SUCK CREEK STREAM RESTORATION
(Project No. .00012)

MONITORING YEAR 2 (2005)

Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

TABLE OF CONTENTS

I. Executive Summary …….. 1

II. Project Background …….. 2
Location and Setting ……. 2
Project Structure, Mitigation Type, Approach and Objectives ..…….. 2
Project History and Background ……... 4

III. Monitoring Plan …… 7

IV. Project Condition and Monitoring Results ……... 7
A. Vegetation Assessment ……... 7
1. Soil Data ……... 7
2. Vegetative Problem Areas …… 7
3. Vegetative Problem Area Plan View ……... 8
4. Stem Counts ……. 8
5. Vegetation Plot Photos ……..…….. 8
B. Stream Assessment ……..…….. 10
1. Procedural Items …….. 10
2. Stream Problem Areas Plan View ……..…….. 10
3. Stream Problem Area Photos …….…….. 10
4. Stability Assessment ……..…….. 10
5. Fixed photo station photos …….…….. 11
6. Quantitative Measurements ……. 11

Figures

Figure 1: Site Vicinity Map …….. 3
Figure 2: Monitoring Plan …… 7

Tables

Table I: Project Structure Table …….. 4
Table II: Project Mitigation Objectives Table ……. 4
Table III: Project Activity and Reporting History ……..…….. 5
Table IV: Project Contact Table …… 5
Table V: Project Background Table ……. 6
Table VI: Preliminary Soil Data …… 7
Table VII: Vegetative Problem Areas ……..... 8

TABLE OF CONTENTS (CONT.)

Table VIII:	Stem counts and survival for each species arranged by plot and location …….	9
Table IX:	Stream Problem Areas ……..	10
Table Xa:	Categorical Stream Feature Visual Stability Assessment - Upper Reach …….	11
Table Xa:	Categorical Stream Feature Visual Stability Assessment - Lower Reach …….	12
Table XI:	Baseline Morphology and Hydraulic Summary ……...	13
Table XII:	Morphology and Hydraulic Monitoring Summary ……...	14

I. Executive Summary

The objective of the Suck Creek stream restoration project, implemented in 2003, was to restore an unstable, degraded stream corridor and adjacent riparian zones to a stable condition that supports high quality instream and riparian habitat. The design integrated design goals with site constraints, such as the need to maintain access to surrounding cattle pastures, and the requirements of local agencies, such as ensuring public safety. Design elements included: (1) constructing 3,260 feet of channel with a stable dimension, pattern and profile; (2) installing in-stream structures such as log vanes, J-hook vanes, cross vanes, root wads, and boulder clusters; (3) planting the stream banks and adjacent 7.8 acres of riparian buffer with native plant species; (4) installing fencing to exclude cattle from the restored area; and (5) creating stable road crossings to allow access to adjacent pasture lands. Construction was completed in April 2003, the as-built survey was completed June 2003, and the riparian buffer was planted in February 2004. Year 1 Monitoring was conducted in October 2004. The Year 2 monitoring provided in this report was conducted in September 2005.

The stream restoration component of the project involved implementing a Priority I Restoration method to create a more stable C4 stream type. Based on the findings of the 2005 monitoring effort summarized in this report, the restored reaches are predominantly stable. Localized areas of bank erosion and bed aggradation in the form of mid-channel bars were observed within the restored channel. The majority of cross vane structures are functioning properly; maintenance is recommended for only two of the vanes. All of the log vane structures are functioning adequately. The mean particle size of mobile sediment has decreased (from D^{50} =16 mm. to D^{50} = 5.9 mm). The formation of point bars along some areas has reduced stream width at low flow, and an extensive mid-channel bar has formed just downstream of the boulder field in the upper reach.

Vegetation representing local riparian communities was planted to provide additional stability to the stream banks and establish a riparian buffer. The planted riparian vegetation onsite is well established on the stream banks and in the riparian corridor. Total cover by herbaceous plants is 99 percent. Predominant species are tall wormwood (*Artemisia caudata*) and whorled coreopsis (*Coreopsis verticillata*). Woody stem growth is most dense on the stream bank and becomes sparse in outlying riparian areas. Volunteer black willow and river birch stems account for the majority of woody stems. The woody stem density for the riparian buffer exceeds the success criteria of 260 stems/acre; however, this criterion was not met within three individual plots.

There is no wetland component to this mitigation site.

II. Project Background

Location and Setting

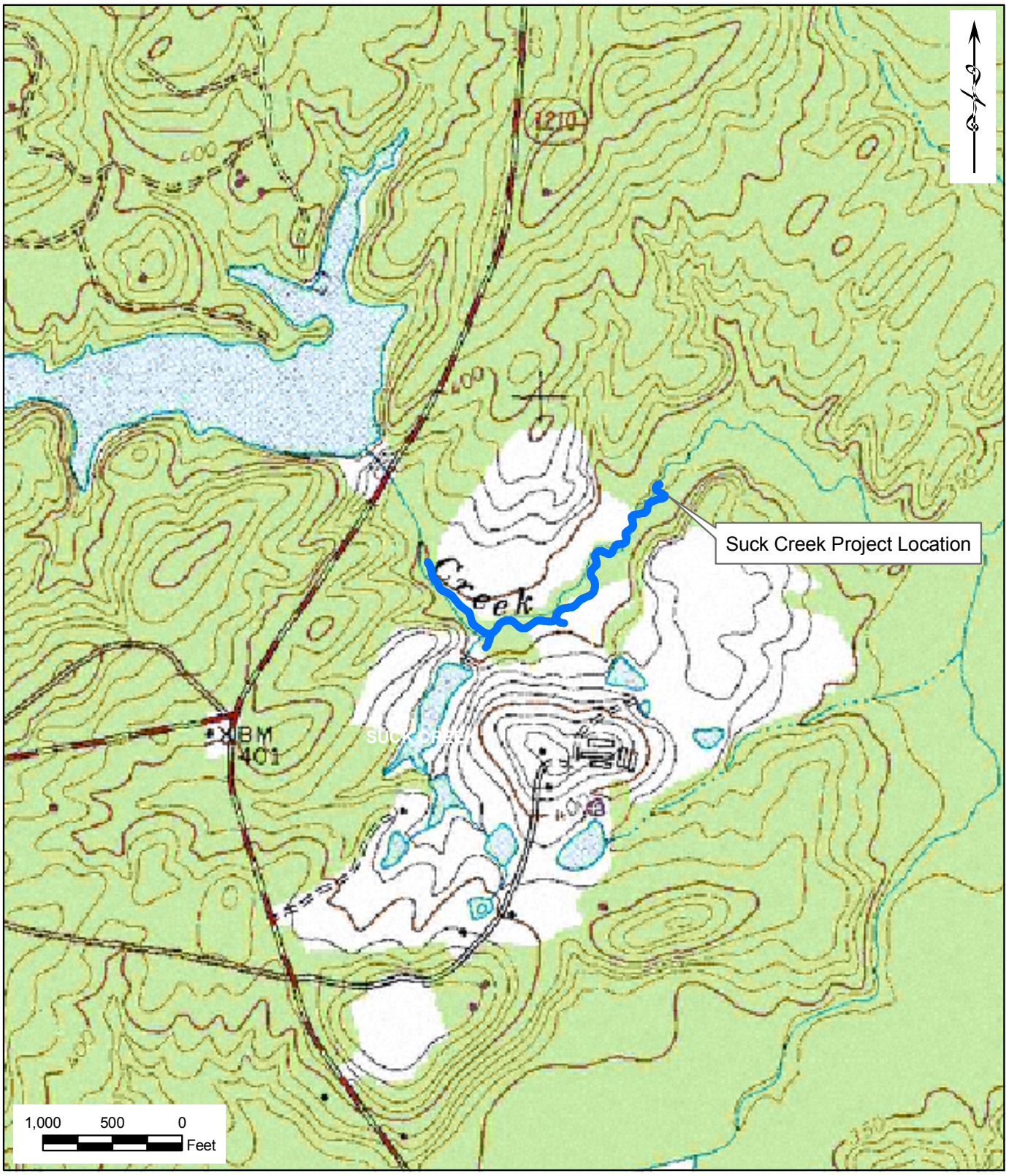
The Suck Creek Stream Restoration Project site lies within the Richardson Farm in Moore County, North Carolina. It is located south of SR1261 and east of SR1210. Access to the site it provided via an access road on Richardson Farm. At the downstream terminus, the stream drains a 4.8 mile watershed that includes several impoundments. A vicinity map is shown in Figure 1.

The directions to the project site are as follows:

> The project is located west of Carthage in Moore County. From Raleigh, follow US-1 south to US-15/501 toward Carthage. When approaching Carthage, take NC-24/ Monroe Street into downtown. Follow through the downtown traffic circle to Dowd Road / SR 1240. Take Dowd Road west away from Carthage for approximately 1.5 miles. Take a right onto Beulah Hill Church Road / Mt. Carmel Road (SR 1210). After approximately 1.5 miles, turn right onto Richardson Farm Road (SR 1290) – a gravel road. Follow Richardson Farm Road to the primary residence and then turn left onto a gravel road. Follow the gravel road past the cattle nursery and chicken barns. The upper section of the project stream is located at the bottom of the hill. Please note that this is a private residence and permission is requested prior to entering the site.

Project Structure, Mitigation Type, Approach and Objectives

The pre-restoration channel was incised with unstable banks. Using reference data from regional curves and appropriate reference reaches, the channel geometry was modified to produce a more stable C4 stream type – as defined by Rosgen (Rosgen 1994). In accordance with the Priority 1 Restoration method, the stream bed was elevated to reconnect it to its abandoned terrace, increasing available flood prone area to near pre-existing conditions. The result of the restoration effort is an increase in the width to depth ratio and reduced bank height ratios, thus improving channel stability. The sinuosity of the reach was also increased which resulted in a decreased mean slope. The decreased mean slope reduces the stream velocities of bankfull events that should also increase stream stability. In-stream structures including rock cross vanes, root wads and log vanes were incorporated into the channel. A vegetative buffer was planted along the stream corridor to further stabilize the stream banks, improve habitat conditions, and reduce ambient water temperature. Stream channel construction was completed in April of 2003 and the vegetated buffers were planted in February 2004. Stream and buffer restoration areas are surrounded by fencing and are protected by a conservation easement.



Source: NCDOT USGS Topographic Quadrangle No. 105

Ecosystem Enhancement Program

FIGURE 1
PROJECT VICINITY MAP

Suck Creek Stream Restoration
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

November 2005

Suck Creek was restored through the North Carolina Ecosystem Enhancement Program (EEP) – formerly Wetlands Restoration Program (NCWRP). The goal of the project was to transform the pre-existing altered stream corridor to a more stable and biologically active form through the following objectives:

1.) Restore 3,260-linear feet of Suck Creek through geomorphic modification through dimension, pattern and profile adjustments, and cattle exclusion
2.) Establish a riparian zone (7.8 acres) surrounding restored sections of Suck Creek
3.) Improve the habitat within the channel and riparian zone
4.) Provide cattle exclusion fencing and controlled crossings to protect restoration effort.
5.) Provide perpetual protection of the riparian area and stream with a conservation easement.

This is the year 2 monitoring report for Suck Creek. Exhibit Tables I and II provide information on the project structure and objectives.

Table I: Project Structure Table
Suck Creek Stream Restoration: Project No. 0117950008

Project Segment or Reach ID	Linear Footage or Acreage
Suck Creek Stream Restoration - Upper Reach	875 Lf
Suck Creek Stream Restoration - Lower Reach	2,088 Lf
Suck Creek Stream Restoration - Riparian Buffer Area	7.8 Ac.

Table II: Project Mitigation Objectives Table
Suck Creek Stream Restoration: Project No. 0117950008

Project Segment or Reach ID	Mitigation Type	Approach	Linear Footage or Acreage	Comment
Upper Reach	R	Priority 1	875 Lf	Restore dimension, pattern, and profile
Lower Reach	R	Priority 1	2,088 Lf	Restore dimension, pattern, and profile
Riparian Buffer Area	R	SS	7.8 Ac.	Restore riparian wetland community

Project History and Background

Project activity and reporting history are provided in Exhibit Table III. The project contact information is provided in Exhibit Table IV. The project background history is provided in Table V.

Table III. Project Activity and Reporting History Suck Creek Stream Restoration: Project No. 0117950008			
Activity Report	**Scheduled Completion**	**Data Completion Data**	**Actual Completion or Delivery**
Restoration Plan	N/A	N/A	N/A
Final Design - 90%	N/A	N/A	2002
Construction	N/A	N/A	Apr-03
Temporary S&E mix applied to entire project area	N/A	N/A	N/A
Permanent seed mix applied to reach/segments 1 & 2	N/A	N/A	Apr-03
Containerized and B&B plantings for reach/segments 1 & 2	N/A	N/A	Feb-04
Mitigation Plan / As-built (Year 0 Monitoring - Baseline)	N/A	Mar-04	Jul-04
Year 1 Monitoring	N/A	Oct-04	Dec-04
Year 2 Monitoring	N/A	Sep-05	Dec-05

N/A: Historical project documents necessary to provide this data were unavailable at the time of this report submission.

