

ANNUAL REPORT FOR 2001



**Huskanaw Swamp Mitigation Site
Martin County
Project No. 6.099008T
TIP No. R-2111 WM**



Natural Systems Unit & Roadside Environmental Unit
North Carolina Department of Transportation
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Summary

The following report summarizes the monitoring activities at the Huskanaw Swamp Mitigation Site. This site was constructed in 1996 to provide wetland mitigation for the relocation of US 64. The site is monitored using three hydrologic monitoring gauges and eight vegetation plots. The year 2001 reflects the fourth complete year that monitoring has taken place on the site.

During the 2001 monitoring season all of the three monitoring gauges showed saturation for more than 12.5% of the growing season, with one gauge showing saturation for 16.0% of the season and two gauges showing saturation for 13.1% of the growing season. This is the fourth consecutive year in which all groundwater gauges located on the site have met the minimum hydrologic success criteria of 8% for “transitional areas” as defined in the mitigation plan, dated October, 1994.

The vegetation plots yielded an average plot density of 557 trees per acre, with all but one of the eight plots showing very successful stem counts. All of the plots exceed the typical fourth year standard of 290 trees per acre. This is the fourth consecutive year in which average plot density has exceeded the minimum criteria for success.

The daily rainfall data depicted on the monitoring gauge graphs is recorded from an on-site rain gauge that was installed on May 23, 2000. Historical rainfall data used for the 30-70 percentile was recorded at the Williamston rain gauge, maintained by the NC State Climate Office. All three monitoring gauges showed saturation for more than 12.5% of the growing season during months of normal or below normal rainfall in 2001.

Based on the hydrologic and vegetation success observed over the past four years, the NCDOT believes that this site has met its design objective to restore both wet hardwood forest and swamp forest wetland communities. The NCDOT recommends that all monitoring activities be discontinued at this site.

1.0 Introduction

1.1 PROJECT DESCRIPTION

The Huskanaw Swamp Mitigation Site is located in north central Martin County and encompasses approximately 112 acres. It is approximately 0.95 miles west of the US 64 - US 64 Business Interchange, along SR 1405 (Figure 1). The site was originally constructed in the winter of 1996-97. However, planting activities were not completed until February 1998. Since construction activities were not completed before the start of the 1997 growing season, the fourth year of monitoring at the site has just been completed.

The site serves as mitigation for the US 64 relocation and consists of restoration, enhancement, and preservation. The site is designed to restore both wet hardwood forest and swamp forest wetland communities. An additional area preserves approximately 33 acres of swamp/bottomland forest wetlands.

1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of three years. 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 vegetation monitoring during the 2001 growing season at the Huskanaw Swamp 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 and site photographs.

1.3 PROJECT HISTORY

| | |
|----------------------|-------------------------------|
| Winter 1996-97 | Site Constructed |
| April 1997 | Monitoring Gauges Installed |
| April- November 1997 | Hydrologic Monitoring |
| February 1998 | Site Planted |
| March- November 1998 | Hydrologic Monitoring (1 yr.) |
| October 1998 | Vegetation Monitoring (1 yr.) |
| March- November 1999 | Hydrologic Monitoring (2 yr.) |
| October 1999 | Vegetation Monitoring (2 yr.) |
| March- November 2000 | Hydrologic Monitoring (3 yr.) |
| September 2000 | Vegetation Monitoring (3 yr.) |
| May 2001 | On-site Agency Meeting |
| March- November 2001 | Hydrologic Monitoring (4 yr.) |
| July 2001 | Vegetation Monitoring (4 yr.) |

1.4 DEBIT LEDGER

Table 1. Huskanaw Swamp Mitigation Site Debit Ledger

| Site Habitat | Mitigation Plan | | | Ratios | TIP Debit | | | | | |
|-------------------------|-----------------|-----------------|-------------------|--------|-----------|-------------|-----------------|-------------|--------|--------|
| | Acres at Start | Acres Remaining | Percent Remaining | | R-2112B | R-2112 Bmod | R-2112 BA&BBmod | R-2112 Bmod | R-218A | R-218B |
| BLH Restoration | 3.00 | 0.00 | 0.00 | -- | | 3.00 | | | | |
| SPH Restoration | 1.00 | 0.00 | 0.00 | -- | | | | | | 1.00 |
| BLH Enhancement | 50.00 | 23.60 | 47.20 | 3.5:1 | | | 4.01 | 9.07 | 12.32 | 1.00 |
| SPH Preservation | 33.00 | 0.00 | 0.00 | -- | 33.00 | | | | | |
| Upland Mgmt | 33.00 | N/A | -- | -- | | | | | | |
| Total | 120.00 | 23.60 | 19.67 | | | | | | | |

