East Tarboro Canal Stream Restoration Project
Edgecombe County
North Carolina

CU: 03020103
SCO# 030603101
EEP Project No. 123

Year 2 Monitoring Report
November 15, 2009

Prepared for:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Parker Lincoln Building
2728 Capital Boulevard, Suite 1H-103
Raleigh, NC 27606

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Prepared by:

Rummel, Klepper & Kahl, LLP
900 Ridgefield Drive
Suite 350
Raleigh, NC 27609

2.0 Table of Contents

3.0 EXECUTIVE SUMMARY/PROJECT ABSTRACT

Project goals and objectives for the East Tarboro Canal stream restoration project included:

The project had the following objectives:

- Enhance over 1,800 linear feet of stream on East Tarboro Canal along Reach 1 and restore approximately 2,900 linear feet of East Tarboro Canal along Reach 2.
- Create a limited floodplain for East Tarboro Canal below its natural floodplain to allow access during flood events (Reach 1).
- Construct a new floodplain at a lower elevation (Reach 2).

While project goals included:

- Provide a stable stream channel that neither aggrades nor degrades while maintaining its dimension, pattern, and profile with the capacity to transport its watershed's water and sediment load.
- Improve water quality and reduce erosion.
- Improve aquatic habitat with the use of natural material stabilization structures such as root wads, rock vanes, woody debris, and a riparian buffer.
- Provide a native stream buffer that will increase bank stability, improve wildlife habitat, and eliminate or reduce exotic invasive plant infestations and increase the aesthetic value by transforming the unvegetated ditch into a function stream buffer.

Thirteen (13) permanent vegetation plots were established and used in annual vegetation monitoring. Overall, the site is exceeding the minimum success requirements. As per the mitigation plan, the vegetative success criteria are based on the US Army Corps of Engineers Stream Mitigation Guidelines (USACE, 2003). The final vegetative success criteria will be the survival of 260 5-year old planted woody stems per acre at the end of the year 5 monitoring period. Monitoring for 2009 revealed that vegetation plots VP1, VP4, VP9 and VP13 fall below the minimum success requirements. VP1 has been mowed and other areas within the conservation easement along Reach 2 have been mowed also (Vegetation problem areas are shown on the Integrated Plan View map in Appendix D). Vegetation plots VP2, VP3, VP5, VP6, VP7, VP8, VP10, VP11, and VP12 meet or exceed minimum success requirements. Vegetation plot locations are identified in Appendix C.

Overall the East Tarboro Canal Stream Restoration Site is performing adequately. Channel dimension and pattern are similar to as-built conditions with the exception of the structure failure at station 21+50 and sediment erosion, both identified on Figure 2. Upon review of channel longitudinal profile, cross sections, and designed dimensions, both Reach 1 and Reach 2 channel profiles appear to be holding grade and maintaining bedform features. Stream reaches at East Tarboro Canal are stable and are showing few signs of instability. Reach 2 has a structure that is in need of immediate attention. Photos and location of these areas are shown in Figure 2.

Wetland restoration or enhancement was not a part of the East Tarboro Canal Stream Restoration Site. Therefore, no wetland monitoring is required.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

4.0 METHODOLOGY

Vegetative sample plots were quantitatively monitored during the first growing season. One (1) 100m^2 plot was established for Reach 1 and twelve (12) 100m^2 plots were established for Reach 2 for a total of thirteen (13) plots. Species composition, density, vigor and survival were monitored. Each plot corner is permanently located with rebar. Year 2 vegetation monitoring was completed in October 2009 utilizing the Carolina Vegetation Survey (CVS) – EEP protocol Level 1 (version 4.1). Baseline data provided was not completed utilizing the CVS-EEP protocol, therefore some data will be skewed.

Stream monitoring was completed by utilizing total station survey along with Rosgen Level II techniques to determine stream stability and performance. The annual cross-sectional survey included points surveyed at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg, if the features were present. Longitudinal profile survey was conducted for the entire length of the restored channel for both Reach 1 and Reach 2. Measurements included thalweg, water surface, and bankfull. All surveys were complete using existing onsite benchmarks.

Photo monitoring was conducted by walking each stream reach and taking photos at each predetermined photo point location using a digital camera.

5.0 References

USACOE (2003). *Stream Mitigation Guidelines*. USACOE, USEPA, NCWRC, NCDENR-DWQ.

USACOE (1987). *Corps of Engineers Wetlands Delineation Manual*. Tech report Y-87-1. AD/A176.

Rosgen, D.L. (1996) *Applied River Morphology*. Wildland Hydrology books, Pagosa Springs, CO.

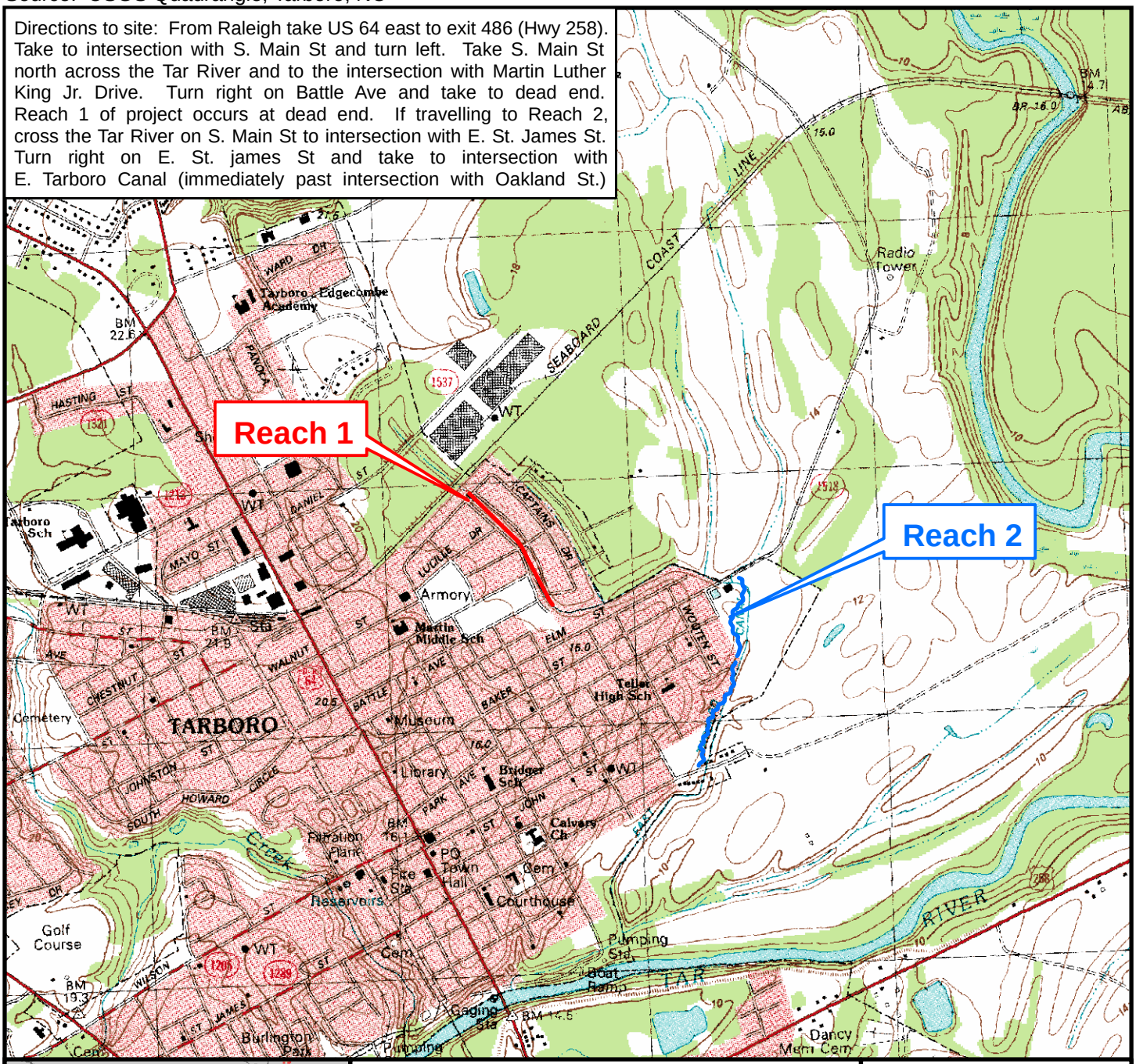
Lee, M.T., R.K. Peet, S.D. Roberts, T.R. Wentworth. (2006). CVS-EEP Protocol for Recording Vegetation Version 4.0

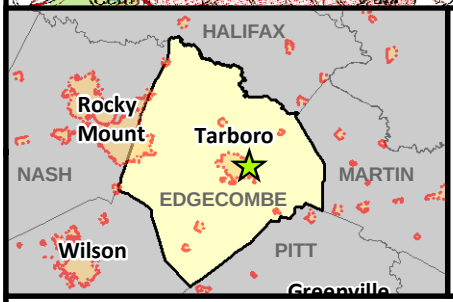
6.0 Project Condition and Monitoring Data Appendices

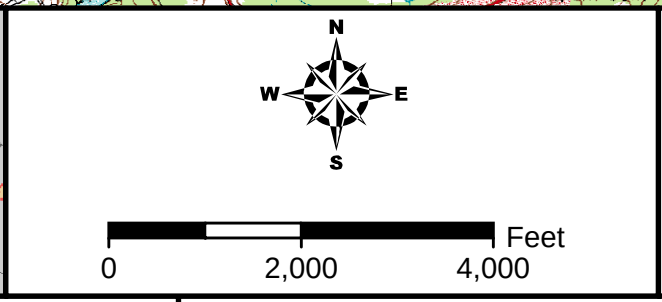
APPENDIX A

Source: USGS Quadrangle, Tarboro, NC

Directions to site: From Raleigh take US 64 east to exit 486 (Hwy 258). Take to intersection with S. Main St and turn left. Take S. Main St north across the Tar River and to the intersection with Martin Luther King Jr. Drive. Turn right on Battle Ave and take to dead end. Reach 1 of project occurs at dead end. If travelling to Reach 2, cross the Tar River on S. Main St to intersection with E. St. James St. Turn right on E. St. james St and take to intersection with E. Tarboro Canal (immediately past intersection with Oakland St.)







Ecosystem Enhancement Program

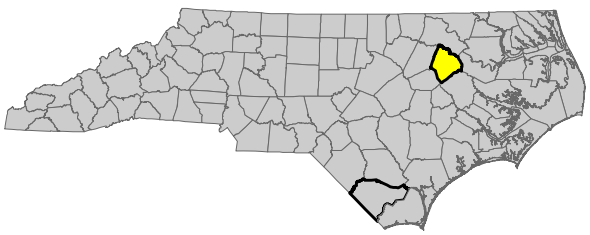


FIGURE 1
Site Location Map
East Tarboro Canal Stream Restoration Project
EEP No. 123
Edgecombe County, North Carolina
November 2009

FIGURE 2a

Current Conditions Plan View
Reach 1

East Tarboro Canal
Stream Restoration Project
EEP No. 123
Edgecombe County, North Carolina

Legend

- Stream Thalweg
- Cross Section

Vegetation Monitoring Counts

- Less Than 320 Stems per Acre
- More Than 320 Stems per Acre

N E S W

0 200 400 Feet

Ecosystem Enhancement PROGRAM

November 2009

FIGURE 2b

Current Conditions Plan View
Reach 2

East Tarboro Canal
Stream Restoration Project
EEP No. 123
Edgecombe County, North Carolina

Legend

Stream Thalweg

Cross Section

Vegetation Monitoring Counts

Less Than 320 Stems per Acre

More Than 320 Stems per Acre

0 200 400 Feet

Ecosystem Enhancement PROGRAM

November 2009

APPENDIX B

Table 1. Project Restoration Components East Tarboro Canal Stream Mitigation Site EEP Project No: 123					
Project Segment/Reach ID	Mitigation Type	Approach	Linear Footage	Stationing	Comment
Reach 1	Enhancement 1	N/A	1,869	10+00 to 28+69	Instream structures and vegetated buffers
Reach 2	Restoration	Priority 2	2,933	10+00 to 39+33	Instream structures and vegetated Buffers

Table 2. Project Activity and Reporting History East Tarboro Canal Stream Restoration - EEP Project No. 123		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan	NA	January 2005
Final Design - 90%	NA	May 2005
Construction	Jan 2007	February 2007
Temporary S&E mix applied to entire project area	Jan 2007	Jan 2007
Permanent seed mix applied to entire project area	Jan 2007	Jan 2007
Containerized and B&B plantings	Jan 2007	Jan 2007
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	April 2007	June 2007
Year 1 Monitoring	Nov 2008	Jan 2009
Year 2 Monitoring	Oct 2009	Nov 2009
Year 3 Monitoring	NA	NA
Year 4 Monitoring	NA	NA
Year 5 Monitoring	NA	NA

Table 3. Project Contacts Table East Tarboro Canal Stream Restoration - EEP Project No. 123	
Designer Primary project design POC	Earth Tech 701 Corporate Center Drive Suite 475 Raleigh, NC 27607
Construction Contractor Construction contractor POC	Shamrock Environmental Corporation P.O. Box 14987 Greensboro, NC 27415 Mike Granson (336)-375-1989
Planting Contractor Planting Contractor POC	Shamrock Environmental Corporation P.O. Box 14987 Greensboro, NC 27415 Mike Granson (336)-375-1989
Seeding Contractor Seeding Contractor POC	Shamrock Environmental Corporation P.O. Box 14987 Greensboro, NC 27415 Mike Granson (336)-375-1989
Seed Mix Sources	contact Shamrock Environmental Corporation
   Nursery Stock Suppliers	Mellow Marsh Farm 1312 Woody Store Road Siler City, NC 27344 (919) 742-1200
Monitoring Performers (MY1 and MY2)	Rummel, Klepper, and Kahl, LLP 900 Ridgefield Drive Suite 250 Raleigh, NC 27609
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	Pete Stafford (919)878-9560 Pete Stafford (919)878-9560 NA

Table 4. Project Attribute Table East Tarboro Canal Restoration Site - EEP Project No. 123	
Project County	Edgecombe
Drainage Area	2.78 sq mi
Drainage impervious cover estimate (%)	10 percent
Stream Order	1st/2nd
Physiographic Region	Coastal Plain
Ecoregion	Southeastern Floodplains and Low Terraces
Rosgen Classification of As-built	Reach 1 –NA, Reach 2 – C5
Cowardin Classification	Riverine
Dominant soil types	Grantham-Urban land complex
	Portsmouth fine sandy loam
	Roanoke Loam
Reference site ID	UT to Mill Creek
USGS HUC for Project	03020103
USGS HUC for Reference	Unnamed tributary to Mill Creek (03020201)
NCDWQ Subbasin for Project	030303
NCDWQ Subbasin for Reference	Unnamed tributary to Mill Creek (030404)
NCDWQ Classification for Project	East Tarboro Canal (C, NSW)
NCDWQ Classification for Reference	Unnamed tributary to Mill Creek (C, NSW)
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
Percent of project easement fenced	0%

APPENDIX C

Appendix C – Vegetation Data Assessment

Table 5. Vegetation Plot Mitigation Success Summary Table			
Tract	**Vegetation Plot ID**	**Vegetation Survival Threshold Met?**	**Tract Mean**
Reach 1	VP1	N	0%
Reach 2	VP2	Y	75%
Reach 2	VP3	Y	
Reach 2	VP4	N	
Reach 2	VP5	Y	
Reach 2	VP6	Y	
Reach 2	VP7	Y	
Reach 2	VP8	Y	
Reach 2	VP9	N	
Reach 2	VP10	Y	
Reach 2	VP11	Y	
Reach 2	VP12	Y	
Reach 2	VP13	N	

Appendix C- Vegetation Plot Photos (all photos recorded on October 28, 2009)

Vegetation Plot 1

Vegetation Plot 2

Photos recorded on October 28, 2009

Vegetation Plot 3, November 10, 2008 (2009 Digital Photo Damaged)

