ANNUAL REPORT FOR 2004

Roanoke Island Mitigation Site
Dare County
Project No. 8.1052501
TIP No. K-4003

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North Carolina Department of Transportation
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SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Roanoke Island Mitigation Site. The site was constructed to serve as mitigation for the Roanoke Island Visitor Center/ Rest Area; approximately 1.77 acres of impacts are mitigated for onsite and the remaining 1.36 acres of preservation were debited from the Mashoes Road Mitigation Site. The Roanoke Island Site was constructed in 2002 and this report details the third year of hydrology monitoring and first year of vegetation monitoring following construction.

Data from the third year of hydrologic monitoring indicates that nine of the eleven monitoring gauges are meeting jurisdictional success by showing saturation within 12 inches of the surface for at least 12.5% of the growing season. Four gauges in the constructed areas on the south tract are within 20% of the saturation period for three of the four respective reference gauges (The saturation period is longer in the constructed zone than at one of the four reference area gauges, which only met for 10.1% of the growing season). The two gauges located in the north tract were not within 20% of the saturation period for the reference gauge in that area. Gauge RIST-7 (ref) is at an elevation 10" higher than RIST-8. Graph RIST-7 (ref) shows that this gauge meets hydrology 100% of the growing season if this difference in elevation is adjusted. NCDOT recommends moving RIST-7 (ref) to a more suitable reference elevation.

Due to low tree density during the 2003-monitoring year, the site was replanted in February 2004. Vegetation monitoring yielded an average tree density of 238 trees per acre for year 1, which is below the 320 trees per acre minimum requirement. The site did not meet vegetation criteria for the 2004-year. NCDOT will replant the site in 2005 with containerized material, if available, in an attempt to increase survival rates.

NCDOT will continue to monitor vegetation and hydrology at the Roanoke Island Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Roanoke Island Site serves as onsite mitigation for the Roanoke Island Visitor Center/Rest Area, located adjacent to the new US 64-264 Manteo Bypass. The site is divided into two tracts; the "south" tract is on the same property as the Visitor Center and the "north" tract is located approximately 600 feet north of the Visitor Center (Figure 1). The mitigation is associated with Project 8.1052501, TIP Numbers K-4003 and R-2551.

The site is designed to provide 0.11 acres of restoration (1:1) and 1.66 acres of creation (1:1) of Estuarine Fringe wetlands. The site also includes 1.29 acres (5:1) of estuarine preservation. In addition, approximately 1,004 feet of riparian buffer was planted with the same vegetation mix as that used in the wetland zones. The width of the buffer zone varies between 9 and 65 feet based on NCDOT property limits. The construction plan for the wetland sites involved grading the former borrow pit areas to meet the elevations of adjacent jurisdictional wetlands.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until success criteria are fulfilled. Success criteria are based on federal guidelines for wetland mitigation and are stipulated in the "Roanoke Island Visitor Center/ Rest Area Mitigation Plan" dated May 2001 (revised July 2001). These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2004 at the Roanoke Island Mitigation Site.

Activities in 2004 reflect the third year of hydrology monitoring and the first year of vegetation monitoring at the mitigation site. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season.

Figure 1. Location Map- Roanoke Island Mitigation Site

1.3 Project History

March 2002	Construction Completed
March 2002	Monitoring Gauges Installed
March 2002	Site Planted
March- November 2002	Hydrologic Monitoring (Year 1)
June 2002	Vegetation Monitoring (Year 1)
March- November 2003	Hydrologic Monitoring (Year 2)
September 2003	Vegetation Monitoring (Year 2)
February 2004	Site Replanted
July 2004	Vegetation Monitoring (1 yr. Restart)
March- November 2004	Hydrologic Monitoring (Year 3)

2.0 HYDROLOGY

2.1 Success Criteria

While a constructed site must typically meet jurisdictional criteria of inundation or saturation within 12 inches of the surface for at least 12.5% of the growing season, NCDOT and consulting agencies agreed that other criteria might be the best indicator of hydrologic success on this particular site. In accordance with the guidelines set forth by the approved mitigation plans, hydrologic success is dictated by the hydrologic condition of the reference wetlands adjacent to the sites. Monitoring gauges are located in both the constructed and reference areas. The site is considered a hydrologic success if the hydrologic frequency, duration and depth are within 20% of its respective reference wetland.

