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UPDATED HYDROLOGY STUDY

FOR

910 Laird Drive

GLENDALE, CALIFORNIA

Prepared by: Maher Qassis

Reviewed by: David Silverman, PE, PhD

Date: December 26, 2013 (UPDATED 12-20-20)

Signature:

A handwritten signature in blue ink, appearing to read "DS", is written over the signature line.

David Silverman, PE 58650



1. DESCRIPTION OF PROJECT

The study area is the watershed draining to Laird Dr. in Glendale, in the County of Los Angeles, California. The site is located east of the Glendale Freeway.

The purpose of the project is to look at the outflow from the watershed extending south from Laird Dr. and the impact of the proposed driveway at 910 Laird Dr. on the flows to Laird Dr.

2. HYDROLOGIC ANALYSIS

a. *Watershed Area.* The watershed area extends south of the Laird Dr. The total watershed area is approximately 31.9 acres. The area is currently undeveloped except for some small landscape improvements.

The runoff from the undeveloped condition will flow over land towards the end of Laird Dr. and then down to E. Chevy Chase Dr.

The runoff sheet flows on the hillsides to the canyon bottom then flows northerly to Laird Dr.

b. *Hydrologic Parameters.* The hydrologic parameters were determined from the Los Angeles County Department of Public Works Hydrology GIS. The project site is in the 6.9 inch isohyet and the project is located in soil classification area 068. The proportion imperviousness for the undeveloped and developed site is 0.10.

c. *Determination of Discharge.* The project site is less than 40 acres, so for this analysis the Los Angeles County HydroCalc program was used to determine the Time of Concentration, the peak flow and the 24-hr runoff for the 50-yr storm event for both clear flow and with a fire factor of 0.71 for the LA River Basin. The watershed produces approximately 70.6 cfs at the outlet for clear flow and 78.8 cfs with the fire factor. The hydrology map and HydroCalc results are included in Appendix B.

The property at 2480 Chevy Chase has done some landscape improvements that affect the flow from the canyon by channelizing the flow (see pictures below). This had the effect of moving the overbank flow as it approaches Laird Dr to the west, away from the 910 Laird Dr. property (see Appendix D for map of extents of water surface).





d. *Water surface determination.* HEC-RAS was used to determine the water surface elevations and water surface limits for the 50-yr design storm. A field survey was done to map the existing ground from the end of Laird Dr. to approximately 200 feet up the major canyon to the south. Cross-sections were developed every 10 feet from Laird Dr. up the canyon. The results are in Appendix D. The depth of flow where the pavement starts at the southerly end of Laird Dr. is approximately 0.71 feet for clear flow and 0.40 feet for burned flow. HEC-RAS was unable to converge on a subcritical flow regime, so the supercritical regime is accepted.

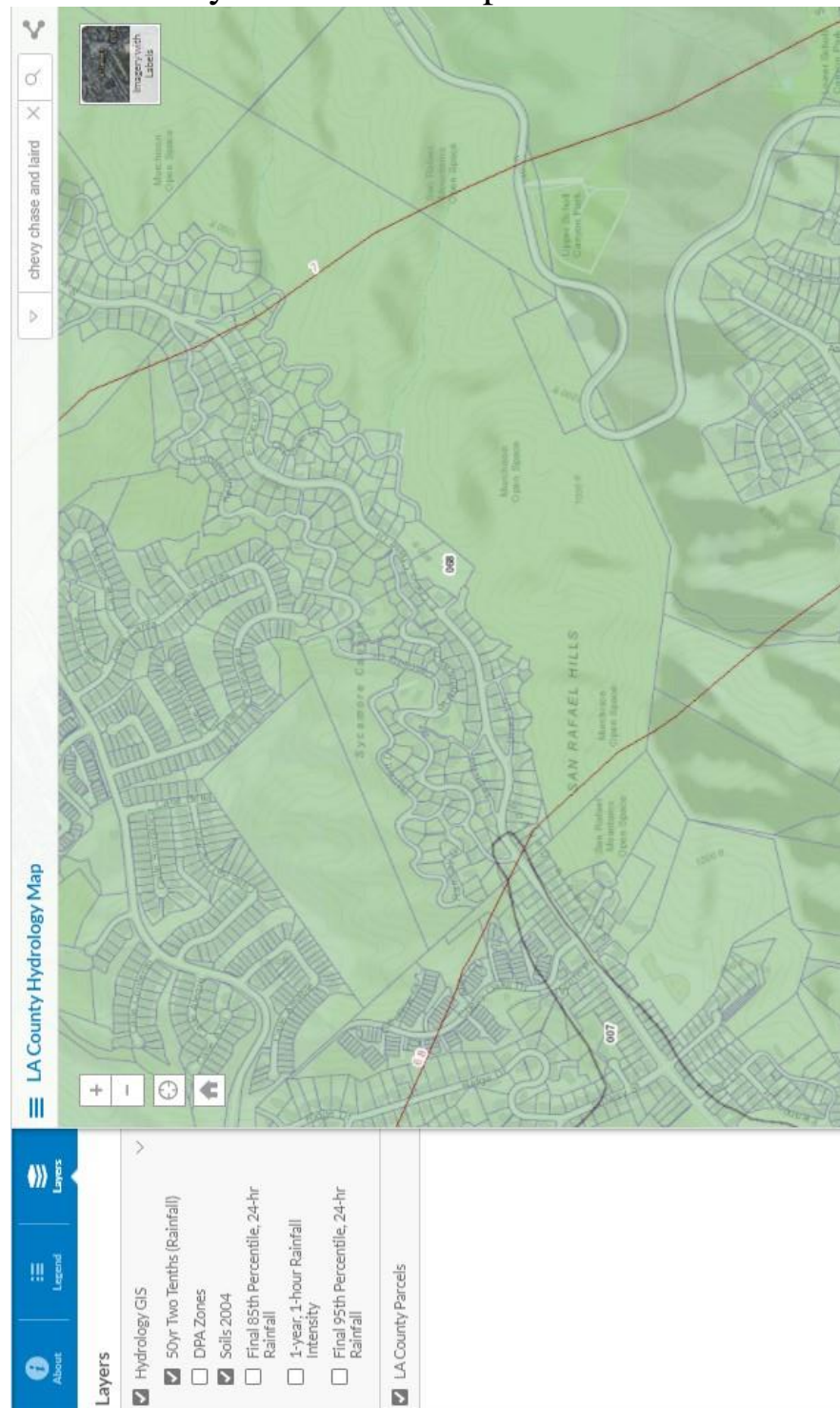
e. *Impact of Proposed Driveway at 910 Laird Dr.* The proposed driveway is currently designed to match the existing grades for the first 30 feet +/- . This is the only area that the 50-yr water surface (both clear and burned) impacts, therefore the construction of the proposed driveway will have no impact on the flow regime.

3. CONCLUSION

All the flow from the project will be conveyed to E. Chevy Chase Dr. The undeveloped flowrate is 70.6 cfs and 78.8 cfs for the clear and burned (respectively) Q_{50} . At the outlet to Laird Dr. the depth of flow is a maximum of 0.71 feet. Because of the channel improvements at 2480 Chevy Chase, the water surface is directed to the west and the portion of the proposed driveway area for 910 Laird Dr. that changes the existing grades is outside the flood limits of the 50-yr storm runoff. The construction of the proposed driveway at 910 Laird Dr. will have no impact on the flow to Laird Drive.

Appendix A

Isohyet and Soils Map



Appendix B

Hydrology Map & HydroCalc Results

Peak Flow Hydrologic Analysis

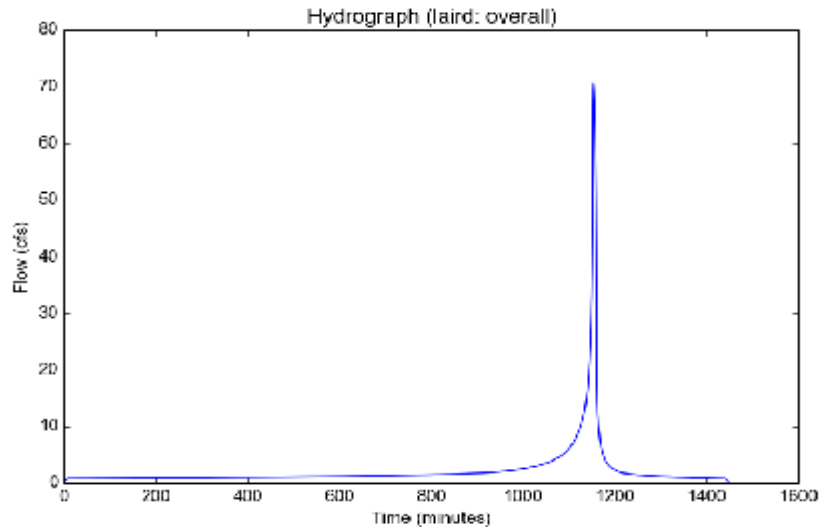
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Version: HydroCalc 1.0.3

Input Parameters

Project Name	laird
Subarea ID	overall
Area (ac)	31.9
Flow Path Length (ft)	1775.0
Flow Path Slope (vft/hft)	0.295
50-yr Rainfall Depth (in)	6.9
Percent Impervious	0.1
Soil Type	68
Design Storm Frequency	50-yr
Fire Factor	lar
LID	False

Output Results

Modeled (50-yr) Rainfall Depth (in)	6.9
Peak Intensity (in/hr)	3.123
Undeveloped Runoff Coefficient (Cu)	0.6874
Developed Runoff Coefficient (Cd)	0.7086
Time of Concentration (min)	9.0
Clear Peak Flow Rate (cfs)	70.5957
Burned Peak Flow Rate (cfs)	78.783
24-Hr Clear Runoff Volume (ac-ft)	4.6495
24-Hr Clear Runoff Volume (cu-ft)	202534.187



Peak Flow Hydrologic Analysis

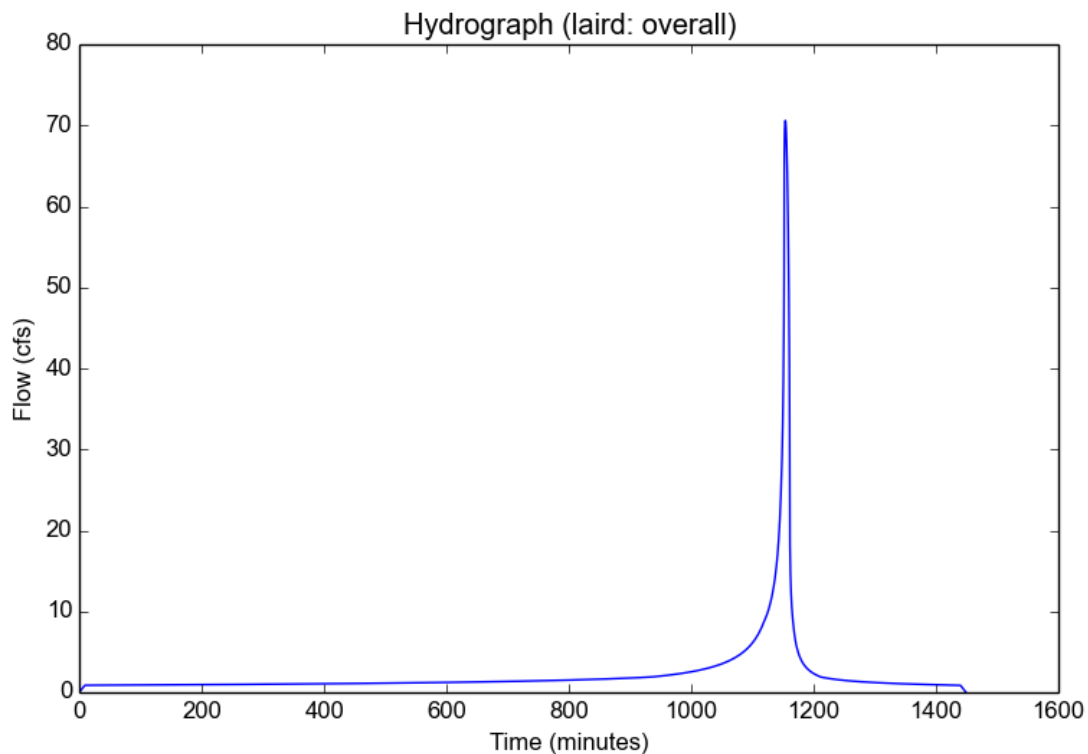
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Input Parameters

