UT to Little Hunting Creek (Johnson Site)
Stream Restoration
Project No. 197
2009 Monitoring Report: Year 2 of 5

November 2009 (Revised May 2010)

Prepared for: NCDENR-EEP
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EXECUTIVE SUMMARY

SECTION 1
EXECUTIVE SUMMARY

The unnamed tributary to Little Hunting Creek (UTLHC) Stream Restoration Project (Site) is located west of Harmony Highway (NC 21) and north of Hunting Creek Road (SR 1111) in Iredell County, North Carolina (Appendix 1.1). The Site lies within the 197 acre parcel owned by Mrs. Lottie V. Johnson. UTLHC is a first order perennial stream located in the Northern Inner Piedmont ecoregion in the Yadkin River Basin (USGS HUC 03040102). The stream restoration plan was designed by KCI Associates of North Carolina. Construction and seeding activities were completed in the fall of 2007.

This report serves as the second year of the five year monitoring plan for the Site.

1.1 Goals and Objectives

UTLHC is an active dairy farm with several structures located on the property for housing livestock and storing farm machinery. The primary land uses on the site are dairy operation, rangeland, agriculture (small grain), and forest. A private residence is located on the northeastern section of the property. The following goals and objectives were established for the Site.

Restoration Goals

1. Restore a stable channel that is capable of moving the flows and sediment provided by its watershed.
2. Improve water quality and reduce land and riparian vegetation loss resulting from lateral erosion and bed degradation.
3. Enhance aquatic and terrestrial habitat.

Restoration Objectives

1. Build an appropriate B4c type channel with stable dimensions.
2. Plant a riparian buffer of native trees and shrubs.
3. Install in-stream structures that will promote bed feature diversity and prevent vertical instability.
4. Exclude livestock from the riparian buffer.

The stream was restored by establishing appropriate dimension and profile to 2,209 lf of UTLHC (Restoration, Priority 3) and stabilize in-place approximately 417 linear feet (lf) of UTLHC's tributaries (Stabilization, Priority 4). UTLHC's main channel was designed and constructed as a B4c type channel. The restoration reach was restored using native vegetation and in-stream structures, such as cross-vanes and rock sill grade controls. Riparian areas were planted with native bare root seedlings and herbaceous cover to enhance the riparian areas and stabilize

streambanks. Construction of the restoration project was completed in the fall of 2007. Appendix 2 provides more detailed project activity, history, contact information, and watershed/site background information for this project.

1.2 Vegetative Assessment

The CVS protocol (Level 2) was conducted to assess the vegetation plots for the 2009 monitoring year (MY-2). Vegetative monitoring success criteria as stated in the 2008 mitigation plan requires that planted woody vegetation must meet a minimum survival success rate of 320 stems/acre after three years, 288 stems/acre after four years, and 260 stems/acre after five years (KCI, 2008). Previously, land access issues resulted in the monitoring activities to be postponed during the 2008 calendar year. The first survey opportunity occurred in the month of January 2009 during the vegetative dormant season. Therefore, the 2009 survey is the first year of the CVS vegetation monitoring.

The average survival rate for the live planted woody vegetation monitored for 2009 is 65%. The monitoring data recorded an average of 7 planted live stems per plot. The site density is approximately 283 planted stems per acre, which does not meet the year 1-3 goal of 320 planted stems per acre. Two out of the seven plots (Plots 2 and 3) met the vegetation success threshold for the 2009 monitoring year. Plot 7 would meet the vegetation success threshold with the inclusion of the volunteer species recorded within the plot.

Planted stem mortality within the plots is most likely due to the stress associated with the drought like conditions that occurred throughout North Carolina in 2007 during plant installation; however, it could also be attributed to wildlife grazing. The vigor of the live planted stems within the plots also appears to have been affected by wildlife activity and drought conditions onsite. Approximately 42 percent of the planted stems scored a vigor level lower than 3 including those missing (29%) or dead (8%). Supplemental plantings may be warranted within planted areas along the Site if the planted stems vigor level continues to decline to ensure the site meets vegetation success criteria in monitoring year 5.

In conclusion, the site did not meet the success criterion of 320 stems per acre for the 2009 monitoring year. Please refer to Appendix 1.2 for the Current Condition Plan View (CCPV) and Appendix 3 for vegetation photos and raw data tables.

1.3 Stream Assessment

A total of five cross-sections and 2,156 linear feet of longitudinal profile were monitored within the main reach of UTLHC. The majority of the project conditions reflected the as-built drawings. The following general observations were noted.

- The pattern, profile, and dimension of the restored channel appear stable.
- There are several areas with bare banks due to lack of vegetation growth. One area has resulted in moderate bank erosion (approximate station 10+15 and 15+71).
- All structures appear to be in good condition.

- In-Stream vegetation is common within both sites, which is most likely due to the low flow conditions that were occurring in previous monitoring years.
- Aggradation is evident throughout the reach. However, the downstream reach appears to have heavier deposition occurring than in the upstream reach. This is most likely due to the backwater effects from the main channel of Hunting Creek.
- Nutrient loading is evident throughout the reach, which has resulted in the growth of filamentous algae. This is more prominent in the upper reach near the cattle crossing, where there is some instability along crossing.
- The two (2) tributaries in the upstream reach of the Site appear stable.

Overall, the present stream dimensions in UTLHC appear to be stable. The average bankfull width (9.52 ft) of the surveyed cross-sections is slightly higher than the proposed 8.4 ft, and the average surveyed mean bankfull depth is 1.05 ft compared to the proposed 0.8 ft. The surveyed bankfull widths and depths lead to an average Width/Depth ratio of 9.63. The average riffle entrenchment ratio is 2.09, which is typical of a B-type stream. The substrate analysis illustrates a coarsening trend compared to the 2008 monitoring year; however, the stream was still classified as a B5c.

JJG conducted a longitudinal profile along 2,156 linear feet of UTLHC. The thalweg profile appears to be stable, and was characterized by riffle and pool features. The average water surface slope and the average bankfull slope were very similar for the surveyed reach, 0.0192 and 0.0193, respectively. The surveyed water surface slope was within the proposed range of 0.0100 ft/ft to 0.0220 ft/ft. The profile appears stable and is not showing significant shift in the bed features. Overall, the reach appears to be maintaining vertical and lateral stability with stable structures and moderate in-stream sedimentation.

In conclusion, the site did meet the stream mitigation goals for the 2009 monitoring year. Please refer to Appendix 1.2 for the CCPV and Appendix 4 for morphological plots and raw data tables.

1.4 Annual Monitoring Summary

Overall, the Site did not meet the vegetation success criterion of 320 stems per acre for the 2009 monitoring year, but did meet the stream mitigation goals for monitoring year 2. Planted stem mortality within the plots is most likely due to the drought like conditions that occurred throughout North Carolina in 2007 during plant installation; however, it may also be due to wildlife grazing. Results from the 2009 stream monitoring effort indicate that UTLHC and the two unnamed tributaries are maintaining vertical and lateral stability. The pattern, profile, and dimension of the restored main channel and tributaries appear stable. A few problem areas were observed, such as bare banks degraded cattle crossing, and in-stream vegetation. Although some areas are illustrating bare banks and in-stream vegetation, visual assessments along the channel indicated that there are no major advancements towards instability within the reach. Areas near the cattle crossing will be closely monitored in the upcoming years to for changes in nutrient loading and the stability of the crossing.

It is assumed that one bankfull or greater event occurred within the Site in the 2009 monitoring year. Since a gauge is not located on-site to record bankfull events, the local USGS gauge number 02118500 located on the main channel of Hunting Creek near Harmony, NC, was used to evaluate the recorded significant rainfall events that could have resulted in a bankfull or greater event within the Site (Appendix 4.4).

The background information provided in this report is referenced from the mitigation plan prepared by KCI and Associates (2008). 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.

SECTION 2
METHODOLOGY

SECTION 2
METHODOLOGY

2.1 Methodology

Methods employed for the Site were a combination of those established by standard regulatory guidance and procedure documents as well as previous monitoring reports completed by KCI. Geomorphic and stream assessments were performed following guidelines outlined in the Stream Channel Reference Sites: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration a Natural Channel Design Handbook (Doll et al, 2003). Precipitation data for the bankfull verification was obtained from an off-site resource. Vegetation assessments were performed following the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2006). JJG used the *Flora of the Carolinas, Virginia, Georgia, and surrounding areas* by Alan S. Weakley as the taxonomic standard for vegetation nomenclature for this report. Off-site daily precipitation was obtained from the USGS gauge station number 02118500 on Hunting Creek near Harmony, NC (the closest location offering daily precipitation data) through the following URL.

http://waterdata.usgs.gov/nwis/dv?cb_00060=on&cb_00065=on&cb_00045=on&format=html&begin_date=2008-01-01&end_date=2009-12-31&site_no=02118500&referred_module=sw.

SECTION 3
REFERENCES

SECTION 3
REFERENCES

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E., 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, Cheryl C; Rawlins, C.L.; Potyondy, John P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

KCI Associates of NC. 2008. Johnson Site Stream Restoration Mitigation Plan and As-Built Report (2008). Raleigh, NC.

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 (http://cvs.bio.unc.edu/methods.htm).

Rosgen, D L. 1996. Applied River Morphology. Wildland Hydrology Books, Pagosa Springs, CO.

Weakley, A.S. 2008. *Flora of the Carolinas, Virginia, Georgia, Northern Florida, and Surrounding Areas* (Draft April 2008). University of North Carolina at Chapel Hill: Chapel Hill, NC.

