Gray Farm Stream Restoration Monitoring Report – Year Two

Contract # D05016-2
EEP Project # 92219

Iredell County, North Carolina

December 2007

Cataloging Unit – Catawba Basin 03050101

Prepared For:

Ecosystem Enhancement PROGRAM

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I. Executive Summary / Project Abstract

The Gray Farm Stream Restoration project consists of two separate reaches (Reach 1 and Reach 2) along unnamed tributaries of Buffalo Shoals Creek, a tributary of the Catawba River (Hydrologic Cataloging Unit 03050101). The site is located approximately 10 miles due west of the City of Statesville in western Iredell County, NC. This restoration was contracted by Restoration Systems LLC (Contract # D05016-2) as a full-delivery project for the North Carolina Ecosystem Enhancement Program (NCEEP). This report summarizes the monitoring efforts for Year 2 (2007) of the Gray Farm Stream Restoration Project.

Restoration construction of the Reach 2 began in early March 2006 and was completed in mid-April 2006. Restoration construction of the Reach 1 began in mid-April 2006 and was completed in early July 2006. Demobilization and minor Contractor punch list items were completed shortly thereafter. Installation of monitoring devices and As-built surveys for both reaches were performed as construction progressed.

Monitoring of the vegetated buffer was performed during the growing season of 2007 by Soil & Environmental Consultants, PA (S&EC). Stem counts were performed within the established vegetation monitoring plots, resulting in an average live stem density of approximately 452 stems per acre.

Physical monitoring of the restored channel consisted of the collection of cross-section and representative longitudinal profile data, and a visual assessment of the stream. Collected data was then compared with As-built and Year 1 Monitoring data.

Based on Year 2 Monitoring results, the site has met the prescribed success criteria.

Year 3 Monitoring will commence in January of 2008.

II. Project Background

The Gray Farm Stream Restoration project is located in the Catawba Basin, Hydrologic Cataloging Unit 03050101. The site consists of two separate reaches (Reach 1 and Reach 2) along unnamed tributaries of Buffalo Shoals Creek, a tributary of the Catawba River. The site is located approximately 10 miles due west of the City of Statesville in western Iredell County, NC.

The restoration project objective was to restore the impaired streams to appropriately sized stream channels that were stable and self-maintaining, and would not aggrade or degrade over time. Restoration was accomplished with Rosgen-based natural channel design procedures and techniques. Reach 1 restoration was a combination of a Priority I (reconnection of the channel with its historic floodplain) restoration and a Priority II (construction of a new floodplain at a lower elevation) restoration. Reach 2 was a Priority I restoration. Restoring an appropriate sinuosity lengthened both channels, thereby lowering their bankfull slope.

Restoration construction of the Reach 2 began in early March 2006 and was completed in mid-April 2006. Restoration construction of the Reach 1 began in mid-April 2006 and was completed in early July 2006. The buffer of both reaches of the restored stream channel were planted with native tree and shrub species and seeded with a native grass seed mix. During construction, site topography and grading allowed for the creation of vernal pools, oxbows, or pocket wetlands within the riparian zone along the restored reaches. Planting operations were performed in April 2006. Supplemental planting was performed in December of 2006.

Demobilization and minor Contractor punch list items were completed shortly after the completion of construction. Installation of monitoring devices and As-built surveys for both reaches were performed as construction progressed.

1. Project Goals and Objectives

The goals of the Gray Farm Stream Restoration project are:

1) Improve local water quality within the restored channel reaches as well as the downstream watercourses through;

    a. The reduction of current channel and off site sediment loads by restoring appropriately sized channels with stable beds and banks.

    b. The reduction of nutrient loads (both soil enhancement practices and cattle) from adjacent agricultural fields with a restored riparian buffer.

c. The reduction of water temperatures provided by shading of the channel from canopy species along with the resultant increase in oxygen content.

2) Improve local aquatic and terrestrial habitat and diversity within the restored channels and their vicinity through;

   a. The formation of varying bed form within the channels to provide for fish, amphibian, and benthic species.

   b. The restoration of a suitable riparian buffer corridor which will provide both vertical and horizontal structure and connectivity with adjacent upland areas.

   c. The restoration of understory and canopy species which will provide forage, cover, and nesting for a variety of mammals, reptiles, and avian species.

3) Improve local watershed conditions through the restoration of two low order streams (one first order, one second order) and the placement of permanent conservation easements.

Through the restoration process the following objectives were accomplished:

1) Restore approximately 7,610 linear feet of appropriately sized stream channel that is stable and self-maintaining, and will not aggrade or degrade over time. Restoration was accomplished with Rosgen-based natural channel design procedures and techniques.

2) Develop restored channels with the appropriate morphological characteristics (cross-sectional dimension, pattern, and longitudinal profile) utilizing collected reference reach data as a guide. Allow for no net loss of overall channel length in the process.

3) Create and/or improve bed form diversity (riffles, runs, pools, and glides) and improve aquatic and benthic macroinvertebrate habitat.

4) Construct a floodplain (or local bankfull bench) that is accessible at the proposed bankfull channel elevation.

5) Ensure channel and stream bank stabilization by integrating in-stream structures and native bank vegetation.

6) Establish a native forested and herbaceous riverine buffer plant community within a minimum width of 50 feet from the edge of the restored channel. This new community will be established in conjunction with the eradication of any existing exotic and/or undesirable plant species.

7) Improve water quality within the subject channels and the downstream receiving waters.

8) Supplement the education and conservation efforts for natural resources in Iredell County as indicated in program goals for the local Soil & Water Conservation District and the NC Cooperative Extension Service.

2. Project Structure, Restoration Type, and Approach

The restoration project objective was to restore the impaired streams to appropriately sized stream channels that are stable and self-maintaining, and will not aggrade or degrade over time. Restoration was accomplished with Rosgen-based natural channel design procedures and techniques. Restoring an appropriate sinuosity lengthened both channels, thereby lowering their bankfull slope. A total of 8,004 linear feet of stream channel were restored onsite (8,004 SMU's).

Reach 1

Reach 1 restoration was a combination of a Priority I (reconnection of the channel with its historic floodplain) restoration and a Priority II (construction of a new floodplain at a lower elevation) restoration. Approximately 800 linear feet of this length was previously inundated by an existing farm pond that was removed during the channel restoration. The pre-restoration length of this channel segment was approximately 4,340 linear feet.

One additional piped farm road crossing existed approximately 700 feet downstream of the dam. This piped crossing was removed and replaced with an in-stream crossing. Immediately downstream of the dam for a distance of approximately 1,000 feet, severe bank erosion, channel incision, and an over-widening of the stream channel was evidenced. This degradation appeared in large part due to previous uncontrolled releases from the existing dam spillway.

The lower two thirds of the reach were characterized by overly steep and undercut banks. Significant localized erosion was evidenced along this lower portion. Trees of large diameter lined the banks, many of which were undercut, suspended or had collapsed into the stream. The channel had down cut and over widened in many locations along the reach allowing no access to its floodplain. The last 200 feet (approximately) of the pre-existing channel was not down cut due to a change in surrounding topography.

The upper portion of Reach 1 has demonstrated pool development since the as-built survey. Significant sediment entered the pools at the upper end of Reach 1 shortly after construction. This sediment came from upstream sources including areas of cattle pasture and areas previously inundated due to the old pond. This sediment has been flushed from the system during the first year causing these pools to deepen to their previously excavated depth.

Reach 1 consists of 5,813 (5,813 SMU's) linear feet of restored Type C4 channel.

Reach 2

Reach 2 was a Priority I restoration. A small impoundment previously existed near the lower end of the reach; however, it was drained and removed a number of years prior to the channel restoration. A piped farm road crossing existed at roughly the same location (the old dam embankment). This was (and remains) the only existing crossing along the reach. The pre-restoration length of this channel segment was approximately 1,600 linear feet.

Throughout Reach 2, severe bank erosion, channel incision, and an over-widening of the stream channel were evidenced. This impairment appeared in large part due to previous uncontrolled grazing operations. The reach was characterized by overly steep, sloughing, and undercut banks.

Significant localized erosion was evidenced along the entire reach. Trees of large diameter lined the banks, many of which were undercut, suspended or collapsed into the stream. The channel had down cut and over widened in many places along the reach allowing no access to its floodplain.

Reach 2 consists of 2,191 linear feet (2,191 SMU's) of restored Type B4 channel.

3. Location and Setting

The Gray Farm Stream Restoration project is located in the Catawba Basin, Hydrologic Cataloging Unit 03050101. The site consists of two separate reaches (Reach 1 and Reach 2) along unnamed tributaries of Buffalo Shoals Creek, a tributary of the Catawba River. The site is located approximately 10 miles due west of the City of Statesville in western Iredell County, NC.

Reach 1 is located immediately north of Bolick Road (SR 1532). Reach 2 is located immediately west of the intersection of New Sterling Road (SR 1525) and Gray House Road. The watershed areas for Reaches 1 and 2 are estimated at approximately 0.91 square miles (582 acres) and 0.085 square miles (54 acres) respectively. See attached Figure 1.

4. Project History and Background

The following tables summarize the project history and background:

Exhibit Table I. Project Restoration Components
Gray Farm Stream Restoration Site/EEP Project # 92219

Project Segment or Reach ID	Existing Feet/Acres	Type	Approach	Footage or Acreage	Mitigation Ratio	Mitigation Units	Stationing	Comment
Reach I	3,000	R	PI	4,119	1:1	4,119	0+00 to 41+19	
Reach I	1,340	R	PII	1,694	1:1	1,694	41+19 to 58+13	
Reach II	1,600	R	PI	2,191	1:1	2,191	0+00 to 20+91	

Mitigation Unit Summations

Stream (lf)	Riparian Wetland (Ac)	Nonriparian Wetland (Ac)	Total Wetland (Ac)	Buffer (Ac)	Comment
8,004	N/A	N/A	N/A	18.38	

Exhibit Table II. Project Activity and Reporting History
Gray Farm Stream Restoration Site/EEP Project # 92219

Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	Aug-05	Nov-05
Construction	Reach 1	Jul-06
	Reach 2	Apr-06
Temporary S&E mix applied to entire project area	Apr-06	Apr-06
Permanent seed mix applied to reach/segments 1 & 2	Apr-06	Apr-06
Plantings for reach/segments 1 & 2	Apr-06	Apr-06
Mitigation Plan / As-built (Year 0 Monitoring - baseline)	May-06	Jun-06
Year 1 Monitoring	Dec-06	Dec-06
Supplemental Planting	Dec-06	
Year 2 Monitoring	Nov-07	Dec-07
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

Exhibit Table III. Project Contacts Table Gray Farm Stream Restoration Site/EEP Project # 92219	
Designer Primary Project Design POC	Soil & Environmental Consultants, PA 11010 Raven Ridge Rd Raleigh, NC 27614 Rebecca S. Wargo, P.E. (919) 846-5900
Construction Contractor Construction Contractor POC	North State Environmental 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Planting Contractor Planting Contractor POC	North State Environmental 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Seeding Contractor Seeding Contractor POC	North State Environmental 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Monitoring Performers	Soil & Environmental Consultants, PA 11010 Raven Ridge Rd. Raleigh, NC 2761
Stream Monitoring POC	Jessica Regan (919) 846-5900
Vegetation Monitoring POC	Jessica Regan (919) 846-5900

Exhibit Table IV. Project Background Table Gray Farm Stream Restoration Site/EEP Project # 92219	
Project County	Iredell
Drainage area	Reach 1 - 0.91 square miles (582 acres)
	Reach 2 - 0.085 square miles (54 acres)
Drainage impervious cover estimate (%)	< 20%
Stream Order	Reach 1 - 2nd order
	Reach 2 - 1st order
Physiographic Region	Piedmont
Ecoregion	Northern Inner Piedmont
Rosgen Classification of As-built	Reach 1 - C4
	Reach 2 - B4
Cowardin Classification	N/A
Dominant soil types	Reach 1 - Cw, CxB
	Reach 2 - CsE2
Reference site ID	Reach 1 - Tributary of Turkey Creek
	Reach 2 - Basin Creek
USGS HUC for Project and Reference	3050101
NCDWQ Sub-basin for Project and Reference	Reach 1 - 03-08-32 / 03-04-02
	Reach 2 - 03-08-32 / 03-07-01
NCDWQ classification for Project and Reference	Reach 1 - WS-IV; CA / C;NSW
	Reach 2 - WS-IV; CA / C; Tr; ORW
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
% of project easement fenced	Reach 1 – No Fence, Reach 2 - 100%

5. Monitoring Plan View

Six (6) tree and shrub buffer vegetation plots (four (4) on Reach 1 and two (2) on Reach 2) and four (4) bank vegetation plots (two (2) on Reach 1 and two (2) on Reach 2) were established. All monitoring will occur within these observation plots throughout the monitoring period for as long as they continue to be representative of the community.

For all buffer monitoring plots, Level 1 of the Carolina Vegetation Survey-Ecosystem Enhancement Program (CVS-EEP) Protocol for Recording Vegetation will be utilized for vegetation sampling in Years 1 and 2. Subsequent monitoring years will utilize Level 2 of the CVS-EEP protocol in order to record and report woody plant volunteers within vegetation monitoring plots along with planted stems. A corner of each vegetation monitoring plot will be used as a permanent photo point for vegetation monitoring photos. Locations of these photo points are shown on the attached Monitoring Plan View.

A total of seven (7) nested riffle and pool cross-section pairs were established along Reach 1, and two (2) nested riffle and pool cross-section pairs were established along Reach 2. Each cross-section also serves as a designated photo point that will be photographed annually.

The locations of all monitoring devices are shown on Sheets 2 through 6 (Reach 1 – Monitoring Plan View) and Sheets 11 through 14 (Reach 2 - Monitoring Plan View).

III. Project Condition and Monitoring Results

A. Vegetation Assessment

The success of the adjacent riparian buffer will be based on the combined survival of tree and shrub species for the five-year monitoring period.

Survival of woody (tree and shrub) species planted within the restored buffers will be at least 320 stems/acre through year three, 288 stems/acre through year four, 260 stems/acre through year five. The stem count will be based on an average of the stem counts of the evaluated tree and shrub buffer vegetation plots.

The success of the bank vegetation plots along the restored channels will be based on the survival of live-stake (or other) bank plantings for the five-year monitoring period. Survival of bank plantings will be based on a linear average of approximately 50 percent of the planted species within the restoration reaches.

Biological monitoring will be used as a general indicator of restoration success, however, no specific biological criteria applies to the success of the restoration reaches.

The approximately 18.4 acre restoration area was planted with various native hardwood tree and shrub species, native to the area. Reaches 1 and 2 were planted in April 2006. Supplemental planting was performed in December of 2006.

The following tree species were planted in the Riparian Buffer Area:

- *Alnus serrulata* (Tag Alder)
- *Betula nigra* (River Birch)
- *Carpinus caroliniana* (Ironwood)
- *Fraxinus pennsylvanica* (Green Ash)
- *Ilex opaca* (American Holly)
- *Lindera benzoin* (Spicebush)
- *Liriodendron tulipifera* (Tulip Poplar)
- *Platanus occidentalis* (Sycamore)
- *Quercus michauxii* (Swamp Chestnut Oak)
- *Quercus nigra* (Water Oak)
- *Quercus phellos* (Willow Oak)
- *Viburnum nudum* (Possumhaw)

Stream banks were planted with live stakes in two offset rows. The following shrub species were planted as live stakes:

- *Cornus amomum* (Silky Dogwood)
- *Salix sericea* (Silky Willow)
- *Sambucus canadensis* (Elderberry)

As previously described, a total of six (6) buffer vegetation monitoring plots were established on site in 2006. The success criteria for the site require a minimum of 320 live stems per acre for the first three (3) years of monitoring. Year 2 vegetation monitoring shows 452 live stems per acre. Future buffer vegetation monitoring data will be compared with previous monitoring data to determine survival rates and stem densities for woody vegetation planted within the riparian buffer. Vegetation monitoring data for buffer plots was collected using the CVS-EEP monitoring protocol and is presented in Appendix A.

Four (4) bank vegetation plots were also established (two on each reach) to monitor survival of live-stake plantings along stream banks. Future bank vegetation monitoring data will be compared with previous monitoring data to determine survival rates for live-stakes planted along stream banks. Live stake survival from Monitoring Year 1 to Monitoring Year 2 for the site overall is approximately 68.9%. Live-stake counts by species and by plot are presented in the following tables:

2006 - REACH 1					
Common Name	**Species**	**REACH 1**		**Species Total**	**% of Total**
		BANK 1	**BANK 2**		
Silky Dogwood	Cornus amomum	12	17	29	39%
Silky Willow	Salix sericea	30	16	46	61%
	TOTAL	42	33	75	100%
2007 - REACH 1					
Common Name	**Species**	**REACH 1**		**Species Total**	**% of Total**
		BANK 1	**BANK 2**		
Silky Dogwood	Cornus amomum	4	9	13	27%
Silky Willow	Salix sericea	27	9	36	73%
	TOTAL	31	18	49	100%
	Live-stake Survival =	73.8%	54.5%	65.3%	

2006 - REACH 2					
Common Name	**Species**	**REACH 2**		**Species Total**	**% of Total**
		BANK 1	**BANK 2**		
Silky Willow	Salix sericea	7	4	11	23%
Silky Dogwood	Cornus amomum	9	25	34	72%
Elderberry	Sambucus canadensis		2	2	4%
	TOTAL	16	31	47	100%
2007 - REACH 2					
Common Name	**Species**	**REACH 2**		**Species Total**	**% of Total**
		BANK 1	**BANK 2**		
Silky Willow	Salix sericea	6	4	10	29%
Silky Dogwood	Cornus amomum	5	20	25	71%
Elderberry	Sambucus canadensis			0	0%
	TOTAL	11	24	35	100%
	Live Stake Survival =	68.8%	77.4%	74.5%	

Live-stake mortality can be attributed to drought conditions during the 2007 growing season as well as dense herbaceous vegetation along stream banks. Most surviving live stakes appear to be healthy and growing vigorously.

Herbaceous vegetation varies widely throughout the restoration site. The native herbaceous species have become densely established and are dominant throughout the site. Herbaceous species observed along stream banks and in the buffer and wetlands onsite include:

- *Impatiens capensis* - Jewelweed
- *Juncus effusus* – Soft Rush
- *Leersia oryzoides* – Cutgrass
- *Mimulus ringens* - Monkeyflower
- *Carex sp.*- Sedges
- *Panicum virgatum* – Switchgrass
- *Sagittaria latifolia* – Duck Potato
- *Solidago sp.* – Goldenrod

- *Eupatorium capillifolium* – Dog-fennel
- *Eupatorium perfoliatum* - Boneset

The dense herbaceous vegetation at the lower end of Reach 2 combined with the steep slope and drought conditions have severely stressed planted tree species and caused their slow establishment. This area will be monitored closely and, if necessary, recommendations will be made for management or supplemental planting.

The lower section of Reach 1 and the upper section of Reach 2 are dominated by sparse, low growing cover crop grasses. In these areas the planted woody species have lower mortality, appear healthier, and have grown more in the last year compared with the areas of extremely dense herbaceous vegetation. In areas given shade by surrounding mature trees, planted woody species are healthy and thriving likely due to less intense light and heat during drought conditions and a less dense herbaceous layer (See Buffer Plots 3 & 4–Reach 1).

1. Problem Areas Plan View (Vegetation)

During a field inspection on November 27 & 28, 2007, a total of twelve localized areas of bare banks and floodplain were observed on Reaches 1 and 2. These areas appear to be due primarily to either surface flows or poor soil conditions. Drought conditions during the growing season have likely contributed as well. These areas are shown on Sheets 6 through 9 (Reach 1) and Sheets 14 through 16 (Reach 2). Photos are included in Appendix A.

Some small amounts of the non-natives johnsongrass (*Sorghum halepense*) and tall fescue (*Lolium arundinaceum*) have been observed at the edges of the buffer restoration areas that border the agricultural fields on both reaches. These populations will be closely monitored to ensure they do not become dominant or exclude native vegetation.

An area of kudzu (*Pueraria lobata*) was noted at the site in early June, 2007, on the west side of Reach 1 between stations 16+00 to 19+00. Although the majority of the kudzu was along and in the edge of the woods immediately outside the easement area, some had encroached into the easement area. The area (approximately 0.5 acre) was treated with the herbicide Transline (clopyralid) at a rate of one pint per acre. The area will continue to be monitored to determine if re-treatment is necessary.

While we will continue to monitor these areas, based on vegetative success criteria the site currently exhibits strong vegetative success.

2. Vegetative Problem Areas Plan View

Vegetative problem areas are shown on Sheets 6 through 9 for Reach 1 and Sheets 14 through 16 for Reach 2 (Problem Area Plan View).

B. Stream Assessment

A review of available on-line USGS gauge sites was performed to determine if a suitable surrogate gauges was present in the area. No nearby gauge was identified. The closest USGS gauge to the site was on the Lower Little River (near Healing Springs, NC, Gauge Identification Number 02142000) which is approximately 15 miles from the project site.

Based on this large distance, significant disparity in watershed sizes, and topographic variation, it is unlikely that a conclusive determination regarding the number of bankfull events experienced on the restoration site could be made.

However, based on site observations, to include wrack lines, floatsom, staining of vegetation, displaced/flattened vegetation, and observable sediment deposition, it is apparent that multiple overbank events have occurred during this monitoring year.

Exhibit Table V. Verification of Bankfull Events
Gray Farm Stream Restoration Site/EEP Project # 92219

Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
03/01/2007	Unknown	Onsite observations (to include wrack lines, floatsom staining of vegetation, displaced/flattened vegetation, and observable sediment deposition)	N/A
03/22/2007	Unknown		N/A
04/05/2007	Unknown		N/A
08/22/2007	Unknown		N/A
11/27/2007	Unknown		N/A

1. Problem Areas Plan View (Stream)

An assessment of channel stability was also preformed on November 27 &28, 2007, by S&EC. Areas of concern that were observed and documented included some minor localized bank scour and four stressed structures. Detail of such scour is evidenced in cross-section 6 (pool). These problem areas are shown on Sheets 6 through 9 for Reach 1 and Sheets 14 through 16 for Reach 2 (Problem Area Plan View).

