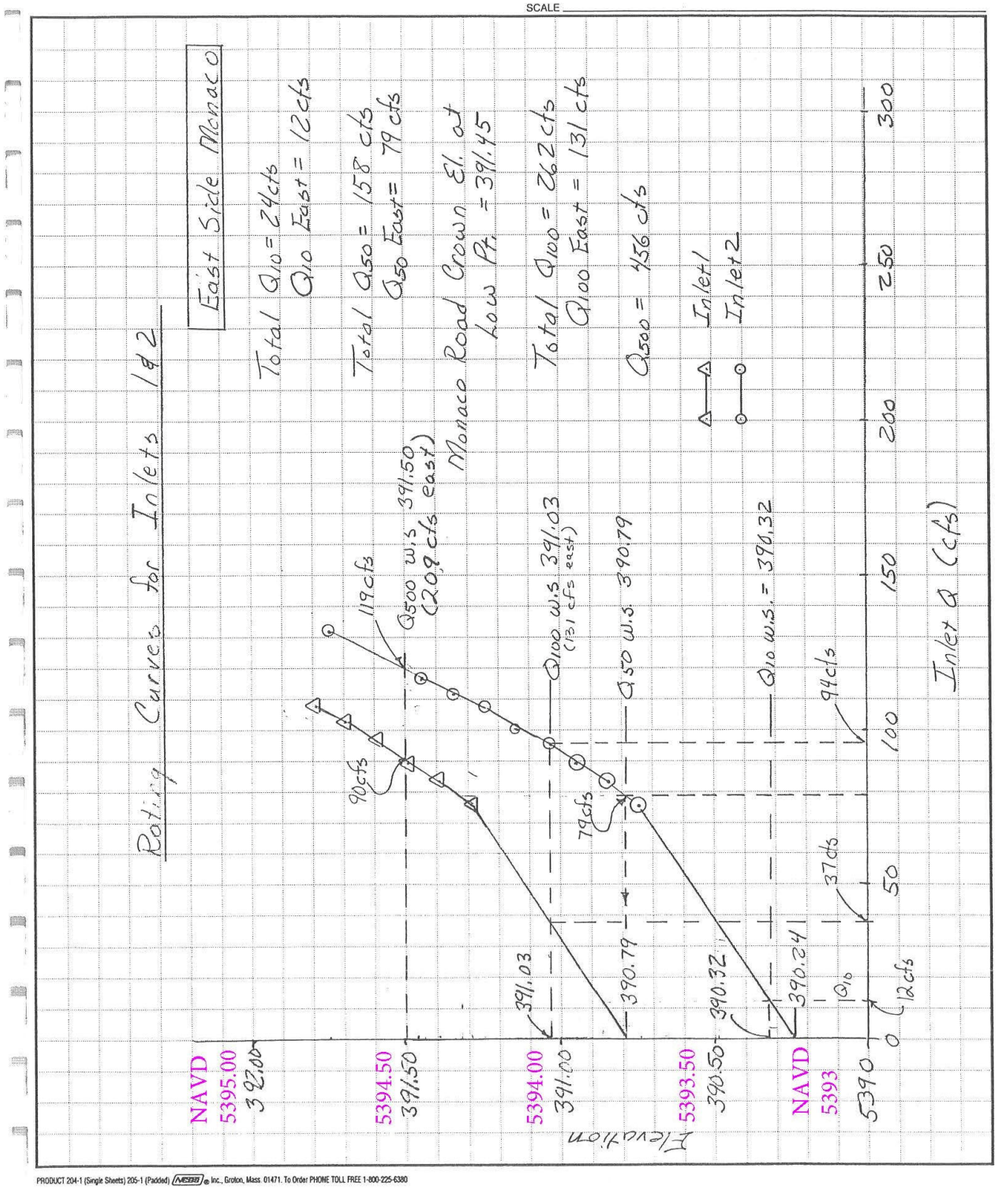

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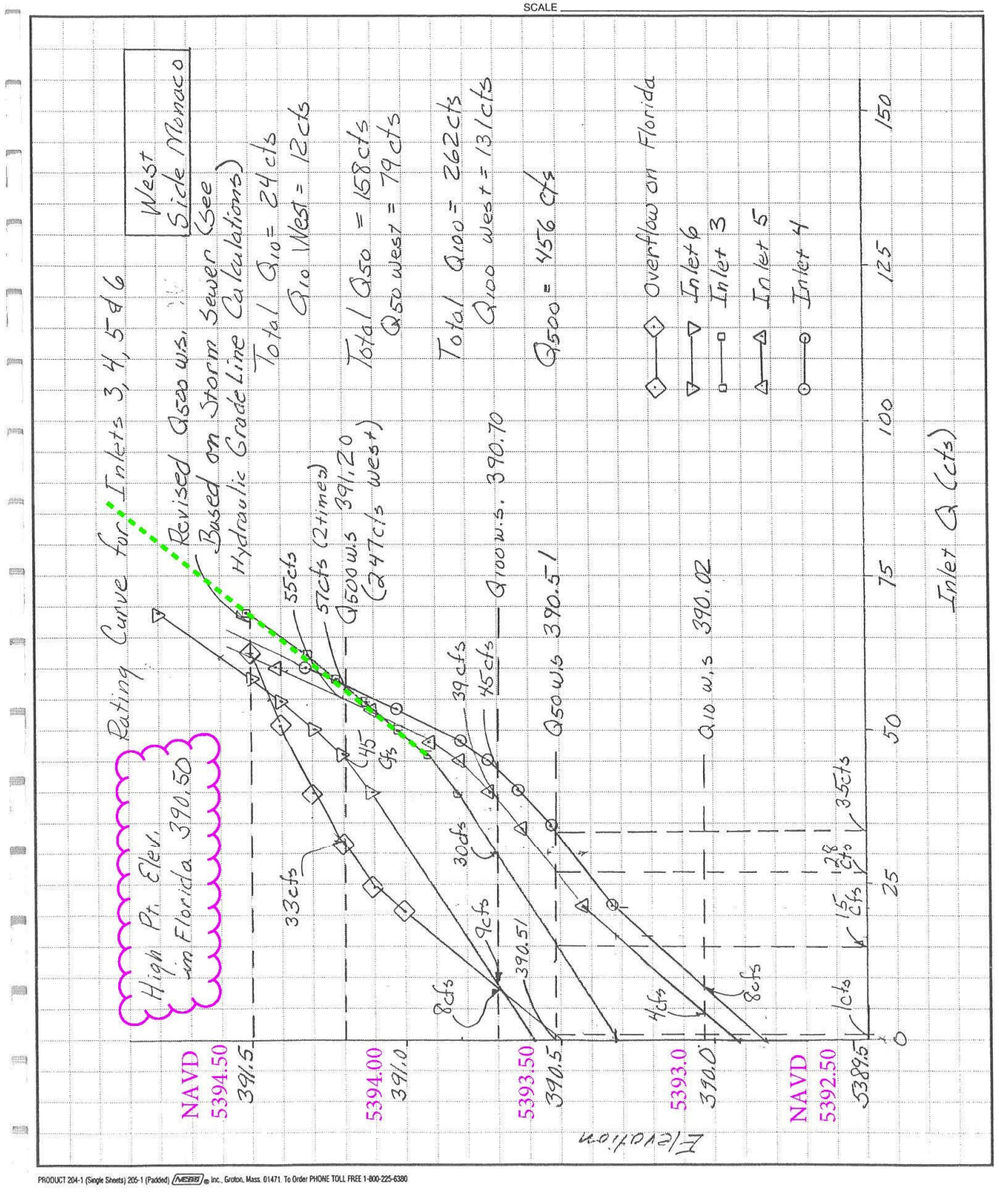

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Summary of Flow Values for Nodes
Florida - Monaco 55 System

Flow Node	Q10 (cfs)	Q50 (cfs)	Q100 (cfs)	Q500 (cfs)
①	12 ✓	79 ✓	94 ✓	112 ✓
②	0 ✓	0 ✓	37 ✓	90 ✓
③	0 ✓	0 ✓	9 ✓	44 ✓
④	0 ✓	15 ✓	39 ✓	101 ✓
⑤	4 ✓	28 ✓	39 ✓	46 ✓
⑥	4+8 12 ✓	28+35 63	39+45 84 ✓	95 ✓
Total E6,4,2,1	24	157	254	398
Florida Ave Overflow	0	1 ✓	8 ✓	58 ±
Total Flow	24 ✓	158 ✓	262 ✓	456

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FLORIDA - MONACO STORM SEWER

FLOOD	Q EAST	WS EAST	Q WEST	WS WEST	HEC2 WS	
						NAVD
10	12	390.32	12	390.02	390.32	5393.32
50	79	390.79	79	390.51	390.79	5393.79
100	131	391.03	131	390.76	391.03	5394.03
500	202	391.50	254 (196+58)	391.50	391.50	5394.50

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Jewell Avenue Culverts, Monaco Street Parkway Diversion Culverts and Skyline Acre Club Monaco Pkwy Culvert

Final Rating Curves

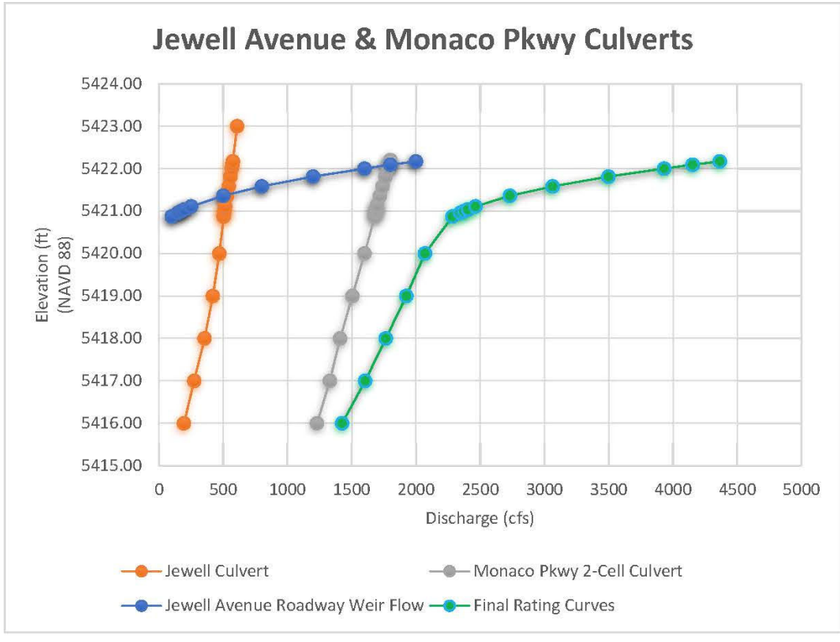
Jewell Avenue & Monaco Pkwy Culverts _ Jewell Avenue to Skyline Acre Club Culvert Downstream

Final Rating Curves

Elevation (NAVD 88) (ft)	Jewell Culvert (cfs)	Monaco Culvert (cfs)	Roadway Overflow (cfs)	Total Discharge (cfs)	Note
5416.00	195	1230		1425	
5417.00	275	1330		1605	
5418.00	355	1410		1765	
5419.00	420	1505		1925	
5420.00	470	1600		2070	Lowest adjacent ground
5420.87	505	1678	100	2283	
5420.96	508	1686	150	2345	
5421.00	510	1690	175	2375	
5421.04	512	1693	200	2405	
5421.11	516	1697	250	2464	
5421.36	531	1700	500	2731	
5421.58	544	1720	800	3064	
5421.81	557	1741	1200	3498	
5422.00	568	1763	1600	3931	
5422.09	572	1781	1800	4153	
5422.17	575	1790	2000	4364	

Search for Flow Distribution

Jewell Culvert (cfs)	Monaco Culvert (cfs)	Roadway Overflow (cfs)	Total Discharge (cfs)
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
495	1657	73	2226
-	-	-	-
510	1689	169	2368
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
572	1781	1803	4156



Jewell Culvert

Elevation (ft)				Discharge	
NGVD 29	NAVD 88	Survey	Adjusted	(cfs)	Note
5410.81	5413.81	5413.7	-	0	Invert
5413.00	5416.00		-	195	Low flow channel bank elevation at approximate 5415.4
5414.00	5417.00		-	275	
5415.00	5418.00		-	355	
5416.00	5419.00		-	420	
5417.00	5420.00		-	470	Lowest adjacent ground
	5420.87		-	505	Interpolated
	5420.96		-	508	Interpolated
5418.00	5421.00		-	510	
	5421.04		-	512	Interpolated
	5421.11		-	516	Interpolated
	5421.36		-	531	Interpolated
	5421.58		-	544	Interpolated
	5421.81		-	557	Interpolated
5419.00	5422.00		-	568	
	5422.09		-	572	Interpolated
	5422.17		-	575	Interpolated
5420.00	5423.00		-	609	

NAVD 88 = NGVD 29 + 3 feet

Monaco Pkwy 2-Cell Culvert

Elevation (ft)				Discharge	
NGVD 29	NAVD 88	Survey	Adjusted	(cfs)	Note
5407.90	5410.90	5410.9	-	0	Invert
5413.00	5416.00		-	1230	
5414.00	5417.00		-	1330	
5415.00	5418.00		-	1410	
5416.00	5419.00		-	1505	
5417.00	5420.00		-	1600	Lowest adjacent ground
	5420.87		-	1678	Interpolated
	5420.96		-	1686	Interpolated
5418.00	5421.00		-	1690	
	5421.04		-	1693	Interpolated
	5421.11		-	1697	Interpolated
5418.15	5421.15		-	1700	
	5421.36		-	1720	Interpolated
	5421.58		-	1741	Interpolated
	5421.81		-	1763	Interpolated
	5422.00		-	1781	Interpolated
	5422.09		-	1790	Interpolated
	5422.17		-	1797	Interpolated
5419.20	5422.20		-	1800	

Jewell Avenue Roadway Weir Flow

Elevation (NAVD (ft)	Jewell Avenue (cfs)	Note
5420.87	100	
5420.96	150	
5421.00	175	Interpolated
5421.04	200	
5421.11	250	
5421.36	500	
5421.58	800	
5421.81	1200	
5422.00	1600	
5422.09	1800	
5422.17	2000	

Source: HY-8 Culvert Analysis Program was used to calculate roadway embankment discharge rating curve.

Source: Design Computation for Goldsmith Gulch - Phase III Schedule III, Sellards & Grigg, Inc., 1994

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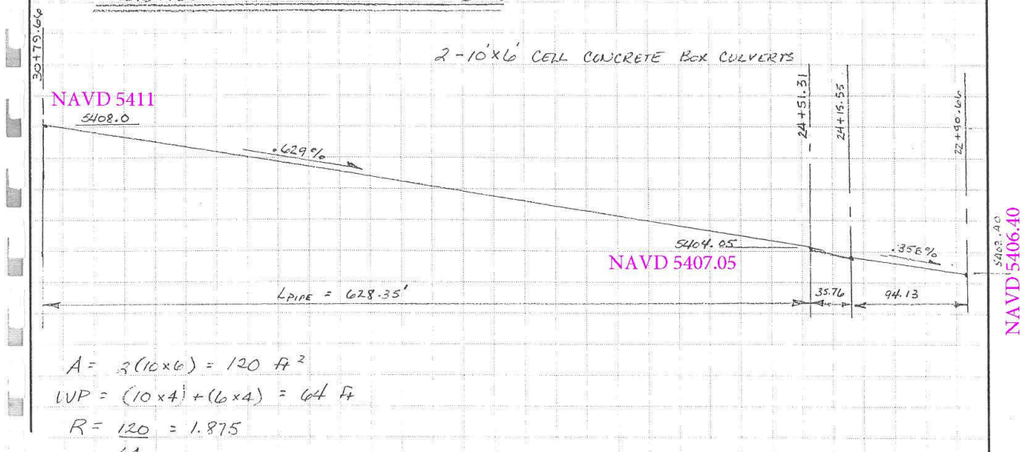
MONACO TWO CELL SYSTEM

2-10'x6' CELL CONCRETE BOX CULVERTS



$A = 3(10 \times 6) = 120\ ft^2$

$WP = (10 \times 4) + (6 \times 4) = 64\ ft$

$R = \frac{120}{64} = 1.875$

Assume critical depth at d/s invert due to vertical hard basin drop.

$Q = 1700$ cfs

Critical depth - rectangular section

$d_c = .315 \sqrt[3]{(Q/B)^2}$ B = width in feet, Q in cfs. — "Hydraulic Design of Highway Culverts" p. 194

$d_c = .315 \sqrt[3]{(1700/20)^2} = 6.09 > 6$ ∴ full barrel flow for full culvert length

Losses:

entrance $K_e = 0.2$ — Table 12 p. 179

bend - disregard bend losses due to large radius

friction $\frac{29 n^2 L}{R^{4/3}}$ $n = .013$, $R = 1.875$

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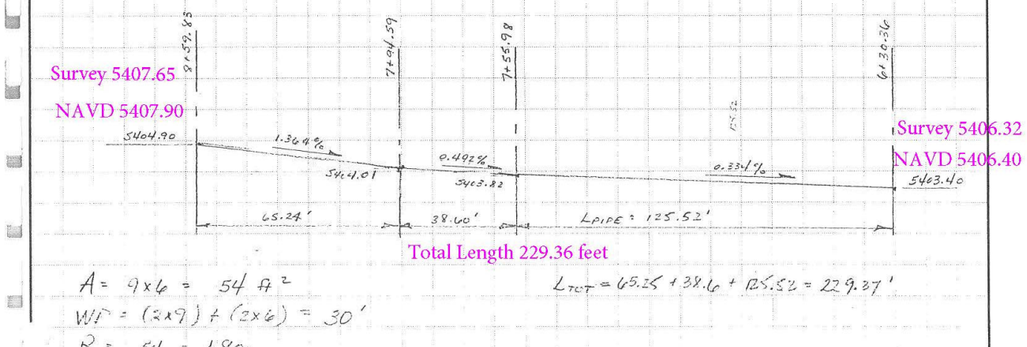
MONACO CULVERT TO SKYLINE SWIM & TENNIS CLUB CHANNEL

1 - 9'x6' CELL CONCRETE BOX CULVERT

T.O.W. 411.83



$A = 9 \times 6 = 54\ ft^2$

$WP = (2 \times 9) + (2 \times 6) = 30'$

$R = \frac{54}{30} = 1.80$

$L_{TOT} = 65.24 + 38.0 + 125.52 = 229.37'$

Assume critical depth at d/s invert due to vertical hard basin drop.

$Q = 500$ cfs.

$d_c = .315 \sqrt[3]{(Q/B)^2}$ B = width in ft (10' @ outlet), Q in cfs — Ref. "Hydraulic Design of Hwy. Culverts" p. 194

$= .315 \sqrt[3]{(500/10)^2}$

$d_c = 4.28' < 6'$ ∴ not full barrel flow for entire length.

Calculate friction slope for full flow:

$S_f = \frac{n^2 V^2}{2.22 R^{4/3}} = \frac{(.013^2)(500/54)^2}{2.22 (1.8^{4/3})} = .00330 < .00334$ — "Open Channel Hydraulics" p. 263

barrel may not flow full

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GOLDSMITH GULCH - F7
MONACO CULVERT TO SKYLINE CHANNEL

REMOVE & REPLACE 50 LF OF CURB & GUTTER AND 5' WIDE CONCRETE SIDEWALK

+94.59 + 7.72 = 8+02.31
EL. 404.05
= (404.9 - 404.05) / (859.83 - 802.31) = 85 / 57.52
= 1.478%

R-3 & INLET R-3-1 SEE PROFILE

RELOCATE EXIST. CURB & GUTTER INLET T.O.G. EL. 5411.68

RELOCAT CURB & INLET T.O.G.

LIMITS OF REMOVAL OF CONCRETE BOX CU SEE

Survey 5407.65
NAVD 5407.90
Inv. El. 404.90

PT STA 8+59.53

CENTERLINE CHANNEL PT STA. 7+55.99
STA. 24+45.55
BASELINE STA.

24+00

S 40°58'16" E

EL. 403.92

PT STA. 24+51.31
N 779228.35
E 997010.60

BEGIN 2 CELL MATCH LINE SEE SHEET PROFILE

S. Monaco Pkwy

35°03'07" E

84" W

E. Colorado Dr.

T R-4-1 PROFILE

REMOVE EXIST. GUARDRAIL

PARAPET WALL & WINGWALLS

AREA OF CONSTANT INVERT ELEV. ON ANY GIVEN RADIAL.

10'x6'
0' radial
S = .643%
C = (.00643)(27.96) + 403.82
ELC = 404.01

Δ = 38° 08' 7.2"

135D 5' 28.6"

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SHEET NO. F-17 OF
CALCULATED BY CAM DATE 4-4-94
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SCALE

Schematic Diagram of Culvert Entrance at Monaco & Jewell

35.9'

10.50

Invert 5410.9 to 5411.35 per survey on top of concrete headwall and field measurement

NAVD 5411.00
8.00 INV

13.14

5.26:1

29.33'

NAVD 5411.00
8.00 INV.

16.66'

1

4

1

4

NAVD 5410.90
7.90 INV.

21'

NAVD 5410.90
7.90 INV.

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SHEET NO. F18 OF
CALCULATED BY DME DATE 10-20-94
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SCALE Monaco / Jewell

DEVELOP COMBINED WS vs. Q CURVE FOR JEWELL CULVERT & MONACO 2 CELL

Jewell from Schedule I design calcs

Twin 14.5'x4.6' culverts cross E. Jewell Ave to Skyline Swim and Tenis Club Channel

** - Inlet control governs

- Set D = 3.05 feet for Plate Contraction
- Invert el. 410.81 - B = 2 * 14.5 = 29'

NAVD 5413.81; Suvery Invert El. 5413.70

Ref -	NAVD	WS	HW/D	Q/B	Q chart	Q 30% reduced *	
Chart 8	5416	413	1.07	9.5	276	193	
"Hydraulic	5418	415	2.04	17.5	508	355	* reduce
Design of	5421	418	3.51	25	725	508	flow due
Hwy.	5422	419	4.0	28	812	568	to debris
Culverts	5423	420	4.48	30	870	609	
	5420	417	3.02	23	467	467	

Suvery headwall El. 5421.6 to 5422.8;
Lowest adjacent ground El. 5420

Monaco 2-cell from Schedule I design calcs

Twin 10'x6' culverts under Monaco Pkwy from E. Jewell Ave to Skyline Swim and Tenis Club cuvlert downstream.

** - Outlet control.

$$\Delta H = \left[.2 + \frac{29(.013^2)(L)}{R^{4/3}} \right] \frac{V^2}{2g}$$

$$= \left[.2 + \frac{(29)(.013^2)(758.24)}{1.875^{4/3}} \right] \frac{V^2}{2g}$$

$$\Delta H = 1.807 \frac{V^2}{2g}$$

A = 120 ft²
WP = 64'
R = 1.875
L = 758.24

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SHEET NO. F20 OF
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SCALE

Monaco 2 cell (continued)

Assume d_c at d/s invert due to vertical hard basin drop.

$d_c = .315 \sqrt[3]{(Q/B)^2}$ B = 20'
EGL D/S = 403.4 + d_c + $V^2/2g$ Aconduit = 120 ft²

	Q	$V^2/2g$	ΔH	d_c	EGL D/S	WS	NAVD
Suvery headwall El. 5421.6 to 5422.8	1700	3.12	5.63	6.09 >6	412.52	418.15	5421.15
Lowest adjacent ground El. 5420	1600	2.76	4.99	5.85	412.00	417.0	5420.0
	1500	2.43	4.38	5.60	411.43	415.81	5418.81
	1400	2.11	3.82	5.35	410.86	414.68	5417.68
	1300	1.82	3.29	5.09	410.31	413.60	5416.60
	1800	3.49	6.31	6.23 >6	412.89	419.2	5422.2

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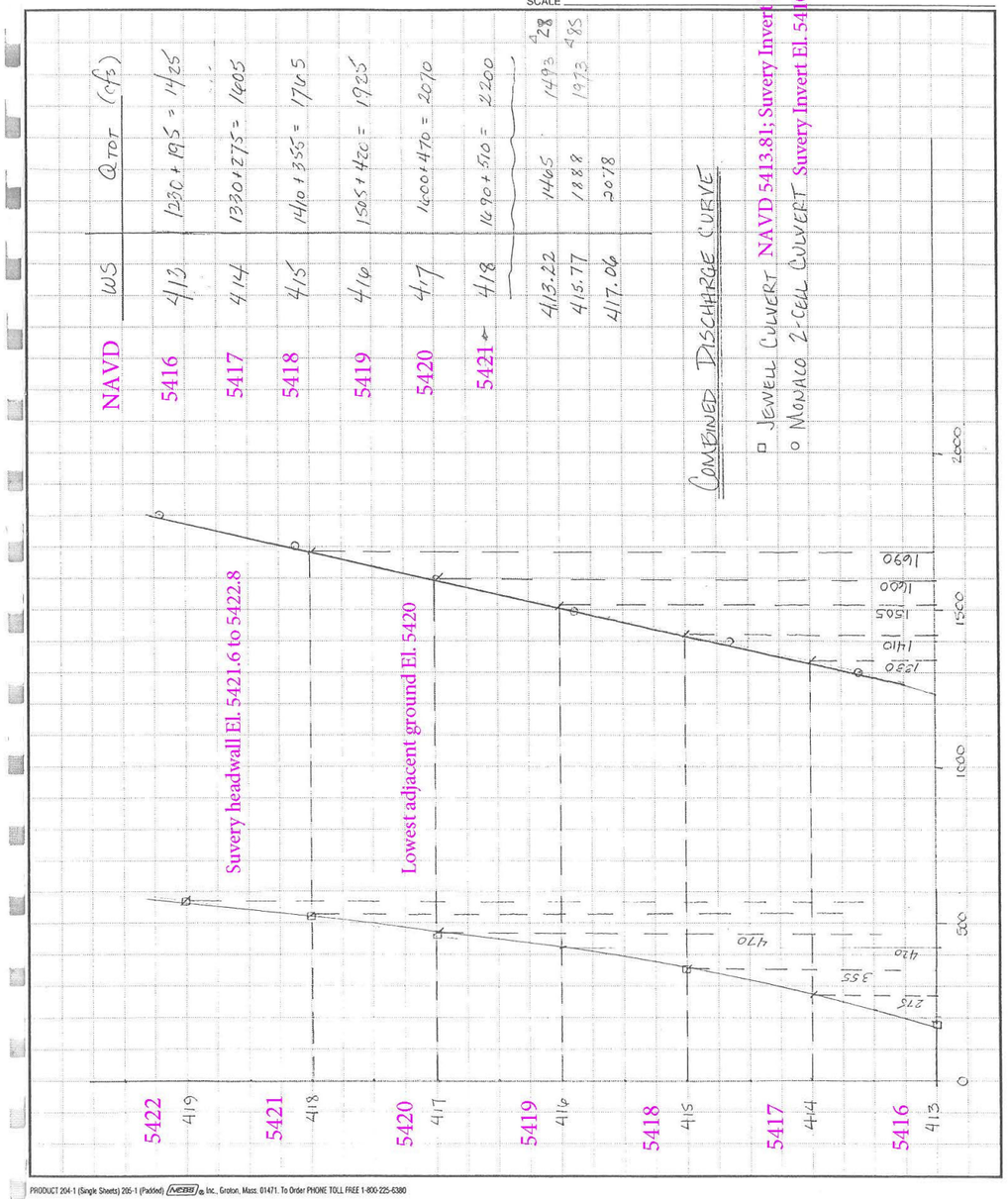

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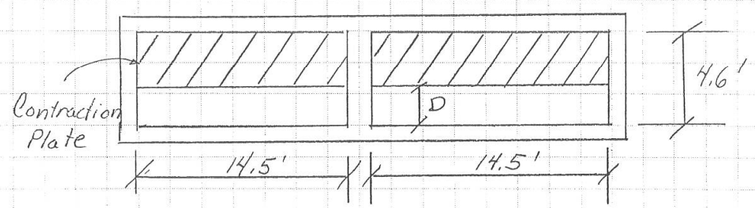
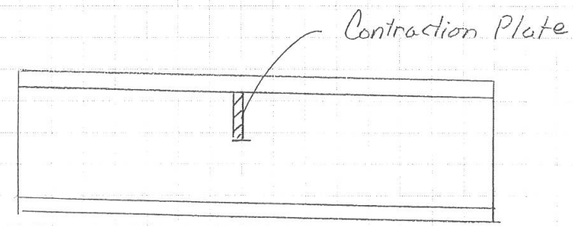
JOB Goldsmith Gulch
SHEET NO. G5 OF
CALCULATED BY CAM DATE 4-25-94
CHECKED BY DATE
SCALE

Determine Restriction Required @ Jewell Culvert to Limit Flow to 520 cfs

Allowable HW = 17.00
Jewell Culvert Inv. S. End 10.81

Determine Plate Contraction Req'd to Limit Flow to 520 cfs





Req'd $B/B = \frac{520}{(2)(14.5)} = 17.93$

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SHEET NO. G7 OF
CALCULATED BY CAM DATE 4-15-94
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SCALE

Check Outlet Control for Contracted Jewell Culvert

$$H = \left\{ 1 + K_{ent} + K_{cont} + \frac{29n^2L}{R^{4/3}} \right\} \frac{V^2}{2g}$$

Use $K_{ent.} = 0.50$
$K_{cont} = 0.50$
$n = 0.013$
$L = 65'$ $R = \frac{A}{WP} = \frac{133.4}{76.4} = 1.75$

TWEL = 412.94
HWEL = 417.00
H = 4.06'

$$4.06 = \left\{ 1 + 0.5 + 0.5 + \frac{29(.013^2)(65)}{(1.75^{4/3})} \right\} \frac{V^2}{2g}$$

$$4.06 = 2.15 \frac{V^2}{2g}$$

$$\frac{V^2}{2g} = 1.88 \qquad V^2 = 121.6$$

$V = 11.02$ fps

$Q = VA$
$= (11.02)(2)(4.1)(14.5)$
$= 1470$ cfs > 520

** Inlet Control Governs

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JOB Goldsmith Gulch
SHEET NO. G-9 OF
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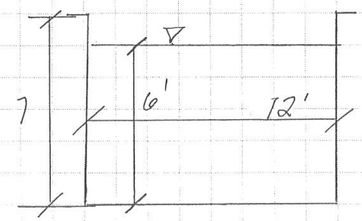
SCALE

Determine Uniform Flow Capacity of Existing Concrete Channel Between Skyline Tennis Courts



$L = 170'$

$S = \frac{1.47}{170}$

$S = 0.00865$

$A = (6)(12) = 72$
$WP = 24$
$R = \frac{72}{24} = 3.0$

$$Q = \frac{1.49}{.013}(72)(3^{2/3})(0.00865^{1/2})$$

$Q = 1584$ cfs

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JOB Goldsmith Gulch
SHEET NO. G-11 OF
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SCALE

Skyline Culvert

Analyze Outlet Control
Neglect Bend Losses Since
Radii are Approximately 50 ft.

Compute Critical Depth @ Outlet
for Q = 510 cfs

$$d_c = .315 \sqrt[3]{(Q/B)^2}$$

$$d_c = .315 \sqrt[3]{(50/10)^2} = 4.21 \quad \text{outlet B}$$

Assume Full Barrel Flow
for Full Length

L = 225 ft.

TWEL = 6.0 + 3.40 = 9.40 ft

AHWEL = 11.83

The outlet of culvert was submerged per HEC-RAS 5.0.5 analysis that reduced the available head and calculated lower culvert capacity.

H = 11.83 - 9.40 = 2.43 ft²

$$H = 2.43 = \left\{ 1 + K_{ent} + \frac{29 n^2 L}{R^{4/3}} \right\} \frac{V^2}{2g}$$

$$2.43 = 1.70 \frac{V^2}{2g} \qquad V^2 = 92.05$$

$$V = 9.59$$

Q = VA = 518 cfs

Approximate 490 cfs per HEC-RAS 5.0.5

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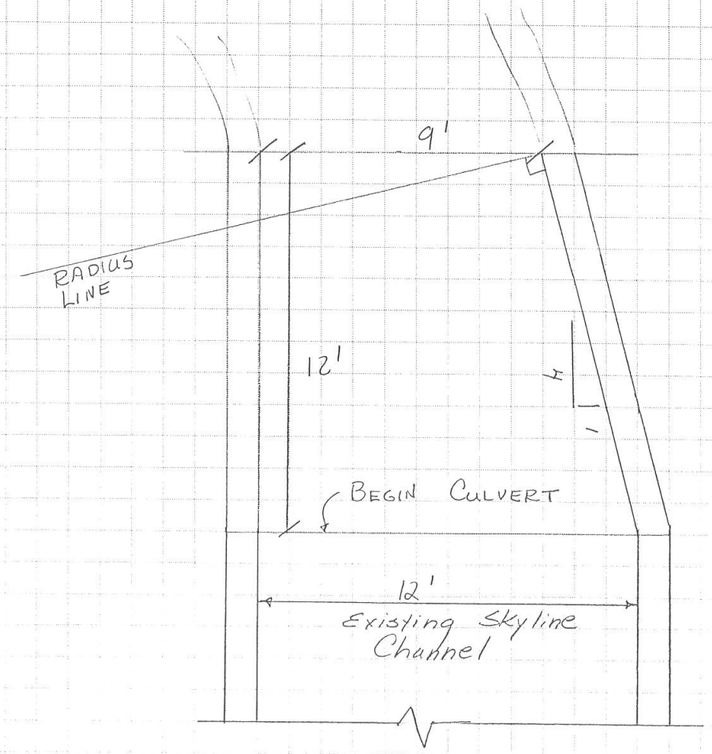
Schematic Diagram of Skyline Culvert Entrance



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Iliff Avenue Culverts

Final Rating Curves

Iliff Avenue Culvert _ Iliff Avenue to Evens Avenue

Final Rating Curves

Elevation (ft)				Discharge	Note
1994 Study		This Study			
NGVD 29	NAVD 88	Survey	Adjusted	(cfs)	
5427.36	5430.36	5429.97	5429.96	0	Invert of culvert
5427.72	5430.72		5430.32	200	
5430.29	5433.29		5432.89	358	
5431.63	5434.63		5434.23	600	
5432.75	5435.75		5435.35	800	
5433.65	5436.65		5436.25	1000	
5434.35	5437.35		5436.95	1200	
5434.56	5437.56	5437.16	5437.16	1250	Street crown
5435.00	5438.00		5437.60	1425	
5435.50	5438.50		5438.10	1775	
5436.00	5439.00		5438.60	2340	
5436.40	5439.40		5439.00	3075	
5437.00	5440.00		5439.60	4877	Extended

Weir Flow Over Roadway

Elevation (ft)				Discharge	Note
NGVD 29	NAVD 88	Survey	Adjusted	(cfs)	
5434.65	5437.65	5437.16	5437.25	2.02	Street crown
5435.00	5438.00		5437.60	74.32	
5435.10	5438.10		5437.70	111.75	
5435.60	5438.60		5438.20	483.68	
5435.80	5438.80		5438.40	697.91	
5436.00	5439.00		5438.60	938.96	
5436.15	5439.15		5438.75	1136.42	
5436.50	5439.50		5439.10	1646.65	
5437.00	5440.00		5439.60	2481.77	
5437.50	5440.50		5440.10	3426.59	
5438.00	5441.00		5440.60	4469.40	
5438.50	5441.50		5441.10	5601.62	
5439.00	5442.00		5441.60	6816.63	

Outlet Control

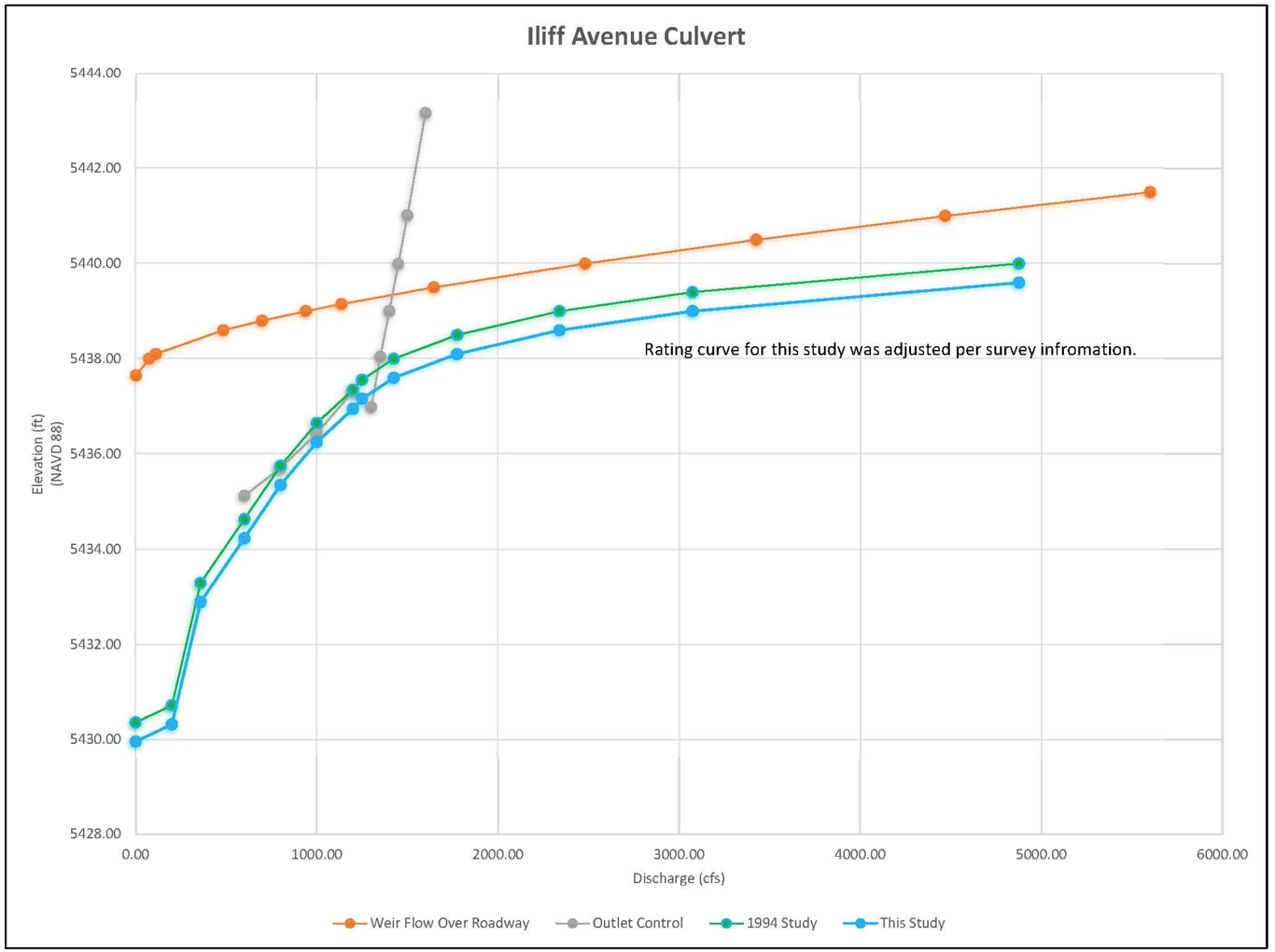
Elevation (ft)				Discharge	Note
NGVD 29	NAVD 88	Survey	Adjusted	(cfs)	
5432.12	5435.12		5434.72	600	
5432.71	5435.71		5435.31	800	
5433.43	5436.43		5436.03	1000	
5434.32	5437.32		5436.92	1200	
5433.98	5436.98		5436.58	1300	
5435.04	5438.04		5437.64	1350	
5436.00	5439.00		5438.60	1400	
5436.99	5439.99		5439.59	1450	
5438.01	5441.01		5440.61	1500	
5440.16	5443.16		5442.76	1600	

NAVD 88 = NGVD 29 + 3 feet

Source: Design Computation for Goldsmith Gulch - Phase III Schedule III, Sellards & Grigg, Inc., 1994

Search for Flow Distribution at the Entrance of Iliff Culvert

Events	Total Inflow (cfs)	Interpolated W.S.E. (cfs)	Culvert Flows (cfs)	Roadway Overflow (cfs)
10-Year	1069	5436.49	1069	0
50-Year	2102	5438.39	1389	713
100-Year	2220	5438.49	1394	825
500-Year	4075	5439.33	1437	2638



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SHEET NO. A 1 OF
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SCALE

Analysis of Improved Inlet
Inlet Control for Ilitt-Evans Box

Throat Control N=2 B=14.
Invert = 27.40 D = 4.5 ft.
NAVD 5430.40 Suvey 5429.97

WS HW	HW	HW/D	Q/NB	Q CULVERT
427.40		0.0	0.0	0.0
429.65	2.25	0.50	10.3	288.4
432.22	4.82	1.07	32.0	896.0
433.77	6.37	1.42	49.0	1372.0
434.60	7.2	1.60	57.0	1596.0
435.12	7.72	1.72	62.0	1736.0
435.52	8.12	1.80	64.0 65.0	1792.0 1820
436.02	8.62	1.92	72.0 Tc.	2016.0 Qx
436.52	9.12	2.02[3]	75.0	2100.00
431.40	4	0.89	25	700
429.20	1.8	0.40	7.5	210

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SCALE

Analysis of Improved Inlet
Inlet Control for Ilitt-Evans Box

Face Control B=28 D = 4.5
Bf = 39

HW	HW/D	Q/Bf	Q CULVERT
427.40	0.0	0.0	0.0
429.65	0.50	9.1	365
432.22	1.07	23.0	897
433.77	1.42	37.0	1443
434.60	1.60	42.0	1638
435.12	1.72	46.0	1794
435.52	1.80	48.0	1872
436.02	1.92	52.0 51	2028
436.52	2.02[3]	54.0	2106

Bf has been increased such that Throat Control or Outlet Control will Govern

Use Bf ≥ 39'

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SCALE

→ Layout Improved Inlet for Iliff/Evans Box Culvert:

From face control analysis Bf = 39.0 required such that throat control or outlet control will govern

use Bf = 39' + 1' divider wall = 40'

B = 14'x2 D = 4.5 TAPER = 4:1

EL. throat invert = 427.36 ; existing u/s invert

S_{barrel} = .0028 ft/ft (existing)

$$L = \left[\frac{Bf - NB}{2}\right] * TAPER$$

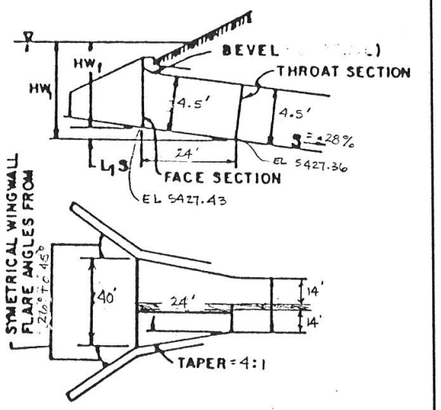
$$L = \left[\frac{40 - (2\times14)}{2}\right] 4 = 24'$$

E = D = 4.5'

EL face invert = 427.36 + (24 * .0028)
= 427.43

26° to 45° wingwall flare angles
top bevel required
no side bevel required

REF.
"Hydraulic Design of Highway Culverts"
p. 73
Tapered inlet design form



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ENTRANCE LOSS ANALYSIS

REACH FROM	REACH TO	DESCRIPTION	Ke	WATERWAY AREA (SQ.FT.)	Ke	DISCHARGE (CFS)	VELOCITY (FPS)	VELOCITY HEAD LOSS (FT.)	ENTRANCE HEAD LOSS (FT.)	HYDRAULIC GRADE LINE (FT.)	DOWNSTREAM HYDRAULIC GRADE LINE (FT.)	DOWNSTREAM INVERT (FT.)	NAVD
12	12	IMPROVED ENTRANCE	Ke = 0.2	126.00	0.2	600	4.76	0.35	0.070	5432.12	5431.70	5427.36	5435.12
				126.00	0.2	800	6.35	0.63	0.125	5432.21	5431.96	5427.36	5435.71
				126.00	0.2	1000	7.94	0.98	0.196	5433.43	5432.26	5427.36	5436.43
				126.00	0.2	1200	9.52	1.41	0.282	5434.32	5432.63	5427.36	5437.32
				126.00	0.2	1300	10.32	1.65	0.331	5433.98	5431.99	5427.36	6436.98
				126.00	0.2	1350	10.71	1.78	0.357	5435.04	5432.90	5427.36	5438.04
				126.00	0.2	1400	11.11	1.92	0.383	5436.00	5433.70	5427.36	5439.00
				126.00	0.2	1450	11.51	2.06	0.411	5436.92	5434.52	5427.36	5439.99
				126.00	0.2	1500	11.90	2.20	0.440	5438.01	5435.37	5427.36	5441.01
				126.00	0.2	1600	12.70	2.50	0.501	5440.16	5437.15	5427.36	5443.16

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SHEET NO. A35 OF
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→ DEVELOP A RATING CURVE FOR ILIFF/EVANS BOX CULVERT ROADWAY OVERFLOW:

USE WEIR FLOW - $Q = C L H^{3/2}$

ASSUME $C = 2.7$

L = length of water surface for a given segment

H = average head (depth of water) at a given segment

See profile on following sheet

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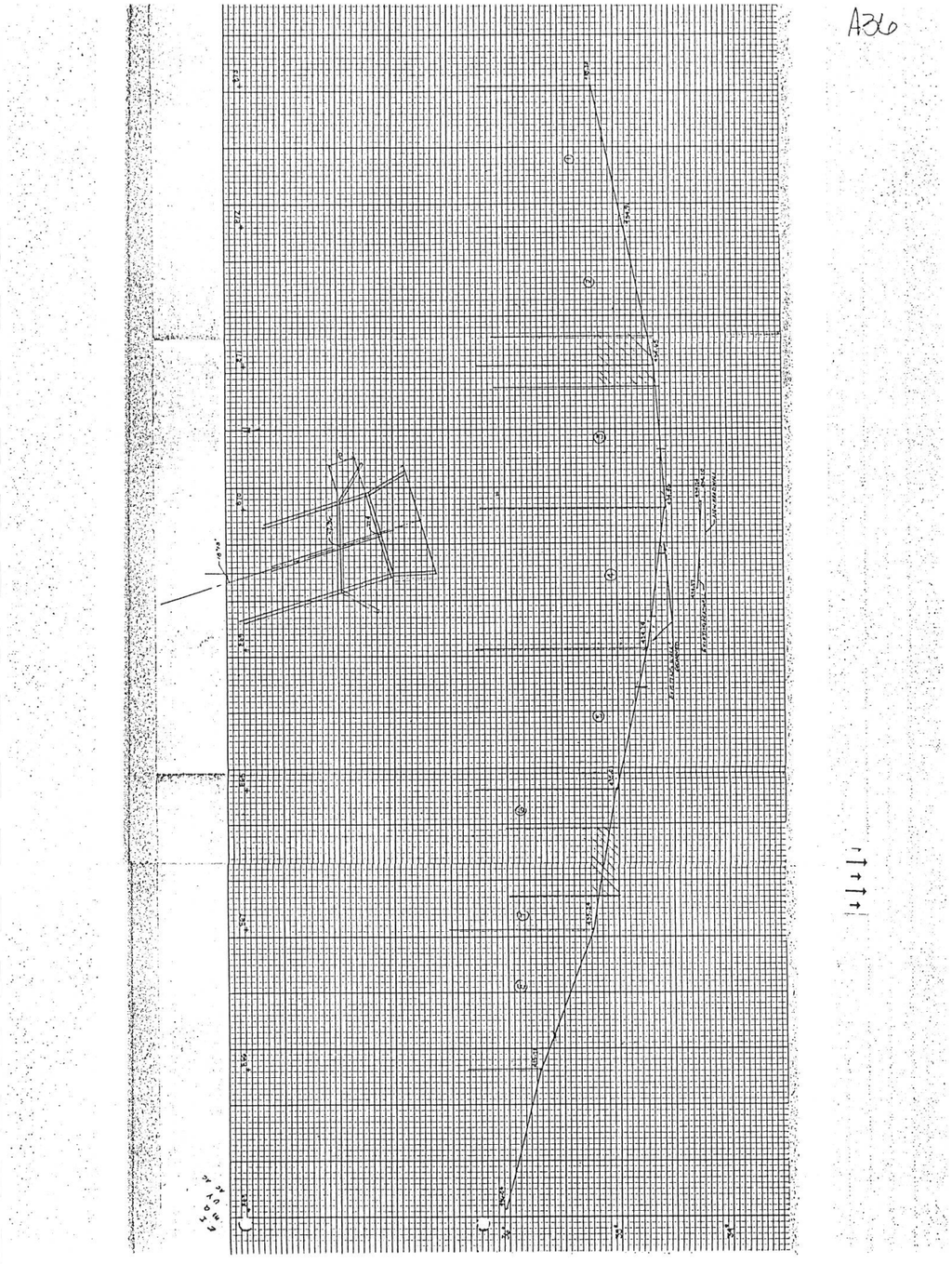
A36