SECTION 4
APPENDICES

Appendix 1 - General Figures and Plan Views

Appendix 2 - General Project Tables

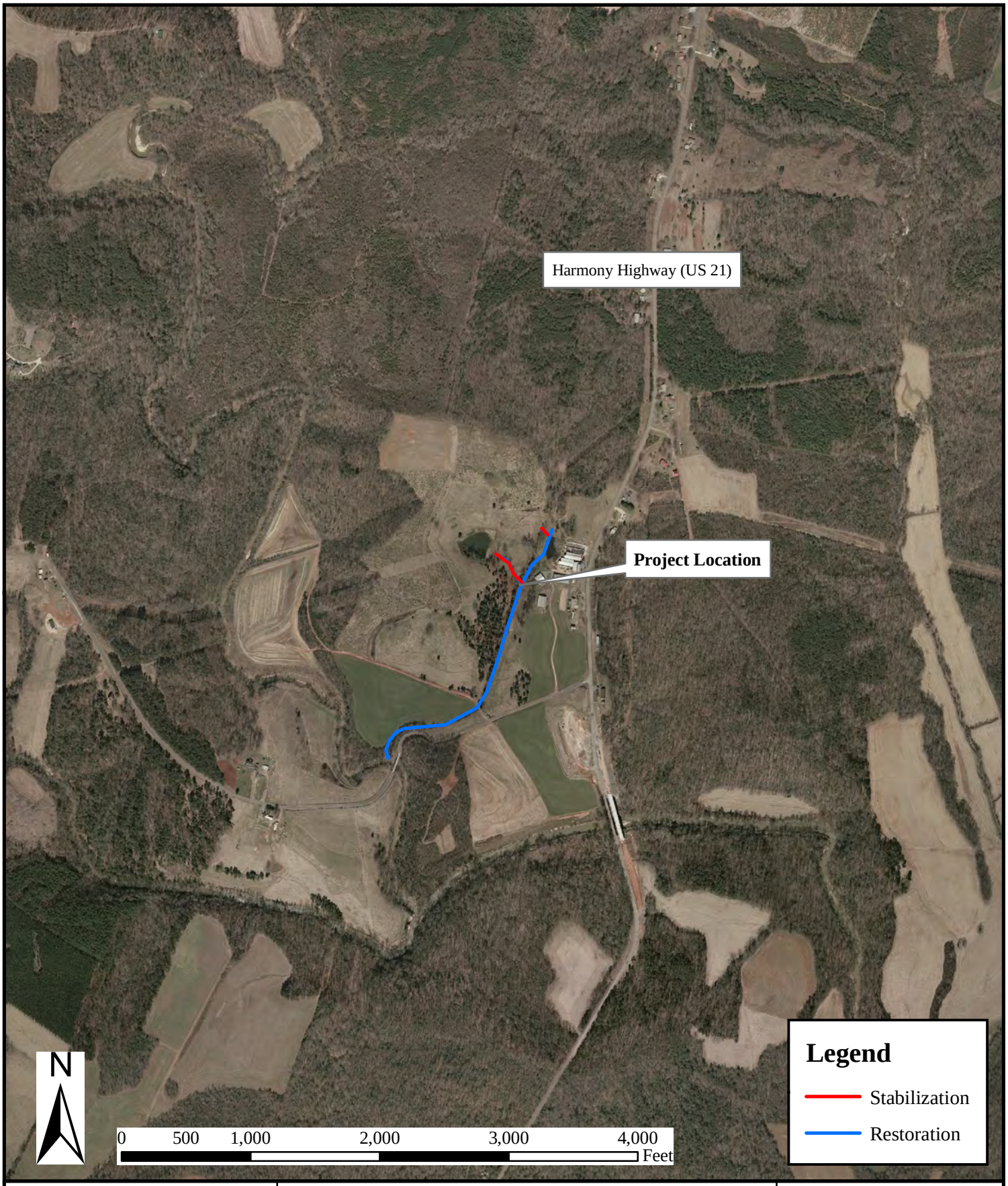
Appendix 3 - Vegetation Assessment Data

Appendix 4 – Stream Assessment Data

APPENDIX 1
GENERAL FIGURES AND PLAN VIEWS

1. Vicinity Map

2. Current Condition Plan View



Ecosystem Enhancement Program

JJG

Appendix 1.1 Vicinity Map
Johnson Site Stream Restoration
Iredell County, NC
Year 2 of 5

Project No. 197
November 2009

Ecosystem Enhancement PROGRAM

NOTES:
1. GENERAL SITE DATA PROVIDED BY NCEEP.
2. ALL LOCATIONS ARE APPROXIMATE.

PROJECT NO. 197
IREDELL COUNTY
NORTH CAROLINA
MONITORING
YEAR 2 of 5

JJG

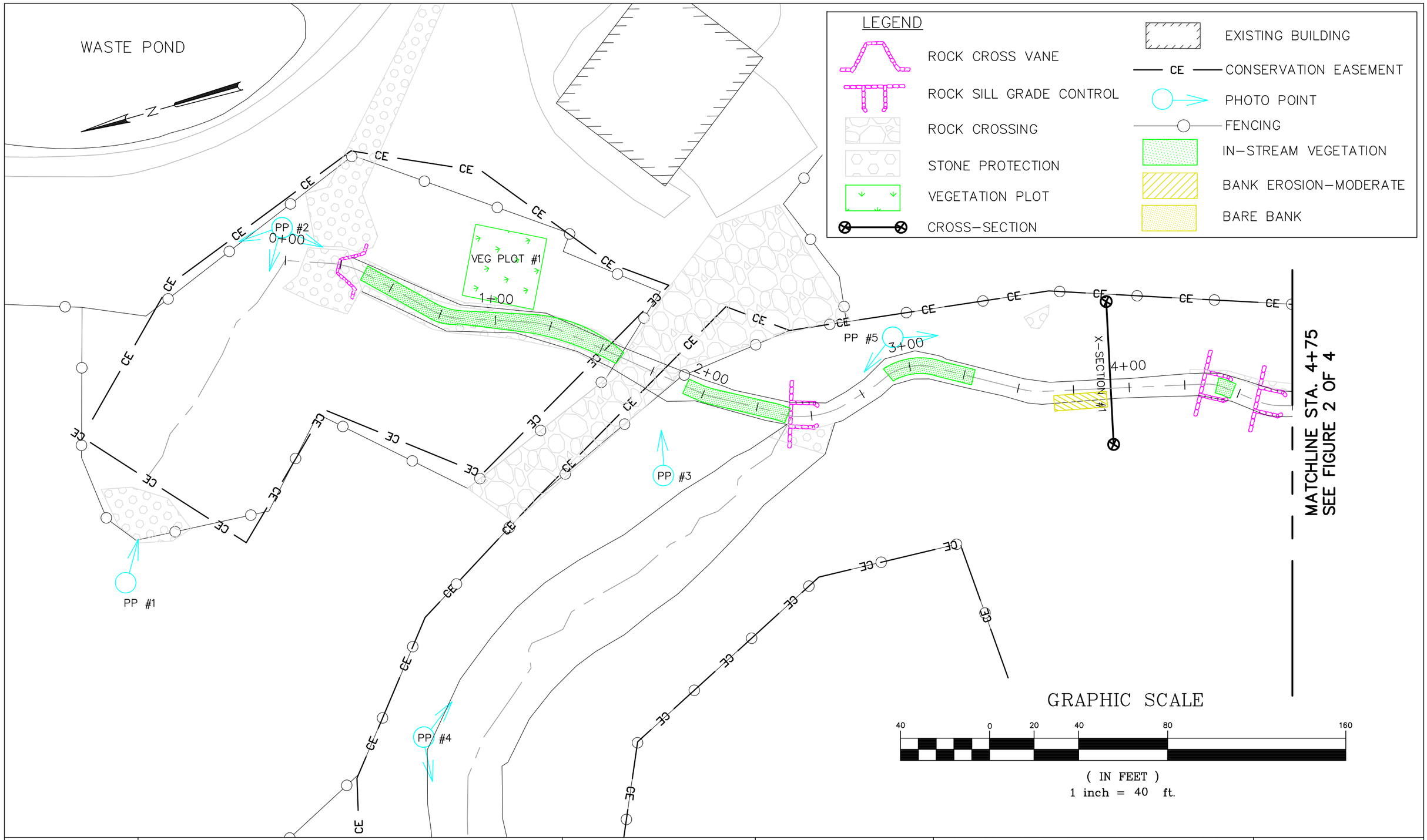
NC ECOSYSTEM ENHANCEMENT PROGRAM
JOHNSON SITE

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009

JOB NO.: 03060005

FIGURE KEY



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PROJECT NO. 197
IREDELL COUNTY
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NC ECOSYSTEM ENHANCEMENT PROGRAM
JOHNSON SITE

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009

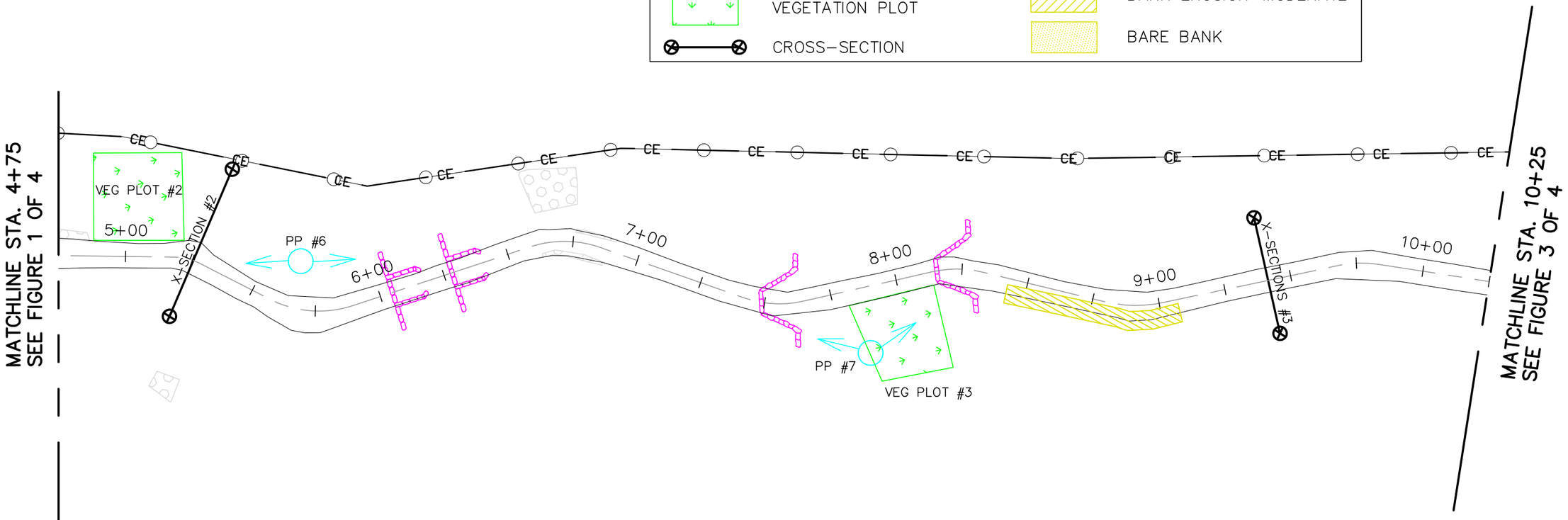
JOB NO.: 03060005

FIGURE 1 OF 4

LEGEND

- ROCK CROSS VANE
- ROCK SILL GRADE CONTROL
- ROCK CROSSING
- STONE PROTECTION
- VEGETATION PLOT
- CROSS-SECTION
- EXISTING BUILDING
- CE — CONSERVATION EASEMENT
- PHOTO POINT
- FENCING
- IN-STREAM VEGETATION
- BANK EROSION-MODERATE
- BARE BANK

N



GRAPHIC SCALE

40 0 20 40 80 160

(IN FEET)
1 inch = 40 ft.

