Farrar Dairy Stream and Wetland Restoration Site
Monitoring Report – MY02
Harnett County, NC

Submitted to:

Ecosystem Enhancement PROGRAM

NCEEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

January 2011

Landmark Center II, Suite 220
4601 Six Forks Road
Raleigh, NC 27609
Phone: (919) 278-2512
Fax: (919) 783-9266

Project Manager: Tim Morris
Email: tim.morris@kci.com
KCI Project No: 12065438

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EXECUTIVE SUMMARY

The Farrar Dairy Stream and Wetland Restoration Site is a full-delivery project that was developed for the North Carolina Ecosystem Enhancement Program (EEP). Construction was completed in March 2009 on the North Prong of Anderson Creek (NPAC), its tributaries, and an associated Coastal Plain Small Stream Swamp wetland community. The project is located within the USGS 8-digit HUC 03030004 and the NCDWQ Sub-basin 03-06-14 in the Cape Fear River Basin. The project restored, enhanced and preserved 13,044 linear feet of channel using a combination of Priority 1 and 2 Approaches, along with Enhancement II, and 112.0 acres of Coastal Plain Small Stream Swamp wetland community, generating 11,881 stream mitigation units and 64.0 wetland mitigation units. The stream design addressed vertical instability problems and a lack of bed variability by stabilizing stream banks, installing in-stream structures, adjusting stream planform, reconnecting the stream to the historic floodplain and replanting the riparian areas with native vegetation. The wetlands were restored by filling ditches, creating microtopography, and planting native trees and shrubs. This report describes the findings from the second year of monitoring that took place in 2010.

The riparian buffer and the restored wetlands were planted with bare root trees and shrubs, and the stream banks were planted with live stakes. Vegetation monitoring plots were established during the as-built survey and included 15 monitoring plots placed throughout the stream buffer and 30 monitoring plots installed in the restored wetland. Vegetation must meet a minimum average density of 320 stems/acre after five years. The second-year monitoring counted an average of 520 stems/acre in the stream plots and 468 stems/acre in the wetland plots. After the second-year monitoring, the vegetation component of the project is on track to meeting the success criterion.

The stream assessment completed during second-year monitoring found the stream to be stable and functioning properly. Channel dimensions have not changed significantly from the first year conditions. Small portions of localized bank erosion and bed degradation have been noted. Beavers have also created a series of beaver dams on the site. These areas have been documented in the Current Condition Plan View. The on-site stream gauges recorded two bankfull events during the second year of monitoring.

During the 2010 monitoring year, wetland hydrology was achieved at five of the seven groundwater monitoring gauges in the restoration area and at the reference gauge. Both of the gauges that did not meet the success criterion in 2010 met the wetland hydrology criterion during the 2009 growing season. To meet the hydrology success criterion, the water table of the restored wetlands must be within 12” of the soil surface continuously for at least 5% (12.5 days) of the 251-day growing season during a year experiencing average rainfall.

The daily rainfall data depicted on the gauge data graphs were obtained from the on-site precipitation gauge. The precipitation gauge was installed at the site after the completion of construction. The daily rainfall data obtained from a local weather station show that the area had average to slightly below average rainfall during the 2010 growing season.

1.0 PROJECT BACKGROUND

Project Goals and Objectives

The goals and objectives of the restoration project are as follows:

Restoration Goals:

- Restore the site's riparian buffers and forested wetlands.
- Create a stable stream and wetland complex through an interconnected floodplain corridor.

Restoration Objectives:

- Connect the new stream planform to its original floodplain.
- Fill and plug ditches in the drained hydric soils to restore saturated hydrologic conditions to the upper soil horizons.
- Plant a functional Coastal Plain Small Swamp Stream community to create an effective riparian buffer and wetland complex.
- Exclude livestock from the riparian and wetland areas with fencing.

1.1 Project Structure, Restoration Type, and Approach

The pre-restoration channel of NPAC had been moved and channelized to maximize the use of an agricultural field adjacent to Powell Farm Road. The other significant hydrologic alterations to the site included ditched wetlands and straightened tributaries that helped convey water through the property. Due to the clearing of the riparian areas, the streams were experiencing significant bank erosion prior to restoration. In addition to the ditching that drained the historic wetlands, ponds were also built to attract migratory waterfowl. The project restored, enhanced and preserved 13,044 linear feet of channel using a combination of Priority 1 and 2 Approaches and Enhancement II, and restored, enhanced, and preserved 111.9 acres of Coastal Plain Small Stream Swamp wetland community, generating 11,881 stream mitigation units and 64.0 wetland mitigation units (Table 1).

1.1.1 Project Streams

The three design reaches of NPAC (Stations 10+00 to 76+00) were restored to C5 channels. Following a Priority 1 approach, the channel was relocated to its historic location and the bed elevation was brought up, reconnecting the stream to the original floodplain. At Station 10+00, the restored channel begins online at the culvert under Powell Farm Road. At Station 21+00, the channel leaves the pre-restoration location and was returned to the adjacent forest in the location of its historic channel. The new channel comes back online at the end of the project at Station 76+00.

T1.1 and T1.2 (Stations 80+00 to 88+25 and Stations 90+00 to 99+80, respectively) were both restored to C5/B5c headwater channels. At the confluence of these two channels, T1 begins. T1 (Stations 100+00 to 108+84) was restored using the same approach as T1.1 and T1.2. A 31'-wide easement exception occurs at Station 101+00, where a ford crossing was installed for the landowner. The restoration created a new planform, profile, and dimension and increased the sinuosity of these previously straightened channels with a combination of Priority 1 and 2 approaches. Grade control structures such as log sills and step pools were installed along the new channels to create a stable profile. This restoration also

created a bankfull bench in entrenched sections and reconnected the stream to the existing floodplain in others.

T2 was divided into two reaches based on the changing slope of the tributary. T2A (Stations 110+00 to 115+00) was restored to a C5/B5c stream and T2B (Stations 115+00 to 120+22) was restored to an E5 stream type. The hydrologic source for the channel is a seep at the top of T2A. The restoration created a new planform, profile, and dimension and increased the sinuosity of the previously straightened channel with a combination of Priority 1 and 2 approaches. Grade control structures such as log sills and step pools were installed along the new channels to create a stable profile. This restoration created a bankfull bench in some places and reconnected the stream to the existing floodplain in others.

T3 (Stations 130+00 to 141+67) is comprised of a single reach that was restored to a C5 channel. This channel was restored using a Priority 1 approach, with a new planform, profile, and dimension being reconnected to the original floodplain. Two drainage ditches that were adjacent to T3 were filled as part of the wetland restoration, reestablishing T3 as the primary hydrologic feature in this area.

T4 is separated into two reaches. The first reach (Stations 150+00 to 151+80) was enhanced (EII) by planting portions of the easement that had been logged and by removing significant amounts of logging debris that had accumulated in the channel, creating unstable conditions. The second reach (Stations 151+80 to 164+20) was preserved. Near Station 162+00, the stream flows out of the easement for approximately 100 feet, but then comes back into the easement. The stationing continues from where the stream left the easement.

1.1.2 Project Wetlands

Wetland Area 1 preserves approximately 46 acres of well-vegetated palustrine forested, scrub-shrub and emergent wetlands that are along the floodplain of the NPAC. The preservation area is dominated by various wetland sedges, rushes and persistent emergent vegetation, but also contains large scrub-shrub alder thickets that are permanently inundated.

Starting from the west and continuing to the east, Wetland Area 2 is located in the general vicinity of Tributary 1. Portions of this area, which is comprised of six wetlands separated by the restored stream, were historically cleared as part of the site's agricultural operations. This area was enhanced through the planting of bare root material. This wetland also borders the restored NPAC channel, and because NPAC has been reconnected to its floodplain, overbank flooding inundates the adjacent wetlands.

Enhancement in Wetland Area 3 took place in the central portion of the site. The wetland includes a shallow pond and adjacent overbank areas of NPAC. Wetland Area 3 is located adjacent to a section of NPAC where overbank flows will have regular access to the floodplain, thus increasing hydrology to the wetlands. This area was planted with wetland trees and shrubs and graded to eliminate the man-made berms that impounded excess surface water.

Wetland Area 4 is located in an area that was heavily manipulated by the landowner to create a series of shallow impoundments intended to attract migratory

waterfowl. Water control structures allowed the landowner to manipulate water levels within the impoundments. These impoundments were regraded to create a mosaic of vegetated wet hummocks throughout the wetland. Wetland W4 serves as a transitional area between the ponded features and the wetland preservation area. This area was planted with bare root seedlings and treated to control invasive species.

Wetland Area 5 includes all of the site's restored wetlands. These areas are within the floodplain of the NPAC and its tributaries, which had historically been hydrologically altered to allow for agricultural production. Four main construction techniques were utilized to restore these wetland areas:

1. Raising the elevation of the NPAC and its tributaries to re-establish an active floodplain connected to the adjacent wetlands.
2. Filling existing ditches and removing tile drains to discourage rapid groundwater discharge to surface water receptors.
3. Scarifying the top 0.5'of organic surface soil to re-establish soil structure and allow for increased surface storage (microtopography). This material was not removed from the site, but simply re-worked to maximize the ability of the surface soils to retain surface and groundwater hydrology.
4. Planting native species of wetland plants and shrubs.

Table 1 below provides a summary of the mitigation actions and units generated from this project.

1.2 Location and Setting

The Farrar Dairy Site is located off of Farrar Dairy Road in southern Harnett County, North Carolina, and is approximately 8.5 miles southwest of Lillington, North Carolina (Figure 1). To reach the site from Raleigh, drive south out of Raleigh on US 401 toward Fuquay-Varina, continuing south from Fuquay-Varina on US-401/US-421 toward Lillington. Turn right onto NC-210 and continue south through Lillington for approximately 6.5 miles to Darroch Road. Turn right onto Darroch Road and continue approximately 3 miles to Powell Farm Road. Turn left onto Powell Farm Road, drive approximately 1.5 miles and the entrance to the site will be on the left through the driveway of the red ranch style home.

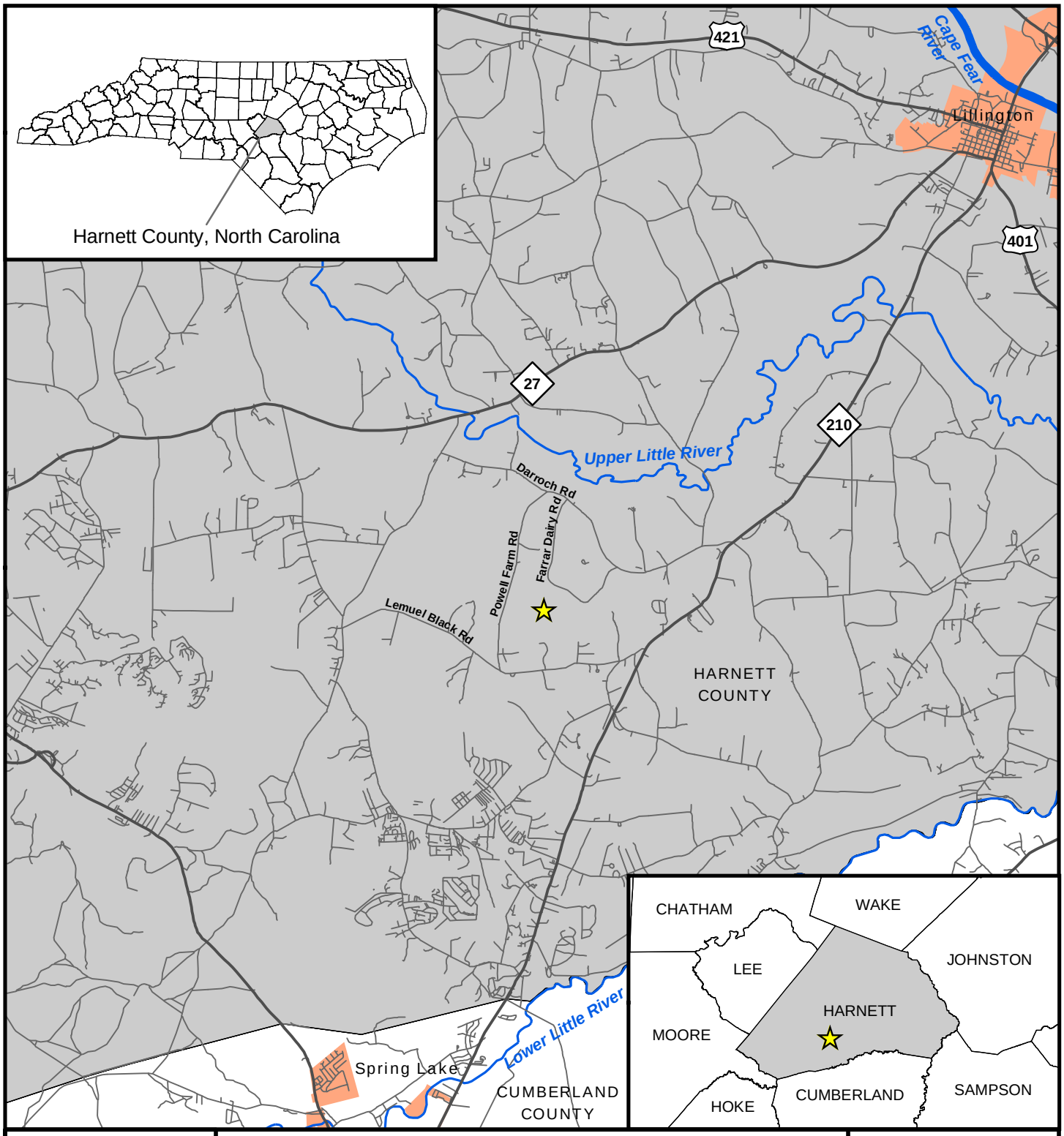


Figure 1. Vicinity Map

- Project Site Location
- Major Roads
- Other Roads
- Major Rivers
- Municipalities
- County Boundaries

1:126,720
1 inch equals 2 miles

2 1 0 2 Miles

KCI TECHNOLOGIES

KCI ASSOCIATES OF NC

Environmental Technologies and Construction, Inc.

Figure 2 - Farrar Dairy Stream and Wetland Restoration Site Map

KCI TECHNOLOGIES

- Project Easement Boundary
- Enhancement II
- Preservation
- Restoration
- Other Streams
- Reach Breaks
- Wetland Restoration (43.8 ac)
- Wetland Enhancement (22.1 ac)
- Wetland Preservation (45.9 ac)

1:7,200
1 inch equals 600 feet

600 300 0 600 Feet

Source: Orthoimagery 2008, Harnett County GIS/Land Records

KCI ASSOCIATES OF NC
ENVIRONMENTAL TECHNOLOGIES AND CONSTRUCTION, INC.

T1.2
T1.1
T1
NPAC-1
Wetland Area 2 Enhancement
Wetland Area 3 Enhancement
Wetland Area 4 Enhancement
Wetland Area 1 Preservation
T2A
T2B
NPAC-2
NPAC-3
T3
Wetland Area 5 Restoration
T4.2
T4.1

1.3 Project History and Background

Table 1. Project Restoration Components
Farrar Dairy Stream and Wetland Restoration Site

Project Streams

Project Segment / Reach ID	Pre-Restoration Feet	Type	Approach	As - Built Footage or Acreage	Stationing	Stream Mitigation Units (SMU)
NPAC	4,565	R	P1	6,746	10+00-77+46	6,714*
T1.1	864	R	P1/2	825	80+00-88+25	825
T1.2	995	R	P1/2	980	90+00-99+80	980
T1	818	R	P1/2	884	100+00-108+84	853*
T2A	977	R	P1/2	500	110+00-115+00	500
T2B		R	P1/2	522	115+00-120+22	522
T3	1,335	R	P1	1,167	130+00-141+67	1,167
T4.1	180	E II	-	180	150+00-151+80	72
T4.2	1,240	P	-	1,240	151+80-164+20	248
TOTAL				**13,044**		**11,881**

R = Restoration P1 = Priority 1
E= Enhancement II P2 = Priority 2
P= Preservation
* Easement exceptions for landowner ford crossings were excluded for these calculations.

Project Wetlands

Project Segment	Type	Acreage	Community Type	Wetland Mitigation Units (WMU)
Area 1	P	45.93	Coastal Plain Small Stream Swamp	9.19
Area 2	E	6.88	Coastal Plain Small Stream Swamp	3.44
Area 3	E	2.57	Coastal Plain Small Stream Swamp	1.29
Area 4	E	12.67	Coastal Plain Small Stream Swamp	6.34
Area 5	R	43.8	Coastal Plain Small Stream Swamp	43.8
TOTAL		**111.85**		**64.06**

Table 2. Project Activity and Reporting History Farrar Dairy Stream and Wetland Restoration		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Restoration Plan	2007	May 08
Final Design	2007	May 08
Construction	N/A	Mar 09
Planting	N/A	Jan 09
Mitigation Plan / As-Built (Year 0 Monitoring - Baseline)	May 09	Jun 09
Year 1 Monitoring	Dec 09	Dec 09
Year 2 Monitoring	Dec 10	Dec 10

Table 3. Project Contact Table Farrar Dairy Stream and Wetland Restoration	
Design Firm	KCI Associates of North Carolina Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	Land Mechanics, Inc. 126 Circle G Lane Willow Springs, NC 27592 Contact: Mr. Lloyd Glover Phone: (919) 639-6132 Fax: (919) 639-7079
Planting Contractor	Bruton Nurseries and Landscapes PO Box 1197 Freemont, NC 27830 Contact: Mr. Charlie Bruton Phone: (919) 242-6555
Monitoring Performers	
MY-00 - MY-05	KCI Associates of North Carolina Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Background Table **Farrar Dairy Stream and Wetland Restoration Site**	
Project County	Harnett County
Physiographic Region	Coastal Plain
Ecoregion	Sand Hills
Project River Basin	Cape Fear
USGS HUC for Project and Reference	03030004110010 (Anderson Creek)
	03030004150050 (Little Rockfish Creek - reference)
	03030002050100 (UT to Wilkinson Creek - reference)
NCDWQ Sub-basin for Project and Reference	03-06-14 (Anderson Creek)
	03-06-15 (Little Rockfish Creek - reference)
	03-06-04 (UT to Wilkinson Creek - reference)
Drainage Area	5.7 sq. mi.
Stream Order	First and Second Order
Watershed Type (Rural, Urban, Developing, etc.)	Rural
Watershed LULC Distribution Urban	<1%
Ag-Row Crop	21%
Ag-Livestock	1%
Forested	72%
Water/Wetlands	6%
Watershed impervious cover (%)	3%
Rosgen Classification of As-built (Stream)	C5 (NPAC)
	C5/B5c (T1.1, T1.2, T1, T2A, T2B, T3, T4)
NCDWQ Classification for Project	Class C (Anderson Creek)
Within EEP Watershed Plan?	No
Any portion of the project segment upstream of a 303d listed segment?	No
Reasons for 303d Listing or Stressor	N/A
Total project acreage of easement	166.9 Acres
Total planted acreage	93.0 Acres
WRC Class (Warm, Cool, Cold)	Warm
Species of concern, endangered etc.	None
Pre-construction Beaver activity?	Yes
Dominant Soil Types	Wehadkee loam and Gilead sandy loam
% of Project Easement Fenced	85%

2.0 PROJECT CONDITIONS AND MONITORING RESULTS

2.1 Vegetation Assessment

The planted vegetation on the site is growing well. The low base flow throughout the summer months allowed vegetation to become established in the stream channels on T1.1, T1.2, T1, T2, and T3. This vegetation included grasses, rushes, cattails, and Asian dayflower (*Murdannia keisak*).

There are minimal populations of invasive species, but Japanese honeysuckle (*Lonicera japonica*) has been observed in the project and stands of privet (*Ligustrum sinense*) can be found at varying densities in the wetland preservation portions. These populations will continue to be monitored to determine if invasive control is required in the future.

The monitored vegetation plots within the stream buffer and wetland revealed that the planted vegetation is growing well with 520 and 467 stems/acre, respectively. There are four monitoring plots that have calculated planted stem densities less than 320 stems/acre; one in the stream buffer (Plot 11) and three in the restored wetland (Plot 35, 38, 45). This is not seen as problematic given the high potential for desirable volunteers to become established in the plots and across the site. Like natural vegetative communities, some areas will have slightly higher densities than others, but the data from the vegetation monitoring plots reveal that the site has an adequate average stem density. The overall vegetation assessment found the site to be on track to meeting the vegetative success criterion. KCI will continue to monitor the buffer and wetland vegetation to determine if supplemental planting is necessary in the future.

The vegetative monitoring results are displayed in Appendix A and the Current Condition Plan View (CCPV).

2.2 Stream Assessment

During the 2010 growing season, the tributaries experienced low flow throughout the summer. This allowed vegetation to grow in the channels as described above. Overall, this vegetation is contributing to stream stability by trapping fine materials and rooting into the erosive silt and clay bottom in these channels. Vegetated headwater channels are typical of small stream swamp communities without developed canopies. It is expected that as the channel receive more shade, the herbaceous vegetation in the channel will decrease.

The stream assessment found the project streams to be stable. T1.1 and T1 experienced isolated bed degradation during the first year of monitoring, but no further migration was shown on monitoring year two. In October 2010, additional log sills were installed along T1 to provide additional grade control as preventive maintenance. The longitudinal profile and visual assessment of Tributary 3 showed aggradation in the upper part of the tributary. This aggradation is due to poor stream stability upstream of the site, which has contributed fine sediment to the stream. This is not expected to be a problem, but it will continue to be monitored. On NPAC, there are isolated areas of bank erosion, which are depicted in the CCPV. Small amounts of bed degradation have exposed old roots on the stream bottom of the lower reaches of NPAC. These roots disrupt stream flow on the stream bottom and in some cases have caused localized bed degradation. While this is not a systemic problem and is not predicted to cause widespread stream instability, KCI did conduct some maintenance in these areas to prevent these isolated problem areas from worsening. This maintenance occurred in October 201 and involved regrading and stabilizing small areas of banks erosion and bed degradation on the upper end of NPAC. All of these stream features will continue to be monitored to make sure that any observed changes are within the range of variability found in stable stream systems. The 2010 maintenance areas are shown in the CCPV.

The stream assessment monitoring is described in Appendix B and the Current Condition Plan View.

2.2.1 Bankfull Events

Table 5. Hydrological (Bankfull) Verifications			
Farrar Dairy Stream and Wetland Restoration Site			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo Number**
3/5/2010	1/21/2010	automated stream gauge	N/A
3/5/2010	2/6/2010	automated stream gauge	N/A

2.2.2 Quantitative Measures Summary Tables

Table 6a. NPAC-1 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	13.9	16.9	14.8	24.3	4	19.5	20.3		21.0	2	19.0		18.4	19.6	20.7	4
Floodprone Width (ft)	20	32	24	60	4			300		2	>60		>60	>60	>60	4
Bankfull Mean Depth (ft)	1.2	1.9	2.1	2.2	4			2.3		2	1.6		1.4	1.5	1.6	4
Bankfull Max Depth (ft)	2.5	2.7	2.7	3.0	4	3.0	3.3		3.5	2	2.4		2.3	2.5	2.7	4
Bankfull Cross-Sectional Area (ft^2)	30.0	30.2	30.2	30.2	4	45.4	47.3		49.1	2	30.0		26.5	29.1	32.2	4
Width/Depth Ratio	6.4	10.1	7.3	19.6	4	8.4	8.8		9.1	2	12.0		12.4	13.2	14.4	4
Entrenchment Ratio	1.3	2.3	1.8	4.3	4	14.3	14.9		15.4	2	>3.0		>3.0	>3.0	>3.0	4
Bank Height Ratio	1.0	1.9	2.1	2.5	4			1.0		2	1.0		1.0	1.0	1.0	4
Pattern																
Channel Beltwidth (ft)	*					25			36		35	60	35		60	
Radius of Curvature (ft)	*					22			36		20	35	20		35	
Rc:Bankfull width (ft/ft)	*					1.0			1.8		1.1	1.8	1.0		1.8	
Meander Wavelength (ft)	*					119			325		95	150	95		150	
Meander Width Ratio	*					1.2			1.8		1.8	3.2	1.8		3.1	
Profile																
Riffle Length (ft)													11	24	38	20
Riffle Slope (ft/ft)	0.0030			0.0210		0.0010			0.0080		0.0034	0.0059	0.0007	0.0034	0.0098	20
Pool Length (ft)	8			42		27			81		20	40	9	30	57	20
Pool Spacing (ft)	60			97		68			123		65	95	62	79	99	20
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					6% / 81% / 15% / 0% / 0% / 0%							7% / 57% / 32% / 3% / 0% / 1%			
d16 / d35 / d50 / d84 / d95 (mm)						0.0 / 0.18 / 0.25 / 1.8 / 9.0							0.12 / 0.28 / 0.42 / 11 / 45			
Additional Reach Parameters																
Channel length (ft)	2,179					620					4,541		4,528			
Drainage Area (SM)	3.92					16.48					3.92		3.92			
Rosgen Classification	C/E5					E5					C5		C5			
Sinuosity	1.00					1.30					1.30		1.39			
Water Surface Slope (ft/ft)	0.0040					0.0020					0.0020		0.0020			

*There was no defined pattern for the NPAC due to the stream being channelized.

-The As-built Dimension is from the monitored riffle cross-sections on this reach.

-The As-built Pattern and Profile data were calculated from the monitored longitudinal profile for NPAC, which contains parts of both NPAC 1 and 2.

Table 6b. NPAC-2 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)			13.2		1	19.5	20.3		21.0	2	19.6		19.5	21.1	22.6	2
Floodprone Width (ft)			>75		1			300		2	>60		>60	>60	>60	2
Bankfull Mean Depth (ft)			2.4		1			2.3		2	1.6		1.6	1.7	1.8	2
Bankfull Max Depth (ft)			3.9		1	3.0	3.3		3.5	2	2.4		2.7	3.1	3.4	2
Bankfull Cross-Sectional Area (ft^2)			31.2		1	45.4	47.3		49.1	2	32.0		35.8	35.9	35.9	2
Width/Depth Ratio			5.6		1	8.4	8.8		9.1	2	12.0		10.6	12.5	14.3	2
Entrenchment Ratio			5.7		1	14.3	14.9		15.4	2	>3.0		>3.0	>3.0	>3.0	2
Bank Height Ratio			1.0		1			1.0		2	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	*					25			36		35	60	35		60	
Radius of Curvature (ft)	*					22			36		20	35	20		35	
Rc:Bankfull width (ft/ft)	*					1.0			1.8		1.0	1.8	1.0		1.7	
Meander Wavelength (ft)	*					119			325		95	150	95		150	
Meander Width Ratio	*					1.2			1.8		1.8	3.1	1.7		2.8	
Profile																
Riffle Length (ft)													7	22	29	7
Riffle Slope (ft/ft)	0.0030			0.0210		0.0010			0.0080		0.0037	0.0075	0.0007	0.0099	0.0236	7
Pool Length (ft)	8			42		27			81		20	40	14	23	41	8
Pool Spacing (ft)	60			97		68			123		50	80	61	74	93	8
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					6% / 81% / 15% / 0% / 0% / 0%							21% / 45% / 31% / 2% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)						0.0 / 0.18 / 0.25 / 1.8 / 9.0							0.062 / 0.11 / 0.32 / 17 / 35			
Additional Reach Parameters																
Channel length (ft)	985					620					1,185		1,212			
Drainage Area (SM)	4.65					16.48					4.65		4.65			
Rosgen Classification	C/E5					E5					C5		C5			
Sinuosity	1.00					1.30					1.30		1.25			
Water Surface Slope (ft/ft)	0.0040					0.0020					0.0030		0.0039			

*There was no defined pattern for the NPAC due to the stream being channelized.

-The As-built Dimension is from the monitored riffle cross-sections on this reach.

-The As-built Pattern and Profile data were calculated from the monitored longitudinal profile for NPAC, which contains parts of both NPAC 1 and 2.

Table 6c. NPAC-3 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)			13.2		1	19.5	20.3		21.0	2	21.0			24.2		1
Floodprone Width (ft)			>75		1			300		2	>60			>60		1
Bankfull Mean Depth (ft)			2.4		1			2.3		2	1.7			2.3		1
Bankfull Max Depth (ft)			3.9		1	3.0	3.3		3.5	2	2.6			3.6		1
Bankfull Cross-Sectional Area (ft^2)			31.2		1	45.4	47.3		49.1	2	36.7			55.8		1
Width/Depth Ratio			5.6		1	8.4	8.8		9.1	2	12.0			10.5		1
Entrenchment Ratio			5.7		1	14.3	14.9		15.4	2	>3.0			>3.0		1
Bank Height Ratio			1.0		1			1.0		2	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	*					25			36		35	60	35		60	
Radius of Curvature (ft)	*					22			36		20	35	22		36	
Rc:Bankfull width (ft/ft)	*					1.0			1.8		1.0	1.7	0.9		1.5	
Meander Wavelength (ft)	*					119			325		105	265	105		265	
Meander Width Ratio	*					1.2			1.8		1.7	2.9	1.4		2.5	
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.0030			0.0210		0.0010			0.0080		0.0040	0.0054				
Pool Length (ft)	8			42		27			81		10	40				
Pool Spacing (ft)	60			97		68			123		85	145				
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					6% / 81% / 15% / 0% / 0% / 0%							21% / 45% / 31% / 2% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)						0.0 / 0.18 / 0.25 / 1.8 / 9.0							0.062 / 0.11 / 0.32 / 17 / 35			
Additional Reach Parameters																
Channel length (ft)	880					620					998		1,006			
Drainage Area (SM)	4.82					16.48					4.82		4.82			
Rosgen Classification	C/E5					E5					C5		C5			
Sinuosity	1.00					1.30					1.30		1.09			
Water Surface Slope (ft/ft)	0.0040					0.0020					0.0030					

*There was no defined pattern for the NPAC due to the stream being channelized.

-The As-built Dimension is from the monitored riffle cross-sections on this reach.

-The As-built survey was completed on NPAC-3, but the monitored detailed longitudinal profile for NPAC does not run through NPAC-3.

Table 6d. Trib 1.1 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	3.5	4.3		5.0	2	7.7	7.9	7.7	8.3	3	4.5		5.9	6.4	6.9	2
Floodprone Width (ft)	6	11		15	2	13	14	13	16	3	>9		16	23	29	2
Bankfull Mean Depth (ft)	0.4	0.5		0.6	2	0.7	0.8	0.8	0.9	3	0.5		0.3	0.4	0.4	2
Bankfull Max Depth (ft)	0.9	1.0		1.1	2	1.1	1.3	1.3	1.4	3	0.7		0.6	0.7	0.7	2
Bankfull Cross-Sectional Area (ft^2)	2.0	2.0		2.0	2	6.1	6.4	6.2	7.0	3	2.0		2.3	2.4	2.4	2
Width/Depth Ratio	6.2	9.4		12.5	2	8.5	9.8	9.6	11.4	3	10.0		15.1	17.5	19.8	2
Entrenchment Ratio	1.7	7.4		13.0	2	1.6	1.9	2.1	2.1	3	>2		2.3	3.6	4.9	2
Bank Height Ratio	1.7	3.1		4.4	2			1.0		3	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	10			21				22			13	17	13		17	
Radius of Curvature (ft)	6			13		11			23		8	13	8		13	
Rc:Bankfull width (ft/ft)	0.7			2.5		1.0			3.0		1.8	2.9	1.3		2.0	
Meander Wavelength (ft)	42			44		49			59		30	45	30		45	
Meander Width Ratio	1.1			4.1		2.0			2.9		2.9	3.8	2.0		2.7	
.																
Riffle Length (ft)	#												8	14	21	22
Riffle Slope (ft/ft)	#					0.0120			0.0280		0.0170	0.0180	0	0.0144	0.0380	22
Pool Length (ft)	#					5			9		2	5	2	5	7	21
Pool Spacing (ft)	#										15	30	19	25	31	21
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					0% / 100% / 0% / 0% / 0% / 0%							13% / 64% / 23% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)													0.07 / 0.14 / 0.29 / 8.6 / 15			
Additional Reach Parameters																
Channel length (ft)	864					204					827		825			
Drainage Area (SM)	0.02					0.15					0.02		0.02			
Rosgen Classification	G5					B4c					C5/B5c		C5			
Sinuosity	1.12					1.20					1.13		1.12			
Water Surface Slope (ft/ft)	0.0240					0.0120					0.0140		0.0131			

No flow during survey, therefore these dimensions were not recorded.

Table 6e. Trib 1.2 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	3.6	5.0		6.4	2	7.7	7.9	7.7	8.3	3	7.6		6.9	7.6	8.3	2
Floodprone Width (ft)	7	34		60	2	13	14	13	16	3	>15.2		26	36	46	2
Bankfull Mean Depth (ft)	0.9	1.3		1.6	2	0.7	0.8	0.8	0.9	3	0.8		0.7	0.8	0.8	2
Bankfull Max Depth (ft)	2.1	2.2		2.2	2	1.1	1.3	1.3	1.4	3	1.2		1.2	1.2	1.2	2
Bankfull Cross-Sectional Area (ft^2)	5.8	5.8		5.8	2	6.1	6.4	6.2	7.0	3	5.8		5.2	5.5	5.7	2
Width/Depth Ratio	2.2	4.7		7.1	2	8.5	9.8	9.6	11.4	3	10.0		9.2	10.7	12.1	2
Entrenchment Ratio	2.0	5.7		9.4	2	1.6	1.9	2.1	2.1	3	>2		3.8	4.7	5.5	2
Bank Height Ratio	1.1	1.6		2.0	2			1.0		3	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	22			34				22			17	26	17		26	
Radius of Curvature (ft)	8			11		11			23		13	20	13		20	
Rc:Bankfull width (ft/ft)	1.4			3.7		1.0			3.0		1.7	2.6	1.7		2.6	
Meander Wavelength (ft)	54			74		49			59		54	75	54		75	
Meander Width Ratio	3.9			11.3		2.0			2.9		2.2	3.4	2.2		3.4	
Profile																
Riffle Length (ft)	#												21	25	35	14
Riffle Slope (ft/ft)	#					0.0120			0.0280		0.0150	0.0180	0.0115	0.0178	0.0234	14
Pool Length (ft)	#					5			9		4	9	3	6	13	14
Pool Spacing (ft)	#										20	40	29	37	50	14
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					0% / 100% / 0% / 0% / 0% / 0%							22% / 76% / 3% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)													0.062 / 0.079 / 0.1 / 0.22 / 0.44			
Additional Reach Parameters																
Channel length (ft)	1,006					620					986		980			
Drainage Area (SM)	0.10					16.48					0.10		0.10			
Rosgen Classification	G5					E5					C5/B5c		C5/B5c			
Sinuosity	1.10					1.30					1.14		1.14			
Water Surface Slope (ft/ft)	0.0130					0.0020					0.0130		0.0142			

No flow during survey, therefore these dimensions were not recorded.

Table 6f. Trib 1 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	^					7.7	7.9	7.7	8.3	3	10.0		8.6	9.5	10.3	2
Floodprone Width (ft)	^					13	14	13	16	3	>20		>60	>60	>60	2
Bankfull Mean Depth (ft)	^					0.7	0.8	0.8	0.9	3	1.0		0.9	1.0	1.0	2
Bankfull Max Depth (ft)	^					1.1	1.3	1.3	1.4	3	1.6		1.7	1.8	1.9	2
Bankfull Cross-Sectional Area (ft^2)	^					6.1	6.4	6.2	7.0	3	10.0		8.2	9.0	9.7	2
Width/Depth Ratio	^					8.5	9.8	9.6	11.4	3	10.0		9.0	10.0	10.9	2
Entrenchment Ratio	^					1.6	1.9	2.1	2.1	3	>2		>3.0	>3.0	>3.0	2
Bank Height Ratio	^							1.0		3	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	8			16				22			23	40	23		40	
Radius of Curvature (ft)	6			20		11			23		15	25	15		25	
Rc:Bankfull width (ft/ft)	^					1.0			3.0		1.5	2.5	1.6		2.6	
Meander Wavelength (ft)	22			50		49			59		55	90	55		90	
Meander Width Ratio	^					2.0			2.9		2.3	4.0	2.4		4.2	
Profile																
Riffle Length (ft)	^												6	24	37	12
Riffle Slope (ft/ft)	^					0.0120			0.0280		0.0150	0.0180	0.0077	0.0184	0.0350	12
Pool Length (ft)	^					5			9		5	12	3	9	21	9
Pool Spacing (ft)	^										35	55	37	46	59	9
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					0% / 100% / 0% / 0% / 0% / 0%							22% / 76% / 3% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)													0.062 / 0.079 / 0.1 / 0.22 / 0.44			
Additional Reach Parameters																
Channel length (ft)	370					620					881		884			
Drainage Area (SM)	0.18					16.48					0.18		0.18			
Rosgen Classification	DA5					E5					C5/B5c		C5/B5c			
Sinuosity	1.19					1.30					1.22		1.21			
Water Surface Slope (ft/ft)	0.0100					0.0020					0.0110		0.0112			

^ These existing conditions data were not collected on T1.

Table 6g. Trib 2A Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)			3.6		1	7.7	7.9	7.7	8.3	3	5.0			5.7		1
Floodprone Width (ft)			4		1	13	14	13	16	3	>10			30		1
Bankfull Mean Depth (ft)			0.7		1	0.7	0.8	0.8	0.9	3	0.5			0.5		1
Bankfull Max Depth (ft)			1.0		1	1.1	1.3	1.3	1.4	3	0.8			0.8		1
Bankfull Cross-Sectional Area (ft^2)			2.5		1	6.1	6.4	6.2	7.0	3	2.5			2.8		1
Width/Depth Ratio			5.2		1	8.5	9.8	9.6	11.4	3	10.0			11.6		1
Entrenchment Ratio			1.1		1	1.6	1.9	2.1	2.1	3	>2			5.3		1
Bank Height Ratio			3.5		1			1.0		3	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	*							22			11	17	11		17	
Radius of Curvature (ft)	*					11			23		8	10	8		10	
Rc:Bankfull width (ft/ft)	*					1.0			3.0		1.6	2.0	1.4		1.8	
Meander Wavelength (ft)	*					49			59		35	45	35		45	
Meander Width Ratio	*					2.0			2.9		2.2	3.4	1.9		3.0	
Profile																
Riffle Length (ft)	#												8	15	28	17
Riffle Slope (ft/ft)	#					0.012			0.028		0.016	0.018	#	#	#	#
Pool Length (ft)	#					5			9		2	6	2	7	28	17
Pool Spacing (ft)	#										15	25	14	31	70	17
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					0% / 100% / 0% / 0% / 0% / 0%							22% / 76% / 3% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)													0.062 / 0.079 / 0.1 / 0.22 / 0.44			
Additional Reach Parameters																
Channel length (ft)	423					620					500		500			
Drainage Area (SM)	0.04					16.48					0.04		0.04			
Rosgen Classification	G5					E5					C5/B5c		C5/B5c			
Sinuosity	1.00					1.30					1.16		1.13			
Water Surface Slope (ft/ft)	0.0260					0.0020					0.0180		#			

No flow during survey, therefore these dimensions were not recorded.

*There was no defined pattern for T2 due to the stream being channelized.

Table 6h. Trib 2B Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)			4.5		1	6.7	7.2	7.1	7.9	3	5.3			5.2		1
Floodprone Width (ft)			8		1	34	63	68	88	3	>25			>60		1
Bankfull Mean Depth (ft)			0.6		1	0.7	0.9	0.9	1.0	3	0.5			0.5		1
Bankfull Max Depth (ft)			0.9		1	1.1	1.2	1.1	1.3	3	0.8			0.8		1
Bankfull Cross-Sectional Area (ft^2)			2.5		1	5.7	6.1	5.8	6.7	3	2.6			2.5		1
Width/Depth Ratio			8.1		1	7.4	8.9	8.0	11.3	3	11.0			10.8		1
Entrenchment Ratio			1.8		1	4.9	8.8	8.6	13	3	>2.4			>3.0		1
Bank Height Ratio			3.2		1			1.0		3	1.0			1.0		1
Pattern																
Channel Beltwidth (ft)	*					15			48		23	40	23		40	
Radius of Curvature (ft)	*					21			47		15	20	15		20	
Rc:Bankfull width (ft/ft)	*					2.7			7.0		2.8	3.8	2.9		3.8	
Meander Wavelength (ft)	*					43			84		70	90	70		90	
Meander Width Ratio	*					1.9			7.2		4.3	7.5	4.4		7.7	
Profile																
Riffle Length (ft)	#												8	15	28	17
Riffle Slope (ft/ft)	#										0.0090	0.0170	#	#	#	#
Pool Length (ft)	#										10	30	2	7	28	17
Pool Spacing (ft)	#							45			30	40	14	31	70	17
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					0% / 100% / 0% / 0% / 0% / 0%							22% / 76% / 3% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)						0.28 / 0.37 / 0.44 / 0.82 / 0.97							0.062 / 0.079 / 0.1 / 0.22 / 0.44			
Additional Reach Parameters																
Channel length (ft)	554					529					509		522			
Drainage Area (SM)	0.04					0.35					0.04		0.04			
Rosgen Classification	G5					E5					E5		E5			
Sinuosity	1.22					1.30					1.22		1.23			
Water Surface Slope (ft/ft)	0.0080					0.0070					0.0080		#			

*There was no defined pattern for T2 due to the stream being channelized.

No flow during survey, therefore these dimensions were not recorded.

Table 6i. Trib 3 Baseline Stream Summary
Farrar Dairy Site

Parameter	Pre-Existing Condition					Reference Reach(es) Data					Design		As-built			
Dimension - Riffle	Min	Mean	Med	Max	n	Min	Mean	Med	Max	n	Min	Max	Min	Mean	Max	n
Bankfull Width (ft)	12.3	15.9		19.5	2	19.5	20.3		21.0	2	15.5		14.9	16.7	18.4	2
Floodprone Width (ft)	50			>70	2			300		2	>31		>60	>60	>60	2
Bankfull Mean Depth (ft)	1.0	1.3		1.6	2			2.3		2	1.3		1.2	1.2	1.2	2
Bankfull Max Depth (ft)	2.3	2.8		3.2	2	3.0	3.3		3.5	2	2.0		1.9	1.9	1.9	2
Bankfull Cross-Sectional Area (ft^2)	20.0	20.1		20.1	2	45.4	47.3		49.1	2	20.0		18.4	19.9	21.4	2
Width/Depth Ratio	7.6	13.3		18.9	2	8.4	8.8		9.1	2	12.0		12.1	14.0	15.8	2
Entrenchment Ratio	3.6	3.9		4.1	2	14.3	14.9		15.4	2	>2		>3	>3	>3	2
Bank Height Ratio	1.0	1.2		1.4	2			1.0		2	1.0		1.0	1.0	1.0	2
Pattern																
Channel Beltwidth (ft)	*					25			36		35	45	35		45	
Radius of Curvature (ft)	*					22			36		20	28	20		28	
Rc:Bankfull width (ft/ft)	*					1.0			1.8		1.3	1.8	1.2		1.7	
Meander Wavelength (ft)	*					119			325		80	125	80		125	
Meander Width Ratio	*					1.2			1.8		2.3	2.9	2.1		2.7	
Profile																
Riffle Length (ft)	#												12	21	35	11
Riffle Slope (ft/ft)	#					0.0130			0.0280		0.0020	0.0050	0.0000	0.0023	0.0058	11
Pool Length (ft)	#					3			25		12	20	3	13	21	9
Pool Spacing (ft)	#					30			59		45	70	45	64	115	9
Substrate and Transport Parameters																
SC% / Sa% / G% / C% / B% / Be%	0% / 100% / 0% / 0% / 0% / 0%					6% / 81% / 15% / 0% / 0% / 0%							22% / 76% / 3% / 0% / 0% / 0%			
d16 / d35 / d50 / d84 / d95 (mm)						0.0 / 0.18 / 0.25 / 1.8 / 9.0							0.062 / 0.079 / 0.1 / 0.22 / 0.44			
Additional Reach Parameters																
Channel length (ft)	1,335					620					1,151		1,167			
Drainage Area (SM)	0.39					16.48					0.39		0.39			
Rosgen Classification	C5/E5					E5					C5		C5			
Sinuosity	1.00					1.30					1.17		1.17			
Water Surface Slope (ft/ft)	0.0020					0.0020					0.0030		0.0211			

*There was no defined pattern for T3 due to the stream being channelized.

No flow during survey, therefore these dimensions were not recorded.