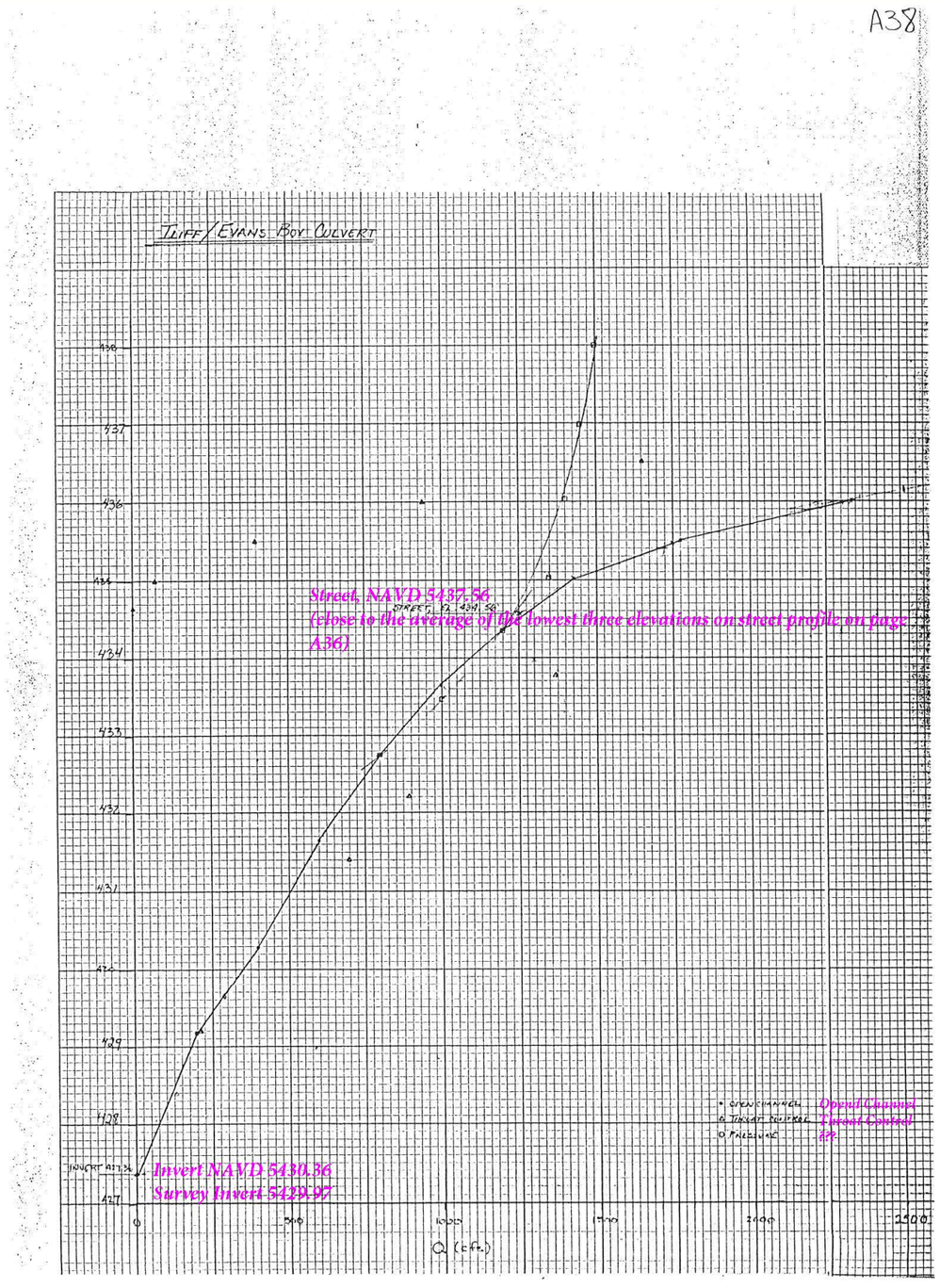
A37

GOLDSMITH GULCH
ILIFF/EVANS BOX CULVERT
WEIR FLOW OVER ROADWAY

Q=C*L*H^(3/2)
C=2.7

WS EL.	NAVD	Q (cfs)	
434.65	5437.65;	2.02	5437.56 on the chart on page A38; (close to the average of the lowest three elevations on street profile on page A36) 5437.35, lowest point on street profile on page A36
435.00		74.32	
435.10	5438.10	111.75	10 YR.
435.60	5438.60	483.68	50 YR.
435.80	5438.80	697.91	100 YR.
436.00		938.96	
436.15	5439.15	1136.42	500 YR.
436.50		1646.65	
437.00	5440.00	2481.77	
437.50		3426.59	
438.00	5441.00	4469.40	
438.50		5601.62	
439.00	5442.00	6816.63	

A38



SELLARDS & GRIGG, INC.
143 Union Blvd. Suite 700
LAKEWOOD, COLORADO 80228
(303) 986-1444
FAX (303) 986-0994

JOB 93039-31
SHEET NO. A38a OF
CALCULATED BY DME DATE 9-22-94
CHECKED BY DATE
SCALE

→ DETERMINE ROADWAY FLOWS ON MONACO PKWY AT ILIFF

From ICPR runs:

				Q_prev
Q_{10} =	1465 cfs	⇒ * WS elev. =	5435.10	112
50 =	1888	⇒ =	5435.60	484
100 =	2078	⇒ =	5435.80	698
500 =	2491	⇒ =	5436.15	1139

The outlet control is the main hydraulic control for Iliff/Evans Culvert. The results are likely not reasonable.

* determined from Elev. vs Q curve developed for Iliff/Evans box culvert

1353
1404
1380
1354

Use Quattro program to determine amount of flow over roadway at Iliff.

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JOB GOLDSMITH GULCH
SHEET NO. A39 OF
CALCULATED BY DATE
CHECKED BY DATE
SCALE

Final Rating Curve for Iliff Avenue

	Discharge	Elevation	NAVD
Survey Invert 5429.97	0.0	427.36	5430.36
	200	427.72	5430.72
	358	430.29	5433.29
	600	431.63	5434.63
	800	432.75	5435.75
	1000	433.65	5436.65
	1200	434.35	5437.35
Survey road crown 5437.16	1250	434.56	5437.65
	1425	435.00	5438.00
	1775	435.50	5438.50
	2340	436.00	5439.00
	3075	436.40	5439.40

This study 500-year flow *4075 cfs*

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Hampden Avenue Culverts and Tiffany Plaza Special Inlet Structure

HY-8 Culvert Analysis Program
Tiffany Plaza Culvert

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Tiffany Plaza Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations	Note
5492.81	1	300	300	0	1	
5494.10	2	500	500	0	1	
5495.24	3	700	700	0	1	
5496.26	4	900	900	0	1	
5497.21	5	1100	1100	0	1	
5498.11	6	1300	1300	0	1	
5498.97	7	1500	1500	0	1	
5499.79	8	1700	1700	0	1	
5500.63	9	1900	1789	111	4	
5501.11	10	2165	1848	316	5	100-year discharge
5501.27	11	2280	1868	412	5	
5501.45	12	2418	1889	528	4	
5502.05	13	3000	1962	1038	4	
5502.43	14	3444	2006	1438	4	500-year discharge
5502.85	15	4000	2054	1945	4	
5499.93	Overtopping	1734	1734	0	1	Lowest elevation of crest

Note: Outlet control dominates the flow condition.

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: Tiffany Plaza

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Tiffany Plaza Culvert Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5492.81	1	300.00	300.00	0.00	1
5494.10	2	500.00	500.00	0.00	1
5495.24	3	700.00	700.00	0.00	1
5496.26	4	900.00	900.00	0.00	1
5497.21	5	1100.00	1100.00	0.00	1
5498.11	6	1300.00	1300.00	0.00	1
5498.97	7	1500.00	1500.00	0.00	1
5499.79	8	1700.00	1700.00	0.00	1
5500.63	9	1900.00	1788.75	110.98	4
5501.11	10	2165.00	1848.46	316.28	5
5501.27	11	2280.00	1868.05	411.76	5
5501.45	12	2418.00	1889.20	527.93	4
5502.05	13	3000.00	1962.04	1037.72	4
5502.43	14	3444.00	2006.04	1437.59	4
5502.85	15	4000.00	2054.19	1944.90	4
5499.93	Overtopping	1734.25	1734.25	0.00	Overtopping

Rating Curve Plot for Crossing: Tiffany Plaza

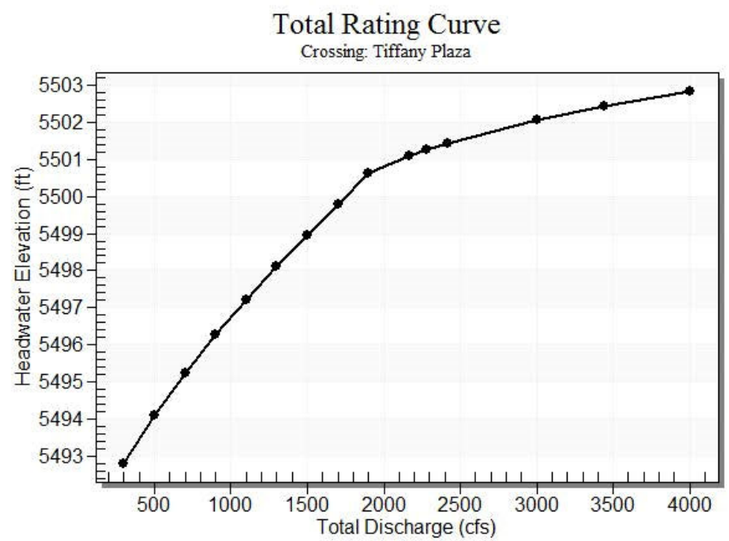


Table 2 - Culvert Summary Table: Tiffany Plaza Culvert

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
1	300.00	300.00	5492.81	2.933	3.226	3-M1t	1.990	1.912	2.490	2.490	6.024
2	500.00	500.00	5494.10	4.129	4.523	3-M1t	2.775	2.687	3.500	3.500	7.143
3	700.00	700.00	5495.24	5.189	5.655	3-M1t	3.471	3.363	4.370	4.370	8.009
4	900.00	900.00	5496.26	6.141	6.680	3-M1t	4.113	3.977	5.140	5.140	8.755
5	1100.00	1100.00	5497.21	7.037	7.631	3-M1t	4.719	4.546	5.860	5.860	9.386
6	1300.00	1300.00	5498.11	7.922	8.529	7-M1t	5.299	5.081	6.540	6.540	9.939
7	1500.00	1500.00	5498.97	8.835	9.386	7-M1t	5.860	5.590	7.190	7.190	10.431
8	1700.00	1700.00	5499.79	9.805	10.211	7-M1t	6.404	6.077	7.840	7.840	10.842
9	1900.00	1788.75	5500.63	10.261	11.412	4-FFf	6.641	6.286	8.000	8.128	11.180
10	2165.00	1848.46	5501.11	10.578	12.580	4-FFf	6.799	6.425	8.000	8.322	11.553
11	2280.00	1868.05	5501.27	10.683	13.067	4-FFf	6.851	6.471	8.000	8.386	11.675
12	2418.00	1889.20	5501.45	10.798	13.662	4-FFf	6.907	6.519	8.000	8.455	11.808
13	3000.00	1962.04	5502.05	11.204	15.514	4-FFf	7.098	6.686	8.000	8.695	12.263
14	3444.00	2006.04	5502.43	11.456	16.180	4-FFf	7.212	6.786	8.000	8.840	12.538
15	4000.00	2054.19	5502.85	11.737	13.274	4-FFf	7.337	6.894	8.000	8.999	12.839

****

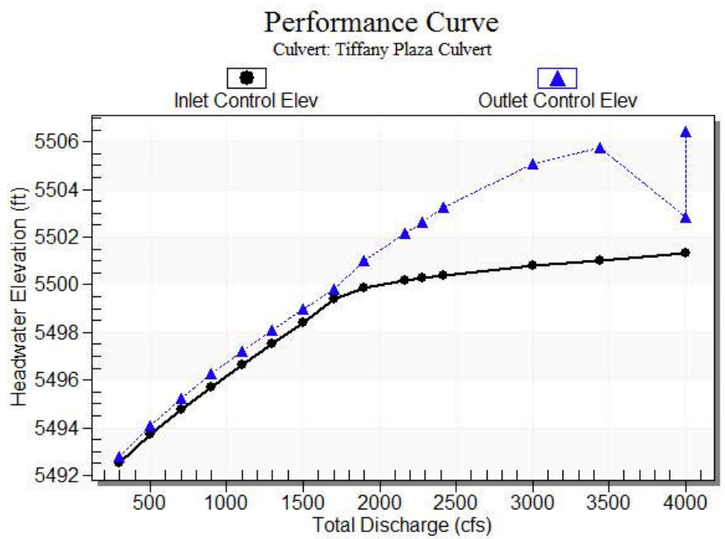
Straight Culvert

Inlet Elevation (invert): 5489.58 ft, Outlet Elevation (invert): 5488.26 ft

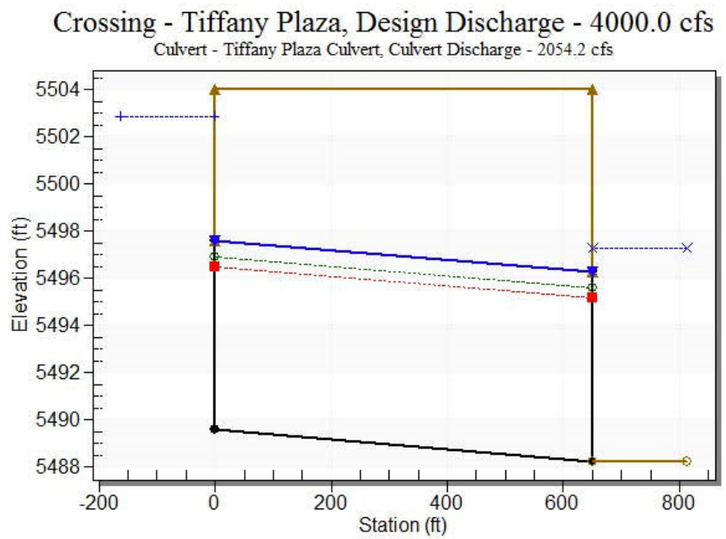
Culvert Length: 650.00 ft, Culvert Slope: 0.0020

****

Culvert Performance Curve Plot: Tiffany Plaza Culvert



Water Surface Profile Plot for Culvert: Tiffany Plaza Culvert



Site Data - Tiffany Plaza Culvert

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 5489.58 ft
Outlet Station: 650.00 ft
Outlet Elevation: 5488.26 ft
Number of Barrels: 1

Culvert Data Summary - Tiffany Plaza Culvert

Barrel Shape: Concrete Box
Barrel Span: 20.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (30-75º flare) Wingwall
Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Tiffany Plaza)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)
300.00	5490.75	5490.75	0.00
500.00	5491.76	5491.76	0.00
700.00	5492.63	5492.63	0.00
900.00	5493.40	5493.40	0.00
1100.00	5494.12	5494.12	0.00
1300.00	5494.80	5494.80	0.00
1500.00	5495.45	5495.45	0.00
1700.00	5496.10	5496.10	0.00
1900.00	5496.75	5496.75	0.00
2100.00	5497.41	5497.41	0.00
2280.00	5498.02	5498.02	0.00
2418.00	5498.51	5498.51	0.00
3000.00	5499.99	5499.99	0.00
3480.00	5500.46	5500.46	0.00
4000.00	5500.84	5500.84	0.00

Tailwater Channel Data - Tiffany Plaza

Tailwater Channel Option: Enter Rating Curve

Channel Invert Elevation: 5488.26 ft

Roadway Data for Crossing: Tiffany Plaza

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Roadway Surface: Paved

Roadway Top Width: 650.00 ft

E. Hampden Avenue _ Half Street Capacity Calculation

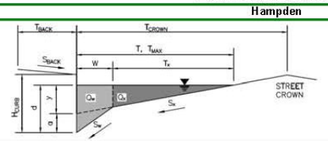
Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: GoldSmith Gulch MDP & FHAD

Inlet ID: Hampden



Gutter Geometry (Enter data in the blue cells)			
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	20.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.050	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	6.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	42.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.020	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.020	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	42.0	42.0	ft
Warning 02 Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	12.0	18.0	inches
Allow Flow Depth at Street Crown (leave blank for no)				check = yes

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Spread Criterion MAJOR STORM Allowable Capacity is based on Spread Criterion	Q_{allow} =	168.3	168.3	cfs

Minor storm max. allowable capacity GOOD - greater than the design flow given on sheet 'Inlet Management'

WARNING: MAJOR STORM max. allowable capacity is less than the design flow given on sheet 'Inlet Management'

HY-8 Culvert Analysis Program
E. Hampden Avenue Culverts

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	West Cell Discharge (cfs)	Central Cell Discharge (cfs)	East Cell Discharge (cfs)	Roadway Discharge (cfs)	Iterations	Note
5490.75	1	300	90	120	90	0	5	
5491.76	2	500	150	200	150	0	3	
5492.63	3	700	210	280	210	0	3	
5493.40	4	900	270	360	270	0	3	
5494.12	5	1100	330	440	330	0	3	
5494.80	6	1300	390	520	390	0	3	
5495.45	7	1500	450	600	450	0	3	
5496.10	8	1700	510	680	510	0	2	
5496.75	9	1900	570	760	570	0	3	100-year pipe flow (1,848 cfs) from Tiffany Plaza Culvert
5497.41	10	2100	630	840	630	0	3	
5498.02	11	2280	684	912	684	0	3	100-year discharge
5498.51	12	2418	725	967	725	0	3	100-year discharge plus overflow from Southmoor Tributary
5499.99	13	3000	844	1125	844	187	6	
5500.46	14	3480	878	1171	878	551	5	500-year discharge
5500.84	15	4000	905	1207	905	982	5	
5499.34	Overtopping	2644	793	1058	793	0	1	

Note: Inlet control dominates the flow condition.

HY-8 Culvert Analysis Report

Crossing Discharge Data

Discharge Selection Method: User Defined

Table 1 - Summary of Culvert Flows at Crossing: E Hampden Ave

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	West Cell Discharge (cfs)	Central Cell Discharge (cfs)	East Cell Discharge (cfs)	Roadway Discharge (cfs)	Iterations
5490.75	1	300.00	89.95	119.92	89.95	0.00	5
5491.76	2	500.00	149.95	199.91	149.95	0.00	3
5492.63	3	700.00	210.00	279.97	210.00	0.00	3
5493.40	4	900.00	269.97	360.03	269.97	0.00	3
5494.12	5	1100.00	330.00	439.97	330.00	0.00	3
5494.80	6	1300.00	389.99	519.99	389.99	0.00	3
5495.45	7	1500.00	450.02	599.96	450.02	0.00	3
5496.10	8	1700.00	510.00	680.02	510.00	0.00	2
5496.75	9	1900.00	569.99	760.03	569.99	0.00	3
5497.41	10	2100.00	629.99	840.03	629.99	0.00	3
5498.02	11	2280.00	684.02	912.00	684.02	0.00	3
5498.51	12	2418.00	725.41	967.22	725.41	0.00	3
5499.99	13	3000.00	843.70	1124.93	843.70	186.65	6
5500.46	14	3480.00	878.48	1171.33	878.48	551.27	5
5500.84	15	4000.00	905.36	1207.21	905.36	981.71	5
5499.34	Overtopping	2644.27	793.29	1057.70	793.29	0.00	Overtopping

Rating Curve Plot for Crossing: E Hampden Ave

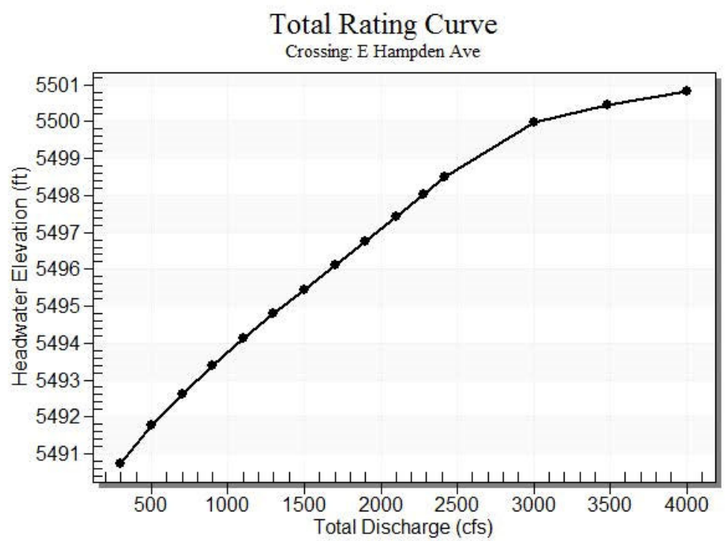


Table 2 - Culvert Summary Table: West Cell

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
1	300.00	89.95	5490.75	2.489	0.661	1-S2n	1.127	1.458	1.172	3.363	8.524
2	500.00	149.95	5491.76	3.499	1.328	1-S2n	1.583	2.050	1.665	4.037	10.008
3	700.00	210.00	5492.63	4.368	1.956	1-S2n	1.990	2.567	2.111	4.576	11.055
4	900.00	269.97	5493.40	5.140	2.574	1-S2n	2.368	3.035	2.525	5.041	11.881
5	1100.00	330.00	5494.12	5.858	3.197	1-S2n	2.727	3.469	2.915	5.456	12.577
6	1300.00	389.99	5494.80	6.538	3.830	1-S2n	3.073	3.878	3.292	5.836	13.165
7	1500.00	450.02	5495.45	7.194	4.482	1-S2n	3.408	4.266	3.654	6.188	13.686
8	1700.00	510.00	5496.10	7.839	5.153	1-S2n	3.734	4.637	4.004	6.515	14.154
9	1900.00	569.99	5496.75	8.487	5.847	5-S2n	4.054	4.994	4.343	6.821	14.584
10	2100.00	629.99	5497.41	9.147	6.567	5-S2n	4.369	5.339	4.676	7.110	14.968
11	2280.00	684.02	5498.02	9.761	7.238	5-S2n	4.648	5.640	4.970	7.357	15.293
12	2418.00	725.41	5498.51	10.246	7.767	5-S2n	4.859	5.865	5.191	7.539	15.528
13	3000.00	843.70	5499.99	11.733	10.113	5-S2n	5.455	6.487	5.807	8.257	16.144
14	3480.00	878.48	5500.46	12.203	10.513	5-S2n	5.628	6.664	5.984	8.804	16.312
15	4000.00	905.36	5500.84	12.577	10.565	5-S2n	5.761	6.799	6.120	9.363	16.437

****

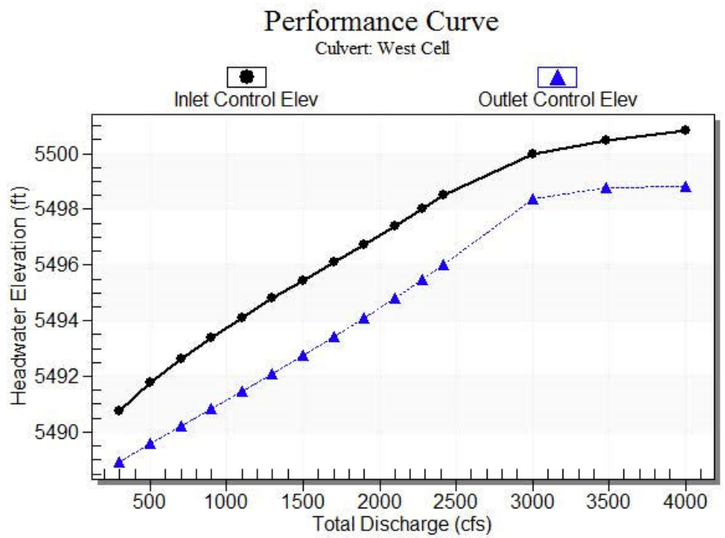
Straight Culvert

Inlet Elevation (invert): 5488.26 ft, Outlet Elevation (invert): 5487.42 ft

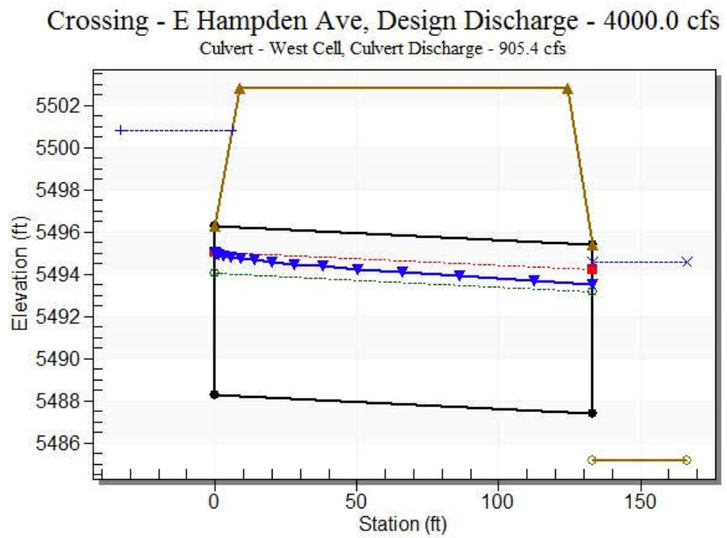
Culvert Length: 133.00 ft, Culvert Slope: 0.0063

****

Culvert Performance Curve Plot: West Cell



Water Surface Profile Plot for Culvert: West Cell



Site Data - West Cell

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 5488.26 ft
Outlet Station: 133.00 ft
Outlet Elevation: 5487.42 ft
Number of Barrels: 1

Culvert Data Summary - West Cell

Barrel Shape: Concrete Box
Barrel Span: 9.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

Table 3 - Culvert Summary Table: Central Cell

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
1	300.00	119.92	5490.75	2.488	0.660	1-S2n	1.102	1.458	1.152	3.363	8.676
2	500.00	199.91	5491.76	3.499	1.325	1-S2n	1.536	2.050	1.633	4.037	10.200
3	700.00	279.97	5492.63	4.368	1.951	1-S2n	1.919	2.566	2.061	4.576	11.322
4	900.00	360.03	5493.40	5.141	2.567	1-S2n	2.273	3.035	2.463	5.041	12.183
5	1100.00	439.97	5494.12	5.858	3.184	1-S2n	2.604	3.469	2.841	5.456	12.907
6	1300.00	519.99	5494.80	6.538	3.814	1-S2n	2.922	3.878	3.203	5.836	13.530
7	1500.00	599.96	5495.45	7.193	4.459	1-S2n	3.228	4.266	3.550	6.188	14.083
8	1700.00	680.02	5496.10	7.839	5.124	1-S2n	3.525	4.637	3.886	6.515	14.584
9	1900.00	760.03	5496.75	8.487	5.812	5-S2n	3.814	4.994	4.213	6.821	15.032
10	2100.00	840.03	5497.41	9.148	6.524	5-S2n	4.098	5.339	4.531	7.110	15.451
11	2280.00	912.00	5498.02	9.760	7.186	5-S2n	4.348	5.640	4.810	7.357	15.799
12	2418.00	967.22	5498.51	10.246	7.709	5-S2n	4.537	5.865	5.020	7.539	16.055
13	3000.00	1124.93	5499.99	11.733	10.034	5-S2n	5.068	6.486	5.606	8.257	16.722
14	3480.00	1171.33	5500.46	12.203	10.428	5-S2n	5.221	6.664	5.774	8.804	16.906
15	4000.00	1207.21	5500.84	12.578	10.475	5-S2n	5.339	6.799	5.902	9.363	17.044

****

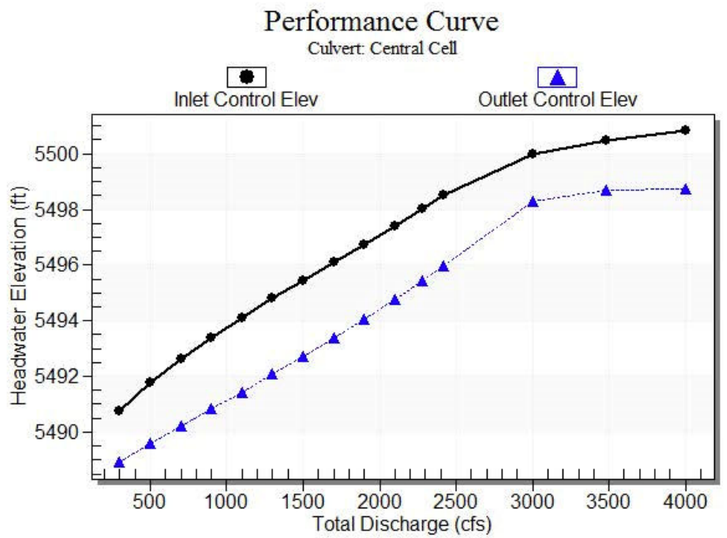
Straight Culvert

Inlet Elevation (invert): 5488.26 ft, Outlet Elevation (invert): 5487.42 ft

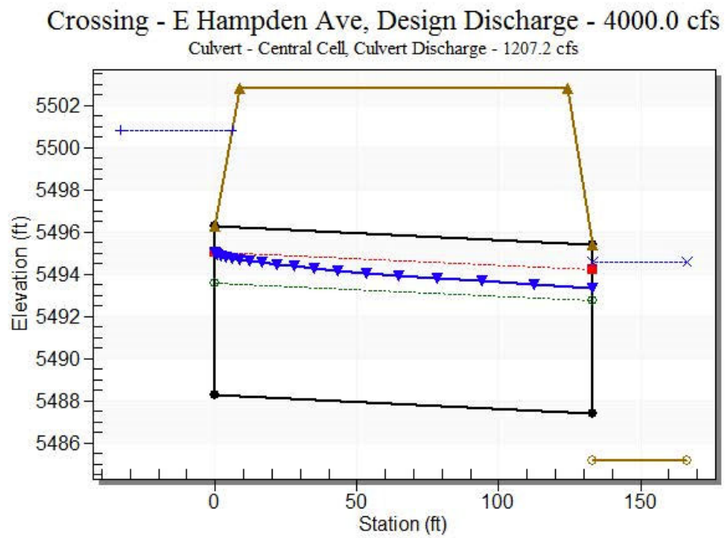
Culvert Length: 133.00 ft, Culvert Slope: 0.0063

****

Culvert Performance Curve Plot: Central Cell



Water Surface Profile Plot for Culvert: Central Cell



Site Data - Central Cell

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 5488.26 ft
Outlet Station: 133.00 ft
Outlet Elevation: 5487.42 ft
Number of Barrels: 1

Culvert Data Summary - Central Cell

Barrel Shape: Concrete Box
Barrel Span: 12.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

Table 4 - Culvert Summary Table: East Cell

Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)
1	300.00	89.95	5490.75	2.489	0.661	1-S2n	1.127	1.458	1.172	3.363	8.524
2	500.00	149.95	5491.76	3.499	1.328	1-S2n	1.583	2.050	1.665	4.037	10.008
3	700.00	210.00	5492.63	4.368	1.956	1-S2n	1.990	2.567	2.111	4.576	11.055
4	900.00	269.97	5493.40	5.140	2.574	1-S2n	2.368	3.035	2.525	5.041	11.881
5	1100.00	330.00	5494.12	5.858	3.197	1-S2n	2.727	3.469	2.915	5.456	12.577
6	1300.00	389.99	5494.80	6.538	3.830	1-S2n	3.073	3.878	3.292	5.836	13.165
7	1500.00	450.02	5495.45	7.194	4.482	1-S2n	3.408	4.266	3.654	6.188	13.686
8	1700.00	510.00	5496.10	7.839	5.153	1-S2n	3.734	4.637	4.004	6.515	14.154
9	1900.00	569.99	5496.75	8.487	5.847	5-S2n	4.054	4.994	4.343	6.821	14.584
10	2100.00	629.99	5497.41	9.147	6.567	5-S2n	4.369	5.339	4.676	7.110	14.968
11	2280.00	684.02	5498.02	9.761	7.238	5-S2n	4.648	5.640	4.970	7.357	15.293
12	2418.00	725.41	5498.51	10.246	7.767	5-S2n	4.859	5.865	5.191	7.539	15.528
13	3000.00	843.70	5499.99	11.733	10.113	5-S2n	5.455	6.487	5.807	8.257	16.144
14	3480.00	878.48	5500.46	12.203	10.513	5-S2n	5.628	6.664	5.984	8.804	16.312
15	4000.00	905.36	5500.84	12.577	10.565	5-S2n	5.761	6.799	6.120	9.363	16.437

****

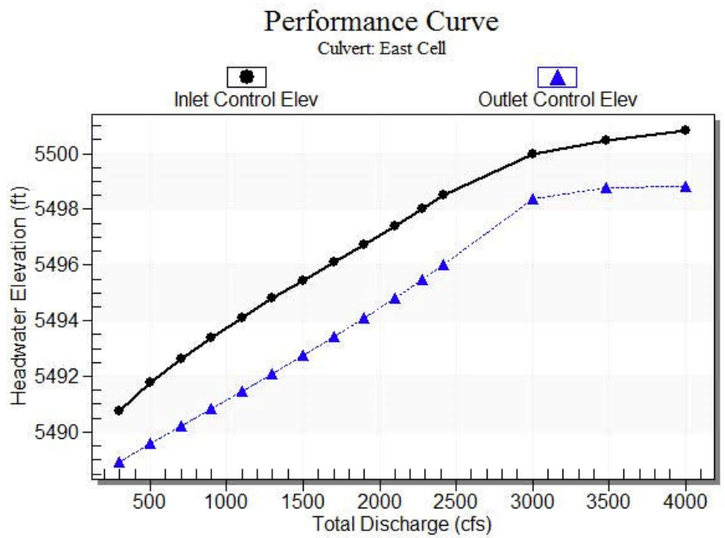
Straight Culvert

Inlet Elevation (invert): 5488.26 ft, Outlet Elevation (invert): 5487.42 ft

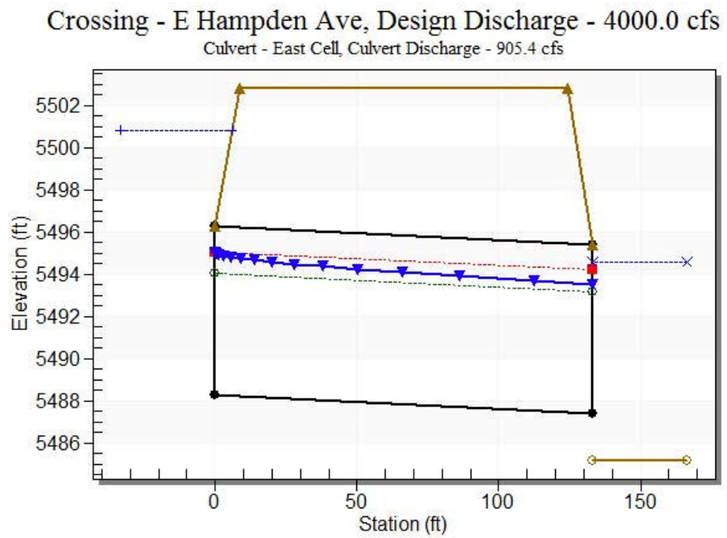
Culvert Length: 133.00 ft, Culvert Slope: 0.0063

****

Culvert Performance Curve Plot: East Cell



Water Surface Profile Plot for Culvert: East Cell



Site Data - East Cell

Site Data Option: Culvert Invert Data
Inlet Station: 0.00 ft
Inlet Elevation: 5488.26 ft
Outlet Station: 133.00 ft
Outlet Elevation: 5487.42 ft
Number of Barrels: 1

Culvert Data Summary - East Cell

Barrel Shape: Concrete Box
Barrel Span: 9.00 ft
Barrel Rise: 8.00 ft
Barrel Material: Concrete
Embedment: 0.00 in
Barrel Manning's n: 0.0130
Culvert Type: Straight
Inlet Configuration: Square Edge (90 & 15º flare) Wingwall
Inlet Depression: None

Table 5 - Downstream Channel Rating Curve (Crossing: E Hampden Ave)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
300.00	5488.55	3.36	4.34	0.99	0.63
500.00	5489.23	4.04	4.87	1.18	0.61
700.00	5489.77	4.58	5.33	1.34	0.61
900.00	5490.23	5.04	5.71	1.48	0.61
1100.00	5490.65	5.46	6.03	1.60	0.61
1300.00	5491.03	5.84	6.32	1.71	0.62
1500.00	5491.38	6.19	6.57	1.81	0.62
1700.00	5491.71	6.52	6.79	1.91	0.62
1900.00	5492.01	6.82	7.01	2.00	0.62
2100.00	5492.30	7.11	7.20	2.09	0.63
2280.00	5492.55	7.36	7.37	2.16	0.63
2418.00	5492.73	7.54	7.50	2.21	0.63
3000.00	5493.45	8.26	7.96	2.42	0.64
3480.00	5493.99	8.80	8.28	2.58	0.64
4000.00	5494.55	9.36	8.57	2.75	0.65

Tailwater Channel Data - E Hampden Ave

Tailwater Channel Option: Irregular Channel

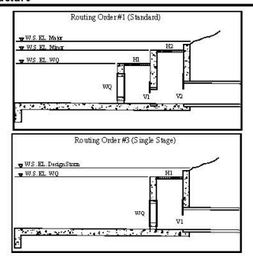
Roadway Data for Crossing: E Hampden Ave

Roadway Profile Shape: Irregular Roadway Shape (coordinates)

Roadway Surface: Paved

Roadway Top Width: 116.00 ft

Project: Goldsmith Gulch MDP & FHAD
Basin ID: Tiffany Plaza Inlet Structure



Current Routing Order is #3

Design Information (Input):

		#1 Horiz.	#2 Horiz.	#1 Vert.	#2 Vert.	
Circular Opening:	Diameter in Inches: Dia. =					inches
OR						
Rectangular Opening:	Width in Feet: W =	32.00		12.00		ft.
	Length (Height for Vertical): L or H =	8.50		8.00		ft.
Percentage of Open Area After Trash Rack Reduction	% open =	74		100	100	%
Orifice Coefficient	C_o =	0.60		0.60		
Weir Coefficient	C_w =	2.60				
Orifice Elevation (Bottom for Vertical)	E_o =	5497.05		5,488.26		ft.

Calculation of Collection Capacity:

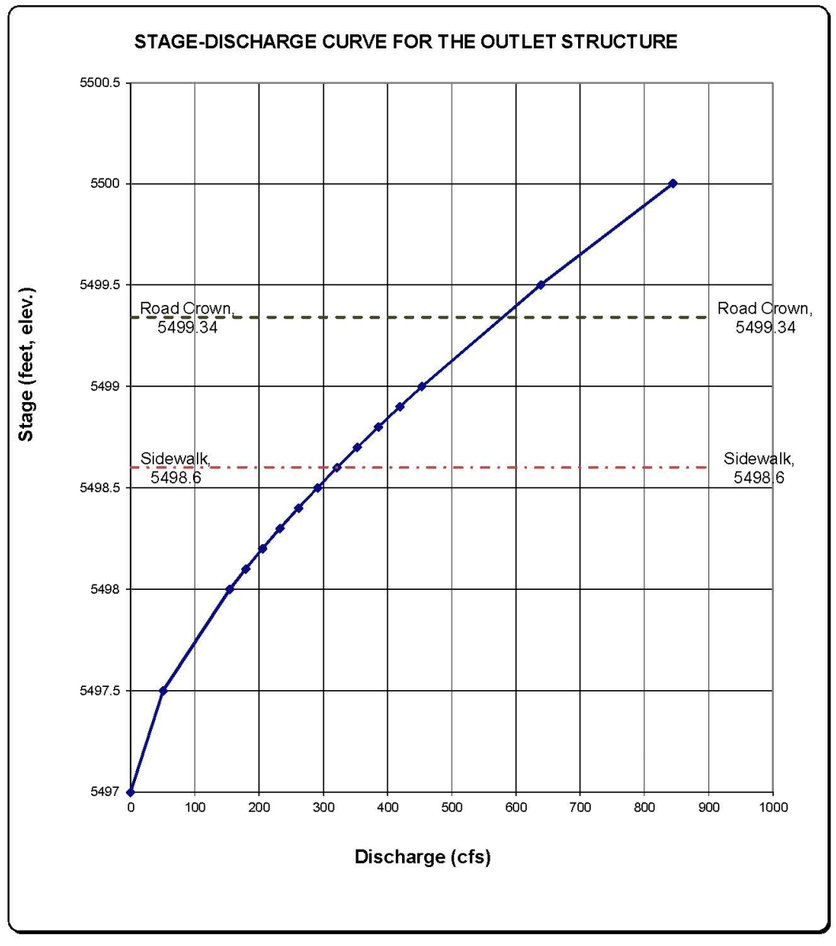
Net Opening Area (after Trash Rack Reduction)	A_o =	200.11		96.00		sq. ft.
OPTIONAL: User-Overide Net Opening Area	A_o =					sq. ft.
Perimeter as Weir Length	L_w =	64.08		ft.		
OPTIONAL: User-Overide Weir Length	L_w =			ft.		

Top Elevation of Vertical Orifice Opening, Top = 5496.26 ft.
Center Elevation of Vertical Orifice Opening, Cen = 5492.26 ft.

Routing 3: Single Stage - Water flows through WQCV plate and #1 horizontal opening into #1 vertical opening. This flow will be applied to culvert sheet (#2 vertical & horizontal openings is not used).