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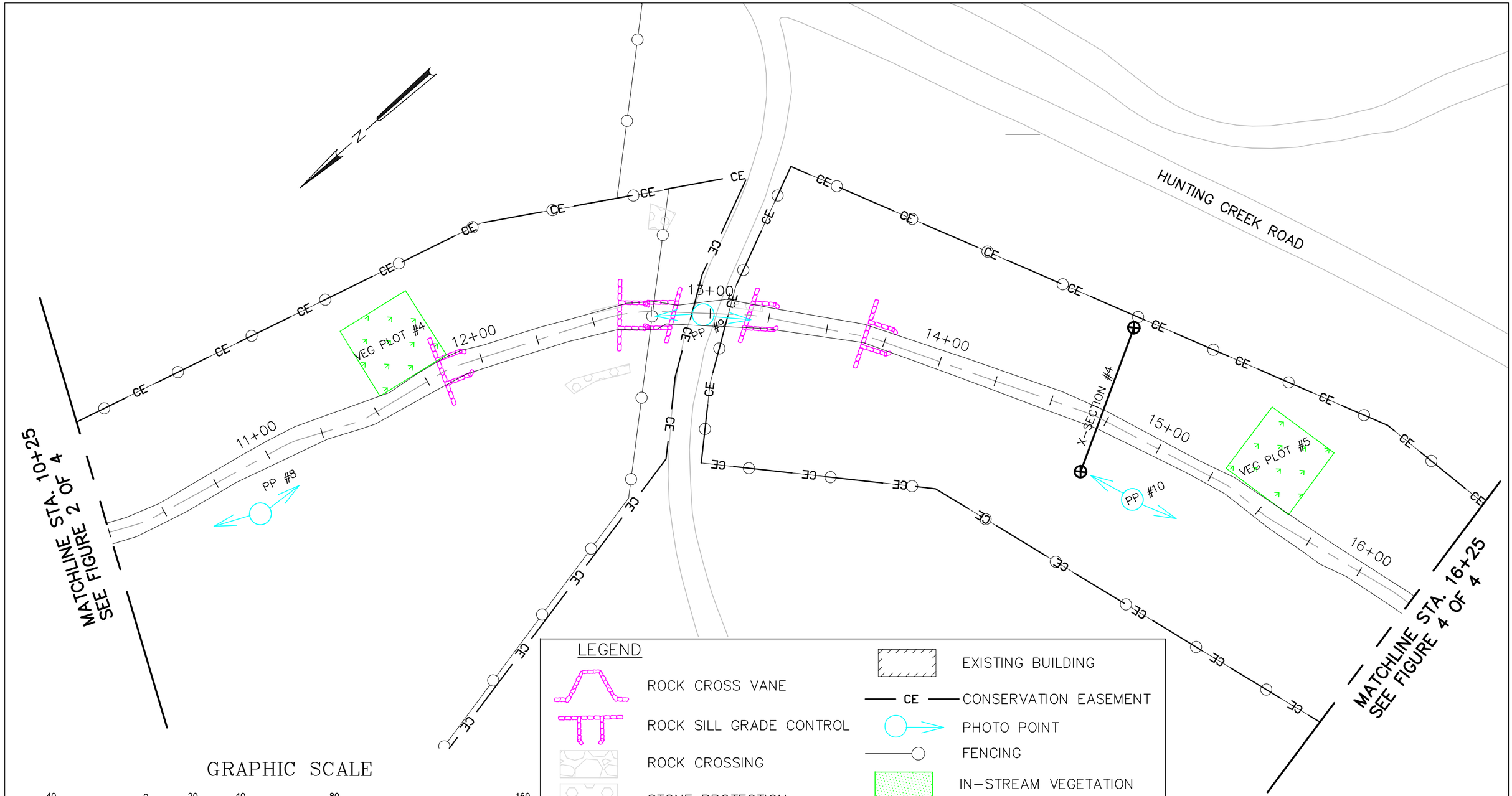
NC ECOSYSTEM ENHANCEMENT PROGRAM
JOHNSON SITE

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009

JOB NO.: 03060005

FIGURE 2 OF 4



LEGEND

- ROCK CROSS VANE
- ROCK SILL GRADE CONTROL
- ROCK CROSSING
- STONE PROTECTION
- VEGETATION PLOT
- CROSS-SECTION
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NORTH CAROLINA
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NC ECOSYSTEM ENHANCEMENT PROGRAM
JOHNSON SITE

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009

JOB NO.: 03060005

FIGURE 3 OF 4

MATCHLINE STA. 16+25
SEE FIGURE 3 OF 4

N

17+00

X-SECTIONS #5

18+00

VEG PLOT #6

HUNTING CREEK ROAD

19+00

20+00

PP #11

PP #12

VEG PLOT #7

21+00

21+58.50

LITTLE HUNTING CREEK

CE

LEGEND

- ROCK CROSS VANE
- ROCK SILL GRADE CONTROL
- ROCK CROSSING
- STONE PROTECTION
- VEGETATION PLOT
- CROSS-SECTION
- EXISTING BUILDING
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GRAPHIC SCALE

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(IN FEET)
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Ecosystem Enhancement PROGRAM

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PROJECT NO. 197
IREDELL COUNTY
NORTH CAROLINA
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JJG

NC ECOSYSTEM ENHANCEMENT PROGRAM
JOHNSON SITE

APPENDIX 1.2
CURRENT CONDITION PLAN VIEW

DATE : NOVEMBER 2009

JOB NO.: 03060005

FIGURE 4 OF 4

APPENDIX 2
GENERAL PROJECT TABLES

1. **Project Restoration Components**
2. **Project Activity and Reporting History**
3. **Project Contacts Table**
4. **Project Attribute Table**

Segment/Reach	Mitigation Type	Approach	Linear Footage or Acres	Stationing (ft)	Comments
UTLHC	Restoration	P3	2,209 lf	10+00-32+09	Channel restoration, established dimension and profile with use of grade control and bank protection structures. Project length includes a 27-foot wide easement exception
UT1	Enhancement	E2	117 lf		Channel stabilization
UT2	Enhancement	E2	300 lf		Channel stabilization

Component Summations

Restoration Level	Stream (lf)	Wetland (ac)		Upland (ac)	Buffer (ac)	BMP
		Riparian	Non-Riparian			
Restoration (R)	2,209	N/A	N/A	N/A	N/A	N/A
Enhancement (E)	N/A	N/A	N/A	N/A	N/A	N/A
Enahncement I (E)	N/A	N/A	N/A	N/A	N/A	N/A
Enhancement II (E)	N/A	N/A	N/A	N/A	N/A	N/A
Creation (C)	N/A	N/A	N/A	N/A	N/A	N/A
Preservation (P)	N/A	N/A	N/A	N/A	N/A	N/A
HQ Preservation (P)	N/A	N/A	N/A	N/A	N/A	N/A
Totals	**2,209**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Activity or Report	Data Collection Completed	Actual Completion or Delivery
Restoration Plan	Nov-05	Feb-06
Final Design-90%	Nov-05	Feb-06
Construction	N/A	Nov-05
Temporary S&E mix applied to entire project area*	N/A	Nov-07
Permanent seed mix applied to reach	N/A	Nov-07
Containerized and B&B plantings for reach	N/A	Dec-07
Mitigation Plan/ As-Built (Year 0 Monitoring)	Dec-07	Jun-08
Year 1 Monitoring	Jan-09	Feb-09
Year 2 Monitoring	Jun-09	Dec-09
Year 3 Monitoring	2010	2010
Year 4 Monitoring	2011	2011
Year 5 Monitoring	2012	2012

*Seed and mulch is added as each section of construction is completed.

Designer	KCI Associates of North Carolina, P.A. Landmark Center II, Suite 220 4601 Six Forks Road Raleigh, NC 27609
Construction	Quartermaster Environmental Inc. P.O. Drawer 400 Shelby, NC 28150
Planting Contractor	Carolina Wetland Services 550 E. Westinghouse Blvd. Charlotte, NC 28273
Seeding Contractor	Quartermaster Environmental Inc. P.O. Drawer 400 Shelby, NC 28150
Monitoring Performers	Jordan, Jones & Goulding 9101 Southern Pine Blvd., Suite 160 Charlotte, NC 28273
Stream Monitoring, POC	Kirsten Young, 704-527-4106 ext.246
Vegetation Monitoring, POC	

Appendix 2.3 Project Contacts Table
Johnson Site Stream and Restoration
Year 2 of 5

Project County	Iredell County, North Carolina
Drainage Area – UTLHC	0.17 sq. mi
UT1	>0.016 sq. mi
UT2	>0.016 sq. mi
Drainage impervious cover estimate	3%
Stream Order – UTLHC	1st
UT1	Intermittent-1st
UT2	Pond Overflow Swale-1st
Physiographic Region	Piedmont
Ecoregion	Northern Inner Piedmont
Rosgen Classification of As-built – UTLHC	B4c
UT1	N/A
UT2	N/A
Dominant soil types	Chewalca, Colfax Sandy Loam, Various Cecil Series
Reference site ID	UT to Fisher River
USGS HUC	3040102
NCDWQ Sub-basin for Project and Reference	03-07-06
NCDWQ classification for Project and Reference	WS-III
Any portion of any project segment 303d list?	No
Any portion of any project segment upstream of a 303d listed segment?	Yes, South Yadkin River
Reason for 303d listing or stressor?	Turbidity
% of project easement fenced?	100%

APPENDIX 3
VEGETATION ASSESSMENT DATA

1. **Vegetation Plot Mitigation Success**

2. **Vegetation Monitoring Plot Photos**

3. **Vegetation Plot Summary Data Table**

Vegetation Plot ID	Vegetation Survival Threshold Met (Y/N)	% survivability
Plot 1	N	55%
Plot 2	Y	100%
Plot 3	Y	82%
Plot 4	N	44%
Plot 5	N	75%
Plot 6	N	50%
Plot 7	N	47%

Monitoring Plot 1 (6/2009)

Monitoring Plot 2 (6/2009)

Monitoring Plot 3 (6/2009)

Monitoring Plot 4 (6/2009)

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	Appendix 3.2 Vegetation Monitoring Plot Photos	

Monitoring Plot 5 (6/2009)

Monitoring Plot 6 (6/2009)

Monitoring Plot 7 (6/2009)

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	Appendix 3.2 Vegetation Monitoring Plot Photos	

Johnson Site
Stem Counts for Planted Species

			Current Data (MY2-2009)														Annual Means			
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Current Mean		MY1 - 2007	
Species	**Common Name**	**Type**	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer negundo	box elder			1												1	**N/A**	**1**		
Betula nigra	river birch	T	1	1	1	1	1	1			1	1				1	**1**	**1**		
Cornus amomum	silky dogwood	S	1	1	3	3	3	3	2	2	2	2	2	2			**2**	**2**		
Fraxinus pennsylvanica	green ash	T	2	2	1	1	1	1	1	1			1	1	1	1	**1**	**1**	*	
Liriodendron tulipifera	tuliptree	T	1	2	2	2	1	1									**1**	**2**		
Platanus occidentalis	american sycamore	T					2	2	1	1	2	2			1	1	**2**	**2**		
Quercus falcata	southern red oak	T			2	2	1	1					1	1	4	4	**2**	**2**		
Unknown		T	1	1	2	2					1	1	2	2	1	2	**1**	**2**		
	Plot Area (acres)		**0.0247**																	
	Species Count		**5**	**5**	**6**	**6**	**6**	**6**	**3**	**3**	**4**	**4**	**4**	**4**	**4**	**5**	**7**	**7**		
	Stem Count		**6**	**7**	**11**	**11**	**9**	**9**	**4**	**4**	**6**	**6**	**6**	**6**	**7**	**9**	**11**	**11**	*	
	Stems per Acre		**243**	**283**	**445**	**445**	**364**	**364**	**162**	**162**	**243**	**243**	**243**	**243**	**283**	**364**	**283**	**301**		

Type=**S**hrub or **T**ree
P = Planted
T = Total
*Data was not collected in MY1 due to land access issues

Johnson Site

Vigor by Species

	Species	CommonName	4	3	2	1	0	Missing	Unknown
	Betula nigra	river birch		4				3	
	Cornus amomum	silky dogwood	5	6	2		1	2	
	Fraxinus pennsylvanica	green ash	2	5				1	
	Quercus falcata	southern red oak	4	2	2		2	4	
	Liriodendron tulipifera	tuliptree		4			3	3	
	Platanus occidentalis	American sycamore	2	4				3	
	Acer negundo	boxelder							
	Unknown	unknown	3	4				6	
TOTAL:	**8**	**8**	**16**	**29**	**4**		**6**	**22**	

APPENDIX 4
STREAM ASSESSMENT DATA

1. **Stream Station Photos**
2. **Stream Cross-Section Photos**
3. **Qualitative Visual Stability Assessment**
4. **Verification of Bankfull Events**
5. **Cross-Section Plots and Raw Data Tables***
6. **Longitudinal Plots and Raw Data Tables***
7. **Pebble Count Plots and Raw Data Tables***

*Raw data tables have been provided electronically.