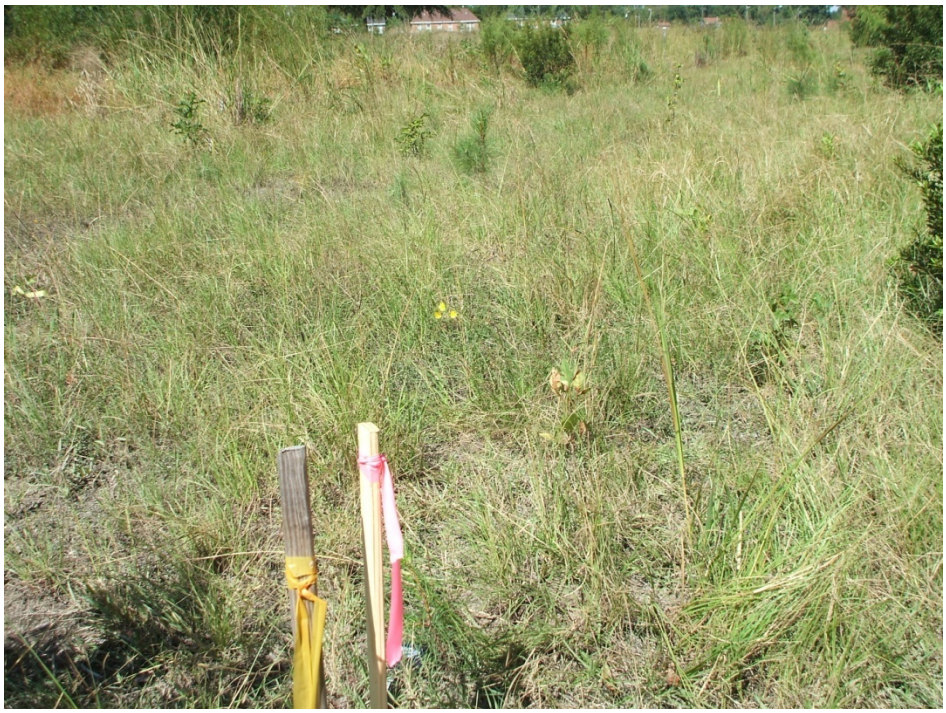
Vegetation Plot 4

Photos recorded on October 28, 2009

Vegetation Plot 5

Vegetation Plot 6

Photos recorded on October 28, 2009



Vegetation Plot 7

Vegetation Plot 8

Photos recorded on October 28, 2009

Vegetation Plot 9

Vegetation Plot 10

Photos recorded on October 28, 2009

Vegetation Plot 11

Vegetation Plot 12

Photos recorded on October 28, 2009

Vegetation Plot 13

Photos recorded on October 28, 2009

Appendix C - Vegetation Metadata

Table 6. Vegetation Metadata Table East Tarboro Canal Mitigation Site EEP No: 123	
Report Prepared By	William (Pete) Stafford
Date Prepared	11/06/2009 9:49 am
Database Name	EastTarboroCanal.mdb
Database Location	C:\Documents and Settings\pstafford\Desktop\CVS Veg Data
Computer Name	STAFFORDP
Description Worksheets In This Document	
Metadata	This worksheet, which is a summary of the project data.
Planted	Each project is listed with its PLANTED stems, for each year. This excludes live stakes and lists stems per acre.
Total Stems	Each Project is listed with its total stems for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. Listed in stems per acre.
Plots	List of Plots surveyed
Vigor	Frequency distribution of vigor classes
Vigor by Species	Frequency distribution of vigor classes listed by species
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each
Damage by Species	Damage values tallied by type for each species
Damage by Plot	Damage values tallied by type for each plot
Planted Stems by Plot	Count of planted living stems of each species for each plot; dead and missing stems are excluded
Project Summary	
EEP Project Number	123
Project Name	East Tarboro Canal
Description	Stream Restoration
River Basin	Tar-Pamlico
Length (ft)	
Stream to Edge width (ft)	
Area (sq. m)	
Required Plots (calculated)	
Sampled Plots	13

Appendix C - Stem Count Total and Planted Species by Plot and Species

			CURRENT DATA (MY2 2009)																								ANNUAL MEANS					
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Plot 10		Plot 11		Plot 12		Plot 13		Current Mean		MY1 (2008)		AB (2007)	
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Alnus serrulata	Tag Alder	s	*		*		*		*		*	1	*		*		*		*	1	*		*		*	1	*		*	3	*	2	*	*
Betula nigra	River Birch	t	*		*		*		*		*		*		*		*		*		*		*		*		*	2	*	2	*	2	*	*
Callicarpa americana	Beautyberry	s	*		*	2	*		*	1	*		*	2	*		*		*		*		*		*		*		*	5	*	5	*	*
Cephalanthus	Buttonbush	s	*		*	1	*		*		*		*		*		*		*		*		*		*		*		*	1	*	1	*	*
Cornus amomum	Silky Dogwood	t	*		*	1	*	1	*		*		*		*		*	1	*		*		*		*		*		*	3	*	3	*	*
Cornus florida	Dogwood	t	*		*		*		*		*		*		*		*		*		*	1	*		*		*		*	1	*	1	*	*
Fraxinus pennsylvanica	Green Ash	t	*		*	1	*	3	*		*	2	*		*	2	*	1	*	1	*	2	*		*		*		*	12	*	15	*	*
Itea virginica	Sweetspire	s	*		*		*		*		*		*		*		*		*		*		*	1	*		*		*	1	*	2	*	*
Myrica	Wax Myrtle	s	*		*	3	*		*	1	*		*	1	*		*		*		*	2	*	2	*	2	*	2	*	13	*	21	*	*
Quercus laurifolia	Laurel Oak	t	*		*		*		*		*		*		*		*		*		*	1	*		*		*		*	1	*	3	*	*
Quercus lyrata	Overcup Oak	t	*		*		*	1	*		*		*		*	2	*		*		*	1	*		*		*		*	4	*	1	*	*
Quercus pagoda	Cherrybark Oak	t	*		*		*	2	*		*		*		*	2	*		*	4	*		*		*		*		*	8	*	7	*	*
Quercus palustris	Pin Oak	t	*		*		*		*		*		*	1	*		*		*		*		*		*		*		*	1	*	2	*	*
Quercus phellos	Willow Oak	t	*		*		*		*		*		*		*		*		*		*		*	2	*		*		*	2	*	4	*	*
Rosa palustris	Rose	s	*		*		*	1	*		*		*		*	1	*	1	*		*	1	*		*		*		*	4	*	7	*	*
Salix caroliniana	Willow	t	*		*		*		*		*	4	*		*		*		*		*		*		*		*		*	4	*	4	*	*
Taxodium distichum	Cypress	s	*		*	1	*		*		*		*		*		*		*		*		*		*		*		*	1	*	1	*	*
Unknown			*		*		*	1	*	1	*		*	1	*	1	*	2	*		*		*	3	*	4	*	1	*	14	*	47	*	*
		Plot Area (acres)	0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025		0.025							
*No baseline data for this project		Species Count		0		6		6		3		3		4		5		4		3		6		4		3		3		18		18		
Type = Tree or Shrub		Stem Count		0		9		9		3		7		5		8		5		6		8		8		7		5		80		128		
P = Planted, T = Total		Stems/Acre		0		360		360		120		280		200		320		200		240		320		320		280		200		320		512		

APPENDIX D

Appendix D – Stream Station Photos (all photos recorded on October 28, 2009)

Photo Station 1. Beginning of Reach 1

Photo Station 2. Reach 1 Culvert upstream

Photos recorded on October 28, 2009

Photo Station 3. Reach 1 Culvert Downstream

Photo Station 4. End of Reach 1 Upstream

Photos recorded on October 28, 2009

Photo Station 5. Beginning of Reach 2 Downstream

Photo Station 6. Beginning of Reach 2

Photos recorded on October 28, 2009

Photo Station 7. Wilson Street Crossing Upstream

Photo Station 8. Wilson Street Crossing – Downstream

Photos recorded on October 28, 2009

Photo Station 9. Culvert Upstream

Photo Station 10. Pool Culvert Downstream

Photos recorded on October 28, 2009

Photo Station 11. Reach 2 End of Project

Photos recorded on October 28, 2009

Appendix D – Table 8 Visual Morphological Stability Assessment

Table 8. Visual Morphological Stability Assessment East Tarboro Canal Stream Restoration Site EEP Project No. 123 Reach 1						
Feature Category	**Metric (per As-built and reference baselines)**	**(# Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number/Feet in Unstable State**	**% Perform in Stable Condition**	**Feature Perform. Mean or Total**
A. Riffles	1. Present?	17	17	0.00	100.00	
	2. Armor stable (eg no displacement?)	NA	NA	0.00	NA	
	3. Facet grade appears stable?	17	17	0.00	100.00	
	4. Minimal evidence of embedding/fining?	17	17	0.00	100.00	
	5. Length appropiate?	17	17	0.00	100.00	100
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	16	16	0.00	100.00	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	16	16	0.00	100.00	
	3. Length appropriate?	16	16	0.00	100.00	100
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	NA	NA	NA		
	2. Downstream of meander (glide/inflection) centering?	NA	NA	NA		NA
D. Meanders	1. Outer bend in state of limited/controlled erosion?	1	1	0.00	100.00	
	2. Of those eroding, # w/concomitant point bar formation?	1	1	0.00	100.00	
	3. Apparent Rc within spec?	1	1	0.00	100.00	
	4. Sufficient floodplain access and relief?	1	1	0.00	100.00	100
E. Bed General	1. General channel bed aggradation areas (bar formation)	1800	1800	0.00	100.00	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?	1800	1800	0.00	100.00	100
F. Bank	1. Actively eroding, wasting, or slumping bank?	1800	1800	0.00	100.00	100
G. Vanes	1. Free of back or arm scour?	7	7	0.00	100.00	
	2. Height appropriate?	7	7	0.00	100.00	
	3. Angle and geometry appear appropriate?	7	7	0.00	100.00	
	4. Free of piping or other structural failures?	7	7	0.00	100.00	100
H. Wads/Boulders	1. Free of scour?	NA	NA	NA	NA	
	2. Footing stable?	NA	NA	NA	NA	NA

Table 8. Visual Morphological Stability Assessment East Tarboro Canal Stream Restoration Site EEP Project No. 123 Reach 2						
Feature Category	**Metric (per As-built and reference baselines)**	**(# Stable) Number Performing as Intended**	**Total Number per As-built**	**Total Number/Feet in Unstable State**	**% Perform in Stable Condition**	**Feature Perform. Mean or Total**
A. Riffles	1. Present?	42	44	0	95.00	
	2. Armor stable (eg no displacement?)	NA	NA	NA	NA	
	3. Facet grade appears stable?	44	44	0	100.00	
	4. Minimal evidence of embedding/fining?	44	44	0	100.00	
	5. Length appropiate?	44	44	0	100.00	95
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	41	42	1	97.62	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	42	42	1	97.62	
	3. Length appropriate?	42	42	0	100.00	98
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	NA	NA	NA		
	2. Downstream of meander (glide/inflection) centering?	NA	NA	NA		NA
D. Meanders	1. Outer bend in state of limited/controlled erosion?	44	44	0	100.00	
	2. Of those eroding, # w/concomitant point bar formation?	44	44	0	100.00	
	3. Apparent Rc within spec?	44	44	0	100.00	
	4. Sufficient floodplain access and relief?	44	44	0	100.00	100.00
E. Bed General	1. General channel bed aggradation areas (bar formation)	2733	2933	0	93.18	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?	2933	2933	0	100.00	93.18
F. Bank	1. Actively eroding, wasting, or slumping bank?	2933	2933	0	99.61	100
G. Vanes	1. Free of back or arm scour?	19	19	0	100.00	
	2. Height appropriate?	19	19	0	100.00	
	3. Angle and geometry appear appropriate?	19	19	0	100.00	
	4. Free of piping or other structural failures?	19	19	0	100.00	100
H. Wads/Boulders	1. Free of scour?	NA	NA	0	100.00	
	2. Footing stable?	NA	NA	0	100.00	100

Appendix D – Verification of Bankfull Events

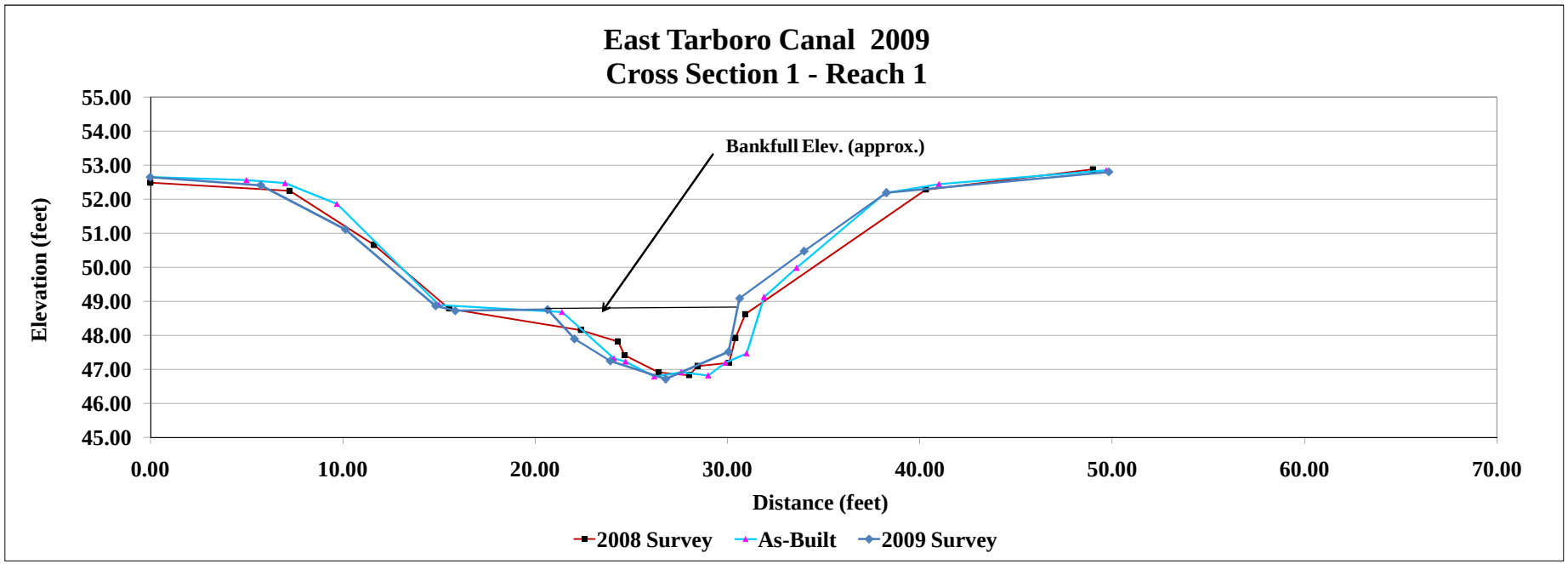
Table 9. Verification of Bankfull Events East Tarboro Canal Stream Restoration Site - EEP Project No. 123			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
October 29, 2009	September/October 2009	Visual Observation	Stream Photos 6

Project Name	East Tarboro Canal
Cross Section	#1
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	52.65	LPIN	0.00	52.49		0.00	52.65										
5	52.56		7.24	52.25		5.74	52.41										
7	52.47		11.63	50.65		10.14	51.11										
9.7	51.86		15.53	48.78		14.83	48.86										
15	48.89		22.38	48.15		15.85	48.72										
21.4	48.68	BKF	24.31	47.82		20.65	48.75										
24.1	47.32		24.66	47.41		22.05	47.89										
24.7	47.22	LEW	26.42	46.91		23.91	47.24										
26.2	46.78	TW	28.01	46.82		26.79	46.71										
27.6	46.91		28.44	47.10		30.06	47.51										
29	46.81		30.09	47.19		30.63	49.08										
29.9	47.19	REW	30.41	47.92		33.98	50.47										
31.00	47.460		30.92	48.61		38.26	52.19										
31.90	49.120		40.32	52.28		49.82	52.80										
33.60	49.980		49.00	52.88													
38.20	52.180																
41.00	52.440																
49.70	52.850	RPIN															

Photo of Cross-Section #1 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	13.72	11.5	13.40			
Width	10.26	13.3	13.60			
Mean Depth	1.34	0.9	1.00			
Max Depth	1.90	1.8	2.00			
W/D	7.66	14.8	13.90			

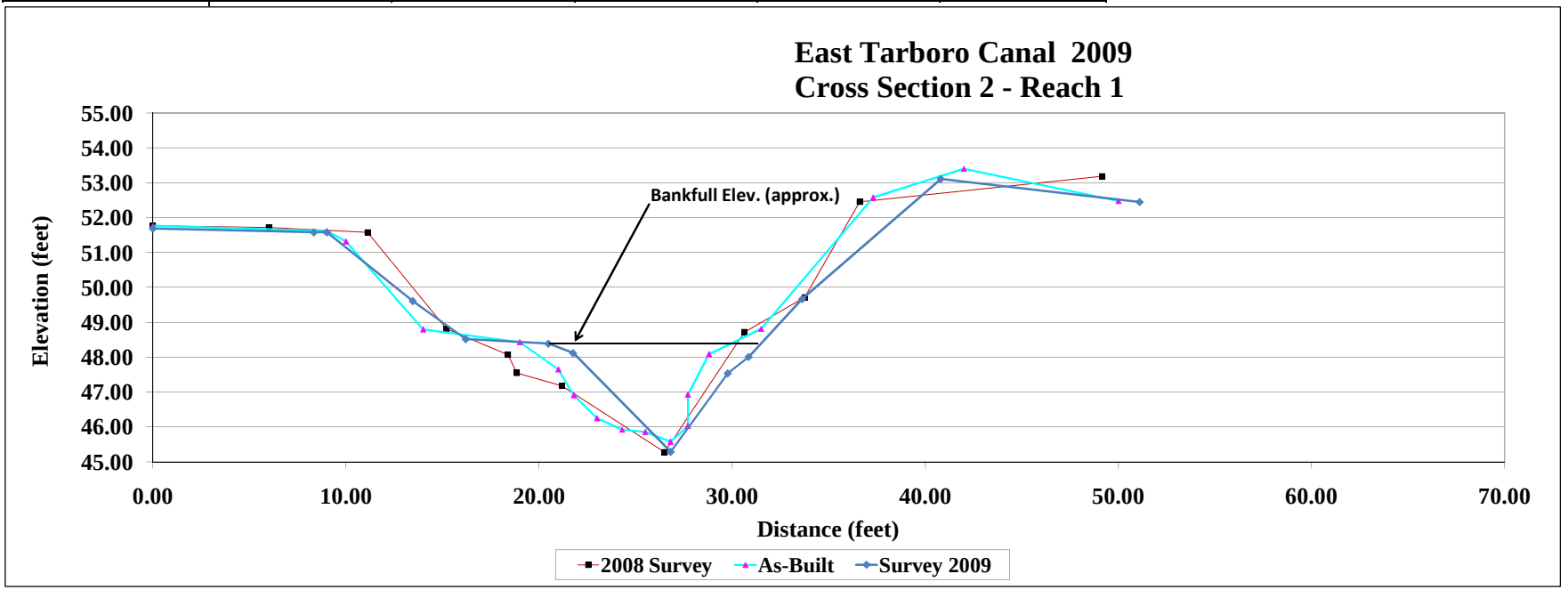


Project Name	East Tarboro Canal
Cross Section	#2
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.00	51.77	LPIN	0.00	51.77		0.00	51.69										
9.00	51.62		6.00	51.72		8.34	51.58										
10.00	51.32		11.12	51.58		9.01	51.58										
14.00	48.8		15.20	48.82		13.46	49.61										
19.00	48.43	BKF	18.38	48.07		16.20	48.52										
21.00	47.65		18.85	47.55		20.48	48.39										
21.80	46.91	LEW	21.17	47.18		21.76	48.12										
23.00	46.25		26.50	45.28		26.81	45.29										
24.30	45.92		30.62	48.72		29.77	47.54										
25.50	45.86		33.75	49.72		30.85	48.01										
26.80	45.58	TW	36.60	52.46		33.63	49.67										
27.70	46.03		49.16	53.19		40.80	53.11										
27.70	46.93	REW				51.10	52.45										
28.80	48.09																
31.50	48.81																
37.30	52.58																
42.00	53.4																
50.00	52.48	RPIN															

