Cox Mitigation Project
Johnston County, North Carolina

FINAL Year 5 Monitoring Report

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1.0 SUMMARY

This Annual Report details the monitoring activities during the 2010 growing season on the Cox Mitigation Site. Construction of the site was completed in December 2005. The 2010 data represent the results from the fifth year of hydrologic, vegetation, and stream morphology monitoring.

Restoration of the Cox Site involved stream restoration, stream enhancement, riverine wetland restoration, and non-riverine wetland restoration. Construction included a stable, meandering channel across prior-converted hydric agricultural fields. The channel was designed and constructed with natural channel design techniques. Wetland restoration activities included raising the water table by filling drainage ditches, and creation of microtopography across the Site. After construction, it was determined there was 7,292 linear feet of stream restoration, 350 linear feet of stream enhancement, 26.8 acres of riverine wetland restoration, and 16.9 acres of non-riverine wetland restoration. **Appendix A** contains the As-Built survey.

This Annual Report presents data from the 12 hydrology monitoring gauges, 22 vegetation monitoring plots, one crest gauge, one on-site rain gauge, and 16 cross sections, as required by the approved Restoration Plan.

In 2010, ten of the 12 hydrology monitoring gauges recorded hydroperiods of at least seven percent of the growing season. The two gauges that did not meet the success criterion recorded hydroperiods of two and five percent of the growing season. Based on the monitoring results of Years 1 through 5, the restored wetland has achieved the success criterion specified in the Restoration Plan for the Site.

During the 2010 growing season a hydrologic assessment was performed on the Cox site to delineate wetland restoration areas that have failed to achieve hydrology success criteria. This assessment identified 0.5 acres of riparian wetland and 0.1 acres of non-riparian wetland in the vicinity of AW12 that are failing to achieve success criteria. An additional 10.0 acres of riparian wetland restoration has been claimed within the stream buffers.

Weather station data from the Smithfield Weather Station were used in conjunction with one manual rain gauge and one automatic rain gauge located on the Site to document precipitation amounts. The on-site gauges are used to validate observations made at the Smithfield station.

This Annual Report documents vegetation survivability based on 22 vegetation-monitoring plots randomly located to represent the different zones within the Site. The vegetation monitoring for 2010 documented a range of surviving tree stem densities of 440 stems per acre to 800 stems per acre, with an average tree density of 591 stems per acre. The Site had earlier met the initial vegetation success criterion of 320 surviving stems per acre after the third growing season, and now has met the final success criterion of 260 stems per acre after the fifth growing season.

During 2010, the restored stream channel remained stable, and continued to provide the intended habitat and hydrologic functions. Two bankfull events were recorded during the year. All monitored cross sections showed minor adjustment in stream dimension. The Site has achieved the stream success criteria specified in the Restoration Plan for the Site.

2.0 INTRODUCTION

2.1 PROJECT DESCRIPTION

The Cox wetland and stream restoration Site is located near the community of Bentonville in Johnston County, North Carolina (**Figure 1** and **Figure 2**). The Site has a history of agricultural use consisting primarily of row crop agriculture. Ditches on the Site were used to increase subsurface drainage when the land was under agricultural production. Construction of the Site, including planting of trees, was completed in December 2005. Groundwater, surface water, and manual rain gauges were functional beginning January 2006. The 2010 monitoring season represents the fifth year of monitoring for the Site.

2.2 PROJECT PURPOSE

Monitoring of the Cox Site is required to demonstrate successful restoration based on comparison to reference site conditions, and based on the other criteria found in the Restoration Plan. Hydrology, vegetation, and stream monitoring are conducted on an annual basis. Success criteria must be met for five consecutive years. This Annual Report details the results of the monitoring efforts for 2010 (Year 5) at the Cox Mitigation Site.

Table 1. Project Mitigation Structure and Objectives

Reach Name	As-Built Length (feet)	Mitigation Units	Restoration Approach
Stream			
UT to Mill Creek	7,292	7,292	Restoration
UT to Mill Creek	350	140	Enhancement
Total	**7,642**	**7,432**	
Wetland	**As-Built Area (acres)**		
Riverine	26.8	26.8	Restoration
Non-Riverine	16.9	16.9	Restoration

2.3 PROJECT HISTORY & SCHEDULE

Table 2. Project Activity and Reporting History

Month	Activity
January 2005	Construction Completed
January 2006	Post-restoration Monitoring Begins
November 2006	1st Annual Monitoring Report
November 2007	2nd Annual Monitoring Report
November 2008	3rd Annual Monitoring Report
November 2009	4th Annual Monitoring Report
September 2010	5th Annual Monitoring Report

Table 3. Project Contacts

Contact	Firm Information
Project Manager Norton Webster	EBX-Neuse 1, LLC (919) 608-9688
Designer Kevin Tweedy, PE	Buck Engineering PC (919) 463-5488
Monitoring Contractor Daniel Ingram	WK Dickson and Co., Inc (919) 782-0495

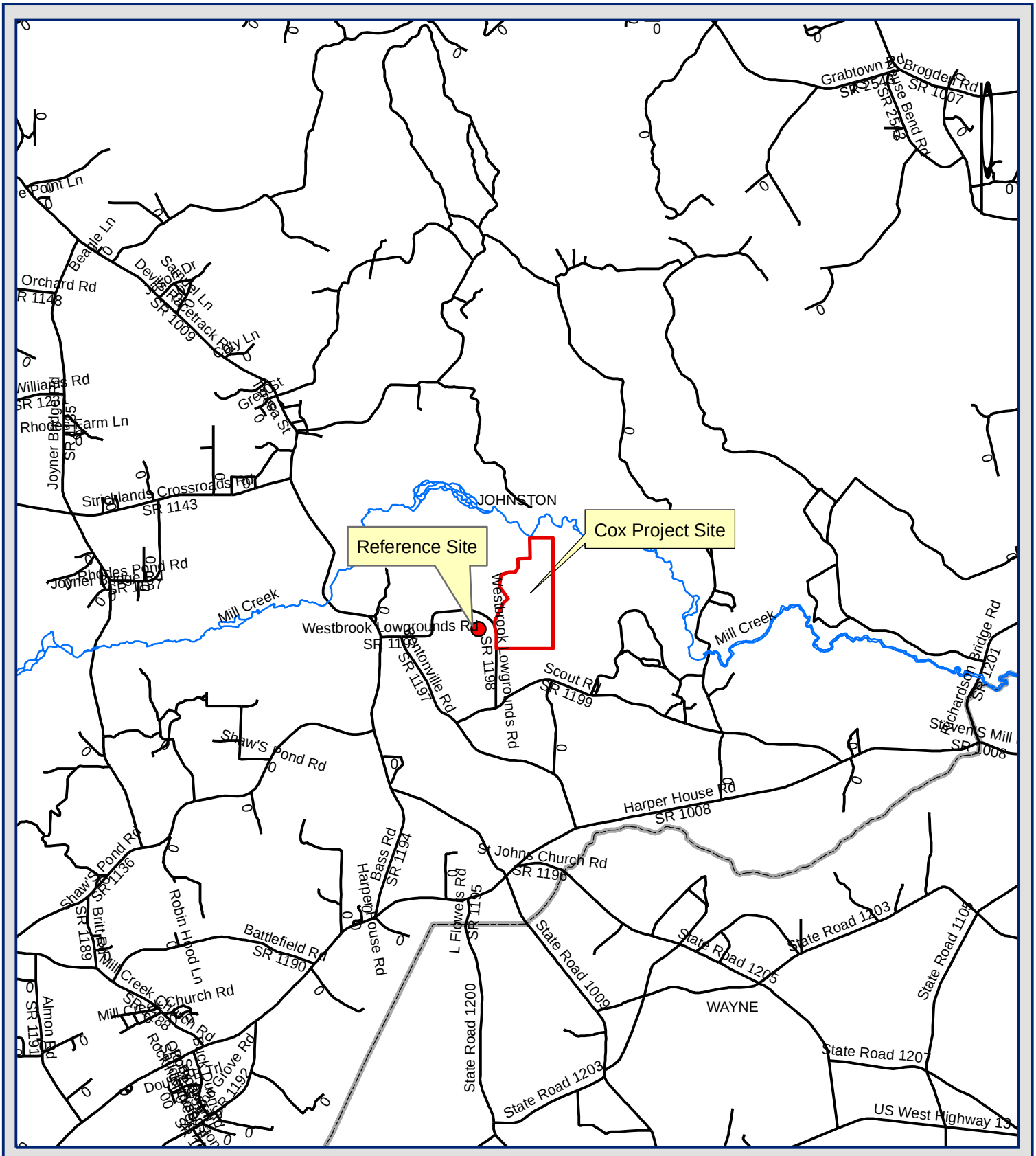
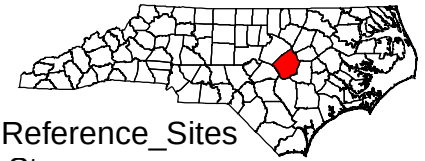


Figure 1.
Cox Stream Mitigation Site
Project Location Map
Johnston County, NC

1 inch equals 1 miles



Reference_Sites
Streams
Roads
Westbrook Site

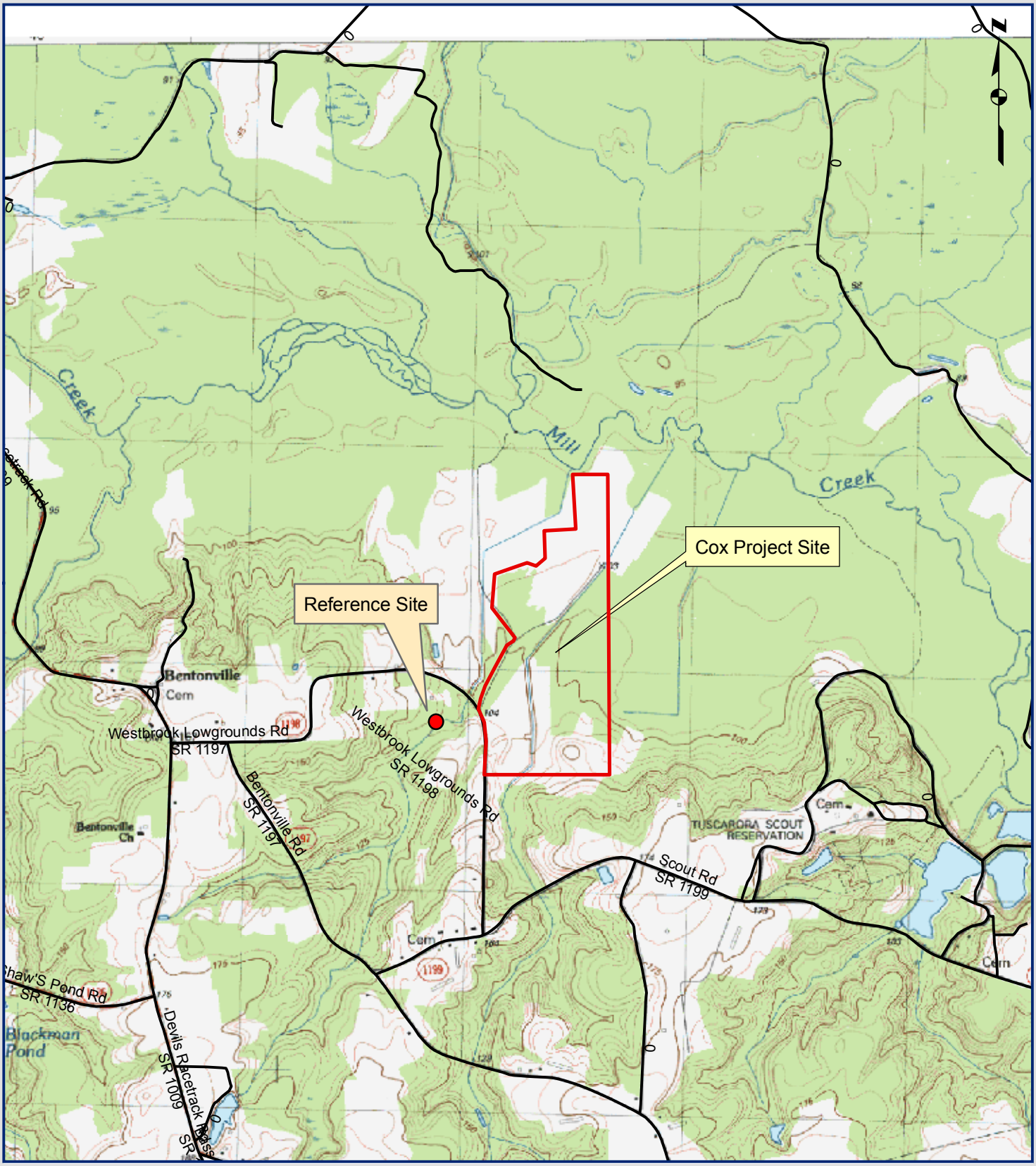


Figure 2.
Cox Stream Mitigation Site
USGS Topographic Map
Johnston County, NC

1 inch equals 2,000 feet

LEGEND

- Reference_Sites
- Streams
- Roads
- Cox Site

3.0 HYDROLOGY

3.1 HYDROLOGIC SUCCESS CRITERIA

As stated in the approved Restoration Plan, to meet the hydrologic success criteria, the monitoring data must show that for each normal year of rainfall within the monitoring period the Site has been inundated or saturated within 12 inches of the soil surface for a minimum of seven percent of the growing season (17 days). The day counts are based on the growing season for Johnston County, which is 232 days long (17 March – 5 November). As specified in the approved Restoration Plan, data are collected from nine automated and three manual groundwater gauges. The Restoration Plan further specifies that in order for the hydrologic data to be considered successful it must be demonstrated that precipitation is either within or below normal limits.

3.2 DESCRIPTION OF HYDROLOGY MONITORING EFFORTS

Three manual groundwater gauges, nine automated Infinities groundwater gauges, one manual rain gauge, one automatic rain gauge, and one manual stream crest gauge were in place throughout the 2010 growing season (**Figures 3a and 3b**). The monitoring protocol for the Site specifies that automated monitoring stations will be downloaded and checked for malfunctions on a monthly basis. During monthly Site visits, manual groundwater gauges are read, the crest gauge is read, and rainfall totals are collected from the on-site rain gauges.

Automated Gauges
Automatic groundwater gauges record water table elevations twice daily at 08:00 and 20:00. Infinities gauges employ pressure sensors that record water elevation above the bottom of the sensor (with atmospheric pressure compensation). Immediately adjacent to each automatic gauge is a manual calibration gauge. The calibration water table depth is recorded at monthly downloads. To determine wetland hydroperiods, the automatically recorded data are compared to the calibration data to determine a standard correction factor between the calibration gauge and the automatic gauge for each location. The standard correction factor is applied to correct daily readings. The corrected daily readings are then used to determine wetland hydroperiods.

Manual Gauges
Water table depths are recorded monthly in manual groundwater gauges. To calculate wetland hydroperiods, interpolations are made between monthly readings by correlating twice daily automatic gauge readings. Each manual gauge is correlated to an automatic gauge based on proximity, landscape position, and the relationship of their groundwater depth readings (i.e. if their readings are separated by a consistent value). Once the appropriate automatic gauge has been selected, a correction factor is calculated for each monthly gauge reading. This correction factor typically varies by several inches on a monthly basis. A daily rate of change between monthly correction factors is calculated to determine the daily correction factor. The daily correction factor is then applied to the automatic gauge readings to calculate an estimated daily water table depth for the manual gauge. These daily readings are used to determine wetland hydroperiods.

Data Interpretation
Wetland hydroperiods are calculated from twice daily water table depth elevations. A hydroperiod is calculated if the water table is equal to or less than -12 inches below ground surface for at least 24 hours. If a gauge falls below -12 inches for two consecutive readings (24 hours), then the hydroperiod ends at the last reading within -12 inches. If a gauge falls below -12 inches for only one reading then maintains a reading above -12 inches for a minimum of 24

WETLAND HYDROPERIOD

> 7 %
5-7 %
< 5 %

NAD 83

MANUAL WELL #9
AUTOMATIC WELL #10
VEGETATION PLOT #5
VEGETATION PLOT #7
VEGETATION PLOT #8
XSEC 4
VEGETATION PLOT #6
XSEC 3
AUTOMATIC WELL #11
AUTOMATIC WELL #4
CUT LIMITS
995
1000
1005
1010
1015
1020
1025
1030
1035
1040
1045
XSEC2
XSEC1
MANUAL WELL #2
AUTOMATIC WELL #1
AUTOMATIC WELL #3
VEGETATION PLOT #9
VEGETATION PLOT #1
VEGETATION PLOT #3
VEGETATION PLOT #4
VEGETATION PLOT #2
XSEC5
AUTOMATIC WELL #12
VEGETATION PLOT #10
VEGETATION PLOT #11
XSEC6
XSEC7
XSEC8
MATCHLINE SHEET 15

Cox
Monitoring Summary

Figure 3a

100 50 0 100 200
SCALE (FT)

WETLAND HYDROPERIOD

> 7 %

5-7 %

< 5 %

NAD 83

ADJACENT PROPERTY CURRENTLY OWNED BY EBX-NEUSE I,LLC

VEGETATION PLOT #21

XSEC14

XSEC13

XSEC12

AUTOMATIC WELL #6

VEGETATION PLOT #13

FILL LIMITS

CG

VEGETATION PLOT #15

VEGETATION PLOT #20

AUTOMATIC WELL #6

FARM PATH

XSEC9

XSEC15

XSEC16

VEGETATION PLOT #19

VEGETATION PLOT #12

VEGETATION PLOT #14

XSEC10

XSEC11

MANUAL WELL #8

VEGETATION PLOT #18

CUT LIMITS

VEGETATION PLOT #16

AUTOMATIC WELL #7

VEGETATION PLOT #17

MATCHLINE SHEET 14

Cox
Monitoring Summary

Figure 3b

100 50 0 100 200

SCALE (FT)

hours, the hydroperiod is calculated continuously. This methodology accounts for minor technical malfunctions experienced by the automatic gauges.

3.3 RESULTS OF HYDROLOGY MONITORING

3.3.1 Site Data

The following hydroperiod statistics were calculated for each monitoring station during the growing season: 1) most consecutive days that the water table was within twelve inches of the soil surface; 2) cumulative number of days that the water table was within twelve inches of the soil surface; and 3) number of times that the water table rose to within twelve inches of the soil surface. The results of these calculations are presented in **Table 4**. **Figures 4a, 4b, and 4c** provide charts of the water depth for each of the monitoring gauges on the site. Precipitation is shown in **Figure 5**. Raw hydrograph data collected from the monitoring gauges are provided in **Appendix C**.

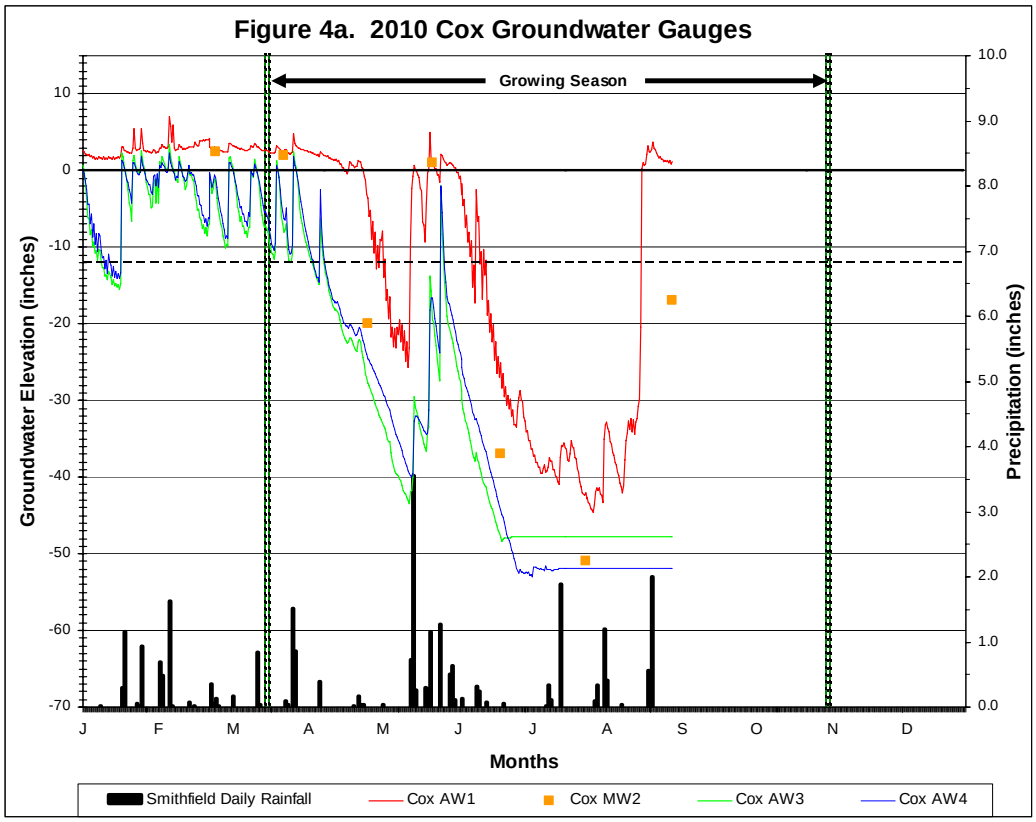
Year Five monitoring demonstrates that the Site is functioning as designed, with varying degrees of wetness and saturation across the Site. All gauges at the Cox site, except AW6 and AW12, exceeded the seven percent hydrologic success criteria. Gauges AW6 and AW12 had hydroperiods of five and two percent of the growing season, respectively. These hydroperiods are consistent with reference data from Years 1 through 4. Overall, the mitigation Site recorded hydroperiods similar to the range of hydroperiods recorded at the reference wetland site.

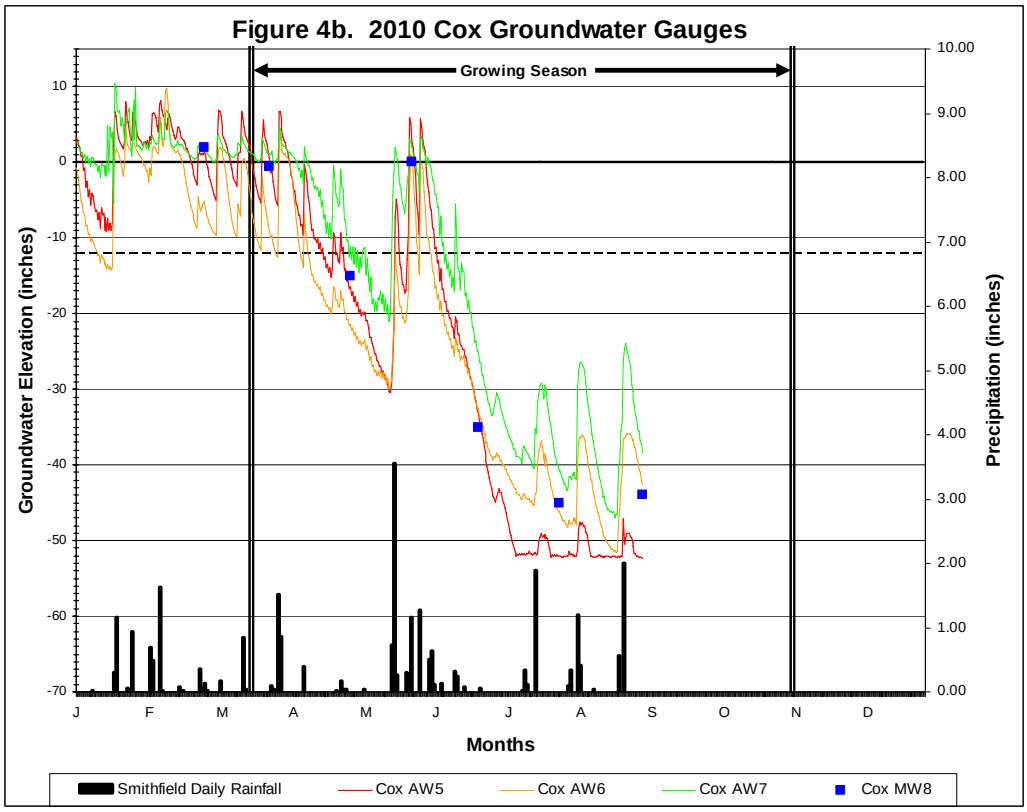
Table 4. Hydrologic Monitoring Results

2010 Max Hydroperiod (Growing Season 17-Mar through 05-Nov, 232 days) Well Data for 17-Mar through 29-Apr (44 days) Success Criterion 7%=16 Consecutive Days					
Gauge	**Consecutive**		**Cumulative**		**Occurrences**
	Days	**Percent of Growing Season**	**Days**	**Percent of Growing Season**	
Cox AW1	51	22	94	40	4
Cox MW2	34	15	57	25	2
Cox AW3	20	9	23	10	3
Cox AW4	21	9	24	10	3
Cox AW5	32	14	50	22	5
Cox AW6	11	5	30	13	5
Cox AW7	47	20	77	33	4
Cox MW8	42	18	62	27	2
Cox MW9	32	14	50	22	4
Cox AW10	31	13	47	20	3
Cox AW11	28	12	43	18	6
Cox AW12	5	2	10	4	4
Reference Gauges					
WBK RAW1	43	18	60	26	3
WBK RMW2	33	14	50	22	7
WBK RAW3	41	18	55	24	3
WBK RMW4	31	13	44	19	5
WBK RAW5	31	13	43	18	5

Note: AW3 malfunctioned from 23-June to 2-Sept

Figure 4. Groundwater Hydrographs





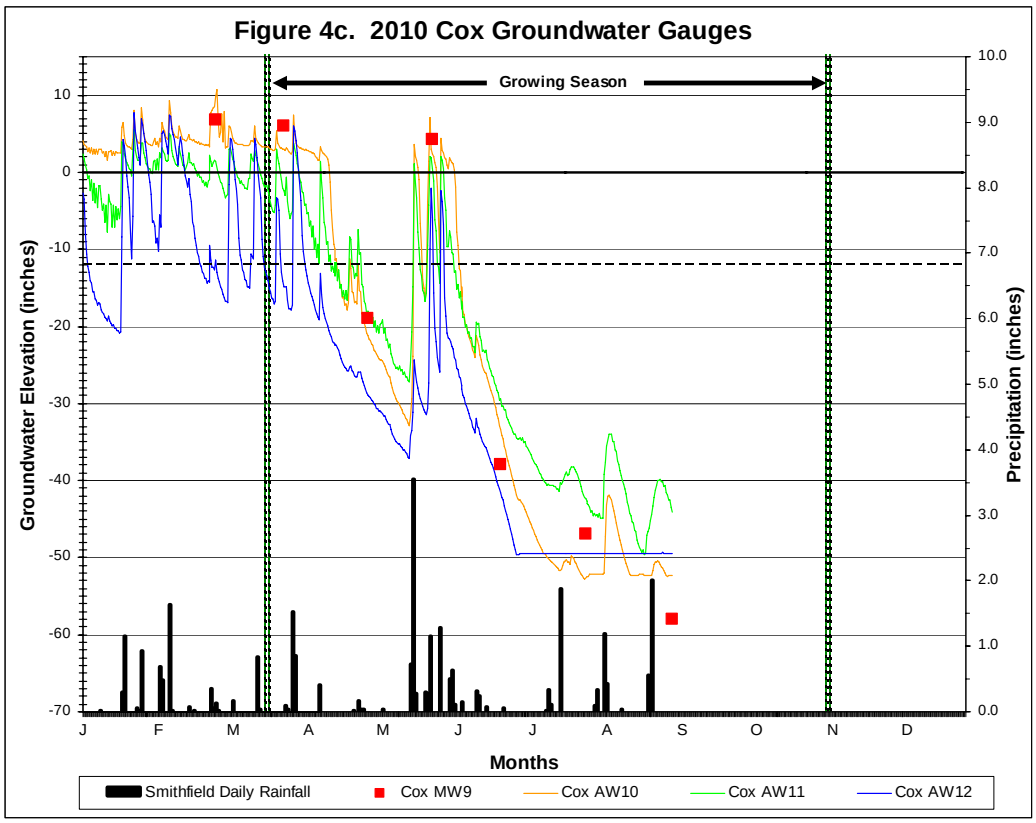


Figure 4c. 2010 Cox Groundwater Gauges
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
Months
J F M A M J J A S O N D
Smithfield Daily Rainfall
Cox MW9
Cox AW10
Cox AW11
Cox AW12

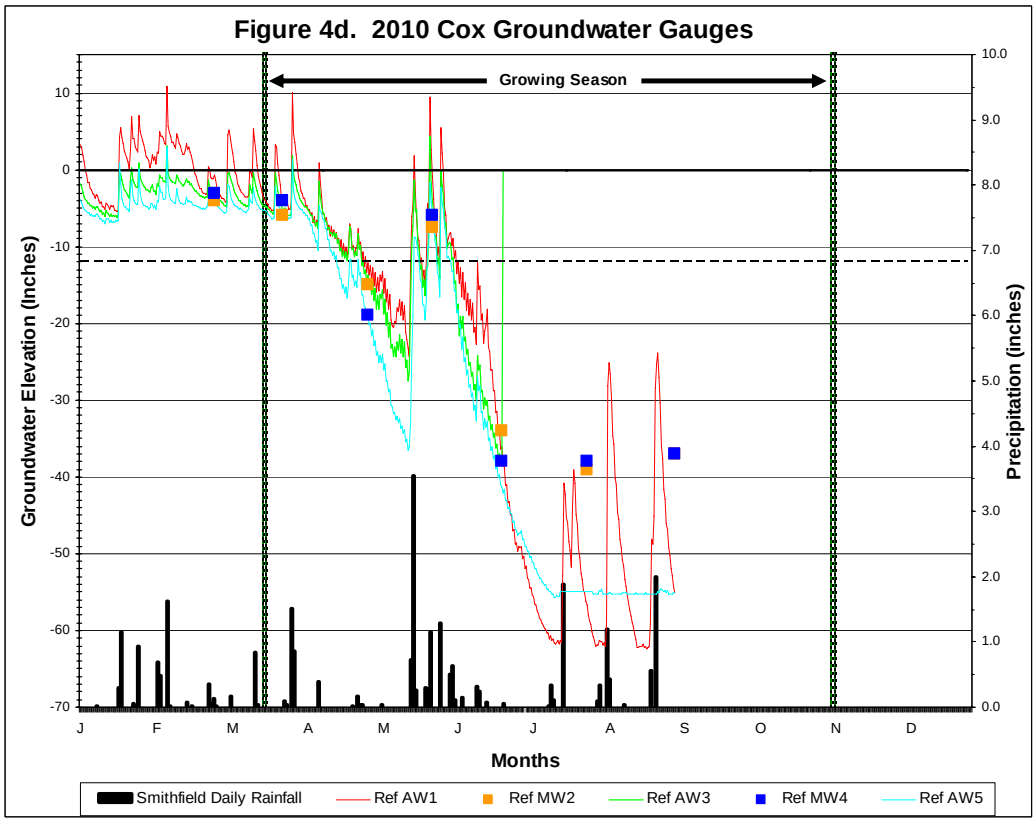


Figure 4d. 2010 Cox Groundwater Gauges
Growing Season
Groundwater Elevation (inches)
Precipitation (inches)
Months
J F M A M J J A S O N D
Smithfield Daily Rainfall
Ref AW1
Ref MW2
Ref AW3
Ref MW4
Ref AW5

3.3.2 Reference Data

The hydroperiod statistics that were calculated for the on-site monitoring stations were also calculated for each reference monitoring station during the growing season. The results of these calculations are presented in **Figure 4d** and **Table 4**. The reference gauges exhibit a range of hydroperiods similar to the mitigation site data, ranging from 13 to 19 percent of the growing season. The reference gauges are located in a riverine wetland upstream of the adjacent Westbrook mitigation site.

