ANNUAL REPORT FOR 2025

Beane Wetland Mitigation Site
New Hanover County
TIP No. R-3300
COE Action ID: SAW 2007-01386
DWR Project #: 20161268 v. 5

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SUMMARY

The following report summarizes the wetland monitoring activities conducted during 2025 at the Beane wetland mitigation site (Site). The 312.9-ac Site is located off Sidbury Road (State Road 1572 / 1336), approximately 1.6 miles north of Scotts Hill (Figure 1). The Site was designed and constructed during 2022 by the North Carolina Department of Transportation (NCDOT) to provide mitigation for wetland impacts associated with the construction of Transportation Improvement Program (TIP) number R-3300 (Hampstead Bypass). This report provides the monitoring results for the third formal year of monitoring (Year 2025). The site must demonstrate hydrologic and vegetative monitoring success for a minimum of seven years or until the site is deemed successful.

The Site's hydrology is monitored with forty groundwater gauges. Thirty gauges are in restoration areas, six in enhancement areas, and four in preservation areas. Current groundwater gauges were installed in August 2023, replacing the defective Bluetooth gauges that were originally installed in March 2023. Due to this issue, only 4 of the 40 groundwater gauges met the optimum jurisdictional criteria for wetland hydrology (≥12.0% of the growing season) during Monitoring Year 1. During Monitoring Year 2, 25 of 40 groundwater gauges met the optimum jurisdictional criteria for wetland hydrology (≥12.0% of the growing season) in a below average rainfall year during the 2024 monitoring season. Monitoring Year 3 resulted in 12 of 40 groundwater gauges meeting the optimum jurisdictional criteria for wetland hydrology in an average rainfall year according to the 30th and 70th percentile rainfall based on 30-years of data spanning 2024 – 1994. However, most of the rainfall occurred during the warmest portion of 2025 monitoring season (May – August).

Sixty-four vegetation plots were established to monitor the planted vegetation area, which totaled 167.4 acres. The 2025 vegetation monitoring revealed an average density of 515 trees per acre across the Site. Little mortality occurred within the vegetation plots following an initial planting density of 680 stems per acre, a Year 1 average density of 582 trees per acre, a Year 2 average density of 535 trees per acre, and a Year 3 average density of 515 trees per acre. The site is currently meeting the Year 3 success criteria of 320 trees per acre in 63 of 64 vegetation plots.

Twenty permanent photo point locations were established across the Site and drone footage was also taken to document site conditions.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the wetland monitoring activities that have occurred during 2025 at the Site. The Site was constructed to provide 79.1 acres of non-riparian wetland restoration, 78.5 acres of non-riparian wetland enhancement, and 31.5 acres of non-riparian wetland preservation. These credits will be used to offset impacts associated with the R-3300 project.

1.2 Purpose

To demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of seven years or until success criteria are satisfied. Success criteria are based on federal guidelines for wetland mitigation. Criteria for hydrologic conditions and vegetation survival are included in these documents. The following report details the results of hydrologic and vegetation monitoring during the 2025 growing season at the Site.

1.3 Project History

March 11, 2023	Site Reforestation Completed
March 30, 2023	Original Gauge Installation (Year 1)
March 30 – August 17, 2023	Original Site Hydrology Monitoring (Year 1)
August 17, 2023	New Gauge Installation (Year 1)
August 17 – December 2, 2023	New Site Hydrology Monitoring (Year 1)
October 2023	Site Vegetation Monitoring (Year 1)
December 2023	Gauge Maintenance (Year 1)
February – December 2024	Site Hydrology Monitoring (Year 2)
September – October 2024	Site Vegetation Monitoring (Year 2)
February – December 2025	Site Hydrology Monitoring (Year 3)
September 2025	Site Vegetation Monitoring (Year 3)
Dec. 2025 – February 2026	Gauge Maintenance (Year 3)

1.4 Debit Ledger

The Site was used to compensate for unavoidable wetland impacts for the R-3300 project.