And, while we will continue to monitor these areas, based on physical success criteria the site clearly exhibits stable conditions and meets the requirements for physical success.

2. Problem Areas Table Summary

Stream problem areas observed are shown in Table 6 in Appendix B.

3. Numbered Issues Photo Section

Representative photos of each category of stream problem area were taken and are shown in Appendix B.

4. Fixed Photo Station Photos

Photos from established photo stations (at each cross-section) were collected during the stream survey (November 2007). These photos are included in Appendix B.

5. Stability Assessment

A visual qualitative assessment was performed to inspect channel facets, meanders, bed, banks, and installed structures. This visual assessment was confirmed and enhanced with a quantitative assessment of the physical stream survey. The goal of this assessment is to provide a percentage of the features listed in Table VII that are in a state of stability. Table VII was compiled from the data in Table B1 in Appendix B of this report.

Table VIIa: Categorical Stream Feature Visual Stability Assessment
Gray Farm Stream and Wetland Restoration Site/EEP Project # 92219
Reach 1

Feature	MY-1 2006	MY-2 2007	MY-3 2008	MY-4 2009	MY-5 2010
A. Riffles	100%	100%			
B. Pools	100%	100%			
C. Thalweg	99%	99%			
D. Meanders	100%	100%			
E. Bed General	96%	99%			
F. Bank Condition	100%	99%			
G. Vanes/ J Hooks, etc.	99%	98%			
H. Wads and Boulders	N/A	N/A			

Table VIIb: Categorical Stream Feature Visual Stability Assessment
Gray Farm Stream and Wetland Restoration Site/EEP Project # 92219
Reach 2

Feature	MY-1 2006	MY-2 2007	MY-3 2008	MY-4 2009	MY-5 2010
A. Riffles	100%	100%			
B. Pools	100%	100%			
C. Thalweg	100%	100%			
D. Meanders	99%	98%			
E. Bed General	100%	100%			
F. Bank Condition	100%	100%			
G. Vanes/ J Hooks, etc.	99%	96%			
H. Wads and Boulders	N/A	N/A			

6. Quantitative Measures Summary Tables

The following tables (Table VIII and Table IX) summarize the quantitative data collected from the cross-sectional and representative longitudinal stream survey. This data was analyzed and summarized, and then compared with baseline data types available for this project.

The Quantitative Morphology Tables illustrate the degree of departure, if any, of the current channel from the baseline data. Tables VIII and IX were compiled from the cross-section and profile raw data and plots located in Appendix B of this report.

Table VIII. Baseline Morphology and Hydraulic Summary
GRAY FARM STREAM RESTORATION SITE (EEP Project #92219)
REACH 1

Parameter	Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.
BF Width (ft)	15.77	15.77	15.77	32.08	32.08	32.08	15.2	15.2	15.2	13.62	19.48	16.02
Floodprone Width (ft)	19.41	52.54	20.39	100			47	90.34	47	37.49	89.67	61.53
BF Cross Sectional Area (ft^2)	17.87	17.87	17.87	79.79	79.79	79.79	17.84	17.84	17.84	11.01	17.92	13.79
BF Mean Depth (ft)	1.13	1.13	1.13	2.49	2.49	2.49	1.17	1.17	1.17	0.7	0.94	0.86
BF Max Depth (ft)	1.49	1.49	1.49	3.61	3.61	3.61	1.71	1.71	1.71	1.36	2.04	1.61
Width/Depth Ratio	13.96	13.96	13.96	12.43	12.43	12.43	12.67	12.67	12.67	18.63	20.07	19.46
Entrenchment Ratio	1.29	1.29	1.29	3.47	3.47	3.47	3.09	3.09	3.09	2.75	4.6	3.84
Wetted Perimeter(ft)	16.52	16.52	16.52	34.8	34.8	34.8	16.01	16.01	16.01	13.26	16.41	15.67
Hydraulic radius (ft)	1.08			2.29			1.11			0.69	0.92	0.83
Pattern												
Channel Beltwidth (ft)	67.62	137.29	98.27	70.8	91.93	84.35	26.1	61.8	40.75	59.32	93.89	72.85
Radius of Curvature (ft)	64.8	121.04	81.58	13.36	36.57	26.56	19.97	37.85	28.23	16.64	40.88	25.73
Meander Wavelength (ft)	716.91	716.91	716.91	148.13	291.09	221.56	77.08	117.13	95.07	77.08	117.13	94.8
Meander Width ratio	4.29	8.71	6.23	2.21	2.87	2.63	1.72	4.07	2.68	3.7	5.86	4.55
Profile												
Riffle length (ft	N/A	N/A	N/A	32.94	48.35	40.29	19.31	54.86	30.86	25.87	54.2	37.85
Riffle slope (ft/ft)	0.00632	0.00657	0.00647	0.00809	0.01395	0.01074	0.0057			0.00092	0.0187	0.0062
Pool length (ft)	93.8	159.47	119.6	8.96	41.09	26.43	22.9	33.17	29.66	7.41	244.47	23.01
Pool Slope (ft/ft)	N/A	N/A	N/A	N/A	N/A	N/A	0.0009	0.0029	0.0013	0.0007	0.0064	0.0016
Pool spacing (ft)	347.07	525.3	444	44.08	130.73	67.98	51.66	82.92	67.79	12.35	142	70.94
Substrate												
d50 (mm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
d84 (mm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Additional Reach Parameters												
Valley Length (ft)	4258.3			648.35			4258.3			4258.3		
Channel Length (ft)	4939.628			758.58			5622			5813.3		
Sinuosity	1.16			1.17			1.29			1.36		
Water Surface Slope (ft/ft)	0.00647			0.01074			0.0057			0.00544		
BF slope (ft/ft)	0.00647			0.01074			0.0057			0.00544		
Rosgen Classification	F4			C4			C4			C4		
*Habitat Index	N/A			N/A			N/A			N/A		
*Macrobenthos	N/A			N/A			N/A			N/A		

Table VIII. Baseline Morphology and Hydraulic Summary
GRAY FARM STREAM RESTORATION SITE (EEP Project #92219)
REACH 2

Parameter	Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.	Min	Max	Avg.
BF Width (ft)	5.34	5.34	5.34	4.86	4.86	4.86	6.9	6.9	6.9	7.38	8.21	7.8
Floodprone Width (ft)	7.04	7.04	7.04	8.73	8.73	8.73	12.4	12.4	12.4	13.96	39.05	26.53
BF Cross Sectional Area (ft^2)	3.88	3.88	3.88	1.94	1.94	1.94	3.96	3.96	3.96	4.14	6.77	5.46
BF Mean Depth (ft)	0.73	0.73	0.73	0.4	0.4	0.4	0.57	0.57	0.57	0.56	0.82	0.69
BF Max Depth (ft)	1.13	1.13	1.13	0.61	0.61	0.61	0.87	0.87	0.87	0.86	1.3	1.08
Width/Depth Ratio	7.32	7.32	7.32	12.15	12.15	12.15	12.11	12.11	12.11	1.01	13.18	11.3
Entrenchment Ratio	1.32	1.32	1.32	1.8	1.8	1.8	1.8	1.8	1.8	1.9	4.7	3.4
Wetted Perimeter(ft)	6.03	6.03	6.03	5.28	5.28	5.28	7.36	7.36	7.36	7.68	8.77	8.23
Hydraulic radius (ft)	0.64			0.37			0.94737	0.94737	0.94737	0.78261	1.11594	0.95652
Pattern												
Channel Beltwidth (ft)	43.58	68.11	54.22	6.97	22.7	13.32	9.49	16.5	12.65	11.83	22.05	16.96
Radius of Curvature (ft)	32.54	52.64	41.25	4.1	8.88	5.93	6.71	9.9	8.05	4.63	9.1	6.43
Meander Wavelength (ft)	209.46	394.66	334.46	22.47	68.78	46.57	31.6	37.12	34.08	27.51	34.72	31.75
Meander Width ratio	8.16	12.75	10.15	1.43	4.67	2.74	1.38	2.39	1.83	1.52	2.83	2.17
Profile												
Riffle length (ft)	N/A	N/A	N/A	5.52	7.6	6.39	4.93	7.24	5.88	3.36	11.6	5.6
Riffle slope (ft/ft)	0.0179	0.03688	0.02444	0.03022	0.05058	0.04025	0.0258			0.0053	0.0555	0.0279
Pool length (ft)	26.27	54.41	40.34	7.56	10.65	8.78	6.25	10.46	8.45	5.2	10.08	7.59
Pool Slope (ft/ft)	N/A	N/A	N/A	N/A	N/A	N/A	0.0017	0.0087	0.003	0.001	0.0092	0.0022
Pool spacing (ft)	125.7	474.65	265.15	20.17	70.04	46.72	15.73	23.84	19.22	9.43	28.94	19.51
Substrate												
d50 (mm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
d84 (mm)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Additional Reach Parameters												
Valley Length (ft)	1872			216.55			1872			1872		
Channel Length (ft)	1965.6			266.36			2114			2191		
Sinuosity	1.05			1.23			1.16			1.2		
Water Surface Slope (ft/ft)	0.0286			0.039			0.0258			0.025		
BF slope (ft/ft)	0.0286			0.039			0.0258			0.025		
Rosgen Classification	G4			B4			B4			B4		
*Habitat Index	N/A			N/A			N/A			N/A		
*Macrobenthos	N/A			N/A			N/A			N/A		

Exhibit Table IX. Morphology and Hydraulic Monitoring Summary
GRAY FARM STREAM RESTORATION SITE (EEP Project #92219)

Parameter	REACH 1															
	RIFFLE 1				POOL 1				RIFFLE 2				POOL 2			
Dimension	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3
	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008
BF Width (ft)	15.34	11.25	20.77		22.32	20.84	24.21		13.62	11.33	16.89		20.84	20.41	26.66	
Floodprone Width (ft)	54.53	50	50		61.28	62.34	62.92		59.9	60.26	60.01		57.43	58.07	57.82	
BF Cross Sectional Area (ft^2)	11.97	5.96	12.52		39.71	41.33	38.36		11.01	9.18	9.29		29.04	26.98	31.28	
BF Mean Depth (ft)	0.78	0.53	0.6		1.78	1.98	1.58		0.81	0.68	0.55		1.39	1.32	1.17	
BF Max Depth (ft)	1.39	0.87	1.42		3.29	3.47	3.61		1.53	1.25	1.46		2.89	2.74	3.63	
Width/Depth Ratio	19.67	21.23	34.62		12.54	10.53	15.32		16.81	19.94	30.71		14.99	15.46	22.79	
Entrenchment Ratio	3.56	4.44	2.41		2.75	2.99	2.6		4.4	4.45	3.55		2.76	2.85	2.17	
Wetted Perimeter(ft)	15.67	11.41	21.04		23.83	22.42	25.37		13.97	13.82	17.34		21.83	21.52	26.62	
Hydraulic radius (ft)	0.76	0.52	0.6		1.67	1.84	1.51		0.79	0.66	0.54		1.33	1.25	1.09	
Substrate																
d50 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	
d84 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	

Parameter	REACH 1															
	RIFFLE 3				POOL 3				RIFFLE 4				POOL 4			
Dimension	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3
	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008
BF Width (ft)	12.94	12.1	49.38		20.75	21.49	22.08		15.7	19	45.04		20.28	21.29	24.79	
Floodprone Width (ft)	89.67	89.64	89.86		61.38	61.32	61.04		66.39	66.2	66.27		65.77	65.75	66	
BF Cross Sectional Area (ft^2)	9.49	9.25	23.48		34.09	33.59	32.19		11.02	13.49	18.12		32.64	38.77	32.22	
BF Mean Depth (ft)	0.73	0.76	0.48		1.64	1.56	1.46		0.7	0.71	0.4		1.61	1.82	1.3	
BF Max Depth (ft)	1.41	1.36	1.64		3.03	2.83	2.94		1.36	1.41	1.3		2.79	3.2	2.83	
Width/Depth Ratio	17.73	15.92	102.88		12.65	13.78	15.12		22.43	26.76	112.6		12.6	11.79	19.07	
Entrenchment Ratio	6.93	7.41	1.82		2.96	2.85	2.76		4.23	3.48	1.47		3.24	3.09	2.66	
Wetted Perimeter(ft)	13.26	12.46	49.83		21.78	22.45	23.01		16.01	19.29	45.45		21.59	22.97	26.04	
Hydraulic radius (ft)	0.72	0.74	0.47		1.57	1.5	1.4		0.69	0.7	0.4		1.51	1.69	1.24	
Substrate																
d50 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	
d84 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	

Parameter	REACH 1															
	RIFFLE 5				POOL 5				RIFFLE 6				POOL 6			
Dimension	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3
	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008
BF Width (ft)	15.63	14.32	51.25		26.27	23.03	22.33		17.01	14.54	24.63		18.59	21.11	19.69	
Floodprone Width (ft)	72.27	64.56	73.17		68.23	68.53	68.67		50.57	60	60		60.15	62.76	63	
BF Cross Sectional Area (ft^2)	14.76	14.03	30.25		37.47	33.39	32.16		16	14.61	16.62		26.72	27.06	51.7	
BF Mean Depth (ft)	0.94	0.98	0.59		1.43	1.45	11.44		0.94	1.01	0.67		1.44	1.28	2.63	
BF Max Depth (ft)	1.67	2.27	2.19		2.75	3.08	3.12		1.56	1.49	1.43		2.83	3.14	4.82	
Width/Depth Ratio	16.63	14.61	86.86		18.37	15.88	15.51		18.1	14.4	36.76		12.91	16.49	7.49	
Entrenchment Ratio	4.62	4.51	1.43		2.6	2.98	3.08		2.97	4.13	2.44		3.24	2.97	3.2	
Wetted Perimeter(ft)	16.14	15.28	52.22		27.26	24.24	23.58		17.42	15	24.92		20.27	22.27	23.49	
Hydraulic radius (ft)	0.91	0.92	0.58		1.37	1.38	1.36		0.92	0.97	0.67		1.32	1.21	2.2	
Substrate																
d50 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	
d84 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A		N/A	N/A	N/A	

Parameter	REACH 1							
	RIFFLE 7				POOL 7			
Dimension	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3
	2006	2006	2007	2008	2006	2006	2007	2008
BF Width (ft)	19.48	16.96	22.43		22.66	22.31	23.12	
Floodprone Width (ft)	50	50	50		51.23	55	55	
BF Cross Sectional Area (ft^2)	17.92	15.49	16.94		42.08	38.22	36.39	
BF Mean Depth (ft)	0.92	0.91	0.76		1.86	1.71	1.57	
BF Max Depth (ft)	2.04	1.61	1.68		3.47	3.06	3.03	
Width/Depth Ratio	21.17	18.64	29.51		12.18	13.03	14.73	
Entrenchment Ratio	2.57	2.95	2.23		2.26	2.46	2.38	
Wetted Perimeter(ft)	20.08	17.38	22.83		23.91	24.11	24.31	
Hydraulic radius (ft)	0.89	0.89	0.74		1.76	1.59	1.5	
Substrate								
d50 (mm)	N/A	N/A	N/A		N/A	N/A	N/A	
d84 (mm)	N/A	N/A	N/A		N/A	N/A	N/A	

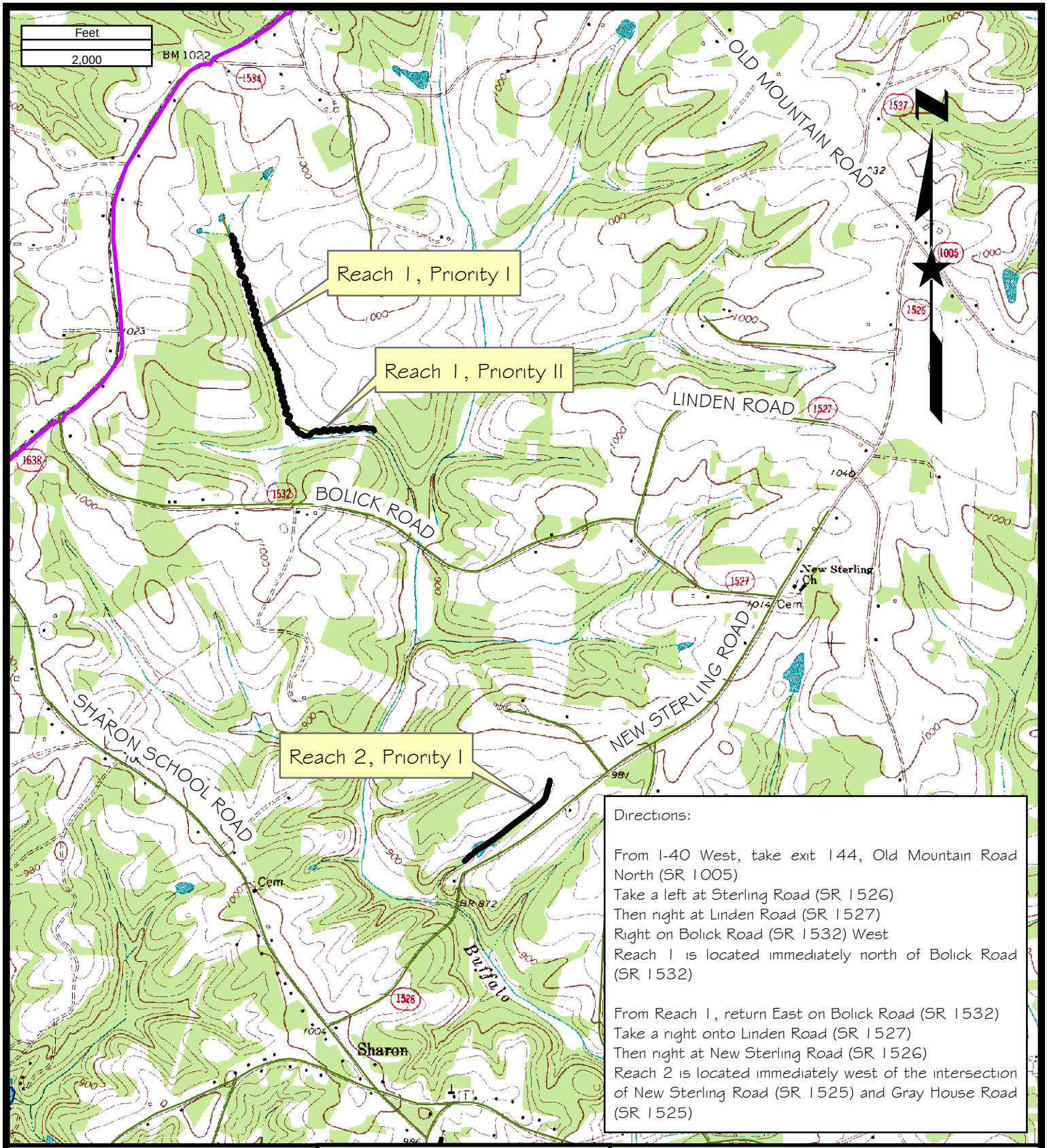
Parameter	As-built (2006)			MY-1 (2006)			MY-2 (2007)			MY-3 (2008)		
Pattern	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Channel Beltwidth (ft)	59.32	93.89	72.85	58.48	96.38	71.67	58.96	97.33	72.54			
Radius of Curvature (ft)	16.64	40.88	25.73	16.84	39.51	24.43	16.72	40.02	25.69			
Meander Wavelength (ft)	77.08	117.13	94.8	76.54	118.26	91.85	75.94	120.96	92.17			
Meander Width ratio	3.7	5.86	4.55	3.56	5.72	4.65	3.24	6.23	4.98			
Profile												
Riffle length (ft)	25.87	54.2	37.85	19.31	54.86	30.86	22.15	58.62	34.61			
Riffle slope (ft/ft)	0.00092	0.0187	0.0062	0.00125	0.01763	0.00883	0.0017	0.025	0.009			
Pool length (ft)	7.41	244.47	23.01	14.19	31.92	24.11	15.64	34.81	26.84			
Pool Slope (ft/ft)	0.0007	0.0064	0.0016	0.0007	0.0029	0.0012	0.0007	0.004	0.0017			
Pool spacing (ft)	12.35	142	70.94	52.58	159	88.05	45.21	148	85.94			
Additional Reach Parameters												
Valley Length (ft)	4258.3			4258.3			4258.3					
Channel Length (ft)	5813.3			5813.3			5813.3					
Sinuosity	1.36			1.36			1.36					
Water Surface Slope (ft/ft)	0.00544			0.00544			0.00544					
BF slope (ft/ft)	0.00544			0.00544			0.00544					
Rosgen Classification	C4			C4			C4					
Habitat Index*	N/A			N/A			N/A					
Macrobenthos*	N/A			N/A			N/A					

Parameter	REACH 2															
	RIFFLE 1				POOL 1				RIFFLE 2				POOL 2			
Dimension	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3	AS BUILT	MY1	MY2	MY3
	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008	2006	2006	2007	2008
BF Width (ft)	7.38	7.61	10.66		18.44	17.46	22.47		8.21	7.6	9.16		9.59	10.03	5.56	
Floodprone Width (ft)	23.08	26.25	29.56		46.7	46.7	46.7		39.05	26.17	2.6		54.65	51.62	54.65	
BF Cross Sectional Area (ft^2)	4.14	4.65	5.33		19.78	18.94	23.35		6.77	4.86	7.71		17.34	16.04	5.82	
BF Mean Depth (ft)	0.56	0.61	0.5		1.07	1.09	1.04		0.82	0.64	0.84		1.81	1.6	1.05	
BF Max Depth (ft)	0.86	0.98	1		2.6	2.64	2.63		1.3	1.19	1.47		3.2	2.88	1.54	
Width/Depth Ratio	13.18	12.48	13.5		17.23	16.02	21.61		10.01	11.88	10.9		5.3	6.27	5.3	
Entrenchment Ratio	3.13	1.84	2.77		2.53	2.67	2.08		4.76	3.44	2.84		5.7	5.15	9.8	
Wetted Perimeter(ft)	7.68	7.92	10.91		20.58	19.14	24.19		8.77	8.01	9.68		12.14	11.79	6.8	
Hydraulic radius (ft)	0.54	0.59	0.58		0.96	0.99	0.97		0.77	0.61	0.8		1.43	1.37	0.86	
Substrate																
d50 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		4.8	7	0.12		N/A	N/A	N/A	
d84 (mm)	N/A	N/A	N/A		N/A	N/A	N/A		28	42	0.6		N/A	N/A	N/A	

Parameter	As-built (2006)			MY-1 (2006)			MY-2 (2007)			MY-3 (2008)		
Pattern	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg	Min	Max	Avg
Channel Beltwidth (ft)	11.83	22.05	16.96	11.56	23.13	17.05	11.45	24.13	17.55			
Radius of Curvature (ft)	4.63	9.1	6.43	4.776	9.84	6.32	4.7	9.7	6.1			
Meander Wavelength (ft)	27.51	34.72	31.75	28.61	35.43	32.47	28.42	35.03	31.73			
Meander Width ratio	1.52	2.83	2.17	1.43	2.94	2.33	1.48	2.95	2.41			
Profile												
Riffle length (ft)	3.36	11.6	5.6	4.93	7.24	5.88	4.95	7.64	6.01			
Riffle slope (ft/ft)	0.0053	0.0555	0.0279	0.0045	0.0393	0.1073	0.0049	0.0534	0.0325			
Pool length (ft)	5.2	10.08	7.59	5.17	8.67	14.37	5	15.25	10.125			
Pool Slope (ft/ft)	0.001	0.0092	0.0022	0.00087	0.00754	0.00253	0.00084	0.00253	0.00738			
Pool spacing (ft)	9.43	28.94	19.51	14.65	21.98	35.31	14.65	36.12	26.95			
Additional Reach Parameters												
Valley Length (ft)	1872.37			1872.37			1872.37					
Channel Length (ft)	2190.67			2190.67			2190.67					
Sinuosity	1.2			1.2			1.2					
Water Surface Slope (ft/ft)	0.025			0.025			0.025					
BF slope (ft/ft)	0.025			0.025			0.025					
Rosgen Classification	B4			B4			B4					
Habitat Index*	N/A			N/A			N/A					
Macrobenthos*	N/A			N/A			N/A					

IV. Methodology Section

No deviations from initially prescribed methodologies were implemented as a part of monitoring Year 2 (2007) activities.



