OVERHILLS STREAM AND WETLAND RESTORATION MONITORING REPORT (YEAR 3 OF 5)

Harnett County, North Carolina
EEP Project No. 199

Prepared for:
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Status of Plan: Final
Submission Date: November 2009

Monitoring Firm:

Stantec Consulting Services Inc
801 Jones Franklin Road, Suite 300
Raleigh, NC 27608

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1.0 Executive Summary

Project goals and objectives for the Overhills stream and wetland restoration project include:

- Restoration of stream dimension, pattern and profile
- Restoration of riverine wetland hydrology and vegetation
- Improvement of current water quality
- Protection of future water quality

The Monitoring Year 3 stem counts within each of the vegetative monitoring plots are included in Table 7 in Appendix C. Seven of the plots have over 320 stems per acre (the success criteria for monitoring year three) while three of the plots have less than 320 stems per acre. Many of the same vegetation problem areas that have been observed during previous monitoring years are still present onsite. These problem areas are referred to as VPA 1 through 6 in the Current Condition Plan View located in Appendix A. In VPA 1, 2, and 4, persistent flooding has occurred and has caused the majority of the planted woody vegetation to die (Problem Area Photos 1, 5, and 6 in Problem Area Photos). Standing water continues to be present in these areas. Other areas onsite are also flooded but are not listed as problem areas because the planted vegetation, especially *Taxodium*, is doing well. VPA 3, 5 and 6 are currently overrun with invasive species, primarily *Lespedeza* (Problem Area Photo 4). *Lespedeza* continues to be a major problem on the project site and its coverage seems to be growing. It is invading dry areas, especially on top of the berms onsite.

The major stream problem area continues to be the headcut (SPA Photo 1) and downstream reach located from station 31+94 to 44+00. In this area and downstream, the stream has failed. This headcut continues to move at an increasing pace upstream, appearing to have moved approximately 40 feet upstream since last year. The headcut most likely first began at the location where the design changes from a C5 to an E5 channel between the Upper and Lower reaches at Station 33+00. Downstream of this headcut, most of the in-stream structures have failed and erosion is occurring. Erosion around the structures has forced the banks to migrate as much as seven feet, making this section of stream extremely unstable (SPA Photo 2 & 3). Because of the vast migration of the stream channel, the stream has become over-widened in many sections, which has lead to mid-channel bar formations (SPA Photo 2). The headcut and downstream problems are shown in the longitudinal profile in Appendix D. Upstream of the headcut, normal water surface elevations are at or near the constructed bankfull elevation, allowing the channel to access the floodplain under very small storm events. The areas immediately adjacent to this section of the channel were ponded near the channel banks. The presence of multiple beaver dams is causing large areas of the floodplain to become inundated with water, some areas over 1 foot in depth. Headcuts are occurring in areas where the inundated water reenters the stream channel from the side (SPA Photos 4, 5, & 6). These areas are located along the bank near Stations 23+50 and 28+00. The beaver dams are located near Stations 3+86, 23+14, 27+77 and 29+67.

Other problems include downcutting at cross-sections (XS) 4 and 7. At XS4, the stream appears to have downcut between the baseline survey and Monitoring Year 1. However, the stream appears relatively

stable between Monitoring Year 1 and Monitoring Year 3. The initial downcutting may be attributed to an undersized channel upstream. The survey of XS7, located in the unstable downstream reach, has shown considerable change in its cross-sectional dimensions from baseline conditions. The bed will most likely continue to downcut until a less erosive bed layer emerges in the profile to stop the incising. Two log cross-vanes, both upstream and downstream of the cross-section, have failed to hold grade and may be contributing to the active degradation of the stream bed.

The reference well met the success criteria, with two relatively long periods of consecutive days of saturation within 12 inches of the ground surface (104 and 109 days respectively). This 213 day period comprises approximately 91% of the growing season. Additionally, all fifteen groundwater monitoring wells onsite met the success criteria, with 7 of the wells being within 12 inches of the ground surface for 100% of the growing season. Monthly precipitation averages for 2009 fell between the 30th and 70th percentiles during the growing season in March, September, and October. For the months of January, April, June, and November, precipitation fell below the 30th percentile. For the months of February, May, July, and August, precipitation fell above the 70th percentile.

Summary information and 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.

2.0 Methodology

2.1 VEGETATION ASSESSMENT

The Carolina Vegetation Survey (CVS) Level 2 methodology was utilized to sample vegetation in September of 2009. Ten 100m^2 plots have been established throughout the project. In each plot, two plot corners have been permanently located with conduit or rebar. 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 trees per acre at the end of the year 5 monitoring period. An interim measure of vegetation planting success will be the survival of at least 320 3-year old planted trees per acre at the end of year 3 and 288 4-year old planted trees per acre at the end of year 4 of the monitoring period.

2.2 STREAM ASSESSMENT

A longitudinal profile survey of the entire length of the project was completed in August 2009. The Upper Reach, classified as a Rosgen C5 stream, flows from the beginning of the project at Station 0+00 to Station 32+80. The Lower Reach, a Rosgen E5 stream, flows from 32+80 to the end of the project at Station 44+00. Additional data collected included riffle length, riffle slope, pool length and pool spacing. During the longitudinal survey, additional pattern data was collected including channel beltwidth, radius of curvature, meander wavelength and meander width ratio. Stability was also visually assessed. A total of nine permanent cross-sections were characterized. A new riffle cross-section, Cross Section 9, was added in 2008 to provide sufficient cross-sectional data for the Lower Reach. Data collected included, at a minimum, cross-sectional area, bankfull width, bankfull mean depth, bankfull max depth, floodprone width, width to depth ratio, and entrenchment ratio. Stream type was determined in riffle cross-sections only. Pebble counts were completed in three typical riffle sections of the stream using the modified Wolman Pebble Count procedure (Rosgen, 1994). Data reported includes the d50 and d84 particle sizes. Success will be measured based on whether the channel features stay within the natural variability of the dimensionless ratios of the reference reaches.

2.3 WETLAND ASSESSMENT

A site is considered to meet the requirements for wetland hydrology if the groundwater saturation is within 12 inches of the ground surface consecutively for 12.5% of the growing season. Fifteen groundwater monitoring wells are currently active on the project site. All 15 wells met the success criteria during the growing season of 2009 (Appendix C). The growing season in this area is from March 18th to November 8th for a total of 234 days (NRCS 2002).

A reference well was installed within the reference site October 2, 2007. Data has been collected since its installation. More specific details regarding the physical and biological characteristics of the reference site can be found in the Overhills Stream and Wetland Restoration Plan.

3.0 References

Harrelson, C.C., C.L. Rawlins and J.P. Potyondy. 1994. Stream Channel Reference Sites: An Illustrated Guide to Field Technique. United States Department of Agriculture, Fort Collins, CO.

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)

NC CRONOS. 2008. NC CRONOS Database – Cunningham Research Station (KINS). North Carolina State University State, Climate Office of North Carolina. http://www.nc-climate.ncsu.edu/cronos

NCEEP. 2009. Revised Table of Contents for 2009 Monitoring Report Submissions. North Carolina Department of Environment and Natural Resources, Ecosystem Enhancement Program. Raleigh, NC. Version 1.2.1 June 1, 2009.

NRCS. 2002. WETS Table for Lenoir County, NC. Natural Resource Conservation Service, National Water and Climate Center.

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

Weakley, Alan S. 2007. Flora of the Carolinas, Virginia, Georgia, and surrounding areas. University of North Carolina Herbarium. Chapel Hill, NC. Working draft of January 11, 2007.

Project Condition and Monitoring Data Appendices

APPENDIX A. GENERAL FIGURES AND PLAN VIEWS

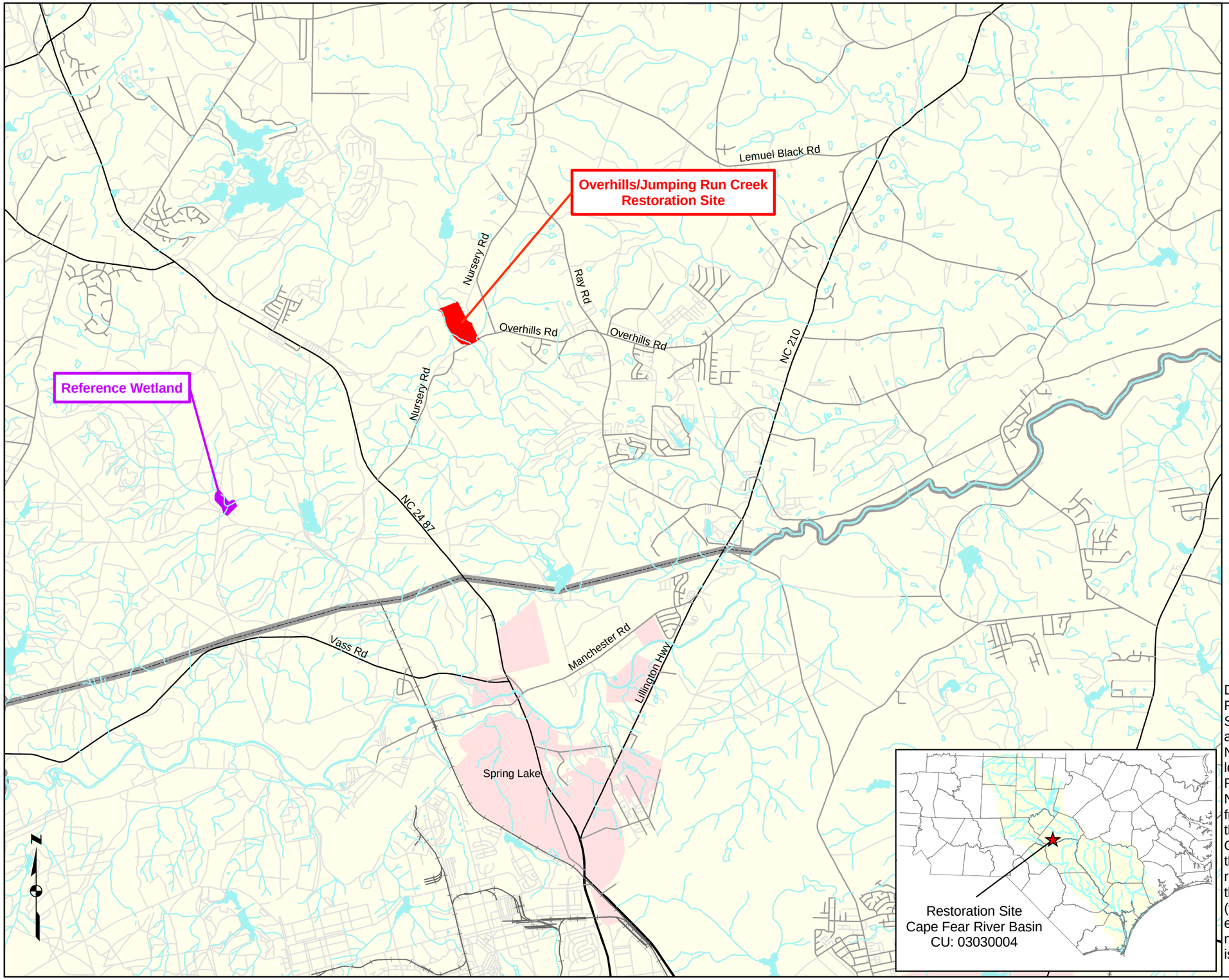

Figure 1 - Vicinity Map

Overhills/Jumping Run Creek Stream and Wetland Restoration Project
EEP #: 0199
Harnett County, North Carolina

Monitoring Report
November 2009

0 0.5 1 2 3Miles

- 1:24000 Hydrography
- Railroads
- NCDOT Secondary Roads
- NCDOT Primary Roads
- Overhills/Jumping Run Creek
  35.258N, 79.000W
- Reference Wetland
  35.227N, 79.050W

Ecosystem Enhancement Program

Stantec

Directions to Overhills/Jumping Run Creek Restoration Site: From Raleigh, take US401 South following signs through Fuquay-Varina and into downtown Lillington. Turn right onto NC 27 and follow for about 9 miles, then turn left onto Nursery Rd. After 6.5 miles, Nursery Rd will come to a T, turn right to stay on Nursery Rd. The restoration site is half a mile from the T on the right hand side. To get to the reference site from the restoration site: Continue travelling east on Nursery Rd for 2 miles, then turn left onto NC24/NC87 for 3 miles. Turn right onto Vass Rd/NC 690. Continue for 3.5 miles, then turn right at sign that states "NO POVs" (this is part of Fort Bragg, need permission to enter). Follow the dirt road straight, at least 1.7 miles (do not turn or veer). The reference well is in the woods, about 100 feet from the end of the road.

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Current Condition Plan View

Overhills Stream and Wetland Restoration
Harnett County, North Carolina
EEP Project Number 199
Monitoring Year 3

Stantec Consulting Services Inc.
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www.stantec.com

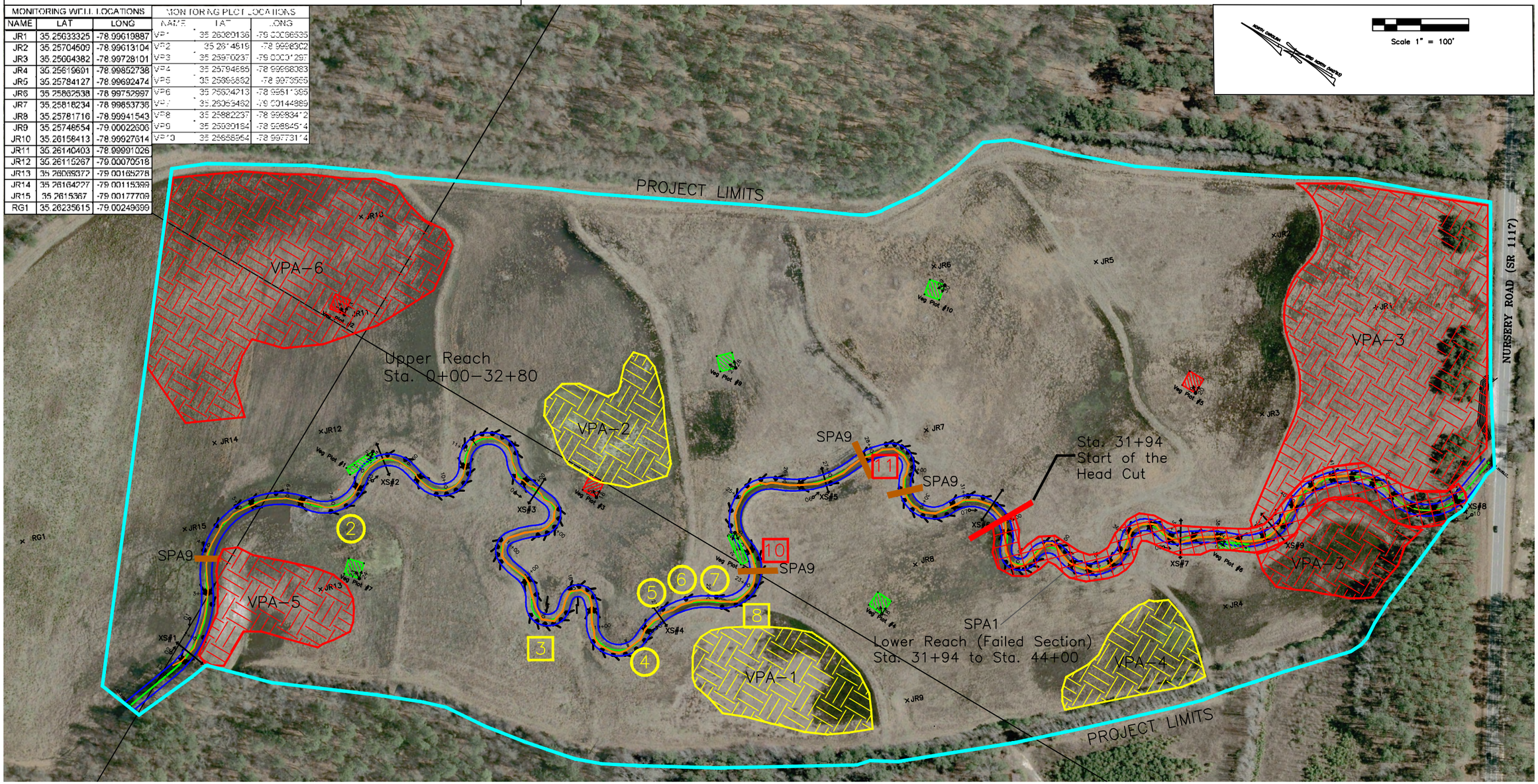
PROJECT NO.	SHEET NO.
SCO#070695701	
11/15/2009	

LEGEND

- Design Thalweg
- Design Bankful
- Monitoring Year 3 Longitudinal Profile
- Beaver Dams (SPA9)
- Photo Points
- × JR — Monitoring Wells/Rain Gauge (all successful)
- Design Log Cross Vein
- Design Root Wad
- Veg Plot Pins
- Veg. Plots >320 Stems/Acre
- Veg. Plots <320 Stems/Acre
- Cross Sections
- Reach Failure (SPA1)
- Major Vegetation Problem Area (VPA 5,3, 6)
- Minor Vegetation Problem Area (VPA 1,2,4)
- 2 — Minor VPA – Rootwad Failure
- 11 — Major SPA – Bank Erosion
- 3 — Minor SPA – Bank Erosion

MONITORING WELL LOCATIONS		
NAME	LAT	LONG
JR1	35.25633325	-78.99619887
JR2	35.25704509	-78.99613104
JR3	35.25664382	-78.99728101
JR4	35.25619691	-78.99852738
JR5	35.25784127	-78.99692474
JR6	35.25862538	-78.99752997
JR7	35.25818234	-78.99853736
JR8	35.25781716	-78.99941543
JR9	35.25748554	-79.00022606
JR10	35.26158413	-78.99927614
JR11	35.26140403	-78.99991026
JR12	35.26115267	-79.00070518
JR13	35.26089372	-79.00165278
JR14	35.26164227	-79.00115399
JR15	35.26153367	-79.00177709
RG1	35.26235615	-79.00249699

MONITORING PLOT LOCATIONS		
NAME	LAT	LONG
VP1	35.26260136	-79.00096535
VP2	35.26174819	-78.9998302
VP3	35.25970237	-79.00012951
VP4	35.25794285	-78.99968383
VP5	35.25866852	-78.9973555
VP6	35.25824213	-78.99811365
VP7	35.25956462	-79.00144989
VP8	35.25822237	-78.99983412
VP9	35.25930184	-78.99884514
VP10	35.25858964	-78.99773174



Data Source: Harnett County 2008 Aerials

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APPENDIX B. GENERAL PROJECT TABLES

Table 1. Project Restoration Components
Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199

	Existing Feet/Acres	Type	Approach	Footage or Acreage	Stationing	Comment
Upper Reach	3064	R	P1	3280	0+00 to 32+80	Includes log structures and root wads
Lower Reach		R	P1	1120	32+80 to 44+00	Includes log structures and root wads; step-down to existing channel
Riparian Wetlands	NA	R	-	70.0		Floodplain of restored stream

R = Restoration
P1 = Priority 1

Table 2. Project Activity and Reporting History
Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199

Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	NA	March 2003
Final Design - 90%	NA	Dec 2003
Construction	NA	June 2006
Temporary S&E mix applied to entire project area	NA	2004
Permanent seed mix applied to entire project area	NA	Nov 2004
Bare root, containers, and live stakes for majority of site	NA	Dec 2004
Water released into new channel	NA	Oct 2005
Permanent seed mix applied to entire project area	NA	Nov 2005
Bare root, containers, and live stakes for remainder of site	NA	Dec 2005
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	July 2007	Nov 2007
Year 1 Monitoring	Nov 2007	Nov 2007
Year 2 Monitoring	Nov 2008	Nov 2008
Year 3 Monitoring	Nov 2009	Nov 2009
Year 4 Monitoring	NA	NA
Year 5 Monitoring	NA	NA

NA = Not Applicable

Table 3. Project Contacts Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199	
Designer	BLUE: Land Water Infrastructure 1271 Old US Highway #1 South Southern Pines, NC 28387 Phone: 910-692-6461
Construction Contractor	Vaughn Contracting, Inc P.O. Box 796 Wadesboro, NC 28170 Phone: 704-694-6450
Surveying Subcontractor	Barbara H. Mulkey Engineers, Inc 7516 E. Independence Blvd, Suite 100 Charlotte, NC 28227 Phone: 704-537-7300
Site Preparation Subcontractor	Herndon, Inc P.O. Box 36 Lugoff, SC 29078 Phone: 803-513-8002
Erosion Control Subcontractor	Carolina Environmental Contractors, Inc P.O. Box 1905 Monut Airy, NC 27030 Phone: 336-320-3849
Vegetation Planting Contractor & Nursery Stock Supplier for livestakes and potted plants	North State Environmental, Inc 2889 Lowery Street Winston-Salem, NC 27101 Phone: 339-725-2010
Nursery Stock Supplier for bare roots	International Paper
Seed Mix Sources	Unknown/Info Not Available
Monitoring Performers	Stantec Consulting Services, Inc 801 Jones Franklin Rd, Ste 300 Raleigh, NC 27606
Stream Monitoring POC Vegetation Monitoring POC Wetland Monitoring POC	David Bidelspach 919-851-6866 Amber Coleman 919-851-6866 Amber Coleman 919-851-6866

Table 4. Project Background Table Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199	
Project County	Harnett County
Drainage Area	15.9 square miles
Drainage impervious cover estimate (%)	5%
Stream Order	3rd
Physiographic Region	Sandhills
Ecoregion	Sandhills
Rosgen Classification of As-built	C5
Cowardin Classification	Palustrine
Dominant soil types	Roanoke
	Bibb
	Wehadkee
	Augusta
Reference site ID	Gum Swamp
USGS HUC for Project	03030004
USGS HUC for Reference	03030004
NCDWQ Subbasin for Project	03-16-14
NCDWQ Subbasin for Reference	03-16-13
NCDWQ Classification for Project	C
NCDWQ Classification for Reference	C
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	No
Percent of project easement fenced	0%

APPENDIX C. VEGETATION ASSESSMENT DATA

Table 5 - Vegetation Plot Mitigation Success Summary		
Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199		
Vegetation Plot ID	**Vegetation Density Met (320 stems/acre)**	**Tract Mean**
VP1	Y (364)	70% (408 stems/acre)
VP2	N (283)	
VP3	N (162)	
VP4	Y (324)	
VP5	N (121)	
VP6	Y (1093)	
VP7	Y (405)	
VP8	Y (567)	
VP9	Y (324)	
VP10	Y (445)	

VEGETATION MONITORING PLOT PHOTOS

Photo Station 11: Vegetation Plot 1 looking southeast (9/30/09).