Photo Point 1-View Downstream
Main Channel (6/2009)

Photo Point 2-View Upstream
Tributary (6/2009)

Photo Point 2-View Upstream
Main Channel (6/2009)

Photo Point 2-View Downstream
Main Channel (6/2009)

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Photo Point 3-View Upstream
Main Channel (6/2009)

Photo Point 4-View Upstream
Tributary (6/2009)

Photo Point 4-View Downstream
Tributary (6/2009)

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	Appendix 4.1 Stream Station Photos	

Photo Point 5-View Upstream
Main Channel (6/2009)

Photo Point 5-View Downstream
Main Channel (6/2009)

Photo Point 6-View Upstream
Main Channel (6/2009)

Photo Point 6-View Downstream
Main Channel (6/2009)

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	Appendix 4.1 Stream Station Photos	

Photo Point 7-View Upstream
Main Channel (6/2009)

Photo Point 7-View Downstream
Main Channel (6/2009)

Photo Point 8-View Upstream
Main Channel (6/2009)

Photo Point 8-View Downstream
Main Channel (6/2009)

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	Appendix 4.1 Stream Station Photos	

Photo Point 9-View Upstream
Main Channel (6/2009)

Photo Point 9-View Downstream
Main Channel (6/2009)

Photo Point 10-View Upstream
Main Channel (6/2009)

Photo Point 10-View Downstream
Main Channel (6/2009)

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	Appendix 4.1 Stream Station Photos	

Photo Point 11-View Upstream
Main Channel (6/2009)

Photo Point 11-View Downstream
Main Channel (6/2009)

Photo Point 12-View Upstream
Main Channel (6/2009)

Photo Point 12-View Downstream
Main Channel (6/2009)

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	Appendix 4.1 Stream Station Photos	

Cross-Section 1-View Upstream (6/2009)

Cross-Section 1-View Downstream (6/2009)

Cross-Section 2-View Upstream (6/2009)

Cross-Section 2-View Downstream (6/2009)

Prepared For:	Johnson Site Stream Restoration Year 2 of 5	Date: November 2009 Project No.: 197
	Appendix 4.2 Stream Cross-Section Photos	

Cross-Section 3-View Upstream (6/2009)

Cross-Section 3-View Downstream (6/2009)

Cross-Section 4-View Upstream (6/2009)

Cross-Section 4-View Downstream (6/2009)

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	Appendix 4.2 Stream Cross-Section Photos	JJG

Cross-Section 5-View Upstream (6/2009)

Cross-Section 5-View Downstream (6/2009)

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	Appendix 4.2 Stream Cross-Section Photos	

Johnson Site-2,209 linear feet

Feature Category		(# Stable) Number Performing as Intended	Total Number assessed per As-built survey	Total Number/ feet in unstable state	% Perform in Stable Condition	Feature Perform Mean or Total
A. Riffles	1. Present?	29	32	N/A	91%	**85%**
	2. Armor Stable?	29			91%	
	3. Facet grade appears stable?	29			91%	
	4. Minimal evidence of embedding/fining?	20			63%	
	5. Length appropriate?	29			91%	
B. Pools	1. Present?	17	22	N/A	77%	**77%**
	2. Sufficiently deep?	17			77%	
	3. Length Appropriate?	17			77%	
C. Thalweg	1. Upstream of meander bend centering?	22	22	N/A	100%	**100%**
	2. Downstream of meander centering?	22			100%	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	22	22	N/A	100%	**100%**
	2. Of those eroding, # w/concomitant point bar formation?	22			100%	
	3. Apparent Rc within spec?	22			100%	
	4. Sufficient floodplain access and relief?	22			100%	
E. Bed General	1. General channel bed aggradation areas (bar formation)?	N/A		0*	70%	**85%**
	2. Channel bed degradation - areas of increasing down-cutting or head cutting?			0	100%	
F. Bank	1. Actively eroding, wasting, or slumping bank	N/A		0	100%	**100%**
G. Vanes	1. Free of back or arm scour?	11	11	N/A	100%	**100%**
	2. Height appropriate?	11			100%	
	3. Angle and geometry appear appropriate?	11			100%	
	4. Free of piping or other structural failures?	11			100%	
H. Wads/ Boulders	1. Free of scour?	2	2	N/A	100%	**100%**
	2. Footing stable?	2			100%	

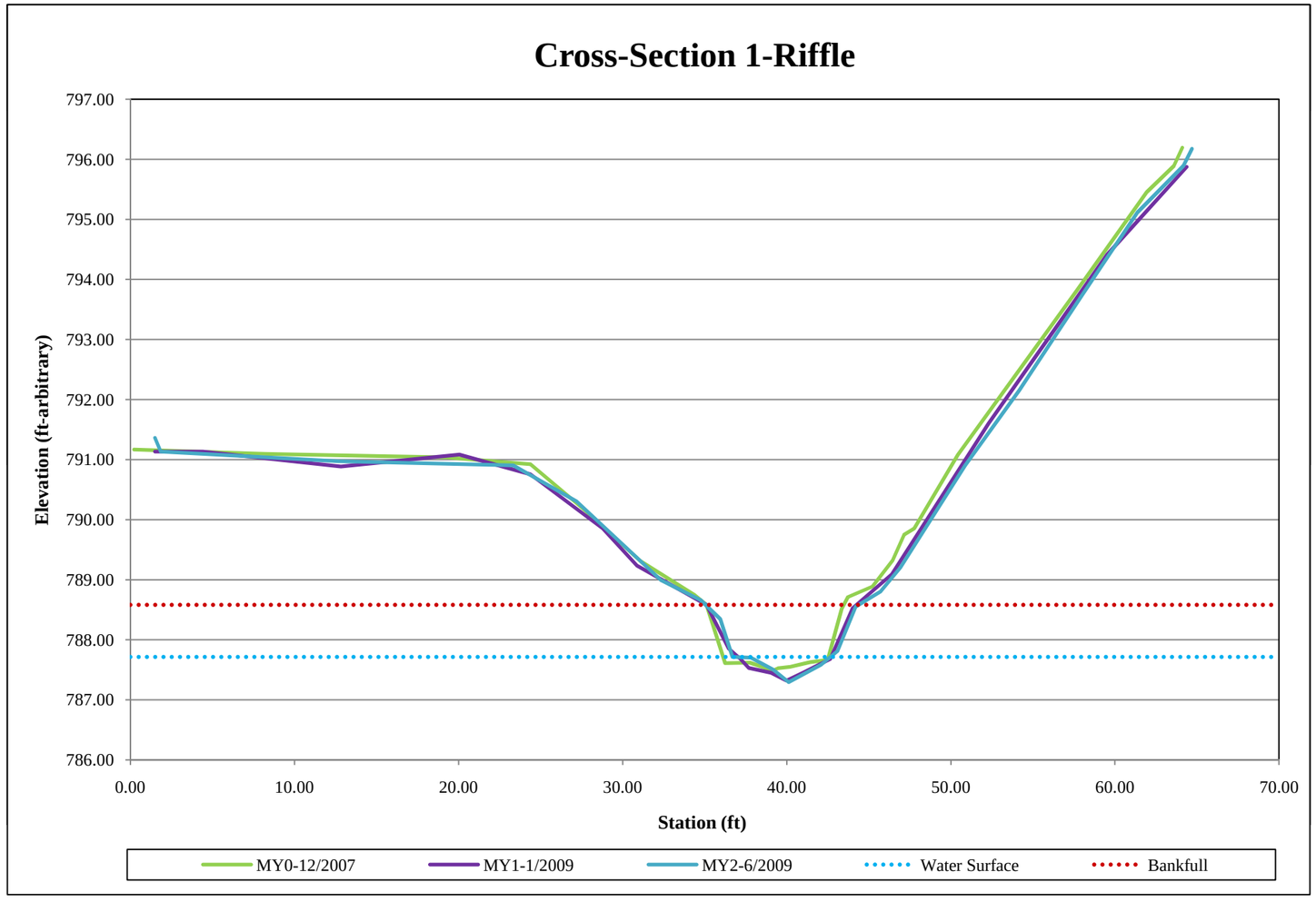
*Aggradation is occurring in isolated reaches along the channel, JJG has estimated through visual assessments that approximately 70% of the site is affected by in-stream sedimentation.

