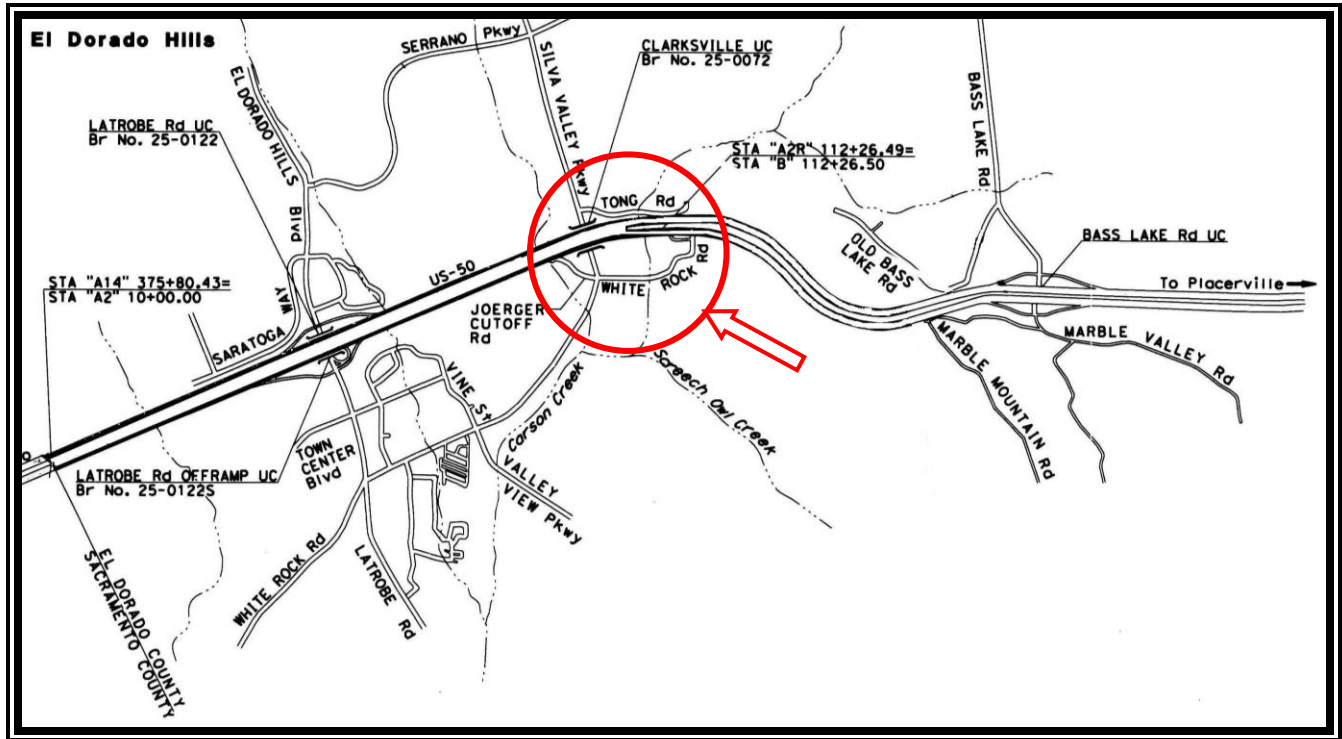


# HYDRAULIC STUDY

## U.S. 50 / SILVA VALLEY PARKWAY INTERCHANGE



03-ED-50

PM 1.07/R2.40

EA: 03-1E290

Project ID No.: 0300000258

Unit No.: 0259

Prepared for:

El Dorado County and State of California Department of Transportation

Prepared By:



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This Hydraulic Study has been prepared under the direction of the following registered Civil Engineer. The registered Civil Engineer attests to the technical information contained herein and the engineering data upon which the recommendations, conclusions, and decisions are based.



A handwritten signature in black ink, appearing to read "Joe Domenichelli", written over a horizontal line.

Joe Domenichelli  
Registered Civil Engineer

5-7-12

Date

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## **HYDRAULIC STUDY**

### **U.S. ROUTE 50 / SILVA VALLEY PARKWAY INTERCHANGE**

#### **1. INTRODUCTION**

##### **A. Project Location and Description**

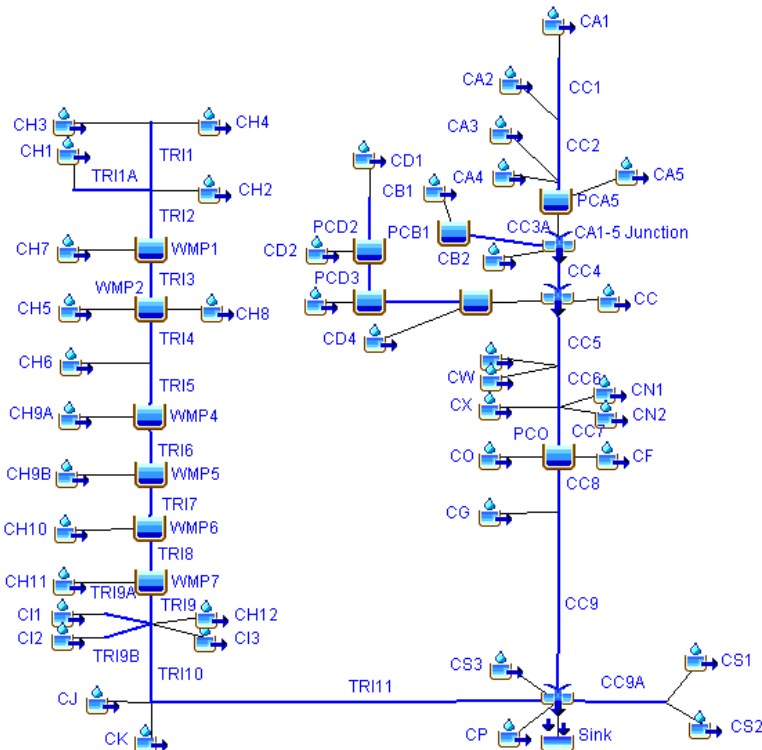
Silva Valley Parkway is located in the town of El Dorado Hills in El Dorado County, California. The Silva Valley Parkway Extension Project will connect Silva Valley Parkway to Interstate Highway 50 (I-50) with two on-ramps and two off-ramps. Project construction includes 2 bridges over Carson Creek and 1 culvert in Carson Creek. Additionally, there is a tributary (Buck's Ravine) to Carson Creek that runs through the project site. The project construction includes a culvert extension under Highway 50, a pedestrian foot bridge, and a new culvert at White Rock Road in Buck's Ravine.

The purpose of this study is to determine the hydraulic impacts, if any, the proposed Silva Valley Parkway Extension Project will have on Carson Creek and Buck's Ravine and to make recommendations for hydraulic conveyance and scour protection. The proposed location of the two bridges are the westbound off-ramp and the eastbound on-ramp connecting Silva Valley Parkway to Highway 50. The proposed bridge piers are designed to remain outside of the 100 year flood limits. One of the proposed culverts is part of the Tong Road realignment, the other is part of the White Rock Road realignment. The culvert extension is an extension of the existing Buck's Ravine culvert under Highway 50.

#### **2. HYDROLOGIC CALCULATIONS**

##### **A. Existing Model**

An existing HEC-1 model revised August 2005 by CTA Engineers / Surveyors for the Carson Creek Regional Drainage Study was converted into a HEC-HMS file for the watershed of Carson Creek upstream of the project site. Field investigations were performed to determine if the detention basins assumed in G E Thorne & Associates Master Drainage Study, 1992 were constructed per the master drainage study and that no significant changes in land use or conveyance routing have occurred relative to the assumptions in the original modeling efforts. Watershed sub-basin and detention basin descriptions and locations were taken from the "Carson Creek Region Drainage Study Base Map" dated April 1995. The resulting HEC-HMS model flow chart can be seen below in Figure 1.



**Figure 1 – Updated HEC-HMS Model**

**B. Updated Model**

Field investigation determined that Detention Basin PCD1 in the original model does not exist. However, PCD2 is estimated to have a much larger volume than planned per the master drainage study modeling efforts. It is assumed that after removing PCD1, PCD2 was increased in size to compensate for elimination of PCD1. Additionally, field investigation confirmed changes in the model which were addressed in technical memorandums; specifically, the elimination of detention basins PCA1 and PCA2 which were replaced with a larger basin PCA5 further downstream.

The original HEC-1 model used a SCS Type 1A storm with a 24-hour, 100-year frequency rainfall depth or 5.26 inches depth per El Dorado County Drainage Manual. For the Silva Valley Project, Caltrans provided an updated depth for the 24-hour, 100-year event of 5.58 inches and a 24-hour, 50-year depth of 5.11 inches for the project area. These updated depths are more current resulting in a more conservative model and were used in place of the original rainfall depths.

Table 1 below shows the results from the HEC-HMS modeling for both the 50 and 100-year flows where Carson Creek and Buck’s Ravine enters the project area. Note that the peak 100-year flow is approximately 11% higher using the new HEC-HMS model and Caltrans rainfall data. Detailed output from the HEC-HMS model output can be found at the end of this technical memorandum in Appendix A.

**Table 1. Results from HEC-HMS Modeling**

Flow Frequency	Original HEC-1 Model Flow (CFS)	New HMS Model Flow (CFS)
50-Year Carson Creek	N/A	1853.4
100-Year Carson Creek	1851	2059.9
50-Year Buck's Ravine	N/A	717.2
100-Year Buck's Ravine	717	819.0

**C. HYDRAULIC CALCULATIONS**

A. Topography

A HEC-RAS model (Hydrologic Engineering Center River Analysis System version. 4.0) was created in order to analyze the proposed crossings of Carson Creek and Buck's Ravine. Survey by Mark Thomas & Company provided existing channel topography of Carson Creek and Buck's Ravine. Cross sections from the survey were input into HEC-RAS to create an existing conditions model for the project's reaches of Carson Creek and Buck's Ravine. Two additional cross sections were interpolated upstream of the last surveyed cross section of Carson Creek to provide an adequate distance upstream of the proposed Tong Road culvert to determine the effect, if any, the Tong Road culvert will have on the water surface elevations.

B. Roughness Values

A site visit was performed to determine the channel and overbank conditions of Carson Creek and Buck's Ravine through the project area. Manning's n-values for the Carson Creek were set between 0.04 and 0.05 for the channel bottom based on mostly rocky open channels in the upper reaches and additional vegetation within the channel in the lower flatter sections. The overbanks of Carson Creek varied from weeds and brush to brush and trees; the Manning's n-values for the overbanks were set between 0.05 and 0.08 depending on site conditions observed during the site visit. Buck's Ravine channel conditions observed during the site visit included blackberry bushes and beaver dams. The channel areas that were found to contain blackberries were set to have a channel Manning's n value of 0.09 and overbanks to have a Manning's n of 0.1.

C. Boundary Conditions

For the boundary condition of this study a normal depth using a slope of 0.023 was used. This value was derived from the average slope of the downstream most cross sections.

D. Hydraulic Structures: Carson Creek

After the existing model was completed, the existing 100-year flood water surface profile was determined. Using the existing water surface elevation it was found that the eastbound onramp piers and bridge soffit were well outside and above the existing 100 year flood plain limits and were not added to the model. The proposed design of the westbound off-ramp piers places the piers near the 100-year flood plain; therefore, the piers were added to the model at station 17+00 and 17+50 as blocked areas. The Tong Road crossing was

Hydraulic Study

added at station 22+30 as a Consplan Arch 36-feet wide by 9-feet tall. Figure 2 shows the proposed westbound off-ramp piers and Figure 3 shows the proposed Tong Road crossing.

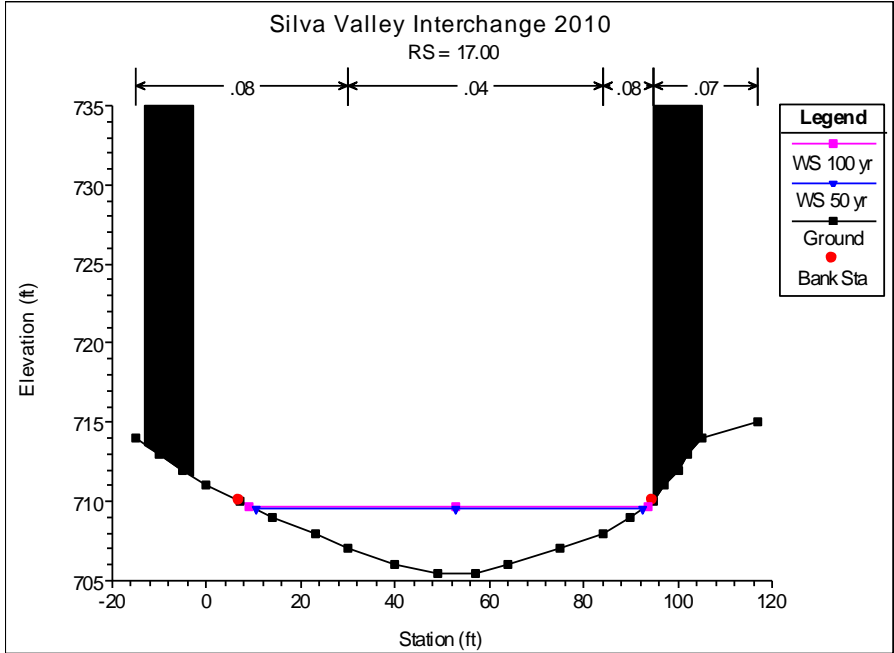


Figure 2 – Carson Creek Westbound Off-Ramp Pier Downstream Cross Section

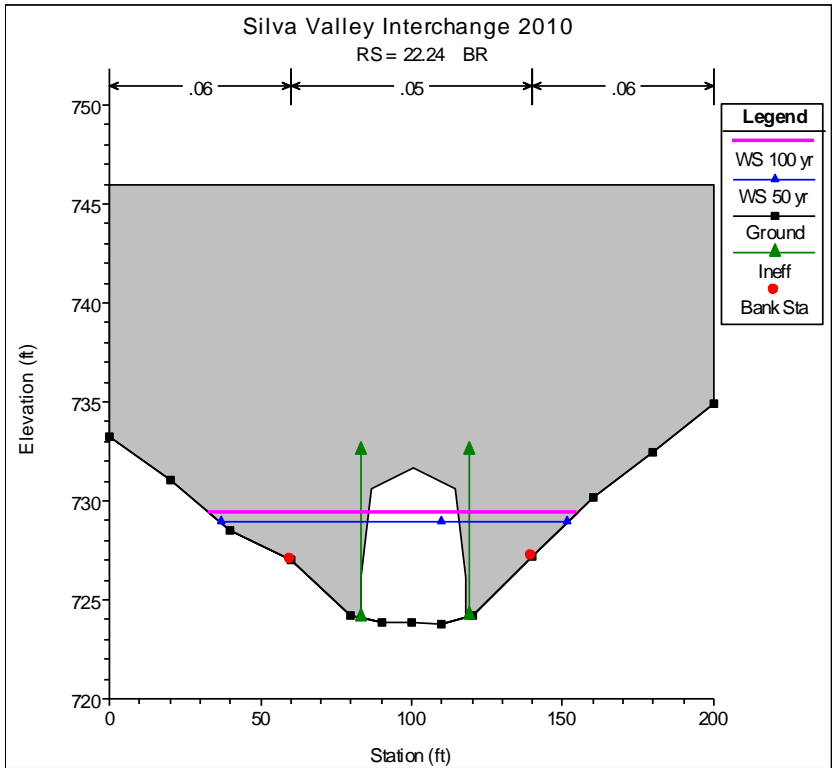
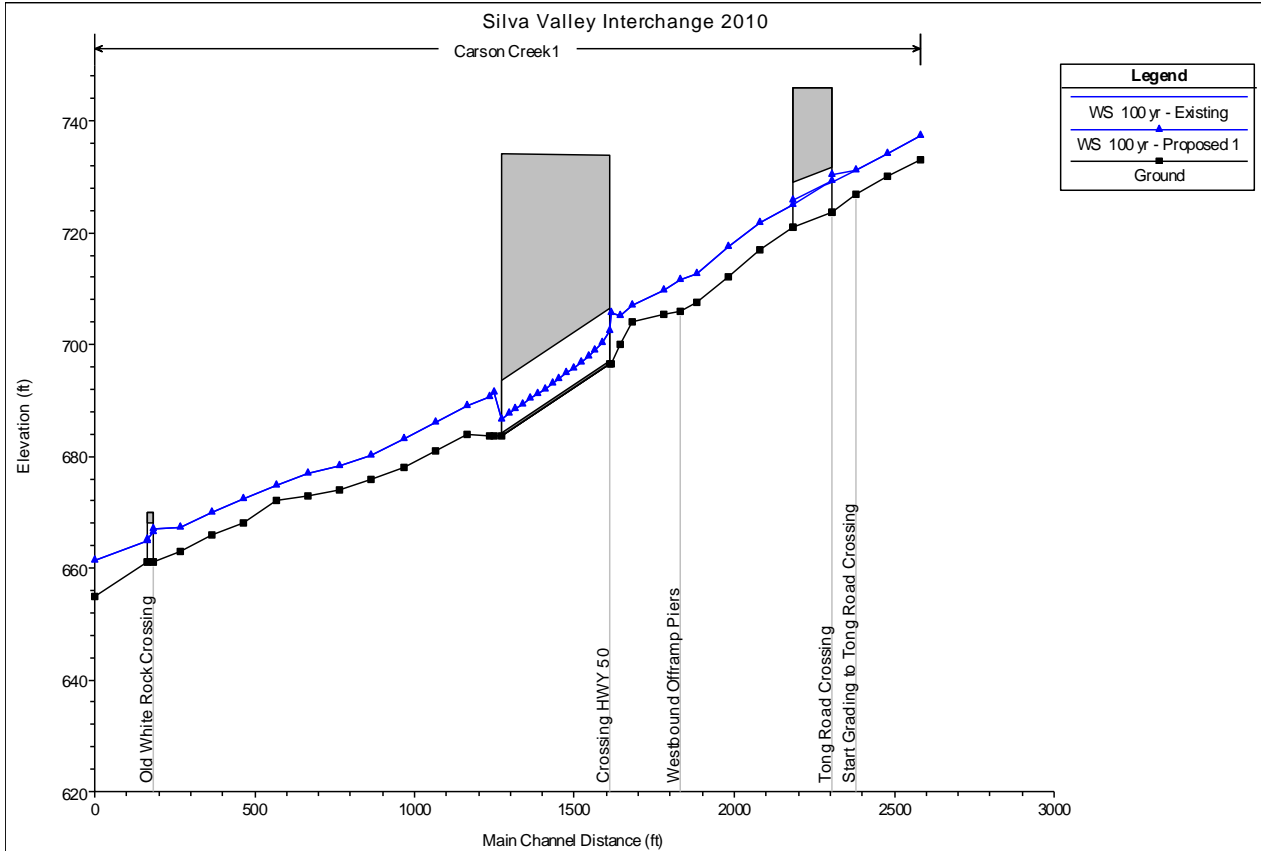


Figure 3 – Carson Creek Tong Road Culvert Downstream Cross Section

As shown in Figure 2 the proposed piers of the westbound off-ramp do not impede the flow of Carson Creek during the 100-year or 50-year flood. The initial design for the Tong Road culvert is capable of passing both the 100-year and 50-year flow; however, the culvert under Tong Road causes a slight increase in water surface elevation immediately upstream of Tong Road. The 100-year Carson Creek profile can be seen below in Figure 4 and the difference in water surface elevation can be seen in Table 2.



**Figure 4 – Carson Creek Existing and Proposed 100-year Water Surface Profile**

Note that the culvert crossings pass both the 50-year and 100-year event flows without pressure flow and the bridge crossings at the on-ramp and off-ramp have soffit elevations which are several feet above the 100-year flood elevations.

**Table 2: 100-yr Carson Creek water surface elevation difference for the existing and proposed conditions**

Cross-section (River Sta)	Description	Existing WSEL (feet)	Proposed WSEL (feet)	WSEL Difference (feet)
25+00		737.26	737.26	0
24+00		734.26	734.26	0
23+00	70' Upstream of Tong Road	731.26	731.27	0.01
22+40	10' Upstream of Tong Road	N/A	730.38	N/A
22+30	Upstream Face of Tong Road	729.17	730.44	1.27
21+00	Downstream Face of Tong Road	725.07	725.07	0
20+00		721.81	721.81	0
19+00		717.47	717.47	0
18+00		712.62	712.62	0
17+50	Upstream Piers of WB off-ramp	711.6	711.6	0
17+00	Downstream Piers of WB off-ramp	709.73	709.73	0
16+00		707.09	707.09	0
15+60		705.11	705.11	0
15+35	Upstream of Highway 50 Culvert	705.6	705.6	0
11+85	Downstream of Highway 50 Culvert	691.56	691.56	0
11+70		690.63	690.63	0
11+00		689.05	689.05	0
10+00		686.04	686.04	0
9+00		683.21	683.21	0
8+00		680.12	680.12	0
7+00		678.27	678.27	0
6+00		676.86	676.86	0
5+00		674.92	674.92	0
4+00		672.27	672.27	0
3+00		669.83	669.83	0
2+00		667.34	667.34	0
1+19	Upstream of Old White Rock Bridge	666.92	666.92	0
0+96	Downstream of Old White Rock Bridge	664.93	664.93	0
-0+66		661.45	661.45	0

E. Hydraulic Structures: Buck's Ravine

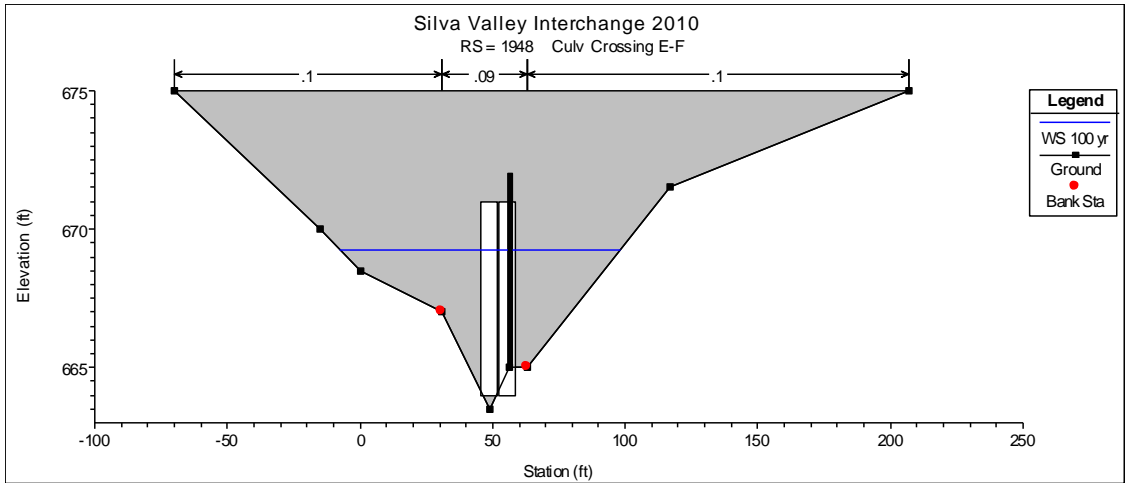
After the changes to Carson Creek were entered into the proposed model, the Buck's Ravine existing conditions and proposed crossings were entered into the model as a tributary of Carson Creek.



Buck’s Ravine currently crosses Highway 50 through a double 6’x7’ culvert. The conditions upstream of the Buck’s Ravine Highway 50 culvert is a channel heavily vegetated with blackberries and a tree in the channel immediately upstream of the culvert entrance. A photo of the entrance conditions can be seen in Figure 5 and the model cross section reflecting these conditions can be seen in Figure 6 below.



**Figure 5 – Existing Entrance Conditions at the Highway 50 Buck’s Ravine Crossing**



**Figure 6 – Modeled Existing Entrance at the Highway 50 Buck’s Ravine Crossing**

The Buck’s Ravine Highway 50 Culvert is proposed to be extended 11 feet upstream of the existing entrance and 84 feet downstream of the existing exit. This extension will require the removal of the blockage due to the existing, improving the inlet conditions.

The final Buck’s Ravine crossing before it combines with Carson Creek is the White Rock Road culvert crossing. The existing crossing is comprised of 4 – 6’x4’ culverts under White Rock Road. The proposed

White Rock Road culvert crossing entrance will be approximately 60 feet downstream of the existing culvert exit and is proposed to be 4 – 6’x6’ culverts. During construction of the new White Rock Road alignment and new culvert the existing culvert will remain in service. At the completion of the project the existing culvert will be removed. Two proposed conditions models have been created, the first proposed conditions model has both the existing and proposed culvert in place, the second proposed conditions model contains only the new culvert with the existing culvert removed. Profiles for these proposed model conditions versus existing can be found below in Figure 7 and Figure 8.

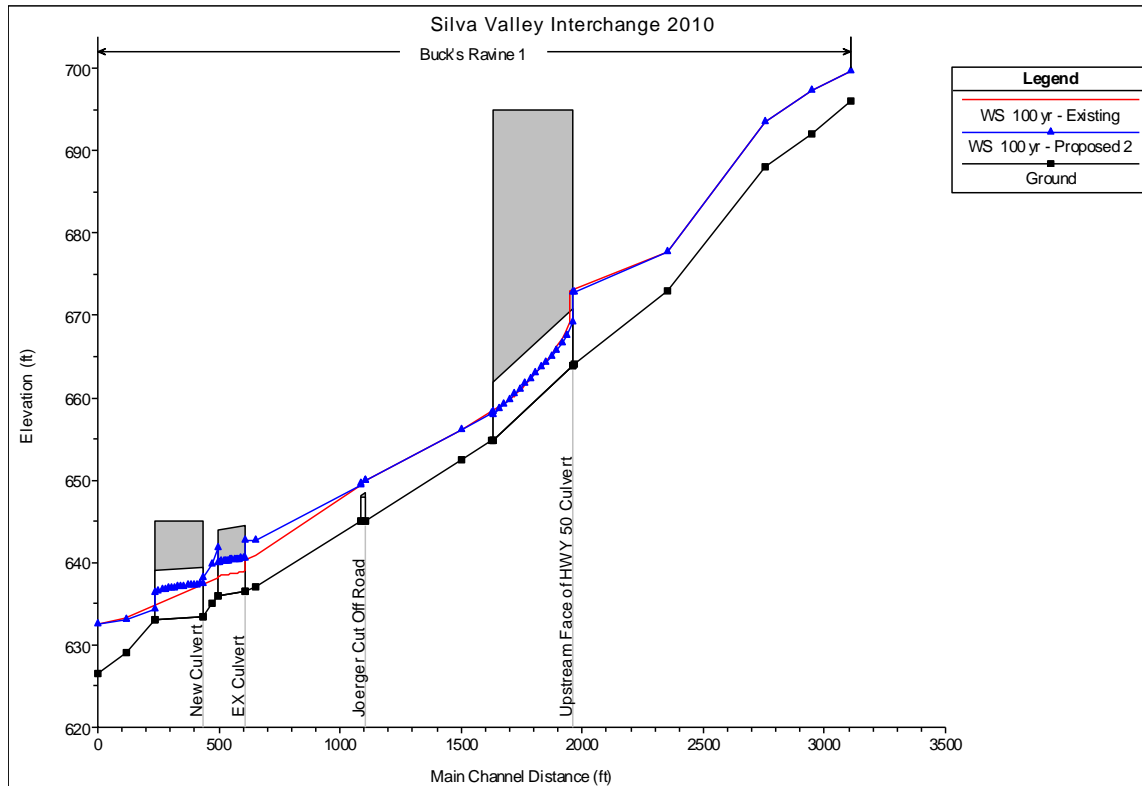


Figure 7 – Buck’s Ravine Water Surface Profile Interim Conditions

Hydraulic Study

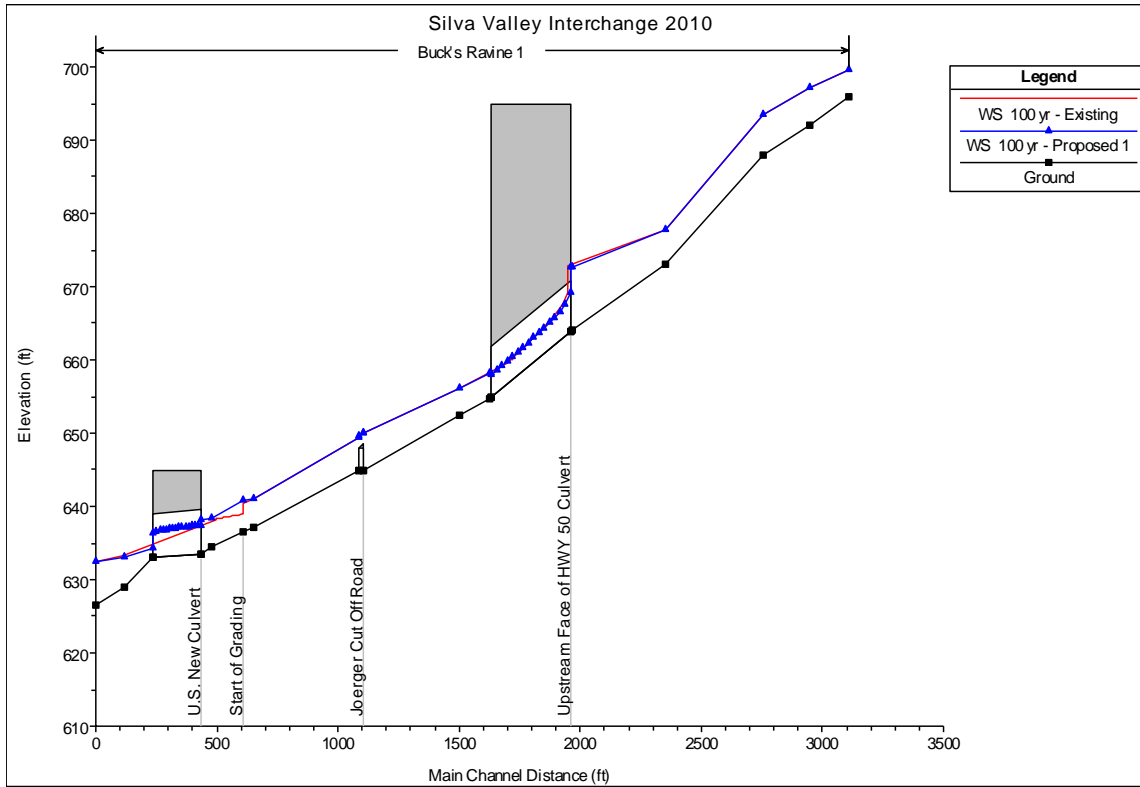


Figure 8 – Buck’s Ravine Water Surface Profile Final Conditions

Table 3 below compares the existing Buck’s Ravine water surface to each of the proposed conditions water surfaces.