Table IV. Project Contact Table Suck Creek Stream Restoration: Project No. 0117950008	
Designer: Kimley-Horn and Associates, Inc.	 P.O. Box 33068, Raleigh, NC, 27636 Mr. Will Wileham, Phone: (919) 677-2000
Construction Contractor: Shamrock Environmental Corporation	 PO Box 14987, Greensboro NC 27415 Mr. Bill Wright
Planting Contractor: Shamrock Environmental Corporation	 PO Box 14987, Greensboro NC 27415 Mr. Bill Wright
Seeding Contractor: Shamrock Environmental Corporation	 PO Box 14987, Greensboro NC 27415 Mr. Bill Wright
Seedmix Sources: Ernst Crownvetch Farms	 9006 Mercer Pike, Meadville, PA 16335 (814) 336-2404
Nursery Stock Suppliers: Hillis Nursery Company	 92 Gardner Rd., McMinnville, TN 37110 (931) 668-9125
Monitoring Performers:	
Year 1 Monitoring (stream and vegetation): Kimley-Horn and Associates, Inc.	 P.O. Box 33068, Raleigh, NC, 27636 Mr. Will Wileham, Phone: (919) 677-2000
Year 2 Monitoring (stream and vegetation): The Louis Berger Group, Inc.	 1513 Walnut Street, Suite 250, Cary, NC, 27511 Mr. Ed Samanns, Phone: (973) 765-1800

Table V. Project Background Table Suck Creek Stream Restoration: Project No. 0117950008	
Project County	Moore
Drainage Area of Upper Reach	4.7 sq. miles
Drainage Area of Lower Reach	4.8 sq. miles
Drainage Area Impervious Cover	<2 percent
Stream Order	2
Physiographic Region:	Piedmont
Ecoregion:	Sand Hills
Rosgen Classification of As-built	C4
Dominant Soil types:	Chewacla silt loam, Tetotum silt loam
Reference Site ID:	Upstream of project site and Richland Creek
USGS HUC for project and reference:	3030003
NCDWQ Sub-basin for project and reference:	03-06-10
NCDWQ classification of reference:	C
NCDWQ classification of Reach 1:	C
NCDWQ classification of Reach 2:	C
Is any portion of the project 303d listed?	No
Is any portion of the project's upstream watershed 303d listed?	No
% of project easement fenced?	100%

III. Monitoring Plan View

The monitoring plan view is included as Figure 2.

IV. Project Condition and Monitoring Results

A. Vegetation Assessment

1. Soil Data

Soil series found on the project site are summarized in Table VI, followed by general descriptions of the soil taxonomy and the conditions on site.

Table VI. Preliminary Soil Data

Series	Max. Depth (in.)	% Clay on Surface	K	T	OM %
Chewacla	72+	10	N/A	N/A	0
Tetotum	20-40	10	N/A	N/A	0

Chewacla silt loam, 0 to 2 percent slopes, frequently flooded:
These nearly level, very deep, somewhat poorly drained soils are on floodplains. They are formed in loamy alluvial deposits. They have a loamy surface layer and subsoil. Permeability is moderate and shrink-swell potential is low. Seasonal high water table is within a depth of 0.5 to 1.0 feet. These soils are subject to frequent flooding.

Tetotum silt loam, 0 to 3 percent slopes, rarely flooded:
These nearly level to gently sloping, very deep, moderately well drained soils are on stream terraces. They have a loamy surface layer and subsoil. Permeability is moderate and shrink-swell potential is low. Hard bedrock is within a depth of 20 to 40 inches. Seasonal high water table is below 6.0 feet.

2. Vegetative Problem Areas

Vegetative Problem Areas are defined as either lacking vegetation or containing exotic vegetation. All problem areas identified during Monitoring Year 2 are summarized in Table VII, photographs of the vegetative problem areas are shown in Appendix A.

Table VII. Vegetative Problem Areas			
Feature/Issue	**Station #/Range**	**Probable Cause**	**Photo #**
Bare Bank	11+50	Backwater eddy scour	1
	19+10	Scour behind failed root wad	2
	22+80	Bank scour from upland sheet flow	3
Bare Flood Plain	22+80	Upland sheet flow	3
	Vegetation Plot 2	unknown	VP-2
	Vegetation Plot 3	unknown	VP-3
	Vegetation Plot 4	unknown	VP-4

3. Vegetative Problem Area Plan View

The location of each vegetative problem area is shown in Appendix A.

4. Stem Counts

Thick herbaceous growth covers nearly all of the stream banks and riparian zone. The herbaceous growth is dominated by tall wormwood (*Artemisia caudata*) and whorled coreopsis (*Coreopsis verticillata*). The thickest woody stem growth occurs on the stream banks. Black willow (*Salix nigra*) and river birch (*Betula nigra*) have recruited natural volunteers that have formed dense, irregular patches. Regeneration from live stakes also contributes to the higher woody stem densities observed along stream banks. Stem density rapidly decreases with distance away from the stream banks. Sycamore (*Platanus occidentalis*) and sweet gum (*Liquidambar styraciflua*) are the most common woody plants outside of the stream banks. Three plots had stem densities below the success criteria of 260 planted trees per acre; however, the tree density for the entire site exceeded the success criteria at 940 trees per acre. Recruitment of volunteer species has significantly increased stem densities over the previous monitoring results.

Raw data for the vegetation plots are provided in Appendix A. A summary of stem count data for each species arranged by plot is provided in Table VIII.

5. Vegetation Plot Photos

Vegetation plot photos are provided in Appendix A.

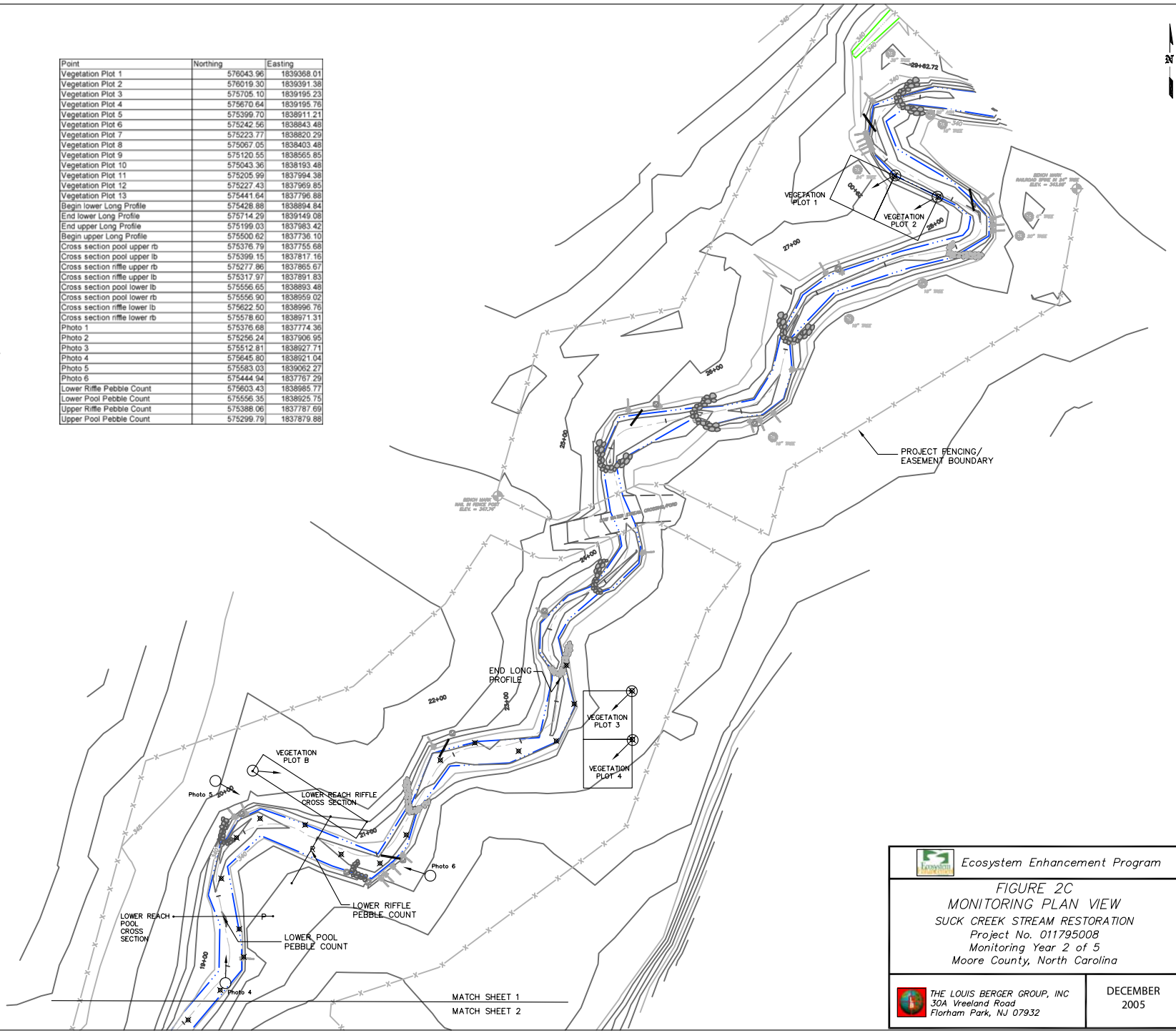
MONITORING LEGEND

- VEGETATION PLOT
- CROSS SECTION
- PHOTO POINT
- 2005 GPS THALWEG

LEGEND

- BOULDER CLUSTER
- ROOT WAD
- BOULDER
- ROCK CROSS VANE
- J-HOOK VANE
- LOG VANE
- PROJECT FENCING/EASEMENT BOUNDARY
- EDGE OF WATER
- ℄ of Suck Creek
- Wetland

Point	Northing	Easting
Vegetation Plot 1	576043.96	1839368.01
Vegetation Plot 2	576019.30	1839391.38
Vegetation Plot 3	575705.10	1839195.23
Vegetation Plot 4	575670.64	1839195.76
Vegetation Plot 5	575399.70	1838911.21
Vegetation Plot 6	575242.56	1838843.48
Vegetation Plot 7	575223.77	1838820.29
Vegetation Plot 8	575067.05	1838403.48
Vegetation Plot 9	575120.55	1838565.85
Vegetation Plot 10	575043.36	1838193.48
Vegetation Plot 11	575205.99	1837994.38
Vegetation Plot 12	575227.43	1837969.85
Vegetation Plot 13	575441.64	1837796.88
Begin lower Long Profile	575428.88	1838894.84
End lower Long Profile	575714.29	1839149.08
End upper Long Profile	575199.03	1837983.42
Begin upper Long Profile	575500.62	1837736.10
Cross section pool upper rb	575376.79	1837755.68
Cross section pool upper lb	575399.15	1837817.16
Cross section riffle upper rb	575277.86	1837865.67
Cross section riffle upper lb	575317.97	1837891.83
Cross section pool lower lb	575556.65	1838893.48
Cross section pool lower rb	575556.90	1838659.02
Cross section riffle lower lb	575622.50	1838996.76
Cross section riffle lower rb	575578.60	1838971.31
Photo 1	575376.68	1837774.36
Photo 2	575256.24	1837906.95
Photo 3	575512.81	1838927.71
Photo 4	575645.80	1838921.04
Photo 5	575583.03	1839062.27
Photo 6	575444.94	1837767.29
Lower Riffle Pebble Count	575603.43	1838985.77
Lower Pool Pebble Count	575556.35	1838925.75
Upper Riffle Pebble Count	575388.06	1837787.69
Upper Pool Pebble Count	575299.79	1837879.88



Ecosystem Enhancement Program

FIGURE 2C
MONITORING PLAN VIEW
SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

