

STRUCTURAL ENGINEERING

JUL 12 2006

WJK <input type="checkbox"/>	SM <input type="checkbox"/>	TJK <input type="checkbox"/>	JEM <input type="checkbox"/>
JAC <input type="checkbox"/>	RZ <input type="checkbox"/>	AW <input type="checkbox"/>	<input type="checkbox"/>
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SCI-823-0.00

PID No. 19415

S.R. 823 OVER LITTLE SCIOTO RIVER AND S.R. 335

Appendix G
Hydraulic Report

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Hydraulic Narrative

Project Description

TranSystems Corporation is providing engineering services to the Ohio Department of Transportation (ODOT) for the design of a new bypass state route around the town of Portsmouth, Ohio. The proposed alignment will carry two lanes of traffic, 15 plus miles in either direction, from an interchange with US 52 just east of Portsmouth to another interchange with US 23, located north of Portsmouth in Valley Township. As part of the project new left and right overpass structures will carry the proposed S.R. 823 bypass over both the Little Scioto River and S.R. 335. As requested by the Scope of Services, a hydraulic report is to be submitted before any plan development. The purpose of this report is to investigate the hydraulic impacts of the proposed crossing.

Design Criteria

The design year storm was selected as the 50 year as per the ODOT criteria. The proposed crossing is in a Federal Emergency Management Agency (FEMA) regulated flood plain and will be required to meet the requirements of the National Flood Insurance Program (NFIP). Scour will be investigated for the proposed structure and use a 500 year design storm. The 500 year runoff is not contained within the modeling parameters of the USGS Water Resources Investigation Report 89-4126. Common practice is to calculate the flow 500 year flow (Q_{500}) by multiplying 1.3 times the 100 year flow (Q_{100}). This is as suggested in the ODOT Bridge Design Manual section 203.3 and it is utilized in this report.

Structure Hydraulics

Structure hydraulics were calculated using HEC-RAS ver. 3.1.3. The main channel was considered clean and straight. The banks have large trees but the channel flow does not reach into the tree canopy. This study used manning numbers of 0.035 for the channel and 0.10 for the overbank in locations outside of the bridge cross sections. The drainage area was obtained from USGS 7.5 minute Quad Maps and verified by comparison with Ohio Department of Natural Resources' (ODNR) *Gazetteer of Ohio Streams*. Backwater from the Ohio River will reach the proposed crossing for all of the storms included in the 2002 Flood Insurance Study (FIS). The drainage area for the Ohio River is over 300 times greater than the drainage area of the Little Scioto River and it is common practice to neglect the effect of the backwater in the design of the structure when such large differences exist, reference section 1105.7.1 of the ODOT Location and Design Manual Vol. 2. Given the potential effects of backwater on the structure three flow models were used; one that does not include the effects of backwater and another assumes the 10 year frequency of the Ohio River as a known water surface for the 100 year flow in the Little Scioto and the last with concurrent 100 year storms of both watersheds. A more detailed hydrologic study of the backwater is considered beyond the scope of this report. Starting conditions for the HEC-RAS model, not including backwater, used a normal depth set to balance the energy gradient. The Slocum Avenue Bridge, approximately 1500' downstream of the proposed crossing, was included in the model based upon existing plan data. Hydraulic data given on the plans differs from the information calculated in this study. The differences could be attributed to different calculation methodologies; however the previous methods are unknown. The HEC-RAS for the three structure alternatives and the three associated flow models is summarized in Tables 1, 2 & 3. A copy of the HEC-RAS files for are included on a disk attached to this report.

Table-1 Alternative 1 Hydraulic Results

	Existing Conditions no backwater	Proposed Alternative 1 no backwater	Existing Conditions 10 yr. backwater	Proposed Alternative 1 10 yr. backwater	Existing Conditions 100 yr. backwater	Proposed Alternative 1 100 yr. backwater
Q ₅₀₀	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs
V ₅₀₀	8.9 fps	8.6 fps	3.3 fps	2.5 fps	2.5 fps	1.8 fps
HW ₅₀₀	511.0	511.2	534.9	534.9	544.2	544.3
Q ₁₀₀	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs
V ₁₀₀	8.14 fps	8.1 fps	3.0 fps	2.4 fps	2.3 fps	1.7 fps
HW ₁₀₀	508.1	508.2	529.1	529.2	538.1	538.1
Q ₅₀	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs
V ₅₀	7.8 fps	7.7 fps	2.9 fps	2.4 fps	2.2 fps	1.6 fps
HW ₅₀	506.8	506.9	526.6	526.7	535.4	535.4

Table-2 Alternative 2a&2b Hydraulic Results

	Existing Conditions no backwater	Proposed Alternative 2 no backwater	Existing Conditions 10 yr. backwater	Proposed Alternative 2 10 yr. backwater	Existing Conditions 100 yr. backwater	Proposed Alternative 2 100 yr. backwater
Q ₅₀₀	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs
V ₅₀₀	8.9 fps	8.6 fps	3.3 fps	2.5 fps	2.5 fps	1.8 fps
HW ₅₀₀	511.0	511.1	534.9	534.7	544.2	544.3
Q ₁₀₀	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs
V ₁₀₀	8.1 fps	7.7 fps	3.0 fps	2.4 fps	2.3 fps	1.7 fps
HW ₁₀₀	508.1	508.2	529.1	529.2	538.1	538.1
Q ₅₀	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs
V ₅₀	7.8 fps	7.3 fps	2.9 fps	2.4 fps	2.2 fps	1.6 fps
HW ₅₀	506.8	506.8	526.6	526.5	535.4	535.4

Table-3 Alternative 3a&3b Hydraulic Results

	Existing Conditions no backwater	Proposed Alternative 3 no backwater	Existing Conditions 10 yr. backwater	Proposed Alternative 3 10 yr. backwater	Existing Conditions 100 yr. backwater	Proposed Alternative 3 100 yr. backwater
Q ₅₀₀	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs	19,717 cfs
V ₅₀₀	8.9 fps	8.6 fps	3.3 fps	2.5 fps	2.5 fps	1.8 fps
HW ₅₀₀	511.0	511.1	534.8	534.9	544.2	544.3
Q ₁₀₀	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs	15,167 cfs
V ₁₀₀	8.1 fps	8.1 fps	3.0 fps	2.4 fps	2.3 fps	1.6 fps
HW ₁₀₀	508.1	508.2	529.1	529.2	538.1	538.1
Q ₅₀	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs	13,337 cfs
V ₅₀	7.8 fps	7.7 fps	2.9 fps	2.4 fps	2.2 fps	1.2 fps
HW ₅₀	506.8	506.8	526.6	526.7	535.4	535.4

Scour Analysis

Scour analysis was performed based upon the geometry of the preferred structure (Alternative 1). The analysis indicates a contraction scour of 3.14' and pier scour of 21.07' for a total scour depth of 24.21'. Factors that contribute to the high scour depths are proposed piers meet the flow at an attack angle of approximately 23degrees and the large curve in the river. The bridge will be founded upon drilled shafts, socketed into bedrock so scour is not a concern.

Flood Hazard Evaluation

The preferred structure (Alternative1) increases the water surface elevation by 0.10' for the 100 year storm when backwater from the Ohio River is not considered. From the Flood Insurance Rate Map (FIRM), approximately 200 feet downstream, the 100 year flood elevation is 538. The proposed bridge crosses in the FIRM flood zone designated as ZONE A. This zone has no base flood elevation determination. Due to the proximity of the known downstream 100 year flood elevation (538), the flood elevation in ZONE A would be at least 538. A check of contours through the houses adjacent to the proposed bridge show elevations of 554 or higher. Therefore the existing flood would not encroach upon the houses adjacent to the proposed bridge.

RUNOFF CALCULATION

**TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A**
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

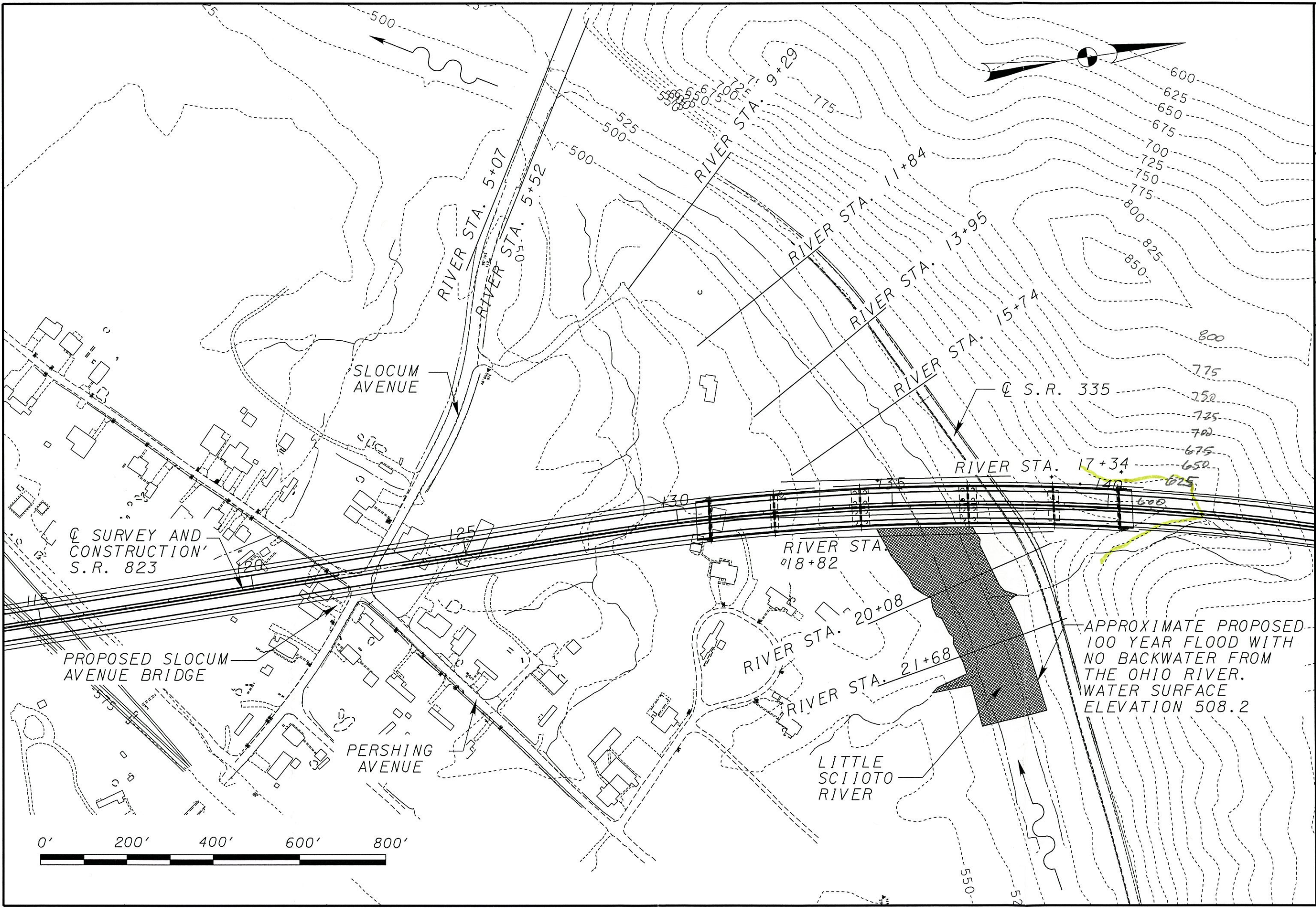
	Values	Units	Definitions
	6236354100	SQ. FT.	
	223.70	SQ. MI.	CONTDA = Contributing Drainage Area
	0.00	SQ. FT.	
	0.00	%	STORAGE = Storage Area
	189555.00	FT.	TOTAL CHANNEL LENGTH
	18955.50	FT.	L₁₀ = 10% of the Distance along channel
	505.00	FT.	Elev₁₀ = Elevation at point L₁₀
	161121.75	FT.	L₈₅ = 85% of the Distance along channel
	622.00	FT.	Elev₈₅ = Elevation at point L₈₅
	142166.25	FT.	Length = L₈₅ - L₁₀
	4.35	FT./MI.	SLOPE = (Elev ₁₀ -Elev ₈₅)/Length
		CFS	Q_# = Flood-Peak Discharge
			# = Frequency of Storm
Q₂	4967.52	CFS	= 56.1(CONTDA) ^{0.782} (SLOPE) ^{0.172} (STORAGE+1) ^{-0.297}
Q₅	7494.64	CFS	= 84.5(CONTDA) ^{0.769} (SLOPE) ^{0.221} (STORAGE+1) ^{-0.322}
Q₁₀	9286.53	CFS	= 104(CONTDA) ^{0.764} (SLOPE) ^{0.244} (STORAGE+1) ^{-0.335}
Q₂₅	11608.38	CFS	= 129(CONTDA) ^{0.760} (SLOPE) ^{0.264} (STORAGE+1) ^{-0.347}
Q₅₀	13336.78	CFS	= 148(CONTDA) ^{0.757} (SLOPE) ^{0.276} (STORAGE+1) ^{-0.355}
Q₁₀₀	15166.95	CFS	= 167(CONTDA) ^{0.756} (SLOPE) ^{0.285} (STORAGE+1) ^{-0.363}
Q₅₀₀	19717.04	CFS	= 1.3*Q ₁₀₀ (Ref. ODOT BDM 203.3)

**TECHNIQUES FOR ESTIMATING FLOOD-PEAK
DISCHARGES OF RURAL, UNREGULATED STREAMS IN OHIO AREA A**
U.S. GEOLOGICAL SURVEY Water Resources Investigations Report 89-4126

	Values	Units	Definitions
	6239894700	SQ. FT.	
	223.83	SQ. MI.	CONTDA = Contributing Drainage Area
	0.00	SQ. FT.	
	0.00	%	STORAGE = Storage Area
	190885.00	FT.	TOTAL CHANNEL LENGTH
	19088.50	FT.	L₁₀ = 10% of the Distance along channel
	504.95	FT.	Elev₁₀ = Elevation at point L₁₀
	162252.25	FT.	L₈₅ = 85% of the Distance along channel
	622.80	FT.	Elev₈₅ = Elevation at point L₈₅
	143163.75	FT.	Length = L₈₅ - L₁₀
	4.35	FT./MI.	SLOPE = (Elev ₁₀ -Elev ₈₅)/Length
		CFS	Q_# = Flood-Peak Discharge
			# = Frequency of Storm
Q₂	4969.93	CFS	= 56.1(CONTDA) ^{0.782} (SLOPE) ^{0.172} (STORAGE+1) ^{-0.297}
Q₅	7498.32	CFS	= 84.5(CONTDA) ^{0.769} (SLOPE) ^{0.221} (STORAGE+1) ^{-0.322}
Q₁₀	9291.12	CFS	= 104(CONTDA) ^{0.764} (SLOPE) ^{0.244} (STORAGE+1) ^{-0.335}
Q₂₅	11614.15	CFS	= 129(CONTDA) ^{0.760} (SLOPE) ^{0.264} (STORAGE+1) ^{-0.347}
Q₅₀	13343.42	CFS	= 148(CONTDA) ^{0.757} (SLOPE) ^{0.276} (STORAGE+1) ^{-0.355}
Q₁₀₀	15174.53	CFS	= 167(CONTDA) ^{0.756} (SLOPE) ^{0.285} (STORAGE+1) ^{-0.363}
Q₅₀₀	19726.89	CFS	= 1.3*Q100 (Ref. ODOT BDM 203.3)

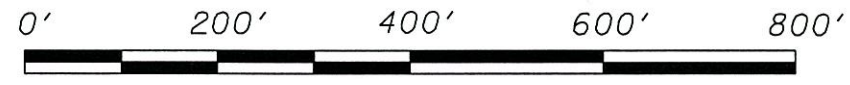
SUPPLEMENTAL SITE PLAN





	DESIGN AGENCY
	DATE
REVIEWED	DATE
DATE	7/12/06
HJS	STRUCTURE FILE NUMBER
CAS	REVISED
PJP	CHECKED
DESIGNED	
SCIOTO CO	
STA. 131+37.49	
STA. 139+62.51	
SUPPLEMENTAL SITE PLAN	
BRIDGE NO. SCI-823-XXXX	
SR 823 OVER S.R. 335 AND LITTLE SCIOTO RIVER	
SCI-823-0.00	
PID 19415	

APPROXIMATE PROPOSED 100 YEAR FLOOD WITH NO BACKWATER FROM THE OHIO RIVER. WATER SURFACE ELEVATION 508.2





Downstream of the Proposed Bridge



Upstream of the Proposed Bridge



Downstream of Existing Slocum Road Bridge



Upstream of Existing Slocum Road Bridge

Appendix I
Hydraulic Calculations
Existing Conditions

HEC-RAS Plan: Exist no BW River: Little Scioto Reach: Reach-1

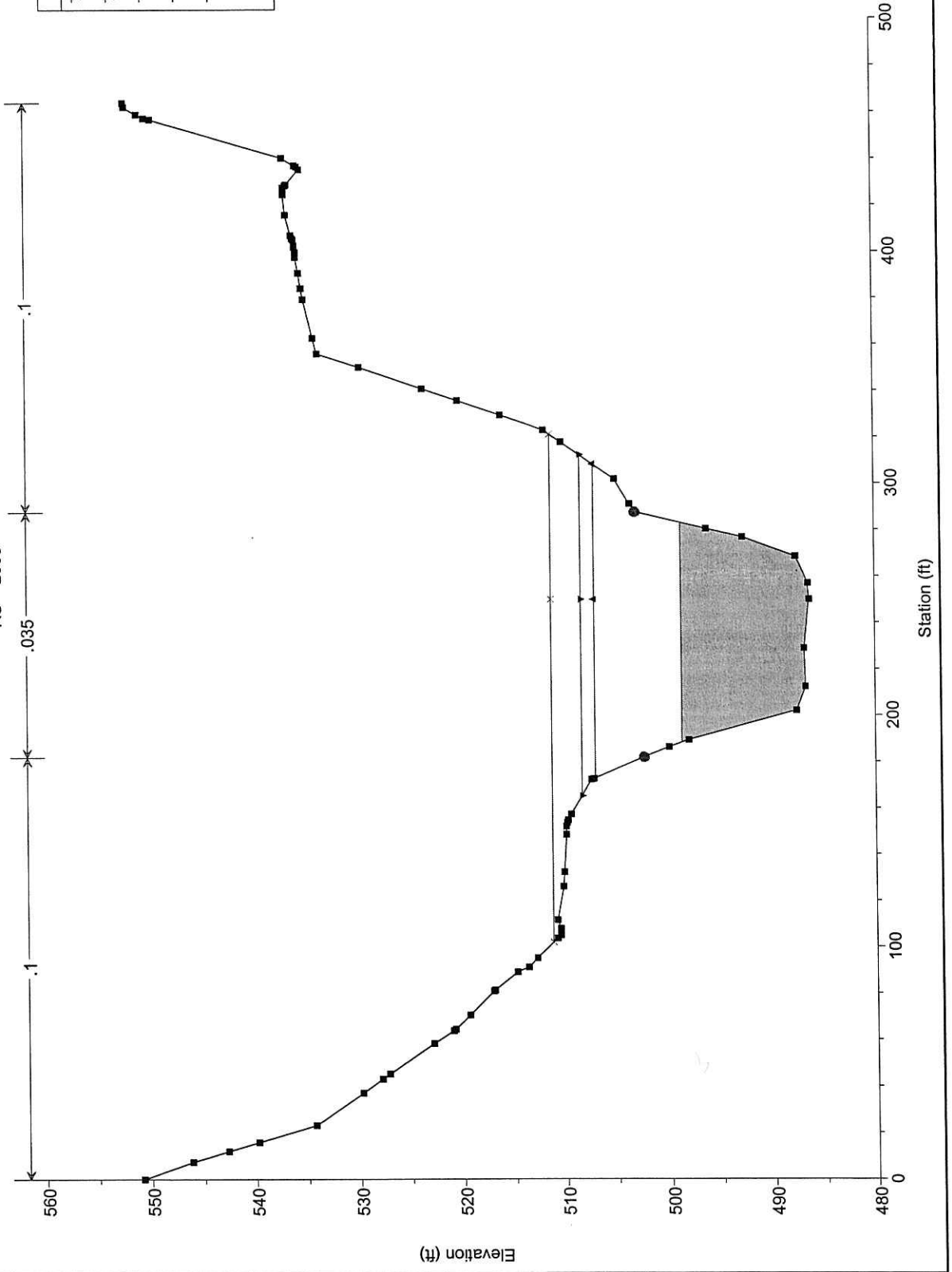
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit.W.S. (ft)	E/G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chml (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4986.00	486.50	498.93		499.32	0.000793	5.01	995.72	109.96	0.29
Reach-1	2169	Q 50	13337.00	486.50	507.32		508.01	0.000675	6.65	2054.39	152.54	0.29
Reach-1	2169	Q 100	15167.00	486.50	508.65		509.40	0.000666	6.97	2261.38	158.39	0.29
Reach-1	2169	Q 500	19717.00	486.50	511.57		512.48	0.000662	7.70	2744.18	173.64	0.30
Reach-1	2008	Q 2	4986.00	486.40	498.77		499.19	0.000771	5.22	955.04	94.61	0.29
Reach-1	2008	Q 50	13337.00	486.40	507.04		507.88	0.000774	7.36	1875.86	135.24	0.31
Reach-1	2008	Q 100	15167.00	486.40	508.34		509.27	0.000779	7.75	2058.85	147.03	0.32
Reach-1	2008	Q 500	19717.00	486.40	511.20		512.34	0.000800	8.65	2563.52	219.08	0.33
Reach-1	1882	Q 2	4986.00	486.40	498.58		499.08	0.000960	5.69	876.68	89.55	0.32
Reach-1	1882	Q 50	13337.00	486.40	506.83		507.76	0.000947	7.75	1751.91	130.74	0.34
Reach-1	1882	Q 100	15167.00	486.40	508.13		509.16	0.000940	8.14	1930.61	147.90	0.35
Reach-1	1882	Q 500	19717.00	486.40	511.01		512.23	0.000921	8.93	2557.50	245.72	0.35
Reach-1	1734	Q 2	4986.00	486.40	498.53		498.92	0.000752	5.01	995.03	104.89	0.29
Reach-1	1734	Q 50	13337.00	486.40	506.86		507.58	0.000696	6.82	1972.35	150.04	0.30
Reach-1	1734	Q 100	15167.00	486.40	508.17		508.97	0.000690	7.15	2226.35	206.21	0.30
Reach-1	1734	Q 500	19717.00	486.40	511.09		512.03	0.000679	7.86	2857.16	230.85	0.31
Reach-1	1574	Q 2	4970.00	486.30	498.34		498.79	0.000849	5.34	930.63	96.82	0.30
Reach-1	1574	Q 50	13343.00	486.30	506.65		507.44	0.000879	7.13	1885.65	155.79	0.33
Reach-1	1574	Q 100	15175.00	486.30	507.98		508.84	0.000848	7.42	2116.05	184.91	0.33
Reach-1	1574	Q 500	19727.00	486.30	510.91		511.91	0.000799	8.06	2690.78	205.87	0.33
Reach-1	1395	Q 2	4970.00	486.30	498.17		498.63	0.000897	5.43	914.75	96.51	0.31
Reach-1	1395	Q 50	13343.00	486.30	506.44		507.28	0.000855	7.36	1852.23	148.03	0.33
Reach-1	1395	Q 100	15175.00	486.30	507.76		508.68	0.000842	7.71	2053.84	159.96	0.33
Reach-1	1395	Q 500	19727.00	486.30	510.65		511.75	0.000829	8.49	2557.53	186.53	0.33
Reach-1	1185	Q 2	4970.00	486.30	497.97		498.44	0.000935	5.49	905.48	97.46	0.32
Reach-1	1185	Q 50	13343.00	486.30	506.26		507.10	0.000879	7.36	1822.94	131.24	0.33
Reach-1	1185	Q 100	15175.00	486.30	507.58		508.50	0.000864	7.71	2002.84	141.38	0.33
Reach-1	1185	Q 500	19727.00	486.30	510.45		511.57	0.000853	8.51	2424.89	152.03	0.34
Reach-1	929	Q 2	4970.00	486.24	497.70		498.19	0.000999	5.62	884.94	96.82	0.33
Reach-1	929	Q 50	13343.00	486.24	506.01		506.87	0.000917	7.46	1797.78	129.49	0.34
Reach-1	929	Q 100	15175.00	486.24	507.33		508.27	0.000896	7.79	1976.44	140.03	0.34

HEC-RAS Plan: Exist no BW River: Little_Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 500	19727.00	486.24	510.21		511.35	0.000878	8.58	2397.55	151.38	0.34
Reach-1	552	Q 2	4970.00	485.40	497.32	492.10	497.80	0.001007	5.56	893.12	100.38	0.33
Reach-1	552	Q 50	13343.00	485.40	505.67	496.56	506.53	0.000892	7.44	1799.14	124.33	0.33
Reach-1	552	Q 100	15175.00	485.40	506.99	497.33	507.94	0.000878	7.80	1972.75	135.34	0.33
Reach-1	552	Q 500	19727.00	485.40	509.88	499.11	511.02	0.000870	8.61	2387.81	152.23	0.34
Reach-1	529	Bridge										
Reach-1	507	Q 2	4970.00	485.20	497.14	491.97	497.73	0.001200	6.19	802.92	85.29	0.36
Reach-1	507	Q 50	13343.00	485.20	505.25	496.81	506.40	0.001200	8.60	1562.38	108.84	0.38
Reach-1	507	Q 100	15175.00	485.20	506.53	497.67	507.80	0.001200	9.05	1709.76	126.34	0.38
Reach-1	507	Q 500	19727.00	485.20	509.33	499.69	510.86	0.001200	9.99	2098.63	144.65	0.39

SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

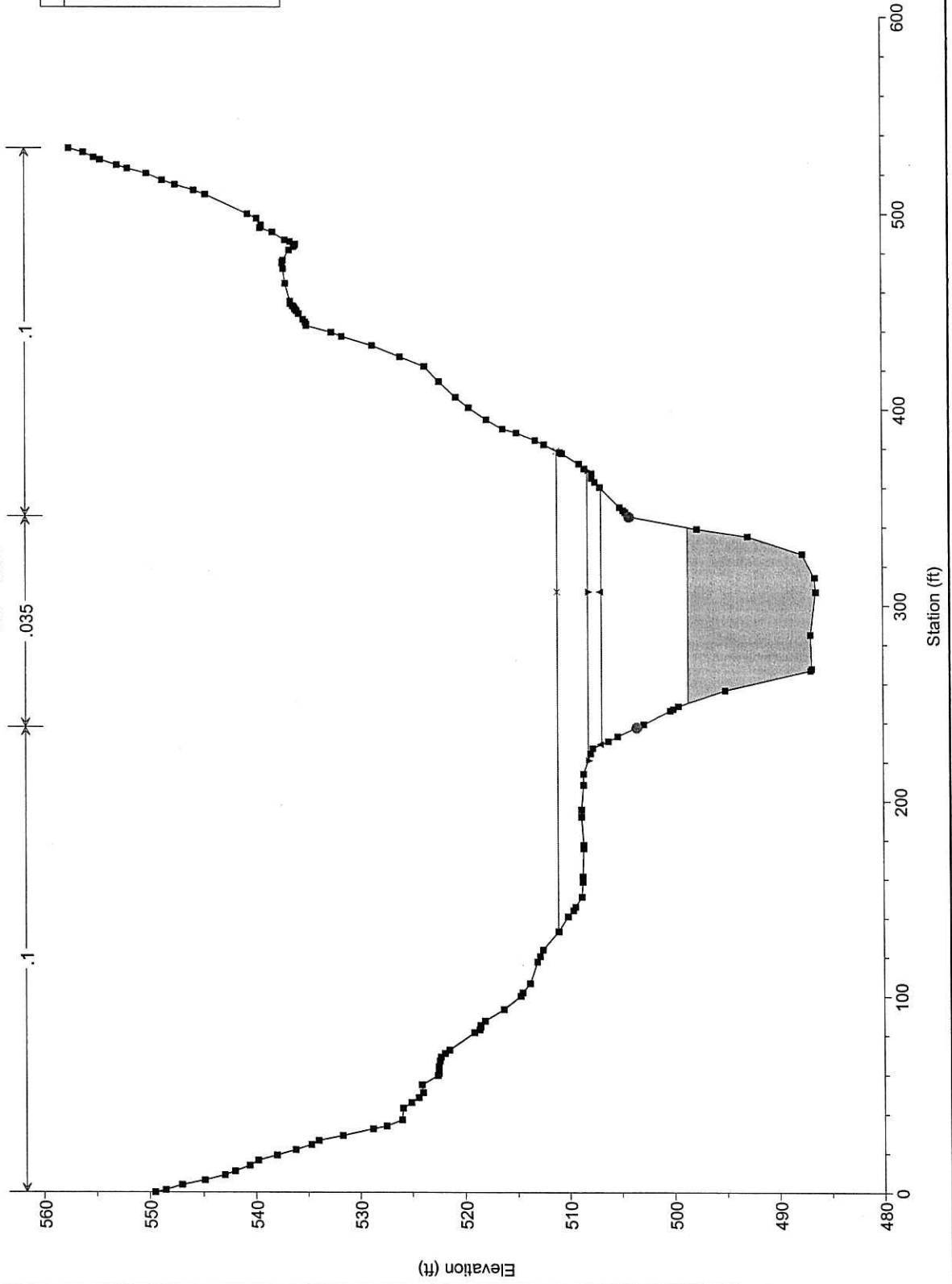
RS = 2008



Legend	
WS Q 500	▲
WS Q 100	▼
WS Q 50	▲
WS Q 2	▼
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

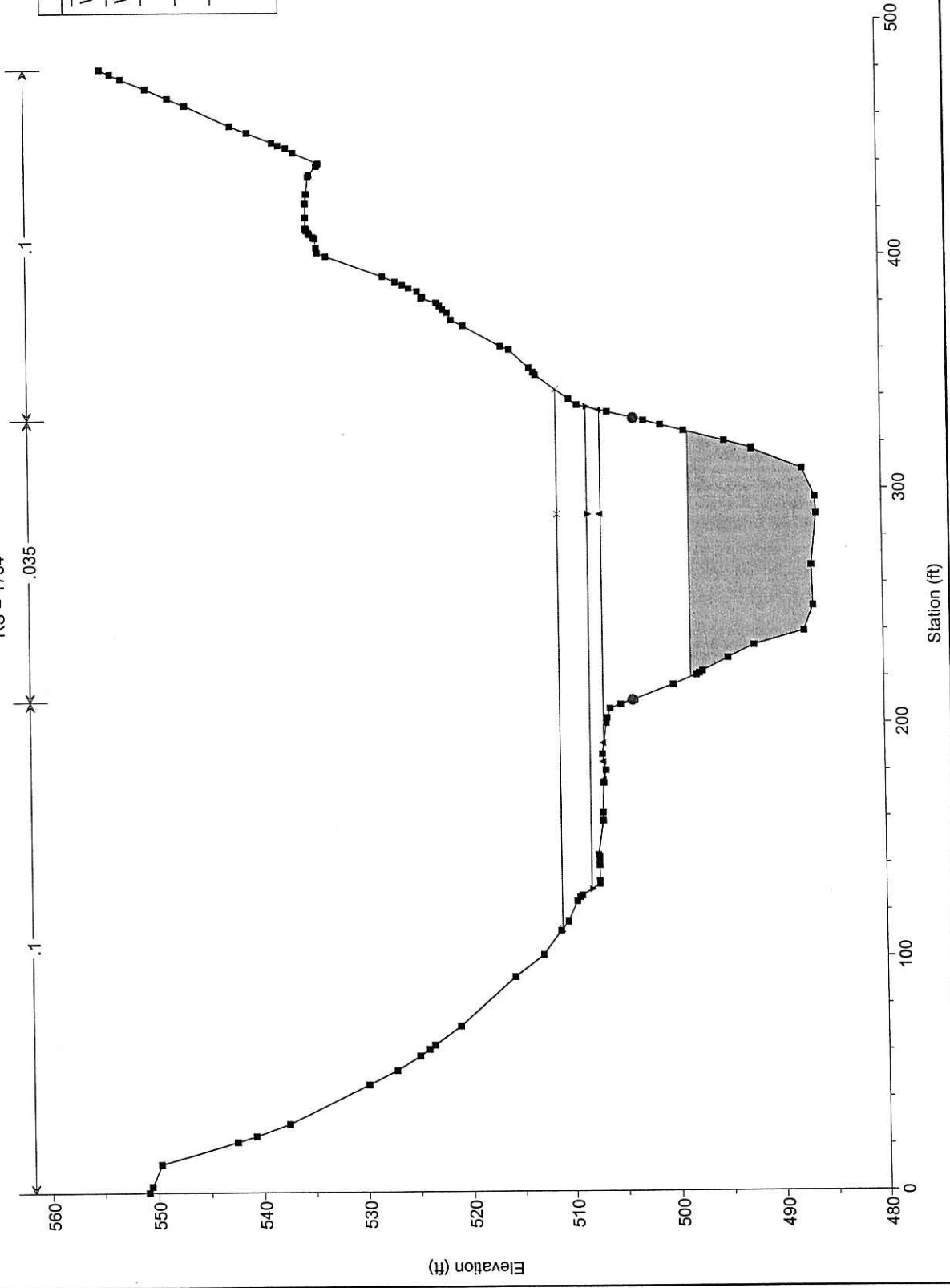
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WS Q 500	Bank Sta
WS Q 100	Ground
WS Q 50	Bank Sta
WS Q 2	Ground
Ground	Bank Sta
Bank Sta	Ground

SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

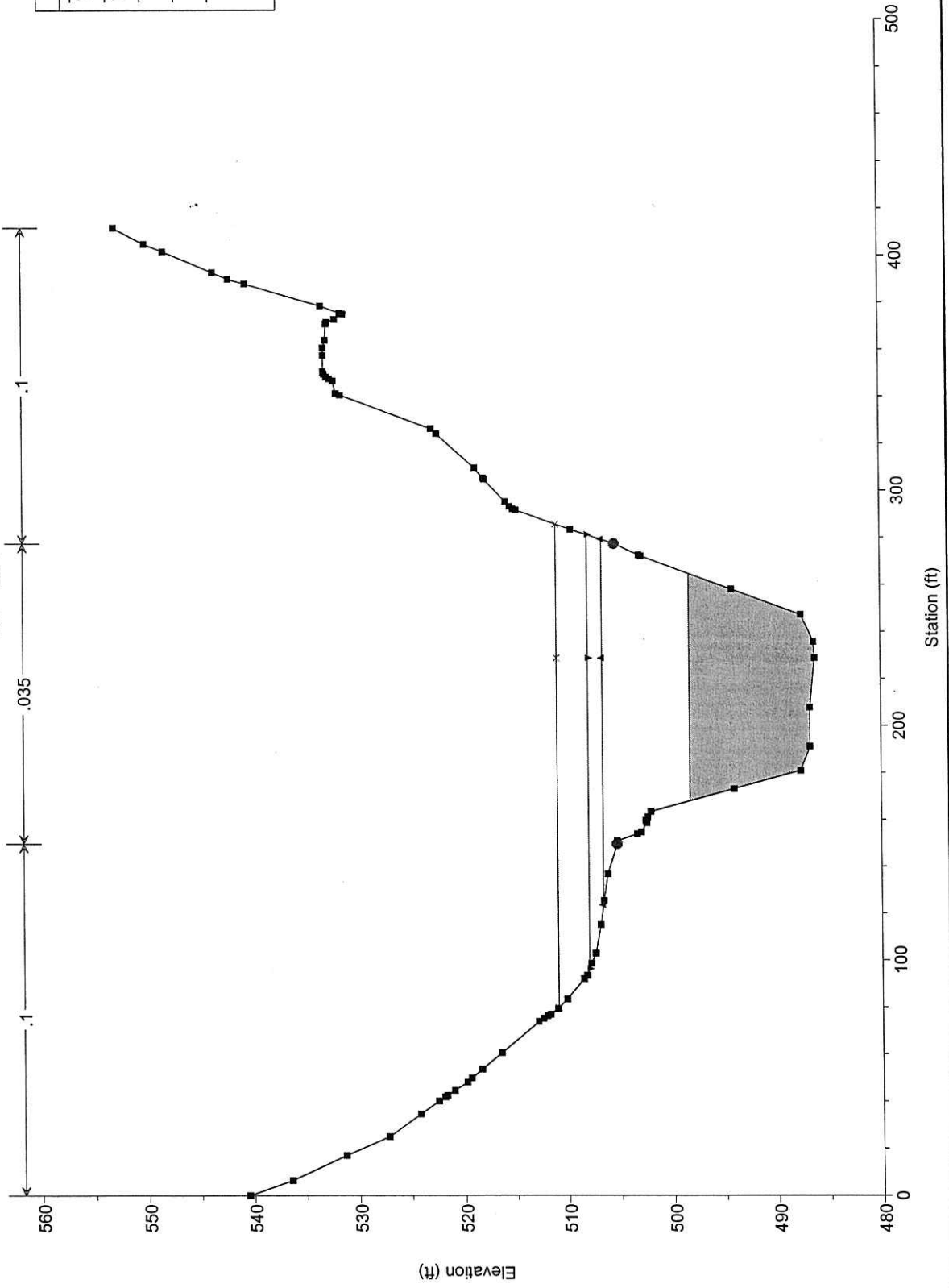
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Legend	
WS Q 500	x
WS Q 100	v
WS Q 50	u
WS Q 2	w
Ground	—■—
Bank Sta	—●—

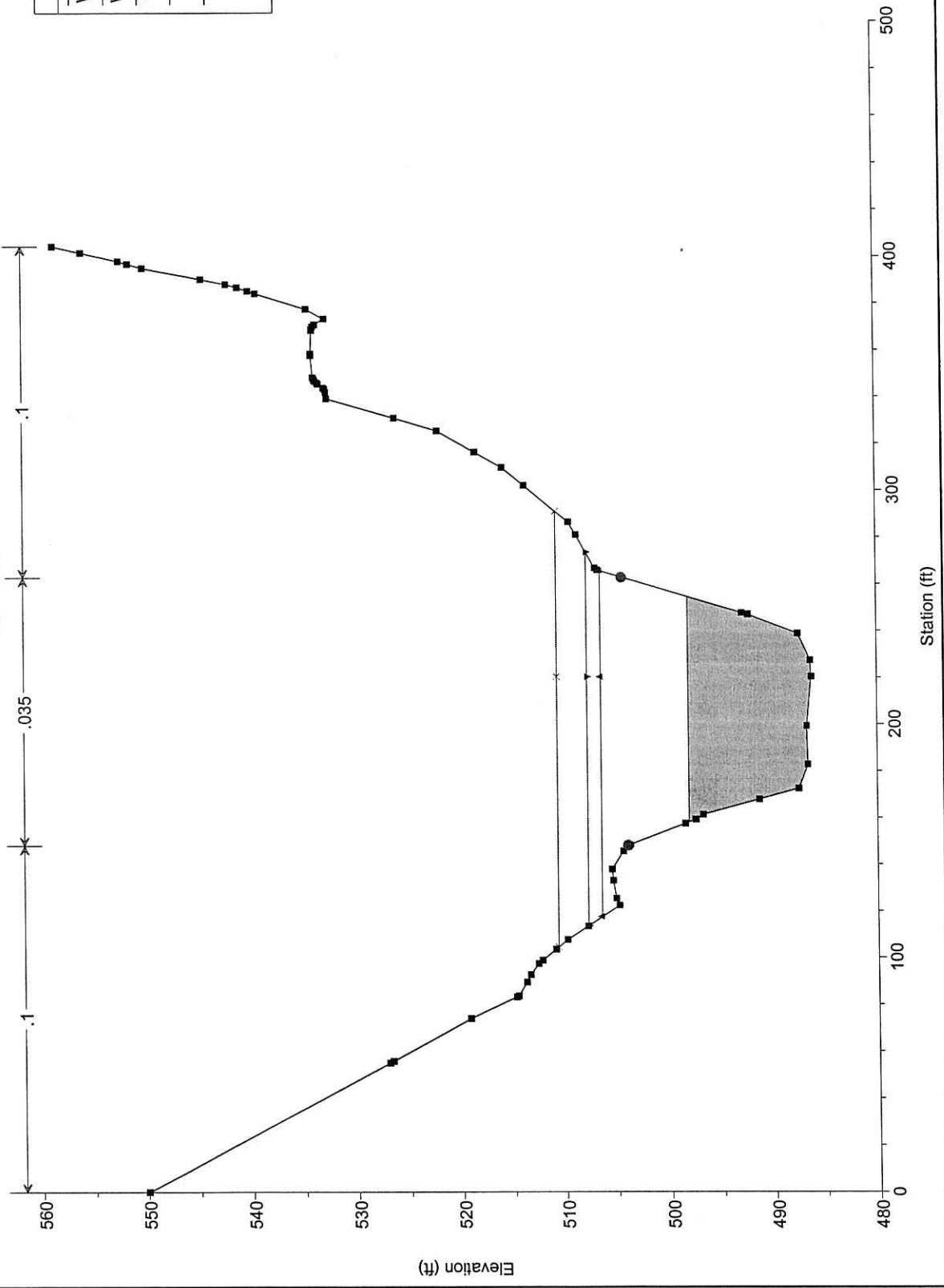
SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

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SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

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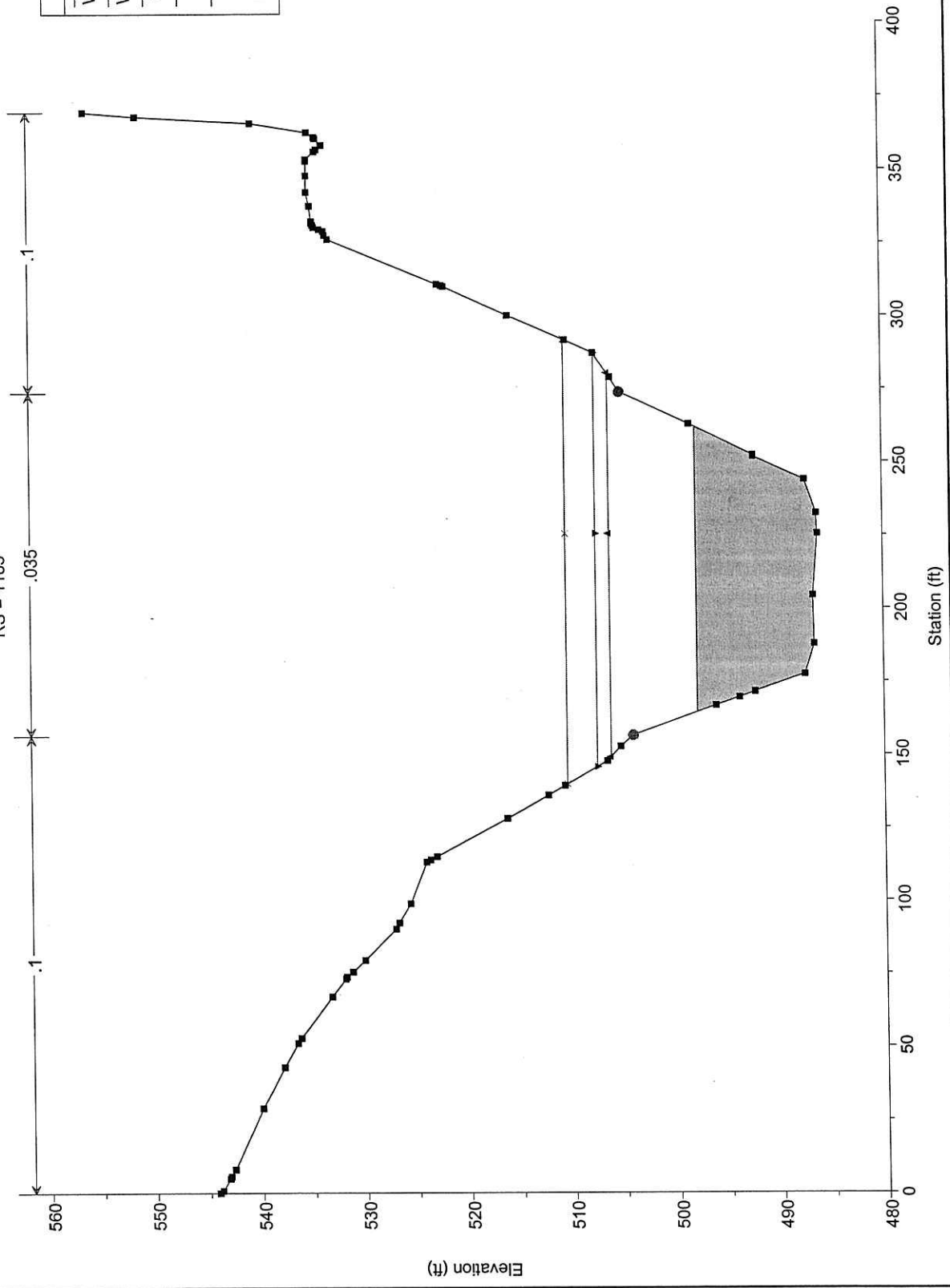


Legend	
— x —	WS Q 500
- - - x - - -	WS Q 100
- - - - - x - - - - -	WS Q 50
— ■ —	Ground
●	Bank Sta

SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

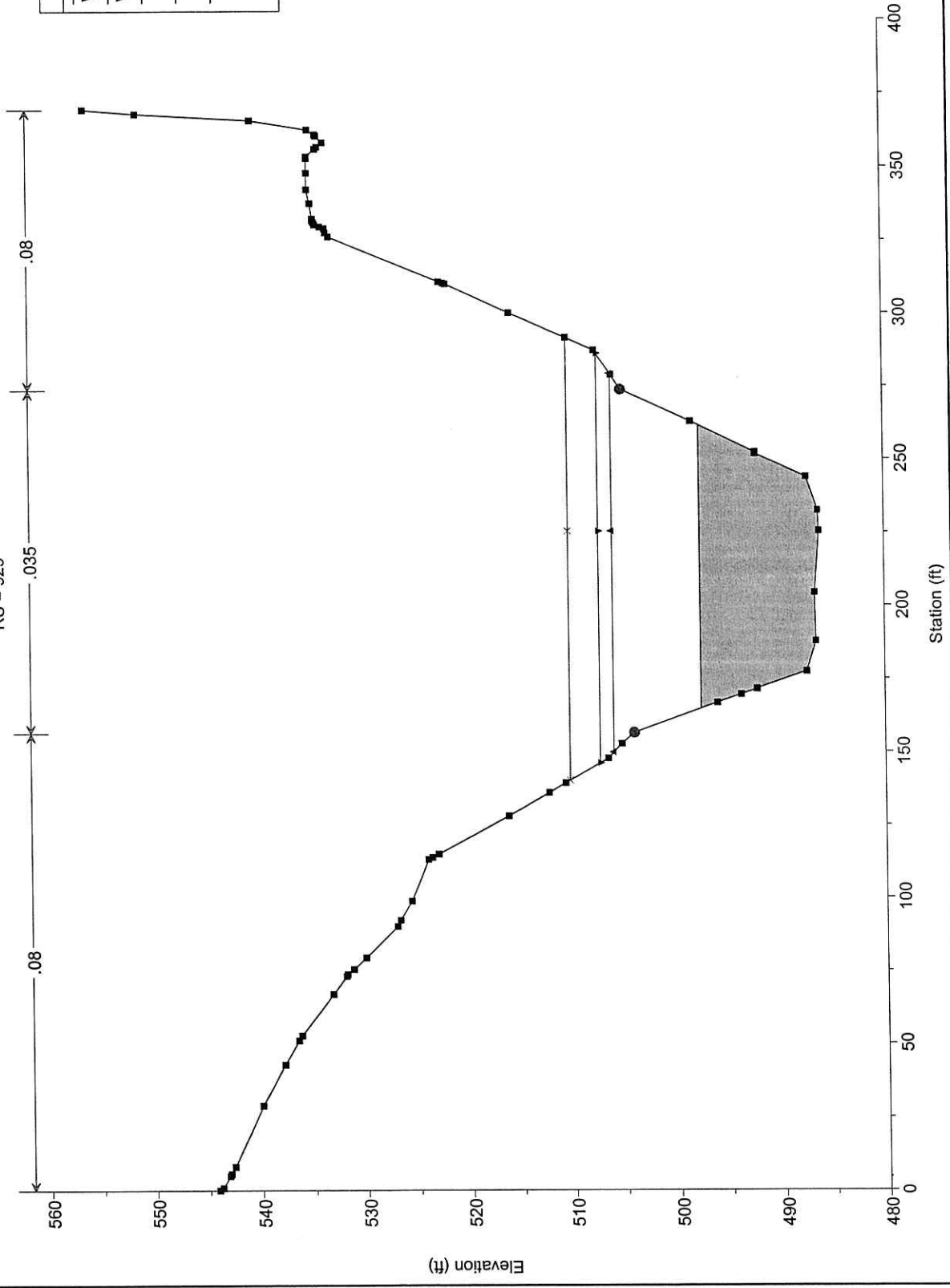
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Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●



SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

RS = 929

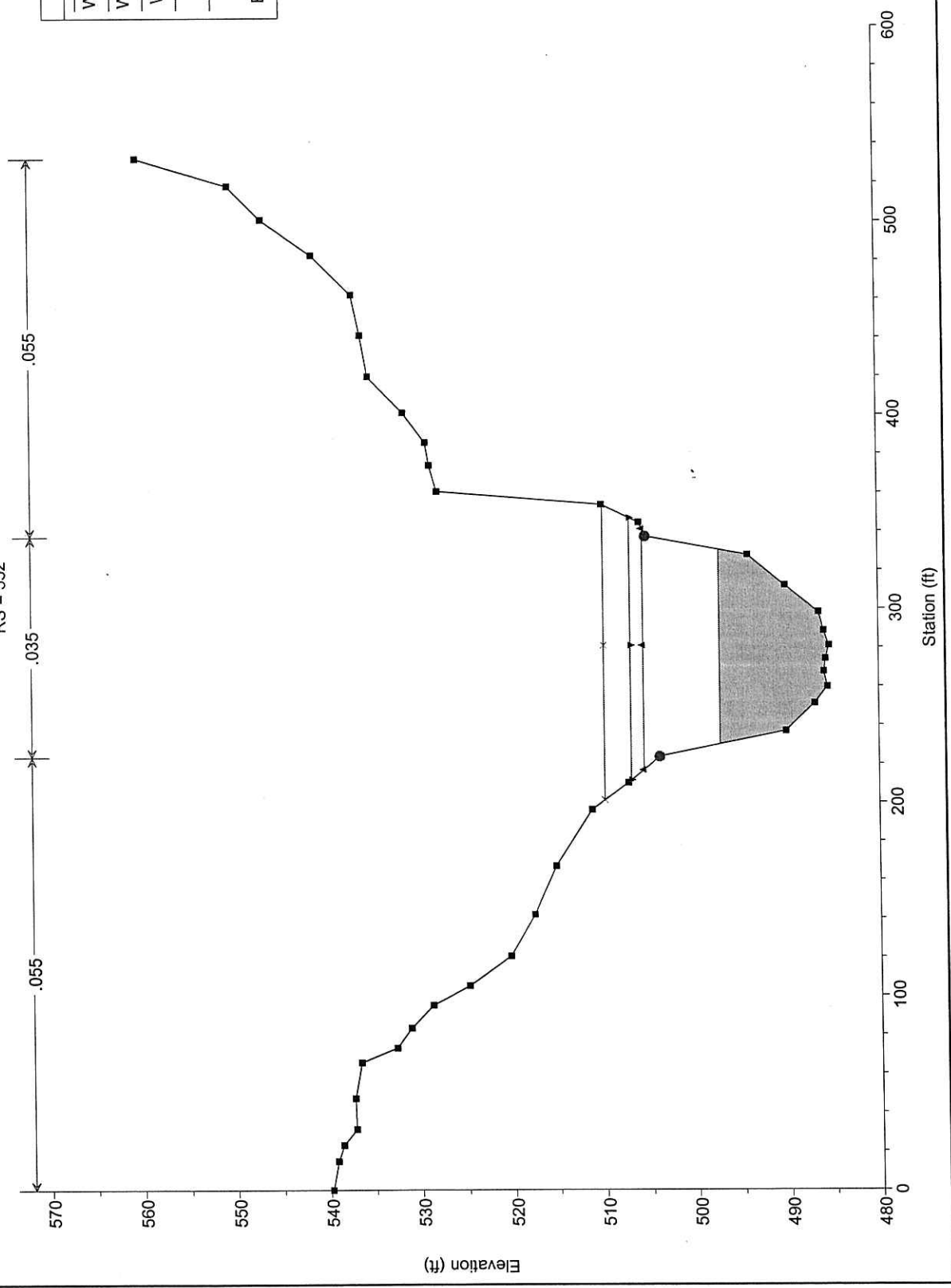


Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
■	Ground
●	Bank Sta

SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

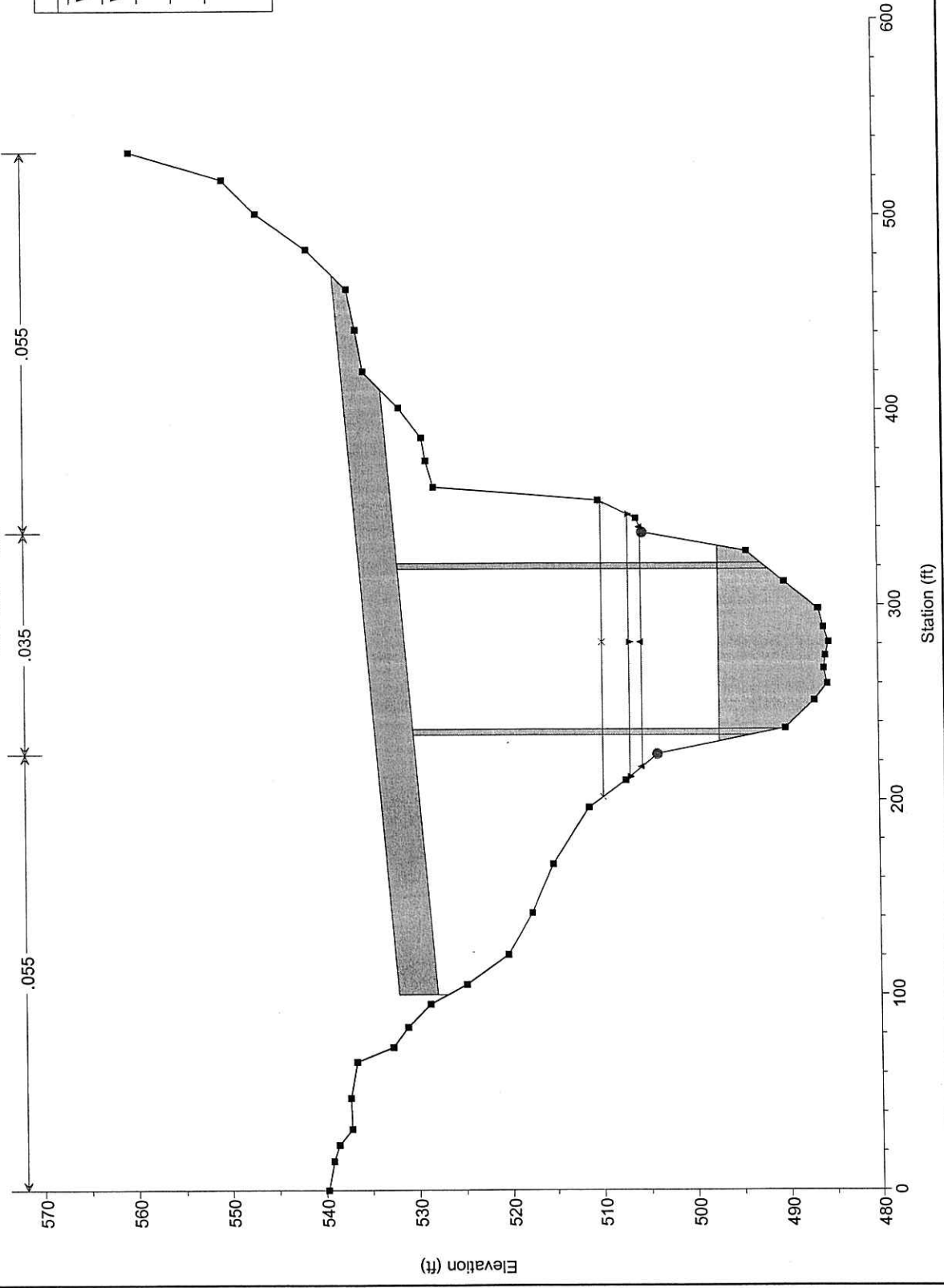
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Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
■	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

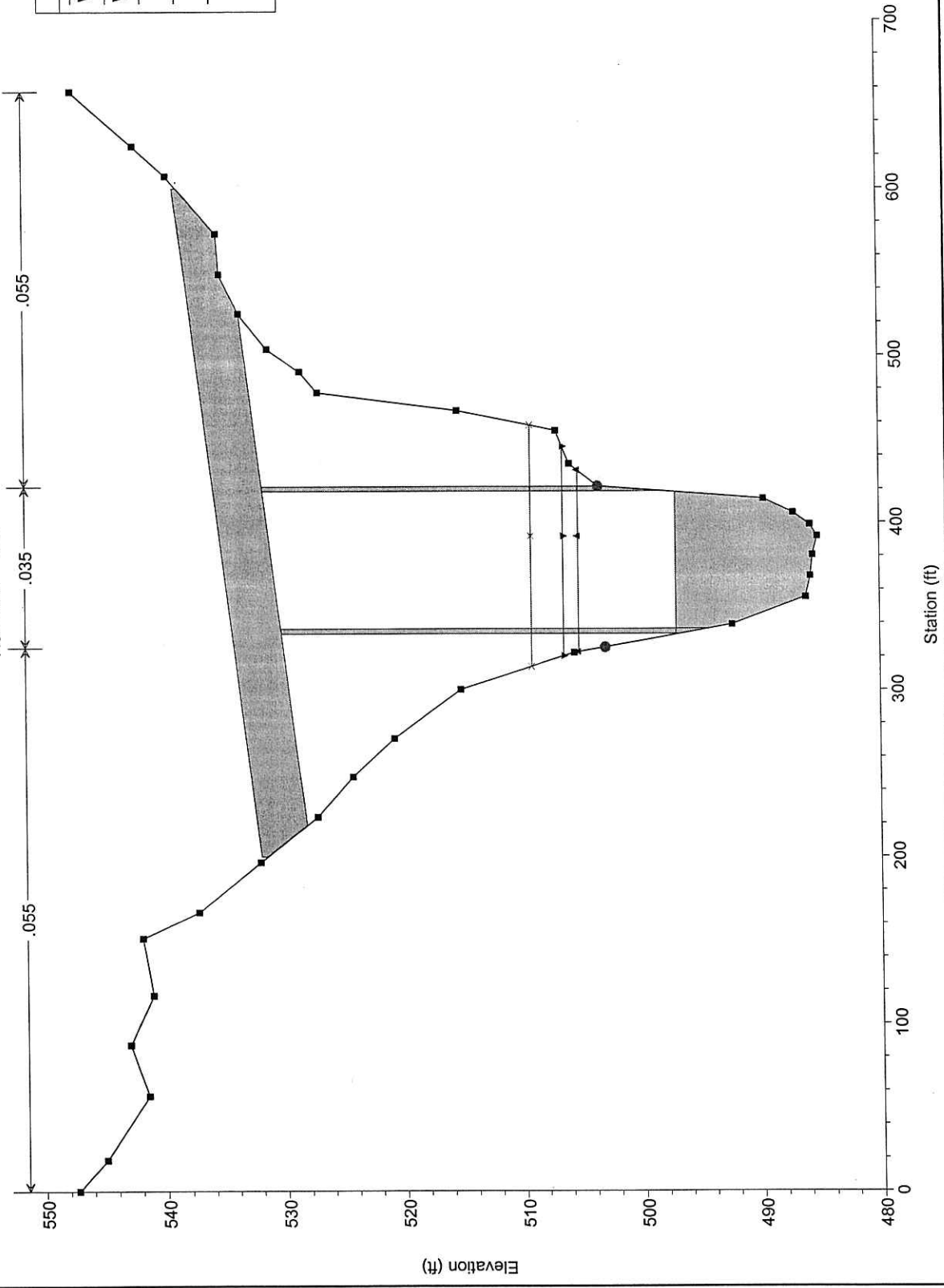
RS = 529 BR



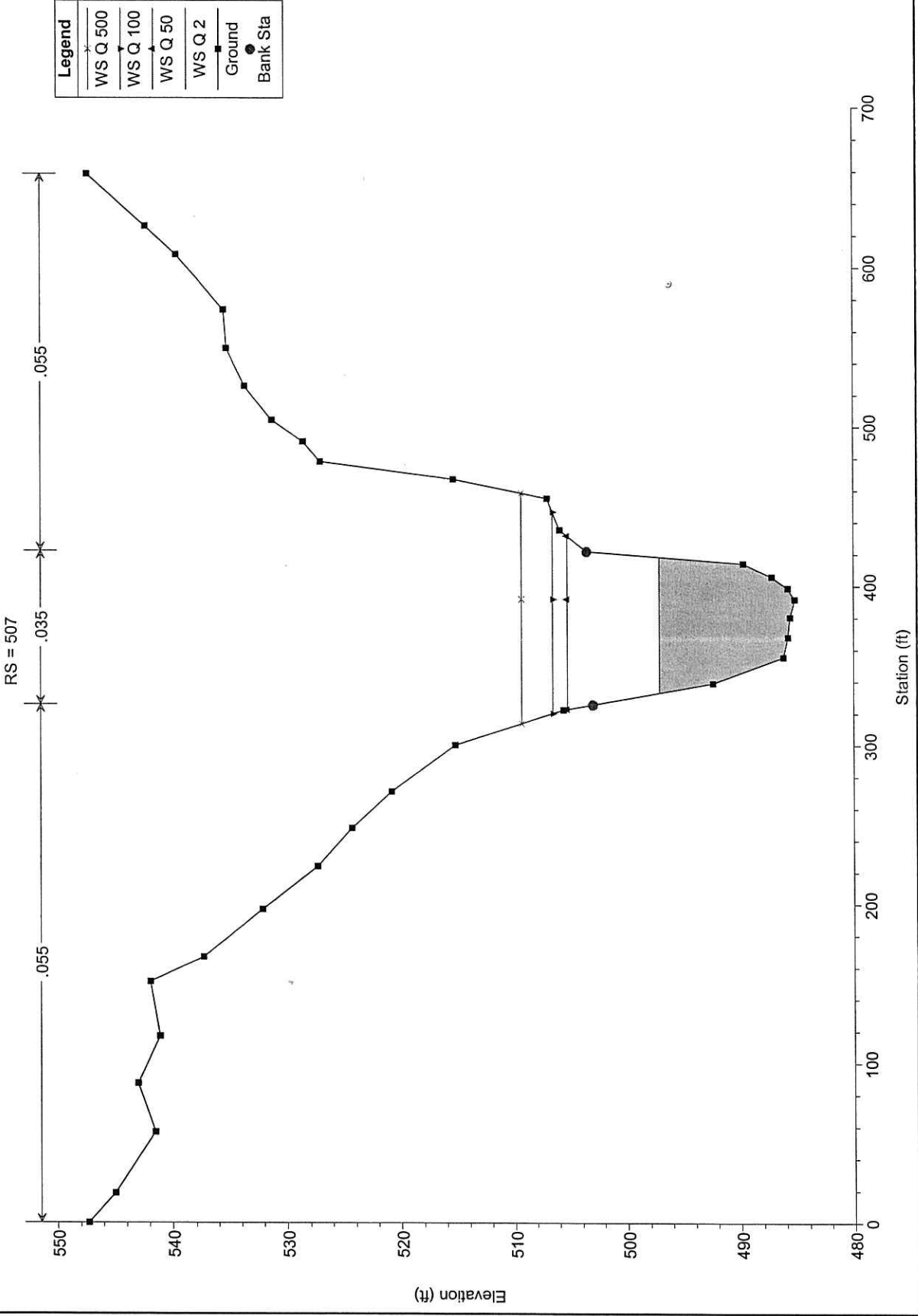
SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006

RS = 529 BR

Legend	
WS Q 500	✕
WS Q 100	▲
WS Q 50	▼
WS Q 2	■
Ground	●
Bank Sta	■

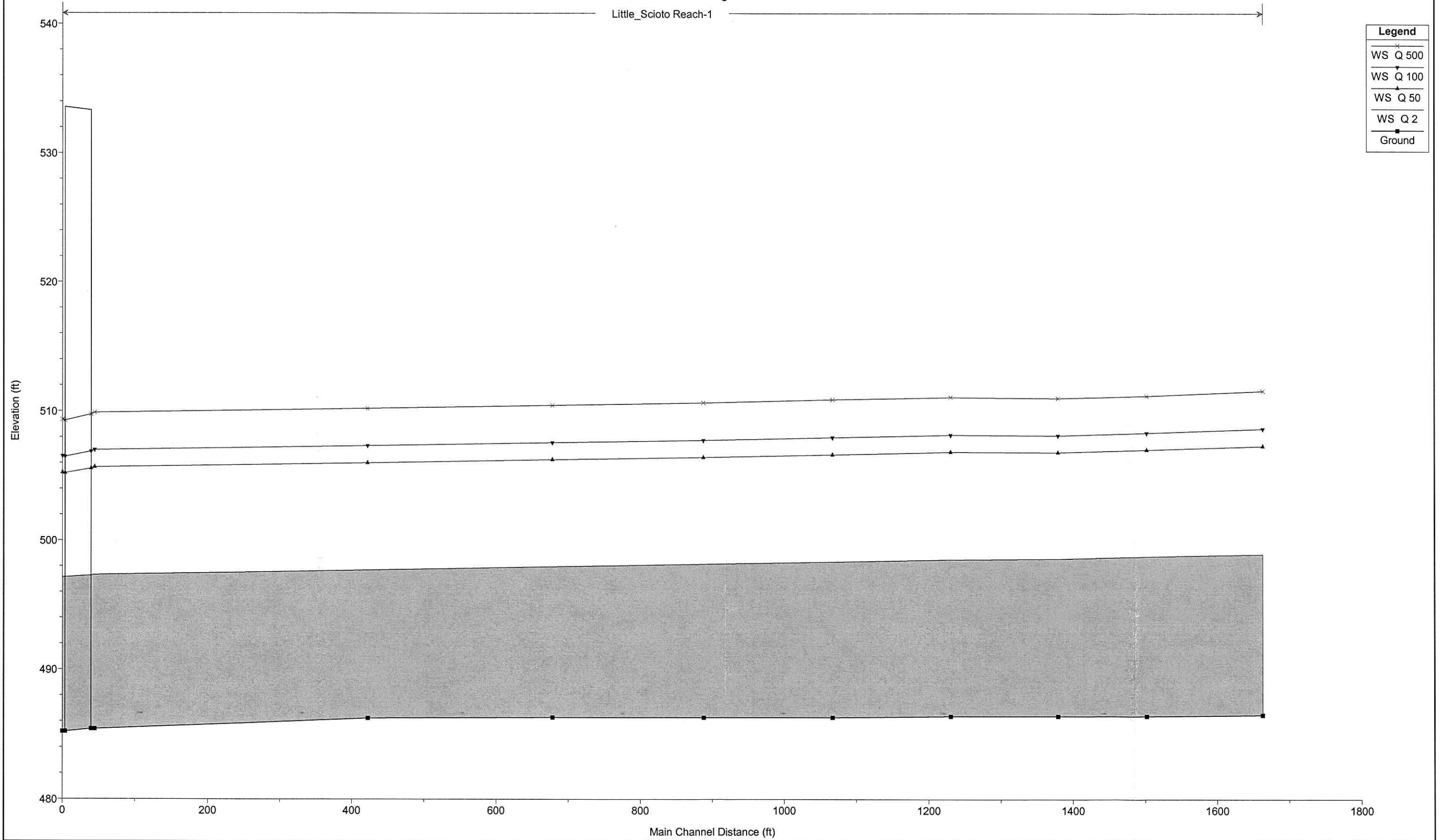


SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/11/2006



SR 823 over Little Scioto Plan: Existing Conditions NO Backwater 7/12/2006

Little_Scioto Reach-1



HEC-RAS Plan: Exist Backwa River: Little Scioto Reach: Reach-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
Reach-1	2169	Q 2	4968.00	486.50	511.24		511.30	0.000044	1.97	2687.10	171.72	0.08
Reach-1	2169	Q 50	13337.00	486.50	526.45		526.58	0.000044	2.87	5915.40	299.83	0.09
Reach-1	2169	Q 100	15167.00	486.50	529.13		529.26	0.000044	3.00	6747.91	320.21	0.09
Reach-1	2169	Q 500	19717.00	486.50	534.66		534.81	0.000044	3.31	8620.52	357.79	0.09
Reach-1	2008	Q 2	4968.00	486.40	511.22		511.29	0.000051	2.18	2568.41	219.24	0.08
Reach-1	2008	Q 50	13337.00	486.40	526.44		526.57	0.000049	3.06	6526.41	297.58	0.09
Reach-1	2008	Q 100	15167.00	486.40	529.12		529.25	0.000048	3.18	7340.04	310.10	0.09
Reach-1	2008	Q 500	19717.00	486.40	534.64		534.80	0.000049	3.53	9130.79	351.71	0.09
Reach-1	1882	Q 2	4968.00	486.40	511.21		511.28	0.000056	2.22	2605.77	247.46	0.09
Reach-1	1882	Q 50	13337.00	486.40	526.44		526.56	0.000047	2.96	7464.80	391.76	0.09
Reach-1	1882	Q 100	15167.00	486.40	529.12		529.24	0.000045	3.04	8529.51	401.30	0.09
Reach-1	1882	Q 500	19717.00	486.40	534.66		534.79	0.000044	3.28	10792.81	417.69	0.09
Reach-1	1734	Q 2	4968.00	486.40	511.21		511.27	0.000042	1.97	2886.17	231.94	0.08
Reach-1	1734	Q 50	13337.00	486.40	526.44		526.55	0.000039	2.73	7263.02	335.27	0.08
Reach-1	1734	Q 100	15167.00	486.40	529.12		529.23	0.000038	2.84	8177.02	346.33	0.08
Reach-1	1734	Q 500	19717.00	486.40	534.65		534.78	0.000039	3.12	10159.37	384.73	0.08
Reach-1	1574	Q 2	4970.00	486.30	511.20		511.27	0.000048	2.00	2751.49	207.44	0.08
Reach-1	1574	Q 50	13343.00	486.30	526.43		526.54	0.000042	2.76	6655.79	304.83	0.08
Reach-1	1574	Q 100	15175.00	486.30	529.11		529.23	0.000041	2.87	7487.65	315.45	0.08
Reach-1	1574	Q 500	19727.00	486.30	534.64		534.77	0.000042	3.17	9358.42	370.27	0.09
Reach-1	1395	Q 2	4970.00	486.30	511.19		511.26	0.000048	2.08	2660.05	190.50	0.08
Reach-1	1395	Q 50	13343.00	486.30	526.41		526.53	0.000046	2.95	6309.71	274.79	0.09
Reach-1	1395	Q 100	15175.00	486.30	529.08		529.22	0.000046	3.08	7058.76	284.75	0.09
Reach-1	1395	Q 500	19727.00	486.30	534.60		534.76	0.000048	3.44	8720.88	340.95	0.09
Reach-1	1185	Q 2	4970.00	486.30	511.18		511.25	0.000048	2.07	2536.40	154.68	0.08
Reach-1	1185	Q 50	13343.00	486.30	526.38		526.52	0.000050	3.06	5313.51	221.76	0.09
Reach-1	1185	Q 100	15175.00	486.30	529.05		529.20	0.000050	3.22	5928.97	237.27	0.09
Reach-1	1185	Q 500	19727.00	486.30	534.56		534.75	0.000052	3.59	7321.79	279.89	0.10
Reach-1	929	Q 2	4970.00	486.24	511.17		511.23	0.000047	2.06	2543.88	154.86	0.08
Reach-1	929	Q 50	13343.00	486.24	526.37		526.50	0.000049	3.03	5324.73	222.14	0.09
Reach-1	929	Q 100	15175.00	486.24	529.04		529.19	0.000049	3.17	5941.19	237.53	0.09

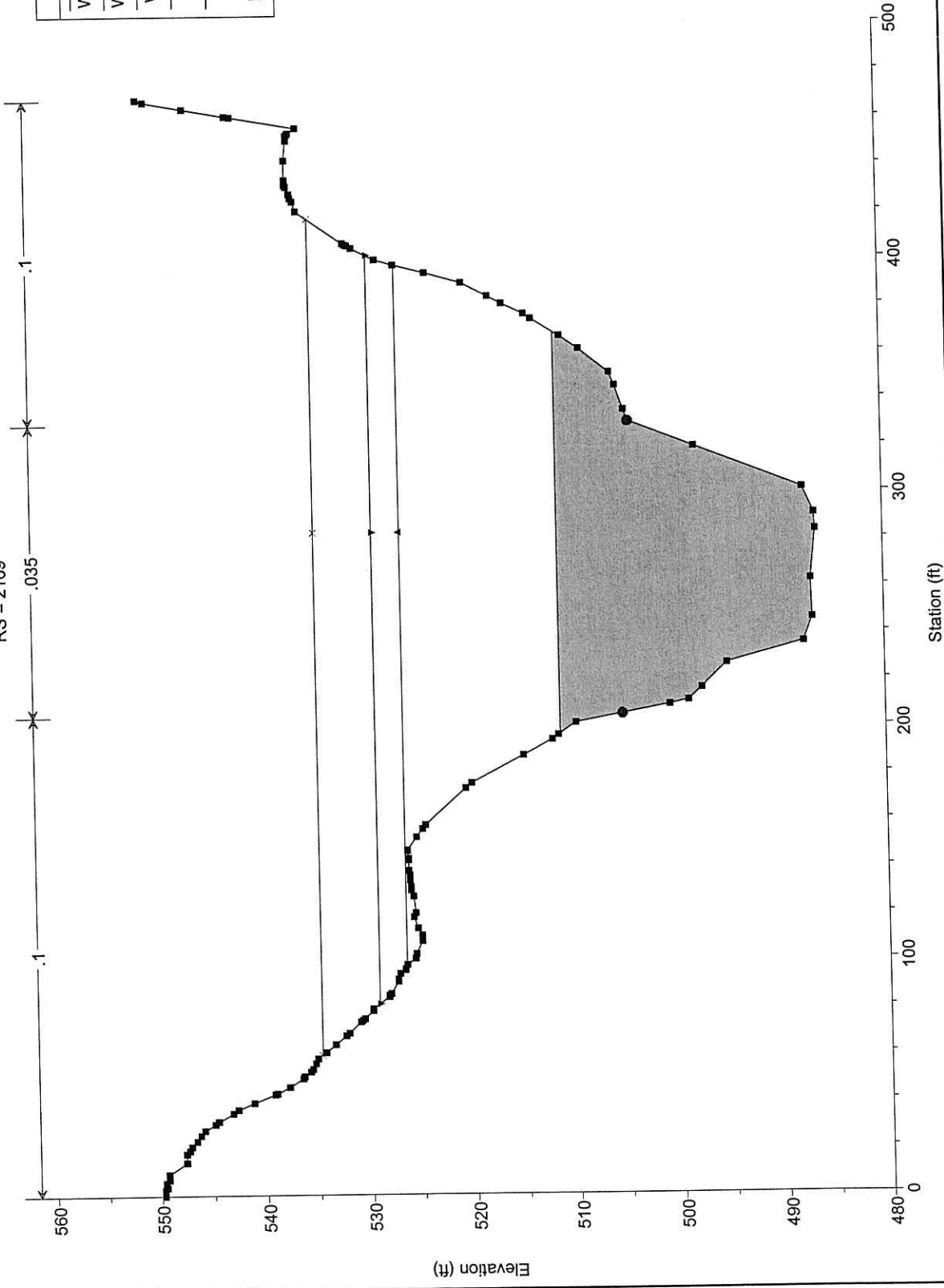
HEC-RAS Plan: Exist Backwa River: Little Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 500	19727.00	486.24	534.56		534.73	0.000050	3.53	7336.71	281.85	0.09
Reach-1	552	Q 2	4970.00	485.40	511.15	492.10	511.22	0.000044	2.03	2585.03	157.40	0.08
Reach-1	552	Q 50	13343.00	485.40	526.37	496.56	526.48	0.000043	2.85	5885.76	258.83	0.08
Reach-1	552	Q 100	15175.00	485.40	529.04	497.33	529.17	0.000042	2.98	6603.32	292.83	0.08
Reach-1	552	Q 500	19727.00	485.40	534.57	499.11	534.70	0.000042	3.23	8387.10	347.37	0.09
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	511.13	491.97	511.21	0.000056	2.29	2364.84	151.39	0.09
Reach-1	507	Q 50	13343.00	485.20	526.32	496.81	526.47	0.000056	3.25	5270.28	245.53	0.09
Reach-1	507	Q 100	15175.00	485.20	529.00	497.67	529.16	0.000056	3.39	5970.48	278.64	0.09
Reach-1	507	Q 500	19727.00	485.20	534.49	499.69	534.67	0.000056	3.70	7686.14	355.62	0.10

SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

RS = 2169

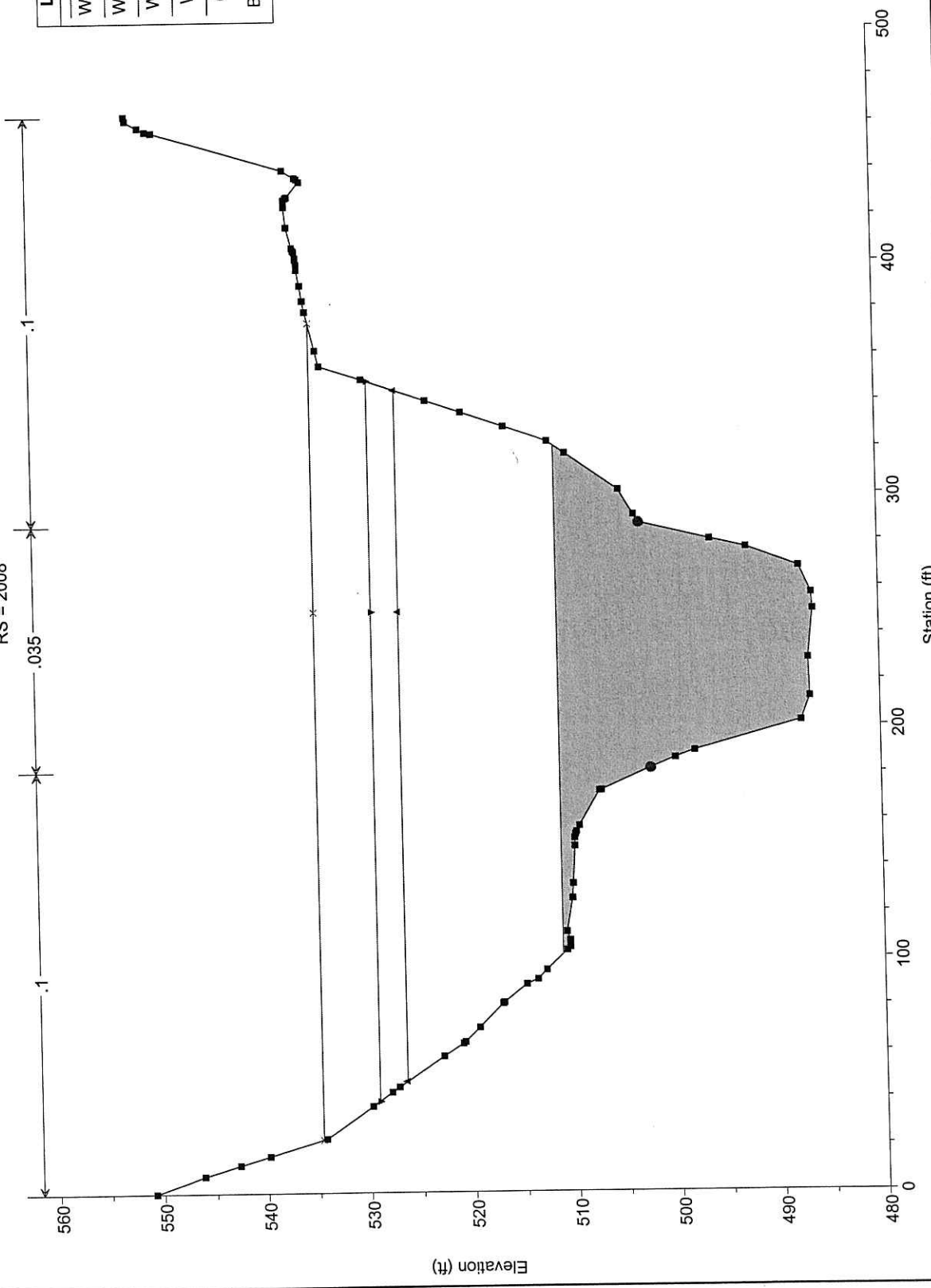
Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

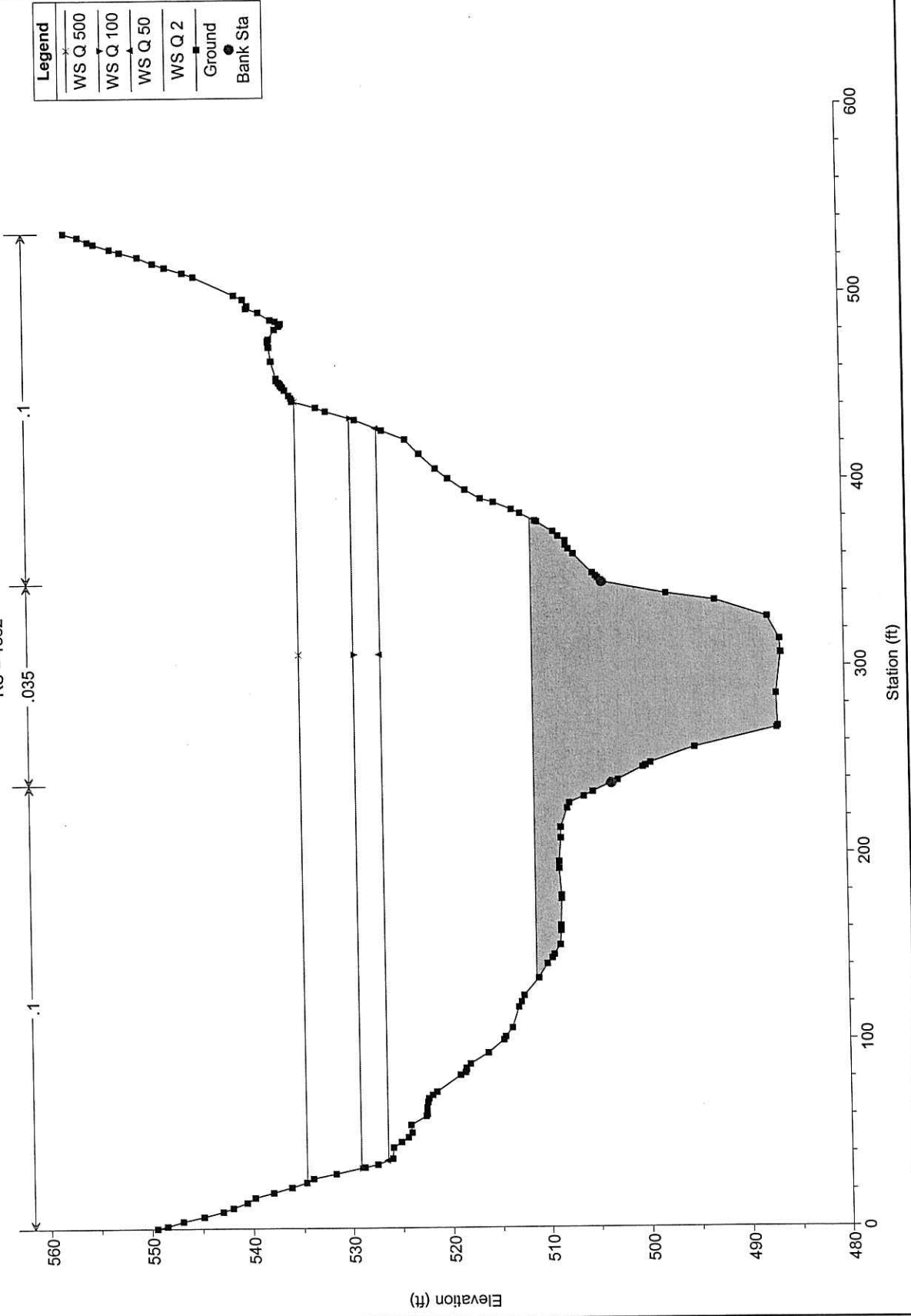
RS = 2008

Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

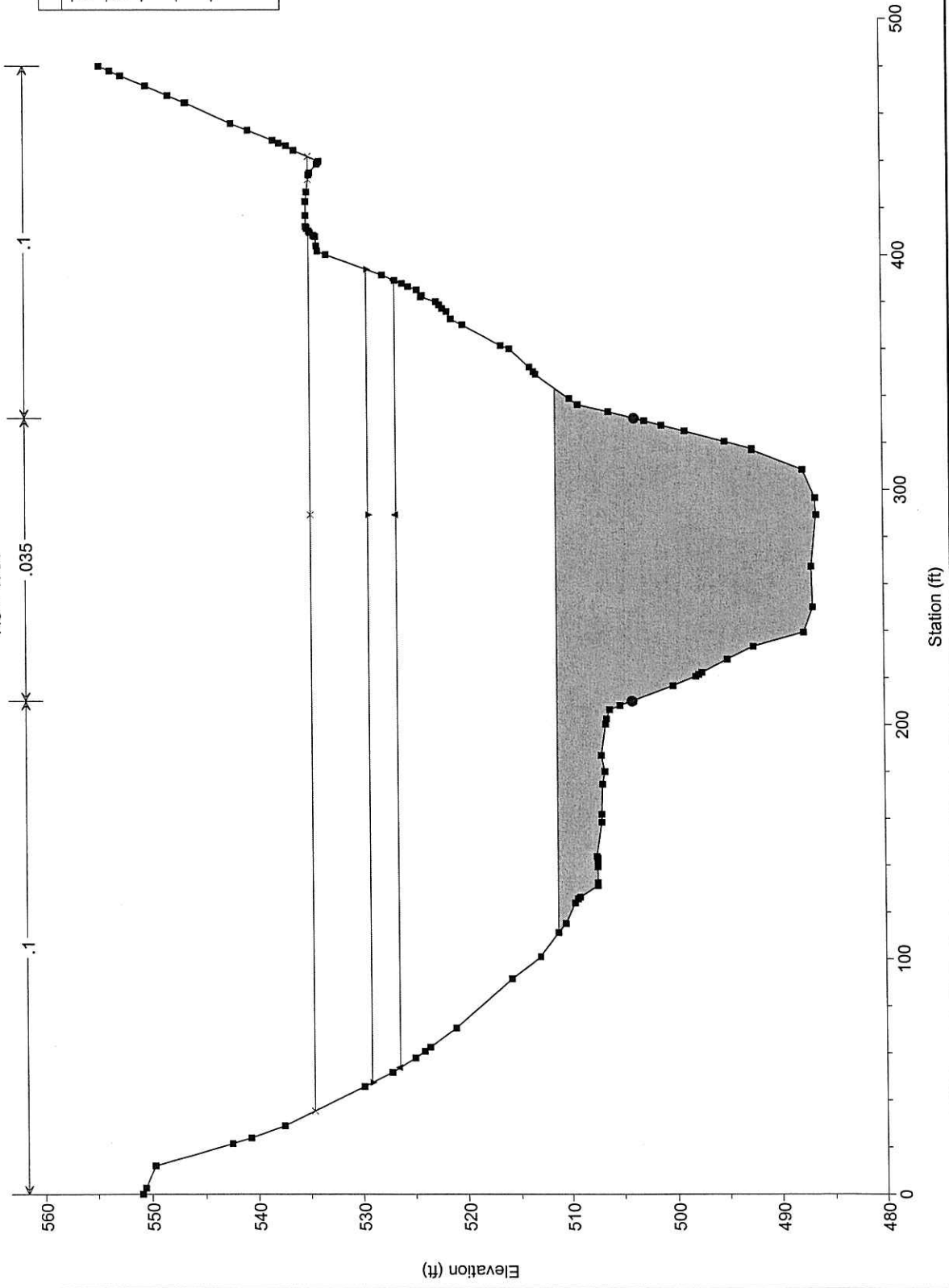
RS = 1882



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

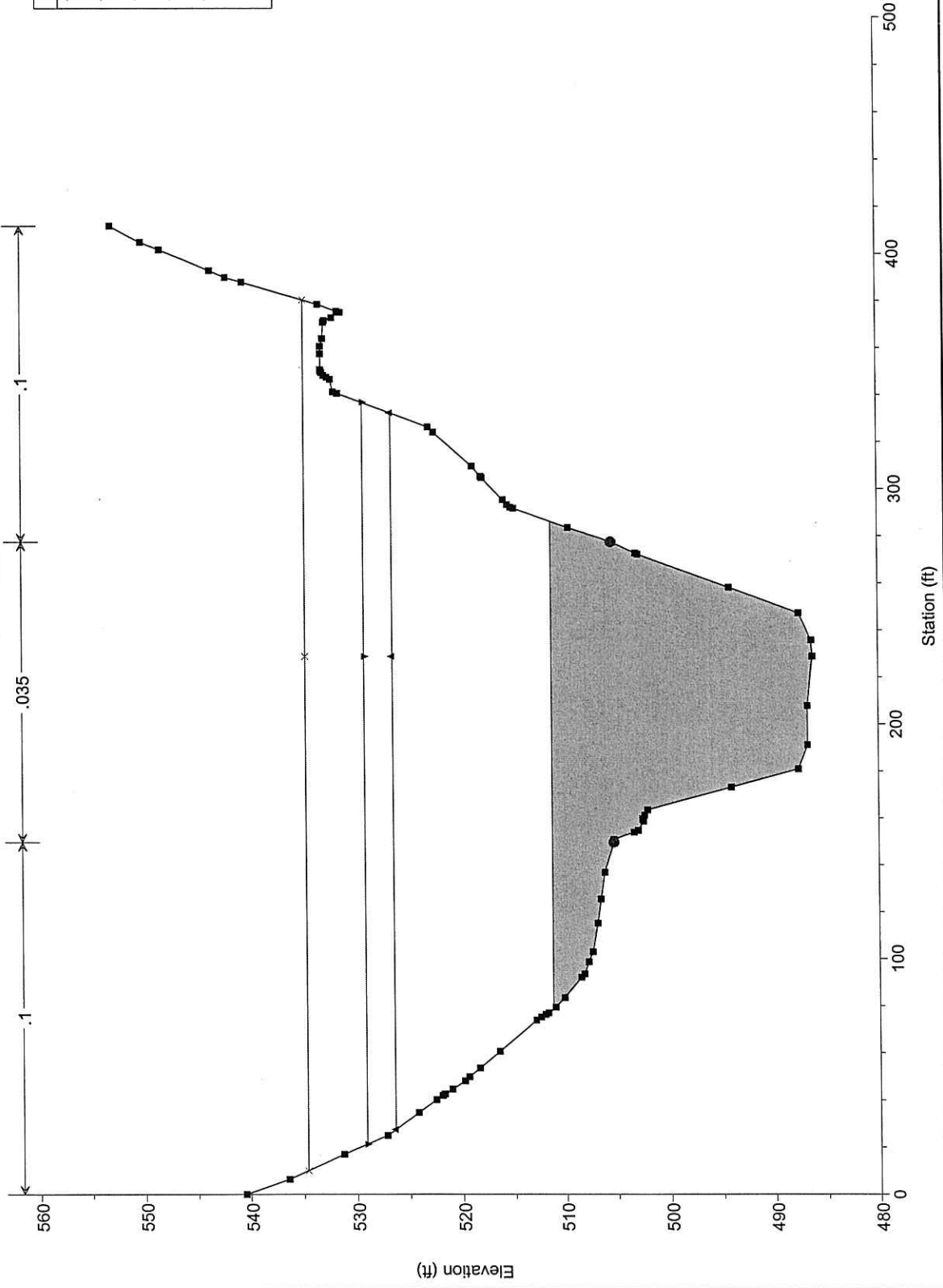
RS = 1734



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

RS = 1574

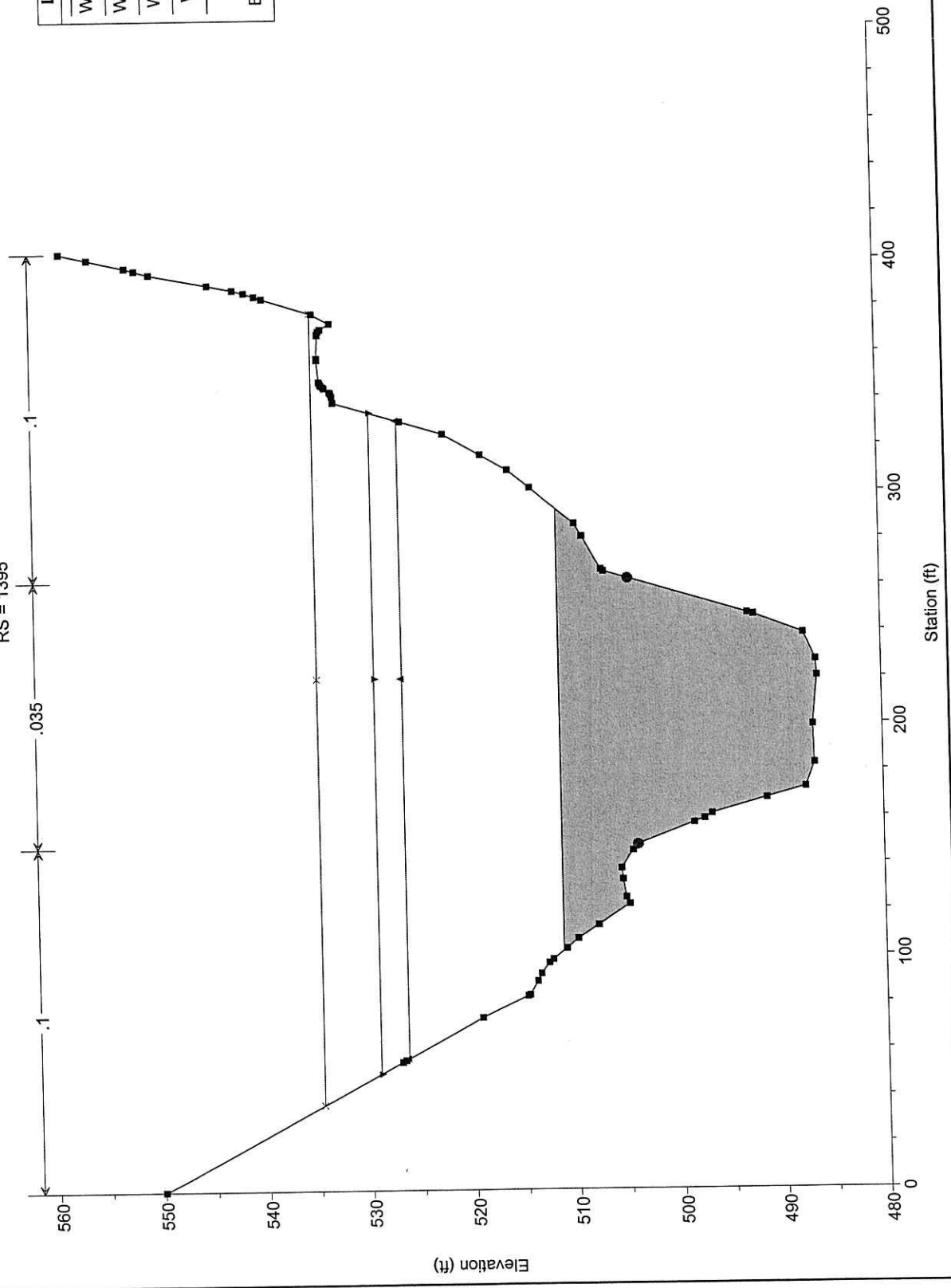


Legend	
WS Q 500	✕
WS Q 100	▲
WS Q 50	▲
WS Q 2	▲
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