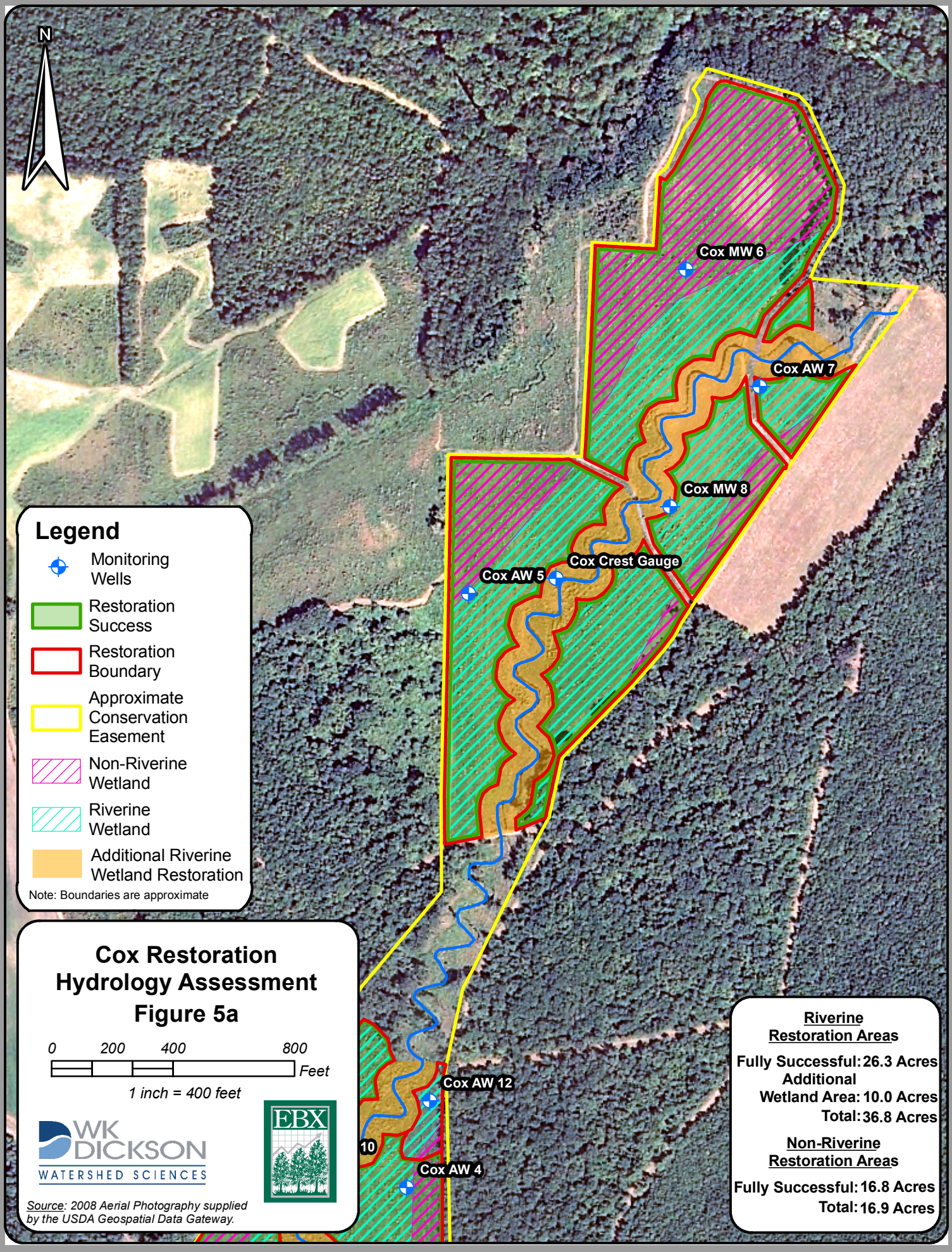
The approved Restoration Plan for the site provides that if the rainfall data for any given year during the monitoring period is not normal, the reference wetland data can be used to determine if there is a positive correlation between the performance of the restoration Site and the natural hydrology of the reference site.

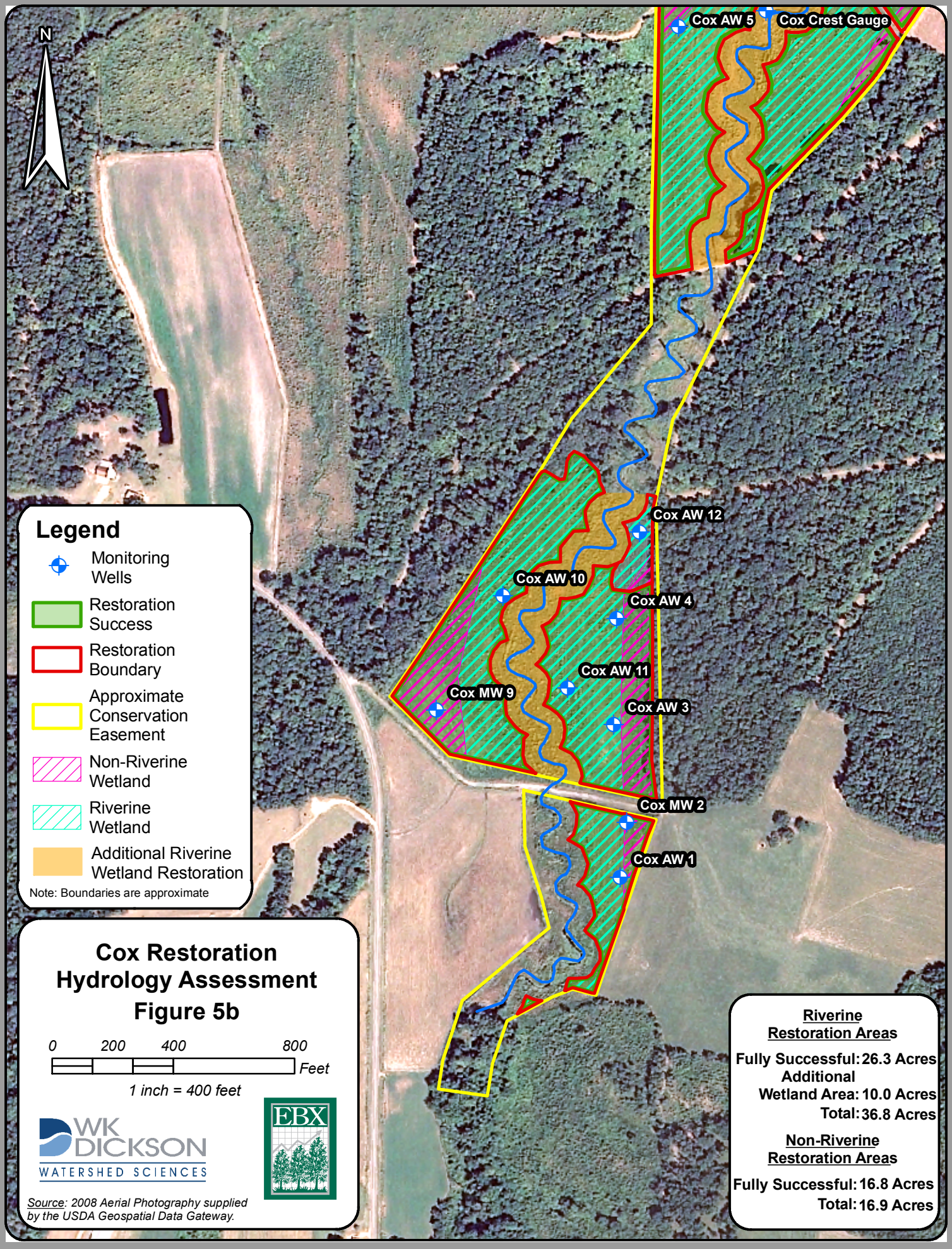
Table 5. Comparison of Normal Rainfall to Observed Rainfall

Month	Average	Normal Limits		Smithfield Precipitation	On-Site Manual Rain Gauge	On-Site Automatic Rain Gauge
		30 Percent	70 Percent			
January	4.17	2.90	4.92	2.46	---	3.67
February	3.66	2.51	4.78	3.46	---	2.30
March	4.23	3.28	5.01	3.56	2.90	---
April	3.00	1.79	3.89	0.64	2.55	---
May	3.76	2.54	4.62	7.60	4.25	5.29
June	3.74	1.99	4.47	2.08	2.50	1.53
July	5.04	3.40	5.89	2.34	2.80	2.64
August	4.56	3.00	5.72	4.63	3.71	---
September	4.35	2.11	5.28	---	---	---
October	3.14	1.80	3.93	---	---	---
November	3.14	1.93	3.81	---	---	---
December	3.15	2.10	3.80	---	---	---
Average	---	**29.35**	**56.12**	---	---	---
Total	**45.94**	---	---	**26.77**	**18.71**	**15.43**

3.3.3 Climate Data

The manual rain gauge at the Cox mitigation Site recorded rainfall conditions below the annual average in March and July, and normal conditions in April, May, June, and August (**Table 5** and **Figure 6**). The on-site automatic rain gauge recorded below-average rainfall in February, June, and July, and normal or above normal rainfall in February and May. No data was available from this gauge in March, April, or August. The Smithfield rain gauge recorded below-normal rainfall in January, April, and July, and normal rainfall in February, March, June, and August. Only May had above normal rainfall. Total on-site rainfall is slightly below normal limits for the year. Rainfall totals from the Smithfield gauge are below average, but within normal limits for the year.


N
Cox MW 6
Cox AW 7
Cox MW 8
Cox Crest Gauge
Cox AW 5
Cox AW 12
10
Cox AW 4
Legend
Monitoring Wells
Restoration Success
Restoration Boundary
Approximate Conservation Easement
Non-Riverine Wetland
Riverine Wetland
Additional Riverine Wetland Restoration
Note: Boundaries are approximate
Cox Restoration Hydrology Assessment
Figure 5a
0 200 400 800
Feet
1 inch = 400 feet
WK DICKSON
WATERSHED SCIENCES
EBX
Source: 2008 Aerial Photography supplied by the USDA Geospatial Data Gateway.
Riverine Restoration Areas
Fully Successful: 26.3 Acres
Additional Wetland Area: 10.0 Acres
Total: 36.8 Acres
Non-Riverine Restoration Areas
Fully Successful: 16.8 Acres
Total: 16.9 Acres


N
Cox AW 5
Cox Crest Gauge
Cox AW 12
Cox AW 10
Cox AW 4
Cox AW 11
Cox MW 9
Cox AW 3
Cox MW 2
Cox AW 1
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0 200 400 800
Feet
1 inch = 400 feet
WK DICKSON
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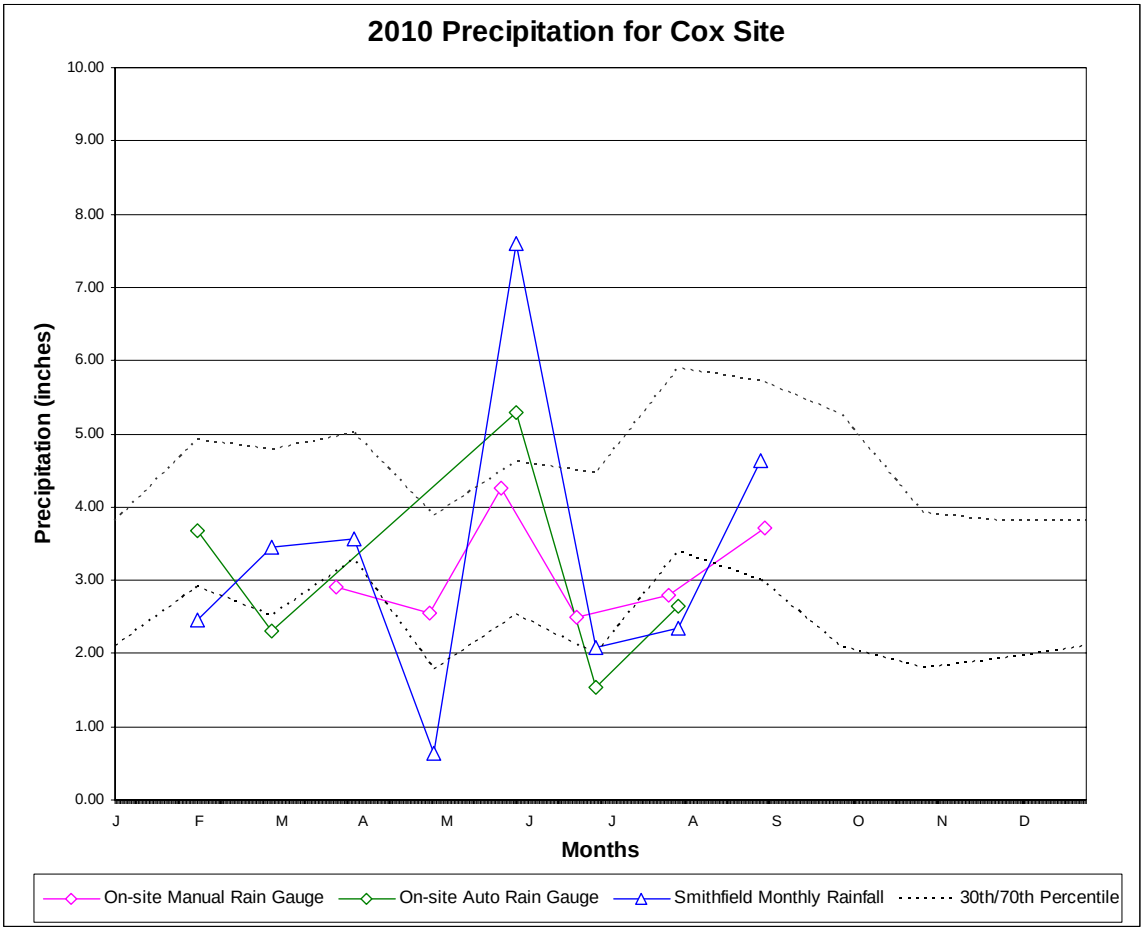
Total: 16.9 Acres

Figure 6. 2010 Rainfall



3.4 HYDROLOGIC CONCLUSIONS

Data collected from all the groundwater monitoring gauges on the Cox Mitigation Site indicate that ten of the 12 hydrology monitoring stations recorded hydroperiods of at least seven percent of the growing season. The remaining gauges recorded hydroperiods of two and five percent of the growing season.

On-site rainfall data is slightly below normal limits January through August 2010. The Smithfield gauge recorded rainfall totals that are below average but within normal limits for the same time period. Based on the results from the mitigation Site monitoring gauges during Years 1 through 5, the site has achieved the success criteria specified in the Restoration Plan.

During the 2010 growing season a hydrologic assessment was performed on the Cox site to delineate wetland restoration areas that have failed to achieve hydrology success criteria. This assessment identified 0.5 acres of riparian wetland and 0.1 acres of non-riparian wetland in the vicinity of AW12 that are failing to achieve success criteria. An additional 10.0 acres of riparian wetland restoration has been claimed within the stream buffers. These areas are depicted on **Figure 5**.

4.0 VEGETATION

4.1 VEGETATION SUCCESS CRITERIA

The interim measure of vegetative success for the Cox Wetland Restoration Plan is the survival of at least 320 three-year old planted trees per acre at the end of Year 3 of the monitoring period. The final vegetative success criterion is the survival of 260 five-year old planted trees per acre at the end of Year 5 of the monitoring period.

Up to 20 percent of the Site species composition may be comprised of invasive species (i.e. loblolly pine, red maple, sweet gum, etc.). Remedial action may be required should these present a problem and exceed 20 percent composition.

4.2 DESCRIPTION OF SPECIES AND VEGETATION MONITORING

The following monitoring protocol was designed to monitor vegetation survival: 22 plots were established on the Cox Mitigation Site to monitor approximately 1.2 percent of the site (**Figures 3a** and **3b**). Fifteen of the plots are established next to the stream bed to monitor the vegetation in the stream restoration buffer and riverine wetland zone. The other seven plots are randomly located to represent the non-riverine wetland zone on the Site.

Plots have metal fence posts at each of the four corners to clearly and permanently establish the area to be sampled. Ropes are hung connecting all four corners to help determine if trees close to the plot boundary are inside or outside of the plot. Trees on the boundary, and trees just outside of the boundary that appear to have greater than 50 percent of their canopy inside the boundary are counted inside the plot. A piece of ten-foot-tall, white PVC pipe is placed over the metal post on one corner to facilitate visual location of the plot throughout the five-year monitoring period.

All of the planted stems inside the plot are flagged with orange flagging, and marked with a three-foot-tall piece of half-inch PVC to identify them as the planted stems (vs. any colonizers), and to help locate them in the future. Each stem is tagged with a permanent, numbered, aluminum tag. **Table 6** identifies the planted tree species.

Table 6. Planted Tree Species

ID	Scientific Name	Common Name	FAC Status
1	*Quercus michauxii*	Swamp Chestnut Oak	FACW-
2	*Quercus phellos*	Coastal Willow Oak	FACW-
3	*Platanus occidentalis*	Sycamore	FACW-
4	*Celtis laevigata*	Sugarberry	FACW
5	*Quercus lyrata*	Overcup Oak	OBL
6	*Nyssa sylvatica*	Blackgum	FAC
7	*Betula nigra*	River Birch	FACW
8	*Nyssa biflora*	Swamp Tupleo	OBL
9	*Taxodium distichum*	Bald Cypress	OBL
10	*Fraxinus pennsylvanica*	Green Ash	FACW

4.3 RESULTS OF VEGETATION MONITORING

The vegetation monitoring documented a surviving tree stem density range of 440 to 800 stems per acre with an overall average density of 591 stems per acre. The Site had earlier met the initial

vegetation survival criteria of 320 stems per acre surviving after the third growing season, and has now met the final vegetation survival criteria of 260 stems per acre surviving after the fifth growing season.

Table 7 presents stem counts for each of the monitoring plots. Each planted tree species is identified across the top row, and each plot is identified down the left column. The numbers on the top row correlate to the ID column of **Table 6**. Trees are flagged in the field on an as-needed basis before the flags degrade. Flags are utilized because they will not interfere with the growth of the tree. Volunteers are also flagged and recorded during this process. Annual variation in stem count data can be attributed to mortality and regeneration from root stock of stems previously assessed to be dead.

Table 7. 2010 Vegetation Monitoring Plot Species Composition

Plot	1	2	3	4	5	6	7	8	9	10	Total	Stems per Acre
1	2	2	2	0	1	0	5	0	1	0	13	520
2	0	0	3	0	5	0	7	0	0	2	17	680
3	2	5	7	0	1	0	0	0	5	0	20	800
4	2	1	3	0	1	0	3	0	2	0	12	480
5	3	0	0	1	1	0	4	3	0	0	12	480
6	1	1	10	0	0	0	3	0	1	0	16	640
7	1	0	1	0	0	0	8	0	3	0	13	520
8	0	0	1	0	0	0	10	0	0	2	13	520
9	7	0	7	0	0	0	2	0	0	0	16	640
10	5	4	2	0	0	0	0	0	1	0	12	480
11	2	2	0	0	2	3	3	0	1	3	16	640
12	0	0	0	0	0	2	6	0	1	7	16	640
13	9	1	1	0	0	0	3	0	2	1	17	680
14	0	0	0	0	1	1	14	0	0	2	18	720
15	2	0	1	0	5	5	3	1	0	0	17	680
16	1	0	0	2	3	0	5	0	0	0	11	440
17	6	0	8	0	0	0	0	0	0	0	14	560
18	1	0	3	0	3	3	4	0	2	1	17	680
19	2	0	6	0	2	0	1	0	0	0	11	440
20	3	0	1	5	0	0	2	0	0	0	11	440
21	3	0	3	5	0	0	6	3	0	0	20	800
22	2	0	4	2	0	0	4	1	0	0	13	520

Average Stems per Acre: 591
Range of Stems per Acre: 440-800

Volunteer species will also be monitored throughout the five-year monitoring period. Below is a table of the most commonly found woody volunteer species.

Table 8. Volunteers within the Wetland Restoration Area

ID	Scientific Name	Common Name	FAC Status
A	*Liquidambar styraciflua*	Sweetgum	FAC+
B	*Acer rubrum*	Red Maple	FAC
C	*Pinus taeda*	Loblolly Pine	FAC

Woody volunteer species were observed in high quantities in vegetation Plots 10 and 11. Sweetgum (*Liquidambar styraciflua*) is the most common volunteer, though red maple (*Acer rubrum*) and loblolly pine (*Pinus taeda*) were also observed. These areas are overpopulated with invasives due to the presence of seed trees in close proximity, as this is the narrowest part of the Site.

4.4 VEGETATION OBSERVATIONS & CONCLUSIONS

After construction of the mitigation Site, a permanent ground cover seed mixture of Virginia wild rye (*Elymus virginicus*), switch grass (*Panicum virgatum*), and fox sedge (*Carex vulpinoidea*) was broadcast on the site at a rate of 10 pounds per acre. These species are present on the site. Hydrophytic herbaceous vegetation, including rush (*Juncus effusus*), spike-rush (*Eleocharis obtusa*), boxseed (*Ludwigia* sp.), sedge (*Carex* spp.), smartweed (*Polygonum* spp.), and woolgrass (*Scirpus cyperinus*) were observed across the site, particularly in areas of periodic inundation. The presence of these herbaceous wetland plants helps to confirm the presence of wetland hydrology on the Site.

A number of weedy species occur on the Site, though none seem to pose any problems for the woody or herbaceous hydrophytic vegetation. Common weedy vegetation includes ragweed (*Ambrosia artemisiifolia*), wild dill (*Foeniculum vulgare*), goldenrod (*Solidago* spp.), dogfennel (*Eupatorium capillifolium*), horseweed (*Conyza* spp.), and broomsedge (*Andropogon* spp.).

The Site was planted in costal plain small stream swamp and wet hardwood forest species in January 2006. Twenty-two vegetation-monitoring plots were established throughout the planting areas. The data reflects that the site had earlier met the interim minimum success criteria of 320 trees per acre at the end of year three, and has now met the final success criteria of 260 trees per acre at the end of year five.

5.0 STREAM MONITORING

5.1 STREAM SUCCESS CRITERIA

As stated in the approved Restoration Plan, the stream restoration success criteria for the Site includes the following:

- *Bankfull Events*: Two bankfull flow events must be documented within the five-year monitoring period.
- *Cross-sections*: There should be little change in as-built cross sections. Cross sections shall be classified using the Rosgen stream classification method, and all monitored cross sections should fall within the quantitative parameters defined for "E" or "C" type channels.
- *Longitudinal Profiles*: The longitudinal profiles should show that the bedform features are remaining stable, e.g. they are not aggrading or degrading. Bedforms observed should be consistent with those observed in "E" and "C" type channels.

- *Photo Reference Stations*: Photographs will be used to subjectively evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, and effectiveness of erosion control measures.

5.2 STREAM MORPHOLOGY MONITORING PLAN

To document the stated success criteria, the monitoring program described in the following sections was instituted following construction completion on the Cox Site.

5.2.1 Cross Sections

Two permanent cross sections were installed per 1,000 linear feet of stream restoration work, with one of the locations being a riffle cross section, and one location being a pool cross section. A total of 16 permanent cross sections were established across the mitigation site (**Figures 3a** and **3b**). Each cross section was marked on both banks with permanent pins to establish the exact transect used. Permanent cross section pins were surveyed and located relative to a common benchmark to facilitate easy comparison of year-to-year data. The annual cross section surveys include points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg. Riffle cross sections are classified using the Rosgen stream classification system. Permanent cross sections for 2010 (Year 5) were surveyed in July 2010.

5.2.2 Longitudinal Profile

A longitudinal profile of approximately 3,000 feet was surveyed along the restoration reach in Years 1, 3, and 5. Measurements include thalweg, water surface, bankfull, and top of low bank. Each of these measurements is taken at the head of each feature (e.g. riffle, run, pool, glide) and at the maximum pool depth. A common benchmark will be used each year to facilitate comparison of year-to-year data.

5.2.3 Hydrology

A crest gauge was installed on the site to document bankfull events (**Figure 3**). The gauge is checked monthly, and records the highest out-of-bank flow event that occurred during the past month (**Table 10**).

5.2.4 Photo Reference Stations

Photographs are used to visually document restoration success. Reference stations are marked with wooden stakes, and Global Positioning Satellite (GPS) coordinates have been determined for each location. Reference photos are taken at each permanent cross section from both stream banks, as well as facing upstream and downstream in the channel. The survey tape is centered in the photographs of the bank, and the water line is located in the lower edge of the frame with as much of the bank as possible included in each photo. In-stream structures (e.g., rock vanes, cross vanes, and constructed riffles) are also photographed. Photo reference stations will be photographed at least once per year for at least five years following construction.

5.3 STREAM MORPHOLOGY MONITORING RESULTS

Photographs were taken throughout the monitoring season to document the evolution of the restored stream channel (**Appendix D**). Herbaceous vegetation is moderately dense along the restored stream. Pools have maintained a variety of depths and habitat qualities, depending on the location and type of scour features (logs, root wads, transplants, etc.).

In-stream structures installed within the restored stream included constructed riffles, log vanes, log weirs, and root wads. Visual observations of structures throughout the 2010 growing season

indicated that most of the structures are stable and functioning properly. Vegetation has stabilized several areas of bank erosion and end cutting that were observed in previous monitoring years. Minor erosion is still occurring at a few structures, and several mid-channel bars were noted. **Table 9** details the stream areas of concern.

5.3.1 Cross Sections

Year 5 cross section monitoring data for stream stability were collected during July 2010, and compared to baseline data collected in 2006 (**Appendix B**). All monitored cross sections fell within the quantitative parameters defined for "E" or "C" type channels. The cross section data are summarized in **Table 11**.

5.3.2 Longitudinal Profile

A longitudinal profile survey was conducted in Year 5. Based on a comparison to the previous profiles and cross sections, there has been little adjustment to the stream profile or dimension since construction. Stream observation areas are listed in **Table 9**, and their locations are shown in **Figure7**. None of these areas threaten the overall stability of the stream system.

Table 9. Stream Observation Areas

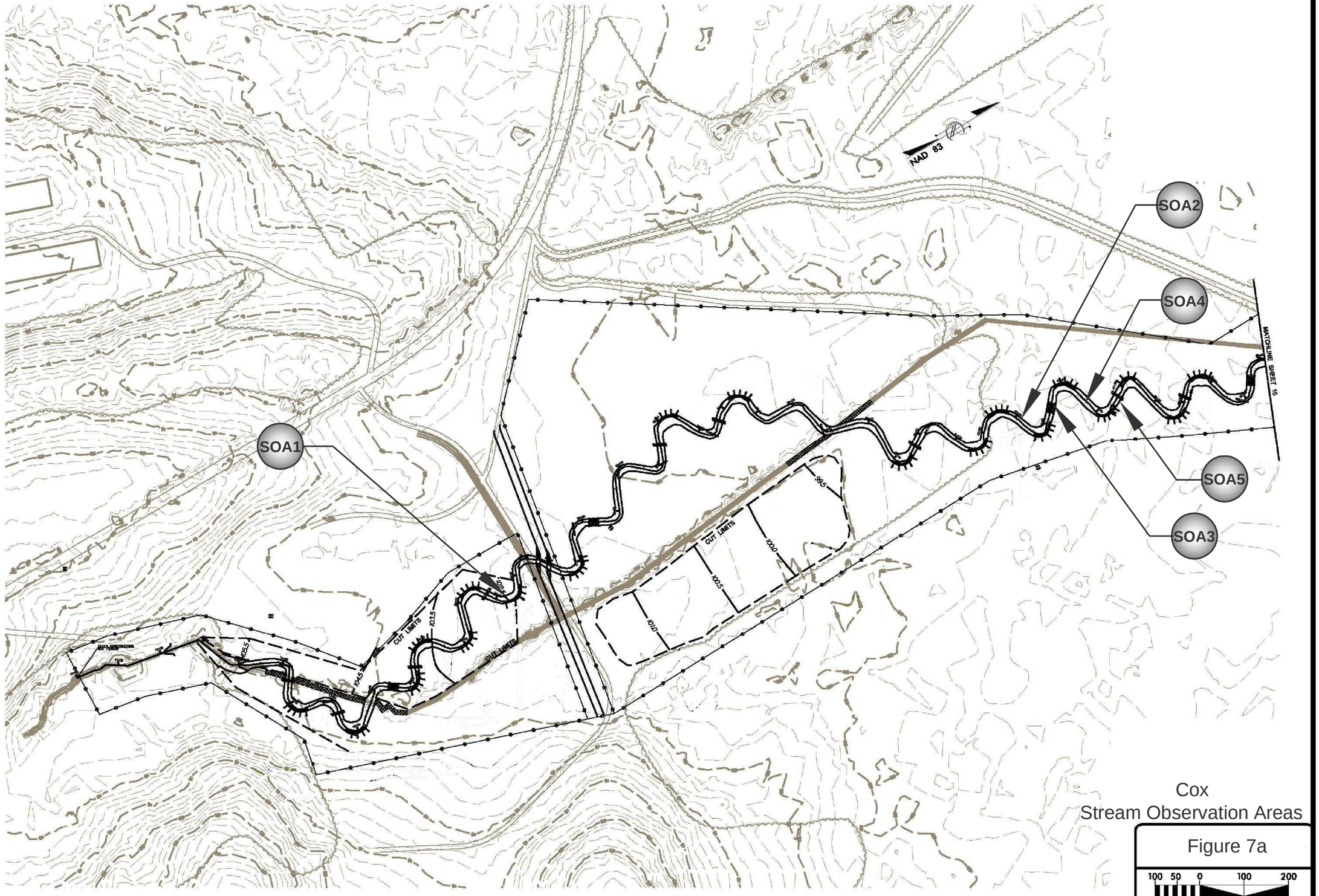
Feature	STA	Description/Recommendation	Photo Number
Root wads	24+25	Minor erosion on right bank behind root wads, vegetation is stabilizing banks, no repair needed	SOA 1
Channel	43+00	Mid-channel bar formation, no repair needed	SOA 2
Channel	44+35	Mid-channel bar formation, no repair needed	SOA 3
Channel	45+50	Vegetation in channel, no repair needed	SOA 4
Log weir	46+85	Log weir not functioning properly, causing minor erosion of banks, stream is stable and no repair is needed	SOA 5
Channel	74+90 to 75+00	Mid-channel bar formation, no repair needed	SOA 6

5.3.3 Hydrology

Two bankfull events were recorded between February and August of the 2010 monitoring season. Out of bank events of 0.10 and 0.15 feet above bankfull stage were recorded during the April and May site visits, respectively. The crest gauge data from 2010 are summarized in **Table 10**.

Table 10. Crest Gauge Data

Month Recorded	Crest Gauge
January	---
February	0.00
March	0.00
April	0.10
May	0.15
June	0.00
July	0.00
August	0.00
September	---
October	---
November	---
December	---



Cox
Stream Observation Areas

Figure 7a

100 50 0 100 200
SCALE (FT)

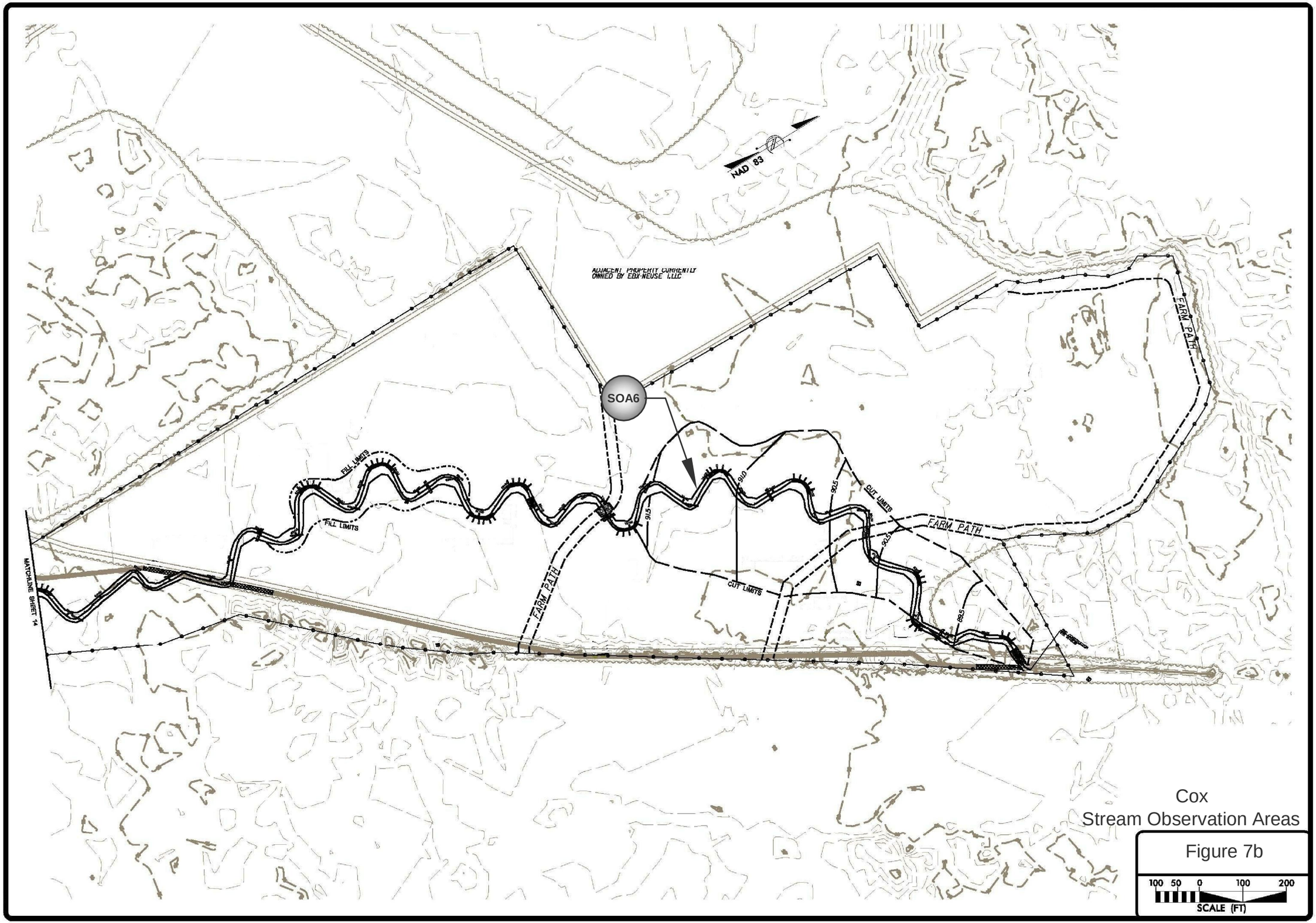

NAD 83
ADJACENT PROPERTY CURRENTLY
OWNED BY EBX-NEUSE I,LLC
SOA6
FARM PATH
FILL LIMITS
FILL LIMITS
CUT LIMITS
CUT LIMITS
FARM PATH
FARM PATH
915
910
905
900
895
MATCHLINE SHEET 14
Cox
Stream Observation Areas
Figure 7b
100 50 0 100 200
SCALE (FT)

Table 11. Summary of Morphologic Monitoring Parameters

Parameter	As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
Bankfull Xsec Area, Abkf (sq ft)	17.4	13.0	10.9	13.6	12.5	12.3
Avg. Bankfull Width, Wbkf (ft)	17.5	15.1	15.3	16.7	13.9	14.0
Bankfull W/D	18.5	18.8	22.8	21.4	16.4	17.0
Bankfull Mean Depth, Dbkf (ft)	1.0	0.8	0.7	0.8	0.9	0.9
Bankfull Max Depth, Dmax (ft)	1.9	1.5	1.3	1.4	1.7	1.7

5.4 STREAM CONCLUSIONS

Overall the Cox Stream Mitigation Site is performing as designed. Cross section and profile data indicate that little change has occurred since the stream channel was built. Two bankfull events occurred at the site in 2010. A log weir and a root wad have experienced minor erosion, and minor bank erosion has occurred. Several small mid-channel bars have formed, and vegetation was observed in the channel. Several areas of erosion observed in 2008 and 2009 have been stabilized by vegetation. The Site has achieved the success criteria specified in the Restoration Plan for the site.