DECEMBER 2005

Point	Northing	Easting
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End upper Long Profile	575199.03	1837983.42
Begin upper Long Profile	575500.62	1837736.10
Cross section pool upper rb	575376.79	1837755.68
Cross section pool upper lb	575399.15	1837817.16
Cross section riffle upper rb	575277.86	1837865.67
Cross section riffle upper lb	575317.97	1837891.83
Cross section pool lower lb	575556.65	1838893.48
Cross section pool lower rb	575556.90	1838959.02
Cross section riffle lower lb	575622.50	1838996.76
Cross section riffle lower rb	575578.60	1838971.31
Photo 1	575376.68	1837774.36
Photo 2	575256.24	1837906.95
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Upper Riffle Pebble Count	575388.06	1837787.69
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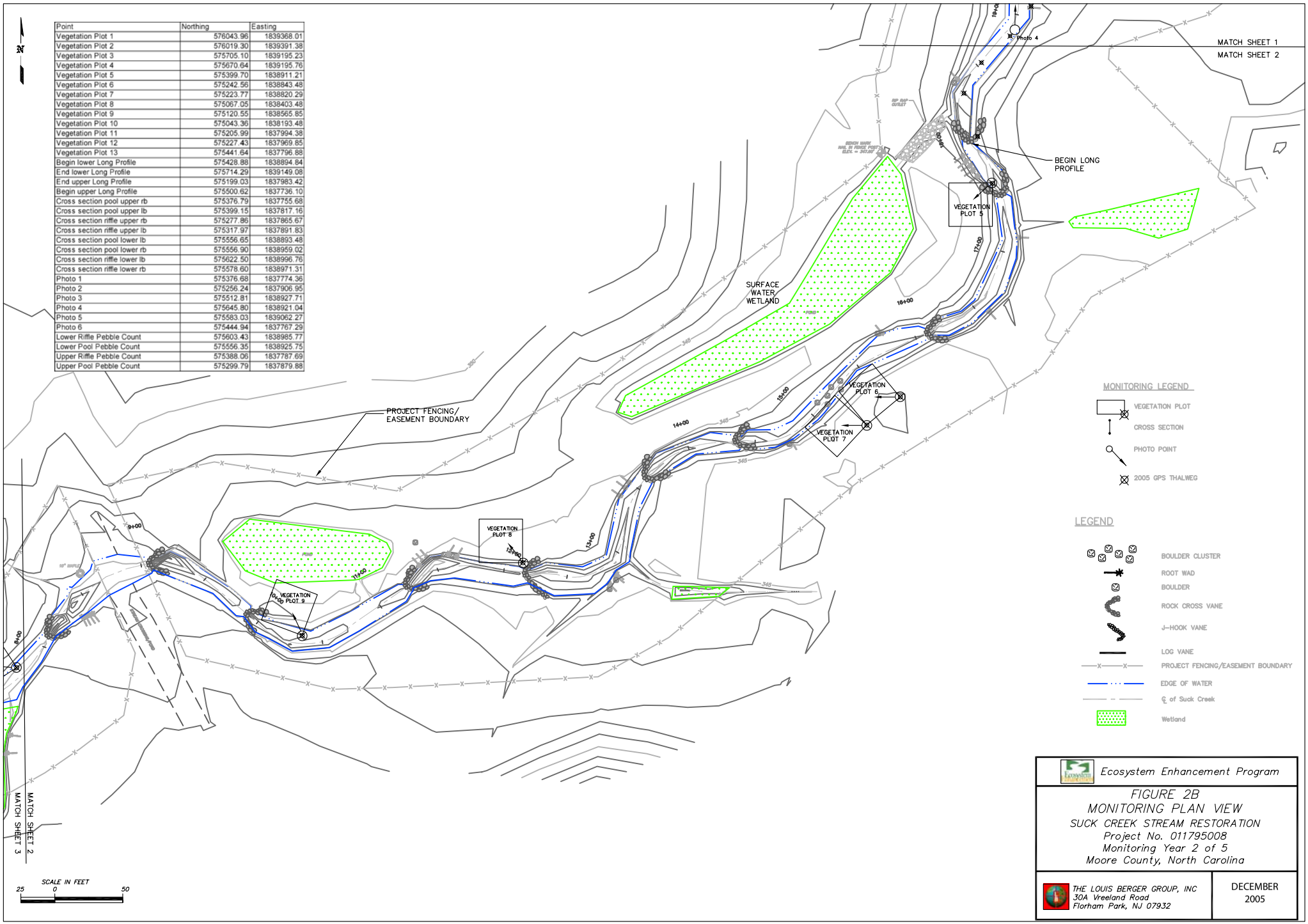
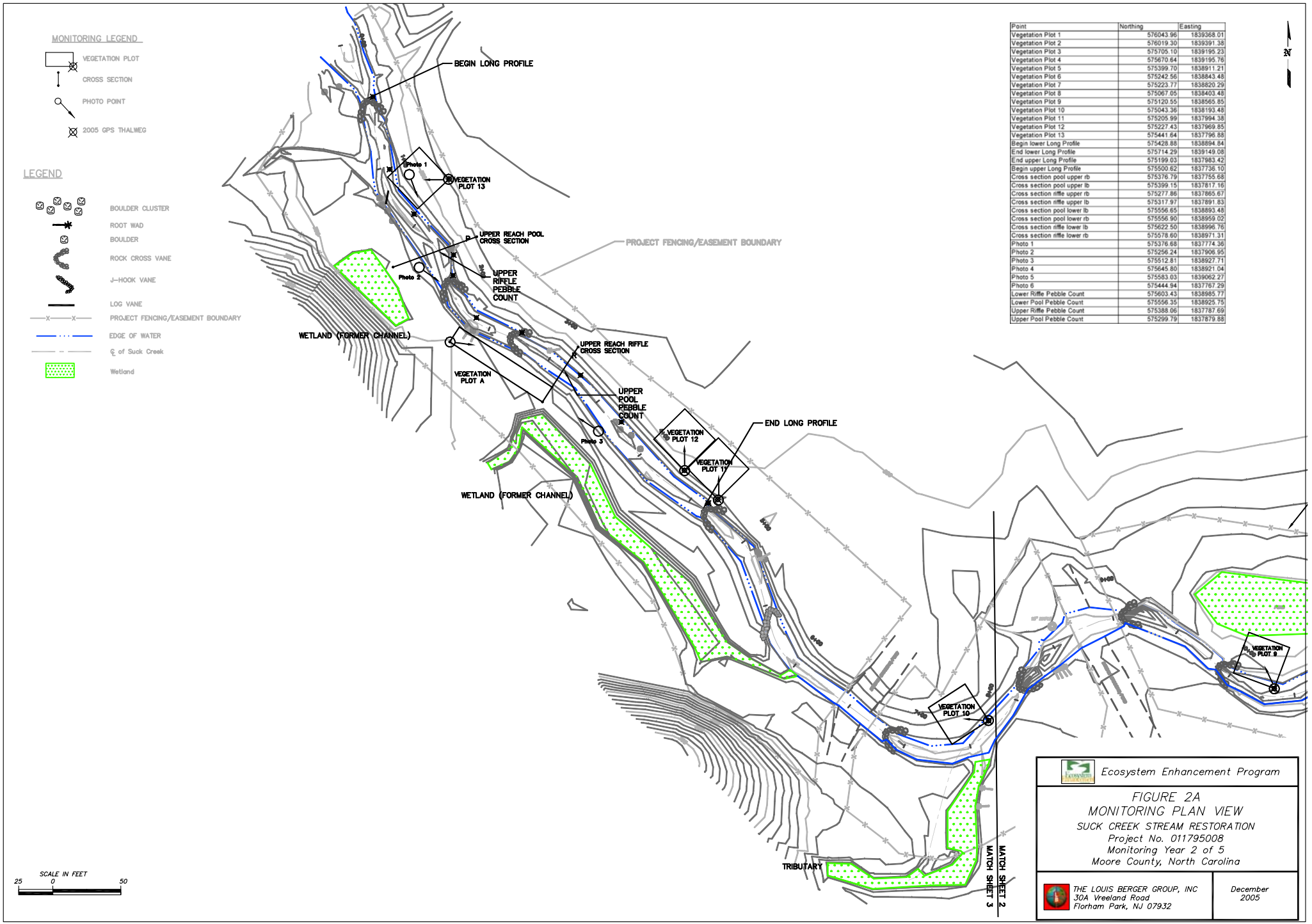


Ecosystem Enhancement Program

FIGURE 2B
MONITORING PLAN VIEW
SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

DECEMBER 2005



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Vegetation Plot 7	575223.77	1838820.29
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Vegetation Plot 9	575120.55	1838565.85
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Vegetation Plot 13	575441.64	1837796.88
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Cross section pool upper rb	575376.79	1837755.68
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Cross section riffle upper lb	575317.97	1837891.83
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Lower Pool Pebble Count	575556.35	1838925.75
Upper Riffle Pebble Count	575388.06	1837787.69
Upper Pool Pebble Count	575299.79	1837879.88

Ecosystem Enhancement Program

FIGURE 2A
MONITORING PLAN VIEW

SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

December 2005

Table VIII. Stem counts for each species arranged by plot.

Species	Plot													Year 2 Totals	Transect Plot Data				Survival %[2]	
															Year 1 Totals		Year 2 Totals			
	1	2	3	4	5	6	7	8	9	10	11	12	13		A	B	A	B	A	B
Shrubs																				
Alnus spp.[1]	0	0	0	0	0	0	0	0	3	2	0	2	0	7	1	0	0	0	0	0
Celtis laevigata[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Cornus sericea	0	0	2	0	0	5	9	0	2	1	3	0	1	23	1	2	1	0	100	0
Cornus amomum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Oxydendrum arboreum[1]	0	0	0	0	0	0	1	0	0	0	0	0	2	3	0	0	0	0	0	0
Trees																				
Acer rubrum[1]	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	0	0	0	0
Betula nigra	7	0	0	0	0	7	4	0	7	15	34	49	27	150	7	1	0	0	0	0
Fraxinus pennsylvanica	0	0	0	0	3	0	1	0	0	0	0	0	0	4	3	1	3	1	100	100
Liquidambar styraciflua[1]	4	1	0	0	0	0	0	0	3	3	1	9	3	24	0	0	0	0	0	0
Pinus palustris	0	0	0	0	0	0	1	0	1	0	0	0	0	2	0	0	0	0	0	0
Platanus occidentalis	1	3	0	0	0	0	4	0	2	8	0	0	18	36	0	4	0	3	0	75
Quercus phellos	0	0	1	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0
Salix nigra	2	0	8	4	4	5	5	3	12	5	1	0	1	50	1	6	0	0	0	0
Totals	14	4	11	5	7	17	25	3	30	34	39	60	53	302						

[1] volunteer or sapling vegetation found within sampling plots

[2] calculated for woody vegetation planted within transect sampling plots

B. Stream Assessment

1. Procedural Items

During the field sampling effort of the lower pool cross section, the right bank stake could not be found. The field crew used a sub-meter accurate GPS unit to locate to the approximate coordinates of the previous year's location. When the stake location could not be located, a new end point was created. Conduit was driven into the ground to mark the location, GPS coordinates were resurveyed at the location of the installed conduit, and the cross section was surveyed. The graphic comparison presented in this report indicates that these cross sections are too different to have been measured along the same plane.

2. Stream Problem Areas Plan View

The position of each structural problem area is provided in Appendix B.

3. Stream Problem Area Photos

A photograph of each structural problem area is shown in Appendix B.

4. Stability Assessment

A summary of the unstable and stressed structures observed during Year 2 monitoring is provided in Table IX.

Table IX. Stream Problem Areas
Suck Creek Stream Restoration: Project No. 0117950008

Feature Issue	Station numbers	Suspected Cause	Photo number
Mid channel bar	4+00 to 4+60	Slope not sufficient to move sediment	1
Cross Vane, arm scour	18+00	Large voids between rocks in vane	2
Root wad failure	19+10	Improper installation	3
Cross Vane, arm scour	21+60	Large voids between rocks in vane	4
Cross Vane, arm scour	25+70	Large voids between rocks in vane	5
Cross Vane, arm scour	26+60	Large voids between rocks in vane	6

Maintenance is recommended on the cross vanes at Sta. 21+60 and 26+60 since scour between and around individual rocks in the arm is extensive and the arm of the structure is not creating a bar behind the structure of any kind.

The mid-channel bar downstream of the boulder field (Sta. 4+00 to 4+60) has become vegetated with rice cutgrass (*Leersia oryzoides*). This feature likely occurs because of unfocused velocity, post-boulder field, and too gentle a water surface slope. Low water levels due to the late summer drought may have also created shallow water conditions conducive for the germination and establishment of rice-cut grass.

The root wad failure at Sta. 19+10 has caused bed scour beneath the structure and bank scour under the fabric matting. This structure acts in creating an eddy within the pool during high flows, causing the channel to widen slightly. The banks and fabric matting are forming a vegetated slumping bank. This area is expected to stabilize over time.

5. Fixed Station Photos

Photographs taken at each established photograph station are provided in Appendix B.

6. Quantitative Measurements

Graphic interpretations of cross sections, profiles and sediment distribution are shown in Appendix B. A summary of geomorphic measurements is shown in Table Xa for the Upper Reach, Table Xb. For the Lower Reach, and Table XI.

Table Xa. Categorical Stream Feature Visual Stability Assessment
Project Number 0117950008 (Suck Creek)
Segment/Reach: Upper Reach

Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles	N/A	N/A	88			
B. Pools	N/A	N/A	88			
C. Thalweg	N/A	N/A	100			
D. Meanders	N/A	N/A	100			
E. Bed General	N/A	N/A	99			
F. Vanes / J Hooks etc.	N/A	N/A	100			
G. Wads and Boulders	N/A	N/A	100			

N/A: Historical project documents necessary to provide this data were unavailable at the time of this report submission.

Table Xb. Categorical Stream Feature Visual Stability Assessment
Project Number 0117950008 (Suck Creek)
Segment/Reach: Lower Reach

Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles	N/A	N/A	93.5			
B. Pools	N/A	N/A	100			
C. Thalweg	N/A	N/A	100			
D. Meanders	N/A	N/A	99			
E. Bed General	N/A	N/A	100			
F. Vanes / J Hooks etc.	N/A	N/A	85			
G. Wads and Boulders	N/A	N/A	96			

N/A: Historical project documents necessary to provide this data were unavailable at the time of this report submission.

Table XI. Baseline Morphology and Hydraulic Summary
Project Number 0117950008 (Suck Creek)
Segment/Reach:

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)													15	20	N/A	N/A	N/A	21.2
Floodprone Width (ft)																		
BF Cross Sectional Area (ft^2)													18	36	N/A	N/A	N/A	18.1
BF Mean Depth (ft)													1.2	1.8	N/A	N/A	N/A	1.3
BF Max Depth (ft)													1.8	2.9	N/A	N/A	N/A	2.2
Width/Depth Ratio													12.5	11.1	N/A	N/A	N/A	16.3
Entrenchment Ratio																		
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Pattern																		
Channel Beltwidth (ft)													21	99	N/A	20	104	N/A
Radius of Curvature (ft)													32	69	N/A	35	55	N/A
Meander Wavelength (ft)													130	265	N/A	120	265	N/A
Meander Width ratio																		
Profile																		
Riffle length (ft)													N/A	N/A	N/A	10	42	N/A
Riffle slope (ft/ft)													.45	1.0	N/A	.5	1.0	N/A
Pool length (ft)													N/A	N/A	N/A	20	128	N/A
Pool spacing (ft)													60	140	N/A	54	171	N/A
Substrate																		
d50 (mm)													N/A	N/A	N/A	.8	20	N/A
d84 (mm)													N/A	N/A	N/A	10	34	N/A
Additional Reach Parameters																		
Valley Length (ft)																		
Channel Length (ft)																		
Sinuosity																		
Water Surface Slope (ft/ft)																		
BF slope (ft)																		
Rosgen Classification																		
Number of Bankfull Events																		
Extent of BF floodplain (acres)																		
*BEHI																		
*Habitat Index																		
*Macrobenthos																		

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria
N/A: Historical project documents necessary to provide this data were unavailable at the time of this report submission.