Table 3: 100-yr Buck’s Ravine water surface elevation difference for the existing and proposed conditions

Cross-section (River Sta)	Description	Existing WSEL (feet)	Proposed Interim WSEL (feet)	Interim WSEL Difference (feet)	Proposed Final WSEL (feet)	Final WSEL Difference (feet)
31+09		699.56	699.56	0	699.56	0
29+49		697.23	697.23	0	697.23	0
27+58		693.45	693.45	0	693.45	0
23+52		677.77	677.77	0	677.77	0
19+70	Upstream of HWY 50 Culvert Extension Apron	673.14	672.74	-0.4	672.74	-0.4
19+60	Upstream of HWY 50 Culvert Extension	673.00	672.74	-0.26	672.74	-0.26
16+33		658.5	658.20	-0.3	658.20	-0.3
16+23		658.28	658.10	-0.18	658.10	-0.18
14+99		656.16	656.16	0	656.16	0
11+05	Upstream of Joerger Cut Off Road	649.91	649.90	-0.01	649.91	0

Cross-section (River Sta)	Description	Existing WSEL (feet)	Proposed Interim WSEL (feet)	Interim WSEL Difference (feet)	Proposed Final WSEL (feet)	Final WSEL Difference (feet)
<b>10+84</b>		649.40	649.39	-0.01	649.40	0
<b>6+50</b>		640.93	642.63	1.7	641.01	0.08
<b>6+08</b>	Upstream of Existing White Rock Culvert	640.33	642.59	2.26	640.77	0.44
<b>4+95</b>	Downstream of Existing White Rock Culvert	638.10	641.78	3.68	638.68	0.58
<b>4+37</b>	Upstream of New White Rock Culvert	637.37	638.13	0.76	638.25	0.88
<b>2+37</b>	Downstream of New White Rock Culvert	634.82	634.34	-0.48	634.34	-0.48
<b>1+21</b>		633.36	633.04	-0.32	633.04	-0.32
<b>0+00</b>		632.52	632.44	-0.08	632.44	-0.08

Water surface elevations upstream of Highway 50 are reduced as a result of the removal of vegetation which reduced the potential capacity of the culvert inlet. At the White Rock Road crossing for the final conditions there is an increase in water surface through the channel where the existing culvert was removed but returns to 0.08 feet of existing conditions within 200 feet of the new culvert entrance.

As with the Carson Creek culverts, the proposed Buck's Ravine culverts can pass the 50-year and 100-year flows without pressure flow, however the Highway 50 culvert headwall is impacted by the flood flows as is the case under existing conditions.

Complete results of the existing conditions and proposed conditions model can be found in Appendix B and Appendix C respectively. Table 2 shows the difference between the 100-year existing and proposed water surface elevations for Carson Creek through the project area.

## D. SCOUR

Due to the slope of Carson Creek the channel flow tends to remain close to critical depth. This high velocity flow over time has exposed the bedrock in portions of Carson Creek. Figure 9 below shows existing conditions of Carson Creek immediately upstream of the Highway 50 Culvert.



**Figure 9 – Carson Creek Immediately Upstream of the Highway 50 Culvert**

Due to the channel exposure to bedrock in Carson Creek it is assumed that long term channel degradation will be minimal and a 1-foot maximum degradation assumption would be adequate. The westbound off-ramp and eastbound on-ramp crossing will not cause any additional scour because the abutments and piers do not impede flow (as they are outside of the 100-year flow limits). Lateral movement of Carson Creek is not anticipated due to channel conditions, however, if lateral movement were to occur both piers would maintain their footings due to their foundation on bedrock (See Log of Test Boring).

Buck's Ravine currently experiences scour downstream of the existing Highway 50 culvert. The proposed outlet conditions of the culvert extension will introduce a new concrete apron graded to match the existing ground elevation. In addition to the concrete apron, rock slope protection (RSP) is being placed downstream of the concrete apron to address channel scour. Channel velocity of the water exiting the culvert apron in the model is 9.0 ft/s with a depth of 3.3 feet. Sizing for the Highway 50 culvert extension as well as the White Rock Road crossing are provided below.

The new Buck's Ravine crossing of White Rock Road will replace an existing crossing with a new 4 – 6'x6' concrete culvert crossing. The outlet velocity of 9.65 ft/s at a depth of 2.1 ft is significant enough to cause scour downstream of the White Rock Road culvert. The current design plans propose RSP downstream of the new culvert on the channel bottom and on channel banks to a minimum elevation of 640 feet. This elevation is well above the 100-year water surface elevation of 636.3 feet.

The RSP for the Buck's Ravine culverts was sized using the following equation:

$$D_{50} = [y * K / (S_s - 1)] * [V^2 / (g * y)]^{0.14}$$

The resulting  $D_{50}$  downstream of the Highway 50 culvert is 1.17 ft and the  $D_{50}$  downstream of the White Rock Road culvert is 0.81 ft. It is recommended that Caltrans Light Class RSP be placed downstream of the Highway 50 culvert and that Caltrans Backing No. 1 Class RSP be placed downstream of the White Rock Road culvert at a minimum. Placement of the RSP shall be per Caltrans standard specifications.

## **E. RECOMMENDATIONS / CONCLUSIONS**

### **A. Carson Creek**

Bridge features for the on-ramp and off-ramp crossing are out of the 100-year flood levels, therefore they have no hydraulic impact on Carson Creek.

The current Tong Road design adequately passes the 100-year design flow with greater than 1 foot of clearance to the soffit. This design will cause an increase in the 100-year water surface elevation upstream of the crossing entrance of 1.27 feet above existing conditions which is brought back to existing conditions within 70 feet of the crossing entrance. The limits of the current water surface increase do not affect adjacent property nor does the increase in water surface elevation rise above the height of the proposed entrance wingwall.

Regarding any channel erosion, the westbound off-ramp piers were designed to avoid encroachment into Carson Creek; however, due to steep banks, it is recommended that the any disturbed channel bank during the construction of the piers be treated with vegetated rock slope protection to maintain slope stability. The Tong Road crossing will remain an earthen bottom crossing with a channel velocity that is similar to existing velocities modeled in nearby parts of Carson Creek (within 0.5 ft/s) and should produce no additional erosion.

### **B. Buck's Ravine**

The pedestrian bridge is assumed to be constructed with a soffit 2 feet above the existing 50-year water surface elevation with no piers and with abutments outside of the limits of the 100-year water surface.

The westbound on-ramp and eastbound off-ramp do not require bridge structures over Buck's Ravine. Instead, the on-ramp and off-ramp cross Buck's Ravine through the use of the existing double 6'x7' culvert and proposed culvert extensions. The inlet conditions for the Highway 50 culvert will be improved over the existing conditions through the addition of a concrete apron and removal of existing vegetation obstructions. RSP is being proposed downstream to eliminate the scour conditions. D&A recommends that Caltrans Light Class RSP be placed to prevent scour downstream of the Highway 50 culvert.

The interim conditions for the White Rock Road crossing (to temporarily leave in the existing culvert) increase the water surface upstream of White Rock Road by 2.3 feet to an elevation of 642.6 feet but does

not impact the existing road at elevation 644.6 feet. Being a temporary condition during construction with no adverse effects, Domenichelli & Associates is making no recommendations to reduce the temporary increase in water surface.

The final conditions for the White Rock Road culvert crossing (includes removal of the existing culvert) will increase the water surface elevation at the upstream face by 0.9 feet over the existing water surface. Within 200 feet upstream of the new White Rock Culvert the water surface elevation returns to within 0.1 feet of existing. Due to the velocity through the White Rock Road Culvert, RSP is being placed downstream of the culvert. D&A recommends that Caltrans Backing No. 1 Class RSP be placed to prevent scour downstream of the new White Rock Road culvert.

## **Appendices**

- A. HEC-HMS Results**
- B. HEC-RAS Output Tables (Existing)**
- C. HEC-RAS Output Tables (Proposed)**



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**APPENDIX A – HEC-HMS RESULTS**

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Project: Silva Valley Pkwy Bridge Pr Simulation Run: Updated Conditions Caltrans

Start of Run: 01Jan2000, 00:00 Basin Model: Updated Conditions  
 End of Run: 02Jan2000, 00:05 Meteorologic Model: Caltrans100  
 Compute Time: 18Nov2010, 11:19:10 Control Specifications: SILVA VALLEY

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CA1	0.1970	212.1	01Jan2000, 10:10	3.68
CC1	0.1970	209.4	01Jan2000, 10:15	3.67
CA2	0.1125	136.6	01Jan2000, 10:05	3.79
CC2	0.3095	324.5	01Jan2000, 10:15	3.71
CA4	0.3050	287.4	01Jan2000, 10:20	3.77
CA3	0.0830	93.4	01Jan2000, 10:10	3.68
CC3	0.6975	689.7	01Jan2000, 10:20	3.73
CA5	0.1000	112.4	01Jan2000, 10:10	3.68
PCA5	0.7975	481.4	01Jan2000, 10:40	3.72
CB1	0.1050	138.4	01Jan2000, 10:05	3.59
PCB1	0.1050	31.3	01Jan2000, 10:45	3.56
CC3A	0.1050	31.3	01Jan2000, 10:55	3.55
CB2	0.0940	100.7	01Jan2000, 10:10	3.78
CA1-5 Junction	0.9965	565.4	01Jan2000, 10:30	3.71
CC4	0.9965	565.0	01Jan2000, 10:30	3.70
CC	0.4420	304.9	01Jan2000, 10:30	3.36

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CD2	0.1270	160.9	01Jan2000, 10:05	3.89
CD1	0.0690	102.5	01Jan2000, 10:05	4.10
CC4A	0.0690	98.9	01Jan2000, 10:10	4.09
PCD2	0.1960	212.2	01Jan2000, 10:15	3.80
CC4B	0.1960	211.5	01Jan2000, 10:20	3.79
CD3	0.1250	168.7	01Jan2000, 10:05	3.69
PCD3	0.3210	351.7	01Jan2000, 10:10	3.74
CC4C	0.3210	340.7	01Jan2000, 10:15	3.73
CD4	0.0750	93.7	01Jan2000, 10:05	3.69
PCD4	0.3960	462.7	01Jan2000, 10:15	3.70
CA+CB+CD	1.8345	1251.8	01Jan2000, 10:25	3.62
CC5	1.8345	1209.5	01Jan2000, 10:25	3.62
CE	0.0640	84.9	01Jan2000, 10:05	3.69
CW	0.0520	78.1	01Jan2000, 10:00	3.60
CC6	1.9505	1257.1	01Jan2000, 10:25	3.62
CN1	0.9160	605.5	01Jan2000, 10:35	3.35
CN2	0.1030	101.6	01Jan2000, 10:10	3.38
CX	0.0203	32.9	01Jan2000, 10:00	3.70
CC7	2.9898	1914.8	01Jan2000, 10:30	3.53
CO	0.1980	182.5	01Jan2000, 10:20	3.67
PCO	0.1980	110.6	01Jan2000, 10:40	3.67

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CF	0.0670	90.1	01Jan2000, 10:05	3.89
CC8	3.2548	2050.1	01Jan2000, 10:35	3.53
CG	0.0363	43.7	01Jan2000, 10:05	3.69
CC9	3.2911	2059.9	01Jan2000, 10:40	3.53
CS1	0.5770	307.1	01Jan2000, 10:50	3.23
CS2	0.5420	408.3	01Jan2000, 10:25	3.32
CC9A	1.1190	652.1	01Jan2000, 10:40	3.26
CH3	0.0890	122.5	01Jan2000, 10:05	3.79
CH4	0.0117	16.9	01Jan2000, 10:05	3.90
TRI1	0.1007	137.4	01Jan2000, 10:05	3.80
CH2	0.0932	113.4	01Jan2000, 10:05	3.59
CH1	0.0860	100.5	01Jan2000, 10:05	3.49
TRI1A	0.0860	96.2	01Jan2000, 10:10	3.48
TRI2	0.2799	339.9	01Jan2000, 10:10	3.63
CH7	0.2230	212.5	01Jan2000, 10:15	3.77
WMP1	0.5029	486.3	01Jan2000, 10:20	3.62
TRI3	0.5029	488.8	01Jan2000, 10:20	3.62
CH5	0.0897	122.3	01Jan2000, 10:05	3.69
CH8	0.0264	40.8	01Jan2000, 10:00	3.70
WMP2	0.6190	552.1	01Jan2000, 10:20	3.61
TRI4	0.6190	547.8	01Jan2000, 10:25	3.61

Project: Silva Valley Pkwy Bridge Pr Simulation Run: Updated Caltrans 50yr

Start of Run: 01Jan2000, 00:00 Basin Model: Updated Conditions  
 End of Run: 02Jan2000, 00:05 Meteorologic Model: Caltrans50  
 Compute Time: 18Nov2010, 11:23:15 Control Specifications: SILVA VALLEY

Hydrologic Element	Drainage Area (MI2)	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CA1	0.1970	186.6	01Jan2000, 10:10	3.25
CC1	0.1970	182.7	01Jan2000, 10:15	3.25
CA2	0.1125	120.5	01Jan2000, 10:05	3.36
CC2	0.3095	285.4	01Jan2000, 10:15	3.28
CA4	0.3050	253.8	01Jan2000, 10:20	3.34
CA3	0.0830	82.3	01Jan2000, 10:10	3.26
CC3	0.6975	605.0	01Jan2000, 10:20	3.30
CA5	0.1000	98.9	01Jan2000, 10:10	3.26
PCA5	0.7975	455.8	01Jan2000, 10:40	3.29
CB1	0.1050	121.7	01Jan2000, 10:05	3.17
PCB1	0.1050	30.3	01Jan2000, 10:40	3.14
CC3A	0.1050	30.3	01Jan2000, 10:50	3.13
CB2	0.0940	88.9	01Jan2000, 10:10	3.35
CA1-5 Junction	0.9965	538.6	01Jan2000, 10:25	3.28
CC4	0.9965	537.3	01Jan2000, 10:30	3.27
CC	0.4420	265.5	01Jan2000, 10:30	2.95

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CD2	0.1270	142.5	01Jan2000, 10:05	3.45
CD1	0.0690	91.5	01Jan2000, 10:05	3.66
CC4A	0.0690	88.2	01Jan2000, 10:10	3.65
PCD2	0.1960	196.5	01Jan2000, 10:15	3.36
CC4B	0.1960	195.1	01Jan2000, 10:20	3.35
CD3	0.1250	148.7	01Jan2000, 10:05	3.26
PCD3	0.3210	320.7	01Jan2000, 10:10	3.30
CC4C	0.3210	307.8	01Jan2000, 10:15	3.30
CD4	0.0750	82.5	01Jan2000, 10:05	3.26
PCD4	0.3960	366.3	01Jan2000, 10:20	3.27
CA+CB+CD	1.8345	1113.4	01Jan2000, 10:20	3.19
CC5	1.8345	1091.1	01Jan2000, 10:30	3.19
CE	0.0640	74.8	01Jan2000, 10:05	3.26
CW	0.0520	68.6	01Jan2000, 10:00	3.17
CC6	1.9505	1135.6	01Jan2000, 10:30	3.19
CN1	0.9160	527.6	01Jan2000, 10:35	2.94
CN2	0.1030	88.5	01Jan2000, 10:10	2.97
CX	0.0203	29.0	01Jan2000, 10:00	3.27
CC7	2.9898	1716.5	01Jan2000, 10:30	3.11
CO	0.1980	160.8	01Jan2000, 10:20	3.24
PCO	0.1980	104.0	01Jan2000, 10:40	3.24

Hydrologic Element	Drainage Area (MI <sup>2</sup> )	Peak Discharge (CFS)	Time of Peak	Volume (IN)
CF	0.0670	79.9	01Jan2000, 10:05	3.46
CC8	3.2548	1844.3	01Jan2000, 10:35	3.11
CG	0.0363	38.4	01Jan2000, 10:05	3.26
CC9	3.2911	1853.4	01Jan2000, 10:40	3.11
CS1	0.5770	266.5	01Jan2000, 10:50	2.83
CS2	0.5420	355.3	01Jan2000, 10:25	2.91
CC9A	1.1190	565.3	01Jan2000, 10:40	2.85
CH3	0.0890	108.3	01Jan2000, 10:05	3.36
CH4	0.0117	15.0	01Jan2000, 10:05	3.46
TRI1	0.1007	121.4	01Jan2000, 10:05	3.37
CH2	0.0932	99.5	01Jan2000, 10:05	3.16
CH1	0.0860	87.9	01Jan2000, 10:05	3.07
TRI1A	0.0860	84.1	01Jan2000, 10:10	3.06
TRI2	0.2799	299.0	01Jan2000, 10:10	3.21
CH7	0.2230	187.6	01Jan2000, 10:20	3.34
WMP1	0.5029	426.8	01Jan2000, 10:20	3.20
TRI3	0.5029	428.9	01Jan2000, 10:20	3.20
CH5	0.0897	107.9	01Jan2000, 10:05	3.26
CH8	0.0264	35.9	01Jan2000, 10:00	3.27
WMP2	0.6190	481.3	01Jan2000, 10:20	3.19
TRI4	0.6190	480.5	01Jan2000, 10:25	3.19

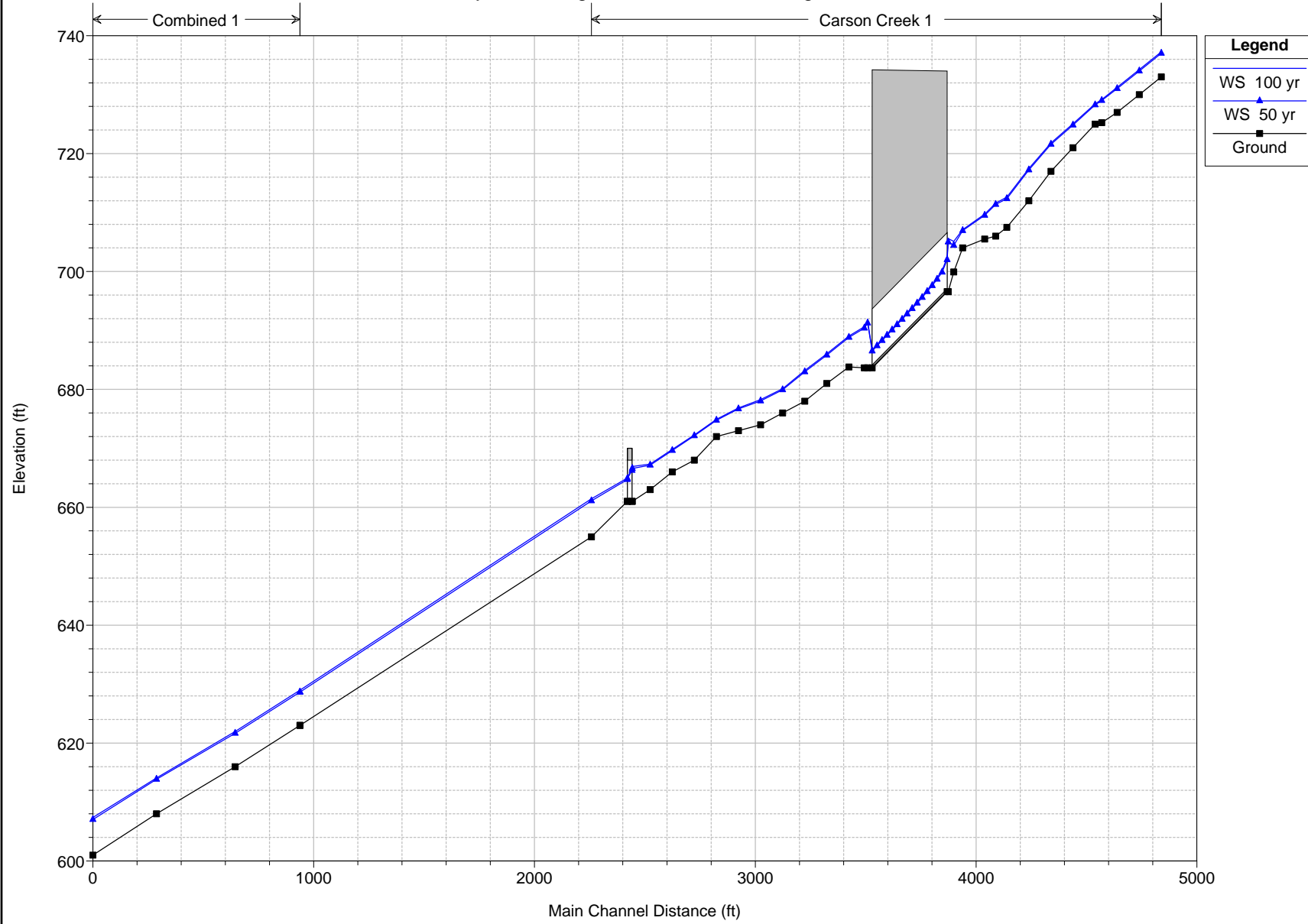


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**APPENDIX B – HEC-RAS OUTPUT (EXISTING)**

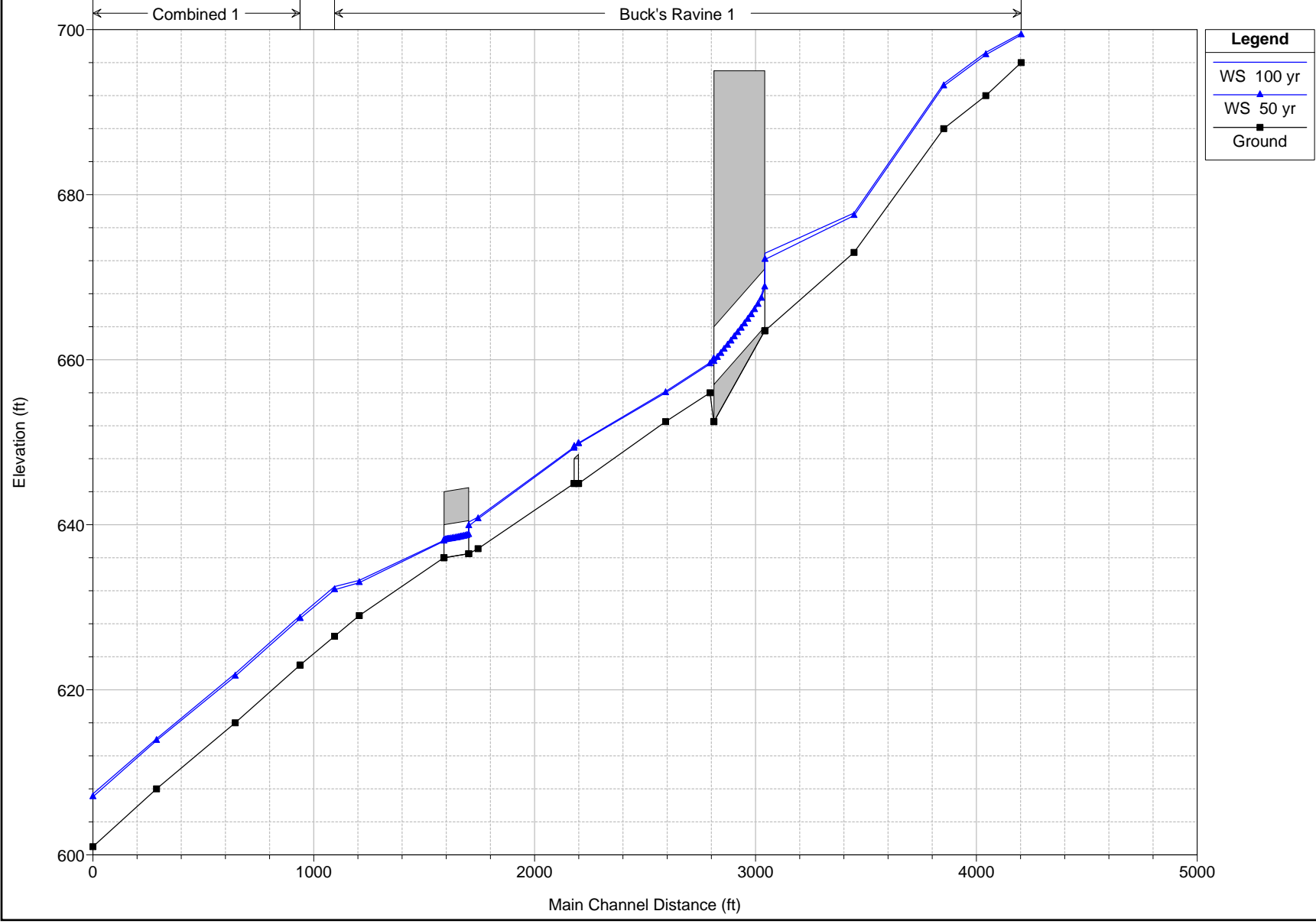
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Silva Valley Interchange 2010 Plan: Existing 11/18/2010



Legend	
WS 100 yr	(Blue line with triangle markers)
WS 50 yr	(Blue line with triangle markers)
Ground	(Black line with square markers)

Silva Valley Interchange 2010 Plan: Existing 11/18/2010



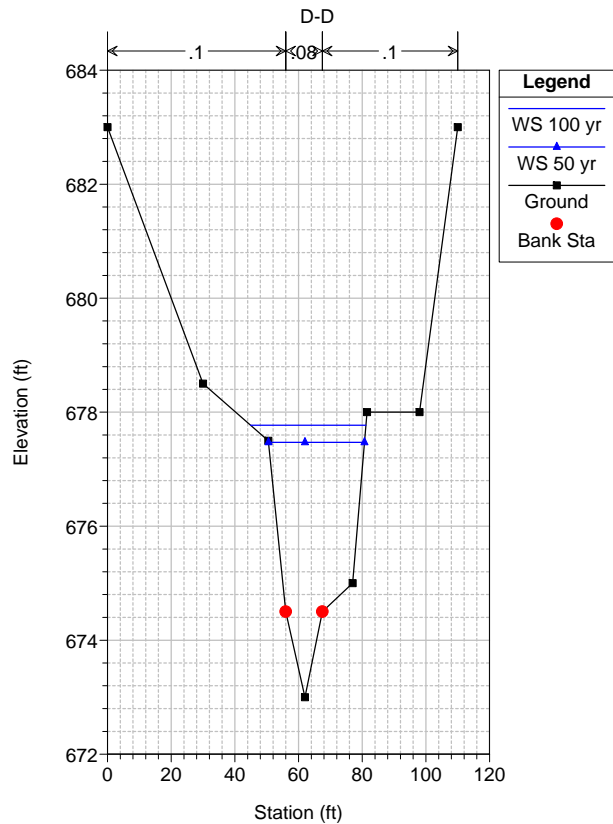
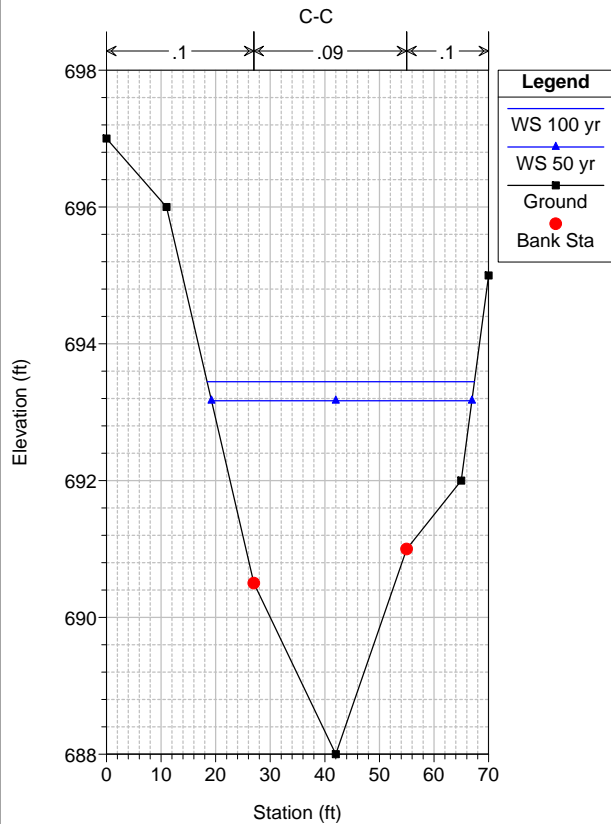
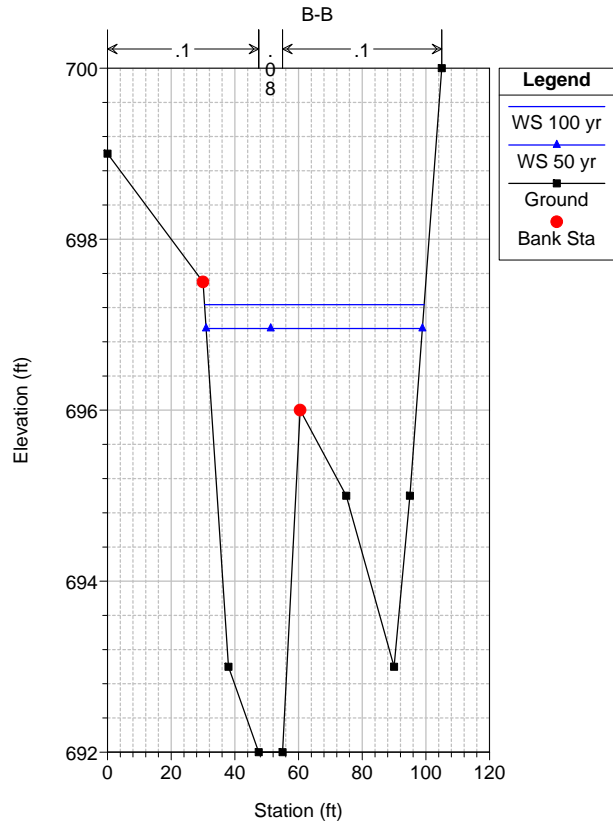
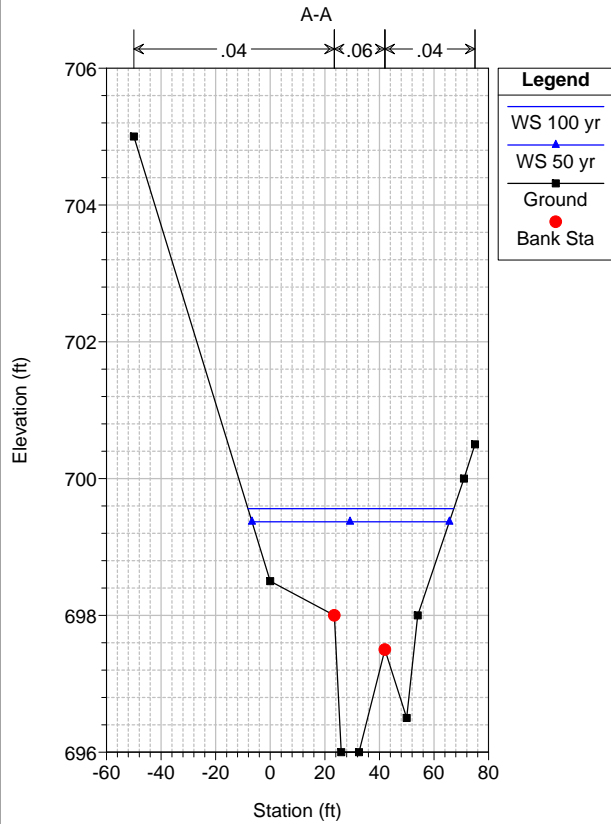
Legend	
WS 100 yr	Blue line with triangle markers
WS 50 yr	Blue line with triangle markers
Ground	Black line with square markers