6.0 CONCLUSIONS AND RECOMMENDATIONS

The stream, hydrologic, and vegetation monitoring data for all five monitoring years at the Site are summarized in **Tables 12-15**. Based on this data and the other data and comments provided above in Sections 3, 4, and 5, the Site has achieved the stream, hydrologic, and vegetative success criteria specified in the Restoration Plan.

During the 2010 growing season a hydrologic assessment was performed on the Cox site to delineate wetland restoration areas that have failed to achieve hydrology success criteria. This assessment identified 0.5 acres of riparian wetland and 0.1 acres of non-riparian wetland in the vicinity of AW12 that are failing to achieve success criteria. An additional 10.0 acres of riparian wetland restoration has been claimed within the stream buffers.

Table 12. Summary of Vegetative Monitoring Data 2006-2010

Plot	Planted Stems Per Acre					
	Base	**2006**	**2007**	**2008**	**2009**	**2010**
1	720	600	600	520	520	520
2	760	640	640	680	680	680
3	800	760	800	800	800	800
4	680	680	680	680	520	480
5	680	680	640	640	600	480
6	640	640	640	640	640	640
7	720	720	720	720	560	520
8	680	640	640	600	520	520
9	720	680	680	640	640	640
10	720	720	520	480	480	480
11	720	720	720	720	640	640
12	720	760	760	760	720	640
13	680	680	680	680	680	680
14	720	720	720	720	720	720
15	680	680	680	680	680	680
16	640	520	560	560	440	440
17	640	640	600	560	560	560
18	680	680	680	680	680	680
19	640	640	520	440	440	440
20	680	600	520	520	440	440
21	800	800	800	800	800	800
22	680	640	560	560	520	520
Average	**700**	**675**	**653**	**640**	**604**	**591**

Table 13. Summary of Hydrology Monitoring Data 2006-2010

Gauge	Max Consecutive Hydroperiod (%)				
	2006	2007	2008	2009	2010
AW1	43	20	30	38	22
MW2	29	18	27	31	15
AW3	0	17	7	10	9
AW4	2	2	7	11	9
AW5	9	5	17	17	13
AW6	29	4	8	12	5
AW7	58	28	32	45	20
MW8	13	8	25	19	18
MW9	7	8	26	16	14
AW10	6	4	22	17	13
AW11	N/A	4	27	18	12
AW12	N/A	0	4	3	2
Ref AW1	8	3	2	3	19
Ref MW2	8	8	8	15	14
Ref AW3	29	19	22	17	18
Ref MW4	9	19	16	16	13
Ref AW5	0	1	0	0	13

Table 14. Summary of Crest Gauge Data 2006-2010

	2006	2007	2008	2009	2010
Number of Bankfull Events	2	1	2	3	2
Maximum Height Above Bankfull (feet)	0.3	0.3	1.5	0.8	0.15

Table 15. Summary of Morphologic Monitoring Parameters 2006-2010

Parameter	As-Built	Year 1	Year 2	Year 3	Year 4	Year 5
Bankfull Xsec Area, Abkf (sq ft)	17.4	13	10.9	13.6	12.5	12.3
Avg. Bankfull Width, Wbkf (ft)	17.5	15.1	15.3	16.7	13.9	14
Bankfull W/D	18.5	18.8	22.8	21.4	16.4	17
Bankfull Mean Depth, Dbkf (ft)	1	0.8	0.7	0.8	0.9	0.9
Bankfull Max Depth, Dmax (ft)	1.9	1.5	1.3	1.4	1.7	1.7

APPENDIX A

As-Built Survey

COX SITE

PROJECT: 0214R

STATE	BUCK PROJECT REFERENCE NO.	SHEET NO.	TOTAL SHEETS
N.C.	0214R	1	20

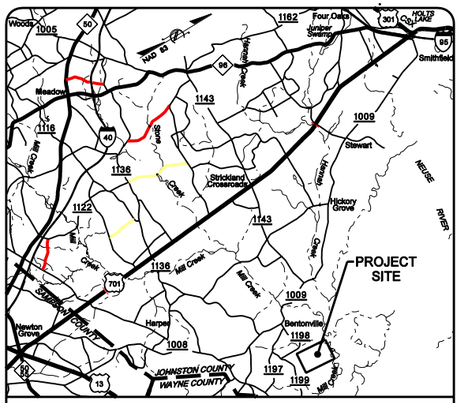
NO.	DATE	CHECKED BY	APPROVED BY
1	01/25/06	JOHN HUTTON	KEVIN TWEEDY

EBX NEUSE - I, LLC
COX SITE

JOHNSTON COUNTY

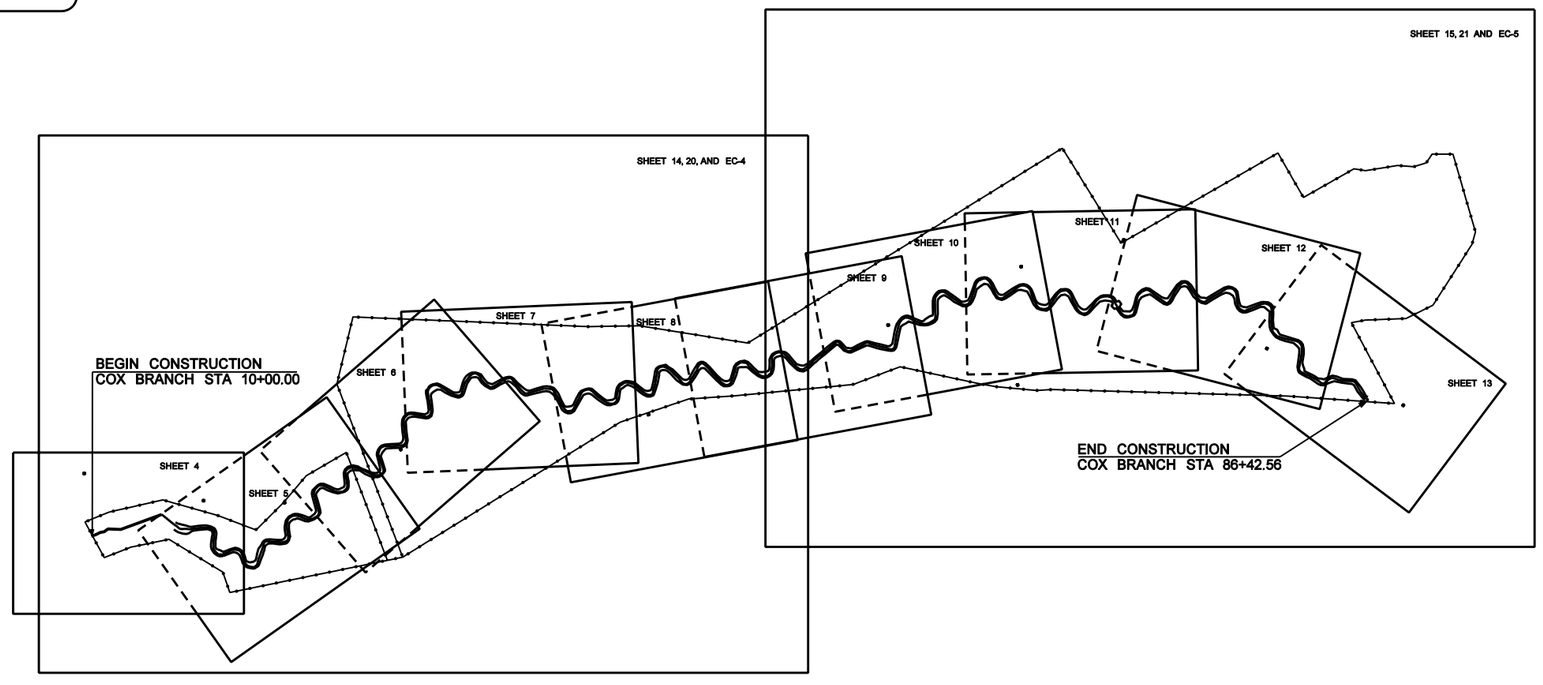
LOCATION: WEST OF GOLDSBORO
OFF SR 1198 WESTBROOK LOWGROUNDS ROAD

TYPE OF WORK: AS-BUILT PLANS



VICINITY MAP

INDEX OF SHEETS



NAD 83

GRAPHIC SCALES

50 0 50 100
PLANS

50 0 50 100
PROFILE (HORIZONTAL)

5 0 5 10
PROFILE (VERTICAL)

PROJECT SUMMARY

EXISTING STREAM LENGTH	=	5944 FEET
AS-BUILT STREAM RESTORATION LENGTH	=	7357 FEET
AS-BUILT STREAM ENHANCEMENT LENGTH	=	285 FEET
EXISTING WETLAND ACREAGE	=	0.8 ACRES
AS-BUILT WETLAND ACREAGE RIVERINE WETLAND	=	26.8 ACRES
AS-BUILT WETLAND ACREAGE NON-RIVERINE WETLAND	=	16.9 ACRES

PREPARED FOR THE OFFICE OF:
EBX NEUSE - I, LLC

2530 MERIDIAN PARKWAY, SUITE 200
DURHAM, NORTH CAROLINA 27713

EBX CONTACT:
THOMAS L. RINKER
PROJECT MANAGER

PREPARED IN THE OFFICE OF:

BUCK ENGINEERING
8000 Regency Parkway Suite 200
Cary, North Carolina 27511
Phone: 919-463-5488
Fax: 919-463-5490

DECEMBER '05
COMPLETION DATE:

KEVIN TWEEDY
PROJECT ENGINEER

JOHN HUTTON
PROJECT MANAGER

PROJECT ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY:

KEVIN L. TWEEDY
027337
APRIL 4, 2006

THIS MEDIA SHALL NOT BE CONSIDERED A CERTIFIED DOCUMENT

SIGNATURE: *P.E.*

2/26/03

STREAM CONVENTIONAL SYMBOLS
SUPERCEDES SHEET 1B

- ROCK J-HOOK
- ROCK VANE
- OUTLET PROTECTION
- ROCK CROSS VANE
- DOUBLE DROP ROCK CROSS VANE
- SINGLE WING DEFLECTOR
- DOUBLE WING DEFLECTOR
- TEMPORARY SILT CHECK
- ROOT WAD
- LOG J-HOOK
- LOG VANE
- LOG WEIR
- LOG CROSS VANE
- CONSTRUCTED RIFFLE
- BOULDER CLUSTER
- ROCK STEP POOL
- SAFETY FENCE
- TAPE FENCE
- 100 YEAR FLOOD PLAIN
- CONSERVATION EASEMENT
- EXISTING MAJOR CONTOUR
- EXISTING MINOR CONTOUR
- FOOT BRIDGE
- TEMPORARY STREAM CROSSING
- PERMANENT STREAM CROSSING
- TRANSPLANTED VEGETATION
- TREE REMOVAL
- TREE PROTECTION
- TRANSPLANTS

**NOTE: ALL ITEMS ABOVE MAY NOT BE USED ON THIS PROJECT

GENERAL NOTES

1. THE CONTRACTOR IS REQUIRED TO INSTALL INSTREAM STRUCTURES USING A TRACK HOE WITH A HYDRAULIC THUMB OF SUFFICIENT SIZE TO MOVE BOULDERS 2FT X 2FT X 3FT (APPROXIMATELY 0.7 TONS).

2. THE CONTRACTOR WILL BE REQUIRED TO PROVIDE, AT A MINIMUM, TWO OPERATORS AT ALL TIMES DURING CONSTRUCTION OF THE NEW STREAM CHANNEL. IN GENERAL, ONE OPERATOR WILL CUT THE NEW CHANNEL WITH A TRACK HOE, WHILE THE OTHER OPERATOR FOLLOWS AND INSTALLS INSTREAM STRUCTURES, BANK STABILIZATION PRACTICES, AND TRANSPLANTS. DURING CONSTRUCTION OF THE NEW STREAM CHANNEL, THE CONTRACTOR WILL BE REQUIRED TO HAVE TWO TRACK HOES AND ONE LOADER ON-SITE.

3. CONSTRUCTION IS SCHEDULED TO BEGIN JUNE 2005.

PROJECT REFERENCE NO.	SHEET NO.
0214R	1-A

PROJECT ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY:

KEVIN L. TWEEDY
027337
AUGUST 26, 2005

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BUCK ENGINEERING
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Cary, North Carolina 27511
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Fax: 919-463-5490

STANDARD SPECIFICATIONS

EROSION AND SEDIMENT CONTROL PLANNING AND DESIGN MANUAL
DECEMBER 1993

6.60 TEMPORARY SEDIMENT TRAP

6.06 CONSTRUCTION ACCESS

6.62 SILT FENCE

6.70 TEMPORARY (FORD) STREAM CROSSING

VEGETATION SELECTION

STREAMBANK AND RIVERINE WETLAND VEGETATION SELECTION LIST

BARE ROOTVEGETATION

NOTE: BARE ROOT VEGETATION SHALL BE INSTALLED RANDOMLY 6 TO 8 FEET APART FROM THE TOP OF THE STREAMBANK OUT TO THE EDGE OF RIVERINE WETLAND REVEGETATION LIMITS.

COMMON NAME	*SCIENTIFIC NAME*	*Percentage of Total*	Total Number
Blackgum	*Nyssa sylvatica*	10	2900
Green ash	*Fraxinus pennsylvanica*	10	2900
Swamp Chestnut Oak	*Quercus michauxii*	15	4350
Overcup Oak	*Quercus lyrata*	10	2900
Willow Oak	*Quercus phellos*	5	1450
Sycamore	*Platanus occidentalis*	20	5800
River Birch	*Betula nigra*	20	5800
Bald Cypress	*Taxadium Distichum*	10	2900
	TOTAL	100	29000

LIVE STAKING

NOTE: LIVE STAKES SHALL BE INSTALLED RANDOMLY 2 TO 3 FEET APART ALONG THE STREAMBANKS FROM THE TOE OF THE BANK TO THE TOP OF BANK.

COMMON NAME	*SCIENTIFIC NAME*	*Percentage of Total*	Total Number
ELDERBERRY	*SAMBUCUS CANADENSIS*	42	2500
BUTTONBUSH	*CEPHALANTHUS OCCIDENTALIS*	50	3000
BLACK WILLOW	*SALIX NIGRA*	8	500
	TOTAL	100	6000

TEMPORARY SEED MIX

NOTE: ALL DISTURBED AREAS WILL BE STABILIZED USING TEMPORARY SEED MIX

COMMON NAME	RATE	DATES
ANNUAL RYE (COOL SEASON)	130 LBS/ACRE	SEPTEMBER TO MARCH
MILLET (WARM SEASON)	45 LBS/ACRE	APRIL TO AUGUST

NON-RIVERINE WETLAND VEGETATION SELECTION LIST

BARE ROOT VEGETATION

NOTE: BARE ROOT VEGETATION SHALL BE INSTALLED RANDOMLY 6 TO 8 FEET APART FROM THE TOP OF THE STREAMBANK OUT TO THE EDGE OF RIVERINE WETLAND REVEGETATION LIMITS.

COMMON NAME	*SCIENTIFIC NAME*	*Percentage of Total*	Total Number
Swamp Tupelo	*Nyssa sylvatica var.biflora*	15	1800
Sycamore	*Platanus occidentalis*	5	600
Swamp Chestnut Oak	*Quercus michauxii*	10	1200
Overcup Oak	*Quercus lyrata*	10	1200
Willow Oak	*Quercus phellos*	5	600
Sugarberry	*Celtis laevigata*	20	2400
River Birch	*Betula nigra*	20	2400
Green Ash	*Fraxinus pennsylvanica*	5	600
Bald Cypress	*Taxadium distichum*	10	1200
	TOTAL	100	12000

PERMANENT SEED MIX FOR ALL PLANTING ZONES

NOTE:
WETLAND SEED MIX SHALL BE SEEDED AT A RATE OF 15 LBS PER ACRE THOUGHOUT PLANTING ZONES

COMMON NAME	*SCIENTIFIC NAME*	*Percentage of Total*	Rate (lbs per acre)
Redtop	*Agrostis alba*	10	1.5
Virginia Wildrye	*Elymus virginicus*	15	2.25
Switch Grass	*Panicum virgatum*	15	2.25
Eastern Gamma Grass	*Tripsicum dactyloides*	5	0.75
Pennsylvania Smartweed	*Polygonum pennsylvanicum*	5	0.75
Little Blue Stem	*Schizachyrium scoparium*	5	0.75
Soft Rush	*Juncus effusus*	5	0.75
Beggars Tick	*Bidens frondosa (or aristosa)*	10	1.5
Lance-Leaved Tick Seed	*Coreopsis lanceolata*	10	1.5
Tioga Deer Tongue	*Panicum clandestinum*	10	1.5
Big Blue Stem	*Andropogon gerardii*	5	0.75
Indian Grass	*Sorgastrum nutans*	5	0.75

4/12/2006
C:\0214R\Design\Plans\0214R_EBX_PSH_1A.dgn

2/26/03

*S.U.E = SUBSURFACE UTILITY ENGINEER

STATE OF NORTH CAROLINA
DIVISION OF HIGHWAYS

CONVENTIONAL SYMBOLS

ROADS & RELATED ITEMS

Edge of Pavement
Curb
Prop. Slope Stakes Cut
Prop. Slope Stakes Fill
Prop. Woven Wire Fence
Prop. Chain Link Fence
Prop. Barbed Wire Fence
Prop. Wheelchair Ramp
Curb Cut for Future Wheelchair Ramp
Exist. Guardrail
Prop. Guardrail
Equality Symbol
Pavement Removal

RIGHT OF WAY

Baseline Control Point
Existing Right of Way Marker
Exist. Right of Way Line w/Marker
Prop. Right of Way Line with Proposed R/W Marker (Iron Pin & Cap)
Prop. Right of Way Line with Proposed (Concrete or Granite) R/W Marker
Exist. Control of Access Line
Prop. Control of Access Line
Exist. Easement Line
Prop. Temp. Construction Easement Line
Prop. Temp. Drainage Easement Line
Prop. Perm. Drainage Easement Line

HYDROLOGY

Stream or Body of Water
River Basin Buffer
Flow Arrow
Disappearing Stream
Spring
Swamp Marsh
Shoreline
Falls, Rapids
Prop Lateral, Tail, Head Ditches

STRUCTURES

MAJOR
Bridge, Tunnel, or Box Culvert
Bridge Wing Wall, Head Wall and End Wall

MINOR
Head & End Wall
Pipe Culvert
Footbridge
Drainage Boxes
Paved Ditch Gutter

UTILITIES

Exist. Pole
Exist. Power Pole
Prop. Power Pole
Exist. Telephone Pole
Prop. Telephone Pole
Exist. Joint Use Pole
Prop. Joint Use Pole
Telephone Pedestal
U/G Telephone Cable Hand Hold
Cable TV Pedestal
U/G TV Cable Hand Hold
U/G Power Cable Hand Hold
Hydrant
Satellite Dish
Exist. Water Valve
Sewer Clean Out
Power Manhole
Telephone Booth
Cellular Telephone Tower
Water Manhole
Light Pole
H-Frame Pole
Power Line Tower
Pole with Base
Gas Valve
Gas Meter
Telephone Manhole
Power Transformer
Sanitary Sewer Manhole
Storm Sewer Manhole
Tank; Water, Gas, Oil
Water Tank With Legs
Traffic Signal Junction Box
Fiber Optic Splice Box
Television or Radio Tower
Utility Power Line Connects to Traffic Signal Lines Cut Into the Pavement

Recorded Water Line
Designated Water Line (S.U.E.*)
Sanitary Sewer
Recorded Sanitary Sewer Force Main
Designated Sanitary Sewer Force Main(S.U.E.*)
Recorded Gas Line
Designated Gas Line (S.U.E.*)
Storm Sewer
Recorded Power Line
Designated Power Line (S.U.E.*)
Recorded Telephone Cable
Designated Telephone Cable (S.U.E.*)
Recorded U/G Telephone Conduit
Designated U/G Telephone Conduit (S.U.E.*)
Unknown Utility (S.U.E.*)
Recorded Television Cable
Designated Television Cable (S.U.E.*)
Recorded Fiber Optics Cable
Designated Fiber Optics Cable (S.U.E.*)
Exist. Water Meter
U/G Test Hole (S.U.E.*)
Abandoned According to U/G Record
End of Information

BOUNDARIES & PROPERTIES

State Line
County Line
Township Line
City Line
Reservation Line
Property Line
Property Line Symbol
Exist. Iron Pin
Property Corner
Property Monument
Property Number
Parcel Number
Fence Line
Existing Wetland Boundaries
High Quality Wetland Boundary
Medium Quality Wetland Boundaries
Low Quality Wetland Boundaries
Proposed Wetland Boundaries
Existing Endangered Animal Boundaries
Existing Endangered Plant Boundaries

BUILDINGS & OTHER CULTURE

Buildings
Foundations
Area Outline
Gate
Gas Pump Vent or U/G Tank Cap
Church
School
Park
Cemetery
Dam
Sign
Well
Small Mine
Swimming Pool

TOPOGRAPHY

Loose Surface
Hard Surface
Change in Road Surface
Curb
Right of Way Symbol
Guard Post
Paved Walk
Bridge
Box Culvert or Tunnel
Ferry
Culvert
Footbridge
Trail, Footpath
Light House

VEGETATION

Single Tree
Single Shrub
Hedge
Woods Line
Orchard
Vineyard

RAILROADS

Standard Gauge
RR Signal Milepost
Switch

2/26/03

PROJECT REFERENCE NO.	SHEET NO.
0214R	2

PROJECT ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY:

KEVIN L. TWEEDY
027337
AUGUST 26, 2005

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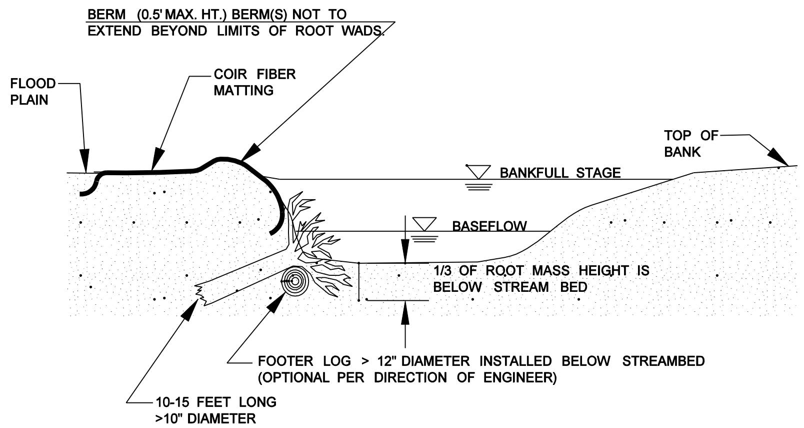
BUCK ENGINEERING
8000 Regency Parkway Suite 200
Cary, North Carolina 27511
Phone: 919-463-5488
Fax: 919-463-5490

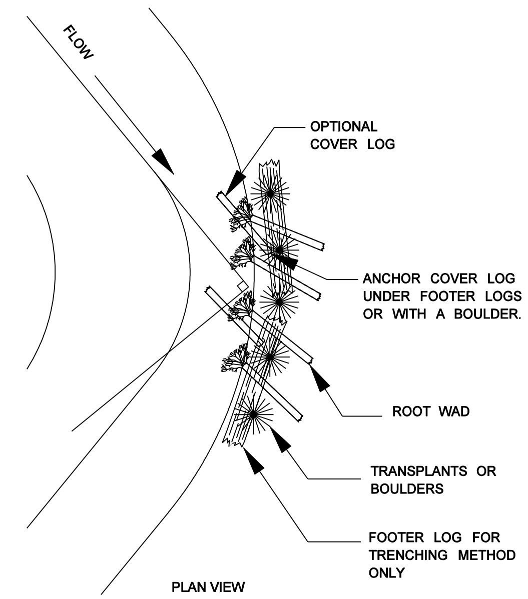
ROOT WADS WITHOUT TRANSPLANTS

NTS



CROSS SECTION VIEW

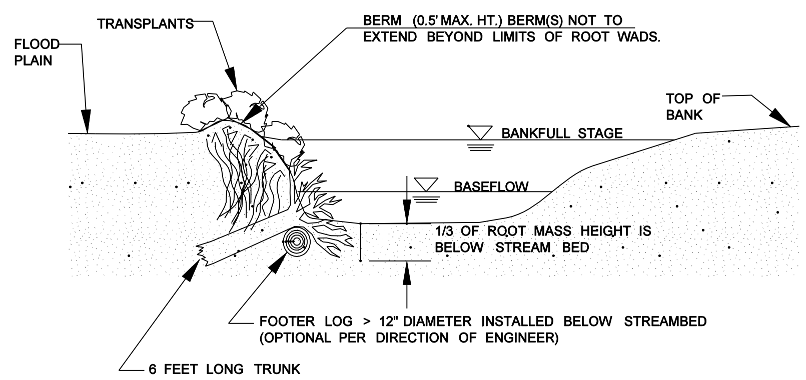
ROOT WADS



PLAN VIEW

ROOT WADS WITH TRANSPLANTS

NTS



CROSS SECTION VIEW

NOTES:

TRENCHING METHOD:
IF THE ROOT WAD CANNOT BE DRIVEN INTO THE BANK OR THE BANK NEEDS TO BE RECONSTRUCTED, THE TRENCHING METHOD SHOULD BE USED. THIS METHOD REQUIRES THAT A TRENCH BE EXCAVATED FOR THE LOG PORTION OF THE ROOT WAD. IN THIS CASE, A FOOTER LOG SHOULD BE INSTALLED UNDERNEATH THE ROOT WAD IN A TRENCH EXCAVATED PARALLEL TO THE BANK AND WELL BELOW THE STREAMBED. ONE-THIRD OF THE ROOT WAD SHOULD REMAIN BELOW NORMAL BASE FLOW CONDITIONS.

NOTES:

DRIVE POINT METHOD:
SHARPEN THE END OF THE LOG WITH A CHAINSAW BEFORE "DRIVING" IT INTO THE BANK. ORIENT ROOT WADS UPSTREAM SO THAT THE STREAM FLOW MEETS THE ROOT WAD AT A 90-DEGREE ANGLE, DEFLECTING THE WATER AWAY FROM THE BANK. A TRANSPLANT OR BOULDER SHOULD BE PLACED ON THE DOWNSTREAM SIDE OF THE ROOT WAD IF A BACK EDDY IS FORMED BY THE ROOT WAD. THE BOULDER SHALL BE APPROXIMATELY 4'X 3'X 2'.

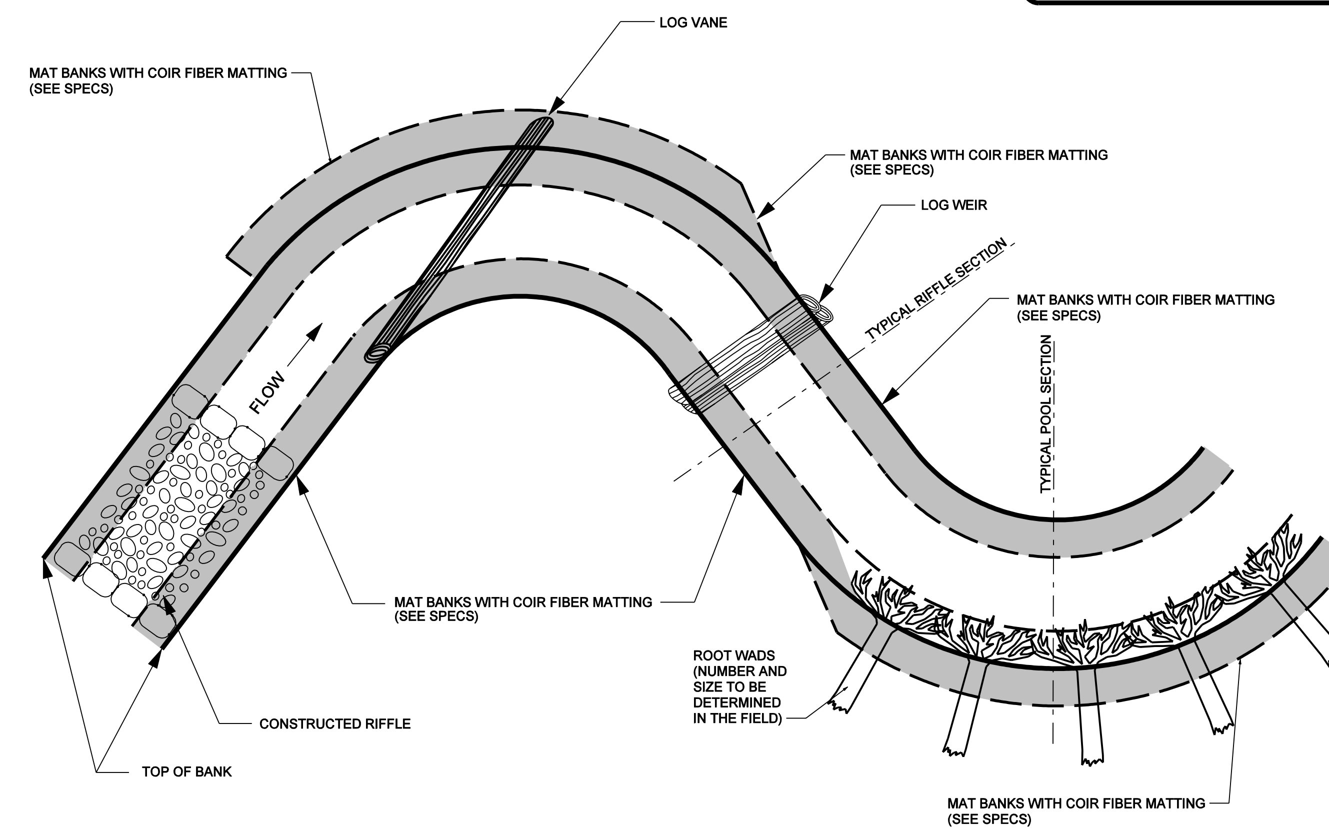
TYPICAL STRUCTURE PLACEMENT

STRUCTURE NOTES:

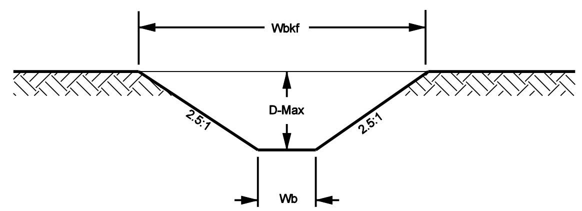
1. GENERALLY LOG WEIRS, ROOT WADS, LOG VANES AND COIR FIBER MATTING WILL BE INSTALLED IN THE LOCATION AND SEQUENCE AS SHOWN.
2. ADDITIONAL STRUCTURES OR CHANGES TO STRUCTURE LOCATIONS MAY BE MADE BY THE DESIGN ENGINEER DURING CONSTRUCTION.

NOTES:

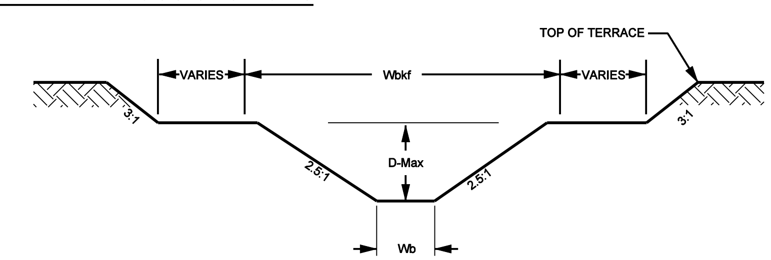
1. COIR FIBER MATTING TO BE INSTALLED ON ALL RESTORED STREAMBANKS.
2. IF ROOT WADS DO NOT COVER ENTIRE SLOPE ON OUTSIDE OF MEANDER BENDS, COIR FIBER MATTING IS NEEDED.