Table XII. Morphology and Hydraulic Monitoring Summary
Project Number 0117950008 (Suck Creek)
Segment/Reach:

Parameter	Cross Section 1 Upper Pool						Cross Section 2 Upper Riffle						Cross Section 3 Lower Pool						Cross Section 4 Lower Riffle					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	27.3	26.2					21.2	19.2					31	9.9					20.7	16.6				
Floodprone Width (ft)	N/A	N/A					N/A	N/A					N/A	N/A					N/A	N/A				
BF Cross Sectional Area (ft^2)	34.3	32.5					18.1	15.2					33	13.4					27.4	20.9				
BF Mean Depth (ft)	1.8	1.2					0.9	0.8					1.1	1.4					1.3	1.3				
BF Max Depth (ft)	2.8	2.7					1.6	1.6					2.8	1.6					2.2	2				
Width/Depth Ratio	7.4	21.1					25	24.2					29.2	7.3					15.6	13.2				
Entrenchment Ratio	2.1	N/A					2.8	N/A					2.5	N/A					3.2	N/A				
Wetted Perimeter (ft)	N/A	27.3					N/A	19.7					N/A	11.7					N/A	13.2				
Hydraulic Radius (ft)	N/A	1.2					N/A	0.8					N/A	1.1					N/A	1.2				
Substrate																								
d50 (mm)	17.9	14.8					13.2	7.3					0.8	0.8					20	0.7				
d84 (mm)	32	32					30.8	34					10	9					33.4	5				

Parameter	MY-01 (2004)			MY-02 (2005)			MY-03 (XXXX)			MY-04 (XXXX)			MY-05 (XXXX)			MY+ (XXXX)		
Pattern	Min	Max	Med	Lower	Upper	Avg.	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	21	99	N/A	27	13	20												
Radius of Curvature (ft)	32	69	N/A	30	33	31.5												
Meander Wavelength (ft)	130	265	N/A	160	141	150												
Meander Width ratio	N/A	N/A	N/A	N/A	N/A	N/A												
Profile																		
Riffle length (ft)	10	42	N/A	28.5	45.6	37												
Riffle slope (ft/ft)	0.5%	1.0%	N/A	.318	.131	.224												
Pool length (ft)	20	128	N/A	22.6	28.2	25.4												
Pool spacing (ft)	54	171	N/A	64	35.3	49.6												
Additional Reach Parameters				Lower/Upper														
Valley Length (ft)		N/A			411/386													
Channel Length (ft)		N/A			515/408													
Sinuosity		N/A			1.25/1.05													
Water Surface Slope (ft/ft)		N/A			.0022/.0017													
BF slope (ft)		N/A			.0023/.0029													
Rosgen Classification		C5			C5													
Number of Bankfull Events		N/A			N/A													
Extent of BF floodplain (acres)		N/A			N/A													
*BEHI		N/A			N/A													
*Habitat Index		N/A			N/A													
*Macrobenthos		N/A			N/A													

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria
N/A: Historical project documents necessary to provide this data were unavailable at the time of this report submission.

APPENDIX A

Appendix A

1. Vegetation Plot Photos

A representative photo of each vegetation plot, taken on the day of sampling, is shown.

Vegetation Plot 1

Vegetation Plot 2

Vegetation Plot 3

Vegetation Plot 4

Vegetation Plot 5

Vegetation Plot 6

Vegetation Plot 7

Vegetation Plot 8

Vegetation Plot 9

Vegetation Plot 10

Vegetation Plot 11

Vegetation Plot 12

Vegetation Plot 13

2. Vegetation Problem Area Photos

Photo 14, bank scour at station 11+50

Photo 12, bank scour at station 19+10

Photo 7, bank scour and un-vegetated floodplain bench at station 22+80.

EEP Stem Count Data Sheet

EEP Project #:		Date:	9/18/05
Project Name:	Suck Creek	Staff Name(s):	Jen Burton
Monitoring Contractor:			Rich Bolton
County:			
8 Digit Catalog Unit			
Stream/Wetland Name:			

Plot Location SC Rip Veg Plot 3

Plot ID	Photo #	Species	Stem #
3	3 &	Willow Oak	1
		Black Willow	//// ///
		Dogwood	//

Plot Location SC Rip Veg 4

Plot ID	Photo #	Species	Stem #
4		Willow Oak	1
4		Black Willow	////

Plot Location SC - Lower Rock Rip Veg 1

Plot ID	Photo #	Species	Stem #
1	3 &	Sycamore	1
1		Sweetgum	////
1		Riverbirch	//// //
		Black Willow	//

Plot Location SC-Lower Rip Veg 2

Plot ID	Photo #	Species	Stem #
2	2 &	Sycamore	///
		Sweetgum	/

EEP Stem Count Data Sheet

EEP Project #:		Date:	9/19/05
Project Name:	Sugar Creek	Staff Name(s):	J. Brunton
Monitoring Contractor:			R. Batton
County:	Moore		
8 Digit Catalog Unit			
Stream/Wetland Name:			

Plot Location	SC Rip Veg 6		
Plot ID	Photo #	Species	Stem #
6	2	Dogwood	////
6		Black Willow	////
6		River birch	//// //
			//

Plot Location			
Plot ID	Photo #	Species	Stem #
7	3	Green Ash	/
7		Black Willow	////
7		Sycamore	////
7		Dogwood	//// ///
7		River birch	////
7		Longleaf Pine	/
7		Sourwood	/

Plot Location	Lower Belt Transect		
Plot ID	Photo #	Species	Stem #
	3 sc	Green Ash	/
		Black Willow	////
		Sycamore	////
		River birch	/
		Dogwood	//

Plot Location	SC Rip Veg 5		
Plot ID	Photo #	Species	Stem #
5	1 sc	Green Ash	///
5	2c	Black Willow	////

EEP Stem Count Data Sheet

EEP Project #:		Date:	
Project Name:		Staff Name(s):	
Monitoring Contractor:			
County:			
8 Digit Catalog Unit			
Stream/Wetland Name:			

Plot Location SC Rip Veg 8

Plot ID	Photo #	Species	Stem #
8	8	Black Willow	///

Plot Location SC Rip Veg Plot 9

Plot ID	Photo #	Species	Stem #
9	9	Dogwood	//
9		Sycamore	//
9		River birch	////
		Black Willow	//// ///
		Alder	//
		Sweetgum	///
		Long leaf pine	/

Plot Location SC Rip Veg 10

Plot ID	Photo #	Species	Stem #
		Black Willow	///
		Sycamore	//// ///
		River Birch	//// ////
		Sweetgum	//
		Alder	//
		Dogwood	//

Plot Location SC Rip Veg 11

Plot ID	Photo #	Species	Stem #
11		River Birch	//// //// //// ////
		Sweetgum	/
		Black Willow	/
		Dogwood	///

EEP Stem Count Data Sheet

EEP Project #:		Date:	
Project Name:		Staff Name(s):	
Monitoring Contractor:			
County:			
8 Digit Catalog Unit			
Stream/Wetland Name:			

Plot Location SC Rip Veg 12

Plot ID	Photo #	Species	Stem #
		River birch 4 total	
		Sweetgum	
		Alder	

+26

Plot Location SC-Rett upper

Plot ID	Photo #	Species	Stem #
		Red Maple	
		~~Dead~~ Green Ash	
		Alder	
		Black Willow	
		River Birch	
		Dogwood	

Plot Location

Plot ID	Photo #	Species	Stem #

Plot Location SC Rip Veg 13

Plot ID	Photo #	Species	Stem #
13		Sycamore	
		Dogwood	
		Sweetgum	
		Sourwood	
		River birch	
		Red Maple	
		Black Willow	

+1

VEGETATIVE PROBLEM AREA LEGEND

PHOTO STATION

2005 PHOTO STATION

STRESSED

LEGEND

BOULDER CLUSTER

ROOT WAD

BOULDER

ROCK CROSS VANE

J-HOOK VANE

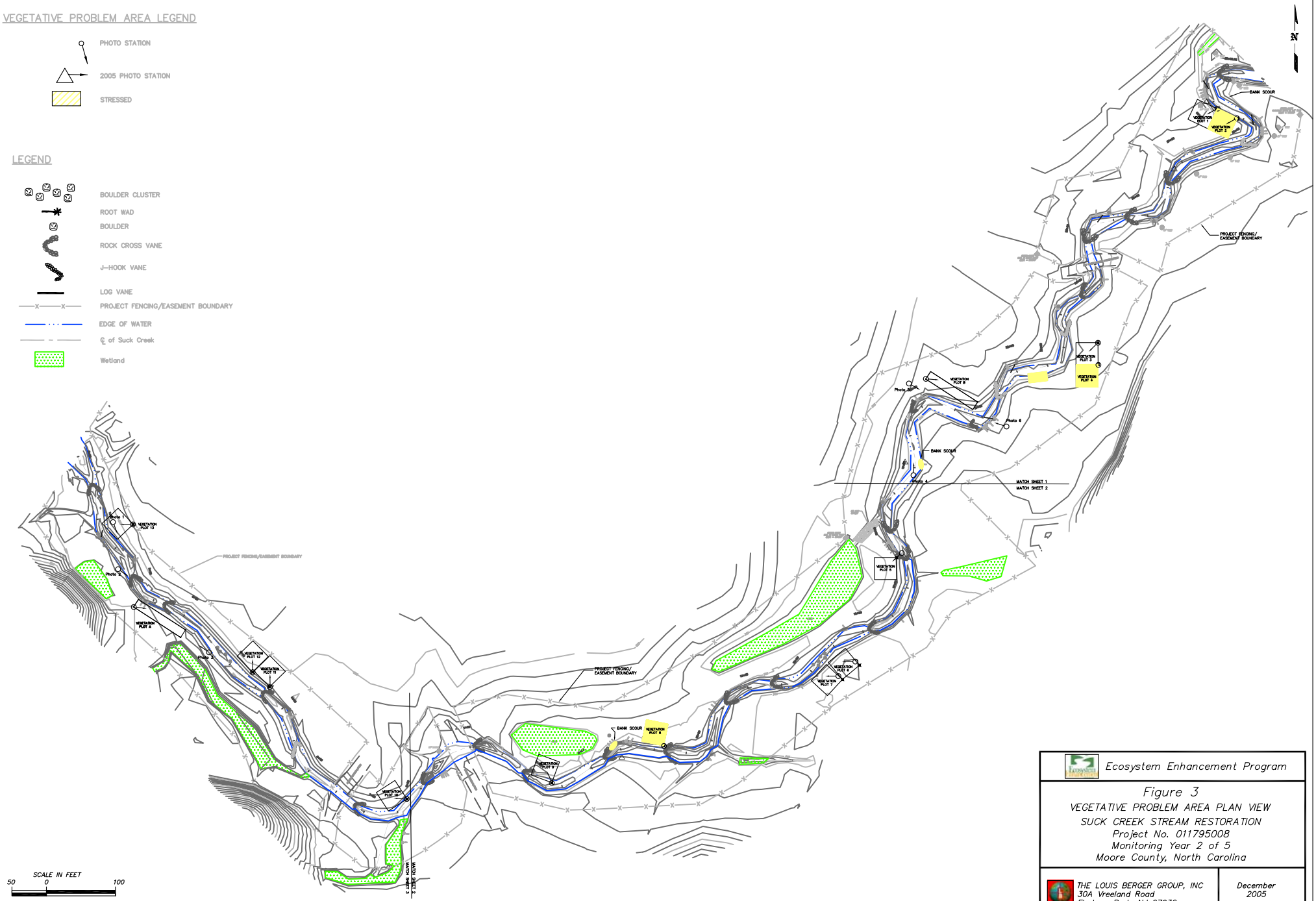
LOG VANE

PROJECT FENCING/EASEMENT BOUNDARY

EDGE OF WATER

℄ of Suck Creek

Wetland



Ecosystem Enhancement Program

Figure 3

VEGETATIVE PROBLEM AREA PLAN VIEW

SUCK CREEK STREAM RESTORATION

Project No. 011795008

Monitoring Year 2 of 5

Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

December 2005

APPENDIX B

Appendix B

1. Representative Stream Problem Area Photos

A photo of each structural problem area is shown with corresponding stationing.