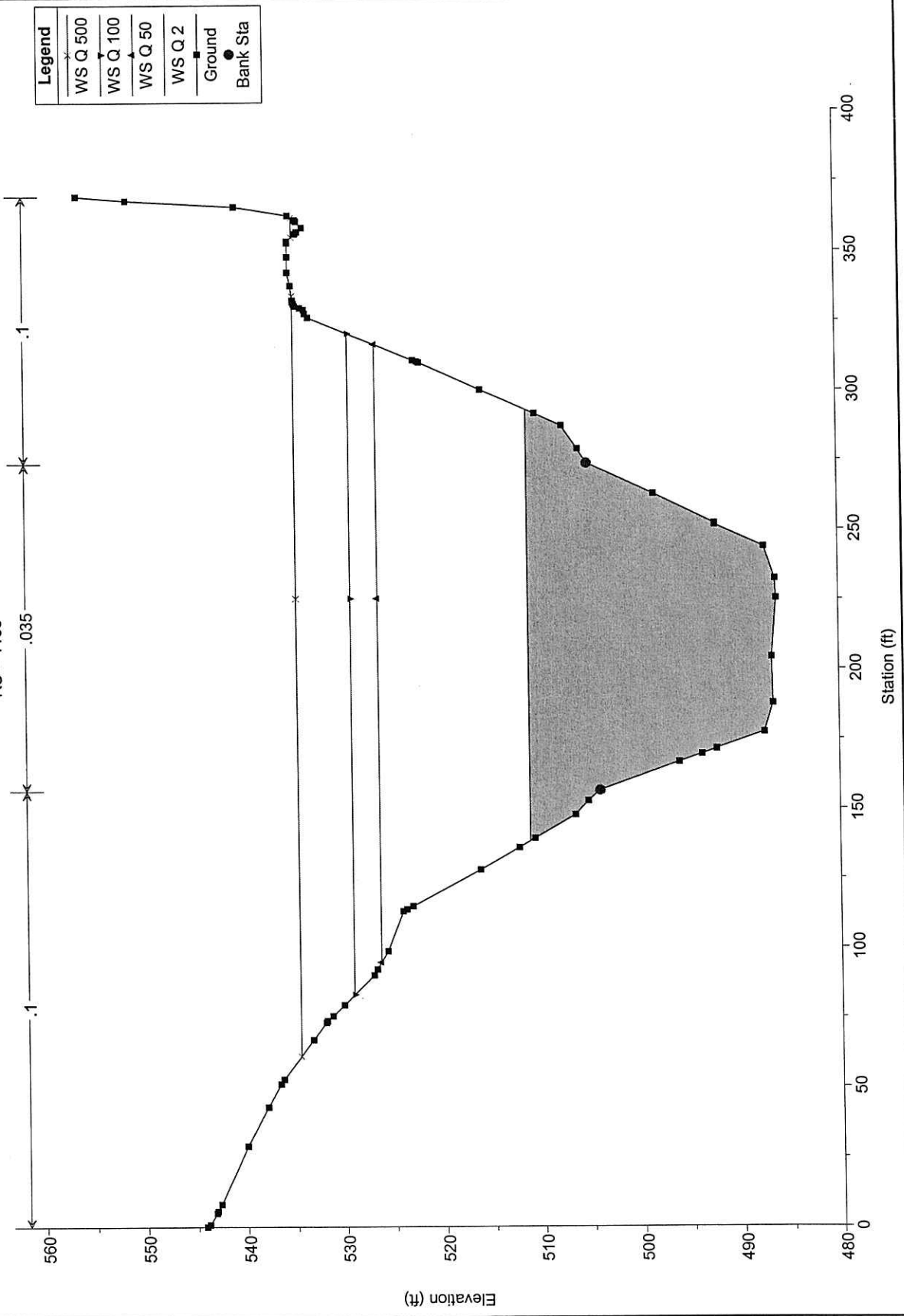
RS = 1395

Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
■	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

RS = 1185

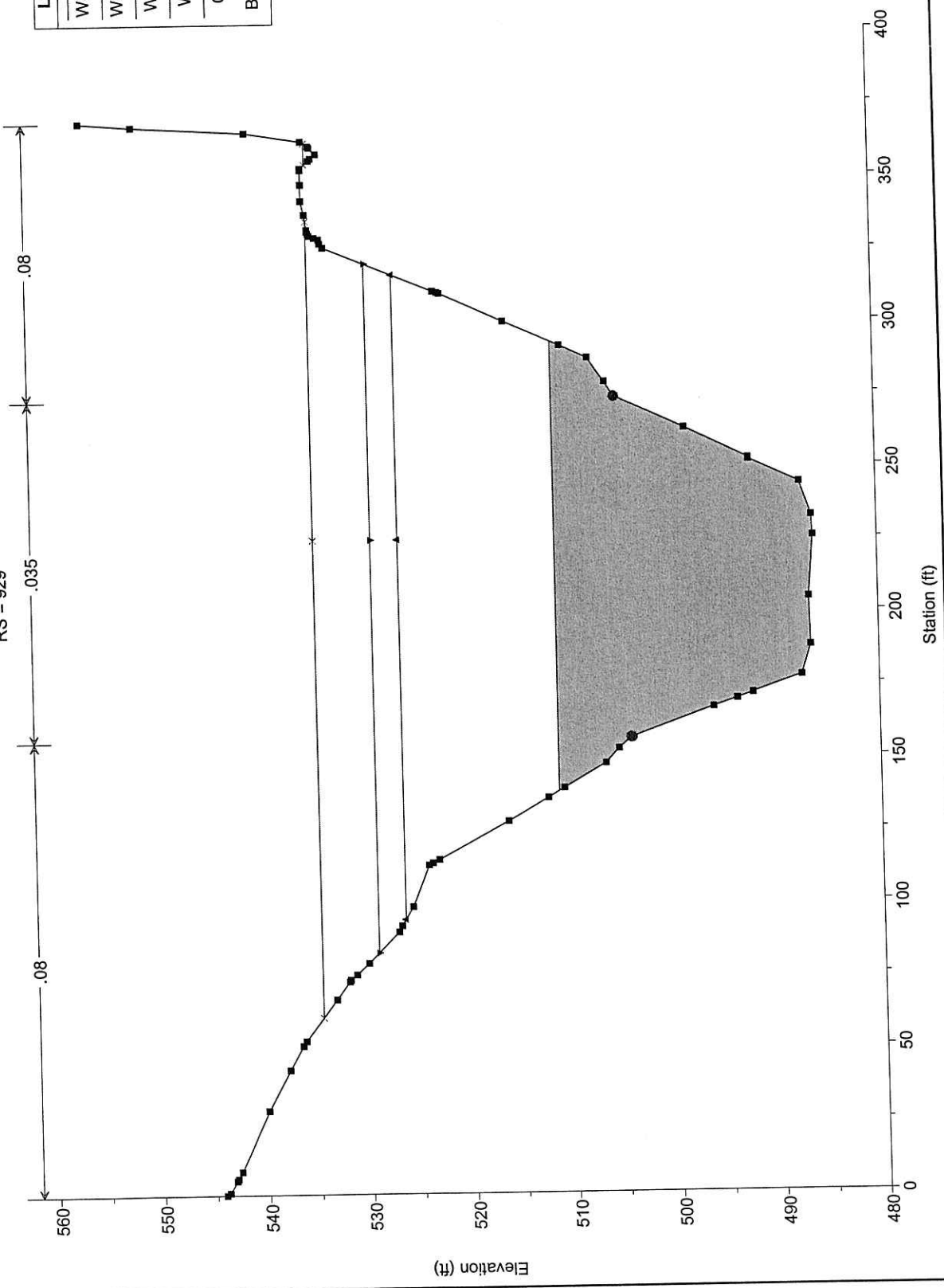


Legend
WS Q 500
WS Q 100
WS Q 50
WS Q 2
Ground
Bank Sta

SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

RS = 929

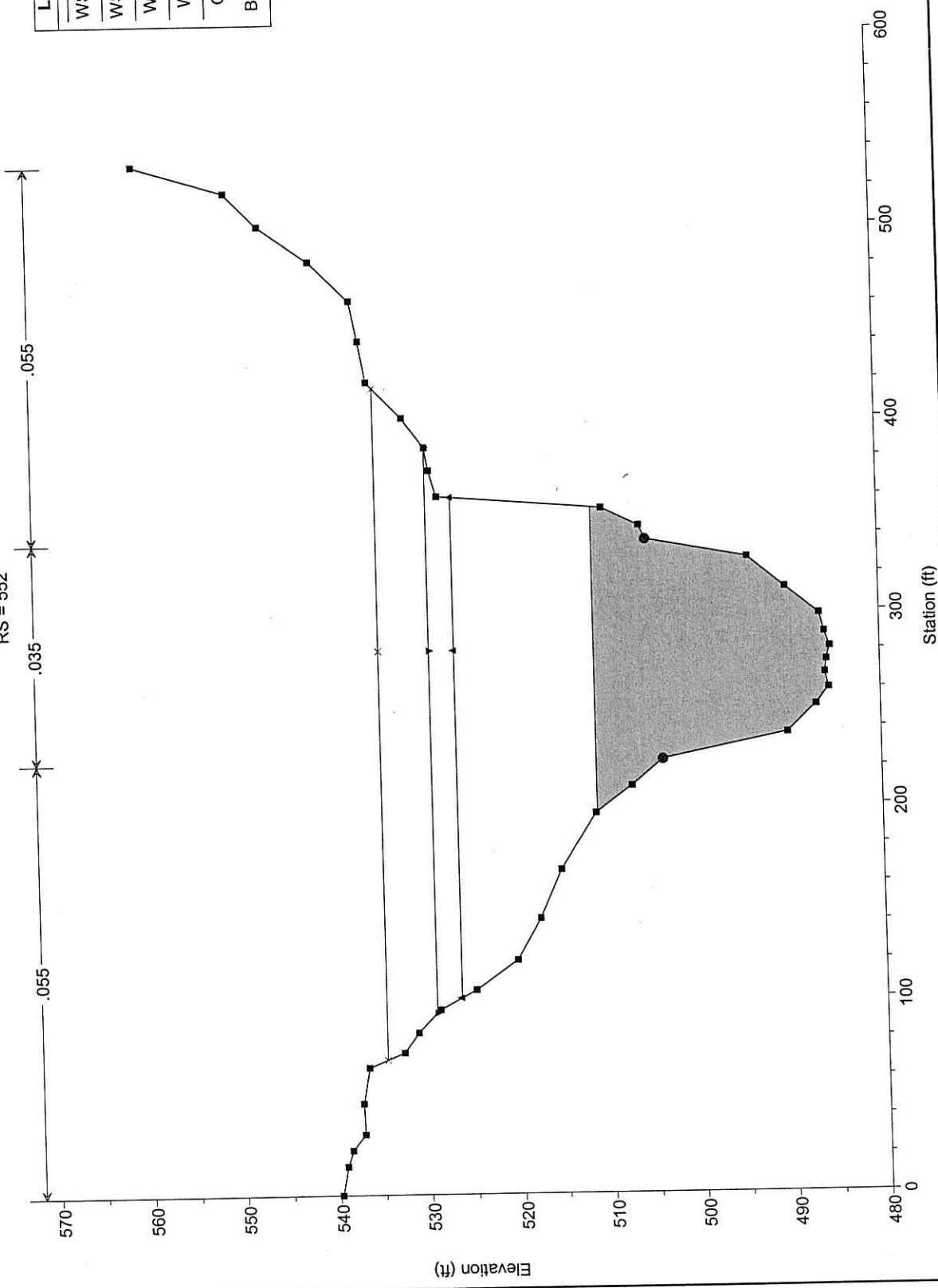
Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta



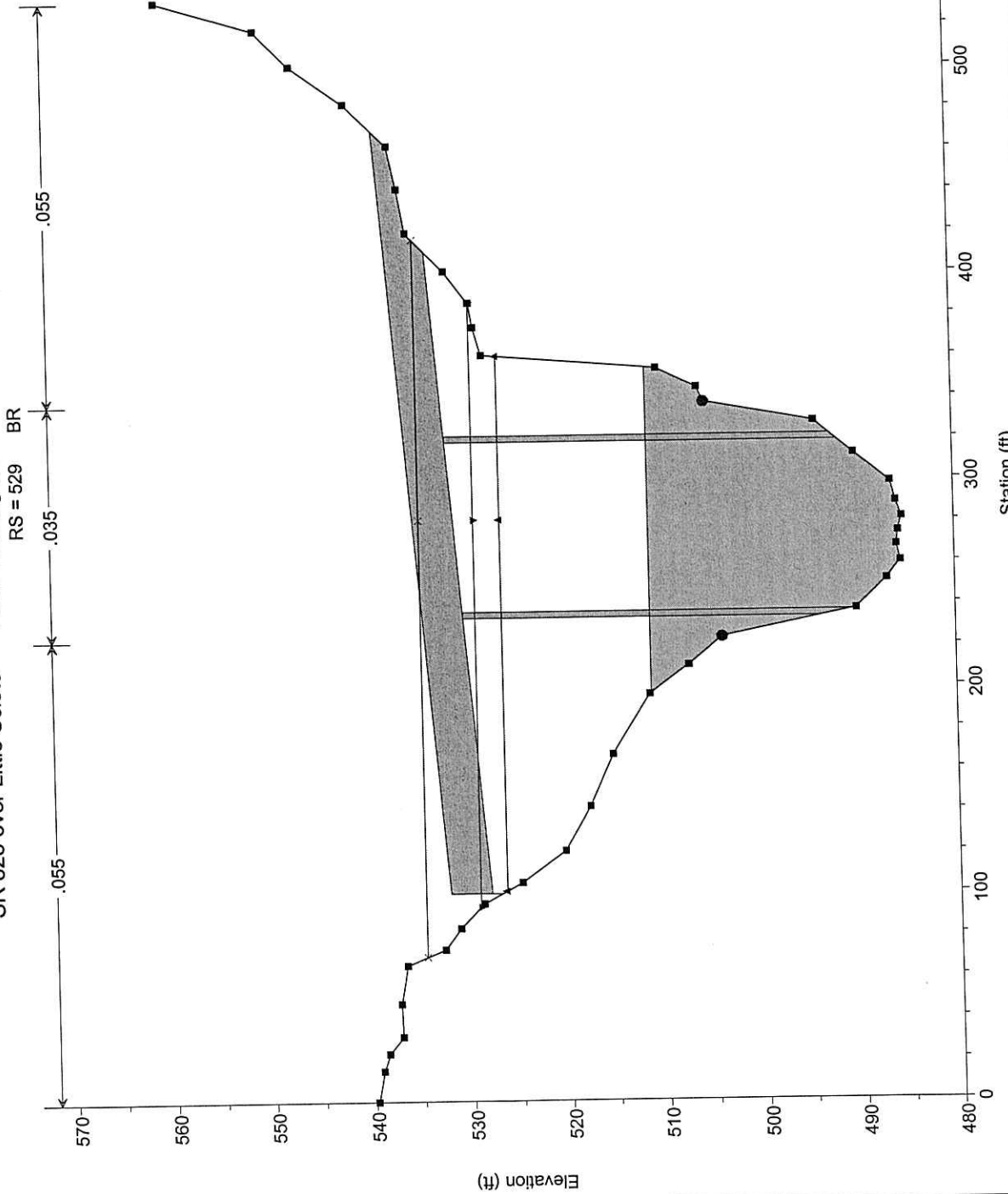
SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

RS = 552

Legend	
WS Q 500	✕
WS Q 100	↑
WS Q 50	↓
WS Q 2	■
Ground	●
Bank Sta	●



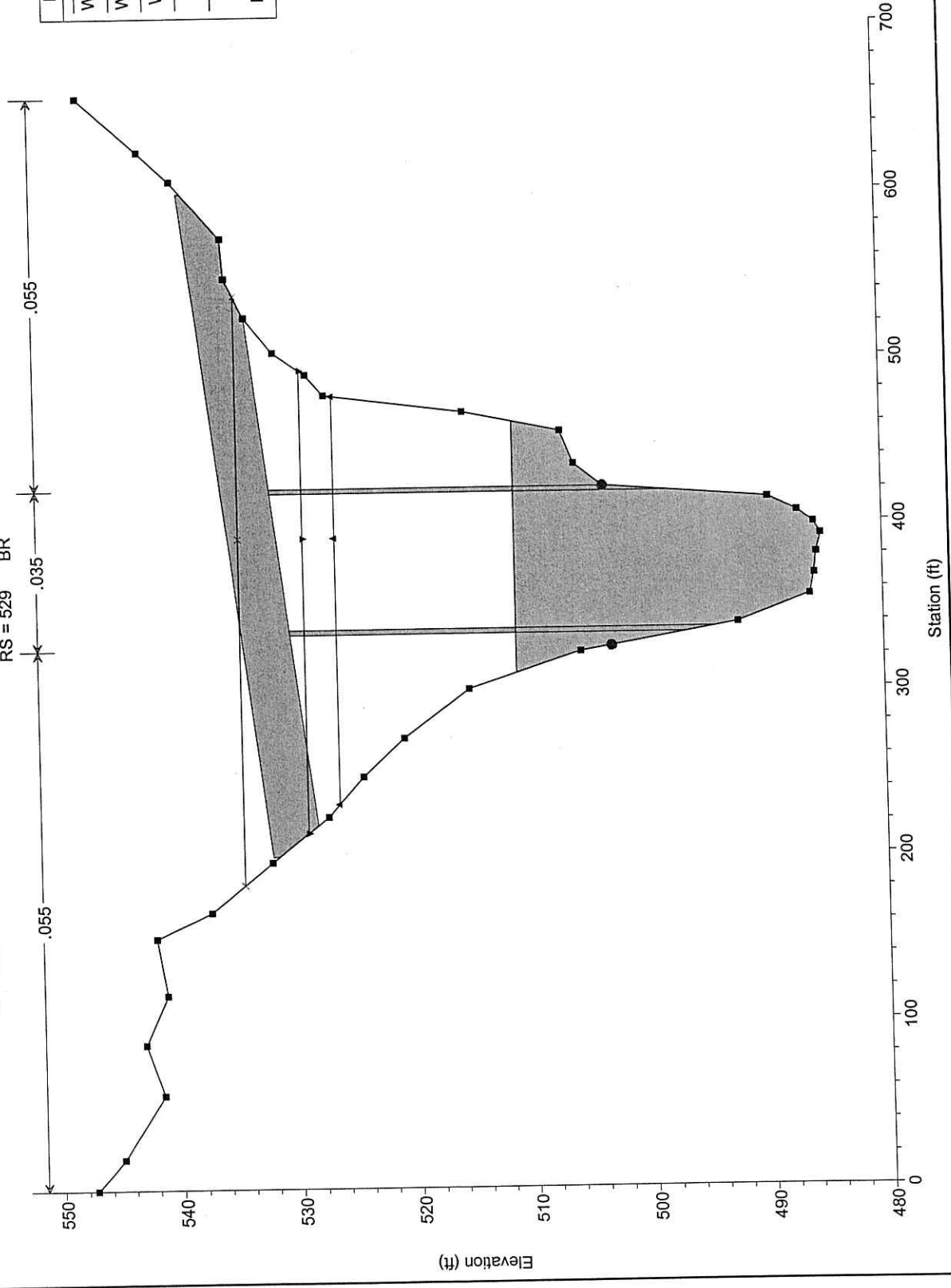
SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006



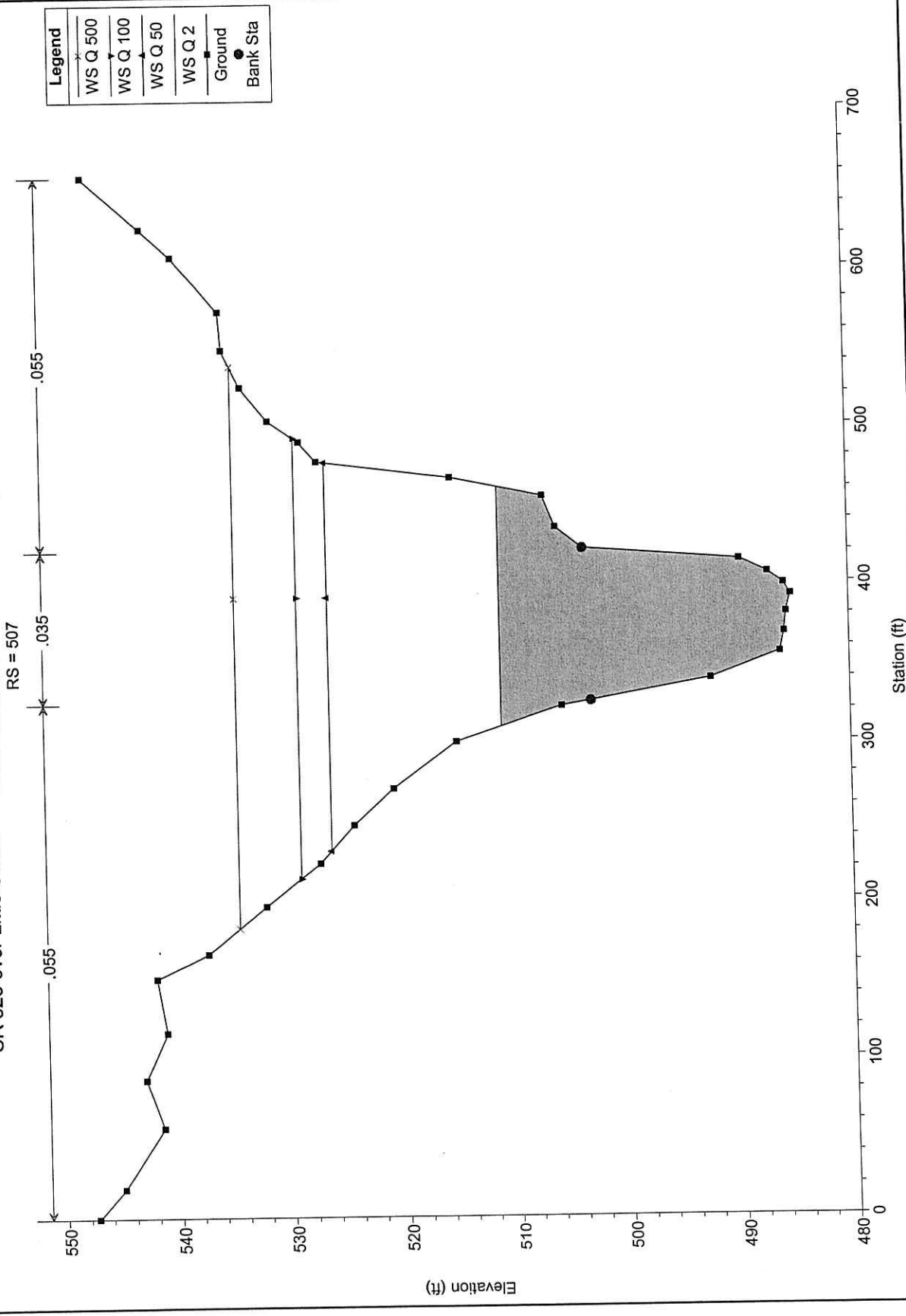
SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

RS = 529 BR

Legend	
WS Q 500	— x —
WS Q 100	— v —
WS Q 50	— ^ —
WS Q 2	— ■ —
Ground	— ● —
Bank Sta	— ■ —



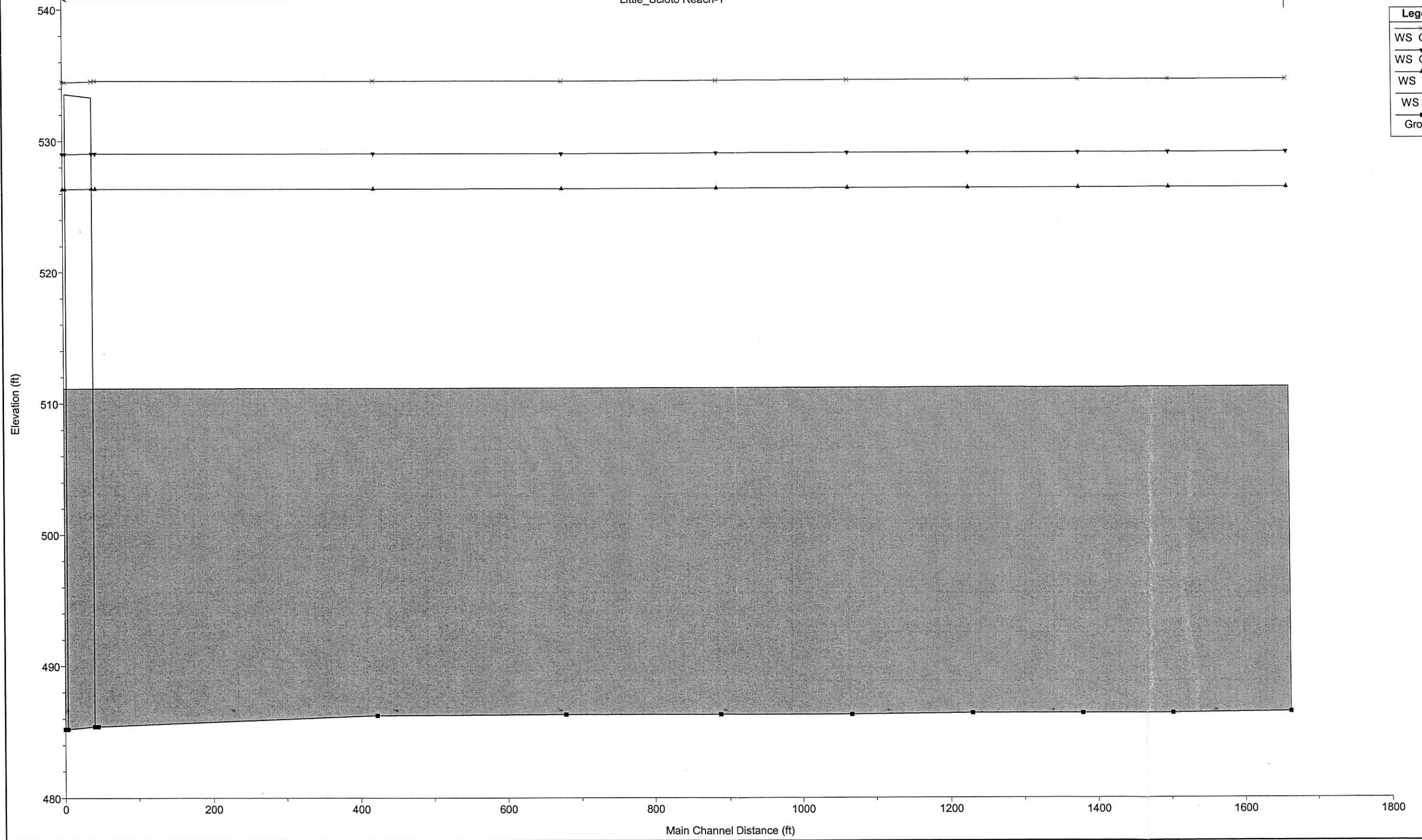
SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006



Legend	
WS Q 500	x
WS Q 100	v
WS Q 50	▲
WS Q 2	■
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions with 10 yr Backwater 7/12/2006

Little_Scioto Reach-1



Legend	
x	WS Q 500
v	WS Q 100
^	WS Q 50
■	WS Q 2
	Ground

HEC-RAS Plan: Exist 100 BW River: Little Scioto Reach: Reach-1

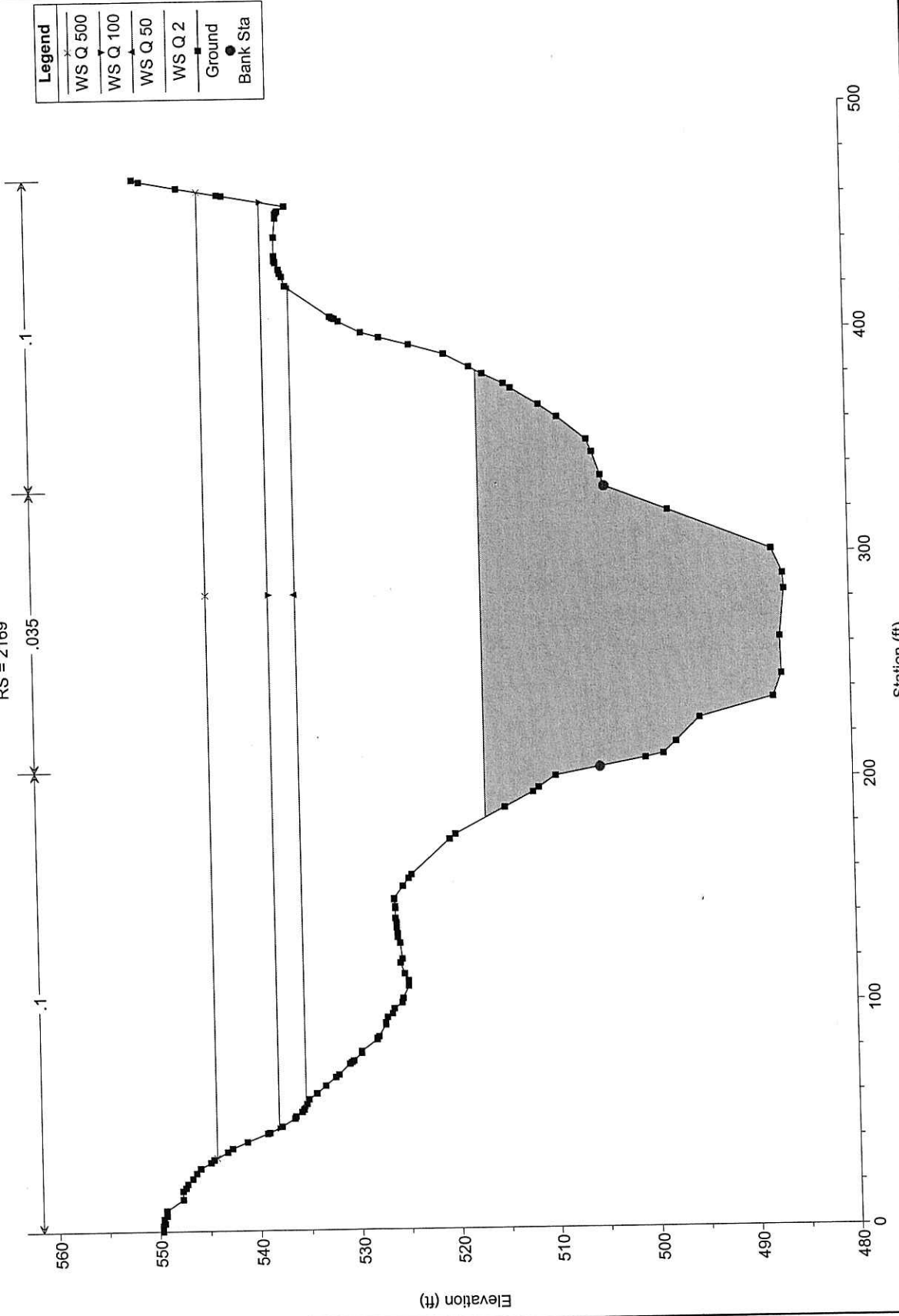
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4968.00	486.50	516.88		516.92	0.000019	1.52	3737.15	199.51	0.05
Reach-1	2169	Q 50	13337.00	486.50	535.40		535.47	0.000019	2.19	8887.60	364.44	0.06
Reach-1	2169	Q 100	15167.00	486.50	538.07		538.15	0.000020	2.33	9939.64	412.52	0.06
Reach-1	2169	Q 500	19717.00	486.50	544.26		544.35	0.000020	2.56	12548.01	430.26	0.06
Reach-1	2008	Q 2	4968.00	486.40	516.87		516.91	0.000021	1.65	3896.87	248.88	0.06
Reach-1	2008	Q 50	13337.00	486.40	535.39		535.46	0.000021	2.34	9401.52	373.13	0.06
Reach-1	2008	Q 100	15167.00	486.40	538.06		538.14	0.000022	2.48	10493.33	423.65	0.06
Reach-1	2008	Q 500	19717.00	486.40	544.26		544.35	0.000023	2.72	13168.25	440.01	0.07
Reach-1	1882	Q 2	4968.00	486.40	516.87		516.91	0.000022	1.65	4173.39	300.58	0.06
Reach-1	1882	Q 50	13337.00	486.40	535.40		535.46	0.000019	2.17	11104.73	423.97	0.06
Reach-1	1882	Q 100	15167.00	486.40	538.07		538.14	0.000020	2.30	12304.36	471.34	0.06
Reach-1	1882	Q 500	19717.00	486.40	544.27		544.34	0.000020	2.51	15325.50	501.83	0.06
Reach-1	1734	Q 2	4968.00	486.40	516.87		516.90	0.000017	1.48	4329.69	275.08	0.05
Reach-1	1734	Q 50	13337.00	486.40	535.40		535.45	0.000017	2.08	10458.44	409.43	0.05
Reach-1	1734	Q 100	15167.00	486.40	538.07		538.13	0.000017	2.19	11568.99	420.48	0.06
Reach-1	1734	Q 500	19717.00	486.40	544.26		544.34	0.000018	2.42	14237.71	441.05	0.06
Reach-1	1574	Q 2	4970.00	486.30	516.87		516.90	0.000019	1.50	4007.86	241.02	0.05
Reach-1	1574	Q 50	13343.00	486.30	535.39		535.45	0.000018	2.10	9638.38	372.84	0.06
Reach-1	1574	Q 100	15175.00	486.30	538.06		538.13	0.000018	2.21	10646.77	381.00	0.06
Reach-1	1574	Q 500	19727.00	486.30	544.26		544.33	0.000019	2.45	13051.28	394.13	0.06
Reach-1	1395	Q 2	4970.00	486.30	516.86		516.90	0.000020	1.58	3872.48	233.55	0.05
Reach-1	1395	Q 50	13343.00	486.30	535.37		535.44	0.000020	2.28	8985.72	343.88	0.06
Reach-1	1395	Q 100	15175.00	486.30	538.05		538.12	0.000021	2.41	9918.29	354.01	0.06
Reach-1	1395	Q 500	19727.00	486.30	544.24		544.33	0.000022	2.68	12181.22	376.37	0.06
Reach-1	1185	Q 2	4970.00	486.30	516.85		516.89	0.000021	1.59	3471.51	174.88	0.06
Reach-1	1185	Q 50	13343.00	486.30	535.36		535.44	0.000023	2.39	7555.65	305.69	0.06
Reach-1	1185	Q 100	15175.00	486.30	538.03		538.12	0.000024	2.54	8392.84	322.43	0.07
Reach-1	1185	Q 500	19727.00	486.30	544.21		544.32	0.000025	2.83	10529.90	366.63	0.07
Reach-1	929	Q 2	4970.00	486.24	516.85		516.89	0.000020	1.58	3481.19	175.07	0.05
Reach-1	929	Q 50	13343.00	486.24	535.35		535.43	0.000022	2.35	7573.12	305.99	0.06
Reach-1	929	Q 100	15175.00	486.24	538.02		538.11	0.000023	2.49	8411.45	322.85	0.06

HEC-RAS Plan: Exist 100 BW River: Little Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 500	19727.00	486.24	544.21		544.31	0.000024	2.76	10551.72	366.64	0.07
Reach-1	552	Q 2	4970.00	485.40	516.84	492.10	516.88	0.000019	1.56	3608.68	206.49	0.05
Reach-1	552	Q 50	13343.00	485.40	535.36	496.56	535.42	0.000018	2.13	8664.60	356.22	0.06
Reach-1	552	Q 100	15175.00	485.40	538.03	497.33	538.10	0.000019	2.27	9731.47	441.13	0.06
Reach-1	552	Q 500	19727.00	485.40	544.23	499.11	544.30	0.000018	2.41	12683.48	492.93	0.06
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	516.83	491.97	516.88	0.000024	1.74	3292.24	176.72	0.06
Reach-1	507	Q 50	13343.00	485.20	535.33	496.81	535.41	0.000024	2.46	7990.49	384.90	0.06
Reach-1	507	Q 100	15175.00	485.20	538.00	497.67	538.08	0.000024	2.55	9093.83	430.35	0.06
Reach-1	507	Q 500	19727.00	485.20	544.20	499.69	544.29	0.000024	2.76	12213.17	610.51	0.07

SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

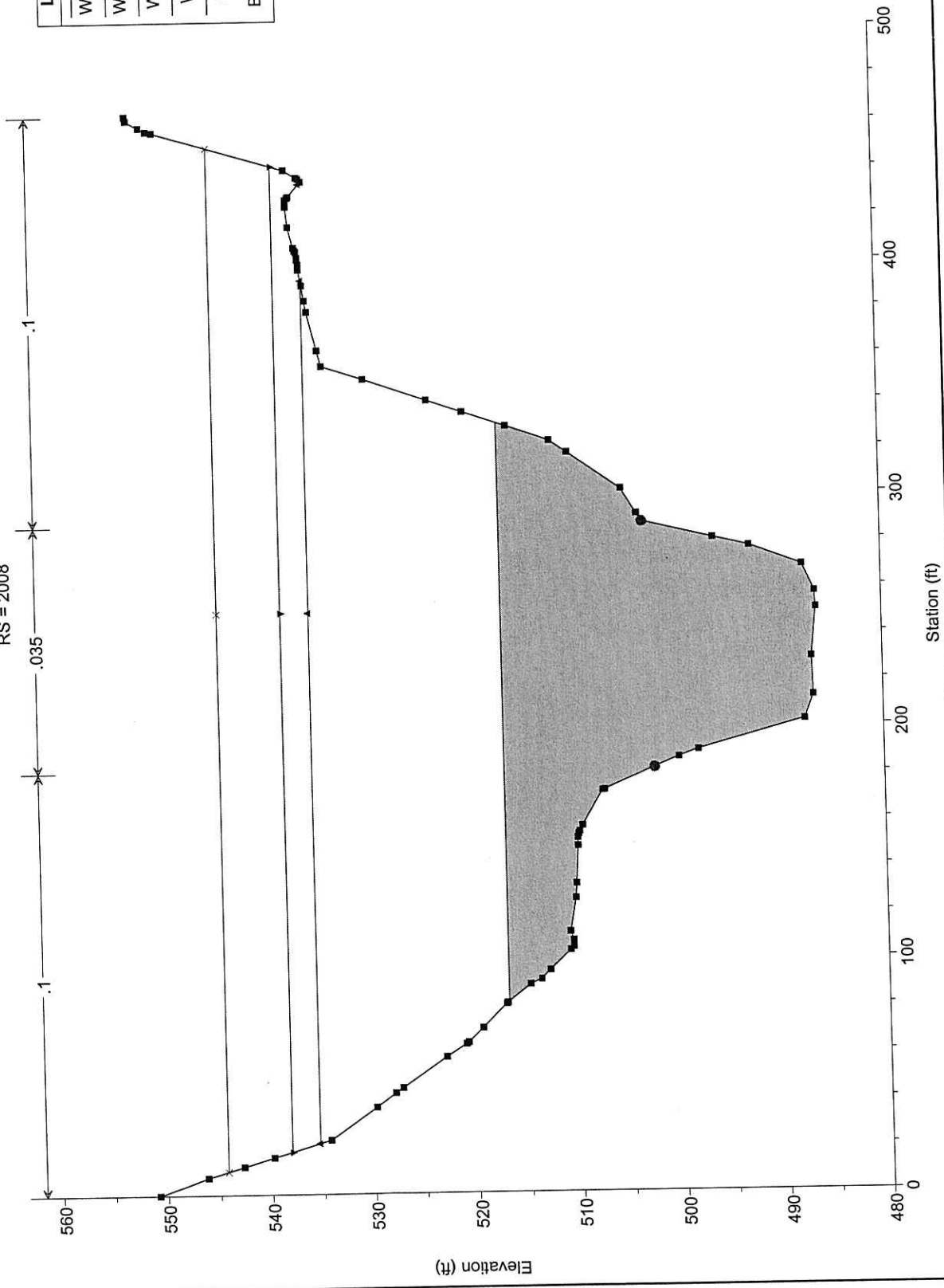
RS = 2169



SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

RS = 2008

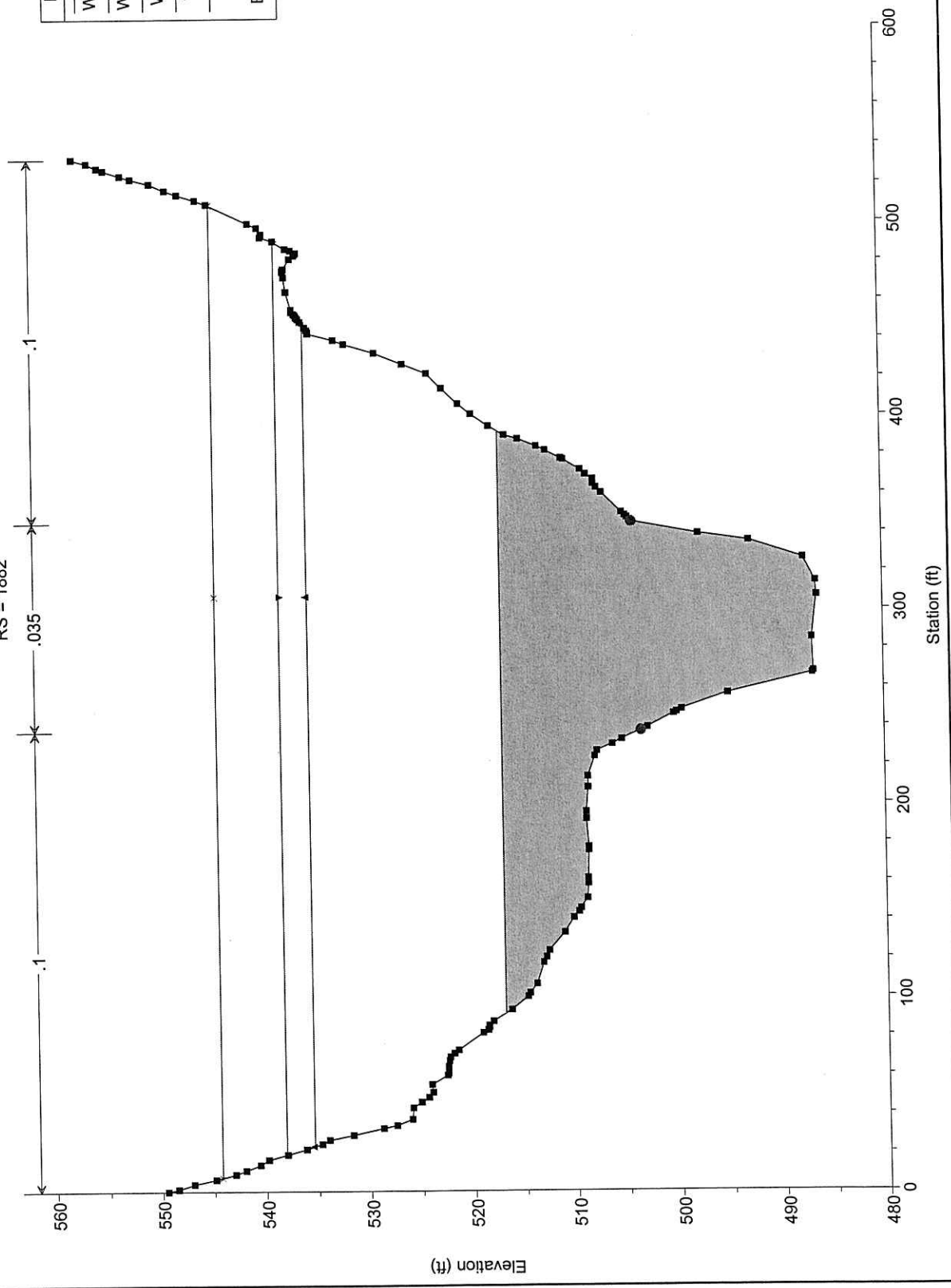
Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

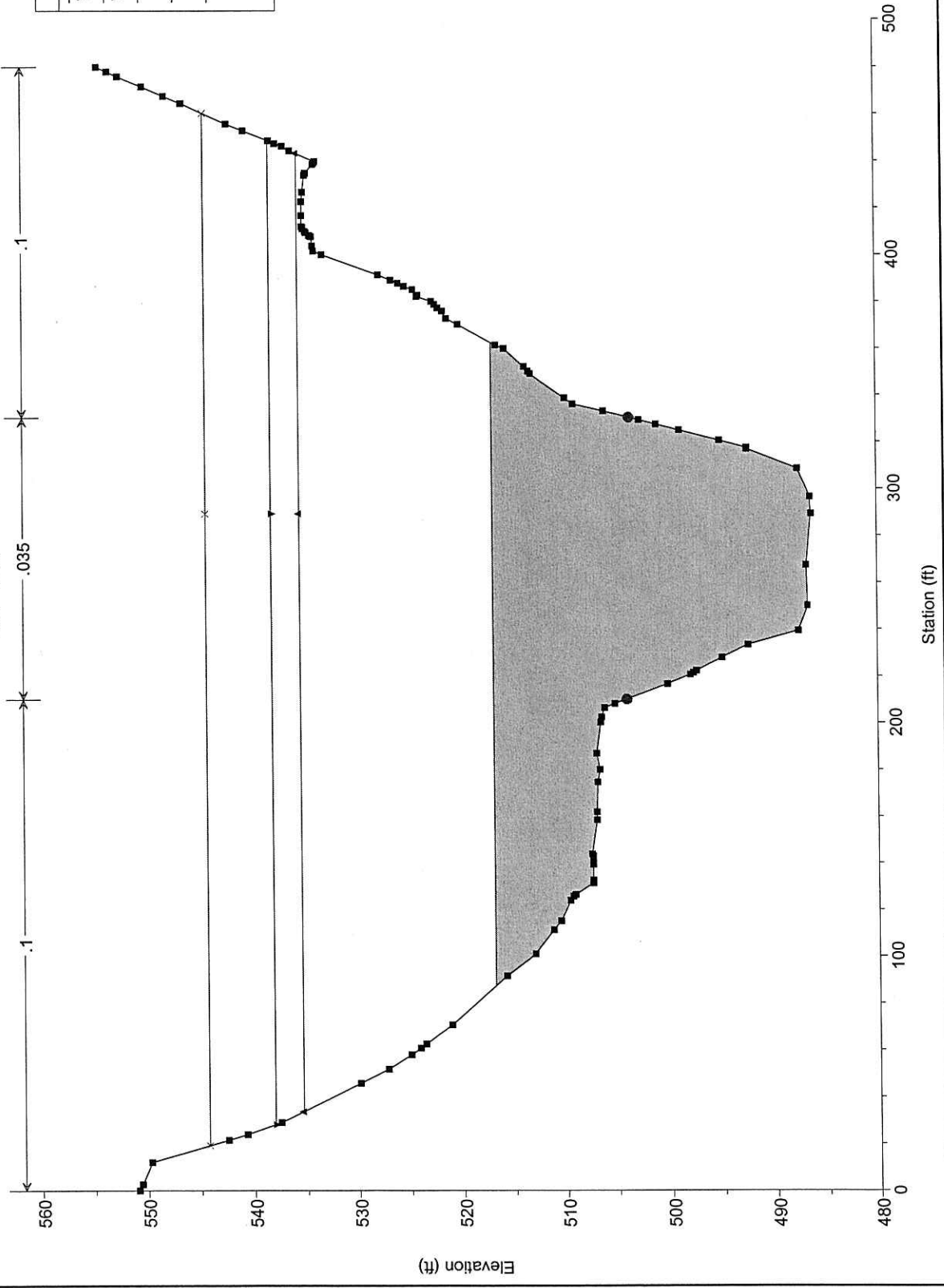
RS = 1882

Legend	
WS Q 500	▲
WS Q 100	▼
WS Q 50	◆
WS Q 2	■
Ground	●
Bank Sta	●



SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

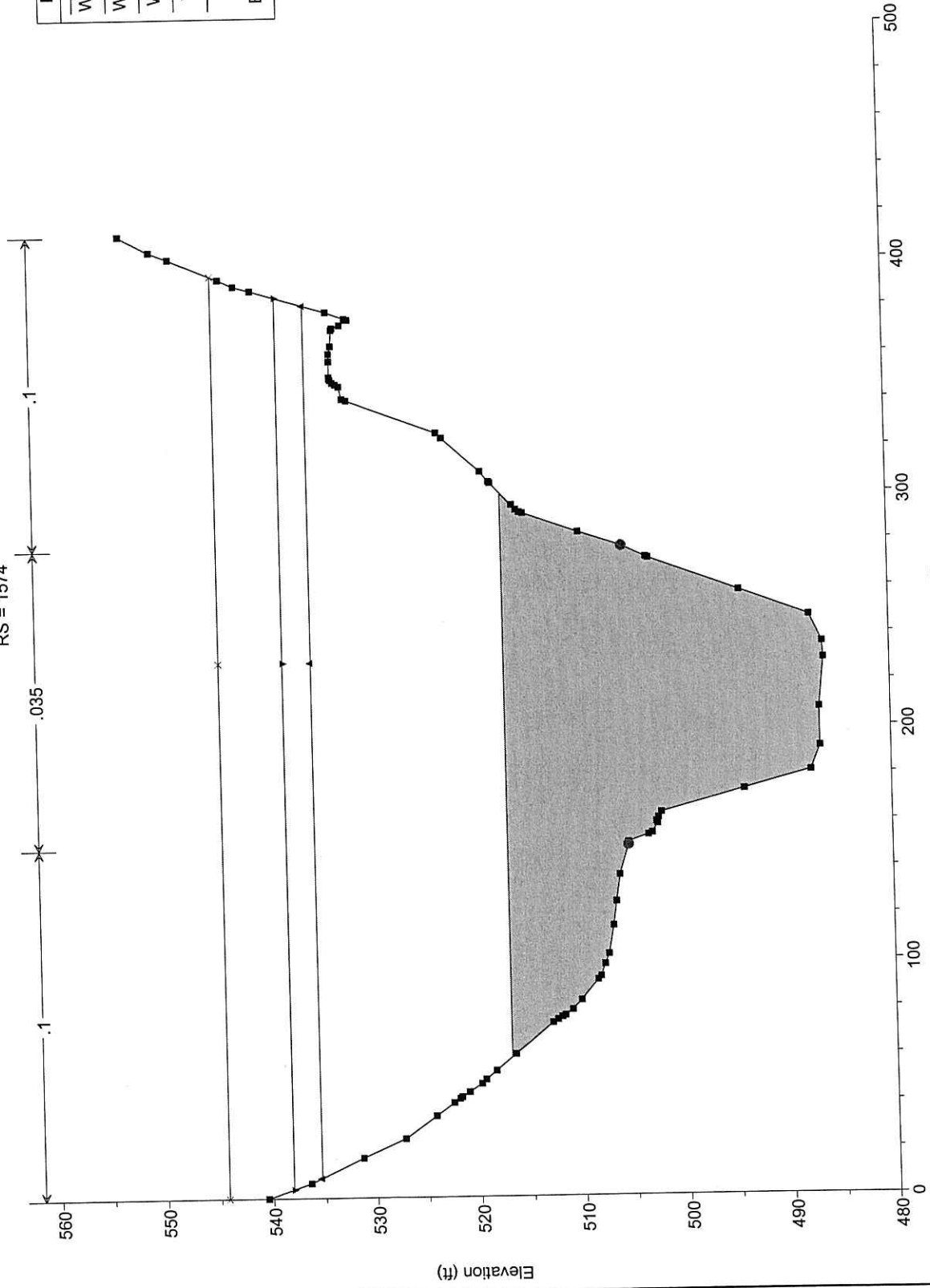
RS = 1734



Legend	
WS Q 500	x
WS Q 100	o
WS Q 50	•
WS Q 2	□
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

RS = 1574



0.1 0.035 0.1

560
550
540
530
520
510
500
490
480

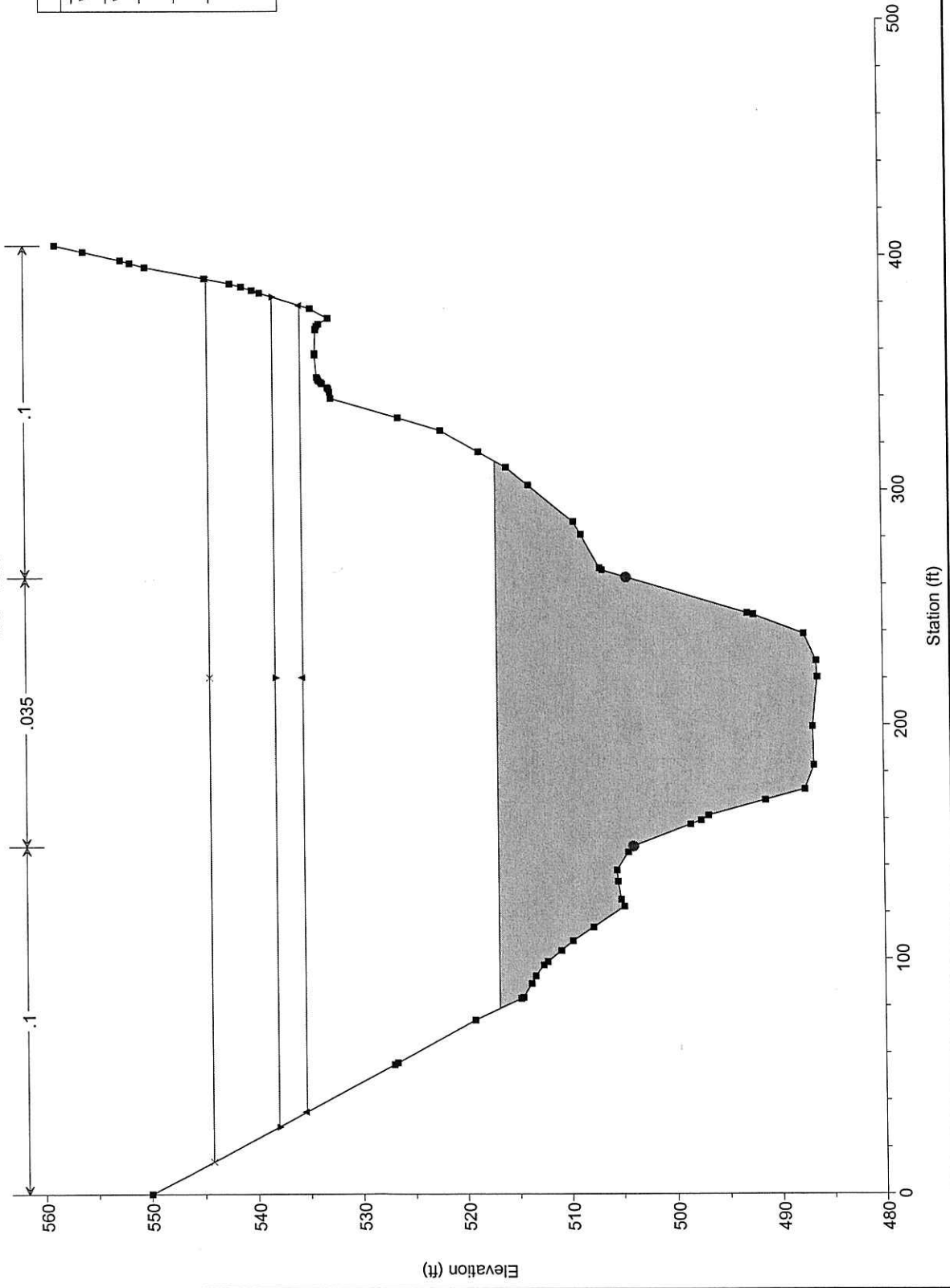
Elevation (ft)

0 100 200 300 400 500

Station (ft)

SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

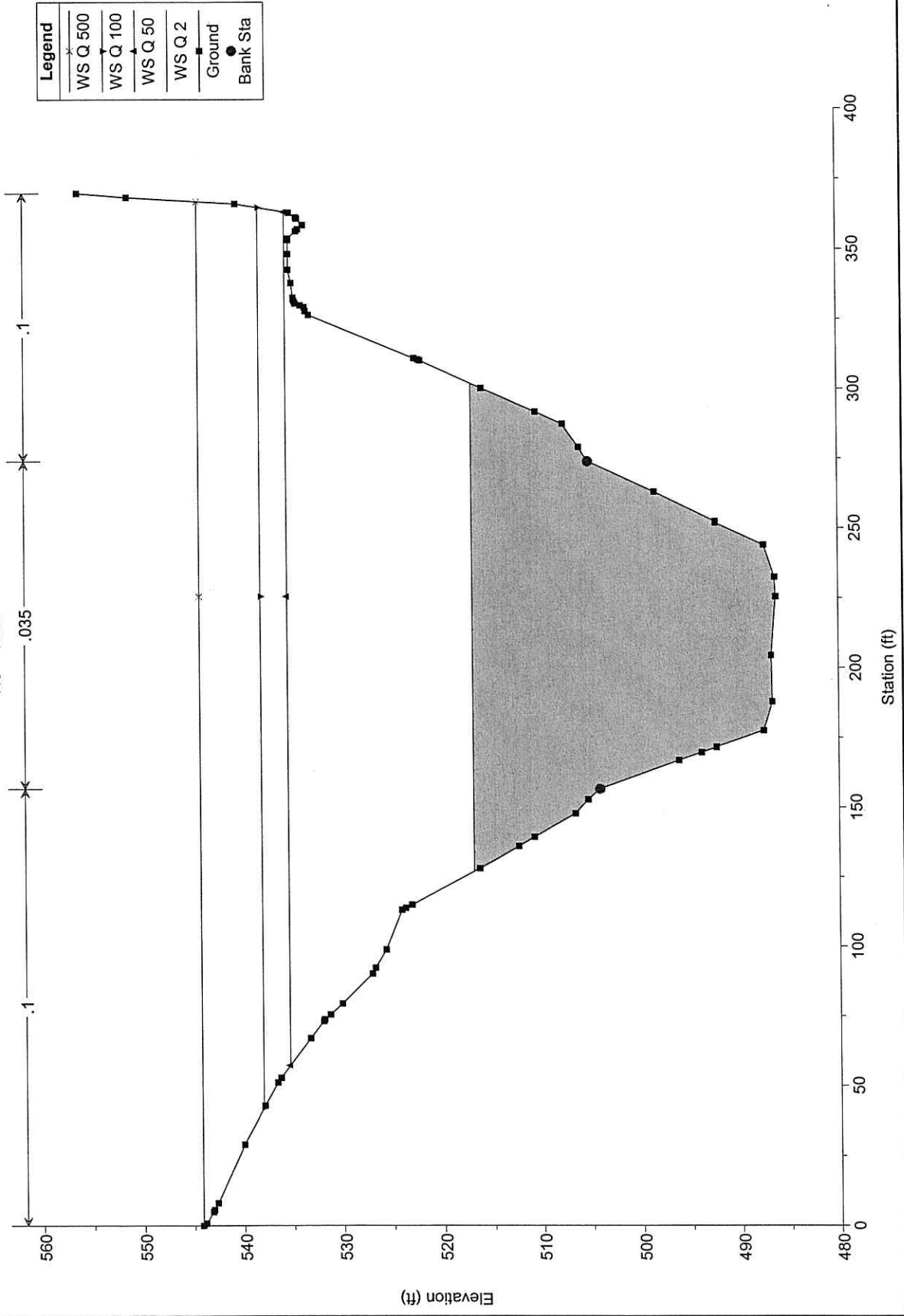
RS = 1395



Legend	
→	WS Q 500
→	WS Q 100
→	WS Q 50
—	WS Q 2
■	Ground
●	Bank Sta

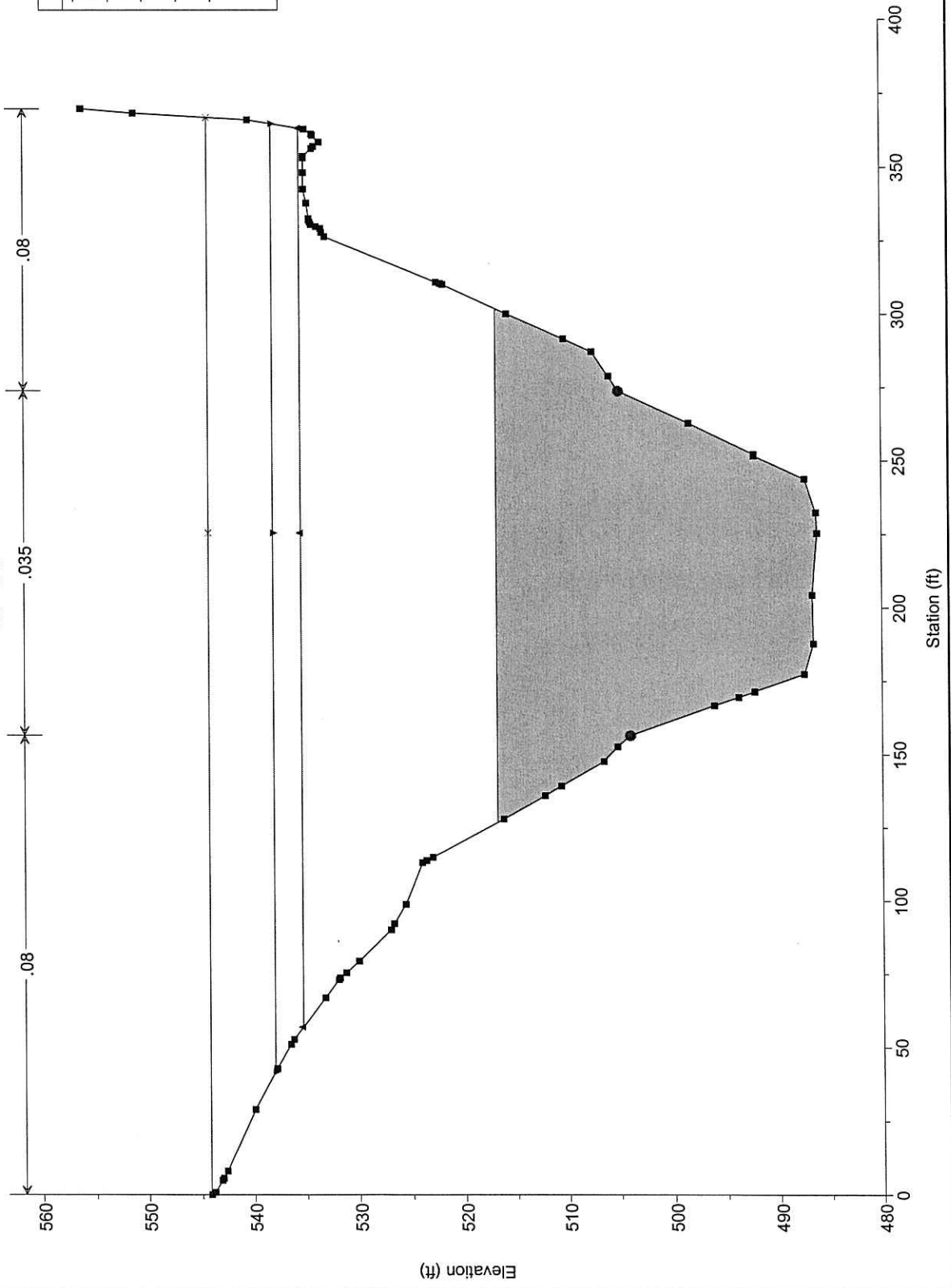
SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

RS = 1185



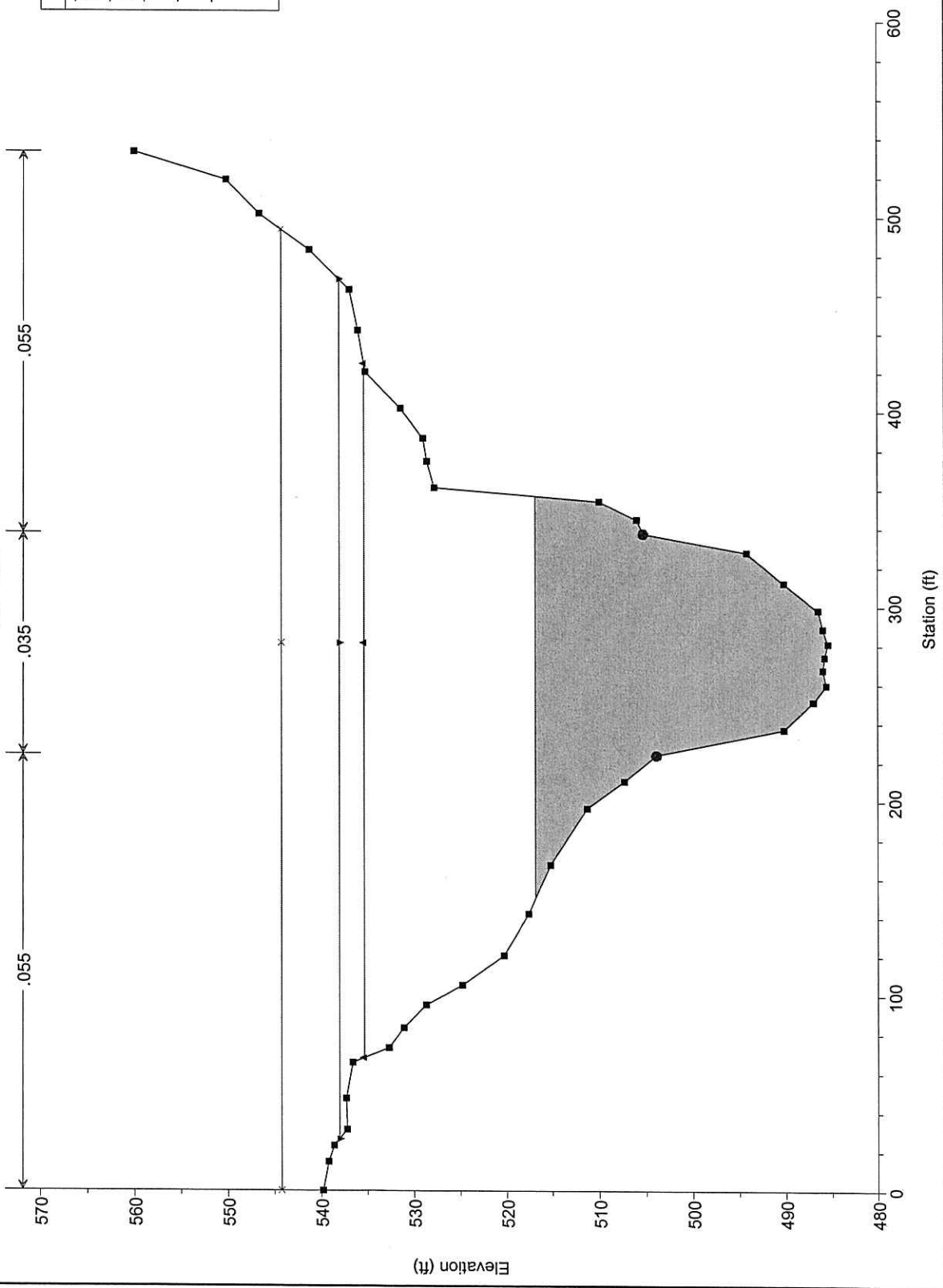
SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

RS = 929



SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

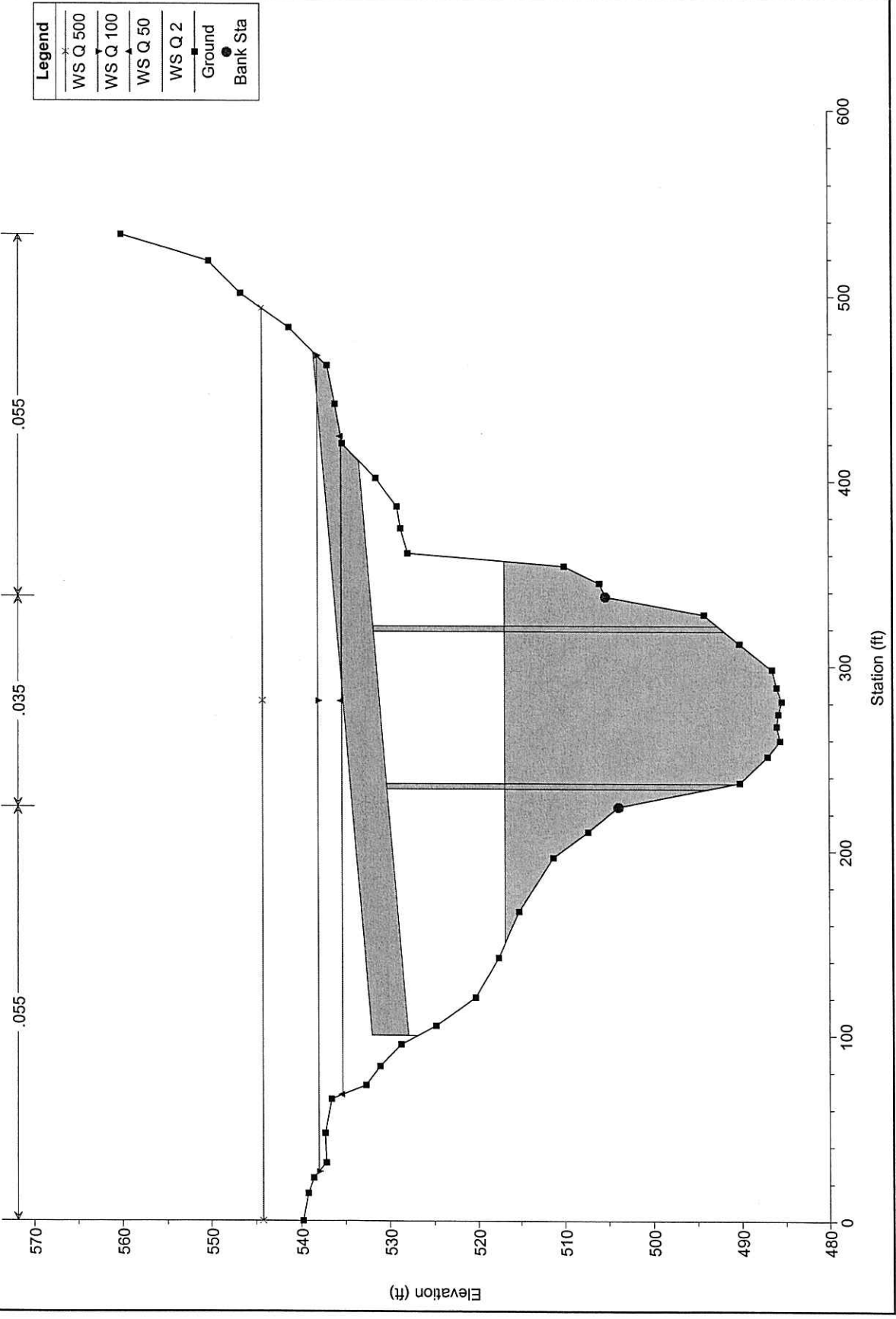
RS = 552



Legend	
WS Q 500	↔
WS Q 100	↔
WS Q 50	↔
WS Q 2	↔
Ground	■
Bank Sta	●

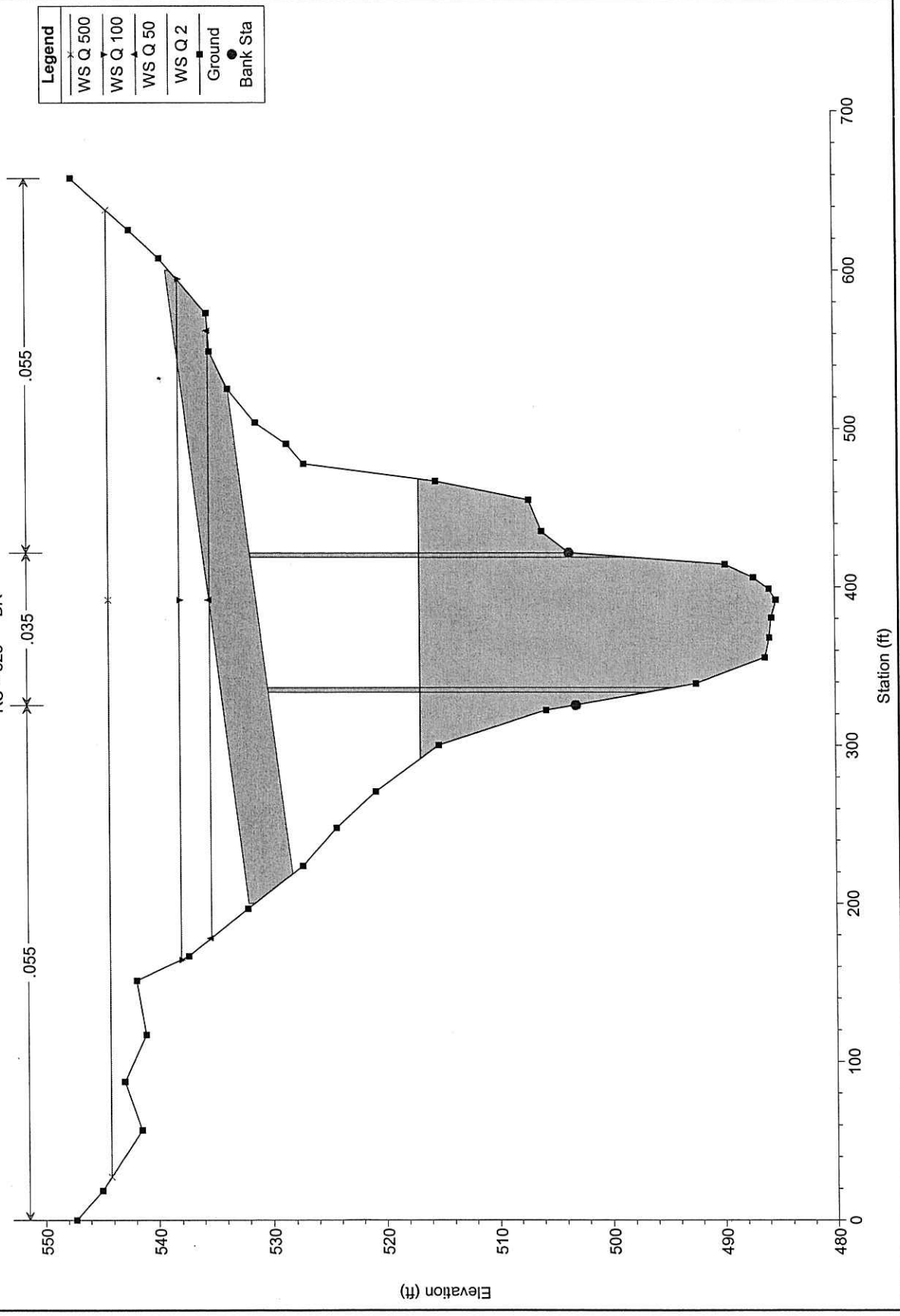
SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

RS = 529 BR



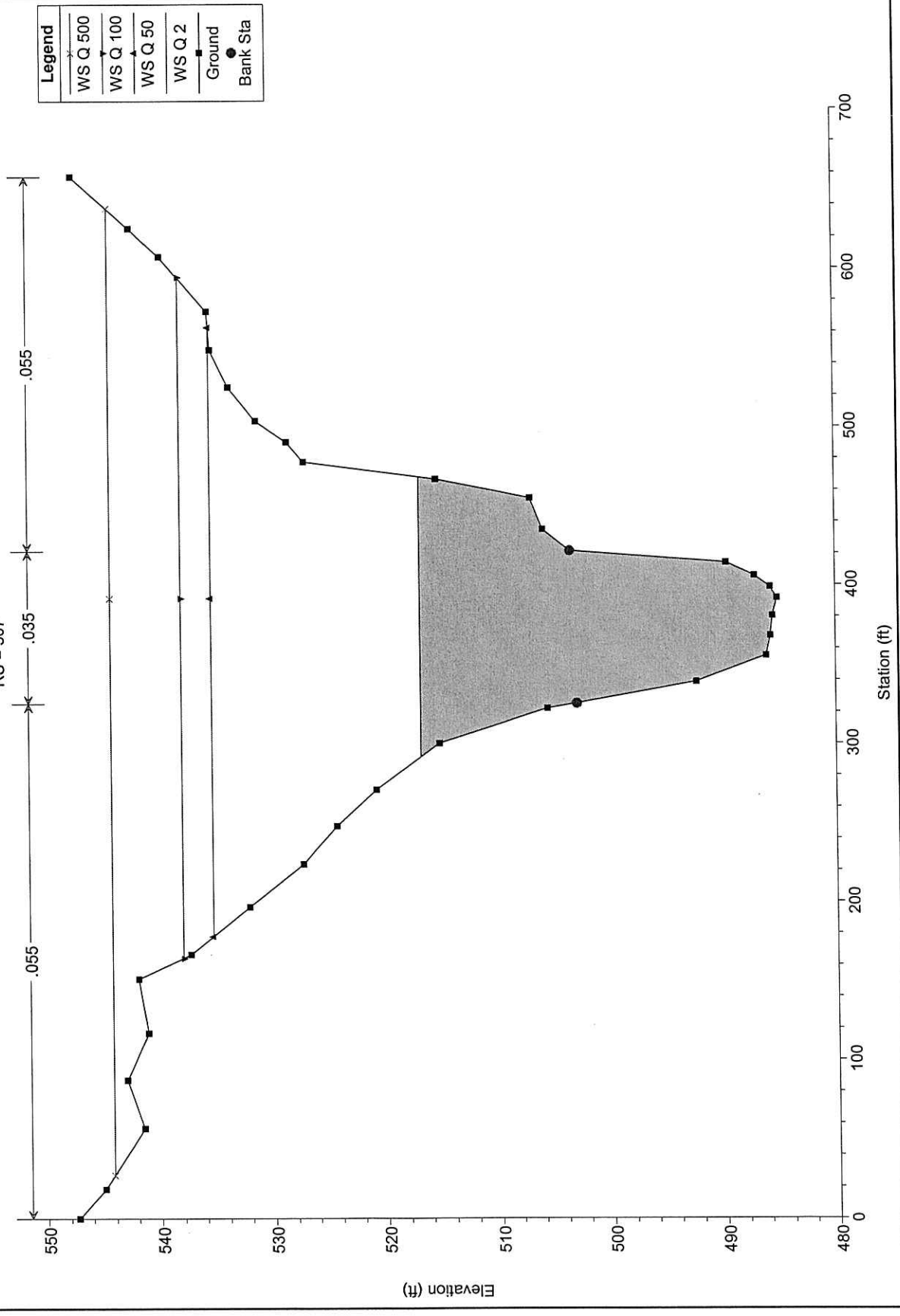
SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

RS = 529 BR



SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/11/2006

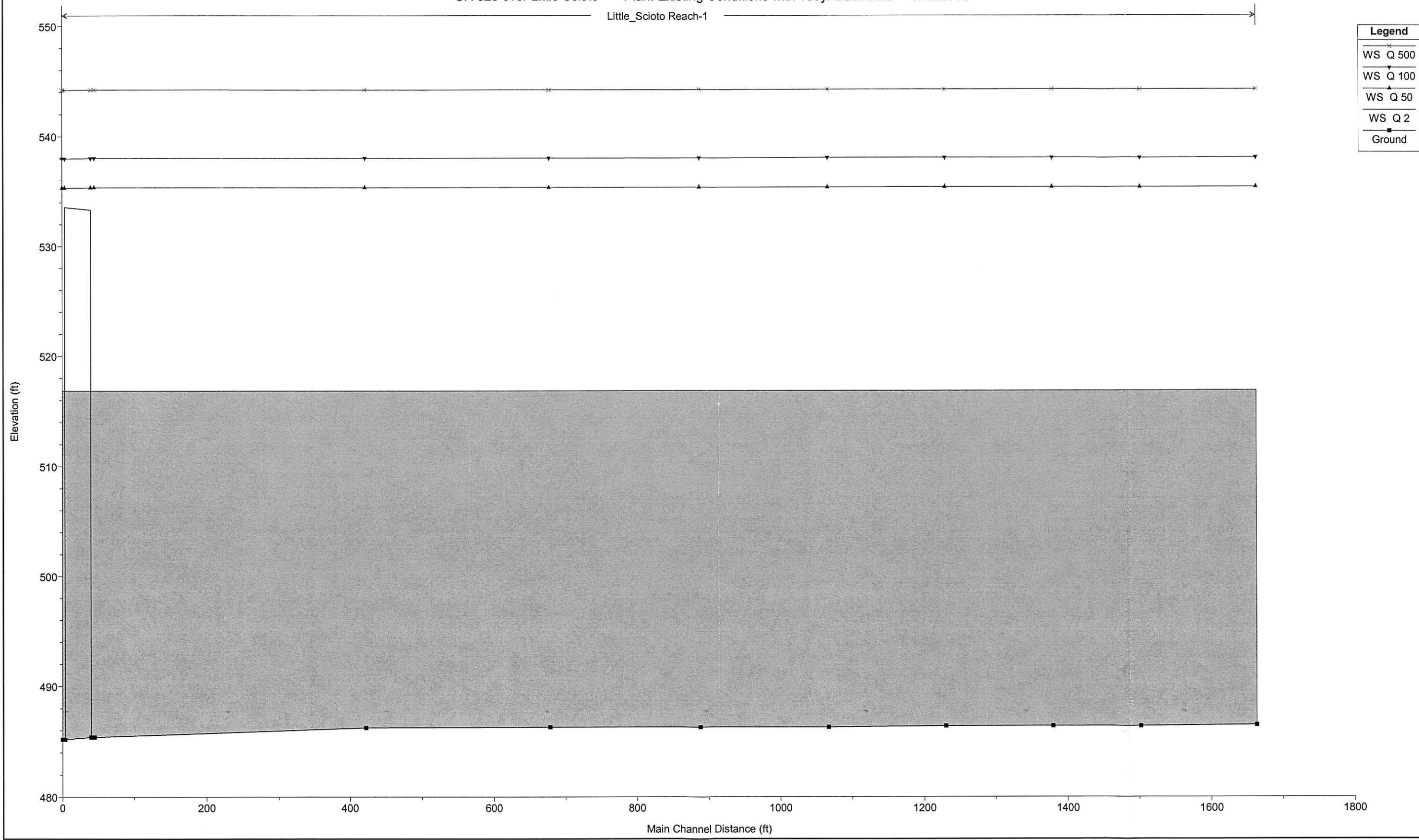
RS = 507



Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Existing Conditions with 100yr Backwater 7/12/2006

Little_Scioto Reach-1



Appendix II
Hydraulic Calculations
Alternative 1

HEC-RAS Plan: Alt 1 NO BW River: Little Scioto Reach: Reach-1

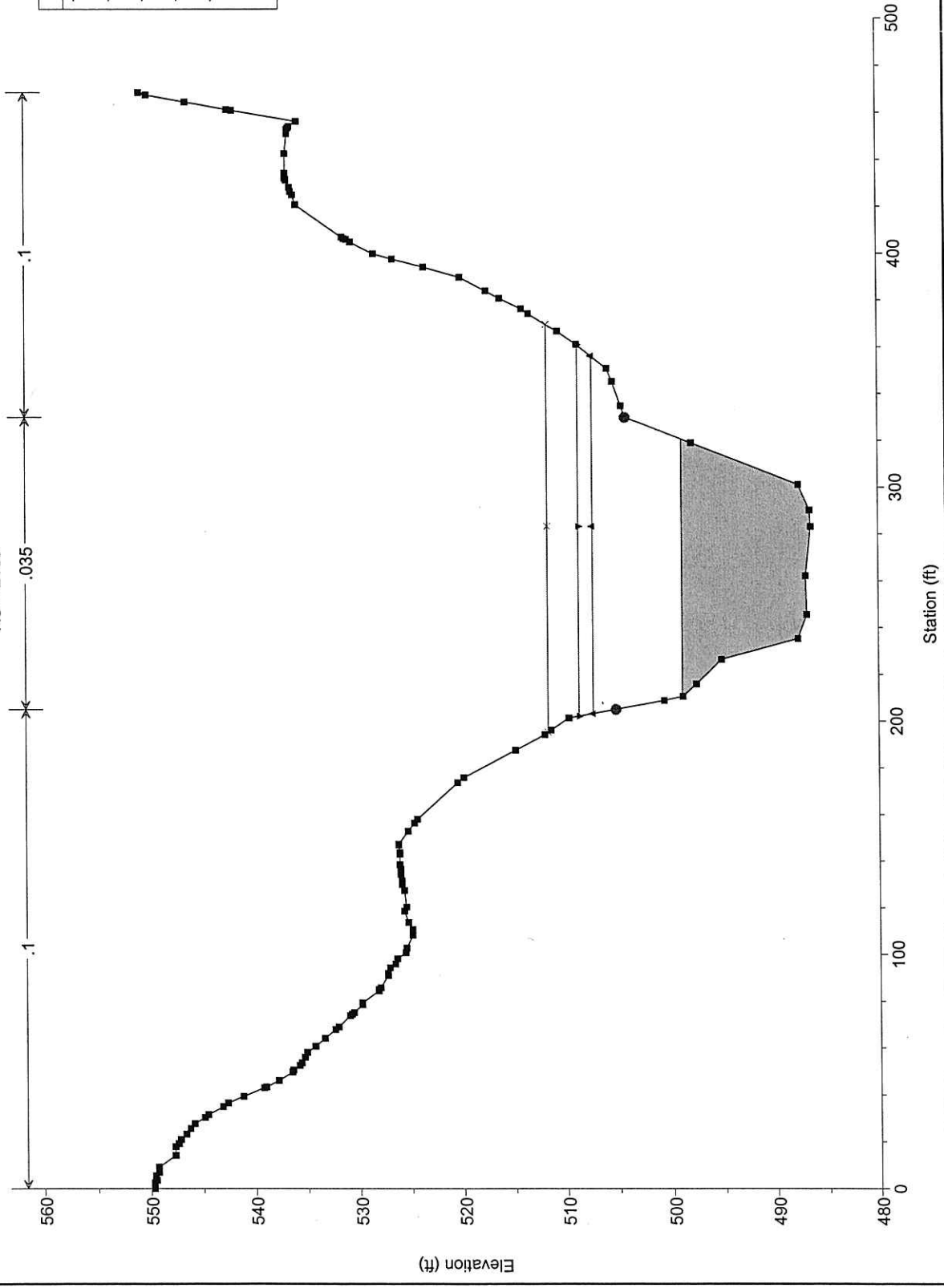
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4986.00	486.50	498.94		499.33	0.000790	5.00	997.00	109.99	0.29
Reach-1	2169	Q 50	13337.00	486.50	507.38		508.06	0.000667	6.63	2063.18	152.79	0.29
Reach-1	2169	Q 100	15167.00	486.50	508.72		509.47	0.000657	6.94	2272.60	158.71	0.29
Reach-1	2169	Q 500	19717.00	486.50	511.67		512.57	0.000652	7.67	2760.86	174.21	0.30
Reach-1	2008	Q 2	4986.00	486.40	498.78		499.20	0.000768	5.21	956.19	94.64	0.29
Reach-1	2008	Q 50	13337.00	486.40	507.10		507.93	0.000761	7.32	1884.71	135.57	0.31
Reach-1	2008	Q 100	15167.00	486.40	508.43		509.34	0.000763	7.70	2071.17	147.92	0.32
Reach-1	2008	Q 500	19717.00	486.40	511.33		512.43	0.000773	8.54	2592.27	220.03	0.33
Reach-1	1882	Q 2	4986.00	486.40	498.59	492.59	499.09	0.000956	5.68	877.83	89.58	0.32
Reach-1	1882	Q 50	13337.00	486.40	506.90	497.51	507.82	0.000928	7.70	1761.33	131.31	0.34
Reach-1	1882	Q 100	15167.00	486.40	508.23	498.40	509.23	0.000913	8.05	1945.18	149.72	0.34
Reach-1	1882	Q 500	19717.00	486.40	511.24	500.46	512.33	0.000833	8.56	2614.21	247.76	0.33
Reach-1	1808	Bridge										
Reach-1	1734	Q 2	4986.00	486.40	498.53		498.92	0.000752	5.01	995.03	104.89	0.29
Reach-1	1734	Q 50	13337.00	486.40	506.86		507.58	0.000695	6.81	1972.54	150.15	0.30
Reach-1	1734	Q 100	15167.00	486.40	508.19		508.97	0.000681	7.11	2229.14	206.26	0.30
Reach-1	1734	Q 500	19717.00	486.40	511.17		512.03	0.000635	7.62	2875.80	231.55	0.30
Reach-1	1574	Q 2	4970.00	486.30	498.34		498.79	0.000849	5.34	930.63	96.82	0.30
Reach-1	1574	Q 50	13343.00	486.30	506.65		507.44	0.000879	7.13	1885.63	155.79	0.33
Reach-1	1574	Q 100	15175.00	486.30	507.98		508.84	0.000848	7.42	2116.01	184.91	0.33
Reach-1	1574	Q 500	19727.00	486.30	510.91		511.91	0.000799	8.06	2690.64	205.87	0.33
Reach-1	1395	Q 2	4970.00	486.30	498.17		498.63	0.000897	5.43	914.75	96.51	0.31
Reach-1	1395	Q 50	13343.00	486.30	506.44		507.28	0.000855	7.36	1852.21	148.03	0.33
Reach-1	1395	Q 100	15175.00	486.30	507.76		508.68	0.000842	7.71	2053.80	159.96	0.33
Reach-1	1395	Q 500	19727.00	486.30	510.65		511.75	0.000829	8.49	2557.41	186.52	0.33
Reach-1	1185	Q 2	4970.00	486.30	497.97		498.44	0.000935	5.49	905.48	97.46	0.32
Reach-1	1185	Q 50	13343.00	486.30	506.26		507.10	0.000879	7.36	1822.92	131.24	0.33
Reach-1	1185	Q 100	15175.00	486.30	507.58		508.50	0.000864	7.71	2002.80	141.38	0.33
Reach-1	1185	Q 500	19727.00	486.30	510.45		511.57	0.000853	8.51	2424.78	152.03	0.34
Reach-1	929	Q 2	4970.00	486.24	497.70		498.19	0.000999	5.62	884.94	96.82	0.33

HEC-RAS Plan: Alt 1 NO BW River: Little_Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	506.01		506.87	0.000917	7.46	1797.78	129.49	0.34
Reach-1	929	Q 100	15175.00	486.24	507.33		508.27	0.000896	7.79	1976.52	140.03	0.34
Reach-1	929	Q 500	19727.00	486.24	510.22		511.35	0.000876	8.57	2398.11	151.39	0.34
Reach-1	552	Q 2	4970.00	485.40	497.32	492.10	497.80	0.001007	5.56	893.12	100.38	0.33
Reach-1	552	Q 50	13343.00	485.40	505.67	496.58	506.53	0.000892	7.44	1799.14	124.33	0.33
Reach-1	552	Q 100	15175.00	485.40	506.99	497.36	507.94	0.000878	7.80	1972.73	135.34	0.33
Reach-1	552	Q 500	19727.00	485.40	509.88	499.14	511.02	0.000870	8.61	2387.80	152.23	0.34
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	497.14	491.97	497.73	0.001200	6.19	802.92	85.29	0.36
Reach-1	507	Q 50	13343.00	485.20	505.25	496.82	506.40	0.001200	8.60	1562.38	108.84	0.38
Reach-1	507	Q 100	15175.00	485.20	506.53	497.71	507.80	0.001200	9.05	1709.75	126.34	0.38
Reach-1	507	Q 500	19727.00	485.20	509.33	499.70	510.86	0.001200	9.99	2098.63	144.65	0.39

SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

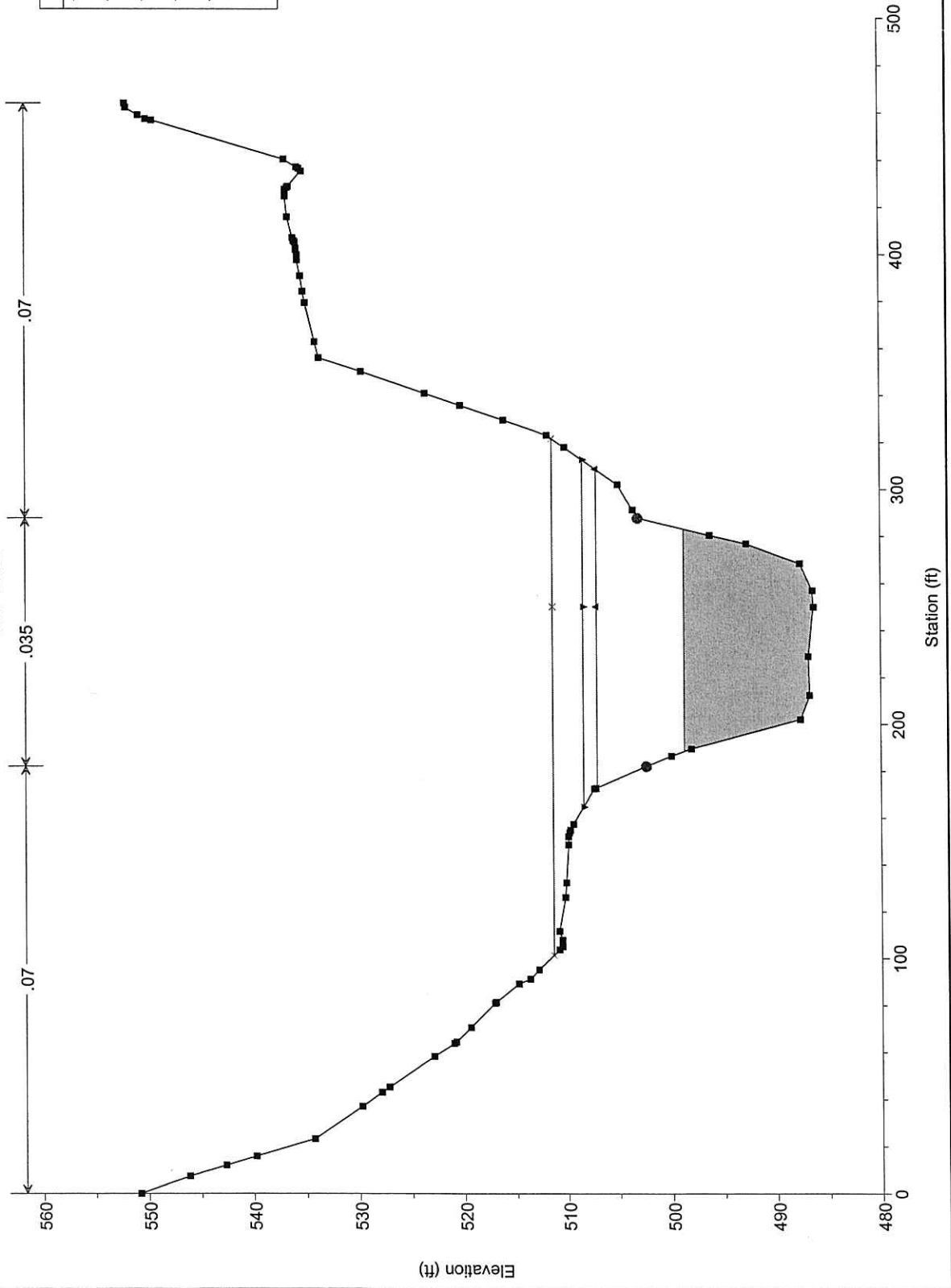
RS = 2169



Legend	
—x—	WS Q 500
—v—	WS Q 100
—^—	WS Q 50
—□—	WS Q 2
—■—	Ground
●	Bank Sta

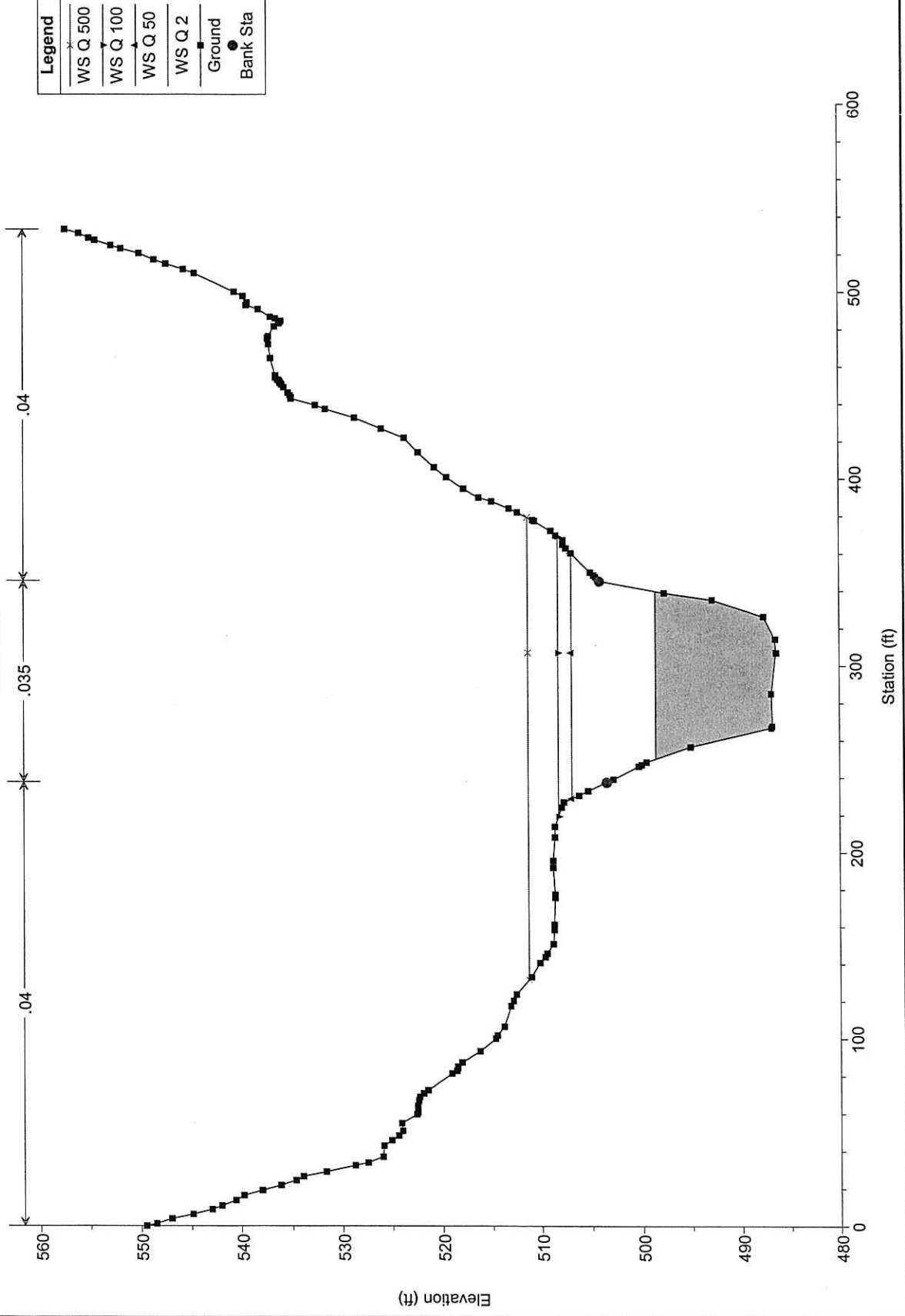
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 2008



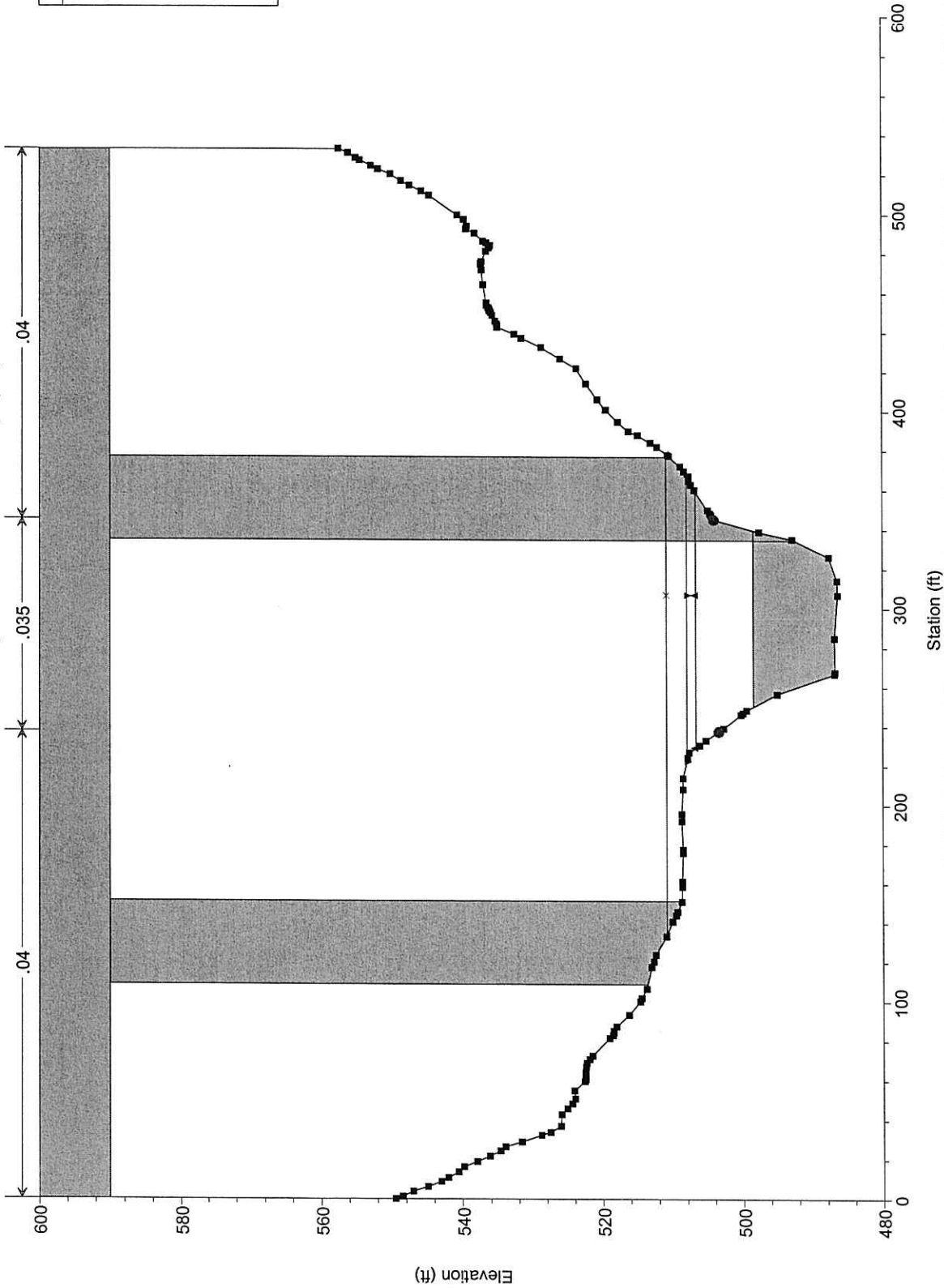
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 1882



Legend	
WS Q 500	—x—
WS Q 100	—▲—
WS Q 50	—■—
WS Q 2	—●—
Ground	—■—
Bank Sta	●

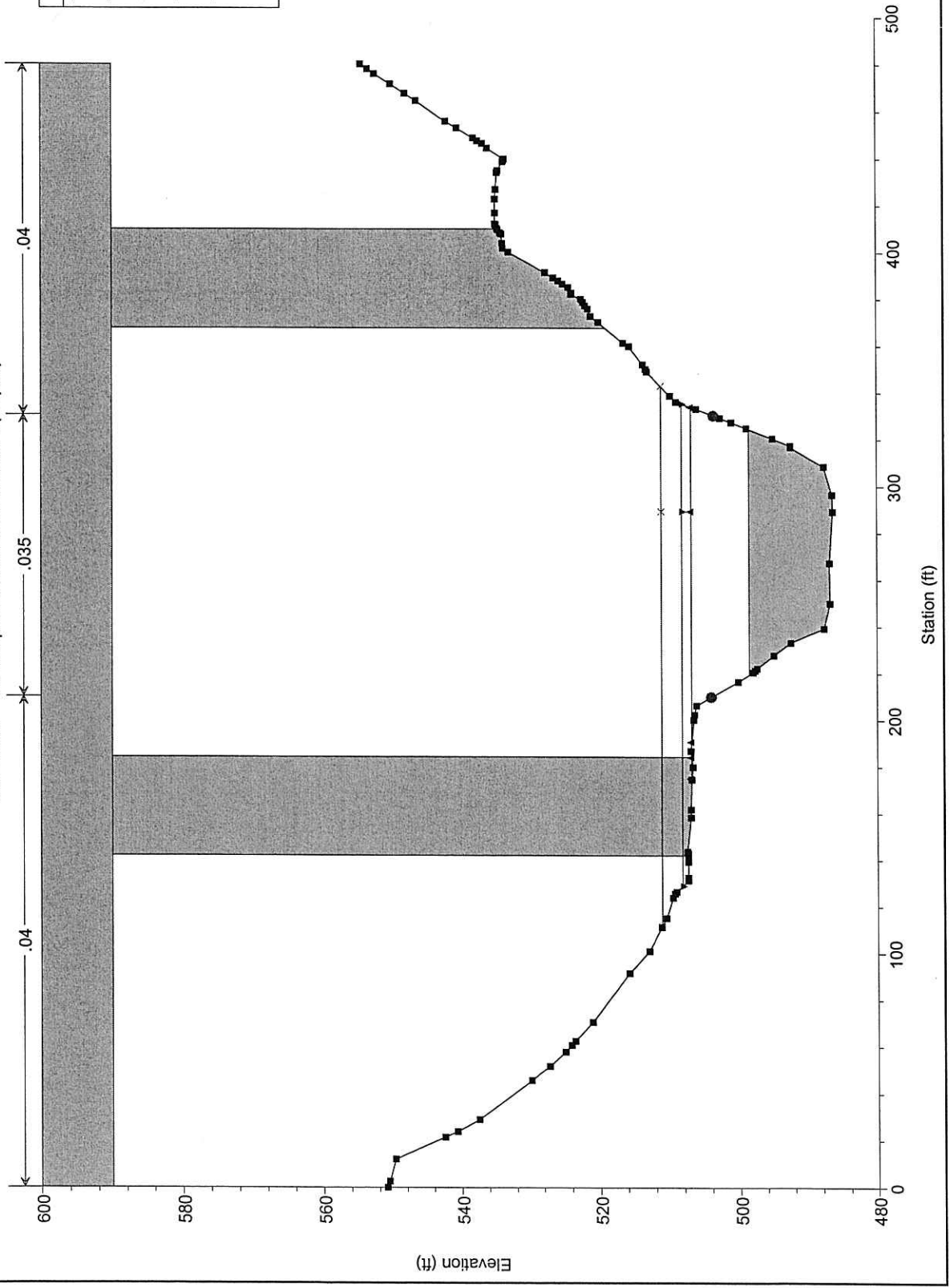
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006
 RS = 1808 BR Proposed SR 823 Alternative 1 (5 span)



Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006
 RS = 1808 BR Proposed SR 823 Alternative 1 (5 span)

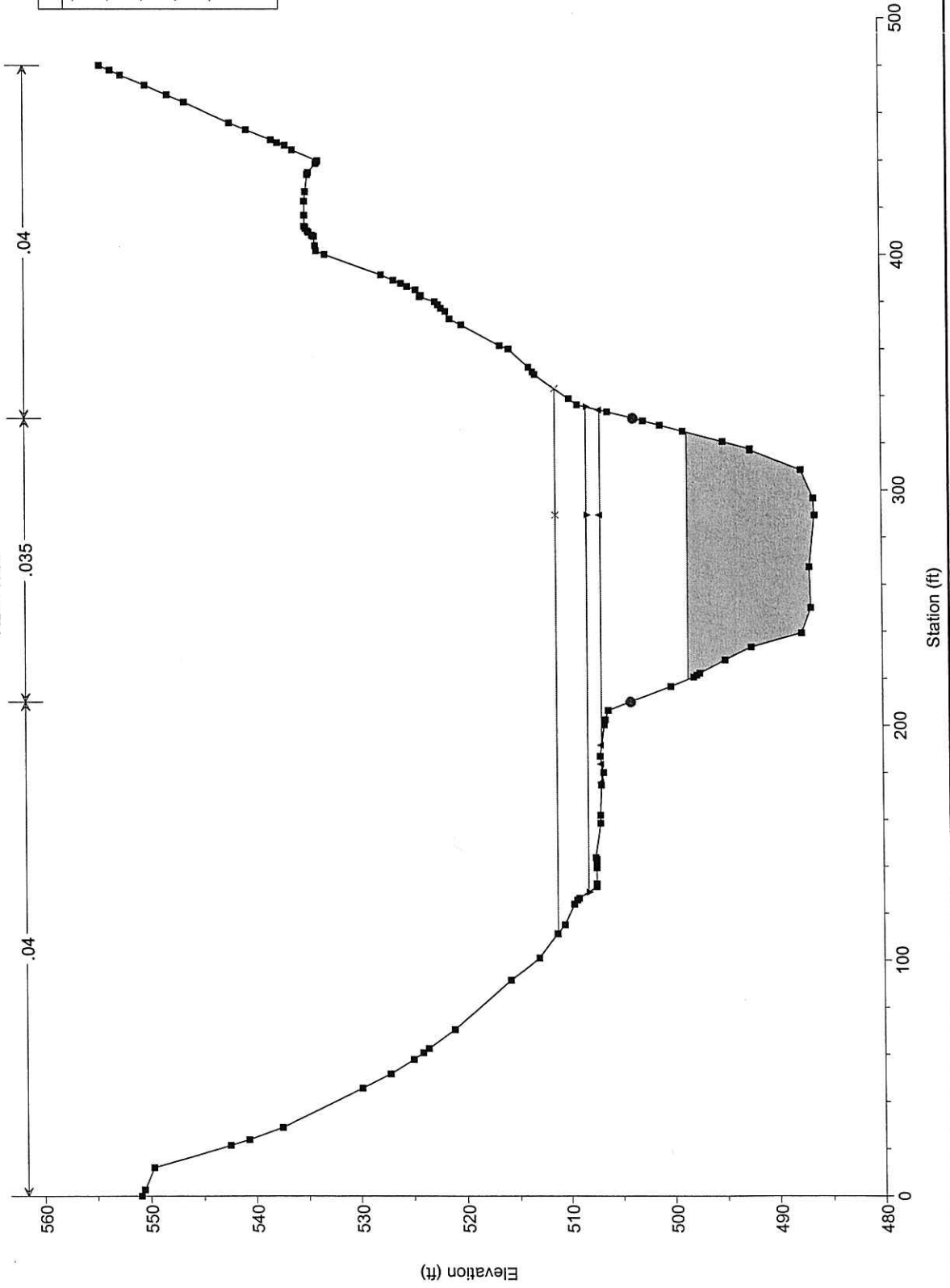
Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta



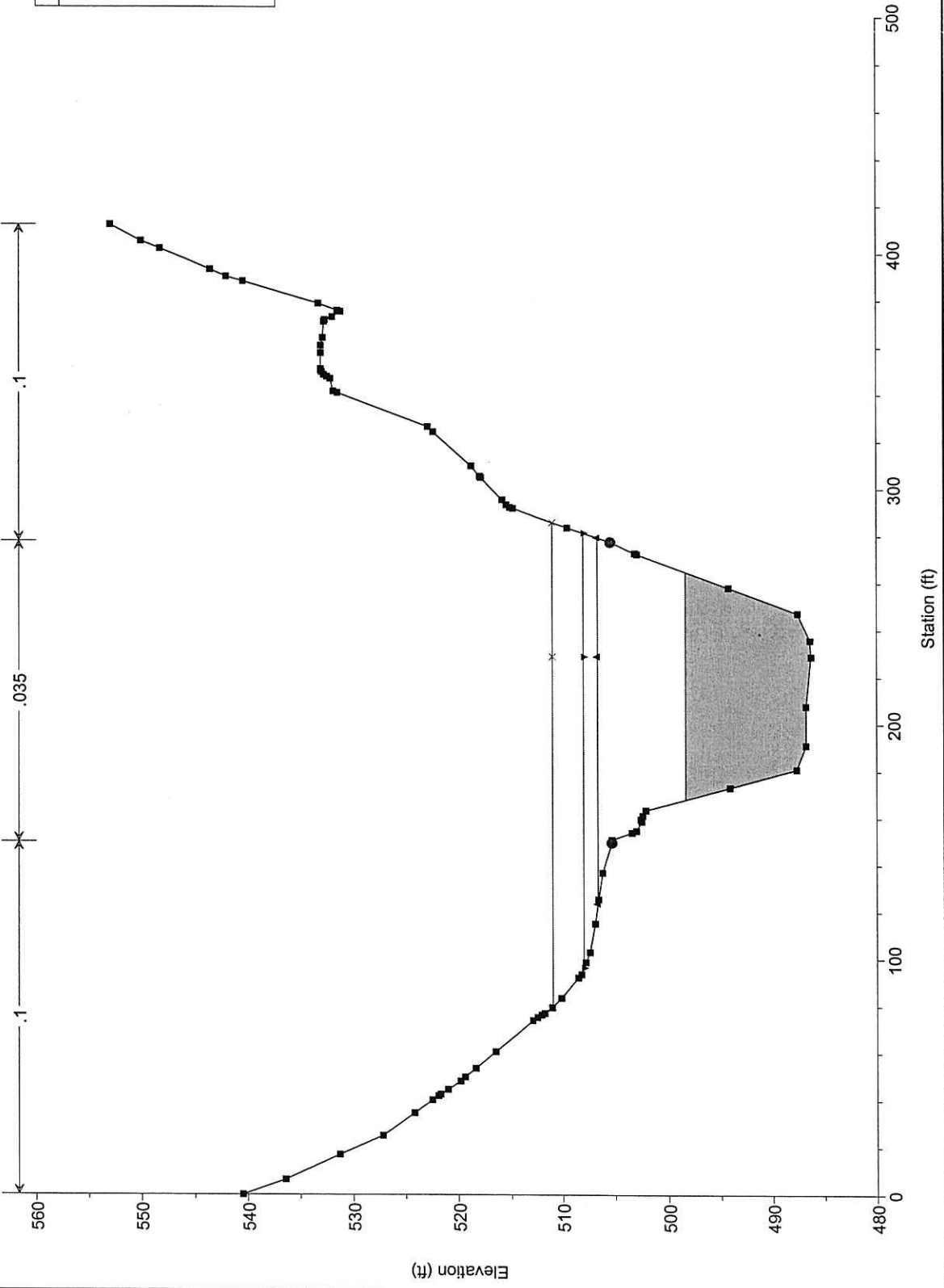
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 1734

Legend	
WS Q 500	▲
WS Q 100	▼
WS Q 50	◆
WS Q 2	■
Ground	—
Bank Sta	●



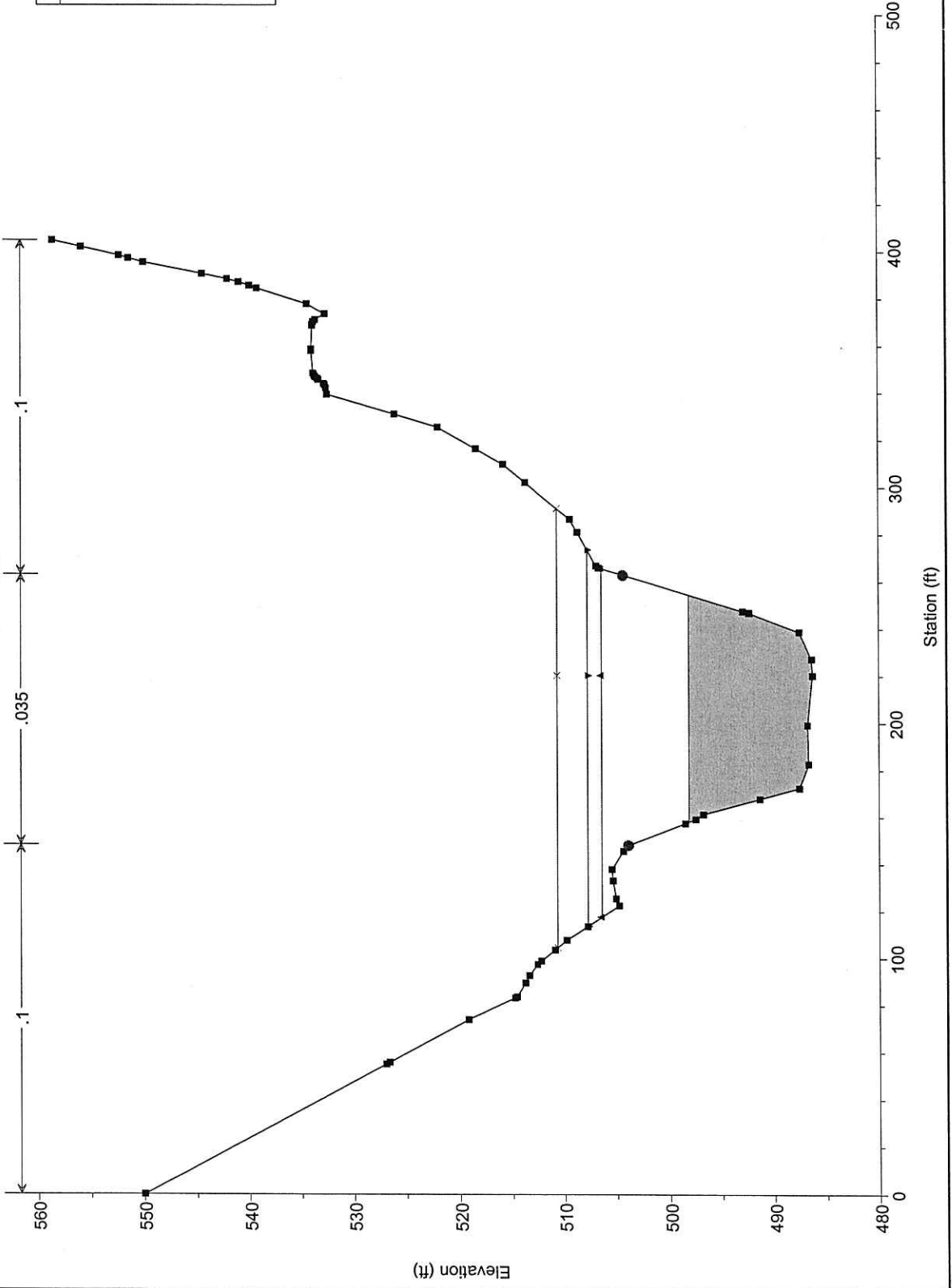
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006
 RS = 1574



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

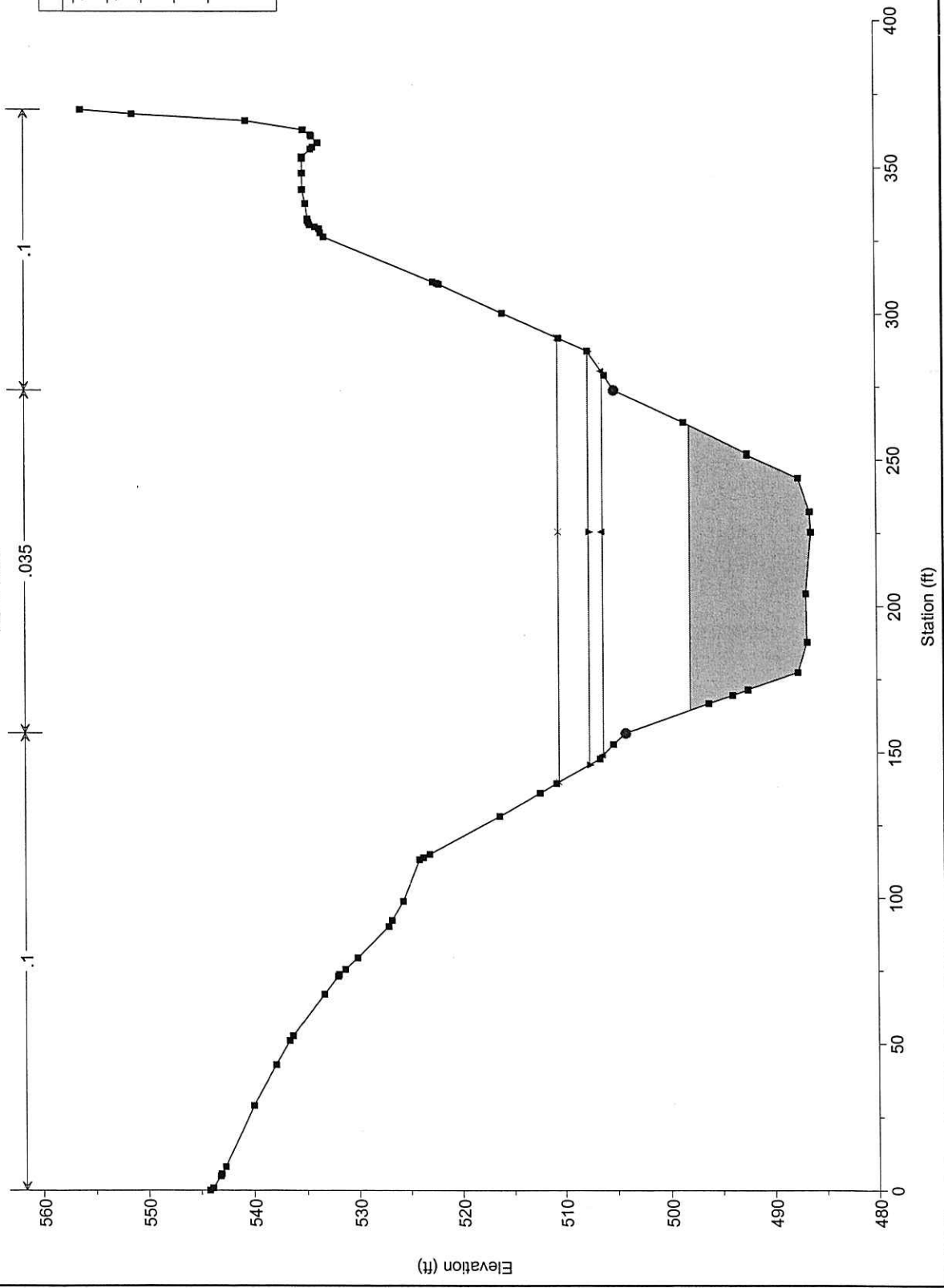
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 1395



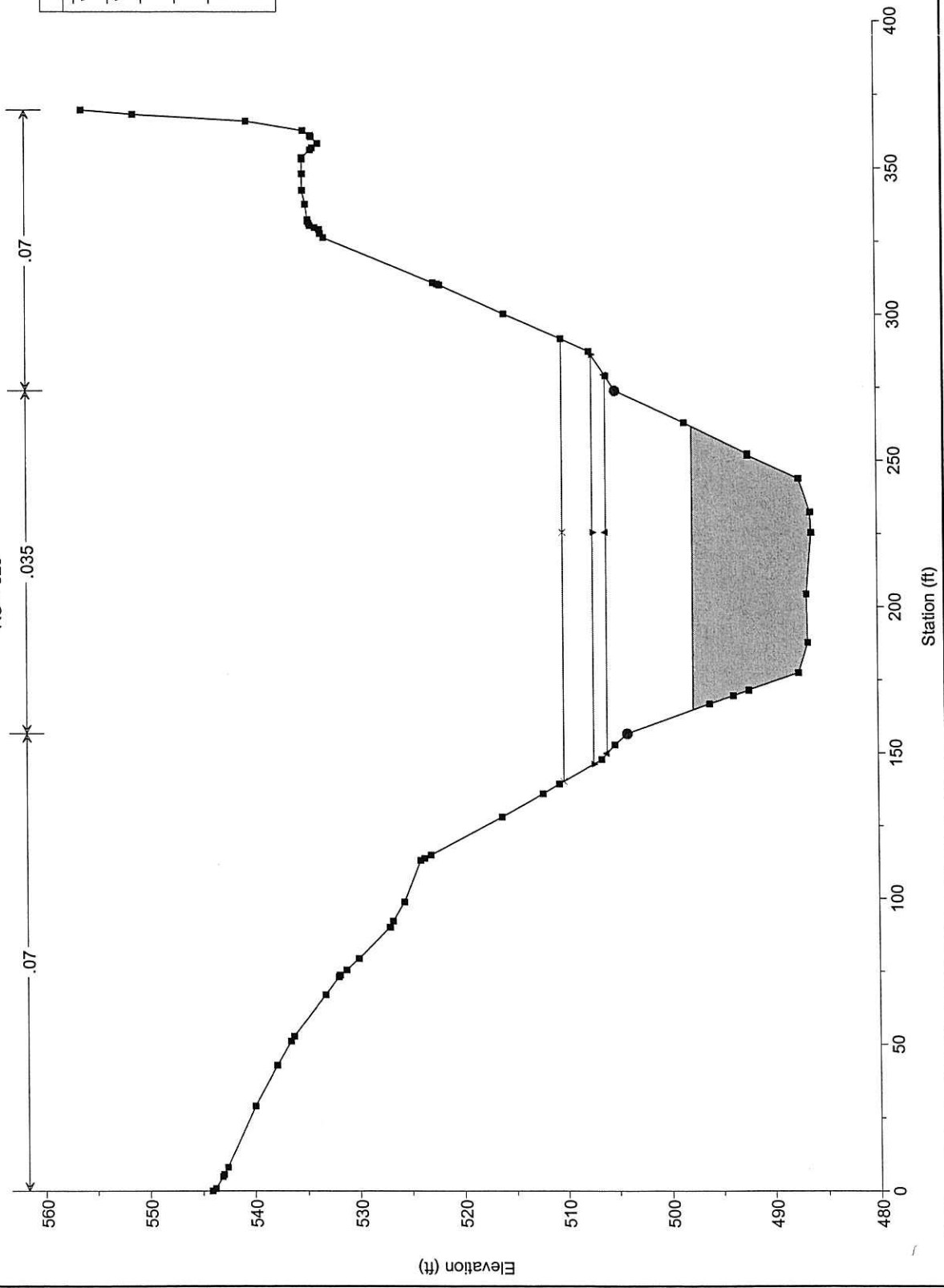
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 1185



SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 929

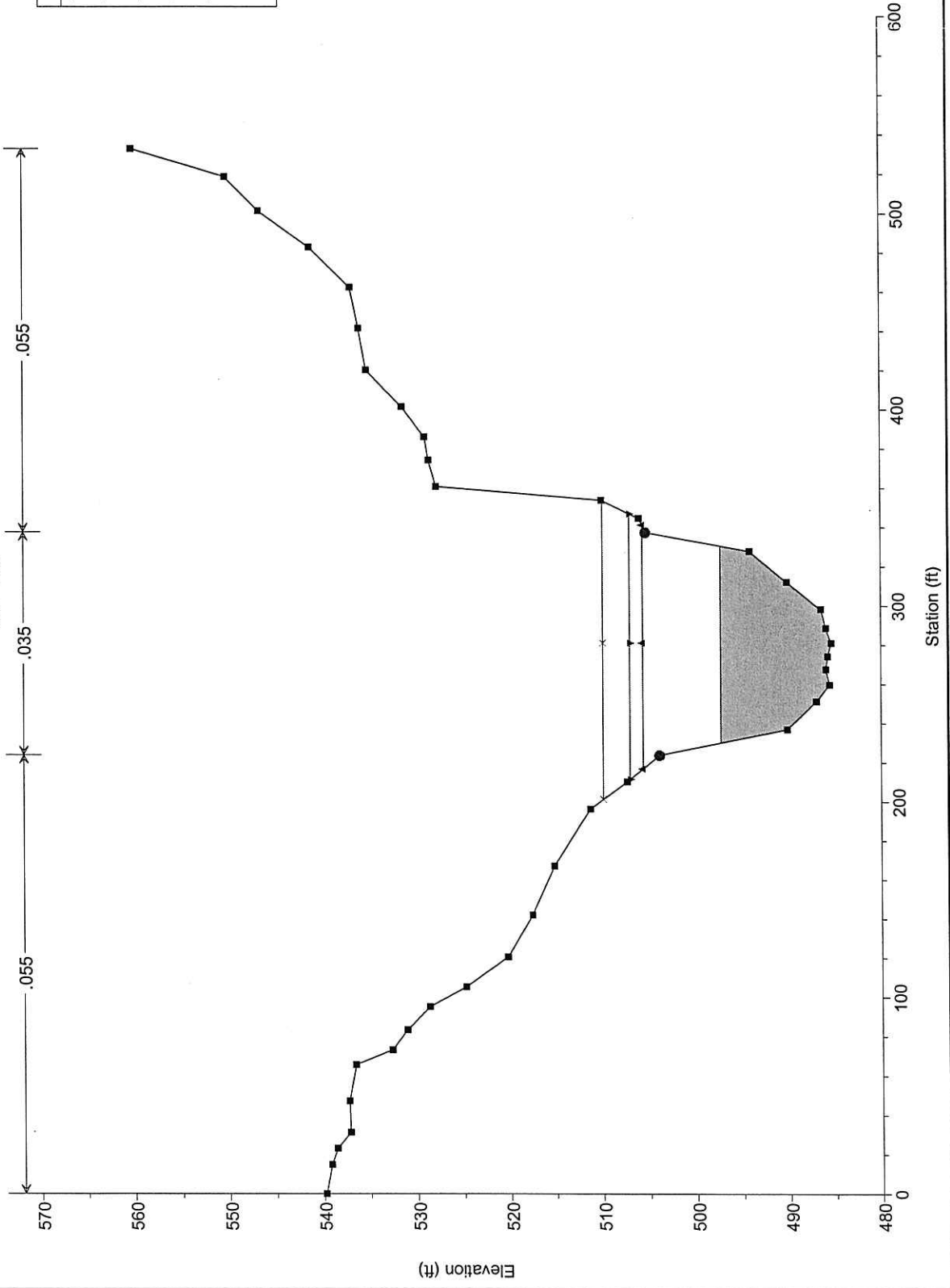


Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

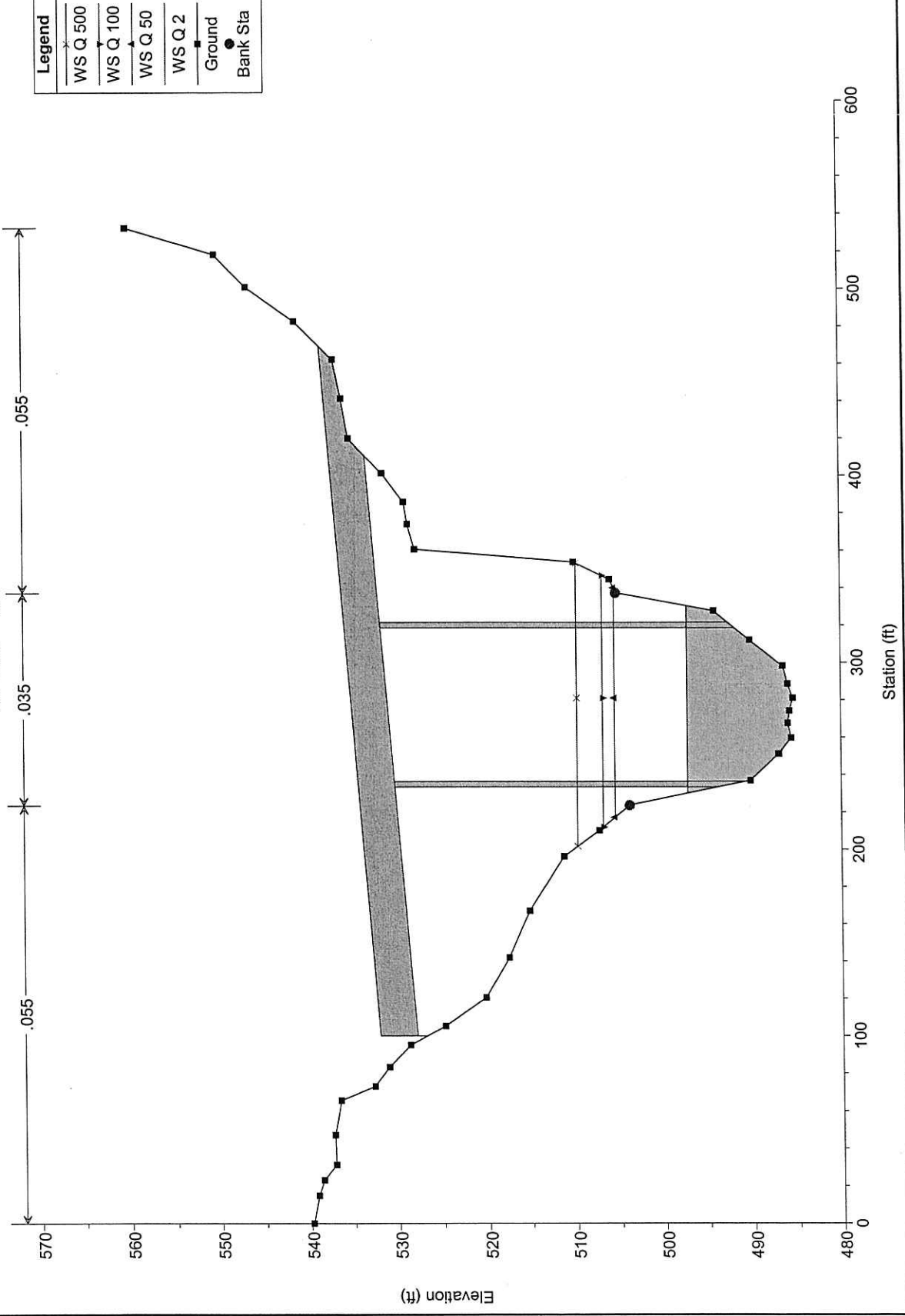
RS = 552

Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●



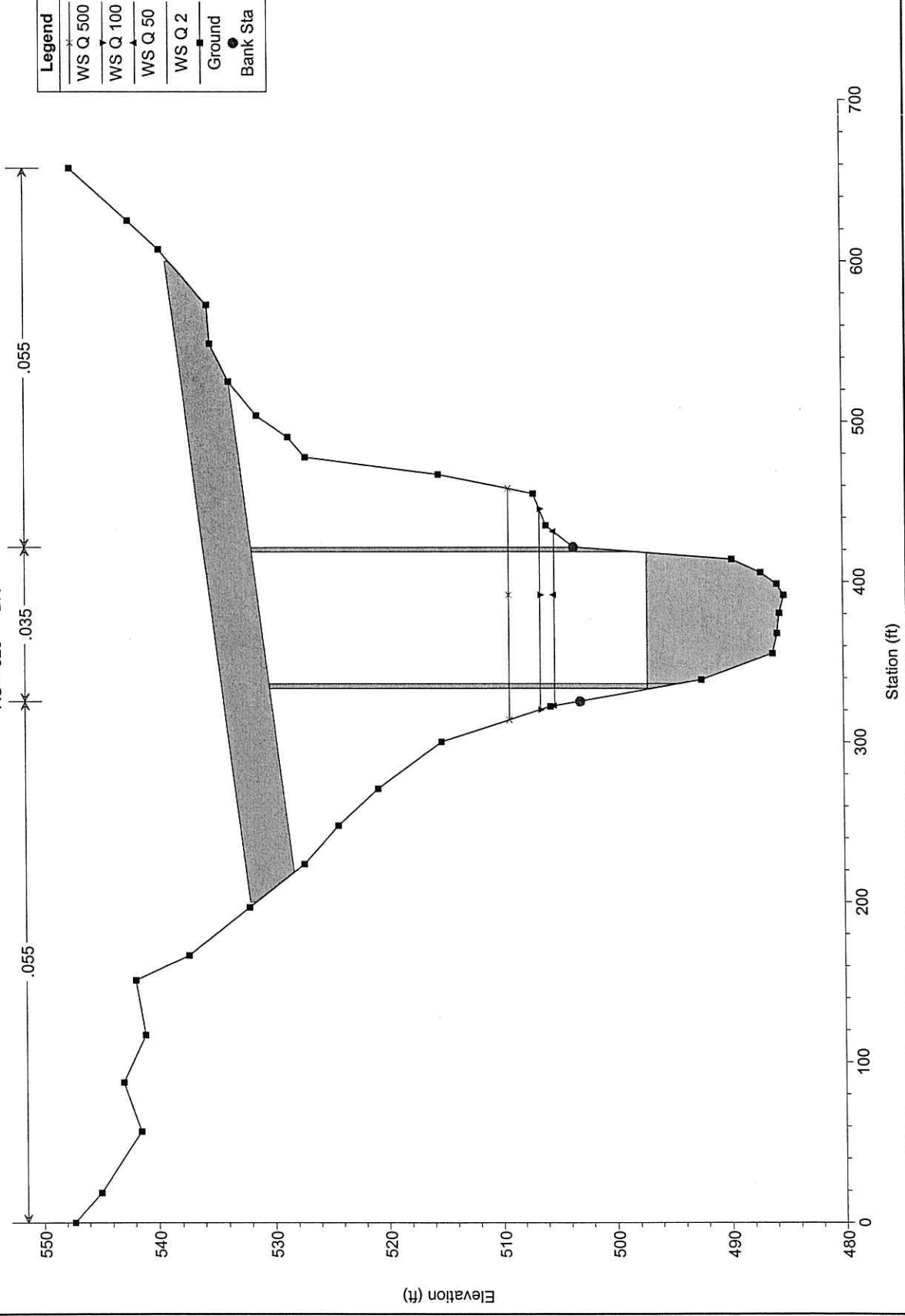
SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 529 BR



SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

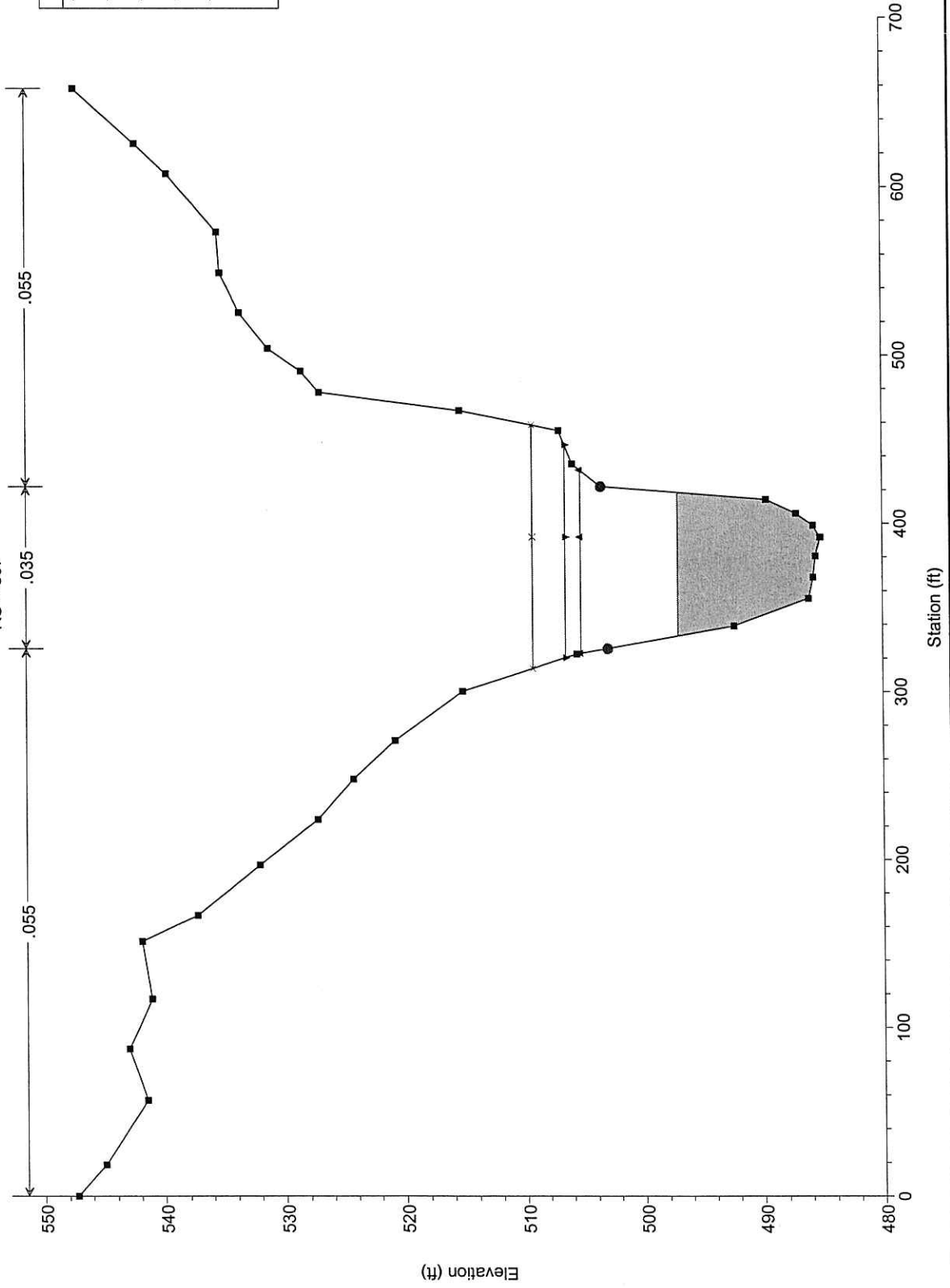
RS = 529 BR



Legend	
WS Q 500	x
WS Q 100	v
WS Q 50	▲
WS Q 2	■
Ground	●
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

RS = 507



Legend	
WS Q 500	—x—
WS Q 100	—v—
WS Q 50	—^—
WS Q 2	— —
Ground	—■—
Bank Sta	—●—

Contraction Scour

	Left	Channel	Right
Input Data			
Average Depth (ft):	2.08	21.39	4.90
Approach Velocity (ft/s):	0.95	8.54	1.66
Br Average Depth (ft):	2.70	20.90	0.30
BR Opening Flow (cfs):	561.26	19155.51	0.23
BR Top WD (ft):	86.37	96.91	1.67
Grain Size D50 (mm):	0.02	0.02	0.02
Approach Flow (cfs):	159.20	19282.34	275.46
Approach Top WD (ft):	80.64	105.60	33.78
K1 Coefficient:	0.690	0.690	0.690

Results

Scour Depth Ys (ft):	3.14	1.67	0.00
Critical Velocity (ft/s):	0.51	0.75	0.59
Equation:	Live	Live	Live

Pier Scour

All piers have the same scour depth

Input Data

Pier Shape:	Round nose
Pier Width (ft):	4.00
Grain Size D50 (mm):	0.02000
Depth Upstream (ft):	24.80
Velocity Upstream (ft/s):	9.73
K1 Nose Shape:	1.00
Pier Angle:	23.00
Pier Length (ft):	22.00
K2 Angle Coef:	2.00
K3 Bed Cond Coef:	1.10
Grain Size D90 (mm):	0.09000
K4 Armouring Coef:	1.00

Set K1 value to 1.0 because angle > 5 degrees

Results

Scour Depth Ys (ft):	21.07
Froude #:	0.34
Equation:	CSU equation

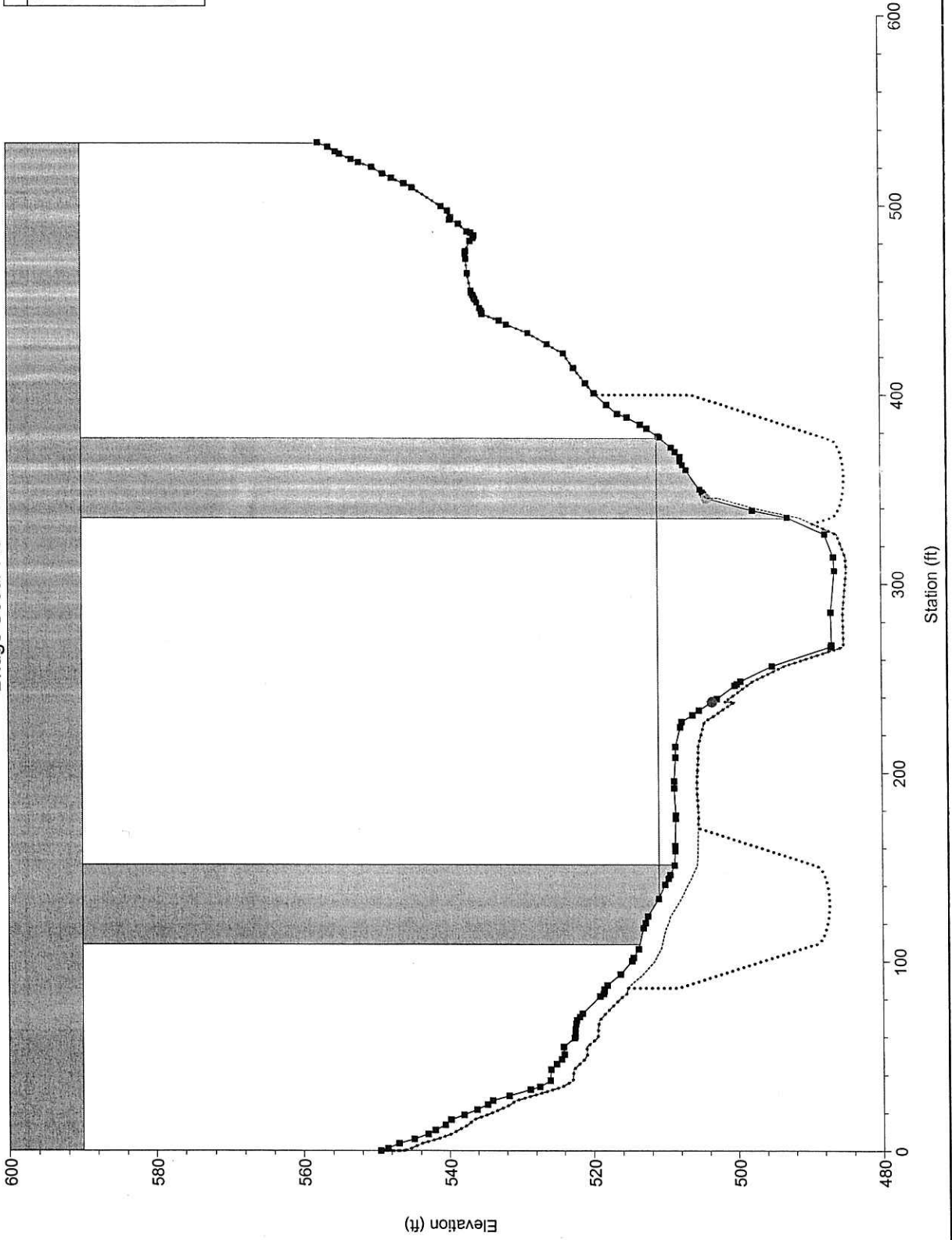
Combined Scour Depths

Pier Scour + Contraction Scour (ft):

Left Bank:	24.21
Right Bank:	21.07

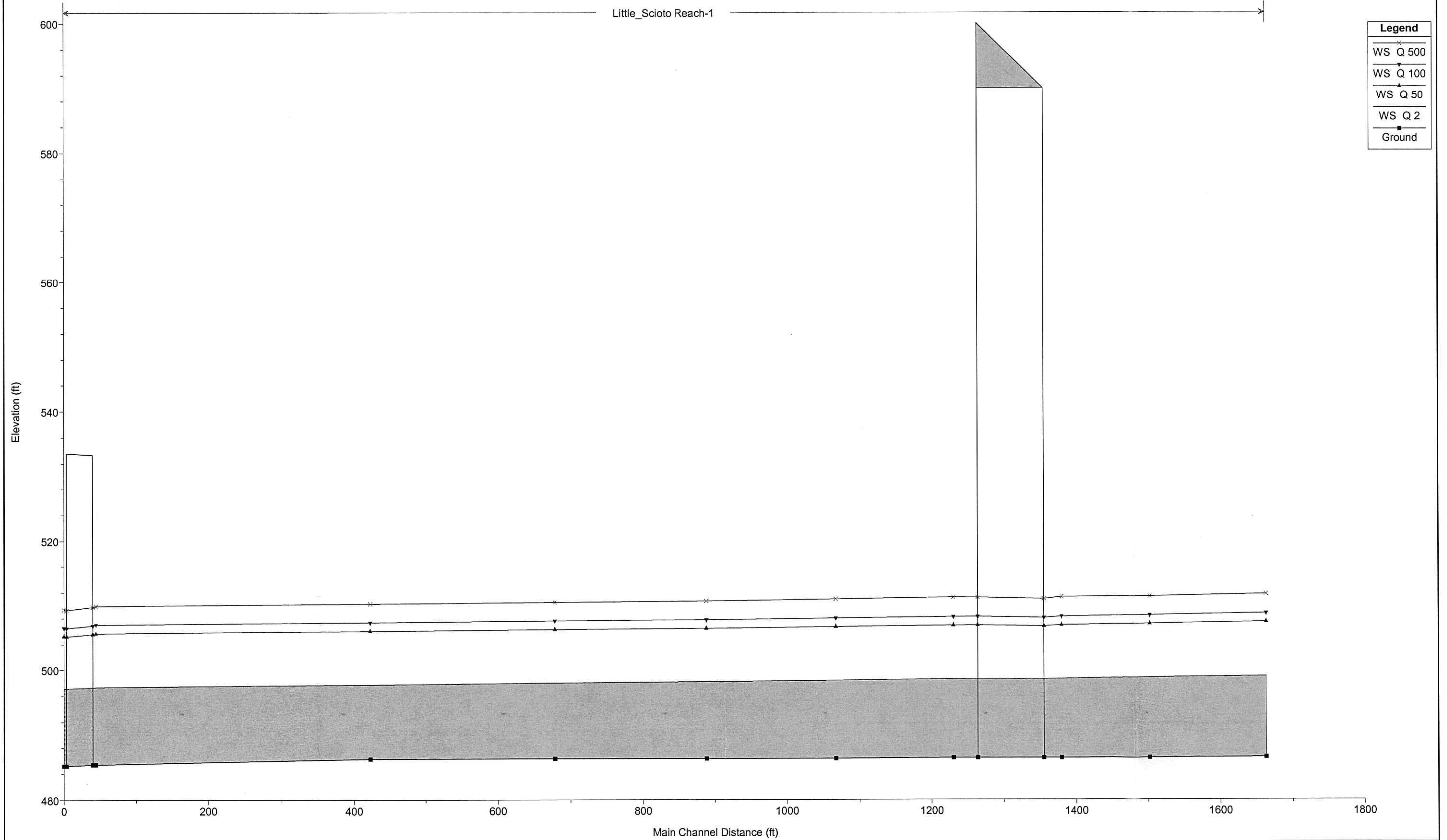
Bridge Scour RS = 1808

Legend	
WS Q 500	—
Ground	■
Bank Sta	●
Contr Scour
Total Scour



SR 823 over Little Scioto Plan: Alt 1 NO Backwater 7/12/2006

Little_Scioto Reach-1



HEC-RAS Plan: Alt 1 10yr B River: Little Scioto Reach: Reach-1

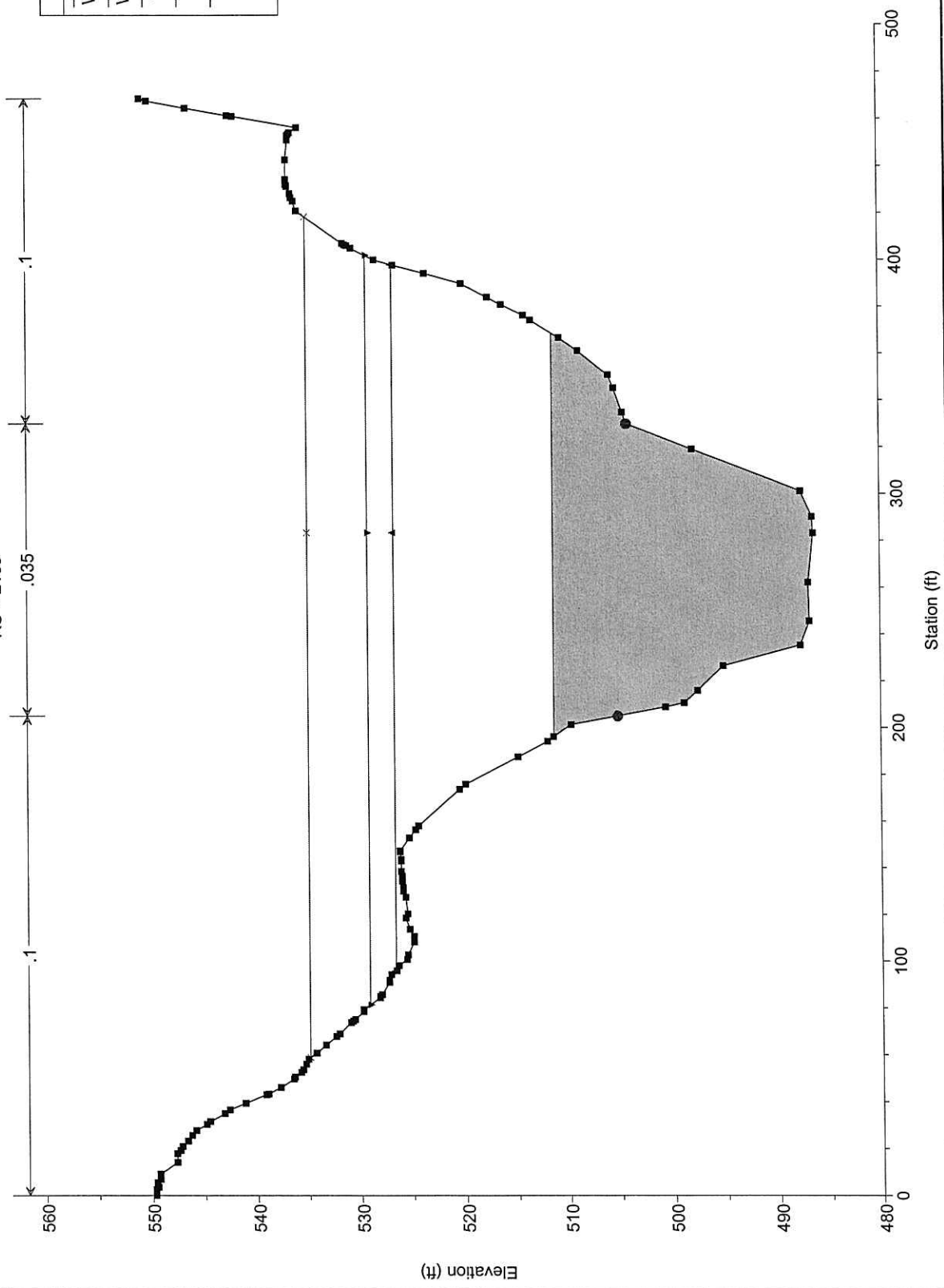
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4968.00	486.50	511.35		511.41	0.000044	1.96	2706.56	172.35	0.08
Reach-1	2169	Q 50	13337.00	486.50	526.64		526.76	0.000043	2.86	5972.19	301.83	0.08
Reach-1	2169	Q 100	15167.00	486.50	529.15		529.28	0.000044	3.00	6755.30	320.34	0.09
Reach-1	2169	Q 500	19717.00	486.50	534.89		535.04	0.000043	3.28	8703.45	359.27	0.09
Reach-1	2008	Q 2	4968.00	486.40	511.33		511.40	0.000049	2.15	2593.67	220.07	0.08
Reach-1	2008	Q 50	13337.00	486.40	526.64		526.75	0.000043	2.89	6587.16	298.50	0.08
Reach-1	2008	Q 100	15167.00	486.40	529.16		529.27	0.000043	3.01	7352.46	310.29	0.08
Reach-1	2008	Q 500	19717.00	486.40	534.89		535.03	0.000043	3.29	9220.98	356.77	0.09
Reach-1	1882	Q 2	4968.00	486.40	511.33	492.58	511.40	0.000052	2.14	2635.52	248.53	0.08
Reach-1	1882	Q 50	13337.00	486.40	526.67	497.48	526.73	0.000031	2.39	7553.79	392.73	0.07
Reach-1	1882	Q 100	15167.00	486.40	529.19	498.35	529.25	0.000028	2.40	8555.56	401.48	0.07
Reach-1	1882	Q 500	19717.00	486.40	534.94	500.42	535.00	0.000024	2.45	10911.05	419.64	0.07
Reach-1	1808	Bridge										
Reach-1	1734	Q 2	4968.00	486.40	511.33		511.38	0.000039	1.90	2912.41	232.94	0.07
Reach-1	1734	Q 50	13337.00	486.40	526.65		526.72	0.000028	2.30	7332.02	336.23	0.07
Reach-1	1734	Q 100	15167.00	486.40	529.17		529.24	0.000026	2.36	8191.84	346.50	0.07
Reach-1	1734	Q 500	19717.00	486.40	534.91		534.98	0.000025	2.52	10259.53	407.43	0.07
Reach-1	1574	Q 2	4970.00	486.30	511.31		511.37	0.000047	1.98	2773.99	207.98	0.08
Reach-1	1574	Q 50	13343.00	486.30	526.60		526.71	0.000041	2.75	6707.23	305.65	0.08
Reach-1	1574	Q 100	15175.00	486.30	529.11		529.23	0.000041	2.87	7487.56	315.45	0.08
Reach-1	1574	Q 500	19727.00	486.30	534.84		534.97	0.000041	3.15	9433.30	370.96	0.08
Reach-1	1395	Q 2	4970.00	486.30	511.30		511.36	0.000047	2.07	2680.76	191.29	0.08
Reach-1	1395	Q 50	13343.00	486.30	526.58		526.70	0.000045	2.94	6356.14	275.42	0.09
Reach-1	1395	Q 100	15175.00	486.30	529.08		529.22	0.000046	3.08	7058.68	284.75	0.09
Reach-1	1395	Q 500	19727.00	486.30	534.80		534.96	0.000047	3.42	8790.01	341.72	0.09
Reach-1	1185	Q 2	4970.00	486.30	511.29		511.35	0.000047	2.05	2553.23	155.08	0.08
Reach-1	1185	Q 50	13343.00	486.30	526.55		526.69	0.000049	3.05	5351.08	223.02	0.09
Reach-1	1185	Q 100	15175.00	486.30	529.05		529.20	0.000050	3.22	5928.90	237.27	0.09
Reach-1	1185	Q 500	19727.00	486.30	534.76		534.95	0.000051	3.58	7379.09	286.65	0.10
Reach-1	929	Q 2	4970.00	486.24	511.28		511.34	0.000046	2.04	2560.79	155.26	0.08

HEC-RAS Plan: Alt 1 10yr B River: Little Scioto Reach: Reach-1 (Continued)

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 # Ctl
Reach-1	929	Q 50	13343.00	486.24	526.54		526.67	0.000047	2.99	5362.88	223.42	0.09
Reach-1	929	Q 100	15175.00	486.24	529.05		529.19	0.000048	3.14	5941.75	237.54	0.09
Reach-1	929	Q 500	19727.00	486.24	534.76		534.93	0.000048	3.48	7395.59	288.15	0.09
Reach-1	552	Q 2	4970.00	485.40	511.26	492.10	511.32	0.000044	2.02	2602.25	157.82	0.08
Reach-1	552	Q 50	13343.00	485.40	526.54	496.56	526.65	0.000042	2.84	5929.73	259.33	0.08
Reach-1	552	Q 100	15175.00	485.40	529.04	497.33	529.17	0.000042	2.98	6603.32	292.83	0.08
Reach-1	552	Q 500	19727.00	485.40	534.77	499.11	534.91	0.000041	3.20	8457.86	348.75	0.08
Reach-1	529	Bridge										
Reach-1	507	Q 2	4970.00	485.20	511.24	491.97	511.32	0.000055	2.27	2381.46	151.80	0.09
Reach-1	507	Q 50	13343.00	485.20	526.49	496.81	526.64	0.000055	3.23	5312.20	247.05	0.09
Reach-1	507	Q 100	15175.00	485.20	529.00	497.66	529.16	0.000056	3.39	5970.49	278.64	0.09
Reach-1	507	Q 500	19727.00	485.20	534.70	499.69	534.87	0.000055	3.68	7759.20	359.82	0.10

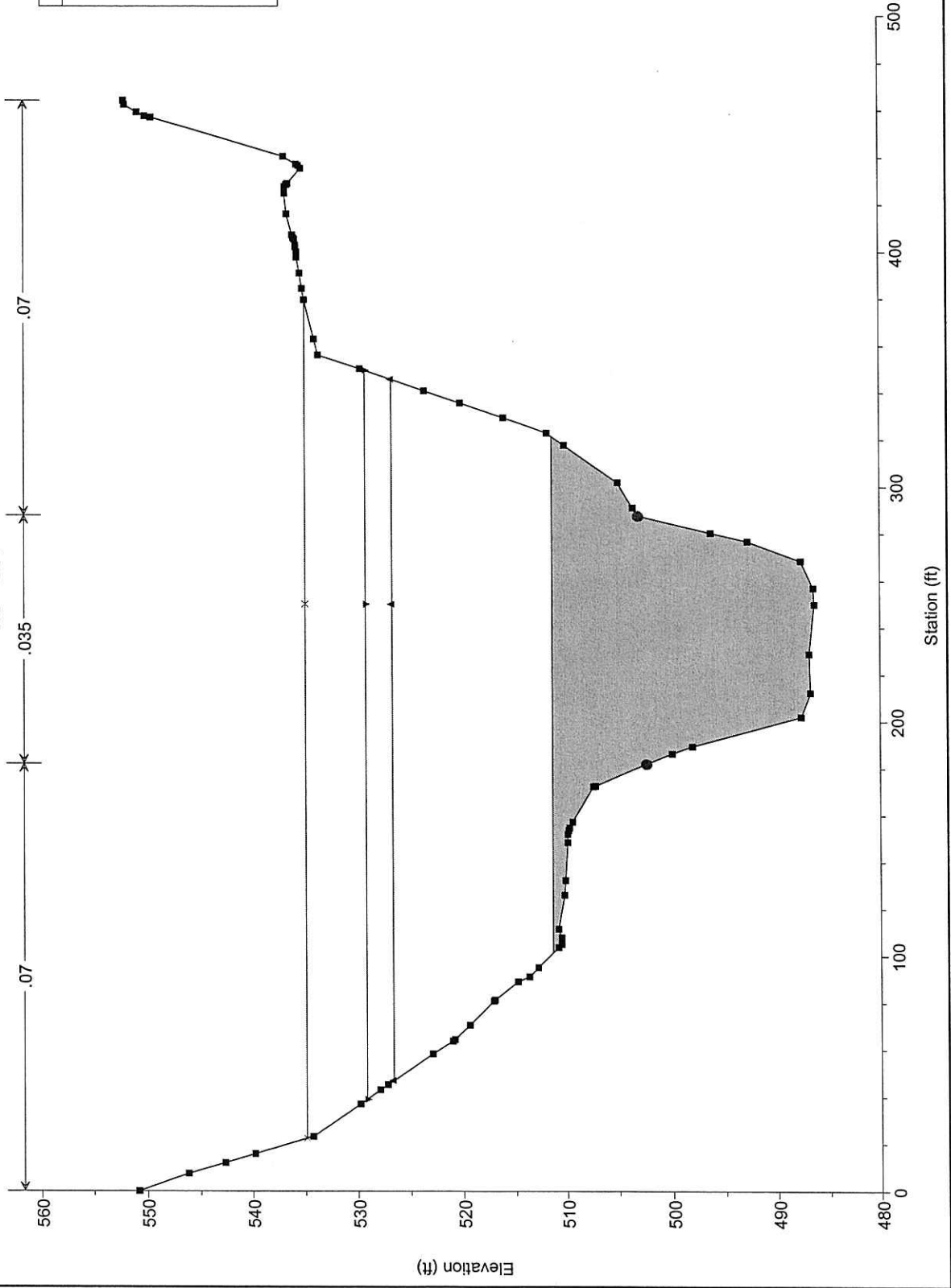
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 2169



SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

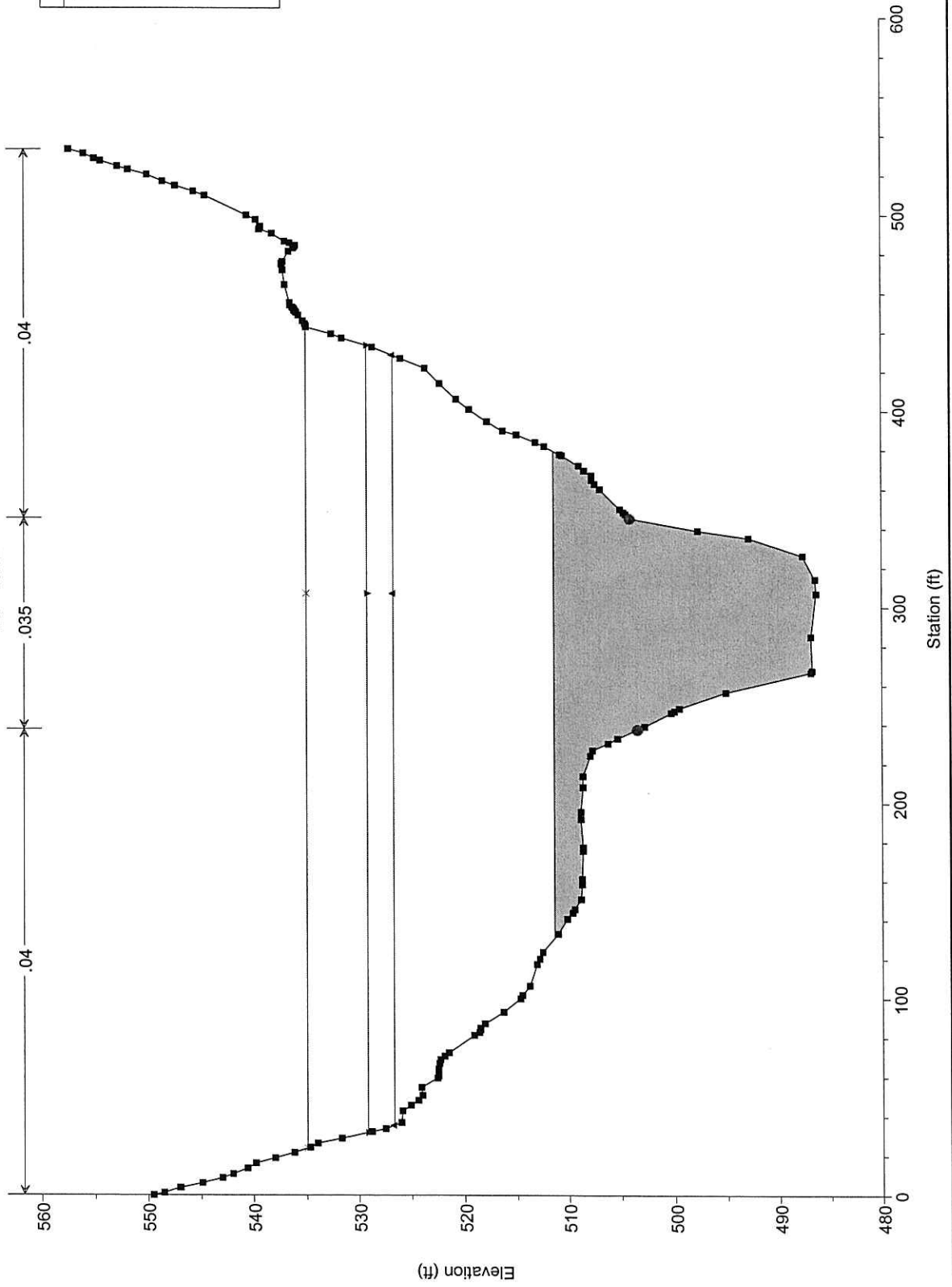
RS = 2008



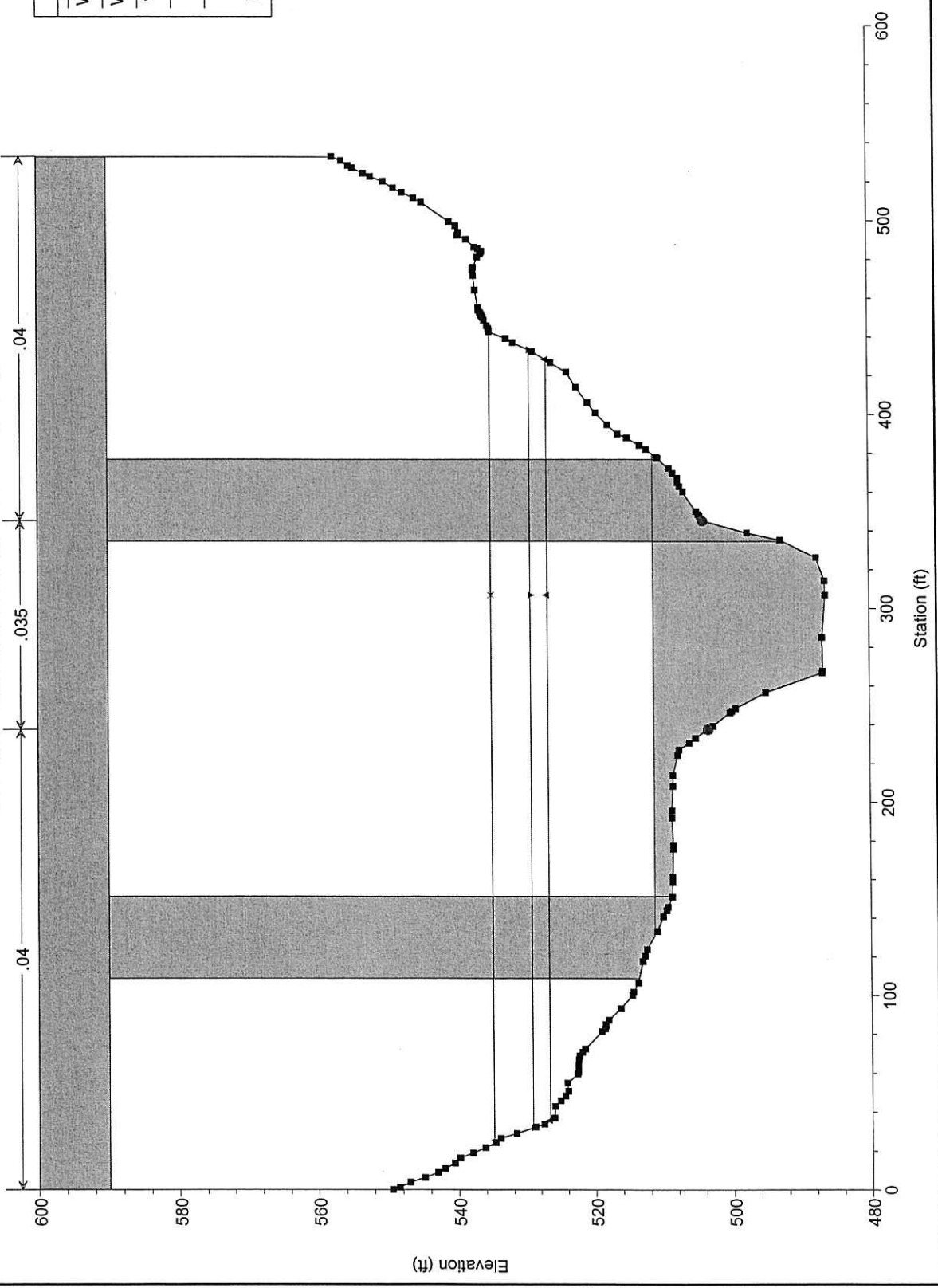
Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 1882



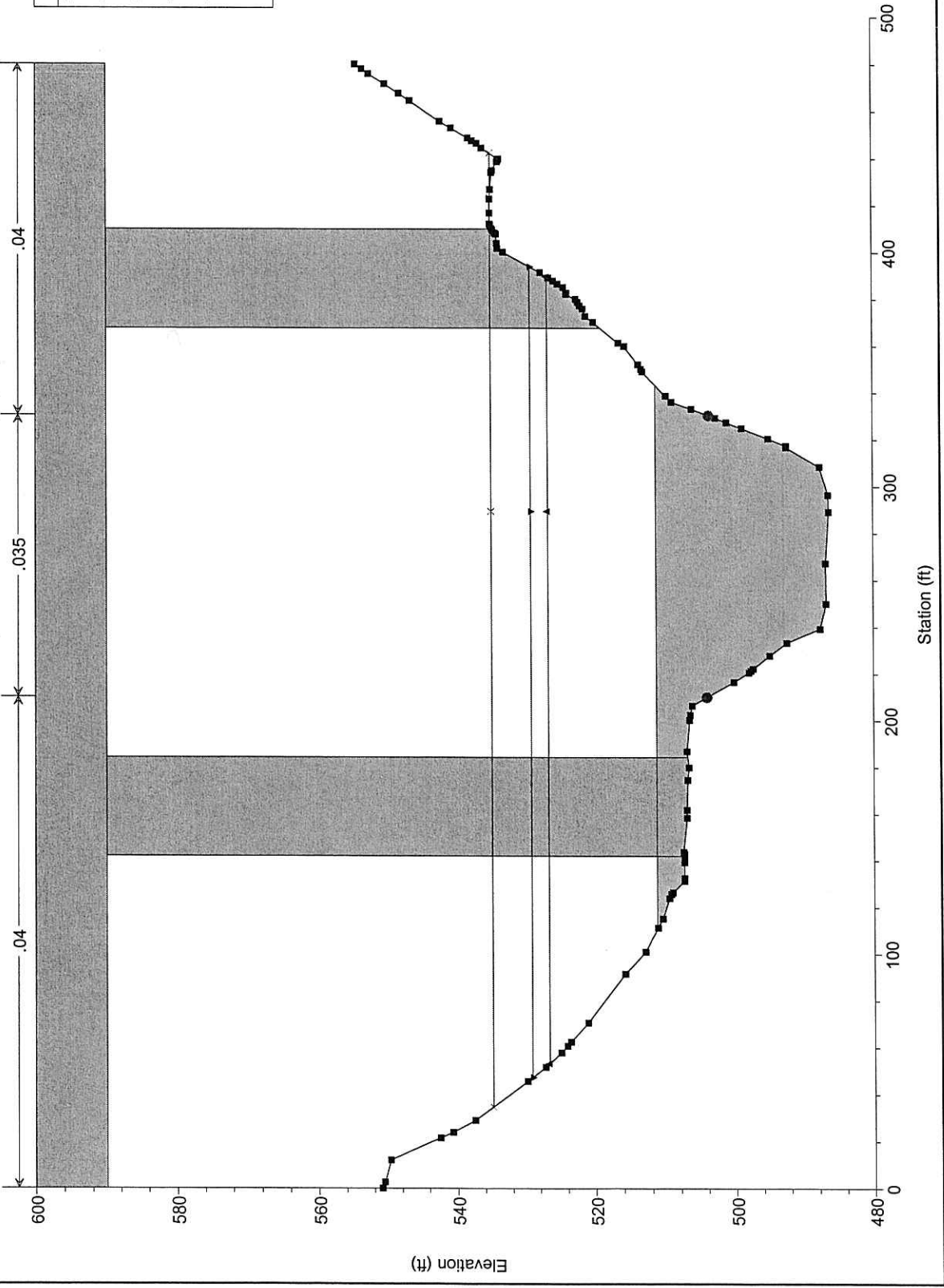
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 1 (5 span)



Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●

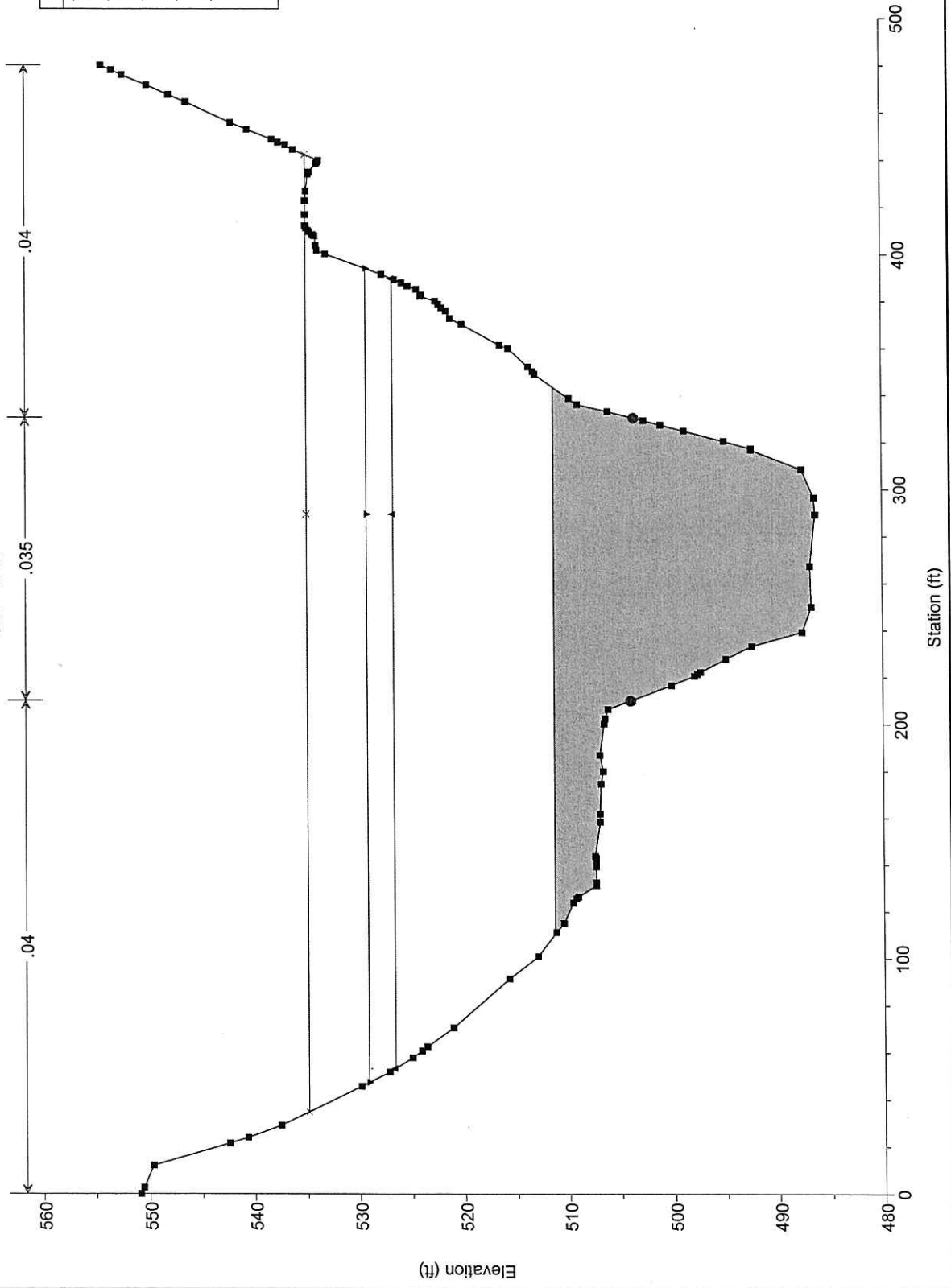
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 1808 BR Proposed SR 823 Alternative 1 (5 span)



SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

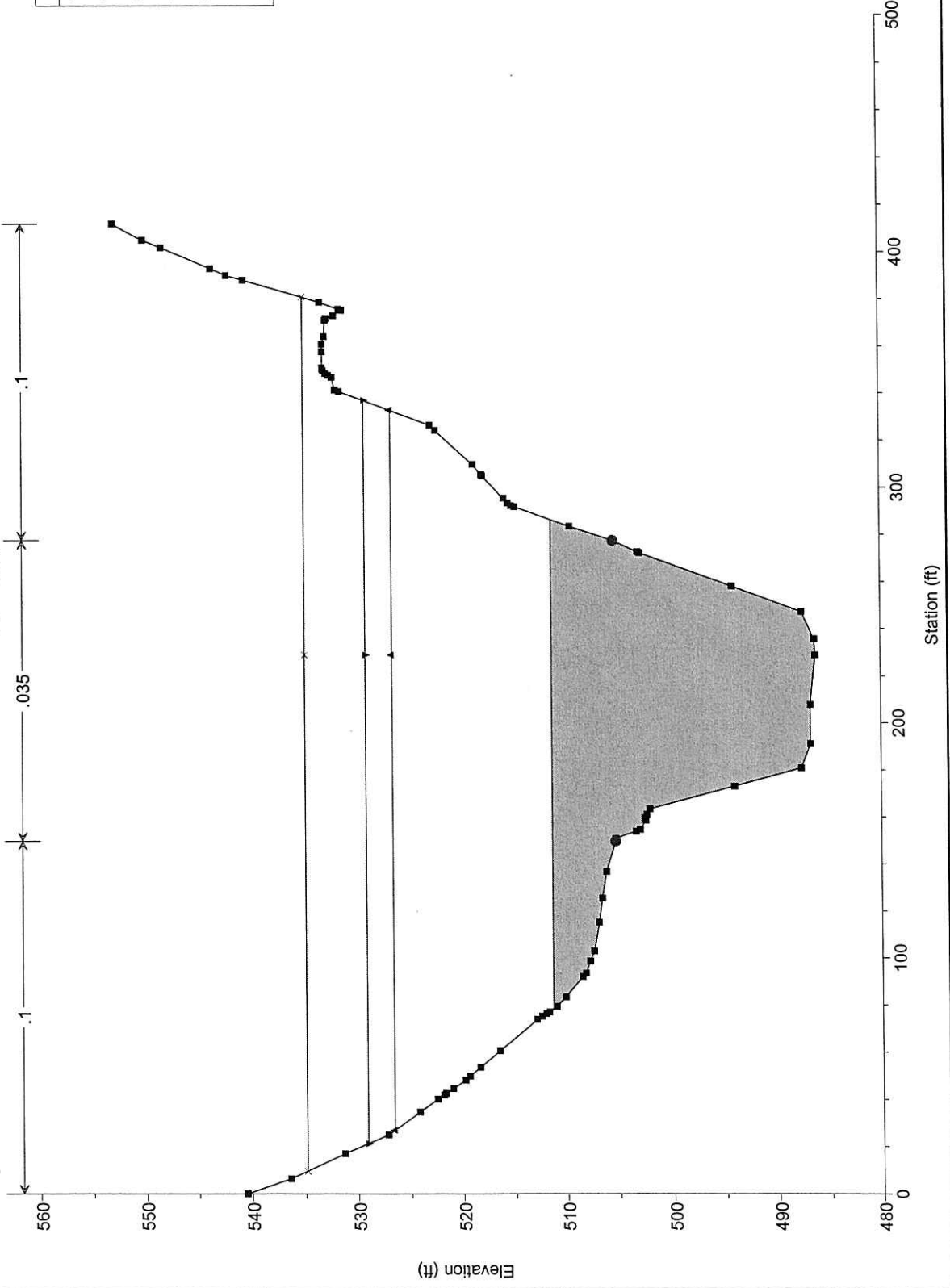
RS = 1734



Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

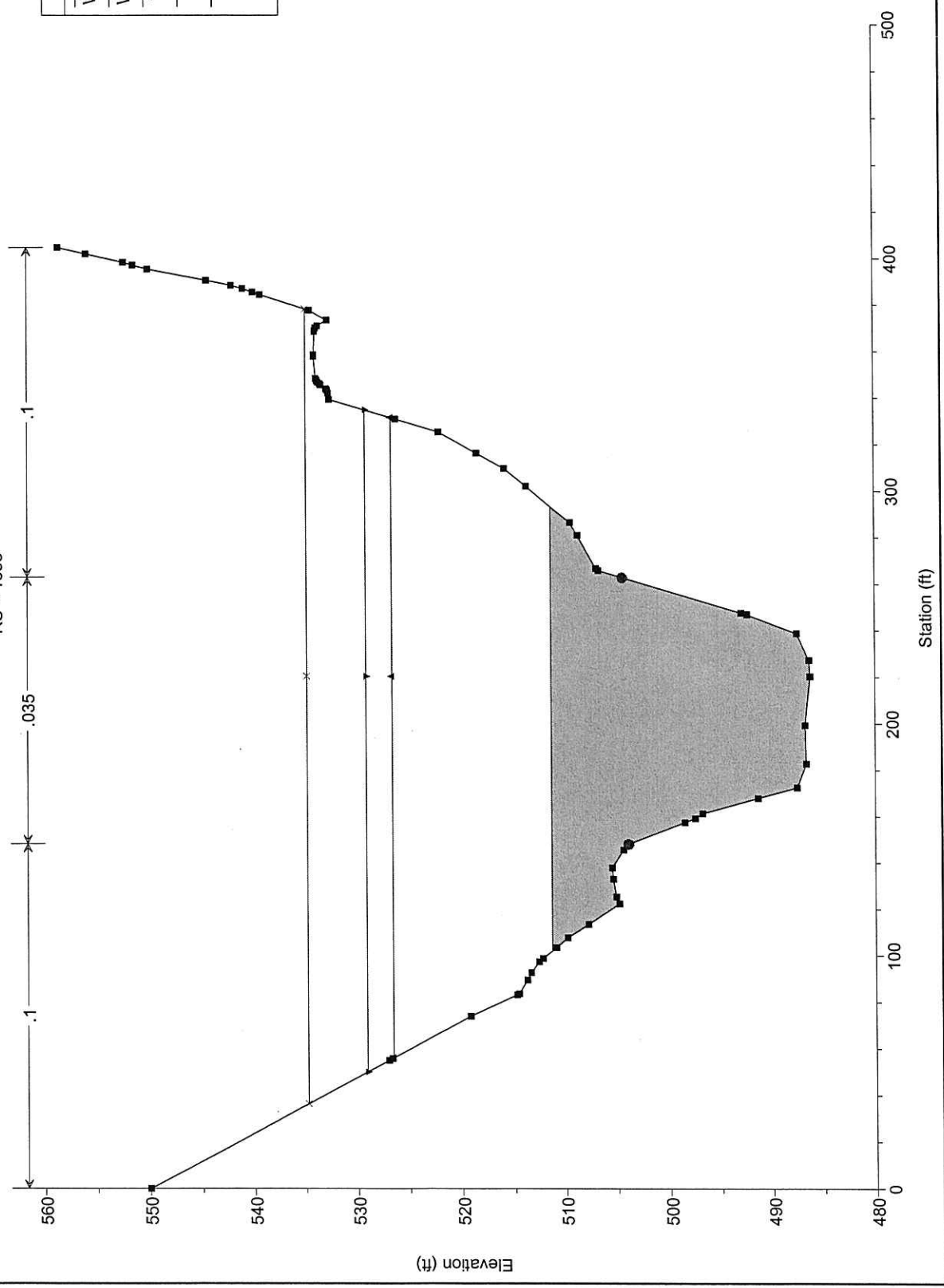
RS = 1574



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

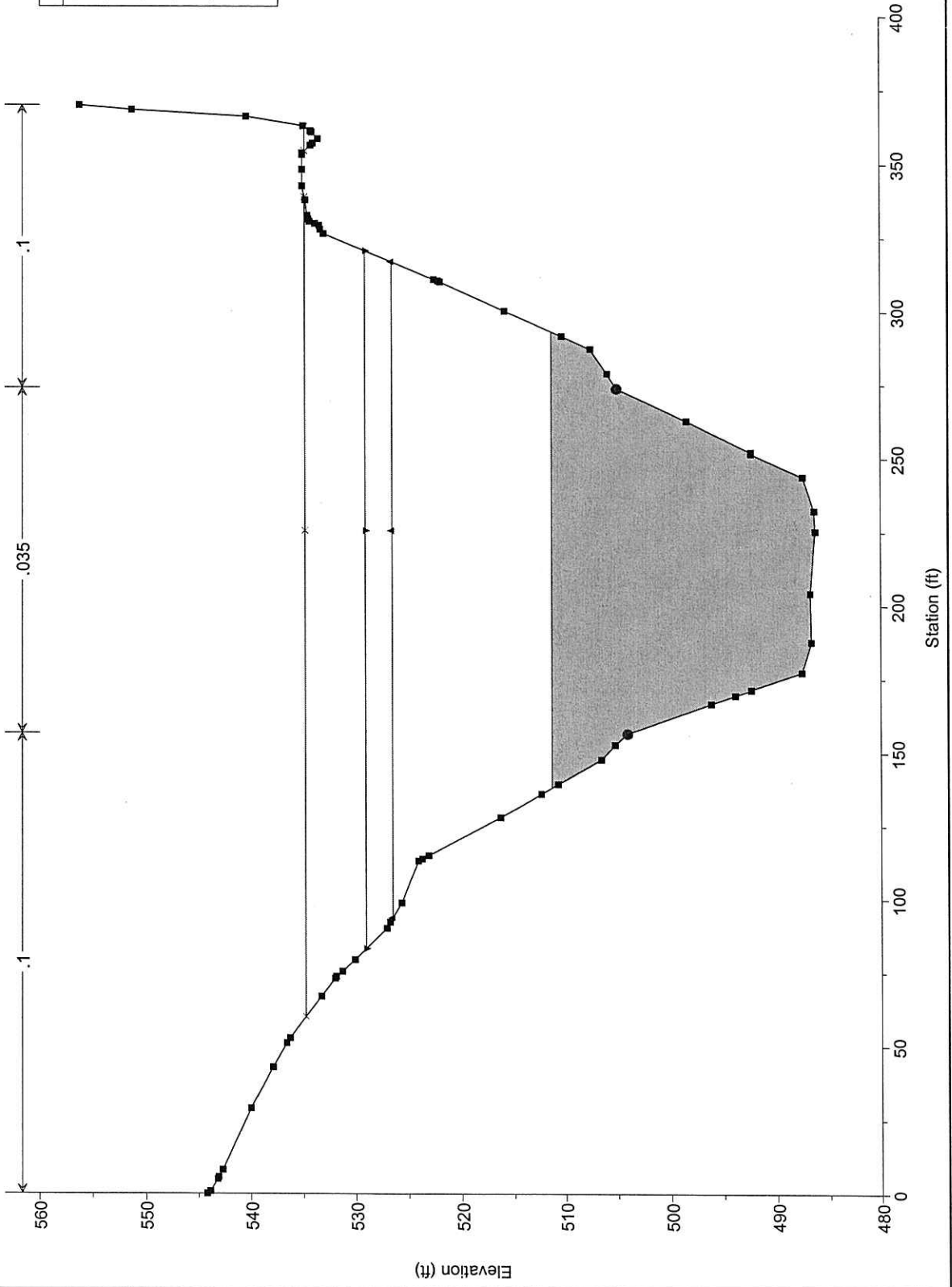
RS = 1395



Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●

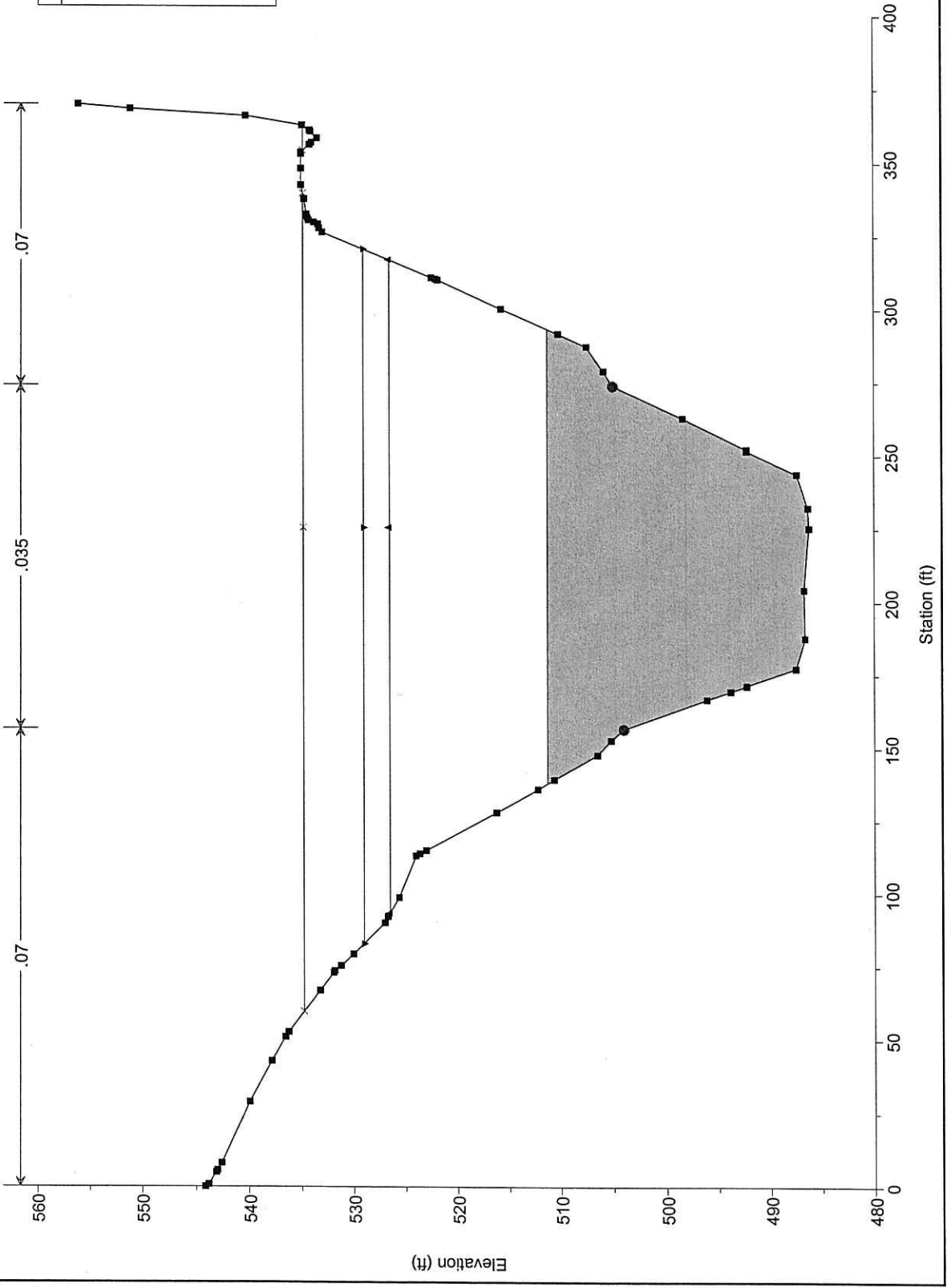
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 1185



SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

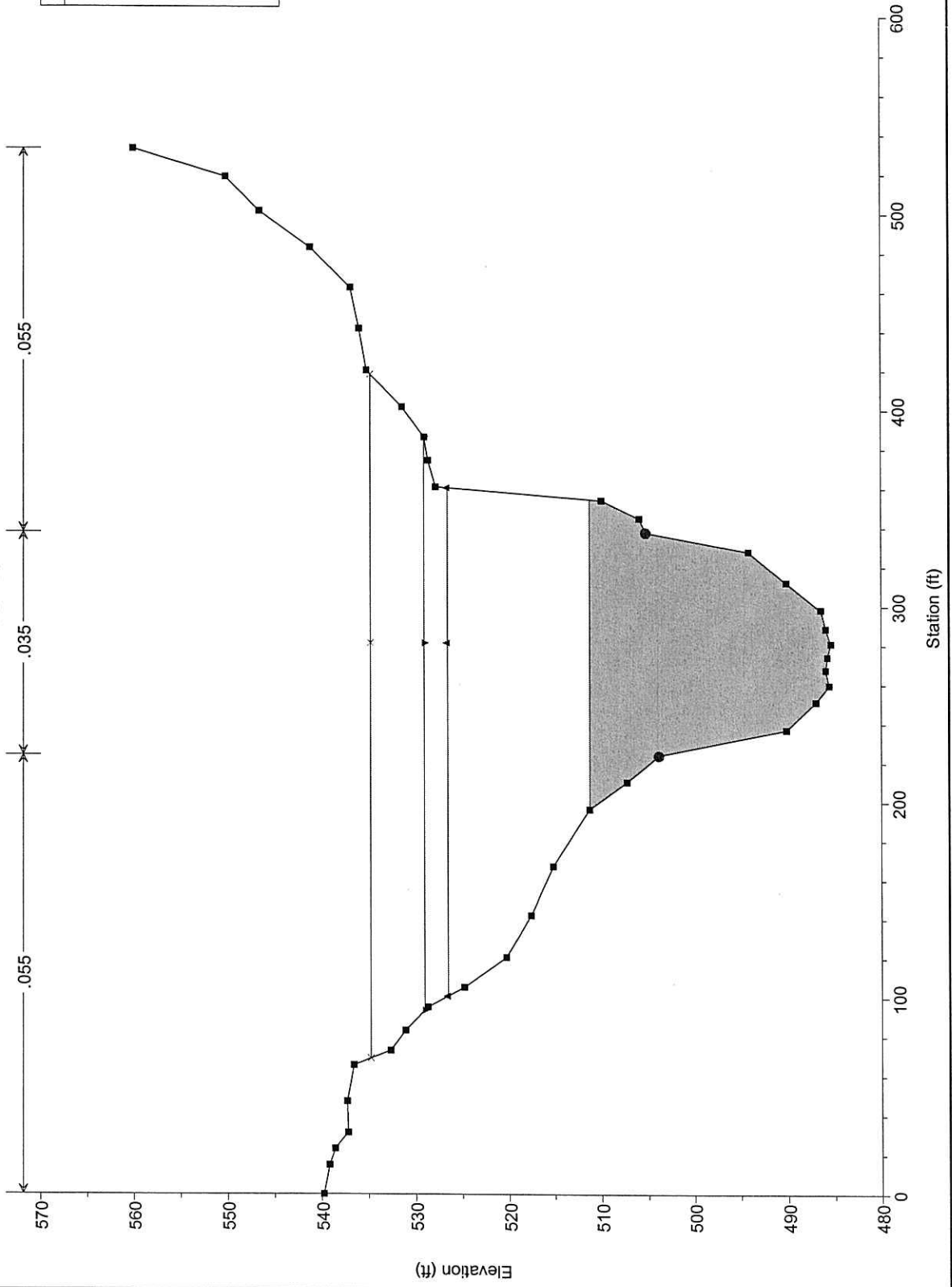
RS = 929



Legend	
WS Q 500	—
WS Q 100	- - -
WS Q 50	· · ·
WS Q 2	· · ·
Ground	—
Bank Sta	●

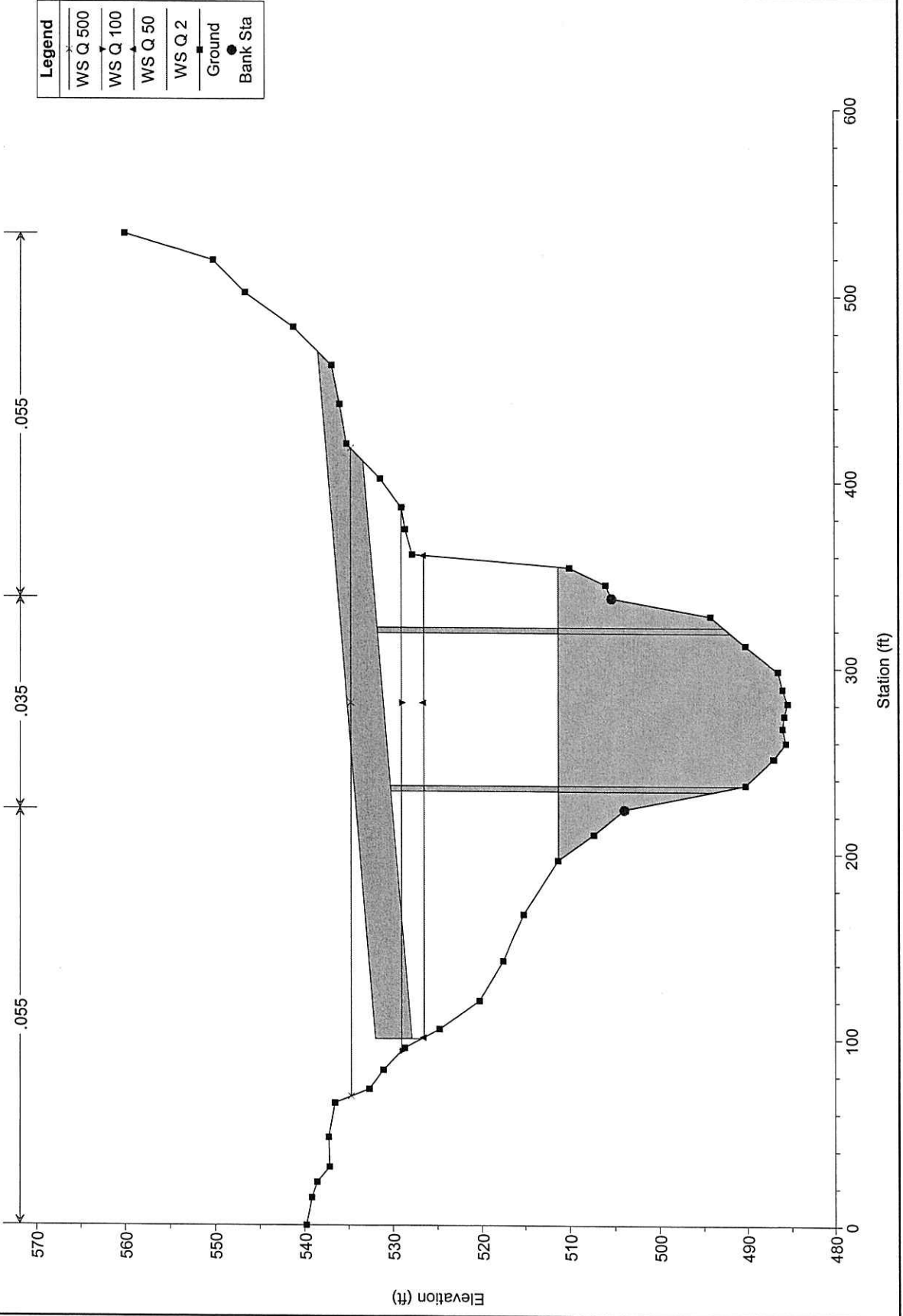
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 552



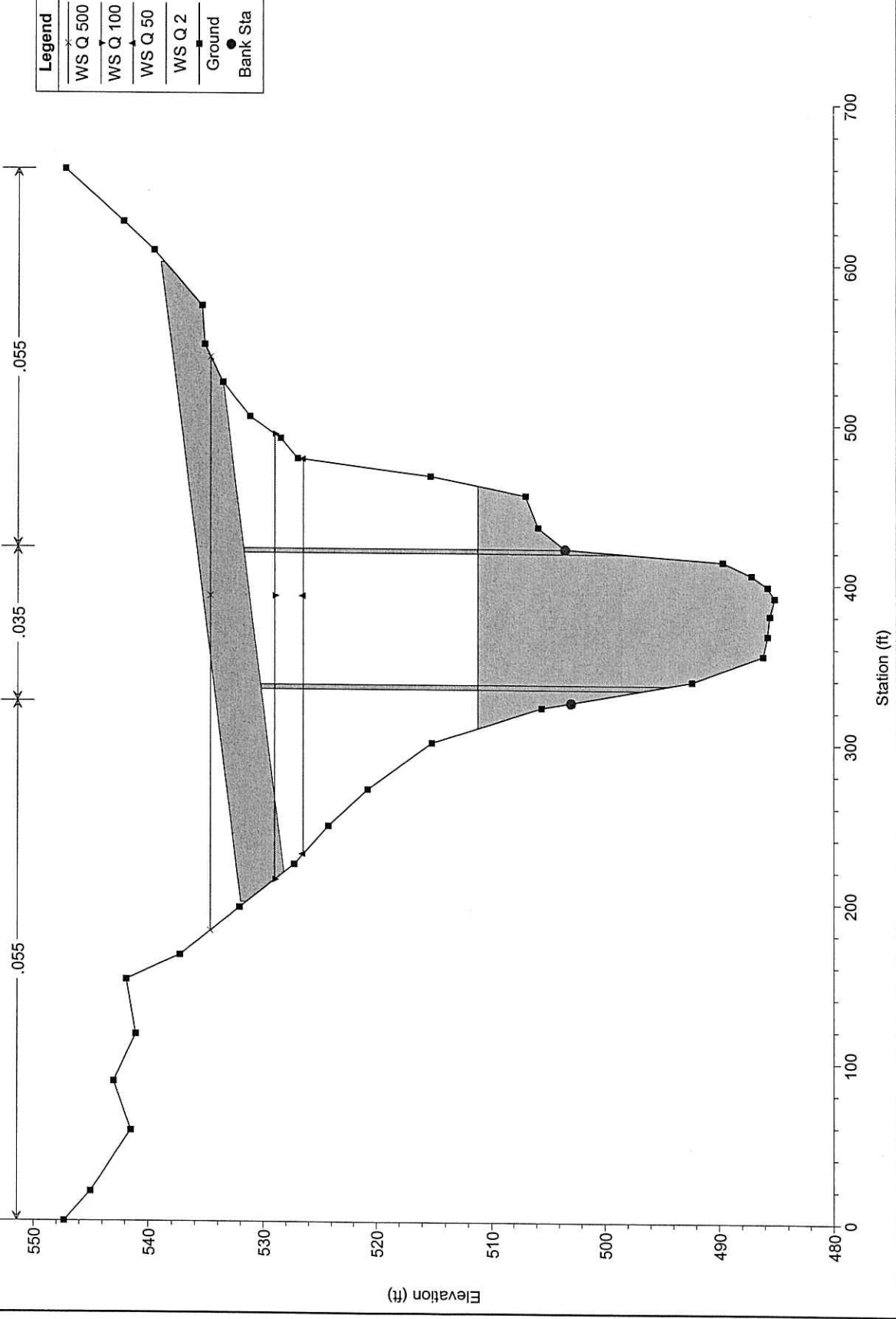
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 529 BR



SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

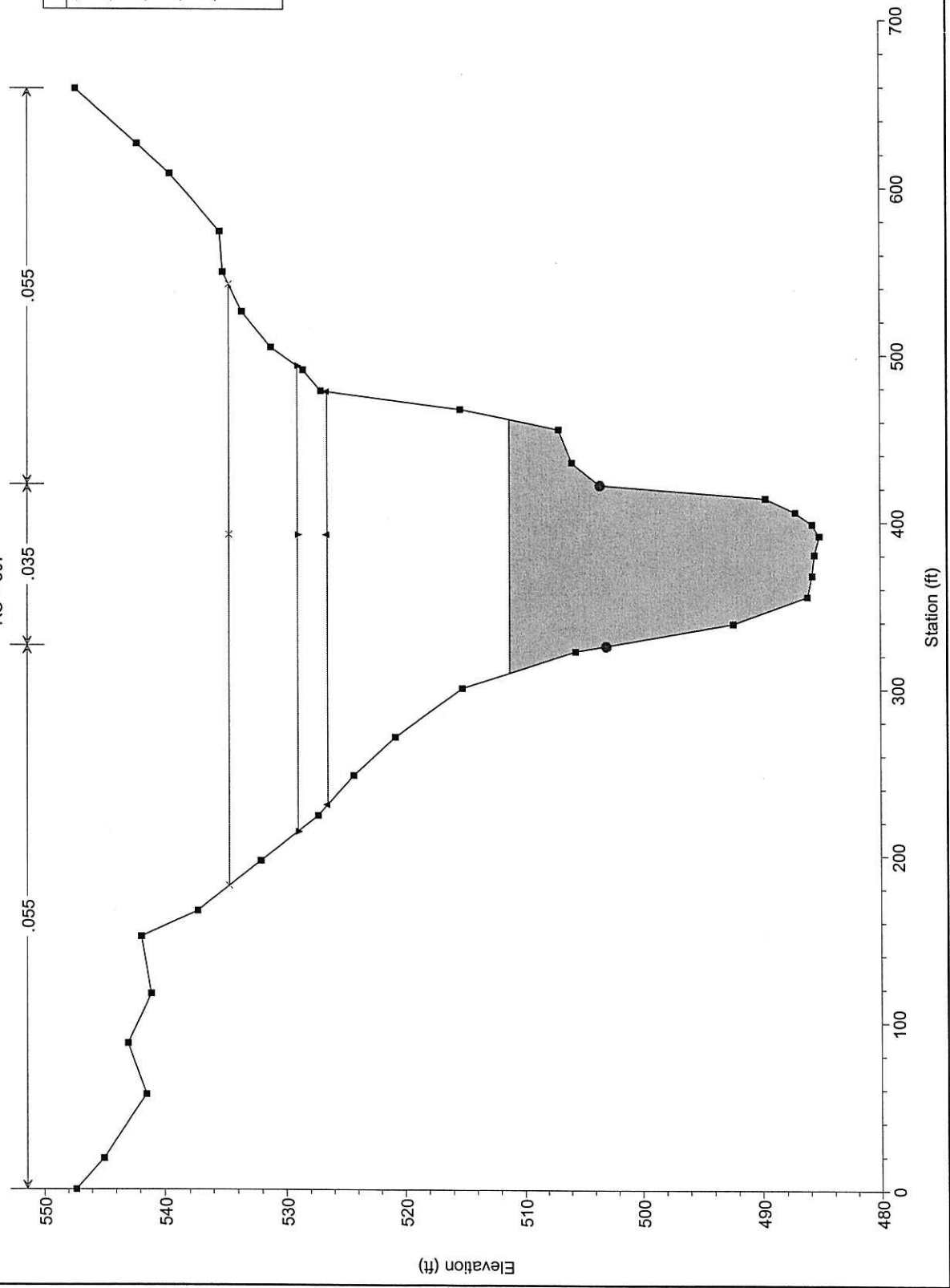
RS = 529 BR



Legend	
WS Q 500	×
WS Q 100	▽
WS Q 50	▲
WS Q 2	■
Ground	—
Bank Sta	●

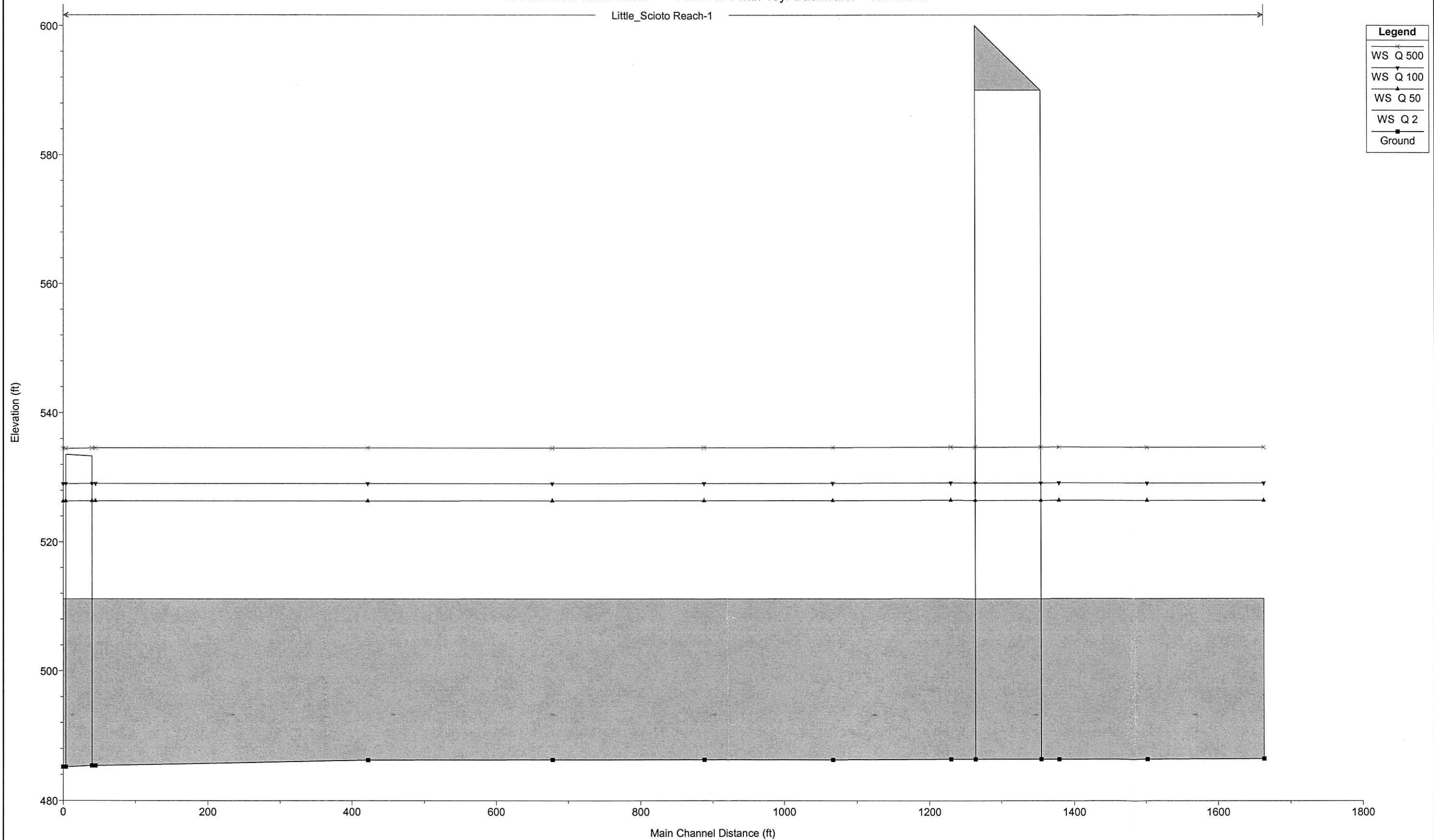
SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/11/2006

RS = 507



SR 823 over Little Scioto Plan: Alt 1 with 10yr Backwater 7/12/2006

Little_Scioto Reach-1



Legend	
WS Q 500	x
WS Q 100	▼
WS Q 50	▲
WS Q 2	■
Ground	■

HEC-RAS Plan: Alt 1 100 BW River: Little Scioto Reach: Reach-1

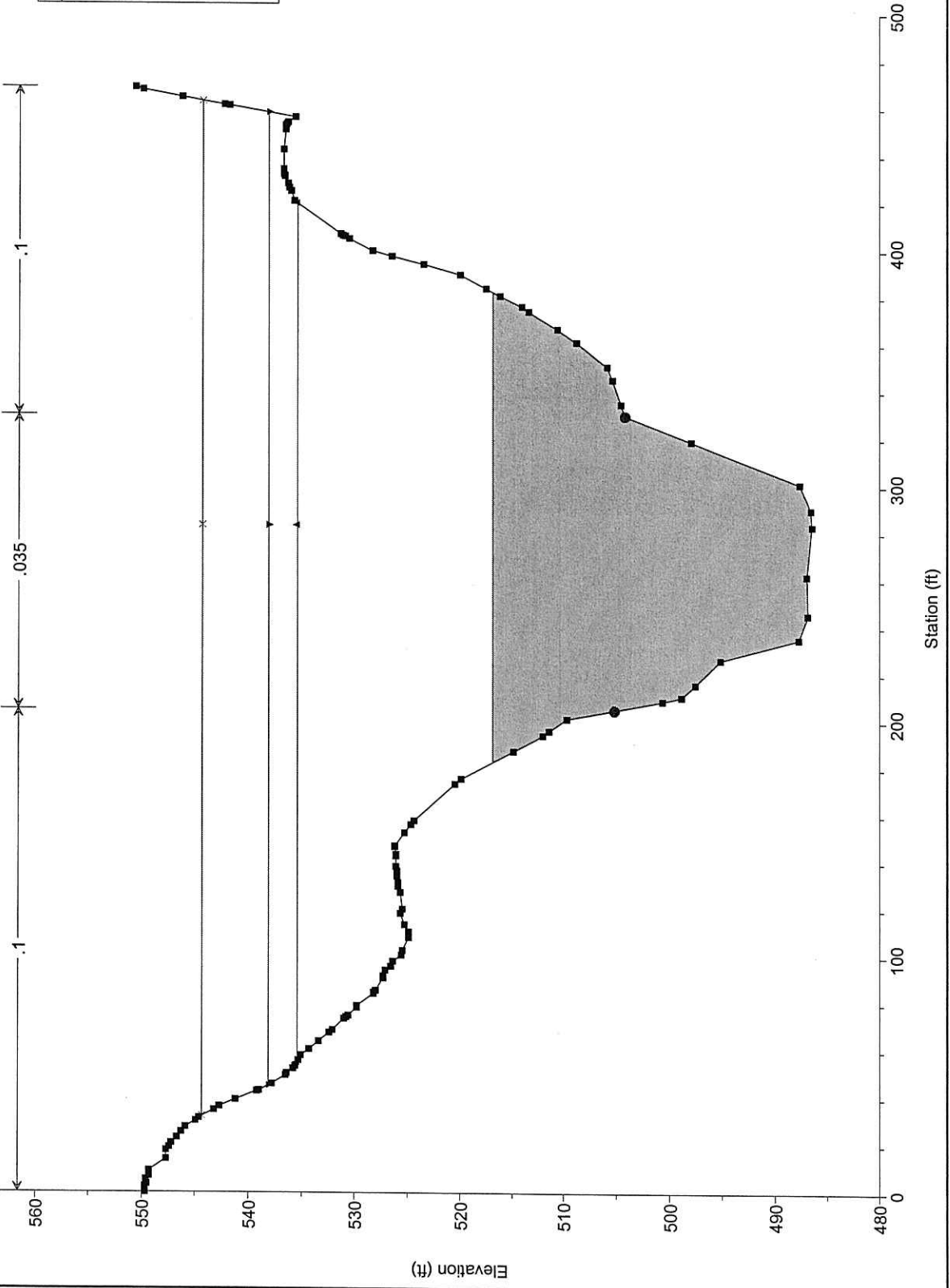
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Cnl
Reach-1	2169	Q 2	4968.00	486.50	516.89		516.92	0.000019	1.51	3738.11	199.53	0.05
Reach-1	2169	Q 50	13337.00	486.50	535.41		535.48	0.000019	2.19	8892.39	364.59	0.06
Reach-1	2169	Q 100	15167.00	486.50	538.09		538.16	0.000020	2.33	9946.04	412.57	0.06
Reach-1	2169	Q 500	19717.00	486.50	544.29		544.37	0.000020	2.56	12557.15	430.33	0.06
Reach-1	2008	Q 2	4968.00	486.40	516.88		516.92	0.000020	1.61	3898.80	248.92	0.05
Reach-1	2008	Q 50	13337.00	486.40	535.41		535.47	0.000019	2.20	9410.36	373.92	0.06
Reach-1	2008	Q 100	15167.00	486.40	538.09		538.16	0.000019	2.31	10504.89	423.72	0.06
Reach-1	2008	Q 500	19717.00	486.40	544.29		544.37	0.000019	2.49	13184.36	440.11	0.06
Reach-1	1882	Q 2	4968.00	486.40	516.88	492.58	516.91	0.000018	1.49	4177.28	300.66	0.05
Reach-1	1882	Q 50	13337.00	486.40	535.43	497.48	535.46	0.000011	1.63	11120.01	424.30	0.04
Reach-1	1882	Q 100	15167.00	486.40	538.11	498.35	538.14	0.000011	1.71	12323.64	471.52	0.04
Reach-1	1882	Q 500	19717.00	486.40	544.32	500.42	544.35	0.000010	1.79	15351.42	502.03	0.04
Reach-1	1808	Bridge										
Reach-1	1734	Q 2	4968.00	486.40	516.88		516.90	0.000015	1.37	4331.53	275.13	0.05
Reach-1	1734	Q 50	13337.00	486.40	535.42		535.45	0.000011	1.67	10468.63	409.53	0.04
Reach-1	1734	Q 100	15167.00	486.40	538.10		538.13	0.000011	1.73	11581.08	420.57	0.04
Reach-1	1734	Q 500	19717.00	486.40	544.30		544.34	0.000010	1.85	14254.10	441.18	0.04
Reach-1	1574	Q 2	4970.00	486.30	516.87		516.90	0.000019	1.50	4007.85	241.02	0.05
Reach-1	1574	Q 50	13343.00	486.30	535.39		535.45	0.000018	2.10	9638.29	372.84	0.06
Reach-1	1574	Q 100	15175.00	486.30	538.06		538.13	0.000018	2.21	10646.70	381.00	0.06
Reach-1	1574	Q 500	19727.00	486.30	544.26		544.33	0.000019	2.45	13051.18	394.13	0.06
Reach-1	1395	Q 2	4970.00	486.30	516.86		516.90	0.000020	1.58	3872.47	233.55	0.05
Reach-1	1395	Q 50	13343.00	486.30	535.37		535.44	0.000020	2.28	8985.64	343.88	0.06
Reach-1	1395	Q 100	15175.00	486.30	538.05		538.12	0.000021	2.41	9918.22	354.00	0.06
Reach-1	1395	Q 500	19727.00	486.30	544.24		544.33	0.000022	2.68	12181.13	376.37	0.06
Reach-1	1185	Q 2	4970.00	486.30	516.85		516.89	0.000021	1.59	3471.50	174.88	0.06
Reach-1	1185	Q 50	13343.00	486.30	535.36		535.44	0.000023	2.39	7555.57	305.69	0.06
Reach-1	1185	Q 100	15175.00	486.30	538.03		538.12	0.000024	2.54	8392.78	322.43	0.07
Reach-1	1185	Q 500	19727.00	486.30	544.21		544.32	0.000025	2.83	10529.81	366.63	0.07
Reach-1	929	Q 2	4970.00	486.24	516.85		516.89	0.000020	1.58	3481.23	175.07	0.05

HEC-RAS Plan: Alt 1 100 BW River: Little Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	535.35		535.43	0.000021	2.33	7573.59	306.00	0.06
Reach-1	929	Q 100	15175.00	486.24	538.03		538.11	0.000022	2.45	8412.14	322.86	0.06
Reach-1	929	Q 500	19727.00	486.24	544.21		544.31	0.000023	2.71	10552.97	366.64	0.07
Reach-1	552	Q 2	4970.00	485.40	516.84	492.10	516.88	0.000019	1.56	3608.68	206.49	0.05
Reach-1	552	Q 50	13343.00	485.40	535.36	496.56	535.42	0.000018	2.13	8664.56	356.22	0.06
Reach-1	552	Q 100	15175.00	485.40	538.03	497.33	538.10	0.000019	2.27	9731.47	441.13	0.06
Reach-1	552	Q 500	19727.00	485.40	544.23	499.11	544.30	0.000018	2.41	12683.48	492.93	0.06
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	516.83	491.97	516.88	0.000024	1.74	3292.24	176.72	0.06
Reach-1	507	Q 50	13343.00	485.20	535.33	496.81	535.41	0.000024	2.46	7990.45	384.89	0.06
Reach-1	507	Q 100	15175.00	485.20	538.00	497.66	538.08	0.000024	2.55	9093.83	430.35	0.06
Reach-1	507	Q 500	19727.00	485.20	544.20	499.69	544.29	0.000024	2.76	12213.17	610.51	0.07

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

RS = 2169



560
550
540
530
520
510
500
490
480

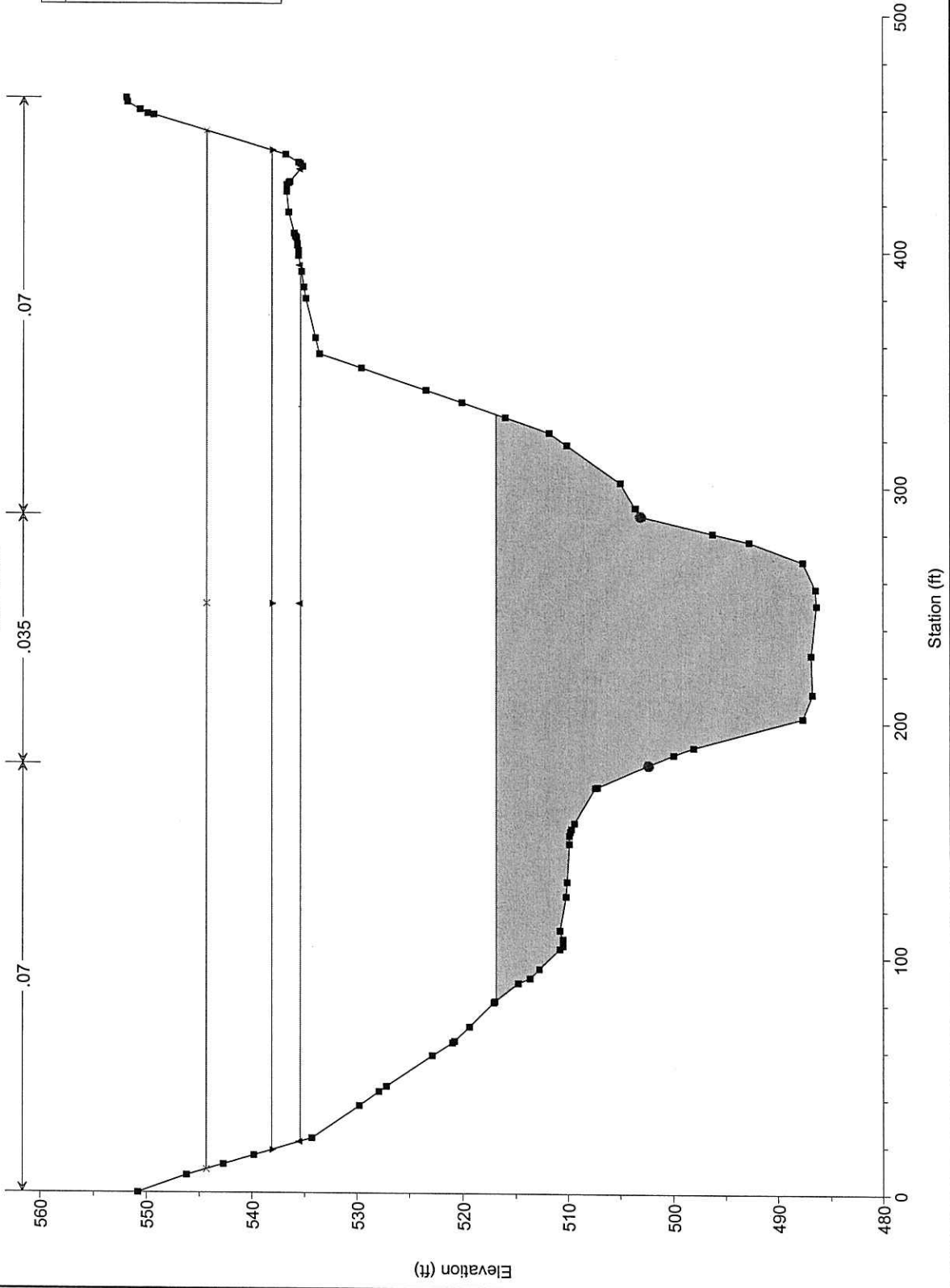
0
100
200
300
400
500

.1 .035 .1

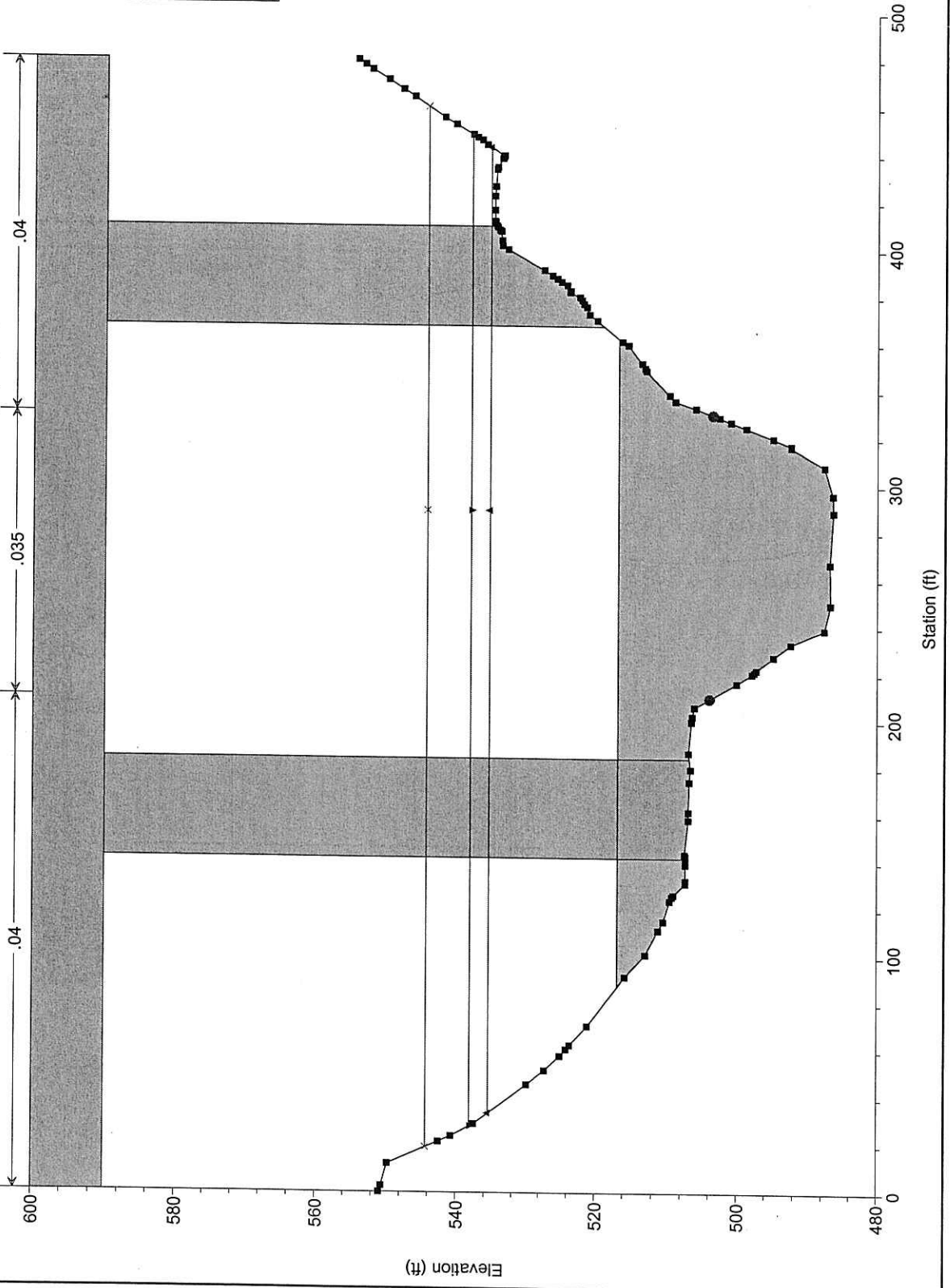
Legend	
WS Q 500	—■—
WS Q 100	—■—
WS Q 50	—■—
WS Q 2	—■—
Ground	—■—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

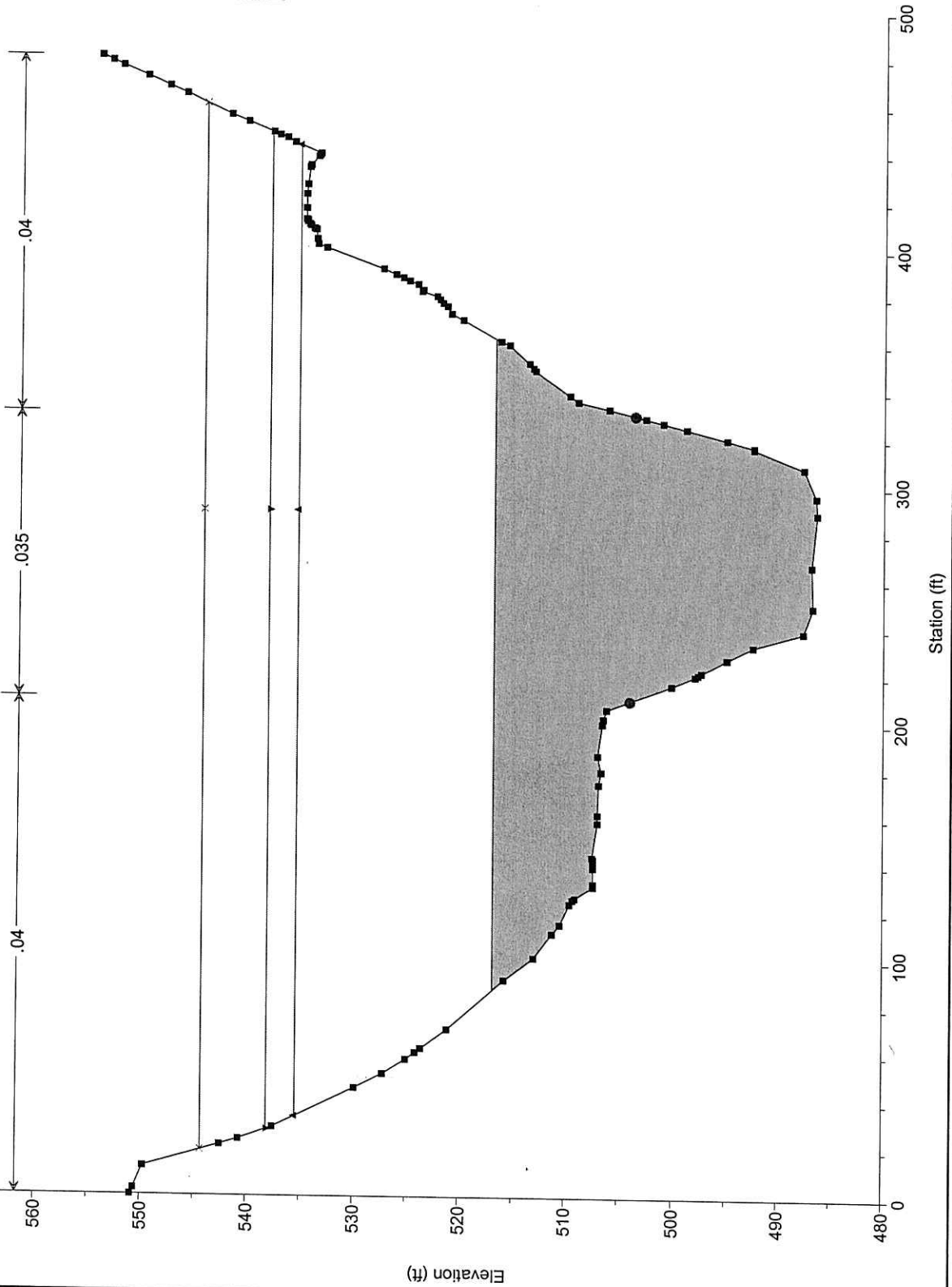
RS = 2008



SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 1 (5 span)

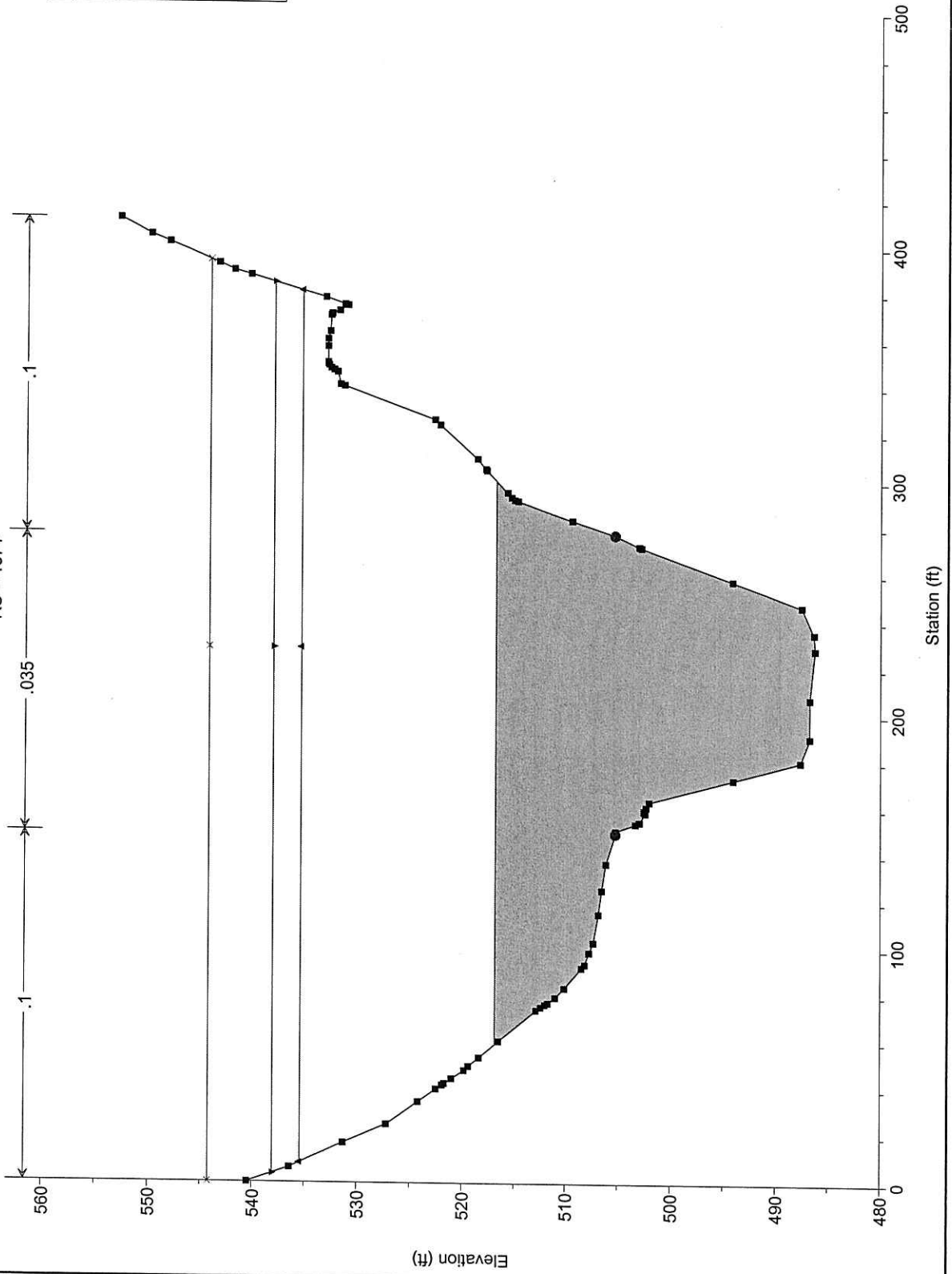


SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006
 RS = 1734



Legend	
WS Q 500	○
WS Q 100	□
WS Q 50	▲
WS Q 2	■
Ground	●
Bank Sta	●

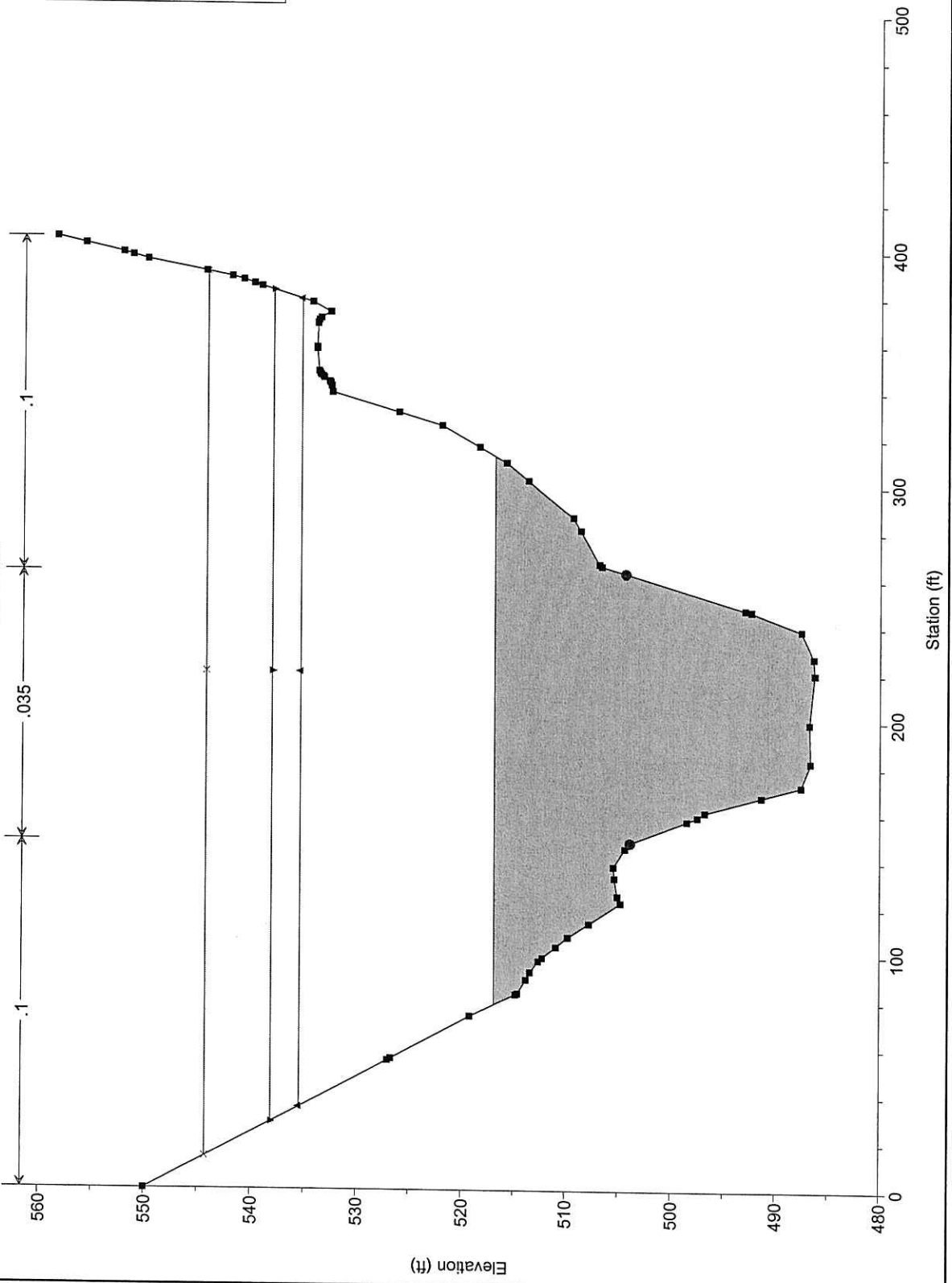
SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006
 RS = 1574



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

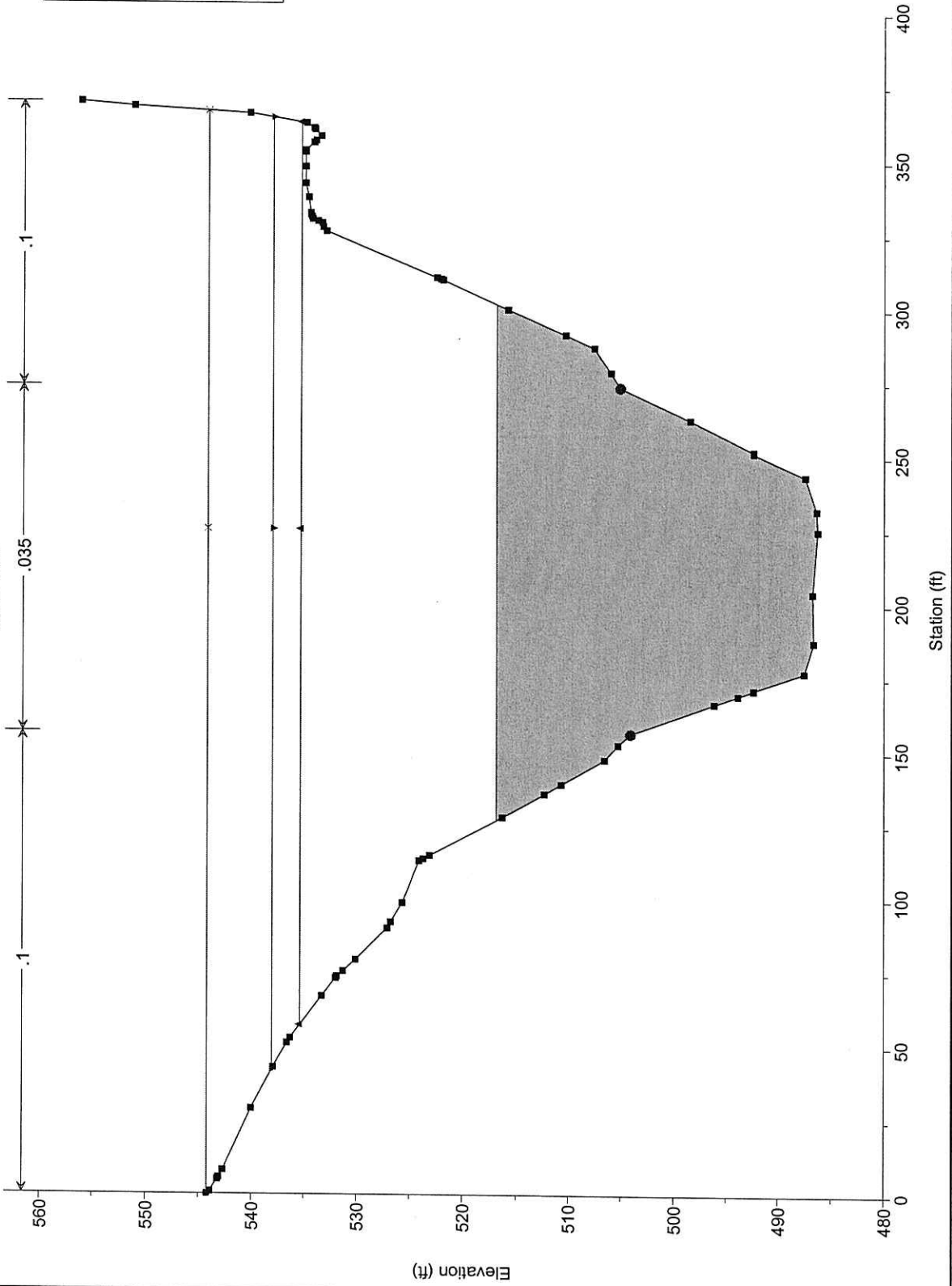
RS = 1395



Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

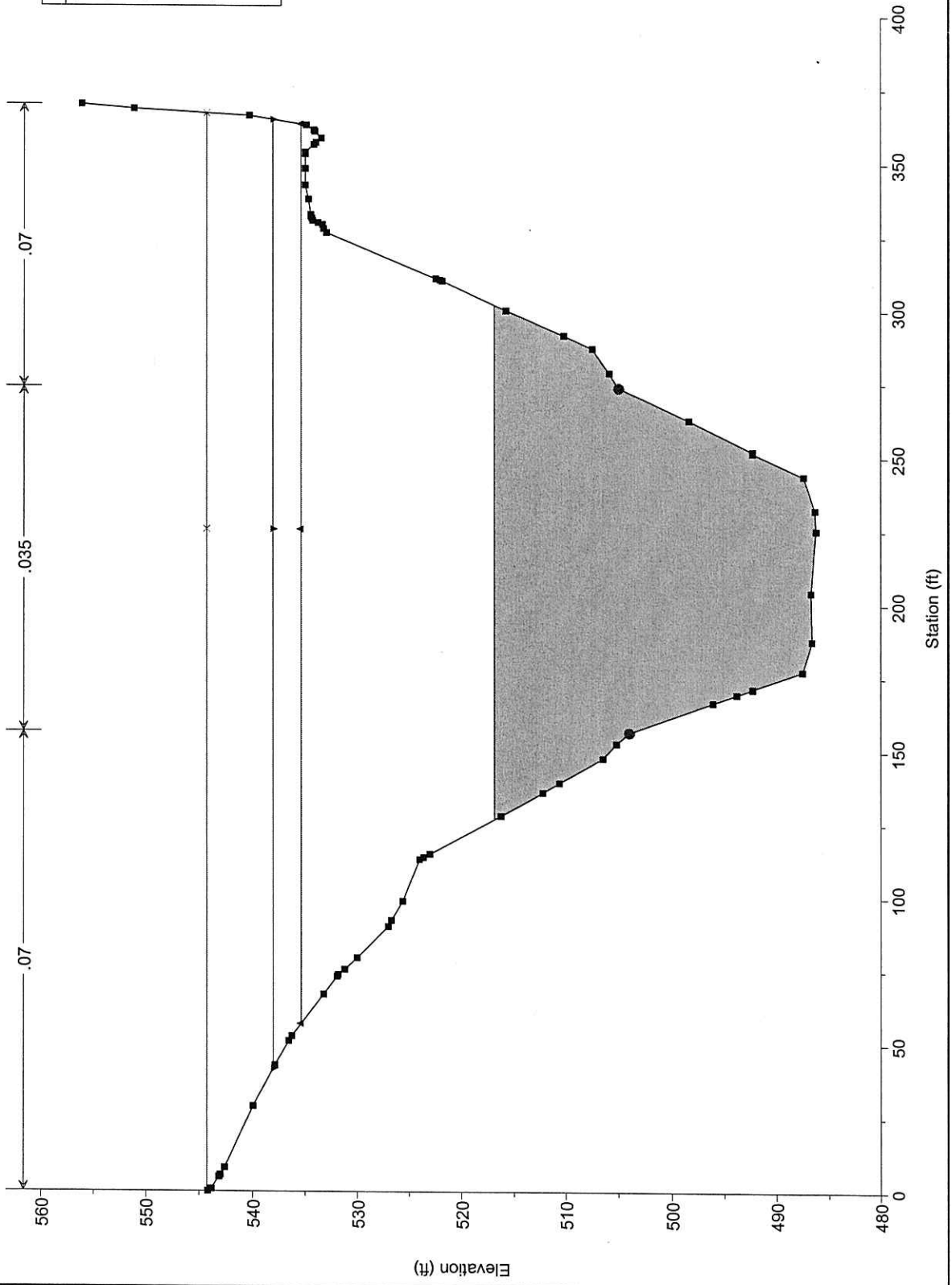
RS = 1185



Legend	
WS Q 500	✕
WS Q 100	▲
WS Q 50	▲
WS Q 2	■
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

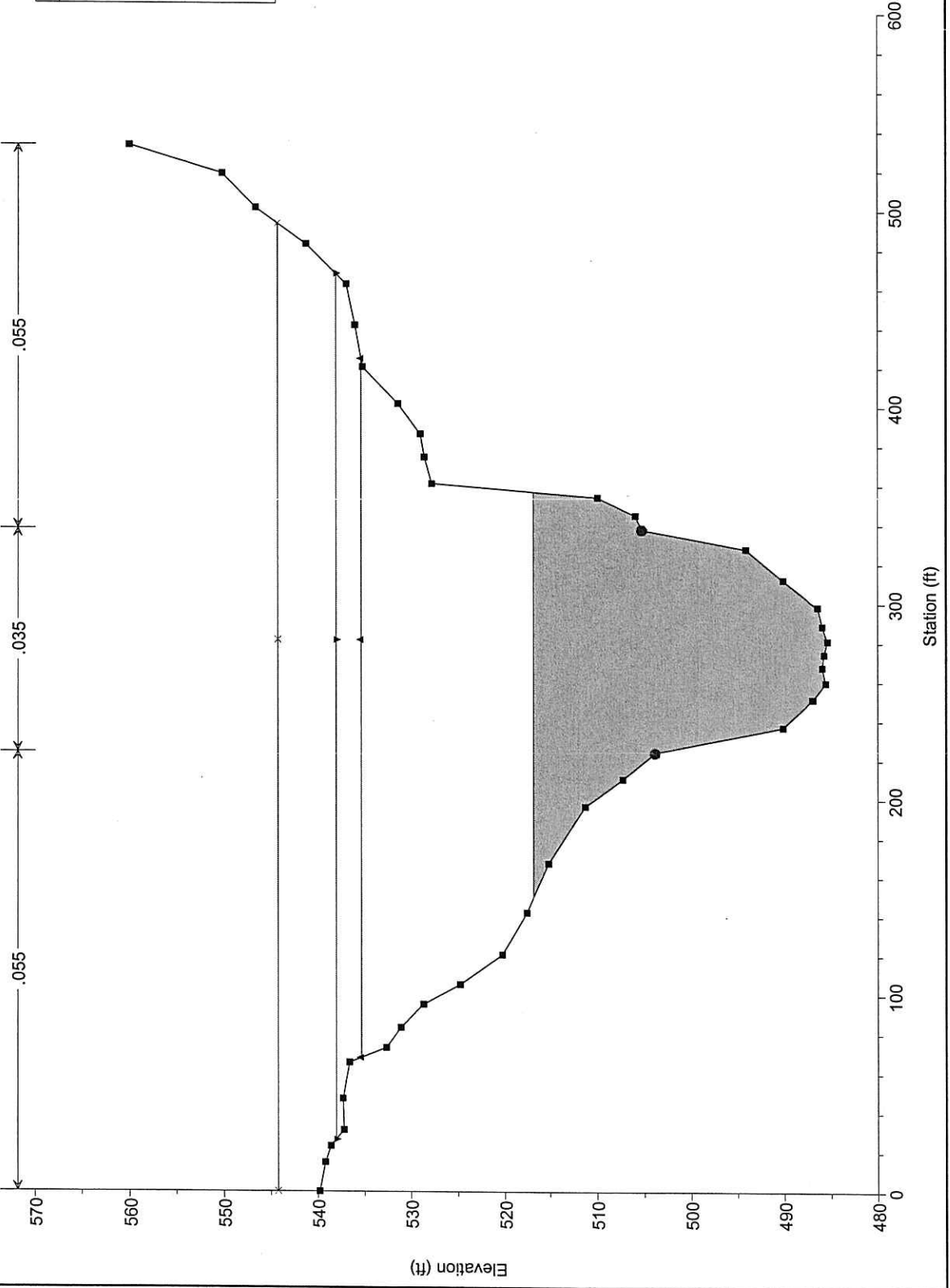
RS = 929



Legend	
WS Q 500	×
WS Q 100	▽
WS Q 50	△
WS Q 2	■
Ground	●
Bank Sta	●

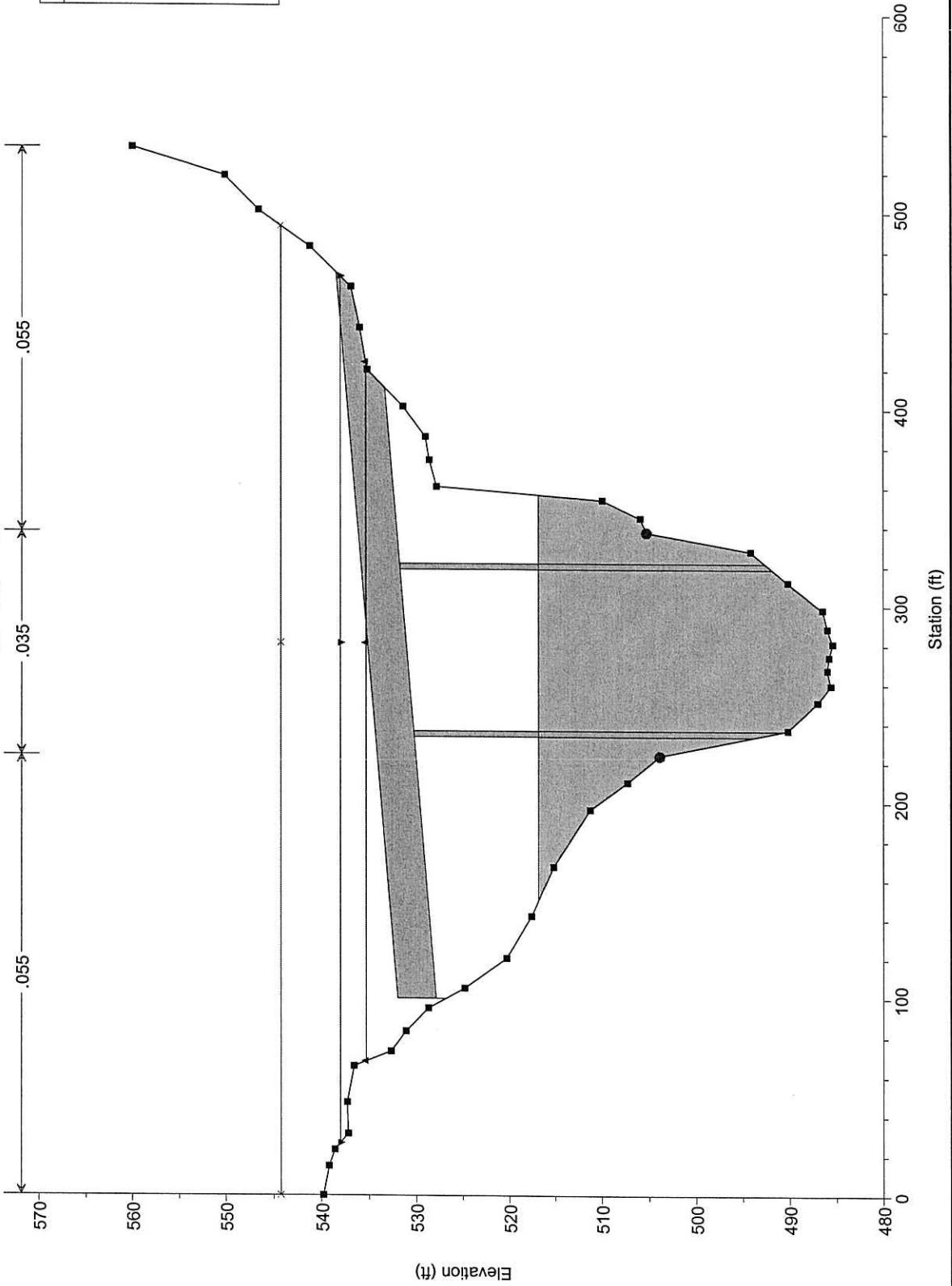
SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

RS = 552



SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

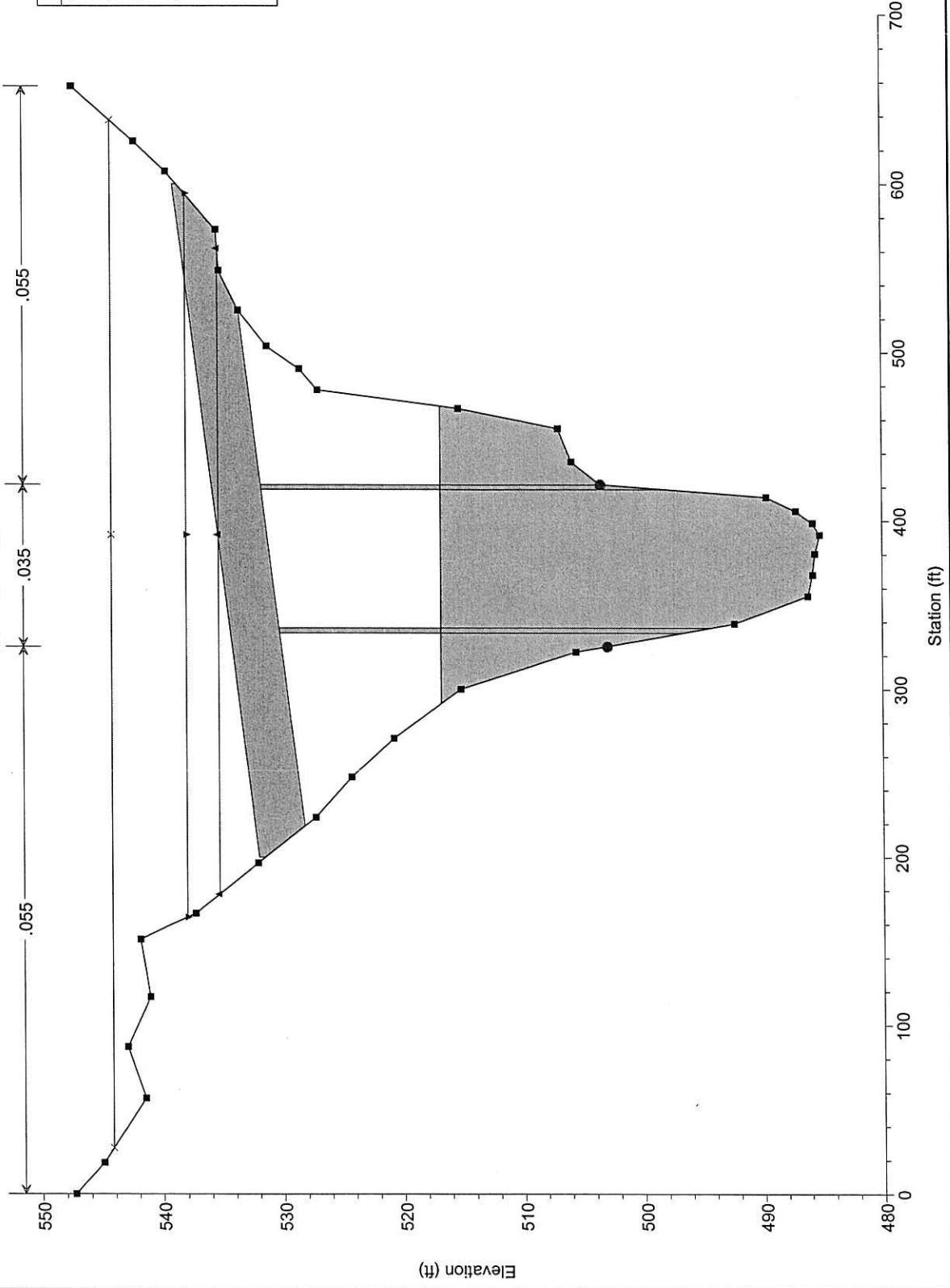
RS = 529 BR



Legend	
—x—	WS Q 500
—v—	WS Q 100
—^—	WS Q 50
—□—	WS Q 2
—●—	Bank Sta
—	Ground

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

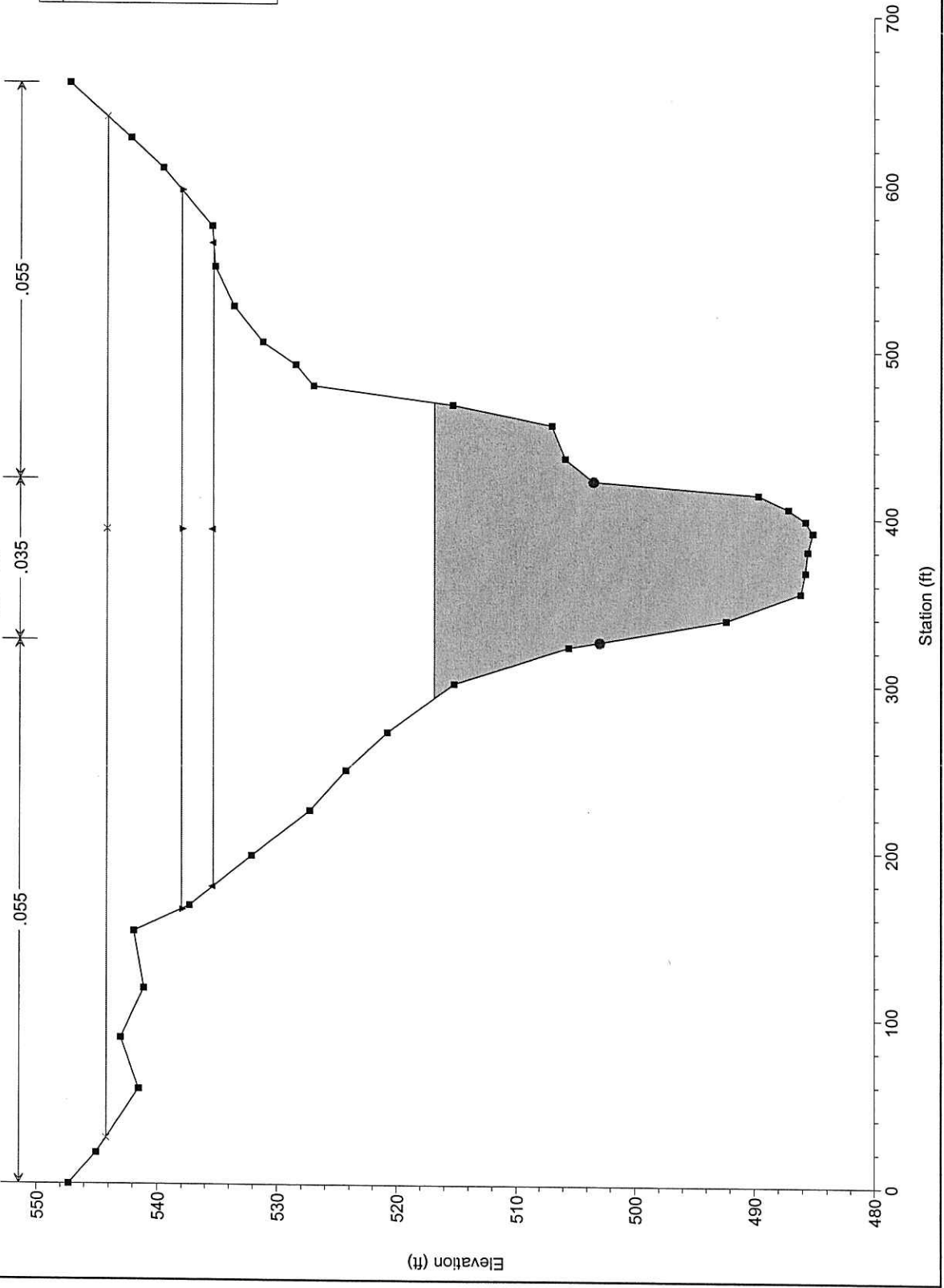
RS = 529 BR



Legend	
WS Q 500	✕
WS Q 100	▲
WS Q 50	▼
WS Q 2	■
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

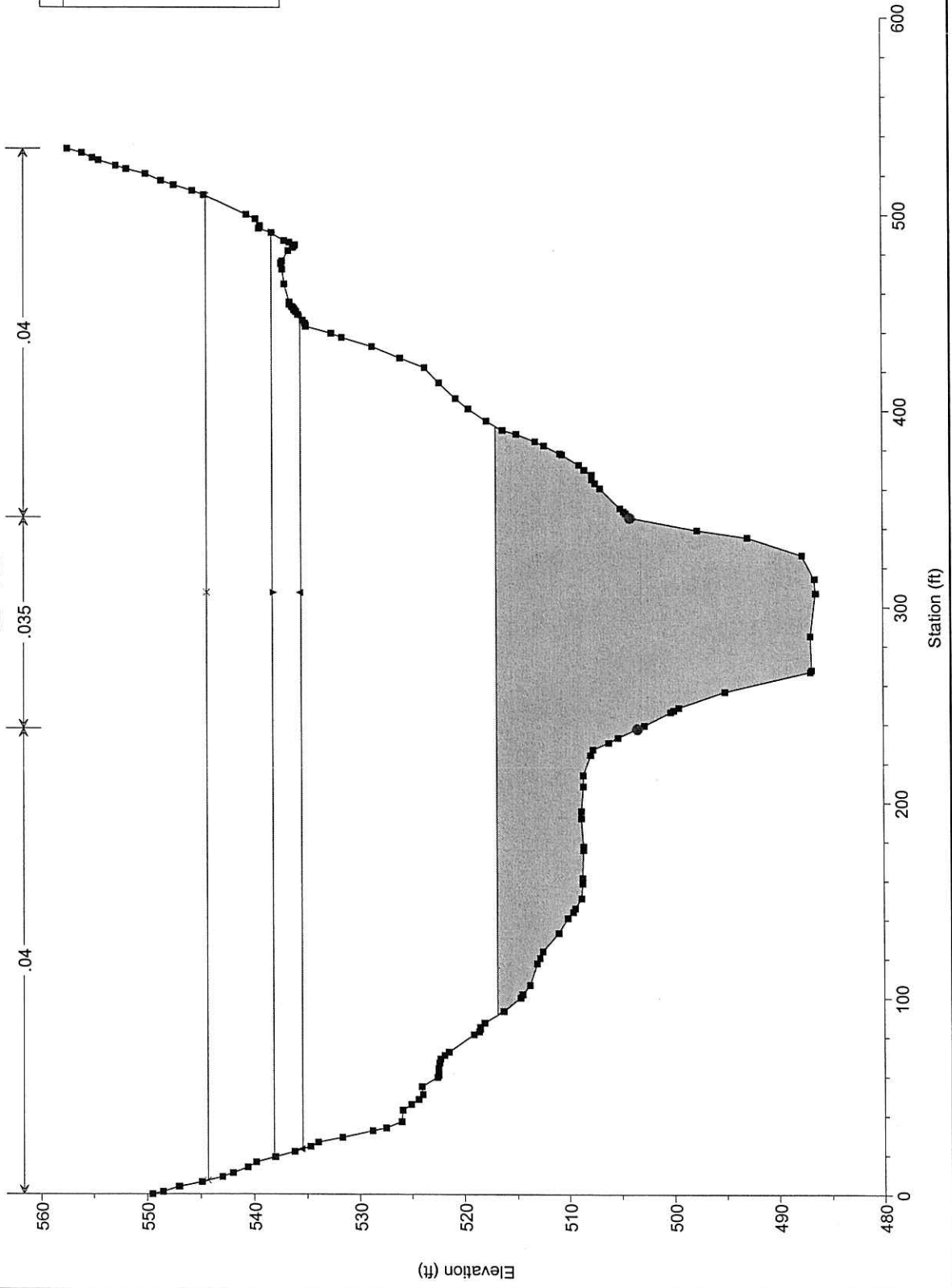
RS = 507



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	●
Bank Sta	●

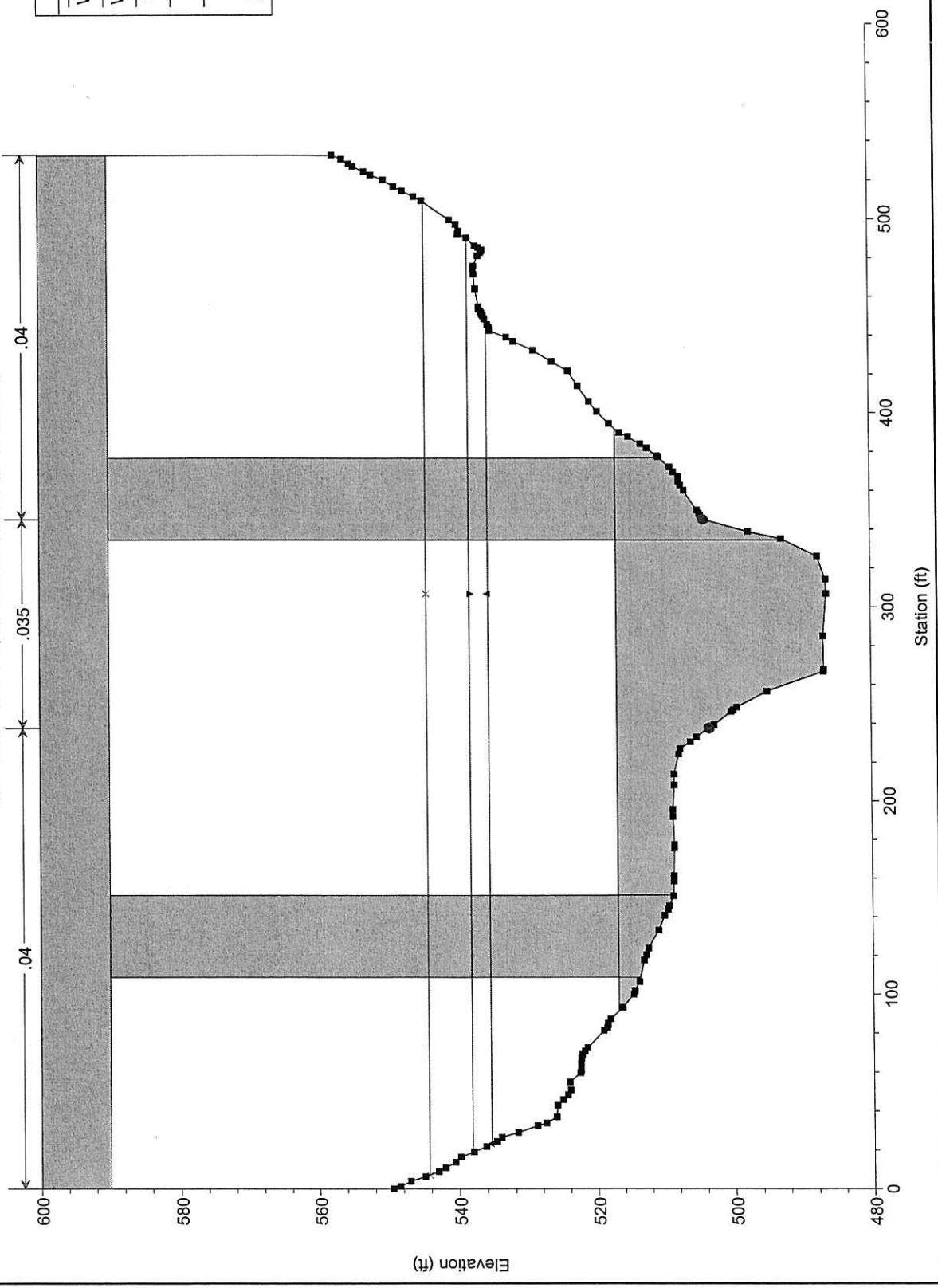
SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006

RS = 1882



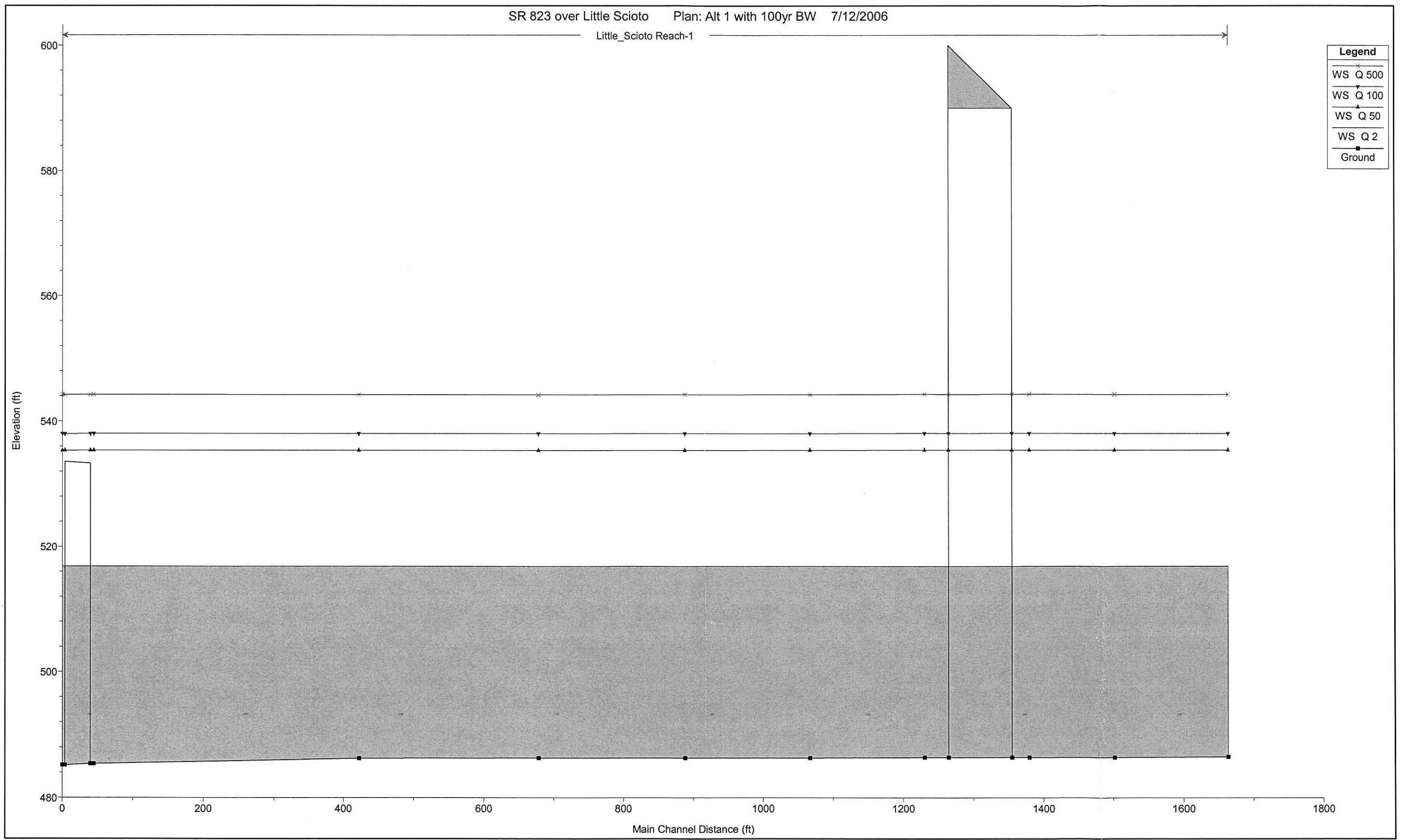
SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 1 (5 span)

Legend	
WS Q 500	▲
WS Q 100	▼
WS Q 50	◆
WS Q 2	■
Ground	●
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 1 with 100yr BW 7/12/2006

Little_Scioto Reach-1



Legend	
WS Q 500	✕
WS Q 100	▼
WS Q 50	▲
WS Q 2	■
Ground	■

Appendix III
Hydraulic Calculations
Alternative 2a & 2b

HEC-RAS Plan: Alt 2 NO BW River: Little Scioto Reach: Reach-1

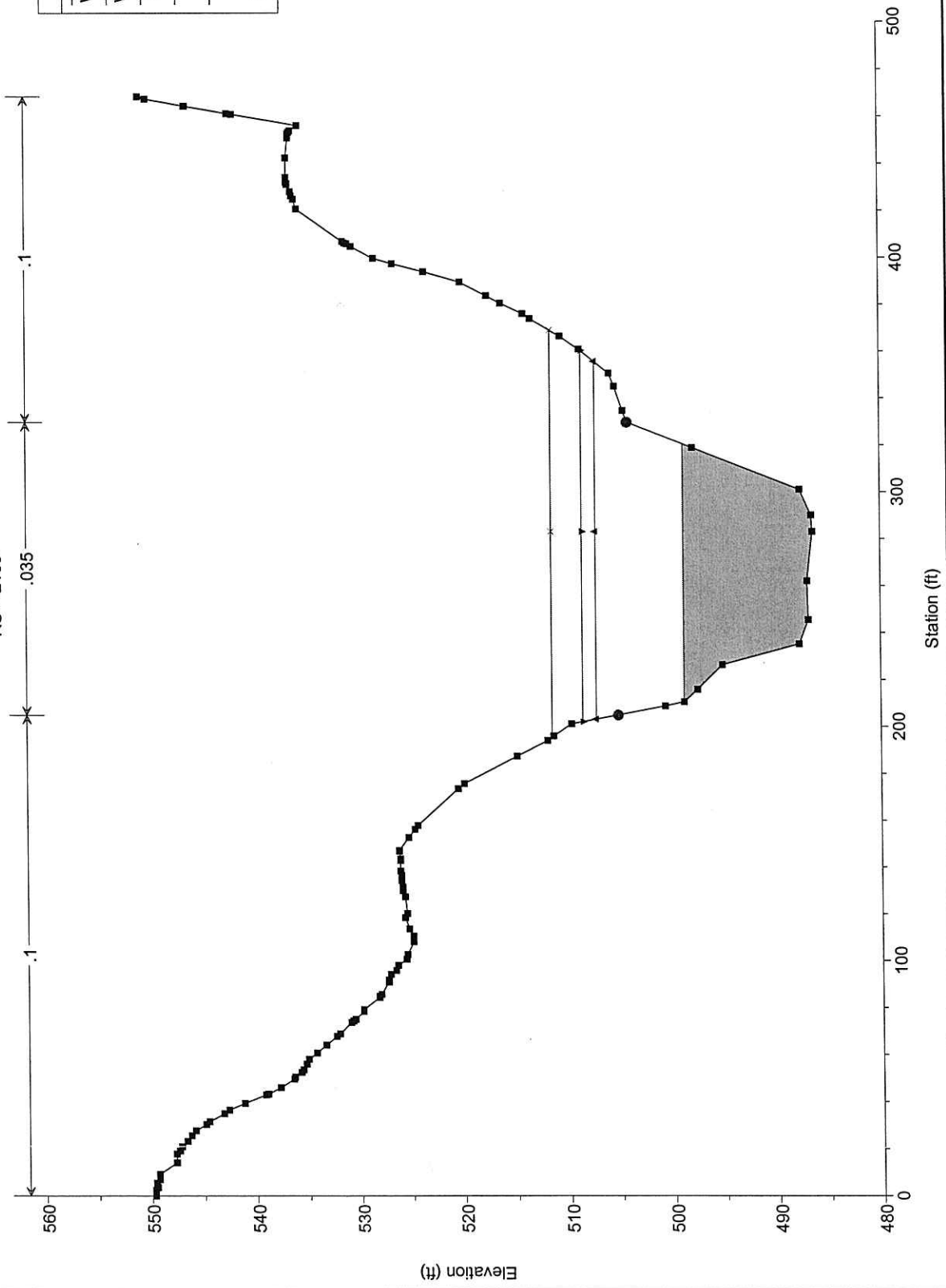
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Chl
Reach-1	2169	Q 2	4986.00	486.50	498.93		499.32	0.000793	5.01	995.81	109.96	0.29	
Reach-1	2169	Q 50	13337.00	486.50	507.32		508.00	0.000675	6.65	2053.99	152.53	0.29	
Reach-1	2169	Q 100	15167.00	486.50	508.65		509.40	0.000667	6.97	2260.69	158.38	0.29	
Reach-1	2169	Q 500	19717.00	486.50	511.55		512.47	0.000664	7.71	2740.94	173.53	0.30	
Reach-1	2008	Q 2	4986.00	486.40	498.77		499.19	0.000771	5.22	955.12	94.61	0.29	
Reach-1	2008	Q 50	13337.00	486.40	507.04		507.87	0.000771	7.34	1876.19	135.25	0.31	
Reach-1	2008	Q 100	15167.00	486.40	508.35		509.27	0.000775	7.73	2059.56	147.08	0.32	
Reach-1	2008	Q 500	19717.00	486.40	511.21		512.33	0.000789	8.59	2565.35	219.14	0.33	
Reach-1	1882	Q 2	4986.00	486.40	498.58	492.59	499.08	0.000960	5.69	876.76	89.55	0.32	
Reach-1	1882	Q 50	13337.00	486.40	506.84	497.48	507.76	0.000941	7.73	1752.67	130.79	0.34	
Reach-1	1882	Q 100	15167.00	486.40	508.15	498.35	509.15	0.000928	8.09	1932.85	148.18	0.34	
Reach-1	1882	Q 500	19717.00	486.40	511.11	500.42	512.22	0.000856	8.64	2582.20	246.61	0.34	
Reach-1	1808	Bridge											
Reach-1	1734	Q 2	4986.00	486.40	498.53		498.92	0.000752	5.01	995.03	104.89	0.29	
Reach-1	1734	Q 50	13337.00	486.40	506.86		507.58	0.000695	6.81	1972.54	150.15	0.30	
Reach-1	1734	Q 100	15167.00	486.40	508.19		508.97	0.000681	7.11	2229.15	206.26	0.30	
Reach-1	1734	Q 500	19717.00	486.40	511.17		512.03	0.000635	7.62	2875.80	231.55	0.30	
Reach-1	1574	Q 2	4970.00	486.30	498.34		498.79	0.000849	5.34	930.63	96.82	0.30	
Reach-1	1574	Q 50	13343.00	486.30	506.65		507.44	0.000879	7.13	1885.63	155.79	0.33	
Reach-1	1574	Q 100	15175.00	486.30	507.98		508.84	0.000848	7.42	2116.02	184.91	0.33	
Reach-1	1574	Q 500	19727.00	486.30	510.91		511.91	0.000799	8.06	2690.65	205.87	0.33	
Reach-1	1395	Q 2	4970.00	486.30	498.17		498.63	0.000897	5.43	914.75	96.51	0.31	
Reach-1	1395	Q 50	13343.00	486.30	506.44		507.28	0.000855	7.36	1852.21	148.03	0.33	
Reach-1	1395	Q 100	15175.00	486.30	507.76		508.68	0.000842	7.71	2053.81	159.96	0.33	
Reach-1	1395	Q 500	19727.00	486.30	510.65		511.75	0.000829	8.49	2557.42	186.52	0.33	
Reach-1	1185	Q 2	4970.00	486.30	497.97		498.44	0.000935	5.49	905.48	97.46	0.32	
Reach-1	1185	Q 50	13343.00	486.30	506.26		507.10	0.000879	7.36	1822.92	131.24	0.33	
Reach-1	1185	Q 100	15175.00	486.30	507.58		508.50	0.000864	7.71	2002.80	141.38	0.33	
Reach-1	1185	Q 500	19727.00	486.30	510.45		511.57	0.000853	8.51	2424.79	152.03	0.34	
Reach-1	929	Q 2	4970.00	486.24	497.70		498.19	0.000999	5.62	884.94	96.82	0.33	