Photo of Cross-Section #2 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	17.13	12.70	15.40			
Width	11.07	9.40	11.20			
Mean Depth	1.55	1.40	1.40			
Max Depth	2.85	2.80	3.10			
W/D	7.14	7.00	8.20			

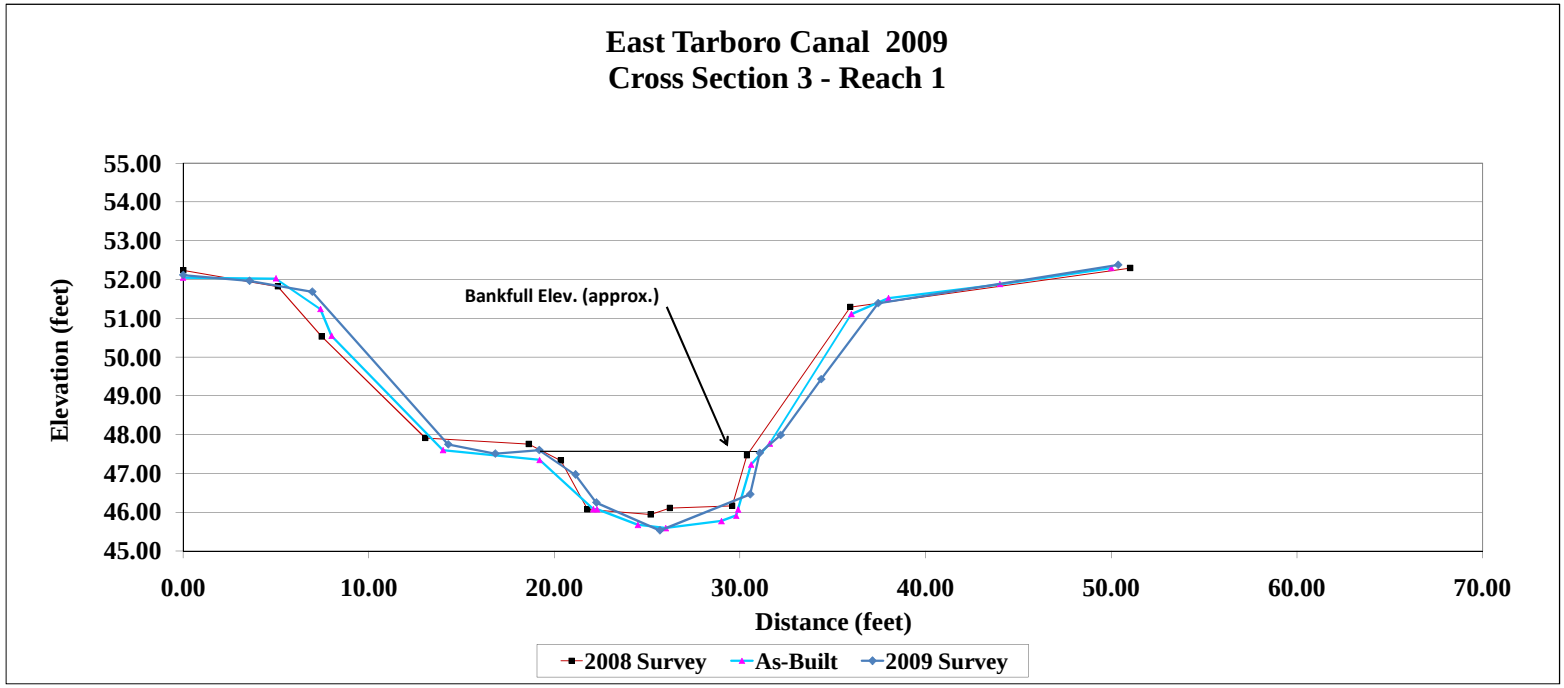


Project Name	East Tarboro Canal
Cross Section	#3
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elv.**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	52.05	LPIN	0.00	52.25		0.00	52.12										
5	52.03		5.10	51.82		3.57	51.97										
7.4	51.24		7.46	50.53		6.95	51.69										
8	50.55		13.05	47.91		14.28	47.75										
14	47.6		18.62	47.76		16.81	47.51										
19.2	47.35	BKF	20.35	47.33		19.18	47.60										
22.1	46.08		21.78	46.07		21.13	46.97										
22.3	46.08	LEW	25.19	45.94		22.26	46.25										
24.5	45.67		26.22	46.11		25.68	45.53										
26	45.59	TW	29.58	46.17		30.55	46.46										
29	45.77		30.37	47.47		31.06	47.53										
29.8	45.91		35.94	51.30		32.18	47.99										
29.9	46.07	REW	51.02	52.30		34.37	49.43										
30.6	47.23					37.44	51.39										
31.6	47.77					50.37	52.38										
36	51.11																
38	51.52																
44	51.88																
50	52.3	RPIN															

Photo of Cross-Section #3 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	14.78	14.30	14.20			
Width	11.62	10.90	11.20			
Mean Depth	1.27	1.30	1.30			
Max Depth	1.76	1.80	2.00			
W/D	9.15	8.40	8.80			

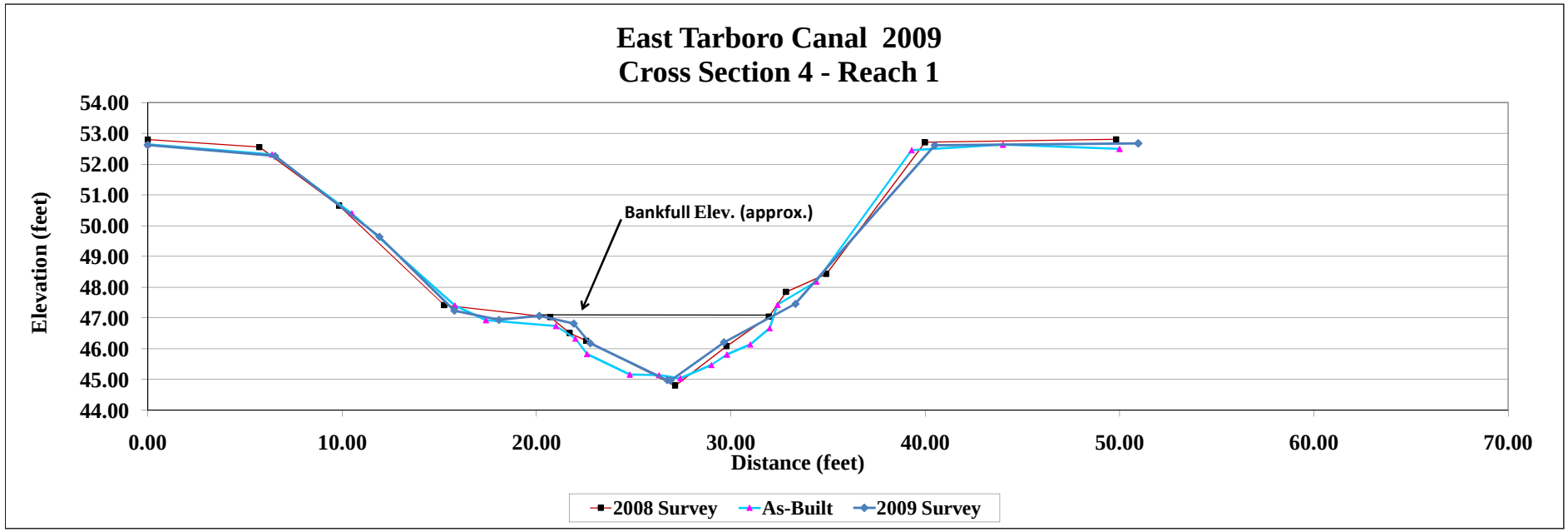


Project Name	East Tarboro Canal
Cross Section	#4
Feature	Riffle
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	52.64	LPIN	0.00	52.79		0.00	52.62										
6.4	52.31		5.74	52.56		6.56	52.26										
10.5	50.4		9.85	50.65		11.92	49.64										
15.8	47.4		15.26	47.41		15.78	47.24										
17.4	46.93		20.71	47.03		18.07	46.94										
21	46.74	BKF	21.71	46.51		20.15	47.07										
22	46.33		22.56	46.26		21.92	46.82										
22.6	45.83	LEW	27.14	44.80		22.77	46.18										
24.8	45.16		29.78	46.08		26.73	44.98										
26.3	45.14		31.96	47.04		26.90	44.97										
27.4	45.04	TW	32.85	47.85		29.65	46.21										
29	45.47		34.91	48.43		33.33	47.46										
29.8	45.81	REW	39.99	52.71		40.50	52.61										
31	46.14		49.83	52.80		50.97	52.67										
32	46.67																
32.4	47.43																
34.4	48.18																
39.3	52.45																
44	52.63																
50	52.49	RPIN															

Photo of Cross-Section #4 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	12.05	12.60	12.03			
Width	11.04	10.90	14.48			
Mean Depth	1.09	1.20	0.83			
Max Depth	1.70	2.20	2.13			
W/D	10.13	9.40	17.40			

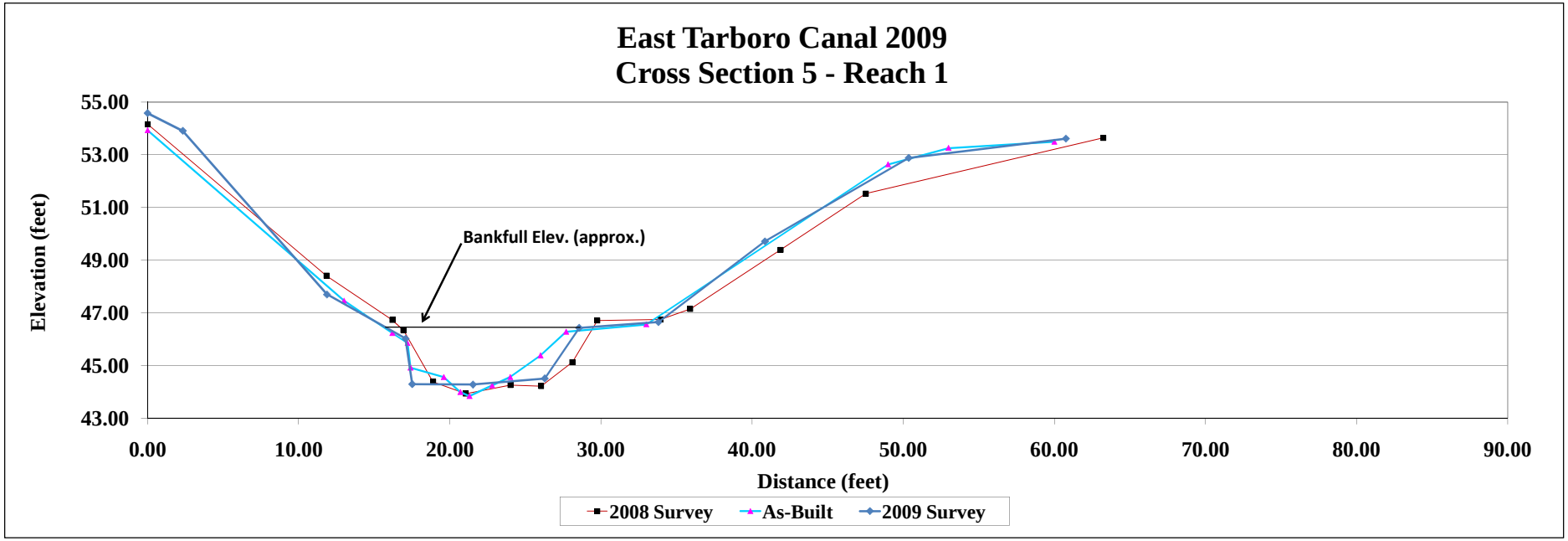


Project Name	East Tarboro Canal
Cross Section	#5
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	53.93	LPIN	0.00	54.16		0.00	54.57										
13	47.46		11.84	48.41		2.33	53.90										
16.2	46.23		16.20	46.73		11.87	47.69										
17.2	45.85		16.93	46.34		17.07	46.01										
17.4	44.92		18.89	44.38		17.51	44.29										
19.6	44.56	LEW	21.06	43.93		21.53	44.28										
20.7	43.99		24.01	44.25		26.28	44.50										
21.3	43.84	TW	26.04	44.22		28.56	46.43										
22.8	44.25		28.11	45.13		33.8	46.65										
24	44.56	REW	29.76	46.70		40.85	49.71										
26	45.38		33.94	46.74		50.36	52.87										
27.7	46.28	BKF	35.91	47.15		60.76	53.61										
33	46.56		41.89	49.39													
49	52.63		47.53	51.53													
53	53.25		63.25	53.64													
60	53.49	RPIN															

Photo of Cross-Section #5 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	16.42	25.60	15.33			
Width	11.63	13.00	10.08			
Mean Depth	1.41	2.80	1.52			
Max Depth	2.44	2.00	1.74			
W/D	8.25	6.60	6.60			

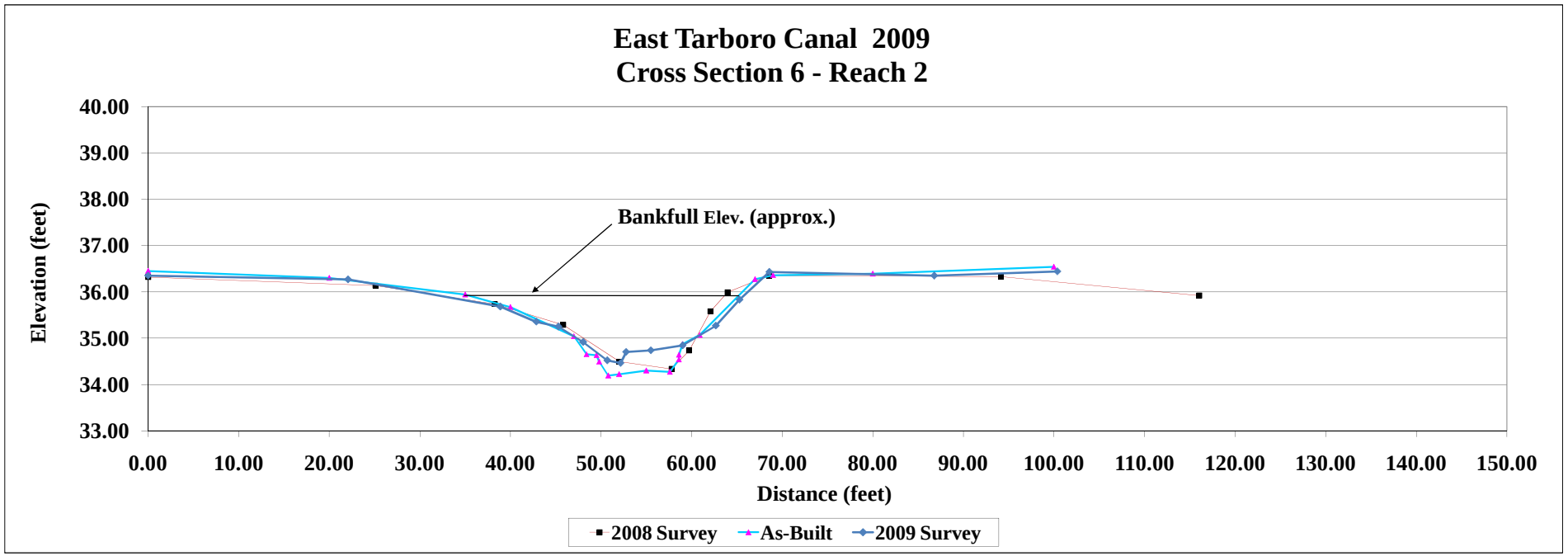


Project Name	East Tarboro Canal
Cross Section	#6
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0.00	36.45	LPIN	0.00	36.32		0.00	36.35										
20	36.3		25.08	36.14		22.07	36.27										
35	35.94	BKF	38.26	35.74		38.88	35.68										
40	35.67		45.82	35.29		42.86	35.35										
47	35.04		52.03	34.49		45.30	35.25										
48.4	34.65		57.78	34.33		48.03	34.92										
49.5	34.63	LEW	59.72	34.73		50.69	34.52										
49.8	34.49		62.08	35.58		52.16	34.46										
50.8	34.19	TW	63.97	35.99		52.77	34.70										
52	34.22		68.53	36.35		55.50	34.74										
55	34.3		94.15	36.33		59.02	34.84										
57.6	34.27		116.05	35.92		62.67	35.27										
58.6	34.54					65.29	35.83										
58.6	34.64	REW				68.58	36.43										
59	34.87					86.79	36.35										
60.9	35.07					100.38	36.44										
67	36.27																
69	36.36																
80	36.39																
100	36.54	RPIN															

