ANNUAL REPORT FOR 2002

U. S. Marine Corps Mitigation Site
Onslow County
Project No. 6.269010T
TIP No. U-2107 WM

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North Carolina Department of Transportation
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USMC MARSH MITIGATION SITE
2002 REPORT – EXECUTIVE SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the U.S. Marine Corps Mitigation Site. This site was constructed in 1999. Because portions of the site did not meet hydrological success criteria, the site was regraded in 2002. Monitoring activities in 2002 represent the first year of monitoring. The site must demonstrate vegetation success for three years and hydrologic monitoring must be conducted until success is demonstrated.

The site is monitored with one vegetation plot for the shrub area and 50 random plots for the marsh grass area. The site is monitored hydrologically by 3 gauges. These gauges consist of one gauge to monitor tidal flow and two gauges to determine surface water elevation within the site. These gauges (Infinity model) were installed in 2001-2002.

Historical rainfall data used for the 30-70 percentile was recorded at the Wilmington (New Hanover County) rain gauge, maintained by the NC State Climate Office.

Prior to re-grading activities in April 2002 all monitoring gauges were removed, including two reference gauges and gauges within the shrub area. Surface gauges will be replaced in an appropriate marsh reference area to compare to gauge data in the newly constructed marsh area. Groundwater gauges will also be replaced in the shrub area for 2003 monitoring.

The gauge data that is available from the site shows that the gauge USMC-2 is inundated 50% of the time while gauge USMC-3 is inundated 82% of the time.

Vegetation monitoring of the shrub area revealed an average density of 640 shrubs per acre, well above the minimum requirement. For the marsh grass area, the vegetative coverage and frequency do not currently meet the success criteria. However, vegetation coverage and frequency do appear to be on track for year one.

Based on results from the 2002 growing season, NCDOT recommends that monitoring continue.

1.0 INTRODUCTION

1.1 Project Description

The U.S. Marine Corp Mitigation Site encompasses 3.5 acres and is located in Onslow County on the Intracoastal Waterway southeast of Onslow Beach at the Camp Lejeune Marine Corps Base (Figure 1). Designed as a salt marsh, the site provides compensatory mitigation for the US 17 Bypass of Jacksonville, TIP Project U-2107A, B, BA, C, and D (USACE Action ID No. 199402926).

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for five years (for vegetation) and until success is shown (hydrologic). Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2002 at the USMC Mitigation Site.

Activities in 2002 reflect the first year of hydrologic monitoring and the first year of vegetation monitoring following re-grading and replanting of the site. Included in this report are analyses of both hydrologic and vegetative monitoring results as well as local climate conditions throughout the growing season.

1.3 Project History

March 1999	Grading Construction
April 1999	Site planted
May 1999	Monitoring Gauges Installed
May- November 1999	Hydrologic Monitoring (Year 1)
October 1999	Vegetation Monitoring (Year 1)
March-November 2000	Hydrologic Monitoring (Year 2)
August 2000	Vegetation Monitoring (Year 2)
March – November 2001	Hydrologic Monitoring (Year 3)
October 2001	Vegetation Monitoring (Year 3)
April 2002	Site re-graded
May 2002	Site Replanted
August 2002	Vegetation Monitoring (Restart 1 yr.)