4+00-4+60

18+00

19+10

21+60

25+70

26+60

2. Stream Photo-station Photos

Photo Station 1

Photo Station 2

Photo Station 3

Photo Station 4

Photo Station 5

Photo Station 6

3. Table B1. Qualitative Visual Stability Assessment

Table B1a. Visual Morphological Stability Assessment Suck Creek Stream Restoration - Upper Reach: 2,088 feet						
Feature Category	Metric (per As-Built and reference baseline)	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	7	8		88	
	2. Armor Stable?		0			
	3. Facet grade appears stable?	7	8		88	
	4. Minimal evidence of embedding / fining?	7	8		88	
	5. Length appropriate?	7	8		88	88
B. Pools	1. Present?	7	8		88	
	2. Sufficient depth?	7	8		88	
	3. Length appropriate?	7	8		88	88
C. Thalweg	1. Upstream of meander bend centering?	8	8		100	
	2. Downstream of meander bend centering?	8	8		100	100
D. Meanders	1. Outer bend in state of limited / controlled erosion	7	7		100	
	2. Of those eroding, # w/concomitant point bar formation?					
	3. Apparent Rc within spec?				100	
	4. Sufficient Floodplain Access and Relief?	7	7		100	100
E. Bed General	1. General channel bed aggradation areas?			60/850	93	
	2. Channel bed degradation?			0/850	100	96
F. Vanes	1. Free of back or arm scour?	7	7		100	
	2. Height appropriate?	7	7		100	
	3. Angle and geometry appear appropriate?	7	7		100	
	4. Free of piping or other structural failures?	7	7		100	100
G. Wads / Boulders	1. Free of Scour?	7	7		100	
	2. Footing Stable?	7	7		100	100

Table B1b. Visual Morphological Stability Assessment Suck Creek Stream Restoration - Lower Reach: 875 feet

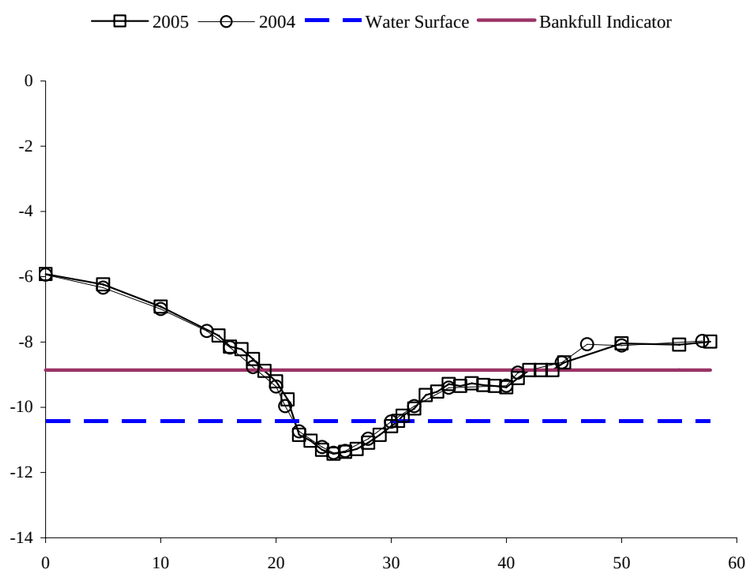
Feature Category	Metric (per As-Built and reference baselines)	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	23	23		100	
	2. Armor Stable?		0			
	3. Facet grade appears stable?	20	23		87	
	4. Minimal evidence of embedding / fining?	20	23		87	
	5. Length appropriate?	23	23		100	93.5
B. Pools	1. Present?	24	24		100	
	2. Sufficient depth?	24	24		100	
	3. Length appropriate?	24	24		100	100
C. Thalweg	1. Upstream of meander bend centering?	21	21		100	
	2. Downstream of meander bend centering?	21	21		100	100
D. Meanders	1. Outer bend in state of limited / controlled erosion	20	21		95	
	2. Of those eroding, # w/concomitant point bar formation?	21	21		100	
	3. Apparent Rc within spec?				100	
	4. Sufficient Floodplain Access and Relief?	21	21		100	99
E. Bed General	1. General channel bed aggradation areas?		0/2000		100	
	2. Channel bed degradation?		0/2000		100	100
F. Vanes	1. Free of back or arm scour?	15	19		79	
	2. Height appropriate?	17	19		90	
	3. Angle and geometry appear appropriate?	19	19		100	
	4. Free of piping or other structural failures?	14	19		73	85
G. Wads / Boulders	1. Free of Scour?	25	26		96	
	2. Footing Stable?	25	26		96	96

Survey Data					
Benchmark Elevation		**Benchmark Elevation**			**LEP**
Station	**Foreshot**	**Station**	**Foreshot**	**Elevation**	**Feature**
2004		*2005*			
0	6.02	0	5.92		LB
5	6.42	5	6.24		
10	7.07	10	6.92		
14	7.74	15	7.80		
16	8.25	16	8.14		
18	8.85	17	8.22		
20	9.45	18	8.52		
20.8	10.05	19	8.89		
22	10.82	20	9.21		
24	11.30	21	9.76		
25	11.48	22	10.85		LEW
26	11.42	23	11.03		SB
28	11.05	24	11.31		SB
30	10.52	25	11.43		CL
32	10.05	26	11.37		SB
35	9.48	27	11.28		SB
40	9.42	28	11.09		SB
41	9.02	29	10.85		SB
44.8	8.71	30	10.58		SB
47	8.15	30.6	10.42		REW
50	8.19	31	10.26		SB
57	8.05	32	10.04		SB
		33	9.63		SB
		34	9.52		SB
		35	9.29		SB
		36	9.35		SB
		37	9.27		SB
		38	9.32		SB
		39	9.35		SB
		40	9.39		SB
		41	9.11		SB
		42	8.86		BKF
		43	8.86		
		44	8.86		
		45	8.63		
		50	8.04		
		55	8.08		
		57.7	7.99		RB

Summary Data		
	2004	*2005*
Bankfull Cross Sectional Area (ft^2)	34.3	32.5
Bankfull Width (ft)	27.3	26.2
Bankfull Mean Depth (ft)	1.8	1.2
Bankfull Max Depth (ft)	2.8	2.7
Width/Depth Ration	7.4	21.1
Entrenchment Ratio	2.1	N/A
Classification	-	-

Cross Section - Upper Pool

Cross Section Plot - Looking Downstream



Cross Section Photo - Looking Downstream

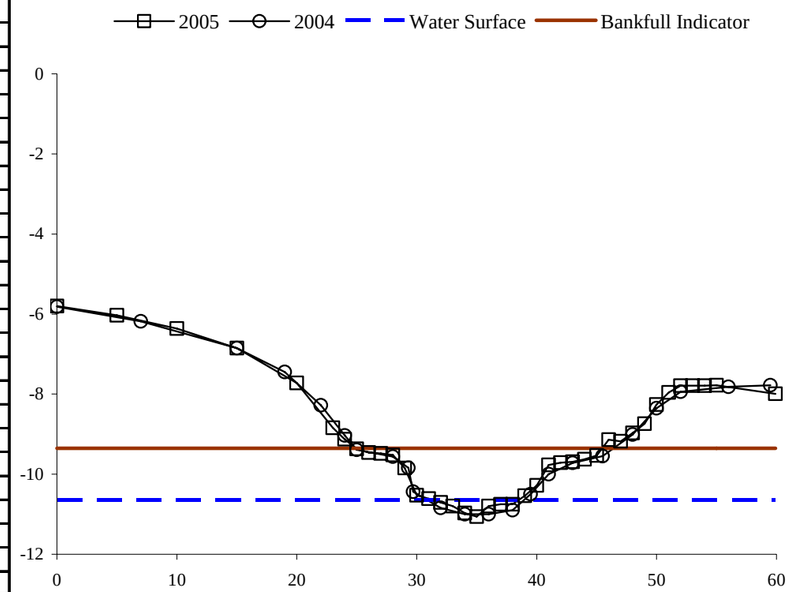
Title	Cross Section 1			
Project	Suck Creek Stream Restoration Project Moore County, NC		**Project #**	011795008
			Figure	
Survey Date	**Survey Weather**	**Field Team**	**Location**	
September 19, 2005	Sunny, 90° F	Richard Bolton; Jennifer Brunton	Upper Reach	

Survey Data					
Benchmark Elevation		**Benchmark Elevation**			**LEP**
Station	**Foreshot**	**Station**	**Foreshot**	**Elevation**	**Feature**
2004		*2005*			
0	5.82	0	5.69		LB
7	6.18	5	5.92		
15	6.85	10	6.25		
19	7.45	15	6.74		
22	8.28	20	7.61		
24	9.03	23	8.73		
25	9.39	24	9.02		
28	9.56	25	9.26		
29.3	9.84	26	9.35		BKF
29.7	10.44	27	9.37		SB
32	10.84	28	9.41		SB
34	11.00	29	9.74		SB
36	11.00	30	10.42		LEW
38	10.90	31	10.50		SB
39.5	10.50	32	10.60		SB
41	10.00	33	10.69		SB
43	9.72	34	10.86		CL
45.5	9.55	35	10.95		SB
48	9.01	36	10.69		SB
50	8.35	37	10.64		SB
52	7.94	38	10.64		SB
56	7.82	39	10.43		SB
59.5	7.78	40	10.17		SB
		41	9.66		SB
		42	9.60		SB
		43	9.58		SB
		44	9.52		SB
		45	9.42		SB
		46	9.03		
		47	9.07		
		48	8.86		
		49	8.63		
		50	8.15		
		51	7.85		
		52	7.68		
		53	7.68		
		54	7.68		
		55	7.67		
		59.9	7.88		RB

Summary Data		
	2004	*2005*
Bankfull Cross Sectional Area (ft^2)	18.1	15.2
Bankfull Width (ft)	21.2	19.2
Bankfull Mean Depth (ft)	0.9	0.8
Bankfull Max Depth (ft)	1.6	1.6
Width/Depth Ration	25.0	24.2
Entrenchment Ratio	2.8	N/A
Classification	-	-

Cross Section - Upper Riffle

Cross Section Plot - Looking Downstream



Cross Section Photo - Looking Downstream

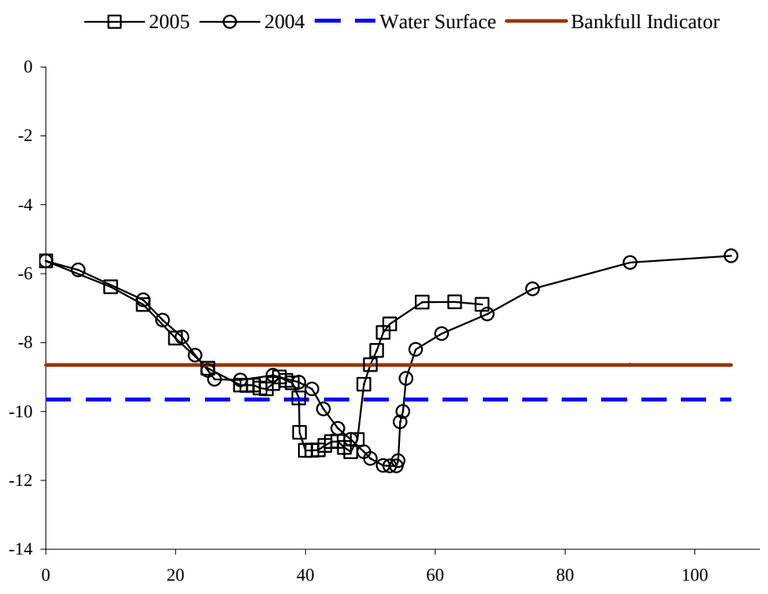
Title	Cross Section 2			
Ecosystem Enhancement Program	**Project**	Suck Creek Stream Restoration Project Moore County, NC	**Project #**	011795008
			Figure	
	Survey Date	**Survey Weather**	**Field Team**	**Location**
	September 19, 2005	Sunny, 90° F	Richard Bolton; Jennifer Brunton	Upper Reach

Survey Data					
Benchmark Elevation		**Benchmark Elevation**			**LEP**
Station	**Foreshot**	**Station**	**Foreshot**	**Elevation**	**Feature**
2004		*2005*			
0	5.63	0	4.67		LB
5	5.89	10	5.42		
15	6.76	15	5.94		
18	7.35	20	6.91		
21	7.84	25	7.79		
23	8.37	30	8.28		
25	8.81	31	8.28		
26	9.07	32	8.28		
30	9.09	33	8.36		
35	8.95	34	8.39		
39	9.15	35	8.23		
41	9.35	36	8.04		
42.8	9.93	37	8.14		
45	10.49	38	8.21		
47	10.81	39	8.65		BKF
49	11.17	39.1	9.65		LEW
50	11.37	40	10.17		SB
52	11.57	41	10.17		SB
53	11.58	42	10.16		SB
54	11.58	43	10.03		SB
54.3	11.43	44	9.92		SB
54.6	10.30	45	9.91		SB
55	10.00	46	10.09		SB
55.5	9.04	47	10.21		CL
57	8.20	48	9.86		SB
61	7.74	49	8.25		SB
68	7.17	50	7.68		
75	6.44	51	7.27		
90	5.68	52	6.75		
105.6	5.48	53	6.50		
		58	5.87		
		63	5.86		
		67.2	5.93		RB

Summary Data		
	2004	*2005*
Bankfull Cross Sectional Area (ft^2)	33.0	13.4
Bankfull Width (ft)	31.0	9.9
Bankfull Mean Depth (ft)	1.1	1.4
Bankfull Max Depth (ft)	2.8	1.6
Width/Depth Ration	29.2	7.3
Entrenchment Ratio	2.5	N/A
Classification	-	-

