MOORES RUN, BALTIMORE CITY, MARYLAND
2008 ABBREVIATED GEOMORPHIC CONDITION AND CHANNEL STABILITY RESURVEY

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Stream Habitat Assessment and Restoration Program
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

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Annapolis, MD
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I. INTRODUCTION

The City of Baltimore (City) and the U.S. Fish and Wildlife Service, Chesapeake Bay Field Office (Service) entered into a cooperative agreement (Agreement 51410-1902-5047) to facilitate stream and riparian habitat assessment and restoration projects within the City. The survey of Moores Run, which is part of a stream monitoring network under the City's National Pollutant Discharge Elimination System (NPDES) permit, is included under this agreement.

The Service conducted an initial geomorphic condition and channel stability field survey for Moores Run in October 2003. Under that project scope of work, the Service conducted a limited data analysis, including a comparison of existing City data sets with the data gathered by the Service, a bank erosion prediction, and Rosgen Level III stream stability and sediment supply analysis. In 2005 and 2007, the Service completed abbreviated geomorphic surveys to assess stream stability conditions and evaluate changes in stream stability.

In 2003, the Service assessed the stability conditions of Reach 09. For the 2005 and 2007 resurveys, the Service did not assess the stability conditions of this reach because of an active bank stabilization project located in Reach 09. However, as part of 2008 resurvey, the Service assessed the stability conditions of Reach 09 following the completion of the bank stabilization project.

In 2008, the Service completed another abbreviated geomorphic survey to assess the current stream stability conditions, as well as to validate stability predictions made in the 2007 resurvey. The stream stability analysis for previous surveys followed the methodology provided in the Rosgen (2001b) *A Stream Channel Stability Assessment Methodology*. However, in 2008, Wildland Hydrology, Inc. revised the stability analysis methodology (Rosgen 2008). The Service analyzed the 2008 stream data using the revised stability analysis. The Service did not reanalyze the stream data from the previous surveys. In certain situations, the Service was not able to compare the analysis results because of the change in the stability analysis method. However, when possible the Service compared current analysis results with results from previous surveys.

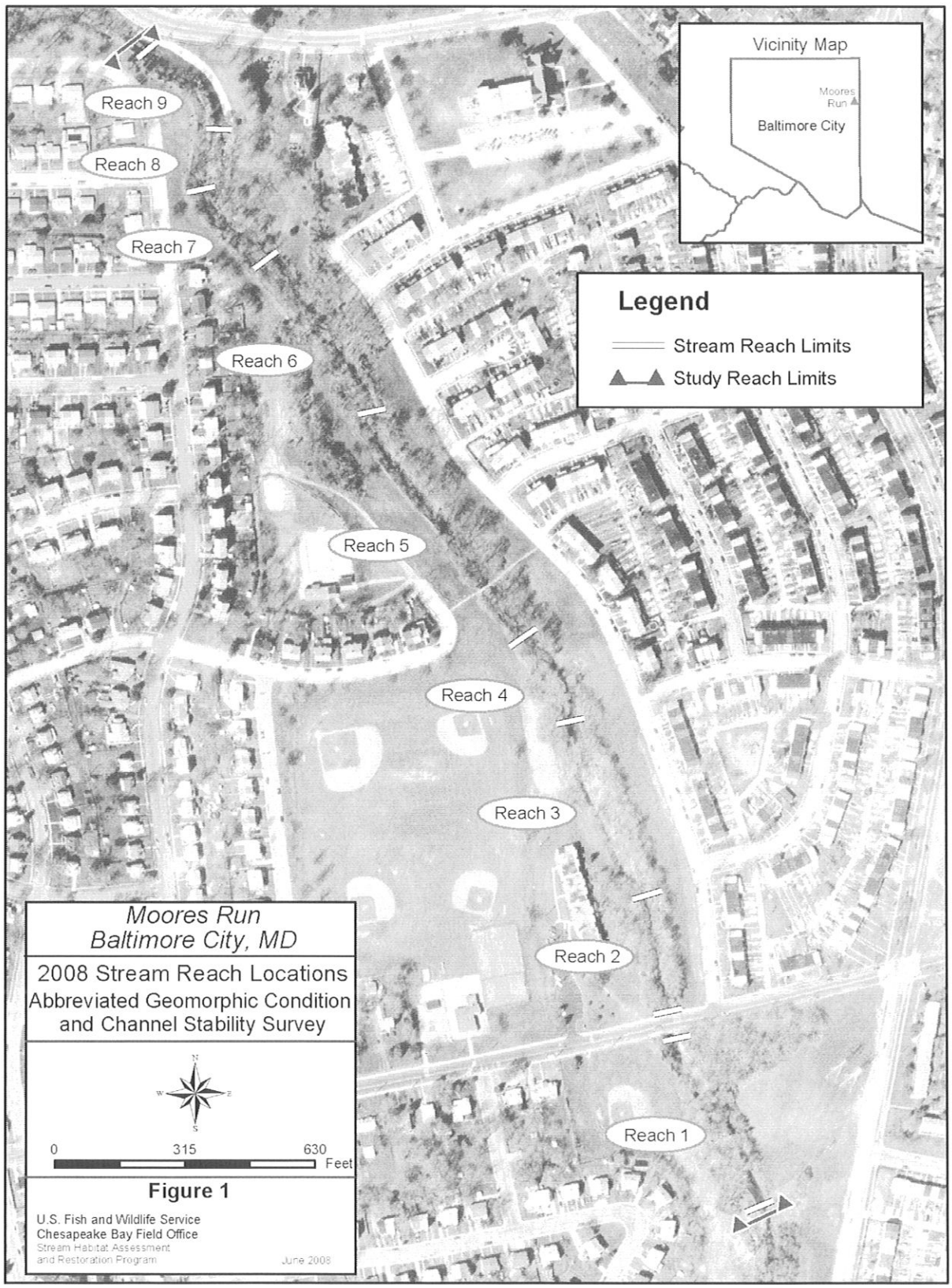
This report contains a summary of the field data collected by the Service, the comparison between 2003, 2005 and 2007 data, as well as an interpretation of the 2008 data and revised Rosgen Level III stream stability and sediment supply analysis.

II. MOORES RUN EXISTING CONDITIONS

The Moores Run assessment area starts at the quadruple-cell box culvert located near the intersection of Hamilton Avenue and Evanshire Avenue, and ends approximately 520 feet downstream of the Radecke Road crossing in Baltimore City, Maryland (Figure 1).

A. Moores Run 2008 Reach Delineation

In 2003, the Service divided Moores Run into nine stream reaches based on geomorphic characteristics and stability conditions. Since the stream type and stability conditions of the reaches have not significantly changed, the Service used the same nine originally identified reaches from the previous surveys (Table 1).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Moores Run
Baltimore City, MD
2008 Stream Reach Locations
Abbreviated Geomorphic Condition
and Channel Stability Survey
N
W
E
S
0
315
630
Feet
Figure 1
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
Stream Habitat Assessment
and Restoration Program
June 2008

Table 1. Reach Number and Length			
Reach Number	**Reach Length (ft)**	**Reach Number**	**Reach Length (ft)**
01	520	06	489
02	255	07	134
03	448	08	169
04	317	09	354
05	672	**Total**	**3,358**

B. Rosgen Stream Types

Similar to the previous surveys, the 2008 abbreviated geomorphic survey identified four Rosgen Level I stream types (*i.e.,* B, C, D, and F) (Rosgen 1996). There were no changes in stream type for the study reaches. The F stream type represents 44 percent, the C stream type represents 28 percent, the D stream type represents 23 percent, and the B stream type represents 5 percent of the classified stream reaches (Table 2). Reach 04 and 09 were transitional reaches, consisting predominately of pools, which the Service did not classify. Because Moores Run was straightened, only one value for sinuosity was calculated for the entire assessment area.

Table 2. Rosgen Stream Type Classification							
Reach	**Classification Cross Section**	**Stream Type**	**Entrenchment Ratio**	**Width/ Depth Ratio**	**Sinuosity**	**Reach Slope (ft/ft)**	**Substrate**
01	Service XS G	C	2.87	21.0	1.07	0.0035	Gravel with Bedrock
02	Baltimore XS 32	C	3.18	18.9		0.0114	Cobble with Boulder
03	Service XS A	D	5.06	14.0		0.0119	Cobble
04	N/A	Transitional Reach – Not Classified				N/A	Gravel/Cobble with Bedrock
05	Service XS C	F	1.20	23.1		0.0105	Cobble with Boulder
06	N/A	F	Not Resurveyed in 2008			0.0168	Cobble with Bedrock
07	N/A	B	Not Resurveyed in 2008			0.0365	Cobble with Boulder
08	N/A	D	Not Resurveyed in 2008 Similar to Reach 03			0.0199	Cobble with Boulders & Bedrock
09	N/A	Transitional Reach – Not Classified				N/A	Gravel/Sand

Reach 01, the farthest downstream reach, is a Rosgen C stream type that is slightly entrenched with a moderate width/depth ratio, shallow slope, and a gravel substrate with bedrock grade control. Reach 02 is also a Rosgen C stream type but with a moderately steep slope and a cobble/boulder substrate.

Reach 03 and 08 are Rosgen D (i.e., braided) stream types, which are slightly entrenched with moderate width/depth ratios. Reach 03 has a moderately steep slope and cobble substrate and reach 08 has a highly steep slope and a cobble substrate with bedrock control.

Reaches 04 and 09 are transitional reaches consisting predominately of pools. Reach 04 has a gravel/cobble substrate with bedrock. Reach 09 has a predominately sand and gravel substrate.

Reaches 05 and 06 are Rosgen F stream types, which are highly entrenched with moderate width/depth ratios, moderately steep slopes, and a cobble/boulder substrate. Reach 06 has bedrock control. Reach 07 is a Rosgen B stream type that is moderately entrenched with a moderate width/depth ratio, highly steep slope, and a cobble/boulder substrate.

III. SERVICE FIELD DATA COMPARISON SUMMARY

In 2008, the Service collected the following geomorphic and channel stability field data to assess the current stream stability, sediment supply, bank stability, and to estimate erosion quantities for Moores Run:

- Cross Section Survey
- Longitudinal Profile Survey
- Reach Average - Bank Erosion Hazard Index (BEHI) and Near Bank Shear Stress (NBS) Assessment
- Bank Profiles
- Cross Section – BEHI and NBS Assessment
- Pfankuch Channel Stability Assessment

The Moores Run field protocol document provides descriptions of survey tasks (Eng *et al,* 2004*)*. The Service used the revised stability analysis methodology for the 2008 stream data (Rosgen 2008). The stream data from the previous surveys were not reanalyzed using the revised stability analysis. When possible and appropriate, the Service compared current analysis results with results from previous surveys. The 2008 field data and comparison plots are located in the appendices.

A. Stream Stability and Sediment Supply Assessment

The Service conducted a Rosgen Level III stream stability and sediment supply assessment (Rosgen 2008). This assessment provides predictions of lateral stability, vertical (aggradation) stability, vertical (degradation) stability, channel enlargement potential, Pfankuch channel stability, and sediment supply for Moores Run.

The Service was unable to conduct all of the Level III assessment procedures. The Service did not collect bar samples because of the large substrate (*i.e.*, boulder and large cobble substrate) and sand substrate and consequently, did not assess critical dimensionless shear stress and critical shear stress. Lastly, due to the lack of sediment yield curves, the Service did not model sediment capacity. Additionally, the Service did not conduct a Rosgen Level III assessment for Reach 04 and 09 because they are both transitional reaches.

Despite the absence of these criteria, the Service had sufficient data to support the overall predicted stability ratings. In cases where individual stability criteria values were not available and their absence affected the overall stability rating, the Service reviewed the collective individual criteria ratings and selected an overall predicted lateral and vertical stability rating and

enlargement potential rating for the existing conditions. A summary of the 2008 Rosgen Level III assessment data is in Appendix E.

The Service further documented stream stability in Moores Run by conducting monumented cross section and longitudinal profile resurveys. The overlays associated with the resurveys allow the Service to observe trends in the Moores Run vertical and lateral stability over time, as well as to validate predictions made in previous years. Lateral stability potentials were validated using cross section and bank profile overlays; vertical stability potentials were validated using both longitudinal profile overlay and cross section overlays.

1. Lateral Stability

Lateral stability of Moores Run was determined by conducting the Rosgen Level III lateral stability potential assessment. The criteria for the revised lateral stability analysis did not change from the previous method, so the Service can continue to make comparisons with the previous results. The assessment predicts lateral stability potentials by evaluating width/depth state (study/reference) ratios, depositional patterns, meander patterns, dominant BEHI and NBS, and confinement. The Service used the cross section and bank profile resurveys to validate the lateral stability potential.

a. Lateral Stability Potential Results

For 2008, the lateral stability assessment for Moores Run resulted in three ratings: stable, moderately unstable, and unstable (Table 3). The stable rating represents 38 percent, the moderately unstable rating represents 37 percent, and the unstable rating represents 25 percent of the assessment area.

The lateral stability prediction for Reaches 01, 03, 04, 06, 07, and the right channel of Reach 08 have not changed since 2003. The ratings for Reaches 02, 05, and the left channel of Reach 08 changed in 2007 (i.e., stable to moderately unstable). All the 2007 ratings remained the same in 2008, with the exception of Reach 02. The rating for Reach 02 changed from moderately unstable to stable, which was the rating for 2003 and 2005. For this resurvey, the Service evaluated the lateral stability of Reach 09 as stable, following the completion of the bank stabilization project.

b. Cross Section Comparison

In order to reassess channel stability conditions and to validate erosion rates the Service resurveyed the eight cross sections selected in 2005 (Figure 2). The cross sections selected represent the range of stability conditions present in Moores Run (Eng *et al.* 2007). The Service did not survey the remaining cross sections established in 2003 by the City of Baltimore and the Service because they represent duplicate bank erosion conditions, less dominant bank erosion conditions, or low erosion potentials. All cross section and bank profile plots, field data, and photographs are in Appendix A.

Table 3. Lateral Stability Potential Comparison

Study Reach	Survey Year			
	2003	2005	2007	2008*
01	Unstable	Unstable	Unstable	Unstable
02	Stable	Stable	Moderately Unstable	Stable
03 (Left Channel)	Stable	Stable	Stable	Stable
03 (Right Channel)	Unstable	Unstable	Unstable	Unstable
04	Stable	Stable	Stable	Stable
05	Stable	Stable	Moderately Unstable	Moderately Unstable
06	Moderately Unstable	Moderately Unstable	Moderately Unstable	Moderately Unstable
07	Stable	Stable	Stable	Stable
08 (Left Channel)	Stable	Stable	Moderately Unstable	Moderately Unstable
08 (Right Channel)	Moderately Unstable	Moderately Unstable	Moderately Unstable	Moderately Unstable
09	Highly Unstable	On-going bank stabilization project	On-going bank stabilization project	Stable

(*) Used the revised Wildland Hydrology, Inc. (Rosgen 2008) river stability assessment procedures

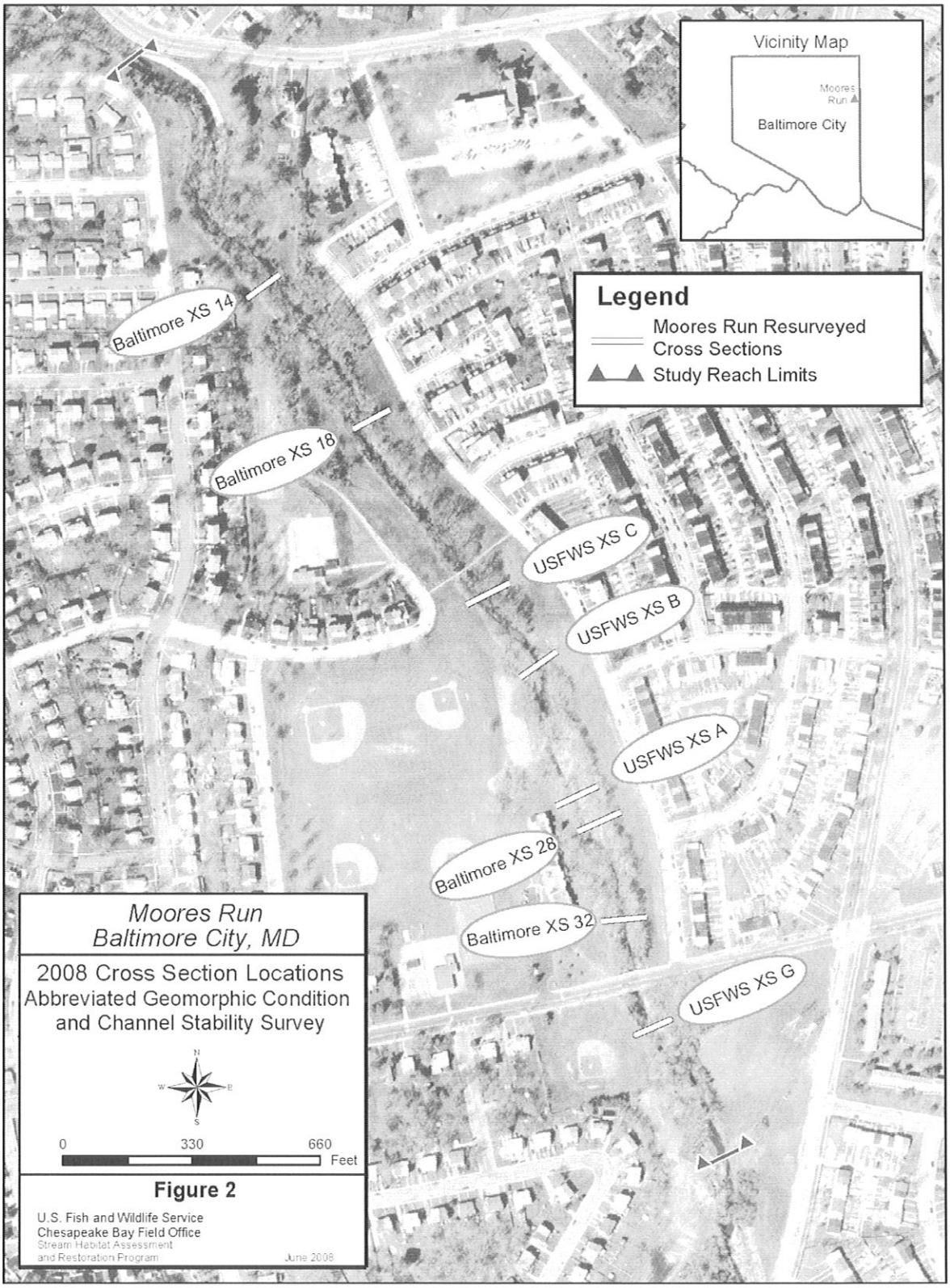
To document lateral channel adjustments the Service overlaid 2003, 2005, 2007, and 2008 cross section and bank profile plots. The changes in channel characteristics for the resurveyed cross sections are summarized in Table 4. The channel characteristics for each year were compared with the previous year to determine the degree of change.

A comparison of the 2008 and 2007 cross-section data showed changes in bankfull width ranged from a decrease of 5.17 feet to an increase of 1.10 feet. The bankfull area changes ranged from a decrease of 0.10 square feet to an increase of 0.13 square feet. The comparison found width/depth ratios ranged from a decrease of 2.20 to an increase of 0.94.

A comparison of the 2008 and 2003 cross-section data showed only slight changes in the cross-section parameters, with the exception of bankfull area and width/depth ratios (Table 5). Significant changes in bankfull area ranged from 22.67 to 14.15. The width/depth ratio changes ranged from a decrease of 4.74 to an increase of 2.01.

c. Data Analysis

There were no changes in the results of the lateral stability analysis between 2007 and 2008 surveys, with the exception of Reach 09. Reach 09 had a bank stabilization project in progress during the 2005 and 2007 surveys. The stabilization project was completed prior to the 2008 survey. The lateral stability rating for Reach 09 changed from highly unstable in


Vicinity Map
Moores Run
Baltimore City
Legend
Moores Run Resurveyed Cross Sections
Study Reach Limits
Baltimore XS 14
Baltimore XS 18
USFWS XS C
USFWS XS B
USFWS XS A
Baltimore XS 28
Baltimore XS 32
USFWS XS G
Moores Run
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2008 Cross Section Locations
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N
W
E
S
0
330
660
Feet
Figure 2
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
Stream Habitat Assessment
and Restoration Program
June 2008

Table 4. Monumented Cross Section Annual Data Comparison

Cross Section			Survey Year						
			2003	2005		2007		2008	
Reach	Name	Parameter		Data	Change	Data	Change	Data	Change
01	Service XS G	Width (ft)	46.50	46.97	0.47	46.80	-0.17	46.27	-0.53
		Mean Depth (ft)	2.17	2.47	0.30	2.23	-0.24	2.13	-0.10
		Area (ft^2)	101.10	116.19	15.09	104.58	-11.61	98.66	-5.92
		Maximum Depth (ft)	4.48	4.01	-0.47	3.82	-0.19	3.72	-0.10
		Wetted Perimeter (ft)	51.72	50.66	-1.06	49.31	-1.35	49.11	-0.20
		Hydraulic Radius (ft)	1.95	2.29	0.34	2.12	-0.17	2.01	-0.11
		Width/Depth Ratio	21.43	19.02	-2.41	20.99	1.97	21.72	0.74
02	Baltimore XS 32	Width (ft)	45.10	45.30	0.20	45.90	0.60	46.50	0.60
		Mean Depth (ft)	2.29	2.43	0.14	2.44	0.01	2.41	-0.03
		Area (ft^2)	103.48	110.07	6.59	111.91	1.84	112.00	0.09
		Maximum Depth (ft)	3.87	4.12	0.25	4.06	-0.06	4.29	0.23
		Wetted Perimeter (ft)	46.37	46.93	0.56	47.32	0.39	48.23	0.91
		Hydraulic Radius (ft)	2.23	2.35	0.12	2.37	0.02	2.32	-0.05
		Width/Depth Ratio	19.69	18.64	-1.05	18.81	0.17	19.29	0.48
03	Baltimore XS 28	Width (ft)	54.10	55.82	1.72	54.60	-1.22	55.70	1.10
		Mean Depth (ft)	1.87	1.90	0.03	1.82	-0.08	1.80	-0.02
		Area (ft^2)	101.14	105.80	4.66	99.43	-6.37	100.19	0.76
		Maximum Depth (ft)	4.10	4.08	-0.02	3.50	-0.58	3.56	0.06
		Wetted Perimeter (ft)	61.70	60.91	-0.79	57.55	-3.36	58.72	1.17
		Hydraulic Radius (ft)	1.64	1.74	0.10	1.73	-0.01	1.71	-0.02
		Width/Depth Ratio	28.93	29.38	0.45	30.00	0.62	30.94	0.94
	Service XS A	Width (ft)	44.00	39.50	-4.50	41.90	2.40	42.30	0.40
		Mean Depth (ft)	2.28	2.52	0.24	2.99	0.47	2.91	-0.08
		Area (ft^2)	100.23	99.65	-0.58	125.90	26.25	122.90	-3.00
		Maximum Depth (ft)	3.81	3.86	0.05	5.30	1.44	5.03	-0.27
		Wetted Perimeter (ft)	50.08	42.88	-7.20	45.55	2.67	49.13	3.58
		Hydraulic Radius (ft)	2.00	2.32	0.32	3.16	0.84	2.50	-0.66
		Width/Depth Ratio	19.30	15.67	-3.63	14.01	-1.66	14.56	0.55
04	Service XS B	Width (ft)	60.20	59.88	-0.32	59.09	-0.79	59.01	-0.08
		Mean Depth (ft)	3.50	3.60	0.10	3.93	0.33	3.86	-0.07
		Area (ft^2)	210.98	215.70	4.72	232.15	16.45	227.67	-4.48
		Maximum Depth (ft)	6.24	6.29	0.05	6.72	0.43	6.40	-0.32
		Wetted Perimeter (ft)	65.34	65.43	0.09	65.43	0.00	65.68	0.25
		Hydraulic Radius (ft)	3.23	3.30	0.07	3.55	0.25	3.47	-0.08
		Width/Depth Ratio	17.20	16.63	-0.57	15.04	-1.60	15.29	0.25
05	Baltimore XS 18	Width (ft)	41.62	42.02	0.40	45.87	3.85	40.70	-5.17
		Mean Depth (ft)	2.73	2.79	0.06	3.09	0.30	3.22	0.13
		Area (ft^2)	113.64	117.22	3.58	141.83	24.61	130.97	-10.86
		Maximum Depth (ft)	5.09	4.83	-0.26	4.68	-0.15	4.56	-0.12
		Wetted Perimeter (ft)	49.94	46.67	-3.27	49.81	3.14	45.93	-3.88
		Hydraulic Radius (ft)	2.28	2.51	0.23	2.85	0.34	2.85	0.00
		Width/Depth Ratio	15.25	15.06	-0.18	14.84	-0.22	12.64	-2.20
	Service XS C	Width (ft)	50.00	50.00	0.00	49.2	-0.80	49.5	0.30
		Mean Depth (ft)	2.17	2.23	0.06	2.13	-0.10	2.11	-0.02
		Area (ft^2)	108.35	111.47	3.12	104.55	-6.92	104.63	0.08
		Maximum Depth (ft)	3.11	3.19	0.08	3.10	-0.09	3.19	0.09
		Wetted Perimeter (ft)	51.81	51.90	0.09	50.87	-1.03	51.28	0.41
		Hydraulic Radius (ft)	2.09	2.15	0.06	2.06	-0.09	2.04	-0.02
		Width/Depth Ratio	23.04	22.42	-0.62	23.10	0.68	23.46	0.36
06	Baltimore XS 14	Width (ft)	44.12	45.57	1.45	47.91	2.34	46.49	-1.42
		Mean Depth (ft)	2.84	2.96	0.12	3.07	0.11	2.99	-0.08
		Area (ft^2)	125.09	134.78	9.69	146.89	12.11	139.24	-7.65
		Maximum Depth (ft)	5.13	4.75	-0.38	5.55	0.80	5.48	-0.07
		Wetted Perimeter (ft)	53.21	51.48	-1.73	53.31	1.83	50.75	-2.56
		Hydraulic Radius (ft)	2.35	2.62	0.27	2.76	0.14	2.74	-0.02
		Width/Depth Ratio	15.54	15.40	-0.14	15.61	0.21	15.55	-0.06

Table 5. Monumented Cross Section 2003 and 2008 Data Comparison

Cross Section			Survey Year		
			2003	2008	
Reach	Name	Parameter		Data	Change
01	Service XS G	Width (ft)	46.50	46.27	-0.23
		Mean Depth (ft)	2.17	2.13	-0.04
		Area (ft^2)	101.10	98.66	-2.44
		Maximum Depth (ft)	4.48	3.72	-0.76
		Wetted Perimeter (ft)	51.72	49.11	-2.61
		Hydraulic Radius (ft)	1.95	2.01	0.06
		Width/Depth Ratio	21.43	21.72	0.29
02	Baltimore XS 32	Width (ft)	45.10	46.50	1.40
		Mean Depth (ft)	2.29	2.41	0.12
		Area (ft^2)	103.48	112.00	8.52
		Maximum Depth (ft)	3.87	4.29	0.42
		Wetted Perimeter (ft)	46.37	48.23	1.86
		Hydraulic Radius (ft)	2.23	2.32	0.09
		Width/Depth Ratio	19.69	19.29	-0.40
03	Baltimore XS 28	Width (ft)	54.10	55.70	1.60
		Mean Depth (ft)	1.87	1.80	-0.07
		Area (ft^2)	101.14	100.19	-0.95
		Maximum Depth (ft)	4.10	3.56	-0.54
		Wetted Perimeter (ft)	61.70	58.72	-2.98
		Hydraulic Radius (ft)	1.64	1.71	0.07
		Width/Depth Ratio	28.93	30.94	2.01
	Service XS A	Width (ft)	44.00	42.30	-1.70
		Mean Depth (ft)	2.28	2.91	0.63
		Area (ft^2)	100.23	122.90	22.67
		Maximum Depth (ft)	3.81	5.03	1.22
		Wetted Perimeter (ft)	50.08	49.13	-0.95
		Hydraulic Radius (ft)	2.00	2.50	0.50
		Width/Depth Ratio	19.30	14.56	-4.74
04	Service XS B	Width (ft)	60.20	59.01	-1.19
		Mean Depth (ft)	3.50	3.86	0.36
		Area (ft^2)	210.98	227.67	16.69
		Maximum Depth (ft)	6.24	6.40	0.16
		Wetted Perimeter (ft)	65.34	65.68	0.34
		Hydraulic Radius (ft)	3.23	3.47	0.24
		Width/Depth Ratio	17.20	15.29	-1.91
05	Baltimore XS 18	Width (ft)	41.62	40.70	-0.92
		Mean Depth (ft)	2.73	3.22	0.49
		Area (ft^2)	113.64	130.97	17.33
		Maximum Depth (ft)	5.09	4.56	-0.53
		Wetted Perimeter (ft)	49.94	45.93	-4.01
		Hydraulic Radius (ft)	2.28	2.85	0.57
		Width/Depth Ratio	15.25	12.64	-2.61
	Service XS C	Width (ft)	50.00	49.5	-0.50
		Mean Depth (ft)	2.17	2.11	-0.06
		Area (ft^2)	108.35	104.63	-3.72
		Maximum Depth (ft)	3.11	3.19	0.08
		Wetted Perimeter (ft)	51.81	51.28	-0.53
		Hydraulic Radius (ft)	2.09	2.04	-0.05
		Width/Depth Ratio	23.04	23.46	0.42
06	Baltimore XS 14	Width (ft)	44.12	46.49	2.37
		Mean Depth (ft)	2.84	2.99	0.15
		Area (ft^2)	125.09	139.24	14.15
		Maximum Depth (ft)	5.13	5.48	0.35
		Wetted Perimeter (ft)	53.21	50.75	-2.46
		Hydraulic Radius (ft)	2.35	2.74	0.39
		Width/Depth Ratio	15.54	15.55	0.01

2003 to stable in 2008, due to the installation of a concrete toe and concrete-block bank for both banks of the reach. Although the 2008 and 2007 cross-section data comparison showed only slight changes in cross-section parameters, the 2008 and 2003 data comparison showed changes that are more representative of the lateral stability ratings.

The lateral stability rating for Reach 02 changed from stable in 2005 to moderately unstable in 2007, and changed to stable in 2008. This return to a stable rating was due to a change in the dominant BEHI (i.e., moderate to low) that resulted from a clarification in BEHI assessment procedures (Rosgen; personal communication 2008). The Service observed little change in the cross section and bank profile for Reach 02 over the monitoring period, which further supports a stable rating for the lateral stability.

d. Recommendations

The Service recommends additional cross section monitoring, particularly in Reaches 07, 08, and 09. Since there were no cross sections surveyed in these reaches, the Service was unable to validate the lateral stability predictions. In addition, with the completion of the bank stabilization project in Reach 09, cross section surveys in Reach 08 and 09 will be useful to monitor the results of the project.

2. Vertical Stability

The revised stream stability analysis has two vertical stability evaluations that assess the aggradation and degradation potentials of the channel separately (Rosgen 2008). The previous vertical stability analysis had only one vertical stability evaluation to determine whether the stream was aggrading, degrading, or stable (Rosgen 2001b). The Service analyzed the 2008 stream data using the revised stability analysis. However, the Service did not reanalyze the stream data from the previous surveys. The Service used longitudinal profile and cross section plots to validate the vertical stability potentials.

a. Vertical (Aggradation) Stability Results

The revised stability analysis has added a new vertical stability evaluation that assesses the aggradation potential, using the following parameters: sediment competence, sediment capacity, width/depth state (study/reference) ratios, stream succession state, depositional patterns, and debris/blockages.

For 2008, the vertical (aggradation) stability assessment for Moores Run resulted in two rating categories: no deposition and moderate deposition (Table 6). The no deposition rating represents 87 percent, and the moderate deposition rating represents 13 percent of the assessment area.

For Reach 04, 06, 07 and 09, the Service was unable to conduct a vertical (aggradation) stability analysis to the same level as the other reaches, because a riffle cross sections was not surveyed in these reaches in 2008. The predictions for these reaches were determined through analysis of depositional patterns, debris blockages, and the longitudinal profile and cross section overlays.

Table 6. Vertical Stability Potential Comparison

Study Reach	Survey Year				
	2003	2005	2007	2008*	
				Aggradation	Degradation
01	Stable	Stable	Stable	Moderate Deposition	Slightly Incised
02	Stable	Stable	Stable	No Deposition	Slightly Incised
03 (Left Channel)	Aggrading	Aggrading	Aggrading	No Deposition	Not Incised
03 (Right Channel)	Degrading	Degrading	Degrading	No Deposition	Not Incised
04	Stable	Stable	Stable	No Deposition	Not Incised
05	Stable	Stable	Stable	No Deposition	Not Incised
06	Stable	Stable	Stable	No Deposition	Not Incised
07	Stable	Stable	Stable	No Deposition	Not Incised
08 (Left Channel)	Stable	Stable	Stable	No Deposition	Not Incised
08 (Right Channel)	Stable	Stable	Stable	No Deposition	Not Incised
09	Stable	On-going bank stabilization project	On-going bank stabilization project	No Deposition	Not Incised

(*) Used the revised Wildland Hydrology, Inc. (Rosgen 2008) river stability assessment procedures

b. Vertical (Degradation) Stability Results

The revised stability analysis used the following parameters to evaluate the degradation potential of the stream: sediment competence, sediment capacity, width/depth state (study/reference) ratios, degree of incision, stream type stage, depositional patterns, meander pattern, entrenchment, and confinement. Although the revised vertical (degradation) stability analysis had similar assessment parameters to the previous analysis, the rating values and categories have changed. Thus, a direct comparison with previous surveys is not appropriate.

For 2008, the vertical (degradation) stability assessment for Moores Run resulted in two rating categories: not incised and slightly incised (Table 6). The not incised rating represents 81 percent, and the slightly incised rating represents 19 percent of the assessment area.

For Reach 04, 06, 07 and 09, the Service was unable to conduct a vertical (aggradation) stability analysis to the same level as the other reaches, because a riffle cross sections was not surveyed in these reaches, for this abbreviated geomorphic survey. The predictions for these reaches were determined through analysis of depositional patterns, debris blockages, and the longitudinal profile and cross section overlays.

c. Longitudinal Profile Comparison

The Service surveyed 3,358 feet of stream for the 2008 longitudinal profile (Appendix B). A comparison of the 2007 and 2008 longitudinal profiles showed an adequate alignment of facet features to allow for an accurate evaluation of bed elevation change. This evaluation showed an overall change in bed elevation of 80 percent, with 36 percent of the bed decreasing in elevation and 44 percent of the bed increasing in elevation (Table 7). Elevation decreases ranged from 0.06 to 2.45 feet with an average of 0.37 feet; elevation increases ranged from 0.04 to 1.67 feet, with an average of 0.41 feet. Reaches 04, 08, and 09 had the highest percentage of change, ranging from 76 to 100 percent.

Table 7. 2008 Moores Run Bed Elevation Changes

Reach	Reach Length (ft)	Elevation Decrease (Degradation)				Percent	Elevation Increase (Aggradation)				Percent
		Length (ft)	Depth (ft)				Length (ft)	Depth (ft)			
			Min.	Max.	Ave.			Min.	Max.	Ave.	
01	520	178	0.13	0.85	0.52	34	289	0.04	1.48	0.40	56
02	255	142	0.08	0.52	0.28	56	69	0.10	0.48	0.23	27
03	448	157	0.09	0.79	0.39	35	224	0.14	1.63	0.60	50
04	317	230	0.10	2.45	0.58	73	85	0.10	0.78	0.35	27
05	672	209	0.11	1.17	0.48	31	259	0.10	0.81	0.37	39
06	489	188	0.06	1.26	0.36	38	163	0.10	1.67	0.38	33
07	134	36	0.11	0.32	0.22	27	57	0.12	0.67	0.38	43
08	169	45	0.07	0.77	0.30	27	105	0.09	0.74	0.37	62
09	354	31	0.09	0.24	0.17	9	238	0.09	1.31	0.58	67
Total	**3,358**	**1,216**	**0.06**	**2.45**	**0.37**	**36**	**1,489**	**0.04**	**1.67**	**0.41**	**44**

There are few consistent trends in the bed elevation change for Moores Run from 2007 to 2008. However, the overall percent of scour did not change significantly; while the percent of aggradation increased by 11 percent (Table 8).

Table 8. Moores Run Bed Elevation Change Comparison

Reach	Reach Length (ft)	Length of Elevation Decrease (ft)			Length of Elevation Increase (ft)		
		2007	2008	Change	2007	2008	Change
01	520	38	34	4	49	56	-7
02	255	50	56	-6	28	27	1
03	448	51	35	16	38	50	-12
04	317	55	73	-18	48	27	21
05	672	0	31	-31	0	39	-39
06	489	53	38	15	25	33	-8
07	134	21	27	-6	79	43	36
08	169	0	27	-27	77	62	15
09	354	47	9	38	25	67	-42
Total	**3,358**	**35**	**36**	**-1**	**33**	**44**	**-11**

c. Data Analysis

To validate the 2007 overall vertical stability ratings, the Service compared the vertical stability ratings to the changes shown in the 2007 and 2008 longitudinal profile overlay. There was no evidence of a base level change for any of the reaches, and any elevation changes were similar to those observed in previous years. In general, the bed elevation changes were associated primarily with localized scour and deposition. In addition, some of the bed elevation changes are likely due to natural variability in large-sized bed material (i.e., boulders), as found in Reach 02, 07, and 08.

The Service found that stability ratings accurately predicted the vertical stability for all the reaches, except for the left channel of Reach 03. The cross section overlays for the left channel of Reach 03 showed no channel adjustments, which does not support the aggrading rating from the previous years. This inconsistency maybe due to debris jams at the upstream limit of the left channel diverting flow into the right channel.

An initial comparison of the vertical stability rating and bed elevation change for the right channel of Reach 03 shows a potential discrepancy. This section of Reach 03 had a degrading stability rating, but the profile comparison showed an average increase of 0.60 feet for 50 percent of the reach. On closer inspection, it appears that there was an extension of a pool from Reach 04 into Reach 03, which caused the downstream riffle to aggrade and steepen. Additionally, a localized scour in the riffle from the previous year has filled in 1.63 feet, thus inflating the average bed change. Based on these considerations, the aggradation observed in Reach 03 is not representative of the vertical stability potential for Reach 03.

The Service observed another potential discrepancy with the vertical (degradation) ratings for Reach 05 and 06. The Service classified these reaches as F stream types; however, the vertical (degradation) ratings indicate that these reaches are "not incised". Although these

results initially appear contradictory, the cross section survey shows that the active channel bench is developing into a bankfull bench. The Service observed this bankfull bench development throughout Reach 05 and 06. The vertical (degradation) evaluation reflects a stability trend towards a more stable stream condition: a F stream type evolving towards a Bc stream type.

Additionally, the Service reviewed the classification cross section data for Reach 05. Over the entire monitoring period, the entrenchment ratio for the classification cross section (i.e., USFWS C) for this reach has consistently been around 1.20. When considering the "continuum of physical variables", the entrenchment for this cross section is at the lower limits of a B stream type. Although a stream can be entrenched but not incised, this situation shows that the reach is in a transitional state.

The bankfull widths of these reaches will eventually narrow as the active channel bench develops into a bankfull bench. As the stream narrows, the stream will become less entrenched and reflect a stability trend towards a more stable stream condition. These facts help to explain how Reach 05 and 06 have a "not incised" vertical (degradation) rating, while being a F stream type.

3. Enlargement Potential

The revised enlargement potential analysis uses the following parameters to evaluate the enlargement potential of the stream: successional stage shift, lateral stability, and vertical aggradation and degradation stability (Rosgen 2008). The previous enlargement potential analysis had only one vertical stability evaluation (Rosgen 2001b). The Service analyzed the 2008 stream data using the revised stability analysis. However, the Service did not reanalyze the stream data from the previous surveys.

a. Enlargement Potential Results

For 2008, the enlargement potential for Moores Run resulted in two rating categories: slight increase and moderate increase (Table 9). The slight increase rating represents 87 percent, and the moderate increase rating represents 13 percent of the assessment area.

b. Data Analysis

To validate the 2007 the enlargement potential ratings, the Service compared the enlargement potential ratings to changes in the 2007 and 2008 cross section overlays. In general, the changes in the cross section overlays validate the 2007 predictions when observing the overall cross section area trends from 2003 to 2008. There is a slight discrepancy when comparing the results for Reach 01. The enlargement potential for Reach 01 predicts a moderate increase; however, there has been no significant change to the cross sectional area. This may be due to the bank slumping into the cross section from the steep left bank or this cross section's access to a floodplain. Any enlargement of the channel may be obscured by the bank failure. Alternatively, this cross section's access to a floodplain may be adequate to reduce its channel enlargement potential by attenuating channel shear stresses.

Table 9. Enlargement Potential Comparison

Study Reach	Survey Year			
	2003	2005	2007	2008*
01	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase
02	Stable	Stable	Slight Increase	Slight Increase
03 (Left Channel)	Stable	Stable	Stable	Slight Increase
03 (Right Channel)	Slight Increase	Slight Increase	Slight Increase	Slight Increase
04	Stable	Stable	Stable	Slight Increase
05	Slight Increase	Slight Increase	Moderate Increase	Slight Increase
06	Moderate Increase	Moderate Increase	Slight Increase	Slight Increase
07	Stable	Stable	Stable	Slight Increase
08 (Left Channel)	Stable	Stable	Slight Increase	Slight Increase
08 (Right Channel)	Slight Increase	Slight Increase	Slight Increase	Slight Increase
09	Extensive	On-going bank stabilization project	On-going bank stabilization project	Slight Increase

(*) Used the revised Wildland Hydrology, Inc. (Rosgen 2008) river stability assessment procedures

4. Pfankuch Channel Stability Assessment

The Pfankuch Channel Stability (Pfankuch) assessment provides an overall channel stability rating by evaluating such parameters as: mass wasting, vegetative banks, debris jams, channel capacity, cutting, deposition, consolidation of particles, and aquatic vegetation (Pfankuch 1975).

a. Pfankuch Channel Stability Results

For 2008, the Moores Run lateral stability assessment of the nine reaches resulted in two rating categories: stable and moderately unstable (Table 10). The stable rating represents 76 percent, and the moderately unstable rating represents 24 percent of the assessment area. For the previous year, the Service did not conduct a Pfankuch assessment for Reach 09 because of an on-going bank stabilization project. However, the bank stabilization project was completed in 2008 and Reach 09 had a stable rating. The Pfankuch data are located in Appendix E.

b. Data Analysis

The Pfankuch ratings are representative of the evaluated conditions found in each reach, except for Reach 09. Based on the Pfankuch score, Reach 09 should have a moderately unstable rating, but the rating was changed to stable because of the stabilized banks and bedrock grade controls. Furthermore, there was only a two-point difference between a stable

and moderately unstable rating for Reach 09. The Service believes that a stable rating for Reach 09 is representative of the existing conditions

Table 10. Pfankuch Channel Stability Comparison

Study Reach	Survey Year			
	2003	2005	2007	2008
01	Stable	Stable	Stable	Stable
02	Stable	Stable	Stable	Stable
03	Moderately Unstable	Stable	Stable	Stable
04	Stable	Stable	Stable	Stable
05	Stable	Stable	Stable	Stable
06	Stable	Stable	Moderately Unstable	Moderately Unstable
07	Moderately Unstable	Moderately Unstable	Moderately Unstable	Moderately Unstable
08	Moderately Unstable	Moderately Unstable	Moderately Unstable	Moderately Unstable
09	Moderately Unstable	On-going bank stabilization project	On-going bank stabilization project	Stable

5. Sediment Supply

The revised sediment supply assessment predicts sediment supply based on the results of the following criteria: lateral stability, vertical aggradation and degradation stability, channel enlargement potential, and Pfankuch channel stability rating (Rosgen 2008). The previous enlargement potential analysis had only one vertical stability evaluation (Rosgen 2001b). Each criteria are given a numeric value and the individual values are added together to get a total score for the reach. A higher score indicates a larger potential for sediment contribution from the study reach. The Service analyzed the 2008 stream data using the revised stability analysis. However, the Service did not reanalyze the stream data from the previous surveys.

a. Sediment Supply Results

For 2008, the sediment supply assessment for Moores Run resulted in three rating categories: low, moderate, and high (Table 11). The low rating represents 28 percent, the moderate rating represents 59 percent, and the high rating represents 13 percent of the assessment area.

b. Data Analysis

To validate the 2007 the sediment supply predictions, the Service compared the sediment supply ratings to changes in the 2007 and 2008 longitudinal profile and cross section overlays. For Reach 07, 08 and 09, the Service was only able to validate the predictions using the longitudinal profile, because no cross sections were resurveyed for these reaches in 2008.

Table 11. Sediment Supply Potential Comparison

Study Reach	Survey Year			
	2003	2005	2007	2008*
01	Moderate	Moderate	Moderate	High
02	Low	Low	Moderate	Moderate
03 (Left Channel)	Moderate	Moderate	Moderate	Low
03 (Right Channel)	High	High	High	Moderate
04	Low	Low	Low	Low
05	Low	Low	Moderate	Moderate
06	Moderate	Moderate	Moderate	Moderate
07	Low	Low	Low	Moderate
08 (Left Channel)	Low	Low	Moderate	Moderate
08 (Right Channel)	Moderate	Moderate	Moderate	Moderate
09	High	On-going bank stabilization project	On-going bank stabilization project	Low

(*) Used the revised Wildland Hydrology, Inc. (Rosgen 2008) river stability assessment procedures

While the prediction of potential sediment supply is based on several criteria, the Service used cross section and longitudinal data to validate the predications. Often, it is difficult to validate the predications by only comparing the current data with the previous year. However, when reviewing the trend of changes over the four years, the channel changes shown in the longitudinal profile and cross section concur with and validate the potential sediment supply predictions.

For example, the reaches with a low sediment supply potential showed less longitudinal and cross section changes when compared to the reaches with a moderate sediment supply potential. The only exception was Reach 04 that had a low sediment supply potential, but a comparison of the longitudinal profiles for 2007 and 2008 showed an average elevation decrease of 0.58 feet over 73 percent of the reach. When reviewing the changes in cross section area over the monitoring period, the area increased by 16.69 feet. Reach 04 is a transitional pool that is influenced by a 48-inch outfall. The vertical and lateral changes observed in Reach 04 are associated with the scour resulting from the outfall.

B. Bank Stability

The Service evaluated bank stability using the Bank Erosion Hazard Index (BEHI) and channel erosional forces using the near bank shear stress (NBS) for all stream banks prone to erosion within the study area. The Service also evaluated BEHI and NBS conditions at individual cross sections in order to validate bank erosion predictions made in 2007. Reach BEHI data,

photographs, and maps are located in Appendix C and cross section BEHIs and cross section bank profile data are provided in Appendix A.