Table 7a. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 1 NPAC 1						Cross-Section 2 NPAC 1						Cross-Section 3 NPAC 1					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	19.6	20.0	18.5				20.9	23.9	24.8				19.6	16.0	16.0			
Floodprone Width (ft)	>60	>60	>60				-	-	-				>60	>60	>60			
Bankfull Cross-Sectional Area (ft^2)	31.0	31.7	31.6				29.2	28.8	32.9				26.6	19.9	19.9			
Bankfull Mean Depth (ft)	1.6	1.6	1.7				1.4	1.2	1.3				1.4	1.2	1.2			
Bankfull Maximum Depth (ft)	2.4	2.7	2.9				3.3	3.2	3.3				2.5	2.0	2.3			
Width/Depth Ratio	12.4	12.6	10.8				-	-	-				14.4	12.9	12.9			
Entrenchment Ratio	>3.0	>3.0	>3.0				-	-	-				>3.0	>3.0	>3.0			
Bank Height Ratio	1.0	1.0	1.0				-	-	-				1.0	1.0	1.0			
Wetted Perimeter (ft)	20.5	20.9	19.6				22.3	25.0	26.8				20.5	16.9	17.9			
Hydraulic Radius (ft)	1.5	1.5	1.6				1.3	1.2	1.2				1.3	1.2	1.2			
Substrate																		
d50 (mm)	0.07	0.06	0.06				0.09	0.14	0.28				0.06	0.18	0.06			
d84 (mm)	0.22	0.11	0.11				0.65	0.49	3.7				0.11	0.44	0.09			

Table 7b. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 4 NPAC 1						Cross-Section 5 NPAC 1						Cross-Section 6 NPAC 1					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	18.9	18.5	18.6				18.4	18.0	18.0				20.4	18.6	20.4			
Floodprone Width (ft)	-	-	-				>60	>60	>60				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	24.7	26.7	28.7				26.5	24.6	24.6				26.6	25.1	28.1			
Bankfull Mean Depth (ft)	1.3	1.4	1.5				1.4	1.4	1.4				1.3	1.5	1.4			
Bankfull Maximum Depth (ft)	2.8	3.2	3.0				2.3	2.3	2.9				3.0	3.1	3.5			
Width/Depth Ratio	-	-	-				12.8	13.1	13.1				-	-	-			
Entrenchment Ratio	-	-	-				>3.0	>3.0	>3.0				-	-	-			
Bank Height Ratio	-	-	-				1.0	1.0	1.0				-	-	-			
Wetted Perimeter (ft)	20.9	20.1	20.8				19.2	22.2	22.0				22.0	19.9	22.1			
Hydraulic Radius (ft)	1.2	1.3	1.4				1.4	1.1	1.1				1.2	1.3	1.3			
Substrate																		
d50 (mm)	0.54	0.11	0.10				0.09	0.09	0.21				0.12	0.07	0.073			
d84 (mm)	0.82	0.40	0.34				0.37	0.38	0.38				0.29	0.26	0.14			

Table 7c. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 7 NPAC-1						Cross-Section 8 NPAC-2						Cross-Section 9 NPAC-2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	20.7	20.0	20.9				19.5	18.9	19.2				22.9	22.2	24.7			
Floodprone Width (ft)	>60	>60	>60				>60	>60	>60				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	32.2	30.7	33.6				35.9	35.0	36.0				36.0	34.3	36.7			
Bankfull Mean Depth (ft)	1.6	1.5	1.6				1.8	1.9	1.9				1.6	1.5	1.5			
Bankfull Maximum Depth (ft)	2.7	2.9	3.2				3.4	3.6	3.9				3.4	3.2	4.2			
Width/Depth Ratio	13.3	13.0	13.0				10.6	10.2	10.2				-	-	-			
Entrenchment Ratio	>3.0	>3.0	>3.0				>3.0	>3.0	>3.0				-	-	-			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				-	-	-			
Wetted Perimeter (ft)	21.5	21.0	22.1				24.9	20.6	20.9				24.5	23.9	27.1			
Hydraulic Radius (ft)	1.5	1.5	1.5				1.4	1.7	1.7				1.5	1.4	1.4			
Substrate																		
d50 (mm)	0.06	0.06	0.06				0.06	0.06	0.06				0.11	0.29	0.17			
d84 (mm)	0.10	0.10	0.06				0.07	0.10	0.09				0.66	0.69	0.23			

Table 7d. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 10 NPAC-2						Cross-Section 11 NPAC-3						Cross-Section 12 NPAC-3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	22.6	21.0	20.2				24.2	21.6	23.9				22.3	21.0	22.8			
Floodprone Width (ft)	>60	>60	>60				>60	>60	>60				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	35.8	34.0	31.3				55.8	53.1	59.8				42.0	38.0	50.9			
Bankfull Mean Depth (ft)	1.6	1.6	1.5				2.3	2.2	2.5				1.9	1.8	2.2			
Bankfull Maximum Depth (ft)	2.7	2.8	2.7				3.6	3.5	4.0				3.2	3.5	4.5			
Width/Depth Ratio	14.3	13.0	13.0				10.5	8.7	9.6				-	-	-			
Entrenchment Ratio	>3.0	>3.0	>3.0				>3.0	>3.0	>3.0				-	-	-			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				-	-	-			
Wetted Perimeter (ft)	23.7	22.0	21.4				23.5	23.1	25.8				23.9	23.0	25.3			
Hydraulic Radius (ft)	1.5	1.5	1.5				2.3	2.3	2.3				1.8	1.7	2.0			
Substrate																		
d50 (mm)	0.06	0.49	0.35				0.71	0.29	0.15				1.40	0.23	0.09			
d84 (mm)	3.10	9.60	18.00				0.90	0.44	0.21				3.00	0.40	0.11			

Table 7e. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 13 T1.1						Cross-Section 14 T1.1						Cross-Section 15 T1.1					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	6.9	8.0	7.2				7.1	6.9	7.3				5.9	5.8	6.5			
Floodprone Width (ft)	16	16	16				-	-	-				29	30	30			
Bankfull Cross-Sectional Area (ft^2)	2.4	2.8	2.8				5.1	5.2	5.5				2.3	2.5	2.2			
Bankfull Mean Depth (ft)	0.3	0.4	0.4				0.7	0.7	0.8				0.4	0.4	0.3			
Bankfull Maximum Depth (ft)	0.7	0.7	0.8				1.3	1.3	1.5				0.6	0.7	0.6			
Width/Depth Ratio	19.8	22.9	18.5				-	-	-				15.1	13.2	13.2			
Entrenchment Ratio	2.3	2.0	2.2				-	-	-				4.9	5.2	5.2			
Bank Height Ratio	1.0	1.0	1.0				-	-	-				1.0	1.0	1.1			
Wetted Perimeter (ft)	7.1	8.2	7.3				7.7	7.6	8.3				6.1	6.0	6.0			
Hydraulic Radius (ft)	0.3	0.3	0.4				0.7	0.7	0.7				0.4	0.4	0.4			
Substrate																		
d50 (mm)	0.06	0.06	0.06				0.06	0.06	0.06				0.06	0.06	0.06			
d84 (mm)	0.07	0.06	0.06				0.06	37.00	0.06				0.09	11.00	0.48			

Table 7f. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 16 T1.2						Cross-Section 17 T1.2						Cross-Section 18 T1.2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	8.9	9.2	9.3				8.3	8.5	8.5				6.9	6.9	7.0			
Floodprone Width (ft)	-	-	-				46	46	46				26	26	26			
Bankfull Cross-Sectional Area (ft^2)	6.4	6.8	6.8				5.7	5.8	5.7				5.2	5.1	5.6			
Bankfull Mean Depth (ft)	0.7	0.7	0.7				0.7	0.7	0.7				0.8	0.7	0.8			
Bankfull Maximum Depth (ft)	1.6	1.4	1.5				1.2	1.2	1.3				1.2	1.2	1.3			
Width/Depth Ratio	-	-	-				12.1	12.5	12.7				9.2	9.3	8.8			
Entrenchment Ratio	-	-	-				5.5	5.4	5.4				3.8	3.8	3.7			
Bank Height Ratio	-	-	-				1.0	1.0	1.0				1.0	1.0	1.0			
Wetted Perimeter (ft)	9.5	9.7	10.9				8.7	8.9	8.9				7.5	7.5	7.7			
Hydraulic Radius (ft)	0.7	0.7	0.7				0.6	0.7	0.6				0.7	0.7	0.7			
Substrate																		
d50 (mm)	0.31	0.12	0.30				0.06	0.06	0.06				0.06	0.25	0.28			
d84 (mm)	0.48	0.35	0.42				0.08	44.00	0.42				0.10	0.65	0.42			

Table 7g. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 19 T1						Cross-Section 20 T1						Cross-Section 21 T1					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	9.5	10.5	9.3				10.3	9.1	8.9				8.6	10.1	10.1			
Floodprone Width (ft)	-	-	-				>60	>60	>60				>60	>60	>60			
Bankfull Cross-Sectional Area (ft^2)	10.9	12.0	10.8				9.7	8.3	8.5				8.2	9.9	10.3			
Bankfull Mean Depth (ft)	1.1	1.1	1.2				0.9	0.9	1.0				1.0	1.0	1.0			
Bankfull Maximum Depth (ft)	2.4	2.5	2.3				1.9	1.8	1.9				1.7	1.8	1.8			
Width/Depth Ratio	-	-	-				10.9	10.1	12.0				9.0	10.3	9.9			
Entrenchment Ratio	-	-	-				>3.0	>3.0	>3.0				>3.0	>30	>30			
Bank Height Ratio	-	-	-				1.0	1.0	1.0				1.0	1.0	1.0			
Wetted Perimeter (ft)	10.7	11.8	10.5				11.2	10.0	11.7				9.5	10.9	10.9			
Hydraulic Radius (ft)	1.0	1.0	1.0				0.9	0.8	0.8				0.9	0.9	0.9			
Substrate																		
d50 (mm)	0.06	0.06	0.33				0.062	0.06	0.06				0.53	0.06	0.3			
d84 (mm)	0.12	0.06	0.44				0.10	0.06	0.33				2.0	7.3	0.44			

Table 7h. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 22 T2						Cross-Section 23 T2						Cross-Section 24 T2					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	7.5	7.5	8.9				5.7	5.9	6.0				7.1	6.5	7.7			
Floodprone Width (ft)	-	-	-				30	31	31				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	5.1	5.0	5.5				2.8	2.8	2.9				4.2	3.9	4.5			
Bankfull Mean Depth (ft)	0.7	0.7	0.6				0.5	0.5	0.5				0.6	0.6	0.6			
Bankfull Maximum Depth (ft)	1.1	1.1	1.1				0.8	0.8	0.8				1.1	1.0	1.1			
Width/Depth Ratio	-	-	-				11.6	12.8	13.2				-	-	-			
Entrenchment Ratio	-	-	-				5.3	5.2	4.0				-	-	-			
Bank Height Ratio	-	-	-				1.0	1.0	1.0				-	-	-			
Wetted Perimeter (ft)	7.9	7.9	9.2				6.0	6.2	6.3				7.5	6.9	8.2			
Hydraulic Radius (ft)	0.7	0.6	0.6				0.5	0.4	0.5				0.6	0.6	0.5			
Substrate																		
d50 (mm)	0.06	0.06	0.06				0.06	0.06	0.06				0.06	0.06	0.06			
d84 (mm)	0.06	0.06	0.06				16	52	0.19				0.06	0.06	0.06			

Table 7i. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 25 T2						Cross-Section 26 T3						Cross-Section 27 T3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	5.2	5.6	6.7				18.4	17.6	17.6				19.2	18.9	21.2			
Floodprone Width (ft)	>60	>60	>60				>60	>60	>60				-	-	-			
Bankfull Cross-Sectional Area (ft^2)	2.5	2.7	2.9				21.4	20.1	15.8				24.2	22.1	18.3			
Bankfull Mean Depth (ft)	0.5	0.5	0.4				1.2	1.1	0.9				1.3	1.2	0.9			
Bankfull Maximum Depth (ft)	0.8	0.8	0.8				1.9	1.8	1.3				2.5	2.3	1.6			
Width/Depth Ratio	10.8	11.7	15.5				15.8	15.5	19.61				-	-	-			
Entrenchment Ratio	>3.0	>3.0	>3.0				>3.0	>3.0	>3.0				-	-	-			
Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0				-	-	-			
Wetted Perimeter (ft)	5.5	5.9	7.0				18.9	18.1	18.1				18.2	19.6	23.9			
Hydraulic Radius (ft)	0.5	0.5	0.4				1.1	1.1	0.9				1.3	1.1	0.9			
Substrate																		
d50 (mm)	0.06	0.06	0.06				0.06	0.09	0.14				0.06	0.06	0.07			
d84 (mm)	0.06	0.06	0.06				0.09	0.18	0.21				0.10	0.08	0.10			

Table 7j. Morphology and Hydraulic Monitoring Summary
Farrar Dairy Site

Parameter	Cross-Section 28 T3						Cross-Section 29 T3					
Dimension	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
Bankfull Width (ft)	23.3	23.3	23.5				14.9	15.4	15.3			
Floodprone Width (ft)	-	-	-				>60	>60	>60			
Bankfull Cross-Sectional Area (ft^2)	29.1	29.4	22.5				18.4	19.4	18.2			
Bankfull Mean Depth (ft)	1.2	1.3	1.0				1.2	1.3	1.2			
Bankfull Maximum Depth (ft)	2.6	2.7	1.4				1.9	2.0	1.9			
Width/Depth Ratio	-	-	-				12.1	12.2	12.9			
Entrenchment Ratio	-	-	-				>3.0	>3.0	>3.0			
Bank Height Ratio	-	-	-				1.0	1.0	1.0			
Wetted Perimeter (ft)	23.9	24.1	25.1				15.6	16.1	15.9			
Hydraulic Radius (ft)	1.2	1.2	1.0				1.2	1.2	1.1			
Substrate												
d50 (mm)	0.06	0.06	0.08				0.06	0.06	0.06			
d84 (mm)	0.06	0.06	0.11				0.06	0.06	0.46			

2.3 Wetland Assessment

The maximum number of consecutive days that the groundwater was within 12 inches of the surface was determined for each groundwater gauge. This number was converted into a percentage of the 251-day growing season (March 11 to November 16). Table 8 presents the hydrological monitoring results for 2010. The wetland gauges used to monitor site hydrology were installed in March 2009. During the second year of monitoring, wetland hydrology was achieved at all of the gauges on the site except for gauges 2 and 4 (Table 8). Based on these data, the majority of the site has exceeded the minimum duration of 12.5 consecutive days (5% of the growing season) with the water table within 12 inches of the soil surface for the 2010 growing season (Appendix C). Climatic data for the 2010 growing season were analyzed in comparison to historical data to determine whether 2010 was a normal year in terms of climatic conditions. The historical data were collected from the NRCS, Water and Climate Center, "Climate Analysis for Wetlands by County" website. This evaluation concluded that 2010 was a normal to slightly less than normal year for rainfall. Rainfall was within the 30th to 70th percentiles for the months of February, March, and May. Rainfall was less than the 30th percentile threshold in April, July, October, November, and December, and was greater than the 70th percentile threshold in January, August, and September (Appendix C).

Table 8. Hydrologic Monitoring Results
Farrar Dairy Site

	Hydroperiod					
Gauge #	<5%	5% - 8%	8% - 12.5%	>12.5%	Max. No. of Consecutive Days / Exact Hydroperiod Percentage	Dates Meeting Success
1				X	33 / 13%	March 11 - April 12
2	X				10 / 4%	
3			X		28 / 11%	March 11 - April 7
4	X				8 / 3%	
5				X	33 / 13%	March 11 - April 12
6				X	39 / 16%	March 11 - April 18
7				X	39 / 16%	March 11 - April 18
Ref				X	63 / 25%	March 11 - May 11

Table 9. Hydroperiod History
Farrar Dairy Site

Gauge #	Pre-Restoration	Year 1	Year 2	Year 3	Year 4	Year 5
1	<5%	>12.5%	>12.5%			
2	<5%	8%-12.5%	<5%			
3	<5%	8%-12.5%	8%-12.5%			
4	<5%	8%-12.5%	<5%			
5	<5%	8%-12.5%	>12.5%			
6	<5%	5%-8%	>12.5%			
7	<5%	8%-12.5%	>12.5%			
Ref	>12.5%	>12.5	>12.5%			

3.0 CONCLUSIONS

The stream is functioning as designed and has not developed any significant problems. The monitored cross-sections and profiles indicate some changes over the course of monitoring, but the stream in these areas is not trending towards instability. Any feature changes will be tracked to see if the stream is moving beyond its expected variability. Stream maintenance was conducted in 2010 on NPAC and T1. The work on NPAC focused on stabilizing isolated areas of bank erosion and the T1 maintenance installed additional grade control. There were two bankfull events in the second monitoring year.

The hydrology data in Section 2.3 indicate that two gauges did not demonstrate wetland hydrology in 2010. These two gauges did attain wetland hydrology in the previous monitoring year. Future monitoring will determine if these areas are having consistent hydrologic deficiencies or if 2010 was not a typical hydrologic year for the wetlands.

The beaver dams on the site will be evaluated further to determine a maintenance strategy.

The planted vegetation has been doing well, with some plots experiencing more mortality than others. This mortality can be attributed to normal losses after the initial planting as well as aggressive growth from the site's herbaceous vegetation. The site also has vigorous volunteers, which will increase the overall vegetation success of the site. The vegetation is on track to meeting the success criteria in the steam and wetland for the second year of monitoring.

Appendix A
Vegetation Data

Table A1. Stream Riparian Buffer Stem Density and Species Count by Plot
Farrar Dairy Stream and Wetland Restoration

Species	Plot #															Total (Year 2)
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Pawpaw *Asimina triloba*					2											2
River Birch *Betula nigra*	3	1		4		2	3	5	10			2	6	6	4	46
Sugarberry *Celtis laevigata*	4	1	2	1			1	3								12
Buttonbush *Cephalanthus occidentalis*	1	4			2	1			5						5	18
Silky Dogwood *Cornus amomum*	11			4	3	7	3	1						3	2	34
Persimmon *Diospyros virginiana*	2	1	6							2		1				12
Green Ash *Fraxinus pennsylvanica*		4		1	4		2	4				5	2	2	1	25
Sweetbay *Magnolia virginiana*														1		1
Sycamore *Platanus occidentalis*										3						3
White Oak *Quercus alba*										6						6
Laurel Oak *Quercus laurifolia*		2	2	1	1	1										7
Overcup Oak *Quercus lyrata*										1						1
Swamp Chestnut Oak *Quercus michauxii*					1											1
Pin Oak *Quercus palustris*					3											3
Willow Oak *Quercus phellos*			1					1								2
Black Willow *Salix nigra*				1			2									3
Silky Willow *Salix sericea*				1			6				5		3			15
Elderberry *Sambucus canadensis*											1		1			2
Unknown					1										1	2
Total (Year 2)	21	13	11	13	17	11	17	14	15	12	6	8	12	12	13	195
Average Density (Stems/Acre)	840	520	440	520	680	440	680	560	600	480	240	320	480	480	520	
				Total Density (Stems/Acre)										**520**		

Table A1b. Wetland Stem Density and Species Count by Plot
Farrar Dairy Stream and Wetland Restoration

Species	Plot #																													Total (Year 2)
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	
River Birch *Betula nigra*		1																													1
American Beautyberry *Callicarpa americana*							1																								1
Shagbark Hickory *Carya ovata*														1																	1
Silky Dogwood *Cornus amomum*	1	1	1	1	2				2		1							5							1	6	3	1			25
Persimmon *Diospyros virginiana*		7	3	1	1														1												13
Green Ash *Fraxinus pennsylvanica*	1			3	4	1	6	4		1	4	2		4	8	4			4		1	7		3	7	2	3	2	3		74
Oak sp. *Quercus*		1		1		1	2												1									1	2		9
White Oak *Quercus alba*						1																									1
Southern Red Oak *Quercus falcata*						3	2	4			1					1			1	3	2	2	3								22
Laurel Oak *Quercus laurifolia*				4		2	4	3		1	2	3									1		2			1	5	5			33
Overcup Oak *Quercus lyrata*										1	2							3	1		3	1									11
Swamp Chestnut Oak *Quercus michauxii*	1		1		1	2		2				2	8	6	3	1	5	1			3			2	2		3		5	2	50
Cherrybark Oak *Quercus pagoda*		3		5	1	1	3	5								2				3	1					2					26
Pin Oak *Quercus palustris*	1		5	3	1	1	3			4	2					1		1					1	2				1	2		28
Willow Oak *Quercus phellos*	5			5	2			1	8	4	1	5	2				5			1	4		1	3	4					2	53
Unknown							1														1			1							3
Total (Year 2)	9	13	10	23	12	12	22	19	10	11	13	12	10	11	11	9	10	10	8	7	16	10	7	11	14	11	14	10	12	4	351
Average Density (Stems/Acre)	360	520	400	920	480	480	880	760	400	440	520	480	400	440	440	360	400	400	320	280	640	400	280	440	560	440	560	400	480	160	
																					Total Density (Stems/Acre)								**468**		

Table A3. Riparian Buffer Vegetation History (stems/acre)
Farrar Dairy Site

Plot Number	MY-00	MY-01	MY-02		MY-03		MY-04		MY-05	
	planted	planted	planted	total	planted	total	planted	total	planted	total
1	880	840	840	840						
2	720	560	520	1000						
3	320	400	440	5,720						
4	840	400	520	3,960						
5	760	640	680	2,240						
6	560	440	440	480						
7	840	720	680	840						
8	560	560	560	560						
9	600	600	600	600						
10	520	520	480	560						
11	680	360	240	440						
12	520	240	320	320						
13	720	480	480	600						
14	520	480	480	680						
15	560	520	520	520						
Buffer Average	640	517	520	1,291						

Table A4. Wetland Vegetation History (stems/acre)
Farrar Dairy Site

Plot Number	MY-00	MY-01	MY-02		MY-03		MY-04		MY-05	
	planted	planted	planted	total	planted	total	planted	total	planted	total
16	400	400	360	400						
17	560	520	520	520						
18	400	400	400	480						
19	1000	960	920	1040						
20	520	520	480	480						
21	520	480	480	6080						
22	840	840	880	6280						
23	920	800	760	3320						
24	520	480	400	480						
25	440	440	440	680						
26	520	520	520	560						
27	480	480	480	920						
28	480	400	400	800						
29	520	560	440	920						
30	440	440	440	480						
31	440	400	360	480						
32	400	400	400	400						
33	440	400	400	400						
34	480	360	320	360						
35	400	360	280	320						
36	640	640	640	640						
37	480	440	400	560						
38	520	280	280	280						
39	520	440	440	440						
40	600	600	560	600						
41	600	440	440	440						
42	680	560	560	560						
43	480	400	400	400						
44	560	400	480	480						
45	480	320	120	160						
Wetland Average	543	489	467	999						

Stream and Wetland Vegetation Plot Photos

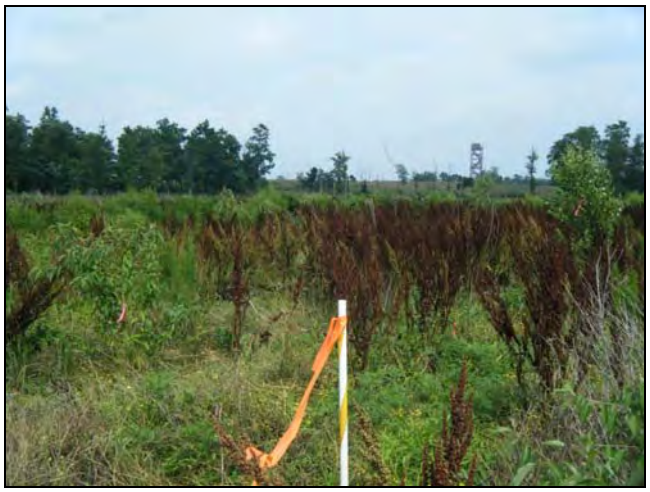

Vegetation Plot 1 – MY-02 – 6/22/10

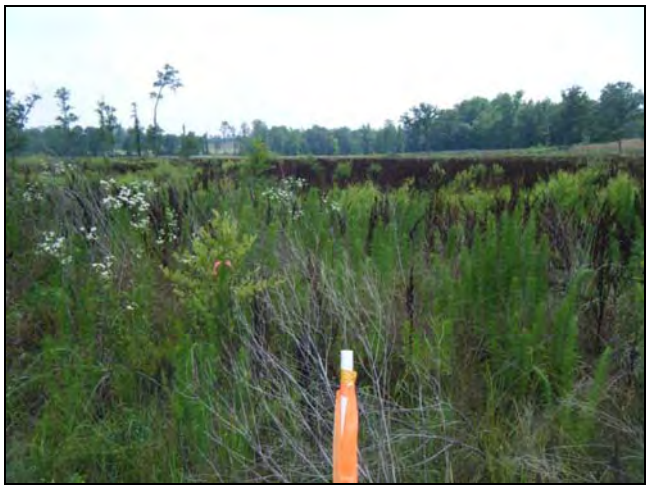

Vegetation Plot 2 – MY-02 – 6/22/10

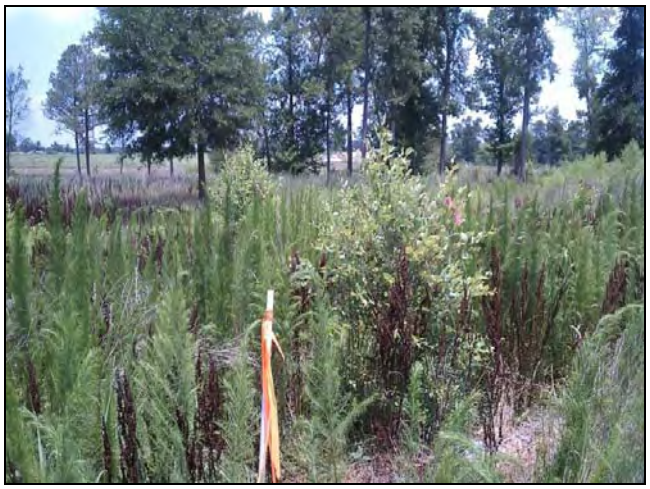

Vegetation Plot 3 – MY-02 – 6/22/10


Vegetation Plot 4 – MY-02 – 6/22/10


Vegetation Plot 5 – MY-02 – 6/22/10


Vegetation Plot 6 – MY-02 – 6/22/10


Vegetation Plot 7 – MY-02 – 6/22/10


Vegetation Plot 8 – MY-02 – 6/22/10

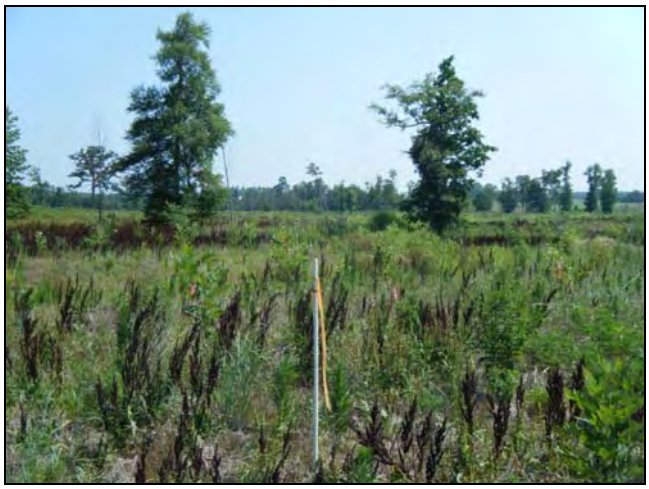

Vegetation Plot 9 – MY-02 – 6/22/10


Vegetation Plot 10 – MY-02 – 6/22/10

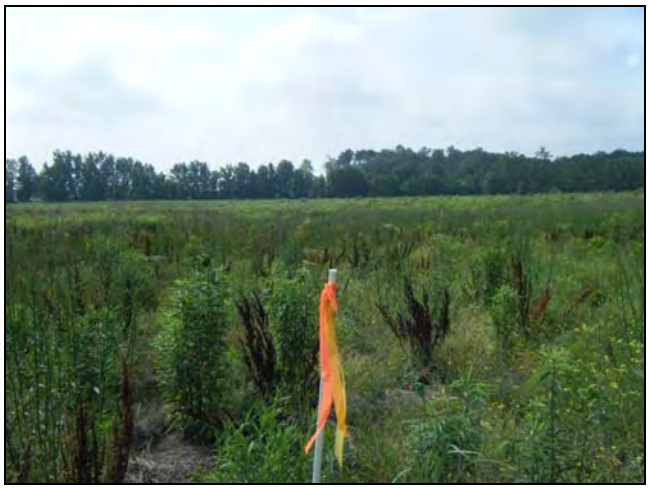

Vegetation Plot 11 – MY-02 – 6/22/10

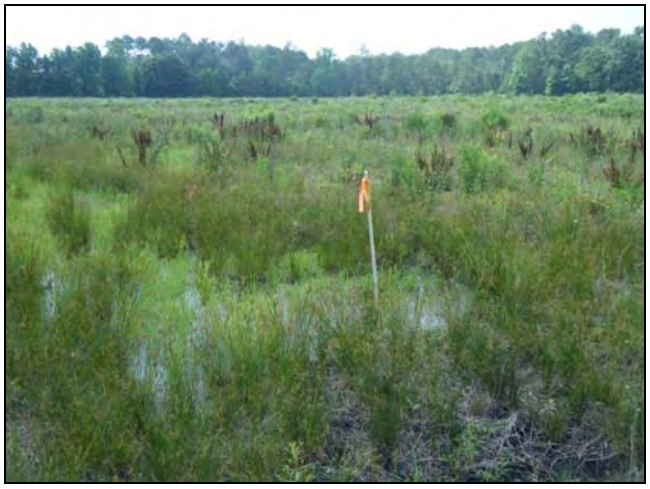

Vegetation Plot 12 – MY-02 – 6/22/10


Vegetation Plot 13 – MY-02 – 6/22/10


Vegetation Plot 14 – MY-02 – 6/22/10


Vegetation Plot 15 – MY-02 – 6/22/10


Vegetation Plot 16 – MY-02 – 6/22/10


Vegetation Plot 17 – MY-02 – 6/22/10


Vegetation Plot 18 – MY-02 – 6/22/10


Vegetation Plot 19 – MY-02 – 6/22/10


Vegetation Plot 20 – MY-02 – 6/22/10


Vegetation Plot 21 – MY-02 – 6/22/10


Vegetation Plot 22 – MY-02 – 6/22/10


Vegetation Plot 23 – MY-02 – 6/22/10


Vegetation Plot 24 – MY-02 – 6/22/10

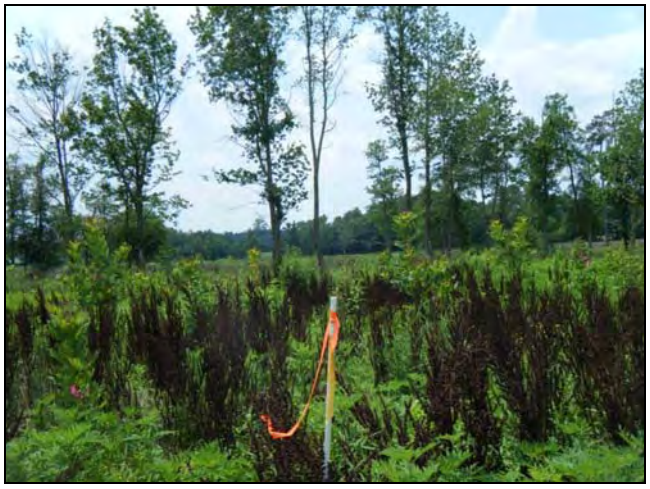

Vegetation Plot 25 – MY-02 – 6/22/10


Vegetation Plot 26 – MY-02 – 6/22/10

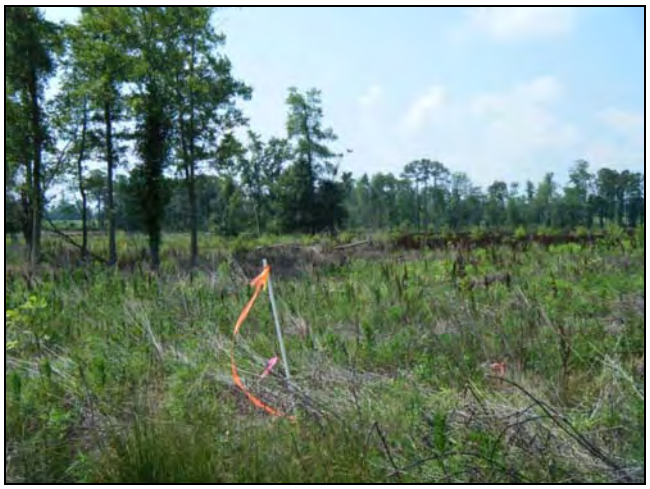

Vegetation Plot 27 – MY-02 – 6/22/10


Vegetation Plot 28 – MY-02 – 6/22/10


Vegetation Plot 29 – MY-02 – 6/22/10


Vegetation Plot 30 – MY-02 – 6/22/10


Vegetation Plot 31 – MY-02 – 6/22/10

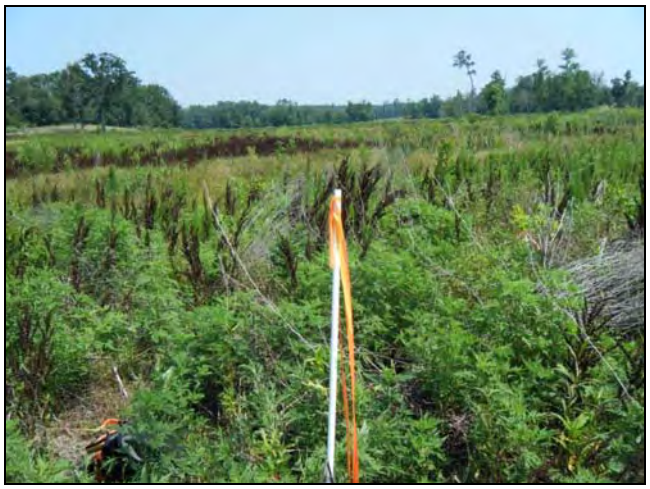

Vegetation Plot 32 – MY-02 – 6/22/10

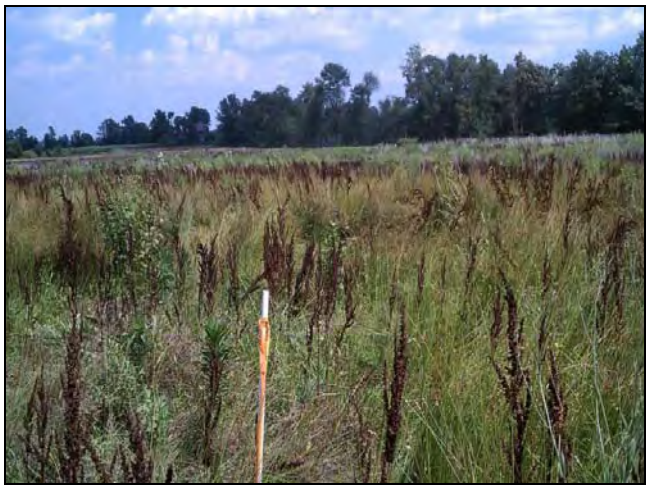

Vegetation Plot 33 – MY-02 – 6/24/10

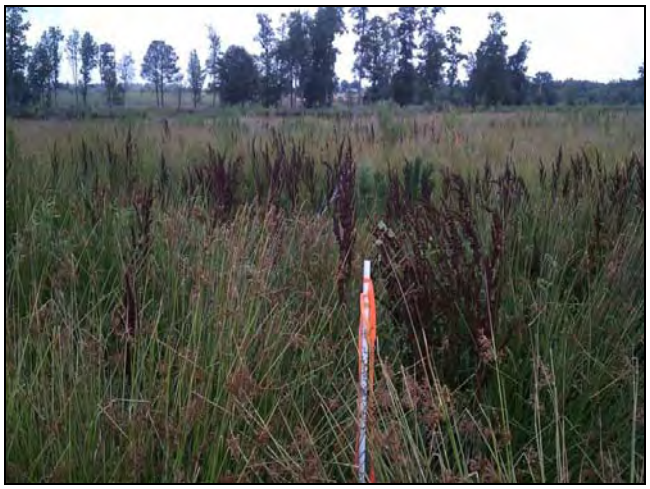

Vegetation Plot 34 – MY-02 – 6/24/10

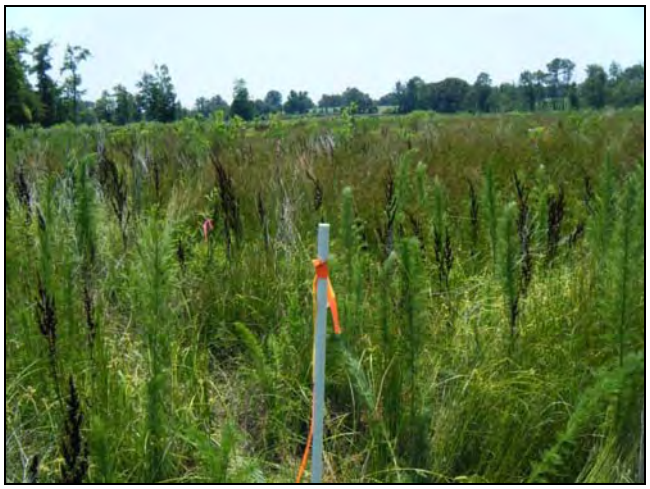

Vegetation Plot 35 – MY-02 – 6/24/10

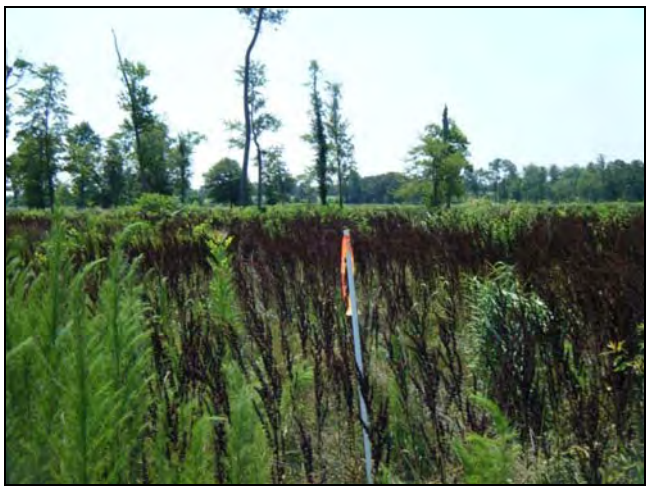

Vegetation Plot 36 – MY-02 – 6/24/10


Vegetation Plot W37 – MY-02 – 6/24/10

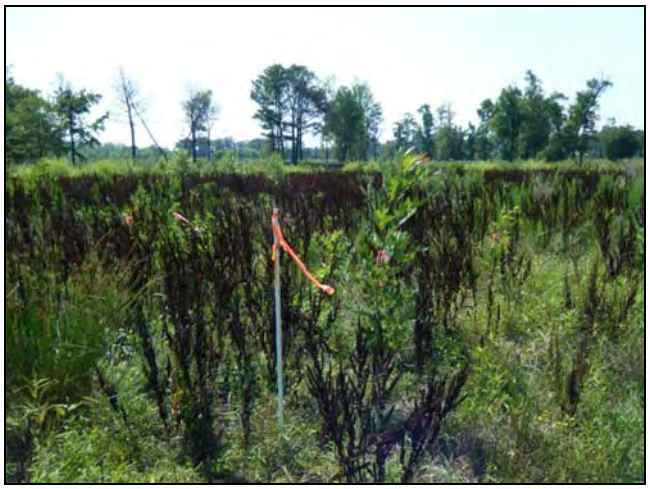

Vegetation Plot 38 – MY-02 – 6/26/10


Vegetation Plot 39 – MY-02 – 6/26/10


Vegetation Plot 40 – MY-02 – 6/23/10

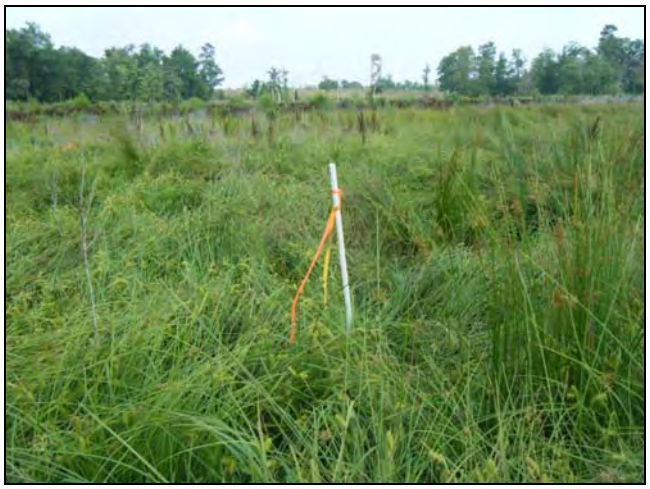

Vegetation Plot 41 – MY-02 – 6/23/10


Vegetation Plot 42 – MY-02 – 6/23/10



Vegetation Plot 43 – MY-02 – 6/23/10

Vegetation Plot 44 – MY-02 – 6/4/10



Vegetation Plot 45 – MY-02 – 6/4/10

Appendix B
Stream and Wetland Photos

Stream and Wetland Photo Points

PP 1 – MY-02 – 12/22/10

PP 2 – MY-02 – 12/22/10

PP 3 – MY-02 – 12/22/10

PP 4 – MY-02 – 12/22/10

PP 5 – MY-02 – 12/22/10

PP 6 – MY-02 – 12/22/10

PP 7 – MY-02 – 12/22/10

PP 8 – MY-02 – 12/22/10

PP 9 – MY-02 – 12/22/10

PP 10 – MY-02 – 12/22/10

PP 11 – MY-02 – 12/22/10

PP 12 – MY-02 – 12/22/10

PP 13 – MY-02 – 12/22/10

PP 14 – MY-02 – 12/22/10

PP 15 – MY-02 – 12/22/10

PP 16 – MY-02 – 12/22/10

PP 17 – MY-02 – 12/22/10

PP 18 – MY-02 – 12/22/10

PP 19 – MY-02 – 12/22/10

PP 20 – MY-02 – 12/22/10

PP 21 – MY-02 – 12/22/10

PP 22 – MY-02 – 12/22/10

PP 23 – MY-02 – 12/22/10

PP 24 – MY-02 – 12/22/10

PP 25 – MY-02 – 12/22/10

PP 26 – MY-02 – 12/22/10

PP 27 – MY-02 – 12/22/10

PP 28 – MY-02 – 12/22/10

PP 29 – MY-02 – 12/22/10

PP 30 – MY-02 – 12/22/10

PP 31 – MY-02 – 12/22/10

PP 32 – MY-02 – 12/22/10

PP 33 – MY-02 – 12/22/10

PP 34 – MY-02 – 12/22/10

PP 35 – MY-02 – 12/22/10

Problem Area Photos

Erosion along toe of bank under coir matting near Station 60+75. MY02 – 12/22/10

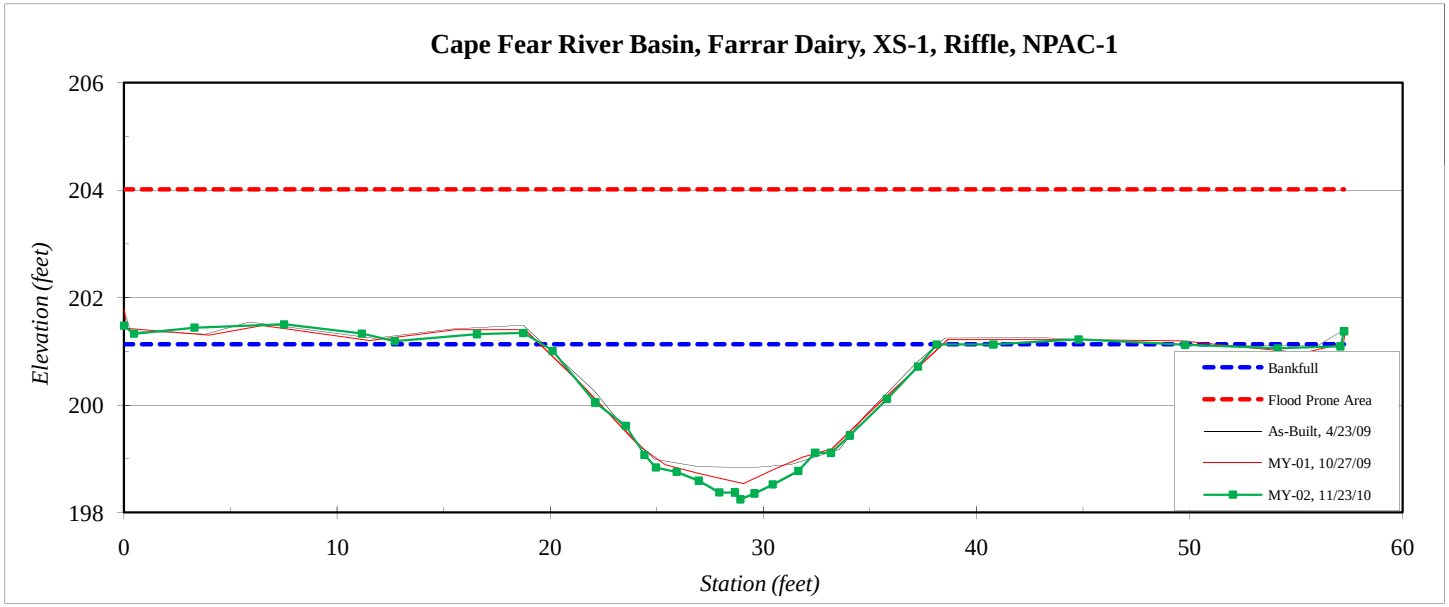
Appendix C
Geomorphologic and Hydrologic Data

