(MY0) FINAL MONITORING REPORT - *Stream Mitigation*

STRAWBERRY HILL MITIGATION PROJECT

Johnston County, North Carolina
Neuse River Basin
HUC 03020201

NCDMS Project #100094
DMS Contract #7745
RFP: 16-007576
USACE Action ID: SAW-2019-00124 | DWR Project #2019-0159

Provided by:

Resource Environmental Solutions, LLC
for Environmental Banc & Exchange – Neuse I, LLC

Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
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July 2022

M E M O R A N D U M

3600 Glenwood Avenue, Suite 100 Raleigh, North Carolina 27612 919.770.5573 tel. 919.829.9913 fax

TO: **Division of Mitigation Services**

FROM: **Jamey McEachran – RES**

DATE: **July 8, 2022**

RE: **DMS Comments on the Draft As-Built Baseline Monitoring Report**
Strawberry Hill, Project ID #100094, DMS Contract #0007745

Comments:

1. DMS recommends using the most current templates and tables for monitoring reports. It is understood that this project was contracted in December 2018 and therefore templates from that time period are applicable. However, the most current templates provide the IRT and DMS with the needed information in a more streamlined and less verbose format.
   Majority of the Report has been updated using the most current template and tables.

2. Recommend adding dates to photos that do not have them either at the top of the page or with each photo.
   Dates have been added to all photos.

3. Please add Limits of Disturbance to the Record Drawings.
   Limits of Disturbance (LOD) have been added to the Record Drawings.

4. Please consider updating the Sheet List Table on the Record Drawing Title Page in the buffer report only by removing the reference to sheets that are not included, or otherwise indicating that only sheets M1 & M2 are included. Also consider a reference to sheet EC2.
   The Sheet List Table has been updated to only include references to sheets M1 and M2. A Cover Page has also been added for the ESC map with a reference to sheet EC2.

5. During the site visit conducted on June 8, 2022 some small, isolated areas of struggling herbaceous growth were observed, specifically a small bare area on JH5 near the tree line and relatively sparse herbaceous cover along some portions of the old farm roads that paralleled JH5 and JH3. Areas did not appear to currently be causing any major issues, but we recommend over seeding this fall if herbaceous vegetation does not more fully establish this summer.
   This area will be monitored this fall and seeded if needed.

6. At the upstream end of JH1-B near Yelverton Grove Road there is a small area that appears to be less than 30' in width, but greater than 20', which would apply a 25% reduction to buffer credits in this area. Please update the buffer credits and report as necessary.
   The revision has been made. The area has been separated out as a unique polygon in the buffer shapefile and a row has been added in the buffer credit table that accounts for the 75% credit stipulation. The resulting credit yield was reduced by 227.498 credits. The report, credit table, and GIS

shapefile have all been updated accordingly.

Digital File Comments:

1. It is not possible to ensure the easement is accurate when compared to the CCPV in the stream asset baseline report, the CCPV does include the entire easement. The digital easement submitted does represent the DMS recorded easement. A requirement of the CCPV is to include the easement boundary, please revise the CCPV in the Stream Baseline Report to include the entire easement boundary. It is complete in the Buffer Baseline Report.
   Figure 2 has been divided into Figure 2a and 2b so that monitoring devices are legible on 2a and the entire conservation easement is visible on 2b.

2. The tables used are not the most updated templates (2020); this project may not have been contracted with these as requirements. The tables are missing the following information:
   a. Project Background is missing regulatory information and pre-existing stream lengths The Project Background tables were updated and display the new requirements.

   b. The goals table is missing from the digital submission and report. The goals table has been added to the report and digital submission.
3. In future submissions, please choose unique names for 'feature name' in buffer excel asset table and use those unique feature names in the digital submission attribute date for buffer feature class. There are numbers on the buffer asset map that are not defined in the legend. This is noted for future submissions, the unique feature names will be consistent.

4. Data missing from the digital submission: Please submit the missing data.
   a. Longitudinal profile is missing, data and graph
      Long pro data and graphs are shown in the as-built record drawings and redlines.

   b. Particle size distribution is missing, data and graph
      This is not a requirement in the approved mitigation plan nor required as part of the monitoring guidance and therefore was not conducted and will not provided in this report.

   c. Photo point spatial data file is missing Photo points have been added.

   d. Station id not included in the raw cross sectional survey data
      A spreadsheet has been added that includes the raw survey data with station id.

   e. Planted zone
      Planted zone has been added.

5. Please refer to DMS As-bult Survey Requirements, item 15; the .dwg file submitted is not adequately attributed.
   All layers were started with "AB-" to symbolize they are part of the As-Built condition. Layer details can be found behind the AB convention.

Table of Contents

1 Project Summary

1.1 Project Location and Description

The Strawberry Hill Mitigation Project ("Project") is located within a mostly rural watershed in Johnston County near Smithfield, NC at the crossroads of Yelverton Grove Road and Brogden Road. The Project lies within the Neuse River Basin, North Carolina United States Geological Survey (USGS) 8-digit Cataloguing Unit 03020201 (Neuse 01) and 14-digit hydrologic unit code (HUC) 03020201140010, a NC Division of Mitigation Services (DMS) Targeted Local Watershed (TLW) and the Division of Water Resources (NCDWR) sub-basin 03-04-02 (**Figure 1**). The Project restores 3,719 linear feet (LF) that will provide water quality benefit for 383 acres of drainage area. Additionally, the Project restores and preserves riparian buffer area within the project area, which provides riparian buffer credits for the Neuse 01 watershed. As-built and baseline conditions pertaining to the buffer mitigation component of this Project will be provided in a separate baseline monitoring report. Also, notably, the Project is in very close proximity (approximately 0.4 miles) to the RES Polecat Stream Mitigation Bank Site, offering even more functional uplift to the local watershed.

The Project area, in whole, is comprised of a 22.12-acre easement involving two unnamed tributaries to Polecat Branch, which eventually drains to the Neuse River. One of the tributary streams, and its associated ditches, are not subject to stream mitigation and are only utilized for buffer mitigation. That portion of the Project will not be discussed in this stream mitigation as-built baseline monitoring report but will be included in a separate baseline monitoring report. Therefore, the stream mitigation component of the Project involves one tributary, whose total length prior to restoration was 3,267 LF.

The Project is accessible from both Yelverton Grove Road and Brogden Road. Coordinates for the Project area are approximately 35.469579, -78.323896 at the NC Department of Transportation (DOT) culvert exiting the Project at Brogden Road.

1.2 Project Components

Prior to restoration, the project stream was significantly impacted by historic relocation and straightening, crop production, timbering, and lack of riparian buffer. Proposed improvements to the Project will help meet the river basin needs expressed in the 2010 Neuse RBRP. Through stream restoration, the Project presents 3,719 LF of proposed stream, generating 3,719.000 Warm Stream Mitigation Units (SMUs). The Project Mitigation Quantities and Credits and Project Attributes are provided below in **Table 1.**

Table 1. Strawberry Hill Mitigation Project (ID-100094) Project Mitigation Quantities and Credit

Project Segment	Original Mitigation Plan Ft/Ac	As-Built Ft/Ac	Original Mitigation Category	Original Restoration Level	Original Mitigation Ratio (X:1)	Credits	Comments
Stream							
Reach JH1-A	1007	1007	Warm	R	1.00000	1,007.000	Channel restoration,installed log structures for grade control and habitat, riparian planting, installed livestakes (Stream Crossing: STA 11+64 to 12+59)
Reach JH1-B	1054	1054	Warm	R	1.00000	1,054.000	Channel restoration,installed log structures for grade control and habitat, riparian planting, installed livestakes, (Stream Crossing: STA 23+13 to 23+74), Removed trash/debris
Reach JH1-B	1658	1658	Warm	R	1.00000	1,658.000	Channel restoration, installed log structures for grade control and habitat, riparian planting, installed livestakes, Removed trash/debris
					Total:	**3,719.000**	
No Wetland Mitigation							

Project Credits

	Stream			Riparian	Non-Rip	Coastal
Restoration Level	Warm	Cool	Cold	Wetland	Wetland	Marsh
Restoration	3,719.000					
Totals	**3,719.000**					
Total Stream Credit	**3,719.000**					

1.3 Project Goals and Objectives

Prior to construction the stream had been significantly impacted by historic relocation and straightening, crop production, timbering and lack of riparian buffer. The past land use disturbances, absence of buffer vegetation, and current agricultural practices presented a significant opportunity for water quality and ecosystem improvements through the implementation of this Project. Through the comprehensive analysis of the Project's maximum functional uplift using the Stream Functions Pyramid Framework, specific, attainable goals and objectives are being realized by the Project. These goals clearly help to address the degraded water quality and nutrient input from agricultural practices that were identified as major watershed stressors in the 2010 Neuse River Basin Restoration Priorities (RBRP) (amended August 2018). Ultimately, the Project supports the RBRP Goals listed in the Approved Mitigation Plan. The Project Summary Goals, Performance, and Results are provided below in **Table 2**. The Project Attributes are found in **Table 3**.

Table 2: Summary: Goals, Performance and Results

Goal	Objective/Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Improve flood flow attenuation on site and downstream by allowing for overbanks flows and connection to the floodplain.	Designed and constructed stream channels sized to convey bankfull flows that will maintain a stable dimension, profile, and planform based on modeling, watershed conditions, and reference reach conditions.	Dispersion of high flows on the floodplain, increase in biogeochemical cycling within the system.	Four bankfull events and within monitoring period. Intermittent stream reaches must have 30 days of consecutive flow.	Stage recorder on JH1-A, and flow gauge on JH1-B.	N/A
To transport water within streams and floodplains in a stable, non-erosive, non-aggrading manner.	Improved flood bank connectivity by reducing bank height ratios and increase entrenchment ratios.	Reduction in sediment inputs from bank erosion, reduction of shear stress, and improved overall hydraulic function.	Bank height ratios remain below 1.2 and entrenchment ratios above 2.2 over the monitoring period. Visual assessments showing progression towards stability.	14 Cross section surveys.	N/A
Restore and preserve native floodplain and streambank vegetation.	Established and increased forested riparian buffers to 50 feet and greater along both sides of the channel along the project reaches with a hardwood riparian plant community.	Reduction in floodplain sediment inputs from runoff, increased bank stability, increased LWD and organic material in streams, increased.	Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7.	Seven fixed vegetation plots and four random vegetation plots.	N/A

Table 3. Project Attribute Table			
Project Name	Strawberry Hill Mitigation Project		
County	Johnston		
Project Area (acres)	22.12		
Project Coordinates (latitude and longitude decimal	35.469579, -78.323896		
Project Watershed Summary Information			
Physiographic Province	65m - Rolling Coastal Plain		
River Basin	Neuse		
USGS Hydrologic Unit 8-digit	3020201		
DWR Sub-basin	03-04-02		
Project Drainage Area (acres)	383 ac		
Project Drainage Area Percentage of Impervious Area	2%		
Land Use Classification	Bottomland Forest, Cultivated, Evergreen Shrubland, Southern Yellow Pine, Unconsolidated Sediment		
Reach Summary Information			
Parameters	**Reach JH1-A**	**Reach JH1-B**	
Pre-project length (feet)	901	2,336	
Post-project (feet)	1,007	2,712	
Valley confinement (Confined, moderately confined,	Unconfined	Unconfined	
Drainage area (acres)	193 ac	266 ac	
Perennial, Intermittent, Ephemeral	Intermittent	Intermittent	
NCDWR Water Quality Classification	None	None	
Dominant Stream Classification (existing)	F5	F5	
Dominant Stream Classification (proposed)	C5/E5	C5/E5	
Dominant Evolutionary class (Simon) if applicable	II	II	
Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	Yes	Yes	See PCN Approval
Water of the United States - Section 401	Yes	Yes	See PCN Approval
Endangered Species Act	Yes	Yes	Appendix L
Historic Preservation Act	Yes	Yes	Appendix L
Coastal Zone Management Act (CZMA or CAMA)	No	N/A	N/A
Essential Fisheries Habitat	No	N/A	N/A

1.4 Construction and As-Built Conditions

Project construction was completed on January 20th, 2022, and planting was completed on March 7th, 2022. The Strawberry Hill Project was built to design plans and guidelines. The record drawings are included in **Appendix F.**

There were no changes to the planting plan. However, as some high-quality tree species were found within the cutover areas that were timbered over eight years ago, these species were left in place where feasible. Minor monitoring device location changes were made during as-built installation, however, the quantities remained as proposed in the Mitigation Plan.

1.5 Baseline Monitoring Performance (MY0)

The Strawberry Hill Baseline Monitoring activities were performed in February and March 2022. All Baseline Monitoring data is presented below and in the appendices. The Project is on track to meeting stream and vegetation interim success criteria.

1.5.1 Vegetation

Setup and monitoring of the seven permanent vegetation plots and four random vegetation plots were completed after stream construction and planting, on March 7th, 2022 and March 15th, 2022. Vegetation

data are in **Appendix B**, associated photos are in **Appendix B,** and plot locations are in **Appendix A**. MY0 monitoring data indicates that all plots are exceeding the interim success criteria of 320 planted stems per acre. Planted stem densities ranged from 647 to 1,133 planted stems per acre with a mean of 861 planted stems per acre across all plots. A total of twelve planted species were documented within the plots. Two large volunteer species were identified in random plots (*Diospyros virginiana* and *Sambucus canadensis*) and it is expected that more volunteers will establish in upcoming years. The average stem height in the vegetation plots was 1.6 feet.

Visual assessment of vegetation outside of the monitoring plots indicates that herbaceous vegetation is establishing throughout the project area.

1.5.2 Stream Hydrology

One stage recorder and one flow gauge were installed on February 16th, 2022 on reaches JH1-A and JH1-B, respectively. The stage recorder is in place to document bankfull events. The flow gauge is in place to document presence and persistence of stream flow in the intermittent channel. In addition, a camera rig (flow camera) was installed in conjunction with the flow gauge on JH1-B in the attempt to capture daily images of stream flow through the riffle. Stream hydrology data will be included in the Monitoring Year 1 Report in this section and in the appendices. Gauge locations can be found on **Figure 2** and photos are in **Appendix A**.

1.5.3 Stream Geomorphology

Cross section setup and geomorphology data collection for MY0 was collected on February 16th, 2022. Summary tables and cross section plots are in **Appendix C**. Overall, the baseline cross sections and profile relatively match the proposed design. The as-built conditions show that shear stress and velocities have been reduced for all restoration reaches. All reaches were designed as gravel bed channels and remain classified as gravel bed channels post-construction.

Visual assessment of the stream channel was performed to document signs of instability, such as eroding banks, structural instability, or excessive sedimentation. The channel is transporting sediment as designed and will continue to be monitored for aggradation and degradation (**Appendix C**). Since Project construction, a suspected beaver dam has formed offsite, somewhere downstream of reach JH1-B and Brogden Road. This is causing some water to back up within the JH1-B channel near the road; however, most of the water is still contained within the channel and not causing any real inundation in the floodplain at this time. RES will continue to monitor the effect, but the suspected dam is offsite and not within the property of the Project's landowner.

2 References

Griffith, G.E., J.M.Omernik, J.A. Comstock, M.P. Schafale, W.H.McNab, D.R.Lenat, T.F.MacPherson, J.B. Glover, and V.B. Shelburne. (2002). "Ecoregions of North Carolina and South Carolina." (color Poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

Lee Michael T., Peet Robert K., Roberts Steven D., and Wentworth Thomas R., 2008. "CVS-EEP Protocol for Recording Vegetation Level." Version 4.2

North Carolina Division of Mitigation Services (NCDMS). "Neuse River Basin Restoration Priorities 2010. Amended August 2018."

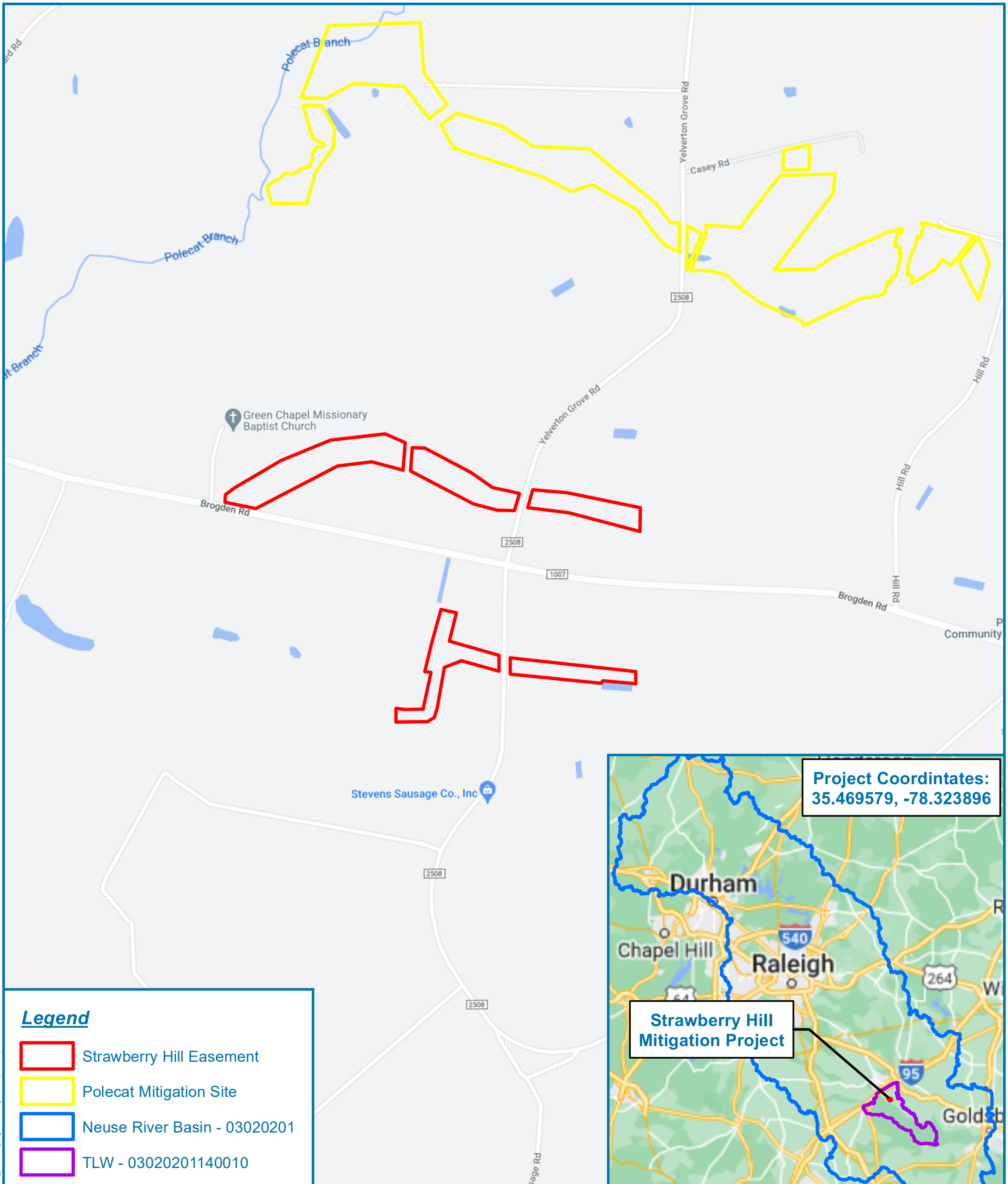
Peet, R.K., Wentworth, T.S., and White, P.S. (1998). "A flexible, multipurpose method for recording vegetation composition and structure." Castanea 63:262-274

Resource Environmental Solutions (2020). "Strawberry Hill Final Mitigation Plan".

US Army Corps of Engineers (USACE). (2016). "Wilmington District Stream and Wetland Compensatory Mitigation Update." NC: Interagency Review Team (IRT).

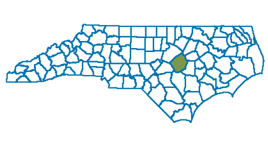
Appendix A

Visual Assessment Data



Legend

- Strawberry Hill Easement
- Polecat Mitigation Site
- Neuse River Basin - 03020201
- TLW - 03020201140010



N
W E
S

0 500 1,000
Feet

Figure 1 - Site Location Map

Strawberry Hill Mitigation Project

Johnston County, North Carolina

Date: 3/8/2022

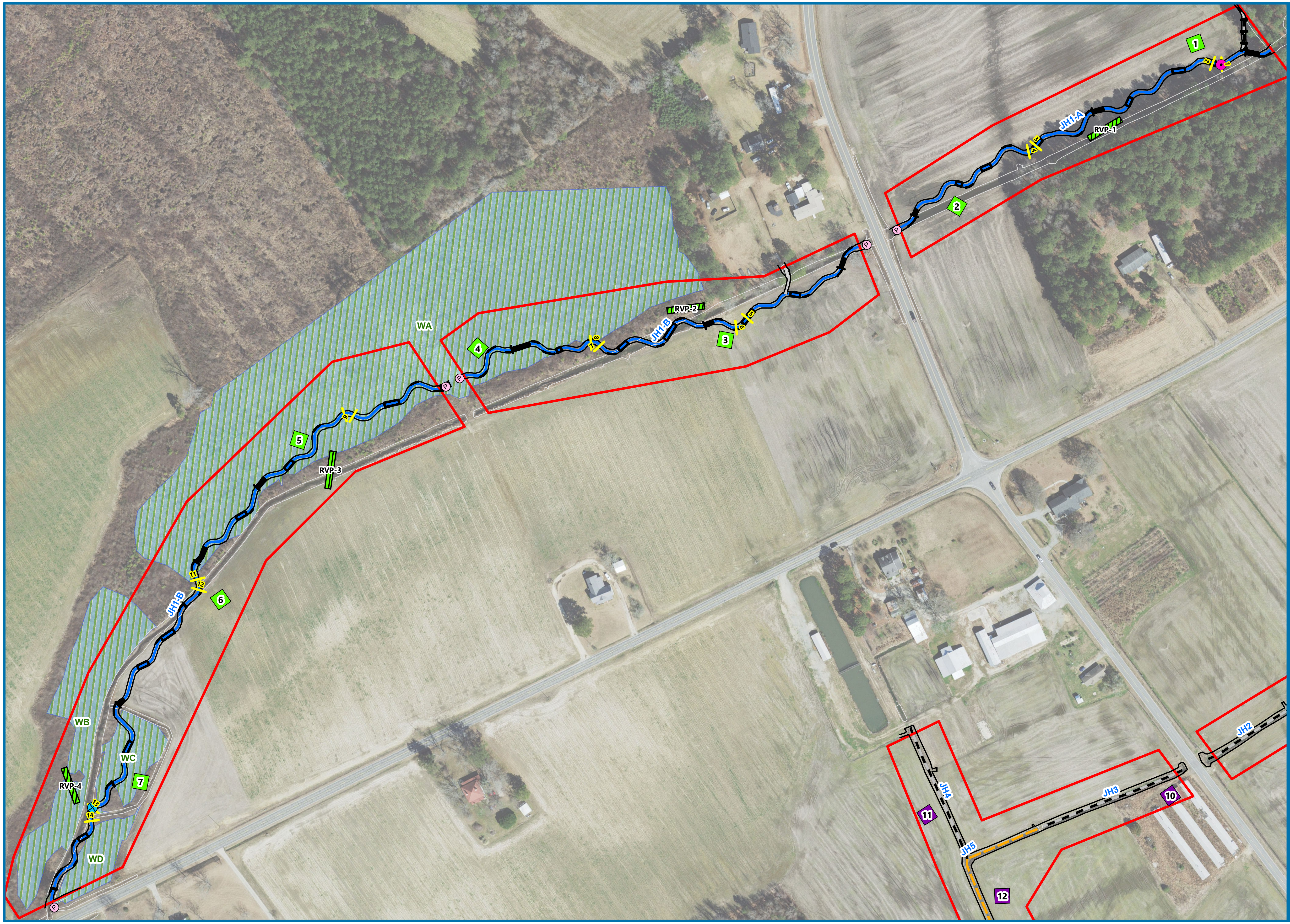
Drawn by: MDD

Checked by: JRM

1 inch = 1,000 feet

res

Document Path: R:\Resgis\entgis\Projects\101038_Strawberry_Hill\MXDs\4_Mitigation Plan\Figure 1 - Project Vicinity.mxd



res

0 100 200
Feet

Figure 2a

Current Conditions Plan View
Stream Mitigation

MY0 2022

Strawberry Hill Mitigation Project

Johnston County, North Carolina

Date: 7/6/2022	Drawn by: EJU
Checked by: RTM	1 in = 200 feet

Legend

- Recorded Easement (22.12 ac)

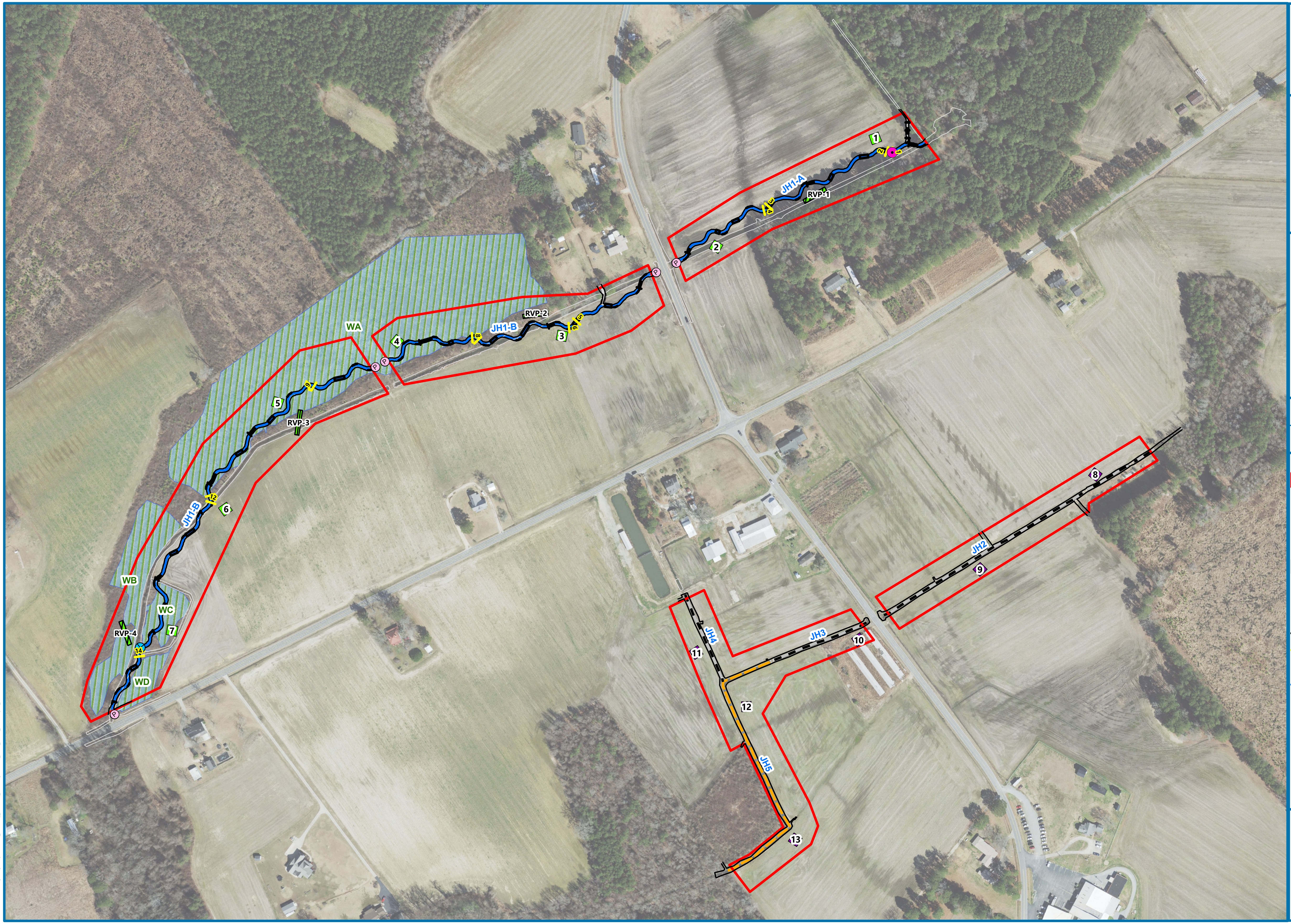
Vegetation Plot
- >320 stems/acre
- Buffer Only

Random Vegetation Plot
- >320 stem/acre
- Existing Wetlands
- Pre-existing Top of Bank
- Surveyed Top of Bank
- Stream Structure
- Cross-section

Stream Mitigation Approach
- Restoration
- No Credit
- Ditch
- Swale
- Stage Recorder
- Flow Gauge
- Photo Location

Vegetation Condition Assessment

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			



res

N E S W
0 150 300
Feet

Figure 2b

Current Conditions Plan View
Stream Mitigation

MY0 2022

Strawberry Hill Mitigation Project

Johnston County, North Carolina

Date: 7/6/2022	Drawn by: EJU
Checked by: RTM	1 in = 300 feet

Legend

- Recorded Easement (22.12 ac)

Vegetation Plot
- >320 stems/acre
- Buffer Only

Random Vegetation Plot
- >320 stem/acre
- Existing Wetlands
- Pre-existing Top of Bank
- Surveyed Top of Bank
- Stream Structure
- Cross-section

Stream Mitigation Approach
- Restoration
- No Credit
- Ditch
- Swale
- Stage Recorder
- Flow Gauge
- Photo Location