Date of Collection	Date of Occurrence	Method	Photo # (if available)
Unknown 2008	Unknown	Land Owner Confirmation	N/A
2009	Unknown	USGS Data	N/A

Date of Rainfall	Amount (inches)	USGS Approved (A) or Provisional (P)
8/26/2008	1.6	A
8/27/2008	2.96	A
12/10/2008	1.06	P
12/11/2008	2.04	P
1/6/2009-1/7/2009	2.55	A
6/3/2009-6/5/2009	4.59	P

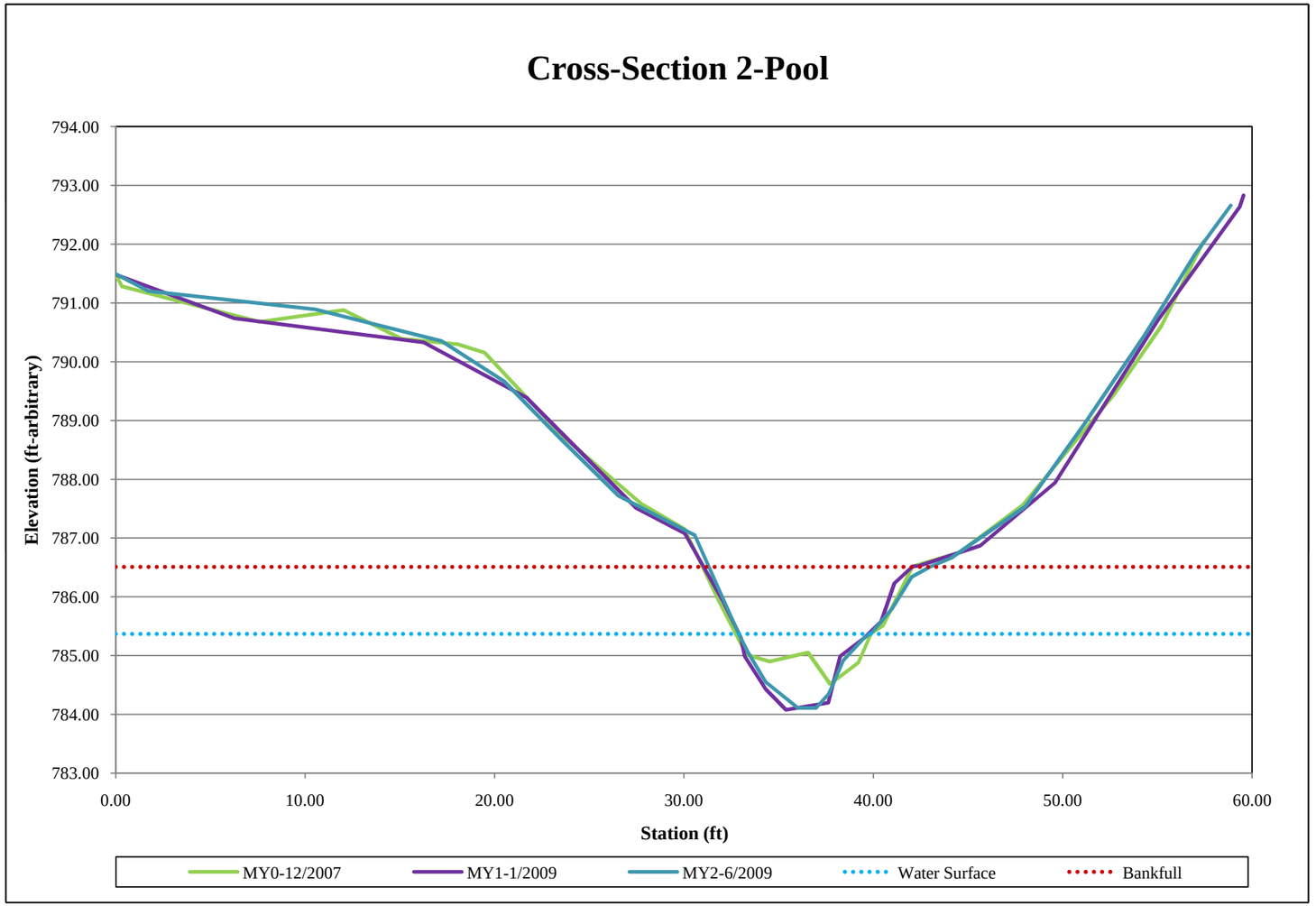
Project Name: Johnson Site		
Cross-Section: 1		
Feature: Riffle		
6/2009		
Station	**Elevation**	**Notes**
1.50	791.36	x1-lpt
1.84	791.13	x1
12.69	790.97	x1
23.33	790.90	x1
27.19	790.30	x1
32.33	788.99	x1
34.75	788.66	x1
35.95	788.34	x1
36.69	787.71	x1-lw
37.81	787.70	x1
39.16	787.50	x1
40.12	787.29	x1
42.09	787.58	x1
43.09	787.71	x1-rw
44.20	788.55	x1
45.71	788.80	x1
46.93	789.20	x1
50.87	790.90	x1
54.18	792.15	x1
58.03	793.75	x1
61.36	795.11	x1
64.17	795.89	x1
64.69	796.17	x1-rpt

Summary Data	
Bankfull Cross-sectional Area (ft^2)	7.27
Bankfull Width (ft)	9.04
Bankfull Mean Depth (ft)	0.80
Bankfull Max Depth (ft)	1.26
Width/Depth Ratio	11.30
Entrenchment Ratio	2.13



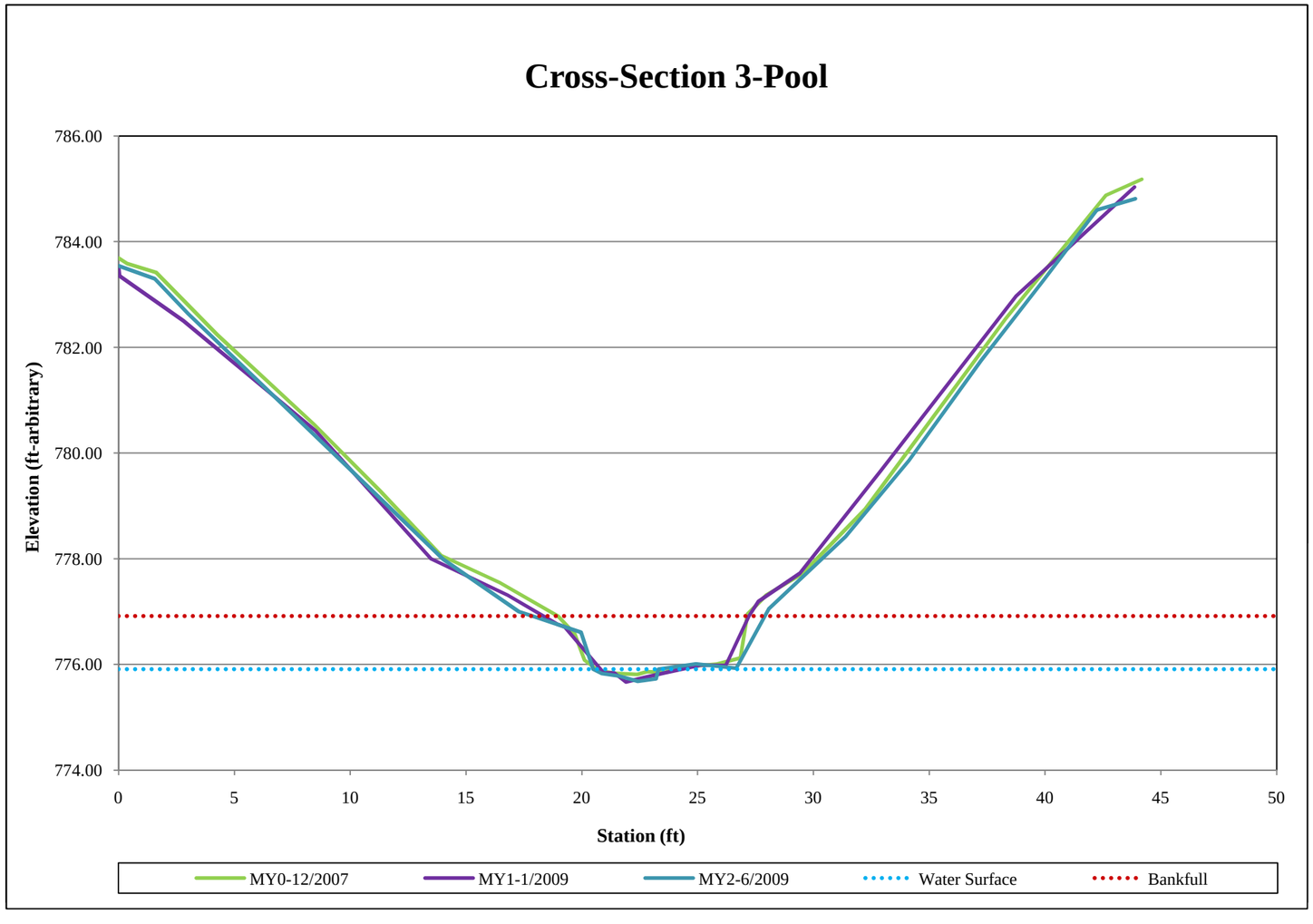
Project Name: Johnson Site		
Cross-Section: 2		
Feature: Pool		
6/2009		
Station	**Elevation**	**Notes**
0	791.49	x2-lpt
1.73	791.2	x2
10.54	790.89	x2
17.2	790.35	x2
20.5	789.67	x2
23.58	788.66	x2
26.55	787.72	x2
30.58	787.05	x2
31.8	786.16	x2
32.9	785.37	x2-lw
33.38	785.06	x2
34.32	784.55	x2
36.02	784.11	x2
36.98	784.11	x2
37.65	784.35	x2
38.42	784.92	x2
39.48	785.37	x2-rw
39.94	785.4	x2
40.99	785.8	x2
42.03	786.34	x2
42.99	786.51	x2
44.11	786.66	x2
48.04	787.54	x2
51.11	788.92	x2
54.3	790.44	x2
57.01	791.84	x2
58.88	792.66	x2
59.36	792.83	x2-rpt

Summary Data	
Bankfull Cross-sectional Area (ft^2)	15.63
Bankfull Width (ft)	11.67
Bankfull Mean Depth (ft)	1.34
Bankfull Max Depth (ft)	2.40
Width/Depth Ratio	8.71
Entrenchment Ratio	N/A