1. Reach BEHI and NBS

The reach BEHI and NBS ratings are used in the Rosgen Level III stability assessment, and to estimate sediment quantities from streambank erosion.

a. Reach BEHI and NBS Results

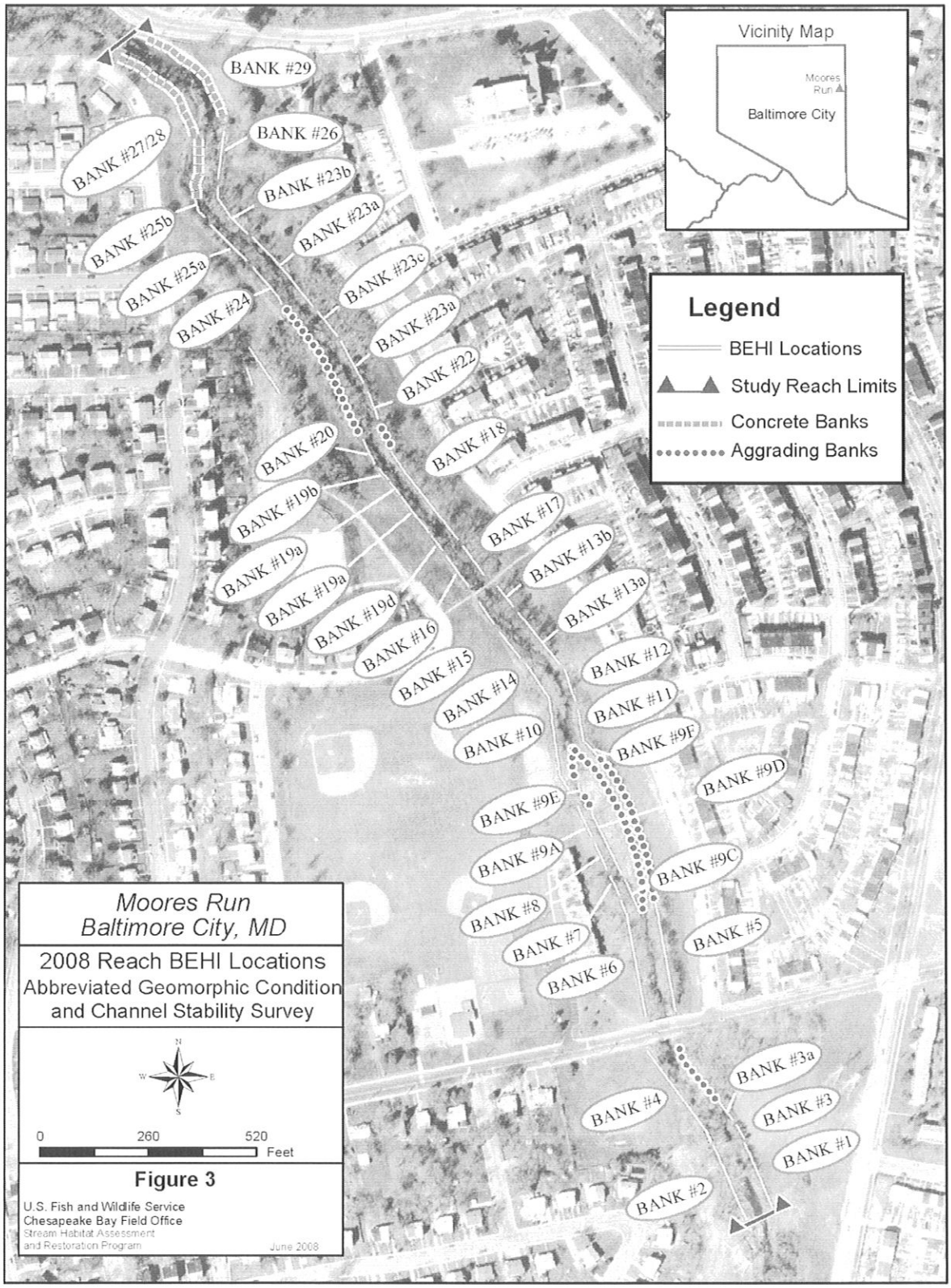
For the 2008 survey, the Service assessed 4,783 feet of stream bank of the total 6,716 feet of bank (Figure 3). The Service only assessed banks prone to erosion; thus aggrading banks and stabilized banks were not included in the assessment. A summary of the reach BEHI and NBS ratings are provided in Table 12. A geomorphic map with detailed 2008 BEHI bank locations is located in Appendix C.

The Service identified five BEHI conditions, ranging from low to extreme. The low BEHI rating represents 29 percent of the banks, while the moderate BEHI rating represents 37 percent of the banks. The high and very high BEHI ratings represent 24 percent. The extreme BEHI rating represents approximately 7 percent of the banks. The Service identified four NBS conditions, ranging from very low to high. The very low NBS rating represents 4 percent and the low NBS rating represents 67 percent of the banks. The moderate NBS rating represents 23 percent and the high NBS rating represents the remaining 6 percent of banks.

b. Data Analysis

The Service compared the changes between the 2007 and 2008 BEHI and NBS ratings, and found that 14 conditions changed in the 2008 survey, out of the 64 BEHI and NBS conditions identified in 2007. Seven banks changed BEHI ratings, while seven banks changed NBS ratings. In some situations, a direct comparison between the 2007 and 2008 data was not possible, because bank conditions changed and the Service identified nine additional BEHI and NBS conditions in 2008 for the same length of bank assessed in 2007.

A closer evaluation of the changes found a significant decrease in the high and very high BEHI ratings, from 45 percent in 2007 to 24 percent in 2008. When reviewing the changes for individual reach BEHI ratings, only two changes are noteworthy. Banks 17 and 20, both in Reach 5, had an increase in bank stability, from high in 2007 to moderate in 2008. This increase in bank stability is associated with the development of an inner berm to an elevation where it is now a bankfull bench. The changes in NBS ratings are associated with changes in flow patterns and debris jams. Overall, the bank stability conditions for Moores Run have not changed significantly from 2007 to 2008.


Vicinity Map
Moores Run
Baltimore City
Legend
BEHI Locations
Study Reach Limits
Concrete Banks
Aggrading Banks
BANK #29
BANK #26
BANK #27/28
BANK #23b
BANK #23a
BANK #25b
BANK #23c
BANK #25a
BANK #24
BANK #23a
BANK #22
BANK #18
BANK #20
BANK #19b
BANK #17
BANK #13b
BANK #19a
BANK #19a
BANK #13a
BANK #19d
BANK #16
BANK #12
BANK #15
BANK #14
BANK #11
BANK #10
BANK #9F
BANK #9D
BANK #9E
BANK #9A
BANK #9C
BANK #8
BANK #7
BANK #5
BANK #6
BANK #3a
BANK #4
BANK #3
BANK #1
BANK #2
Moores Run
Baltimore City, MD
2008 Reach BEHI Locations
Abbreviated Geomorphic Condition
and Channel Stability Survey
N
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0
260
520
Feet
Figure 3
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
Stream Habitat Assessment
and Restoration Program
June 2008

Table 12. Study Reach BEHI and NBS Comparison

Reach		Survey Year											
		2003			2005			2007			2008		
		Length of Bank (ft)	BEHI Rating	NBS Rating	Length of Bank (ft)	BEHI Rating	NBS Rating	Length of Bank (ft)	BEHI Rating	NBS Rating	Length of Bank (ft)	BEHI Rating	NBS Rating
1	Bank 1	120	Moderate	Low	120	Moderate	Low	120	Moderate	Low	120	Moderate	Low
	Bank 2	151	Low	Low	151	Low	Low	151	Low	Low	151	Low	Low
	Bank 3	74	High	Low	74	High	Low	74	High	Moderate	38	Very High	High
	Bank 3a	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			36	High	Moderate
	Bank 4	268	Extreme	High	268	Extreme	Moderate	268	Extreme	Moderate	268	Extreme	Moderate
2	Bank 5	260	Moderate	Moderate	260	Moderate	Moderate	260	Moderate	Low	260	Moderate	Low
	Bank 6	250	Low	Low	250	Low	Low	250	Moderate	Low	250	Moderate	Low
3	Bank 7	54	Very High	Moderate	54	High	Moderate	54	Very High	Moderate	54	Very High	Low
	Bank 8	110	Moderate	High	110	Moderate	High	110	Moderate	Low	110	Moderate	Low
	Bank 9a[1]	80	Very High	Moderate	58	Very High	Moderate	114	Very High	Low	114	Very High	Low
	Bank 9b	21	Moderate	Low	21	Moderate	Low	Not surveyed in 2007			Not surveyed in 2008		
	Bank 9c	75	Low	Low	75	Low	Low	75	Low	Low	75	Low	Low
	Bank 9d	125	Low	Low	125	Moderate	Low	125	Low	Low	125	Low	Low
	Bank 9e	20	Moderate	Moderate	20	Moderate	Moderate	20	High	Moderate	20	Moderate	High
	Bank 9f	35	Low	Low	35	Low	Low	35	Low	Low	35	Low	Low
	Bank 9g	Not surveyed in 2003			35	High	Moderate	Not surveyed in 2007			Not surveyed in 2008		
4	Bank 10	392	Low	Low	392	Low	Low	392	Low	Low	392	Low	Low
	Bank 11	52	Moderate	Moderate	52	Moderate	Moderate	52	Moderate	Moderate	52	Moderate	Moderate
	Bank 12	88	High	Moderate	88	Moderate	Moderate	88	High	Moderate	88	High	Moderate
	Bank 13	102	High	Low	102	High	Low	102	High	Low	Bank replaced by Bank 13a		
	Bank 13a	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			180	Low	Low
5	Bank 13	153	High	Low	153	High	Low	153	High	Low	Bank replaced by Bank 13b		
	Bank 13b	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			75	High	Low
	Bank 14	75	Very High	Low	75	High	Low	75	Very High	Low	75	High	Low
	Bank 15	88	High	Low	88	Very High	Low	88	High	Low	88	Very High	Low
	Bank 16	135	Moderate	Low	135	Moderate	Low	135	Moderate	Low	135	Moderate	Low
	Bank 17	113	High	Low	113	High	Low	113	High	Low	113	Moderate	Low
	Bank 18	350	Moderate	Low	350	Moderate	Low	350	Moderate	Low	350	Moderate	Low
	Bank 19	285	High	Low	285	High	Low	285	High	High	Bank replaced by Bank 19a – 19d		
	Bank 19a	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			184	Moderate	Low
	Bank 19b	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			36	High	Low
	Bank 19c	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			15	Very High	High
	Bank 19d	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			50	Extreme	High
	Bank 20	35	Very High	High	35	Extreme	High	35	Very High	High	35	Moderate	High
	Bank 21	63	High	Moderate	63	High	Moderate	Not surveyed in 2007			Not surveyed in 2008		
	Bank 22	70	Extreme	High	70	Very High	High	70	Very High	Low	70	High	Moderate
6	Bank 23a	397	High	Moderate	397	High	Moderate	397	High	Moderate	372	High	Moderate
	Bank 23c	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			25	High	Moderate
	Bank 24	155	Low	Low	155	Low	Low	70	Low	Low	178	Low	Low
	Bank 24a	Not surveyed in 2003			Not surveyed in 2005			108	High	Moderate	Not surveyed in 2008		
7	Bank 23a	180	High	Low	180	High	Low	180	High	Moderate	50	High	Moderate
	Bank 23b	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			130	Moderate	Moderate
	Bank 25a	221	Low	Low	221	Low	Low	221	Low	Low	211	Low	Low
	Bank 25b	Not surveyed in 2003			Not surveyed in 2005			Not surveyed in 2007			10	Very High	Moderate
8	Bank 26	213	Low	Moderate	213	Low	Moderate	213	Low	Low	213	Low	Very Low
	Bank 27	Previously included in Reach 09			Previously included in Reach 09			Previously included in Reach 09			Concrete banks		
	Bank 28	Previously included in Reach 09			Previously included in Reach 09			Previously included in Reach 09			Concrete banks		
9	Bank 27	165	Very Low	Extreme	354	On-going bank stabilization project		354	On-going bank stabilization project		Concrete banks		
	Bank 28	155	Very High	Extreme	354			354			Concrete banks		
	Bank 29	Concrete banks			Concrete banks			Concrete banks			Concrete banks		

(1) Reach 3 Bank 9a includes Banks 9a, 9b, and 9g from 2005.

2. Representative Cross Section BEHI, NBS, and Bank Profiles

Cross section BEHI, NBS, and bank profiles are used to validate bank erosion rates. The Service evaluated BEHI and NBS conditions at monumented cross sections, and repeated surveys at these cross sections will show lateral adjustments from which the Service can calculate actual bank erosion rates for the BEHI and NBS combinations.

The Service reassessed BEHI and NBS conditions at eight monumented cross sections to validate the erosion rates and sediment contributions for these BEHI and NBS combinations (Table 13). There were no significant changes in the cross section BEHI and/or NBS ratings, and the ratings are representative of the existing conditions.

Unfortunately, the Service could not validate the bank erosion rates, because there were five storm events that resulted in discharges that significantly exceeded the bankfull discharge (i.e., 535 cubic feet per second (Rating Table 14)). The largest discharge during the monitoring period occurred on July 23, 2007, with a peak storm discharge of 1,691 cubic feet per second. It is not appropriate to measure erosion rates if the stream experienced a drought or storm flows that significantly exceed bankfull during the monitoring period.

Table 13. Selected Cross Section BEHI and NBS Comparison

Reach	Cross Section	Bank	2005		2007		2008	
			BEHI	NBS	BEHI	NBS	BEHI	NBS
01	USFWS G	Right	Extreme	Moderate	Extreme	Moderate	Very High	Moderate
02	Balt. 32	Left	Low	Moderate	Low	Low	Low	Moderate
03	Balt. 28	Right	Moderate	High	High	High	High	High
	USFWS A	Right	Moderate	Low	Moderate	Low	Moderate	Low
04	USFWS B	Left	High	Moderate	Very High	Moderate	Very High	Moderate
05	Balt. 18	Right	Moderate	Moderate	Moderate	Low	Moderate	Low
	USFWS C	Right	Moderate	Low	High	Low	High	Low
06	Balt. 14	Left	High	Moderate	High	Moderate	High	High

C. Bank Erosion Estimates

For the 2008 geomorphic condition and channel stability survey, the Service used reach BEHI and NBS ratings, bank dimensions, and a bank erodibility curve to predict reach average erosion quantities and rates for the study reaches. Because Maryland does not have bank erodibility curves, the Service used a draft bank erodibility curve developed by the Service for Washington, D.C. The Service selected this curve because it represents watershed and stream conditions at Moores Run.

a. Bank Erosion Results

In 2008, the Service reassessed the reach BEHI and NBS ratings and bank dimensions for each bank prone to erosion. The Service applied these ratings and dimensions to the draft

bank erodibility curve to predict reach average erosion quantities and rates for the study reaches (Table 14).

The Service predicts that the banks will contribute a total of 698 tons of sediment in 2008, with individual study reaches ranging from 0.5 tons/year to 353 tons/year. Study reach erosion rates ranged from 0.003 tons/year/feet to 0.82 tons/year/feet.

Table 14. Bank Erosion Prediction Comparison

Reach	Survey Year							
	2003		2005		2007		2008	
	Total (tons/year)	Rate (tons/year/feet)	Total (tons/year)	Rate (tons/year/feet)	Total (tons/year)	Rate (tons/year/feet)	Total (tons/year)	Rate (tons/year/feet)
01	411	0.96	319	0.74	349	0.81	353	0.82
02	20	0.10	20	0.10	14	0.05	15	0.06
03	47	0.11	51	0.12	29	0.07	24	0.05
04	35	0.08	26	0.08	35	0.11	27	0.09
05	143	0.19	162	0.24	127	0.19	139	0.21
06	149	0.31	117	0.24	143	0.29	105	0.21
07	30	0.22	30	0.22	50	0.37	35	0.26
08	7	0.04	7	0.04	2	0.01	0.5	0.003
09	269	0.76	Active stabilization project		Active stabilization project		Concrete banks	
Total	**1,111**		**732**		**749**		**698**	

b. Bank Erosion Discussion

The Service compared the changes between the 2007 and 2008 bank erosion quantities, and found a decrease of 51 tons of sediment per year. Reasons for the difference between the 2007 and 2008 erosion quantities include changes in BEHI ratings and NBS ratings and the addition of nine additional BEHI and NBS conditions for the same length of assessed banks.

The Service also compared the sediment supply predictions (Table 11) to the bank erosion predictions (Table 14) for 2008. Interestingly, the sediment supply predictions correlated well with the erosion rates (i.e., tons/year/feet) provided in the bank erosion predictions, with the exception of Reach 02. Reach 02 has a moderate sediment supply prediction; however, the estimated erosion rate was 0.06 tons/year/feet, which correlates better with a low sediment supply prediction. A closer inspection of the sediment supply prediction showed that the moderate rating was at the limit of the moderate and low ratings.

IV. CONCLUSIONS

Although the 2008 abbreviated survey indicates that Moores Run is continuing to adjust, these adjustments are minor and localized. Reach 02, 03, 04, 05, 07, 08 and 09 (approximately 70 percent of the study area) are generally stable. The stability trend of these reaches should remain stable if there are no significant changes in watershed land use or flow regime. Reach 01 and 06 (approximately 25 percent of the study area) continue to have widespread instability problems and will continue to adjust until reaching equilibrium. Although Reach 08 can be considered unstable, the presence of bedrock, boulders, and concrete banks through portions of the reach

provide sufficient vertical and lateral stability. However, continued monitoring of this reach will be required because of its erosion potential.

The stream stabilization project in Reach 09 was completed in 2008. As part of this stabilization project, additional concrete banks were constructed in Reach 08 and 09; an existing culvert was replaced with a larger 36-inch culvert in Reach 08; and an additional culvert and 48-inch culvert were installed in Reach 09. The Service is concerned that the additional stormwater runoff from the replaced and new culverts may degrade the stream channel. Although these infrastructure improvements were recently completed, the Service has not observed any significant changes to stream stability that can be attributed to these infrastructure improvements. The Service recommends continued monitoring of Moores Run to document any changes that may occur because of the additional stormwater flow. In addition, the Service recommends resurveying all of the Moores Run 2008 representative cross sections in order to validate bank erosion predictions.

LITERATURE CITED

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8. ---. 2008. River Stability Field Guide. Wildland Hydrology. Fort Collins, CO.

APPENDIX A

MOORES RUN – CROSS SECTION DATA

APPENDIX A

REACH 01 USFWS CROSS SECTION G

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 02 BALTIMORE CITY CROSS SECTION 32

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 03 BALTIMORE CITY CROSS SECTION 28

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 03 USFWS CROSS SECTION A

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 04 USFWS CROSS SECTION B

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 05 BALTIMORE CITY CROSS SECTION 18

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

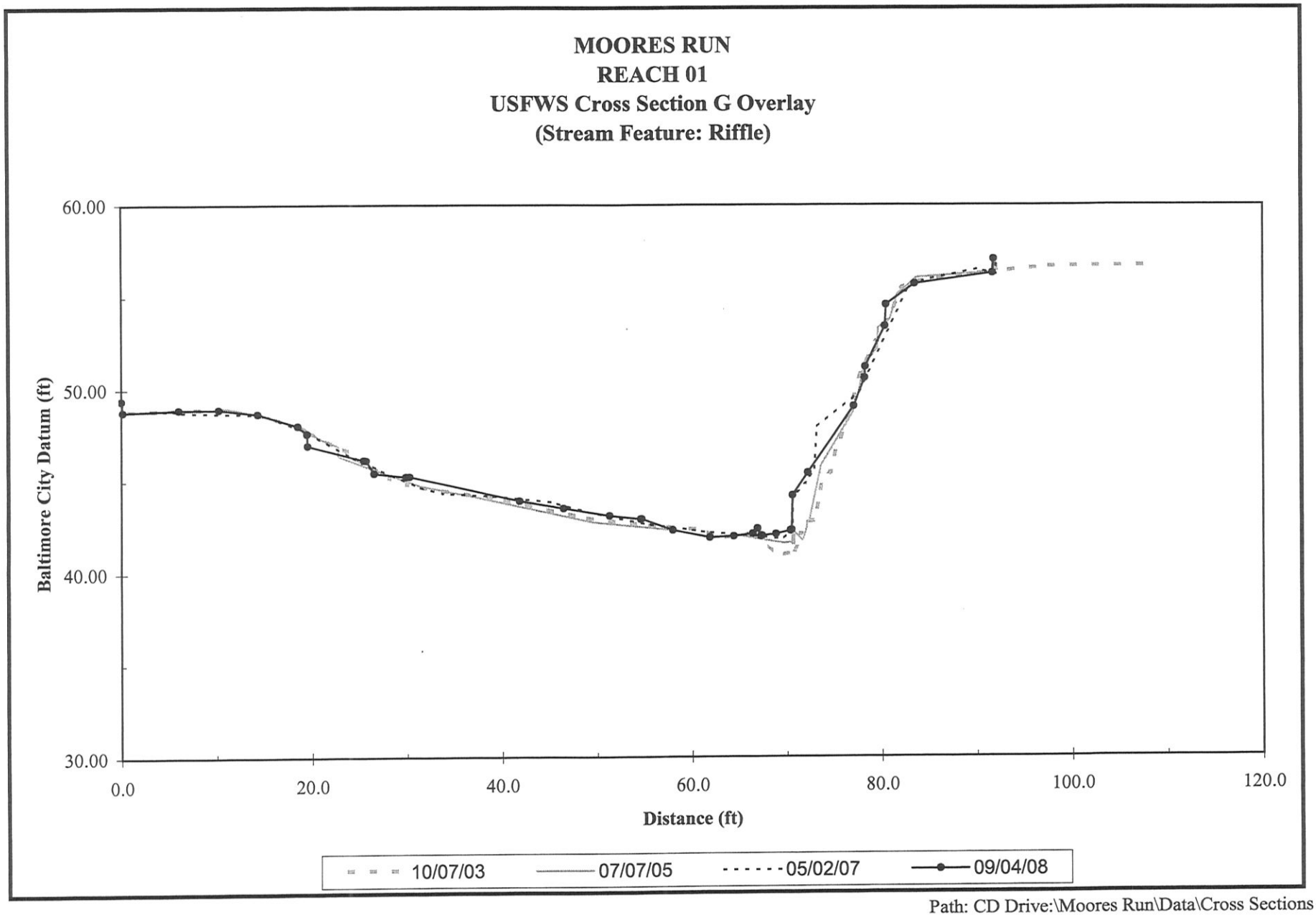
REACH 05 USFWS CROSS SECTION C

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 06 BALTIMORE CITY CROSS SECTION 14

Cross Section Overlay Plot
2008 Cross Section Data
Cross Section Monument Map
Cross Section Photographs
Bank Profile Overlay Plot
2008 Bank Profile Data

REACH 01
CROSS SECTION G



Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 01 - USFWS XS G Balt. City Datum.xls
03/10/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 01 - 2008

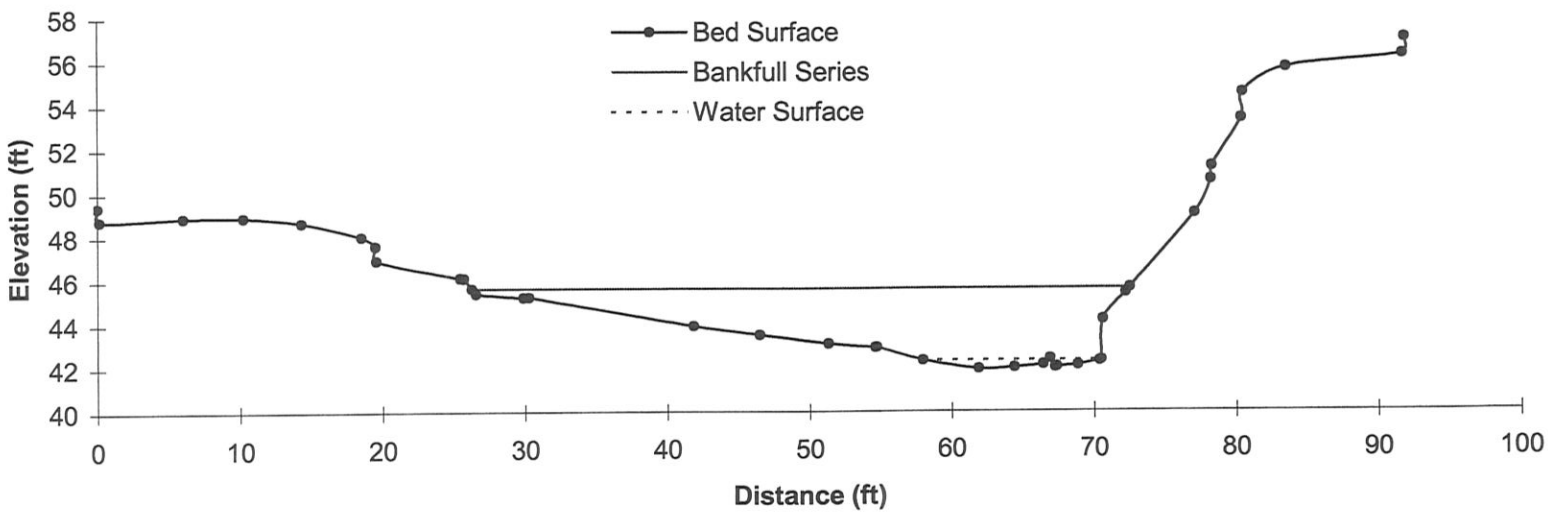
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	
46.27	98.66	2.13	3.72	49.11	2.01	Bankfull
12.52	2.98	0.24	0.40	12.84	0.23	Water Surface

STREAM: Moores Run
REACH & XS: Reach 01 - USFWS XS G (Riffle)
DATE: 09/04/08
CREW: SD, MS
DATA: SD
QA/QC:

MON. COORD.: LTMON: N: 39° 19' 47.8" W: 76° 32' 04.4" (+/- 24 ft)
RTMON: N: 39° 19' 47.7" W: 76° 32' 06.0" (+/- 18 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
TLMON	0.0	49.40	BAR	46.5	43.53
GLMON	0.1	48.79	BAR	51.3	43.13
GS	6.0	48.92	BAR	54.6	42.95
GS	10.2	48.93	CS	54.7	42.96
GS	14.3	48.69	LEW	58.0	42.34
SL BRK	18.5	48.03	CS	61.9	41.94
SL BRK	19.5	47.61	CS	64.4	42.00
GS	19.6	46.95	CS	66.4	42.14
GS	25.4	46.15	ROCK	66.9	42.42
SL BRK	25.7	46.14	CS	67.3	42.00
LBF	26.2	45.66	CS	67.4	42.03
SL BRK	26.5	45.43	GRPIN	68.9	42.11
SL BRK	29.9	45.25	TTPIN	70.4	42.30
BAR	30.3	45.26	REW	70.5	42.34
BAR	41.9	43.94	BOULDER	70.6	44.20

Identifier	Distance (ft)	Elevation (ft)			
SL BRK	72.2	45.43			
RBF	72.5	45.66			
GS	77.1	49.05			
GS	78.2	50.59			
GS	78.3	51.19			
GS	80.4	53.40			
GS	80.5	54.58			
RTOB	83.5	55.71			
GRMON	91.7	56.30			
TRMON	91.8	57.06			



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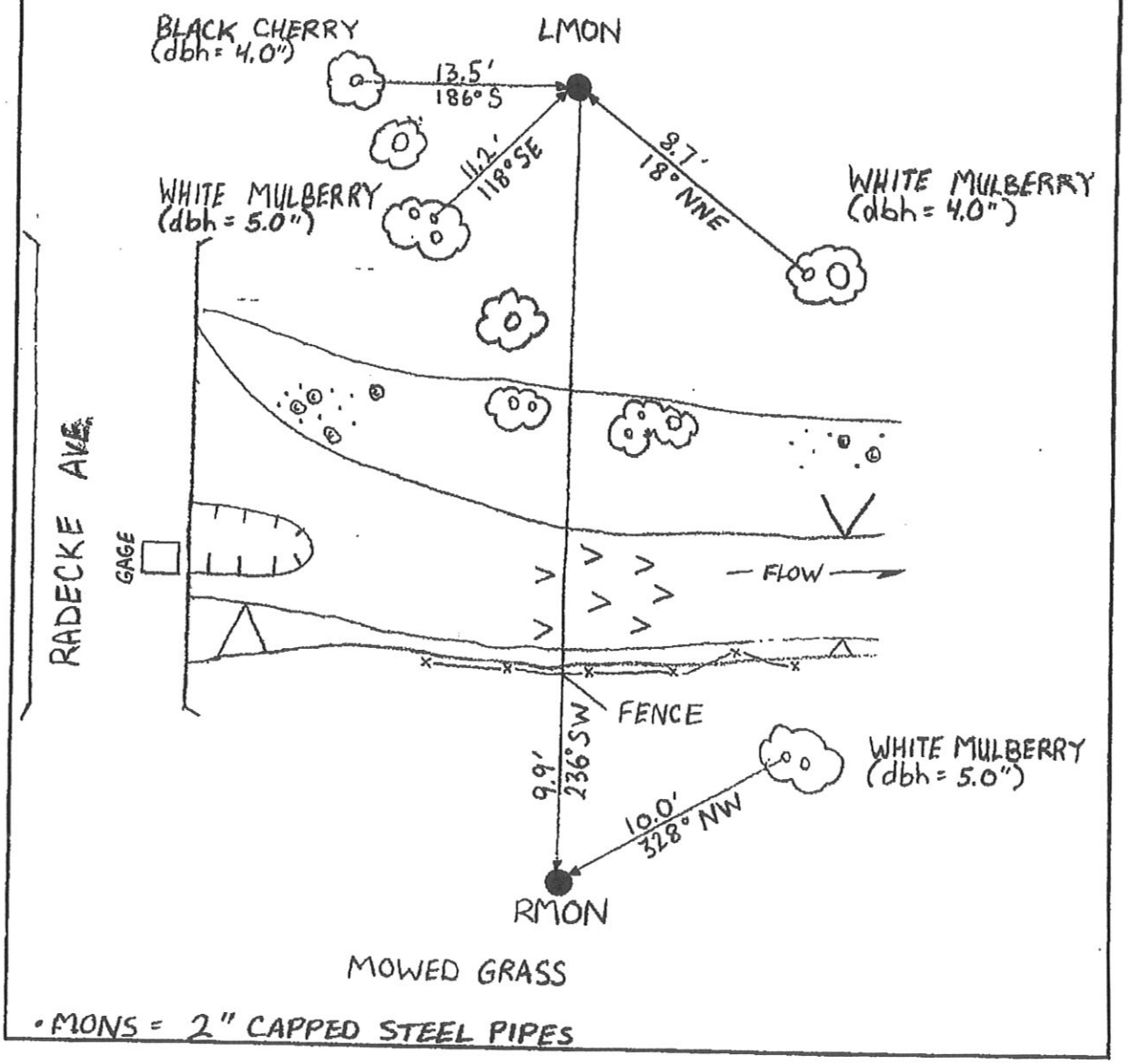
File: Reach 01 - USFWS XS G Balt. City Datum.xls
04/01/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Moores Run
Reach 01
Baltimore Cross Section G
(Stream Feature: Riffle)

Cross-Section Monument Map

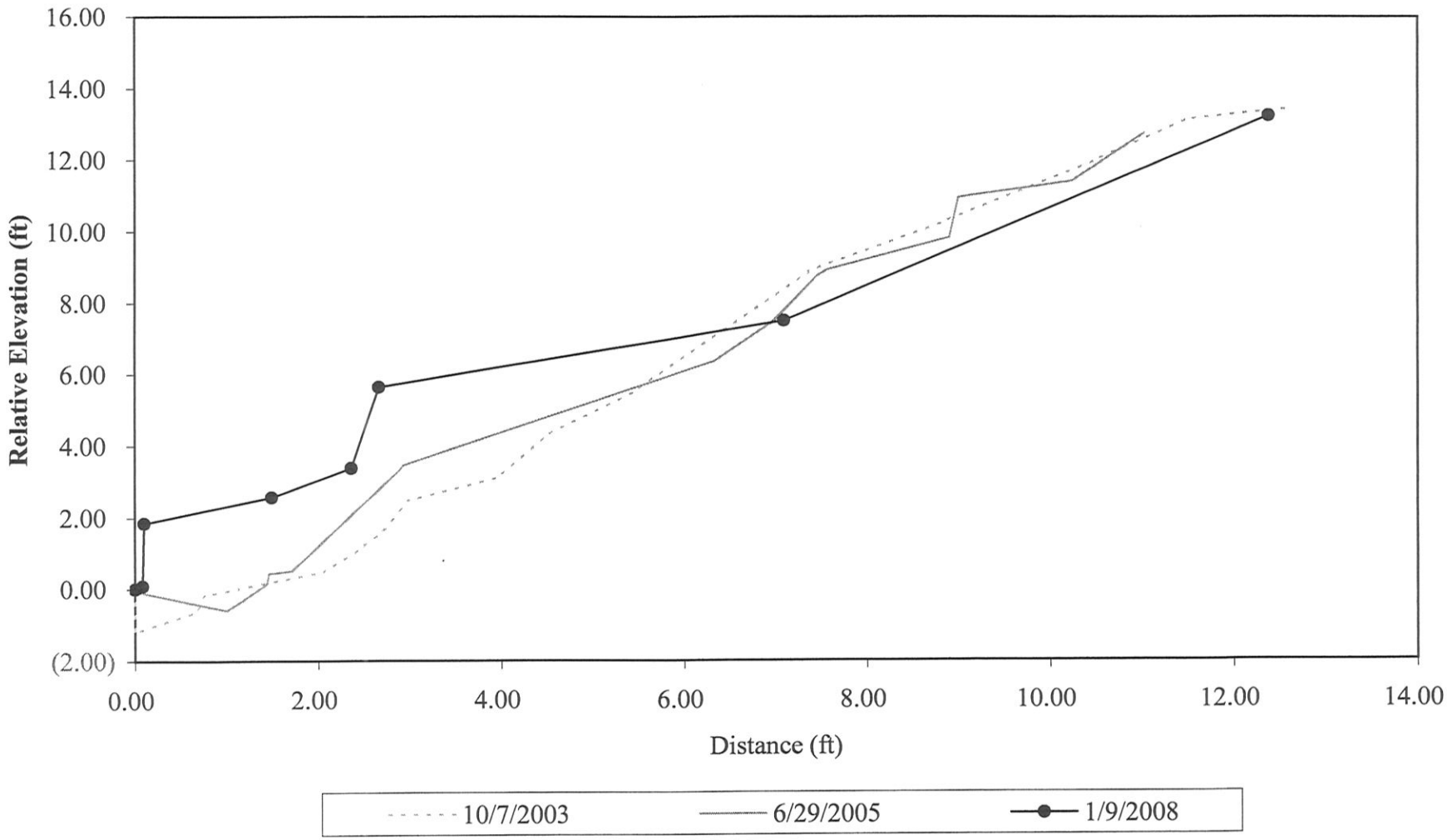


Moores Run 2008 Cross Section Photographs

Photo 1. Reach 01 Service XS G looking at right bank.

Photo 2. Looking downstream at Reach 01 Service XS G.

Moores Run
Reach 01
USFWS XS-G (RB) Bank Profile Overlay



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03/16/06

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 01 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	SD, MS	**Data:**	SD	**QA/QC:**		**Total Score:**	44.28
Reach:	01	**Comments:**	GPS Coordinates:						**Very High**
Location:	USFWS XS G		LMON: N: 39° 19' 47.8" W: 76° 32' 04.4" (+/- 24 feet)					**Notes:**	RIGHT BANK
Date:	9/4/2008		RMON: N: 39° 19' 47.7" W: 76° 32' 06.0" (+/- 18 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
13.60	3.32	4.10	10.00	Extreme	From XS data
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
1.00	13.60	0.07	8.74	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
25.00	0.07	1.84	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
48.00			3.32	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
20.00			7.22	High	
			Adjustment		Notes
Bank Materials			5.00		Clay Loam
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**44.28**		

Bank Erosion Potential

		Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables							
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

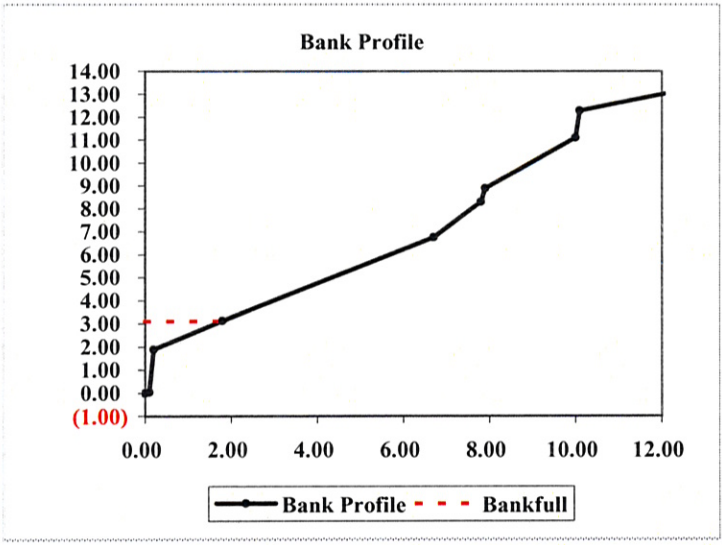
Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

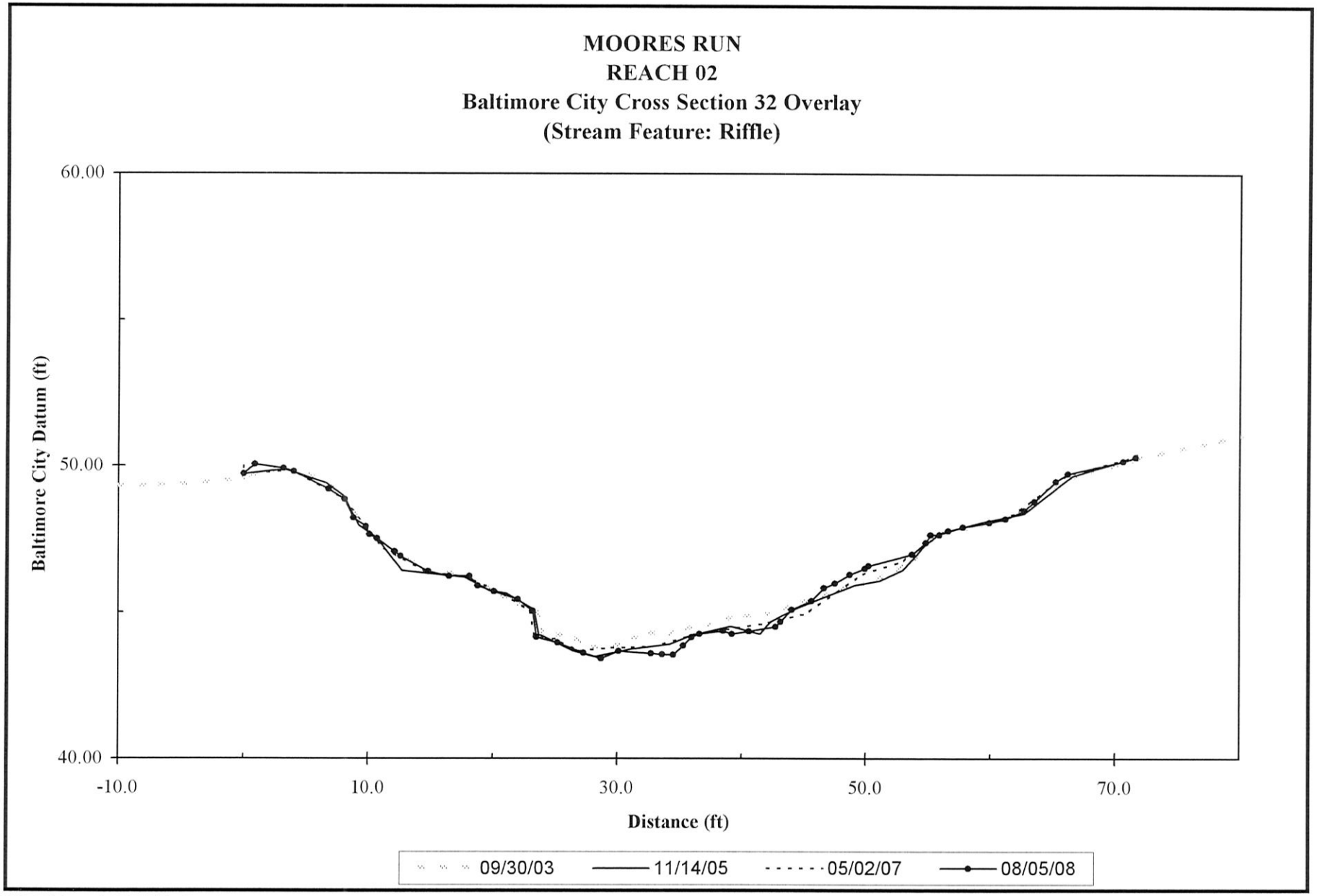
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes
(1.50)	(0.19)	GTPIN
0.00	0.00	TTPIN
0.10	0.04	REW
0.20	1.90	BOULDER
1.80	3.13	RBF
6.70	6.75	GS
7.80	8.29	GS
7.90	8.89	GS
10.00	11.10	GS
10.10	12.28	GS
13.10	13.41	RTOB
Bankfull		



REACH 02
CROSS SECTION 32



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

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File: Reach 02 - BALT XS 32 Balt. City Datum.xls
08/19/08

MOORES RUN - REACH 02 - 2008

Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	
46.50	112.00	2.41	4.29	48.23	2.32	Bankfull
12.50	5.50	0.44	0.73	12.69	0.43	Water Surface

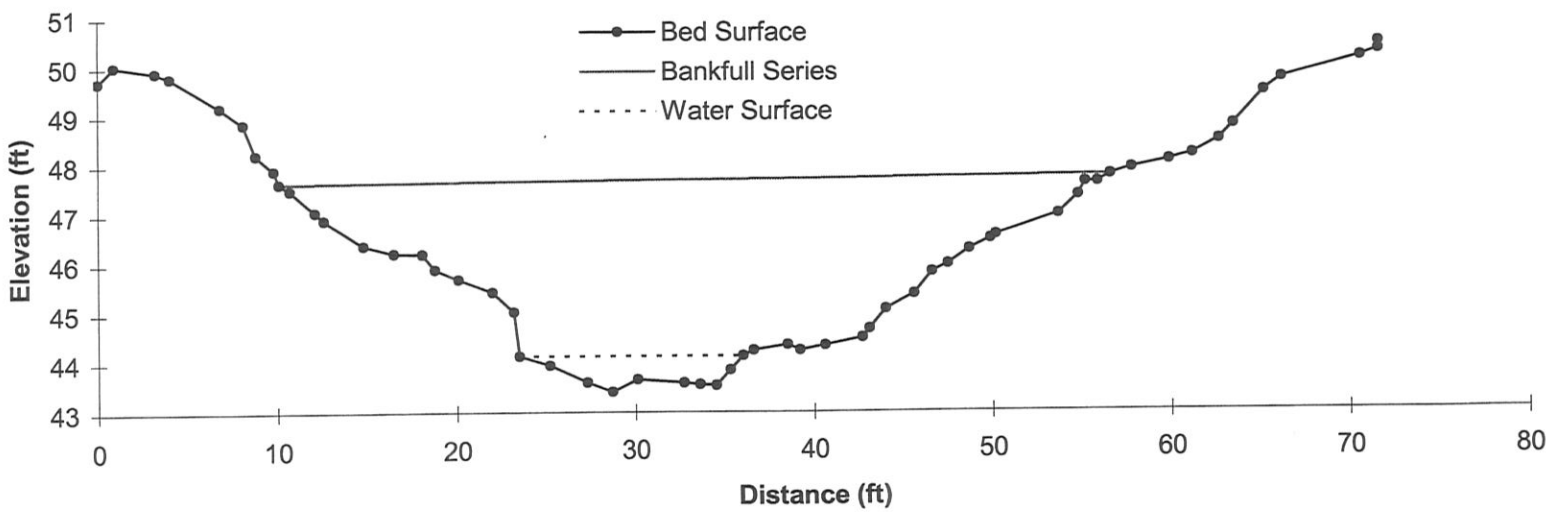
STREAM: Moores Run
REACH & XS: Reach 02 - Balt. XS 32 (Riffle)
DATE: 08/05/08

CREW: SD, CE
DATA: SD
QA/QC:

MON. COORD.: LTMON: N: 39° 19' 50.4" W: 76° 32' 05.5" (+/- 22 ft)
RTMON: N: 39° 19' 50.3" W: 76° 32' 06.7" (+/- 23 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
LTMON	0.0	49.71	CS	18.8	45.90
GS	0.9	50.04	CS	20.1	45.70
GS	3.2	49.91	CS	22.0	45.44
GS	4.0	49.80	IP	23.2	45.04
SL BRK	6.8	49.19	LEW	23.5	44.14
LTOB	8.1	48.85	CS	25.2	43.95
SL BRK	8.8	48.22	CS	27.3	43.60
SL BRK	9.8	47.91	TW	28.7	43.41
LBF	10.1	47.64	CS	30.1	43.66
SL BRK	10.7	47.50	CS	32.7	43.59
SL BRK	12.1	47.06	CS	33.6	43.56
SL BRK	12.6	46.90	CS	34.5	43.54
SL BRK	14.8	46.39	CS	35.3	43.85
SL BRK	16.5	46.23	REW	36.0	44.14
SL BRK	18.1	46.22	BAR	36.6	44.25

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
BAR	38.5	44.36	SL BRK	55.9	47.64
BAR	39.2	44.25	RBF	56.6	47.79
BAR	40.6	44.35	GS	57.8	47.92
BAR	42.7	44.50	GS	59.9	48.08
CS	43.1	44.68	GS	61.2	48.20
SL BRK	44.0	45.08	GS	62.7	48.49
SL BRK	45.6	45.38	GS	63.5	48.80
SL BRK	46.6	45.83	GS	65.2	49.48
SL BRK	47.5	45.99	GS	66.2	49.75
SL BRK	48.7	46.29	GS	70.6	50.18
SL BRK	49.9	46.50	RGMON	71.6	50.31
SL BRK	50.2	46.58	RTMON	71.6	50.47
SL BRK	53.7	46.99			
SL BRK	54.8	47.37			
SL BRK	55.2	47.64			



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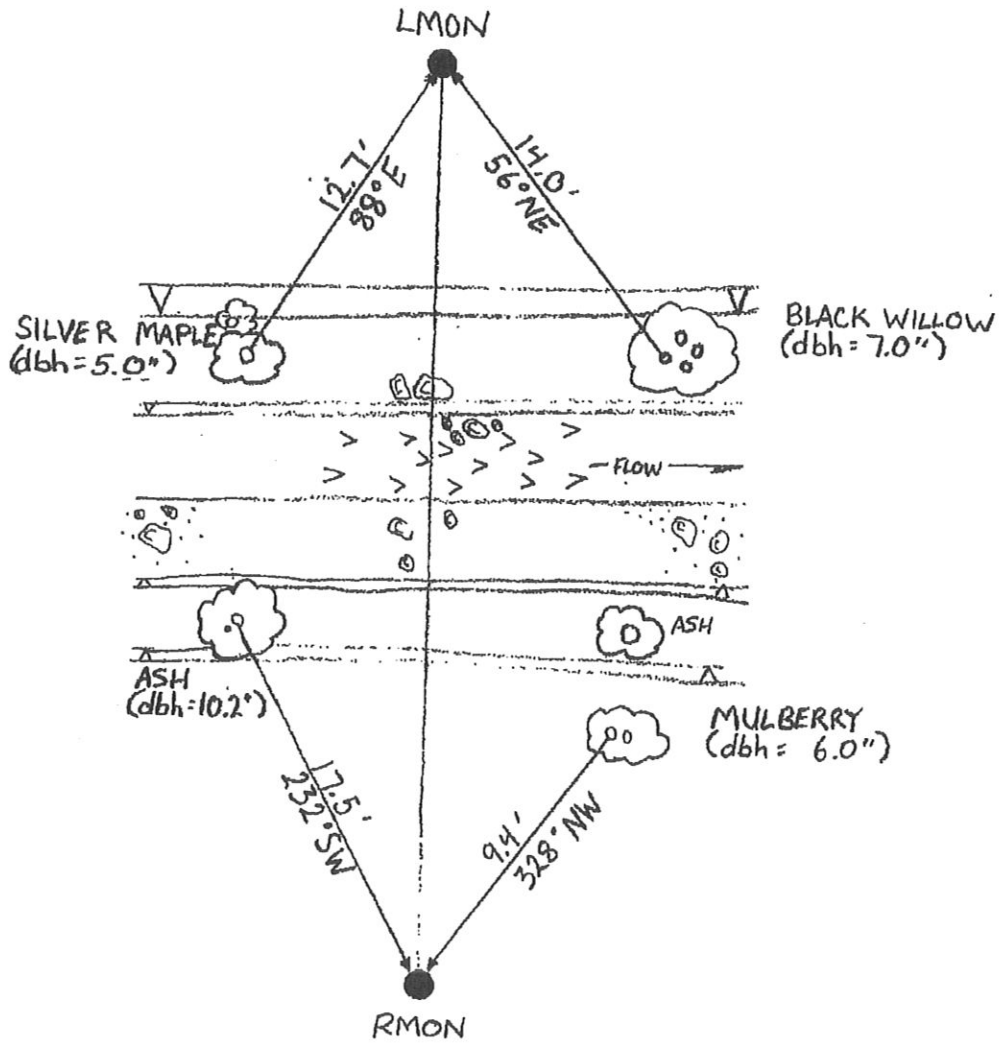
File: Reach 02 - BALT XS 32 Balt. City Datum.xls
08/19/08

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Moores Run
Reach 02
Baltimore Cross Section 32
(Stream Feature: Riffle)

Cross-Section Monument Map



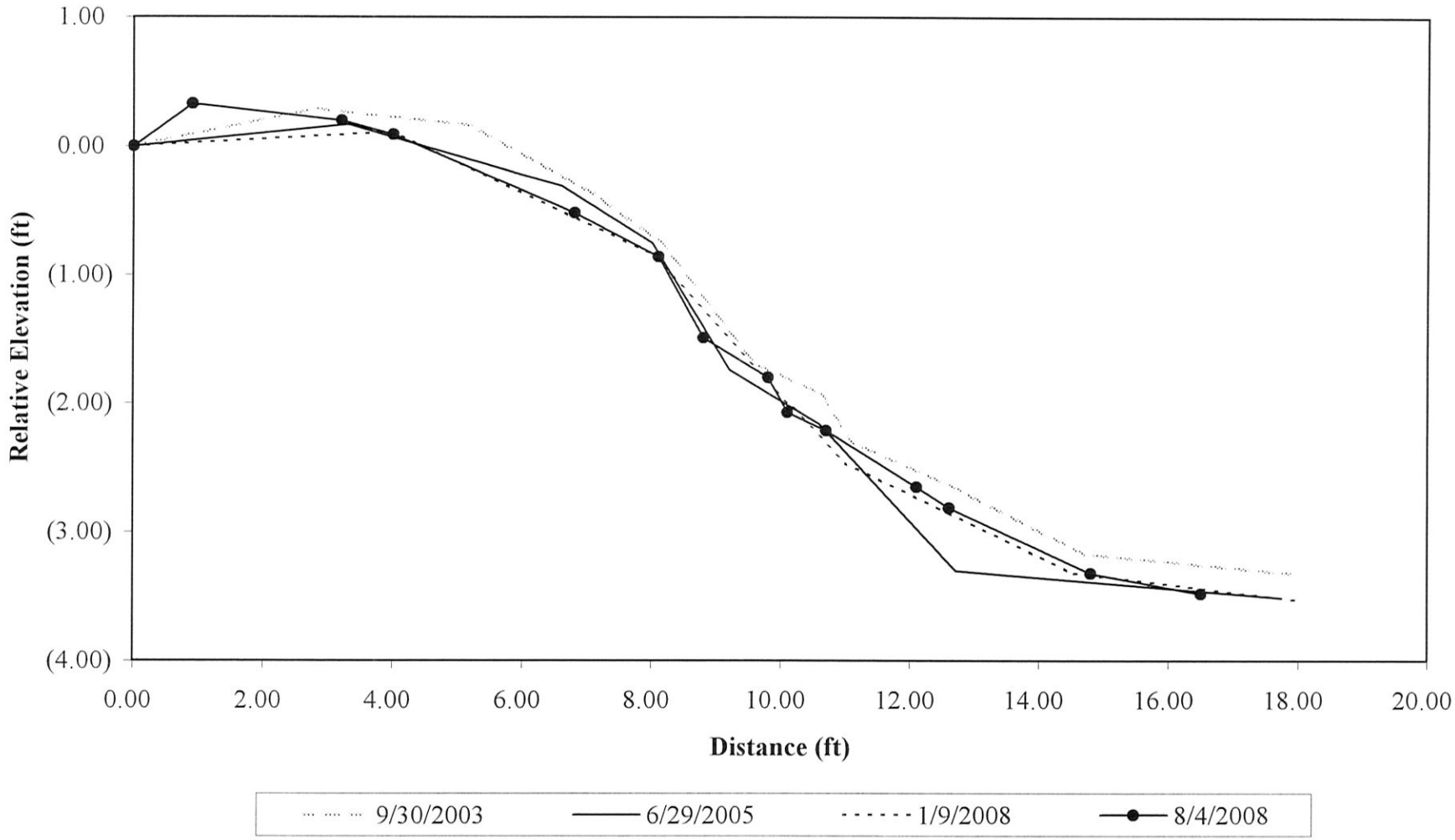
• MONS = 2" CAPPED STEEL PIPES

Moores Run 2008 Cross Section Photographs

Photo 3. Reach 02 Baltimore City XS 32 looking at right bank.