Photo of Cross-Section #6 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	26.95	24.00	25.46			
Width	30.32	36.60	35.51			
Mean Depth	0.89	0.67	0.72			
Max Depth	1.75	1.60	1.54			
W/D	34.07	55.70	49.50			

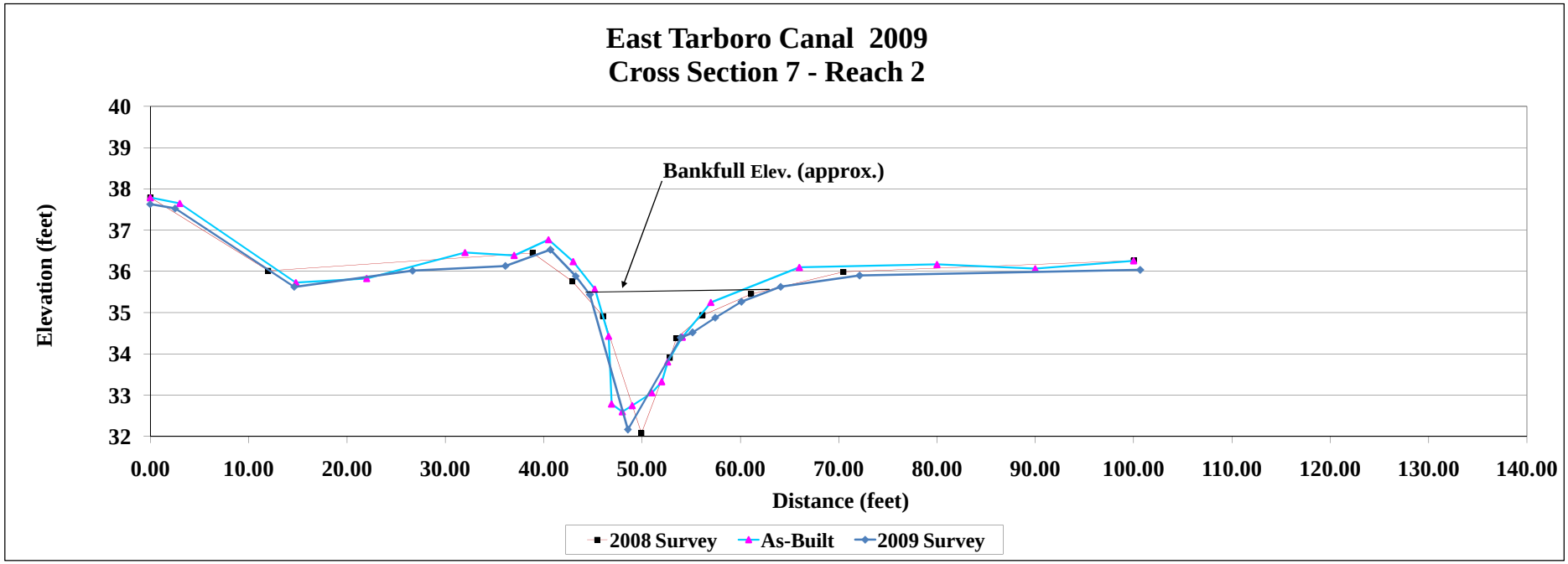


Project Name	East Tarboro Canal
Cross Section	#7
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey Station	Elevation	Notes	2008 2008 Survey Station	Elevation	Notes	2009 2009 Survey Station	Elevation	Notes	2010 2010 Survey Station	Elevation	Notes	2011 2011 Survey Station	Elevation	Notes	2012 2012 Survey Station	Elevation	Notes
0	37.79	LPIN	0.00	37.79		0.00	37.63										
3	37.65		12.00	36.02		2.53	37.53										
14.8	35.73		38.87	36.45		14.64	35.63										
22	35.83		42.91	35.76		26.68	36.02										
32	36.46		46.03	34.92		36.11	36.13										
37	36.39		49.94	32.08		40.69	36.53										
40.5	36.77		52.84	33.91		43.26	35.89										
43	36.24		53.48	34.38		44.70	35.44										
45.2	35.57		56.17	34.94		48.57	32.17										
46.6	34.43	LEW	61.09	35.45		53.95	34.40										
46.9	32.79		70.47	35.99		55.15	34.52										
48	32.6	TW	100.00	36.26		57.45	34.88										
49	32.75					60.11	35.27										
51	33.06					64.10	35.63										
52	33.33					72.13	35.90										
52.6	33.81					100.66	36.04										
54.1	34.41	REW															
57	35.25																
66	36.1	BKF															
80	36.17																
90	36.07																
100	36.26	RPIN															

Photo of Cross-Section #7 - Looking Upstream

	AsBuilt	2008	2009	2010	2011	2012
Area	31.22	30.00	19.60			
Width	22.54	26.80	23.54			
Mean Depth	1.39	1.10	0.83			
Max Depth	3.50	4.20	3.72			
W/D	16.22	23.90	29.00			

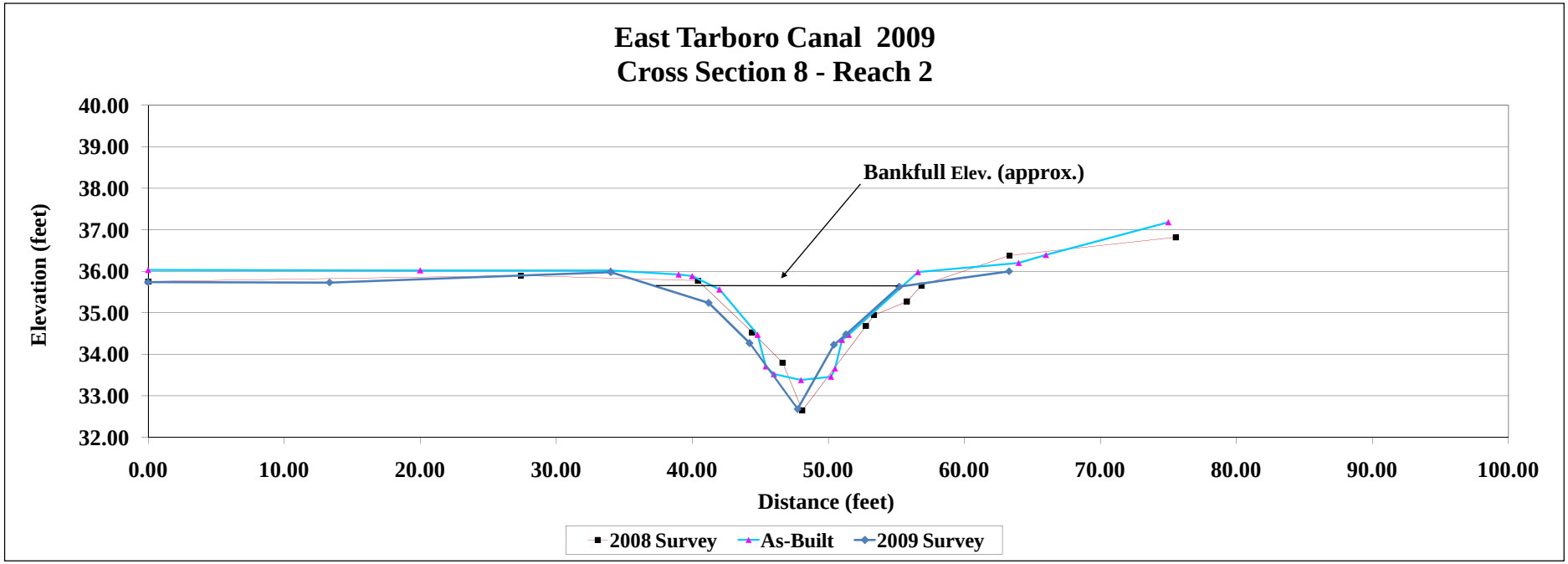


Project Name	East Tarboro Canal
Cross Section	#8
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	36.03	LPIN	0.00	35.76		0.00	35.74										
20	36.02		27.39	35.90		13.34	35.73										
34	36.02		40.41	35.77		34.02	35.98										
39	35.92		44.41	34.53		41.21	35.24										
40	35.88		46.63	33.80		44.22	34.27										
42	35.56		48.09	32.65		47.75	32.68										
44.8	34.47	LEW	52.77	34.69		50.42	34.23										
45.4	33.71		53.36	34.95		51.31	34.48										
46	33.52		55.78	35.28		55.22	35.63										
48	33.38	TW	56.84	35.66		63.30	36.00										
50.2	33.46		63.32	36.38		74.01	36.86										
50.5	33.66		75.55	36.82													
51	34.35																
51.5	34.47	REW															
56.6	35.98	BKF															
64	36.2																
66	36.39																
75	37.18	RPIN															

Photo of Cross-Section #8 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	22.99	12.10	14.30			
Width	20.60	12.70	15.13			
Mean Depth	1.12	1.00	0.95			
Max Depth	2.60	3.00	2.61			
W/D	18.39	13.30	16.00			



Project Name	East Tarboro Canal
Cross Section	#9
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey
As-Built Survey

Station	Elevation	Notes
0	34.41	LPIN
20	34.44	
37	34.39	
42	34.61	
45	35.08	
47	34.51	
48.2	34	
49.2	32.08	LEW
51	31.03	TW
51.8	31.1	
53.1	31.71	
54.5	31.73	
55	32.08	REW
58	32.74	
63	34	
67	34.24	BKF
80	34.07	
90	34.1	
100	34.25	
101.4	34.25	RPIN

2008
2008 Survey

Station	Elevation	Notes
0.00	34.40	
31.81	34.84	
38.72	34.32	
39.90	33.24	
54.34	30.37	
57.17	32.15	
58.59	33.23	
60.90	33.91	
65.70	34.41	
76.79	34.12	
99.09	34.35	

2009
2009 Survey

Station	Elevation	Notes
0.00	34.22	
10.00	34.22	
34.76	34.19	
50.10	30.60	
54.90	32.61	
55.85	32.99	
58.96	33.90	
65.41	34.26	
77.54	34.01	
97.90	34.21	

2010
2010 Survey

Station	Elevation	Notes

2011
2011 Survey

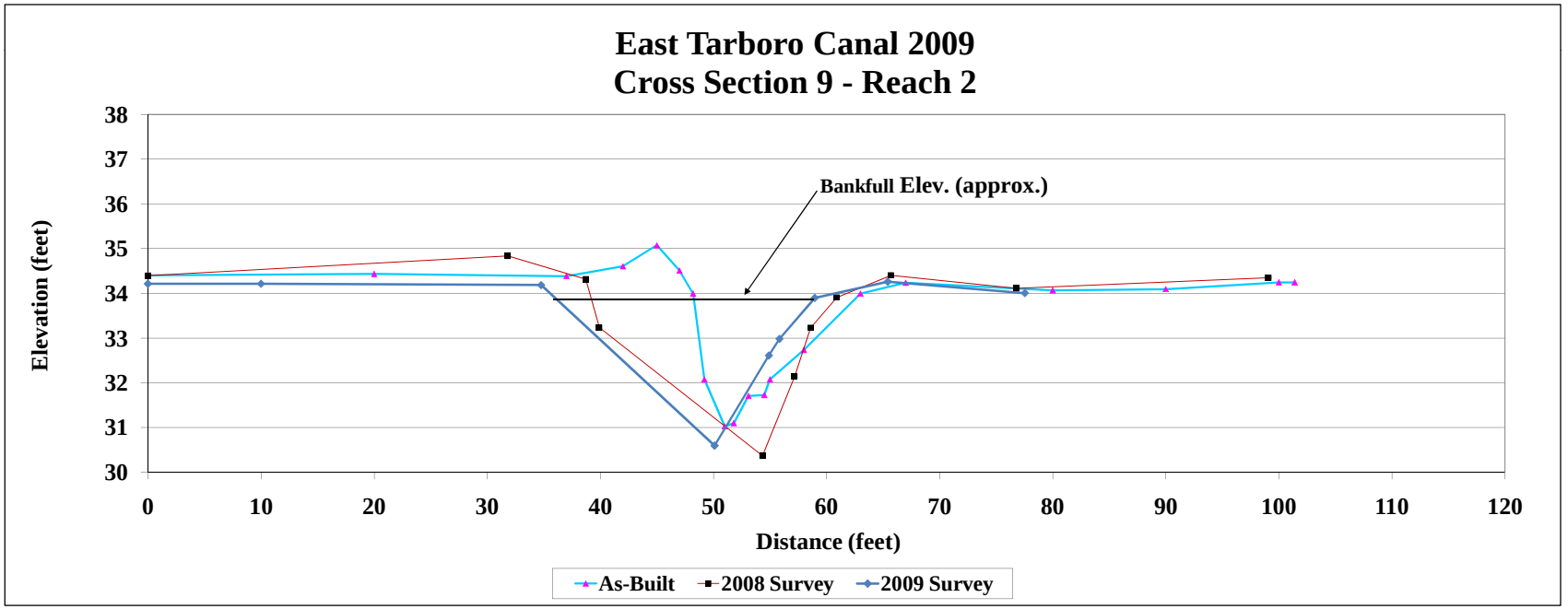
Station	Elevation	Notes

2012
2012 Survey

Station	Elevation	Notes

Photo of Cross-Section #9 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	27.34	22.11	23.30			
Width	19.36	34.70	14.00			
Mean Depth	1.41	0.50	1.70			
Max Depth	3.21	4.90	3.30			
W/D	13.73	66.90	8.40			

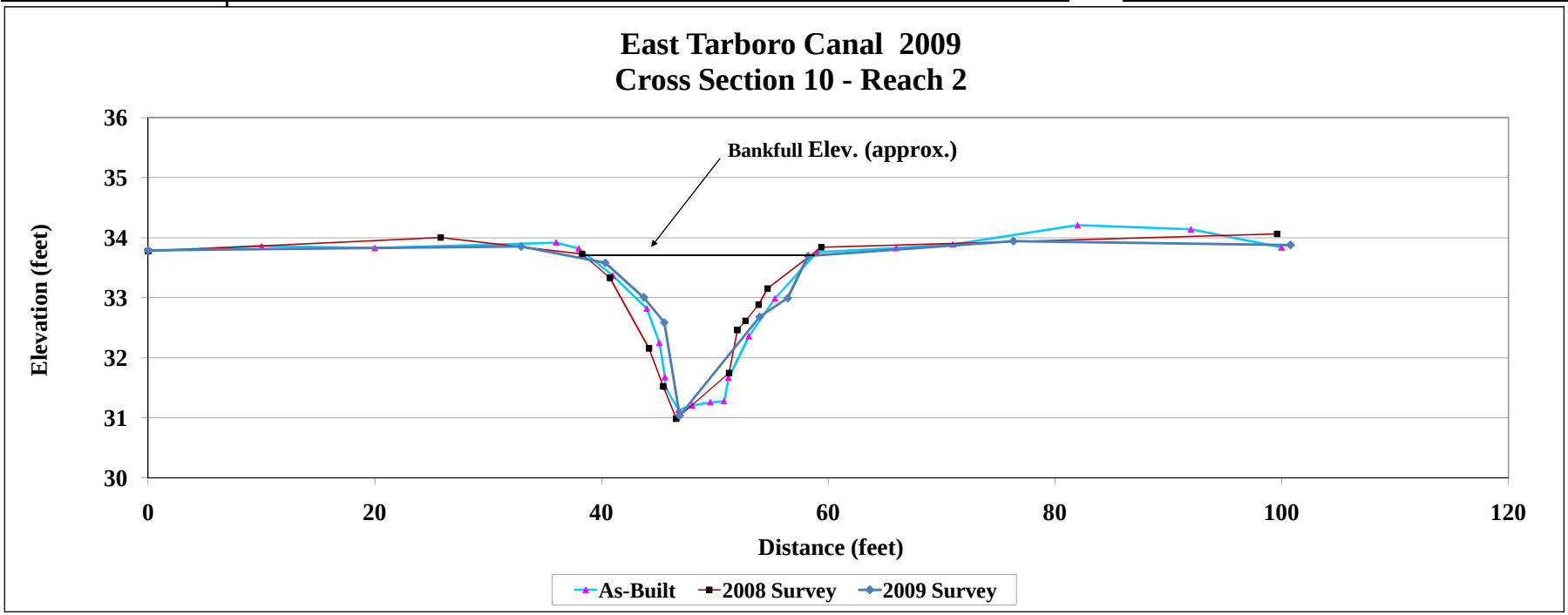


Project Name	East Tarboro Canal
Cross Section	#10
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	33.78	LPIN	0.00	33.78		0.00	33.79										
10	33.86		25.81	34.00		32.90	33.86										
20	33.83		38.28	33.73		40.35	33.58										
36	33.92		40.74	33.33		43.73	33.01										
38	33.82		44.20	32.16		45.54	32.59										
41	33.37		45.45	31.53		46.89	31.04										
44	32.82		46.60	30.99		53.95	32.69										
45.1	32.25		51.25	31.75		56.42	33.00										
45.6	31.68	LEW	51.99	32.46		58.23	33.70										
45.6	31.52		52.72	32.62		76.34	33.94										
46.8	31.13	TW	53.86	32.89		100.78	33.88										
48	31.21		54.66	33.16													
49.6	31.26		59.39	33.85													
50.8	31.28		99.61	34.07													
51.2	31.67	REW															
53	32.36																
55.3	32.99																
59	33.76	BKF															
66	33.83																
71	33.89																
82	34.21																
92	34.14																
100	33.84	RPIN															