Photo Station 12: Vegetation Plot 1 looking east (9/30/09)

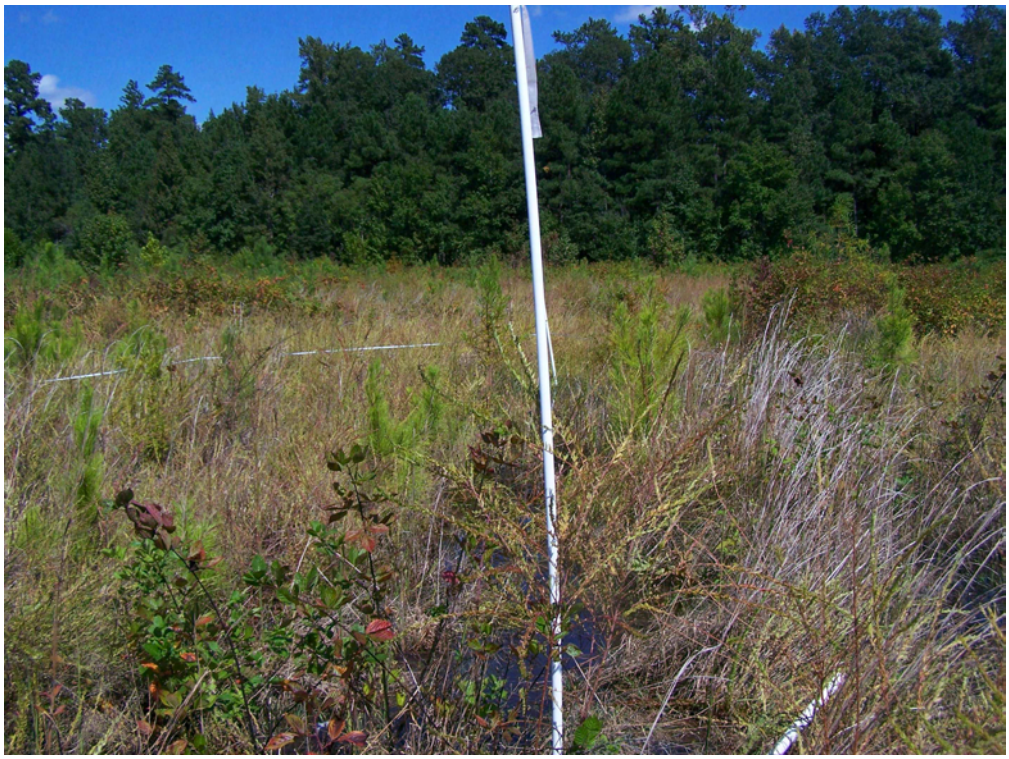


Photo Station 13: Vegetation Plot 2 looking northeast (9/30/09)

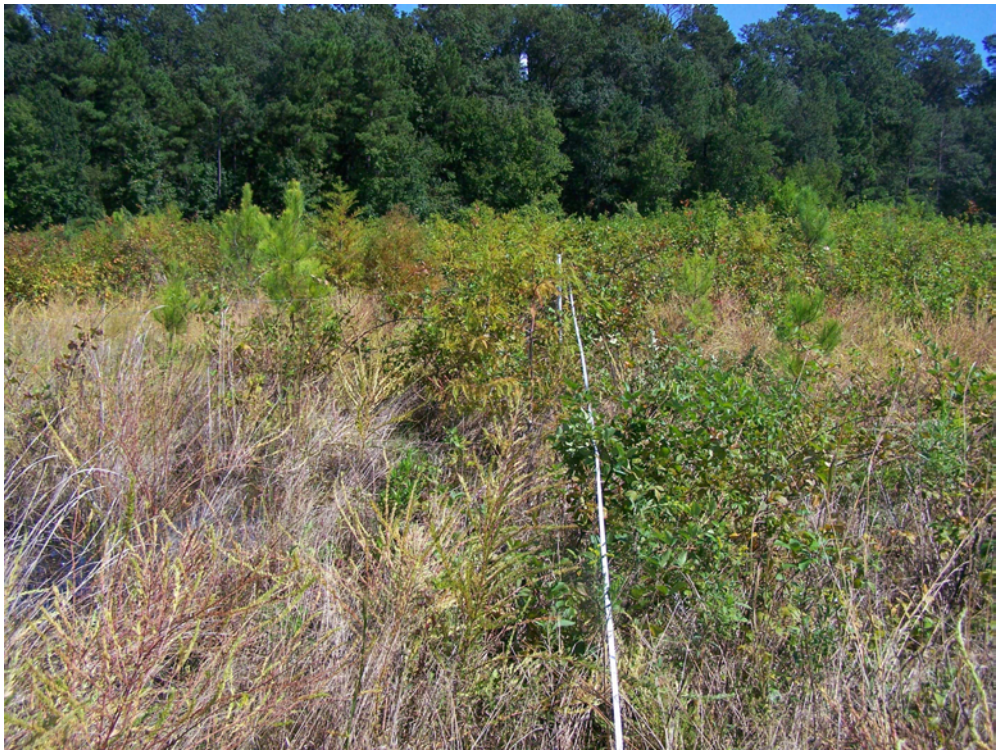


Photo Station 14: Vegetation Plot 2 looking east (9/30/09)

Photo Station 15: Vegetation Plot 3 looking northwest (9/30/09)

Photo Station 16: Vegetation Plot 3 looking west (9/30/09)

Photo Station 17: Vegetation Plot 4 looking northeast (9/30/09)

Photo Station 18: Vegetation Plot 4 looking east (9/30/09)

Photo Station 19: Vegetation Plot 5 looking northeast (11/3/09)

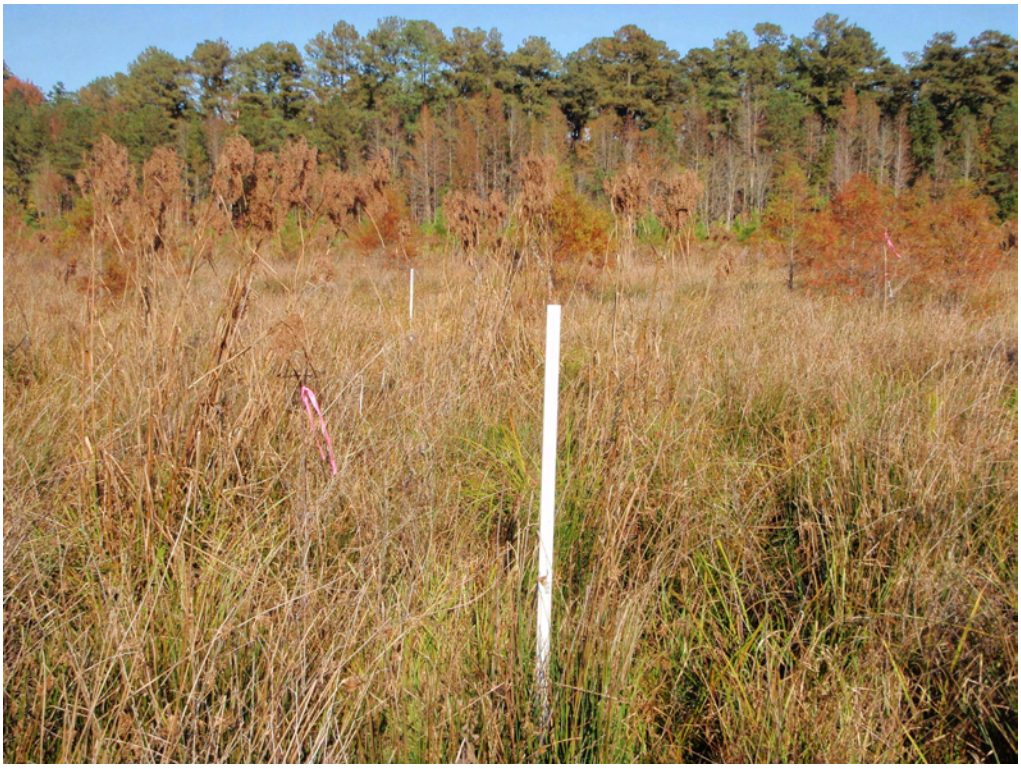


Photo Station 20 Vegetation Plot 5 looking east (11/3/09)

Photo Station 21 Vegetation Plot 6 looking south (9/30/09)

Photo Station 22 Vegetation Plot 6 looking southwest (9/30/09)

Photo Station 23 Vegetation Plot 7 looking north (9/30/09)

Photo Station 24 Vegetation Plot 7 looking northeast (9/30/09)

Photo Station 25 Vegetation Plot 8 looking southwest (9/30/09)

Photo Station 26 Vegetation Plot 8 looking west (9/30/09)

Photo Station 27 Vegetation Plot 9 looking north (9/30/09)

Photo Station 28 Vegetation Plot 9 looking northeast (9/30/09)

Photo Station 29 Vegetation Plot 10 looking northwest (9/30/09)

Photo Station 30 Vegetation Plot 10 looking west (9/30/09)

Table 6. Vegetation Metadata

Report Prepared By	Richard Andrews
Date Prepared	11/11/2009 9:18
database name	Stantec_Overhills_2009_MY3_cvs-eep-entrytool-v2.2.7.mdb
database location	U:\171300316\project\1-Overhills\site_data\cvs
computer name	RUIZM-LT
file size	49025024
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	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 Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	199
project Name	Overhills Stream and Wetland Restoration
Description	Stream and Wetland Restoration
River Basin	Cape Fear
length(ft)	4482
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	0

Table 7 - Stem Count Total and Planted by Plot and Species Overhills Stream and Wetland Restoration Site EEP Project #199

			Current Plot Data (MY3 2009)																							
			Overhills-01-0001			Overhills-01-0002			Overhills-01-0003			Overhills-01-0004			Overhills-01-0005			Overhills-01-0006			Overhills-01-0007			Overhills-01-0008		
Scientific Name	Common Name	Species Type	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
Acer rubrum	red maple	Tree												4			3						4			1
Cephalanthus occidentalis	common buttonbush	Shrub Tree	4	4	4													6	7	7						
Cornus amomum	silky dogwood	Shrub		1	1													6	6	6				5	5	5
Cyrilla racemiflora	swamp titi	Shrub Tree		1	1																					
Diospyros virginiana	common persimmon	Tree																				2	2		1	1
Fraxinus pennsylvanica	green ash	Tree					1	1		1	1		3	3								1	1			
Ilex decidua	possumhaw	Shrub Tree																								
Liquidambar styraciflua	sweetgum	Tree												1												1
Magnolia grandiflora	southern magnolia	Tree																	2	2						
Morella cerifera	wax myrtle	Shrub Tree																	1	1					1	1
Nyssa biflora	swamp tupelo	Tree		1	1					1	1		3	3		1	1					3	3		2	2
Pinus taeda	loblolly pine	Tree						10						5						31						2
Quercus nigra	water oak	Tree																							1	1
Quercus phellos	willow oak	Tree		1	1														3	3						
Salix nigra	black willow	Tree	1	1	1													2	2	2				1	1	1
Sambucus canadensis	Common Elderberry	Shrub Tree																4	5	6					1	1
Sambucus nigra	European black elderberry	Shrub Tree																								
Taxodium distichum	bald cypress	Tree					6	6		2	2		2	2		2	2		1	1		4	4		2	2
Unknown		unknown																								
		Stem count	5	9	9	0	7	17	0	4	4	0	8	18	0	3	6	18	27	59	0	10	14	6	14	18
		size (ares)	1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	2	6	6	0	2	3	0	3	3	0	3	6	0	2	3	4	8	9	0	4	5	2	8	11
		Stems per ACRE	202.3	364.2	364.2	0	283.3	688	0	161.9	161.9	0	323.7	728.4	0	121.4	242.8	728.4	1093	2388	0	404.7	566.6	242.8	566.6	728.4

Table 7 (Continued) - Stem Count Total and Planted by Plot and Species Overhills Stream and Wetland Restoration Site EEP Project #199																		
Current Plot Data (MY3 2009)						Annual Means												
Overhills-01-0009			Overhills-01-0010			MY3 (2009)			MY2 (2008)			MY1 (2007)			MY0 (2007)		
P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
					2			14			10						
						10	11	11	10	11	11	10	11	11	10	11	11
						11	12	12	11	12	12	11	12	12	12	13	13
							1	1		1	1		1	1		1	1
							3	3									
	1	1					7	7		7	7		7	7		7	7
											1						
		1			6			9			5						
							2	2		2	2		2	2		3	3
							2	2		2	2		2	2		2	2
	3	3		5	6		19	20		24	24		23	23		21	21
		17			2			67			35						
							1	1		1	1		1	1		1	1
							4	4		2	2		4	4		4	4
						4	4	4	6	6	7	6	6	6	6	6	6
						4	6	7	7	8	8	7	8	8	11	12	12
										1	1		1	1		1	1
	4	4		6	6		29	29		27	27		27	27		27	27
										2	2		3	3		3	3
0	8	26	0	11	22	29	101	193	34	106	158	34	108	108	39	112	112
1			1			10			10			10			10		
0.02			0.02			0.25			0.25			0.25			0.25		
0	3	5	0	2	5	4	13	16	4	14	18	4	14	14	4	14	14
0	323.7485	1052.183	0	445.1542	890.3084	117.3588	408.7325	781.0433	137.5931	428.9668	639.4033	137.5931	437.0605	437.0605	157.8274	453.2479	453.2479

APPENDIX D. STREAM ASSESSMENT DATA

Photo 1 – Evidence of bankfull overflow near Station 22+00 (3/26/09)

Photo 2 – Typical example of the restored channel upstream of headcut area (9/30/09)

Photo Station 1 – Beaver dam just downstream of Cross Section 1 – looking upstream (8/26/09)
(Note: Locations of Photo Stations are located on the Current Condition Plan View in Appendix A)

Photo Station 2 – Cross Section 1 – looking downstream (8/26/09)

Photo Station 3 – Cross Section 2 – looking downstream (8/26/09)

Photo Station 4 – Cross Section 3 – looking downstream (8/26/09)

Photo Station 5 – Cross Section 4 – looking downstream (8/26/09)

Photo Station 6 – Cross Section 5 – looking downstream (8/26/09)

Photo Station 7 – Cross Section 6 – looking downstream (8/26/09)

Photo Station 8 – Cross Section 7 – looking upstream (8/26/09)

Photo Station 9 – Cross Section 8 – looking downstream (8/26/09)

Photo Station 10 – Cross Section 8 – looking upstream from end of project (8/26/09)

Photo Station 11 – Cross Section 9 – looking downstream (8/26/09)

Exhibit Table 8A - Visual Morphological Stability Assessment - Upper Reach Overhills/Jumping Run Creek - EEP Project No. 199						
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?	14	15		93%	
	2. Armor stable (eg no displacement?)	N/A	N/A			
	3. Facet grade appears stable?	5	15		33%	
	4. Minimal evidence of embedding/fining?	N/A	N/A			
	5. Length appropiate?	10	14		71%	66%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	13	19		68%	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	14	19		74%	
	3. Length appropriate?	12	19		63%	68%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	18	20		90%	
	2. Downstream of meander (glide/inflection) centering?	17	20		85%	88%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	20	20		100%	
	2. Of those eroding, # w/concomitant point bar formation?	0	3		0%	
	3. Apparent Rc within spec?	17	20		85%	
	4. Sufficient floodplain access and relief?	17	20		85%	68%
E. Bed General	1. General channel bed aggradation areas (bar formation)		3200	400	13%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		3200	1100	34%	23%
F. Bank	1. Actively eroding, wasting, or slumping bank?		3200	1200	38%	38%
G. Vanes	1. Free of back or arm scour?	14	15		93%	
	2. Height appropriate?	12	15		80%	
	3. Angle and geometry appear appropriate?	10	15		67%	
	4. Free of piping or other structural failures?	12	15		80%	80%
H. Wads/Boulders	1. Free of scour?	12	N/A		NA	
	2. Footing stable?	N/A	N/A		NA	NA

Exhibit Table 8B - Visual Morphological Stability Assessment - Lower Reach Overhills/Jumping Run Creek - EEP Project No. 199						
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?	0	7		0%	
	2. Armor stable (eg no displacement?)		N/A		NA	
	3. Facet grade appears stable?	0	7		0%	
	4. Minimal evidence of embedding/fining?	4	N/A		NA	
	5. Length appropiate?	1	7		14%	5%
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	2	8		25%	
	2. Sufficiently deep (Max Pool D:Mean Bkf > 1.6?)	4	8		50%	
	3. Length appropriate?	4	8		50%	42%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	2	9		22%	
	2. Downstream of meander (glide/inflection) centering?	2	9		22%	22%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	1	9		11%	
	2. Of those eroding, # w/concomitant point bar formation?	1	9		11%	
	3. Apparent Rc within spec?	0	9		0%	
	4. Sufficient floodplain access and relief?	0	9		0%	6%
E. Bed General	1. General channel bed aggradation areas (bar formation)		1200	0	0%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting?		1200	0	0%	0%
F. Bank	1. Actively eroding, wasting, or slumping bank?		1200	0	0%	0%
G. Vanes	1. Free of back or arm scour?	0	22		0%	
	2. Height appropriate?	0	22		0%	
	3. Angle and geometry appear appropriate?	0	22		0%	
	4. Free of piping or other structural failures?	0	22		0%	0%
H. Wads/Boulders	1. Free of scour?	NA	N/A		NA	
	2. Footing stable?	NA	N/A		NA	NA

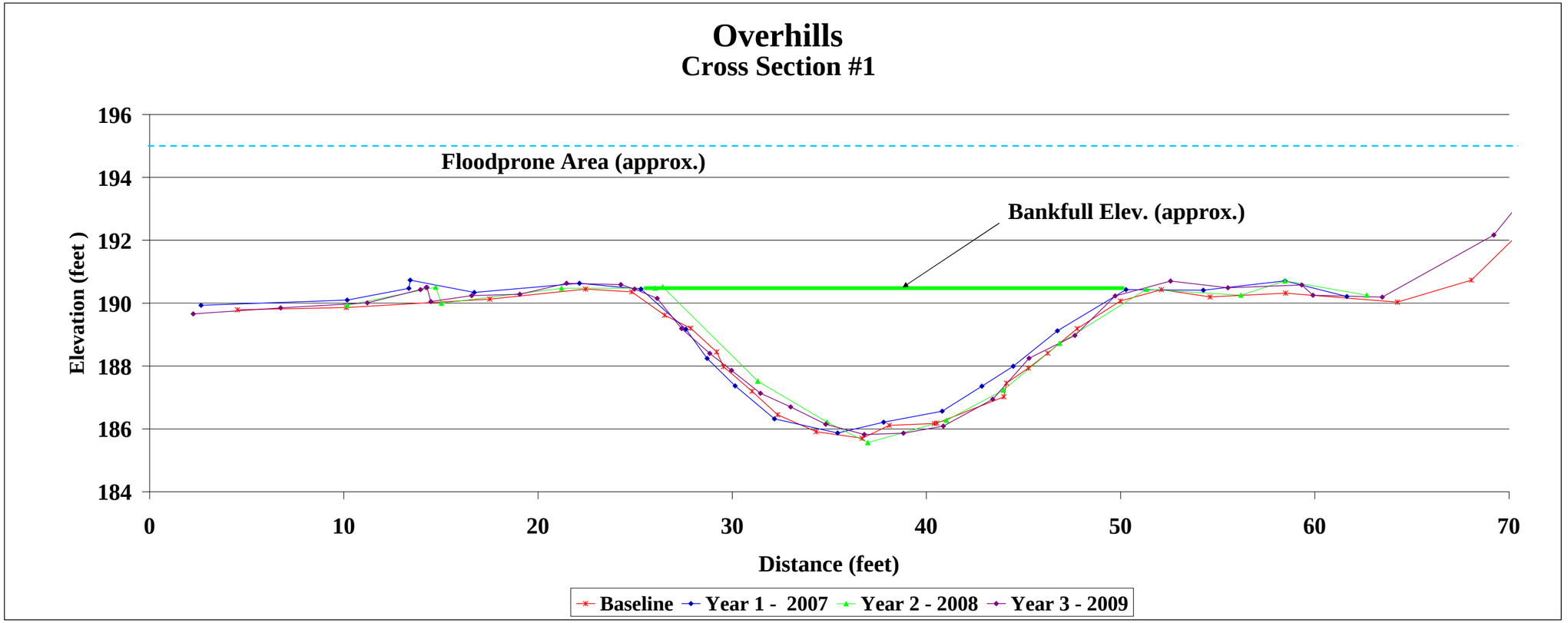
Table 9 - Verification of Bankfull Events Overhills/Jumping Run Creek Restoration Project - EEP Project No. 199			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo**
2009	March, 2009	Field observation	Appendix D, Photo 1

Project Name Overhills
Cross Section Cross Section 1
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Jean/Geenen

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						2.25	189.66		10.17	189.93		2.65	189.93	Left Pin	4.52	189.79	Left Pin
						6.75	189.85		14.73	190.51		10.17	190.1		10.13	189.86	
						11.21	190.01		15.03	190		13.35	190.47		17.52	190.13	
						13.95	190.43		21.21	190.47		13.42	190.73		22.45	190.45	
						14.24	190.5		26.03	190.48		16.72	190.34		24.83	190.36	LBK
						14.28	190.5		26.42	190.52		22.13	190.63		26.52	189.62	
						14.48	190.05		31.32	187.52		25.3	190.45	LBK	27.86	189.2	
						16.59	190.24		34.88	186.22		27.61	189.17		29.2	188.45	
						19.06	190.28		36.98	185.56		28.71	188.24		29.55	187.98	
						21.47	190.63		41.03	186.27		30.15	187.37		31.02	187.2	
						24.26	190.59		43.96	187.23		32.17	186.32		32.34	186.45	
						24.97	190.45		46.86	188.72		35.43	185.87		34.32	185.91	
						26.14	190.15		51.33	190.44		37.8	186.21		36.69	185.7	
						27.39	189.19		56.2	190.25		40.81	186.56		38.09	186.11	
						28.84	188.4		58.46	190.71		42.86	187.36		40.41	186.17	
						29.97	187.86		62.68	190.25		44.47	187.99		40.54	186.18	
						31.45	187.13					46.74	189.12		43.99	187.02	
						33.01	186.7					50.28	190.43	RBK	44.12	187.46	
						34.81	186.15					54.26	190.41		45.25	187.93	
						36.8	185.82					58.46	190.71	Right Pin	46.24	188.41	
						38.82	185.86					61.65	190.21		47.76	189.19	
						40.87	186.09								49.99	190.07	
						43.41	186.94								52.1	190.43	RBK
						45.28	188.25								54.6	190.2	
						47.65	188.97								58.49	190.32	Right Pin
						49.72	190.23								64.25	190.03	
						52.57	190.7								68.06	190.73	
						55.53	190.49								70.27	192.07	
						59.33	190.58								73.77	192.89	
					-	59.9	190.25										
						63.47	190.19										
						69.21	192.17										
						72.2	194.45										

Photo of Cross-Section 1 - Looking Downstream @ STA 1+64

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			69.97	67.39	67.45	71.89	
Width			25.18	24.42	24.66	26.87	
Mean Depth			2.78	2.76	2.74	2.68	
Max Depth			4.54	4.80	4.49	4.66	
W/D			9.06	8.85	9.02	10.04	