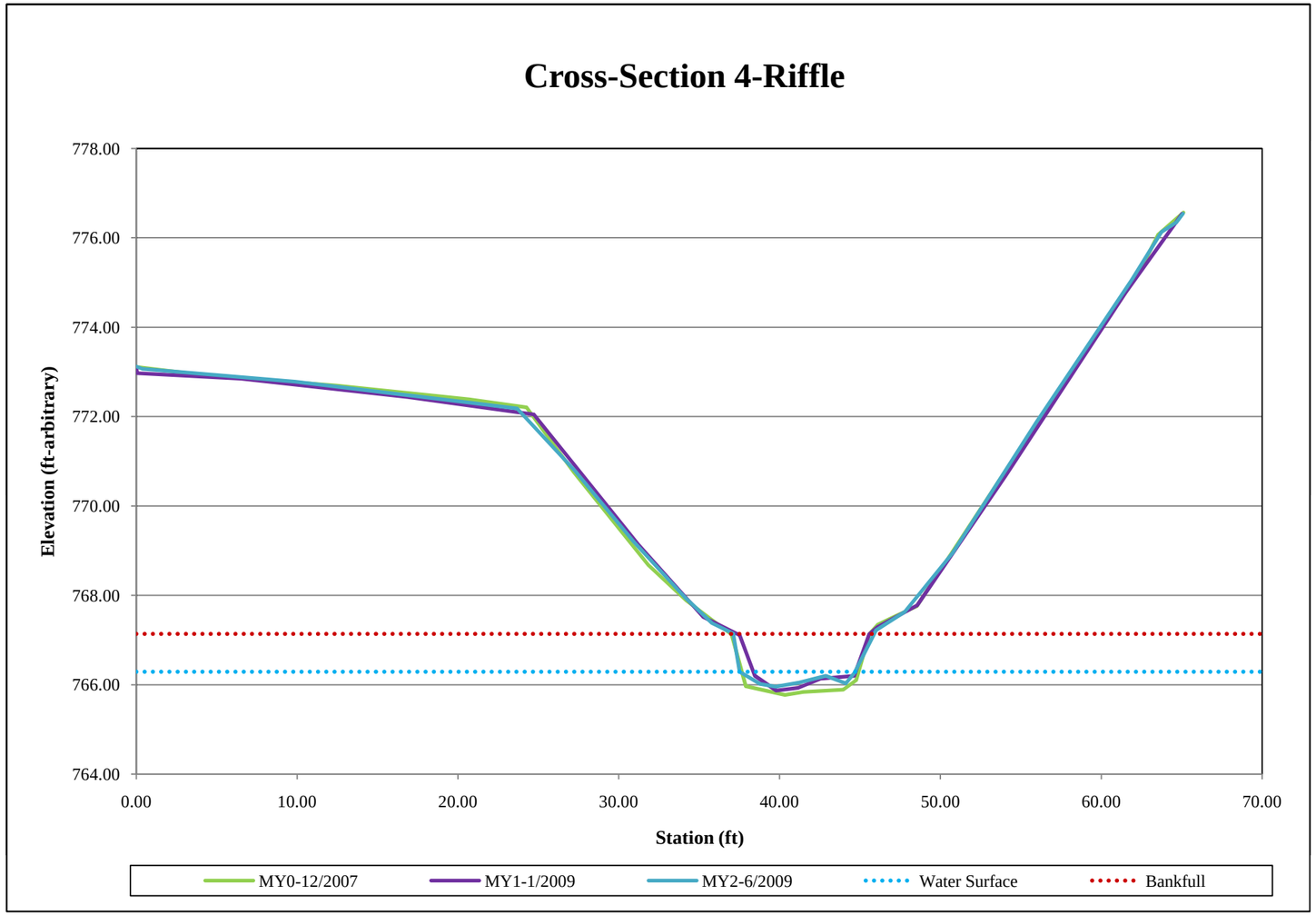
Project Name: Johnson Site		
Cross-Section: 3		
Feature: Pool		
6/2009		
Station	**Elevation**	**Notes**
0.00	783.54	x3-lpt
1.55	783.3	x3
3.01	782.63	x3
9.69	779.82	x3
14.01	777.99	x3
17.28	777	x3
17.90	776.91	x3-b
19.96	776.61	x3
20.49	775.91	x3-lw
20.86	775.83	x3
21.62	775.78	x3
22.42	775.68	x3
23.21	775.73	x3
23.31	775.91	x3-rw
24.93	776.01	x3
26.67	775.93	x3
28.07	777.05	x3
31.39	778.42	x3
34.12	779.86	x3
37.25	781.75	x3
39.96	783.28	x3
42.24	784.6	x3
43.9	784.81	x3
44.17	785.03	x3-rpt

Summary Data	
Bankfull Cross-sectional Area (ft^2)	7.66
Bankfull Width (ft)	10.00
Bankfull Mean Depth (ft)	0.77
Bankfull Max Depth (ft)	1.23
Width/Depth Ratio	12.99
Entrenchment Ratio	N/A



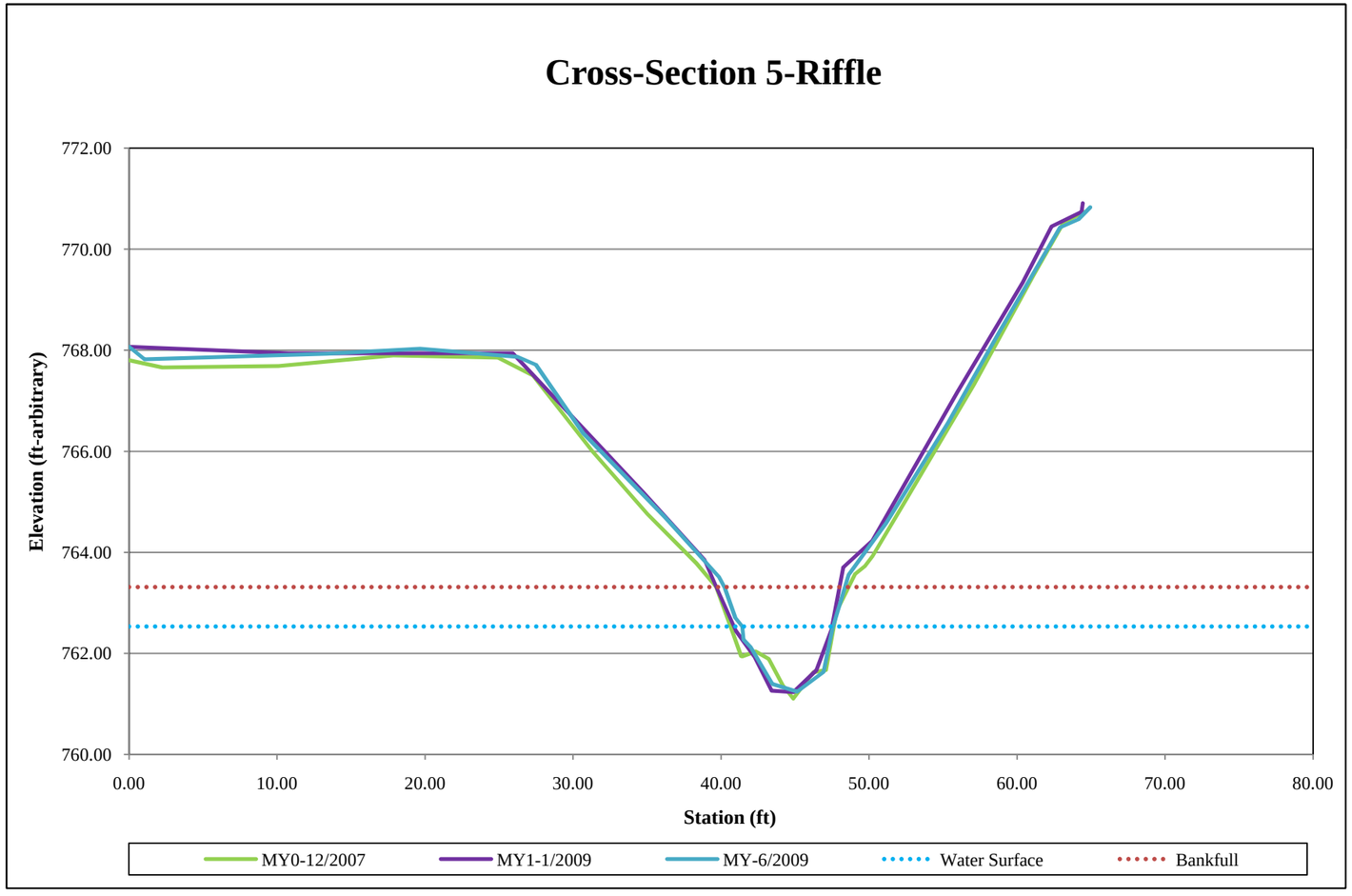
Project Name: Johnson Site		
Cross-Section: 4		
Feature: Riffle		
6/2009		
Station	**Elevation**	**Notes**
0.00	773.12	x4-lpt
0.37	773.07	x4
9.88	772.78	x4
20.80	772.31	x4
23.68	772.18	x4
27.28	770.79	x4
30.91	769.21	x4
34.11	767.96	x4
35.81	767.38	x4
37.12	767.15	x4
37.51	766.29	x4-lw
38.78	766.02	x4
39.76	765.96	x4
41.22	766.05	x4
42.86	766.20	x4
44.12	766.03	x4
44.66	766.29	x4-rw
46.00	767.22	x4
47.79	767.63	x4
50.76	768.95	x4
55.95	771.87	x4
61.91	775.06	x4
63.75	776.13	x4
64.68	776.35	x4
65.08	776.54	x4-rpt

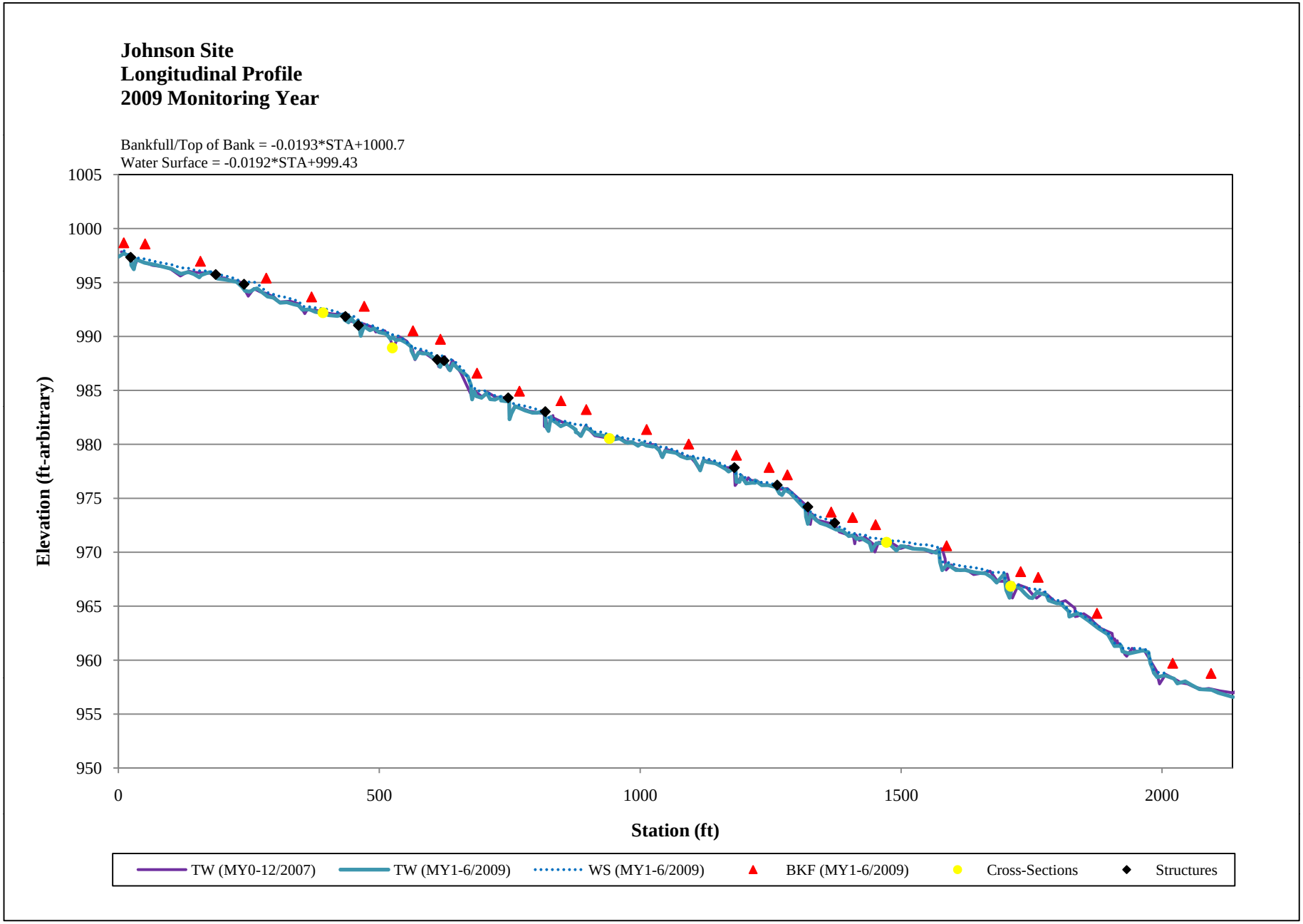
Summary Data	
Bankfull Cross-sectional Area (ft^2)	8.31
Bankfull Width (ft)	8.78
Bankfull Mean Depth (ft)	0.95
Bankfull Max Depth (ft)	1.19
Width/Depth Ratio	9.24
Entrenchment Ratio	1.85