The growing season in Dare County begins March 13 and ends November 25. The dates correspond to a 50% probability that temperatures will drop to 28^{o} F or lower after March 13 and before November 25.[1] The growing season is 258 days; therefore the optimum duration for wetland hydrology is 32 days. While the monitoring gauges record ground/surface water levels throughout the year, special attention is placed on water levels during the 258-day growing season. In addition, local rainfall totals are monitored to ensure that the site is functioning in normal climatic conditions.

[1] Natural Resources Conservation Service, Soil Survey of Dare County, North Carolina, p.69.

2.2 Hydrologic Description

The site was constructed by grading the existing fill material down to meet the elevations of existing reference wetlands. The removed fill material is associated with borrow pit/ spoil basins that were previously onsite. Eleven monitoring gauges were installed on the site in order to monitor the new hydrologic conditions. Three gauges were located on the north tract and eight gauges were located on the south tract. Of these, one gauge is located within the north tract reference wetland, while four gauges are located within reference areas in the south tract. The success of the site is determined by comparing the groundwater levels in the reference areas with those in the constructed zones.

Site rainfall is monitored with a rainfall gauge located onsite. In addition, the recorded data is compared to rainfall data at the Manteo Airport gauge in order to check the accuracy of the measured data. The NC State Climate Office provided the Manteo data. Figures 2 and 3 are monitoring gauge maps of the north and south tracts, respectively.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

Table 1 is a summary of the hydrologic monitoring results for both the north and south tracts.

The mitigation plan states that the hydrologic conditions of the constructed areas must be within 20% of those in the reference areas.

Figures 4 and 5 are representations of the hydrologic monitoring results.

Appendix A contains a plot of the groundwater depth for each monitoring gauge. While success of the site is based on reference wetlands and not the percentage of the growing season that the groundwater is within 12 inches of the surface, the 12-inch line is provided for reference. The number of days the water level was above this line is also provided on each graph. Precipitation events, as recorded by the onsite rain gauge, are included on each graph as bars. A comparison of the rainfall data collected onsite with that recorded at the Manteo Airport gauge revealed that the onsite gauge collected accurate data.