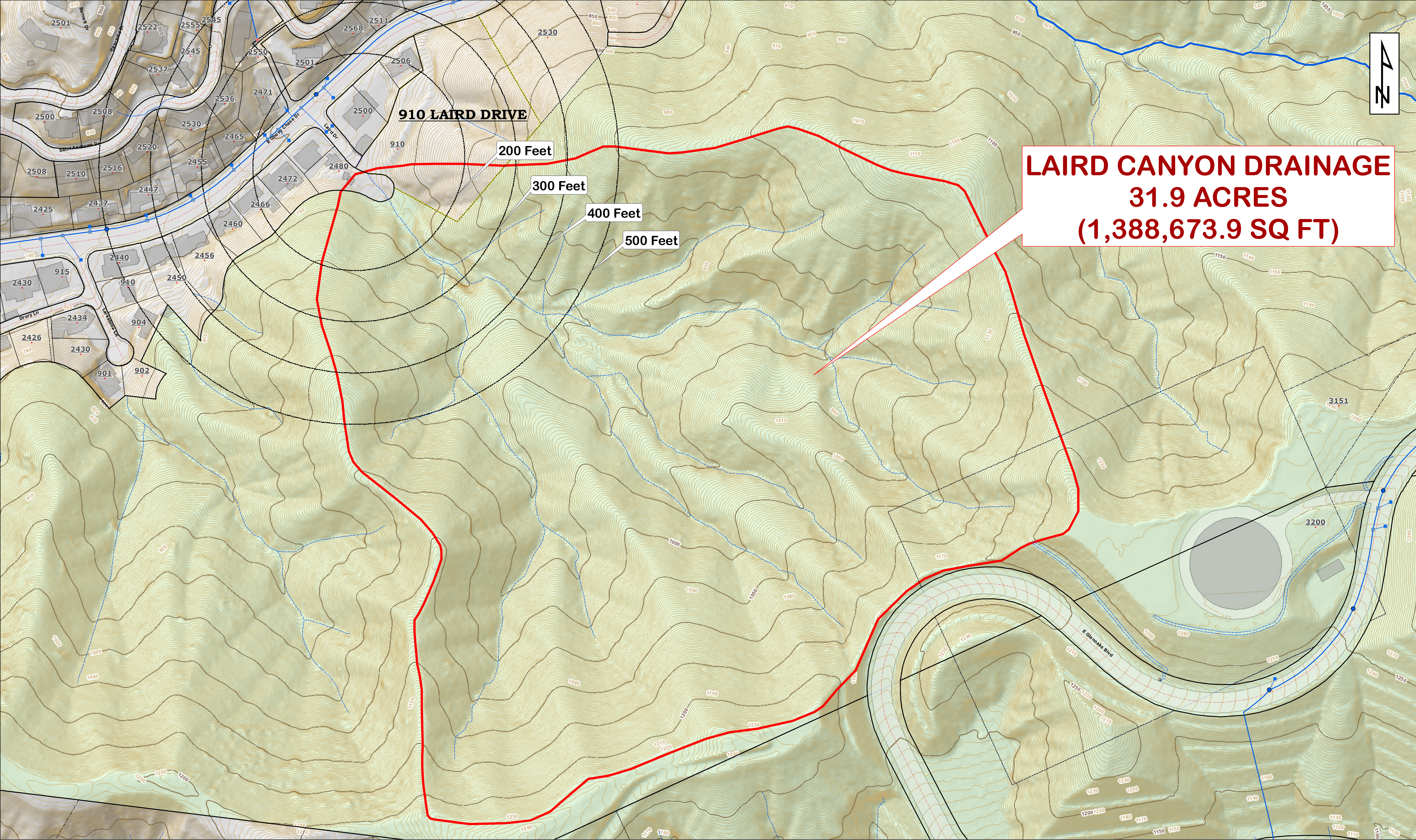
Project Name	laird
Subarea ID	overall
Area (ac)	31.9
Flow Path Length (ft)	1775.0
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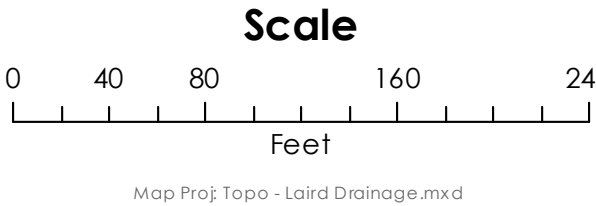
LAIRD CANYON DRAINAGE - GLENDALE, CA



Disclaimer:
This Drawing is neither a legally recorded map nor a survey,
and is not intended to be used as such. The information
displayed is a compilation of records, information and data
obtained from various sources, including the City of Glendale
which is not responsible for its accuracy or timeliness.

Sources:
BaseMap - City of Glendale PW ENG - 2014
Trans (Roads) - City of Glendale PW ENG/LA County - 2008
Topo - City of Glendale PW ENG - 1992/2003
Aerial Photography - LA County - 2014

Map Prepared by:
Mapping & Real Property
W.F. A'Hearn, GIS Analyst
20 October 2020



Map Proj: Topo - Laird Drainage.mxd

LEGEND

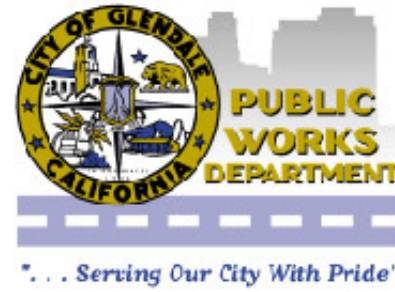
- Property: 901 Laird Drive
- LAIRD_DRAINAGE
- Hydro Features**
- BlueLine Stream
- Streams
- Property Ownership**
- City of Glendale

Storm Drains

- Storm Drain Mains
- Catch Basins

Contours

- LARIAC Contours 50FT L4
- LARIAC Contours 2FT L4



Appendix C

HEC-RAS Results

Clear Flow

HEC-RAS Plan: laird River: laird-exist Reach: offsite Profile: PF 1												
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
offsite	260.0000	PF 1	70.60	776.93	779.25	779.25	779.94	0.007015	8.87	17.21	13.01	1.04
offsite	250.0000	PF 1	70.60	776.26	778.34	778.34	779.06	0.006397	7.86	13.16	9.99	0.98
offsite	240.0000	PF 1	70.60	775.69	777.51	777.51	778.18	0.006890	7.22	12.88	10.56	0.99
offsite	230.0000	PF 1	70.60	775.07	776.85	776.85	777.51	0.007550	6.87	12.16	10.19	1.01
offsite	220.0000	PF 1	70.60	773.67	775.41	775.41	776.10	0.007956	7.37	12.30	9.80	1.04
offsite	210.0000	PF 1	70.60	772.34	774.31	774.31	775.00	0.007369	7.91	13.41	10.12	1.03
offsite	200.0000	PF 1	70.60	771.46	772.72	772.72	773.18	0.008050	5.62	13.74	15.79	0.98
offsite	190.0000	PF 1	70.60	771.64	772.35	772.35	772.66	0.009755	4.50	15.91	25.85	1.00
offsite	180.0000	PF 1	70.60	770.73	771.51	771.51	771.79	0.010121	4.26	16.75	30.08	1.00
offsite	170.0000	PF 1	70.60	769.76	770.60	770.60	770.87	0.010224	4.21	16.83	31.05	1.00
offsite	160.0000	PF 1	70.60	768.90	769.83	769.83	770.23	0.007969	5.26	15.26	20.58	0.96
offsite	150.0000	PF 1	70.60	767.87	769.03	769.03	769.46	0.006429	5.48	15.59	20.81	0.90
offsite	140.0000	PF 1	70.60	766.71	768.16	768.16	768.50	0.004182	5.13	20.99	42.67	0.75
offsite	130.0000	PF 1	70.60	765.84	767.29	767.29	767.95	0.008369	6.92	12.33	11.76	1.05
offsite	120.0000	PF 1	70.60	765.10	766.70	766.70	767.05	0.004660	5.66	21.25	32.25	0.80
offsite	110.0000	PF 1	70.60	764.64	766.22	766.22	766.51	0.005748	5.93	23.51	36.64	0.88
offsite	100.0000	PF 1	70.60	764.34	765.30	765.30	765.56	0.014494	6.84	19.31	34.50	1.28
offsite	90.0000	PF 1	70.60	763.71	765.14	765.12	765.35	0.007607	6.61	24.45	39.51	1.00
offsite	80.0000	PF 1	70.60	762.79	765.02	765.02	765.29	0.004222	6.68	28.04	42.92	0.80
offsite	70.0000	PF 1	70.60	762.11	763.78	763.78	764.08	0.005381	6.37	23.79	33.52	0.87
offsite	60.0000	PF 1	70.60	761.95	763.23	763.23	763.47	0.006595	5.76	24.19	40.79	0.92
offsite	50.0000	PF 1	70.60	761.22	762.33	762.33	762.65	0.009773	5.00	17.27	27.92	1.02
offsite	40.0000	PF 1	70.60	759.81	760.91	760.91	761.23	0.009726	4.62	16.41	28.20	0.99
offsite	30.0000	PF 1	70.60	758.79	759.63	759.63	759.90	0.010678	4.39	17.56	32.79	1.02
offsite	20.0000	PF 1	70.60	757.90	758.70	758.70	758.98	0.010586	4.37	17.18	31.88	1.02
offsite	10.0000	PF 1	70.60	756.97	757.84	757.84	758.14	0.010118	4.45	16.33	27.49	1.01
offsite	-0.0000	PF 1	70.60	756.04	756.75	756.75	757.06	0.004050	4.47	15.84	26.01	1.01