HEC-RAS Plan: Alt 2 NO BW River: Little_Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	506.01		506.87	0.000917	7.46	1797.78	129.49	0.34
Reach-1	929	Q 100	15175.00	486.24	507.33		508.27	0.000896	7.79	1976.53	140.03	0.34
Reach-1	929	Q 500	19727.00	486.24	510.22		511.35	0.000876	8.57	2398.11	151.39	0.34
Reach-1	552	Q 2	4970.00	485.40	497.32	492.10	497.80	0.001007	5.56	893.12	100.38	0.33
Reach-1	552	Q 50	13343.00	485.40	505.67	496.56	506.53	0.000892	7.44	1799.14	124.33	0.33
Reach-1	552	Q 100	15175.00	485.40	506.99	497.33	507.94	0.000878	7.80	1972.74	135.34	0.33
Reach-1	552	Q 500	19727.00	485.40	509.88	499.11	511.02	0.000870	8.61	2387.80	152.23	0.34
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	497.14	491.97	497.73	0.001200	6.19	802.92	85.29	0.36
Reach-1	507	Q 50	13343.00	485.20	505.25	496.81	506.40	0.001200	8.60	1562.38	108.84	0.38
Reach-1	507	Q 100	15175.00	485.20	506.53	497.66	507.80	0.001200	9.05	1709.76	126.34	0.38
Reach-1	507	Q 500	19727.00	485.20	509.33	499.69	510.86	0.001200	9.99	2098.63	144.65	0.39

SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

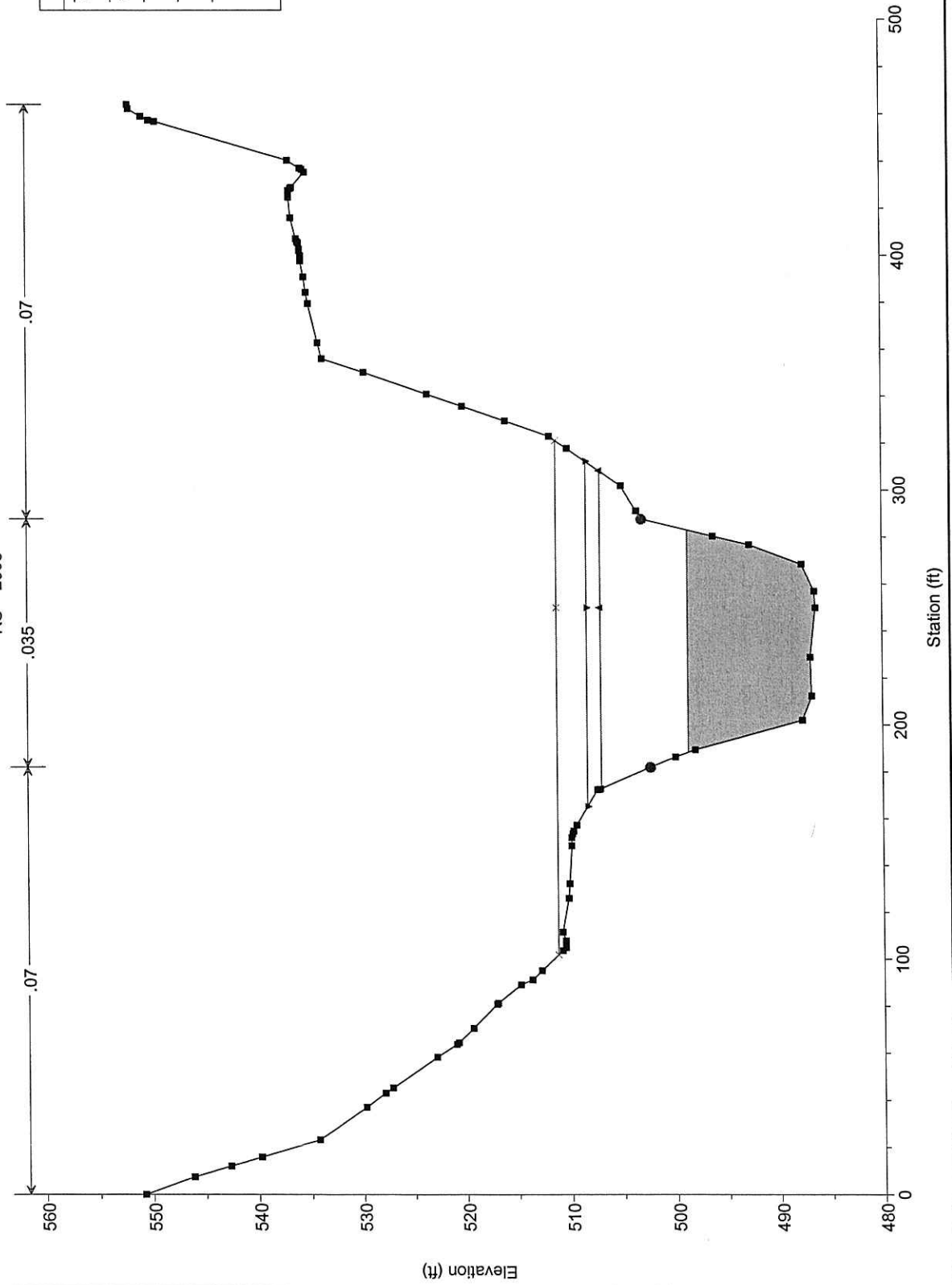
RS = 2169



SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

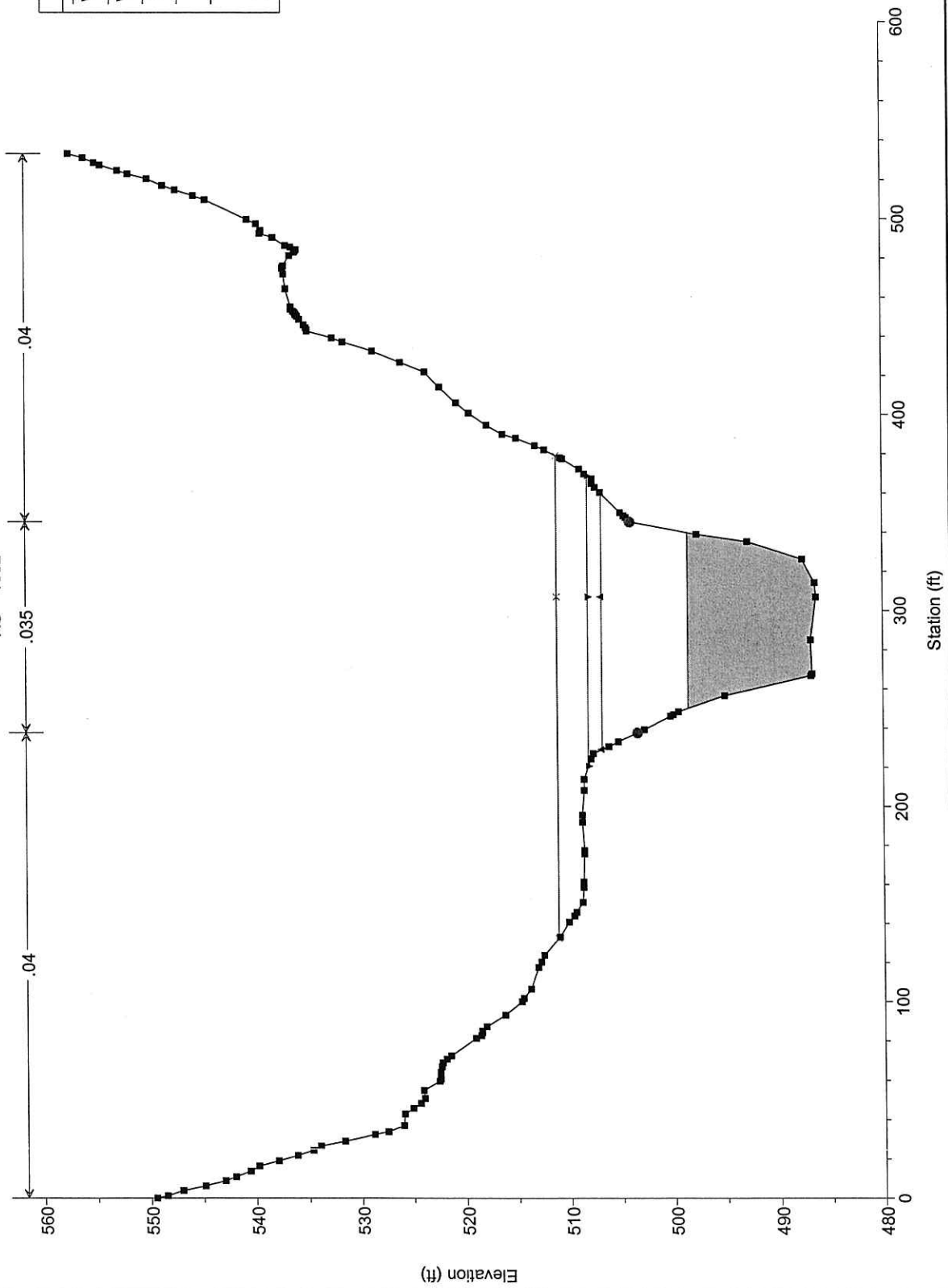
RS = 2008

Legend	
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—^—	WS Q 50
—	WS Q 2
■	Ground
●	Bank Sta



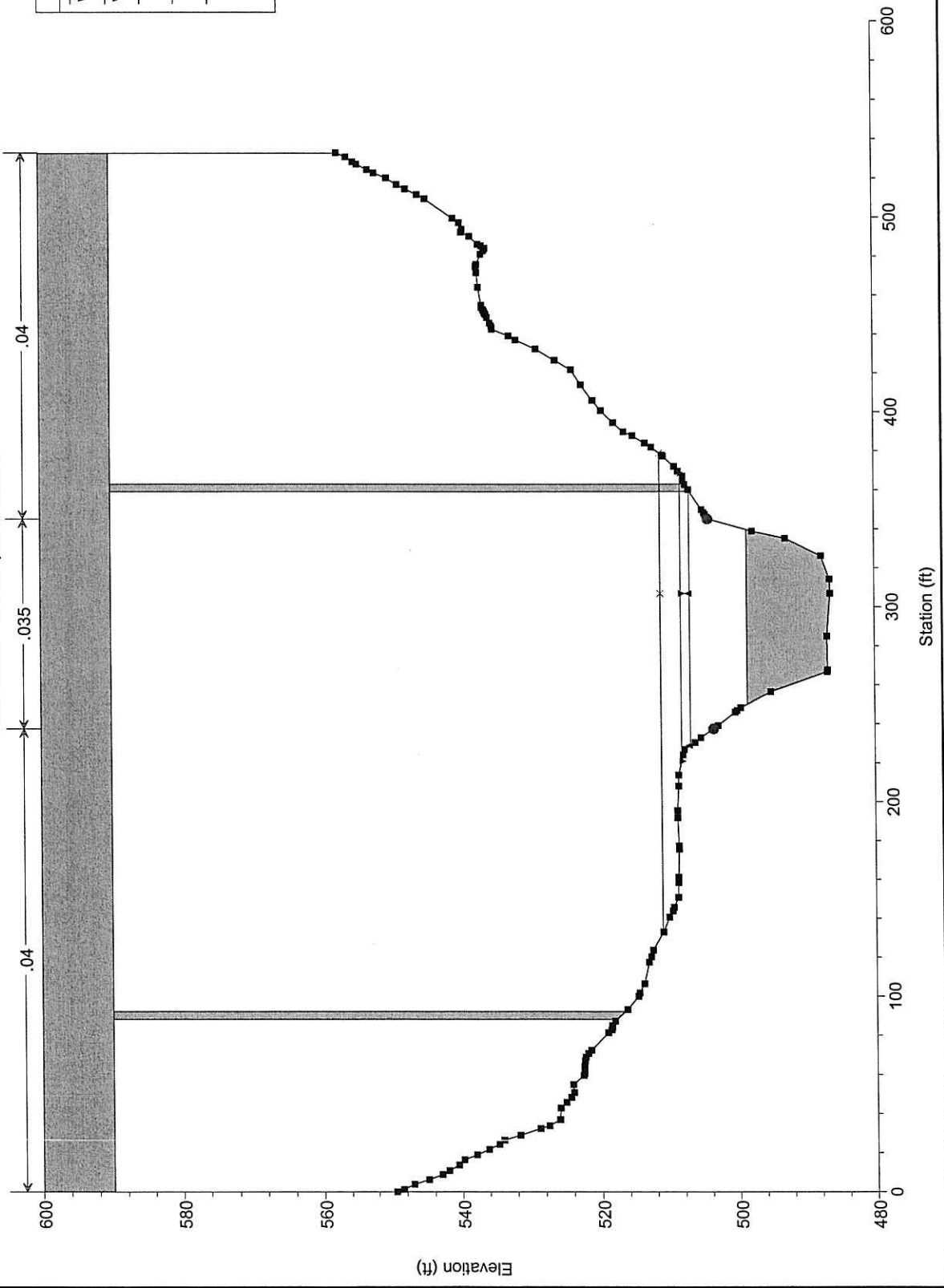
SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006
 RS = 1882

Legend	
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—	WS Q 2
—■—	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

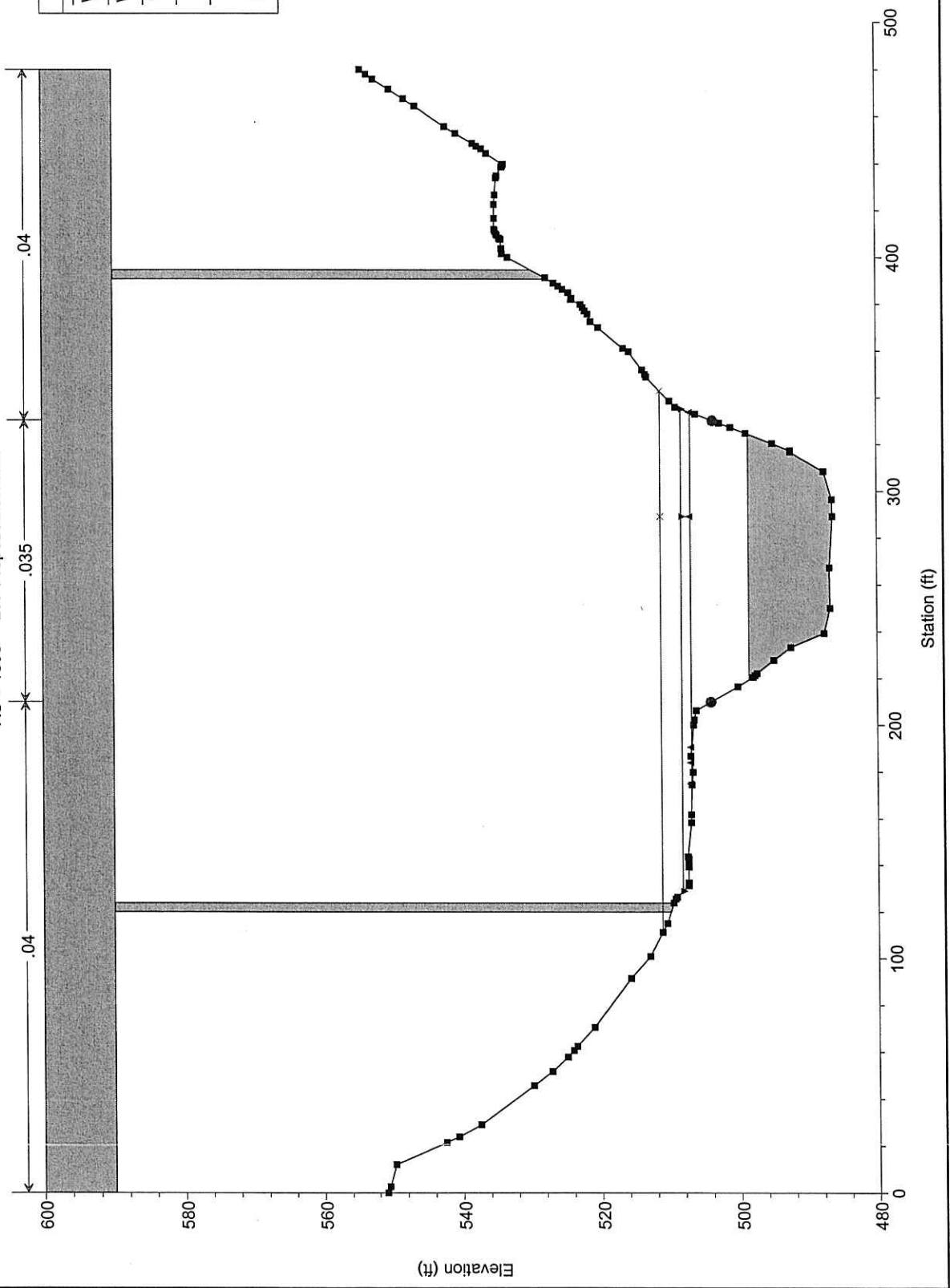
RS = 1808 BR Proposed SR 823



Legend	
WS Q 500	x
WS Q 100	v
WS Q 50	u
WS Q 2	o
Ground	■
Bank Sta	●

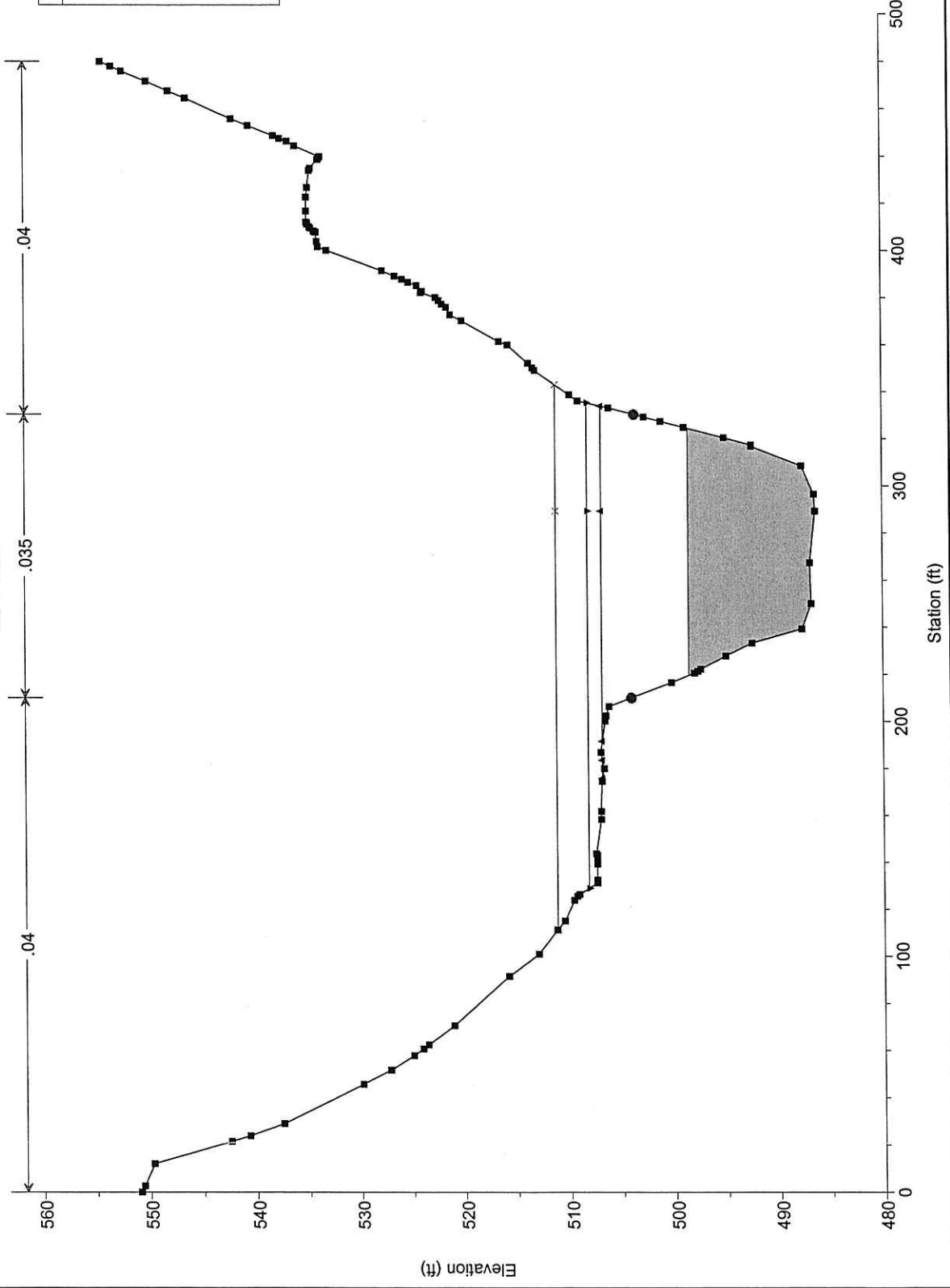
SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006
 RS = 1808 BR Proposed SR 823

Legend	
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—v—	WS Q 100
—^—	WS Q 50
—	WS Q 2
—■—	Ground
●	Bank Sta



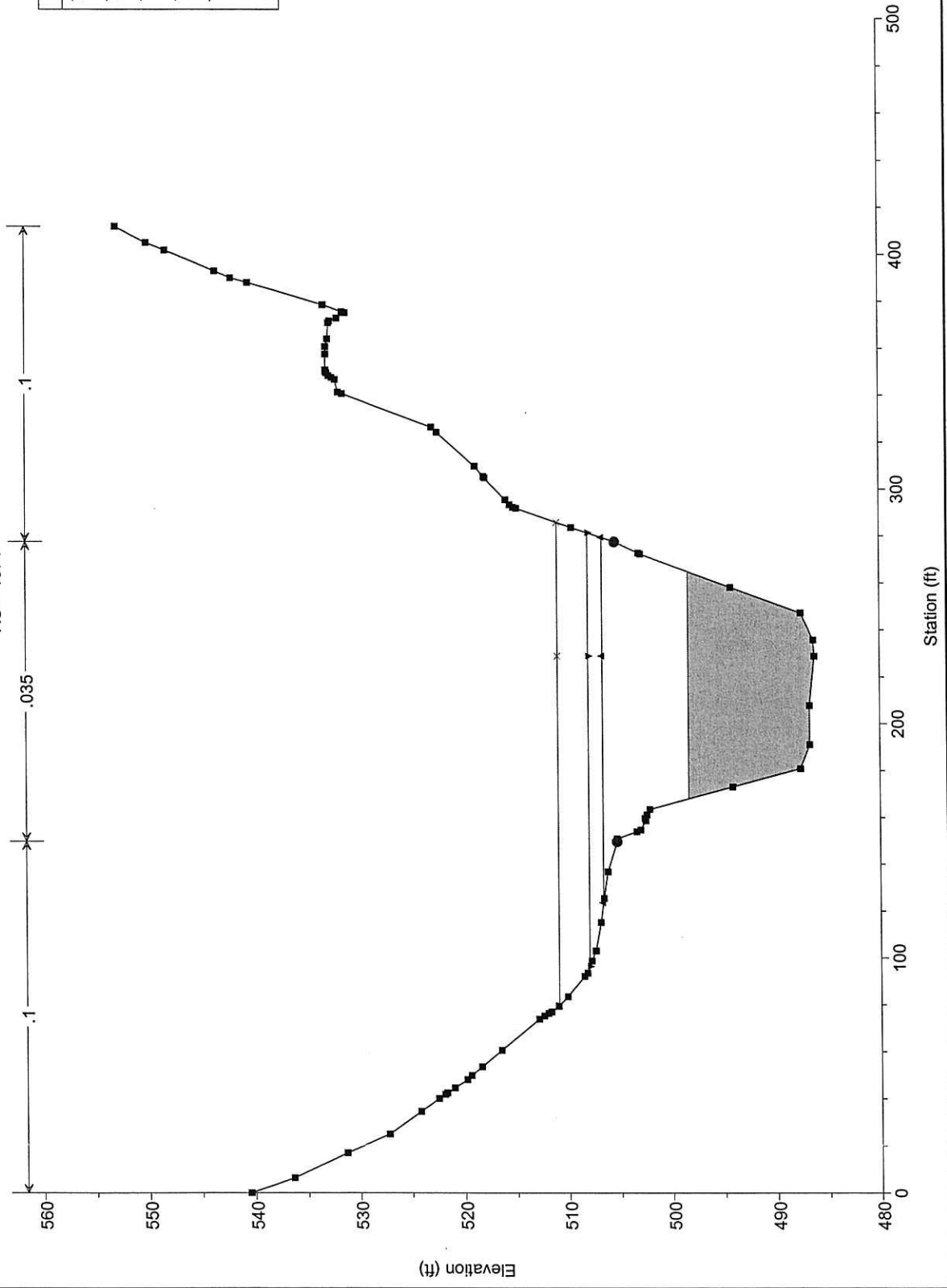
SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006
 RS = 1734

Legend	
—x—	WS Q 500
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—^—	WS Q 50
—	WS Q 2
—■—	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

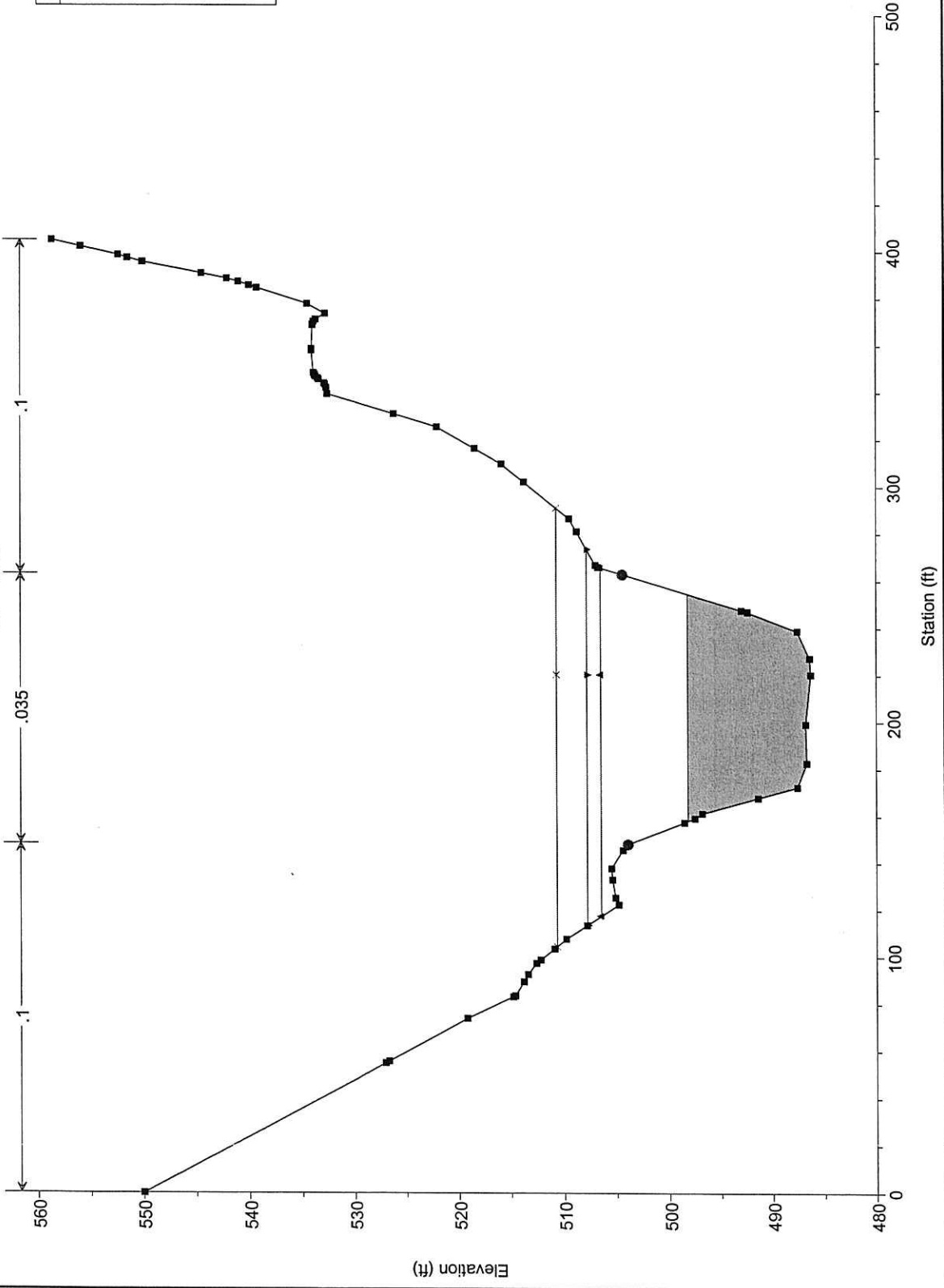
RS = 1574



Legend	
WS Q 500	×
WS Q 100	□
WS Q 50	○
WS Q 2	△
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

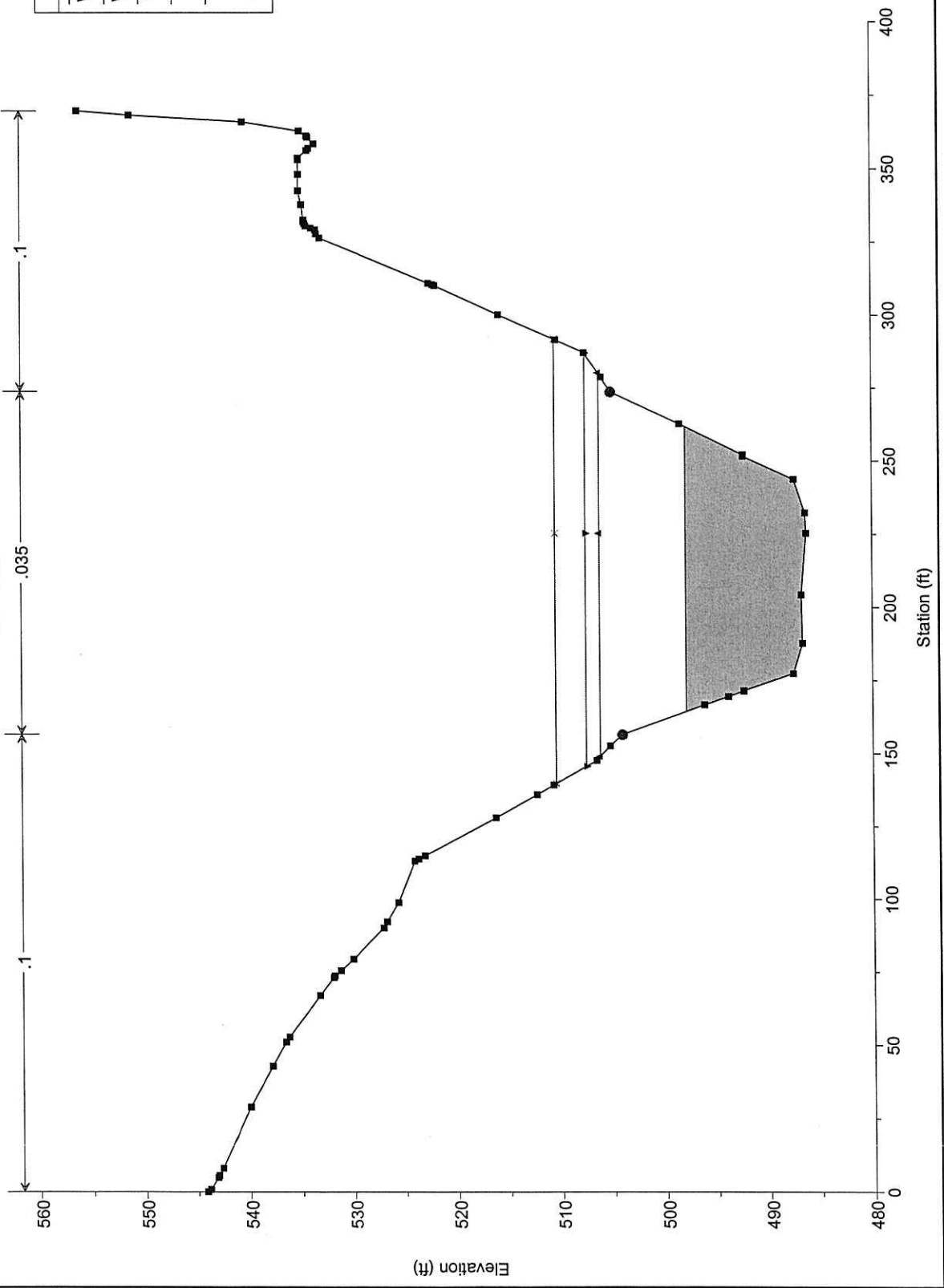
RS = 1395



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

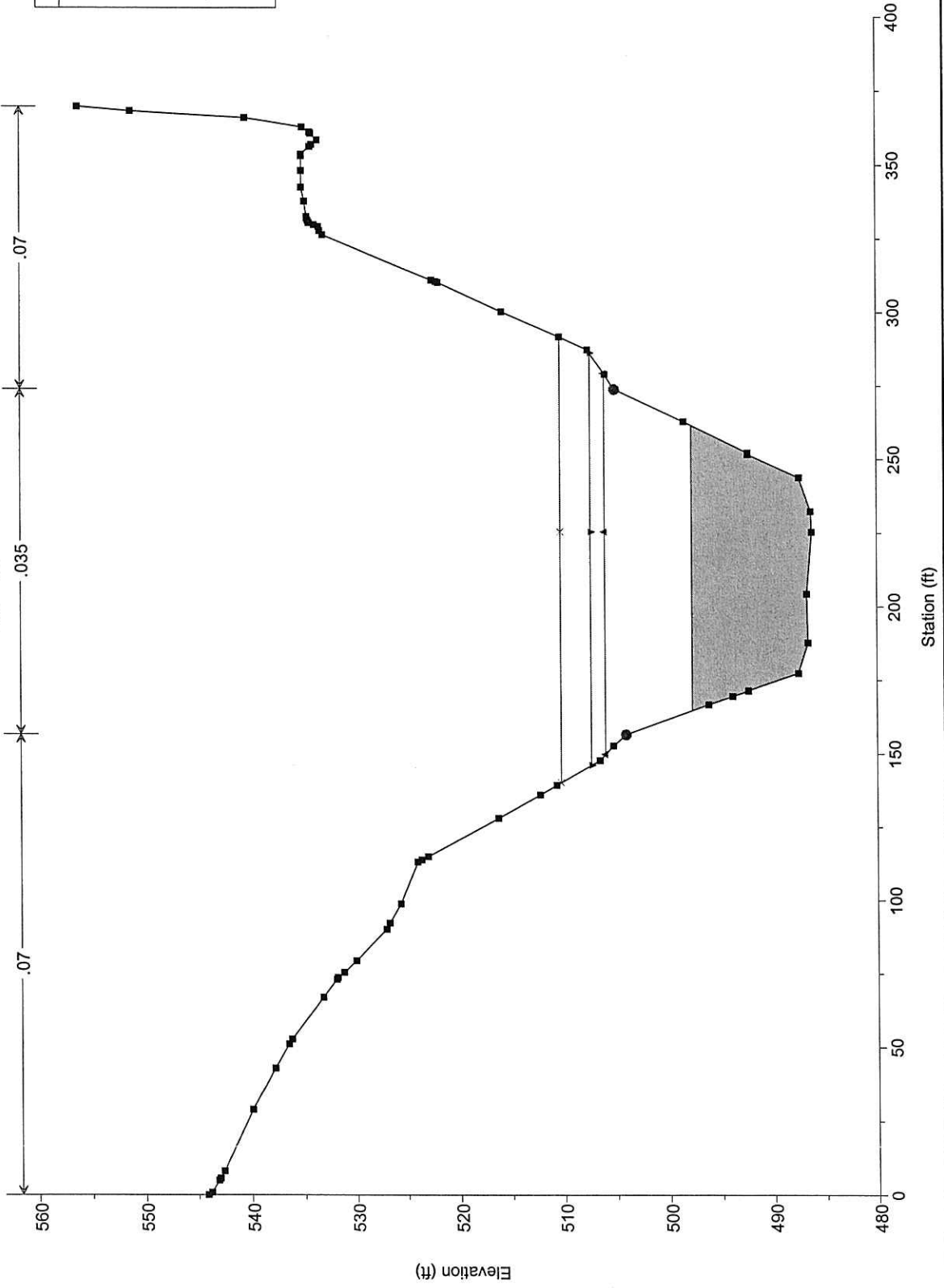
RS = 1185



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

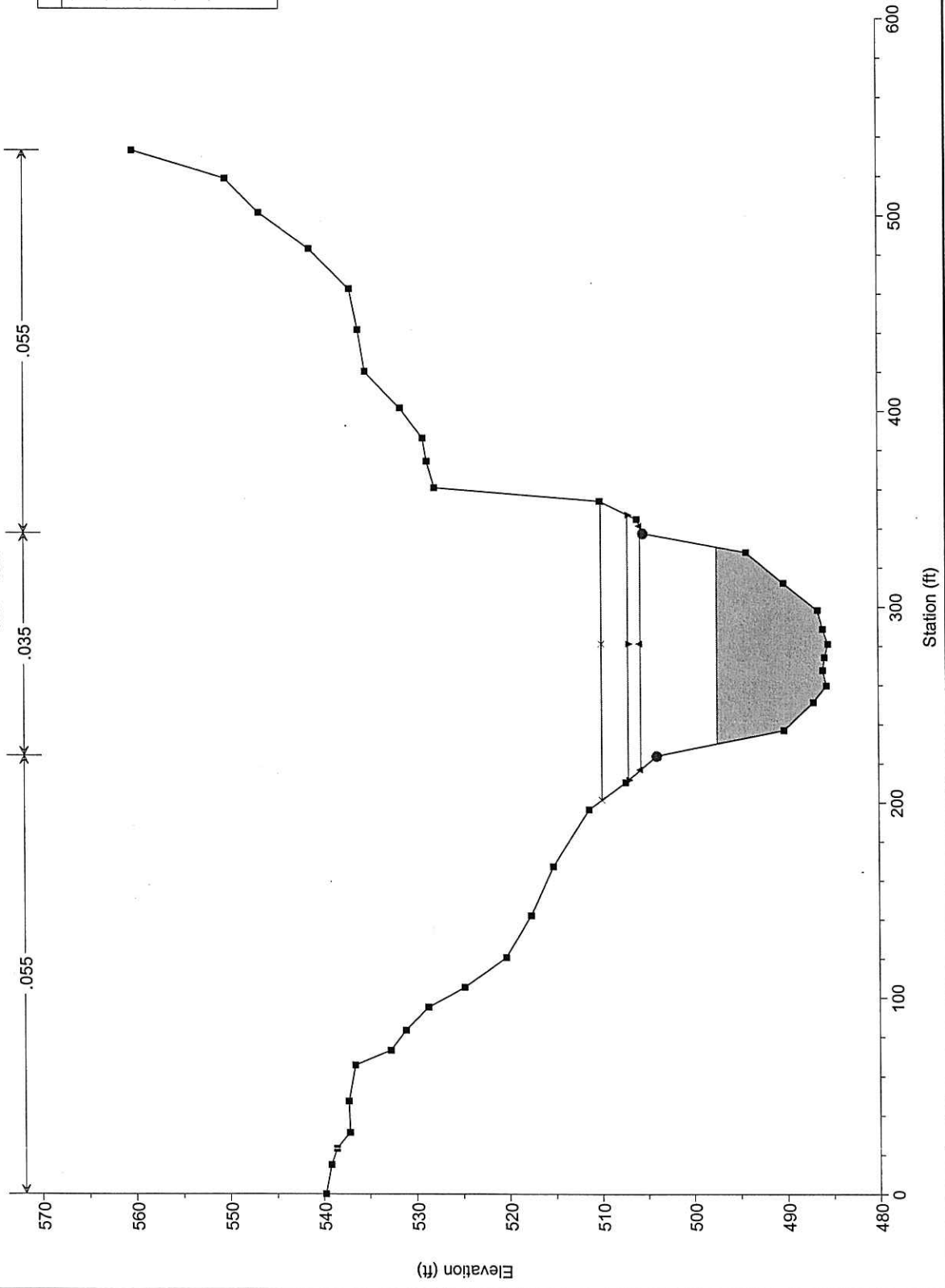
RS = 929



Legend	
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WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

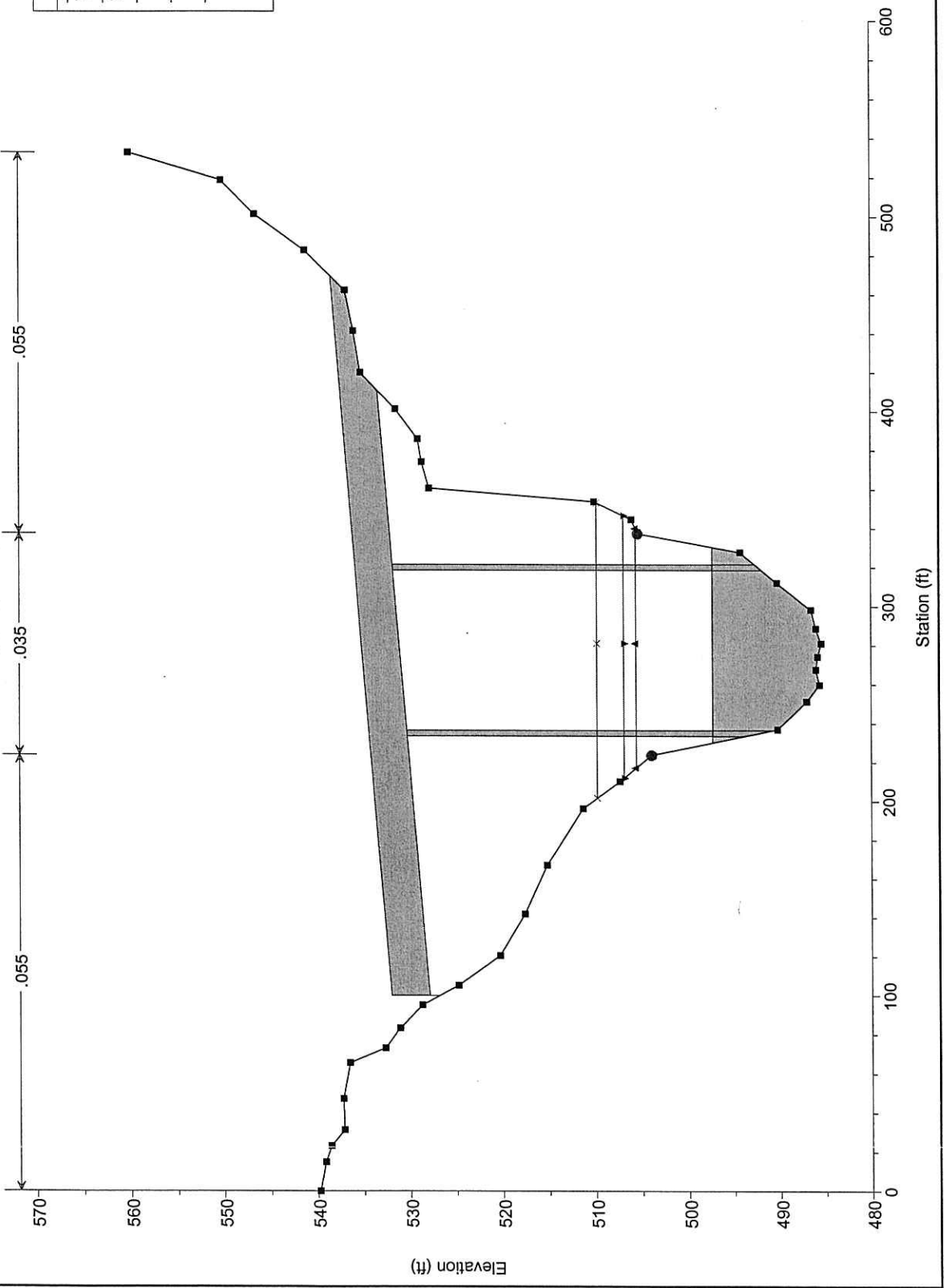
SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

RS = 552



SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

RS = 529 BR



0.055 0.035 0.055

Elevation (ft)

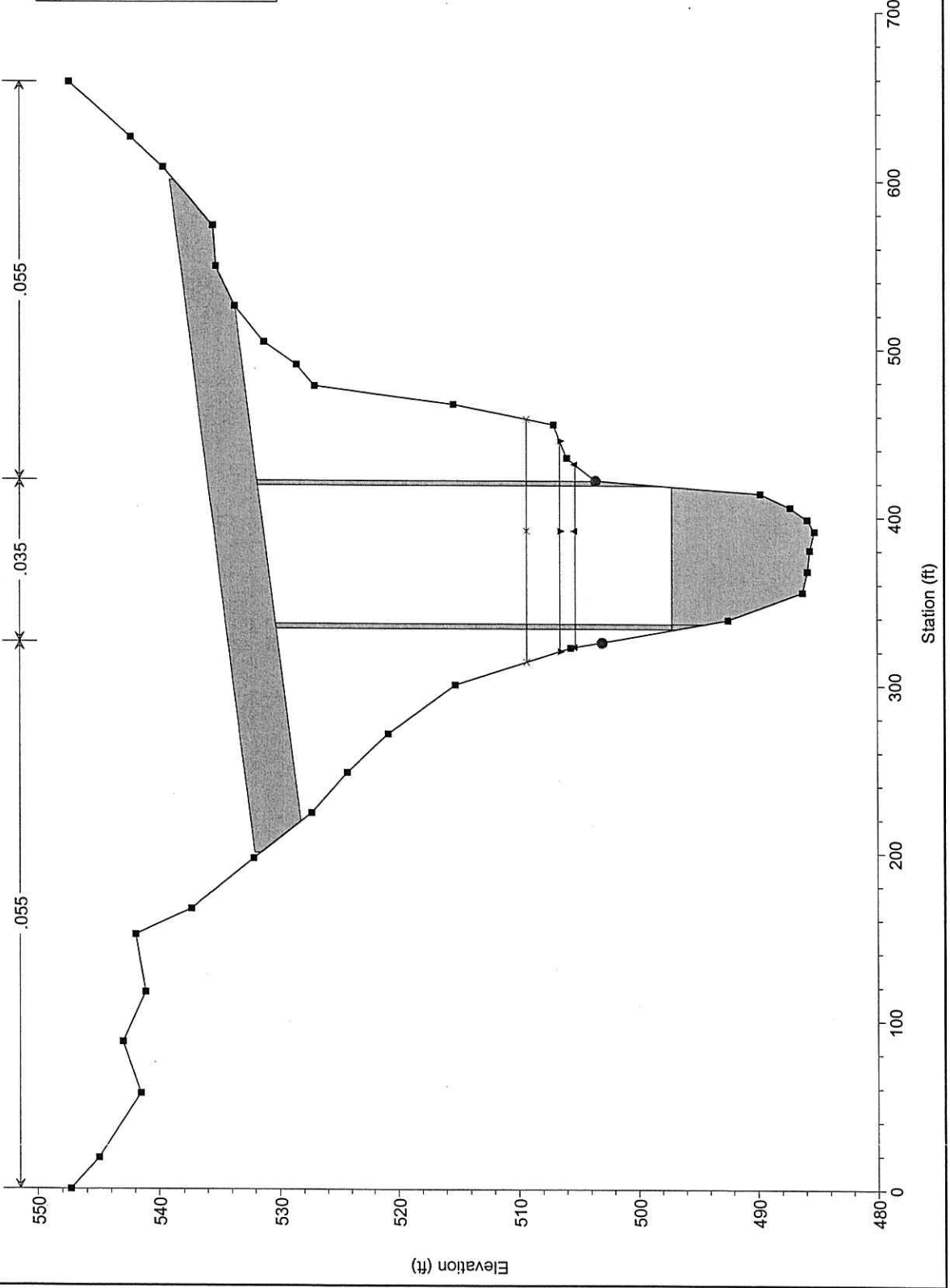
Station (ft)

SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

RS = 529 BR

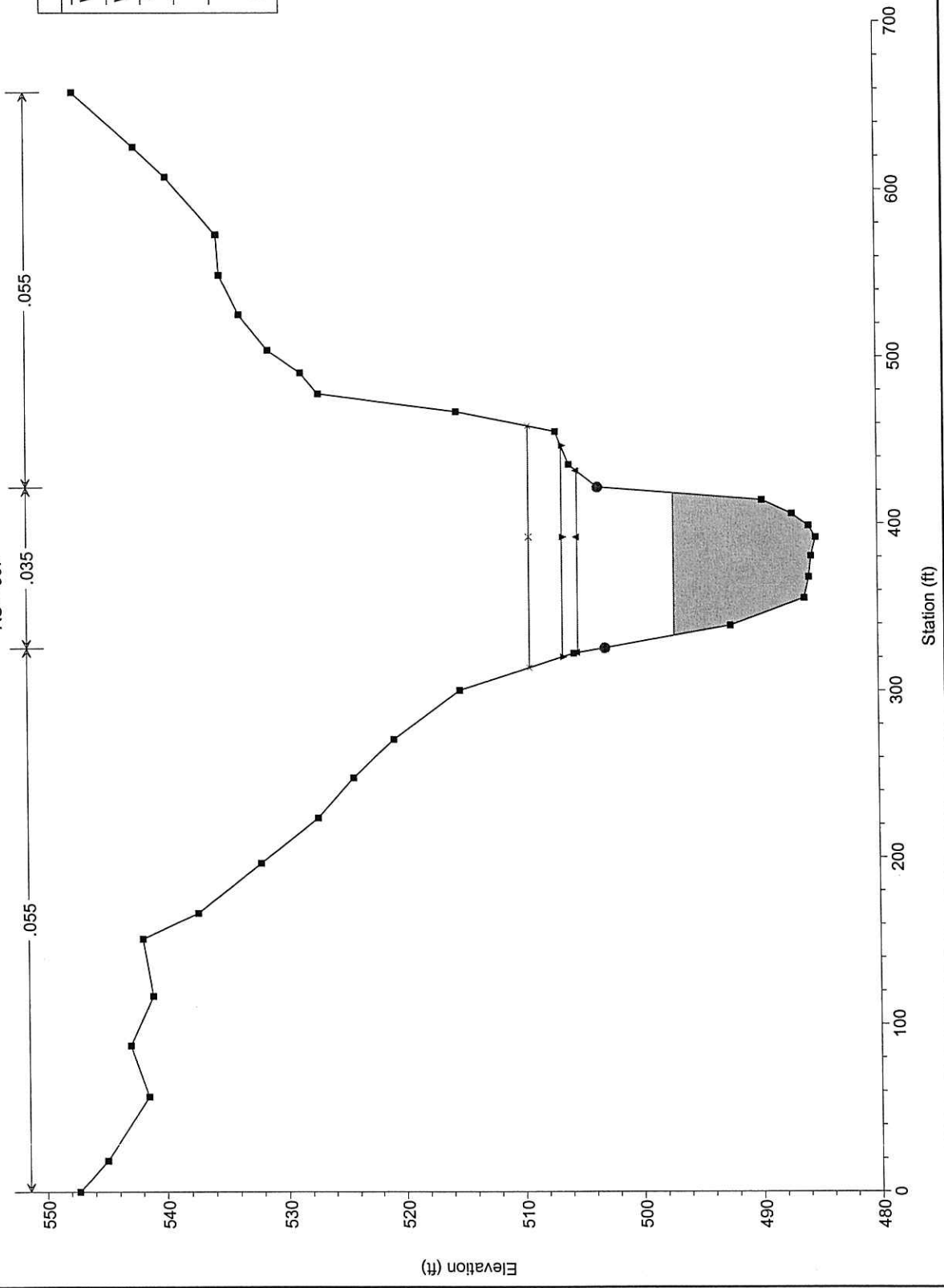
0.055 0.035 0.055

Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta



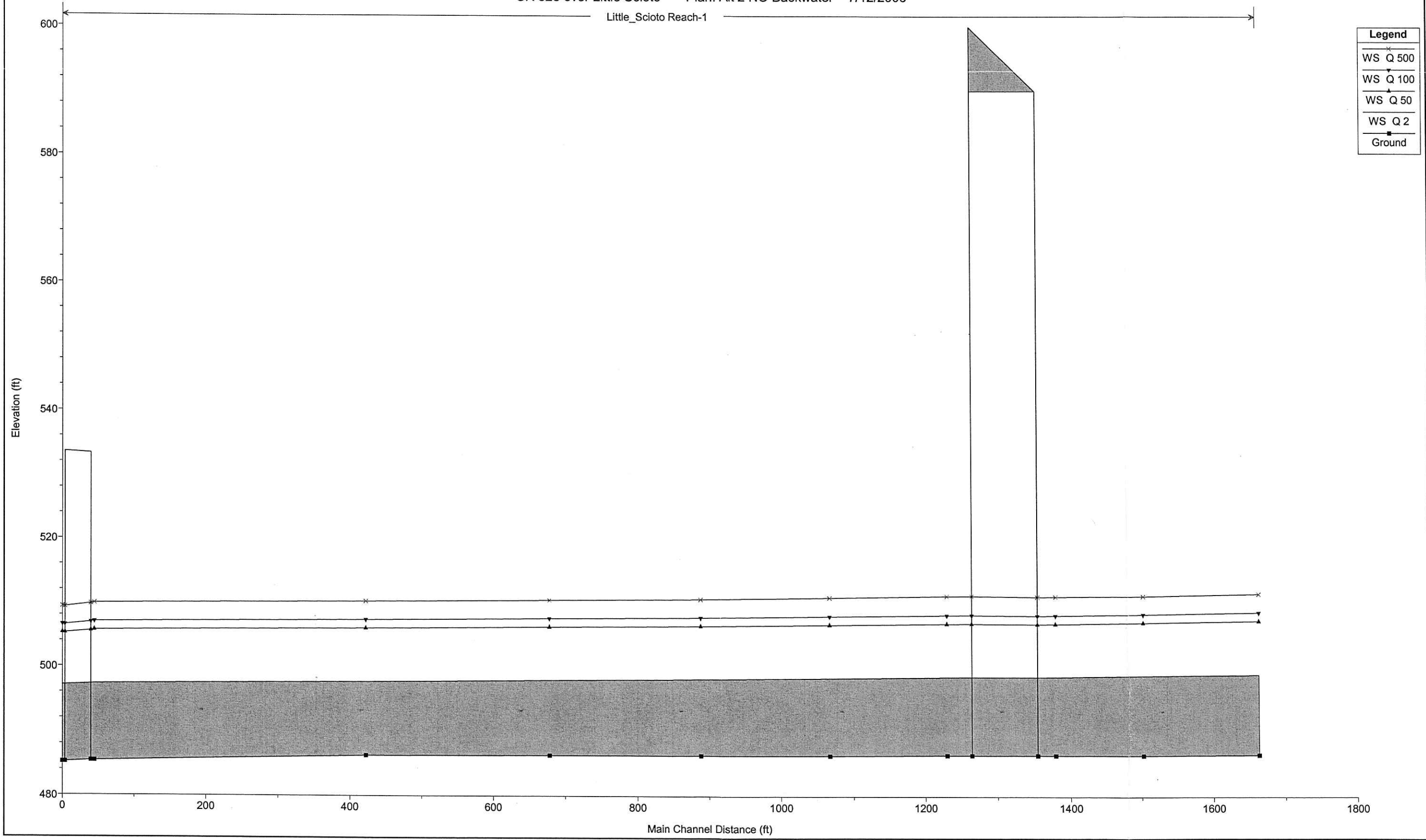
SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

RS = 507



SR 823 over Little Scioto Plan: Alt 2 NO Backwater 7/12/2006

Little_Scioto Reach-1



Legend	
x	WS Q 500
▼	WS Q 100
▲	WS Q 50
■	WS Q 2
■	Ground

HEC-RAS Plan: Alt 2 10y BW River: Little Scioto Reach: Reach-1

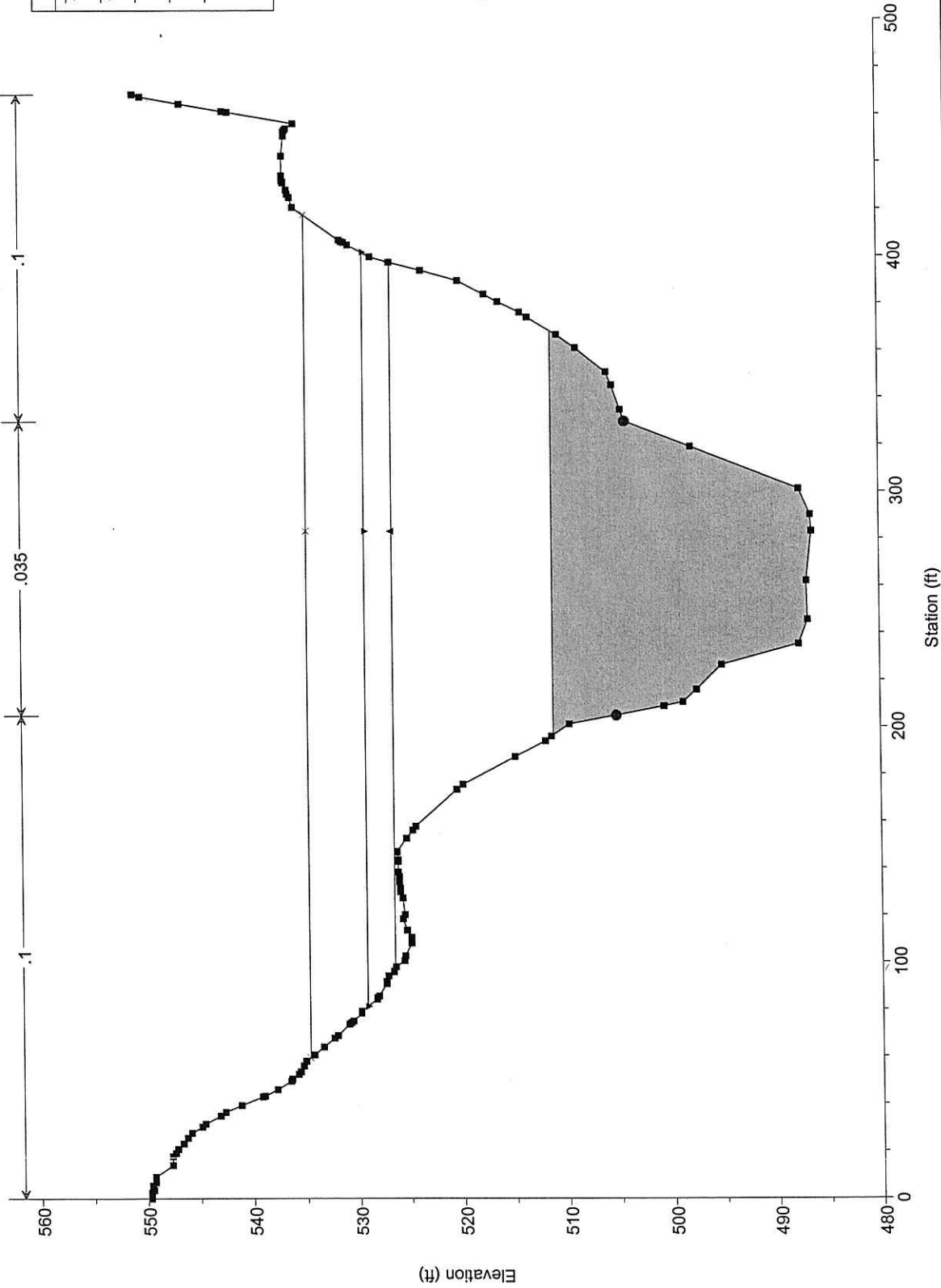
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4968.00	486.50	511.24		511.30	0.000044	1.97	2687.02	171.71	0.08
Reach-1	2169	Q 50	13337.00	486.50	526.46		526.58	0.000044	2.87	5917.58	299.92	0.09
Reach-1	2169	Q 100	15167.00	486.50	529.14		529.27	0.000044	3.00	6751.23	320.27	0.09
Reach-1	2169	Q 500	19717.00	486.50	534.67		534.83	0.000044	3.30	8626.44	357.90	0.09
Reach-1	2008	Q 2	4968.00	486.40	511.22		511.29	0.000050	2.16	2568.63	219.25	0.08
Reach-1	2008	Q 50	13337.00	486.40	526.46		526.57	0.000044	2.91	6533.02	297.68	0.08
Reach-1	2008	Q 100	15167.00	486.40	529.14		529.26	0.000043	3.01	7348.52	310.23	0.08
Reach-1	2008	Q 500	19717.00	486.40	534.68		534.82	0.000043	3.30	9144.87	352.50	0.09
Reach-1	1882	Q 2	4968.00	486.40	511.22	492.58	511.28	0.000053	2.16	2607.17	247.51	0.08
Reach-1	1882	Q 50	13337.00	486.40	526.49	497.48	526.55	0.000031	2.41	7482.54	391.95	0.07
Reach-1	1882	Q 100	15167.00	486.40	529.18	498.35	529.24	0.000028	2.40	8550.48	401.44	0.07
Reach-1	1882	Q 500	19717.00	486.40	534.72	500.42	534.79	0.000025	2.47	10821.35	417.96	0.07
Reach-1	1808		Bridge									
Reach-1	1734	Q 2	4968.00	486.40	511.22		511.27	0.000040	1.91	2887.23	231.98	0.07
Reach-1	1734	Q 50	13337.00	486.40	526.48		526.55	0.000028	2.32	7275.49	335.44	0.07
Reach-1	1734	Q 100	15167.00	486.40	529.17		529.24	0.000026	2.36	8191.84	346.50	0.07
Reach-1	1734	Q 500	19717.00	486.40	534.71		534.78	0.000025	2.51	10181.21	387.31	0.07
Reach-1	1574	Q 2	4970.00	486.30	511.20		511.27	0.000048	2.00	2751.47	207.44	0.08
Reach-1	1574	Q 50	13343.00	486.30	526.43		526.54	0.000042	2.76	6655.72	304.83	0.08
Reach-1	1574	Q 100	15175.00	486.30	529.11		529.23	0.000041	2.87	7487.56	315.45	0.08
Reach-1	1574	Q 500	19727.00	486.30	534.64		534.77	0.000042	3.17	9358.29	370.27	0.09
Reach-1	1395	Q 2	4970.00	486.30	511.19		511.26	0.000048	2.08	2660.03	190.50	0.08
Reach-1	1395	Q 50	13343.00	486.30	526.41		526.53	0.000046	2.95	6309.65	274.79	0.09
Reach-1	1395	Q 100	15175.00	486.30	529.08		529.22	0.000046	3.08	7058.68	284.75	0.09
Reach-1	1395	Q 500	19727.00	486.30	534.60		534.76	0.000048	3.44	8720.75	340.95	0.09
Reach-1	1185	Q 2	4970.00	486.30	511.18		511.25	0.000048	2.07	2536.39	154.68	0.08
Reach-1	1185	Q 50	13343.00	486.30	526.38		526.52	0.000050	3.06	5313.46	221.76	0.09
Reach-1	1185	Q 100	15175.00	486.30	529.05		529.20	0.000050	3.22	5928.90	237.27	0.09
Reach-1	1185	Q 500	19727.00	486.30	534.56		534.75	0.000052	3.59	7321.69	279.87	0.10
Reach-1	929	Q 2	4970.00	486.24	511.17		511.23	0.000047	2.05	2543.89	154.86	0.08

HEC-RAS Plan: Alt 2 10y BW River: Little_Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	526.37		526.50	0.000048	3.01	5325.14	222.15	0.09
Reach-1	929	Q 100	15175.00	486.24	529.05		529.19	0.000048	3.14	5941.75	237.54	0.09
Reach-1	929	Q 500	19727.00	486.24	534.56		534.73	0.000049	3.49	7337.77	281.99	0.09
Reach-1	552	Q 2	4970.00	485.40	511.15	492.10	511.22	0.000044	2.03	2585.03	157.40	0.08
Reach-1	552	Q 50	13343.00	485.40	526.37	496.56	526.48	0.000043	2.85	5885.74	258.83	0.08
Reach-1	552	Q 100	15175.00	485.40	529.04	497.33	529.17	0.000042	2.98	6603.32	292.83	0.08
Reach-1	552	Q 500	19727.00	485.40	534.57	499.11	534.70	0.000042	3.23	8387.08	347.36	0.09
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	511.13	491.97	511.21	0.000056	2.29	2364.84	151.38	0.09
Reach-1	507	Q 50	13343.00	485.20	526.32	496.81	526.47	0.000056	3.25	5270.27	245.52	0.09
Reach-1	507	Q 100	15175.00	485.20	529.00	497.66	529.16	0.000056	3.39	5970.49	278.64	0.09
Reach-1	507	Q 500	19727.00	485.20	534.49	499.69	534.67	0.000056	3.70	7686.12	355.62	0.10

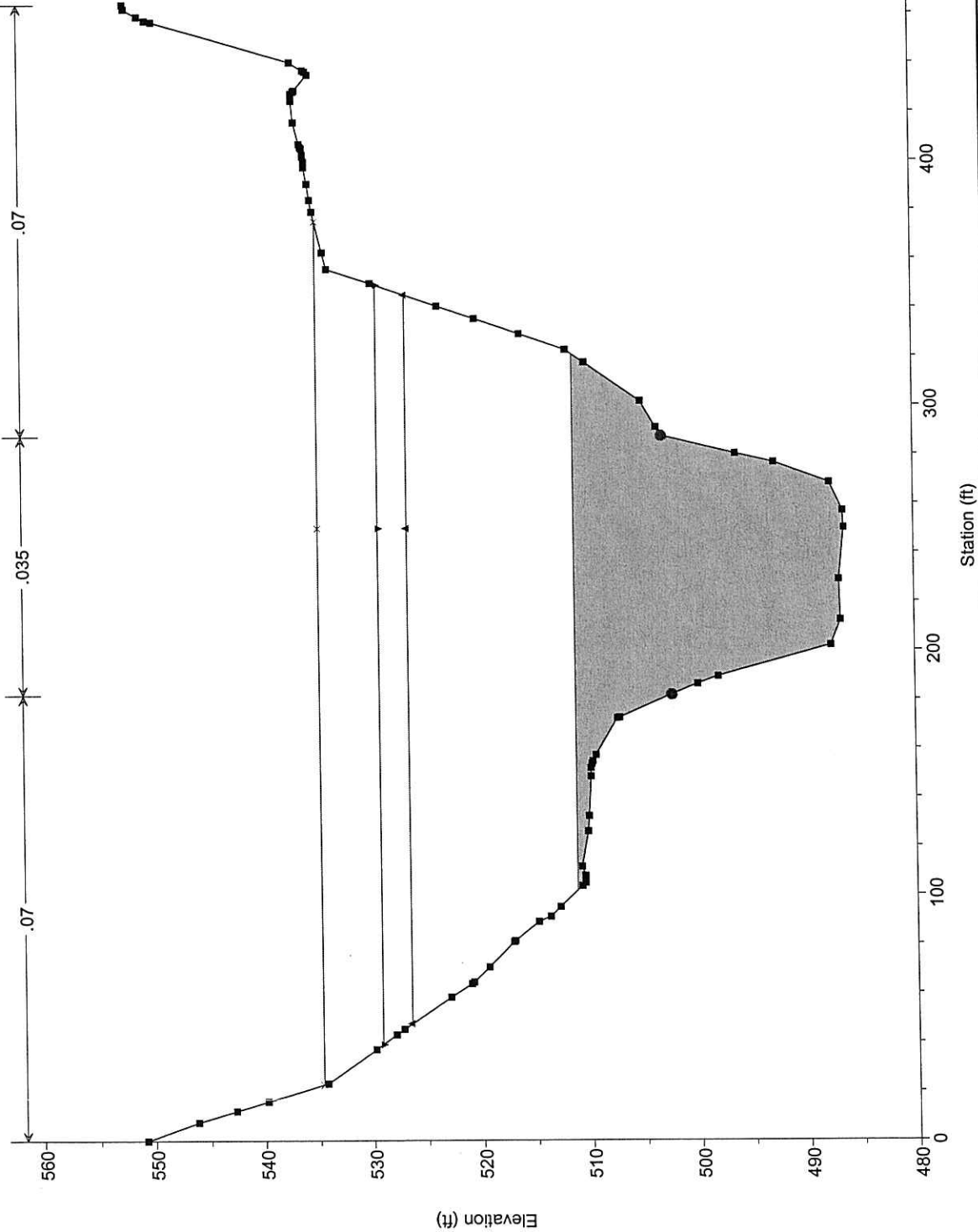
SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 2169



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 2008

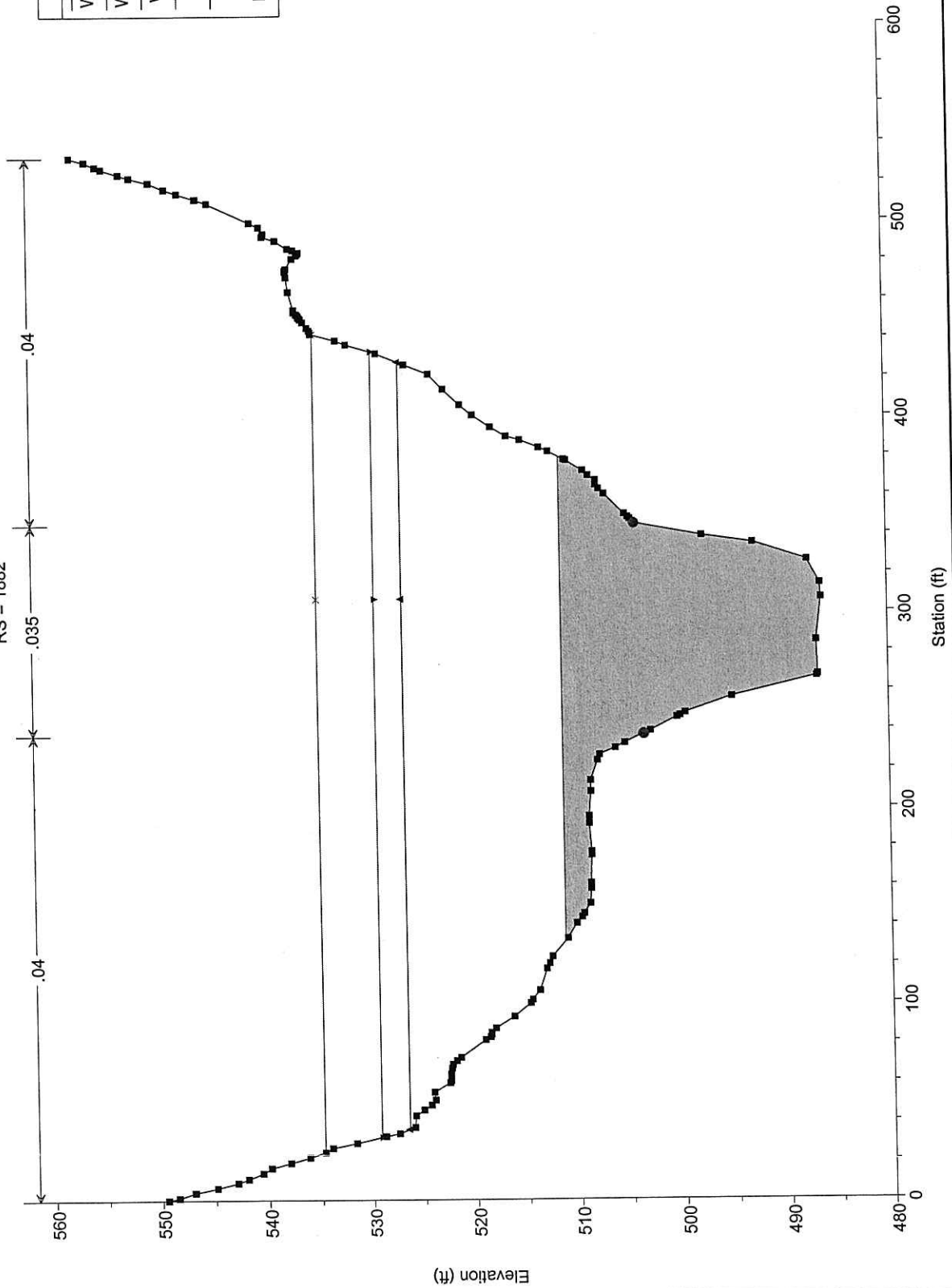


Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 1882

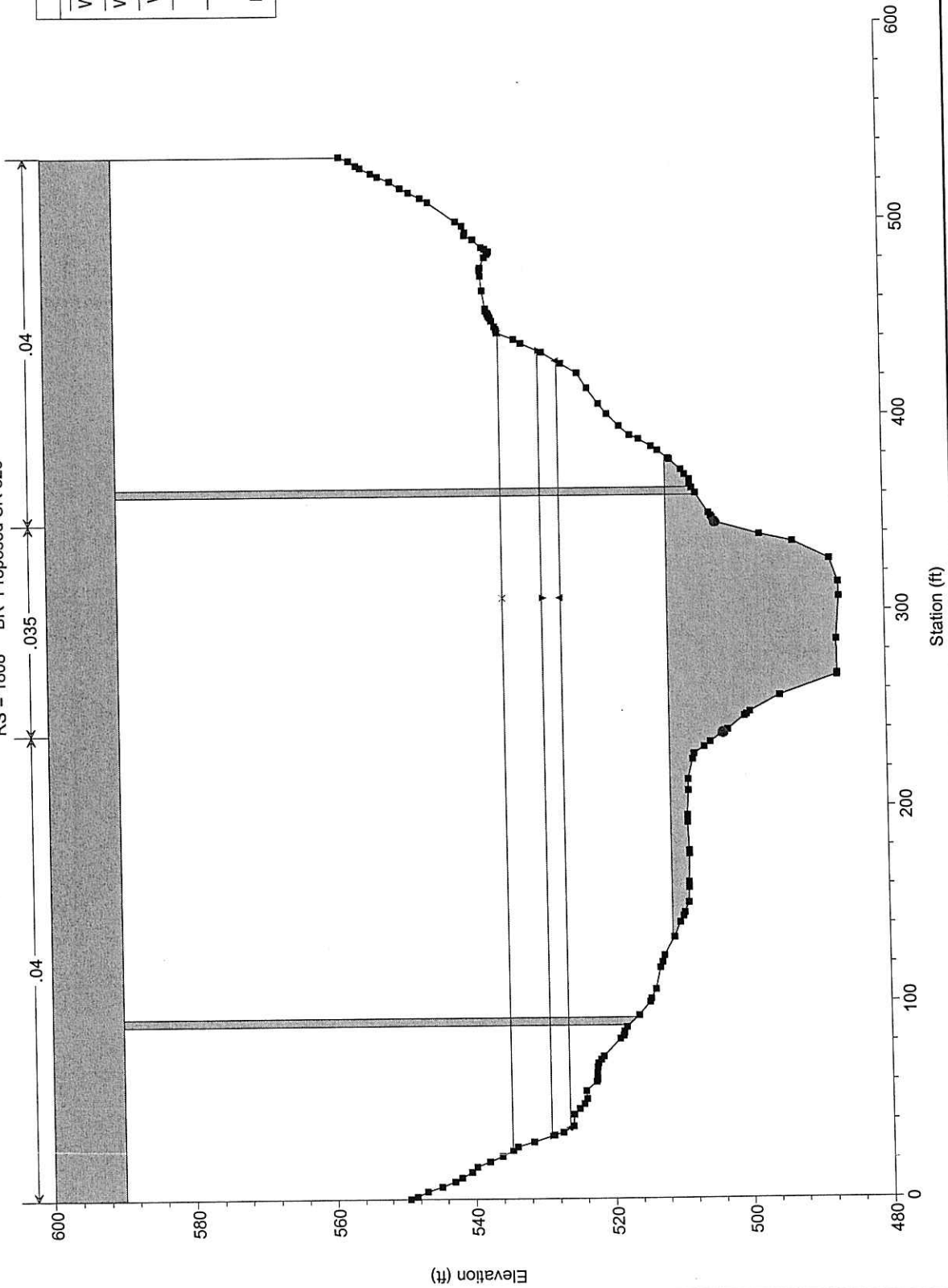
Legend	
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WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

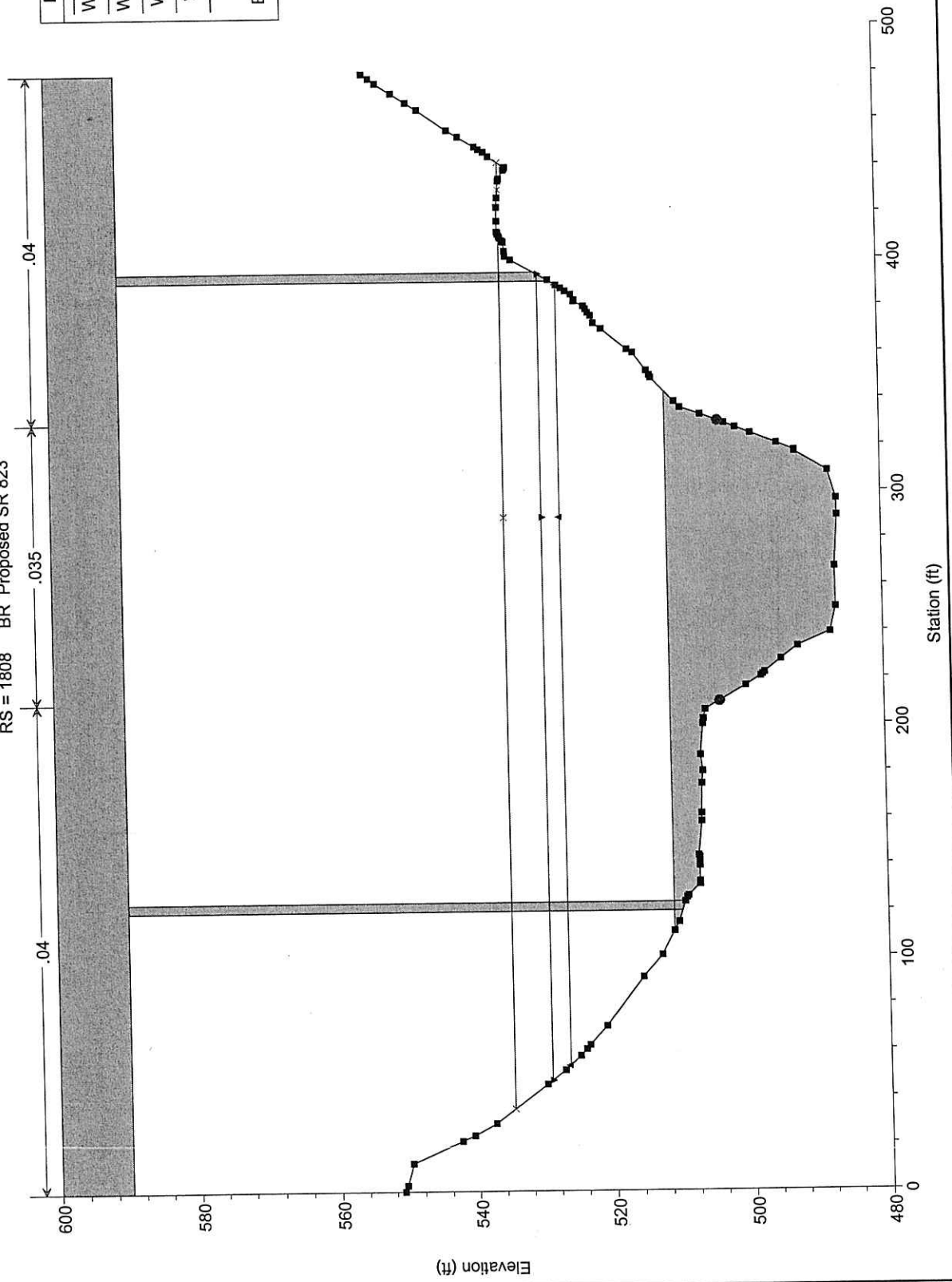
RS = 1808 BR Proposed SR 823

Legend	
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WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



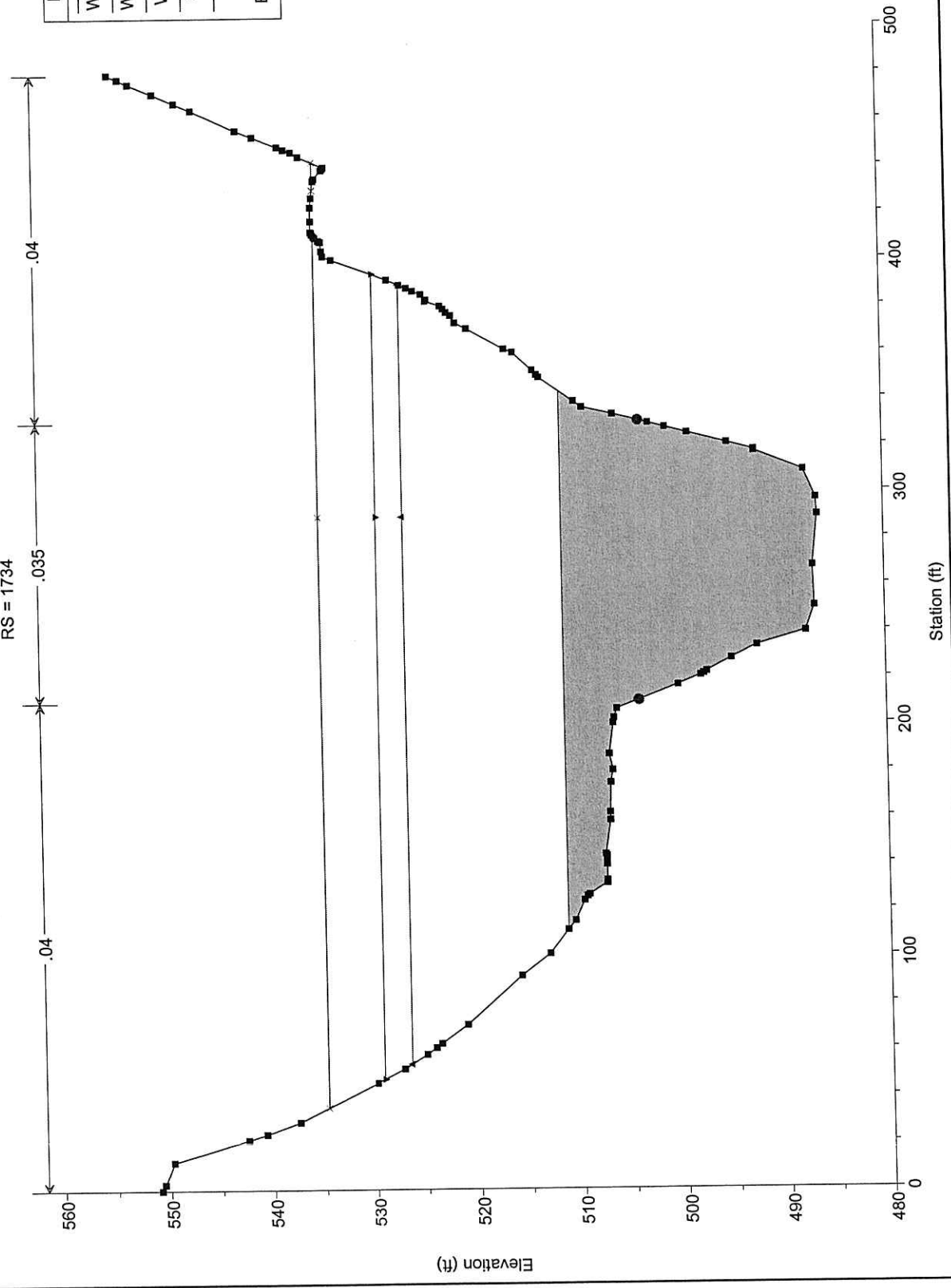
SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006
RS = 1808 BR Proposed SR 823

Legend	
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—v—	WS Q 100
—^—	WS Q 50
—	WS Q 2
—■—	Ground
●	Bank Sta



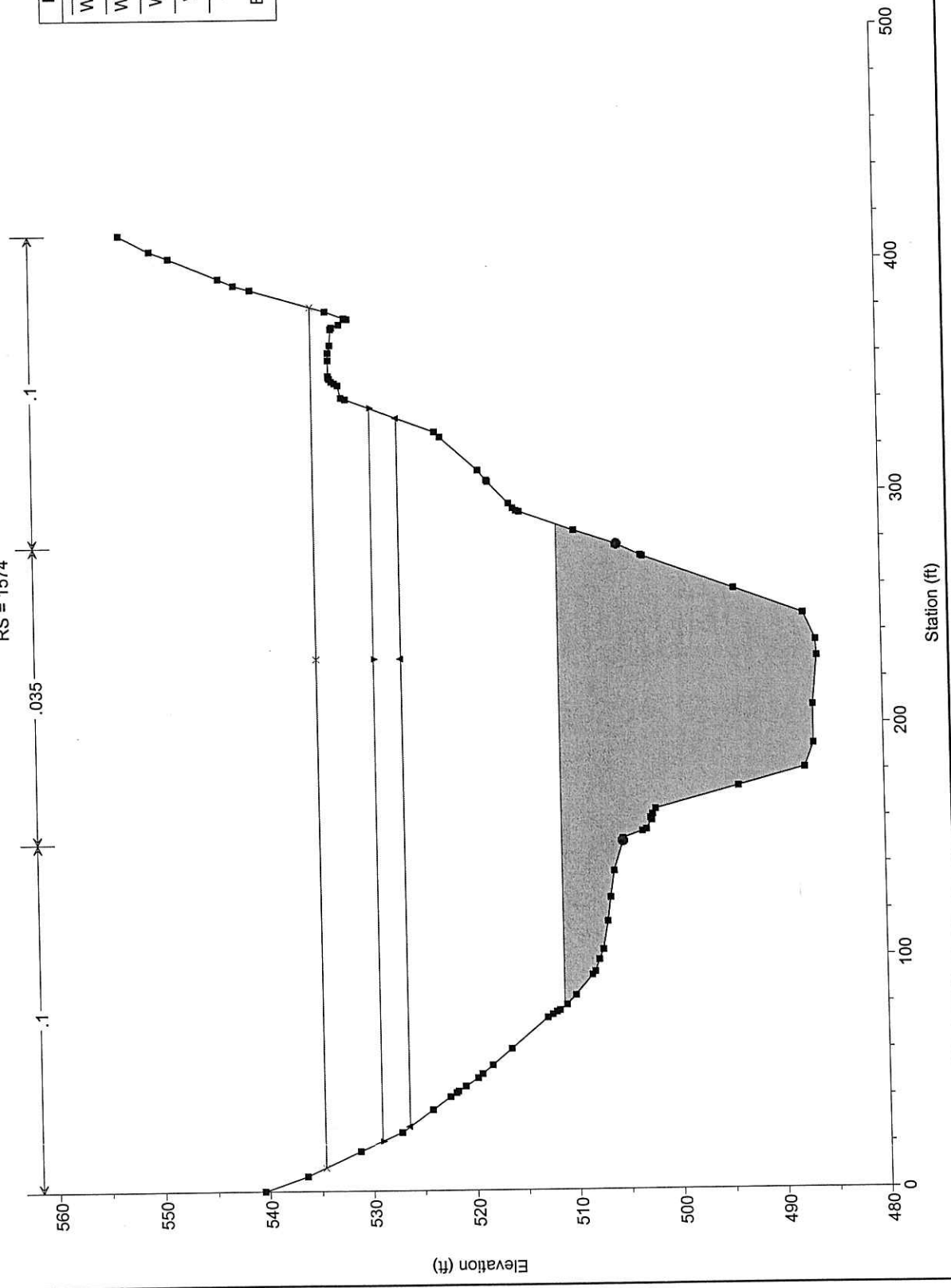
SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006
RS = 1734

Legend	
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WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006
 RS = 1574

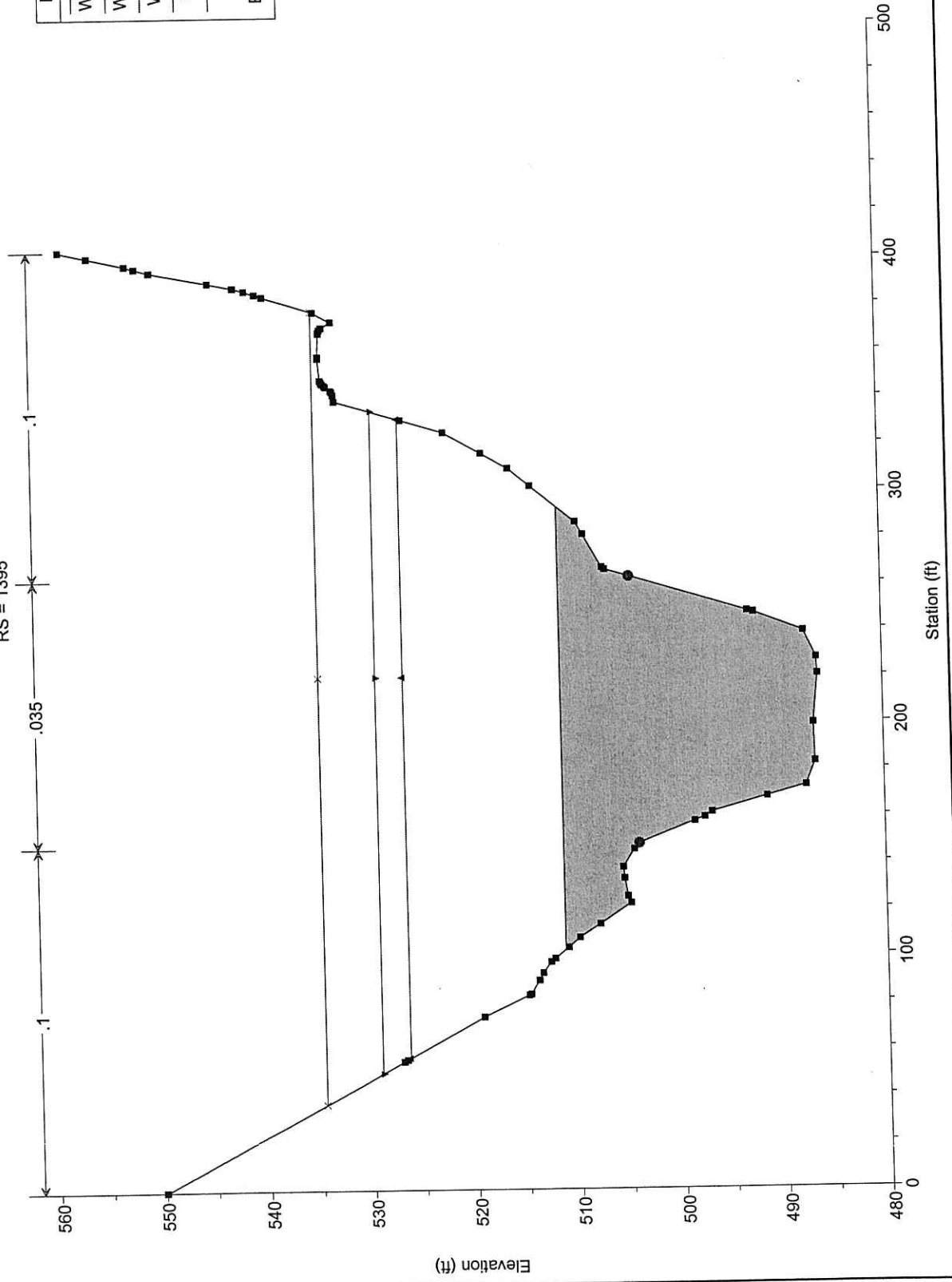
Legend	
WS Q 500	—
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WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 1395