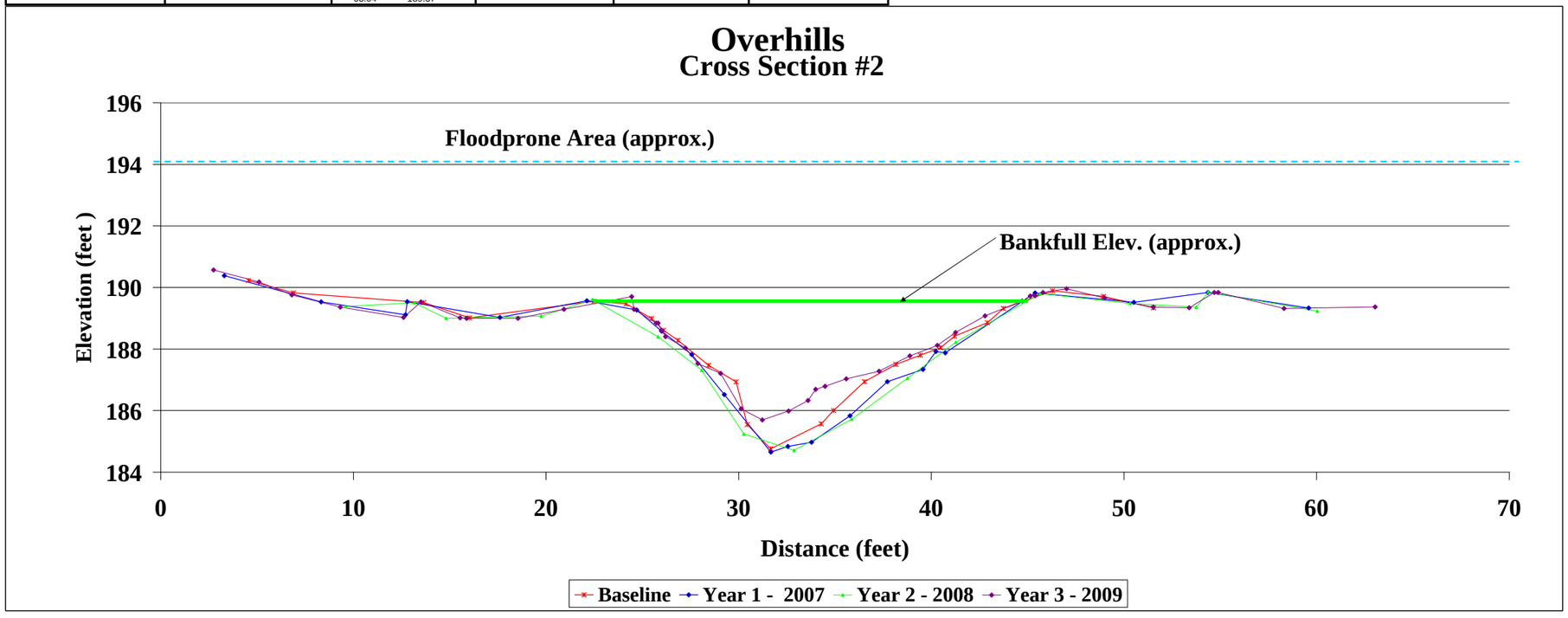


Project Name Overhills
Cross Section Cross Section 2
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen, Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						2.75	190.57		9.58	189.38		3.3	190.38		4.56	190.23	
						5.11	190.18		13.16	189.5		8.33	189.53		6.9	189.82	
						6.81	189.76		14.81	189		12.7	189.11		13.65	189.51	Left Pin
						9.32	189.36		19.75	189.07		12.8	189.54	Left Pin	16.04	189.01	
						12.6	189.03		22.42	189.6		17.6	189.03		22.49	189.55	LBK
						13.51	189.53		25.82	188.4		22.12	189.57	LBK	24.16	189.47	
						15.54	189.01		28.09	187.31		24.71	189.27		25.49	188.99	
						15.87	189		30.26	185.24		26	188.58		26.1	188.61	
						18.55	189		32.87	184.71		27.56	187.82		26.85	188.28	
						20.93	189.29		35.87	185.72		29.26	186.52		28.44	187.47	
						24.44	189.7		38.76	187.05		31.67	184.65		29.87	186.93	
						24.57	189.29		41.27	188.22		32.55	184.84		30.45	185.55	
						25.72	188.84		45.66	189.8		33.78	184.97		31.66	184.76	
						25.82	188.84		50.32	189.48		35.78	185.83		34.28	185.57	
						25.99	188.61		53.76	189.36		37.72	186.94		34.93	186	
						26.2	188.4		54.37	189.85		39.57	187.34		36.53	186.94	
						27.23	188.03		60.03	189.23		40.23	187.92		38.16	187.5	
						27.88	187.53					40.72	187.88		39.43	187.8	
						29.06	187.21					45.38	189.82	RBK	40.48	188.05	
						30.13	186.06					50.51	189.52		41.2	188.42	
						31.23	185.7					54.36	189.84	Right Pin	42.91	188.86	
						32.59	185.99					59.59	189.33		43.74	189.32	
						33.6	186.33								46.29	189.89	RBK
						34	186.69								48.93	189.71	
						34.48	186.79								51.53	189.34	
						35.58	187.03								54.39	189.81	Right Pin
						37.29	187.28								57.19	189.28	
						38.88	187.78								62.87	189.3	
						40.31	188.12										
						41.26	188.54										
						42.79	189.08										
						44.71	189.56										
						45.13	189.72										
						45.38	189.73										
						45.79	189.84										
						47.02	189.96										
						48.99	189.66										
						51.52	189.36										
						53.38	189.34										
						54.69	189.84										
						54.89	189.84										
						58.31	189.32										
						63.04	189.37										

Photo of Cross-Section 2 - Looking Downstream @ STA 8+47

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			39.54	54.18	51.12	44.82	
Width			20.86	22.40	22.29	22.27	
Mean Depth			1.90	2.42	2.29	2.01	
Max Depth			3.84	4.83	4.90	4.79	
W/D			11.01	9.26	9.72	11.07	



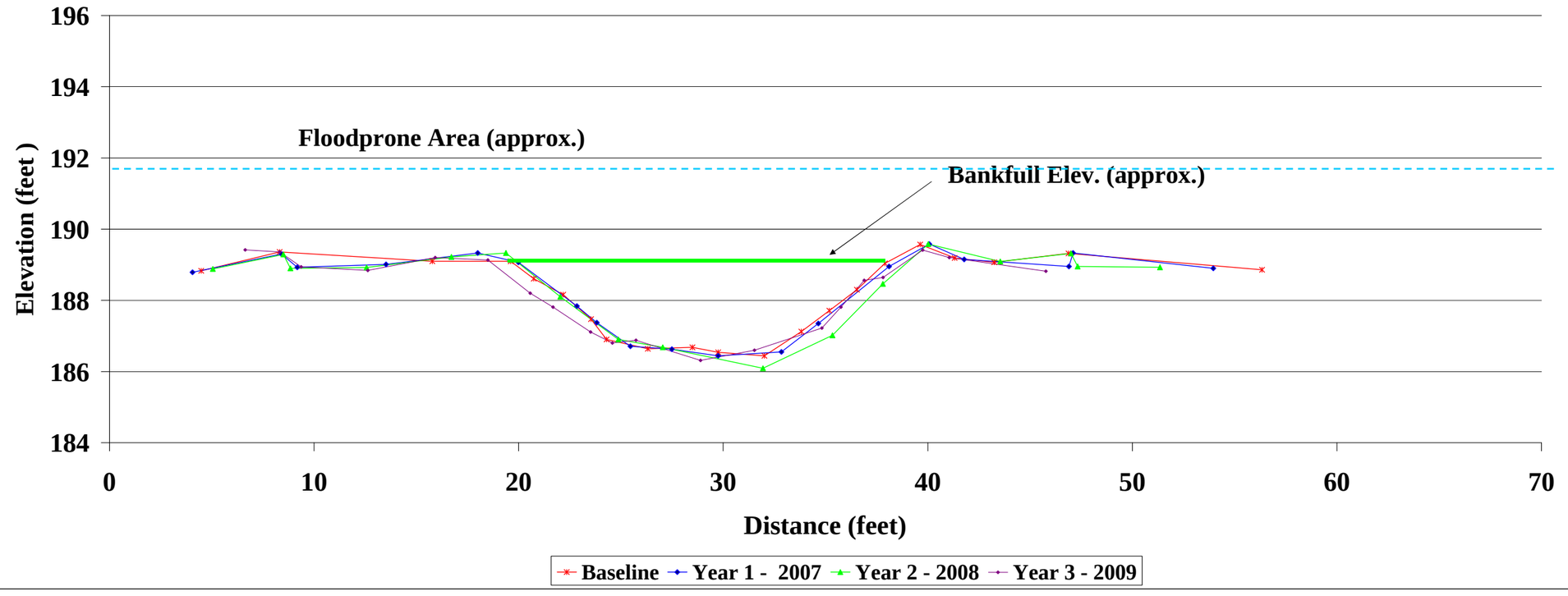
Project Name Overhills
Cross Section Cross Section 3
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen/Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						6.63	189.42		5.05	188.88		4.06	188.79		4.48	188.83	
						8.32	189.36		8.5	189.29		8.41	189.3	Left Pin	8.32	189.36	Left Pin
						9.37	188.94		8.84	188.9		9.18	188.93		15.78	189.1	
						12.62	188.84		12.56	188.92		13.52	189.01		19.61	189.1	
						15.92	189.2		16.71	189.22		18	189.33		20.74	188.61	LBK
						18.5	189.13		19.38	189.33		19.99	189.07	LBK	22.18	188.16	
						20.56	188.2		22.04	188.1		22.85	187.84		23.54	187.47	
						21.68	187.81		24.87	186.9		23.82	187.37		24.3	186.9	
						23.52	187.11		27.04	186.68		25.46	186.71		26.31	186.64	
						24.58	186.8		31.94	186.09		27.49	186.63		28.49	186.68	
						25.74	186.88		35.34	187.02		29.75	186.44		29.75	186.54	
						28.89	186.31		37.8	188.46		32.85	186.55		32.01	186.44	
						31.53	186.6		40.02	189.58		34.65	187.35		33.82	187.12	
						34.82	187.22		43.54	189.09		38.11	188.95		35.19	187.71	
						35.76	187.81		47	189.32		40.08	189.58		36.54	188.3	
						36.89	188.56		47.33	188.95		41.78	189.15	RBK	37.91	189.04	RBK
						37.81	188.64		51.35	188.93		46.9	188.95		39.63	189.57	
						39.75	189.41					47.1	189.33	Right Pin	41.31	189.19	
						41.05	189.2					53.96	188.9		43.25	189.07	
						45.77	188.82								46.88	189.32	Right Pin
															56.34	188.86	

Photo of Cross-Section 3 - Looking Downstream @ STA 13+12

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			33.96	35.19	31.56	31.03	
Width			19.22	18.94	18.36	18.15	
Mean Depth			1.77	1.86	1.72	1.71	
Max Depth			2.73	2.95	2.60	2.60	
W/D			10.87	10.19	10.68	10.62	

Overhills
Cross Section #3



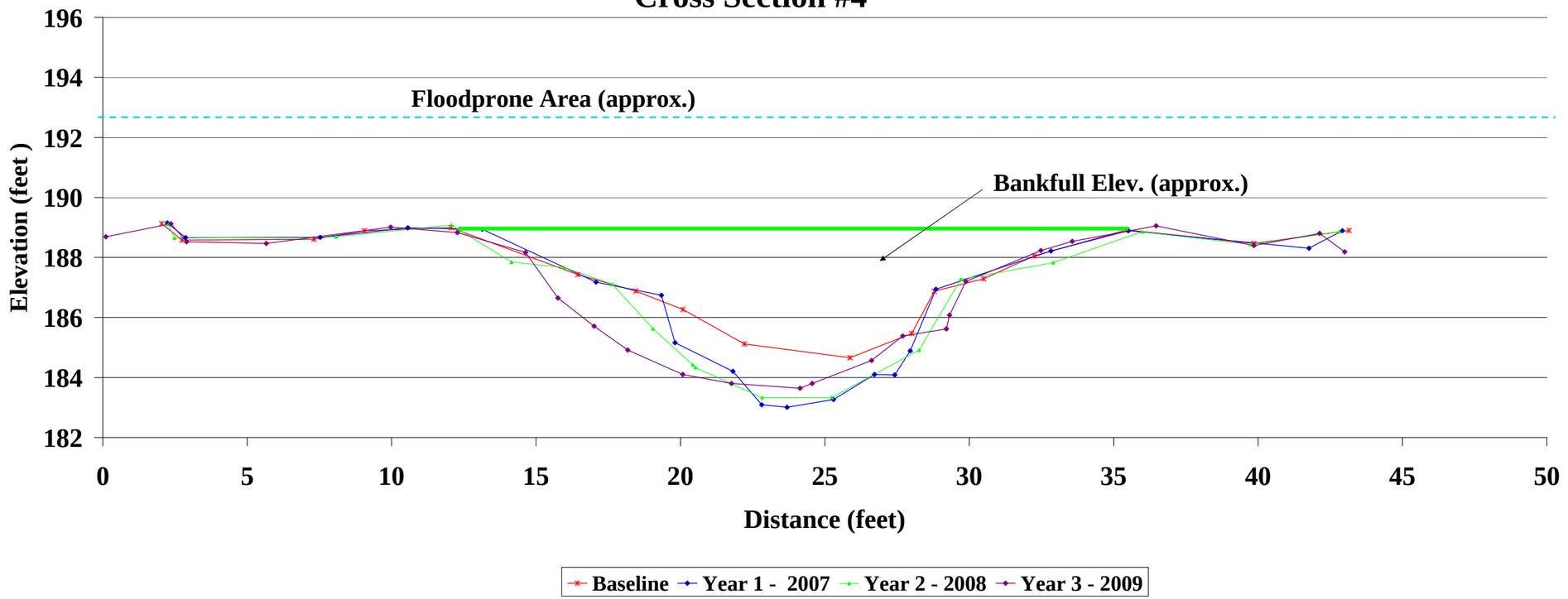
Project Name Overhills
Cross Section Cross Section 4
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen/Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						0.11	188.69		2.27	189.11		2.24	189.15	Left Pin	2.04	189.13	Left Pin
						2.36	189.12		2.48	188.65		2.87	188.66		2.74	188.58	
						2.9	188.52		8.08	188.69		7.53	188.67		7.31	188.61	
						5.66	188.47		12.07	189.08		10.56	188.99	LBK	9.06	188.89	
						9.97	189.01		14.15	187.85		13.14	188.94		12.06	188.99	LBK
						12.28	188.83		15.97	187.67		17.08	187.18		16.45	187.43	
						14.64	188.17		17.64	187.11		19.34	186.74		18.45	186.88	
						15.76	186.65		19.05	185.63		19.81	185.16		20.09	186.27	
						17.01	185.71		20.43	184.42		21.82	184.21		22.22	185.12	
						18.18	184.92		20.52	184.33		22.82	183.09		25.87	184.66	
						20.08	184.1		22.83	183.33		23.69	183.01		28.01	185.47	
						21.77	183.8		25.24	183.34		25.3	183.27		28.79	186.87	
						24.14	183.64		28.27	184.92		26.72	184.1		30.5	187.29	
						24.56	183.8		29.7	187.27		27.42	184.09		32.24	188.05	
						26.62	184.57		32.91	187.83		27.96	184.89		35.46	188.92	RBK
						27.7	185.38		35.98	188.86		28.85	186.94		39.85	188.47	
						29.21	185.62		39.74	188.43		32.83	188.22		43.15	188.9	Right Pin
						29.32	186.08		42.81	188.86		35.51	188.89	RBK			
						29.88	187.2					41.76	188.31				
						32.48	188.23					42.92	188.89	Right Pin			
						33.57	188.54										
						36.47	189.05										
						39.86	188.4										
						42.13	188.8										
						43	188.19										

Photo of Cross-Section 4 - Looking Upstream @ STA 20+93

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			66.54	64.86	59.60	49.19	
Width			23.42	23.11	22.25	23.19	
Mean Depth			2.84	2.81	2.68	2.12	
Max Depth			5.28	5.59	5.91	4.26	
W/D			8.24	8.23	8.31	10.93	

Overhills
Cross Section #4



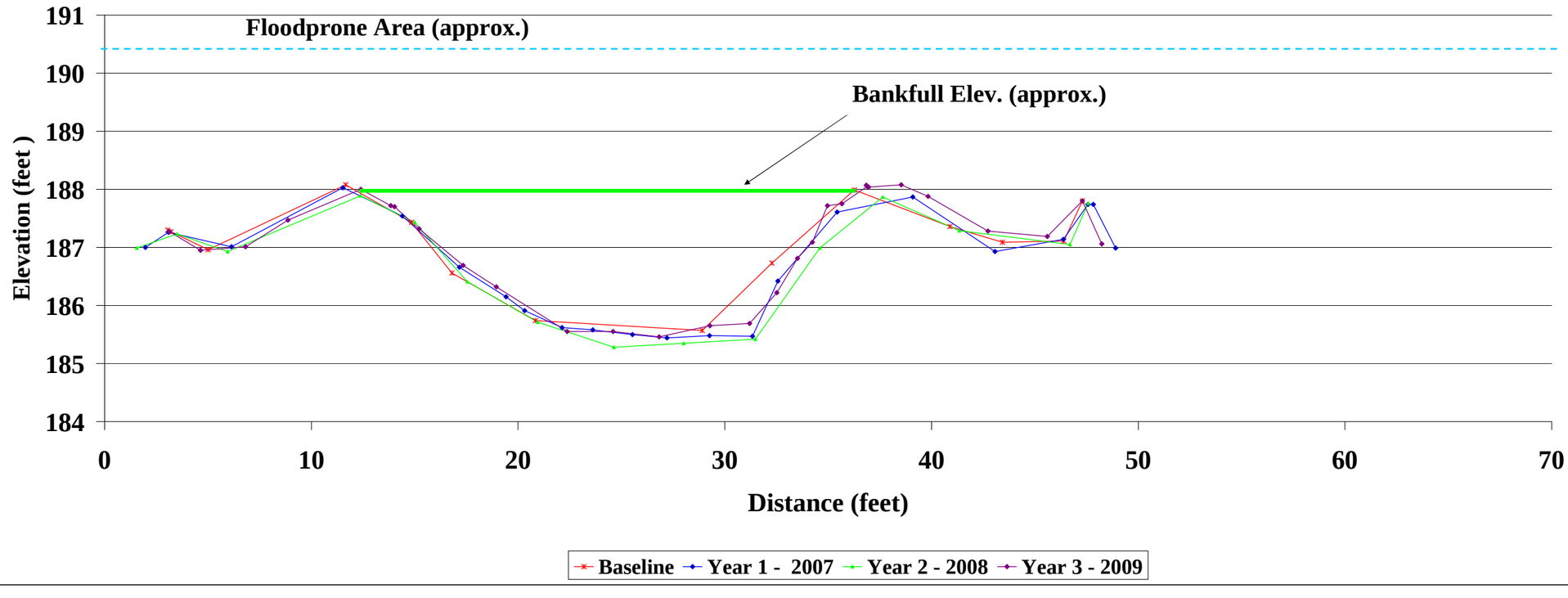
Project Name Overhills
Cross Section Cross Section 5
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen/Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						3.14	187.27		1.55	186.99		1.97	187		3.05	187.3	Left Pin
						4.64	186.95		3.5	187.23		3.09	187.26	Left Pin	3.21	187.27	
						6.82	187.01		5.95	186.93		6.14	187.01		5.01	186.96	
						8.86	187.47		12.38	187.89		11.52	188.03	LBK	11.66	188.08	LBK
						12.39	188		15	187.43		14.4	187.54		14.84	187.43	
						13.84	187.72		17.55	186.41		17.16	186.66		16.8	186.56	
						14.02	187.7		20.95	185.71		19.42	186.15		20.84	185.74	
						15.21	187.32		24.63	185.28		20.32	185.91		28.91	185.57	
						17.34	186.69		28.01	185.35		22.12	185.62		32.28	186.73	
						18.95	186.32		31.48	185.42		23.61	185.58		36.26	187.99	RBK
						22.37	185.55		34.6	186.99		25.53	185.5		40.89	187.36	
						24.59	185.55		37.64	187.87		27.2	185.44		43.43	187.09	
						26.82	185.46		41.34	187.29		29.26	185.48		46.4	187.11	Right Pin
						29.28	185.65		46.7	187.05		31.34	185.47		47.3	187.8	
						31.2	185.69		47.58	187.76		32.57	186.42				
						32.52	186.22					35.43	187.61				
						33.52	186.81					39.09	187.87	RBK			
						34.24	187.09					43.07	186.93				
						34.97	187.72					46.38	187.14	Right Pin			
						35.66	187.75					47.57	187.74				
						36.88	188.05					47.83	187.74				
						36.84	188.07					48.91	186.99				
						36.95	188.04										
						38.53	188.08										
						39.83	187.88										
						42.73	187.28										
						45.6	187.19										
						47.3	187.8										
						48.24	187.06										

Photo of Cross-Section 5 - Looking Downstream @ STA 26+86

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			39.38	44.36	40.91	37.70	
Width			24.49	24.63	24.50	24.16	
Mean Depth			1.61	1.80	1.67	1.56	
Max Depth			2.53	2.71	2.55	2.42	
W/D			15.23	13.67	14.68	15.48	

Overhills
Cross Section #5

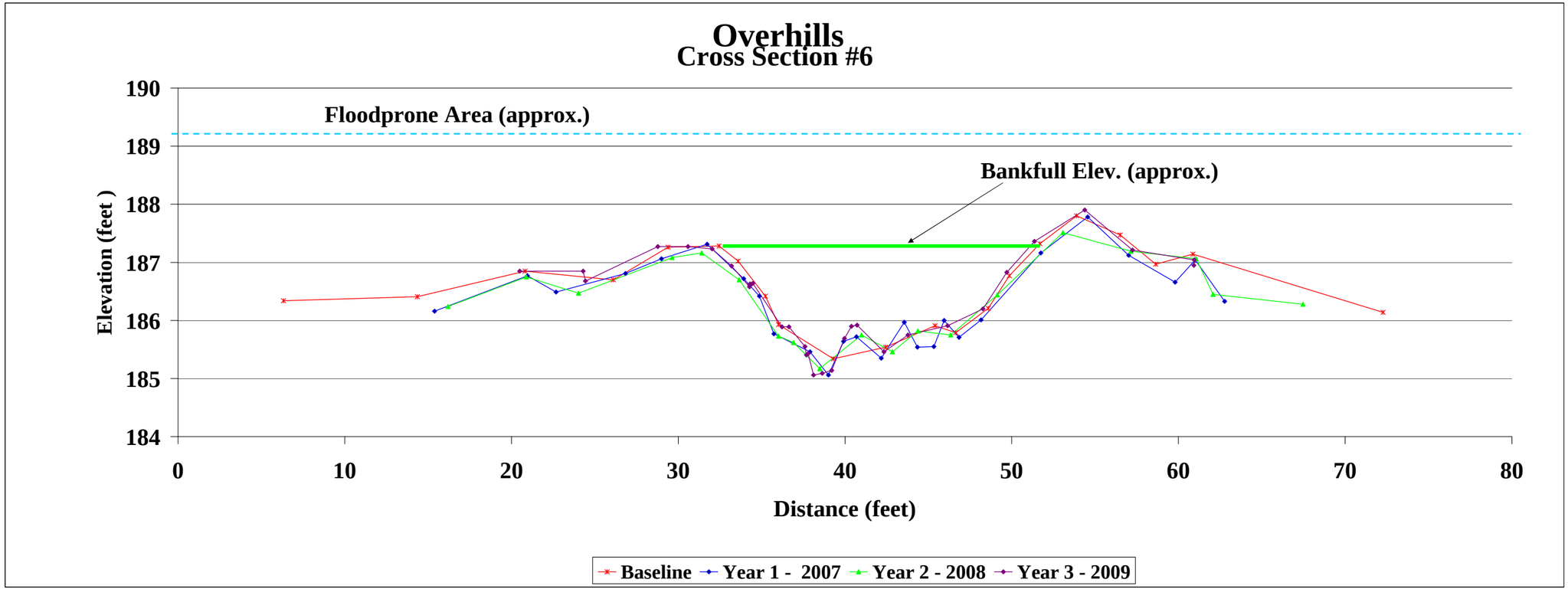


Project Name Overhills
Cross Section Cross Section 6
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen/Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						20.49	186.85		16.19	186.24		15.39	186.16		6.32	186.34	
						24.3	186.85		20.88	186.75		20.95	186.77	Left Pin	14.35	186.41	
						24.44	186.68		24.02	186.47		22.67	186.49		20.81	186.85	Left Pin
						28.78	187.27		29.63	187.08		26.84	186.81		26.11	186.7	
						30.58	187.27		31.41	187.16		29	187.06		29.39	187.26	
						32.03	187.23		33.66	186.7		31.73	187.31	LBK	32.45	187.28	LBK
						33.2	186.94		36.02	185.73		33.93	186.72		33.59	187.02	
						34.27	186.58		36.92	185.62		34.87	186.42		35.23	186.42	
						34.28	186.61		38.49	185.17		35.74	185.77		36.01	185.93	
						34.31	186.63		40.99	185.75		37.91	185.46		39.3	185.34	
						34.32	186.61		42.85	185.46		39.01	185.06		42.44	185.54	
						34.47	186.64		44.37	185.82		39.91	185.64		45.4	185.91	
						36.22	185.89		46.34	185.75		40.69	185.72		46.64	185.79	
						36.64	185.89		49.14	186.44		42.18	185.35		48.59	186.21	
						37.6	185.55		53.07	187.51		43.56	185.97		49.86	186.77	
						37.69	185.407		57.15	187.19		44.34	185.54		51.69	187.32	RBK
						37.79	185.43		61.07	187.06		45.33	185.55		53.89	187.8	
						38.12	185.06		62.07	186.45		45.95	186		56.5	187.47	
						38.64	185.09		67.47	186.28		46.84	185.71		58.64	186.97	
						39.2	185.14					48.16	186.01		60.87	187.14	Right Pin
						39.97	185.69					51.75	187.16	RBK	72.27	186.14	
						40.39	185.9					54.56	187.78				
						40.72	185.92					57.01	187.12				
						42.34	185.46					59.8	186.66				
						43.78	185.75					61.01	187.04	Right Pin			
						46.16	185.91					62.77	186.33				
						48.28	186.2										
						49.7	186.83										
					-	51.37	187.36										
						54.38	187.9										
						57.25	187.21										
						60.95	187.04										
						60.93	186.95										