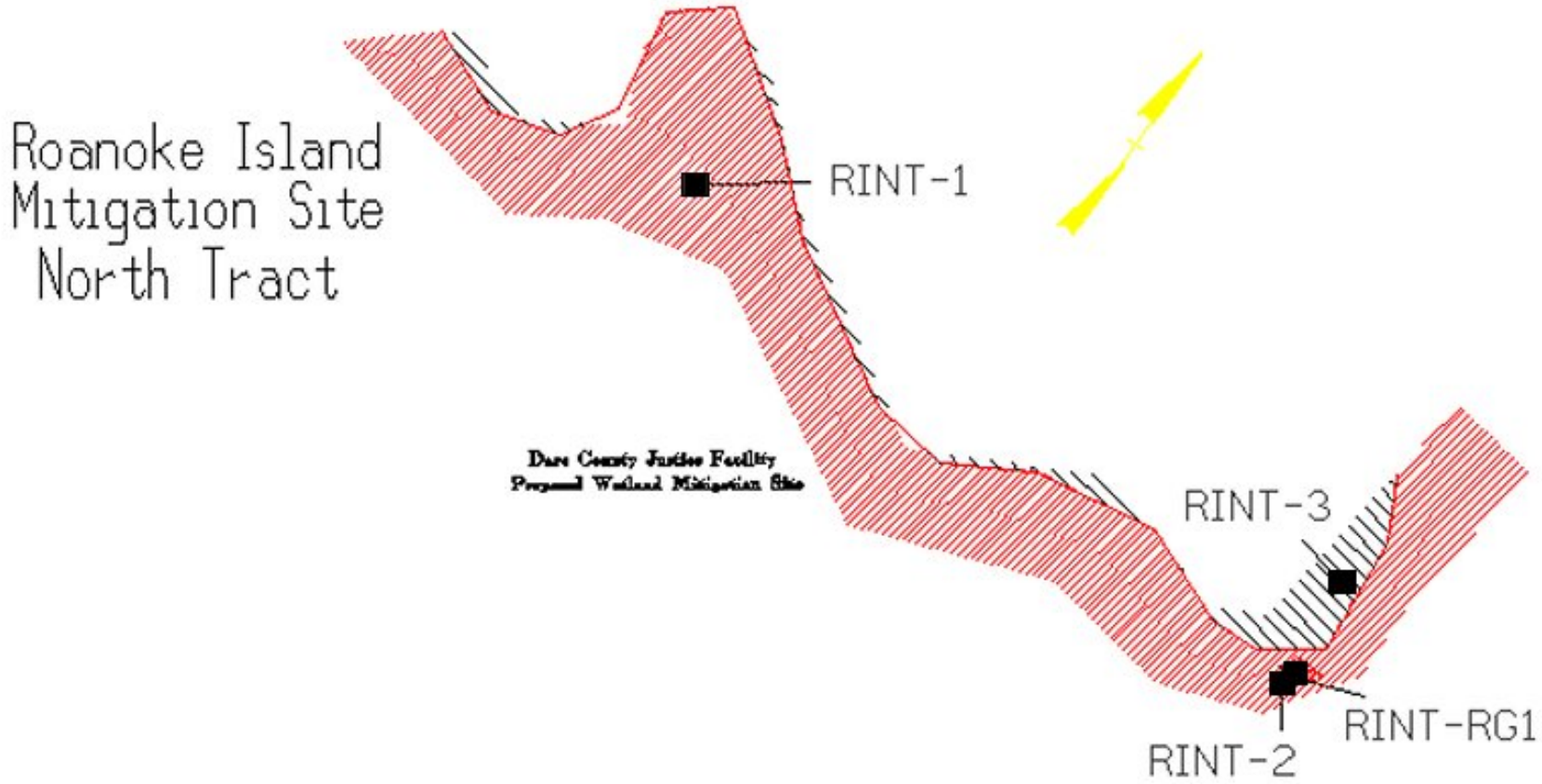


Figure 2. Monitoring Gauge Location Map - North Tract

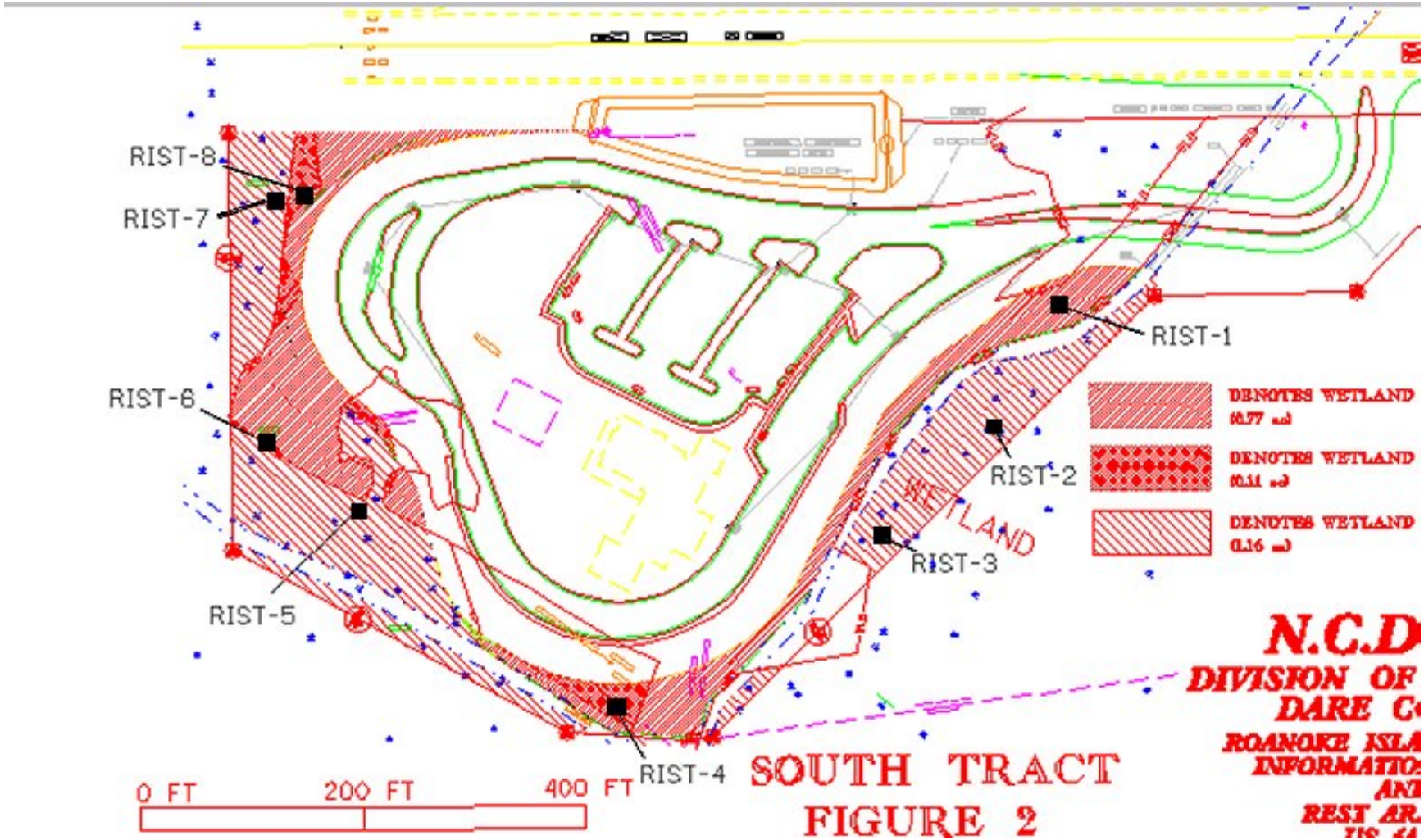