Photo of Cross-Section #10 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	25.78	21.60	19.96			
Width	20.60	22.70	19.52			
Mean Depth	1.25	1.00	1.02			
Max Depth	2.63	2.90	2.66			
W/D	16.48	23.80	19.10			



Project Name	East Tarboro Canal
Cross Section	#11
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey Station	Elevation	Notes
0	34.73	LPIN
7	33.02	
20	33.19	
37	33.06	BKF
45	31.42	
47.4	31.13	LEOW
50	30.77	
51	30.58	
52	30.38	TW
53.8	30.67	
53.8	31.15	REOW
54.1	32.53	
56	33.08	
62	33.56	
70	33.59	
90	33.27	
96	33.24	
100	33.83	RPIN

2008 2008 Survey Station	Elevation	Notes
100.86	33.99	
95.21	33.37	
62.08	33.82	
55.44	33.17	
53.68	32.85	
52.99	32.31	
51.53	32.06	
49.29	30.12	
45.72	31.37	
43.52	32.00	
38.01	33.01	
26.25	33.39	
4.14	33.41	
0.00	34.63	

2009 2009 Survey Station	Elevation	Notes
0.00	34.72	
0.31	34.83	
6.82	33.21	
17.23	33.22	
34.84	33.11	
40.96	32.63	
43.29	32.37	
45.86	32.19	
51.42	30.16	
55.18	32.64	
55.96	32.75	
57.21	33.24	
58.84	33.44	
63.32	33.62	
80.80	33.48	
96.16	33.27	
101.71	33.94	

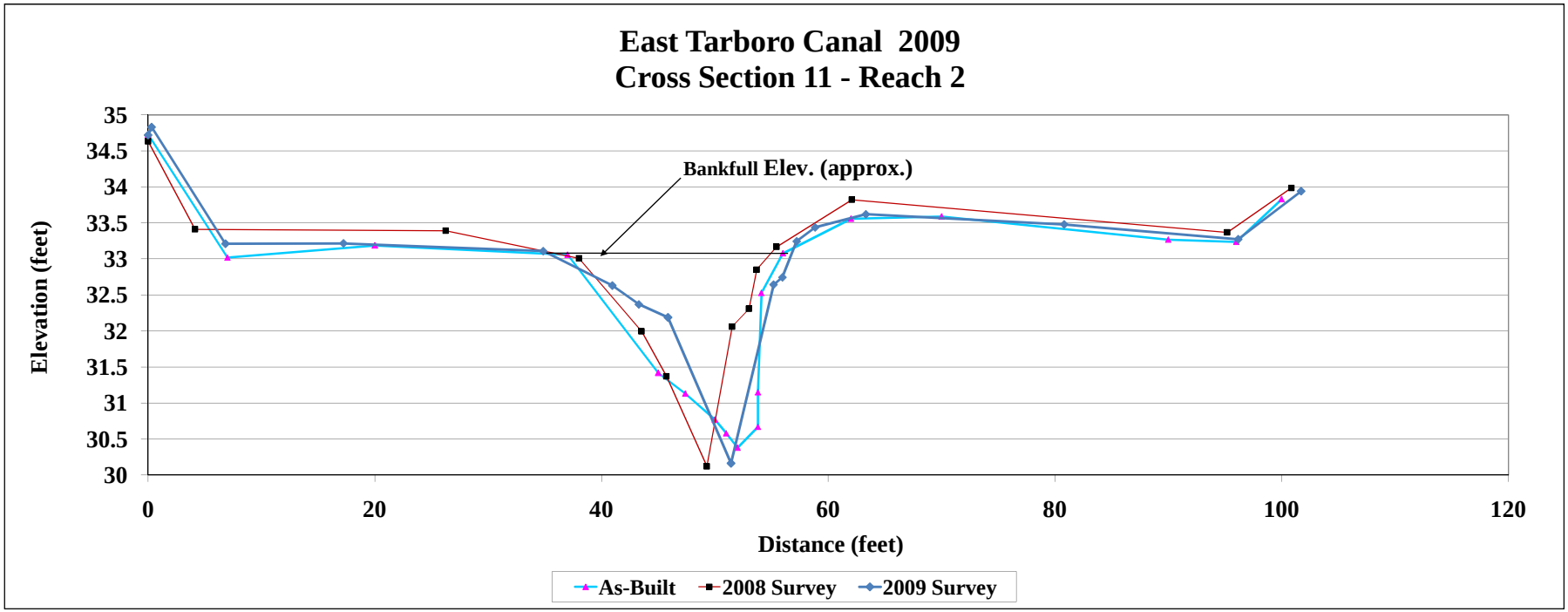
2010 2010 Survey Station	Elevation	Notes

2011 2011 Survey Station	Elevation	Notes

2012 2012 Survey Station	Elevation	Notes

Photo of Cross-Section #11 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	26.71	18.20	18.07			
Width	18.93	15.10	18.77			
Mean Depth	1.41	1.20	0.96			
Max Depth	2.68	2.90	2.94			
W/D	13.43	12.60	19.50			

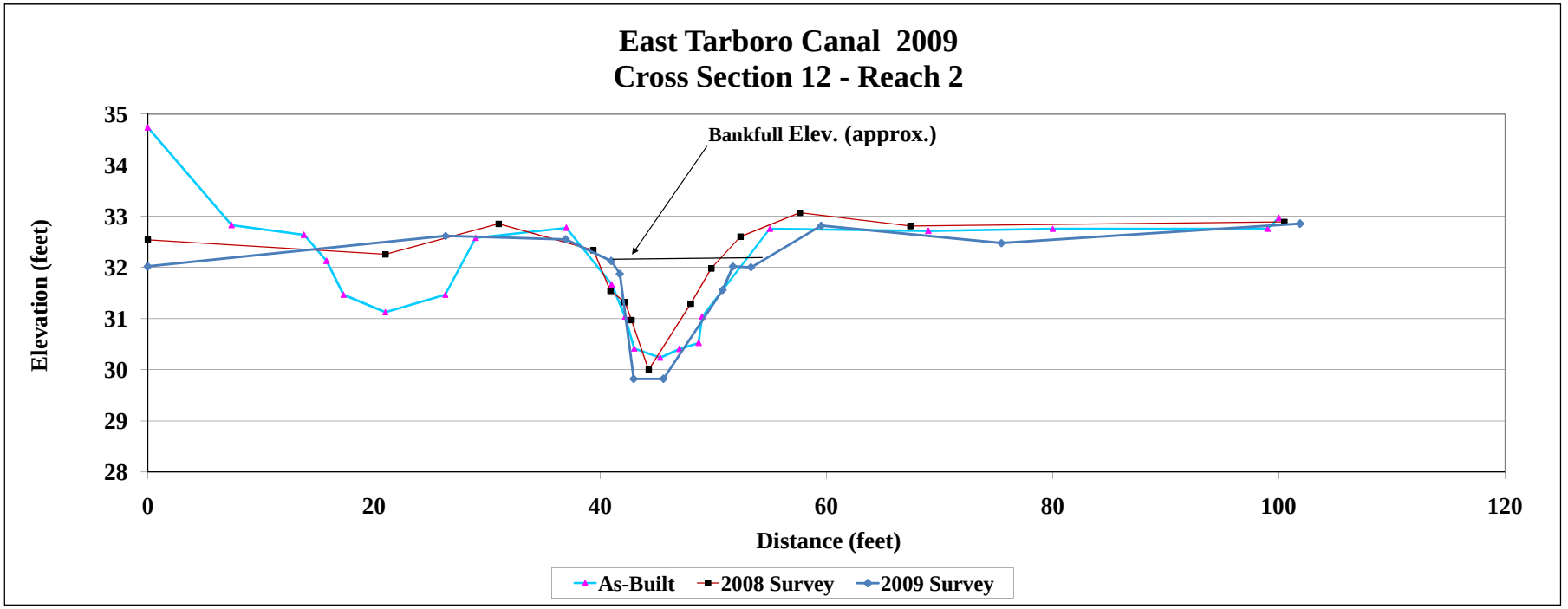


Project Name	East Tarboro Canal
Cross Section	#12
Feature	
Date	Aug-09
Crew	Tutt, Stafford

As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	34.74	LPIN	0	32.54		0.00	32.02										
7.4	32.83		21.01	32.262		26.33	32.62										
13.8	32.64		31.01	32.855		36.95	32.55										
15.8	32.13		39.38	32.3439		40.97	32.13										
17.3	31.47		40.89	31.545		41.73	31.88										
21	31.13		42.18	31.3237		42.96	29.83										
26.3	31.47		42.76	30.9748		45.59	29.83										
29	32.58		44.28	29.9971		50.82	31.56										
37	32.78		48.01	31.2924		51.74	32.02										
41	31.67		49.82	31.9828		53.33	32.00										
42.2	31.04	LEW	52.41	32.6088		59.54	32.82										
43	30.42		57.65	33.074		75.48	32.48										
45.3	30.24	TW	67.42	32.814		101.87	32.86										
47	30.41		100.49	32.896													
48.7	30.53																
49	31.04	REW															
55	32.76	BKF															
69	32.72																
80	32.76																
99	32.76																
100	32.97	RPIN															

Photo of Cross-Section #12 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	24.83	12.90	14.28			
Width	18.13	15.60	17.98			
Mean Depth	1.37	0.80	0.79			
Max Depth	2.52	2.30	2.18			
W/D	13.23	18.90	22.60			

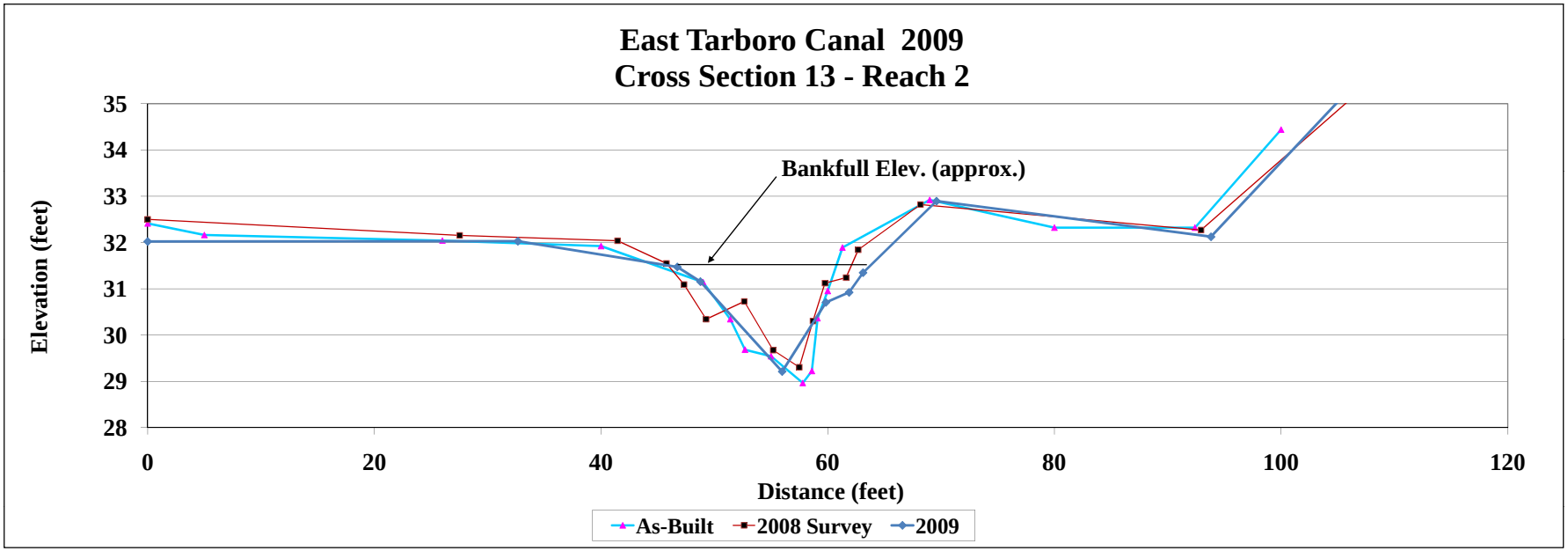


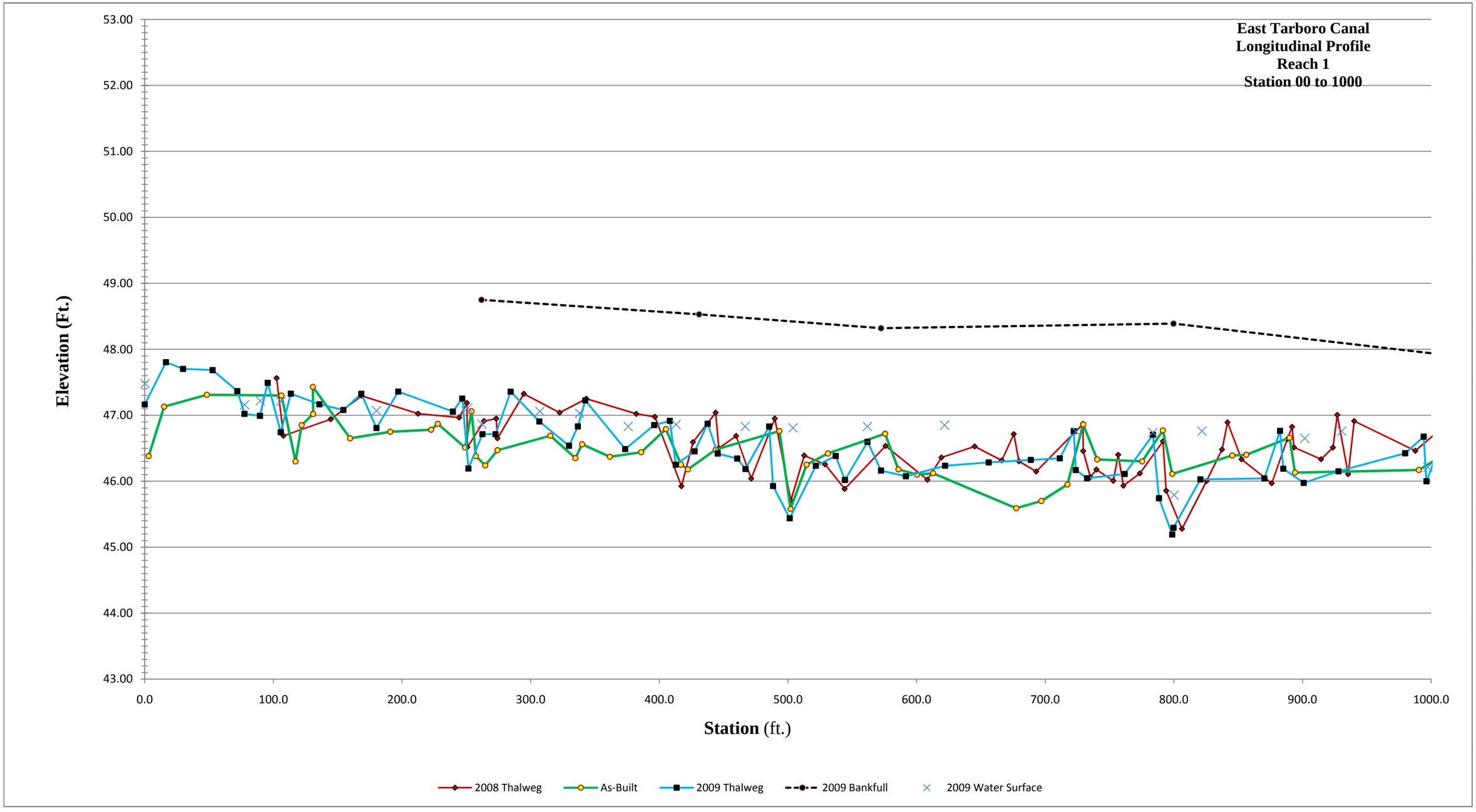
Project Name	East Tarboro Canal
Cross Section	#13
Feature	
Date	Aug-09
Crew	Tutt, Stafford