Photo 4. Looking downstream at Reach 02 Baltimore City XS 32.

Moores Run
Reach 02
BALT. CITY XS-32 (LB) Bank Profile Overlay



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File: Reach 02 - BALT XS 32 (LB).xls
01/10/08

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 02 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	CE, SD	**Data:**	SD	**QA/QC:**		**Total Score:**	**15.68**
Reach:	02	**Comments:**	GPS Coordinates:						**Low**
Location:	BALT XS 32		LMON: N: 39° 19' 50.4" W: 76° 32' 05.5" (+/- 22 feet)					**Notes:**	LEFT BANK
Date:	8/4/2008		RMON: N: 39° 19' 50.3" W: 76° 32' 06.7" (+/- 23 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
2.46	1.21	2.03	8.06	Very High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
2.00	2.46	0.81	2.38	Low	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.81	48.78	4.41	Moderate	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
36.00			2.73	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			(5.00)		Boulder Placement
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**15.68**		

Bank Erosion Potential

		Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables							
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

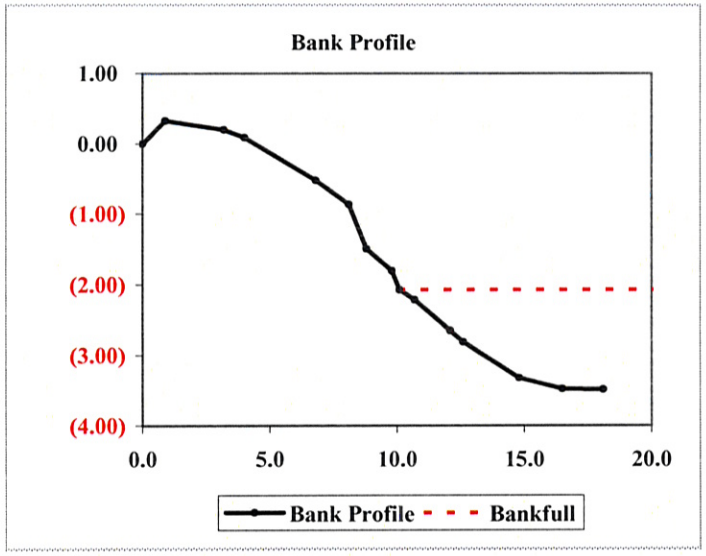
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

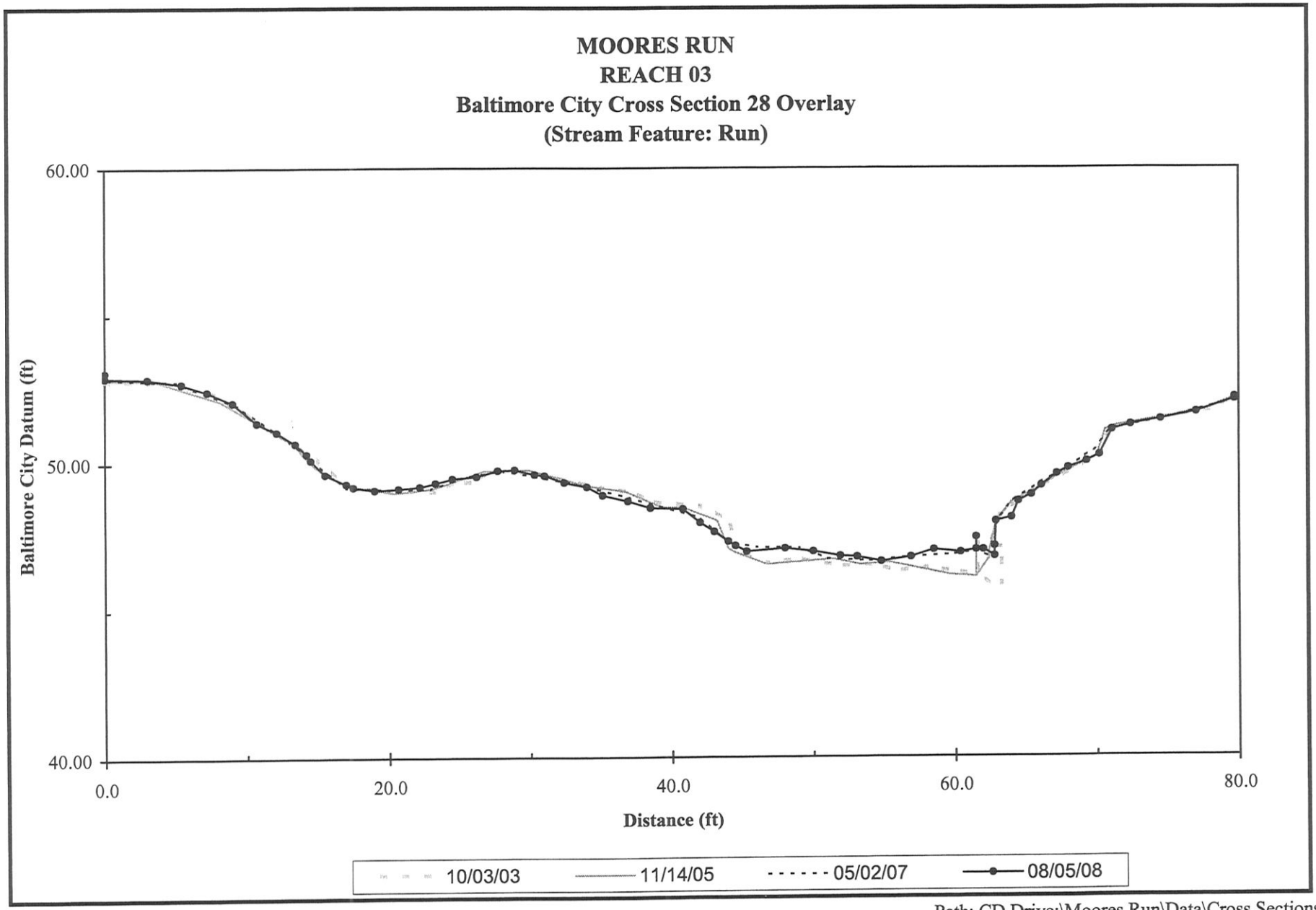
Horizontal Distance	Vertical Height	Notes
0.0	0.00	LTMON
0.9	0.33	GS
3.2	0.20	GS
4.0	0.09	GS
6.8	(0.52)	SL BRK
8.1	(0.86)	LTOB
8.8	(1.49)	SL BRK
9.8	(1.80)	SL BRK
10.10	(2.07)	LBF
10.70	(2.21)	SL BRK
12.10	(2.65)	SL BRK
12.60	(2.81)	SL BRK
14.80	(3.32)	SL BRK
16.50	(3.48)	SL BRK
18.10	(3.49)	SL BRK

Bankfull

Horizontal Distance	Vertical Height	Notes
10.10	(2.07)	
20.00	(2.07)	



REACH 03
CROSS SECTION 28



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 03 - BALT XS 28 Balt. City Datum.xls
08/19/08

MOORES RUN - REACH 03 - 2008

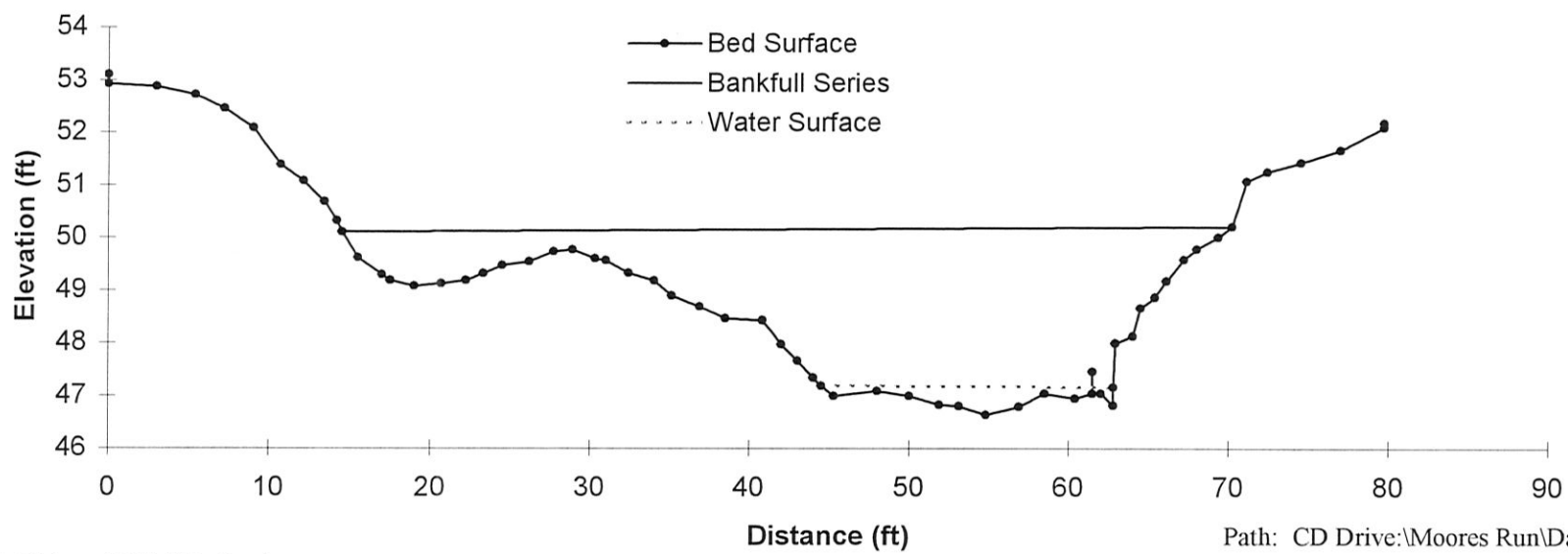
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	
55.70	100.19	1.80	3.56	58.72	1.71	Bankfull
18.30	4.60	0.25	0.53	19.59	0.23	Water Surface

STREAM: Moores Run
REACH & XS: Reach03 - Balt. XS 28 (Run)
DATE: 08/05/08
CREW: CE, SD
DATA: SD
QA/QC:

MON. COORD.: LTMON: N: 39° 19' 53.1" W: 76° 32' 06.6" (+/- 19 ft)
RTMON: N: 39° 19' 52.3" W: 76° 32' 07.6" (+/- 19 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
LTMON	0.0	53.10	OVERFLOW	20.7	49.13
GLMON	0.0	52.92	OVERFLOW	22.2	49.19
GS	3.0	52.88	OVERFLOW	23.3	49.32
SL BRK	5.4	52.72	OVERFLOW	24.5	49.47
SL BRK	7.2	52.45	CS	26.2	49.54
SL BRK	9.0	52.08	CS	27.7	49.74
SL BRK	10.7	51.39	CS	28.9	49.77
SL BRK	12.1	51.08	CS	30.3	49.61
SL BRK	13.4	50.68	CS	31.0	49.57
SL BRK	14.2	50.32	CS	32.4	49.33
LBF	14.5	50.11	CS	34.0	49.18
SL BRK	15.5	49.62	CS	35.1	48.90
SL BRK	17.0	49.29	CS	36.9	48.70
OVERFLOW	17.5	49.18	CS	38.5	48.47
OVERFLOW	19.0	49.08	ROCKS	40.8	48.43

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
ROCKS	42.0	47.98	GTPIN	61.5	47.04
TOE	43.0	47.67	CS	62.0	47.04
CS	44.0	47.34	CS	62.8	46.82
LEW	44.5	47.19	REW	62.8	47.16
CS	45.3	46.99	SL BRK	62.9	48.00
CS	48.0	47.09	SL BRK	64.0	48.13
CS	50.0	46.99	SL BRK	64.5	48.67
CS	51.9	46.83	SL BRK	65.4	48.88
CS	53.1	46.80	SL BRK	66.1	49.19
TW	54.8	46.64	SL BRK	67.2	49.59
CS	56.9	46.79	SL BRK	68.0	49.80
CS	58.5	47.04	SL BRK	69.3	50.02
CS	60.4	46.95	RBF	70.2	50.23
GTPIN	61.5	47.04	RTOB	71.1	51.09
TTPIN	61.5	47.47	GS	72.4	51.27



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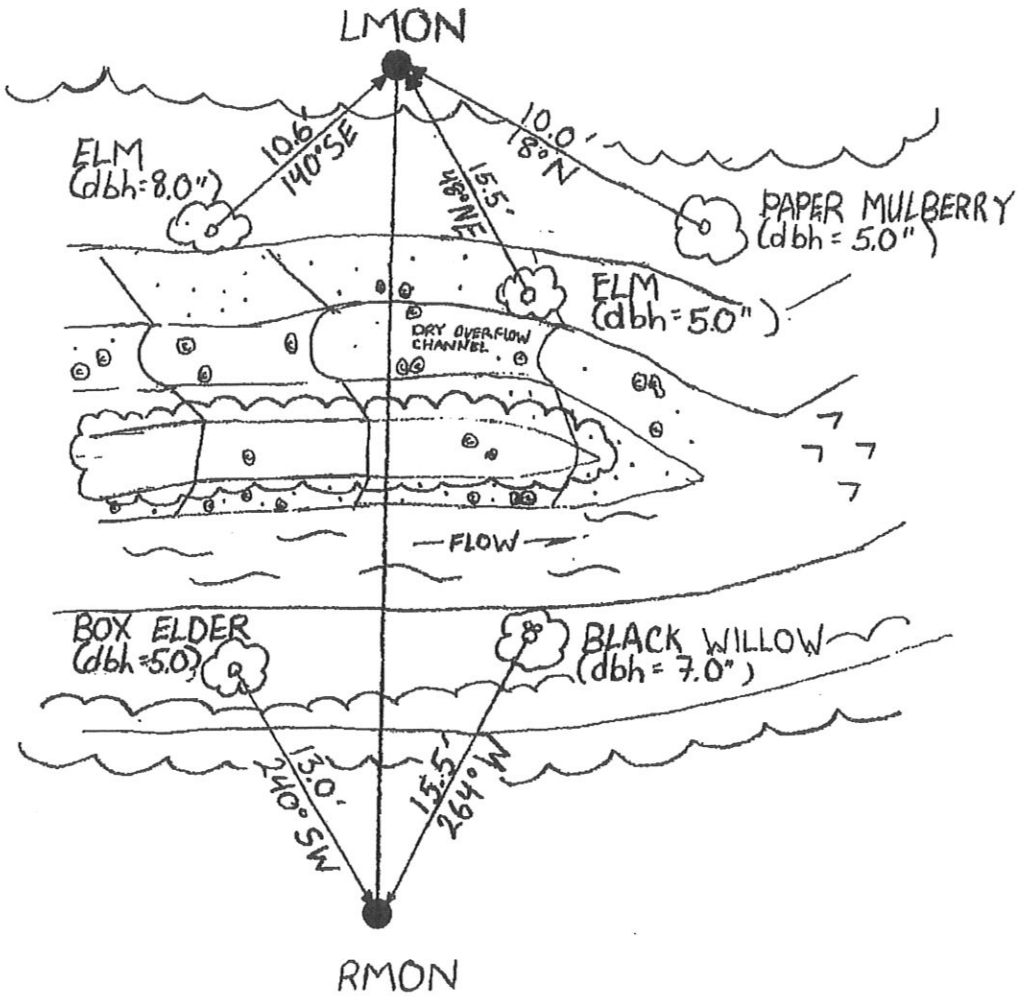
Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 03 - BALT XS 28 Balt. City Datum.xls
08/19/08

MOORES RUN - REACH 03 - 2008

GS	74.5	51.45			
GS	77.0	51.69			
RGMON	79.7	52.12			
RTMON	79.7	52.20			

Moores Run
Reach 03
Baltimore Cross Section 28
(Stream Feature: Run)

Cross-Section Monument Map



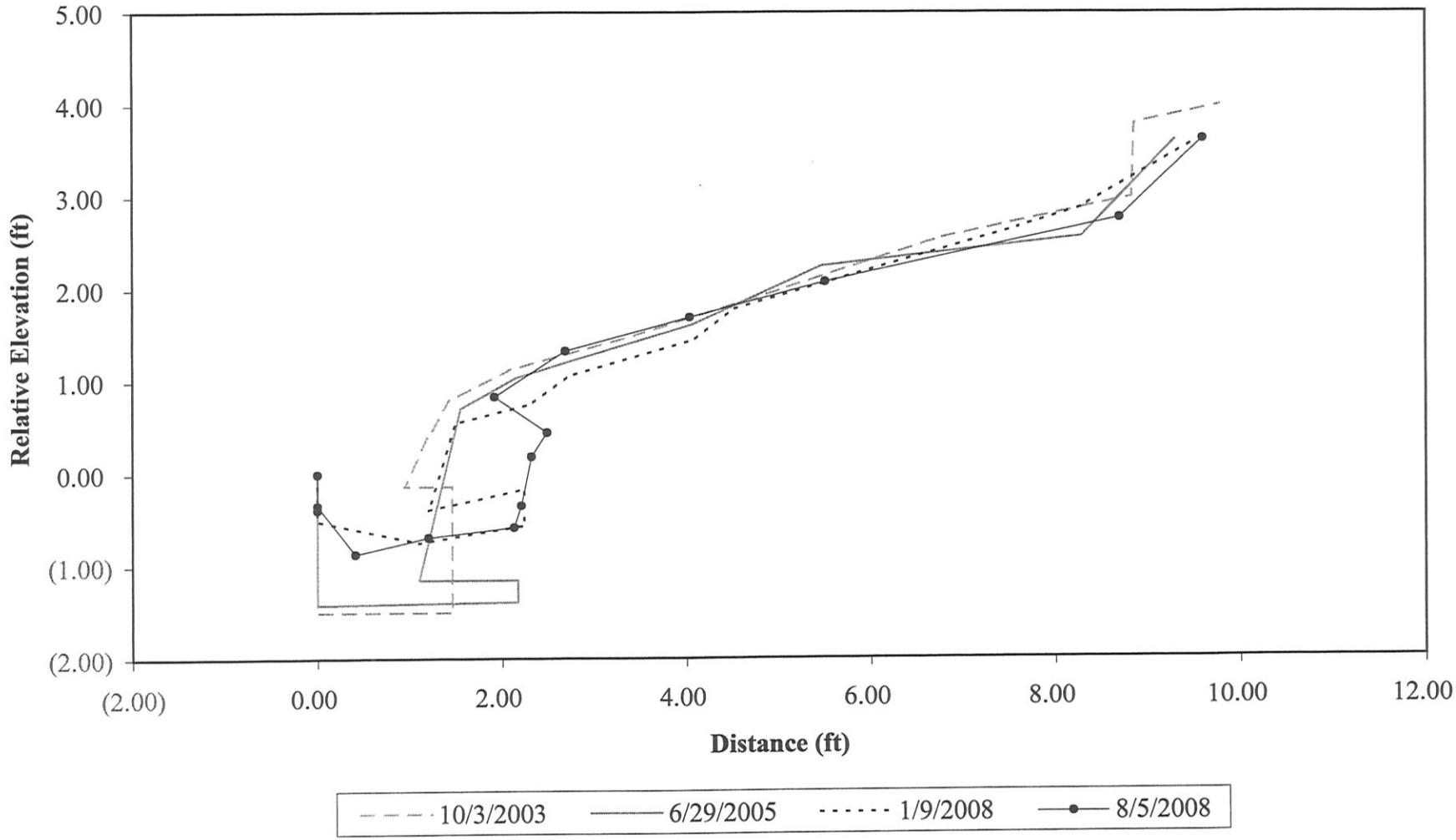
• MONS = 2" CAPPED STEEL PIPES

Moores Run 2008 Cross Section Photographs

Photo 5. Reach 03 Baltimore City XS 28 looking at left bank.

Photo 6. Reach 03 Baltimore City XS 28 looking upstream.

Moores Run
Reach 03
BALT. CITY XS-28 (RB) Bank Profile Overlay



Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File: Reach 03 - BALT XS 28 (RB).xls
04/01/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 03 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	CE, SD	**Data:**	SD	**QA/QC:**		**Total Score:**	34.23
Reach:	03	**Comments:**	GPS Coordinates:						**High**
Location:	BALT XS 28		LMON: N: 39° 19' 53.1" W: 76° 32' 06.6" (+/- 19 feet)					**Notes:**	RIGHT BANK
Date:	8/5/2008		RMON: N: 39° 19' 52.3" W: 76° 32' 07.6" (+/- 19 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
4.32	3.46	1.25	4.31	Moderate	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.75	4.32	0.17	7.58	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.17	10.42	8.40	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
22.00			2.05	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
55.00			3.90	Low	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			8.00		Undercut
		TOTAL SCORE	**34.23**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

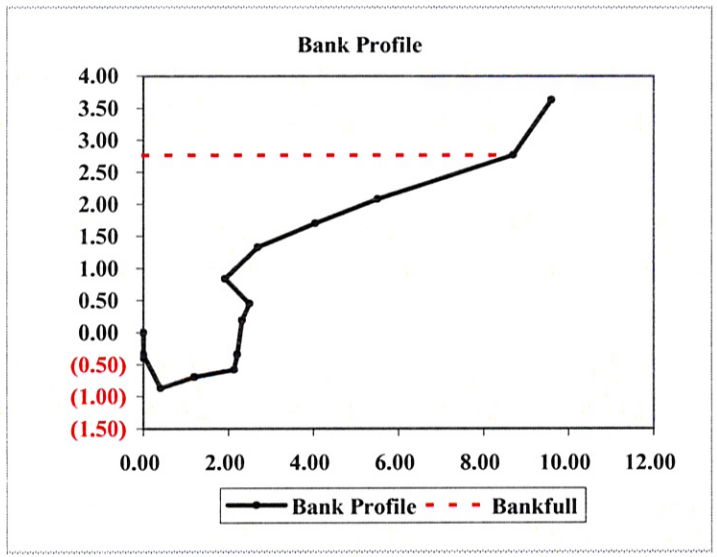
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes
0.00	0.00	TTPIN
0.00	(0.39)	GTPIN
0.00	(0.34)	WS
0.41	(0.87)	CS
1.20	(0.69)	CS
2.13	(0.58)	CS
2.21	(0.34)	UNDERCUT
2.32	0.19	UNDERCUT
2.49	0.45	SLP BRK
1.92	0.84	SLP BRK
2.69	1.33	SLP BRK
4.04	1.70	SLP BRK
5.51	2.08	SLP BRK
8.70	2.77	RBF
9.60	3.63	RTOB

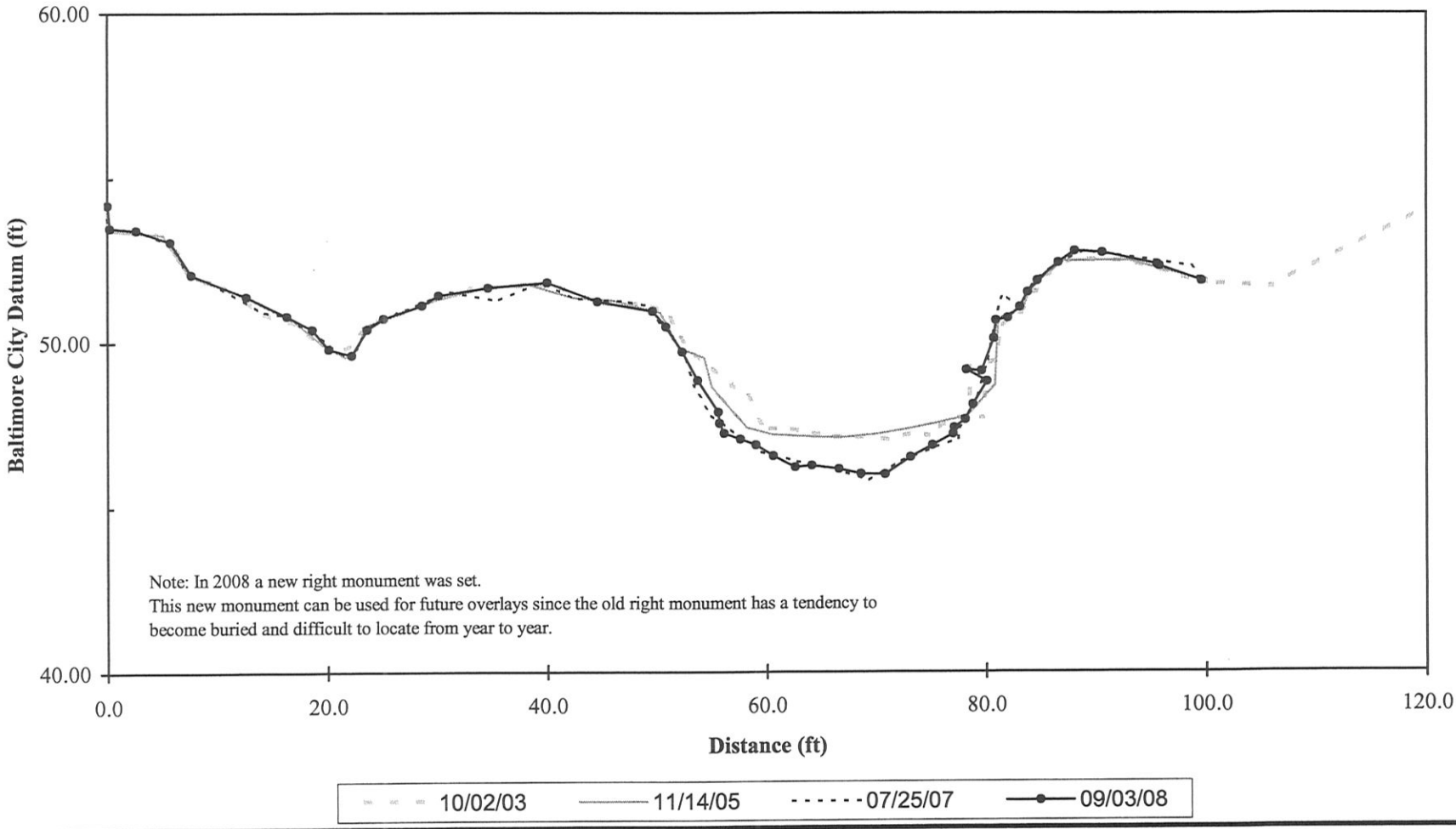
Bankfull

Horizontal Distance	Vertical Height	Notes
0.00	2.77	
8.70	2.77	



REACH 03
CROSS SECTION A

MOORES RUN
REACH 03
USFWS Cross Section A Overlay
(Stream Feature: Riffle)



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Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 03 - USFWS XS A Balt. City Datum.xls
03/20/09

MOORES RUN - REACH 03 - 2008

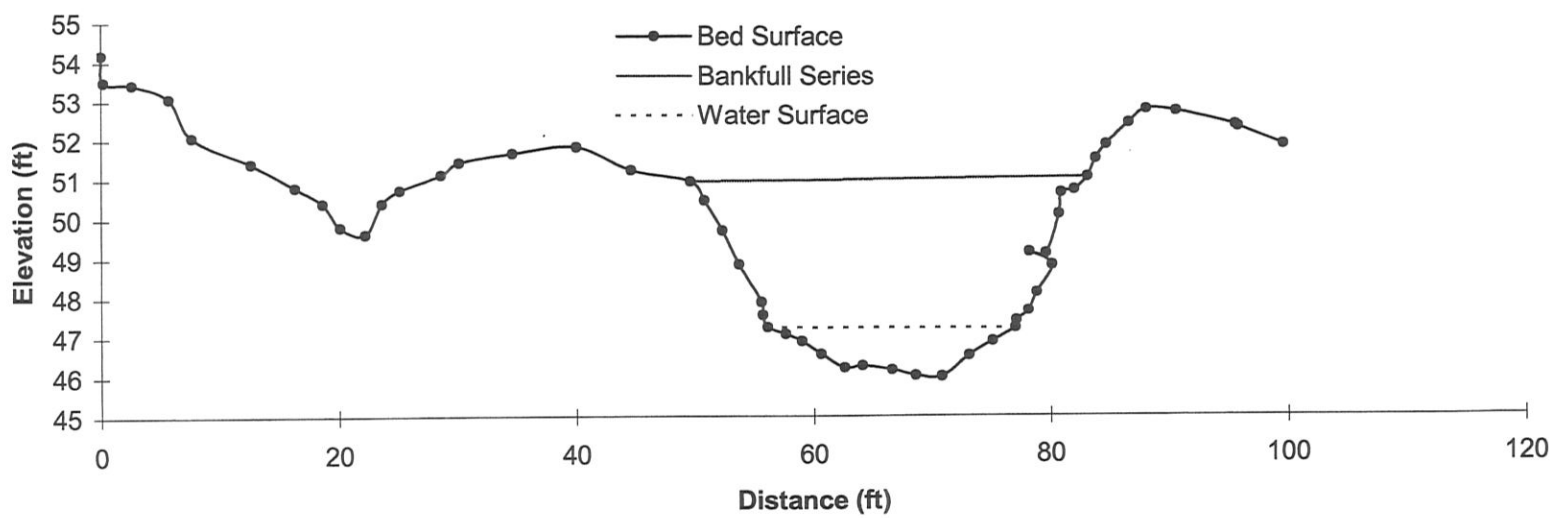
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	
33.50	117.92	3.52	5.03	39.93	2.95	Bankfull
20.90	15.61	0.75	1.24	21.12	0.74	Water Surface

STREAM: Moores Run
REACH & XS: Reach 03 - USFWS XS A (Riffle)
DATE: 09/04/08
CREW: MS, SD
DATA: SD
QA/QC:

MON. COORD.: LMON: N: 39° 19' 53.5" W: 76° 32' 06.8" (+/- 21 ft)
RMON: N: 39° 19' 53.0" W: 76° 32' 08.0" (+/- 27 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
TLMON	0.0	54.19	GS	40.0	51.83
GLMON	0.2	53.50	GS	44.6	51.25
GS	2.6	53.43	LBF	49.6	50.96
SL BRK	5.7	53.07	SL BRK	50.8	50.48
SL BRK	7.6	52.08	SL BRK	52.3	49.72
SIDE CHANNEL	12.6	51.41	SL BRK	53.7	48.86
SIDE CHANNEL	16.3	50.81	CS	55.6	47.90
SIDE CHANNEL	18.6	50.40	CS	55.7	47.56
SIDE CHANNEL	20.1	49.80	LEW	56.1	47.25
SIDE CHANNEL	22.2	49.62	CS	57.6	47.08
SIDE CHANNEL	23.6	50.40	CS	59.0	46.90
GS	25.1	50.73	CS	60.6	46.57
GS	28.6	51.13	CS	62.6	46.23
GS	30.1	51.44	CS	64.1	46.28
GS	34.6	51.67	CS	66.6	46.17

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
CS	68.6	46.02	SL BRK	83.8	51.53
TW	70.8	46.00	SL BRK	84.7	51.88
CS	73.1	46.53	RTOB	86.6	52.43
CS	75.1	46.89	GS	88.1	52.78
REW	77.0	47.23	GS	90.6	52.73
GS	77.1	47.42	NEW RTMON	95.6	52.38
GS	78.1	47.67	GS	95.8	52.33
UNDERCUT	78.8	48.13	OLD RTMON	99.6	51.88
UNDERCUT	80.1	48.83			
ON ROOT	78.2	49.17			
GS	79.6	49.13			
GS	80.7	50.12			
ON ROOT	80.9	50.67			
SL BRK	82.0	50.74			
RBF	83.1	51.07			



Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 03 - USFWS XS A Balt. City Datum.xls
03/20/09

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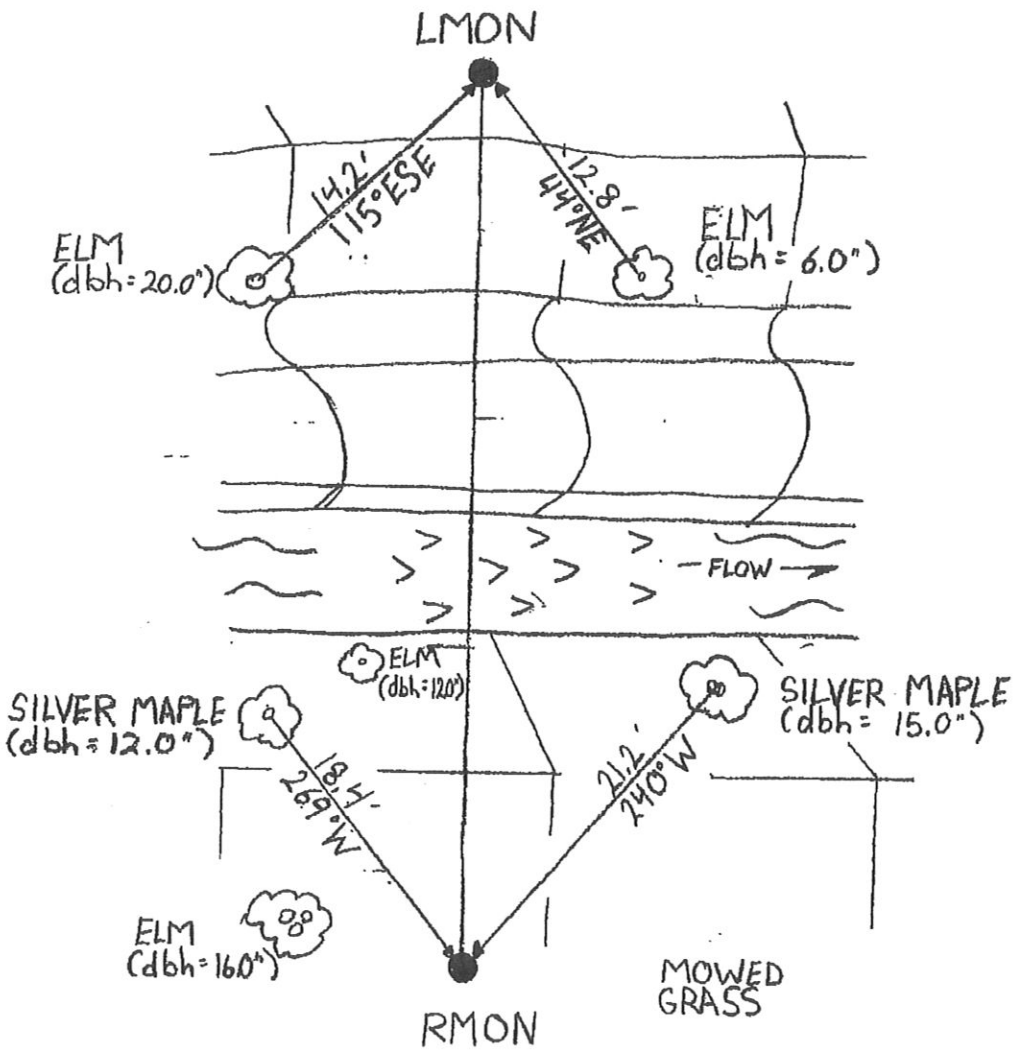
Moores Run
Reach 03
USFWS Cross Section A
(Stream Feature: Riffle)

Cross-Section Monument Map



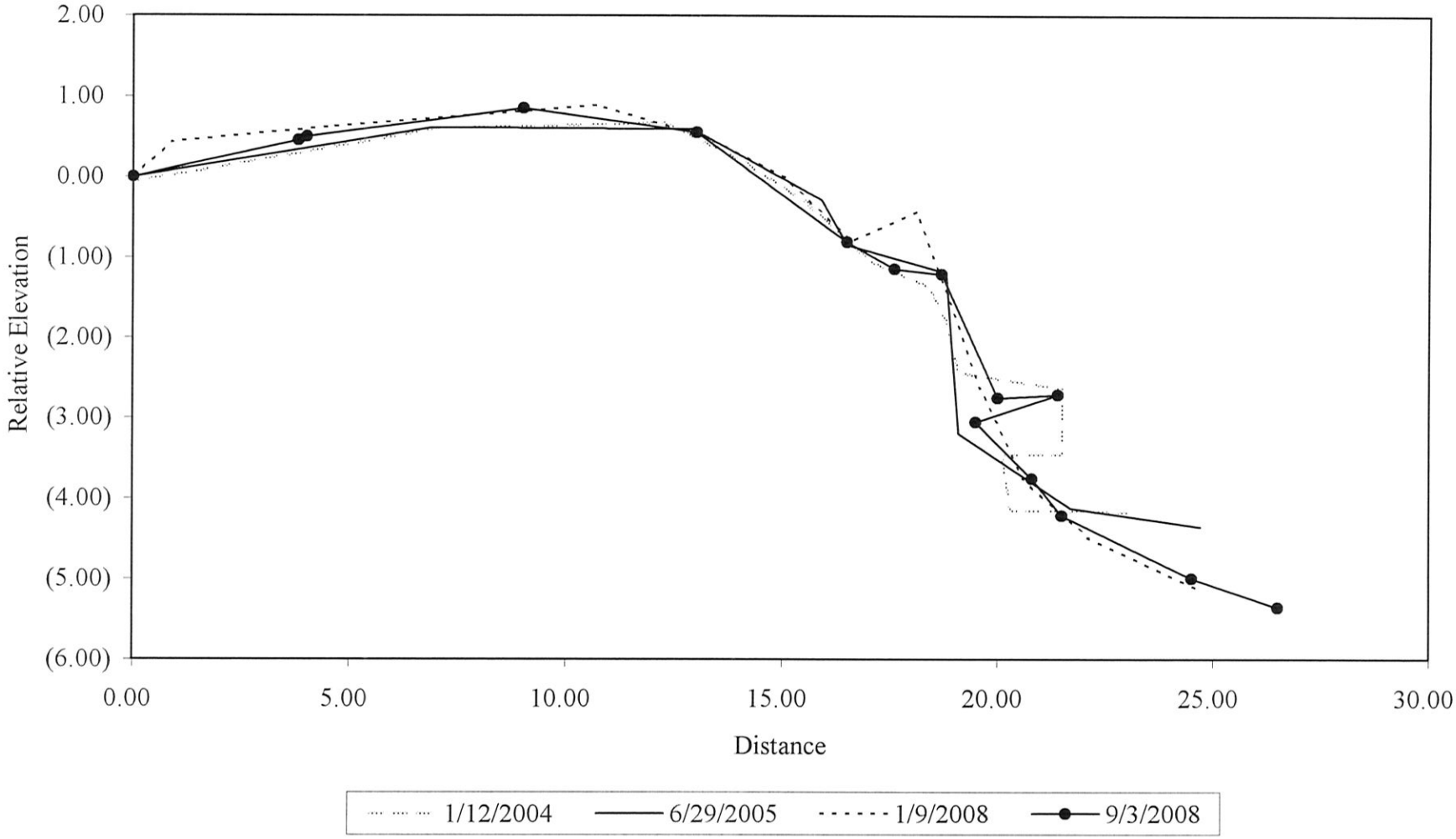
• MONS = 5/8" REBAR W/YELLOW CAPS SET IN CONCRETE

Moores Run 2008 Cross Section Photographs

Photo 7. Reach 03 Service XS A looking at right bank.

Photo 8. Reach 03 Service XS A looking upstream.