Cross Section - Lower Pool

Cross Section Plot - Looking Downstream



Cross Section Photo - Looking Downstream

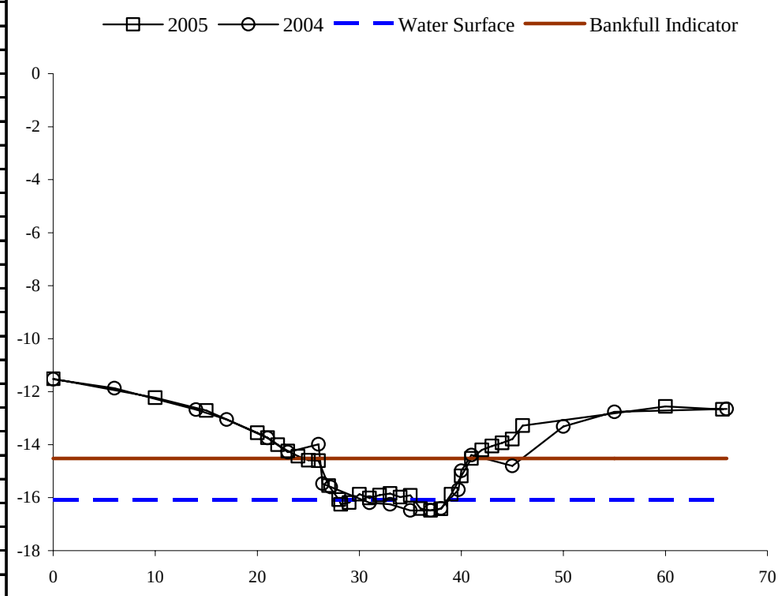
Title	Cross Section 3			
Ecosystem Enhancement Program	**Project**	Suck Creek Stream Restoration Project Moore County, NC	**Project #**	011795008
			Figure	
	Survey Date	**Survey Weather**	**Field Team**	**Location**
	September 22, 2005	Sunny, 90° F	Richard Bolton; Jennifer Brunton	Lower Reach

Survey Data					
Benchmark Elevation		**Benchmark Elevation**			**LEP**
Station	**Foreshot**	**Station**	**Foreshot**	**Elevation**	**Feature**
2004		*2005*			
0	5.98	0	11.51		LB
6	6.32	10	12.23		
14	7.13	15	12.71		
17	7.50	20	13.55		
21	8.20	21	13.74		
23	8.73	22	14.00		
26	8.43	23	14.24		
26.4	9.92	24	14.43		
27.2	10.05	25	14.59		SB
31	10.64	26	14.60		SB
33	10.70	27	15.55		SB
35	10.93	28	16.07		LEW
37	10.93	28.2	16.25		SB
38	10.85	29	16.18		SB
39.7	10.15	30	15.87		SB
40	9.44	31	16.01		SB
41	8.84	32	15.90		SB
45	9.25	33	15.84		SB
50	7.76	34	15.98		SB
55	7.21	35	15.91		CL
66	7.10	36	16.41		SB
		37	16.48		SB
		38	16.42		SB
		39	15.87		SB
		40	15.18		SB
		41	14.52		BKF
		42	14.20		
		43	14.05		
		44	13.93		
		45	13.79		
		46	13.28		
		60	12.56		
		65.6	12.67		RB

Summary Data		
	2004	*2005*
Bankfull Cross Sectional Area (ft^2)	27.4	20.9
Bankfull Width (ft)	20.7	16.6
Bankfull Mean Depth (ft)	1.3	1.3
Bankfull Max Depth (ft)	2.2	2.0
Width/Depth Ration	15.6	13.2
Entrenchment Ratio	3.2	N/A
Classification	-	-

Cross Section - Lower Riffle

Cross Section Plot - Looking Downstream



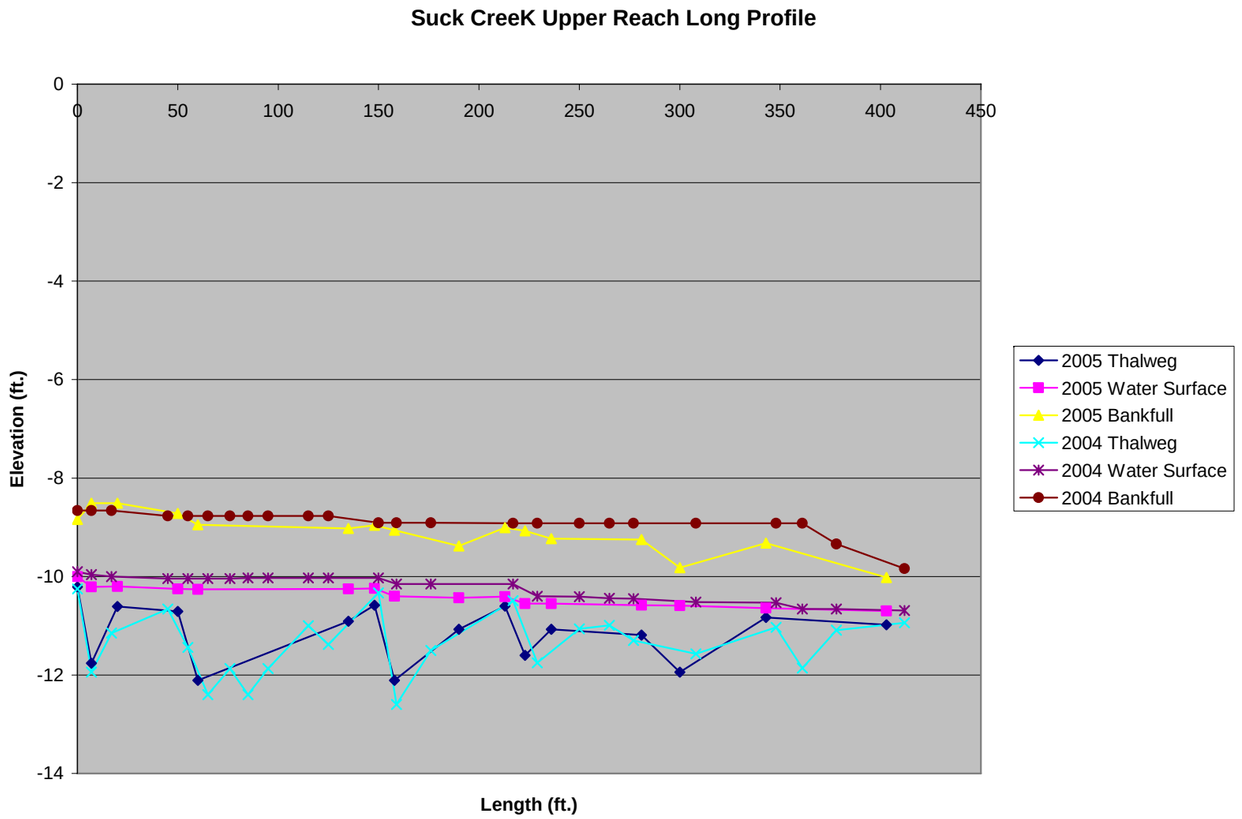
Cross Section Photo - Looking Downstream

Title	Cross Section 4			
	Project	Suck Creek Stream Restoration Project Moore County, NC	**Project #**	011795008
			Figure	
	Survey Date	**Survey Weather**	**Field Team**	**Location**
	September 20, 2005	Sunny, 90° F	Richard Bolton; Jennifer Brunton	Lower Reach

5. Long Profiles

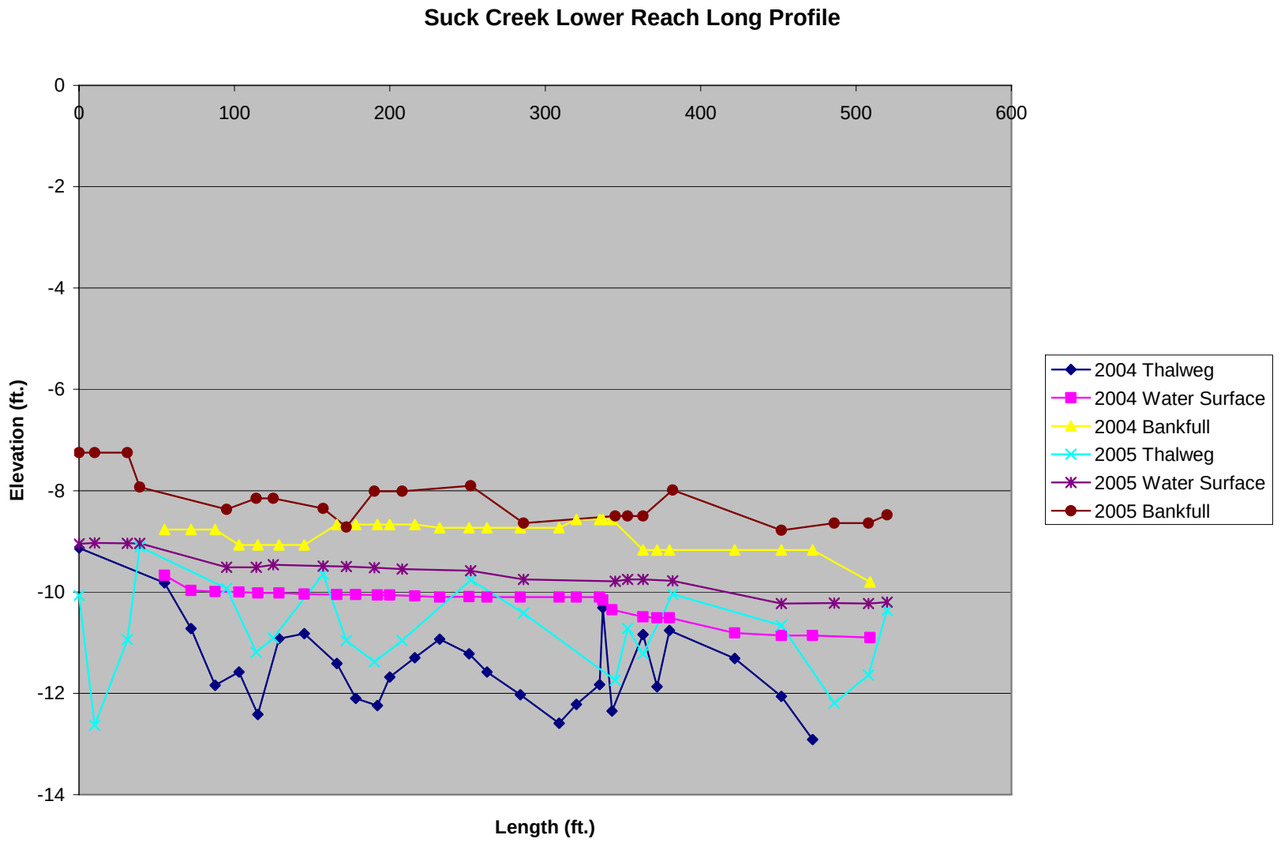
Longitudinal Profile – Upper Reach

Feature/Facet slope, length and spacing							
Upper Long Profile							
Station	Feature length	Water elevation	Bottom elevation	Bankfull	Water slope	Depth at bankfull	Feature
0		-10	-10.21	-8.84		1.37	
7	7	-10.21	-11.76	-8.51	-0.03	3.25	pool
20	13	-10.2	-10.61	-8.51	0.000769	2.1	glide
50	30	-10.25	-10.71	-8.72	-0.00167	1.99	riffle
60	10	-10.26	-12.11	-8.95	-0.001	3.16	pool
135	75	-10.25	-10.91	-9.02	0.000133	1.89	riffle
148	13	-10.24	-10.58	-8.96	0.000769	1.62	pool
158	10	-10.4	-12.11	-9.06	-0.016	3.05	glide
190	32	-10.43	-11.07	-9.38	-0.00094	1.69	riffle
213	23	-10.41	-10.6	-9.01	0.00087	1.59	pool
223	10	-10.55	-11.6	-9.07	-0.014	2.53	glide
236	13	-10.55	-11.07	-9.23	0	1.84	run
281	45	-10.58	-11.19	-9.25	-0.00067	1.94	pool
300	19	-10.59	-11.94	-9.82	-0.00053	2.12	run
343	43	-10.64	-10.83	-9.32	-0.00116	1.51	pool
403	60	-10.7	-10.98	-10.02	-0.001	0.96	run