River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-1, Riffle, NPAC-1
Drainage Area (sq mi):	3.92
Date:	11/23/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	201.48
0.5	201.33
3.3	201.44
7.5	201.50
11.2	201.33
12.7	201.19
16.6	201.32
18.7	201.34
20.1	201.01
22.1	200.04
23.6	199.62
24.4	199.07
25.0	198.84
25.9	198.76
27.0	198.59
27.9	198.37
28.7	198.37
28.9	198.25
29.6	198.35
30.5	198.52
31.6	198.77
32.4	199.11
33.2	199.11
34.1	199.43
35.8	200.11
37.3	200.72
38.1	201.13
40.8	201.13
44.8	201.22
49.8	201.12
54.1	201.05
57.1	201.09
57.3	201.37

SUMMARY DATA	
Bankfull Elevation:	201.1
Bankfull Cross-Sectional Area:	31.6
Bankfull Width:	18.5
Flood Prone Area Elevation:	204.0
Flood Prone Width:	>60
Max Depth at Bankfull:	2.9
Mean Depth at Bankfull:	1.7
W / D Ratio:	10.8
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5

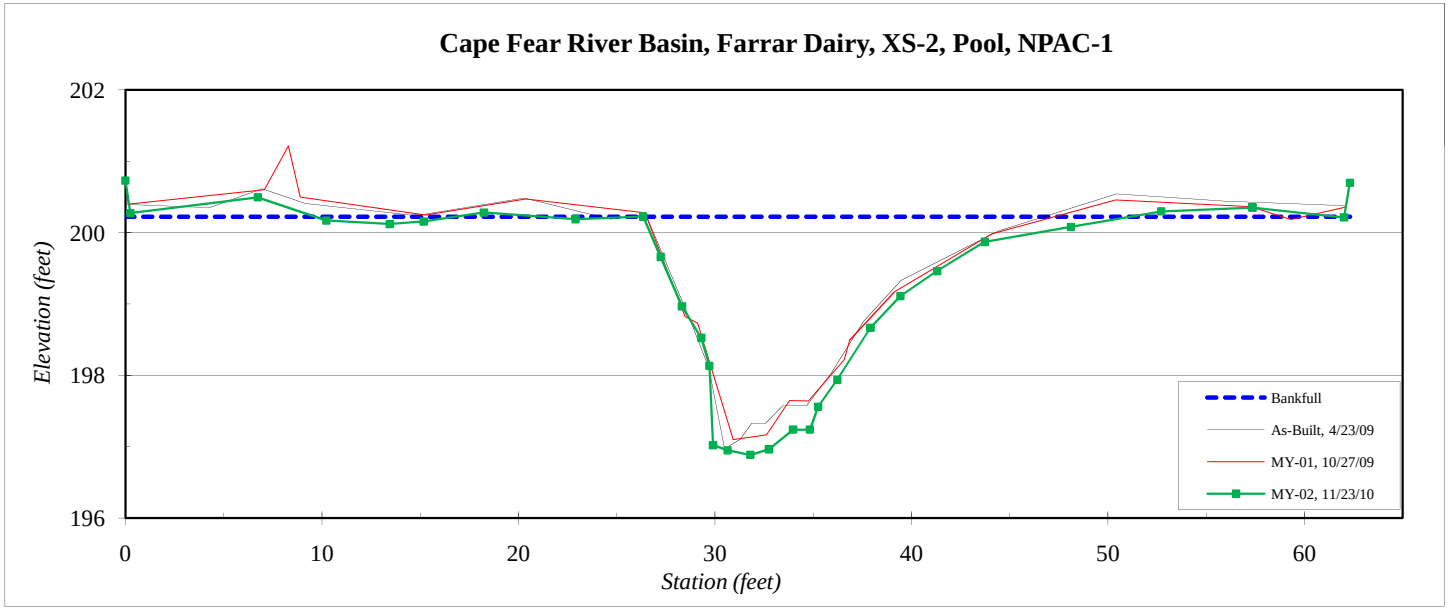


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-2, Pool, NPAC-1
Drainage Area (sq mi):	3.92
Date:	11/23/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	200.73
0.3	200.27
6.7	200.49
10.2	200.17
13.5	200.12
15.2	200.16
18.2	200.28
22.9	200.19
26.4	200.22
27.2	199.66
28.3	198.97
29.3	198.52
29.7	198.13
29.9	197.02
30.6	196.95
31.8	196.89
32.8	196.97
34.0	197.24
34.8	197.24
35.3	197.56
36.2	197.94
37.9	198.67
39.4	199.11
41.3	199.46
43.7	199.87
48.1	200.08
52.7	200.30
57.4	200.35
62.0	200.21
62.3	200.70

SUMMARY DATA	
Bankfull Elevation:	200.2
Bankfull Cross-Sectional Area:	32.9
Bankfull Width:	24.8
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	3.3
Mean Depth at Bankfull:	1.3
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

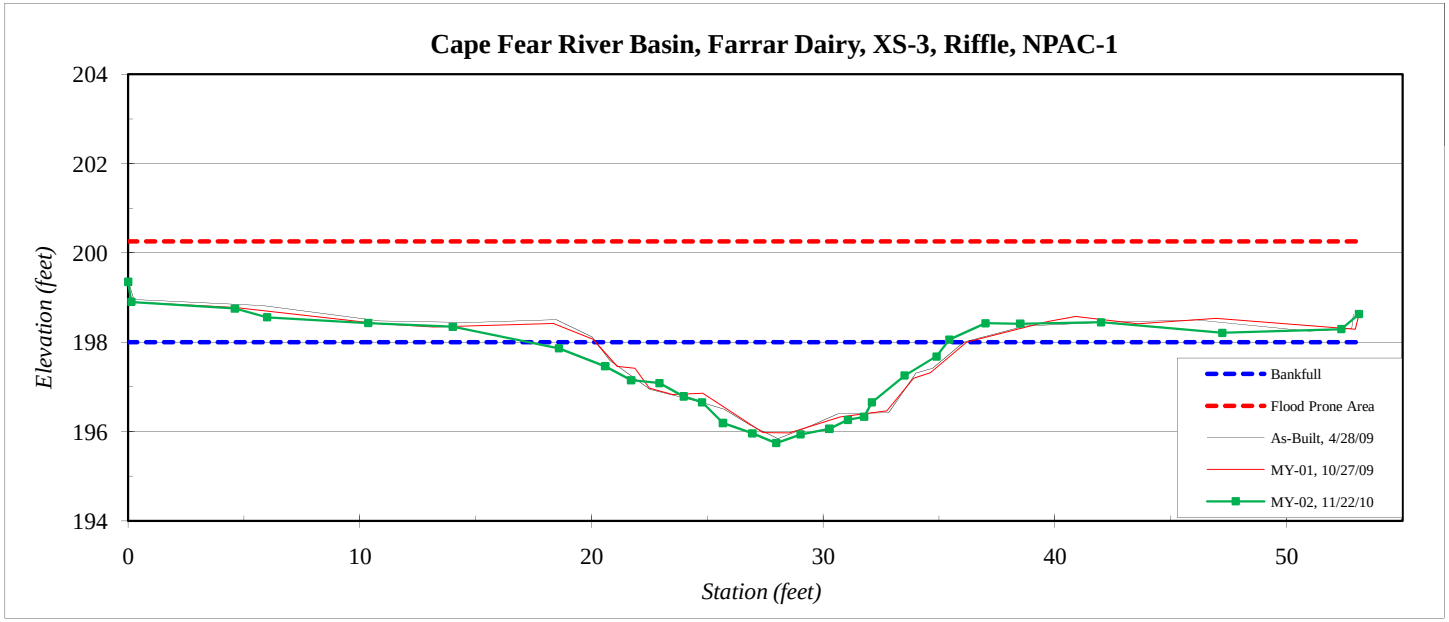


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-3, Riffle, NPAC-1
Drainage Area (sq mi):	3.92
Date:	11/22/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	199.35
0.1	198.90
4.6	198.75
6.0	198.56
10.4	198.43
14.0	198.35
18.6	197.86
20.6	197.46
21.7	197.15
22.9	197.08
24.0	196.79
24.8	196.66
25.7	196.19
26.9	195.96
28.0	195.74
29.0	195.94
30.3	196.06
31.1	196.26
31.8	196.33
32.1	196.65
33.5	197.25
34.9	197.68
35.4	198.06
37.0	198.42
38.5	198.41
42.0	198.45
47.2	198.21
52.4	198.29
53.1	198.63

SUMMARY DATA	
Bankfull Elevation:	198.0
Bankfull Cross-Sectional Area:	21.4
Bankfull Width:	19.1
Flood Prone Area Elevation:	200.3
Flood Prone Width:	>60
Max Depth at Bankfull:	2.3
Mean Depth at Bankfull:	1.1
W / D Ratio:	17.0
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5

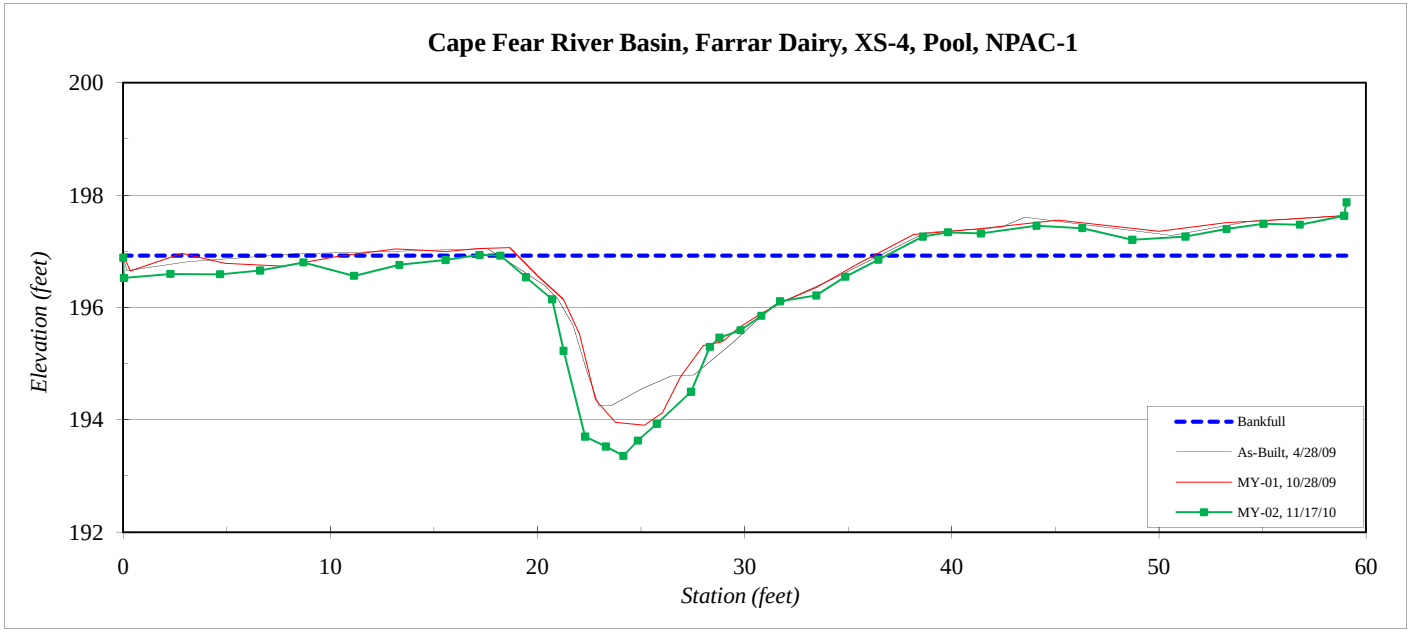


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-4, Pool, NPAC-1
Drainage Area (sq mi):	4.10
Date:	11/17/2010
Field Crew:	A. Helms, K. Knight-Meng

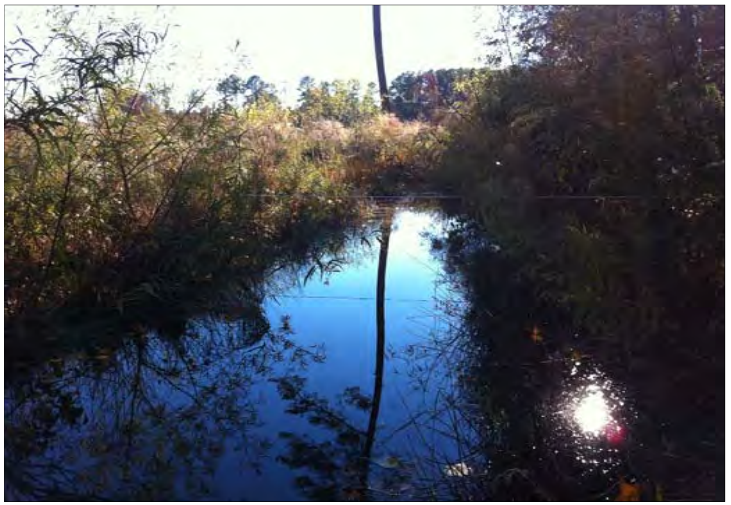
Station	Elevation
0.0	196.94
0.3	196.65
2.8	196.96
4.9	196.79
7.7	196.73
10.5	196.92
13.2	197.04
15.6	197.00
17.1	197.05
18.7	197.06
20.0	196.56
21.3	196.14
22.0	195.53
22.8	194.36
23.8	193.95
25.2	193.90
26.0	194.13
26.9	194.77
28.0	195.32
28.9	195.39
29.7	195.63
30.8	195.90
32.0	196.13
33.5	196.36
35.5	196.77
38.2	197.30
41.3	197.40
45.1	197.55
50.0	197.35
53.2	197.51
56.1	197.56
58.9	197.63
59.1	197.87

SUMMARY DATA	
Bankfull Elevation:	196.9
Bankfull Cross-Sectional Area:	28.7
Bankfull Width:	18.6
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	3.0
Mean Depth at Bankfull:	1.5
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5



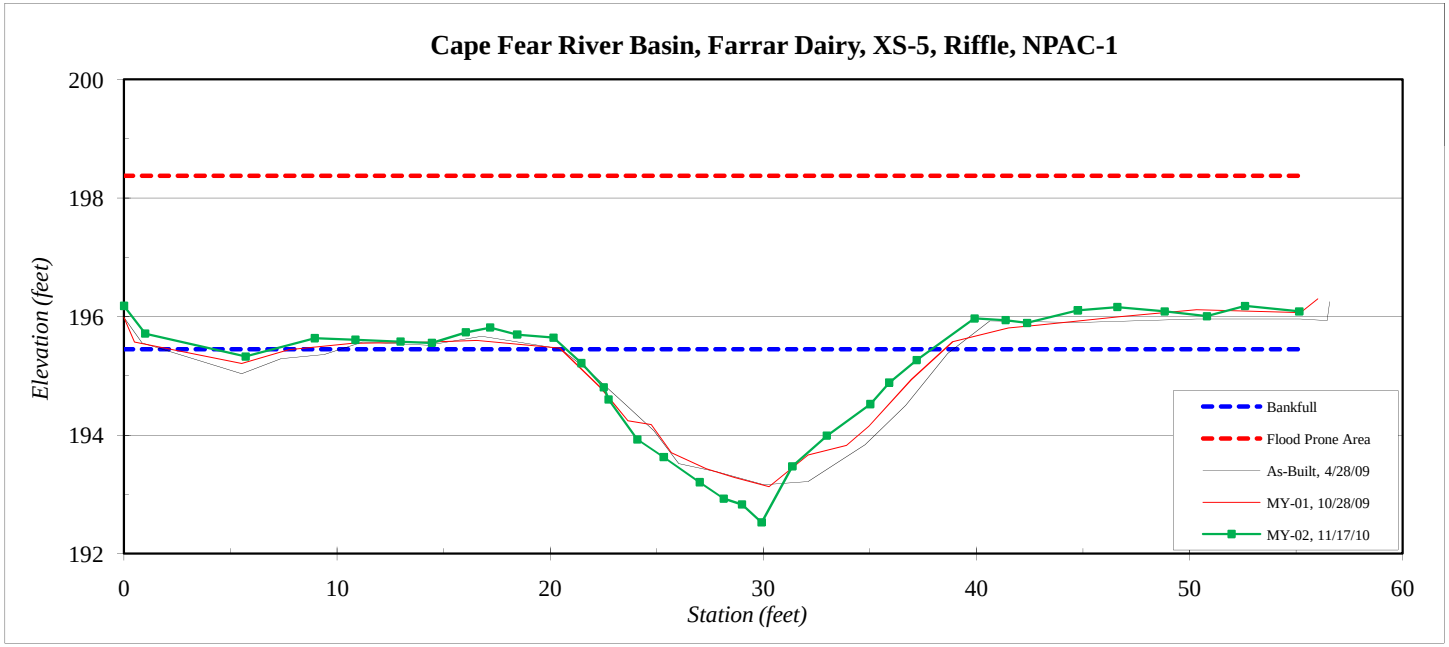
River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-5, Riffle, NPAC-1
Drainage Area (sq mi):	4.10
Date:	11/17/2010
Field Crew:	A. Helms, K. Knight-Meng



Station	Elevation
0.0	196.18
1.0	195.71
5.7	195.32
9.0	195.63
10.9	195.61
13.0	195.58
14.4	195.56
16.0	195.73
17.2	195.81
18.5	195.69
20.2	195.64
21.5	195.21
22.5	194.81
22.7	194.60
24.1	193.93
25.3	193.63
27.0	193.20
28.1	192.93
29.0	192.83
29.9	192.53
31.4	193.47
33.0	193.99
35.0	194.52
35.9	194.88
37.2	195.26
39.9	195.97
41.4	195.94
42.4	195.89
44.8	196.10
46.6	196.16
48.8	196.09
50.8	196.00
52.6	196.18
55.2	196.09
55.2	196.49

SUMMARY DATA	
Bankfull Elevation:	195.5
Bankfull Cross-Sectional Area:	24.6
Bankfull Width:	18.0
Flood Prone Area Elevation:	198.4
Flood Prone Width:	>60
Max Depth at Bankfull:	2.9
Mean Depth at Bankfull:	1.4
W / D Ratio:	13.1
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5

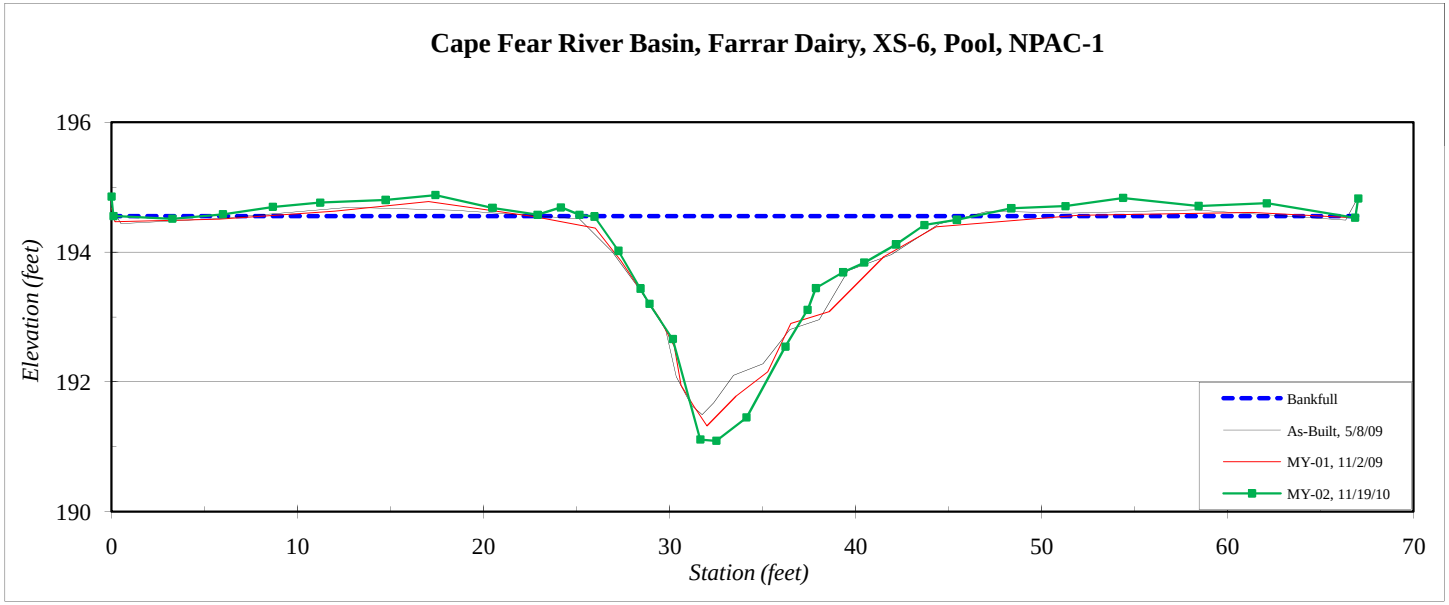


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-6, Pool, NPAC-1
Drainage Area (sq mi):	4.1
Date:	11/19/2010
Field Crew:	A. French, K. Knight-Meng

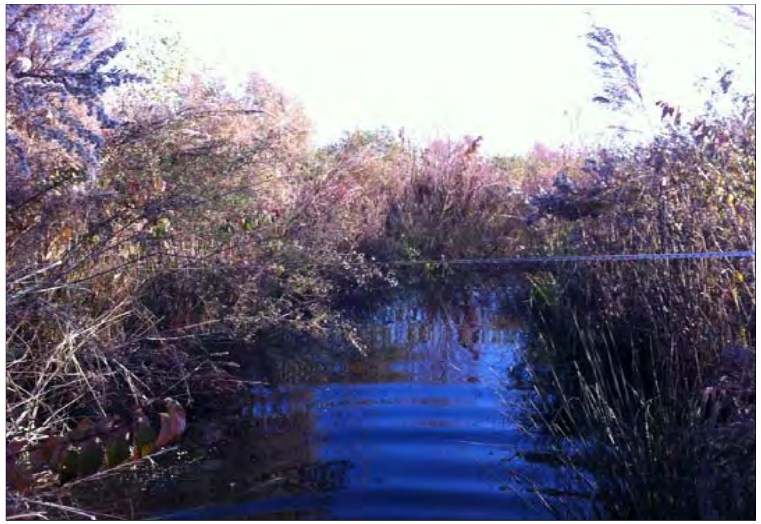
Station	Elevation
0.0	194.85
0.1	194.55
3.3	194.51
6.0	194.58
8.7	194.69
11.2	194.76
14.7	194.80
17.4	194.88
20.5	194.68
22.9	194.57
24.2	194.69
25.2	194.57
26.0	194.55
27.2	194.02
28.4	193.44
28.9	193.20
30.2	192.66
31.7	191.11
32.5	191.09
34.1	191.45
36.2	192.54
37.4	193.11
37.9	193.44
39.3	193.69
40.5	193.84
42.2	194.12
43.7	194.42
45.4	194.50
48.4	194.67
51.3	194.71
54.4	194.83
58.4	194.71
62.1	194.75
66.9	194.53
67.0	194.82

SUMMARY DATA	
Bankfull Elevation:	194.6
Bankfull Cross-Sectional Area:	28.1
Bankfull Width:	20.4
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	3.5
Mean Depth at Bankfull:	1.4
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5



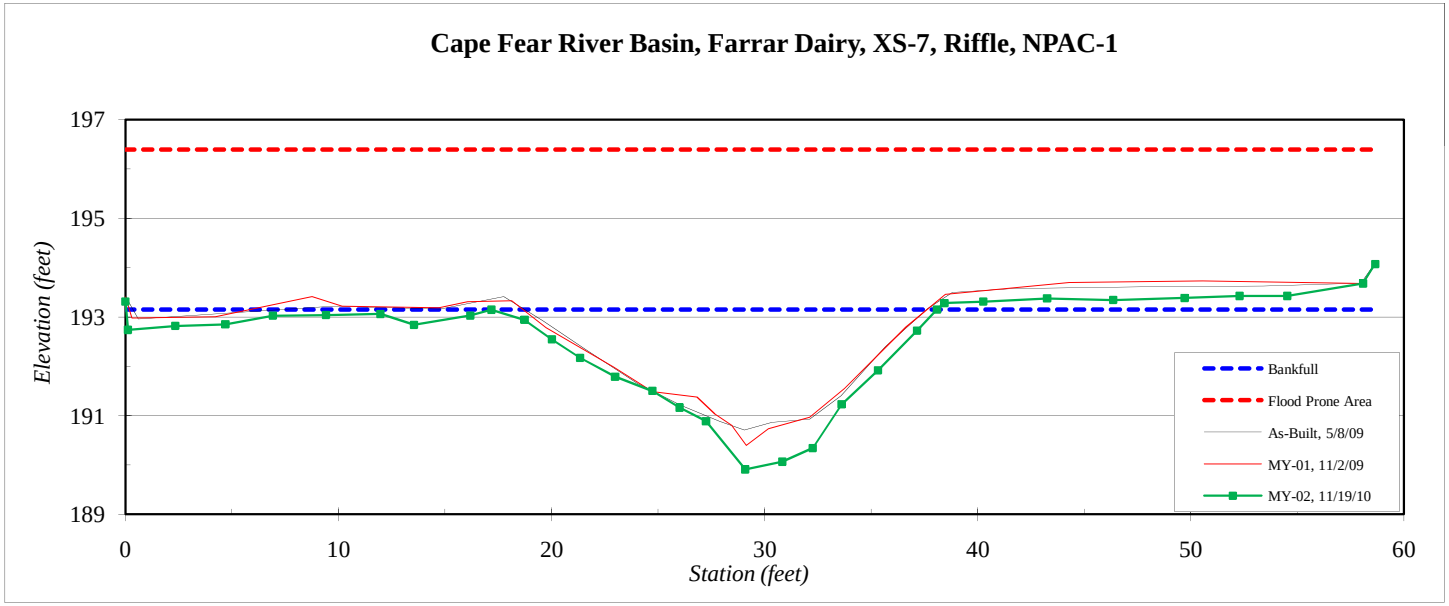
River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-7, Riffle, NPAC-1
Drainage Area (sq mi):	4.1
Date:	11/19/2010
Field Crew:	A. French, K. Knight-Meng



Station	Elevation
0.0	193.31
0.1	192.74
2.3	192.82
4.7	192.85
6.9	193.02
9.4	193.04
12.0	193.06
13.5	192.84
16.2	193.03
17.2	193.15
18.7	192.94
20.0	192.54
21.3	192.17
23.0	191.79
24.7	191.50
26.0	191.16
27.2	190.89
29.1	189.91
30.8	190.07
32.3	190.34
33.6	191.23
35.3	191.92
37.2	192.72
38.1	193.15
38.4	193.28
40.3	193.31
43.3	193.37
46.4	193.34
49.7	193.38
52.3	193.43
54.5	193.43
58.1	193.68
58.7	194.07

SUMMARY DATA	
Bankfull Elevation:	193.2
Bankfull Cross-Sectional Area:	33.6
Bankfull Width:	20.9
Flood Prone Area Elevation:	196.4
Flood Prone Width:	>60
Max Depth at Bankfull:	3.2
Mean Depth at Bankfull:	1.6
W / D Ratio:	13.0
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5



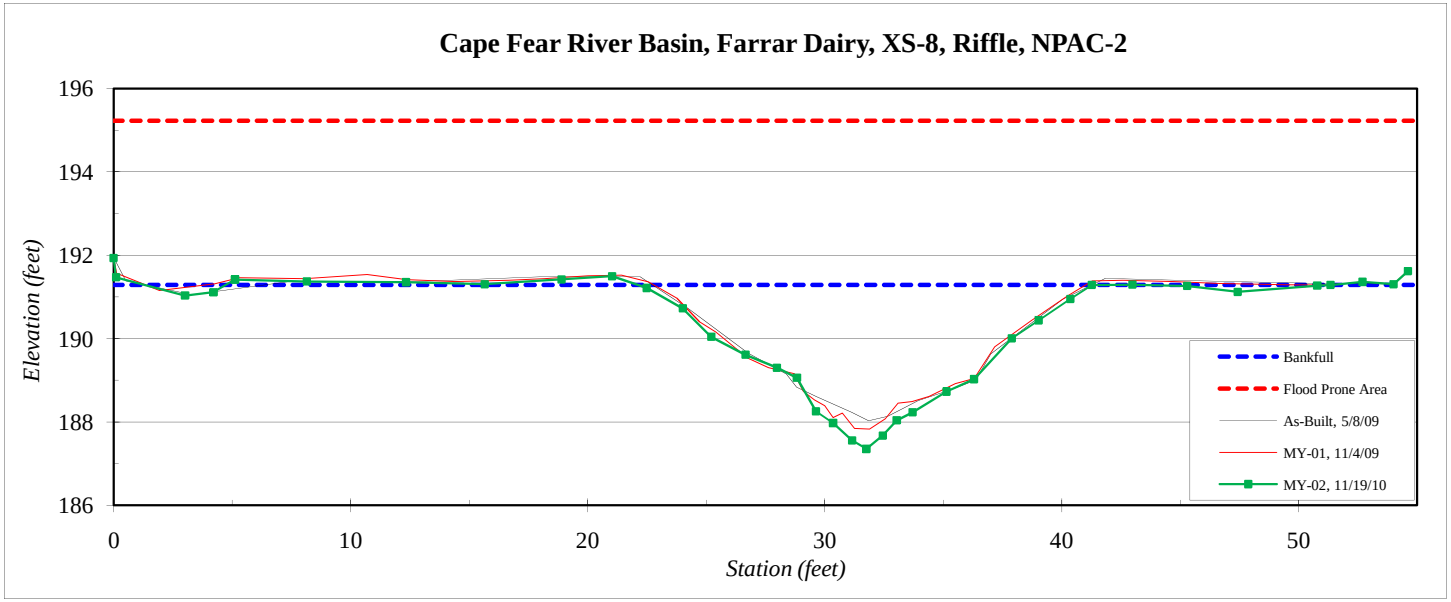
River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-8, Riffle, NPAC-2
Drainage Area (sq mi):	4.1
Date:	11/19/2010
Field Crew:	A. French, K. Knight-Meng

Station	Elevation
0.0	191.93
0.1	191.47
3.0	191.03
4.2	191.11
5.1	191.41
8.1	191.37
12.3	191.35
15.7	191.30
18.9	191.42
21.0	191.50
22.5	191.21
24.0	190.72
25.2	190.04
26.7	189.61
28.0	189.30
28.8	189.06
29.6	188.25
30.4	187.97
31.2	187.55
31.8	187.35
32.5	187.67
33.0	188.04
33.7	188.23
35.1	188.73
36.3	189.03
37.9	190.00
39.0	190.44
40.4	190.95
41.3	191.29
43.0	191.29
45.3	191.26
47.4	191.12
50.8	191.27
51.3	191.28

*Other shots not included due to space

SUMMARY DATA	
Bankfull Elevation:	191.3
Bankfull Cross-Sectional Area:	36.0
Bankfull Width:	19.2
Flood Prone Area Elevation:	195.2
Flood Prone Width:	>60
Max Depth at Bankfull:	3.9
Mean Depth at Bankfull:	1.9
W / D Ratio:	10.2
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5

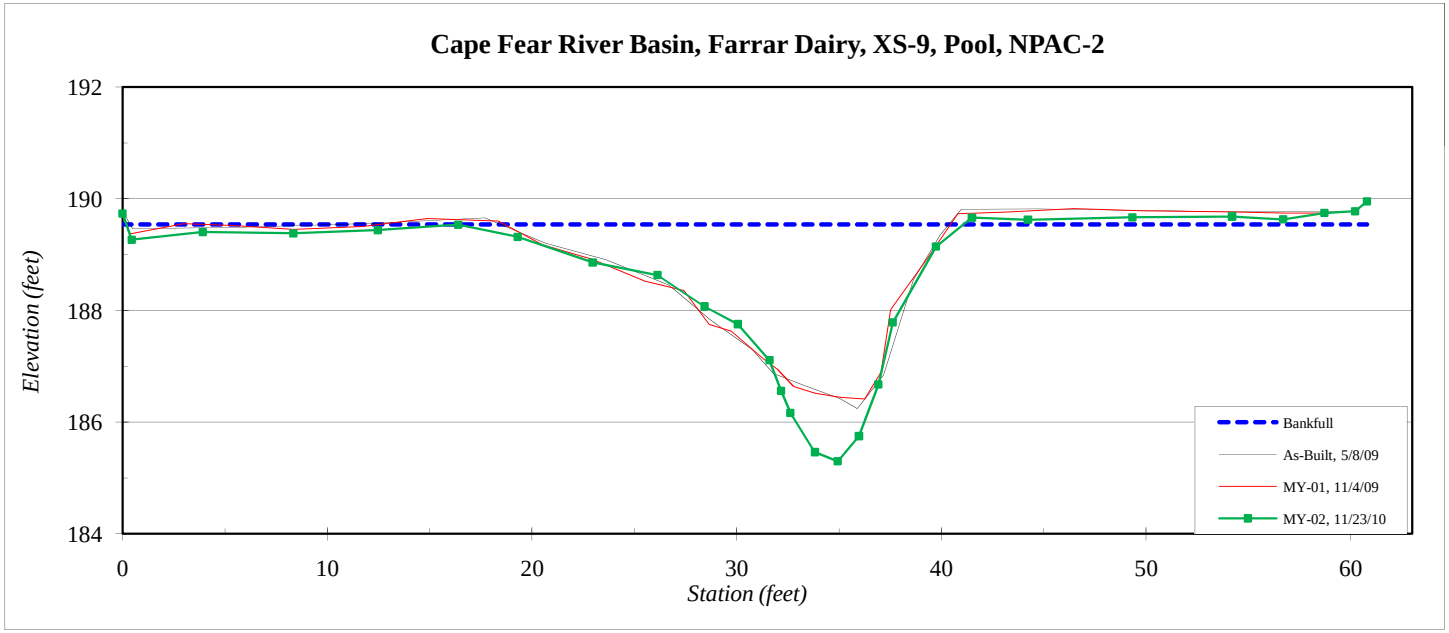


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-9, Pool, NPAC-2
Drainage Area (sq mi):	4.65
Date:	11/23/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	189.74
0.4	189.27
3.9	189.40
8.3	189.38
12.5	189.44
16.4	189.54
19.3	189.32
23.0	188.86
26.1	188.63
28.4	188.07
30.1	187.75
31.6	187.11
32.2	186.56
32.6	186.16
33.8	185.46
34.9	185.30
36.0	185.75
36.9	186.67
37.6	187.79
39.7	189.14
41.5	189.66
44.2	189.63
49.3	189.67
54.2	189.68
56.7	189.63
58.7	189.75
60.2	189.78
60.8	189.95

SUMMARY DATA	
Bankfull Elevation:	189.5
Bankfull Cross-Sectional Area:	36.7
Bankfull Width:	24.7
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	4.2
Mean Depth at Bankfull:	1.5
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

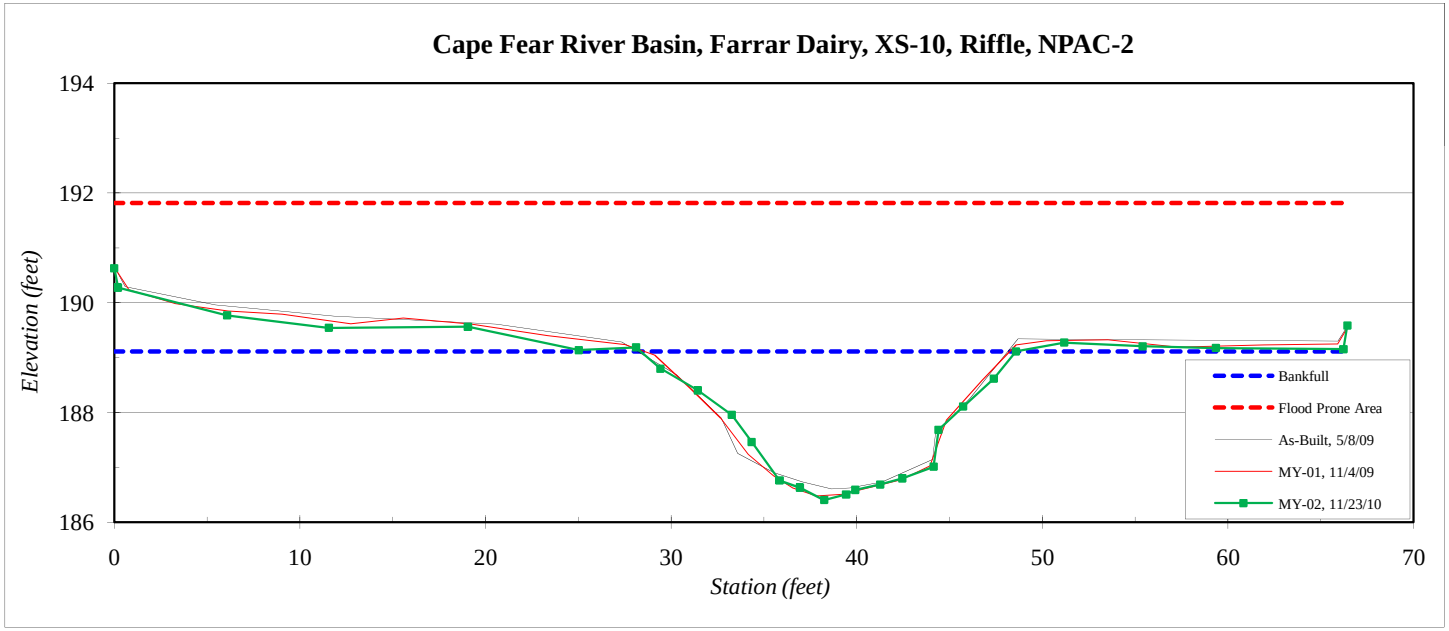


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-10, Riffle, NPAC-2
Drainage Area (sq mi):	4.65
Date:	11/23/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	190.63
0.2	190.28
6.1	189.77
11.6	189.54
19.1	189.56
25.0	189.14
28.1	189.19
29.4	188.80
31.4	188.40
33.3	187.95
34.3	187.46
35.8	186.76
36.9	186.63
38.2	186.40
39.4	186.50
39.9	186.59
41.3	186.68
42.5	186.80
44.1	187.01
44.4	187.68
45.7	188.11
47.4	188.61
48.6	189.11
51.2	189.27
55.4	189.21
59.4	189.17
66.2	189.15
66.4	189.58

SUMMARY DATA	
Bankfull Elevation:	189.1
Bankfull Cross-Sectional Area:	31.3
Bankfull Width:	20.2
Flood Prone Area Elevation:	191.8
Flood Prone Width:	>60
Max Depth at Bankfull:	2.7
Mean Depth at Bankfull:	1.5
W / D Ratio:	13.0
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5



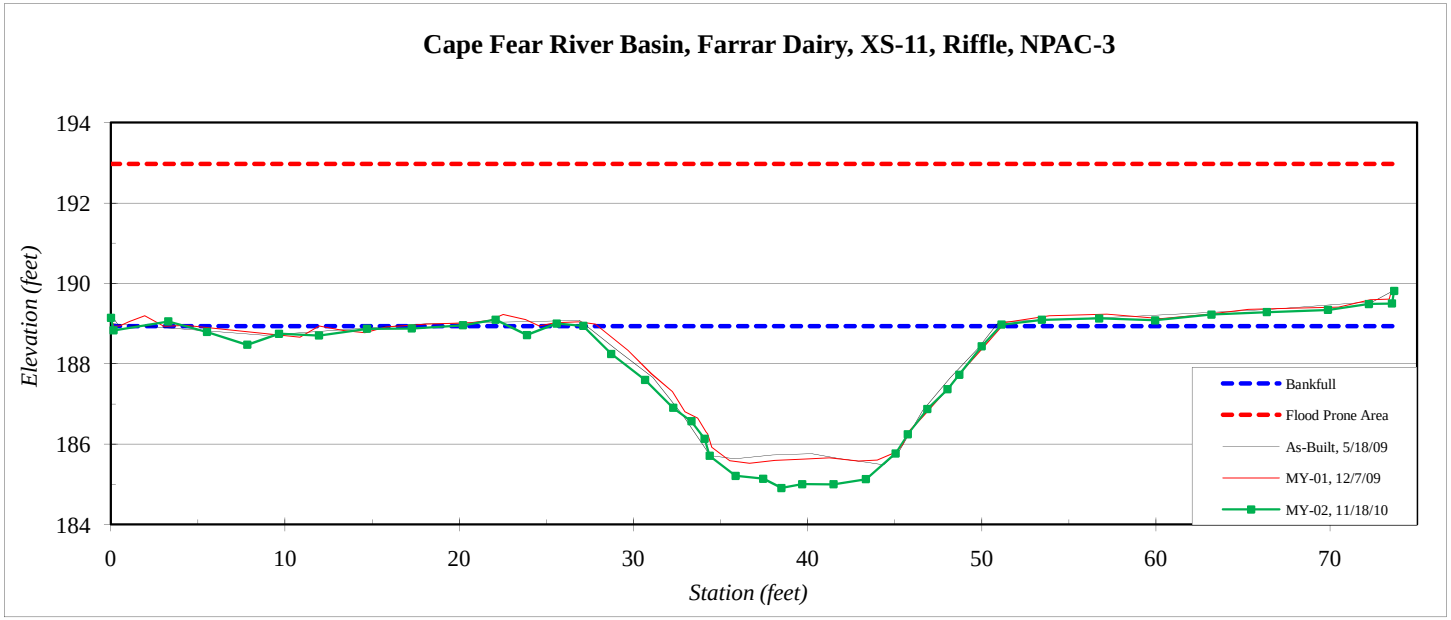
River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-11, Riffle, NPAC-3
Drainage Area (sq mi):	4.82
Date:	11/18/2010
Field Crew:	A. French, K. Knight-Meng

Station	Elevation
0.0	189.14
0.2	188.83
3.3	189.05
5.5	188.79
7.8	188.47
9.7	188.75
11.9	188.70
14.7	188.87
17.3	188.88
20.2	188.96
22.1	189.10
23.9	188.71
25.6	189.00
27.1	188.94
28.7	188.25
30.7	187.60
32.3	186.90
33.3	186.57
34.1	186.13
34.4	185.71
35.9	185.21
37.5	185.14
38.5	184.91
39.7	185.01
41.5	185.00
43.3	185.13
45.0	185.77
45.8	186.25
46.9	186.88
48.0	187.37
48.7	187.73
50.0	188.44
51.1	188.98
53.4	189.09
56.7	189.13

*Other shots not included due to space

SUMMARY DATA	
Bankfull Elevation:	188.9
Bankfull Cross-Sectional Area:	59.8
Bankfull Width:	23.9
Flood Prone Area Elevation:	193.0
Flood Prone Width:	>60
Max Depth at Bankfull:	4.0
Mean Depth at Bankfull:	2.5
W / D Ratio:	9.6
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5