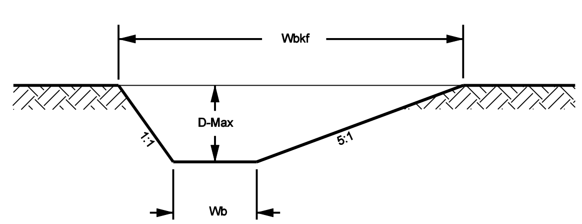
TYPICAL RIFFLE, POOL, AND BANKFULL BENCH CROSS SECTIONS



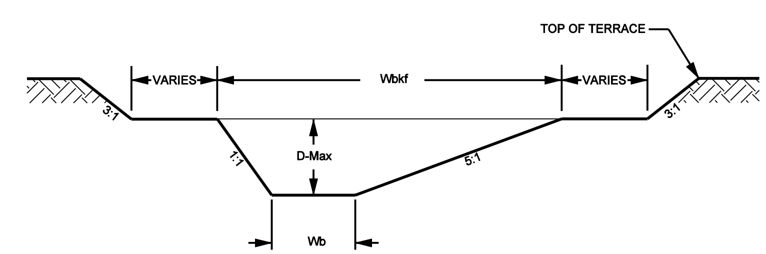
RIFFLE



RIFFLE WITH BANKFULL BENCH



POOL



POOL WITH BANKFULL BENCH

NOTES:

1. DURING CONSTRUCTION CORNERS OF DESIGN CHANNEL WILL BE ROUNDED AND A THALWEG WILL BE SHAPED PER DIRECTION OF ENGINEER.
2. POOLS SHOWN ABOVE ARE LEFT POOLS ONLY.

COX		
RIFFLE	POOL	
13.7	18.0	WIDTH OF BANKFULL (Wbkf)
1.0	1.5	MAXIMUM DEPTH (D-Max)
14.0	12.1	WIDTH TO DEPTH RATIO (Wbkf / D)
13.5	26.9	BANKFULL AREA (Abkf)
9.0	5.4	BOTTOM WIDTH (Wb)

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2/26/03

PROJECT REFERENCE NO.	SHEET NO.
0214R	2-A

PROJECT ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY:

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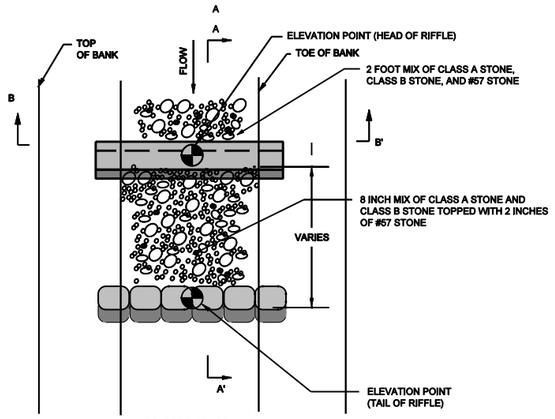
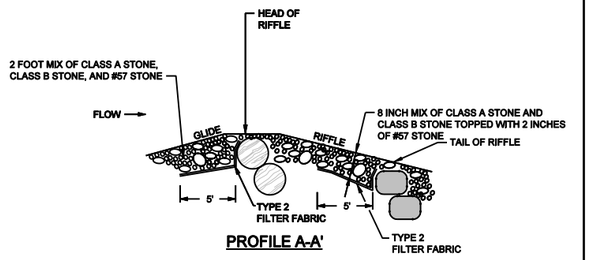
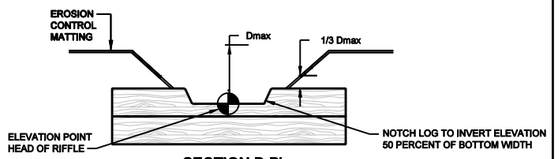


PLAN VIEW



PROFILE A-A'

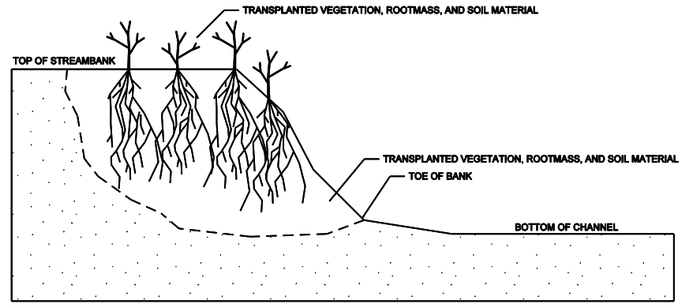


SECTION B-B'

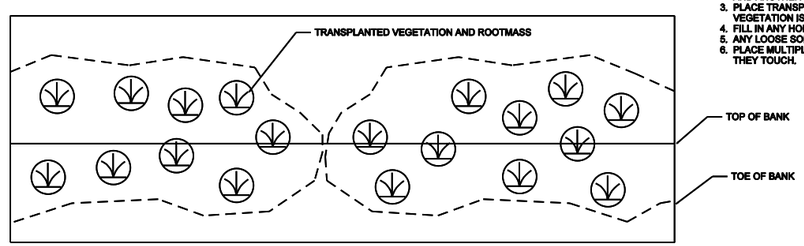
NOTES:

1. LOGS MUST BE AT LEAST 10 INCHES IN DIAMETER AND 15 FEET LONG.
2. DIG A TRENCH BELOW THE BED FOR THE UPSTREAM FOOTER LOGS AND STOCK PILE CUT MATERIAL.
3. PLACE FOOTER LOGS FIRST AND THEN HEADER (TOP) LOG. SET HEADER LOG APPROXIMATELY 3 INCHES ABOVE THE INVERT ELEVATION.
4. CUT A NOTCH IN THE HEADER LOG APPROXIMATELY 50 PERCENT OF THE CHANNEL BOTTOM WIDTH AND EXTENDING DOWN TO THE INVERT ELEVATION.
5. PLACE FOOTER ROCK FIRST AT TAIL OF RIFFLE AND THEN HEADER ROCK.
6. FOR BOTH INVERTS, INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER AND EXTEND DOWNWARDTO THE DEPTH OF THE FOOTER, AND THEN UPSTREAM TO A MINIMUM OF FIVE FEET.
7. FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH 2 FOOT MIX OF CLASS A STONE, CLASS B STONE, AND #57 STONE TO THE ELEVATION OF THE TOP OF THE HEADER LOG.
8. UNDERCUT RIFFLE BETWEEN INVERTS BY 8 INCHES, BACKFILL BETWEEN LOGS WITH A 8 INCH MIX OF CLASS A AND B STONE TOP WITH 2 INCHES OF #57 STONE.

TRANSPLANTED VEGETATION



CROSS SECTION VIEW

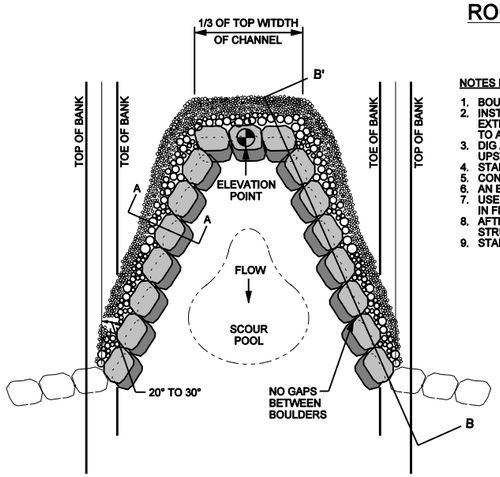


PLAN VIEW

NOTES:

1. EXCAVATE A HOLE IN THE BANK TO BE STABILIZED THAT WILL ACCOMMODATE THE SIZE OF TRANSPLANT TO BE PLACED. BEGIN EXCAVATION AT THE TOE OF THE BANK.
2. EXCAVATE TRANSPLANT USING A FRONT END LOADER. EXCAVATE THE ENTIRE ROOT MASS AND AS MUCH ADDITIONAL SOIL MATERIAL AS POSSIBLE. IF ENTIRE ROOT MASS CAN NOT BE EXCAVATE IN ONE BUCKET LOAD, THE TRANSPLANT IS TOO LARGE AND ANOTHER SHOULD BE SELECTED.
3. PLACE TRANSPLANT IN THE BANK TO BE STABILIZED SO THAT VEGETATION IS ORIENTATED VERTICALLY.
4. FILL IN ANY HOLES AROUND THE TRANSPLANT AND COMPACT.
5. ANY LOOSE SOIL LEFT IN THE STREAM SHOULD BE REMOVED.
6. PLACE MULTIPLE TRANSPLANTS CLOSE TOGETHER SUCH THAT THEY TOUCH.

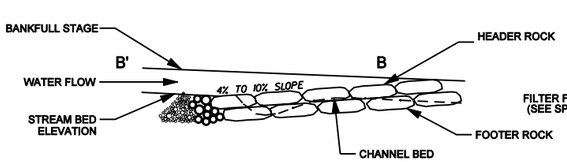
ROCK CROSS VANE



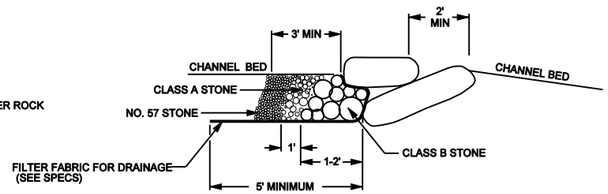
PLAN VIEW

NOTES FOR ALL VANE STRUCTURES:

1. BOULDERS MUST BE AT LEAST 2' x 2' x 3'.
2. INSTALL FILTER FABRIC FOR DRAINAGE BEGINNING AT THE MIDDLE OF THE HEADER ROCKS AND EXTEND DOWNWARD TO THE DEPTH OF THE BOTTOM FOOTER ROCK, AND THEN UPSTREAM TO A MINIMUM OF FIVE FEET.
3. DIG A TRENCH BELOW THE BED FOR FOOTER ROCKS AND PLACE FILL ON UPSTREAM SIDE OF VANE ARM, BETWEEN THE ARM AND STREAMBED.
4. START AT BANK AND PLACE FOOTER ROCKS FIRST AND THEN HEADER (TOP) ROCK.
5. CONTINUE WITH STRUCTURE, FOLLOWING ANGLE AND SLOPE SPECIFICATIONS.
6. AN EXTRA BOULDER CAN BE PLACED IN SCOUR POOL FOR HABITAT IMPROVEMENT.
7. USE CLASS B STONE TO FILL GAPS ON UPSTREAM SIDE OF BOULDERS,THEN CLASS A STONE IN FRONT OF CLASS B STONE, AND #57 STONE TO FILL GAPS ON UPSTREAM SIDE OF CLASS A STONE.
8. AFTER ALL STONE HAS BEEN PLACED, FILL IN THE UPSTREAM SIDE OF THE STRUCTURE WITH ON-SITE ALLUVIUM TO THE ELEVATION OF THE TOP OF THE HEADER ROCK.
9. START SLOPE AT BANKFULL STAGE.

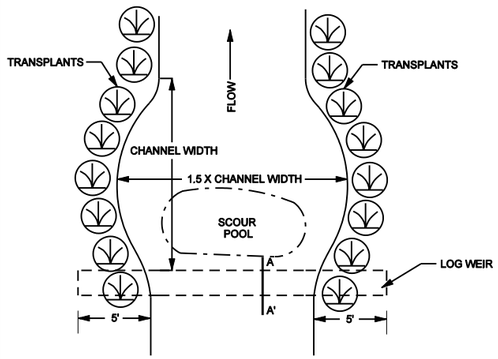


PROFILE VIEW B-B

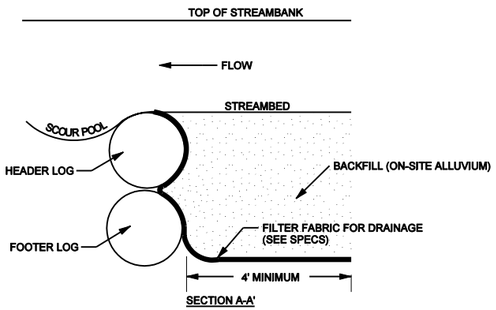


SECTION A - A

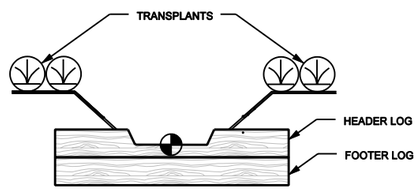
LOG WEIR



PLAN VIEW



SECTION A-A'



CROSS SECTION VIEW

NOTES:

1. LOGS SHOULD BE AT LEAST 12 INCHES IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
2. LOGS >24 INCHES IN DIAMETER MAY BE USED ALONE WITHOUT AN ADDITIONAL LOG. FILTER FABRIC SHOULD STILL BE USED TO SEAL AROUND LOG
3. PLACE FOOTER LOGS FIRST AND THEN HEADER (TOP) LOG. SET HEADER LOG APPROXIMATLEY 3 INCHES ABOVE THE INVERT ELEVATION.
4. CUT A NOTCH IN THE HEADER LOG APPROXIMATLEY 50 PERCENT OF THE CHANNEL BOTTOM WIDTH AND EXTENDING DOWN TO THE INVERT ELEVATION.
5. USE FILTER FABRIC FOR DRAINAGE TO SEAL GAPS BETWEEN LOGS.
6. PLACE TRANSPLANTS FROM TOE OF STREAMBANK TO TOP OF STREAMBANK.

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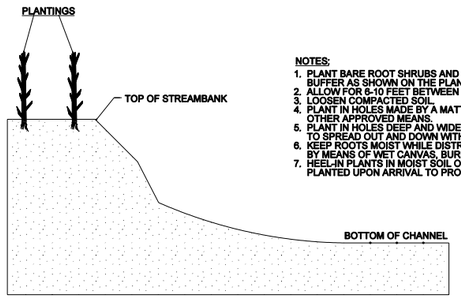
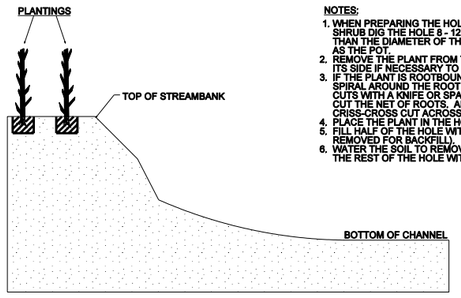
PLANTING SPECIFICATIONS



NOTES:
1. PLANT BARE ROOT SHRUBS AND TREES TO THE WIDTH OF THE BUFFER AS SHOWN ON THE PLANS.
2. ALLOW FOR 8-10 FEET BETWEEN PLANTINGS, DEPENDING ON SIZE.
3. LOOSEN COMPACTED SOIL.
4. PLANT IN HOLES MADE BY A MATTOCK, DIBBLE, PLANTING BAR, OR OTHER APPROVED MEANS.
5. PLANT IN HOLES DEEP AND WIDE ENOUGH TO ALLOW THE ROOTS TO SPREAD OUT AND DOWN WITHOUT J-ROOTING.
6. KEEP ROOTS MOIST WHILE DISTRIBUTING OR WAITING TO PLANT BY MEANS OF WET CANVAS, BURLAP, OR STRAW.
7. HEEL-IN PLANTS IN MOIST SOIL OR SAWDUST IF NOT PROMPTLY PLANTED UPON ARRIVAL TO PROJECT SITE.

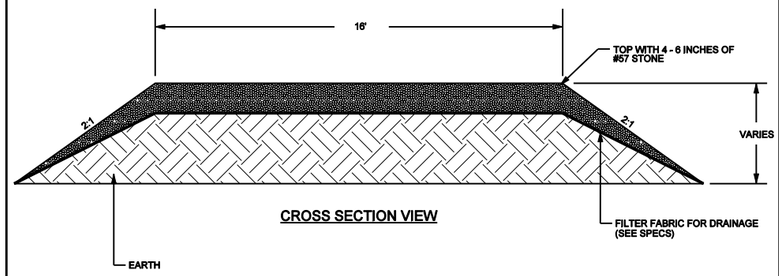
CROSS SECTION VIEW OF BARE ROOT PLANTING



NOTES:
1. WHEN PREPARING THE HOLE FOR A POTTED PLANT OR SHRUB DIG THE HOLE 6 - 12 INCHES LARGER THAN THE DIAMETER OF THE POT AND THE SAME DEPTH AS THE POT.
2. REMOVE THE PLANT FROM THE POT. LAY THE PLANT ON ITS SIDE IF NECESSARY TO REMOVE THE POT.
3. IF THE PLANT IS ROOTBOUND (ROOTS GROWING IN A SPIRAL AROUND THE ROOT BALL), MAKE VERTICAL CUTS WITH A KNIFE OR SPADE JUST DEEP ENOUGH TO CUT THE NET OF ROOTS. ALSO MAKE A CRISS-CROSS CUT ACROSS THE BOTTOM OF THE BALL.
4. PLACE THE PLANT IN THE HOLE.
5. FILL HALF OF THE HOLE WITH SOIL (SAME SOIL REMOVED FOR BACKFILL).
6. WATER THE SOIL TO REMOVE AIR POCKETS AND FILL THE REST OF THE HOLE WITH THE REMAINING SOIL.

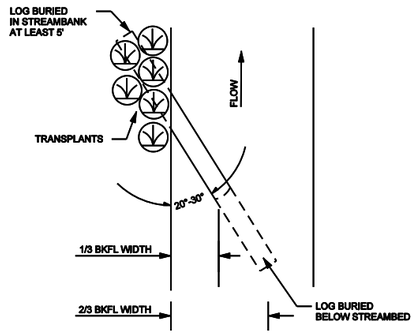
CROSS SECTION VIEW OF CONTAINER PLANTING

FARM PATH

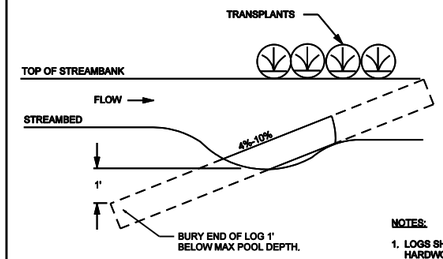


CROSS SECTION VIEW

LOG VANE



PLAN VIEW



PROFILE VIEW

NOTES:
1. LOGS SHOULD BE AT LEAST 12" INCHES IN DIAMETER, RELATIVELY STRAIGHT, HARDWOOD, AND RECENTLY HARVESTED.
2. SOIL SHOULD BE COMPACTED WELL AROUND BURIED PORTIONS OF LOG.
3. TRANSPLANTS ARE PLACED ALONG THE TOP OF THE BANK OVER THE BURIED LOG VANE TO PROTECT AGAINST EROSION DURING HIGH FLOWS.

PROJECT REFERENCE NO.	SHEET NO.
0214R	2-B

PROJECT ENGINEER

THIS DOCUMENT ORIGINALLY ISSUED AND SEALED BY:

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AUGUST 26, 2005

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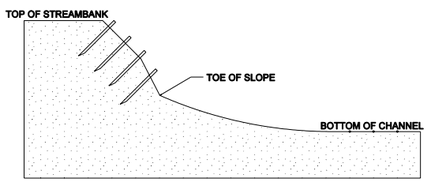
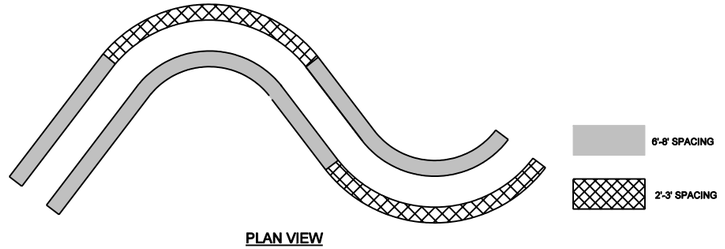
LIVE STAKING SPECIFICATION



CROSS SECTION VIEW

NOTES:
1. STAKES SHOULD BE CUT AND INSTALLED ON THE SAME DAY.
2. DO NOT INSTALL STAKES THAT HAVE BEEN SPLIT.
3. STAKES MUST BE INSTALLED WITH BUDS POINTING UPWARDS.
4. STAKES SHOULD BE INSTALLED PERPENDICULAR TO BANK.
5. STAKES SHOULD BE 1/2 TO 2 INCHES IN DIAMETER AND 2 TO 3 FT LONG.
6. STAKES SHOULD BE INSTALLED LEAVING 1/5 OF STAKE ABOVE GROUND.



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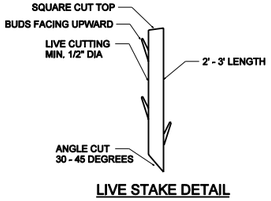
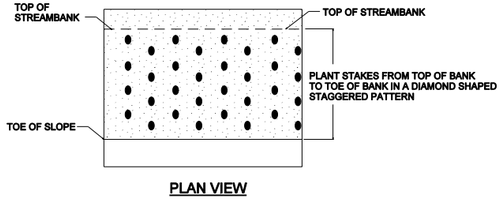
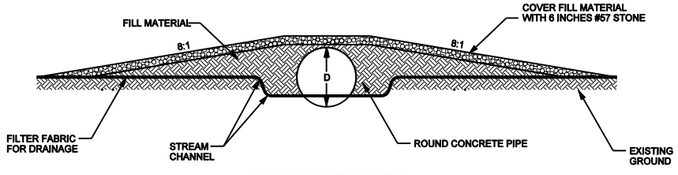


LIVE STAKE DETAIL

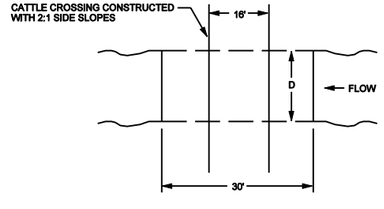


PLAN VIEW

PERMANENT STREAM CROSSING



CROSS SECTION VIEW



PLAN VIEW

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BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	4

PROJECT ENGINEER

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NAD 83

REBAR & CAP
2214423.21 N
581084.25 E
120.91 ELEV.

REBAR & CAP
2214754.00 N
581425.53 E
106.18 ELEV.

BEGIN CONSTRUCTION
STA 10+00.00

10+00
11+00
12+00
13+00
14+00
15+00
16+00

PHOTO POINT
#1

PHOTO POINT
#2

PHOTO POINT
#3

MATCHLINE SHEET 5 STA 16+00.00

CHANNEL BLOCK

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

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2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	5

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Phone: 919-463-5488
Fax: 919-463-5490

NAD 83

MATCHLINE SHEET 4 STA 16+00.00

REBAR & CAP
2214923.88 N
581689.62 E
104.60 ELEV.

PHOTO POINT
#6

MATCHLINE SHEET 6 STA 24+50.00

PHOTO POINT
#4

X-SECTION 1
STA 19+58.69

X-SECTION 2
STA 19+98.20

PHOTO POINT
#5

17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00

FILL EXISTING CHANNEL

CHANNEL BLOCK

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/12/2006
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2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
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Phone: 919-463-5488
Fax: 919-463-5490

NAD 83

MATCHLINE SHEET 5 STA 24+50.00

MATCHLINE SHEET 7 STA 33+00.00

25+00

27+00

28+00

29+00

30+00

31+00

32+00

33+00

A

A'

X-SECTION 3
STA 30+00.02

X-SECTION 4
STA 31+31.12

PHOTO POINT
#7

REBAR & CAP
2214981.00 N
582182.92 E
100.74 ELEV.

100

ARMOR PIPE CROSSING
WITH #57 STONE

ARMOR UPSTREAM
AND DOWNSTREAM
FACE OF FILL SLOPE
WITH CLASS B RIP RAP

EL=105.5'

CL

106.00

103.00

100.00

0.00

50.00

80.00

EL=100.6

EL=100.0

SECTION A-A'

FILL EXISTING CHANNEL

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/4/2006
c:\0214R\Design\as-built\0214R_EBX_asb_6.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	7

PROJECT ENGINEER

THIS DOCUMENT
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KEVIN L. TWEEDY
027337
APRIL 4, 2006

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BUCK ENGINEERING
8000 Regency Parkway Suite 200
Cary, North Carolina 27511
Phone: 919-463-5488
Fax: 919-463-5490

NAD 83

MATCHLINE SHEET 6 STA 33+00.00

PHOTO POINT #8

X-SECTION 6 STA 40+33.63

X-SECTION 5 STA 38+52.46

MATCHLINE SHEET 8 STA 41+00.00

FILL EXISTING CHANNEL

CHANNEL BLOCK

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/12/2006
c:\projects\0214R\Design\as-built\0214R_EBX_asb_7.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	8

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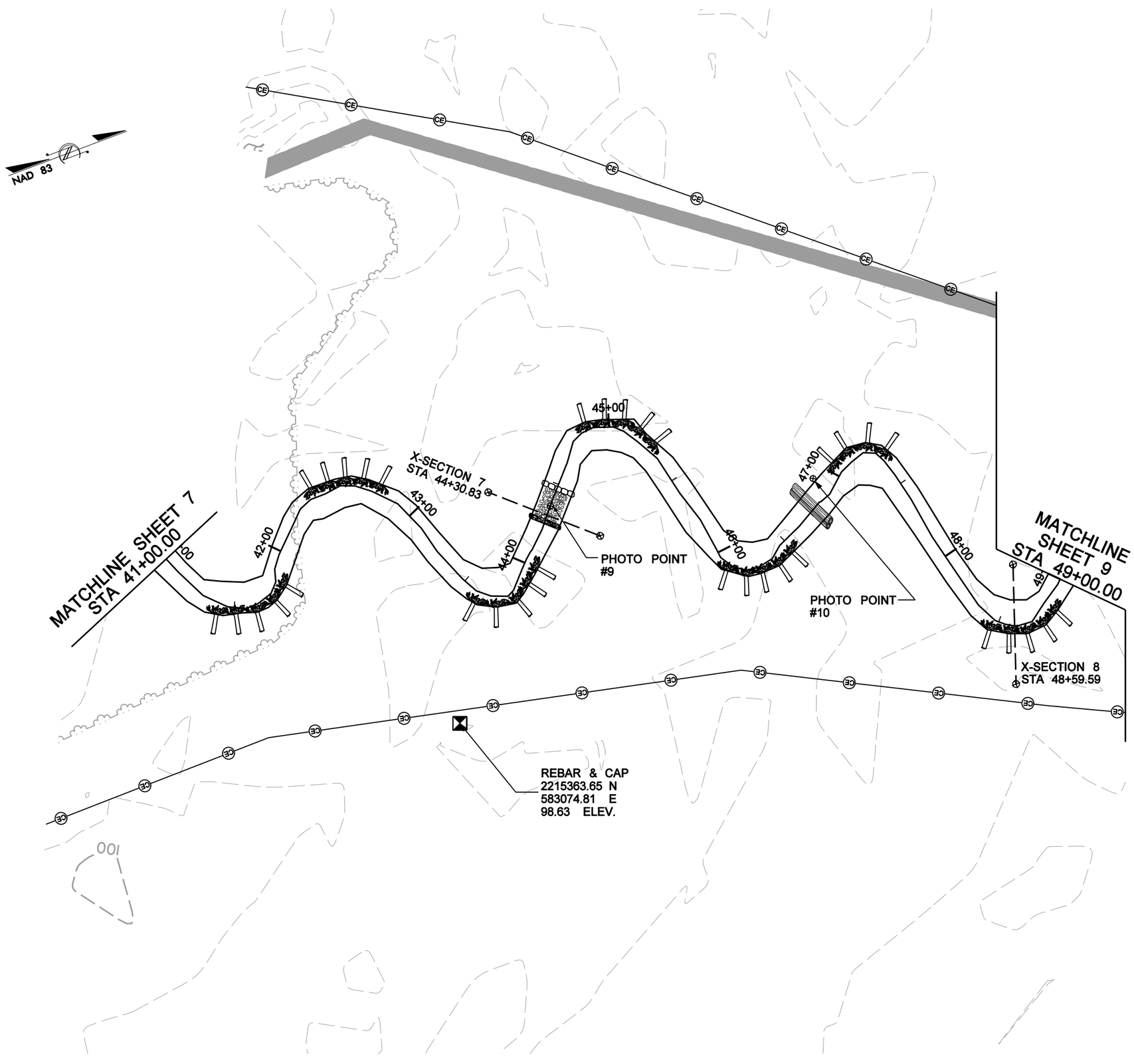

FILL EXISTING CHANNEL

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/12/2006
I:\0214R\Design\as-built\0214R_EBX_asb_8.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	9

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NAD 83

MATCHLINE SHEET 8 STA 49+00.00

MATCHLINE SHEET 10 STA 57+00.00

PHOTO POINT #11

PHOTO POINT #12

PHOTO POINT #13

PHOTO POINT #14

49+00 50+00 51+00 52+00 53+00 54+00 55+00 56+00 57+00

A A'

95 96

OE

ARMOR PIPE CROSSING WITH #57 STONE

ARMOR UPSTREAM AND DOWNSTREAM FACE OF FILL SLOPE WITH CLASS B RIP RAP

EL=99.1 CL

100.00 97.00 93.00

0.00 100.00 200.00 223.74

EL=94.3' EL=93.7' CL

SECTION A-A'

FILL EXISTING CHANNEL

CHANNEL BLOCK

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/12/2006
I:\0214R\Design\as-built\0214R_EBX_asb_9.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	10

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Fax: 919-463-5490

NAD 83

REBAR & CAP
2215325.43 N
584313.32 E
93.99 ELEV.

REBAR & CAP
2215548.93 N
584050.65 E
93.22 ELEV.

PHOTO POINT
#15

X-SECTION 10
STA 61+26.02

X-SECTION 9
STA 58+15.58

X-SECTION 11
STA 64+71.98

MATCHLINE SHEET 9 STA 57+00.00

MATCHLINE SHEET 11
STA 65+00.00

FILL EXISTING CHANNEL

CHANNEL BLOCK

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/10/2006
C:\0214R\Design\as-built\0214R_EBX_asb_10.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	11

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NAD 83

REBAR & CAP
2215622.36 N
584609.39 E
91.54 ELEV.

PHOTO POINT
#16

MATCHLINE SHEET 10
STA 65+00.00

65+00

66+00

X-SECTION 12
STA 65+21.43

67+00

68+00

PHOTO POINT
#17

X-SECTION 13
STA 68+92.20

69+00

70+00

71+00

REBAR & CAP
2215740.31 N
585002.58 E
90.57 ELEV.

X-SECTION 14
STA 73+09.46

72+00

73+00

74+00

MATCHLINE SHEET 12
STA 74+00.00

PHOTO POINT
#18

FARM PATH

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/10/2006
c:\0214R\Design\as-built\0214R_EBX_asb_11.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	12

PROJECT ENGINEER

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APRIL 4, 2006

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Cary, North Carolina 27511
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Fax: 919-463-5490

NAD 83

MATCHLINE SHEET 11
STA 74+00.00

MATCHLINE SHEET 13
STA 81+50.00

75+00
76+00
77+00
78+00
79+00
80+00
81+00

X-SECTION 15
STA 81+45.73

FARM PATH

REBAR & CAP
2216388.37 N
585260.18 E
89.30 ELEV.

FILL EXISTING CHANNEL

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/12/2006
I:\0214R\Design\as-built\0214R_EBX_asb_12.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	13

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Cary, North Carolina 27511
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Fax: 919-463-5490

NAD 83

FARM PATH

MATCHLINE SHEET 12
STA 81+50.00

X-SECTION 16
STA 82+06.90

82+00
83+00
84+00
85+00
86+00

PHOTO POINT
#19

PHOTO POINT
#20

END CONSTRUCTION
STA 86+42.56

REBAR & CAP
2216851.22 N
585598.33 E
88.53 ELEV.