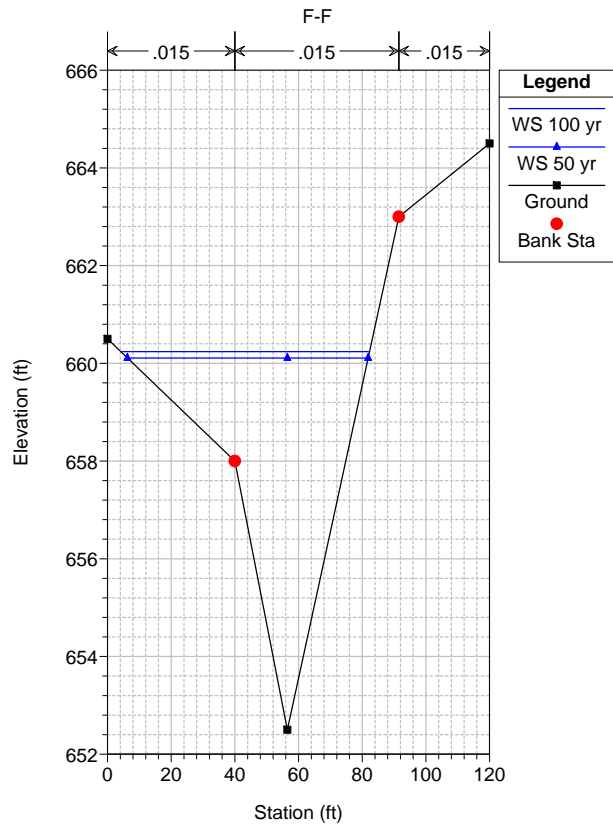
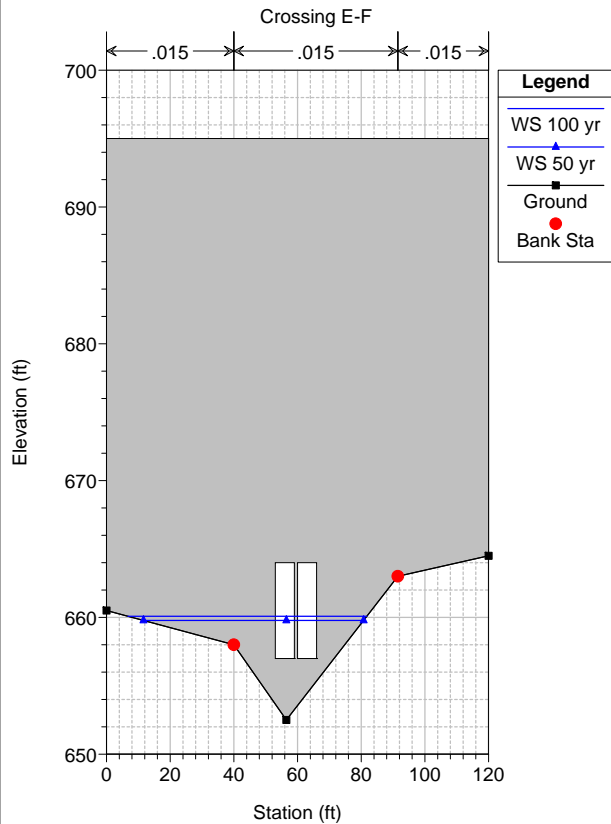
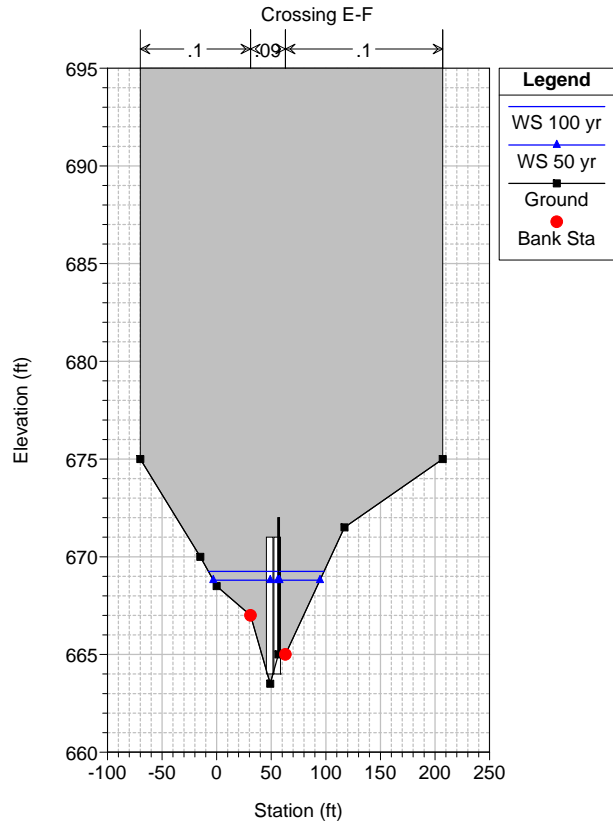
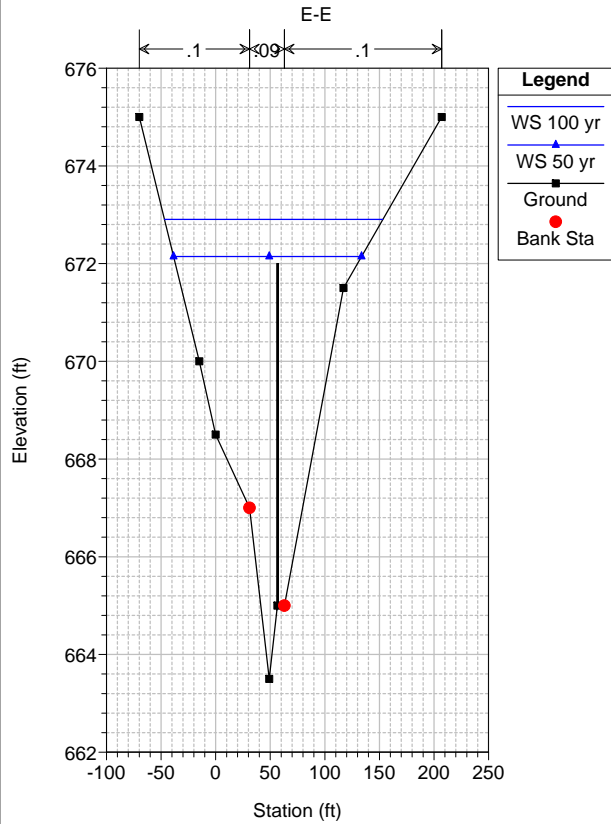
HEC-RAS Plan: Existing

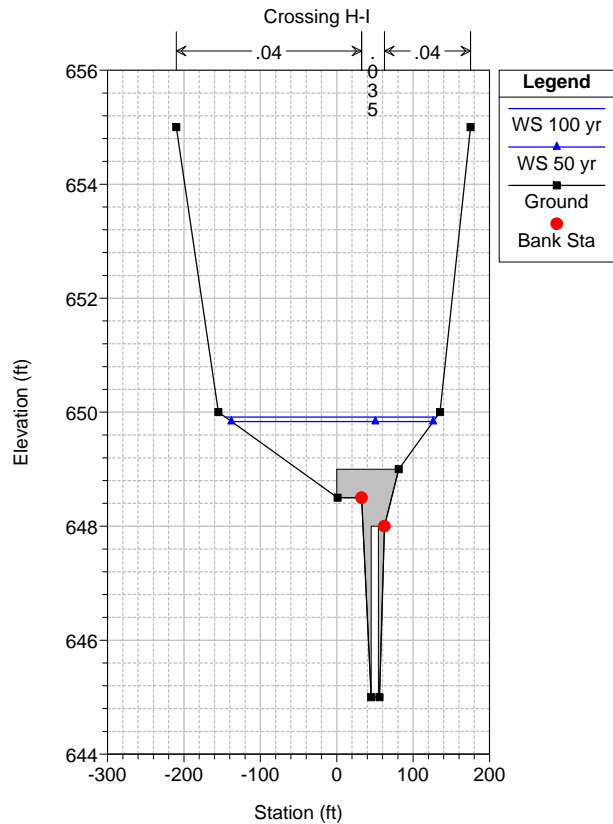
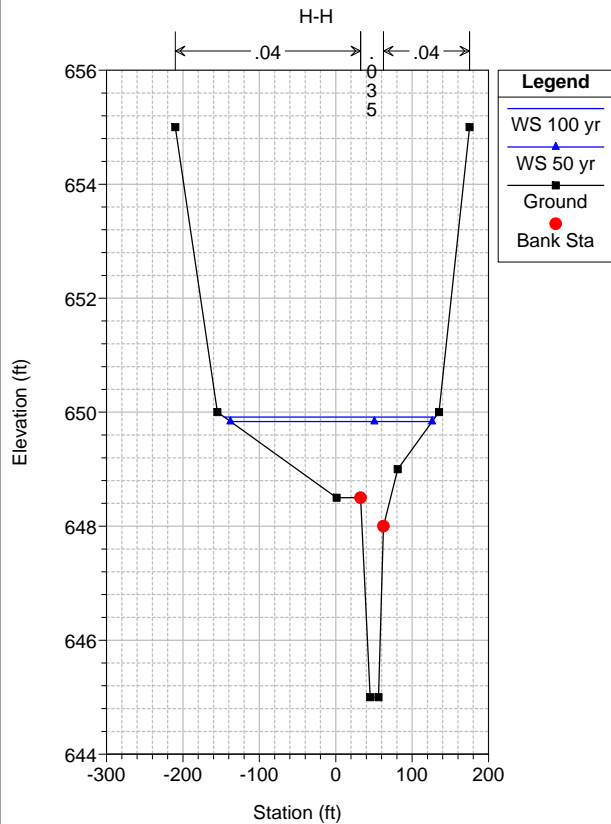
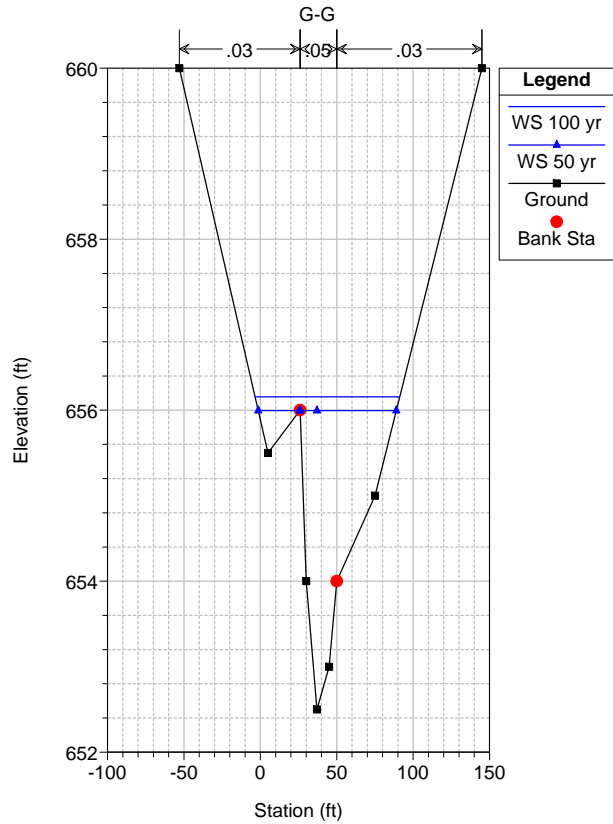
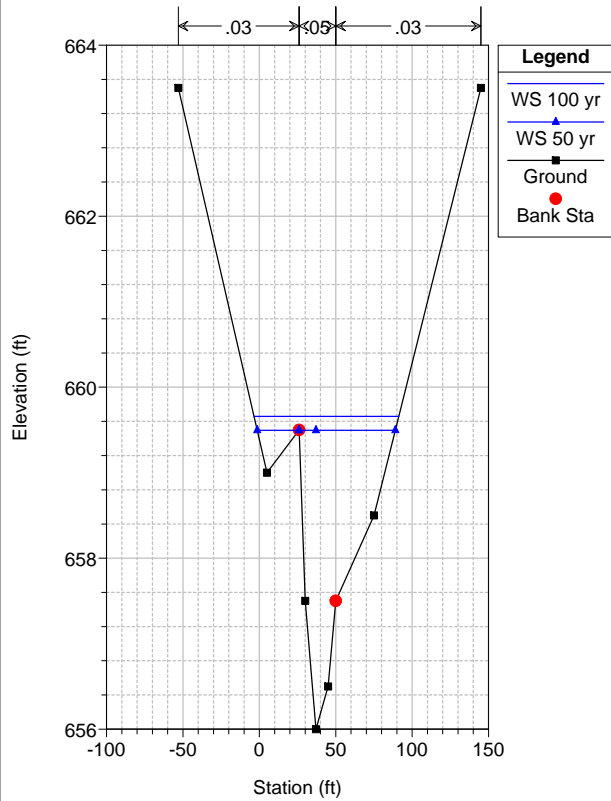
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Combined	1	-13.85	100 yr	3850.00	623.00	628.98	628.98	631.03	0.018525	11.97	339.04	83.36	0.93
Combined	1	-13.85	50 yr	3397.40	623.00	628.65	628.65	630.54	0.018800	11.54	311.73	82.75	0.93
Combined	1	-16.79	100 yr	3850.00	616.00	621.98	621.98	624.03	0.018525	11.97	339.04	83.36	0.93
Combined	1	-16.79	50 yr	3397.40	616.00	621.65	621.65	623.54	0.018800	11.54	311.73	82.75	0.93
Combined	1	-20.35	100 yr	3850.00	608.00	614.08	614.08	615.60	0.016124	10.87	400.01	123.00	0.86
Combined	1	-20.35	50 yr	3397.40	608.00	613.85	613.85	615.23	0.015779	10.42	371.75	123.00	0.84
Combined	1	-23.23	100 yr	3850.00	601.00	607.39	607.39	609.15	0.017611	10.95	376.34	111.59	0.89
Combined	1	-23.23	50 yr	3397.40	601.00	607.04	607.04	608.72	0.018503	10.65	337.97	105.44	0.90
Carson Creek	1	25.00	100 yr	2059.90	733.00	737.26	737.26	738.64	0.027354	9.74	229.99	88.34	0.93
Carson Creek	1	25.00	50 yr	1853.40	733.00	737.01	737.01	738.36	0.028875	9.55	209.06	84.21	0.95
Carson Creek	1	24.00	100 yr	2059.90	730.00	734.26	734.26	735.64	0.027354	9.74	229.99	88.34	0.93
Carson Creek	1	24.00	50 yr	1853.40	730.00	734.01	734.01	735.36	0.028875	9.55	209.06	84.21	0.95
Carson Creek	1	23.00	100 yr	2059.90	727.00	731.26	731.26	732.64	0.027354	9.74	229.99	88.34	0.93
Carson Creek	1	23.00	50 yr	1853.40	727.00	731.01	731.01	732.36	0.028875	9.55	209.06	84.21	0.95
Carson Creek	1	22.30	100 yr	2059.90	725.25	729.17	729.12	730.46	0.024026	9.13	228.72	92.56	0.96
Carson Creek	1	22.30	50 yr	1853.40	725.25	729.01	728.93	730.19	0.023488	8.70	214.88	89.50	0.94
Carson Creek	1	22.00	100 yr	2059.90	725.00	728.45	728.45	729.69	0.026299	9.32	246.87	105.22	0.93
Carson Creek	1	22.00	50 yr	1853.40	725.00	728.26	728.26	729.44	0.026773	9.03	227.48	102.23	0.93
Carson Creek	1	21.00	100 yr	2059.90	721.00	725.07	725.07	726.47	0.013601	9.84	234.98	89.72	0.92
Carson Creek	1	21.00	50 yr	1853.40	721.00	724.84	724.84	726.18	0.013982	9.58	214.81	86.90	0.92
Carson Creek	1	20.00	100 yr	2059.90	717.00	721.81	721.81	723.25	0.013338	10.41	242.04	88.35	0.88
Carson Creek	1	20.00	50 yr	1853.40	717.00	721.57	721.57	722.95	0.013579	10.12	221.21	84.99	0.88
Carson Creek	1	19.00	100 yr	2059.90	712.00	717.47	717.47	718.97	0.011926	11.51	248.02	84.19	0.89
Carson Creek	1	19.00	50 yr	1853.40	712.00	717.22	717.22	718.66	0.012028	11.19	227.61	81.02	0.89
Carson Creek	1	18.00	100 yr	2059.90	707.50	712.62	712.62	714.49	0.016915	11.53	208.29	62.67	0.92
Carson Creek	1	18.00	50 yr	1853.40	707.50	712.34	712.34	714.11	0.017059	11.14	191.46	60.30	0.92
Carson Creek	1	17.5	100 yr	2059.90	706.00	711.60	711.60	713.23	0.016164	10.25	203.24	69.84	1.00
Carson Creek	1	17.5	50 yr	1853.40	706.00	711.37	711.37	712.90	0.016764	9.93	187.44	66.83	1.01
Carson Creek	1	17.00	100 yr	2059.90	705.50	709.73	709.73	711.06	0.015731	9.26	222.55	84.74	1.01
Carson Creek	1	17.00	50 yr	1853.40	705.50	709.52	709.52	710.79	0.015893	9.04	205.13	82.24	1.01
Carson Creek	1	16	100 yr	2059.90	704.00	707.09	707.09	708.23	0.018621	8.57	240.27	107.91	1.01
Carson Creek	1	16	50 yr	1853.40	704.00	706.94	706.94	708.00	0.018696	8.28	223.71	106.24	1.01
Carson Creek	1	15.6	100 yr	2059.90	699.92	705.11		706.09	0.010681	7.95	259.20	89.01	0.82
Carson Creek	1	15.6	50 yr	1853.40	699.92	704.43	704.43	705.74	0.016546	9.18	201.91	78.34	1.01
Carson Creek	1	15.35	100 yr	2059.90	696.58	705.60	700.97	705.77	0.001473	3.38	608.82	111.57	0.26
Carson Creek	1	15.35	50 yr	1853.40	696.58	705.00	700.70	705.18	0.001645	3.41	543.45	108.29	0.27
Carson Creek	1	12		Culvert									
Carson Creek	1	11.85	100 yr	2059.90	683.65	691.56		691.91	0.002115	4.74	434.45	75.76	0.35
Carson Creek	1	11.85	50 yr	1853.40	683.65	691.25		691.56	0.002002	4.51	411.13	74.29	0.34
Carson Creek	1	11.7	100 yr	2059.90	683.65	690.63		691.65	0.010281	8.08	255.05	66.49	0.73
Carson Creek	1	11.7	50 yr	1853.40	683.65	690.38		691.32	0.009983	7.78	238.37	64.37	0.71
Carson Creek	1	11	100 yr	2059.90	683.80	689.05	689.05	690.59	0.021364	9.95	207.05	69.53	1.01
Carson Creek	1	11	50 yr	1853.40	683.80	688.83	688.83	690.28	0.021388	9.65	191.97	66.99	1.01
Carson Creek	1	10	100 yr	2059.90	681.00	686.04	686.04	687.57	0.021284	9.93	207.46	69.30	1.01
Carson Creek	1	10	50 yr	1853.40	681.00	685.81	685.81	687.26	0.021322	9.66	191.86	66.58	1.00
Carson Creek	1	9.00	100 yr	2059.90	678.00	683.21	683.21	684.67	0.021199	9.69	212.50	72.94	1.00
Carson Creek	1	9.00	50 yr	1853.40	678.00	682.98	682.98	684.37	0.021590	9.47	195.81	70.64	1.00
Carson Creek	1	8.00	100 yr	2059.90	676.00	680.12	680.12	681.60	0.021461	9.74	211.47	73.61	1.01
Carson Creek	1	8.00	50 yr	1853.40	676.00	679.92	679.92	681.30	0.021731	9.42	196.85	72.22	1.01
Carson Creek	1	7.00	100 yr	2059.90	674.00	678.27	678.11	679.49	0.018765	8.87	232.28	83.82	0.94
Carson Creek	1	7.00	50 yr	1853.40	674.00	678.05	677.88	679.21	0.018648	8.65	214.24	79.85	0.93
Carson Creek	1	6.00	100 yr	2059.90	673.00	676.86		677.74	0.014589	7.54	273.32	104.72	0.82
Carson Creek	1	6.00	50 yr	1853.40	673.00	676.70		677.51	0.013828	7.21	257.03	101.08	0.80
Carson Creek	1	5.00	100 yr	2059.90	672.00	674.92	674.92	675.89	0.024021	7.90	260.63	135.59	1.00
Carson Creek	1	5.00	50 yr	1853.40	672.00	674.76	674.76	675.69	0.024584	7.73	239.61	131.02	1.01

HEC-RAS Plan: Existing (Continued)

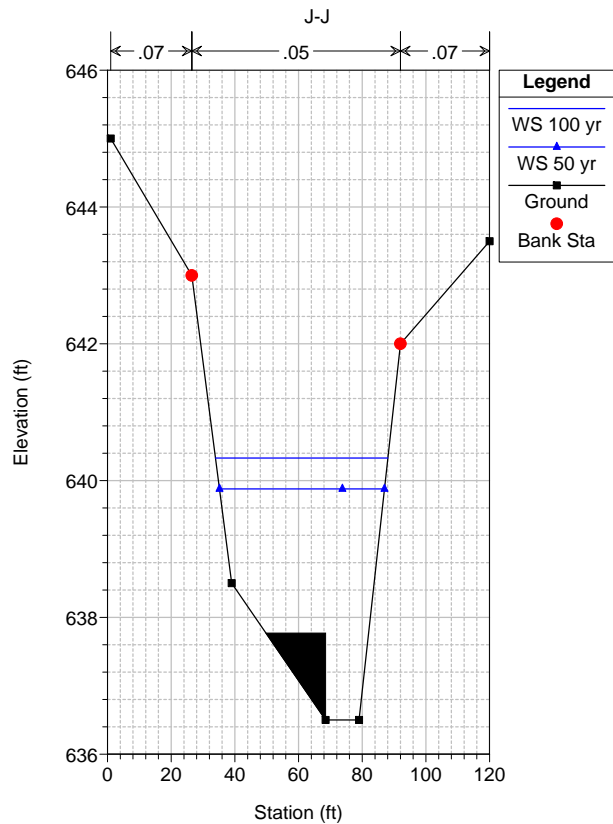
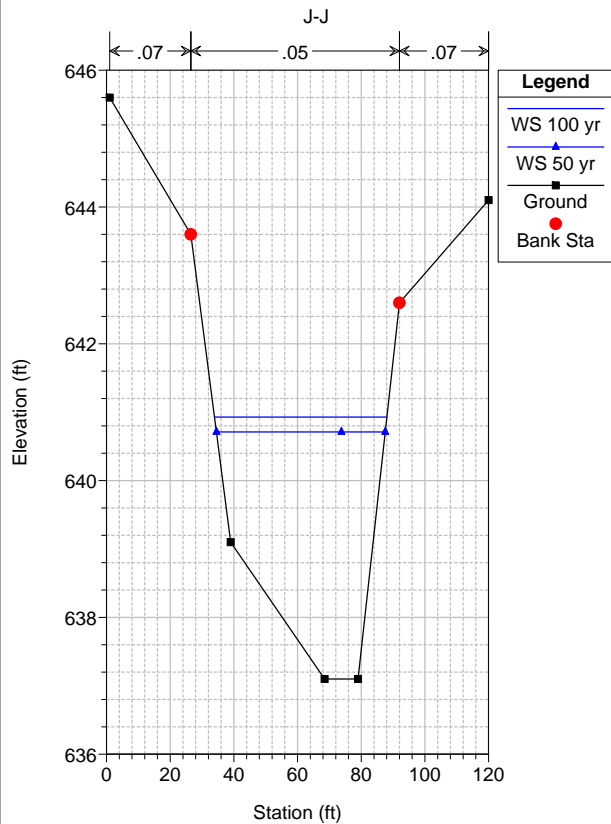
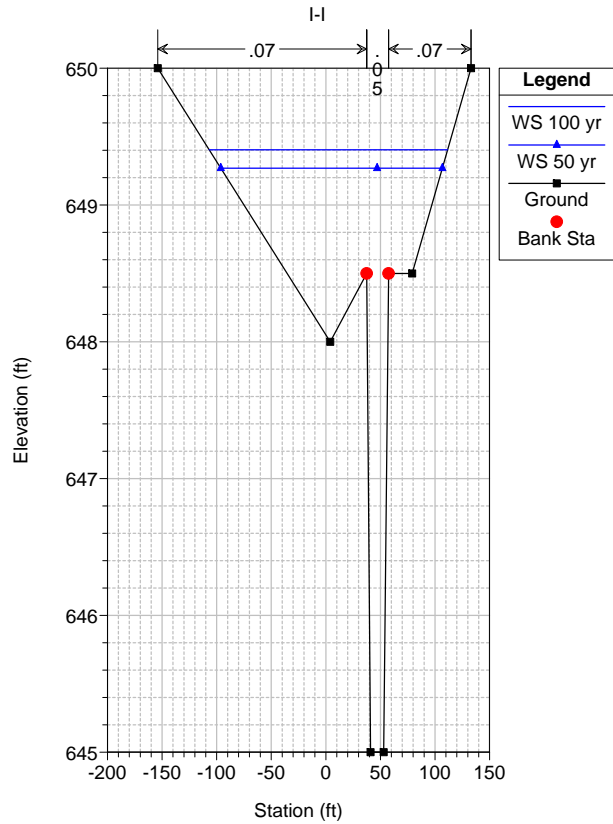
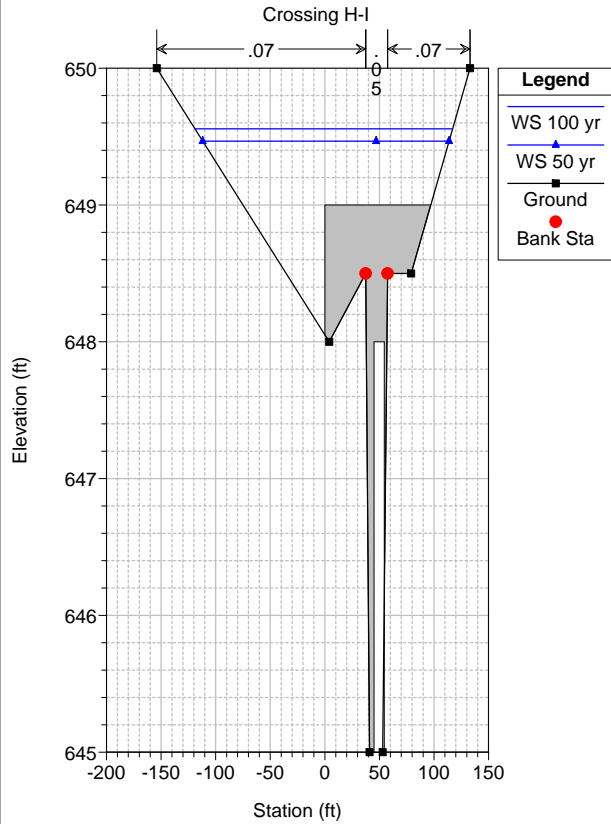
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Carson Creek	1	4.00	100 yr	2059.90	668.00	672.27	672.18	673.23	0.021246	7.86	262.14	124.91	0.96
Carson Creek	1	4.00	50 yr	1853.40	668.00	672.12	672.03	673.02	0.021400	7.60	243.80	122.76	0.95
Carson Creek	1	3	100 yr	2059.90	666.00	669.83	669.83	671.02	0.022649	8.75	235.30	100.04	1.01
Carson Creek	1	3	50 yr	1853.40	666.00	669.64	669.64	670.77	0.023126	8.56	216.61	96.81	1.01
Carson Creek	1	2.00	100 yr	2059.90	663.00	667.34	667.34	668.82	0.018974	9.90	222.83	82.68	0.96
Carson Creek	1	2.00	50 yr	1853.40	663.00	667.14	667.14	668.52	0.019167	9.54	206.37	81.01	0.96
Carson Creek	1	1.19	100 yr	2059.90	661.00	666.92	665.37	667.69	0.006278	7.00	294.30	64.10	0.58
Carson Creek	1	1.19	50 yr	1853.40	661.00	666.59	665.13	667.30	0.006391	6.79	272.80	63.13	0.58
Carson Creek	1	1.18		Bridge									
Carson Creek	1	.96	100 yr	2059.90	661.00	664.94	664.91	666.64	0.020481	10.46	196.98	56.43	0.99
Carson Creek	1	.96	50 yr	1853.40	661.00	664.71	664.66	666.28	0.020540	10.07	184.09	56.21	0.98
Carson Creek	1	-0.66	100 yr	2979.00	655.00	661.45	661.45	663.44	0.018321	11.38	269.07	74.15	0.98
Carson Creek	1	-0.66	50 yr	2644.50	655.00	661.09	661.09	662.98	0.019274	11.06	243.51	71.07	0.99
Buck's Ravine	1	3109	100 yr	819.00	696.00	699.56	699.37	700.18	0.017239	6.63	131.43	75.42	0.67
Buck's Ravine	1	3109	50 yr	717.20	696.00	699.37	699.21	699.97	0.018253	6.53	117.29	72.32	0.68
Buck's Ravine	1	2949	100 yr	819.00	692.00	697.23		697.48	0.014359	4.40	212.77	69.00	0.39
Buck's Ravine	1	2949	50 yr	717.20	692.00	696.95		697.19	0.014526	4.27	193.65	67.94	0.39
Buck's Ravine	1	2758	100 yr	819.00	688.00	693.45		694.00	0.022761	6.28	148.08	48.98	0.55
Buck's Ravine	1	2758	50 yr	717.20	688.00	693.17		693.68	0.022848	6.00	134.63	47.71	0.54
Buck's Ravine	1	2352	100 yr	819.00	673.00	677.77	677.77	679.44	0.066273	11.83	91.23	36.23	1.04
Buck's Ravine	1	2352	50 yr	717.20	673.00	677.47	677.47	679.00	0.067061	11.30	81.29	30.15	1.03
Buck's Ravine	1	1949	100 yr	819.00	663.50	672.90	667.57	672.92	0.000774	1.38	781.26	200.07	0.09
Buck's Ravine	1	1949	50 yr	717.20	663.50	672.15	667.36	672.17	0.000960	1.44	640.12	172.23	0.10
Buck's Ravine	1	1948		Culvert									
Buck's Ravine	1	1717	100 yr	819.00	652.50	660.24		660.48	0.000262	4.12	222.22	78.12	0.35
Buck's Ravine	1	1717	50 yr	717.20	652.50	660.11		660.31	0.000224	3.75	212.26	75.61	0.32
Buck's Ravine	1	1700	100 yr	819.00	656.00	659.66	659.66	660.34	0.013985	6.73	127.82	94.72	0.72
Buck's Ravine	1	1700	50 yr	717.20	656.00	659.50	659.50	660.16	0.014831	6.65	112.69	90.12	0.73
Buck's Ravine	1	1499	100 yr	819.00	652.50	656.16	656.16	656.84	0.014073	6.75	127.51	94.63	0.72
Buck's Ravine	1	1499	50 yr	717.20	652.50	656.00	656.00	656.66	0.014832	6.65	112.69	90.11	0.73
Buck's Ravine	1	1105	100 yr	819.00	645.00	649.91	649.31	650.14	0.002039	4.60	313.19	276.51	0.41
Buck's Ravine	1	1105	50 yr	717.20	645.00	649.84	649.10	650.03	0.001788	4.25	292.15	264.21	0.39
Buck's Ravine	1	1104		Culvert									
Buck's Ravine	1	1084	100 yr	819.00	645.00	649.40	649.40	649.93	0.011850	7.13	224.61	218.39	0.65
Buck's Ravine	1	1084	50 yr	717.20	645.00	649.27	649.27	649.79	0.011685	6.91	196.41	203.00	0.64
Buck's Ravine	1	650	100 yr	819.00	637.10	640.93		641.42	0.009853	5.63	145.59	54.13	0.60
Buck's Ravine	1	650	50 yr	717.20	637.10	640.71		641.16	0.009689	5.35	133.95	53.01	0.59
Buck's Ravine	1	608	100 yr	819.00	636.50	640.33	639.73	640.91	0.013473	6.12	133.72	54.13	0.69
Buck's Ravine	1	608	50 yr	717.20	636.50	639.88	639.54	640.54	0.018738	6.53	109.85	51.81	0.79
Buck's Ravine	1	607		Culvert									
Buck's Ravine	1	495	100 yr	819.00	636.00	638.10		638.51	0.008503	5.19	157.80	83.55	0.67
Buck's Ravine	1	495	50 yr	717.20	636.00	638.01		638.36	0.007607	4.77	150.43	83.31	0.63
Buck's Ravine	1	112	100 yr	819.00	629.00	633.26	633.26	633.97	0.018612	7.37	124.97	81.23	0.70
Buck's Ravine	1	112	50 yr	717.20	629.00	632.99	632.99	633.78	0.022522	7.67	103.50	77.42	0.76
Buck's Ravine	1	0	100 yr	819.00	626.50	632.52		632.63	0.001536	2.80	313.49	108.63	0.22
Buck's Ravine	1	0	50 yr	717.20	626.50	632.12		632.23	0.001786	2.86	271.69	103.16	0.23