			Horizontal Orifices				Vertical Orifices			
Labels for WQCV, Minor, & Major Storage W.S. Elevations (input)	Water Surface Elevation ft (linked)	WQCV Plate/Riser Flow cfs (User-linked)	#1 Horiz. Weir Flow cfs (output)	#1 Horiz. Orifice Flow cfs (output)	#2 Horiz. Weir Flow cfs (output)	#2 Horiz. Orifice Flow cfs (output)	#1 Vert. Collection Capacity cfs (output)	#2 Vert. Collection Capacity cfs (output)	**Total Collection Capacity cfs (output)**	Target Volumes for WQCV, Minor, & Major Storage Volumes (link for goal seek)
	5497.00	0.00	0.00	0.00	0.00	0.00	1006.36	0.00	**0.00**	
	5497.50	0.00	50.30	646.35	0.00	0.00	1058.11	0.00	**50.30**	
	5498.00	0.00	154.28	939.13	0.00	0.00	1107.44	0.00	**154.28**	
	5498.10	0.00	179.27	987.32	0.00	0.00	1117.05	0.00	**179.27**	
	5498.20	0.00	205.48	1033.27	0.00	0.00	1126.57	0.00	**205.48**	
	5498.30	0.00	232.86	1077.26	0.00	0.00	1136.01	0.00	**232.86**	
	5498.40	0.00	261.35	1119.52	0.00	0.00	1145.38	0.00	**261.35**	
	5498.50	0.00	290.85	1160.21	0.00	0.00	1154.69	0.00	**290.90**	
Approximately at top of sidewalk	5498.60	0.00	321.53	1199.58	0.00	0.00	1163.88	0.00	**321.53**	
	5498.70	0.00	353.15	1237.67	0.00	0.00	1173.03	0.00	**353.15**	
	5498.80	0.00	385.73	1274.63	0.00	0.00	1182.10	0.00	**385.73**	
	5498.90	0.00	419.26	1310.54	0.00	0.00	1191.10	0.00	**419.26**	
	5499.00	0.00	453.71	1345.49	0.00	0.00	1200.04	0.00	**453.71**	
	5499.50	0.00	638.97	1508.16	0.00	0.00	1243.75	0.00	**638.97**	
	5500.00	0.00	844.23	1654.91	0.00	0.00	1285.98	0.00	**844.23**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	
		#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	0.00	**#N/A**	

Project: Goldsmith Gulch MDP & FHAD
Basin ID: Tiffany Plaza Inlet Structure



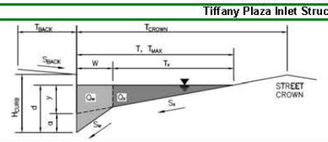
Tiffany Plaza Inlet Box.xls, Outlet 11/7/2018, 2:27 PM

Version 4.05 Released March 2017

ALLOWABLE CAPACITY FOR ONE-HALF OF STREET (Minor & Major Storm)

(Based on Regulated Criteria for Maximum Allowable Flow Depth and Spread)

Project: Goldsmith Gulch MDP & FHAD
Inlet ID: Tiffany Plaza Inlet Structure



Gutter Geometry (Enter data in the blue cells)

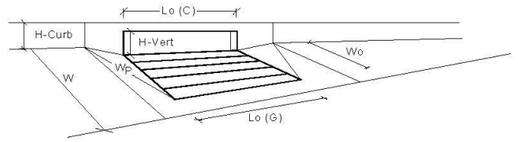
Maximum Allowable Width for Spread Behind Curb	T_{BACK} =	88.0	ft
Side Slope Behind Curb (leave blank for no conveyance credit behind curb)	S_{BACK} =	0.007	ft/ft
Manning's Roughness Behind Curb (typically between 0.012 and 0.020)	n_{BACK} =	0.020	
Height of Curb at Gutter Flow Line	H_{CURB} =	11.00	inches
Distance from Curb Face to Street Crown	T_{CROWN} =	100.0	ft
Gutter Width	W =	2.00	ft
Street Transverse Slope	S_X =	0.013	ft/ft
Gutter Cross Slope (typically 2 inches over 24 inches or 0.083 ft/ft)	S_W =	0.083	ft/ft
Street Longitudinal Slope - Enter 0 for sump condition	S_O =	0.000	ft/ft
Manning's Roughness for Street Section (typically between 0.012 and 0.020)	n_{STREET} =	0.016	

		Minor Storm	Major Storm	
Max. Allowable Spread for Minor & Major Storm	T_{MAX} =	100.0	100.0	ft
Max. Allowable Depth at Gutter Flowline for Minor & Major Storm	d_{MAX} =	9.0	11.0	inches
Check boxes are not applicable in SUMP conditions		☐	☐	

		Minor Storm	Major Storm	
MINOR STORM Allowable Capacity is based on Depth Criterion				
MAJOR STORM Allowable Capacity is based on Depth Criterion	Q_{allow} =	SUMP	SUMP	cfs

INLET IN A SUMP OR SAG LOCATION

Version 4.05 Released March 2017



Design Information (Input) — Denver No. 14 Curb Opening

		MINOR	MAJOR	
Type of Inlet	Type =	Denver No. 14 Curb Opening		
Local Depression (additional to continuous gutter depression 'a' from above)	a_{local} =	3.00	3.00	inches
Number of Unit Inlets (Grate or Curb Opening)	No =	1	1	
Water Depth at Flowline (outside of local depression)	Ponding Depth =	9.0	11.0	inches

Grate Information

		MINOR	MAJOR	
Length of a Unit Grate	L_o (G) =	N/A	N/A	feet
Width of a Unit Grate	W_o =	N/A	N/A	feet
Area Opening Ratio for a Grate (typical values 0.15-0.90)	A_{ratio} =	N/A	N/A	
Clogging Factor for a Single Grate (typical value 0.50 - 0.70)	C_f (G) =	N/A	N/A	
Grate Weir Coefficient (typical value 2.15 - 3.60)	C_w (G) =	N/A	N/A	
Grate Orifice Coefficient (typical value 0.60 - 0.80)	C_o (G) =	N/A	N/A	

Curb Opening Information

		MINOR	MAJOR	
Length of a Unit Curb Opening	L_o (C) =	60.00	60.00	feet
Warning 1 Height of Vertical Curb Opening in Inches	H_{vert} =	6.00	6.00	inches
Warning 1 Height of Curb Orifice Throat in Inches	H_{throat} =	9.00	9.00	inches
Angle of Throat (see USDCM Figure ST-5)	Theta =	63.40	63.40	degrees
Side Width for Depression Pan (typically the gutter width of 2 feet)	W_p =	2.00	2.00	feet
Clogging Factor for a Single Curb Opening (typical value 0.10)	C_f (C) =	0.10	0.10	
Curb Opening Weir Coefficient (typical value 2.3-3.7)	C_w (C) =	3.60	3.60	
Curb Opening Orifice Coefficient (typical value 0.60 - 0.70)	C_o (C) =	0.67	0.67	

Half of the curb opening

Matches field measurement

Low Head Performance Reduction (Calculated)

		MINOR	MAJOR	
Depth for Grate Midwidth	d_{Grate} =	N/A	N/A	ft
Depth for Curb Opening Weir Equation	d_{Curb} =	0.58	0.75	ft
Combination Inlet Performance Reduction Factor for Long Inlets	$RF_{Combination}$ =	0.85	1.00	
Curb Opening Performance Reduction Factor for Long Inlets	RF_{Curb} =	0.93	1.00	
Grated Inlet Performance Reduction Factor for Long Inlets	RF_{Grate} =	N/A	N/A	

		MINOR	MAJOR	
Total Inlet Interception Capacity (assumes clogged condition)	Q_a =	94.4	147.3	cfs
WARNING: Inlet Capacity less than Q Peak for Minor and Major Storms	$Q_{PEAK\ REQUIRED}$ =	316.0	454.0	cfs

Warning 1: Dimension entered is not a typical dimension for inlet type specified.

The approximate average throat elevation of curb opening is 5497.8. Assuming maximum water surface of 5498.7 at the top of curb opening.

Tiffany Plaza_UD-Inlet_v4.05.xlsm, Tiffany Plaza Inlet Structure 11/7/2018, 1:30 PM

Arapahoe Lake Downstream Concrete Box Culvert

Arapahoe Lake Downstream Concrete Box Culvert (8'x4') Capacity

This study culvert information

GIS Layer	Survey		
Length	Inlet Invert	Outlet Invert	Culvert Slope
1057	5674.51	5661.34	0.0125

HY-8 Culvert Analysis Program

Headwater Elevation (ft)	Discharge Names	Total Discharge (cfs)	Culvert Discharge (cfs)	Roadway Discharge (cfs)	Hydraulic Control	Note
5677.36	1	100	100	0	Inlet	
5678.26	2	151	151	0	Inlet	10-year discharge
5679.11	3	200	200	0	Inlet	
5681.14	4	300	300	0	Inlet	
5683.45	5	400	385	15	Inlet	
5683.59	6	419	390	29	Inlet	50-year discharge
5684.00	7	500	403	97	Inlet	
5684.08	8	520	405	115	Inlet	100-year discharge
5684.36	9	600	414	186	Inlet	
5684.66	10	700	423	277	Inlet	
5684.82	11	760	427	332	Inlet	500-year discharge
5684.92	12	800	430	370	Inlet	
5685.14	13	900	437	463	Outlet	
5685.35	14	1000	443	557	Outlet	
5685.55	15	1100	448	652	Outlet	
5683.21	Overtopping	377	0	1		Lowest elevation of crest

Note:

1. The bend loss of culvert was assumed to be minimal and was neglected in the calculation using HY-8.
2. A trapezoidal roadway profile shape was assumed in HY-8. The side slope(H:V = 10:1) was estimated per 2014 LiDAR topographic contours and site photos.
3. The wooden fence was assumed to be collapsible to avoid overestimate of the culvert capacity.
4. The assumption of collapsible wooden fence deem reasonably conservative and safe because there is no insurable habitable structure will be negatively impacted by the backwater caused from the wooden fence.

2005 Upper Goldsmith Gulch FHAD

	10-Year	50-Year	100-Year	500-Year
Total Discharge (cfs)	344	645	787	1026
Overflow (cfs)	1	225	357	586
Culvert Flow (cfs)	343	420	430	440

HEC-RAS Flow Rates and Flow Change Locations Analysis

HEC -RAS Flows and Flow Change Locations

Item No.	Flow Change Reference Locations	River Station	HEC-RAS Steady Flow Data				Note
			Q_{10}	Q_{50}	Q_{100}	Q_{500}	
West Fork Goldsmith Gulch							
1	Boston Peakview Detention Inflow	63+72	70	102	114	141	
2	Boston Peakview Detention Outflow	62+38	0.1	33	46	78	Overland flows were calculated by subtracting the capacity of the 36" RCP outlet.
3	West of S Boston Street	57+25	55	152	196	298	
4	Caley Detention Inflow	49+59	137	366	452	713	
5	U/S E Caley Avenue	46+24	82	291	412	672	
6	D/S E Caley Avenue	44+72	84	306	433	706	
7	E Fair Avenue	35+73	90	334	476	774	
8	Tommy Davis Park at Maplewood Avenue	27+47	95	365	526	858	
9	Tommy Davis Detention Inflow	18+96	113	437	650	1060	
10	Orchard Road at Tommy Davis Park (Tommy Davis Detention)	16+00	71	402	632	1050	
11	Confluence with Goldsmith Gulch	7+09	72	416	649	1091	
Goldsmith Gulch							
12	North of E Arapahoe Road	395+85	19	40	48	67	
13	Approx. 450' U/S of E Peakview Avenue	389+24	59	127	155	216	
14	Avery Park Apartment/ Appletree Apartment	376+71	78	180	219	311	
15	U/S of E Caley Avenue	369+99	100	248	304	435	Use flows from the downstream Design Point JUNCT_U-700
16	Arapahoe Lake	360+98	151	419	521	760	
17	D/S of E Maplewood Ave.	353+77	0.1	29	116	333	Overland flow excludes the 8'x4' CBC capacity.
18	E Pinewood Avenue	345+44	37	179	252	543	Overland flow excludes the 8'x4' CBC capacity.
19	D/S of S Dayton St	342+61	206	626	731	1081	
20	U/S Orchard Road	336+54	79	309	536	911	A rate curve is used for internal control at this cross-section.
21	Orchard Road	335+96	0.1	205	430	803	Overland flows exclude the capacity of the 36" CMP Outlet.
22	D/S Orchard Road	334+96	86	336	578	989	
23	Goldsmith Drive	327+75	97	366	625	1081	
24	Downstream of West Fork Confluence	319+83	159	774	1270	2141	
25	Upstream of Orchard Hills Detention	317+37	169	811	1328	2247	
26	Pedestrian Trail (Berm of Orchard Hills Detention)	314+34	169	802	1275	2218	
27	340' u/s of E Berry Ave	309+15	175	816	1295	2264	Use flows from the downstream Design Point JUNCT_U-200

Hydrologic Design Points of EPA SWMM 5.0 and Flow Diversion/Subtraction

Item No.	Hydrology Reference Locations	Design Points/ Conveyance Elements	Surface Flow Subtraction/Addition per Culvert Capacity/Flow Diversion/Hydrograph Calculation				Notes
			Q_{10}	Q_{50}	Q_{100}	Q_{500}	
West Fork Goldsmith Gulch							
1	Boston Peakview Detention Inflow	DP_Boston_Peakview	-	-	-	-	
2	Boston Peakview Detention Outflow	OUTLET_Peakview	55	55	55	55	36" RCP capacity 55 cfs was calculated assuming pipe slope 0.005.
3	S Boston Street (D/S Boston Peakview Detention)	JUNCT_U-515	-	-	-	-	
4	Caley Detention Inflow	DP_Caley	-	-	-	-	
5	E Caley Avenue (D/S Caley Detention)	OUTLET_Caley	-	-	-	-	
6	D/S E Caley Avenue	JUNCT_U-450	-	-	-	-	
7	E Fair Avenue	JUNCT_U-440	-	-	-	-	
8	Tommy Davis Park at Maplewood Avenue	JUNCT_U-430	-	-	-	-	
9	Tommy Davis Detention Inflow	DP_Tommy	-	-	-	-	
10	Orchard Road at Tommy Davis Park (D/S Tommy Davis Detention)	OUTLET_Tommy	-	-	-	-	
11	Confluence with Goldsmith Gulch	JUNCT_U-400	-	-	-	-	
Goldsmith Gulch							
12	Arapahoe Road	JUNCT_U-770	-	-	-	-	
13	E Peakview Avenue	JUNCT_U-740	-	-	-	-	
14	Avery Park Apartment/ Appletree Apartment	JUNCT_U-730	-	-	-	-	
15	S Elmira Cir W (u/s of Arapahoe Lake)	JUNCT_U-700	-	-	-	-	The corresponding D.P. at River Sta. 369+99 is JUNCT_U-710, however, the JUNCT_U-700 was used instead because of similar flows.
16	E Maplewood Avenue	JUNCT_U-660	-	-	-	-	
17	E Maplewood Avenue	JUNCT_U-660	151	390	405	427	8'x4' CBC capacity calculated by HY-8 (Appendix C).
18	E Pinewood Avenue	JUNCT_U-640	151	390	405	427	8'x4' CBC capacity calculated by HY-8 (Appendix C).
19	Silo Park Detention	DP_Silo	-	-	-	-	
20	U/S Orchard Road (Outlet of Silo Park Detention)	OUTLET_Silo	-	-	-	-	The discharges of OUTLET_Silo include flows through the 36" CMP and overland flows.
21	D/S Orchard Road (D/S Silo Park Detention Basin)	OUTLET_Silo	79	104	106	108	36" CMP capacity per Nomograph Chart 2B of HDS 5, FHWA, Revised May 2005
22	D/S Orchard Road (D/S Silo Park Detention Basin)	JUNCT_U-621	-	-	-	-	
23	Upstream of West Fork Confluence	JUNCT_U-600	-	-	-	-	
24	Downstream of West Fork Confluence	JUNCT_U-601	-	-	-	-	
25	Orchard Hills Detention Basin West Fork Goldsmith Gulch	DP_Orchard	-	-	-	-	
26	Pedestrian Trail (Berm of Orchard Hills Detention)	OUTLET_Orchard	-	-	-	-	
27	E Berry Avenue	JUNCT_U-190	-	-	-	-	The corresponding D.P. at River Sta. 309+15 is JUNCT_U-190, however, the JUNCT_U-200 was used instead because of similar flows.

HEC -RAS Flows and Flow Change Locations

Hydrologic Design Points of EPA SWMM 5.0 and Flow Diversion/Subtraction

Item No.	Flow Change Reference Locations	River Station	HEC-RAS Steady Flow Data Q_{10}	Q_{50}	Q_{100}	Q_{500}	Note	Item No.	Hydrology Reference Locations	Design Points/ Conveyance Elements	Surface Flow Subtraction/Addition per Culvert Capacity/Flow Diversion/Hydrograph Calculation Q_{10}	Q_{50}	Q_{100}	Q_{500}	Notes
Goldsmith Gulch								**Goldsmith Gulch**							
28	U/S of Yosemite Street	295+42	193	853	1351	2382		**28**	U/S of Yosemite Street	JUNCT_U-151	-	-	-	-	
29	D/S of Yosemite Street	292+57	221	880	1392	2519		**29**	D/S of Yosemite Street	JUNCT_U-155	-	-	-	-	
30	U/S E Prentice Avenue	285+38	243	901	1421	2592		**30**	E Prentice Avenue	JUNCT_U-111	-	-	-	-	
31	U/S Belleview Avenue	269+83	373	1025	1499	2787		**31**	Belleview Avenue	JUNCT_U-100	-	-	-	-	
32	D/S Belleview Avenue	268+01	433	1180	1547	2891		**32**	D/S Belleview Avenue	JUNCT_L-011	-	-	-	-	
33	E Chenango Avenue	255+24	470	1282	1620	2956		**33**	George Wallace Park South	JUNCT_L-065	-	-	-	-	
34	E Layton Avenue	249+59	511	1377	1741	2977		**34**	George Wallace Park South	JUNCT_L-045	-	-	-	-	
35	George Wallace Park S Detention	241+56	646	1696	2143	3230		**35**	George Wallace Park S Detention	DP_Wallace_S	-	-	-	-	
36	U/S E Temple Drive	240+92	473	743	830	2744	A rate curve is used for internal control at this cross-section.	**36**	E Temple Drive (Wallace Park S Detention Outlet)	OUTLET_Wallace_S	-	-	-	-	The discharges of OUTLET_Wallace_S include flows through the outlet structure and overland flows.
37	E Temple Drive (D/S Wallace Park S Detention)	240+29	0.1	0.1	0.1	1872	Overland flows exclude the capacity of the outlet pipes.	**37**	E Temple Drive (Wallace Park S Detention Outlet)	OUTLET_Wallace_S	473	743	830	872	Flows conveyed through the outlet pipes with restrictor plates. See rating curve calculation in Appendix B.
38	D/S E Temple Drive	238+70	473	743	830	2744		**38**	E Temple Drive (Wallace Park S Detention Outlet)	OUTLET_Wallace_S	-	-	-	-	
39	Wallace Park N Detention	234+66	527	796	897	2789		**39**	Wallace Park N Detention Inflow	DP_Wallace_N	-	-	-	-	
40	I-225 (D/S Wallace Park N Detention)	226+58	525	777	846	2768	A rate curve is used for internal control at this cross-section.	**40**	I-225 (D/S Wallace Park N Detention)	OUTLET_Wallace_N	525	777	846	1097	Flows conveyed through the outlet pipes with restrictor plates. See rating curve calculation in Appendix B.
41	D/S I-225	220+32	525	777	846	2768	Duplicate flow change location for more detailed information only	**41**	I-225 (D/S Wallace Park N Detention)	OUTLET_Wallace_N	-	-	-	-	
42	340' U/S of E Quincy Avenue	216+36	680	1238	1453	3390		**42**	U/S of E Quincy Avenue (TREX Outfall)	JUNCT_L-145	-	-	-	-	
43	590' U/S of E Princeton Ave/ E Mansfield Ave	200+67	739	1466	1763	3390	500-year was replaced with Junct_L-145 at final.	**43**	E Princeton Ave/ E Mansfield Ave	JUNCT_L-345	-	-	-	-	500-year discharge reduces from the upstream D.P. JUNCT_L-145.
44	E Nassau Ave/ E Lehigh Dr.	181+56	763	1553	1879	3403		**44**	E Nassau Ave/ E Lehigh Dr.	JUNCT_L-355	-	-	-	-	
45	S Rosemary Way/ E Kenyon Ave	171+34	798	1680	2050	3434		**45**	S Rosemary Way/ E Kenyon Ave	JUNCT_L-365	-	-	-	-	
46	U/S of Tiffany Plaza Culvert	161+91	824	1763	2165	3448		**46**	U/S of Tiffany Plaza Culvert	JUNCT_L-375	-	-	-	-	
47	Tiffany Plaza Southeast Corner	160+86	0.1	0.1	317	1442	Overland flows exclude the capacity of the Tiffany Plaza Culvert.	**47**	U/S of Tiffany Plaza Culvert	JUNCT_L-375	824	1763	1848	2006	Tiffany Plaza Culvert capacity by HY-8 (Appendix C).
48	U/S E Hampden Avenue	154+49	0.1	0.1	0.1	877	Overland flows that overtop E Hampden Ave. were calculated by subtracting the capacity of the Hampden Culverts from the total discharges u/s of Hampden Ave. which include flows at D.P. JUNCT_L-405 and the overland flows split from Southmoor Park Tributary (Item No. 49).	**48**	E Hampden Avenue	JUNCT_L-405	853	2125	2418	2928	Hampden Ave Culvert capacity by HY-8 (Appendix C).
49	D/S E Hampden Avenue	153+09	860	2137	2418	3805	The total discharges d/s of Hampden Ave. include flows at D.P. JUNCT_L-405 and the overland flows split from Southmoor Park Tributary (Item No. 49).	**49**	E Hampden Avenue	JUNCT_L-405	7	12	138	320	Southmoor Park Tributary overland flows diverted by Hampden Avenue were calculated per street capacity analysis using UD-Inlet Worksheet (Appendix C).

HEC -RAS Flows and Flow Change Locations

Hydrologic Design Points of EPA SWMM 5.0 and Flow Diversion/Subtraction

Item No.	Flow Change Reference Locations	River Station	HEC-RAS Steady Flow Data Q_{10}	Q_{50}	Q_{100}	Q_{500}	Note	Item No.	Hydrology Reference Locations	Design Points/ Conveyance Elements	Surface Flow Subtraction/Addition per Culvert Capacity/Flow Diversion/Hydrograph Calculation Q_{10}	Q_{50}	Q_{100}	Q_{500}	Notes
Goldsmith Gulch								**Goldsmith Gulch**							
50		144+36	860	2137	2418	3752		**50**	-	-	-	-	-	-	
51		143+95	860	2137	2418	3687		**51**	-	-	-	-	-	-	
52		143+33	860	2137	2418	3676	Hardwired 500-year flows are the results of Flow	**52**	-	-	-	-	-	-	
53		143+13	860	2137	2418	3668	Optimization calculation at the lateral structure 13657 and	**53**	-	-	-	-	-	-	
54		143+06	860	2137	2418	3659	14544 in HEC-RAS hydraulic model. 10-, 50- and 100-year	**54**	-	-	-	-	-	-	
55		142+79	860	2137	2418	3621	flows are contained in the channel.	**55**	-	-	-	-	-	-	
56		142+31	860	2137	2418	3544		**56**	-	-	-	-	-	-	
57	U/S E Eastman Avenue	140+76	885	2192	2501	3371		**57**	E Eastman Avenue	JUNCT_L-415	-	-	-	-	Flow change location per D.P. JUNCT_L-415
58	U/S E Eastman Avenue	140+76	885	2192	2501	3805	Supplemental information that shows the initial total flows at the River Station 140+76 before flow optimization calculation. The total discharges include flows at D.P. JUNCT_L-415 and the overland flows split from Southmoor Park Tributary (Item No. 49).	**58**	E Eastman Avenue	JUNCT_L-415					The 500-Year flow was replaced with the 500-year flow at D.P. JUNCT_L-405 because the 500-year flow decreases at D.P. JUNCT_L-415.
59	U/S face of E. Eastman Avenue Bridge	140+43	885	2192	2501	3347	Hardwired 500-year flow is the results of Flow Optimization calculation.	**59**	-	-	-	-	-	-	
60	D/S of Hutchinson Park Pedestrian Bridge	134+89	1157	2934	3290	4927	Use flows at the d/s Design Point JUNCT_L-445	**60**	E Cornell Avenue (Confluence with Southmoor Tributary)	JUNCT_L-445	-	-	-	-	High flows of Goldsmith Gulch and Southmoor Park Tributary comingle immediately downstream of the pedestrian bridge at Hutchinson Park.
61	Bible Park (1,250' d/s E. Cornell Ave.)	113+65	1174	2986	3370	5044		**61**	Bible Park (1,250' d/s E. Cornell Ave.)	JUNCT_L-491	-	-	-	-	
62	U/S of Bible Park Low Flow Crossing	101+37	1161	2983	3443	5207		**62**	Bible Park Detention Inflow	DP_Bible	-	-	-	-	
63	Bible Park Outlet Structure	94+66	1153	2415	2612	4234	A rate curve is used for internal control at this cross-section.	**63**	Bible Park Detention Outflow	OUTLET_BiblePark	-	-	-	-	The discharges of OUTLET_BiblePark include flows through the outlet structure and overland flows.
64	U/S of E. Yale Avenue	94+26	0.1	0.1	0.1	1316	Overland flows exclude outlet culvert capacity.	**64**	Bible Park Detention Outflow	OUTLET_BiblePark	1153	2415	2612	2918	Outlet culvert capacity per Nomograph Chart 11B of HDS 5, FHWA, Revised May 2005 (Appendix C)
65	D/S E. Yale Avenue	92+77	1171	2446	2642	4296		**65**	D/S E. Yale Avenue	JUNCT_L-505	-	-	-	-	
66	Approx. E. Harvard Ave/E. La Salle Pl	75+04	1197	2502	2704	4395		**66**	U/S of Iliff & Monaco Detention Diversion	JUNCT_L-580	-	-	-	-	
67	Approx. E Iliff Pl	65+92	1069	2102	2220	4075		**67**	E Iliff Avenue (D/S Iliff & Monaco Detention)	JUNCT_L-565	-	-	-	-	
68	E. Iliff Avenue	63+40	0.1	760	880	2710	Overland flows exclude Iliff/Evens Culvert capacities.	**68**	D/S of E Iliff Avenue	JUNCT-L-525	1091	1389	1394	1437	Iliff Culvert Capacities per LOMR Case No. 97-08-009P (Appendix C). Culvert capacity is approximate 1,200 cfs before overtops Iliff Avenue.
68a		59+57	0.1	758	877	2688	Overland flows exclude Iliff/Evens Culvert capacities. Main branch flows through parking lots, overflows to Monaco Pkwy. Flows shown at left from lateral weir optimization in HEC-RAS model used to calculate overflows, but note the hardwired main stem run conservatively retains the full flows.	**68a**	-	-	0	2	3	22	Overflows in Monaco Pkwy (subtracted from main branch flows). Hardwired flows per lateral weir optimization in HEC-RAS model.
68b		58+99	0.1	743	858	2618		**68b**	-	-	0	17	22	92	
68c		58+10	0.1	718	825	2419		**68c**	-	-	0	42	55	291	
68d		57+19	0.1	641	735	2159		**68d**	-	-	0	119	145	551	
68e		56+60	0.1	641	735	2153		**68e**	-	-	0	119	145	557	
68f	Memorial Way	54+31	0.1	760	880	2710	Main branch joins Monaco Pkwy at this location.	**68f**	Memorial Way	-	-	-	-	-	Main branch joins Monaco Pkwy at this location.
69	U/S of E Evans Avenue	48+88	0.1	793	914	2719	Overland flows exclude Iliff/Evens Culvert capacities.	**69**	Outlet of Iliff/Evans Culvert	JUNCT_L-616	1118	1389	1394	1437	
70	Outlet of Iliff/Evans Culvert	45+70	1118	2182	2308	4156		**70**	Outlet of Iliff/Evans Culvert	JUNCT_L-616	-	-	-	-	
71	U/S of E Jewell Avenue	37+71	1141	2226	2368	4156	The 500-Year flow was replaced with the 500-year flow at D.P. JUNCT_L-616 because the 500-year flow decreases at D.P. JUNCT_L-635.	**71**	U/S E Jewell Avenue	JUNCT_L-635	-	-	-	-	
72	E Jewell Avenue	34+53	0.1	73	169	1803	Overland flows exclude Jewell & Monaco Culverts capacities . The 500-Year flow was replaced with the 500-year flow at D.P. JUNCT_L-616 because the 500-year flow decreases at D.P. JUNCT_L-635.	**72**	U/S E Jewell Avenue	JUNCT_L-635	1141	2153	2199	2353	Culvert group capacities of Jewell Ave Culverts & Monaco Pkwy culverts are per LOMR Case No. 97-08-009P (Appendix C).

HEC -RAS Flows and Flow Change Locations

Hydrologic Design Points of EPA SWMM 5.0 and Flow Diversion/Subtraction

Item No.	Flow Change Reference Locations	River Station	HEC-RAS Steady Flow Data Q_{10}	Q_{50}	Q_{100}	Q_{500}	Note	Item No.	Hydrology Reference Locations	Design Points/ Conveyance Elements	Surface Flow Subtraction/Addition per Culvert Capacity/Flow Diversion/Hydrograph Calculation Q_{10}	Q_{50}	Q_{100}	Q_{500}	Notes
Goldsmith Gulch								**Goldsmith Gulch**							
73	D/S E. Jewell Avenue (Open channel at Skyline Acres Swim and Tennis Club)	34+10	195	568	679	2375	Total flows downstream E. Jewell Ave were calculated by subtracting the flows diverted through Monaco Pkwy culverts from the total flows at D.P. JUNCT_L-635. The 500-Year flow was replaced with the 500-year flow at D.P. JUNCT_L-616 because the 500-year flow decreases at D.P. JUNCT_L-635.	**73**	E Jewell Avenue	JUNCT_L-635	946	1658	1689	1781	Monaco Culverts Capacity per LOMR Case No. 97-08-009P(Appendix C).
74	D/S of Monaco Pkwy Culvert at Skyline Acres Swim and Tennis Club	24+39	1142	2126	2167	2557	Total discharges were calculated by subtracting the overland flows diverted onto Monaco St Pkwy from the flows at D.P. JUNCT_L-665, then plus the return flows split from Monaco St Pkwy that exceed the street capacity (Item No. 78). The 500-Year flow was replaced with the 500-year flow at D.P. JUNCT_L-616 because the 500-year flow decreases at D.P. JUNCT_L-665.	**74**	D/S Skyline Acres Swim and Tennis Club	JUNCT_L-665	0	103	206	1863	Overland flows diverted to Monaco St Pkwy are the results of culvert hydraulics calculated using HEC-RAS hydraulic model. A trial-and-error approach was used to determine the split flows. The method assumed an initial flow split to Monaco Pkwy then subtracted the split flow from the total discharge in the open channel downstream of the Monaco Pkwy Culvert at Skyline Acres Swim and Tennis Club. The process was repeated until the flow reductions in the downstream channel match the flows diverted Monaco St Pkwy.
75	D/S Mexico Avenue At Cook Park	17+15	1142	2134	2189	2842	Total discharges include main stem discharges from upstream (Item No. 74) plus split flow from Monaco Street Pkwy Overflow (Item No. 75).	**75**	-	-	0	8	22	285	Split flows from Monaco Street Pkwy Overflow to return to Goldsmith Gulch downstream of Mexico Avenue. The split flows were calculated using the lateral structure 1990 in the Monaco Pkwy Overflow HEC-RAS hydraulic model.
76	Cook Park	14+67	1142	2134	2189	2996	Total discharges include main stem discharges from upstream (Item No. 75) plus split flow from Monaco Street Pkwy Overflow (Item No. 76).	**76**	-	-	0	0	0	154	Split flows from Monaco Street Pkwy Overflow to return to Goldsmith Gulch at Cook Park. The split flows were calculated using the lateral structure 1700 in the Monaco Pkwy Overflow HEC-RAS hydraulic model.
77	Cook Park	9+17	1142	2134	2189	3248	Total discharges include main stem discharges from upstream (Item No. 76) plus split flow from Monaco Street Pkwy Overflow (Item No. 77).	**77**	-	-	0	0	0	252	Split flows from Monaco Street Pkwy Overflow to return to Goldsmith Gulch at Cook Park. The split flows were calculated using the lateral structure 1250 in the Monaco Pkwy Overflow HEC-RAS hydraulic model.
Monaco Pkwy Overflow (near Iliff Ave)								**Monaco Pkwy Overflow (near Iliff Ave)**							
200	D/S of E. Iliff Avenue	3+85	0.1	2	3	22	Monaco Pkwy overflow diversion (Item No. 68a-68e). Hardwired flows per lateral structure 6112 optimization in HEC-RAS model.	**200**	-	-					
201		3+65	0.1	17	22	92		**201**	-	-					
202		3+26	0.1	42	55	291		**202**	-	-					
203		2+36	0.1	119	145	551		**203**	-	-					
203		1+52	0.1	119	145	557		**203**	-	-					

HEC -RAS Flows and Flow Change Locations

Hydrologic Design Points of EPA SWMM 5.0 and Flow Diversion/Subtraction

Item No.	Flow Change Reference Locations	River Station	HEC-RAS Steady Flow Data				Note	Item No.	Hydrology Reference Locations	Design Points/ Conveyance Elements	Surface Flow Subtraction/Addition per Culvert Capacity/Flow Diversion/Hydrograph Calculation				Notes
			Q_{10}	Q_{50}	Q_{100}	Q_{500}					Q_{10}	Q_{50}	Q_{100}	Q_{500}	
Monaco Street Pkwy Overflow								**Monaco Street Pkwy Overflow**							
78	Monaco Pkwy Culvert at Skyline Acre Club	24+99	0.1	103	206	1863	Monaco Street Pkwy Overflow diversion (Item No. 74).	**78**	-	-	0	0	0	264	Split flows from Monaco Street Pkwy Overflow to return to Goldsmith Gulch downstream of the Monaco Pkwy Culvert at Skyline Acres Swim and Tennis Club. The split flows were calculated using the lateral structure 2490 in the Monaco Pkwy Overflow HEC-RAS hydraulic model.
79	D/S Monaco Pkwy Culvert at Skyline Acre Club	24+29	0.1	103	206	1636	Hardwired flows per lateral structure optimization calculation in HEC-RAS hydraulic model.	**79**	-	-	-	-	-	-	
80		23+51	0.1	103	206	1601	Same as above	**80**	-	-	-	-	-	-	
81		19+94	8	127	236	1646	Flows from upstream plus discharges from sub-basin L-670 (JUNCT_L-670).	**81**	Florida Ave storm outfall at Cherry Creek	JUNCT_L-670	-	-	-	-	
82	U/S E Mexico Ave	19+39	8	127	236	1643	Hardwired flows per lateral structure optimization calculation in HEC-RAS hydraulic model.	**82**	-	-	-	-	-	-	
83	D/S E Mexico Ave	17+91	8	119	214	1361	Same as above	**83**	-	-	-	-	-	-	
84		16+07	8	119	214	1318	Same as above	**84**	-	-	-	-	-	-	
85		15+10	8	119	214	1210	Same as above	**85**	-	-	-	-	-	-	
86		14+58	8	119	214	1205	Same as above	**86**	-	-	-	-	-	-	
87	D/S E Iowa Avenue	11+32	8	119	214	1068	Same as above	**87**	-	-	-	-	-	-	
88		9+82	8	119	214	956	Same as above	**88**	-	-	-	-	-	-	

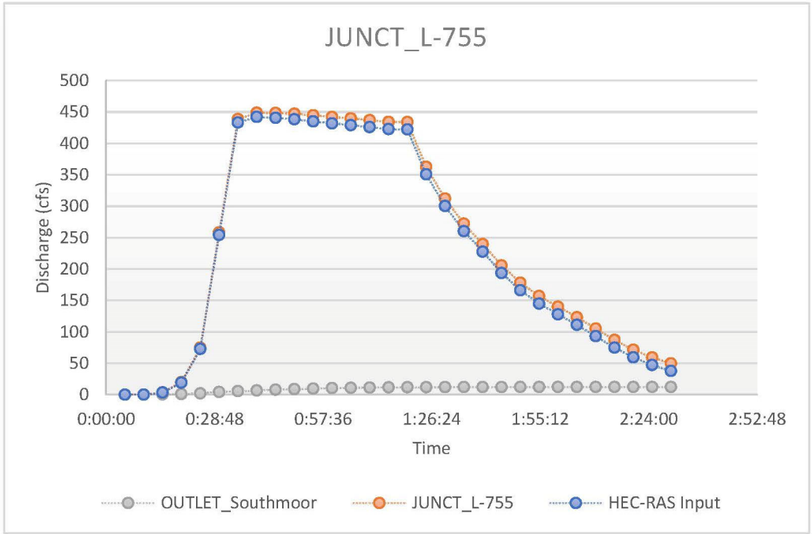
HEC -RAS Flows and Flow Change Locations

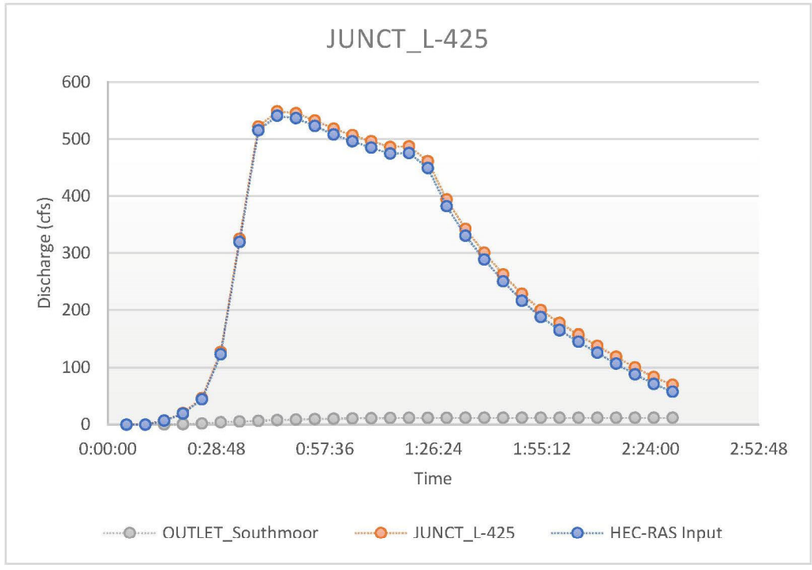
Hydrologic Design Points of EPA SWMM 5.0 and Flow Diversion/Subtraction

Item No.	Flow Change Reference Locations	River Station	HEC-RAS Steady Flow Data Q_{10}	Q_{50}	Q_{100}	Q_{500}	Note	Item No.	Hydrology Reference Locations	Design Points/ Conveyance Elements	Surface Flow Subtraction/Addition per Culvert Capacity/Flow Diversion/Hydrograph Calculation Q_{10}	Q_{50}	Q_{100}	Q_{500}	Notes
Southmoor Tributary								**Southmoor Tributary**							
89	Southmoor Detention Inflow	42+49	16	264	444	860		**88**	Southmoor Detention Inflow	DP_Southmoor	-	-	-	-	
90	Southmoor Outlet (D/S Southmoor Detention)	34+36	7	12	138	622		**90**	Southmoor Outlet (D/S Southmoor Detention)	OUTLET_Southmoor	-	-	-	-	
91	On Poplar St D/S (north) of the intersection of Hampden Ave and Poplar St	29+37	0.1	0.1	0.1	302	Discharges exclude overland flows that are diverted to E. Hampden Avenue. Assuming the discharges exceed the full street capacity will cross E. Hampden Avenue to north and return Southmoor Park Tributary downstream (north) of E. Hampden Avenue.	**91**	Southmoor Outlet (D/S Southmoor Detention)	OUTLET_Southmoor	7	12	138	320	Southmoor Park Tributary overland flows diverted by Hampden Avenue were calculated per street capacity analysis using UD-Inlet Worksheet (Appendix C).
92	At the end of Southmoor Park Detention outlet pipe (north of E Hampton Ave.)	25+70	242	442	479	745	Flows are calculated by subtracting the overland flows diverted to E. Hampden Avenue from the D.P. JUNCT_L-755.	**92**	E Hampton Avenue	JUNCT_L-755	0	442	479	745	The peak discharges at D.P. JUNCT_L-755 from the Baseline Hydrologic Report cannot be used directly in the HEC-RAS hydraulic model because of inclusion of the flows diverted to E. Hampden Avenue. The flows to be used in HEC-RAS hydraulic model are calculated by subtracting the overland flows diverted to E. Hampden Avenue from the D.P. JUNCT_L-755. The calculation was completed using hydrograph calculation (Appendix C).
93	U/S Eastman Avenue	16+87	242	442	479	1006	500-year flow increase due to the additional flow split from Goldsmith Gulch.	**93**	-	-	0	0	0	261	261 cfs overland flow split from Goldsmith Gulch per lateral structure flow optimization in 500-year event.
94	Confluence with Goldsmith Gulch	12+89	275	541	580	1268	500-year flow incudes the adjusted peak flow (Item No. 94) plus additional 450 cfs of overland flow diverted from Goldsmith Gulch per flow optimization at lateral structure 14544.	**94**	E Eastman Avenue	JUNCT_L-425	0	541	580	818	The peak discharges at D.P. JUNCT_425 from the Baseline Hydrologic Report cannot be used directly in the HEC-RAS hydraulic model because of inclusion of the flows diverted to E. Hampden Avenue. Flows were calculated by subtracting the overland flows diverted to E. Hampden Avenue from D.P. JUNCT_L-425. The calculation was completed using hydrograph calculation (Appendix C).
Hampden Avenue Overflow								**Hampden Avenue Overflow**							
95	Southmoor Outlet (D/S Southmoor Detention)	10+16	7	12	138	320	Flood water flows in Hampden Ave. only count street capacity, discharges exceeding street capacity overtop Hampden Ave. and flow north in Poplar St.	**95**	Southmoor Outlet (D/S Southmoor Detention)	OUTLET_Southmoor	0	0	0	302	Flows exceed the street capacity (Appendix C) overtop E. Hampden Avenue and flow north in Poplar St.

HEC-RAS Peak Flow and Flow Change Location
Southmoor Park Tributary
2-Percent Annual Chance Flood

	EPA-SWMM Output			HEC-RAS Input	
Reference Location	Hampden Avenue Downstream	Eastman Avenue Upstream	Southmoor Park Detention Outlet	Hampden Avenue Downstream	Eastman Avenue Upstream
River Station	25+70	15+83	34+36	25+70	15+83
Design Point/ Conveyance Element	Node JUNCT_L-755	Node JUNCT_L-425	Link OUTLET_Southmoor	Node JUNCT_L-755	Node JUNCT_L-425
Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0:05:00	0	0	0	0	0
0:10:00	0	0	0	0	0
0:15:00	4	7	0	3	7
0:20:00	20	20	1	19	19
0:25:00	75	46	2	73	44
0:30:00	258	127	4	254	123
0:35:00	438	325	5	433	319
0:40:00	449	522	7	442	515
0:45:00	448	548	8	441	541
0:50:00	447	545	9	438	536
0:55:00	445	532	10	435	523
1:00:00	442	518	10	432	508
1:05:00	440	507	11	429	496
1:10:00	437	496	11	426	485
1:15:00	434	486	12	423	474
1:20:00	434	487	12	422	475
1:25:00	362	461	12	351	449
1:30:00	312	394	12	300	382
1:35:00	272	342	12	260	330
1:40:00	239	300	12	227	288
1:45:00	206	262	12	194	250
1:50:00	178	228	12	166	216
1:55:00	157	200	12	145	188
2:00:00	140	177	12	128	165
2:05:00	123	157	12	111	145
2:10:00	105	138	12	93	126
2:15:00	87	119	12	75	107
2:20:00	71	100	12	59	88
2:25:00	59	83	12	47	71
2:30:00	50	70	12	38	58

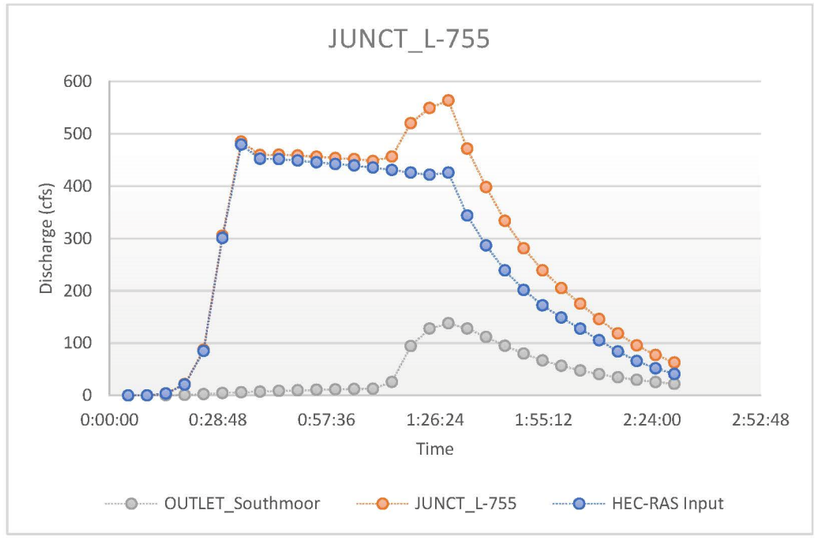


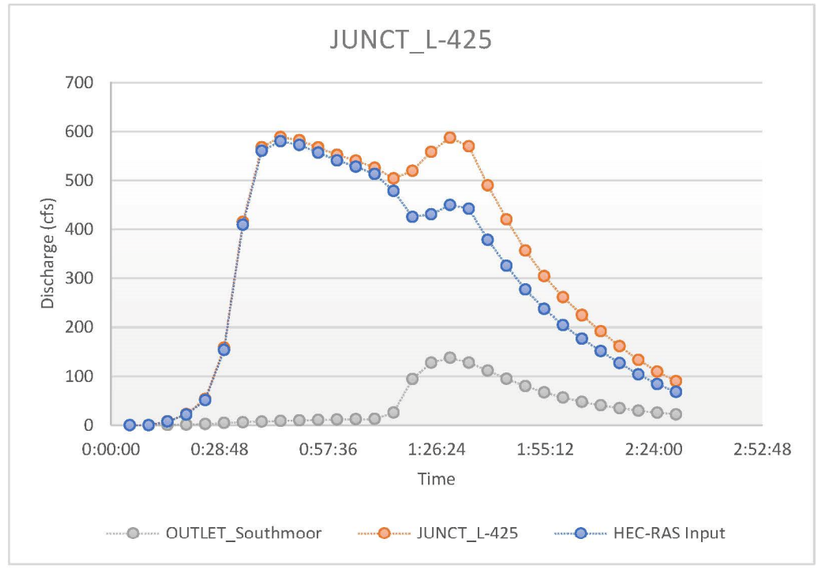


Note: 1. This table calculates peak discharges and flow change locations for HEC-RAS hydraulic model flow inputs.
2. The peak discharges from baseline hydrologic model cannot be used in HEC-RAS hydraulic model directly because it did not subtract flow due to diversion at E Hampden Avenue.

HEC-RAS Peak Flow and Flow Change Location
Southmoor Park Tributary
1-Percent Annual Chance Flood

	EPA-SWMM Output			HEC-RAS Input	
Reference Location	Hampden Avenue Downstream	Eastman Avenue Upstream	Southmoor Park Detention Outlet	Hampden Avenue Downstream	Eastman Avenue Upstream
River Station	25+70	15+83	34+36	25+70	15+83
Design Point/ Conveyance Element	Node JUNCT_L-755	Node JUNCT_L-425	Link OUTLET_Southmoor	Node JUNCT_L-755	Node JUNCT_L-425
Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0:05:00	0	0	0	0	0
0:10:00	0	0	0	0	0
0:15:00	4	8	0	3	7
0:20:00	22	22	1	21	22
0:25:00	87	53	2	85	51
0:30:00	305	158	4	301	154
0:35:00	485	415	6	479	409
0:40:00	460	568	7	452	560
0:45:00	460	589	9	451	580
0:50:00	459	582	10	449	572
0:55:00	456	567	11	446	557
1:00:00	454	552	12	442	541
1:05:00	452	540	12	439	528
1:10:00	448	526	13	435	513
1:15:00	456	504	26	431	478
1:20:00	520	519	94	426	425
1:25:00	549	558	128	422	430
1:30:00	564	587	138	426	450
1:35:00	472	570	128	344	442
1:40:00	398	490	112	287	378
1:45:00	334	420	95	239	325
1:50:00	281	356	80	201	277
1:55:00	239	304	67	172	237
2:00:00	205	261	56	149	205
2:05:00	175	225	48	127	177
2:10:00	146	192	41	105	151
2:15:00	118	162	35	84	127
2:20:00	95	134	30	66	104
2:25:00	77	109	25	52	84
2:30:00	63	90	22	41	68

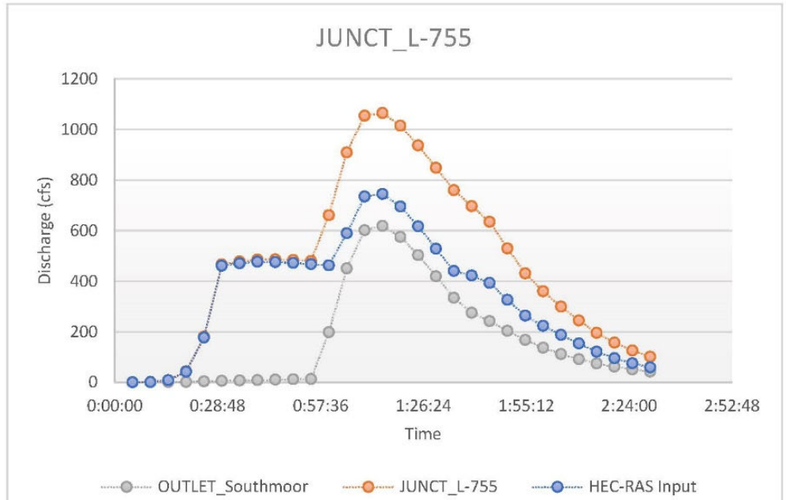


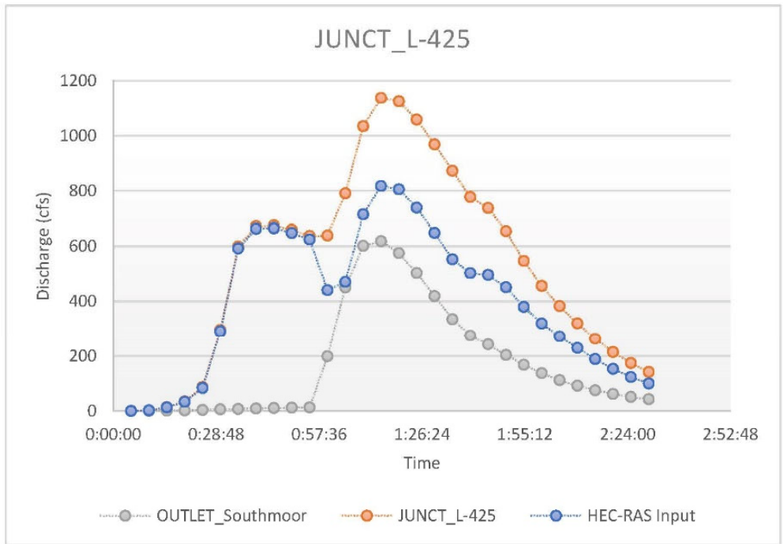


Note: 1. This table calculates peak discharges and flow change locations for HEC-RAS hydraulic model flow inputs.
2. The peak discharges from baseline hydrologic model cannot be used in HEC-RAS hydraulic model directly because it did not subtract flow due to diversion at E Hampden Avenue.