WLB

CHANNEL BLOCK

FILL EXISTING CHANNEL

COX SITE
AS-BUILT

30 0 30 60
SCALE (FT)

4/4/2006
c:\0214R\Design\as-built\0214R_EBX_asb_13.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	14

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NAD 83

VEGETATION PLOT #5
VEGETATION PLOT #7
VEGETATION PLOT #8
VEGETATION PLOT #6
VEGETATION PLOT #11
VEGETATION PLOT #10
VEGETATION PLOT #9
MANUAL WELL #3
AUTOMATIC WELL #3
MANUAL WELL #2
AUTOMATIC WELL #1
VEGETATION PLOT #1
VEGETATION PLOT #2
VEGETATION PLOT #3
VEGETATION PLOT #4
MATCHLINE SHEET 15
CUT LIMITS
99.5
100.0
100.5
101.0
102.5
103.5
104.5
105.5
FILL EXISTING CHANNEL
CHANNEL BLOCK

GRADING PLAN / MONITORING OVERVIEW

100 50 0 100 200
SCALE (FT)

4/12/2006
10:21:41
K:\Design\as-built\0214R_EBX_asb_14.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	15

PROJECT ENGINEER

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Fax: 919-463-5490

NAD 83

ADJACENT PROPERTY CURRENTLY
OWNED BY EBX-NEUSE I,LLC

VEGETATION PLOT #21

AUTOMATIC WELL #5

VEGETATION PLOT #13

FILL LIMITS

VEGETATION PLOT #12

VEGETATION PLOT #14

MATCHLINE SHEET 14

VEGETATION PLOT #15

MANUAL WELL #6

VEGETATION PLOT #20

FARM PATH

CUT LIMITS

VEGETATION PLOT #19

MANUAL WELL #8

VEGETATION PLOT #18

VEGETATION PLOT #16

AUTOMATIC WELL #7

VEGETATION PLOT #17

FILL EXISTING CHANNEL

CHANNEL BLOCK

GRADING PLAN / MONITORING OVERVIEW

100 50 0 100 200
SCALE (FT)

4/12/2006
C:\0214R\Design\as-built\0214R_EBX_asb_15.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	16

PROJECT ENGINEER

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Cary, North Carolina 27511
Phone: 919-463-5488
Fax: 919-463-5490

NAD 83

MATCHLINE SHEET 17

PLANTING ZONES

- RIVERINE WETLAND
- NON-RIVERINE WETLAND
- MINIMUM 50' STREAM RESTORATION BUFFER
- MINIMUM 50' STREAM ENHANCEMENT BUFFER

NOTE:
SEE VEGETATION SELECTION TABLES SHEET 1-A TO DETERMINE SPECIES COMPOSITION OF DIFFERENT PLANTING ZONES

WETLAND OVERVIEW

100 50 0 100 200
SCALE (FT)

4/12/2006
N:\0214R\Design\as-built\0214R_EBX_asb_16.dgn

2/26/03

BUCK PROJECT REFERENCE NO.	SHEET NO.
0214R	17

PROJECT ENGINEER

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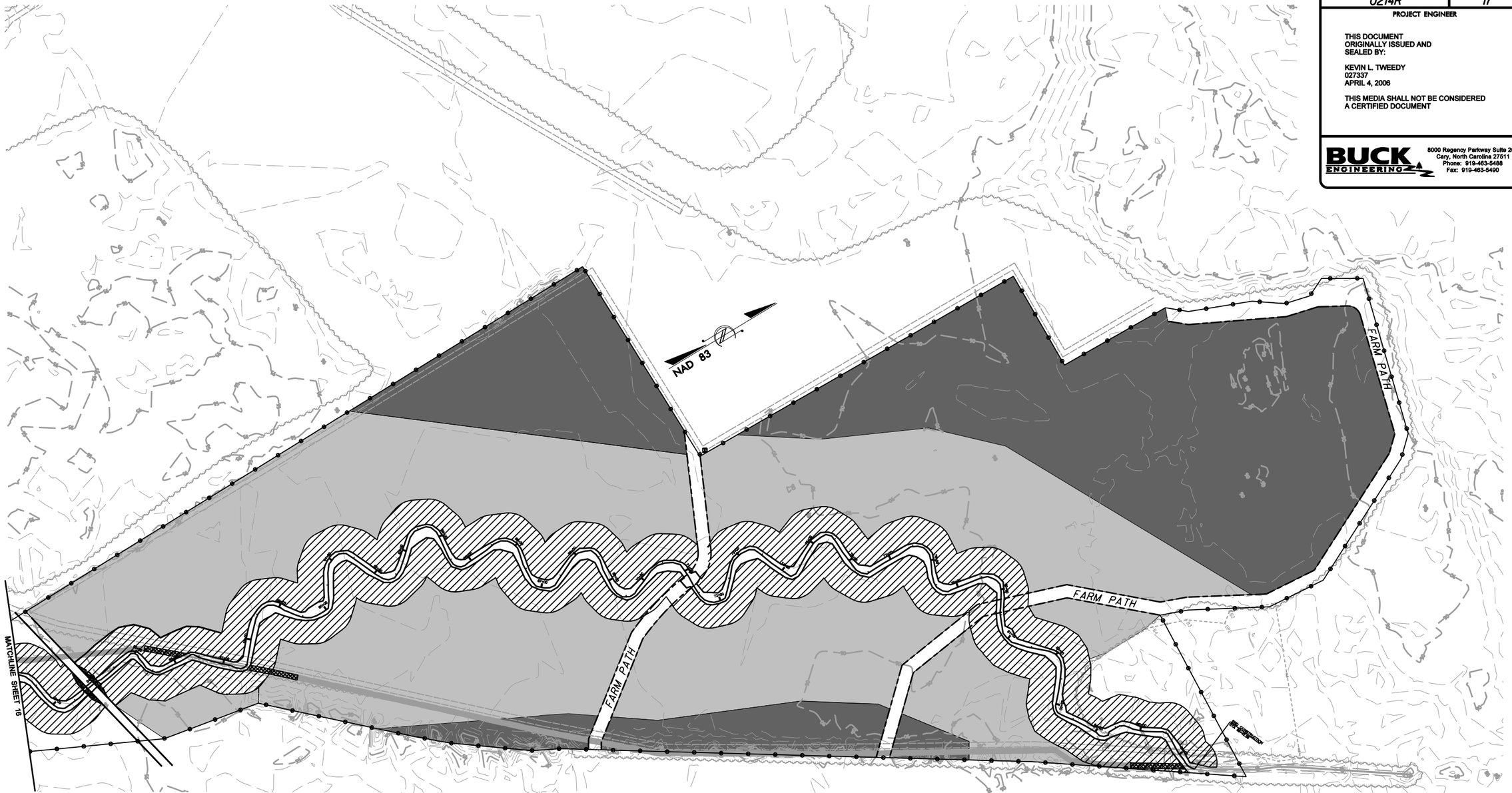


PLANTING ZONES

- RIVERINE WETLAND
- NON-RIVERINE WETLAND
- MINIMUM 50' STREAM RESTORATION BUFFER
- MINIMUM 50' STREAM ENHANCEMENT BUFFER

NOTE:
SEE VEGETATION SELECTION TABLES SHEET 1-A TO DETERMINE SPECIES COMPOSITION OF DIFFERENT PLANTING ZONES

WETLAND OVERVIEW

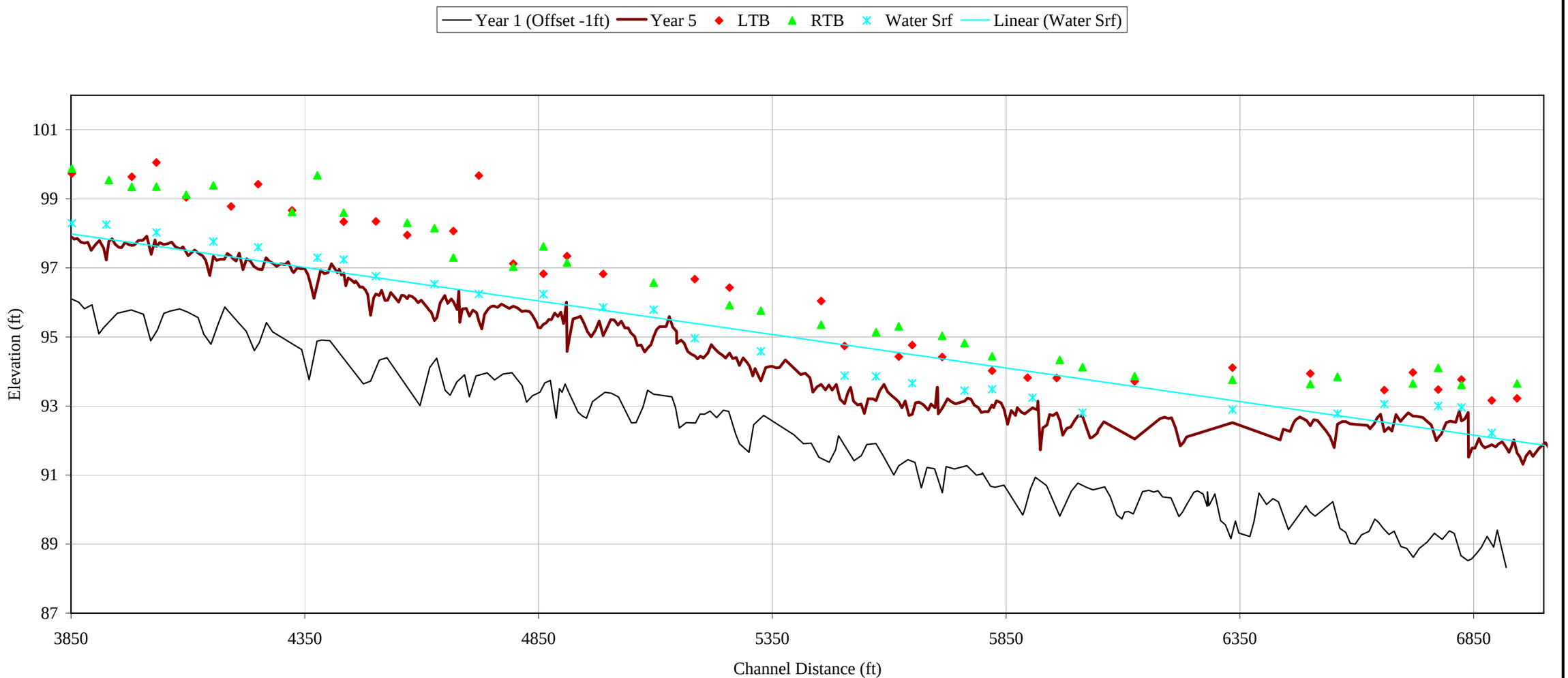
100 50 0 100 200
SCALE (FT)

4/12/2006
c:\projects\0214R\design\as-built\0214R_EBX_asb_17.dgn

APPENDIX B

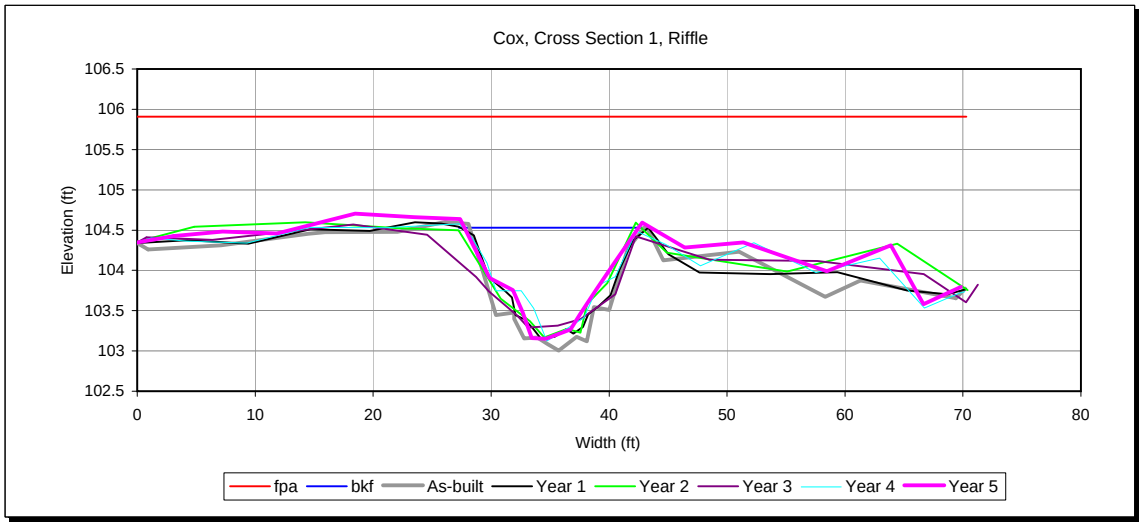
2010 Profile and Cross Section Data

Cox
Station 38+52 - 68+92



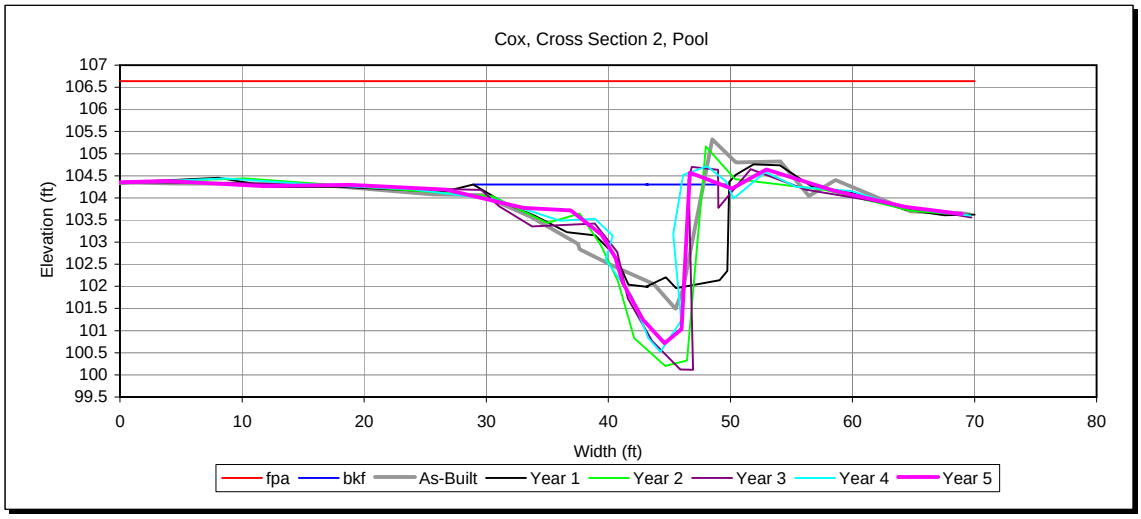
Looking at left bank.

Looking at right bank.



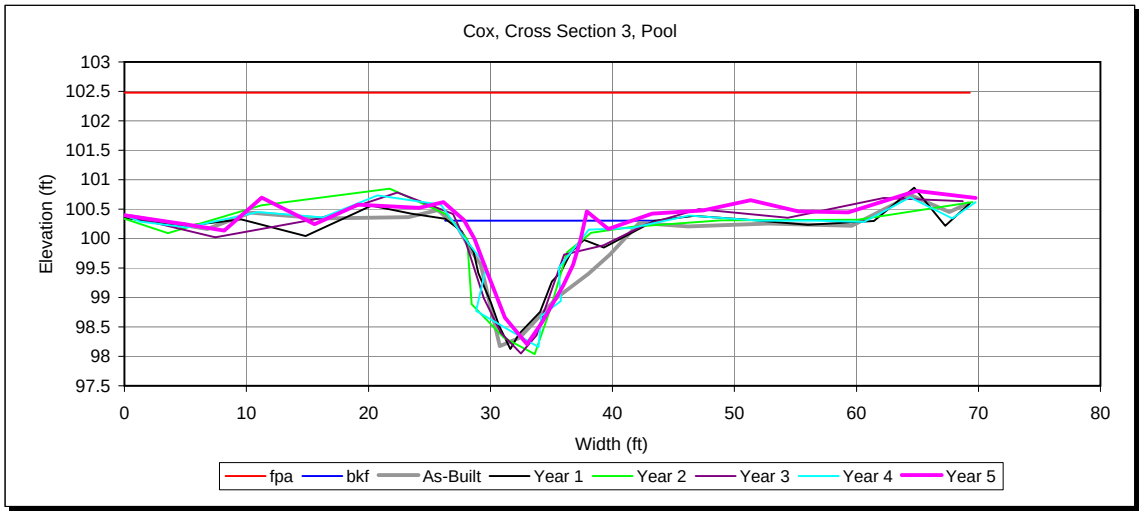
Looking at left bank.

Looking at right bank.



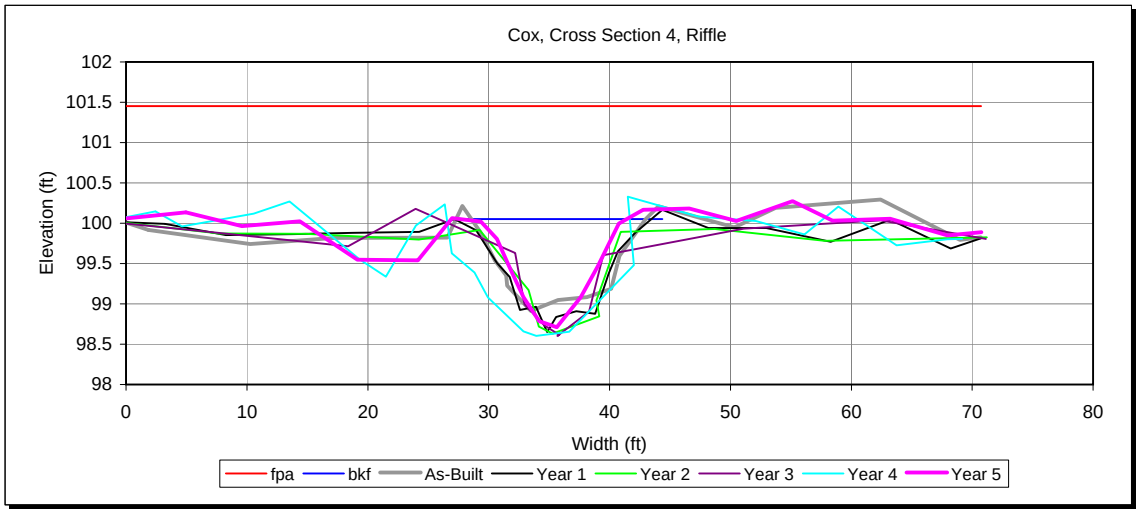
Looking at left bank.

Looking at right bank.



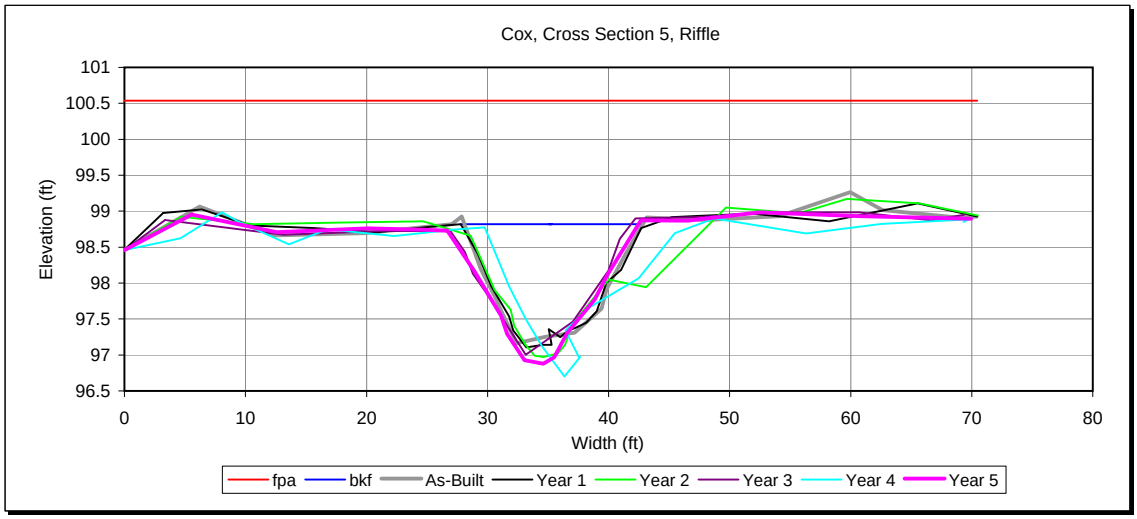
Looking at left bank.

Looking at right bank.



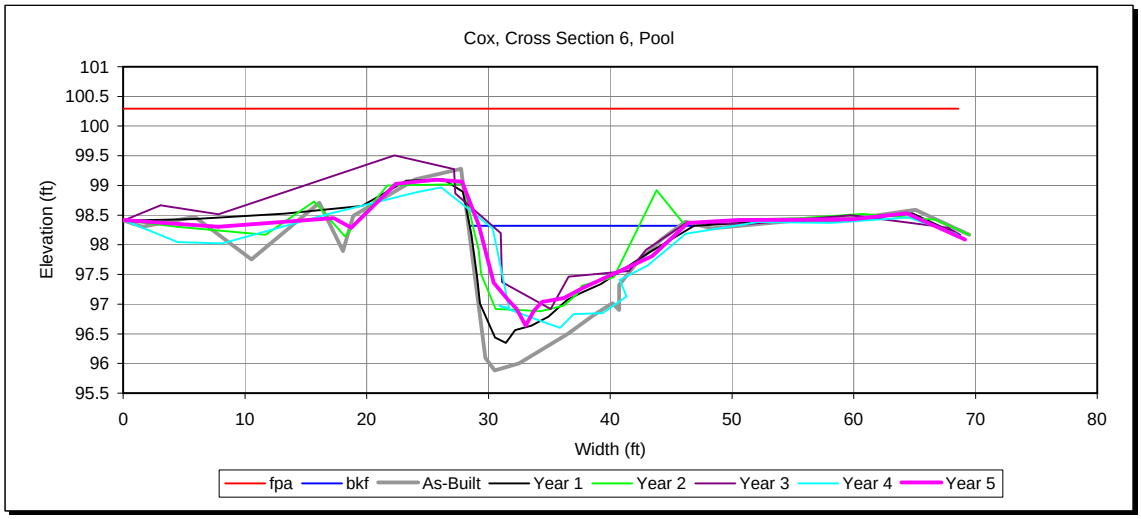
Looking at left bank.

Looking at right bank.



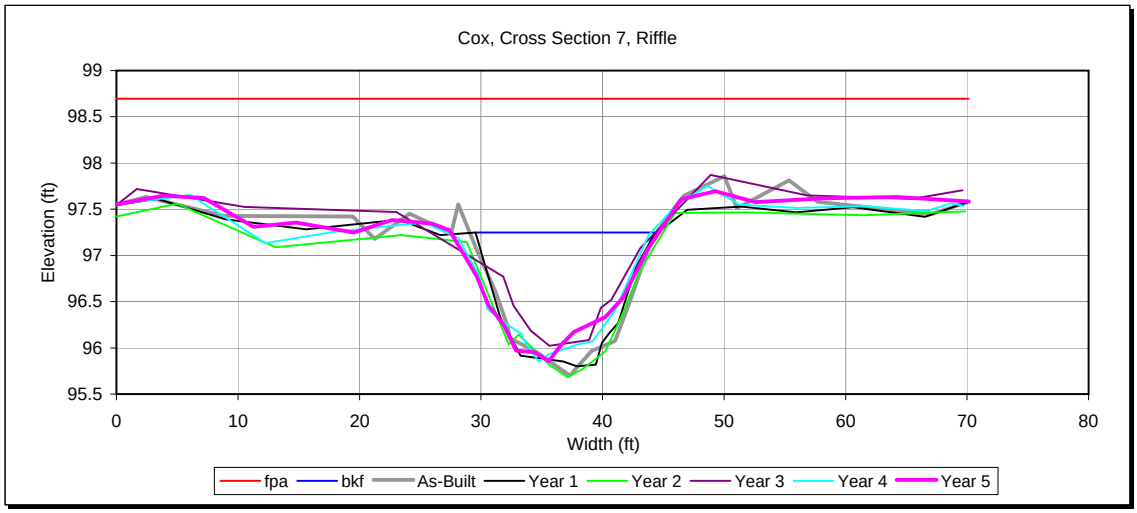
Looking at left bank.

Looking at right bank.



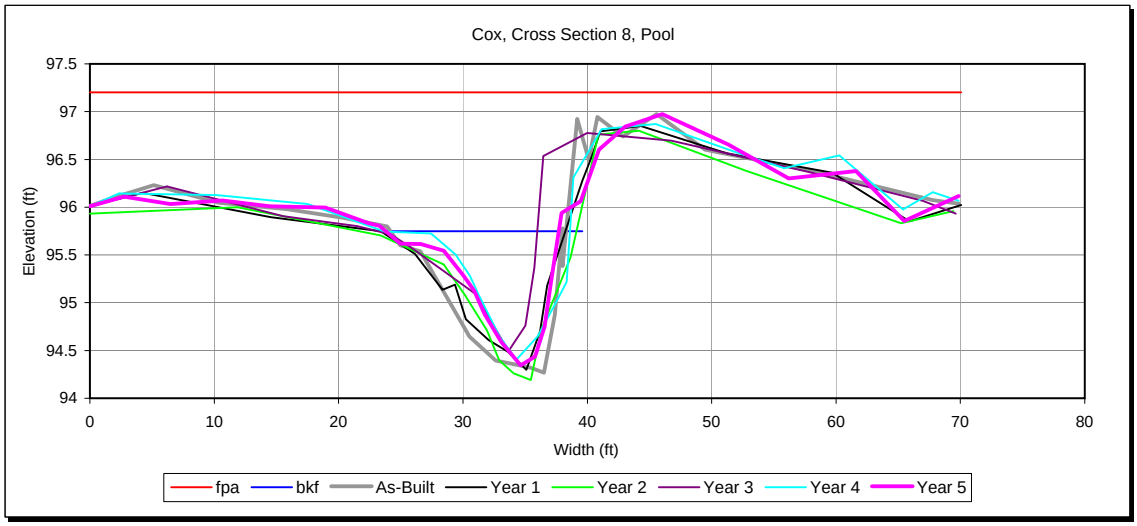
Looking at left bank.

Looking at right bank.



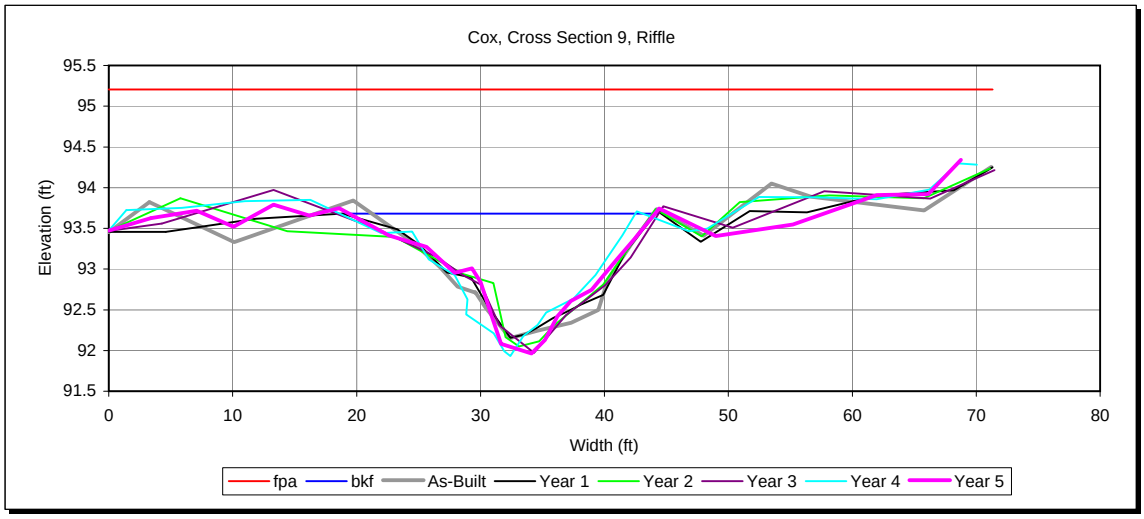
Looking at left bank.

Looking at right bank.



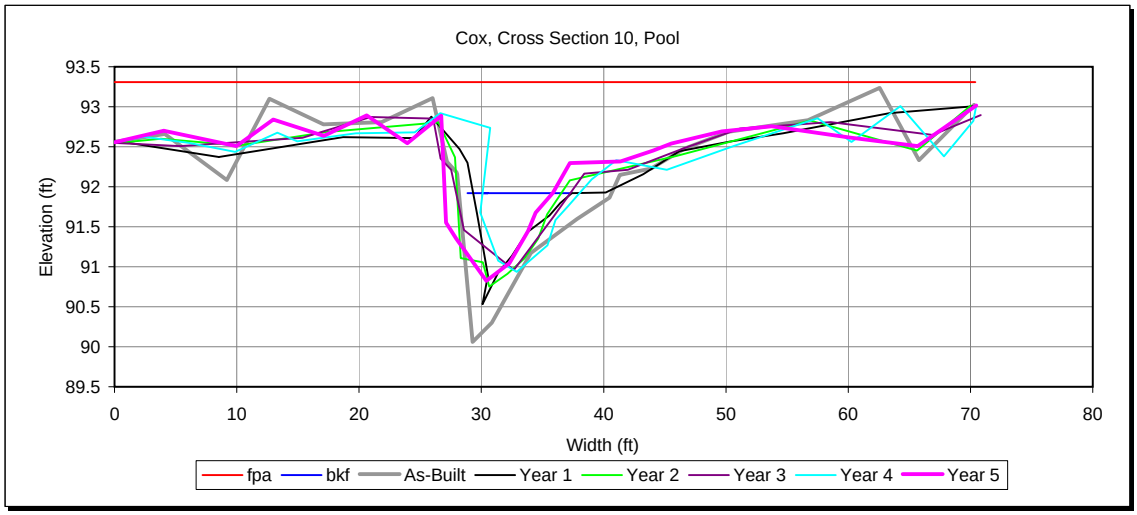
Looking at left bank.

Looking at right bank.



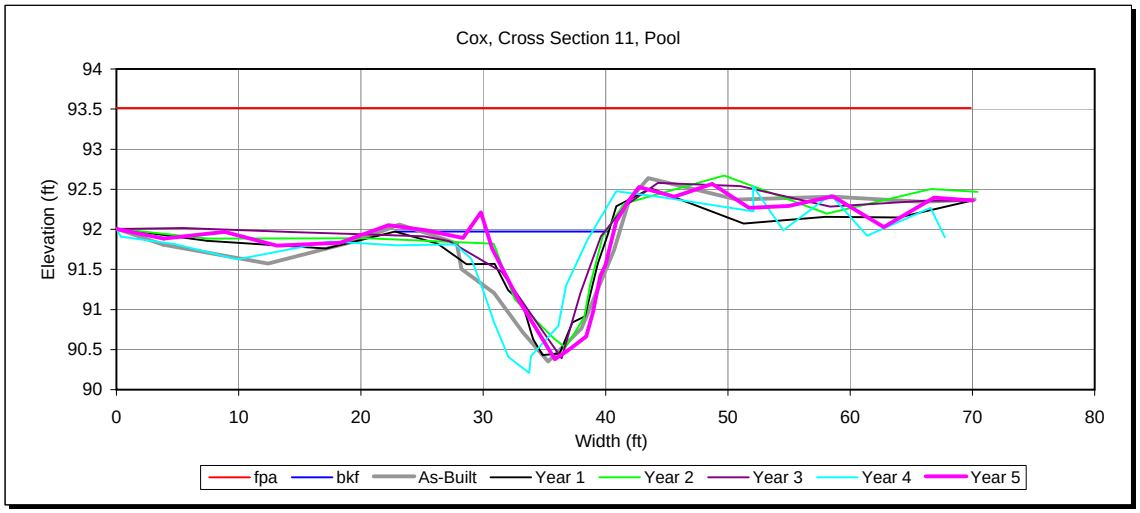
Looking at left bank.

Looking at right bank.



Looking at left bank.

Looking at right bank.



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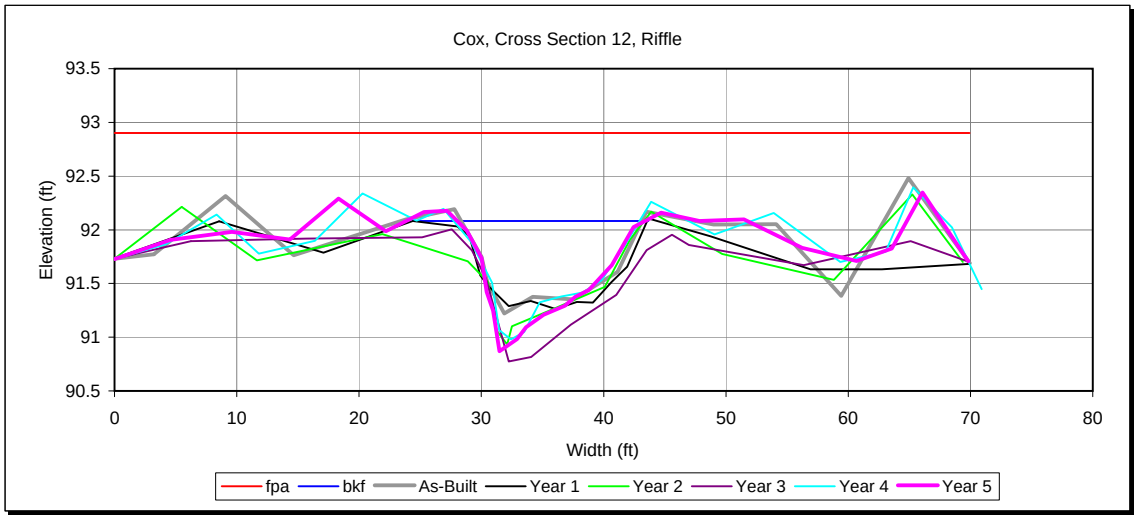
Looking at right bank.



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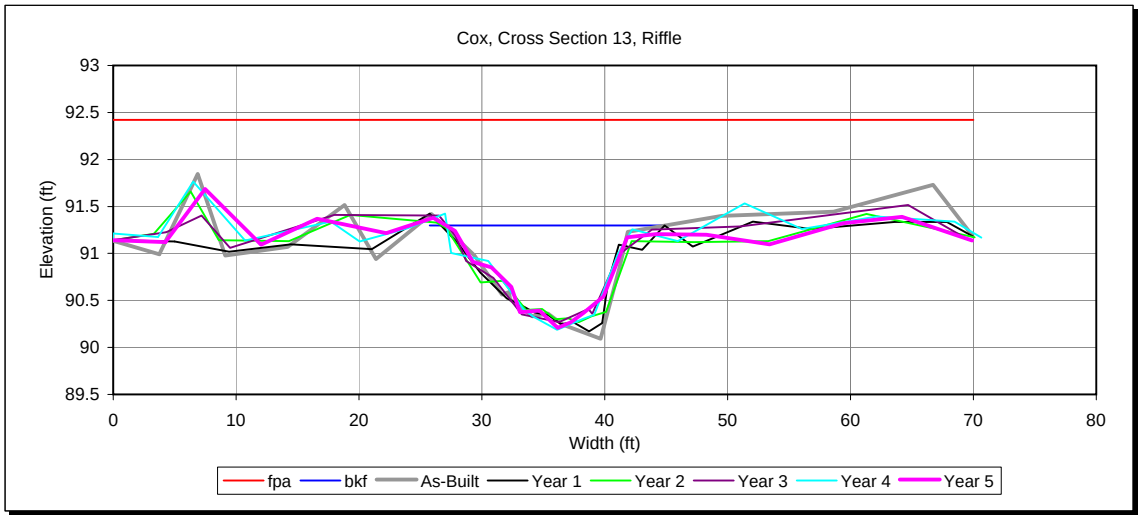
Looking at right bank.