Photo of Cross-Section 6 - Looking Downstream @ STA 31+56

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			23.06	25.14	25.35	23.43	
Width			18.65	19.23	19.24	19.06	
Mean Depth			1.24	1.31	1.32	1.23	
Max Depth			2.22	2.11	2.21	1.94	
W/D			15.08	14.71	14.59	15.51	

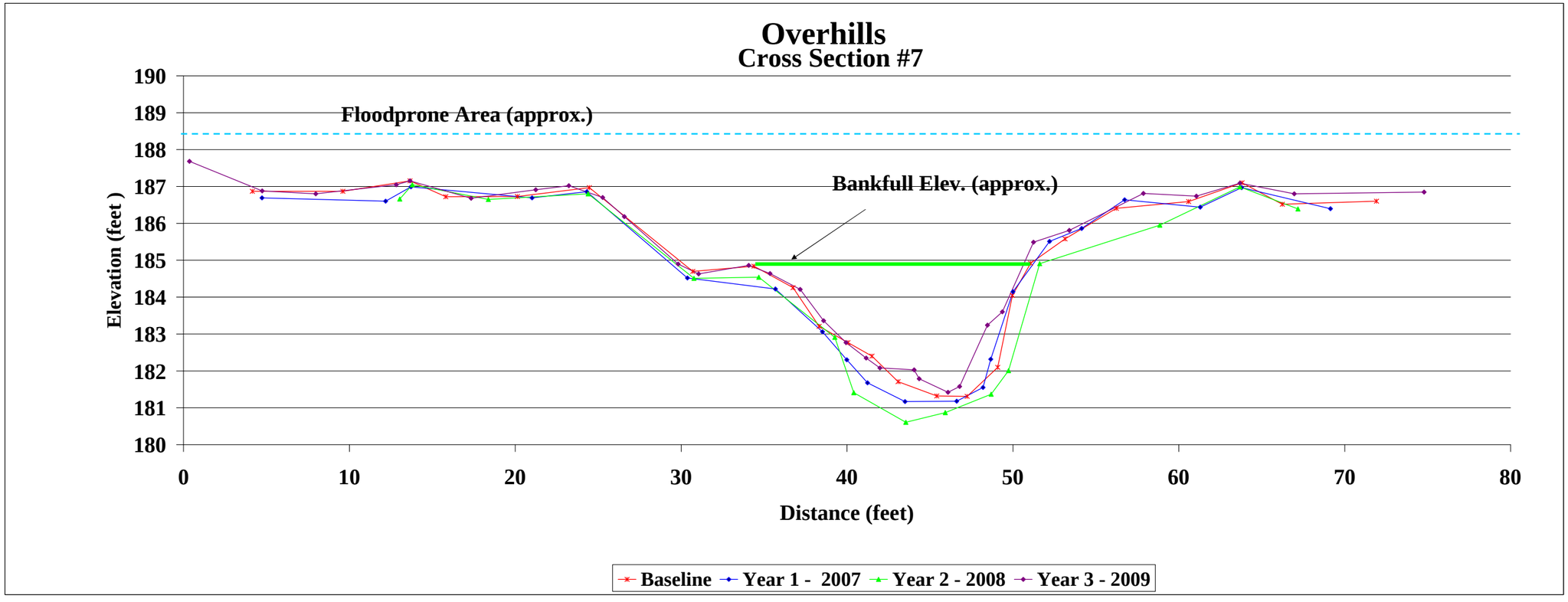


Project Name Overhills
Cross Section Cross Section 7
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen/Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						0.36	187.68		13.04	186.66		4.74	186.69		4.15	186.87	
						4.75	186.88		13.8	187.05		12.19	186.6		9.61	186.87	
						7.98	186.8		18.38	186.65		13.71	186.99	Left Pin	13.66	187.15	Left Pin
						12.83	187.05		24.4	186.8		21.01	186.69		15.81	186.72	
						13.66	187.15		30.78	184.51		24.31	186.86		20.13	186.73	
						17.34	186.68		34.68	184.54		30.38	184.52	LBK	24.47	186.97	
						21.24	186.91		39.27	182.91		35.69	184.22		30.71	184.7	
						23.23	187.02		40.41	181.41		38.52	183.06		34.39	184.84	LBK
						25.27	186.7		43.55	180.61		39.99	182.3		36.75	184.26	
						26.58	186.18		45.93	180.87		41.24	181.68		38.32	183.21	
						29.82	184.9		48.69	181.37		43.5	181.17		40.06	182.77	
						31.05	184.63		49.74	182.01		46.61	181.18		41.51	182.4	
						34.08	184.86		51.62	184.91		48.2	181.55		43.08	181.71	
						35.36	184.64		58.86	185.95		48.67	182.32		45.41	181.32	
						37.18	184.21		63.69	186.99		50	184.15		47.24	181.31	
						38.59	183.36		67.18	186.39		52.21	185.51	RBK	49.08	182.1	
						39.94	182.77					54.14	185.86		49.97	184.05	
						41.16	182.35					56.73	186.64		51.07	184.92	RBK
						41.98	182.08					61.3	186.44		53.14	185.58	
						44.05	182.03					63.79	186.97	Right Pin	56.23	186.41	
						44.35	181.79					69.14	186.4		60.6	186.59	
						46.09	181.42								63.81	187.1	Right Pin
						46.79	181.58								66.24	186.52	
						48.47	183.24								71.92	186.6	
						49.37	183.6										
						51.24	185.49										
						53.4	185.81										
						57.87	186.81										
					-	61.06	186.74										
						63.69	187.09										
						66.96	186.8										
						74.79	186.85										

Photo of Cross-Section 7 - Looking Downstream @ STA 37+24

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			30.41	40.80	39.41	35.21	
Width			16.15	16.68	16.68	16.54	
Mean Depth			1.88	2.45	2.36	2.13	
Max Depth			3.41	4.23	3.67	3.53	
W/D			8.58	6.82	7.06	7.77	

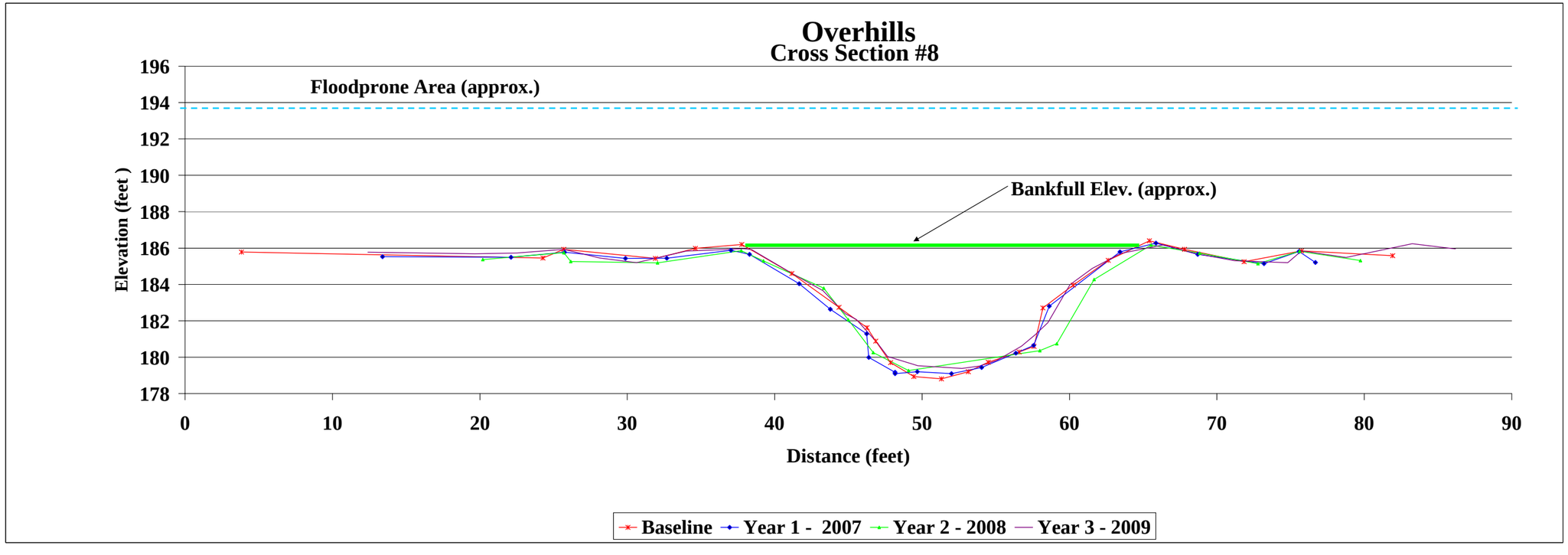


Project Name Overhills
Cross Section Cross Section 8
Feature
Date As Built -7/04/08, Year 1 - 11/09/08, Year 2 - 8/12/08, Year 3 - 8/15/09
Crew As Built - Bidelspach/Jean/Geenen, Year 1&2 - Geenen/Ballestero, Year 3 - Geenen/Jean

Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						12.4	185.77		20.2	185.37		13.4	185.53		3.83	185.78	
						19.67	185.69		25.7	185.75		22.11	185.5		24.28	185.45	
						22.55	185.73		26.17	185.26		25.75	185.77	Left Pin	25.7	185.93	Left Pin
						25.7	185.93	Left Pin	32.05	185.19		29.88	185.43		31.91	185.43	
						28.13	185.45		37.73	185.86		32.68	185.44		34.62	185.98	
						30.63	185.2		39.24	185.29		37.04	185.88	LBK	37.77	186.2	LBK
						34.01	185.84		43.33	183.79		38.3	185.65		41.17	184.6	
						37.88	185.96		44.99	182.06		41.67	184.04		44.37	182.74	
						38.43	185.92		46.69	180.25		43.77	182.64		46.27	181.63	
						41.08	184.66		49.08	179.27		46.24	181.29		46.85	180.88	
						43.28	183.66		57.99	180.36		46.38	179.99		47.86	179.7	
						44.79	182.39		59.14	180.74		48.16	179.17		49.44	178.94	
						45.55	182.07		61.67	184.27		48.17	179.1		51.31	178.81	
						46.97	180.77		65.53	186.17		49.67	179.2		53.14	179.2	
						47.65	180.04		68.83	185.72		51.99	179.1		54.48	179.72	RBK
						49.71	179.53		72.79	185.15		54.04	179.44	RBK	56.58	180.29	
						52.7	179.38		75.6	185.82		56.36	180.22		57.59	180.59	
						53.88	179.51		79.74	185.31		57.57	180.65		58.19	182.71	
						55.03	179.81					58.63	182.81		60.26	183.96	
						56.74	180.6					63.42	185.79		62.63	185.33	
						57.68	181.24					65.87	186.27		65.42	186.4	
						58.54	181.9					68.7	185.65		67.81	185.93	
						60.03	183.99					73.19	185.15		71.84	185.25	
						61.54	184.88					75.56	185.81	Right Pin	75.73	185.85	Right Pin
						63.48	185.71					76.68	185.21		81.92	185.58	
						66.38	186.18								89.04	186.33	
						68.56	185.7										
						71.21	185.3										
					-	74.8	185.2										
						75.73	185.85	Right Pin									
						78.76	185.48										
						83.25	186.24										
						86.19	185.95										

Photo of Cross-Section 8 - Looking Downstream @ STA 43+02

	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			103.50	113.53	110.97	106.10	
Width			27.75	27.69	27.72	27.10	
Mean Depth			3.73	4.10	4.00	3.92	
Max Depth			6.82	6.92	7.09	7.38	
W/D			7.44	6.75	6.92	6.92	

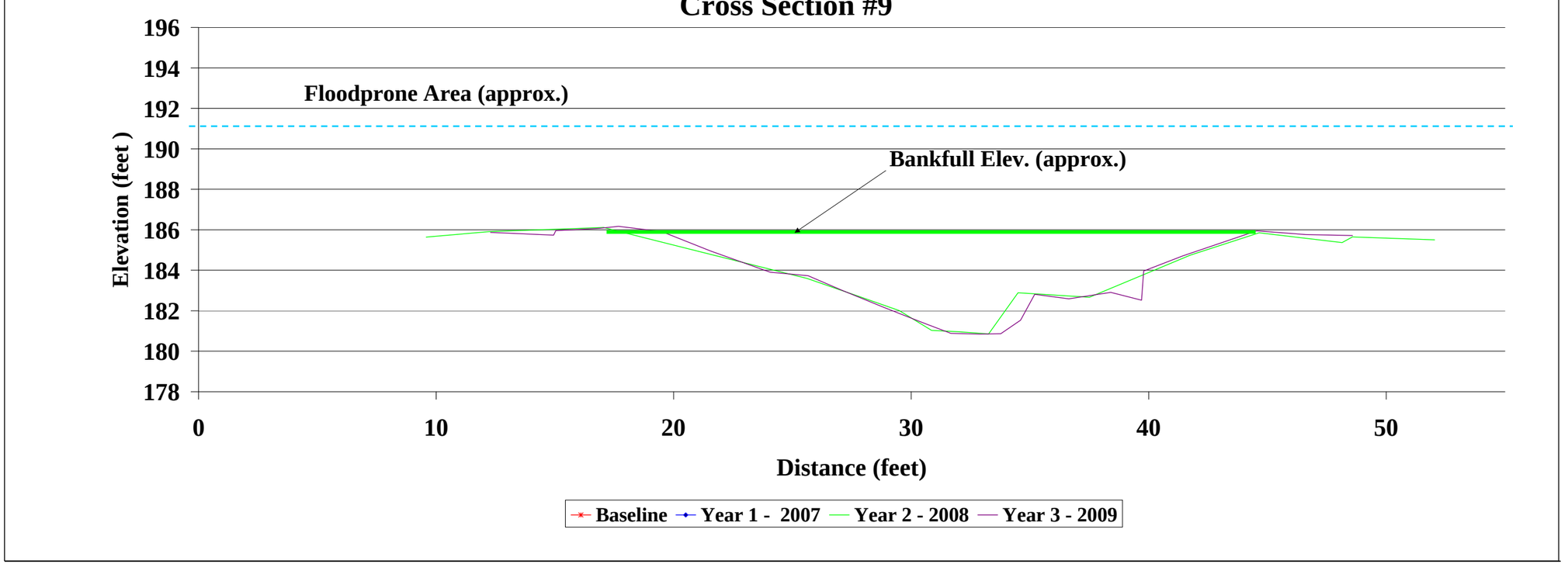


Project Name Overhills
Cross Section Cross Section 9
Feature
Date Year 2 - 8/12/08, Year 3 - 8/15/09
Crew Year 2 - Geenen/Ballestero, Year 3 - Geenen/Jean

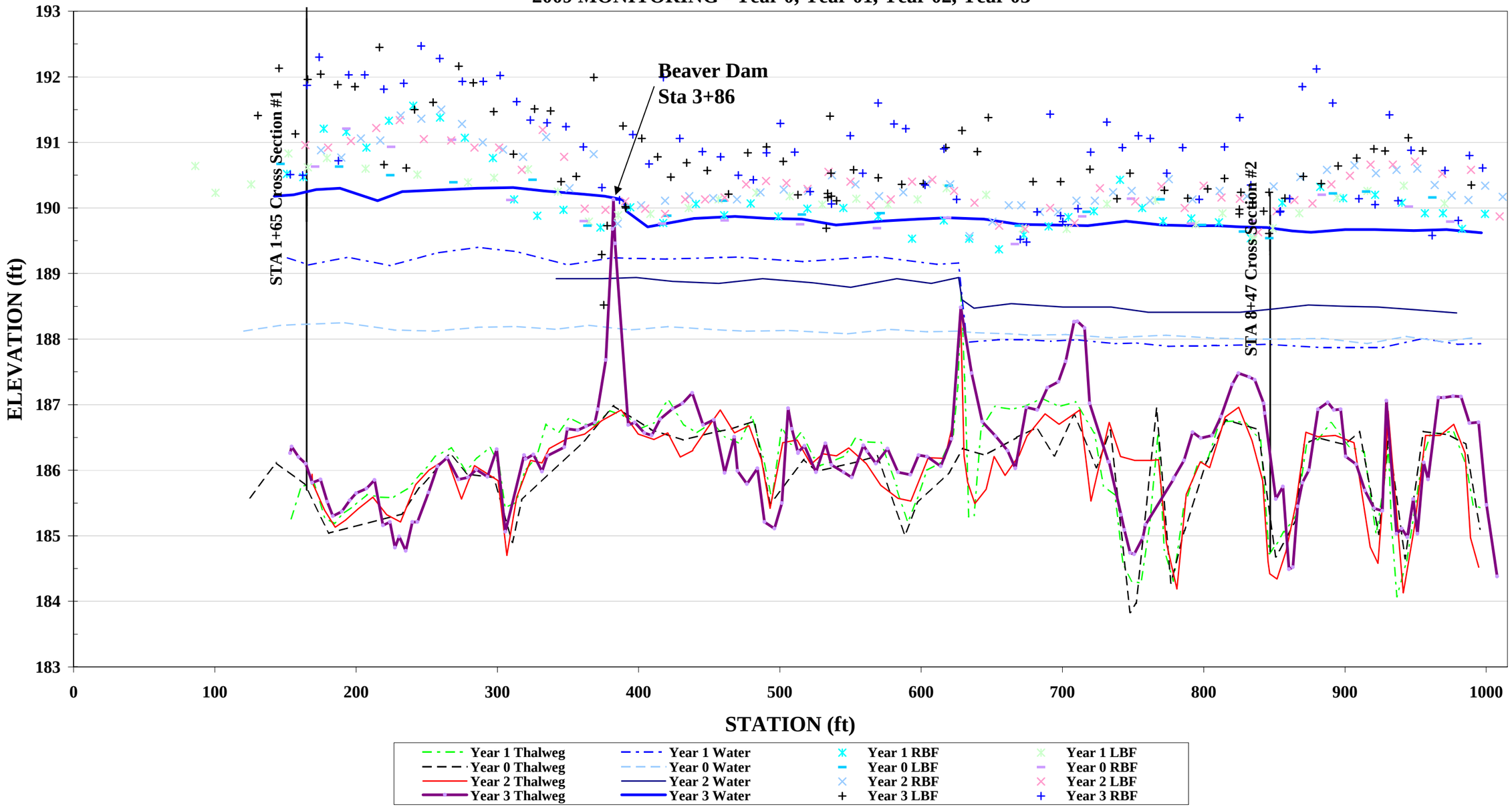
Year 5 - 2011 2011 Survey			Year 4 - 2010 2010 Survey			Year 3 - 2009 2009 Survey			Year 2 - 2008 2008 Survey			Year 1 - 2007 2007 Survey			Baseline Survey		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						12.29	185.87	Left Pin	9.58	185.64							
						14.95	185.74		12.23	185.91	Left Pin						
						15.04	185.96		17.05	186.11	BKF						
						16.9	186.08		21.52	184.8							
						17.68	186.17		25.62	183.6							
						19.5	185.91		27.83	182.7							
						21.56	184.95		29.5	182.01							
						24.06	183.91		30.86	181.03							
						25.66	183.73		31.99	180.96							
						27.08	183.02		33.26	180.86							
						28.88	182.15		34.5	182.89							
						30.54	181.39		37.5	182.67							
						31.67	180.89		41.75	184.75							
						32.86	180.85	thalweg	44.65	185.85	BKF						
						33.77	180.87		48.14	185.37							
						34.61	181.53		48.58	185.65	Right Pin						
						35.2	182.81		52.04	185.5							
						36.64	182.59										
						38.4	182.91										
						39.7	182.52										
						39.79	183.96										
						41.43	184.71										
						44.54	185.95										
						46.61	185.77										
						48.58	185.72	Right Pin									

Photo of Cross-Section 9 - Looking Downstream @ STA 39+30

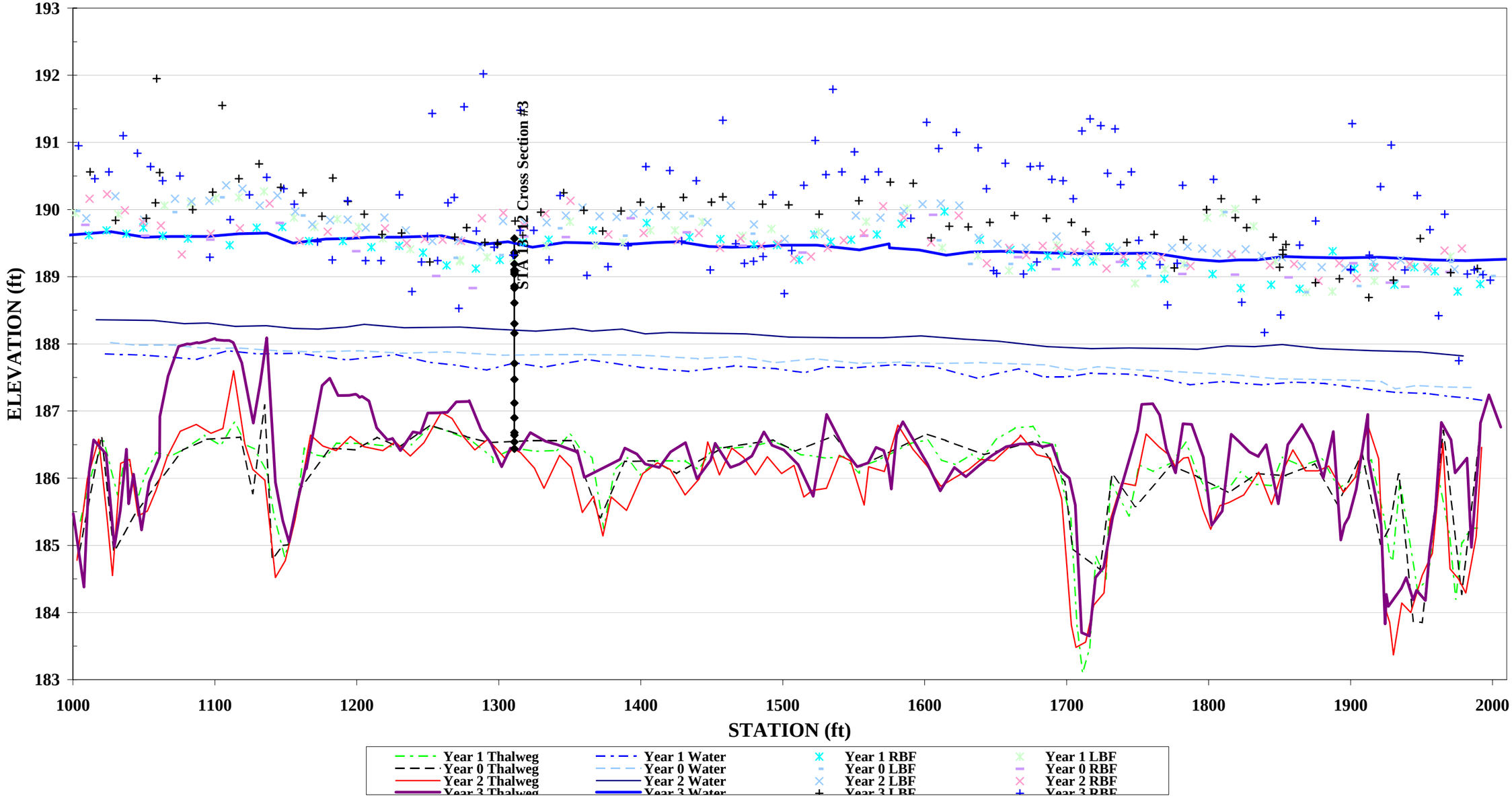
	Year 5 - 2011	Year 4 - 2010	Year 3 - 2009	Year 2 - 2008	Year 1 - 2007	Baseline	Bench
Area			64.11	62.93			
Width			24.64	26.71			
Mean Depth			2.60	2.36			
Max Depth			5.00	4.99			
W/D			9.47	11.34			