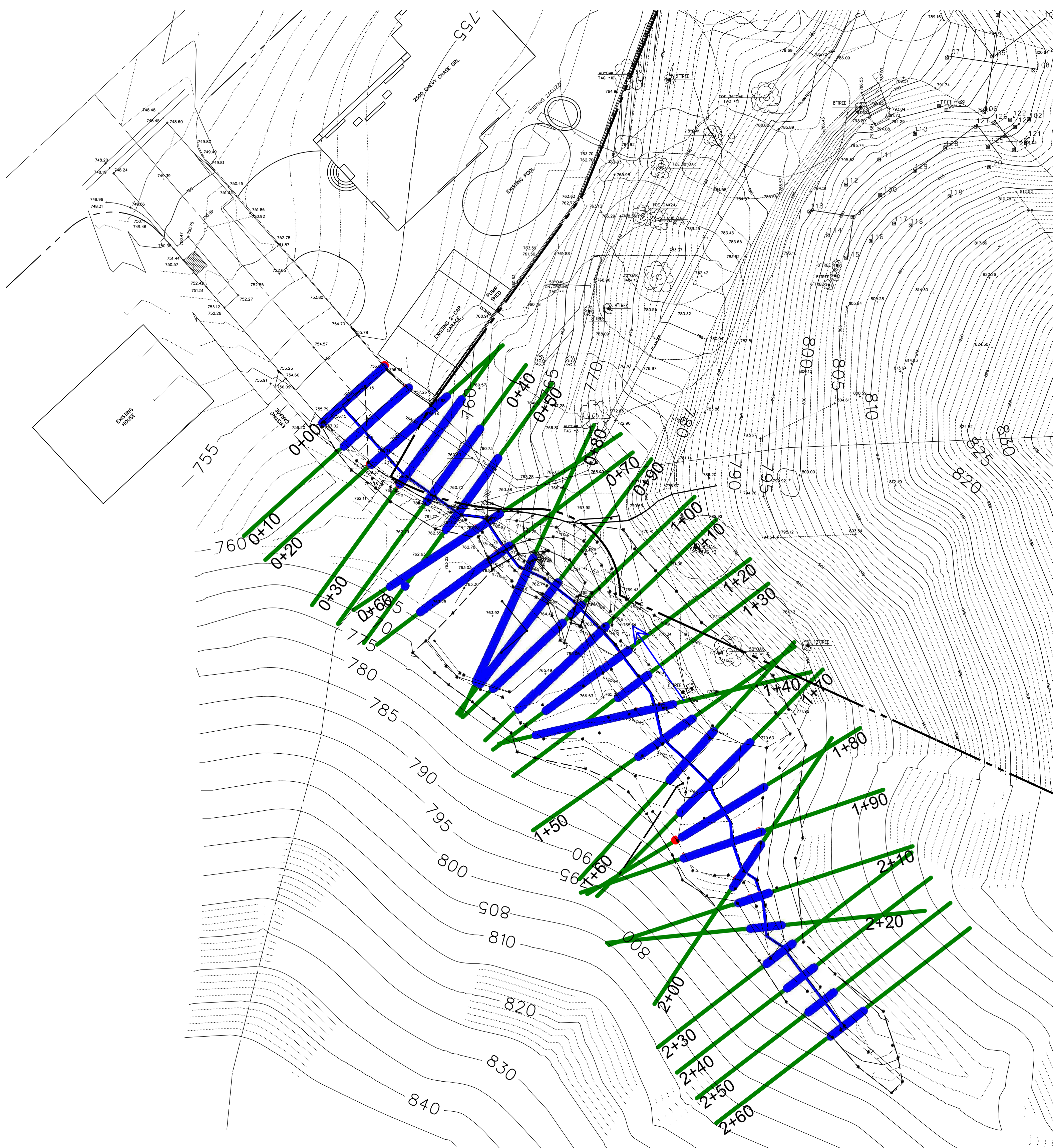
Burned Flow

HEC-RAS Plan: laird River: laird-exist Reach: offsite Profile: PF 1

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
offsite	260.0000	PF 1	78.80	776.93	779.36	779.36	780.10	0.007046	9.19	18.75	13.40	1.05
offsite	250.0000	PF 1	78.80	776.26	777.82	778.47	779.85	0.025183	12.80	8.46	8.22	1.85
offsite	240.0000	PF 1	78.80	775.69	776.89	777.62	779.47	0.046670	13.80	6.98	8.44	2.37
offsite	230.0000	PF 1	78.80	775.07	776.24	776.96	778.92	0.061974	13.65	6.43	8.56	2.63
offsite	220.0000	PF 1	78.80	773.67	774.69	775.53	778.11	0.086489	16.04	5.89	8.09	3.10
offsite	210.0000	PF 1	78.80	772.34	773.56	774.42	777.29	0.072627	17.44	6.37	8.64	2.97
offsite	200.0000	PF 1	78.80	771.46	772.12	772.79	776.10	0.212821	16.04	4.97	12.69	4.35
offsite	190.0000	PF 1	78.80	771.64	772.02	772.39	773.72	0.139239	10.46	7.57	25.12	3.34
offsite	180.0000	PF 1	78.80	770.73	771.21	771.56	772.53	0.086523	9.21	8.60	24.15	2.71
offsite	170.0000	PF 1	78.80	769.76	770.31	770.64	771.61	0.097174	9.16	8.60	26.28	2.82
offsite	160.0000	PF 1	78.80	768.90	769.48	769.89	770.90	0.052419	9.80	8.64	16.78	2.28
offsite	150.0000	PF 1	78.80	767.87	768.55	769.10	770.34	0.053203	11.00	7.77	13.03	2.36
offsite	140.0000	PF 1	78.80	766.71	767.45	768.26	769.72	0.061533	12.56	7.09	11.48	2.57
offsite	130.0000	PF 1	78.80	765.84	766.80	767.49	769.15	0.052495	12.80	7.01	9.83	2.44
offsite	120.0000	PF 1	78.80	765.10	766.10	766.77	768.62	0.049305	13.36	7.03	12.72	2.41
offsite	110.0000	PF 1	78.80	764.64	765.81	766.26	768.04	0.050708	14.08	10.12	29.34	2.46
offsite	100.0000	PF 1	78.80	764.34	764.98	765.34	767.09	0.203850	19.00	8.71	31.64	4.46
offsite	90.0000	PF 1	78.80	763.71	764.88	765.16	765.96	0.044870	13.91	14.32	37.76	2.34
offsite	80.0000	PF 1	78.80	762.79	764.82	765.08	765.69	0.012613	10.83	19.73	41.83	1.37
offsite	70.0000	PF 1	78.80	762.11	763.40	763.83	765.37	0.035820	13.88	11.77	31.33	2.16
offsite	60.0000	PF 1	78.80	761.95	762.89	763.26	764.89	0.061961	14.21	11.15	36.16	2.66
offsite	50.0000	PF 1	78.80	761.22	761.95	762.39	764.01	0.147922	12.26	7.44	23.50	3.52
offsite	40.0000	PF 1	78.80	759.81	760.55	760.96	762.46	0.149617	11.17	7.25	23.77	3.45
offsite	30.0000	PF 1	78.80	758.79	759.33	759.67	760.84	0.150078	10.20	8.19	29.78	3.41
offsite	20.0000	PF 1	78.80	757.90	758.45	758.74	759.61	0.093293	8.84	9.30	29.83	2.75
offsite	10.0000	PF 1	78.80	756.97	757.57	757.88	758.74	0.082573	8.73	9.19	26.56	2.61
offsite	-0.0000	PF 1	78.80	756.04	756.44	756.80	758.04	0.052705	10.14	7.78	25.74	3.25

Appendix D

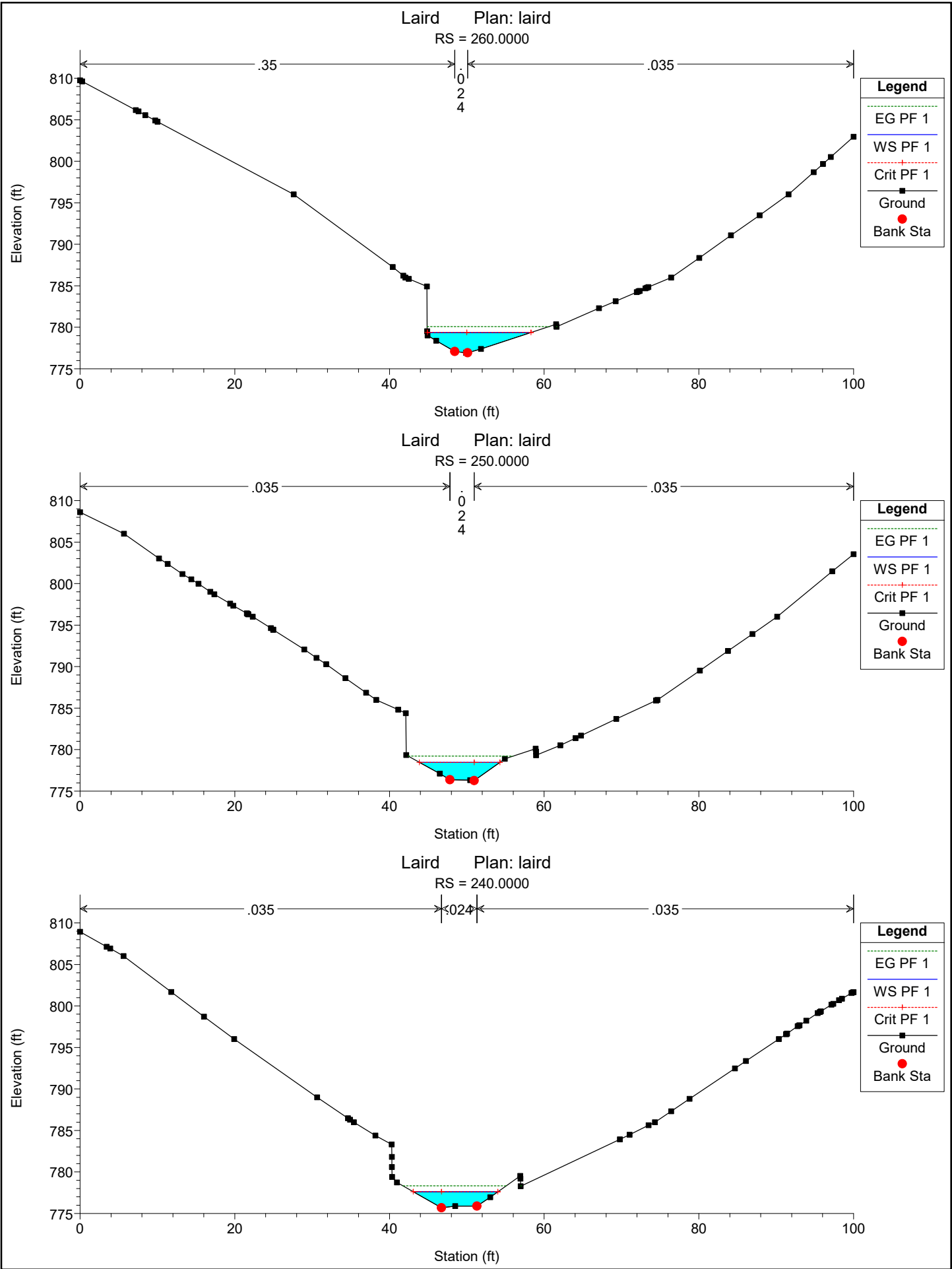
Water Surface Limits (plan view)