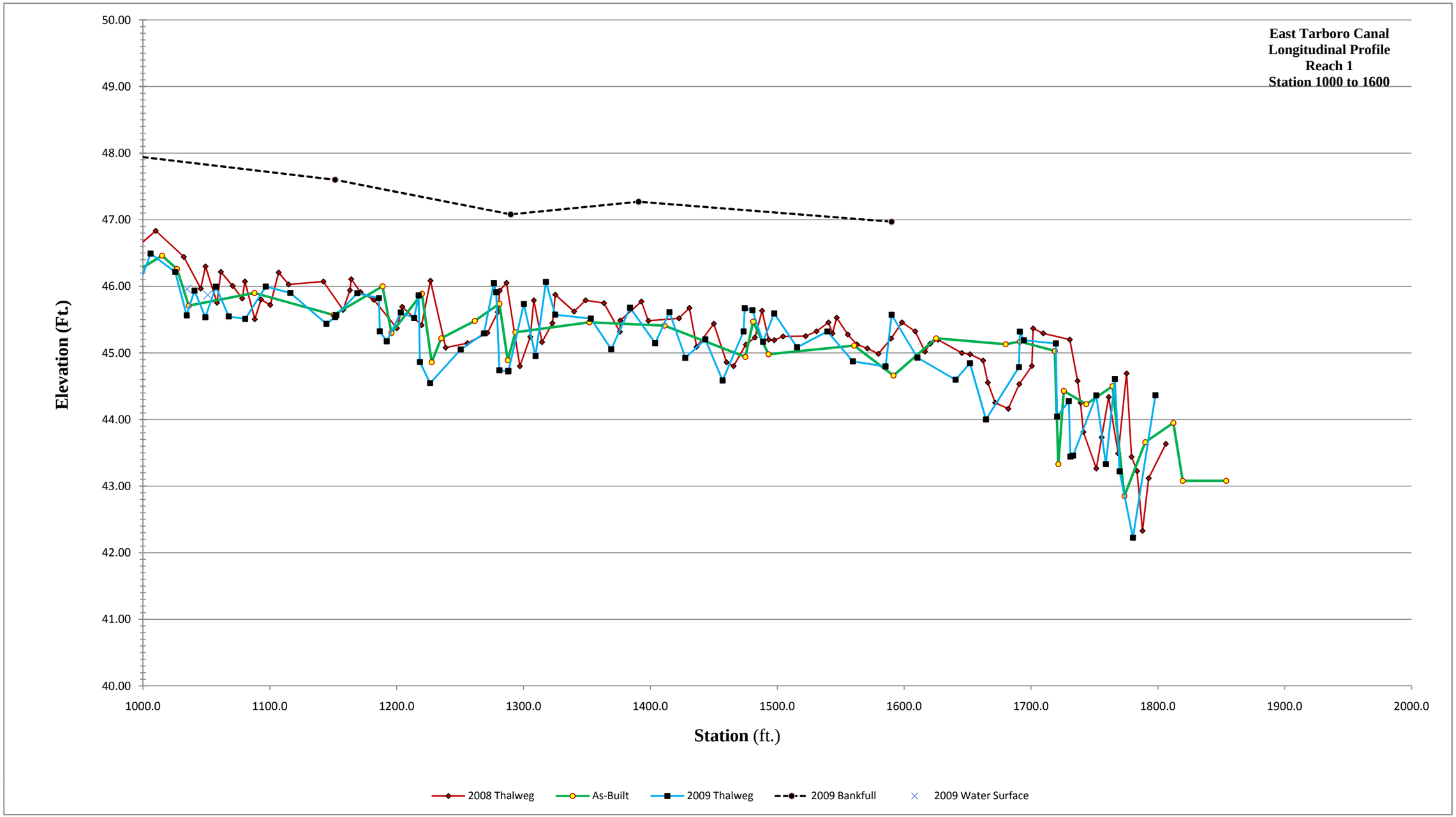
As-Built Survey As-Built Survey			2008 2008 Survey			2009 2009 Survey			2010 2010 Survey			2011 2011 Survey			2012 2012 Survey		
Station	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**	**Station**	**Elevation**	**Notes**
0	32.41	LPIN	0.00	32.50		0.00	32.02										
5	32.16		27.52	32.15		32.66	32.03										
26	32.04		41.46	32.04		46.73	31.47										
40	31.92	BKF	45.78	31.55		48.77	31.15										
49	31.14		47.33	31.09		55.98	29.21										
51.4	30.34	LEW	49.27	30.34		59.84	30.70										
52.7	29.68		52.64	30.73		61.89	30.92										
55	29.54		55.19	29.67		63.12	31.35										
57.8	28.96	TW	57.49	29.30		69.6	32.89										
58.6	29.22		58.70	30.30		93.82	32.12										
59.1	30.36	REW	59.76	31.12		105.18	35.08										
60	30.95		61.62	31.24													
61.3	31.89		62.70	31.84													
69	32.92		68.18	32.82													
80	32.32		92.94	32.27													
92.4	32.32		108.00	35.50													
100	34.44	RPIN															

Photo of Cross-Section #13 - Looking Downstream

	AsBuilt	2008	2009	2010	2011	2012
Area	26.73	13.50	11.43			
Width	21.52	9.60	10.99			
Mean Depth	1.24	1.40	1.04			
Max Depth	2.96	2.70	2.26			
W/D	17.35	6.90	10.60			




East Tarboro Canal
Longitudinal Profile
Reach 1
Station 00 to 1000
Elevation (Ft.)
53.00
52.00
51.00
50.00
49.00
48.00
47.00
46.00
45.00
44.00
43.00
0.0
100.0
200.0
300.0
400.0
500.0
600.0
700.0
800.0
900.0
1000.0
Station (ft.)
2008 Thalweg
As-Built
2009 Thalweg
2009 Bankfull
2009 Water Surface


East Tarboro Canal
Longitudinal Profile
Reach 1
Station 1000 to 1600
Elevation (Ft.)
50.00
49.00
48.00
47.00
46.00
45.00
44.00
43.00
42.00
41.00
40.00
1000.0
1100.0
1200.0
1300.0
1400.0
1500.0
1600.0
1700.0
1800.0
1900.0
2000.0
Station (ft.)
2008 Thalweg
As-Built
2009 Thalweg
2009 Bankfull
2009 Water Surface

East Tarboro Canal
Longitudinal Profile
Reach 2
Station 00 to 1600

Elevation (Ft.)

38.00
37.00
36.00
35.00
34.00
33.00
32.00
31.00
30.00
29.00
28.00
27.00
26.00

0.0
200.0
400.0
600.0
800.0
1000.0
1200.0
1400.0
1600.0

Station (Ft.)

As-Built
2008 Thalweg
2009 Thalweg
2009 Bankfull
2009 Water Surface

East Tarboro Canal
Longitudinal Profile
Reach 2
Station 1600 to 3200

Elevation (Ft.)

36.00
35.00
34.00
33.00
32.00
31.00
30.00
29.00
28.00
27.00
26.00

1600.0 1800.0 2000.0 2200.0 2400.0 2600.0 2800.0 3000.0 3200.0

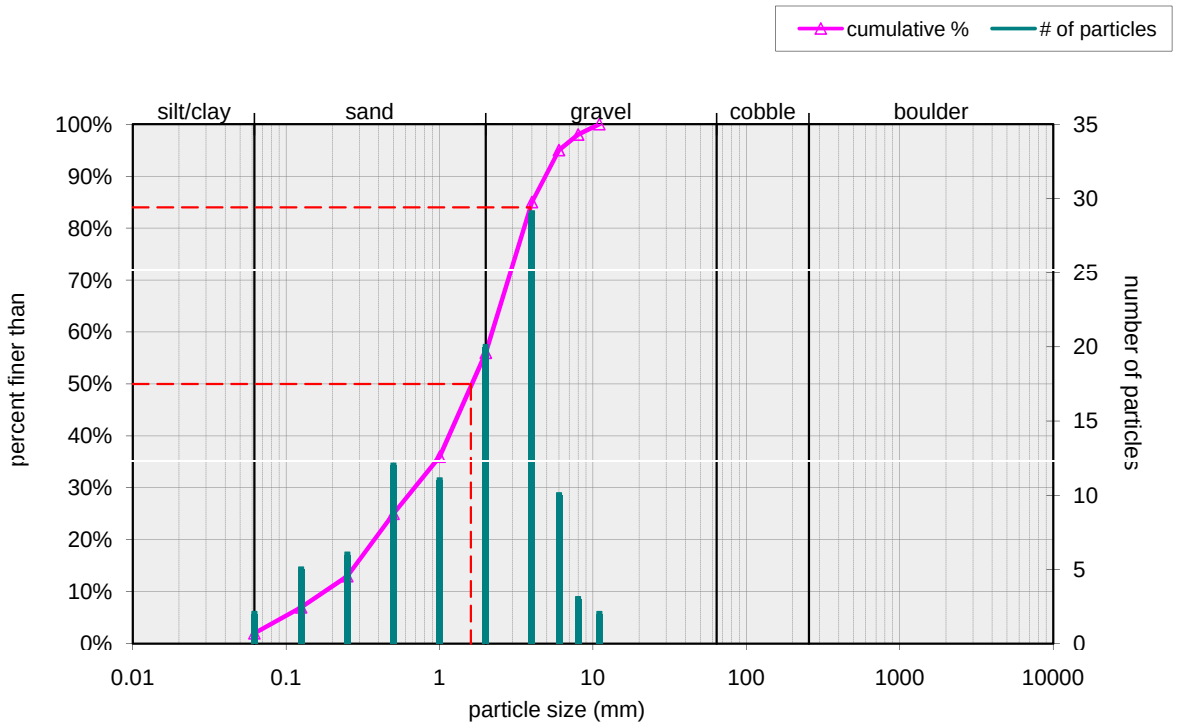
Station (Ft.)

As-Built
2008 Thalweg
2009 Thalweg
2009 Bankfull
2009 Water Surface

Cross Section 1

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	40
very fine sand	0.062 - 0.125	26
fine sand	0.125 - 0.25	19
medium sand	0.25 - 0.5	11
coarse sand	0.5 - 1	2
very coarse sand	1 - 2	1
very fine gravel	2 - 4	1
fine gravel	4 - 6	0
fine gravel	6 - 8	0
medium gravel	8 - 11	0
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 1



Size (mm)	
D16	0.062
D35	0.062
D50	0.081
D65	0.12
D84	0.24
D95	0.47

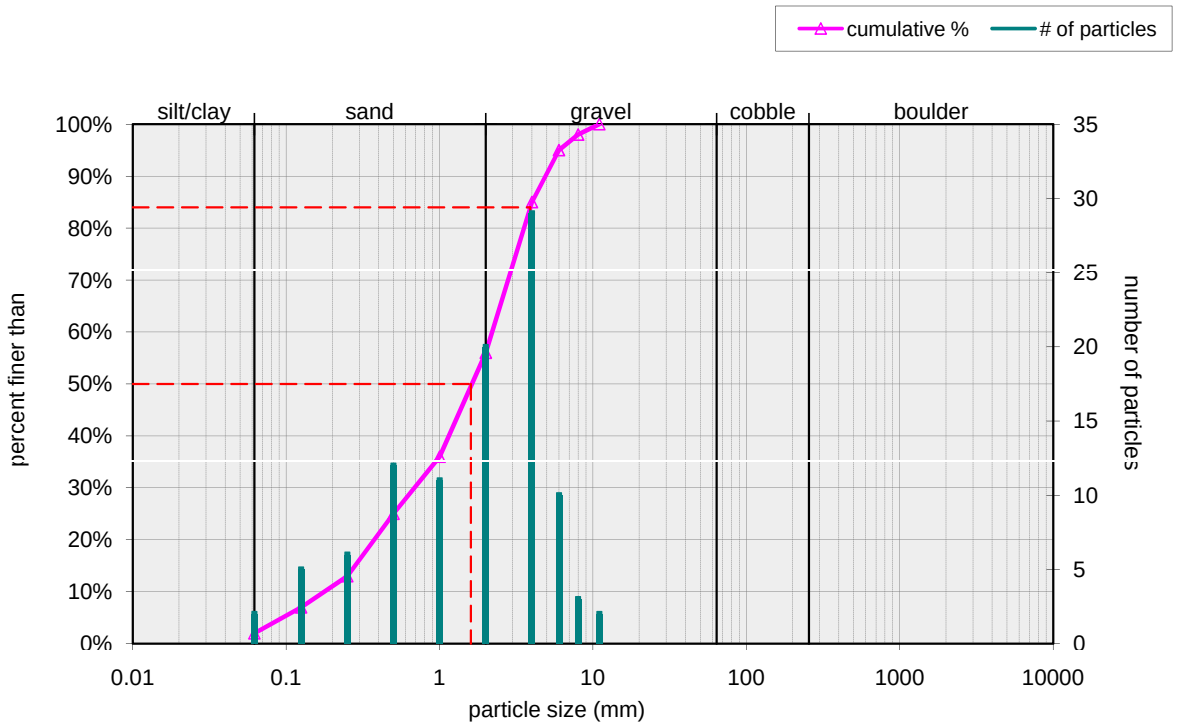
Size Distribution	
mean	0.1
dispersion	2.1
skewness	0.23

Type	
silt/clay	40%
sand	59%
gravel	1%
cobble	0%
boulder	0%

Cross Section 2

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	32
very fine sand	0.062 - 0.125	21
fine sand	0.125 - 0.25	19
medium sand	0.25 - 0.5	15
coarse sand	0.5 - 1	6
very coarse sand	1 - 2	3
very fine gravel	2 - 4	1
fine gravel	4 - 6	2
fine gravel	6 - 8	0
medium gravel	8 - 11	1
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 2



Size (mm)	
D16	0.062
D35	0.069
D50	0.11
D65	0.19
D84	0.44
D95	1.6

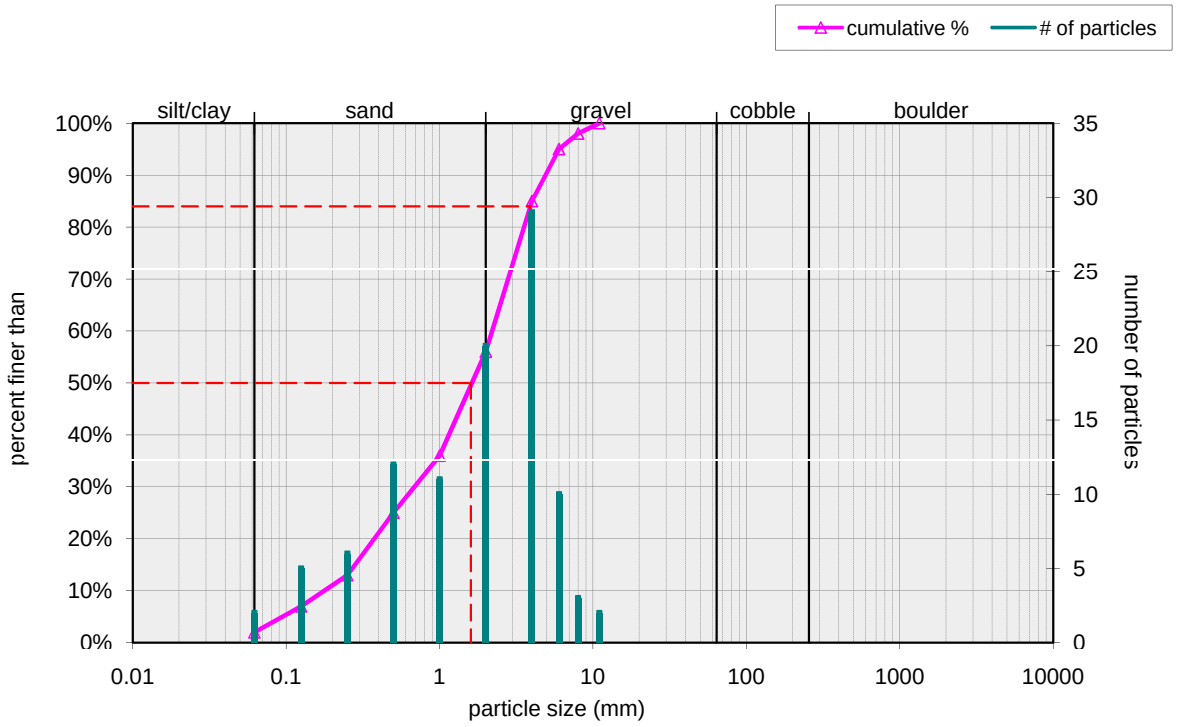
Size Distribution	
mean	0.2
dispersion	2.9
skewness	0.19

Type	
silt/clay	32%
sand	64%
gravel	4%
cobble	0%
boulder	0%

Cross Section 3

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	29
very fine sand	0.062 - 0.125	35
fine sand	0.125 - 0.25	12
medium sand	0.25 - 0.5	17
coarse sand	0.5 - 1	3
very coarse sand	1 - 2	2
very fine gravel	2 - 4	0
fine gravel	4 - 6	1
fine gravel	6 - 8	1
medium gravel	8 - 11	0
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 3