HEC-RAS Peak Flow and Flow Change Location
Southmoor Park Tributary
0.2-Percent Annual Chance Flood

	EPA-SWMM Output			Residual Flow	HEC-RAS Input	
Reference Location	Hampden Avenue Downstream	Eastman Avenue Upstream	Southmoor Park Detention Outlet	Hampden Avenue Downstream	Hampden Avenue Downstream	Eastman Avenue Upstream
River Station	25+70	15+83	34+36	-	25+70	15+83
Design Point/ Conveyance Element	Node JUNCT_L-755	Node JUNCT_L-425	Link OUTLET_Southmoor	- -	Node JUNCT_L-755	Node JUNCT_L-425
Time	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
0:05:00	0	0	0	0	0	0
0:10:00	1	2	0	0	1	2
0:15:00	8	13	1	0	8	13
0:20:00	43	34	1	0	42	33
0:25:00	180	86	3	0	177	83
0:30:00	467	296	5	0	461	291
0:35:00	478	599	7	0	471	592
0:40:00	486	672	9	0	477	663
0:45:00	486	675	10	0	476	665
0:50:00	484	660	12	0	472	648
0:55:00	480	638	13	0	467	625
1:00:00	661	639	198	0	463	441
1:05:00	910	791	451	130.74	590	471
1:10:00	1055	1035	602	281.74	735	715
1:15:00	1065	1138	619	298.59	745	818
1:20:00	1015	1126	575	255.38	695	806
1:25:00	937	1059	503	183.08	617	739
1:30:00	849	969	419	99.2	529	649
1:35:00	760	873	335	14.63	440	553
1:40:00	697	778	275	0	422	503
1:45:00	635	738	242	0	393	496
1:50:00	529	655	203	0	326	451
1:55:00	431	547	167	0	264	380
2:00:00	360	456	137	0	223	320
2:05:00	299	383	112	0	188	271
2:10:00	244	320	91	0	153	229
2:15:00	195	263	75	0	121	188
2:20:00	157	214	61	0	95	152
2:25:00	126	174	51	0	75	123
2:30:00	101	141	42	0	59	99





Note: 1. This table calculates peak discharges and flow change locations for HEC-RAS hydraulic model flow inputs.
2. The peak discharges from baseline hydrologic model cannot be used in HEC-RAS hydraulic model directly because it did not subtract flow due to diversion at E Hampden Avenue.
3. Residual flow is the excessive discharge beyond full street capacity that crosses E Hampden Avenue to north and return Southmoor Park Tributary downstream of E Hampden Avenue.

Appendix D – Floodplain and Floodway Data Tables

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)							NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR											
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Goldsmith Gulch _ Confluence with Cherry Creek to the E Arapahoe Road																								
Confluence with Cherry Creek	0+85	85	5384.93	1142		2134	2189	3248	5392.80		5394.50	5395.20	5395.20	142	5395.48	5395.20	5395.48	142	604	4.1	0.00	0.00	3	D/S limits of lateral structure
E Cherry Creek S Drive	1+25	125	Culvert																					
	1+59	159	5389.15	1142		2134	2189	3248	5394.60		5397.65	5397.94	5398.82	438	5398.30	5397.94	5398.30	64	486	4.5	0.00	0.00	3	
	2+94	294	5389.93	1142		2134	2189	3248	5394.95		5398.05	5398.33	5399.48	1086	5398.39	5398.33	5398.39	282	1202	1.8	0.00	0.00	2	Set FW to exclude IEFA
	3+81	381	Lat Struct																					U/S limits of lateral structure
	4+30	430	5390.27	1142		2134	2189	3248	5395.20		5397.89	5398.23	5399.44	1224	5398.56	5398.22	5398.56	271	648	3.4	-0.01	0.00	2	Set FW to exclude IEFA
	4+38	438	5392.41	1142		2134	2189	3248	5396.99		5397.87	5398.23	5399.46	455	5398.58	5398.23	5398.59	270	576	3.8	0.00	0.01	3	Set FW to exclude IEFA
Foot Bridge_Cook Park	4+51	451	Bridge																					
	4+58	458	5391.39	1142		2134	2189	3248	5397.51		5398.28	5398.43	5399.53	423	5398.71	5398.44	5398.72	270	618	3.5	0.01	0.01	3	Set FW to exclude IEFA
	5+95	595	5393.25	1142		2134	2189	3248	5397.76		5398.58	5398.68	5399.67	294	5399.29	5398.69	5399.29	211	439	5.0	0.01	0.00	2	Set FW to exclude IEFA
	6+69	669	5393.81	1142		2134	2189	3248	5398.68		5399.31	5399.35	5399.81	243	5400.08	5399.40	5400.08	243	427	5.1	0.05	0.00		D/S limits of lateral structure
	7+19	719	5394.26	1142		2134	2189	3248	5399.57		5400.28	5400.31	5400.75	298	5401.00	5400.31	5401.00	298	448	4.9	0.00	0.00		
	7+68	768	5394.66	1142		2134	2189	3248	5400.01		5400.61	5400.65	5401.29	240	5401.50	5400.65	5401.50	240	377	5.8	0.00	0.00		
	7+77	777	5394.67	1142		2134	2189	3248	5400.06		5400.67	5400.72	5401.37	234	5401.56	5400.72	5401.56	234	380	5.8	0.00	0.00		
	7+97	797	5396.01	1142		2134	2189	3248	5400.18		5401.26	5401.29	5401.74	257	5402.02	5401.34	5402.02	257	412	5.3	0.05	0.00		
	8+18	818	5395.91	1142		2134	2189	3248	5400.64		5401.79	5401.82	5402.26	252	5402.51	5401.86	5402.51	252	429	5.1	0.04	0.00		
	8+68	868	5395.79	1142		2134	2189	3248	5401.51		5402.27	5402.32	5402.89	332	5403.06	5402.32	5403.06	332	465	4.7	0.00	0.00		
	9+17	917	5395.76	1142		2134	2189	3248	5401.89		5402.91	5402.93	5403.44	338	5403.27	5402.93	5403.27	338	651	3.4	0.00	0.00		
	9+63	963	5394.11	1142		2134	2189	2996	5402.35		5402.96	5402.98	5403.51	312	5403.39	5402.98	5403.39	303	625	3.5	0.00	0.00		
Foot Bridge_Cook Park	9+75	975	Bridge																					
	9+80	980	5393.94	1142		2134	2189	2996	5402.59		5403.50	5403.54	5404.34	139	5404.17	5403.54	5404.17	139	459	4.9	0.00	0.00	3	
	10+00	1000	5395.68	1142		2134	2189	2996	5402.58		5403.52	5403.56	5404.35	112	5404.25	5403.56	5404.25	112	368	5.9	0.00	0.00		
	10+11	1011	5398.10	1142		2134	2189	2996	5402.51		5403.46	5403.51	5404.12	103	5404.72	5403.51	5404.72	103	275	8.0	0.00	0.00		
	10+62	1062	5398.12	1142		2134	2189	2996	5403.14		5404.25	5404.30	5404.94	96	5405.63	5404.30	5405.63	96	282	7.8	0.00	0.00		
	11+11	1111	5398.19	1142		2134	2189	2996	5403.76		5404.67	5404.72	5405.30	91	5405.97	5404.72	5405.97	91	283	7.7	0.00	0.00		
	11+68	1168	5398.51	1142		2134	2189	2996	5403.69		5405.19	5405.24	5406.30	93	5406.80	5405.24	5406.80	93	267	8.2	0.00	0.00		
	12+15	1215	Lat Struct																					U/S limits of lateral structure
	12+16	1216	5398.72	1142		2134	2189	2996	5404.40		5406.12	5406.20	5406.76	106	5407.12	5406.20	5407.12	106	349	6.3	0.00	0.00		
	12+67	1267	5399.07	1142		2134	2189	2996	5405.04		5406.63	5406.71	5407.54	114	5407.30	5406.71	5407.30	114	425	5.2	0.00	0.00		
	13+74	1374	5399.19	1142		2134	2189	2996	5405.22		5406.85	5406.93	5407.84	115	5407.55	5406.93	5407.55	115	418	5.2	0.00	0.00		
	14+67	1467	5399.48	1142		2134	2189	2996	5405.45		5407.05	5407.12	5408.03	108	5407.82	5407.12	5407.82	108	381	5.7	0.00	0.00		D/S limits of lateral structure
	15+65	1565	5399.76	1142		2134	2189	2842	5405.80		5407.54	5407.63	5408.71	153	5408.09	5407.63	5408.09	153	481	4.6	0.00	0.00		
	16+49	1649	5399.92	1142		2134	2189	2842	5406.00		5407.54	5407.62	5408.71	150	5408.47	5407.62	5408.47	150	337	6.5	0.00	0.00		
	16+96	1696	Lat Struct																					U/S limits of lateral structure
	16+97	1697	5400.51	1142		2134	2189	2842	5406.20		5407.66	5407.71	5408.44	54	5408.72	5407.71	5408.72	54	278	7.9	0.00	0.00		
	17+15	1715	5401.14	1142		2134	2189	2842	5406.17		5407.57	5407.62	5408.30	48	5409.01	5407.62	5409.01	48	239	9.2	0.00	0.00		
E Mexico Ave	17+52	1752	Culvert																					
	17+96	1796	5401.73	1142		2126	2167	2557	5407.86		5411.29	5411.41	5412.25	65	5412.20	5411.50	5412.28	65	312	7.0	0.09	0.08	4	
	18+81	1881	5402.09	1142		2126	2167	2557	5407.94		5411.33	5411.45	5412.25	44	5412.70	5411.54	5412.76	44	282	7.7	0.09	0.06		
	22+30	2230	5402.48	1142		2126	2167	2557	5409.51		5412.09	5412.19	5412.91	34	5414.14	5412.24	5414.16	34	240	9.0	0.05	0.02		
	23+63	2363	5403.12	1142		2126	2167	2557	5410.41		5413.34	5413.45	5414.37	37	5414.60	5413.48	5414.62	37	293	7.4	0.03	0.02		
	24+39	2439	5403.88	1142		2126	2167	2557	5410.71		5413.83	5413.95	5414.95	31	5414.79	5413.97	5414.81	31	295	7.4	0.02	0.02		
S Monaco Pkwy	25+54	2554	Culvert																					
	26+69	2669	5407.65	195		568	679	2375	5411.61		5415.79	5415.81	5417.38	177	5416.35	5416.13	5416.65	90	201	3.4	0.32	0.30		
	26+90	2690	5407.82	195		568	679	2375	5411.64		5415.82	5415.85	5417.74	188	5416.42	5416.15	5416.72	102	197	3.5	0.30	0.30		
	27+96	2796	5408.60	195		568	679	2375	5411.88		5416.15	5416.41	5418.29	393	5416.70	5416.57	5417.00	190	321	2.1	0.16	0.30	2	
	28+23	2823	5408.80	195		568	679	2375	5411.97		5416.28	5416.55	5418.36	371	5416.77	5416.69	5417.07	206	355	1.9	0.14	0.30	4	
Sky Acres Club Foot Bridge	28+28	2828	Bridge																					
	28+34	2834	5408.80	195		568	679	2375	5412.19		5416.44	5416.70	5418.44	381	5416.88	5416.97	5417.30	130	318	2.2	0.27	0.42	4	
	28+76	2876	5408.96	195		568	679	2375	5412.46		5416.60	5416.86	5418.58	385	5416.92	5417.23	5417.37	55	271	2.5	0.37	0.45	4	
	30+00	3000	5409.10	195		568	679	2375	5412.74		5416.64	5416.90	5418.64	370	5417.01	5417.28	5417.49	38	203	3.3	0.38	0.48	4	
	30+54	3054	5409.20	195		568	679	2375	5412.83		5416.63	5416.87	5418.62	347	5417.11	5417.30	5417.56	32	180	3.8	0.43	0.45	4,5	
Sky Acres Pedestrian Bridge	30+55	3055	Bridge																					
	30+75	3075	5409.25	195		568	679	2375	5412.85		5416.65	5416.93	5418.82	337	5417.29	5417.29	5417.68	27	152	4.5	0.36	0.39	4,5	
	31+10	3110	5409.82	195		568	679	2375	5413.10		5416.76	5417.06	5418.90	333	5417.35	5417.42	5417.73	27	162	4.2	0.36	0.38	4,5	
	33+54	3354	5411.22	195		568	679	2375	5413.98		5416.93	5417.24	5420.12	33	5417.90	5417.64	5418.18	33	129	5.3	0.40	0.28	5	
	34+10	3410	5413.47	195		568	679	2375	5414.62		5417.33	5417.74	5420.35	37	5418.15	5418.01	5418.37	37	147	4.6	0.27	0.22		
E Jewell Ave	34+53	3453	5420.28	0.1		73	169	1803	5420.33		5420.73	5420.87	5421.82	232	5421.01	5421.02	5421.22	110	47	3.6	0.15	0.21	4	
	35+10	3510	5413.89	1141		2226	2368	4156	5415.88		5420.64	5420.99	5422.09	236	5421.23	5420.99	5421.25	153	659	3.6	0.00	0.02	4	
	37+71	3771	5414.88	1141		2226	2368	4156	5419.81		5421.10	5421.25	5422.89	264	5422.82	5421.29	5422.82	118	354	6.7	0.04	0.00	2	
	40+71	4071	5416.17	1118		2182	2308	4156	5421.08		5422.35	5422.45	5424.34	99	5424.01	5422.54	5424.01	99	347	6.7	0.09	0.00		
	43+03	4303	5417.02	1118		2182	2308	4156	5422.36		5423.62	5423.75	5425.85	100	5425.34	5423.80	5425.34	100	339	6.8	0.05	0.00		
	44+48	4448	5417.54	1118		2182	2308	4156	5422.94		5424.23	5424.44	5426.02	106	5425.92	5424.44	5425.92	106	322	7.2	0.00	0.00		
	44+95	4495	5417.72	1118		2182	2308	4156	5423.30		5425.46	5425.67	5428.48	57	5427.74	5425.74	5427.74	57	228	10.1	0.07	0.00		
	45+44	4544	5418.22	1118		2182	2308	4156	5424.61		5425.66	5425.82	5429.30	37	5428.01	5425.86	5428.02	37	199	11.6	0.04	0.01		
	45+70	4570	5420.16	1118		2182	2308	4156	5424.54		5425.65	5425.84	5429.77	37	5428.36	5425.84	5428.36	37	183	12.6	0.00	0.00		
	45+91	4591	5427.27	0.1		793	914	2719	5427.35		5429.25	5429.40	5431.33	210	5429.83	5429.40	5429.83	210	189	4.8	0.00	0.00	3	
	46+41	4641	5427.96	0.1		793	914	2719	5428.04		5430.03	5430.15	5431.45	133	5430.74	5430.15	5430.74	133	153	6.0	0.00	0.00		
	47+15	4715	5428.68	0.1		793	914	2719	5428.78		5430.78	5430.97	5432.27	217	5431.49	5430.95	5431.49	138	159	5.7	-0.02	0.00	2,5	
	47+48	4748	5429.02	0.1		793	914	2719	5429.09		5431.28	5431.40	5432.69	286	5431.61	5431.37	5431.62	189	234	3.9	-0.03	0.01	3	

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)						NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR										
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
	47+77	4777	5429.62	0.1		793	914	2719	5429.65		5431.37	5431.50	5432.80	516	5431.65	5431.50	5431.67	214	282	3.3	0.00	0.02	3	
E Evans Ave	48+11	4811	5430.30	0.1		793	914	2719	5430.33		5431.55	5431.63	5432.67	337	5432.07	5431.63	5432.10	175	173	5.5	0.00	0.03	3	Smooth FW tranistion across roadway
	48+88	4888	5429.10	0.1		793	914	2719	5430.34		5431.92	5432.02	5432.61	156	5432.22	5432.02	5432.27	98	229	4.0	0.00	0.05		
	50+17	5017	5429.15	0.1		760	880	2710	5430.34		5432.08	5432.20	5433.57	321	5432.30	5432.20	5432.38	107	260	3.4	0.00	0.08	2	
	51+70	5170	5430.04	0.1		760	880	2710	5430.34		5432.05	5432.18	5433.59	208	5432.47	5432.16	5432.67	100	154	5.7	-0.02	0.20		
	53+43	5343	5430.44	0.1		760	880	2710	5430.53		5432.66	5432.77	5434.04	151	5433.33	5432.77	5433.39	102	139	6.3	0.00	0.06	3,5	Parking lot depression modeled as blocked obstruction to spill point
	54+31	5431	5431.04	0.1		760	880	2710	5431.11		5433.17	5433.31	5434.75	348	5433.68	5433.34	5433.76	166	176	5.0	0.03	0.08	3	
	56+60	5660	5434.43	0.1		760	880	2710	5434.46		5435.77	5435.83	5436.62	292	5436.21	5435.82	5436.26	200	178	4.9	-0.01	0.05	3,5	Adjusted FW for smooth transition
	57+19	5719	5434.68	0.1		760	880	2710	5434.73		5436.04	5436.11	5436.94	311	5436.42	5436.22	5436.47	211	226	3.9	0.11	0.05	3	D/S limits of lateral structure
	58+10	5810	5434.38	0.1		760	880	2710	5434.73		5436.34	5436.45	5437.54	234	5436.57	5436.47	5436.60	214	315	2.8	0.02	0.03	5	
	58+99	5899	5434.95	0.1		760	880	2710	5435.00		5436.43	5436.54	5437.72	324	5436.65	5436.56	5436.68	250	330	2.7	0.02	0.03	3	
	59+57	5957	5435.17	0.1		760	880	2710	5435.33		5436.67	5436.75	5437.72	295	5437.14	5436.75	5437.14	237	184	4.8	0.00	0.00	3	
	61+12	6112	Lat Struct																					U/S limits of lateral structure
	61+37	6137	5435.54	0.1		760	880	2710	5435.60		5437.72	5437.82	5438.86	245	5438.00	5437.82	5438.00	245	275	3.2	0.00	0.00		
	62+12	6212	5435.37	0.1		760	880	2710	5435.60		5437.82	5437.94	5439.05	262	5438.08	5437.94	5438.08	262	318	2.8	0.00	0.00		
	62+50	6250	5435.54	0.1		760	880	2710	5435.60		5437.85	5437.96	5439.10	353	5438.11	5437.96	5438.11	269	299	3.0	0.00	0.00	5	
	62+84	6284	5435.45	0.1		760	880	2710	5435.62		5437.96	5438.08	5439.30	636	5438.14	5438.04	5438.14	268	538	2.5	-0.04	0.00	3	Smooth FW transition across roadway
	63+12	6312	5437.16	0.1		760	880	2710	5437.18		5438.14	5438.21	5439.08	398	5438.56	5438.33	5438.70	232	193	4.6	0.12	0.14	3	
E Iliff Ave	63+40	6340	5436.88	0.1		760	880	2710	5437.18		5438.36	5438.41	5439.34	379	5438.73	5438.53	5438.85	200	209	4.2	0.12	0.12	3	
	63+81	6381	5429.08	1069		2102	2220	4075	5436.49		5438.39	5438.49	5439.33	510	5438.99	5438.49	5438.98	465	3299	4.1	0.00	-0.01	3	Set FW to exclude exist structures
	65+92	6592	5430.60	1069		2102	2220	4075	5436.82		5439.01	5439.13	5440.38	614	5439.33	5439.12	5439.33	557	5477	2.8	-0.01	0.00	3	Set FW to exclude exist structures
	67+25	6725	5431.49	1197		2502	2704	4395	5437.24		5439.14	5439.24	5440.50	674	5439.60	5439.24	5439.60	608	6094	3.6	0.00	0.00	3	Set FW to exclude exist structures
	69+62	6962	5432.31	1197		2502	2704	4395	5437.87		5439.74	5439.93	5440.90	644	5441.10	5439.93	5441.10	644	2771	6.3	0.00	0.00	3	
	70+04	7004	5432.60	1197		2502	2704	4395	5439.16		5440.60	5440.73	5441.76	153	5441.40	5440.73	5441.40	153	503	5.4	0.00	0.00	3	
Foot Bridge	70+12	7012	Bridge																					
	70+24	7024	5432.62	1197		2502	2704	4395	5439.31		5440.81	5440.96	5442.14	145	5441.68	5440.96	5441.68	145	499	5.4	0.00	0.00		
	71+42	7142	5433.40	1197		2502	2704	4395	5439.47		5440.93	5441.06	5442.11	110	5442.38	5441.06	5442.38	110	412	6.6	0.00	0.00		
	75+04	7504	5434.90	1197		2502	2704	4395	5440.79		5442.83	5443.08	5444.90	94	5444.55	5443.08	5444.55	94	410	6.6	0.00	0.00		
	78+35	7835	5436.31	1171		2446	2642	4296	5442.46		5444.74	5445.06	5446.86	94	5446.12	5445.06	5446.12	94	458	5.8	0.00	0.00		
	81+98	8198	5438.25	1171		2446	2642	4296	5443.98		5446.14	5446.42	5448.26	94	5447.80	5446.42	5447.80	94	402	6.6	0.00	0.00		
	86+50	8650	5440.12	1171		2446	2642	4296	5446.37		5448.40	5448.67	5450.47	88	5450.00	5448.67	5450.00	88	414	6.4	0.00	0.00		
	89+91	8991	5442.42	1171		2446	2642	4296	5447.77		5449.71	5449.94	5452.43	64	5452.49	5449.94	5452.49	64	287	9.2	0.00	0.00		
	91+89	9189	5442.87	1171		2446	2642	4296	5449.28		5452.18	5452.58	5454.83	91	5453.56	5452.58	5453.56	91	480	5.5	0.00	0.00		
	92+77	9277	5442.97	1171		2446	2642	4296	5450.11		5452.62	5452.96	5455.33	65	5453.79	5452.96	5453.79	65	446	7.3	0.00	0.00	3	
	93+13	9313	5456.97	0.1		0.1	0.1	1316	5457.00		5457.00	5457.00	5458.39	9	5457.01	5457.00	5457.01	9	0	0.7	0.00	0.00		
	93+56	9356	5456.92	0.1		0.1	0.1	1316	5457.01		5457.01	5457.01	5458.80	44	5457.01	5457.01	5457.01	44	2	0.1	0.00	0.00		
E Yale Ave	93+77	9377	5456.32	0.1		0.1	0.1	1316	5457.01		5457.01	5457.01	5458.96	117	5457.01	5457.01	5457.01	117	36	0.0	0.00	0.00		
	94+26	9426	5460.30	0.1		0.1	0.1	1316	5460.39		5460.39	5460.39	5462.62	2	5460.42	5460.39	5460.42	2	0	1.2	0.00	0.00		
	94+66	9466	5442.99	1153		2415	2612	4234	5460.39		5460.39	5461.08	5463.32	1099	5461.31	5461.08	5461.31	1099	3579	3.8	0.00	0.00	2	
	94+90	9490	5443.57	1161		2983	3443	5207	5460.43		5460.48	5461.15	5463.32	1113	5461.33	5461.15	5461.33	1113	4673	2.9	0.00	0.00	2	
	95+36	9536	5447.52	1161		2983	3443	5207	5460.44		5460.53	5461.21	5463.33	1041	5461.35	5461.21	5461.35	1041	4596	2.3	0.00	0.00	3	
	97+62	9762	5448.77	1161		2983	3443	5207	5460.46		5460.68	5461.38	5463.35	663	5461.42	5461.38	5461.42	663	2746	1.3	0.00	0.00		
	100+65	10065	5449.71	1161		2983	3443	5207	5460.45		5460.63	5461.36	5463.36	524	5461.58	5461.36	5461.58	524	1619	2.1	0.00	0.00		
	100+94	10094	5455.38	1161		2983	3443	5207	5460.46		5460.67	5461.45	5463.43	508	5461.62	5461.45	5461.62	508	1222	2.8	0.00	0.00		
Foot Bridge_Bible Park	101+16	10116	Bridge																					
	101+27	10127	5454.54	1161		2983	3443	5207	5460.50		5460.96	5461.53	5463.43	484	5461.89	5461.53	5461.89	484	1008	3.4	0.00	0.00		
	101+37	10137	5455.96	1161		2983	3443	5207	5460.51		5461.13	5461.64	5463.45	480	5461.94	5461.64	5461.94	480	941	3.7	0.00	0.00		
	105+25	10525	5456.18	1174		2986	3370	5044	5461.39		5462.96	5463.11	5463.98	442	5463.64	5463.11	5463.64	442	791	4.3	0.00	0.00	4	
	107+50	10750	5456.72	1174		2986	3370	5044	5462.39		5463.93	5464.26	5464.80	433	5465.00	5464.26	5465.00	433	828	4.1	0.00	0.00		
	109+08	10908	5457.02	1174		2986	3370	5044	5463.44		5464.94	5465.11	5465.61	340	5465.56	5465.11	5465.56	340	979	3.4	0.00	0.00		
	111+25	11125	5457.78	1174		2986	3370	5044	5463.72		5465.26	5465.49	5466.25	317	5466.27	5465.49	5466.27	317	746	4.5	0.00	0.00		
	112+13	11213	5457.86	1174		2986	3370	5044	5463.66		5465.60	5465.79	5466.64	311	5466.83	5465.79	5466.83	311	727	4.6	0.00	0.00	4	
	113+65	11365	5458.58	1174		2986	3370	5044	5464.70		5466.69	5466.94	5467.82	347	5467.62	5466.94	5467.63	347	785	4.3	0.00	0.01		
	117+45	11745	5458.83	1157		2934	3290	4927	5466.30		5467.93	5468.17	5469.00	256	5469.04	5468.17	5469.04	256	716	4.6	0.00	0.00		
	117+50	11750	5461.64	1157		2934	3290	4927	5466.25		5467.93	5468.28	5469.31	256	5469.06	5468.29	5469.06	256	674	4.9	0.01	0.00		
	121+31	12131	5462.07	1157		2934	3290	4927	5468.05		5470.05	5470.34	5471.04	188	5471.64	5470.34	5471.64	188	541	6.1	0.00	0.00		
	123+74	12374	5463.03	1157		2934	3290	4927	5469.30		5472.86	5473.15	5474.52	201	5475.03	5473.15	5475.03	201	721	5.5	0.00	0.00	3	
	124+48	12448	5463.17	1157		2934	3290	4927	5471.69		5474.89	5475.34	5476.86	438	5475.59	5475.34	5475.59	125	1018	3.2	0.00	0.00	2	
E Cornell Ave	126+16	12616	Culvert																					
	126+60	12660	5469.72	1157		2934	3290	4927	5472.47		5477.71	5478.44	5479.76	451	5478.85	5478.43	5478.85	372	1316	4.3	-0.01	0.00	3	Smooth FW tranistion across roadway
	126+96	12696	5469.77	1157		2934	3290	4927	5473.33		5477.42	5478.04	5479.49	409	5479.11	5478.04	5479.11	354	1079	4.5	0.00	0.00	3	
	128+41	12841	5470.38	1157		2934	3290	4927	5474.97		5478.16	5479.07	5480.25	326	5479.53	5479.07	5479.53	326	1232	2.7	0.00	0.00		
	128+79	12879	5473.58	1157		2934	3290	4927	5476.36		5478.43	5479.10	5480.50	374	5479.68	5479.10	5479.68	342	1008	3.3	0.00	0.00	2	
	131+46	13146	5473.96	1157		2934	3290	4927	5479.85		5480.37	5480.45	5481.41	533	5481.39	5480.47	5481.60	305	830	4.0	0.02	0.21	2	
	133+94	13394	5474.14	1157		2934	3290	4927	5480.01		5481.77	5482.07	5483.11	302	5483.46	5482.08	5483.46	302	672	4.9	0.01	0.00	4	
	134+33	13433	5476.96	1157		2934	3290	4927	5481.95		5483.54	5483.70	5484.45	322	5484.76	5483.78	5484.76	322	831	4.0	0.08	0.00		
	134+89	13489	5475.75	1157		2934	3290	4927	5482.47		5484.03	5484.29	5485.18	303	5485.50	5484.34	5485.50	303	790	4.2	0.05	0.00		
	135+76	13576	5475.78	885		2192	2501	3347	5482.98		5484.31	5484.43	5485.07	78	5486.32	5484.45	5486.33	78	305	8.2	0.02	0.01		D/S limits of lateral structure
Foot Bridge_Hutchinson Park	135+87	13587	Bridge																					
	135+95	13595	5475.90	885		2192	2501	3347	5483.54		5486.77	5487.11	5488.40	138	5487.87	5487.11	5487.87	138	572	4.4	0.00	0.00	3	
	136+57	13657	Lat Struct																					U/S limits of lateral structure

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)						NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR										
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
	137+44	13744	5478.00	885		2192	2501	3347	5483.95		5487.32	5487.76	5489.04	195	5488.20	5487.76	5488.20	169	756	3.3	0.00	0.00		
	139+01	13901	5479.10	885		2192	2501	3347	5484.03		5487.33	5487.84	5489.16	68	5490.28	5487.84	5490.28	68	304	8.2	0.00	0.00		
	139+53	13953	5479.76	885		2192	2501	3347	5486.13		5490.02	5490.61	5491.96	83	5490.95	5490.62	5490.96	83	679	4.6	0.01	0.01	3	D/S limits of lateral structure
E Eastman Ave	139+96	13996	Bridge																					
	140+43	14043	5480.74	885		2192	2501	3347	5488.01		5490.26	5491.40	5493.14	96	5491.73	5491.40	5491.73	96	680	4.2	0.00	0.00	3	
	140+76	14076	5480.91	885		2192	2501	3371	5487.91		5490.08	5491.31	5493.18	140	5491.79	5491.31	5491.79	106	537	4.7	0.00	0.00	2	
	141+90	14190	5481.31	860		2137	2418	3544	5488.08		5490.52	5491.60	5493.29	103	5491.93	5491.60	5491.93	103	584	4.1	0.00	0.00		
Foot Bridge	142+12	14212	Bridge																					
	142+31	14231	5481.38	860		2137	2418	3544	5488.14		5490.59	5491.65	5493.32	95	5492.03	5491.65	5492.03	95	553	4.4	0.00	0.00		
	142+79	14279	5481.00	860		2137	2418	3621	5488.13		5490.57	5491.63	5493.29	92	5492.10	5491.63	5492.10	92	512	4.7	0.00	0.00		
	143+06	14306	5480.94	860		2137	2418	3659	5488.05		5490.47	5491.56	5493.23	93	5492.17	5491.56	5492.17	93	461	5.2	0.00	0.00		
	143+13	14313	5483.05	860		2137	2418	3668	5487.89		5490.36	5491.52	5493.18	90	5492.21	5491.52	5492.21	90	419	5.8	0.00	0.00		
	143+33	14333	5483.00	860		2137	2418	3676	5487.86		5490.36	5491.51	5493.14	85	5492.27	5491.51	5492.27	85	396	6.1	0.00	0.00		
	143+76	14376	5482.73	860		2137	2418	3687	5488.26		5490.48	5491.56	5493.16	79	5492.41	5491.56	5492.41	79	373	6.5	0.00	0.00		
Foot Bridge	143+90	14390	Bridge																					
	143+95	14395	5482.73	860		2137	2418	3687	5488.55		5490.71	5491.55	5493.67	81	5492.53	5491.56	5492.53	81	352	6.9	0.01	0.00		
	144+36	14436	5483.34	860		2137	2418	3752	5488.57		5490.69	5491.54	5493.60	78	5492.73	5491.55	5492.73	78	321	7.5	0.01	0.00		
	145+44	14544	Lat Struct																					U/S limits of lateral structure
	145+45	14545	5483.63	860		2137	2418	3805	5489.52		5491.53	5491.94	5493.84	205	5493.12	5491.94	5493.12	76	325	7.4	0.00	0.00	2	
	145+58	14558	5484.21	860		2137	2418	3805	5489.63		5491.67	5492.08	5493.90	207	5493.17	5492.08	5493.17	76	329	7.3	0.00	0.00	2	
	147+09	14709	5484.40	860		2137	2418	3805	5489.99		5492.13	5492.53	5494.28	70	5493.74	5492.53	5493.74	70	309	7.8	0.00	0.00		
	147+77	14777	5484.49	860		2137	2418	3805	5490.49		5492.73	5493.12	5494.70	71	5494.05	5493.12	5494.05	71	349	6.9	0.00	0.00		
Foot Bridge	147+89	14789	Bridge																					
	147+95	14795	5484.51	860		2137	2418	3805	5490.51		5492.78	5493.17	5494.87	72	5494.12	5493.17	5494.12	72	343	7.1	0.00	0.00		
	148+42	14842	5485.19	860		2137	2418	3805	5490.72		5493.08	5493.48	5495.21	78	5494.26	5493.48	5494.27	78	379	6.4	0.00	0.01		
	151+13	15113	5486.22	860		2137	2418	3805	5491.23		5493.61	5494.01	5495.78	76	5495.11	5494.02	5495.11	76	326	7.4	0.01	0.00		
	152+21	15221	5486.96	860		2137	2418	3805	5491.95		5494.00	5494.38	5495.70	130	5496.13	5494.38	5496.13	130	368	9.2	0.00	0.00	2	
	153+09	15309	5487.42	860		2137	2418	3805	5493.14		5495.41	5495.74	5497.38	80	5496.72	5495.74	5496.72	80	347	7.0	0.00	0.00		
	153+26	15326	5497.32	0.1		0.1	0.1	877	5497.43		5497.43	5497.43	5499.05	1	5497.46	5497.43	5497.46	1	0	1.4	0.00	0.00		No floodway over Hamden Ave
E Hampden Ave	153+84	15384	5498.97	0.1		0.1	0.1	877	5498.99		5498.99	5498.99	5500.18	14	5499.01	5498.99	5499.01	14	0	1.0	0.00	0.00		No floodway over Hamden Ave
	154+49	15449	5497.75	0.1		0.1	0.1	877	5497.83		5497.83	5498.70	5500.46	184	5498.70	5498.70	5498.70	184	74	0.0	0.00	0.00		No floodway over Hamden Ave
	154+61	15461	5496.77	0.1		0.1	317	1442	5497.86		5497.86	5498.69	5500.45	225	5498.72	5498.69	5498.72	151	244	1.3	0.00	0.00	4	
	154+69	15469	5497.12	0.1		0.1	317	1442	5497.86		5497.86	5498.56	5500.39	127	5498.79	5498.56	5498.79	117	90	3.5	0.00	0.00	4	
	157+19	15719	5498.17	0.1		0.1	317	1442	5498.23		5498.23	5499.86	5501.02	158	5499.96	5499.86	5499.97	117	124	2.6	0.00	0.01		
	159+64	15964	5498.94	0.1		0.1	317	1442	5499.06		5499.06	5500.51	5501.89	154	5500.57	5500.51	5500.58	154	157	2.0	0.00	0.01		
	160+86	16086	5499.89	0.1		0.1	317	1442	5499.94		5499.94	5500.89	5502.21	127	5501.15	5500.89	5501.15	127	80	4.0	0.00	0.00		
	161+21	16121	5489.81	824		1763	2165	3448	5495.87		5500.06	5501.11	5502.43	134	5501.47	5501.11	5501.47	134	558	3.9	0.00	0.00		
	161+91	16191	5490.00	824		1763	2165	3448	5495.94		5500.20	5501.22	5502.52	88	5501.53	5501.22	5501.53	88	557	3.9	0.00	0.00		
	162+32	16232	5490.06	798		1680	2050	3434	5496.21		5500.35	5501.39	5502.73	96	5501.56	5501.39	5501.56	96	689	3.0	0.00	0.00		
	162+47	16247	5495.88	798		1680	2050	3434	5499.06		5500.31	5500.76	5502.69	54	5502.57	5500.76	5502.57	54	191	10.8	0.00	0.00		
	162+77	16277	5495.94	798		1680	2050	3434	5499.67		5501.08	5501.68	5502.79	68	5503.10	5501.69	5503.10	68	247	8.3	0.01	0.00		
	163+27	16327	5496.30	798		1680	2050	3434	5500.75		5502.26	5502.76	5504.47	57	5504.54	5502.81	5504.54	57	216	9.5	0.05	0.00		
	167+95	16795	5498.34	798		1680	2050	3434	5503.70		5505.47	5506.04	5507.83	156	5506.46	5506.04	5506.48	94	409	5.0	0.00	0.02	4	
	169+50	16950	5498.75	798		1680	2050	3434	5504.00		5505.73	5506.27	5507.87	102	5506.98	5506.30	5507.00	102	334	6.1	0.03	0.02	4	
	170+55	17055	5499.37	798		1680	2050	3434	5504.73		5506.07	5506.56	5508.03	78	5507.52	5506.58	5507.54	78	303	6.8	0.02	0.02		
S Rosemary Way	170+97	17097	Culvert																					
	171+34	17134	5499.99	798		1680	2050	3434	5504.28		5507.92	5508.42	5510.50	156	5509.29	5508.92	5509.61	84	411	5.6	0.50	0.32	2	Set FW to exclude Tamarac Dr
	172+00	17200	5500.83	763		1553	1879	3403	5505.43		5507.68	5508.54	5510.39	141	5509.59	5509.02	5509.82	81	327	5.7	0.48	0.23	4	Set FW to exclude Tamarac Dr
	173+84	17384	5502.10	763		1553	1879	3403	5507.77		5509.46	5509.90	5511.42	137	5511.24	5509.86	5511.24	87	267	7.1	-0.04	0.00	4	Set FW to exclude Tamarac Dr
	176+45	17645	5502.29	763		1553	1879	3403	5509.66		5511.26	5511.71	5512.78	89	5512.40	5511.72	5512.45	75	345	5.5	0.01	0.05		
	176+47	17647	5502.80	763		1553	1879	3403	5509.64		5511.25	5511.71	5512.76	89	5512.41	5511.71	5512.46	75	338	5.6	0.00	0.05		
	178+73	17873	5503.44	763		1553	1879	3403	5510.20		5511.82	5512.29	5513.67	73	5513.27	5512.35	5513.30	73	287	6.6	0.06	0.03		
	178+75	17875	5504.34	763		1553	1879	3403	5510.17		5511.83	5512.32	5514.06	73	5513.28	5512.39	5513.31	73	283	6.7	0.07	0.03		
	181+54	18154	5505.62	763		1553	1879	3403	5511.34		5512.90	5513.41	5515.24	67	5515.06	5513.42	5515.06	67	229	8.2	0.01	0.00		
	181+56	18156	5506.44	763		1553	1879	3403	5511.14		5513.08	5513.55	5515.37	68	5515.28	5513.55	5515.28	68	229	8.2	0.00	0.00		
	183+84	18384	5506.86	739		1466	1763	3390	5513.15		5514.91	5515.47	5517.23	69	5516.55	5515.47	5516.55	69	266	6.6	0.00	0.00		
	186+79	18679	5508.70	739		1466	1763	3390	5514.20		5515.94	5516.42	5518.84	50	5518.27	5516.42	5518.27	50	205	8.6	0.00	0.00		
	186+81	18681	5509.28	739		1466	1763	3390	5514.17		5516.06	5516.71	5519.60	53	5518.31	5516.71	5518.31	53	210	8.4	0.00	0.00		
	189+77	18977	5510.58	739		1466	1763	3390	5516.27		5517.94	5518.50	5520.65	48	5520.39	5518.50	5520.39	48	194	9.1	0.00	0.00		
	189+79	18979	5511.19	739		1466	1763	3390	5516.17		5517.91	5518.45	5520.80	47	5520.61	5518.45	5520.61	47	181	9.8	0.00	0.00		
	190+78	19078	5511.88	739		1466	1763	3390	5517.72		5519.86	5520.59	5523.73	66	5521.05	5520.59	5521.05	66	359	4.9	0.00	0.00		
	190+81	19081	5514.71	739		1466	1763	3390	5517.58		5519.48	5520.24	5523.55	61	5521.41	5520.25	5521.41	61	222	8.0	0.01	0.00		
	191+35	19135	5514.88	739		1466	1763	3390	5519.67		5521.38	5521.56	5524.52	58	5523.88	5521.56	5523.88	58	178	9.9	0.00	0.00		
	193+96	19396	5517.44	739		1466	1763	3390	5522.32		5523.97	5524.92	5525.82	67	5525.86	5524.92	5525.87	64	278	6.3	0.00	0.01	3	
E Princeton Ave	194+50	19450	Culvert																					
	194+83	19483	5519.82	739		1466	1763	3390	5522.93		5526.17	5527.29	5528.82	160	5527.90	5527.58	5528.14	43	298	5.9	0.29	0.24	2	
	194+93	19493	5520.54	739		1466	1763	3390	5523.98		5525.80	5527.13	5529.33	150	5528.00	5527.45	5528.23	58	263	6.7	0.32	0.23	4	
	195+80	19580	5521.53	739		1466	1763	3390	5525.62		5527.14	5527.45	5529.25	125	5528.51	5527.79	5528.56	125	321	5.5	0.34	0.05		
	195+85	19585	5523.55	739		1466	1763	3390	5526.32		5527.43	5527.68	5529.39	132	5528.61	5527.74	5528.61	132	280	6.3	0.06	0.00		
	196+79	19679	5524.13	739		1466	1763	3390	5527.97		5528.78	5529.07	5530.40	237	5529.39	5529.04	5529.37	237	400	4.4	-0.03	-0.02		
	198+19	19819	5525.07	739		1466	1763	3390	5529.58		5531.20	5531.43	5532.53	303	5532.34	5531.49	5532.33	303	325	5.4	0.06	-0.01	4	
	198+42	19842	5525.20	739		1466	1763	3390	5530.50		5532.16	5532.45	5533.28	360	5533.12	5532.45	5533.12	360	411	4.3	0.00	0.00	4	