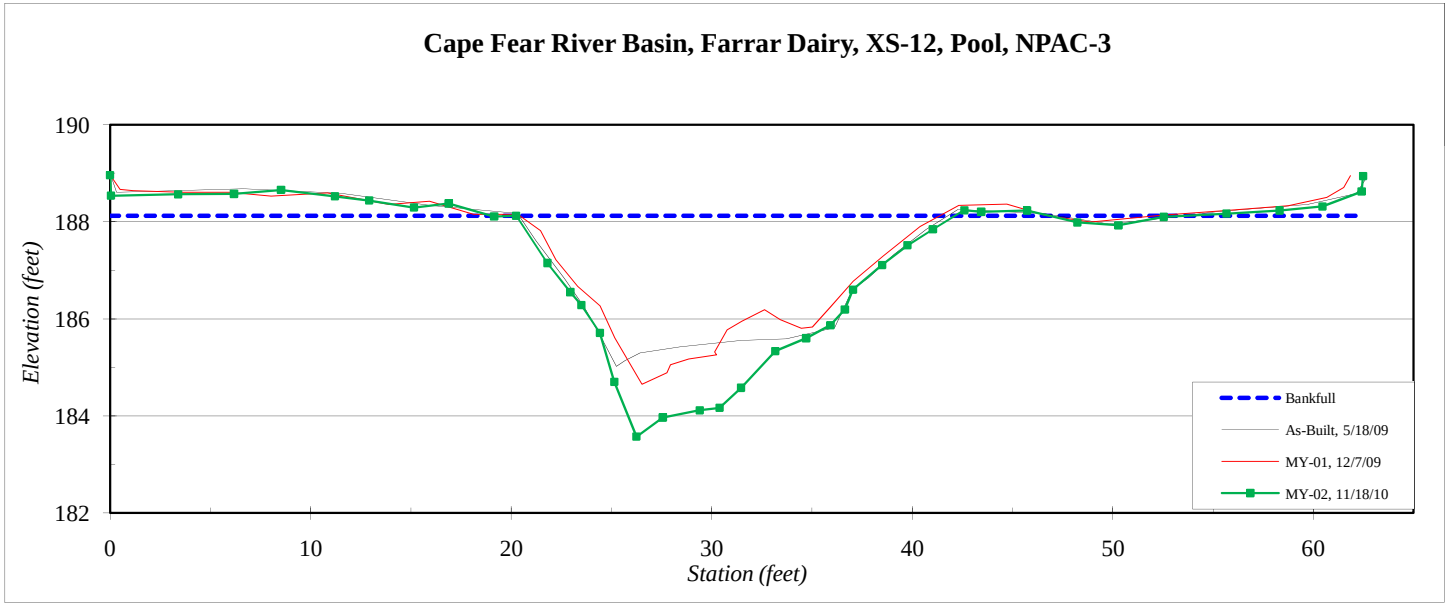
River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-12, Pool, NPAC-3
Drainage Area (sq mi):	4.82
Date:	11/18/2010
Field Crew:	A. French, K. Knight-Meng

Station	Elevation
0.0	188.96
0.0	188.54
3.4	188.57
6.2	188.57
8.5	188.66
11.2	188.52
12.9	188.44
15.2	188.29
16.9	188.38
19.2	188.11
20.2	188.12
21.8	187.15
23.0	186.55
23.5	186.28
24.4	185.71
25.1	184.70
26.2	183.57
27.6	183.97
29.4	184.12
30.4	184.17
31.5	184.58
33.2	185.34
34.7	185.60
35.9	185.87
36.6	186.19
37.0	186.60
38.5	187.11
39.8	187.52
41.0	187.84
42.6	188.24
43.4	188.20
45.7	188.23
48.2	187.99
50.3	187.93

*Other shots not included due to space

SUMMARY DATA	
Bankfull Elevation:	188.1
Bankfull Cross-Sectional Area:	50.9
Bankfull Width:	22.8
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	4.5
Mean Depth at Bankfull:	2.2
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

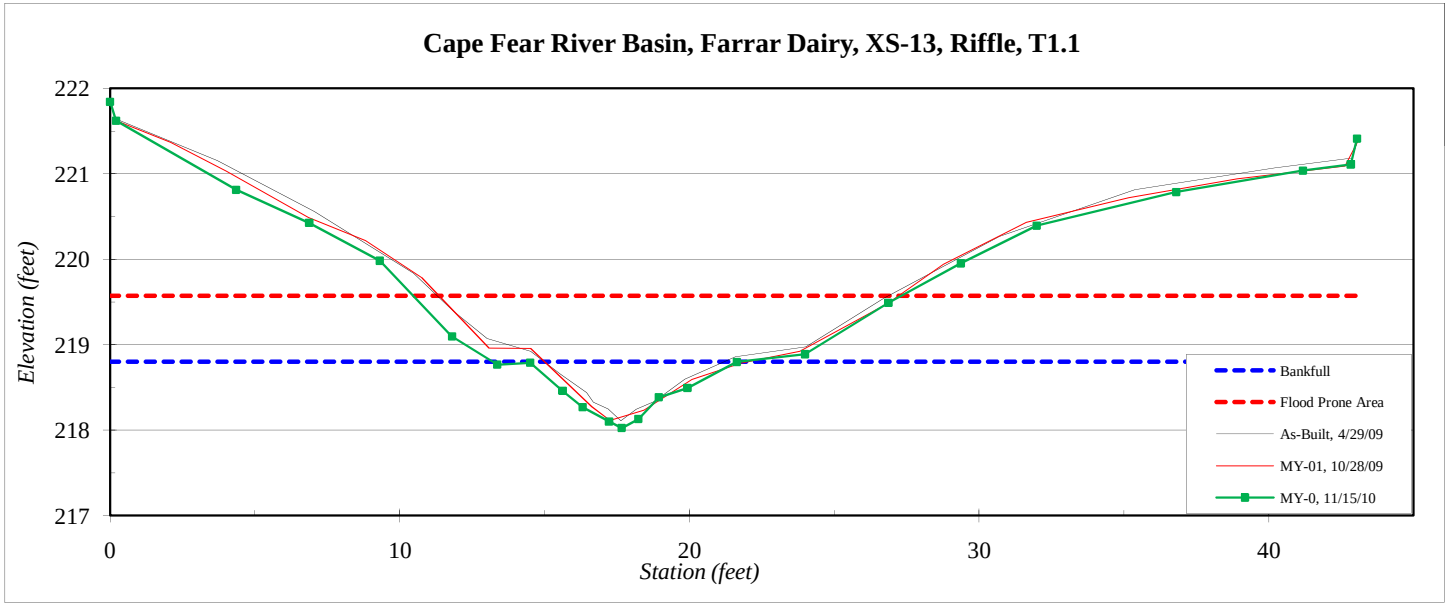


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-13, Riffle, T1.1
Drainage Area (sq mi):	0.02
Date:	11/15/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	221.84
0.2	221.62
4.4	220.81
6.9	220.43
9.3	219.98
11.8	219.10
13.4	218.77
14.5	218.79
15.6	218.46
16.3	218.27
17.2	218.10
17.7	218.03
18.2	218.13
18.9	218.38
19.9	218.49
21.6	218.80
24.0	218.89
26.9	219.49
29.4	219.95
32.0	220.39
36.8	220.79
41.2	221.04
42.8	221.11
43.0	221.41

SUMMARY DATA	
Bankfull Elevation:	218.8
Bankfull Cross-Sectional Area:	2.8
Bankfull Width:	7.2
Flood Prone Area Elevation:	219.6
Flood Prone Width:	16.1
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	18.5
Entrenchment Ratio:	2.2
Bank Height Ratio:	1.0

Stream Type	C5

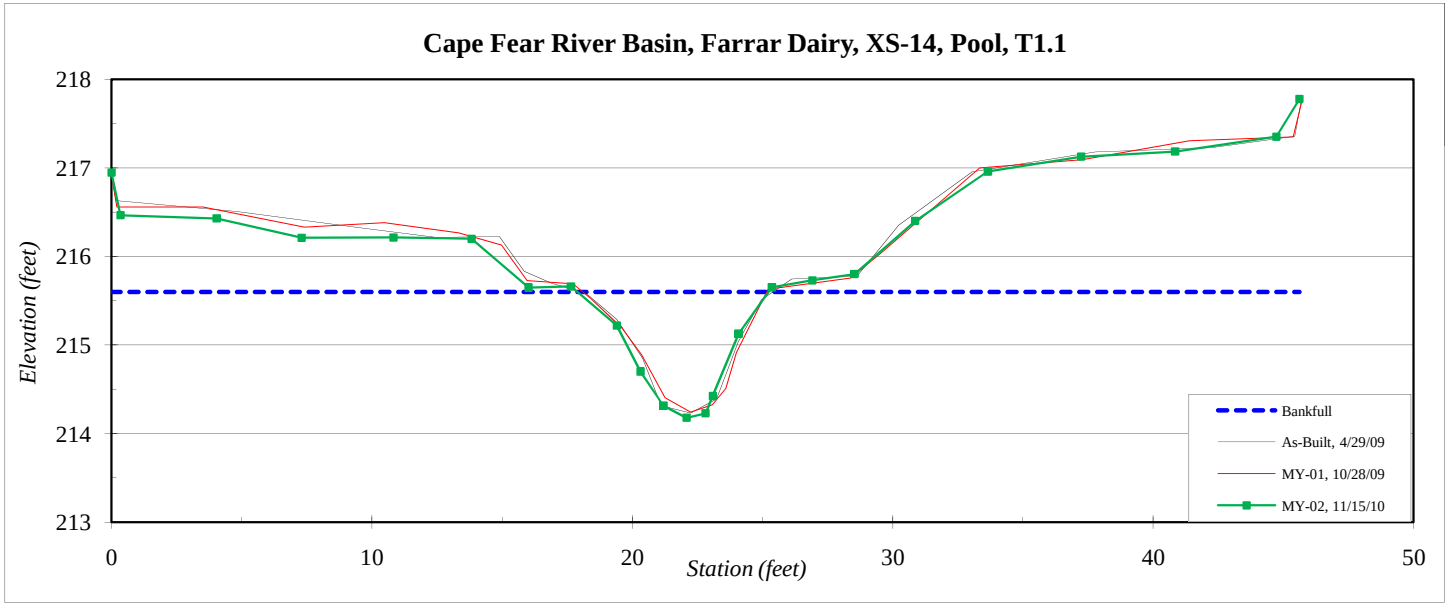


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-14, Pool, T1.1
Drainage Area (sq mi):	0.02
Date:	11/15/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	216.95
0.3	216.47
4.0	216.43
7.3	216.21
10.8	216.21
13.8	216.20
16.0	215.65
17.6	215.66
19.4	215.22
20.3	214.70
21.2	214.31
22.1	214.18
22.8	214.23
23.1	214.43
24.1	215.13
25.4	215.65
26.9	215.73
28.5	215.80
30.9	216.40
33.7	216.96
37.2	217.13
40.8	217.19
44.7	217.35
45.6	217.78

SUMMARY DATA	
Bankfull Elevation:	215.6
Bankfull Cross-Sectional Area:	5.5
Bankfull Width:	7.3
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.8
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

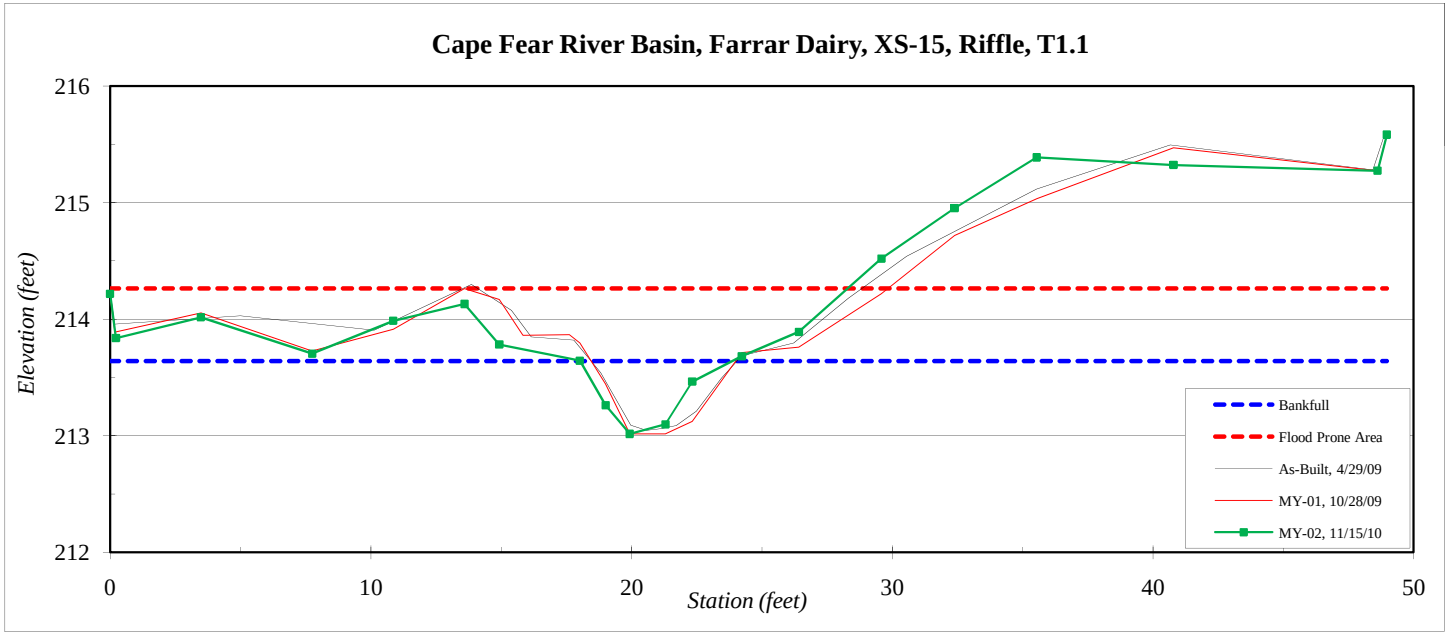


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-15, Riffle, T1.1
Drainage Area (sq mi):	0.02
Date:	11/15/2010
Field Crew:	A. Helms, Kristin Knight-Meng

Station	Elevation
0.0	214.22
0.2	213.84
3.5	214.02
7.8	213.70
10.9	213.99
13.6	214.13
14.9	213.78
18.0	213.64
19.0	213.26
19.9	213.02
21.3	213.10
22.3	213.46
24.2	213.68
26.4	213.89
29.6	214.52
32.4	214.95
35.5	215.39
40.8	215.32
48.6	215.27
49.0	215.58

SUMMARY DATA	
Bankfull Elevation:	213.6
Bankfull Cross-Sectional Area:	2.2
Bankfull Width:	6.5
Flood Prone Area Elevation:	214.3
Flood Prone Width:	30
Max Depth at Bankfull:	0.6
Mean Depth at Bankfull:	0.3
W / D Ratio:	18.8
Entrenchment Ratio:	4.7
Bank Height Ratio:	1.1

Stream Type	C5

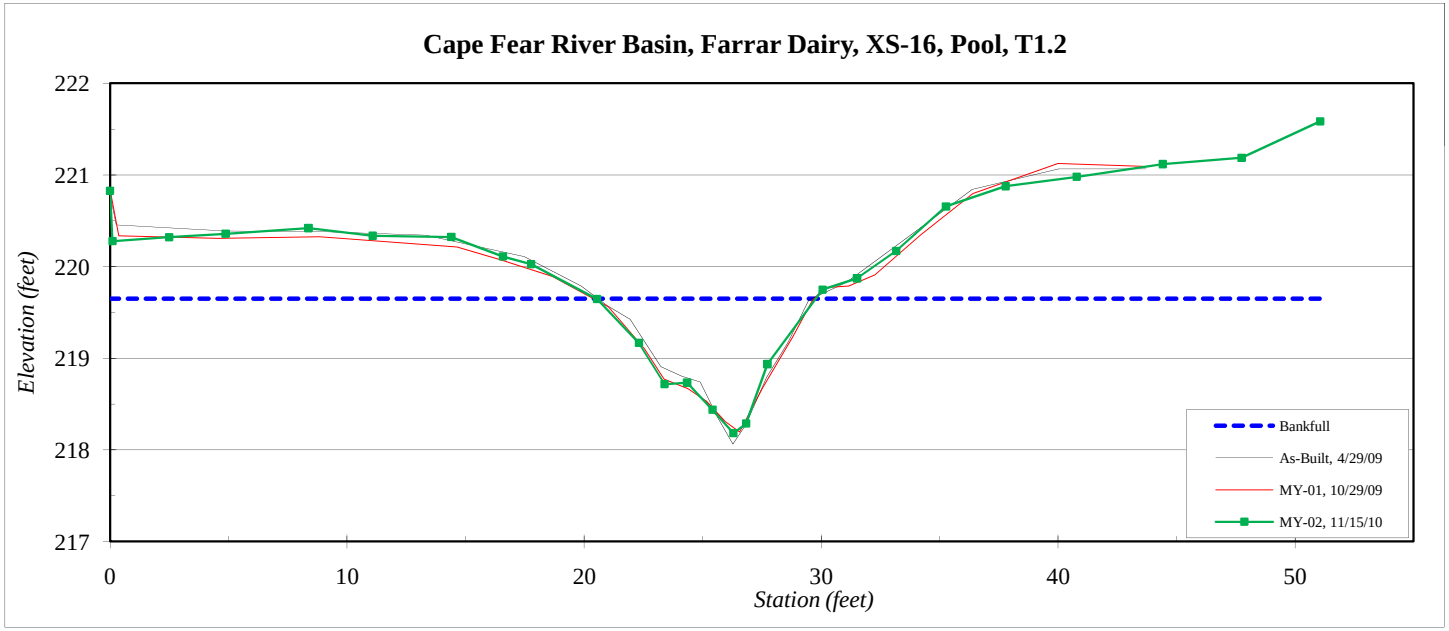


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-16, Pool, T1.2
Drainage Area (sq mi):	0.10
Date:	11/15/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	220.83
0.1	220.28
2.5	220.32
4.9	220.36
8.4	220.42
11.1	220.34
14.4	220.32
16.6	220.11
17.8	220.03
20.5	219.65
22.3	219.17
23.4	218.72
24.3	218.73
25.4	218.44
26.3	218.18
26.8	218.29
27.7	218.94
30.1	219.75
31.5	219.87
33.2	220.17
35.3	220.66
37.8	220.88
40.8	220.98
44.4	221.12
47.7	221.19
51.1	221.58

SUMMARY DATA	
Bankfull Elevation:	219.7
Bankfull Cross-Sectional Area:	6.8
Bankfull Width:	9.3
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.5
Mean Depth at Bankfull:	0.7
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

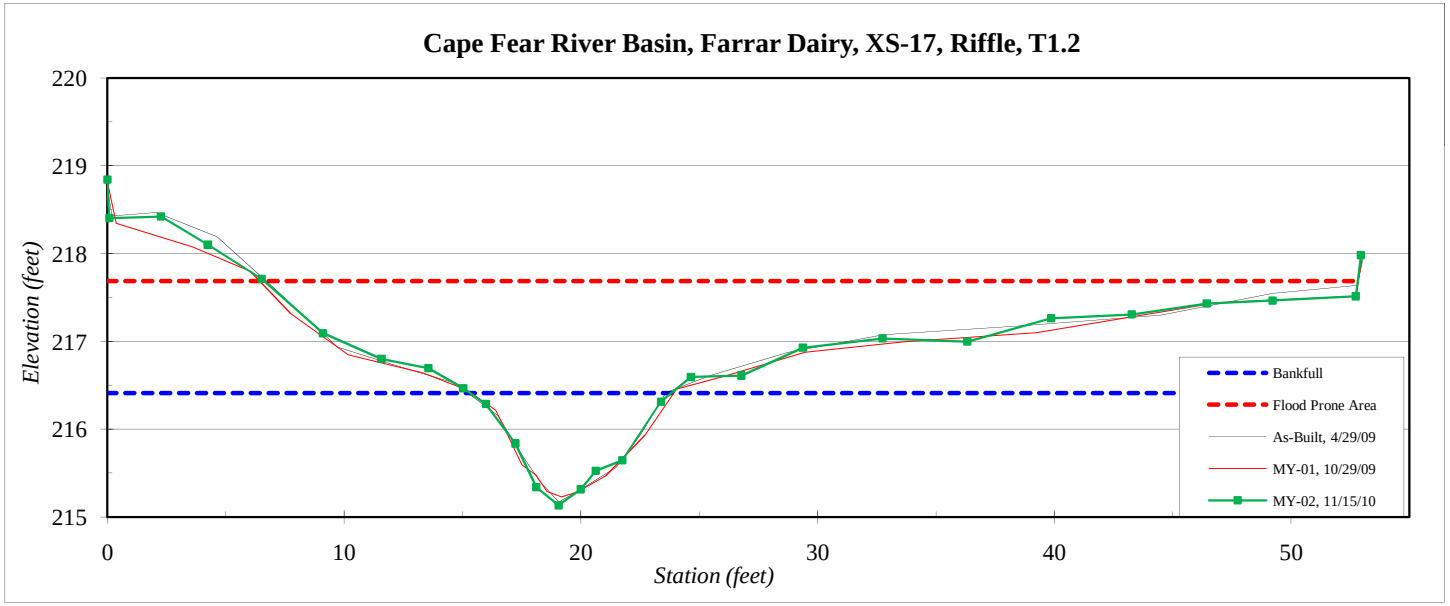


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-17, Riffle, T1.2
Drainage Area (sq mi):	0.10
Date:	11/15/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	218.84
0.1	218.40
2.3	218.42
4.2	218.10
6.5	217.71
9.1	217.09
11.6	216.80
13.6	216.69
15.0	216.47
16.0	216.29
17.2	215.84
18.1	215.34
19.1	215.13
20.0	215.32
20.6	215.53
21.7	215.64
23.4	216.31
24.7	216.59
26.8	216.61
29.4	216.93
32.7	217.03
36.3	217.00
39.9	217.26
43.3	217.31
46.4	217.43
49.2	217.47
52.7	217.51
53.0	217.98

SUMMARY DATA	
Bankfull Elevation:	216.4
Bankfull Cross-Sectional Area:	5.7
Bankfull Width:	8.5
Flood Prone Area Elevation:	217.7
Flood Prone Width:	46
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.7
W / D Ratio:	12.7
Entrenchment Ratio:	5.4
Bank Height Ratio:	1.0

Stream Type	C5

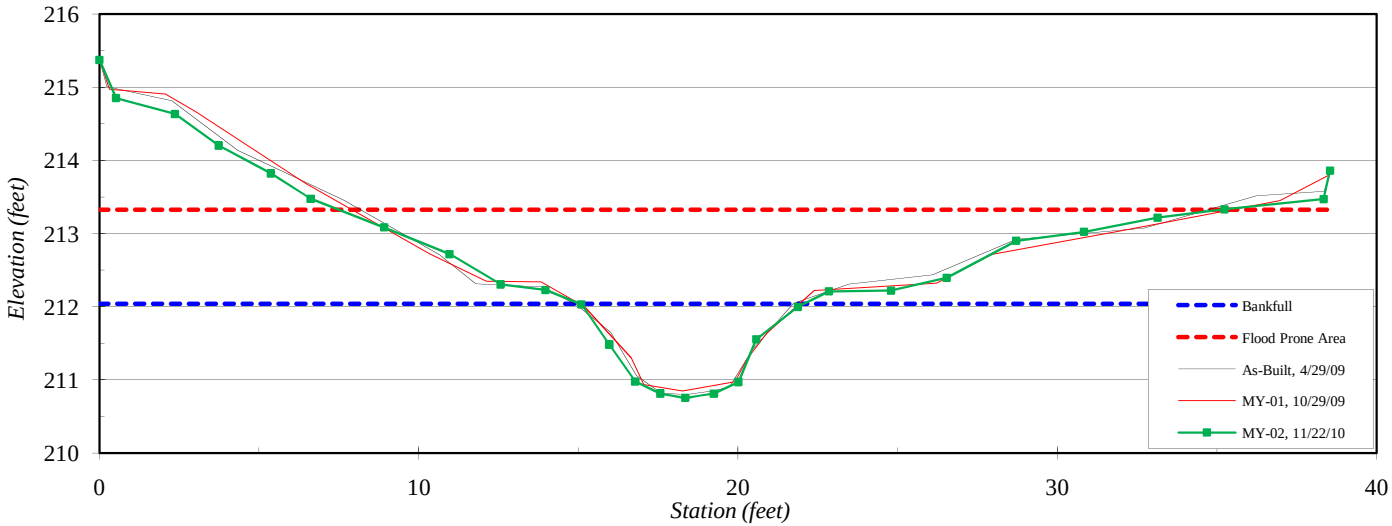


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-18, Riffle, T1.2
Drainage Area (sq mi):	0.10
Date:	11/22/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	215.37
0.5	214.85
2.4	214.63
3.7	214.20
5.4	213.82
6.6	213.47
8.9	213.08
11.0	212.72
12.6	212.30
14.0	212.23
15.1	212.03
16.0	211.48
16.8	210.98
17.6	210.81
18.3	210.75
19.2	210.81
20.0	210.97
20.6	211.55
21.9	212.00
22.9	212.21
24.8	212.22
26.5	212.39
28.7	212.90
30.8	213.02
33.1	213.22
35.2	213.33
38.3	213.47
38.5	213.86

SUMMARY DATA	
Bankfull Elevation:	212.0
Bankfull Cross-Sectional Area:	5.6
Bankfull Width:	7.0
Flood Prone Area Elevation:	213.3
Flood Prone Width:	26
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.8
W / D Ratio:	8.8
Entrenchment Ratio:	3.7
Bank Height Ratio:	1.0

Stream Type	E5

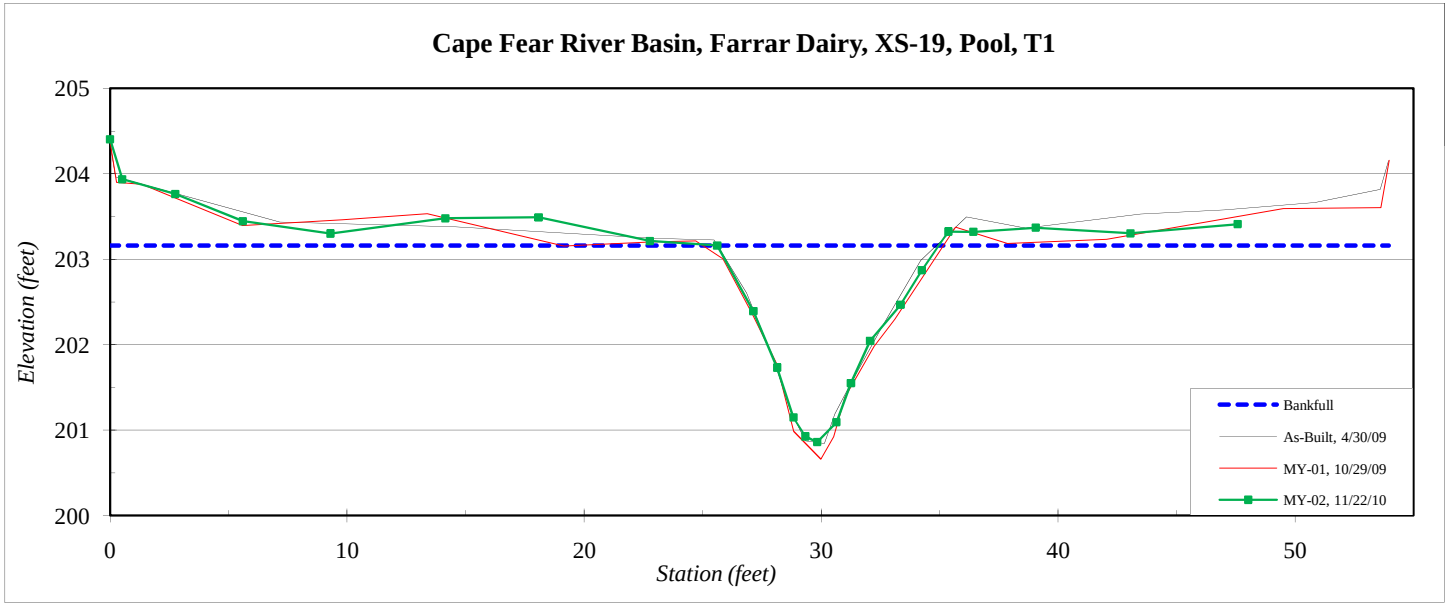


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-19, Pool, T1
Drainage Area (sq mi):	0.18
Date:	11/22/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	204.40
0.5	203.94
2.7	203.76
5.6	203.45
9.3	203.30
14.1	203.48
18.1	203.49
22.8	203.21
25.6	203.16
27.1	202.39
28.1	201.73
28.8	201.15
29.3	200.93
29.8	200.86
30.6	201.09
31.3	201.55
32.1	202.05
33.4	202.47
34.3	202.87
35.4	203.32
36.4	203.32
39.1	203.37
43.1	203.30
47.6	203.41
51.4	203.42
53.7	203.61
54.0	204.21

SUMMARY DATA	
Bankfull Elevation:	203.2
Bankfull Cross-Sectional Area:	10.8
Bankfull Width:	9.3
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	2.3
Mean Depth at Bankfull:	1.2
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	E5

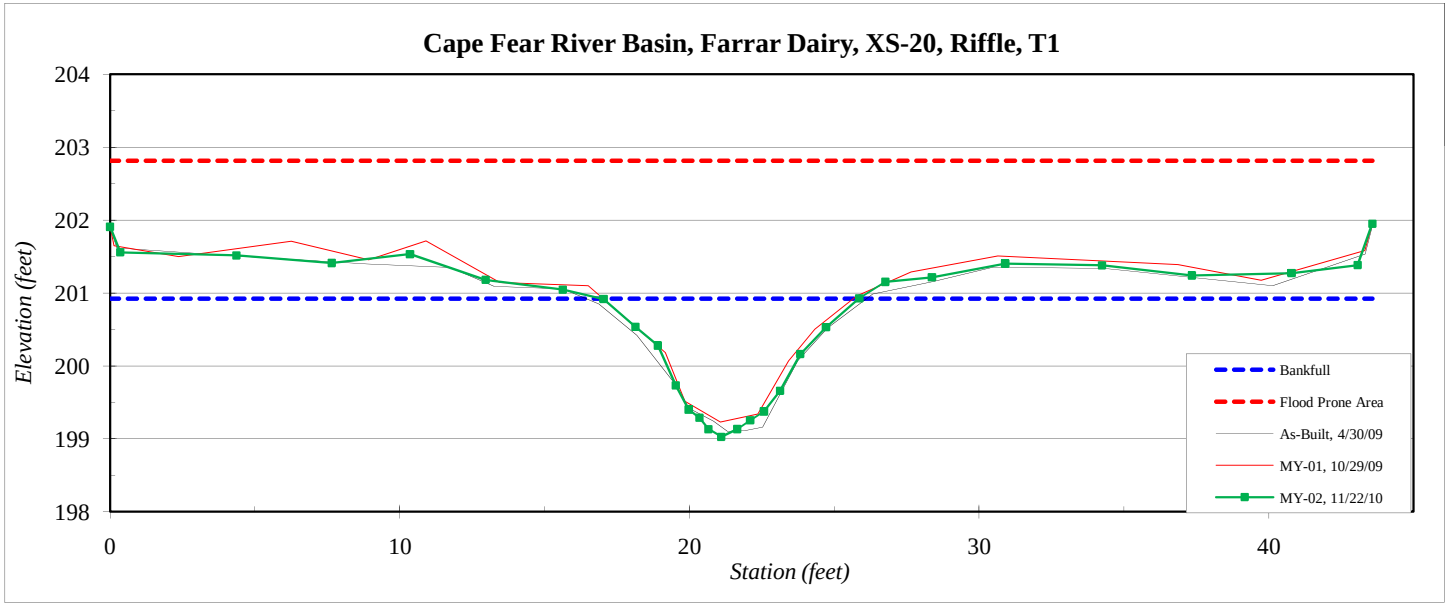


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-20, Riffle, T1
Drainage Area (sq mi):	0.18
Date:	11/22/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	201.91
0.4	201.56
4.4	201.51
7.6	201.41
10.4	201.53
13.0	201.18
15.6	201.05
17.0	200.92
18.1	200.54
18.9	200.28
19.5	199.73
20.0	199.40
20.3	199.29
20.7	199.13
21.1	199.03
21.6	199.13
22.1	199.25
22.6	199.37
23.1	199.66
23.8	200.16
24.7	200.53
25.9	200.93
26.8	201.15
28.4	201.21
30.9	201.40
34.2	201.38
37.4	201.24
40.8	201.27
43.1	201.38
43.6	201.95

SUMMARY DATA	
Bankfull Elevation:	200.9
Bankfull Cross-Sectional Area:	8.5
Bankfull Width:	8.9
Flood Prone Area Elevation:	202.8
Flood Prone Width:	>60
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.0
W / D Ratio:	9.3
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	E5

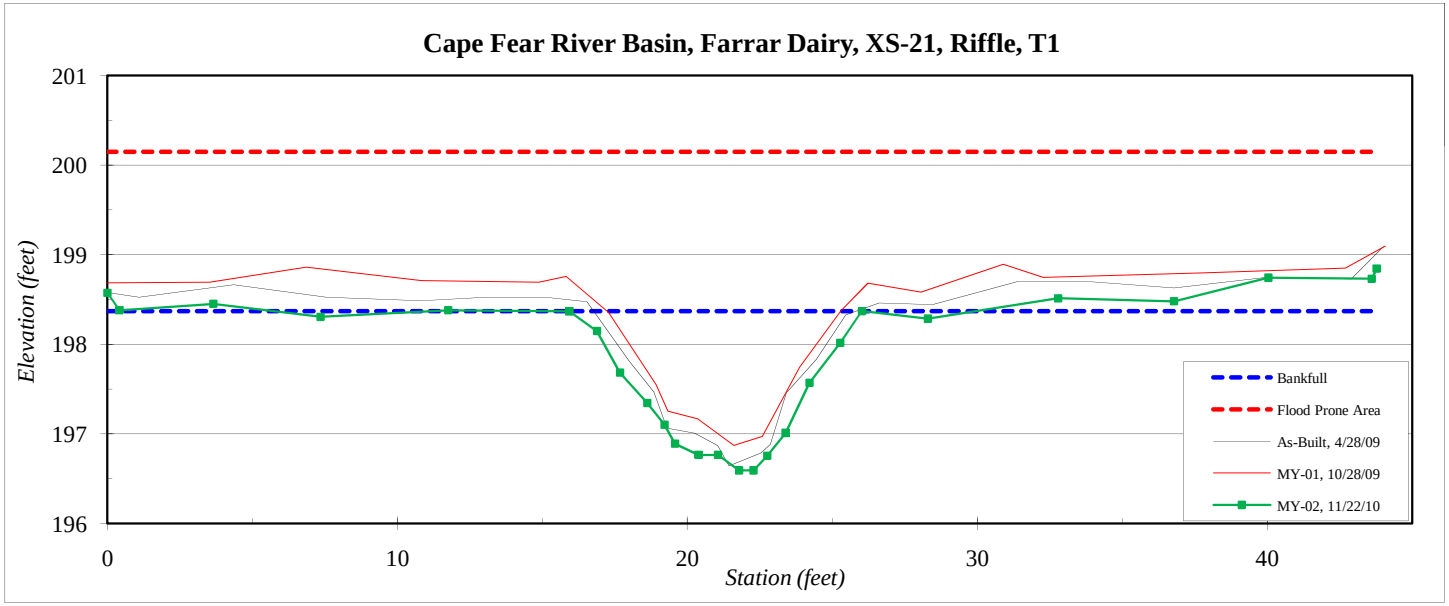


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-21, Riffle, T1
Drainage Area (sq mi):	0.18
Date:	11/22/2010
Field Crew:	A. French, A. Helms

Station	Elevation
0.0	198.57
0.4	198.38
3.7	198.45
7.4	198.30
11.8	198.38
15.9	198.37
16.9	198.15
17.7	197.68
18.6	197.35
19.2	197.10
19.6	196.89
20.4	196.77
21.1	196.76
21.8	196.59
22.3	196.59
22.8	196.75
23.4	197.01
24.2	197.57
25.3	198.02
26.0	198.37
28.3	198.29
32.8	198.51
36.8	198.48
40.0	198.74
43.6	198.73
43.8	198.84

SUMMARY DATA	
Bankfull Elevation:	198.4
Bankfull Cross-Sectional Area:	10.3
Bankfull Width:	10.1
Flood Prone Area Elevation:	200.1
Flood Prone Width:	>60
Max Depth at Bankfull:	1.8
Mean Depth at Bankfull:	1.0
W / D Ratio:	9.9
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	E5

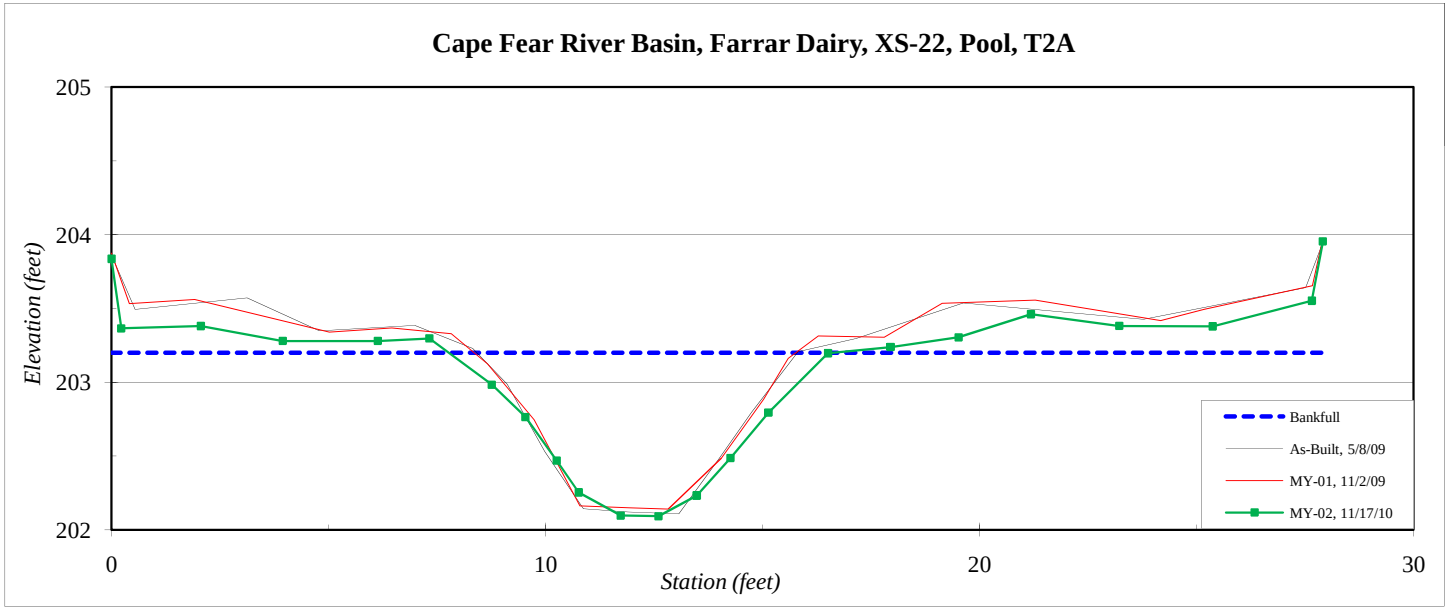


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-22, Pool, T2A
Drainage Area (sq mi):	0.04
Date:	11/17/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	203.84
0.2	203.36
2.1	203.38
3.9	203.28
6.1	203.28
7.3	203.30
8.8	202.98
9.5	202.76
10.3	202.47
10.8	202.25
11.7	202.10
12.6	202.09
13.5	202.23
14.3	202.49
15.1	202.79
16.5	203.20
18.0	203.24
19.5	203.30
21.2	203.46
23.2	203.38
25.4	203.38
27.7	203.55
27.9	203.95

SUMMARY DATA	
Bankfull Elevation:	203.2
Bankfull Cross-Sectional Area:	5.5
Bankfull Width:	8.9
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

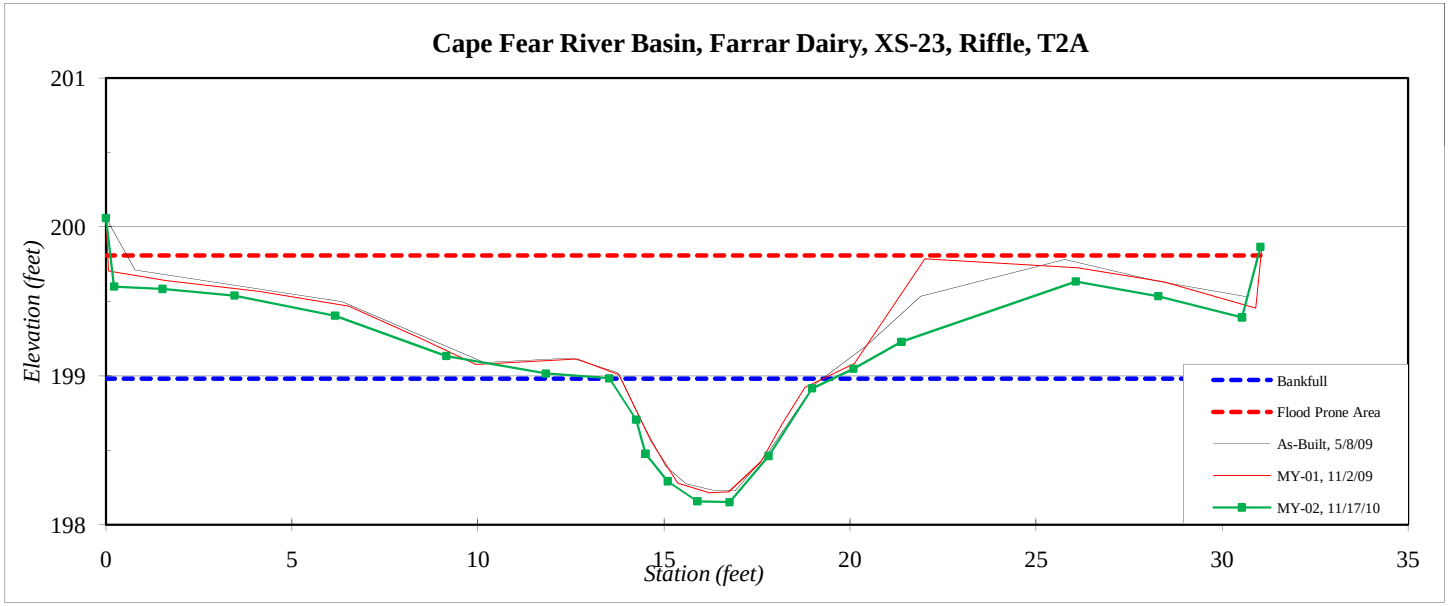


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-23, Riffle, T2A
Drainage Area (sq mi):	0.04
Date:	11/17/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	200.06
0.2	199.60
1.5	199.58
3.5	199.54
6.2	199.40
9.1	199.13
11.8	199.02
13.5	198.98
14.3	198.71
14.5	198.48
15.1	198.29
15.9	198.16
16.8	198.15
17.8	198.46
19.0	198.92
20.1	199.05
21.4	199.23
26.1	199.63
28.3	199.54
30.5	199.39
31.0	199.87

SUMMARY DATA	
Bankfull Elevation:	199.0
Bankfull Cross-Sectional Area:	2.9
Bankfull Width:	6.0
Flood Prone Area Elevation:	199.8
Flood Prone Width:	31
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.5
W / D Ratio:	12.4
Entrenchment Ratio:	5.2
Bank Height Ratio:	1.0

Stream Type	C5

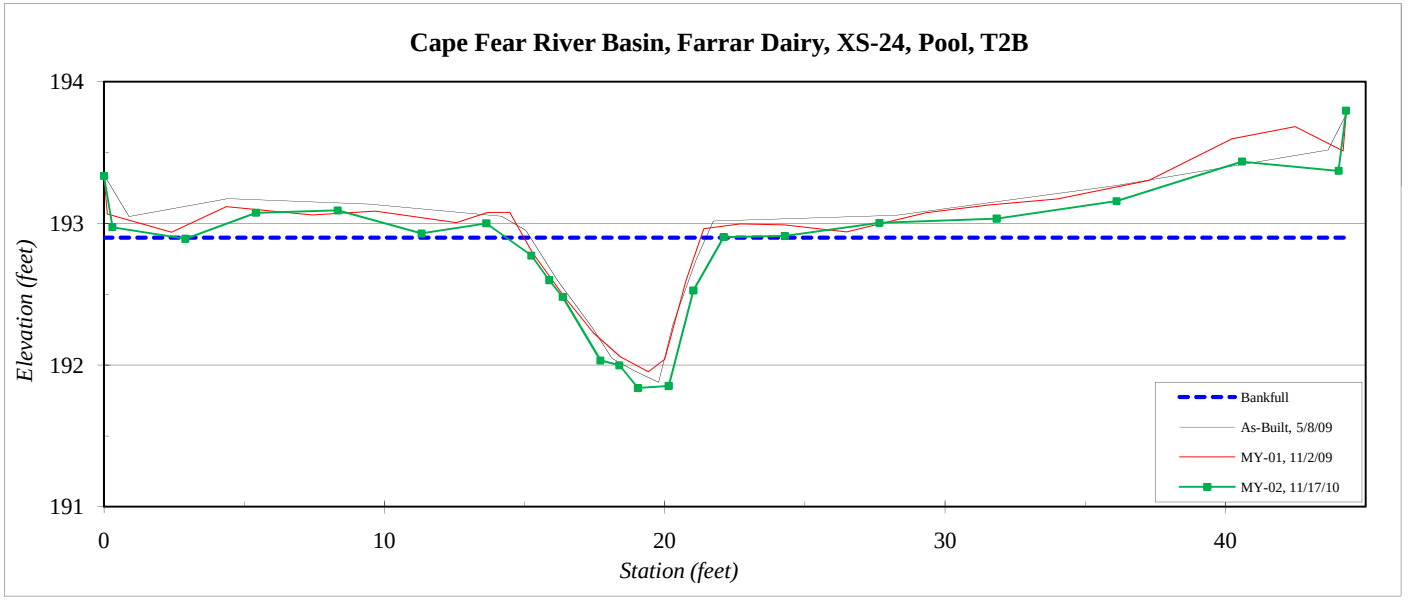


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-24, Pool, T2B
Drainage Area (sq mi):	0.04
Date:	11/17/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	193.34
0.3	192.97
2.9	192.89
5.4	193.08
8.3	193.09
11.3	192.93
13.6	193.00
15.2	192.77
15.9	192.60
16.4	192.48
17.7	192.03
18.4	192.00
19.0	191.84
20.1	191.85
21.0	192.53
22.1	192.90
24.3	192.91
27.7	193.00
31.8	193.03
36.1	193.16
40.6	193.44
44.0	193.37
44.3	193.80