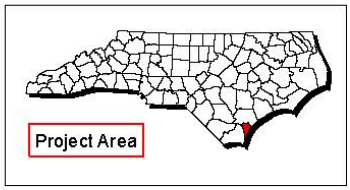

Figure 1

Project Vicinity

Beane Property

New Hanover County, North Carolina

North Carolina
Department of Transportation

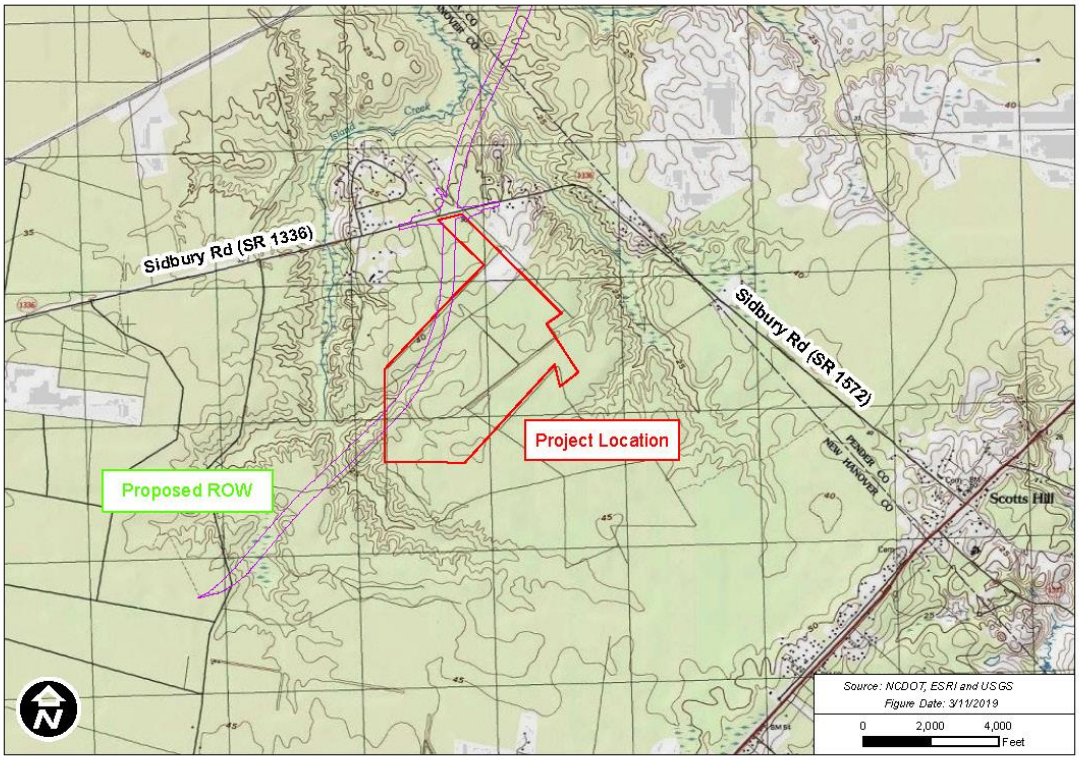

Figure 1. Site Location Map

2.0 HYDROLOGY

2.1 Success Criteria

In accordance with the mitigation plan and permit for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) consecutively by surface or ground water for at least 12.0% of the growing season. Hydrologic monitoring shall persist for a total of seven years with monitoring reports submitted annually.

The growing season in New Hanover County begins February 28 and ends December 2. These dates correspond to a 50% probability that temperatures will remain above 28° F or higher after February 28 and before December 2. The growing season is 277 days; therefore, hydrology for 12.0% of the growing season is at least 33 consecutive days. Local climate must represent average conditions for the area for the hydrologic data to be valid.

2.2 General Hydrologic Gauge Description

Forty groundwater monitoring gauges (U20-001-04 stainless steel water level loggers) are used to record hydrologic data at the Site (Figure 2). The groundwater gauges are set to record water levels at 4-hour intervals, for a total of 6 samplings per day. The hydrologic response (groundwater) to rainfall events is evaluated using an on-site rain gauge and data provided by the North Carolina State Climate Office.

Appendix A contains a plot of the water depth for each of the new groundwater monitoring gauges for February 28, 2024 – December 2, 2024. Precipitation events, from the on-site rain gauge and data provided by the State Climate Office, are included on each groundwater graph as blue lines.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The total number of consecutive days that the groundwater was within twelve inches of the surface was determined for each groundwater monitoring gauge. This number was converted into a percentage of the growing season. Table 1 presents the hydrologic results for 2025. Appendix A contains the gauge reports for the 2025 hydrologic monitoring period.

During the monitoring year gauge R09 had its sensor break off from the wire it is suspended from inside the well housing during data download. The sensor was at the bottom of the well housing approximately one inch from its normal elevation below ground from 3/13/2025 – 4/10/2025. During this period the groundwater level results would be approximately one inch higher than the actual groundwater level due to the difference in position of the sensor.