Vegetation Condition Assessment

Invasive Species	Target Community: Present	Marginal	Absent
Absent	No Fill		
Present			

Visual Stream Stability Assessment

Reach JH1-A

Assessed Stream Length 1007

Assessed Bank Length 2014

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	9	9		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	7	7		100%

Visual Stream Stability Assessment

Reach JH1-B

Assessed Stream Length 2712

Assessed Bank Length 5424

Major Channel Category		Metric	Number Stable, Performing as Intended	Total Number in As-built	Amount of Unstable Footage	% Stable, Performing as Intended
Bank	**Surface Scour/Bare Bank**	Bank lacking vegetative cover resulting simply from poor growth and/or surface scour			0	100%
	Toe Erosion	Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	100%
	Bank Failure	Fluvial and geotechnical - rotational, slumping, calving, or collapse			0	100%
Totals					0	100%
Structure	**Grade Control**	Grade control structures exhibiting maintenance of grade across the sill.	21	21		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in DMS monitoring guidance document)	28	28		100%

Visual Vegetation Assessment

Planted acreage **19.73**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	0.00	0.0%
Low Stem Density Areas	Woody stem densities clearly below target levels based on current MY stem count criteria.	0.1 acres	0.00	0.0%
	Total			
Areas of Poor Growth Rates	Planted areas where average height is not meeting current MY Performance Standard.	0.25 acres	0.00	0.0%
	Cumulative Total			0.0%

Easement Acreage **22.12**

Vegetation Category	Definitions	Mapping Threshold	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Species included in summation above should be identified in report summary.	1000 SF	0.00	0.0%
Easement Encroachment Areas	Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area.	none	N/A	

Strawberry Hill General Site Photos

JH1-A looking upstream (3/7/2022)

JH1-A looking downstream (3/15/2022)

JH1-B looking downstream (3/7/2022)

JH1-B looking upstream (3/15/2022)

Hay bale toe – JH1-A (3/15/2022)

Hay bale toe – JH1-A (3/15/2022)

Brush toe – JH1-B (3/15/2022)

Wood/rock riffle – JH1-B (3/15/2022)

Strawberry Hill Crossing Photos

DOT Culvert at Yelverton Grove Rd. (Entrance) (3/7/2022)

DOT Culvert at Yelverton Grove Rd. (Exit) (3/7/2022)

Culvert at JH1-B Crossing (Entrance) (3/7/2022)

Culvert at JH1-B Crossing (Exit) (3/7/2022)

DOT Culvert at Brogden Rd. (Entrance) (3/7/2022)

Strawberry Hill Monitoring Device Photos

Flow Gauge JH1-A (Looking Upstream) (2/16/2022)

Flow Camera JH1-A (2/16/2022)

Stage Recorder JH1-B (Looking Upstream) (2/16/2022)

Appendix B

Vegetation Plot Data

Table 7. Planted Species Summary

Common Name	Species	% Zone 1	% Zone 2	Total Planted Amount
River birch	*Betula nigra*	10	10	1,600
Buttonbush	*Cephalanthus occidentalis*	5	5	800
Yellow poplar	*Liriodendron tulipifera*	10	10	1,600
Wax Myrtle	*Morella cerifera*	5	10	1,000
Swamp tupelo	*Nyssa biflora*	5	5	800
American sycamore	*Platanus occidentalis*	10	10	1,600
Laurel oak	*Quercus laurifolia*	5	10	1,000
Overcup oak	*Quercus lyrata*	10	10	1,600
Swamp chestnut oak	*Quercus michauxii*	10	10	1,600
Water oak	*Quercus nigra*	10	10	1,600
Willow oak	*Quercus phellos*	10	10	1,600
Bald cypress	*Taxodium distichum*	10	0	1,000
			TOTAL	15,800

Table 8. Vegetation Plot Mitigation Success Summary

Plot #	Planted Stems/Acre	Volunteers Stems/Acre	Total Stems/Acre	Success Criteria Met?	Averaged Planted Stem Height (ft.)
1	850	0	850	Yes	1.6
2	809	0	809	Yes	1.6
3	647	0	647	Yes	1.6
4	769	0	769	Yes	1.7
5	971	0	971	Yes	1.6
6	850	0	850	Yes	1.5
7	809	0	809	Yes	1.3
R1	1133	0	1133	Yes	1.4
R2	890	0	890	Yes	1.3
R3	809	40	850	Yes	1.5
R4	931	81	1012	Yes	2.0
Project Avg	**861**	**11**	**872**	**Yes**	**1.6**

Table 9. Stem Count Total and Planted by Plot Species

Strawberry Hill Stream Vegetation			Current Plot Data (MY0 2022)																					
			100094-01-0001			100094-01-0002			100094-01-0003			100094-01-0004			100094-01-0005			100094-01-0006			100094-01-0007		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree				2	2	2	3	3	3	2	2	2	3	3	3	2	2	2			
Cephalanthus occidentalis	common buttonbush	Shrub				1	1	1	1	1	1										1	1	1
Diospyros virginiana	common persimmon	Tree																					
Liriodendron tulipifera	tuliptree	Tree	1	1	1	3	3	3	1	1	1	2	2	2	1	1	1	4	4	4	2	2	2
Morella cerifera	wax myrtle	shrub	2	2	2	1	1	1							2	2	2	4	4	4	6	6	6
Nyssa biflora	swamp tupelo	Tree	2	2	2	1	1	1	1	1	1							1	1	1			
Platanus occidentalis	American sycamore	Tree							2	2	2				4	4	4				2	2	2
Quercus laurifolia	laurel oak	Tree	4	4	4				3	3	3	3	3	3	3	3	3				1	1	1
Quercus lyrata	overcup oak	Tree	2	2	2	1	1	1	1	1	1	1	1	1				2	2	2			
Quercus michauxii	swamp chestnut oak	Tree	1	1	1				2	2	2	1	1	1				4	4	4	1	1	1
Quercus nigra	water oak	Tree	5	5	5							1	1	1	4	4	4	2	2	2	1	1	1
Quercus phellos	willow oak	Tree	1	1	1	3	3	3	2	2	2	5	5	5	7	7	7	1	1	1	2	2	2
Sambucus canadensis	common elderberry	shrub																					
Taxodium distichum	bald cypress	Tree	3	3	3	8	8	8				4	4	4				1	1	1	4	4	4
		Stem count	21	21	21	20	20	20	16	16	16	19	19	19	24	24	24	21	21	21	20	20	20
		size (ares)	1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	9	9	9	8	8	8	9	9	9	8	8	8	7	7	7	9	9	9	9	9	9
		Stems per ACRE	850	850	850	809	809	809	647	647	647	769	769	769	971	971	971	850	850	850	809	809	809

Strawberry Hill Stream Vegetation			Current Plot Data (MY0 2022)														
			100094-01-R1			100094-01-R2			100094-01-R3			100094-01-R4			MY0 (2022)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Betula nigra	river birch	Tree	3	3	3	4	4	4	2	2	2	6	6	6	27	27	27
Cephalanthus occidentalis	common buttonbush	Shrub	1	1	1	1	1	1	1	1	1				6	6	6
Diospyros virginiana	common persimmon	Tree												1			1
Liriodendron tulipifera	tuliptree	Tree				1	1	1	5	5	5	1	1	1	21	21	21
Morella cerifera	wax myrtle	shrub	1	1	1	1	1	1	2	2	2	1	1	1	20	20	20
Nyssa biflora	swamp tupelo	Tree	1	1	1	2	2	2	1	1	1	2	2	2	11	11	11
Platanus occidentalis	American sycamore	Tree				2	2	2				2	2	2	12	12	12
Quercus laurifolia	laurel oak	Tree	5	5	5	3	3	3	1	1	1	3	3	3	26	26	26
Quercus lyrata	overcup oak	Tree	3	3	3	1	1	1	4	4	4	4	4	4	19	19	19
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	3	3	3	1	1	1				15	15	15
Quercus nigra	water oak	Tree	7	7	7	3	3	3	1	1	1	2	2	2	26	26	26
Quercus phellos	willow oak	Tree	2	2	2				2	2	2	2	2	2	27	27	27
Sambucus canadensis	common elderberry	shrub									1			1			2
Taxodium distichum	bald cypress	Tree	3	3	3	1	1	1							24	24	24
		Stem count	28	28	28	22	22	22	20	20	21	23	23	25	234	234	237
		size (ares)	1			1			1			1			11		
		size (ACRES)	0.02			0.02			0.02			0.02			0.27		
		Species count	10	10	10	11	11	11	10	10	11	9	9	11	12	12	14
		Stems per ACRE	1133	1133	1133	890	890	890	809	809	850	931	931	1012	861	861	872

Strawberry Hill Stream Vegetation Monitoring Plot Photos (MY0)

Fixed Vegetation Plot 1 (3/15/2022)

Fixed Vegetation Plot 2 (3/15/2022)

Fixed Vegetation Plot 3 (3/15/2022)

Fixed Vegetation Plot 4 (3/15/2022)

Fixed Vegetation Plot 5 (3/15/2022)

Fixed Vegetation Plot 6 (3/15/2022)

Fixed Vegetation Plot 7 (3/15/2022)

Strawberry Hill Stream Random Vegetation Monitoring Plot Photos (MY0)

Random Vegetation Plot 1 (3/7/2022)

Random Vegetation Plot 2 (3/7/2022)

Random Vegetation Plot 3 (3/7/2022)

Random Vegetation Plot 4 (3/7/2022)

Appendix C

Stream Morphology Data

Baseline Stream Data Summary Strawberry Hill JH1-A										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	6.7	9.3	9.3	11.8	2		9.6	9.6	10.1	2
Floodprone Width (ft)	12.4	14.0	14.0	15.5	2		>25	30	30	2
Bankfull Mean Depth (ft)	0.7	0.9	0.9	1.1	2		0.9	---	---	2
Bankfull Max Depth (ft)	1.2	1.4	1.4	1.5	2		1.4	1.3	1.5	2
Bankfull Cross Sectional Area (ft^2)	7.1	7.7	7.7	8.3	2		8.8	8.2	9.2	2
Width/Depth Ratio	6.3	11.6	11.6	16.9	2		10.4	---	---	2
Entrenchment Ratio	1.3	1.6	1.6	1.9	2		>2.2	>3.0	>3.1	2
Bank Height Ratio	1.5	1.7	1.7	1.9	2		1.0	**1**	**1**	2
Max part size (mm) mobilized at bankfull										
Rosgen Classification	F5					C5/E5		C5/E5		
Bankfull Discharge (cfs)										
Sinuosity (ft)	1.00					1.13		1.13		
Water Surface Slope (Channel) (ft/ft)										
Other										

Baseline Stream Data Summary Strawberry Hill JH1-B										
Parameter	**Pre-Existing Condition (applicaple)**					**Design**		**Monitoring Baseline (MY0)**		
Riffle Only	Min	Mean	Med	Max	n	Min	Max	Min	Max	n
Bankfull Width (ft)	9.3	9.5	9.5	9.6	2		9.6	8.8	11.1	5
Floodprone Width (ft)	11.6	15.9	15.9	20.2	2		>25	>30	>30	5
Bankfull Mean Depth (ft)	0.9	0.9	0.9	1.0	2		0.9	---	---	5
Bankfull Max Depth (ft)	1.4	1.5	1.5	1.6	2		1.4	1.4	1.6	5
Bankfull Cross Sectional Area (ft^2)	8.5	8.9	8.9	9.3	2		8.8	7.3	9.1	5
Width/Depth Ratio	9.3	10.1	10.1	10.8	2		10.4	---	---	5
Entrenchment Ratio	1.2	1.7	1.7	2.1	2		>2.2	>2.7	>3.4	5
Bank Height Ratio	1.7	2.0	2.0	2.3	2		1.0	**1**	**1**	5
Max part size (mm) mobilized at bankfull										
Rosgen Classification	F5					C5/E5		C5/E5		
Bankfull Discharge (cfs)										
Sinuosity (ft)	1.01					1.14		1.14		
Water Surface Slope (Channel) (ft/ft)										
Other										

Monitoring Data - Cross Section Morphology Monitoring Summary
Project Name/Number (Strawnberry Hill/ DMS:100094) Segment/Reach: JH1-A and JH1-B

	Cross Section 1 (Pool - JH1-A)							Cross Section 2 (Riffle - JH1-A)							Cross Section 3 (Riffle - JH1-A)							Cross Section 4 (Pool - JH1-A)							Cross Section 5 (Riffle - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---							139.30							138.85							---							137.97						
Bank Height Ratio_Based on AB Bankfull[1] Area	---							1.00							1.00							---							1.00						
Thalweg Elevation	137.24							137.98							137.34							136.57							136.42						
LTOB[2] Elevation	138.91							139.30				`			138.85							138.71							137.97						
LTOB[2] Max Depth (ft)	1.7							1.3							1.5							2.1							1.6						
LTOB[2] Cross Sectional Area (ft^2)	7.60							8.20							9.20							13.70							9.10						
	Cross Section 6 (Pool - JH1-B)							Cross Section 7 (Riffle - JH1-B)							Cross Section 8 (Pool - JH1-B)							Cross Section 9 (Riffle - JH1-B)							Cross Section 10 (Pool - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---							137.52							---							136.88							---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---							1.00							---							1.00							---						
Thalweg Elevation	135.85							136.12							135.40							135.53							134.94						
LTOB[2] Elevation	137.91							137.52							137.57							136.88							136.81						
LTOB[2] Max Depth (ft)	2.1							1.4							2.2							1.4							1.9						
LTOB[2] Cross Sectional Area (ft^2)	11.50							8.30							12.50							8.30							12.20						
	Cross Section 11 (Riffle - JH1-B)							Cross Section 12 (Pool - JH1-B)							Cross Section 13 (Pool - JH1-B)							Cross Section 14 (Riffle - JH1-B)													
	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+	MY0	MY1	MY2	MY3	MY5	MY7	MY+							
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	136.18							---							---							135.15													
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00							---							---							1.00													
Thalweg Elevation	134.81							134.35							133.13							133.64													
LTOB[2] Elevation	136.18							136.22							135.07							135.15													
LTOB[2] Max Depth (ft)	1.4							1.9							1.9							1.5													
LTOB[2] Cross Sectional Area (ft^2)	7.30							10.10							9.70							8.30													

The above morphology parameters reflect the 2018 guidance that arose from the mitigation technical workgroup consisting of DMS, the IRT and industry mitigation providers/practitioners. The outcome resulted in the focus on three primary morphological parameters of interest for the purposes of tracking channel change moving forward. They are the bank height ratio using a constant As-built bankfull area and the cross sectional area and max depth based on each years low top of bank. These are calculated as follows:

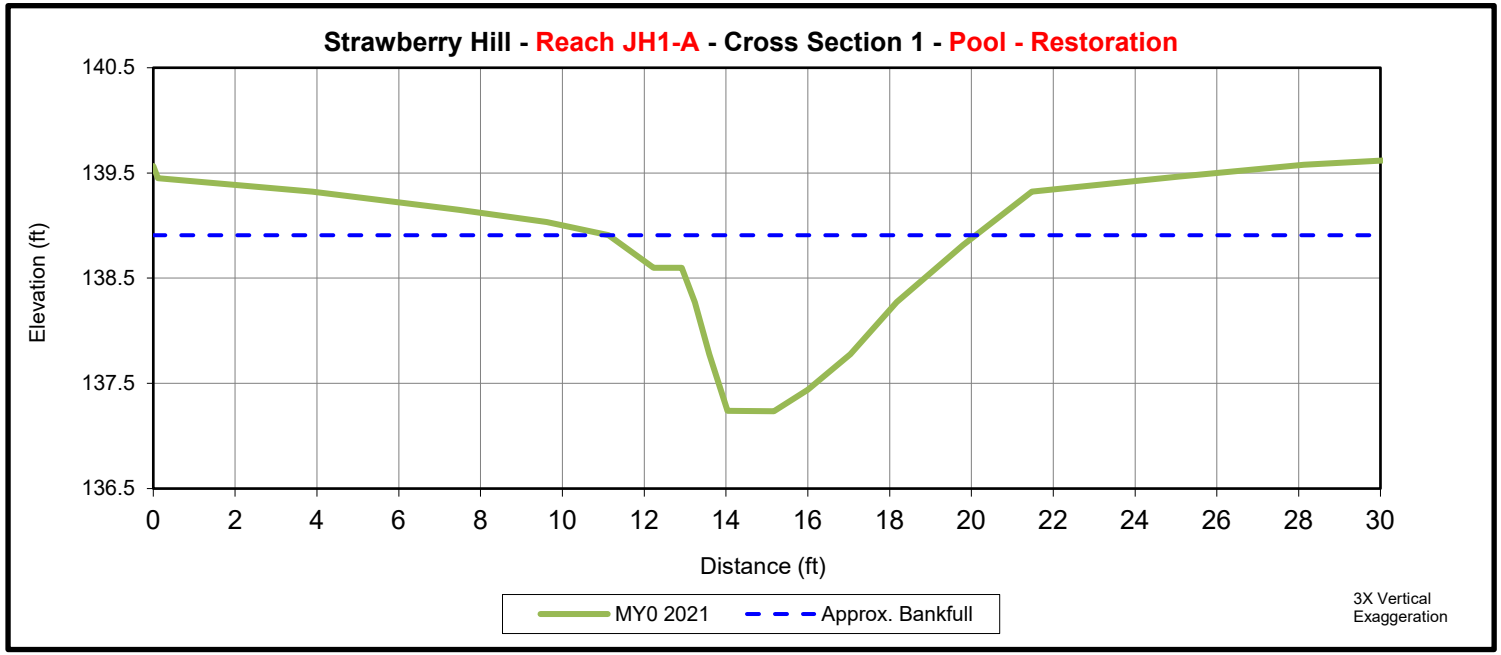
1 - **Bank Height Ratio (BHR)** takes the As-built bankfull area as the basis for adjusting each subsequent years bankfull elevation. For example if the As-built bankfull area was 10 ft2, then the MY1 bankfull elevation would be adjusted until the calculated bankfull area within the MY1 cross section survey = 10 ft2. The BHR would then be calculated with the difference between the low top of bank (LTOB) elevation for MY1 and the thalweg elevation for MY1 in the numerator with the difference between the MY1 bankfull elevation and the MY1 thalweg elevation in the denominator. This same process is then carried out in each successive year.

2 - **LTOB Area and Max depth -** These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as

Note: The smaller the channel the closer the survey measurements are to their limit of reliable detection, therefore inter-annual variation in morphological measurement (as a percentage) is by default magnified as channel size decereases. Some of the variability above is the result of this factor and some is due to the large amount of depositional sediments observed.

Upstream

Downstream

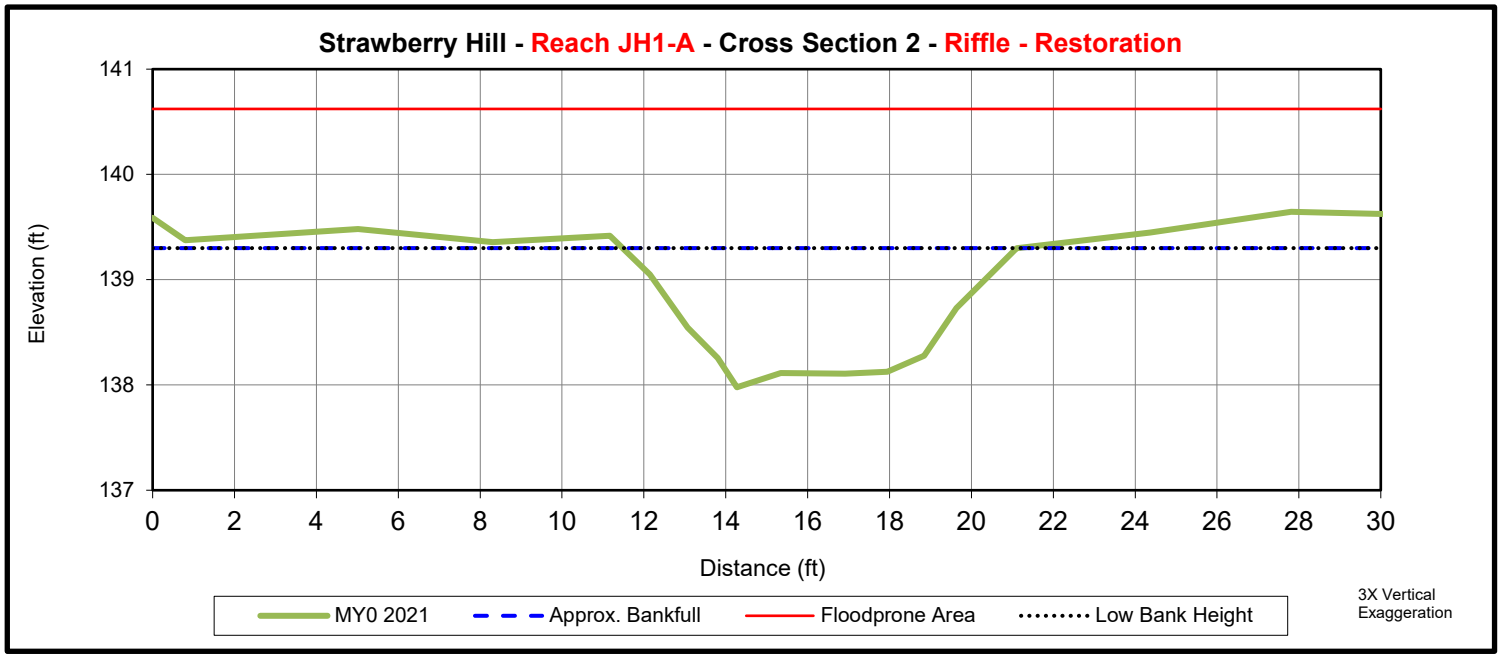


	Cross Section 1 (Pool - JH1-A)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---						
Thalweg Elevation	137.24						
LTOB[2] Elevation	138.91						
LTOB[2] Max Depth (ft)	1.7						
LTOB[2] Cross Sectional Area (ft^2)	7.60						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

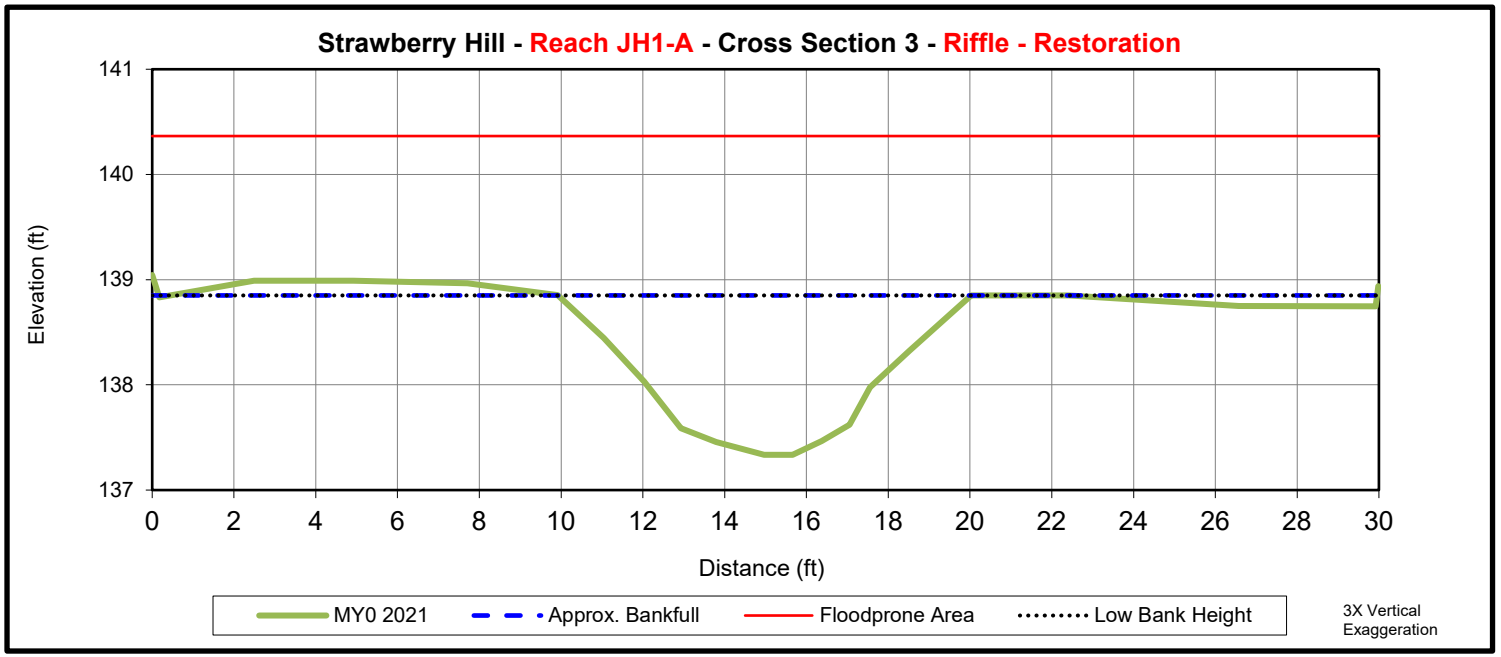


	Cross Section 2 (Riffle - JH1-A)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	139.30						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	137.98						
LTOB[2] Elevation	139.30						
LTOB[2] Max Depth (ft)	1.3						
LTOB[2] Cross Sectional Area (ft^2)	8.20						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

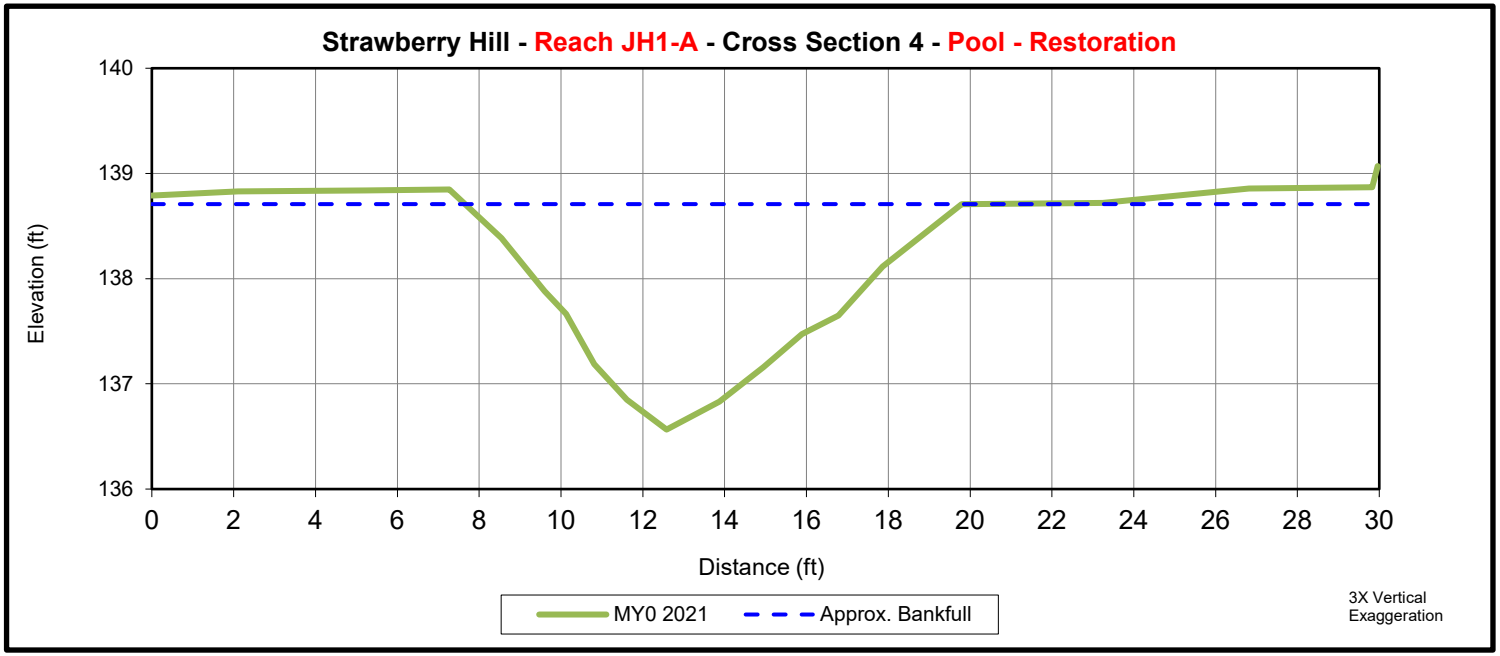


	Cross Section 3 (Riffle - JH1-A)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	138.85						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	137.34						
LTOB[2] Elevation	138.85						
LTOB[2] Max Depth (ft)	1.5						
LTOB[2] Cross Sectional Area (ft^2)	9.20						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