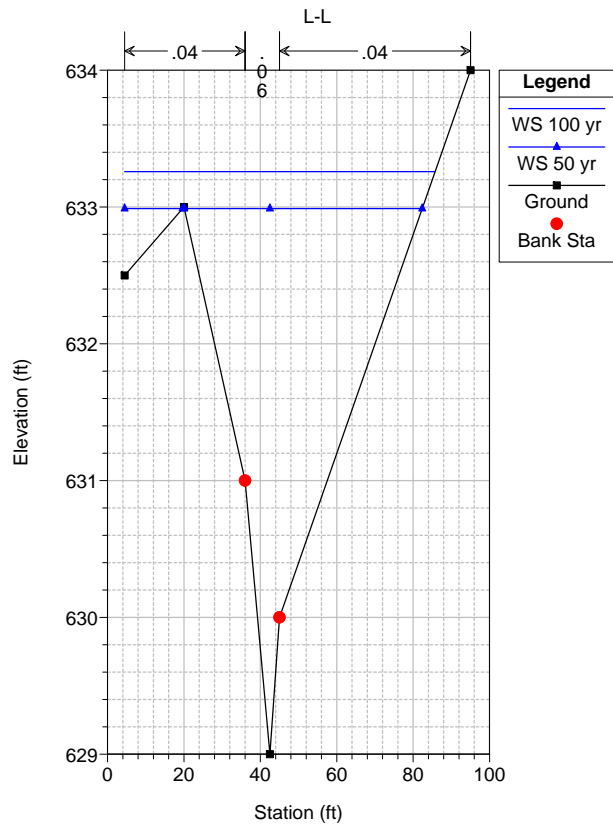
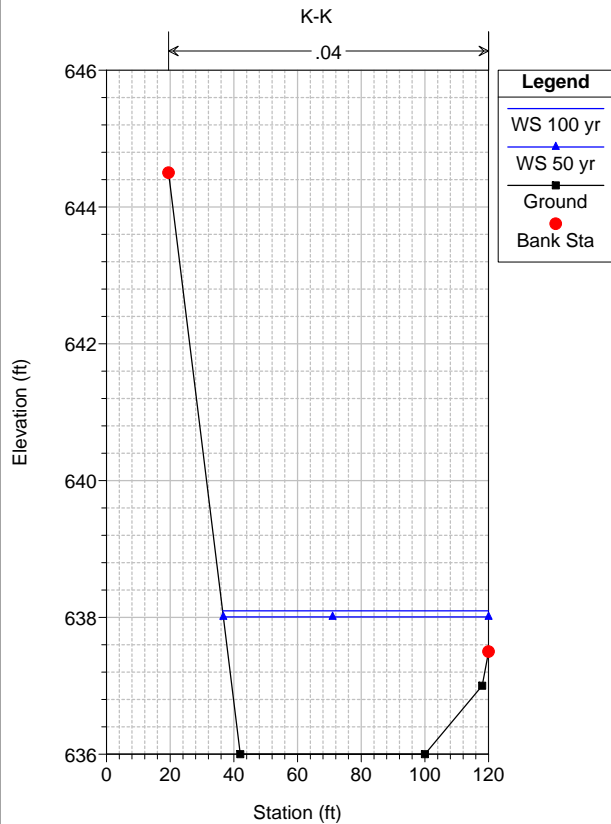
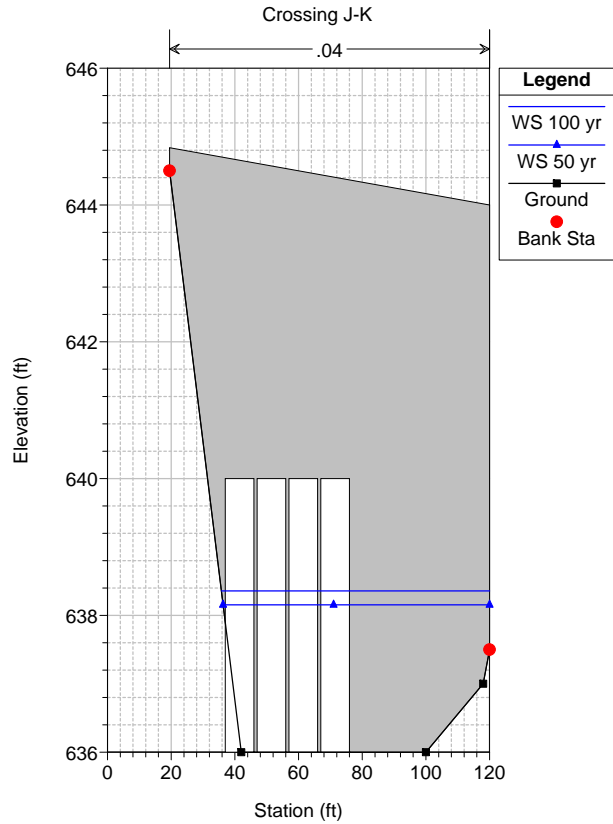
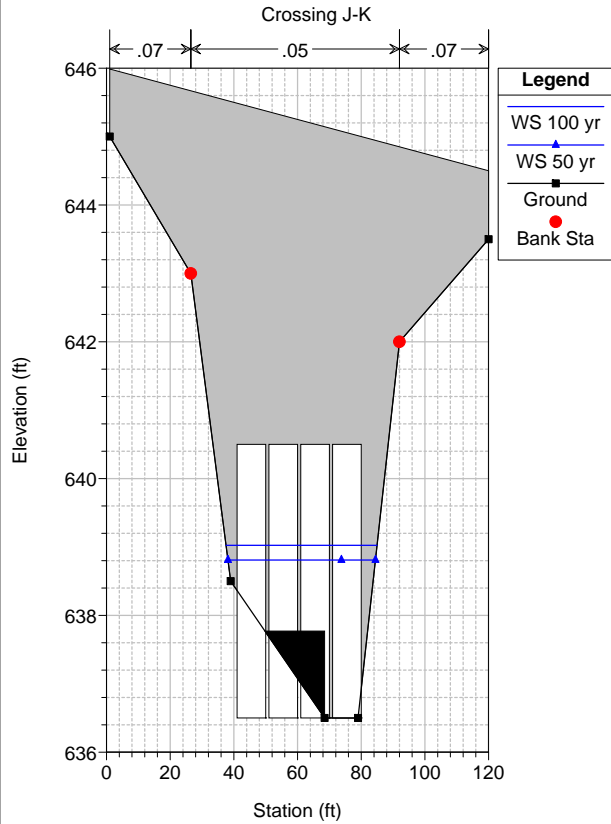


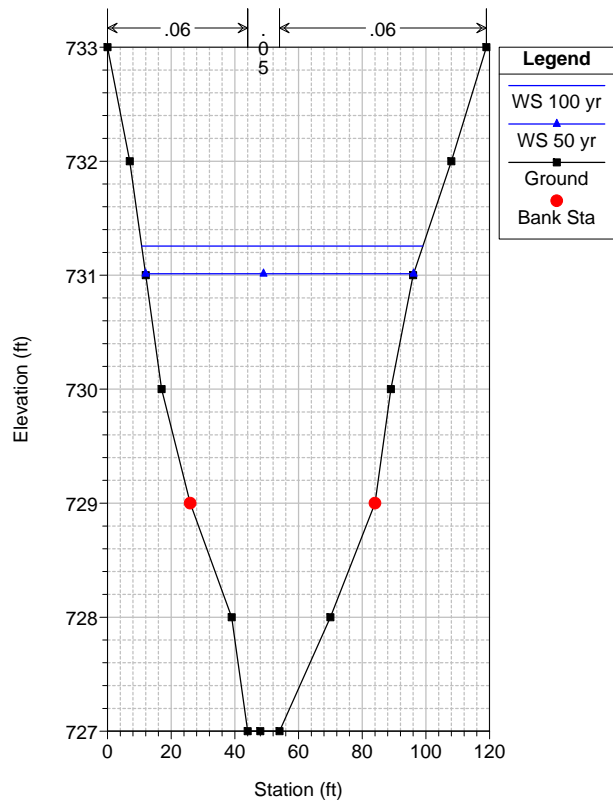
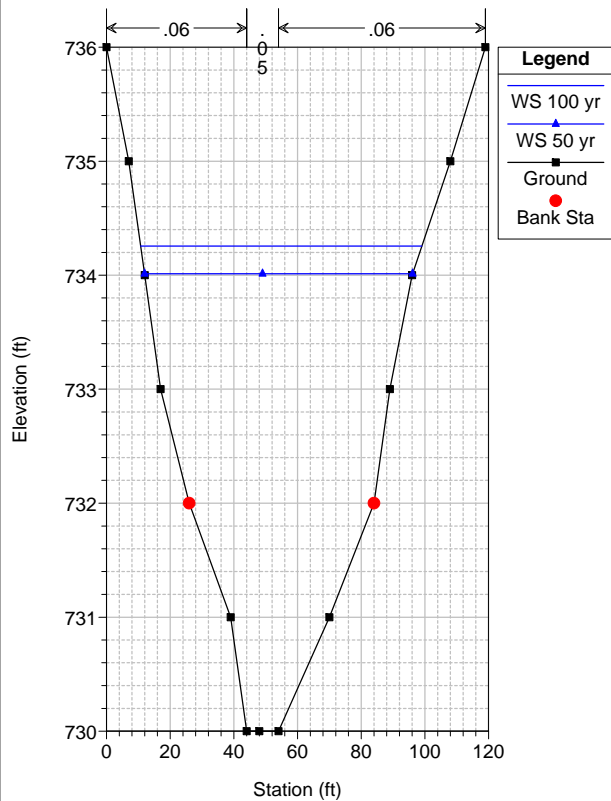
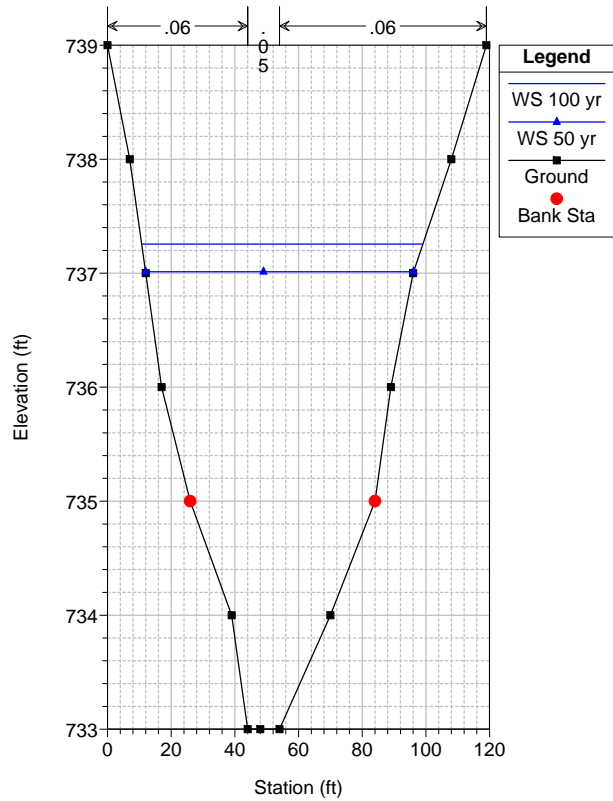
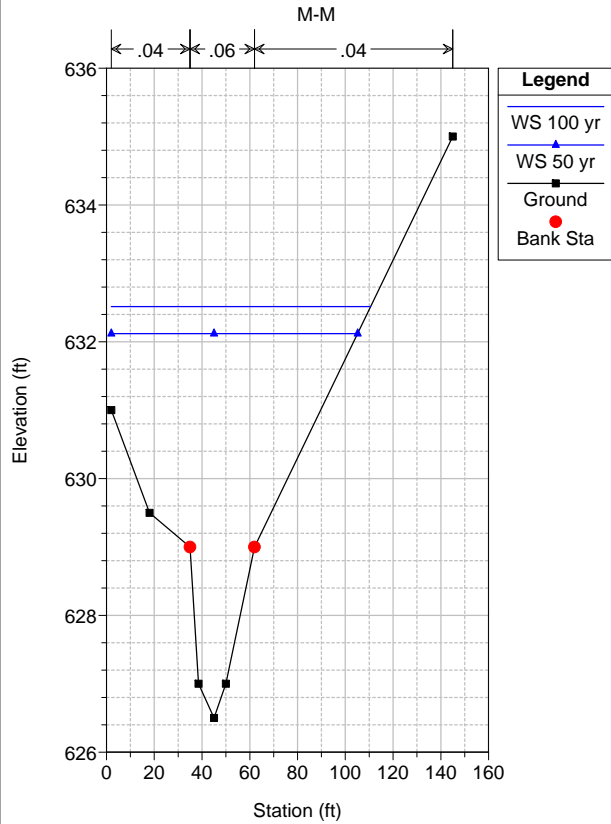




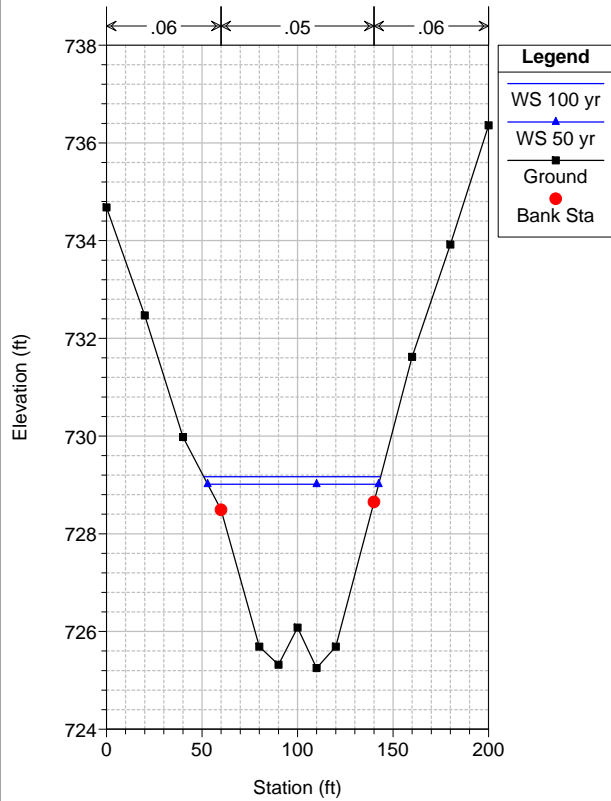




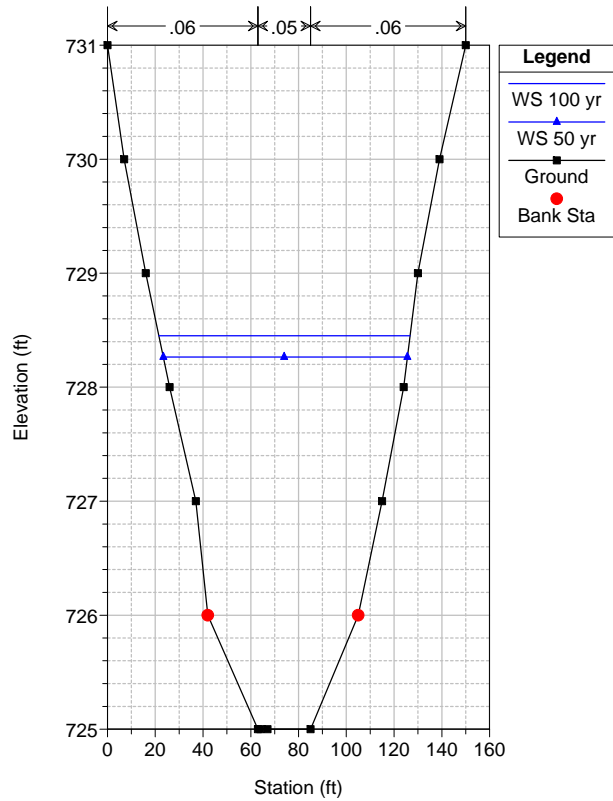




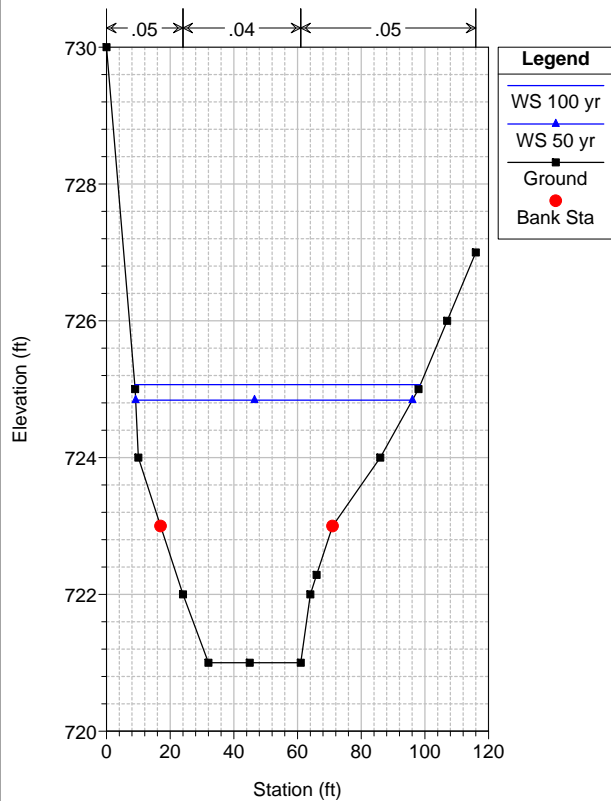
Silva Valley Interchange 2010 Plan: Existing 11/18/2010



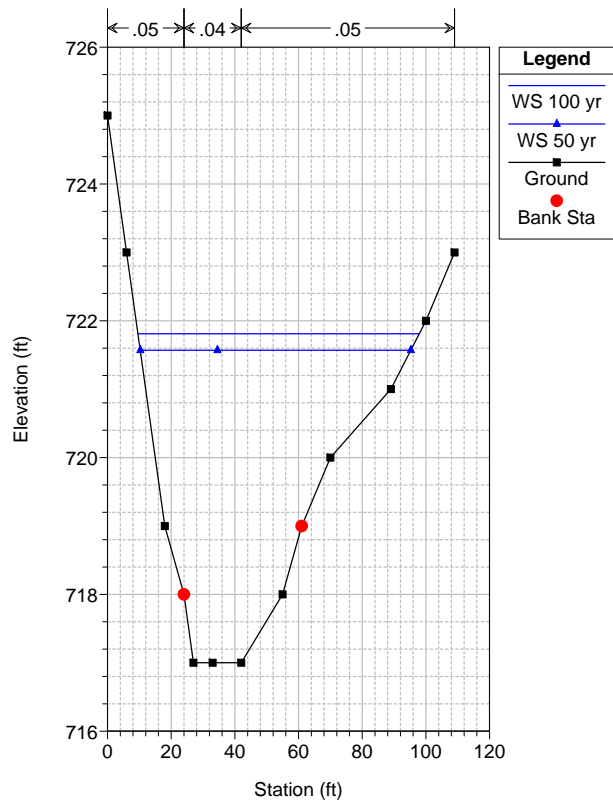
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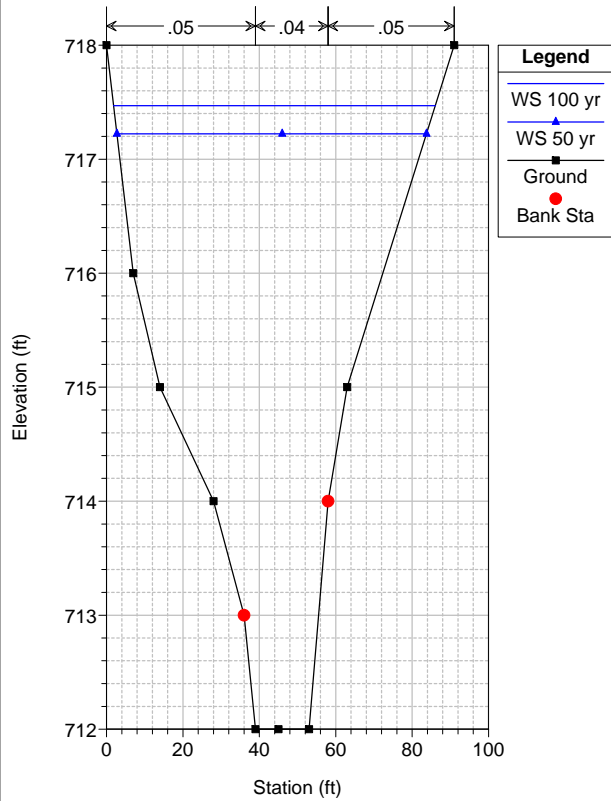
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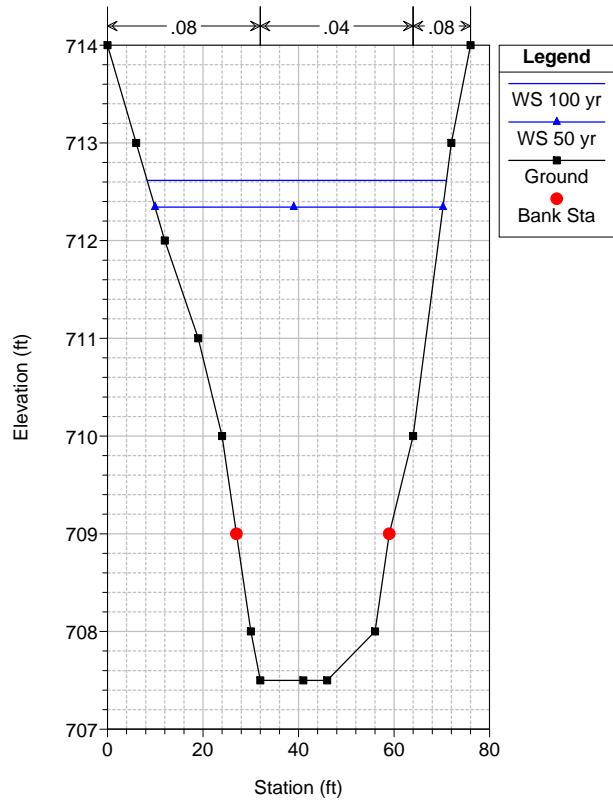
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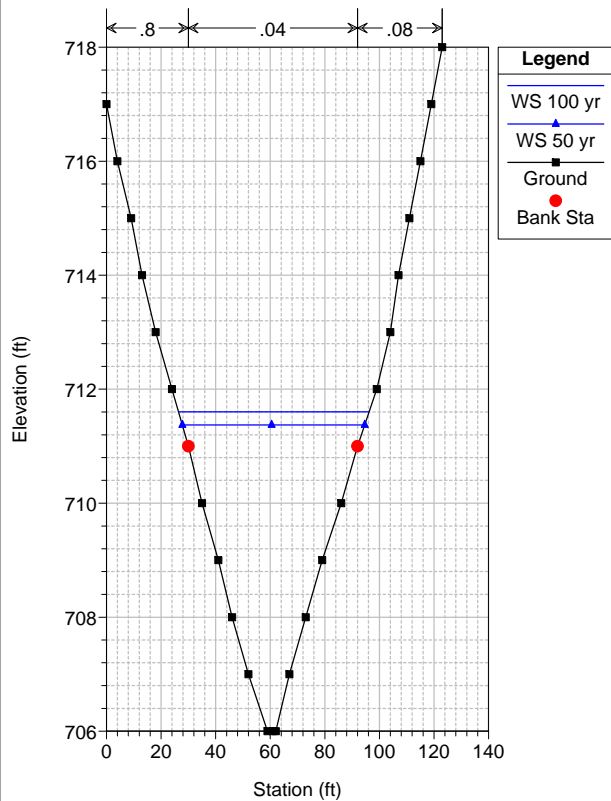
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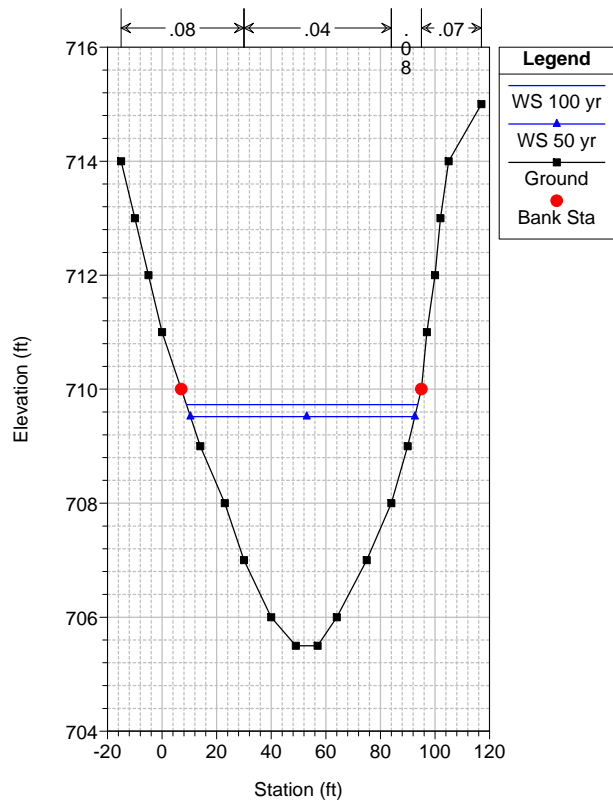
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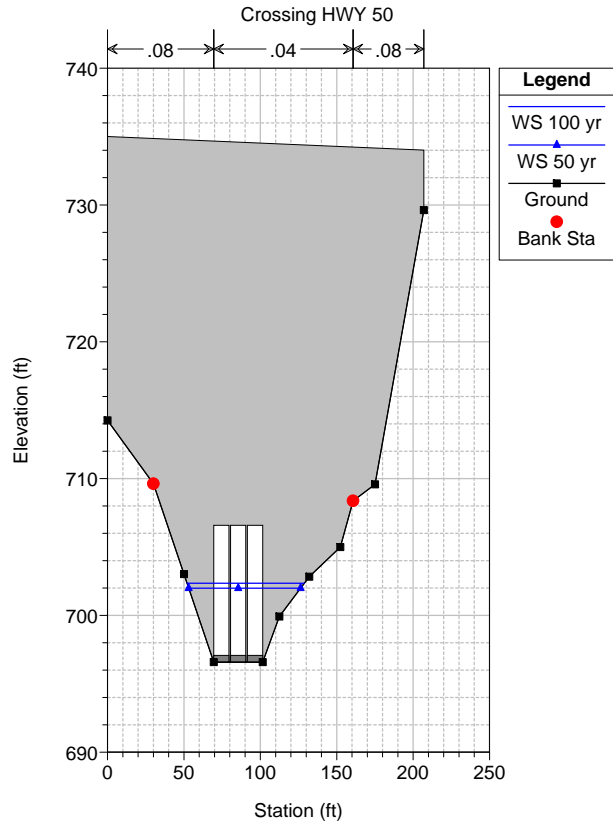
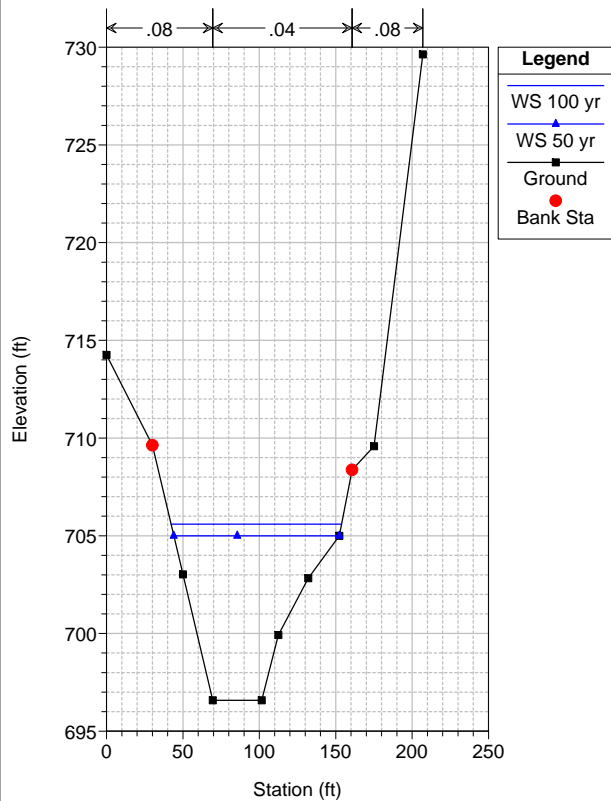
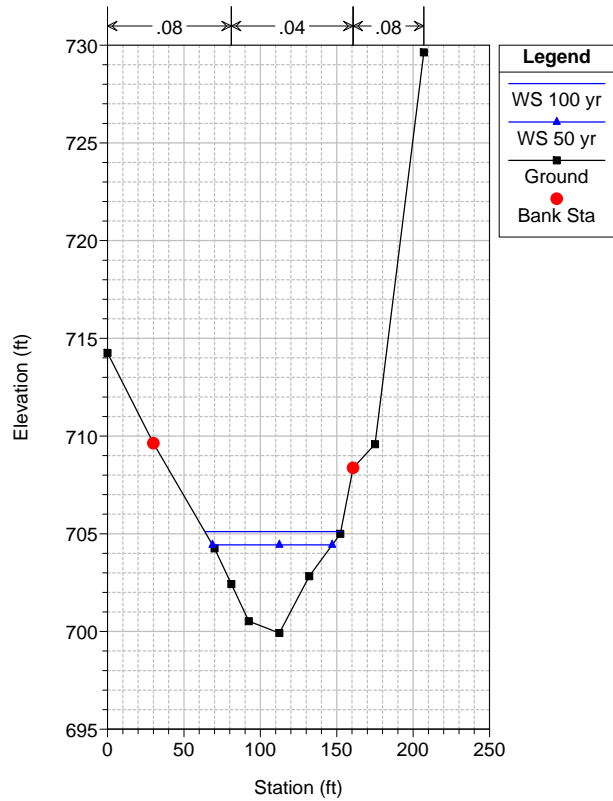
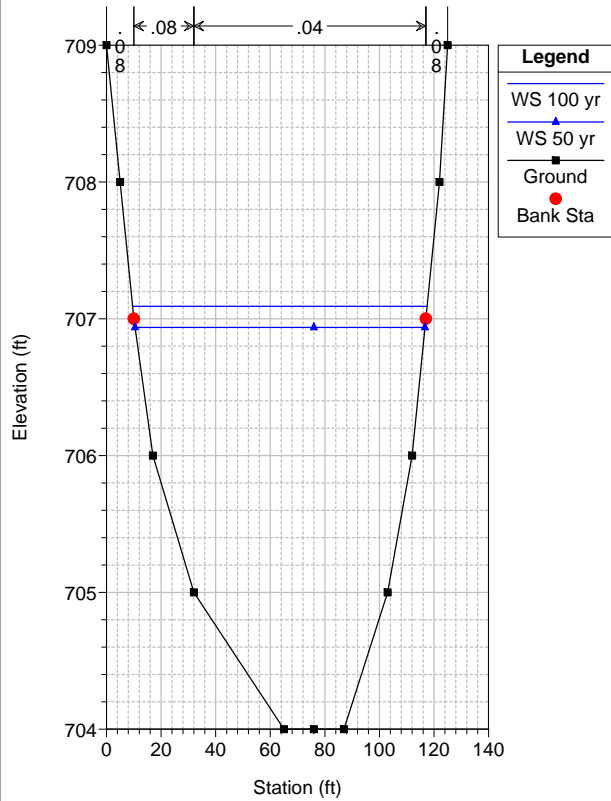