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)							NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR											
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
Foot Bridge_Rosamond Park	198+54	19854	Bridge																					
	198+64	19864	5525.09	739		1466	1763	3390	5532.25		5533.09	5533.32	5534.28	380	5533.40	5533.32	5533.40	380	956	1.8	0.00	0.00		
	199+21	19921	5526.26	739		1466	1763	3390	5532.27		5533.13	5533.37	5534.34	361	5533.43	5533.37	5533.43	361	1006	1.8	0.00	0.00		
	200+67	20067	5526.60	739		1466	1763	3390	5532.23		5533.08	5533.32	5534.24	211	5533.64	5533.32	5533.64	211	498	3.5	0.00	0.00		
	201+52	20152	5527.65	680		1238	1453	3390	5532.33		5533.18	5533.46	5534.78	154	5534.30	5533.46	5534.30	154	273	5.3	0.00	0.00		
	202+14	20214	5527.84	680		1238	1453	3390	5532.87		5533.49	5533.72	5535.50	110	5534.76	5533.72	5534.76	110	228	6.4	0.00	0.00		
	202+47	20247	5527.99	680		1238	1453	3390	5533.19		5534.27	5534.60	5536.63	166	5535.07	5534.60	5535.07	166	343	4.3	0.00	0.00	2	
Foot Bridge_Rosamond Park	202+66	20266	Bridge																					
	202+81	20281	5527.99	680		1238	1453	3390	5534.09		5534.75	5534.95	5536.84	153	5535.41	5534.98	5535.42	153	339	4.3	0.03	0.01		
	203+36	20336	5529.41	680		1238	1453	3390	5533.86		5535.13	5535.49	5537.60	93	5536.66	5535.49	5536.66	93	197	7.4	0.00	0.00		
	203+78	20378	5530.07	680		1238	1453	3390	5534.80		5535.99	5536.26	5538.25	88	5537.46	5536.26	5537.46	88	204	7.1	0.00	0.00		
	204+41	20441	5530.41	680		1238	1453	3390	5535.82		5537.04	5537.46	5539.51	186	5537.87	5537.46	5537.87	186	394	3.7	0.00	0.00		
	205+66	20566	5531.02	680		1238	1453	3390	5536.31		5537.50	5537.84	5539.83	206	5538.38	5537.84	5538.38	206	368	4.0	0.00	0.00		
	207+44	20744	5532.74	680		1238	1453	3390	5537.57		5538.34	5538.63	5540.23	213	5539.03	5538.63	5539.03	213	402	3.6	0.00	0.00		
	208+71	20871	5534.00	680		1238	1453	3390	5537.92		5538.81	5539.07	5540.70	196	5539.68	5539.07	5539.68	196	295	4.9	0.00	0.00		
	210+09	21009	5535.92	680		1238	1453	3390	5540.16		5540.95	5541.10	5543.15	99	5542.10	5541.10	5542.10	99	196	7.4	0.00	0.00		
	211+84	21184	5537.36	680		1238	1453	3390	5541.42		5542.14	5542.40	5544.77	70	5543.50	5542.40	5543.50	70	185	8.0	0.00	0.00	3	
E Quincy Ave	212+61	21261	Culvert																					
	213+28	21328	5539.64	680		1238	1453	3390	5544.42		5547.03	5548.02	5552.01	219	5548.20	5548.02	5548.20	219	795	3.2	0.00	0.00	3	
	214+64	21464	5539.80	680		1238	1453	3390	5544.63		5547.22	5548.21	5552.35	270	5548.25	5548.21	5548.25	270	1087	1.3	0.00	0.00		
	216+36	21636	5539.80	680		1238	1453	3390	5544.74		5547.25	5548.23	5552.36	305	5548.29	5548.23	5548.29	194	841	1.7	0.00	0.00	4	
	218+76	21876	5539.84	525		777	846	2768	5545.22		5547.34	5548.30	5552.39	196	5548.34	5548.30	5548.35	196	630	1.3	0.00	0.01		
	220+32	22032	5539.98	525		777	846	2768	5545.66		5547.38	5548.31	5552.40	118	5548.39	5548.31	5548.39	118	435	2.0	0.00	0.00		
I-225	226+58	22658	5547.83	525		777	846	2768	5552.31		5555.13	5556.13	5559.93	359	5556.17	5556.13	5556.17	359	621	1.4	0.00	0.00	2	D/S limits of lateral structure
	228+89	22889	5548.64	527		796	897	2789	5552.48		5555.11	5556.12	5559.98	149	5556.21	5556.12	5556.21	149	466	1.9	0.00	0.00		
	230+89	23089	Lat Struct																					U/S limits of lateral structure
	230+90	23090	5549.58	527		796	897	2789	5553.51		5555.13	5556.12	5559.94	101	5556.32	5556.12	5556.32	101	301	3.0	0.00	0.00		
	232+10	23210	5550.12	527		796	897	2789	5554.23		5555.27	5556.19	5559.96	88	5556.41	5556.19	5556.41	88	274	3.3	0.00	0.00		
	234+66	23466	5551.12	527		796	897	2789	5555.22		5555.68	5556.25	5560.10	81	5556.87	5556.25	5556.87	81	179	5.0	0.00	0.00		
	236+38	23638	5551.70	473		743	830	2744	5556.05		5556.66	5556.74	5560.35	92	5557.39	5556.74	5557.39	92	161	5.1	0.00	0.00		
	237+73	23773	5552.25	473		743	830	2744	5556.57		5557.06	5557.18	5560.21	81	5558.00	5557.18	5558.00	81	143	5.8	0.00	0.00		
	238+70	23870	5552.74	473		743	830	2744	5557.17		5557.67	5557.80	5560.23	77	5558.38	5557.80	5558.38	77	151	5.5	0.00	0.00	4	
	239+35	23935	5574.46	0.1		0.1	0.1	1872	5574.49		5574.49	5574.49	5575.91	7	5574.50	5574.49	5574.50	7	0	1.0	0.00	0.00		
E Temple Dr	239+84	23984	5575.93	0.1		0.1	0.1	1872	5576.00		5576.00	5576.00	5577.47	27	5576.02	5576.00	5576.02	27	0	0.8	0.00	0.00		No FW at roadway
	240+29	24029	5574.72	0.1		0.1	0.1	1872	5576.02		5576.02	5576.02	5577.94	248	5576.02	5576.02	5576.02	248	191	0.0	0.00	0.00		No FW at roadway
	240+92	24092	5554.09	473		743	830	2744	5562.14		5571.74	5575.40	5577.82	323	5575.40	5575.40	5575.40	323	3384	0.3	0.00	0.00		
	241+56	24156	5554.71	646		1696	2143	3230	5562.06		5571.73	5575.40	5577.82	454	5575.40	5575.40	5575.40	454	4908	0.4	0.00	0.00		
	242+11	24211	5554.87	511		1377	1741	2977	5562.21		5571.74	5575.40	5577.83	544	5575.40	5575.40	5575.40	544	6218	0.3	0.00	0.00		
	242+18	24218	5555.95	511		1377	1741	2977	5562.20		5571.74	5575.40	5577.83	557	5575.40	5575.40	5575.40	557	6393	0.3	0.00	0.00		
	242+45	24245	5555.48	511		1377	1741	2977	5562.23		5571.75	5575.40	5577.83	568	5575.40	5575.40	5575.40	568	6681	0.3	0.00	0.00		
	242+55	24255	5555.41	511		1377	1741	2977	5562.23		5571.75	5575.40	5577.83	584	5575.40	5575.40	5575.40	584	6872	0.3	0.00	0.00		
	242+89	24289	5555.68	511		1377	1741	2977	5562.20		5571.74	5575.40	5577.83	615	5575.40	5575.40	5575.40	615	7258	0.2	0.00	0.00		
	243+71	24371	5556.21	511		1377	1741	2977	5562.21		5571.75	5575.40	5577.83	589	5575.41	5575.40	5575.41	589	7066	0.3	0.00	0.00		
	245+54	24554	5557.13	511		1377	1741	2977	5562.30		5571.75	5575.40	5577.83	429	5575.41	5575.40	5575.41	429	5196	0.3	0.00	0.00		
	245+55	24555	5557.77	511		1377	1741	2977	5562.29		5571.75	5575.40	5577.83	428	5575.41	5575.40	5575.41	428	5179	0.3	0.00	0.00		
	245+95	24595	5557.68	511		1377	1741	2977	5562.31		5571.75	5575.40	5577.83	411	5575.41	5575.40	5575.41	411	4848	0.4	0.00	0.00		
	245+96	24596	5558.25	511		1377	1741	2977	5562.32		5571.75	5575.40	5577.83	410	5575.41	5575.40	5575.41	410	4832	0.4	0.00	0.00		
	246+03	24603	5558.33	511		1377	1741	2977	5562.32		5571.75	5575.40	5577.83	406	5575.41	5575.40	5575.41	406	4774	0.4	0.00	0.00		
	246+45	24645	5558.76	511		1377	1741	2977	5562.28		5571.75	5575.40	5577.83	366	5575.41	5575.40	5575.41	366	4185	0.4	0.00	0.00		
	249+09	24909	5560.00	511		1377	1741	2977	5562.33		5571.74	5575.40	5577.82	309	5575.41	5575.40	5575.41	257	2336	0.8	0.00	0.00	4	Set FW to exclude Wabash St
	249+59	24959	5560.00	511		1377	1741	2977	5562.87		5571.74	5575.40	5577.82	307	5575.41	5575.40	5575.41	251	2208	0.8	0.00	0.00		Set FW to exclude Wabash St
	249+89	24989	5560.00	470		1282	1620	2956	5562.85		5571.73	5575.40	5577.81	316	5575.41	5575.40	5575.41	250	2019	0.8	0.00	0.00		Set FW to exclude Wabash St
	250+14	25014	5560.00	470		1282	1620	2956	5564.68		5571.54	5575.38	5577.80	320	5575.42	5575.37	5575.42	250	1322	1.2	-0.01	0.00		Set FW to exclude Wabash St
	250+40	25040	5565.44	470		1282	1620	2956	5567.46		5571.74	5575.39	5577.81	333	5575.42	5575.39	5575.42	249	1360	1.2	0.00	0.00		Set FW to exclude Wabash St
	251+21	25121	5566.00	470		1282	1620	2956	5568.20		5571.84	5575.41	5577.83	333	5575.43	5575.41	5575.43	247	1590	1.0	0.00	0.00		Set FW to exclude Wabash St
	252+86	25286	5567.00	470		1282	1620	2956	5568.89		5571.81	5575.40	5577.82	291	5575.44	5575.40	5575.44	249	1162	1.4	0.00	0.00	4	Set FW to exclude Wabash St
	255+24	25524	5566.80	470		1282	1620	2956	5570.00		5571.86	5575.41	5577.83	245	5575.47	5575.42	5575.47	245	1033	1.6	0.01	0.00		
	257+72	25772	5568.02	433		1180	1547	2891	5571.17		5572.27	5575.42	5577.80	152	5575.53	5575.42	5575.53	152	627	2.5	0.00	0.00		
	259+07	25907	5568.77	433		1180	1547	2891	5571.88		5572.85	5575.43	5577.82	158	5575.60	5575.43	5575.60	157	546	2.8	0.00	0.00	4	
	260+30	26030	5569.64	433		1180	1547	2891	5572.44		5573.51	5575.44	5577.79	116	5575.69	5575.44	5575.69	116	421	3.7	0.00	0.00	4	
	260+49	26049	5570.47	433		1180	1547	2891	5572.53		5573.55	5575.42	5577.72	93	5575.72	5575.43	5575.72	93	379	4.1	0.01	0.00		
	260+77	26077	5571.01	433		1180	1547	2891	5573.65		5575.18	5575.69	5577.24	54	5577.21	5575.69	5577.21	54	166	9.3	0.00	0.00		
	261+05	26105	5573.78	433		1180	1547	2891	5576.56		5579.17	5579.61	5581.02	93	5580.76	5579.69	5580.76	93	236	6.6	0.08	0.00		
	261+17	26117	5577.66	433		1180	1547	2891	5579.11		5580.09	5580.45	5581.42	115	5581.38	5580.48	5581.38	115	228	6.8	0.03	0.00		
	261+95	26195	5577.28	433		1180	1547	2891	5580.07		5581.30	5581.73	5583.06	83	5583.00	5581.73	5583.00	83	207	7.5	0.00	0.00		
	265+13	26513	5578.82	433		1180	1547	2891	5581.69		5583.03	5583.57	5585.18	98	5584.15	5583.57	5584.15	98	275	5.6	0.00	0.00		
	267+58	26758	5580.44	433		1180	1547	2891	5583.11		5584.10	5584.50	5585.77	77	5585.37	5584.50	5585.37	77	208	7.4	0.00	0.00		
	267+81	26781	5580.70	433		1180	1547	2891	5584.25		5586.01	5586.51	5587.89	66	5587.79	5586.51	5587.79	66	171	9.1	0.00	0.00		
	267+87	26787	5583.76	433		1180	1547	2891	5585.59		5586.72	5587.19	5588.59	69	5588.45	5587.19	5588.45	69	177	8.7	0.00	0.00		
	268+01	26801	5584.49	433		1180	1547	2891	5585.75		5587.27	5587.75	5589.16	74	5588.62	5587.75	5588.62	74	212	7.4	0.00	0.00	3	
E Belleview Ave	268+87	26887	Bridge																					
	269+53	26953	5585.19	373		1025	1499	2787	5586.73		5588.14	5589.16	5590.94	78	5589.70	5589.16	5589.70	78	266	5.8	0.00	0.00	3	

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)						NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR										
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
	269+83	26983	5585.22	373		1025	1499	2787	5587.01		5588.16	5588.78	5590.50	63	5590.10	5588.78	5590.10	63	165	9.1	0.00	0.00		
	270+19	27019	5585.33	243		901	1421	2592	5587.49		5588.97	5589.68	5591.02	74	5590.94	5589.74	5590.94	74	191	7.4	0.06	0.00		
	271+73	27173	5586.12	243		901	1421	2592	5588.68		5590.32	5591.05	5592.41	75	5592.39	5591.05	5592.39	75	202	7.0	0.00	0.00		
	272+76	27276	5586.28	243		901	1421	2592	5589.54		5591.34	5592.26	5593.85	80	5592.92	5592.26	5592.92	80	252	6.1	0.00	0.00	3	
E Crescent Pkwy	273+25	27325	Bridge																					
	273+69	27369	5586.54	243		901	1421	2592	5589.82		5591.85	5592.92	5594.86	69	5593.29	5592.92	5593.29	69	295	4.8	0.00	0.00		
	274+04	27404	5587.97	243		901	1421	2592	5589.89		5591.98	5593.11	5595.17	98	5593.33	5593.11	5593.33	98	398	3.6	0.00	0.00		
	274+40	27440	5590.78	243		901	1421	2592	5592.93		5594.69	5595.70	5597.44	44	5597.45	5595.75	5597.45	44	146	9.7	0.05	0.00		
	274+57	27457	5592.90	243		901	1421	2592	5595.61		5596.79	5597.47	5598.66	74	5598.67	5597.47	5598.67	74	194	7.3	0.00	0.00		
	274+70	27470	5593.08	243		901	1421	2592	5595.85		5597.49	5598.39	5600.07	112	5598.78	5598.39	5598.78	112	336	4.2	0.00	0.00		
	276+43	27643	5593.66	243		901	1421	2592	5596.29		5597.73	5598.63	5600.28	116	5599.10	5598.63	5599.10	116	316	4.5	0.00	0.00		
	277+40	27740	5594.06	243		901	1421	2592	5596.82		5598.01	5598.83	5600.44	111	5599.35	5598.83	5599.35	111	271	5.2	0.00	0.00		
	277+74	27774	5594.64	243		901	1421	2592	5597.23		5598.54	5599.29	5600.79	116	5599.57	5599.29	5599.57	116	331	4.3	0.00	0.00		
	280+05	28005	5596.13	243		901	1421	2592	5598.60		5600.34	5601.21	5602.73	134	5601.33	5601.21	5601.33	134	520	2.7	0.00	0.00		
	283+38	28338	5597.75	243		901	1421	2592	5600.25		5602.12	5603.10	5604.77	101	5603.30	5603.10	5603.30	101	402	3.5	0.00	0.00		
	283+49	28349	5600.74	243		901	1421	2592	5601.91		5602.91	5603.48	5604.49	92	5604.49	5603.48	5604.49	92	179	8.0	0.00	0.00		
	284+26	28426	5599.37	243		901	1421	2592	5603.74		5605.49	5606.36	5607.77	95	5606.68	5606.36	5606.68	95	357	4.5	0.00	0.00	3	
E Prentice Ave	284+83	28483	Bridge																					
	285+38	28538	5599.78	243		901	1421	2592	5604.39		5606.69	5607.92	5610.20	110	5608.07	5607.92	5608.07	88	473	3.0	0.00	0.00	3	
	287+44	28744	5603.11	221		880	1392	2519	5605.37		5607.63	5608.88	5611.13	144	5609.00	5608.88	5609.01	110	500	2.8	0.00	0.01		
	289+52	28952	5604.04	221		880	1392	2519	5607.12		5609.01	5610.12	5612.03	143	5610.32	5610.14	5610.36	95	383	3.6	0.02	0.04	4	
Foot Bridge_Isabella Greenwood Village	289+63	28963	Culvert																					
	289+73	28973	5604.10	221		880	1392	2519	5607.48		5609.07	5610.18	5612.06	140	5610.39	5610.27	5610.50	95	401	3.8	0.09	0.11	3	
	289+88	28988	5604.35	221		880	1392	2519	5607.65		5609.28	5610.34	5612.18	136	5610.55	5610.44	5610.67	90	373	3.7	0.10	0.12		
	289+91	28991	5606.72	221		880	1392	2519	5607.59		5609.21	5610.31	5612.16	134	5610.62	5610.38	5610.75	90	291	4.8	0.07	0.13		
	290+59	29059	5607.04	221		880	1392	2519	5609.52		5610.96	5611.66	5613.04	110	5612.05	5611.77	5612.16	83	288	4.8	0.11	0.11		
	290+95	29095	5607.30	221		880	1392	2519	5609.94		5611.61	5612.44	5613.81	124	5612.79	5612.50	5612.88	90	296	4.7	0.06	0.09		
	292+57	29257	5608.00	221		880	1392	2519	5611.47		5613.30	5614.17	5615.46	281	5614.26	5614.30	5614.43	137	515	2.7	0.13	0.17		
	294+78	29478	5610.41	193		853	1351	2382	5613.43		5615.38	5616.19	5617.19	60	5616.82	5616.37	5616.94	60	224	6.0	0.18	0.12		
S Yosemite St	295+15	29515	Culvert																					
	295+42	29542	5610.49	193		853	1351	2382	5613.52		5616.12	5617.64	5618.77	328	5618.14	5618.13	5618.52	86	371	4.9	0.49	0.38	2	
	298+06	29806	5611.00	175		816	1295	2264	5614.05		5616.85	5618.42	5619.27	260	5618.47	5618.79	5618.88	108	644	2.0	0.37	0.41		
	298+80	29880	5611.16	175		816	1295	2264	5614.64		5616.89	5618.45	5619.31	238	5618.50	5618.81	5618.93	105	492	2.6	0.36	0.43		
Foot Bridge	298+90	29890	Culvert																					
	299+01	29901	5611.08	175		816	1295	2264	5615.28		5616.79	5618.45	5619.34	236	5618.52	5618.85	5619.00	106	463	2.9	0.40	0.48	3	
	300+31	30031	5612.58	175		816	1295	2264	5615.46		5617.13	5618.53	5619.44	213	5618.70	5618.96	5619.19	110	368	3.5	0.43	0.49		
Foot Bridge	300+60	30060	Bridge																					
	300+78	30078	5612.67	175		816	1295	2264	5616.90		5618.05	5618.70	5619.57	151	5619.00	5619.10	5619.37	102	346	3.8	0.40	0.37	3	
	302+28	30228	5614.60	175		816	1295	2264	5617.37		5618.55	5619.22	5620.20	141	5619.80	5619.41	5620.05	99	247	5.2	0.19	0.25		
	303+51	30351	5615.41	175		816	1295	2264	5618.22		5619.70	5620.27	5621.23	183	5620.47	5620.51	5620.97	94	275	4.7	0.24	0.50		
	305+23	30523	5616.60	175		816	1295	2264	5618.82		5620.48	5621.55	5623.35	51	5623.21	5621.58	5623.71	28	115	11.2	0.03	0.50		
E Berry Ave	305+63	30563	Culvert																					
	306+05	30605	5616.56	175		816	1295	2264	5619.48		5624.17	5625.70	5626.86	135	5626.12	5626.19	5626.58	47	322	4.3	0.49	0.46	3	
	307+70	30770	5616.60	175		816	1295	2264	5620.20		5624.52	5626.22	5627.61	204	5626.26	5626.62	5626.75	92	538	2.4	0.40	0.49		
	309+02	30902	5616.63	175		816	1295	2264	5621.34		5624.46	5626.22	5627.63	194	5626.37	5626.70	5626.87	103	487	2.7	0.48	0.50		
	309+15	30915	5619.28	175		816	1295	2264	5621.11		5624.58	5626.26	5627.68	198	5626.39	5626.73	5626.89	93	430	3.0	0.47	0.50		
	310+19	31019	5618.73	169		802	1275	2218	5622.41		5624.69	5626.26	5627.65	134	5626.67	5626.76	5627.10	79	322	4.0	0.50	0.43		
	310+34	31034	5621.26	169		802	1275	2218	5622.88		5624.79	5626.28	5627.64	125	5626.72	5626.78	5627.13	82	305	4.2	0.50	0.41		
	312+33	31233	5620.18	169		802	1275	2218	5624.55		5626.30	5627.09	5628.20	107	5628.13	5627.09	5628.13	107	202	6.3	0.00	0.00		
	312+49	31249	5622.66	169		802	1275	2218	5624.64		5626.80	5627.71	5628.59	128	5628.55	5627.74	5628.55	128	236	5.4	0.03	0.00		
	313+55	31355	5623.61	169		802	1275	2218	5626.13		5628.55	5629.24	5629.90	158	5629.99	5629.25	5630.40	75	187	6.8	0.01	0.41		
	314+07	31407	5629.65	169		802	1275	2218	5630.84		5631.78	5632.33	5633.01	196	5633.03	5632.49	5633.41	108	190	6.7	0.16	0.38		
Spillway of Orchard Hill Pond	314+34	31434	5630.85	169		802	1275	2218	5631.81		5632.94	5633.55	5635.03	84	5634.60	5633.55	5634.60	78	160	8.0	0.00	0.00		
	314+53	31453	5629.97	169		811	1328	2247	5632.16		5633.91	5635.03	5636.17	219	5635.09	5635.03	5635.09	219	791	1.7	0.00	0.00		
	317+37	31737	5630.00	169		811	1328	2247	5632.20		5634.01	5635.13	5636.30	202	5635.27	5635.13	5635.27	202	567	2.3	0.00	0.00		
	319+11	31911	5630.04	159		774	1270	2141	5632.66		5634.55	5635.57	5636.73	153	5635.79	5635.57	5635.79	153	428	3.0	0.00	0.00		
Confluence with Goldsmith Gulch West Tributary	319+83	31983	5630.01	159		774	1270	2141	5633.13		5634.95	5635.92	5637.08	163	5636.27	5635.92	5636.27	163	397	3.2	0.00	0.00		
	321+03	32103	5631.19	97		366	625	1081	5633.88		5635.71	5636.64	5637.80	165	5636.87	5636.64	5636.87	165	273	2.3	0.00	0.00		
Pedestrian Bridge	321+10	32110	Bridge																					
	321+20	32120	5631.29	97		366	625	1081	5634.91		5636.19	5636.87	5637.93	173	5637.02	5636.87	5637.02	173	308	2.0	0.00	0.00		
	322+10	32210	5633.24	97		366	625	1081	5635.27		5636.34	5637.05	5638.05	121	5637.36	5637.05	5637.36	121	206	3.0	0.00	0.00		
	323+11	32311	5634.51	97		366	625	1081	5636.49		5637.75	5638.25	5638.86	112	5638.87	5638.46	5639.37	57	118	5.3	0.21	0.50		
	324+33	32433	5637.00	97		366	625	1081	5638.91		5639.72	5640.06	5640.66	92	5640.69	5640.25	5641.12	50	95	6.6	0.19	0.43		
	326+87	32687	5640.05	97		366	625	1081	5642.25		5643.46	5644.02	5644.66	103	5644.66	5644.02	5644.81	53	103	6.1	0.00	0.15		
	327+60	32760	5640.67	97		366	625	1081	5643.20		5644.42	5644.96	5645.60	102	5645.48	5645.14	5645.65	65	125	5.0	0.18	0.17		
Foot Bridge	327+68	32768	Bridge																					
	327+75	32775	5640.67	97		366	625	1081	5643.91		5645.28	5645.86	5646.62	106	5646.02	5646.17	5646.33	73	207	3.0	0.31	0.31		
	328+13	32813	5641.31	86		336	578	989	5644.00		5645.32	5645.92	5646.74	110	5646.17	5646.22	5646.44	74	183	3.2	0.30	0.27		
	329+86	32986	5643.30	86		336	578	989	5645.22		5647.34	5647.86	5648.55	92	5648.59	5647.88	5648.62	63	108	5.3	0.02	0.03		
	331+22	33122	5644.99	86		336	578	989	5647.98		5649.22	5649.66	5650.20	85	5650.25	5649.87	5650.61	58	100	5.8	0.21	0.36		
	331+45	33145	5646.85	86		336	578	989	5649.13		5649.82	5650.20	5650.75	90	5650.80	5650.57	5651.28	60	94	6.1	0.37	0.48		
	332+51	33251	5646.60	86		336	578	989	5649.89		5651.48	5651.93	5652.51	88	5652.55	5652.17	5652.96	57	103	5.6	0.24	0.41		

Notes in Column 23 are footnoted at bottom of table

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)							NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR											
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
	332+81	33281	5648.69	86		336	578	989	5650.84		5652.31	5652.73	5653.25	104	5653.30	5653.05	5653.80	58	102	5.7	0.32	0.50		
	333+39	33339	5648.73	86		336	578	989	5651.76		5653.12	5653.58	5654.09	112	5654.15	5653.75	5654.52	61	113	5.1	0.17	0.37		
	333+68	33368	5649.84	86		336	578	989	5652.39		5653.56	5653.94	5654.64	117	5654.40	5654.21	5654.90	64	106	5.5	0.27	0.50		
	334+60	33460	5651.54	86		336	578	989	5653.75		5655.28	5655.79	5656.42	115	5656.42	5655.95	5656.88	41	90	6.4	0.16	0.46		
	334+96	33496	5653.36	86		336	578	989	5654.46		5656.23	5656.84	5657.48	92	5657.53	5656.88	5658.01	33	77	7.5	0.04	0.48		
	335+49	33549	5670.19	0.1		205	430	803	5670.21		5670.99	5671.25	5671.54	176	5671.55	5671.29	5671.66	126	94	4.6	0.04	0.11		
	335+65	33565	5668.52	0.1		205	430	803	5670.24		5671.21	5671.57	5672.01	269	5671.58	5671.68	5671.70	163	431	1.0	0.11	0.12		
E Orchard Rd	335+96	33596	5669.00	0.1		205	430	803	5670.24		5671.21	5671.57	5672.01	276	5671.58	5671.69	5671.70	240	485	0.9	0.12	0.12		
	336+54	33654	5657.89	79		309	536	911	5670.24		5671.21	5671.57	5672.01	380	5671.57	5671.69	5671.69	380	2971	0.5	0.12	0.12	3	
	337+12	33712	5658.54	206		626	731	1081	5670.24		5671.21	5671.58	5672.02	350	5671.58	5671.69	5671.69	350	2707	0.4	0.11	0.11	3	
Foot Bridge_Silo Park	337+21	33721	Bridge																					
	337+28	33728	5658.16	206		626	731	1081	5670.24		5671.21	5671.58	5672.03	343	5671.58	5671.69	5671.69	343	2666	0.3	0.11	0.11	3	
	340+47	34047	5659.60	206		626	731	1081	5670.24		5671.22	5671.58	5672.03	262	5671.58	5671.70	5671.70	262	1835	0.4	0.12	0.12		
	341+24	34124	5660.00	206		626	731	1081	5670.24		5671.22	5671.58	5672.03	251	5671.59	5671.70	5671.70	251	1567	0.5	0.12	0.11		
	342+25	34225	5660.47	206		626	731	1081	5670.24		5671.22	5671.58	5672.03	176	5671.59	5671.70	5671.71	176	885	0.8	0.12	0.12		
Foot Bridge_Silo Park	342+32	34232	Bridge																					
	342+36	34236	5660.41	206		626	731	1081	5670.24		5671.22	5671.58	5672.04	153	5671.60	5671.70	5671.72	153	711	1.0	0.12	0.12		
	342+61	34261	5661.34	206		626	731	1081	5670.24		5671.22	5671.59	5672.04	77	5671.62	5671.70	5671.73	77	540	1.4	0.11	0.11		
	342+65	34265	5673.74	37		179	252	543	5673.97		5674.41	5674.59	5675.89	57	5675.01	5674.59	5675.01	57	48	5.2	0.00	0.00	5	
S Dayton St	343+12	34312	5673.00	37		179	252	543	5674.14		5674.86	5675.14	5676.58	252	5675.15	5675.14	5675.15	252	298	0.9	0.00	0.00		
	344+61	34461	5675.07	37		179	252	543	5675.75		5676.43	5676.67	5677.18	100	5677.02	5676.67	5677.02	100	68	4.4	0.00	0.00	3	
	345+44	34544	5675.51	37		179	252	543	5676.32		5676.89	5677.20	5677.72	188	5677.57	5677.20	5677.57	188	96	4.6	0.00	0.00	2	
	348+18	34818	5677.94	0.1		29	116	333	5678.03		5678.77	5679.07	5679.54	75	5679.21	5679.07	5679.21	75	43	2.7	0.00	0.00		
	351+57	35157	5680.04	0.1		29	116	333	5680.12		5680.58	5680.92	5681.49	56	5681.20	5680.92	5681.20	56	29	4.0	0.00	0.00		
	352+87	35287	5682.80	0.1		29	116	333	5682.85		5683.51	5683.88	5684.66	37	5684.25	5683.88	5684.25	37	24	4.8	0.00	0.00		
	353+47	35347	5684.22	0.1		29	116	333	5684.35		5685.41	5686.35	5687.37	94	5686.38	5686.35	5686.38	94	89	1.3	0.00	0.00	4	
	353+77	35377	5683.21	0.1		29	116	333	5684.35		5685.44	5686.43	5687.52	191	5686.43	5686.43	5686.43	191	355	0.3	0.00	0.00	4	
	353+85	35385	5674.51	151		419	521	760	5684.35		5685.44	5686.43	5687.52	200	5686.44	5686.43	5686.44	200	1004	0.5	0.00	0.00		
	354+36	35436	5674.74	151		419	521	760	5684.35		5685.44	5686.43	5687.52	109	5686.44	5686.43	5686.44	109	699	0.7	0.00	0.00		
	354+61	35461	5680.24	151		419	521	760	5684.34		5685.42	5686.41	5687.49	83	5686.45	5686.41	5686.45	83	344	1.5	0.00	0.00		
	354+81	35481	5680.44	151		419	521	760	5684.34		5685.42	5686.41	5687.49	69	5686.45	5686.41	5686.45	69	312	1.7	0.00	0.00		
	355+29	35529	5696.33	151		419	521	760	5696.98		5697.38	5697.50	5697.73	152	5697.88	5697.51	5697.88	152	113	4.6	0.01	0.00		
E Maplewood Ave	355+54	35554	5696.84	151		419	521	760	5697.35		5697.68	5697.79	5698.02	138	5698.19	5697.79	5698.19	138	105	5.0	0.00	0.00		
	355+98	35598	5693.78	151		419	521	760	5697.58		5698.13	5698.31	5698.67	229	5698.31	5698.31	5698.31	205	800	0.7	0.00	0.00		
	357+62	35762	5693.78	151		419	521	760	5697.58		5698.14	5698.31	5698.68	329	5698.31	5698.31	5698.32	299	1314	0.4	0.00	0.01		
	358+91	35891	5693.78	151		419	521	760	5697.57		5698.13	5698.29	5698.65	243	5698.33	5698.30	5698.33	215	953	1.4	0.01	0.00	3	
	359+14	35914	5688.54	151		419	521	760	5697.56		5698.07	5698.22	5698.52	205	5698.42	5698.22	5698.42	181	314	3.5	0.00	0.00	1,3	
Foot Bridge_Arapahoe Lake	359+29	35929	Bridge																					
	359+35	35935	5688.81	151		419	521	760	5697.57		5698.10	5698.27	5698.60	48	5698.49	5698.27	5698.50	48	246	3.8	0.00	0.01	1,3	
	359+51	35951	5693.78	151		419	521	760	5697.61		5698.30	5698.53	5699.05	214	5698.56	5698.53	5698.56	214	723	1.4	0.00	0.00	3	
	360+98	36098	5693.78	151		419	521	760	5697.61		5698.31	5698.55	5699.09	384	5698.57	5698.55	5698.57	375	1256	1.1	0.00	0.00	3	
	362+01	36201	5693.78	100		248	304	435	5697.61		5698.31	5698.56	5699.10	74	5698.58	5698.56	5698.59	74	246	1.2	0.00	0.01		
	363+37	36337	5695.64	100		248	304	435	5697.35		5698.66	5698.89	5699.38	34	5699.67	5698.94	5699.67	34	48	6.4	0.05	0.00		
Foot Bridge_Arapahoe Lake	363+43	36343	Culvert																					
	363+51	36351	5695.86	100		248	304	435	5698.87		5699.90	5700.15	5700.62	34	5700.54	5700.16	5700.55	34	81	4.1	0.01	0.01	3	
	364+09	36409	5697.12	100		248	304	435	5699.69		5701.16	5701.66	5702.55	19	5702.92	5701.66	5702.92	19	38	7.9	0.00	0.00		
	366+46	36646	5699.51	100		248	304	435	5702.19		5703.45	5703.82	5704.54	39	5704.13	5703.82	5704.13	39	79	3.9	0.00	0.00		
	366+85	36685	5700.66	100		248	304	435	5702.99		5703.85	5704.09	5704.55	34	5704.87	5704.16	5704.87	34	53	5.7	0.07	0.00		
	367+78	36778	5704.03	100		248	304	435	5705.63		5706.48	5706.74	5707.19	32	5707.52	5706.74	5707.52	32	47	6.5	0.00	0.00	3	
E Caley Ave	368+40	36840	Culvert																					
	369+09	36909	5706.12	100		248	304	435	5707.58		5709.86	5710.82	5712.43	36	5711.03	5710.82	5711.03	36	101	3.1	0.00	0.00	3	
	369+57	36957	5706.68	100		248	304	435	5709.18		5710.17	5710.83	5712.54	57	5711.12	5710.83	5711.12	57	88	3.5	0.00	0.00		
Foot Bridge	369+65	36965	Bridge																					
	369+68	36968	5706.70	100		248	304	435	5710.21		5711.13	5711.37	5712.61	62	5711.53	5711.37	5711.53	62	116	2.6	0.00	0.00		
	369+99	36999	5706.91	100		248	304	435	5710.23		5711.14	5711.38	5712.60	55	5711.57	5711.38	5711.57	55	115	2.6	0.00	0.00		
	371+94	37194	5707.62	78		180	219	311	5710.22		5711.02	5711.18	5712.44	20	5712.05	5711.18	5712.05	20	34	6.4	0.00	0.00		
	372+15	37215	5712.34	78		180	219	311	5713.12		5713.59	5713.76	5714.11	45	5714.30	5713.76	5714.30	45	42	5.2	0.00	0.00		
	372+33	37233	5707.71	78		180	219	311	5713.44		5714.06	5714.24	5714.58	54	5714.36	5714.24	5714.36	54	116	1.9	0.00	0.00		
	373+20	37320	5709.03	78		180	219	311	5713.45		5714.07	5714.26	5714.61	40	5714.39	5714.26	5714.39	40	100	2.2	0.00	0.00		
	373+41	37341	5709.31	78		180	219	311	5713.45		5714.06	5714.25	5714.58	29	5714.41	5714.25	5714.41	29	80	2.7	0.00	0.00		
	373+58	37358	5713.00	78		180	219	311	5714.31		5715.02	5715.37	5715.72	40	5715.96	5715.37	5715.96	40	44	5.0	0.00	0.00		
	373+79	37379	5713.59	78		180	219	311	5714.83		5715.70	5715.91	5716.31	54	5716.06	5715.91	5716.06	54	78	2.8	0.00	0.00		
	374+93	37493	5715.16	78		180	219	311	5716.50		5716.88	5717.01	5717.24	61	5717.44	5717.06	5717.44	61	58	3.8	0.05	0.00		
	375+40	37540	5716.00	78		180	219	311	5717.76		5718.39	5718.54	5718.89	54	5719.18	5718.58	5719.18	54	55	5.0	0.04	0.00	3	
	375+69	37569	5716.43	78		180	219	311	5718.20		5718.80	5718.95	5719.15	33	5719.33	5718.96	5719.34	18	44	5.0	0.01	0.01	3	
Foot Bridge	375+78	37578	Culvert																					
	375+87	37587	5716.02	78		180	219	311	5718.45		5719.45	5719.80	5720.71	22	5719.94	5719.80	5719.94	21	73	3.0	0.00	0.00	3	
	376+14	37614	5716.01	78		180	219	311	5718.47		5719.49	5719.83	5720.75	20	5719.99	5719.84	5719.99	20	70	3.1	0.01	0.00		
	376+34	37634	5720.47	78		180	219	311	5721.59		5722.10	5722.25	5722.54	38	5722.78	5722.27	5722.78	38	40	5.5	0.02	0.00		
	376+71	37671	5720.97	78		180	219	311	5722.50		5723.09	5723.34	5723.80	20	5724.15	5723.37	5724.15	20	32	6.9	0.03	0.00		
	377+72	37772	5722.40	59		127	155	216	5724.58		5725.51	5725.85	5726.28	16	5726.65	5725.85	5726.65	16	23	6.9	0.00	0.00		
	379+38	37938	5724.40	59		127	155	216	5726.92		5727.99	5728.24	5728.74	12	5728.64	5728.24	5728.64	12	31	5.0	0.00	0.00		

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)						NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR										
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
	379+66	37966	5724.69	59		127	155	216	5727.12		5728.26	5728.56	5729.16	14	5728.79	5728.56	5728.79	14	42	3.7	0.00	0.00		
	379+90	37990	5728.81	59		127	155	216	5730.39		5731.07	5731.30	5731.73	15	5732.09	5731.30	5732.09	15	22	7.0	0.00	0.00		
	380+20	38020	5728.97	59		127	155	216	5731.25		5731.94	5732.18	5732.68	24	5732.62	5732.18	5732.62	24	31	4.9	0.00	0.00		
	381+83	38183	5730.97	59		127	155	216	5733.32		5734.04	5734.23	5734.48	12	5734.93	5734.23	5734.93	12	24	6.5	0.00	0.00		
	382+83	38283	5732.07	59		127	155	216	5734.15		5735.26	5735.59	5736.28	22	5735.75	5735.59	5735.75	22	49	3.2	0.00	0.00	3	
E Peakview Ave	384+00	38400	Culvert																					
	384+82	38482	5735.88	59		127	155	216	5738.12		5739.44	5739.85	5741.03	41	5739.88	5739.85	5739.88	41	107	1.5	0.00	0.00	3	
	385+38	38538	5738.82	59		127	155	216	5739.98		5740.59	5740.78	5741.17	22	5741.48	5740.84	5741.48	22	28	5.6	0.06	0.00		
	387+09	38709	5740.45	59		127	155	216	5741.61		5742.25	5742.49	5742.88	21	5743.19	5742.49	5743.19	21	26	6.0	0.00	0.00		
	388+90	38890	5742.44	59		127	155	216	5743.82		5744.30	5744.42	5744.70	21	5744.98	5744.42	5744.98	21	27	5.8	0.00	0.00		
	389+24	38924	5742.90	59		127	155	216	5744.21		5744.74	5744.94	5745.35	17	5745.68	5744.96	5745.68	17	24	6.6	0.02	0.00		
	389+93	38993	5754.94	19		40	48	67	5755.71		5756.11	5756.22	5756.50	9	5756.73	5756.24	5756.73	9	9	5.5	0.02	0.00		
	390+06	39006	5755.77	19		40	48	67	5756.75		5757.18	5757.30	5757.59	9	5757.81	5757.33	5757.81	9	9	5.6	0.03	0.00		
	391+52	39152	5759.33	19		40	48	67	5760.24		5760.68	5760.82	5761.11	8	5761.36	5760.83	5761.36	8	8	5.8	0.01	0.00		
E Arapahoe Rd	395+85	39585	5769.54	19		40	48	67	5770.33		5770.74	5770.88	5771.16	8	5771.42	5770.90	5771.42	8	8	5.7	0.02	0.00		
Goldsmith Gulch West Tributary _ Confluence with Goldsmith Gulch to Boston St/Peakview Ave Pond																								
Confluence with Goldsmith Gulch	0+54	54	5630.63	72		416	649	1091	5633.83		5635.84	5636.68	5637.80	109	5636.93	5636.68	5636.93	109	181	3.6	0.00	0.00		
Trail Crossing	0+79	79	Culvert																					
	0+95	95	5630.99	72		416	649	1091	5636.22		5637.51	5637.92	5638.40	121	5638.22	5638.38	5638.72	65	251	3.5	0.46	0.50		
	1+01	101	5631.04	72		416	649	1091	5636.24		5637.68	5638.15	5638.77	123	5638.25	5638.62	5638.75	65	271	2.4	0.47	0.50		
	1+02	102	5632.21	72		416	649	1091	5636.24		5637.68	5638.15	5638.77	122	5638.25	5638.62	5638.75	65	264	2.5	0.47	0.50		
	1+98	198	5632.60	72		416	649	1091	5636.24		5637.71	5638.20	5638.85	102	5638.43	5638.68	5638.90	60	198	3.3	0.48	0.47		
	4+07	407	5633.81	72		416	649	1091	5636.33		5639.03	5639.50	5640.15	97	5640.20	5639.67	5640.68	46	106	6.1	0.17	0.48		
	4+10	410	5635.24	72		416	649	1091	5637.37		5639.28	5639.76	5640.36	106	5640.43	5639.90	5640.92	48	111	5.8	0.14	0.49		
	4+90	490	5636.15	72		416	649	1091	5638.71		5641.10	5641.72	5642.42	89	5642.51	5641.72	5642.70	55	118	5.5	0.00	0.19	4	
	6+93	693	5637.46	72		416	649	1091	5640.15		5642.65	5643.47	5644.29	107	5644.15	5643.49	5644.29	56	128	5.1	0.02	0.14		
Foot Bridge	7+00	700	Bridge																					
	7+09	709	5637.63	72		416	649	1091	5640.34		5643.82	5644.23	5644.92	121	5644.46	5644.67	5644.94	56	187	3.5	0.44	0.48		
	8+84	884	5638.85	71		402	632	1050	5642.06		5645.06	5645.65	5646.35	98	5646.36	5645.71	5646.67	52	107	5.9	0.06	0.31		
	8+87	887	5640.53	71		402	632	1050	5642.49		5645.36	5645.86	5646.45	114	5646.51	5645.96	5646.91	52	112	5.7	0.10	0.40		
	10+71	1071	5641.49	71		402	632	1050	5644.27		5646.73	5647.34	5648.09	98	5648.04	5647.77	5648.40	52	127	5.0	0.43	0.36	4	
	10+76	1076	5642.18	71		402	632	1050	5643.97		5647.11	5647.68	5648.28	103	5648.37	5647.69	5648.74	52	107	5.9	0.01	0.37		
	11+66	1166	5641.71	71		402	632	1050	5645.12		5647.68	5648.44	5649.23	126	5649.05	5648.69	5649.46	65	130	4.9	0.25	0.41	4	
	11+96	1196	5644.29	71		402	632	1050	5645.97		5648.57	5648.96	5649.44	129	5649.52	5649.15	5649.92	76	129	4.9	0.19	0.40		
	12+42	1242	5643.93	71		402	632	1050	5646.91		5649.11	5649.55	5650.15	126	5649.86	5650.02	5650.30	67	179	3.5	0.47	0.44		
Foot Bridge	12+62	1262	Bridge																					
	12+84	1284	5643.93	71		402	632	1050	5647.76		5649.58	5650.09	5650.67	123	5650.36	5650.32	5650.58	58	179	3.5	0.23	0.22		
	13+41	1341	5645.40	71		402	632	1050	5647.80		5649.67	5650.16	5650.64	45	5650.62	5650.39	5650.79	36	125	5.1	0.23	0.17	3	
E Orchard Rd	13+98	1398	Culvert																					
	14+55	1455	5645.88	71		402	632	1050	5648.19		5650.96	5652.47	5654.84	37	5652.67	5652.47	5652.67	36	179	3.5	0.00	0.00	3	
	14+61	1461	5647.14	71		402	632	1050	5648.11		5650.93	5652.47	5654.91	55	5652.67	5652.47	5652.67	55	186	3.5	0.00	0.00	3	
	15+19	1519	5659.97	71		402	632	1050	5660.15		5660.45	5660.60	5660.83	257	5660.89	5660.60	5660.89	257	147	4.3	0.00	0.00		
	16+00	1600	5654.00	71		402	632	1050	5660.15		5660.92	5661.15	5661.44	363	5661.15	5661.15	5661.15	363	1949	0.3	0.00	0.00		
	18+96	1896	5654.00	113		437	650	1060	5660.15		5660.92	5661.14	5661.44	221	5661.15	5661.14	5661.15	221	899	0.7	0.00	0.00		
	20+32	2032	5656.00	95		365	526	858	5660.15		5660.92	5661.14	5661.44	228	5661.16	5661.14	5661.16	228	549	1.0	0.00	0.00		
	21+09	2109	5657.00	95		365	526	858	5660.14		5660.92	5661.14	5661.44	189	5661.20	5661.14	5661.20	189	391	1.6	0.00	0.00		
Foot Bridge_Tommy Davis Park	21+28	2128	Bridge																					
	21+45	2145	5657.00	95		365	526	858	5660.17		5660.97	5661.22	5661.58	174	5661.28	5661.22	5661.28	174	344	1.7	0.00	0.00		
	21+75	2175	5658.00	95		365	526	858	5660.18		5661.00	5661.25	5661.61	165	5661.30	5661.25	5661.30	165	315	1.7	0.00	0.00		
	21+86	2186	5658.00	95		365	526	858	5660.19		5661.00	5661.26	5661.63	161	5661.31	5661.26	5661.31	161	305	1.7	0.00	0.00		
	23+43	2343	5659.00	95		365	526	858	5660.06		5660.94	5661.27	5661.78	88	5661.87	5661.31	5661.87	88	100	5.2	0.04	0.00		
	24+01	2401	5659.00	95		365	526	858	5660.60		5661.88	5662.45	5663.09	73	5663.18	5662.45	5663.18	73	104	5.0	0.00	0.00		
	24+89	2489	5660.00	95		365	526	858	5661.48		5662.83	5663.28	5663.90	57	5664.05	5663.28	5664.05	57	89	5.9	0.00	0.00		
	25+63	2563	5661.00	95		365	526	858	5662.32		5663.55	5663.96	5664.63	58	5664.50	5663.96	5664.50	57	100	5.3	0.00	0.00		
	26+02	2602	5661.00	95		365	526	858	5662.62		5663.89	5664.35	5665.12	67	5664.68	5664.35	5664.68	67	123	4.3	0.00	0.00		
	26+40	2640	5661.27	95		365	526	858	5662.79		5664.04	5664.50	5665.25	57	5664.91	5664.50	5664.91	57	108	4.9	0.00	0.00		
	26+85	2685	5662.00	95		365	526	858	5663.27		5664.25	5664.74	5665.64	35	5665.76	5664.74	5665.76	35	66	7.9	0.00	0.00		
	27+00	2700	5662.00	95		365	526	858	5663.52		5665.17	5665.87	5666.91	76	5666.11	5665.87	5666.11	76	158	3.9	0.00	0.00		
Foot Bridge	27+22	2722	Bridge																					
	27+47	2747	5663.00	95		365	526	858	5664.19		5665.62	5666.28	5667.36	136	5666.42	5666.28	5666.42	136	303	3.0	0.00	0.00	3	
	28+23	2823	5408.80	195		568	679	2375	5411.97		5416.28	5416.55	5418.36	371	5416.77	5416.69	5417.07	206	355	1.9	0.14	0.30		
	28+80	2880	5665.00	90		334	476	774	5666.20		5667.35	5667.81	5668.52	70	5667.98	5667.81	5667.98	70	150	3.2	0.00	0.00		
	29+05	2905	5664.00	90		334	476	774	5666.28		5667.50	5667.98	5668.75	87	5668.05	5667.98	5668.05	87	247	1.9	0.00	0.00		
	29+26	2926	5664.03	90		334	476	774	5666.30		5667.53	5668.02	5668.80	94	5668.09	5668.02	5668.09	94	239	2.0	0.00	0.00		
	29+64	2964	5666.00	90		334	476	774	5666.56		5667.61	5668.10	5668.89	98	5668.25	5668.10	5668.25	98	161	3.0	0.00	0.00		
	29+84	2984	5665.00	90		334	476	774	5666.84		5667.78	5668.25	5669.02	100	5668.33	5668.25	5668.33	100	209	2.3	0.00	0.00		
	30+07	3007	5665.84	90		334	476	774	5666.89		5667.86	5668.32	5669.09	101	5668.44	5668.32	5668.44	101	179	2.7	0.00	0.00		
	30+32	3032	5666.00	90		334	476	774	5667.23		5668.12	5668.53	5669.26	86	5668.68	5668.53	5668.68	86	162	3.0	0.00	0.00		
	30+56	3056	5665.00	90		334	476	774	5667.30		5668.27	5668.70	5669.43	71	5668.80	5668.70	5668.80	71	190	2.5	0.00	0.00		
	30+84	3084	5666.00	90		334	476	774	5667.50		5668.40	5668.74	5669.36	44	5669.52	5668.74	5669.52	44	71	6.7	0.00	0.00		
	31+24	3124	5667.00	90		334	476	774	5668.45		5669.40	5669.75	5670.43	36	5670.50	5669.75	5670.50	36	70	6.8	0.00	0.00		
	31+46	3146	5666.00	90		334	476	774	5668.64		5669.95	5670.49	5671.45	47	5670.69	5670.49	5670.69	47	145	3.3	0.00	0.00		