SUMMARY DATA	
Bankfull Elevation:	192.9
Bankfull Cross-Sectional Area:	4.5
Bankfull Width:	7.7
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.1
Mean Depth at Bankfull:	0.6
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

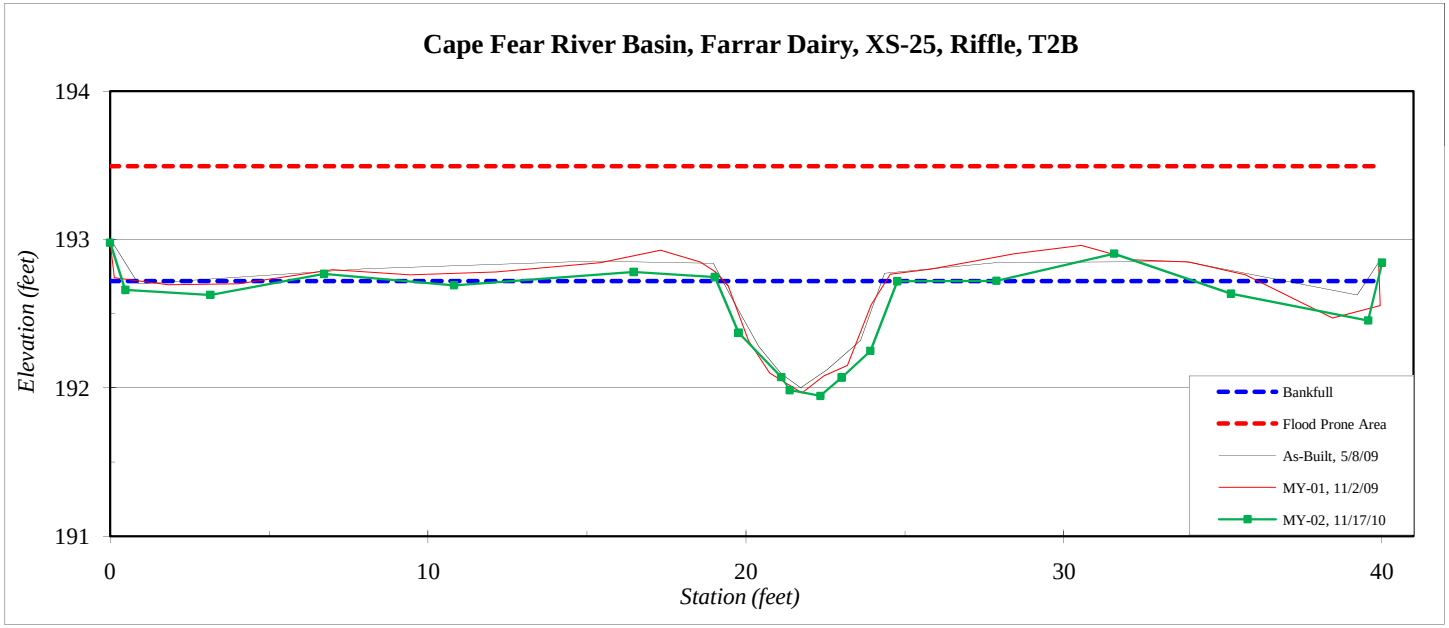


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-25, Riffle, T2B
Drainage Area (sq mi):	0.04
Date:	11/17/2010
Field Crew:	A. Helms, K. Knight-Meng

Station	Elevation
0.0	192.98
0.5	192.66
3.2	192.63
6.7	192.77
10.8	192.69
16.5	192.78
19.0	192.75
19.8	192.37
21.1	192.07
21.4	191.99
22.3	191.95
23.0	192.07
23.9	192.25
24.8	192.72
27.9	192.72
31.6	192.90
35.3	192.63
39.6	192.45
40.0	192.84

SUMMARY DATA	
Bankfull Elevation:	192.7
Bankfull Cross-Sectional Area:	2.9
Bankfull Width:	6.7
Flood Prone Area Elevation:	193.5
Flood Prone Width:	>40
Max Depth at Bankfull:	0.8
Mean Depth at Bankfull:	0.4
W / D Ratio:	15.5
Entrenchment Ratio:	6.0
Bank Height Ratio:	1.0

Stream Type	C5

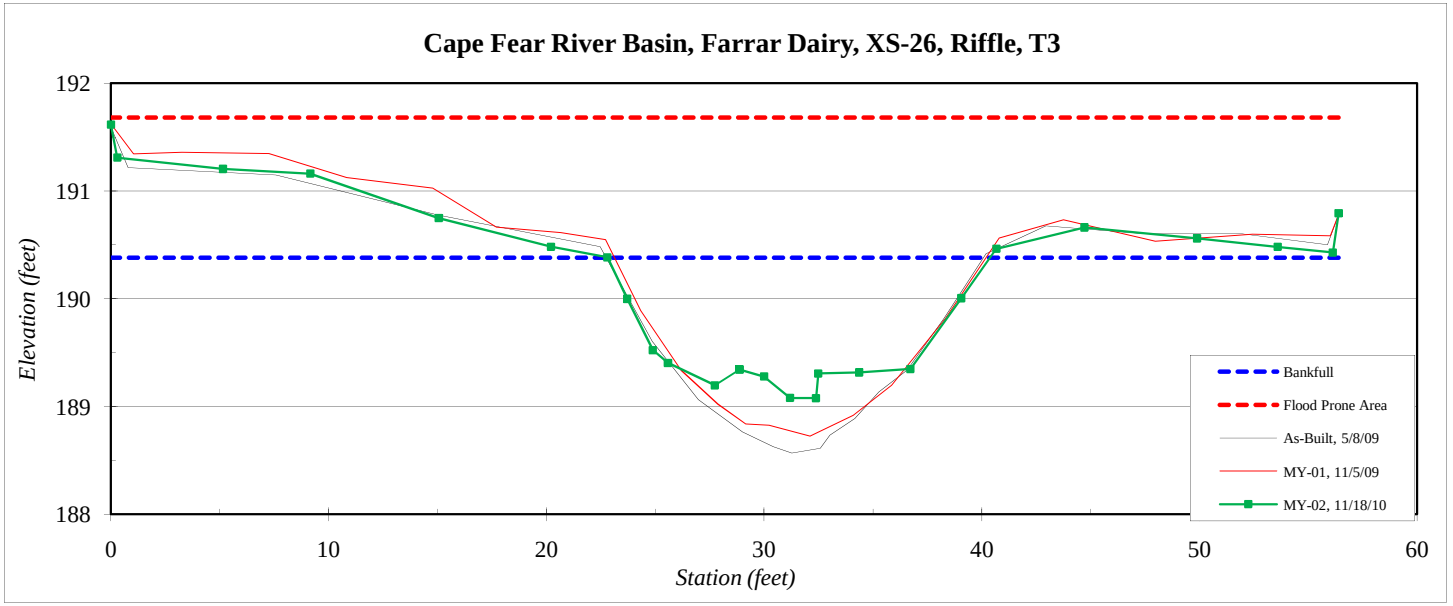


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-26, Riffle, T3
Drainage Area (sq mi):	0.39
Date:	11/18/2010
Field Crew:	A. French, K. Knight-Meng

Station	Elevation
0.0	191.62
0.3	191.31
5.2	191.21
9.2	191.16
15.1	190.75
20.2	190.48
22.8	190.38
23.7	190.00
24.9	189.52
25.6	189.40
27.7	189.20
28.9	189.34
30.0	189.28
31.2	189.08
32.4	189.08
32.5	189.31
34.4	189.32
36.7	189.35
39.1	190.01
40.7	190.46
44.7	190.66
49.9	190.56
53.6	190.48
56.1	190.43
56.4	190.79

SUMMARY DATA	
Bankfull Elevation:	190.4
Bankfull Cross-Sectional Area:	15.8
Bankfull Width:	17.6
Flood Prone Area Elevation:	191.7
Flood Prone Width:	>60
Max Depth at Bankfull:	1.3
Mean Depth at Bankfull:	0.9
W / D Ratio:	19.6
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

Stream Type	C5

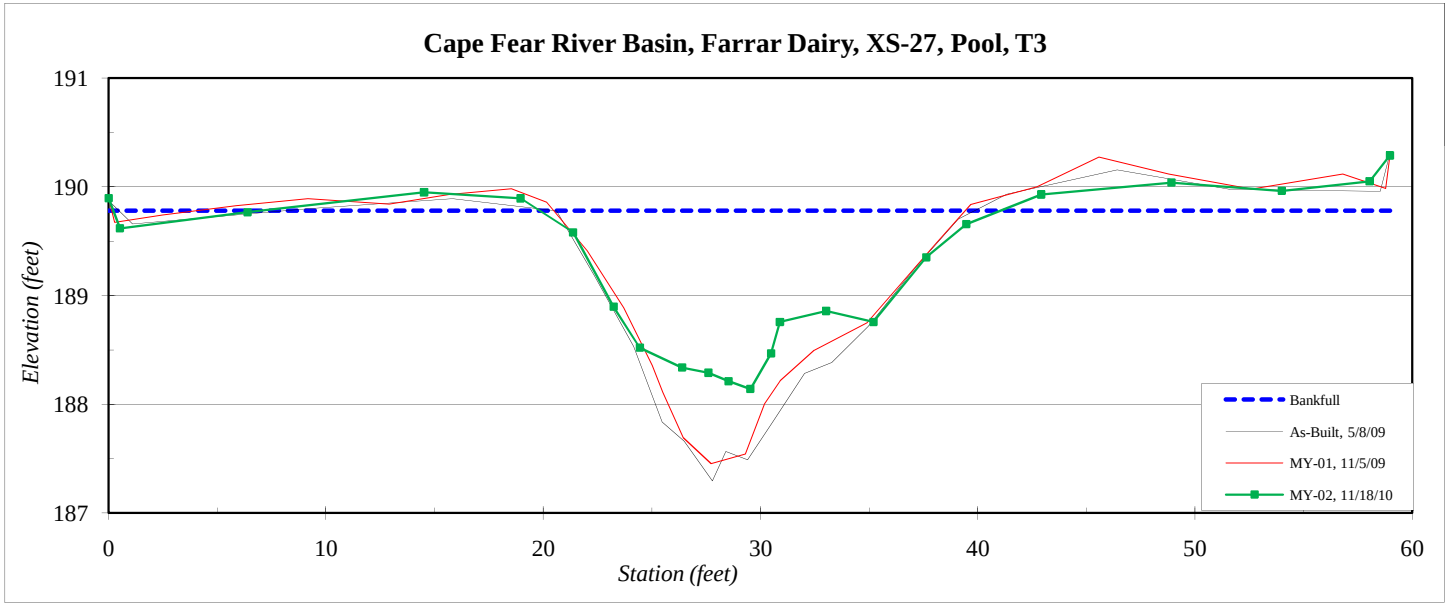


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-27, Pool, T3
Drainage Area (sq mi):	0.39
Date:	11/18/2010
Field Crew:	A. French, K. Knight-Meng

Station	Elevation
0.0	189.90
0.5	189.62
6.4	189.77
14.5	189.95
19.0	189.89
21.4	189.58
23.2	188.90
24.4	188.52
26.4	188.34
27.6	188.29
28.5	188.21
29.5	188.14
30.5	188.47
30.9	188.76
33.0	188.86
35.2	188.76
37.6	189.35
39.5	189.66
42.9	189.93
48.9	190.04
54.0	189.96
58.0	190.05
59.0	190.29

SUMMARY DATA	
Bankfull Elevation:	189.8
Bankfull Cross-Sectional Area:	18.3
Bankfull Width:	21.2
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.6
Mean Depth at Bankfull:	0.9
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

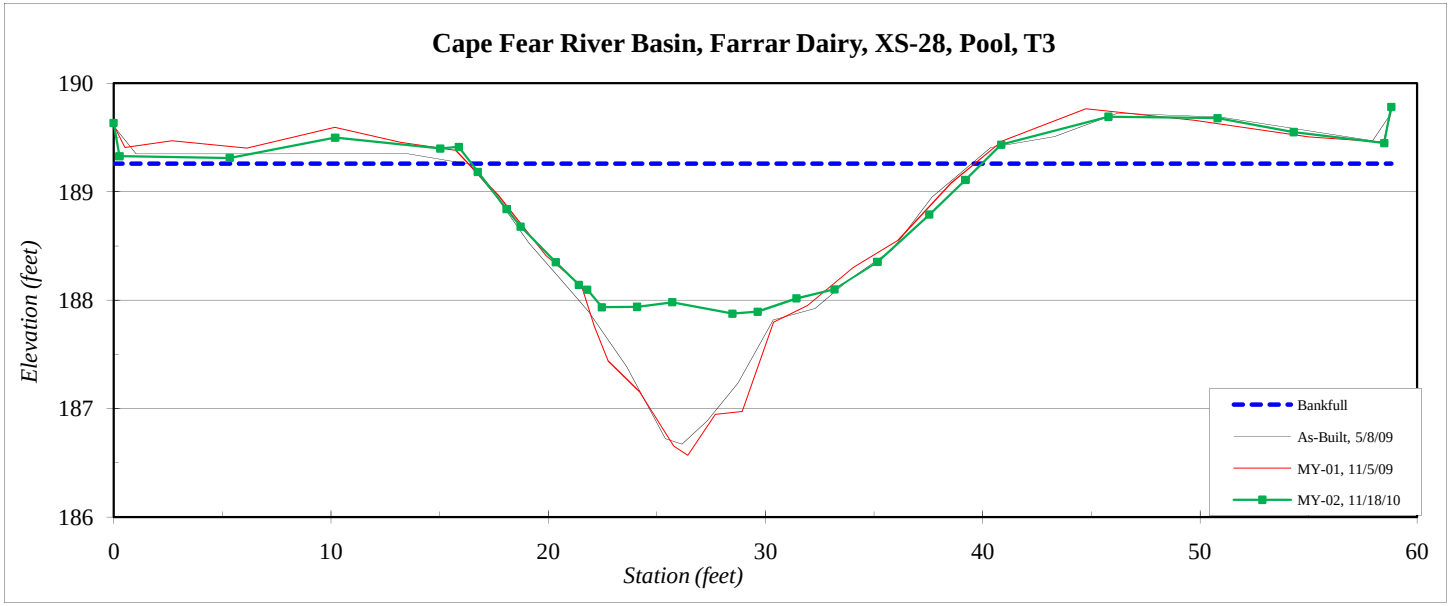


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-28, Pool, T3
Drainage Area (sq mi):	0.39
Date:	11/18/2010
Field Crew:	A. French, K. Knight-Meng

Station	Elevation
0.0	189.63
0.3	189.33
5.3	189.31
10.2	189.50
15.0	189.40
15.9	189.41
16.8	189.18
18.1	188.84
18.7	188.68
20.3	188.35
21.4	188.14
21.8	188.10
22.5	187.93
24.1	187.94
25.7	187.98
28.5	187.88
29.6	187.89
31.4	188.01
33.2	188.10
35.2	188.35
37.5	188.79
39.2	189.11
40.8	189.43
45.8	189.69
50.8	189.68
54.3	189.55
58.5	189.45
58.8	189.78

SUMMARY DATA	
Bankfull Elevation:	189.3
Bankfull Cross-Sectional Area:	22.5
Bankfull Width:	23.5
Flood Prone Area Elevation:	-
Flood Prone Width:	-
Max Depth at Bankfull:	1.4
Mean Depth at Bankfull:	1.0
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-

Stream Type	C5

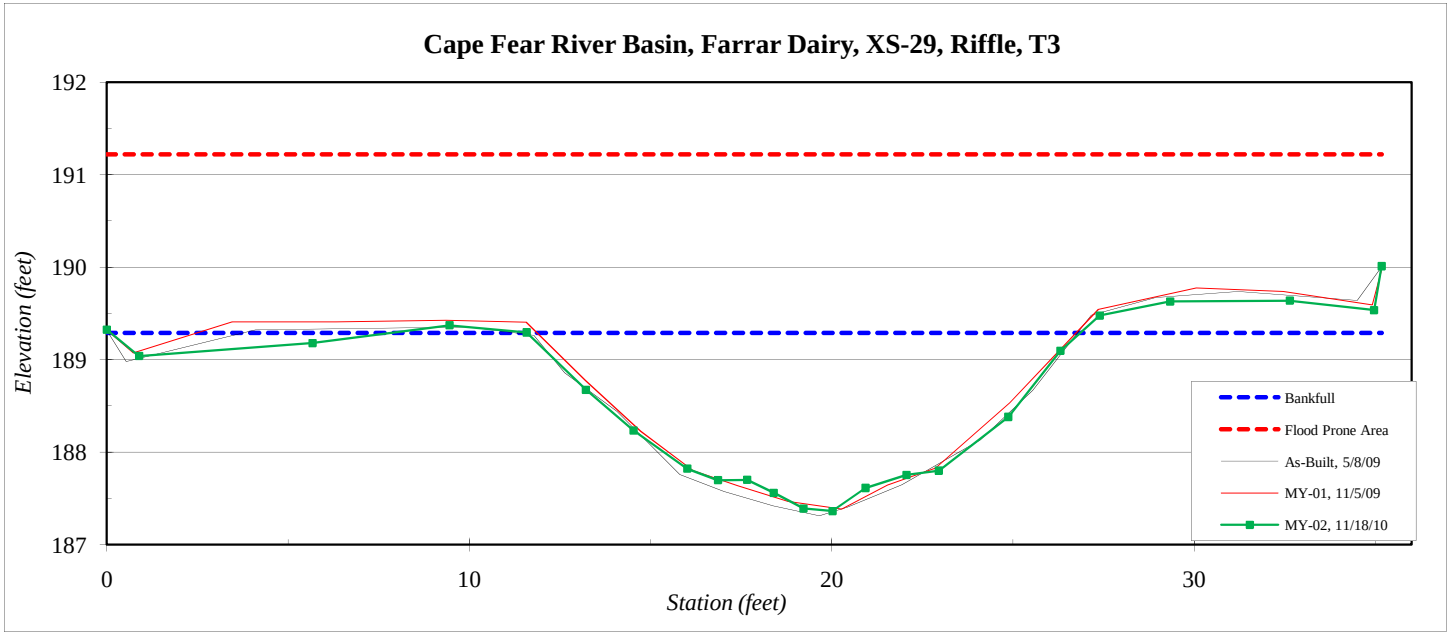


River Basin:	Cape Fear
Watershed:	Farrar Dairy
XS ID	XS-29, Riffle, T3
Drainage Area (sq mi):	0.39
Date:	11/18/2010
Field Crew:	A. French, K. Knight-Meng

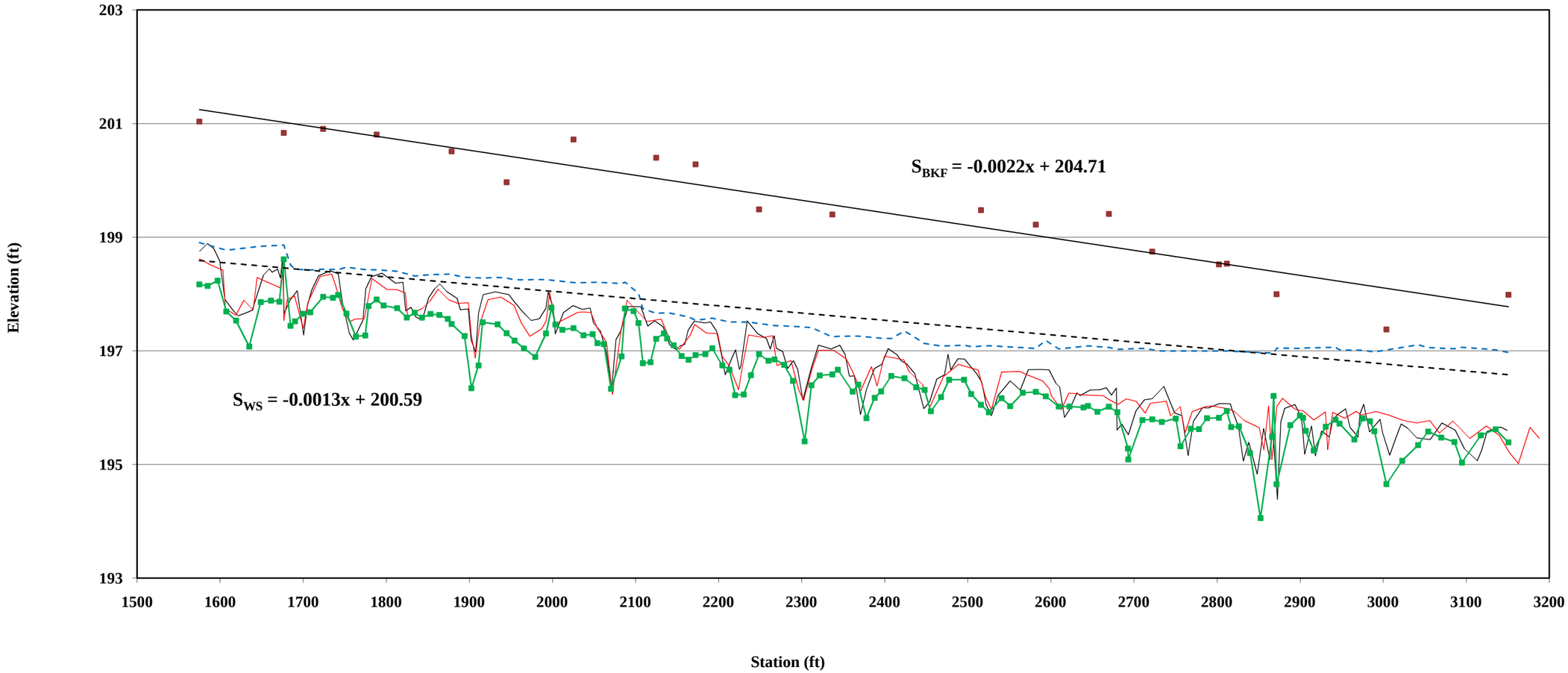
Station	Elevation
0.0	189.32
0.9	189.04
5.7	189.18
9.5	189.37
11.6	189.29
13.2	188.67
14.5	188.23
16.0	187.82
16.9	187.70
17.7	187.70
18.4	187.56
19.2	187.39
20.0	187.36
20.9	187.61
22.1	187.75
23.0	187.80
24.9	188.38
26.3	189.09
27.4	189.48
29.3	189.63
32.6	189.64
35.0	189.53
35.2	190.01

SUMMARY DATA	
Bankfull Elevation:	189.3
Bankfull Cross-Sectional Area:	18.2
Bankfull Width:	15.3
Flood Prone Area Elevation:	191.2
Flood Prone Width:	>60
Max Depth at Bankfull:	1.9
Mean Depth at Bankfull:	1.2
W / D Ratio:	12.9
Entrenchment Ratio:	>3.0
Bank Height Ratio:	1.0

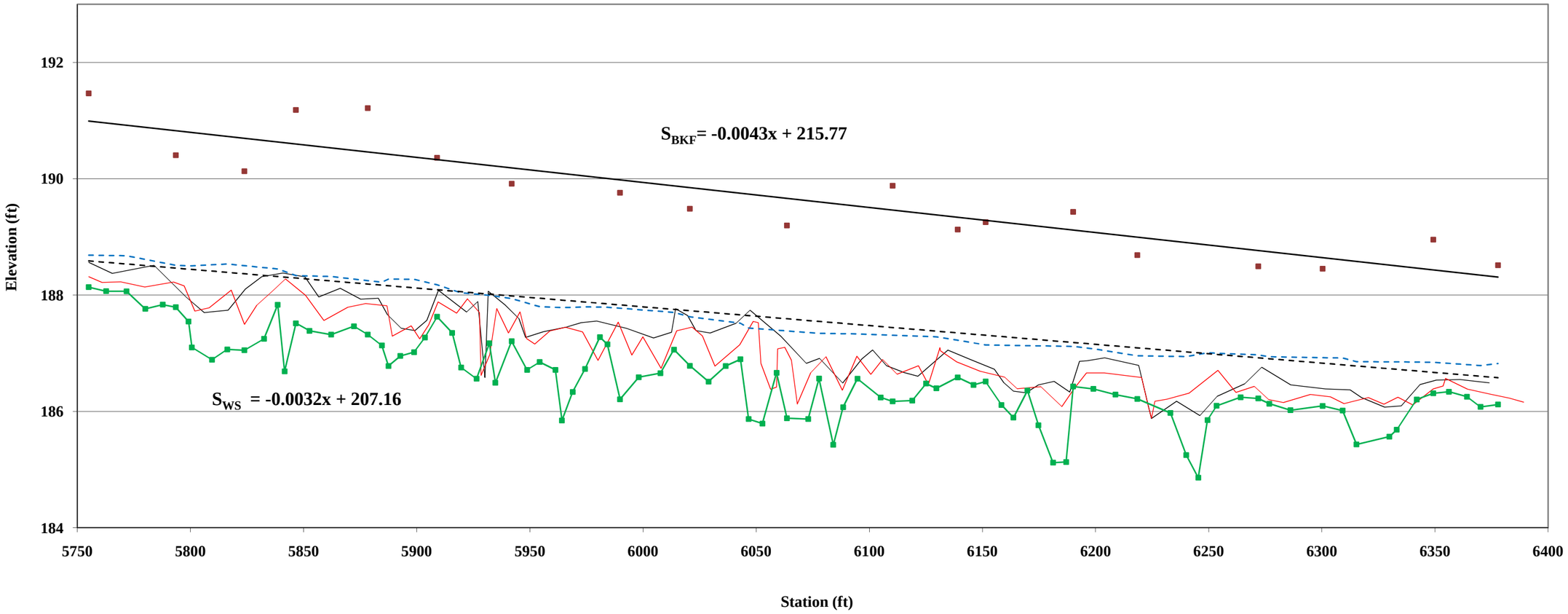
Stream Type	C5



Farrar Dairy Longitudinal Profile
NPAC-1 MY-02
Stations 15+75 - 31+75



Farrar Dairy Longitudinal Profile
NPAC-2 MY-02
Stations 57+55 - 63+77



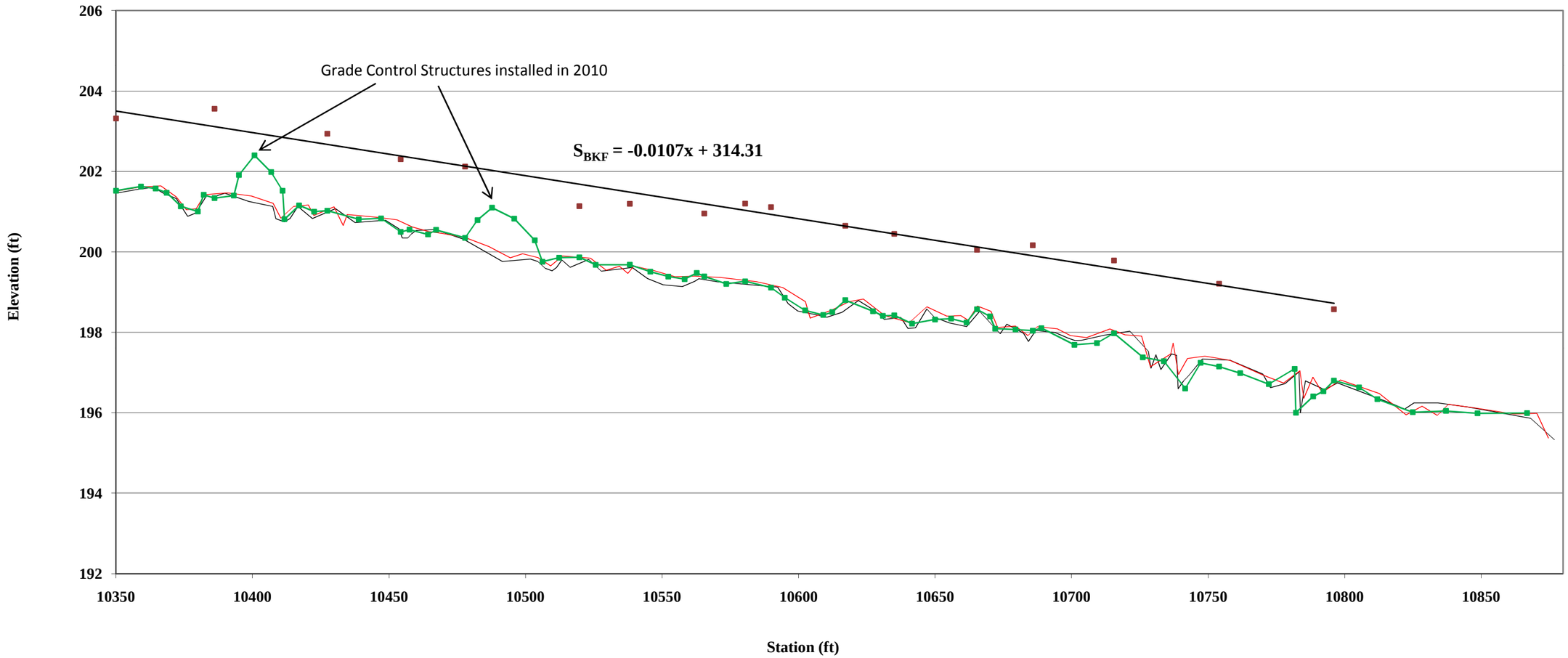
Farrar Dairy Longitudinal Profile
Tributary 1.1 MY-02
Stations 80+25 - 85+75

*No WS due to no flow in channel during survey.

Farrar Dairy Longitudinal Profile
Tributary 1.2 MY-02
Stations 91+45 - 96+70

*No WS due to no flow in channel during survey.

Farrar Dairy Longitudinal Profile
Tributary 1 MY-02
Stations 103+50 - 108+77

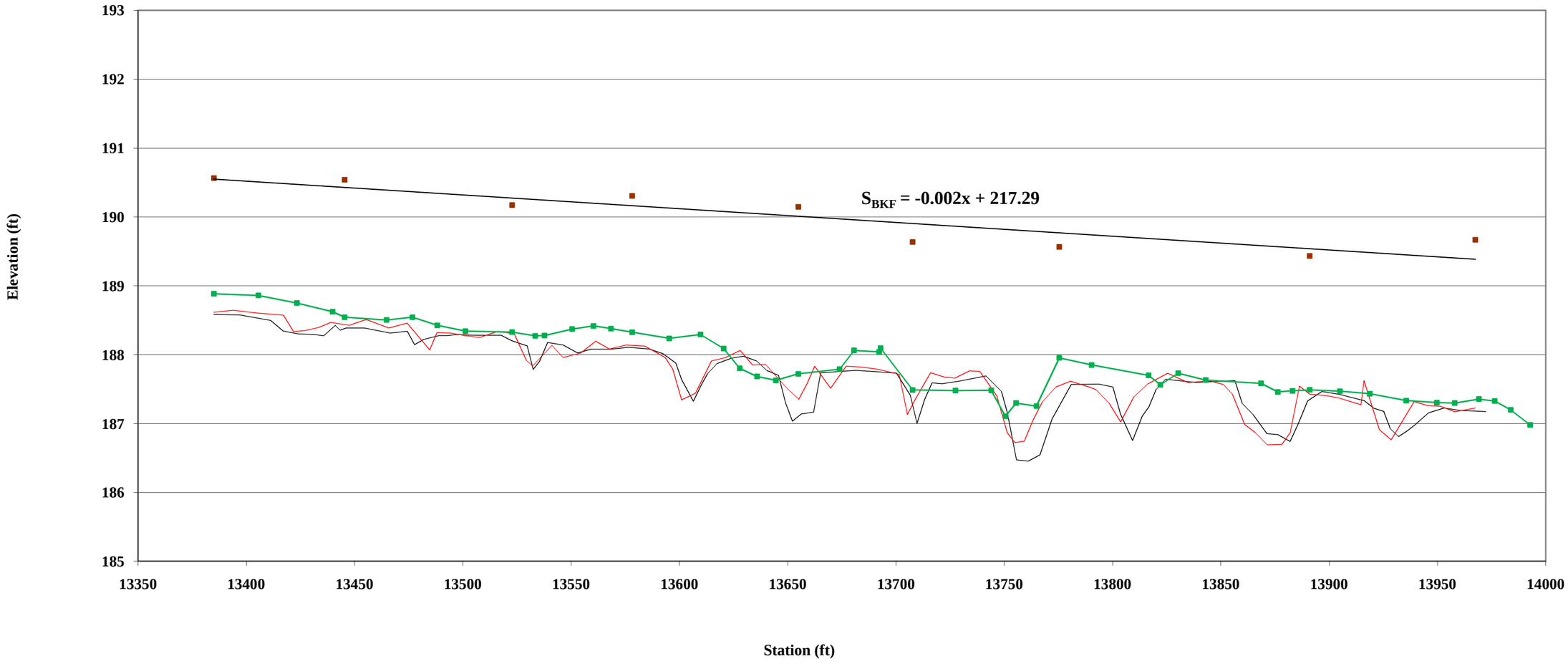


*No WS due to no flow in channel during survey.

Farrar Dairy Longitudinal Profile
Tributary 2 MY-02
Stations 112+80 - 118+37

*No WS due to no flow in channel during survey.

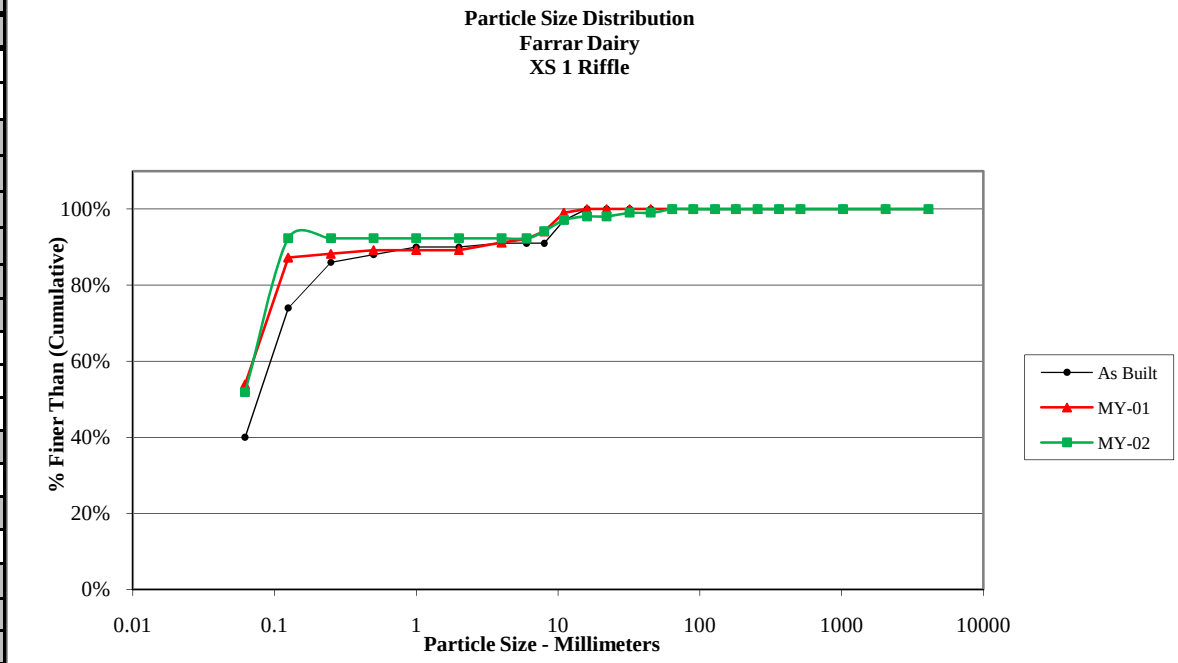
Farrar Dairy Longitudinal Profile
Tributary 3 MY-02
Stations 133+85 - 139+73



*No WS due to no flow in channel during survey.

Cross-Section 1 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	54
Very Fine	.062 - .125	S	42
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		1
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	104

Note:



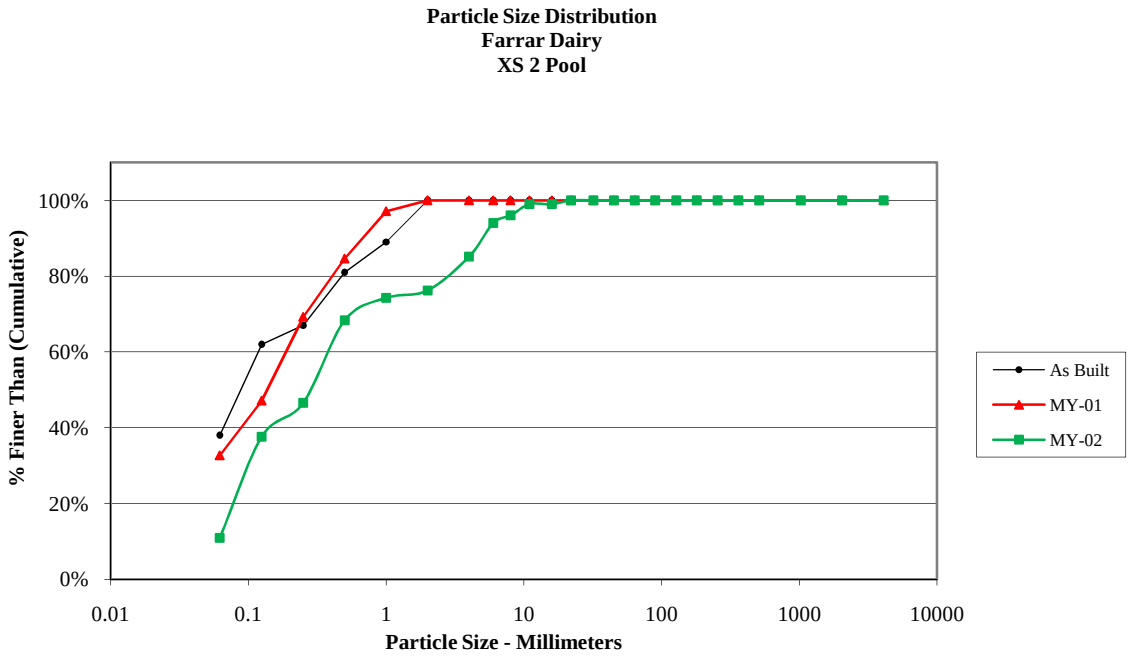
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.078
D84	0.11
D95	8.7

Size Distribution	
mean	0.1
dispersion	1.4
skewness	0.25

Type	
silt/clay	52%
sand	40%
gravel	8%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 2 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	11
Very Fine	.062 - .125	S	27
Fine	.125 - .25	A	9
Medium	.25 - .50	N	22
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	2
Very Fine	2 - 4		9
Fine	4 - 5.7	G	9
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	3
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	1
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



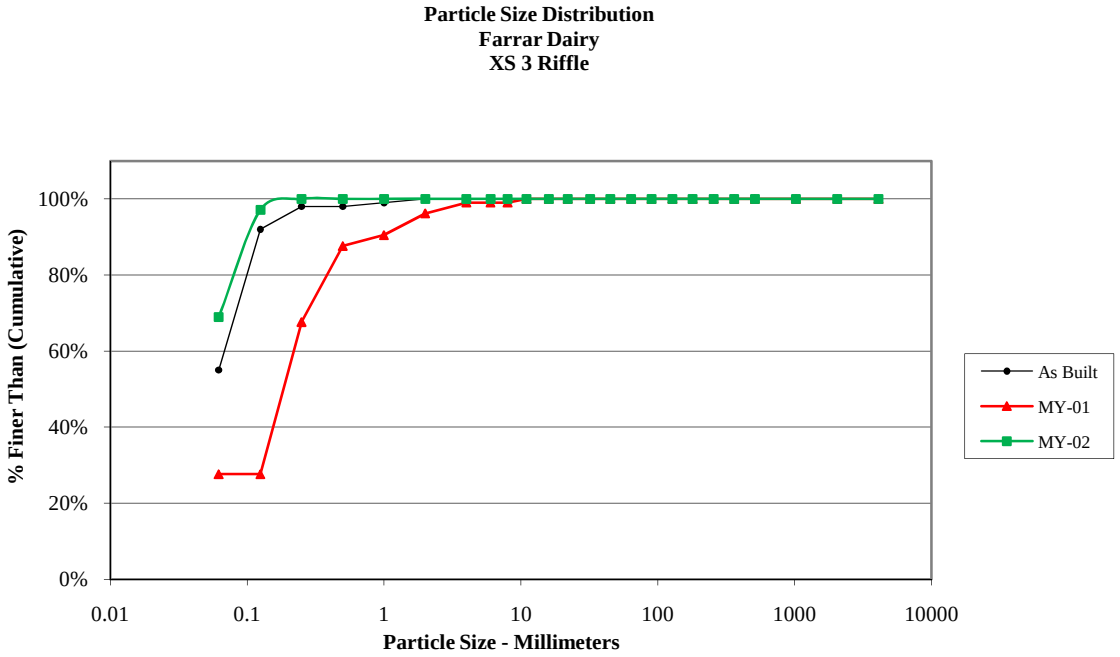
Size (mm)	
D16	0.071
D35	0.12
D50	0.28
D65	0.45
D84	3.7
D95	6.9

Size Distribution	
mean	0.5
dispersion	8.6
skewness	0.20

Type	
silt/clay	11%
sand	65%
gravel	24%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 3 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	71
Very Fine	.062 - .125	S	29
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



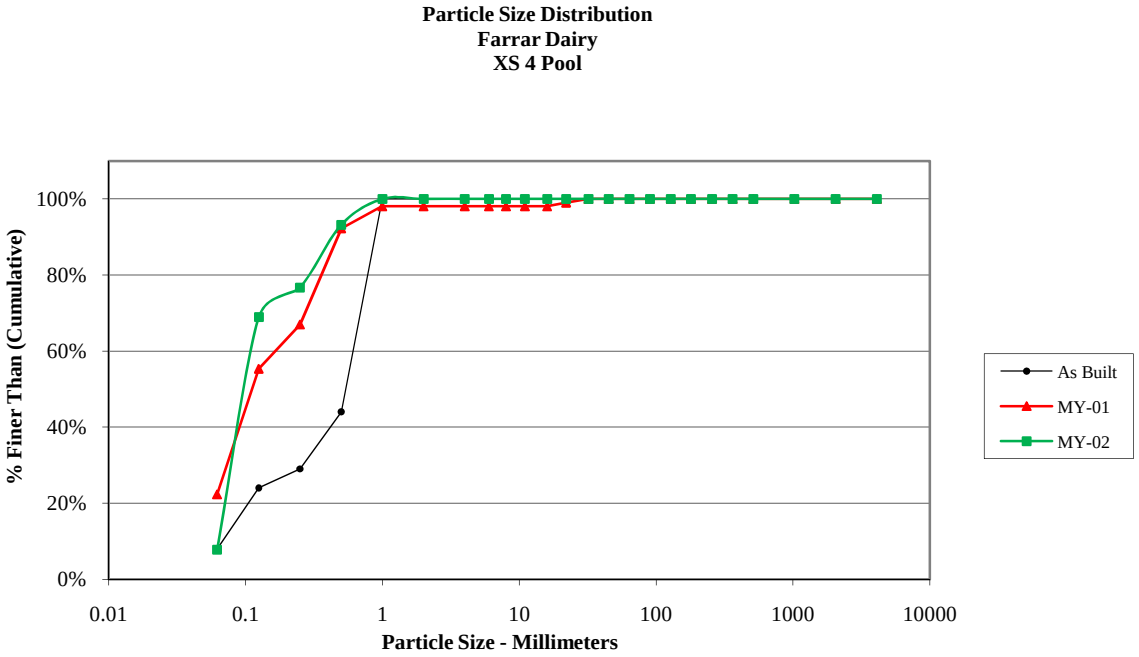
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.09
D95	0.12