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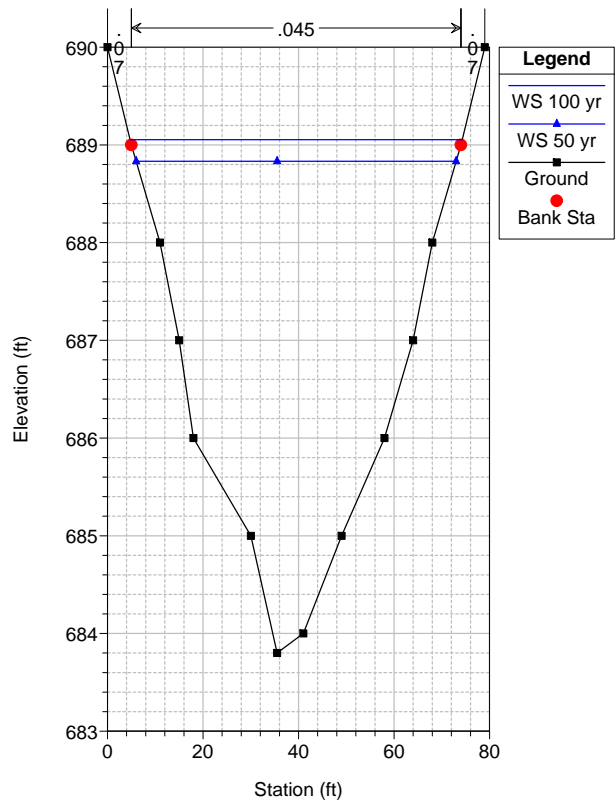
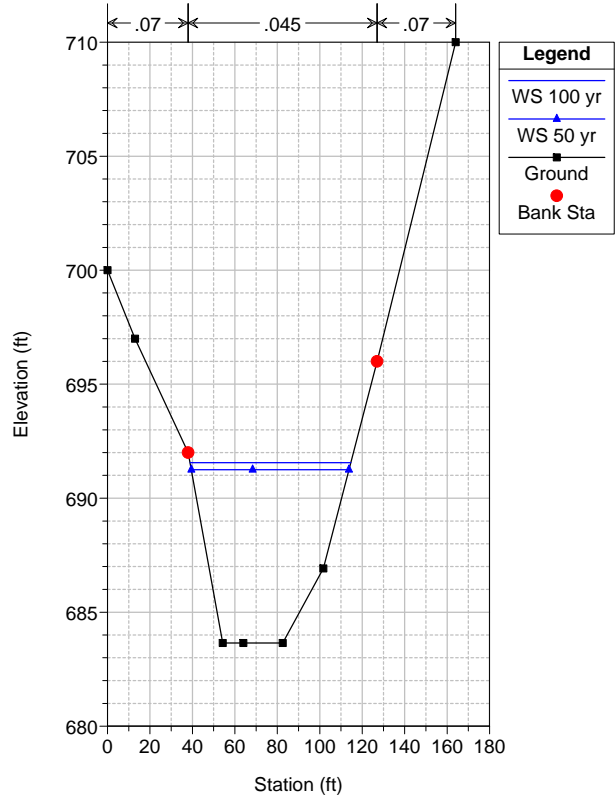
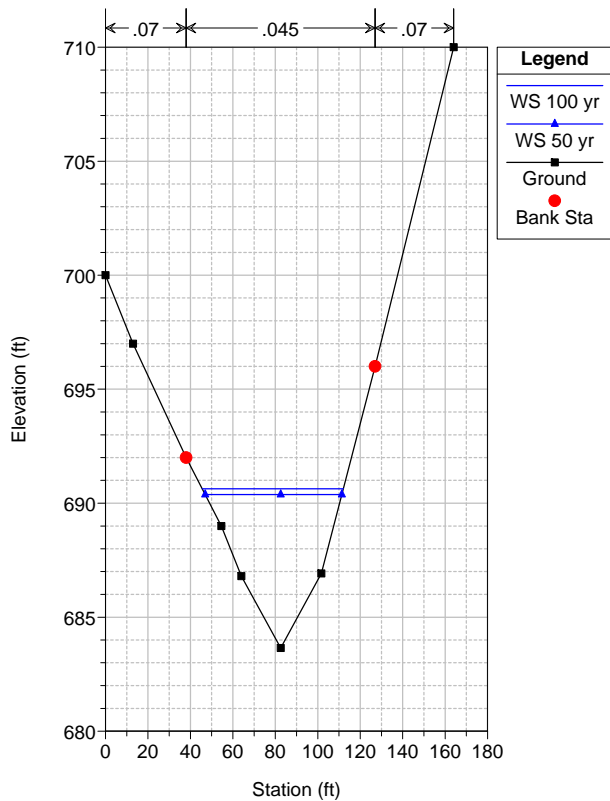
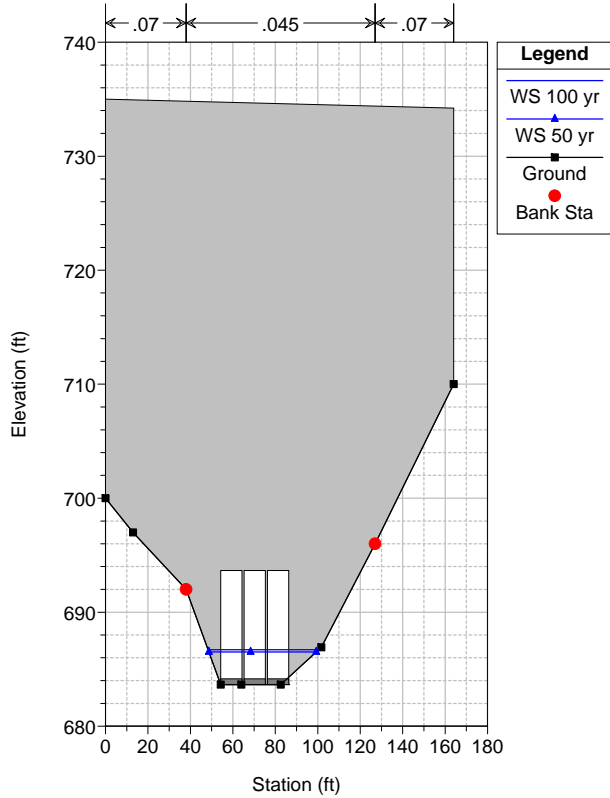


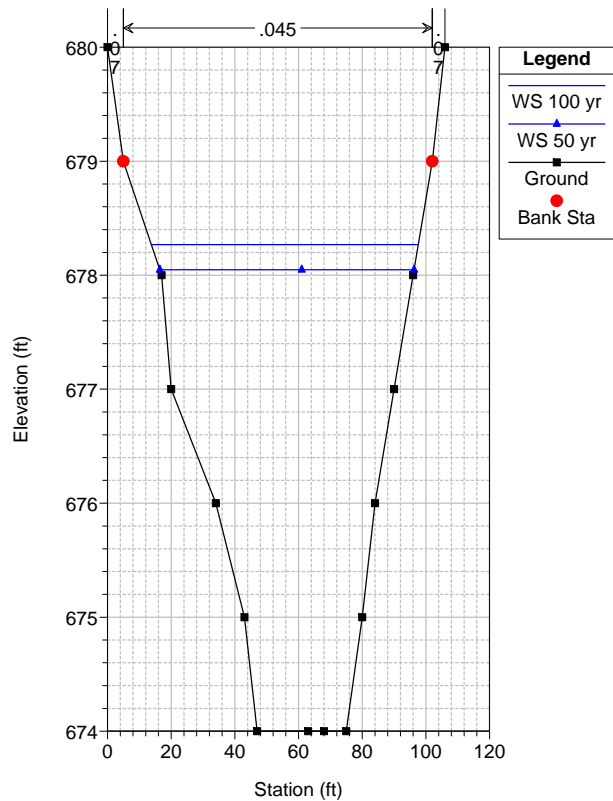
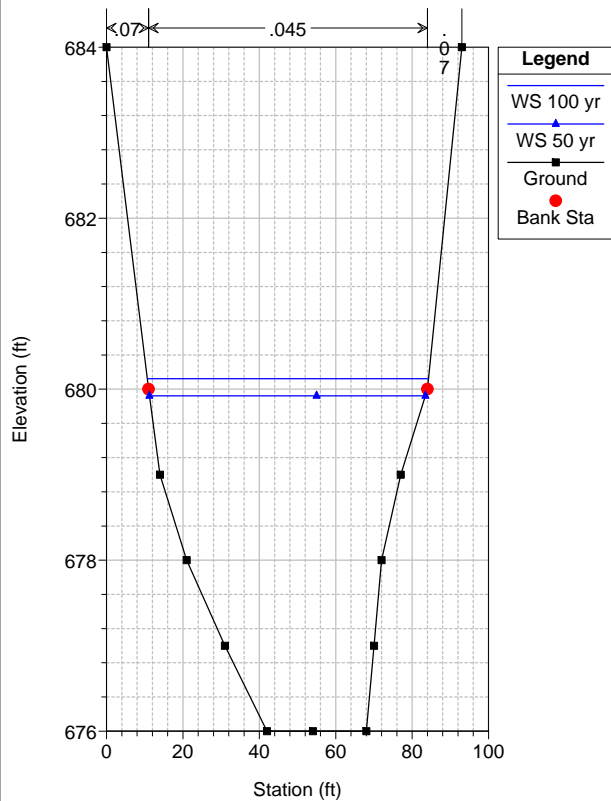
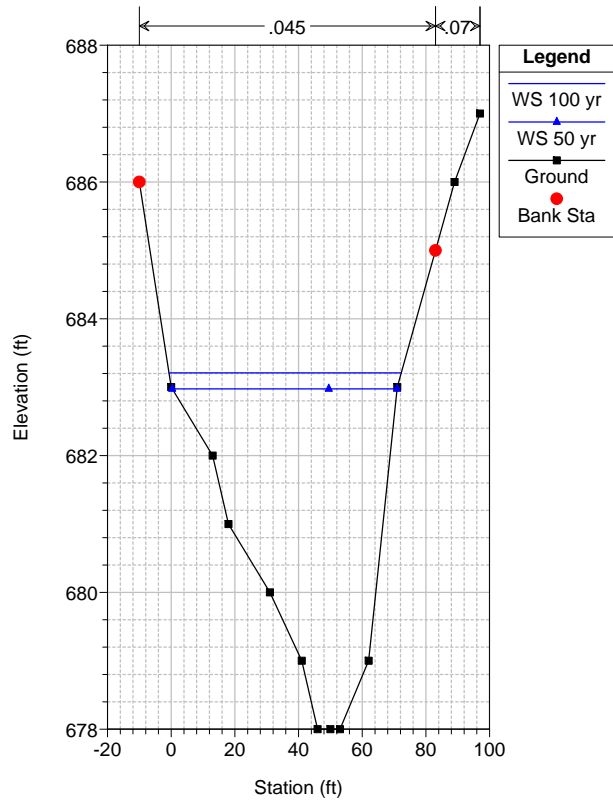
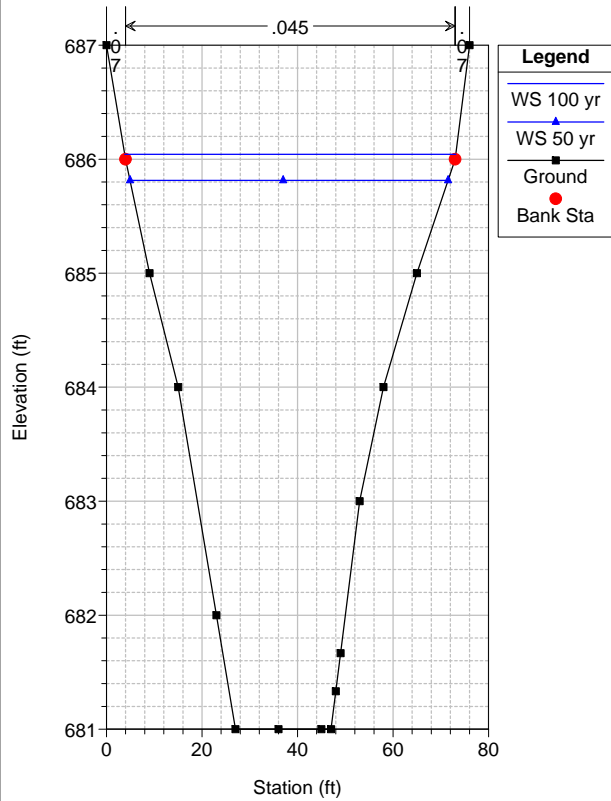
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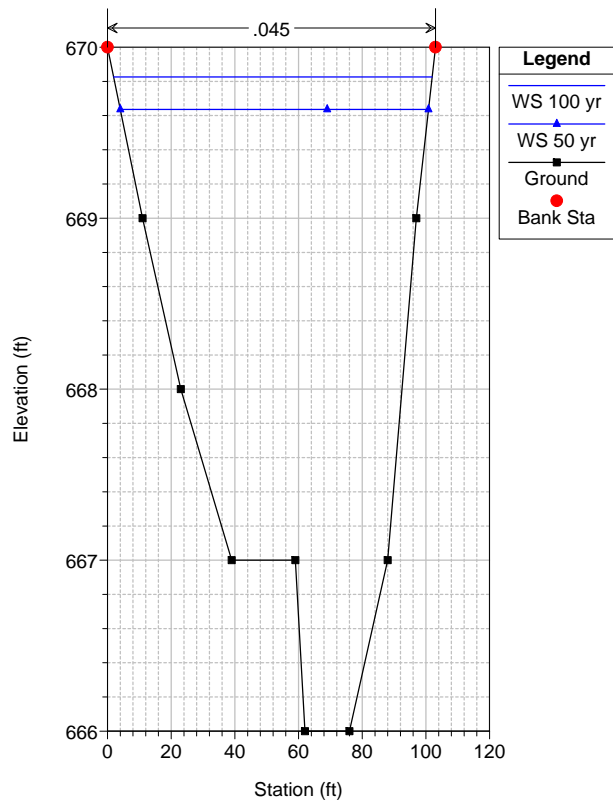
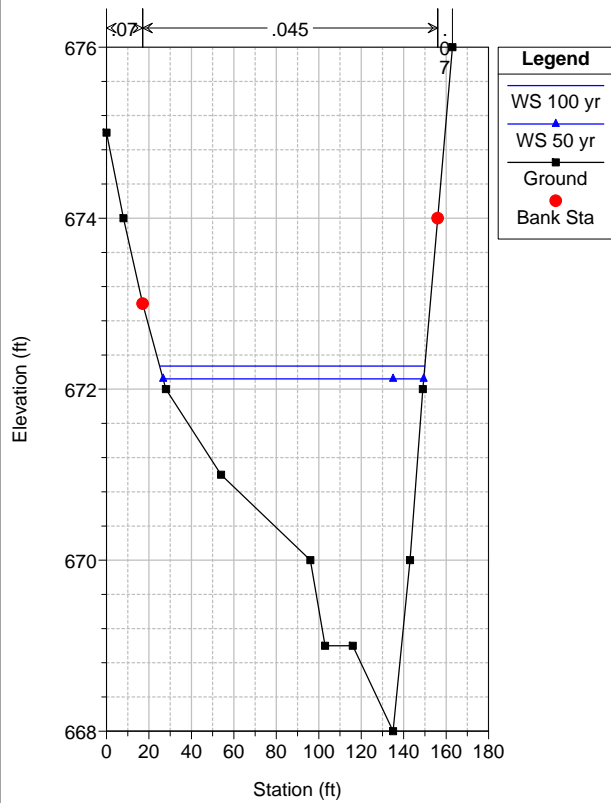
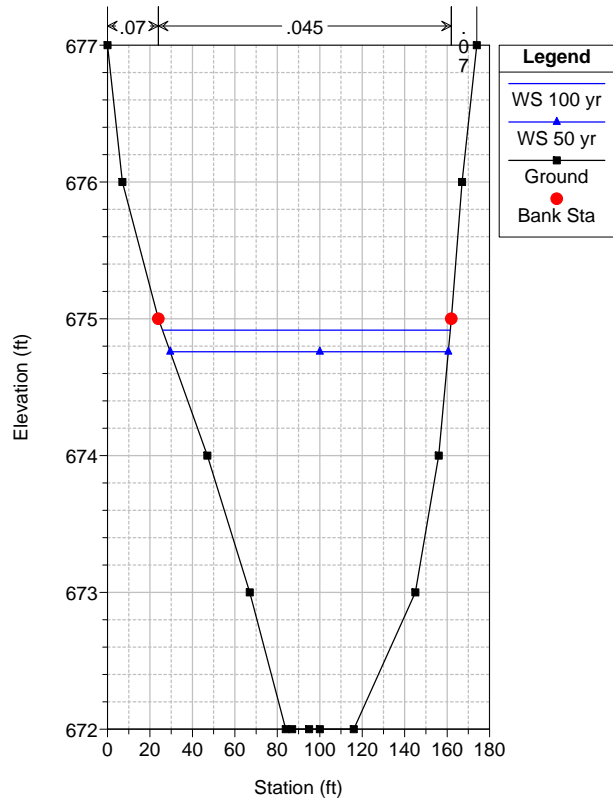
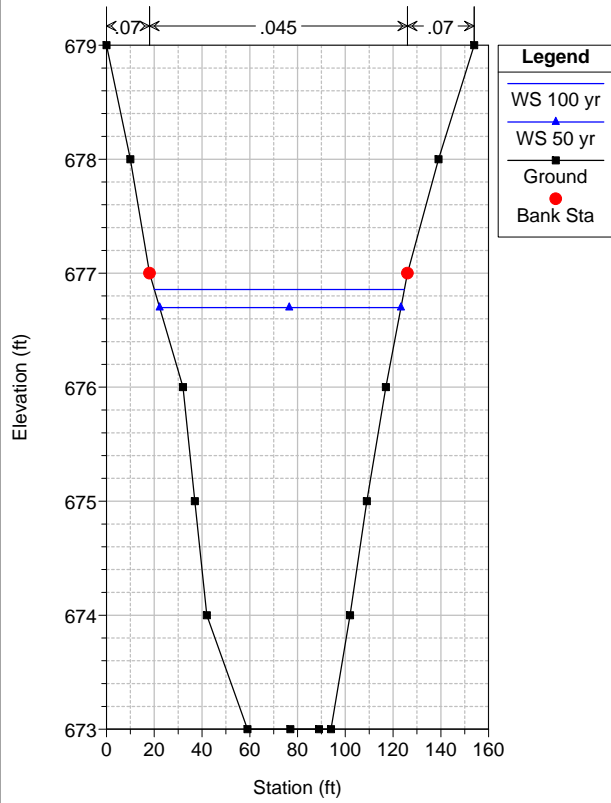


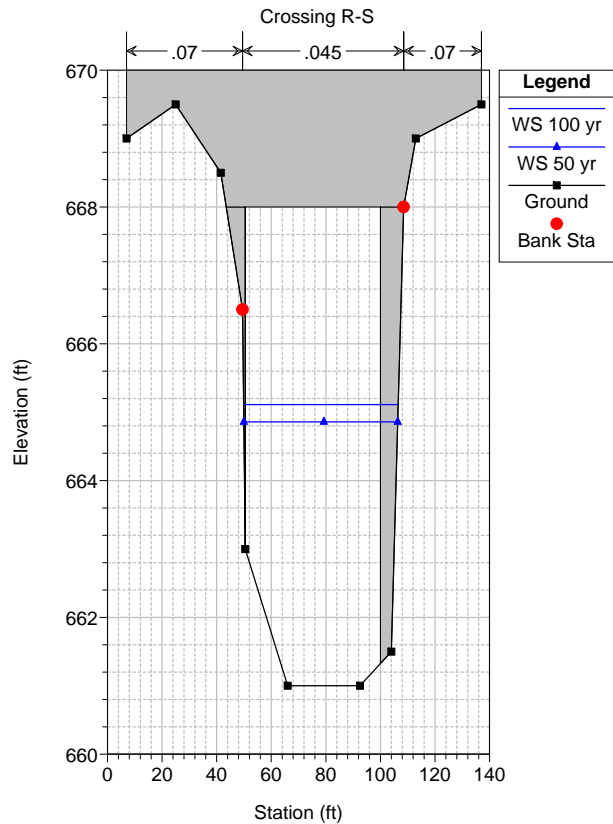
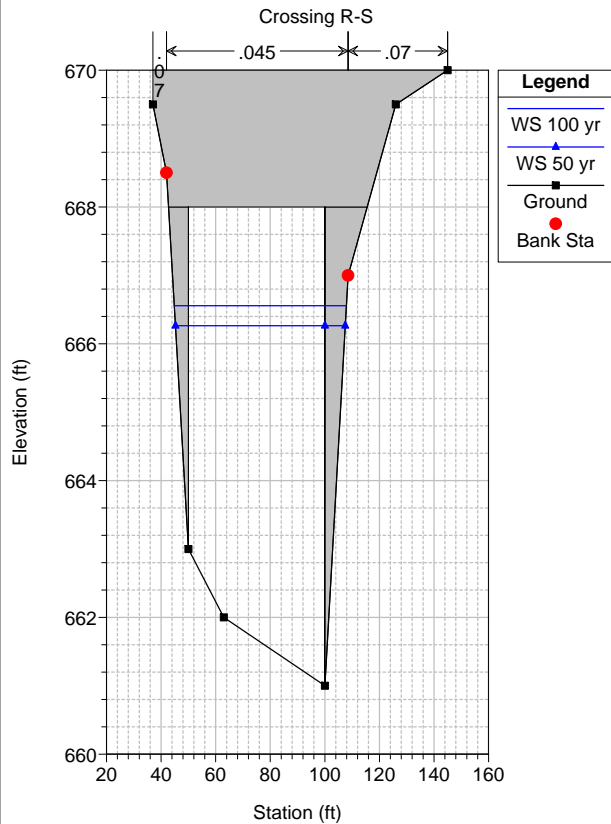
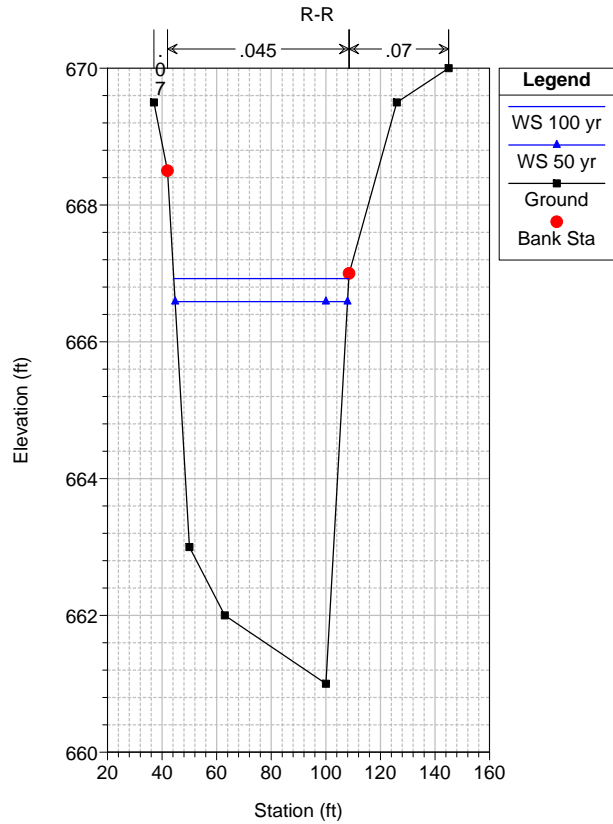
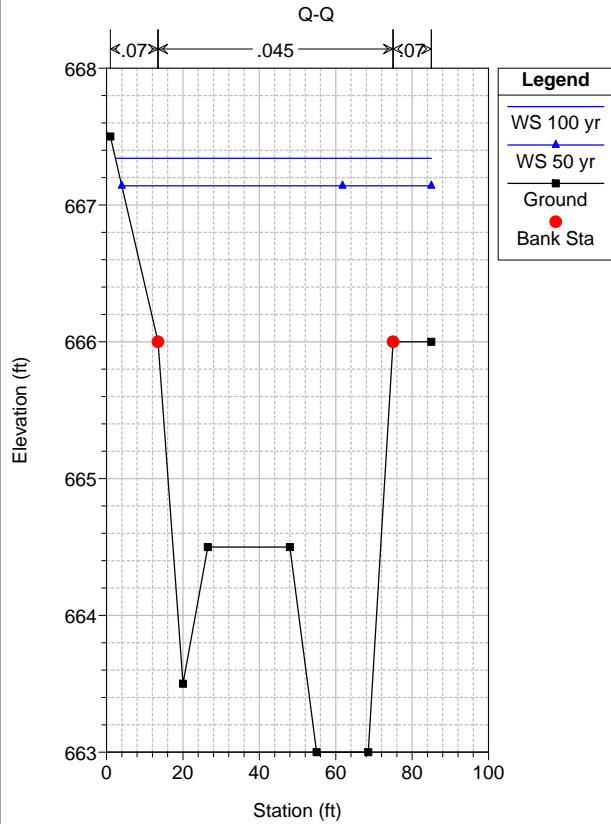
Crossing HWY 50