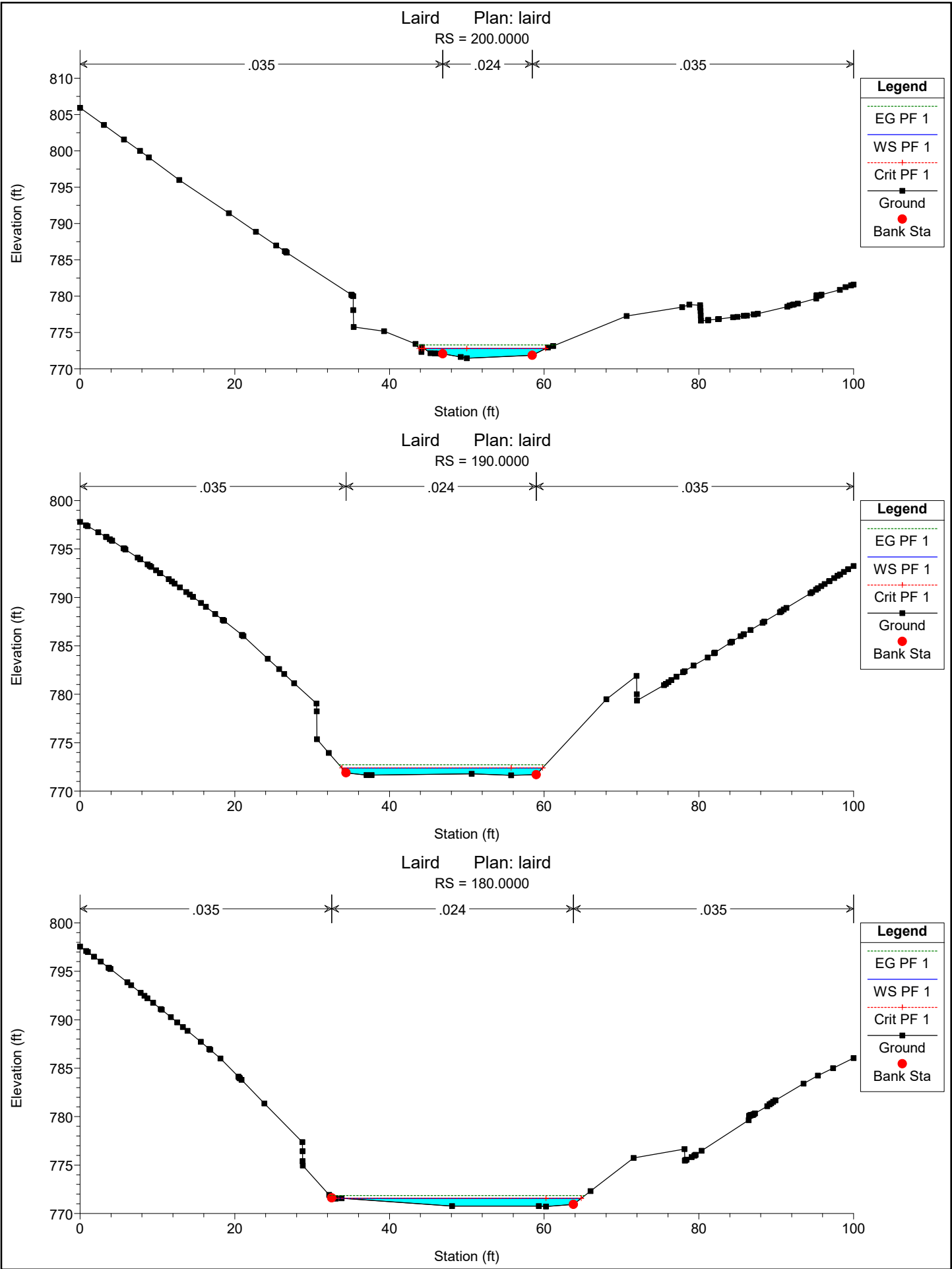


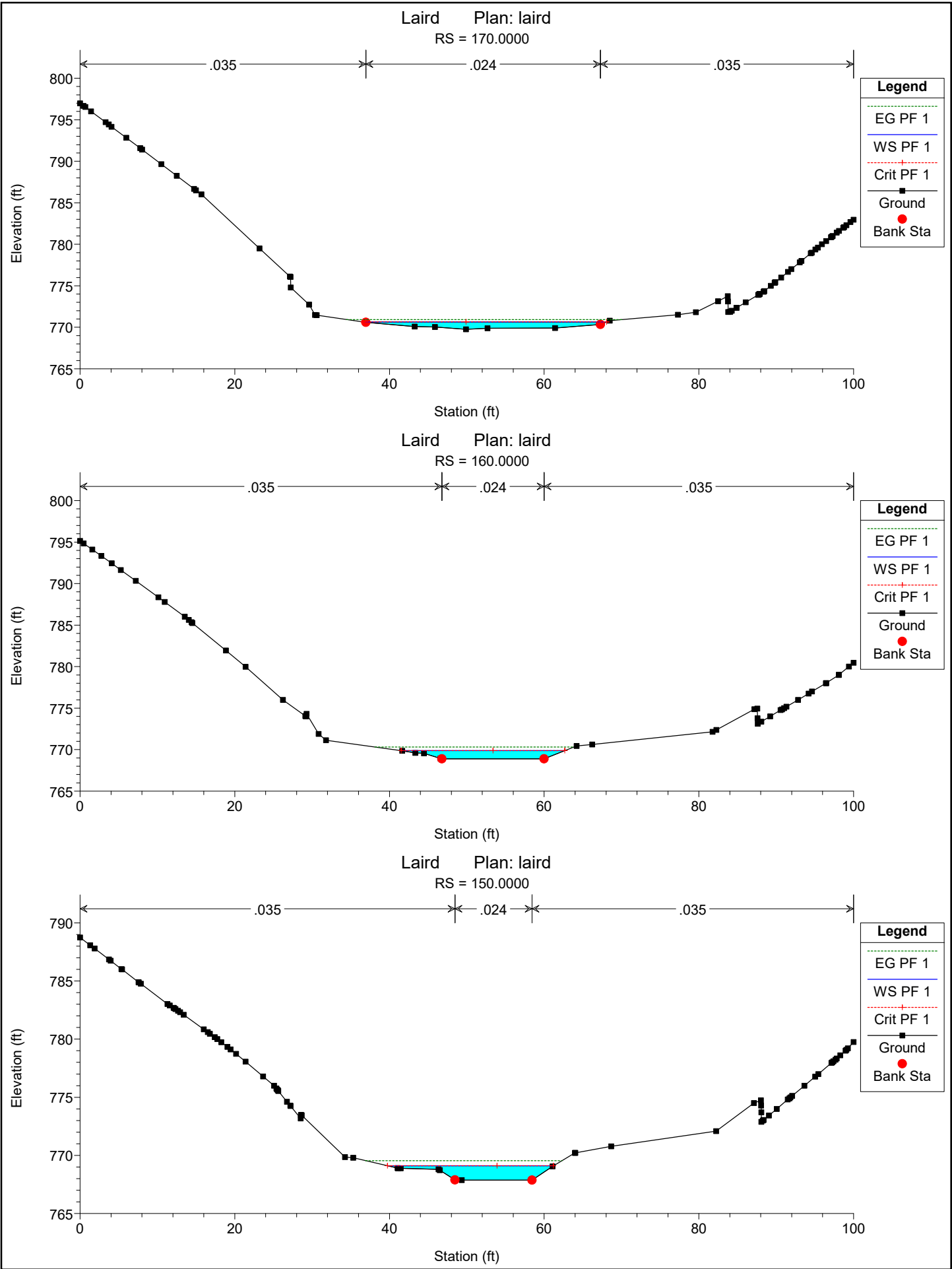
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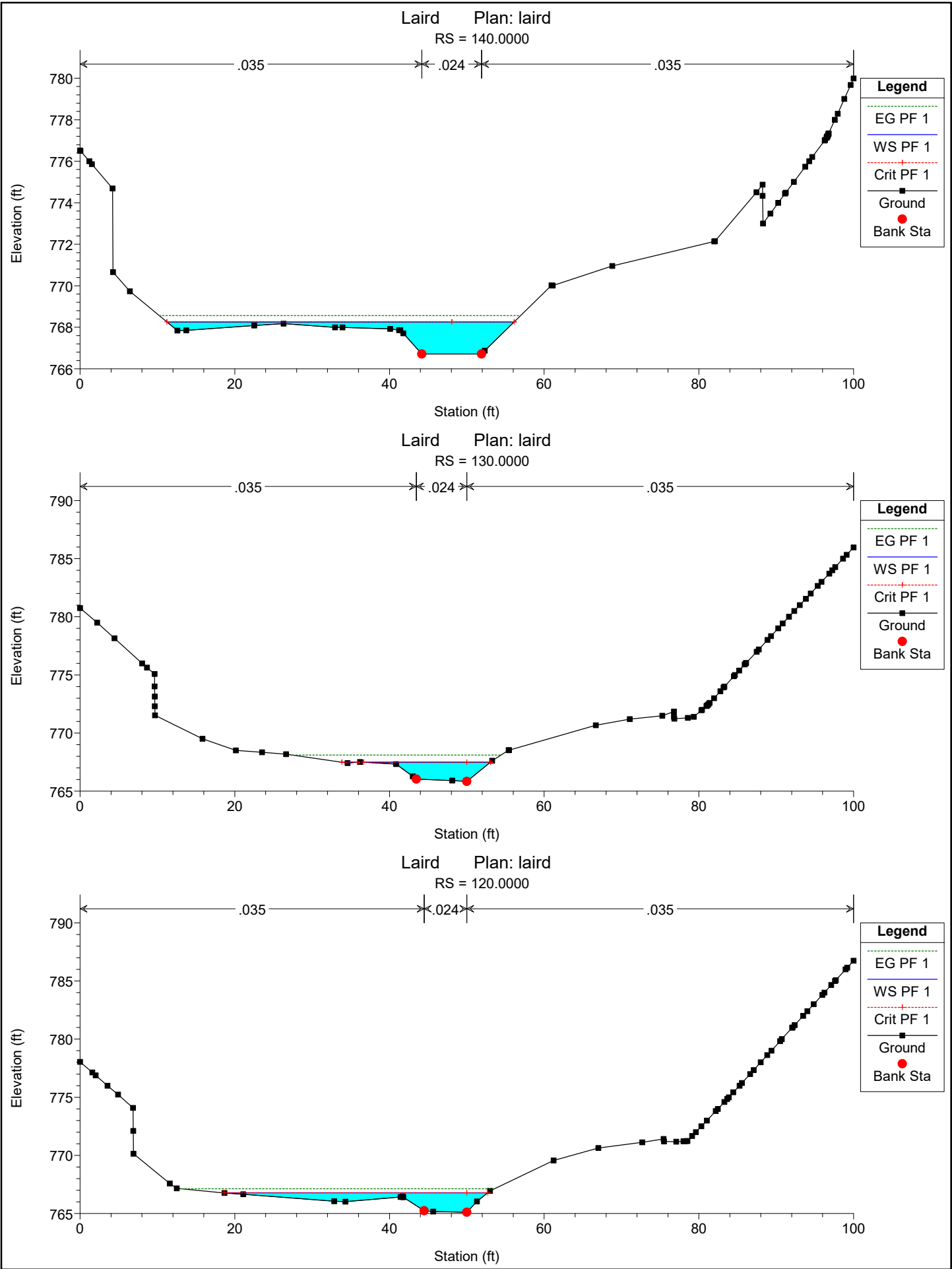
HEC-RAS Cross-sections