Directions:

From I-40 West, take exit 144, Old Mountain Road North (SR 1005)
Take a left at Sterling Road (SR 1526)
Then right at Linden Road (SR 1527)
Right on Bolick Road (SR 1532) West
Reach 1 is located immediately north of Bolick Road (SR 1532)

From Reach 1, return East on Bolick Road (SR 1532)
Take a right onto Linden Road (SR 1527)
Then right at New Sterling Road (SR 1526)
Reach 2 is located immediately west of the intersection of New Sterling Road (SR 1525) and Gray House Road (SR 1525)

Project Number: 9385.D8	Map Title: Figure 1 - Project Location
Project Manager: PKS	Gray Farm Stream Restoration Site EEP Job # 92219 Iredell County, NC
Scale: 1" = 2,000'	
Date: DECEMBER 2007	Source: Stony Point Quadrangle

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Ecosystem Enhancement Program

APPENDIX A

APPENDIX A –

Vegetation Survey Data Tables

Table 1. – Vegetation Metadata

Report Prepared By David Ingersoll
Date Prepared 8/6/2007 14:22

database name 2007-Gray Farm-CVS_EEP_EntryTool_v210.mdb
database location \\Sec2\jobs7-9k\9385.D7-D11\YEAR 2 - D8\MONITORING DATA\Vegetation

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT---------

Metadata	This worksheet, which is a summary of the project and the project data.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Stem Count by Plot and Spp	Count of living stems of each species for each plot; dead and missing stems are excluded.

PROJECT SUMMARY----------

Project Code	project Name	Description	length(ft)
GF1	Gray Farm Reach 1	Gray Farm stream restoration - Reach 1	
GF2	Gray Farm Reach 2	Gray Farm stream restoration - Reach 2	
stream-to-edge width (ft)	**area (sq m)**	**Required Plots (calculated)**	**Sampled Plots**
			4
			2

Table 2. – Vegetation Vigor by Species

	Species	4	3	2	1	0	Missing
	Alnus serrulata		2	1	1	2	
	Betula nigra	2	1	1		1	
	Cornus amomum		2	1			
	Fraxinus pennsylvanica	2	1			3	
	Quercus michauxii		1				
	Quercus nigra			2		3	
	Quercus phellos		5	7		1	
	Viburnum nudum				1		
	Viburnum		2				
	Viburnum dentatum	1					
	Ilex opaca			2		3	1
	Carpinus caroliniana			1			
	Quercus			1		8	1
	Quercus rubra	1		1			
	Lindera benzoin			1		3	
	Liriodendron tulipifera		3			3	
	Platanus occidentalis	4	18	1	1	4	
TOT:	**17**	**10**	**35**	**19**	**3**	**31**	**2**

Table 3. – Vegetation Damage by Species

	Species	All Damage Categories	(no damage)	Insects	(other damage)
	Alnus serrulata	6	5	1	
	Betula nigra	5	5		
	Carpinus caroliniana	1	1		
	Cornus amomum	3	3		
	Fraxinus pennsylvanica	6	6		
	Ilex opaca	6	6		
	Lindera benzoin	4	4		
	Liriodendron tulipifera	6	6		
	Platanus occidentalis	28	20	8	
	Quercus	10	10		
	Quercus michauxii	1	1		
	Quercus nigra	5	5		
	Quercus phellos	13	13		
	Quercus rubra	2	2		
	Viburnum	2	2		
	Viburnum dentatum	1	1		
	Viburnum nudum	1			1
TOT:	**17**	**100**	**90**	**9**	**1**

Table 4. – Vegetation Damage by Plot

	plot	All Damage Categories	(no damage)	Insects	(other damage)
	GFR1-01-buffer1	17	14	2	1
	GFR1-01-buffer2	17	16	1	
	GFR1-01-buffer3	16	16		
	GFR1-01-buffer4	11	6	5	
	GFR2-01-Buffer1	24	24		
	GFR2-01-Buffer2	15	14	1	
TOT:	**6**	**100**	**90**	**9**	**1**

Table 5. – Stem Count by Plot and Species

	Species	Total Stems	# plots	avg# stems	plot GFR1-01-buffer1	plot GFR1-01-buffer2	plot GFR1-01-buffer3	plot GFR1-01-buffer4	plot GFR2-01-Buffer1	plot GFR2-01-Buffer2
	Alnus serrulata	4	3	1.33	2	1	1			
	Betula nigra	4	2	2			2	2		
	Carpinus caroliniana	1	1	1					1	
	Cornus amomum	3	2	1.5			1	2		
	Fraxinus pennsylvanica	3	3	1	1	1	1			
	Ilex opaca	2	2	1			1		1	
	Lindera benzoin	1	1	1		1				
	Liriodendron tulipifera	3	2	1.5		1				2
	Platanus occidentalis	24	6	4	2	3	9	7	2	1
	Quercus	1	1	1	1					
	Quercus michauxii	1	1	1		1				
	Quercus nigra	2	1	2		2				
	Quercus phellos	12	3	3.67	3				8	1
	Quercus rubra	2	1	2	2					
	Viburnum	2	1	2		2				
	Viburnum dentatum	1	1	1						1
	Viburnum nudum	1	1	1	1					
TOT:	**17**	**67**	**17**		**12**	**12**	**15**	**11**	**12**	**5**
	Total Plot Density (Stems Per Acre)				**486**	**486**	**607**	**445**	**486**	**202**
	Average Plot Density (Stems Per Acre)					**452**				

Exhibit Table 6. Vegetative Problem Areas			
Reach 1			
Feature/Issue	**Station # / Range**	**Probable Cause**	**Photo #**
Bare Floodplain	0+00 - 2+10	Surface flow / Poor soil quality	1-2
	5+00 - 7+00	Surface flow / Poor soil quality	
	43+00 - 44+00	Surface flow / Poor soil quality	
	51+50 - 52+75	Surface flow / Poor soil quality	
	52+50 - 53+15	Surface flow / Poor soil quality	
Bare Bank	42+90 - 43+30	Surface flow / Poor soil quality	3
	45+95 - 46+30	Surface flow / Poor soil quality	
	46+90 - 47+40	Surface flow / Poor soil quality	
Exposed roots	39+90 - 43+25	Settling of fill /Lack of compaction / Surface flow	4
Reach 2			
Feature/Issue	**Station # / Range**	**Probable Cause**	**Photo #**
Bare Floodplain	2+45 - 2+60	Surface flow / Poor soil quality	5
	2+90 - 3+10	Surface flow / Poor soil quality	
	4+50 - 4+75	Surface flow / Poor soil quality	
	19+60 - 19+85	Surface flow / Poor soil quality	

APPENDIX A –

Vegetation Problem Area Photos

Photo 1—Typical Bare Bench/Floodplain—Reach 1—Year 2 (2007)

Photo 2—Typical Bare Floodplain—Reach 1—Year 2 (2007)

Photo 3—Typical Bare Bank—Reach 1—Year 2 (2007)

Photo 4—Exposed Roots—Reach 1—Year 2 (2007)

Photo 5—Typical Bare Bench/Floodplain—Reach 2—Year 2 (2007)

APPENDIX A –

Vegetation Monitoring Plot Photos

Vegetation Monitoring Plot— Reach 1—Buffer 1—Year 2 (2007)

Vegetation Monitoring Plot— Reach 1—Buffer 1—Year 1 (2006)

Vegetation Monitoring Plot— Reach 1—Buffer 2—Year 2 (2007)

Vegetation Monitoring Plot—Reach 1—Buffer 2—Year 1 (2006)

Vegetation Monitoring Plot—Reach 1—Buffer 3—Year 2 (2007)

Vegetation Monitoring Plot—Reach 1—Buffer 3—Year 1 (2006)

Vegetation Monitoring Plot—Reach 1—Buffer 4—Year 2 (2007)

Vegetation Monitoring Plot—Reach 1—Buffer 4—Year 1 (2006)

Vegetation Monitoring Plot—Reach 1—Bank 1—Year 2 (2007)

Vegetation Monitoring Plot—Reach 1—Bank 1—Year 1 (2006)

Vegetation Monitoring Plot—Reach 1—Bank 2—Year 2 (2007)

Vegetation Monitoring Plot—Reach 1—Bank 2—Year 1 (2006)

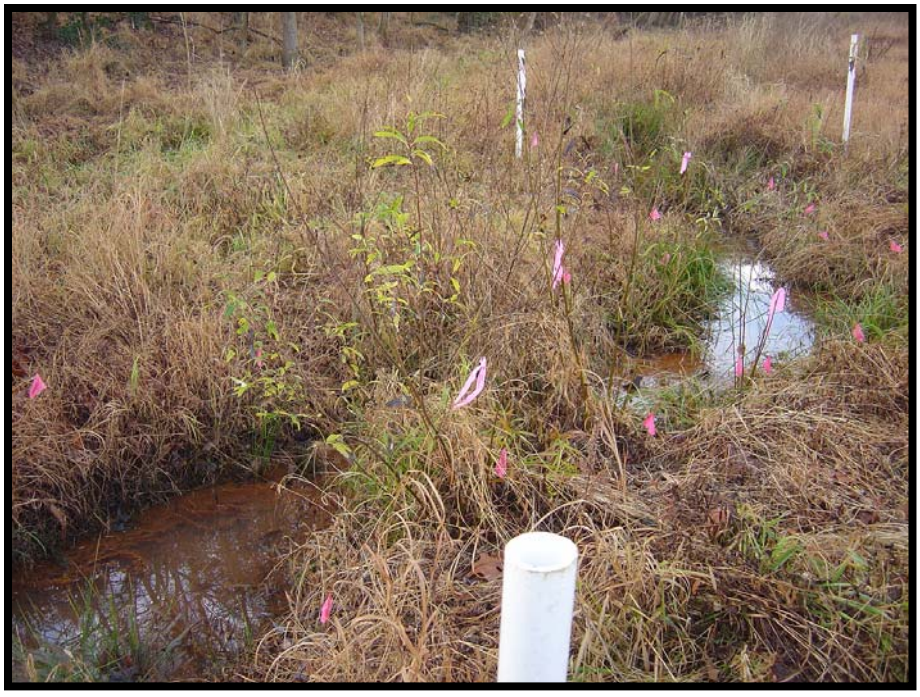
Vegetation Monitoring Plot—Reach 2—Buffer 1—Year 2 (2007)

Vegetation Monitoring Plot—Reach 2—Buffer 1—Year 1 (2006)

Vegetation Monitoring Plot—Reach 2—Buffer 2—Year 2 (2007)

Vegetation Monitoring Plot—Reach 2—Buffer 2—Year 1 (2006)

Vegetation Monitoring Plot—Reach 2—Bank 1—Year 2 (2007)



Vegetation Monitoring Plot—Reach 2—Bank 1—Year 1 (2006)

Vegetation Monitoring Plot—Reach 2—Bank 2—Year 2 (2007)

Vegetation Monitoring Plot—Reach 2—Bank 2—Year 1 (2006)

APPENDIX B

APPENDIX B –

Stream Problem Area Table

Exhibit Table B.1a Stream Problem Areas Gray Farm Stream Restoration Site/EEP Project #92219 Reach 1			
Feature Issue	**Station numbers**	**Suspected Cause**	**Photo number**
Bank Scour	5+30	Surface flow	1-2
	6+85	Surface flow	
	14+00	Surface flow	
	43+05	Surface flow - Settling fill	
	47+90	Surface flow	
Structures	43+05	Stressed structure - Bank Scour	2

Exhibit Table B.1a Stream Problem Areas Gray Farm Stream Restoration Site/EEP Project #92219 Reach 2			
Feature Issue	**Station numbers**	**Suspected Cause**	**Photo number**
Bank Scour	4+80	Surface flow	2
	6+00	Surface flow	
	16+75	Surface flow	
Structures	4+80	Stressed structure - Bank Scour	
	6+00	Stressed structure - Bank Scour	
	16+75	Stressed structure - Bank Scour	

APPENDIX B –

Representative Stream Problem Area Photos

Photo 1—Typical Bank Scour—Reach 1—Year 2 (2007)

Typical Stressed Structure/Bank Scour—Reach 1—Year 2 (2007)

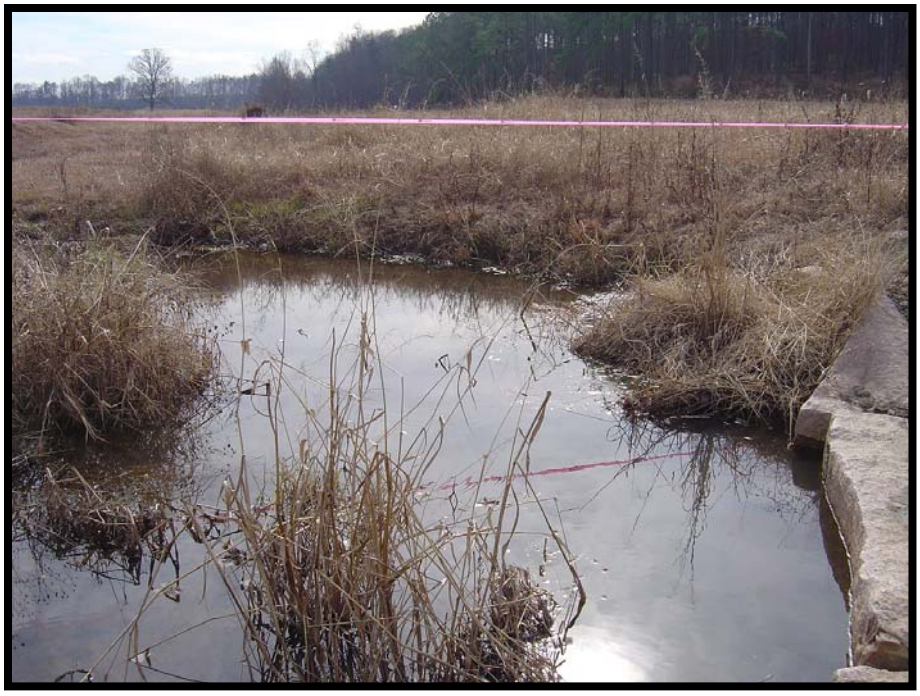
APPENDIX B –

Stream Photo Point Photos

Cross-Section 1— Reach 1—Riffle 1—Year 2 (2007)

Cross-Section 1— Reach 1—Riffle 1—Year 1 (2006)

Cross-Section 1— Reach 1—Pool 1—Year 2 (2007)



Cross-Section 1— Reach 1—Pool 1—Year 1 (2006)

Cross-Section 2—Reach 1—Riffle 2—Year 2 (2007)

Cross-Section 2—Reach 1—Riffle 2—Year 1 (2006)

Cross-Section 2—Reach 1 - Pool 2—Year 2 (2007)

Cross-Section 2—Reach 1 - Pool 2—Year 1 (2006)

Cross-Section 3—Reach 1—Riffle 3—Year 2 (2007)

Cross-Section 3—Reach 1—Riffle 3—Year 1 (2006)

Cross-Section 3—Reach 1 - Pool 3—Year 2 (2007)

Cross-Section 3—Reach 1 - Pool 3—Year 1 (2006)

Cross-Section 4—Reach 1—Riffle 4—Year 2 (2007)

Cross-Section 4—Reach 1—Riffle 4—Year 1 (2006)

Cross-Section 4—Reach 1—Pool 4—Year 2 (2007)

Cross-Section 4—Reach 1—Pool 4—Year 1 (2006)

Cross-Section 5—Reach 1—Riffle 5—Year 2 (2007)

Cross-Section 5—Reach 1—Riffle 5—Year 1 (2006)

Cross-Section 5—Reach 1—Pool 5—Year 2 (2007)

Cross-Section 5—Reach 1—Pool 5—Year 1 (2006)

Cross-Section 6—Reach 1—Riffle 6—Year 2 (2007)

Cross-Section 6—Reach 1—Riffle 6—Year 1 (2006)

Cross-Section 6—Reach 1—Pool 6—Year 2 (2007)

Cross-Section 6—Reach 1—Pool 6—Year 1 (2006)

Cross-Section 7—Reach 1—Riffle 7—Year 2 (2007)

Cross-Section 7—Reach 1—Riffle 7—Year 1 (2006)

Cross-Section 7—Reach 1—Pool 7—Year 2 (2007)

Cross-Section 7—Reach 1—Pool 7—Year 1 (2006)

Cross-Section 1—Reach 2—Riffle 1—Year 2 (2007)

Cross-Section 1—Reach 2—Riffle 1—Year 1 (2006)

Cross-Section 1—Reach 2—Pool 1—Year 2 (2007)

Cross-Section 1—Reach 2—Pool 1—Year 1 (2006)

Cross-Section 2—Reach 2—Riffle 2—Year 2 (2007)

Cross-Section 2—Reach 2—Riffle 2—Year 1 (2006)

Cross-Section 2—Reach 2—Pool 2—Year 2 (2007)

Cross-Section 2—Reach 2—Pool 2—Year 1 (2006)

APPENDIX B –

Exhibit Table B.1. Qualitative Visual Stability Assesment

Table B2. Qualitative Visual Stability Assessment
Date: NOVEMBER 2007 Project # 9385.D8
GRAY FARM STREAM RESTORATION - REACH 1

Feature Category	Metric (per As-built and reference baselines	(# stable) Number performing as intended	Total number per As-built	Total Number / feet in unstable state	% perfor. in stable condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	34	34	NA	100%	
	2. Armor stable (e.g. no displacement)?	34	34	NA	100%	
	3. Facet grade appears stable?	33	34	NA	97%	
	4. Stable interval grade?	34	34	NA	100%	
	5. Feature spacing appropriate?	34	34	NA	100%	
	6. Minimal evidence of embedding/fining?	34	34	NA	100%	
	7. Depth appears appropriate for current discharge?	34	34	NA	100%	
	8. Length appropriate?	34	34	NA	100%	**100%**
B. Pools	1. Present? (e.g. not subject to severe aggradation?)	49	49	NA	100%	
	2. Suffieciently deep (Max Pool D:Mean Bkf>1.6)	49	49	NA	100%	
	3. Thalweg located outer bend?	49	49	NA	100%	
	4. Spacing appropriate?	49	49	NA	100%	
	5. Non-aggrading (not filling)?	49	49	NA	100%	
	6. Length appropriate?	49	49	NA	100%	**100%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	34	34	NA	100%	
	2. Downstream of meander (glide/inflection) centering?	33	34	NA	97%	**99%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	49	49	NA	100%	
	2. Of those eroding, # w/ concomitant point bar formation?	N/A	49	NA	N/A	
	3. Apparent Rc within spec?	49	49	NA	100%	
	4. Sufficient floodplain access and relief?	49	49	NA	100%	**100%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	0	100%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting?	NA	NA	75	98%	**99%**
G. Banks	1. Apparent scour points from channel processes	NA	NA	20	99%	
	2. Apparent cut points from overland flow	NA	NA	150	96%	
	3. Apparent cut or scour from flood water re-entry to channel (e.g. inadequate floodplain access?)	NA	NA	0	100%	
	4. Tension cracks	NA	NA	0	100%	
	5. Bank gradient in excess of 40%?	NA	NA	0	100%	
	6. Collapse/slumping	NA	NA	0	100%	
	7. Ratio of bank height: bankfull height elevated	NA	NA	0	100%	**99%**
H. Vanes	1. Free of back or arm scour?	27	28	N/A	96%	
	2. Height appropriate?	28	28	N/A	100%	
	3. Angle and geometry appear appropriate?	27	28	N/A	96%	
	4. Free of piping or other structural failures?	28	28	N/A	100%	**98%**
I. Wads/Boulders	1. Free of scour?	0	0	N/A	N/A	
	2. Footing stable?	0	0	N/A	N/A	**N/A**