Additionally, six PVC housings were found to have been damaged, presumably by wildlife, on three different site visits. Damage to gauge R21 was discovered on

9/25/2025 during photo point data collection. The R21 gauge was replaced on 11/6/2025 approximately two feet from the original location. New measurements related to sensor elevation and housing dimensions were recorded and are reflected in the gauge data to ensure comparable data throughout the monitoring year. Damage to gauges E04, R04, R25, and R27 was discovered on 11/6/2025. Based on sensor data, gauge E04 was damaged, and the sensor pulled out of the housing to the surface on 9/21/2025. Damage to E04 also caused data issues with sensor water level readings leading to erroneous depth values. Data for E04 has been omitted for the period of 9/21/2025 –12/2/2025. Gauge R25 is estimated to have been damaged on 9/17/2025 based on sensor data. It was not possible to determine the date when gauges R04 and R27 were damaged. Gauges E04, R04, R25, and R27 were all replaced in their original locations on 11/18/2025 and installation depth remained the same so there was no change in sensor elevation providing comparable data throughout the monitoring year. However, the above ground PVC housings for these four gauges were shortened to approximately 1.5-ft to minimize future damage from wildlife. R30 was also noted to be damaged on 12/4/25. R30 will be repaired in late December 2025. For all damaged gauges, except E04 gauge data recorded after damage would underestimate groundwater elevation by 1-2 in. and can therefore still provide usable data for the post-damage period during the monitoring year.

Only gauge R04 had already met the optimum jurisdictional criteria for wetland hydrology (≥12.0% of the growing season) prior to the damage occurring.