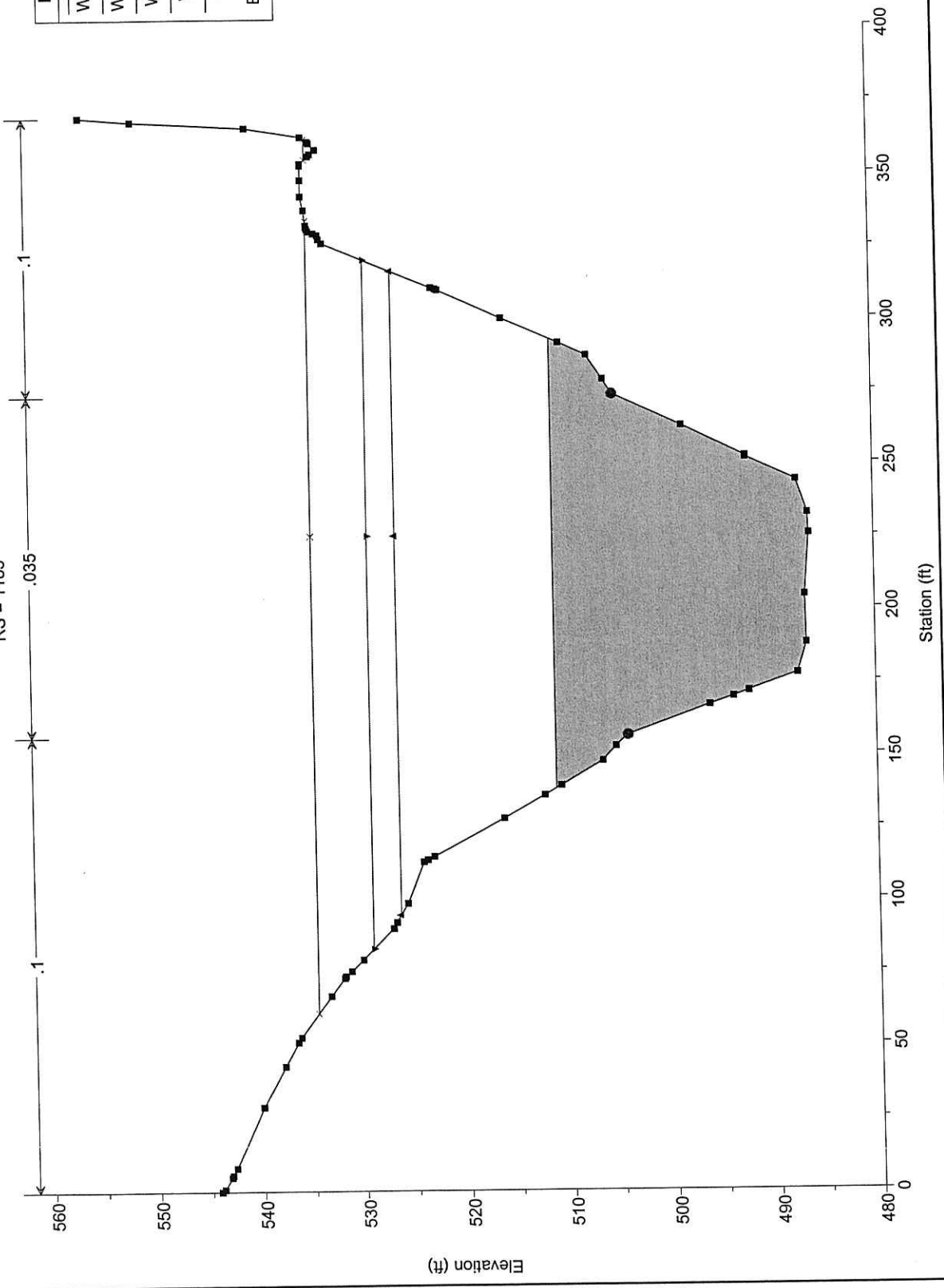
Legend	
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—	WS Q 2
—■—	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 1185

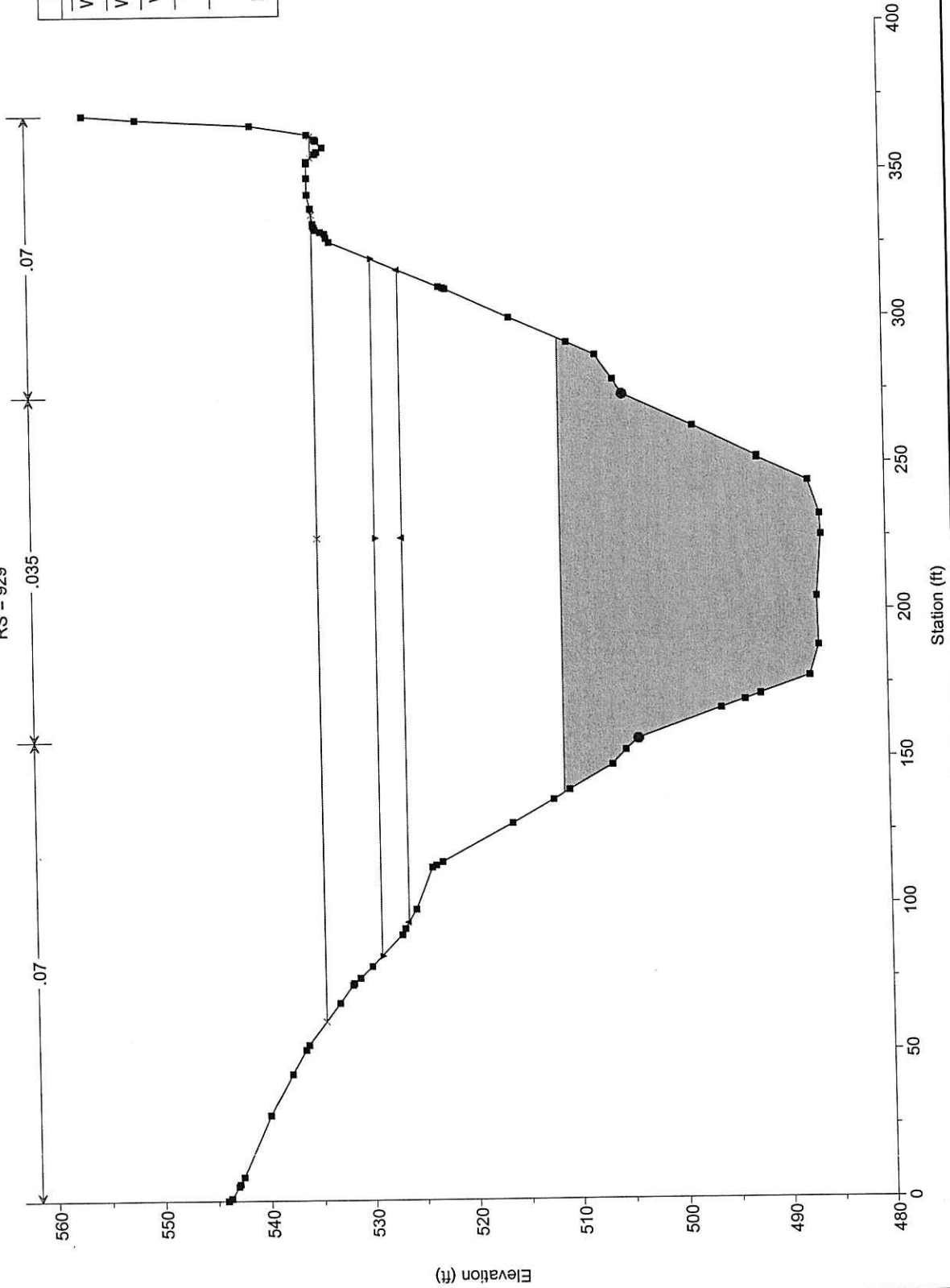
Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 929

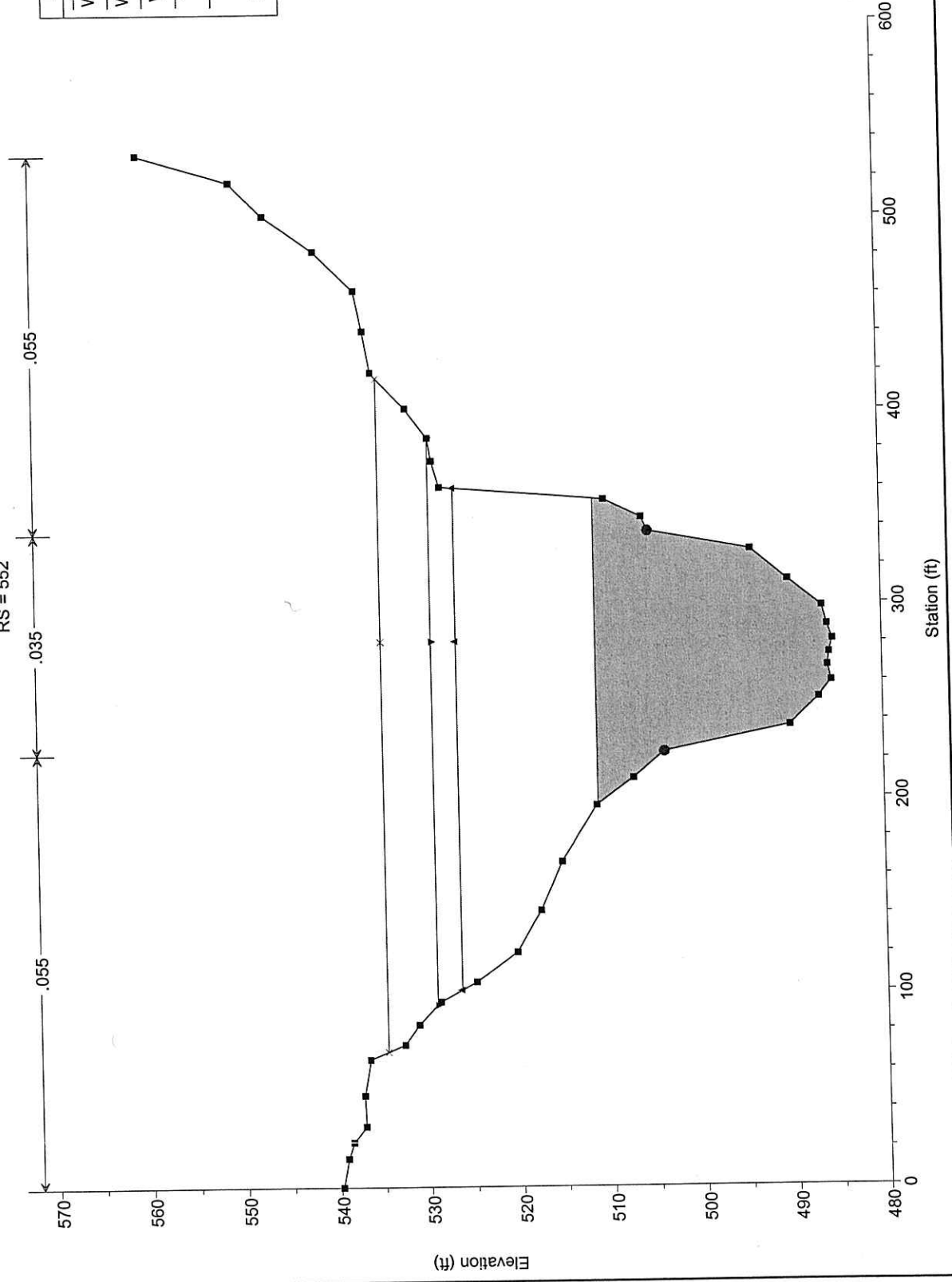
Legend	
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WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

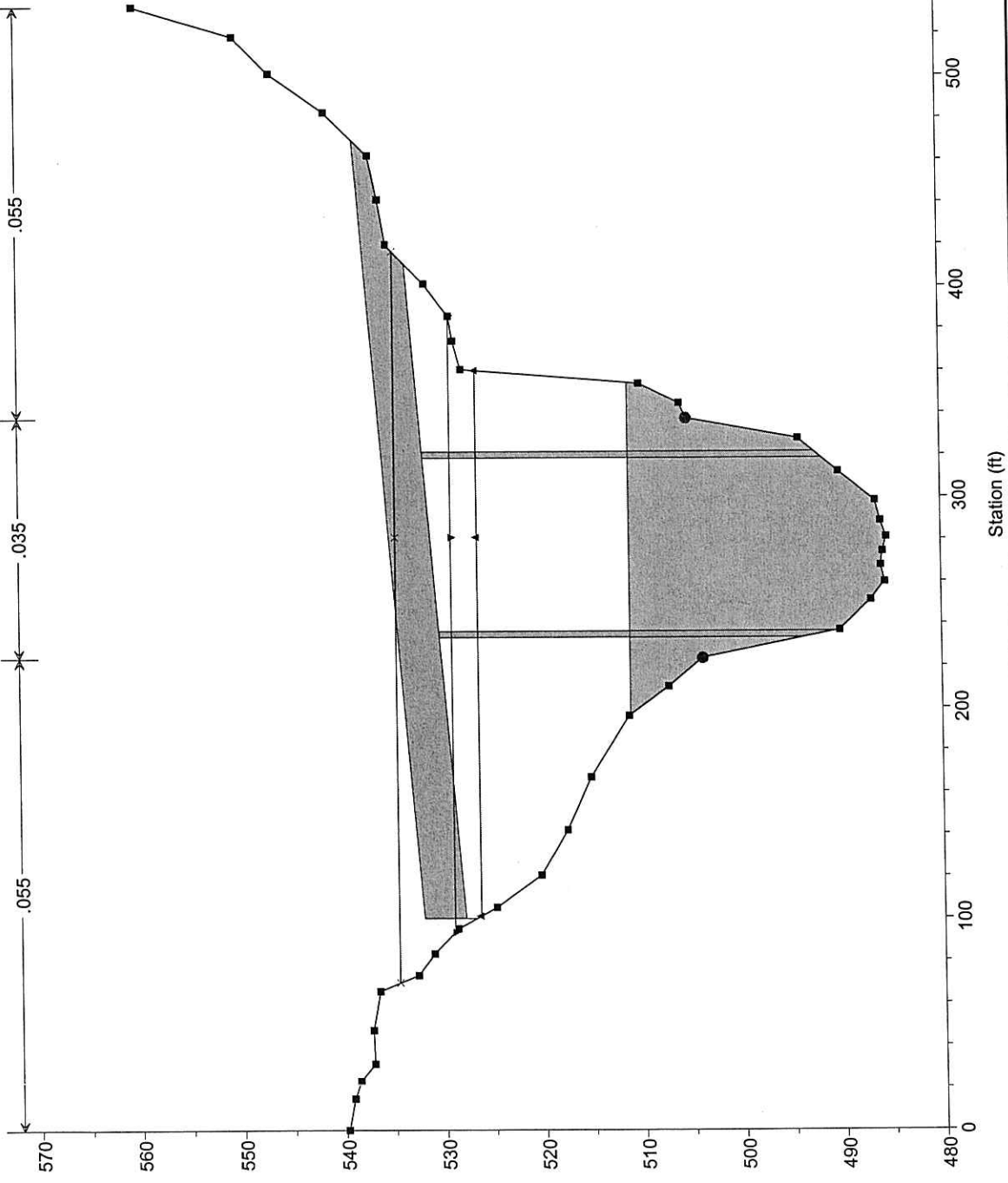
RS = 552

Legend	
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—v—	WS Q 100
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—■—	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

RS = 529 BR

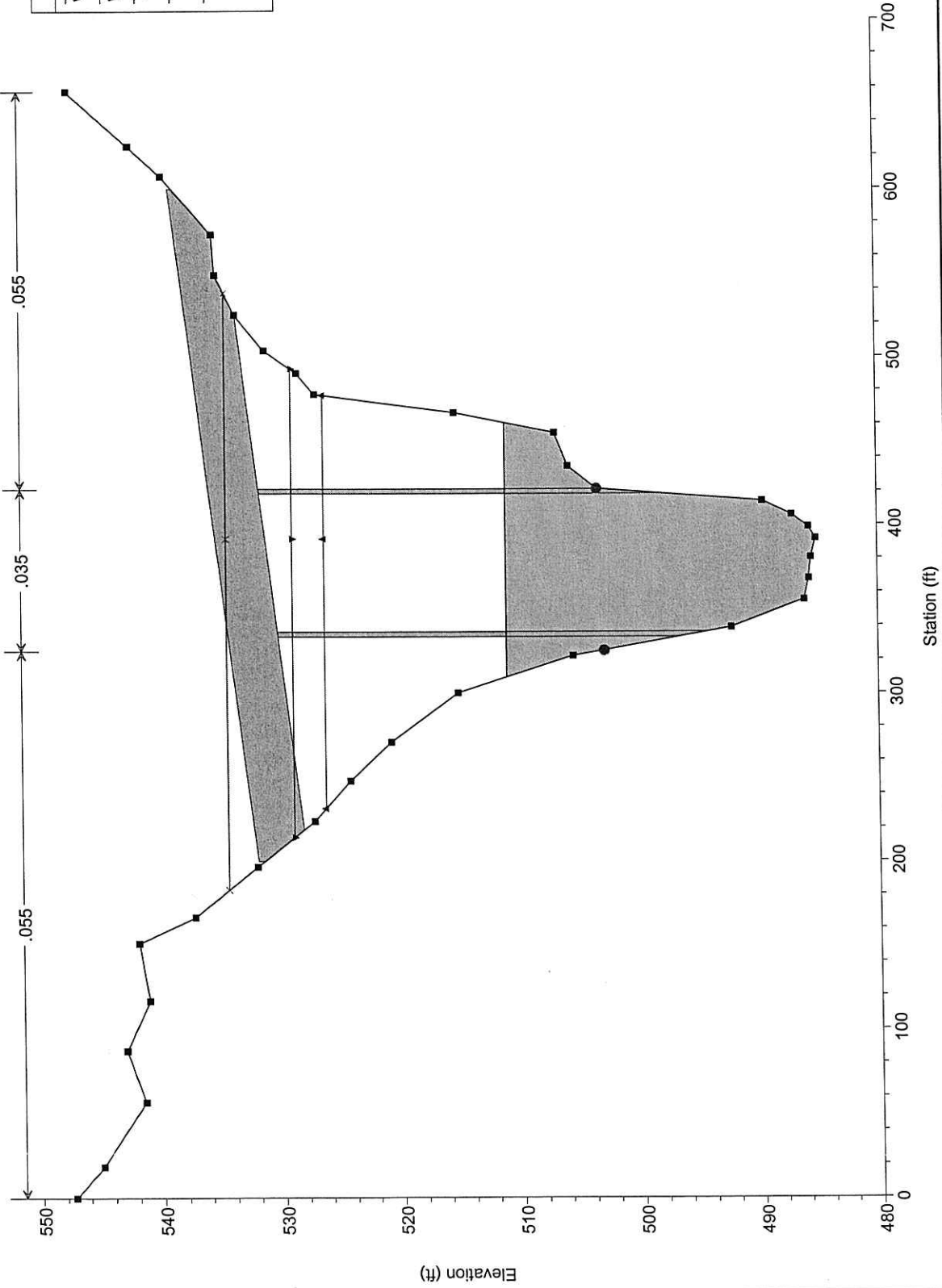


Legend	
×	WS Q 500
▲	WS Q 100
◆	WS Q 50
●	WS Q 2
■	Ground
●	Bank Sta

0.055 0.035 0.055

SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

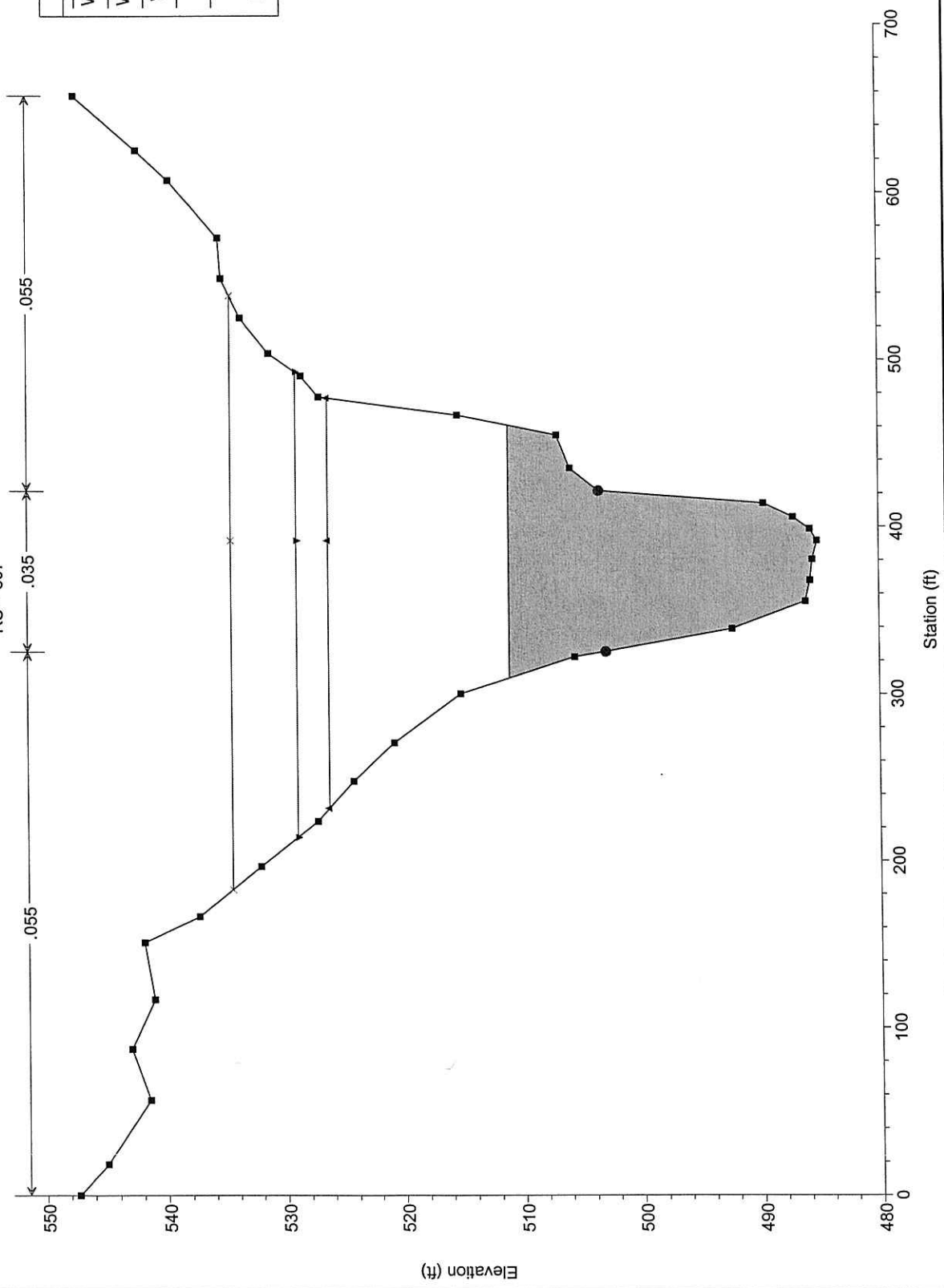
RS = 529 BR



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

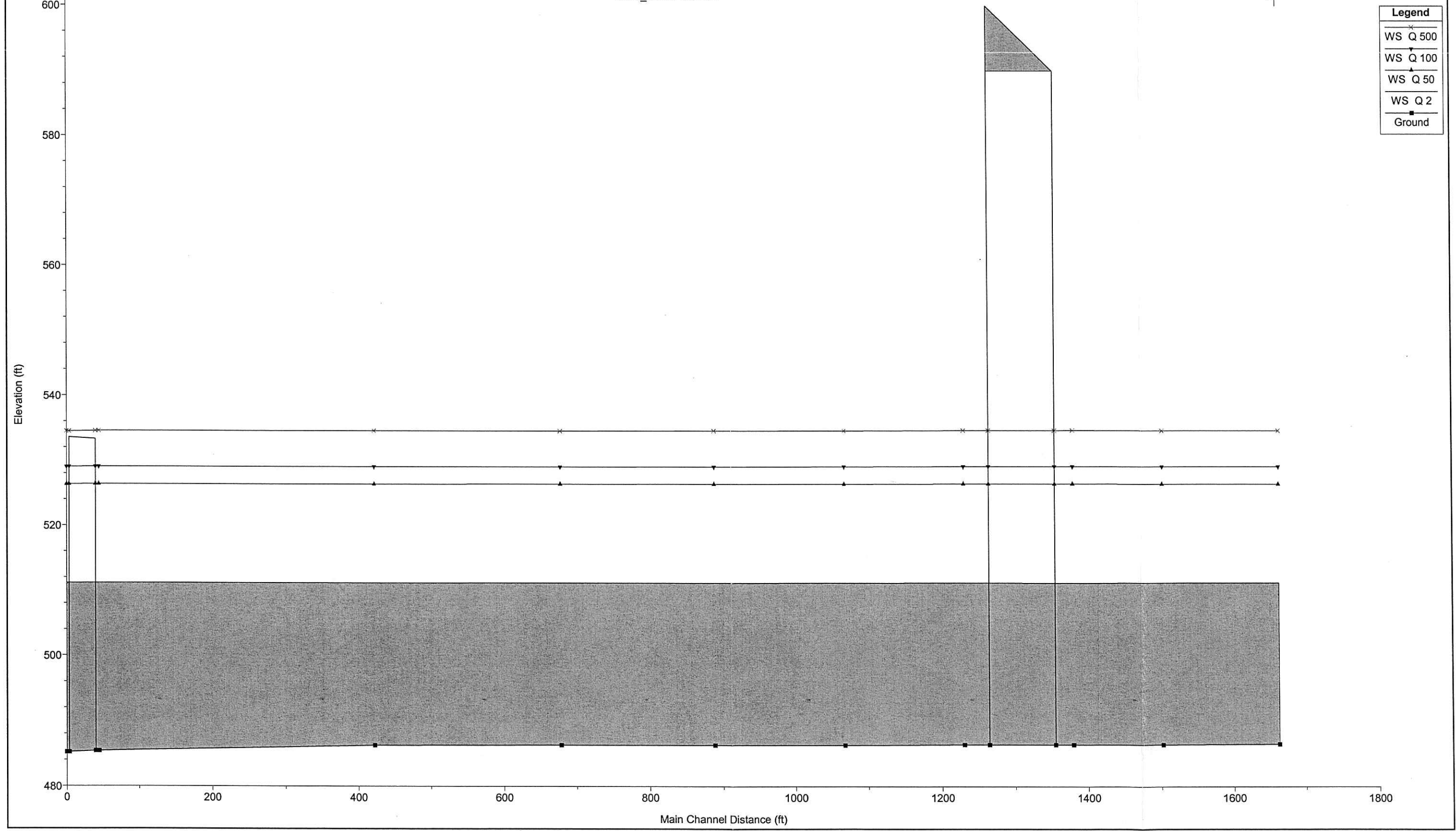
RS = 507

Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●



SR 823 over Little Scioto Plan: Alt 2 10yr Backwater 7/12/2006

Little_Scioto Reach-1



Legend	
WS Q 500	x
WS Q 100	▼
WS Q 50	▲
WS Q 2	■
Ground	■

HEC-RAS Plan: Alt 2 100 BW River: Little_Scioto Reach: Reach-1

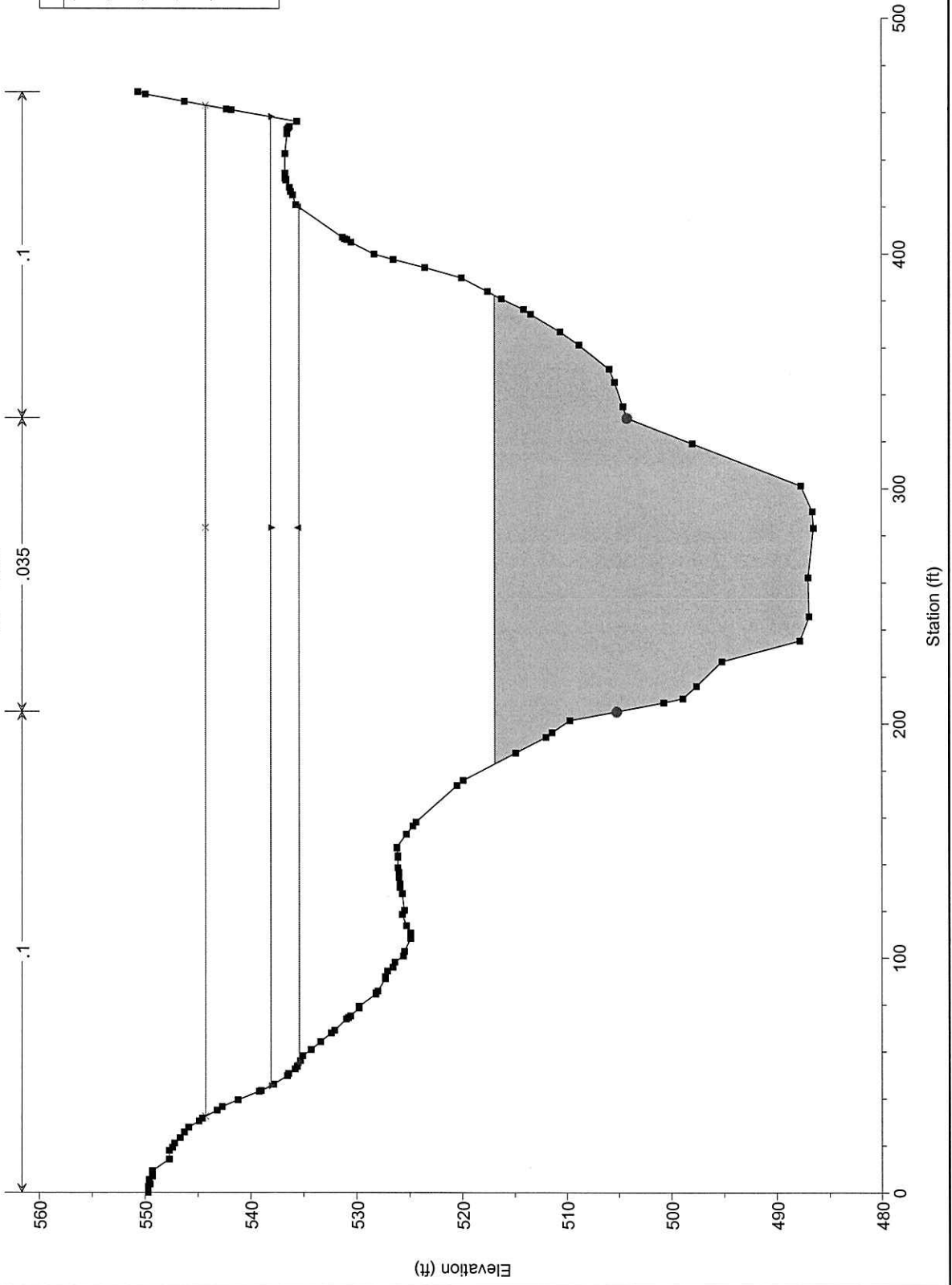
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4968.00	486.50	516.88		516.92	0.000019	1.51	3737.31	199.51	0.05
Reach-1	2169	Q 50	13337.00	486.50	535.41		535.47	0.000019	2.19	8890.16	364.52	0.06
Reach-1	2169	Q 100	15167.00	486.50	538.08		538.16	0.000020	2.33	9943.24	412.55	0.06
Reach-1	2169	Q 500	19717.00	486.50	544.28		544.37	0.000020	2.56	12553.52	430.30	0.06
Reach-1	2008	Q 2	4968.00	486.40	516.88		516.91	0.000020	1.61	3897.80	248.90	0.05
Reach-1	2008	Q 50	13337.00	486.40	535.41		535.47	0.000019	2.20	9408.08	373.73	0.06
Reach-1	2008	Q 100	15167.00	486.40	538.08		538.15	0.000019	2.31	10502.02	423.70	0.06
Reach-1	2008	Q 500	19717.00	486.40	544.29		544.36	0.000019	2.49	13180.66	440.09	0.06
Reach-1	1882	Q 2	4968.00	486.40	516.88	492.58	516.91	0.000018	1.49	4176.07	300.64	0.05
Reach-1	1882	Q 50	13337.00	486.40	535.43	497.48	535.46	0.000011	1.63	11117.42	424.24	0.04
Reach-1	1882	Q 100	15167.00	486.40	538.11	498.35	538.14	0.000011	1.71	12320.44	471.49	0.04
Reach-1	1882	Q 500	19717.00	486.40	544.31	500.42	544.34	0.000010	1.79	15347.19	502.00	0.04
Reach-1	1808	Bridge										
Reach-1	1734	Q 2	4968.00	486.40	516.88		516.90	0.000015	1.37	4331.53	275.13	0.05
Reach-1	1734	Q 50	13337.00	486.40	535.42		535.45	0.000011	1.67	10468.63	409.53	0.04
Reach-1	1734	Q 100	15167.00	486.40	538.10		538.13	0.000011	1.73	11581.08	420.57	0.04
Reach-1	1734	Q 500	19717.00	486.40	544.30		544.34	0.000010	1.85	14254.10	441.18	0.04
Reach-1	1574	Q 2	4970.00	486.30	516.87		516.90	0.000019	1.50	4007.85	241.02	0.05
Reach-1	1574	Q 50	13343.00	486.30	535.39		535.45	0.000018	2.10	9638.29	372.84	0.06
Reach-1	1574	Q 100	15175.00	486.30	538.06		538.13	0.000018	2.21	10646.70	381.00	0.06
Reach-1	1574	Q 500	19727.00	486.30	544.26		544.33	0.000019	2.45	13051.18	394.13	0.06
Reach-1	1395	Q 2	4970.00	486.30	516.86		516.90	0.000020	1.58	3872.47	233.55	0.05
Reach-1	1395	Q 50	13343.00	486.30	535.37		535.44	0.000020	2.28	8985.64	343.88	0.06
Reach-1	1395	Q 100	15175.00	486.30	538.05		538.12	0.000021	2.41	9918.22	354.00	0.06
Reach-1	1395	Q 500	19727.00	486.30	544.24		544.33	0.000022	2.68	12181.13	376.37	0.06
Reach-1	1185	Q 2	4970.00	486.30	516.85		516.89	0.000021	1.59	3471.50	174.88	0.06
Reach-1	1185	Q 50	13343.00	486.30	535.36		535.44	0.000023	2.39	7555.57	305.69	0.06
Reach-1	1185	Q 100	15175.00	486.30	538.03		538.12	0.000024	2.54	8392.78	322.43	0.07
Reach-1	1185	Q 500	19727.00	486.30	544.21		544.32	0.000025	2.83	10529.81	366.63	0.07
Reach-1	929	Q 2	4970.00	486.24	516.85		516.89	0.000020	1.58	3481.23	175.07	0.05

HEC-RAS Plan: Alt 2 100 BW River: Little_Scioto Reach: Reach-1 (Continued)

Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit V.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	929	Q 50	13343.00	486.24	535.35		535.43	0.000021	2.33	7573.59	306.00	0.06
Reach-1	929	Q 100	15175.00	486.24	538.03		538.11	0.000022	2.45	8412.14	322.86	0.06
Reach-1	929	Q 500	19727.00	486.24	544.21		544.31	0.000023	2.71	10552.97	366.64	0.07
Reach-1	552	Q 2	4970.00	485.40	516.84	492.10	516.88	0.000019	1.56	3608.68	206.49	0.05
Reach-1	552	Q 50	13343.00	485.40	535.36	496.56	535.42	0.000018	2.13	8664.56	356.22	0.06
Reach-1	552	Q 100	15175.00	485.40	538.03	497.33	538.10	0.000019	2.27	9731.47	441.13	0.06
Reach-1	552	Q 500	19727.00	485.40	544.23	499.11	544.30	0.000018	2.41	12683.48	492.93	0.06
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	516.83	491.97	516.88	0.000024	1.74	3292.24	176.72	0.06
Reach-1	507	Q 50	13343.00	485.20	535.33	496.81	535.41	0.000024	2.46	7990.45	384.89	0.06
Reach-1	507	Q 100	15175.00	485.20	538.00	497.66	538.08	0.000024	2.55	9093.83	430.35	0.06
Reach-1	507	Q 500	19727.00	485.20	544.20	499.69	544.29	0.000024	2.76	12213.17	610.51	0.07

SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 2169



Legend

WS Q 500

WS Q 100

WS Q 50

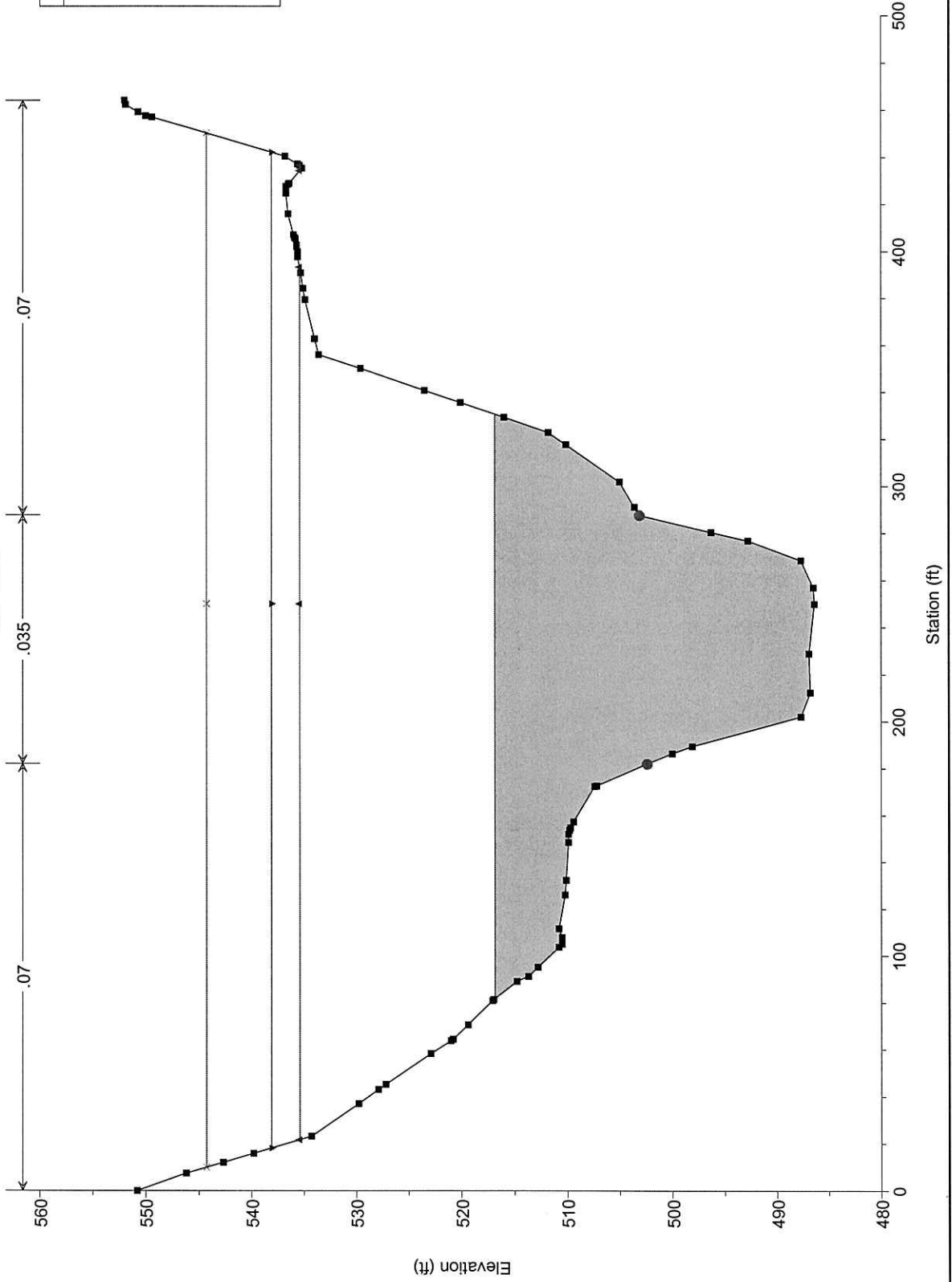
WS Q 2

Ground

Bank Sta

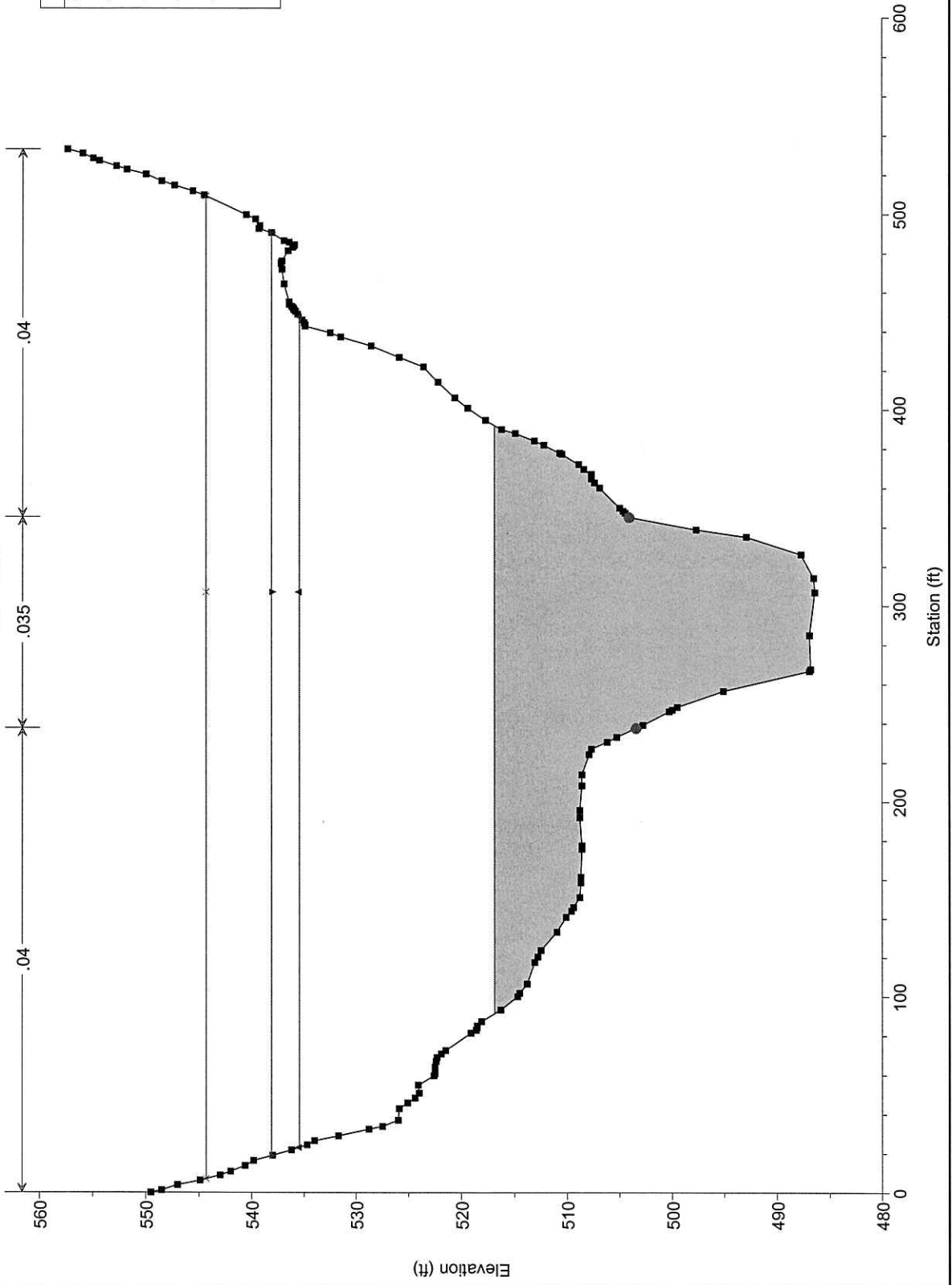
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 2008



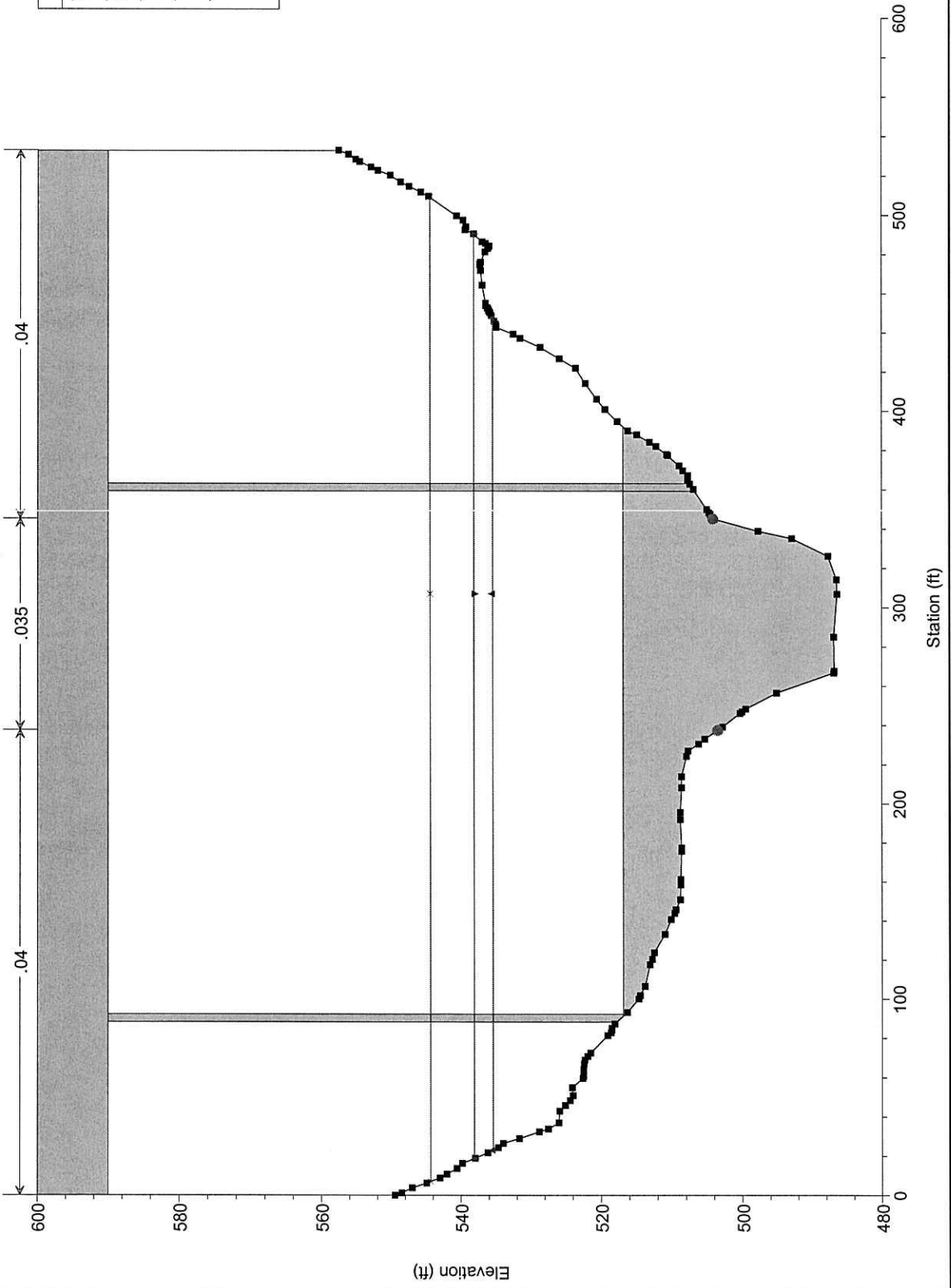
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 1882



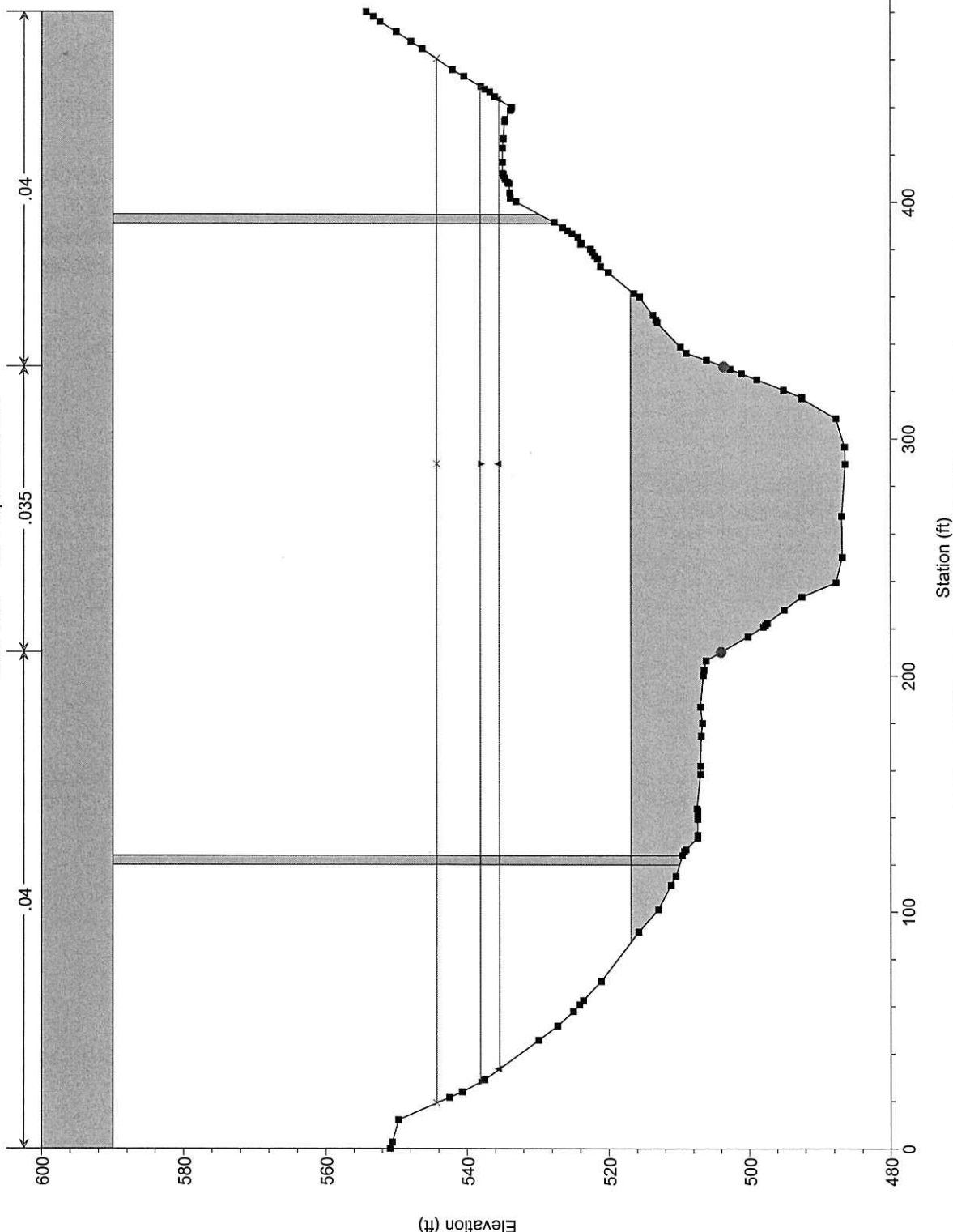
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 1808 BR Proposed SR 823



SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

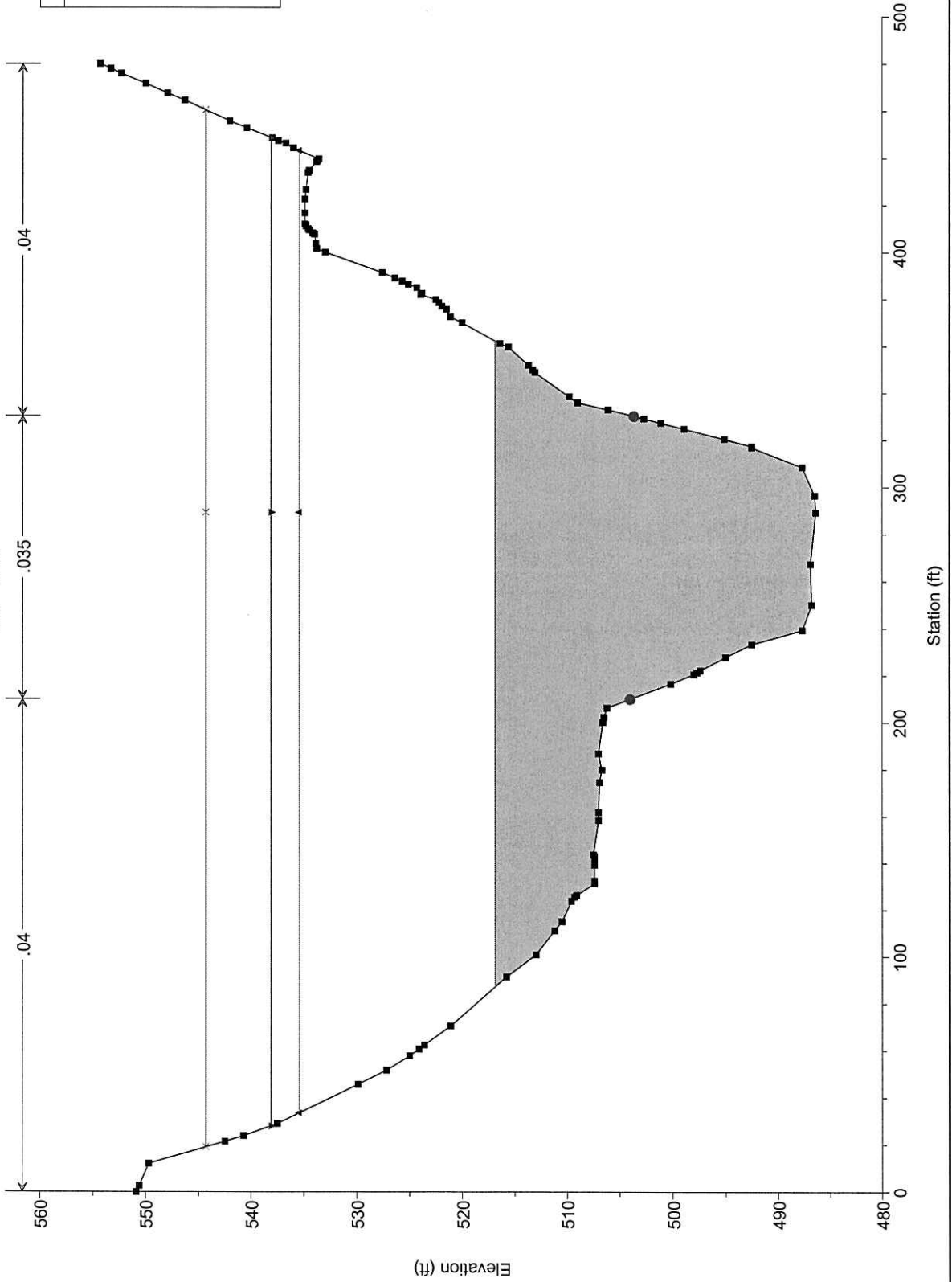
RS = 1808 BR Proposed SR 823



Legend	
→	WS Q 500
→	WS Q 100
→	WS Q 50
→	WS Q 2
■	Ground
●	Bank Sta

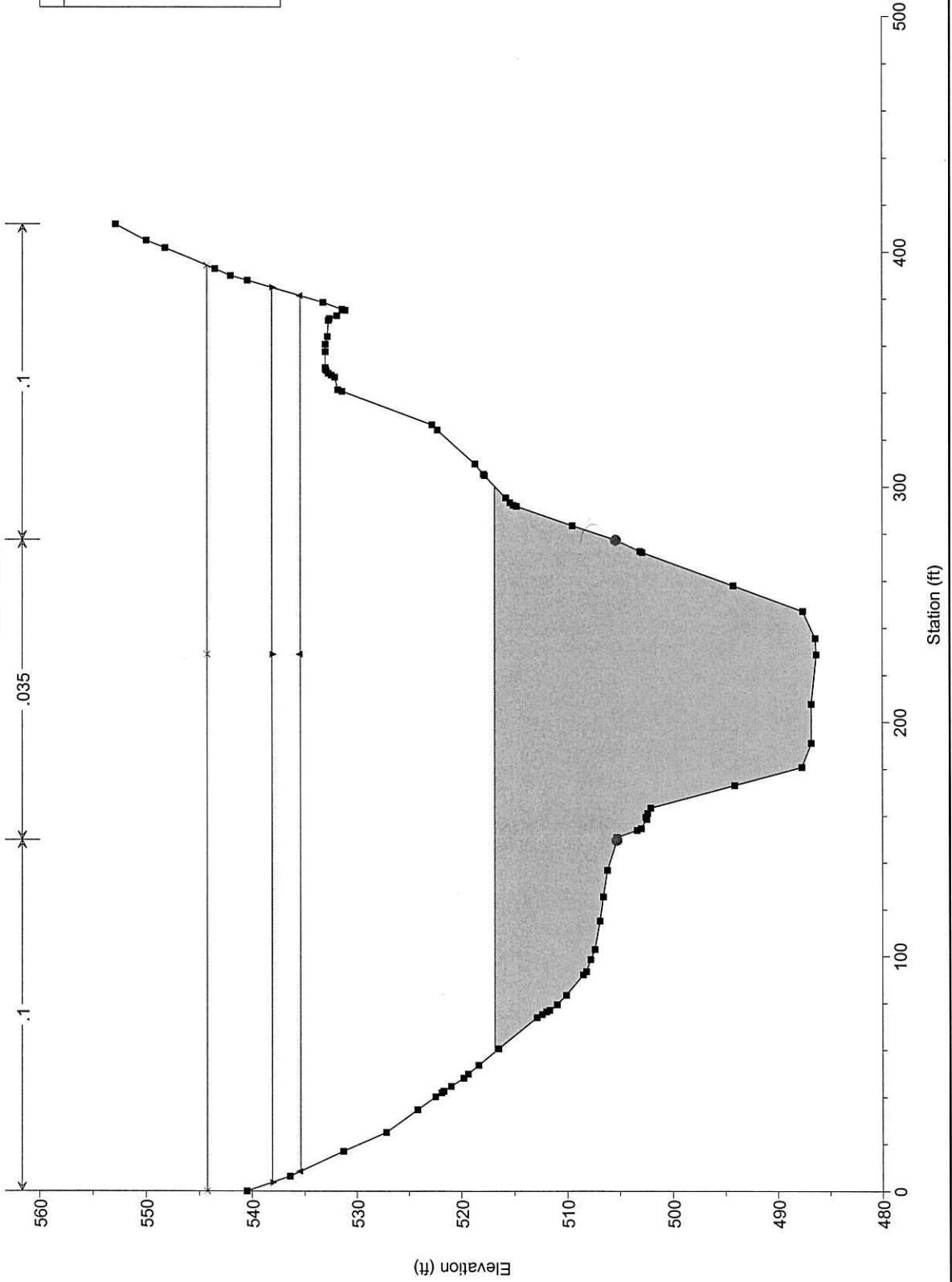
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 1734



SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

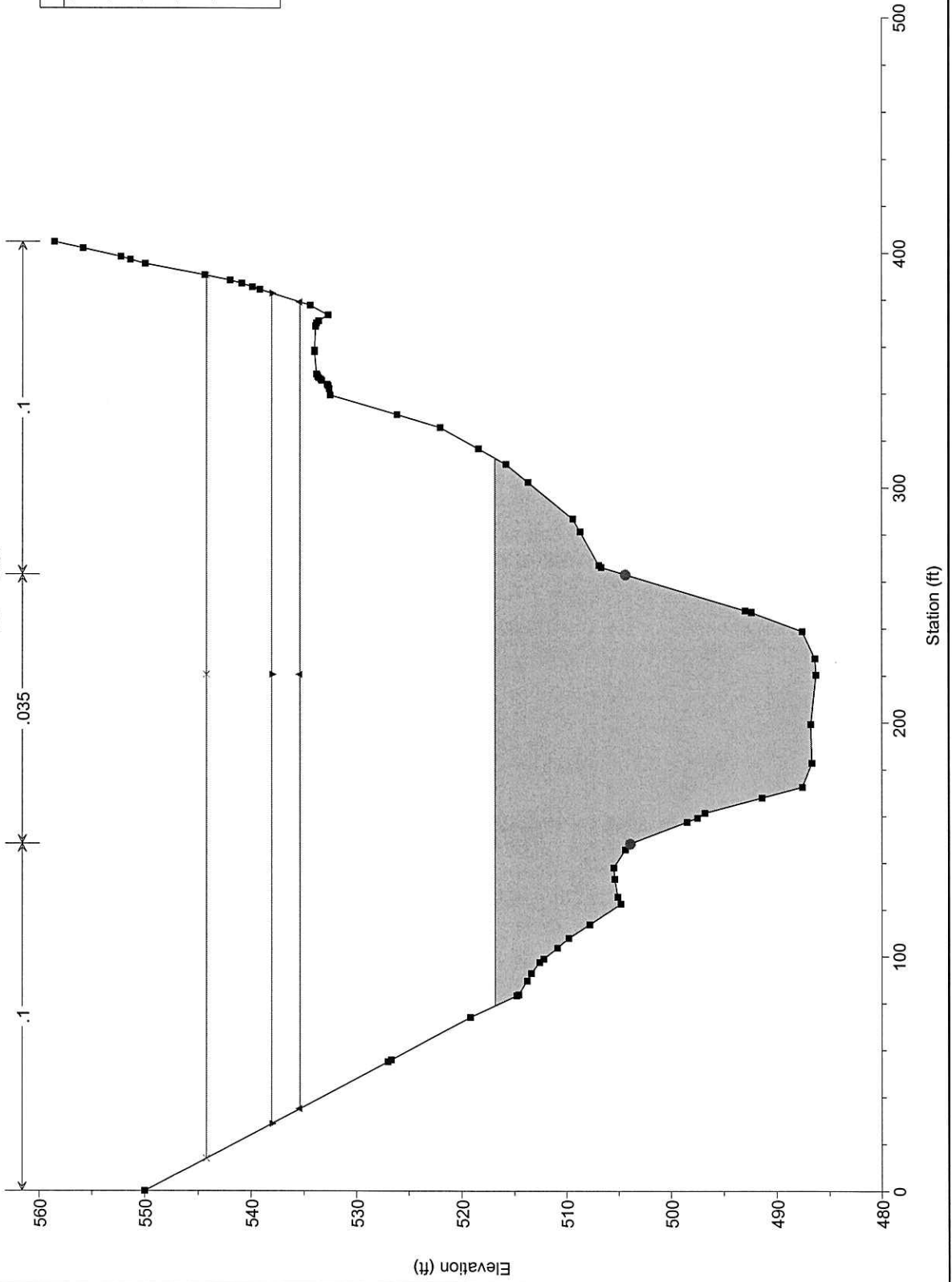
RS = 1574



Legend	
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→	WS Q 100
→	WS Q 50
→	WS Q 2
■	Ground
●	Bank Sta

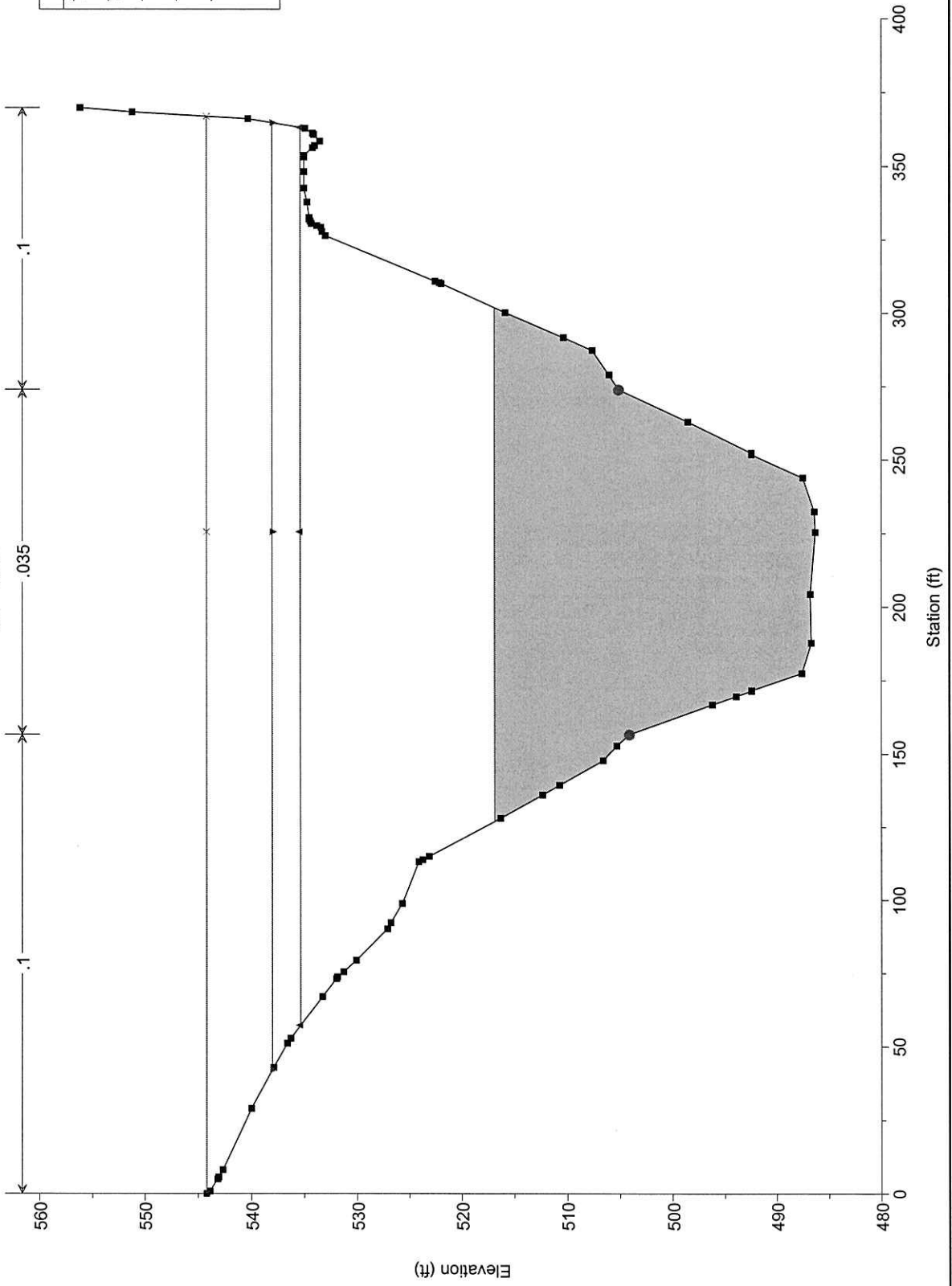
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 1395



SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

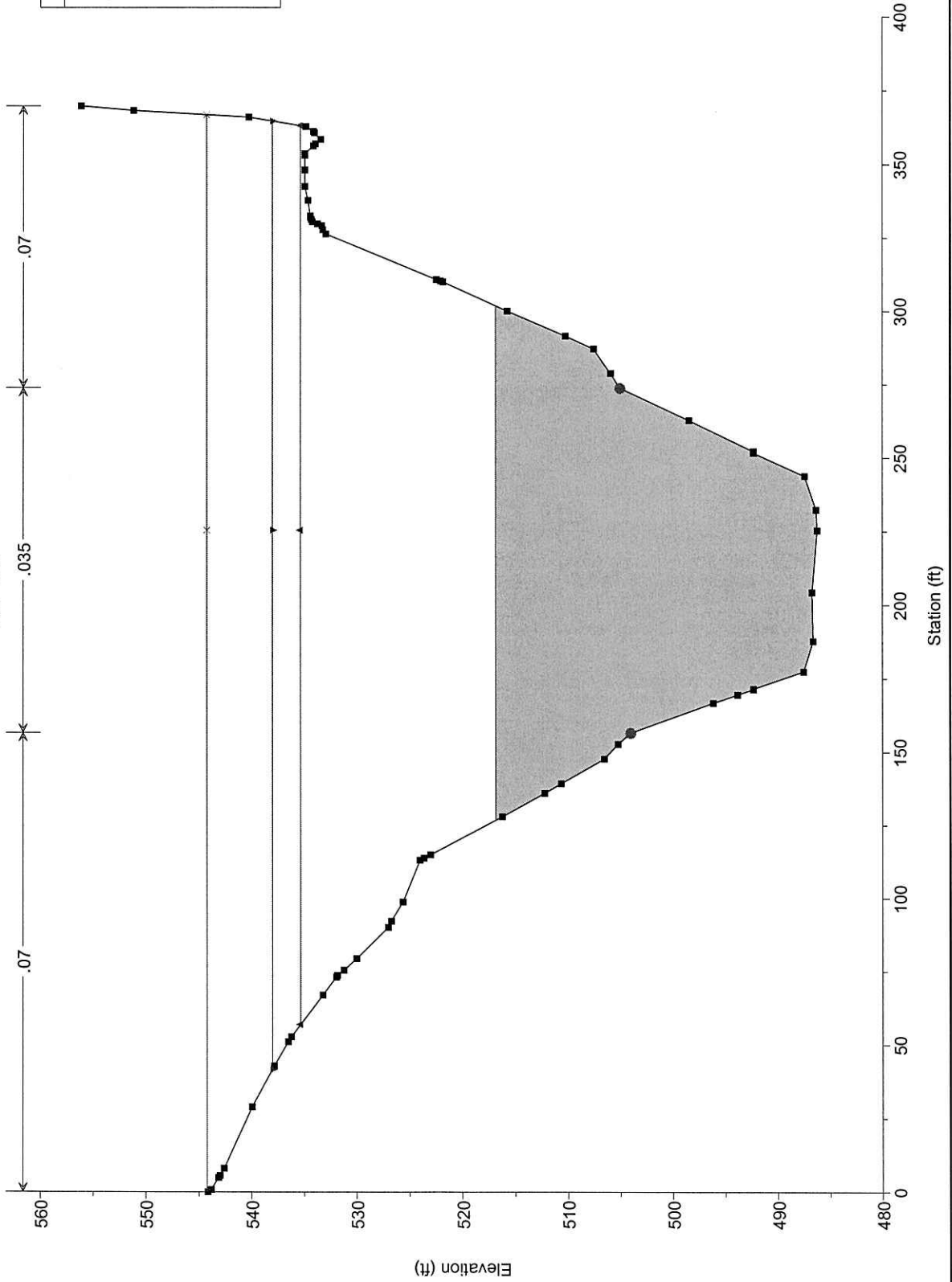
RS = 1185



Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta

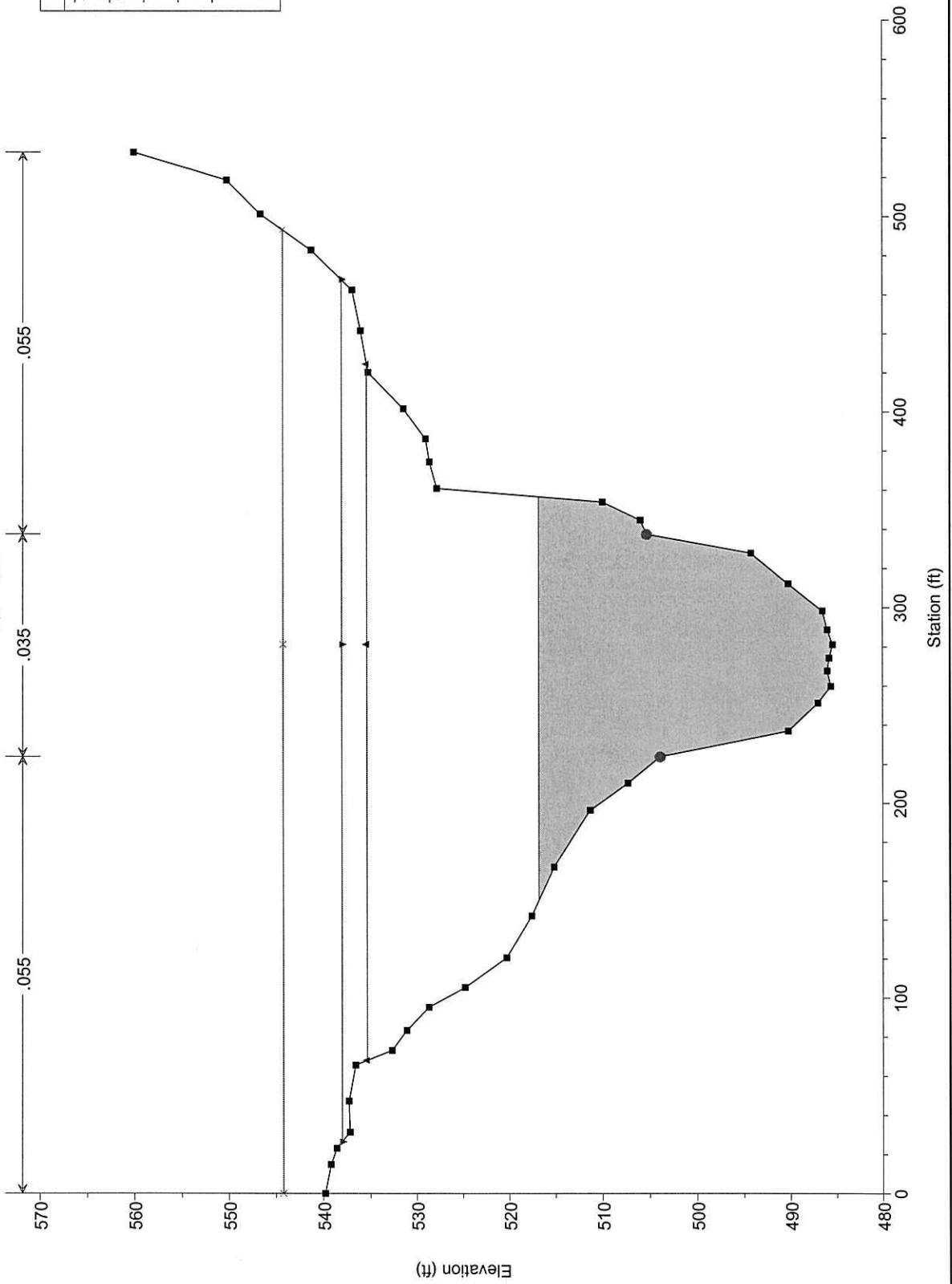
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 929



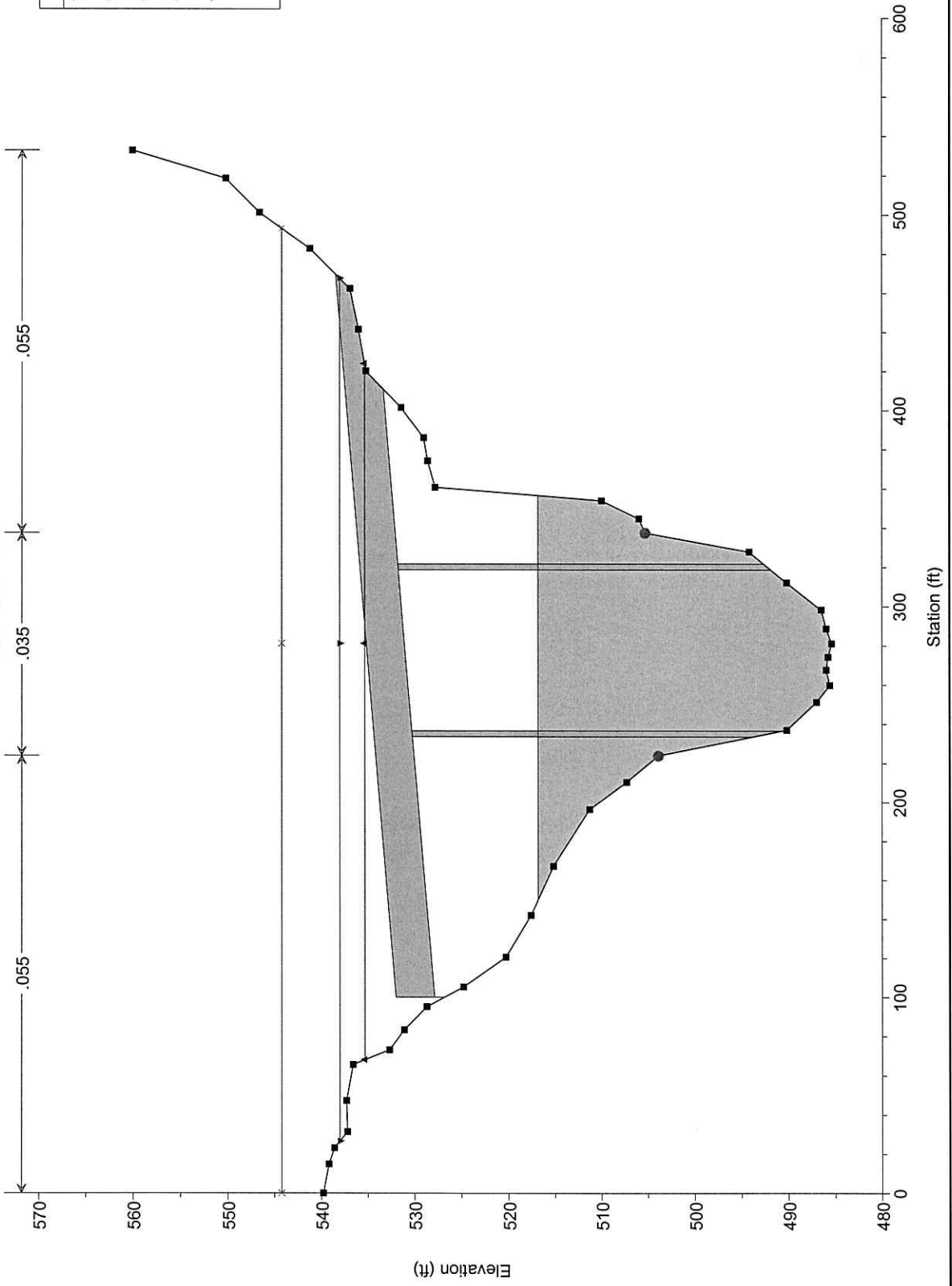
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 552



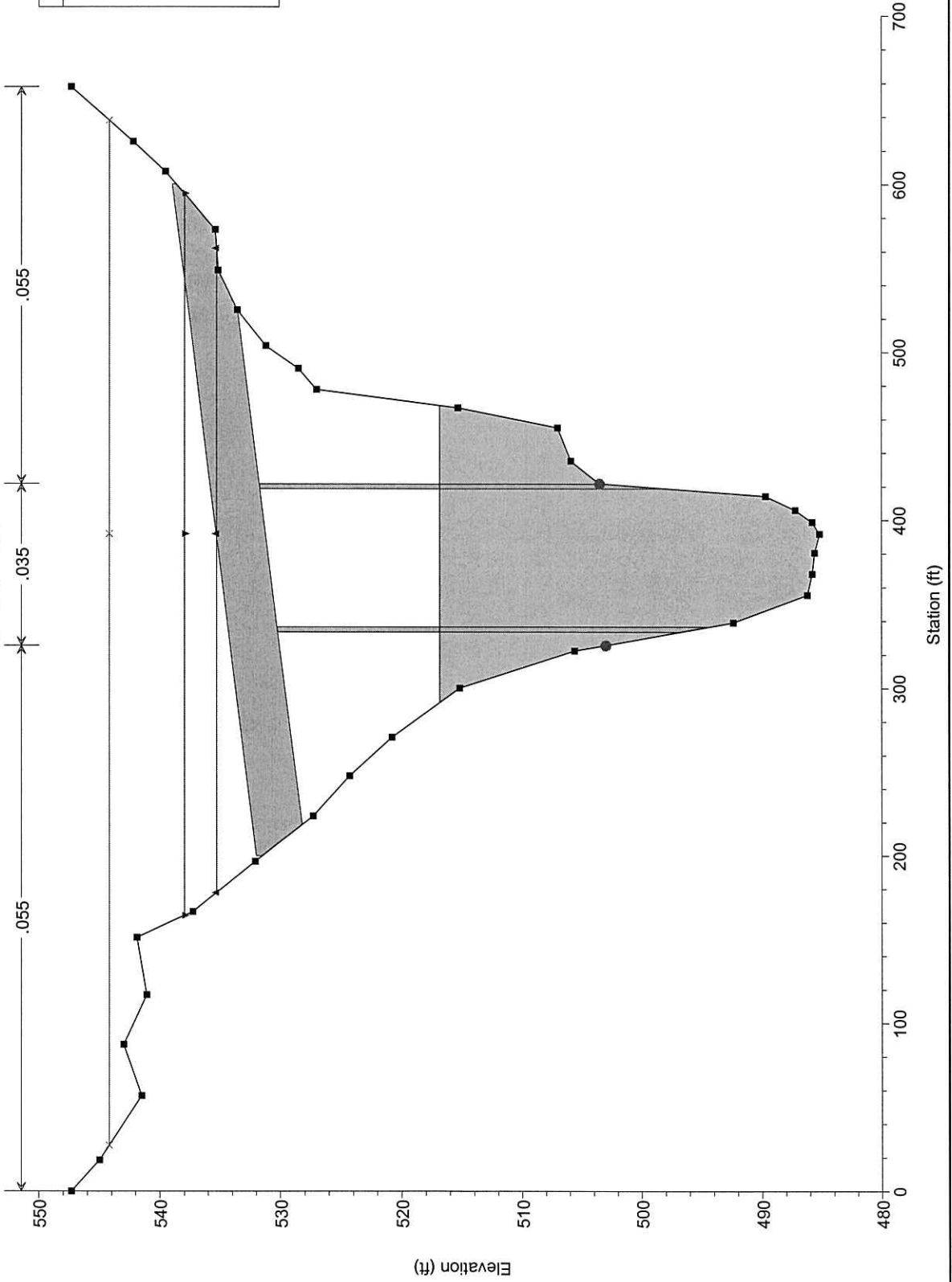
SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

RS = 529 BR



SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

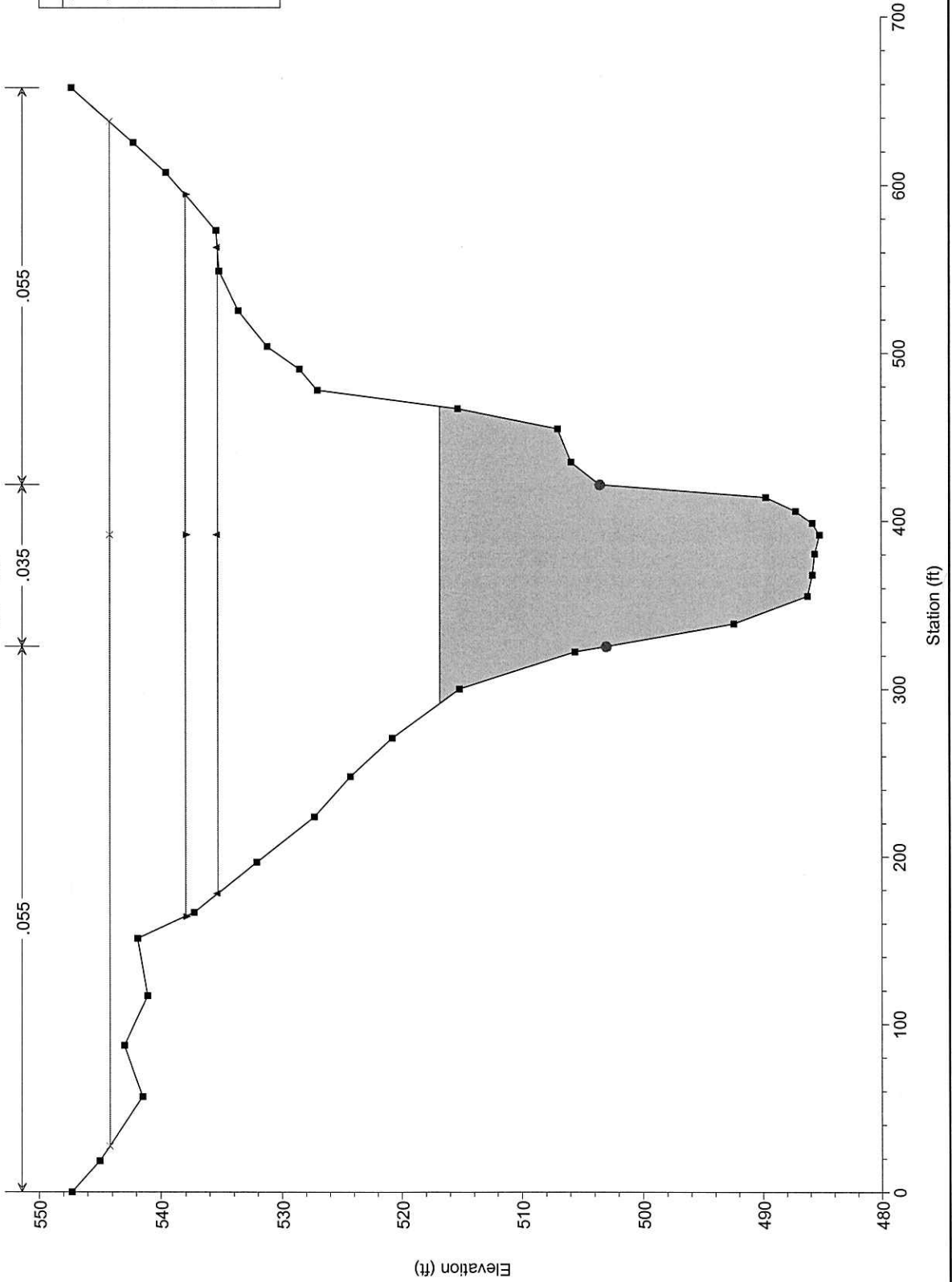
RS = 529 BR



Legend	
—	WS Q 500
- - -	WS Q 100
- - -	WS Q 50
- - -	WS Q 2
—	Ground
●	Bank Sta

SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

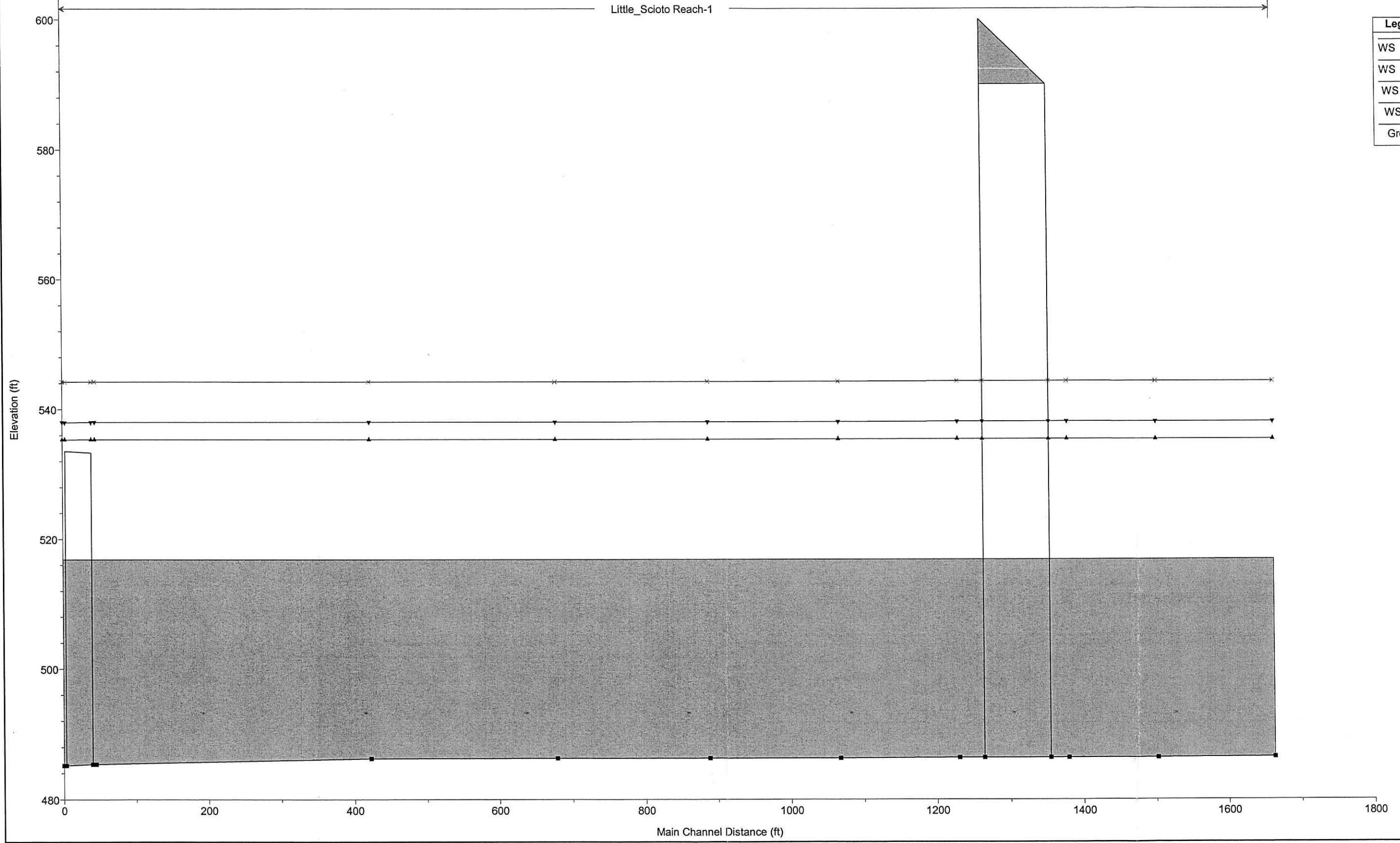
RS = 507



Legend	
×	WS Q 500
△	WS Q 100
□	WS Q 50
○	WS Q 2
—	Ground
●	Bank Sta

SR 823 over Little Scioto Plan: Alt 2 100yr Backwater 7/12/2006

Little_Scioto Reach-1



Legend	
WS Q 500	x
WS Q 100	v
WS Q 50	^
WS Q 2	■
Ground	(shaded area)

Appendix IV
Hydraulic Calculations
Alternative 3a & 3b

HEC-RAS Plan: Alt 3 NO BW River: Little_Scioto Reach: Reach-1

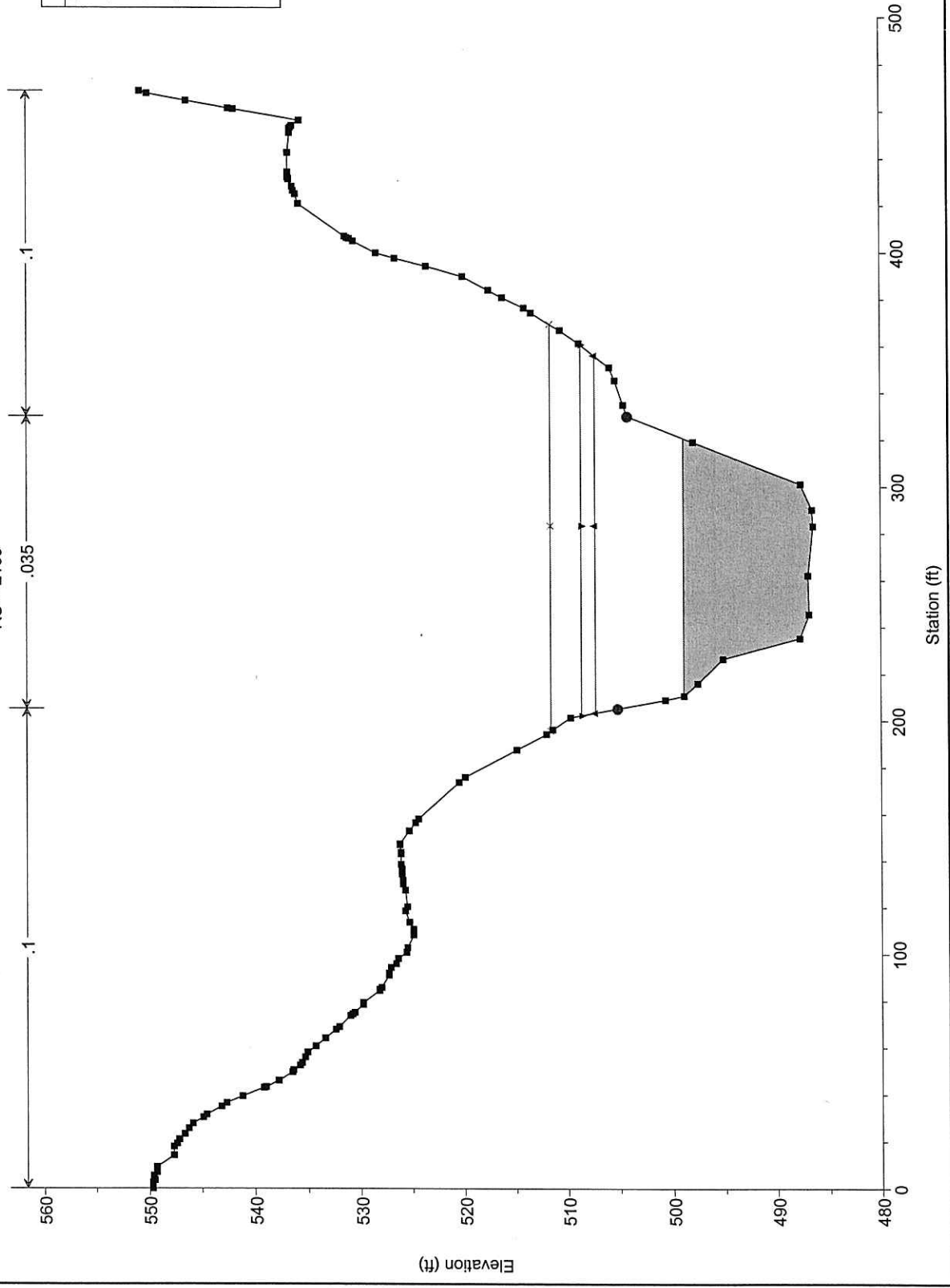
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4986.00	486.50	498.93		499.32	0.000793	5.01	995.81	109.96	0.29
Reach-1	2169	Q 50	13337.00	486.50	507.32		508.00	0.000675	6.65	2054.07	152.53	0.29
Reach-1	2169	Q 100	15167.00	486.50	508.65		509.40	0.000666	6.97	2261.30	158.39	0.29
Reach-1	2169	Q 500	19717.00	486.50	511.57		512.48	0.000663	7.71	2743.75	173.62	0.30
Reach-1	2008	Q 2	4986.00	486.40	498.77		499.19	0.000771	5.22	955.12	94.61	0.29
Reach-1	2008	Q 50	13337.00	486.40	507.04		507.87	0.000771	7.34	1876.26	135.25	0.31
Reach-1	2008	Q 100	15167.00	486.40	508.35		509.27	0.000774	7.73	2060.15	147.12	0.32
Reach-1	2008	Q 500	19717.00	486.40	511.22		512.34	0.000787	8.58	2569.13	219.26	0.33
Reach-1	1882	Q 2	4986.00	486.40	498.58	492.59	499.08	0.000960	5.69	876.76	89.55	0.32
Reach-1	1882	Q 50	13337.00	486.40	506.84	497.48	507.76	0.000941	7.73	1752.74	130.79	0.34
Reach-1	1882	Q 100	15167.00	486.40	508.15	498.35	509.16	0.000927	8.09	1933.48	148.26	0.34
Reach-1	1882	Q 500	19717.00	486.40	511.13	500.42	512.24	0.000852	8.62	2586.67	246.77	0.34
Reach-1	1808	Bridge										
Reach-1	1734	Q 2	4986.00	486.40	498.53		498.92	0.000752	5.01	995.03	104.89	0.29
Reach-1	1734	Q 50	13337.00	486.40	506.86		507.58	0.000695	6.81	1972.54	150.15	0.30
Reach-1	1734	Q 100	15167.00	486.40	508.19		508.97	0.000681	7.11	2229.15	206.26	0.30
Reach-1	1734	Q 500	19717.00	486.40	511.17		512.03	0.000635	7.62	2875.80	231.55	0.30
Reach-1	1574	Q 2	4970.00	486.30	498.34		498.79	0.000849	5.34	930.63	96.82	0.30
Reach-1	1574	Q 50	13343.00	486.30	506.65		507.44	0.000879	7.13	1885.63	155.79	0.33
Reach-1	1574	Q 100	15175.00	486.30	507.98		508.84	0.000848	7.42	2116.02	184.91	0.33
Reach-1	1574	Q 500	19727.00	486.30	510.91		511.91	0.000799	8.06	2690.65	205.87	0.33
Reach-1	1395	Q 2	4970.00	486.30	498.17		498.63	0.000897	5.43	914.75	96.51	0.31
Reach-1	1395	Q 50	13343.00	486.30	506.44		507.28	0.000855	7.36	1852.21	148.03	0.33
Reach-1	1395	Q 100	15175.00	486.30	507.76		508.68	0.000842	7.71	2053.81	159.96	0.33
Reach-1	1395	Q 500	19727.00	486.30	510.65		511.75	0.000829	8.49	2557.42	186.52	0.33
Reach-1	1185	Q 2	4970.00	486.30	497.97		498.44	0.000935	5.49	905.48	97.46	0.32
Reach-1	1185	Q 50	13343.00	486.30	506.26		507.10	0.000879	7.36	1822.92	131.24	0.33
Reach-1	1185	Q 100	15175.00	486.30	507.58		508.50	0.000864	7.71	2002.80	141.38	0.33
Reach-1	1185	Q 500	19727.00	486.30	510.45		511.57	0.000853	8.51	2424.79	152.03	0.34
Reach-1	929	Q 2	4970.00	486.24	497.70		498.19	0.000999	5.62	884.94	96.82	0.33