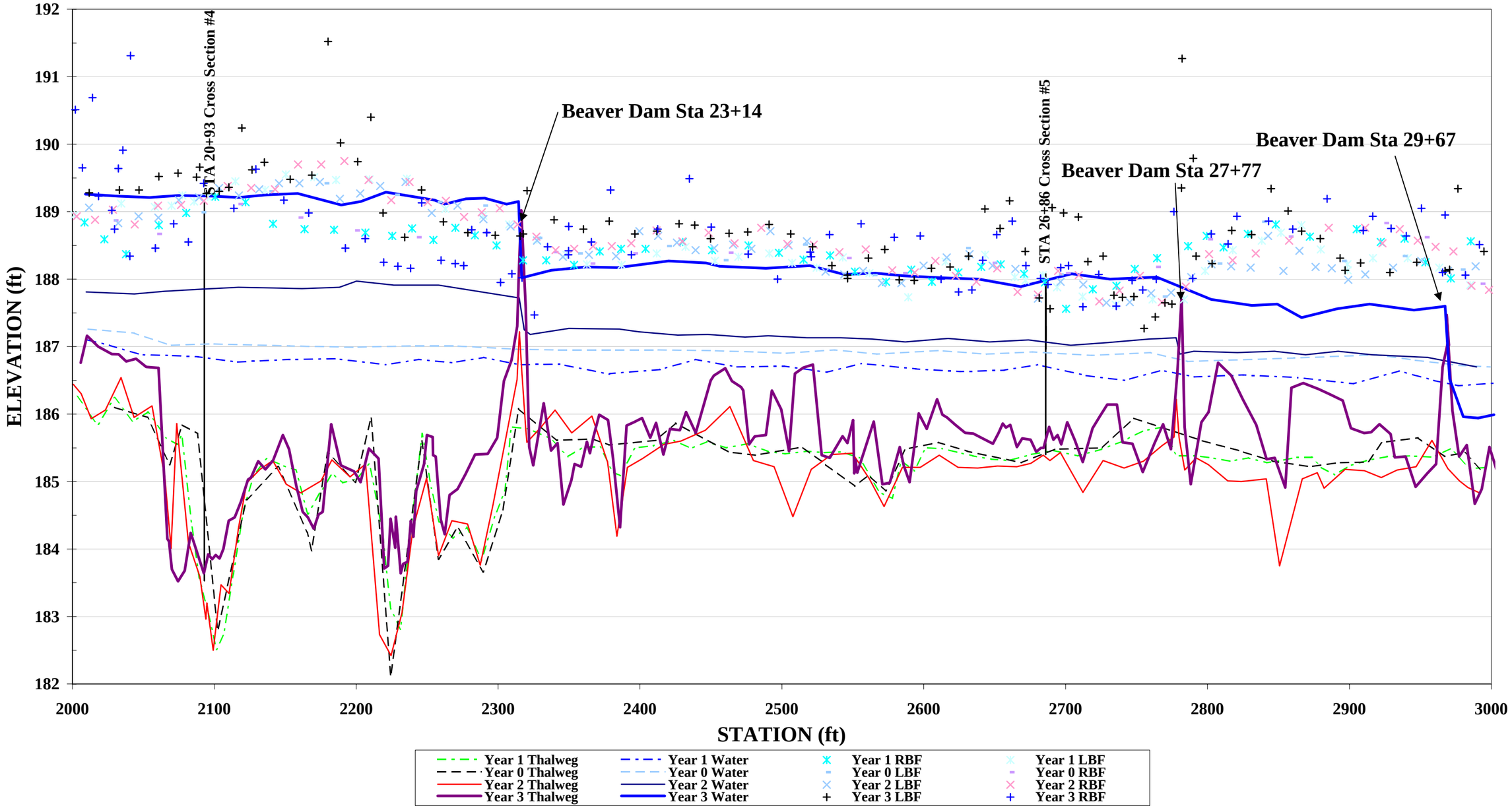
Overhills Profile -Upper Reach
STA 0+00 - STA 10+00
2009 MONITORING - Year 0, Year 01, Year 02, Year 03



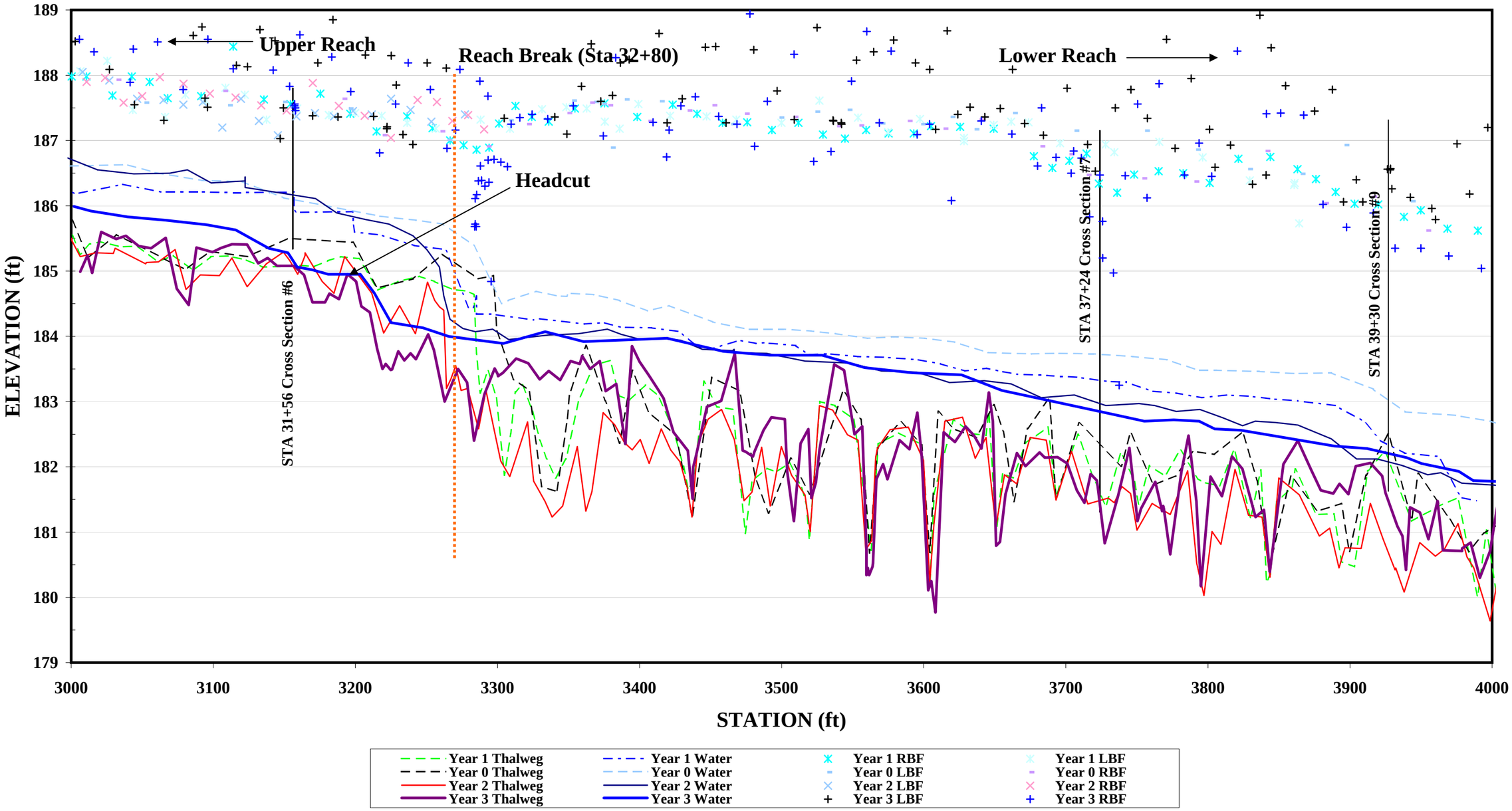
Overhills Profile - Upper Reach
STA 10+00 - STA 20+00
2009 MONITORING - Year 0, Year 01, Year 02 Year 03



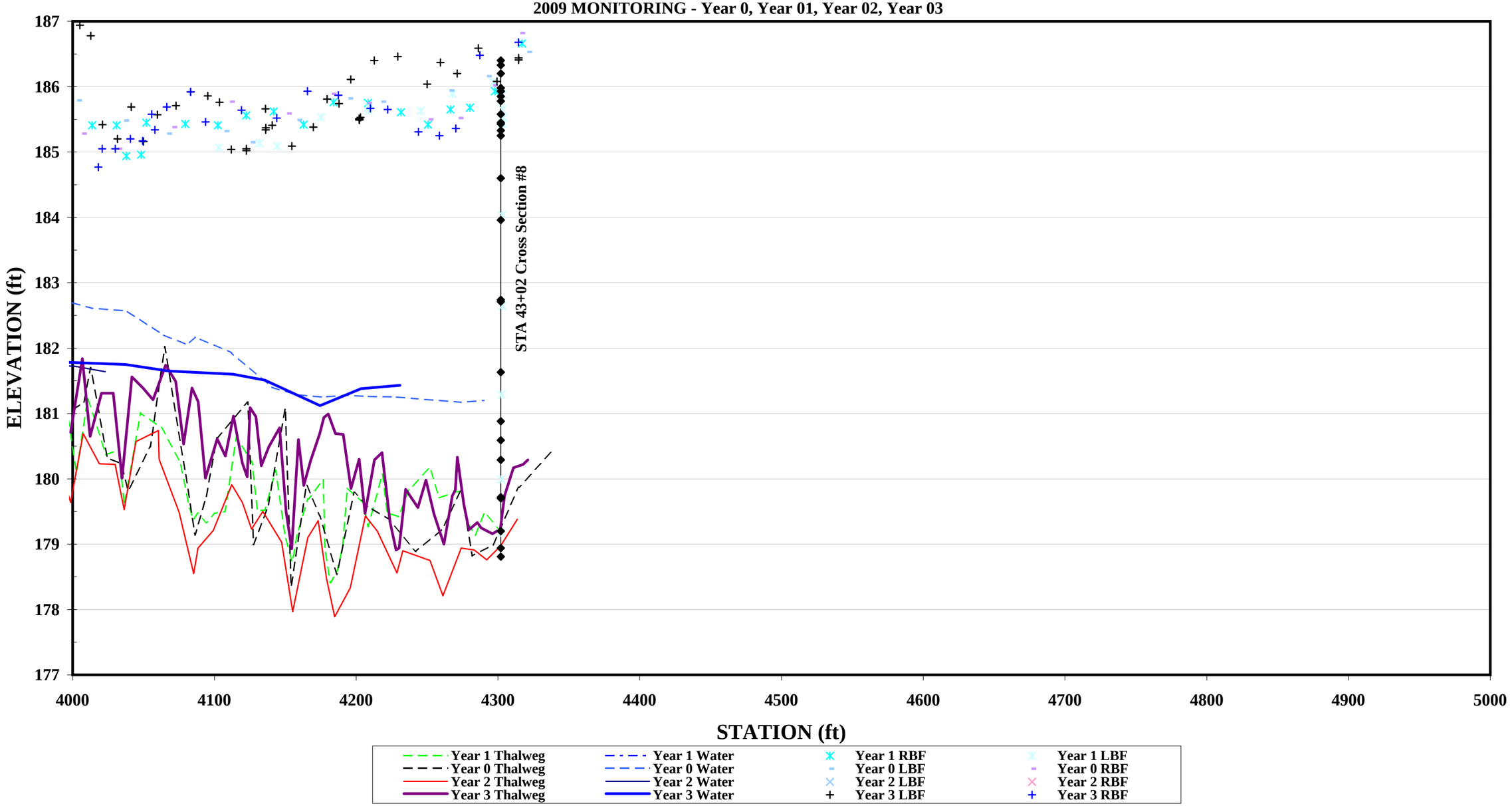
Overhills Profile - Upper Reach
STA 20+00 - STA 30+00
2009 MONITORING - Year 0, Year 01, Year 02, Year 03



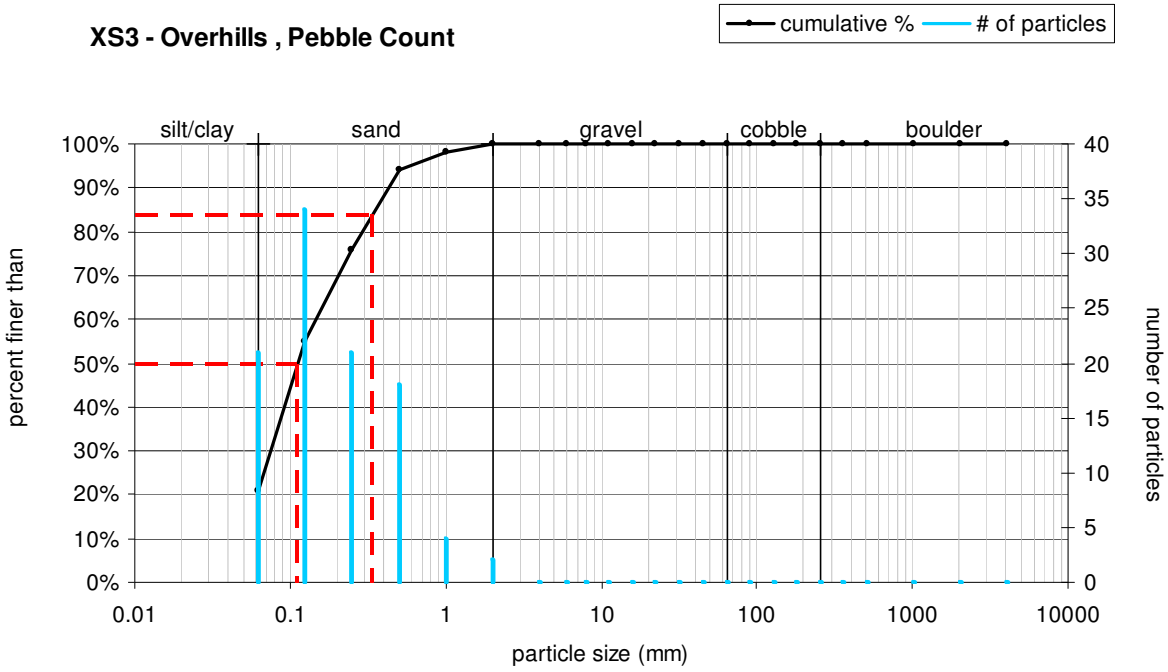
Overhills Profile - Upper & Lower Reaches
STA 30+00 - STA 40+00
2009 MONITORING - Year 0, Year 01, Year 02, Year 03



Overhills Profile
Lower Reach
STA 40+00 - STA 50+00
2009 MONITORING - Year 0, Year 01, Year 02, Year 03