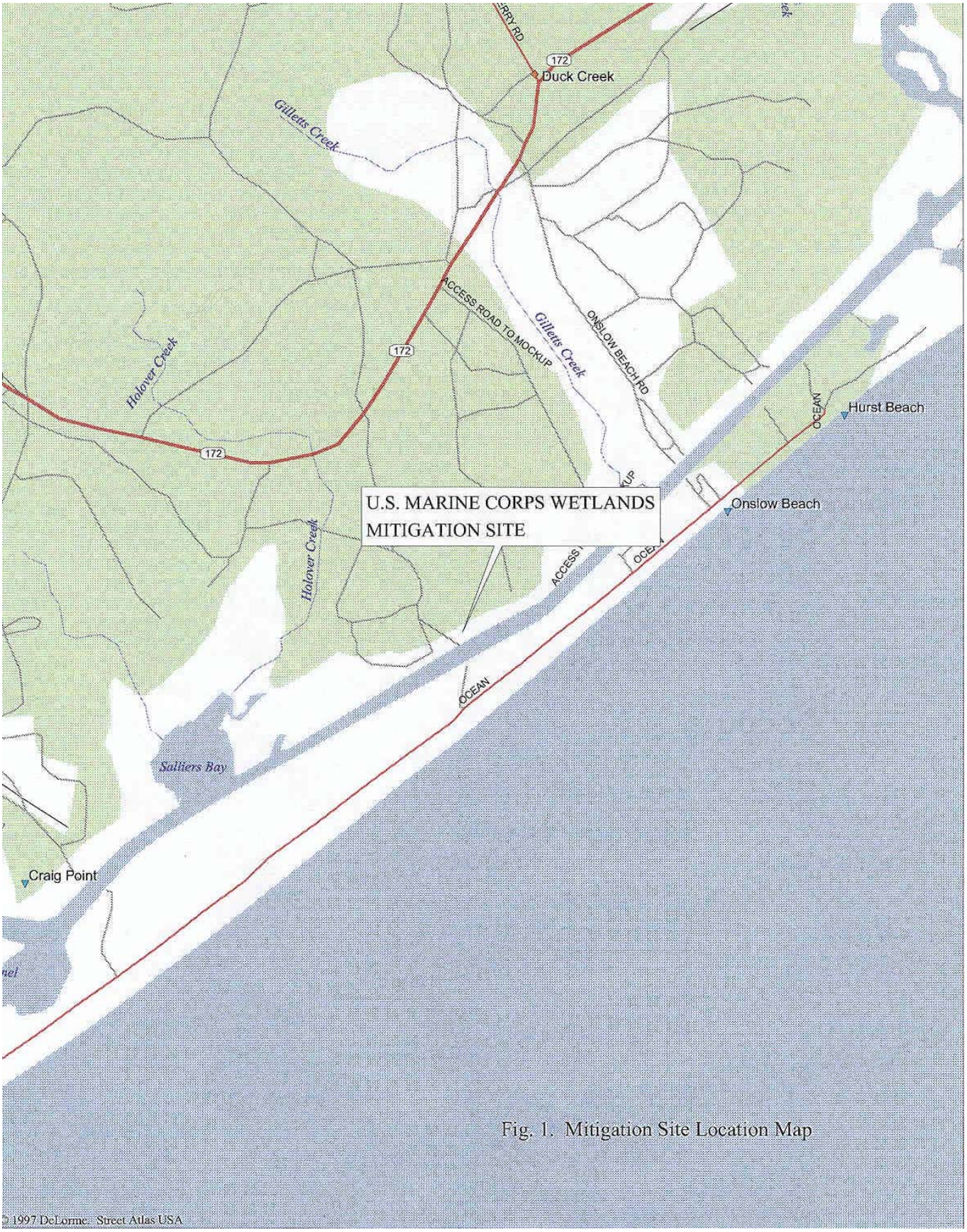

Fig. 1. Mitigation Site Location Map

1.4 Permit Related Requirements

Special conditions of the permit for U-2107 required that NCDOT:

- "3.5 acres of *Spartina alterniflora* and *Juncus roemerianus* marsh shall be restored as described in the Onslow County marsh Mitigation plan dated September 1997. All grading and planting on the site shall be completed no later than June 1, 1999." This site was initially completed in March 1999. Remediation activities occurred in Spring 2002.
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2.0 HYDROLOGY

2.1 Success Criteria

Shrub area

Project specifications require saturation or inundation (within 12 inches of the surface) for at least 12.5% of the growing season for one year under reasonably average climatic conditions. However, areas may still be classified as wetlands even though the hydrology does not meet optimum wetland criteria.

Marsh area
For the lower marsh area, the success criteria require daily tidal flooding.

According to the September 1997 mitigation plan this is defined as "Hydrological success criteria will include the recorded presence of similar water level elevations and flood durations within the mitigation area as compared with the RME".

The growing season in Onslow County begins April 8 and ends November 5. These dates correspond to a 50% probability that air temperatures will drop to 28° F or lower after April 8 and before November 5.[1] The growing season is 212 days; therefore, optimum duration for wetland hydrology is 27 days. Also, local climate conditions must represent average conditions for the area.

2.2 Monitoring Procedure

Following site construction in April 2002, three groundwater monitoring gauges, one rain gauge, and four surface water gauges were removed from the site. The Infinity tidal gauge, which was installed in spring of 2001, was left in place while 2 additional surface water gauges were installed. (Figure 2). The tidal gauge measures water elevation every three hours while the surface water gauges record every hour.

[1] Soil Conservation Service, Soil Survey of Johnston County, North Carolina, 1994.