Project Name: Johnson Site		
Cross-Section: 5		
Feature: Riffle		
6/2009		
Station	**Elevation**	**Notes**
0.00	768.07	x5-lpt
1.05	767.82	x5
13.37	767.93	x5
19.66	768.03	x5
26.25	767.87	x5
27.49	767.71	x5
30.67	766.36	x5
36.18	764.70	x5
39.85	763.51	x5
40.24	763.30	x5-b
40.96	762.70	x5
41.44	762.53	x5-lw
41.51	762.27	x5
42.02	762.11	x5
43.46	761.39	x5
45.14	761.24	x5
46.92	761.63	x5
47.53	762.53	x5-rw
48.61	763.55	x5
51.17	764.58	x5
55.33	766.56	x5
58.74	768.33	x5
62.90	770.43	x5
64.15	770.59	x5
64.95	770.83	x5-rpt

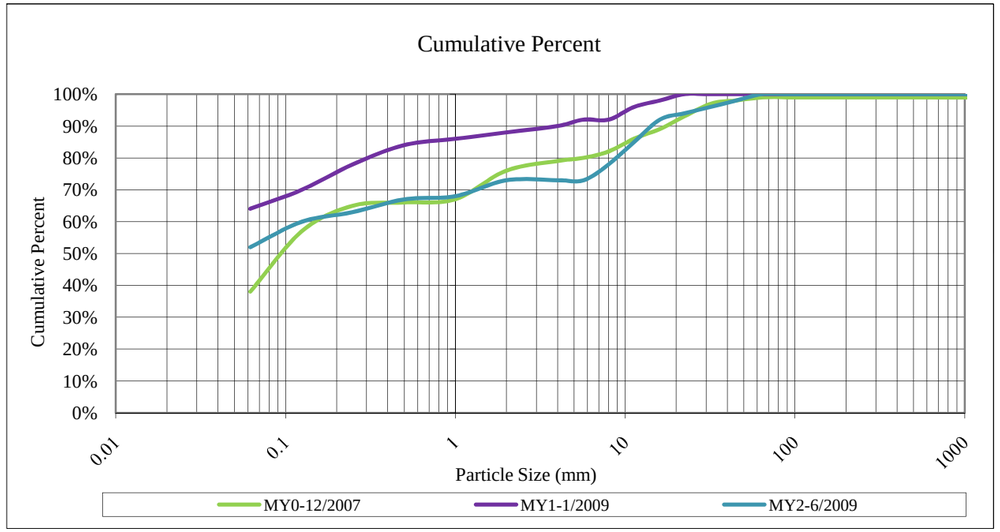
Summary Data	
Bankfull Cross-sectional Area (ft^2)	11.15
Bankfull Width (ft)	8.12
Bankfull Mean Depth (ft)	1.37
Bankfull Max Depth (ft)	2.06
Width/Depth Ratio	5.93
Entrenchment Ratio	2.32

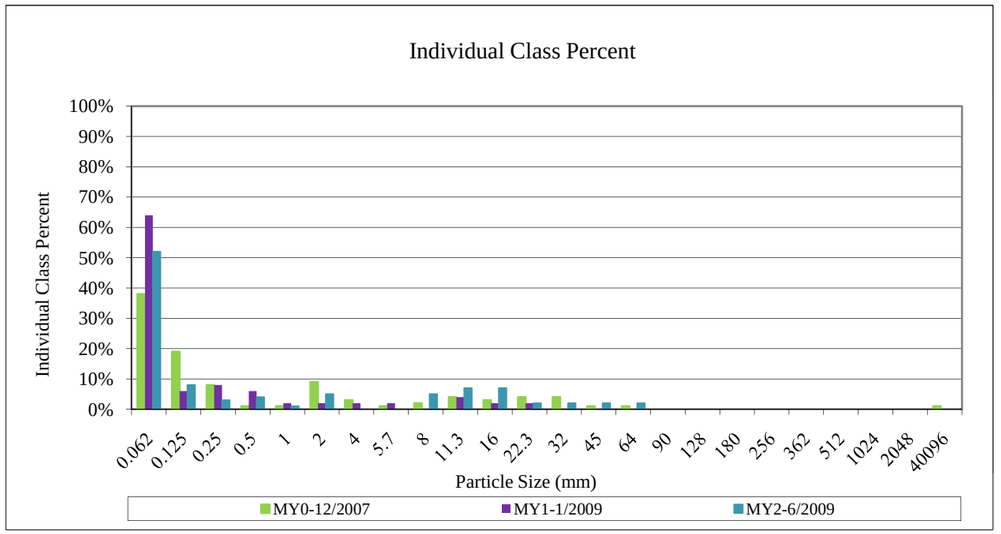



Johnson Site
Longitudinal Profile
2009 Monitoring Year
Bankfull/Top of Bank = -0.0193*STA+1000.7
Water Surface = -0.0192*STA+999.43
Elevation (ft-arbitrary)
1005
1000
995
990
985
980
975
970
965
960
955
950
0
500
1000
1500
2000
Station (ft)
TW (MY0-12/2007)
TW (MY1-6/2009)
WS (MY1-6/2009)
BKF (MY1-6/2009)
Cross-Sections
Structures

Project Name: Johnson Site					
Cross-Section: 1					
Feature: Riffle					
			6/2009		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	52	52%	52%
Sand	very fine sand	0.125	8	8%	8%
	fine sand	0.250	3	3%	3%
	medium sand	0.50	4	4%	4%
	coarse sand	1.00	1	1%	1%
	very coarse sand	2.0	5	5%	5%
Gravel	very fine gravel	4.0	0	0%	0%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	5	5%	5%
	medium gravel	11.3	7	7%	7%
	medium gravel	16.0	7	7%	7%
	course gravel	22.3	2	2%	2%
	course gravel	32.0	2	2%	2%
	very coarse gravel	45	2	2%	2%
	very coarse gravel	64	2	2%	2%
Cobble	small cobble	90	0	0%	0%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
TOTAL % of whole count			100	100%	100%

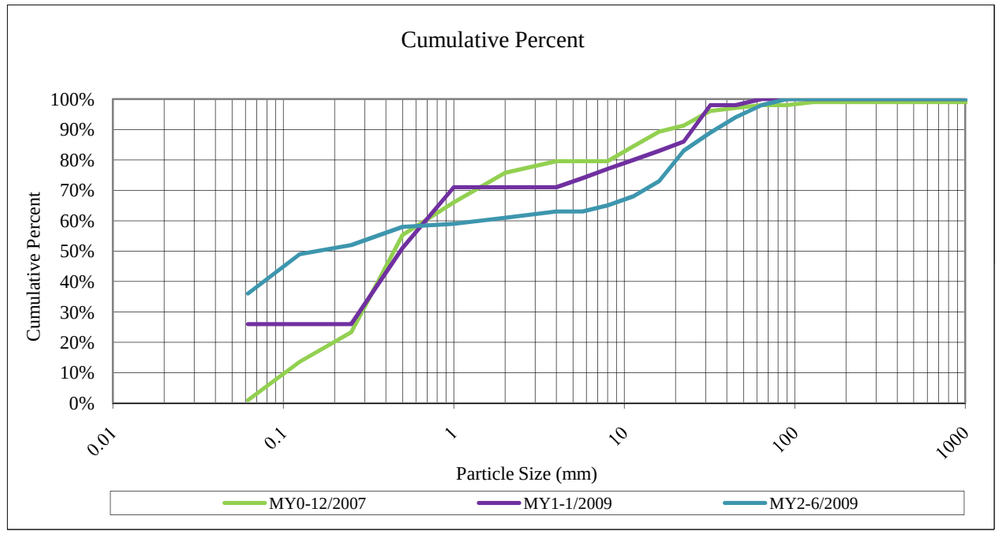
Summary Data	
D50	0.06
D84	10.83
D95	27.3

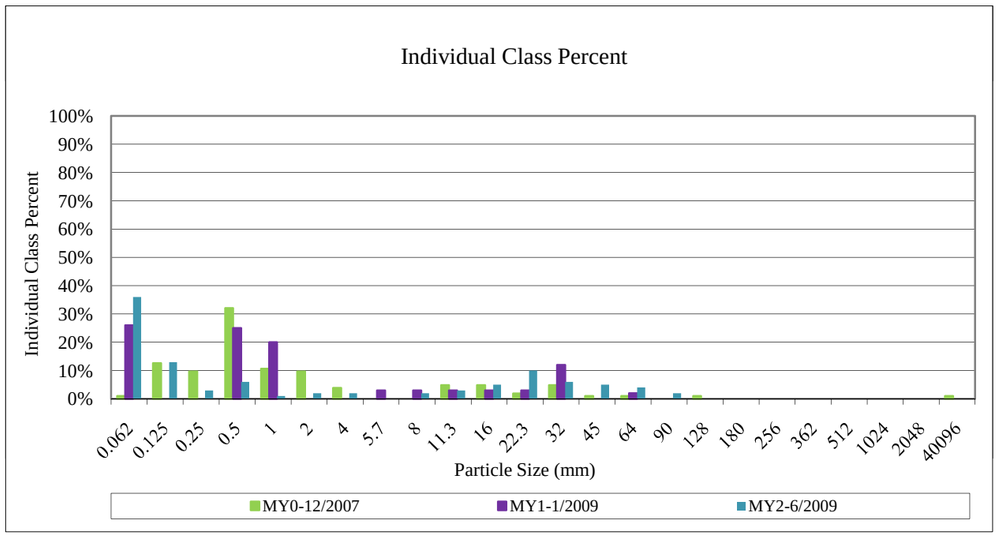




Project Name: Johnson Site					
Cross-Section: 2					
Feature: Pool					
			6/2009		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	36	36%	36%
Sand	very fine sand	0.125	13	13%	13%
	fine sand	0.250	3	3%	3%
	medium sand	0.50	6	6%	6%
	coarse sand	1.00	1	1%	1%
	very coarse sand	2.0	2	2%	2%
Gravel	very fine gravel	4.0	2	2%	2%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	2	2%	2%
	medium gravel	11.3	3	3%	3%
	medium gravel	16.0	5	5%	5%
	course gravel	22.3	10	10%	10%
	course gravel	32.0	6	6%	6%
	very coarse gravel	45	5	5%	5%
	very coarse gravel	64	4	4%	4%
Cobble	small cobble	90	2	2%	2%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
TOTAL % of whole count			100	100%	100%