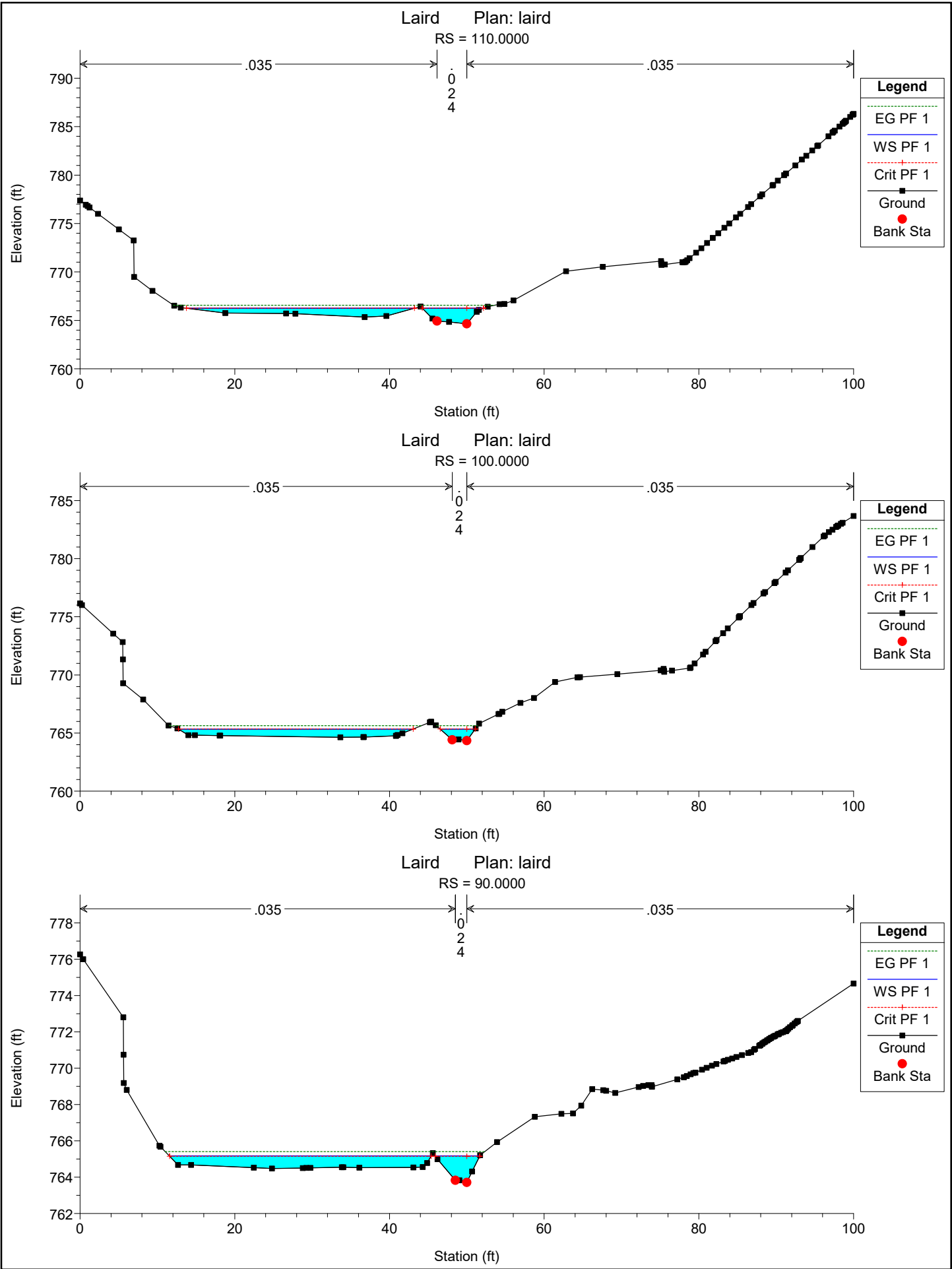
CLEAR FLOW

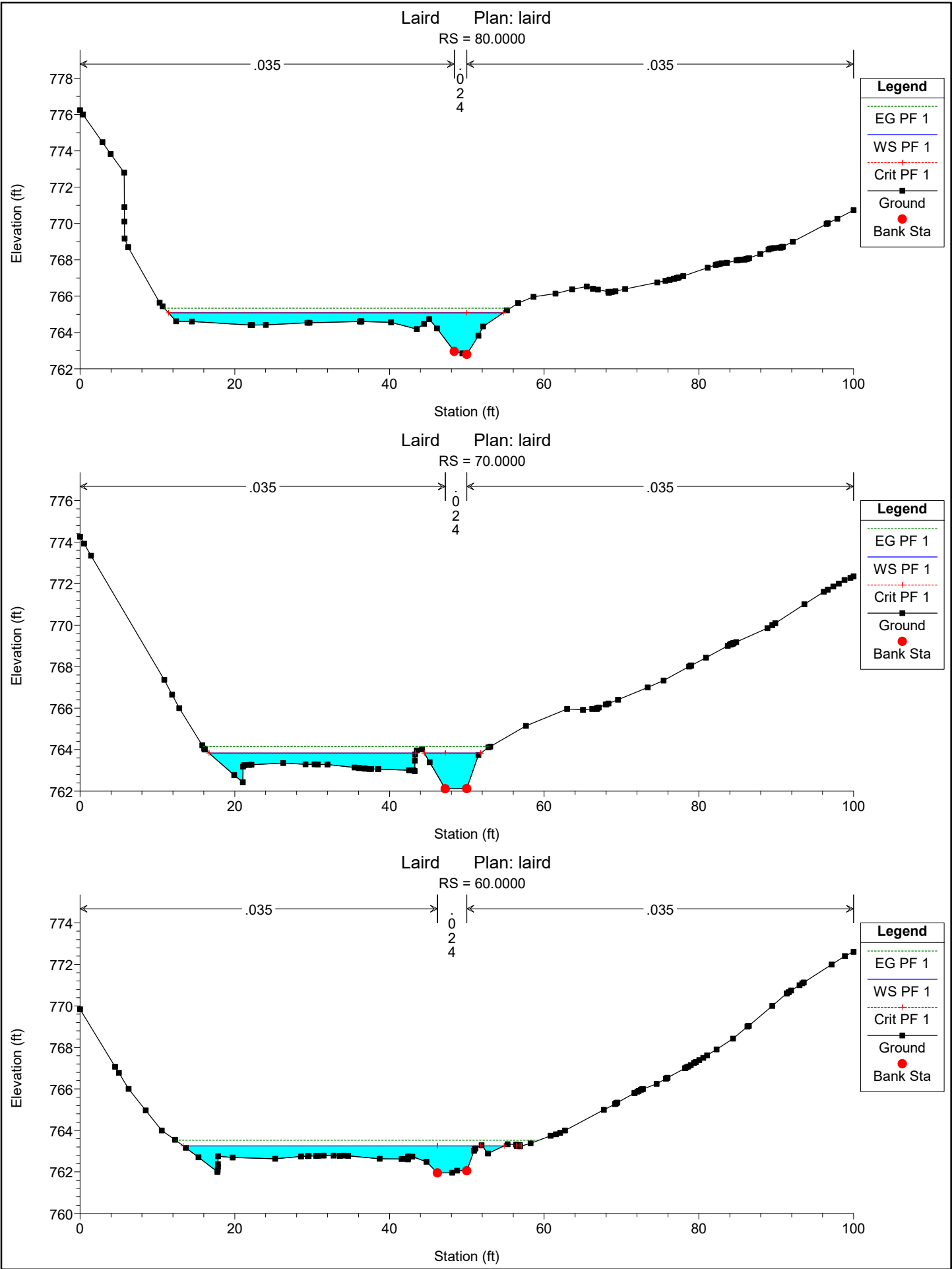


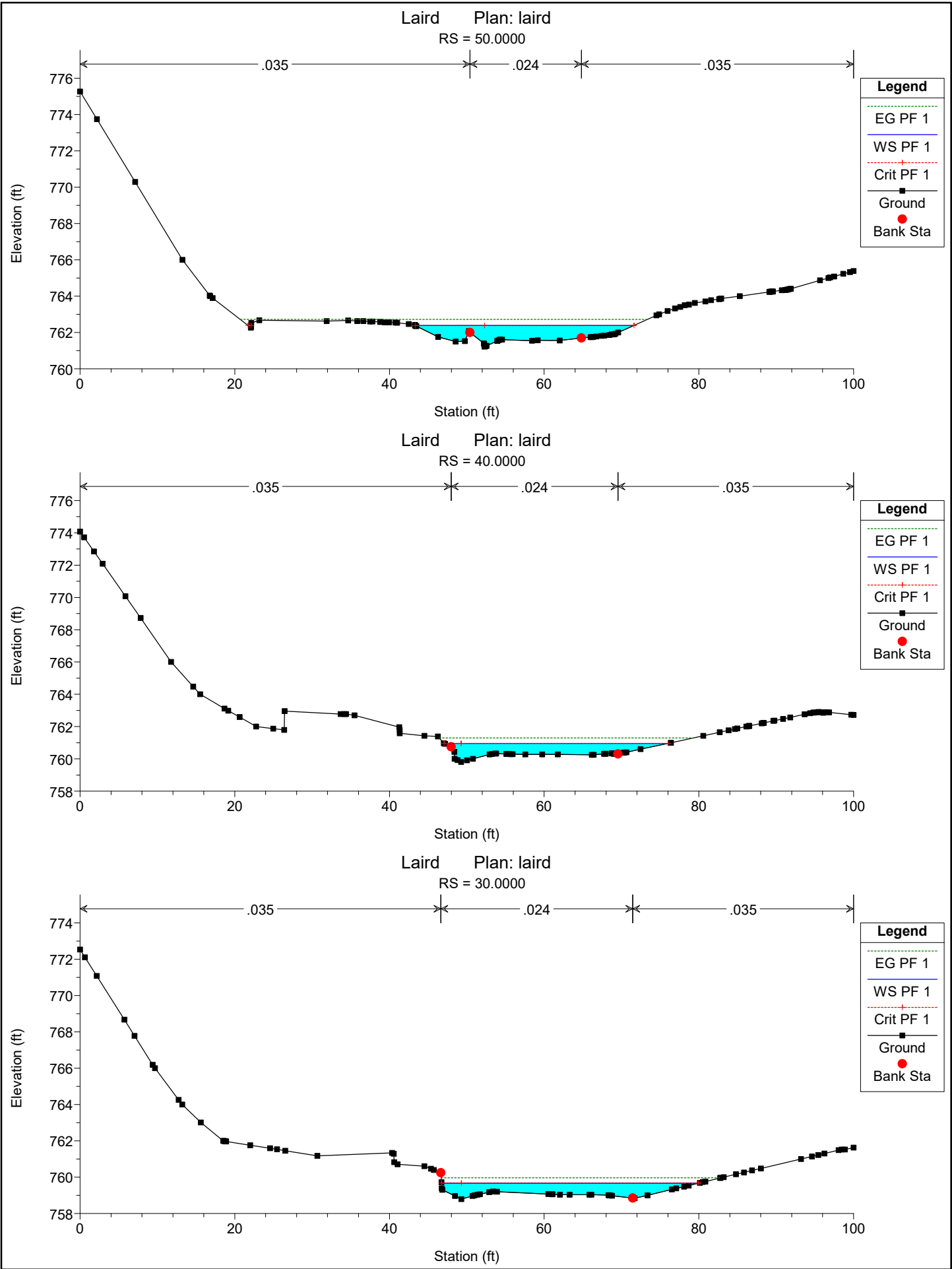


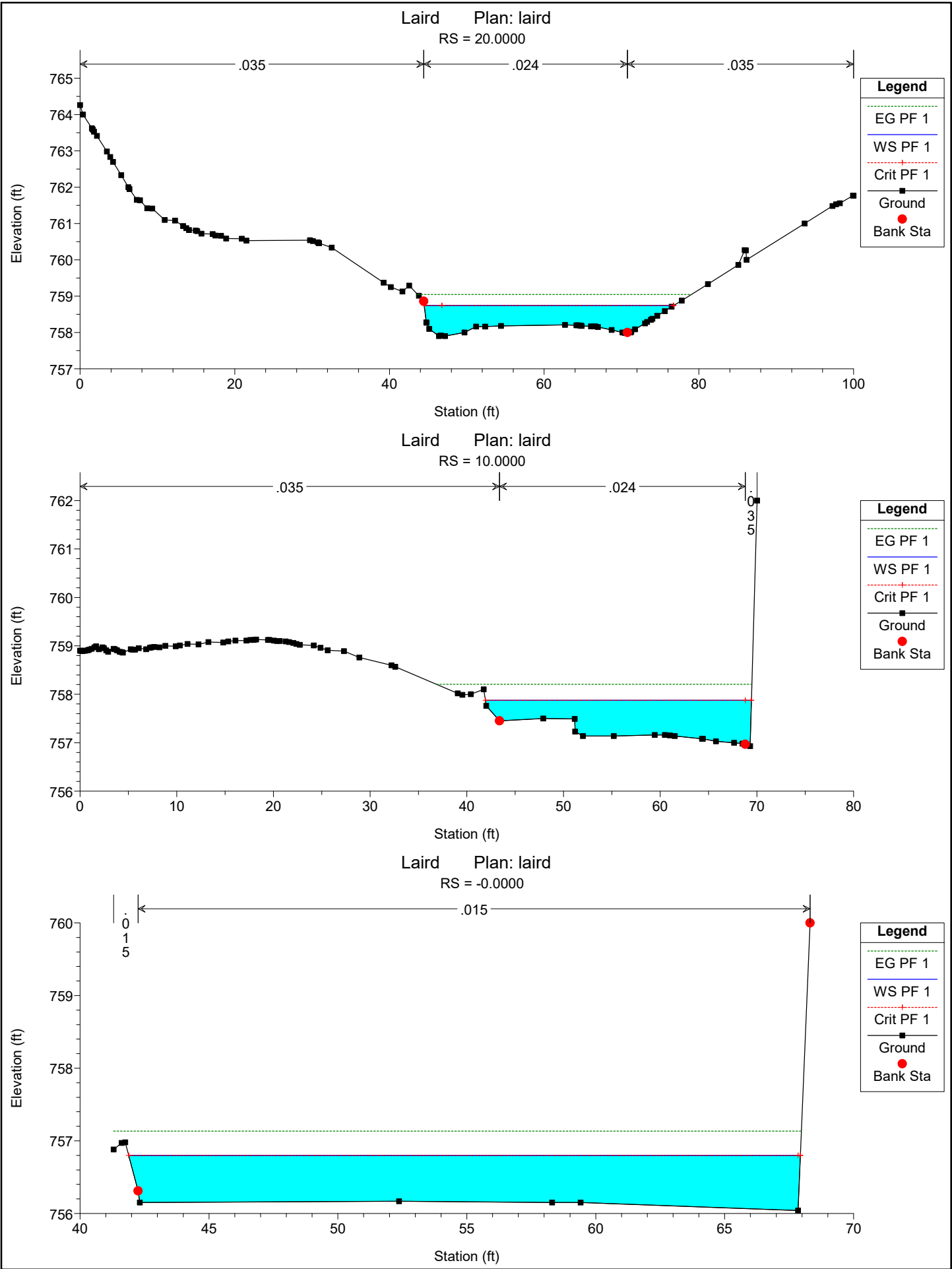






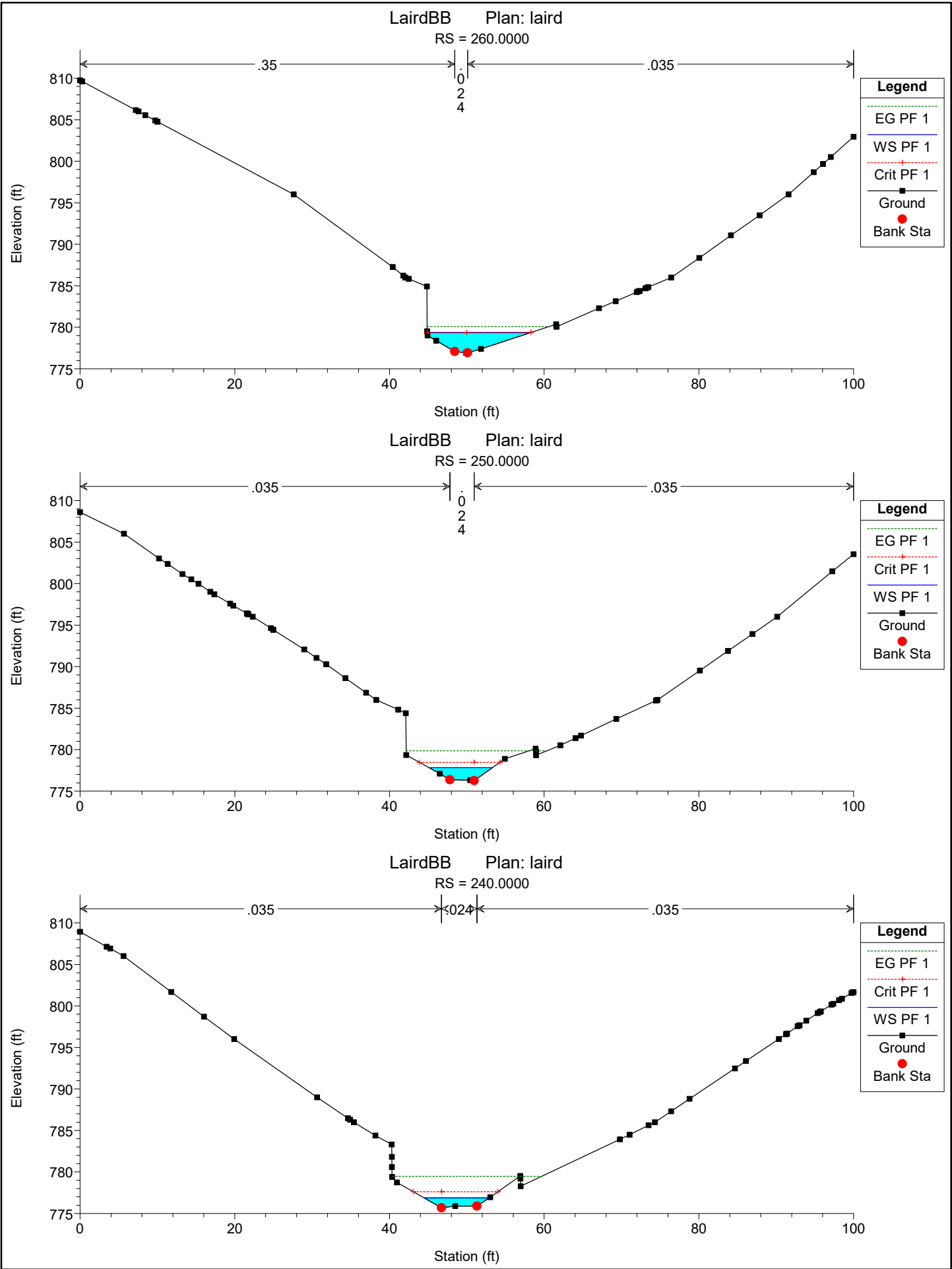