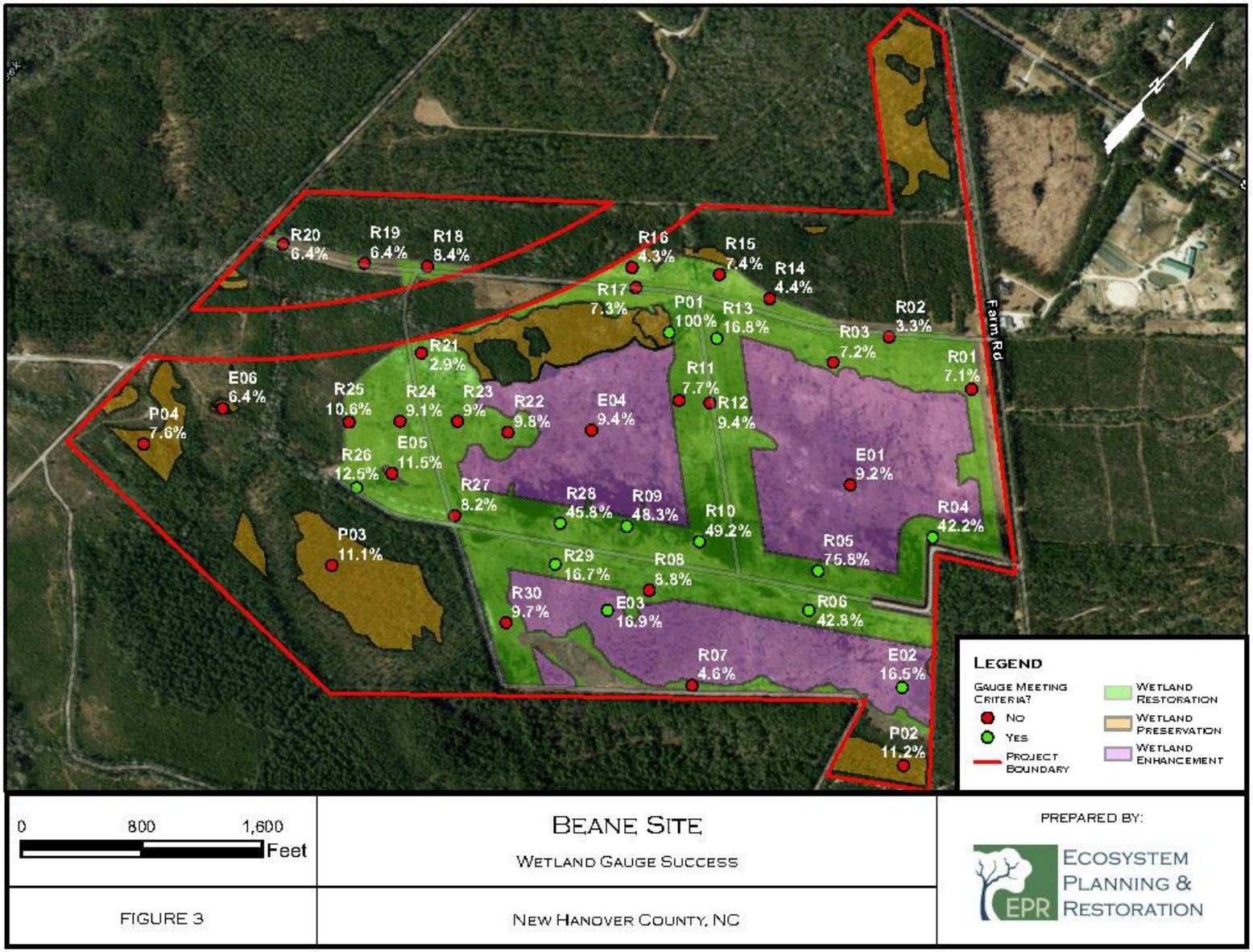

Figure 2. Site Wetland Gauge Success Map

Table 1. 2025 Hydrologic Monitoring Results

Monitoring Gauge *	< 5.0%	5.0 – 11.9%	≥ 12.0%	Actual %	Dates of Success
E01		X		9.2	July 31 – Aug. 25
E02			X	16.5	Feb. 28 – Apr. 15
E03			X	16.9	Feb. 28 – Apr. 16
E04		X		9.4	Feb. 28 – Mar. 26
E05		X		11.5	July 27 – Aug. 28
E06		X		6.4	Aug. 7 – Aug. 24
P01			X	100.0	Feb. 28 – Dec. 2
P02		X		11.2	Aug. 7 – Sept. 26
P03		X		11.1	Mar. 5 – Apr. 5
P04		X		7.6	Aug. 7 – Aug. 28
R01		X		7.1	Mar. 5 – Mar. 25
R02	X			3.3	Aug. 11 – Aug. 20
R03		X		7.2	Mar. 5 – Mar. 25
R04			X	42.2	May 11 – Sept. 9
R05			X	75.8	Feb. 28 – Sept. 26
R06			X	42.8	May 11 – Sept. 26
R07	X			4.6	Aug. 7 – Aug. 19
R08		X		8.8	Aug. 1 – Aug. 25
R09			X	48.3	May 11 – Sept. 22
R10			X	49.2	Mar. 11 – Sept. 11
R11		X		7.7	Mar. 4 – Mar. 26
R12		X		9.4	Feb. 28 – Mar. 27
R13			X	16.8	Feb. 28 – Apr. 16
R14	X			4.4	Aug. 10 – Aug. 22
R15		X		7.4	Aug. 7 – Aug. 27
R16	X			4.3	Aug. 7 – Aug. 18

Table 1. 2025 Hydrologic Monitoring Results (continued)

Monitoring Gauge *	< 5.0%	5.0 – 11.9%	≥ 12.0%	Actual %	Dates of Success
R17		X		7.3	Mar. 5 – Aug. 25
R18		X		8.4	Aug. 7 – Aug. 30
R19		X		6.4	Aug. 7 – Aug. 24
R20		X		6.4	Aug. 7 – Aug. 24
R21	X			2.9	Aug. 10 – Aug. 18
R22		X		9.8	July 30 – Aug. 26
R23		X		9.0	July 30 – Aug. 24
R24		X		9.1	July 31 – Aug. 25
R25		X		10.6	July 26 – Aug. 25
R26			X	12.5	July 26 – Aug. 30
R27		X		8.2	Aug. 8 – Aug. 29
R28			X	45.8	May 11 – Sept. 14
R29			X	16.7	Feb. 28 – Apr. 16
R30		X		9.7	Feb. 28 – Mar. 27

*E=Enhancement, R=Restoration, and P=Preservation (e.g., E01=Gauge 1 in Wetland Enhancement).
*Appendix A contains plots of groundwater data during 2025.

2.3.2 Climatic Data

Figure 3 is a comparison of monthly rainfall for the period of January 2025 through November 2025 to historical precipitation (collected between 1994 and 2024) for Wilmington International Airport in New Hanover County. This comparison gives an indication of how 2025 relates to historical data in terms of climate conditions. Data was gathered from the Applied Climate Information System (ACIS) maintained by the NOAA Regional Climate Centers (RCC).