Longitudinal Profile – Lower Reach

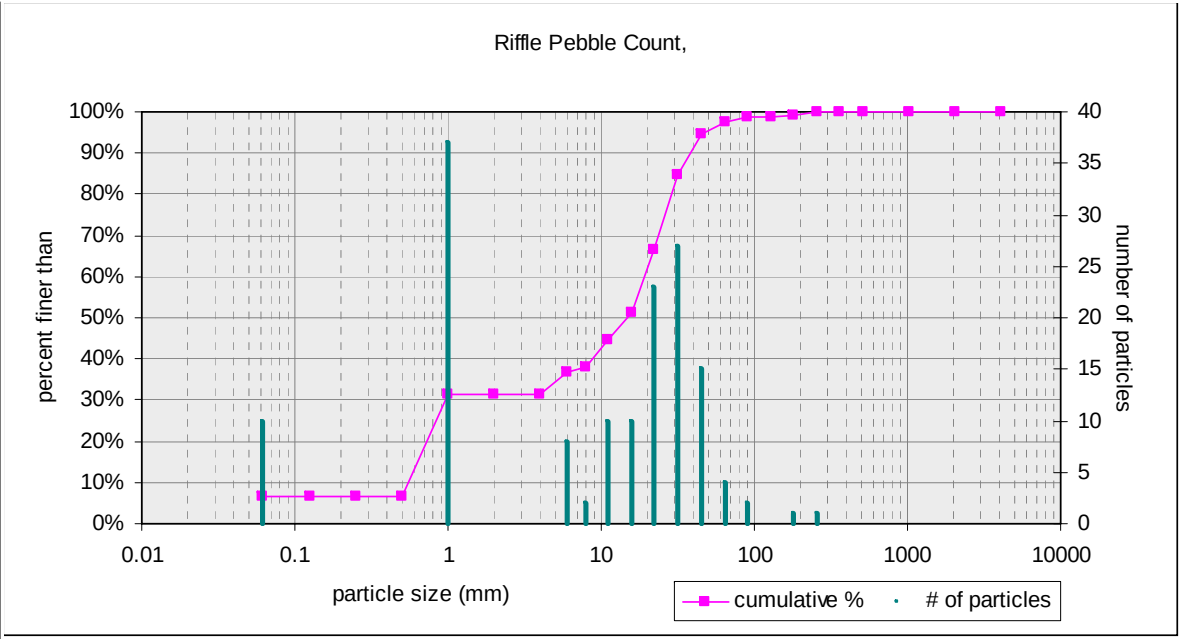
Feature/Facet slope, length and spacing							
Lower Long Profile							
Station	Feature length	Water elevation	Bottom elevation	Bankfull	Water slope	Depth at bankfull	Feature
0		-9.05	-10.07	-7.25		-2.82	
10	10	-9.03	-12.63	-7.25	0.002	-5.38	run
31	21	-9.04	-10.94	-7.25	-0.00048	-3.69	pool
39	8	-9.04	-9.11	-7.93	0	-1.18	glide
95	56	-9.51	-9.93	-8.37	-0.00839	-1.56	riffle
114	19	-9.51	-11.19	-8.15	0	-3.04	pool
125	11	-9.46	-10.91	-8.15	0.004545	-2.76	glide
157	32	-9.49	-9.65	-8.35	-0.00094	-1.3	riffle
172	15	-9.5	-10.96	-8.72	-0.00067	-2.24	run
190	18	-9.52	-11.38	-8.01	-0.00111	-3.37	pool
208	18	-9.55	-10.96	-8.01	-0.00167	-2.95	glide
252	44	-9.58	-9.76	-7.9	-0.00068	-1.86	riffle
286	34	-9.75	-10.42	-8.64	-0.005	-1.78	pool
345	59	-9.79	-11.74	-8.5	-0.00068	-3.24	glide
353	8	-9.75	-10.72	-8.5	0.005	-2.22	riffle
363	10	-9.75	-11.22	-8.5	0	-2.72	pool
382	19	-9.78	-10.04	-7.99	-0.00158	-2.05	riffle
452	70	-10.23	-10.66	-8.78	-0.00643	-1.88	run
486	34	-10.22	-12.19	-8.64	0.000294	-3.55	pool
508	22	-10.23	-11.64	-8.64	-0.00045	-3	glide
520	12	-10.2	-10.36	-8.48	0.0025	-1.88	riffle



6. Sediment Distribution

Upper Riffle Cross Section

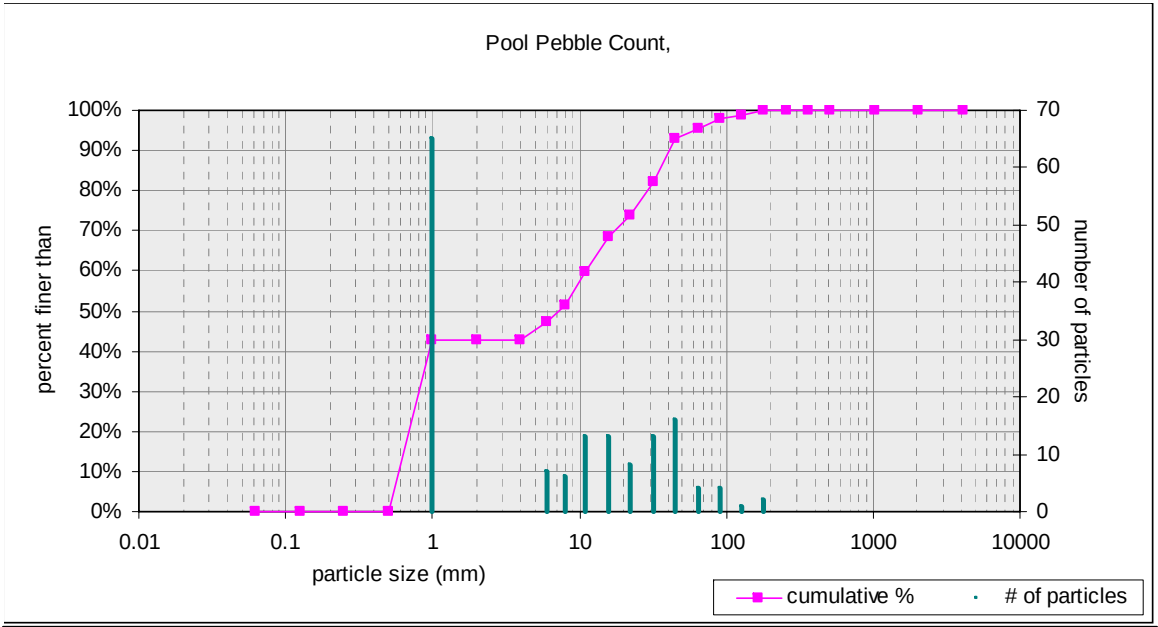
Material	Size Range (mm)		Count
silt/clay	0	0.062	10
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	37
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	8
fine gravel	6	8	2
medium gravel	8	11	10
medium gravel	11	16	10
coarse gravel	16	22	23
coarse gravel	22	32	27
very coarse gravel	32	45	15
very coarse gravel	45	64	4
small cobble	64	90	2
medium cobble	90	128	
large cobble	128	180	1
very large cobble	180	256	1
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	



based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.650	5.29	14.8	21	32	47	12.5	4.5	7.0

Upper Pool Cross Section

Material	Size Range (mm)		Count
silt/clay	0	0.062	
very fine sand	0.062	0.13	
fine sand	0.13	0.25	
medium sand	0.25	0.5	
coarse sand	0.5	1	65
very coarse sand	1	2	
very fine gravel	2	4	
fine gravel	4	6	7
fine gravel	6	8	6
medium gravel	8	11	13
medium gravel	11	16	13
coarse gravel	16	22	8
coarse gravel	22	32	13
very coarse gravel	32	45	16
very coarse gravel	45	64	4
small cobble	64	90	4
medium cobble	90	128	1
large cobble	128	180	2
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	



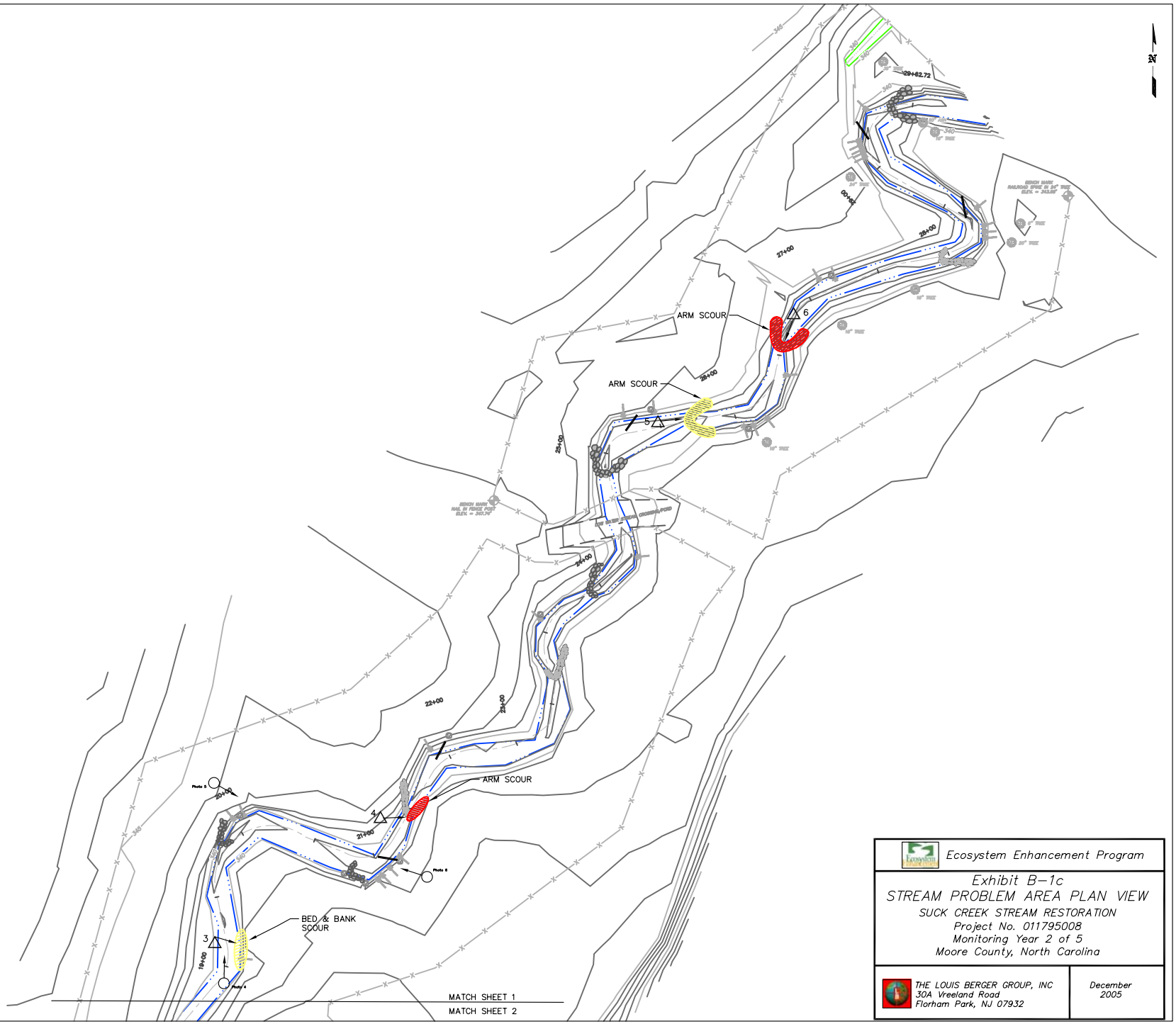
based on sediment particles only	size percent less than (mm)						particle size distribution		
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.648	0.88	7.3	14	34	61	7.9	4.7	7.2

STREAM PROBLEM AREA LEGEND

- PHOTO STATION
- 2005 PHOTO STATION
- STRESSED
- FAILING

LEGEND

- BOULDER CLUSTER
- ROOT WAD
- BOULDER
- ROCK CROSS VANE
- J-HOOK VANE
- LOG VANE
- PROJECT FENCING/EASEMENT BOUNDARY
- EDGE OF WATER
- ℄ of Suck Creek
- Wetland



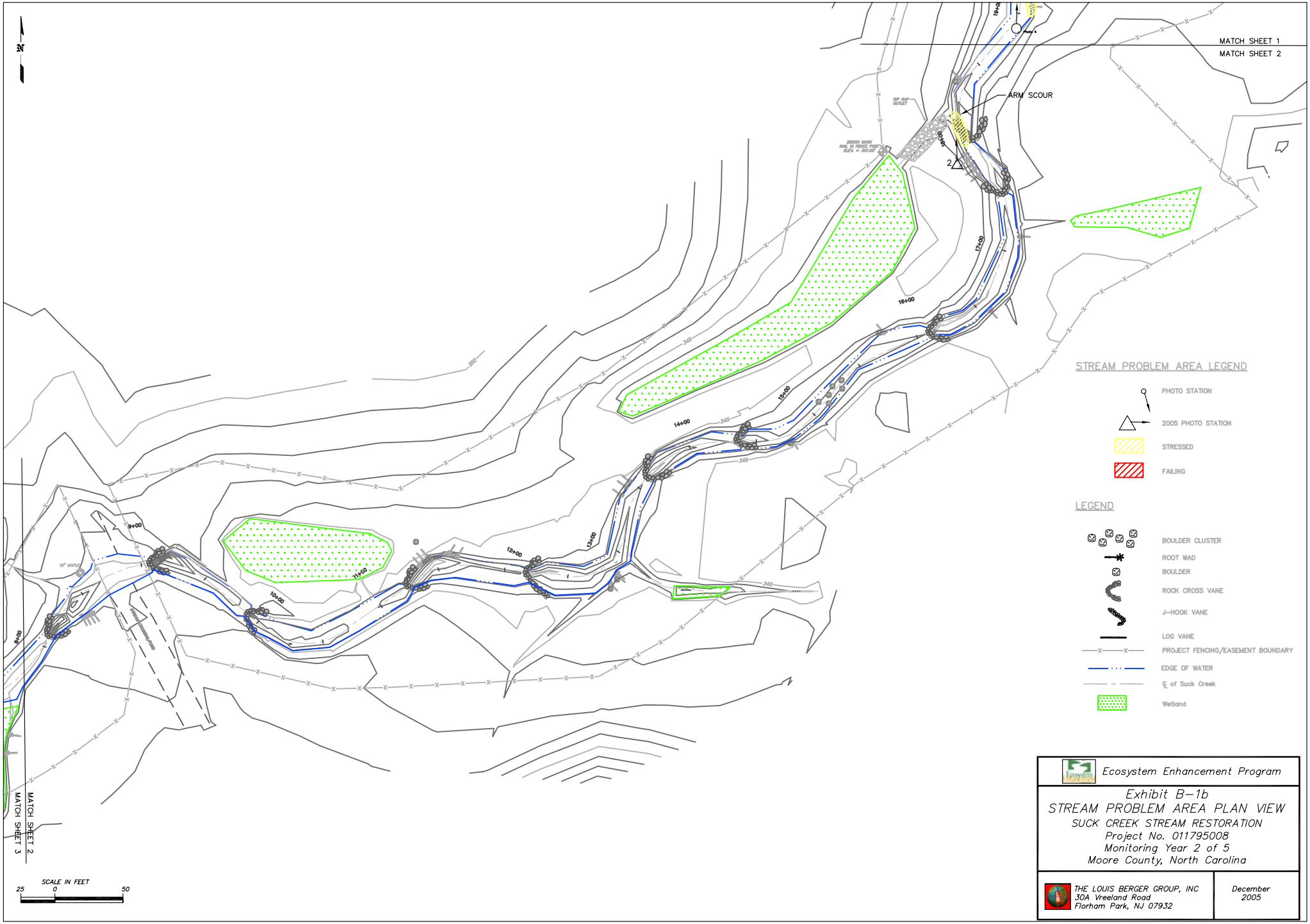
Ecosystem Enhancement Program

Exhibit B-1c
STREAM PROBLEM AREA PLAN VIEW

SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

December 2005



Ecosystem Enhancement Program

Exhibit B–1b
STREAM PROBLEM AREA PLAN VIEW
SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
30A Vreeland Road
Florham Park, NJ 07932