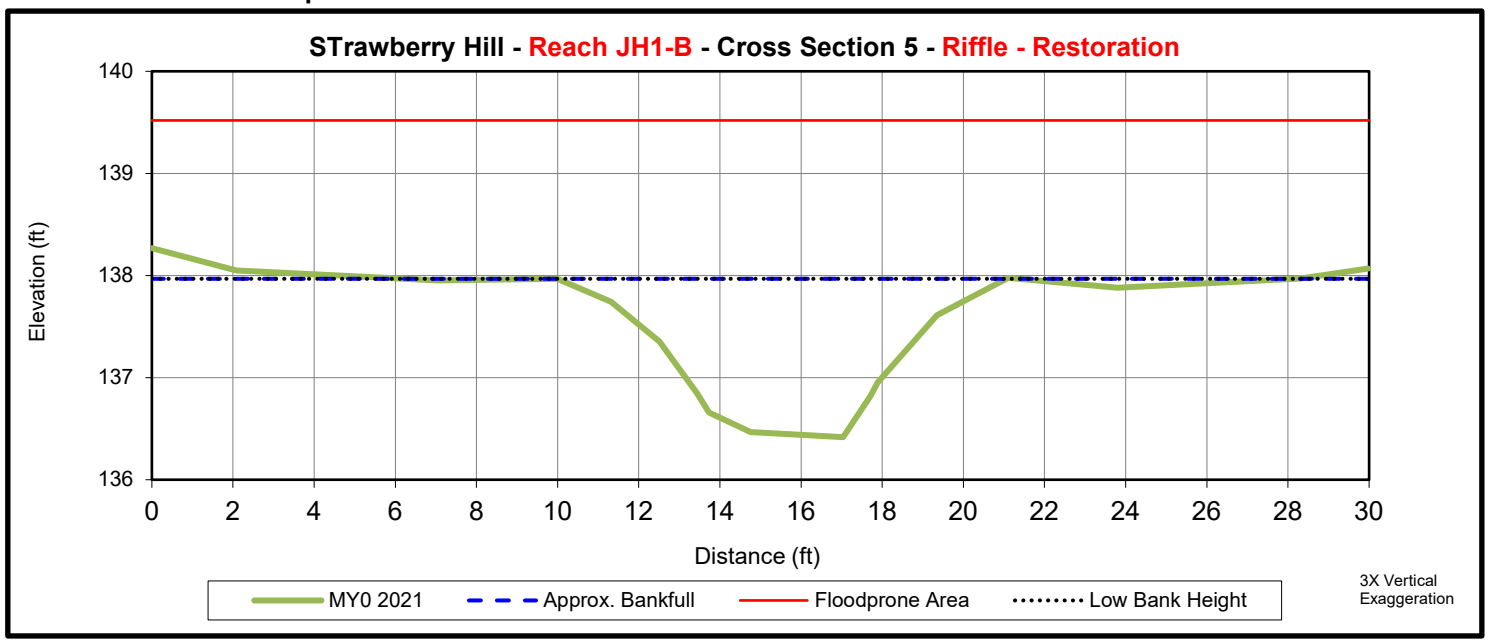


	Cross Section 4 (Pool - JH1-A)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---						
Thalweg Elevation	136.57						
LTOB[2] Elevation	138.71						
LTOB[2] Max Depth (ft)	2.1						
LTOB[2] Cross Sectional Area (ft^2)	13.70						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

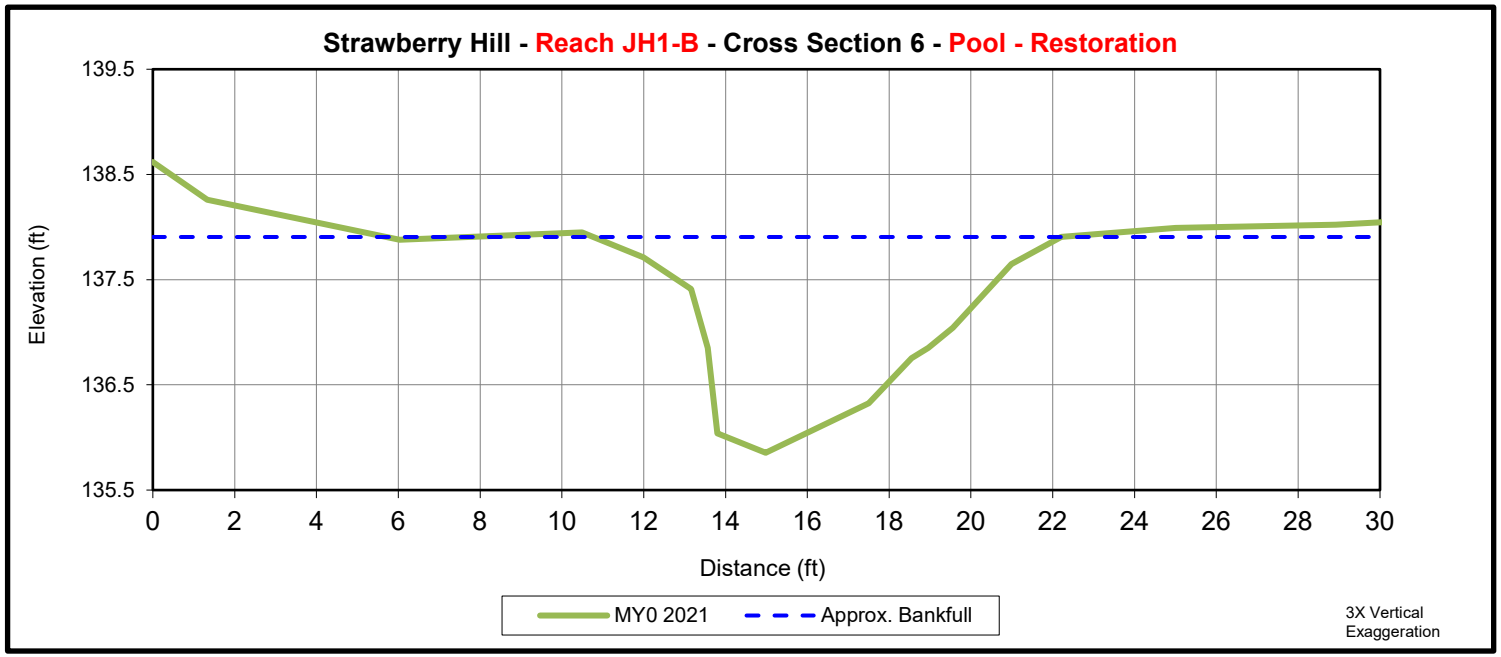


	Cross Section 5 (Riffle - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	137.97						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	136.42						
LTOB[2] Elevation	137.97						
LTOB[2] Max Depth (ft)	1.6						
LTOB[2] Cross Sectional Area (ft^2)	9.10						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

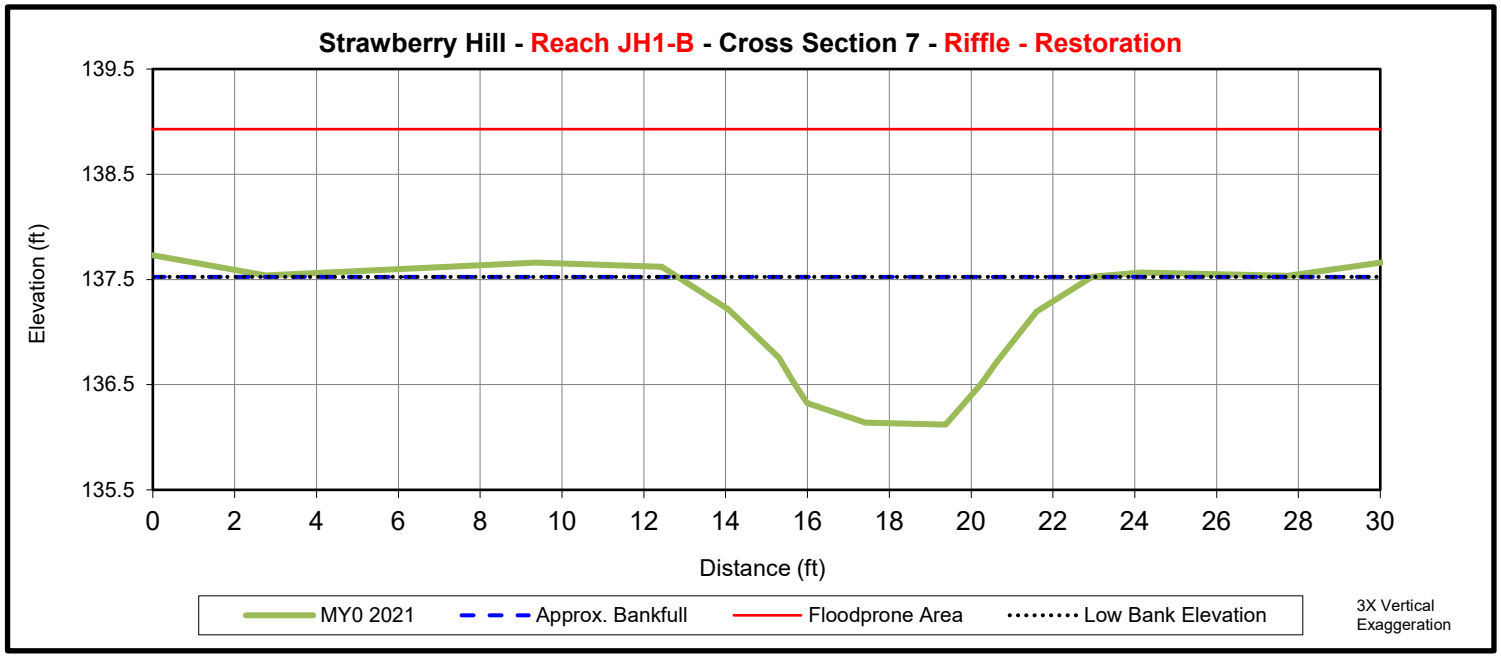


	Cross Section 6 (Pool - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---						
Thalweg Elevation	135.85						
LTOB[2] Elevation	137.91						
LTOB[2] Max Depth (ft)	2.1						
LTOB[2] Cross Sectional Area (ft^2)	11.50						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

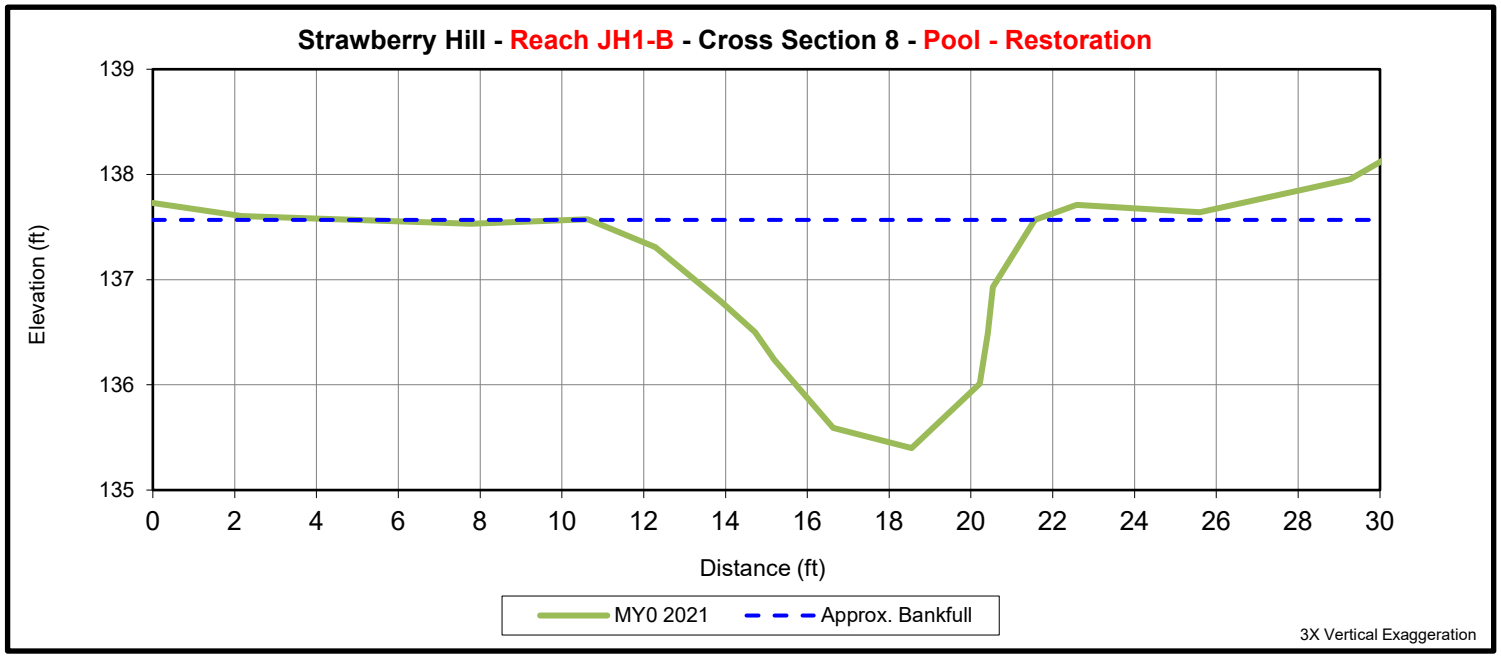


	Cross Section 7 (Riffle - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	137.52						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	136.12						
LTOB[2] Elevation	137.52						
LTOB[2] Max Depth (ft)	1.4						
LTOB[2] Cross Sectional Area (ft^2)	8.30						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

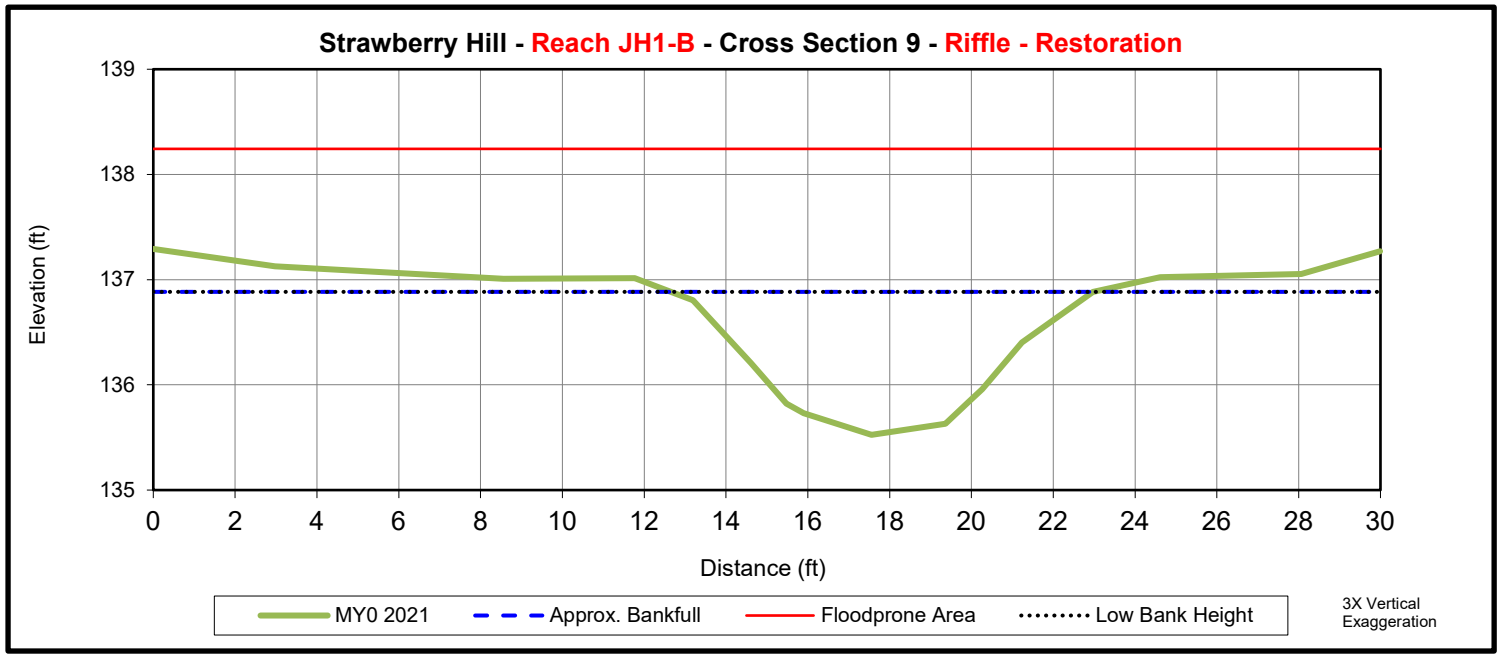


	Cross Section 8 (Pool - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio Based on AB Bankfull[1] Area	---						
Thalweg Elevation	135.40						
LTOB[2] Elevation	137.57						
LTOB[2] Max Depth (ft)	2.2						
LTOB[2] Cross Sectional Area (ft^2)	12.50						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

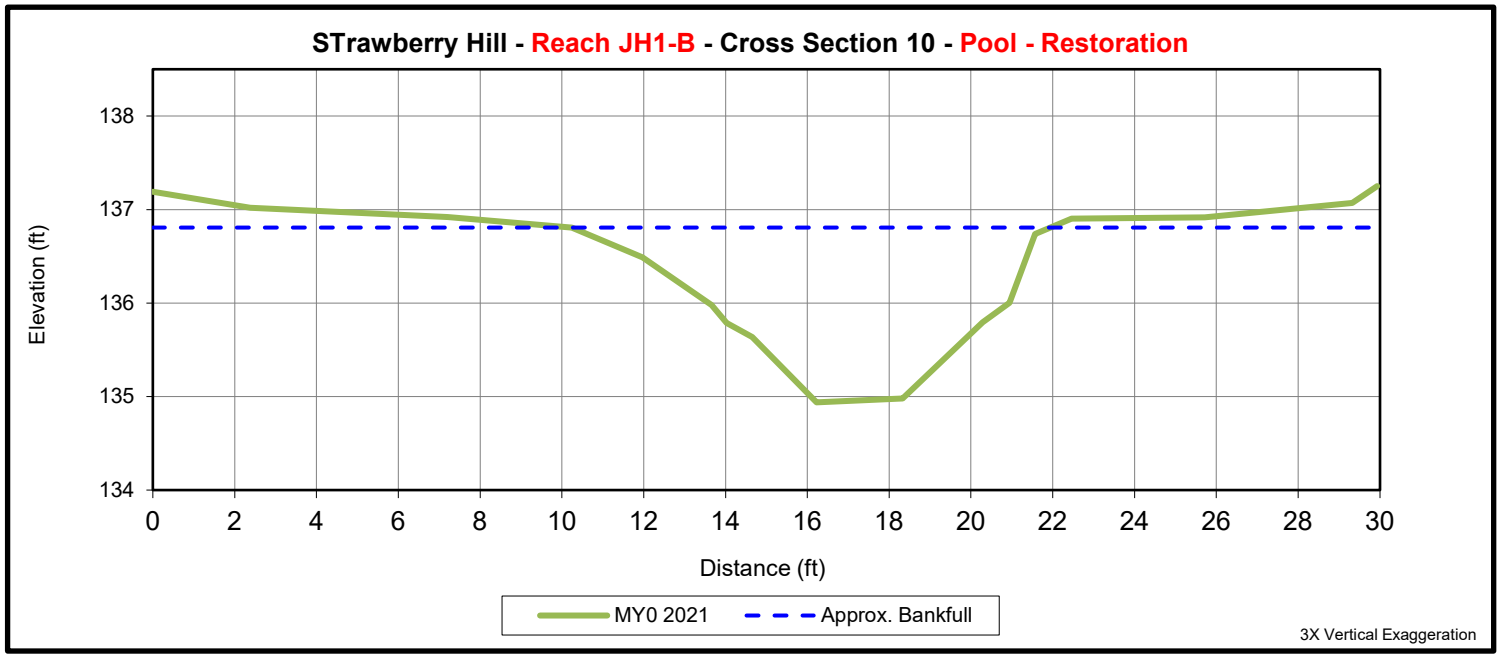


	Cross Section 9 (Riffle - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	136.88						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	135.53						
LTOB[2] Elevation	136.88						
LTOB[2] Max Depth (ft)	1.4						
LTOB[2] Cross Sectional Area (ft^2)	8.30						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

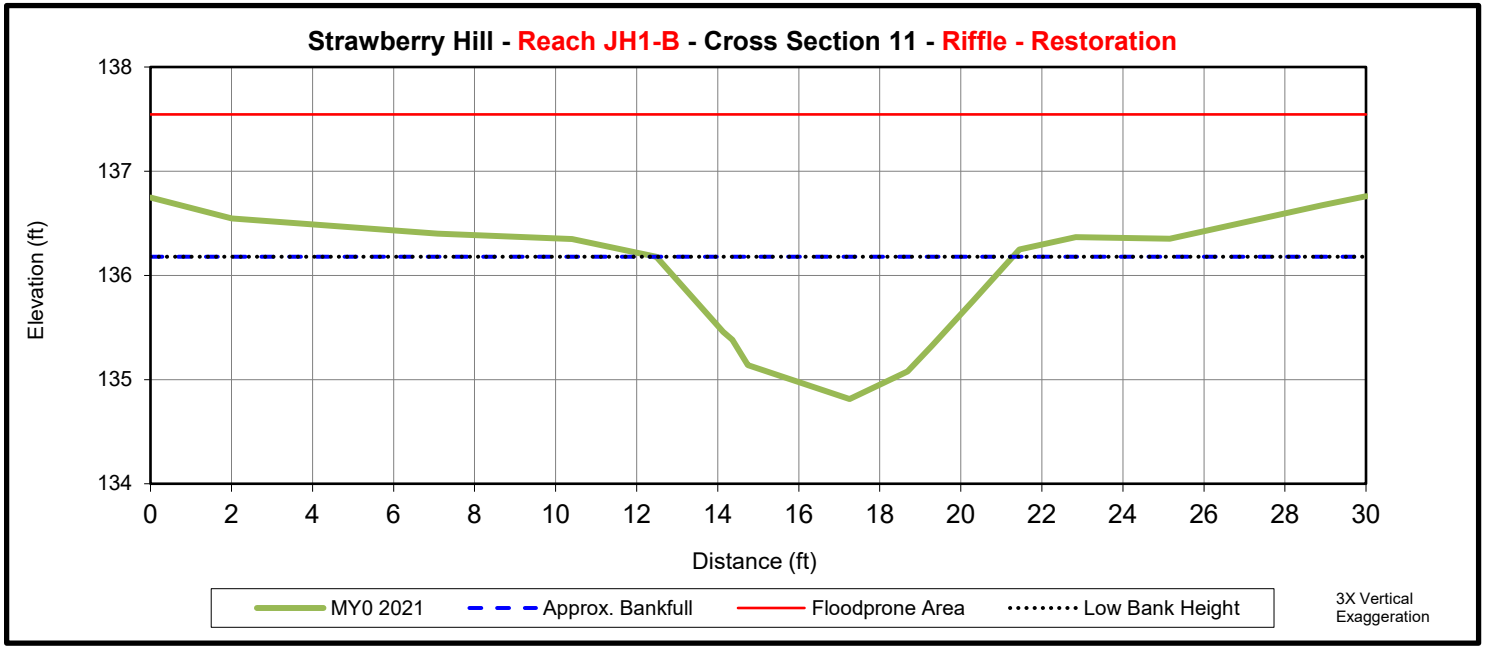


	Cross Section 10 (Pool - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---						
Thalweg Elevation	134.94						
LTOB[2] Elevation	136.81						
LTOB[2] Max Depth (ft)	1.9						
LTOB[2] Cross Sectional Area (ft^2)	12.20						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

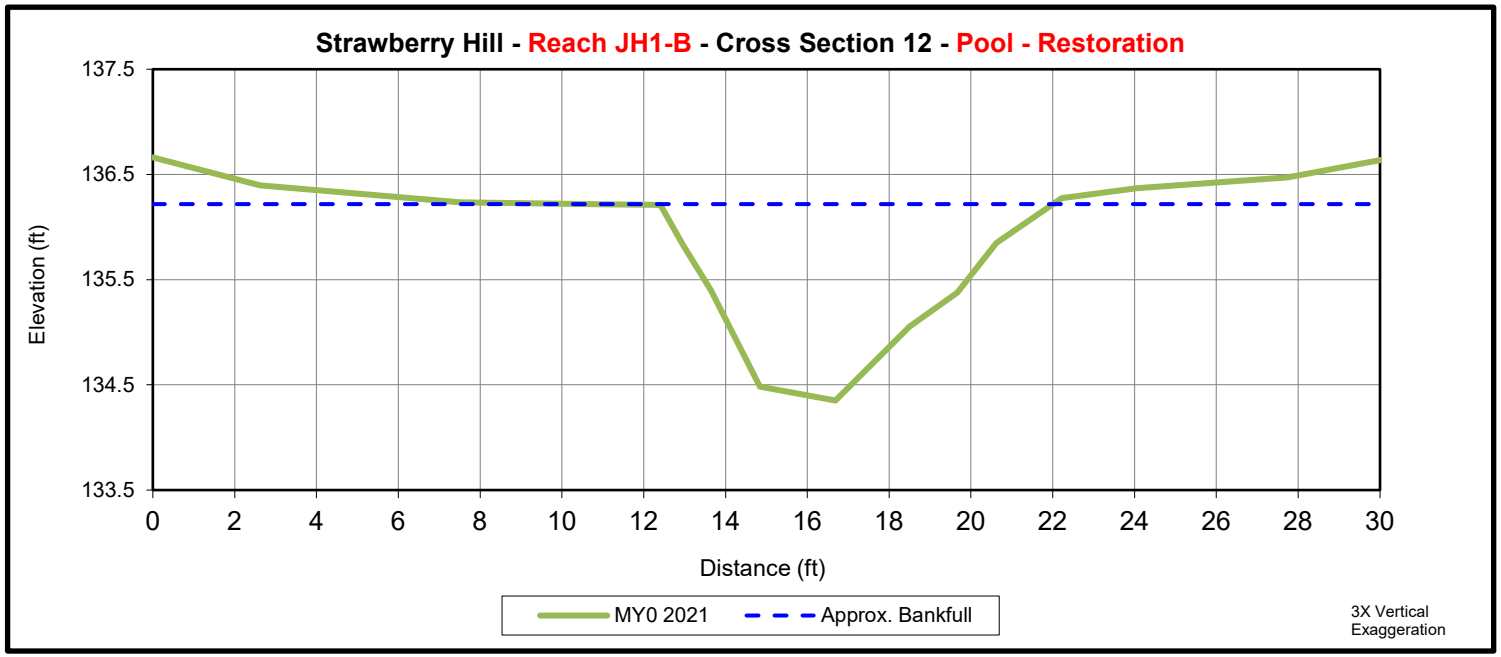


	Cross Section 11 (Riffle - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	136.18						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	134.81						
LTOB[2] Elevation	136.18						
LTOB[2] Max Depth (ft)	1.4						
LTOB[2] Cross Sectional Area (ft^2)	7.30						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream



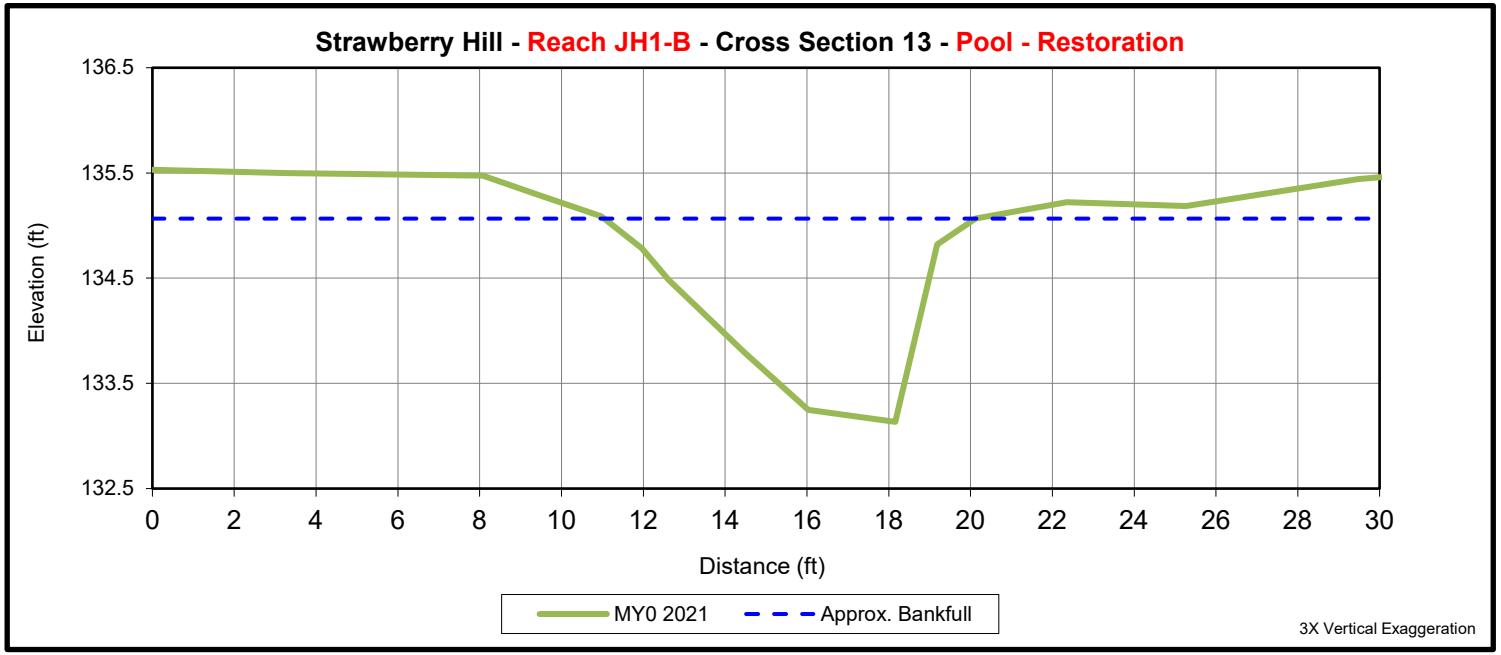
	Cross Section 12 (Pool - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---						
Thalweg Elevation	134.35						
LTOB[2] Elevation	136.22						
LTOB[2] Max Depth (ft)	1.9						
LTOB[2] Cross Sectional Area (ft^2)	10.10						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation

2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream

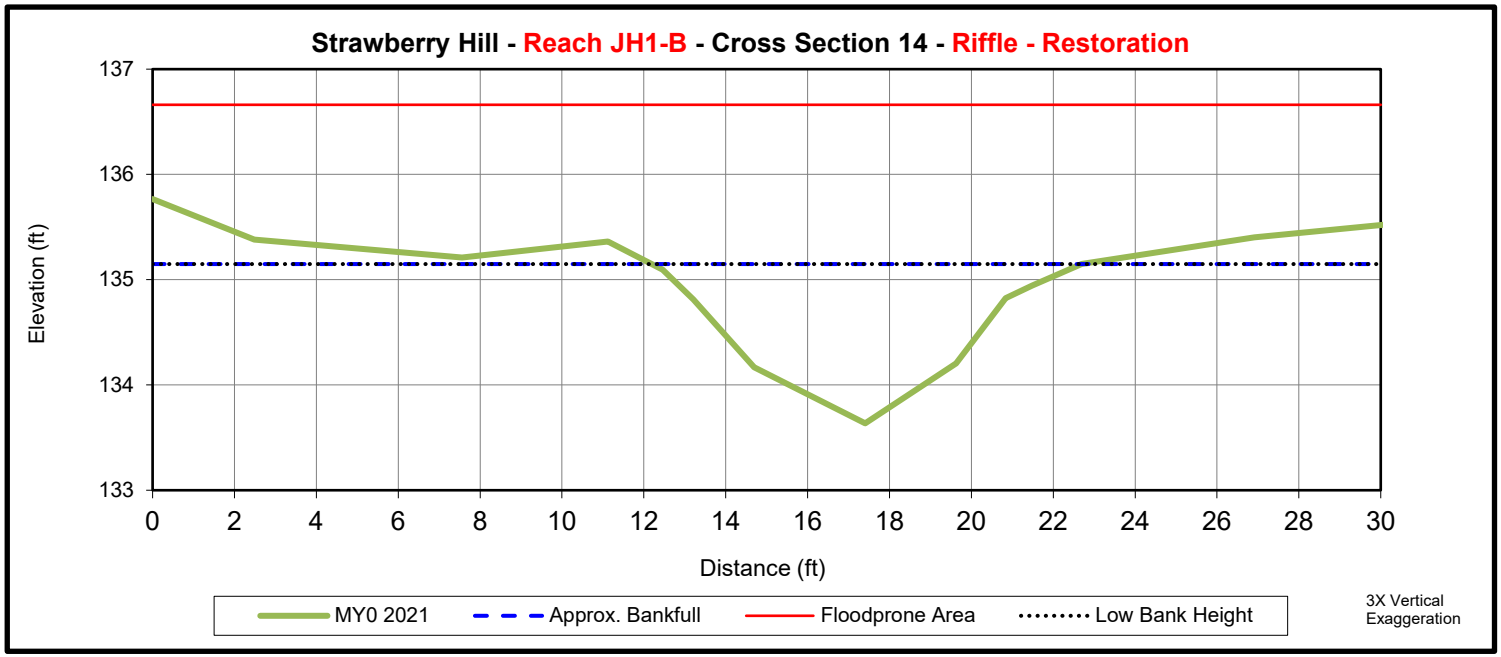


	Cross Section 13 (Pool - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	---						
Bank Height Ratio_Based on AB Bankfull[1] Area	---						
Thalweg Elevation	133.13						
LTOB[2] Elevation	135.07						
LTOB[2] Max Depth (ft)	1.9						
LTOB[2] Cross Sectional Area (ft^2)	9.70						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation
2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Upstream

Downstream



	Cross Section 14 (Riffle - JH1-B)						
	MY0	MY1	MY2	MY3	MY5	MY7	MY+
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	135.15						
Bank Height Ratio_Based on AB Bankfull[1] Area	1.00						
Thalweg Elevation	133.64						
LTOB[2] Elevation	135.15						
LTOB[2] Max Depth (ft)	1.5						
LTOB[2] Cross Sectional Area (ft^2)	8.30						

1 - Uses the as-built cross sectional area as the basis for adjusting each subsequent years bankfull elevation

2 - Uses the current years low top of bank as the basis for adjusting each subsequent years bankfull elevation

Appendix D

Hydrologic Data

(Data to be collected in following monitoring years)

Appendix E

Project Timeline and

Contact Information

Table 4. Project Timeline and Contacts

Activity or Deliverable	Data Collection Complete	Task Completion or Deliverable Submission
Project Instituted	NA	Dec-20
Mitigation Plan Approved	NA	Nov-20
Construction (Grading) Completed	NA	20-Jan-22
Planting Completed	NA	07-Mar-22
As-built Survey Completed	NA	May-22
MY-0 Baseline Report	Mar-22	May-22
MY1+ Monitoring Reports		
Remediation Items (e.g. beaver removal, supplements, repairs etc.)		
Encroachment		

Strawberry Hill #100094	
Provider	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Mitigation Provider POC	Jamey Mceachran (919) 623-9889
Designer	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Primary project design POC	Ben Carroll, PE (336) 514-0927
Construction Contractor	RES / 3600 Glenwood Ave., Suite 100, Raleigh, NC 27612
Construction contractor POC	Jacy Kirkpatrick

Appendix F

As-built Survey

STRAWBERRY HILL MITIGATION PROJECT

PROJECT LOCATION: 35.469170°, -78.312918°
JOHNSTON COUNTY, NORTH CAROLINA

NEUSE RIVER BASIN: HUC 030202201
MAY 2022

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC

3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

VICINITY MAP
NTS

PROJECT DIRECTORY

OWNER:
JEREMIAH DOW
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 WEST JONES ST., SUITE 3000A
RALEIGH, NC 27603

DESIGNED & CONSTRUCTED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

AS-BUILT SURVEY BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

DMS PROJECT #: 100094
CONTRACT #: 7745
USACE ACTION ID #: SAW-2019-00124
RFP #: 16-007576
DWR #: 20190159

NOTES:

- ALL DISTANCES ARE HORIZONTAL GROUND MEASUREMENTS IN U.S. SURVEY FEET UNLESS OTHERWISE NOTED.
- HORIZONTAL DATUM IS NAD83(2011); VERTICAL DATUM IS NAVD 88
- THIS MAP IS NOT INTENDED FOR RECORDATION, SALES OR CONVEYANCES
- THE PURPOSE OF THIS MAP AND AS-BUILT DRAWING IS TO ILLUSTRATE THE POST- CONSTRUCTION "AS-BUILT CONDITIONS" OF THE STREAM RESTORATION AND MAY NOT SHOW ALL IMPROVEMENTS OR UTILITIES.
- NO PROPERTY LINES WERE SURVEYED, ALL BOUNDARY AND CONSERVATION EASEMENT LINES WERE REFERENCED FROM RECORDED PLATS
- STATE PLANE COORDINATES AND ELEVATIONS WERE DERIVED FROM EXISTING ONSITE CONTROL SURVEY PREPARED AND ESTABLISHED BY WSP USA INC.

SITE MAP
NTS

I, BRIAN S. HOCKETT CERTIFY THAT THIS MAP WAS DRAWN UNDER MY SUPERVISION AND THAT THIS GROUND SURVEY WAS PERFORMED AT THE 90% CONFIDENCE LEVEL TO MEET FEDERAL GEOGRAPHIC DATA COMMITTEE STANDARDS; THAT THIS SURVEY WAS PERFORMED TO MEET THE REQUIIREMENTS FOR A TOPOGRAPHIC/PLANIMETRIC SURVEY TO THE ACCURACY OF CLASS "A" AND VERTICAL ACCURACY WHEN APPLICABLE TO THE CLASS "A" STANDARD, AND THAT THE ORIGINAL DATA WAS OBTAINED ON OCTOBER 27th 2021; THAT THE SURVEY WAS COMPLETED ON MARCH 29th 2022; THAT CONTOURS SHOWN AS BROKEN LINES MAY NOT MEET THE STATED STANDARD; AND ALL COORDINATES ARE BASED ON NAD83 (2011) AND ELEVATIONS ARE BASED ON NAVD88 (GEOID18)

1. CLASS OF SURVEY: CLASS A
2. POSITIONAL ACCURACY: 0.08'
3. TYPE OF GPS FIELD PROCEDURE: RTK/VRS
4. DATES OF SURVEY: 10-27-2021 - 3-29-2022
5. GEOID MODEL: 18
6. UNITS: U.S. SURVEY FEET

WITNESS MY ORIGINAL SIGNATURE, LICENSE NUMBER AND SEAL THIS 13th DAY OF May, 2022, A.D.

Brian S. Hockett
BRIAN S. HOCKETT L-5165

Sheet List Table

Sheet Number	Sheet Title
--	Cover
A1	OVERALL AERIAL VIEW
S1	REACH JH1
S2	REACH JH1
S3	REACH JH1
S4	REACH JH1
S5	REACH JH1
S6	REACH JH1
S7	REACH JH1
S8	REACH JH2
S9	REACH JH3-5
S10	DITCH TIE
M1	MAINTENANCE COMPLETED
M2	MAINTENANCE COMPLETED

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Raleigh, NC 27612
Main: 919.829.9909
www.res.us

Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT
5-13-2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PLOT DATE: ---

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

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FILE NAME:R:\Respd\Projects\101038-Strawberry Hill\ABRL\101038_AB_Cover.dwg SAVED BY: Bearroll

Strawberry Hill Project Credits				
Reach	**Mitigation Type**	**Proposed Length (LF)**	**Mitigation Ratio**	**SMUs**
JHI-A	Restoration	1,007	1 : 1.0	1,007
JHI-B	Restoration	1,054	1 : 1.0	1,054
	Restoration	1,658	1 : 1.0	1,658
JH2	Buffer	1,009	N/A	N/A
JH3	Buffer	326	N/A	N/A
JH4	Buffer	297	N/A	N/A
JH5	Buffer	924	N/A	N/A
Total		**6,275**		**3,719**

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOWETT
5-13-2022

FULL SCALE: 1"=150

0 150 300

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/13/2022

REVISIONS:

RELEASED FOR:
AS-BUILT DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
OVERALL AERIAL VIEW

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

A1

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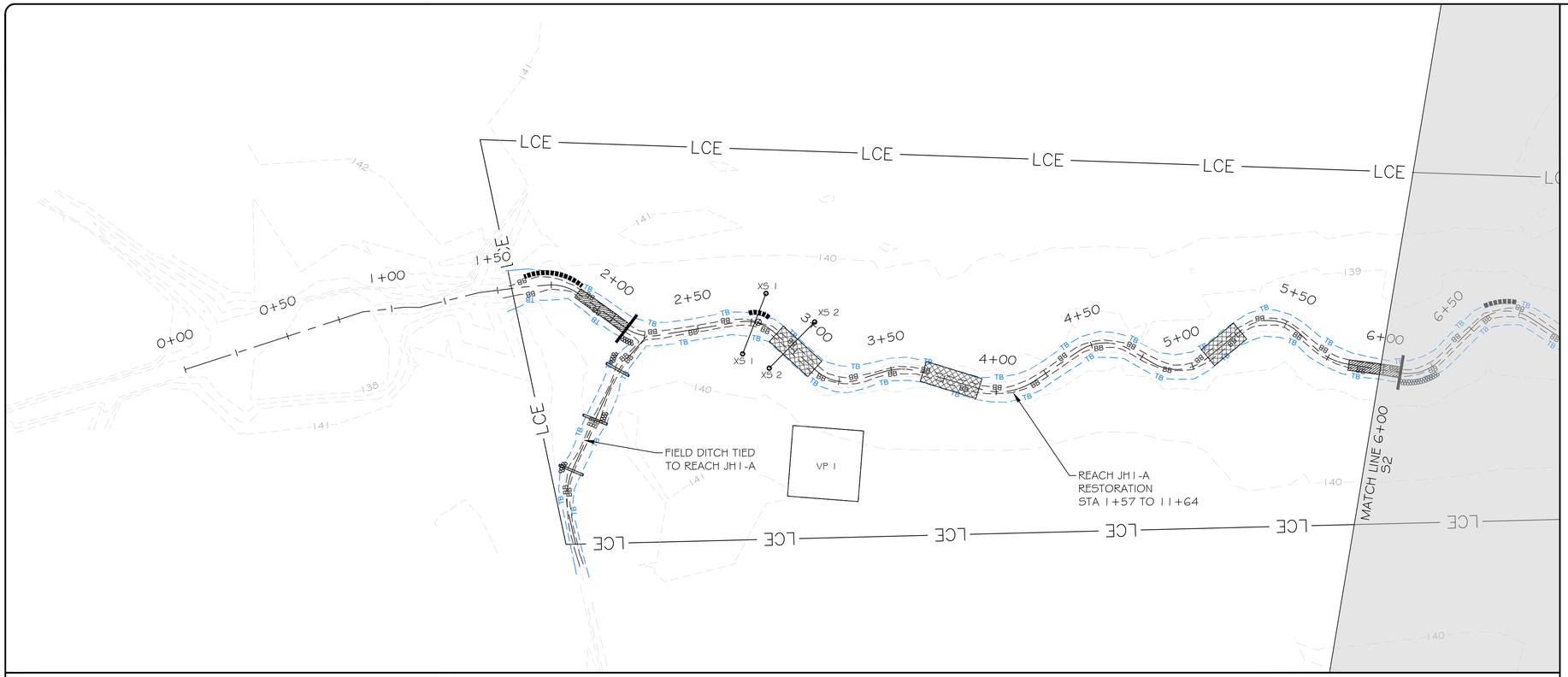
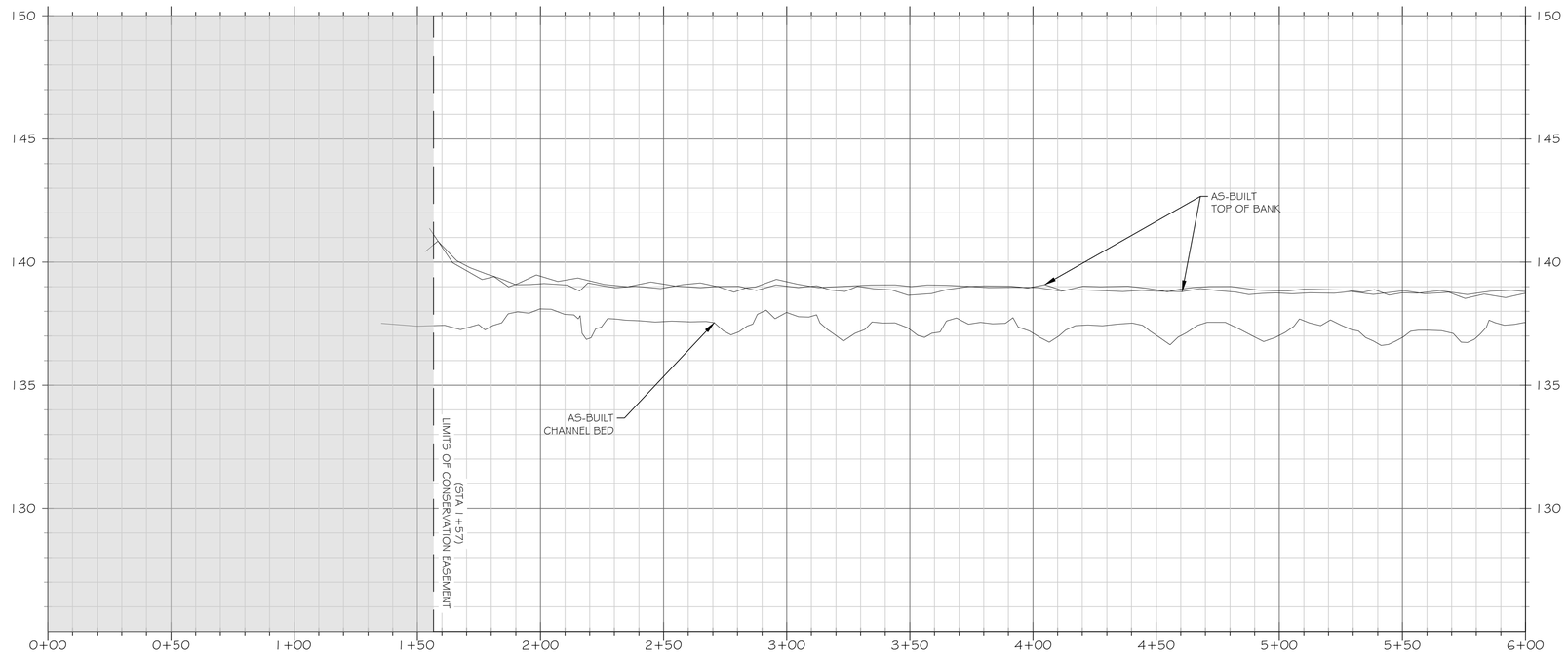


LEGEND

- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF PROPOSED CONSERVATION EASEMENT (LCE)
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL STRUCTURE
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT (VP#)



SCALE: HOR 1"=30'; VERT 1"=3'

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN HACKETT
5-13-2022

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER: S1

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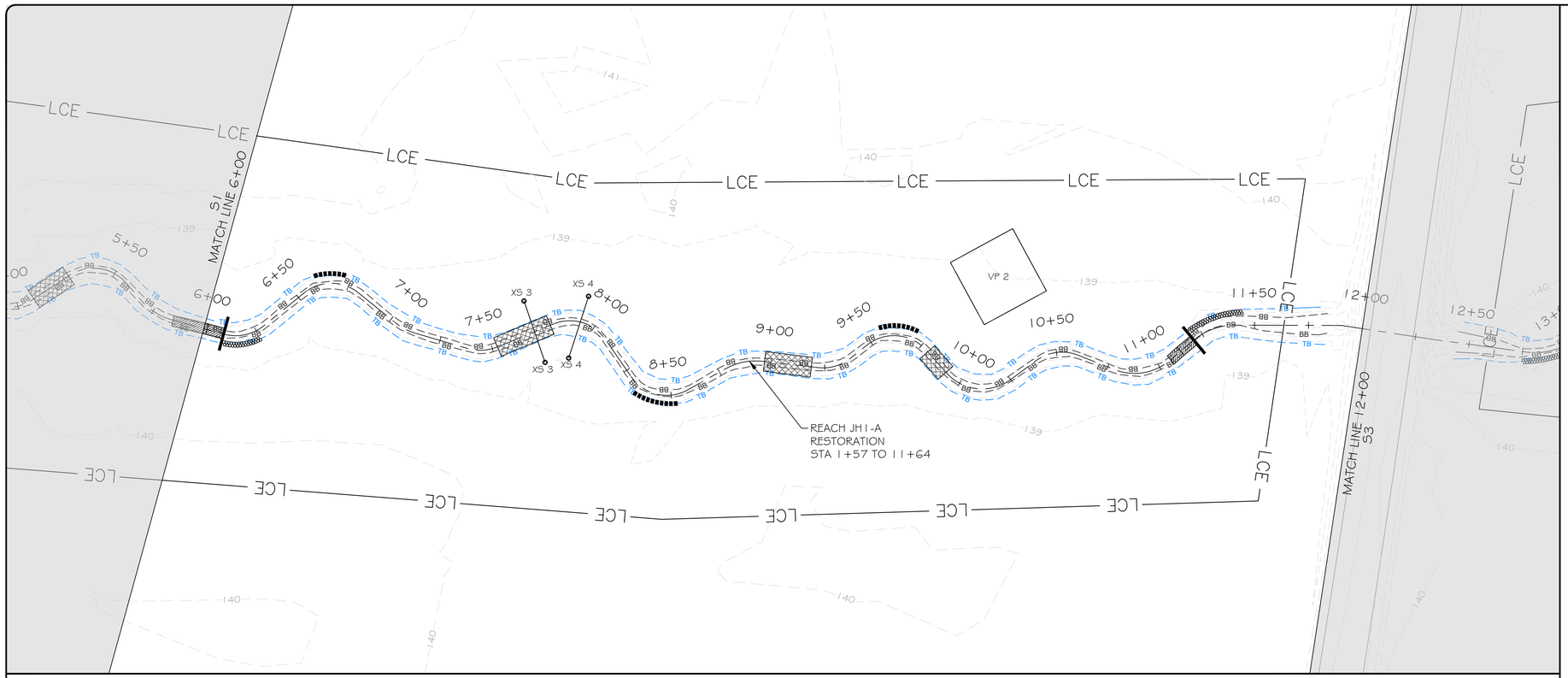

LEGEND

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- CONTOUR MINOR
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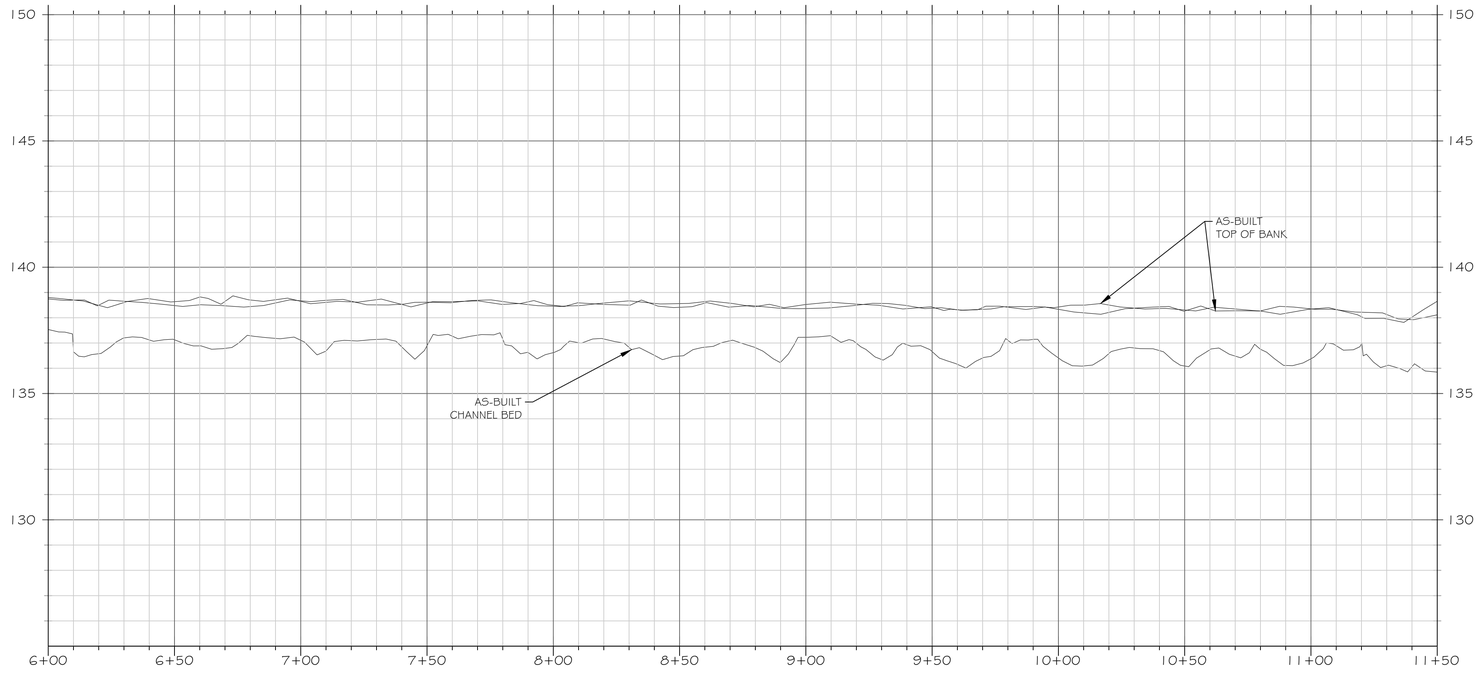

SCALE: HOR 1"=30'; VERT 1"=3'

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOKEFIELD
5-15-2022

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

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PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

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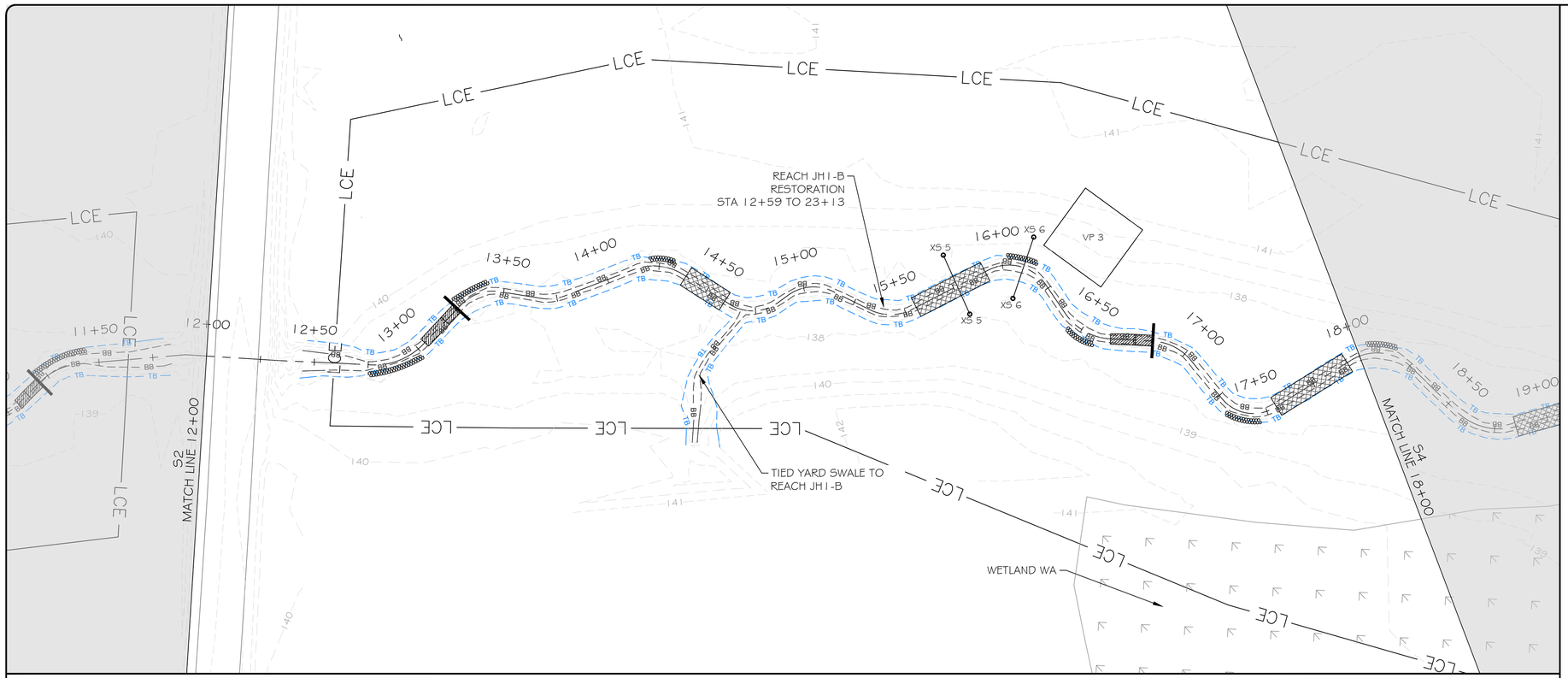

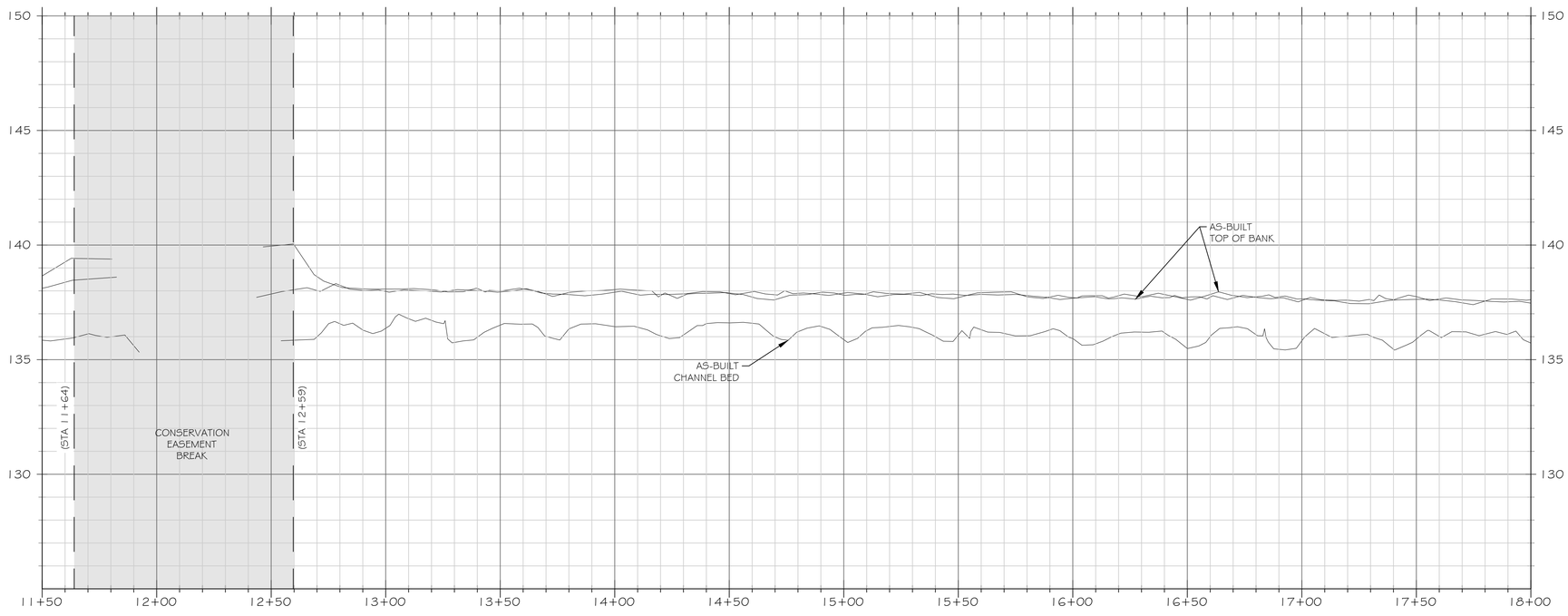

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
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- HAY BALE TOE PROTECTION
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NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRYAN S. LOCKETT
5-13-2022