Notes:

Table B2. Qualitative Visual Stability Assessment
Date: NOVEMBER 2007 Project # 9385.D8
GRAY FARM STREAM RESTORATION - REACH 2

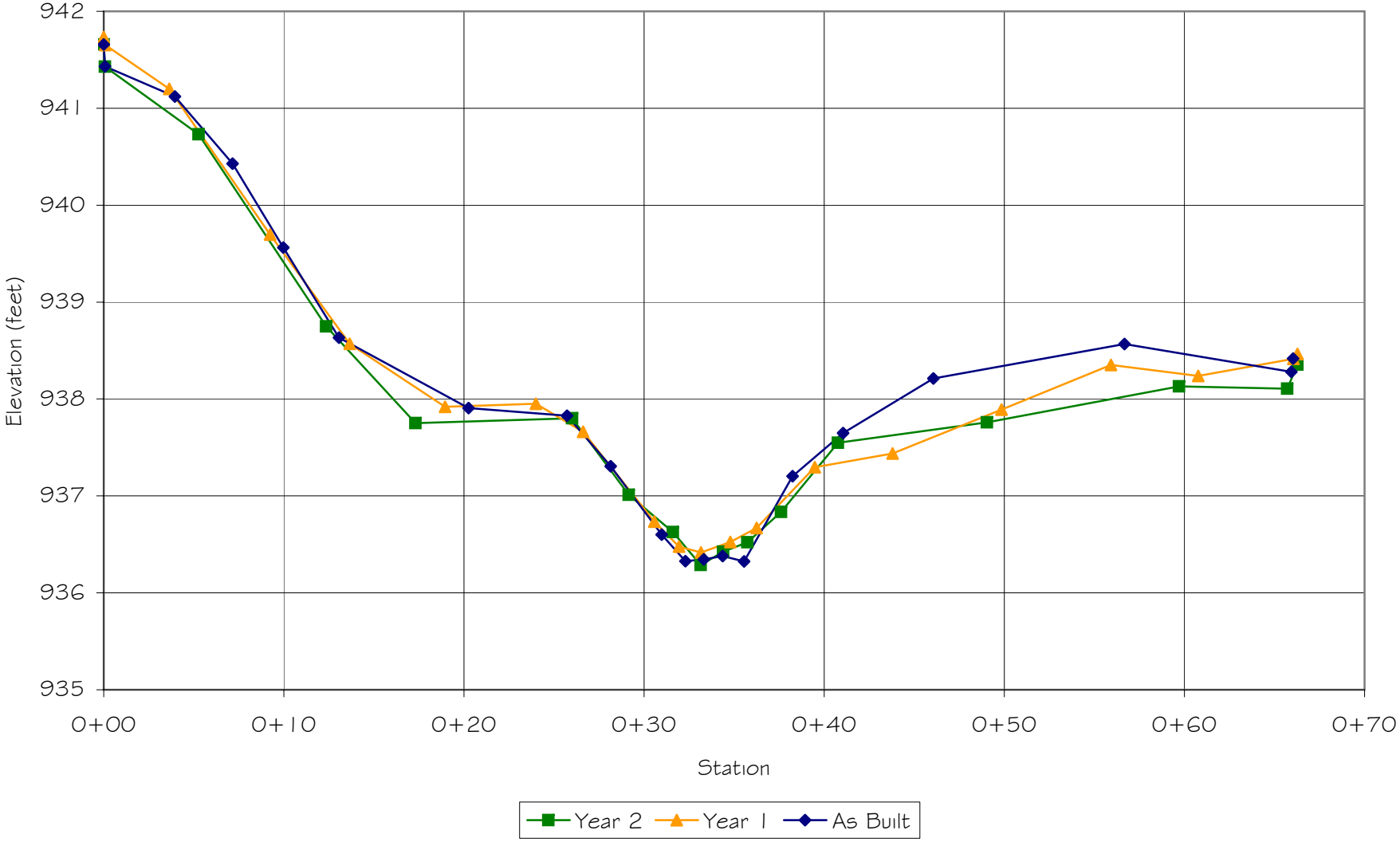
Feature Category	Metric (per As-built and reference baselines	(# stable) Number performing as intended	Total number per As-built	Total Number / feet in unstable state	% perfor. in stable condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	51	51	NA	100%	
	2. Armor stable (e.g. no displacement)?	51	51	NA	100%	
	3. Facet grade appears stable?	51	51	NA	100%	
	4. Stable interval grade?	51	51	NA	100%	
	5. Feature spacing appropriate?	51	51	NA	100%	
	6. Minimal evidence of embedding/fining?	51	51	NA	100%	
	7. Depth appears appropriate for current discharge?	51	51	NA	100%	
	8. Length appropriate?	51	51	NA	100%	**100%**
B. Pools	1. Present? (e.g. not subject to severe aggradation?)	52	52	NA	100%	
	2. Suffieciently deep (Max Pool D:Mean Bkf>1.6)	52	52	NA	100%	
	3. Thalweg located outer bend?	52	52	NA	100%	
	4. Spacing appropriate?	52	52	NA	N/A	
	5. Non-aggrading (not filling)?	52	52	NA	100%	
	6. Length appropriate?	52	52	NA	N/A	**100%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	51	51	NA	100%	
	2. Downstream of meander (glide/inflection) centering?	51	51	NA	100%	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	50	52	NA	96%	
	2. Of those eroding, # w/ concomitant point bar formation?	N/A	N/A	NA	N/A	
	3. Apparent Rc within spec?	52	52	NA	100%	
	4. Sufficient floodplain access and relief?	52	52	NA	100%	**98%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	0	100%	
	2. Channel bed degradation - areas of increasing down cutting or head cutting?	NA	NA	0	100%	**100%**
G. Banks	1. Apparent scour points from channel processes	NA	NA	20	98%	
	2. Apparent cut points from overland flow	NA	NA	0	100%	
	3. Apparent cut or scour from flood water re-entry to channel (e.g. inadequate floodplain access?)	NA	NA	0	100%	
	4. Tension cracks	NA	NA	0	100%	
	5. Bank gradient in excess of 40%?	NA	NA	0	100%	
	6. Collapse/slumping	NA	NA	0	100%	
	7. Ratio of bank height: bankfull height elevated	NA	NA	0	100%	**100%**
H. Vanes	1. Free of back or arm scour?	50	53	NA	94%	
	2. Height appropriate?	53	53	NA	100%	
	3. Angle and geometry appear appropriate?	51	53	NA	96%	
	4. Free of piping or other structural failures?	50	53	NA	94%	**96%**
I. Wads/Boulders	1. Free of scour?	0	0	NA	N/A	
	2. Footing stable?	0	0	NA	N/A	**N/A**

Notes:

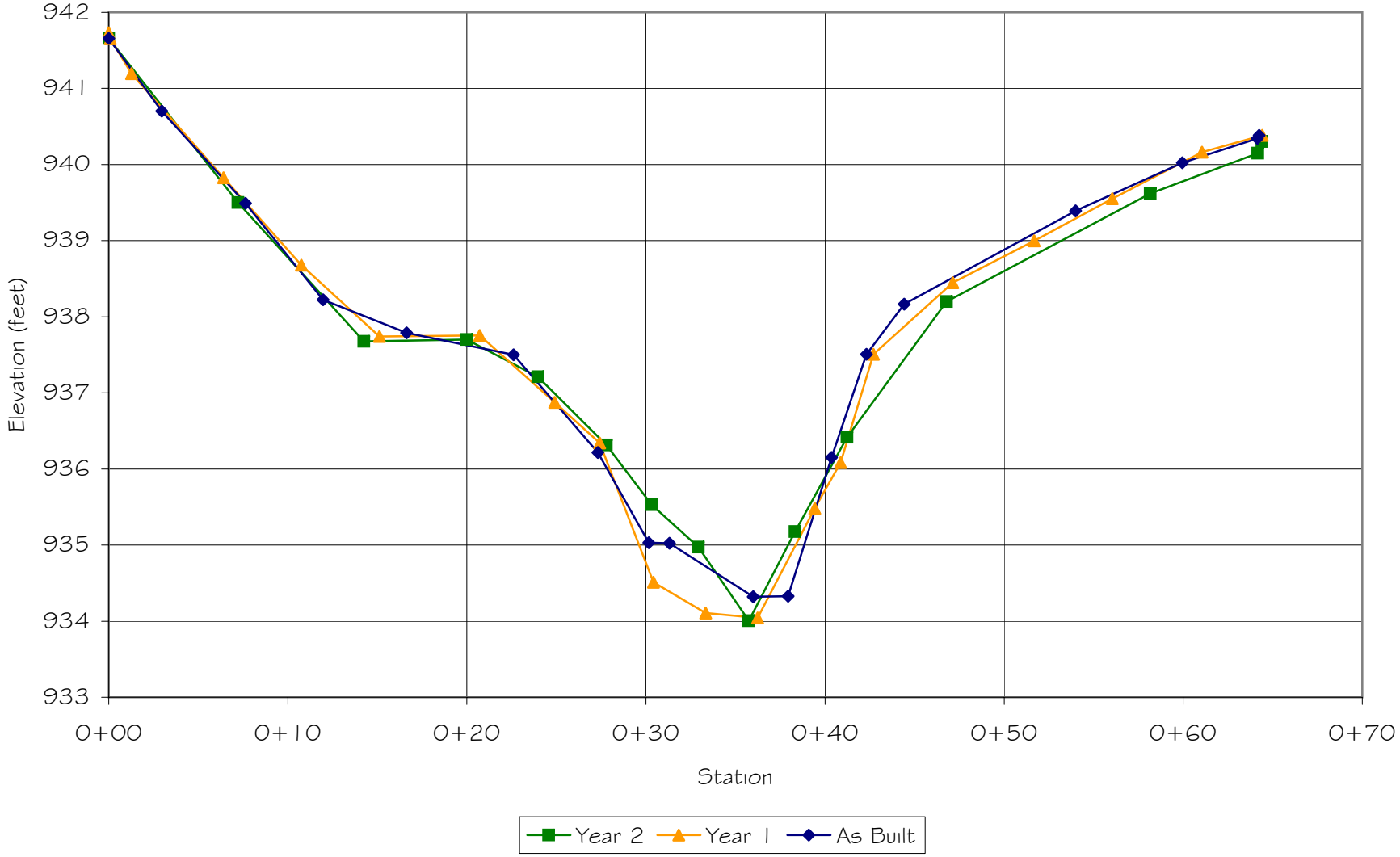
APPENDIX B –

Annual Overlays of Cross Section Plots

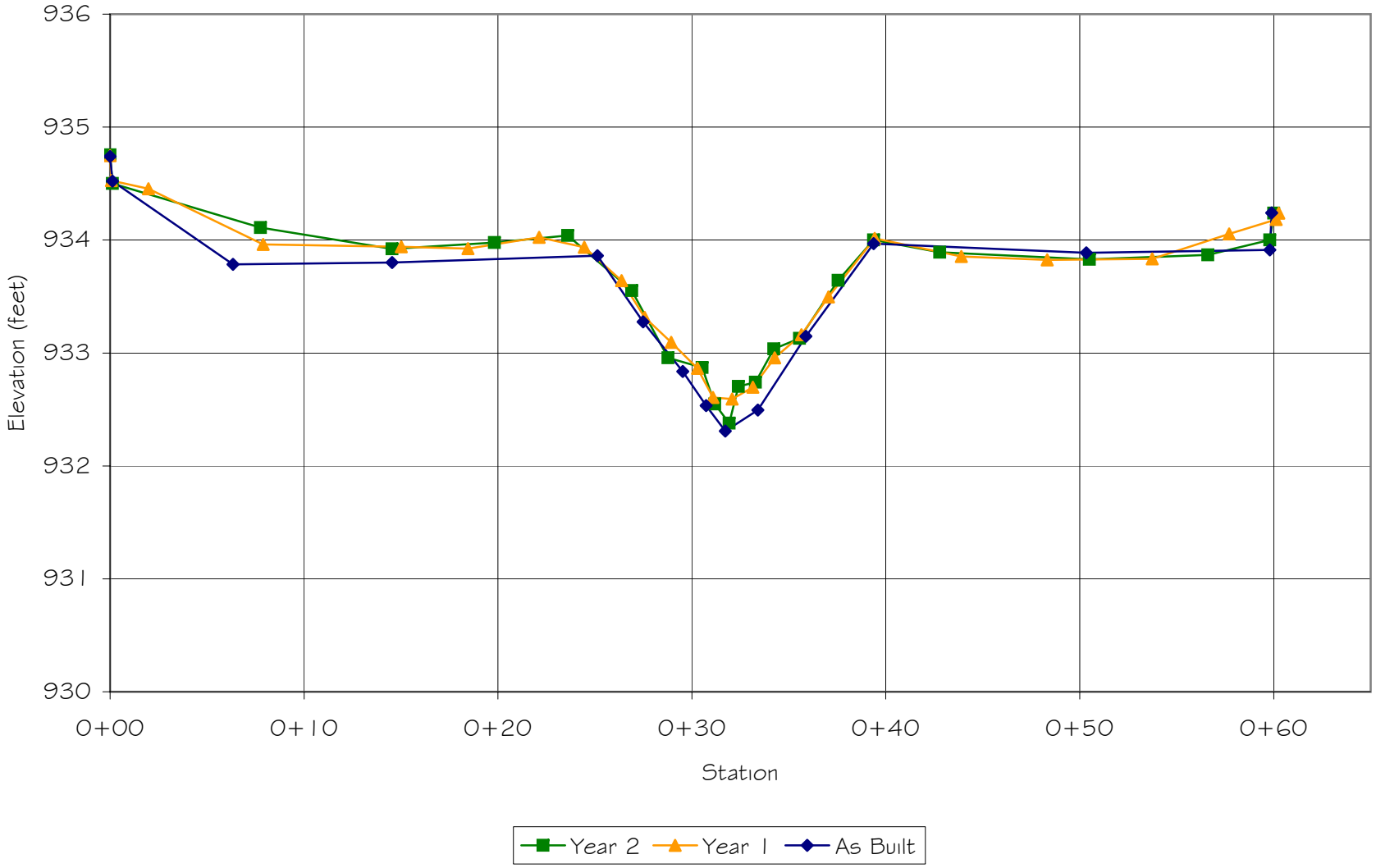
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 1 (RIFFLE)
(STA. 4+25)



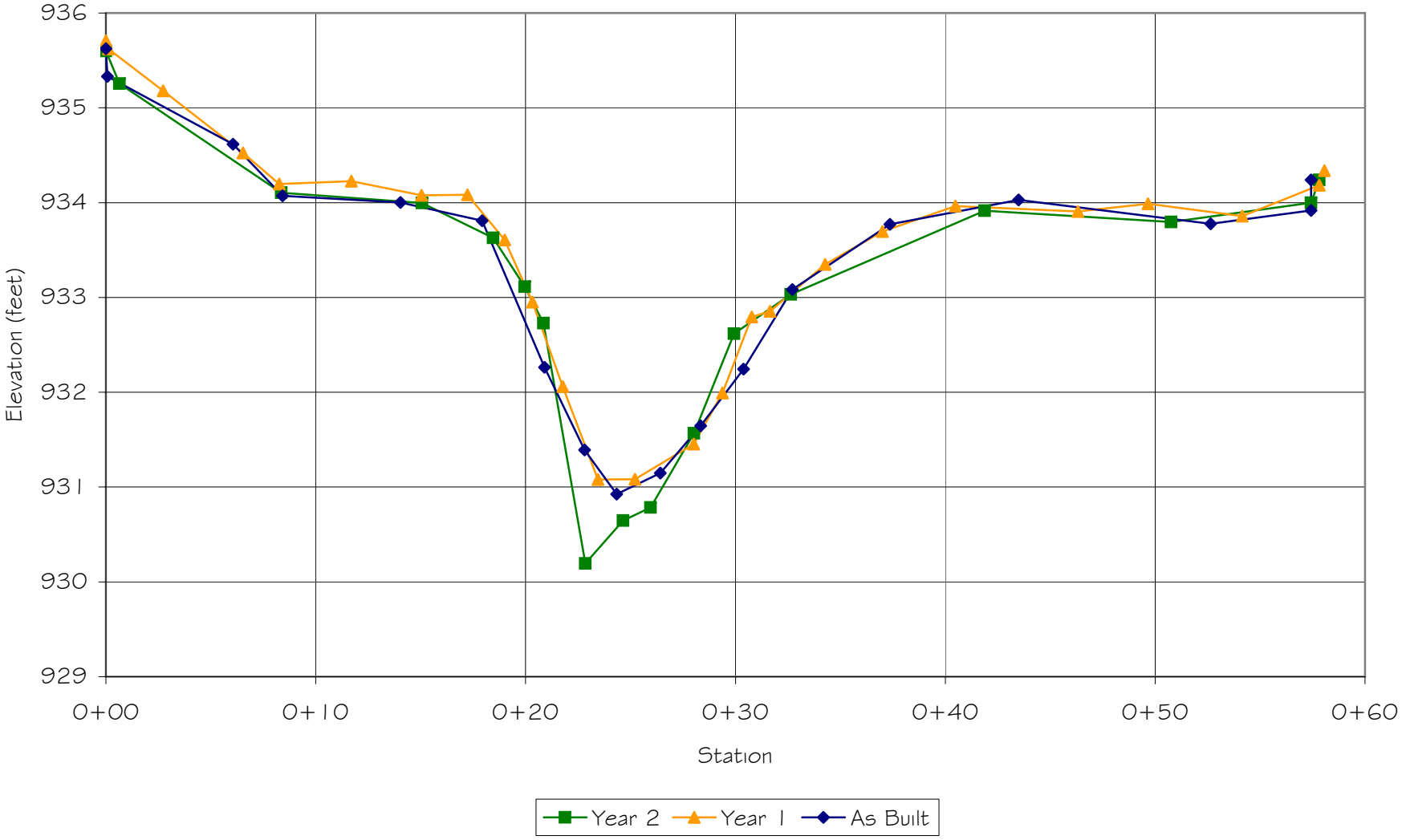
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 1 (POOL)
(STA. 4+65)



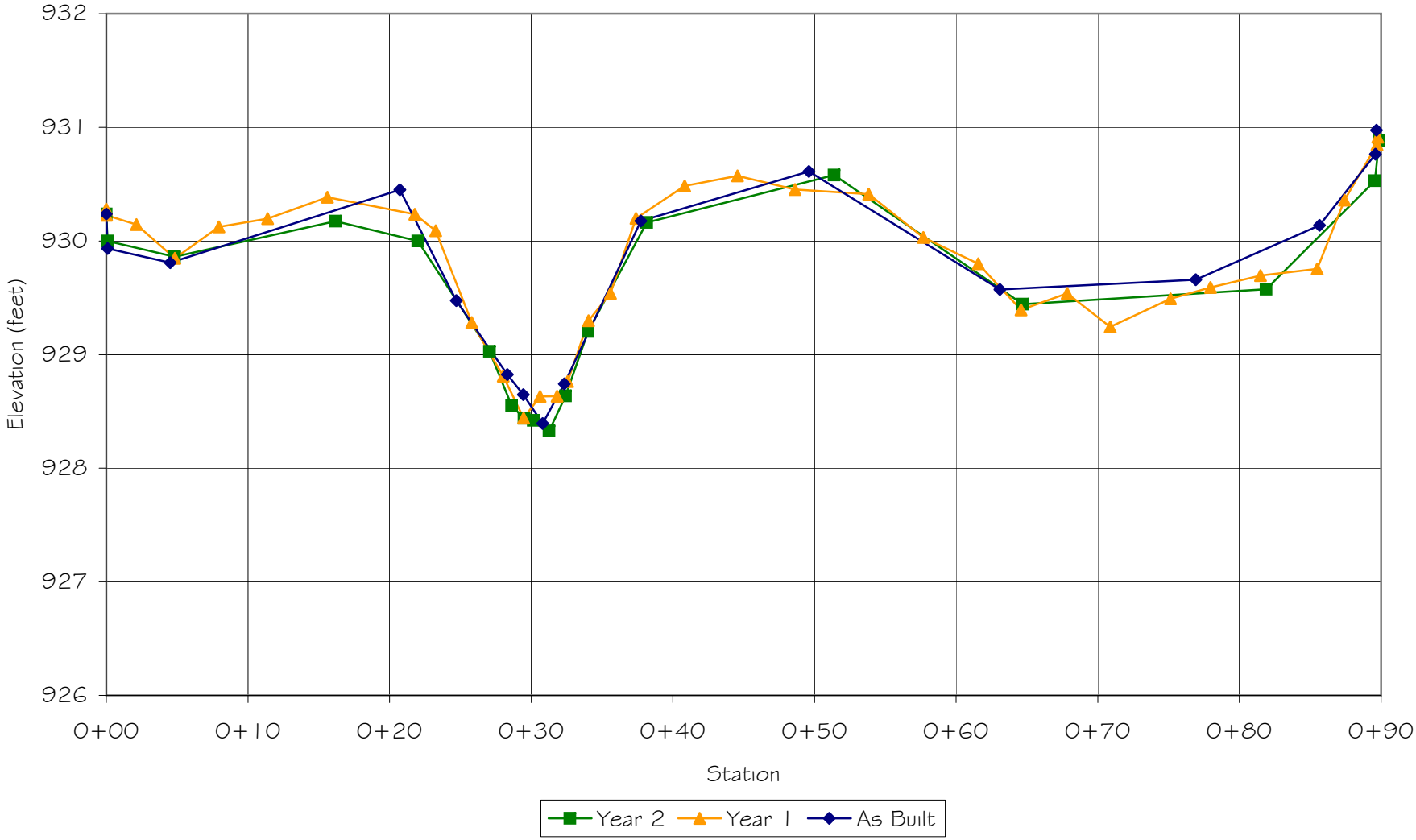
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 2 (RIFFLE)
(STA. 13+55)