Figure 3. Monitoring Gauge Location Map - South Tract

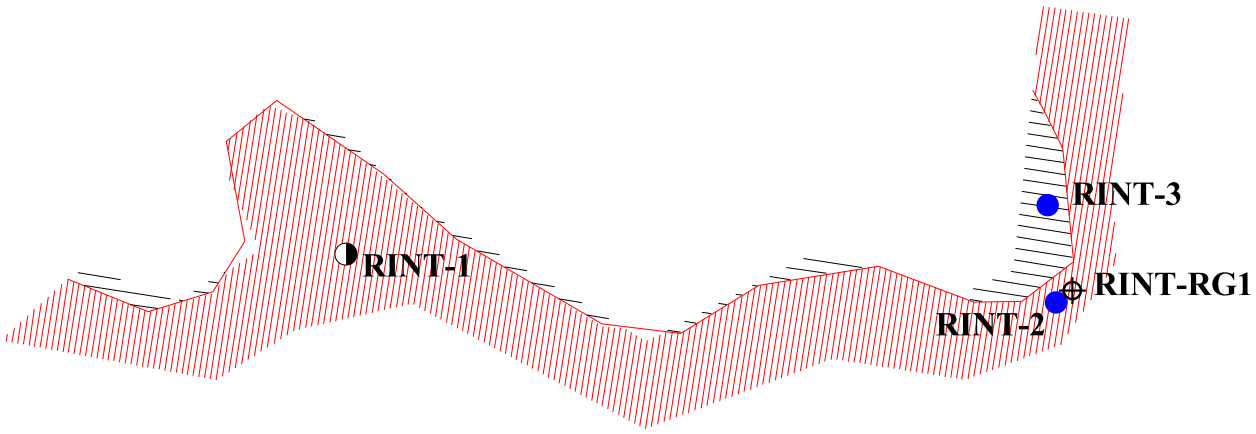
Table 1. 2004 Hydrologic Monitoring Results (March 13 – November 25)