Moores Run
Reach 03
USFWS XS-A (RB) Bank Profile Overlay



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Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File: Reach 03 - USFWS XS A (Right Channel - RB).xls
04/01/09

MOORES RUN - REACH 03 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	MS, SD	**Data:**	SLD	**QA/QC:**		**Total Score:**	24.33
Reach:	03	**Comments:**	GPS Coordinates:						**Moderate**
Location:	USFWS XS A - RIGHT CHANNEL		LMON: N: 39° 19' 53.5" W: 76° 32' 06.8" (+/- 21 feet)					**Notes:**	RIGHT BANK
Date:	9/3/2008		RMON: N: 39° 19' 53.0" W: 76° 32' 08.0" (+/- 27 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.54	4.18	1.33	4.79	Moderate	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
1.50	5.54	0.27	6.26	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.27	16.25	7.73	High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
30.00			2.44	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**24.33**		

Bank Erosion Potential

		Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables							
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

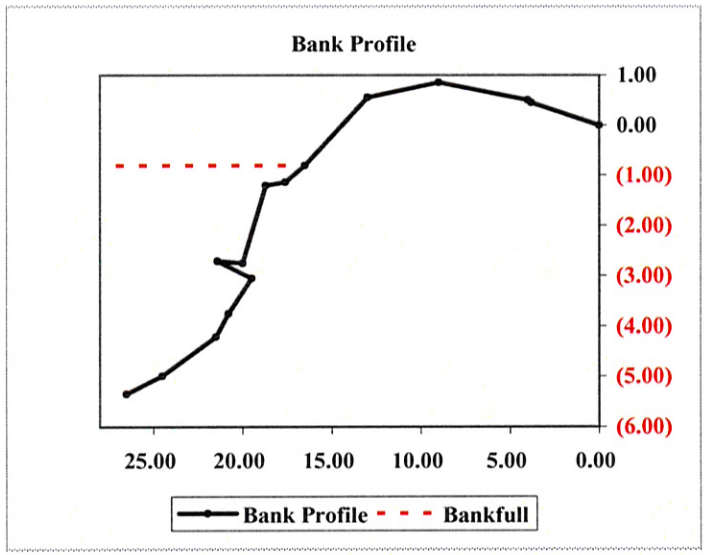
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

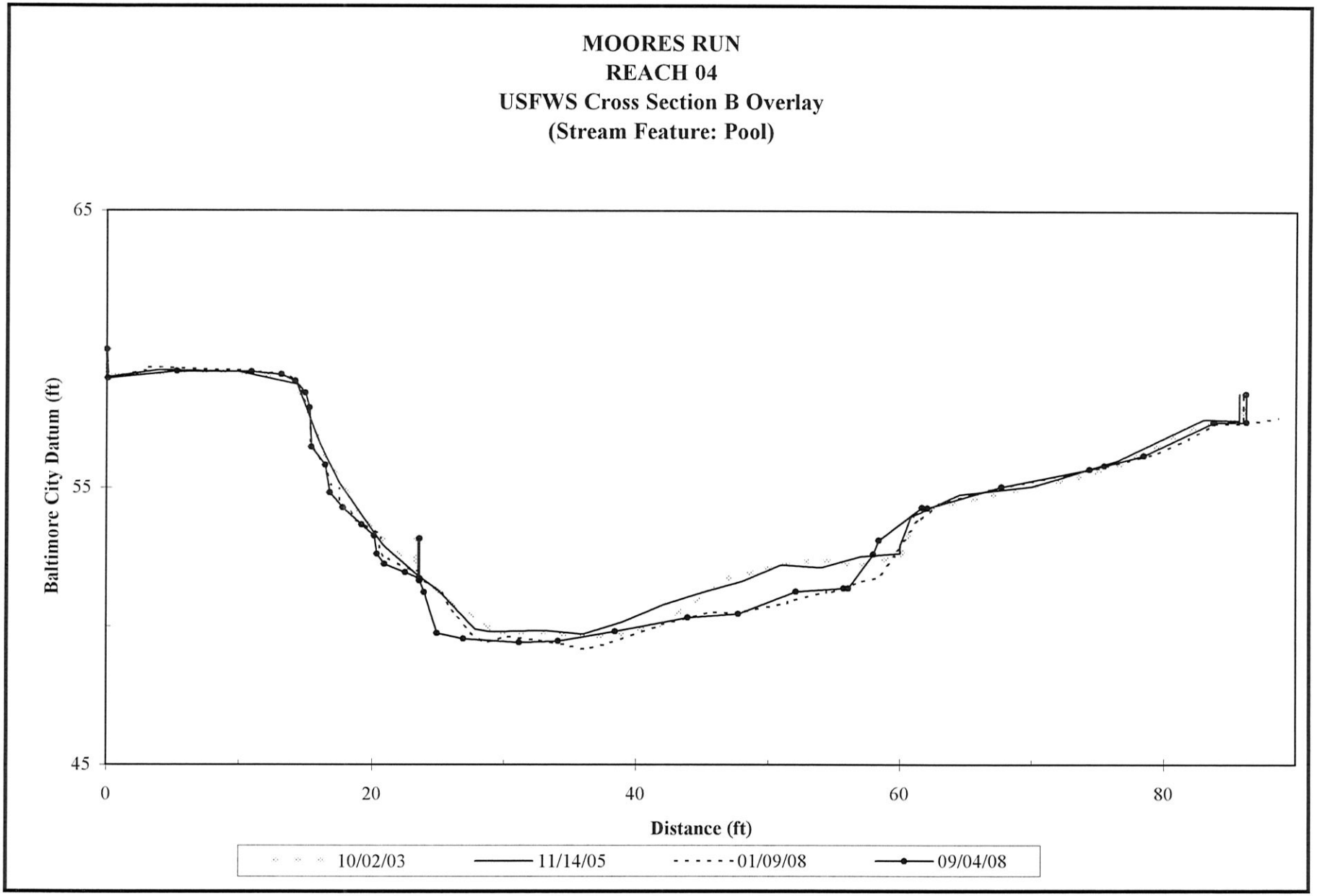
Horizontal Distance	Vertical Height	Notes
0.00	0.00	OLD TRMON
3.80	0.45	GS
4.00	0.50	NEW TRMON
9.00	0.85	GS
13.00	0.55	RTOB
16.50	(0.81)	RBF
17.60	(1.14)	SLP BRK
18.70	(1.21)	ON ROOT
20.00	(2.75)	GS
21.40	(2.71)	UNDERCUT
19.50	(3.05)	UNDERCUT
20.80	(3.75)	GS
21.50	(4.21)	CS
24.50	(4.99)	CS
26.50	(5.35)	CS

Bankfull

Horizontal Distance	Vertical Height	Notes
27.00	(0.81)	
16.50	(0.81)	



REACH 04
CROSS SECTION B



Path: CD Drive:\Moore Run\Data\Cross Sections
File: Reach 04 - USFWS XS B Balt. City Datum.xls
03/20/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 04 - 2008

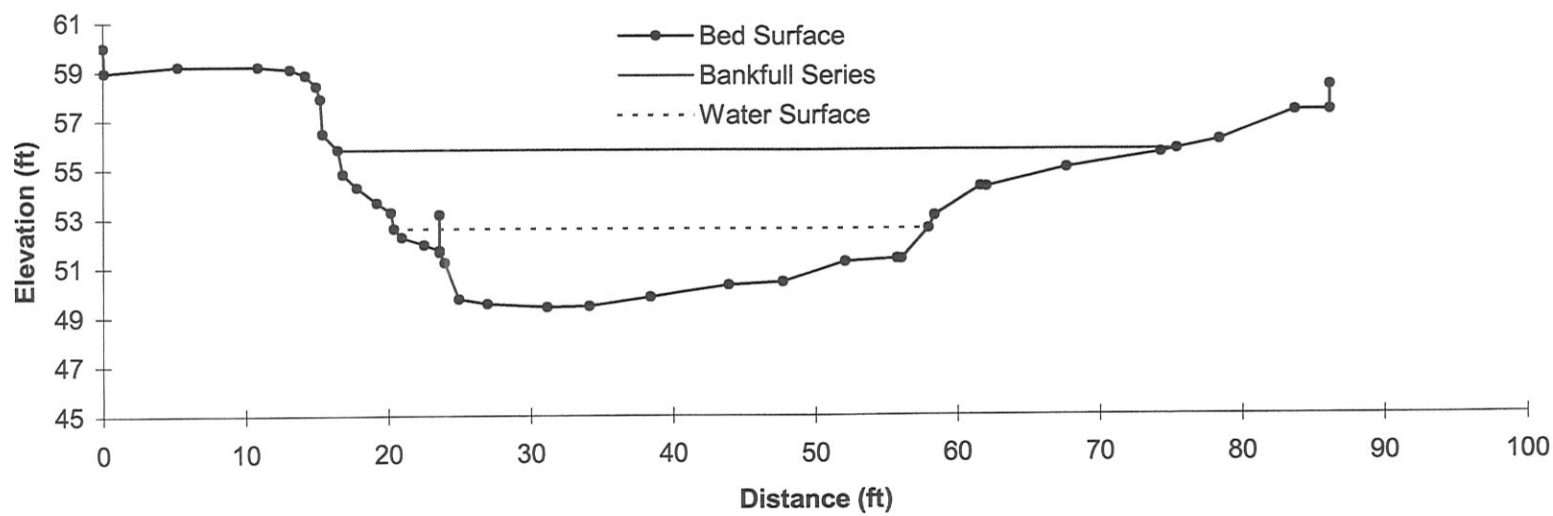
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	
59.01	227.67	3.86	6.40	65.68	3.47	Bankfull
37.61	81.79	2.17	3.19	42.21	1.94	Water Surface

STREAM: Moores Run
REACH & XS: Reach 04 - USFWS XS B (Pool)
DATE: 09/04/08
CREW: MS, SD
DATA: SD
QA/QC:

MON. COORD.: LMON: N: 39° 19' 56.7" W: 76° 32' 08.4" (+/- 24 ft)
RMON: N: 39° 19' 56.6" W: 76° 32' 09.5" (+/- 21 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
TLMON	0.0	59.98	CS	20.9	52.24
GS	0.1	58.95	CS	22.5	51.94
GS	5.3	59.21	BTPIN	23.6	51.71
GS	10.9	59.19	TTPIN	23.6	53.16
SL BRK	13.1	59.09	BTPIN	23.6	51.64
LTOB	14.2	58.85	CS	24.0	51.22
GS	14.9	58.41	CS	24.9	49.75
GS	15.2	57.88	CS	26.9	49.55
GS	15.4	56.46	CS	31.1	49.41
LBF	16.4	55.81	CS	34.1	49.46
CS	16.8	54.81	CS	38.4	49.82
CS	17.8	54.27	CS	43.9	50.31
SL BRK	19.2	53.65	CS	47.7	50.44
SL BRK	20.2	53.26	CS	52.1	51.25
LEW	20.4	52.60	CS	55.7	51.37

Identifier	Distance (ft)	Elevation (ft)
CS	56.1	51.36
REW	58.0	52.60
CS	58.4	53.11
CS	61.6	54.29
SL BRK	62.1	54.28
GS	67.7	55.05
GS	74.3	55.67
RBF	75.5	55.81
SL BRK	78.4	56.18
GS	83.7	57.38
GRMON	86.2	57.39
TRMON	86.2	58.41

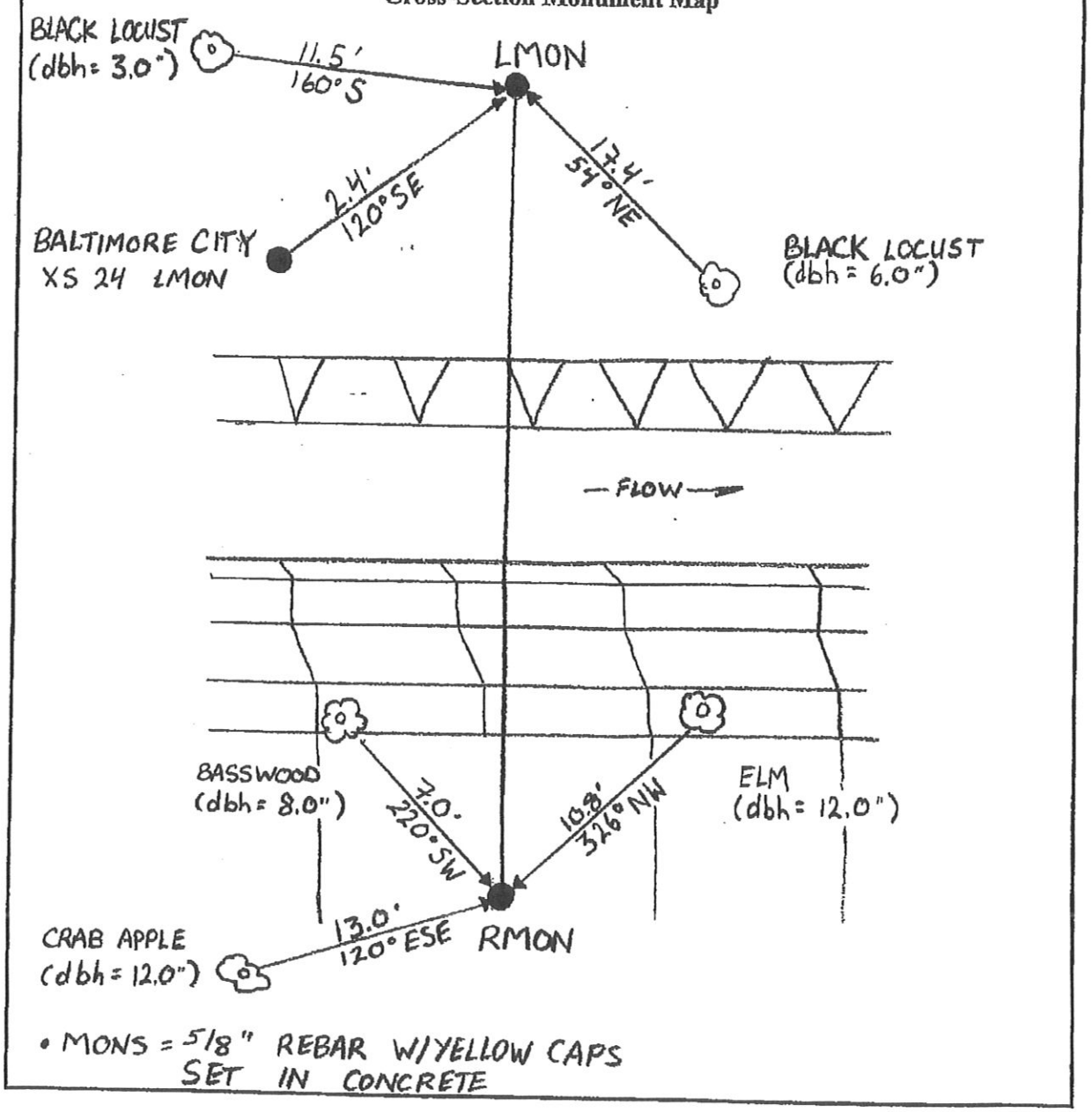


Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 04 - USFWS XS B Balt. City Datum.xls
03/20/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Moores Run
Reach 04
USFWS Cross Section B
(Stream Feature: Pool)

Cross-Section Monument Map



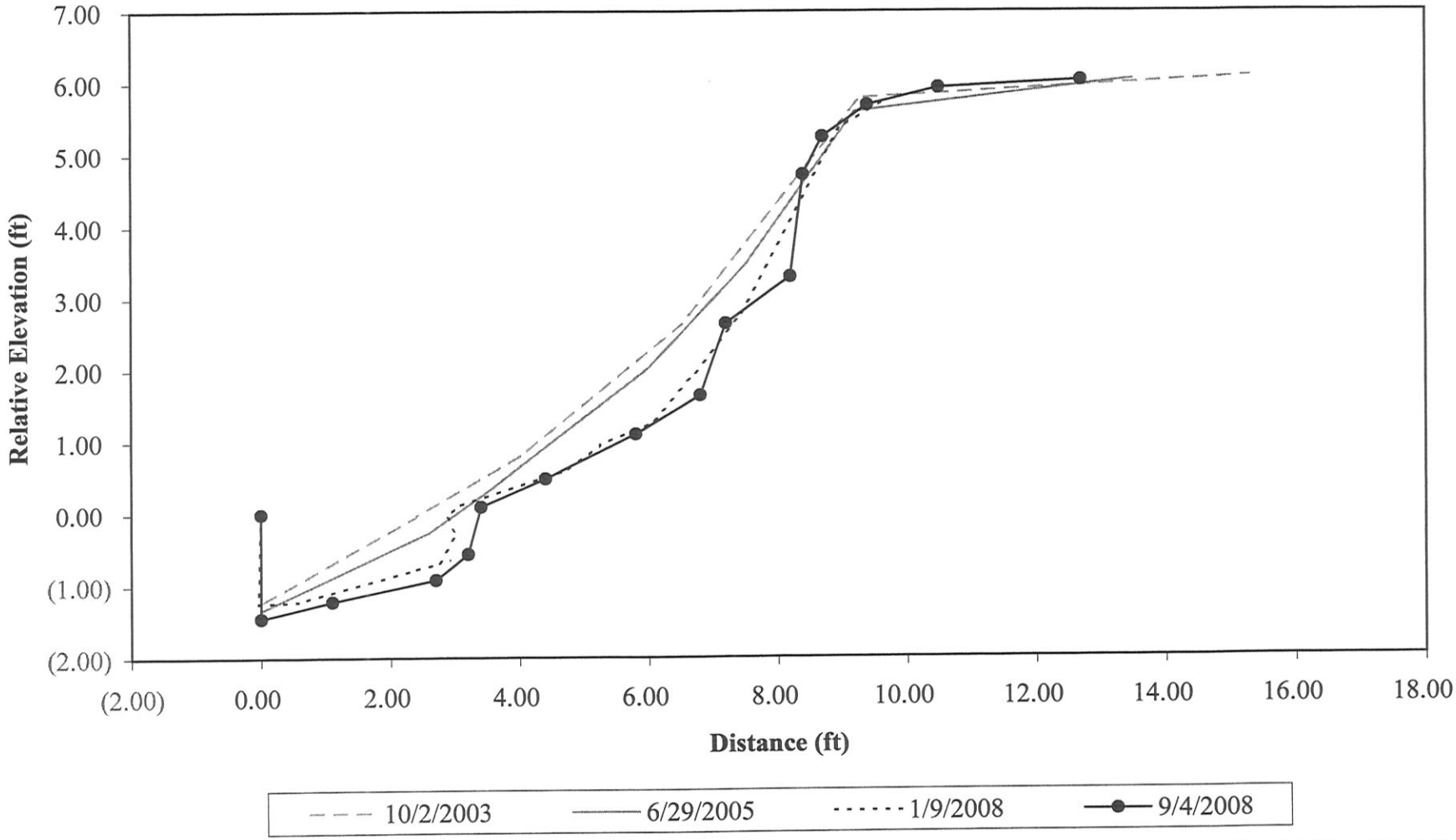
• MONS = 5/8" REBAR W/YELLOW CAPS SET IN CONCRETE

Moores Run 2008 Cross Section Photographs

Photo 9. Reach 04 Service XS B looking at left bank.

Photo 10. Reach 04 Service XS B looking downstream.

Moores Run
Reach 04
USFWS XS-B (LB) Bank Profile Overlay



Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File: Reach 04 - USFWS XS B (LB).xls
04/01/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 04 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	MS, SD	**Data:**	SD	**QA/QC:**		**Total Score:**	**40.19**
Reach:	04	**Comments:**	GPS Coordinates:						**Very High**
Location:	USFWS XS B		LMON: N: 39° 19' 56.7" W: 76° 32' 08.4" (+/- 24 feet)					**Notes:**	LEFT BANK
Date:	9/4/2008		RMON: N: 39° 19' 56.6" W: 76° 32' 09.5" (+/- 21 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
6.25	3.21	1.95	7.65	High	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
1.50	6.25	0.24	6.68	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
50.00	0.24	12.00	8.22	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
62.00			4.10	Moderate	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
25.00			6.54	High	
			Adjustment		Notes
Bank Materials			7.00		Gravel Loam
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**40.19**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

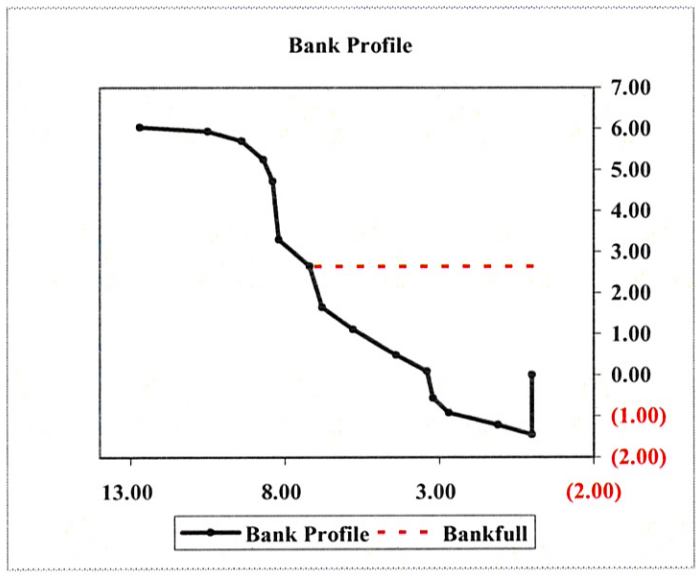
Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

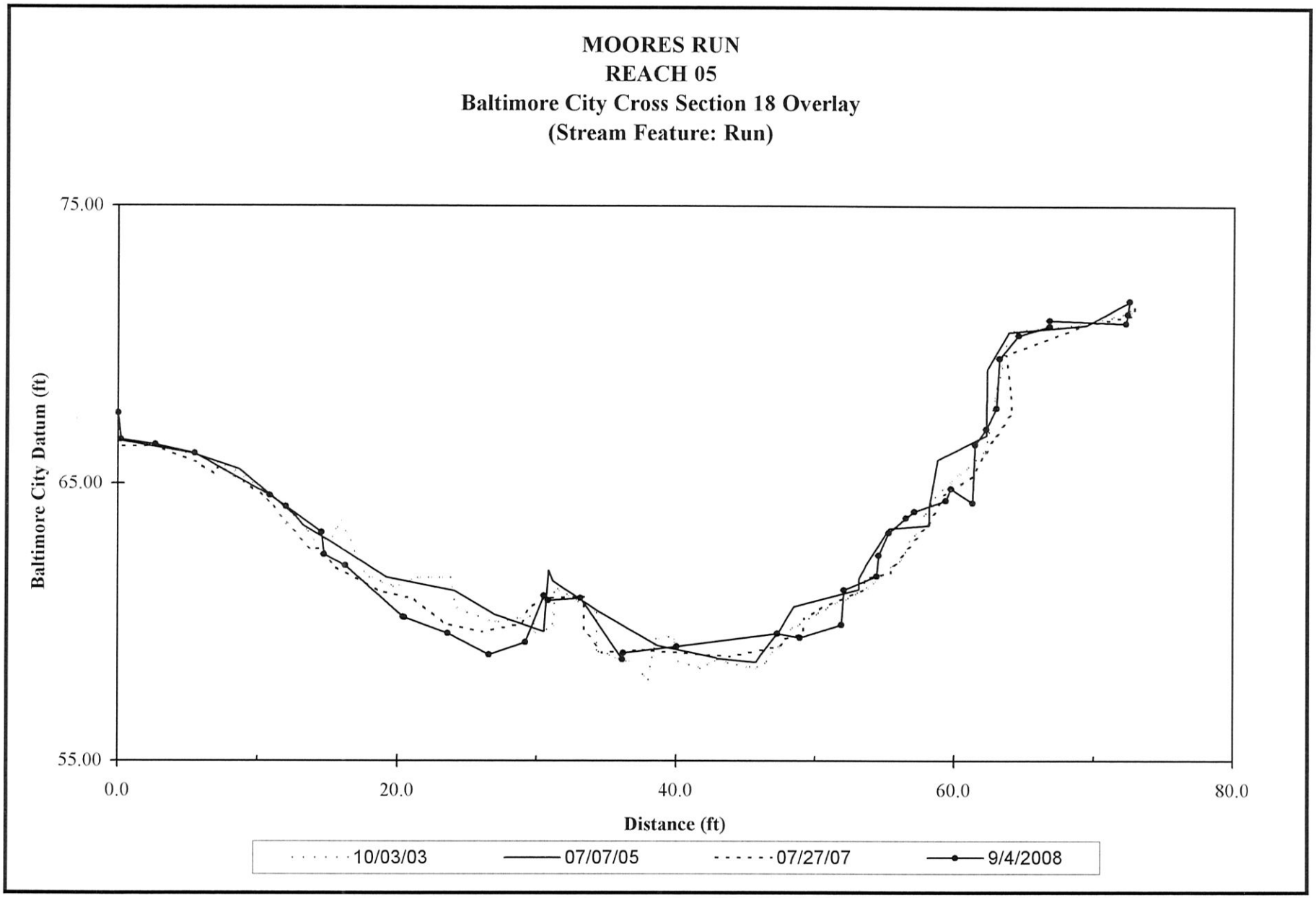
Horizontal Distance	Vertical Height	Notes
0.00	0.00	TTPIN
0.00	(1.45)	BTPIN
1.10	(1.22)	CS
2.70	(0.92)	CS
3.20	(0.56)	LEW
3.40	0.10	SL BRK
4.40	0.49	SL BRK
5.80	1.11	CS
6.80	1.65	CS
7.20	2.65	LBF
8.20	3.30	GS
8.40	4.72	GS
8.70	5.25	GS
9.40	5.69	LTOB
10.50	5.93	SL BRK
12.70	6.03	GS
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**
0.00	2.65	
7.20	2.65	



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File:Reach 04 - USFWS XS B (LB).xls
04/01/09

REACH 05
CROSS SECTION 18



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 05 - BALT XS 18 Balt. City Datum.xls
03/04/09

MOORES RUN - REACH 05 - 2008

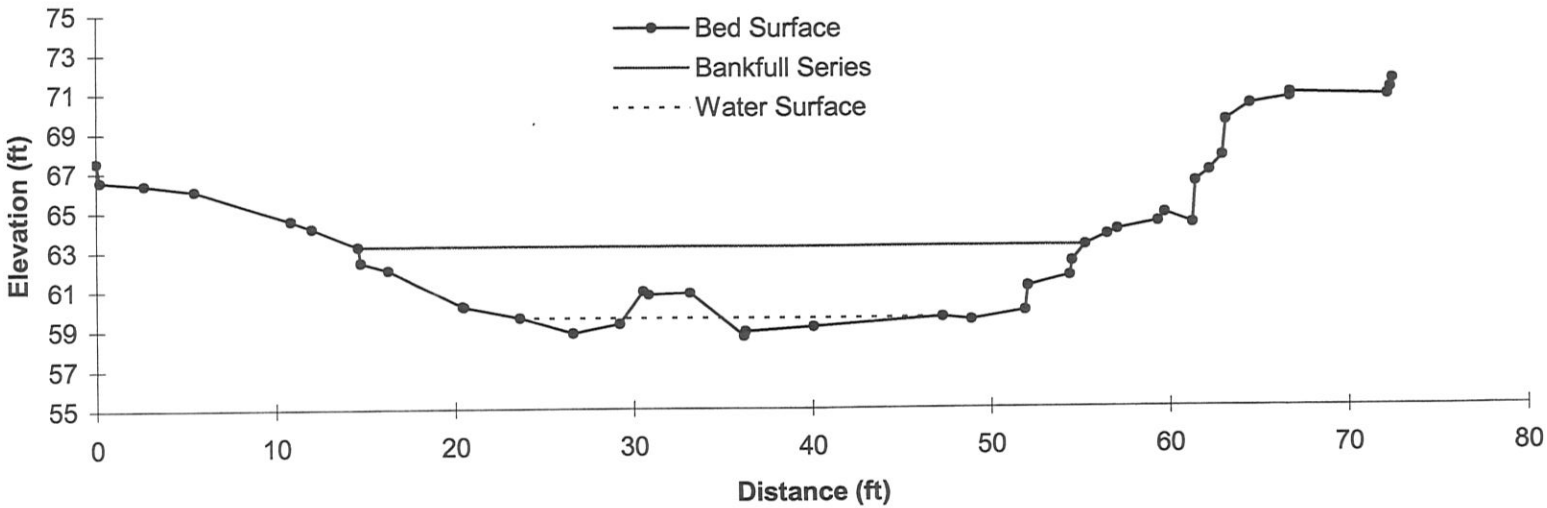
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)	
40.70	130.97	3.22	4.56	45.93	2.85	Bankfull
23.65	2.18	0.09	0.93	25.53	0.09	Water Surface

STREAM: Moores Run
REACH & XS: Reach 05 - Balt. XS 18 (Run)
DATE: 08/05/08
CREW: SD, CE
DATA: SD
QA/QC:

MON. COORD.: LTMON: N: 39° 20' 03.1" W: 76° 32' 14.2" (+/- 21 ft)
RTMON: N: 39° 20' 02.7" W: 76° 32' 14.9" (+/- 17 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
TLMON	0.0	67.53	BOULDER	30.8	60.77
GLMON	0.2	66.57	BOULDER	33.2	60.85
GS	2.7	66.39	CS	36.2	58.66
GS	5.5	66.08	CS	36.3	58.89
GS	10.9	64.55	CS	40.1	59.12
GS	12.0	64.16	REW	47.3	59.59
LBF	14.6	63.22	CS	48.9	59.44
SL BRK	14.7	62.42	CS	51.9	59.90
SL BRK	16.3	62.03	CS	52.1	61.15
CS	20.4	60.17	CS	54.4	61.66
SL BRK	20.5	60.15	CS	54.5	62.40
LEW	23.6	59.59	RBF	55.3	63.22
CS	26.6	58.82	BOULDER	56.5	63.75
CS	29.2	59.27	BOULDER	57.1	63.99
CS	30.5	60.94	GS	59.4	64.39

Identifier	Distance (ft)	Elevation (ft)			
GS	59.7	64.82			
GS	61.3	64.31			
GS	61.5	66.41			
GS	62.3	66.97			
GS	63.0	67.73			
GS	63.2	69.53			
GS	64.5	70.37			
GS	66.8	70.69			
GS	66.8	70.91			
GS	72.2	70.79			
GRMON	72.4	71.13			
TRMON	72.5	71.60			

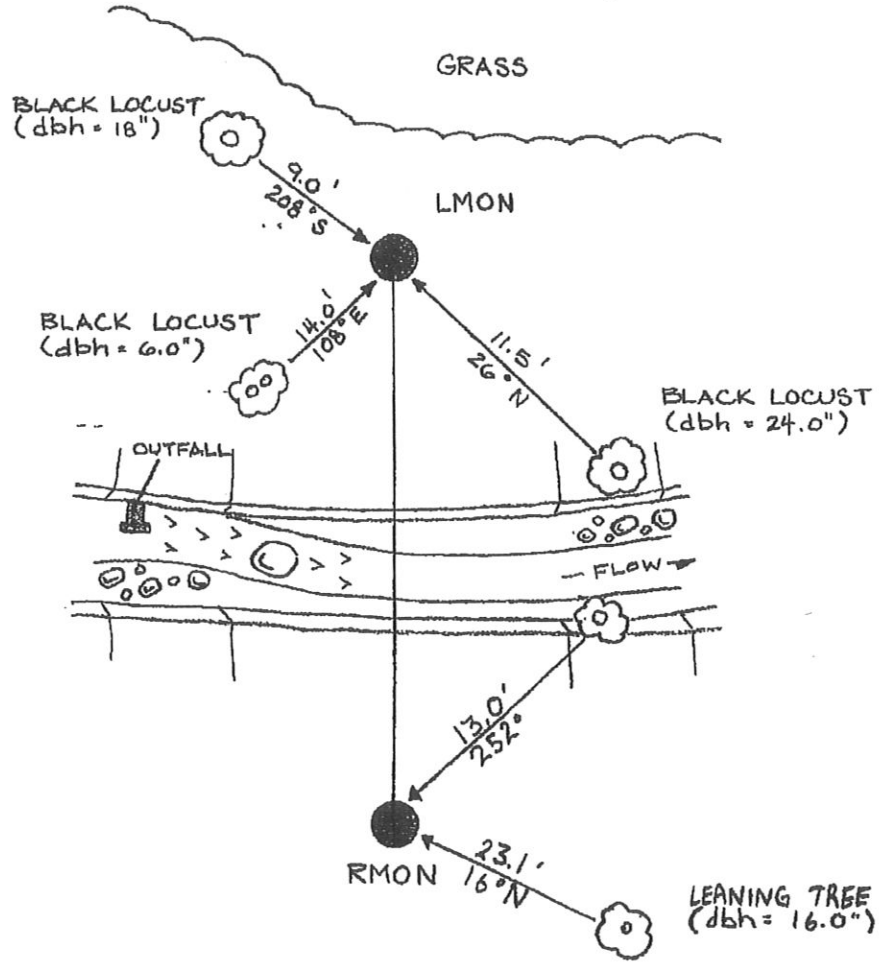


Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 05 - BALT XS 18 Balt. City Datum.xls
03/04/09

U.S. Fish and Wildife Service
Chesapeake Bay Field Office

Moores Run
Reach 05
Baltimore Cross Section 18
(Stream Feature: Run)

Cross-Section Monument Map



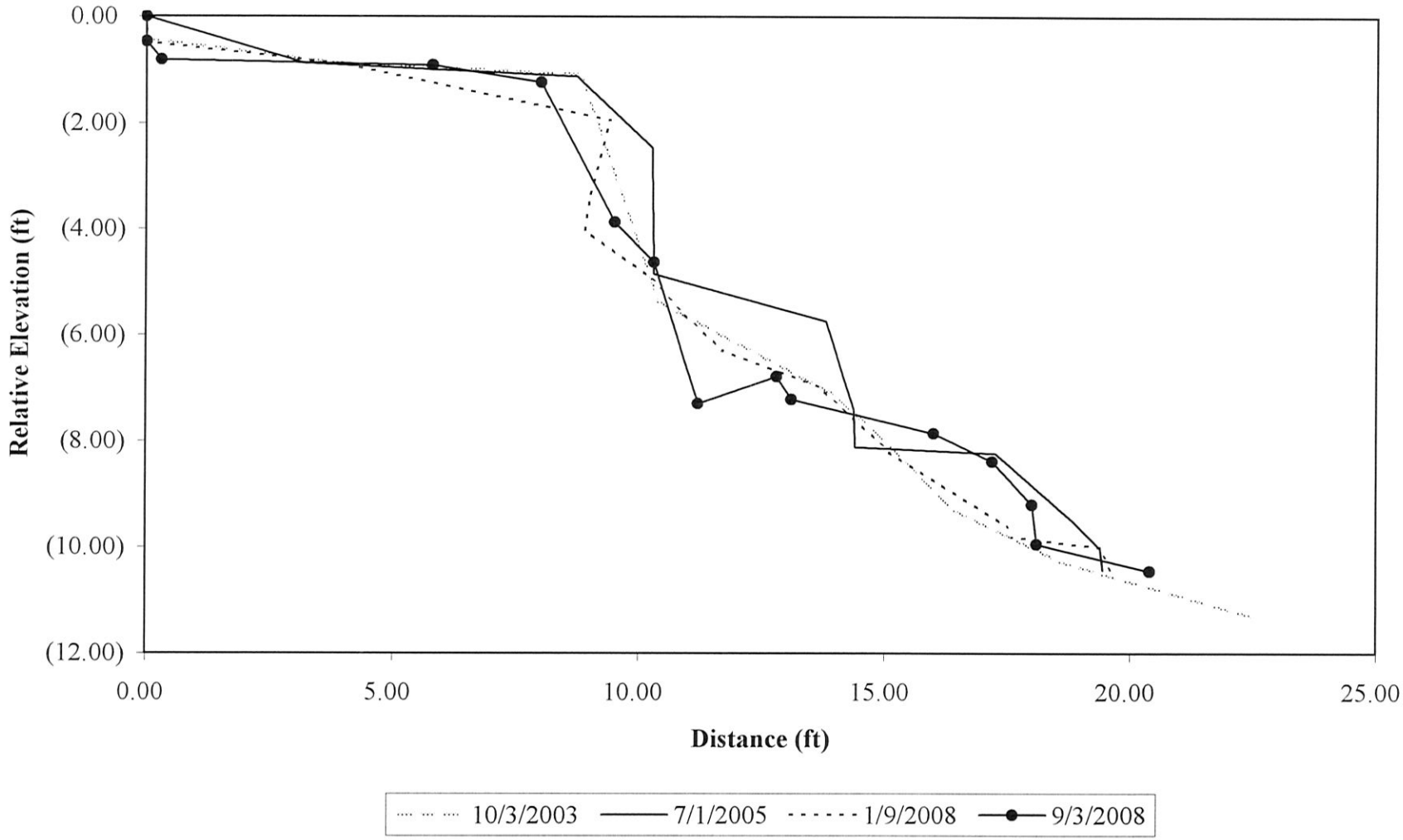
• MONS = 2" CAPPED STEEL PIPES

Moores Run 2008 Cross Section Photographs

Photo 11. Reach 05 Baltimore City XS 18 looking at left bank.

Photo 12. Looking upstream at Reach 05 Baltimore City XS 18.

Moores Run
Reach 05
BALT. CITY XS-18 (RB) Bank Profile Overlay



Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File: Reach 05 - BALT XS 18 (RB).xls
04/01/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 05 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	MS, SD	**Data:**	SD	**QA/QC:**		**Total Score:**	22.42
Reach:	05	**Comments:**	GPS Coordinates:						**Moderate**
Location:	BALT XS 18		LMON: N: 39° 20' 03.1" W: 76° 32' 14.2" (+/- 21 feet)					**Notes:**	RIGHT BANK
Date:	9/3/2008		RMON: N: 39° 19' 52.3" W: 76° 32' 07.6" (+/- 19 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
8.71	1.56	5.58	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
1.50	8.71	0.17	7.60	High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
40.00	0.17	6.89	8.79	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
40.00			2.93	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
65.00			3.11	Low	
			Adjustment		Notes
Bank Materials			(10.00)		Boulders
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**22.42**		

Bank Erosion Potential

			Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables	**Bank Height / Bankfull Height**	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
	Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
		Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

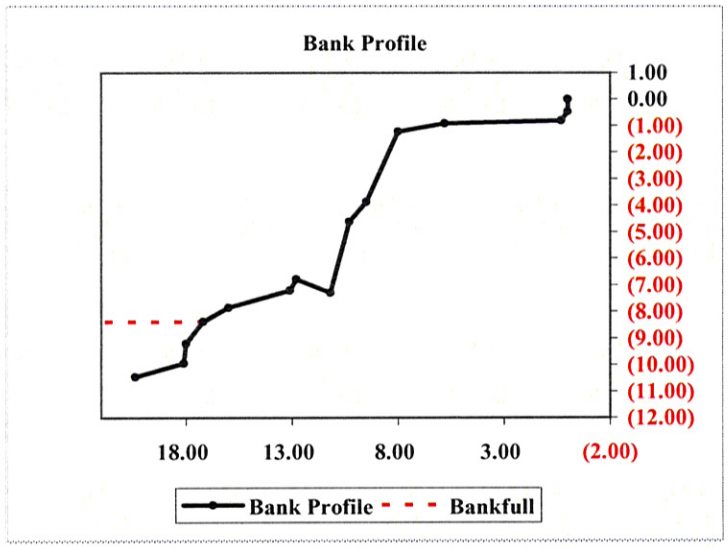
Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

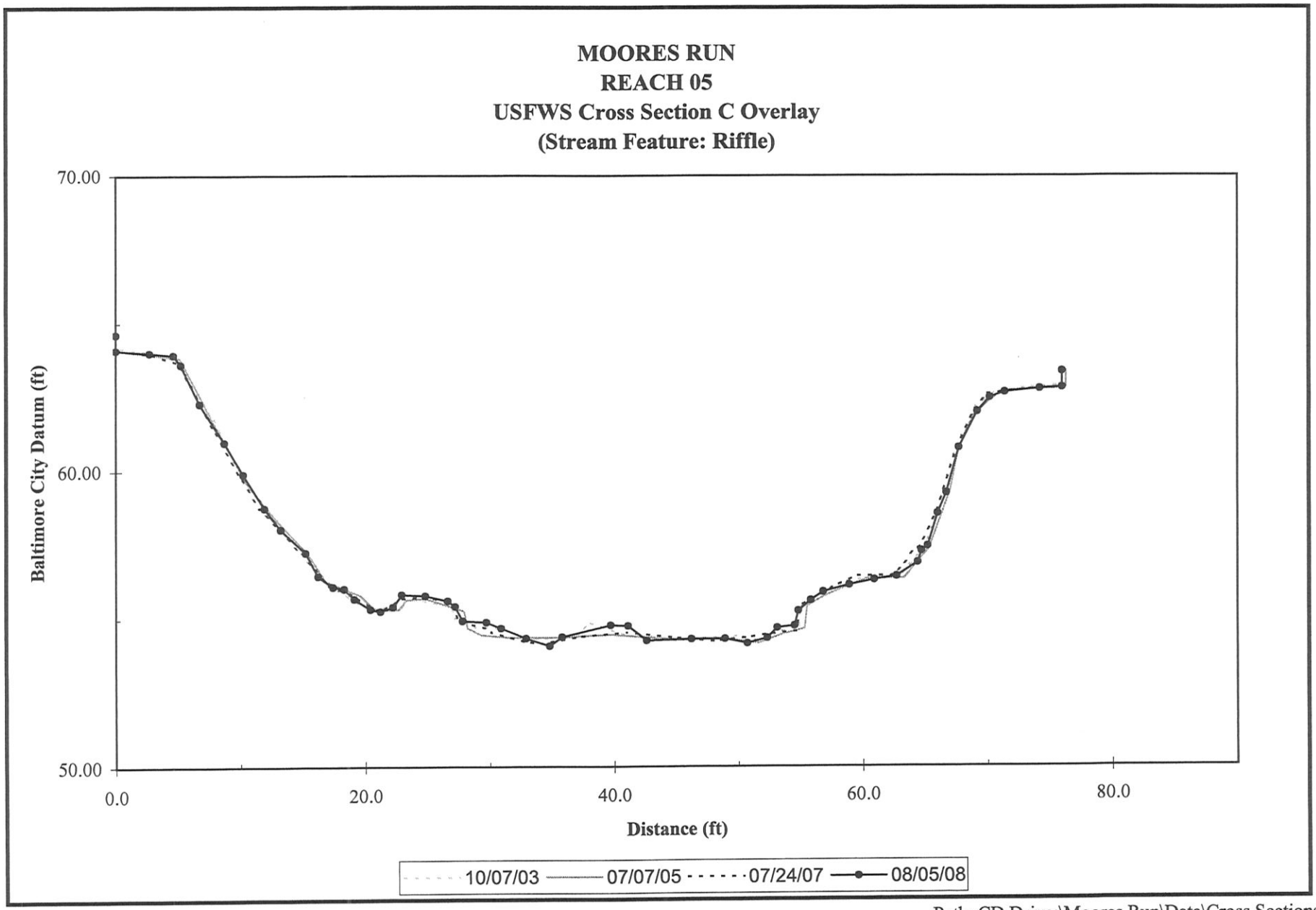
Horizontal Distance	Vertical Height	Notes
0.00	0.00	TRMON
0.00	(0.47)	GRMON
0.30	(0.81)	GS
5.80	(0.91)	GS
8.00	(1.23)	RTOB
9.50	(3.87)	GS
10.30	(4.63)	GS
11.20	(7.29)	GS
12.80	(6.78)	GS
13.10	(7.21)	GS
16.00	(7.85)	BOULDER
17.20	(8.38)	RBF
18.00	(9.20)	CS
18.10	(9.94)	CS
20.40	(10.45)	CS

Bankfull

Horizontal Distance	Vertical Height	Notes
17.20	(8.38)	



REACH 05
CROSS SECTION C



Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 05 - USFWS XS C Balt. City Datum.xls
08/19/08

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 05 - 2008

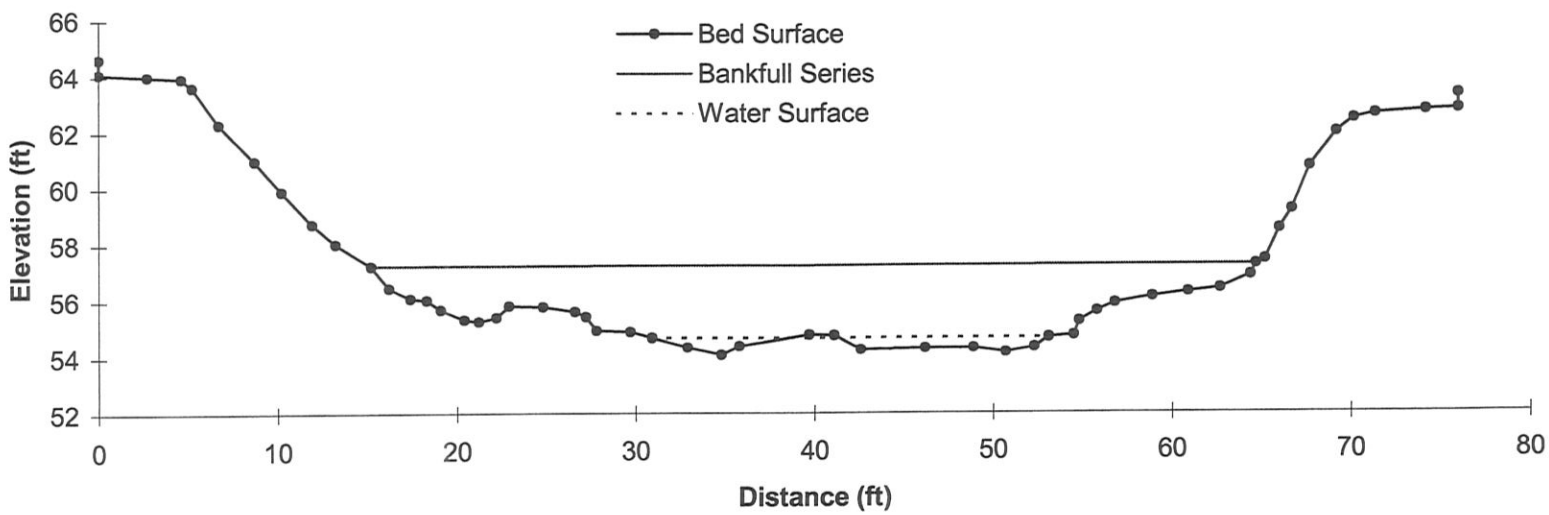
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)		
49.50	104.63	2.11	3.19	51.28	2.04	Bankfull	
22.20	6.37	0.29	0.61	22.49	0.28	Water Surface	

STREAM: Moores Run
REACH & XS: Reach 05 - USFWS XS C (Riffle)
DATE: 08/05/08
CREW: CE, SD
DATA: SD
QA/QC:

MON. COORD.: LMON: N: 39° 19' 59.0" W: 076° 32' 10.4" (+/- 24 ft)
RMON: N: 39° 19' 58.6" W: 076° 32' 10.8" (+/- 18 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
LTMON	0.0	64.62	CS	20.4	55.34
GLMON	0.0	64.10	CS	21.2	55.27
GS	2.7	64.01	CS	22.2	55.42
SL BRK	4.6	63.94	CS	22.9	55.84
SL BRK	5.2	63.62	CS	24.8	55.80
SL BRK	6.7	62.30	CS	26.6	55.63
SL BRK	8.7	60.99	CS	27.2	55.44
SL BRK	10.2	59.90	CS	27.8	54.94
SL BRK	11.9	58.75	CS/BAR	29.7	54.89
SL BRK	13.2	58.04	LEW	30.9	54.69
LBF	15.2	57.25	CS	32.9	54.34
TOE	16.2	56.46	CS	34.8	54.08
SL BRK	17.4	56.10	CS	35.8	54.39
SL BRK	18.3	56.04	CS	39.7	54.79
CS	19.1	55.70	CS	41.1	54.77

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
CS	42.6	54.26	SL BRK	65.2	57.45
CS	46.2	54.31	SL BRK	66.0	58.55
CS	48.9	54.32	SL BRK	66.7	59.24
CS	50.7	54.16	GS	67.7	60.78
CS	52.3	54.34	SL BRK	69.2	62.00
REW	53.1	54.69	SL BRK	70.2	62.48
CS	54.5	54.76	SL BRK	71.4	62.66
CS	54.8	55.27	GS	74.2	62.78
SL BRK	55.8	55.63	GRMON	76.0	62.83
SL BRK	56.8	55.91	TRMON	76.0	63.37
SL BRK	58.9	56.14			
SL BRK	60.9	56.31			
SL BRK	62.7	56.43			
TOE	64.4	56.90			
RBF	64.7	57.29			

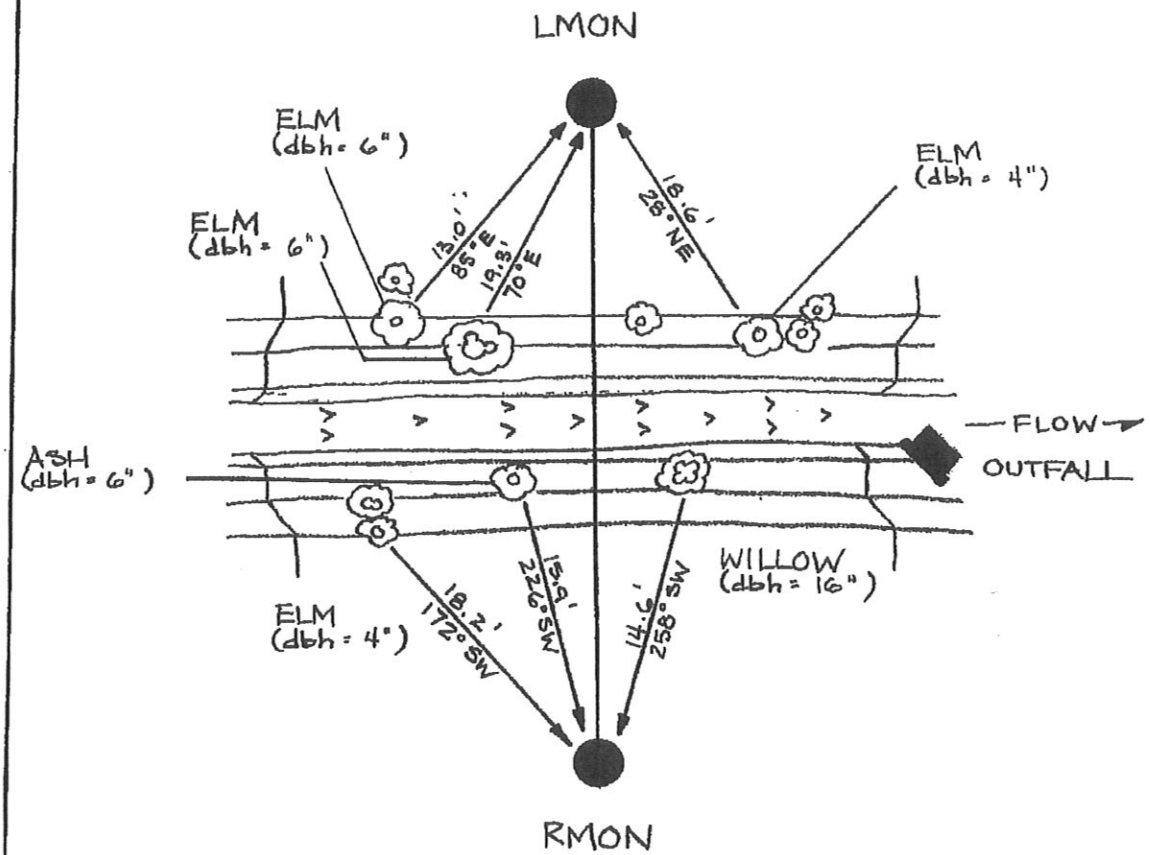


Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 05 - USFWS XS C Balt. City Datum.xls
08/19/08

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Moores Run
Reach 05
USFWS Cross Section C
(Stream Feature: Riffle)

Cross-Section Monument Map



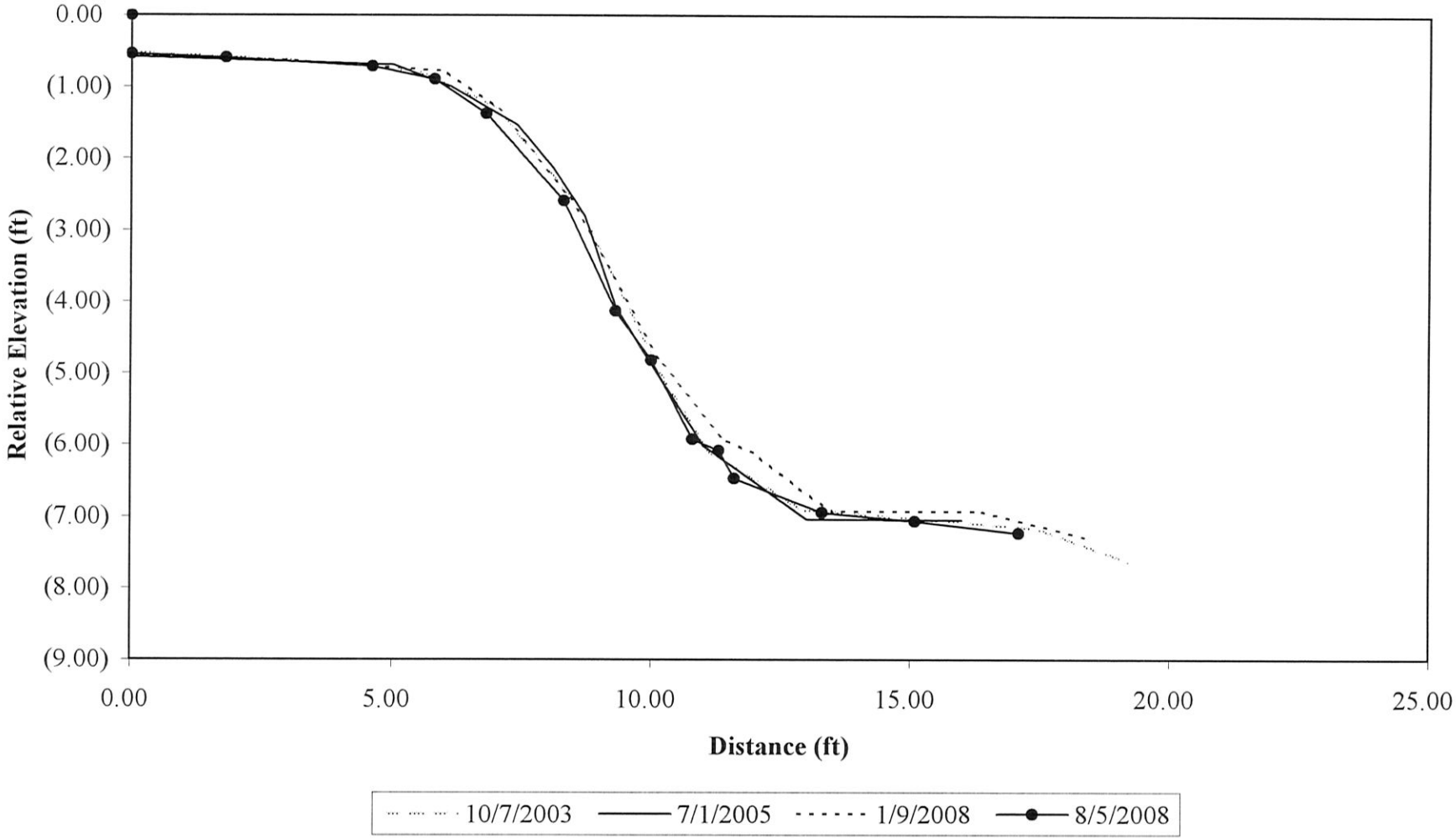
-- • MONS = 2" CAPPED STEEL PIPES

Moores Run 2008 Cross Section Photographs

Photo 13. Reach 05 Service XS C looking at left bank.