XS3 - Overhills , Pebble Count

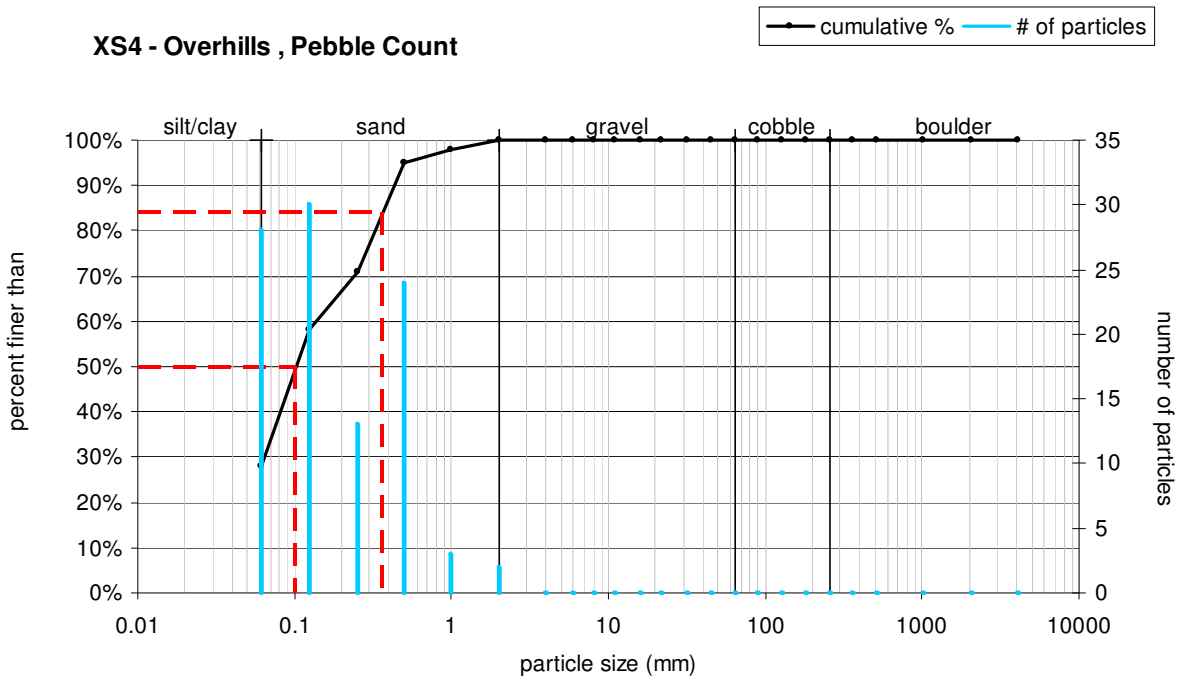


Size (mm)	
D16	0.062
D35	0.083
D50	0.11
D65	0.17
D84	0.34
D95	0.59

Size Distribution	
mean	0.1
dispersion	2.4
skewness	0.14

Type	
silt/clay	21%
sand	79%
gravel	0%
cobble	0%
boulder	0%

XS4 - Overhills , Pebble Count

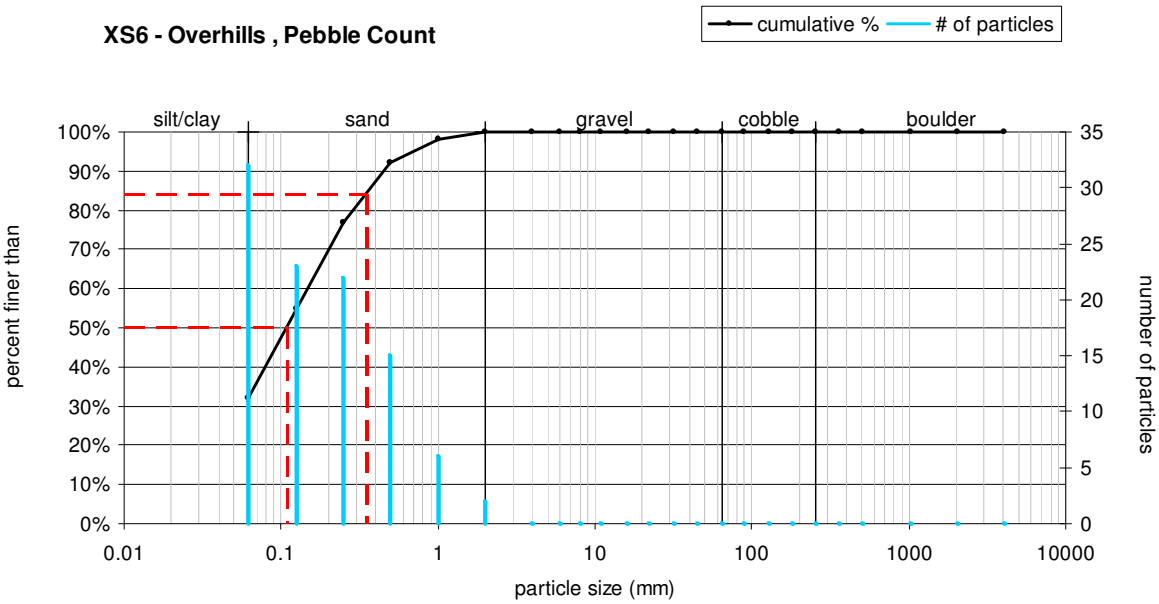


Size (mm)	
D16	0.062
D35	0.073
D50	0.1
D65	0.18
D84	0.36
D95	0.5

Size Distribution	
mean	0.1
dispersion	2.6
skewness	0.20

Type	
silt/clay	28%
sand	72%
gravel	0%
cobble	0%
boulder	0%

XS6 - Overhills , Pebble Count

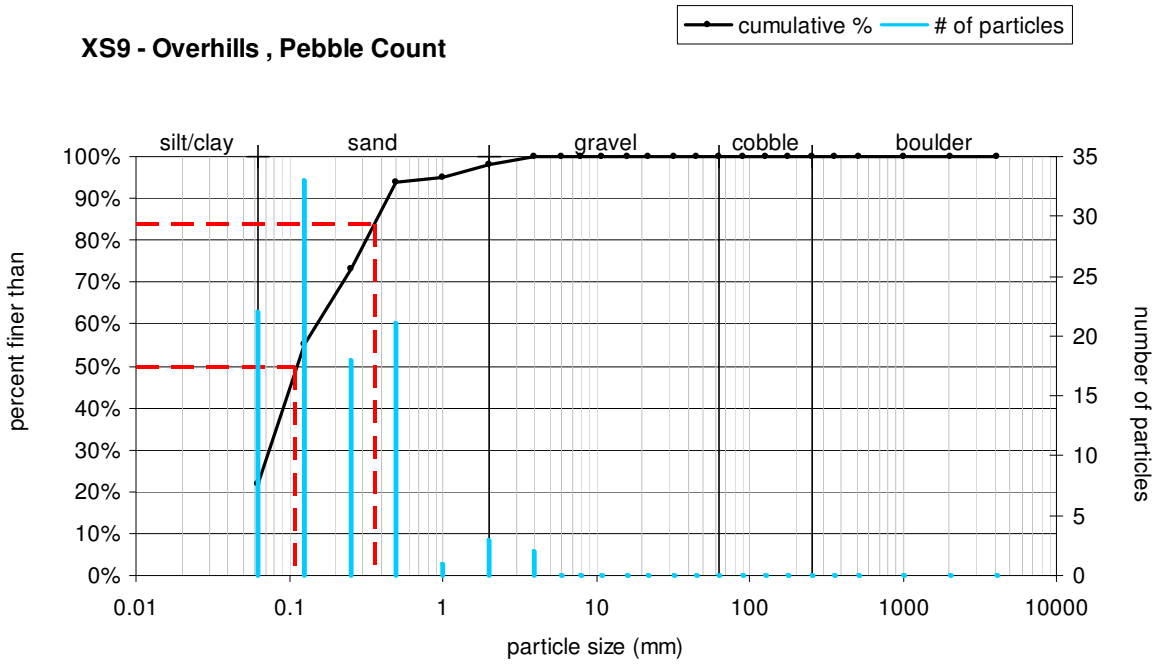


Size (mm)	
D16	0.062
D35	0.068
D50	0.11
D65	0.17
D84	0.35
D95	0.71

Size Distribution	
mean	0.1
dispersion	2.5
skewness	0.15

Type	
silt/clay	32%
sand	68%
gravel	0%
cobble	0%
boulder	0%

XS9 - Overhills , Pebble Count

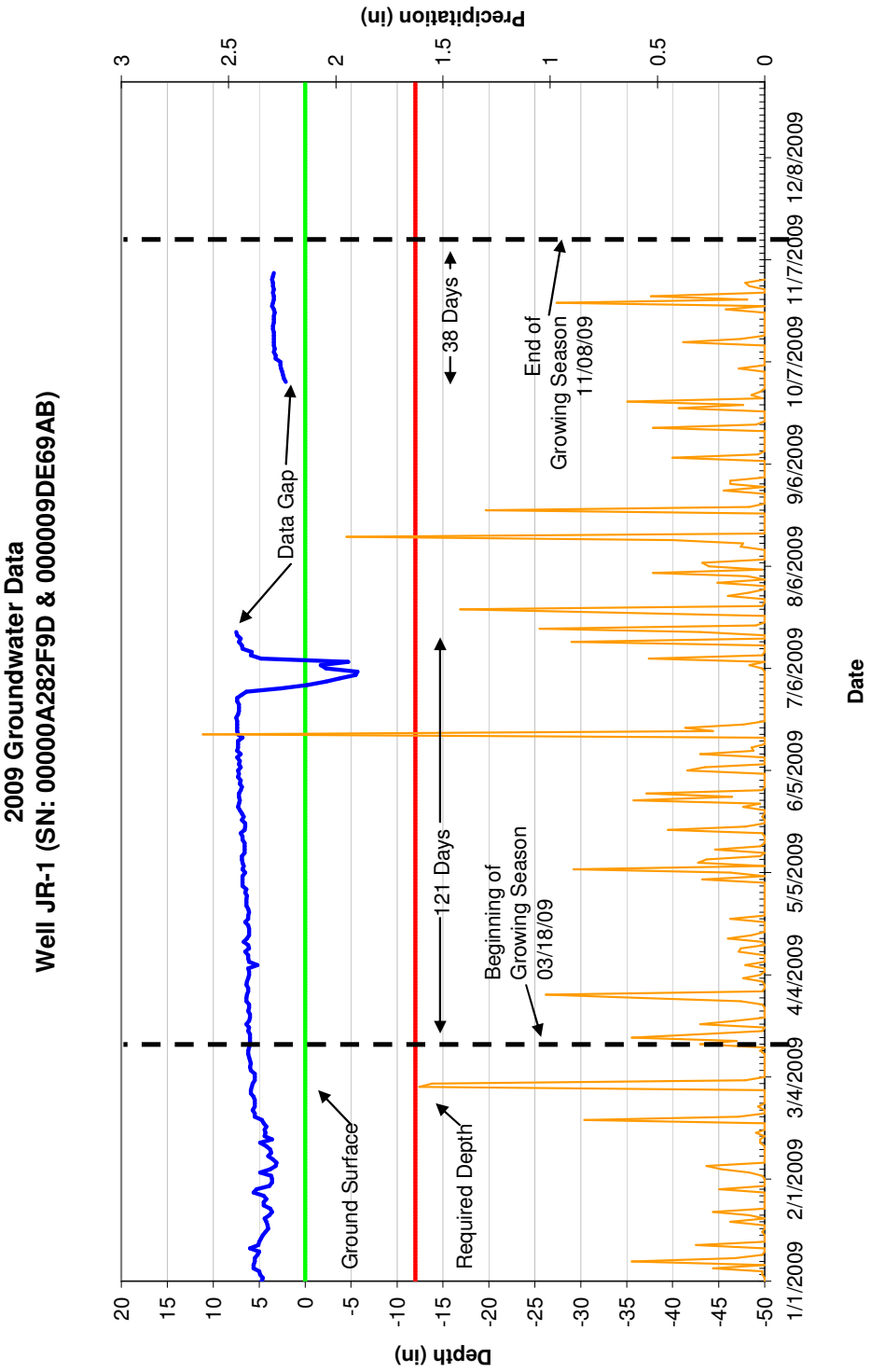


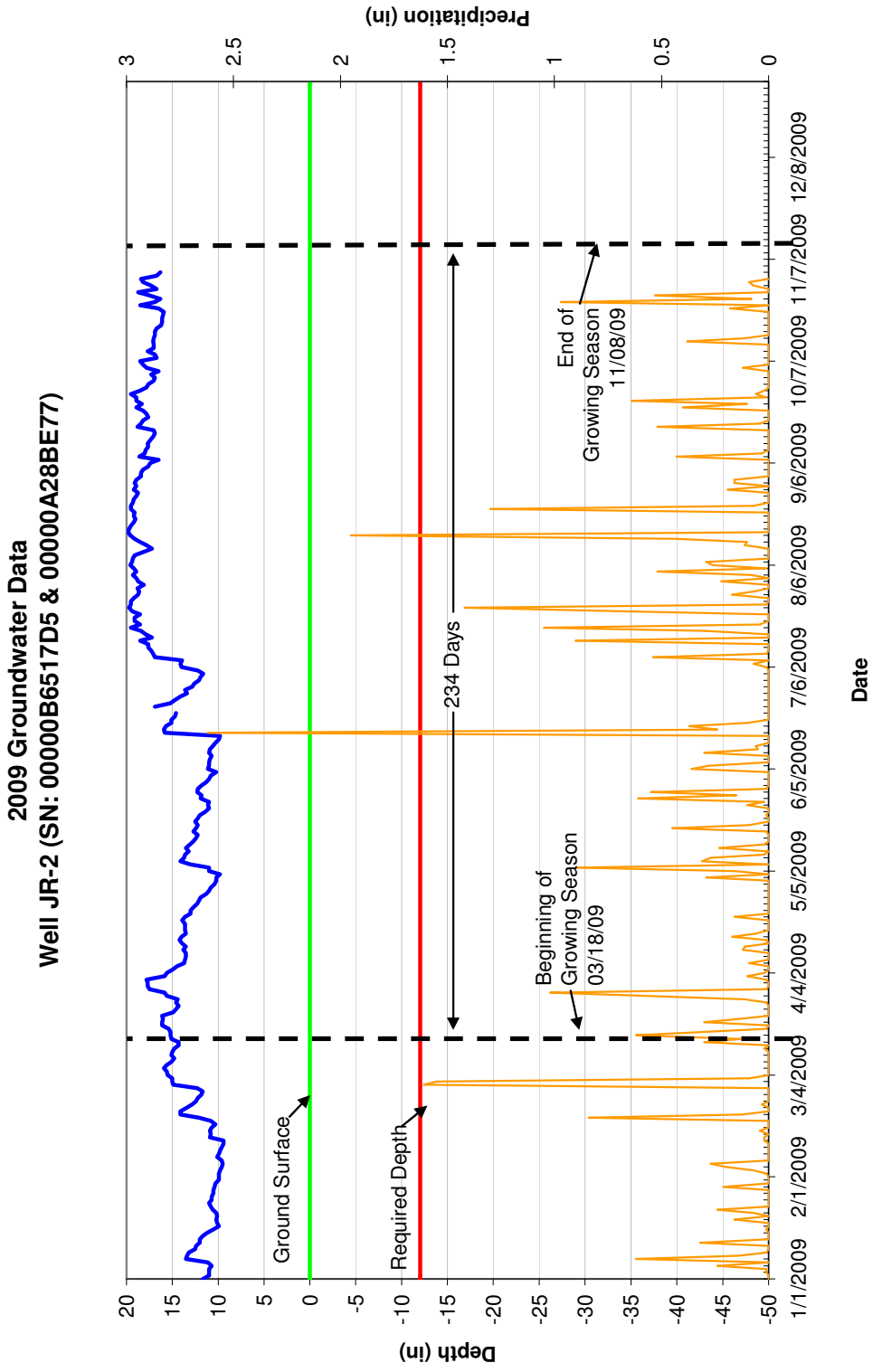
Size (mm)	
D16	0.062
D35	0.082
D50	0.11
D65	0.18
D84	0.36
D95	1

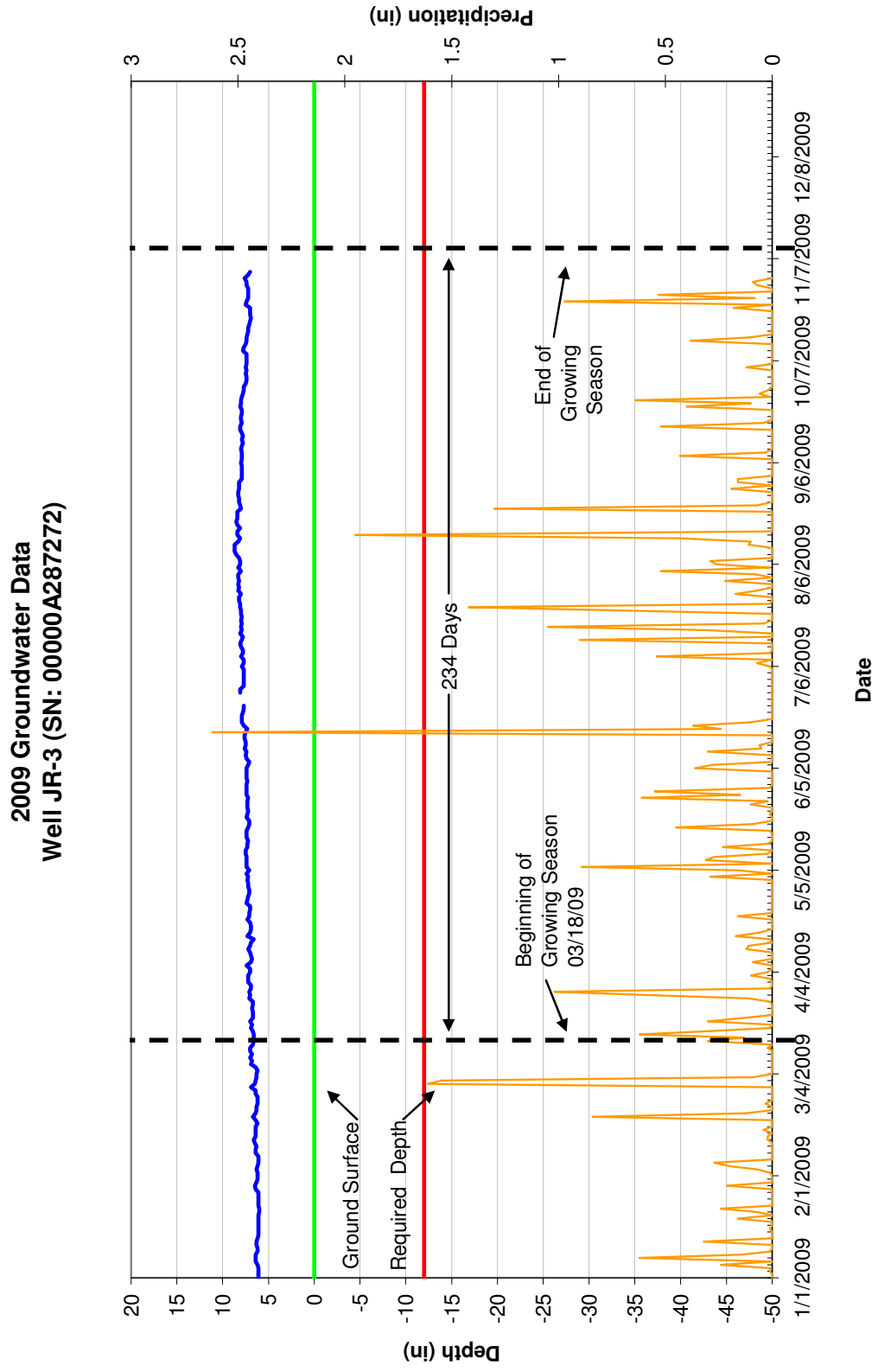
Size Distribution	
mean	0.1
dispersion	2.5
skewness	0.15

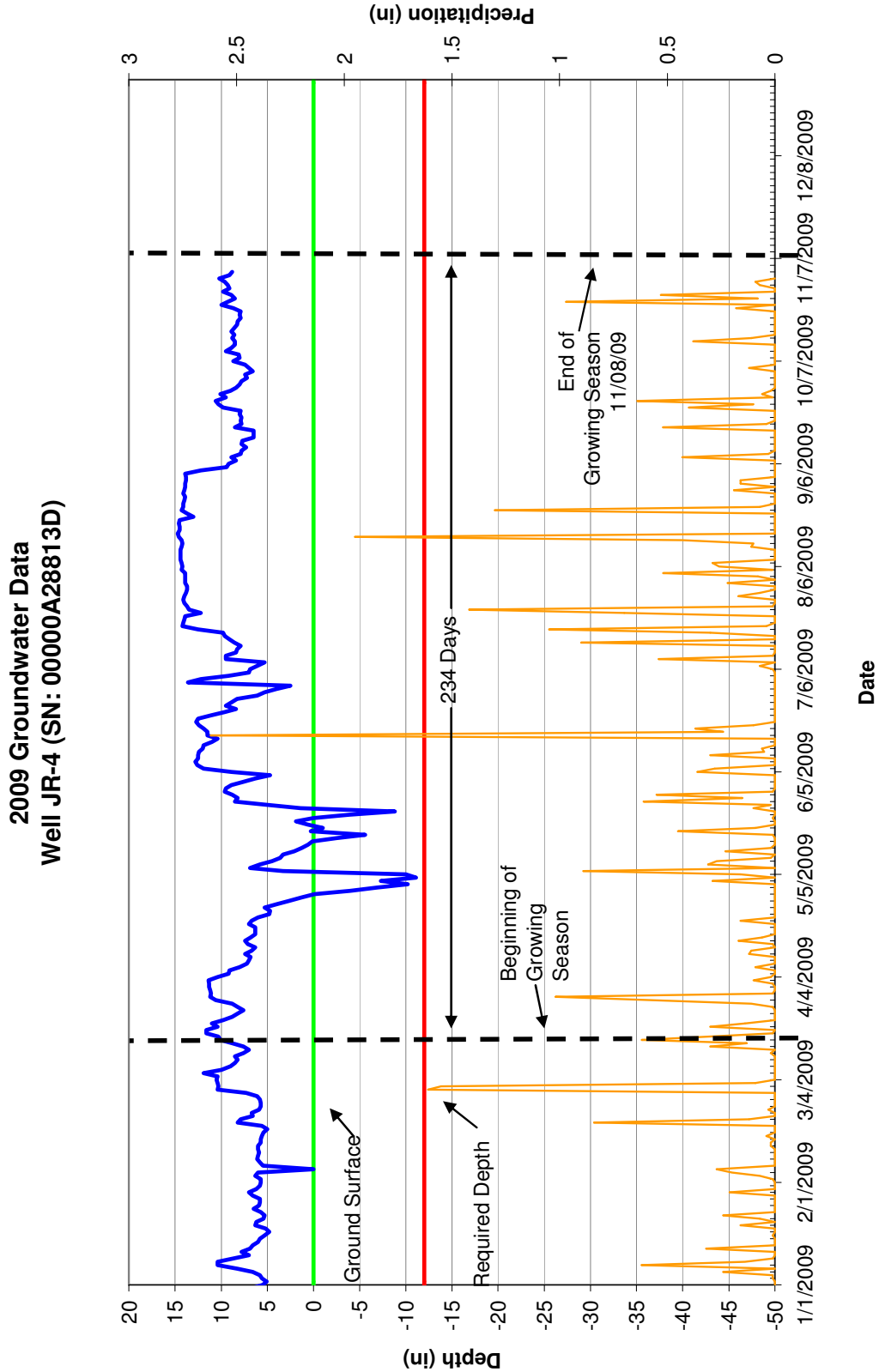
Type	
silt/clay	22%
sand	76%
gravel	2%
cobble	0%
boulder	0%