Monitoring Gauge	< 5%	5 - 8%	8 – 12.5%	> 12.5%	Actual Consecutive %	Dates Meeting Success
NORTH TRACT						
RINT-1	✕				0	
RINT-2+				✕	26.7	April 11-May 16 July 22-Aug 28 Sept 18-Nov 25
RINT-3 (ref)+				✕	100	March 13-Nov 25
SOUTH TRACT						
RIST-1+				✕	38.4	March 13-June 3 Aug 19-Nov 25
RIST-2 (ref)+				✕	93	March 31-Nov 25
RIST-3 (ref)+				✕	100	March 13-Nov 25
RIST-4+				✕	67.8	June 4-Nov 25
RIST-5 (ref)+				✕	49.2	March 13-June 3 July 22-Nov 25
RIST-6+				✕	49.2	April 7-June 3 July 22-Nov 25
RIST-7 (ref)			✕		10.1	Oct 14-Nov 8
RIST-8+				✕	100	March 13-Nov 25

Notes: "RINT" denotes gauges on the northern tract.
"RIST" denotes gauges on the southern tract.
"ref" denotes gauges in preservation areas of the site, used as reference wetlands.
+ Gauge met the success criterion during an average rainfall month (February, April, May, July, and September)

Specific Gauge Problems:

- Gauge RINT-1 malfunctioned throughout the entire growing season, therefore there is no data available.
- Gauge RIST-7 (ref) is at an elevation 10" higher than RIST-8. Graph RIST-7 (ref) shows that this gauge meets hydrology for 100% of the growing season if this difference in elevation is adjusted. NCDOT recommends moving RIST-7 (ref) to a more suitable reference elevation.