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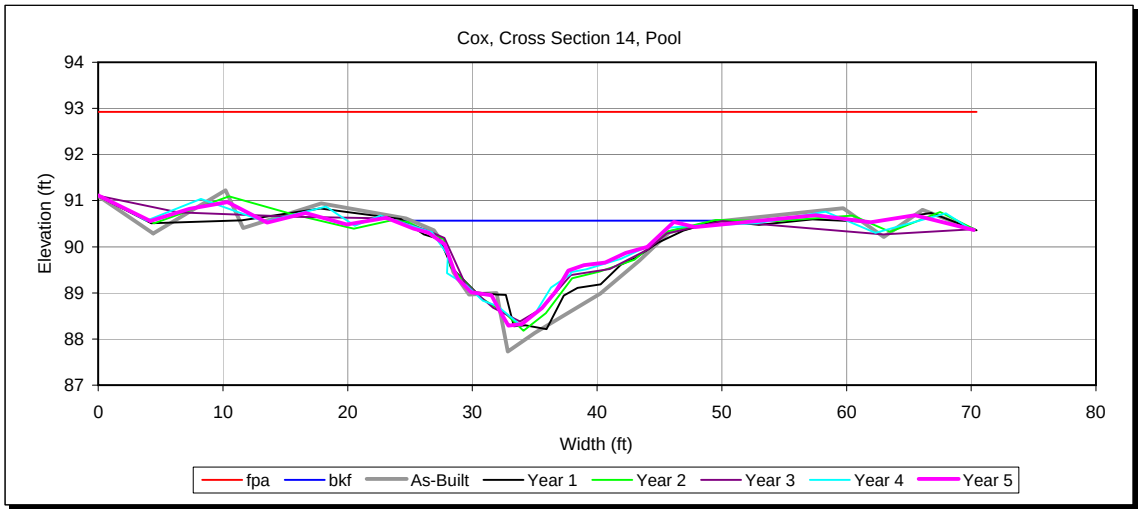

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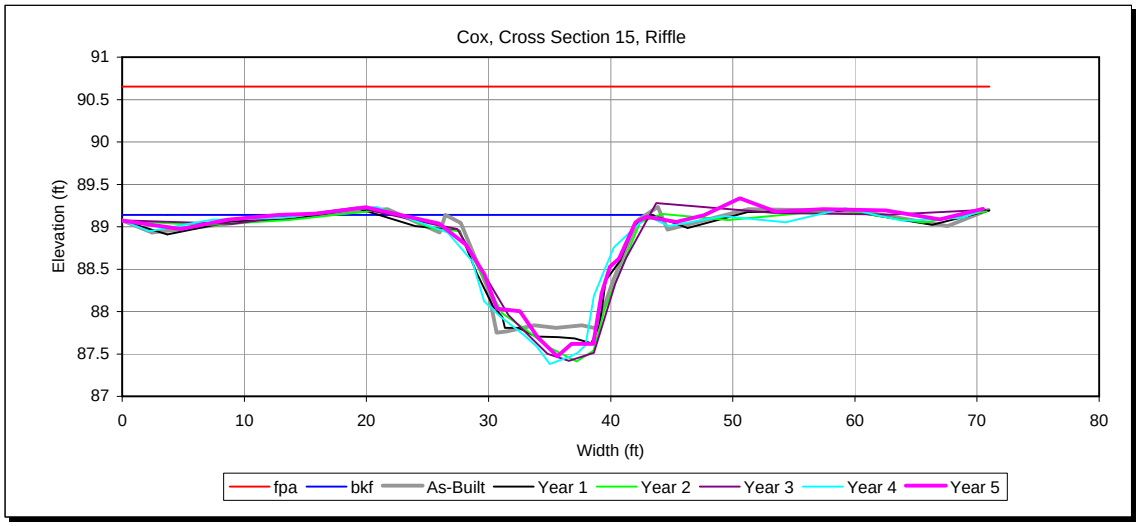

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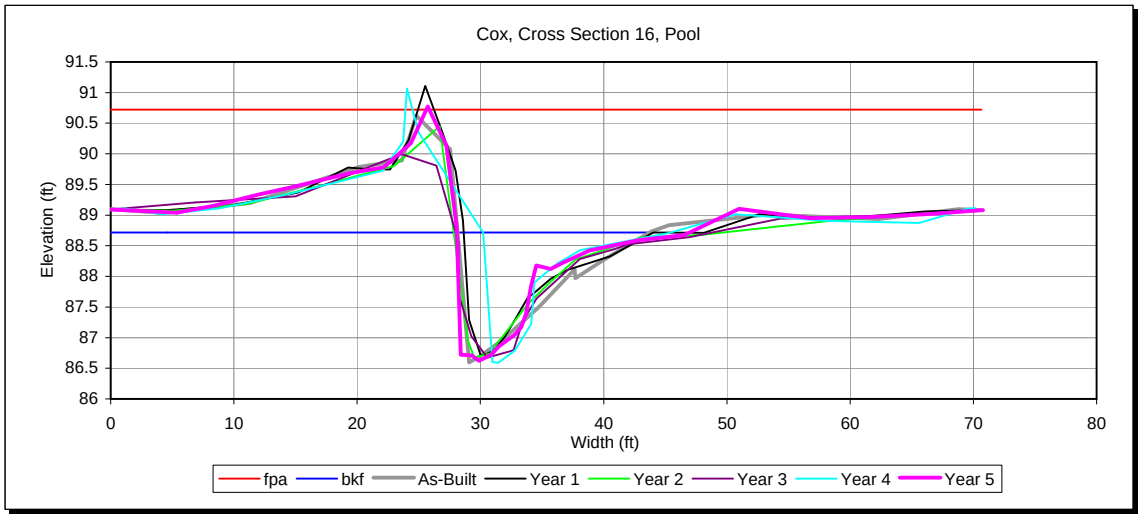
Looking at right bank.



APPENDIX C

2010 Gauge Data

317994 Smithfield

Date	Time	Water Level (inches)																			On-site Manual Rain Gauge	On-site Tipping Bucket	TBRG Monthly Totals	Smithfield Daily Rainfall	Smithfield Monthly Rainfall
dd-mmm-yyyy	hh:mm:ss	Cox AW1	Cox MW2	Cox AW3	Cox AW4	Cox AW5	Cox AW6	Cox AW7	Cox MW8	Cox MW9	Cox AW10	Cox AW11	Cox AW12	Ref AW1	Ref MW2	Ref AW3	Ref MW4	Ref AW5	CG							
1-Jan-2010	08:00:00	2.54		0.75	0.23	3.45	-0.69	2.76			4.09	2.33	-2.65	3.23		-1.81		-3.91				0.01		0.00	
1-Jan-2010	20:00:00	2.43		0.02	-0.34	2.89	-1.19	2.51			3.66	1.72	-3.45	2.80		-2.32		-4.39							
2-Jan-2010	08:00:00	2.17		-1.68	-1.42	2.34	-2.25	2.05			3.40	0.90	-7.97	1.87		-2.95		-4.88						0.00	
2-Jan-2010	20:00:00	2.16		-3.75	-2.54	1.99	-3.59	1.76			3.25	0.30	-10.66	0.99		-3.49		-5.10							
3-Jan-2010	08:00:00	2.01		-6.19	-4.44	0.89	-4.99	1.29			2.75	-0.74	-12.20	0.01		-3.91		-5.34						0.00	
3-Jan-2010	20:00:00	2.05		-6.22	-4.46	0.85	-5.51	1.32			3.10	-0.42	-12.91	-0.63		-4.04		-5.38							
4-Jan-2010	08:00:00	1.85		-8.41	-6.85	-0.99	-6.74	0.48			2.51	-2.37	-14.14	-1.60		-4.41		-5.68						0.00	
4-Jan-2010	20:00:00	1.94		-7.72	-5.67	-0.68	-7.00	1.03			3.08	-0.91	-14.37	-1.60		-4.35		-5.56							
5-Jan-2010	08:00:00	1.66		-9.88	-8.66	-3.26	-8.32	0.08			2.43	-3.59	-15.45	-2.41		-4.71		-5.93						0.00	
5-Jan-2010	20:00:00	1.76		-9.26	-6.95	-2.48	-8.32	0.79			3.06	-1.48	-15.55	-2.61		-4.59		-5.73							
6-Jan-2010	08:00:00	1.55		-10.79	-9.59	-4.62	-9.41	-0.14			2.43	-3.97	-16.44	-3.14		-4.91		-6.03						0.00	
6-Jan-2010	20:00:00	1.68		-10.39	-8.17	-3.55	-9.40	0.58			3.02	-2.06	-16.57	-3.25		-4.82		-5.89							
7-Jan-2010	08:00:00	1.47		-11.62	-10.54	-5.70	-10.34	-0.50			2.41	-4.61	-17.18	-3.68		-5.12		-6.17						0.00	
7-Jan-2010	20:00:00	1.87		-10.23	-8.12	-4.04	-10.04	0.71			3.04	-1.79	-16.85	-3.29		-4.87		-5.70							
8-Jan-2010	08:00:00	1.73		-10.47	-8.57	-4.39	-10.34	0.52			3.06	-1.82	-17.01	-3.32		-4.75		-5.73						0.01	
8-Jan-2010	20:00:00	1.60		-11.86	-10.44	-5.69	-10.82	-0.03			2.92	-3.48	-17.85	-3.97		-5.13		-6.08							
9-Jan-2010	08:00:00	1.48		-12.72	-11.38	-6.43	-11.40	-0.33			2.47	-4.87	-18.24	-4.27		-5.39		-6.34						0.00	
9-Jan-2010	20:00:00	1.74		-12.71	-11.27	-6.33	-11.66	-0.22			2.66	-4.16	-18.33	-4.23		-5.32		-6.35							
10-Jan-2010	08:00:00	1.45		-13.69	-12.76	-7.55	-12.33	-1.26			2.00	-6.55	-18.86	-4.75		-5.73		-6.79						0.00	
10-Jan-2010	20:00:00	1.64		-13.55	-11.72	-6.65	-12.21	-0.42			2.62	-4.22	-18.91	-4.80		-5.58		-6.64							
11-Jan-2010	08:00:00	1.50		-14.24	-13.40	-8.65	-13.26	-1.96			1.59	-7.74	-19.33	-5.10		-6.13		-7.11						0.00	
11-Jan-2010	20:00:00	1.79		-13.09	-10.88	-5.97	-12.23	-0.12			2.66	-2.85	-18.69	-4.32		-5.36		-6.44							
12-Jan-2010	08:00:00	1.61		-13.47	-11.81	-6.95	-12.61	-0.48			2.66	-3.84	-19.27	-4.53		-5.59		-6.36						0.00	
12-Jan-2010	20:00:00	1.69		-13.88	-12.36	-6.81	-12.79	-0.46			2.82	-4.18	-19.52	-4.79		-5.70		-6.35							
13-Jan-2010	08:00:00	1.50		-14.82	-13.76	-8.95	-13.66	-1.67			2.14	-7.06	-19.92	-5.09		-6.10		-6.81						0.00	
13-Jan-2010	20:00:00	1.75		-14.22	-12.52	-7.26	-13.22	-0.42			2.65	-4.22	-19.76	-4.63		-5.80		-6.59							
14-Jan-2010	08:00:00	1.50		-15.07	-13.99	-9.20	-14.07	-1.78			2.14	-7.11	-20.23	-4.87		-6.11		-6.89						0.00	
14-Jan-2010	20:00:00	1.72		-14.75	-13.18	-7.47	-13.49	4.91			2.64	-4.49	-20.23	-4.60		-5.90		-6.65							
15-Jan-2010	08:00:00	1.62		-15.24	-14.01	-8.97	-14.08	-1.21			2.44	-6.12	-20.49	-5.24		-6.09		-6.82						0.00	
15-Jan-2010	20:00:00	1.78		-14.93	-13.47	-7.99	-13.82	4.65			2.58	-4.77	-20.53	-5.25		-6.00		-6.62							
16-Jan-2010	08:00:00	1.73		-15.45	-14.14	-8.95	-14.20	3.20			2.54	-5.95	-20.81	-5.42		-6.18		-6.74						0.00	
16-Jan-2010	20:00:00	1.91		-14.79	-13.27	-8.04	-13.97	4.09			2.58	-4.39	-20.64	-5.23		-5.99		-6.51							
17-Jan-2010	08:00:00	3.14		2.23	1.27	2.23	-1.51	-5.43			5.89	3.94	-8.43	4.18		-0.36		0.81				1.38		0.29	
17-Jan-2010	20:00:00	3.14		1.87	1.07	6.80	1.01	10.45			6.52	3.55	4.27	5.41		-0.48		-1.78							
18-Jan-2010	08:00:00	2.59		0.59	0.33	6.12	1.77	9.92			4.69	2.43	3.50	4.25		-1.40		-3.70						1.16	
18-Jan-2010	20:00:00	2.56		-0.13	-0.34	4.42	1.55	6.97			3.75	1.78	2.06	3.50		-2.02		-4.31							
19-Jan-2010	08:00:00	2.40		-1.37	-1.13	3.27	1.16	6.57			3.47	1.27	-0.51	2.47		-2.54		-4.76						0.00	
19-Jan-2010	20:00:00	2.45		-2.43	-1.47	2.76	0.63	6.89			3.38	0.99	-1.87	2.00		-2.78		-4.86							
20-Jan-2010	08:00:00	2.34		-4.30	-2.44	2.46	-0.12	4.88			3.26	0.49	-3.32	1.49		-3.12		-5.08						0.00	
20-Jan-2010	20:00:00	2.29		-4.89	-3.09	2.18	-0.92	6.01			3.21	0.32	-7.85	1.01		-3.34		-5.20							
21-Jan-2010	08:00:00	2.21		-6.61	-4.26	1.76	-1.89	5.04			2.99	-0.42	-11.23	0.05		-3.75		-5.48				1.01		0.00	
21-Jan-2010	20:00:00	2.96		1.35	0.99	2.93	-0.27	2.46			4.25	2.96	-5.69	2.66		-1.24		-2.46							
22-Jan-2010	08:00:00	5.45		1.93	0.99	7.96	4.68	4.28			7.99	5.47	7.73	6.90		0.31		-1.41				0.13		0.00	
22-Jan-2010	20:00:00	2.85		0.92	0.49	6.26	2.68	5.74			5.09	2.78	5.38	4.12		-1.36		-3.38							
23-Jan-2010	08:00:00	2.67		0.24	-0.05	5.30	2.18	6.73			4.23	2.06	4.25	4.05		-1.73		-4.09						0.06	
23-Jan-2010	20:00:00	2.69		-0.03	-0.44	4.00	1.87	7.27			3.89	1.63	3.14	2.89		-2.08		-4.32							
24-Jan-2010	08:00:00	2.74		-0.34	-0.58	3.25	1.61	2.41			3.77	1.53	1.89	2.60		-2.36		-4.45						0.01	
24-Jan-2010	20:00:00	2.88		-0.02	-0.22	3.00	1.48	0.81			3.84	1.54	0.91	2.30		-2.31		-4.43							
25-Jan-2010	08:00:00	5.41		2.66	1.79	6.64	3.45	4.19			8.39	3.82	6.91	7.11		0.81		0.02				0.72		0.93	
25-Jan-2010	20:00:00	3.54		1.29	0.73	7.26	4.18	8.13			6.73	3.71	6.16	5.08		-0.94		-2.87							
26-Jan-2010	08:00:00	2.68		0.51	0.16	6.16	2.39	3.15			4.99	2.57	5.03	4.34		-1.53		-3.88						0.00	
26-Jan-2010	20:00:00	2.60		-0.15	-0.46	5.35	1.97	9.87			4.28	1.86	4.02	3.74		-1.89		-4.33							
27-Jan-2010	08:00:00	2.40		-1.53	-1.24	4.29	1.71	2.14			3.92	1.09	2.86	3.31		-2.15		-4.68						0.00	
27-Jan-2010	20:00:00	2.53		-2.20	-1.34	3.43	1.36	2.22			3.77	0.80	1.16	2.45		-2.36		-4.73							
28-Jan-2010	08:00:00	2.45		-3.14	-1.82	3.03	1.10	2.12			3.66	0.47	-0.30	1.75		-2.56		-4.85						0.00	
28-Jan-2010	20:00:00	2.50		-3.10	-1.81	2.88	0.89	1.99			3.69	0.52	-1.24	1.56		-2.56		-4.83							
29-Jan-2010	08:00:00	2.32		-4.92	-2.84	2.76	0.60	1.68			3.51	-0.08	-2.86	1.14		-2.81		-5.07						0.00	
29-Jan-2010	20:00:00	2.43		-4.65	-3.05	2.34	0.00	1.72			3.47	-0.24	-6.56	0.30		-3.00		-4.91							
30-Jan-2010	08:00:00	2.71		-1.70	-0.78	2.37	-0.22	2.70			3.96	1.47	-6.29	0.82		-2.31		-4.40						0.00	
30-Jan-2010	20:00:00	2.61		-1.17	-0.56	2.75	-0.44	2.39			4.38	1.51	-7.02	2.01		-1.91		-4.56							
31-Jan-2010	08:00:00	2.23		-4.23	-2.03	2.39	-1.15	1.79			3.56	0.30	-9.21	1.24		-2.79		-4.99				0.42		0.00	
31-Jan-2010	20:00:00	2.52		-1.07	-0.44	2.94	-1.00	2.44			3.95	1.77	-8.59	1.69		-2.72		-4.63					3.67		2.46
1-Feb-2010	08:00:00	2.42		-4.19	-2.19	2.03	-2.56	1.66			3.32	0.26	-10.30	0.76		-3.20		-5.07						0.00	
1-Feb-2010	20:00:00	2.87		1.16	0.64	3.32	-0.69	2.63			4.34	2.54	-5.53	2.36		-1.80		-3.96							
2-Feb-2010	08:00:00	2.90		0.77	0.44	2.89	-1.62	2.46			4.01	1.92	-7.14	2.12		-2.19		-4.16				0.35		0.69	
2-Feb-2010	20:00:00	3.47		1.75	1.03	6.46	1.63	3.52			6.39	3.14	5.10	4.99		-0.75		-2.18							
3-Feb-2010	08:00:00	3.12		1.29	0.70	6.57	2.08	3.09			5.68	2.68	5.34	4.45		-1.07		-2.95				0.03		0.48	
3-Feb-2010	20:00:00	3.08		0.87	0.48	6.41	1.94	2.79			5.44	2.32	4.96	4.39		-0.95		-2.94							
4-Feb-2010	08:00:00	2.85		0.25	-0.16	5.88	1.66	2.41			4.59	1.54	4.06	4.09		-1.57		-3.89						0.00	
4-Feb-2010	20:00:00	2.99		0.07	-0.28	4.76	1.41	2.51			4.39	1.42	3.31	3.37		-1.48		-3.89							
5-Feb-2010	08:00:00	3.03		0.42	0.10	4.06	1.21	2.68			4.30	1.63	2.29	3.29		-1.62		-3.79				1.23		0.00	
5-Feb-2010	20:00:00	6.99		3.37	2.27	7.67	3.84	5.50			9.31	5.02	7.42	10.80		3.17		2.92							
6-Feb-2010	08:00:00	5.80		1.81	1.04	8.10	5.87	5.15			7.73	4.80	7.29	5.71		-0.51		-2.05				0.01		1.63	
6-Feb-2010	20:00:00	3.68		0.98	0.61	6.92	2.76	3.23			5.94	2.86	5.65	4.84		-1.07		-3.34							
7-Feb-2010	08:00:00	6.00		0.23	-0.07	6.33	2.19	3.03			5.15	2.03	4.82	4.37		-1.39		-3.84						0.01	
7-Feb-2010	20:00:00	2.87		-0.01	-0.44	5.99	3.42	3.05			4.86	1.64	4.24	3.66		-1.44		-4.02							
8-Feb-2010	08:00:00	2.67		-1.16	-1.14	5.42	5.92	4.08			4.50	1.03	3.11	3.53		-1.65		-4.25						0.00	
8-Feb-2010	20:00:00	2.82		-1.14	-0.80	5.07	9.45	6.44			4.53	1.02	2.19	3.16		-1.64		-4.29							
9-Feb-2010	08:00:00	2.83		-1.54	-0.85	4.40	9.78	6.91			4.35	0.85	0.99	2.87		-1.77		-4.33				0.25		0.00	
9-Feb-2010	20:00:00	3.39		1.76	1.11	5.86	8.08	6.57			5.96	3.09	3.34	4.75		-0.72		-2.38							
10-Feb-2010	08:00:00	3.10		1.08	0.63	6.45	5.07	4.41			5.33	2.44	4.52	4.16		-1.07		-3.43				0.01		0.00	
10-Feb-2010	20:00:00	3.01		0.43	0.06	5.80	2.58	2.97			4.70	1.67	3.82	3.43		-1.47		-4.00							
11-Feb-2010	08:00:00	2.83		-0.69	-0.74	4.79	2.02	2.36			4.29	1.01	2.15	3.05		-1.66		-4.31						0.00	
11-Feb-2010	20:00:00	2.87		-1.15	-0.95	4.18	1.81	2.12			4.28	0.76	0.95	2.42		-1.81		-4.40							
12-Feb-2010	08:00:00	2.79		-2.42	-1.44	3.55	1.62	2.01			4.09	0.37	-0.55	1.95		-2.07		-4.57						0.00	
12-Feb-2010	20:00:00	2.88		-2.05	-1.20	3.09	1.32	2.33			4.16	0.78	-1.16	2.06		-2.04		-4.46							
13-Feb-2010	08:00:00	2.95		-0.97	-0.40	3.41	1.42	2.34			4.45	1.28	-1.88	2.55		-1.71		-4.30				0.15		0.00	
13-Feb-2010	20:00:00	3.10		0.69	0.67	4.65	1.68	2.87			4.82	2.59	-0.78	3.42		-1.15		-3.61							
14-Feb-2010	08:00:00	3.05		-0.55	-0.37	4.61	1.14	2.24			4.19	1.30	-2.82	2.71		-1.72		-4.14						0.08	
14-Feb-2010	20:00:00	3.10		-0.50	-0.33	4.03	1.04	2.42			4.33	1.31	-3.85	2.94		-1.54		-4.03							
15-Feb-2010	08:00:00	3.10		-1.18	-0.58	3.23	0.47	2.34			4.10	0.94	-6.46	2.24		-1.93		-4.24				0.01		0.00	

Date	Time	Water Level (inches)																		On-site Manual Rain Gauge	On-site Tipping Bucket	TBRG Monthly Totals	Smithfield Daily Rainfall	Smithfield Monthly Rainfall
dd-mmm-yyyy	hh:mm:ss	Cox AW1	Cox MW2	Cox AW3	Cox AW4	Cox AW5	Cox AW6	Cox AW7	Cox MW8	Cox MW9	Cox AW10	Cox AW11	Cox AW12	Ref AW1	Ref MW2	Ref AW3	Ref MW4	Ref AW5	CG					
15-Feb-2010	20:00:00	3.16		-1.26	-0.54	3.07	-0.04	2.35			4.21	1.05	-7.01	1.86		-1.86		-4.26						
16-Feb-2010	08:00:00	3.67		-3.09	-1.40	2.91	-0.61	1.82			3.96	0.44	-8.60	1.09		-2.27		-4.53					0.01	
16-Feb-2010	20:00:00	3.41		-3.88	-2.04	2.60	-1.51	1.66			3.93	0.14	-9.52	0.22		-2.51		-4.62						
17-Feb-2010	08:00:00	3.27		-5.11	-3.24	1.80	-2.81	1.47			3.73	-0.45	-10.47	-0.58		-2.80		-4.74					0.00	
17-Feb-2010	20:00:00	3.29		-5.06	-3.34	1.84	-3.47	1.38			3.92	-0.12	-10.83	-0.93		-2.78		-4.74						
18-Feb-2010	08:00:00	3.93		-6.17	-4.36	1.13	-4.35	1.18			3.68	-0.70	-11.85	-1.49		-3.06		-4.84					0.00	
18-Feb-2010	20:00:00	3.87		-6.41	-4.58	0.86	-4.99	1.05			3.72	-0.63	-12.15	-2.00		-3.04		-4.89						
19-Feb-2010	08:00:00	3.90		-7.51	-5.78	0.10	-5.80	0.79			3.55	-1.26	-12.96	-2.40		-3.34		-5.06					0.00	
19-Feb-2010	20:00:00	3.98		-7.09	-5.74	-0.24	-6.28	0.70			3.63	-1.06	-13.17	-2.43		-3.38		-4.92						
20-Feb-2010	08:00:00	3.94		-8.18	-6.72	-1.16	-7.00	0.52			3.44	-1.77	-13.82	-2.95		-3.60		-5.12					0.00	
20-Feb-2010	20:00:00	4.03		-7.38	-6.25	-1.47	-7.41	0.59			3.61	-1.28	-13.75	-3.03		-3.54		-5.00						
21-Feb-2010	08:00:00	3.96		-8.44	-7.23	-2.06	-7.94	0.44			3.46	-1.86	-14.34	-3.06		-3.71		-5.14					0.00	
21-Feb-2010	20:00:00	4.05		-7.15	-6.18	-2.52	-8.29	0.62			3.62	-1.14	-13.99	-3.16		-3.56		-4.97						
22-Feb-2010	08:00:00	4.12		-6.94	-6.25	-2.90	-8.60	0.78			3.30	-1.01	-14.22	-3.04		-3.61		-4.87			0.14		0.00	
22-Feb-2010	20:00:00	3.15		-0.41	-0.27	1.09	-4.56	2.34			4.04	2.23	-9.53	0.39		-1.41		-3.83						
23-Feb-2010	08:00:00	2.95		-1.59	-1.18	1.32	-5.69	1.87			7.80	1.47	-11.33	0.07		-2.18		-4.16			0.01		0.36	
23-Feb-2010	20:00:00	2.92		-2.92	-2.14	0.94	-6.40	1.47			7.98	0.83	-12.29	-1.02		-2.69		-4.34						
24-Feb-2010	08:00:00	2.80		-2.34	-1.48	1.15	-5.99	1.88			8.40	1.27	-12.29	-1.21		-2.52		-4.27					0.05	
24-Feb-2010	20:00:00	3.01		-0.98	-0.62	1.03	-5.57	2.14			8.57	1.58	-12.63	-1.18		-2.67		-3.81						
25-Feb-2010	08:00:00	2.91	2.50	-1.39	-0.87	1.38	-5.10	2.04	2.00	6.75	9.86	1.45	-11.32	-0.65	-4.00	-2.24	-3.00	-4.19	0.00		0.11		0.13	
25-Feb-2010	20:00:00	2.85		-3.52	-2.14	1.14	-5.99	1.64			10.80	0.56	-12.94	-1.41		-2.91		-4.49						
26-Feb-2010	08:00:00	2.76		-5.07	-3.51	-0.19	-6.96	1.40			6.75	-0.16	-13.77	-2.28		-3.35		-4.74					0.02	
26-Feb-2010	20:00:00	2.72		-5.89	-4.28	-0.74	-7.45	0.99			4.61	-0.63	-14.28	-2.67		-3.55		-4.90						
27-Feb-2010	08:00:00	2.65		-6.91	-5.30	-1.81	-8.09	0.94			5.18	-1.20	-14.91	-3.12		-3.84		-5.02					0.00	
27-Feb-2010	20:00:00	2.63		-7.19	-5.78	-2.34	-8.38	0.67			7.61	-1.50	-15.20	-3.44		-3.96		-5.11						
28-Feb-2010	08:00:00	2.50		-8.53	-6.99	-3.01	-8.73	0.52			3.93	-2.10	-15.85	-3.65		-4.26		-5.32					0.00	
28-Feb-2010	20:00:00	2.42		-9.19	-7.74	-3.59	-8.98	0.10			7.86	-2.62	-16.27	-3.67		-4.37		-5.44				2.30		3.46
1-Mar-2010	08:00:00	2.37		-10.14	-8.86	-4.27	-9.31	0.03			3.21	-3.31	-16.80	-3.83		-4.64		-5.67					0.00	
1-Mar-2010	20:00:00	2.52		-9.62	-8.55	-4.65	-9.52	0.12			3.24	-3.06	-16.81	-4.21		-4.72		-5.54						
2-Mar-2010	08:00:00	2.51		-9.83	-8.76	-5.08	-9.69	0.51			3.25	-2.84	-16.86	-4.21		-4.79		-5.44					0.00	
2-Mar-2010	20:00:00	3.56		1.67	1.05	3.63	-0.37	3.50			5.95	2.95	-1.65	4.51		-0.49		-1.92						
3-Mar-2010	08:00:00	3.55		1.84	1.02	6.82	1.62	3.70			5.85	3.12	4.36	5.10		-0.40		-2.15					0.00	
3-Mar-2010	20:00:00	3.46		1.08	0.60	6.73	2.01	3.09			5.18	2.46	4.31	4.22		-0.96		-3.15						
4-Mar-2010	08:00:00	3.25		0.50	0.20	6.02	1.78	2.58			4.36	1.79	3.02	3.15		-1.50		-3.84					0.16	
4-Mar-2010	20:00:00	3.19		-0.24	-0.47	4.76	1.47	2.22			4.02	1.18	1.36	2.11		-1.93		-4.19						
5-Mar-2010	08:00:00	3.01		-1.57	-1.31	3.69	0.98	1.92			3.83	0.43	-1.02	1.00		-2.68		-4.45					0.00	
5-Mar-2010	20:00:00	3.01		-2.92	-1.93	3.22	0.40	1.71			3.74	0.05	-2.16	-0.40		-3.03		-4.63						
6-Mar-2010	08:00:00	2.88		-4.78	-3.13	2.88	-0.48	1.61			3.68	-0.59	-4.04	-0.70		-3.43		-4.82					0.00	
6-Mar-2010	20:00:00	2.90		-5.35	-3.68	2.43	-1.55	1.41			3.62	-0.78	-8.47	-1.83		-3.57		-4.90						
7-Mar-2010	08:00:00	2.80		-6.64	-4.86	1.89	-3.02	1.20			3.61	-1.45	-10.74	-2.10		-4.00		-5.09					0.00	
7-Mar-2010	20:00:00	2.90		-6.01	-4.64	1.22	-4.39	1.25			3.61	-1.12	-11.41	-2.58		-4.00		-5.03						
8-Mar-2010	08:00:00	2.75		-7.18	-5.60	0.67	-5.56	1.12			3.58	-1.55	-12.60	-2.85		-4.32		-5.21					0.00	
8-Mar-2010	20:00:00	2.78		-7.18	-5.65	-0.23	-6.59	0.89			3.53	-1.65	-13.01	-3.09		-4.37		-5.24						
9-Mar-2010	08:00:00	2.63		-8.22	-6.67	-0.96	-7.65	0.78			3.46	-2.11	-13.96	-3.23		-4.62		-5.41					0.00	
9-Mar-2010	20:00:00	2.67		-7.82	-6.53	-1.94	-8.48	0.69			3.44	-2.00	-14.14	-3.53		-4.57		-5.41						
10-Mar-2010	08:00:00	2.59		-8.64	-7.20	-2.54	-9.20	0.67			3.41	-2.14	-14.83	-3.53		-4.82		-5.57					0.00	
10-Mar-2010	20:00:00	2.73		-7.45	-5.56	-2.64	-9.57	1.02			3.50	-0.82	-14.87	-3.51		-4.65		-5.29						
11-Mar-2010	08:00:00	2.70		-7.38	-5.99	-3.05	-9.81	1.07			3.55	-0.75	-15.08	-3.47		-4.75		-5.20						
11-Mar-2010	20:00:00	3.20		-0.31	-0.08	0.99	-5.48	2.65			4.06	2.34	-10.53	-0.10		-2.03		-3.71						
12-Mar-2010	08:00:00	3.13		-0.63	-0.46	1.32	-6.42	2.26			4.02	1.75	-10.83	-0.41		-2.57		-4.12						
12-Mar-2010	20:00:00	3.14		-0.95	-0.70	1.40	-7.11	2.24			3.91	1.38	-11.23	-1.09		-3.13		-4.29						
13-Mar-2010	08:00:00	3.61		1.52	0.91	6.71	-0.01	3.55			6.01	2.85	4.43	5.34		-0.42		-2.26						
13-Mar-2010	20:00:00	3.41		0.75	0.45	5.95	0.21	2.98			4.48	2.16	3.57	3.67		-1.27		-3.51						
14-Mar-2010	08:00:00	3.09		0.03	-0.21	4.65	0.47	2.46			4.02	1.52	1.85	2.40		-2.19		-4.08					0.84	
14-Mar-2010	20:00:00	3.01		-1.00	-0.82	3.61	0.10	2.10			3.77	0.91	-0.46	0.61		-2.74		-4.43						
15-Mar-2010	08:00:00	2.88		-2.40	-1.51	3.18	-0.52	1.92			3.66	0.40	-1.96	-0.91		-3.40		-4.65					0.04	
15-Mar-2010	20:00:00	2.74		-4.54	-2.58	2.84	-1.55	1.43			3.51	-0.33	-3.39	-1.44		-3.72		-4.91						
16-Mar-2010	08:00:00	2.67		-5.84	-3.62	2.46	-2.88	1.46			3.37	-0.83	-8.72	-2.05		-4.27		-5.09					0.00	
16-Mar-2010	20:00:00	2.63		-6.70	-4.51	1.91	-4.09	1.30			3.28	-1.35	-10.86	-2.89		-4.57		-5.20						
17-Mar-2010	08:00:00	2.66		-7.48	-5.45	1.24	-5.25	1.11			3.28	-1.92	-12.38	-3.49		-4.74		-5.31					0.00	
17-Mar-2010	20:00:00	2.71		-7.17	-5.41	0.26	-6.29	1.18			3.30	-1.82	-12.86	-3.81		-4.67		-5.28						
18-Mar-2010	08:00:00	2.66		-7.53	-5.86	-0.37	-7.05	1.18			3.32	-1.79	-13.48	-4.02		-4.77		-5.36					0.00	
18-Mar-2010	20:00:00	2.59		-8.02	-6.36	-1.38	-7.88	0.96			3.26	-2.43	-13.99	-4.29		-4.89		-5.50						
19-Mar-2010	08:00:00	2.45		-9.40	-7.75	-2.10	-8.72	0.69			3.16	-3.18	-15.03	-4.53		-5.22		-5.74					0.00	
19-Mar-2010	20:00:00	2.35		-9.89	-8.47	-3.18	-9.60	0.33			3.03	-4.01	-15.55	-5.00		-5.21		-5.94						
20-Mar-2010	08:00:00	2.31		-10.80	-9.61	-3.77	-10.21	0.27			2.95	-4.56	-16.26	-5.04		-5.54		-6.14					0.00	
20-Mar-2010	20:00:00	2.25		-10.93	-9.87	-4.59	-10.79	0.03			2.84	-5.03	-16.50	-5.24		-5.44		-6.34						
21-Mar-2010	08:00:00	2.32		-11.48	-10.44	-4.87	-11.15	0.15			2.82	-5.22	-17.02	-5.27		-5.79		-6.38						
21-Mar-2010	20:00:00	2.41		-10.59	-9.51	-5.32	-11.49	0.47			2.92	-4.28	-16.77	-5.09		-5.54		-6.21						
22-Mar-2010	08:00:00	3.19		1.27	0.65	2.56	-1.91	3.17			5.37	2.98	-3.33	3.19		-0.32		-2.13						
22-Mar-2010	20:00:00	3.11		0.28	0.08	5.64	-3.85	2.80			3.82	1.86	-3.48	2.95		-1.51		-3.74						
23-Mar-2010	08:00:00	2.90		-0.80	-0.83	3.57	-5.15	2.23			3.45	1.17	-4.97	0.74		-2.80		-4.28						
23-Mar-2010	20:00:00	2.72		-3.48	-2.43	2.85	-6.29	1.59			3.18	0.01	-10.55	-0.67		-3.47		-4.77						
24-Mar-2010	08:00:00	2.57		-6.02	-4.21	2.40	-7.31	1.39			3.08	-0.98	-12.94	-1.92		-4.54		-5.09					0.00	
24-Mar-2010	20:00:00	2.59		-6.99	-5.30	1.36	-8.39	1.17			2.95	-2.03	-13.99	-3.55		-4.72		-5.25						
25-Mar-2010	08:00:00	2.58	2.00	-8.11	-6.31	0.32	-9.13	1.17	-0.50	6.00	2.97	-2.45	-14.89	-4.10	-6.00	-5.15	-4.00	-5.49	0.00	2.90			0.00	
25-Mar-2010	20:00:00	2.74		-7.72	-6.45	-1.34	-9.95	1.09			2.87	-2.96	-14.89	-4.40		-5.25		-5.45						
26-Mar-2010	08:00:00	2.80		-6.88	-4.89	-1.09	-9.68	1.48			3.17	-0.70	-14.85	-3.75		-4.98		-5.34					0.10	
26-Mar-2010	20:00:00	2.31		-10.11	-8.39	-2.56	-10.72	0.28			2.93	-3.83	-16.66	-4.03		-5.48		-5.83						
27-Mar-2010	08:00:00	2.22		-11.66	-10.22	-3.66	-11.41	0.08			2.68	-5.14	-17.65	-4.30		-5.91		-6.14					0.04	
27-Mar-2010	20:00:00	2.17		-12.02	-10.84	-4.84	-12.05	-0.06			2.44	-5.99	-17.74	-5.11		-5.90		-6.42						
28-Mar-2010	08:00:00	2.36		-11.81	-10.81	-5.36	-12.33	0.40			2.41	-5.42	-17.83	-5.07		-5.96		-6.28					0.00	
28-Mar-2010	20:00:00	2.48		-10.86	-9.74	-5.65	-12.46	0.60			2.60	-5.01	-17.24	-4.48		-5.75		-6.23						
29-Mar-2010	08:00:00	4.78		2.44	1.76	6.68	2.01	4.61			7.39	3.79	5.99	10.02		1.88		1.30					1.52	
29-Mar-2010	20:00:00	3.51		1.11	0.67	6.74	3.87	4.53			4.93	3.02	5.39	4.73		-0.60		-2.84						
30-Mar-2010	08:00:00	3.21		0.40	0.13	5.81	2.20	3.11			3.78	2.16	4.14	3.53		-1.42		-3.78					0.86	
30-Mar-2010	20:00:00	3.08		-0.80	-0.79	4.31	1.62	2.58			3.39	1.15	2.58	1.94		-1.92		-4.26						
31-Mar-2010	08:00:00	2.93		-2.46	-1.68	3.46	1.40	2.26			3.29	0.47	0.18	0.76		-2.77		-4.55						
31-Mar-2010	20:00:00	2.85		-4.86	-2.93	2.87	1.03	2.07			3.08	-0.80	-1.46	-0.99		-3.11		-4.84						3.56
1-Apr-2010	08:00:00	2.75		-6.08	-4.08	2.67	1.13	2.09			3.09	-1.31	-3.60	-1.46		-3.68		-4.91						
1-Apr-2010	20:00:00	2.78		-6.93	-5.04	1.88	0.78	1.81			2.98	-2.50	-8.24	-2.72		-3.96		-5.12						
2-Apr-2010	08:00:00	2.69		-7.75	-5.96	1.56	0.72	1.62			3.03	-2.73	-10.28	-3.00		-4.34		-5.20					0.00	