HEC-RAS Plan: Alt 3 NO BW River: Little Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	506.01		506.87	0.000917	7.46	1797.78	129.49	0.34
Reach-1	929	Q 100	15175.00	486.24	507.33		508.27	0.000896	7.79	1976.53	140.03	0.34
Reach-1	929	Q 500	19727.00	486.24	510.22		511.35	0.000876	8.57	2398.11	151.39	0.34
Reach-1	552	Q 2	4970.00	485.40	497.32	492.10	497.80	0.001007	5.56	893.12	100.38	0.33
Reach-1	552	Q 50	13343.00	485.40	505.67	496.56	506.53	0.000892	7.44	1799.14	124.33	0.33
Reach-1	552	Q 100	15175.00	485.40	506.99	497.33	507.94	0.000878	7.80	1972.74	135.34	0.33
Reach-1	552	Q 500	19727.00	485.40	509.88	499.11	511.02	0.000870	8.61	2387.80	152.23	0.34
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	497.14	491.97	497.73	0.001200	6.19	802.92	85.29	0.36
Reach-1	507	Q 50	13343.00	485.20	505.25	496.81	506.40	0.001200	8.60	1562.38	108.84	0.38
Reach-1	507	Q 100	15175.00	485.20	506.53	497.66	507.80	0.001200	9.05	1709.76	126.34	0.38
Reach-1	507	Q 500	19727.00	485.20	509.33	499.69	510.86	0.001200	9.99	2098.63	144.65	0.39

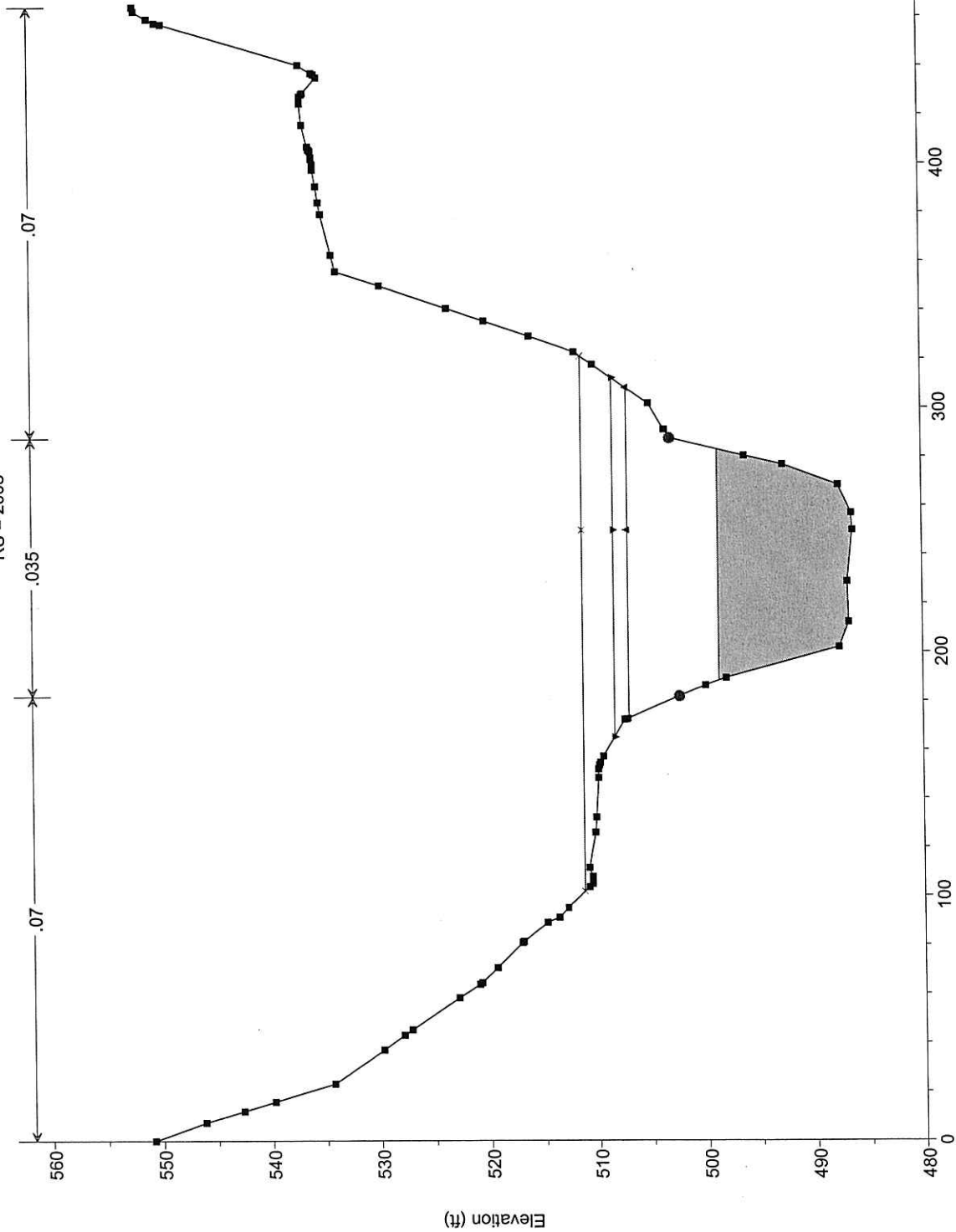
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 2169



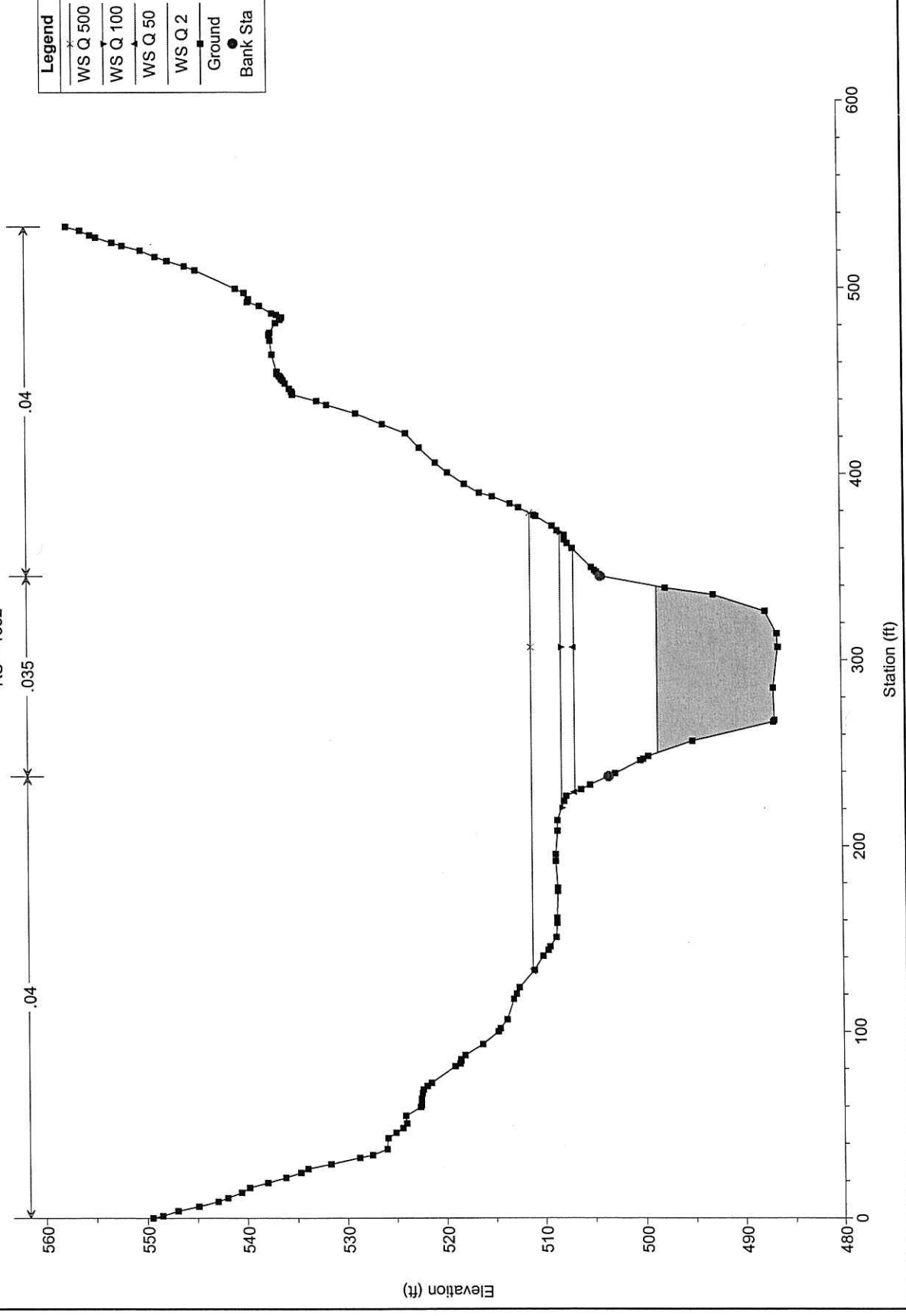
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 2008

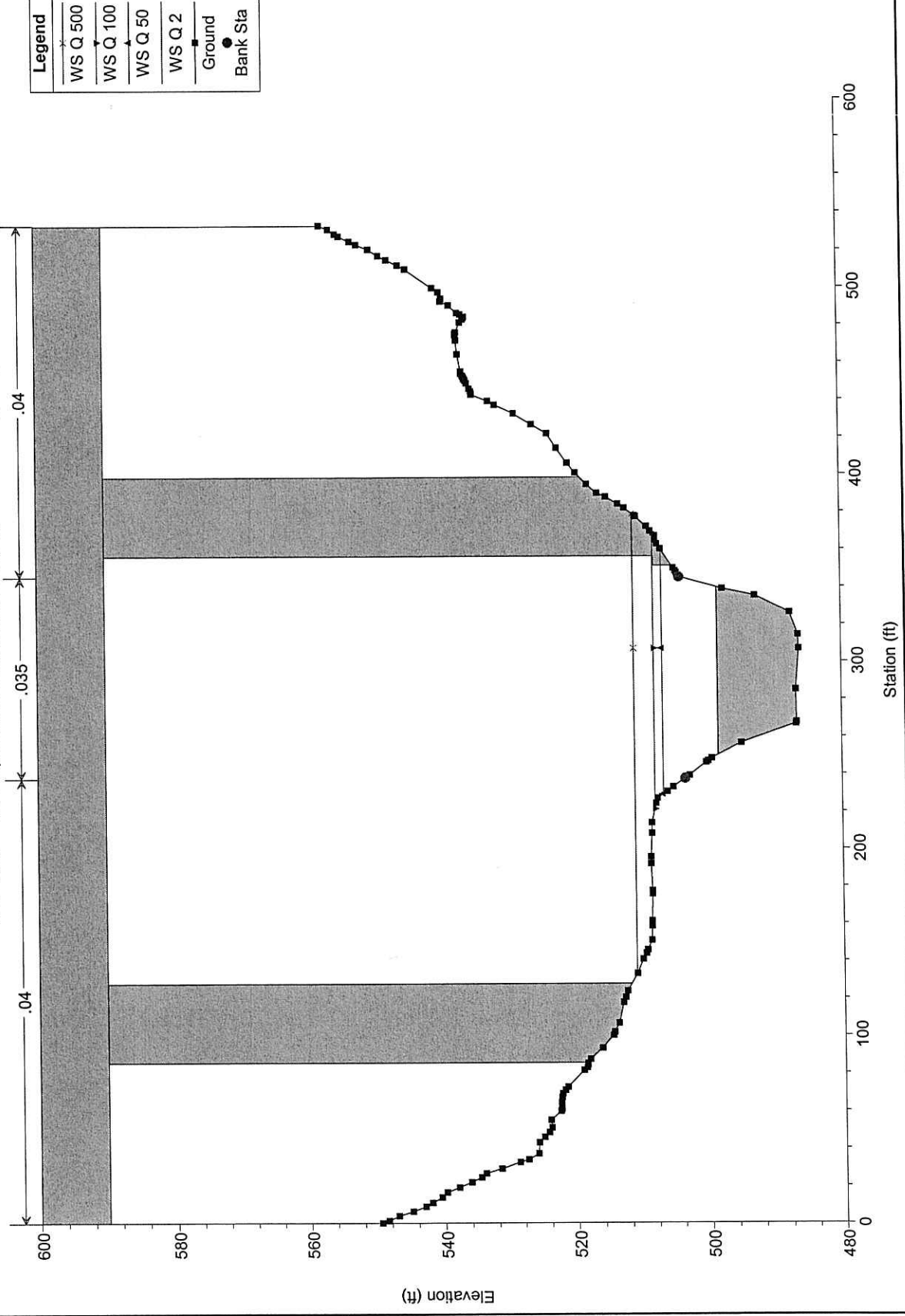


SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 1882



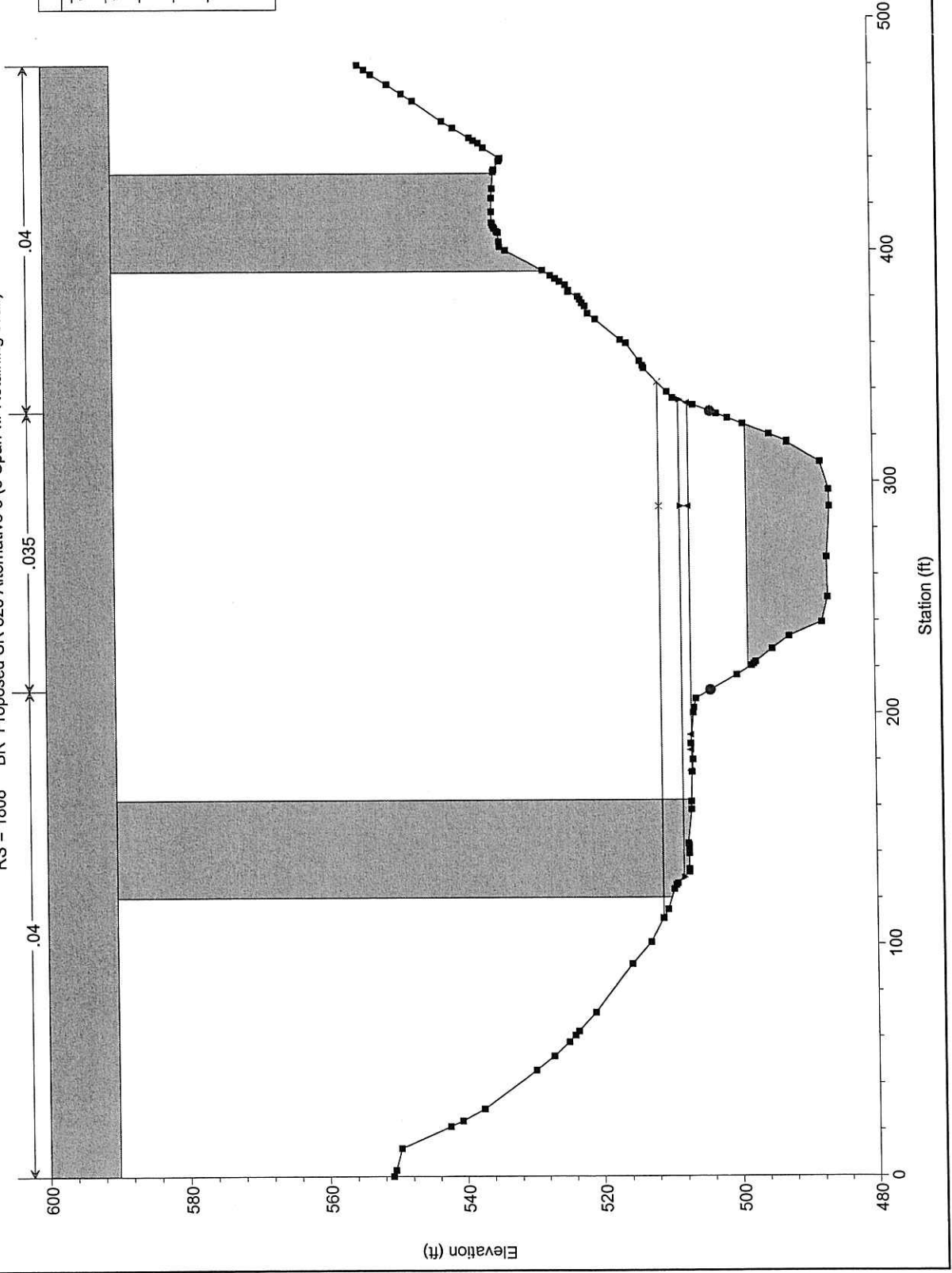
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 3 (3 Span w/ Retaining Wall)



Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta

SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 3 (3 Span w/ Retaining Wall)

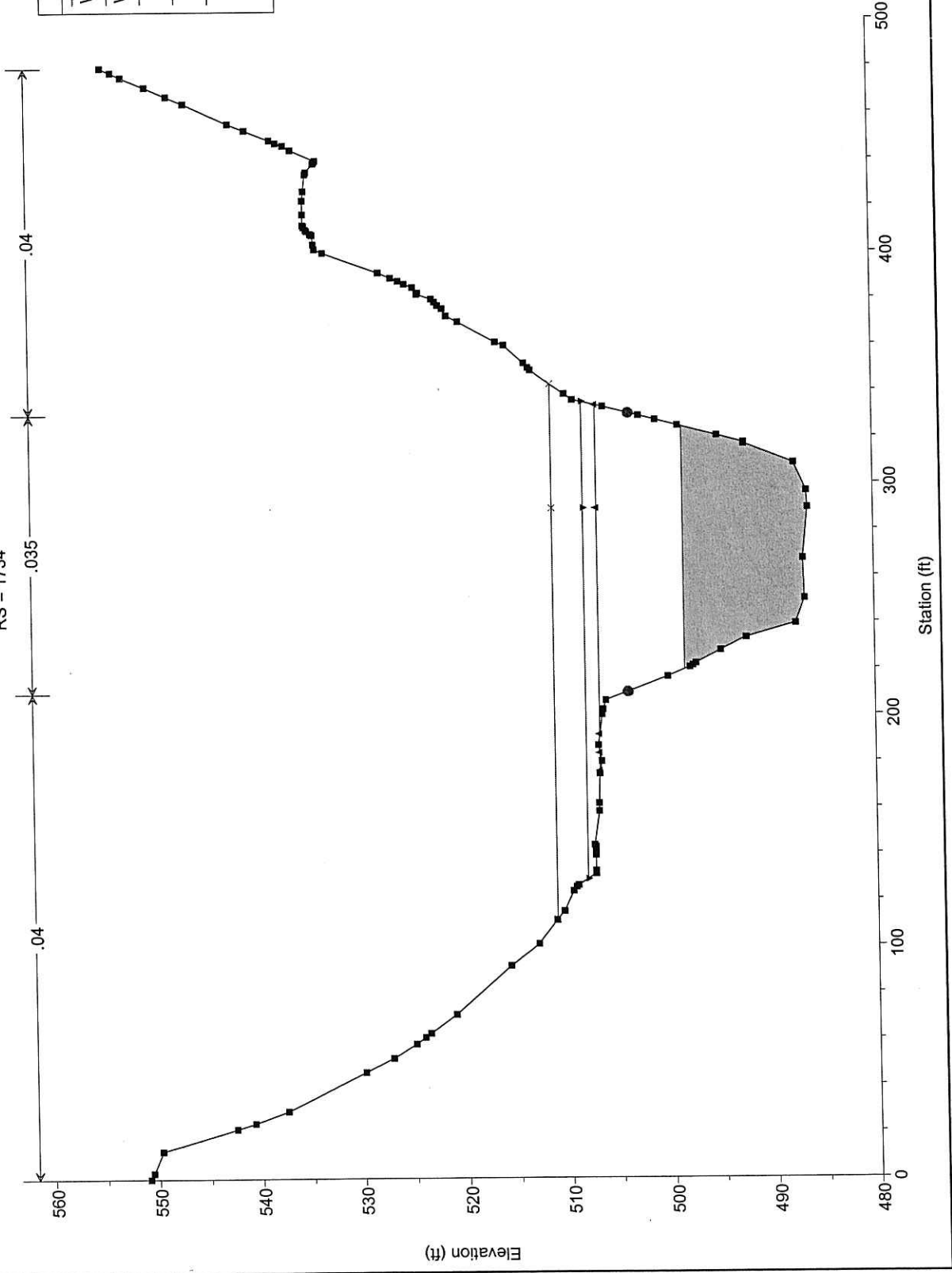
Legend	
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—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta



SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

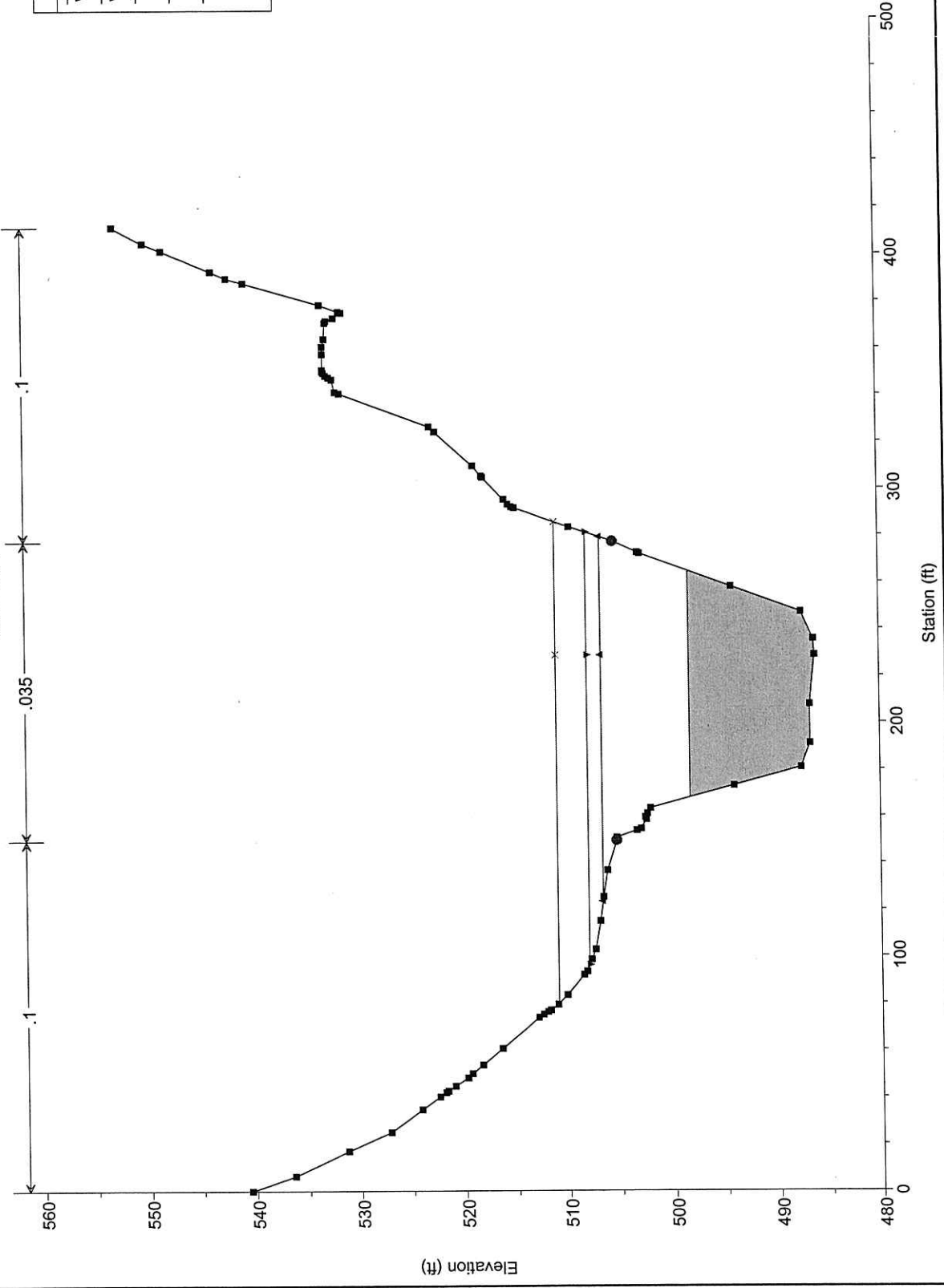
RS = 1734

Legend	
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—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta



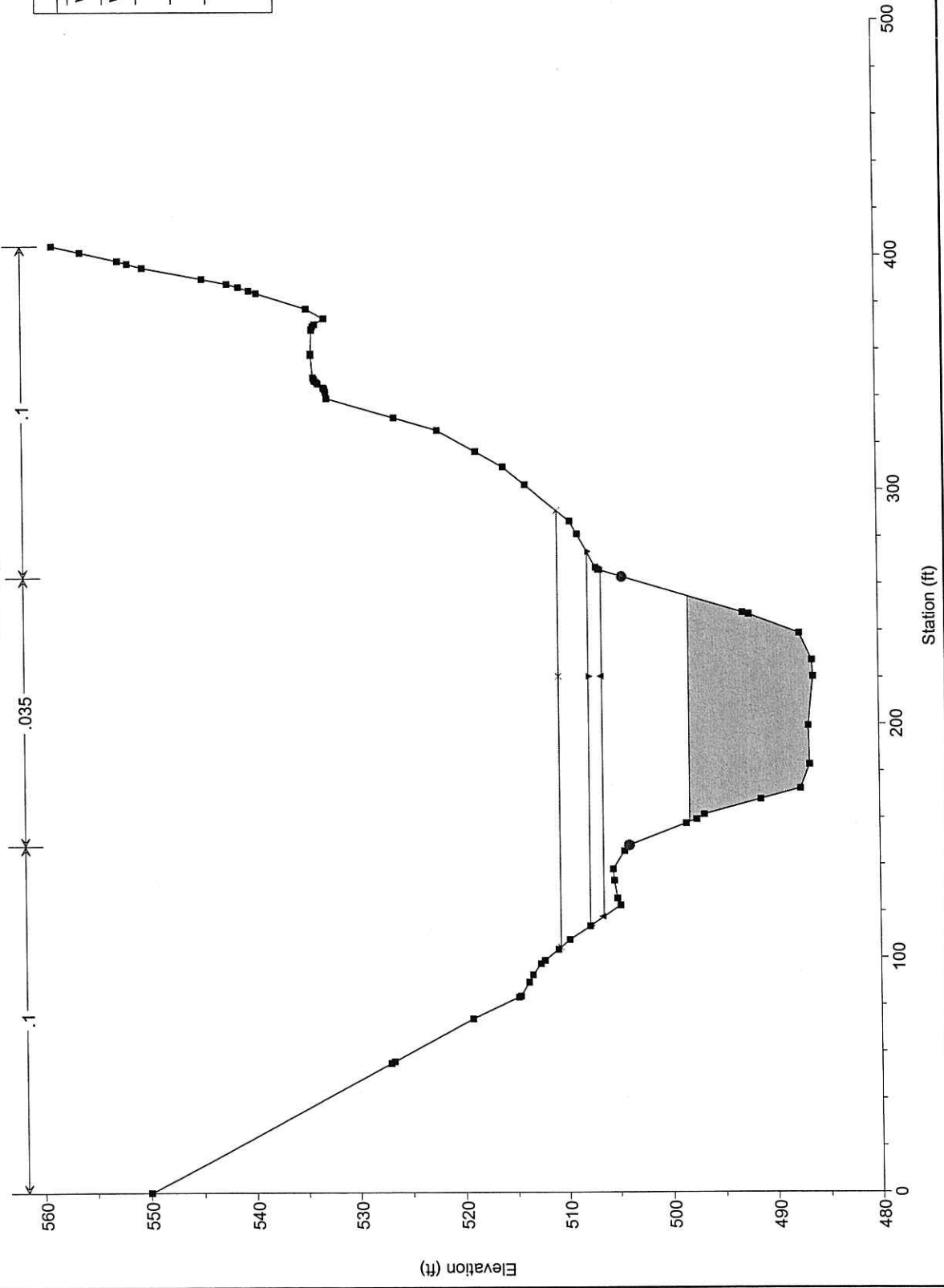
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 1574



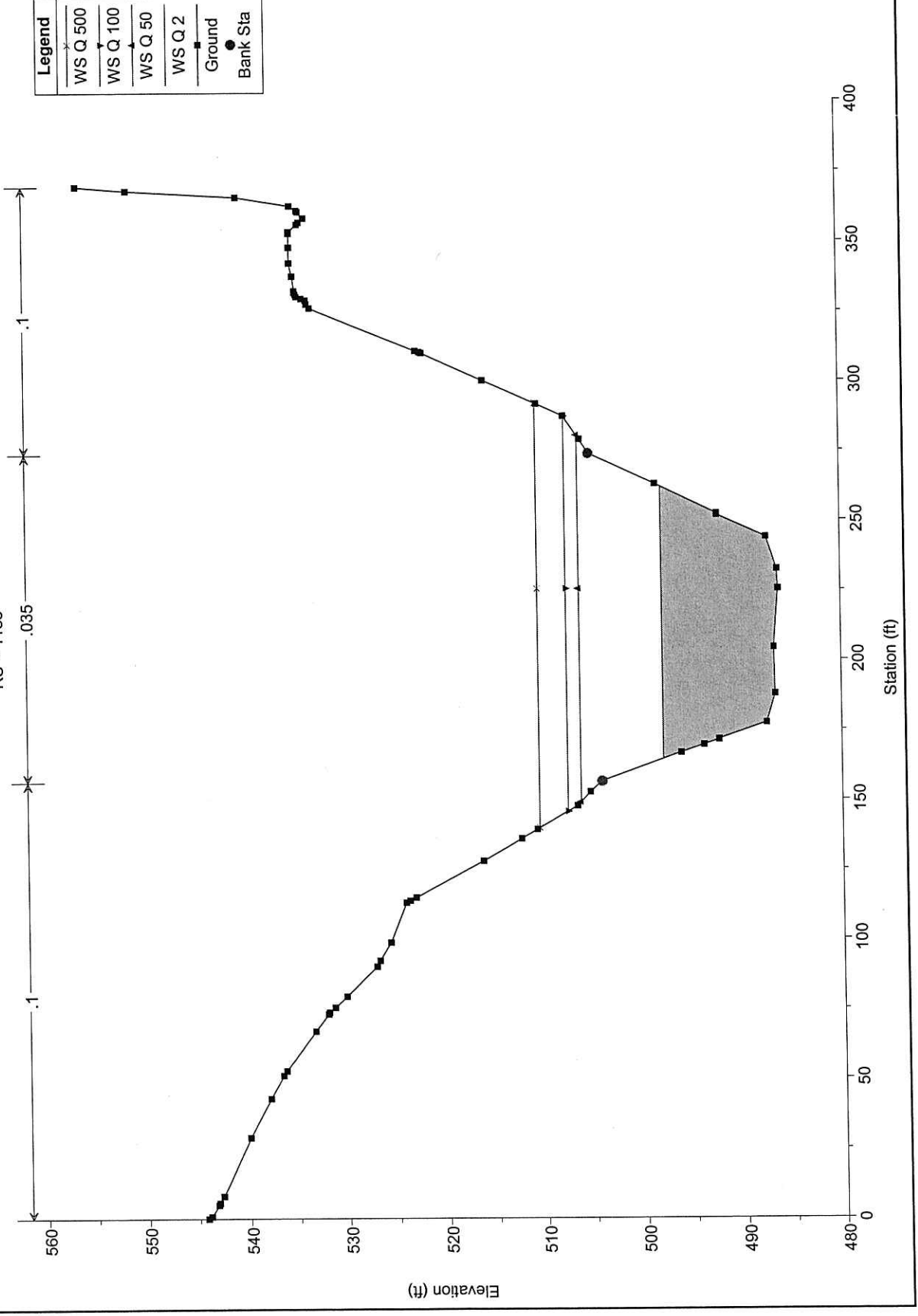
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 1395



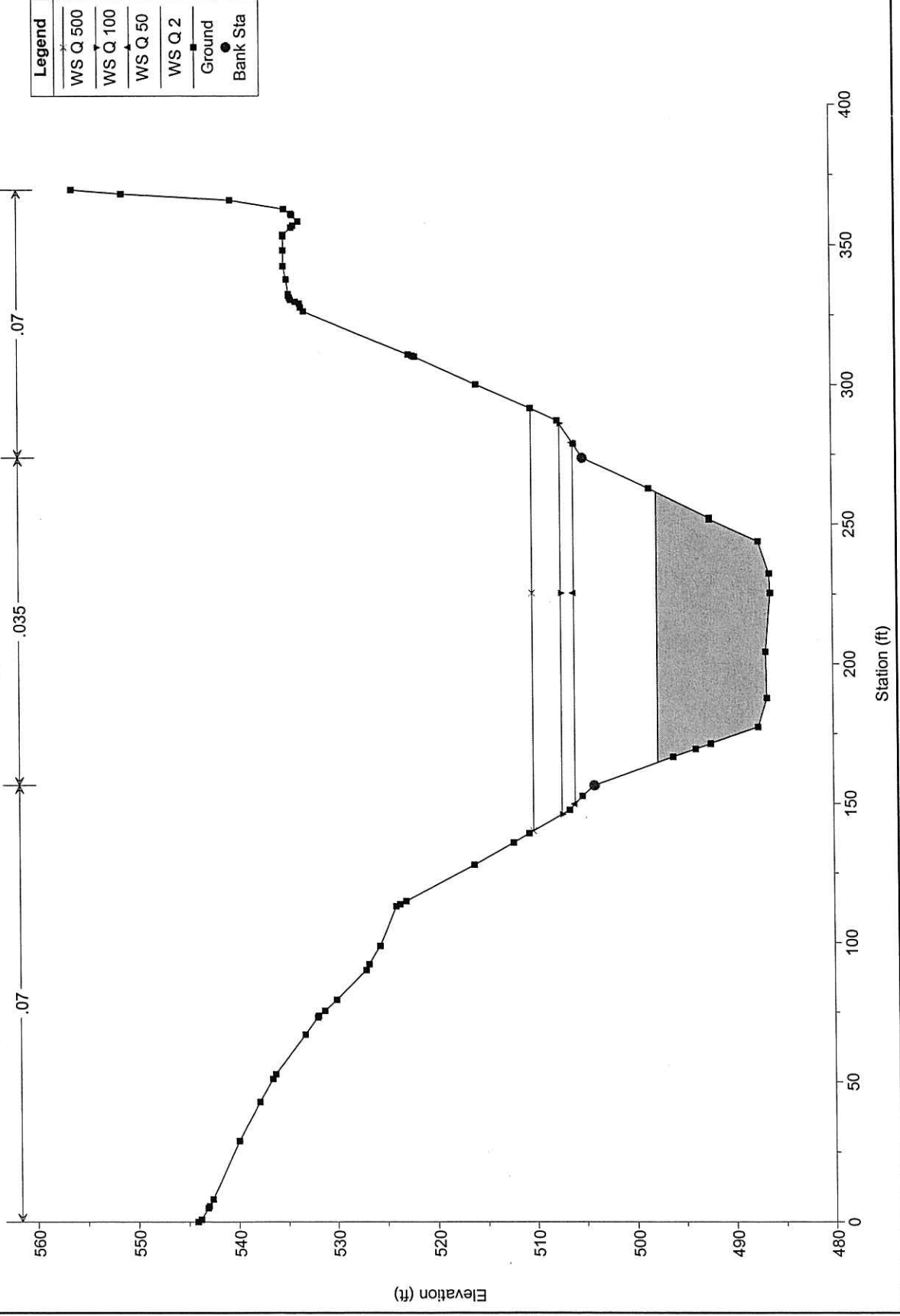
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 1185



SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

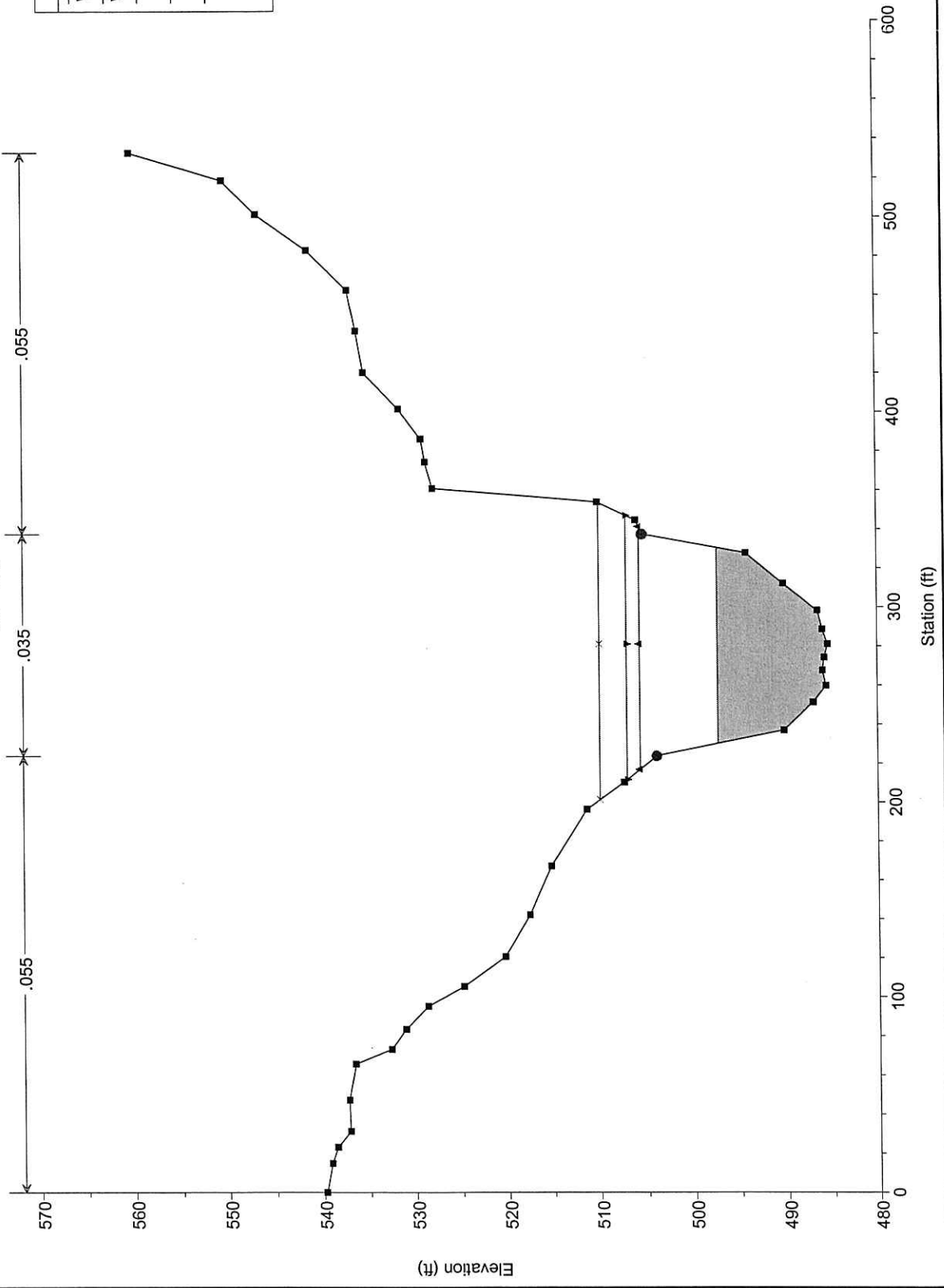
RS = 929



Legend
WS Q 500
WS Q 100
WS Q 50
WS Q 2
Ground
Bank Sta

SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

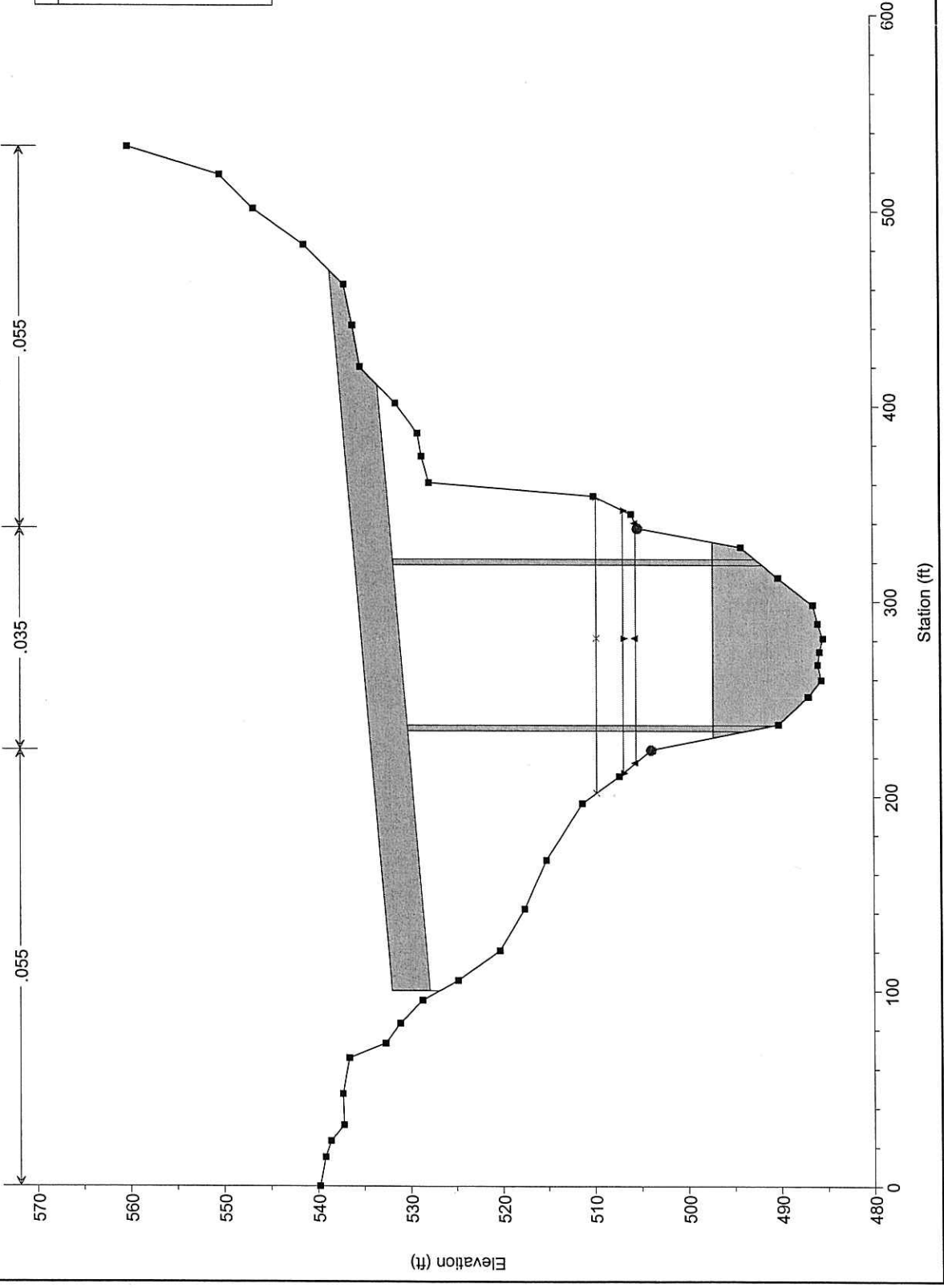
RS = 552



Legend	
WS Q 500	×
WS Q 100	▲
WS Q 50	■
WS Q 2	●
Ground	—
Bank Sta	●

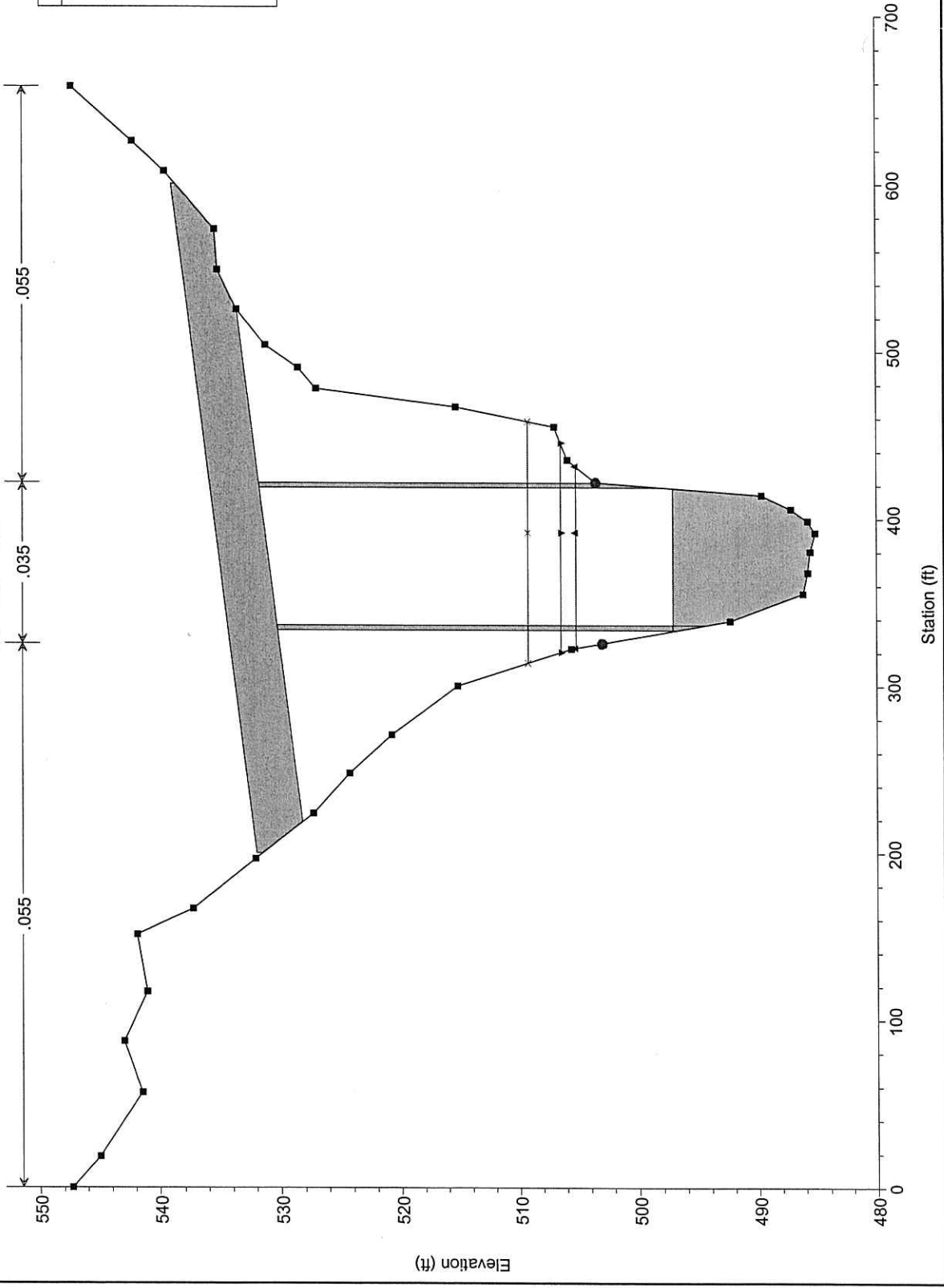
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 529 BR



SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

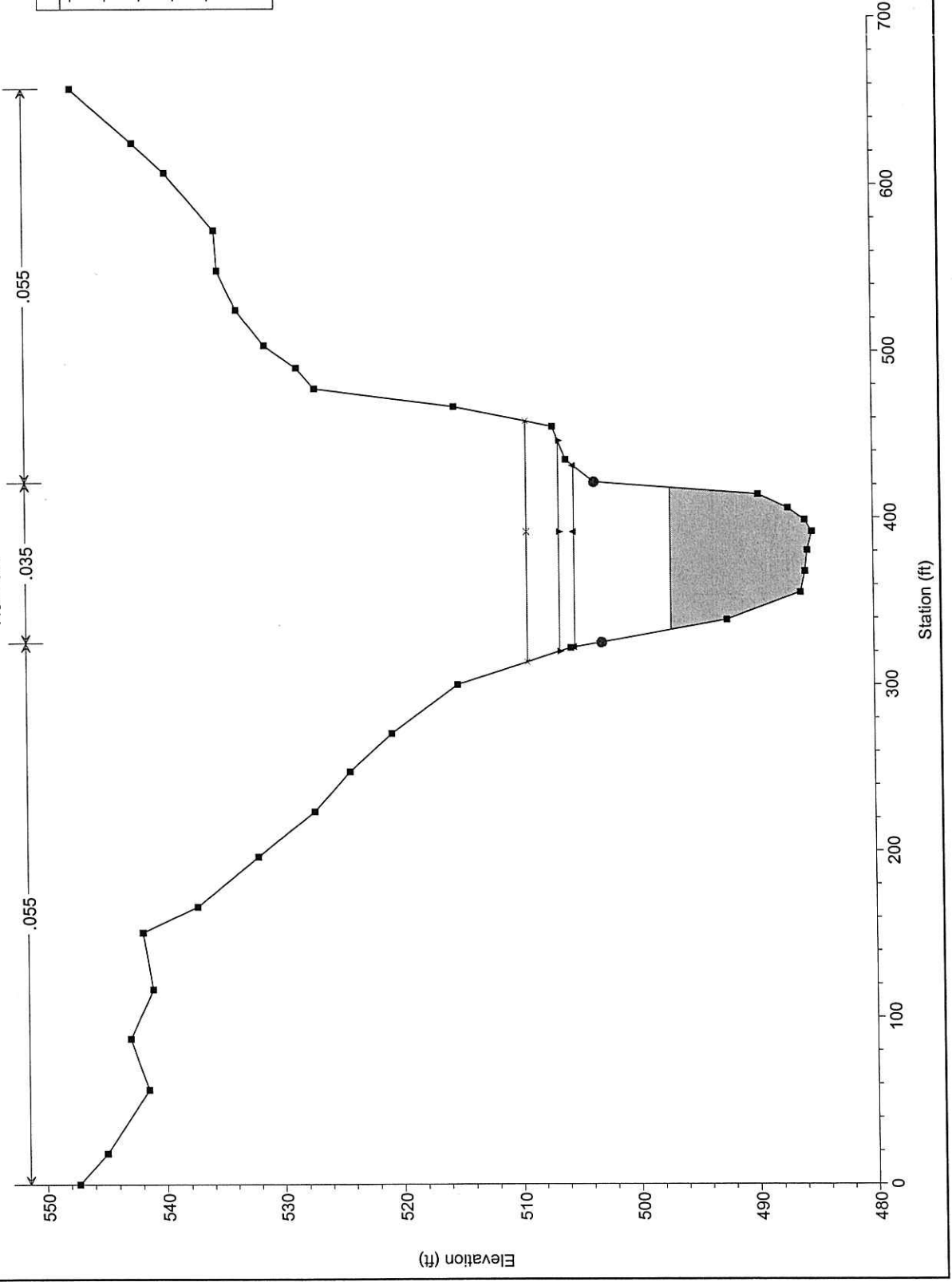
RS = 529 BR



Legend	
—x—	WS Q 500
—x—	WS Q 100
—x—	WS Q 50
—x—	WS Q 2
—■—	Ground
●	Bank Sta

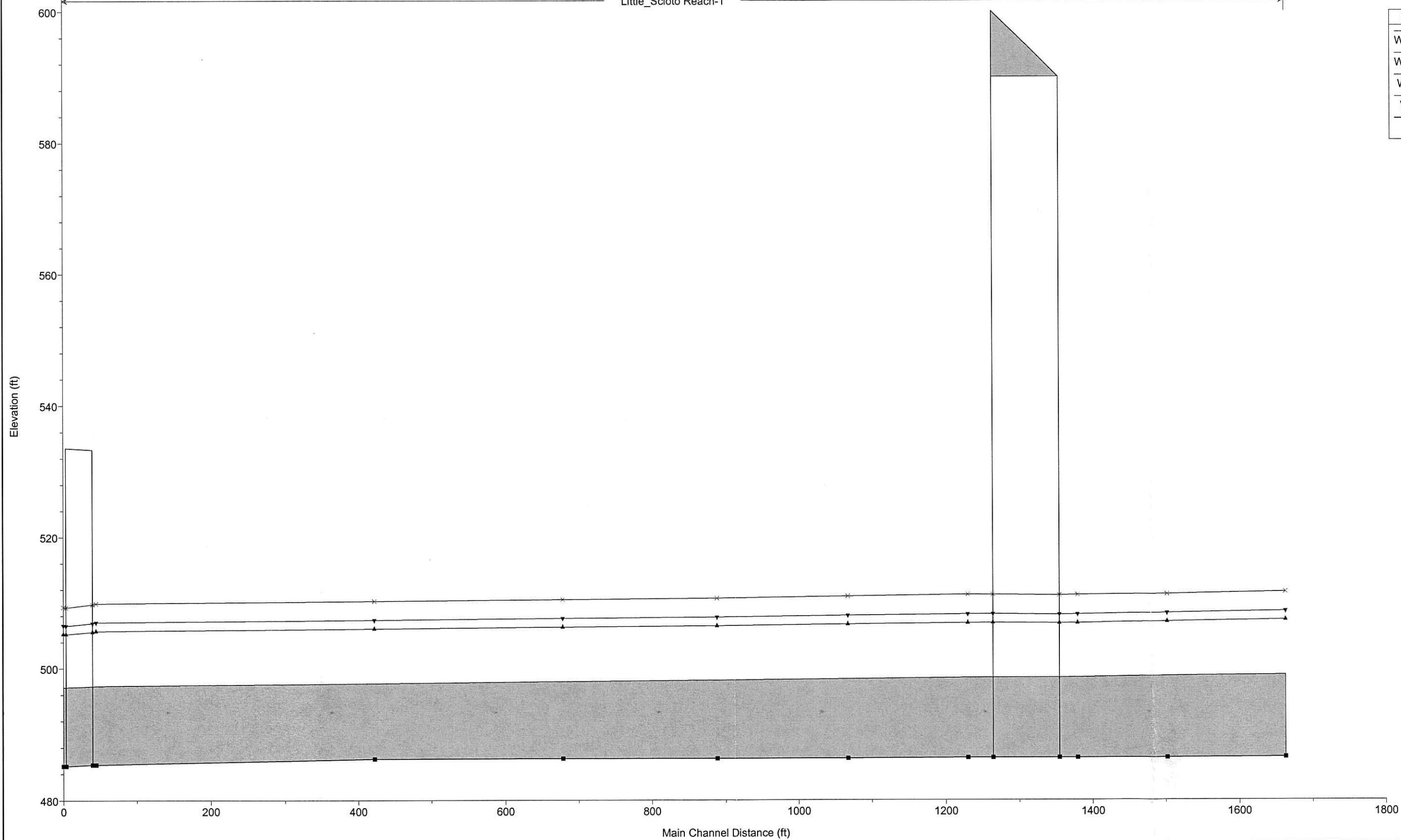
SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

RS = 507



SR 823 over Little Scioto Plan: Alt 3 NO Backwater 7/11/2006

Little_Scioto Reach-1



Legend	
WS Q 500	×
WS Q 100	▲
WS Q 50	▲
WS Q 2	■
Ground	■

HEC-RAS Plan: Alt 3 10y BW River: Little Scioto Reach: Reach-1

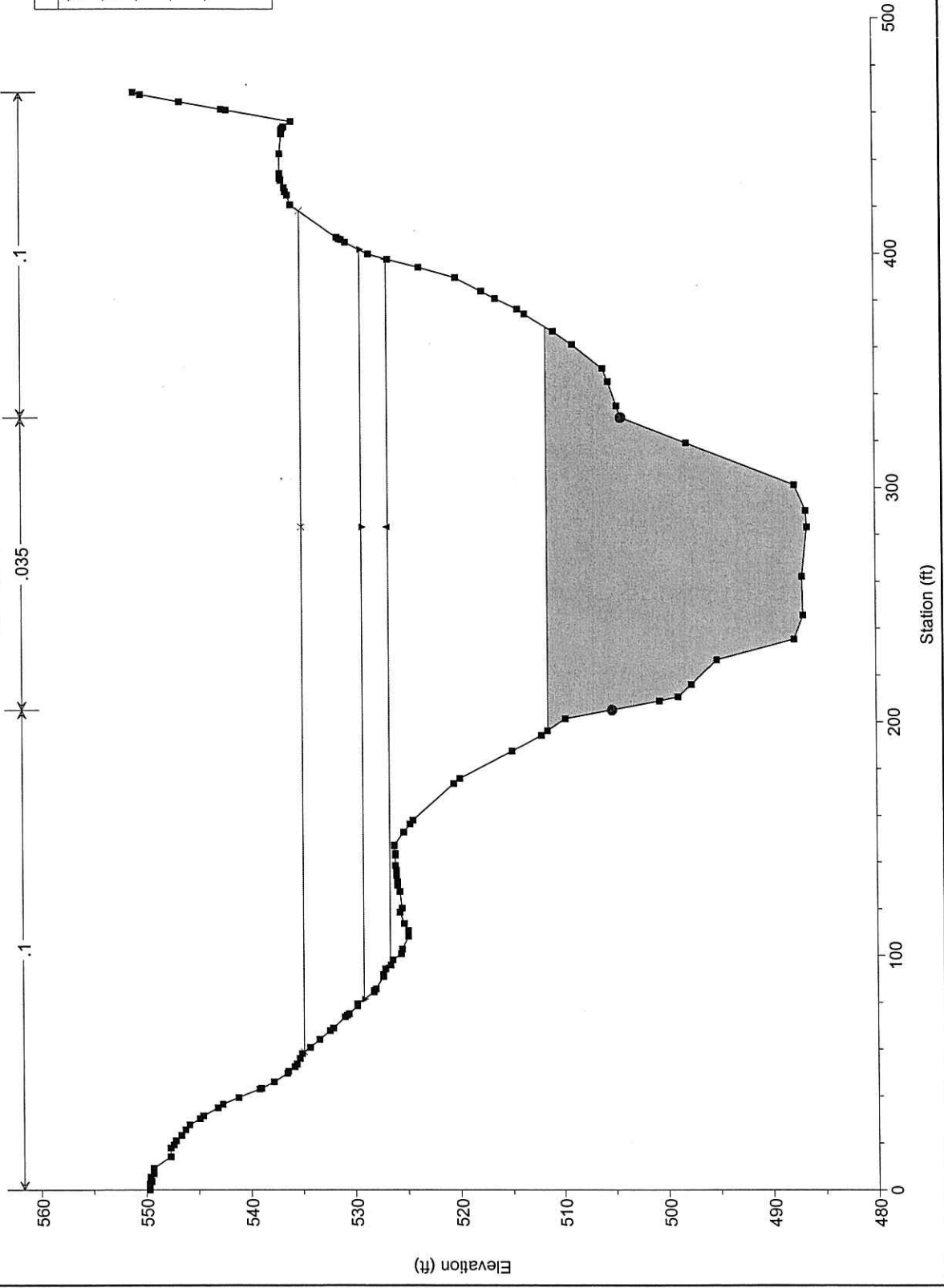
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude #	Chl
Reach-1	2169	Q 2	4968.00	486.50	511.35		511.41	0.000044	1.96	2705.68	172.32	0.08	
Reach-1	2169	Q 50	13337.00	486.50	526.64		526.76	0.000043	2.86	5970.72	301.80	0.08	
Reach-1	2169	Q 100	15167.00	486.50	529.15		529.28	0.000044	3.00	6754.06	320.32	0.09	
Reach-1	2169	Q 500	19717.00	486.50	534.88		535.04	0.000043	3.29	8701.96	359.24	0.09	
Reach-1	2008	Q 2	4968.00	486.40	511.33		511.40	0.000049	2.15	2592.55	220.04	0.08	
Reach-1	2008	Q 50	13337.00	486.40	526.64		526.75	0.000043	2.89	6585.71	298.48	0.08	
Reach-1	2008	Q 100	15167.00	486.40	529.15		529.27	0.000043	3.01	7351.27	310.27	0.08	
Reach-1	2008	Q 500	19717.00	486.40	534.89		535.03	0.000043	3.29	9219.49	356.69	0.09	
Reach-1	1882	Q 2	4968.00	486.40	511.32	492.58	511.39	0.000052	2.14	2634.25	248.48	0.08	
Reach-1	1882	Q 50	13337.00	486.40	526.66	497.48	526.73	0.000031	2.39	7551.87	392.71	0.07	
Reach-1	1882	Q 100	15167.00	486.40	529.18	498.35	529.25	0.000028	2.40	8554.04	401.47	0.07	
Reach-1	1882	Q 500	19717.00	486.40	534.93	500.42	535.00	0.000024	2.45	10909.31	419.59	0.07	
Reach-1	1808		Bridge										
Reach-1	1734	Q 2	4968.00	486.40	511.33		511.38	0.000039	1.90	2912.41	232.94	0.07	
Reach-1	1734	Q 50	13337.00	486.40	526.65		526.72	0.000028	2.30	7332.02	336.23	0.07	
Reach-1	1734	Q 100	15167.00	486.40	529.17		529.24	0.000026	2.36	8191.84	346.50	0.07	
Reach-1	1734	Q 500	19717.00	486.40	534.91		534.98	0.000025	2.52	10259.53	407.43	0.07	
Reach-1	1574	Q 2	4970.00	486.30	511.31		511.37	0.000047	1.98	2773.99	207.98	0.08	
Reach-1	1574	Q 50	13343.00	486.30	526.60		526.71	0.000041	2.75	6707.23	305.65	0.08	
Reach-1	1574	Q 100	15175.00	486.30	529.11		529.23	0.000041	2.87	7487.56	315.45	0.08	
Reach-1	1574	Q 500	19727.00	486.30	534.84		534.97	0.000041	3.15	9433.30	370.96	0.08	
Reach-1	1395	Q 2	4970.00	486.30	511.30		511.36	0.000047	2.07	2680.76	191.29	0.08	
Reach-1	1395	Q 50	13343.00	486.30	526.58		526.70	0.000045	2.94	6356.14	275.42	0.09	
Reach-1	1395	Q 100	15175.00	486.30	529.08		529.22	0.000046	3.08	7058.68	284.75	0.09	
Reach-1	1395	Q 500	19727.00	486.30	534.80		534.96	0.000047	3.42	8790.01	341.72	0.09	
Reach-1	1185	Q 2	4970.00	486.30	511.29		511.35	0.000047	2.05	2553.23	155.08	0.08	
Reach-1	1185	Q 50	13343.00	486.30	526.55		526.69	0.000049	3.05	5351.08	223.02	0.09	
Reach-1	1185	Q 100	15175.00	486.30	529.05		529.20	0.000050	3.22	5928.90	237.27	0.09	
Reach-1	1185	Q 500	19727.00	486.30	534.76		534.95	0.000051	3.58	7379.09	286.65	0.10	
Reach-1	929	Q 2	4970.00	486.24	511.28		511.34	0.000046	2.04	2560.79	155.26	0.08	

HEC-RAS Plan: Alt 3 10y BW River: Little Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	526.54		526.67	0.000047	2.99	5362.88	223.42	0.09
Reach-1	929	Q 100	15175.00	486.24	529.05		529.19	0.000048	3.14	5941.75	237.54	0.09
Reach-1	929	Q 500	19727.00	486.24	534.76		534.93	0.000048	3.48	7395.59	288.15	0.09
Reach-1	552	Q 2	4970.00	485.40	511.26	492.10	511.32	0.000044	2.02	2602.25	157.82	0.08
Reach-1	552	Q 50	13343.00	485.40	526.54	496.56	526.65	0.000042	2.84	5929.73	259.33	0.08
Reach-1	552	Q 100	15175.00	485.40	529.04	497.33	529.17	0.000042	2.98	6603.32	292.83	0.08
Reach-1	552	Q 500	19727.00	485.40	534.77	499.11	534.91	0.000041	3.20	8457.86	348.75	0.08
Reach-1	529		Bridge									
Reach-1	507	Q 2	4970.00	485.20	511.24	491.97	511.32	0.000055	2.27	2381.46	151.80	0.09
Reach-1	507	Q 50	13343.00	485.20	526.49	496.81	526.64	0.000055	3.23	5312.20	247.05	0.09
Reach-1	507	Q 100	15175.00	485.20	529.00	497.66	529.16	0.000056	3.39	5970.49	278.64	0.09
Reach-1	507	Q 500	19727.00	485.20	534.70	499.69	534.87	0.000055	3.68	7759.20	359.82	0.10

SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

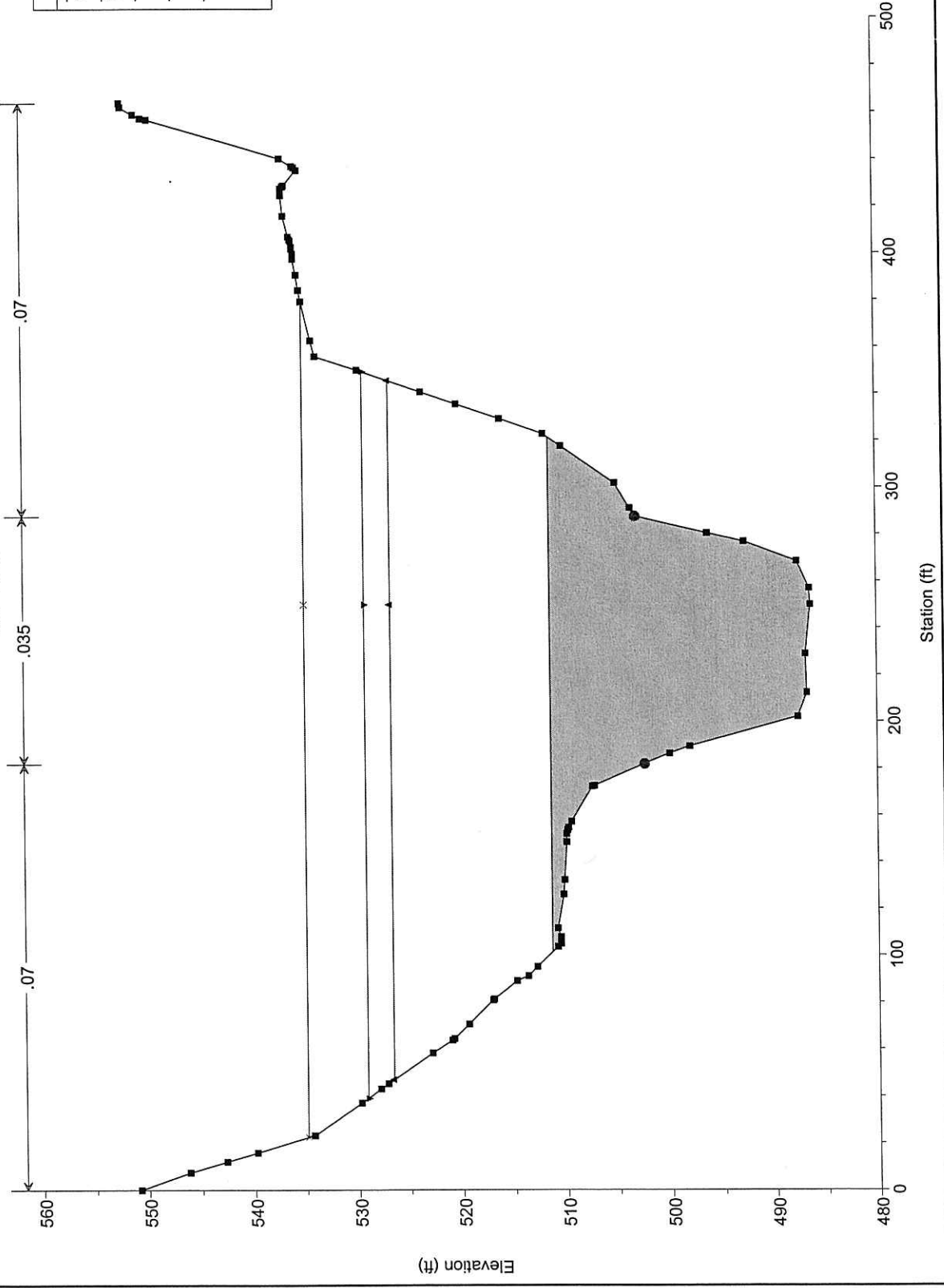
RS = 2169



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	■
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

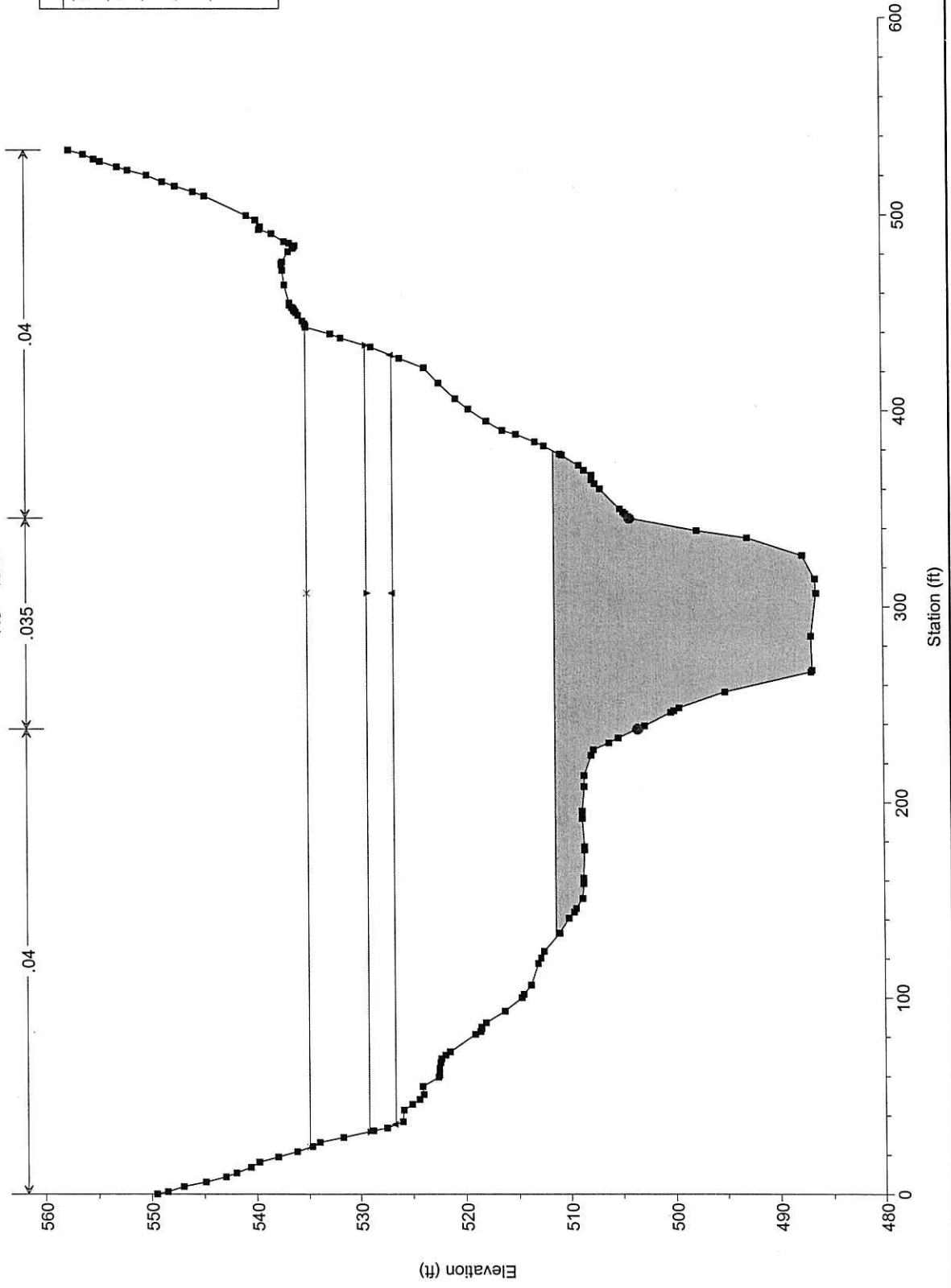
RS = 2008



Legend	
—	WS Q 500
—	WS Q 100
—	WS Q 50
—	WS Q 2
—	Ground
●	Bank Sta

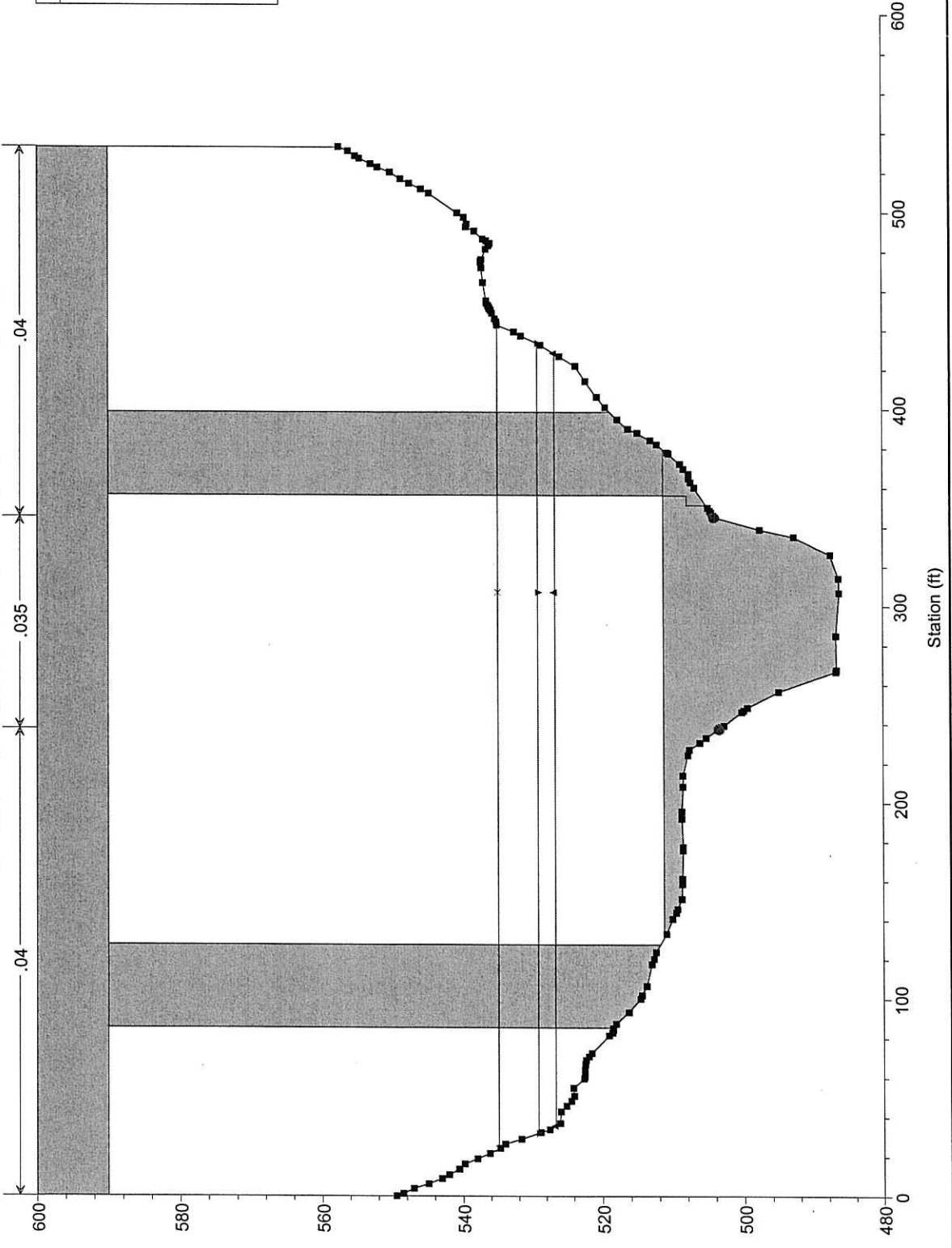
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

RS = 1882



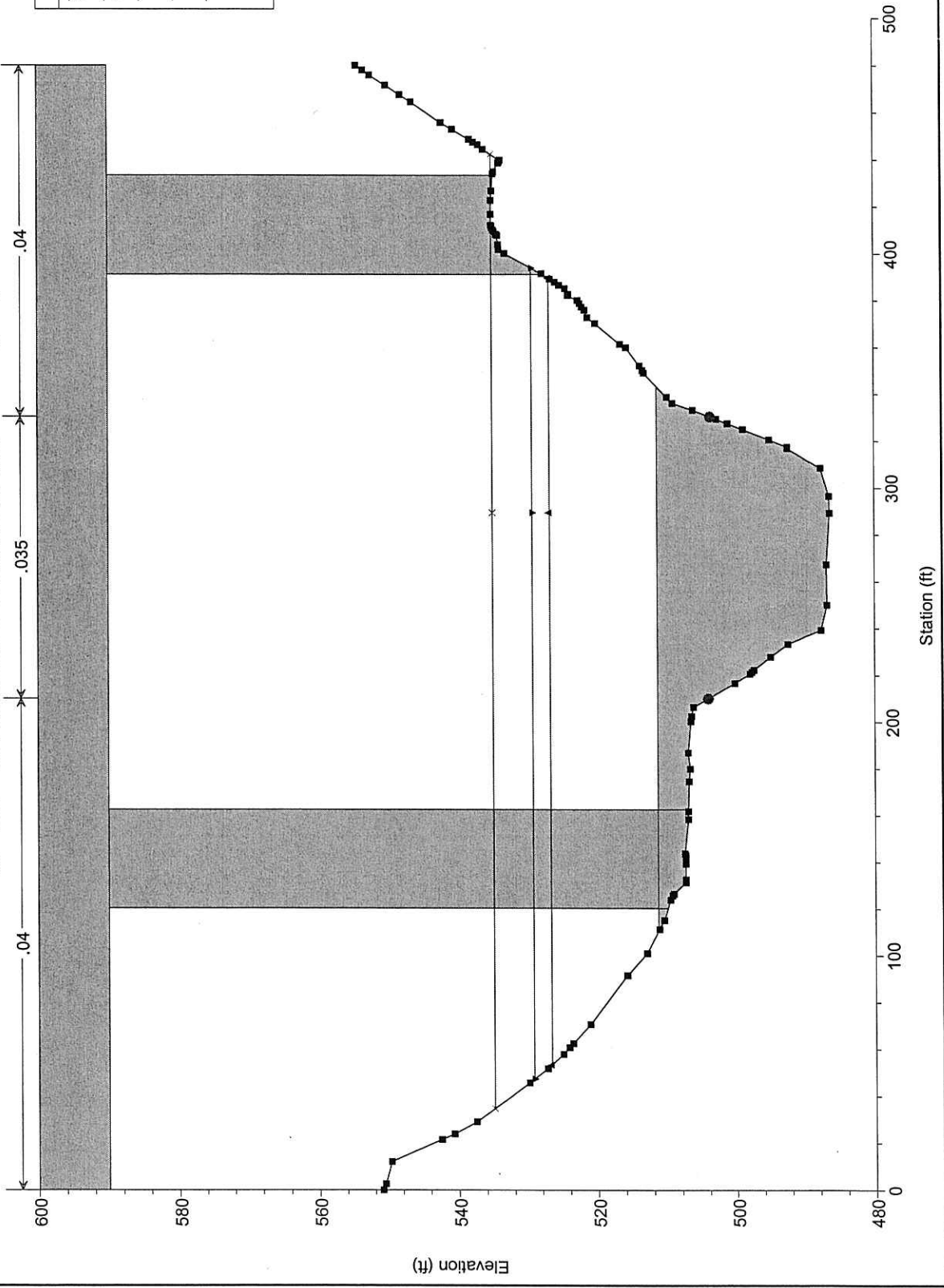
Legend	
WS Q 500	▲
WS Q 100	▼
WS Q 50	▲
WS Q 2	▲
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 3 (3 Span w/ Retaining Wall)

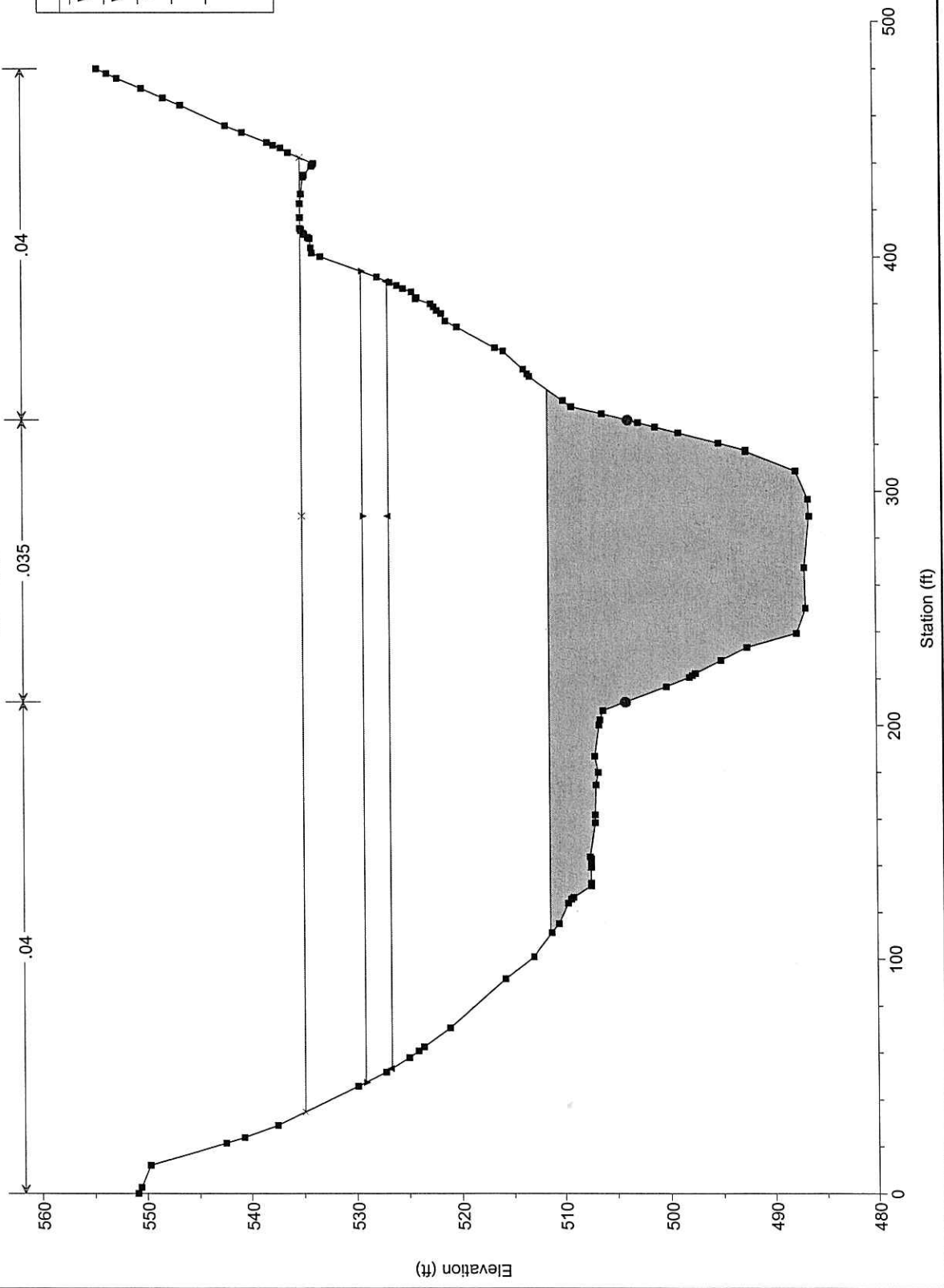


Legend	
WS Q 500	→
WS Q 100	→
WS Q 50	→
WS Q 2	→
Ground	—■—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 3 (3 Span w/ Retaining Wall)



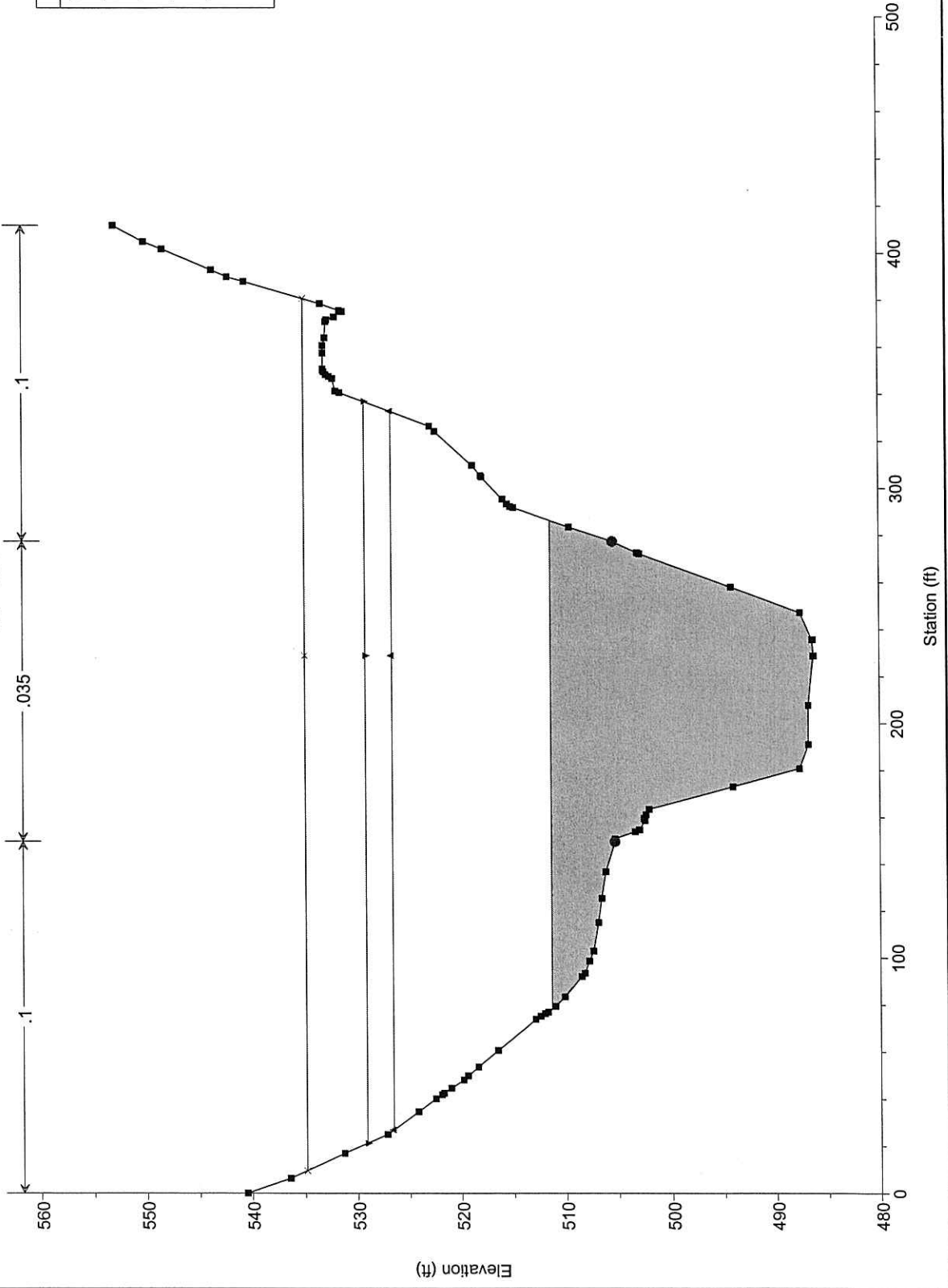
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006
 RS = 1734



Legend	
—	WS Q 500
- - -	WS Q 100
- - -	WS Q 50
- - -	WS Q 2
—	Ground
●	Bank Sta

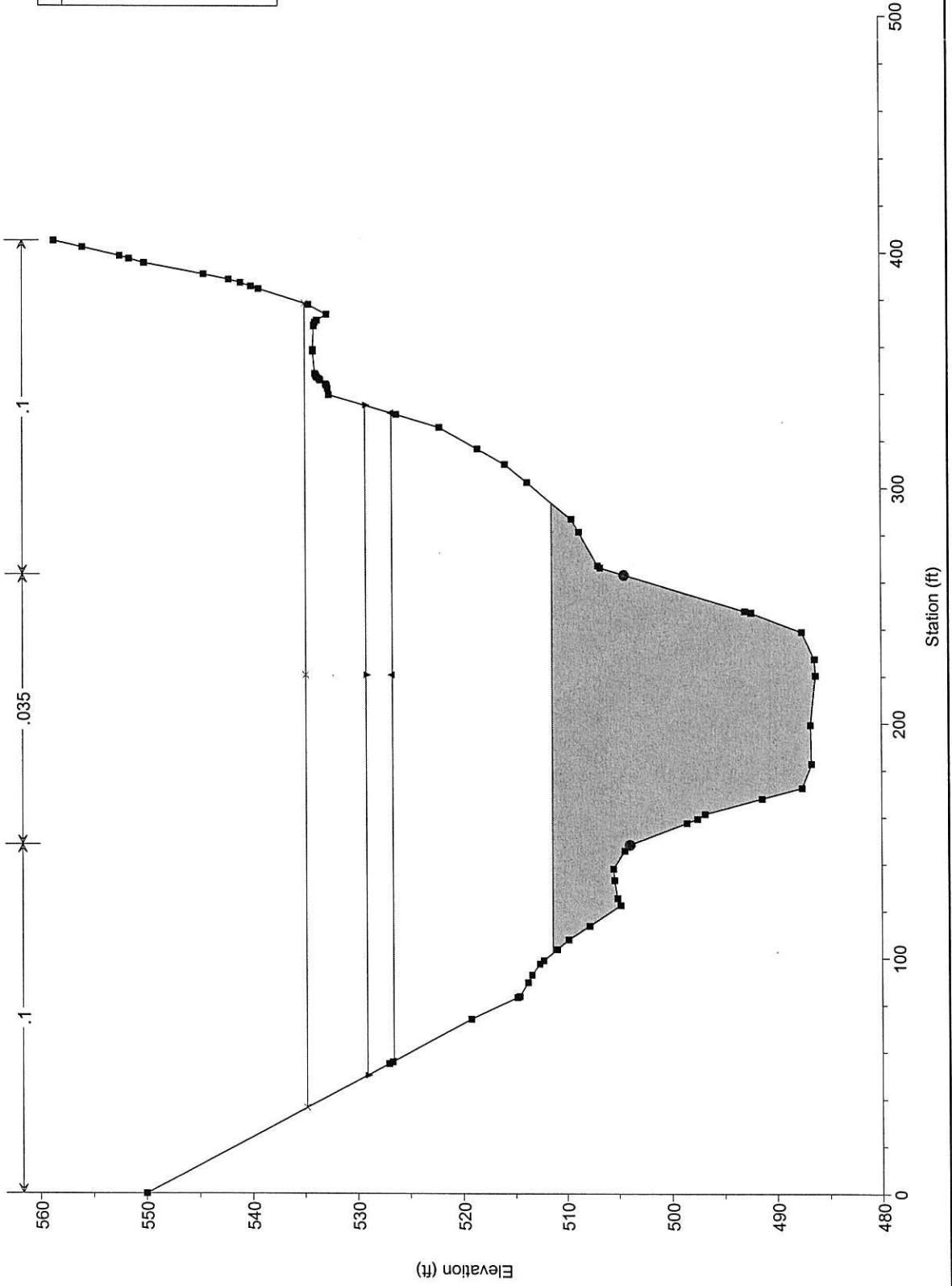
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