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)							NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR											
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
	31+77	3177	5666.00	90		334	476	774	5668.66		5669.99	5670.54	5671.48	42	5670.79	5670.54	5670.79	42	125	3.8	0.00	0.00		
	32+51	3251	5669.00	90		334	476	774	5670.05		5670.98	5671.48	5672.26	45	5672.32	5671.48	5672.32	45	71	6.8	0.00	0.00		
	32+76	3276	5668.00	90		334	476	774	5670.46		5671.84	5672.38	5673.24	71	5672.49	5672.38	5672.49	71	190	2.5	0.00	0.00		
	33+03	3303	5668.75	90		334	476	774	5670.42		5671.81	5672.36	5673.22	69	5672.59	5672.36	5672.59	69	140	3.4	0.00	0.00		
	33+84	3384	5670.96	90		334	476	774	5671.64		5672.49	5672.93	5673.71	69	5673.33	5672.93	5673.33	69	100	4.8	0.00	0.00		
	33+99	3399	5670.00	90		334	476	774	5671.95		5672.79	5673.09	5673.70	57	5673.54	5673.09	5673.54	57	108	4.4	0.00	0.00		
	34+16	3416	5670.43	90		334	476	774	5671.93		5672.79	5673.12	5673.80	47	5673.85	5673.12	5673.85	47	73	6.5	0.00	0.00		
	34+79	3479	5672.00	90		334	476	774	5672.99		5674.02	5674.39	5674.97	42	5675.11	5674.39	5675.11	42	76	6.7	0.00	0.00	3	
E Fair Avenue	35+10	3510	Culvert																					
	35+39	3539	5672.36	90		334	476	774	5674.07		5677.46	5678.32	5678.97	100	5678.39	5678.32	5678.39	100	264	2.0	0.00	0.00	3	
	35+42	3542	5674.00	90		334	476	774	5674.79		5677.45	5678.31	5678.96	73	5678.40	5678.31	5678.41	73	211	2.3	0.00	0.01		
	35+48	3548	5674.18	90		334	476	774	5675.17		5677.44	5678.30	5678.95	61	5678.43	5678.30	5678.43	61	173	2.8	0.00	0.00		
	35+73	3573	5675.00	90		334	476	774	5676.09		5677.35	5678.23	5678.82	50	5678.55	5678.23	5678.55	50	114	4.2	0.00	0.00		
	36+06	3606	5676.00	84		306	433	706	5677.00		5677.72	5678.41	5679.23	78	5678.81	5678.41	5678.81	78	100	4.3	0.00	0.00		
	36+31	3631	5676.00	84		306	433	706	5677.39		5678.28	5678.60	5679.26	58	5679.17	5678.60	5679.17	58	83	5.2	0.00	0.00		
	36+81	3681	5677.00	84		306	433	706	5678.04		5679.11	5679.53	5680.12	61	5679.97	5679.53	5679.97	61	90	4.8	0.00	0.00		
	37+21	3721	5677.00	84		306	433	706	5678.42		5679.63	5680.11	5680.83	91	5680.18	5680.11	5680.18	91	210	2.1	0.00	0.00		
	37+51	3751	5677.00	84		306	433	706	5678.46		5679.69	5680.18	5680.93	130	5680.23	5680.18	5680.23	130	258	1.7	0.00	0.00		
	37+76	3776	5677.28	84		306	433	706	5678.49		5679.71	5680.19	5680.93	114	5680.27	5680.19	5680.27	114	210	2.1	0.00	0.00		
	38+06	3806	5677.76	84		306	433	706	5678.58		5679.76	5680.23	5680.97	105	5680.35	5680.23	5680.35	105	171	2.5	0.00	0.00		
	38+42	3842	5678.00	84		306	433	706	5678.98		5679.84	5680.22	5680.89	62	5680.74	5680.22	5680.74	62	80	5.4	0.00	0.00		
	38+81	3881	5678.00	84		306	433	706	5679.37		5680.51	5680.95	5681.59	43	5681.20	5680.95	5681.20	43	111	3.9	0.00	0.00		
	39+06	3906	5678.00	84		306	433	706	5679.47		5680.53	5680.94	5681.49	38	5681.53	5680.94	5681.53	38	76	5.7	0.00	0.00		
	39+31	3931	5678.30	84		306	433	706	5679.67		5680.61	5681.16	5682.21	35	5682.18	5681.16	5682.18	35	57	7.6	0.00	0.00		
	39+56	3956	5678.25	84		306	433	706	5680.03		5681.33	5682.12	5683.12	66	5682.47	5682.12	5682.47	66	106	4.1	0.00	0.00	3	
Foot Bridge at Huntington Park	39+68	3968	Bridge																					
	39+79	3979	5678.37	84		306	433	706	5680.23		5682.37	5683.78	5684.19	136	5683.92	5683.78	5683.92	136	243	2.2	0.00	0.00	2	
	40+09	4009	5680.10	84		306	433	706	5681.17		5682.87	5683.91	5684.37	125	5683.98	5683.91	5683.98	125	243	1.8	0.00	0.00		
	40+50	4050	5681.00	84		306	433	706	5682.00		5683.06	5683.96	5684.45	107	5684.06	5683.96	5684.06	107	193	2.2	0.00	0.00		
	41+02	4102	5681.00	84		306	433	706	5682.32		5683.39	5684.10	5684.63	104	5684.23	5684.10	5684.23	104	171	2.5	0.00	0.00		
	41+38	4138	5681.00	84		306	433	706	5682.46		5683.58	5684.22	5684.79	102	5684.38	5684.22	5684.38	102	160	2.7	0.00	0.00		
	42+03	4203	5681.00	84		306	433	706	5682.65		5683.88	5684.43	5685.03	84	5684.58	5684.43	5684.58	84	155	2.8	0.00	0.00		
	42+34	4234	5681.00	84		306	433	706	5682.73		5683.99	5684.54	5685.16	94	5684.68	5684.54	5684.68	94	166	2.6	0.00	0.00		
	42+95	4295	5681.01	84		306	433	706	5682.87		5684.20	5684.72	5685.38	93	5684.84	5684.72	5684.84	93	180	2.4	0.00	0.00		
	43+39	4339	5682.00	84		306	433	706	5682.98		5684.29	5684.80	5685.47	80	5685.00	5684.80	5685.00	80	137	3.2	0.00	0.00		
	43+65	4365	5683.94	84		306	433	706	5684.64		5685.37	5685.67	5686.23	45	5686.39	5685.67	5686.39	45	64	6.8	0.00	0.00		
	43+74	4374	5685.00	84		306	433	706	5686.01		5686.88	5687.25	5687.82	58	5687.92	5687.25	5687.92	58	73	6.0	0.00	0.00		
	44+12	4412	5687.00	84		306	433	706	5687.96		5688.98	5689.41	5690.12	44	5690.25	5689.48	5690.25	44	70	6.2	0.07	0.00		
	44+38	4438	5687.40	84		306	433	706	5688.74		5689.77	5690.20	5690.91	45	5691.03	5690.20	5691.03	45	65	6.6	0.00	0.00		
	44+54	4454	5687.60	84		306	433	706	5689.16		5690.27	5690.68	5691.43	50	5691.31	5690.68	5691.31	50	78	5.6	0.00	0.00		
	44+72	4472	5687.67	84		306	433	706	5689.49		5690.60	5690.90	5691.50	29	5691.58	5690.90	5691.58	29	68	6.4	0.00	0.00		
E Caley Ave	45+40	4540	Culvert																					
	46+10	4610	5689.20	82		291	412	672	5691.16		5693.58	5695.33	5697.04	25	5695.47	5695.33	5695.47	25	141	2.9	0.00	0.00		
	46+24	4624	5693.94	82		291	412	672	5696.57		5698.03	5698.40	5699.13	175	5698.45	5698.40	5698.45	175	344	1.8	0.00	0.00	2	
	46+32	4632	5692.13	137		366	452	713	5696.87		5698.09	5698.46	5699.19	387	5698.47	5698.46	5698.47	387	1077	0.6	0.00	0.00	2	
	47+60	4760	5692.90	137		366	452	713	5696.87		5698.10	5698.47	5699.20	455	5698.47	5698.47	5698.47	455	2321	0.2	0.00	0.00	2	
	48+85	4885	5693.30	137		366	452	713	5696.87		5698.09	5698.46	5699.18	137	5698.48	5698.46	5698.48	137	484	0.9	0.00	0.00		
	48+95	4895	5693.35	137		366	452	713	5696.87		5698.09	5698.46	5699.18	125	5698.48	5698.46	5698.48	125	438	1.0	0.00	0.00		
	49+33	4933	5693.58	137		366	452	713	5696.87		5698.09	5698.46	5699.16	90	5698.51	5698.46	5698.51	90	354	1.8	0.00	0.00	3	
	49+40	4940	5693.60	137		366	452	713	5696.87		5698.08	5698.45	5699.14	82	5698.52	5698.45	5698.52	82	329	2.2	0.00	0.00	3	
	49+54	4954	5693.65	137		366	452	713	5696.86		5698.03	5698.38	5699.01	57	5698.57	5698.38	5698.57	57	222	3.5	0.00	0.00	3	
	49+59	4959	5693.66	137		366	452	713	5696.82		5697.85	5698.14	5698.45	39	5698.87	5698.14	5698.87	39	130	6.6	0.00	0.00	3	
E Caley Way	50+07	5007	Culvert																					
	50+54	5054	5694.02	55		152	196	298	5696.95		5698.37	5698.84	5700.04	19	5698.95	5698.84	5698.95	19	80	2.6	0.00	0.00	3	
	50+58	5058	5693.03	55		152	196	298	5696.97		5698.42	5698.90	5700.13	23	5698.96	5698.90	5698.96	23	98	2.0	0.00	0.00		
	50+67	5067	5693.28	55		152	196	298	5696.97		5698.42	5698.90	5700.13	26	5698.98	5698.90	5698.98	26	88	2.2	0.00	0.00		
	50+74	5074	5700.04	55		152	196	298	5700.51		5700.94	5701.10	5701.39	48	5701.54	5701.10	5701.54	48	39	5.3	0.00	0.00		
	50+87	5087	5699.43	55		152	196	298	5700.80		5701.37	5701.58	5702.01	113	5701.64	5701.58	5701.64	113	120	2.0	0.00	0.00	3	
	52+77	5277	5701.52	55		152	196	298	5702.25		5702.71	5702.89	5703.20	37	5703.38	5702.89	5703.38	37	35	5.6	0.00	0.00		
	53+17	5317	5703.35	55		152	196	298	5704.91		5705.82	5706.09	5706.63	19	5706.61	5706.09	5706.61	19	39	5.8	0.00	0.00	3	
Bridgewater Access Road	53+53	5353	Culvert																					
	53+88	5388	5704.27	55		152	196	298	5705.16		5707.21	5707.95	5709.46	28	5708.05	5707.95	5708.05	28	78	2.5	0.00	0.00		
	54+10	5410	5705.96	55		152	196	298	5707.17		5708.02	5708.29	5709.30	19	5709.06	5708.31	5709.06	19	28	7.0	0.02	0.00		
	54+49	5449	5710.12	55		152	196	298	5712.35		5713.16	5713.28	5713.55	50	5713.69	5713.31	5713.69	50	41	4.8	0.03	0.00		
	55+00	5500	5711.58	55		152	196	298	5713.71		5714.23	5714.43	5714.78	31	5714.98	5714.46	5714.98	31	35	5.6	0.03	0.00		
	55+94	5594	5713.03	55		152	196	298	5714.34		5715.13	5715.36	5715.83	121	5715.40	5715.39	5715.46	61	96	2.0	0.03	0.06	4	
	56+63	5663	Lat Struct																					
	56+65	5665	5711.89	55		152	196	298	5714.38		5715.18	5715.41	5715.89	94	5715.43	5715.47	5715.48	94	230	0.9	0.06	0.05		
	57+25	5725	5711.94	55		152	196	298	5714.39		5715.19	5715.43	5715.90	89	5715.44	5715.48	5715.49	89	256	0.8	0.05	0.05		
S Boston Street	58+01	5801	5724.23	0.1		33	46	78	5724.26		5724.52	5724.57	5724.66	84	5724.68	5724.57	5724.68	84	18	2.6	0.00	0.00		
S Boston Street	58+58	5858	5725.41	0.1		33	46	78	5725.47		5725.82	5725.86	5725.95	125	5725.96	5725.86	5725.96	125	18	2.5	0.00	0.00	4	
S Boston Street	60+74	6074	5728.40	0.1		33	46	78	5728.64		5729.08	5729.08	5729.12	83	5729.15	5729.08	5729.15	80	22	2.1	0.00	0.00	4	

Goldsmith Gulch FHAD

Floodplain and Floodway Data Table

REFERENCE LOCATION	RIVER STATION	CROSS SECTION	THALWEG ELEVATION (FT)	PEAK DISCHARGE					WATER SURFACE ELEVATION					100-YEAR FLOODPLAIN		100-YEAR FLOODWAY (<0.5' HGL/EGL and No Negative Surcharge)						NOTE	COMMENT
				10-YR	25-YR	50-YR	100-YR	500-YR	10-YR	25-YR	50-YR	100-YR	500-YR										
				FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	FLOW (CFS)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WSEL (FT)	WIDTH (FT)	EGL (FT)	WSEL (FT)	EGL (FT)	WIDTH (FT)	AREA (SQ FT)	VELOCITY (FT/S)	HGL SURCHARGE (FT)	EGL SURCHARGE (FT)		
S Boston Street	61+77	6177	5732.81	0.1		33	46	78	5732.88		5733.39	5733.48	5733.52	93	5733.64	5733.48	5733.64	93	26	2.9	0.00	0.00	4	
	62+38	6238	5735.53	0.1		33	46	78	5735.61		5736.20	5736.29	5736.44	37	5736.47	5736.29	5736.47	37	13	3.4	0.00	0.00		
	63+72	6372	5727.50	70		102	114	141	5735.68		5736.20	5736.29	5736.44	152	5736.29	5736.29	5736.29	152	997	0.1	0.00	0.00		
Goldsmith Gulch Southmoor Park Tributary _ Confluence with Goldsmith Gulch to Southmoor Park																								
Confluence with Goldsmith Gulch	12+89	1289	5480.10	275		541	580	1268	5483.33		5484.31	5484.43	5485.07	233	5485.18	5484.43	5485.20	98	146	4.0	0.00	0.02	2	
Trail Crossing	13+96	1396	5480.15	275		541	580	1268	5484.45		5485.35	5485.45	5486.16	230	5486.21	5485.49	5486.24	30	90	6.4	0.04	0.03	2	
	14+93	1493	5480.22	275		541	580	1268	5484.90		5486.15	5486.31	5488.42	34	5487.12	5486.32	5487.13	34	91	6.4	0.01	0.01		
	15+36	1536	Culvert																					
	15+83	1583	5481.45	275		541	580	1268	5486.67		5489.25	5489.35	5490.12	194	5489.51	5489.62	5489.78	50	206	2.8	0.27	0.27	4	
	16+42	1642	5482.20	275		541	580	1268	5486.83		5489.42	5489.53	5490.44	464	5489.54	5489.72	5489.82	58	252	2.3	0.19	0.28	4	
	16+87	1687	5483.10	242		442	479	1006	5486.91		5489.43	5489.54	5490.46	539	5489.55	5489.80	5489.85	65	264	1.8	0.26	0.30	4	
	17+49	1749	5483.70	242		442	479	745	5487.08		5489.43	5489.54	5490.47	203	5489.56	5489.82	5489.89	64	238	2.0	0.28	0.33		
	18+30	1830	5484.82	242		442	479	745	5487.81		5489.22	5489.33	5490.33	70	5489.74	5489.83	5490.04	65	135	3.6	0.50	0.30		
	19+03	1903	5485.34	242		442	479	745	5489.07		5489.58	5489.67	5490.18	27	5490.28	5489.89	5490.42	27	83	5.8	0.22	0.14		
Foot Bridge	19+30	1930	5485.76	242		442	479	745	5489.08		5489.55	5489.62	5490.38	22	5490.75	5489.83	5490.81	22	61	7.8	0.21	0.06	3	
	21+12	2112	Culvert																					
	22+95	2295	5490.09	242		442	479	745	5495.73		5500.87	5501.10	5502.16	50	5501.16	5501.33	5501.40	25	233	2.1	0.23	0.24	3	
	23+17	2317	5493.41	242		442	479	745	5495.62		5500.87	5501.10	5502.16	45	5501.17	5501.33	5501.40	45	240	2.0	0.23	0.23		
	24+38	2438	5495.85	242		442	479	745	5499.12		5500.27	5500.53	5501.47	25	5501.55	5500.92	5501.69	25	71	6.8	0.39	0.14		
	25+23	2523	5497.07	242		442	479	745	5500.50		5501.21	5501.37	5502.31	25	5502.61	5501.37	5502.61	25	56	8.6	0.00	0.00		
	25+70	2570	5497.36	242		442	479	745	5501.15		5502.19	5502.33	5503.16	26	5503.03	5502.33	5503.03	26	73	6.5	0.00	0.00		
	27+52	2752	5517.85	0.1		0.1	0.1	302	5517.92		5517.92	5517.92	5519.39	3	5517.94	5517.92	5517.94	3	0	1.1	0.00	0.00		
	29+37	2937	5522.79	0.1		0.1	0.1	302	5522.90		5522.90	5522.90	5523.88	3	5522.90	5522.90	5522.90	3	0	0.7	0.00	0.00		
Foot Bridge	32+26	3226	5525.64	7		12	138	622	5526.13		5526.23	5526.85	5527.59	89	5527.08	5526.85	5527.08	89	36	3.8	0.00	0.00		
	33+14	3314	5525.96	7		12	138	622	5526.32		5526.42	5527.19	5528.10	249	5527.21	5527.19	5527.21	249	161	0.9	0.00	0.00	4	
	34+36	3436	5524.00	7		12	138	622	5526.32		5526.42	5527.19	5528.10	391	5527.19	5527.19	5527.19	176	554	0.3	0.00	0.00		
E Orchard Rd	37+92	3792	5519.00	16		264	444	860	5526.32		5526.42	5527.19	5528.10	437	5527.19	5527.19	5527.19	437	2532	0.2	0.00	0.00		
	42+49	4249	5524.34	16		264	444	860	5526.32		5526.41	5527.19	5528.11	432	5527.20	5527.19	5527.20	432	880	0.5	0.00	0.00		
Goldsmith Gulch Southmoor Park Tributary _ Hampden Avenue Overflow _ Confluence with Goldsmith Gulch to Southmoor Park Tributary																								
	2+50	250	5502.36	7		12	138	320	5502.63		5502.70	5503.36	5503.41	140	5503.63	5503.36	5503.63	140	74	3.9	0.00	0.00	2	
	6+76	676	5515.13	7		12	138	320	5515.48		5515.56	5516.20	5516.51	126	5516.48	5516.20	5516.48	126	87	4.1	0.00	0.00	2	
	10+15	1015	Lat Struct																					
	10+16	1016	5522.87	7		12	138	320	5523.27		5523.36	5523.96	5524.05	260	5524.18	5523.96	5524.18	260	102	3.1	0.00	0.00	2	
Goldsmith Gulch _ Monaco Pkwy Overflow																								
	4+75	475	5393.24	8		119	214	956	5393.60		5394.16	5394.39	5395.33	98	5394.67	5394.39	5394.67	98	53	4.0	0.00	0.00		
	5+59	559	5393.34	8		119	214	956	5393.68		5394.22	5394.42	5395.50	86	5394.73	5394.42	5394.73	85	50	4.3	0.00	0.00		
	8+26	826	5397.13	8		119	214	956	5397.47		5397.96	5398.21	5399.34	78	5398.55	5398.21	5398.55	78	48	4.5	0.00	0.00		
	9+82	982	5399.35	8		119	214	956	5399.80		5400.31	5400.57	5401.72	77	5400.91	5400.57	5400.91	77	48	4.5	0.00	0.00		
	11+32	1132	5401.42	8		119	214	1068	5401.81		5402.32	5402.57	5403.85	79	5402.92	5402.57	5402.92	79	46	4.6	0.00	0.00	4	
	12+50	1250	Lat Struct																					
	12+57	1257	5402.78	8		119	214	1205	5403.17		5403.66	5403.88	5405.38	77	5404.21	5403.88	5404.21	77	48	4.4	0.00	0.00		
	14+58	1458	5404.88	8		119	214	1205	5405.25		5405.76	5406.02	5407.43	77	5406.36	5406.02	5406.36	77	48	4.5	0.00	0.00		
	15+10	1510	5405.49	8		119	214	1210	5405.85		5406.33	5406.57	5408.05	79	5406.91	5406.58	5406.91	79	49	4.4	0.01	0.00		
	16+07	1607	5406.48	8		119	214	1318	5406.84		5407.30	5407.55	5409.10	79	5407.89	5407.56	5407.89	79	49	4.3	0.01	0.00		
	17+00	1700	Lat Struct																					
	17+01	1701	5407.44	8		119	214	1361	5407.75		5408.26	5408.49	5410.04	81	5408.82	5408.50	5408.82	81	49	4.3	0.01	0.00		
	17+91	1791	5408.34	8		119	214	1361	5408.65		5409.12	5409.33	5410.72	94	5409.62	5409.33	5409.62	94	51	4.2	0.00	0.00		
	19+39	1939	5409.75	8		127	236	1643	5410.11		5410.62	5410.89	5412.70	85	5411.25	5410.89	5411.25	85	52	4.5	0.00	0.00	4	
	19+90	1990	Lat Struct																					
	19+94	1994	5410.29	8		127	236	1646	5410.66		5411.10	5411.36	5413.16	88	5411.72	5411.36	5411.72	88	52	4.6	0.00	0.00	4	
	23+51	2351	5413.11	0.1		103	206	1601	5413.26		5413.89	5414.12	5415.95	86	5414.43	5414.12	5414.43	86	51	4.1	0.00	0.00		
	24+29	2429	5413.84	0.1		103	206	1636	5413.90		5414.61	5414.84	5416.49	90	5415.14	5414.84	5415.14	90	51	4.0	0.00	0.00		
	24+90	2490	Lat Struct																					
	24+99	2499	5414.56	0.1		103	206	1863	5414.64		5415.50	5415.71	5417.76	93	5416.02	5415.72	5416.02	93	55	3.8	0.01	0.00		
Goldsmith Gulch _ Monaco Pkwy @ Iliff Overflow																								
	1+52	152	5432.57	0.1		119	145	557	5432.54		5433.89	5434.00	5435.09	106	5434.04	5434.00	5434.04	106	92	1.6	0.00	0.00		
	2+36	236	5432.88	0.1		119	145	551	5432.99		5433.99	5434.06	5435.07	103	5434.28	5434.06	5434.28	103	41	3.5	0.00	0.00		
	3+26	326	5433.59	0.1		42	55	291	5433.67		5434.53	5434.59	5435.32	93	5434.68	5434.59	5434.68	93	25	2.2	0.00	0.00		
	3+65	365	5434.04	0.1		17	22	92	5434.14		5434.71	5434.78	5435.53	84	5434.92	5434.78	5434.92	84	9	2.6	0.00	0.00		
	3+85	385	5434.21	0.1		2	3	22	5434.27		5434.88	5434.95	5435.56	86	5434.95	5434.95	5434.95	86	10	0.3	0.00	0.00		

Notes Key:

1. Permanent IFEA was used for wet pond.
2. Floodplain top width includes high ground and IEFA.
3. Floodplain top width includes IEFA.
4. Floodplain top width includes high ground.
5. Floodplain top width include high ground and IEFA, but exclude water quality detention at right overbank from floodplain top width.

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location	Cross Section	River Station	Distance b/a RS, ft			Model/Map	Cumulative Distance, ft			Model/Map	500 YR FP Width, ft		Model/Map	Model/Map	100 YR FP Width, ft		Model/Map	Model/Map	FW Width, ft		Model/Map	Model/Map	BFE, ft		Model/Profile	BFE	Comments and/or Explanations
			Model	Profile	Map	% Check	Model	Profile	Map	% Check	Model	Map	Diff. Check	% Check	Model	Map	Diff. Check	% Check	Model	Map	Diff. Check	% Check	Model	Profile	Diff. Check	Loc.	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Goldsmith Gulch _ Confluence with Cherry Creek to the E Arapahoe Road																											
Confluence with Cherry Creek	85	0+85	85	85	85	0%	85	85	85	0%	142		-142	-100%	142		-142	-100%	142		-142	-100%	5395.2	5395.2	0		Within Cherry Creek mapping limits
E Cherry Creek S Drive	125	1+25					85	85																			
	159	1+59	73	73	73	0%	159	159	159	0%	493	494	0	0%	438	438	0	0%	64	64	0	0%	5397.9	5397.9	0		
	294	2+94	135	135	135	0%	294	294	294	0%	1153	1153	0	0%	1086	1086	0	0%	282	282	0	0%	5398.3	5398.3	0		
	430	4+30	136	136	136	0%	430	430	430	0%	1271	1271	0	0%	1224	1224	0	0%	271	271	0	0%	5398.2	5398.2	0		
	438	4+38	8	8	8	0%	438	438	438	0%	655	706	51	8%	455	455	0	0%	270	270	0	0%	5398.2	5398.2	0		500-Yr includes shallow flooding in Cook Park
Foot Bridge_Cook Park	451	4+51					438	438																			
	458	4+58	20	20	20	0%	458	458	458	0%	645	693	48	7%	423	423	0	0%	270	270	0	0%	5398.4	5398.4	0		500-Yr includes shallow flooding in Cook Park
	595	5+95	138	138	138	0%	595	595	595	0%	362	419	58	16%	294	294	0	0%	211	235	24	11%	5398.7	5398.7	0		500-Yr includes shallow flooding in Cook Park, FW mapped wider to transition smoothly between U/S and D/S
	669	6+69	73	73	73	0%	669	669	669	0%	316	316	0	0%	243	242	-1	0%	243	242	0	0%	5399.4	5399.4	0		
	719	7+19	50	50	50	0%	719	719	719	0%	306	307	0	0%	298	298	0	0%	298	298	0	0%	5400.3	5400.3	0		FW=FP but no encroachment in model due to negative surcharge
	768	7+68	50	50	50	0%	768	768	768	0%	301	301	0	0%	240	240	0	0%	240	240	0	0%	5400.7	5400.7	0		FW=FP but no encroachment in model due to negative surcharge
	777	7+77	9	9	9	0%	777	777	777	0%	310	310	0	0%	234	234	0	0%	234	234	0	0%	5400.7	5400.7	0		
	797	7+97	20	20	20	0%	797	797	797	0%	270	270	0	0%	257	257	0	0%	257	257	0	0%	5401.3	5401.3	0		
	818	8+18	21	21	21	0%	818	818	818	0%	262	262	0	0%	252	252	0	0%	252	252	0	0%	5401.8	5401.8	0		
	868	8+68	50	50	50	0%	868	868	868	0%	361	370	9	3%	332	332	0	0%	332	332	0	0%	5402.3	5402.3	0		FW=FP but no encroachment in model due to negative surcharge
	917	9+17	49	49	49	0%	917	917	917	0%	346	346	0	0%	338	337	0	0%	338	337	0	0%	5402.9	5402.9	0		FW=FP but no encroachment in model due to negative surcharge
	963	9+63	46	46	46	0%	963	963	963	0%	320	320	0	0%	312	312	0	0%	303	303	0	0%	5403.0	5403.0	0		
Foot Bridge_Cook Park	975	9+75					963	963																			
	980	9+80	17	17	17	0%	980	980	980	0%	147	147	0	0%	139	139	0	0%	139	139	0	0%	5403.5	5403.5	0		
	1000	10+00	20	20	20	0%	1000	1000	1000	0%	118	118	0	0%	112	112	0	0%	112	112	0	0%	5403.6	5403.6	0		
	1011	10+11	10	10	10	0%	1011	1011	1011	0%	106	106	0	0%	103	103	0	0%	103	103	0	0%	5403.5	5403.5	0		FW=FP but no encroachment in model due to negative surcharge
	1062	10+62	52	52	52	0%	1062	1062	1062	0%	100	100	0	0%	96	96	0	0%	96	96	0	0%	5404.3	5404.3	0		FW=FP but no encroachment in model due to negative surcharge
	1111	11+11	49	49	49	0%	1111	1111	1111	0%	93	93	0	0%	91	91	0	0%	91	91	0	0%	5404.7	5404.7	0		
	1168	11+68	57	57	57	0%	1168	1168	1168	0%	120	120	0	0%	93	93	0	0%	93	93	0	0%	5405.2	5405.2	0		FW=FP but no encroachment in model due to negative surcharge
	1216	12+16	49	49	49	0%	1216	1216	1216	0%	128	140	11	9%	106	106	0	0%	106	106	0	0%	5406.2	5406.2	0		FW=FP but no encroachment in model due to negative surcharge
	1267	12+67	50	50	50	0%	1267	1267	1267	0%	138	204	66	48%	114	114	0	0%	114	114	0	0%	5406.7	5406.7	0		500-Yr includes shallow flooding in Cook Park
	1374	13+74	107	107	107	0%	1374	1374	1374	0%	128	188	60	47%	115	115	0	0%	115	115	0	0%	5406.9	5406.9	0		500-Yr includes shallow flooding in Cook Park
	1467	14+67	93	93	93	0%	1467	1467	1467	0%	136	172	35	26%	108	108	0	0%	108	108	0	0%	5407.1	5407.1	0		500-Yr includes shallow flooding in Cook Park
	1565	15+65	98	98	98	0%	1565	1565	1565	0%	162	162	0	0%	153	153	0	0%	153	153	0	0%	5407.6	5407.6	0		
	1649	16+49	84	84	84	0%	1649	1649	1649	0%	158	158	0	0%	150	150	0	0%	150	150	0	0%	5407.6	5407.6	0		
	1697	16+97	48	48	48	0%	1697	1697	1697	0%	66	65	0	-1%	54	54	0	0%	54	54	0	0%	5407.7	5407.7	0		
	1715	17+15	18	18	18	0%	1715	1715	1715	0%	50	50	0	-1%	48	48	0	0%	48	48	0	0%	5407.6	5407.6	0		
E Mexico Ave	1752	17+52					1715	1715																			
	1796	17+96	81	81	81	0%	1796	1796	1796	0%	110	134	24	22%	65	65	0	0%	65	65	0	0%	5411.4	5411.4	0		FP500 left limit from Monaco Overflow lateral flow
	1881	18+81	85	85	85	0%	1881	1881	1881	0%	47	41	-5	-12%	44	38	-6	-14%	44	38	-6	-14%	5411.5	5411.5	0		Adjusted limits to follow contours
	2230	22+30	349	349	349	0%	2230	2230	2230	0%	35	37	2	6%	34	35	2	5%	34	35	1	4%	5412.2	5412.2	0		Adjusted limits to follow contours
	2363	23+63	132	132	132	0%	2363	2363	2363	0%	38	38	0	0%	37	37	0	1%	37	36	0	0%	5413.5	5413.5	0		
	2439	24+39	76	76	76	0%	2439	2439	2439	0%	31	44	13	42%	31	39	8	26%	31	31	0	0%	5414.0	5414.0	0		FP500 left limit from Monaco Overflow lateral flow, FP100 limits adjusted to follow contours
S Monaco Pkwy	2554	25+54					2439	2439																			
	2669	26+69	230	230	230	0%	2669	2669	2669	0%	311	311	0	0%	177	177	0	0%	90	90	0	0%	5415.8	5415.8	0		
	2690	26+90	20	20	20	0%	2690	2690	2690	0%	340	339	0	0%	188	188	0	0%	102	102	0	0%	5415.9	5415.9	0		
	2796	27+96	106	106	106	0%	2796	2796	2796	0%	421	421	0	0%	393	393	0	0%	190	190	0	0%	5416.4	5416.4	0		
	2823	28+23	27	27	27	0%	2823	2823	2823	0%	437	437	-1	0%	371	371	0	0%	206	206	0	0%	5416.6	5416.6	0		
Sky Acres Club Foot Bridge	2828	28+28					2823	2823																			
	2834	28+34	11	11	11	0%	2834	2834	2834	0%	499	499	0	0%	381	381	0	0%	130	130	0	0%	5416.7	5416.7	0		
	2876	28+76	42	42	42	0%	2876	2876	2876	0%	474	463	-11	-2%	385	385	0	0%	55	55	0	0%	5416.9	5416.9	0		
	3000	30+00	124	124	124	0%	3000	3000	3000	0%	433	433	0	0%	370	370	0	0%	38	38	0	0%	5416.9	5416.9	0		
	3054	30+54	54	54	54	0%	3054	3054	3054	0%	361	362	1	0%	347	347	0	0%	32	32	0	1%	5416.9	5416.9	0		
Sky Acres Pedestrian Bridge	3055	30+55					3054	3054																			
	3075	30+75	21	21	21	0%	3075	3075	3075	0%	451	451	0	0%	337	338	1	0%	27	28	1	4%	5416.9	5416.9	0		
	3110	31+10	35	35	35	0%	3110	3110	3110	0%	496	496	0	0%	333	334	1	0%	27	28	1	3%	5417.1	5417.1	0		
	3354	33+54	244	244	244	0%	3354	3354	3354	0%	265	267	2	1%	33	33	0	0%	33	33	0	0%	5417.2	5417.2	0		
	3410	34+10	56	56	56	0%	3410	3410	3410	0%	225	225	0	0%	37	39	1	3%	37	39	1	3%	5417.7	5417.7	0		
E Jewell Ave	3453	34+53	43	43	43	0%	3453	3453	3453	0%	487	487	0	0%	232	232	0	0%	110	110	0	0%	5420.9	5420.9	0		
	3510	35+10	57	57	57	0%	3510	3510	3510	0%	329	329	0	0%	236	236	0	0%	153	153	0	0%	5421.0	5421.0	0		
	3771	37+71	261	261	261	0%	3771	3771	3771	0%	299	298	-1	0%	264	264	0	0%	118	118	0	0%	5421.3	5421.3	0		
	4071	40+71	300	300	300	0%	4071	4071	4071	0%	291	291	0	0%	99	99	0	0%	99	99	0	0%	5422.5	5422.5	0		
	4303	43+03	233	233	233	0%	4303	4303	4303	0%	216	214	-2	-1%	100	100	0	0%	100	100	0	0%	5423.8	5423.8	0		
	4448	44+48	145	145	145	0%	4448	4448	4448	0%	140	142	2	1%	106	106	0	0%	106	106	0	0%	5424.4	5424.4	0		FW=FP but no encroachment in model due to negative surcharge
	4495	44+95	47	47	47	0%	4495	4495	4495	0%	223	223	0	0%	57	57	-1	-1%	57	57	-1	-1%	5425.7	5425.7	0		
	4544	45+44	49	49	49	0%	4544	4544	4544	0%	413	396	-17	-4%	37	37	0	1%	37	37	0	1%	5425.8	5425.8	0		
	4570	45+70	26	26	26	0%	4570	4570	4570	0%	311	311	0	0%	37	37	0	0%	37	37	0	0%	5425.8	5425.8	0		FW=FP but no encroachment in model due to negative surcharge
	4591	45+91	21	21	21	0%	4591	4591	4591	0%	373	373	0	0%	210	210	0	0%	210	210	0	0%	5429.4	5429.4	0		FW=FP but no encroachment in model due to negative surcharge
	4641	46+41	50	50	50	0%	4641	4641	4641	0%	309	306	-2	-1%	133	133	0	0%	133	133	0	0%	5430.2	5430.2	0		FW=FP but no encroachment in model due to negative surcharge
	4715	47+15	74	74	74	0%	4715	4715	4715	0%	365	365	0	0%	217	217	0	0%	138	139	0	0%	5431.0	5431.0	0		
	4748	47+48	33	33	33	0%	4748	4748	4748	0%	611	611	0	0%	286	286	0	0%	189	190	1	0%	5431.4	5431.4	0		
	4777	47+77	29	29	29	0%	4777	4777	4777	0%	788	788	0	0%	516	516	0	0%	214	214	0	0%	5431.5	5431.5	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
E Evans Ave	4811	48+11	34	34	34	0%	4811	4811	4811	0%	603	603	0	0%	337	337	0	0%	175	175	0	0%	5431.6	5431.6	0		
	4888	48+88	77	77	77	0%	4888	4888	4888	0%	417	417	0	0%	156	156	0	0%	98	98	0	0%	5432.0	5432.0	0		
	5017	50+17	129	129	129	0%	5017	5017	5017	0%	495	495	0	0%	321	321	0	0%	107	107	0	0%	5432.2	5432.2	0		
	5170	51+70	153	153	153	0%	5170	5170	5170	0%	491	491	0	0%	208	208	0	0%	100	100	0	0%	5432.2	5432.2	0		
	5343	53+43	173	173	173	0%	5343	5343	5343	0%	554	554	0	0%	151	151	0	0%	102	103	1	1%	5432.8	5432.8	0		Excluded disconnected low ground in west overbank
	5431	54+31	88	88	88	0%	5431	5431	5431	0%	564	564	0	0%	348	239	-109	-31%	166	165	0	0%	5433.3	5433.3	0		Excluded disconnected low ground in west overbank
	5660	56+60	229	229	229	0%	5660	5660	5660	0%	381	381	0	0%	292	292	0	0%	200	200	0	0%	5435.8	5435.8	0		
	5719	57+19	59	59	59	0%	5719	5719	5719	0%	388	388	0	0%	311	311	0	0%	211	211	0	0%	5436.1	5436.1	0		
	5810	58+10	90	90	90	0%	5809	5809	5810	0%	442	454	12	3%	234	247	12	5%	214	214	0	0%	5436.5	5436.5	0		Mapped overflow area from split flow
	5899	58+99	89	89	89	0%	5899	5899	5899	0%	408	408	0	0%	324	324	0	0%	250	250	0	0%	5436.5	5436.5	0		Mapped overflow area from split flow
	5957	59+57	58	58	58	0%	5957	5957	5957	0%	393	393	0	0%	295	322	26	9%	237	237	0	0%	5436.8	5436.8	0		Mapped overflow area from split flow
	6137	61+37	180	180	180	0%	6137	6137	6137	0%	313	313	0	0%	245	245	0	0%	245	245	0	0%	5437.8	5437.8	0		
	6212	62+12	75	75	75	0%	6212	6212	6212	0%	319	319	0	0%	262	262	0	0%	262	262	0	0%	5437.9	5437.9	0		
	6250	62+50	38	38	38	0%	6250	6250	6250	0%	494	494	0	0%	353	353	0	0%	269	269	0	0%	5438.0	5438.0	0		Left overbank includes high ground
	6284	62+84	34	34	34	0%	6284	6284	6284	0%	792	792	0	0%	636	636	0	0%	268	268	0	0%	5438.1	5438.1	0		
	6312	63+12	28	28	28	0%	6312	6312	6312	0%	627	627	0	0%	398	398	0	0%	232	232	0	0%	5438.2	5438.2	0		
E Iliff Ave	6340	63+40	28	28	28	0%	6340	6340	6340	0%	754	754	0	0%	379	379	0	0%	200	200	0	0%	5438.4	5438.4	0		
	6381	63+81	41	41	41	0%	6381	6381	6381	0%	645	645	0	0%	510	510	0	0%	465	464	0	0%	5438.5	5438.5	0		
	6592	65+92	211	211	211	0%	6592	6592	6592	0%	645	645	0	0%	614	614	0	0%	557	557	0	0%	5439.1	5439.1	0		
	6725	67+25	133	133	133	0%	6725	6725	6725	0%	692	692	0	0%	674	674	0	0%	608	608	0	0%	5439.2	5439.2	0		
	6962	69+62	237	237	237	0%	6962	6962	6962	0%	657	657	0	0%	644	643	0	0%	644	643	0	0%	5439.9	5439.9	0		
	7004	70+04	42	42	42	0%	7004	7004	7004	0%	258	258	0	0%	153	153	0	0%	153	153	0	0%	5440.7	5440.7	0		
Foot Bridge	7012	70+12					7004	7004																			
	7024	70+24	21	21	21	0%	7024	7024	7024	0%	286	286	0	0%	145	145	0	0%	145	145	0	0%	5441.0	5441.0	0		
	7142	71+42	117	117	117	0%	7141	7141	7142	0%	137	138	1	1%	110	111	1	1%	110	111	1	1%	5441.1	5441.1	0		
	7504	75+04	363	363	363	0%	7504	7504	7504	0%	134	134	0	0%	94	95	1	1%	94	95	1	1%	5443.1	5443.1	0		
	7835	78+35	331	331	331	0%	7835	7835	7835	0%	131	131	0	0%	94	94	0	0%	94	94	0	0%	5445.1	5445.1	0		
	8198	81+98	363	363	363	0%	8198	8198	8198	0%	124	124	0	0%	94	94	0	0%	94	94	0	0%	5446.4	5446.4	0		
	8650	86+50	452	452	452	0%	8650	8650	8650	0%	118	116	-2	-2%	88	88	0	0%	88	88	0	0%	5448.7	5448.7	0		
	8991	89+91	341	341	341	0%	8991	8991	8991	0%	119	119	0	0%	64	64	0	0%	64	64	0	0%	5449.9	5449.9	0		
	9189	91+89	198	198	198	0%	9189	9189	9189	0%	115	113	-2	-1%	91	91	0	0%	91	91	0	0%	5452.6	5452.6	0		
	9277	92+77	88	88	88	0%	9277	9277	9277	0%	88	88	0	0%	65	65	0	0%	65	65	0	0%	5453.0	5453.0	0		
	9313	93+13	37	37	37	0%	9313	9313	9313	0%	414	414	0	0%	9	0	-9	-100%	9		-9	-100%	5457.0	5457.0	0		100-yr flow within culvert
	9356	93+56	43	43	43	0%	9356	9356	9356	0%	401	401	0	0%	44	0	-44	-100%	44		-44	-100%	5457.0	5457.0	0		100-yr flow within culvert
E Yale Ave	9377	93+77	20	20	20	0%	9377	9377	9377	0%	514	512	-2	0%	117	0	-117	-100%	117		-117	-100%	5457.0	5457.0	0		100-yr flow within culvert
	9426	94+26	50	50	50	0%	9426	9426	9426	0%	427	427	0	0%	2	0	-2	-100%	2		-2	-100%	5460.4	5460.4	0		100-yr flow within culvert
	9466	94+66	40	40	40	0%	9466	9466	9466	0%	1193	1193	0	0%	1099	1100	1	0%	1099	1100	1	0%	5461.1	5461.1	0		
	9490	94+90	24	24	24	0%	9490	9490	9490	0%	1215	1215	0	0%	1113	1114	1	0%	1113	1114	2	0%	5461.2	5461.2	0		
	9536	95+36	46	46	46	0%	9536	9536	9536	0%	1141	1141	0	0%	1041	1041	0	0%	1041	1041	0	0%	5461.2	5461.2	0		
	9762	97+62	226	226	226	0%	9762	9762	9762	0%	928	928	0	0%	663	663	0	0%	663	663	0	0%	5461.4	5461.4	0		
	10065	100+65	303	303	303	0%	10065	10065	10065	0%	689	689	0	0%	524	524	0	0%	524	524	0	0%	5461.4	5461.4	0		
	10094	100+94	29	29	29	0%	10094	10094	10094	0%	718	718	0	0%	508	508	0	0%	508	508	0	0%	5461.5	5461.5	0		
Foot Bridge_Bible Park	10116	101+16					10094	10094												433							
	10127	101+27	33	33	33	0%	10127	10127	10127	0%	714	711	-3	0%	484	484	0	0%	484	484	0	0%	5461.5	5461.5	0		
	10137	101+37	10	10	10	0%	10137	10137	10137	0%	698	698	0	0%	480	480	0	0%	480	480	0	0%	5461.6	5461.6	0		FW=FP but no encroachment in model due to negative surcharge
	10525	105+25	388	388	388	0%	10525	10525	10525	0%	482	481	-1	0%	442	442	0	0%	442	442	0	0%	5463.1	5463.1	0		
	10750	107+50	225	225	225	0%	10750	10750	10750	0%	462	462	0	0%	433	433	0	0%	433	433	0	0%	5464.3	5464.3	0		FW=FP but no encroachment in model due to negative surcharge
	10908	109+08	158	158	158	0%	10908	10908	10908	0%	362	362	0	0%	340	340	0	0%	340	340	0	0%	5465.1	5465.1	0		
	11125	111+25	216	216	216	0%	11125	11125	11125	0%	382	382	0	0%	317	317	0	0%	317	317	0	0%	5465.5	5465.5	0		
	11213	112+13	88	88	88	0%	11213	11213	11213	0%	378	378	0	0%	311	311	0	0%	311	311	0	0%	5465.8	5465.8	0		FW=FP but no encroachment in model due to negative surcharge
	11365	113+65	152	152	152	0%	11365	11365	11365	0%	413	413	0	0%	347	347	0	0%	347	347	0	0%	5466.9	5466.9	0		
	11745	117+45	380	380	380	0%	11745	11745	11745	0%	351	351	0	0%	256	256	0	0%	256	256	0	0%	5468.2	5468.2	0		
	11750	117+50	4	4	4	0%	11750	11750	11750	0%	361	361	0	0%	256	256	0	0%	256	256	0	0%	5468.3	5468.3	0		
	12131	121+31	381	381	381	0%	12131	12131	12131	0%	204	206	2	1%	188	188	0	0%	188	188	0	0%	5470.3	5470.3	0		FW=FP but no encroachment in model due to negative surcharge
	12374	123+74	244	244	244	0%	12374	12374	12374	0%	299	307	8	3%	201	201	0	0%	201	201	0	0%	5473.2	5473.2	0		FW=FP but no encroachment in model due to negative surcharge
	12448	124+48	73	73	73	0%	12447	12447	12448	0%	477	477	0	0%	438	438	0	0%	125	125	0	0%	5475.3	5475.3	0		FW=FP but no encroachment in model due to negative surcharge
E Cornell Ave	12616	126+16					12447	12447																			
	12660	126+60	213	213	213	0%	12660	12660	12660	0%	527	527	0	0%	451	451	0	0%	372	372	0	0%	5478.4	5478.4	0		
	12696	126+96	36	36	36	0%	12696	12696	12696	0%	493	494	1	0%	409	409	0	0%	354	354	0	0%	5478.0	5478.0	0		
	12841	128+41	145	145	145	0%	12841	12841	12841	0%	491	491	0	0%	326	330	3	1%	326	326	0	0%	5479.1	5479.1	0		
	12879	128+79	38	38	38	0%	12879	12879	12879	0%	496	496	0	0%	374	375	1	0%	342	355	13	4%	5479.1	5479.1	0		
	13146	131+46	267	267	267	0%	13146	13146	13146	0%	563	565	2	0%	533	533	0	0%	305	305	0	0%	5480.5	5480.5	0		
	13394	133+94	248	248	248	0%	13394	13394	13394	0%	339	339	0	0%	302	302	0	0%	302	302	0	0%	5482.1	5482.1	0		
	13433	134+33	38	38	38	0%	13432	13432	13433	0%	345	345	0	0%	322	322	0	0%	322	322	0	0%	5483.7	5483.7	0		
	13489	134+89	56	56	56	0%	13489	13489	13489	0%	324	324	0	0%	303	303	0	0%	303	303	0	0%	5484.3	5484.3	0		
	13576	135+76	87	87	87	0%	13576	13576	13576	0%	95	251	156	165%	78	110	32	42%	78	110	32	41%	5484.4	5484.4	0		Mapped overflow area from split flow, Model XS skewed for bridge
Foot Bridge_Hutchinson Park	13587	135+87					13576	13576																			
	13595	135+95	19	19	19	0%	13595	13595	13595	0%	164	279	115	70%	138	184	46	33%	138	184	46	33%	5487.1	5487.1	0		Mapped overflow area from split flow, Model XS skewed for bridge
	13744	137+44	149	149	149	0%	13743	13743	13744	0%	241	261	20	8%	195	193	-2	-1%	169	169	0	0%	5487.8	5487.8	0		Mapped overflow area from split flow