Size (mm)	
D16	0.062
D35	0.07
D50	0.094
D65	0.13
D84	0.35
D95	0.79

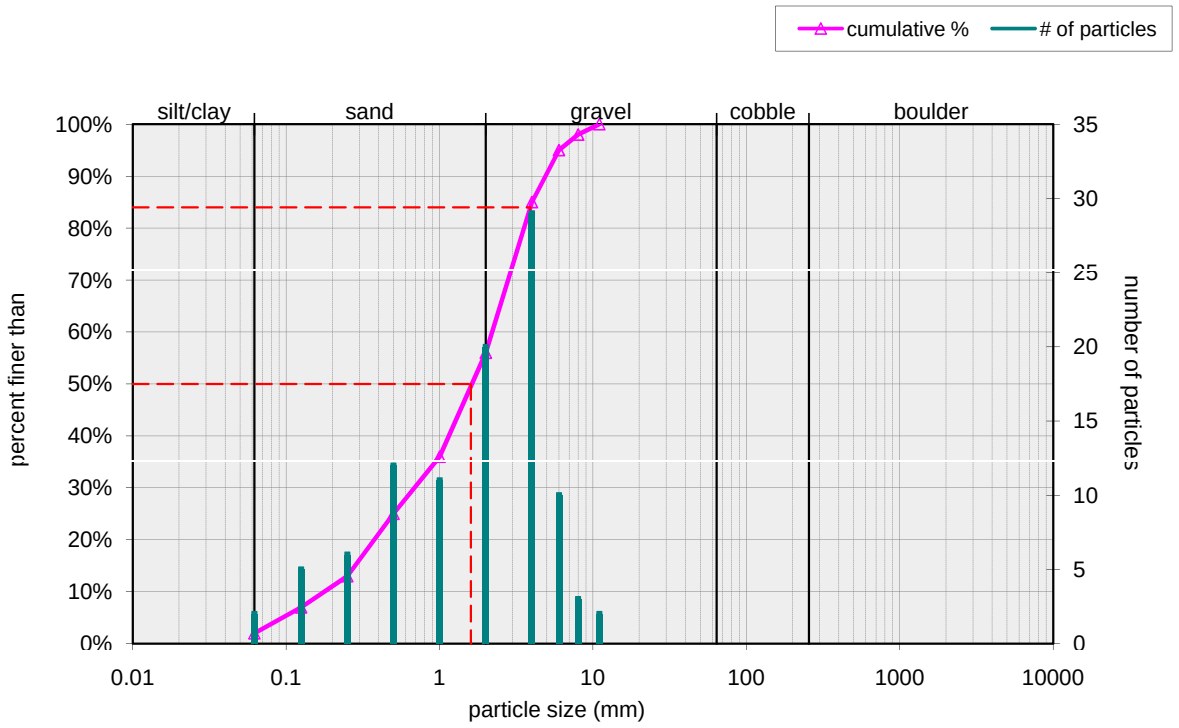
Size Distribution	
mean	0.1
dispersion	2.6
skewness	0.23

Type	
silt/clay	29%
sand	69%
gravel	2%
cobble	0%
boulder	0%

Cross Section 4

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	30
very fine sand	0.062 - 0.125	29
fine sand	0.125 - 0.25	22
medium sand	0.25 - 0.5	13
coarse sand	0.5 - 1	3
very coarse sand	1 - 2	2
very fine gravel	2 - 4	1
fine gravel	4 - 6	
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 4



Size (mm)	
D16	0.062
D35	0.07
D50	0.1
D65	0.15
D84	0.29
D95	0.63

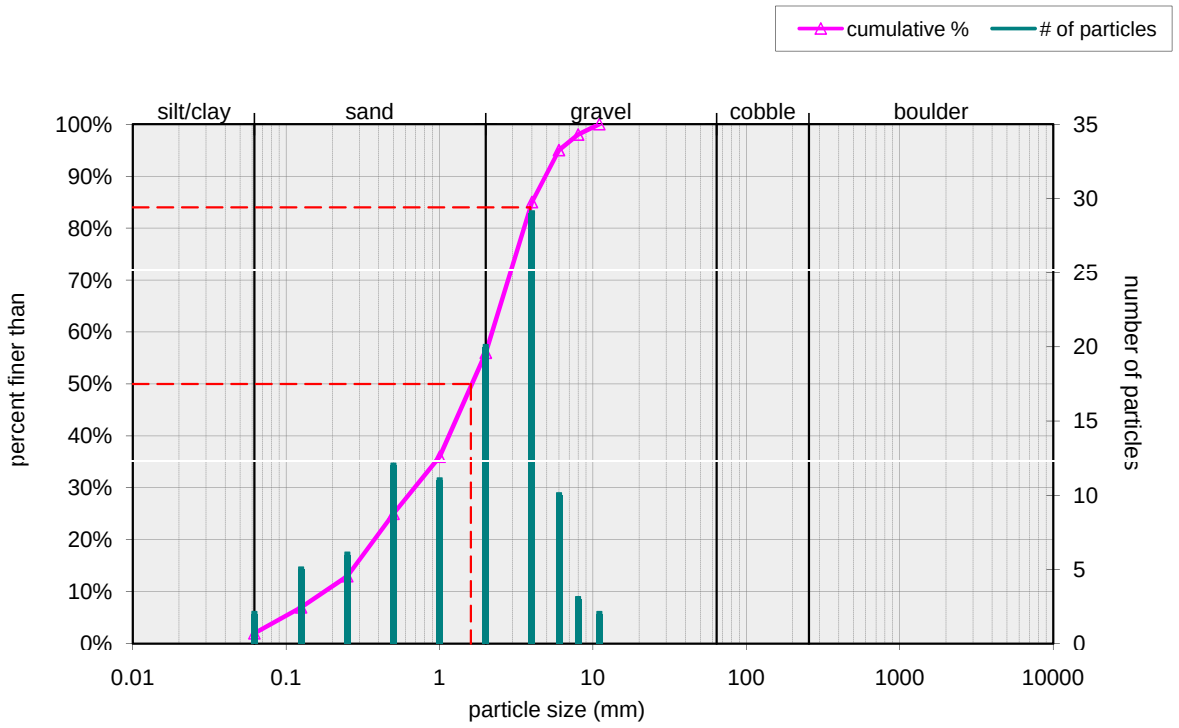
Size Distribution	
mean	0.1
dispersion	2.3
skewness	0.16

Type	
silt/clay	30%
sand	69%
gravel	1%
cobble	0%
boulder	0%

Cross Section 5

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	19
very fine sand	0.062 - 0.125	36
fine sand	0.125 - 0.25	20
medium sand	0.25 - 0.5	12
coarse sand	0.5 - 1	9
very coarse sand	1 - 2	1
very fine gravel	2 - 4	1
fine gravel	4 - 6	1
fine gravel	6 - 8	1
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 5



Size (mm)	
D16	0.062
D35	0.085
D50	0.11
D65	0.18
D84	0.42
D95	0.93

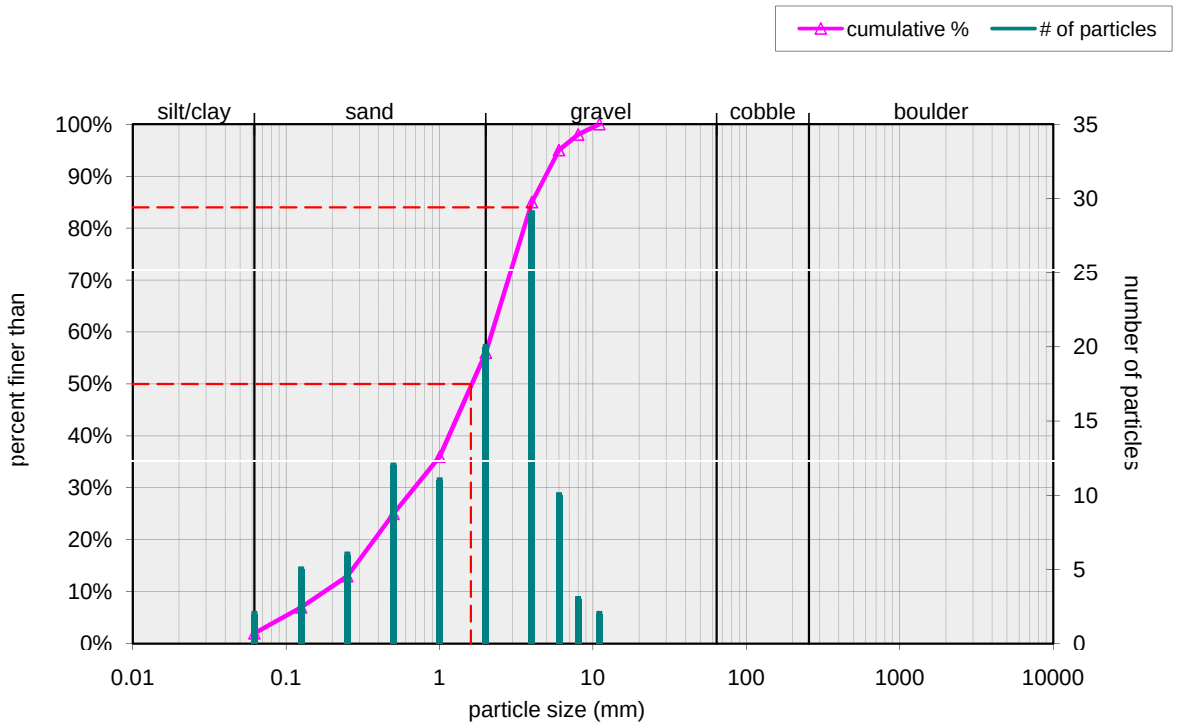
Size Distribution	
mean	0.2
dispersion	2.8
skewness	0.18

Type	
silt/clay	19%
sand	78%
gravel	3%
cobble	0%
boulder	0%

Cross Section 6

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	18
very fine sand	0.062 - 0.125	21
fine sand	0.125 - 0.25	27
medium sand	0.25 - 0.5	20
coarse sand	0.5 - 1	6
very coarse sand	1 - 2	2
very fine gravel	2 - 4	3
fine gravel	4 - 6	0
fine gravel	6 - 8	1
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	98
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	98

Note: Cross Section 6



Size (mm)	
D16	0.062
D35	0.11
D50	0.16
D65	0.24
D84	0.44
D95	1.5

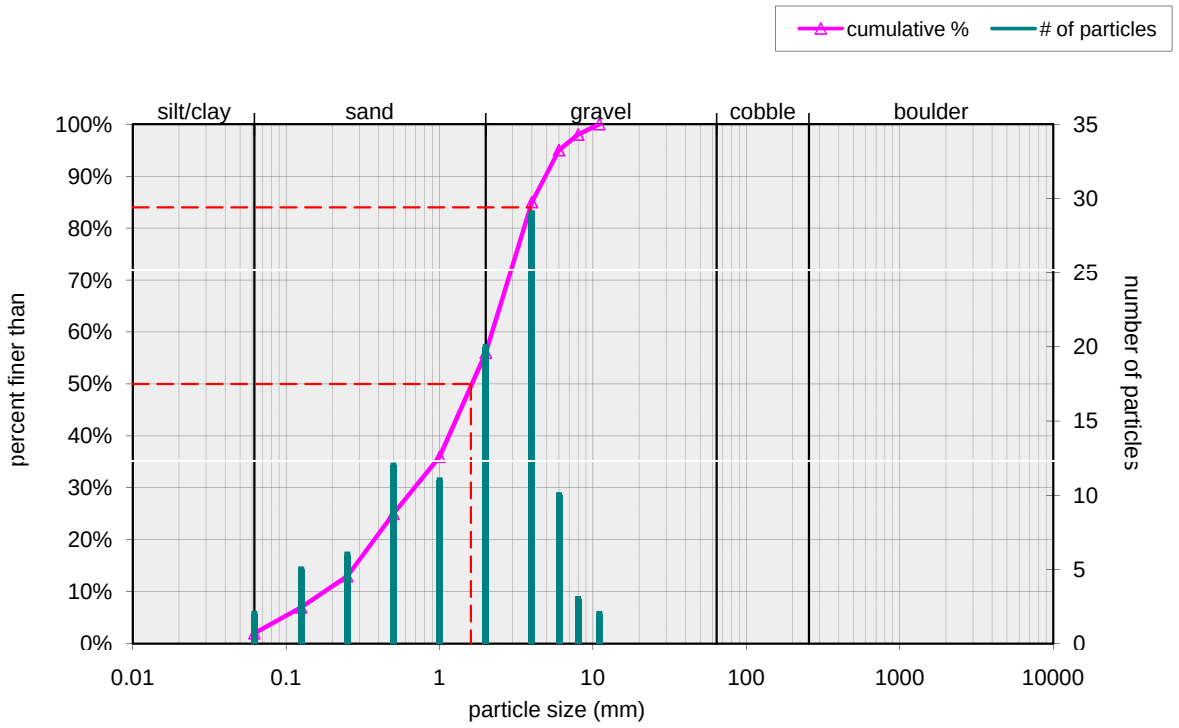
Size Distribution	
mean	0.2
dispersion	2.7
skewness	0.01

Type	
silt/clay	18%
sand	78%
gravel	4%
cobble	0%
boulder	0%

Cross Section 7

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	38
very fine sand	0.062 - 0.125	30
fine sand	0.125 - 0.25	17
medium sand	0.25 - 0.5	9
coarse sand	0.5 - 1	2
very coarse sand	1 - 2	3
very fine gravel	2 - 4	0
fine gravel	4 - 6	0
fine gravel	6 - 8	1
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 7



Size (mm)	
D16	0.062
D35	0.062
D50	0.082
D65	0.12
D84	0.24
D95	0.71

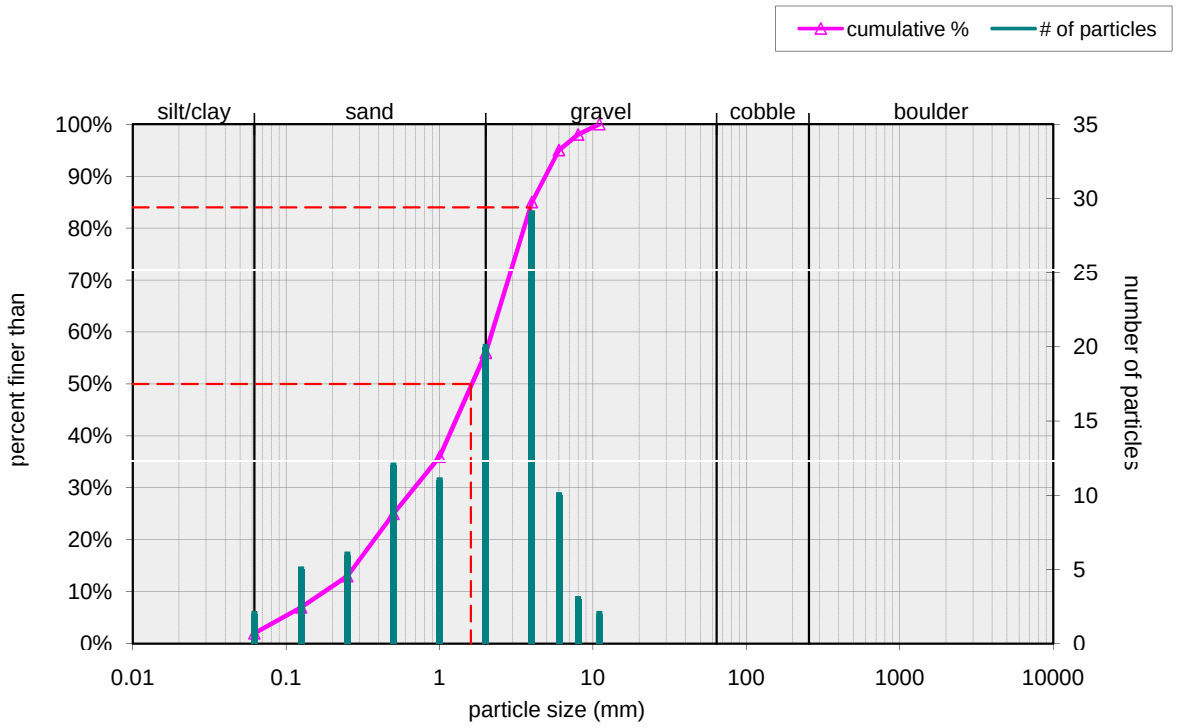
Size Distribution	
mean	0.1
dispersion	2.1
skewness	0.22

Type	
silt/clay	38%
sand	61%
gravel	1%
cobble	0%
boulder	0%

Cross Section 8

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	23
very fine sand	0.062 - 0.125	18
fine sand	0.125 - 0.25	22
medium sand	0.25 - 0.5	21
coarse sand	0.5 - 1	7
very coarse sand	1 - 2	7
very fine gravel	2 - 4	1
fine gravel	4 - 6	1
fine gravel	6 - 8	
medium gravel	8 - 11	
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 8