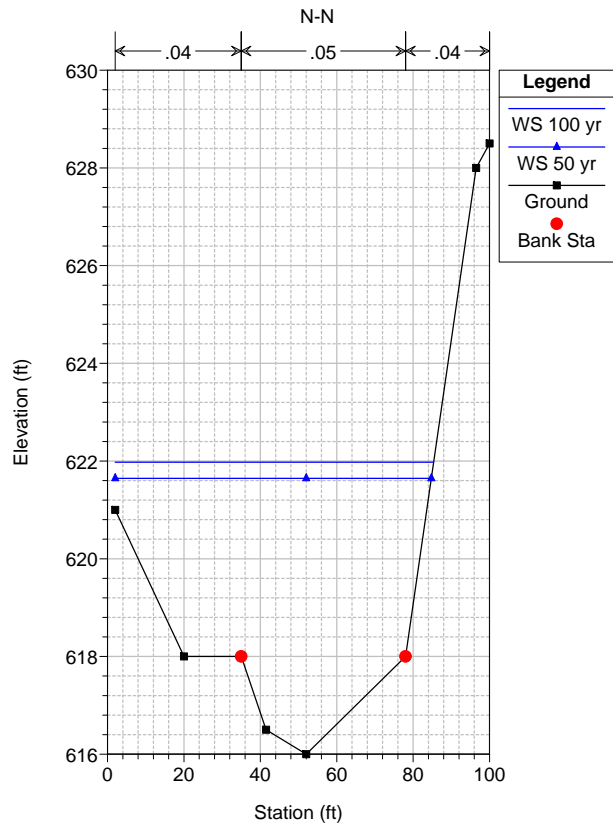
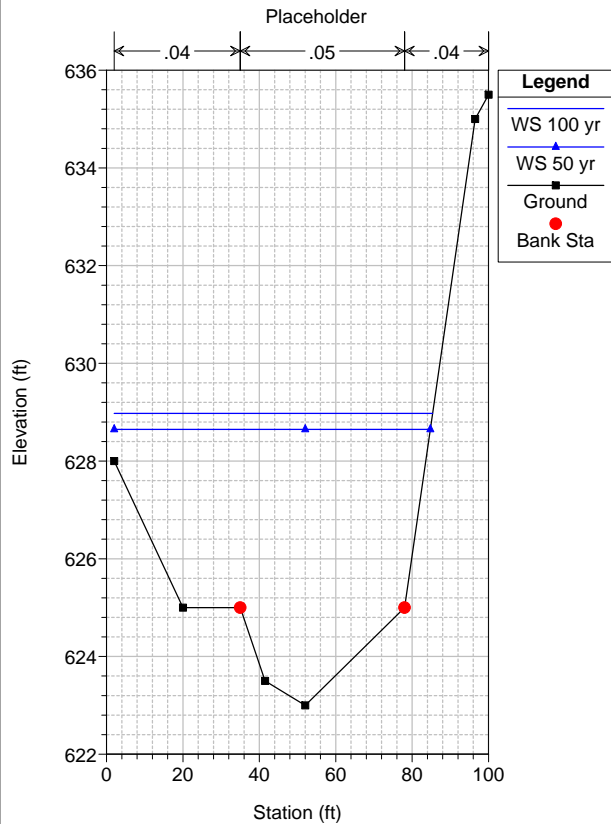
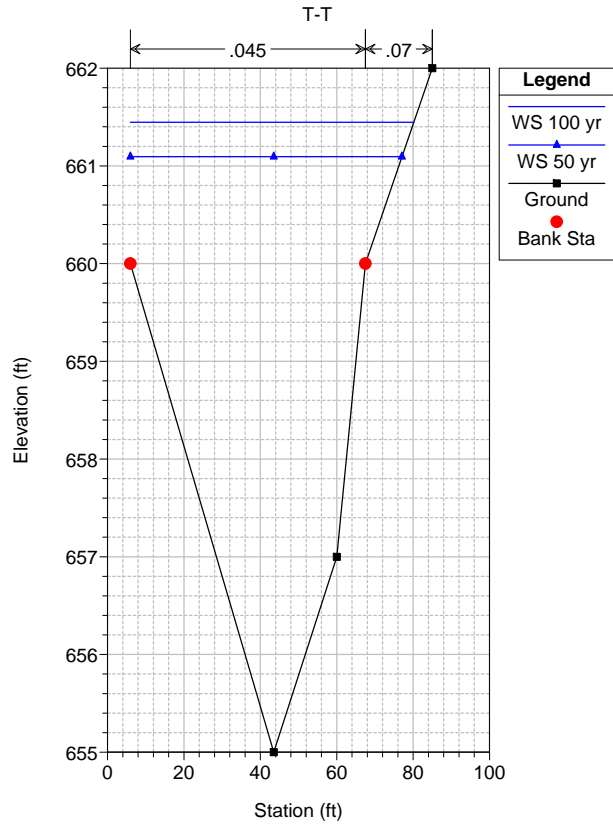
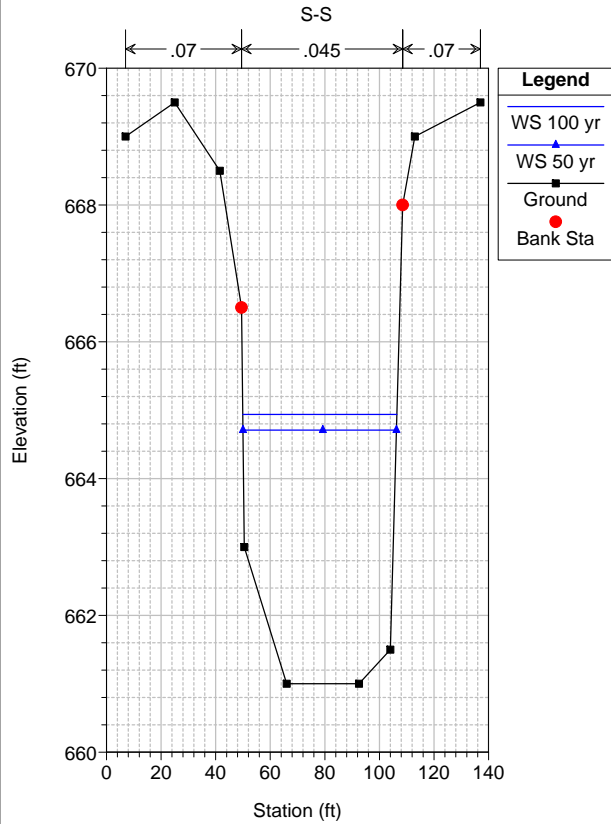


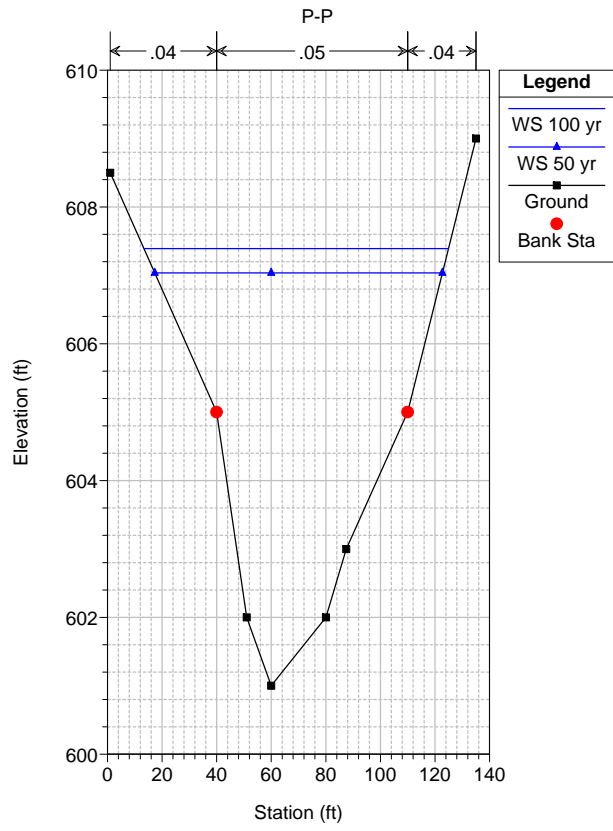
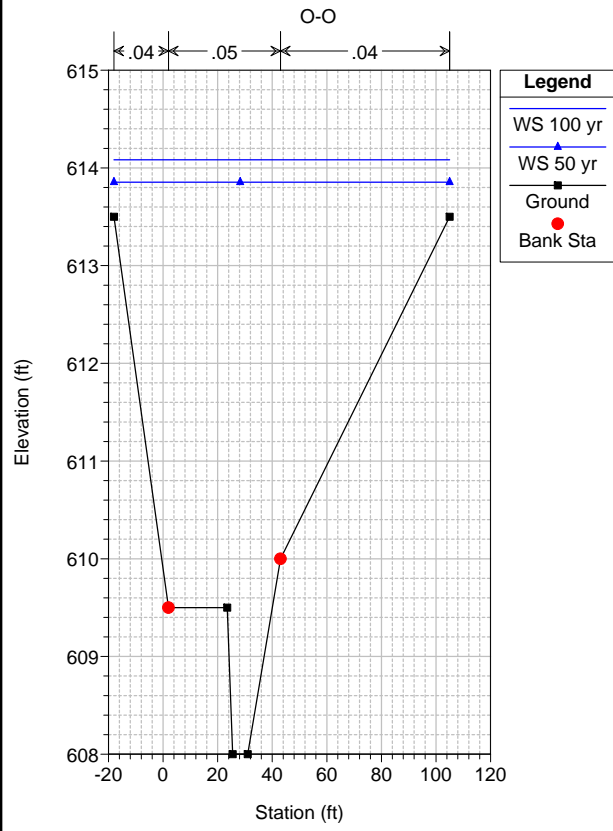










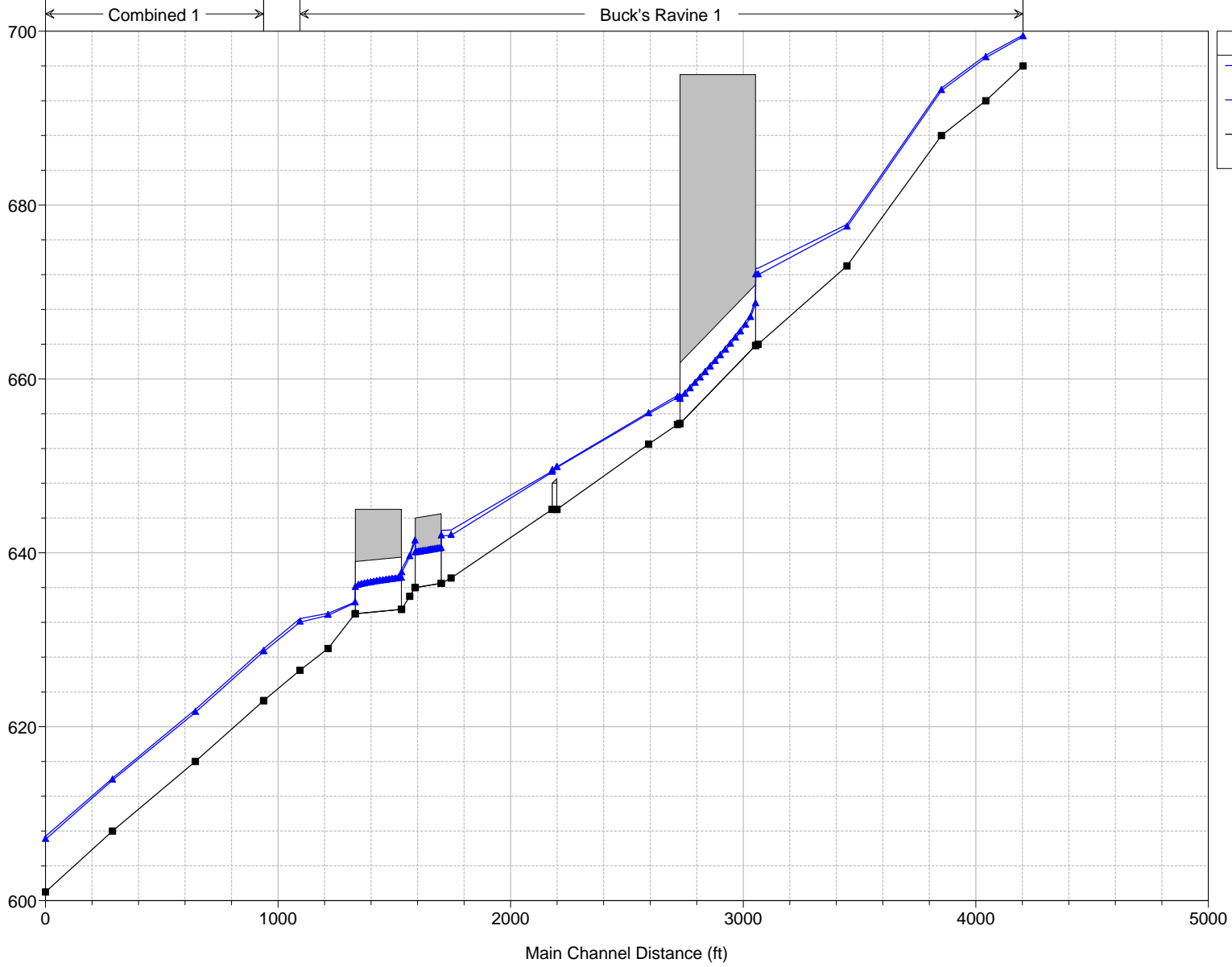


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**APPENDIX C – HEC-RAS OUTPUT (PROPOSED)**

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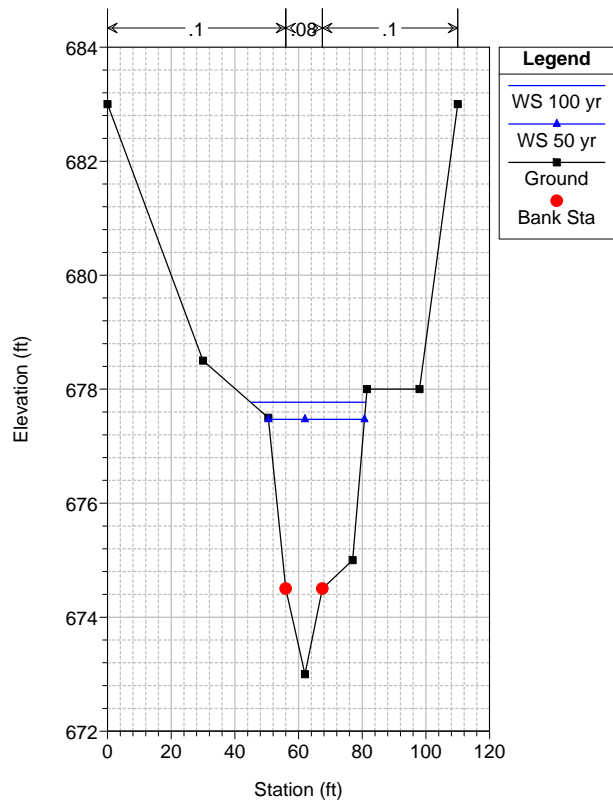
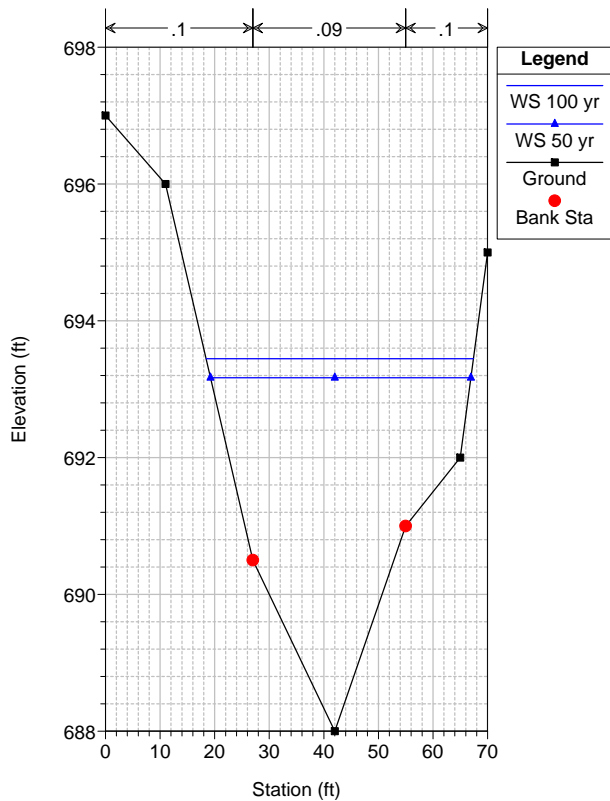
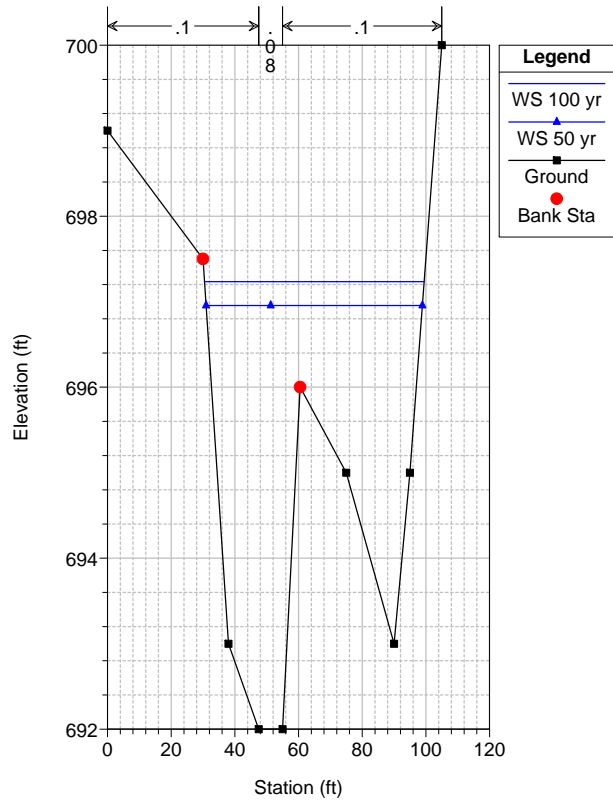
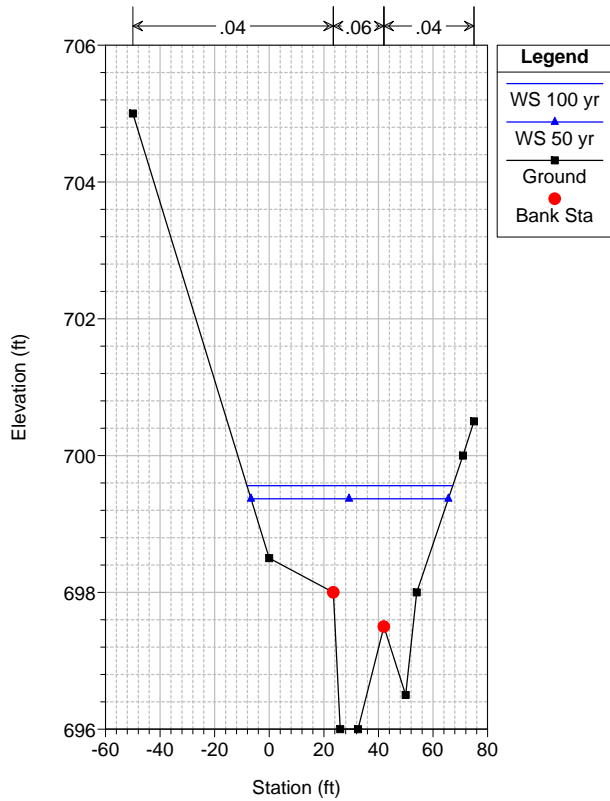
Silva Valley Interchange 2010 Plan: Proposed Interim Buck's 11/18/2010



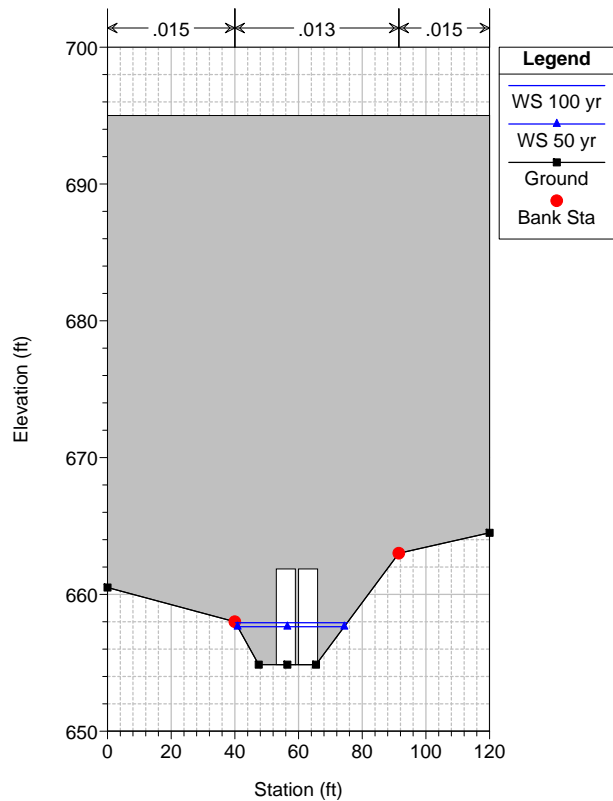
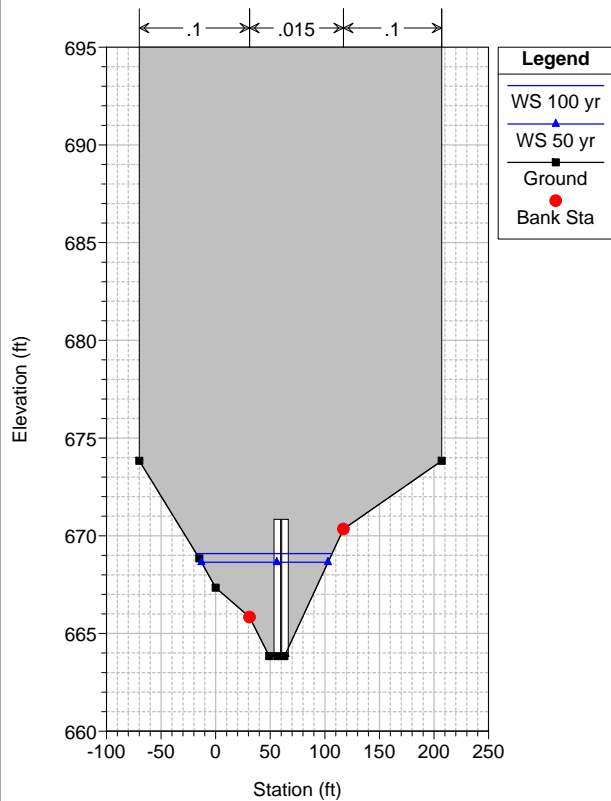
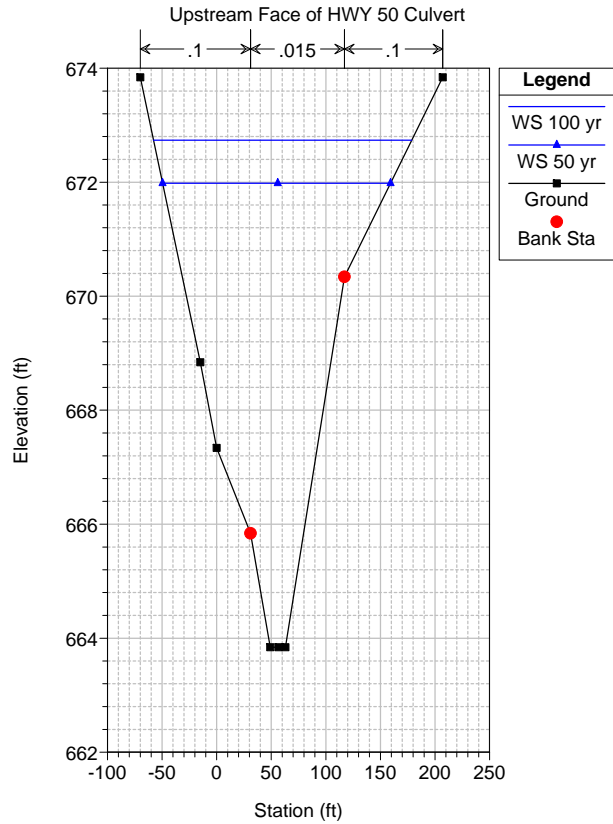
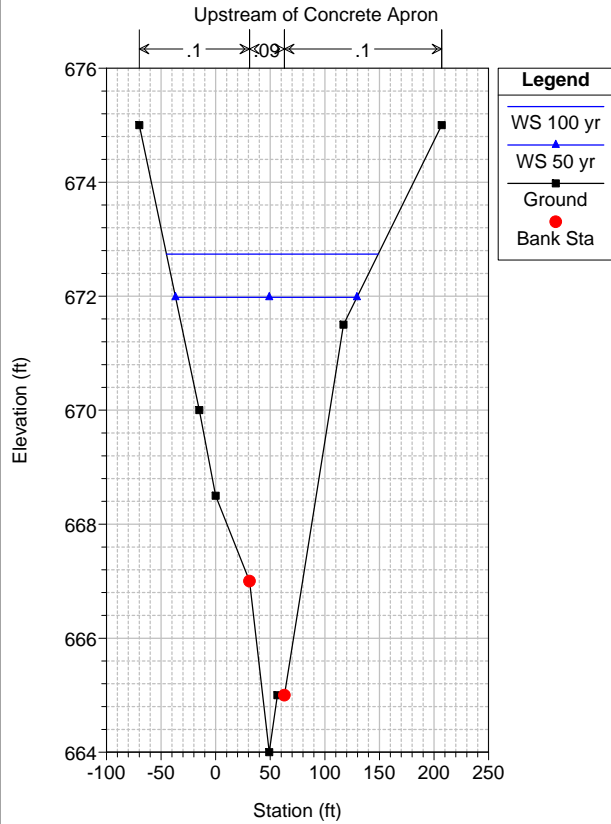
Legend	
WS 100 yr	Blue line with triangle markers
WS 50 yr	Blue line with triangle markers
Ground	Black line with square markers

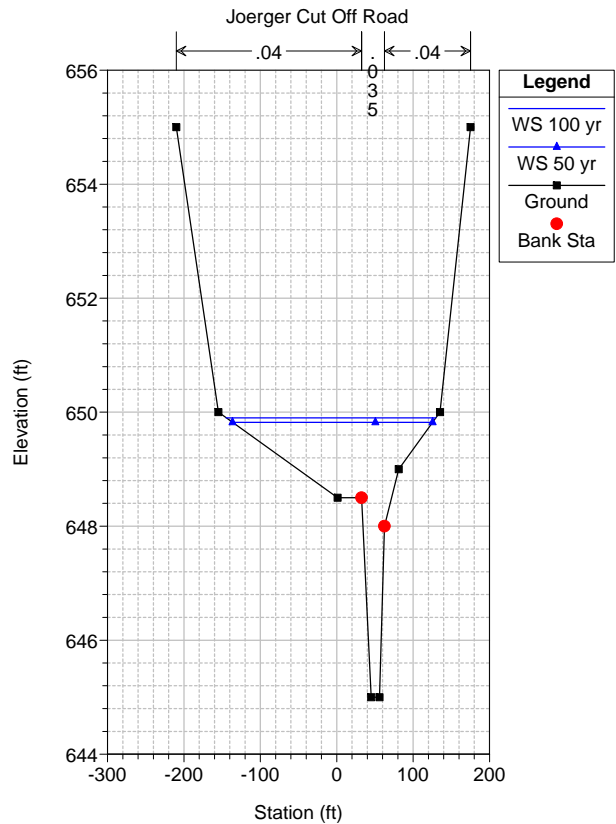
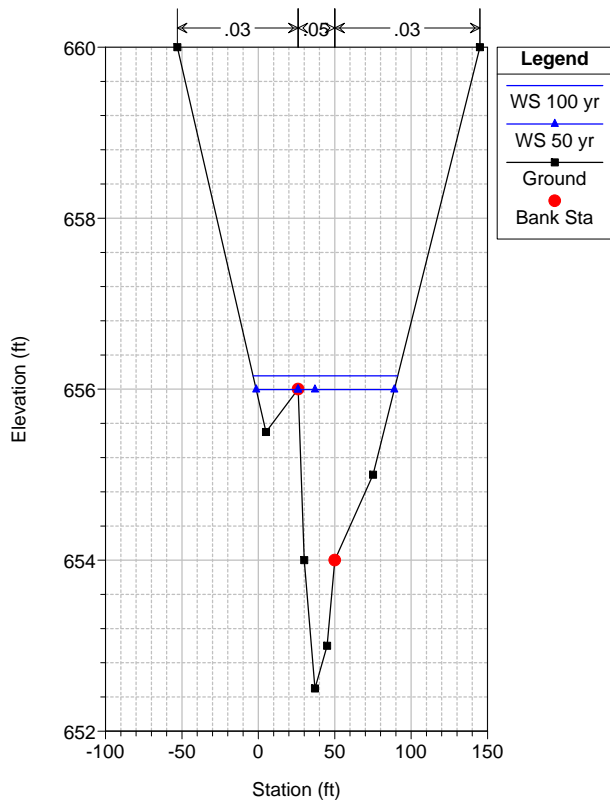
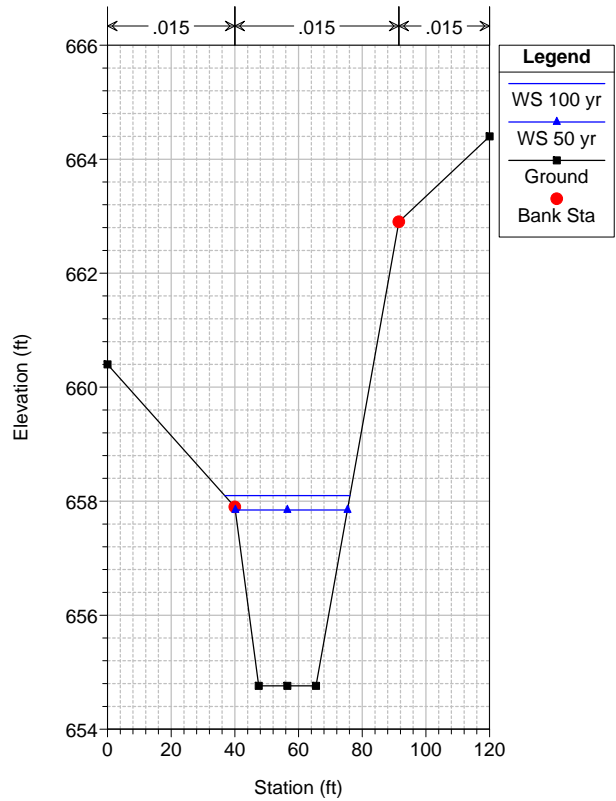
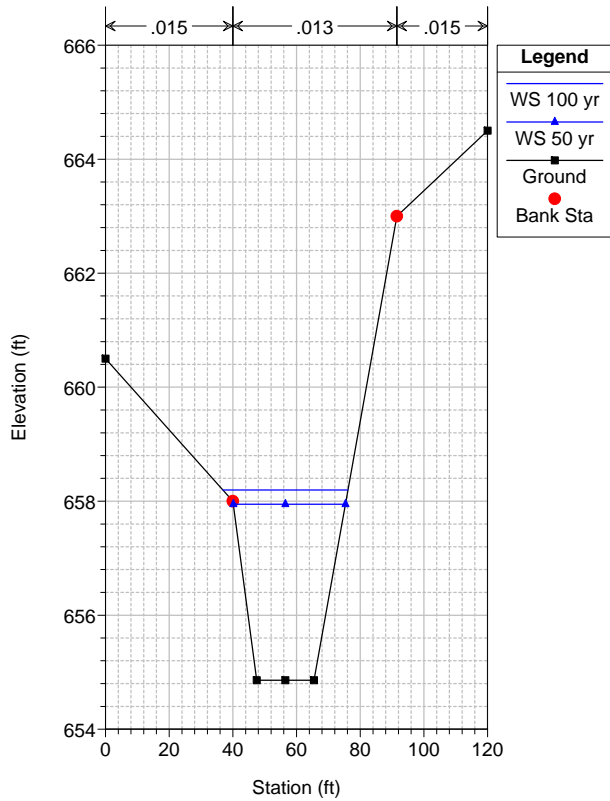
HEC-RAS Plan: Bucks Interim