Photo 14. Looking upstream at Reach 05 Service XS C.

Moores Run
Reach 05
USFWS XS-C (RB) Bank Profile Overlay



Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File: Reach 05 - USFWS XS C (RB) .xls
04/01/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN - REACH 05 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	CE	**Data:**	SLD	**QA/QC:**	DS	**Total Score:**	**38.26**
Reach:	05	**Comments:**	GPS Coordinates:						**High**
Location:	USFWS XS C		LMON: N: 39° 19' 59.0" W: 76° 32' 10.4" (+/- 24 feet)					**Notes:**	RIGHT BANK
Date:	1/9/2008		RMON: N: 39° 19' 58.6" W: 76° 32' 10.8" (+/- 18 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
5.90	0.86	6.86	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
0.75	5.90	0.13	8.14	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
60.00	0.13	7.63	8.71	Very High	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
50.00			3.41	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
15.00			8.00	Very High	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**38.26**		

Bank Erosion Potential

		Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables							
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

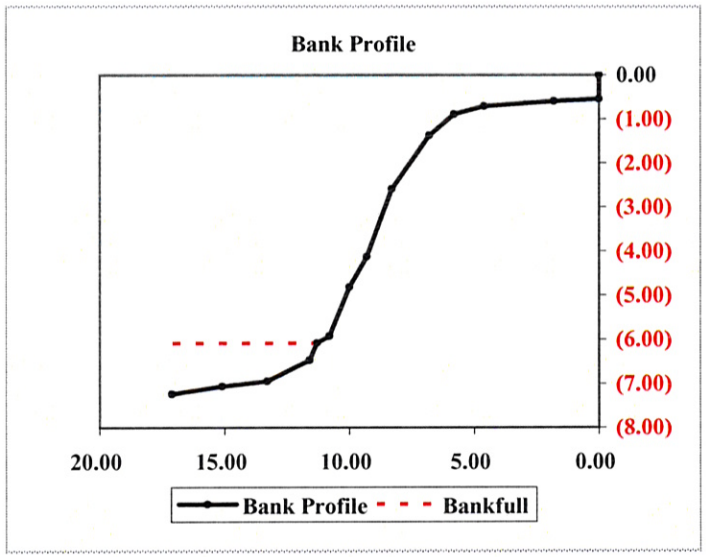
Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

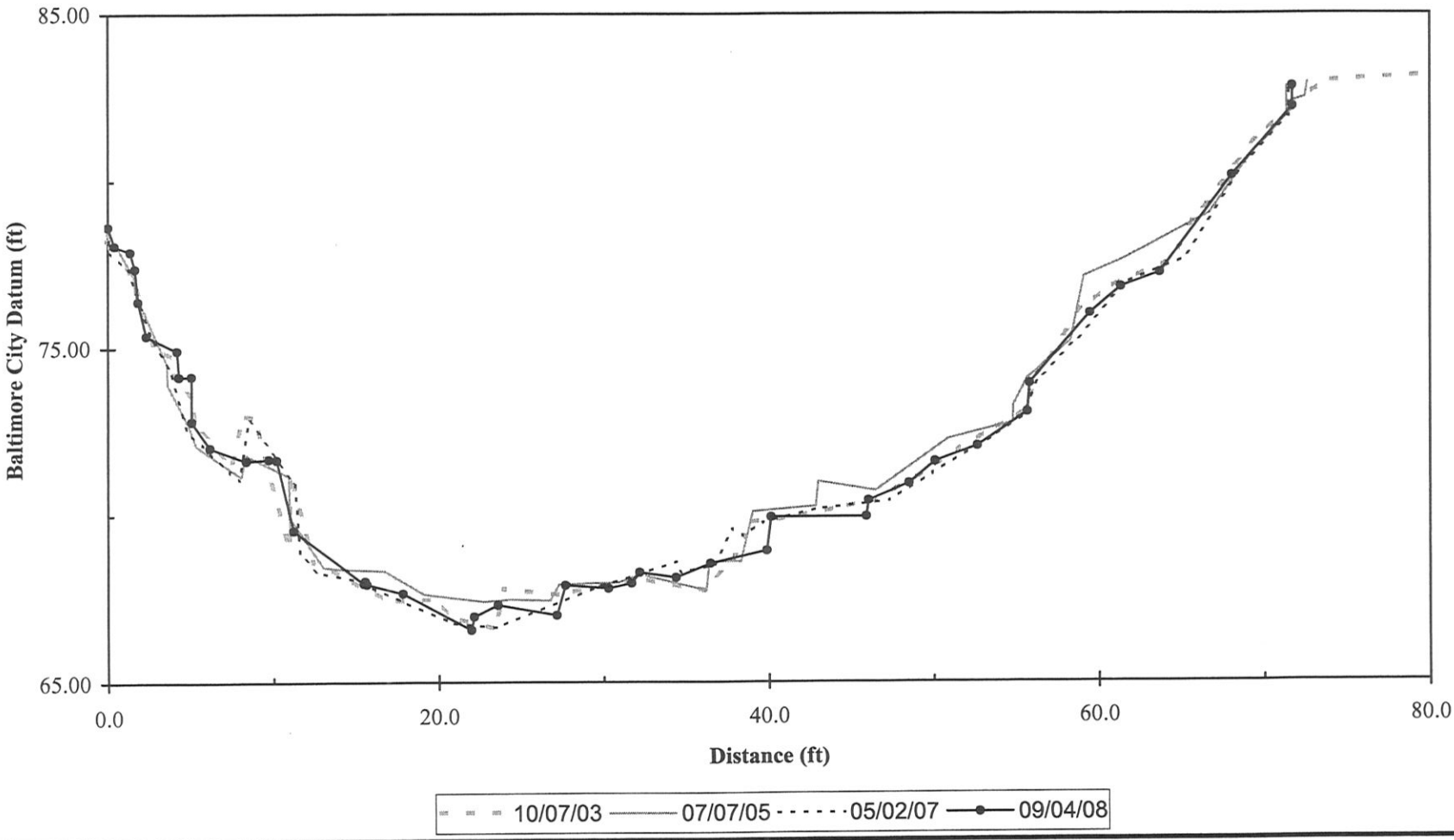
Bank Profile

Horizontal Distance	Vertical Height	Notes
0.00	0.00	TRMON
0.00	(0.54)	GRMON
1.80	(0.59)	GS
4.60	(0.71)	SL BRK
5.80	(0.89)	RTOB
6.80	(1.37)	SL BRK
8.30	(2.59)	GS
9.30	(4.13)	SL BRK
10.00	(4.82)	SL BRK
10.80	(5.92)	SL BRK
11.30	(6.08)	RBF
11.60	(6.47)	TOE
13.30	(6.94)	SL BRK
15.10	(7.06)	SL BRK
17.10	(7.23)	SL BRK
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**
17.00	(6.08)	
11.30	(6.08)	



REACH 06
CROSS SECTION 14

MOORES RUN
REACH 06
Baltimore City Cross Section 14 Overlay
(Stream Feature: Pool)



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 06 - BALT XS 14 Balt. City Datum.xls
03/04/09

MOORES RUN - REACH 06 - 2008

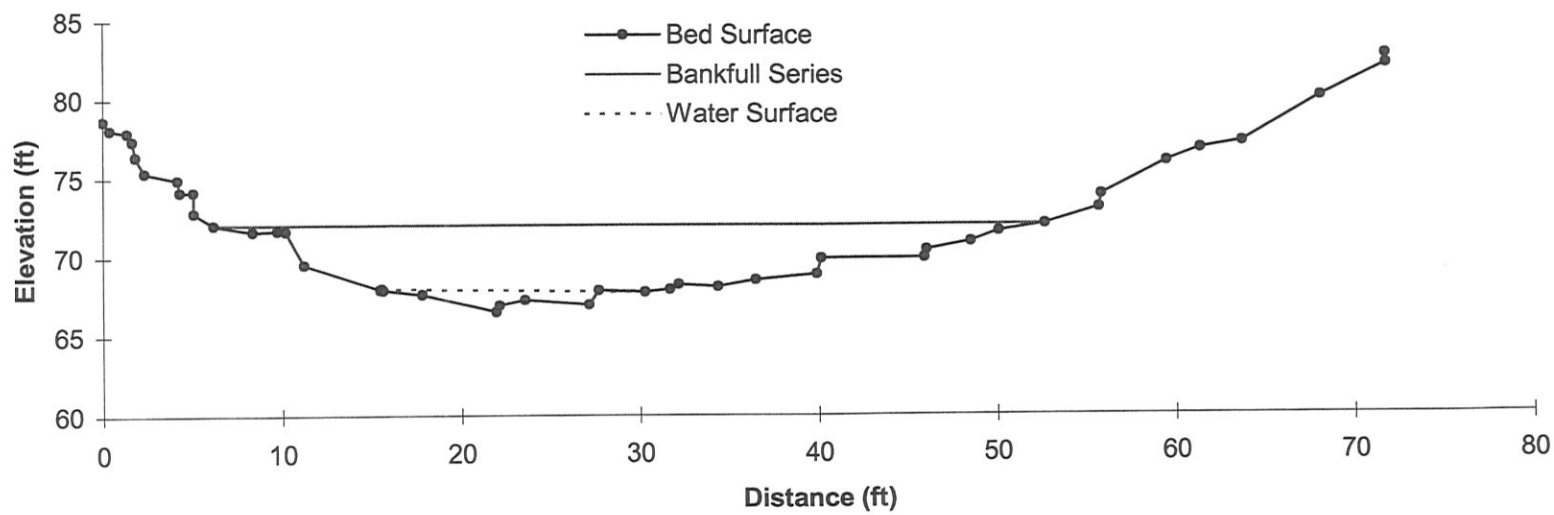
Width (ft)	Cross-Sectional Area (Sq.ft)	Mean Depth (ft)	Maximum Depth (ft)	Wetted Perimeter (ft)	Hydraulic Radius (ft)		
46.49	139.24	2.99	5.48	50.75	2.74	Bankfull	
14.73	8.02	0.54	1.37	15.76	0.51	Water Surface	

STREAM: Moores Run
REACH & XS: Reach 06 - Balt. XS 14 (Pool)
DATE: 09/04/08
CREW: SD, MS
DATA: SLD
QA/QC:

MON. COORD.: LTMON: N: 39° 20' 06.9" W: 76° 32' 17.2" (+/- 23 ft)
RTMON: N: 39° 20' 06.5" W: 76° 32' 17.8" (+/- 18 ft)

Identifier	Distance (ft)	Elevation (ft)	Identifier	Distance (ft)	Elevation (ft)
TLMON	0.0	78.65	SL BRK	15.4	67.96
GLMON	0.4	78.08	LEW	15.5	68.02
GS	1.3	77.90	CS	15.6	67.93
GS	1.6	77.39	CS	17.8	67.66
GS	1.8	76.41	CS	22.0	66.56
GS	2.3	75.37	CS	22.1	66.96
GS	4.2	74.92	CS	23.6	67.31
GS	4.3	74.14	CS	27.1	67.00
GS	5.0	74.15	CS	27.7	67.90
GS	5.1	72.81	REW	30.3	67.81
LBF	6.2	72.03	CS	31.7	67.96
GS	8.3	71.64	CS	32.2	68.28
TBLDER	9.7	71.69	CS	34.4	68.13
GS/BLDER	10.2	71.66	CS	36.5	68.55
CS	11.2	69.54	GS	39.9	68.93

Identifier	Distance (ft)	Elevation (ft)			
GS	40.1	69.94			
GS	45.9	69.95			
GS	46.0	70.44			
GS	48.5	70.95			
GS	50.1	71.60			
RBF	52.7	72.06			
GS	55.7	73.08			
GS	55.8	73.93			
GS	59.5	76.03			
GS	61.4	76.83			
GS	63.7	77.26			
GS	68.1	80.15			
GRMON	71.7	82.22			
TRMON	71.7	82.83			



Path: CD Drive:\Moores Run\Data\Cross Sections
File: Reach 06 - BALT XS 14 Balt. City Datum.xls
03/04/09

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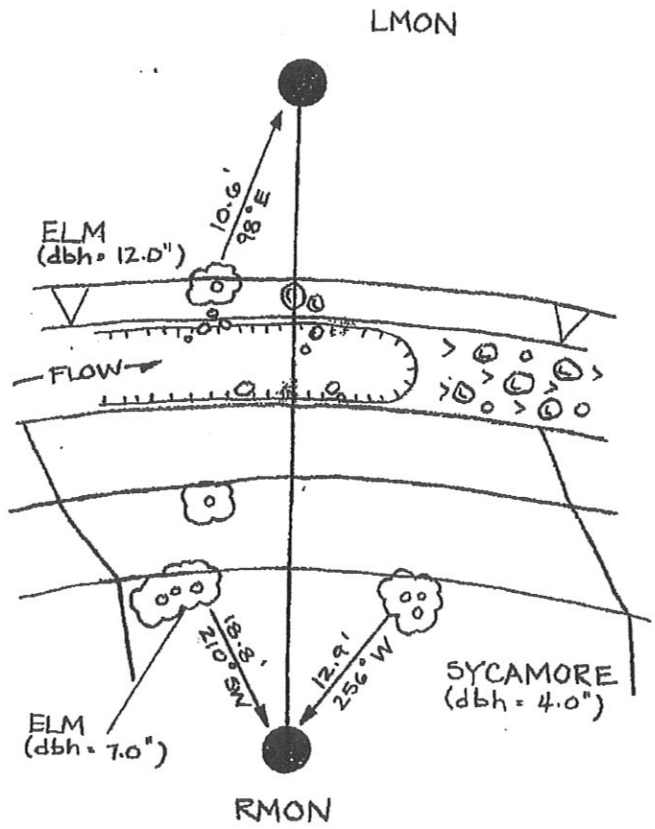
Chesapeake Bay Field Office

Moores Run
Reach 06
Baltimore Cross Section 14
(Stream Feature: Pool)

Cross-Section Monument Map



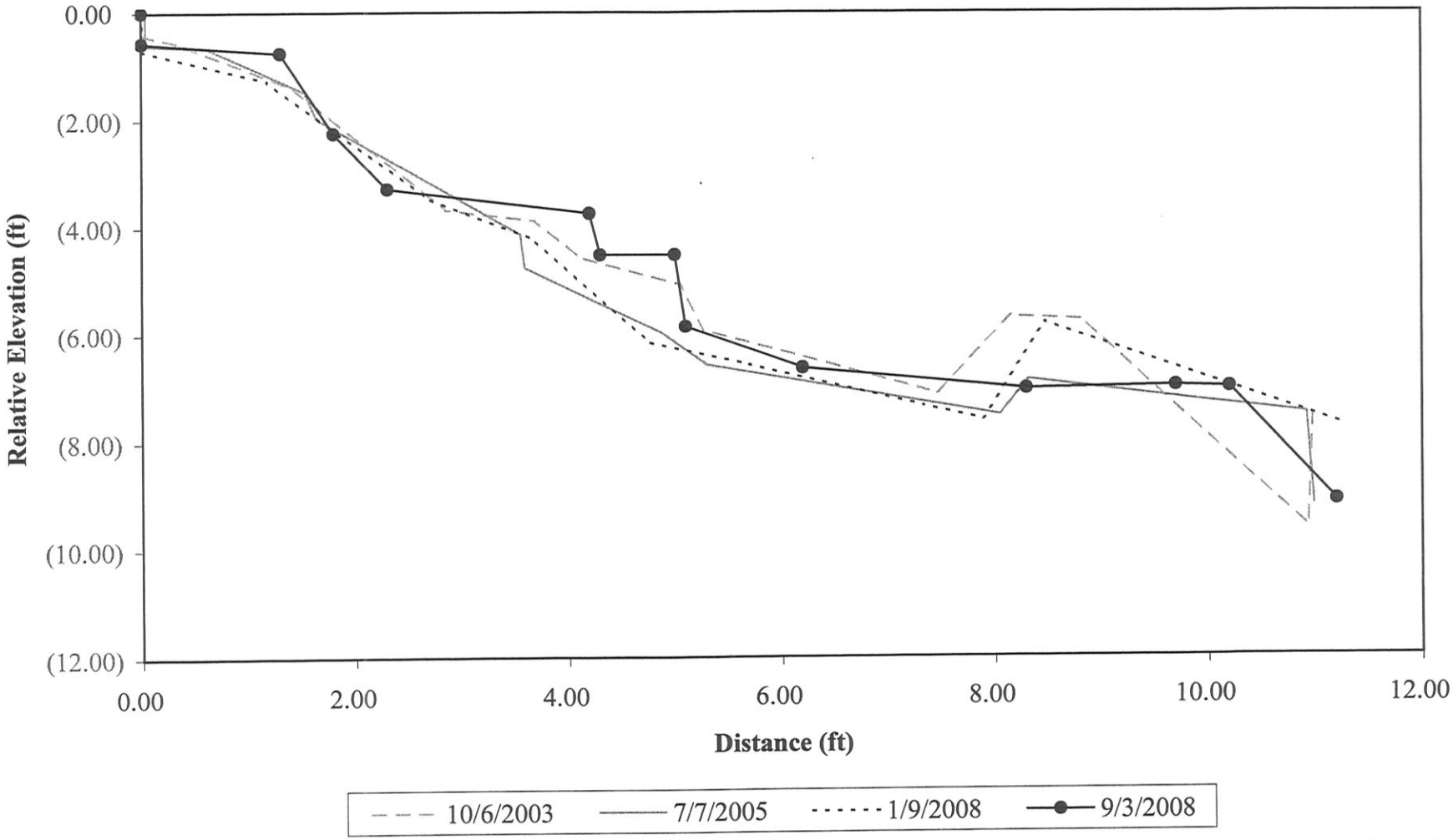
• MONS = 2" CAPPED STEEL PIPES

Moores Run 2008 Cross Section Photographs

Photo 15. Reach 06 Baltimore City XS 14 looking at left bank.

Photo 16. Looking downstream at Reach 06 Baltimore City XS 14.

Moores Run
Reach 06
BALT. CITY XS-14 (LB) Bank Profile Overlay



Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File: Reach 06 - BALT XS 14 (LB).xls
04/01/09

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Chesapeake Bay Field Office

MOORES RUN - REACH 06 - 2008

BANK PROFILE AND BANK EROSION HAZARD INDEX FOR MONUMENTED CROSS SECTION

Stream:	MOORES RUN, BALTIMORE, MD	**Observer(s):**	MS,SD	**Data:**	SD	**QA/QC:**		**Total Score:**	35.71
Reach:	06	**Comments:**	GPS Coordinates:						**High**
Location:	BALT XS 14		LMON: N: 39° 20' 06.9" W: 76° 32' 17.2" (+/- 23 feet)					**Notes:**	LEFT BANK
Date:	9/3/2008		RMON: N: 39° 20' 06.5" W: 76° 32' 17.8" (+/- 18 feet)						

Erodibility Variables

Bank Height / Bankfull Height Ratio					
Bank Height	Bankfull Height	Value	Index	Bank Erosion Potental	Notes
8.36	2.49	3.36	10.00	Extreme	
Root Depth / Bank Height Ratio					
Root Depth	Bank Height	Value	Index	Bank Erosion Potental	Notes
1.00	8.36	0.12	8.23	Very High	
Weighted Root Density					
Root Density (%)	Root Depth / Bank Height	Value	Index	Bank Erosion Potental	Notes
30.00	0.12	3.59	10.00	Extreme	
Bank Angle					
Bank Angle (°)			Index	Bank Erosion Potental	Notes
45.00			3.17	Low	
Surface Protection					
Surface Protection (%)			Index	Bank Erosion Potental	Notes
50.00			4.32	Moderate	
			Adjustment		Notes
Bank Materials			0.00		
			Adjustment		Notes
Bank Stratification			0.00		
		TOTAL SCORE	**35.71**		

Bank Erosion Potential

		Very Low	Low	Moderate	High	Very High	Extreme
Erodibility Variables							
Bank Height / Bankfull Height	Value	1.00-1.10	1.11-1.19	1.20-1.50	1.60-2.00	2.10-2.80	>2.80
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Root Depth / Bank Height	Value	1.00-0.90	0.89-0.50	0.49-0.30	0.29-0.15	0.14-0.05	<0.05
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Weighted Root Density	Value	100-80	79-55	54-30	29-15	14-5	<5
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Bank Angle	Value	0-20	21-60	61-80	81-90	91-119	>119
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10
Surface Protection	Value	100-80	79-55	54-30	29-15	14-10	<10
	Index	1.0-1.9	2.0-3.9	4.0-5.9	6.0-7.9	8.0-9.0	10

Adjustments

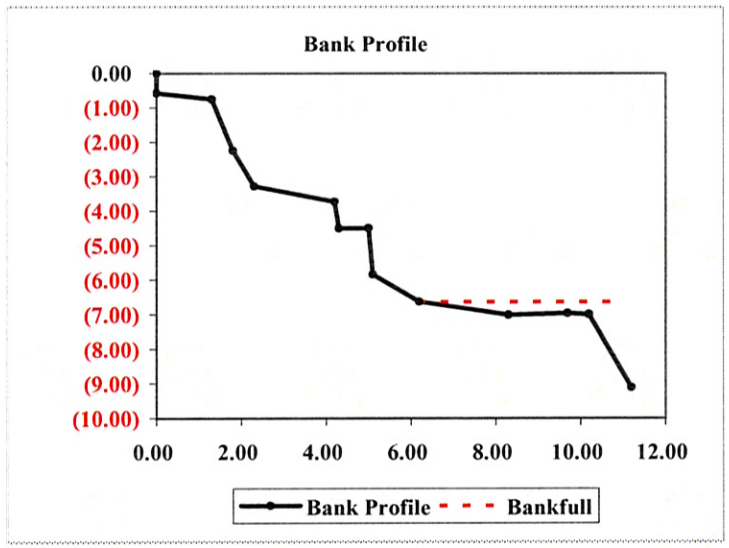
Bank Material	
Bedrock	Bedrock banks have a very low erosion potential.
Boulders	Boulder banks have a low erosion potential.
Cobble	Substract 10 points. No adjustment if sand/gravel compose greater than 50% of bank.
Sand/Silt/Clay Loam	Add 5 points.
Gravel	Add 5-10 points depending on percentage of bank material composed of sand.
Sand	Add 10 points.
Silt / Clay	No adjustment.

Stratification

Add 5-10 points depending on position of unstable layers in relation to bankfull stage.

Bank Profile

Horizontal Distance	Vertical Height	Notes
0.00	0.00	TLMON
0.00	(0.57)	GLMON
1.30	(0.75)	GS
1.80	(2.24)	GS
2.30	(3.28)	GS
4.20	(3.73)	GS
4.30	(4.51)	GS
5.00	(4.50)	GS
5.10	(5.84)	GS
6.20	(6.62)	LBF
8.30	(7.01)	GS
9.70	(6.96)	TBOULDER
10.20	(6.99)	GS/BOULDER
11.20	(9.11)	CS
Bankfull		
Horizontal Distance	**Vertical Height**	**Notes**
6.20	(6.62)	
11.00	(6.62)	



Path: CD Drive:\Moores Run\Data\BEHI and Bank Profile
File:Reach 06 - BALT XS 14 (LB).xls
04/01/09

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Chesapeake Bay Field Office

APPENDIX B

MOORES RUN – LONGITUDINAL PROFILE DATA

APPENDIX B

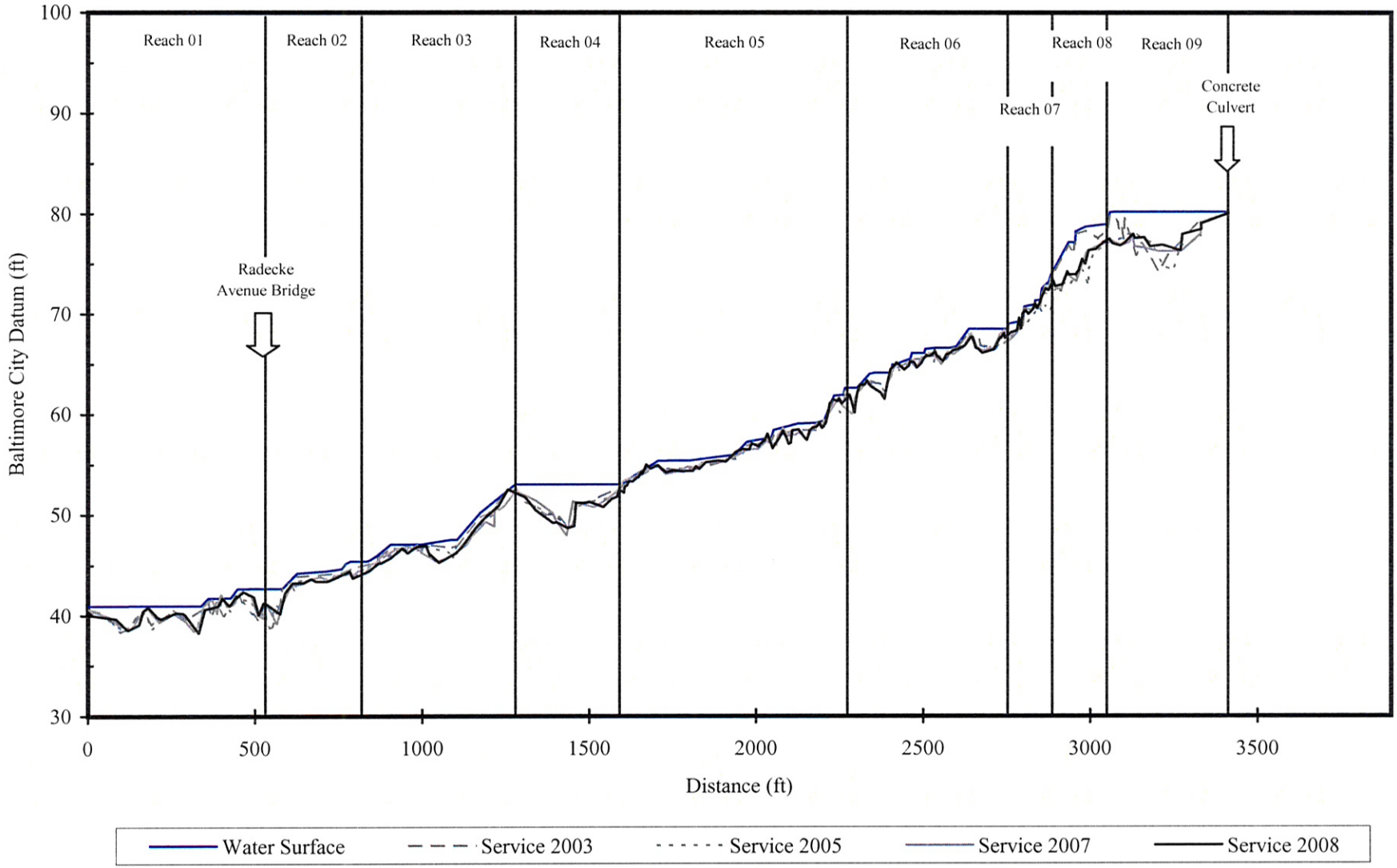
LONGITUDINAL PROFILE OVERLAY PLOTS

2008 LONGITUDINAL PROFILE PLOTS

2008 LONGITUDINAL PROFILE DATA

LONGITUDINAL PROFILE OVERLAY PLOTS

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay



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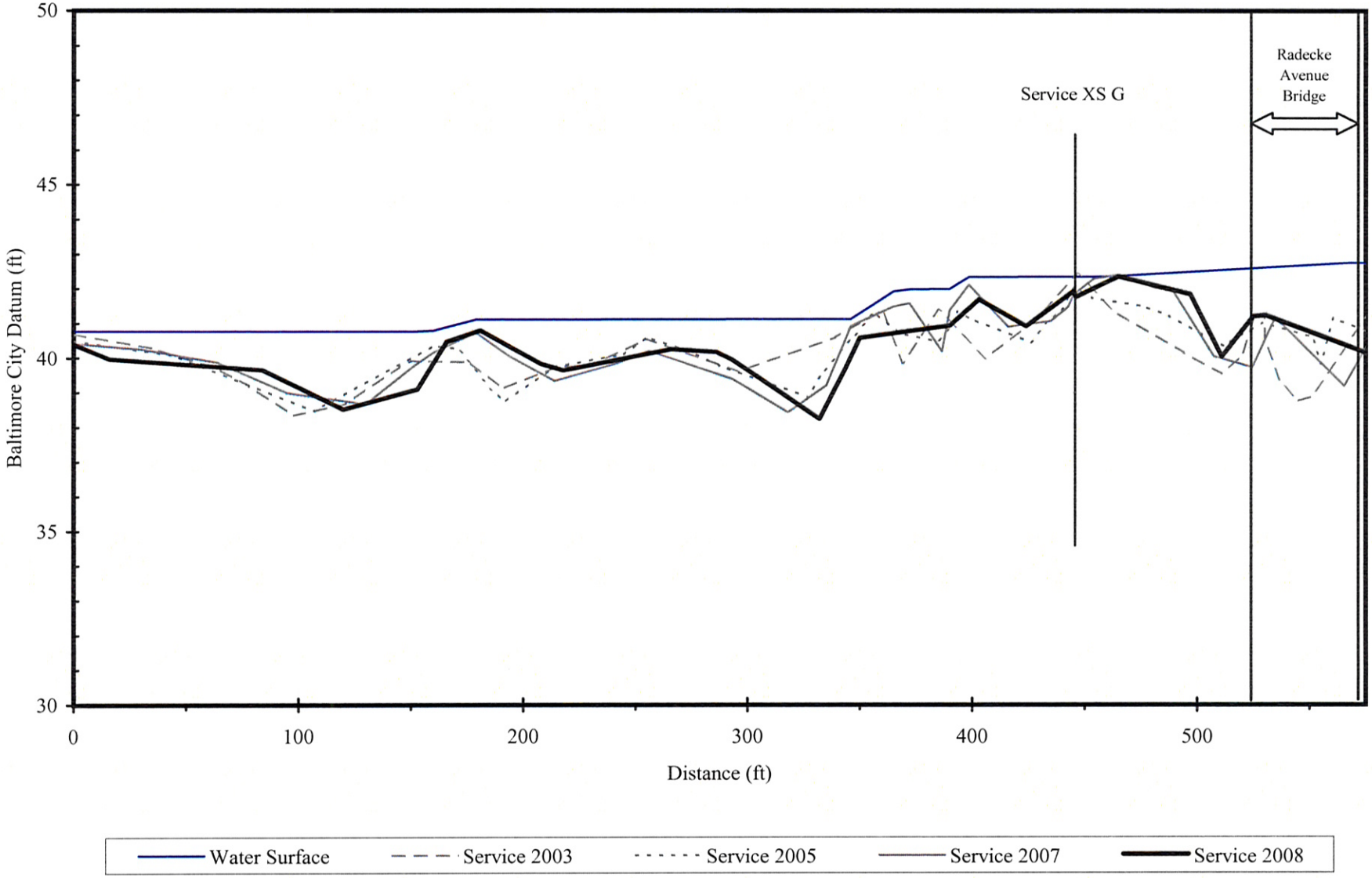
Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 01



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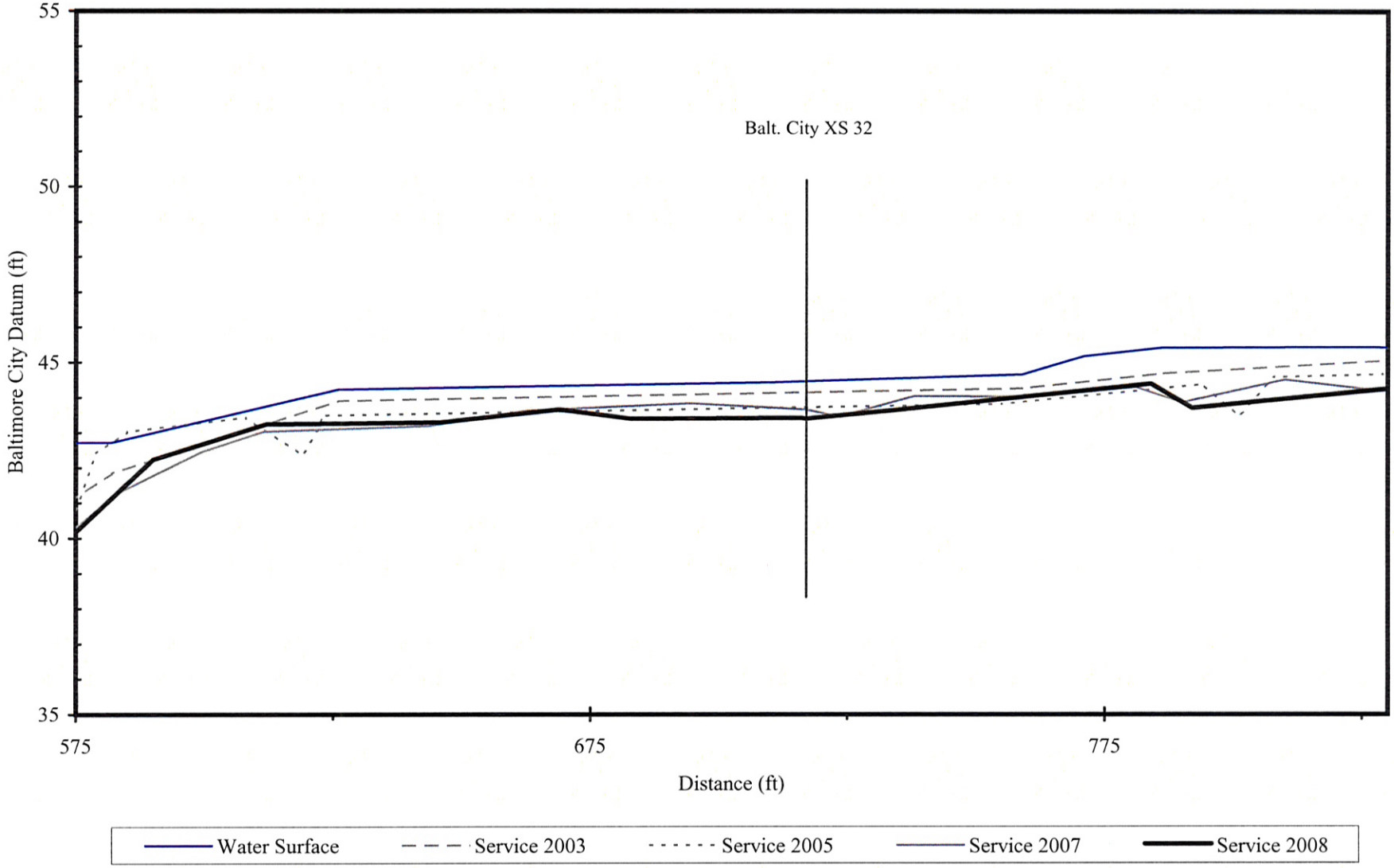
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

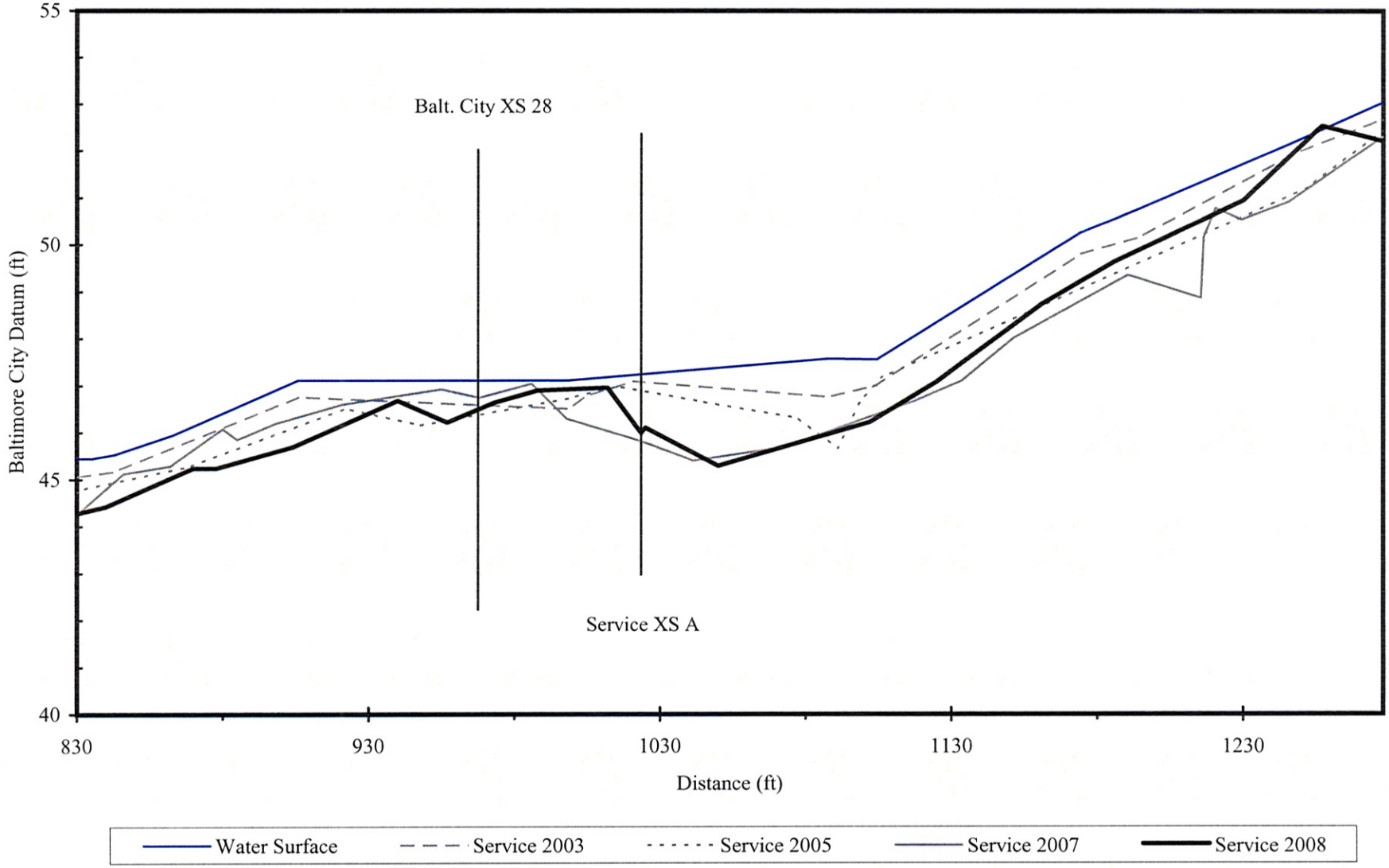
MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Overlay
Reach 02



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 03



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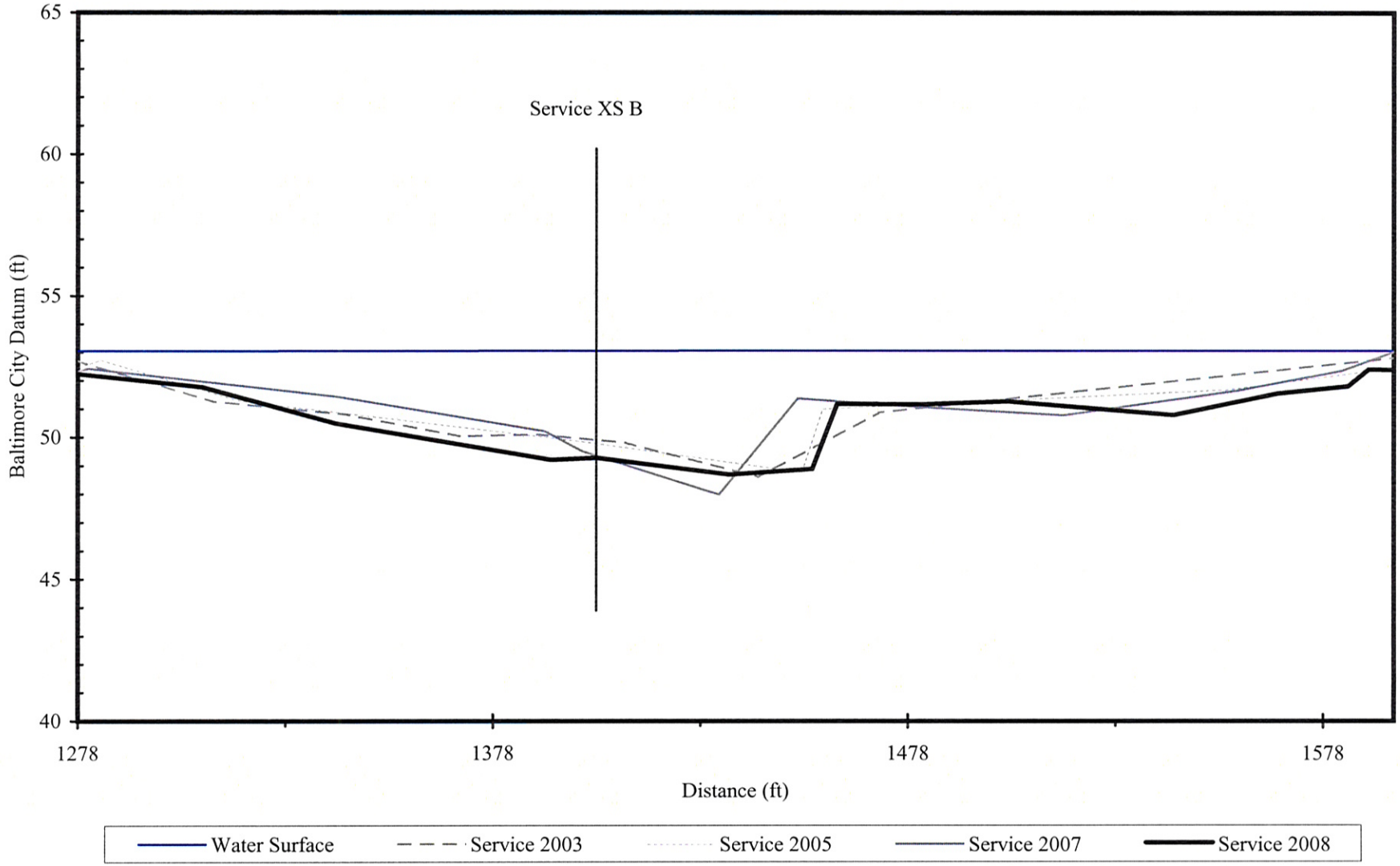
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

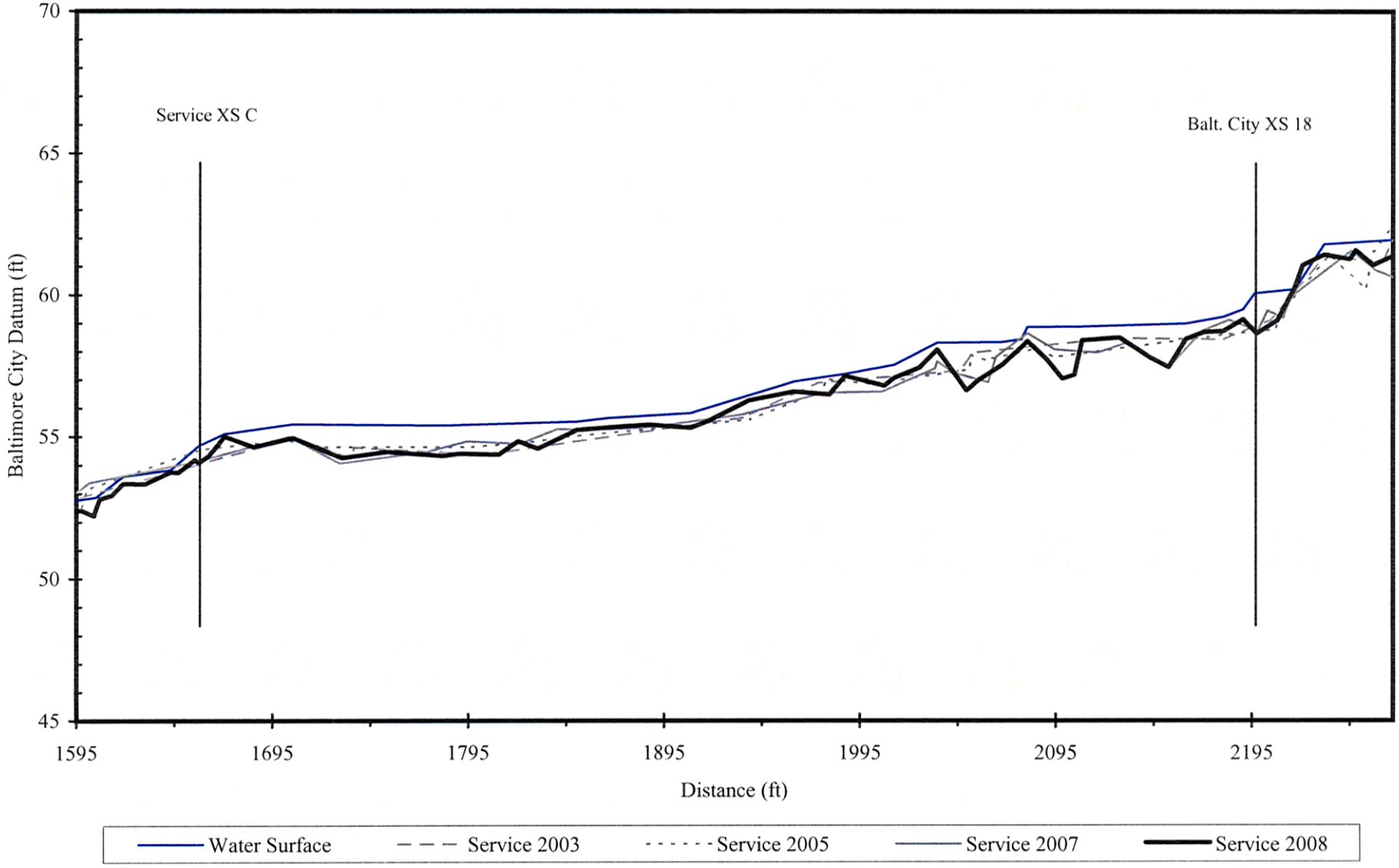
MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 04



Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

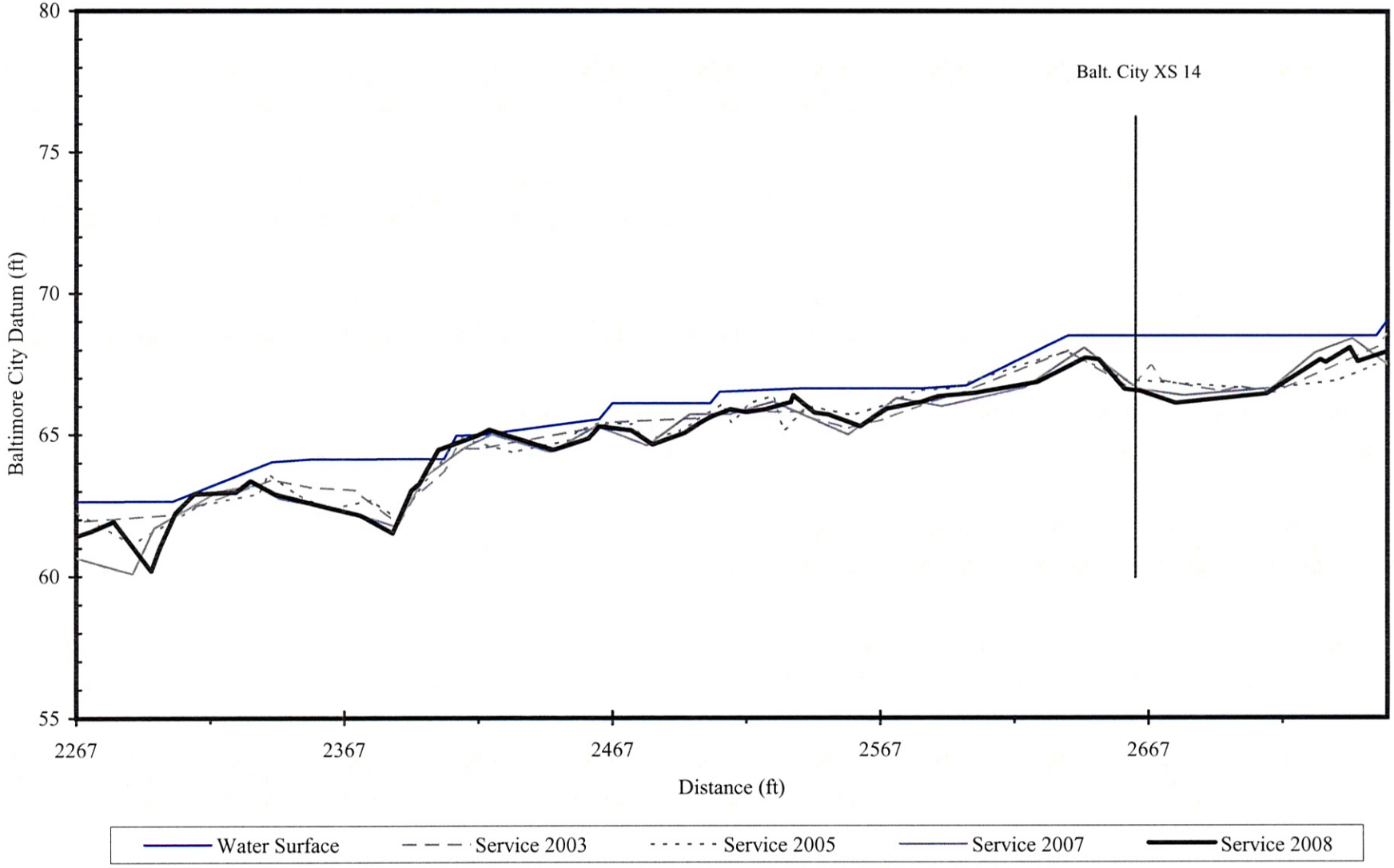
MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 05



U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 06



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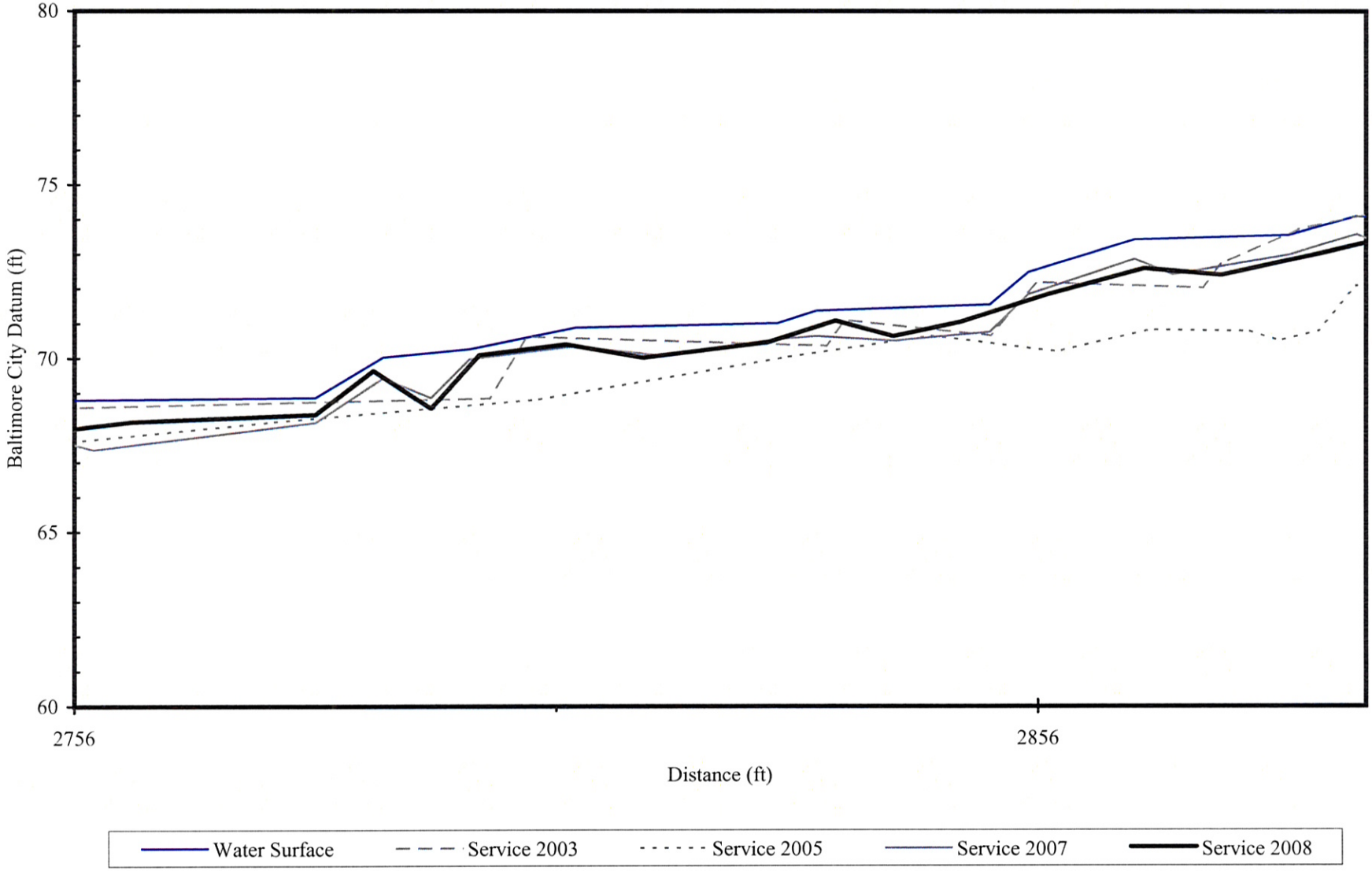
Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 07



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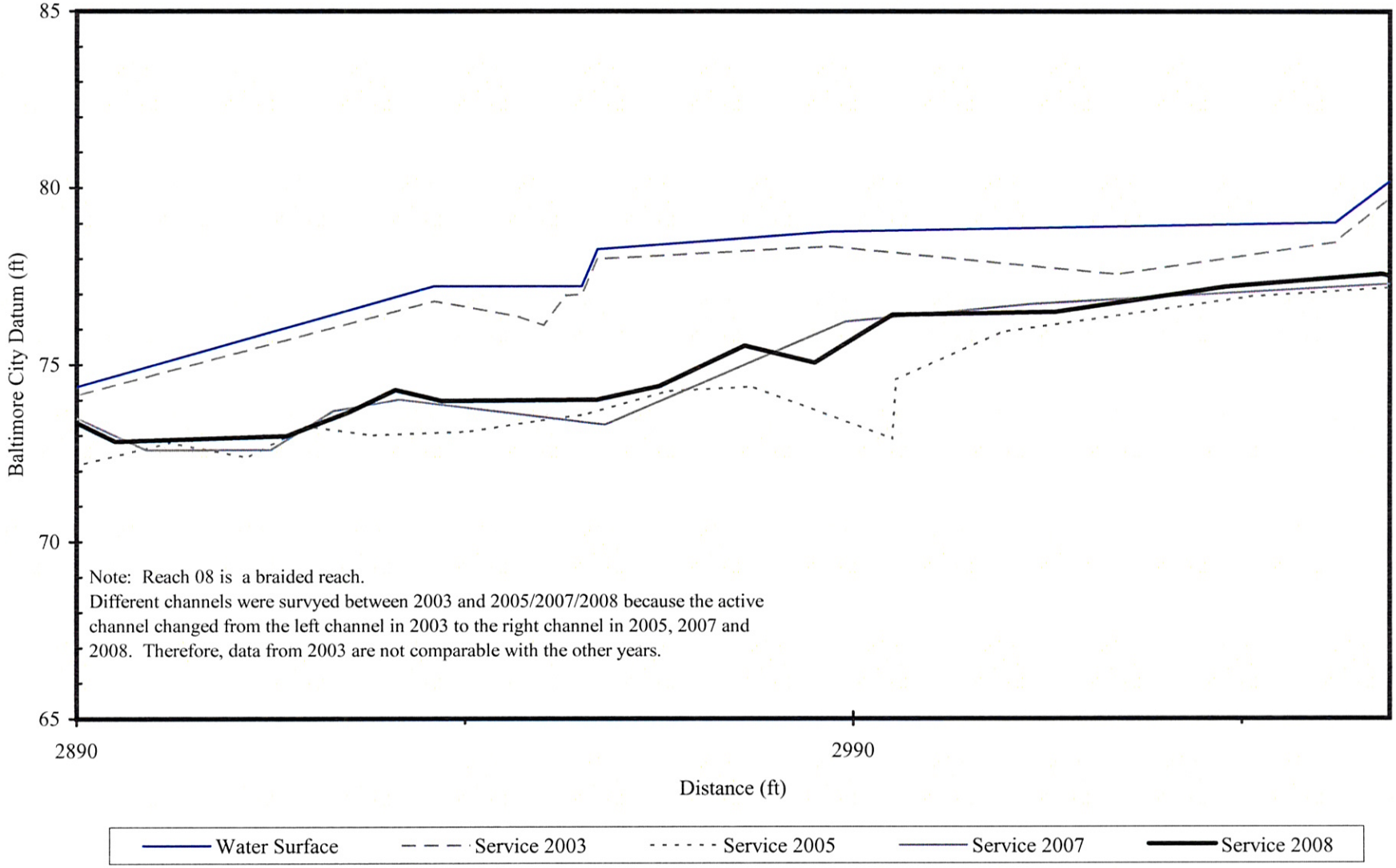
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
3/20/09

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 08



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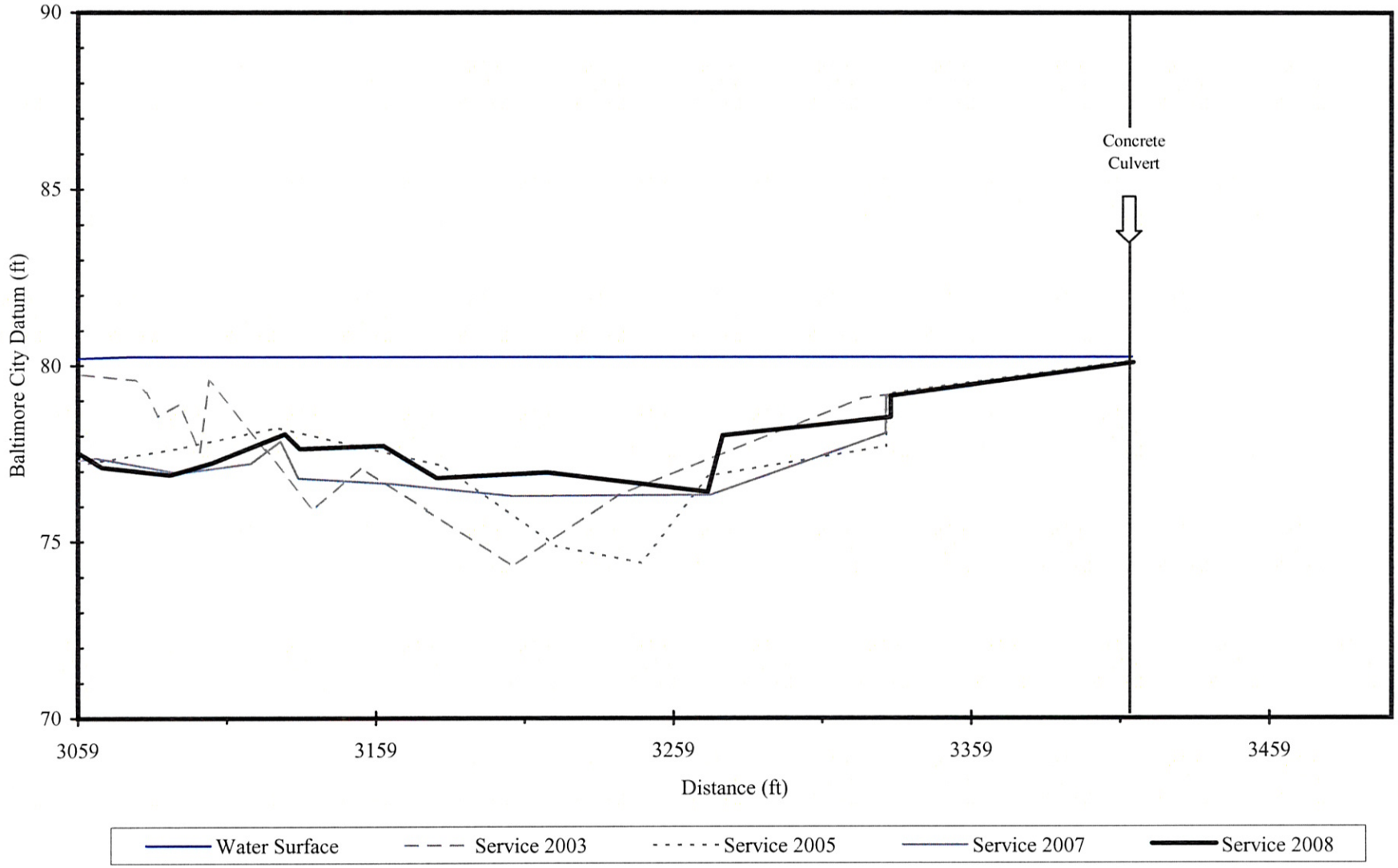
Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD
Longitudinal Profile Thalweg Overlay
Reach 09



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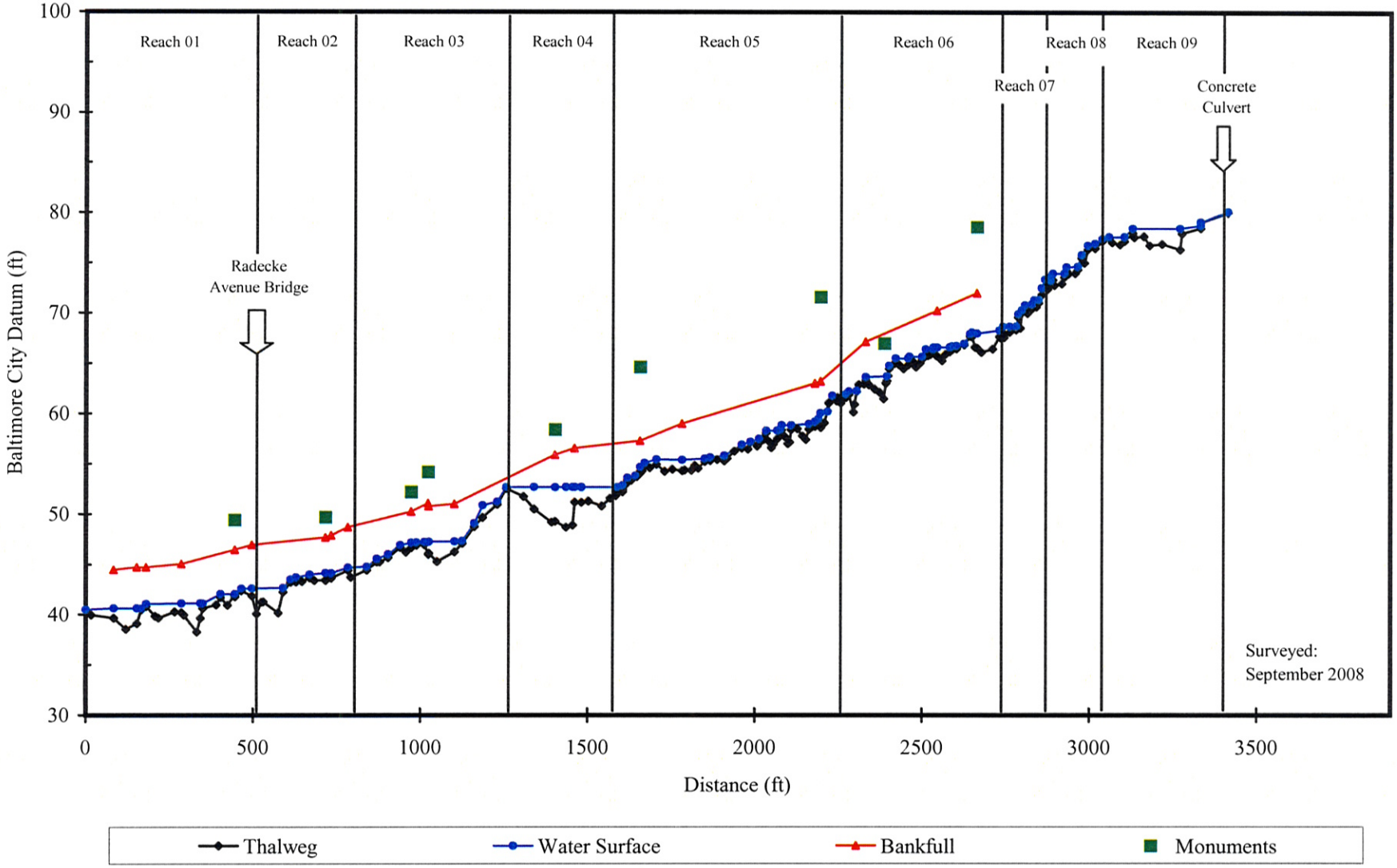
Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

2008 LONGITUDINAL PROFILE PLOT

MOORES RUN, BALTIMORE CITY, MD
2008



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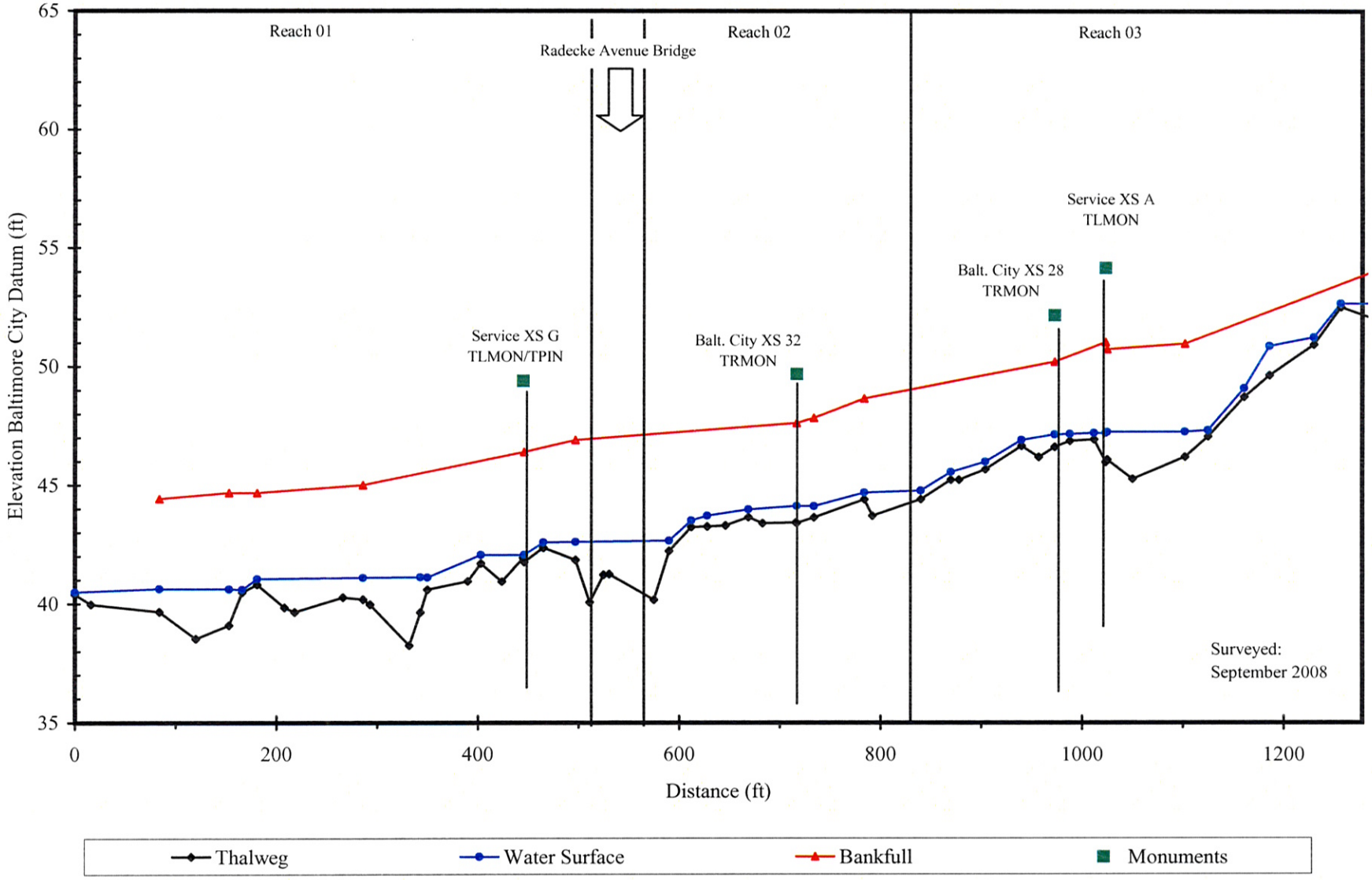
Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File: Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD 2008
Reaches 01 - 03



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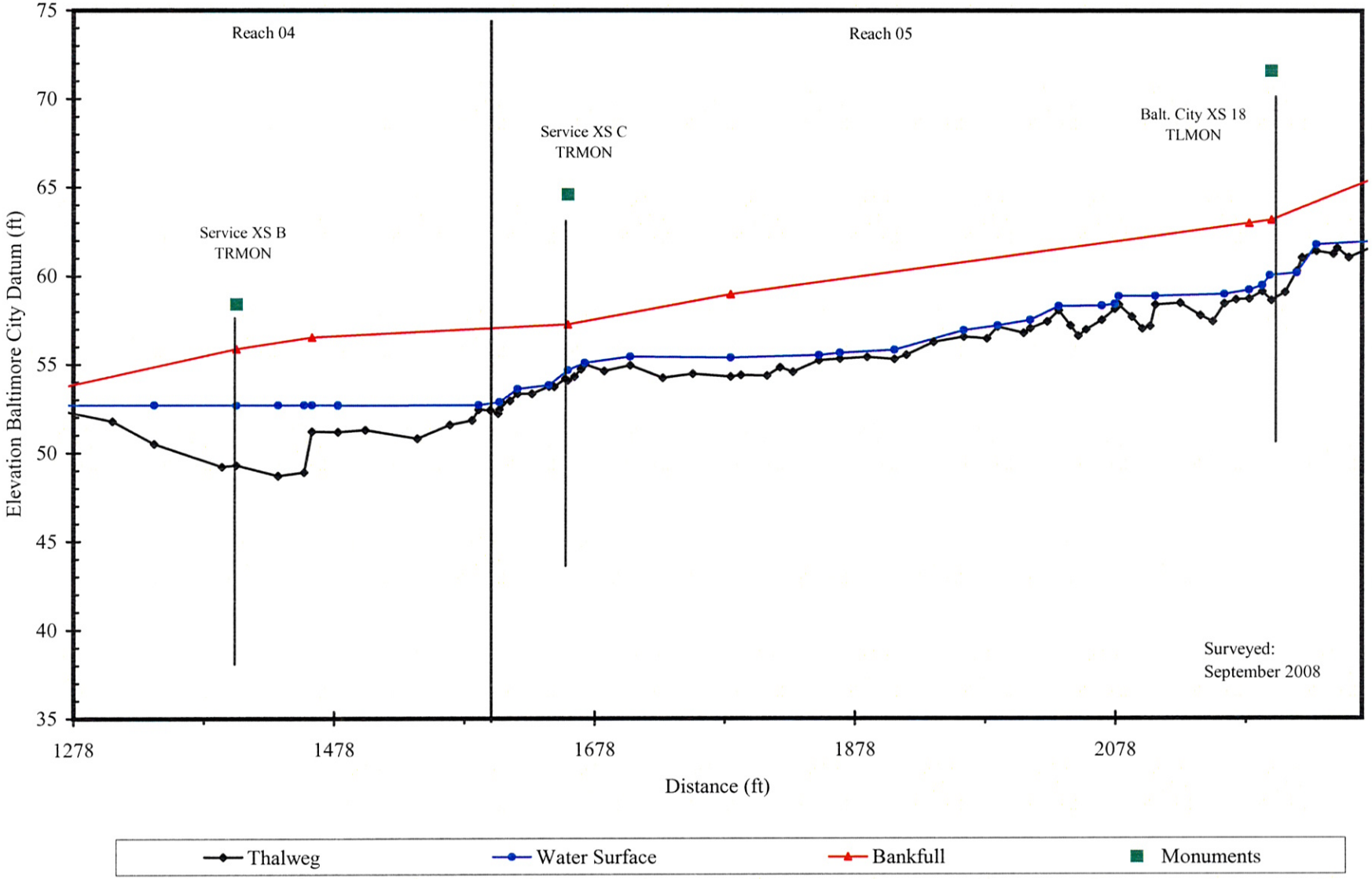
Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File:Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

MOORES RUN, BALTIMORE CITY, MD 2008
Reaches 04 - 05



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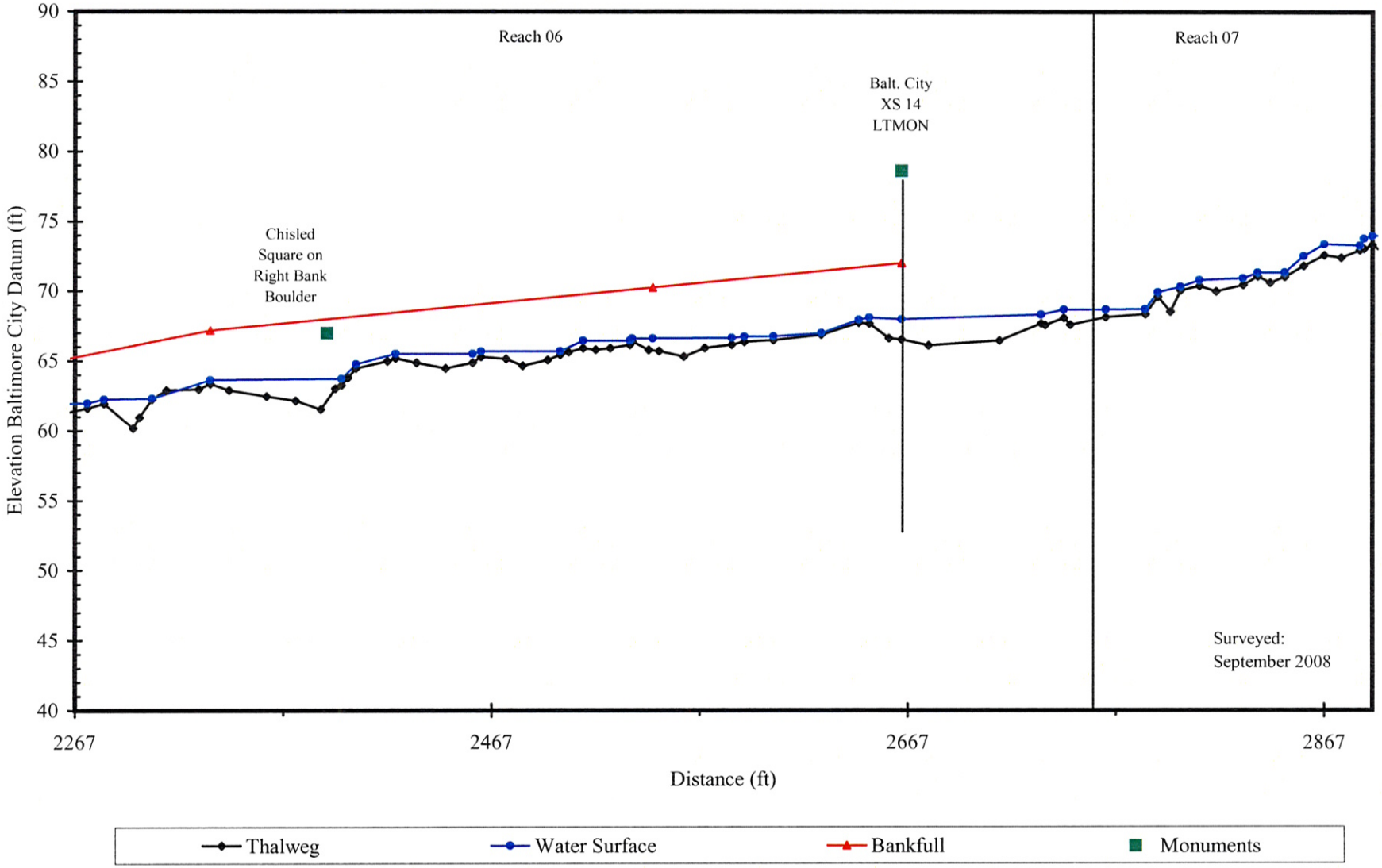
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File:Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

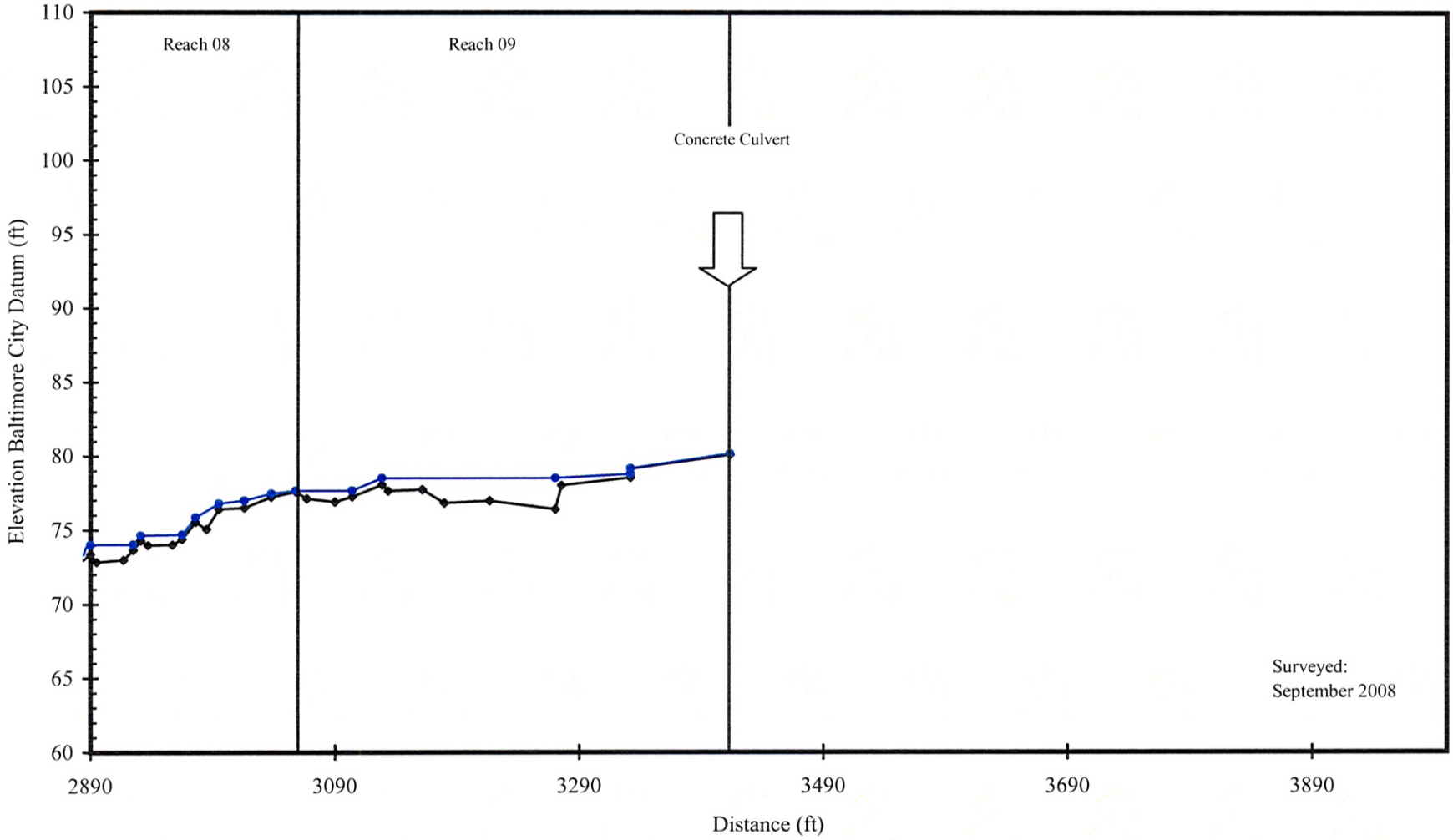
MOORES RUN, BALTIMORE CITY, MD 2008
Reaches 06 - 07



Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File:Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

MOORES RUN, BALTIMORE CITY, MD 2008
Reaches 08 - 09



Thalweg | Water Surface | Bankfull | Monuments

U.S. Fish and Wildlife Service
Chesapeake Bay Field Office

Path: CD Drive:\Moores Run\Data\Longitudinal Profile
File:Longitudinal Profile Overlay - Baltimore City Datum (2008).xls
03/20/09

2008 LONGITUDINAL PROFILE DATA

U.S. FISH AND WILDLIFE SERVICE
MOORES RUN, BALTIMORE CITY, MD - LONGITUDINAL PROFILE

STREAM	MOORES RUN at RADECKE RD - USGS # 01585230	QA/QC		DATE	2008
REACH	MOORES RUN STUDY AREA			CREW	RRS, MAS

REFERENCE RP3
REFERENCE ELEVATION (48.800

Comment	BS	FS	HI	Station	BED Rod	BED Elev	WS Rod	WS Elev	BKF Rod	BKF Elev	BKF-WS	TOB Rod	TOB Elev	IP Rod	IP Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF	MONS Rod	MONS Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF
Elevations are in Baltimore City Datum																									
Height of Instrument	4.37		53.17																						
RP3																									
TP 1	5.96	12.05	47.08																						
START OF REACH 01				0.00																					
TRIFF/BGLIDE				0.00	6.68	40.40	6.58	40.50																	
CS				16.00	7.11	39.97																			
CS				84.00	7.42	39.66	6.45	40.63	2.65	44.43	3.80														
CS				120.00	8.55	38.53																			
BRUN/TGLIDE				153.00	7.98	39.10	6.46	40.62	2.39	44.69	4.07														
BRIFF/TRUN				166.00	6.60	40.48	6.48	40.60																	
TRIFF/BGLIDE				181.00	6.27	40.81	6.02	41.06	2.39	44.69	3.63														
CS				208.00	7.24	39.84																			
CS				218.00	7.43	39.65																			
CS/BEDROCK				266.00	6.81	40.27																			
TGLIDE/BPOOL BEDROCK				286.00	6.89	40.19	5.97	41.11	2.06	45.02	3.91														
TP 2	5.55	3.11	49.52																						
CS				293.00	9.55	39.97																			
DMAX				332.00	11.26	38.26																			
TPOOL/BRUN				343.00	9.88	39.64	8.39	41.13																	
TRUN/BRIFF				350.00	8.92	40.60	8.40	41.12																	
CS				390.00	8.57	40.95																			
TRIFF/BRUN				403.00	7.81	41.71	7.45	42.07																	
CS				424.00	8.58	40.94																			
CROSS SECTION G TLMON				445.00		41.94														0.10	49.42				
TRUN/BRIFF				446.00	7.74	41.78	7.45	42.07	3.10	46.42	4.35														
TRIFF/BGLIDE				465.00	7.15	42.37	6.92	42.60																	
TGLIDE/BPOOL				497.00	7.66	41.86	6.90	42.62	2.60	46.92	4.30														
DMAX				511.00	9.45	40.07																			
END OF REACH 01				519.00																					
D/S RADECKE AVENUE BRIDGE				519.00																					
D/S CONCRETE CASEMENT				525.00	8.29	41.23																			
U/S CONCRETE CASEMENT				530.50	8.26	41.26																			
CS					9.64	39.88																			
CS				575.00	9.34	40.18																			
U/S RADECKE AVENUE BRIDGE				575.00																					
START OF REACH 02				575.00																					
TP 3	6.46	4.91	51.06																						
TPOOL/BRIFF				590.00	8.83	42.23	8.40	42.66																	
TRIFF/BRUN				612.00	7.82	43.24	7.54	43.52																	
CS				628.00	7.80	43.26	7.34	43.72																	
CS				646.00	7.76	43.30																			
CS				669.00	7.40	43.66	7.07	43.99																	
CS				683.00	7.66	43.40																			
CS				716.00	7.63	43.43																			
CROSS SECTION 32 LTMON				717.00		43.41		44.14		47.64										1.36	49.70				
TRUN/BRIFF				734.00	7.41	43.65	6.93	44.13	3.20	47.86	3.73														
TRIFF/BRUN				784.00	6.65	44.41	6.36	44.70	2.38	48.68	3.98														
CS				792.00	7.34	43.72																			
END OF REACH 02/START OF REACH 03				830.00																					
TRUN/BRIFF				840.00	6.64	44.42	6.27	44.79																	
CS				870.00	5.82	45.24	5.48	45.58																	

Comment	BS	FS	HI	Station	BED Rod	BED Elev	WS Rod	WS Elev	BKF Rod	BKF Elev	BKF-WS	TOB Rod	TOB Elev	IP Rod	IP Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF	MONS Rod	MONS Elev	WS DIFF	Other** Rod	Other** Elev	WS DIFF
CS				878.00	5.82	45.24																			
CS				904.00	5.37	45.69	5.05	46.01																	
TP 4	6.24	2.95	54.35																						
CS				940.00	7.67	46.68	7.42	46.93																	
CS				957.00	8.13	46.22																			
CROSS SECTION 28 RTMON				973.00		46.64		47.16		50.23										2.15	52.20				
TRIFF/BPOOL				988.00	7.45	46.90	7.16	47.19																	
CS				1012.00	7.39	46.96	7.12	47.23																	
CROSS SECTION A LTMON				1023.50		46.00		47.23		51.07											54.19				
CS				1025.00	8.24	46.11	7.08	47.27	3.58	50.77	3.50														
DMAX				1050.00	9.06	45.29																			
TPOOL/BRUN				1102.00	8.12	46.23	7.07	47.28	3.35	51.00	3.72														
TRUN/BRIFF				1125.00	7.26	47.09	7.00	47.35																	
CS				1161.00	5.60	48.75	5.24	49.11																	
CS				1186.00	4.69	49.66	3.45	50.90																	
CS				1230.00	3.39	50.96	3.09	51.26																	
TP 5	5.80	1.05	59.10																						
TRIFF/BGLIDE				1257.00	6.55	52.55	6.40	52.70																	
END OF REACH 03/START OF REACH 04				1278.00																					
CS				1308.00	7.33	51.77																			
TGLIDE/BPOOL				1340.00	8.60	50.50	6.40	52.70																	
CS				1392.00	9.89	49.21																			
CROSS SECTION B RTMON				1403.00	9.81	49.29	6.41	52.69	3.20	55.90	3.21									0.68	58.42				
DMAX				1435.00	10.40	48.70	6.40	52.70																	
CS				1455.00	10.20	48.90	6.40	52.70																	
TPOOL/BRUN				1461.00	7.90	51.20	6.39	52.71	2.55	56.55	3.84														
CS				1481.00	7.92	51.18	6.40	52.70																	
TP 6	7.20	4.85	61.45																						
CS				1481.00			8.78	52.67																	
CS				1502.00	10.16	51.29																			
CS				1542.00	10.64	50.81																			
CS				1567.00	9.88	51.57																			
CS				1584.00	9.62	51.83																			
TPOOL/BRUN				1589.00	9.02	52.43	8.74	52.71																	
END OF REACH 04/START OF REACH 05				1595.00																					
CS				1598.00	9.05	52.40																			
CS				1604.00	9.23	52.22																			
TRUN/BRIFF				1605.00	9.01	52.44	8.58	52.87																	
CS				1607.00	8.64	52.81																			
CS				1613.00	8.52	52.93																			
CS				1619.00	8.10	53.35	7.84	53.61																	
CS				1630.00	8.12	53.33																			
CS				1643.00	7.70	53.75	7.62	53.83																	
CS				1647.00	7.72	53.73																			
CS				1655.50	7.26	54.19																			
CROSS SECTION C TLMON				1657.50		54.08		54.69		57.29											64.62				
CS				1662.50	7.13	54.32																			
CS				1667.50	6.72	54.73																			
CS				1670.50	6.44	55.01	6.35	55.10																	
CS				1685.50	6.82	54.63																			
TRIFF/BPOOL				1705.50	6.49	54.96	6.00	55.45																	
CS				1730.50	7.20	54.25																			
CS				1753.50	6.98	54.47																			
CS				1782.50	7.13	54.32	6.05	55.40	2.45	59.00	3.60														
CS				1790.50	7.05	54.40																			
CS				1810.50	7.08	54.37																			
CS				1820.50	6.61	54.84																			
CS				1830.50	6.87	54.58																			
TPOOL/BRIFF				1850.50	6.21	55.24	5.91	55.54																	

Comment	BS	FS	HI	Station	BED Rod	BED Elev	WS Rod	WS Elev	BKF Rod	BKF Elev	BKF-WS	TOB Rod	TOB Elev	IP Rod	IP Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF	MONS Rod	MONS Elev	WS DIFF	Other** Rod	Other** Elev	WS DIFF
TRIFF/BRUN				1866.50	6.12	55.33	5.78	55.67																	
24" OUTFALL ON LEFT BANK				1887.50	6.02	55.43																			
TRUN/BRIFF				1908.50	6.14	55.31	5.61	55.84																	
CS				1917.50	5.89	55.56																			
CS				1938.50	5.17	56.28																			
CS				1961.50	4.86	56.59	4.50	56.95																	
CS				1979.50	4.96	56.49																			
CS				1987.50	4.30	57.15	4.23	57.22																	
CS				2007.50	4.65	56.80																			
CS				2012.50	4.38	57.07	3.91	57.54																	
CS				2025.50	4.00	57.45																			
TRIFF/BPOOL				2034.50	3.37	58.08	3.12	58.33																	
CS				2043.50	4.22	57.23																			
CS				2049.50	4.81	56.64																			
DMAX				2055.50	4.45	57.00																			
TPOOL/BRUN				2067.50	3.91	57.54	3.10	58.35																	
TRUN/BSTEP				2077.50	3.28	58.17	3.00	58.45																	
TSTEP/BPOOL				2080.50	3.06	58.39	2.57	58.88																	
CS				2090.50	3.72	57.73																			
TP 7	9.32	1.93	68.85																						
CS				2098.50	11.79	57.06																			
CS				2104.50	11.65	57.20																			
CS				2108.50	10.43	58.42	9.95	58.90																	
CS				2127.50	10.33	58.52																			
CS				2143.00	11.04	57.81																			
DMAX				2152.50	11.38	57.47																			
TPOOL/BRUN				2161.50	10.37	58.48	9.84	59.01																	
CS				2170.50	10.14	58.71																			
CS				2180.50	10.10	58.75	9.60	59.25	5.82	63.03	3.78														
TRUN/BSTEP				2190.50	9.68	59.17	9.34	59.51																	
TSTEP/BPOOL				2196.50			8.77	60.08																	
CROSS SECTION 18 RTMON				2197.50		58.66				63.22											71.60				
DMAX				2208.00	9.72	59.13																			
TPOOL/BRIFF				2217.00	8.53	60.32	8.62	60.23																	
CS				2221.00	7.77	61.08																			
CS				2232.00	7.39	61.46	7.03	61.82																	
CS				2245.00	7.55	61.30																			
CS				2248.00	7.23	61.62																			
12" OUTFALL ON LEFT BANK				2257.00	7.76	61.09																			
END OF REACH 05/START OF REACH 06				2267.00																					
CS				2273.00	7.24	61.61	6.85	62.00																	
TRIFF/BPOOL				2281.00	6.91	61.94	6.59	62.26																	
DMAX				2295.00	8.66	60.19																			
CS				2298.00	7.89	60.96																			
TPOOL/BRIFF				2304.00	6.61	62.24	6.53	62.32																	
CS				2311.00	5.94	62.91																			
CS				2326.50	5.88	62.97																			
TRIFF/BPOOL				2332.00	5.48	63.37	5.19	63.66	1.65	67.20	3.54														
CS				2341.00	5.94	62.91																			
CS				2359.00	6.38	62.47																			
CS				2373.00	6.70	62.15																			
DMAX				2385.00	7.32	61.53																			
CHISLED SQUARE ON RIGHT BANK BOULDER				2388.00																1.83	67.02				
CS				2392.00	5.81	63.04																			
TPOOL/BRIFF				2395.00	5.58	63.27	5.10	63.75																	
TP 8	5.79	1.83	72.81																						
CS				2398.00	9.01	63.80																			
CS				2402.00	8.34	64.47	8.03	64.78																	
CS				2417.00	7.82	64.99																			
TRIFF/BPOOL				2421.00	7.63	65.18	7.28	65.53																	
CS				2431.00	7.93	64.88																			

Comment	BS	FS	HI	Station	BED Rod	BED Elev	WS Rod	WS Elev	BKF Rod	BKF Elev	BKF-WS	TOB Rod	TOB Elev	IP Rod	IP Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF	MONS Rod	MONS Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF
DMAX				2445.00	8.34	64.47																			
CS				2458.00	7.94	64.87	7.27	65.54																	
CS				2462.00	7.51	65.30	7.11	65.70																	
CS				2474.00	7.65	65.16																			
DMAX/LOCATION OF LEFT BANK OUTFALL				2482.00	8.15	64.66																			
CS				2494.00	7.74	65.07																			
TPOOL/BRIFF				2500.00	7.37	65.44	7.10	65.71																	
CS				2504.00	7.16	65.65																			
TRIFF/BPOOL				2511.00	6.90	65.91	6.35	66.46																	
CS				2517.00	7.00	65.81																			
CS				2524.00	6.90	65.91																			
CROSS SECTION D LTMON				2531.00																					
CS				2533.50	6.65	66.16	6.35	66.46																	
CS				2534.50	6.40	66.41	6.18	66.63																	
CS				2542.50	7.02	65.79																			
CS				2544.50			6.18	66.63	2.53	70.28	3.65														
CS				2547.50	7.09	65.72																			
DMAX				2559.50	7.50	65.31																			
CS				2569.50	6.88	65.93																			
CS				2582.50	6.63	66.18	6.15	66.66																	
CS				2588.50	6.44	66.37	6.06	66.75																	
TP 9	4.41	3.63	73.59																						
TPOOL/BRIFF				2602.50	7.09	66.50	6.82	66.77																	
CS				2625.50	6.71	66.88	6.58	67.01																	
CS				2643.50	5.84	67.75	5.60	67.99																	
TRIFF				2648.50	5.90	67.69	5.46	68.13																	
CS				2658.00	6.95	66.64																			
CROSS SECTION 14 TLMON				2664.00		66.56		68.02		72.03											78.65				
DMAX				2677.00	7.45	66.14																			
CS				2711.00	7.11	66.48																			
TPOOL/BRIFF				2731.00	5.89	67.70	5.24	68.35																	
CS				2733.00	5.99	67.60																			
TSTEP/BPOOL				2742.00	5.48	68.11	4.88	68.71																	
CS				2745.00	5.97	67.62																			
END OF REACH 06/START OF REACH 07				2756.00																					
CS				2762.00	5.42	68.17	4.88	68.71																	
TPOOL/BSTEP				2781.00	5.21	68.38	4.84	68.75																	
TSTEP/BPOOL				2787.00	3.94	69.65	3.64	69.95																	
DMAX				2793.00	5.03	68.56																			
TPOOL/BSTEP				2798.00	3.49	70.10	3.23	70.36																	
TSTEP/BPOOL				2807.00	3.18	70.41	2.76	70.83																	
CS				2815.00	3.56	70.03																			
CS				2828.00	3.11	70.48	2.64	70.95																	
CS				2835.00	2.49	71.10	2.23	71.36																	
CS				2841.00	2.94	70.65																			
TP 10	8.55	1.57	80.57																						
CS				2848.00	9.50	71.07	9.19	71.38																	
TSTEP/BPOOL				2857.00	8.71	71.86	8.02	72.55																	
CS				2867.00	7.95	72.62	7.16	73.41																	
CS				2875.00	8.14	72.43																			
TP 11	8.16	1.57	80.18																						
CS				2884.00	7.20	72.98	6.86	73.32																	
CS				2886.00	7.08	73.10	6.37	73.81																	
CS				2890.00	6.82	73.36	6.17	74.01																	
END OF REACH 07/START OF REACH 08				2890.00																					
CS				2895.00	7.35	72.83																			
CS				2917.00	7.19	72.99																			
TPOOL/BSTEP				2925.00	6.52	73.66	6.15	74.03																	
TSTEP/BPOOL				2931.00	5.89	74.29	5.53	74.65																	