North Tract

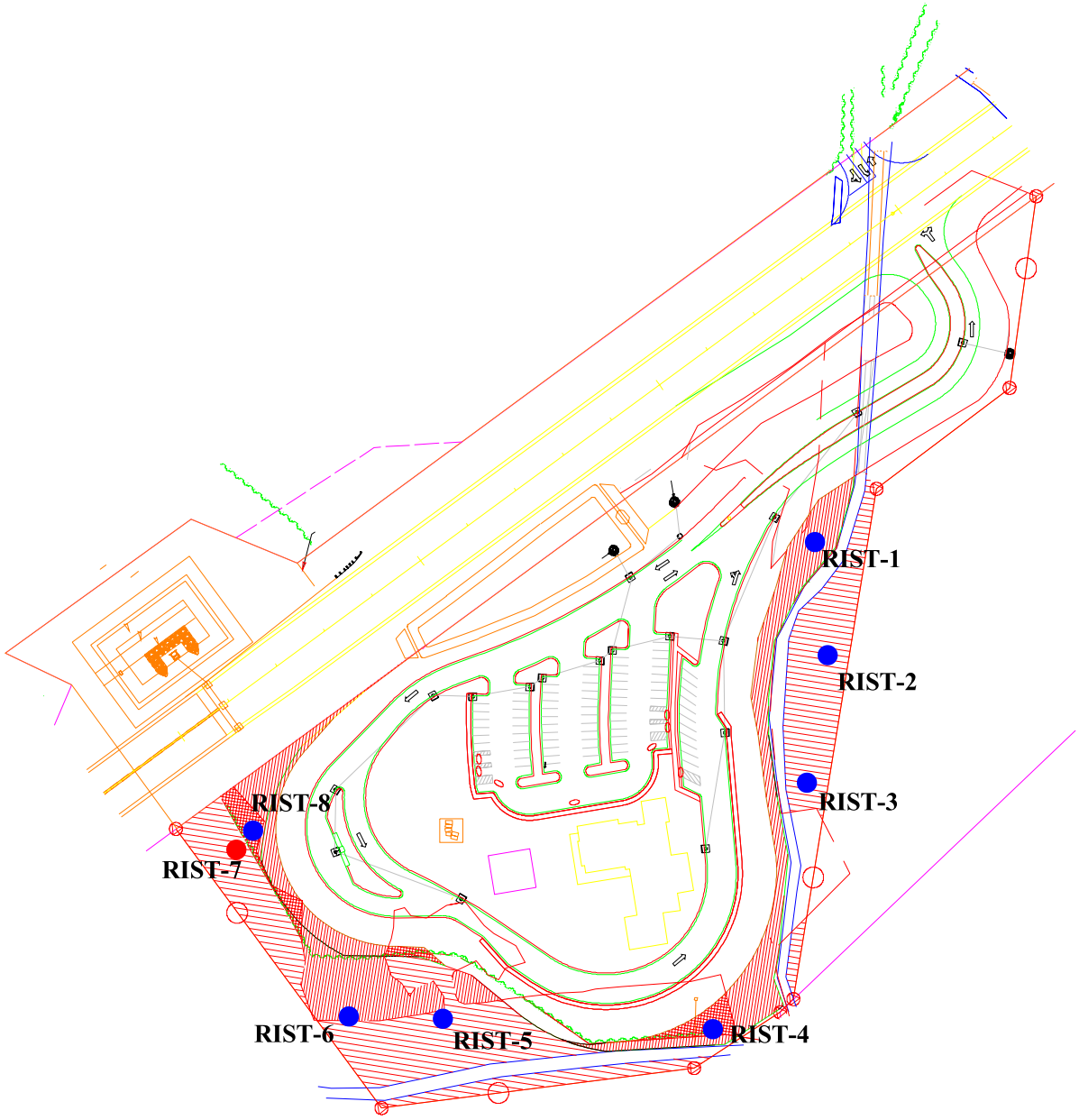
Figure 4. 2004 Hydrologic Monitoring Results

Hydrology Results
- < 5%
- 5 - 8%
- 8 - 12%
- >12.5%

Rain Gauge
N/A

N

40 0 40 Feet



South Tract

Figure 5. 2004 Hydrologic Monitoring Results

Hydrology Results
- < 5%
- 5 - 8%
- 8 - 12%
- >12.5%

Rain Gauge
Surface Gauge

N

40 0 40 Feet

2.3.2 Climatic Data

Figure 6 provides an evaluation of the local climate in comparison with historical data in order to determine whether 2004 was “average” in terms of climate conditions. The two lines represent the 30th and 70th percentiles of monthly precipitation for Manteo, NC. The bars are monthly rainfall totals for 2003 and 2004. The onsite rain gauge at Roanoke Island was used for the 30-70 percentile graph for the months of September-November. The historical data was collected from the State Climate Office of North Carolina.