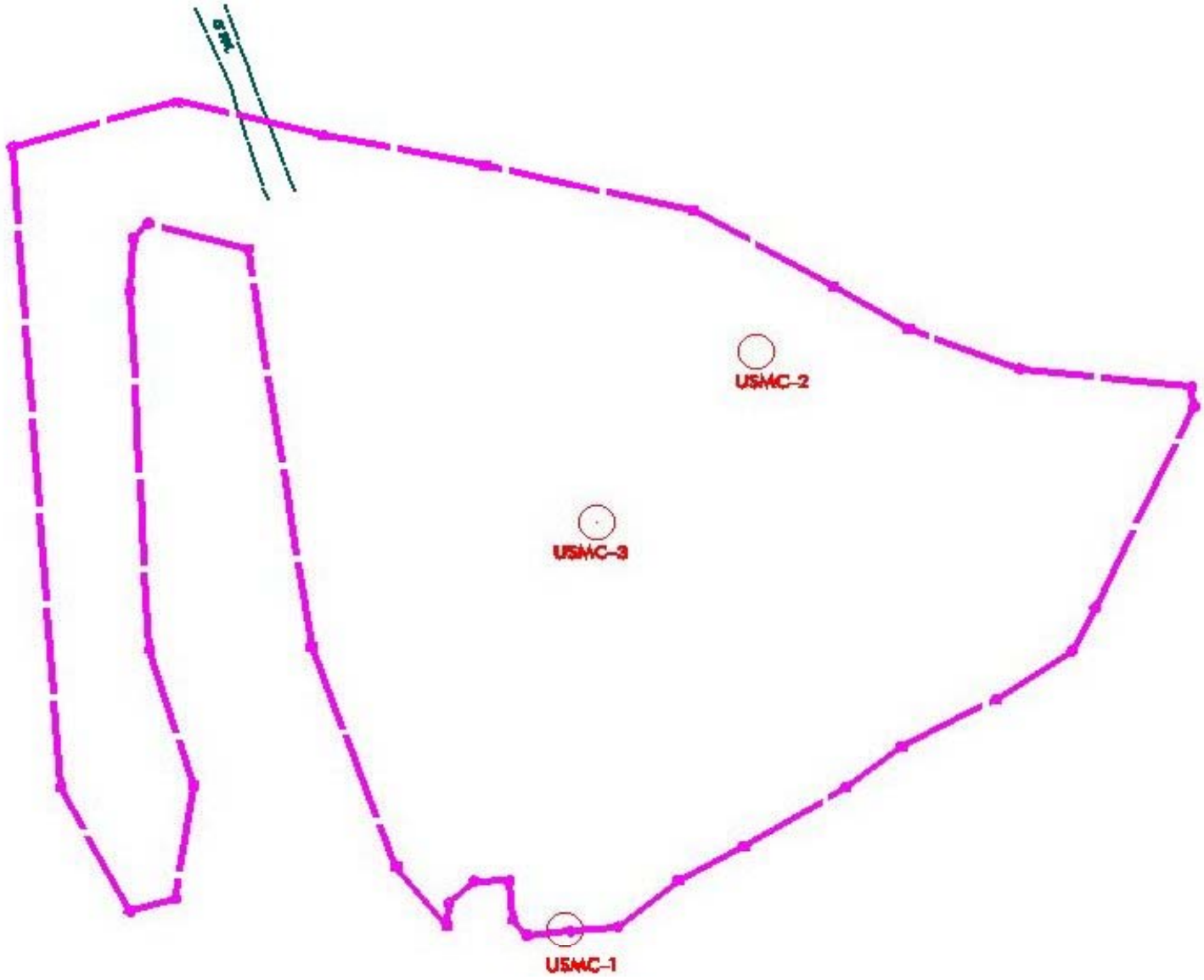


Figure 2: 2002 Gauge Location Map

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

Prior to re-grading activities in April 2002 all monitoring gauges were removed, including two reference gauges and gauges within the shrub area. Surface gauges will be replaced in an appropriate marsh reference area to compare to gauge data in the newly constructed marsh area. Groundwater gauges will also be replaced in the shrub area for 2003 monitoring.

The gauge data that is available from the site shows that the gauge USMC-2 is inundated 50% of the time while gauge USMC-3 is inundated 82% of the time.

2.3.2 Climatic Data

Figure 3 is a comparison of monthly rainfall for the period of November 2001 through October 2002 to historical precipitation (collected between 1971 and 2002) for Wilmington, North Carolina. This comparison gives an indication of how 2002 relates to historical data in terms of climate conditions. All off-site data was provided by the NC State Climate Office. The rainfall totals for November and December 2002 are not included.

For 2002, January, February, April, May, and June experienced below average rainfall. The months of March, July, September, and October all recorded average rainfall for the site. August experienced above average rainfall. For 2002, the site received below average rainfall.