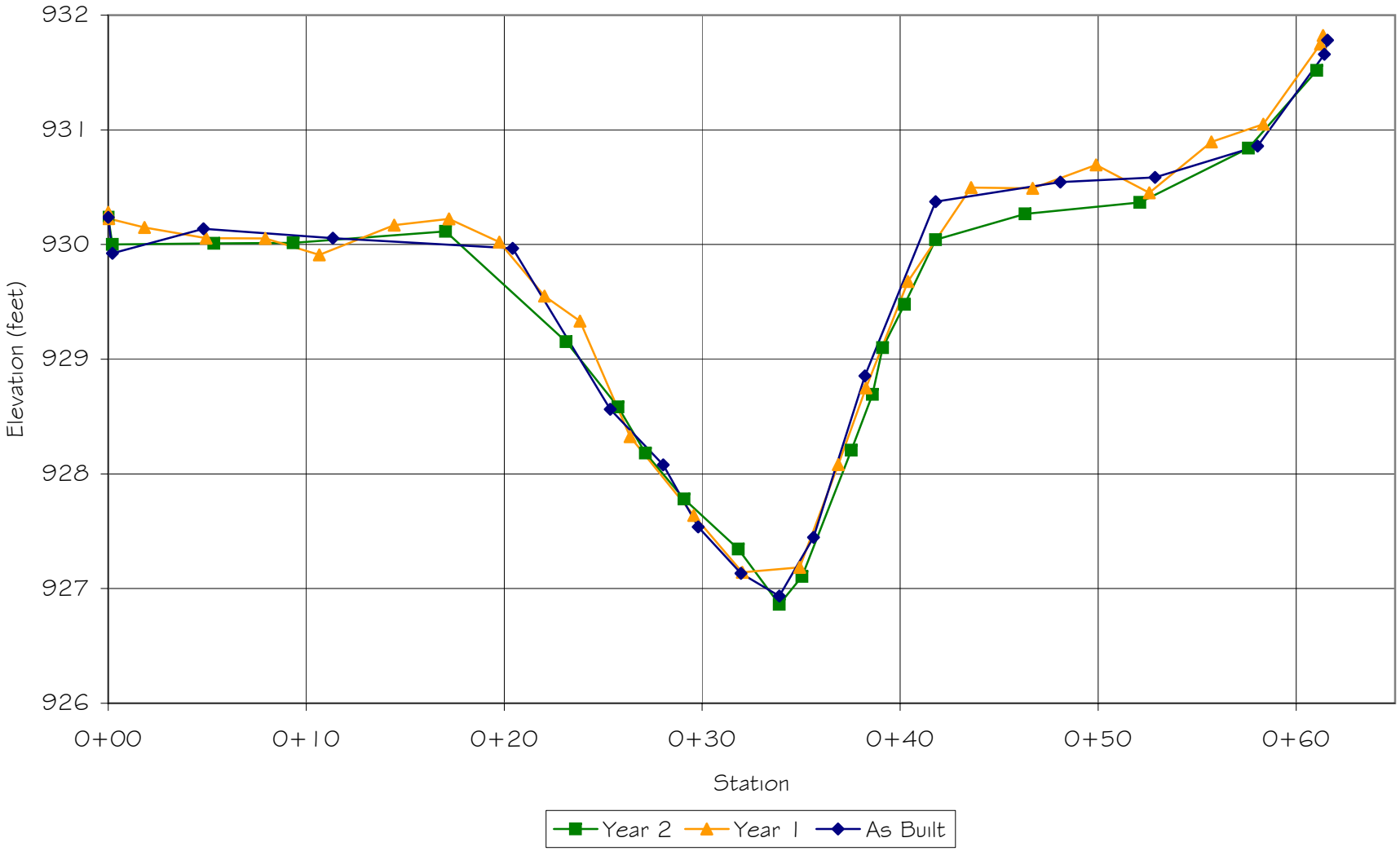
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 2 (POOL)
(STA. 13+90)



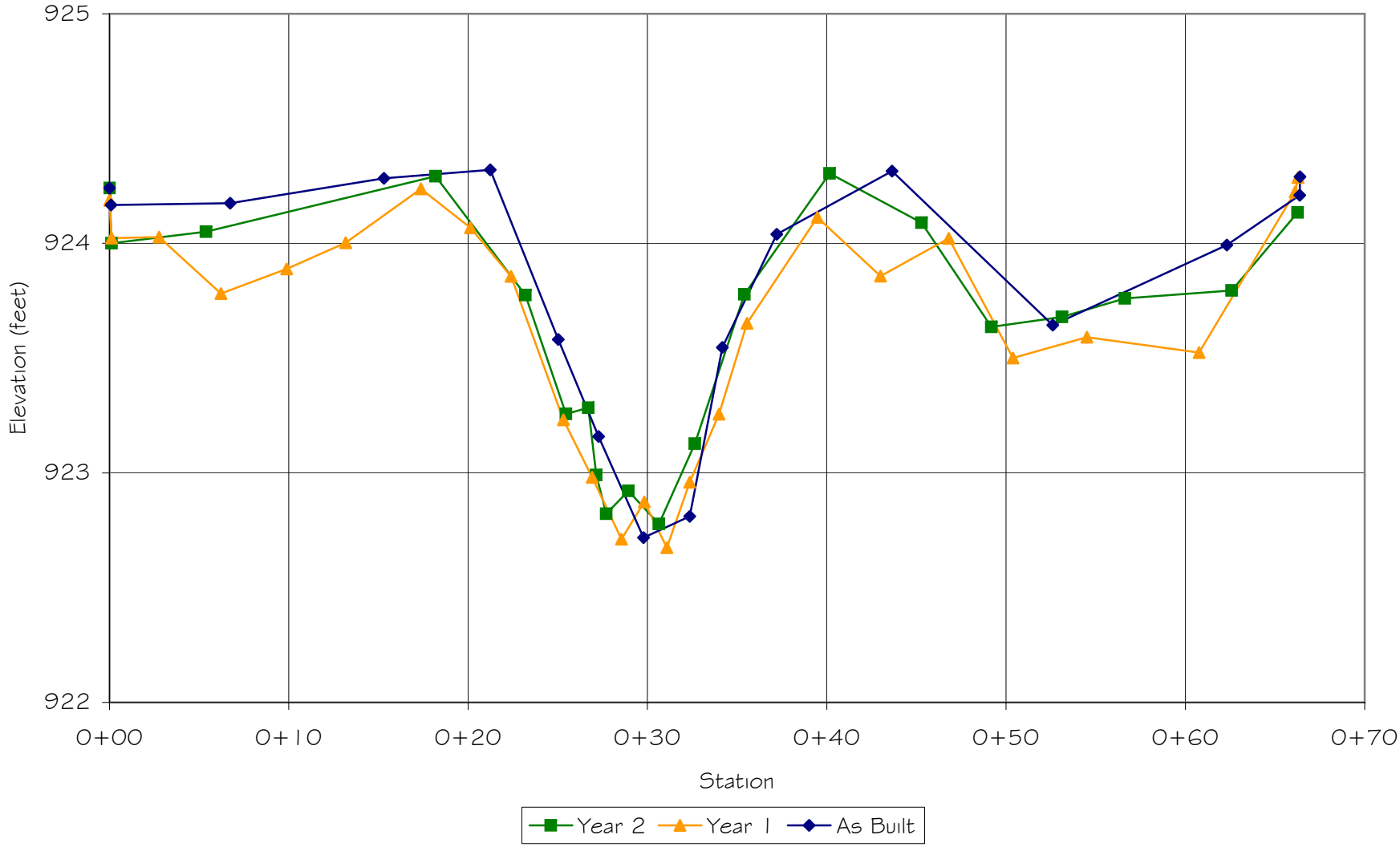
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 3 (RIFFLE)
(STA. 23+40)



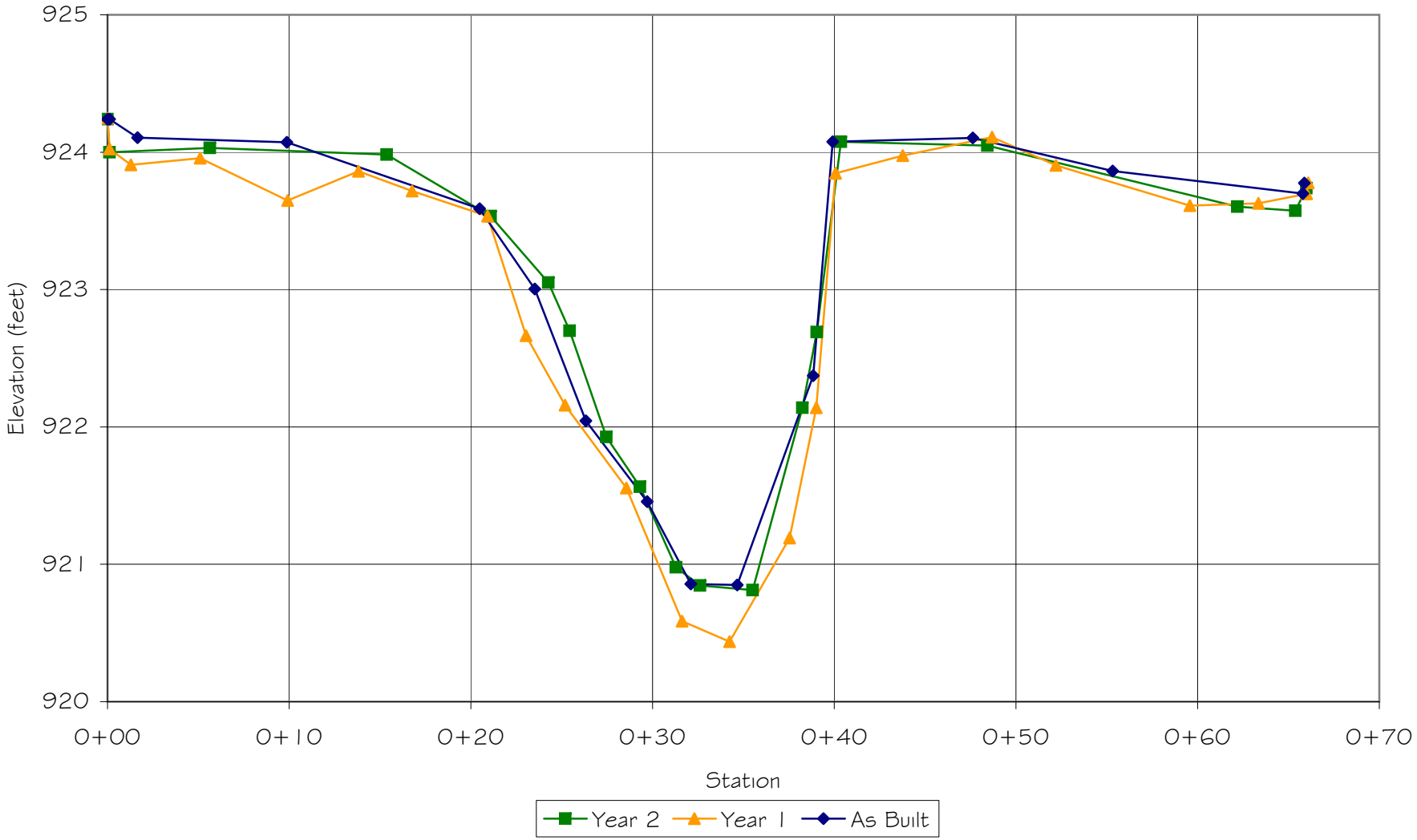
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 3 (POOL)
(STA. 23+20)



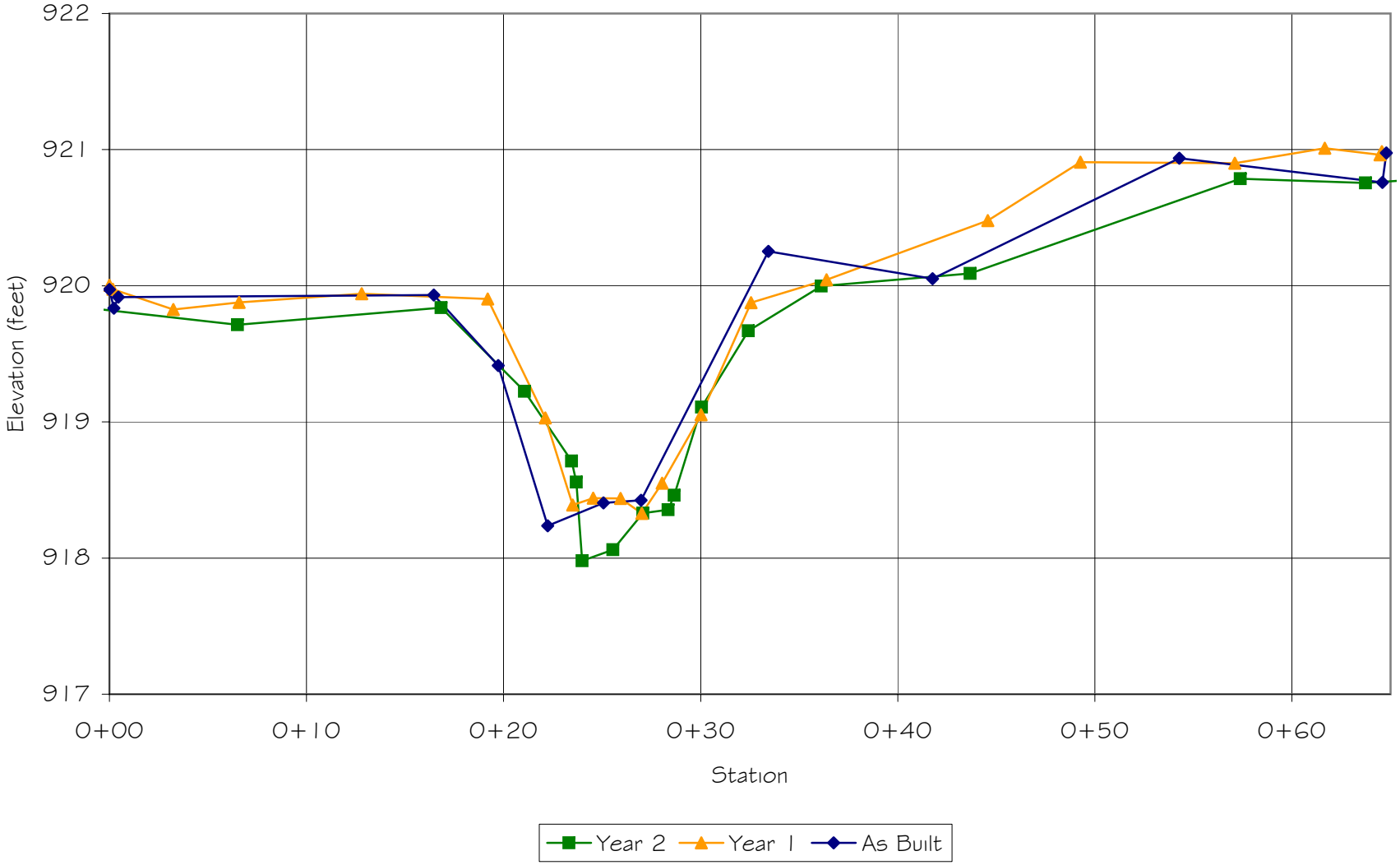
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 4 (RIFFLE)
(STA. 32+95)



GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 4 (POOL)
(STA. 33+30)

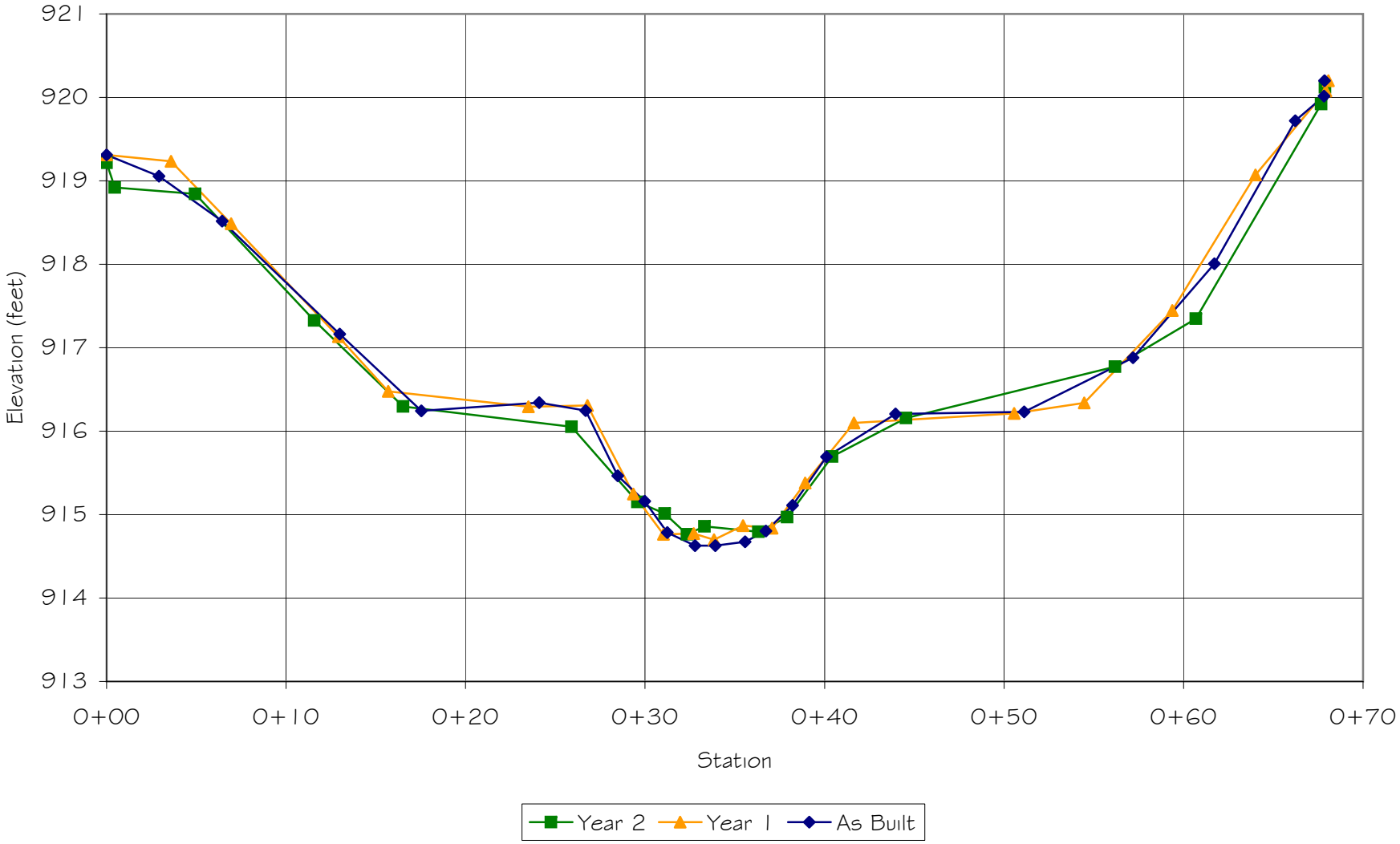


GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 5 (RIFFLE)
(STA. 39+30)

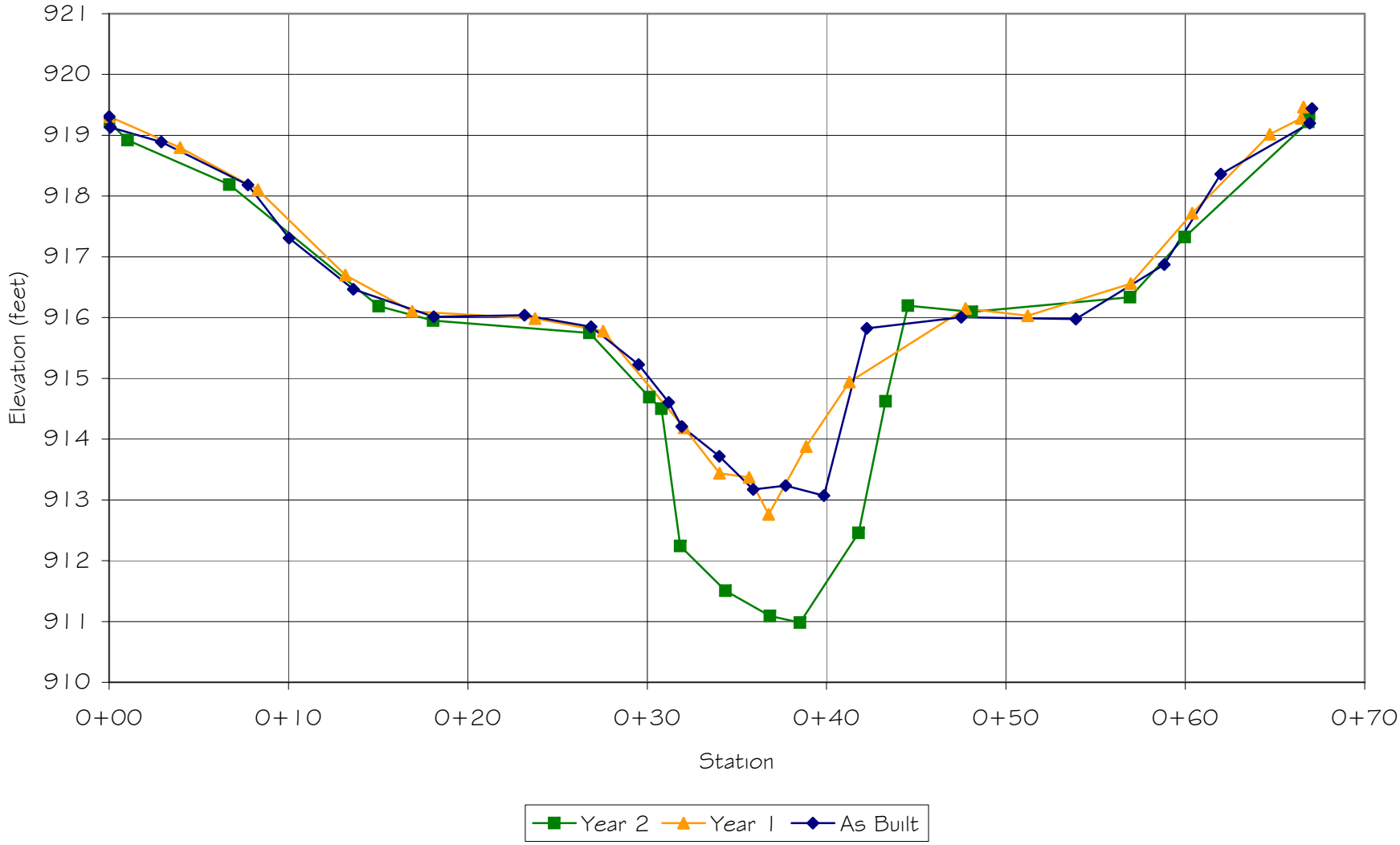



GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 5 (POOL)
(STA. 38+95)
922
921
920
919
918
917
916
Elevation (feet)
0+00
0+10
0+20
0+30
0+40
0+50
0+60
0+70
Station
Year 2
Year 1
As Built