SPH: Swamp Hardwood BLH: Bottomland Hardwood

2.0 Hydrology

2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation and the wetland mitigation plan (entitled “North Carolina Department of Transportation (NCDOT) US 64 Wetland Restoration and Conservation Management Plan, Edgecombe and Martin Counties”, dated October 1994) the success criteria for hydrology states that the area must be inundated or saturated (within 12” of the surface) by surface or ground water for at least a consecutive 12.5% of the growing season. This success criteria was agreed upon as part of the special conditions set forth by the Corps of Engineers (COE) through their issuance of permits for NCDOT’s TIP projects R-2112 and R-218A (Action ID Numbers 199400663 and 199501132). Also included in the success criteria, is the following: areas inundated less than 5% of the growing season are always classified as non-wetlands, while zones inundated between 5% - 12.5% of the growing season can be classified as wetlands based on factors such as the presence of hydrophytic vegetation and hydric soils.

The growing season in Martin County begins March 16 and ends November 14. The dates correspond to a 50% probability that temperatures will remain above 28° F or higher after March 16 and before November 14.¹ The growing season is 244 days; therefore, the minimum duration for 12.5% of the growing season to have wetland hydrology is 31 consecutive days.

2.2 HYDROLOGIC DESCRIPTION

Three monitoring gauges were installed on site in April of 1997 (Figure 2). Rainfall is the primary hydrologic input for the Huskanaw site. The automatic monitoring gauges record daily readings of the groundwater depth. The 2001 data represents the fourth full growing season for hydrologic monitoring.

2.3 RESULTS OF HYDROLOGIC MONITORING

2.3.1 Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 244 day growing season (March 16 – November 14). It is this hydrologic data which will determine the hydrologic success of this mitigation site.

There were periods of battery failures for gauges (HS-3 and HS-4); however, ample data was collected to determine hydrologic success. There were no other problems noted with the monitoring gauge units during the growing season. Table 2 shows the

¹ Soil Conservation Service, Soil Survey of Martin County, North Carolina, p.75.