2.4 Conclusions

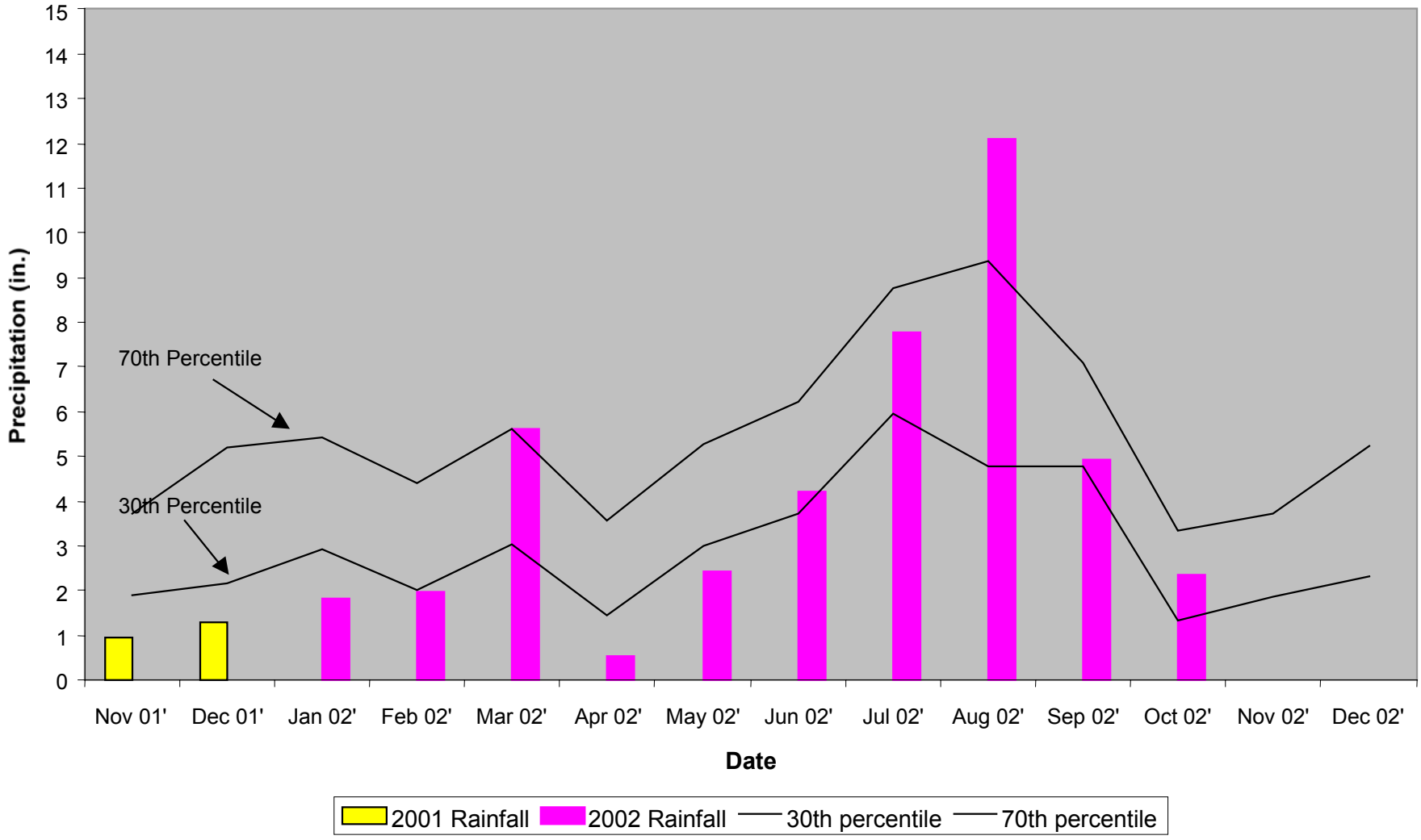
2002 represent the first year that the hydrologic monitoring data has been examined since re-grading of the site.

Prior to re-grading activities in April 2002 all monitoring gauges were removed, including two reference gauges and gauges within the shrub area. Surface gauges will be replaced in an appropriate marsh reference area to compare to gauge data in the newly constructed marsh area. Groundwater gauges will also be replaced in the shrub area for 2003 monitoring.

The gauge data that is available from the site shows that the gauge USMC-2 is inundated 50% of the time while gauge USMC-3 is inundated 82% of the time.

FIGURE 3

USMC 30 - 70 Percentile Graph 2002
Wilmington, NC



3.0 VEGETATION: USMC MITIGATION SITE (YEAR 1 MONITORING)

3.1A Success Criteria (Shrub Area)

Success Criteria states that there must be a minimum mean density of 320 trees per acre of approved target species surviving for at least three years

3.1B Success Criteria (Marsh Grass Area)

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count to the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met.

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

3.2A Description of Planted Areas (Shrub Area)

The following plant communities were planted in the Shrub Area:

Zone 1: (approximately 0.56 acres)

Myrica cerifera, Wax Myrtle

Baccharis halimifolia, False Willow

Iva frutescens, Marsh Elder

3.2B Description of Planted Areas (Marsh Grass Area)

The following plant communities were planted in the Marsh Grass Area:

Zone 1: (approximately 0.7acres)

Juncus roemerianus, Black Needle Rush

Zone 2: (approximately 2.23 acres)

Spartina alterniflora, Smooth Cordgrass

3.3A Results of Vegetation Monitoring (1 year) (Shrub Area)

Plot #	Wax Myrtle	False Willow	Marsh Elder	Total (1 year)	Total (at planting)	Density (Shrubs/Acre)
1	26	8	14	48	51	640
TOTAL DENSITY						**640**

Site Notes: Natural propagation seen in marsh elder and false willow species. Phragmites on the outer fringe of the site was treated in August 2001 and will continue to be evaluated throughout the monitoring period.

3.3B Results of Vegetation Monitoring (Marsh Grass Area)