Size Distribution	
mean	0.1
dispersion	1.2
skewness	0.20

Type	
silt/clay	69%
sand	31%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 4 Pool -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	63
Fine	.125 - .25	A	8
Medium	.25 - .50	N	17
Coarse	.50 - 1	D	7
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



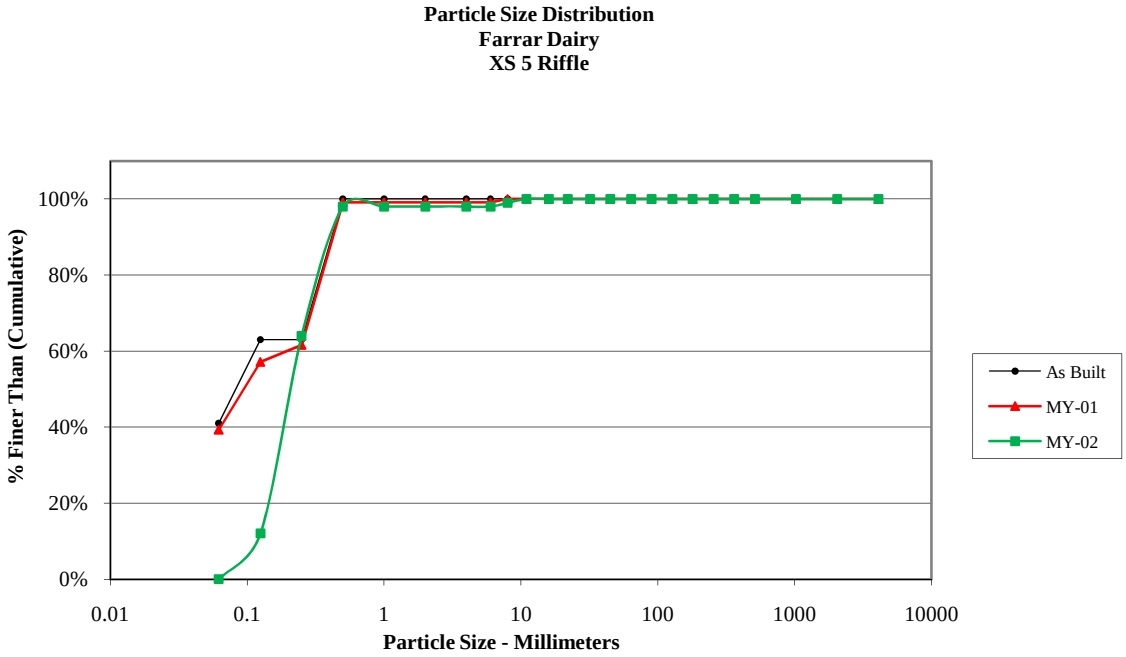
Size (mm)	
D16	0.068
D35	0.085
D50	0.1
D65	0.12
D84	0.34
D95	0.6

Size Distribution	
mean	0.2
dispersion	2.4
skewness	0.22

Type	
silt/clay	8%
sand	92%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 5 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	12
Fine	.125 - .25	A	52
Medium	.25 - .50	N	34
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



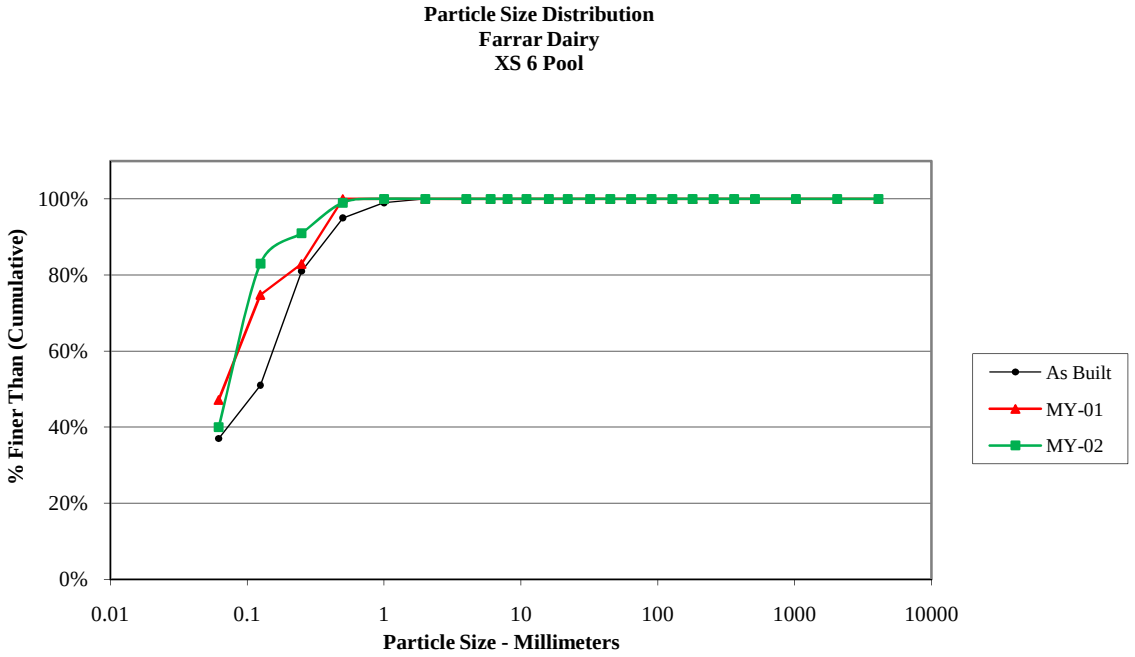
Size (mm)	
D16	0.13
D35	0.17
D50	0.21
D65	0.26
D84	0.38
D95	0.47

Size Distribution	
mean	0.2
dispersion	1.7
skewness	0.04

Type	
silt/clay	0%
sand	98%
gravel	2%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 6 Pool -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	40
Very Fine	.062 - .125	S	43
Fine	.125 - .25	A	8
Medium	.25 - .50	N	8
Coarse	.50 - 1	D	1
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



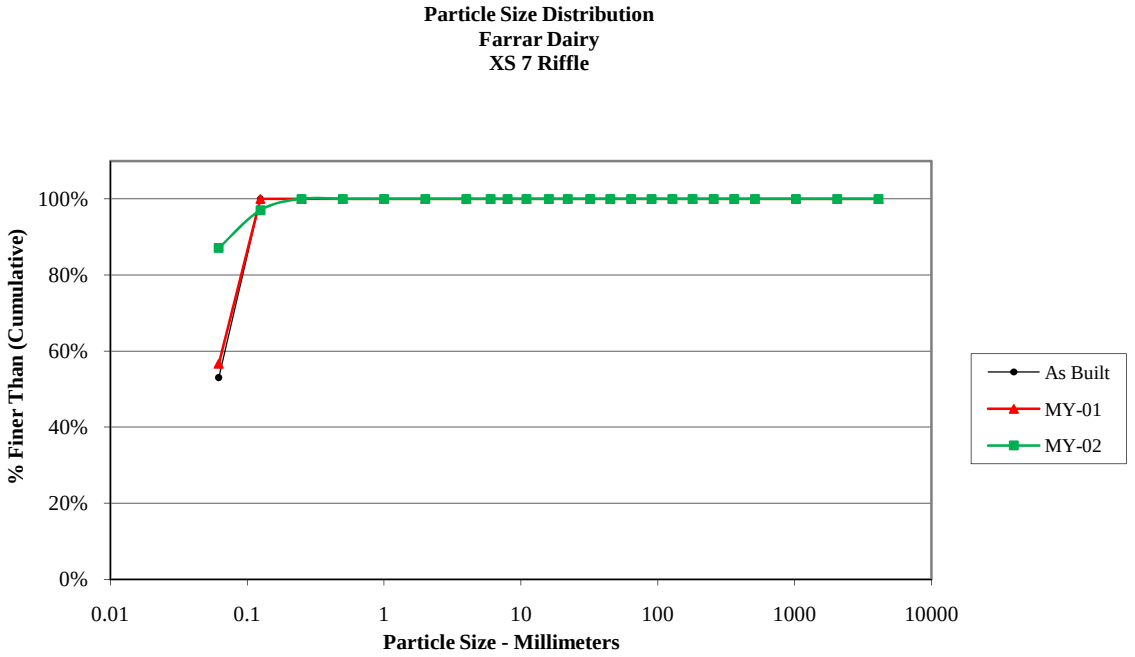
Size (mm)	
D16	0.062
D35	0.062
D50	0.073
D65	0.093
D84	0.14
D95	0.35

Size Distribution	
mean	0.1
dispersion	1.5
skewness	0.18

Type	
silt/clay	40%
sand	60%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 7 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	88
Very Fine	.062 - .125	S	10
Fine	.125 - .25	A	3
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



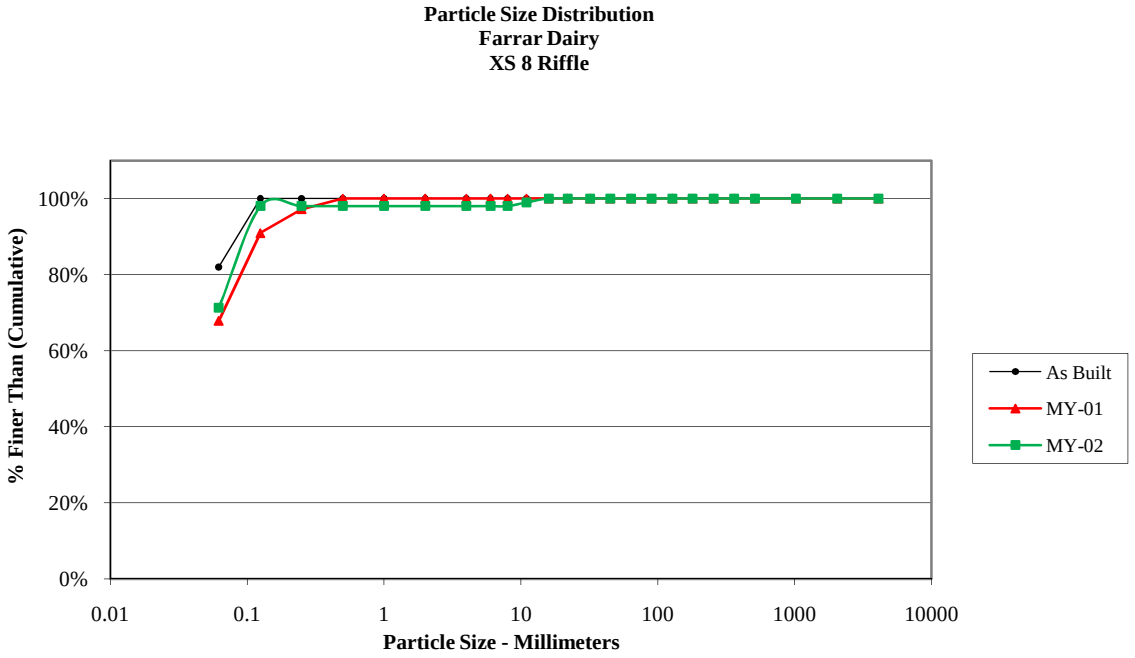
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.11

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	87%
sand	13%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 8 Riffle -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	72
Very Fine	.062 - .125	S	27
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	1
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



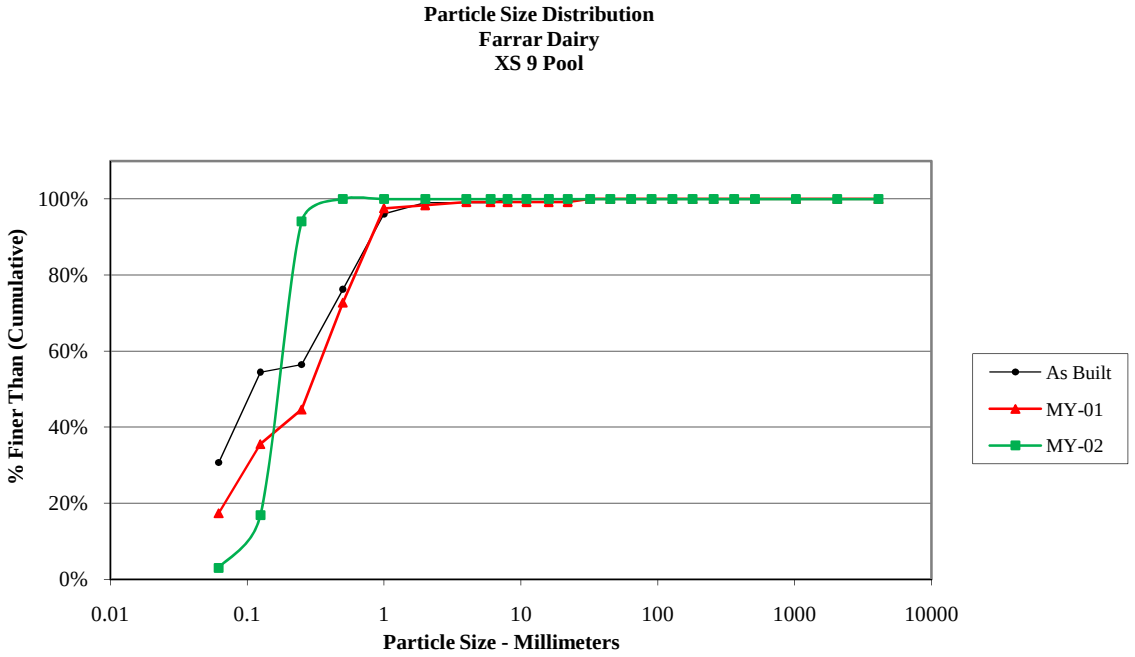
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.087
D95	0.12

Size Distribution	
mean	0.1
dispersion	1.2
skewness	0.19

Type	
silt/clay	71%
sand	27%
gravel	2%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 9 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	14
Fine	.125 - .25	A	78
Medium	.25 - .50	N	6
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



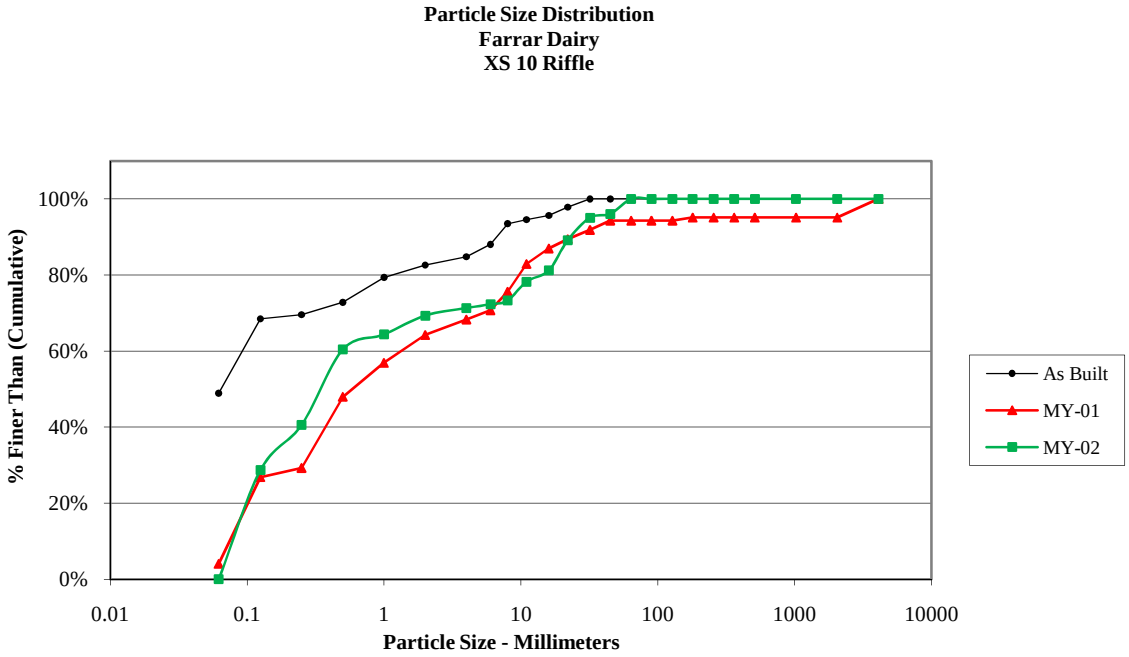
Size (mm)	
D16	0.12
D35	0.15
D50	0.17
D65	0.19
D84	0.23
D95	0.28

Size Distribution	
mean	0.2
dispersion	1.4
skewness	-0.02

Type	
silt/clay	3%
sand	97%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 10 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	29
Fine	.125 - .25	A	12
Medium	.25 - .50	N	20
Coarse	.50 - 1	D	4
Very Coarse	1 - 2	S	5
Very Fine	2 - 4		2
Fine	4 - 5.7	G	1
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	3
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	6
Very Coarse	32 - 45	S	1
Very Coarse	45 - 64		4
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



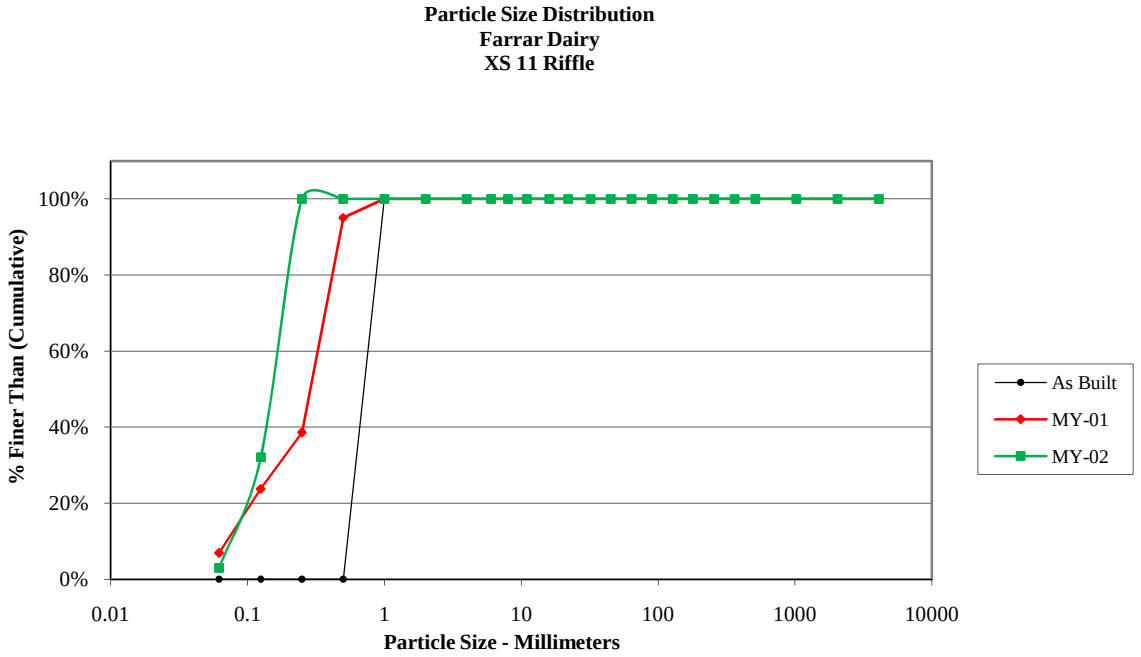
Size (mm)	
D16	0.092
D35	0.18
D50	0.35
D65	1.1
D84	18
D95	32

Size Distribution	
mean	1.3
dispersion	27.6
skewness	0.37

Type	
silt/clay	0%
sand	65%
gravel	29%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 11 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	30
Fine	.125 - .25	A	70
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



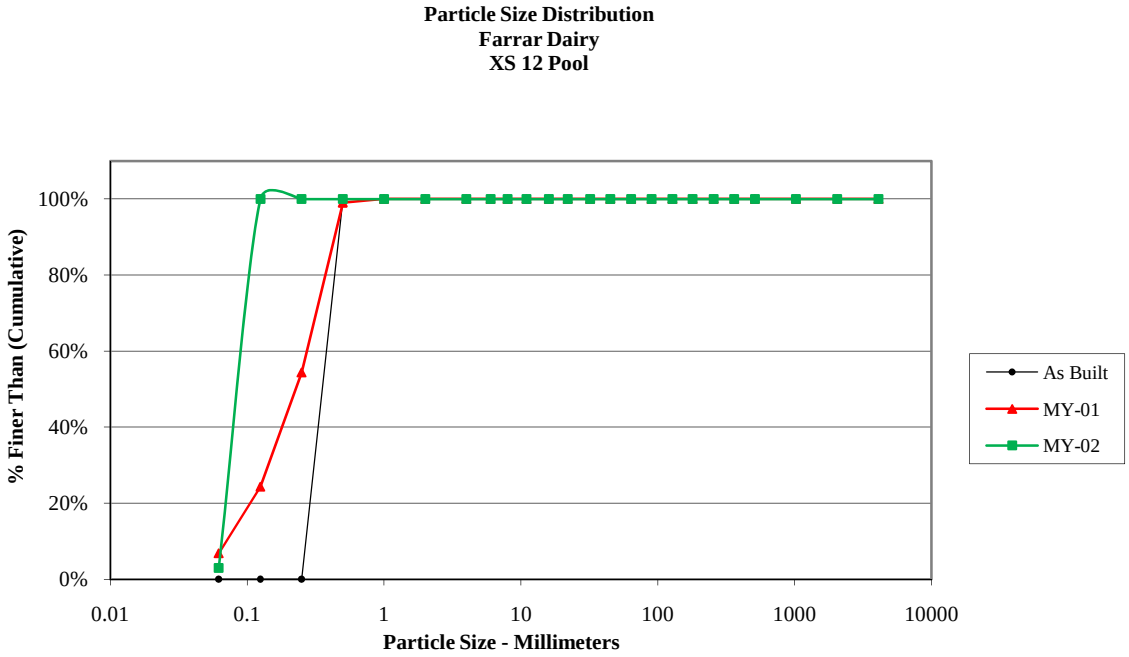
Size (mm)	
D16	0.085
D35	0.13
D50	0.15
D65	0.17
D84	0.21
D95	0.24

Size Distribution	
mean	0.1
dispersion	1.6
skewness	-0.08

Type	
silt/clay	3%
sand	97%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 12 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	3
Very Fine	.062 - .125	S	98
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



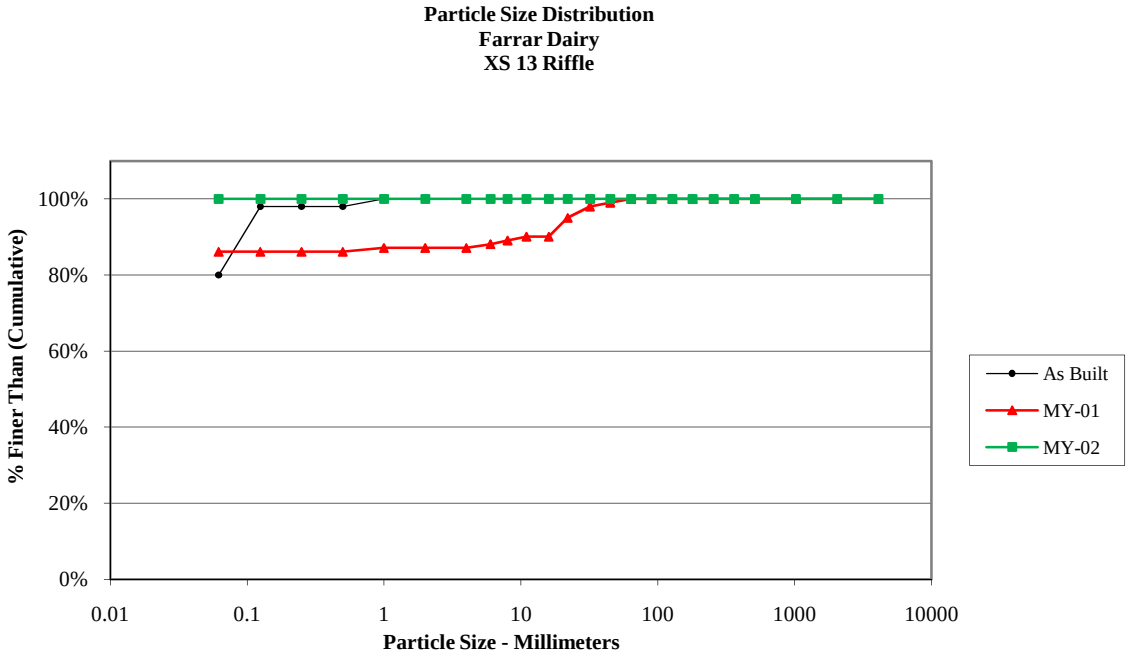
Size (mm)	
D16	0.068
D35	0.078
D50	0.087
D65	0.097
D84	0.11
D95	0.12

Size Distribution	
mean	0.1
dispersion	1.3
skewness	-0.01

Type	
silt/clay	3%
sand	97%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 13 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



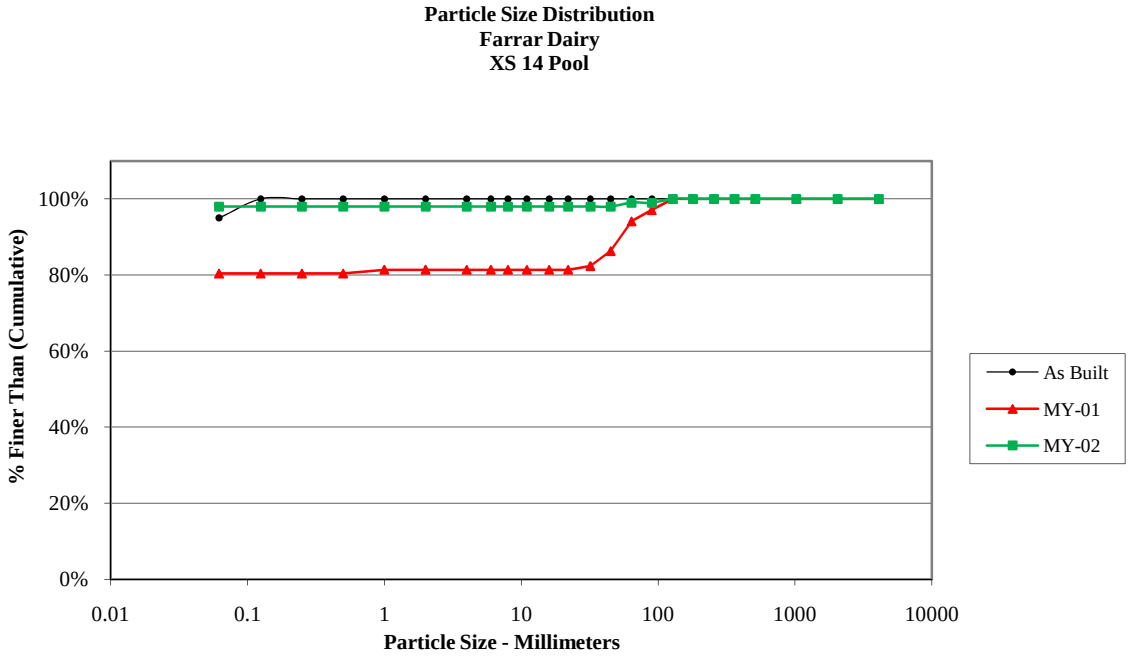
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 14 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	98
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		1
Small	64 - 90	C	
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



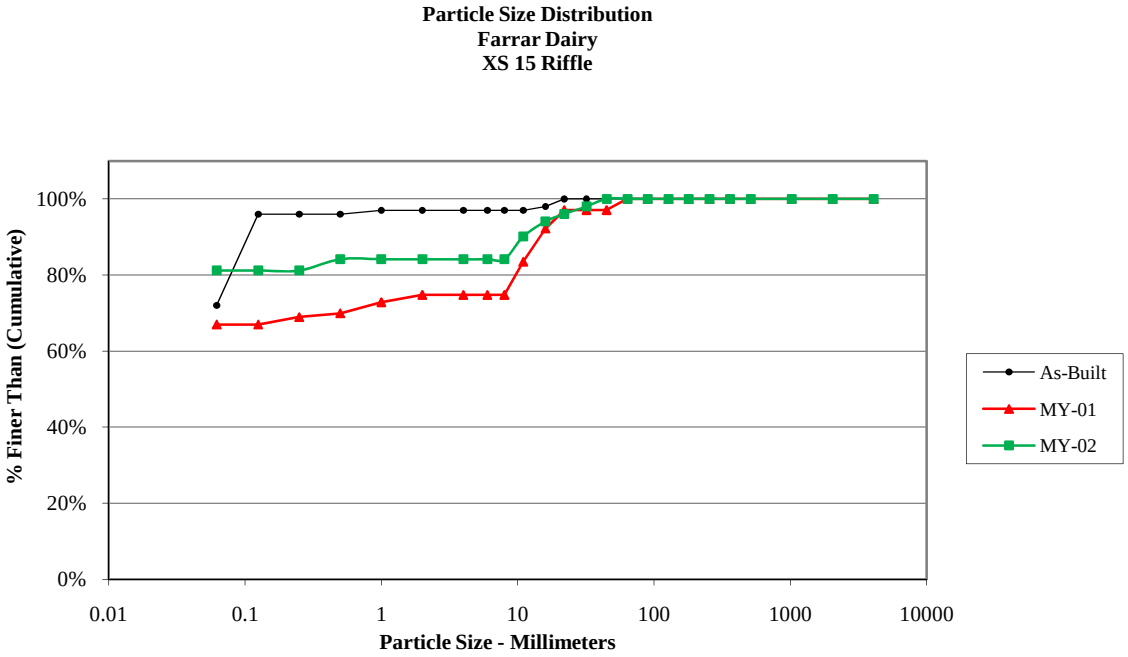
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	98%
sand	0%
gravel	1%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 15 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	82
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	3
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	6
Medium	11.3 - 16	V	4
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	2
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	101

Note:



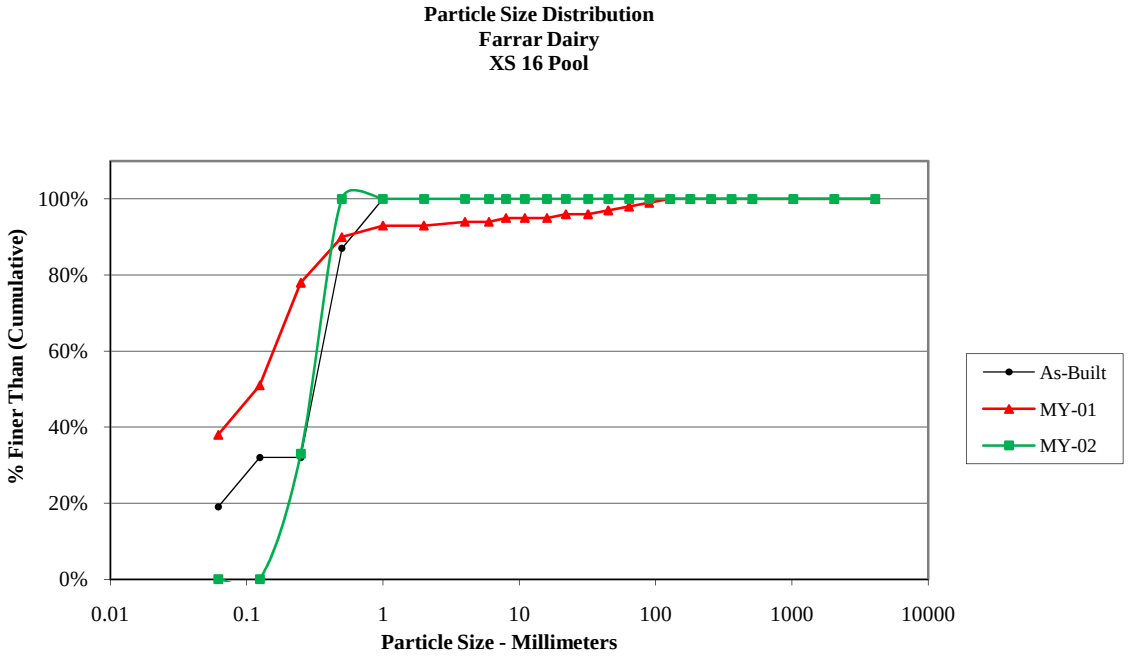
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.48
D95	19

Size Distribution	
mean	0.2
dispersion	4.4
skewness	0.47

Type	
silt/clay	81%
sand	3%
gravel	16%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 16 Pool -MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	33
Medium	.25 - .50	N	67
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



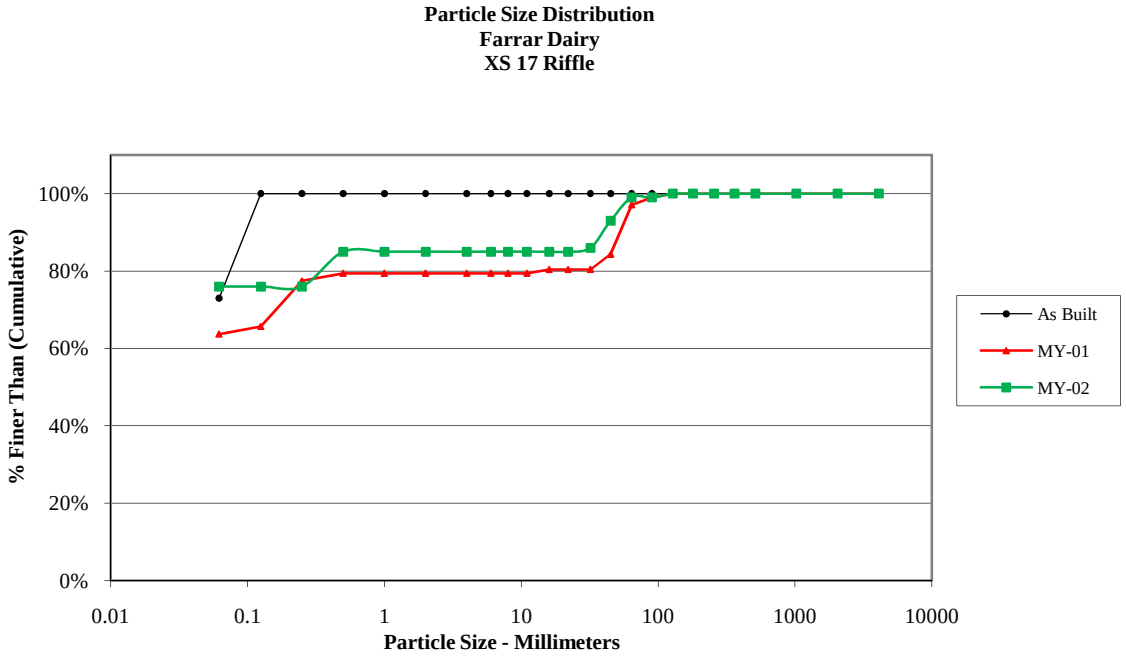
Size (mm)	
D16	0.17
D35	0.26
D50	0.3
D65	0.35
D84	0.42
D95	0.47

Size Distribution	
mean	0.3
dispersion	1.6
skewness	-0.08

Type	
silt/clay	0%
sand	100%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 17 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	76
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	9
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	1
Very Coarse	32 - 45	S	7
Very Coarse	45 - 64		6
Small	64 - 90	C	
Small	90 - 128	O	1
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



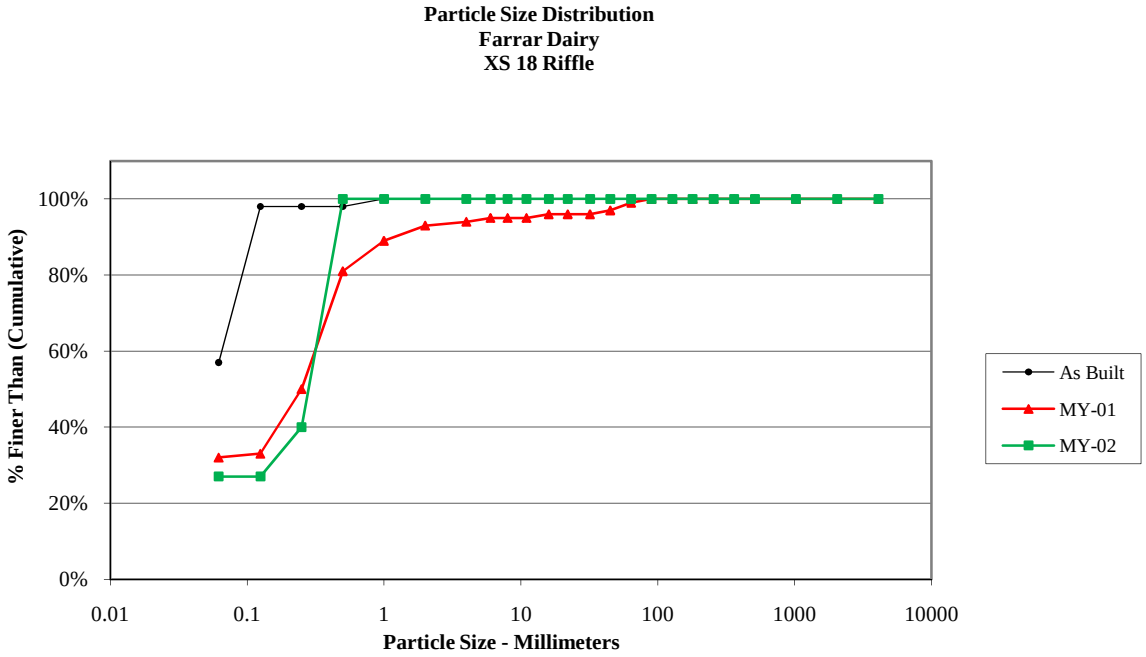
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.46
D95	51

Size Distribution	
mean	0.2
dispersion	4.2
skewness	0.47

Type	
silt/clay	76%
sand	9%
gravel	14%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 18 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	27
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	13
Medium	.25 - .50	N	60
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



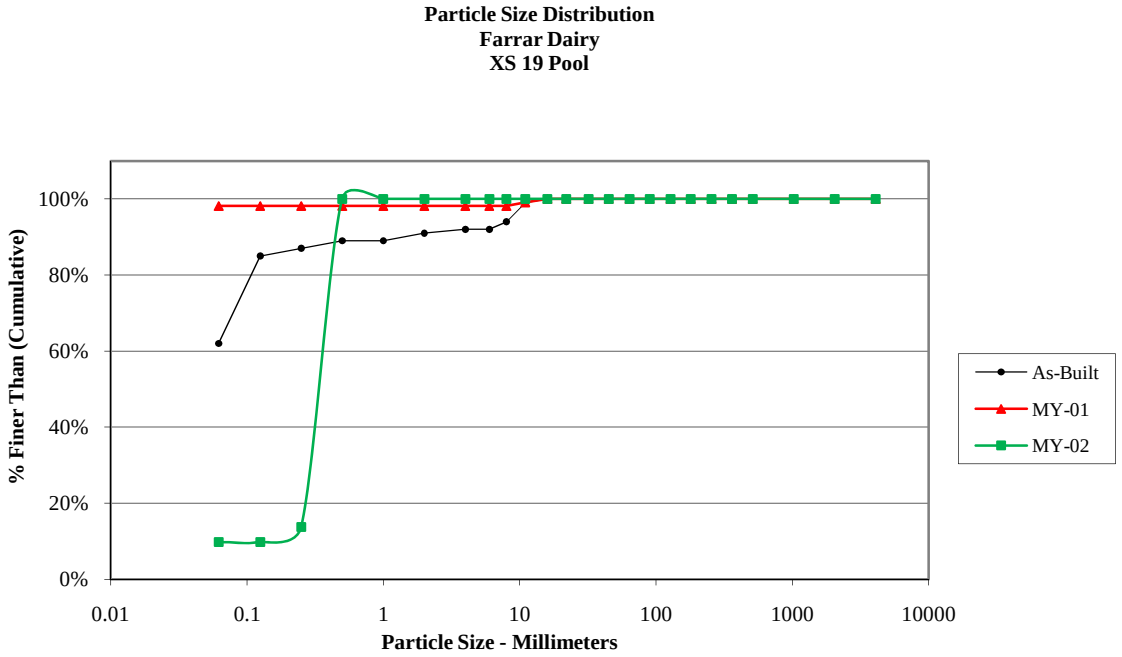
Size (mm)	
D16	0.062
D35	0.19
D50	0.28
D65	0.33
D84	0.42
D95	0.47

Size Distribution	
mean	0.2
dispersion	3.0
skewness	-0.26

Type	
silt/clay	27%
sand	73%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 19 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	10
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	4
Medium	.25 - .50	N	88
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	102

Note:



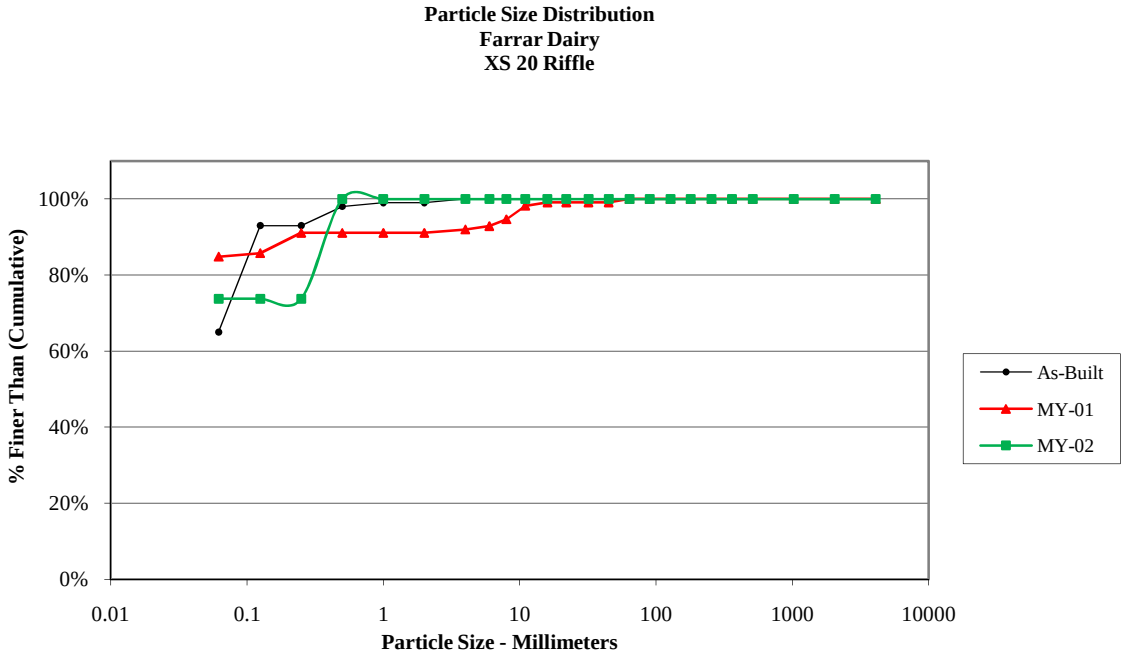
Size (mm)	
D16	0.25
D35	0.3
D50	0.33
D65	0.38
D84	0.44
D95	0.48

Size Distribution	
mean	0.3
dispersion	1.3
skewness	0.00

Type	
silt/clay	10%
sand	90%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 20 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	73
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	26
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	99

Note:



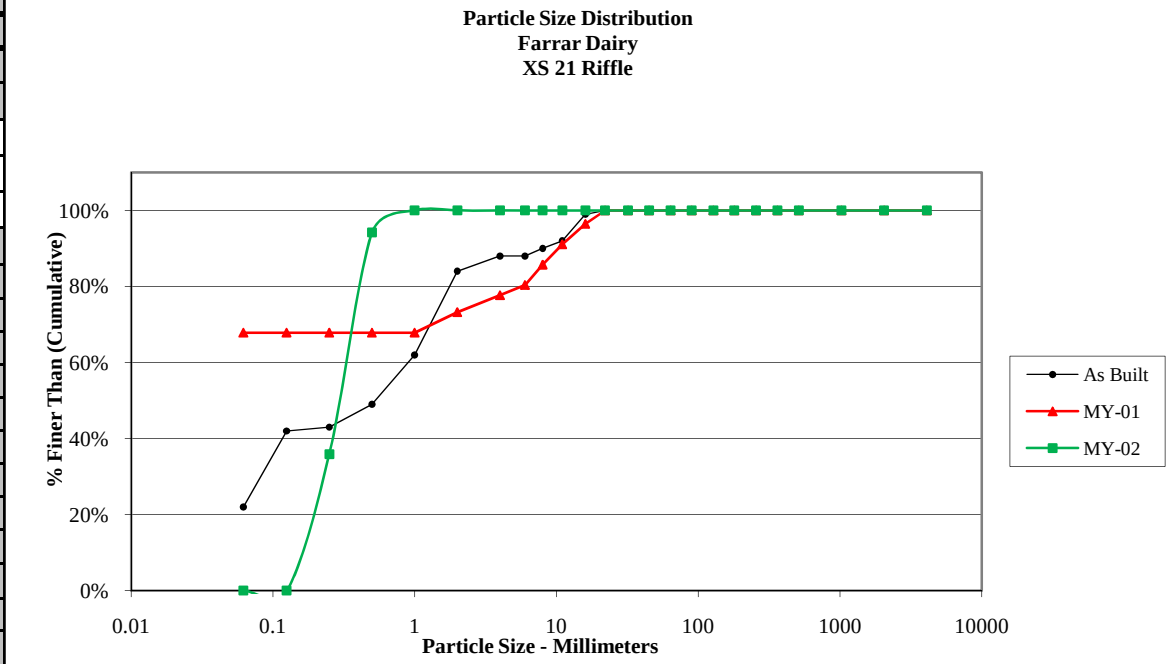
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.33
D95	0.44