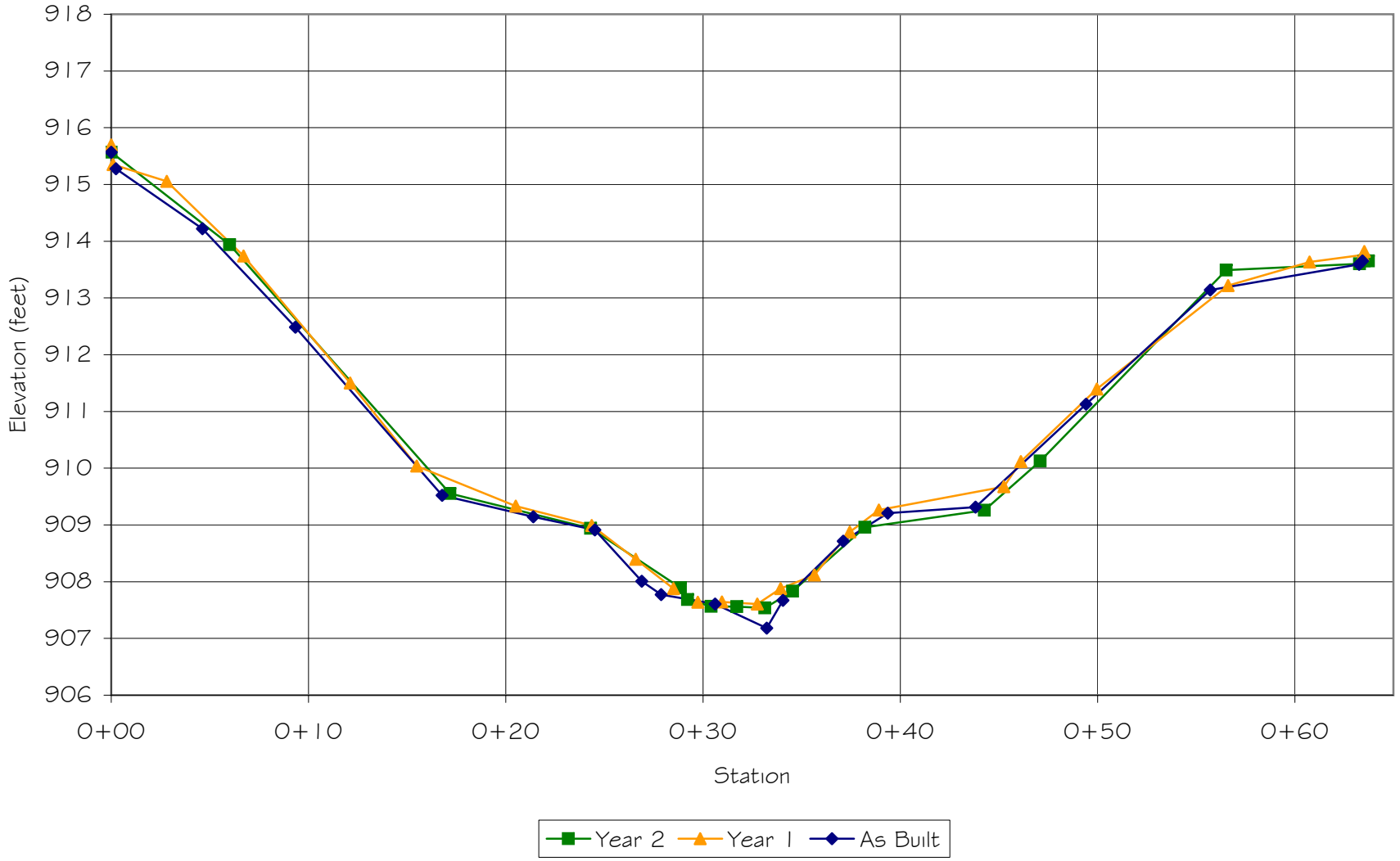
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 6 (RIFFLE)
(STA. 42+80)



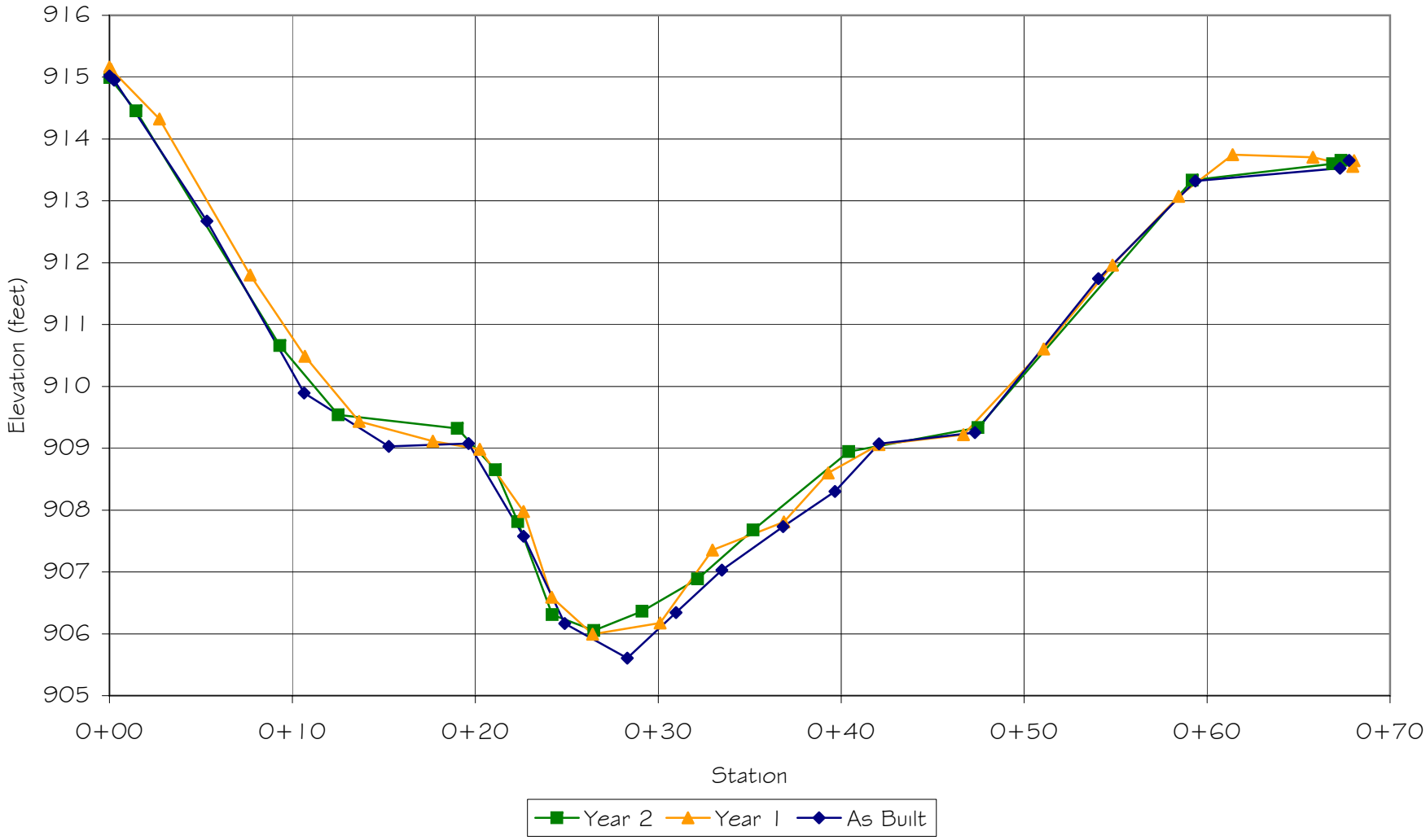
GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 6 (POOL)
(STA. 43+10)

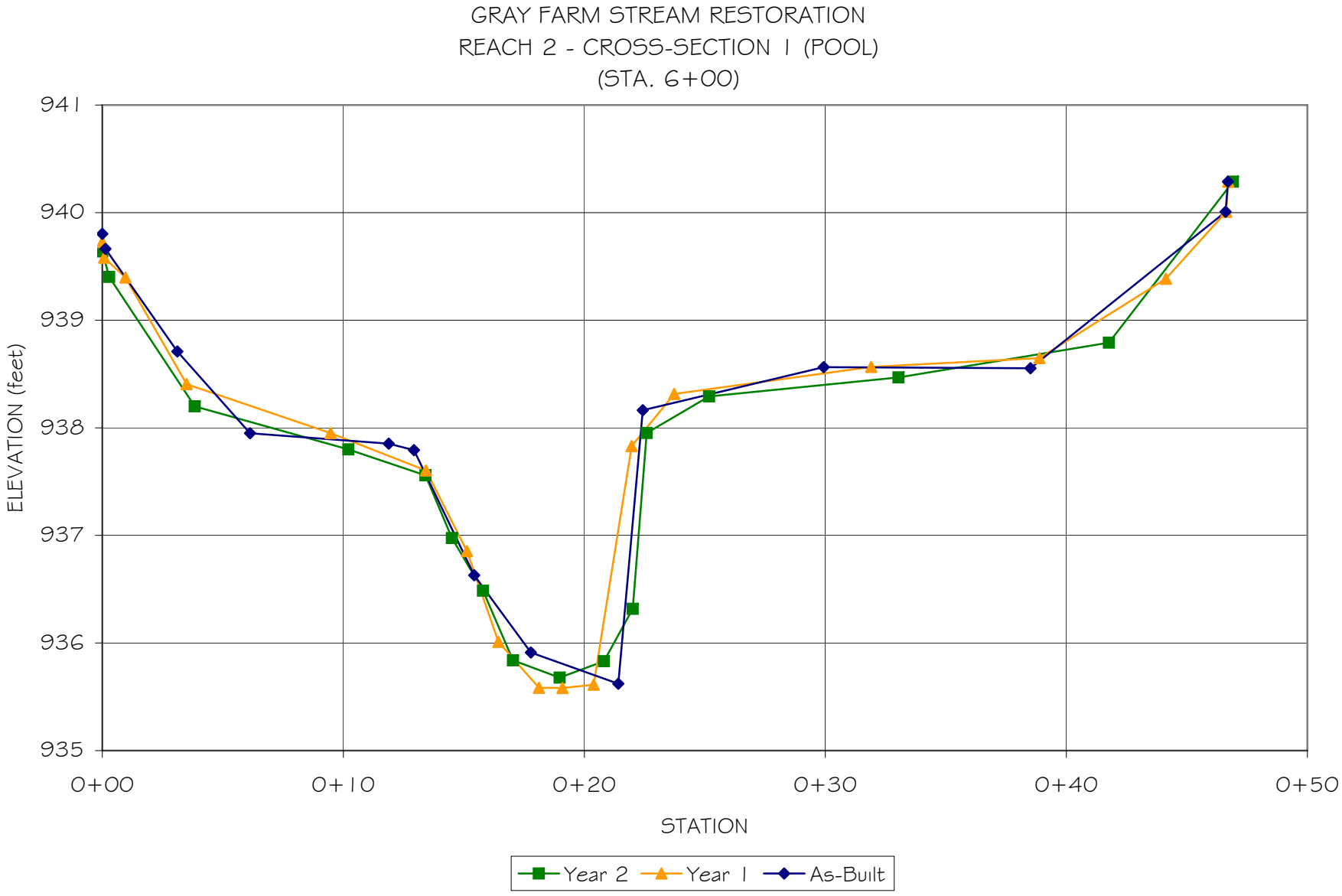


GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 7 (RIFFLE)
(STA. 54+05)

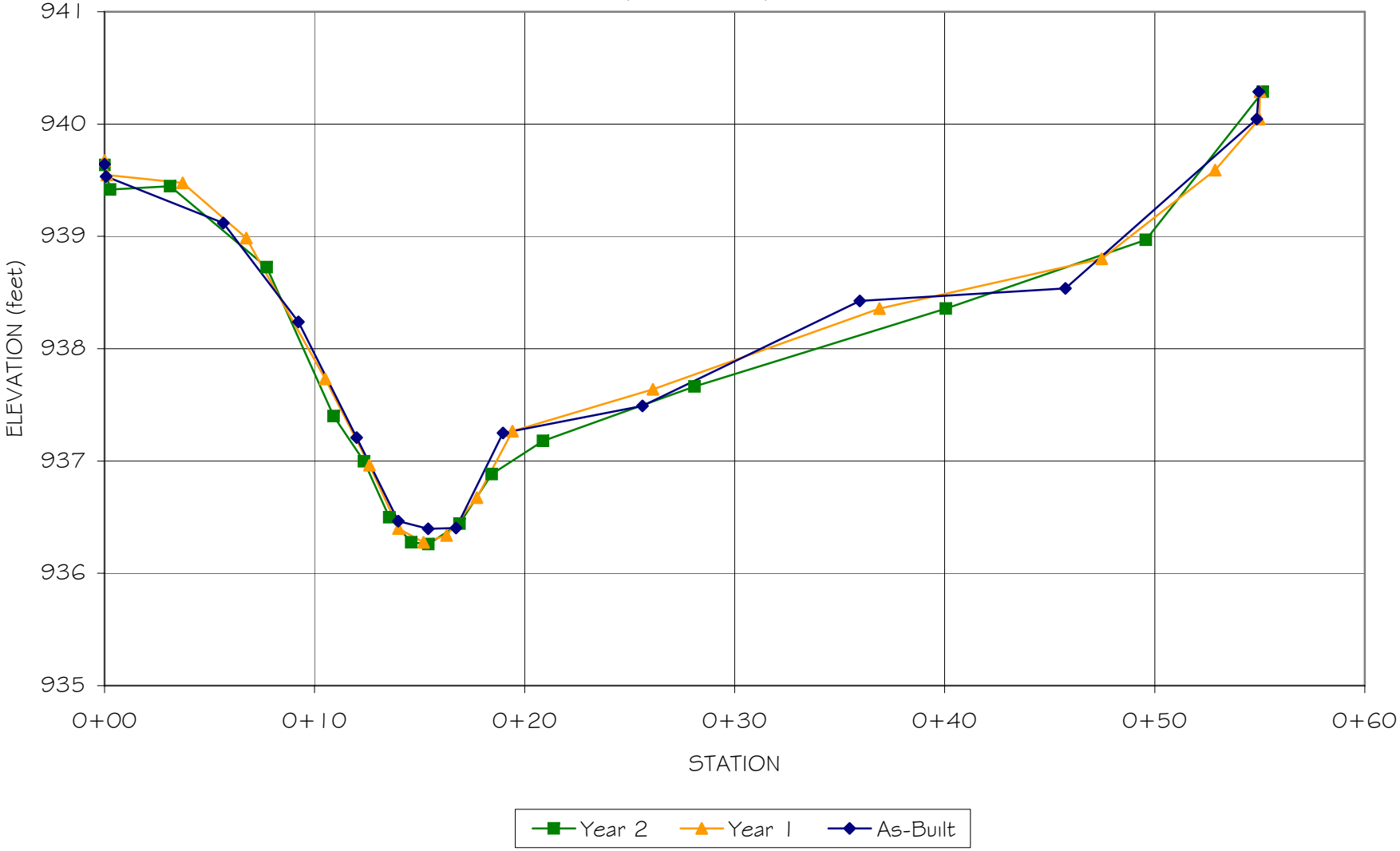


GRAY FARM STREAM RESTORATION
REACH 1 - CROSS-SECTION 7 (POOL)
(STA. 54+45)

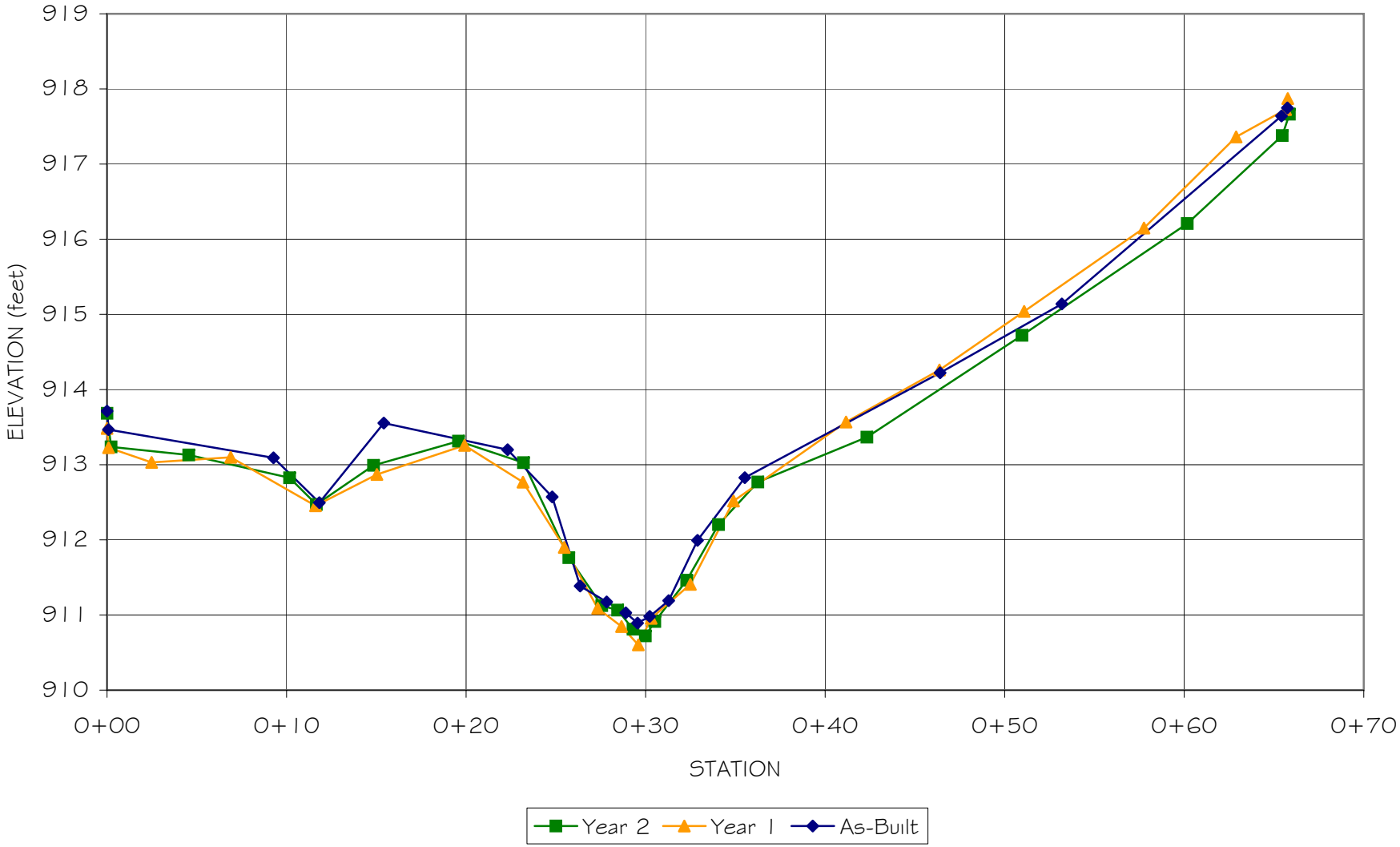



GRAY FARM STREAM RESTORATION
REACH 2 - CROSS-SECTION 1 (POOL)
(STA. 6+00)
941
940
939
938
937
936
935
ELEVATION (feet)
0+00
0+10
0+20
0+30
0+40
0+50
STATION
Year 2
Year 1
As-Built