Comment	BS	FS	HI	Station	BED Rod	BED Elev	WS Rod	WS Elev	BKF Rod	BKF Elev	BKF-WS	TOB Rod	TOB Elev	IP Rod	IP Elev	WS DIFF	Other* Rod	Other* Elev	WS DIFF	MONS Rod	MONS Elev	WS DIFF	Other** Rod	Other** Elev	WS DIFF
CS				2937.00	6.20	73.98																			
36" CULVERT ON RIGHT BANK				2957.00	6.16	74.02																			
TPOOL/BSTEP				2965.00	5.78	74.40	5.48	74.70																	
CS				2976.00	4.64	75.54	4.31	75.87																	
CS				2985.00	5.12	75.06																			
TSTEP/BPOOL				2995.00	3.76	76.42	3.37	76.81																	
CS				3016.00	3.67	76.51	3.17	77.01																	
CS				3038.00	2.95	77.23	2.69	77.49																	
CS				3058.00	2.59	77.59	2.49	77.69																	
END OF REACH 08/START OF REACH 09				3059.00																					
CS				3067.00	3.06	77.12																			
CS				3090.00	3.28	76.90																			
CS				3104.00	2.94	77.24	2.49	77.69																	
TP 12	20.49	1.30	99.37																						
TOP MAN MADE DAM				3128.50	21.31	78.06	20.83	78.54																	
CS				3133.50	21.73	77.64																			
CS				3161.50	21.64	77.73																			
CS				3179.50	22.55	76.82																			
CS				3216.50	22.39	76.98																			
D/S END RIP RAP IN CHANNEL				3270.50	22.95	76.42	20.83	78.54																	
CS				3275.50	21.35	78.02																			
D/S END OF CONCRETE APRON, BOTTOM APRON				3332.00	20.82	78.55	20.57	78.80																	
D/S END OF CONCRETE APRON, TOP APRON				3332.00	20.22	79.15	20.18	79.19																	
END OF SURVEY AT BOX CULVERT				3413.50	19.27	80.10	19.19	80.18																	
END OF REACH 09				3413.00																					

APPENDIX C

MOORES RUN – REACH BEHI AND NBS CHARTS

APPENDIX C

BEHI SUMMARY TABLES

2008 BEHI Summary Table

BANK EROSION PREDICTION SUMMARYS

2008 Bank Erosion Prediction Summary

REACH BEHI MAP

REACH BEHI PHOTOGRAPHS

BEHI SUMMARY TABLES

2008 BEHI SUMMARY TABLE
Moores Run, Baltimore, MD

Reach ID	Bank Length	Bank Height	Bank Area	BKF Height	Bank Height / BKF Height	Bank Ratio Index	Root Depth	Root Depth / Bank Height	Root Ratio Index	Root Density (%)	Root Density / Bank Height	Root Density Index	Bank Angle	Bank Angle Index	Surface Protection (%)	Surface Protection Index	Materials & Stratificaiton Index	Total Score	Rating Category
Reach 1																			
Bank 1	120.0	4.0	480.0	4.0	1.0	1.0	1.0	0.3	6.5	40.0	10.0	8.4	75.0	5.4	80.0	1.9	0.0	23.3	Moderate
Bank 2	151.0	4.0	604.0	4.0	1.0	1.0	1.0	0.3	6.5	50.0	12.5	8.2		1.0	80.0	1.9	0.0	18.6	Low
Bank 3	38.0	8.5	323.0	4.5	1.9	7.4	1.3	0.1	7.9	30.0	4.4	10.0	80.0	5.9	10.0	9.0	0.0	40.2	Very High
Bank 3a	36.0	8.5	306.0	4.5	1.9	7.4	1.0	0.1	8.2	20.0	2.4	10.0	40.0	2.9	30.0	5.9	0.0	34.4	High
Bank 4	268.0	14.0	3,752.0	4.0	3.5	10.0	1.0	0.1	8.8	15.0	1.1	10.0	70.0	4.9	20.0	7.2	5.0	45.9	Extreme
Reach 2																			
Bank 5	260.0	6.0	1,560.0	3.5	1.7	6.5	5.0	0.8	2.3	65.0	54.2	4.0	30.0	2.4	90.0	1.5	0.0	16.7	Low
Bank 6	250.0	5.0	1,250.0	3.5	1.4	5.4	4.0	0.8	2.4	65.0	52.0	4.2	30.0	2.4	90.0	1.5	0.0	15.9	Low
Reach 3																			
Bank 7	54.0	5.5	297.0	3.0	1.8	7.1	0.8	0.1	8.0	30.0	4.1	10.0	60.0	3.9	15.0	8.0	5.0	42.0	Very High
Bank 8	110.0	5.0	550.0	3.5	1.4	5.4	1.5	0.3	5.9	60.0	18.0	7.5	40.0	2.9	85.0	1.7	0.0	23.4	Moderate
Bank 9a[1]	114.0	6.5	741.0	3.5	1.9	7.2	1.0	0.2	7.8	35.0	5.4	9.0	50.0	3.4	10.0	9.0	5.0	41.4	Very High
Bank 9c	75.0	3.5	262.5	3.5	1.0	1.0	1.3	0.4	5.3	70.0	25.0	6.5	25.0	2.2	95.0	1.2	0.0	16.3	Low
Bank 9d	125.0	4.0	500.0	3.5	1.1	2.9	1.5	0.4	5.2	80.0	30.0	5.9	45.0	3.2	90.0	1.5	0.0	18.6	Low
Bank 9e	20.0	3.0	60.0	3.0	1.0	1.0	1.5	0.5	3.9	80.0	40.0	5.1	80.0	5.9	60.0	3.5	5.0	24.4	Moderate
Bank 9f	35.0	3.4	119.0	3.0	1.1	2.7	1.5	0.4	4.5	80.0	35.3	5.5	20.0	1.9	70.0	2.7	0.0	17.3	Low
Reach 4																			
Bank 10	392.0	3.5	1,372.0	3.5	1.0	1.0	2.5	0.7	2.9	75.0	53.6	4.0	80.0	5.9	80.0	1.9	0.0	15.7	Low
Bank 11	52.0	5.5	286.0	4.0	1.4	5.1	2.0	0.4	5.3	45.0	16.4	7.7	85.0	6.8	55.0	3.9	0.0	28.8	Moderate
Bank 12	88.0	6.0	528.0	4.5	1.3	4.8	2.5	0.4	4.7	40.0	16.7	7.7	60.0	3.9	30.0	5.9	5.0	32.1	High
Bank 13a	180.0	3.5	630.0	3.5	1.0	1.0	2.0	0.6	3.6	70.0	40.0	5.1	75.0	5.4	90.0	1.5	0.0	16.5	Low
Reach 5																			
Bank 13b	75.0	7.0	525.0	2.5	2.8	9.0	1.3	0.2	7.5	50.0	8.9	8.6	60.0	3.9	30.0	5.9	0.0	34.9	High
Bank 14	75.0	7.0	525.0	3.7	1.9	7.4	2.3	0.3	5.7	25.0	8.0	8.7	50.0	3.4	30.0	5.9	2.5	33.5	High
Bank 15	88.0	7.0	616.0	2.5	2.8	9.0	0.8	0.1	8.4	40.0	4.3	10.0	80.0	5.9	20.0	7.2	0.0	40.5	Very High
Bank 16	135.0	8.0	1,080.0	3.5	2.3	8.3	3.0	0.4	5.2	60.0	22.5	6.9	70.0	4.9	80.0	1.9	0.0	27.1	Moderate
Bank 17	113.0	7.0	791.0	3.5	2.0	7.9	3.0	0.4	4.6	60.0	25.7	6.4	50.0	3.4	60.0	3.5	0.0	25.9	Moderate
Bank 18	350.0	5.0	1,750.0	2.0	2.5	8.6	3.5	0.7	2.9	60.0	42.0	5.0	50.0	3.4	80.0	1.9	0.0	21.8	Moderate
Bank 19a	184.0	7.0	1,288.0	2.0	3.5	10.0	3.0	0.4	4.6	60.0	25.7	6.4	50.0	3.4	60.0	3.5	0.0	28.0	Moderate
Bank 19b	36.0	10.0	360.0	3.7	2.7	8.9	3.5	0.4	5.4	50.0	17.5	7.6	80.0	5.9	35.0	5.5	2.5	35.7	High
Bank 19c	15.0	10.0	150.0	3.7	2.7	8.9	1.0	0.1	8.4	60.0	6.0	8.9	75.0	5.4	10.0	9.0	0.0	40.6	Very High
Bank 19d	50.0	9.0	450.0	3.7	2.4	8.5	0.8	0.1	8.6	50.0	4.2	10.0	75.0	5.4	10.0	9.0	5.0	46.5	Extreme
Bank 20	35.0	10.0	350.0	3.7	2.7	8.9	3.5	0.4	5.4	50.0	17.5	7.6	60.0	3.9	65.0	3.1	0.0	28.8	Moderate
Bank 22	70.0	7.0	490.0	3.7	1.9	7.4	0.8	0.1	8.4	65.0	7.0	8.8	85.0	6.8	40.0	5.1	0.0	36.5	High

2008 BEHI SUMMARY TABLE
Moores Run, Baltimore, MD

Reach ID	Bank Length	Bank Height	Bank Area	BKF Height	Bank Height / BKF Height	Bank Ratio Index	Root Depth	Root Depth / Bank Height	Root Ratio Index	Root Density (%)	Root Density / Bank Height	Root Density Index	Bank Angle	Bank Angle Index	Surface Protection (%)	Surface Protection Index	Materials & Stratificaiton Index	Total Score	Rating Category
Reach 6																			
Bank 23a	372.0	9.0	3,348.0	3.7	2.4	8.5	3.5	0.4	5.0	60.0	23.3	6.8	80.0	5.9	60.0	3.5	2.5	32.2	High
Bank 23c	25.0	8.5	212.5	3.7	2.3	8.3	1.0	0.1	8.2	60.0	7.1	8.8	100.0	8.3	35.0	5.5	0.0	39.1	High
Bank 24[2]	178.0	3.5	623.0	3.5	1.0	1.0	1.5	0.4	4.6	70.0	30.0	5.9	80.0	5.9	80.0	1.9	0.0	19.3	Low
Reach 7																			
Bank 23a	50.0	9.0	450.0	3.7	2.4	8.5	3.5	0.4	5.0	60.0	23.3	6.8	80.0	5.9	60.0	3.5	2.5	32.2	High
Bank 23b	130.0	8.0	1,040.0	2.5	3.2	10.0	4.5	0.6	3.6	60.0	33.8	5.6	80.0	5.9	80.0	1.9	0.0	27.0	Moderate
Bank 25a	211.0																		Low
Bank 25b	10.0	13.0		3.7	3.5	10.0	2.0	0.2	7.8	60.0	9.2	8.5	85.0	6.8	5.0	10.0	0.0	43.2	Very High
Reach 8																			
Bank 26	213.0																		Low
Reach 9																			
Bank 27/28	320.0																		Very Low
Bank 29	304.0																		Very Low

1. Reach 3 Bank 9a includes Banks 9a, 9b and 9g from 2005.

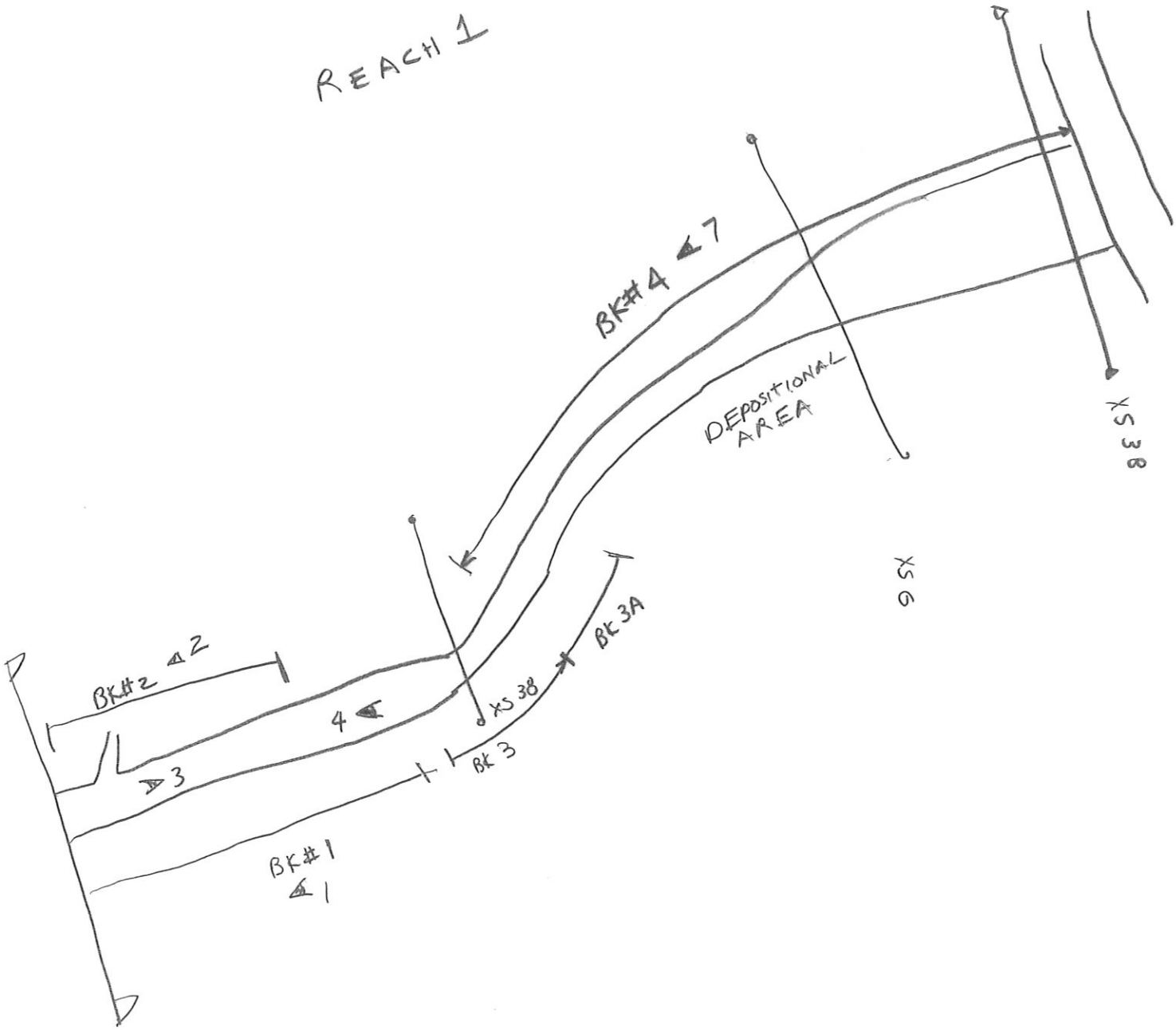
BANK EROSION PREDICTION SUMMARYS

MOORES RUN
GENERAL EROSION PREDICTION

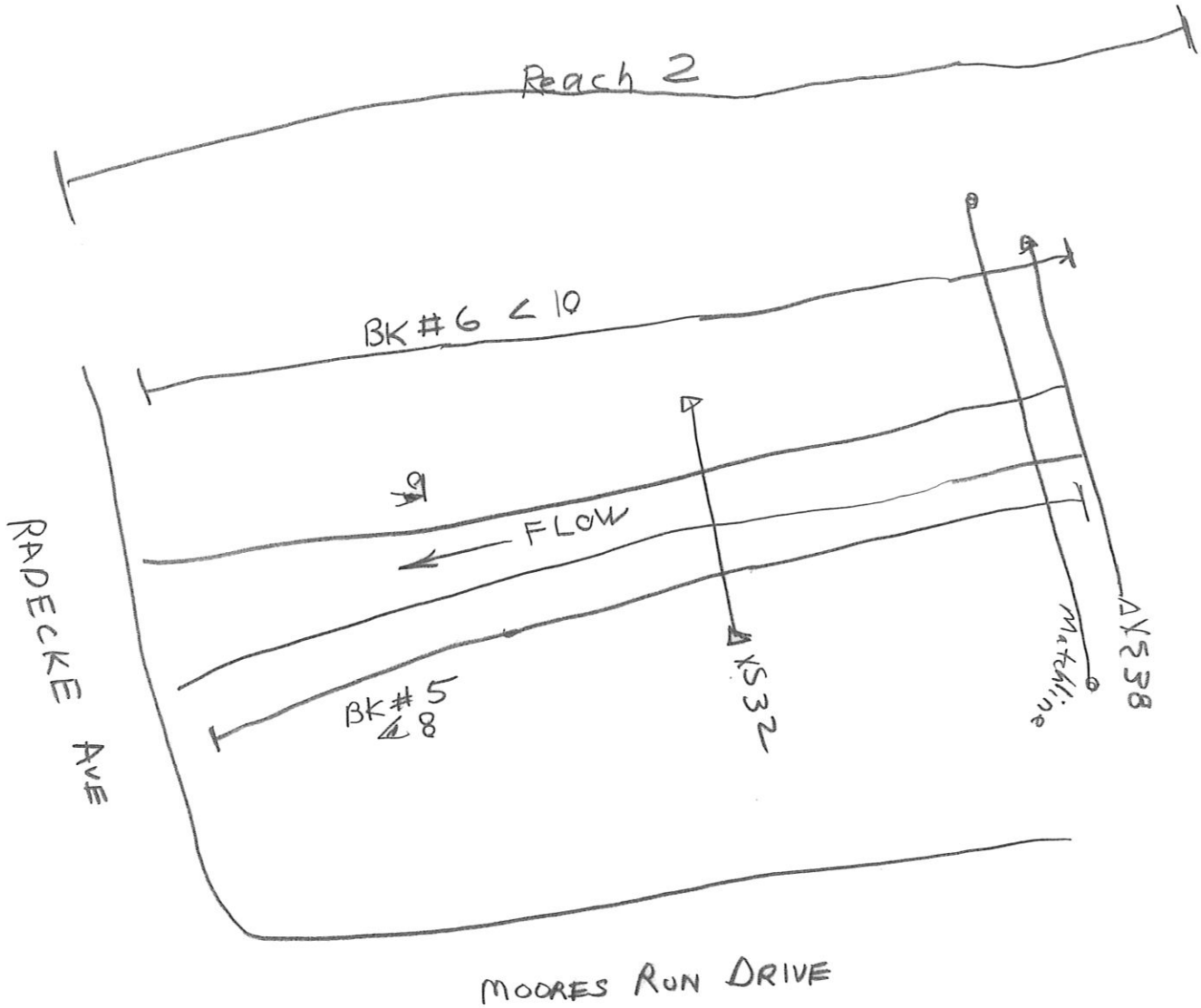
BANK EROSION PREDICTION SUMMARY 2008

Reach		Reach Length	Cross Section	BEHI	Near Bank Stress Rating	Bank Erosion Prediction (ft/yr)	Length of Bank (ft)	Height of Bank (ft)	Erosion Total (ft^3/yr)	Erosion Total (ton/yr)	Reach Total (ton/yr)	Reach Total (ton/yr/ft)	Comments
1	Bank 1	429		Moderate	Low	0.1100	120	4.0	52.80	2.54			
	Bank 2	429		Low	Low	0.0170	151	4.0	10.27	0.49			
	Bank 3	429		Very High	High	1.0000	38	8.5	323.00	15.55			
	Bank 3a	429		High	Moderate	0.6100	36	8.5	186.66	8.99			
	Bank 4	429	XS G (RB)	Extreme	Moderate	1.8000	268	14.0	6753.60	325.17	352.75	0.82	
2	Bank 5	255	XS 32 (LB)	Moderate	Low	0.1100	260	6.0	171.60	8.26			
	Bank 6	255		Moderate	Low	0.1100	250	5.0	137.50	6.62	14.88	0.06	
3	Bank 7	448		Very High	Low	0.4000	54	5.5	118.80	5.72			
	Bank 8	448	XS 28 (RB)	Moderate	High	0.1880	110	5.0	103.40	4.98			
	Bank 9a	448	XS A (RB)	Very High	Low	0.4000	114	6.5	296.40	14.27			
	Bank 9c	448		Low	Low	0.0170	75	3.5	4.46	0.21			
	Bank 9d	448		Low	Low	0.0170	125	4.0	8.50	0.41			
	Bank 9e	448		Moderate	High	0.1880	20	3.0	11.28	0.54			
	Bank 9f	448		Low	Low	0.0170	35	3.4	2.02	0.10	26.23	0.06	
4	Bank 10	317		Low	Low	0.1100	392	3.5	150.92	7.27			
	Bank 11	317		Moderate	Moderate	0.3050	52	5.5	87.23	4.20			
	Bank 12	317	XS B (LB)	High	Moderate	0.6100	88	6.0	322.08	15.51			
	Bank 13a	317		Low	Low	0.0170	180	3.5	10.71	0.52	27.49	0.09	
5	Bank 13b	672		High	Low	0.4000	75	7.0	210.00	10.11			
	Bank 14	672		High	Low	0.4000	75	7.0	210.00	10.11			
	Bank 15	672	XS C (RB)	Very High	Low	0.4000	88	7.0	246.40	11.86			
	Bank 16	672		Moderate	Low	0.1100	135	5.0	74.25	3.58			
	Bank 17	672		Moderate	Low	0.1100	113	7.0	87.01	4.19			
	Bank 18	672		Moderate	Low	0.1100	350	5.0	192.50	9.27			
	Bank 19a	672		Moderate	Low	0.1100	184	7.0	141.68	6.82			
	Bank 19b	672		High	Low	0.4000	36	10.0	144.00	6.93			
	Bank 19c	672		Very High	High	1.0000	15	10.0	150.00	7.22			
	Bank 19d	672		Extreme	High	2.3500	50	9.0	1057.50	50.92			
	Bank 20	672		Moderate	High	0.1880	35	10.0	65.80	3.17			
	Bank 22	672	XS 18 (RB)	High	Moderate	0.6100	70	7.0	298.90	14.39	138.57	0.21	
6	Bank 23a	489	XS 14 (LB)	High	Moderate	0.6100	372	9.0	2042.28	98.33			
	Bank 23c	489		High	Moderate	0.6100	25	8.5	129.63	6.24			
	Bank 24	489		Low	Low	0.0170	178	3.5	10.59	0.51	105.08	0.21	
7	Bank 23a	134	XS 14 (LB)	High	Moderate	0.6100	50	9.0	274.50	13.22			
	Bank 23b	134		Moderate	Moderate	0.3050	130	8.0	317.20	15.27			
	Bank 25a	134		Low	Low	0.0170	211	13.0	46.63	2.25			
	Bank 25b	134		Very High	Moderate	0.6100	10	13.0	79.30	3.82	34.55	0.26	
8	Bank 26	169		Low	Very Low	0.0050	213	9.0	9.59	0.46			Boulder Protected
	Bank 27/28	169		N/A	N/A	0.0000					0.46	0.0027	Concrete Banks
9	Bank 27/28	354		N/A	N/A	0.0000							Concrete Banks
	Bank 29	354		N/A	N/A	0.0000					0.00	0.00	
						TOTAL	4,783	TOTAL	14538.99	700.03			

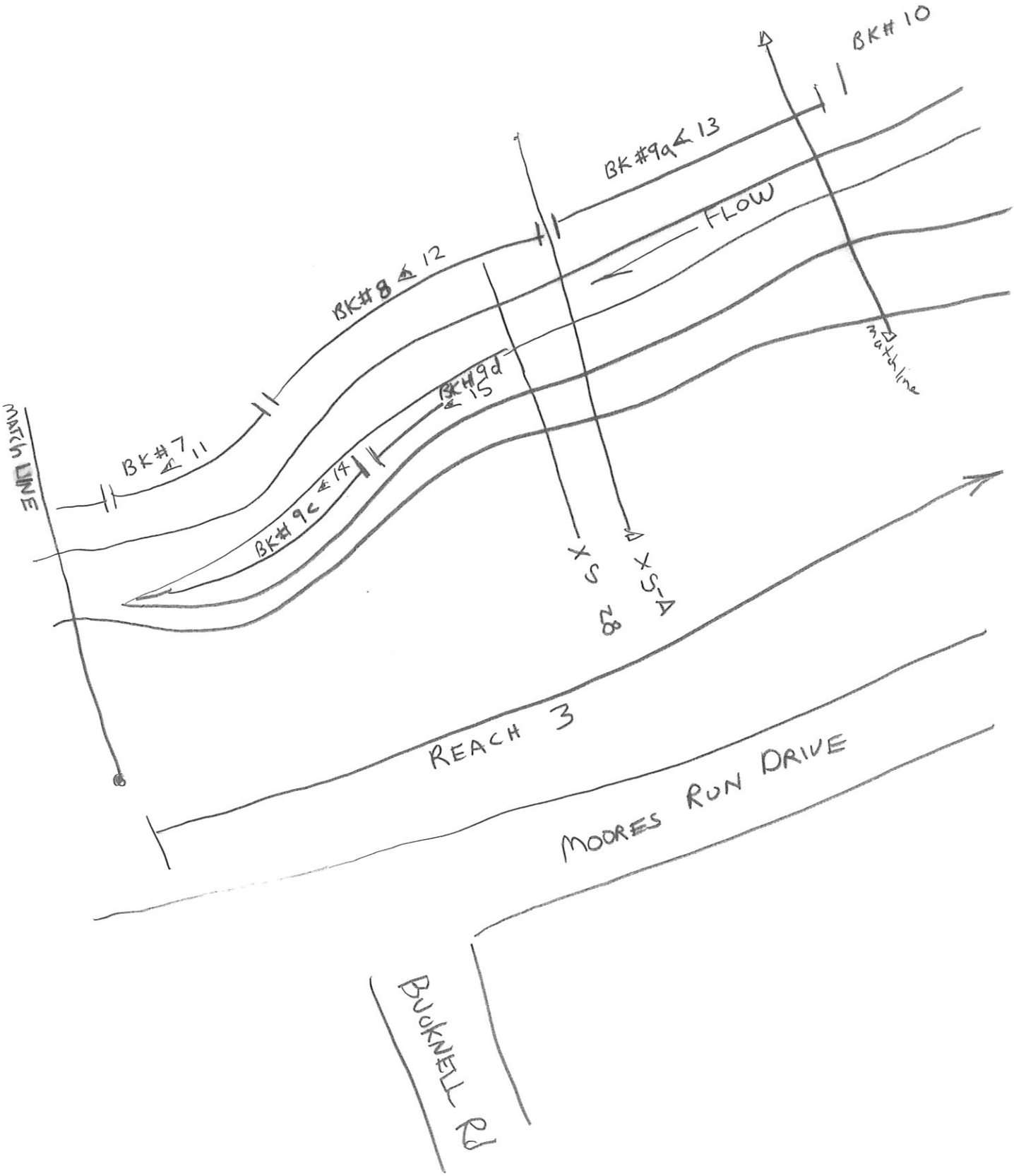
REACH BEHI MAP

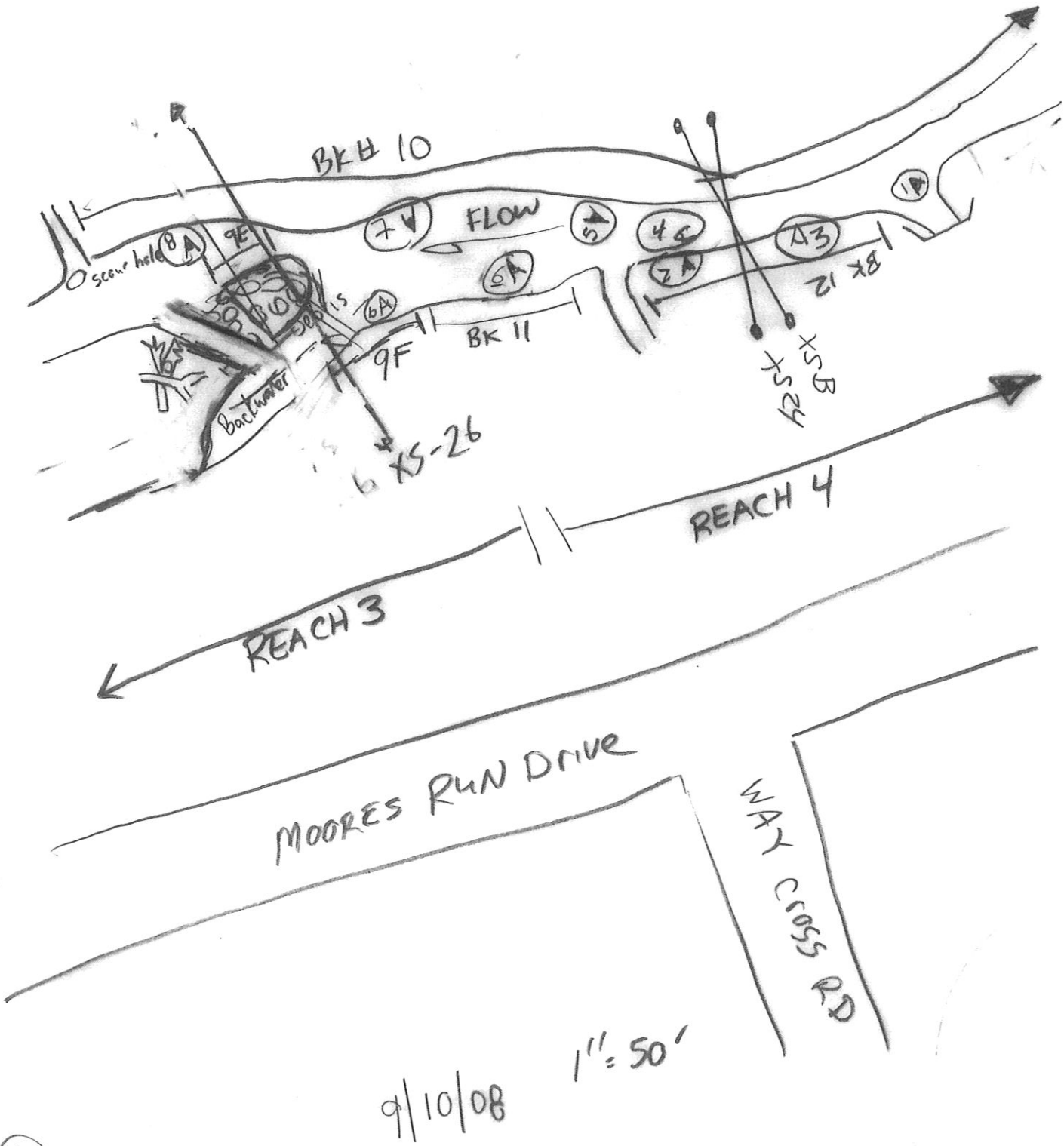

REACH 1
BK#4
7
DEPOSITIONAL AREA
XS 38
XS 6
BK 3A
BK#2
2
4
XS 38
3
BK 3
BK#1
1

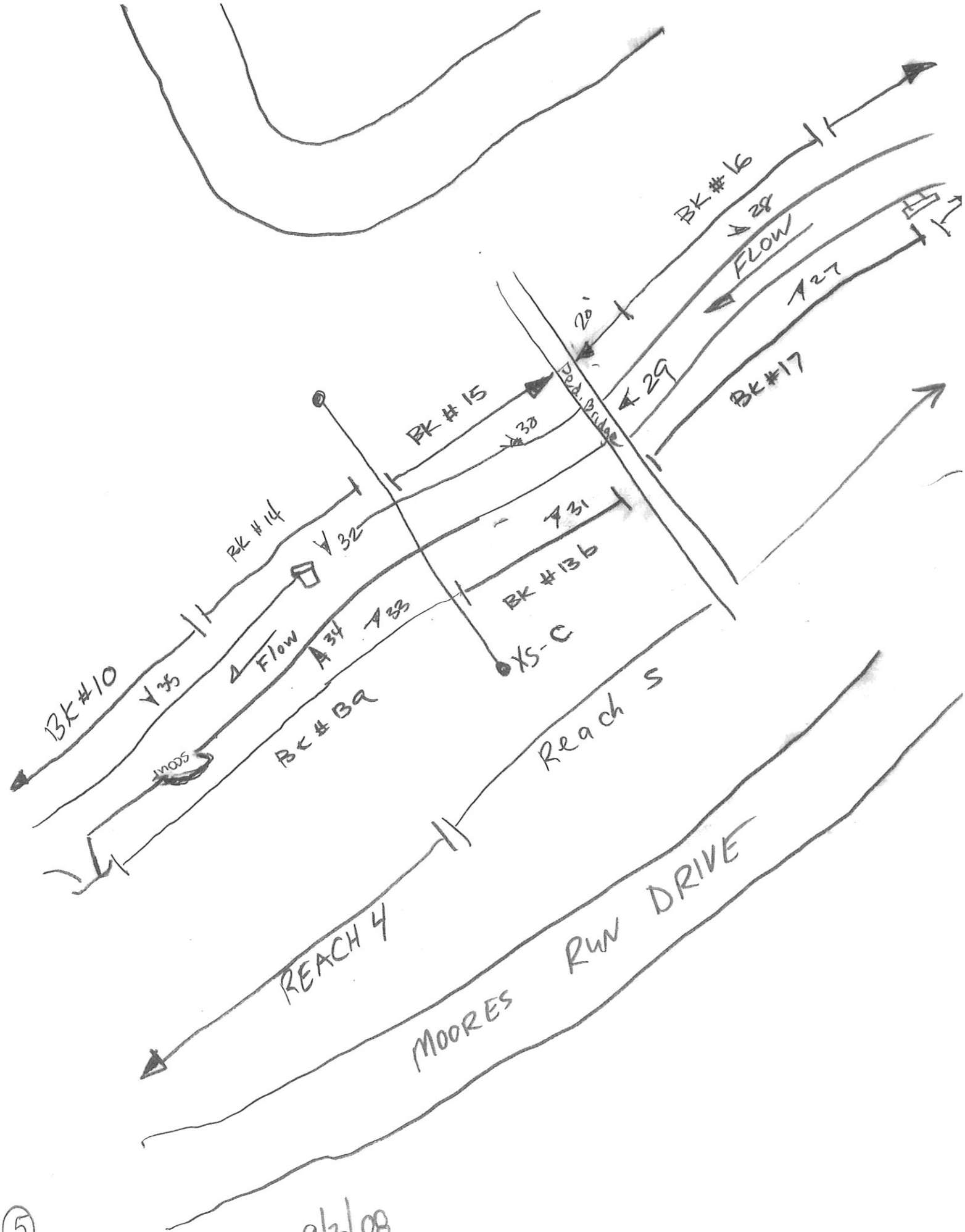
9/10/08


Reach 2
BK #6 < 10
FLOW
BK #5
< 8
XS 32
Matching
XS 38
RADECKE AVE
MOORES RUN DRIVE

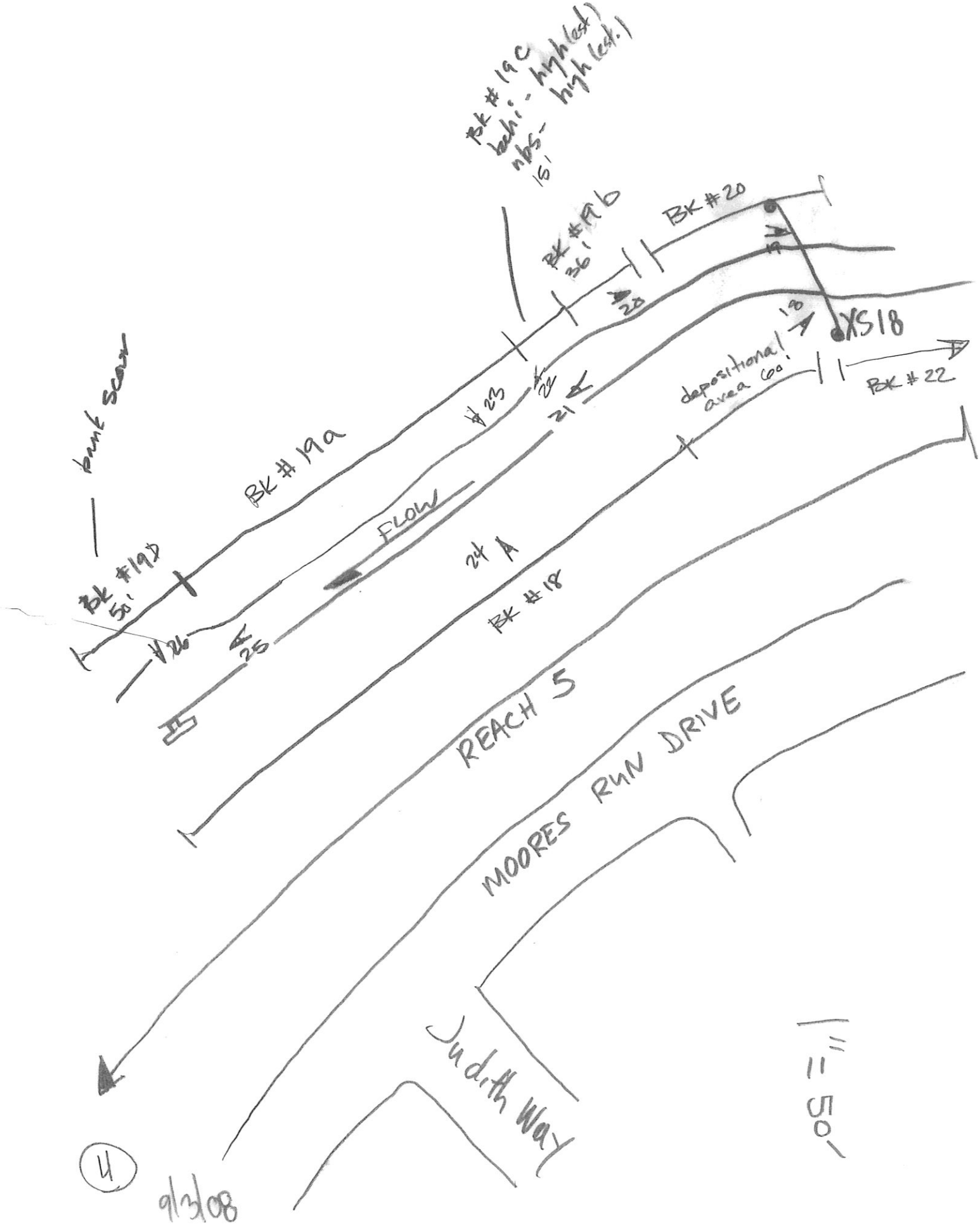
9/10/08


BK#10
BK#9a 13
FLOW
BK#8 12
BK#9d 15
BK#7 11
BK#9c 14
MATCH LINE
XS 8
XS-A
30th line
REACH 3
MOORES RUN DRIVE
BUCKNELL Rd


BK # 10
FLOW
7A
5A
4C
4B
4A
3
1A
8A
9E
scour hole
6A
6A
BK 11
9F
Backwater
XS-26
XS-4
XS-3
21 x 8
REACH 4
REACH 3
MOORES RUN Drive
WAY CROSS RD
1" = 50'
9/10/08

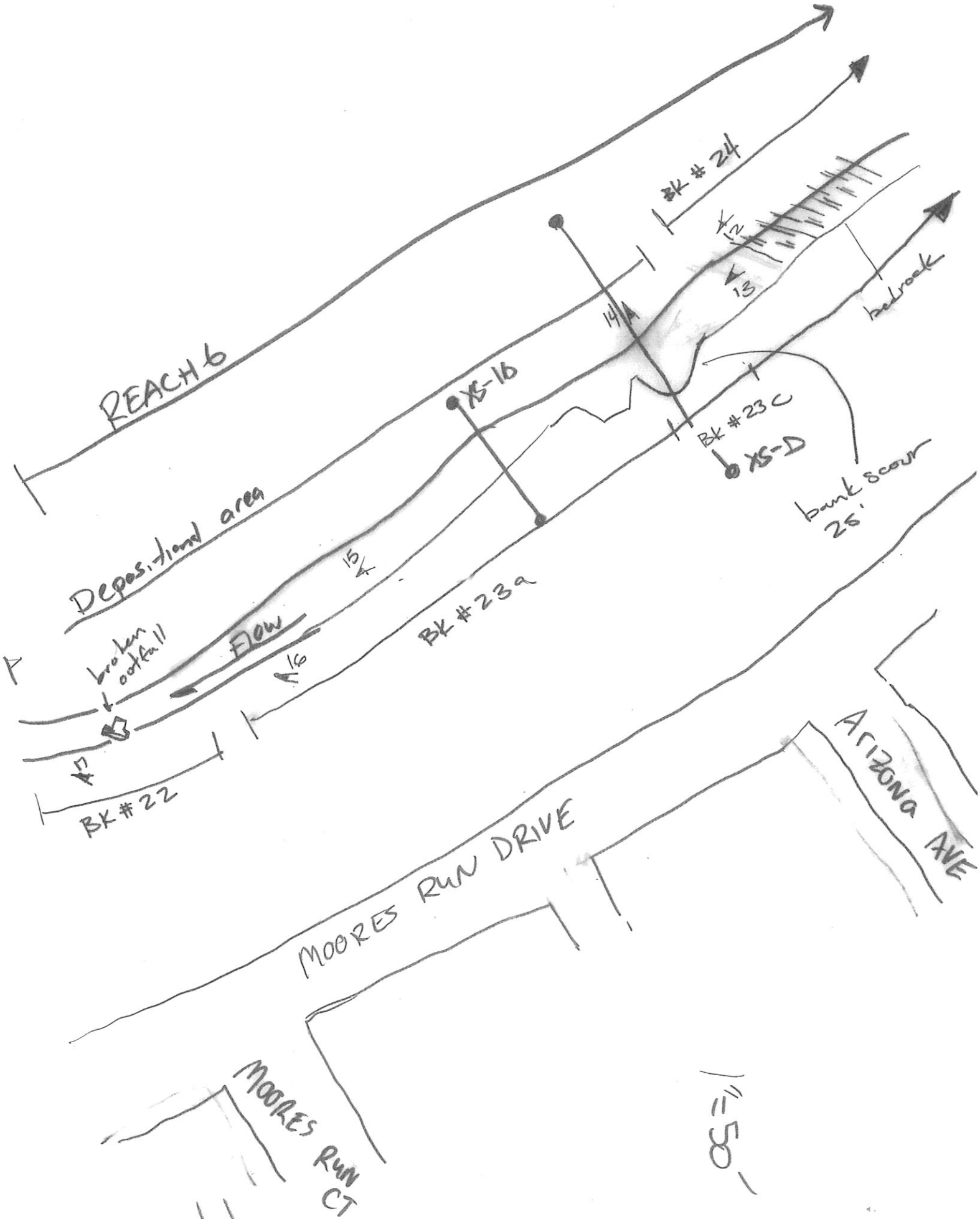

BK #16
28
FLOW
27
20'
Ped. Bridge
29
BK #17
BK #15
30
BK #14
32
31
BK #13b
33
34
FLOW
XS-C
BK #10
35
moss
BK #13a
Reach 5
REACH 4
MOORES RUN DRIVE

9/3/08

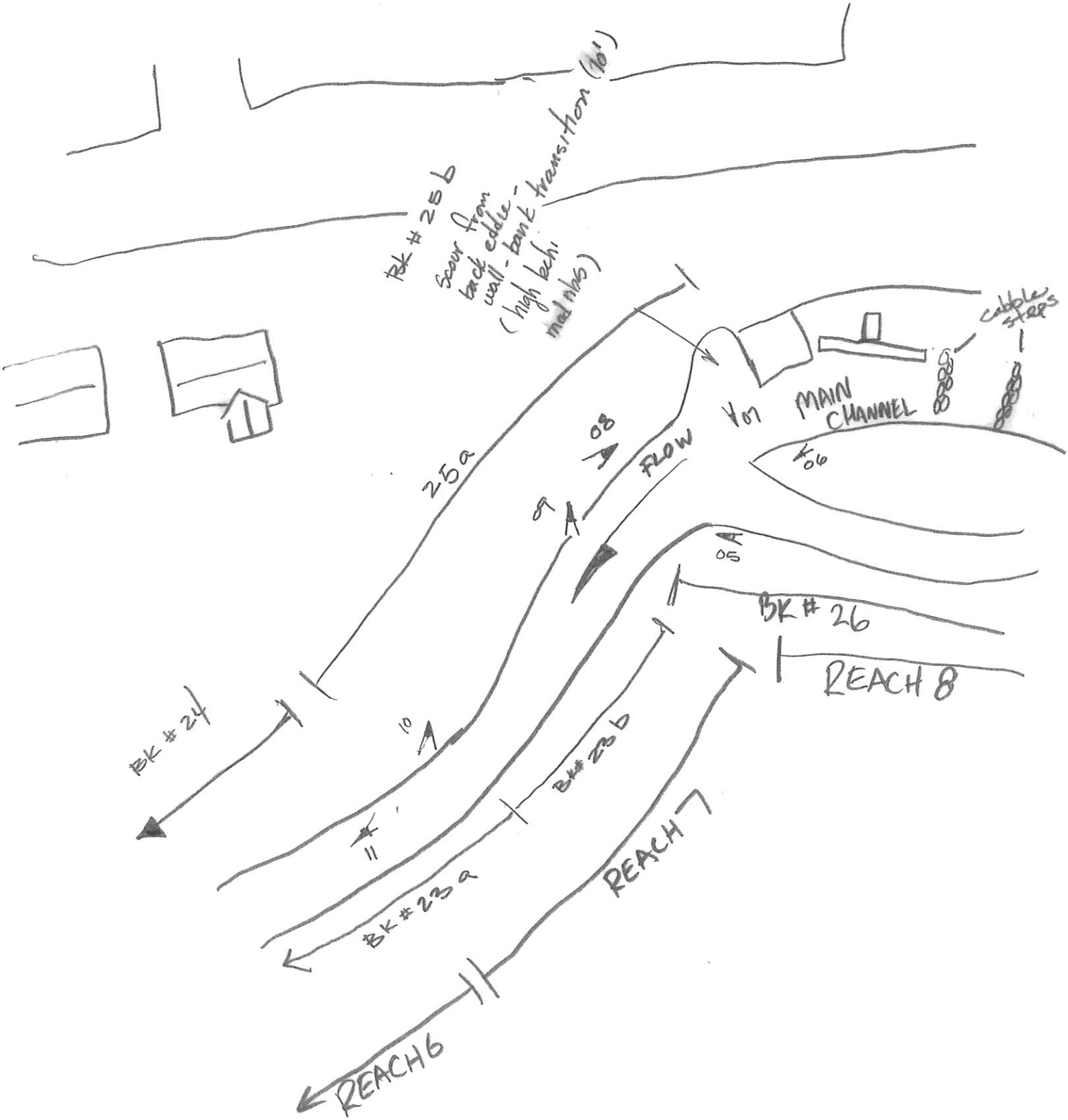

bk #19c
bank: - high (est.)
nbs - high (est.)
15'
BK #19b
36'
BK #20
19
28
XS18
18
depositional area 60'
BK #22
bank scour
BK #19a
#23
24
21
FLOW
24 A
BK #18
BK #19D
50'
#26
25
REACH 5
MOORES RUN DRIVE
Judith Way
11 50'

4

9/3/08


REACH 6
Depositional area
broken outfall
Flow
BK #22
BK #23a
XS-16
BK #23c
XS-D
BK #24
bedrock
bank scour
25'
MOORES RUN DRIVE
MOORES RUN CT
ARIZONA AVE
N

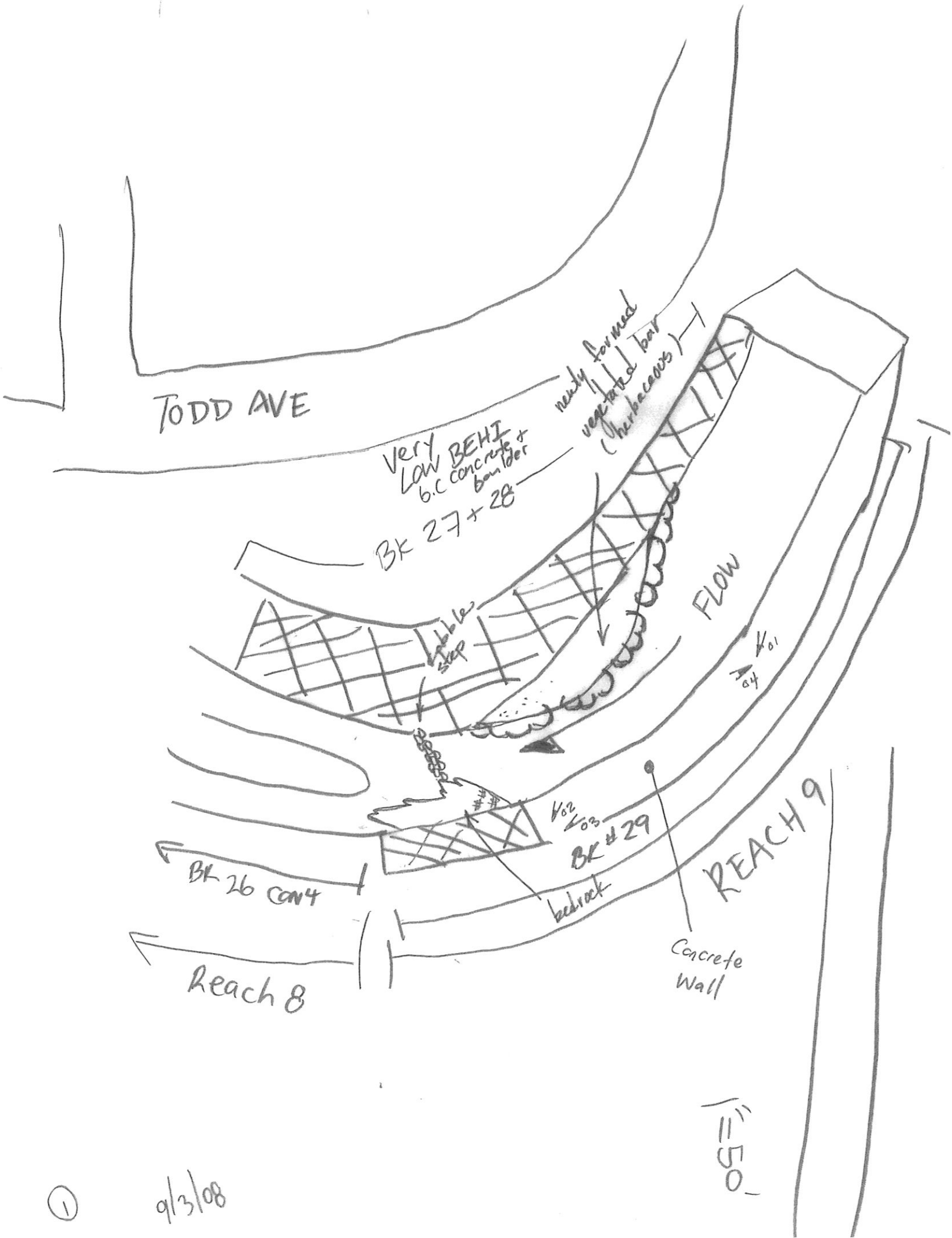
③ 9/3/08



MOORES RUN DRIVE

9/3/08

②


TODD AVE
Very LOW BEHI
b.c concrete + boulder
newly formed vegetated bar (herbaceous)
BK 27 + 28
FLOW
bible step
K01
K04
K02
K03
BK #29
REACH 9
BK 26 CON4
bedrock
Concrete Wall
Reach 8
1" = 50'

① 9/3/08

REACH BEHI PHOTOGRAPHS

Moores Run 2008 Reach BEHI Photographs

Photo 1. Reach 01 BEHI Bank 01.