Figure 2. Huskanaw Swamp Site Gauge Location Map

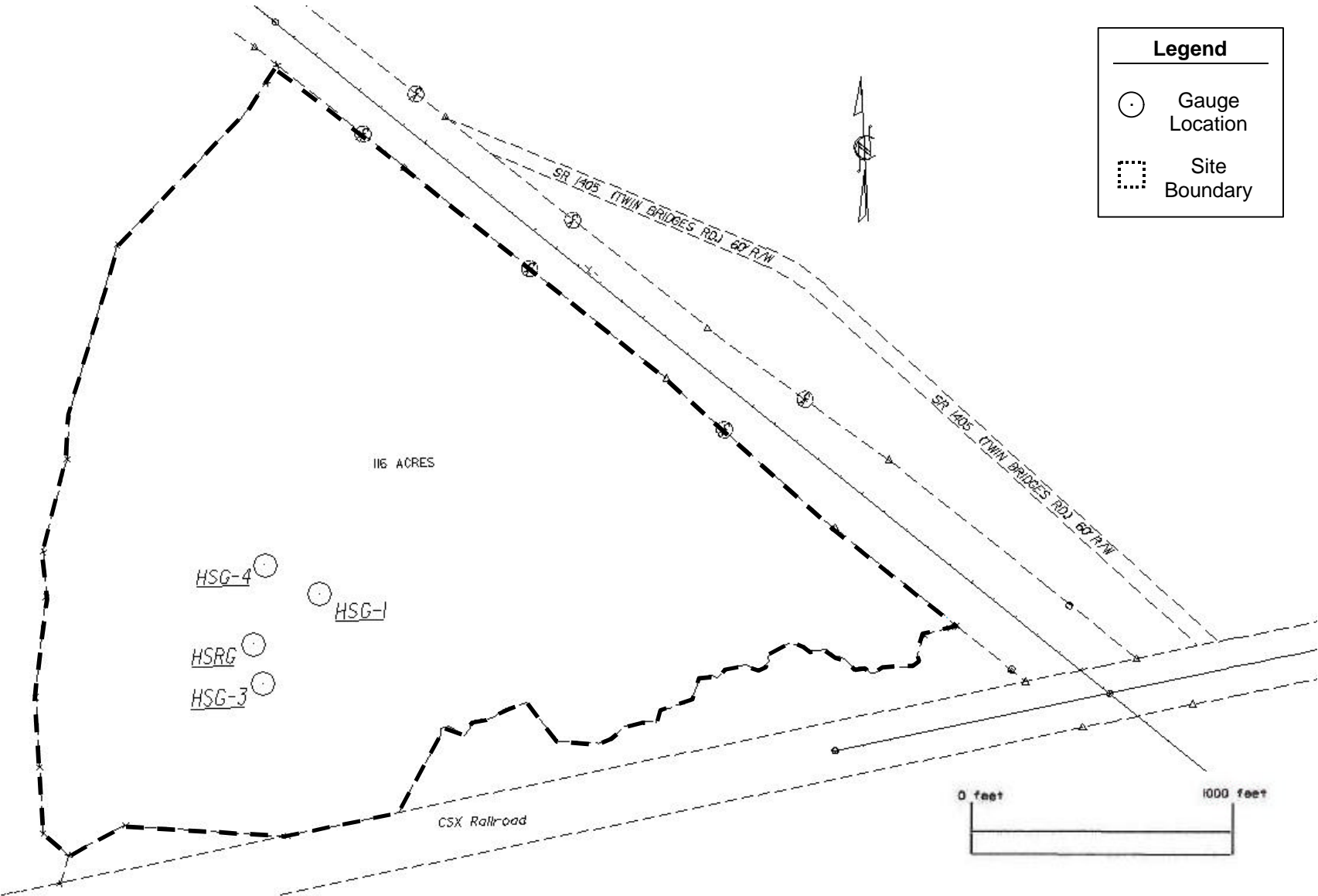


Table 2. 2001 Hydrologic Monitoring Results

| Monitoring Gauge | < 5% | 5% - 8% | 8% - 12.5% | > 12.5% | Number Consecutive Days | Actual % | Success Dates |
|------------------|------|---------|------------|---------|-------------------------|----------|------------------------------------|
| HS-1 | | | | ✓ | 39 39 | 16.0 | Mar 16 – Apr 23 May 22 – Jun 29 |
| HS-3 | | | | ✓ | 32 | 13.1 | Mar 16 – Apr 16 |
| HS-4 | | | | ✓ | 32 | 13.1 | Mar 16 – Apr 16 |

hydrologic results for 2001. HS-1 had two periods with 39 consecutive days. (Figure 3 is a graphical representation of the hydrologic monitoring results. See Appendix A for hydrologic Graphs.)

Appendix A contains charts of the groundwater depth for each monitoring gauge during 2001. These monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. If the gauge shows saturation for 5% or greater of the growing season, the maximum number of consecutive days is noted on each graph.

A rain gauge was installed during the 2000 growing season. Daily precipitation events, shown on each monitoring gauge graph, represent data from the onsite rain gauge.

2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall for the period of November 2000 through October 2001 to historical precipitation (collected between 1931 and 2000) for Williamston, North Carolina. This comparison gives an indication of how 2001 relates to historical data in terms of climate conditions. All off-site data was provided by the NC State Climate Office. Data for January 2001 is unavailable. Because data for the complete 2001 year was not available at the time this report was published, the rainfall totals for November and December 2001 are not included.

2001 monthly rainfall for the site fluctuated around the average rainfall for this site. February, April, August, September, and October experienced below average rainfall. The months of March, May, and July all recorded average rainfall for the site. June was the only month to experience above average rainfall. No data is available for January, November or December; however, the site meets hydrologic success criteria without these data.