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/13/2022

REVISIONS:

RELEASED FOR:
AS-BUILT DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:
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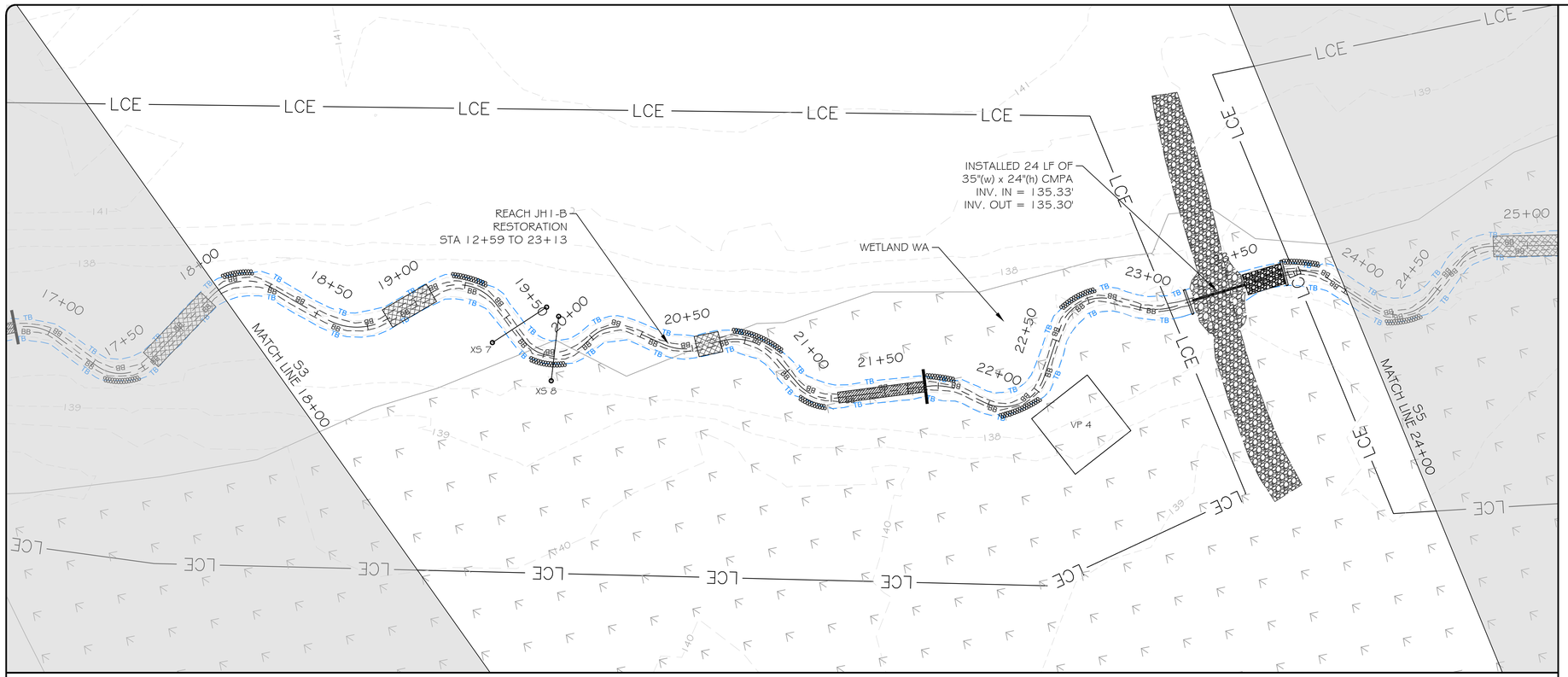

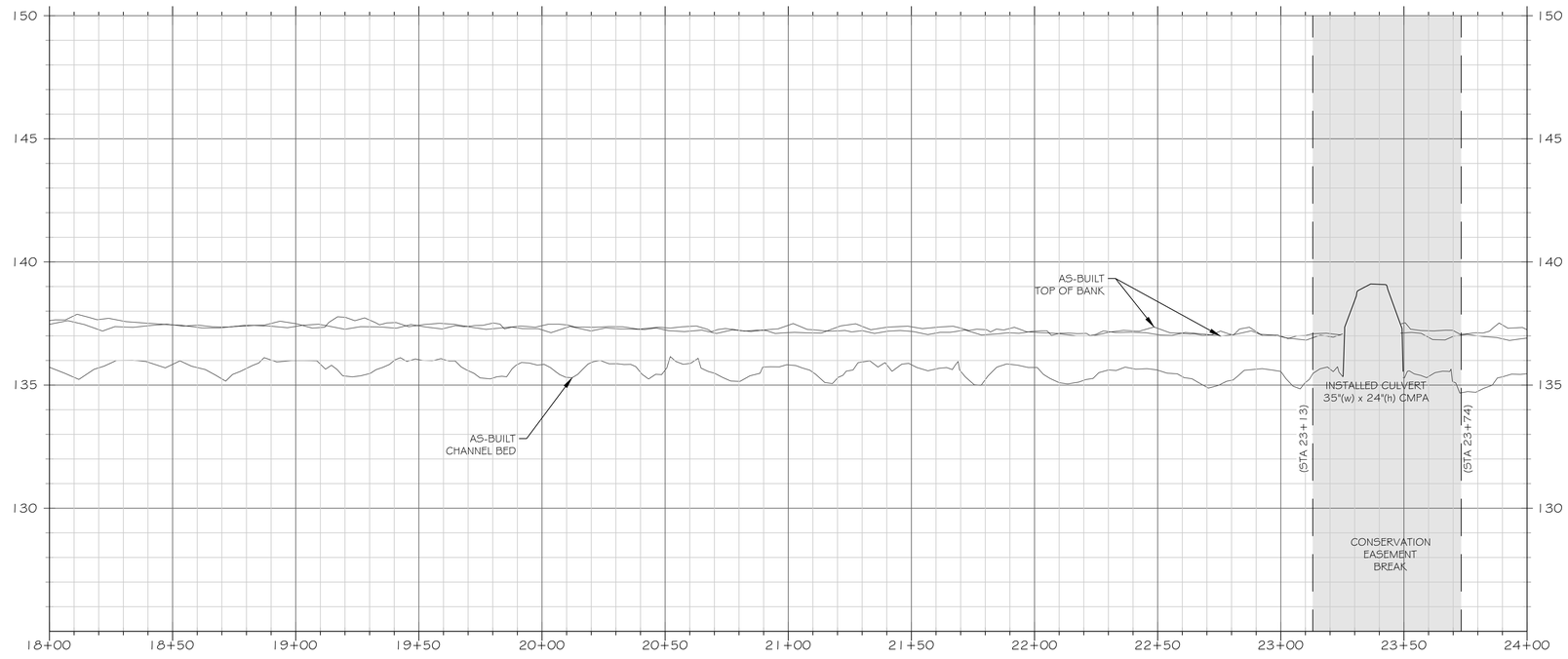

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- CONTOUR MAJOR
- CONTOUR MINOR
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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT
5-13-2022

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER: S4

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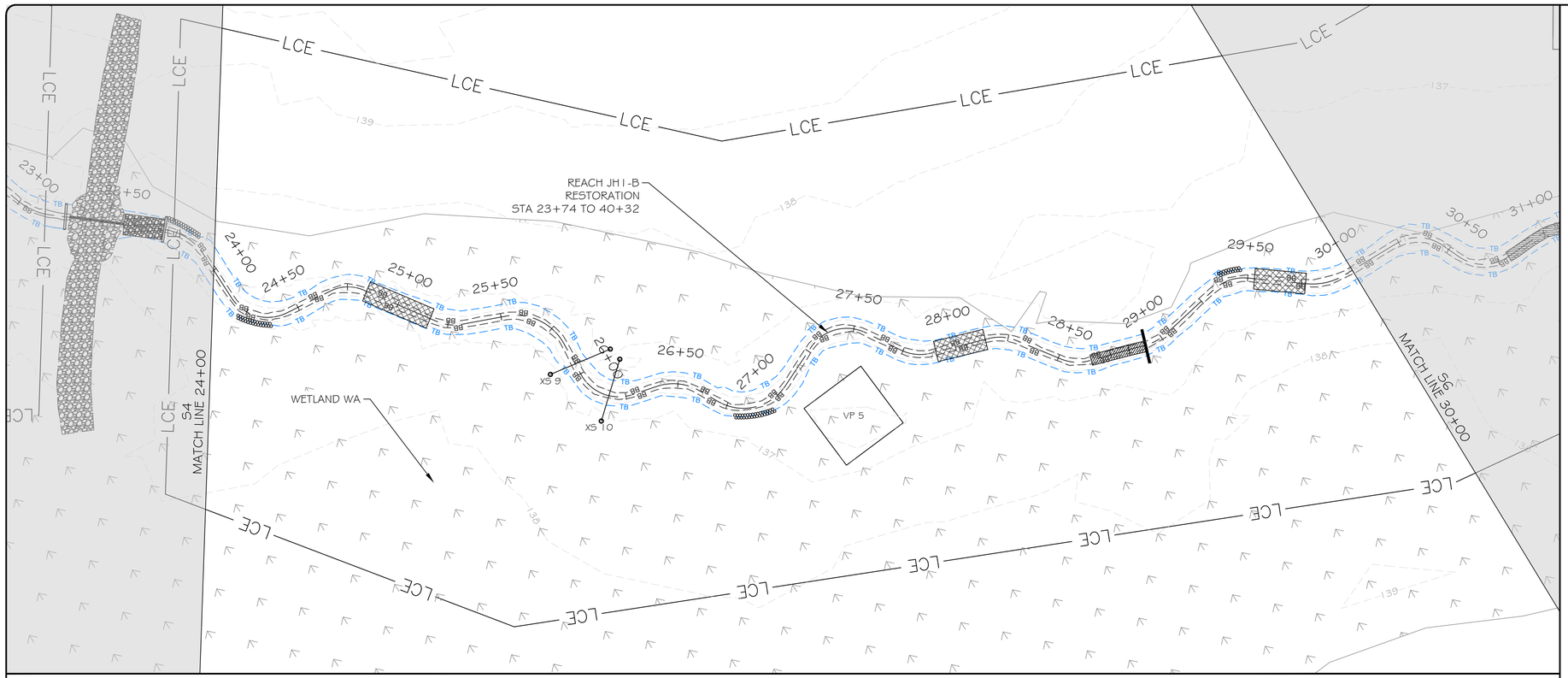

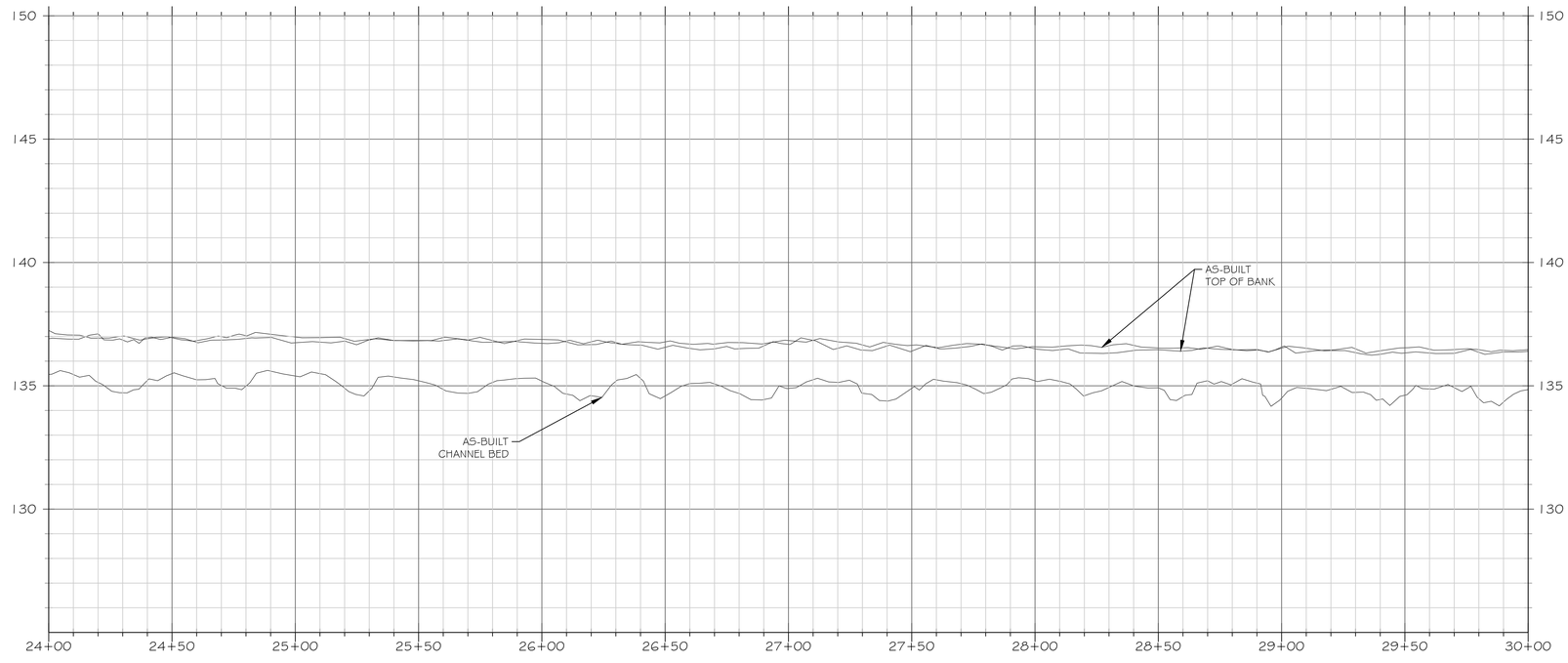

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- CONTOUR MAJOR — 50
- CONTOUR MINOR — 46
- WETLAND
- TOP OF BANK — TB
- BOTTOM OF BANK — BB
- PROPERTY LINE
- LIMITS OF PROPOSED CONSERVATION EASEMENT — LCE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
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- FLOW GAUGE
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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOPKETT
5-13-2022

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

S5

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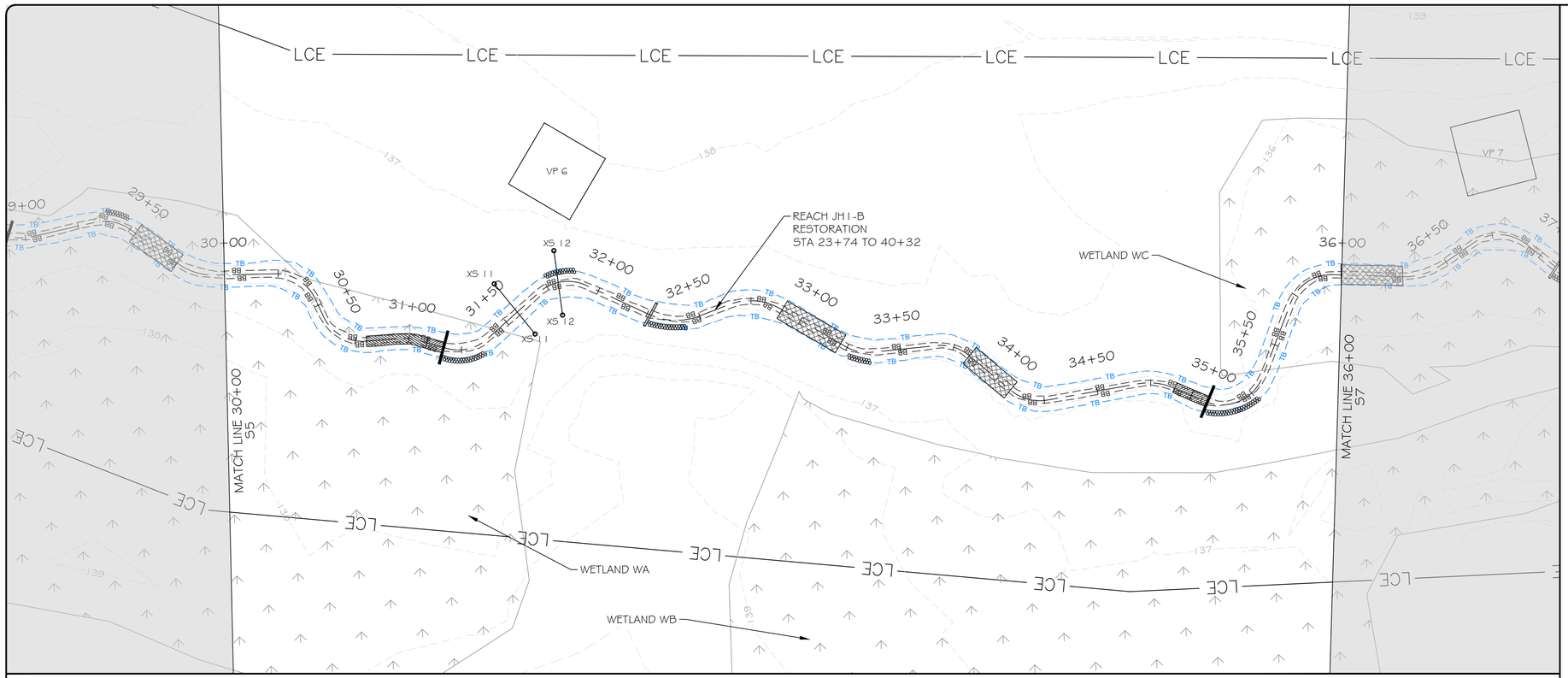

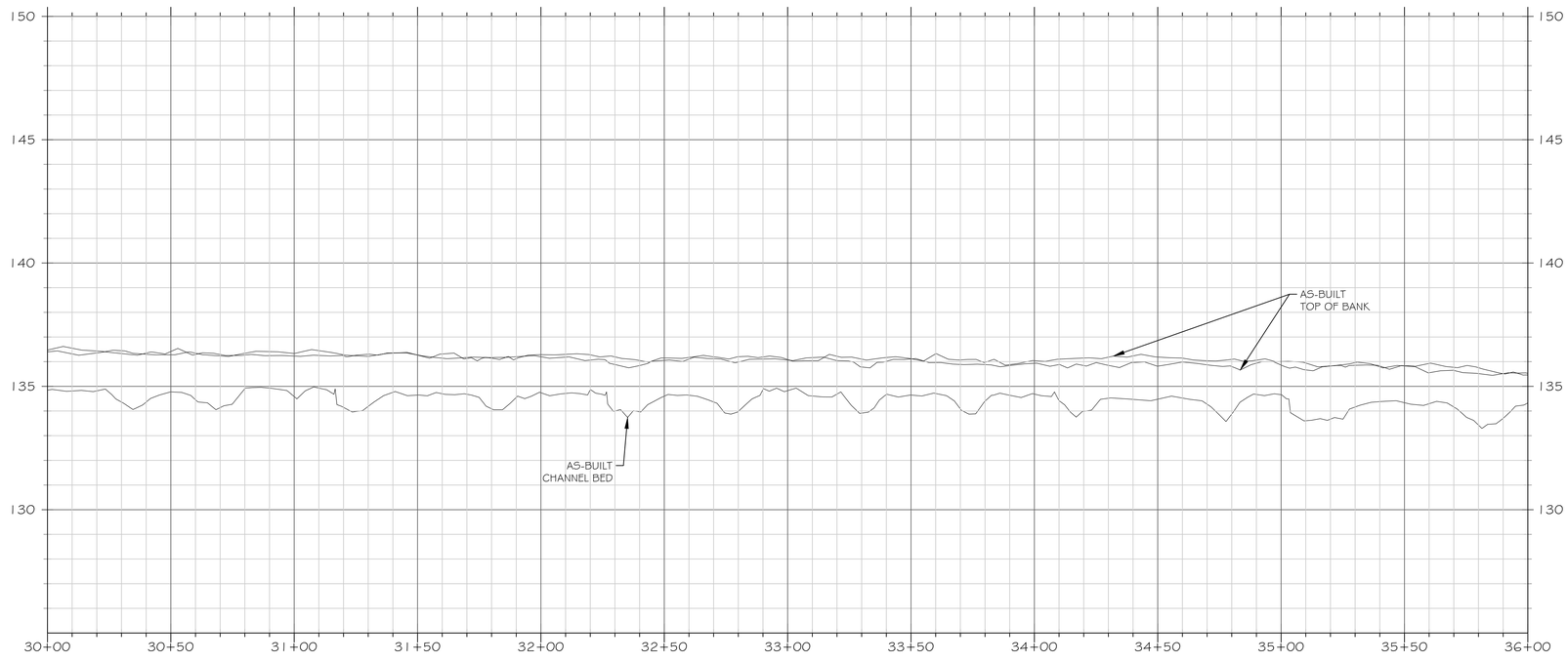

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- CONTOUR MAJOR — 50
- CONTOUR MINOR — 46
- WETLAND
- TOP OF BANK — TB
- BOTTOM OF BANK — BB
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- LIMITS OF PROPOSED CONSERVATION EASEMENT — LCE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
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- VEGETATION MONITORING PLOT — VP#

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT
5-13-2022

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER: S6

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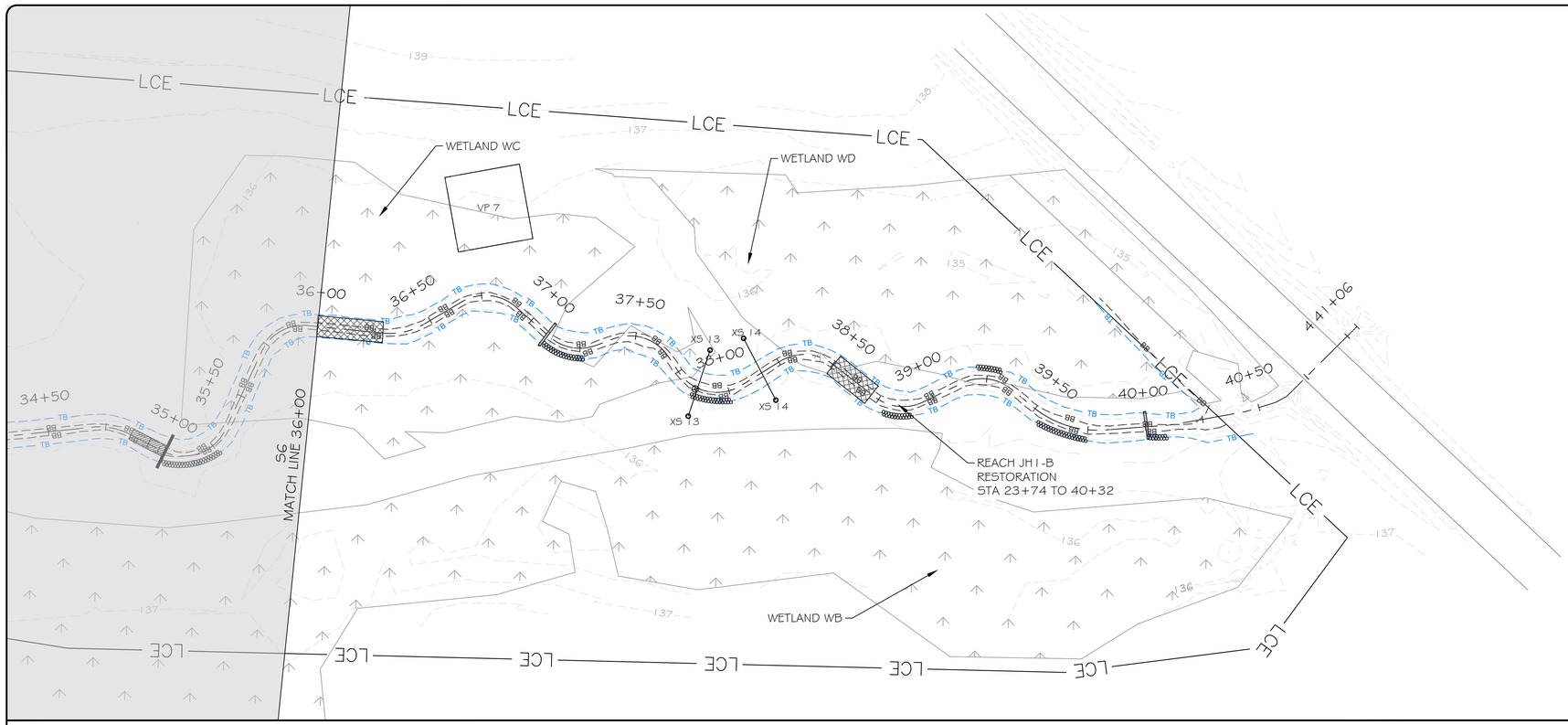

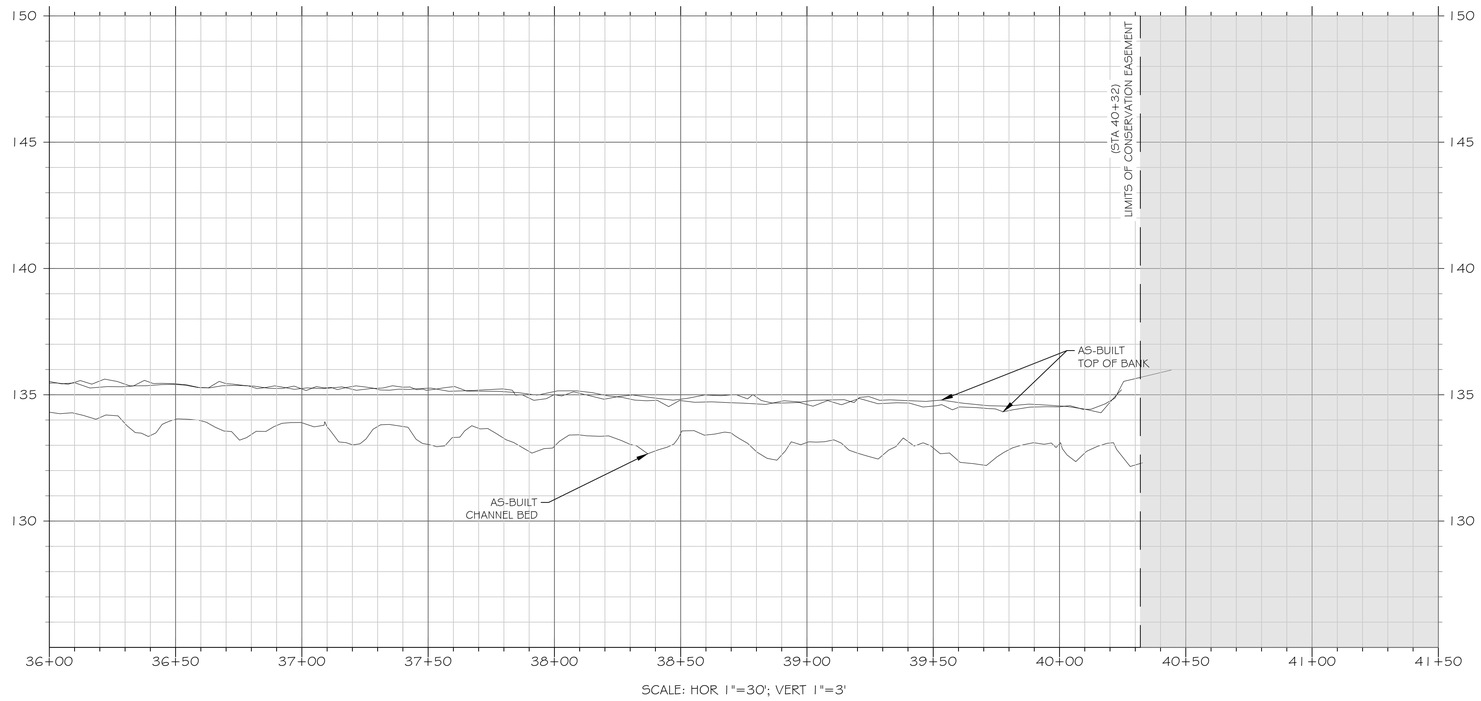

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF PROPOSED CONSERVATION EASEMENT (LCE)
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Engineering Services Provided By:
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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HUDNELL
5-13-2022