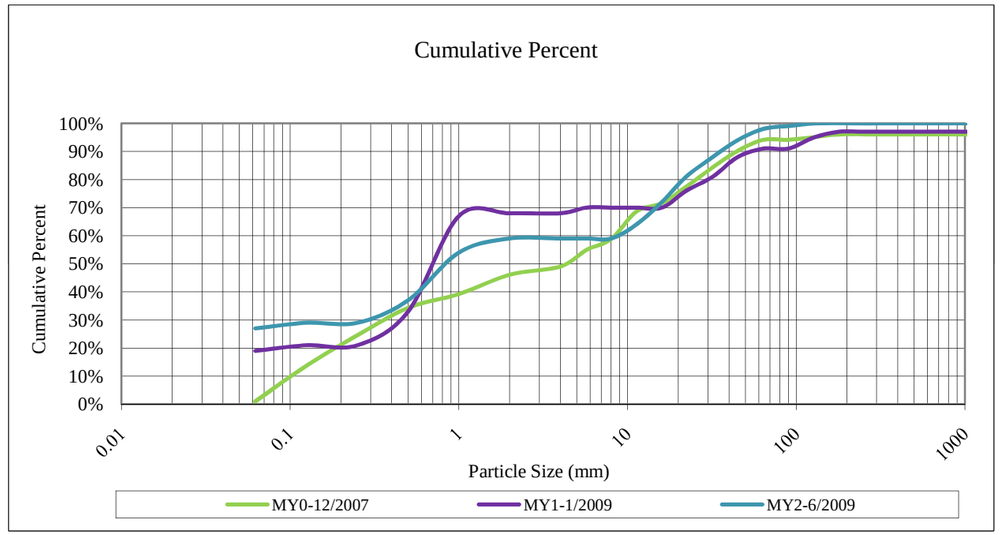
Summary Data	
D50	0.17
D84	24.17
D95	49.75

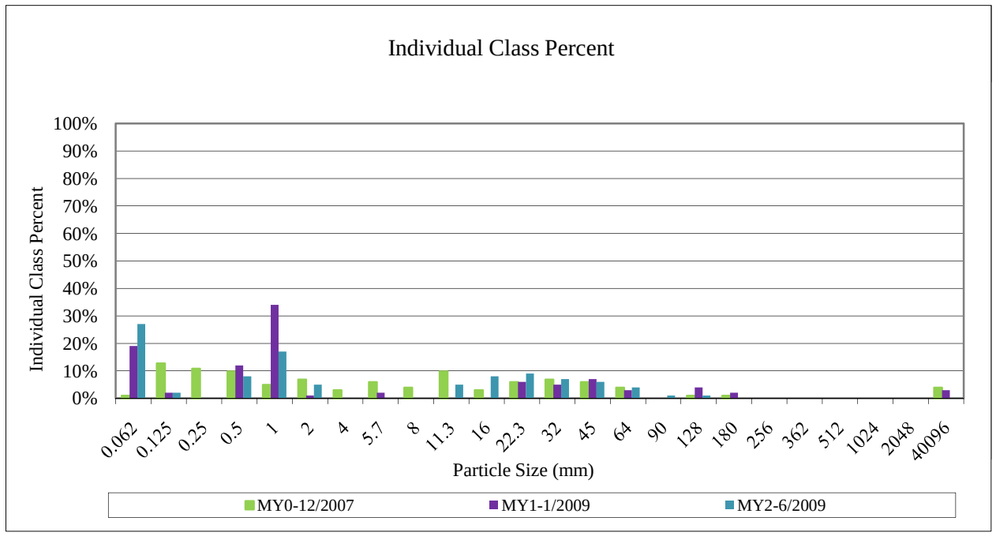




Project Name: Johnson Site					
Cross-Section: 3					
Feature: Pool					
			6/2009		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	27	27%	27%
Sand	very fine sand	0.125	2	2%	2%
	fine sand	0.250	0	0%	0%
	medium sand	0.50	8	8%	8%
	coarse sand	1.00	17	17%	17%
	very coarse sand	2.0	5	5%	5%
Gravel	very fine gravel	4.0	0	0%	0%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	0	0%	0%
	medium gravel	11.3	5	5%	5%
	medium gravel	16.0	8	8%	8%
	course gravel	22.3	9	9%	9%
	course gravel	32.0	7	7%	7%
	very coarse gravel	45	6	6%	6%
	very coarse gravel	64	4	4%	4%
Cobble	small cobble	90	1	1%	1%
	medium cobble	128	1	1%	1%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
TOTAL % of whole count			100	100%	100%

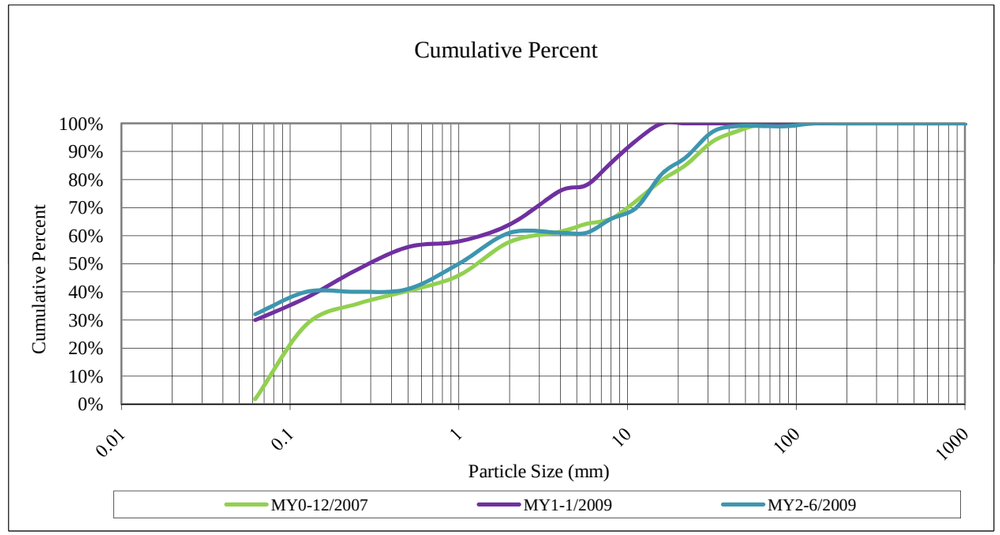
Summary Data	
D50	0.88
D84	26.63
D95	49.75

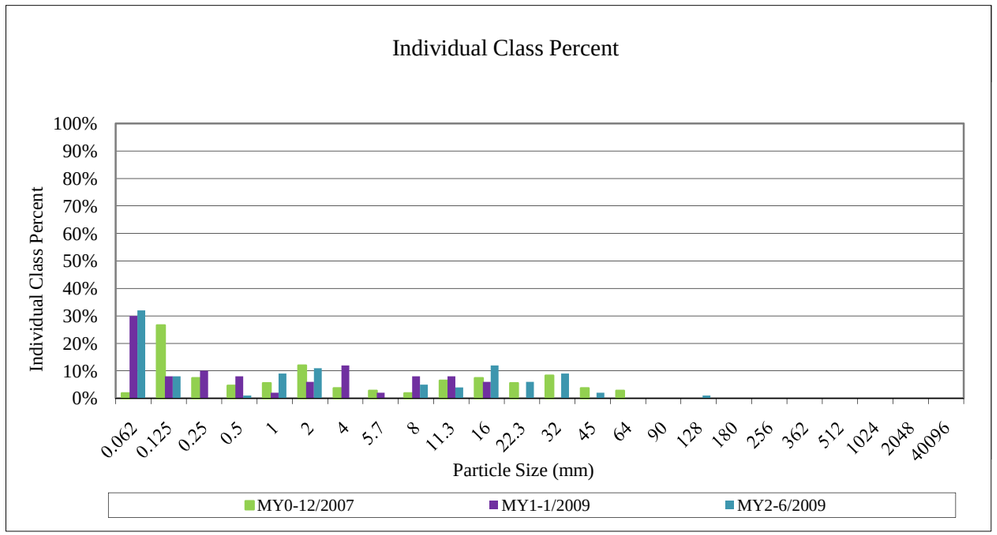




Project Name: Johnson Site					
Cross-Section: 4					
Feature: Riffle					
			6/2009		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	32	32%	32%
Sand	very fine sand	0.125	8	8%	8%
	fine sand	0.250	0	0%	0%
	medium sand	0.50	1	1%	1%
	coarse sand	1.00	9	9%	9%
	very coarse sand	2.0	11	11%	11%
Gravel	very fine gravel	4.0	0	0%	0%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	5	5%	5%
	medium gravel	11.3	4	4%	4%
	medium gravel	16.0	12	12%	12%
	course gravel	22.3	6	6%	6%
	course gravel	32.0	9	9%	9%
	very coarse gravel	45	2	2%	2%
	very coarse gravel	64	0	0%	0%
Cobble	small cobble	90	0	0%	0%
	medium cobble	128	1	1%	1%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
TOTAL % of whole count			100	100%	100%

Summary Data	
D50	1
D84	18.2
D95	29.91





Project Name: Johnson Site					
Cross-Section: 5					
Feature: Riffle					
			6/2009		
Description	**Material**	**Size (mm)**	**Total #**	**Item %**	**Cum %**
Silt/Clay	silt/clay	0.062	23	23%	23%
Sand	very fine sand	0.125	1	1%	1%
	fine sand	0.250	10	10%	10%
	medium sand	0.50	26	26%	26%
	coarse sand	1.00	12	12%	12%
	very coarse sand	2.0	10	10%	10%
Gravel	very fine gravel	4.0	2	2%	2%
	fine gravel	5.7	0	0%	0%
	fine gravel	8.0	1	1%	1%
	medium gravel	11.3	1	1%	1%
	medium gravel	16.0	3	3%	3%
	course gravel	22.3	4	4%	4%
	course gravel	32.0	4	4%	4%
	very coarse gravel	45	3	3%	3%
	very coarse gravel	64	0	0%	0%
Cobble	small cobble	90	0	0%	0%
	medium cobble	128	0	0%	0%
	large cobble	180	0	0%	0%
	very large cobble	256	0	0%	0%
Boulder	small boulder	362	0	0%	0%
	small boulder	512	0	0%	0%
	medium boulder	1024	0	0%	0%
	large boulder	2048	0	0%	0%
Bedrock	bedrock	40096	0	0%	0%
TOTAL % of whole count			100	100%	100%

Summary Data	
D50	0.4
D84	4
D95	27.3