For the year 2025, March, April, June, and October experienced average rainfall. January, February, September, and November recorded below average rainfall while May, July, and August recorded above average rainfall. Overall, 2025 (January - November) experienced an average rainfall year.

Results from the Antecedent Precipitation Tool (APT) also confirmed the climatic conditions that occurred in 2025 (USACE, 2023). However, the APT output also showed that the Site experienced drought conditions throughout the entire growing season and during the period leading up to the 2025 growing season. Additionally,

most of the rainfall at the Site occurred during the warmest portion of 2025 monitoring season (May – August) when evapotranspiration is generally highest (Figure 4). APT output data for the Site is included in Appendix A.

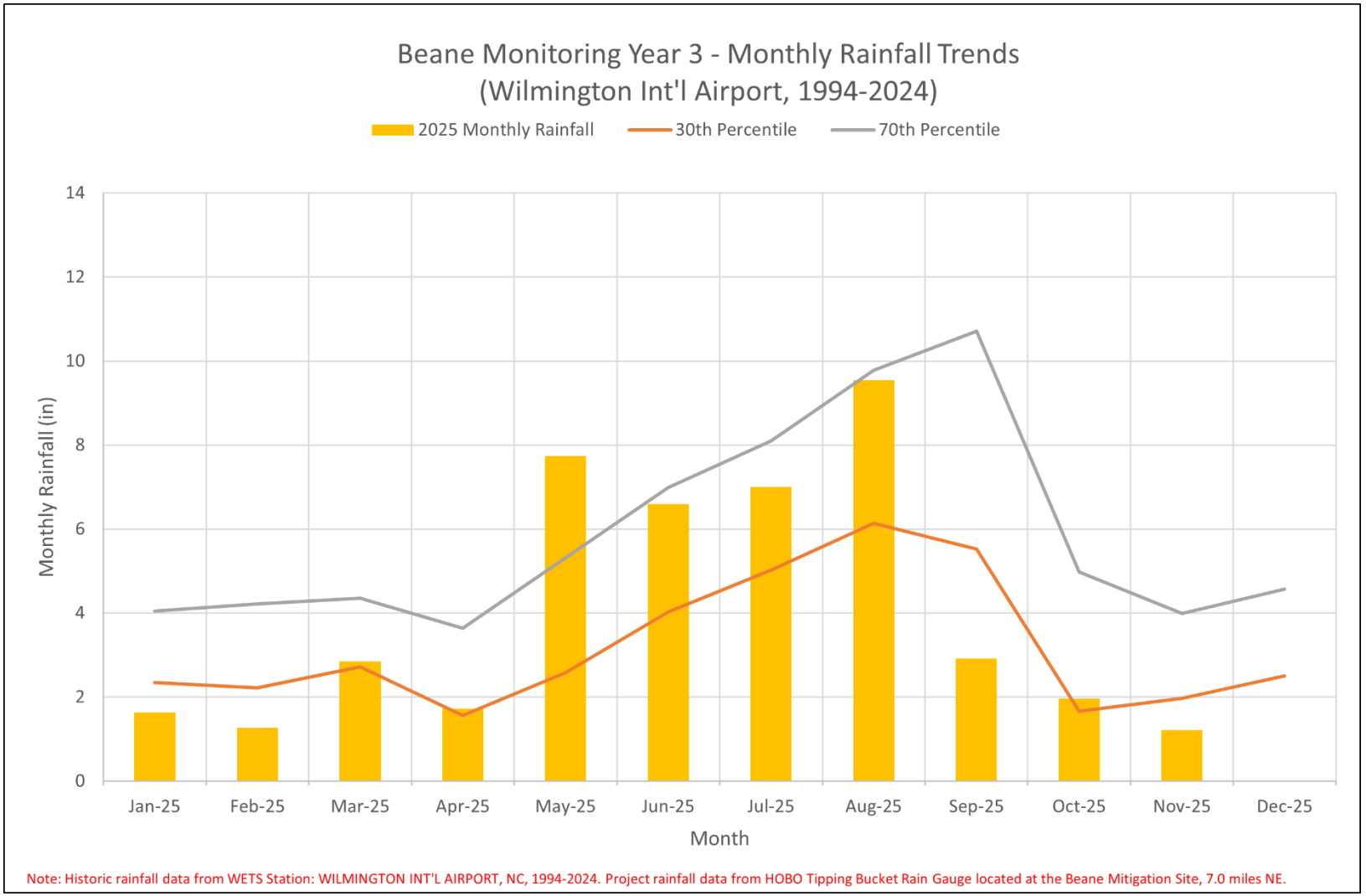

Figure 3. 30-70 Percentile Rainfall Graph 2025

2.4 Conclusions

2025 represents the third year that hydrologic data has been collected at the Site. Twelve of the forty groundwater gauges met the optimum jurisdictional criteria for wetland hydrology (≥12.0% of the growing season) in an average rainfall year during the 2025 monitoring season.