Photo 2. Reach 01 BEHI Bank 02.

Moores Run 2008 Reach BEHI Photographs

Photo 3. Reach 01 BEHI Bank 03.

Photo 4. Reach 01 BEHI Bank 03a.

Moores Run 2008 Reach BEHI Photographs

Photo 5. Reach 01 BEHI Bank 04.

Photo 6. Reach 02 BEHI Bank 05.

Photo 7. Reach 02 BEHI Bank 06.

Photo 8. Reach 03 BEHI Bank 07.

Photo 9. Reach 03 BEHI Bank 08.

Photo 10. Reach 03 BEHI Bank 09a.

Photo 11. Reach 03 BEHI Bank 09c.

Photo 12. Reach 03 BEHI Bank 09d.

Photo 13. Reach 03 BEHI Bank 09e.

Photo 14. Reach 03 BEHI Bank 09f.

Photo 15. Reach 04 BEHI Bank 10.

Photo 16. Reach 04 BEHI Bank 11.

Photo 17. Reach 04 BEHI Bank 12.

Photo 18. Reach 04 BEHI Bank 13a.

Photo 19. Reach 05 BEHI Bank 13b.

Photo 20. Reach 05 BEHI Bank 14.

Photo 21. Reach 05 BEHI Bank 15.

Photo 22. Reach 05 BEHI Bank 16.

Photo 23. Reach 05 BEHI Bank 17.

Photo 24. Reach 05 BEHI Bank 18.

Photo 25. Reach 05 BEHI Bank 19a.

Photo 26. Reach 05 BEHI Bank 19b.

Photo 27. Reach 05 BEHI Bank 19c.

Photo 28. Reach 05 BEHI Bank 19d.

Photo 29. Reach 05 BEHI Bank 20.

Photo 30. Reach 05 BEHI Bank 22.

Photo 31. Reach 06 BEHI Bank 23a.

Photo 32. Reach 06 BEHI Bank 23c.

Photo 33. Reach 06 BEHI Bank 24.

Photo 34. Reach 07 BEHI Bank 23b.

Photo 35. Reach 07 BEHI Bank 25a.

Photo 36. Reach 07 BEHI Bank 25b.

Photo 37. Reach 08 BEHI Bank 26.

Photo 38. Reach 09 BEHI Banks 27 and 28.

Photo 39. Reach 09 BEHI Bank 29.

APPENDIX D

MOORES RUN – BENCHMARK AND MONUMENT LOCATION

APPENDIX D

2008 MONUMENT LOCATION TABLE

2008 MONUMENT LOCATION MAPS

2008 MONUMENT LOCATION TABLE

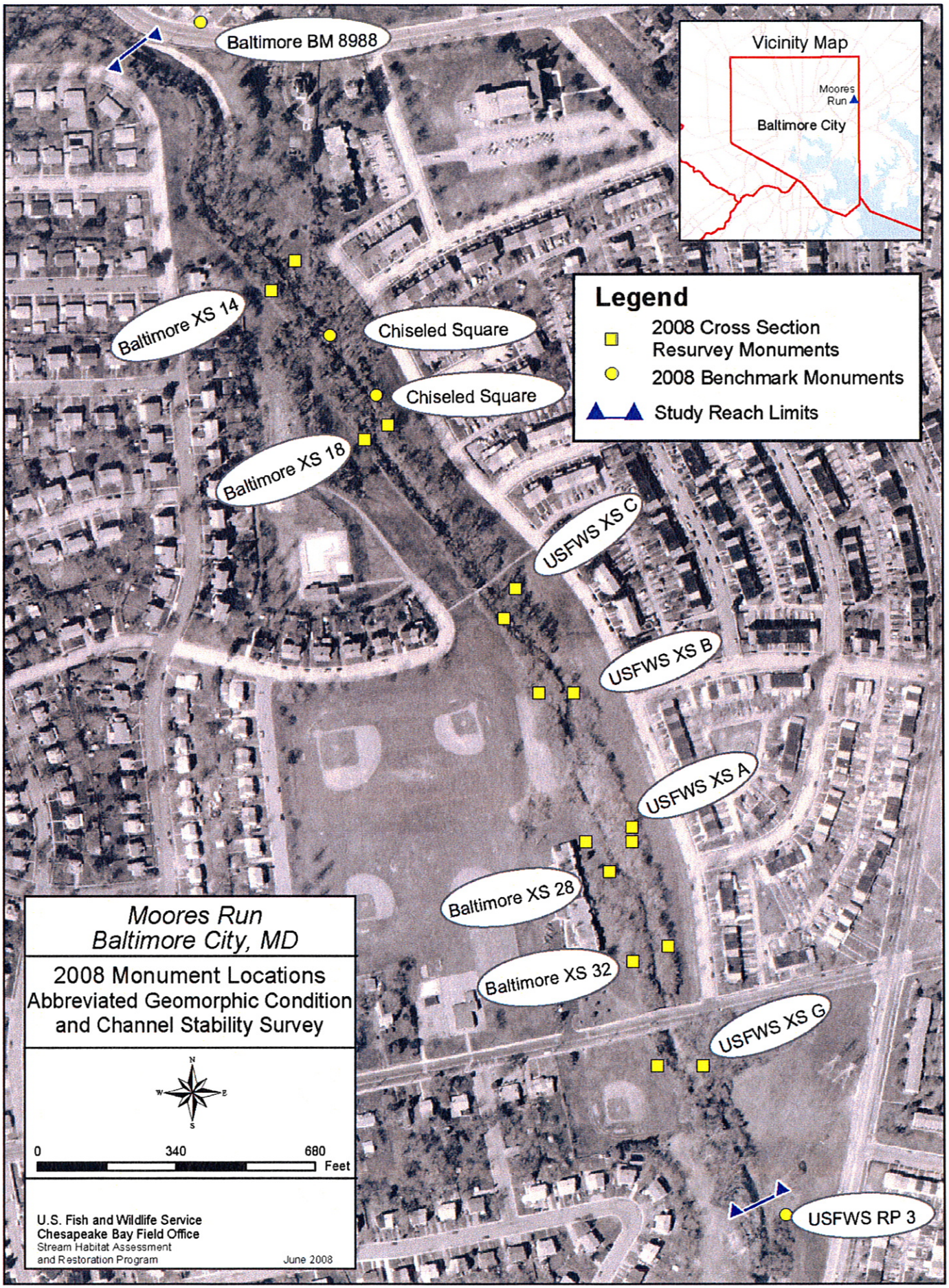
2008 MOORES RUN MONUMENT LOCATIONS

MONUMENT	GLOBAL POSITIONING SYSTEM (GPS) COORDINATE (NAD 83)	ELEVATION (ft) (Baltimore City Datum)
Cross Sections		
Service XS A		
Left	N: 39° 19' 53.5" (+/- 27 ft)	54.19 ft
	W: 76° 32' 06.8" (+/- 27 ft)	
Right	N: 39° 19' 53.0" (+/- 21 ft)	51.89 ft
	W: 76° 32' 08.0" (+/- 21 ft)	
Service XS B		
Left	N: 39° 19' 56.7" (+/- 24 ft)	59.98 ft
	W: 76° 32' 08.4" (+/- 24 ft)	
Right	N: 39° 19' 56.6" (+/- 21 ft)	58.45 ft
	W: 76° 32' 09.5" (+/- 21 ft)	
Service XS C		
Left	N: 39° 19' 59.0" (+/- 24 ft)	64.62 ft
	W: 76° 32' 10.4" (+/- 24 ft)	
Right	N: 39° 19' 58.6" (+/- 18 ft)	63.42 ft
	W: 76° 32' 10.8" (+/- 18 ft)	
Service XS G		
Left	N: 39° 19' 47.8" (+/- 24 ft)	49.40 ft
	W: 76° 32' 04.4" (+/- 24 ft)	
Right	N: 39° 19' 47.7" (+/- 18 ft)	57.15 ft
	W: 76° 32' 06.0" (+/- 18 ft)	
Baltimore City XS 14		
Left	N: 39° 20' 06.9" (+/- 23 ft)	78.65 ft
	W: 76° 32' 17.2" (+/- 23 ft)	
Right	N: 39° 20' 06.5" (+/- 18 ft)	82.85 ft
	W: 76° 32' 17.8" (+/- 18 ft)	
Baltimore City XS 18		
Left	N: 39° 20' 03.1" (+/- 21 ft)	67.49 ft
	W: 76° 32' 14.2" (+/- 21 ft)	
Right	N: 39° 20' 02.7" (+/- 17 ft)	71.60 ft
	W: 76° 32' 14.9" (+/- 17 ft)	
Baltimore City XS 28		
Left	N: 39° 19' 53.1" (+/-19 ft)	53.10 ft
	W: 76° 32' 06.6" (+/- 19 ft)	
Right	N: 39° 19' 52.3" (+/- 19 ft)	52.24 ft
	W: 76° 32' 07.6" (+/- 19 ft)	

2008 MOORES RUN MONUMENT LOCATIONS

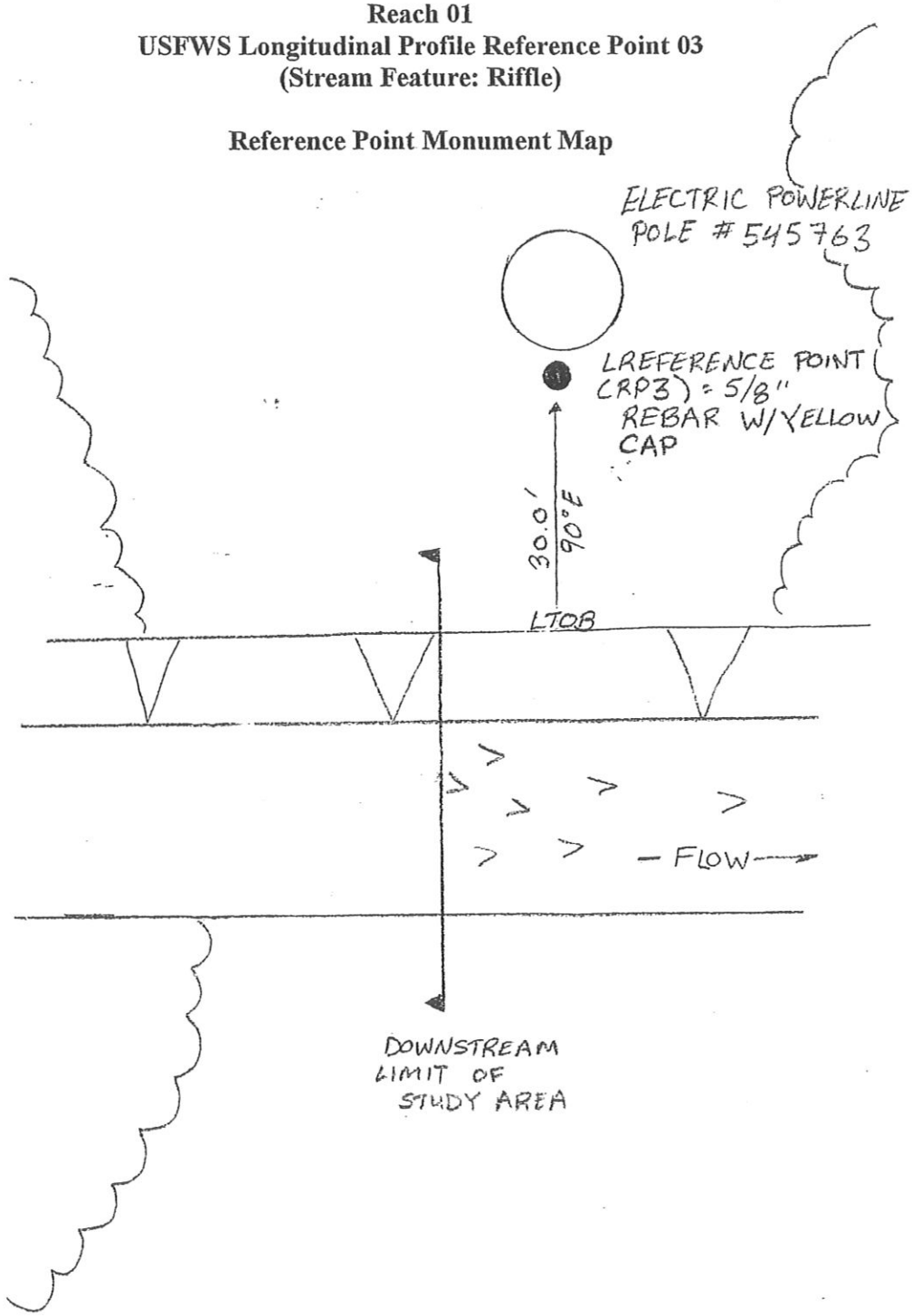
MONUMENT	GLOBAL POSITIONING SYSTEM (GPS) COORDINATE (NAD 83)	ELEVATION (ft) (Baltimore City Datum)
Baltimore City XS 32		
Left	N: 39° 19' 50.4" (+/-22 ft)	49.71 ft
	W: 76° 32' 05.5" (+/- 22 ft)	
Right	N: 39° 19' 50.3" (+/- 23 ft)	50.45 ft
	W: 76° 32' 06.7" (+/- 23 ft)	
Longitudinal Profile		
USFWS Reference Point 3	N: 39° 19 ' 44.2" (+/- 20 ft)	48.80 ft
	W: 76° 32 ' 02.0" (+/- 20 ft)	
Chiseled square on culvert (LB) at station 2257'	N: 39° 20' 03.8" (+/- 22 ft)	67.15 ft
	W: 76° 32' 14.7" (+/- 22 ft)	
Chiseled square on boulder (Near LB – ID as #11) at station 2465'	N: 39° 20' 05.2" (+/- 21 ft)	67.19 ft
	W: 76° 32' 15.9" (+/- 21 ft)	
Baltimore City Benchmark 8988 (Screw at intersection of Newholme and Hamilton Avenue)	N: 39° 20 ' 13.0" (+/- 22 ft)	95.78 ft
	W: 76° 32 ' 20.0" (+/- 22 ft)	

2008 MONUMENT LOCATION MAPS


Baltimore BM 8988
Vicinity Map
Moores Run
Baltimore City
Legend
2008 Cross Section Resurvey Monuments
2008 Benchmark Monuments
Study Reach Limits
Baltimore XS 14
Chiseled Square
Chiseled Square
Baltimore XS 18
USFWS XS C
USFWS XS B
USFWS XS A
Baltimore XS 28
Baltimore XS 32
USFWS XS G
USFWS RP 3
Moores Run
Baltimore City, MD
2008 Monument Locations
Abbreviated Geomorphic Condition
and Channel Stability Survey
N
W
E
S
0
340
680
Feet
U.S. Fish and Wildlife Service
Chesapeake Bay Field Office
Stream Habitat Assessment
and Restoration Program
June 2008

Moores Run
Reach 01
USFWS Longitudinal Profile Reference Point 03
(Stream Feature: Riffle)

Reference Point Monument Map



APPENDIX E

MOORES RUN – STABILITY SUMMARY TABLES

APPENDIX E

2008 STABILITY SUMMARY TABLES

2008 Lateral Stability Summary
2008 Vertical Stability Summary
2008 Enlargement Prediction
2008 Sediment Supply Prediction

PFANKUCH CHANNEL STABILITY ASSESSMENT

MOORES RUN
LATERAL STABILITY - 2008

LATERAL STABILITY SUMMARY 2008

Reach	Rosgen Stream Type	Channel	Width/Depth Ratio State					Dominant BEHI and NBS[2]				Depositional Pattern			Meander Pattern			Confinement							Lateral Stability Rating		Comments
			Study	Reference[1]	Study / Reference	Rating Description	Rating Score	BEHI	Near Bank Shear Stress	Rating Description	Rating Score	Category	Rating Description	Rating Score	Category	Rating Description	Rating Score	Study Beltwidth	Study Bankfull	Study MWR	Reference MWR[4]	Study / Reference	Rating Description	Rating Score	Score	Description	
1	C		23.67	16.39	1.44	Unstable	6	Extreme	Moderate	Highly Unstable	8	B4	Moderately Unstable	4	Straightened	Stable	1	47.31	45.69	1.04	3.50	0.30	Moderately Unstable	2	N/A	Unstable	
2	C		19.29	19.30	1.00	Stable	2	Low	Low	Stable	2	B4	Moderately Unstable	4	Straightened	Stable	1	45.10	46.50	0.97	3.50	0.28	Unstable	3	N/A	Stable	
3	D	Left Channel	9.52	19.30	0.49	Stable	2	Low	Low	Stable	2	B7	Highly Unstable	8	Straightened	Stable	1	44.00	42.30	1.04	3.50	0.30	Moderately Unstable	2	N/A	Stable	Debris jam cutting off upstream limit of left channel
		Right Channel	15.44	19.30	0.80	Stable	2	Moderate	Low	Moderately Unstable	4	B7	Highly Unstable	8	Straightened	Stable	1				3.50				N/A	Unstable	
4	Transitional		N/A	N/A	N/A	N/A	N/A	Low	Low	Stable	2	B4	Moderately Unstable	4	Straightened	Stable	1	N/A	N/A	N/A	3.50	N/A	N/A	N/A	N/A	Stable	For abbreviated survey - did not resurvey cross section in 2008
5	F		23.46	19.30	1.22	Moderately Unstable	4	Moderate	Low	Moderately Unstable	4	B4	Moderately Unstable	4	Straightened	Stable	1	50.00	49.50	1.01	3.50	0.29	Unstable	3	N/A	Moderately Unstable	
6	F		N/A	N/A	N/A	N/A	N/A	High	Moderate	Unstable	6	B4	Moderately Unstable	4	Straightened	Stable	1	N/A	N/A	N/A	3.50	N/A	N/A	N/A	N/A	Moderately Unstable	For abbreviated survey - did not resurvey cross section in 2008
7	B		N/A	N/A	N/A	N/A	N/A	Low	Low	Stable	2	B4	Moderately Unstable	4	Straightened	Stable	1	N/A	N/A	N/A	3.50	N/A	N/A	N/A	N/A	Stable	For abbreviated survey - did not resurvey cross section in 2008
8	D	Left Channel	Similar to Reach 03 - Right Channel			N/A	N/A	Low	Low	Stable	2	B7	Highly Unstable	8	Straightened	Stable	1	Did not have a cross section in this reach		N/A	3.50	N/A	N/A	N/A	N/A	Moderately Unstable	For abbreviated survey - did not resurvey cross section in 2008
		Right Channel				N/A	N/A	Low	Low	Stable	2	B7	Highly Unstable	8	Straightened	Stable	1			N/A	3.50	N/A	N/A	N/A	N/A	Moderately Unstable	
9	Stablization Project		N/A	N/A	N/A	N/A	N/A	Low	Low	Stable	2	B4	Moderately Unstable	4	Straightened	Stable	1	N/A	N/A	N/A	3.50	N/A	N/A	N/A	N/A	Stable	Stabilized stream banks

1. Width/depth reference conditions taken from USFWS Maryland Stream Survey reports (CBFO-S02-01 and CBFO-S03-01).
2. Dominant BEHI and NBS are the representative BEHI and NBS of banks prone to erosion for the study reach.
3. Rosgen does not provide a rating for straightened reaches.

MOORES RUN
VERTICAL STABILITY

VERTICAL STABILITY (AGGRADATION) SUMMARY 2008

Reach	Stream Type	Channel	Sediment Competence[1]	Sediment Capacity (POWERSED)[2]	Width/Depth Ratio State			Successional Stage			Depositional Pattern			Debris/Blockages			Vertical Stability Rating		Comments
					Study / Reference[3]	Rating		Value	Rating		Value	Rating		Value	Rating		Score	Description	
						Description	Score		Description	Score		Description	Score		Description	Score			
1	C		N/A	N/A	1.44	Excess Deposition	6	C	No Deposition	2	B4	Moderate Deposition	4	D2	No Deposition	2	N/A	Moderate Deposition	
2	C				1.00	No Deposition	2	C	No Deposition	2	B4	Moderate Deposition	4	D2	No Deposition	2	N/A	No Deposition	
3	D	Left Channel			0.49	No Deposition	2	D > C	No Deposition	2	B7	Aggradation	8	D3	No Deposition	2	N/A	No Deposition	Debris jam cutting off upstream limit of left channel
		Right Channel			0.80	No Deposition	2	D > C	No Deposition	2	B7	Aggradation	8	D3	No Deposition	2	N/A	No Deposition	
4	Transitional				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	No Deposition	For abbreviated survey - did not resurvey cross section in 2008
5	F				1.22	No Deposition	2	F > Bc	No Deposition	2	B4	Moderate Deposition	4	D2	No Deposition	2	N/A	No Deposition	Changed width/depth description based on professional judgement and existing conditions
6	F				N/A	N/A	N/A	F > Bc	No Deposition	2	B4	Moderate Deposition	4	D2	No Deposition	2	N/A	No Deposition	For abbreviated survey - did not resurvey cross section in 2008
7	B				N/A	N/A	N/A	B	No Deposition	2	B4	Moderate Deposition	4	D2	No Deposition	2	N/A	No Deposition	For abbreviated survey - did not resurvey cross section in 2008
8	D	Left Channel			Similar to Reach 3	No Deposition	2	D > C	No Deposition	2	B7	Aggradation	8	D3	No Deposition	2	N/A	No Deposition	Debris jam cutting off upstream limit of left channel
		Right Channel				No Deposition	2	D > C	No Deposition	2	B7	Aggradation	8	D3	No Deposition	2	N/A	No Deposition	
9	Stablization Project				N/A	N/A	N/A	F > Bc	No Deposition	2	B4	Moderate Deposition	4	D2	No Deposition	2	N/A	No Deposition	Stabilized stream banks

1. No bar sample collected. Bars in upper reaches - large cobble and boulders. Bars in Reach 01 - sand. No critical dimensionless shear stress or entrainment calculations.
2. The Service did not model sediment capacity.
3. Width/depth reference conditions taken from USFWS Maryland Stream Survey reports (CBFO-S02-01 and CBFO-S03-01).

MOORES RUN
VERTICAL STABILITY

VERTICAL STABILITY (DEGRADATION) SUMMARY 2008

Reach	Stream Type	Channel	Sediment Competence[1]	Sediment Capacity (POWERSED)[2]	Lowest Bank Height (ft)	Maximum Bankfull Depth (ft)	Bank Height Ratio			Width / Depth Ratio	Successional Stage			Confinement[4]			Vertical Stability Rating		Comments
							Value	Description	Score		Value	Description	Score	Value	Description	Score	Score	Description	
1	C		N/A	N/A	4.20	3.72	1.13	Slightly Incised	4	23.67	C	Not Incised	2	0.30	Slightly Incised	2	N/A	Slightly Incised	
2	C				5.44	4.29	1.27	Slightly Incised	4	19.29	C	Not Incised	2	0.28	Moderately Incised	3	N/A	Slightly Incised	
3	D	Left Channel			1.14	1.14	1.00	Not Incised	2	9.52	D > C	Not Incised	2	0.30	Slightly Incised	2	N/A	Not Incised	
		Right Channel			5.03	5.03	1.00	Not Incised	2	15.44	D > C	Not Incised	2				N/A	Not Incised	
4	Transitional				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Not Incised	For abbreviated survey - did not resurvey cross section in 2008
5	F				8.32	3.19	2.61	Degradation	8	23.46	F > Bc	Not Incised	2	0.29	Moderately Incised	3	N/A	Not Incised	
6	F				N/A	N/A	N/A	N/A	N/A	N/A	F > Bc	Not Incised	2	N/A	N/A	N/A	N/A	Not Incised	For abbreviated survey - did not resurvey cross section in 2008
7	B				N/A	N/A	N/A	N/A	N/A	N/A	B	Not Incised	2	N/A	N/A	N/A	N/A	Not Incised	For abbreviated survey - did not resurvey cross section in 2008
8	D	Left Channel			Similar to Reach 03 - Right Channel			Not Incised	2	N/A	D > C	Not Incised	2	N/A	N/A	N/A	N/A	Not Incised	
		Right Channel						Not Incised	2		D > C	Not Incised	2	N/A	N/A	N/A	N/A	Not Incised	
9	Stablization Project				N/A	N/A	N/A	N/A	N/A	N/A	F > Bc	Not Incised	2	N/A	N/A	N/A	N/A	Not Incised	Stabilized stream banks

1. No bar sample collected. Bars in upper reaches - large cobble and boulders. Bars in Reach 01 - sand. No critical dimensionless shear stress or entrainment calculations.
2. The Service did not model sediment capacity.
3. Width/depth reference conditions taken from USFWS Maryland Stream Survey reports (CBFO-S02-01 and CBFO-S03-01).
4. Reference MWR is for the Piedmont Region of North Carolina collected by Baker Engineering NY, Inc.

MOORES RUN
ENLARGEMENT PREDICTION

ENLARGEMENT PREDICTION 2008																	
Reach	Stream Type	Channel	Successional Stage			Lateral Stability			Vertical Stability (Aggradation)			Vertical Stability (Degradation)			Potential Enlargement Categories		Comments
			Description	Enlargement Potential		Description	Enlargement Potential		Description	Enlargement Potential		Description	Enlargement Potential				
				Description	Score		Description	Score		Description	Score		Description	Score	Score	Description	
1	C		C	No Increase	2	Unstable	Moderate Increase	6	Moderate Deposition	Slight Increase	4	Slightly Incised	Slight Increase	4	16	Moderate Increase	
2	C		C	No Increase	2	Stable	No Increase	2	No Deposition	No Increase	2	Slightly Incised	Slight Increase	4	10	Slight Increase	
3	D	Left Channel	D > C	No Increase	2	Stable	No Increase	2	No Deposition	No Increase	2	Not Incised	No Increase	2	8	Slight Increase	
		Right Channel	D > C	No Increase	2	Unstable	Moderate Increase	6	No Deposition	No Increase	2	Not Incised	No Increase	2	12	Slight Increase	
4	Transitional		N/A	No Increase	2	Stable	No Increase	2	No Deposition	No Increase	2	Not Incised	No Increase	2	8	Slight Increase	
5	F		F > Bc	No Increase	2	Moderately Unstable	Slight Increase	4	No Deposition	No Increase	2	Not Incised	No Increase	2	10	Slight Increase	
6	F		F > Bc	No Increase	2	Moderately Unstable	Slight Increase	4	No Deposition	No Increase	2	Not Incised	No Increase	2	10	Slight Increase	Vertically stable because of bedrock
7	B		B	No Increase	2	Stable	No Increase	2	No Deposition	No Increase	2	Not Incised	No Increase	2	8	Slight Increase	
8	D	Left Channel	D > C	No Increase	2	Moderately Unstable	Slight Increase	4	No Deposition	No Increase	2	Not Incised	No Increase	2	10	Slight Increase	
		Right Channel	D > C	No Increase	2	Moderately Unstable	Slight Increase	4	No Deposition	No Increase	2	Not Incised	No Increase	2	10	Slight Increase	
9	Stablization Project		F > Bc	No Increase	2	Stable	No Increase	2	No Deposition	No Increase	2	Not Incised	No Increase	2	8	Slight Increase	Stabilized stream banks

MOORES RUN
SEDIMENT SUMMARY

PREDICTIVE SEDIMENT SUPPLY SUMMARY 2008																
Reach	Rosgen Stream Type	Channel	Lateral Stability		Vert. Stability (Aggradation)		Vert. Stability (Degradation)		Channel Enlargement		Pfankuch Channel Stability			Total Sediment Supply		Comments
											Value	Rating				
			Description	Score	Description	Score	Description	Score	Description	Score		Description	Score	Total Score	Description	
1	C		Unstable	3	Moderate Deposition	2	Slightly Incised	2	Moderate Increase	3	Good	Stable	1	9	High	
2	C		Stable	1	No Deposition	1	Slightly Incised	2	Slight Increase	2	Good	Stable	1	6	Moderate	
3	D	Left Channel	Stable	1	No Deposition	1	Not Incised	1	Slight Increase	2	Good	Stable	1	5	Low	
		Right Channel	Unstable	3	No Deposition	1	Not Incised	1	Slight Increase	2	Good	Stable	1	7	Moderate	
4	Transitional		Stable	1	No Deposition	1	Not Incised	1	Slight Increase	2	Good	Stable	1	5	Low	For abbreviated survey - did not resurvey cross section in 2008
5	F		Moderately Unstable	2	No Deposition	1	Not Incised	1	Slight Increase	2	Good	Stable	1	6	Moderate	
6	F		Moderately Unstable	2	No Deposition	1	Not Incised	1	Slight Increase	2	Fair	Moderately Unstable	2	7	Moderate	For abbreviated survey - did not resurvey cross section in 2008
7	B		Stable	1	No Deposition	1	Not Incised	1	Slight Increase	2	Fair	Moderately Unstable	2	6	Moderate	For abbreviated survey - did not resurvey cross section in 2008
8	D	Left Channel	Moderately Unstable	2	No Deposition	1	Not Incised	1	Slight Increase	2	Fair	Moderately Unstable	2	7	Moderate	
		Right Channel	Moderately Unstable	2	No Deposition	1	Not Incised	1	Slight Increase	2	Fair	Moderately Unstable	2	7	Moderate	
9	Stablization Project		Stable	1	No Deposition	1	Not Incised	1	Slight Increase	2	Good	Stable	1	5	Low	Stabilized stream banks

PFANKUCH CHANNEL STABILITY ASSESSMENT

MOORES RUN - REACH 01

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	MAS	Ex. Stream Type:	C	Ref. Stream Type:	C4
Reach:	1	Comments:		Grand Total:	81.00		
Location:	Baltimore City, MD			Stability Rating:	Good		
Date:	9/10/2008			Notes:			

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4	4	Bank slope gradient 40-60%.	6		Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3		Infrequent. Mostly healed over. Low future potential.	6	6	Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	3	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6	4	50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9		< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1	1	Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2		40-65%. Mostly boulders and small cobbles 6-12".	4		20-40% with most in the 3-6" diameter class.	6	5	< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	4	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4		Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6		Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12	10	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4		Some new bar increase, mostly from coarse gravel.	8	9	Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1		Rounded corners and edges, surfaces smooth, flat.	2	2	Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2	2	Mixture dull and bright, *ie*. 35-65% mixture range.	3		Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4		Mostly loose assortment with no apparent overlap.	6	6	No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	9	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	14	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
				Excellent Total	1		Good Total	59		Fair Total	21		Poor Total	0

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

MOORES RUN - REACH 02

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	MAS	Ex. Stream Type:	C	Ref. Stream Type:	C3
Reach:	2	Comments:		Grand Total:	57.00		
Location:	Baltimore City, MD			Stability Rating:	Good		
Date:	9/10/2008			Notes:			

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2	2	Bank slope gradient 30-40%.	4		Bank slope gradient 40-60%.	6		Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3	2	Infrequent. Mostly healed over. Low future potential.	6		Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	3	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3	4	70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9		< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1	1	Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2		40-65%. Mostly boulders and small cobbles 6-12".	4	4	20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	3	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4	4	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6		Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4	4	Some new bar increase, mostly from coarse gravel.	8		Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1	1	Rounded corners and edges, surfaces smooth, flat.	2		Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2		Mixture dull and bright, *ie*. 35-65% mixture range.	3	3	Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4	4	Mostly loose assortment with no apparent overlap.	6		No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	8	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	12	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
					Excellent Total			Good Total			Fair Total			Poor Total
					18			36			3			0

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

MOORES RUN - REACH 03

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	MAS	Ex. Stream Type:	D	Ref. Stream Type:	C3
Reach:	3	Comments:	Braided on left side	Grand Total:	80.00		
Location:	Baltimore City, MD			Stability Rating:	Good		
Date:	9/10/2008			Notes:			

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4	5	Bank slope gradient 40-60%.	6		Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3		Infrequent. Mostly healed over. Low future potential.	6	7	Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	5	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9	10	< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1		Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3	3	Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2		40-65%. Mostly boulders and small cobbles 6-12".	4	4	20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	3	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4		Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6		Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12	9	Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4	4	Some new bar increase, mostly from coarse gravel.	8		Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1	1	Rounded corners and edges, surfaces smooth, flat.	2		Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2	2	Mixture dull and bright, *ie*. 35-65% mixture range.	3		Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4		Mostly loose assortment with no apparent overlap.	6	5	No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	8	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	12	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
					Excellent Total	5		Good Total	48		Fair Total	27		Poor Total	0

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

MOORES RUN - REACH 04

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	SD	Ex. Stream Type:	C	Ref. Stream Type:	C4
Reach:	4	Comments:		Grand Total:	88.00		
Location:	Baltimore City, MD			Stability Rating:	Good		
Date:	9/10/2008			Notes:			

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4	4	Bank slope gradient 40-60%.	6		Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3		Infrequent. Mostly healed over. Low future potential.	6		Frequent or large, causing sediment nearly year long.	9	7	Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	3	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9	9	< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1		Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2	2	Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2		40-65%. Mostly boulders and small cobbles 6-12".	4		20-40% with most in the 3-6" diameter class.	6	6	< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	4	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4		Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6	8	Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4	4	Some new bar increase, mostly from coarse gravel.	8		Moderate deposition of new gravel and coarse sand on old and some new bars.	12	10	Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1		Rounded corners and edges, surfaces smooth, flat.	2	2	Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1	1	Mostly dull, but may have < 35% bright surfaces.	2		Mixture dull and bright, *ie*. 35-65% mixture range.	3		Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4		Mostly loose assortment with no apparent overlap.	6	5	No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8		Moderate change in sizes. Stable materials 20-50%.	12	10	Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	11	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
				Excellent Total	5		Good Total	36		Fair Total	47		Poor Total	0

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

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MOORES RUN - REACH 05

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	CE	Ex. Stream Type:	F	Ref. Stream Type:	C3
Reach:	5	Comments:		Grand Total:	80.00		
Location:	Baltimore City, MD			Stability Rating:	Good		
Date:	9/3/2008			Notes:			

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4		Bank slope gradient 40-60%.	6	6	Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3		Infrequent. Mostly healed over. Low future potential.	6		Frequent or large, causing sediment nearly year long.	9	9	Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2	3	Present, but mostly small twigs and limbs.	4		Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6	6	50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9		< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1		Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	4
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2		40-65%. Mostly boulders and small cobbles 6-12".	4	5	20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	4	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4		Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6	8	Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4		Some new bar increase, mostly from coarse gravel.	8	10	Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1	1	Rounded corners and edges, surfaces smooth, flat.	2	2	Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2		Mixture dull and bright, *ie*. 35-65% mixture range.	3	3	Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4	5	Mostly loose assortment with no apparent overlap.	6		No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4	5	Distribution shift light. Stable material 50-80%.	8		Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6	6	5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12		30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2		Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3	3	Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
				Excellent Total	15		Good Total	40		Fair Total	21		Poor Total	4

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

MOORES RUN - REACH 06

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	CE	Ex. Stream Type:	F	Ref. Stream Type:	C3
Reach:	6	Comments:		Grand Total:	88.00		
Location:	Baltimore City, MD			Stability Rating:	Fair		
Date:	9/3/2008			Notes:			

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4		Bank slope gradient 40-60%.	6	7	Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3		Infrequent. Mostly healed over. Low future potential.	6	7	Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	4	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9	9	< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1		Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	4
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2		40-65%. Mostly boulders and small cobbles 6-12".	4	4	20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	4	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4		Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6	10	Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4	4	Some new bar increase, mostly from coarse gravel.	8		Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1		Rounded corners and edges, surfaces smooth, flat.	2	2	Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2		Mixture dull and bright, *ie*. 35-65% mixture range.	3	3	Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4	5	Mostly loose assortment with no apparent overlap.	6		No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	8	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	15	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
					Excellent Total			Good Total			Fair Total			Poor Total
					4			61			19			4

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

MOORES RUN - REACH 07

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	CE	Ex. Stream Type:	B	Ref. Stream Type:	B3
Reach:	7	Comments:		Grand Total:	71.00		
Location:	Baltimore City, MD			Stability Rating:	Fair		
Date:	9/3/2008			Notes:			

Location	Key	Category	Excellent Description	Excellent Rating	Excellent Score	Good Description	Good Rating	Good Score	Fair Description	Fair Rating	Fair Score	Poor Description	Poor Rating	Poor Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4		Bank slope gradient 40-60%.	6	6	Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3		Infrequent. Mostly healed over. Low future potential.	6	6	Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	4	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9	9	< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1	1	Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2	3	40-65%. Mostly boulders and small cobbles 6-12".	4		20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	4	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4	4	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6		Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4	4	Some new bar increase, mostly from coarse gravel.	8		Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1	1	Rounded corners and edges, surfaces smooth, flat.	2		Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2		Mixture dull and bright, *ie*. 35-65% mixture range.	3	3	Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4	4	Mostly loose assortment with no apparent overlap.	6		No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	8	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	12	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
				Excellent Total	13		Good Total	40		Fair Total	18		Poor Total	0

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

MOORES RUN - REACH 08

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	CE	Ex. Stream Type:	D	Ref. Stream Type:	B3
Reach:	8	Comments:	Right bank is concrete	Grand Total:	66.00		
Location:	Baltimore City, MD			Stability Rating:	Fair		
Date:	9/3/2008			Notes:			

Location	Key	Category	Excellent Description	Excellent Rating	Excellent Score	Good Description	Good Rating	Good Score	Fair Description	Fair Rating	Fair Score	Poor Description	Poor Rating	Poor Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2		Bank slope gradient 30-40%.	4		Bank slope gradient 40-60%.	6	6	Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3	3	Infrequent. Mostly healed over. Low future potential.	6		Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2		Present, but mostly small twigs and limbs.	4	4	Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9	9	< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1		Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	4
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2	2	40-65%. Mostly boulders and small cobbles 6-12".	4		20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2		Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4	3	Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment traps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4	4	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6		Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4	4	Some new bar increase, mostly from coarse gravel.	8		Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1	1	Rounded corners and edges, surfaces smooth, flat.	2		Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2	2	Mixture dull and bright, *ie*. 35-65% mixture range.	3		Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4	4	Mostly loose assortment with no apparent overlap.	6		No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	8	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	10	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
				Excellent Total	14		Good Total	33		Fair Total	15		Poor Total	4

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+

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MOORES RUN - REACH 09

MODIFIED PFANKUCH STREAM REACH INVENTORY AND CHANNEL STABILITY EVALUATION

Stream:	Moores Run	Observer(s):	CE	Ex. Stream Type:	F	Ref. Stream Type:	B3
Reach:	9	Comments:	Reach is hardened by concrete and boulders	Grand Total:	63.00		
Location:	Baltimore City, MD			Stability Rating:	Good		
Date:	9/3/2008			Notes:	Original rating of fair changed to good because of bank stabilization.		

Location	Key	Category	Excellent			Good			Fair			Poor		
			Description	Rating	Score	Description	Rating	Score	Description	Rating	Score	Description	Rating	Score
Upper Banks	1	Landform Slope	Bank slope gradient < 30%.	2	2	Bank slope gradient 30-40%.	4		Bank slope gradient 40-60%.	6		Bank slope gradient > 60%.	8	
	2	Mass Wasting	No evidence of past or furture mass wasting.	3	0	Infrequent. Mostly healed over. Low future potential.	6		Frequent or large, causing sediment nearly year long.	9		Frequent or large, causing sediment nearly year long OR imminent danger of same.	12	
	3	Debris Jam Potential	Essentially absent from immediate channel area.	2	1	Present, but mostly small twigs and limbs.	4		Moderate to heavy amounts, mostly larger sizes.	6		Moderate to heavy amounts, predominantly larger sizes.	8	
	4	Vegetative Bank Protection	> 90% plant density. Vigor and variety suggest a deep, dense soil binding root mass.	3		70-90% density. Fewer species or less vigor suggest less dense or deep root mass.	6		50-70% density. Lower vigor and fewer species from shallow, discontinuous root mass.	9		< 50% density plus fewer species and less vigor indicating poor, discontinuous, and shallow root mass.	12	12
Lower Banks	5	Channel Capacity	Ratio of w/d ratio to reference w/d ratio between 1.0-1.2.	1		Ratio of w/d ratio to reference w/d ratio between 1.2-1.4.	2		Ratio of w/d ratio to reference w/d ratio between 1.4-1.6.	3		Ratio of w/d ratio to reference w/d ratio between 1.6-1.8.	4	4
			For incising channels, ratio of w/d ratio to reference w/d ratio between 0.8-1.0.	1		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.6-0.8.	2		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.4-0.6.	3		**For incising channels**, ratio of w/d ratio to reference w/d ratio between 0.2-0.4.	4	
	6	Bank Rock Content	> 65% with large angular boulders. > 12" common.	2	1	40-65%. Mostly boulders and small cobbles 6-12".	4		20-40% with most in the 3-6" diameter class.	6		< 20% rock fragments of gravel sizes, 1-3" or less.	8	
	7	Obstructions to Flow	Rocks and logs firmly imbedded. Flow pattern without cutting or deposition. Stable bed.	2	2	Some present causing erosive cross currents and minor pool filling. Obstructions fewer and less firm.	4		Moderately frequent, unstable obstructions move with high flows causing bank cutting and pool filling.	6		Frequent obstruction and deflectors cause bank erosion year long. Sediment reaps full, channel migration occurring.	9	
	8	Cutting	Little or none. Infrequent raw banks < 6".	4	0	Some, intermittently at outcurves and constrictions. Raw banks may be up to 12".	6		Significant. Cuts 12-24" high. Root mat overhangs and sloughing evident.	12		Almost continuous cuts, some over 24" high. Failure of overhangs frequent.	16	
	9	Deposition	Little or no enlargement of channel or point bars.	4		Some new bar increase, mostly from coarse gravel.	8	8	Moderate deposition of new gravel and coarse sand on old and some new bars.	12		Extensive deposit of predominantly fine particles. Accelerated bar development.	16	
Channel Bottom	10	Rock Angularity	Sharp edges and corners. Plane surfaces rough.	1		Rounded corners and edges, surfaces smooth, flat.	2	2	Corners and edges well rounded in 2 dimensions.	3		Well rounded in all dimensions, surfaces smooth.	4	
	11	Brightness	Surfaces dull, dark or stained. Generally not bright.	1		Mostly dull, but may have < 35% bright surfaces.	2		Mixture dull and bright, *ie*. 35-65% mixture range.	3	3	Predominantly bright, > 65% exposed or scoured surfaces.	4	
	12	Cosolidation of Particles	Assorted sizes tightly packed or overlapping.	2		Moderately packed with some overlapping.	4	4	Mostly loose assortment with no apparent overlap.	6		No packing evident. Loose assortment easily moved.	8	
	13	Bottom Size Distribution	No size change evident. Stable material 80-100%.	4		Distribution shift light. Stable material 50-80%.	8	10	Moderate change in sizes. Stable materials 20-50%.	12		Marked distribution change. Stable materials 0-20%. Sand deposition.	16	
	14	Scouring and Deposition	< 5% of bottom affected by scour or deposition.	6		5-30% affected. Scour at constrictions and where grades steepen. Some deposition in pools.	12	12	30-50% affected. Deposits and scour at obstructions, constriction and bends. Some filling of pools.	18		> 50% of the bottom in a state of flux or change nearly year long.	24	
	15	Aquatic Vegetation	Abundant growth moss-like, dark green perennial. In swift water, too.	1		Common. Algae forms in low velocity and pool areas. Moss here, too.	2	2	Present but spotty, mostly in backwater. Seasonal algae growth makes rocks slick.	3		Perennial types scarce or absent. Yellow-green, short term bloom may be present.	4	
				Excellent Total	6		Good Total	38		Fair Total	3		Poor Total	16

Stream Type	A1	A2	A3	A4	A5	A6	B1	B2	B3	B4	B5	B6	C1	C2	C3	C4	C5	C6	D3	D4	D5
Good (Stable)	38-43	38-43	54-90	60-95	60-95	50-80	38-45	38-45	40-60	40-64	48-68	40-60	38-50	38-50	60-85	70-90	70-90	60-85	85-107	85-107	85-107
Fair (Moderately Unstable)	44-47	44-47	91-129	96-132	96-142	81-110	46-58	46-58	61-78	65-84	69-88	61-78	51-61	51-61	86-105	91-110	91-110	86-105	108-132	108-132	108-132
Poor (Unstable)	48+	48+	130+	133+	143+	111+	59+	59+	79+	85+	89+	79+	62+	62+	106+	111+	111+	106+	133+	133+	133+
Stream Type	D6	DA3	DA4	DA5	DA6	E3	E4	E5	E6	F1	F2	F3	F4	F5	F6	G1	G2	G3	G4	G5	G6
Good (Stable)	67-98	40-63	40-63	40-63	40-63	40-63	50-75	50-75	40-63	60-85	60-85	85-110	85-110	90-115	80-95	40-60	40-60	85-107	85-107	90-112	85-107
Fair (Moderately Unstable)	99-125	64-86	64-86	64-86	64-86	64-86	76-96	76-96	64-86	86-105	86-105	111-125	111-125	116-130	96-110	61-78	61-78	108-120	108-120	113-126	108-120
Poor (Unstable)	126+	87+	87+	87+	87+	87+	97+	97+	87+	106+	106+	126+	126+	111+	111+	79+	79+	121+	121+	126+	121+