	Plot #	Scale Factor	*Juncus roemerianus*	*Spartina alterniflora*	Frequency	Notes
	1	5.0	✓		✓	
	2	5.0	✓	✓	✓	*Distichlis spicata*
	3	5.0		✓	✓	*Aster* sp.
	4					Open Water
	5	5.0		✓	✓	*Aster* sp.
	6	0.0				Bare Ground
	7	5.0	✓		✓	*Spartina patens*
	8	0.0				Bare Ground
	9	2.0		✓	✓	
	10	5.0		✓	✓	*Distichlis spicata*, Glasswort
	11	2.0		✓	✓	
	12	0.0				Bare Ground
	13	5.0		✓	✓	
	14	4.0		✓	✓	
	15	5.0		✓	✓	Glasswort
	16	1.0		✓	✓	
	17	0.0				Bare Ground
	18	2.0		✓	✓	
	19	5.0				*Spartina patens*
	20	5.0		✓	✓	Goldenrod, Foxtail, *S. patens*, *D. spicata*,
	21	5.0		✓	✓	
	22	0.0				Bare Ground
	23	5.0		✓	✓	
	24	1.0		✓	✓	
	25	1.0				
	26	5.0		✓	✓	
	27	1.0		✓	✓	
	28	3.0		✓	✓	Glasswort
	29	0.0				Bare Ground
	30	5.0				Marsh elder, *Distichlis spicata*,
	31	5.0		✓	✓	*Distichlis spicata*, Glasswort
	32	0.0				Bare Ground
	33	4.0		✓	✓	
	34	0.0				Bare Ground
	35	5.0		✓	✓	
	36	5.0				
	37	5.0				*Baccharis halimifloia*, Crabgrass
	38	5.0		✓	✓	Marsh elder, *Distichlis spicata*,
	39	5.0	✓		✓	*Baccharis halimifolia*, *Aster* sp., Wax myrtle
	40	3.0		✓	✓	
	41	0.0				Bare Ground
	42	5.0				Beach Pea, *B. halimifolia*, Crabgrass
	43	3.0		✓	✓	*Distichlis spicata*
	44	1.0		✓	✓	
	45	5.0		✓	✓	*Distichlis spicata*
	46	5.0		✓	✓	Glasswort
	47	2.0		✓	✓	
	48	5.0		✓	✓	Glasswort
	49	5.0		✓	✓	
	50	0.0				Bare Ground

Frequency/Percentage of Plots with Desired Species		67.3%	
Sum Scale Value		155.0	
Total # of Plots Counted		49	
Vegetative Cover (Scale Value)		3.16	

Site Notes: Marsh area has grasses present through portions of the site, and coverage is increasing in these areas.

3.4A Conclusions (Shrub Area)

Of the 3.5 acres of this site, approximately 0.56 acres involved shrub planting. There was 1 test plot established in the planting area. The 2002 vegetation monitoring of the planted area revealed an average density of 640 shrubs per acre, which is well above the minimum requirement of 320 shrubs per acre. The marsh elder and false willow shrubs are spreading by natural propagation throughout the shrub area.

3.4B Conclusions (Marsh Grass Area)

- Percent Frequency of Target Species (Black Needle Rush and Smooth Cordgrass)
  Frequency of 70% required. **67.3%**
- Vegetative Cover Scale Value **3.16**

  Scale Value of 5 required for year 5.

Of the 3.5 acres of this site, approximately 2.93 acres involved marsh grass planting. There were 50 random plots established throughout the planting area and located using GPS. The vegetative coverage and frequency do not currently meet the success criteria. However, vegetation coverage and frequency do appear to be on track for year one.

NCDOT re-graded portions of the site in 2002. The marsh portion of the site was replanted in May 2002.

NCDOT will continue vegetation monitoring at the USMC Mitigation Site.

4.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS

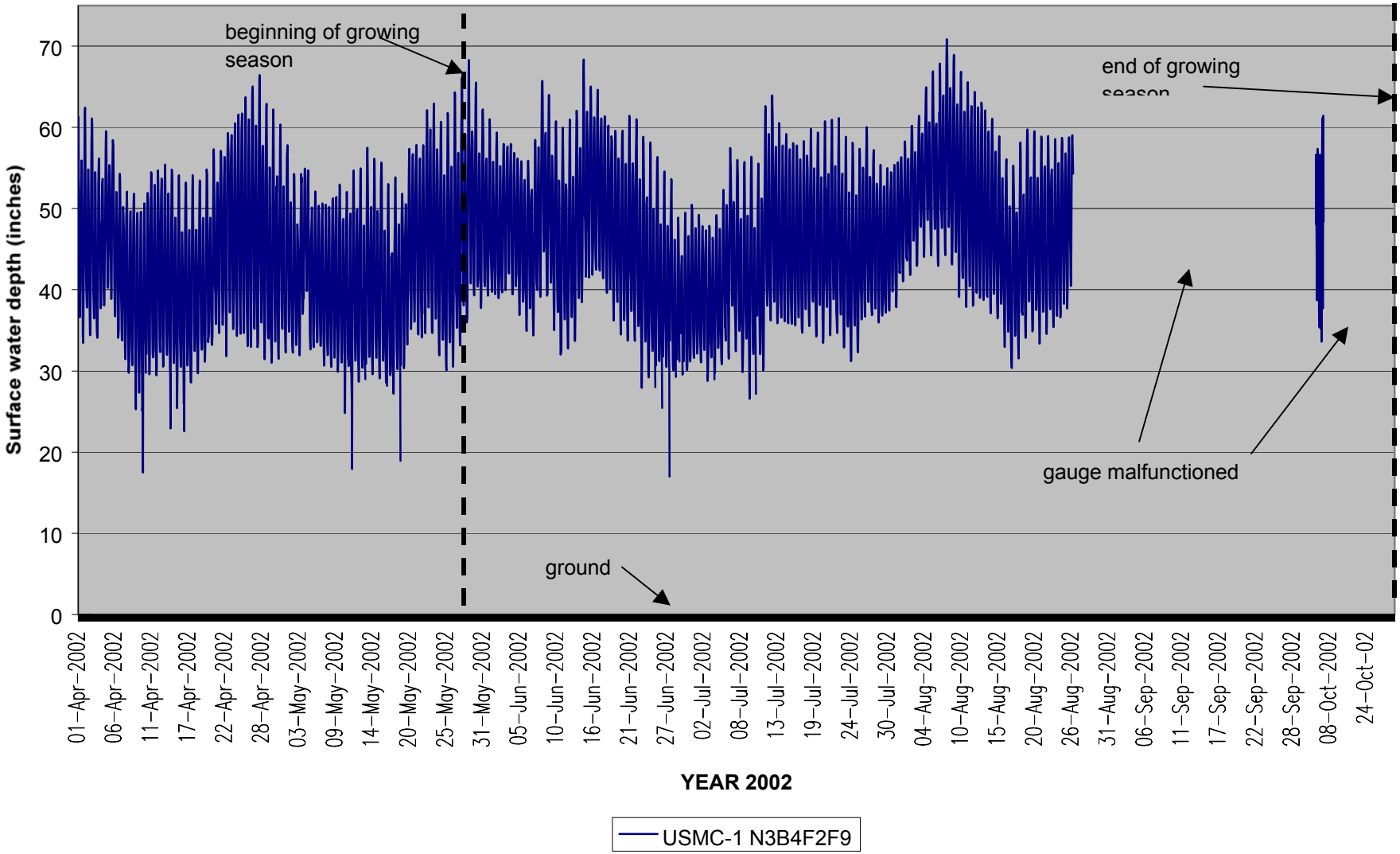
Hydrologic monitoring indicates that the site is getting daily inundation within the marsh grass portion of the site. Additional gauges will be installed in an appropriate marsh grass reference area to compare with gauge data collected within the restoration area. Groundwater gauges will also be replaced in the shrub area.