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
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Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
	13901	139+01	158	158	158	0%	13901	13901	13901	0%	80	99	19	24%	68	68	0	0%	68	68	0	0%	5487.8	5487.8	0		Mapped overflow area from split flow, FW=FP but no encroachment in model due to negative surcharge
	13953	139+53	52	52	52	0%	13953	13953	13953	0%	100	107	7	7%	83	82	-1	-1%	83	82	-1	-1%	5490.6	5490.6	0		Mapped overflow area from split flow
E Eastman Ave	13996	139+96					13953	13953																			
	14043	140+43	90	90	90	0%	14043	14043	14043	0%	117	117	0	0%	96	94	-2	-2%	96	94	-2	-2%	5491.4	5491.4	0		
	14076	140+76	33	33	33	0%	14076	14076	14076	0%	201	201	0	0%	140	140	0	0%	106	105	0	0%	5491.3	5491.3	0		
	14190	141+90	114	114	114	0%	14190	14190	14190	0%	112	112	0	0%	103	103	0	0%	103	103	0	0%	5491.6	5491.6	0		
Foot Bridge	14212	142+12					14190	14190																			
	14231	142+31	41	41	41	0%	14231	14231	14231	0%	106	106	0	0%	95	95	0	0%	95	95	0	0%	5491.7	5491.7	0		
	14279	142+79	48	48	48	0%	14279	14279	14279	0%	109	110	0	0%	92	92	0	0%	92	92	0	0%	5491.6	5491.6	0		
	14306	143+06	27	27	27	0%	14306	14306	14306	0%	107	107	0	0%	93	93	0	0%	93	93	0	0%	5491.6	5491.6	0		
	14313	143+13	7	7	7	0%	14313	14313	14313	0%	107	107	0	0%	90	90	0	0%	90	90	0	0%	5491.5	5491.5	0		
	14333	143+33	20	20	20	0%	14333	14333	14333	0%	102	102	0	0%	85	85	0	0%	85	85	0	0%	5491.5	5491.5	0		
	14376	143+76	43	43	43	0%	14376	14376	14376	0%	102	102	0	0%	79	79	0	0%	79	79	0	0%	5491.6	5491.6	0		
Foot Bridge	14390	143+90					14376	14376																			
	14395	143+95	19	19	19	0%	14395	14395	14395	0%	99	99	0	0%	81	81	0	0%	81	81	0	0%	5491.6	5491.6	0		
	14436	144+36	41	41	41	0%	14436	14436	14436	0%	101	101	0	0%	78	78	0	0%	78	78	0	0%	5491.5	5491.5	0		
	14545	145+45	108	108	108	0%	14545	14545	14545	0%	214	212	-1	-1%	205	176	-29	-14%	76	76	0	0%	5491.9	5491.9	0		Disconnected low spot in right overbank excluded from width
	14558	145+58	13	13	13	0%	14558	14558	14558	0%	214	215	1	1%	207	184	-22	-11%	76	76	0	0%	5492.1	5492.1	0		Disconnected low spot in right overbank excluded from width
	14709	147+09	152	152	152	0%	14709	14709	14709	0%	81	81	0	0%	70	70	0	0%	70	70	0	0%	5492.5	5492.5	0		Mapped FP500 from Hampden overflow
	14777	147+77	68	68	68	0%	14777	14777	14777	0%	83	83	0	0%	71	71	0	0%	71	71	0	0%	5493.1	5493.1	0		Mapped FP500 from Hampden overflow
Foot Bridge	14789	147+89					14777	14777																			
	14795	147+95	18	18	18	0%	14795	14795	14795	0%	82	80	-1	-2%	72	72	0	0%	72	72	0	0%	5493.2	5493.2	0		Mapped FP500 from Hampden overflow
	14842	148+42	47	47	47	0%	14842	14842	14842	0%	92	92	0	0%	78	78	0	0%	78	78	0	0%	5493.5	5493.5	0		Mapped FP500 from Hampden overflow
	15113	151+13	270	270	270	0%	15113	15113	15113	0%	86	86	0	0%	76	76	0	0%	76	76	0	0%	5494.0	5494.0	0		Mapped FP500 from Hampden overflow
	15221	152+21	109	109	109	0%	15221	15221	15221	0%	136	137	1	0%	130	111	-19	-15%	130	70	-60	-46%	5494.4	5494.4	0		FW=active flow area but no encroachment in model due to neg surcharge
	15309	153+09	88	88	88	0%	15309	15309	15309	0%	93	93	0	0%	80	80	0	0%	80	80	0	0%	5495.7	5495.7	0		Mapped FP500 from Hampden overflow
	15326	153+26	17	17	17	0%	15326	15326	15326	0%	223	371	148	66%	1		-1	-100%	1		-1	-100%	5497.4	5497.4	0		Mapped overflow area from split flow, no FW across rdwy
E Hampden Ave	15384	153+84	59	59	59	0%	15384	15384	15385	0%	270	387	117	44%	14		-14	-100%	14		-14	-100%	5499.0	5499.0	0		Mapped overflow area from split flow, no FW across rdwy
	15449	154+49	64	64	64	0%	15449	15449	15449	0%	370	381	11	3%	184	283	99	53%	184		-184	-100%	5498.7	5498.7	0		Mapped overflow area from split flow, no FW across rdwy
	15461	154+61	13	13	13	0%	15461	15461	15461	0%	325	325	0	0%	225	225	0	0%	151	151	0	0%	5498.7	5498.7	0		
	15469	154+69	8	8	8	0%	15469	15469	15469	0%	301	303	3	1%	127	127	0	0%	117	117	0	0%	5498.6	5498.6	0		
	15719	157+19	250	250	250	0%	15719	15719	15719	0%	205	208	3	2%	158	154	-3	-2%	117	117	0	0%	5499.9	5499.9	0		
	15964	159+64	245	245	245	0%	15964	15964	15964	0%	208	205	-3	-2%	154	154	0	0%	154	154	0	0%	5500.5	5500.5	0		
	16086	160+86	122	122	122	0%	16086	16086	16086	0%	183	183	0	0%	127	127	0	0%	127	127	0	0%	5500.9	5500.9	0		
	16121	161+21	35	35	35	0%	16121	16121	16121	0%	175	175	0	0%	134	134	0	0%	134	134	0	0%	5501.1	5501.1	0		
	16191	161+91	69	69	69	0%	16191	16191	16191	0%	101	101	0	0%	88	88	0	0%	88	88	0	0%	5501.2	5501.2	0		
	16232	162+32	41	41	41	0%	16232	16232	16232	0%	154	155	2	1%	96	97	1	1%	96	97	1	1%	5501.4	5501.4	0		
	16247	162+47	15	15	15	0%	16247	16247	16247	0%	109	109	0	0%	54	56	2	3%	54	56	2	3%	5500.8	5500.8	0		FW=FP but no encroachment in model due to negative surcharge
	16277	162+77	30	30	30	0%	16277	16277	16277	0%	86	86	0	0%	68	68	0	-1%	68	68	0	-1%	5501.7	5501.7	0		
	16327	163+27	50	50	50	0%	16327	16327	16327	0%	75	75	0	0%	57	56	-1	-2%	57	56	-1	-2%	5502.8	5502.8	0		
	16795	167+95	468	468	468	0%	16795	16795	16795	0%	209	209	0	0%	156	156	0	0%	94	94	0	0%	5506.0	5506.0	0		
	16950	169+50	155	155	155	0%	16950	16950	16950	0%	166	166	-1	0%	102	101	-1	-1%	102	101	-1	-1%	5506.3	5506.3	0		
	17055	170+55	104	104	104	0%	17055	17055	17055	0%	157	158	1	1%	78	78	0	0%	78	78	0	0%	5506.6	5506.6	0		
S Rosemary Way	17097	170+97					17055	17055												87							
	17134	171+34	79	79	79	0%	17134	17134	17134	0%	174	174	0	0%	156	156	0	0%	84	84	0	0%	5508.4	5508.4	0		
	17200	172+00	67	67	67	0%	17200	17200	17200	0%	160	159	-1	-1%	141	141	0	0%	81	81	0	0%	5508.5	5508.5	0		
	17384	173+84	183	183	183	0%	17383	17383	17384	0%	157	157	0	0%	137	137	0	0%	87	87	0	0%	5509.9	5509.9	0		
	17645	176+45	261	261	261	0%	17645	17645	17645	0%	144	144	0	0%	89	89	0	0%	75	75	0	0%	5511.7	5511.7	0		
	17647	176+47	2	2	2	0%	17647	17647	17647	0%	144	144	0	0%	89	89	0	0%	75	75	0	0%	5511.7	5511.7	0		
	17873	178+73	226	226	226	0%	17873	17873	17873	0%	94	95	1	1%	73	73	0	0%	73	73	0	0%	5512.3	5512.3	0		
	17875	178+75	2	2	2	0%	17875	17875	17875	0%	143	144	1	1%	73	73	0	0%	73	73	0	0%	5512.3	5512.3	0		
	18154	181+54	279	279	279	0%	18154	18154	18154	0%	80	80	0	0%	67	67	0	0%	67	67	0	0%	5513.4	5513.4	0		
	18156	181+56	2	2	2	0%	18156	18156	18156	0%	80	80	0	0%	68	68	0	0%	68	68	0	0%	5513.6	5513.6	0		FW=FP but no encroachment in model due to negative surcharge
	18384	183+84	228	228	228	0%	18384	18384	18384	0%	85	85	0	0%	69	69	0	0%	69	69	0	0%	5515.5	5515.5	0		
	18679	186+79	295	295	295	0%	18679	18679	18679	0%	77	77	0	0%	50	51	1	1%	50	51	1	1%	5516.4	5516.4	0		
	18681	186+81	2	2	2	0%	18681	18681	18681	0%	88	88	0	0%	53	53	0	0%	53	53	0	0%	5516.7	5516.7	0		FW=FP but no encroachment in model due to negative surcharge
	18977	189+77	296	296	296	0%	18977	18977	18977	0%	64	64	0	0%	48	48	0	0%	48	48	0	0%	5518.5	5518.5	0		
	18979	189+79	2	2	2	0%	18979	18979	18979	0%	65	65	0	0%	47	47	0	0%	47	47	0	0%	5518.5	5518.5	0		FW=FP but no encroachment in model due to negative surcharge
	19078	190+78	99	99	99	0%	19078	19078	19078	0%	192	192	0	0%	66	66	0	0%	66	66	0	0%	5520.6	5520.6	0		
	19081	190+81	3	3	3	0%	19081	19081	19081	0%	190	190	0	0%	61	61	1	1%	61	61	1	1%	5520.2	5520.2	0		
	19135	191+35	54	54	54	0%	19135	19135	19135	0%	175	175	0	0%	58	58	0	0%	58	58	0	0%	5521.6	5521.6	0		FW=FP but no encroachment in model due to negative surcharge
	19396	193+96	260	260	260	0%	19396	19396	19396	0%	89	89	0	0%	67	67	0	0%	64	64	0	0%	5524.9	5524.9	0		
E Princeton Ave	19450	194+50					19396	19396																			
	19483	194+83	88	88	88	0%	19483	19483	19483	0%	240	240	0	0%	160	160	0	0%	43	43	0	0%	5527.3	5527.3	0		
	19493	194+93	9	9	9	0%	19493	19493	19493	0%	263	263	0	0%	150	153	3	2%	58	60	3	5%	5527.1	5527.1	0		
	19580	195+80	87	87	87	0%	19580	19580	19580	0%	163	163	0	0%	125	125	0	0%	125	125	0	0%	5527.5	5527.5	0		
	19585	195+85	5	5	5	0%	19585	19585	19585	0%	180	180	0	0%	132	132	0	0%	132	132	0	0%	5527.7	5527.7	0		
	19679	196+79	94	94	94	0%	19679	19679	19679	0%	258	258	0	0%	237	237	0	0%	237	237	0	0%	5529.1	5529.1	0		
	19819	198+19	140	140	140	0%	19819	19819	19819	0%	337	337	0	0%	303	303	0	0%	303	303	0	0%	5531.4	5531.4	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
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Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
	19842	198+42	24	24	24	0%	19842	19842	19842	0%	381	381	0	0%	360	360	0	0%	360	360	0	0%	5532.5	5532.5	0		FW=FP but no encroachment in model due to negative surcharge
Foot Bridge_Rosamond Park	19854	198+54					19842	19842																			
	19864	198+64	22	22	22	0%	19864	19864	19864	0%	437	437	0	0%	380	380	0	0%	380	380	0	0%	5533.3	5533.3	0		
	19921	199+21	57	57	57	0%	19921	19921	19921	0%	382	382	0	0%	361	361	0	0%	361	361	0	0%	5533.4	5533.4	0		
	20067	200+67	146	146	146	0%	20067	20067	20067	0%	225	225	0	0%	211	211	0	0%	211	211	0	0%	5533.3	5533.3	0		
	20152	201+52	85	85	85	0%	20152	20152	20152	0%	179	179	0	0%	154	154	0	0%	154	154	0	0%	5533.5	5533.5	0		FW=FP but no encroachment in model due to negative surcharge
	20214	202+14	62	62	62	0%	20214	20214	20214	0%	193	193	0	0%	110	110	0	0%	110	110	0	0%	5533.7	5533.7	0		FW=FP but no encroachment in model due to negative surcharge
	20247	202+47	32	32	32	0%	20247	20247	20247	0%	212	212	0	0%	166	166	0	0%	166	166	0	0%	5534.6	5534.6	0		
Foot Bridge_Rosamond Park	20266	202+66					20247	20247																			
	20281	202+81	34	34	34	0%	20281	20281	20281	0%	202	202	0	0%	153	153	0	0%	153	153	0	0%	5535.0	5535.0	0		
	20336	203+36	55	55	55	0%	20336	20336	20336	0%	194	194	0	0%	93	93	0	0%	93	93	0	0%	5535.5	5535.5	0		FW=FP but no encroachment in model due to negative surcharge
	20378	203+78	42	42	42	0%	20378	20378	20378	0%	211	211	0	0%	88	93	5	6%	88	88	0	0%	5536.3	5536.3	0		FW=FP but no encroachment in model due to negative surcharge
	20441	204+41	63	63	63	0%	20441	20441	20441	0%	308	308	0	0%	186	188	2	1%	186	186	0	0%	5537.5	5537.5	0		
	20566	205+66	125	125	125	0%	20566	20566	20566	0%	320	320	0	0%	206	205	0	0%	206	205	0	0%	5537.8	5537.8	0		
	20744	207+44	179	179	179	0%	20744	20744	20744	0%	310	310	0	0%	213	213	0	0%	213	213	0	0%	5538.6	5538.6	0		
	20871	208+71	127	127	127	0%	20871	20871	20871	0%	361	361	0	0%	196	198	1	1%	196	198	1	1%	5539.1	5539.1	0		
	21009	210+09	138	138	138	0%	21009	21009	21009	0%	350	350	0	0%	99	102	2	2%	99	102	2	2%	5541.1	5541.1	0		FW=FP but no encroachment in model due to negative surcharge
	21184	211+84	175	175	175	0%	21184	21184	21184	0%	312	311	0	0%	70	70	0	0%	70	70	0	0%	5542.4	5542.4	0		
E Quincy Ave	21261	212+61					21184	21184																			
	21328	213+28	144	144	144	0%	21328	21328	21328	0%	335	338	4	1%	219	227	8	4%	219	227	8	4%	5548.0	5548.0	0		
	21464	214+64	137	137	137	0%	21464	21464	21464	0%	351	351	0	0%	270	270	0	0%	270	270	0	0%	5548.2	5548.2	0		
	21636	216+36	172	172	172	0%	21636	21636	21636	0%	391	393	2	0%	305	305	0	0%	194	194	0	0%	5548.2	5548.2	0		
	21876	218+76	239	239	239	0%	21876	21876	21876	0%	371	371	0	0%	196	196	0	0%	196	196	0	0%	5548.3	5548.3	0		
	22032	220+32	156	156	156	0%	22032	22032	22032	0%	519	519	0	0%	118	118	0	0%	118	118	0	0%	5548.3	5548.3	0		
I-225	22658	226+58	626	626	626	0%	22658	22658	22658	0%	524	524	0	0%	359	127	-232	-65%	359	127	-232	-65%	5556.1	5556.1	0		Disconnected low ground in right overbank excluded
	22889	228+89	231	231	231	0%	22889	22889	22889	0%	196	196	0	0%	149	150	1	1%	149	150	1	1%	5556.1	5556.1	0		FP500 mapping reflects overflow from Temple Dr
	23090	230+90	201	201	201	0%	23090	23090	23090	0%	159	159	0	0%	101	102	1	1%	101	102	1	1%	5556.1	5556.1	0		FP500 mapping reflects overflow from Temple Dr
	23210	232+10	120	120	120	0%	23210	23210	23210	0%	138	138	0	0%	88	88	0	0%	88	88	0	0%	5556.2	5556.2	0		FP500 mapping reflects overflow from Temple Dr
	23466	234+66	256	256	256	0%	23466	23466	23466	0%	164	164	0	0%	81	81	0	0%	81	81	0	0%	5556.3	5556.3	0		FP500 mapping reflects overflow from Temple Dr
	23638	236+38	172	172	172	0%	23638	23638	23638	0%	186	186	0	0%	92	92	0	0%	92	92	0	0%	5556.7	5556.7	0		FP500 mapping reflects overflow from Temple Dr
	23773	237+73	135	135	135	0%	23773	23773	23773	0%	123	123	0	0%	81	81	0	0%	81	81	0	0%	5557.2	5557.2	0		FW=FP but no encroachment in model due to negative surcharge
	23870	238+70	97	97	97	0%	23870	23870	23870	0%	101	101	0	0%	77	73	-4	-5%	77	73	-4	-5%	5557.8	5557.8	0		FP500 mapping reflects overflow from Temple Dr
	23935	239+35	65	65	65	0%	23935	23935	23935	0%	448	448	0	0%	7	0	-7	-100%	7		-7	-100%	5574.5	5574.5	0		100-yr flow within culvert
E Temple Dr	23984	239+84	49	49	49	0%	23984	23984	23984	0%	431	431	0	0%	27	0	-27	-100%	27		-27	-100%	5576.0	5576.0	0		100-yr flow within culvert
	24029	240+29	45	45	45	0%	24029	24029	24029	0%	484	484	0	0%	248	256	8	3%	248		-248	-100%	5576.0	5576.0	0		No FW defined at roadway
	24092	240+92	63	63	63	0%	24092	24092	24092	0%	445	445	0	0%	323	323	0	0%	323		-323	-100%	5575.4	5575.4	0		No FW defined at roadway
	24156	241+56	64	64	64	0%	24156	24156	24156	0%	497	497	0	0%	454	454	0	0%	454	454	0	0%	5575.4	5575.4	0		
	24211	242+11	55	55	55	0%	24211	24211	24211	0%	577	577	0	0%	544	544	0	0%	544	544	0	0%	5575.4	5575.4	0		
	24218	242+18	7	7	7	0%	24218	24218	24218	0%	590	590	0	0%	557	556	0	0%	557	556	0	0%	5575.4	5575.4	0		
	24245	242+45	27	27	27	0%	24245	24245	24245	0%	600	600	0	0%	568	568	0	0%	568	568	0	0%	5575.4	5575.4	0		
	24255	242+55	10	10	10	0%	24255	24255	24255	0%	613	613	0	0%	584	584	0	0%	584	584	0	0%	5575.4	5575.4	0		
	24289	242+89	34	34	34	0%	24289	24289	24289	0%	643	643	0	0%	615	615	0	0%	615	615	0	0%	5575.4	5575.4	0		
	24371	243+71	82	82	82	0%	24371	24371	24371	0%	614	614	0	0%	589	589	0	0%	589	589	0	0%	5575.4	5575.4	0		
	24554	245+54	183	183	183	0%	24554	24554	24554	0%	451	451	0	0%	429	429	0	0%	429	429	0	0%	5575.4	5575.4	0		
	24555	245+55	1	1	1	0%	24555	24555	24555	0%	450	451	0	0%	428	428	0	0%	428	428	0	0%	5575.4	5575.4	0		
	24595	245+95	40	40	40	0%	24595	24595	24595	0%	431	431	0	0%	411	411	0	0%	411	411	0	0%	5575.4	5575.4	0		
	24596	245+96	1	1	1	1%	24596	24596	24596	0%	430	430	0	0%	410	410	0	0%	410	410	0	0%	5575.4	5575.4	0		
	24603	246+03	7	7	7	0%	24603	24603	24603	0%	426	426	0	0%	406	406	0	0%	406	406	0	0%	5575.4	5575.4	0		
	24645	246+45	42	42	42	0%	24645	24645	24645	0%	385	385	0	0%	366	366	0	0%	366	366	0	0%	5575.4	5575.4	0		
	24909	249+09	265	265	265	0%	24909	24909	24909	0%	377	376	-1	0%	309	308	0	0%	257	257	0	0%	5575.4	5575.4	0		
	24959	249+59	50	50	50	0%	24959	24959	24959	0%	360	359	-1	0%	307	307	0	0%	251	251	0	0%	5575.4	5575.4	0		
	24989	249+89	30	30	30	0%	24989	24989	24989	0%	370	368	-1	0%	316	316	0	0%	250	250	0	0%	5575.4	5575.4	0		
	25014	250+14	25	25	25	0%	25014	25014	25014	0%	374	375	1	0%	320	320	-1	0%	250	250	0	0%	5575.4	5575.4	0		
	25040	250+40	26	26	26	0%	25040	25040	25040	0%	447	448	1	0%	333	332	-1	0%	249	249	0	0%	5575.4	5575.4	0		
	25121	251+21	81	81	81	0%	25121	25121	25121	0%	413	413	-1	0%	333	333	0	0%	247	247	0	0%	5575.4	5575.4	0		
	25286	252+86	165	165	165	0%	25286	25286	25286	0%	335	335	-1	0%	291	290	0	0%	249	249	0	0%	5575.4	5575.4	0		
	25524	255+24	238	238	238	0%	25524	25524	25524	0%	329	329	0	0%	245	245	0	0%	245	245	0	0%	5575.4	5575.4	0		
	25772	257+72	248	248	248	0%	25772	25772	25772	0%	173	172	-1	0%	152	151	-1	-1%	152	151	-1	-1%	5575.4	5575.4	0		
	25907	259+07	135	135	135	0%	25907	25907	25907	0%	177	177	0	0%	158	157	0	0%	157	157	0	0%	5575.4	5575.4	0		
	26030	260+30	123	123	123	0%	26030	26030	26030	0%	146	145	-1	0%	116	117	1	1%	116	117	1	1%	5575.4	5575.4	0		
	26049	260+49	19	19	19	0%	26049	26049	26049	0%	120	120	0	0%	93	95	2	2%	93	95	2	2%	5575.4	5575.4	0		
	26077	260+77	28	28	28	0%	26077	26077	26077	0%	55	56	1	2%	54	54	0	0%	54	54	0	0%	5575.7	5575.7	0		
	26105	261+05	28	28	28	0%	26105	26105	26105	0%	120	120	0	0%	93	93	0	0%	93	93	0	0%	5579.6	5579.6	0		
	26117	261+17	12	12	12	0%	26117	26117	26117	0%	125	125	0	0%	115	115	0	0%	115	115	0	0%	5580.5	5580.5	0		
	26195	261+95	78	78	78	0%	26195	26195	26195	0%	99	99	0	0%	83	83	0	0%	83	83	0	0%	5581.7	5581.7	0		FW=FP but no encroachment in model due to negative surcharge
	26513	265+13	318	318	318	0%	26513	26513	26513	0%	107	107	0	0%	98	98	0	0%	98	98	0	0%	5583.6	5583.6	0		
	26758	267+58	245	245	245	0%	26758	26758	26758	0%	79	80	1	1%	77	77	0	0%	77	77	0	0%	5584.5	5584.5	0		
	26781	267+81	23	23	23	0%	26781	26781	26781	0%	70	71	1	1%	66	66	0	0%	66	66	0	0%	5586.5	5586.5	0		
	26787	267+87	7	7	7	0%	26787	26787	26787	0%	76	74	-2	-3%	69	69	0	0%	69	69	0	0%	5587.2	5587.2	0		
	26801	268+01	14	14	14	0%	26801	26801	26801	0%	80	81	1	1%	74	74	0	0%	74	74	0	0%	5587.8	5587.8	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
E Belleview Ave	26887	268+87					26801	26801																			
	26953	269+53	152	152	152	0%	26953	26953	26953	0%	85	85	0	0%	78	78	0	0%	78	78	0	0%	5589.2	5589.2	0		
	26983	269+83	30	30	30	0%	26983	26983	26983	0%	80	80	0	0%	63	63	0	0%	63	63	0	0%	5588.8	5588.8	0		
	27019	270+19	35	35	35	0%	27019	27019	27019	0%	82	82	0	0%	74	73	-1	-1%	74	73	-1	-1%	5589.7	5589.7	0		
	27173	271+73	155	155	155	0%	27173	27173	27173	0%	85	85	0	0%	75	76	0	0%	75	76	0	0%	5591.1	5591.1	0		FW=FP but no encroachment in model due to negative surcharge
	27276	272+76	102	102	102	0%	27276	27276	27276	0%	90	92	1	1%	80	81	1	2%	80	81	1	2%	5592.3	5592.3	0		
E Crescent Pkwy	27325	273+25					27276	27276																			
	27369	273+69	93	93	93	0%	27369	27369	27369	0%	69	85	16	23%	69	77	8	12%	69	77	8	12%	5592.9	5592.9	0		Mapped WSEL to contours
	27404	274+04	36	36	36	0%	27404	27404	27405	0%	102	102	0	0%	98	98	-1	-1%	98	98	-1	-1%	5593.1	5593.1	0		
	27440	274+40	35	35	35	0%	27440	27440	27440	0%	48	46	-2	-4%	44	41	-4	-8%	44	41	-4	-8%	5595.7	5595.7	0		Mapped WSEL to contours
	27457	274+57	17	17	17	0%	27457	27457	27457	0%	79	78	-1	-1%	74	74	0	-1%	74	74	0	-1%	5597.5	5597.5	0		FW=FP but no encroachment in model due to negative surcharge
	27470	274+70	13	13	13	0%	27470	27470	27470	0%	124	126	2	1%	112	112	0	0%	112	112	0	0%	5598.4	5598.4	0		FW=FP but no encroachment in model due to negative surcharge
	27643	276+43	172	172	172	0%	27643	27643	27643	0%	130	130	0	0%	116	116	0	0%	116	116	0	0%	5598.6	5598.6	0		
	27740	277+40	97	97	97	0%	27740	27740	27740	0%	135	135	0	0%	111	111	0	0%	111	111	0	0%	5598.8	5598.8	0		
	27774	277+74	33	33	33	0%	27774	27774	27774	0%	134	129	-5	-4%	116	113	-3	-2%	116	113	-3	-2%	5599.3	5599.3	0		
	28005	280+05	231	231	231	0%	28005	28005	28005	0%	145	145	0	0%	134	134	0	0%	134	134	0	0%	5601.2	5601.2	0		
	28338	283+38	333	333	333	0%	28338	28338	28338	0%	114	114	0	0%	101	102	1	1%	101	102	1	1%	5603.1	5603.1	0		
	28349	283+49	11	11	11	0%	28349	28349	28349	0%	101	103	2	2%	92	92	0	0%	92	92	0	0%	5603.5	5603.5	0		
	28426	284+26	77	77	77	0%	28426	28426	28426	0%	104	102	-2	-2%	95	97	1	2%	95	97	1	2%	5606.4	5606.4	0		
E Prentice Ave	28483	284+83					28426	28426																			
	28538	285+38	112	112	112	0%	28538	28538	28538	0%	214	208	-6	-3%	110	109	-1	-1%	88	89	1	2%	5607.9	5607.9	0		
	28744	287+44	206	206	206	0%	28744	28744	28744	0%	373	373	0	0%	144	142	-2	-1%	110	110	0	0%	5608.9	5608.9	0		
	28952	289+52	208	208	208	0%	28952	28952	28952	0%	297	297	0	0%	143	143	0	0%	95	95	0	0%	5610.1	5610.1	0		
Foot Bridge_Isabella Greenwood Villag	28963	289+63					28952	28952																			
	28973	289+73	21	21	21	0%	28973	28973	28973	0%	262	263	1	0%	140	140	0	0%	95	95	0	0%	5610.2	5610.2	0		
	28988	289+88	16	16	16	0%	28988	28988	28988	0%	246	246	0	0%	136	136	0	0%	90	90	0	0%	5610.3	5610.3	0		
	28991	289+91	3	3	3	0%	28991	28991	28991	0%	243	243	0	0%	134	134	0	0%	90	90	0	0%	5610.3	5610.3	0		
	29059	290+59	67	67	67	0%	29059	29059	29059	0%	223	218	-5	-2%	110	110	0	0%	83	83	0	0%	5611.7	5611.7	0		
	29095	290+95	37	37	37	0%	29095	29095	29096	0%	236	237	1	0%	124	124	0	0%	90	90	0	0%	5612.4	5612.4	0		
	29257	292+57	161	161	161	0%	29257	29257	29257	0%	298	295	-4	-1%	281	281	0	0%	137	137	0	0%	5614.2	5614.2	0		
	29478	294+78	221	221	221	0%	29478	29478	29478	0%	226	226	0	0%	60	61	1	2%	60	61	1	2%	5616.2	5616.2	0		
S Yosemite St	29515	295+15					29478	29478																			
	29542	295+42	65	65	65	0%	29542	29542	29542	0%	448	447	-1	0%	328	322	-5	-2%	86	86	0	0%	5617.6	5617.6	0		
	29806	298+06	264	264	264	0%	29806	29806	29807	0%	298	298	0	0%	260	260	0	0%	108	108	0	0%	5618.4	5618.4	0		
	29880	298+80	73	73	73	0%	29880	29880	29880	0%	252	252	0	0%	238	238	0	0%	105	105	0	0%	5618.5	5618.5	0		
Foot Bridge	29890	298+90					29880	29880																			
	29901	299+01	22	22	22	0%	29901	29901	29901	0%	248	248	0	0%	236	236	0	0%	106	106	0	0%	5618.5	5618.5	0		
	30031	300+31	130	130	130	0%	30031	30031	30031	0%	224	224	0	0%	213	213	0	0%	110	110	0	0%	5618.5	5618.5	0		
Foot Bridge	30060	300+60					30031	30031																			
	30078	300+78	47	47	47	0%	30078	30078	30078	0%	182	182	0	0%	151	151	0	0%	102	102	0	0%	5618.7	5618.7	0		
	30228	302+28	150	150	150	0%	30228	30228	30228	0%	160	160	0	0%	141	141	0	0%	99	99	0	0%	5619.2	5619.2	0		
	30351	303+51	123	123	123	0%	30351	30351	30351	0%	206	206	0	0%	183	183	0	0%	94	94	0	0%	5620.3	5620.3	0		
	30523	305+23	172	172	172	0%	30523	30523	30523	0%	86	86	0	0%	51	51	0	0%	28	28	0	0%	5621.6	5621.6	0		
E Berry Ave	30563	305+63					30523	30523																			
	30605	306+05	81	81	81	0%	30605	30605	30605	0%	153	153	0	0%	135	134	0	0%	47	47	0	0%	5625.7	5625.7	0		
	30770	307+70	165	165	165	0%	30770	30770	30770	0%	247	247	0	0%	204	205	1	1%	92	92	0	0%	5626.2	5626.2	0		
	30902	309+02	132	132	132	0%	30902	30902	30902	0%	234	234	0	0%	194	194	0	0%	103	103	0	0%	5626.2	5626.2	0		
	30915	309+15	12	12	12	0%	30915	30915	30915	0%	260	260	0	0%	198	198	0	0%	93	93	0	0%	5626.3	5626.3	0		
	31019	310+19	105	105	105	0%	31019	31019	31019	0%	170	170	0	0%	134	134	0	0%	79	79	0	0%	5626.3	5626.3	0		
	31034	310+34	14	14	14	0%	31034	31034	31034	0%	167	167	0	0%	125	125	0	0%	82	82	0	0%	5626.3	5626.3	0		
	31233	312+33	200	200	200	0%	31233	31233	31233	0%	158	158	0	0%	107	107	0	0%	107	107	0	0%	5627.1	5627.1	0		FW=FP but no encroachment in model due to negative surcharge
	31249	312+49	16	16	16	0%	31249	31249	31249	0%	169	169	0	0%	128	128	0	0%	128	128	0	0%	5627.7	5627.7	0		
	31355	313+55	106	106	106	0%	31355	31355	31355	0%	174	174	0	0%	158	158	0	0%	75	75	0	0%	5629.2	5629.2	0		
	31407	314+07	53	53	53	0%	31407	31407	31407	0%	211	211	0	0%	196	196	0	0%	108	108	0	0%	5632.3	5632.3	0		
Spillway of Orchard Hill Pond	31434	314+34	26	26	26	0%	31434	31434	31434	0%	241	245	4	2%	84	84	0	0%	78	78	0	0%	5633.6	5633.6	0		
	31453	314+53	19	19	19	0%	31453	31453	31453	0%	266	266	0	0%	219	219	0	0%	219	219	0	0%	5635.0	5635.0	0		FW=FP but no encroachment in model due to negative surcharge
	31737	317+37	284	284	284	0%	31737	31737	31737	0%	215	215	0	0%	202	202	0	0%	202	202	0	0%	5635.1	5635.1	0		FW=FP but no encroachment in model due to negative surcharge
	31911	319+11	175	175	175	0%	31911	31911	31911	0%	186	186	0	0%	153	153	0	0%	153	153	0	0%	5635.6	5635.6	0		
Confluence with Goldsmith Gulch West	31983	319+83	72	72	72	0%	31983	31983	31983	0%	202	202	0	0%	163	163	0	0%	163	163	0	0%	5635.9	5635.9	0		
	32103	321+03	121	121	121	0%	32103	32103	32103	0%	198	195	-3	-1%	165	165	0	0%	165	165	0	0%	5636.6	5636.6	0		Reach length in junction instead of XS FW=FP but no encroachment in model due to negative surcharge
Pedestrian Bridge	32110	321+10					32103	32103																			
	32120	321+20	16	16	16	0%	32120	32120	32120	0%	197	197	0	0%	173	168	-6	-3%	173	168	-6	-3%	5636.9	5636.9	0		FW=FP but no encroachment in model due to negative surcharge
	32210	322+10	91	91	91	0%	32210	32210	32210	0%	142	143	1	0%	121	122	1	1%	121	122	1	1%	5637.1	5637.1	0		FW=FP but no encroachment in model due to negative surcharge
	32311	323+11	101	101	101	0%	32311	32311	32311	0%	127	127	0	0%	112	112	0	0%	57	57	0	0%	5638.3	5638.3	0		
	32433	324+33	122	122	122	0%	32433	32433	32433	0%	102	102	0	0%	92	92	0	0%	50	50	0	0%	5640.1	5640.1	0		
	32687	326+87	254	254	254	0%	32687	32687	32687	0%	124	124	0	0%	103	103	0	0%	53	53	0	0%	5644.0	5644.0	0		
	32760	327+60	72	72	72	0%	32760	32760	32760	0%	114	114	0	0%	102	101	0	0%	65	65	0	0%	5645.0	5645.0	0		
Foot Bridge	32768	327+68					32760	32760																			
	32775	327+75	15	15	15	0%	32775	32775	32775	0%	130	130	0	0%	106	103	-3	-3%	73	73	0	0%	5645.9	5645.9	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
	32813	328+13	38	38	38	0%	32813	32813	32813	0%	132	132	0	0%	110	110	0	0%	74	74	0	0%	5645.9	5645.9	0		
	32986	329+86	173	173	173	0%	32986	32986	32986	0%	111	111	0	0%	92	92	0	0%	63	63	0	0%	5647.9	5647.9	0		
	33122	331+22	136	136	136	0%	33122	33122	33122	0%	94	94	0	0%	85	85	0	0%	58	58	0	0%	5649.7	5649.7	0		
	33145	331+45	23	23	23	0%	33145	33145	33145	0%	100	100	0	0%	90	90	0	0%	60	60	0	0%	5650.2	5650.2	0		
	33251	332+51	106	106	106	0%	33251	33251	33251	0%	96	101	5	5%	88	86	-2	-2%	57	57	0	0%	5651.9	5651.9	0		
	33281	332+81	30	30	30	0%	33281	33281	33281	0%	125	122	-3	-2%	104	104	0	0%	58	58	0	0%	5652.7	5652.7	0		
	33339	333+39	58	58	58	0%	33339	33339	33339	0%	119	118	-1	-1%	112	112	0	0%	61	61	0	0%	5653.6	5653.6	0		
	33368	333+68	29	29	29	0%	33368	33368	33368	0%	126	124	-2	-2%	117	115	-2	-2%	64	64	0	0%	5653.9	5653.9	0		
	33460	334+60	92	92	92	0%	33460	33460	33460	0%	137	130	-7	-5%	115	114	-1	-1%	41	41	0	0%	5655.8	5655.8	0		
	33496	334+96	35	35	35	0%	33495	33495	33496	0%	104	104	0	0%	92	88	-4	-4%	33	33	0	0%	5656.8	5656.8	0		
	33549	335+49	53	53	53	0%	33549	33549	33549	0%	199	208	9	4%	176	180	4	2%	126	126	0	0%	5671.3	5671.3	0		
	33565	335+65	16	16	16	0%	33565	33565	33565	0%	291	297	6	2%	269	259	-10	-4%	163	163	0	0%	5671.6	5671.6	0		
E Orchard Rd	33596	335+96	31	31	31	0%	33596	33596	33596	0%	297	304	7	2%	276	277	1	0%	240	240	0	0%	5671.6	5671.6	0		
	33654	336+54	58	58	58	0%	33654	33654	33654	0%	387	392	5	1%	380	380	0	0%	380	380	0	0%	5671.6	5671.6	0		
	33712	337+12	58	58	58	0%	33712	33712	33712	0%	356	360	4	1%	350	350	0	0%	350	350	0	0%	5671.6	5671.6	0		
Foot Bridge_Silo Park	33721	337+21					33712	33712																			
	33728	337+28	15	15	15	0%	33728	33728	33728	0%	353	354	1	0%	343	343	0	0%	343	343	0	0%	5671.6	5671.6	0		
	34047	340+47	319	319	319	0%	34047	34047	34047	0%	269	271	2	1%	262	262	0	0%	262	262	0	0%	5671.6	5671.6	0		
	34124	341+24	77	77	77	0%	34124	34124	34124	0%	258	268	10	4%	251	251	0	0%	251	251	0	0%	5671.6	5671.6	0		Rt FP500 limits from upstream rdwy overtopping
	34225	342+25	101	101	101	0%	34225	34225	34225	0%	181	216	35	20%	176	176	0	0%	176	176	0	0%	5671.6	5671.6	0		FP500 limits from upstream rdwy overtopping
Foot Bridge_Silo Park	34232	342+32					34225	34225																			
	34236	342+36	11	11	11	0%	34236	34236	34236	0%	159	202	43	27%	153	153	0	0%	153	153	0	0%	5671.6	5671.6	0		FP500 limits from upstream rdwy overtopping
	34261	342+61	25	25	25	0%	34261	34261	34261	0%	81	365	284	353%	77	77	0	0%	77	77	0	0%	5671.6	5671.6	0		FP500 limits from upstream rdwy overtopping
	34265	342+65	4	4	4	0%	34265	34265	34265	0%	374	372	-2	-1%	57	57	0	1%	57	57	0	1%	5674.6	5674.6	0		
S Dayton St	34312	343+12	47	47	47	0%	34312	34312	34312	0%	320	321	1	0%	252	251	0	0%	252	251	0	0%	5675.1	5675.1	0		
	34461	344+61	149	149	149	0%	34461	34461	34461	0%	110	110	0	0%	100	100	0	0%	100	100	0	0%	5676.7	5676.7	0		
	34544	345+44	83	83	83	0%	34544	34544	34544	0%	196	196	1	0%	188	188	0	0%	188	188	0	0%	5677.2	5677.2	0		
	34818	348+18	274	274	274	0%	34818	34818	34818	0%	90	90	0	0%	75	75	0	0%	75	75	0	0%	5679.1	5679.1	0		
	35157	351+57	340	340	340	0%	35157	35157	35157	0%	69	69	0	0%	56	56	0	0%	56	56	0	0%	5680.9	5680.9	0		
	35287	352+87	130	130	130	0%	35287	35287	35287	0%	68	68	0	0%	37	37	0	0%	37	37	0	0%	5683.9	5683.9	0		FW=FP but no encroachment in model due to negative surcharge
	35347	353+47	60	60	60	0%	35347	35347	35347	0%	125	125	0	0%	94	94	0	0%	94	94	0	0%	5686.4	5686.4	0		
	35377	353+77	30	30	30	0%	35377	35377	35377	0%	207	207	0	0%	191	191	0	0%	191	191	0	0%	5686.4	5686.4	0		
	35385	353+85	8	8	8	0%	35385	35385	35385	0%	220	220	0	0%	200	200	0	0%	200	200	0	0%	5686.4	5686.4	0		
	35436	354+36	51	51	51	0%	35436	35436	35436	0%	118	118	0	0%	109	109	0	0%	109	109	0	0%	5686.4	5686.4	0		
	35461	354+61	25	25	25	0%	35461	35461	35461	0%	93	93	0	0%	83	83	0	0%	83	83	0	0%	5686.4	5686.4	0		
	35481	354+81	20	20	20	0%	35481	35481	35481	0%	78	79	0	0%	69	69	0	0%	69	69	0	0%	5686.4	5686.4	0		
	35529	355+29	48	48	48	0%	35529	35529	35529	0%	164	164	0	0%	152	152	0	0%	152	152	0	0%	5697.5	5697.5	0		
E Maplewood Ave	35554	355+54	25	25	25	0%	35554	35554	35554	0%	142	143	1	1%	138	138	0	0%	138	138	0	0%	5697.8	5697.8	0		
	35598	355+98	43	43	43	0%	35598	35598	35598	0%	237	237	0	0%	229	229	0	0%	205	205	0	0%	5698.3	5698.3	0		
	35762	357+62	59	59	59	0%	35657	35657	35762	0%	336	336	0	0%	329	329	0	0%	299	299	0	0%	5698.3	5698.3	0		
	35891	358+91	130	130	130	0%	35786	35786	35891	0%	246	246	0	0%	243	243	0	0%	215	216	0	0%	5698.3	5698.3	0		
	35914	359+14	23	23	23	0%	35810	35810	35914	0%	211	211	0	0%	205	205	0	0%	181	181	0	0%	5698.2	5698.2	0		
Foot Bridge_Arapahoe Lake	35929	359+29					35810	35810																			
	35935	359+35	21	21	21	0%	35830	35830	35935	0%	49	49	0	0%	48	48	0	0%	48	48	0	0%	5698.3	5698.3	0		
	35951	359+51	16	16	16	0%	35846	35846	35951	0%	217	217	0	0%	214	214	0	0%	214	214	0	0%	5698.5	5698.5	0		
	36098	360+98	147	147	147	0%	35993	35993	36098	0%	386	389	3	1%	384	383	-1	0%	375	375	0	0%	5698.6	5698.6	0		
	36201	362+01	103	103	103	0%	36097	36097	36201	0%	82	82	0	0%	74	74	0	0%	74	74	0	0%	5698.6	5698.6	0		
	36337	363+37	135	135	135	0%	36232	36232	36337	0%	38	38	0	0%	34	34	0	0%	34	34	0	0%	5698.9	5698.9	0		
Foot Bridge_Arapahoe Lake	36343	363+43					36232	36232																			
	36351	363+51	14	14	14	0%	36246	36246	36351	0%	37	37	0	0%	34	34	0	0%	34	34	0	0%	5700.2	5700.2	0		
	36409	364+09	58	58	58	0%	36304	36304	36409	0%	29	29	0	0%	19	19	0	0%	19	19	0	0%	5701.7	5701.7	0		FW=FP but no encroachment in model due to negative surcharge
	36646	366+46	237	237	237	0%	36541	36541	36646	0%	46	46	0	0%	39	39	0	0%	39	39	0	0%	5703.8	5703.8	0		
	36685	366+85	39	39	39	0%	36580	36580	36685	0%	39	39	0	0%	34	34	0	0%	34	34	0	0%	5704.1	5704.1	0		
	36778	367+78	93	93	93	0%	36673	36673	36778	0%	36	36	0	0%	32	32	0	0%	32	32	0	0%	5706.7	5706.7	0		
E Caley Ave	36840	368+40					36673	36673																			
	36909	369+09	131	131	131	0%	36804	36804	36909	0%	51	51	0	0%	36	36	0	0%	36	36	0	0%	5710.8	5710.8	0		
	36957	369+57	48	48	48	0%	36852	36852	36957	0%	73	73	0	0%	57	57	0	0%	57	57	0	0%	5710.8	5710.8	0		
Foot Bridge	36965	369+65					36852	36852																			
	36968	369+68	11	11	11	0%	36863	36863	36968	0%	72	72	0	0%	62	62	0	0%	62	62	0	0%	5711.4	5711.4	0		
	36999	369+99	31	31	31	0%	36894	36894	36999	0%	66	66	0	0%	55	55	0	0%	55	55	0	0%	5711.4	5711.4	0		
	37194	371+94	196	196	196	0%	37090	37090	37194	0%	40	40	0	0%	20	20	0	0%	20	20	0	0%	5711.2	5711.2	0		
	37215	372+15	21	21	21	0%	37110	37110	37215	0%	57	57	0	0%	45	45	0	0%	45	45	0	0%	5713.8	5713.8	0		FW=FP but no encroachment in model due to negative surcharge
	37233	372+33	18	18	18	0%	37128	37128	37233	0%	59	59	0	0%	54	54	0	0%	54	54	0	0%	5714.2	5714.2	0		
	37320	373+20	87	87	87	0%	37215	37215	37320	0%	44	44	0	0%	40	40	0	0%	40	40	0	0%	5714.3	5714.3	0		
	37341	373+41	21	21	21	0%	37236	37236	37341	0%	32	32	0	0%	29	29	0	0%	29	29	0	0%	5714.3	5714.3	0		
	37358	373+58	17	17	17	0%	37253	37253	37358	0%	44	44	0	0%	40	40	0	0%	40	40	0	0%	5715.4	5715.4	0		FW=FP but no encroachment in model due to negative surcharge
	37379	373+79	21	21	21	0%	37274	37274	37379	0%	58	58	0	0%	54	53	-1	-2%	54	53	-1	-2%	5715.9	5715.9	0		
	37493	374+93	115	115	115	0%	37389	37389	37493	0%	66	66	0	0%	61	61	0	0%	61	61	0	0%	5717.0	5717.0	0		
	37540	375+40	46	46	46	0%	37435	37435	37540	0%	61	61	0	0%	54	54	0	0%	54	54	0	0%	5718.5	5718.5	0		
	37569	375+69	29	29	29	0%	37464	37464	37569	0%	36	36	0	0%	33	33	0	0%	18	18	0	0%	5719.0	5719.0	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
Foot Bridge	37578	375+78					37464	37464																			
	37587	375+87	18	18	18	0%	37482	37482	37587	0%	33	33	0	0%	22	22	0	0%	21	21	0	0%	5719.8	5719.8	0		Ignored false contours through riprap basin
	37614	376+14	26	26	26	0%	37509	37509	37614	0%	30	30	0	0%	20	20	0	0%	20	20	0	0%	5719.8	5719.8	0		Ignored false contours through riprap basin
	37634	376+34	20	20	20	0%	37529	37529	37634	0%	41	41	0	0%	38	38	0	0%	38	38	0	0%	5722.3	5722.3	0		
	37671	376+71	38	38	38	0%	37567	37567	37671	0%	24	24	0	0%	20	20	0	0%	20	20	0	0%	5723.3	5723.3	0		
	37772	377+72	100	100	100	0%	37667	37667	37772	0%	20	20	0	0%	16	15	-1	-7%	16	15	-1	-7%	5725.9	5725.9	0		Mapped WSEL to contours FW=FP but no encroachment in model due to negative surcharge
	37938	379+38	167	167	167	0%	37834	37834	37938	0%	18	18	0	0%	12	12	0	0%	12	12	0	0%	5728.2	5728.2	0		
	37966	379+66	27	27	27	0%	37861	37861	37966	0%	16	16	0	0%	14	14	0	-1%	14	14	0	-1%	5728.6	5728.6	0		Model XS from drop structure survey, does not exactly match contours
	37990	379+90	25	25	25	0%	37886	37886	37990	0%	17	17	0	0%	15	15	0	0%	15	15	0	0%	5731.3	5731.3	0		FW=FP but no encroachment in model due to negative surcharge
	38020	380+20	30	30	30	0%	37916	37916	38020	0%	31	31	0	0%	24	24	0	0%	24	24	0	0%	5732.2	5732.2	0		
	38183	381+83	162	162	162	0%	38078	38078	38183	0%	13	13	0	4%	12	13	0	3%	12	13	0	3%	5734.2	5734.2	0		
	38283	382+83	100	100	100	0%	38178	38178	38283	0%	27	27	0	0%	22	21	0	0%	22	21	0	0%	5735.6	5735.6	0		
E Peakview Ave	38400	384+00					38178	38178																			
	38482	384+82	199	199	199	0%	38377	38377	38482	0%	48	48	0	0%	41	40	-1	-2%	41	40	-1	-2%	5739.9	5739.9	0		
	38538	385+38	56	56	56	0%	38433	38433	38538	0%	25	25	0	0%	22	22	0	0%	22	22	0	0%	5740.8	5740.8	0		
	38709	387+09	172	172	172	0%	38605	38605	38710	0%	24	24	0	0%	21	21	0	0%	21	21	0	0%	5742.5	5742.5	0		FW=FP but no encroachment in model due to negative surcharge
	38890	388+90	181	181	181	0%	38786	38786	38890	0%	22	22	0	0%	21	21	0	0%	21	21	0	0%	5744.4	5744.4	0		
	38924	389+24	34	34	34	0%	38820	38820	38924	0%	18	18	0	0%	17	17	0	0%	17	17	0	0%	5744.9	5744.9	0		
	38993	389+93	69	69	69	0%	38888	38888	38993	0%	10	10	0	0%	9	9	0	0%	9	9	0	0%	5756.2	5756.2	0		
	39006	390+06	13	13	13	0%	38902	38902	39006	0%	10	10	0	0%	9	9	0	5%	9	9	0	5%	5757.3	5757.3	0		Mapped WSEL to contours
	39152	391+52	146	146	146	0%	39048	39048	39152	0%	9	9	0	0%	8	8	0	0%	8	8	0	0%	5760.8	5760.8	0		
E Arapahoe Rd	39585	395+85	433	433	433	0%	39480	39480	39585	0%	9	9	0	0%	8	7	-1	-9%	8	7	-1	-9%	5770.9	5770.9	0		Mapped WSEL to contours
Goldsmith Gulch West Tributary _ Confluence with Goldsmith Gulch to Boston St/Peakview Ave Pond																											
Confluence with Goldsmith Gulch	54	0+54	98	98	54	-45%	98	98	54	-45%	142	140	-2	-1%	109	109	0	0%	109	109	0	0%	5636.7	5636.7	0		Reach length in junction instead of XS, Model shows distance to d/s XS
Trail Crossing	79	0+79					98	98																			
	95	0+95	41	41	41	0%	139	139	95	-32%	134	134	0	0%	121	120	-1	-1%	65	65	0	0%	5637.9	5637.9	0		
	101	1+01	6	6	6	0%	145	145	101	-30%	135	135	0	0%	123	123	0	0%	65	65	0	0%	5638.2	5638.2	0		
	102	1+02	1	1	1	0%	146	146	102	-30%	135	135	0	0%	122	122	0	0%	65	65	0	0%	5638.2	5638.2	0		
	198	1+98	97	97	97	0%	242	242	198	-18%	130	130	0	0%	102	102	0	0%	60	60	0	0%	5638.2	5638.2	0		
	407	4+07	208	208	208	0%	451	451	407	-10%	117	117	0	0%	97	98	2	2%	46	46	0	0%	5639.5	5639.5	0		
	410	4+10	3	3	3	0%	454	454	410	-10%	122	122	0	0%	106	104	-2	-2%	48	48	0	0%	5639.8	5639.8	0		
	490	4+90	80	80	80	0%	534	534	490	-8%	101	101	0	0%	89	89	0	0%	55	55	0	0%	5641.7	5641.7	0		
	693	6+93	203	203	203	0%	737	737	693	-6%	126	126	0	0%	107	107	0	0%	56	56	0	0%	5643.5	5643.5	0		
Foot Bridge	700	7+00					737	737																			
	709	7+09	17	17	17	0%	753	753	709	-6%	138	138	0	0%	121	121	-1	-1%	56	56	0	0%	5644.2	5644.2	0		
	884	8+84	175	175	175	0%	928	928	884	-5%	130	130	0	0%	98	98	0	0%	52	52	0	0%	5645.7	5645.7	0		
	887	8+87	3	3	3	0%	931	931	887	-5%	130	130	0	0%	114	114	0	0%	52	52	0	0%	5645.9	5645.9	0		
	1071	10+71	184	184	184	0%	1115	1115	1071	-4%	114	114	0	0%	98	93	-5	-5%	52	52	0	0%	5647.3	5647.3	0		
	1076	10+76	5	5	5	0%	1120	1120	1076	-4%	116	116	0	0%	103	100	-4	-4%	52	52	0	0%	5647.7	5647.7	0		
	1166	11+66	89	89	89	0%	1210	1210	1166	-4%	136	137	1	1%	126	125	-2	-1%	65	65	0	0%	5648.4	5648.4	0		
	1196	11+96	31	31	31	0%	1240	1240	1196	-4%	135	135	1	1%	129	129	0	0%	76	75	0	0%	5649.0	5649.0	0		
	1242	12+42	46	46	46	0%	1286	1286	1242	-3%	134	138	4	3%	126	126	0	0%	67	67	0	0%	5649.6	5649.6	0		
Foot Bridge	1262	12+62					1286	1286																			
	1284	12+84	42	42	42	0%	1328	1328	1284	-3%	133	133	0	0%	123	119	-3	-3%	58	58	0	0%	5650.1	5650.1	0		
	1341	13+41	57	57	57	0%	1385	1385	1341	-3%	49	49	0	0%	45	46	0	1%	36	36	0	0%	5650.2	5650.2	0		
E Orchard Rd	1398	13+98					1385	1385																			
	1455	14+55	114	114	114	0%	1500	1500	1455	-3%	41	40	0	0%	37	36	-1	-1%	36	36	0	1%	5652.5	5652.5	0		
	1461	14+61	6	6	6	0%	1505	1505	1461	-3%	69	70	1	2%	55	54	-1	-1%	55	54	-1	-1%	5652.5	5652.5	0		
	1519	15+19	58	58	58	0%	1563	1563	1519	-3%	267	267	1	0%	257	257	0	0%	257	257	0	0%	5660.6	5660.6	0		FW=FP but no encroachment in model due to negative surcharge
	1600	16+00	80	80	80	0%	1644	1644	1600	-3%	370	370	0	0%	363	363	0	0%	363	363	0	0%	5661.2	5661.2	0		
	1896	18+96	296	296	296	0%	1940	1940	1896	-2%	226	225	-1	0%	221	222	0	0%	221	222	0	0%	5661.1	5661.1	0		
	2032	20+32	136	136	136	0%	2076	2076	2032	-2%	235	235	0	0%	228	228	0	0%	228	228	0	0%	5661.1	5661.1	0		
	2109	21+09	77	77	77	0%	2153	2153	2109	-2%	195	194	0	0%	189	189	0	0%	189	189	0	0%	5661.1	5661.1	0		
Foot Bridge_Tommy Davis Park	2128	21+28					2153	2153																			
	2145	21+45	36	36	36	0%	2189	2189	2145	-2%	182	182	0	0%	174	174	0	0%	174	174	0	0%	5661.2	5661.2	0		
	2175	21+75	30	30	30	0%	2219	2219	2175	-2%	178	178	0	0%	165	165	0	0%	165	165	0	0%	5661.3	5661.3	0		
	2186	21+86	11	11	11	0%	2230	2230	2186	-2%	174	174	0	0%	161	161	0	0%	161	161	0	0%	5661.3	5661.3	0		
	2343	23+43	157	157	157	0%	2387	2387	2343	-2%	106	106	0	0%	88	88	0	0%	88	88	0	0%	5661.3	5661.3	0		
	2401	24+01	58	58	58	0%	2445	2445	2401	-2%	92	92	0	0%	73	73	0	0%	73	73	0	0%	5662.5	5662.5	0		FW=FP but no encroachment in model due to negative surcharge
	2489	24+89	88	88	88	0%	2533	2533	2489	-2%	67	67	0	0%	57	57	0	0%	57	57	0	0%	5663.3	5663.3	0		FW=FP but no encroachment in model due to negative surcharge
	2563	25+63	74	74	74	0%	2607	2607	2563	-2%	70	70	0	0%	58	58	0	0%	57	58	0	0%	5664.0	5664.0	0		
	2602	26+02	39	39	39	0%	2646	2646	2602	-2%	82	82	0	0%	67	66	0	0%	67	66	0	0%	5664.4	5664.4	0		
	2640	26+40	39	39	39	0%	2684	2684	2640	-2%	73	73	0	0%	57	57	0	0%	57	57	0	0%	5664.5	5664.5	0		
	2685	26+85	45	45	45	0%	2729	2729	2685	-2%	45	45	0	0%	35	35	0	0%	35	35	0	0%	5664.7	5664.7	0		FW=FP but no encroachment in model due to negative surcharge
	2700	27+00	15	15	15	0%	2744	2744	2700	-2%	91	91	0	0%	76	76	0	0%	76	76	0	0%	5665.9	5665.9	0		Model XS skewed for bridge
Foot Bridge	2722	27+22					2744	2744																			
	2747	27+47	47	47	47	0%	2791	2791	2747	-2%	155	156	1	0%	136	136	0	0%	136	132	-5	-3%	5666.3	5666.3	0		Model XS skewed for bridge
	2823	28+23	77	77	77	0%	2867	2867	2823	-2%	65	65	0	-1%	56	56	0	0%	56	56	0	0%	5416.6	5416.6	0		FW=FP but no encroachment in model due to negative surcharge
	2880	28+80	57	57	57	0%	2924	2924	2880	-2%	75	75	0	0%	70	70	0	0%	70	70	0	0%	5667.8	5667.8	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
	2905	29+05	25	25	25	0%	2949	2949	2905	-1%	93	93	0	0%	87	87	0	0%	87	87	0	0%	5668.0	5668.0	0		
	2926	29+26	21	21	21	0%	2970	2970	2926	-1%	99	99	0	0%	94	94	0	0%	94	94	0	0%	5668.0	5668.0	0		
	2964	29+64	37	37	37	0%	3008	3008	2964	-1%	104	104	0	0%	98	98	0	0%	98	98	0	0%	5668.1	5668.1	0		
	2984	29+84	20	20	20	0%	3028	3028	2984	-1%	105	105	0	0%	100	100	0	0%	100	100	0	0%	5668.3	5668.3	0		
	3007	30+07	24	24	24	0%	3051	3051	3007	-1%	107	107	0	0%	101	101	0	0%	101	101	0	0%	5668.3	5668.3	0		
	3032	30+32	25	25	25	0%	3077	3077	3032	-1%	94	94	0	0%	86	86	0	0%	86	86	0	0%	5668.5	5668.5	0		
	3056	30+56	23	23	23	0%	3100	3100	3056	-1%	82	82	0	0%	71	71	0	0%	71	71	0	0%	5668.7	5668.7	0		
	3084	30+84	28	28	28	0%	3128	3128	3084	-1%	48	48	0	0%	44	44	0	0%	44	44	0	0%	5668.7	5668.7	0		FW=FP but no encroachment in model due to negative surcharge
	3124	31+24	40	40	40	0%	3168	3168	3124	-1%	52	52	-1	-1%	36	36	0	0%	36	36	0	0%	5669.8	5669.8	0		
	3146	31+46	23	23	23	0%	3190	3190	3146	-1%	56	56	0	0%	47	47	0	0%	47	47	0	0%	5670.5	5670.5	0		
	3177	31+77	30	30	30	0%	3221	3221	3177	-1%	53	53	0	0%	42	42	0	0%	42	42	0	0%	5670.5	5670.5	0		
	3251	32+51	74	74	74	0%	3295	3295	3251	-1%	61	61	0	0%	45	45	0	0%	45	45	0	0%	5671.5	5671.5	0		FW=FP but no encroachment in model due to negative surcharge
	3276	32+76	25	25	25	0%	3320	3320	3276	-1%	82	82	0	0%	71	71	0	0%	71	71	0	0%	5672.4	5672.4	0		
	3303	33+03	27	27	27	0%	3347	3347	3303	-1%	79	79	0	0%	69	69	0	0%	69	69	0	0%	5672.4	5672.4	0		
	3384	33+84	81	81	81	0%	3428	3428	3384	-1%	79	79	0	0%	69	69	1	1%	69	69	1	1%	5672.9	5672.9	0		
	3399	33+99	15	15	15	0%	3443	3443	3399	-1%	63	63	0	0%	57	57	0	0%	57	57	0	0%	5673.1	5673.1	0		
	3416	34+16	17	17	17	0%	3460	3460	3416	-1%	54	54	0	0%	47	47	0	0%	47	47	0	0%	5673.1	5673.1	0		
	3479	34+79	64	64	64	0%	3523	3523	3479	-1%	49	49	0	0%	42	42	0	0%	42	42	0	0%	5674.4	5674.4	0		
E Fair Avenue	3510	35+10	0	0			3523	3523			329				236				153				5421.0	5421.0			
	3539	35+39	60	60	60	0%	3583	3583	3539	-1%	137	137	0	0%	100	73	-27	-27%	100	73	-27	-27%	5678.3	5678.3	0		Shallow left overbank flow excluded because depth < 0.01'
	3542	35+42	3	3	3	0%	3586	3586	3542	-1%	134	134	0	0%	73	73	0	0%	73	73	0	0%	5678.3	5678.3	0		
	3548	35+48	6	6	6	0%	3592	3592	3548	-1%	122	121	0	0%	61	61	0	0%	61	61	0	0%	5678.3	5678.3	0		
	3573	35+73	25	25	25	0%	3617	3617	3573	-1%	53	92	39	73%	50	50	0	0%	50	50	0	0%	5678.2	5678.2	0		Mapped 500-yr to match surrounding XS
	3606	36+06	33	33	33	0%	3650	3650	3606	-1%	112	111	0	0%	78	78	0	0%	78	78	0	0%	5678.4	5678.4	0		
	3631	36+31	25	25	25	0%	3675	3675	3631	-1%	91	91	0	0%	58	58	0	0%	58	58	0	0%	5678.6	5678.6	0		
	3681	36+81	50	50	50	0%	3725	3725	3681	-1%	76	76	0	0%	61	61	0	0%	61	61	0	0%	5679.5	5679.5	0		
	3721	37+21	40	40	40	0%	3765	3765	3721	-1%	104	104	0	0%	91	91	0	0%	91	91	0	0%	5680.1	5680.1	0		
	3751	37+51	30	30	30	0%	3795	3795	3751	-1%	142	142	0	0%	130	130	0	0%	130	130	0	0%	5680.2	5680.2	0		
	3776	37+76	25	25	25	0%	3820	3820	3776	-1%	126	126	0	0%	114	114	0	0%	114	114	0	0%	5680.2	5680.2	0		
	3806	38+06	30	30	30	0%	3850	3850	3806	-1%	116	115	0	0%	105	105	0	0%	105	105	0	0%	5680.2	5680.2	0		
	3842	38+42	36	36	36	0%	3886	3886	3842	-1%	73	73	0	0%	62	62	0	0%	62	62	0	0%	5680.2	5680.2	0		
	3881	38+81	39	39	39	0%	3925	3925	3881	-1%	54	54	0	0%	43	43	0	0%	43	43	0	0%	5681.0	5681.0	0		
	3906	39+06	25	25	25	0%	3950	3950	3906	-1%	46	46	0	0%	38	38	0	0%	38	38	0	0%	5680.9	5680.9	0		
	3931	39+31	25	25	25	0%	3975	3975	3931	-1%	70	70	0	0%	35	35	0	0%	35	35	0	0%	5681.2	5681.2	0		FW=FP but no encroachment in model due to negative surcharge
	3956	39+56	25	25	25	0%	4000	4000	3956	-1%	128	128	0	0%	66	66	0	0%	66	66	0	0%	5682.1	5682.1	0		FW=FP but no encroachment in model due to negative surcharge
Foot Bridge at Huntington Park	3968	39+68					4000	4000																			
	3979	39+79	23	23	23	0%	4023	4023	3979	-1%	150	150	0	0%	136	136	0	0%	136	136	0	0%	5683.8	5683.8	0		FW=FP but no encroachment in model due to negative surcharge
	4009	40+09	30	30	30	0%	4053	4053	4009	-1%	132	132	0	0%	125	125	0	0%	125	125	0	0%	5683.9	5683.9	0		
	4050	40+50	41	41	41	0%	4094	4094	4050	-1%	119	119	0	0%	107	107	0	0%	107	107	0	0%	5684.0	5684.0	0		FW=FP but no encroachment in model due to negative surcharge
	4102	41+02	51	51	51	0%	4146	4146	4102	-1%	113	113	0	0%	104	104	0	0%	104	104	0	0%	5684.1	5684.1	0		
	4138	41+38	37	37	37	0%	4182	4182	4138	-1%	110	110	0	0%	102	102	0	0%	102	102	0	0%	5684.2	5684.2	0		
	4203	42+03	64	64	64	0%	4247	4247	4203	-1%	93	93	0	0%	84	84	0	0%	84	84	0	0%	5684.4	5684.4	0		
	4234	42+34	32	32	32	0%	4278	4278	4234	-1%	113	113	0	0%	94	94	0	0%	94	94	0	0%	5684.5	5684.5	0		
	4295	42+95	61	61	61	0%	4339	4339	4295	-1%	105	105	0	0%	93	93	0	0%	93	93	0	0%	5684.7	5684.7	0		
	4339	43+39	44	44	44	0%	4383	4383	4339	-1%	86	86	0	0%	80	80	0	0%	80	80	0	0%	5684.8	5684.8	0		
	4365	43+65	26	26	26	0%	4409	4409	4365	-1%	50	50	0	0%	45	45	0	0%	45	45	0	0%	5685.7	5685.7	0		
	4374	43+74	9	9	9	0%	4418	4418	4374	-1%	65	65	0	0%	58	58	0	0%	58	58	0	0%	5687.3	5687.3	0		FW=FP but no encroachment in model due to negative surcharge
	4412	44+12	37	37	37	0%	4456	4456	4412	-1%	53	53	0	0%	44	44	0	0%	44	44	0	0%	5689.4	5689.4	0		
	4438	44+38	26	26	26	0%	4482	4482	4438	-1%	55	55	0	0%	45	45	0	0%	45	45	0	0%	5690.2	5690.2	0		FW=FP but no encroachment in model due to negative surcharge
	4454	44+54	16	16	16	0%	4498	4498	4454	-1%	64	64	0	0%	50	50	0	0%	50	50	0	0%	5690.7	5690.7	0		
	4472	44+72	18	18	18	0%	4516	4516	4472	-1%	33	33	0	0%	29	29	0	0%	29	29	0	0%	5690.9	5690.9	0		
E Caley Ave	4540	45+40					4516	4516																			
	4610	46+10	139	139	139	0%	4655	4655	4610	-1%	61	61	0	0%	25	25	0	0%	25	25	0	0%	5695.3	5695.3	0		
	4624	46+24	14	14	14	0%	4668	4668	4624	-1%	210	210	0	0%	175	175	0	0%	175	175	0	0%	5698.4	5698.4	0		
	4632	46+32	8	8	8	0%	4676	4676	4632	-1%	405	405	0	0%	387	387	0	0%	387	363	-25	-6%	5698.5	5698.5	0		Mapped FW to retaining wall (excluded shallow overflow)
	4760	47+60	128	128	128	0%	4804	4804	4760	-1%	464	464	0	0%	455	454	0	0%	455	415	-40	-9%	5698.5	5698.5	0		Mapped FW to retaining wall (excluded shallow overflow)
	4885	48+85	125	125	125	0%	4929	4929	4885	-1%	153	153	0	0%	137	137	0	0%	137	117	-20	-15%	5698.5	5698.5	0		Mapped FW to retaining wall (excluded shallow overflow)
	4895	48+95	10	10	10	0%	4939	4939	4895	-1%	135	135	0	0%	125	125	0	0%	125	111	-13	-11%	5698.5	5698.5	0		Mapped FW to retaining wall (excluded shallow overflow)
	4933	49+33	39	39	39	0%	4977	4977	4933	-1%	94	94	0	0%	90	90	0	0%	90	90	0	0%	5698.5	5698.5	0		
	4940	49+40	7	7	7	0%	4984	4984	4940	-1%	84	84	0	0%	82	82	0	0%	82	82	0	0%	5698.5	5698.5	0		
	4954	49+54	13	13	13	0%	4998	4998	4954	-1%	58	58	0	1%	57	57	0	0%	57	57	0	0%	5698.4	5698.4	0		
	4959	49+59	5	5	5	0%	5003	5003	4959	-1%	39	42	3	7%	39	38	-1	-2%	39	38	-1	-2%	5698.1	5698.1	0		Mapped higher WSEL from XS 4954
E Caley Way	5007	50+07					5003	5003																			
	5054	50+54	96	96	96	0%	5098	5098	5054	-1%	20	20	0	1%	19	19	0	0%	19	19	0	0%	5698.8	5698.8	0		
	5058	50+58	3	3	3	0%	5102	5102	5058	-1%	24	24	0	0%	23	23	0	0%	23	23	0	0%	5698.9	5698.9	0		
	5067	50+67	10	10	10	0%	5111	5111	5067	-1%	31	31	0	0%	26	26	0	0%	26	26	0	0%	5698.9	5698.9	0		
	5074	50+74	7	7	7	0%	5118	5118	5074	-1%	51	51	0	0%	48	48	0	0%	48	48	0	0%	5701.1	5701.1	0		
	5087	50+87	13	13	13	0%	5132	5132	5087	-1%	145	146	1	1%	113	113	0	0%	113	113	0	0%	5701.6	5701.6	0		
	5277	52+77	189	189	189	0%	5321	5321	5277	-1%	39	120	81	206%	37	37	0	0%	37	37	0	0%	5702.9	5702.9	0		500-yr mapped upstream overflow path
	5317	53+17	41	41	41	0%	5361	5361	5317	-1%	20	21	1	3%	19	19	0	0%	19	19	0	0%	5706.1	5706.1	0		