December 2005

STREAM PROBLEM AREA LEGEND

- PHOTO STATION
- 2005 PHOTO STATION
- STRESSED
- FAILING

LEGEND

- BOULDER CLUSTER
- ROOT WAD
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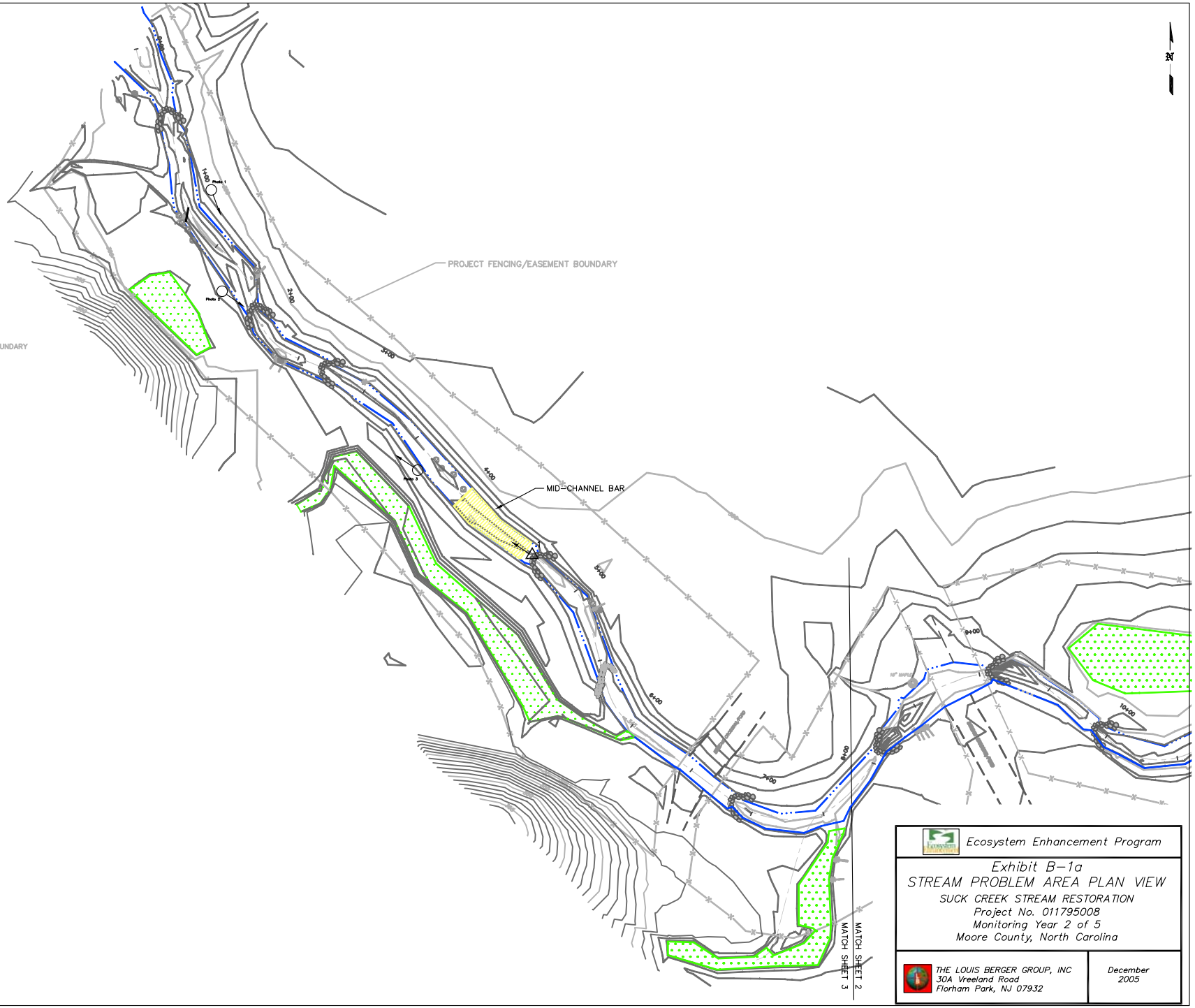

SCALE IN FEET
25 0 50

Ecosystem Enhancement Program

Exhibit B-1a
STREAM PROBLEM AREA PLAN VIEW

SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

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Florham Park, NJ 07932

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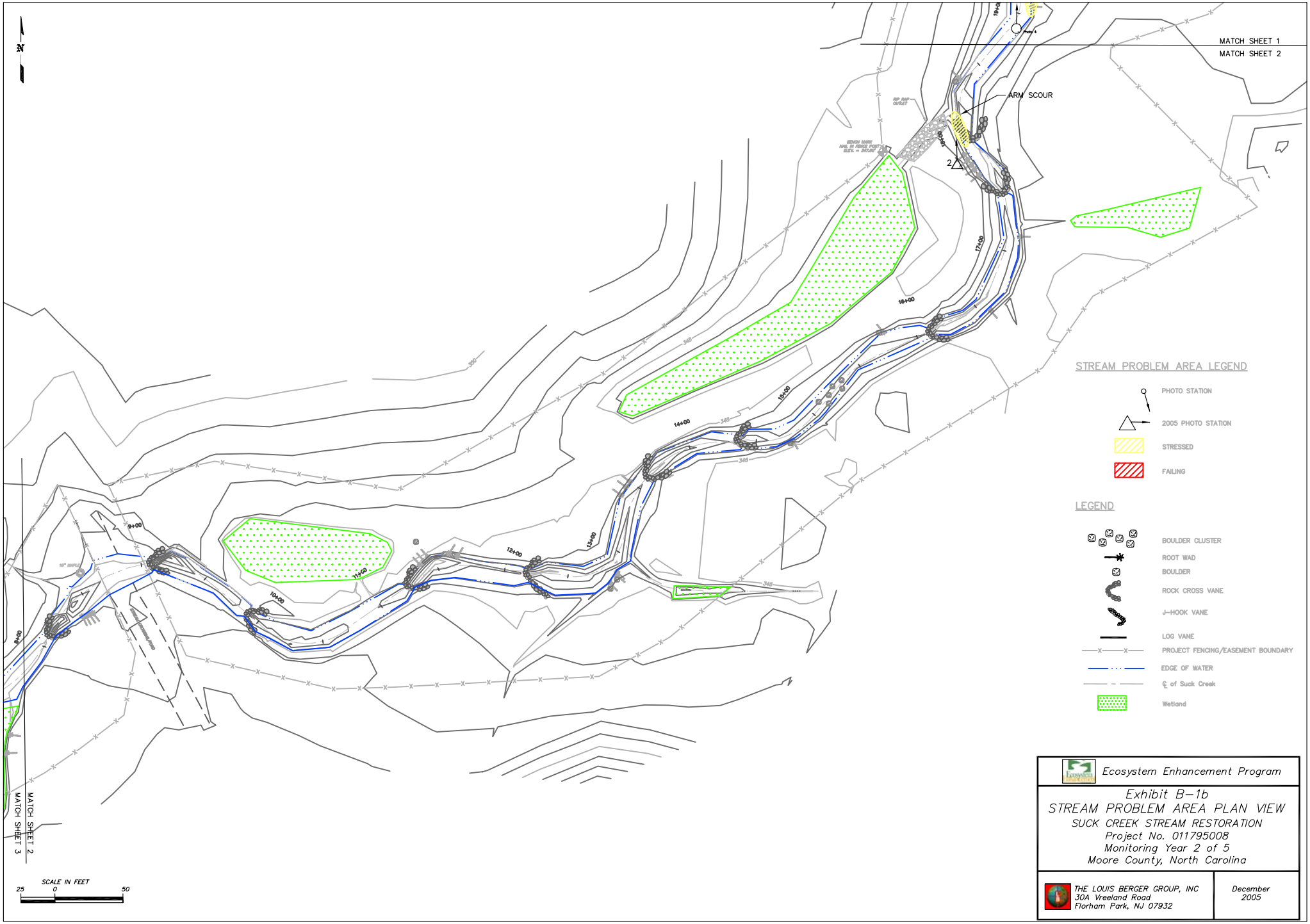

Ecosystem Enhancement Program

Exhibit B–1b
STREAM PROBLEM AREA PLAN VIEW
SUCK CREEK STREAM RESTORATION
Project No. 011795008
Monitoring Year 2 of 5
Moore County, North Carolina

THE LOUIS BERGER GROUP, INC
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Florham Park, NJ 07932

December 2005

STREAM PROBLEM AREA LEGEND

- PHOTO STATION
- 2005 PHOTO STATION
- STRESSED
- FAILING

LEGEND

- BOULDER CLUSTER
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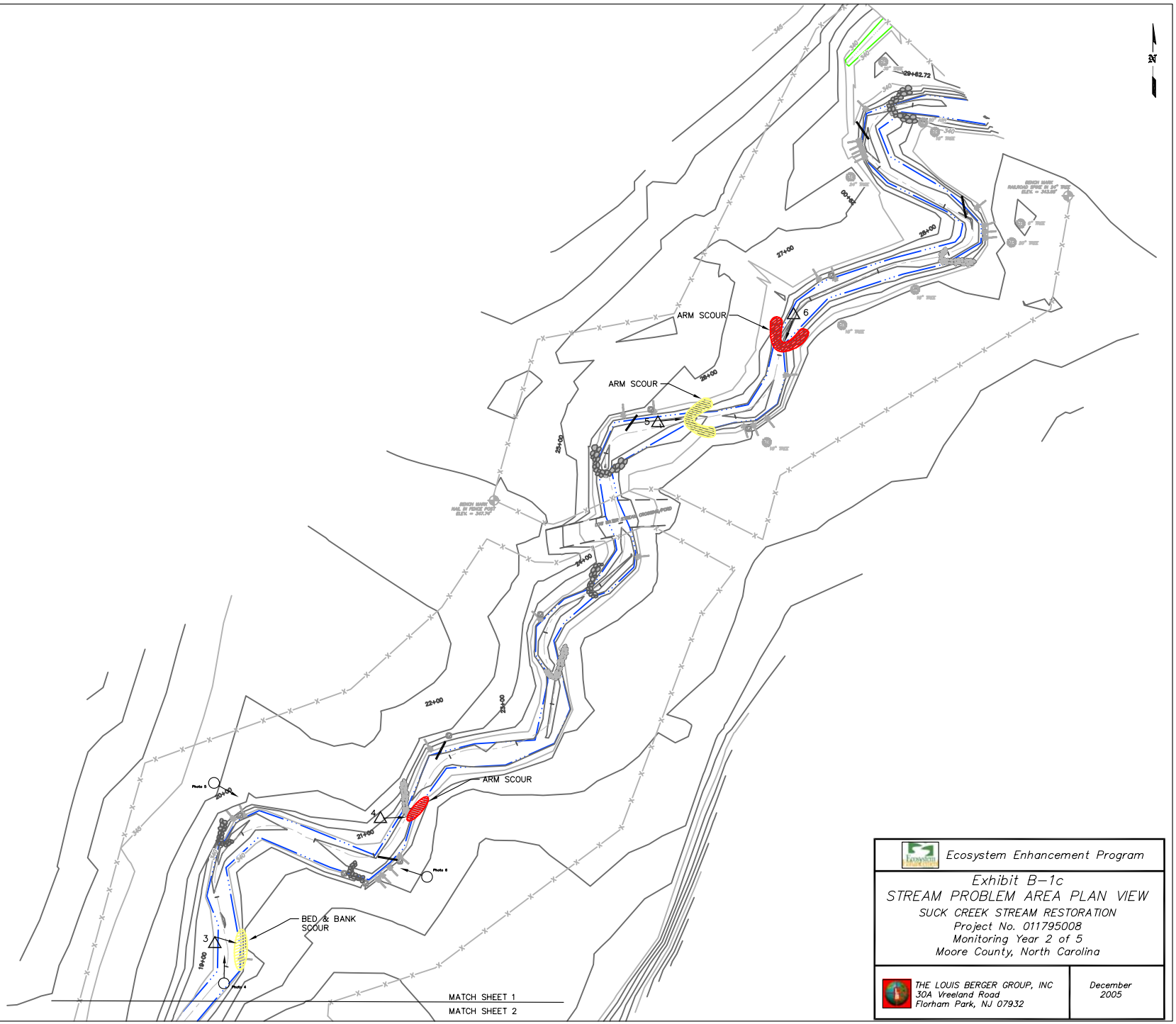

Ecosystem Enhancement Program

Exhibit B-1c
STREAM PROBLEM AREA PLAN VIEW

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