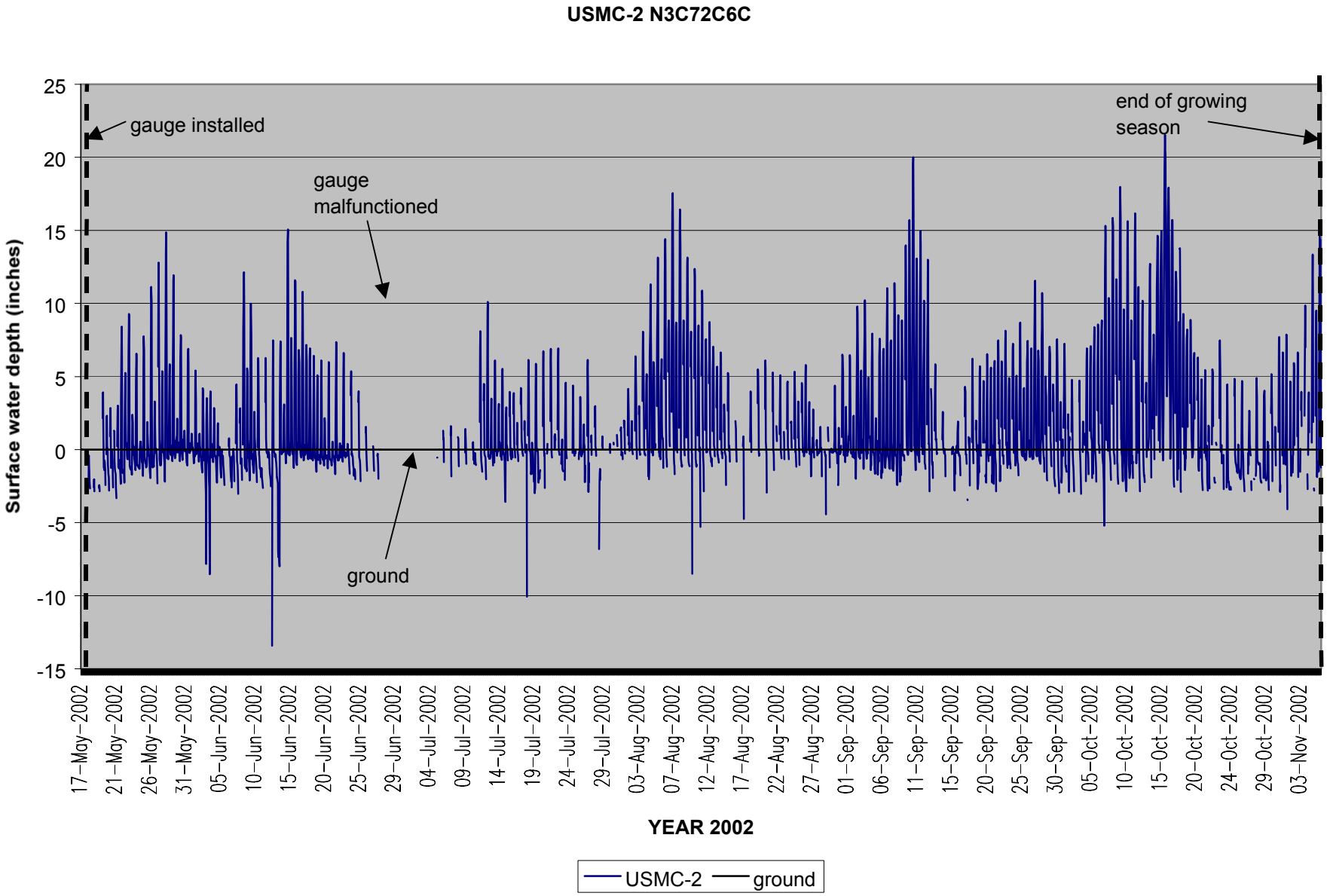
Vegetation monitoring of the shrub area revealed an average density of 640 shrubs per acre, well above the minimum requirement. Vegetation monitoring yielded results below the success criteria in the marsh grass planting areas, but are on track for year one monitoring.