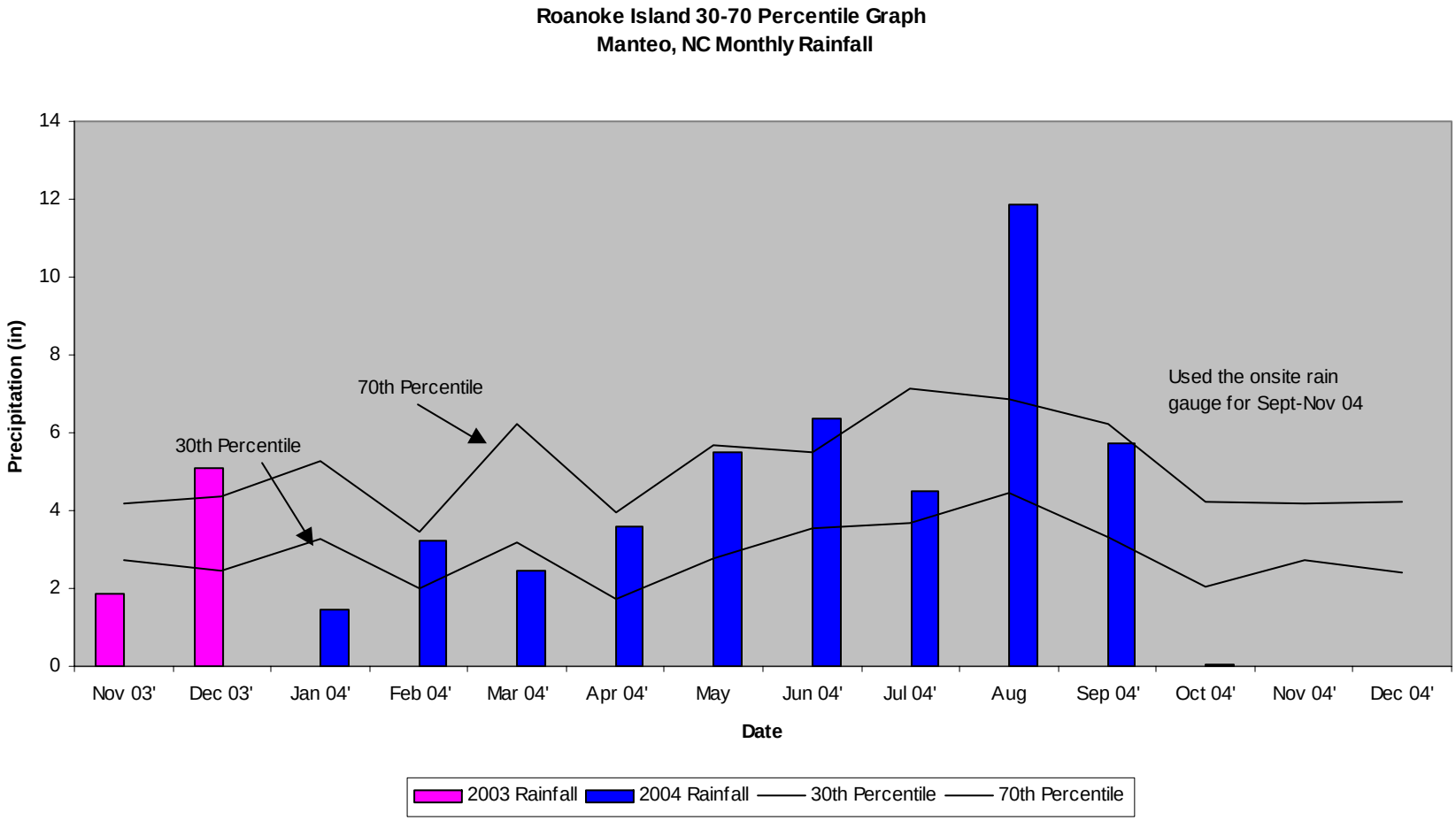
For the 2004-year, November (03’), January, and March experienced below average rainfall. The months of February, April, May, July, and September all recorded average rainfall for the site. December (03’), June, and August experienced above average rainfall. The rainfall data from the onsite rain gauge was used for the months of September-November. Overall, 2004 experienced an average rainfall year.