Date	Time	Water Level (inches)																						
dd-mmm-yyyy	hh:mm:ss	Cox AW1	Cox MW2	Cox AW3	Cox AW4	Cox AW5	Cox AW6	Cox AW7	Cox MW8	Cox MW9	Cox AW10	Cox AW11	Cox AW12	Ref AW1	Ref MW2	Ref AW3	Ref MW4	Ref AW5	CG	On-site Manual Rain Gauge	On-site Tipping Bucket	TBRG Monthly Totals	Smithfield Daily Rainfall	Smithfield Monthly Rainfall
2-Apr-2010	20:00:00	2.60		-8.62	-7.12	0.46	0.16	1.20			2.87	-4.25	-11.58	-3.72		-4.58		-5.57						
3-Apr-2010	08:00:00	2.60		-9.27	-7.89	-0.27	-0.21	1.27			2.92	-4.14	-12.70	-3.65		-4.83		-5.61					0.00	
3-Apr-2010	20:00:00	2.56		-9.72	-8.57	-1.68	-1.17	0.96			2.85	-5.32	-13.37	-4.65		-4.90		-5.92						
4-Apr-2010	08:00:00	2.51		-10.44	-9.32	-2.11	-2.09	0.85			2.90	-5.29	-14.34	-4.63		-5.04		-5.91					0.00	
4-Apr-2010	20:00:00	2.44		-11.01	-10.11	-3.60	-4.17	0.64			2.74	-6.89	-14.86	-5.37		-5.29		-6.44						
5-Apr-2010	08:00:00	2.39		-11.59	-10.71	-3.83	-5.49	0.51			2.75	-6.29	-15.58	-5.14		-5.39		-6.45					0.00	
5-Apr-2010	20:00:00	2.35		-12.03	-11.54	-5.50	-7.60	0.05			2.54	-8.35	-16.05	-5.93		-6.01		-7.22						
6-Apr-2010	08:00:00	2.33		-12.37	-11.70	-5.61	-8.66	0.18			2.52	-6.98	-16.58	-5.57		-6.00		-7.23					0.00	
6-Apr-2010	20:00:00	2.13		-13.01	-12.76	-6.98	-10.54	-1.07			2.29	-9.93	-17.18	-6.87		-6.66		-8.29						
7-Apr-2010	08:00:00	2.14		-13.55	-13.15	-7.00	-11.14	-0.70			2.11	-8.61	-17.79	-6.12		-6.51		-8.29					0.00	
7-Apr-2010	20:00:00	1.90		-14.09	-13.85	-8.40	-12.59	-1.93			1.90	-11.13	-18.40	-7.35		-7.35		-9.41						
8-Apr-2010	08:00:00	2.07		-14.33	-13.92	-8.27	-12.82	-1.05			1.56	-9.38	-18.76	-6.53		-6.91		-9.24					0.00	
8-Apr-2010	20:00:00	1.79		-14.80	-14.49	-9.63	-13.94	-2.79			1.52	-11.89	-19.16	-7.26		-7.70		-10.49						
9-Apr-2010	08:00:00	2.52		-6.25	-2.51	-0.20	-6.69	2.06			3.36	1.34	-13.11	0.92		-1.45		-4.65					0.40	
9-Apr-2010	20:00:00	2.24		-8.79	-7.26	-1.18	-9.20	0.90			2.79	-1.32	-15.78	-1.76		-3.50		-5.43						
10-Apr-2010	08:00:00	2.11		-11.11	-9.89	-2.41	-10.54	0.21			2.58	-3.39	-17.56	-3.41		-4.68		-5.62					0.00	
10-Apr-2010	20:00:00	1.96		-12.16	-11.61	-4.52	-12.13	-0.35			2.39	-6.45	-18.33	-5.72		-5.60		-6.37						
11-Apr-2010	08:00:00	2.03		-13.23	-12.51	-5.44	-12.60	-0.35			2.22	-7.04	-18.93	-5.75		-5.82		-6.56						
11-Apr-2010	20:00:00	1.87		-13.87	-13.37	-7.27	-13.83	-1.24			2.03	-9.40	-19.41	-6.54		-6.71		-7.63						
12-Apr-2010	08:00:00	1.95		-14.77	-14.09	-7.45	-13.88	-1.14			1.69	-9.05	-19.87	-6.19		-6.66		-7.75						
12-Apr-2010	20:00:00	1.65		-15.59	-14.96	-9.03	-14.92	-2.29			0.95	-11.58	-20.50	-7.90		-7.67		-9.13						
13-Apr-2010	08:00:00	1.72		-16.28	-15.55	-8.82	-14.84	-2.04			-1.20	-10.79	-20.94	-7.25		-7.50		-9.17					0.00	
13-Apr-2010	20:00:00	1.45		-16.82	-16.04	-10.18	-15.79	-3.39			-4.84	-12.81	-21.34	-8.57		-8.39		-10.58						
14-Apr-2010	08:00:00	1.44		-17.62	-16.74	-9.88	-15.71	-3.05			-7.46	-12.17	-21.92	-7.43		-8.13		-10.61					0.00	
14-Apr-2010	20:00:00	1.40		-17.92	-16.92	-10.56	-16.28	-3.55			-9.26	-12.96	-22.13	-8.50		-8.59		-11.15						
15-Apr-2010	08:00:00	1.47		-18.13	-17.24	-10.05	-16.06	-3.22			-9.97	-11.72	-22.26	-7.84		-8.09		-10.75					0.00	
15-Apr-2010	20:00:00	1.34		-18.20	-17.12	-11.33	-16.85	-4.59			-11.35	-13.47	-22.42	-8.88		-8.87		-11.65						
16-Apr-2010	08:00:00	1.56		-18.17	-17.26	-10.52	-16.47	-3.58			-11.22	-11.72	-22.50	-8.13		-8.36		-11.24					0.00	
16-Apr-2010	20:00:00	1.22		-18.37	-17.12	-12.05	-17.51	-5.84			-12.95	-14.07	-22.78	-9.14		-9.62		-12.76						
17-Apr-2010	08:00:00	1.31		-18.70	-17.58	-11.34	-17.21	-4.96			-12.97	-12.66	-23.07	-8.99		-9.12		-12.81						
17-Apr-2010	20:00:00	0.91		-19.46	-18.01	-12.87	-18.20	-7.44			-14.54	-14.96	-23.69	-10.18		-10.48		-14.21						
18-Apr-2010	08:00:00	0.87		-20.24	-18.84	-12.52	-18.13	-6.85			-14.93	-14.57	-24.20	-9.05		-10.14		-14.25					0.00	
18-Apr-2010	20:00:00	0.32		-20.91	-19.20	-13.86	-19.02	-9.32			-16.26	-16.11	-24.68	-10.96		-11.26		-15.44						
19-Apr-2010	08:00:00	0.36		-21.39	-19.72	-13.37	-18.77	-7.85			-16.20	-15.34	-24.98	-9.54		-10.54		-14.96					0.00	
19-Apr-2010	20:00:00	-0.06		-21.80	-19.89	-14.54	-19.51	-9.84			-17.18	-16.47	-25.25	-11.05		-11.47		-16.09						
20-Apr-2010	08:00:00	0.04		-22.12	-20.26	-13.88	-19.16	-8.08			-17.01	-15.39	-25.45	-10.01		-10.63		-15.36						
20-Apr-2010	20:00:00	-0.44		-22.46	-20.32	-15.20	-20.01	-10.03			-17.91	-16.64	-25.74	-11.19		-11.84		-16.74						
21-Apr-2010	08:00:00	0.12		-22.31	-20.51	-14.02	-19.32	-7.24			-16.94	-14.91	-25.73	-9.99		-10.78		-15.01						
21-Apr-2010	20:00:00	1.14		-21.80	-20.12	-9.24	-16.46	-0.37			-11.22	-8.40	-25.25	-7.02		-7.35		-11.79						
22-Apr-2010	08:00:00	1.07		-21.79	-20.15	-9.75	-16.61	-1.66			-12.44	-8.65	-25.20	-7.61		-8.02		-11.61						
22-Apr-2010	20:00:00	0.64		-22.26	-20.36	-12.12	-18.15	-4.23			-15.43	-12.19	-25.72	-10.44		-10.32		-14.02						
23-Apr-2010	08:00:00	0.70		-22.70	-20.82	-11.94	-18.28	-4.70			-15.71	-12.40	-25.99	-9.84		-10.26		-13.65					0.01	
23-Apr-2010	20:00:00	0.41		-23.20	-21.15	-13.10	-19.02	-5.86			-16.84	-13.68	-26.36	-11.21		-11.35		-15.10						
24-Apr-2010	08:00:00	0.49		-23.48	-21.47	-12.63	-18.78	-5.52			-16.72	-13.12	-26.53	-10.14		-10.75		-14.52					0.00	
24-Apr-2010	20:00:00	0.47		-23.54	-21.44	-13.32	-19.16	-5.51			-17.06	-13.46	-26.49	-10.29		-11.19		-15.24						
25-Apr-2010	08:00:00	1.33		-22.41	-20.95	-9.34	-16.99	-0.86			-11.97	-7.42	-25.93	-7.67		-8.26		-11.61					0.16	
25-Apr-2010	20:00:00	1.11		-22.10	-20.41	-11.62	-18.16	-3.32			-15.37	-10.55	-25.84	-9.68		-10.30		-13.73						
26-Apr-2010	08:00:00	1.19		-22.35	-20.75	-11.23	-17.99	-3.54			-15.55	-10.36	-25.92	-9.46		-9.90		-13.33					0.03	
26-Apr-2010	20:00:00	0.42		-23.61	-21.52	-14.25	-19.73	-7.55			-18.28	-14.50	-26.74	-11.85		-12.51		-16.32						
27-Apr-2010	08:00:00	0.22		-24.39	-22.16	-14.07	-19.75	-7.55			-18.50	-14.78	-27.19	-10.73		-12.08		-16.34					0.04	
27-Apr-2010	20:00:00	-0.70		-25.25	-22.64	-15.68	-20.67	-10.32			-19.61	-16.81	-27.67	-12.60		-13.49		-17.82						
28-Apr-2010	08:00:00	-1.26		-26.44	-23.51	-15.63	-20.75	-10.20			-20.10	-17.10	-28.20	-11.38		-13.09		-17.98					0.00	
28-Apr-2010	20:00:00	-3.13		-27.09	-23.95	-16.67	-21.51	-12.42			-20.85	-18.29	-28.62	-13.41		-14.61		-19.24						
29-Apr-2010	08:00:00	-3.55	-20.00	-27.75	-24.53	-16.47	-21.41	-11.09	-15.00	-19.00	-21.18	-18.09	-28.88	-12.13	-15.00	-13.63	-19.00	-18.88	0.10	2.55			0.00	
29-Apr-2010	20:00:00	-6.04		-28.04	-24.69	-17.56	-22.19	-12.88			-21.59	-19.00	-29.12	-13.63		-15.25		-20.26						
30-Apr-2010	08:00:00	-5.17		-28.52	-25.12	-17.09	-21.89	-11.17			-21.82	-18.38	-29.30	-12.39		-14.19		-19.97						
30-Apr-2010	20:00:00	-8.98		-29.01	-25.38	-18.30	-22.83	-13.48			-22.32	-19.66	-29.59	-14.47		-16.27		-21.61						0.64
1-May-2010	08:00:00	-6.54		-29.40	-25.79	-17.77	-22.44	-11.27			-22.49	-18.82	-29.78	-12.78		-14.81		-20.89						
1-May-2010	20:00:00	-10.75		-29.98	-26.13	-18.95	-23.38	-13.90			-23.00	-20.12	-30.09	-15.11		-17.05		-22.88						
2-May-2010	08:00:00	-8.02		-30.41	-26.53	-18.54	-23.01	-11.71			-23.18	-19.30	-30.23	-13.35		-15.48		-22.20						
2-May-2010	20:00:00	-12.81		-30.90	-26.94	-19.74	-23.97	-14.57			-23.62	-20.63	-30.58	-15.92		-18.21		-24.25						
3-May-2010	08:00:00	-9.72		-31.30	-27.28	-19.46	-23.58	-12.45			-23.83	-19.84	-30.68	-13.94		-16.36		-23.64					0.00	
3-May-2010	20:00:00	-12.66		-31.81	-27.73	-20.25	-24.22	-13.94			-24.22	-20.80	-31.00	-15.72		-18.10		-25.13						
4-May-2010	08:00:00	-9.04		-32.13	-28.05	-19.83	-23.70	-11.79			-24.27	-19.77	-31.05	-13.77		-16.31		-24.15		0.01				
4-May-2010	20:00:00	-9.17		-32.45	-28.39	-20.14	-23.85	-11.44			-24.38	-19.59	-31.15	-14.46		-16.76		-25.08						
5-May-2010	08:00:00	-7.89		-32.91	-28.81	-19.85	-23.45	-11.16			-24.54	-19.16	-31.28	-13.19		-15.64		-24.05		0.01			0.04	
5-May-2010	20:00:00	-13.95		-33.33	-29.25	-20.98	-24.65	-14.94			-24.86	-20.89	-31.55	-16.09		-18.84		-26.12						
6-May-2010	08:00:00	-11.49		-33.59	-29.51	-20.89	-24.26	-12.67			-25.10	-20.28	-31.57	-14.10		-16.95		-25.27						
6-May-2010	20:00:00	-16.88		-34.27	-30.05	-21.84	-25.31	-15.77			-25.57	-21.76	-32.06	-17.21		-20.23		-27.51						
7-May-2010	08:00:00	-15.46		-35.05	-30.52	-21.82	-24.97	-14.46			-26.04	-21.61	-32.35	-15.57		-18.69		-27.43						
7-May-2010	20:00:00	-19.30		-35.33	-30.99	-23.09	-26.16	-17.09			-26.40	-22.74	-32.72	-18.18		-21.73		-28.93						
8-May-2010	08:00:00	-16.50		-35.41	-31.19	-23.11	-25.74	-15.15			-26.60	-22.22	-32.67	-16.17		-19.86		-28.63						
8-May-2010	20:00:00	-21.77		-36.75	-32.00	-24.00	-26.90	-18.75			-27.28	-23.62	-33.38	-19.59		-23.27		-30.68						
9-May-2010	08:00:00	-20.40		-37.99	-32.70	-24.34	-26.86	-18.02			-27.98	-24.05	-33.92	-20.30		-22.78		-30.83						
9-May-2010	20:00:00	-22.97		-38.50	-33.31	-25.20	-27.70	-19.66			-28.53	-24.78	-34.36	-20.52		-24.29		-31.81						
10-May-2010	08:00:00	-20.67		-39.12	-33.84	-25.41	-27.48	-18.41			-28.98	-24.91	-34.57	-19.72		-23.05		-31.65						
10-May-2010	20:00:00	-23.12		-39.50	-34.41	-26.20	-28.21	-19.69			-29.42	-25.43	-34.94	-19.90		-24.41		-32.55						
11-May-2010	08:00:00	-20.48		-39.70	-34.80	-26.25	-27.63	-17.88			-29.72	-25.30	-35.06	-17.91		-22.46		-32.14						
11-May-2010	20:00:00	-21.43		-39.83	-35.17	-27.00	-28.22	-18.17			-29.93	-25.53	-35.25	-18.53		-23.59		-32.82						
12-May-2010	08:00:00	-19.49		-40.32	-35.58	-26.92	-27.50	-16.89			-30.18	-25.18	-35.27	-16.95		-21.47		-32.45						
12-May-2010	20:00:00	-22.41		-40.52	-36.06	-27.67	-28.46	-18.62			-30.43	-25.69	-35.53	-18.88		-23.93		-33.68						
13-May-2010	08:00:00	-20.16		-41.15	-36.55	-27.56	-27.69	-17.46			-30.81	-25.57	-35.64	-17.25		-22.13		-33.29						
13-May-2010	20:00:00	-23.45		-41.79	-37.31	-28.19	-28.66	-19.65			-31.29	-26.19	-36.03	-19.52		-24.41		-34.30						
14-May-2010	08:00:00	-20.88		-41.99	-37.63	-28.26	-27.96	-18.00			-31.50	-25.97	-35.96	-17.66		-22.47		-33.87						
14-May-2010	20:00:00	-24.86		-42.27	-38.20	-29.25	-29.31	-20.09			-31.88	-26.56	-36.41	-21.11		-25.81		-35.51						
15-May-2010	08:00:00	-22.27		-42.68	-38.59	-29.30	-28.59	-18.80			-32.16	-26.56	-36.46	-22.14		-24.73		-35.13						
15-May-2010	20:00:00	-25.65		-42.95	-39.12	-30.28	-29.92	-21.01			-32.63	-27.07	-36.91	-23.25		-27.53		-36.53						
16-May-2010	08:00:00	-23.16		-43.46	-39.57	-30.47	-29.80	-20.34			-32.95	-27.15	-37.08	-24.25		-26.38		-36.13		0.79				
16-May-2010	20:00:00	-9.17		-41.87	-39.84	-29.53	-28.77	-13.47			-31.60	-24.73	-34.15	-12.85		-17.51		-33.26						
17-May-2010	08:00:00	-2.32		-41.69	-40.05	-26.18	-25.08	-4.39			-29.32	-20.67	-33.52	-6.10		-9.72		-24.20		0.70			0.73	
17-May-2010	20:00:00	-0.70		-39.91	-39.53	-22.08	-21.40	-1.50			-23.86	-14.78	-31.12	-4.76		-7.42		-19.11						
18-May-2010	08:00:00	0.62		-29.56	-32.65	-7.18	-11.33	1.92			3.58	1.11	-24.40	1.84		-1.32		-8.79			0.80		3.55	

Date	Time	Water Level (inches)																						
dd-mmm-yyyy	hh:mm:ss	Cox AW1	Cox MW2	Cox AW3	Cox AW4	Cox AW5	Cox AW6	Cox AW7	Cox MW8	Cox MW9	Cox AW10	Cox AW11	Cox AW12	Ref AW1	Ref MW2	Ref AW3	Ref MW4	Ref AW5	CG	On-site Manual Rain Gauge	On-site Tipping Bucket	TBRG Monthly Totals	Smithfield Daily Rainfall	Smithfield Monthly Rainfall
18-May-2010	20:00:00	0.02		-30.89	-32.05	-4.84	-14.14	1.10			2.12	-1.40	-26.03	-3.23		-5.44		-8.85						
19-May-2010	08:00:00	-0.04		-31.37	-32.03	-6.22	-15.57	0.42			1.50	-3.27	-27.18	-6.37		-5.21		-9.40			0.02		0.27	
19-May-2010	20:00:00	-0.60		-32.06	-32.22	-9.11	-17.21	-0.62			0.55	-7.68	-28.01	-8.78		-9.69		-11.02						
20-May-2010	08:00:00	-0.88		-32.95	-32.48	-10.65	-17.78	-1.48			-1.02	-9.74	-28.69	-9.32		-10.25		-11.60						
20-May-2010	20:00:00	-2.26		-33.72	-32.84	-13.39	-19.05	-2.94			-6.69	-12.69	-29.37	-12.18		-12.85		-14.30						
21-May-2010	08:00:00	-2.61		-34.34	-33.16	-13.90	-19.22	-3.66			-9.96	-13.44	-29.81	-11.48		-12.44		-14.69						
21-May-2010	20:00:00	-6.79		-34.96	-33.52	-16.07	-20.53	-5.41			-13.91	-15.33	-30.38	-14.35		-15.30		-17.57						
22-May-2010	08:00:00	-7.09		-35.70	-33.88	-16.07	-20.46	-5.62			-15.08	-15.63	-30.78	-13.07		-14.29		-17.74			0.01			
22-May-2010	20:00:00	-9.36		-36.12	-34.10	-17.24	-21.23	-6.77			-16.77	-16.68	-31.19	-14.97		-16.41		-19.65						
23-May-2010	08:00:00	-4.18		-36.58	-34.40	-16.86	-20.87	-5.15			-14.47	-15.66	-31.47	-12.03		-13.12		-17.01			0.46		0.29	
23-May-2010	20:00:00	-0.23		-33.91	-34.20	-12.81	-19.37	-2.71			-3.78	-9.55	-30.69	-4.40		-12.58		-10.10						
24-May-2010	08:00:00	0.00		-33.43	-31.18	-9.43	-16.99	-1.35			1.35	-4.22	-27.39	-5.74		-7.15		-10.12			1.15		0.28	
24-May-2010	20:00:00	4.94		-13.69	-18.21	5.93	-3.59	3.03			7.17	2.02	-10.02	9.43		4.33		-1.72						
25-May-2010	08:00:00	1.27		-15.69	-16.56	5.18	1.00	2.72			3.00	1.89	-1.99	2.71		-1.85		-4.21			0.01		1.16	
25-May-2010	20:00:00	0.99	1.00	-19.46	-16.61	2.63	0.02	2.04	0.00	4.25	2.29	0.41	-5.87	-0.92	-7.50	-4.16	-6.00	-5.75						
26-May-2010	08:00:00	0.71		-19.74	-17.83	2.01	-1.36	1.21			2.03	-1.16	-15.65	-3.81		-5.51		-6.74	0.15	4.25	0.01		0.00	
26-May-2010	20:00:00	0.29		-21.62	-19.33	0.03	-4.84	0.88			1.27	-6.12	-20.29	-7.66		-8.63		-9.17						
27-May-2010	08:00:00	0.29		-22.87	-20.31	-1.74	-6.68	0.17			0.65	-7.58	-22.01	-8.05		-8.77		-9.97					0.00	
27-May-2010	20:00:00	-0.52		-24.72	-21.73	-5.45	-10.55	-1.39			-1.97	-11.87	-23.96	-11.20		-12.23		-13.36						
28-May-2010	08:00:00	-0.53		-26.05	-22.74	-6.75	-12.18	-1.57			-6.13	-12.30	-24.89	-10.13		-11.56		-13.85					0.00	
28-May-2010	20:00:00	-1.56		-27.47	-23.80	-9.65	-14.89	-3.92			-10.42	-14.44	-25.90	-12.75		-14.13		-16.56						
29-May-2010	08:00:00	2.06		-1.94	-2.01	5.78	-0.07	3.15			4.38	2.05	-2.31	5.47		-0.30		-2.25			1.32		1.28	
29-May-2010	20:00:00	1.94		-8.37	-5.52	4.59	-0.23	3.38			2.79	1.65	-3.86	2.12		-2.17		-4.38						
30-May-2010	08:00:00	1.57		-11.46	-9.48	2.98	-0.75	1.99			2.48	0.47	-6.74	-0.55		-3.42		-5.25						
30-May-2010	20:00:00	1.18		-14.65	-12.86	1.98	-3.96	1.53			1.90	-3.30	-16.28	-4.91		-6.68		-7.55						
31-May-2010	08:00:00	1.07		-16.70	-14.61	1.46	-5.87	0.82			1.69	-4.91	-18.57	-5.97		-7.06		-8.39						
31-May-2010	20:00:00	0.66		-19.04	-16.39	-1.44	-9.29	-0.30			0.99	-9.63	-20.89	-9.54		-10.16		-11.42				5.29		7.60
1-Jun-2010	08:00:00	0.85		-20.11	-17.29	-2.87	-10.00	-0.07			0.51	-9.58	-21.45	-8.89		-9.68		-11.40			0.19			
1-Jun-2010	20:00:00	0.94		-20.53	-17.49	-2.99	-9.96	0.70			1.81	-7.58	-21.71	-8.38		-9.46		-11.71						
2-Jun-2010	08:00:00	0.96		-21.15	-18.19	-3.93	-10.32	0.24			1.59	-8.39	-22.02	-8.23		-9.69		-11.74			0.01		0.5	
2-Jun-2010	20:00:00	0.89		-21.93	-18.89	-5.91	-11.93	-0.37			1.25	-10.40	-22.66	-9.97		-11.60		-13.20						
3-Jun-2010	08:00:00	0.77		-22.55	-19.55	-6.31	-12.24	-0.94			1.04	-10.62	-22.94	-8.90		-11.44		-13.28					0.64	
3-Jun-2010	20:00:00	0.33		-23.69	-20.44	-8.66	-14.43	-2.24			0.28	-12.96	-23.98	-11.54		-14.75		-15.69						
4-Jun-2010	08:00:00	0.35		-24.38	-21.14	-8.79	-14.57	-2.48			-1.83	-12.78	-24.39	-10.47		-14.51		-15.71					0.11	
4-Jun-2010	20:00:00	-0.29		-25.56	-22.13	-11.43	-16.63	-4.30			-7.76	-15.16	-25.50	-13.61		-18.53		-18.56						
5-Jun-2010	08:00:00	-0.20		-26.10	-22.68	-11.24	-16.34	-4.27			-9.53	-14.50	-25.67	-11.97		-17.50		-18.33			0.05		0	
5-Jun-2010	20:00:00	-0.98		-27.12	-23.51	-13.25	-17.99	-6.04			-12.46	-16.23	-26.61	-14.82		-21.63		-20.59						
6-Jun-2010	08:00:00	-0.74		-27.42	-23.77	-12.94	-17.40	-5.86			-12.87	-15.42	-26.71	-12.80		-19.11		-20.28			0.07		0	
6-Jun-2010	20:00:00	-3.06		-28.64	-24.64	-15.67	-19.53	-9.69			-16.19	-17.78	-27.62	-16.62		-20.72		-23.44						
7-Jun-2010	08:00:00	-1.61		-29.88	-25.61	-14.13	-18.37	-7.11			-14.91	-16.81	-28.20	-13.33		-19.07		-21.79					0.14	
7-Jun-2010	20:00:00	-4.49		-31.01	-26.61	-16.82	-20.26	-11.05			-18.02	-18.81	-28.99	-16.95		-22.23		-24.95						
8-Jun-2010	08:00:00	-3.81		-31.74	-27.16	-16.72	-20.10	-10.63			-18.42	-18.83	-29.28	-14.65		-21.83		-24.55					0	
8-Jun-2010	20:00:00	-7.45		-32.68	-27.98	-18.37	-21.59	-13.33			-19.78	-20.12	-30.07	-18.26		-24.04		-26.76						
9-Jun-2010	08:00:00	-5.78		-33.05	-28.37	-18.29	-21.40	-12.16			-19.99	-19.77	-30.30	-16.01		-23.40		-26.12						
9-Jun-2010	20:00:00	-9.35		-33.64	-28.81	-19.61	-22.68	-14.09			-20.88	-20.79	-30.88	-18.98		-25.52		-28.24						
10-Jun-2010	08:00:00	-8.08		-34.32	-29.32	-19.61	-22.57	-13.25			-21.26	-20.73	-31.26	-16.95		-25.18		-27.90			0.01			
10-Jun-2010	20:00:00	-11.15		-35.14	-29.99	-20.57	-23.50	-14.98			-21.85	-21.51	-31.93	-19.62		-26.90		-29.62						
11-Jun-2010	08:00:00	-9.21		-35.95	-30.56	-20.56	-23.25	-14.13			-22.24	-21.53	-32.31	-17.38		-26.40		-29.12						
11-Jun-2010	20:00:00	-15.13		-36.92	-31.49	-21.76	-24.61	-16.43			-23.01	-22.63	-33.06	-21.20		-28.61		-31.33						
12-Jun-2010	08:00:00	-12.38		-37.40	-31.92	-21.90	-24.31	-15.26			-23.38	-22.61	-33.36	-20.45		-28.03		-30.75					0	
12-Jun-2010	20:00:00	-17.20		-37.87	-32.52	-23.22	-25.72	-17.14			-23.97	-23.41	-33.88	-22.75		-29.96		-32.68						
13-Jun-2010	08:00:00	-2.52		-36.80	-32.30	-20.43	-23.19	-5.44			-21.21	-19.47	-31.92	-12.06		-24.16		-26.88			0.61		0.32	
13-Jun-2010	20:00:00	-6.64		-37.74	-33.06	-21.10	-24.04	-9.88			-21.88	-19.72	-33.04	-15.64		-26.00		-28.72						
14-Jun-2010	08:00:00	-5.99		-38.09	-33.34	-20.98	-23.40	-10.72			-22.51	-19.56	-33.17	-15.14		-25.43		-28.15					0.24	
14-Jun-2010	20:00:00	-12.10		-38.83	-34.08	-22.67	-25.06	-13.94			-23.71	-21.32	-33.97	-19.59		-28.92		-31.64						
15-Jun-2010	08:00:00	-10.66		-39.51	-34.53	-22.85	-24.75	-14.39			-24.36	-21.73	-34.40	-18.73		-28.78		-31.50					0	
15-Jun-2010	20:00:00	-16.81		-40.36	-35.36	-24.12	-26.11	-16.77			-25.18	-23.18	-34.98	-22.54		-31.12		-33.84						
16-Jun-2010	08:00:00	-10.30		-40.72	-35.77	-24.18	-25.61	-13.31			-25.58	-23.06	-35.28	-20.97		-29.71		-32.43			0.20		0	
16-Jun-2010	20:00:00	-13.67		-41.05	-36.25	-24.72	-26.06	-14.39			-25.87	-23.43	-35.62	-20.28		-30.74		-33.46						
17-Jun-2010	08:00:00	-11.76		-41.28	-36.61	-24.74	-25.52	-14.34			-26.09	-23.10	-35.71	-18.17		-30.01		-32.73					0.08	
17-Jun-2010	20:00:00	-18.77		-42.06	-37.49	-25.75	-26.99	-17.49			-26.66	-24.29	-36.16	-23.02		-32.62		-35.34						
18-Jun-2010	08:00:00	-16.92		-42.75	-38.10	-25.88	-26.57	-17.20			-27.12	-24.66	-36.61	-23.68		-32.17		-34.89					0	
18-Jun-2010	20:00:00	-21.09		-43.30	-38.90	-27.05	-27.89	-19.27			-27.81	-25.51	-37.16	-26.04		-33.86		-36.58						
19-Jun-2010	08:00:00	-18.68		-43.79	-39.37	-27.23	-27.46	-18.19			-28.23	-25.75	-37.54	-26.02		-33.27		-35.99						
19-Jun-2010	20:00:00	-22.41		-44.10	-39.94	-28.31	-28.76	-20.01			-28.84	-26.35	-37.99	-28.71		-34.87		-37.59						
20-Jun-2010	08:00:00	-20.04		-44.54	-40.42	-28.54	-28.56	-19.82			-29.25	-26.54	-38.36	-28.69		-34.39		-37.11						
20-Jun-2010	20:00:00	-24.76		-45.16	-41.23	-29.53	-29.86	-21.83			-30.04	-27.31	-38.91	-31.67		-36.16		-38.88						
21-Jun-2010	08:00:00	-22.31		-45.86	-41.76	-29.87	-29.79	-21.81			-30.53	-27.68	-39.43	-31.42		-35.77		-38.49						
21-Jun-2010	20:00:00	-26.40		-46.39	-42.59	-31.08	-31.32	-23.82			-31.41	-28.33	-40.07	-34.33		-37.33		-40.05						
22-Jun-2010	08:00:00	-24.17		-46.94	-43.10	-31.52	-31.31	-23.67			-31.92	-28.67	-40.57	-33.93		-36.96		-39.68					0	
22-Jun-2010	20:00:00	-27.02		-47.32	-43.73	-32.69	-32.58	-24.94			-32.82	-29.55	-41.12	-36.32		-38.19		-40.91						
23-Jun-2010	08:00:00	-25.04	-37.00	-47.83	-44.21	-33.15	-32.49	-25.08	-35.00	-38.00	-33.34	-29.45	-41.56	-36.11	-34.00	-37.99	-38.00	-41.30	0.00	2.50			0	
23-Jun-2010	20:00:00	-28.38		-48.32	-44.91	-34.22	-33.78	-26.53			-34.15	-30.27	-42.14	-38.67		0.00		-42.02						
24-Jun-2010	08:00:00	-26.41		-48.08	-45.28	-34.90	-33.75	-26.51			-34.64	-30.30	-42.57	-38.53		0.00		-41.66					0.05	
24-Jun-2010	20:00:00	-29.48		-47.87	-45.92	-35.91	-35.02	-28.00			-35.48	-30.77	-43.24	-41.06		0.00		-43.02						
25-Jun-2010	08:00:00	-28.19		-47.87	-46.70	-36.48	-34.92	-28.29			-36.06	-30.85	-43.85	-41.03		0.00		-43.02					0	
25-Jun-2010	20:00:00	-30.62		-47.87	-47.49	-37.54	-36.05	-29.53			-36.90	-31.75	-44.47	-43.40		0.00		-44.14						
26-Jun-2010	08:00:00	-29.35		-47.88	-47.84	-38.34	-36.06	-29.78			-37.44	-32.15	-45.01	-43.24		0.00		-43.93					0	
26-Jun-2010	20:00:00	-31.03		-47.86	-48.22	-39.44	-37.08	-30.17			-38.08	-32.52	-45.65	-44.88		0.00		-44.85						
27-Jun-2010	08:00:00	-29.74		-47.86	-48.76	-40.12	-36.99	-30.41			-38.61	-32.84	-46.24	-44.92		0.00		-44.72					0	
27-Jun-2010	20:00:00	-32.11		-47.74	-49.51	-40.91	-37.85	-31.74			-39.30	-33.22	-46.94	-46.99		0.00		-45.86						
28-Jun-2010	08:00:00	-31.30		-47.75	-49.87	-41.78	-38.00	-31.81			-39.90	-33.58	-47.55	-46.88		0.00		-45.75					0	
28-Jun-2010	20:00:00	-33.19		-47.75	-50.64	-42.47	-38.66	-32.90			-40.55	-33.98	-48.28	-48.80		0.00		-46.84						
29-Jun-2010	08:00:00	-33.14		-47.75	-51.17	-43.17	-38.80	-33.38			-41.23	-33.92	-49.01	-48.54		0.00		-46.98			0.33			
29-Jun-2010	20:00:00	-33.41		-47.74	-51.84	-44.08	-39.29	-33.27			-41.88	-34.38	-49.59	-49.71		0.00		-47.59						
30-Jun-2010	08:00:00	-30.74		-47.73	-52.25	-44.46	-38.93	-32.12			-42.31	-34.57	-49.55	-49.13		0.00		-47.28			0.06			
30-Jun-2010	20:00:00	-29.68		-47.75	-52.58	-44.84	-38.99	-31.77			-42.53	-34.67	-49.54	-49.23		0.00		-47.25				1.53		2.08
1-Jul-2010	08:00:00	-28.76		-47.74	-51.99	-44.22	-38.36	-30.40			-42.57	-34.48	-49.52	-49.00		0.00		-47.07			0.17			
1-Jul-2010	20:00:00	-29.93		-47.73	-52.31	-43.82	-38.90	-30.68			-42.79	-34.77	-49.52	-50.60		0.00		-48.10						
2-Jul-2010	08:00:00	-30.20		-47.73	-52.43	-43.18	-38.62	-31.30			-42.99	-34.51	-49.51	-50.29		0.00		-48.07					0	
2-Jul-2010	20:00:00	-32.19		-47.74	-52.47	-43.60	-39.43	-32.01			-43.33	-35.15	-49.51	-51.98		0.00		-49.05						
3-Jul-2010	08:00:00	-32.59		-47.74	-52.58	-43.69	-39.31	-32.79			-43.73	-34.94	-49.48	-51.62		0.00		-49.01					0	