Based on results from the 2002 growing season, NCDOT recommends that monitoring continue.

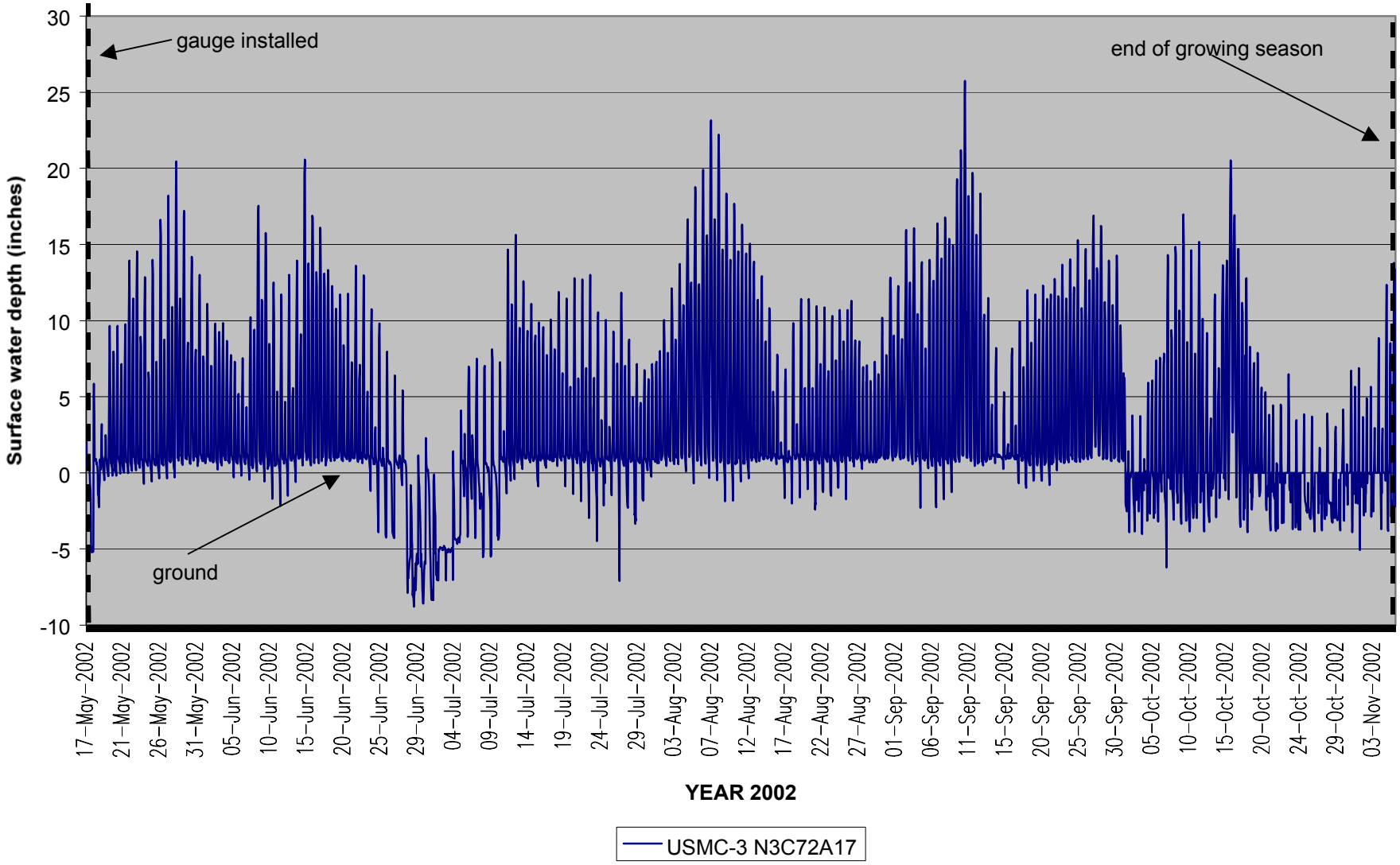
APPENDIX A
TIDAL AND SURFACE WATER GRAPHS