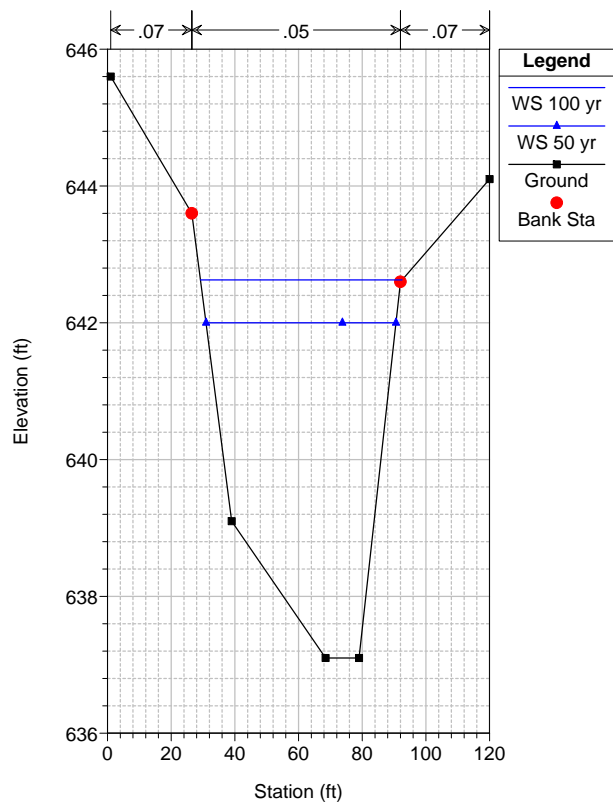
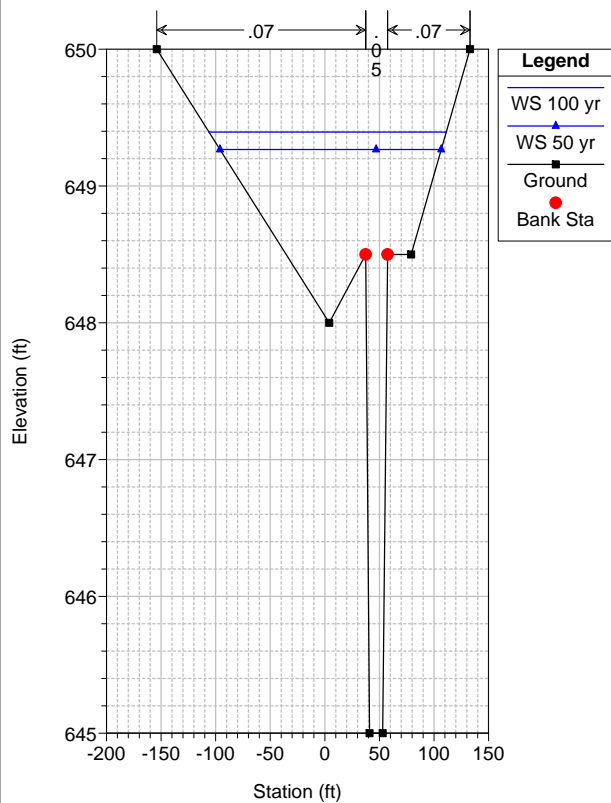
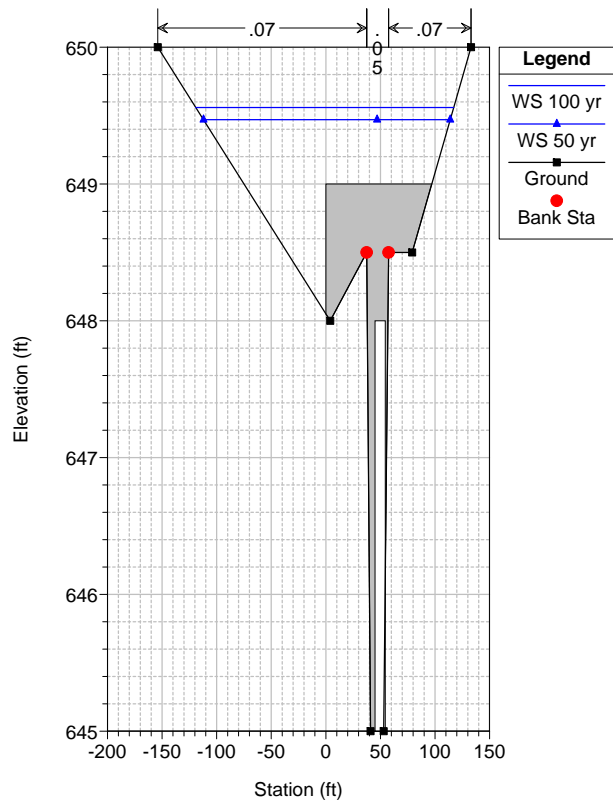
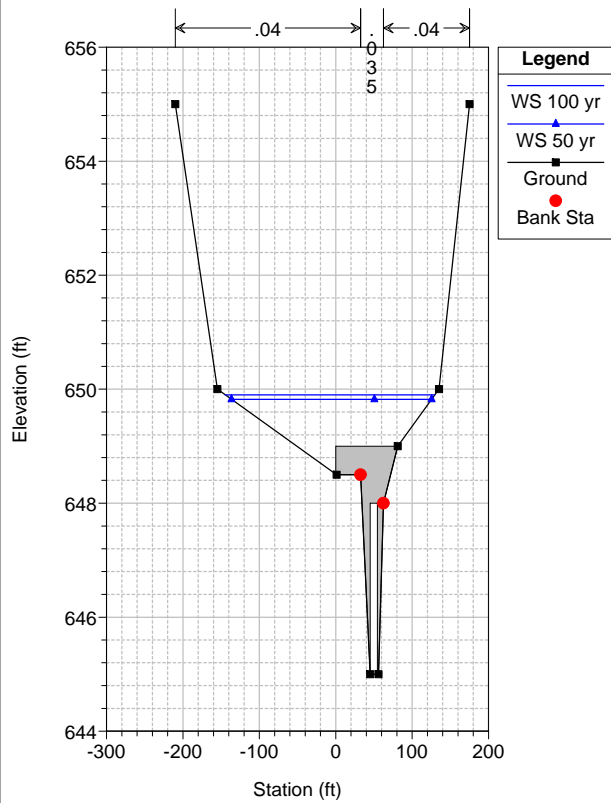
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Combined	1	-13.85	100 yr	3850.00	623.00	628.98	628.98	631.03	0.018525	11.97	339.04	83.36	0.93
Combined	1	-13.85	50 yr	3397.40	623.00	628.65	628.65	630.54	0.018800	11.54	311.73	82.75	0.93
Combined	1	-16.79	100 yr	3850.00	616.00	621.98	621.98	624.03	0.018525	11.97	339.04	83.36	0.93
Combined	1	-16.79	50 yr	3397.40	616.00	621.65	621.65	623.54	0.018800	11.54	311.73	82.75	0.93
Combined	1	-20.35	100 yr	3850.00	608.00	614.08	614.08	615.60	0.016124	10.87	400.01	123.00	0.86
Combined	1	-20.35	50 yr	3397.40	608.00	613.85	613.85	615.23	0.015779	10.42	371.75	123.00	0.84
Combined	1	-23.23	100 yr	3850.00	601.00	607.39	607.39	609.15	0.017611	10.95	376.34	111.59	0.89
Combined	1	-23.23	50 yr	3397.40	601.00	607.04	607.04	608.72	0.018503	10.65	337.97	105.44	0.90
Buck's Ravine	1	3109	100 yr	819.00	696.00	699.56	699.37	700.18	0.017239	6.63	131.43	75.42	0.67
Buck's Ravine	1	3109	50 yr	717.20	696.00	699.37	699.21	699.97	0.018253	6.53	117.29	72.32	0.68
Buck's Ravine	1	2949	100 yr	819.00	692.00	697.23		697.48	0.014359	4.40	212.77	69.00	0.39
Buck's Ravine	1	2949	50 yr	717.20	692.00	696.95		697.19	0.014526	4.27	193.65	67.94	0.39
Buck's Ravine	1	2758	100 yr	819.00	688.00	693.45		694.00	0.022761	6.28	148.08	48.98	0.55
Buck's Ravine	1	2758	50 yr	717.20	688.00	693.17		693.68	0.022848	6.00	134.63	47.71	0.54
Buck's Ravine	1	2352	100 yr	819.00	673.00	677.77	677.77	679.44	0.066273	11.83	91.23	36.23	1.04
Buck's Ravine	1	2352	50 yr	717.20	673.00	677.47	677.47	679.00	0.067061	11.30	81.29	30.15	1.03
Buck's Ravine	1	1970	100 yr	819.00	664.00	672.74		672.76	0.000672	1.64	752.79	193.99	0.10
Buck's Ravine	1	1970	50 yr	717.20	664.00	671.98		672.01	0.000819	1.69	616.32	166.16	0.11
Buck's Ravine	1	1960	100 yr	819.00	663.84	672.74	666.65	672.76	0.000015	1.34	989.56	236.54	0.09
Buck's Ravine	1	1960	50 yr	717.20	663.84	671.98	666.47	672.01	0.000017	1.33	821.26	208.79	0.10
Buck's Ravine	1	1948		Culvert									
Buck's Ravine	1	1633	100 yr	819.00	654.86	658.20	658.20	659.45	0.001883	8.99	91.35	39.28	1.00
Buck's Ravine	1	1633	50 yr	717.20	654.86	657.95	657.95	659.13	0.001964	8.73	82.17	35.23	1.01
Buck's Ravine	1	1623	100 yr	819.00	654.76	658.10	658.10	659.35	0.002498	8.98	91.46	39.33	1.00
Buck's Ravine	1	1623	50 yr	717.20	654.76	657.85	657.85	659.03	0.002615	8.73	82.16	35.23	1.01
Buck's Ravine	1	1499	100 yr	819.00	652.50	656.16	656.16	656.84	0.014073	6.75	127.51	94.63	0.72
Buck's Ravine	1	1499	50 yr	717.20	652.50	656.00	656.00	656.66	0.014832	6.65	112.69	90.11	0.73
Buck's Ravine	1	1105	100 yr	819.00	645.00	649.90	649.31	650.13	0.002085	4.64	309.56	274.43	0.42
Buck's Ravine	1	1105	50 yr	717.20	645.00	649.82	649.10	650.02	0.001835	4.30	288.22	261.85	0.39
Buck's Ravine	1	1104		Culvert									
Buck's Ravine	1	1084	100 yr	819.00	645.00	649.39	649.39	649.93	0.012044	7.17	222.71	217.39	0.66
Buck's Ravine	1	1084	50 yr	717.20	645.00	649.27	649.27	649.79	0.011745	6.92	195.87	202.69	0.65
Buck's Ravine	1	650	100 yr	819.00	637.10	642.63		642.80	0.002139	3.34	245.03	63.32	0.30
Buck's Ravine	1	650	50 yr	717.20	637.10	642.00		642.19	0.002695	3.47	206.59	59.64	0.33
Buck's Ravine	1	608	100 yr	819.00	636.50	642.59	639.47	642.72	0.001406	2.92	283.63	75.27	0.25
Buck's Ravine	1	608	50 yr	717.20	636.50	641.94	639.27	642.08	0.001749	2.99	239.77	62.43	0.27
Buck's Ravine	1	607		Culvert									
Buck's Ravine	1	495	100 yr	819.00	636.00	641.78		641.82	0.000035	1.70	480.66	93.29	0.13
Buck's Ravine	1	495	50 yr	717.20	636.00	641.36		641.40	0.000035	1.62	442.34	92.19	0.13
Buck's Ravine	1	472	100 yr	819.00	635.00	639.84	639.84	641.37	0.007509	9.94	82.43	27.38	1.01
Buck's Ravine	1	472	50 yr	717.20	635.00	639.56	639.56	640.98	0.007650	9.59	74.79	26.75	1.01
Buck's Ravine	1	437	100 yr	819.00	633.50	638.13	636.93	638.92	0.002117	7.13	114.83	68.59	0.61
Buck's Ravine	1	437	50 yr	717.20	633.50	637.71	636.68	638.46	0.002281	6.92	103.70	61.86	0.62
Buck's Ravine	1	436		Culvert									
Buck's Ravine	1	237	100 yr	819.00	633.00	634.34	634.34	634.81	0.003349	5.49	150.84	169.49	1.00
Buck's Ravine	1	237	50 yr	717.20	633.00	634.26	634.26	634.69	0.003521	5.28	136.66	166.95	1.01
Buck's Ravine	1	121	100 yr	819.00	629.00	633.04	633.04	633.87	0.010200	8.00	130.99	84.79	0.79
Buck's Ravine	1	121	50 yr	717.20	629.00	632.81	632.81	633.65	0.011124	7.94	112.18	76.08	0.82
Buck's Ravine	1	0	100 yr	819.00	626.50	632.44		632.56	0.001383	3.16	305.42	107.59	0.25
Buck's Ravine	1	0	50 yr	717.20	626.50	632.04		632.17	0.001608	3.22	263.45	102.05	0.27

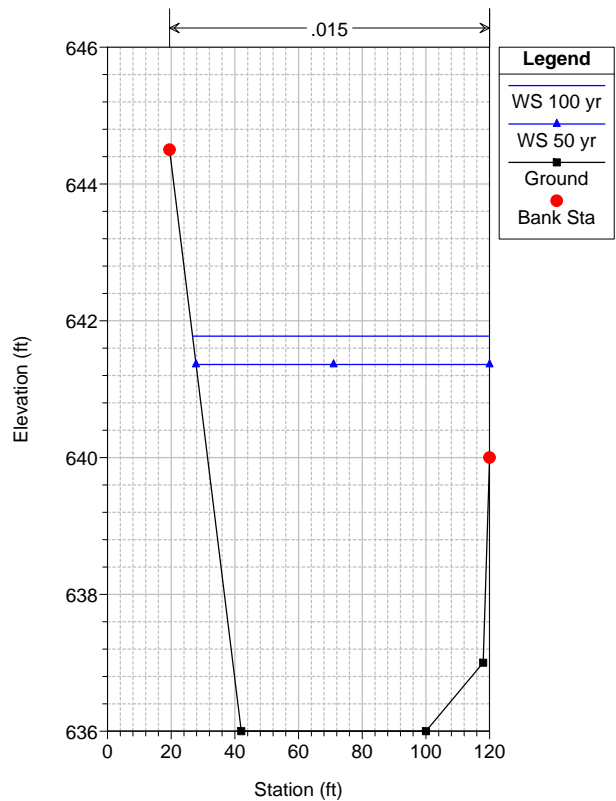
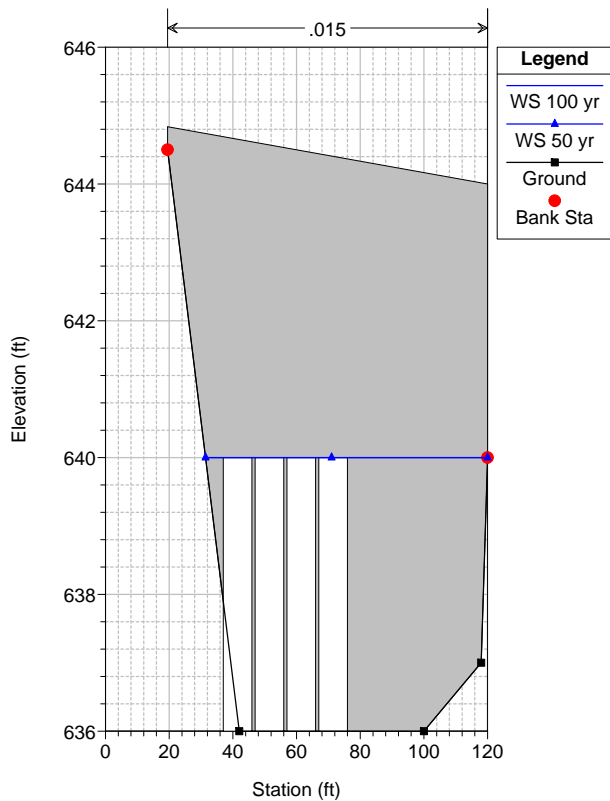
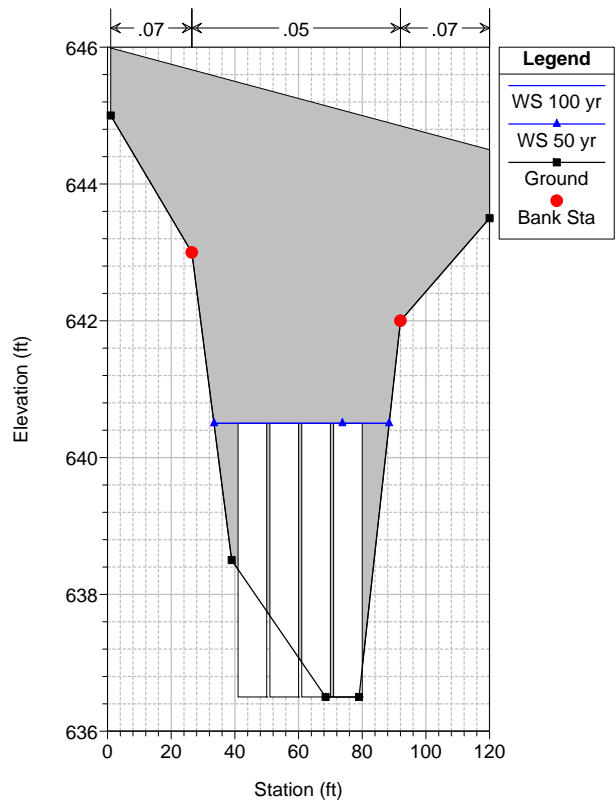
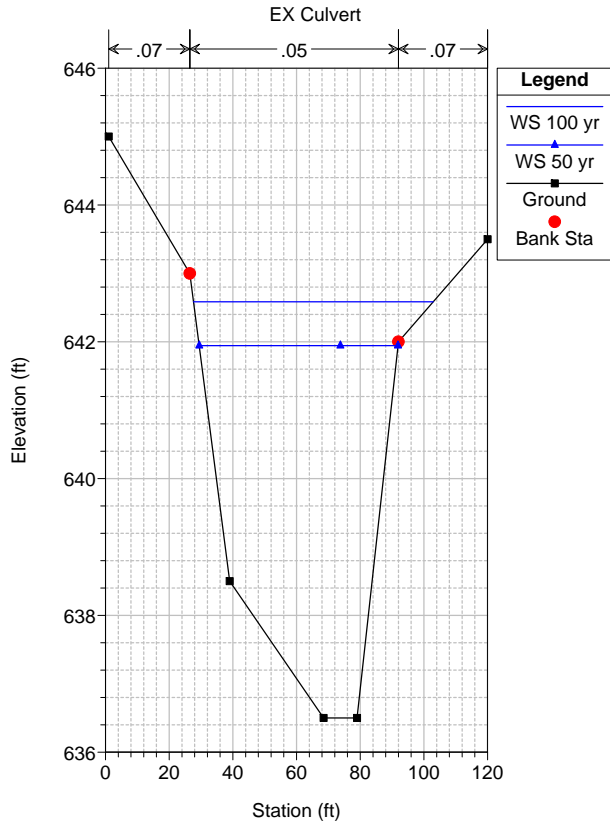


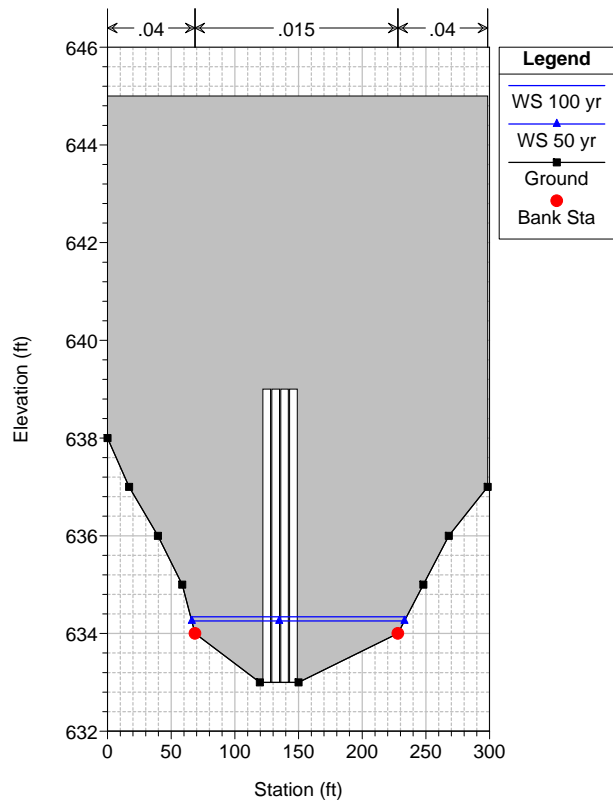
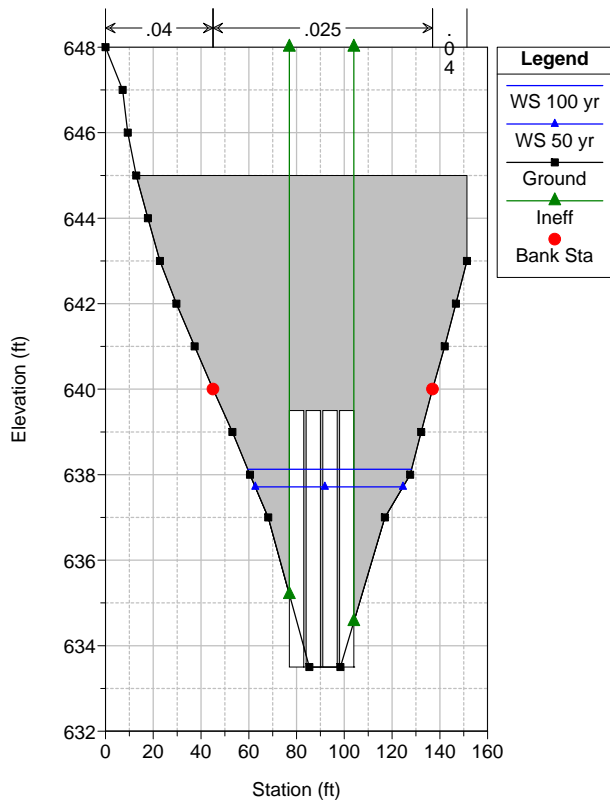
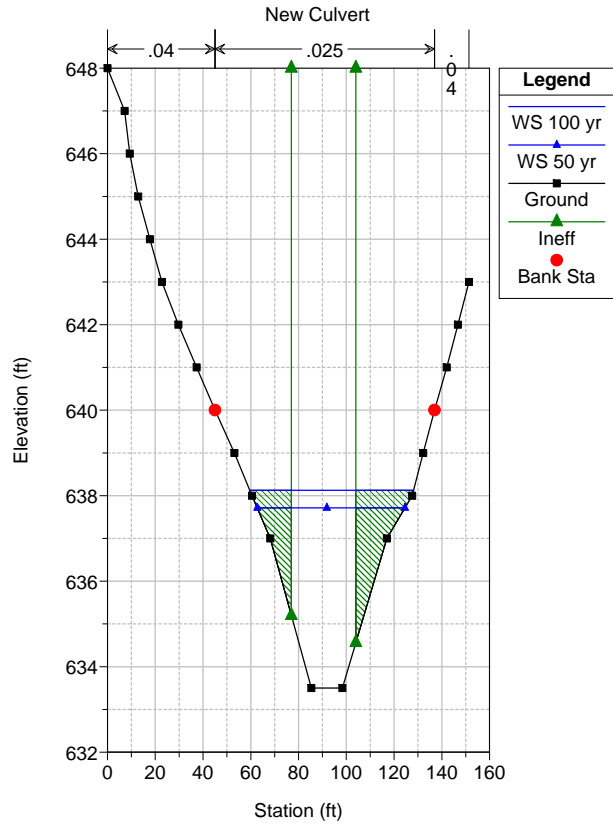
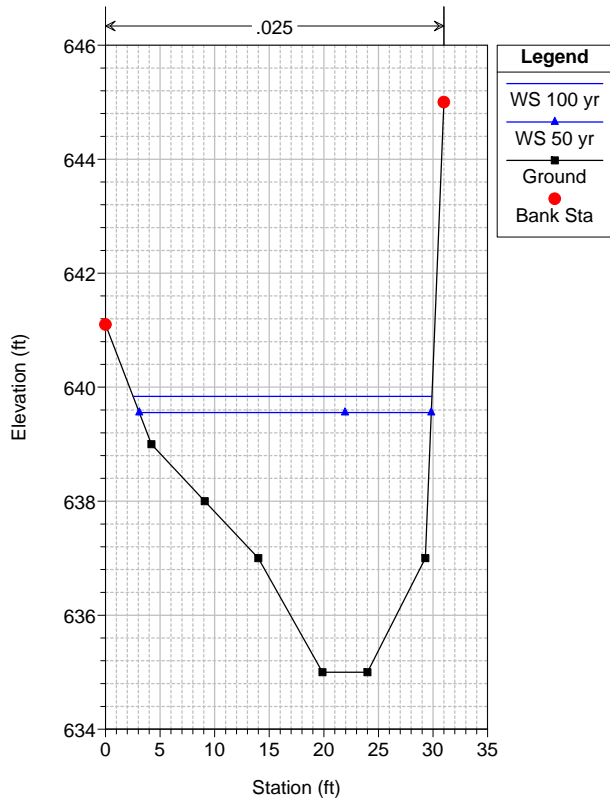


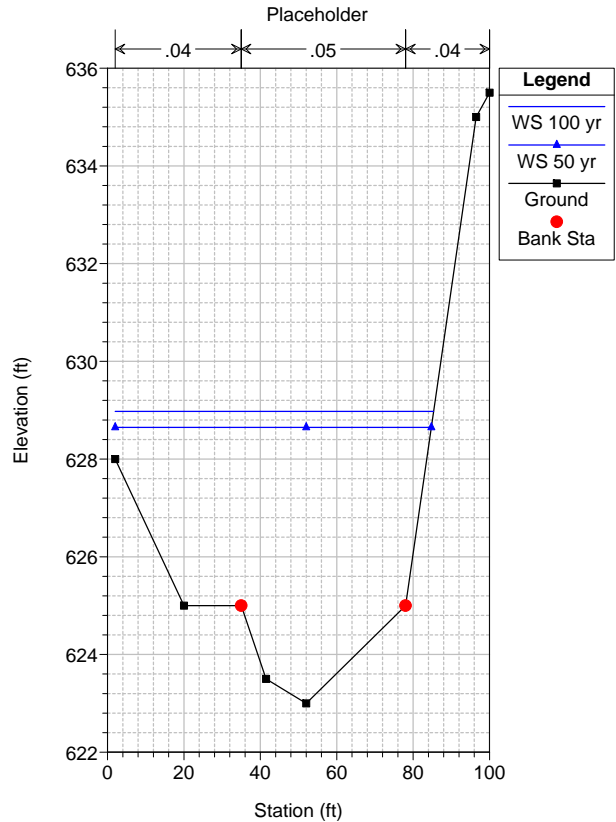
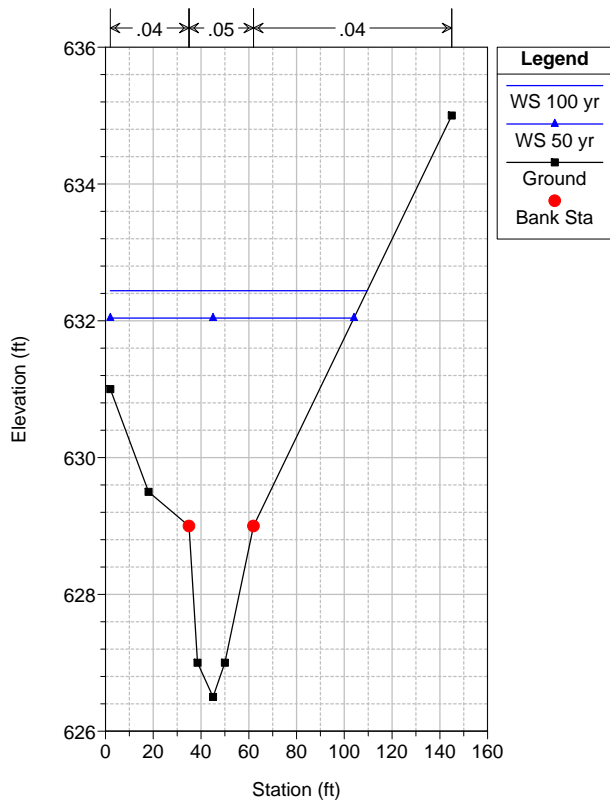
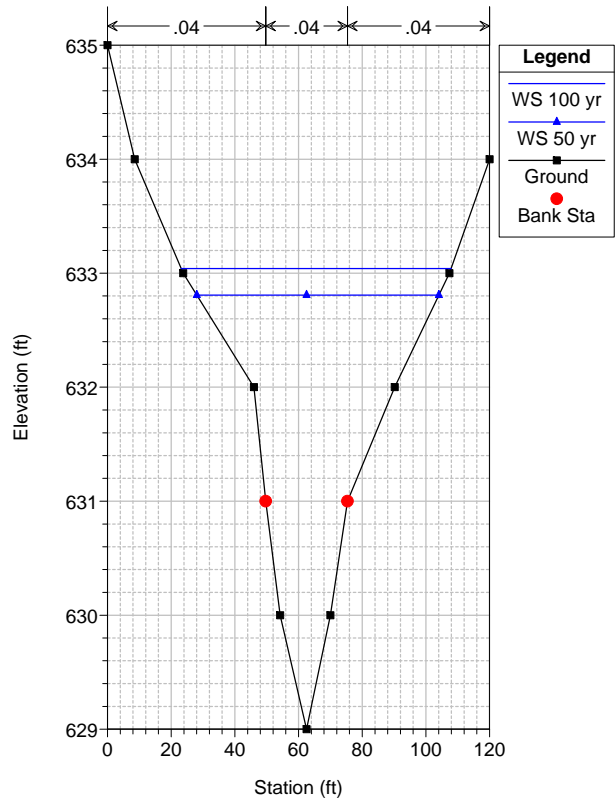
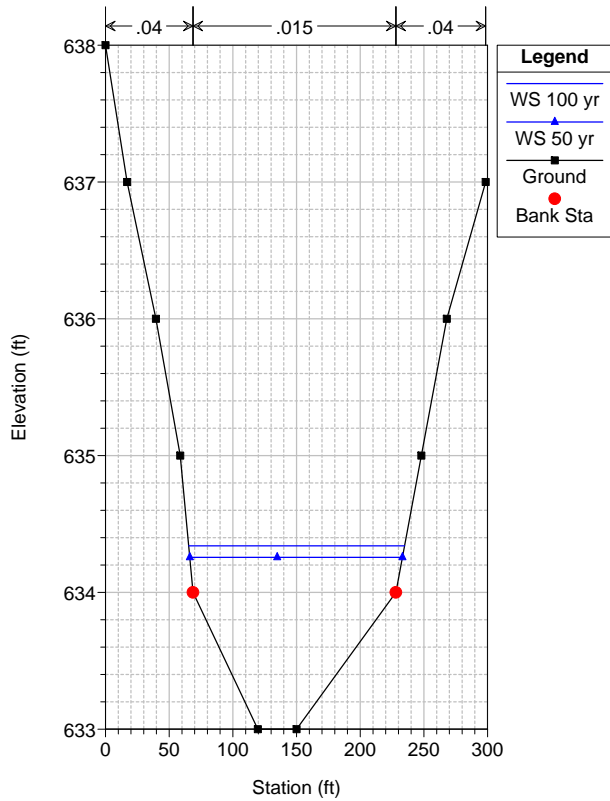