3.0 VEGETATION: YEAR 3 MONITORING

3.1 Success Criteria

For the forested wetland restoration and enhancement portions of the Site, the permittee shall plant 680 stems per acre. Vegetation success shall be measured by survivability and height criteria over a 7-year monitoring period.

- Survivability will be based on 320 stems/acre after Year 3, 260 stems/acre after Year 5, and 210 stems/acre are Year 7.
- Planted trees must average 7 feet in height after Year 5 and 10 feet after Year 7.
- Only planted stems shall count toward the success criteria described above.
- Volunteer species within the plot from the planting list in the approved Mitigation Plan shall be noted.
- All volunteer stems shall be documented separately and not combined with the planted stems.
- No single volunteer species shall comprise more than 50% of the total composition of a plot at each monitoring year event.
- During Year 3 and Year 5, no single volunteer species, comprising over 50% of the total composition, may be more than twice the height of the planted trees.

A survey of the vegetation during the growing season shall be conducted annually over the seven-year monitoring period and submitted to USACE. If the surviving vegetation densities are below the required thresholds after the seven-year monitoring period, the site may still be declared successful at the discretion of, and with written approval from, USACE.

3.2 Planted Tree Species

Tree species were planted within four different planting zones. Planting zones 1 – 3 are based on the plant communities described by Schafale (2012). Planting zone 4 includes the areas along roads and includes both upland and wetland species. The planting zones are listed below:

- Zone 1 – Non-Riverine Wet Hardwood (Oak Flat Subtype) / Non-Riverine Swamp Forest (Cypress-Gum Subtype)
- Zone 2 – Coastal Plain Depression Swamp (Mixed Subtype)

- Zone 3 – Blackwater Bottomland Hardwoods
- Zone 4 – Plantings Along Roads (Upland Areas)

Table 2. Tree Species and Planting Zones

Scientific Name	Common Name	Planting Zone (s)
Chamaecyparis thyoides	Atlantic White Cedar	2
Cyrilla racemiflora	Titi	3, 4
Magnolia virginiana	Sweet Bay	1, 3, 4
Nyssa aquatica	Water Tupelo	1, 2, 3
Nyssa biflora	Swamp Blackgum	1, 2
Quercus lyrata	Overcup Oak	1, 3
Quercus michauxii	Swamp Chestnut Oak	1, 3
Quercus nigra	Water Oak	1, 4
Quercus phellos	Willow Oak	1, 3, 4
Taxodium ascendens	Pond Cypress	2
Taxodium distichum	Bald Cypress	1, 2, 3

3.3 Results of Vegetation Monitoring

3.3.1 Site Data

Sixty-four vegetation plots were established randomly across the site (Figure 2). All the vegetation plot dimensions were 50-ft x 50-ft (0.057392 acres), except for VP64. VP64 is located along an old access road and its dimensions (approx. 10.5-ft x 84-ft; 0.020248 acres) were recorded.

Planted stems were identified by flags installed in the previous monitoring year. New flags were established during the current monitoring year to note the presence of a living tree species. Each living tree was identified at species level (updated if necessary), and the height of each living tree was measured to the nearest tenth of a foot. The stems per acre for each vegetation plot were calculated based on the number of stems identified and the size of the vegetation plot. The site is currently meeting the Year 3 success criteria of 320 trees per acre in 63 of 64 vegetation plots (Figure 5).