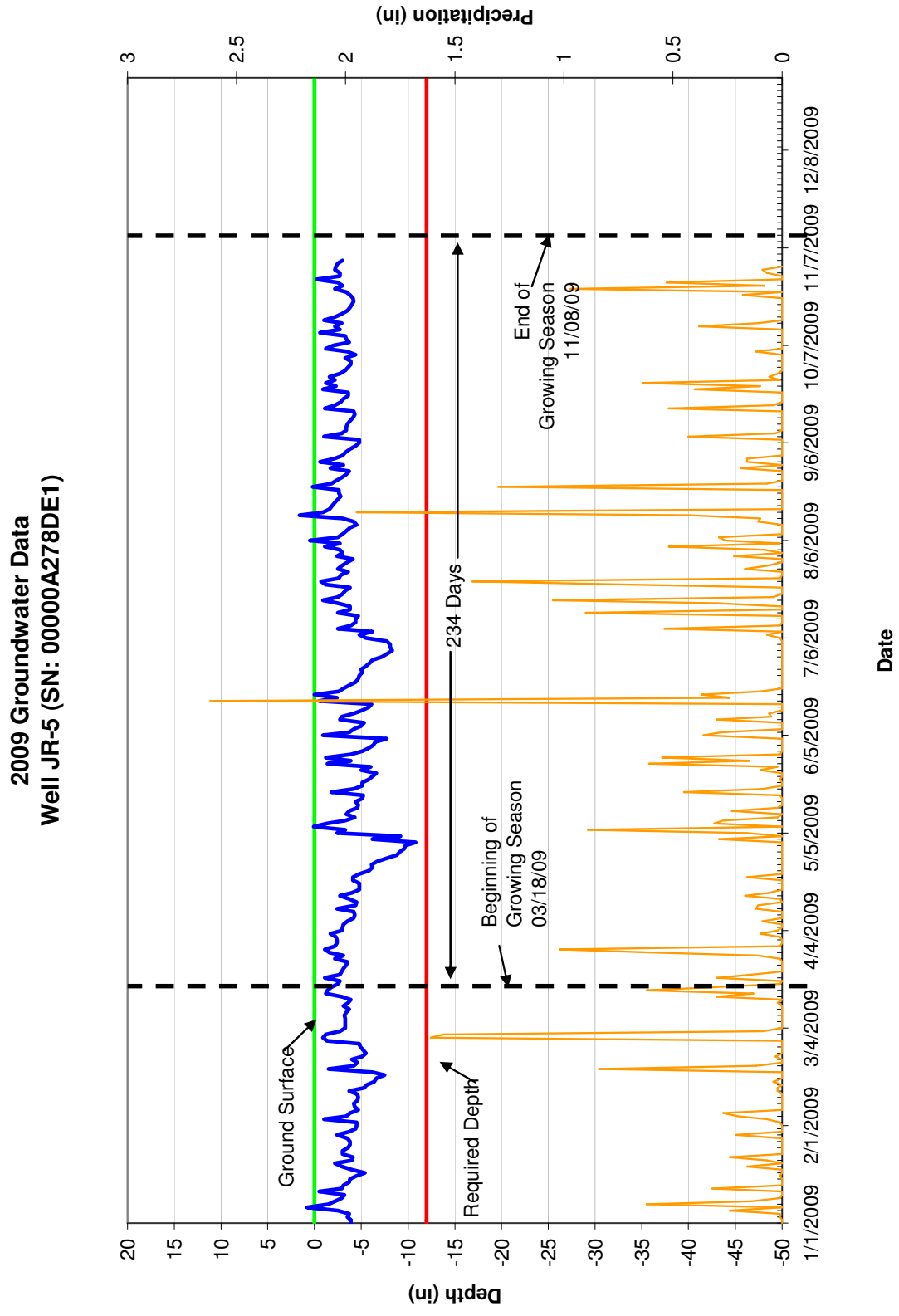
APPENDIX E. WETLAND ASSESSMENT

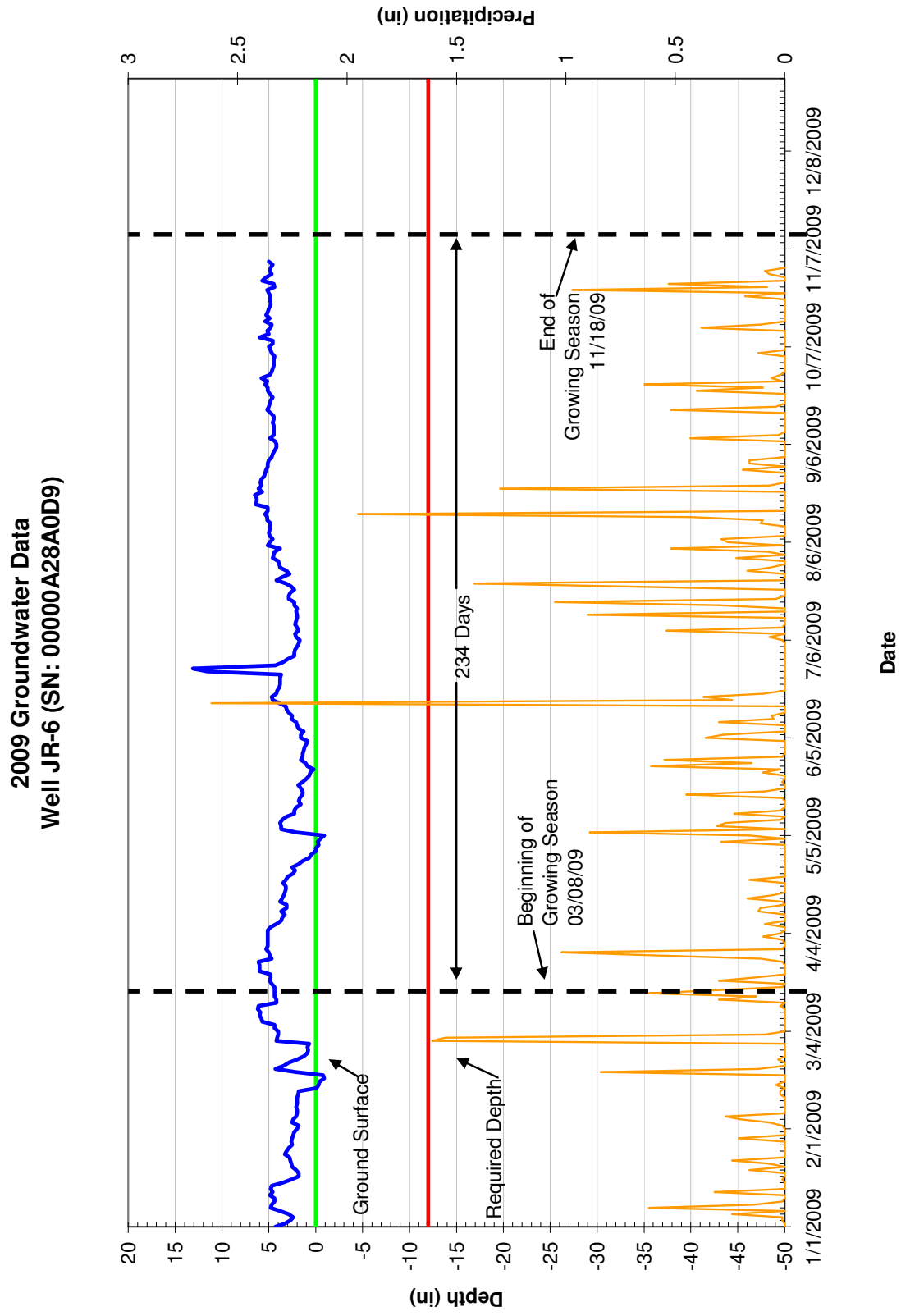


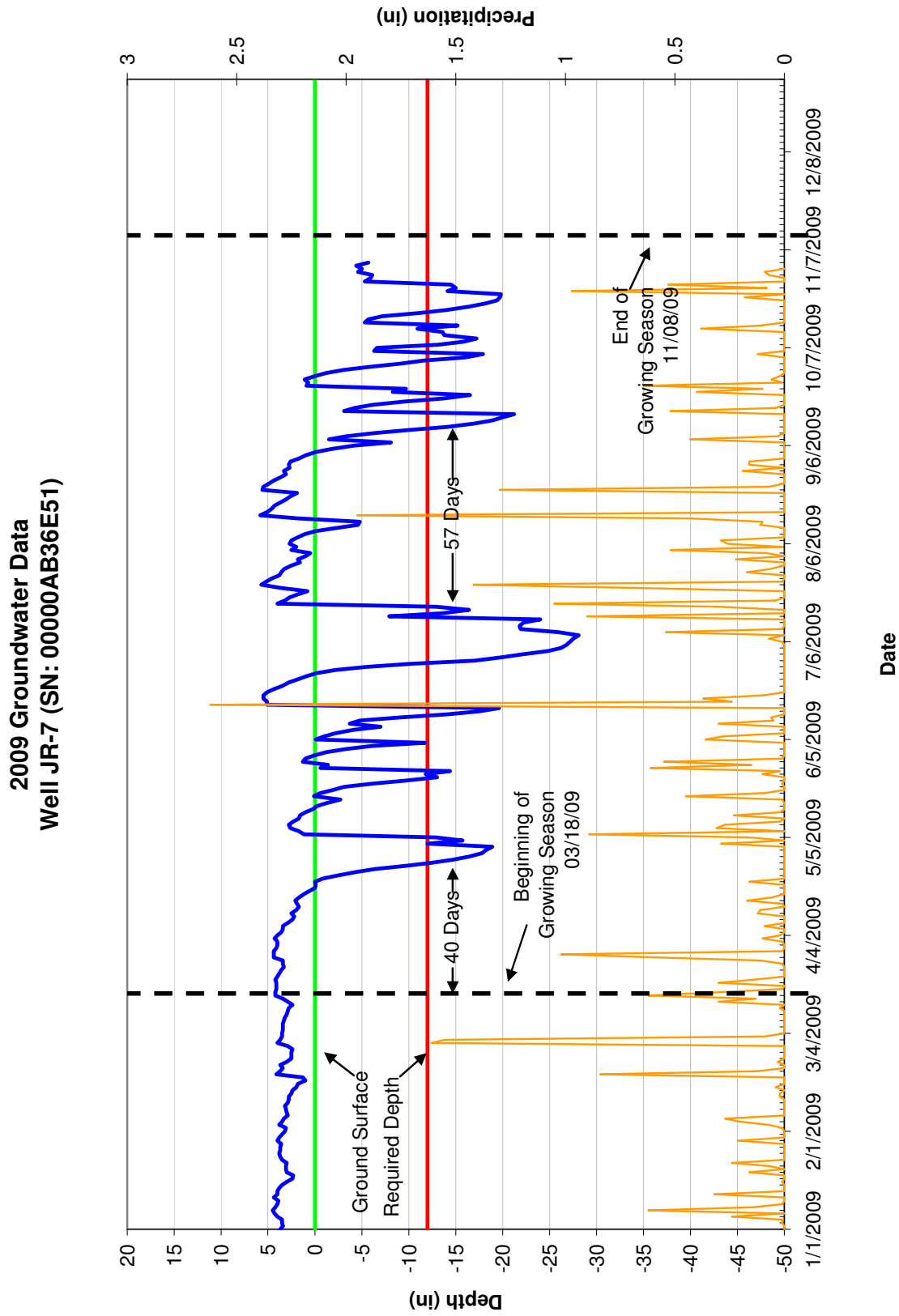

2009 Groundwater Data
Well JR-2 (SN: 00000B6517D5 & 00000A28BE77)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
234 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
3
2.5
2
1.5
1
0.5
0
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

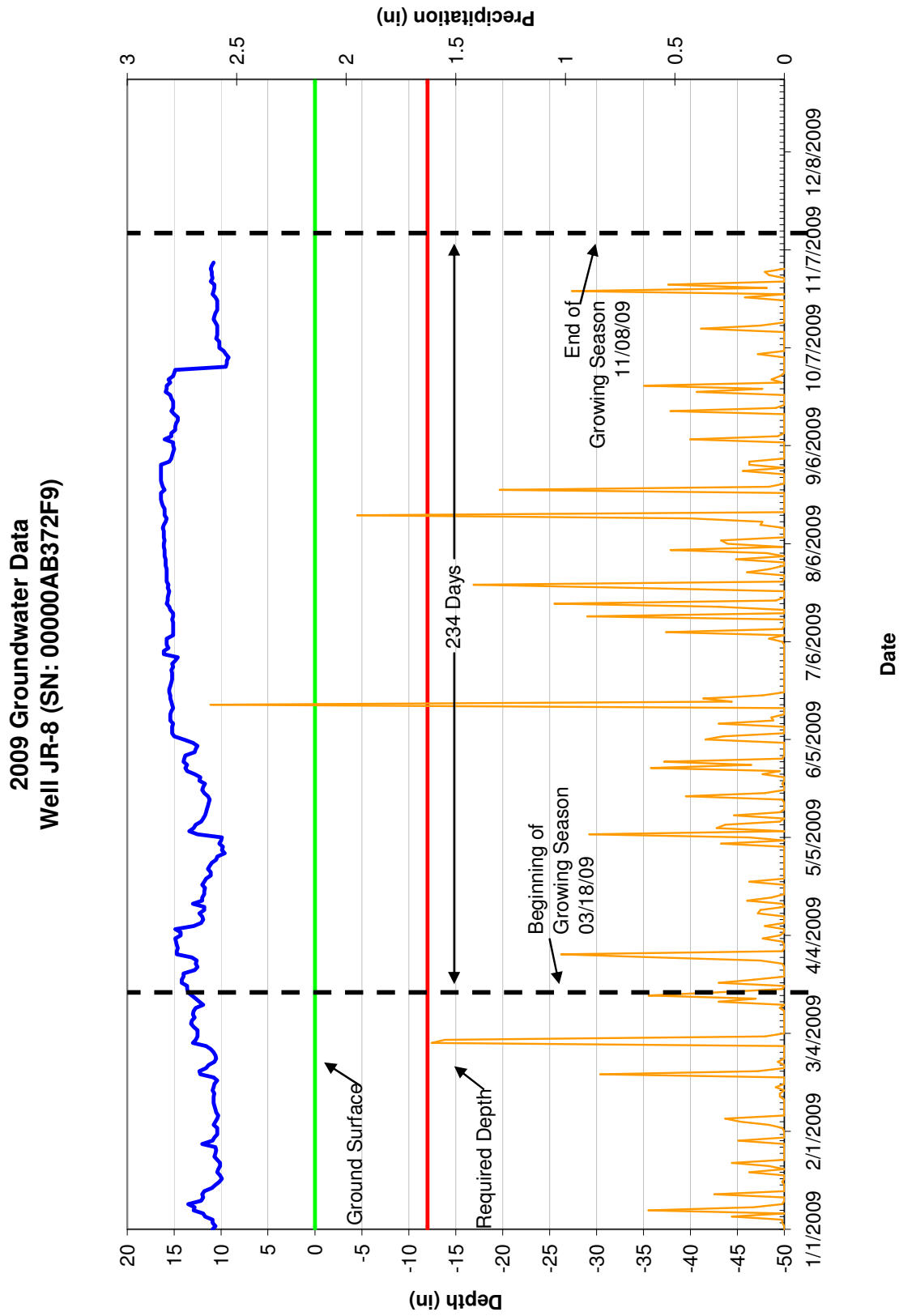

2009 Groundwater Data
Well JR-3 (SN: 00000A287272)
Precipitation (in)
Depth (in)
Date
Ground Surface
Required Depth
234 Days
Beginning of Growing Season 03/18/09
End of Growing Season
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

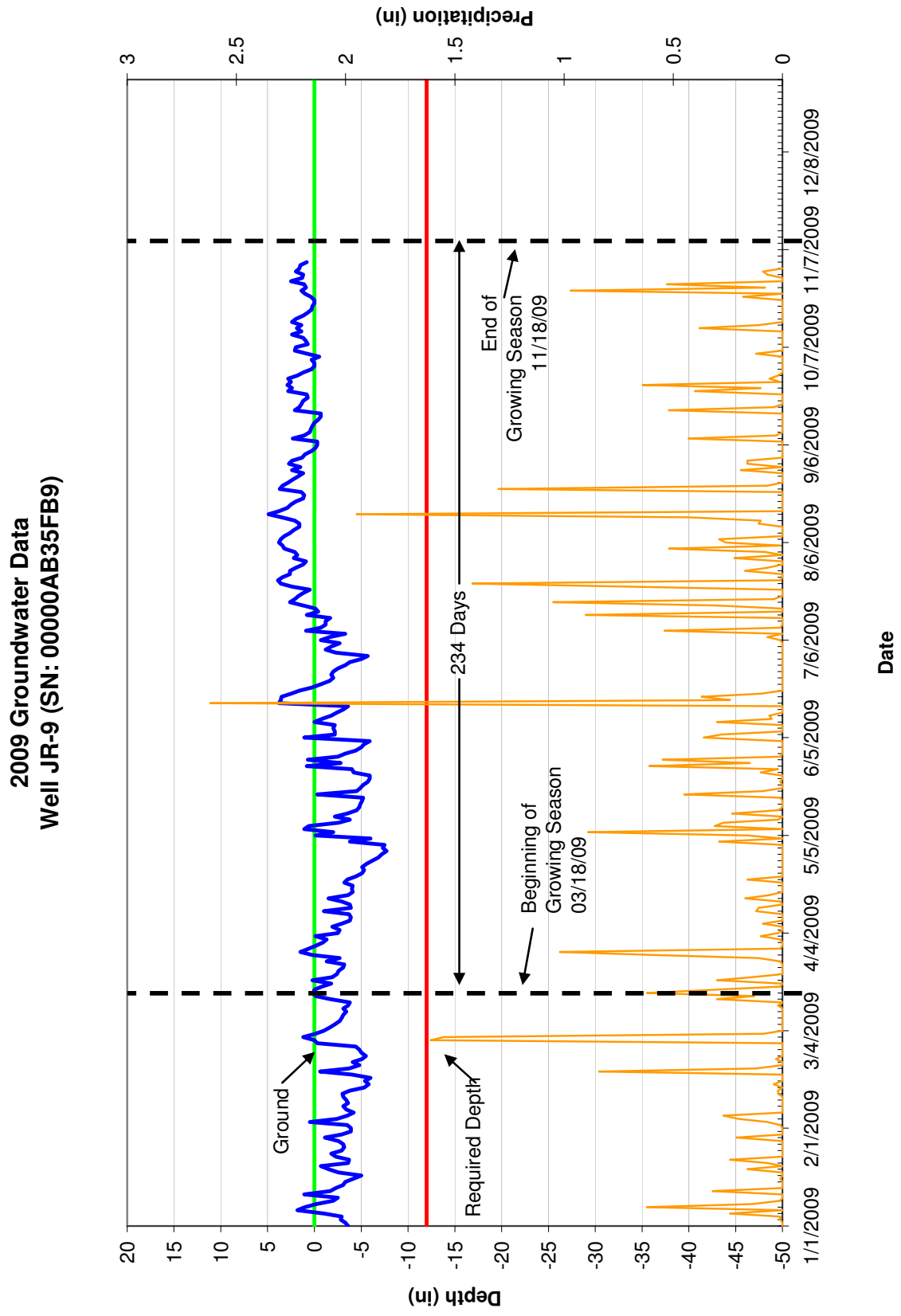

2009 Groundwater Data
Well JR-4 (SN: 00000A28813D)
Precipitation (in)
3
2.5
2
1.5
1
0.5
0
Depth (in)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009
Date
Ground Surface
Required Depth
234 Days
Beginning of Growing Season
End of Growing Season 11/08/09

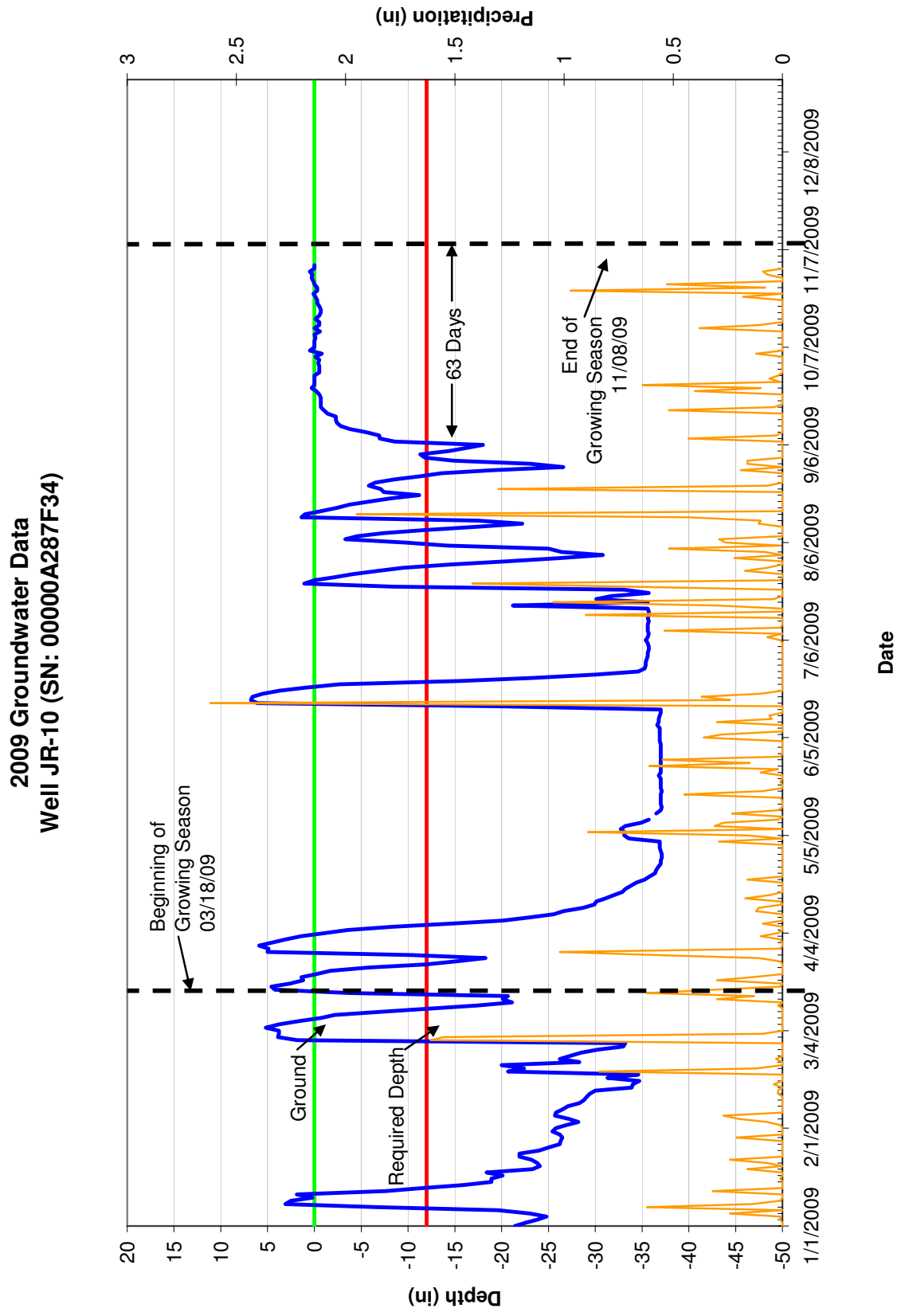

2009 Groundwater Data
Well JR-5 (SN: 00000A278DE1)
Precipitation (in)
Depth (in)
Date
Ground Surface
Required Depth
234 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

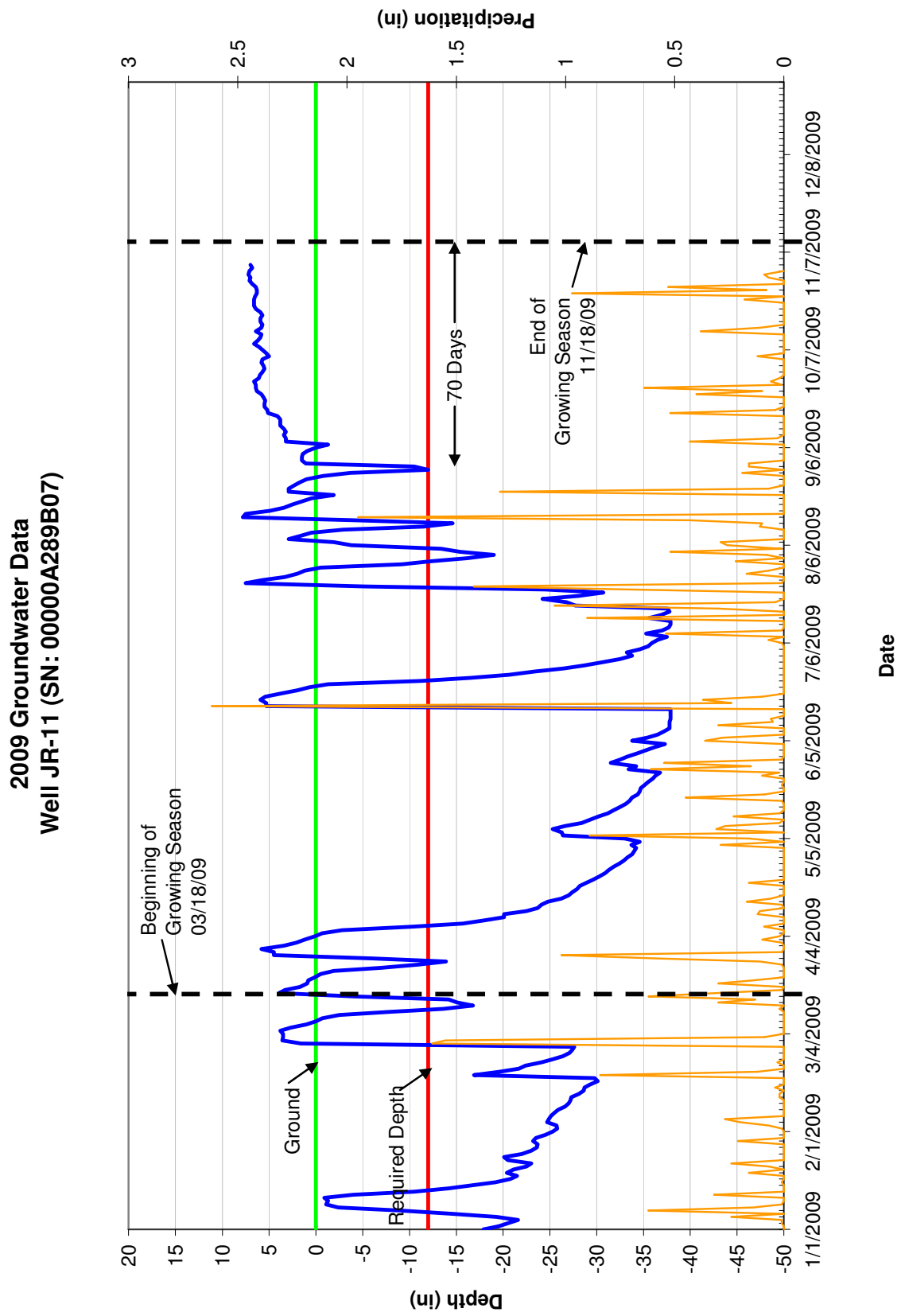

2009 Groundwater Data
Well JR-6 (SN: 00000A28A0D9)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
234 Days
Beginning of Growing Season 03/08/09
End of Growing Season 11/18/09
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
3
2.5
2
1.5
1
0.5
0
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

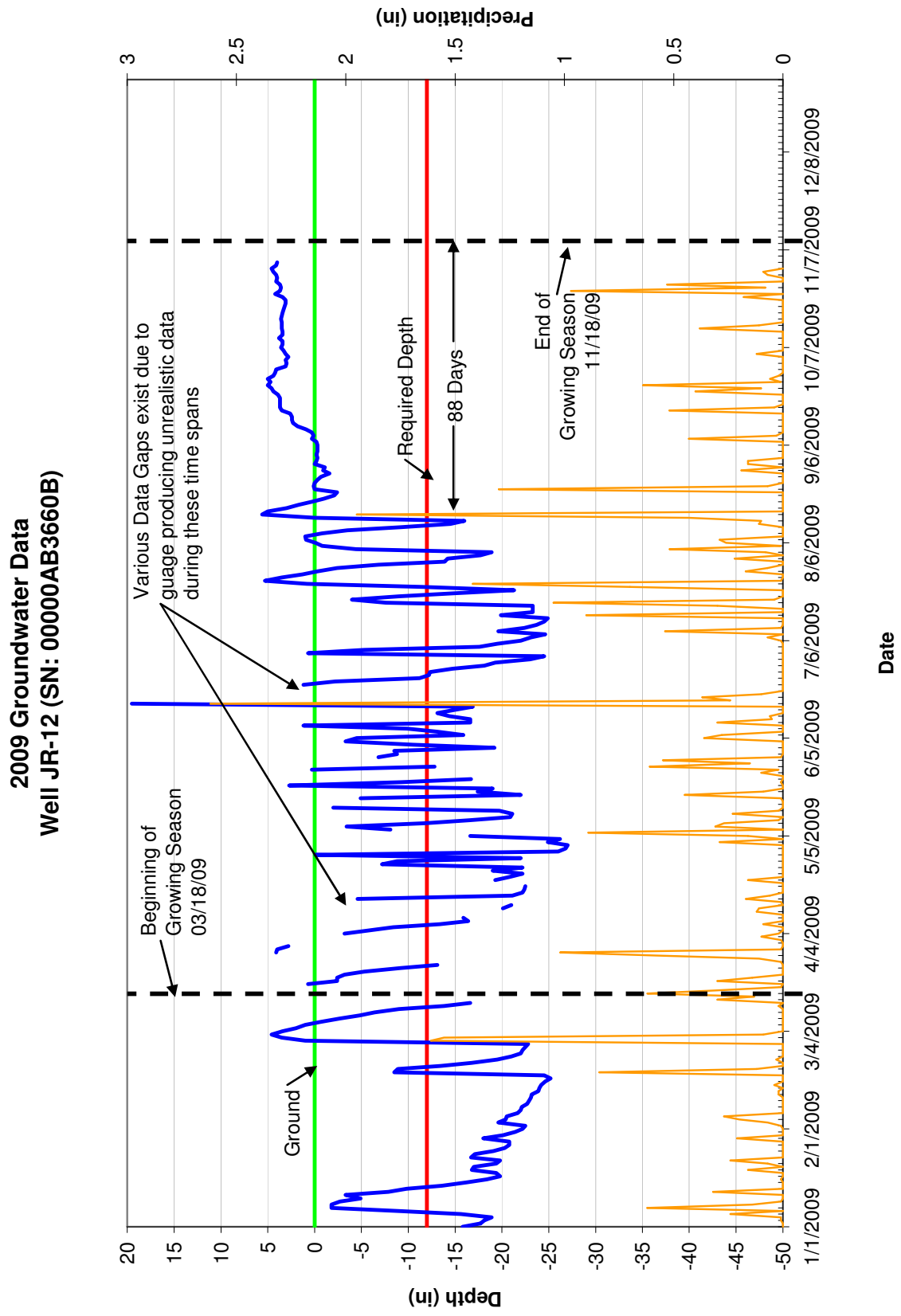

2009 Groundwater Data
Well JR-7 (SN: 00000AB36E51)
Precipitation (in)
Depth (in)
Date
Ground Surface
Required Depth
40 Days
57 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