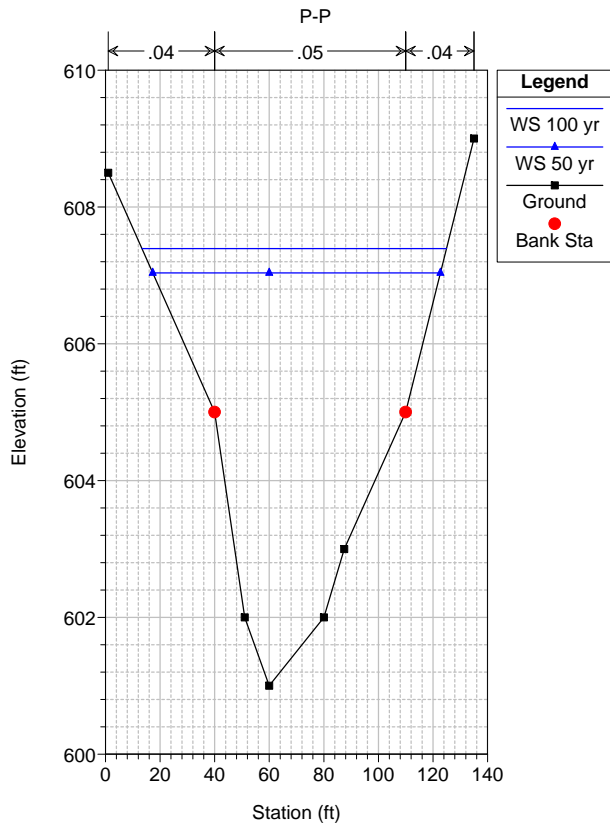
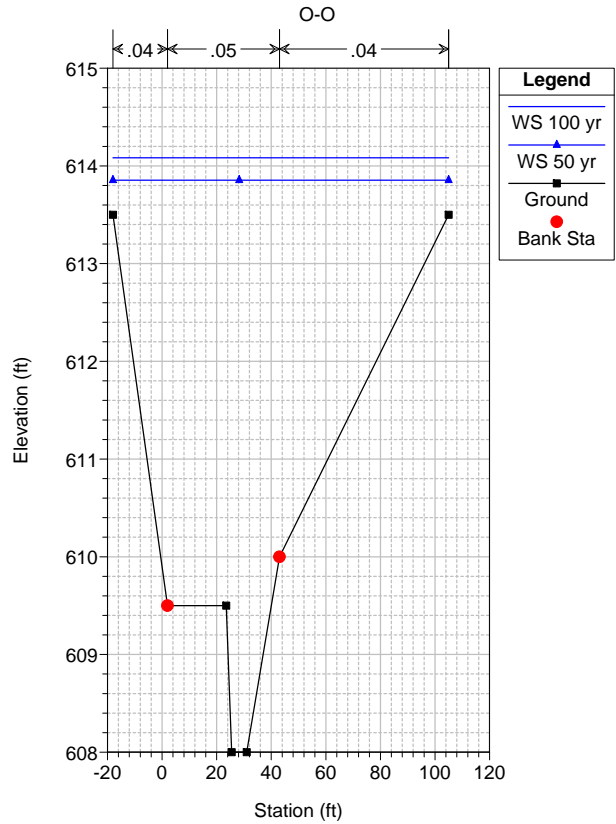
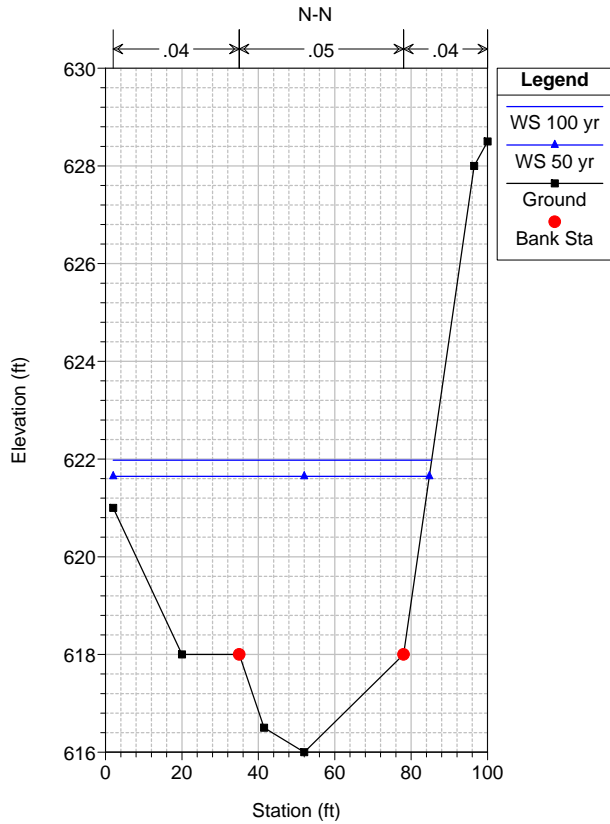




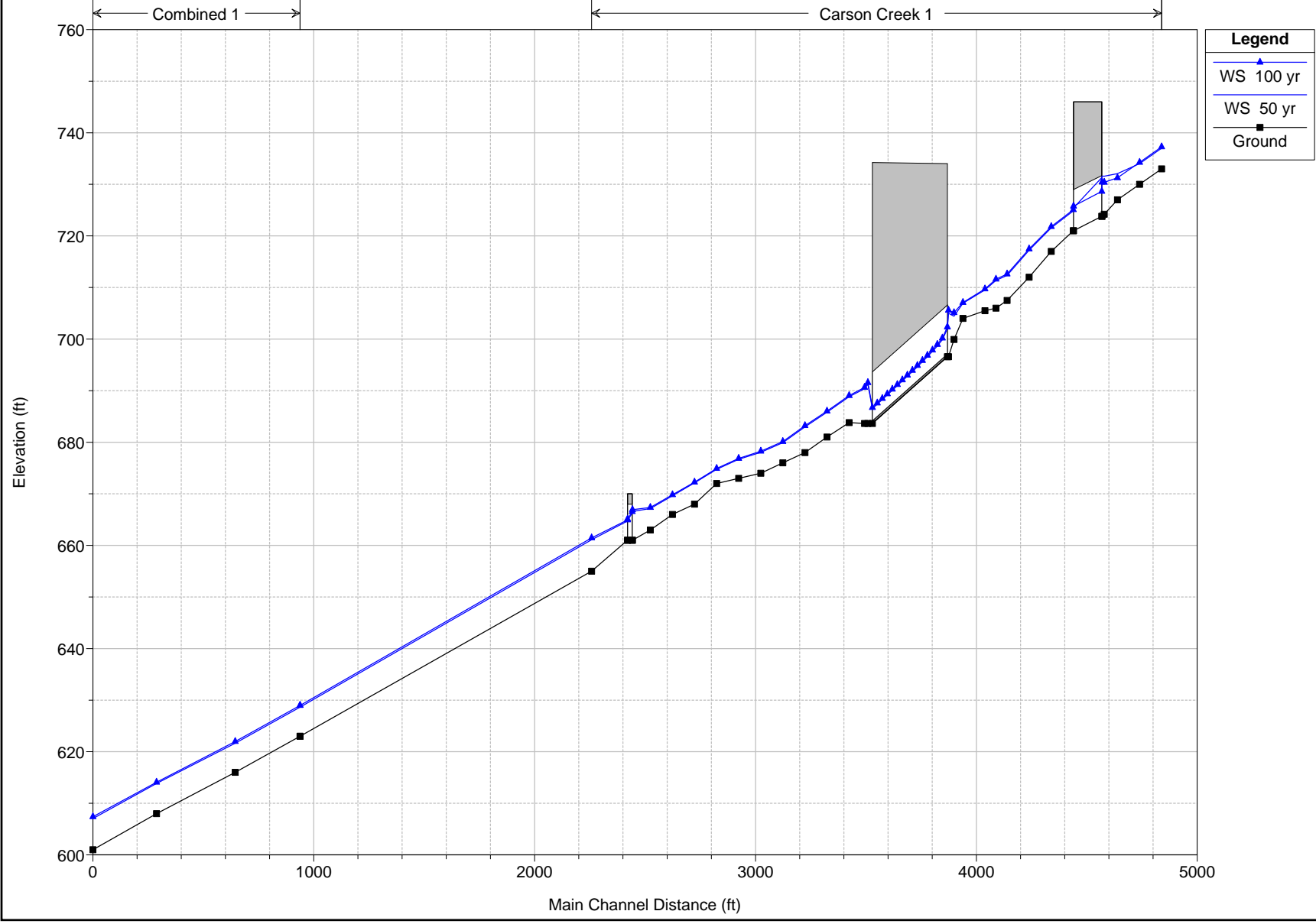






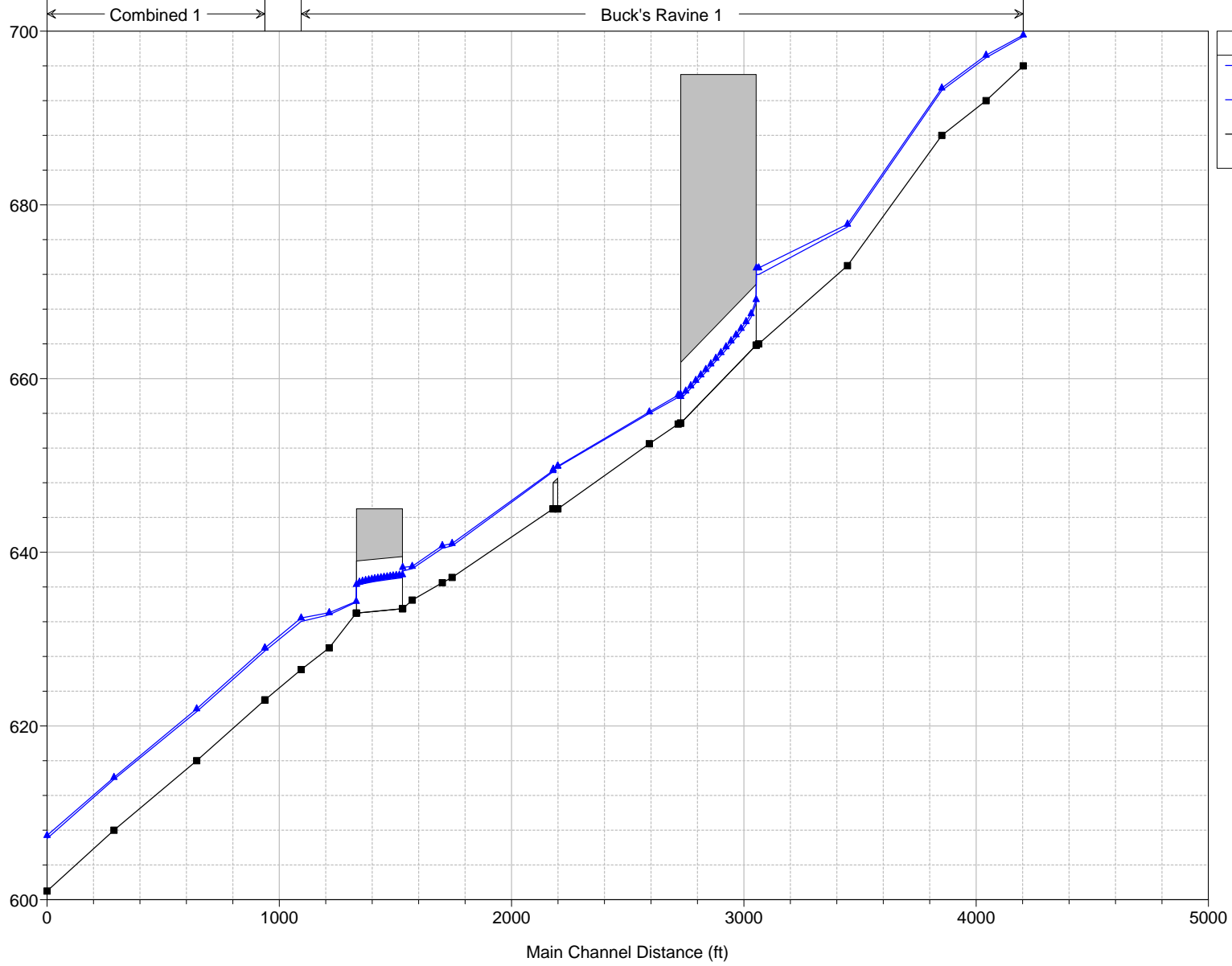


Silva Valley Interchange 2010 Plan: Proposed Final Conditions 11/18/2010





Silva Valley Interchange 2010 Plan: Proposed Final Conditions 11/18/2010



Legend	
WS 100 yr	Blue line with triangle markers
WS 50 yr	Blue line with triangle markers
Ground	Black line with square markers

HEC-RAS Plan: Final Conditions

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Combined	1	-13.85	100 yr	3850.00	623.00	628.98	628.98	631.03	0.018525	11.97	339.04	83.36	0.93
Combined	1	-13.85	50 yr	3397.40	623.00	628.65	628.65	630.54	0.018800	11.54	311.73	82.75	0.93
Combined	1	-16.79	100 yr	3850.00	616.00	621.98	621.98	624.03	0.018525	11.97	339.04	83.36	0.93
Combined	1	-16.79	50 yr	3397.40	616.00	621.65	621.65	623.54	0.018800	11.54	311.73	82.75	0.93
Combined	1	-20.35	100 yr	3850.00	608.00	614.08	614.08	615.60	0.016124	10.87	400.01	123.00	0.86
Combined	1	-20.35	50 yr	3397.40	608.00	613.85	613.85	615.23	0.015779	10.42	371.75	123.00	0.84
Combined	1	-23.23	100 yr	3850.00	601.00	607.39	607.39	609.15	0.017611	10.95	376.34	111.59	0.89
Combined	1	-23.23	50 yr	3397.40	601.00	607.04	607.04	608.72	0.018503	10.65	337.97	105.44	0.90
Carson Creek	1	25.00	100 yr	2059.90	733.00	737.26	737.26	738.64	0.027354	9.74	229.99	88.34	0.93
Carson Creek	1	25.00	50 yr	1853.40	733.00	737.01	737.01	738.36	0.028875	9.55	209.06	84.21	0.95
Carson Creek	1	24.00	100 yr	2059.90	730.00	734.26	734.26	735.64	0.027354	9.74	229.99	88.34	0.93
Carson Creek	1	24.00	50 yr	1853.40	730.00	734.01	734.01	735.36	0.028875	9.55	209.06	84.21	0.95
Carson Creek	1	23.00	100 yr	2059.90	727.00	731.27	731.26	732.64	0.027064	9.71	230.87	88.51	0.93
Carson Creek	1	23.00	50 yr	1853.40	727.00	732.08		732.73	0.009916	6.75	308.86	102.48	0.58
Carson Creek	1	22.40	100 yr	2059.90	724.20	730.38	728.99	731.76	0.009136	9.44	218.20	130.35	0.68
Carson Creek	1	22.40	50 yr	1853.40	724.20	731.57	728.66	732.35	0.004066	7.10	261.09	150.05	0.46
Carson Creek	1	22.30	100 yr	2059.90	723.80	730.44	728.59	731.64	0.004594	8.78	234.59	137.77	0.61
Carson Creek	1	22.30	50 yr	1853.40	723.80	731.60	728.28	732.30	0.002159	6.71	276.15	157.67	0.43
Carson Creek	1	22.24		Bridge									
Carson Creek	1	21.00	100 yr	2059.90	721.00	725.07	725.07	726.47	0.013251	9.83	235.44	89.78	0.92
Carson Creek	1	21.00	50 yr	1853.40	721.00	724.84	724.84	726.19	0.013689	9.59	214.81	86.90	0.92
Carson Creek	1	20.00	100 yr	2059.90	717.00	721.81	721.81	723.25	0.013338	10.41	242.04	88.35	0.88
Carson Creek	1	20.00	50 yr	1853.40	717.00	721.57	721.57	722.95	0.013579	10.12	221.21	84.99	0.88
Carson Creek	1	19.00	100 yr	2059.90	712.00	717.47	717.47	718.97	0.011926	11.51	248.02	84.19	0.89
Carson Creek	1	19.00	50 yr	1853.40	712.00	717.22	717.22	718.66	0.012028	11.19	227.61	81.02	0.89
Carson Creek	1	18.00	100 yr	2059.90	707.50	712.62	712.62	714.49	0.016915	11.53	208.29	62.67	0.92
Carson Creek	1	18.00	50 yr	1853.40	707.50	712.34	712.34	714.11	0.017059	11.14	191.46	60.30	0.92
Carson Creek	1	17.5	100 yr	2059.90	706.00	711.60	711.60	713.23	0.016166	10.25	203.23	69.84	1.00
Carson Creek	1	17.5	50 yr	1853.40	706.00	711.37	711.37	712.90	0.016764	9.93	187.44	66.83	1.01
Carson Creek	1	17.00	100 yr	2059.90	705.50	709.73	709.73	711.06	0.015731	9.26	222.55	84.74	1.01
Carson Creek	1	17.00	50 yr	1853.40	705.50	709.52	709.52	710.79	0.015893	9.04	205.13	82.24	1.01
Carson Creek	1	16	100 yr	2059.90	704.00	707.09	707.09	708.23	0.018621	8.57	240.27	107.91	1.01
Carson Creek	1	16	50 yr	1853.40	704.00	706.94	706.94	708.00	0.018696	8.28	223.71	106.24	1.01
Carson Creek	1	15.6	100 yr	2059.90	699.92	705.11		706.09	0.010681	7.95	259.20	89.01	0.82
Carson Creek	1	15.6	50 yr	1853.40	699.92	704.43	704.43	705.74	0.016546	9.18	201.91	78.34	1.01
Carson Creek	1	15.35	100 yr	2059.90	696.58	705.60	700.97	705.77	0.001473	3.38	608.82	111.57	0.26
Carson Creek	1	15.35	50 yr	1853.40	696.58	705.00	700.70	705.18	0.001645	3.41	543.45	108.29	0.27
Carson Creek	1	12		Culvert									
Carson Creek	1	11.85	100 yr	2059.90	683.65	691.56		691.91	0.002115	4.74	434.45	75.76	0.35
Carson Creek	1	11.85	50 yr	1853.40	683.65	691.25		691.56	0.002002	4.51	411.13	74.29	0.34
Carson Creek	1	11.7	100 yr	2059.90	683.65	690.63		691.65	0.010281	8.08	255.05	66.49	0.73
Carson Creek	1	11.7	50 yr	1853.40	683.65	690.38		691.32	0.009983	7.78	238.37	64.37	0.71
Carson Creek	1	11	100 yr	2059.90	683.80	689.05	689.05	690.59	0.021364	9.95	207.05	69.53	1.01
Carson Creek	1	11	50 yr	1853.40	683.80	688.83	688.83	690.28	0.021388	9.65	191.97	66.99	1.01
Carson Creek	1	10	100 yr	2059.90	681.00	686.04	686.04	687.57	0.021284	9.93	207.46	69.30	1.01
Carson Creek	1	10	50 yr	1853.40	681.00	685.81	685.81	687.26	0.021322	9.66	191.86	66.58	1.00
Carson Creek	1	9.00	100 yr	2059.90	678.00	683.21	683.21	684.67	0.021199	9.69	212.50	72.94	1.00
Carson Creek	1	9.00	50 yr	1853.40	678.00	682.98	682.98	684.37	0.021590	9.47	195.81	70.64	1.00
Carson Creek	1	8.00	100 yr	2059.90	676.00	680.12	680.12	681.60	0.021461	9.74	211.47	73.61	1.01
Carson Creek	1	8.00	50 yr	1853.40	676.00	679.92	679.92	681.30	0.021731	9.42	196.85	72.22	1.01
Carson Creek	1	7.00	100 yr	2059.90	674.00	678.27	678.11	679.49	0.018765	8.87	232.28	83.82	0.94
Carson Creek	1	7.00	50 yr	1853.40	674.00	678.05	677.88	679.21	0.018648	8.65	214.24	79.85	0.93
Carson Creek	1	6.00	100 yr	2059.90	673.00	676.86		677.74	0.014589	7.54	273.32	104.72	0.82
Carson Creek	1	6.00	50 yr	1853.40	673.00	676.70		677.51	0.013828	7.21	257.03	101.08	0.80
Carson Creek	1	5.00	100 yr	2059.90	672.00	674.92	674.92	675.89	0.024021	7.90	260.63	135.59	1.00

HEC-RAS Plan: Final Conditions (Continued)

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Carson Creek	1	5.00	50 yr	1853.40	672.00	674.76	674.76	675.69	0.024584	7.73	239.61	131.02	1.01
Carson Creek	1	4.00	100 yr	2059.90	668.00	672.27	672.18	673.23	0.021246	7.86	262.14	124.91	0.96
Carson Creek	1	4.00	50 yr	1853.40	668.00	672.12	672.03	673.02	0.021400	7.60	243.80	122.76	0.95
Carson Creek	1	3	100 yr	2059.90	666.00	669.83	669.83	671.02	0.022649	8.75	235.30	100.04	1.01
Carson Creek	1	3	50 yr	1853.40	666.00	669.64	669.64	670.77	0.023126	8.56	216.61	96.81	1.01
Carson Creek	1	2.00	100 yr	2059.90	663.00	667.34	667.34	668.82	0.018974	9.90	222.83	82.68	0.96
Carson Creek	1	2.00	50 yr	1853.40	663.00	667.14	667.14	668.52	0.019167	9.54	206.37	81.01	0.96
Carson Creek	1	1.19	100 yr	2059.90	661.00	666.92	665.37	667.69	0.006278	7.00	294.30	64.10	0.58
Carson Creek	1	1.19	50 yr	1853.40	661.00	666.59	665.13	667.30	0.006391	6.79	272.80	63.13	0.58
Carson Creek	1	1.18		Bridge									
Carson Creek	1	.96	100 yr	2059.90	661.00	664.94	664.91	666.64	0.020481	10.46	196.98	56.43	0.99
Carson Creek	1	.96	50 yr	1853.40	661.00	664.71	664.66	666.28	0.020540	10.07	184.09	56.21	0.98
Carson Creek	1	-0.66	100 yr	2979.00	655.00	661.45	661.45	663.44	0.018321	11.38	269.07	74.15	0.98
Carson Creek	1	-0.66	50 yr	2644.50	655.00	661.09	661.09	662.98	0.019274	11.06	243.51	71.07	0.99
Buck's Ravine	1	3109	100 yr	819.00	696.00	699.56	699.37	700.18	0.017239	6.63	131.43	75.42	0.67
Buck's Ravine	1	3109	50 yr	717.20	696.00	699.37	699.21	699.97	0.018253	6.53	117.29	72.32	0.68
Buck's Ravine	1	2949	100 yr	819.00	692.00	697.23		697.48	0.014359	4.40	212.77	69.00	0.39
Buck's Ravine	1	2949	50 yr	717.20	692.00	696.95		697.19	0.014526	4.27	193.65	67.94	0.39
Buck's Ravine	1	2758	100 yr	819.00	688.00	693.45		694.00	0.022761	6.28	148.08	48.98	0.55
Buck's Ravine	1	2758	50 yr	717.20	688.00	693.17		693.68	0.022848	6.00	134.63	47.71	0.54
Buck's Ravine	1	2352	100 yr	819.00	673.00	677.77	677.77	679.44	0.066273	11.83	91.23	36.23	1.04
Buck's Ravine	1	2352	50 yr	717.20	673.00	677.47	677.47	679.00	0.067061	11.30	81.29	30.15	1.03
Buck's Ravine	1	1970	100 yr	819.00	664.00	672.74		672.76	0.000672	1.64	752.79	193.99	0.10
Buck's Ravine	1	1970	50 yr	717.20	664.00	671.98		672.01	0.000819	1.69	616.32	166.16	0.11
Buck's Ravine	1	1960	100 yr	819.00	663.84	672.74	666.65	672.76	0.000015	1.34	989.56	236.54	0.09
Buck's Ravine	1	1960	50 yr	717.20	663.84	671.98	666.47	672.01	0.000017	1.33	821.26	208.79	0.10
Buck's Ravine	1	1948		Culvert									
Buck's Ravine	1	1633	100 yr	819.00	654.86	658.20	658.20	659.45	0.001883	8.99	91.35	39.28	1.00
Buck's Ravine	1	1633	50 yr	717.20	654.86	657.95	657.95	659.13	0.001964	8.73	82.17	35.23	1.01
Buck's Ravine	1	1623	100 yr	819.00	654.76	658.10	658.10	659.35	0.002498	8.98	91.46	39.33	1.00
Buck's Ravine	1	1623	50 yr	717.20	654.76	657.85	657.85	659.03	0.002615	8.73	82.16	35.23	1.01
Buck's Ravine	1	1499	100 yr	819.00	652.50	656.16	656.16	656.84	0.014073	6.75	127.51	94.63	0.72
Buck's Ravine	1	1499	50 yr	717.20	652.50	656.00	656.00	656.66	0.014832	6.65	112.69	90.11	0.73
Buck's Ravine	1	1105	100 yr	819.00	645.00	649.91	649.31	650.14	0.002039	4.60	313.19	276.51	0.41
Buck's Ravine	1	1105	50 yr	717.20	645.00	649.84	649.10	650.03	0.001794	4.26	291.67	263.92	0.39
Buck's Ravine	1	1104		Culvert									
Buck's Ravine	1	1084	100 yr	819.00	645.00	649.40	649.40	649.93	0.011850	7.13	224.61	218.39	0.65
Buck's Ravine	1	1084	50 yr	717.20	645.00	649.26	649.26	649.79	0.011901	6.96	194.46	201.89	0.65
Buck's Ravine	1	650	100 yr	819.00	637.10	641.01		641.47	0.009038	5.46	149.89	54.53	0.58
Buck's Ravine	1	650	50 yr	717.20	637.10	640.73		641.17	0.009486	5.32	134.90	53.10	0.59
Buck's Ravine	1	608	100 yr	819.00	636.50	640.77		641.13	0.006253	4.82	169.75	56.37	0.49
Buck's Ravine	1	608	50 yr	717.20	636.50	640.47		640.81	0.006463	4.67	153.46	54.87	0.49
Buck's Ravine	1	478	100 yr	819.00	634.50	638.38	638.38	639.73	0.018376	9.34	87.66	32.77	1.01
Buck's Ravine	1	478	50 yr	717.20	634.50	638.11	638.11	639.39	0.018763	9.05	79.24	31.62	1.01
Buck's Ravine	1	437	100 yr	819.00	633.50	638.25	636.67	638.92	0.001581	6.54	125.21	70.13	0.54
Buck's Ravine	1	437	50 yr	717.20	633.50	637.85	636.41	638.46	0.001647	6.28	114.22	64.51	0.54
Buck's Ravine	1	436		Culvert									
Buck's Ravine	1	237	100 yr	819.00	633.00	634.34	634.34	634.80	0.003487	5.42	151.17	169.55	1.01
Buck's Ravine	1	237	50 yr	717.20	633.00	634.26	634.26	634.68	0.003591	5.21	137.57	167.12	1.01
Buck's Ravine	1	121	100 yr	819.00	629.00	633.04	633.04	633.87	0.010200	8.00	130.99	84.79	0.79
Buck's Ravine	1	121	50 yr	717.20	629.00	632.81	632.81	633.65	0.011124	7.94	112.18	76.08	0.82
Buck's Ravine	1	0	100 yr	819.00	626.50	632.44		632.56	0.001383	3.16	305.42	107.59	0.25
Buck's Ravine	1	0	50 yr	717.20	626.50	632.04		632.17	0.001608	3.22	263.45	102.05	0.27