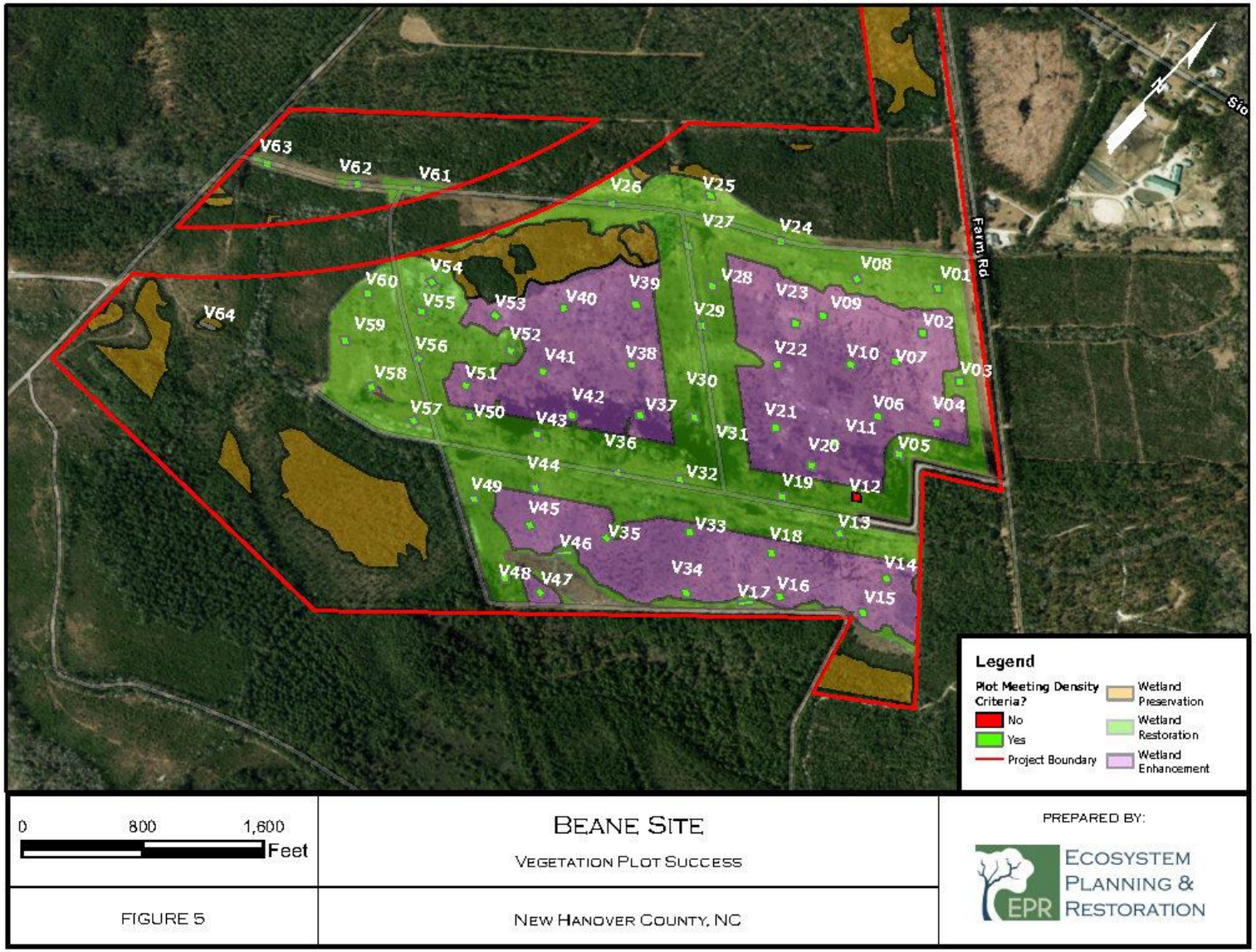

Figure 4. Site Vegetation Plot Success Map

Table 3 shows the stems per acre by vegetation plot and the overall plot average. Table 4 shows the average height for each vegetation plot and the overall plot average. Detailed vegetation data and graphs are included in Appendix B. Photos of each vegetation plot are included in Appendix C.

Table 3. Site Vegetation Monitoring Plot Data (Stems Per Acre)

Plot #	Stems/ Acre
1*	470
2*	488
3*	488
4*	401
5	331
6*	348
7*	488
8	505
9	558
10	436
11	436
12	296
13	383
14	592
15*	592
16	697

Plot #	Stems/ Acre
17*	697
18	627
19	366
20*	348
21	401
22	558
23	488
24*	540
25	401
26*	627
27**	505
28*	488
29*	523
30	627
31*	436
32	819

Plot #	Stems/ Acre
33	558
34	662
35	505
36	680
37	505
38*	523
39*	627
40	453
41	401
42	575
43	488
44*	627
45*	453
46	540
47*	348
48*	505

Plot #	Stems/ Acre
49*	540
50	488
51*	558
52	505
53*	418
54*	488
55*	540
56	523
57*	610
58	488
59*	645
60**	540
61*	523
62*	418
63*	540
64	741
Plot Avg.	**515**

* More than 50% of total plot composition comprised of single volunteer species (loblolly pine).
** More than 50% of total plot composition comprised of single volunteer species (loblolly pine and red bay).