Size Distribution	
mean	0.1
dispersion	3.2
skewness	0.43

Type	
silt/clay	74%
sand	26%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 21 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	37
Medium	.25 - .50	N	60
Coarse	.50 - 1	D	6
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	103

Note:



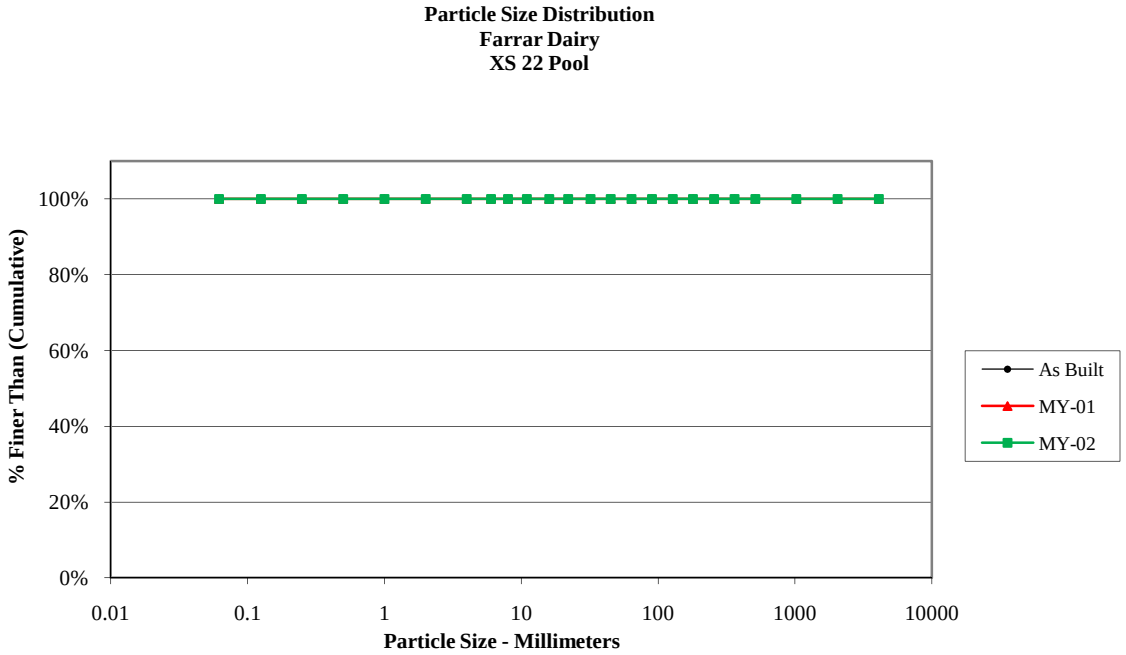
Size (mm)	
D16	0.17
D35	0.25
D50	0.3
D65	0.35
D84	0.44
D95	0.55

Size Distribution	
mean	0.3
dispersion	1.6
skewness	-0.06

Type	
silt/clay	0%
sand	100%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 22 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



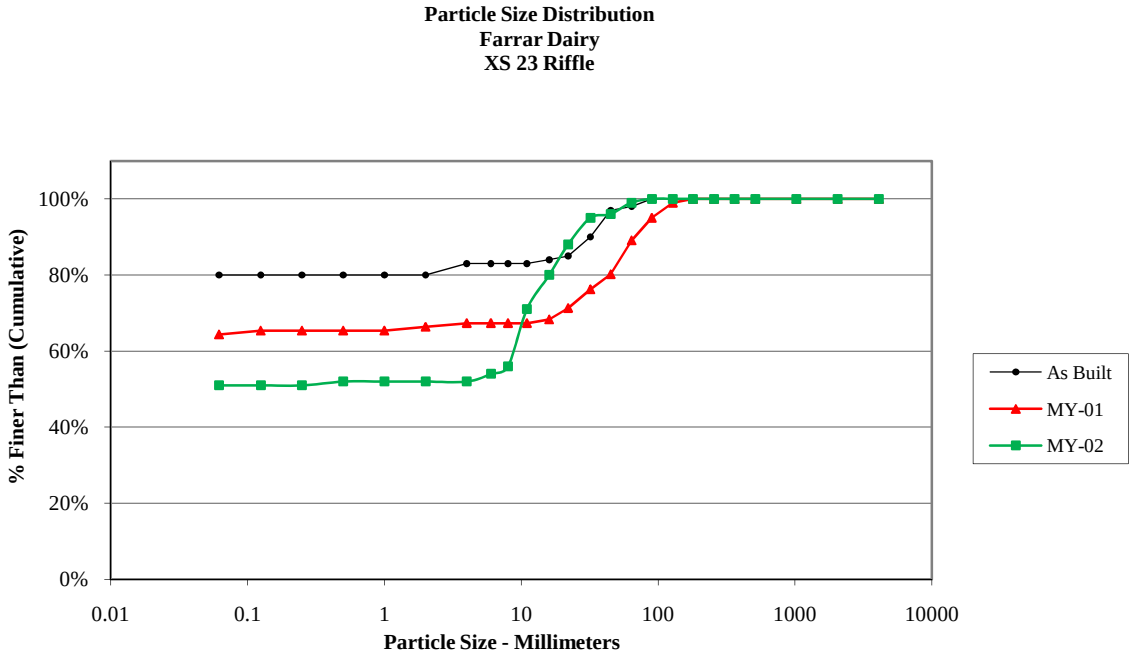
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 23 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	51
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	1
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	2
Medium	8 - 11.3	A	15
Medium	11.3 - 16	V	9
Coarse	16 - 22.6	E	8
Coarse	22.6 - 32	L	7
Very Coarse	32 - 45	S	1
Very Coarse	45 - 64		3
Small	64 - 90	C	1
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



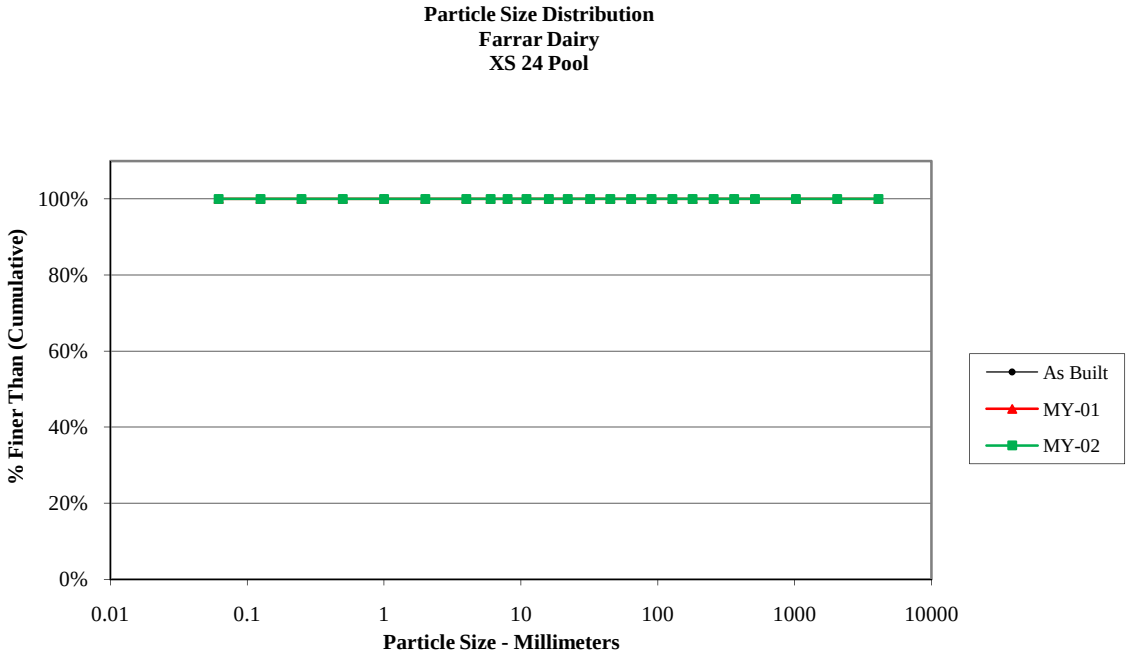
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	9.7
D84	19
D95	32

Size Distribution	
mean	1.1
dispersion	153.7
skewness	0.79

Type	
silt/clay	51%
sand	1%
gravel	47%
cobble	1%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 24 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



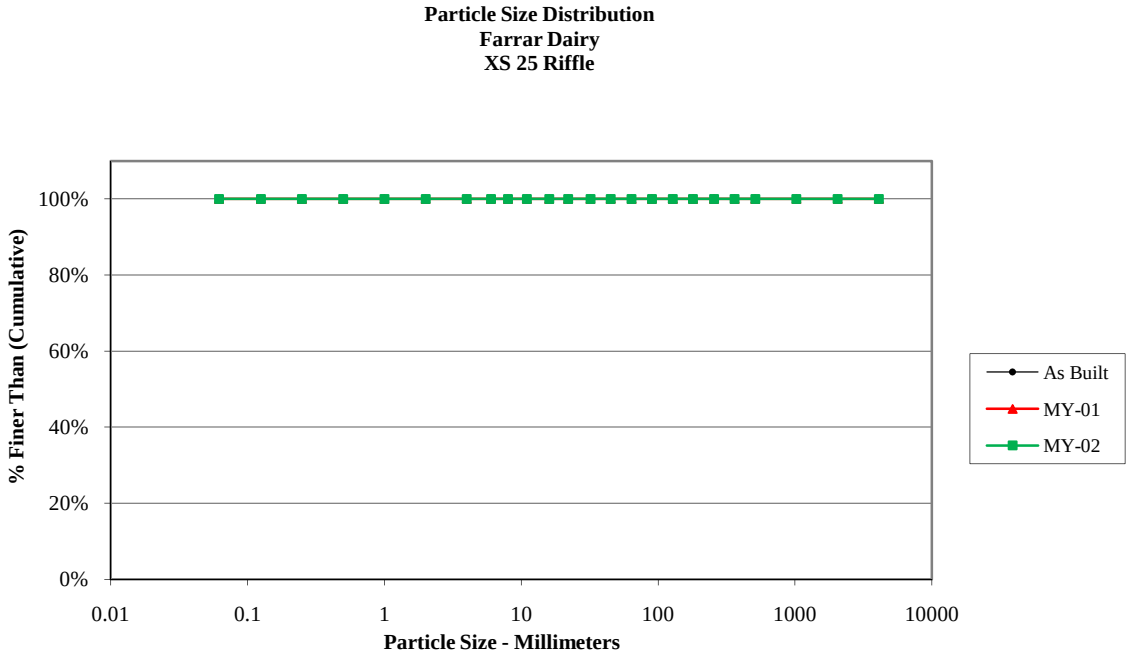
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 25 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	100
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



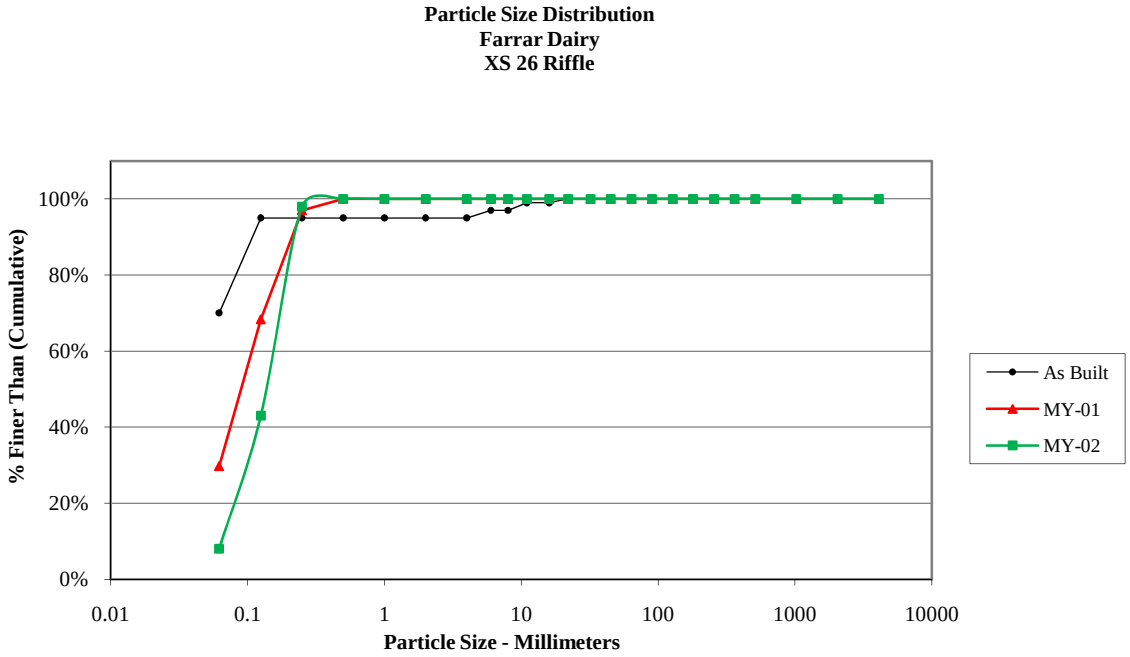
Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.062
D84	0.062
D95	0.062

Size Distribution	
mean	0.1
dispersion	1.0
skewness	---

Type	
silt/clay	100%
sand	0%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 26 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	8
Very Fine	.062 - .125	S	35
Fine	.125 - .25	A	55
Medium	.25 - .50	N	2
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



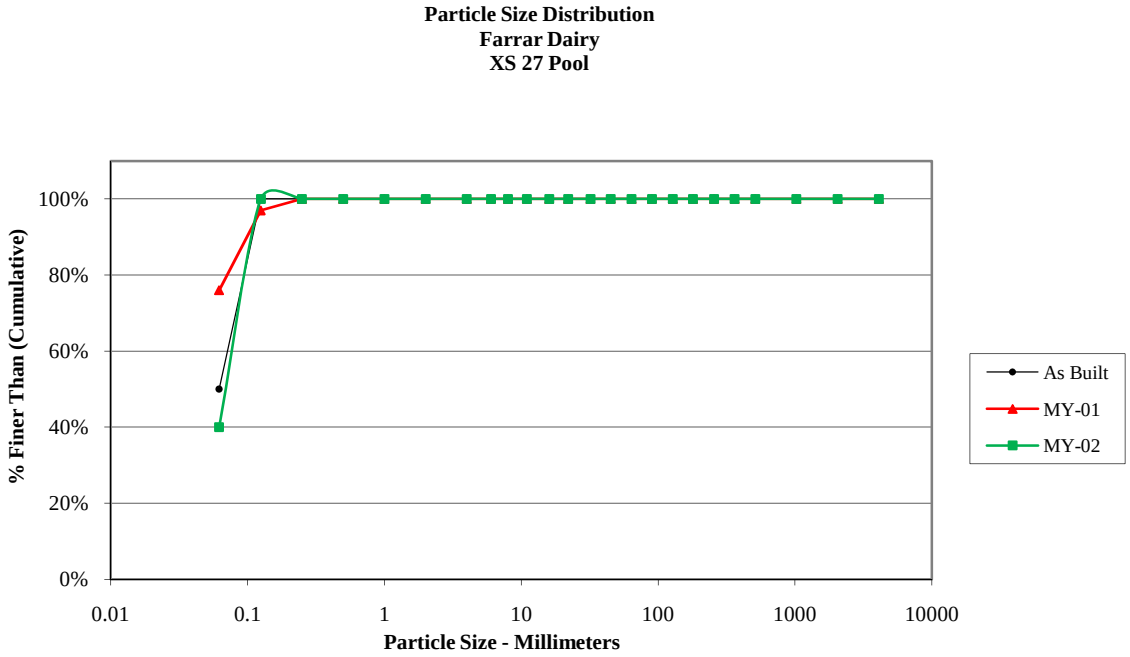
Size (mm)	
D16	0.073
D35	0.11
D50	0.14
D65	0.16
D84	0.21
D95	0.24

Size Distribution	
mean	0.1
dispersion	1.7
skewness	-0.08

Type	
silt/clay	8%
sand	92%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 27 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	40
Very Fine	.062 - .125	S	60
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



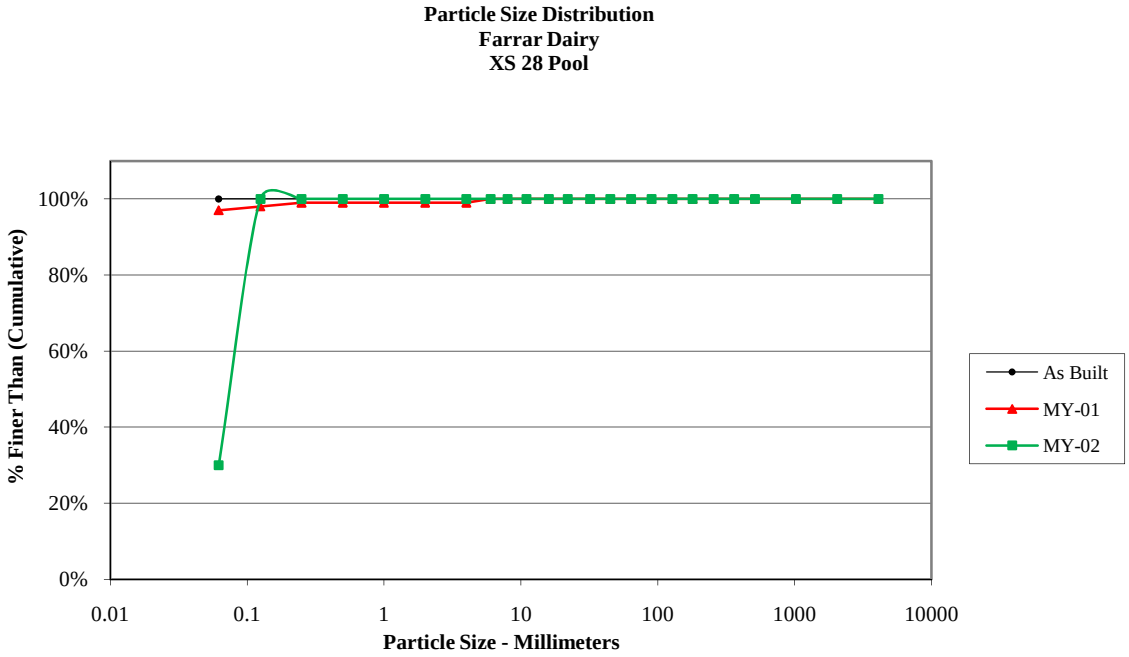
Size (mm)	
D16	0.062
D35	0.062
D50	0.07
D65	0.083
D84	0.1
D95	0.12

Size Distribution	
mean	0.1
dispersion	1.3
skewness	0.11

Type	
silt/clay	40%
sand	60%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 28 Pool - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	30
Very Fine	.062 - .125	S	70
Fine	.125 - .25	A	
Medium	.25 - .50	N	
Coarse	.50 - 1	D	
Very Coarse	1 - 2	S	
Very Fine	2 - 4		
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	100

Note:



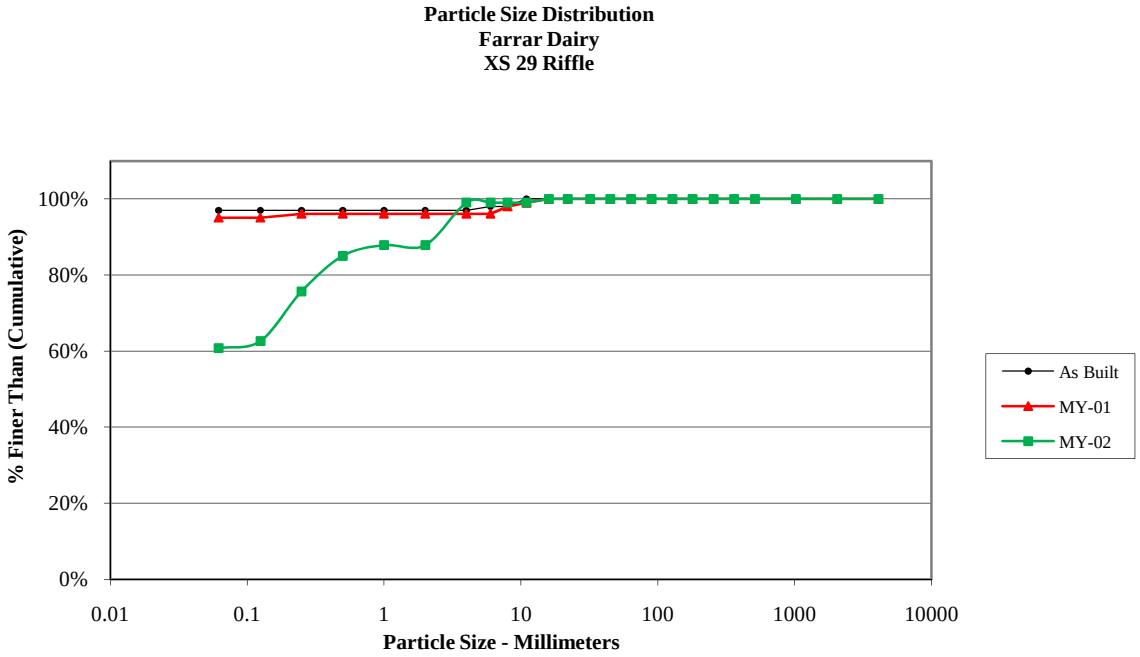
Size (mm)	
D16	0.062
D35	0.065
D50	0.076
D65	0.088
D84	0.11
D95	0.12

Size Distribution	
mean	0.1
dispersion	1.3
skewness	0.07

Type	
silt/clay	30%
sand	70%
gravel	0%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Cross-Section 29 Riffle - MY-02			
Particle	Millimeter		Count
Silt/Clay	< 0.062	S/C	65
Very Fine	.062 - .125	S	2
Fine	.125 - .25	A	14
Medium	.25 - .50	N	10
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	
Very Fine	2 - 4		12
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	1
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		Total	107

Note:

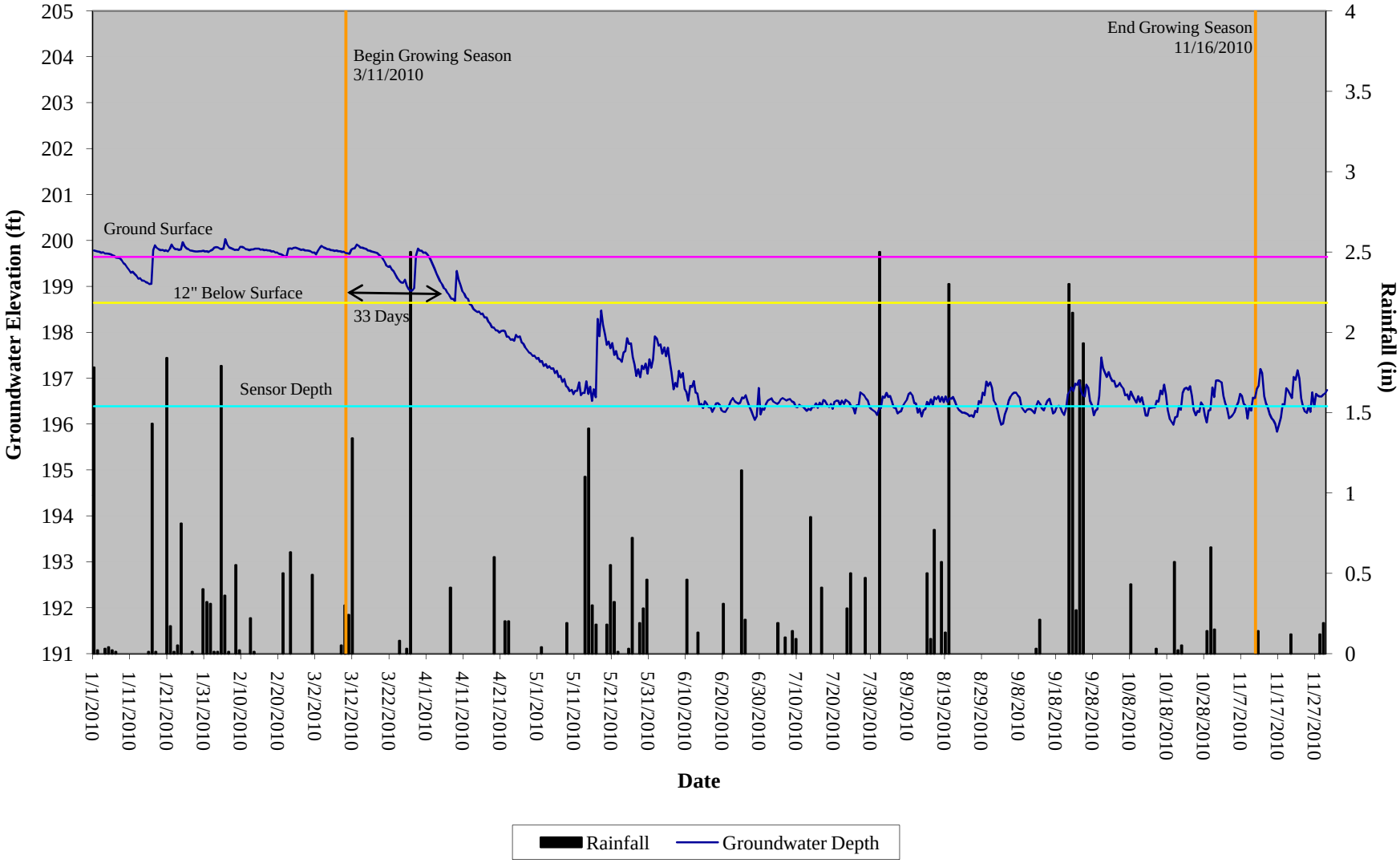


Size (mm)	
D16	0.062
D35	0.062
D50	0.062
D65	0.14
D84	0.46
D95	3.1

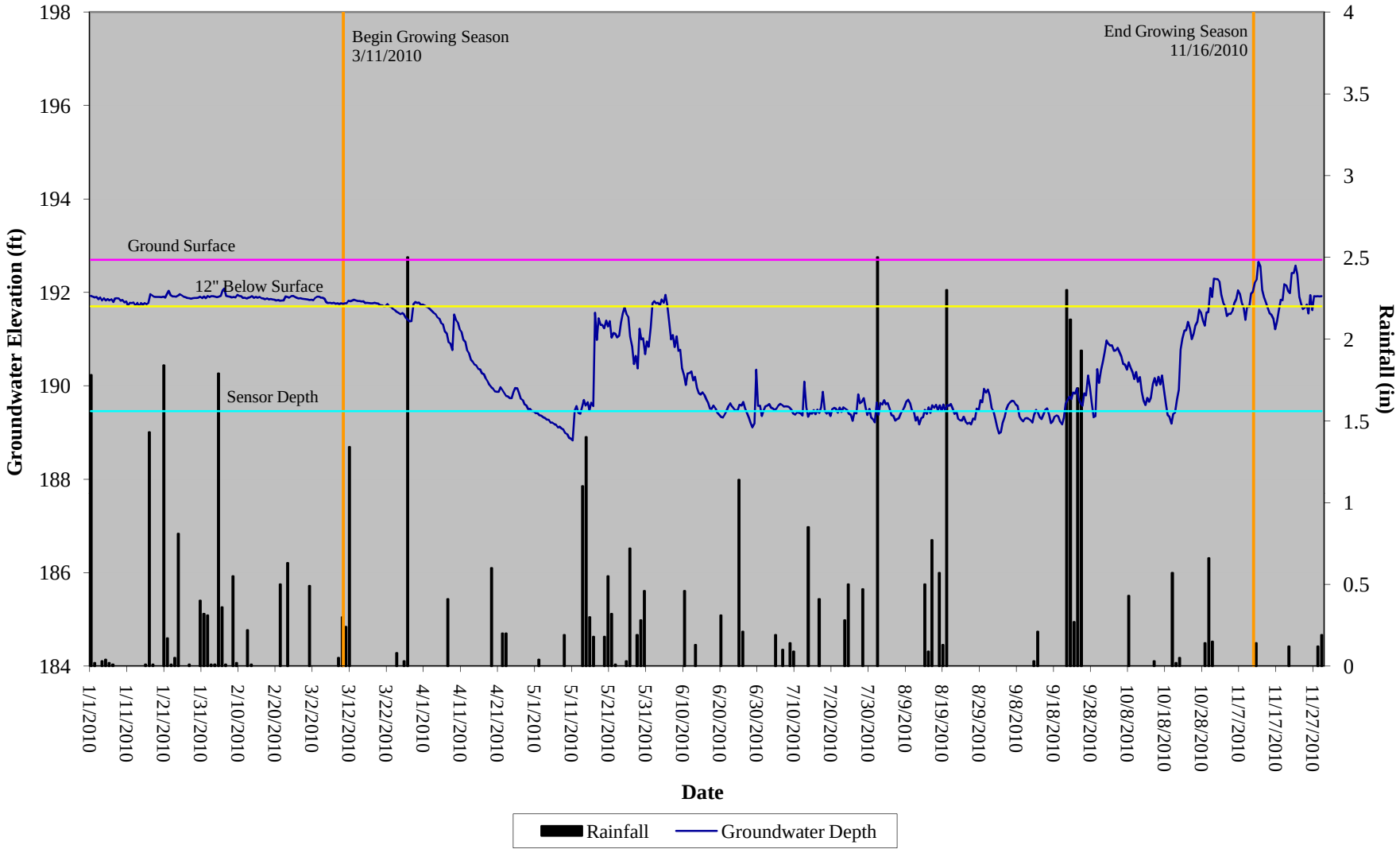
Size Distribution	
mean	0.2
dispersion	4.2
skewness	0.47

Type	
silt/clay	61%
sand	27%
gravel	12%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

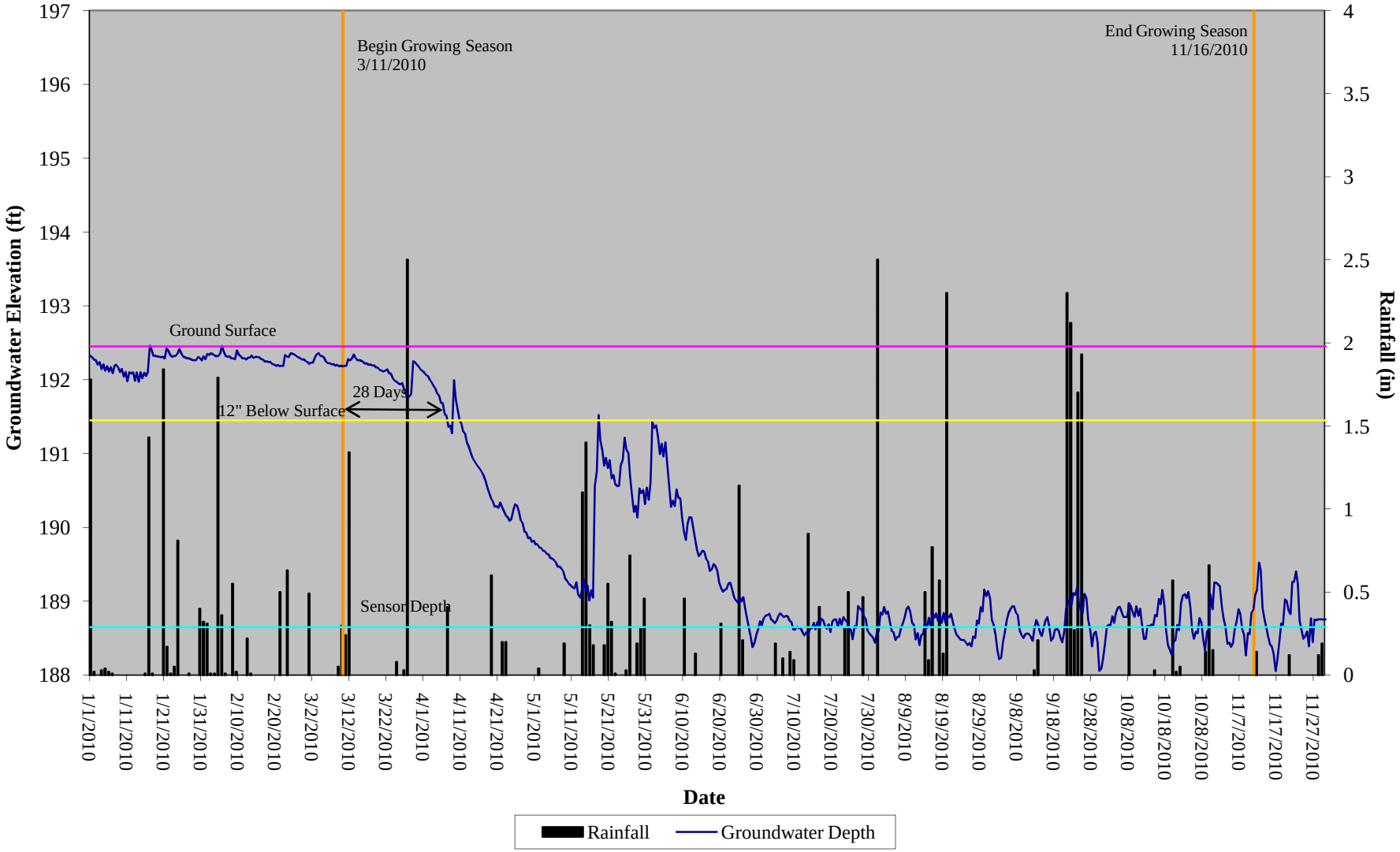
Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 1



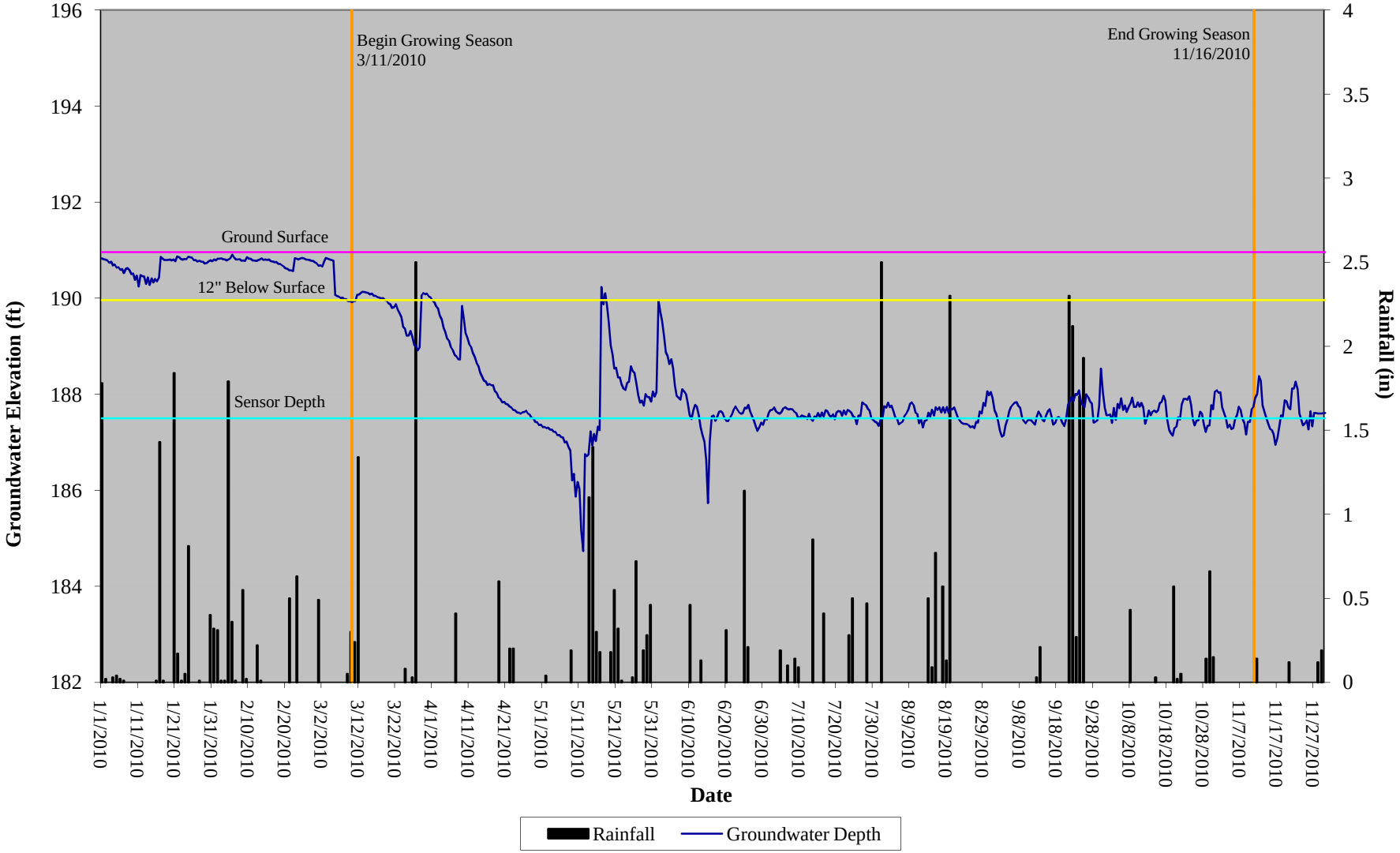
Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 2

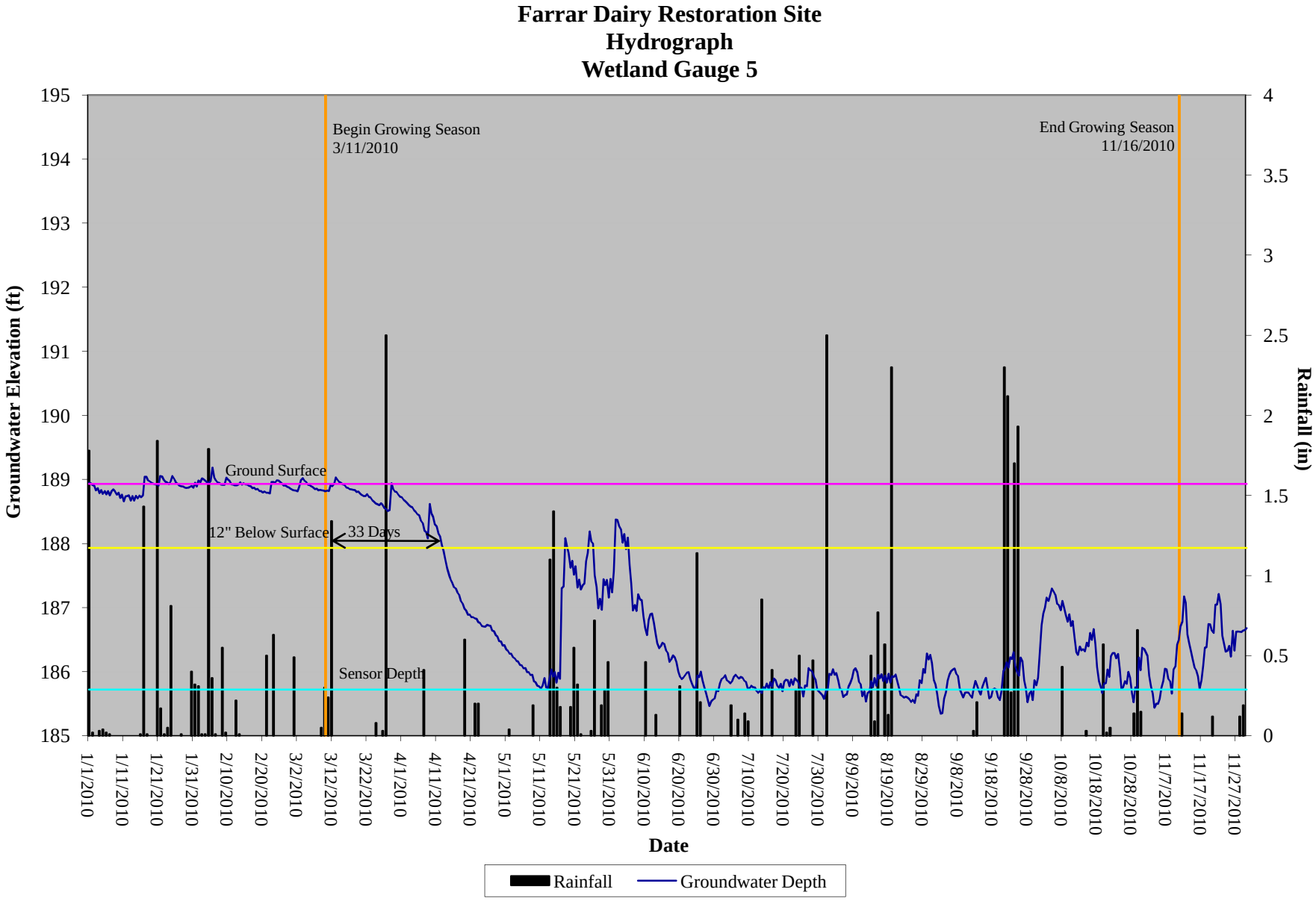


Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 3

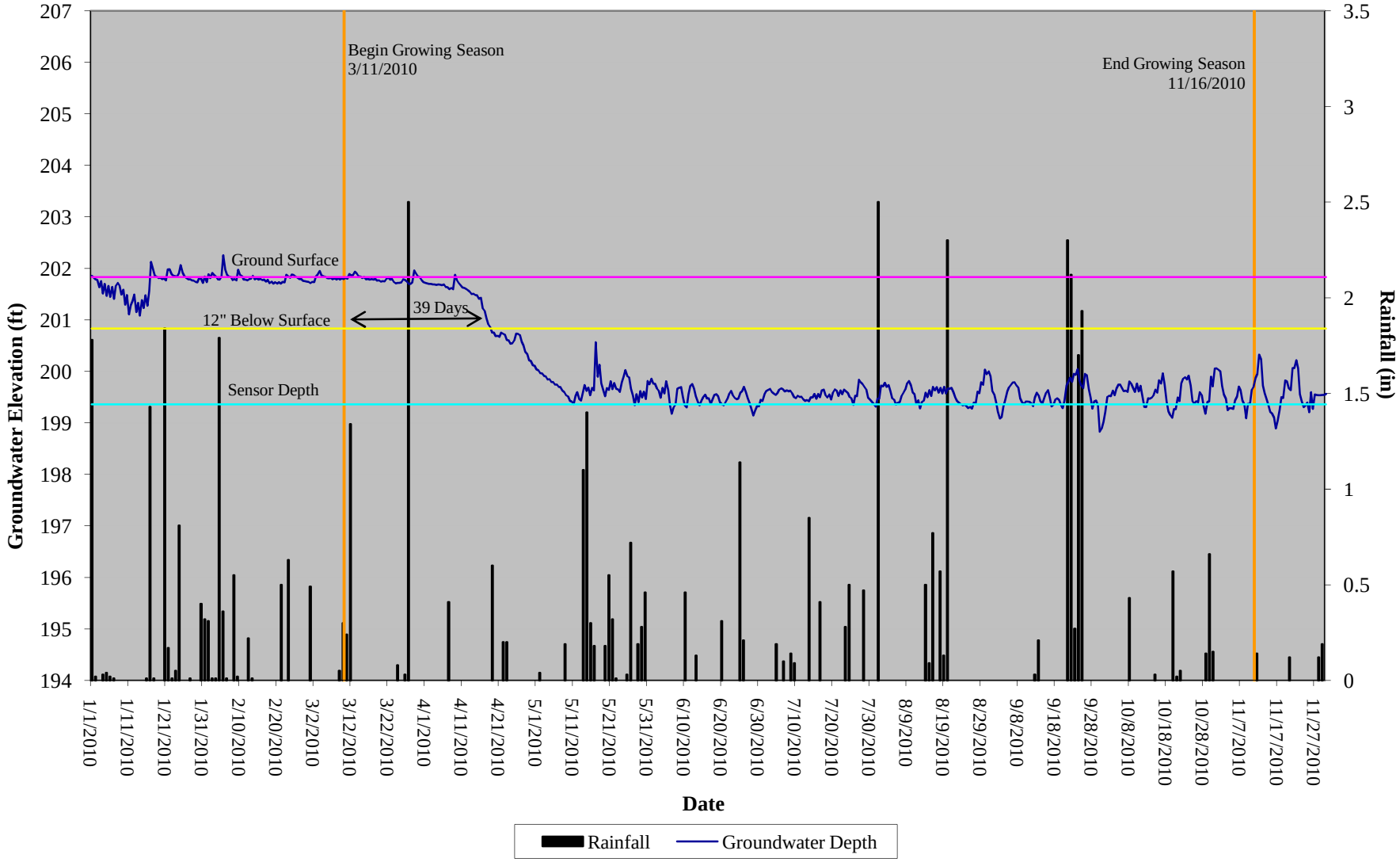


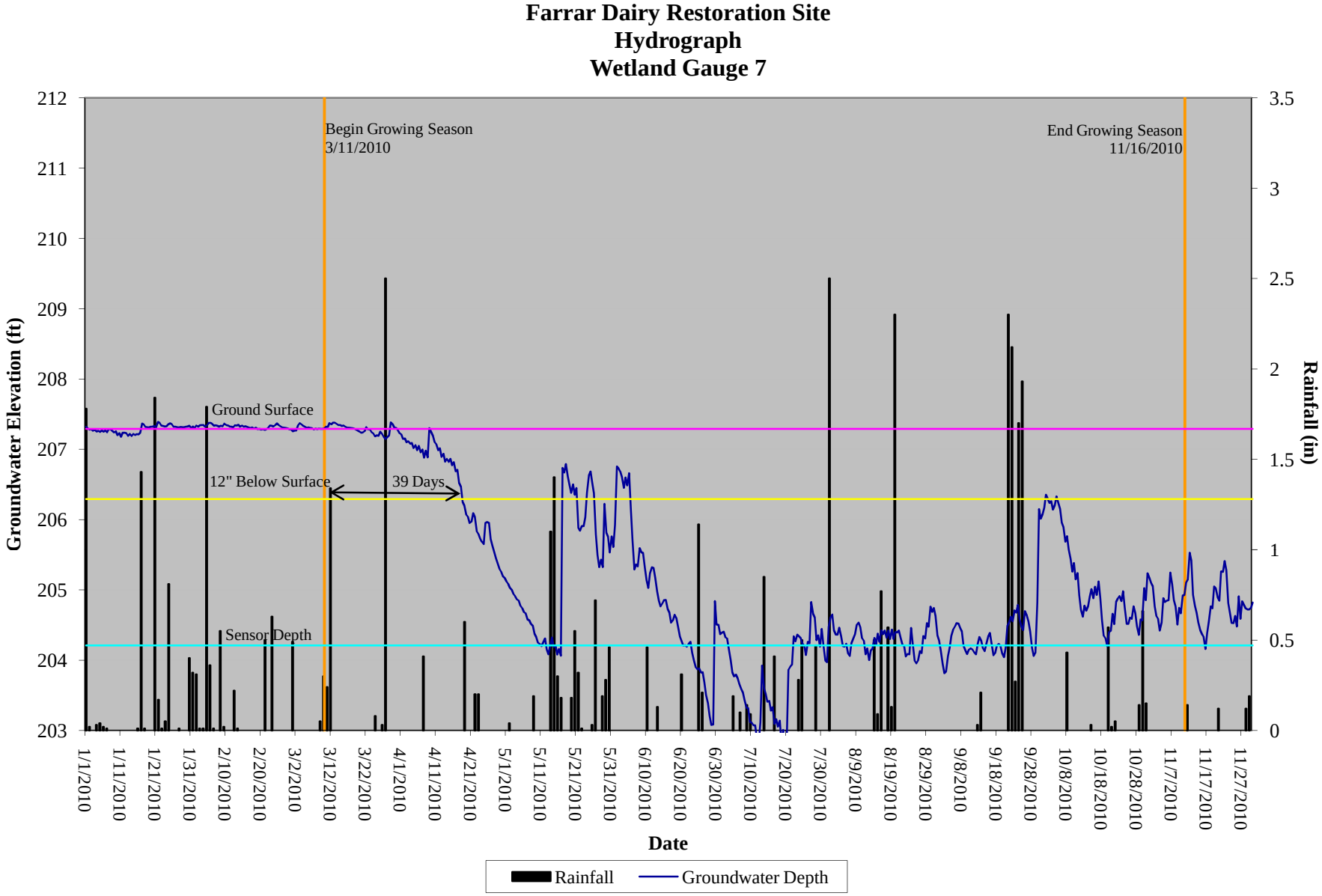
Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 4