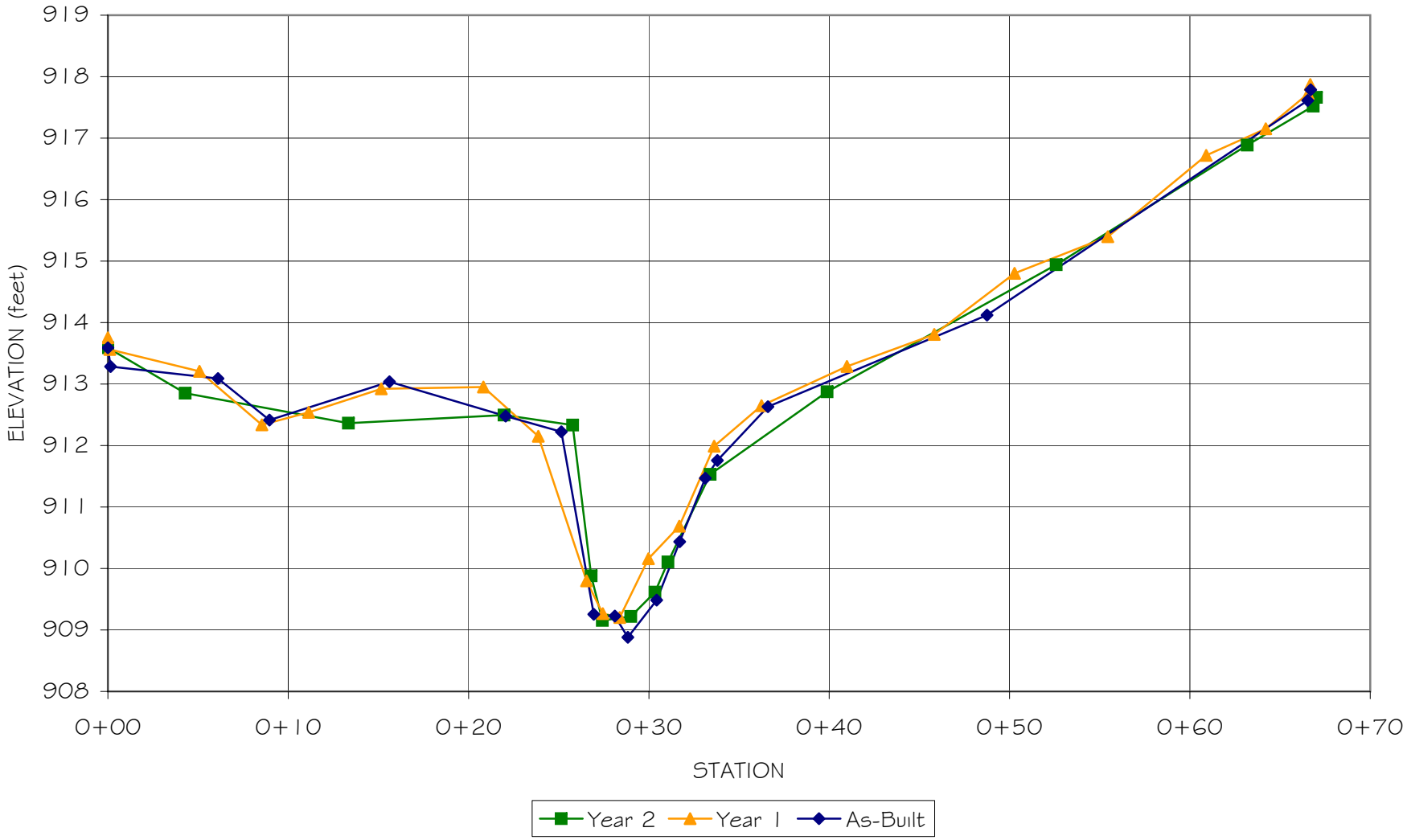
GRAY FARM STREAM RESTORATION
REACH 2 - CROSS-SECTION 1 (RIFFLE)
(STA. 6+30)



GRAY FARM STREAM RESTORATION
REACH 2 - CROSS-SECTION 2 (RIFFLE)
(STA. 19+30)



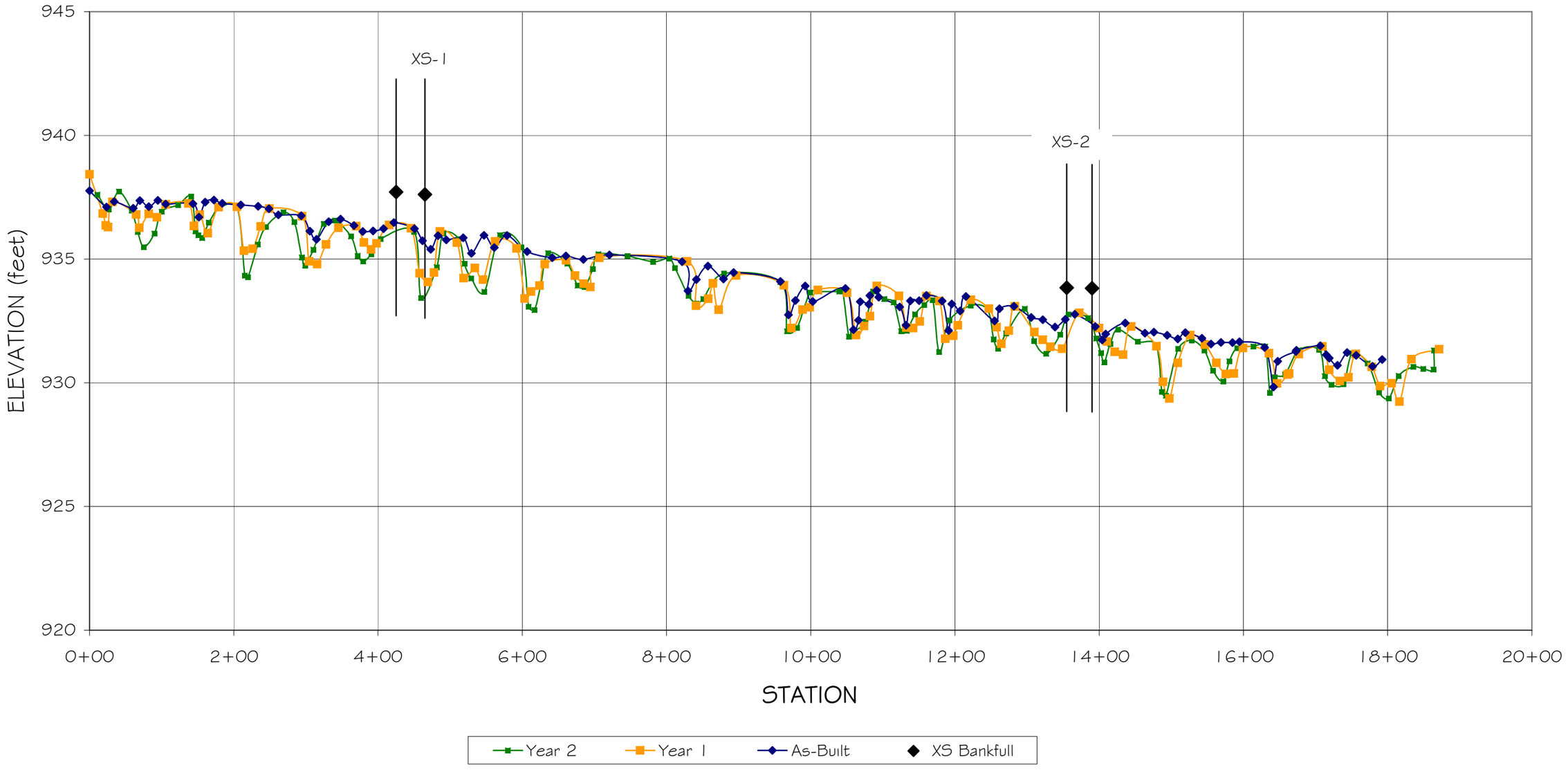
GRAY FARM STREAM RESTORATION
REACH 2 - CROSS-SECTION 2 (POOL)
(STA. 19+45)



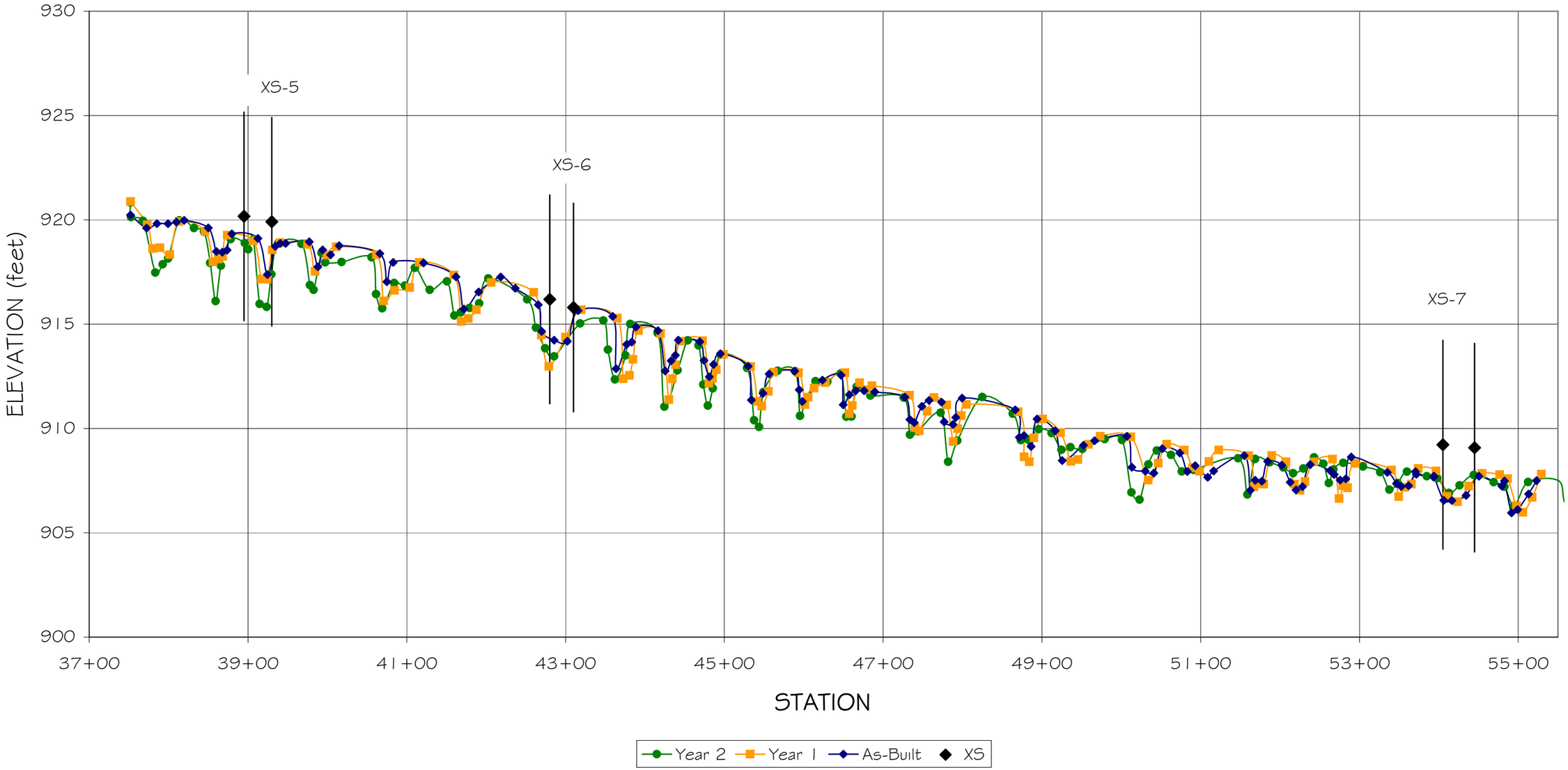
APPENDIX B –

Annual Overlays of Longitudinal Plots

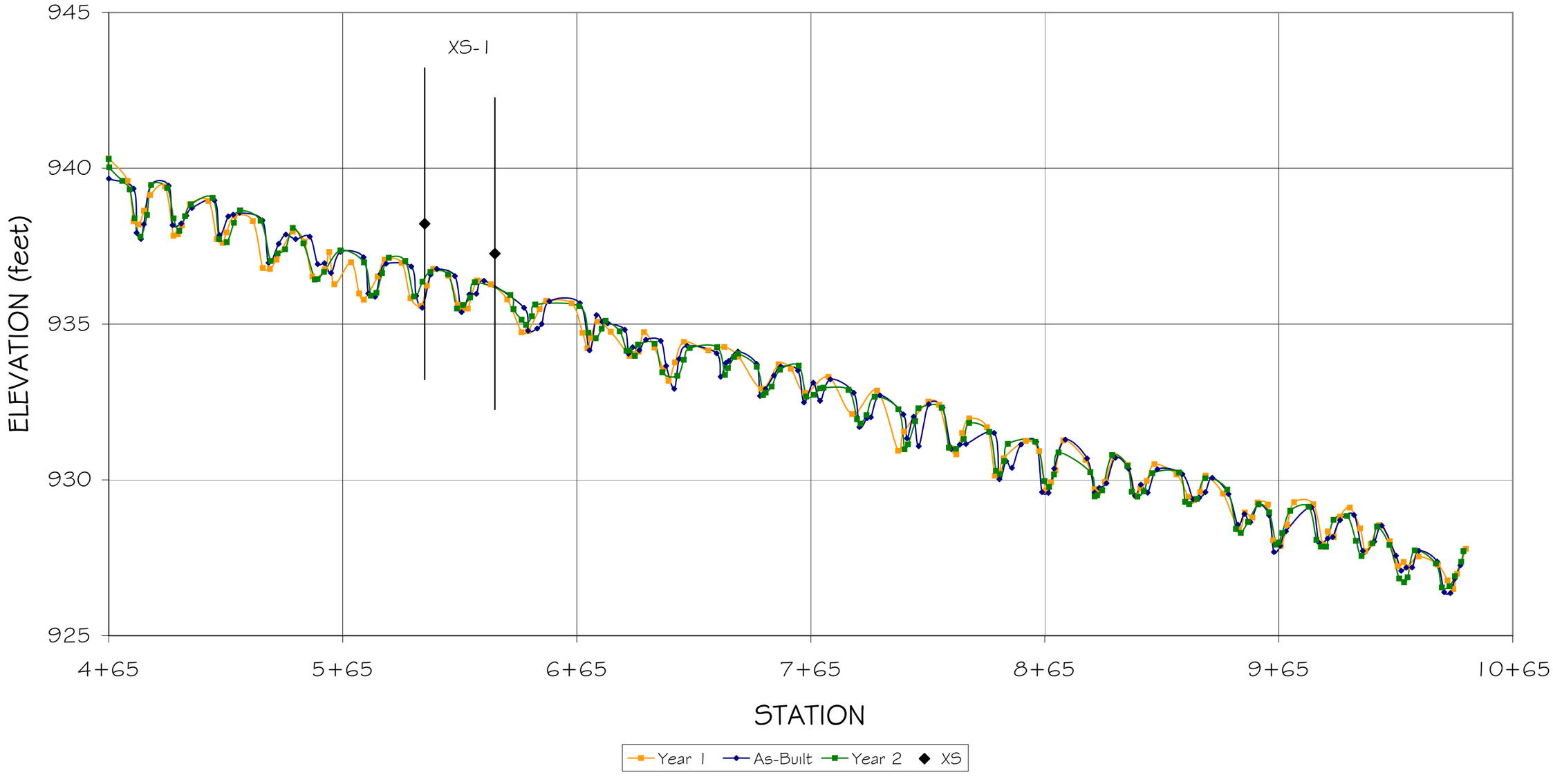
GRAY FARM STREAM RESTORATION
REACH 1 - LONGITUDINAL PROFILE
(STA. 0+00 TO 18+70)



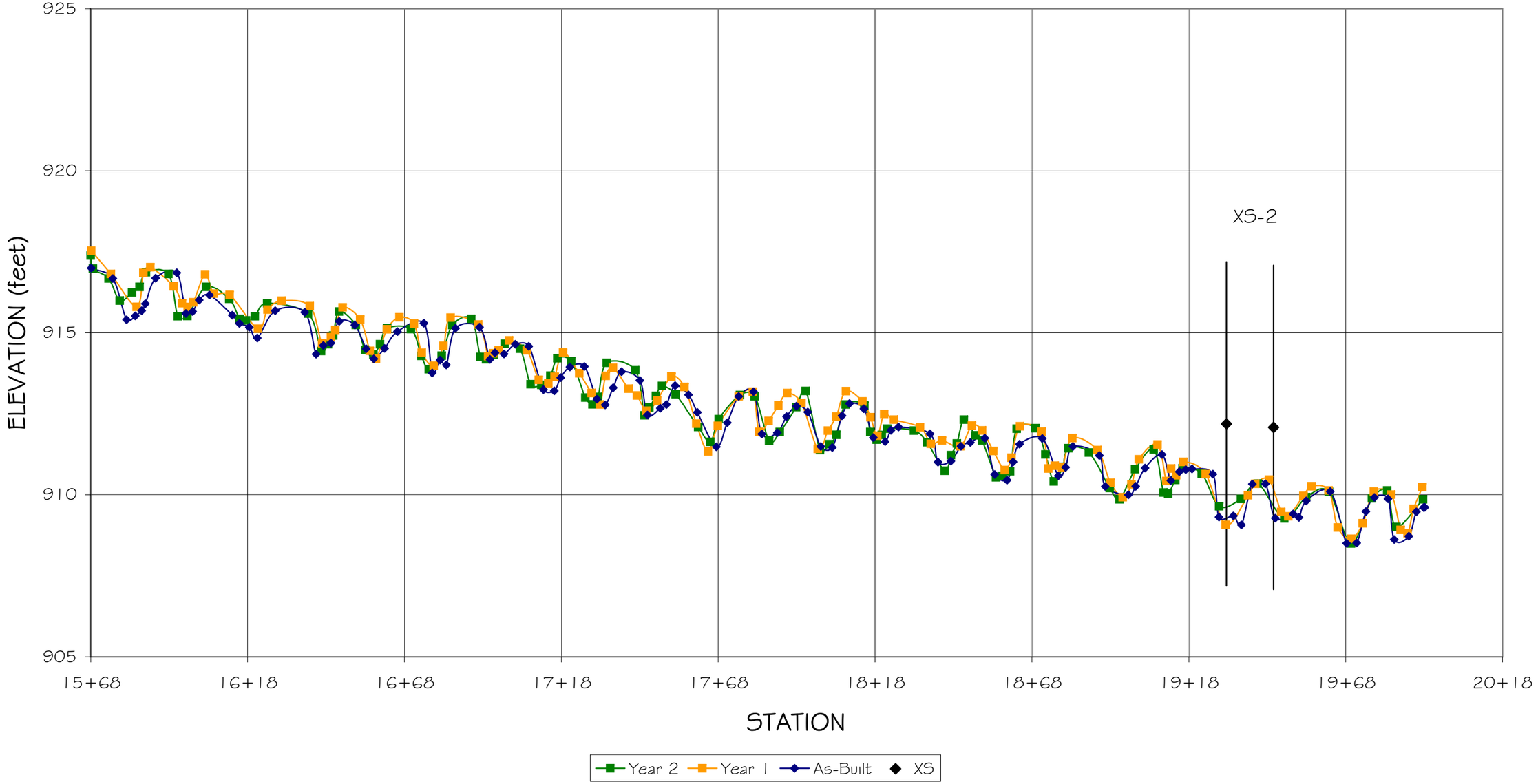
GRAY FARM STREAM RESTORATION
REACH 1 - LONGITUDINAL PROFILE
(STA. 37+50 TO 55+50)



GRAY FARM STREAM RESTORATION
REACH 2 - LONGITUDINAL PROFILE
(STA. 4+65 TO 10+65)