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER: S7

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DITCH JH2
BUFFER MITIGATION

EXISTING PIPES WERE
REMOVED AND
DISPOSED OF OFF-SITE

LCE

VP 10

VP 9

VP 8

S9
MATCH LINE

REMOVED EXISTING PIPE
AND REPLACED WITH SWALE,
PER DETAIL FROM ENGINEER

EXISTING PIPE PILE WAS
REMOVED AND
DISPOSED OF OFF-SITE

EXISTING IRRIGATION
SYSTEM WAS REMOVED AND
DISPOSED OF OFF-SITE

NOTE:
REMOVED ALL PIPES NOT SHOWN
ON PLAN BUT FOUND IN FIELD AND
DISPOSED OF OFF-SITE

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Engineering Services Provided By:
RES Environmental Operating Company, LLC
License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT
5-13-2022

FULL SCALE: 1"=50

0 50 100

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/13/2022

REVISIONS:

RELEASED FOR:
AS-BUILT DRAWINGS

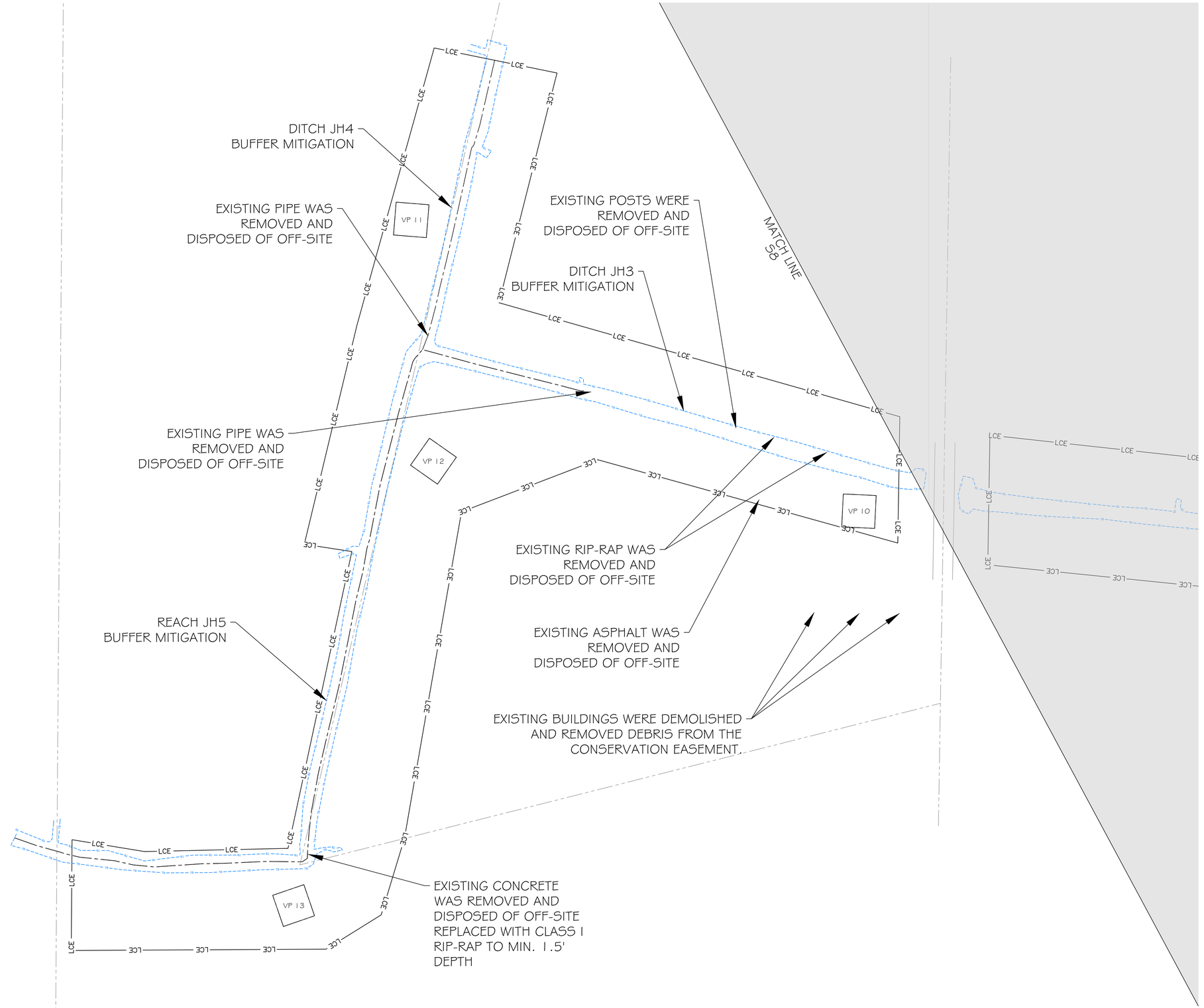
PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH JH2

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

S8



NOTE:
REMOVED ALL PIPES NOT SHOWN
ON PLAN BUT FOUND IN FIELD AND
DISPOSED OF OFF-SITE

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. BURNETT

FULL SCALE: 1"=50

0 50 100

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/13/2022

REVISIONS:

RELEASED FOR:
AS-BUILT DRAWINGS

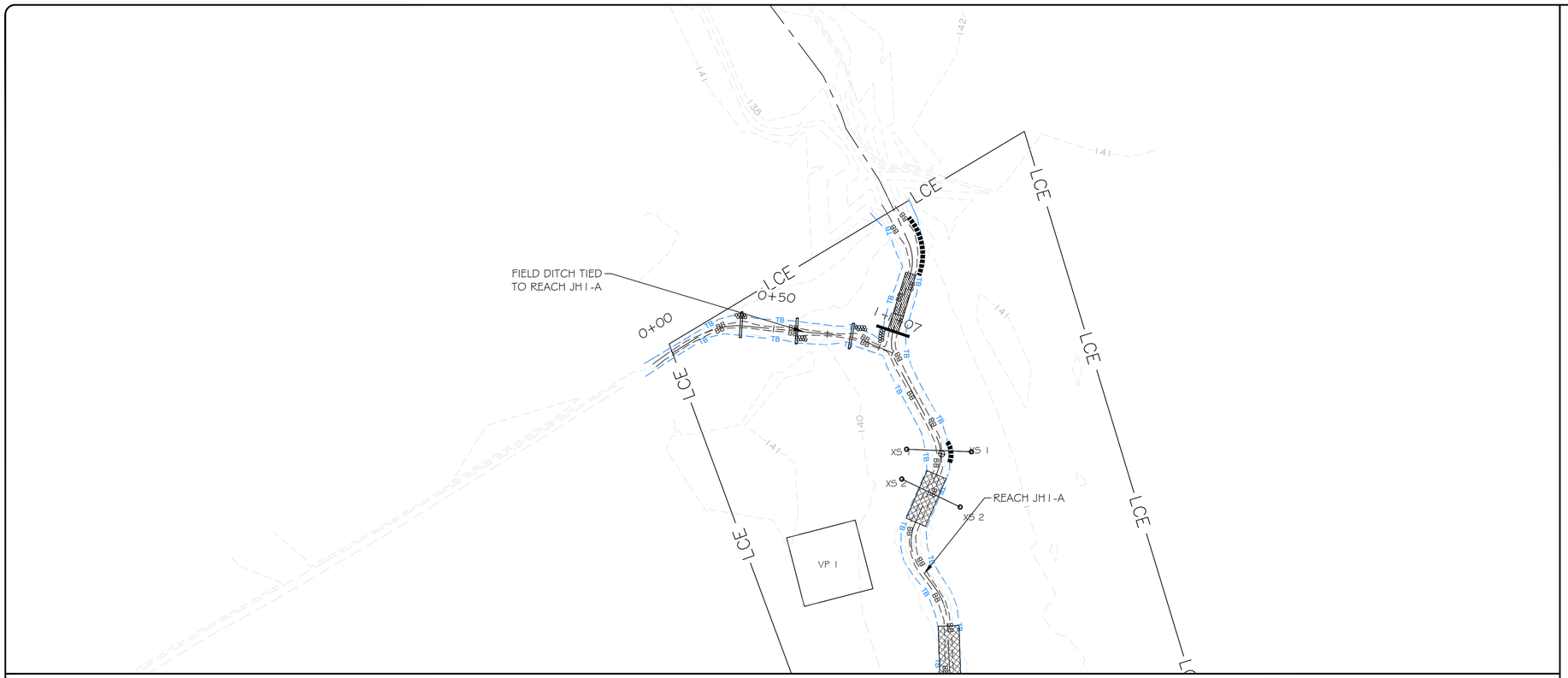
PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH JH3-5

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

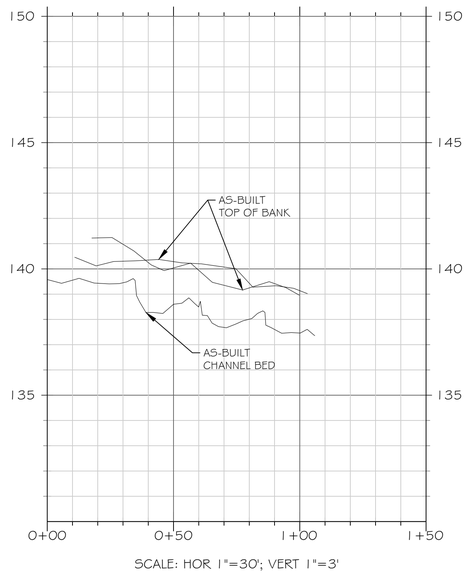
SHEET NUMBER:

S9



LEGEND

- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF PROPOSED CONSERVATION EASEMENT (LCE)
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL STRUCTURE
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT (VP#)



SCALE: HOR 1"=30'; VERT 1"=3'

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Engineering Services Provided By:
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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT 5-13-2022

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 5/13/2022

REVISIONS:

RELEASED FOR: AS-BUILT DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: DITCH TIE

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER: S10

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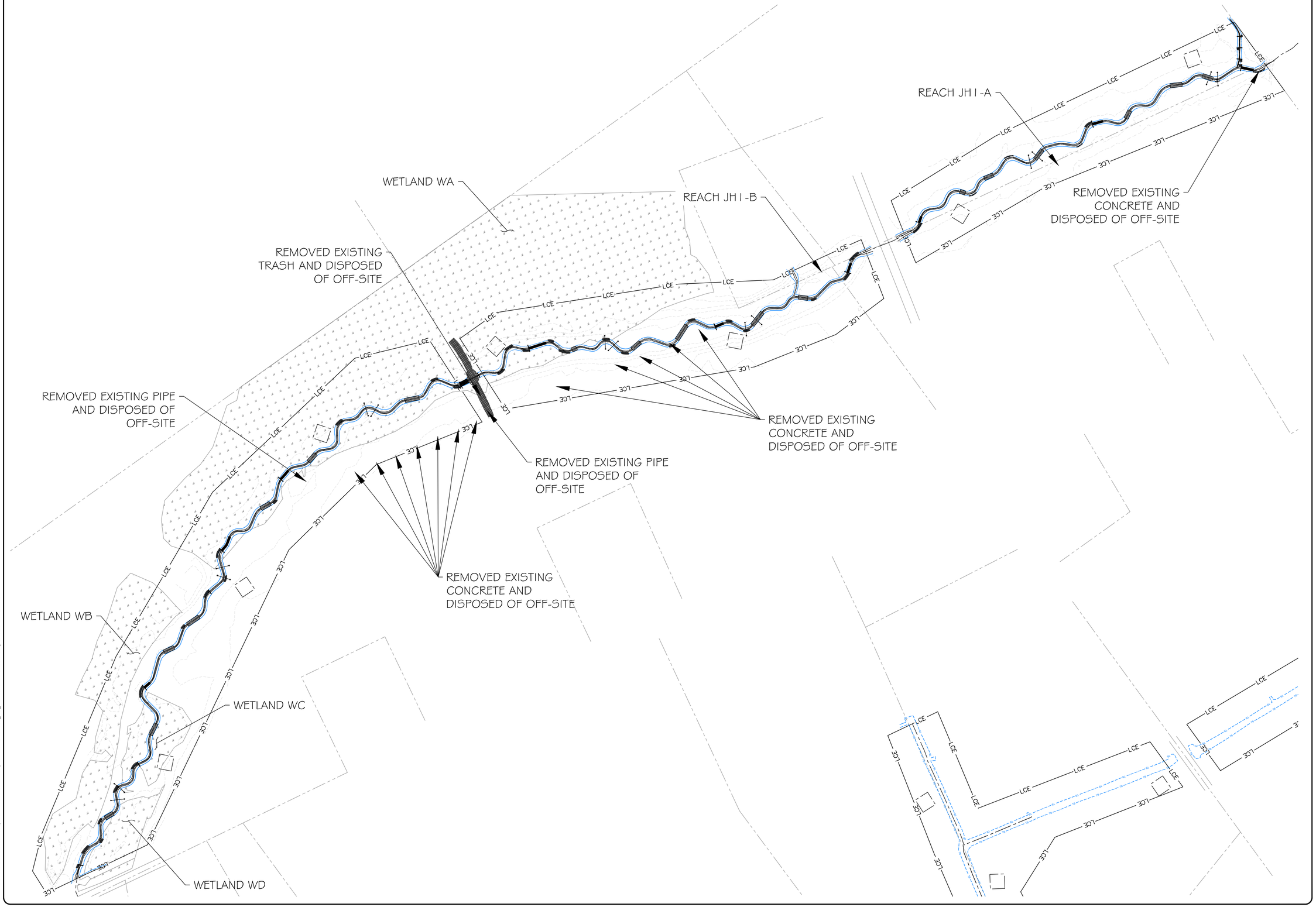

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOCKETT
5-13-2022

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/13/2022

REVISIONS:

RELEASED FOR:
AS-BUILT DRAWINGS

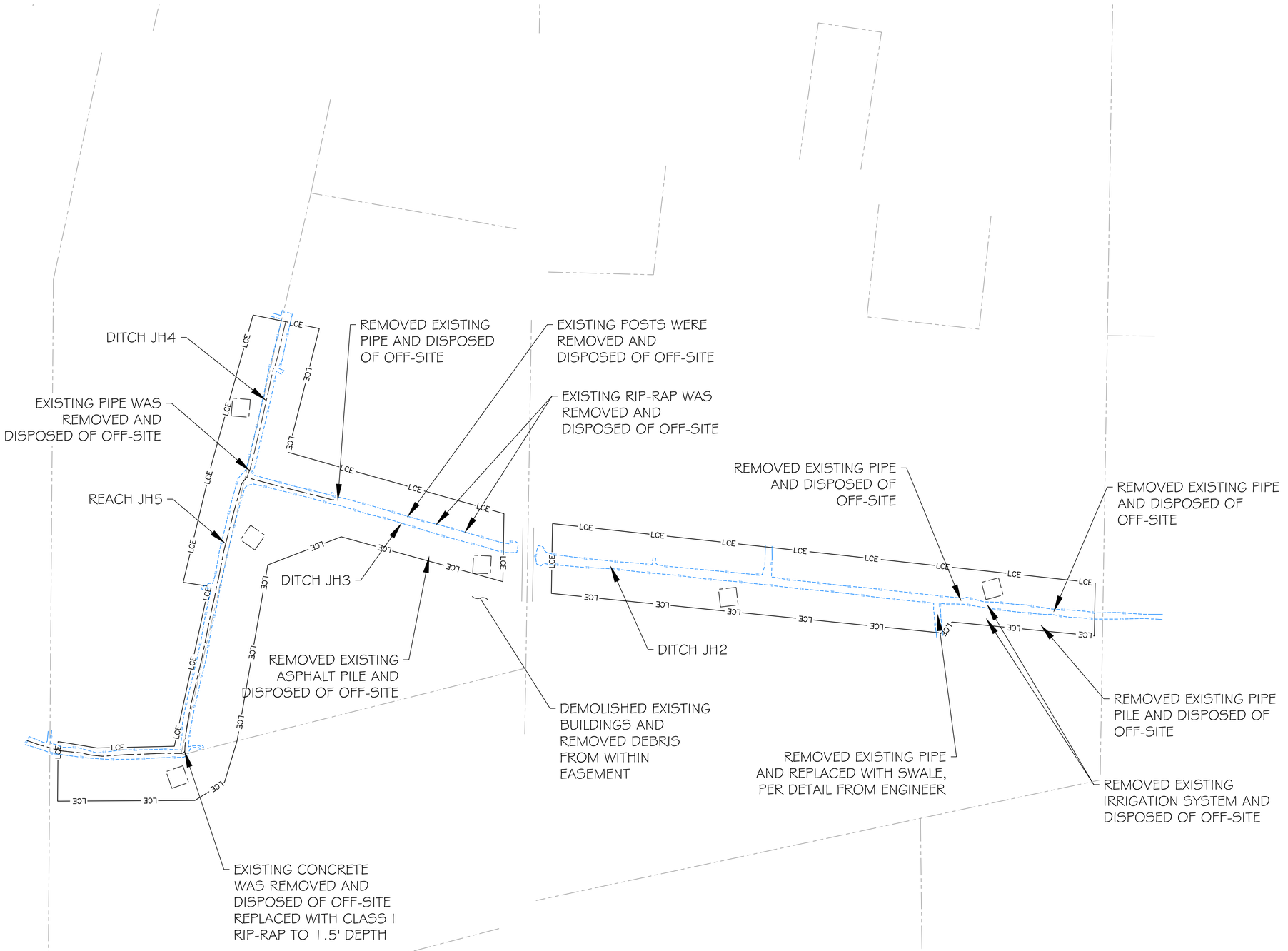
PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
MAINTENANCE COMPLETED

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

M1



NOTE:
REMOVED ALL PIPES NOT SHOWN ON PLAN BUT FOUND IN FIELD AND DISPOSED OF OFF-SITE

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL L-5165 LAND SURVEYOR BRIAN S. HOPKETT
Licensed

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
5/13/2022

REVISIONS:

RELEASED FOR:
AS-BUILT DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
MAINTENANCE COMPLETED

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

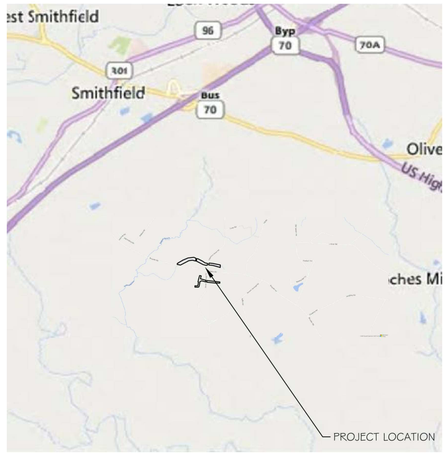
M2

STRAWBERRY HILL MITIGATION PROJECT

PROJECT LOCATION: 35.469170°, -78.312918°
JOHNSTON COUNTY, NORTH CAROLINA

NEUSE RIVER BASIN: HUC 030202201
MAY 2022

RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612



VICINITY MAP
NTS

PROJECT DIRECTORY

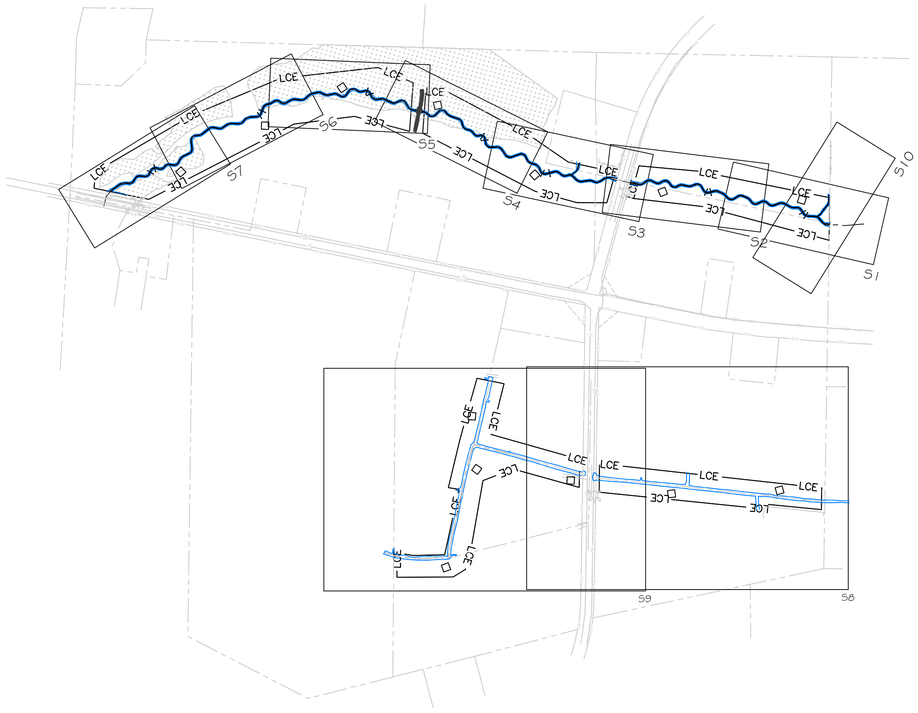
OWNER:
JEREMIAH DOW
NC DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF MITIGATION SERVICES
217 WEST JONES ST., SUITE 3000A
RALEIGH, NC 27603

DESIGNED & CONSTRUCTED BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

AS-BUILT SURVEY BY:
RESOURCE ENVIRONMENTAL SOLUTIONS, LLC
3600 GLENWOOD AVE, SUITE 100
RALEIGH, NC 27612

DMS PROJECT #: 100094
CONTRACT #: 7745
USACE ACTION ID #: SAW-2019-00124
RFP #: 16-007576
DWR #: 20190159

STRAWBERRY HILL MITIGATION SITE AS-BUILT SURVEY SEALED BY BRIAN S. HOCKETT, PLS (L-5165) ON MAY 13, 2022.



SITE MAP
NTS

Sheet List Table	
Sheet Number	Sheet Title
--	Cover
A1	OVERALL AERIAL VIEW
S1	REACH JH1
S2	REACH JH1
S3	REACH JH1
S4	REACH JH1
S5	REACH JH1
S6	REACH JH1
S7	REACH JH1
S8	REACH JH2
S9	REACH JH3-5
S10	DITCH TIE
M1	MAINTENANCE COMPLETED
M2	MAINTENANCE COMPLETED

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BRIAN S. HOCKETT 6/21/22

REVISIONS:

PLOT DATE: —

RELEASED FOR: RECORD DRAWINGS

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	BRC

SHEET NUMBER:

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FILE NAME:R:\Resca\Projects\101038-Strawberry Hill\ABRL\Record Drawings\101038_RD_Cover.dwg SAVED BY: Tswartzfager

Strawberry Hill Project Credits				
Reach	**Mitigation Type**	**Proposed Length (LF)**	**Mitigation Ratio**	**SMUs**
JH1-A	Restoration	1,007	1 : 1.0	1,007
JH1-B	Restoration	1,054	1 : 1.0	1,054
	Restoration	1,658	1 : 1.0	1,658
JH2	Buffer	1,009	N/A	N/A
JH3	Buffer	326	N/A	N/A
JH4	Buffer	297	N/A	N/A
JH5	Buffer	924	N/A	N/A
Total		**6,275**		**3,719**

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 6/27/22 ENGINEER BENJAMIN R. CARROLL

FULL SCALE: 1"=150

0 150 300

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
OVERALL AERIAL VIEW

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

A1

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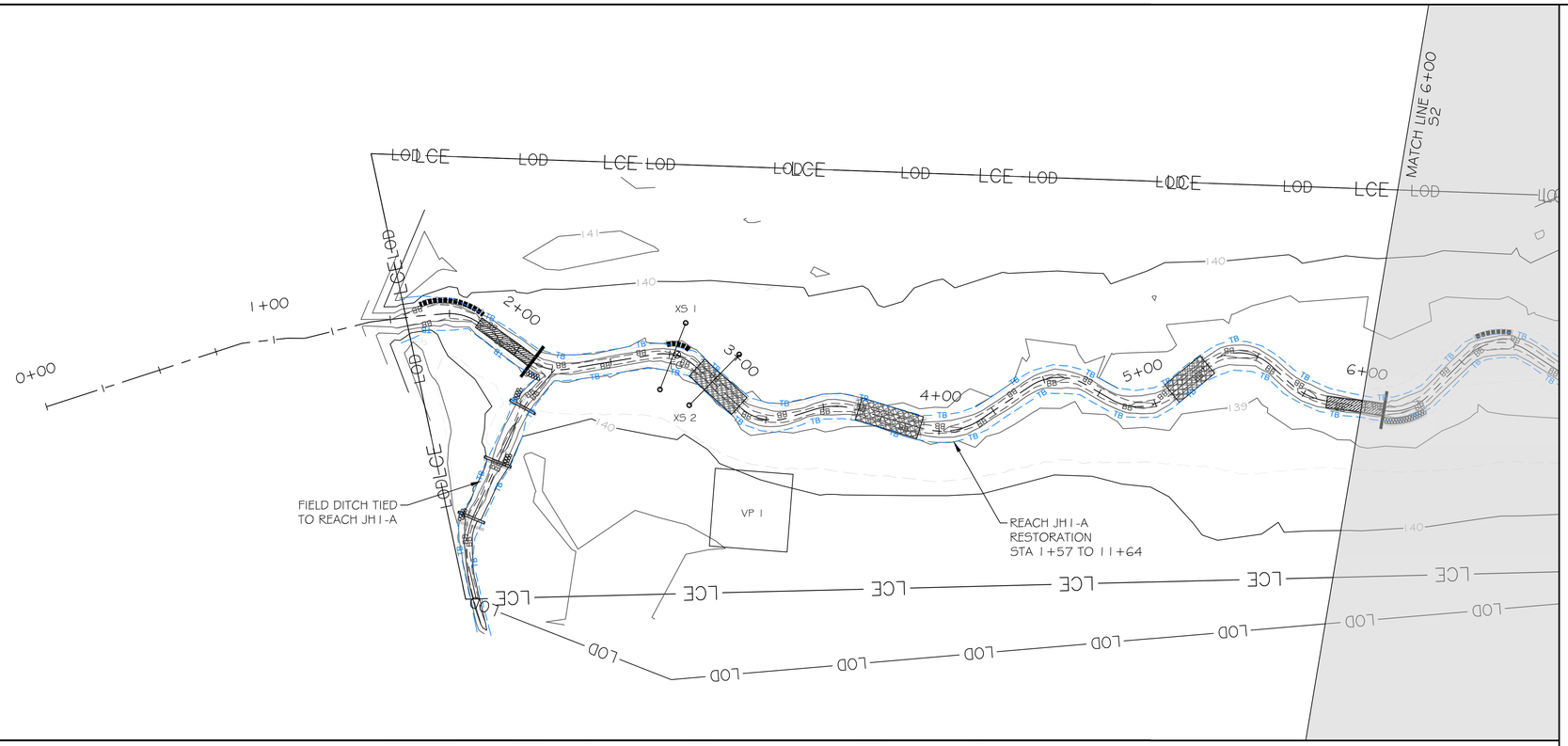

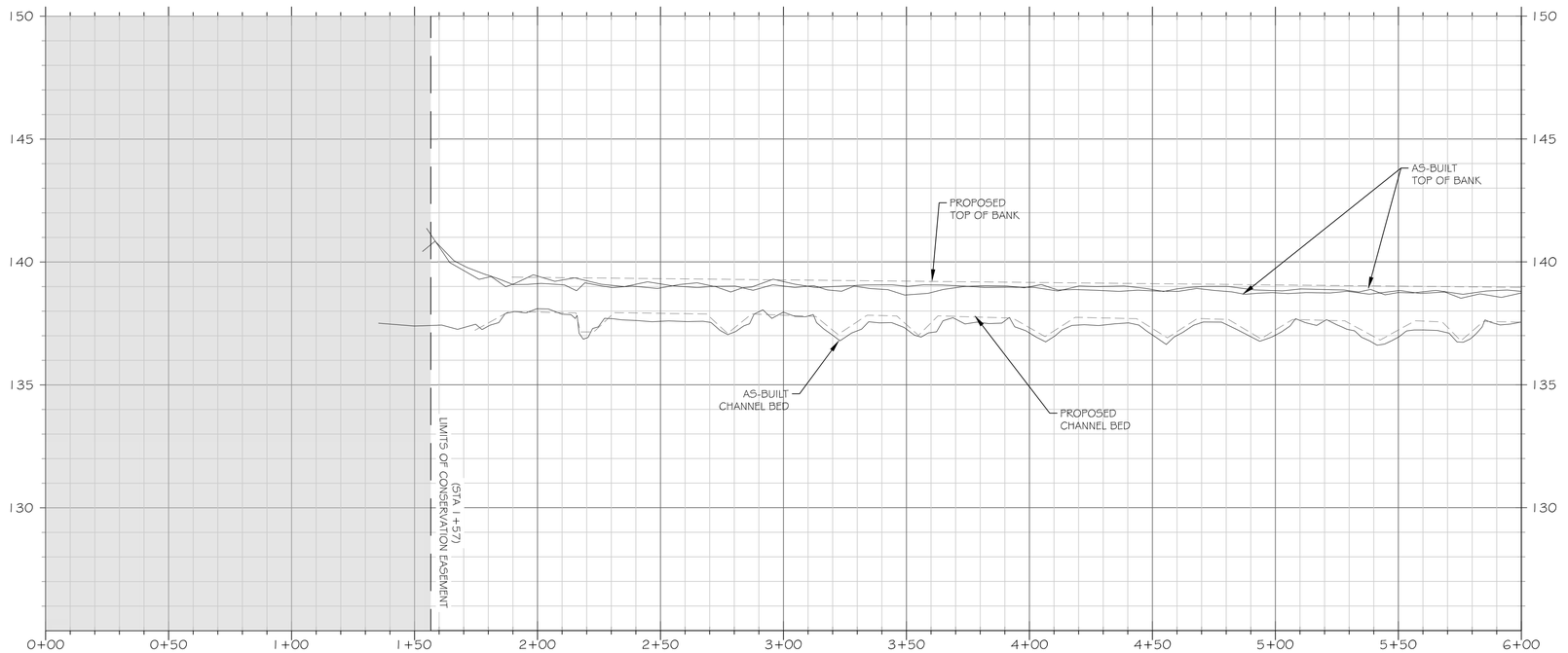

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT (LCE)
- PERMITTED LIMITS OF DISTURBANCE (LOD)
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT (VP#)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENJON R CARROLL 6/27/22