MILE HIGH FLOOD DISTRICT

FHAD AGREEMENT TABLE: MODEL - PROFILE - MAP

PROJECT NAME: Goldsmith Gulch FHAD (18.155.035)

Community(ies): City and County of Denver, City of Greenwood Village, and SEMSWA
Flooding Source: Goldsmith Gulch - 0.5' ΔEGL
Reach: multiple (see headings in gray)

Engineer: Ben Liu
Page: of
Date: 5/12/2022

Reference Location (1)	Cross Section (2)	River Station (3)	Distance b/a RS, ft Model (4)	Profile (5)	Map (6)	Model/Map % Check (7)	Cumulative Distance, ft Model (8)	Profile (9)	Map (10)	Model/Map % Check (11)	500 YR FP Width, ft Model (12)	Map (13)	Model/Map Diff. Check (14)	Model/Map % Check (15)	100 YR FP Width, ft Model (16)	Map (17)	Model/Map Diff. Check (18)	Model/Map % Check (19)	FW Width, ft Model (20)	Map (21)	Model/Map Diff. Check (22)	Model/Map % Check (23)	BFE, ft Model (24)	Profile (25)	Model/Profile Diff. Check (26)	BFE Loc. (27)	Comments and/or Explanations (28)
Bridgewater Access Road	5353	53+53					5361	5361																			
	5388	53+88	71	71	71	0%	5432	5432	5388	-1%	30.88	32	1	4%	28	28	0	0%	28	28	0	0%	5708.0	5708.0	0		
	5410	54+10	22	22	22	0%	5454	5454	5410	-1%	25	25	0	0%	19	19	0	0%	19	19	0	0%	5708.3	5708.3	0		
	5449	54+49	39	39	39	0%	5493	5493	5449	-1%	56	56	0	0%	50	50	0	0%	50	50	0	0%	5713.3	5713.3	0		
	5500	55+00	51	51	51	0%	5544	5544	5500	-1%	36	36	0	0%	31	31	0	0%	31	31	0	0%	5714.4	5714.4	0		
	5594	55+94	94	94	94	0%	5638	5638	5594	-1%	124	124	0	0%	121	121	0	0%	61	61	0	0%	5715.4	5715.4	0		
	5665	56+65	71	71	71	0%	5709	5709	5665	-1%	102	102	0	0%	94	94	0	0%	94	94	0	0%	5715.4	5715.4	0		
	5725	57+25	60	60	60	0%	5769	5769	5725	-1%	92	91	-1	-1%	89	89	0	0%	89	89	0	0%	5715.4	5715.4	0		
S Boston Street	5801	58+01	76	76	76	0%	5845	5845	5801	-1%	94	94	0	0%	84	84	0	0%	84	84	0	0%	5724.6	5724.6	0		
S Boston Street	5858	58+58	57	57	57	0%	5902	5902	5858	-1%	130	179	50	38%	125	178	53	42%	125	178	53	42%	5725.9	5725.9	0		Mapped overflow path from upstream XS
S Boston Street	6074	60+74	216	216	216	0%	6118	6118	6074	-1%	84	84	0	0%	83	83	0	0%	80	83	3	4%	5729.1	5729.1	0		
S Boston Street	6177	61+77	103	103	103	0%	6221	6221	6177	-1%	94	94	0	0%	93	93	0	0%	93	93	0	0%	5733.5	5733.5	0		FW=FP but no encroachment in model due to negative surcharge
	6238	62+38	61	61	61	0%	6282	6282	6238	-1%	40	40	0	0%	37	37	0	0%	37	37	0	0%	5736.3	5736.3	0		
	6372	63+72	134	134	134	0%	6416	6416	6372	-1%	153	153	0	0%	152	152	0	0%	152	152	0	0%	5736.3	5736.3	0		
Goldsmith Gulch Southmoor Park Tributary _ Confluence with Goldsmith Gulch to Southmoor Park																											
Confluence with Goldsmith Gulch	1289	12+89	1289	1289	1289	0%	1289	1289	1289	0%	245	263	18	7%	233	233	0	0%	98	98	0	0%	5484.4	5484.4	0		Mapped overflow area from split flow
Trail Crossing	1396	13+96	107	107	107	0%	1396	1396	1396	0%	240	271	31	13%	230	230	0	0%	30	30	0	1%	5485.5	5485.5	0		Mapped overflow area from split flow
	1493	14+93	97	97	97	0%	1493	1493	1493	0%	215	284	69	32%	34	34	0	0%	34	34	0	0%	5486.3	5486.3	0		Mapped overflow area from split flow
	1583	15+83	89	89	89	0%	1583	1583	1583	0%	268	325	57	21%	194	194	0	0%	50	50	0	0%	5489.4	5489.4	0		Mapped overflow area from split flow
	1642	16+42	60	60	60	0%	1642	1642	1642	0%	500	520	20	4%	464	464	0	0%	58	58	0	0%	5489.5	5489.5	0		Mapped overflow area from split flow
	1687	16+87	45	45	45	0%	1687	1687	1687	0%	590	599	9	1%	539	539	0	0%	65	65	0	0%	5489.5	5489.5	0		Mapped overflow area from split flow
	1749	17+49	62	62	62	0%	1749	1749	1749	0%	235	235	0	0%	203	203	0	0%	64	64	0	0%	5489.5	5489.5	0		
	1830	18+30	81	81	81	0%	1830	1830	1830	0%	88	88	0	0%	70	70	0	0%	65	65	0	0%	5489.3	5489.3	0		
	1903	19+03	73	73	73	0%	1903	1903	1903	0%	28	30	2	6%	27	27	1	3%	27	27	1	3%	5489.7	5489.7	0		Adjusted 500-yr to fall outside 5490 contour
Foot Bridge	1930	19+30	28	28	28	0%	1930	1930	1930	0%	23	23	0	0%	22	22	0	0%	22	22	0	0%	5489.6	5489.6	0		
	2295	22+95	364	364	364	0%	2295	2295	2295	0%	64	152	88	138%	50	50	0	0%	25	25	0	0%	5501.1	5501.1	0		500-yr includes shallow overflows along Poplar St
	2317	23+17	22	22	22	0%	2317	2317	2317	0%	58	74	16	27%	45	46	1	3%	45	45	0	0%	5501.1	5501.1	0		500-yr includes shallow overflows along Poplar St
	2438	24+38	121	121	121	0%	2438	2438	2438	0%	30	54	24	82%	25	25	0	0%	25	25	0	0%	5500.5	5500.5	0		500-yr includes shallow overflows along Poplar St
	2523	25+23	84	84	84	0%	2523	2523	2523	0%	31	59	28	92%	25	25	0	0%	25	25	0	0%	5501.4	5501.4	0		FW=FP but no encroachment in model due to negative surcharge
	2570	25+70	48	48	48	0%	2570	2570	2570	0%	31	70	39	126%	26	26	0	0%	26	26	0	0%	5502.3	5502.3	0		500-yr includes shallow overflows along Poplar St
	2752	27+52	182	182	182	0%	2752	2752	2752	0%	64	64	0	0%	3		-3	-100%	3		-3	-100%	5517.9	5517.9	0		100-yr flow within culvert
	2937	29+37	184	184	184	0%	2937	2937	2937	0%	141	141	0	0%	3		-3	-100%	3		-3	-100%	5522.9	5522.9	0		100-yr flow within culvert
Foot Bridge	3226	32+26	289	289	289	0%	3226	3226	3226	0%	307	308	0	0%	89	89	0	0%	89		-89	-100%	5526.9	5526.9	0		No floodway for roadway overflows
	3314	33+14	89	89	89	0%	3314	3314	3314	0%	282	282	0	0%	249	249	0	0%	249		-249	-100%	5527.2	5527.2	0		No floodway for roadway overflows
	3436	34+36	122	122	122	0%	3436	3436	3436	0%	427	427	-1	0%	391	394	3	1%	176	176	0	0%	5527.2	5527.2	0		
E Orchard Rd	3792	37+92	356	356	356	0%	3792	3792	3792	0%	459	457	-2	0%	437	437	0	0%	437	437	0	0%	5527.2	5527.2	0		
	4249	42+49	457	457	457	0%	4249	4249	4249	0%	472	467	-5	-1%	432	432	0	0%	432	432	0	0%	5527.2	5527.2	0		
Goldsmith Gulch Southmoor Park Tributary _ Hampden Avenue Overflow _ Confluence with Goldsmith Gulch to Southmoor Park Tributary																											
	250	2+50	250	250	250	0%	250	250	250	0%	141	140	-1	-1%	140	67	-74	-52%	140		-140	-100%	5503.4	5503.4	0		Excluded IEFA in westbound lanes, no FW in rdwy
	676	6+76	427	427	427	0%	676	676	676	0%	127	127	-1	-1%	126	58	-68	-54%	126		-126	-100%	5516.2	5516.2	0		Excluded IEFA in westbound lanes, no FW in rdwy, FP500 overflows NE
	1016	10+16	339	339	339	0%	1016	1016	1016	0%	264	264	0	0%	260	143	-117	-45%	260		-260	-100%	5524.0	5524.0	0		Excluded IEFA in westbound lanes, no FW in rdwy
Goldsmith Gulch _ Monaco Pkwy Overflow																											
	475	4+75	475	475	475	0%	475	475	475	0%	139	196	57	41%	98	98	0	0%	98	98	0	0%	5394.4	5394.4	0		FW=FP but no encroachment in model due to negative surcharge, Rt FP500 limits from Goldsmith Gulch lateral flow
	559	5+59	84	84	84	0%	559	559	559	0%	116	116	0	0%	86	86	0	0%	85	86	1	1%	5394.4	5394.4	0		
	826	8+26	268	268	268	0%	826	826	826	0%	100	100	0	0%	78	78	0	0%	78	78	0	0%	5398.2	5398.2	0		
	982	9+82	156	156	156	0%	982	982	982	0%	106	106	0	0%	77	77	0	0%	77	77	0	0%	5400.6	5400.6	0		
	1132	11+32	150	150	150	0%	1132	1132	1132	0%	232	232	0	0%	79	79	0	0%	79	79	0	0%	5402.6	5402.6	0		
	1257	12+57	124	124	124	0%	1257	1257	1257	0%	220	220	0	0%	77	77	0	0%	77	77	0	0%	5403.9	5403.9	0		
	1458	14+58	202	202	202	0%	1458	1458	1458	0%	95	95	0	0%	77	78	1	1%	77	77	0	0%	5406.0	5406.0	0		
	1510	15+10	52	52	52	0%	1510	1510	1510	0%	115	115	0	0%	79	79	0	0%	79	79	0	0%	5406.6	5406.6	0		
	1607	16+07	97	97	97	0%	1607	1607	1607	0%	98	98	0	0%	79	79	0	0%	79	79	0	0%	5407.6	5407.6	0		
	1701	17+01	94	94	94	0%	1701	1701	1701	0%	100	100	0	0%	81	81	0	0%	81	81	0	0%	5408.5	5408.5	0		
	1791	17+91	90	90	90	0%	1791	1791	1791	0%	122	122	0	0%	94	94	0	0%	94	94	0	0%	5409.3	5409.3	0		
	1939	19+39	148	148	148	0%	1939	1939	1939	0%	167	167	0	0%	85	85	0	0%	85	85	0	0%	5410.9	5410.9	0		
	1994	19+94	55	55	55	0%	1994	1994	1994	0%	132	132	0	0%	88	88	0	0%	88	88	0	0%	5411.4	5411.4	0		
	2351	23+51	357	357	357	0%	2351	2351	2351	0%	136	136	0	0%	86	86	0	0%	86	86	0	0%	5414.1	5414.1	0		
	2429	24+29	78	78	78	0%	2429	2429	2429	0%	225	225	0	0%	90	90	0	0%	90	90	0	0%	5414.8	5414.8	0		Mapped overflow area from split flow
	2499	24+99	70	70	70	0%	2499	2499	2499	0%	257	257	0	0%	93	93	0	0%	93	93	0	0%	5415.7	5415.7	0		
Goldsmith Gulch _ Monaco Pkwy @ Iliff Overflow																											
	152	1+52	158	158	152	-3%	158	158	152	-3%	165	237	72	44%	106	106	0	0%	106		-106	-100%	5434.0	5434.0	0		Mapped overflow area from split flow, no FW in rdwy
	236	2+36	84	84	84	0%	242	242	237	-2%	177	260	83	47%	103	273	171	166%	103		-103	-100%	5434.1	5434.1	0		Mapped overflow area from split flow, no FW in rdwy
	326	3+26	90	90	90	0%	332	332	326	-2%	117	253	136	117%	93	250	157	169%	93		-93	-100%	5434.6	5434.6	0		Mapped overflow area from split flow, no FW in rdwy
	365	3+65	39	39	39	0%	371	371	365	-1%	121	221	101	83%	84	213	129	154%	84		-84	-100%	5434.8	5434.8	0		Mapped overflow area from split flow, no FW in rdwy
	385	3+85	19	19	19	0%	390	390	385	-1%	158	227	69	44%	86	219	134	156%	86		-86	-100%	5435.0	5435.0	0		Mapped overflow area from split flow, no FW in rdwy
TOLERANCES			+/- 5% of Model				+/-5% of Cumulative Model				Largest value: 25 feet or 5%												+/- 0.5ft				

Appendix G – Flood Maps

Click here for Flood Hazard Area Delineation Sheet 1 of 3

Click here for Flood Hazard Area Delineation Sheet 2 of 3

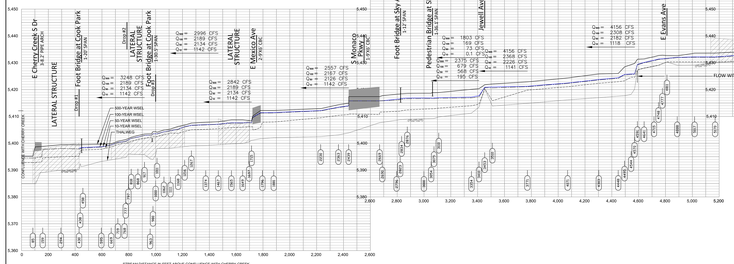
Click here for Flood Hazard Area Delineation Sheet 3 of 3

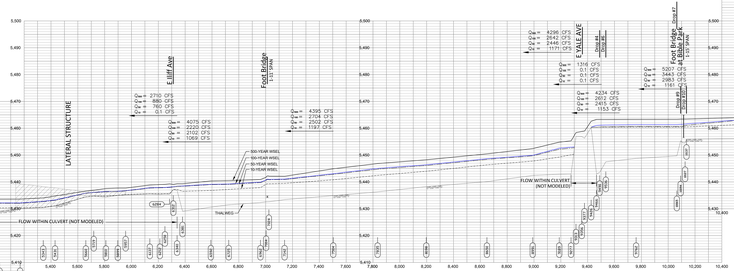
Appendix H – Flood Profiles

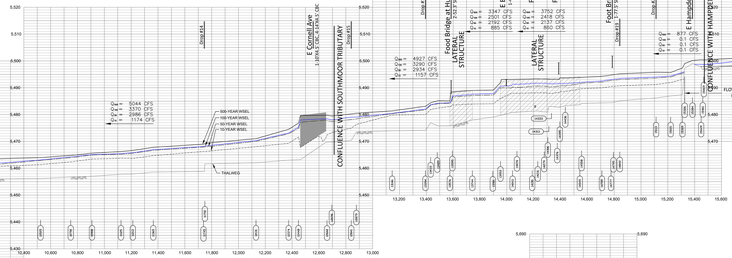
FLOOD HAZARD AREA DELINEATION

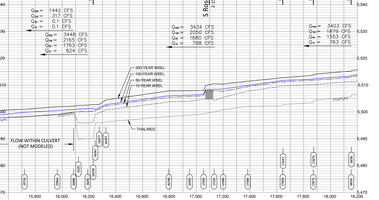
GOLDSMITH GULCH

OCTOBER 2022



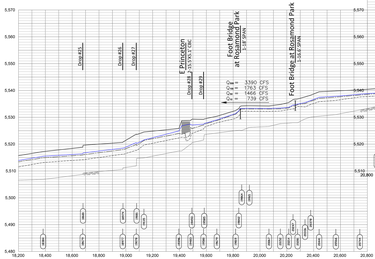


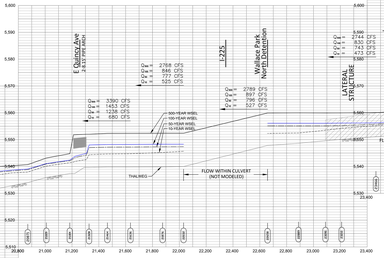


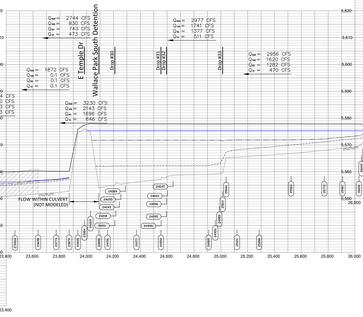


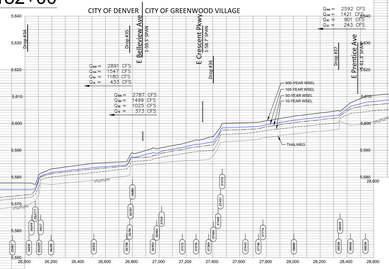
GOLDSMITH GULCH

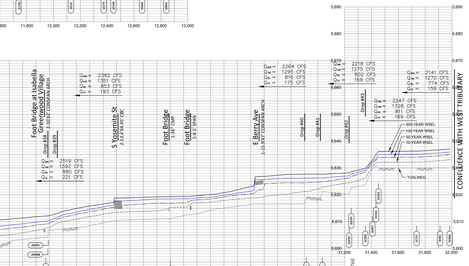
STATION 000+85 TO 182+00











GOLDSMITH GULCH

STATION 182+00 TO 320+00

LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD (50-YEAR)
- 10% ANNUAL CHANCE FLOOD (10-YEAR)
- STREAM BED
- CROSS SECTION (HEC-RAS)

SCALE

0 50 100 200 400

ORIGINAL SHEET SCALE: 1" = 200'

ORIGINAL VERT SCALE: 1" = 10'

INSTRUCTION TO PRINT AN AREA SMALLER THAN THE FULL PAGE TO SCALE:

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2. CLICK FILE>PRINT...
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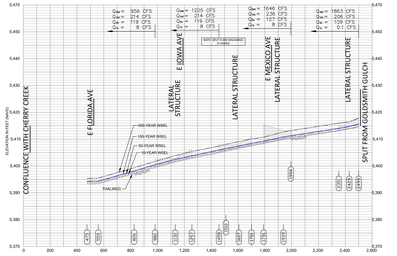
4. SET THE DESIRED PAPER SIZE USING THE PRINTER "PROPERTIES" MENU.
5. CHOOSE THE "SELECTED GRAPHIC" OPTION UNDER "PRINT RANGE".
6. SELECT "NONE" FROM THE "PAGE SCALING" DROPDOWN MENU.
7. UNSELECT "CHOOSE PAPER SOURCE BY PDF SIZE".
8. CLICK "OK" TO PRINT SELECTION.

Matrix

FLOOD HAZARD AREA DELINEATION

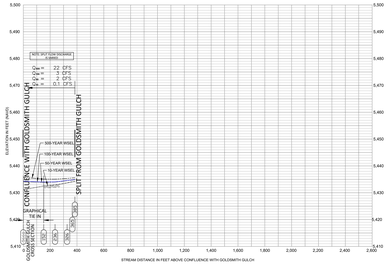
GOLDSMITH GULCH

OCTOBER 2022



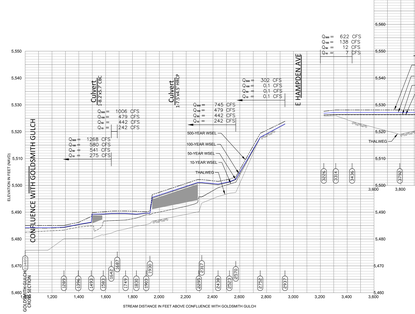
MONACO OVERFLOW

STATION 4+75 TO 24+99



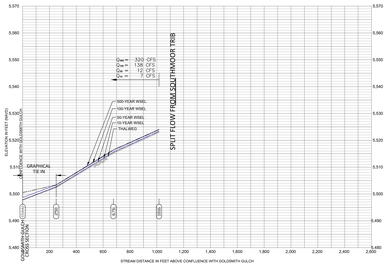
MONACO AT ILIFF OVERFLOW

STATION 1+52 TO 3+85



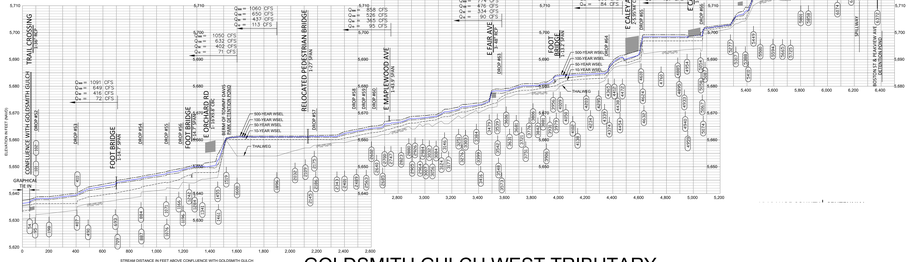
SOUTHMOOR TRIBUTARY

STATION 12+89 TO 42+49



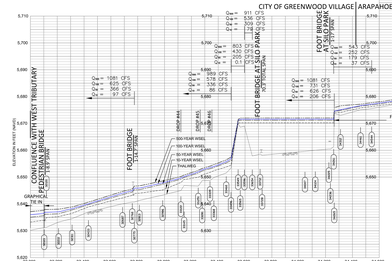
HAMPDEN OVERFLOW

STATION 2+50 TO 10+16



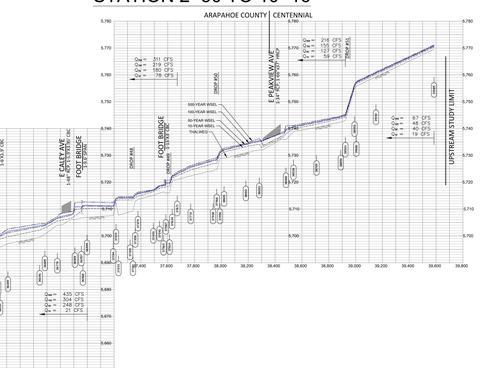
GOLDSMITH GULCH WEST TRIBUTARY

STATION 00+54 TO 63+72



GOLDSMITH GULCH

STATION 320+00 TO 395+85



LEGEND

- 0.2% ANNUAL CHANCE FLOOD
- 1% ANNUAL CHANCE FLOOD
- 2% ANNUAL CHANCE FLOOD (50-YEAR)
- 10% ANNUAL CHANCE FLOOD (10-YEAR)
- STREAM BED
- CROSS SECTION (HEC-RAS)

SCALE

0 100 200 300 400

ORIGINAL SHEET SCALE 1" = 200'

ORIGINAL 11X17 SCALE 1" = 10'

INSTRUCTION TO PRINT AN AREA SMALLER THAN THE FULL PAGE TO SCALE:

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3. SELECT YOUR PRINTER FROM THE PRINTER DROPDOWN MENU.
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Office: 303-572-0200

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