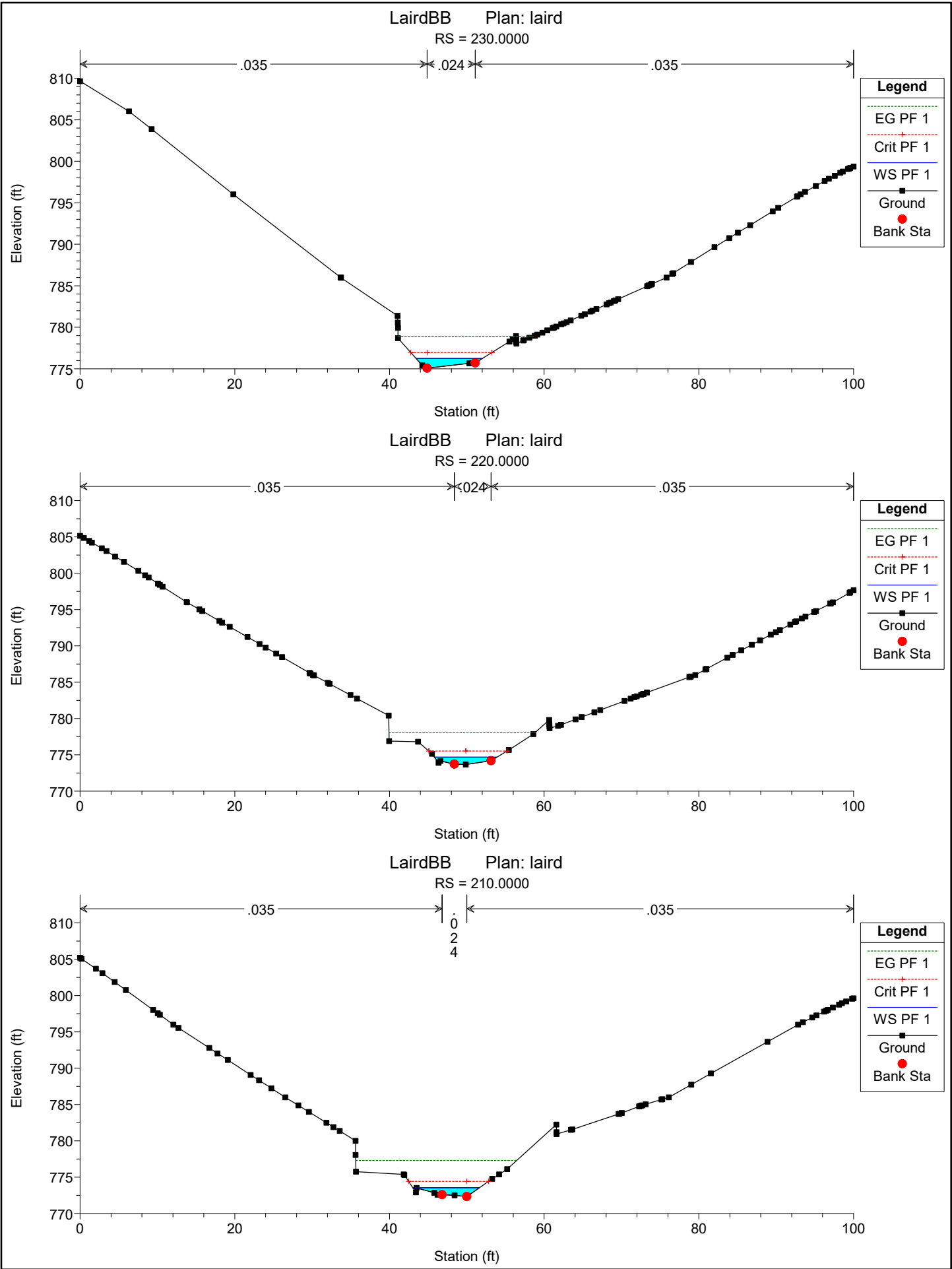


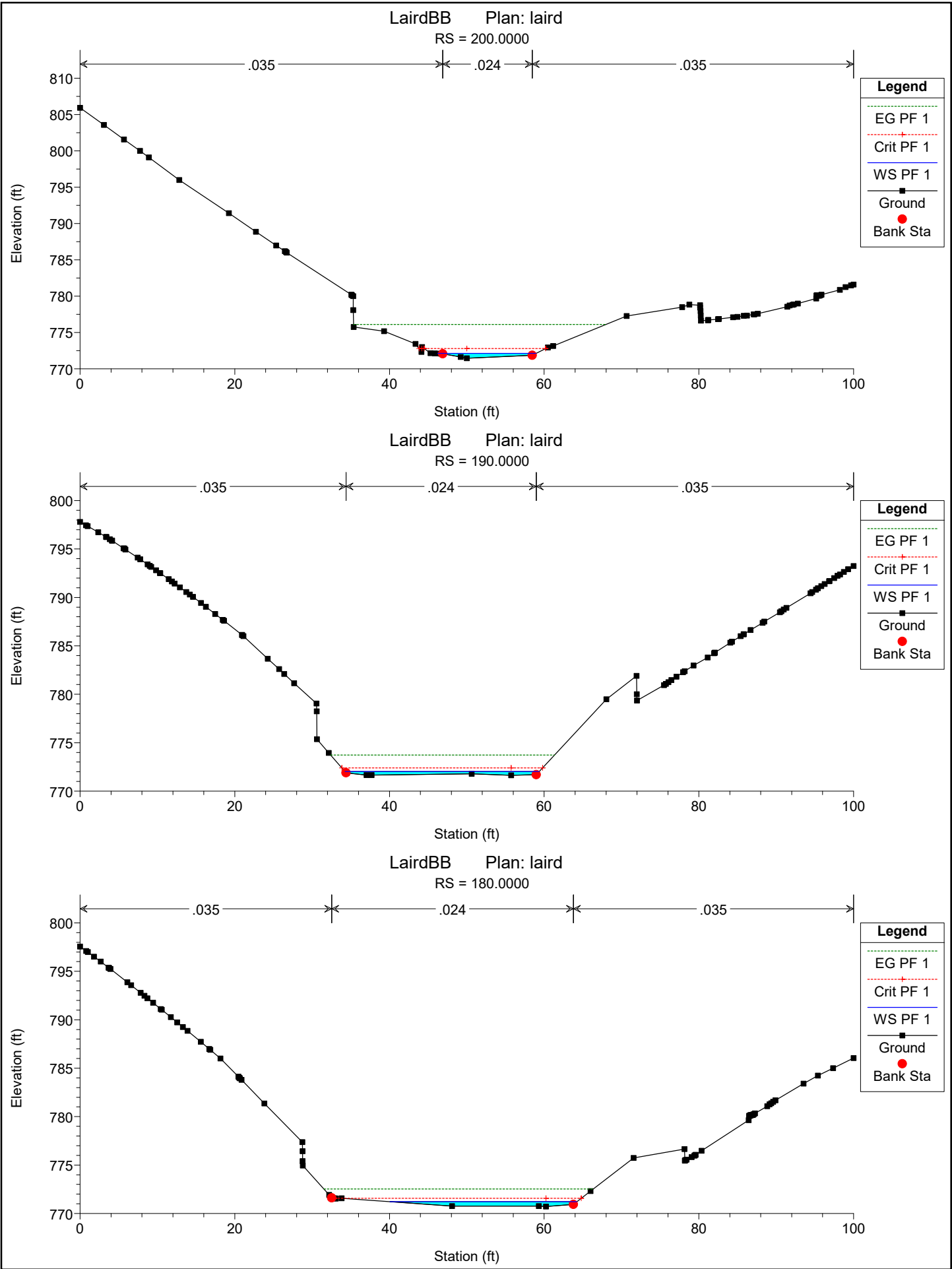


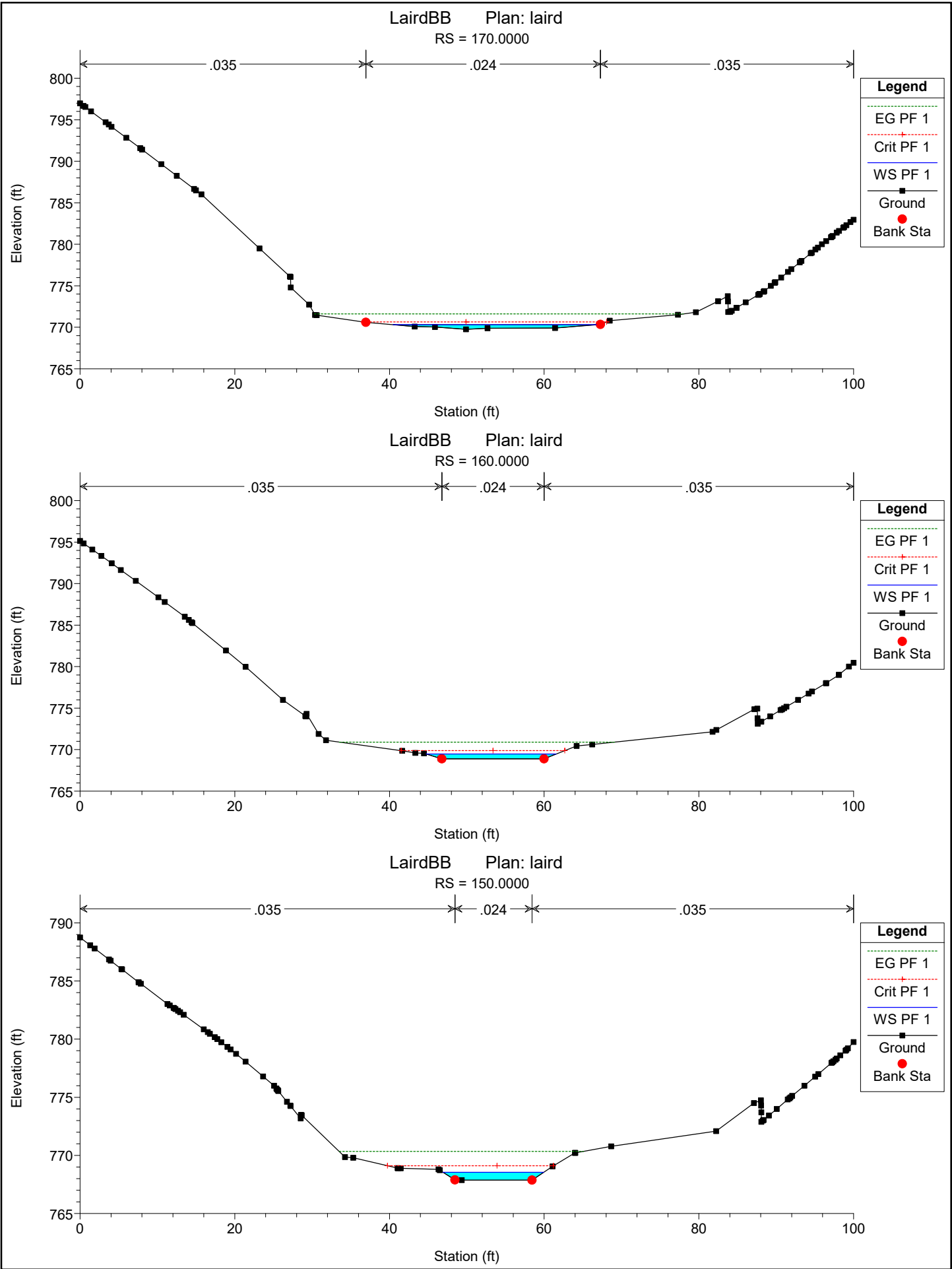
HEC-RAS Cross-sections

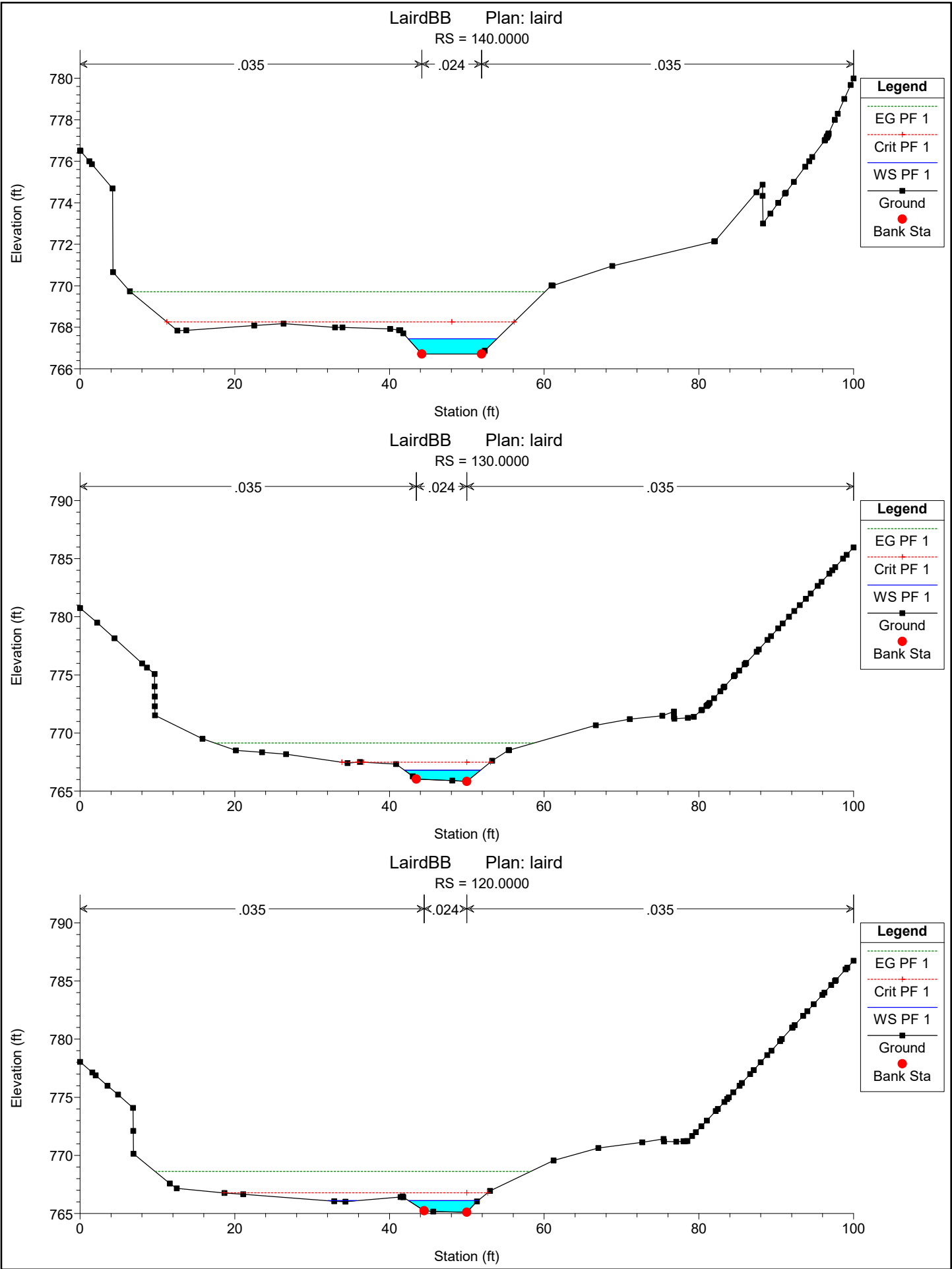
BURNED FLOW