Table 4. Site Vegetation Monitoring Plot Data (Tree Height)

Plot #	Average Height (ft)
1	1.3
2	2.0
3	2.1
4	1.6
5	3.0
6	1.5
7	1.5
8	1.2
9	1.8
10	1.7
11	1.5
12	2.4
13	1.5
14	1.9
15	1.3
16	1.6

Plot #	Average Height (ft)
17	1.4
18	1.5
19	2.5
20	3.6
21	2.3
22	1.4
23	3.3
24*	1.2
25	1.3
26	1.5
27	1.7
28	1.5
29	2.2
30	4.5
31	1.8
32	1.8

Plot #	Average Height (ft)
33	1.5
34	1.2
35	1.4
36	1.7
37	2.7
38	1.9
39	1.6
40	1.1
41	1.3
42	3.7
43	3.1
44	1.9
45	1.9
46	1.4
47*	2.7
48	3.2

Plot #	Average Height (ft)
49	1.8
50	3.8
51	2.2
52	1.0
53	1.4
54	1.5
55	1.6
56	1.5
57	2.3
58	1.5
59*	1.1
60*	1.4
61*	1.5
62*	1.3
63*	2.3
64	1.6
Plot Avg. (ft)	**1.9**

* Plot reviewed to confirm single volunteer species comprising more than 50% of plot composition does not have average height twice that of planted stem average height.

3.4 Conclusions

Sixty-four vegetation monitoring plots were established throughout the Site. The 2025 vegetation monitoring of the Site revealed an average tree density of 515 stems per acre for Year 3 across all plots with an overall density range of 296 to 819 stems per acre (Table 3). The 2025 vegetation monitoring showed an average tree height of 1.9 ft for Year 3 across all plots (Table 4). Thirty-two of the sixty-four vegetation monitoring plots contained a single volunteer species that comprised more than 50% of the total composition of the plot. Loblolly pine and red bay were the primary volunteer species documented in these plots. In accordance with vegetation plot success criteria mentioned in Section 3.1, several plots with the shortest average planted stem heights were reviewed by measuring all volunteer stems and comparing the resulting average to that of the planted stems. Seven plots with the shortest average planted stem heights were reviewed and none of these plots had a single volunteer species with an average height greater than twice the average height of planted stems. The Site was determined to be currently meeting this specific height success criteria for Year 3. The current stem and height data are on track to meet the success criteria described in Section 3.1. Individual stem count by plot and species can be found in Appendix B.

4.0 PHOTOGRAPHIC DOCUMENTATION: YEAR 3 MONITORING

4.1 Photo Points

Twenty photo point locations, established across the site during Year 1, were collected to document the annual Site conditions (Figure 2). Multiple photos were taken at each photo point location to fully depict the area. These photos are included in Appendix D.

4.2 Drone Footage

Drone footage was collected throughout the hydrologic monitoring period to show the aerial site conditions (standing water, vegetation, etc.). These photographs are included in Appendix E.

5.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

2025 represents the third year that hydrologic data has been collected at the Site. Twelve of the 40 groundwater gauges met the optimum jurisdictional criteria for wetland hydrology (>12.0% of the growing season) in an average rainfall year during the 2025 monitoring season.

There were sixty-four vegetation monitoring plots established throughout the wetland enhancement, preservation, and restoration areas. The 2025 vegetation monitoring revealed an average density of 515 trees per acre for the Site. The average for the Site is above the minimum success criteria of 320 trees per acre for year three.

NCDOT proposes to continue all monitoring activities at the Beane mitigation site in 2026.

6.0 REFERENCES

Schafale, M.P. 2012. Guide to the Natural Communities of North Carolina: Fourth Approximation. North Carolina Natural Heritage Program, Department of Environment and Natural Resources. Raleigh, NC. 208 pp.

USACE (US Army Corps of Engineers). 2023. The Antecedent Precipitation Tool, Version 2.0, June 2023. https://www.epa.gov/wotus/antecedent-precipitation-tool-apt Note: Tool accessed for this report on December 10, 2025.