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER: S1

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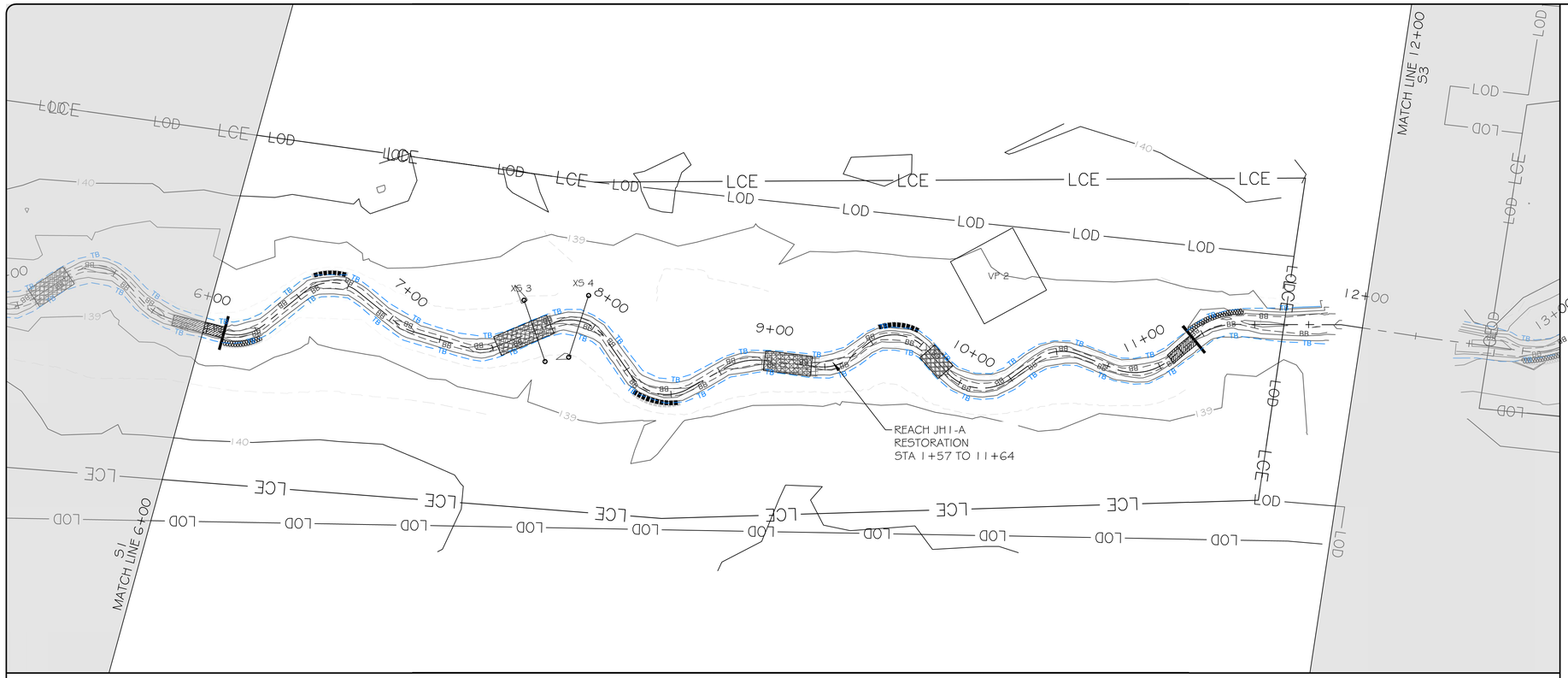

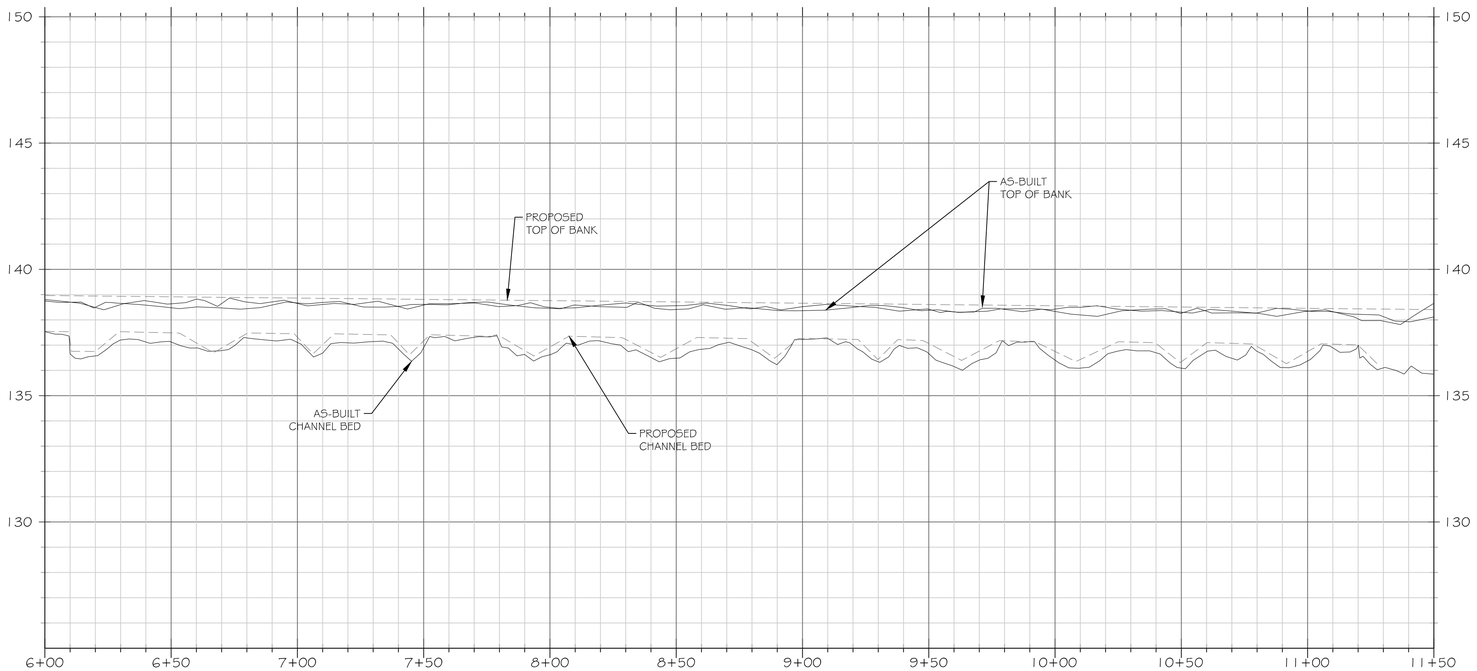

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR — 50
- PROPOSED CONTOUR MINOR — 46
- CONTOUR MAJOR — 50
- CONTOUR MINOR — 46
- WETLAND
- TOP OF BANK — TB
- BOTTOM OF BANK — BB
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT — LCE
- PERMITTED LIMITS OF DISTURBANCE — LOD
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT — VP#

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BRIAN R CARROLL
6/27/22

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S2

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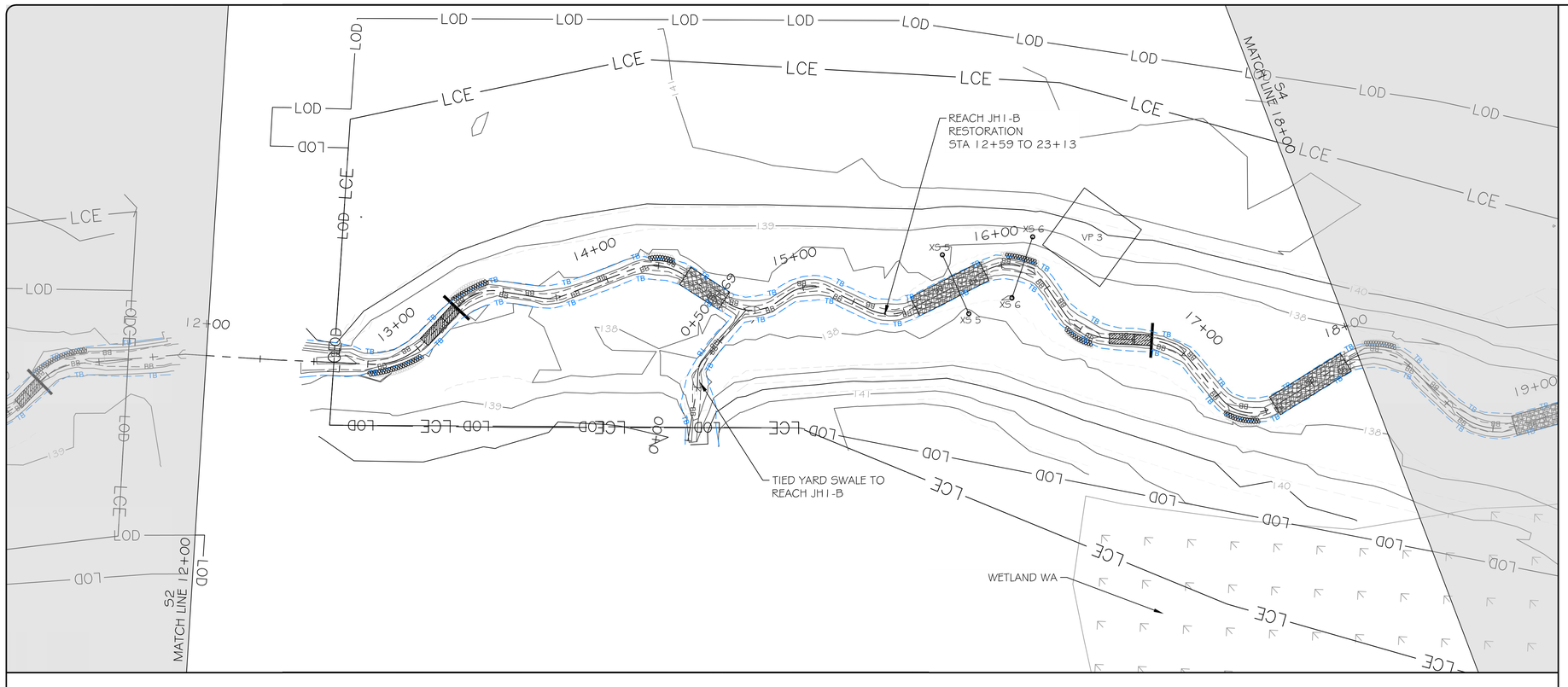

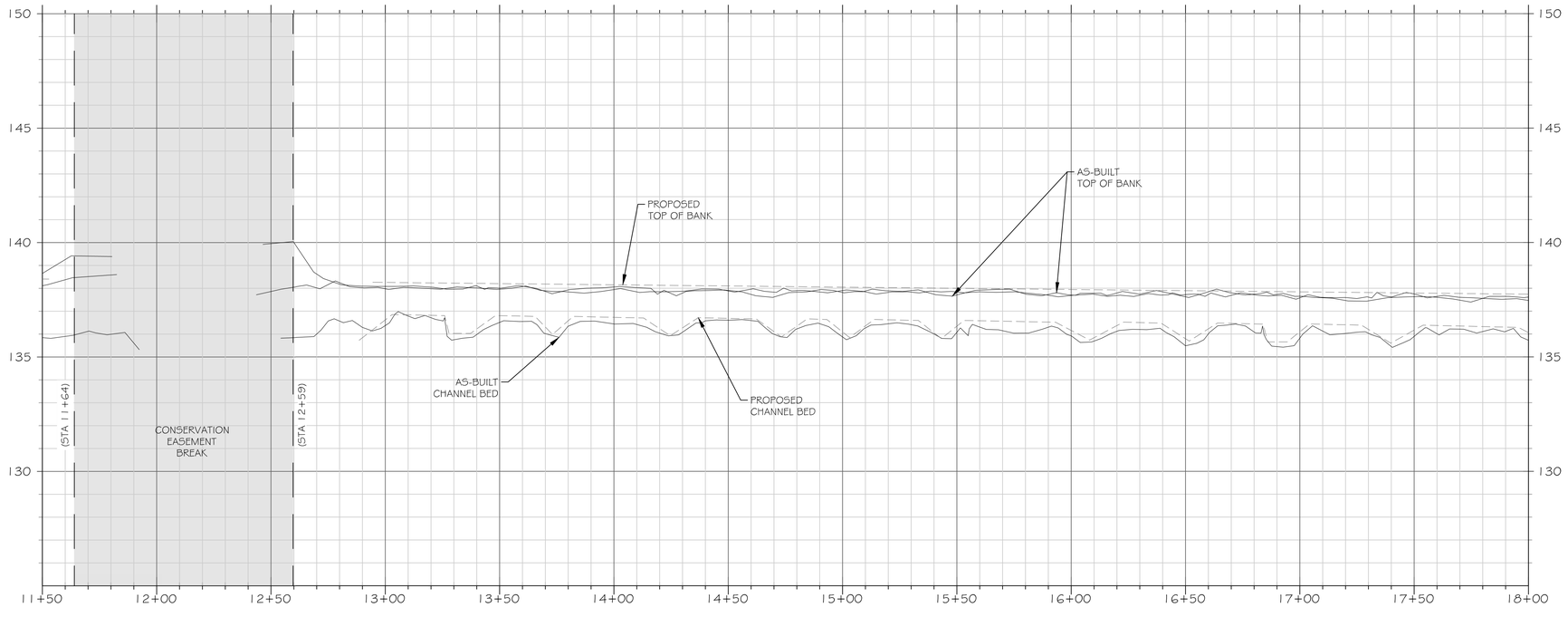

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR — 50
- PROPOSED CONTOUR MINOR — 46
- CONTOUR MAJOR — 50
- CONTOUR MINOR — 46
- WETLAND
- TOP OF BANK — TB
- BOTTOM OF BANK — BB
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT — LCE
- PERMITTED LIMITS OF DISTURBANCE — LOD
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT — VP#

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BRANDON R. CARROLL

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S3

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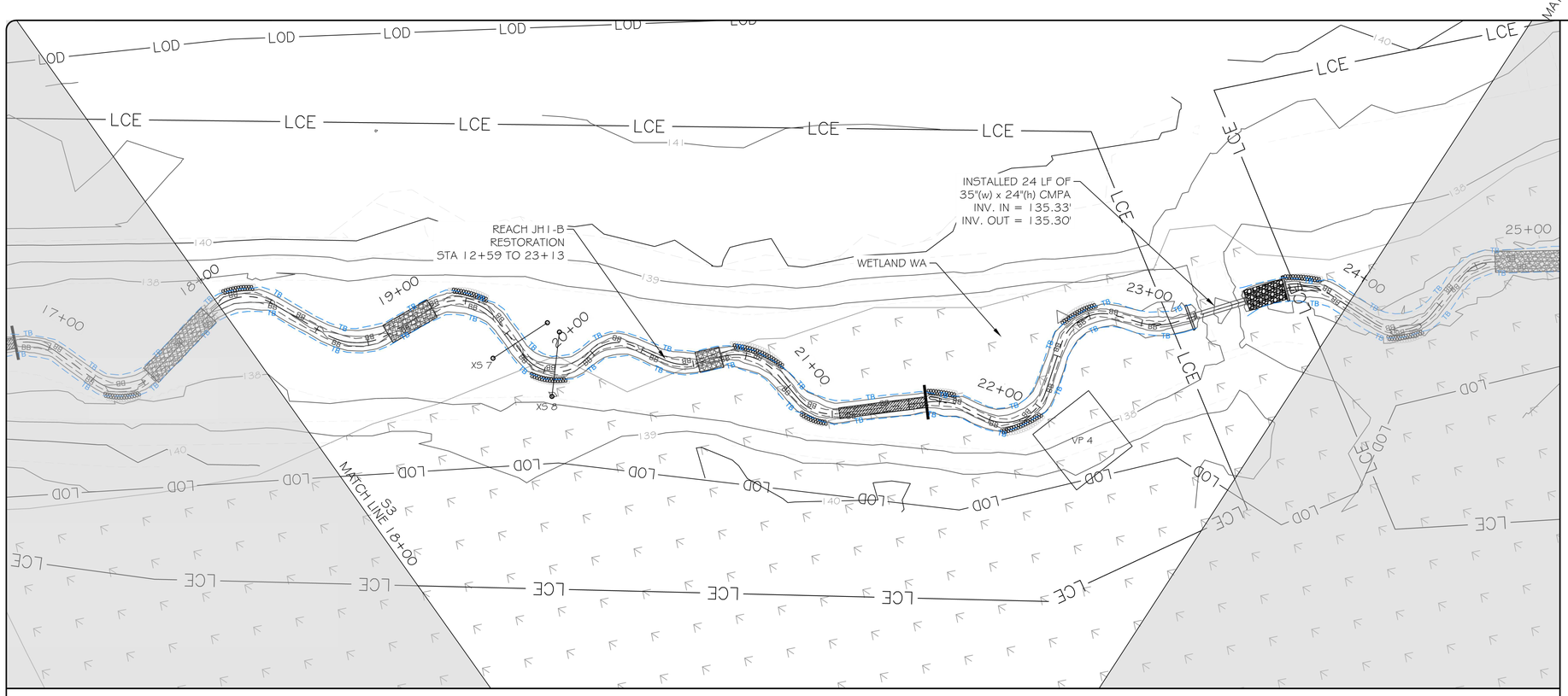

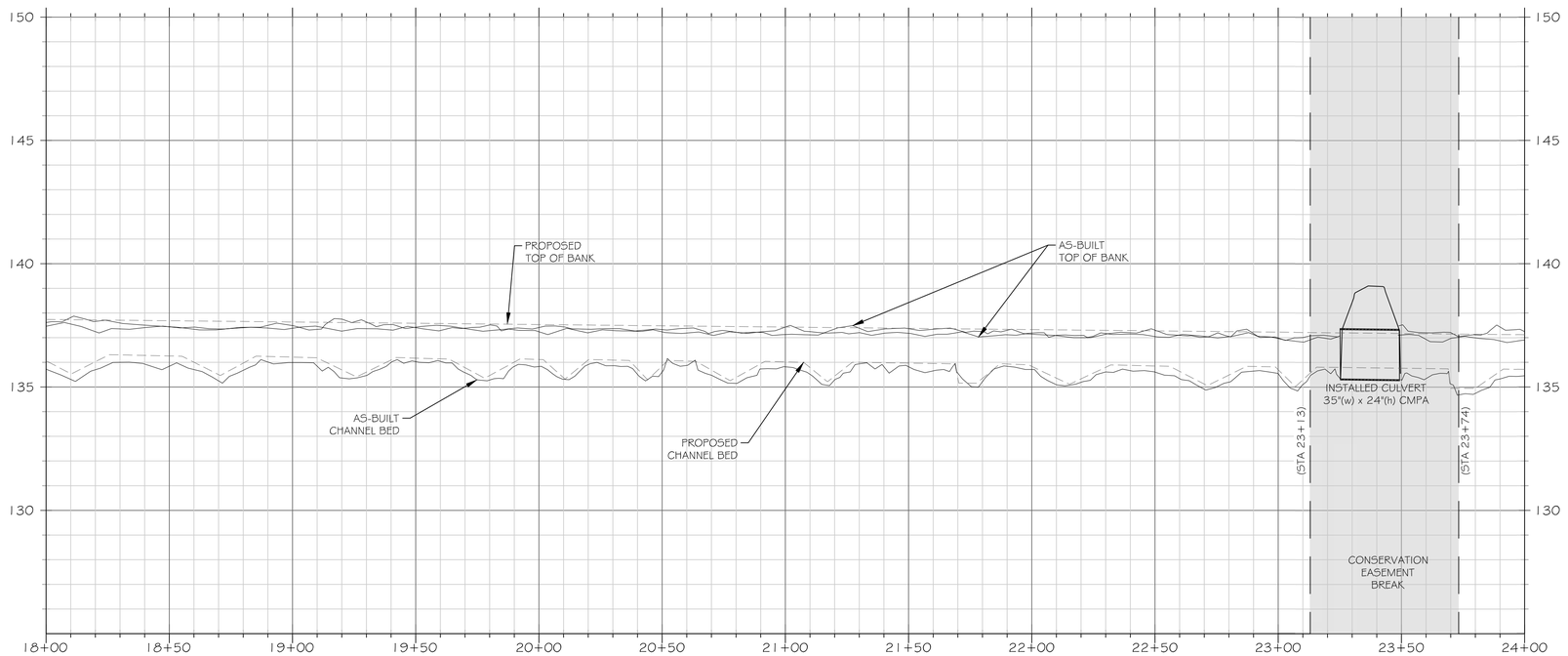

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT (LCE)
- PERMITTED LIMITS OF DISTURBANCE (LOD)
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
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- VEGETATION MONITORING PLOT (VP#)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R CARROLL
6/27/22

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER: S4

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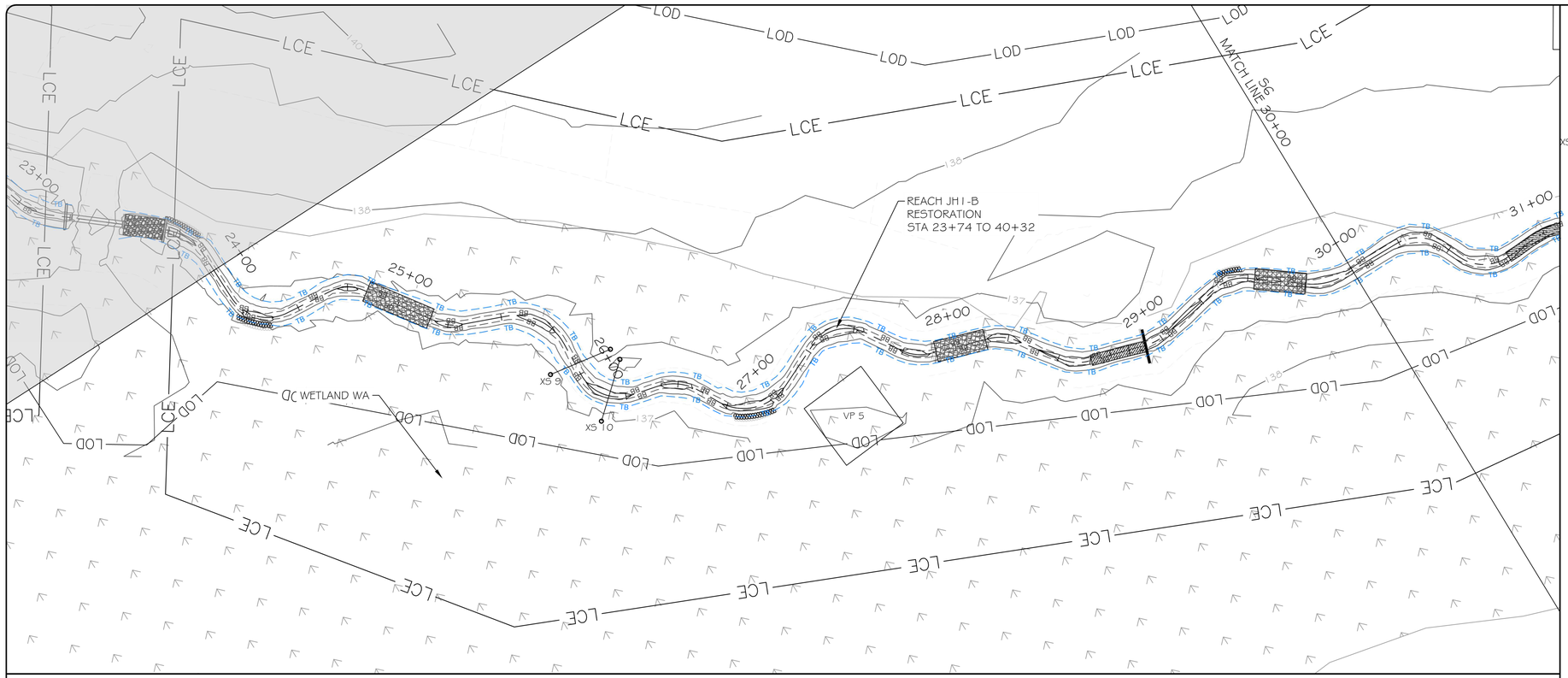

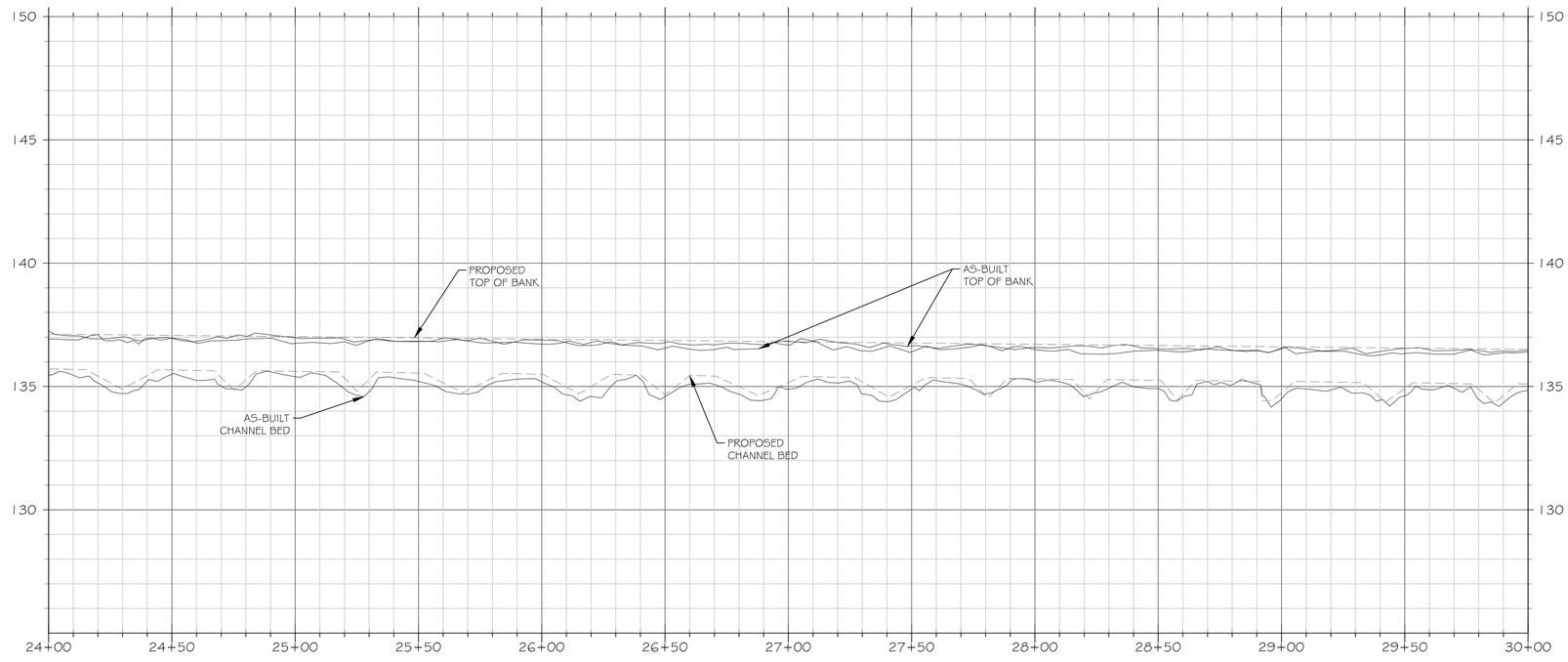

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT (LCE)
- PERMITTED LIMITS OF DISTURBANCE (LOD)
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT (VP#)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENJAMIN CARROLL
6/27/22