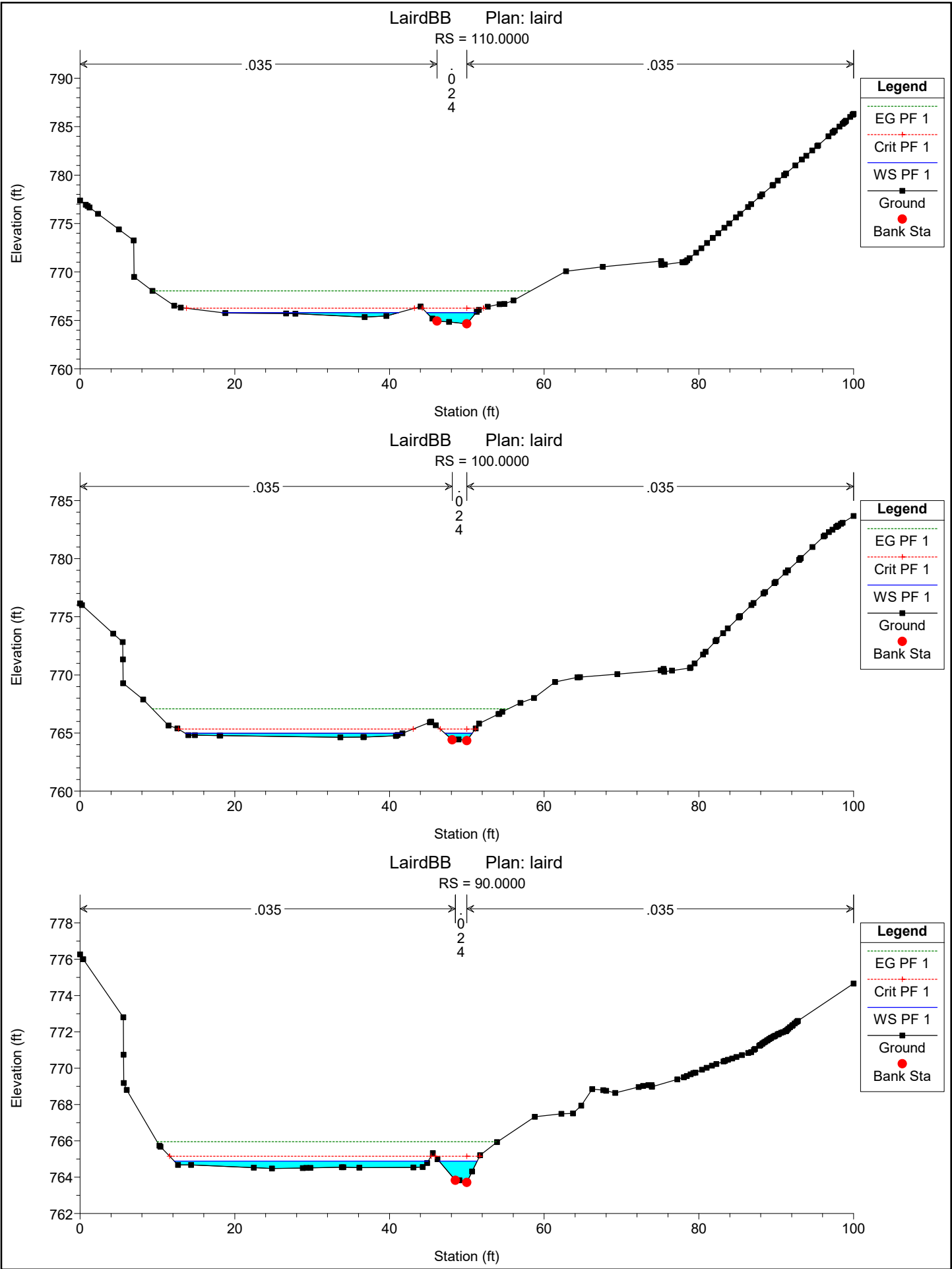


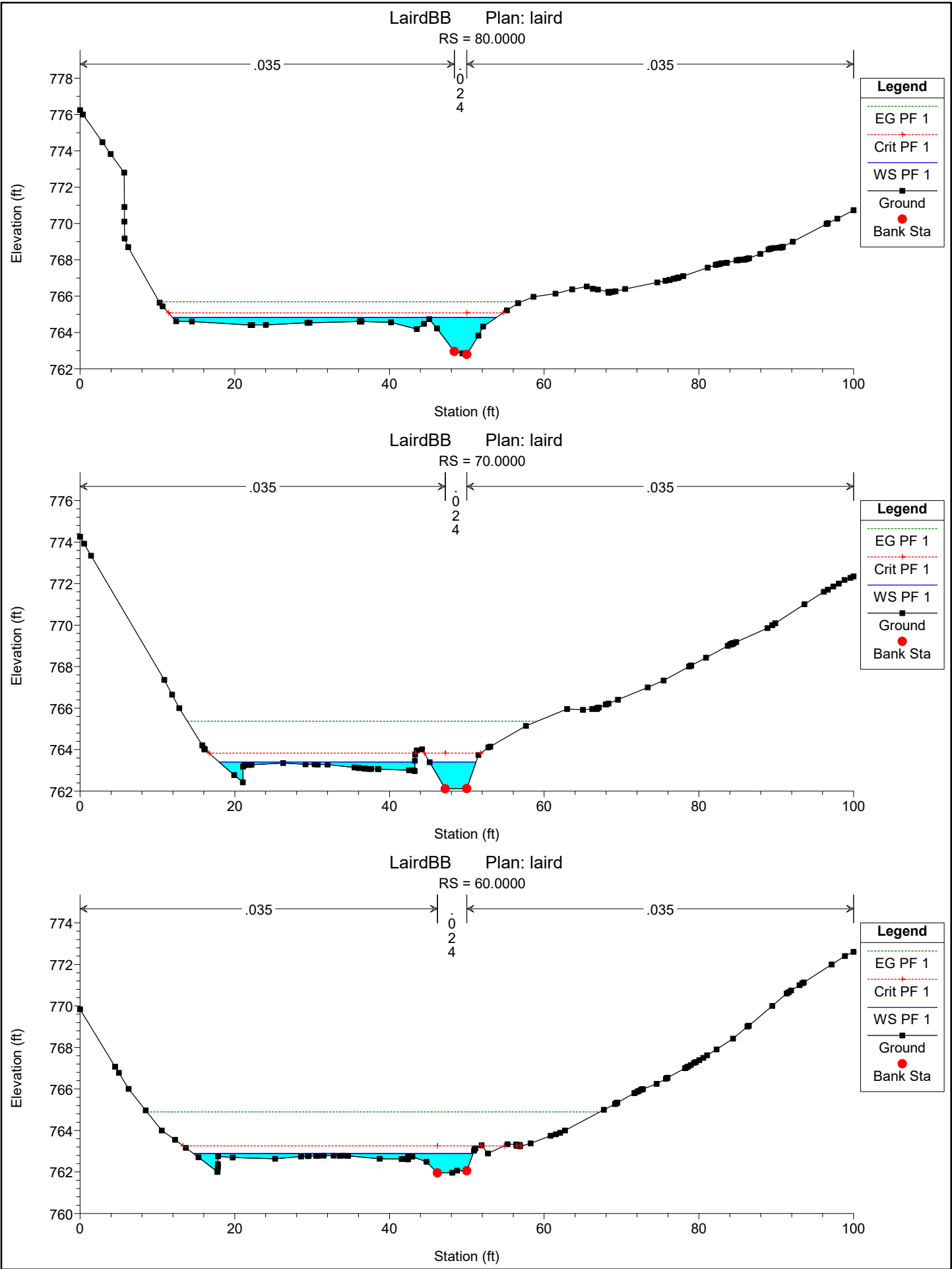


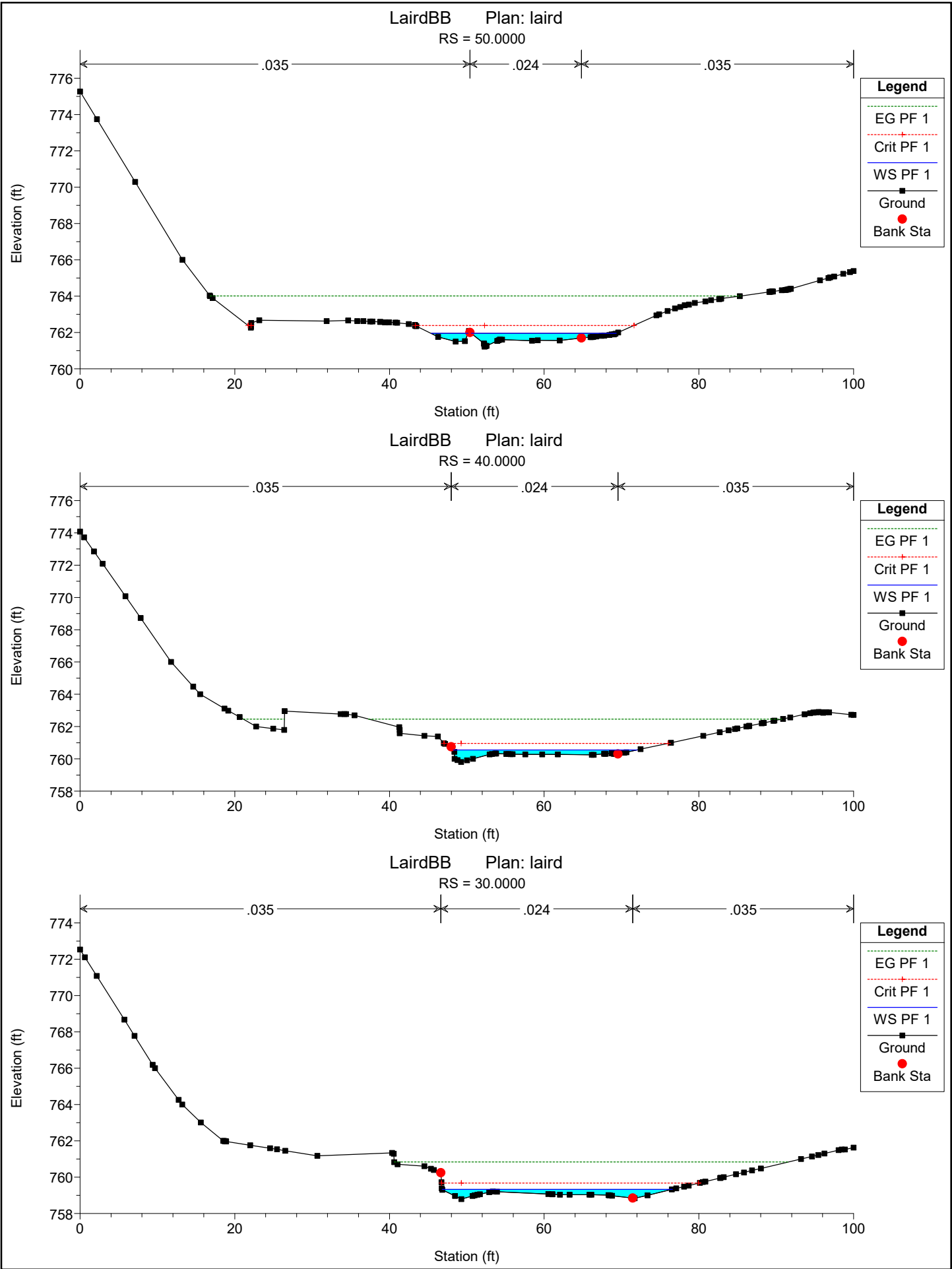


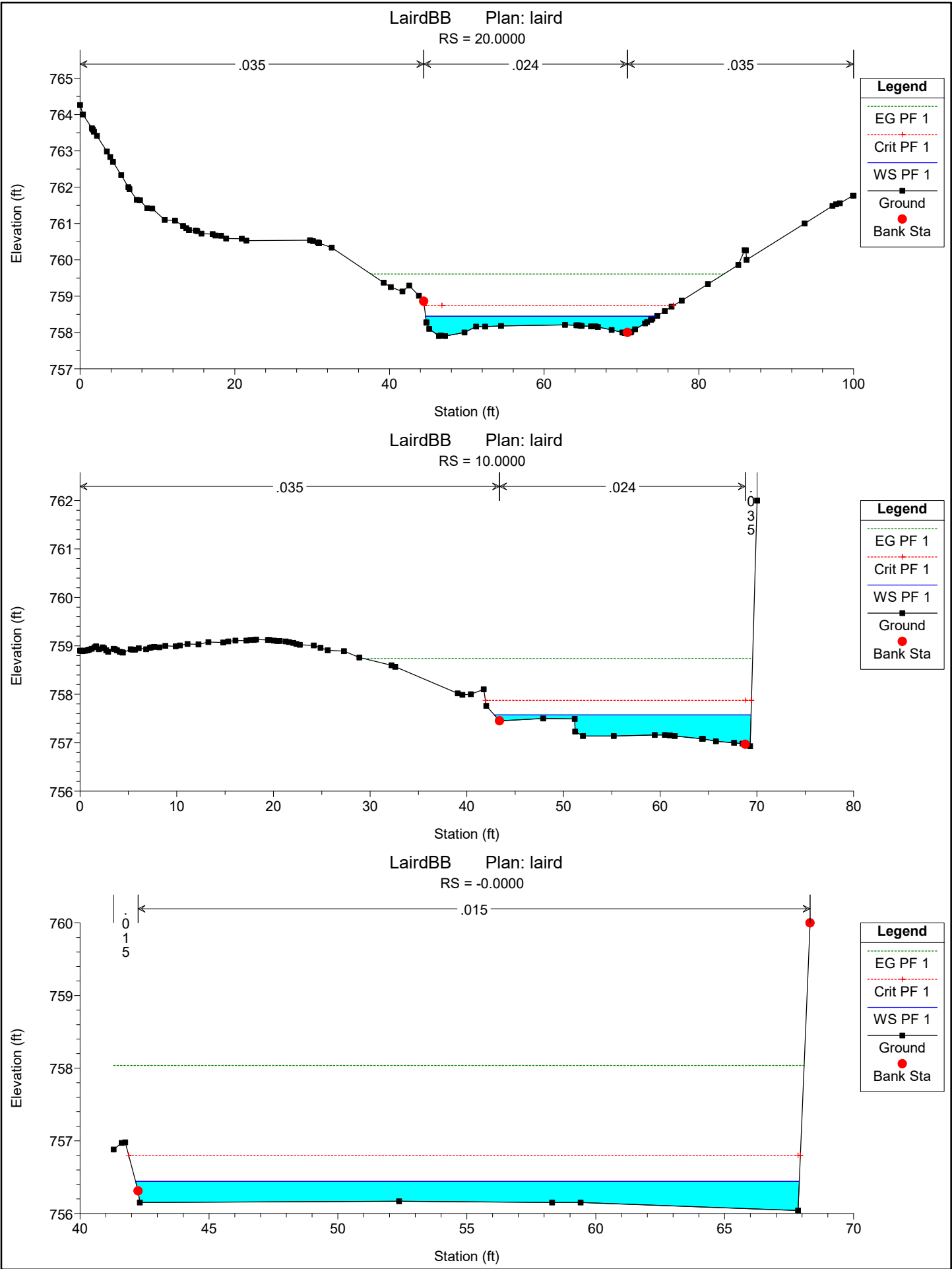












Appendix F

Proposed Driveway at 910 Laird Dr.

(N) wrought iron s

EXISTING 2-CAR GARAGE

EXISTING 2-CAR GARAGE
PUMP SHED

N35° 47' 35" E

FLOOD LIMIT

6'-0" HIGH WROG
GATE (W
moto

40' OAK
TAG #3

#3

L=44.02'
D=93.24'
R=28.66'

10% slope

EXISTING 2-CAR GARAGE