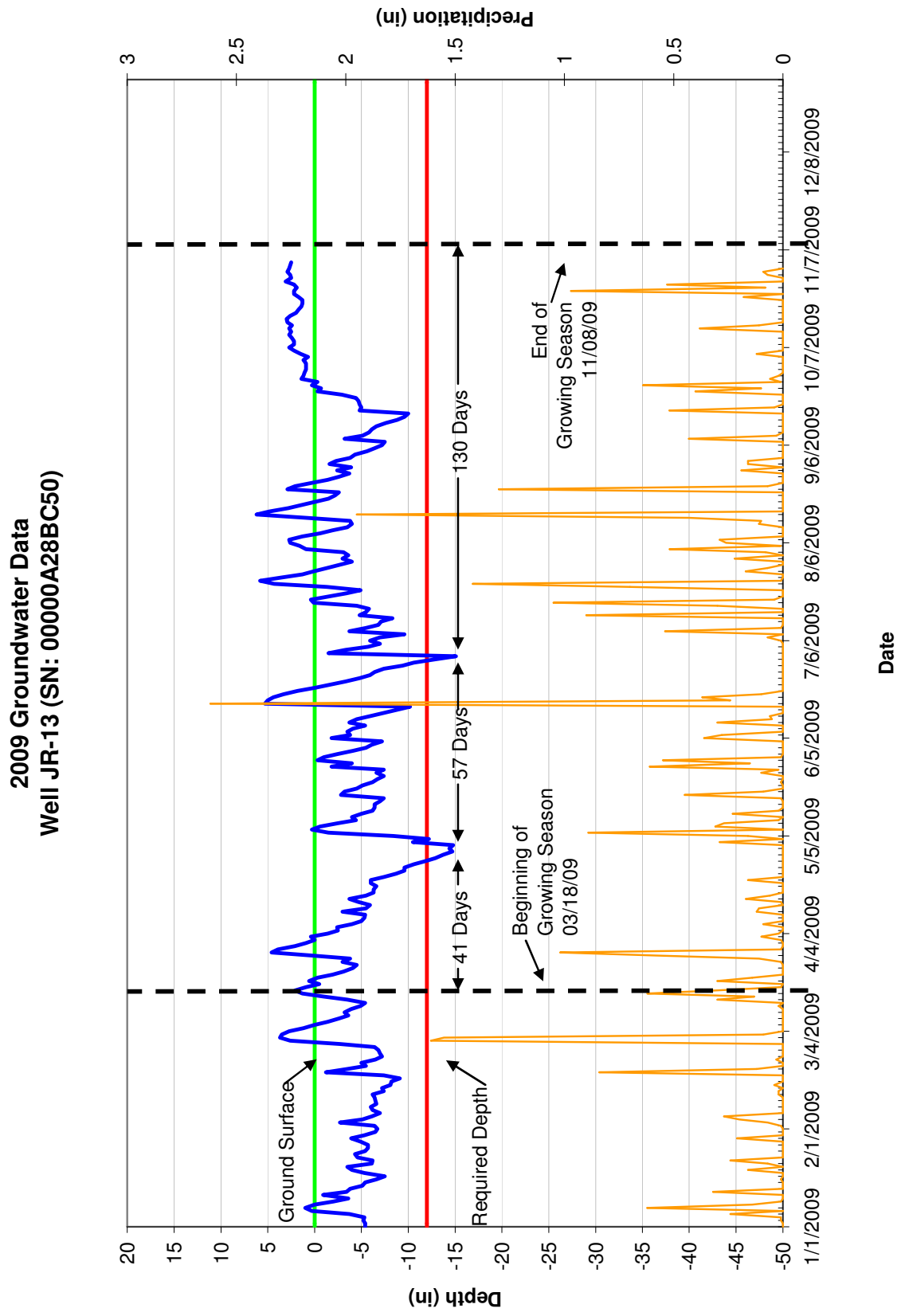

2009 Groundwater Data
Well JR-8 (SN: 00000AB372F9)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
234 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
3
2.5
2
1.5
1
0.5
0
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

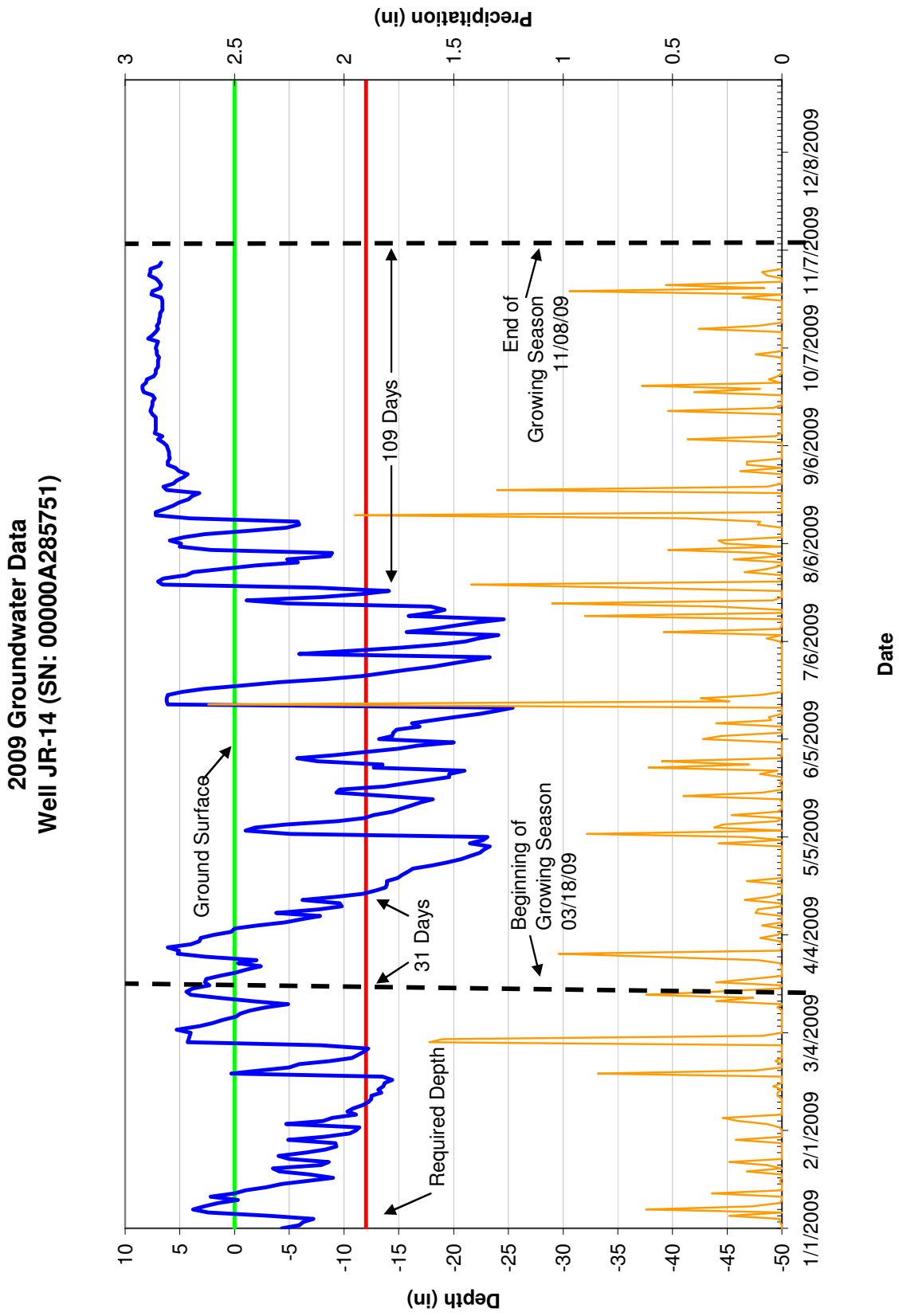

2009 Groundwater Data
Well JR-9 (SN: 00000AB35FB9)
Precipitation (in)
3
2.5
2
1.5
1
0.5
0
Depth (in)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009
Date
Ground
Required Depth
234 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/18/09

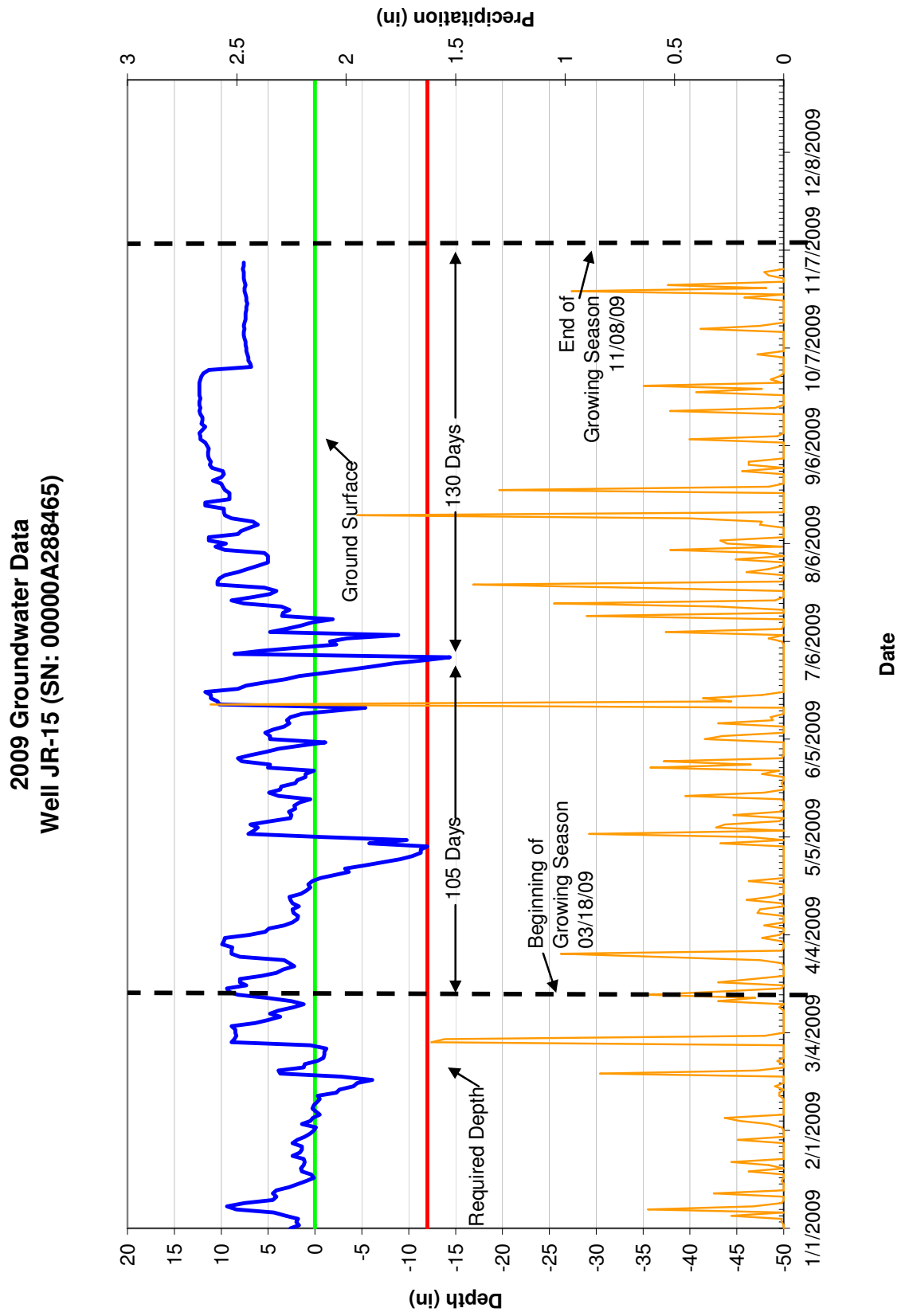

2009 Groundwater Data
Well JR-10 (SN: 00000A287F34)
Precipitation (in)
3
2.5
2
1.5
1
0.5
0
Depth (in)
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009
Date
Beginning of Growing Season 03/18/09
Ground
Required Depth
63 Days
End of Growing Season 11/08/09

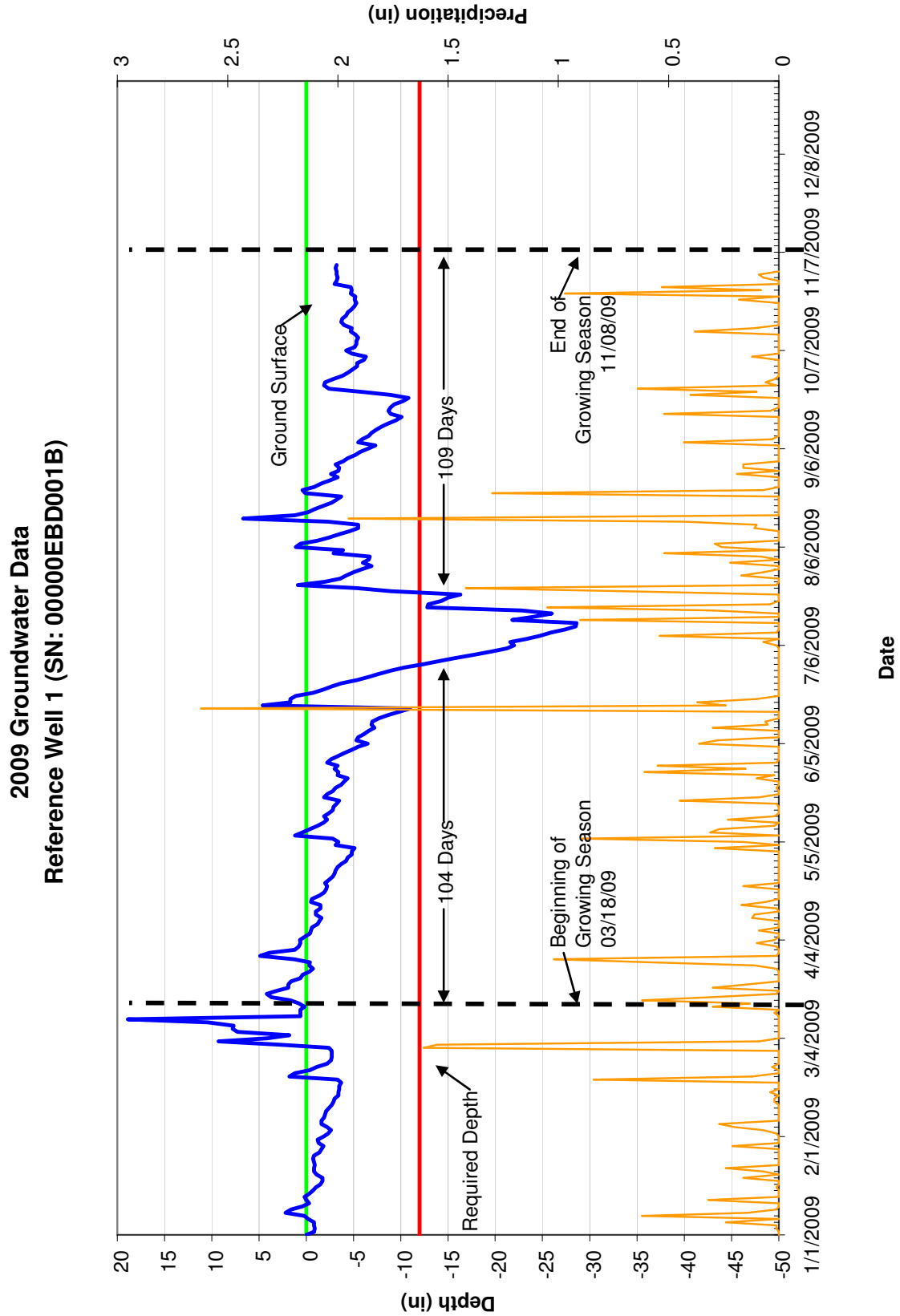

2009 Groundwater Data
Well JR-11 (SN: 00000A289B07)
Precipitation (in)
Depth (in)
Date
Beginning of Growing Season 03/18/09
End of Growing Season 11/18/09
70 Days
Ground
Required Depth
3
2.5
2
1.5
1
0.5
0
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009


2009 Groundwater Data
Well JR-12 (SN: 00000AB3660B)
Precipitation (in)
Depth (in)
Date
Various Data Gaps exist due to guage producing unrealistic data during these time spans
Beginning of Growing Season 03/18/09
End of Growing Season 11/18/09
Required Depth
88 Days
Ground
3
2.5
2
1.5
1
0.5
0
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009


2009 Groundwater Data
Well JR-13 (SN: 00000A28BC50)
Precipitation (in)
Depth (in)
Date
Ground Surface
Required Depth
41 Days
57 Days
130 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09


2009 Groundwater Data
Well JR-14 (SN: 00000A285751)
Precipitation (in)
Depth (in)
Date
Ground Surface
Required Depth
31 Days
109 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
3
2.5
2
1.5
1
0.5
0
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009


2009 Groundwater Data
Well JR-15 (SN: 00000A288465)
Depth (in)
Precipitation (in)
Date
Ground Surface
Required Depth
105 Days
130 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
3
2.5
2
1.5
1
0.5
0
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009


2009 Groundwater Data
Reference Well 1 (SN: 00000EBD001B)
Precipitation (in)
Depth (in)
Date
Ground Surface
Required Depth
109 Days
104 Days
Beginning of Growing Season 03/18/09
End of Growing Season 11/08/09
3
2.5
2
1.5
1
0.5
0
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
1/1/2009
2/1/2009
3/4/2009
4/4/2009
5/5/2009
6/5/2009
7/6/2009
8/6/2009
9/6/2009
10/7/2009
11/7/2009
12/8/2009

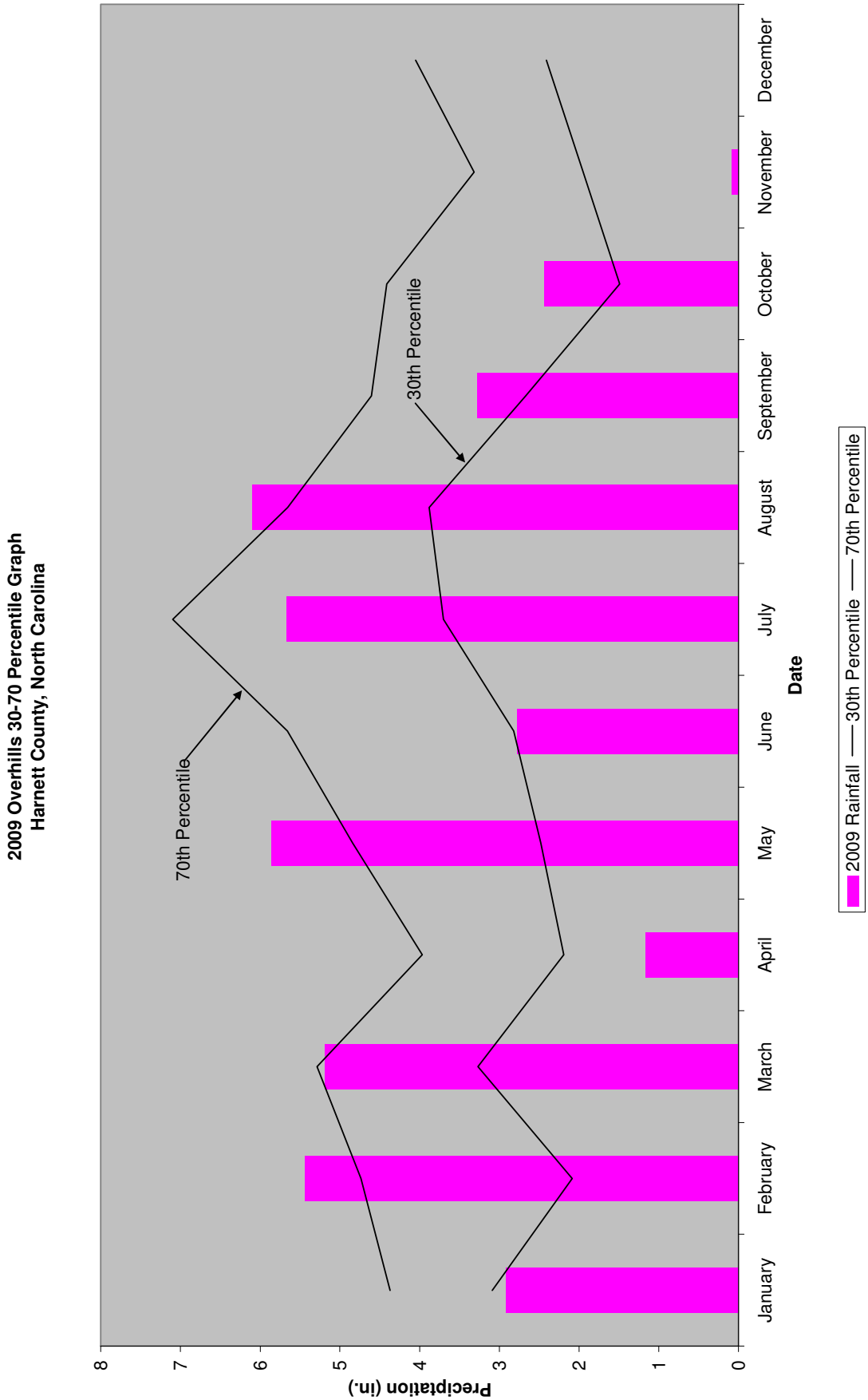

2009 Overhills 30-70 Percentile Graph
Harnett County, North Carolina
Precipitation (in.)
0
1
2
3
4
5
6
7
8
January
February
March
April
May
June
July
August
September
October
November
December
Date
70th Percentile
30th Percentile
2009 Rainfall
30th Percentile
70th Percentile

Table 10 - Summary of Groundwater Results for Years 1 - 5 Overhills/Jumping Run Creek Restoration Project / EEP Project No. 199					
	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)				
Gauge	Year 1 (2007)	Year 2 (2008)	Year 3 (2009)	Year 4 (2010)	Year 5 (2011)
GW1	Yes/57 days (24 percent)	Yes/148 days (63 percent)	Yes/159 days (68 percent)		
GW2	Yes/67 days (29 percent)	Yes/188 days (80 percent)	Yes/234 days (100 percent)		
GW3	Yes/63 days (27 percent)	Yes/149 days (64 percent)	Yes/234 days (100 percent)		
GW4	Yes/61 days (26 percent)	Yes/135 days (58 percent)	Yes/234 days (100 percent)		
GW5	No	Yes/129 days (55 percent)	Yes/234 days (100 percent)		
GW6	Yes/52 days (22 percent)	Yes/146 days (62 percent)	Yes/234 days (100 percent)		
GW7	Yes/56 days (24 percent)	Yes/108 days (46 percent)	Yes/97 days (41 percent)		
GW8	Yes/65 days (28 percent)	Yes/205 days (88 percent)	Yes/234 days (100 percent)		
GW9	Yes/56 days (24 percent)	Yes/138 days (59 percent)	Yes/234 days (100 percent)		
GW10	No	Yes/73 days (31 percent)	Yes/63 days (27 percent)		
GW11	No	Yes/39 days (17 percent)	Yes/70 days (30 percent)		
GW12	No	Yes/33 days (14 percent)	Yes/88 days (38 percent)		
GW13	No	Yes/90 days (38 percent)	Yes/228 days (97 percent)		
GW14	No	Yes/87 days (37 percent)	Yes/140 days (60 percent)		
GW15	Yes/45 days (19 percent)	Yes/140 days (60 percent)	Yes/233 days (99 percent)		
Reference	N/A	Yes/166 days (71 percent)	Yes/213 days (91 percent)		