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S5

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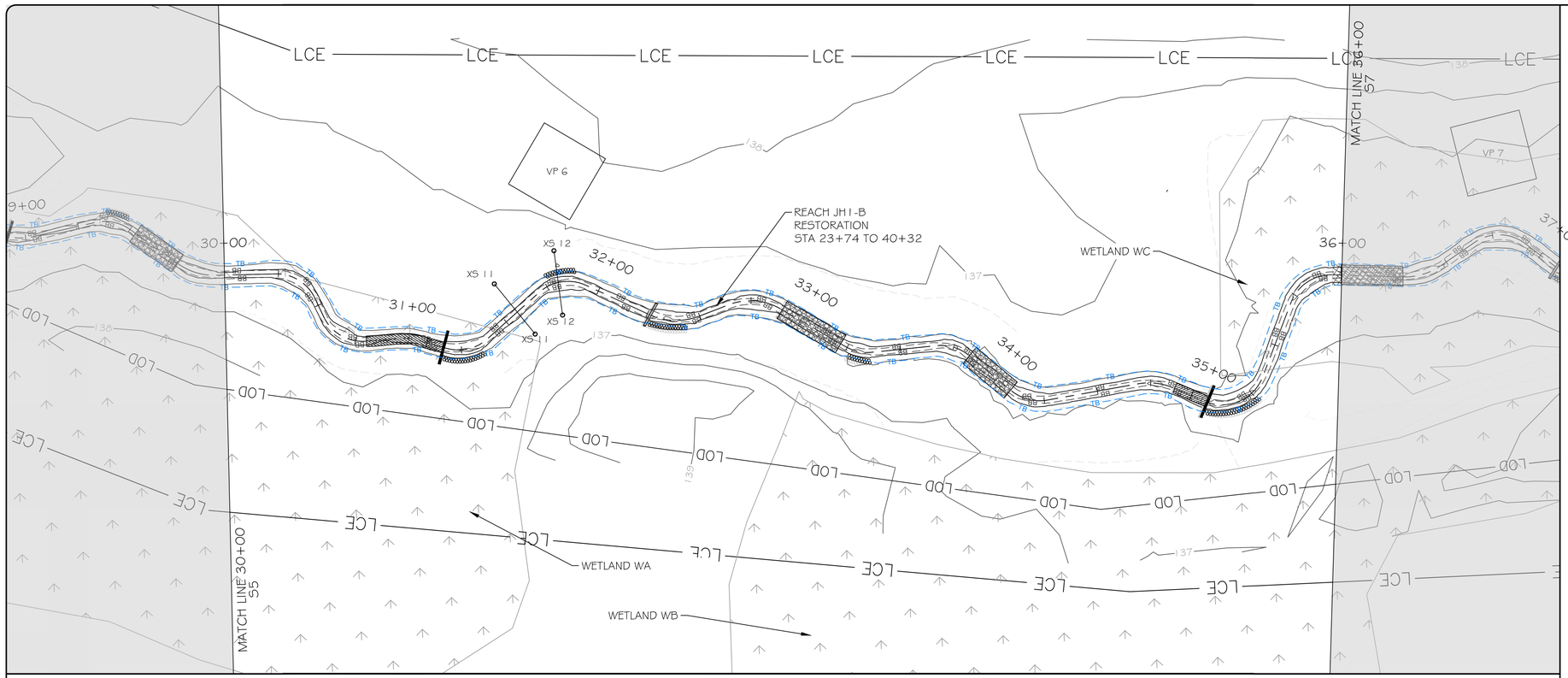

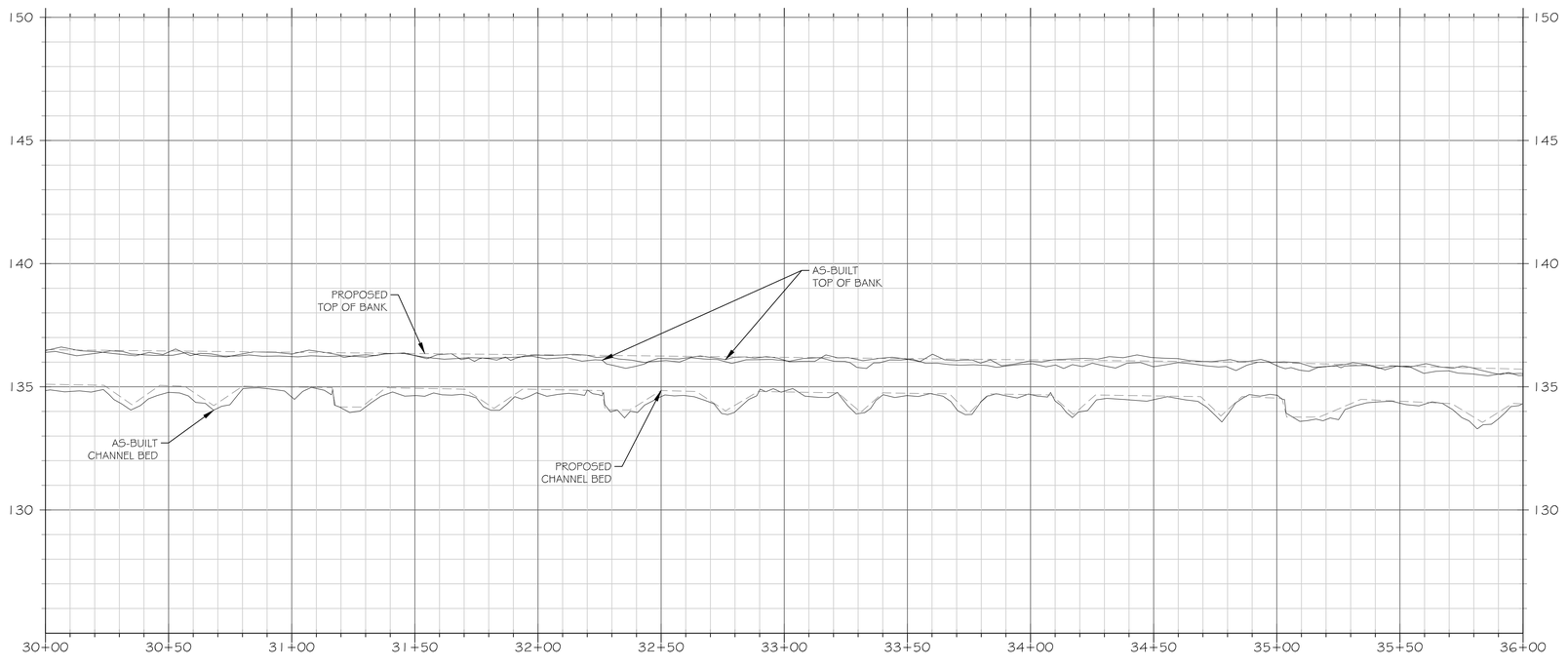

SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR — 50
- PROPOSED CONTOUR MINOR — 46
- CONTOUR MAJOR — 50
- CONTOUR MINOR — 46
- WETLAND
- TOP OF BANK — TB
- BOTTOM OF BANK — BB
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT — LCE
- PERMITTED LIMITS OF DISTURBANCE — LOD
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT — VP#

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BRANDON R. CARROLL 6/27/22

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

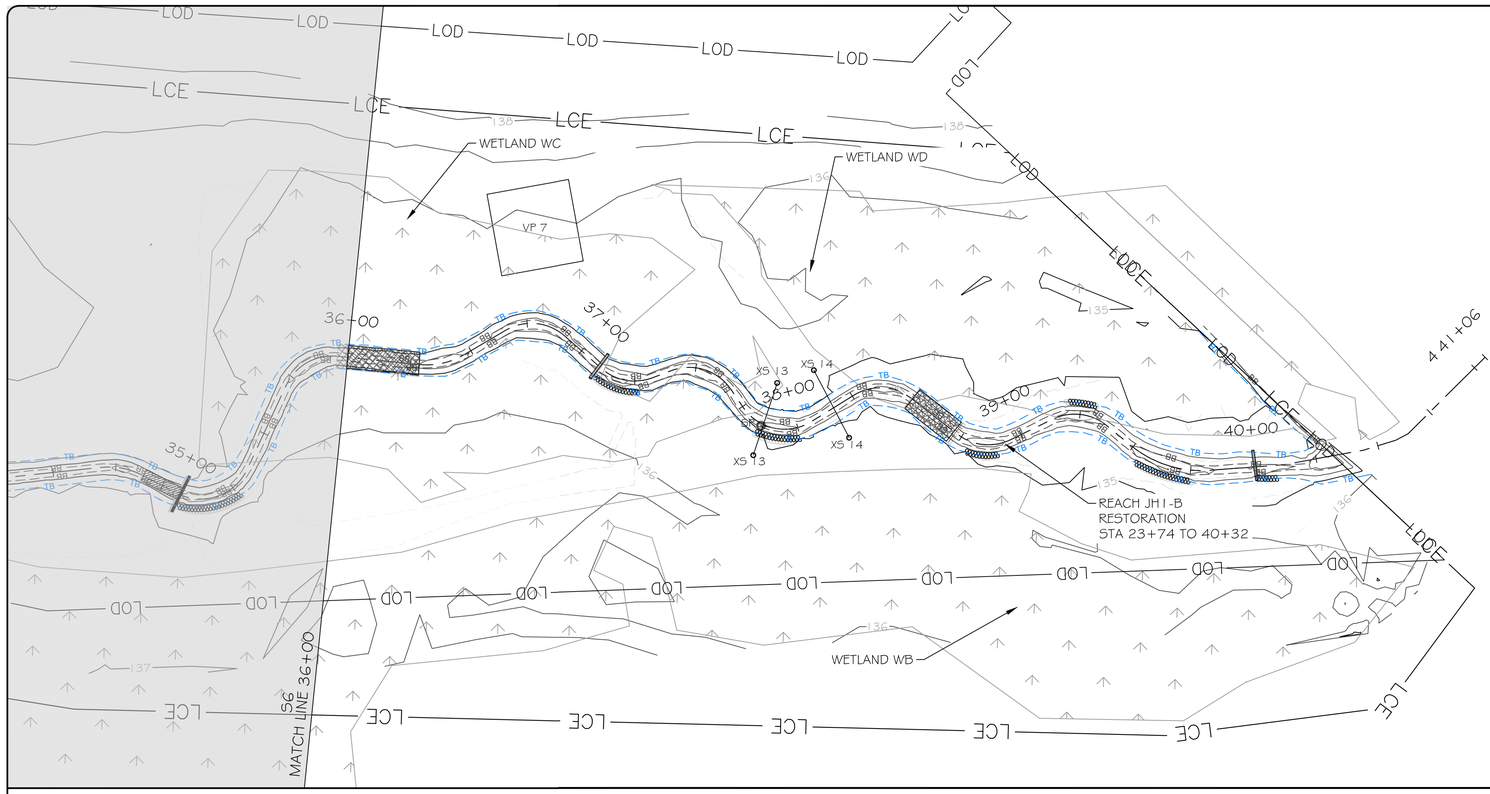
DRAWING TITLE: REACH JH1

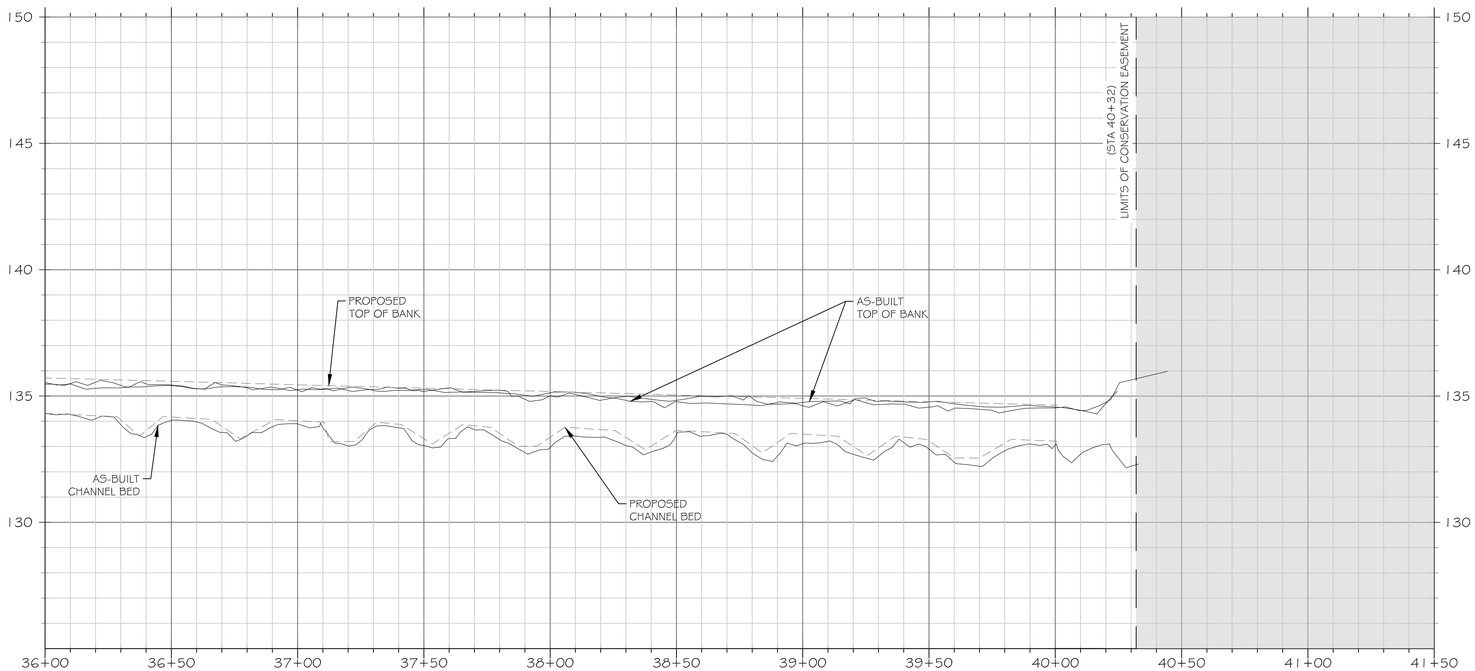
PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S6

FILE NAME:R:\Respo\Projects\101038-Strawberry Hill\ABRL\Record Drawings\101038_RD_Design.dwg SAVED BY: Bcarroll





SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

- PROPOSED CONTOUR MAJOR
- PROPOSED CONTOUR MINOR
- CONTOUR MAJOR
- CONTOUR MINOR
- WETLAND
- TOP OF BANK (TB)
- BOTTOM OF BANK (BB)
- PROPERTY LINE
- LIMITS OF CONSERVATION EASEMENT (LCE)
- PERMITTED LIMITS OF DISTURBANCE (LOD)
- PROPOSED BRUSH TOE PROTECTION
- PROPOSED HAY BALE TOE PROTECTION
- PROPOSED LOG STRUCTURE
- PROPOSED BRUSH BED SILL
- PROPOSED ROCK WOOD RIFFLE
- BRUSH TOE PROTECTION
- HAY BALE TOE PROTECTION
- LOG SILL STRUCTURE
- BRUSH BED SILL
- ROCK WOOD RIFFLE
- STAGE RECORDER
- FLOW GAUGE
- MONITORING CROSS SECTION
- VEGETATION MONITORING PLOT (VP#)

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R CARROLL
4/29/22

FULL SCALE: 1"=30

0 30 60

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE: 6/27/2022

REVISIONS:

RELEASED FOR: RECORD DRAWINGS

PROJECT NAME: STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

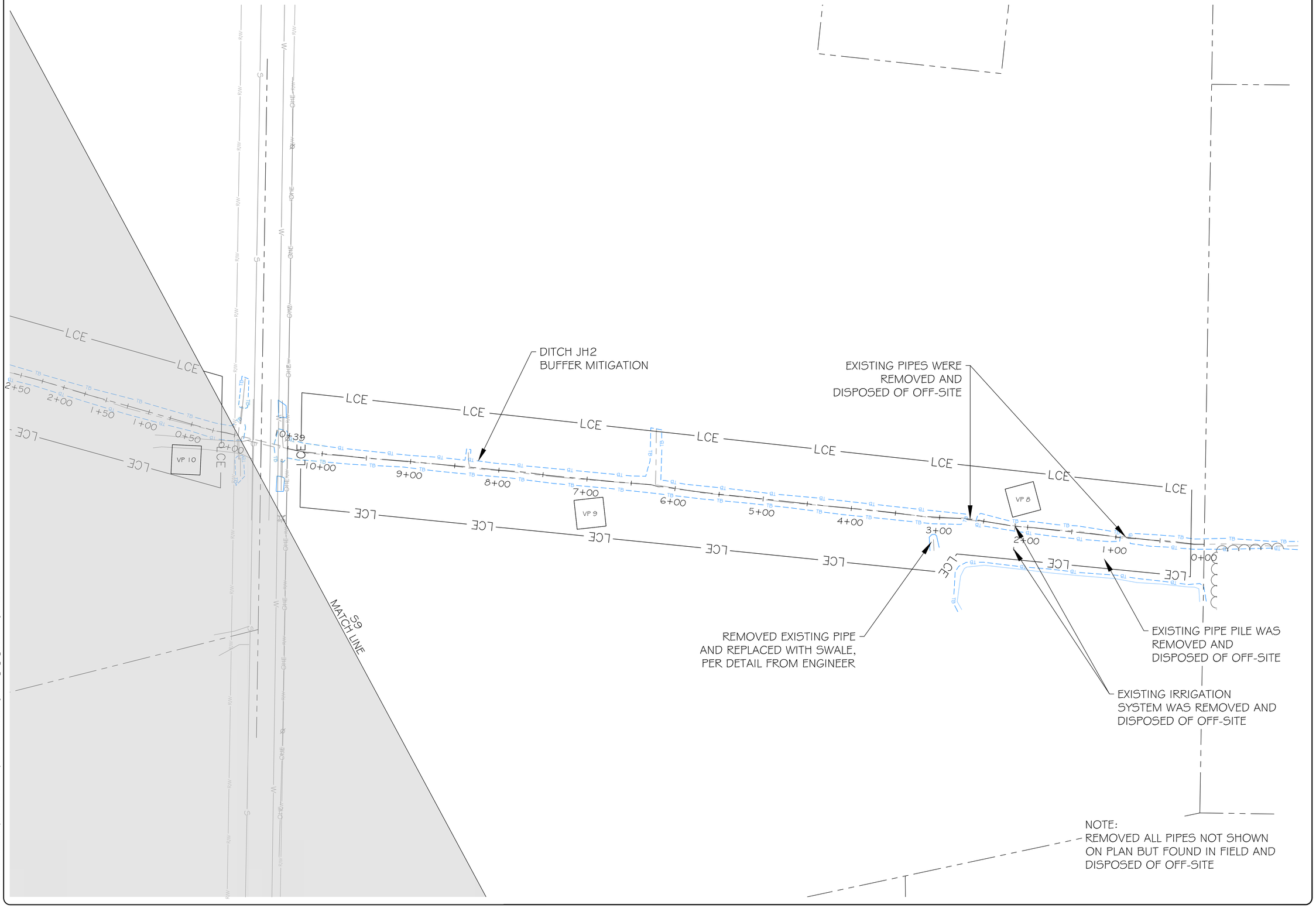
DRAWING TITLE: REACH JH1

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S7

FILE NAME:R:\Resca\Projects\101038-Strawberry Hill\ABRL\Record Drawings\101038_RD_Design.dwg SAVED BY: Bcarroll



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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL
6/27/22

FULL SCALE: 1"=50

0 50 100
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
6/27/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH JH2

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S8

DITCH JH4
BUFFER MITIGATION

EXISTING PIPE WAS
REMOVED AND
DISPOSED OF OFF-SITE

EXISTING POSTS WERE
REMOVED AND
DISPOSED OF OFF-SITE

DITCH JH3
BUFFER MITIGATION

EXISTING PIPE WAS
REMOVED AND
DISPOSED OF OFF-SITE

EXISTING RIP-RAP WAS
REMOVED AND
DISPOSED OF OFF-SITE

EXISTING ASPHALT WAS
REMOVED AND
DISPOSED OF OFF-SITE

EXISTING BUILDINGS WERE DEMOLISHED
AND REMOVED DEBRIS FROM THE
CONSERVATION EASEMENT.

REACH JH5
BUFFER MITIGATION

EXISTING CONCRETE
WAS REMOVED AND
DISPOSED OF OFF-SITE
REPLACED WITH CLASS I
RIP-RAP TO MIN. 1.5'
DEPTH

MATCH LINE
S8

VP 10
VP 11
VP 12
VP 13

NOTE:
REMOVED ALL PIPES NOT SHOWN
ON PLAN BUT FOUND IN FIELD AND
DISPOSED OF OFF-SITE

FILE NAME:R:\Res\ad\Projects\101038-Strawberry Hill\ABRL\Record Drawings\101038_RD_S8_S9 Sheets.dwg SAVED BY: Bcarroll

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SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL
6/27/22

FULL SCALE: 1"=50

0 50 100
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
6/27/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

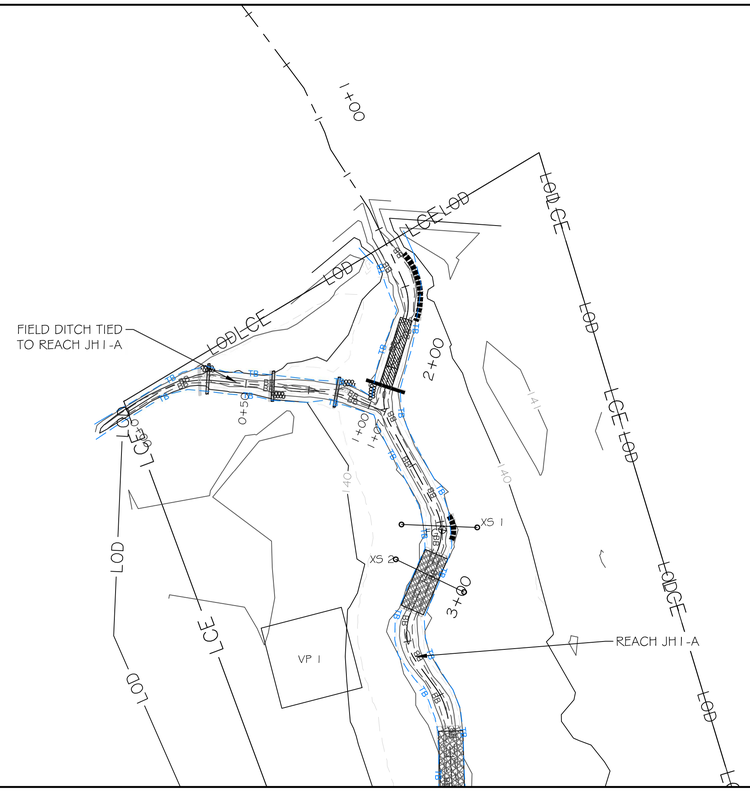
PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
REACH JH3-5

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

S9



SCALE: HOR 1"=30'; VERT 1"=3'

LEGEND

PROPOSED CONTOUR MAJOR	— 50 —
PROPOSED CONTOUR MINOR	— 46 —
CONTOUR MAJOR	— 50 —
CONTOUR MINOR	— 46 —
WETLAND	▨
TOP OF BANK	— — — TB —
BOTTOM OF BANK	— — — BB —
PROPERTY LINE	— — —
LIMITS OF CONSERVATION EASEMENT	— LCE —
PERMITTED LIMITS OF DISTURBANCE	— LOD —
PROPOSED BRUSH TOE PROTECTION	
PROPOSED HAY BALE TOE PROTECTION	
PROPOSED LOG STRUCTURE	
PROPOSED BRUSH BED SILL	
PROPOSED ROCK WOOD RIFFLE	▨
BRUSH TOE PROTECTION	
HAY BALE TOE PROTECTION	
LOG SILL STRUCTURE	
BRUSH BED SILL	
ROCK WOOD RIFFLE	▨
STAGE RECORDER	◎
FLOW GAUGE	⊗
MONITORING CROSS SECTION	●—●
VEGETATION MONITORING PLOT	VP#

NOTE: ALL SIGNIFICANT CHANGES FROM THE DESIGN ARE SHOWN IN RED

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SEAL
042580
6/29/22
BENTON R. CARROLL

FULL SCALE: 1"=30
0 30 60
2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
6/27/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
DITCH TIE

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:
S10

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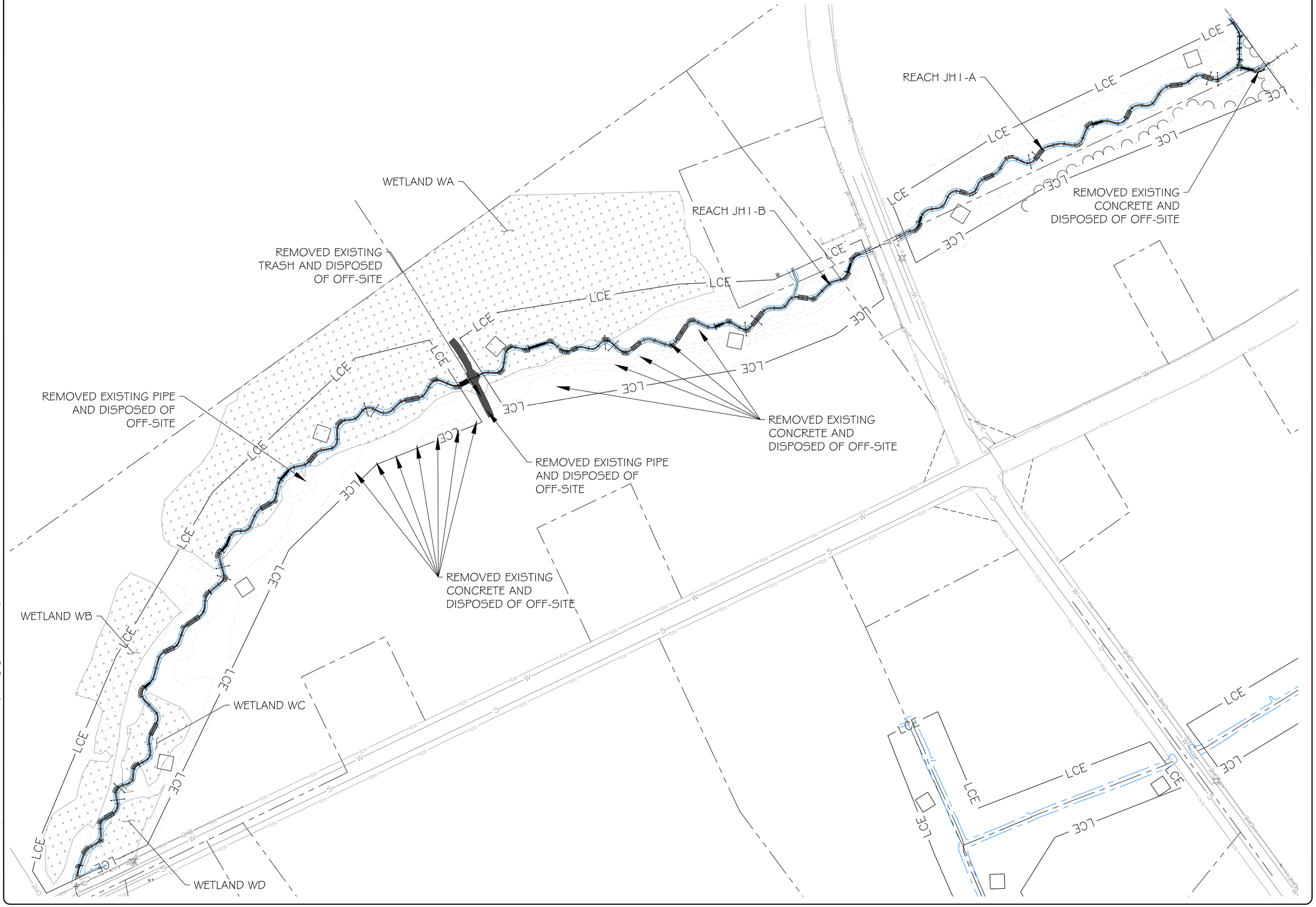

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENJAMIN R. CARROLL
6/27/22

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
6/27/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
MAINTENANCE COMPLETED

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

M1

DITCH JH4

REACH JH5

DITCH JH3

REMOVED EXISTING PIPE AND DISPOSED OF OFF-SITE

EXISTING PIPE WAS REMOVED AND DISPOSED OF OFF-SITE

EXISTING POSTS WERE REMOVED AND DISPOSED OF OFF-SITE

EXISTING RIP-RAP WAS REMOVED AND DISPOSED OF OFF-SITE

REMOVED EXISTING ASPHALT PILE AND DISPOSED OF OFF-SITE

DEMOLISHED EXISTING BUILDINGS AND REMOVED DEBRIS FROM WITHIN EASEMENT

EXISTING CONCRETE WAS REMOVED AND DISPOSED OF OFF-SITE REPLACED WITH CLASS I RIP-RAP TO 1.5' DEPTH

REMOVED EXISTING PIPE AND DISPOSED OF OFF-SITE

DITCH JH2

REMOVED EXISTING PIPE AND REPLACED WITH SWALE, PER DETAIL FROM ENGINEER

REMOVED EXISTING PIPE AND DISPOSED OF OFF-SITE

REMOVED EXISTING PIPE PILE AND DISPOSED OF OFF-SITE

REMOVED EXISTING IRRIGATION SYSTEM AND DISPOSED OF OFF-SITE

NOTE:
REMOVED ALL PIPES NOT SHOWN ON PLAN BUT FOUND IN FIELD AND DISPOSED OF OFF-SITE

FILE NAME:R:\Resca\Projects\101038-Strawberry Hill\ABRL\Record Drawings\101038_RD_Maintenance Sheets.dwg SAVED BY: Bcarroll

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License: F-1428

SEAL

NORTH CAROLINA PROFESSIONAL SEAL 042580 ENGINEER BENTON R. CARROLL
6/27/22

FULL SCALE: 1"=100

0 100 200

2" = FULL SCALE
1" = HALF SCALE

PLOT DATE:
6/27/2022

REVISIONS:

RELEASED FOR:
RECORD DRAWINGS

PROJECT NAME:
STRAWBERRY HILL MITIGATION PROJECT
JOHNSTON COUNTY, NORTH CAROLINA

DRAWING TITLE:
MAINTENANCE COMPLETED

PROJECT NUMBER:	101038
PROJECT MANAGER:	JRM
DESIGNED:	BRC
DRAWN:	BSH
CHECKED:	TRS

SHEET NUMBER:

M2