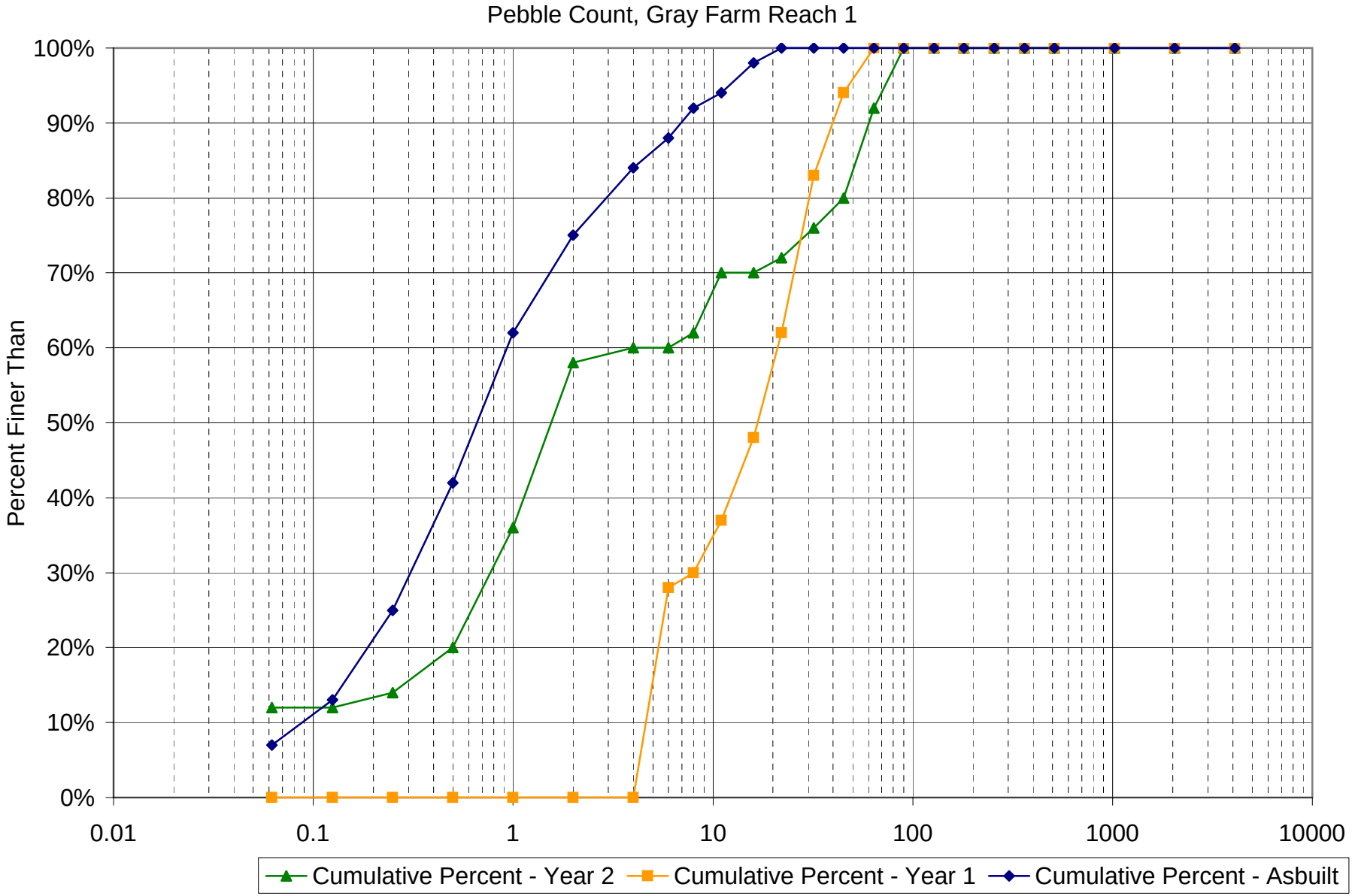


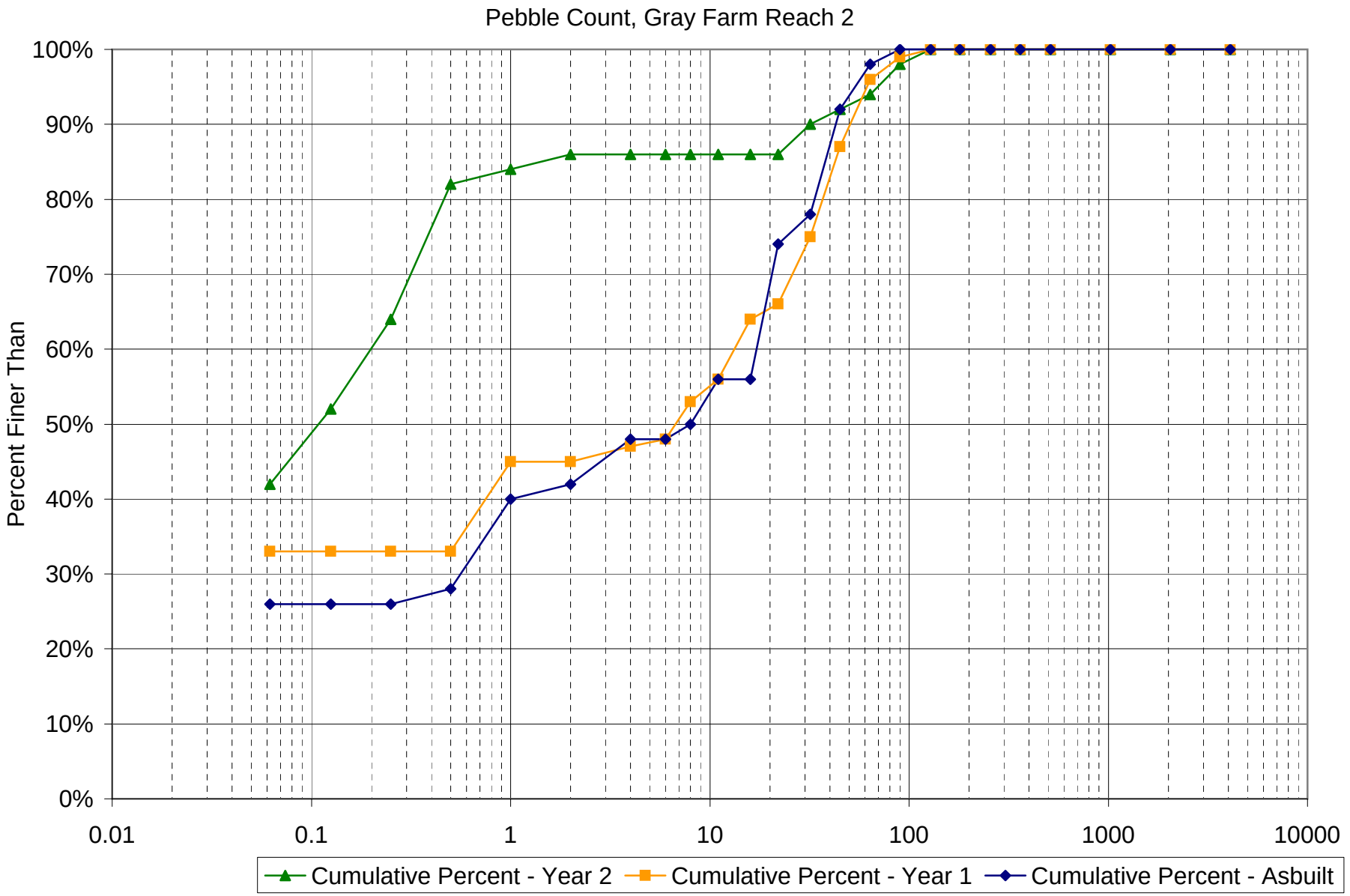
GRAY FARM STREAM RESTORATION
REACH 2 - LONGITUDINAL PROFILE
(STA. 15+68 TO 20+18)



APPENDIX B –

Annual Overlays of pebble count frequency distribution plots


Pebble Count, Gray Farm Reach 1
Percent Finer Than
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
10000
Cumulative Percent - Year 2
Cumulative Percent - Year 1
Cumulative Percent - Asbuilt


Pebble Count, Gray Farm Reach 2
Percent Finer Than
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0.01
0.1
1
10
100
1000
10000
Cumulative Percent - Year 2
Cumulative Percent - Year 1
Cumulative Percent - Asbuilt

APPENDIX C

APPENDIX C –

Integrated Problem Area Plan View

File: Sec\Jobs7-9k\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

REACH 1 - RESTORATION SITE LAYOUT & KEYSHEET

DRAWINGS PRINTED AT HALF- SCALE

RESTORED STREAM CHANNEL

EXISTING CONTOURS

EXISTING NCDENR STREAMS

EXISTING DOT ROADS

PERMANENT ACCESS EASEMENT

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
2. ALL LOCATIONS, ELEVATIONS, AND DIMENSIONS ARE APPROXIMATE.
3. ELEVATIONS ARE APPROXIMATE AND BASED ON AN ASSUMED ELEVATION OF 100' ADJUSTED TO MATCH 2 FOOT CONTOURS.

BEGIN UPPER LONG PROFILE

EXISTING TREELINE

END UPPER LONG PROFILE

PEBBLE COUNT LOCATION

PERMANENT CONSERVATION EASEMENT

BEGIN LOWER LONG PROFILE

END LOWER LONG PROFILE

KEY SHEET INDEX

A

B

C

D

NORTH

SCALE 1" = 200'

200 100 0 200

CONTOUR INTERVAL = 2'

BOLICK ROAD (SR 1532)

VEGETATION PLOT COORDINATES - REACH 1		
	NORTHING	EASTING
BUFFER 1	1385846.18	754364.36
BUFFER 2	1386151.38	753549.82
BUFFER 3	1386517.37	752569.75
BUFFER 4	1386971.65	752535.59
BANK 1	1385719.13	754523.63
BANK 2	1386297.12	752693.45

CROSS SECTION COORDINATES		
	NORTHING	EASTING
CROSS SECTION 1	1385544.83	755250.67
RIFFLE 1	1385494.08	755292.77
POOL 1	1385487.56	755221.71
CROSS SECTION 2	1385714.11	754599.75
RIFFLE 2	1385729.62	754657.41
POOL 2	1385770.59	754609.35
CROSS SECTION 3	1385927.02	753997.26
RIFFLE 3	1385893.90	753914.02
POOL 3	1385874.14	753966.36
CROSS SECTION 4	1386175.52	753301.89
RIFFLE 4	1386120.46	753338.88
POOL 4	1386121.44	753264.47
CROSS SECTION 5	1386236.38	752913.75
RIFFLE 5	1386293.26	752869.42
POOL 5	1386303.28	752926.82
CROSS SECTION 6	1386408.7	752648.11
RIFFLE 6	1386341.17	752644.43
POOL 6	1386369.35	752594.7
CROSS SECTION 7	1387272.28	752583.14
RIFFLE 7	1387227.69	752627.95
POOL 7	1387286.91	752648.36

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

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Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8	
		Proj. Mgr.: JER	Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 200'	
Sheet Title: REACH 1 RESTORATION SITE LAYOUT & KEYSHEET		Sheet No.: 1 OF 16	

File: Sec\Jobs7-9k\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

DRAWINGS PRINTED AT HALF- SCALE

PERMANENT ACCESS EASEMENT

UPPER LIMITS OF RESTORATION

BEGIN UPPER LONG PROFILE

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00 15+00

XS 1

XS 2

BANK 1

EXISTING TREELINE

PERMANENT CONSERVATION EASEMENT BOUNDARY

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS1)

REACH 1 - MONITORING PLAN VIEW - A

A

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REV.	DESCRIPTION	DATE	APPR.

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		Proj. Mgr.: JER	Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 50'	
Sheet Title: REACH 1 - MONITORING PLAN VIEW - A		Sheet No.: 2 OF 16	

File: Sec\Jobs7-9k\9385.D7-D1 1\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

REACH 1 - MONITORING PLAN VIEW - B

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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3. ELEVATIONS ARE APPROXIMATE AND BASED ON AN ASSUMED ELEVATION OF 100' ADJUSTED TO MATCH 2 FOOT CONTOURS.

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS1)

DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

B

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Proj. Mgr.: JER	Drawn: RSW
Sheet Title: REACH 1 - MONITORING PLAN VIEW - B		Scale: 1" = 50'	
		Sheet No.: 3 OF 16	

File: Sec\Jobs7-9k\9385.D7-D1 1\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

DRAWINGS PRINTED AT HALF- SCALE

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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3. ELEVATIONS ARE APPROXIMATE AND BASED ON AN ASSUMED ELEVATION OF 100' ADJUSTED TO MATCH 2 FOOT CONTOURS.

BEGIN LOWER LONG PROFILE

PERMANENT CONSERVATION EASEMENT BOUNDARY

BANK 2

BUFFER 3

XS 5

XS 6

EXISTING TREELINE

NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS1)

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

C

REACH 1 - MONITORING PLAN VIEW - C

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Proj. Mgr.: JER	Drawn: RSW
Sheet Title: REACH 1 - MONITORING PLAN VIEW - C		Scale: 1" = 50'	
		Sheet No.: 4 OF 16	

File: Sec\Jobs7-9k\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

DRAWINGS PRINTED AT HALF- SCALE

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS1)

PERMANENT CONSERVATION EASEMENT BOUNDARY

50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00 58+00 58+13.30

XS 7

BUFFER 4

DOWNSTREAM LIMIT OF RESTORATION

END LOWER LONG PROFILE

EXISTING TREELINE

REACH 1 - MONITORING PLAN VIEW - D

D

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8
		Proj. Mgr.: JER / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 50'
Sheet Title: REACH 1 - MONITORING PLAN VIEW - D		Sheet No.: 5 OF 16

File: Sec\Jobs7-9k\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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3. ELEVATIONS ARE APPROXIMATE AND BASED ON AN ASSUMED ELEVATION OF 100' ADJUSTED TO MATCH 2 FOOT CONTOURS.

NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

DRAWINGS PRINTED AT HALF- SCALE

PERMANENT ACCESS EASEMENT

UPPER LIMITS OF RESTORATION

BEGIN UPPER LONG PROFILE

BARE FLOODPLAIN #1

BANK SCOUR #1

BARE FLOODPLAIN #2

BANK SCOUR #2

EXISTING TREELINE

PERMANENT CONSERVATION EASEMENT BOUNDARY

0+00 1+00 2+00 3+00 4+00 5+00 6+00 7+00 8+00 9+00 10+00 11+00 12+00 13+00 14+00

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

A

REACH 1 - PROBLEM AREA PLAN VIEW - A

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

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		Proj. Mgr.: JER / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 50'
Sheet Title: REACH 1-PROBLEM AREA PLAN VIEW - A		Sheet No.: 6 OF 16

File: Sec\Jobs7-9k\9385.D7-D1 1\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

REACH 1 - PROBLEM AREA PLAN VIEW - B

BANK SCOUR #3

END UPPER LONG PROFILE

EXISTING TREELINE

PERMANENT LOW-WATER CROSSING

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

PERMANENT CONSERVATION EASEMENT BOUNDARY

DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

B

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Proj. Mgr.: JER / Drawn: RSW
Sheet Title: REACH 1-PROBLEM AREA PLAN VIEW - B		Scale: 1" = 50'
		Sheet No.: 7 OF 16

File: Sec\Jobs7-9k\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

DRAWINGS PRINTED AT HALF- SCALE

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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3. ELEVATIONS ARE APPROXIMATE AND BASED ON AN ASSUMED ELEVATION OF 100' ADJUSTED TO MATCH 2 FOOT CONTOURS.

BEGIN LOWER LONG PROFILE

PERMANENT CONSERVATION EASEMENT BOUNDARY

BARE BANK #1

BARE FLOODPLAIN #3

BARE BANK #2 & #3

STRESSED STRUCTURE #1/ BANK SCOUR #3

BANK SCOUR #5

EXISTING TREELINE

NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

C

PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

REACH 1 - PROBLEM AREA PLAN VIEW - C

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

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		Proj. Mgr.: JER / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 50'
Sheet Title: REACH 1-PROBLEM AREA PLAN VIEW - C		Sheet No.: 8 OF 16

File: Sec\Jobs7-9k\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 1-Gray Farm Mont.and PAPV-Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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NORTH

SCALE 1" = 50'

50 25 0 50

CONTOUR INTERVAL = 2'

DRAWINGS PRINTED AT HALF- SCALE

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

BARE FLOODPLAIN #4

PERMANENT CONSERVATION EASEMENT BOUNDARY

50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00 58+00 58+13.30

BARE FLOODPLAIN #5

DOWNSTREAM LIMIT OF RESTORATION

END LOWER LONG PROFILE

EXISTING TREELINE

REACH 1 - PROBLEM AREA PLAN VIEW - D

D

PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

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Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Proj. Mgr.: JER / Drawn: RSW
Sheet Title: REACH 1-PROBLEM AREA PLAN VIEW - D		Scale: 1" = 50'
		Sheet No.: 9 OF 16

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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DRAWINGS PRINTED AT HALF- SCALE

MONITORING FEATURES COORDINATES - REACH 2		
	NORTHING	EASTING
CROSS SECTION 1	1390081.29	746853.93
RIFFLE 1	1390079.60	746799.51
POOL 1	1390109.67	746817.05
CROSS SECTION 2	1389209.56	746215.22
RIFFLE 2	1389254.69	746167.91
POOL 2	1389238.99	746155.98
BUFFER 1	1389961.86	746771.34
BUFFER 2	1389300.47	746281.07
BANK 1	1389733.94	746553.76
BANK 2	1389408.61	746305.49

RESTORED STREAM CHANNEL

EXISTING CONTOURS

EXISTING NCDENR STREAMS

EXISTING DOT ROADS

BEGIN UPPER LONG PROFILE

END UPPER LONG PROFILE

BEGIN LOWER LONG PROFILE

END LOWER LONG PROFILE

EXISTING TREELINE

PERMANENT ACCESS EASEMENT

PERMANENT CONSERVATION EASEMENT & FENCELINE

PEBBLE COUNT LOCATION

KEY SHEET INDEX

NEW STERLING ROAD (SR 1526)

NORTH

SCALE 1" = 100'

100 50 0 100

CONTOUR INTERVAL = 2'

REACH 2 - RESTORATION SITE LAYOUT & KEYSHEET

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

S&EC
Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8	
		Proj. Mgr.: PKS	Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 100'	
Sheet Title: REACH 2 - RESTORATION SITE LAYOUT & KEYSHEET		Sheet No.: 10 OF 16	

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
2. ALL LOCATIONS, ELEVATIONS, AND DIMENSIONS ARE APPROXIMATE.
3. ELEVATIONS ARE APPROXIMATE AND BASED ON AN ASSUMED ELEVATION OF 100' ADJUSTED TO MATCH 2 FOOT CONTOURS.

DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 30'

30 15 0 30

CONTOUR INTERVAL = 2'

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS 1)

UPSTREAM LIMIT OF RESTORATION

0+00

1+00

2+00

3+00

4+00

5+00

6+00

7+00

8+00

9+00

XS 1

BUFFER 1

PL

EXISTING TREELINE

BEGIN UPPER LONG PROFILE

PERMANENT CONSERVATION EASEMENT & FENCELINE

REACH 2 - MONITORING PLAN VIEW - E

E

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8
		Proj. Mgr.: PKS / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 30'
Sheet Title: REACH 2 - MONITORING PLAN VIEW - E		Sheet No.: 11 OF 16

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

1. SITE DATA AS DETERMINED BY LIMITED ENGINEERING SURVEY PERFORMED BY S&EC. (NCDENR STREAMS, LIDAR CONTOURS, AND NCDOT ROADS TAKEN FROM REFERENCE GIS LAYERS)
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DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 30'

30 15 0 30

CONTOUR INTERVAL = 2'

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS1)

END UPPER LONG PROFILE

10+00

11+00

BANK 1

12+00

13+00

14+00

15+00

EXISTING TREELINE

PERMANENT CONSERVATION EASEMENT & FENCELINE

16+00

BEGIN LOWER LONG PROFILE

BANK 2

17+00

F

REACH 2 - MONITORING PLAN VIEW - F

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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www.SandEC.com

Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8
		Proj. Mgr.: PKS / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 30'
Sheet Title: REACH 2 - MONITORING PLAN VIEW - F		Sheet No.: 12 OF 16

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

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DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 30'

30 15 0 30

CONTOUR INTERVAL = 2'

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

LEGEND FOR MONITORING FEATURES

- BUFFER VEGETATION PLOT
- BANK VEGETATION PLOT
- PERMANENT PHOTO POINT
- CROSS-SECTION LOCATION (XS1)

BUFFER 2

18+00

19+00

XS 2

20+00

20+34.14

20+34.14

21+00

21+90.67

END LOWER LONG PROFILE

PEBBLE COUNT LOCATION

PERMANENT ACCESS EASEMENT

EXISTING CULVERT TO REMAIN

EXISTING TREELINE

PERMANENT CONSERVATION EASEMENT & FENCELINE

DOWNSTREAM LIMIT OF RESTORATION

CC

IPF

IPS

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CC

REACH 2 - MONITORING PLAN VIEW - G

G

REVISIONS

REV.	DESCRIPTION	DATE	APPR.

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Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Proj. Mgr.: JER / Drawn: RSW
Sheet Title: REACH 2 - MONITORING PLAN VIEW - G		Scale: 1" = 30'
		Sheet No.: 13 OF 16

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

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DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 30'

30 15 0 30

CONTOUR INTERVAL = 2'

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

UPSTREAM LIMIT OF RESTORATION

0+00

1+00

2+00

3+00

4+00

5+00

6+00

7+00

8+00

9+00

PL

BARE FLOODPLAIN # 1 & #2

BARE FLOODPLAIN # 3

STRESSED STRUCTURE #1/ BANK SCOUR #1

STRESSED STRUCTURE #2/ BANK SCOUR #2

EXISTING TREELINE

BEGIN UPPER LONG PROFILE

PERMANENT CONSERVATION EASEMENT & FENCELINE

REACH 2 - PROBLEM AREA PLAN VIEW - E

E

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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www.SandEC.com

Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8	
		Proj. Mgr.: JER	Drawn: DCI
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 30'	
Sheet Title: REACH 2-PROBLEM AREA PLAN VIEW - E		Sheet No.: 14 OF 16	

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

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DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 30'

30 15 0 30

CONTOUR INTERVAL = 2'

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

END UPPER LONG PROFILE

10+00

11+00

12+00

13+00

14+00

15+00

16+00

17+00

EXISTING TREELINE

PERMANENT CONSERVATION EASEMENT & FENCELINE

BEGIN LOWER LONG PROFILE

STRESSED STRUCTURE #3/ BANK SCOUR #3

F

REACH 2 - PROBLEM AREA PLAN VIEW - F

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8
		Proj. Mgr.: JER / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 30'
Sheet Title: REACH 2-PROBLEM AREA PLAN VIEW - F		Sheet No.: 15 OF 16

File: Sec\Jobs7-9\9385.D7-D11\YEAR 2 - D8\Drawings\REACH 2 - Gray Farm Mont.and PAPV - Year 2.dwg

NOTES:

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DRAWINGS PRINTED AT HALF- SCALE

NORTH

SCALE 1" = 30'

30 15 0 30

CONTOUR INTERVAL = 2'

LEGEND FOR ASBUILT FEATURES

- RESTORED STREAM CHANNEL
- LOG J-HOOK (LJH)
- ROCK J-HOOK (RJH)
- CROSS ROCK VANE (CRV)
- CREATED/RESTORED WETLANDS
- EXISTING STREAMS

PAPV LEGEND

- STREAM PROBLEM AREAS-STRESSED
- STREAM PROBLEM AREAS-FAILING
- VEGETATION PROBLEM AREAS-MODERATE
- VEGETATION PROBLEM AREAS-SEVERE

END LOWER LONG PROFILE

BARE FLOODPLAIN #4

18+00

19+00

20+00

20+34.14

20+34.14

21+00

21+90.67

CC

IPF

IPS

DOWNSTREAM LIMIT OF RESTORATION

EXISTING TREELINE

PERMANENT ACCESS EASEMENT

PERMANENT CONSERVATION EASEMENT & FENCELINE

℄

℄

CC

REACH 2 - PROBLEM AREA PLAN VIEW - G

G

REVISIONS			
REV.	DESCRIPTION	DATE	APPR.

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Project: GRAY FARM STREAM RESTORATION YEAR 2 MONITORING		Project No.: 9385.D8
		Proj. Mgr.: JER / Drawn: RSW
Location: IREDELL CO., NC	Client: NC ECOSYSTEM ENHANCEMENT PROGRAM	Scale: 1" = 30'
Sheet Title: REACH 2-PROBLEM AREA PLAN VIEW - G		Sheet No.: 16 OF 16