2.4 Conclusions

The 2004-year represents the third year of hydrologic monitoring and first year (restart) of vegetation monitoring following construction. The hydrologic data indicates that nine of the eleven monitoring gauges are meeting jurisdictional success by showing saturation within 12 inches of the surface for at least 12.5% of the growing season. Four of the gauges in the constructed areas on the south tract are within 20% of the saturation period for three of the four respective reference gauges (The saturation period is longer in the constructed zone than at one of the four reference area gauges, which only met for 10.1% of the growing season). The two gauges located in the north tract were not within 20% of the saturation period for the reference gauge in that area. Gauge RIST-7 (ref) is at an elevation 10” higher than RIST-8. Graph RIST-7 (ref) shows that this gauge meets hydrology for 100% of the growing season if this difference in elevation is adjusted. NCDOT recommends moving RIST-7 (ref) to a more suitable reference elevation.

NCDOT recommends that hydrologic monitoring continue on the Roanoke Island Mitigation Site.

Figure 6. 30-70 Percentile Graph: Manteo, NC



3.0 VEGETATION: ROANOKE ISLAND VISITOR CENTER (RESTART YEAR 1 MONITORING)

3.1 Success Criteria

The success criteria state that there must be a minimum of 320 trees per acre living for at least three consecutive years. A minimum of 290 trees per acre living at year 4 and a minimum of 260 trees per acre living at year 5.

3.2 Description of Species

The following tree species were planted in the Wetland Enhancement Area:

Taxodium distichum, Baldcypress
Myrica cerifera, Wax Myrtle
Persea palustris, Swamp Redbay
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Gordonia lasianthus, Loblolly Bay

3.3 Results of Vegetation Monitoring

Table 2. Vegetative Monitoring Results

Plot #	Baldcypress	Wax Myrtle	Swamp Redbay	Loblolly Bay	Swamp Blackgum	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1	3					3	44	46
2	5	1			18	24	53	308
3	7	12				19	36	359
4	6	1			5	12	34	240
	Average Tree Density							**238**

Site Notes: Other species noted: *Juncus* sp., cattail, water grass, *Scripus* sp., *Pluchea* sp., and *Baccharis halimifolia*.

3.4 Conclusions

Approximately 1.8 acres of this site were planted in the wetland restoration and creation areas in March 2002. The site was replanted in February 2004. The 2004 vegetation monitoring revealed an average density of 238 trees per acre for year 1, which is below the 320 trees per acre minimum requirement.

This site will be replanted in 2005. Containerized material will be used, if available, in an attempt to increase survival rates.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The 2004-year represents the third year of hydrologic monitoring and first year (restart) of vegetation monitoring following construction. The hydrologic data indicates that nine of the eleven monitoring gauges are meeting jurisdictional success by showing saturation within 12 inches of the surface for at least 12.5% of the growing season. Four gauges in the constructed areas on the south tract are within 20% of the saturation period for three of the four respective reference gauges (The saturation period is longer in the constructed zone than at one of the four reference area gauges, which only met for 10.1% of the growing season). The two gauges located in the north tract were not within 20% of the saturation period for the reference gauge in that area. Gauge RIST-7 (ref) is at an elevation 10" higher than RIST-8. Graph RIST-7 (ref) shows that this gauge meets hydrology 100% of the growing season if this difference in elevation is adjusted. NCDOT recommends moving RIST-7 (ref) to a more suitable reference elevation.

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NCDOT will continue to monitor the Roanoke Island Mitigation Site for hydrology and vegetation.

APPENDIX A

GAUGE DATA GRAPHS

APPENDIX B

PHOTO AND VEGETATION PLOT LOCATIONS/ SITE PHOTOGRAPHS

Roanoke Island Visitor Center

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2004

Photo 7

2004

ROANOKE ISLAND VISITOR CENTER

PHOTO AND VEGETATION PLOT LOCATIONS