USMC-1 Tidal Gauge




USMC-2 N3C72C6C
Surface water depth (inches)
25
20
15
10
5
0
-5
-10
-15
gauge installed
gauge malfunctioned
ground
end of growing season
17-May-2002
21-May-2002
26-May-2002
31-May-2002
05-Jun-2002
10-Jun-2002
15-Jun-2002
20-Jun-2002
25-Jun-2002
29-Jun-2002
04-Jul-2002
09-Jul-2002
14-Jul-2002
19-Jul-2002
24-Jul-2002
29-Jul-2002
03-Aug-2002
07-Aug-2002
12-Aug-2002
17-Aug-2002
22-Aug-2002
27-Aug-2002
01-Sep-2002
06-Sep-2002
11-Sep-2002
15-Sep-2002
20-Sep-2002
25-Sep-2002
30-Sep-2002
05-Oct-2002
10-Oct-2002
15-Oct-2002
20-Oct-2002
24-Oct-2002
29-Oct-2002
03-Nov-2002
YEAR 2002
USMC-2
ground

USMC-3 N3C72A17



APPENDIX B
SITE PHOTOS

USMC

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

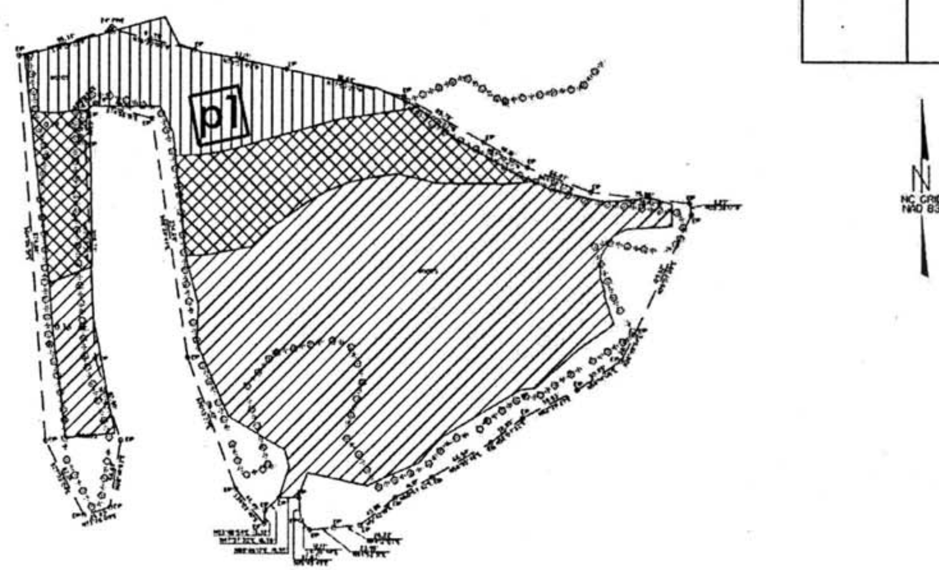
USMC

Photo 7

Photo 8

APPENDIX C
VEGETATION PLANTING PLAN

USMC Marsh/Shrub Site
Onslow County, U–2107 WM
PLANTING PLAN



LEGEND

- Wax Myrtle / False Willow / Marsh Elder
- Blackneedle Rush
- Smooth Cordgrass
- Vegetation Monitoring Plot (50 ft. X 50 ft.)

PROJECT REFERENCE NO.	SHEET NO.
U-2107WM	map 1
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

USMC Marsh/Shrub Site
Onslow County, U–2107 WM

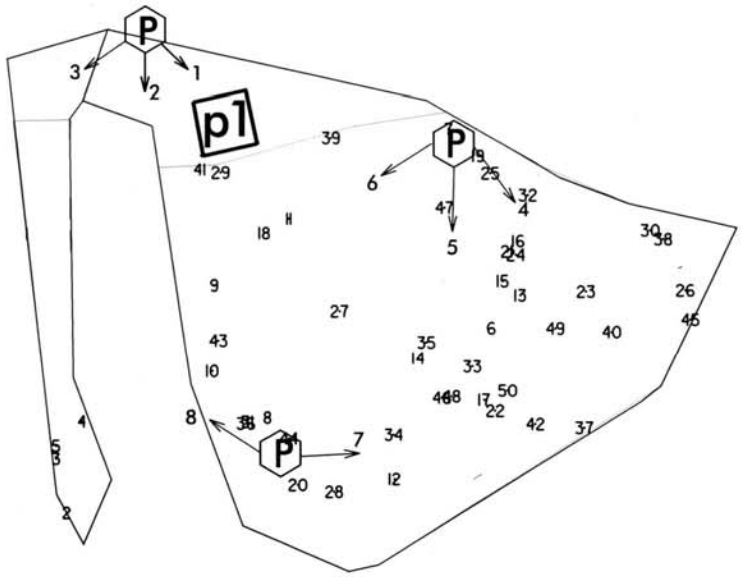


PHOTO AND VEGETATION PLOT LOCATIONS

- Random Plots
- Photograph Locations
- Vegetation Monitoring Plot (50 ft. X 50 ft.)