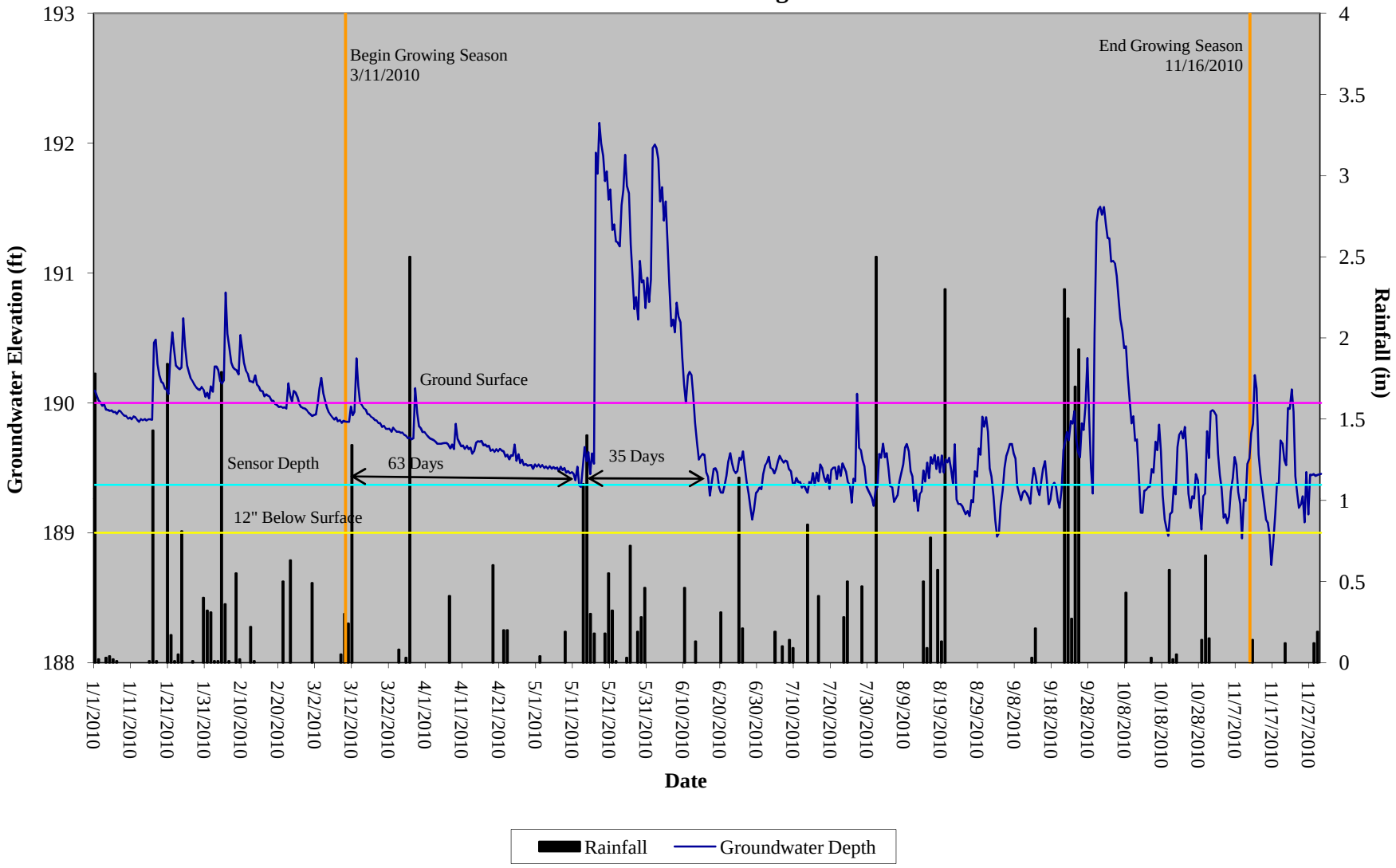

Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 5
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
3/11/2010
End Growing Season
11/16/2010
Ground Surface
12" Below Surface
33 Days
Sensor Depth
Date
Rainfall
Groundwater Depth

Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 6



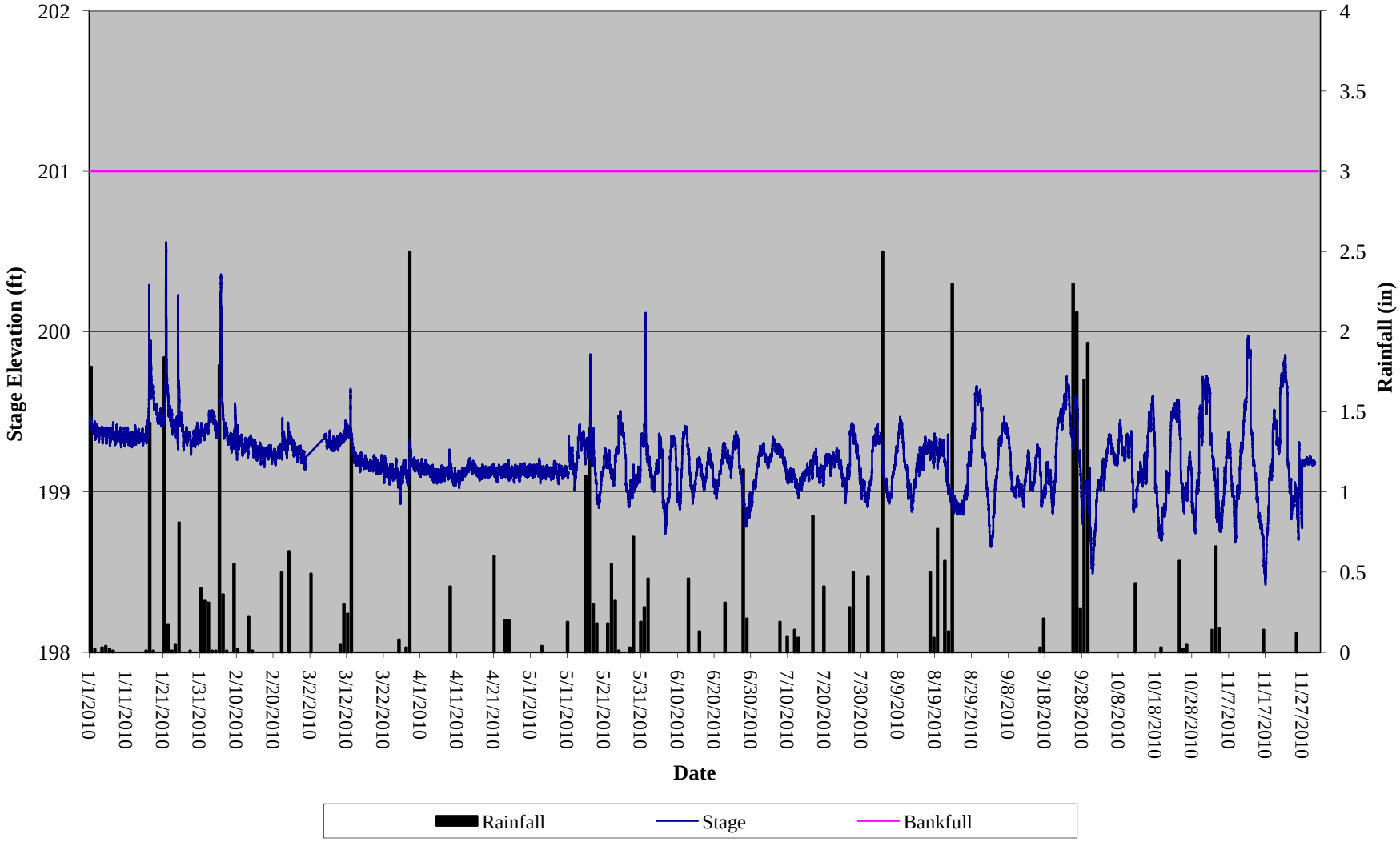

Farrar Dairy Restoration Site
Hydrograph
Wetland Gauge 7
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season
3/11/2010
End Growing Season
11/16/2010
Ground Surface
12" Below Surface
39 Days
Sensor Depth
212
211
210
209
208
207
206
205
204
203
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2010
1/11/2010
1/21/2010
1/31/2010
2/10/2010
2/20/2010
3/2/2010
3/12/2010
3/22/2010
4/1/2010
4/11/2010
4/21/2010
5/1/2010
5/11/2010
5/21/2010
5/31/2010
6/10/2010
6/20/2010
6/30/2010
7/10/2010
7/20/2010
7/30/2010
8/9/2010
8/19/2010
8/29/2010
9/8/2010
9/18/2010
9/28/2010
10/8/2010
10/18/2010
10/28/2010
11/7/2010
11/17/2010
11/27/2010
Date
Rainfall
Groundwater Depth

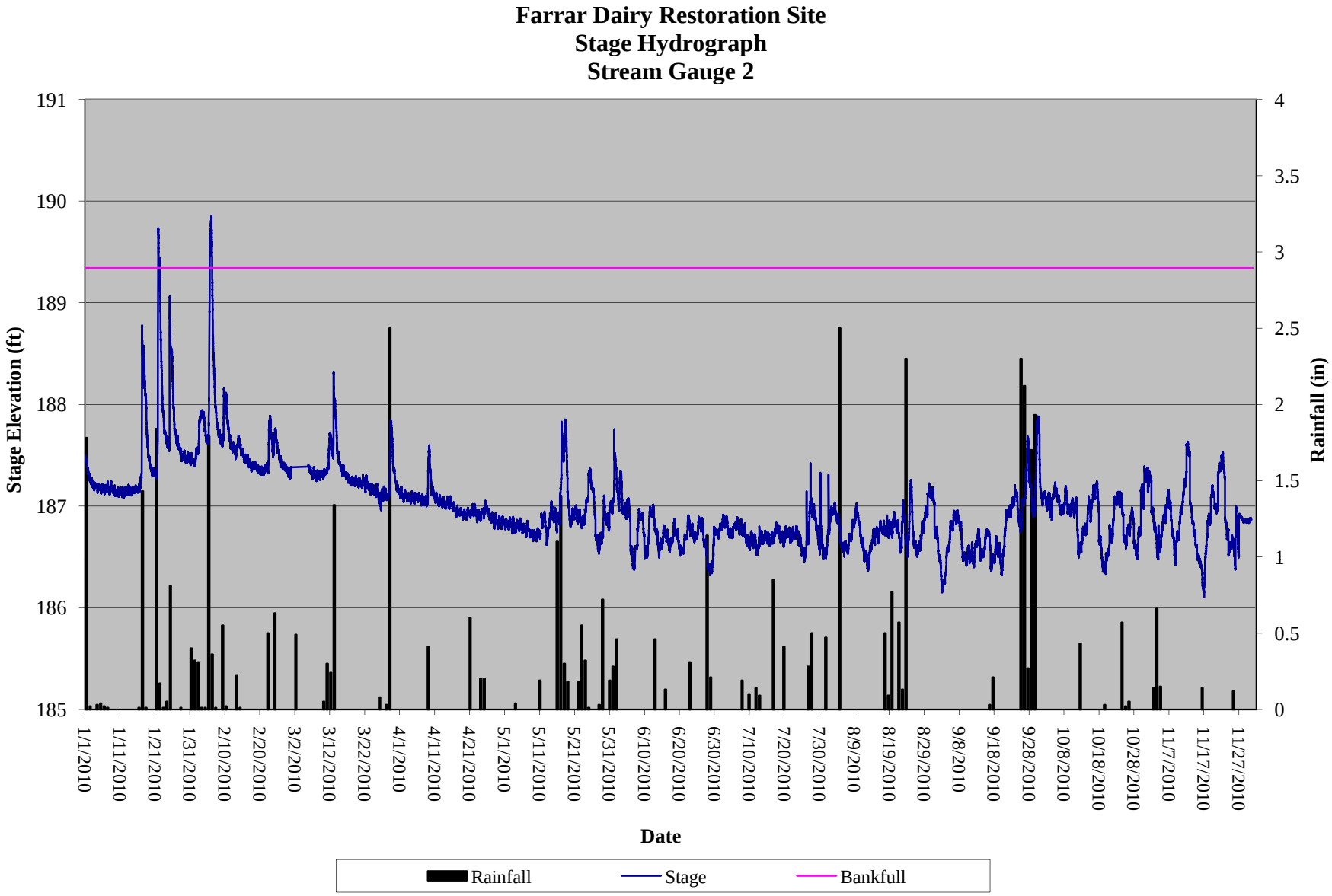
Farrar Dairy Restoration Site
Hydrograph
Reference Gauge



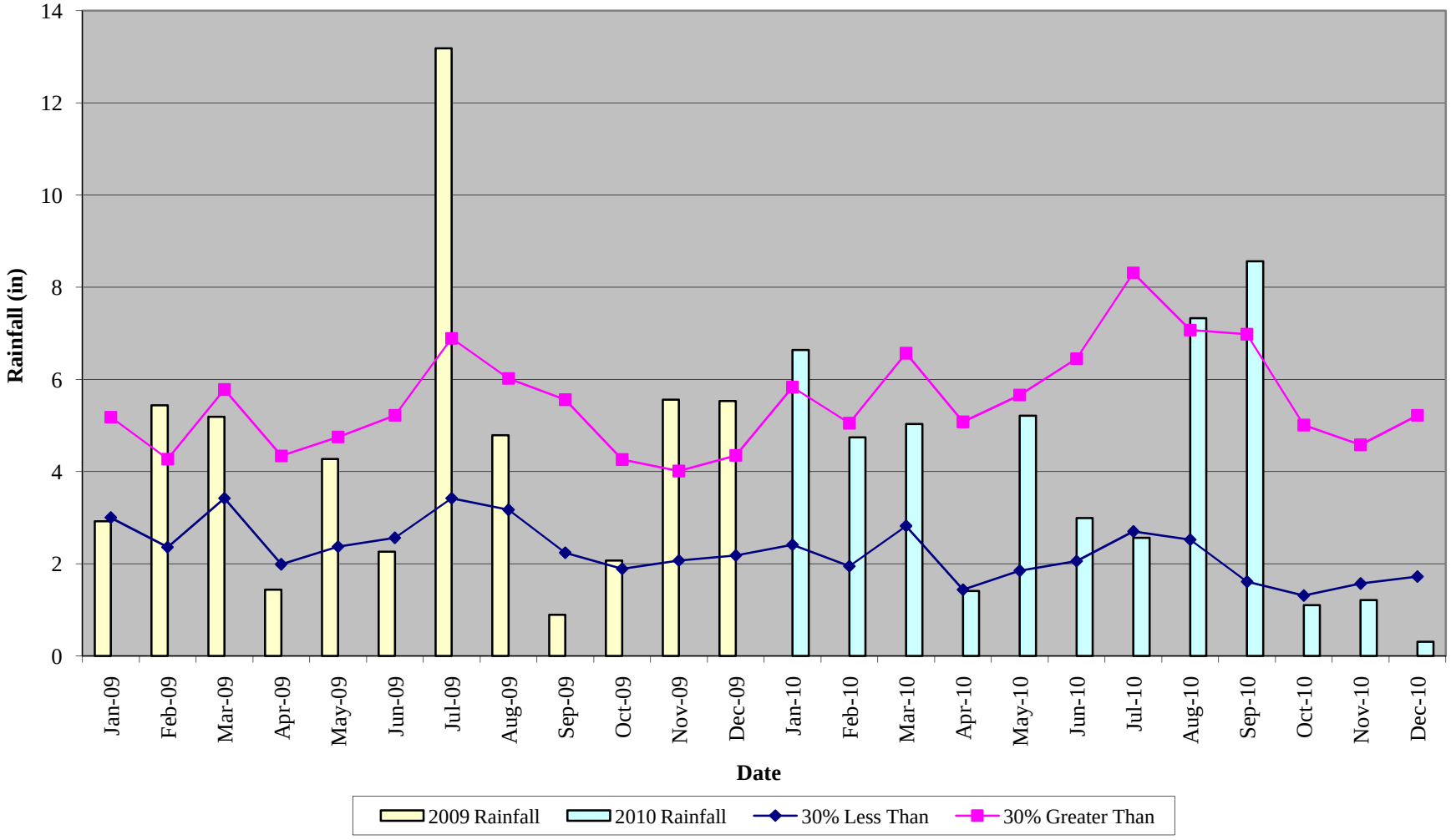
*Sensor elevation higher than jurisdictional elevation. Sensor depth will be lowered for Monitoring Year 3.

Farrar Dairy Restoration Site
Stage Hydrograph
Stream Gauge 1




Farrar Dairy Restoration Site
Stage Hydrograph
Stream Gauge 2
Stage Elevation (ft)
Rainfall (in)
191
190
189
188
187
186
185
4
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2010
1/11/2010
1/21/2010
1/31/2010
2/10/2010
2/20/2010
3/2/2010
3/12/2010
3/22/2010
4/1/2010
4/11/2010
4/21/2010
5/1/2010
5/11/2010
5/21/2010
5/31/2010
6/10/2010
6/20/2010
6/30/2010
7/10/2010
7/20/2010
7/30/2010
8/9/2010
8/19/2010
8/29/2010
9/8/2010
9/18/2010
9/28/2010
10/8/2010
10/18/2010
10/28/2010
11/7/2010
11/17/2010
11/27/2010
Date
Rainfall
Stage
Bankfull

Farrar 30-70 Percentile Graph 2009-2010
Lillington, NC Monthly Rainfall



Appendix D
Current Condition Plan View

SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

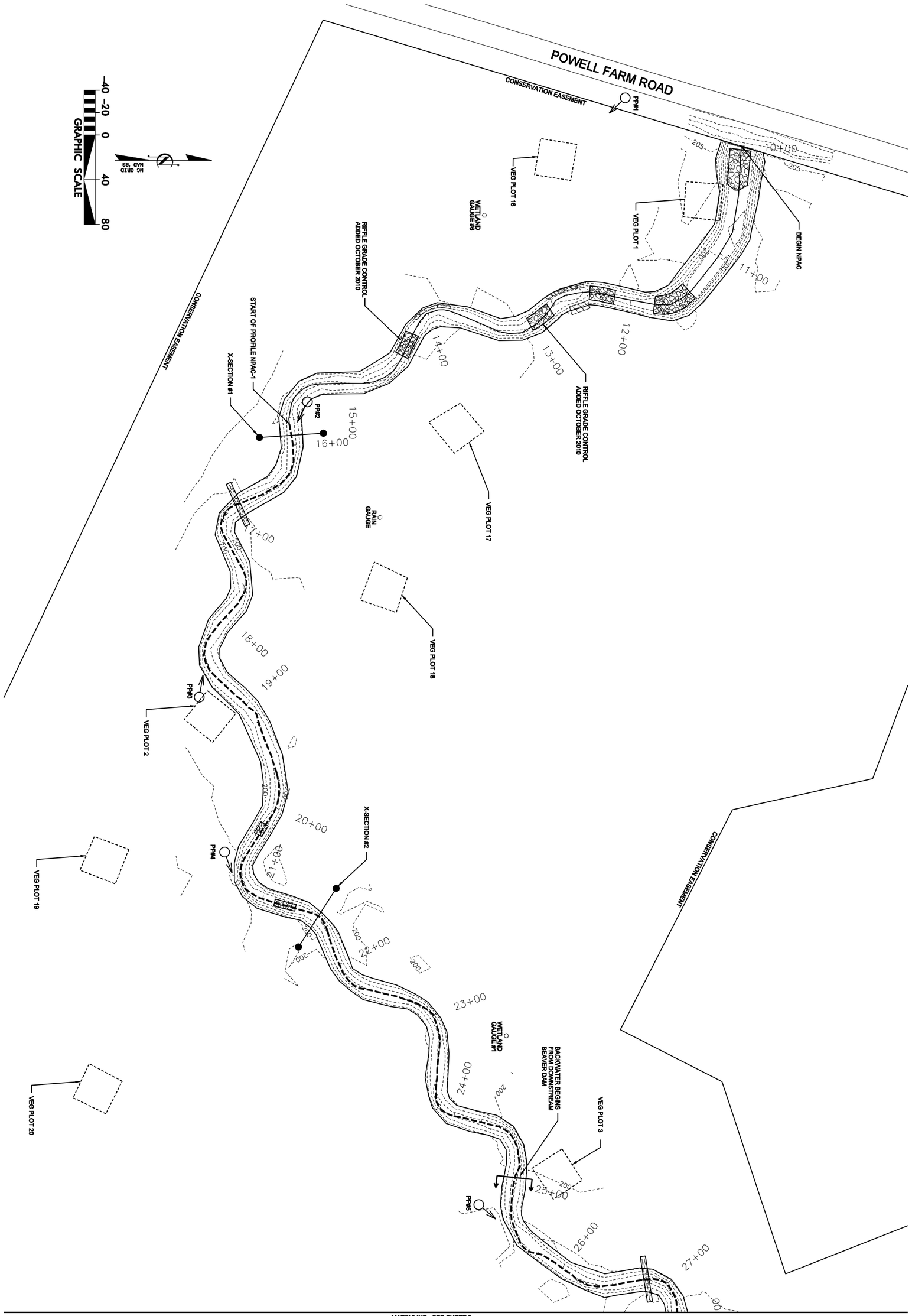
KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA

DATE: DEC 2010
SCALE: 1"=400'

CURRENT CONDITION PLAN VIEW

SHEET 1 OF 11



MATCHLINE - SEE SHEET 3

FARRAR DAIRY
STREAM AND WETLAND RESTORATION

LILLINGTON, HARNETT COUNTY, NORTH CAROLINA

NPAC - STATION 10+00 TO STATION 27+17

CURRENT CONDITION PLAN VIEW

SHEET 2 OF 11

DATE: DEC 2010

SCALE: 1"=80'

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

Ecosystem Enhancement Program

SYM.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

SEE SHEETS 7 - 9 FOR T1.1, T1.2, AND T1

CONSERVATION EASEMENT

CONSERVATION EASEMENT

X-SECTION #21

VEG PLOT 4

PP#26

END OF PROFILE NPAC-1

END OF PROFILE T1

PP#6

PP#7

BACKWATER BEGINS FROM DOWNSTREAM BEAVER DAM

BEAVER DAM

BEAVER DAM

X-SECTION #3

VEG PLOT 21

X-SECTION #4

VEG PLOT 22

VEG PLOT 23

PP#8

MATCHLINE - SEE SHEET 2

MATCHLINE - SEE SHEET 4

BANK EROSION

VEG PLOT 5

NC GRID
MAG 6°

–40 –20 0 40 80

GRAPHIC SCALE

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION

LILLINGTON, HARNETT COUNTY, NORTH CAROLINA

NPAC - STATION 27+17 TO STATION 40+51

DATE: DEC 2010

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

CONSERVATION EASEMENT

40+00

MATCHLINE - SEE SHEET 3

41+00

VEG PLOT 24

42+00

BEAVER DAM

X-SECTION #5

43+00

44+00

PP#9

PP#10

PP#11

45+00

VEG PLOT 25

X-SECTION #6

46+00

47+00

48+00

49+00

50+00

BEAVER DAM

BANK SCOUR AROUND LOG DROP

VEG PLOT 6

BANK EROSION

VEG PLOT 45

VEG PLOT 26

WETLAND GAUGE #2

VEG PLOT 27

X-SECTION #7

51+00

52+00

BEAVER DAM

53+00

PP#12

VEG PLOT 28

54+00

VEG PLOT 7

BEAVER DAM

55+00

PP#13

PP#14

MATCHLINE - SEE SHEET 5

VEG PLOT 44

CONSERVATION EASEMENT

CONSERVATION EASEMENT

X-SECTION #25

118+00

END OF PROFILE T2

X-SECTION #24

117+00

PP#29

115+00

SEE SHEET 10 FOR T2

NC GRID NAD 83

–40 –20 0 40 80

GRAPHIC SCALE

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA
NPAC - STATION 40+51 TO STATION 55+39

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

MATCHLINE - SEE SHEET 4

CONSERVATION EASEMENT

VEG PLOT 28

VEG PLOT 29

TOE EROSION

56+00

57+00

START OF PROFILE NPAC-2

X-SECTION #8

58+00

59+00

PP#15

60+00

BANK EROSION

VEG PLOT 43

VEG PLOT 41

WETLAND GAUGE #3

VEG PLOT 42

VEG PLOT 40

CONSERVATION EASEMENT

CONSERVATION EASEMENT

VEG PLOT 30

WETLAND GAUGE #4

TOE EROSION

61+00

62+00

63+00

X-SECTION #9

VEG PLOT 8

64+00

PP#17

PP#16

END OF PROFILE NPAC-2

X-SECTION #10

STREAM GAUGE #2

65+00

VEG PLOT 39

MATCHLINE - SEE SHEET 6

VEG PLOT 32

66+99

67+00

VEG PLOT 9

68+00

PP#18

69+

41+00

40+00

END OF PROFILE T3

39+06

PP#32

X-SECTION #29

38+00

VEG PLOT 15

X-SECTION #28

37+00

X-SECTION #27

PP#31

36+00

SEE SHEET 11 FOR T3

VEG PLOT 35

WETLAND GAUGE #5

VEG PLOT 36

NC GRID NAD '83

–40 –20 0 40 80

GRAPHIC SCALE

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

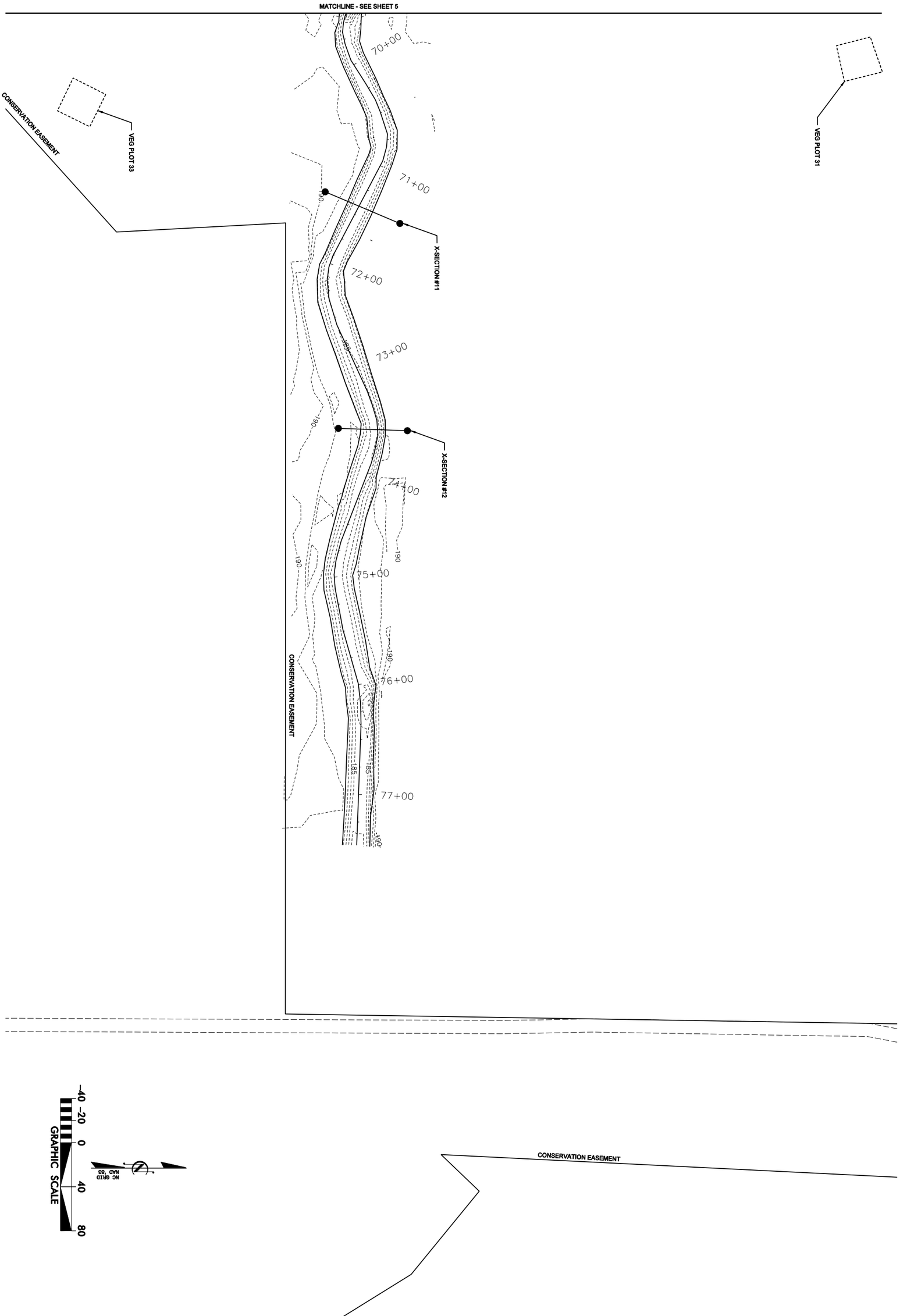
Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA
NPAC - STATION 55+39 TO STATION 69+51

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW



B	REVISED MAIN CHANNEL GRADING PROFILE		
SYM.	DESCRIPTION	DATE	APPROVED

REVISIONS

CURRENT CONDITION PLAN VIEW

SHEET 6 OF 11

DATE: DEC 2010

SCALE: 1"=80'

FARRAR DAIRY
STREAM AND WETLAND RESTORATION

LILLINGTON, HARNETT COUNTY, NORTH CAROLINA

NPAC - STATION 69+51 TO STATION 77+46

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

Ecosystem Enhancement PROGRAM

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
460 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA
T1.1 - STATION 80+00 TO STATION 88+25

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA
T1.2 - STATION 90+00 TO STATION 99+80

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 8 OF 11

-40 -20 0 40 80

GRAPHIC SCALE

NC GRID NAD '83

SEE SHEETS 7 AND 8 FOR T1.1 AND T1.2

MINOR HEADCUTS

CONSERVATION EASEMENT

BEGIN T1

PP#21

VEG PLOT 12

LOG SILL ADDED OCTOBER 2010

START OF PROFILE T1

PP#24

X-SECTION #19

LOG SILL ADDED OCTOBER 2010

PP#25

X-SECTION #20

STREAM GAUGE #1

X-SECTION #21

PP#26

END OF PROFILE T1

BEAVER DAM

PP#7

BACKWATER BEGINS FROM DOWNSTREAM BEAVER DAM

VEG PLOT 4

VEG PLOT 22

VEG PLOT 21

END OF PROFILE NPAC-1

X-SECTION #3

PP#6

SEE SHEET 3 FOR NPAC

CONSERVATION EASEMENT

CONSERVATION EASEMENT

SEE SHEET 3 FOR NPAC

NO.	DESCRIPTION	DATE	APPROVED
	REVISIONS		

Ecosystem Enhancement Program

KCI TECHNOLOGIES

ENGINEERS • PLANNERS • SCIENTISTS

460N SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

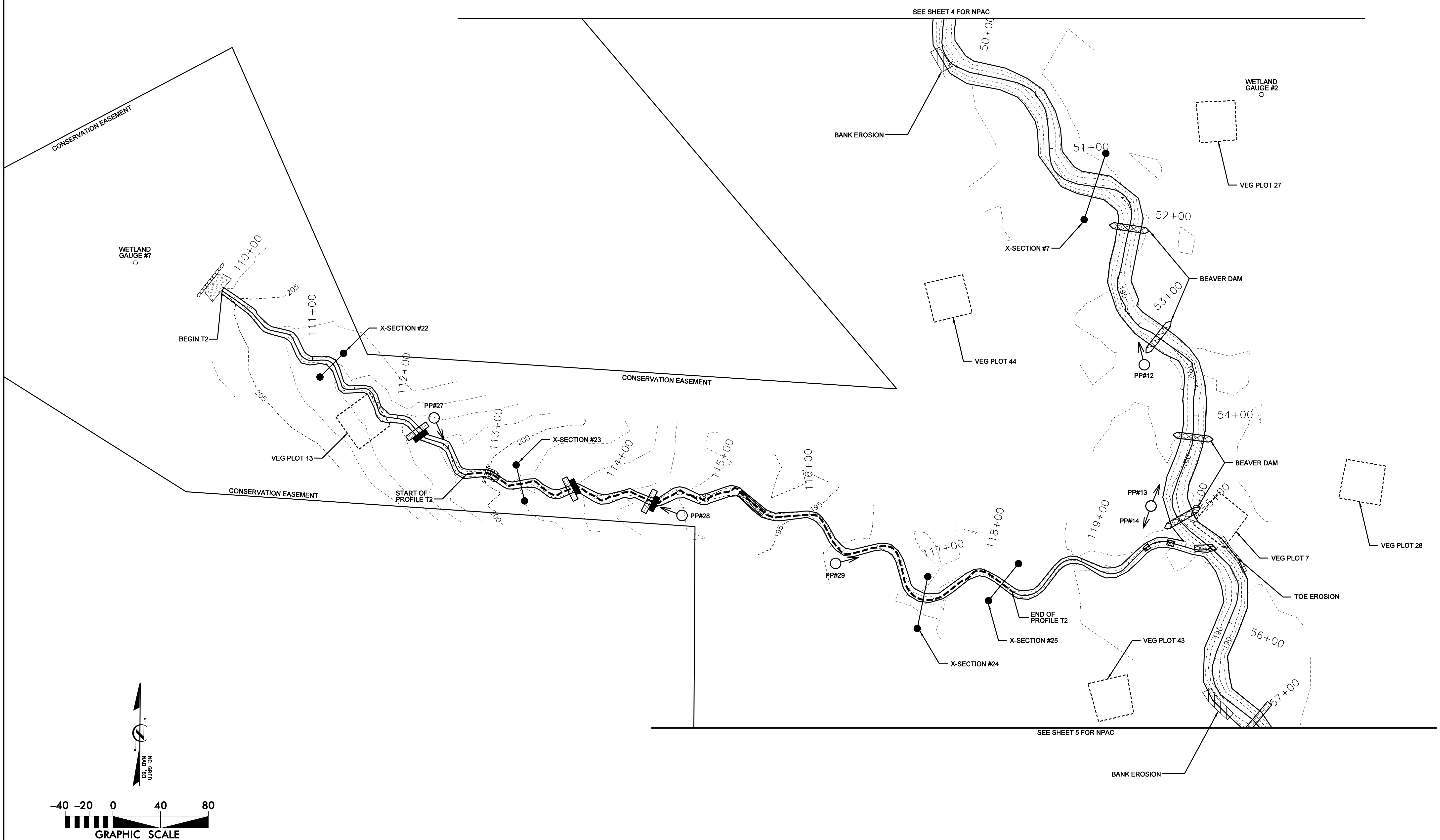
FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA
T1 - STATION 100+00 TO STATION 108+84

DATE: DEC 2010

SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW

SHEET 9 OF 11


SEE SHEET 4 FOR NPAC
CONSERVATION EASEMENT
WETLAND GAUGE #7
BEGIN T2
X-SECTION #22
VEG PLOT 13
PP#27
X-SECTION #23
START OF PROFILE T2
PP#28
PP#29
X-SECTION #24
X-SECTION #25
END OF PROFILE T2
BANK EROSION
X-SECTION #7
BEAVER DAM
VEG PLOT 44
PP#12
PP#13
PP#14
VEG PLOT 27
WETLAND GAUGE #2
VEG PLOT 7
VEG PLOT 28
TOE EROSION
VEG PLOT 43
SEE SHEET 5 FOR NPAC
NC GRID NAD '83
-40 -20 0 40 80
GRAPHIC SCALE

REVISIONS

SYM.	DESCRIPTION	DATE	APPROVED

Ecosystem Enhancement PROGRAM

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

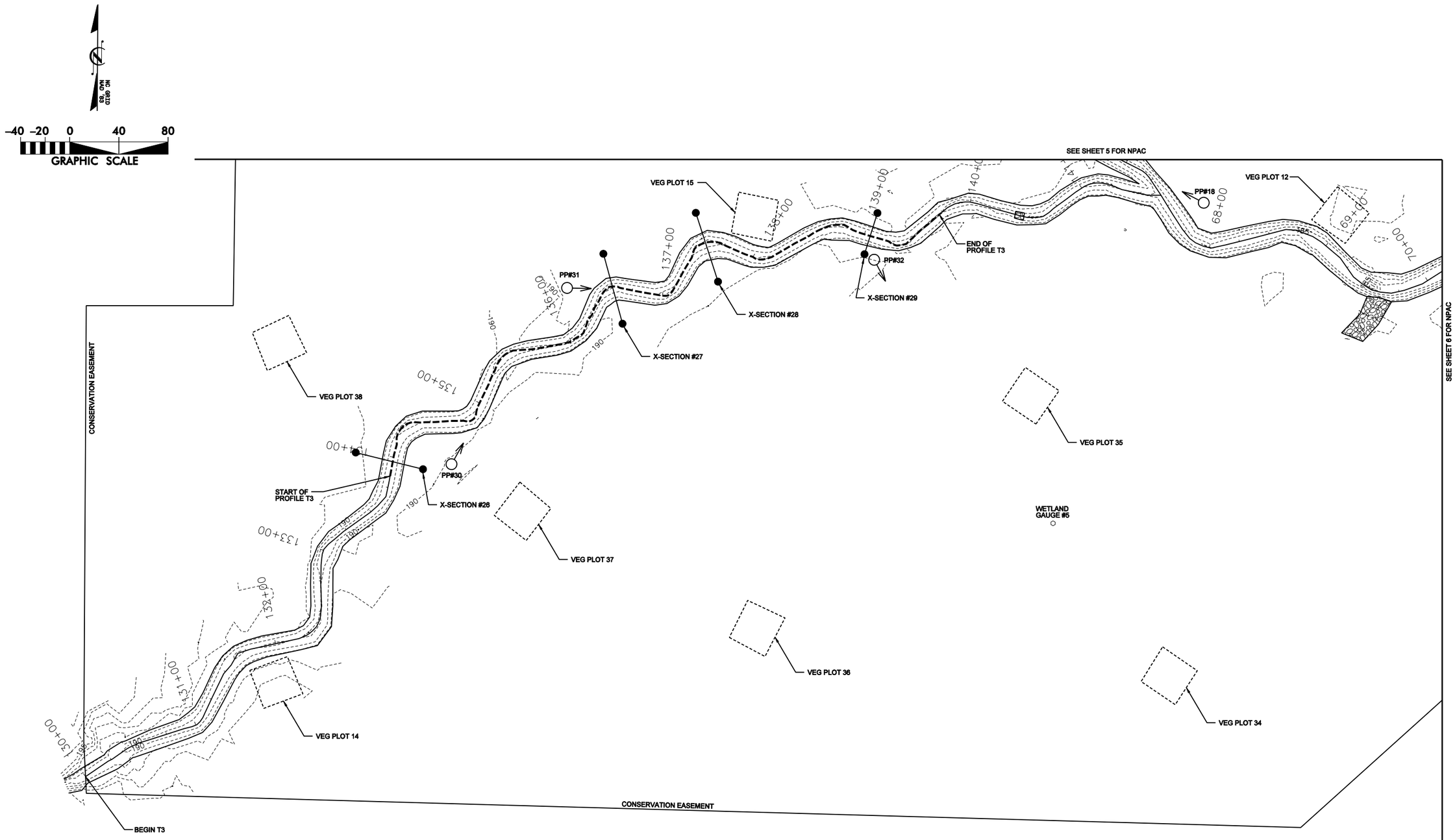
FARRAR DAIRY STREAM AND WETLAND RESTORATION

LILLINGTON, HARNETT COUNTY, NORTH CAROLINA

T2 - STATION 110+00 TO STATION 120+22

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW



REVISIONS			
SYM.	DESCRIPTION	DATE	APPROVED

Ecosystem Enhancement Program

KCI TECHNOLOGIES
ENGINEERS • PLANNERS • SCIENTISTS
4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

FARRAR DAIRY
STREAM AND WETLAND RESTORATION
LILLINGTON, HARNETT COUNTY, NORTH CAROLINA
T3 - STATION 130+00 TO STATION 141+67

DATE: DEC 2010
SCALE: 1"=80'

CURRENT CONDITION PLAN VIEW