Date	Time	Water Level (inches)																		On-site Manual Rain Gauge	On-site Tipping Bucket	TBRG Monthly Totals	Smithfield Daily Rainfall	Smithfield Monthly Rainfall
dd-mmm-yyyy	hh:mm:ss	Cox AW1	Cox MW2	Cox AW3	Cox AW4	Cox AW5	Cox AW6	Cox AW7	Cox MW8	Cox MW9	Cox AW10	Cox AW11	Cox AW12	Ref AW1	Ref MW2	Ref AW3	Ref MW4	Ref AW5	CG					
3-Jul-2010	20:00:00	-34.09		-47.74	-52.38	-44.60	-39.98	-33.37			-44.07	-35.55	-49.50	-53.18		0.00		-49.72						
4-Jul-2010	08:00:00	-33.94		-47.74	-52.58	-45.02	-39.98	-33.92			-44.50	-35.75	-49.48	-53.27		0.00		-49.64					0	
4-Jul-2010	20:00:00	-35.24		-47.74	-52.40	-45.75	-40.58	-34.52			-44.86	-35.98	-49.46	-54.39		0.00		-50.44						
5-Jul-2010	08:00:00	-35.18		-47.73	-52.80	-46.39	-40.63	-35.10			-45.34	-36.41	-49.46	-54.49		0.00		-50.41					0	
5-Jul-2010	20:00:00	-36.33		-47.75	-52.73	-47.29	-41.24	-35.44			-45.72	-36.69	-49.45	-55.45		0.00		-51.18						
6-Jul-2010	08:00:00	-36.30		-47.74	-53.06	-47.84	-41.29	-36.08			-46.15	-37.11	-49.43	-55.50		0.00		-51.17					0	
6-Jul-2010	20:00:00	-37.27		-47.72	-51.71	-48.83	-41.95	-36.31			-46.52	-37.38	-49.44	-56.48		0.00		-51.89						
7-Jul-2010	08:00:00	-37.14		-47.75	-51.77	-49.37	-42.00	-36.83			-46.95	-37.71	-49.43	-56.68		0.00		-51.91					0	
7-Jul-2010	20:00:00	-38.07		-47.74	-51.71	-50.20	-42.58	-37.10			-47.26	-37.90	-49.44	-57.42		0.00		-52.62						
8-Jul-2010	08:00:00	-38.09		-47.74	-51.92	-50.63	-42.63	-37.88			-47.68	-38.27	-49.43	-57.72		0.00		-52.67					0	
8-Jul-2010	20:00:00	-38.77		-47.76	-51.89	-51.31	-43.12	-37.93			-47.99	-38.60	-49.43	-58.39		0.00		-53.20						
9-Jul-2010	08:00:00	-38.75		-47.74	-52.11	-51.69	-43.18	-38.33			-48.38	-38.97	-49.43	-58.56		0.00		-53.17						
9-Jul-2010	20:00:00	-39.43		-47.75	-51.81	-52.11	-43.63	-38.81			-48.69	-39.23	-49.45	-59.11		0.00		-53.71						
10-Jul-2010	08:00:00	-39.53		-47.74	-51.97	-51.88	-43.73	-38.78			-49.05	-39.59	-49.45	-59.37		0.00		-53.76			0.19			
10-Jul-2010	20:00:00	-38.92		-47.75	-51.97	-51.84	-43.99	-38.80			-49.41	-39.84	-49.45	-59.75		0.00		-54.11						
11-Jul-2010	08:00:00	-38.38		-47.75	-52.17	-51.78	-44.00	-39.02			-49.44	-40.11	-49.45	-59.78		0.00		-54.06						
11-Jul-2010	20:00:00	-39.28		-47.74	-51.63	-51.91	-44.45	-39.19			-49.65	-40.33	-49.45	-60.40		0.00		-54.56						
12-Jul-2010	08:00:00	-39.22		-47.75	-52.12	-51.79	-44.51	-39.81			-49.90	-40.54	-49.45	-60.40		0.00		-54.63			0.51		0.01	
12-Jul-2010	20:00:00	-38.66		-47.74	-52.11	-51.91	-44.00	-37.57			-50.10	-40.38	-49.46	-61.04		0.00		-54.92						
13-Jul-2010	08:00:00	-37.40		-47.74	-52.11	-51.78	-43.84	-37.60			-50.30	-40.60	-49.47	-60.66		0.00		-54.86			0.01		0.34	
13-Jul-2010	20:00:00	-37.84		-47.75	-52.12	-51.85	-44.40	-38.01			-50.45	-40.59	-49.45	-61.21		0.00		-55.22						
14-Jul-2010	08:00:00	-37.83		-47.75	-52.14	-51.79	-44.39	-38.25			-50.60	-40.57	-49.45	-61.13		0.00		-55.28			0.01		0.11	
14-Jul-2010	20:00:00	-38.96		-47.75	-52.13	-51.76	-44.64	-38.60			-50.76	-40.66	-49.46	-61.55		0.00		-55.66						
15-Jul-2010	08:00:00	-39.00		-47.74	-52.12	-51.41	-44.47	-38.96			-50.90	-40.76	-49.44	-61.68		0.00		-55.73					0	
15-Jul-2010	20:00:00	-39.88		-47.75	-52.12	-51.68	-44.86	-39.13			-51.05	-40.84	-49.46	-61.62		0.00		-55.34						
16-Jul-2010	08:00:00	-39.98		-47.75	-52.10	-51.72	-44.81	-39.73			-51.25	-41.02	-49.46	-61.27		0.00		-55.55					0	
16-Jul-2010	20:00:00	-40.68		-47.74	-52.10	-51.82	-45.22	-40.11			-51.40	-41.16	-49.47	-61.69		0.00		-55.60						
17-Jul-2010	08:00:00	-40.95		-47.74	-51.86	-51.80	-45.33	-40.40			-51.60	-41.42	-49.46	-61.30		0.00		-54.91			0.81		0	
17-Jul-2010	20:00:00	-37.42		-47.72	-51.86	-51.64	-43.73	-35.17			-51.70	-40.25	-49.47	-61.65		0.00		-54.91						
18-Jul-2010	08:00:00	-35.80		-47.73	-51.86	-51.82	-43.57	-35.85			-51.44	-40.39	-49.47	-52.85		0.00		-54.90			0.08		1.88	
18-Jul-2010	20:00:00	-36.06		-47.74	-51.86	-51.72	-39.63	-31.94			-51.01	-40.08	-49.47	-40.89		0.00		-54.89						
19-Jul-2010	08:00:00	-35.47		-47.73	-51.87	-49.92	-38.16	-30.59			-50.58	-39.59	-49.47	-42.19		0.00		-54.92			0.02			
19-Jul-2010	20:00:00	-36.12		-47.73	-51.86	-49.57	-37.57	-29.47			-50.40	-39.13	-49.49	-45.22		0.00		-54.90						
20-Jul-2010	08:00:00	-36.40		-47.73	-51.85	-49.03	-36.85	-29.21			-50.27	-38.95	-49.48	-46.03		0.00		-54.91			0.09			
20-Jul-2010	20:00:00	-37.80		-47.74	-51.86	-49.43	-37.66	-29.47			-50.56	-39.30	-49.47	-48.50		0.00		-54.91						
21-Jul-2010	08:00:00	-37.85		-47.74	-51.86	-49.31	-38.99	-31.24			-50.59	-39.20	-49.48	-49.57		0.00		-54.91			0.58			
21-Jul-2010	20:00:00	-36.91		-47.75	-51.86	-49.72	-40.15	-30.99			-50.93	-38.60	-49.49	-51.73		0.00		-54.91						
22-Jul-2010	08:00:00	-35.14		-47.74	-51.87	-49.21	-38.53	-29.49			-49.81	-38.23	-49.49	-44.23		0.00		-54.92					0	
22-Jul-2010	20:00:00	-35.98		-47.74	-51.86	-49.66	-39.04	-29.77			-49.86	-38.22	-49.51	-39.01		0.00		-54.90						
23-Jul-2010	08:00:00	-36.19		-47.74	-51.88	-49.71	-40.07	-31.80			-50.06	-38.26	-49.50	-40.89		0.00		-54.91			0.09		0	
23-Jul-2010	20:00:00	-37.36		-47.75	-51.86	-50.49	-41.19	-32.80			-50.51	-38.63	-49.50	-44.90		0.00		-54.90						
24-Jul-2010	08:00:00	-37.62		-47.75	-51.86	-51.07	-41.69	-34.03			-50.76	-38.82	-49.49	-46.25		0.00		-54.91					0	
24-Jul-2010	20:00:00	-38.85		-47.75	-51.86	-52.21	-42.82	-34.74			-51.12	-39.26	-49.52	-49.33		0.00		-54.91						
25-Jul-2010	08:00:00	-39.37		-47.75	-51.85	-51.95	-43.26	-36.21			-51.50	-39.67	-49.50	-50.54		0.00		-54.91					0	
25-Jul-2010	20:00:00	-40.63		-47.74	-51.87	-51.99	-44.21	-36.97			-51.81	-40.20	-49.53	-52.60		0.00		-54.90						
26-Jul-2010	08:00:00	-41.17		-47.75	-51.85	-51.89	-44.63	-38.57			-52.11	-40.81	-49.50	-53.29		0.00		-54.92					0	
26-Jul-2010	20:00:00	-42.01		-47.74	-51.85	-52.00	-45.45	-39.06			-52.37	-41.46	-49.51	-54.82		0.00		-54.91						
27-Jul-2010	08:00:00	-42.18		-47.74	-51.86	-51.90	-45.68	-39.86			-52.63	-41.82	-49.50	-55.12		0.00		-54.90			0.07			
27-Jul-2010	20:00:00	-42.41		-47.75	-51.86	-51.98	-46.08	-40.20			-52.79	-42.12	-49.49	-56.18		0.00		-54.90						
28-Jul-2010	08:00:00	-42.09	-51.00	-47.74	-51.86	-51.98	-46.18	-40.84	-45.00	-47.00	-52.61	-42.35	-49.50	-56.69	-39.00	0.00	-38.00	-54.91	0.00	2.80	0.01			
28-Jul-2010	20:00:00	-42.81		-47.74	-51.87	-52.09	-46.71	-41.00			-52.46	-42.64	-49.52	-57.97		0.00		-54.91						
29-Jul-2010	08:00:00	-42.68		-47.74	-51.86	-52.22	-46.89	-41.56			-52.47	-42.92	-49.51	-58.66		0.00		-54.90						
29-Jul-2010	20:00:00	-43.30		-47.75	-51.86	-52.22	-47.42	-41.85			-52.49	-43.17	-49.53	-59.18		0.00		-54.92						
30-Jul-2010	08:00:00	-43.48		-47.73	-51.86	-51.98	-47.35	-42.45			-52.18	-43.48	-49.50	-60.09		0.00		-54.98						
30-Jul-2010	20:00:00	-44.09		-47.74	-51.85	-52.13	-47.79	-42.54			-52.18	-44.05	-49.50	-60.83		0.00		-55.21						
31-Jul-2010	08:00:00	-44.26		-47.74	-51.86	-52.01	-47.86	-43.25			-52.15	-43.96	-49.51	-61.33		0.00		-55.20						
31-Jul-2010	20:00:00	-44.52		-47.74	-51.86	-52.08	-48.24	-43.33			-52.15	-44.63	-49.50	-62.00		0.00		-55.21				2.64		2.34
1-Aug-2010	08:00:00	-43.56		-47.76	-51.86	-51.47	-47.32	-41.56			-52.15	-44.32	-49.49	-61.93		0.00		-55.20					0.09	
1-Aug-2010	20:00:00	-41.89		-47.75	-51.85	-51.92	-47.69	-41.48			-52.14	-44.53	-49.49	-61.92		0.00		-55.21						
2-Aug-2010	08:00:00	-41.36		-47.75	-51.86	-51.81	-47.73	-41.90			-52.12	-44.46	-49.49	-61.30		0.00		-54.80					0.34	
2-Aug-2010	20:00:00	-41.73		-47.75	-51.87	-51.96	-47.73	-41.32			-52.15	-44.66	-49.49	-61.44		0.00		-54.97						
3-Aug-2010	08:00:00	-41.47		-47.74	-51.86	-51.85	-46.95	-41.37			-52.14	-44.28	-49.49	-61.36		0.00		-54.68					0.00	
3-Aug-2010	20:00:00	-42.25		-47.73	-51.87	-52.12	-47.37	-40.92			-52.17	-44.82	-49.50	-61.85		0.00		-55.21						
4-Aug-2010	08:00:00	-42.28		-47.75	-51.87	-52.00	-47.12	-41.64			-52.17	-44.81	-49.50	-61.53		0.00		-55.22					0.00	
4-Aug-2010	20:00:00	-43.37		-47.74	-51.86	-52.06	-47.94	-41.89			-52.19	-44.94	-49.49	-61.99		0.00		-55.20						
5-Aug-2010	08:00:00	-34.99		-47.74	-51.86	-51.31	-39.83	-29.93			-52.00	-39.21	-49.51	-59.09		0.00		-55.20					1.19	
5-Aug-2010	20:00:00	-33.14		-47.73	-51.86	-48.40	-37.14	-27.61			-47.27	-37.68	-49.50	-28.19		0.00		-55.19						
6-Aug-2010	08:00:00	-32.77		-47.75	-51.87	-47.67	-36.26	-26.42			-43.12	-35.63	-49.49	-25.12		0.00		-55.16					0.42	
6-Aug-2010	20:00:00	-33.67		-47.75	-51.86	-47.86	-36.38	-26.46			-42.01	-34.72	-49.49	-26.47		0.00		-55.13						
7-Aug-2010	08:00:00	-34.03		-47.74	-51.86	-47.67	-35.98	-26.82			-41.87	-33.90	-49.48	-29.75		0.00		-55.19					0.00	
7-Aug-2010	20:00:00	-35.32		-47.75	-51.85	-48.08	-36.29	-27.00			-42.16	-33.94	-49.49	-34.60		0.00		-55.19						
8-Aug-2010	08:00:00	-35.66		-47.75	-51.85	-48.09	-36.53	-27.79			-42.58	-33.99	-49.49	-35.72		0.00		-55.21						
8-Aug-2010	20:00:00	-36.72		-47.75	-51.86	-48.82	-37.89	-29.19			-43.29	-34.92	-49.48	-40.26		0.00		-55.20						
9-Aug-2010	08:00:00	-37.11		-47.75	-51.86	-49.12	-38.82	-31.21			-43.98	-34.96	-49.49	-41.00		0.00		-55.20						
9-Aug-2010	20:00:00	-38.09		-47.75	-51.85	-50.22	-40.16	-32.15			-44.80	-36.05	-49.49	-44.70		0.00		-55.21						
10-Aug-2010	08:00:00	-38.40		-47.75	-51.86	-51.07	-40.63	-33.37			-45.52	-36.25	-49.50	-45.55		0.00		-55.20						
10-Aug-2010	20:00:00	-39.35		-47.74	-51.86	-52.11	-41.82	-34.35			-46.26	-37.40	-49.49	-48.17		0.00		-55.21						
11-Aug-2010	08:00:00	-39.84		-47.75	-51.86	-52.02	-42.26	-35.96			-47.02	-37.91	-49.49	-49.20		0.00		-55.21					0.00	
11-Aug-2010	20:00:00	-40.83		-47.74	-51.87	-52.18	-43.55	-36.72			-47.70	-38.73	-49.51	-50.83		0.00		-55.14						
12-Aug-2010	08:00:00	-41.24		-47.75	-51.86	-52.28	-44.07	-37.90			-48.38	-39.35	-49.50	-51.65		0.00		-55.12					0.03	
12-Aug-2010	20:00:00	-42.01		-47.75	-51.86	-52.15	-45.26	-38.66			-49.03	-39.95	-49.45	-53.27		0.00		-55.06						
13-Aug-2010	08:00:00	-41.03		-47.74	-51.86	-52.03	-45.46	-39.83			-49.63	-40.38	-49.40	-54.30		0.00		-55.14					0.00	
13-Aug-2010	20:00:00	-37.77		-47.75	-51.85	-52.00	-46.32	-40.43			-50.18	-41.14	-49.40	-55.43		0.00		-55.20						
14-Aug-2010	08:00:00	-35.14		-47.74	-51.86	-51.92	-46.86	-41.56			-50.69	-41.79	-49.39	-56.37		0.00		-55.21					0.00	
14-Aug-2010	20:00:00	-34.27		-47.74	-51.86	-52.00	-47.77	-42.11			-51.19	-42.79	-49.40	-57.31		0.00		-55.20						
15-Aug-2010	08:00:00	-32.66		-47.74	-51.86	-51.99	-48.05	-42.94			-51.65	-43.22	-49.40	-58.03		0.00		-55.21					0.00	
15-Aug-2010	20:00:00	-33.75		-47.74	-51.86	-52.14	-48.76	-43.44			-52.15	-44.28	-49.42	-58.86		0.00		-55.20						
16-Aug-2010	08:00:00	-32.38		-47.73	-51.86	-52.02	-48.90	-44.22			-52.29	-44.61	-49.41	-59.61		0.00		-55.20					0.00	
16-Aug-2010	20:00:00	-34.08		-47.75	-51.86	-52.14	-49.52	-44.18			-52.26	-45.35	-49.42	-60.42		0.00		-55.20						
17-Aug-2010	08:00:00	-32.48		-47.74	-51.86	-51.99	-49.58	-45.11			-52.25	-45.58	-49.40	-61.17		0.00		-55.17					0.00	
17-Aug-2010	20:00:00	-34.35		-47.74	-51.86	-52.10	-50.20	-45.35			-52.25	-46.42	-49.41	-62.17		0.00		-55.21						
18-Aug-2010	08:00:00	-32.79		-47.74	-51.86	-52.12	-50.26	-45.90			-52.25	-46.64	-49.40	-62.30		0.00		-55.20						

Date	Time	Water Level (inches)																		On-site Manual Rain Gauge	On-site Tipping Bucket	TBRG Monthly Totals	Smithfield Daily Rainfall	Smithfield Monthly Rainfall
dd-mmm-yyyy	hh:mm:ss	Cox AW1	Cox MW2	Cox AW3	Cox AW4	Cox AW5	Cox AW6	Cox AW7	Cox MW8	Cox MW9	Cox AW10	Cox AW11	Cox AW12	Ref AW1	Ref MW2	Ref AW3	Ref MW4	Ref AW5	CG					
18-Aug-2010	20:00:00	-32.30		-47.74	-51.86	-52.13	-50.65	-45.90			-52.27	-47.67	-49.42	-62.09		0.00		-55.22						
19-Aug-2010	08:00:00	-30.81		-47.74	-51.86	-52.14	-50.71	-46.14			-52.29	-48.13	-49.42	-62.05		0.00		-55.21						
19-Aug-2010	20:00:00	-29.87		-47.74	-51.86	-52.27	-51.02	-46.21			-52.21	-48.67	-49.43	-61.99		0.00		-55.20						
20-Aug-2010	08:00:00	-20.37		-47.75	-51.86	-52.09	-51.03	-46.36			-52.19	-48.98	-49.41	-61.77		0.00		-55.21						
20-Aug-2010	20:00:00	0.20		-47.75	-51.86	-52.05	-51.42	-46.22			-52.22	-49.33	-49.41	-62.27		0.00		-55.21						
21-Aug-2010	08:00:00	1.08		-47.75	-51.85	-52.02	-51.31	-47.04			-52.21	-49.06	-49.40	-62.13		0.00		-55.14					0	
21-Aug-2010	20:00:00	0.70		-47.74	-51.85	-52.22	-51.63	-46.43			-52.23	-49.60	-49.43	-62.32		0.00		-55.20						
22-Aug-2010	08:00:00	0.82		-47.74	-51.86	-52.14	-51.33	-46.45			-52.25	-49.46	-49.42	-62.16		0.00		-55.21					0	
22-Aug-2010	20:00:00	2.05		-47.73	-51.86	-52.02	-47.40	-40.26			-52.24	-47.04	-49.43	-62.07		0.00		-55.21						
23-Aug-2010	08:00:00	3.28		-47.75	-51.86	-52.14	-45.91	-39.45			-52.25	-46.66	-49.43	-59.26		0.00		-55.20					0.56	
23-Aug-2010	20:00:00	2.51		-47.75	-51.86	-52.05	-42.55	-35.52			-52.25	-46.16	-49.44	-48.16		0.00		-55.19						
24-Aug-2010	08:00:00	2.39		-47.75	-51.85	-52.04	-40.94	-34.18			-52.23	-45.23	-49.43	-48.77		0.00		-55.21					0	
24-Aug-2010	20:00:00	2.74		-47.74	-51.86	-47.12	-36.49	-26.09			-52.24	-44.37	-49.42	-45.18		0.00		-55.20						
25-Aug-2010	08:00:00	3.64		-47.74	-51.85	-50.41	-36.46	-24.48			-51.69	-43.28	-49.41	-28.46		0.00		-55.19					2	
25-Aug-2010	20:00:00	2.99		-47.74	-51.86	-49.59	-36.12	-24.00			-50.95	-42.19	-49.41	-25.25		0.00		-55.20						
26-Aug-2010	08:00:00	2.74		-47.74	-51.86	-49.02	-35.77	-24.94			-50.55	-41.17	-49.40	-23.89		0.00		-54.90					0	
26-Aug-2010	20:00:00	2.23		-47.74	-51.86	-49.11	-36.07	-25.49			-50.54	-40.67	-49.42	-26.96		0.00		-55.09						
27-Aug-2010	08:00:00	2.00		-47.74	-51.87	-48.98	-35.76	-26.23			-50.33	-40.00	-49.39	-30.30		0.00		-54.66					0	
27-Aug-2010	20:00:00	1.63		-47.74	-51.86	-49.48	-36.02	-27.12			-50.57	-39.94	-49.40	-35.86		0.00		-54.64						
28-Aug-2010	08:00:00	1.74		-47.75	-51.85	-49.68	-36.33	-29.25			-50.81	-39.84	-49.38	-37.61		0.00		-54.74						
28-Aug-2010	20:00:00	1.43		-47.74	-51.86	-50.38	-36.82	-30.24			-51.15	-40.16	-49.39	-41.55		0.00		-54.89						
29-Aug-2010	08:00:00	1.55		-47.74	-51.86	-50.76	-36.70	-31.45			-51.42	-40.11	-49.37	-42.81		0.00		-54.73						
29-Aug-2010	20:00:00	1.20		-47.74	-51.86	-51.72	-37.52	-32.02			-51.71	-40.78	-49.39	-45.99		0.00		-55.15						
30-Aug-2010	08:00:00	1.37		-47.74	-51.86	-51.81	-37.72	-33.53			-51.94	-40.68	-49.39	-46.85		0.00		-54.73						
30-Aug-2010	20:00:00	1.20		-47.75	-51.86	-52.03	-38.94	-33.79			-52.28	-41.59	-49.40	-49.29		0.00		-55.21						
31-Aug-2010	08:00:00	1.37		-47.75	-51.87	-52.06	-39.32	-35.30			-52.41	-41.81	-49.41	-50.25		0.00		-55.20					0	
31-Aug-2010	20:00:00	0.98		-47.75	-51.86	-52.14	-40.60	-35.45			-52.37	-42.55	-49.41	-51.94		0.00		-55.21				0.00		4.63
1-Sep-2010	08:00:00	1.38		-47.76	-51.85	-52.14	-40.97	-37.03			-52.30	-42.49	-49.40	-52.91		0.00		-55.21						
1-Sep-2010	20:00:00	0.87		-47.75	-51.86	-52.21	-42.22	-37.31			-52.29	-43.53	-49.41	-54.33		0.00		-55.16						
2-Sep-2010	08:00:00	1.18	-17.00	-47.75	-51.86	-52.39	-42.55	-38.40	-44.00	-58.00	-52.24	-44.02	-49.42	-55.16	-37.00	0.00	-37.00	-55.13	0.00	3.71				

APPENDIX D

2010 Site Photos

2010 Stream Observation Area Photos

SOA 1 - Erosion on right bank behind root wads, Sta. 24+25.

SOA 2 – Mid-channel bar formation, Sta. 43+00.

SOA 3 – Mid-channel bar formation, Sta. 44+35.

SOA 4 – Vegetation in channel, Sta. 45+50.

SOA 5 – Erosion on left and right banks at log weir, Sta. 46+85.

SOA 6 – Mid channel bar formation, Sta. 74+90 to 75+00.

Cox Vegetation Monitoring Plot Photos

Cox Vegetation Monitoring Plot #1

Cox Vegetation Monitoring Plot #2

Cox Vegetation Monitoring Plot #3

Cox Vegetation Monitoring Plot #4

Cox Vegetation Monitoring Plot #5

Cox Vegetation Monitoring Plot #6

Cox Vegetation Monitoring Plot #7

Cox Vegetation Monitoring Plot #8

Cox Vegetation Monitoring Plot #9

Cox Vegetation Monitoring Plot #10

Cox Vegetation Monitoring Plot #11

Cox Vegetation Monitoring Plot #12

Cox Vegetation Monitoring Plot #13

Cox Vegetation Monitoring Plot #14

Cox Vegetation Monitoring Plot #15

Cox Vegetation Monitoring Plot #16

Cox Vegetation Monitoring Plot #17

Cox Vegetation Monitoring Plot #18

Cox Vegetation Monitoring Plot #19

Cox Vegetation Monitoring Plot #20

Cox Vegetation Monitoring Plot #21

Cox Vegetation Monitoring Plot #22