RS = 1574



SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

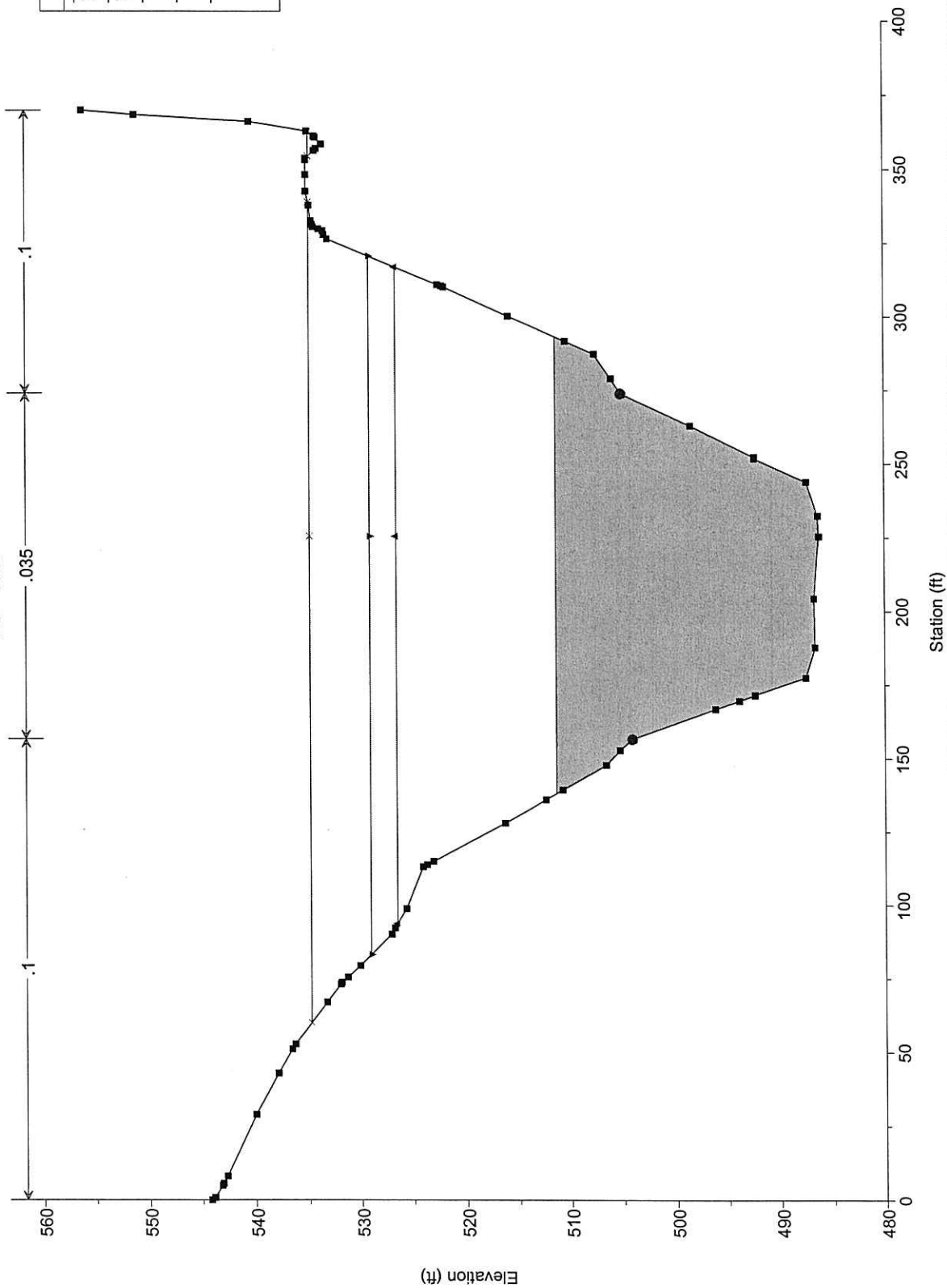
RS = 1395



Legend	
—	WS Q 500
- - -	WS Q 100
- - -	WS Q 50
- - -	WS Q 2
■	Ground
●	Bank Sta

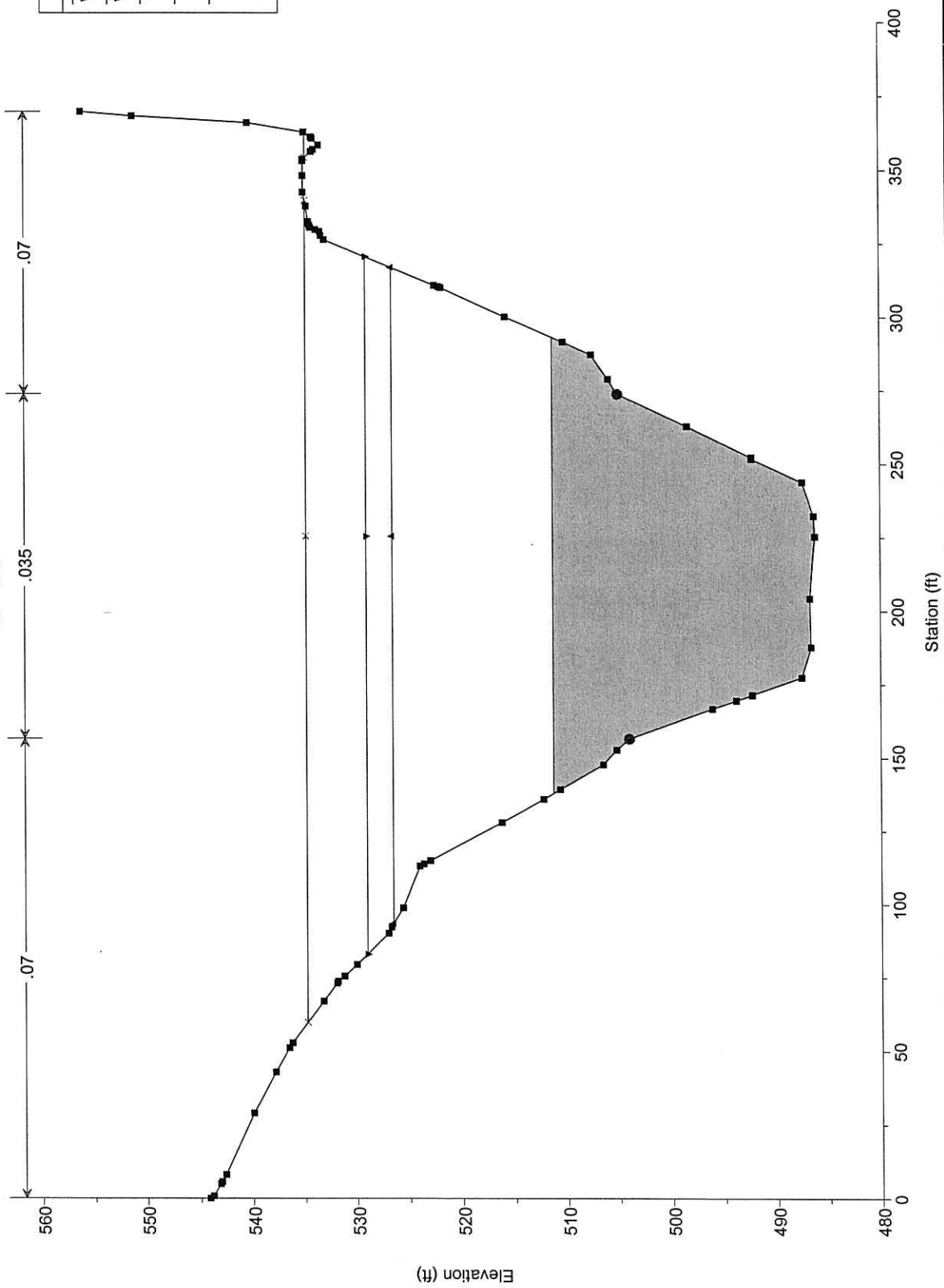
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

RS = 1185



SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

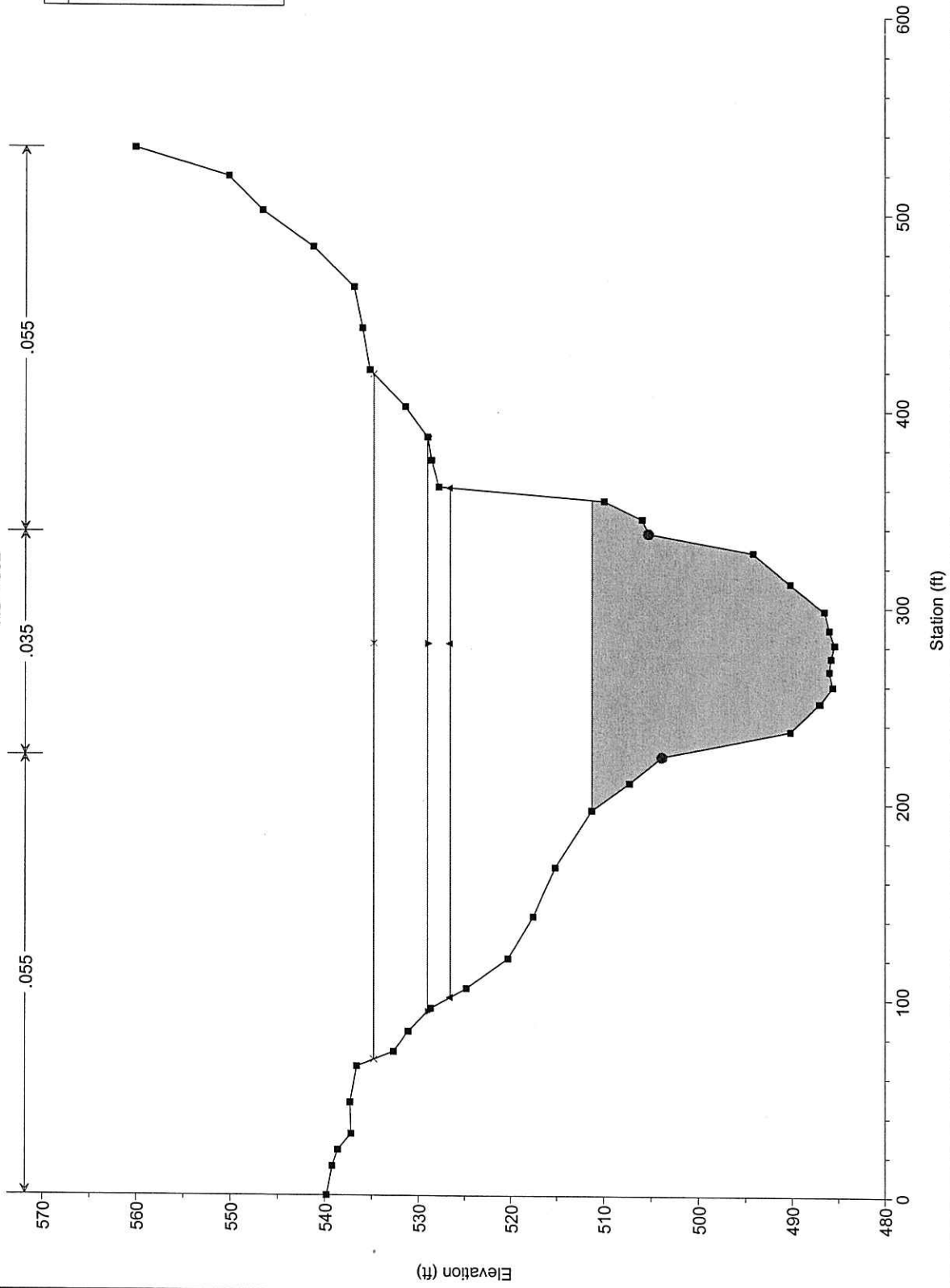
RS = 929



Legend
WS Q 500
WS Q 100
WS Q 50
WS Q 2
Ground
Bank Sta

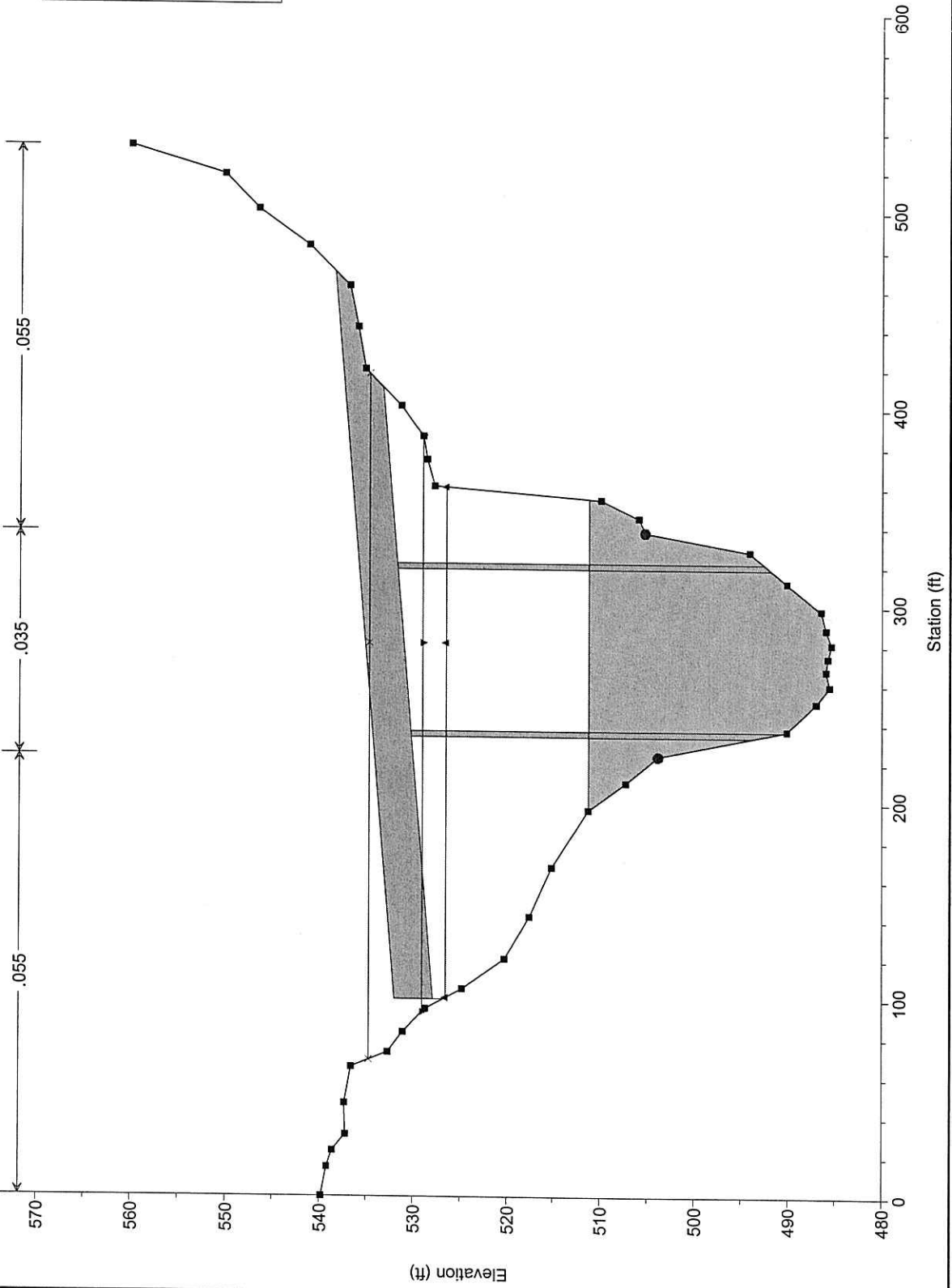
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

RS = 552



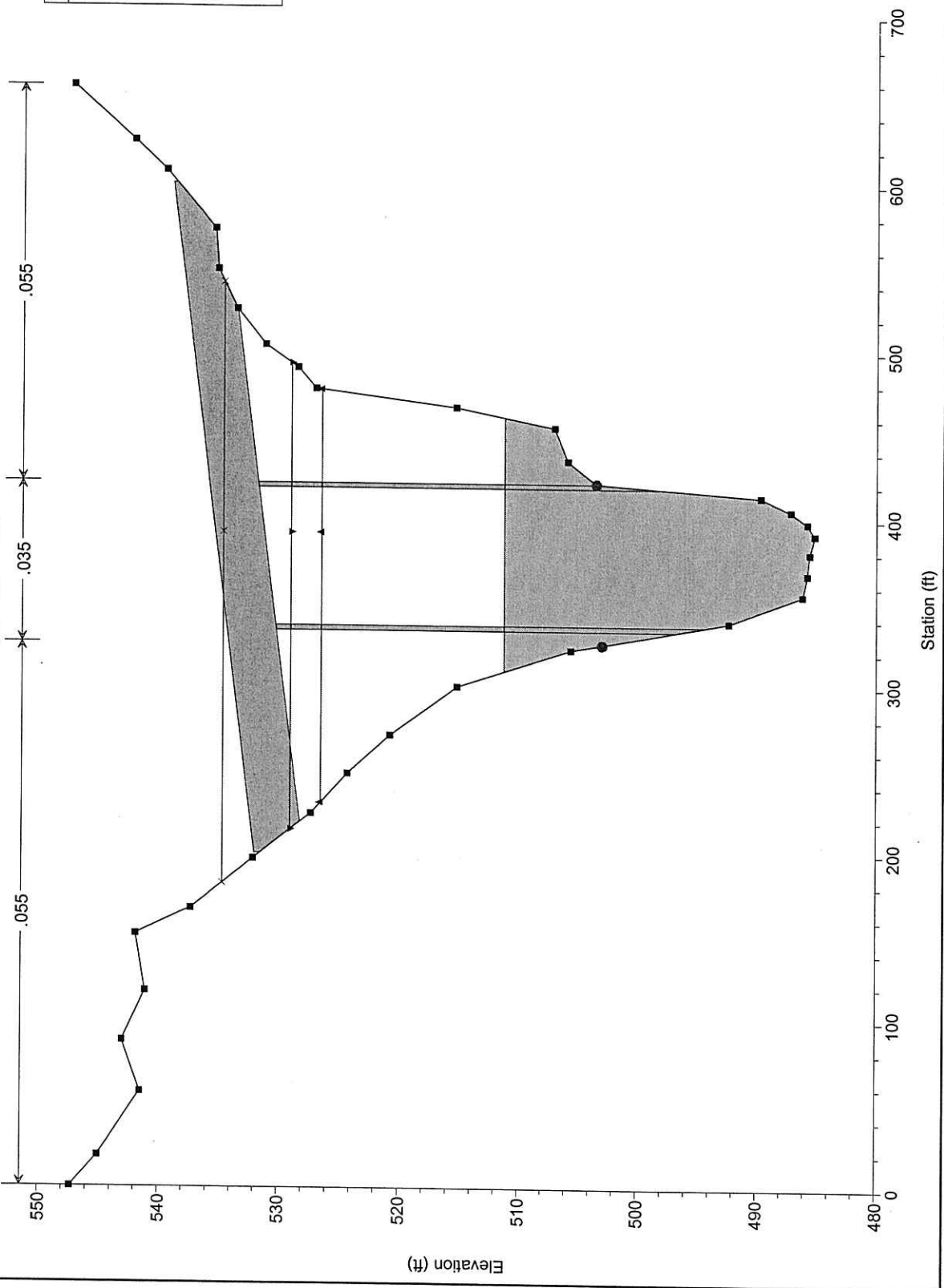
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

RS = 529 BR



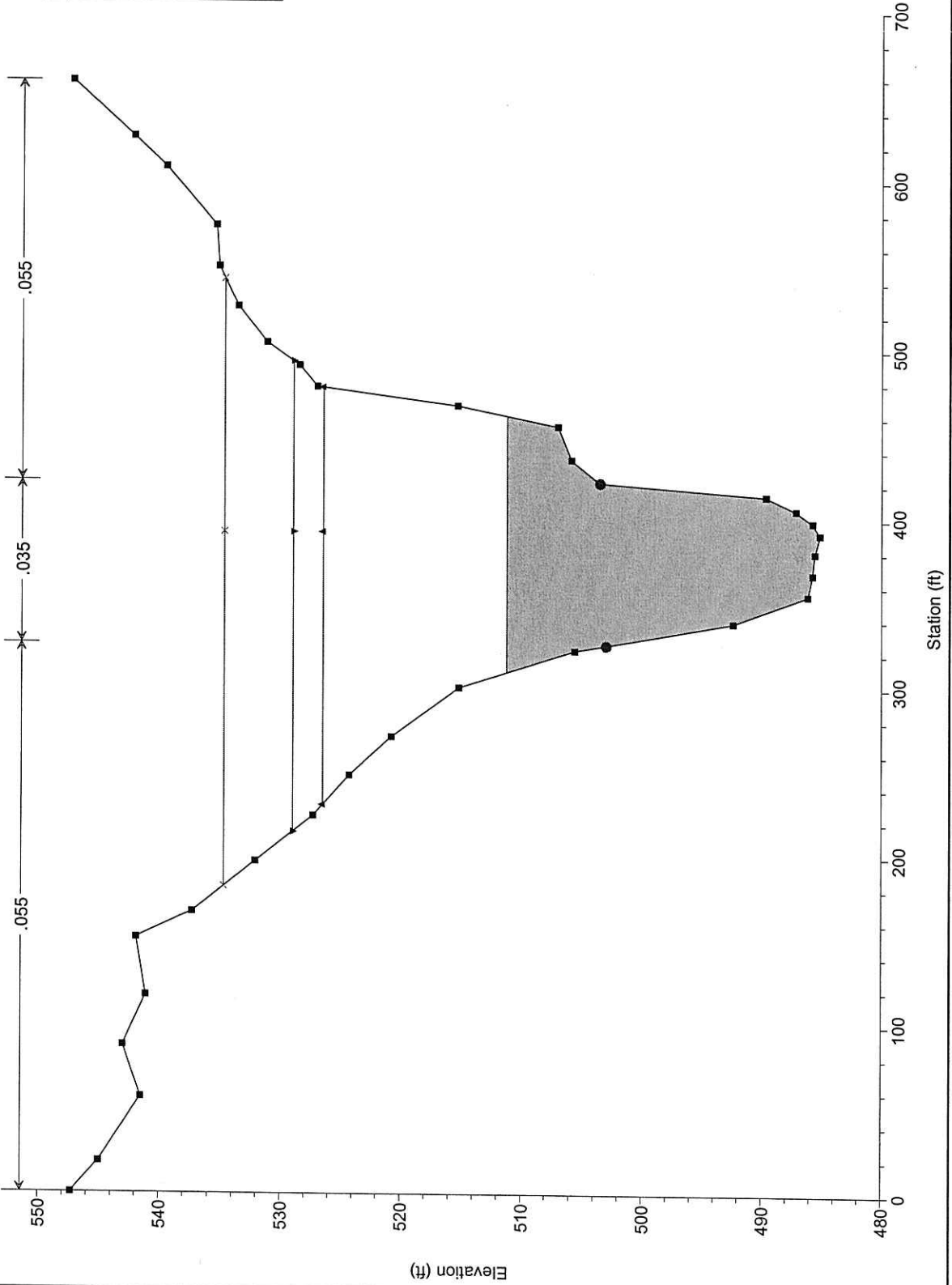
SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

RS = 529 BR



SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

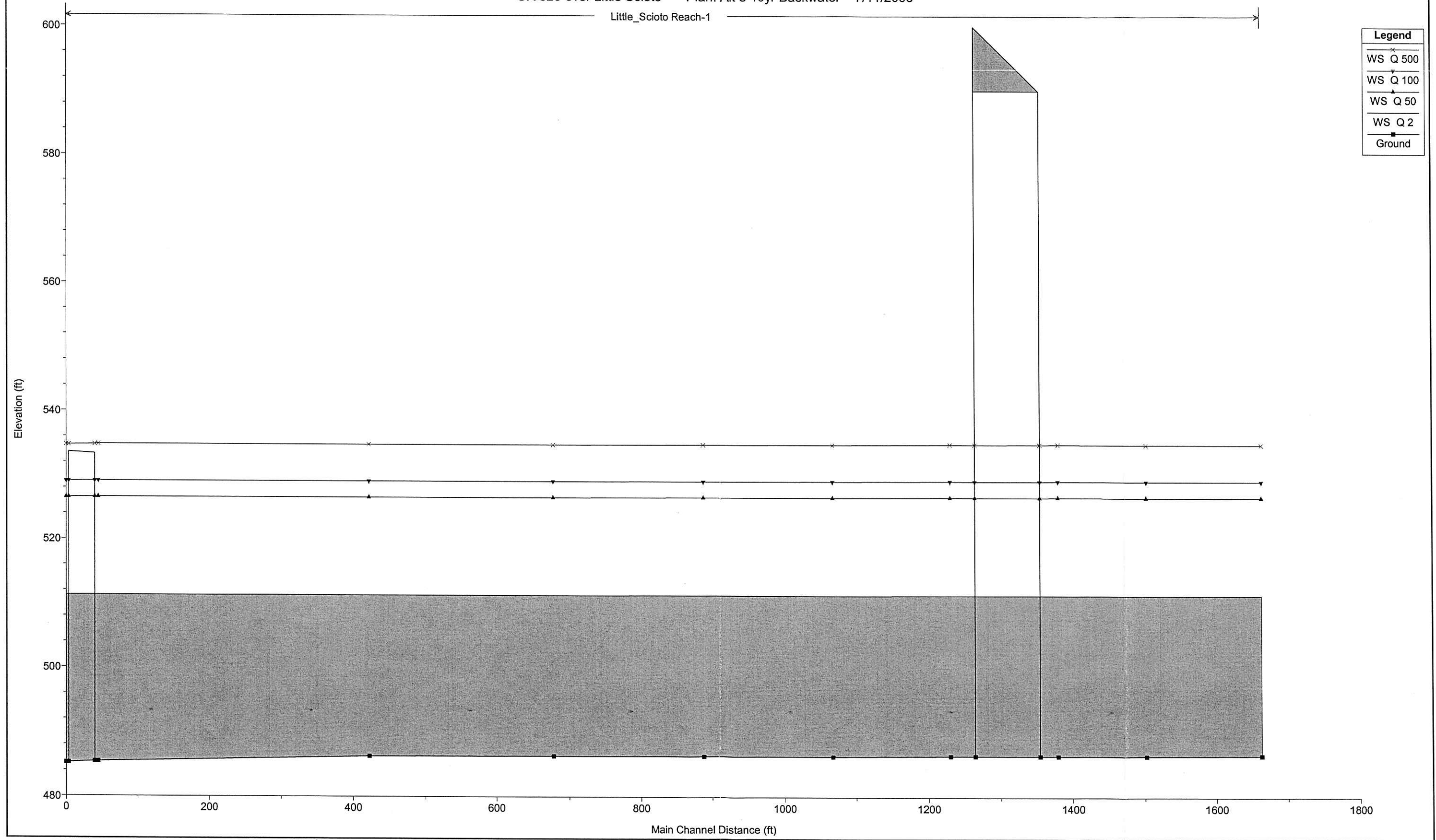
RS = 507



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 3 10yr Backwater 7/11/2006

Little_Scioto Reach-1



Legend	
WS Q 500	x
WS Q 100	▽
WS Q 50	△
WS Q 2	■
Ground	■

HEC-RAS Plan: Alt 3 100 BW River: Little Scioto Reach: Reach-1

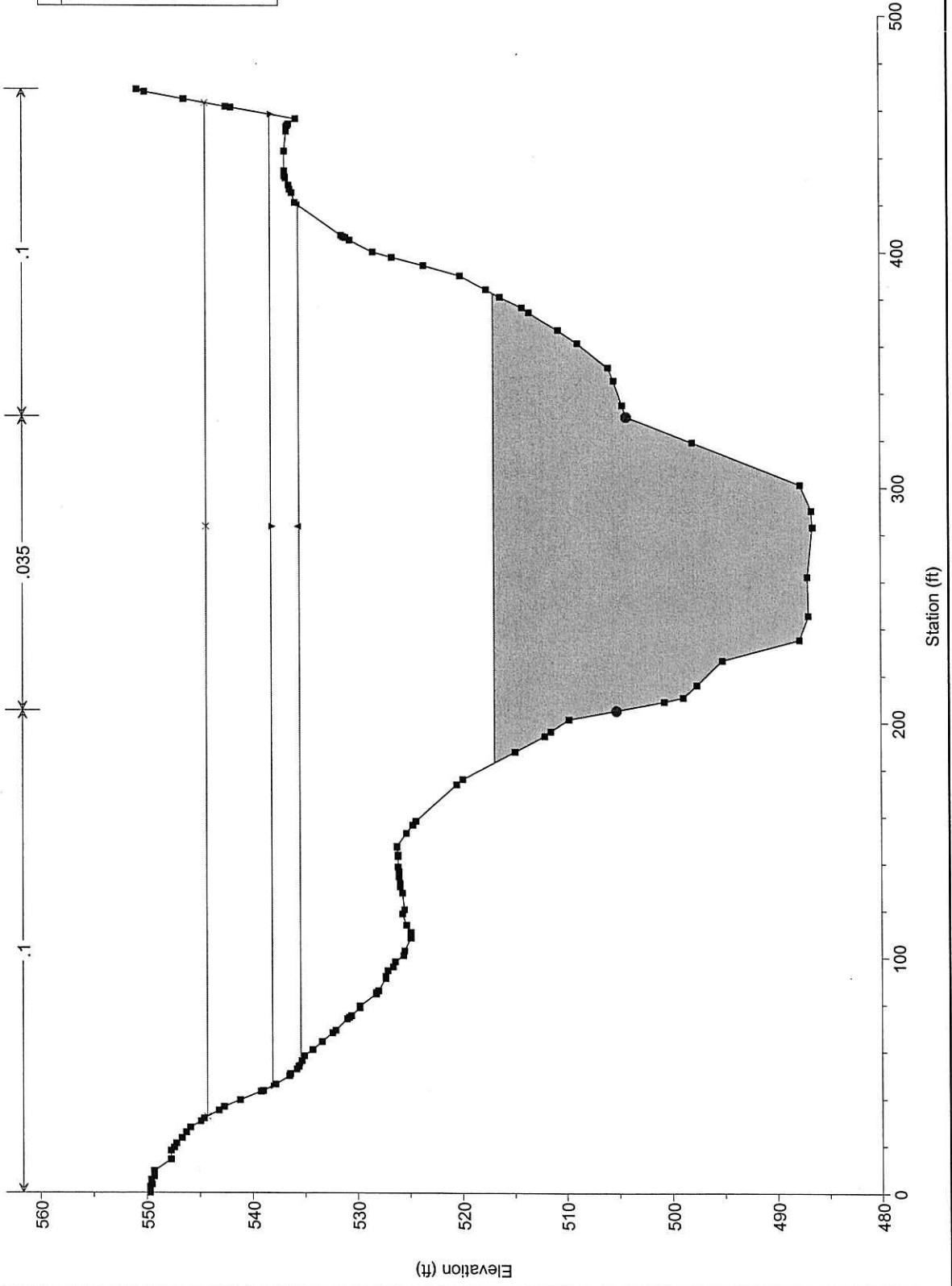
Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Reach-1	2169	Q 2	4968.00	486.50	516.88		516.92	0.000019	1.51	3737.53	199.52	0.05
Reach-1	2169	Q 50	13337.00	486.50	535.41		535.48	0.000019	2.19	8891.72	364.56	0.06
Reach-1	2169	Q 100	15167.00	486.50	538.08		538.16	0.000020	2.33	9945.21	412.56	0.06
Reach-1	2169	Q 500	19717.00	486.50	544.28		544.37	0.000020	2.56	12556.12	430.32	0.06
Reach-1	2008	Q 2	4968.00	486.40	516.88		516.91	0.000020	1.61	3898.07	248.91	0.05
Reach-1	2008	Q 50	13337.00	486.40	535.41		535.47	0.000019	2.20	9409.68	373.86	0.06
Reach-1	2008	Q 100	15167.00	486.40	538.09		538.15	0.000019	2.31	10504.04	423.71	0.06
Reach-1	2008	Q 500	19717.00	486.40	544.29		544.36	0.000019	2.49	13183.31	440.10	0.06
Reach-1	1882	Q 2	4968.00	486.40	516.88	492.58	516.91	0.000018	1.49	4176.40	300.65	0.05
Reach-1	1882	Q 50	13337.00	486.40	535.43	497.48	535.46	0.000011	1.63	11119.23	424.28	0.04
Reach-1	1882	Q 100	15167.00	486.40	538.11	498.35	538.14	0.000011	1.71	12322.69	471.51	0.04
Reach-1	1882	Q 500	19717.00	486.40	544.32	500.42	544.35	0.000010	1.79	15350.22	502.02	0.04
Reach-1	1808	Bridge										
Reach-1	1734	Q 2	4968.00	486.40	516.88		516.90	0.000015	1.37	4331.53	275.13	0.05
Reach-1	1734	Q 50	13337.00	486.40	535.42		535.45	0.000011	1.67	10468.63	409.53	0.04
Reach-1	1734	Q 100	15167.00	486.40	538.10		538.13	0.000011	1.73	11581.08	420.57	0.04
Reach-1	1734	Q 500	19717.00	486.40	544.30		544.34	0.000010	1.85	14254.10	441.18	0.04
Reach-1	1574	Q 2	4970.00	486.30	516.87		516.90	0.000019	1.50	4007.85	241.02	0.05
Reach-1	1574	Q 50	13343.00	486.30	535.39		535.45	0.000018	2.10	9638.29	372.84	0.06
Reach-1	1574	Q 100	15175.00	486.30	538.06		538.13	0.000018	2.21	10646.70	381.00	0.06
Reach-1	1574	Q 500	19727.00	486.30	544.26		544.33	0.000019	2.45	13051.18	394.13	0.06
Reach-1	1395	Q 2	4970.00	486.30	516.86		516.90	0.000020	1.58	3872.47	233.55	0.05
Reach-1	1395	Q 50	13343.00	486.30	535.37		535.44	0.000020	2.28	8985.64	343.88	0.06
Reach-1	1395	Q 100	15175.00	486.30	538.05		538.12	0.000021	2.41	9918.22	354.00	0.06
Reach-1	1395	Q 500	19727.00	486.30	544.24		544.33	0.000022	2.68	12181.13	376.37	0.06
Reach-1	1185	Q 2	4970.00	486.30	516.85		516.89	0.000021	1.59	3471.50	174.88	0.06
Reach-1	1185	Q 50	13343.00	486.30	535.36		535.44	0.000023	2.39	7555.57	305.69	0.06
Reach-1	1185	Q 100	15175.00	486.30	538.03		538.12	0.000024	2.54	8392.78	322.43	0.07
Reach-1	1185	Q 500	19727.00	486.30	544.21		544.32	0.000025	2.83	10529.81	366.63	0.07
Reach-1	929	Q 2	4970.00	486.24	516.85		516.89	0.000020	1.58	3481.23	175.07	0.05

HEC-RAS Plan: Alt 3 100 BW River: Little_Scioto Reach: Reach-1 (Continued)

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
Reach-1	929	Q 50	13343.00	486.24	535.35		535.43	0.000021	2.33	7573.59	306.00	0.06
Reach-1	929	Q 100	15175.00	486.24	538.03		538.11	0.000022	2.45	8412.14	322.86	0.06
Reach-1	929	Q 500	19727.00	486.24	544.21		544.31	0.000023	2.71	10552.97	366.64	0.07
Reach-1	552	Q 2	4970.00	485.40	516.84	492.10	516.88	0.000019	1.56	3608.68	206.49	0.05
Reach-1	552	Q 50	13343.00	485.40	535.36	496.56	535.42	0.000018	2.13	8664.56	356.22	0.06
Reach-1	552	Q 100	15175.00	485.40	538.03	497.33	538.10	0.000019	2.27	9731.47	441.13	0.06
Reach-1	552	Q 500	19727.00	485.40	544.23	499.11	544.30	0.000018	2.41	12683.48	492.93	0.06
Reach-1	529	Bridge										
Reach-1	507	Q 2	4970.00	485.20	516.83	491.97	516.88	0.000024	1.74	3292.24	176.72	0.06
Reach-1	507	Q 50	13343.00	485.20	535.33	496.81	535.41	0.000024	2.46	7990.45	384.89	0.06
Reach-1	507	Q 100	15175.00	485.20	538.00	497.66	538.08	0.000024	2.55	9093.83	430.35	0.06
Reach-1	507	Q 500	19727.00	485.20	544.20	499.69	544.29	0.000024	2.76	12213.17	610.51	0.07

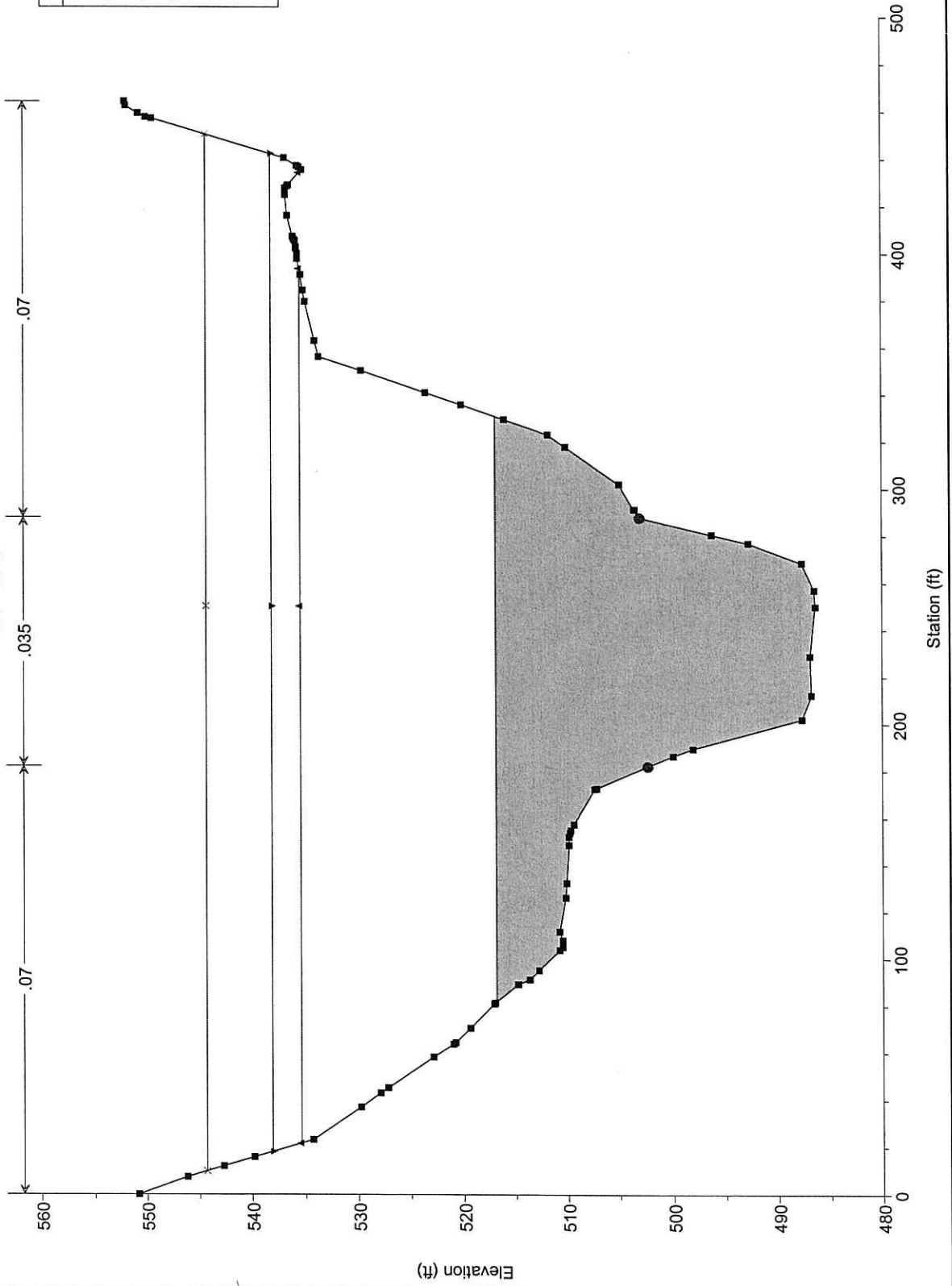
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 2169



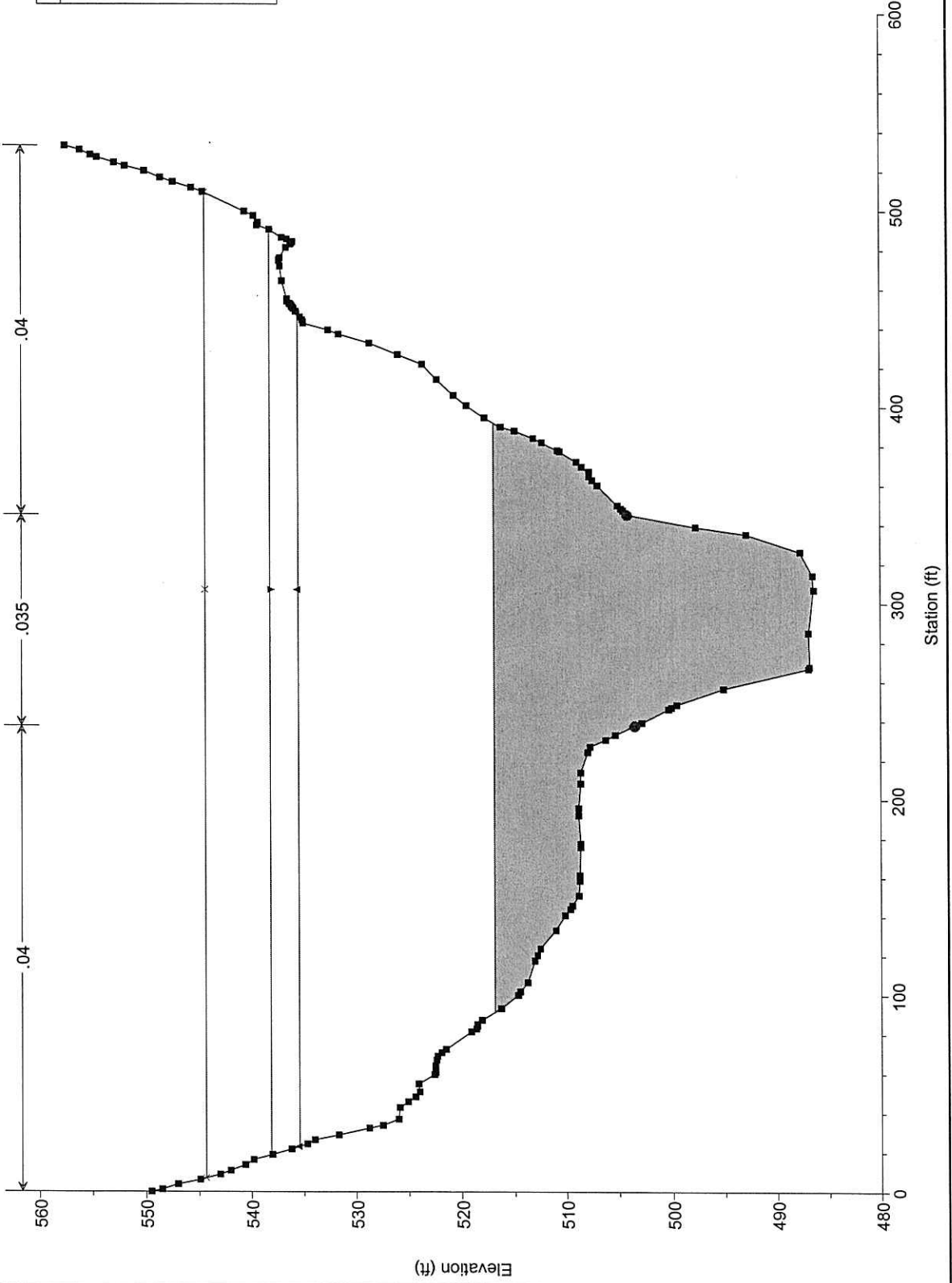
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 2008

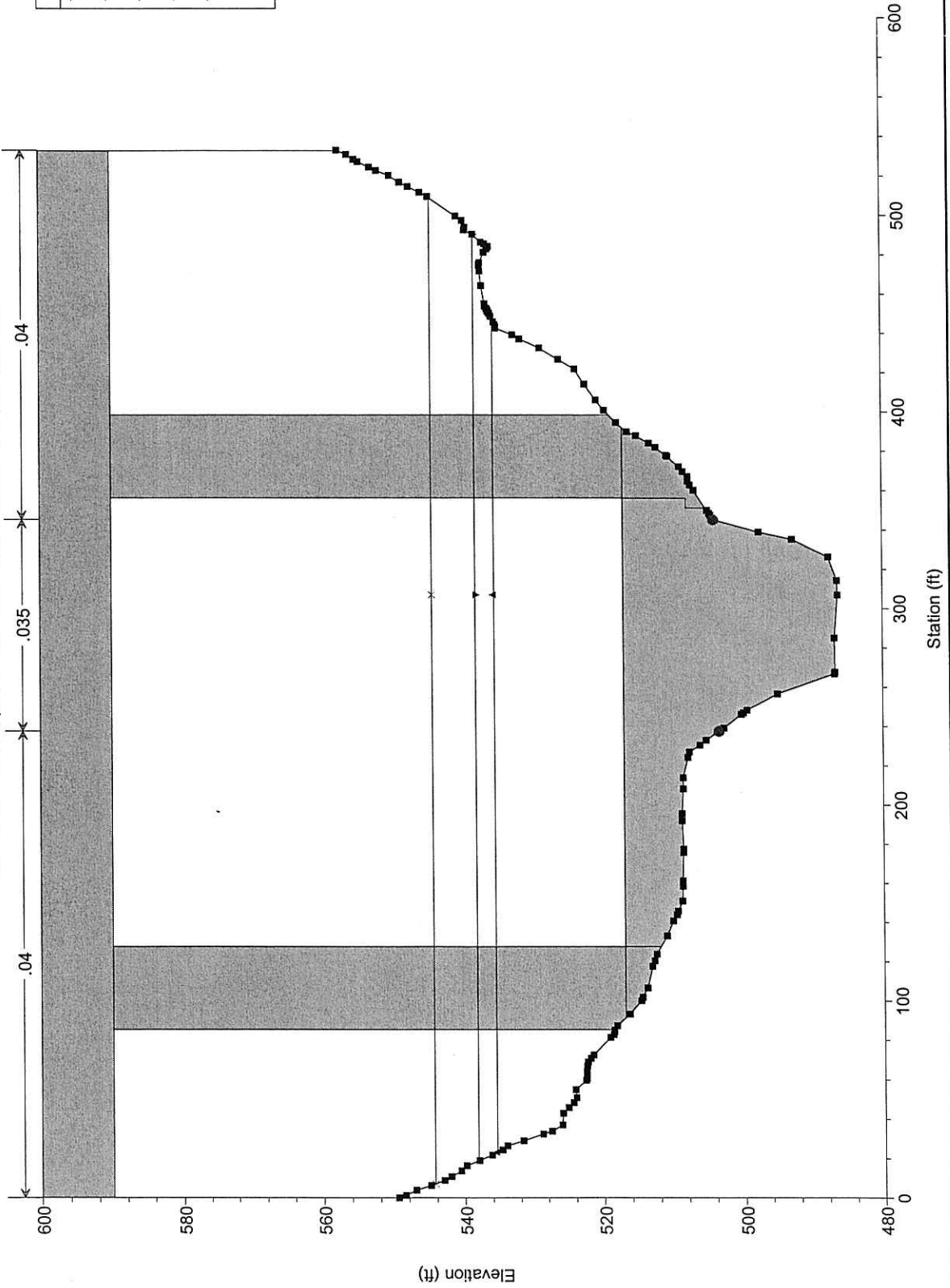


SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

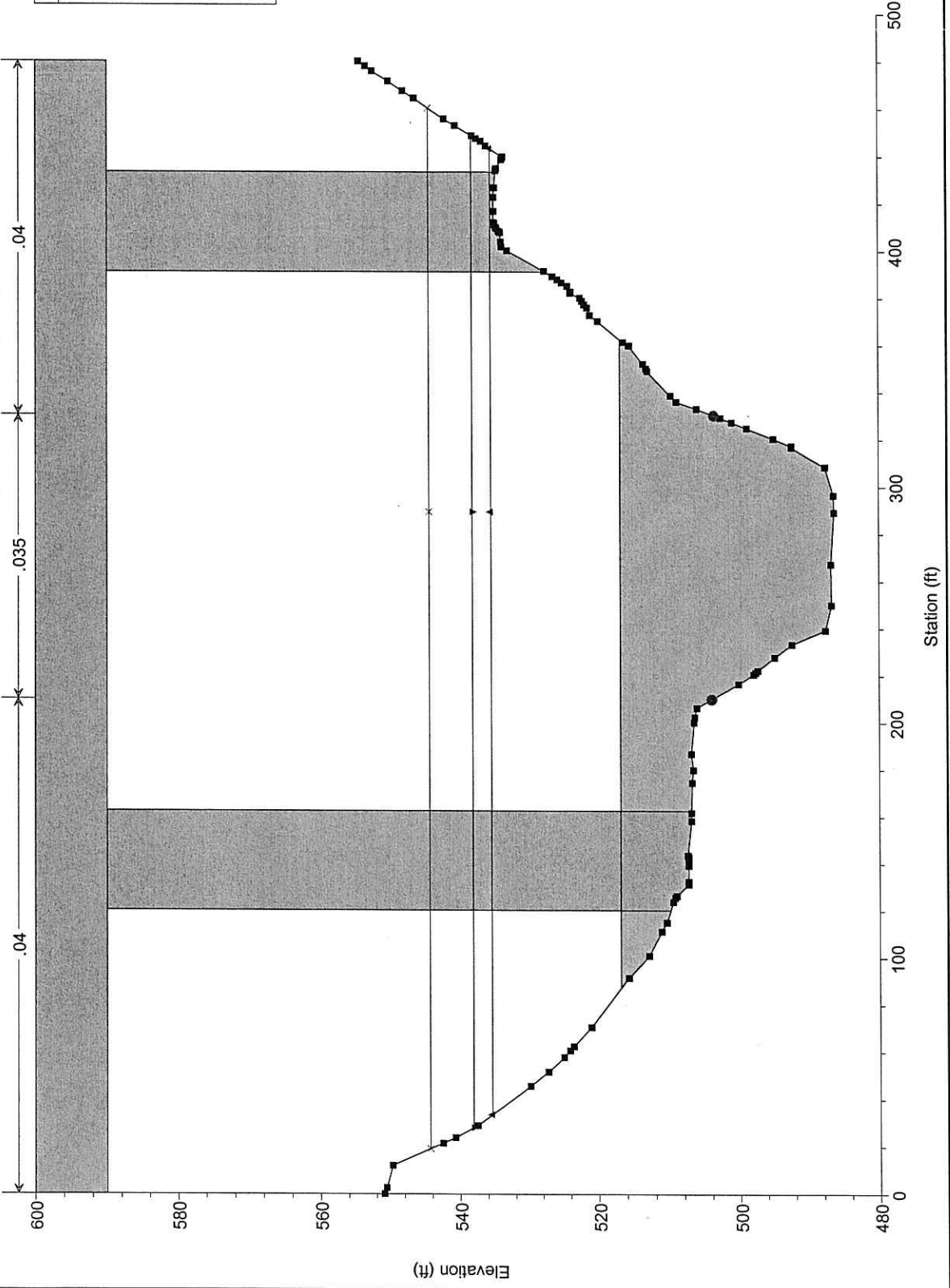
RS = 1882



SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 3 (3 Span w/ Retaining Wall)

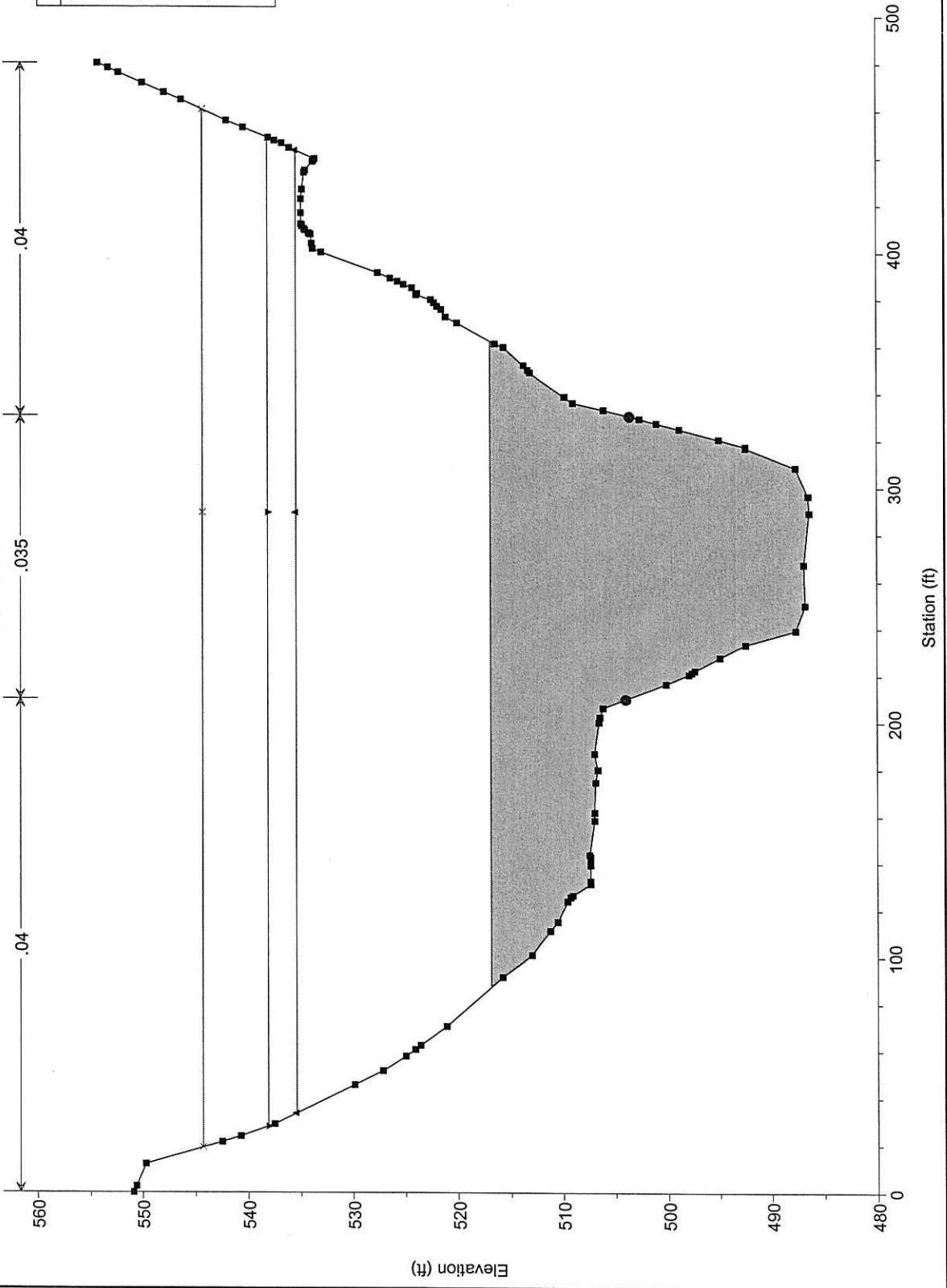


SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006
 RS = 1808 BR Proposed SR 823 Alternative 3 (3 Span w/ Retaining Wall)



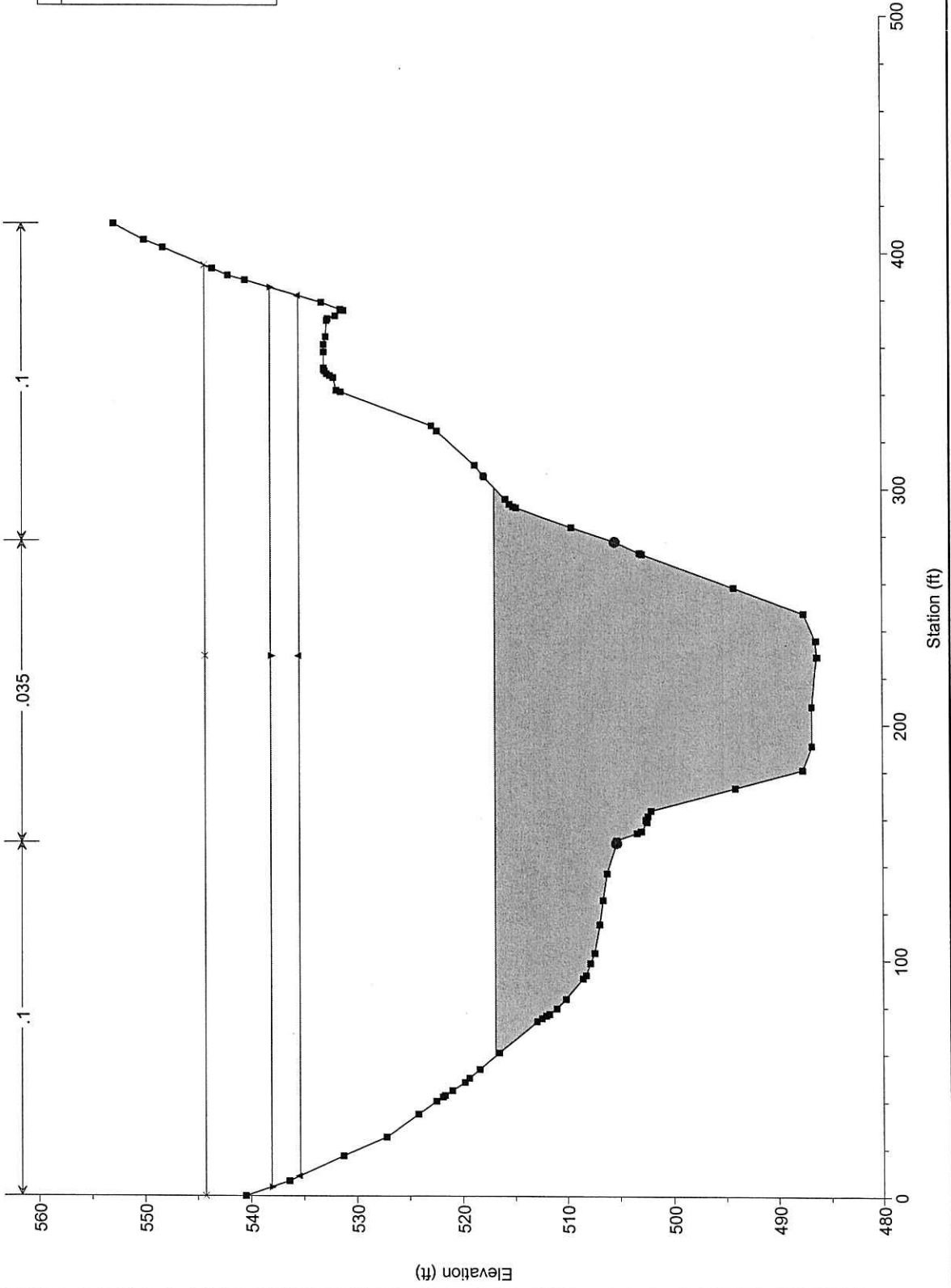
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 1734



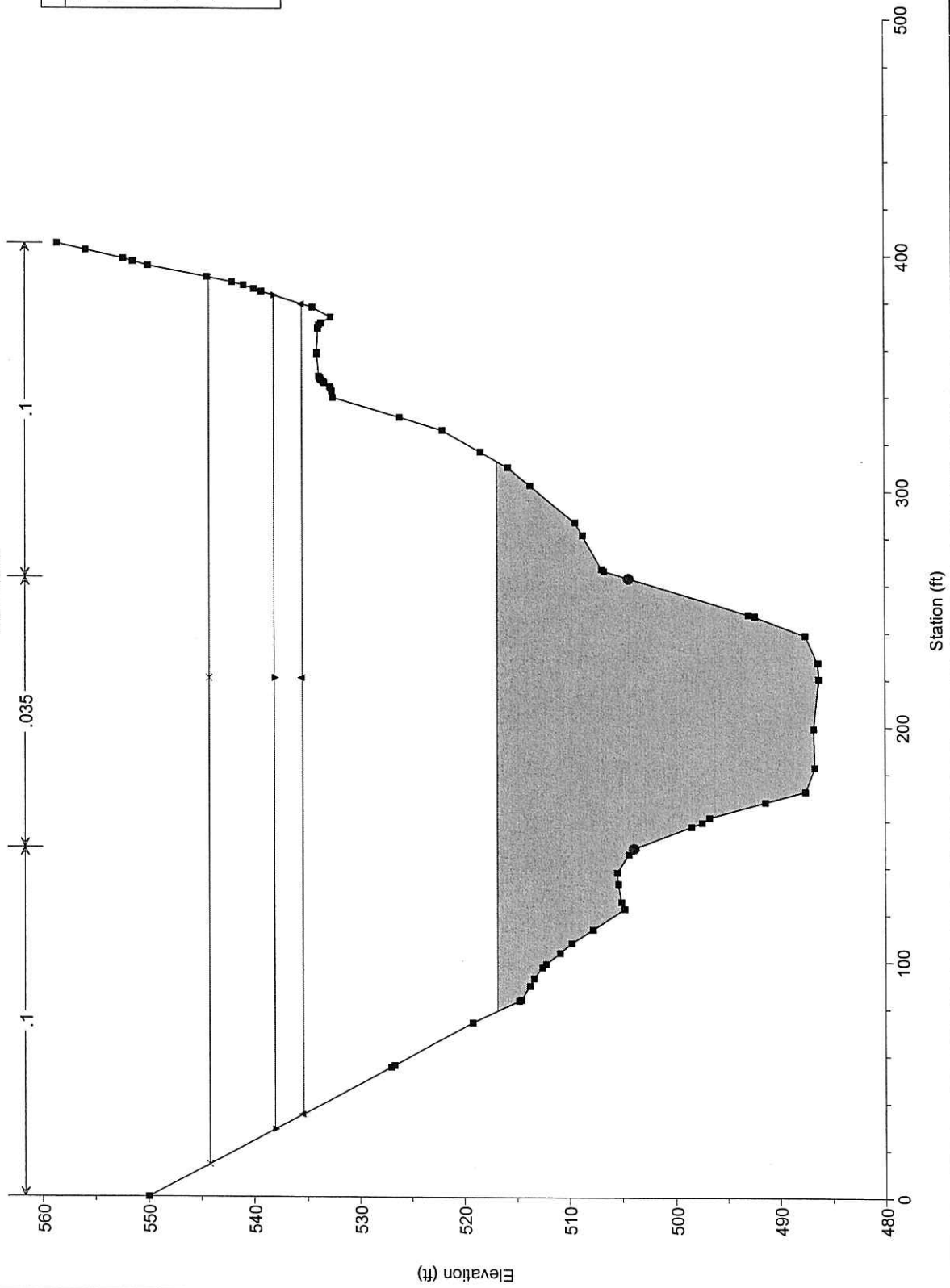
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 1574



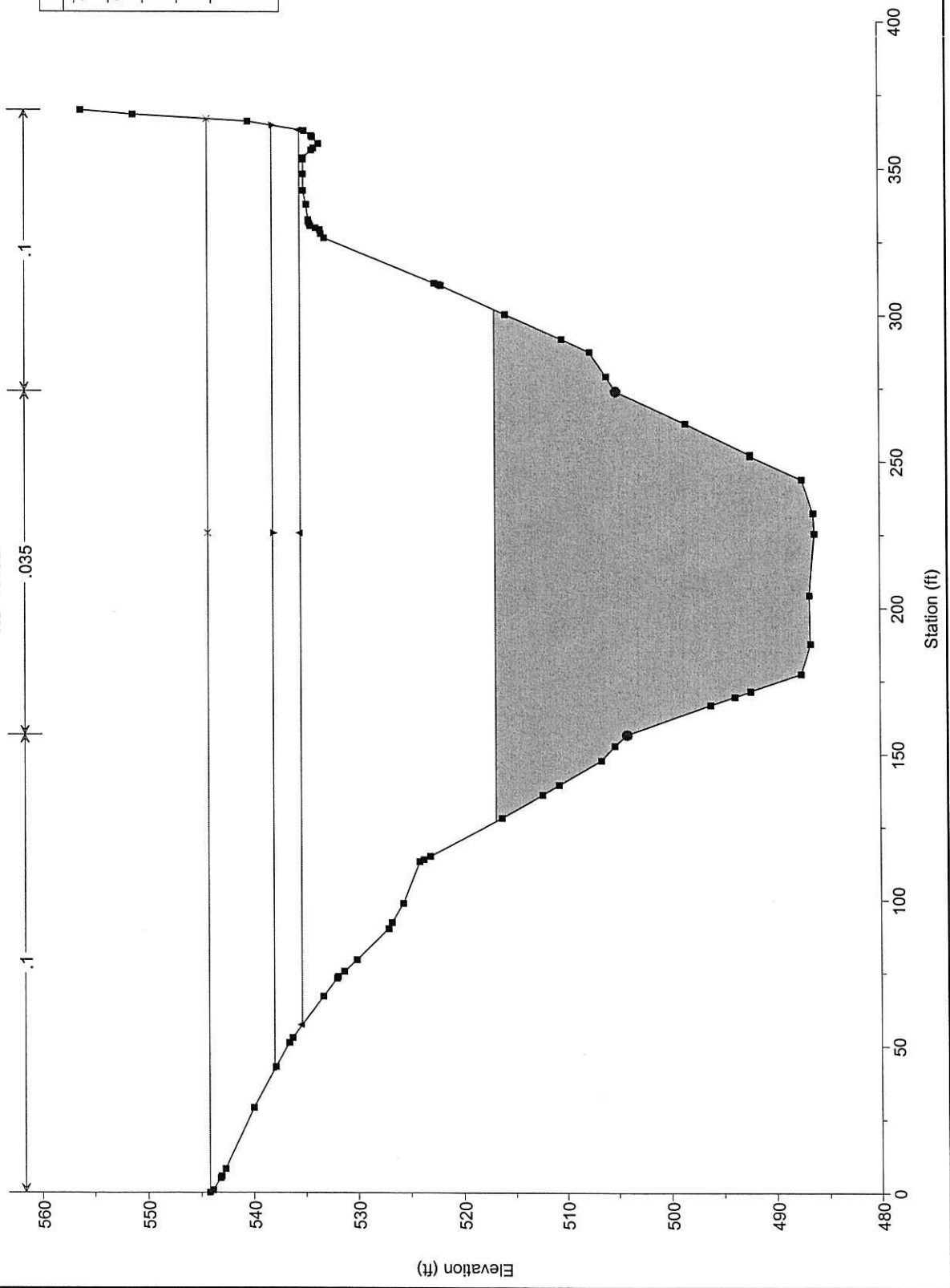
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 1395



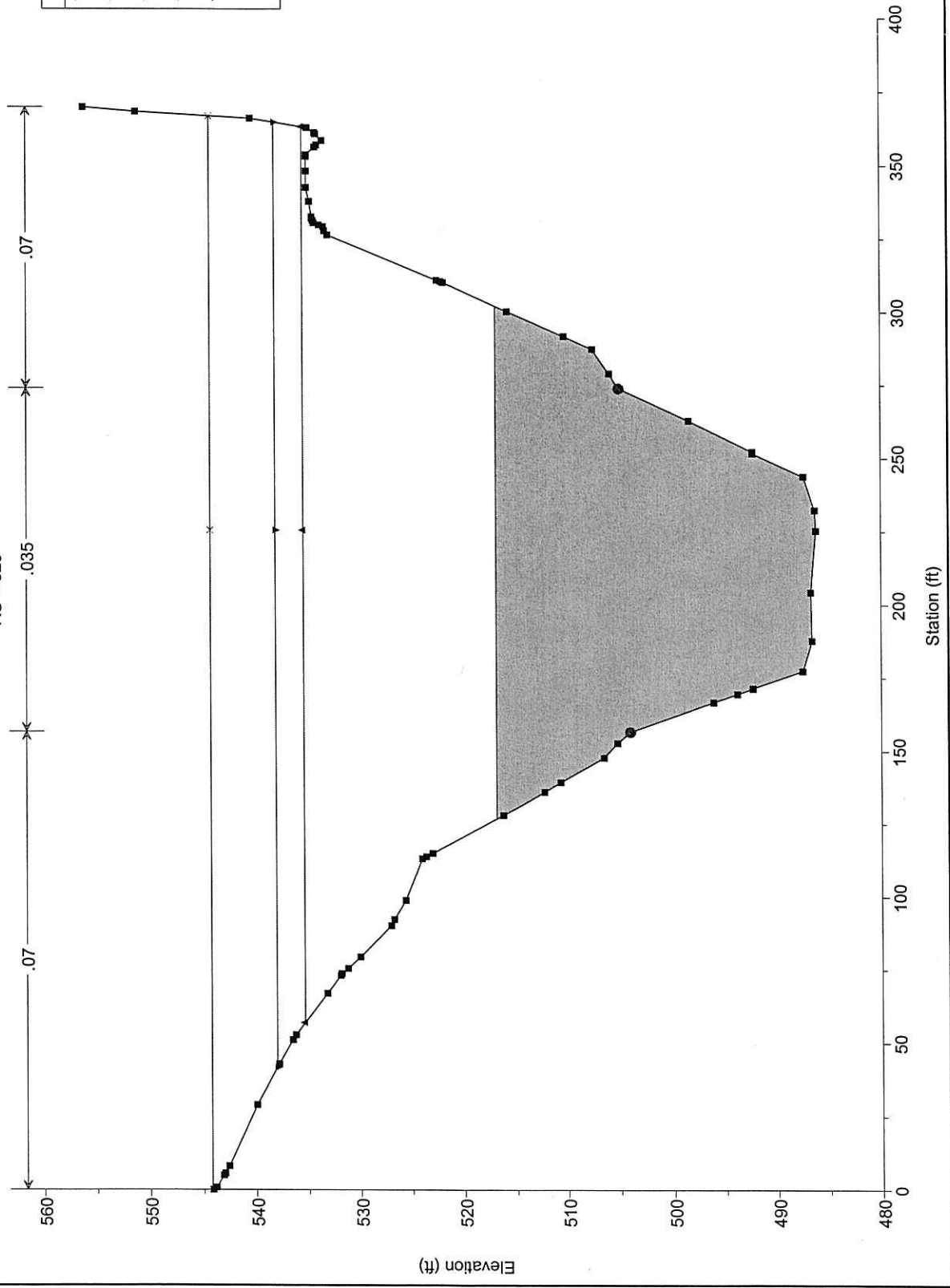
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 1185



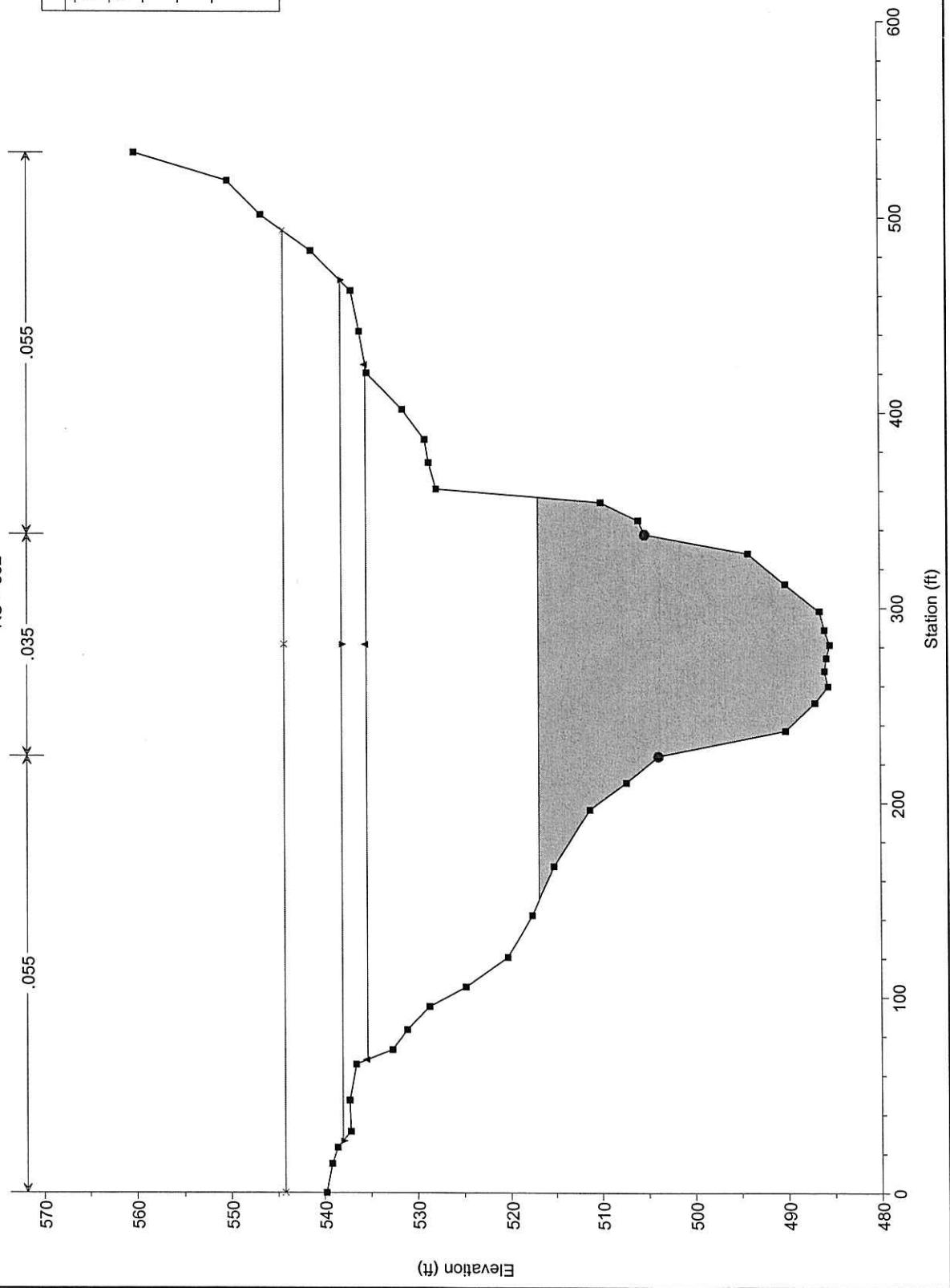
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 929



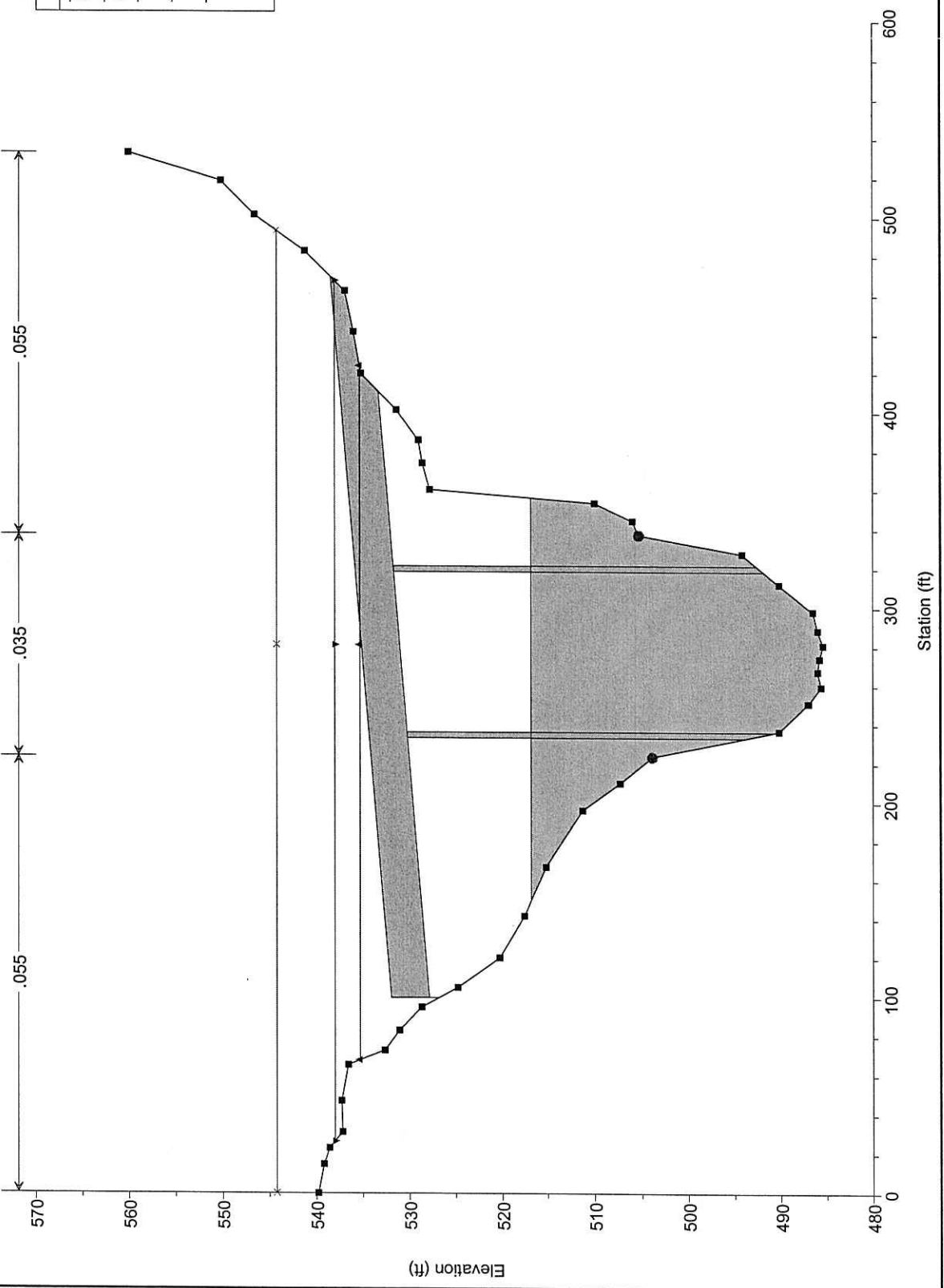
SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

RS = 552



SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

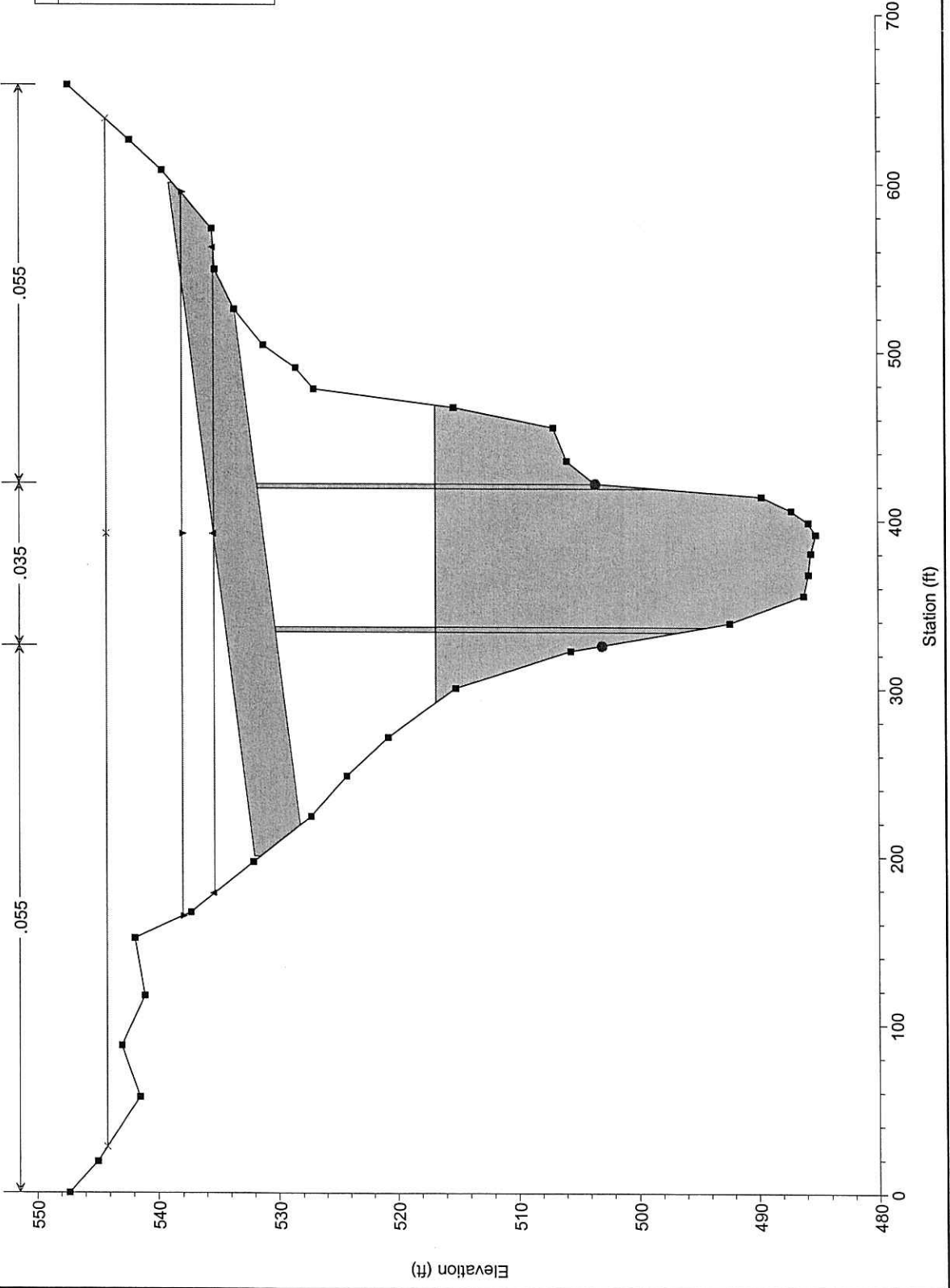
RS = 529 BR



Legend	
WS Q 500	—
WS Q 100	—
WS Q 50	—
WS Q 2	—
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

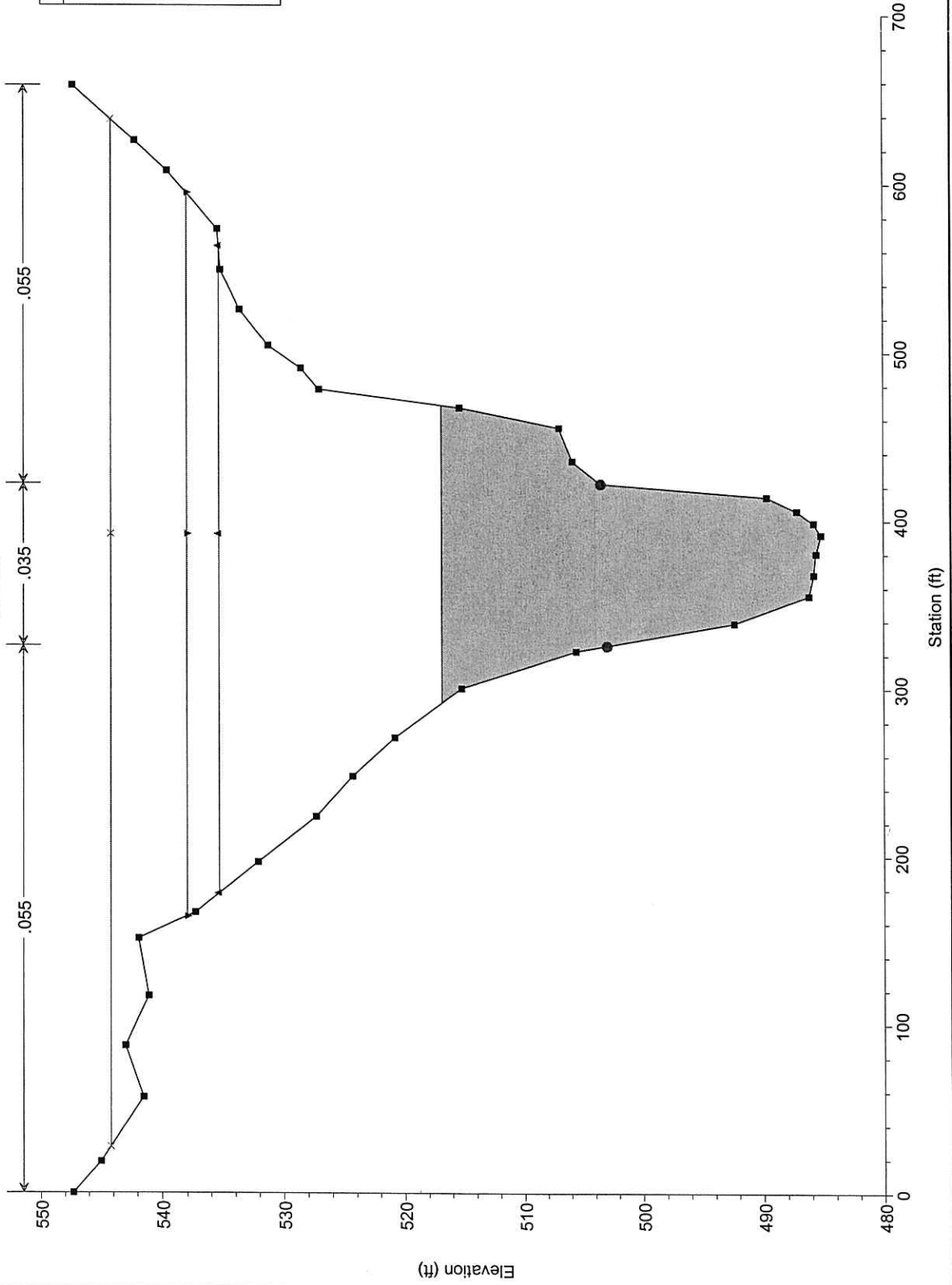
RS = 529 BR



Legend	
WS Q 500	x
WS Q 100	▼
WS Q 50	▲
WS Q 2	■
Ground	—
Bank Sta	●

SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

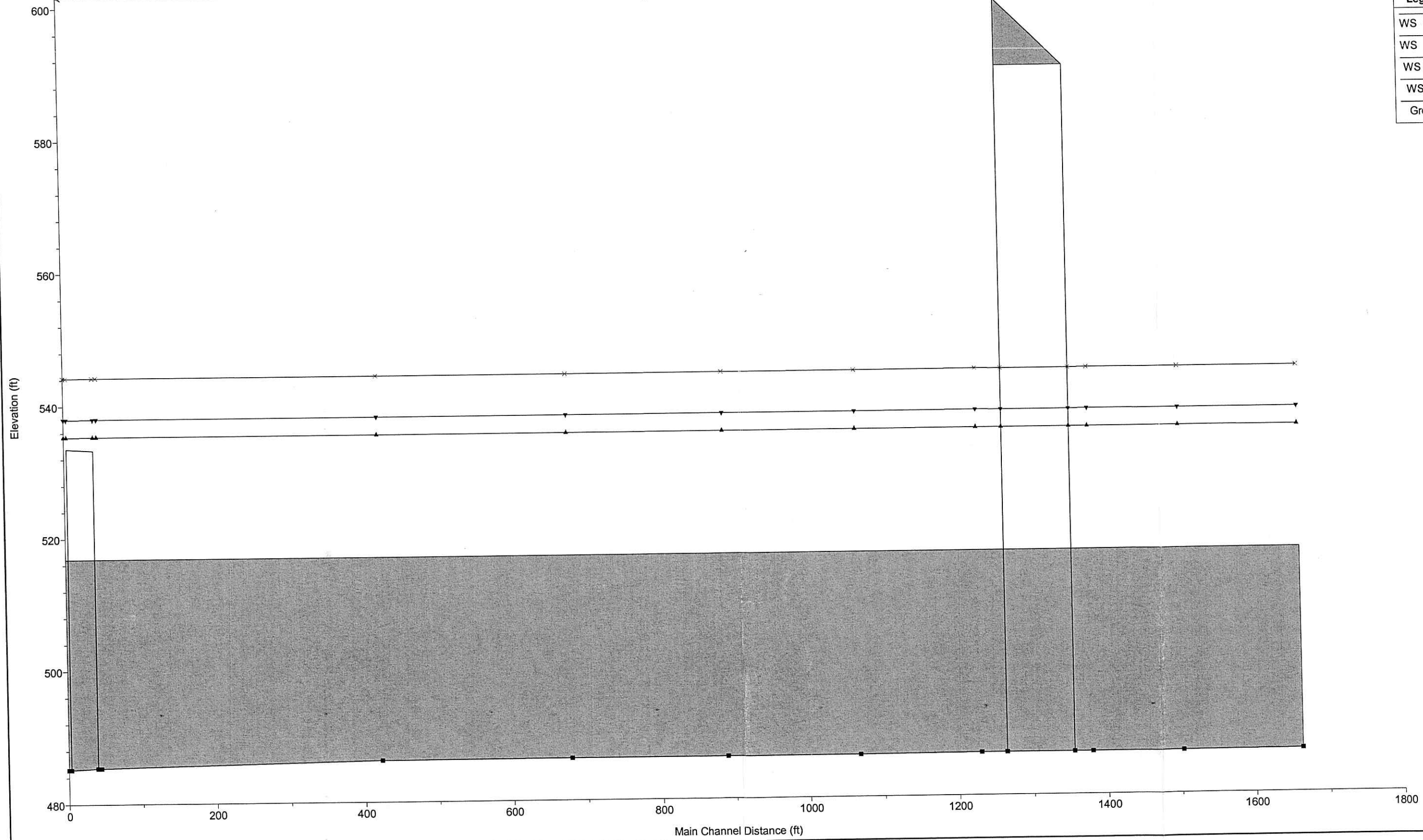
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SR 823 over Little Scioto Plan: Alt 3 100yr Backwater 7/11/2006

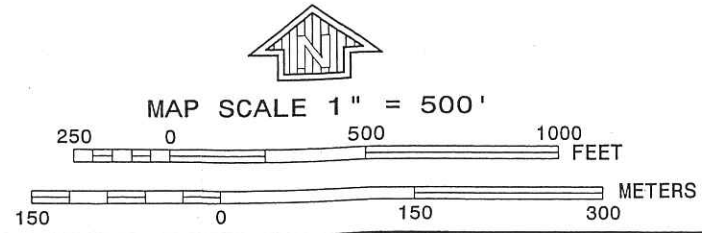
Little_Scioto Reach-1

Legend	
WS Q 500	×
WS Q 100	▼
WS Q 50	▲
WS Q 2	■
Ground	■



For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.



NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0288 D

FIRM
FLOOD INSURANCE RATE MAP
SCIOTO COUNTY,
OHIO
AND INCORPORATED AREAS

PANEL 288 OF 555

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
PORTSMOUTH, CITY OF	390498	0288	D
SCIOTO COUNTY	390496	0288	D

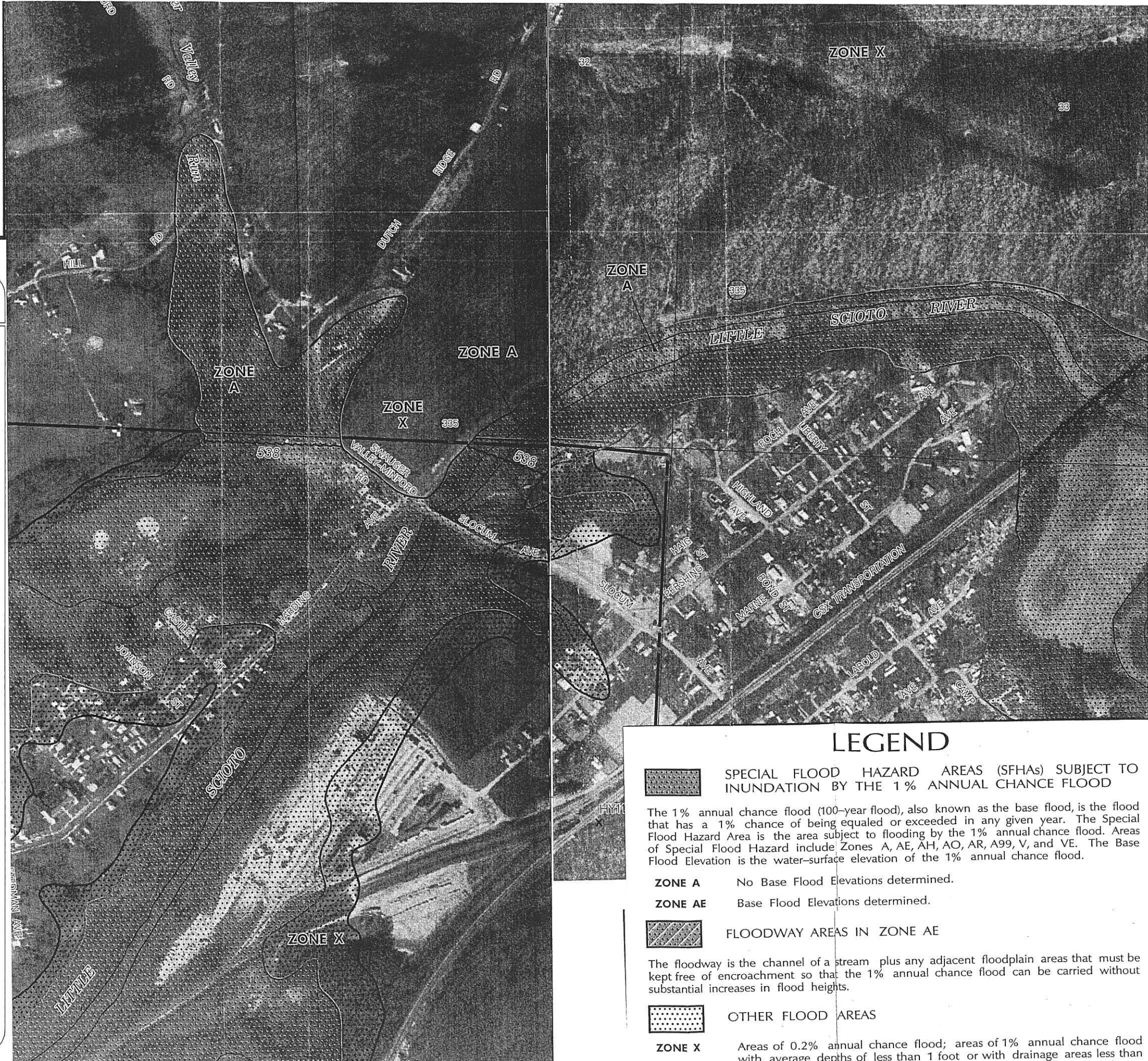
Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.



MAP NUMBER
39145C0288 D

EFFECTIVE DATE
SEPTEMBER 4, 2002

Federal Emergency Management Agency



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

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