Size (mm)	
D16	0.062
D35	0.099
D50	0.17
D65	0.27
D84	0.5
D95	1.5

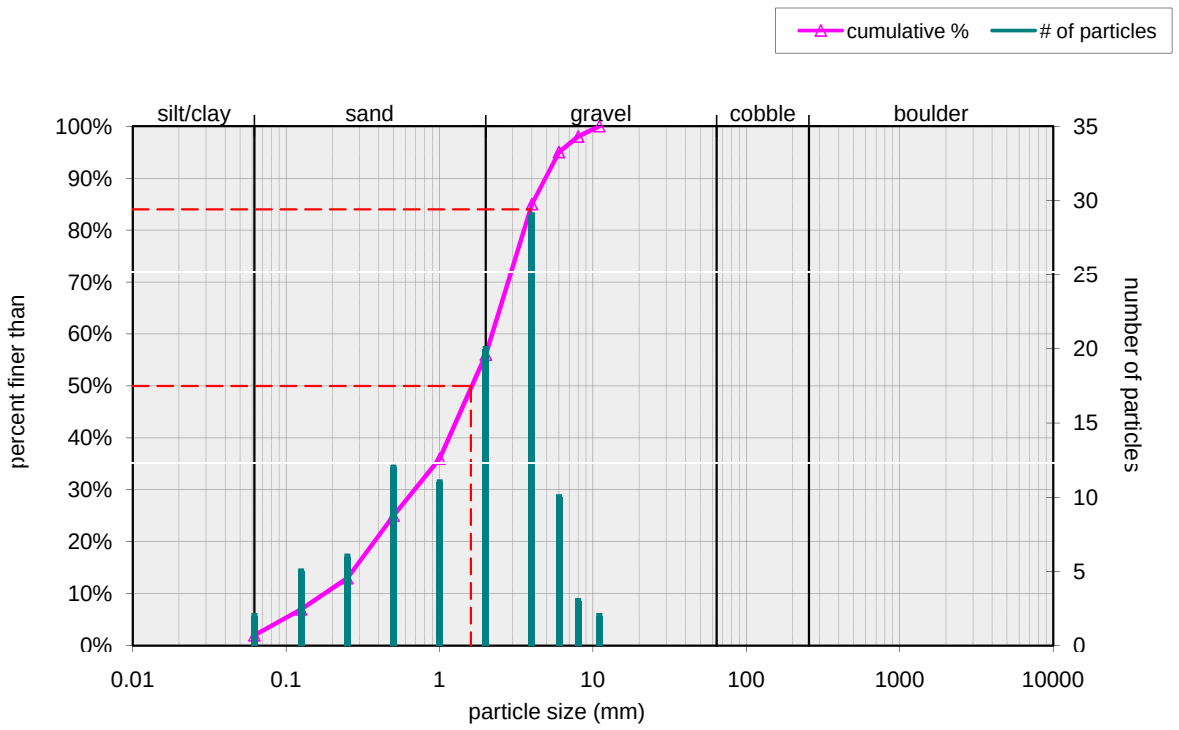
Size Distribution	
mean	0.2
dispersion	2.8
skewness	0.02

Type	
silt/clay	23%
sand	75%
gravel	2%
cobble	0%
boulder	0%

Cross Section 9

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	10
very fine sand	0.062 - 0.125	12
fine sand	0.125 - 0.25	7
medium sand	0.25 - 0.5	6
coarse sand	0.5 - 1	9
very coarse sand	1 - 2	23
very fine gravel	2 - 4	22
fine gravel	4 - 6	9
fine gravel	6 - 8	1
medium gravel	8 - 11	1
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 9



Size (mm)	
D16	0.088
D35	0.5
D50	1.2
D65	1.9
D84	3.4
D95	5.2

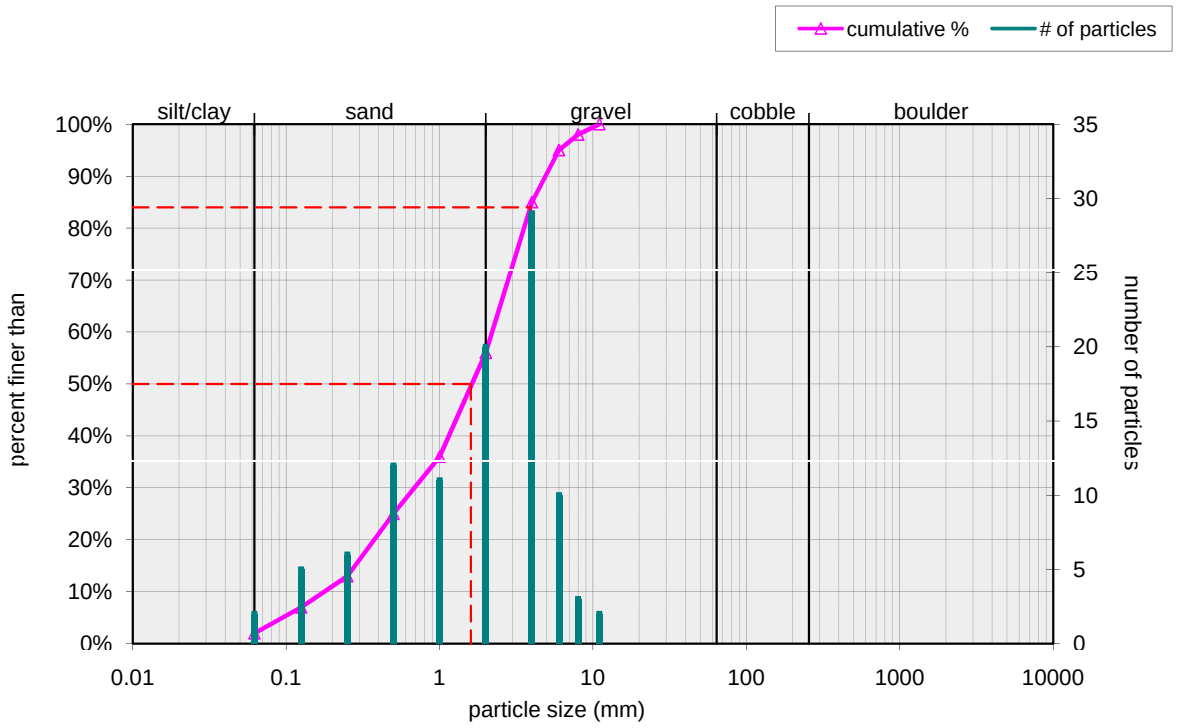
Size Distribution	
mean	0.5
dispersion	8.2
skewness	-0.27

Type	
silt/clay	10%
sand	57%
gravel	33%
cobble	0%
boulder	0%

Cross Section 10

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	3
very fine sand	0.062 - 0.125	2
fine sand	0.125 - 0.25	4
medium sand	0.25 - 0.5	9
coarse sand	0.5 - 1	17
very coarse sand	1 - 2	23
very fine gravel	2 - 4	22
fine gravel	4 - 6	19
fine gravel	6 - 8	0
medium gravel	8 - 11	0
medium gravel	11 - 16	1
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 10



Size (mm)	
D16	0.43
D35	1
D50	1.6
D65	2.5
D84	4.4
D95	5.5

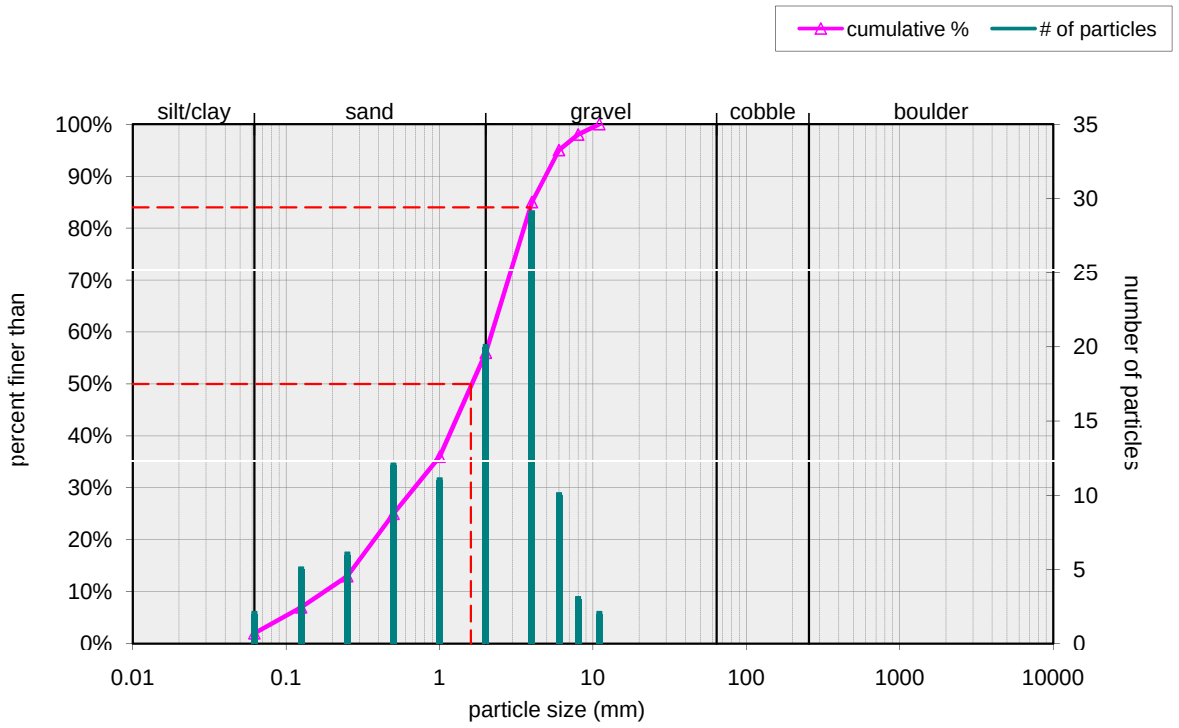
Size Distribution	
mean	1.4
dispersion	3.2
skewness	-0.07

Type	
silt/clay	3%
sand	55%
gravel	42%
cobble	0%
boulder	0%

Cross Section 11

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	7
very fine sand	0.062 - 0.125	4
fine sand	0.125 - 0.25	2
medium sand	0.25 - 0.5	11
coarse sand	0.5 - 1	19
very coarse sand	1 - 2	18
very fine gravel	2 - 4	20
fine gravel	4 - 6	15
fine gravel	6 - 8	2
medium gravel	8 - 11	2
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 11



Size (mm)	
D16	0.3
D35	0.75
D50	1.3
D65	2.3
D84	4.3
D95	5.8

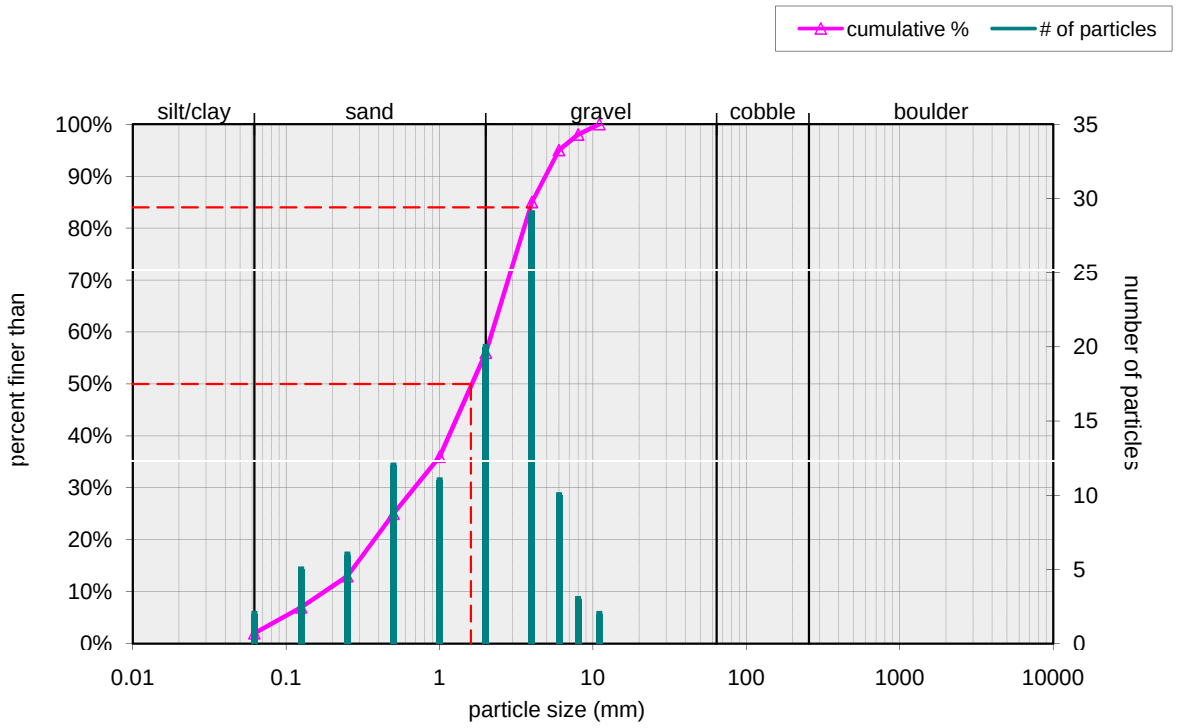
Size Distribution	
mean	1.1
dispersion	3.8
skewness	-0.05

Type	
silt/clay	7%
sand	54%
gravel	39%
cobble	0%
boulder	0%

Cross Section 12

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	7
very fine sand	0.062 - 0.125	13
fine sand	0.125 - 0.25	15
medium sand	0.25 - 0.5	30
coarse sand	0.5 - 1	14
very coarse sand	1 - 2	11
very fine gravel	2 - 4	4
fine gravel	4 - 6	5
fine gravel	6 - 8	0
medium gravel	8 - 11	0
medium gravel	11 - 16	1
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 12



Size (mm)	
D16	0.1
D35	0.25
D50	0.35
D65	0.5
D84	1.4
D95	4.3

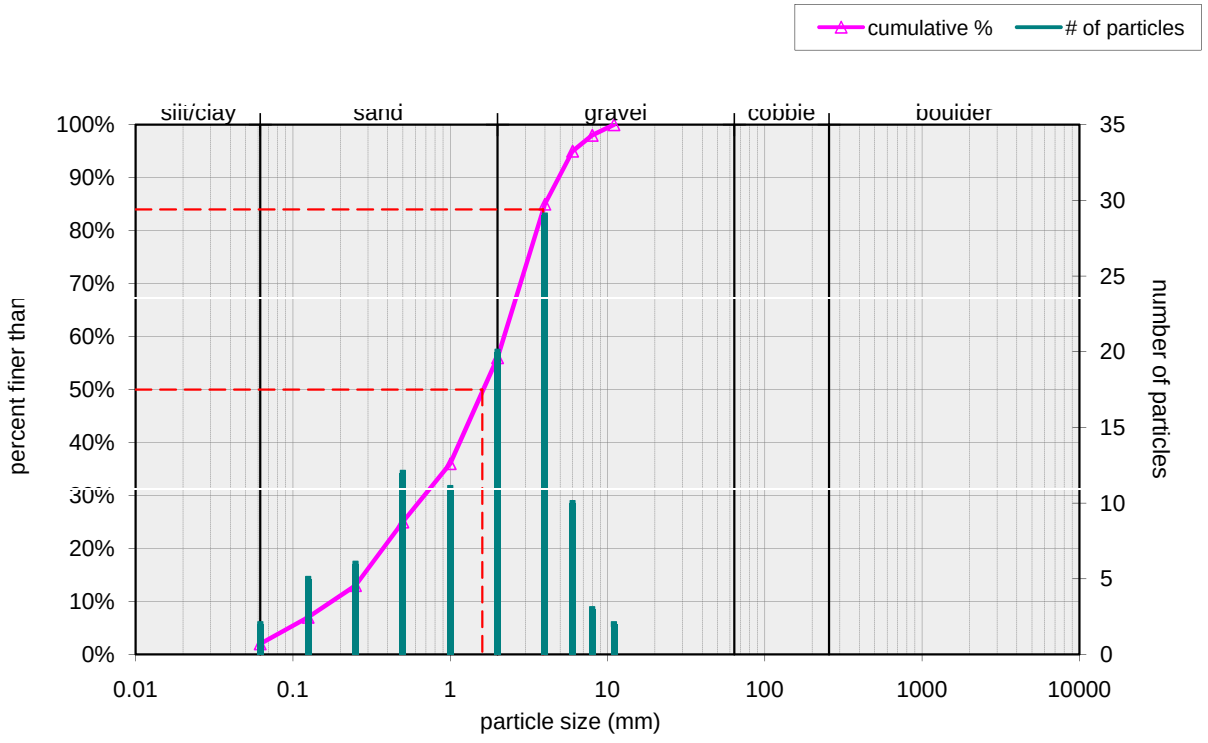
Size Distribution	
mean	0.4
dispersion	3.8
skewness	0.03

Type	
silt/clay	7%
sand	83%
gravel	10%
cobble	0%
boulder	0%

Cross Section 13

Material	Size Range (mm)	Count
silt/clay	0 - 0.062	2
very fine sand	0.062 - 0.125	5
fine sand	0.125 - 0.25	6
medium sand	0.25 - 0.5	12
coarse sand	0.5 - 1	11
very coarse sand	1 - 2	20
very fine gravel	2 - 4	29
fine gravel	4 - 6	10
fine gravel	6 - 8	3
medium gravel	8 - 11	2
medium gravel	11 - 16	
coarse gravel	16 - 22	
coarse gravel	22 - 32	
very coarse gravel	32 - 45	
very coarse gravel	45 - 64	
small cobble	64 - 90	
medium cobble	90 - 128	
large cobble	128 - 180	
very large cobble	180 - 256	
small boulder	256 - 362	
small boulder	362 - 512	
medium boulder	512 - 1024	
large boulder	1024 - 2048	
very large boulder	2048 - 4096	
	total particle count:	100
bedrock	----------	
clay hardpan	----------	
detritus/wood	----------	
artificial	----------	
	total count:	100

Note: Cross Section 13



Size (mm)	
D16	0.3
D35	0.94
D50	1.6
D65	2.5
D84	3.9
D95	6

Size Distribution	
mean	1.1
dispersion	3.9
skewness	-0.16

Type	
silt/clay	2%
sand	54%
gravel	44%
cobble	0%
boulder	0%