All three monitoring gauges showed saturation for more than 12.5% of the growing season during months of normal or below normal rainfall in 2001.

Figure 3. Huskanaw Swamp Site 2001 Hydrologic Monitoring Results

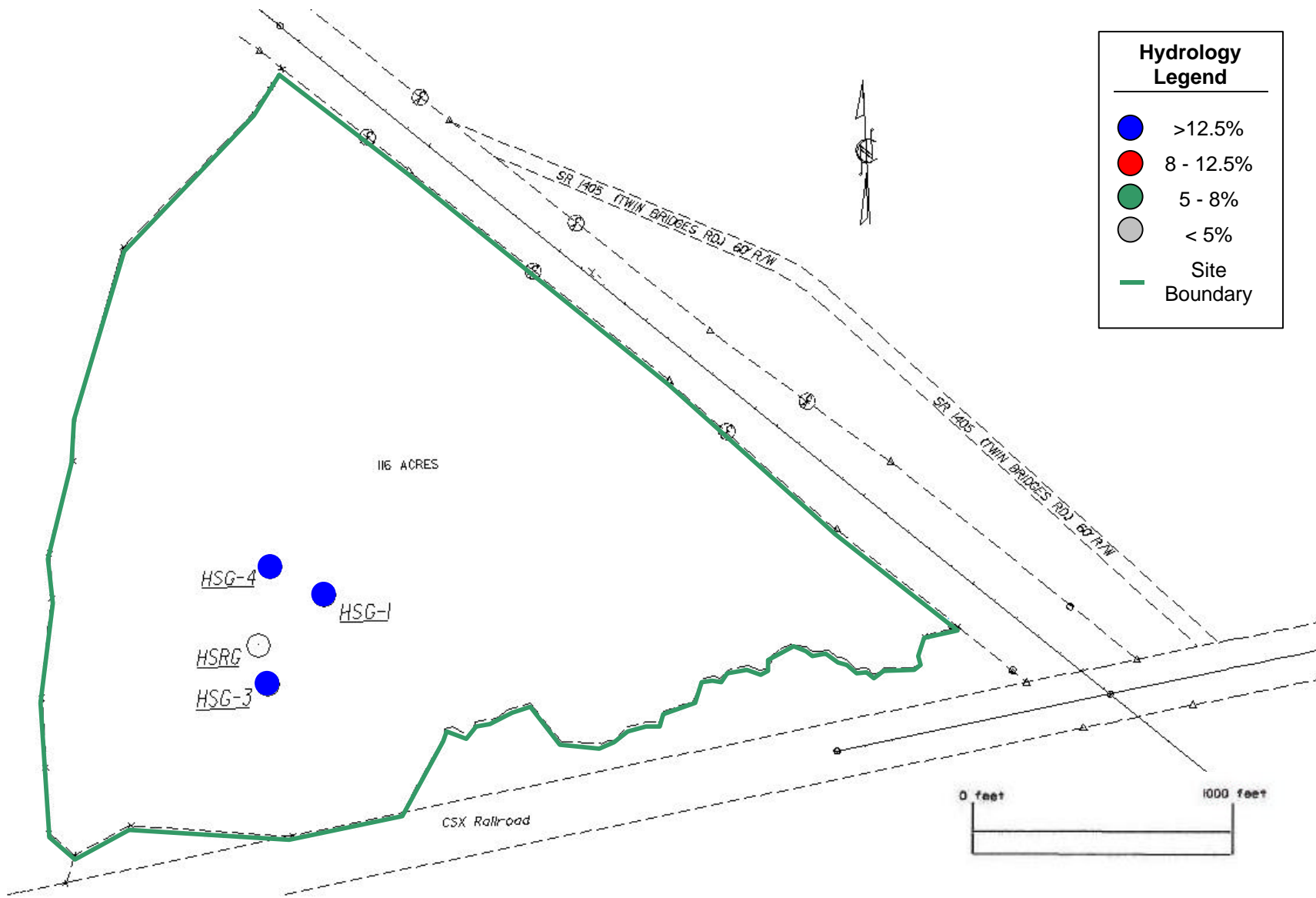
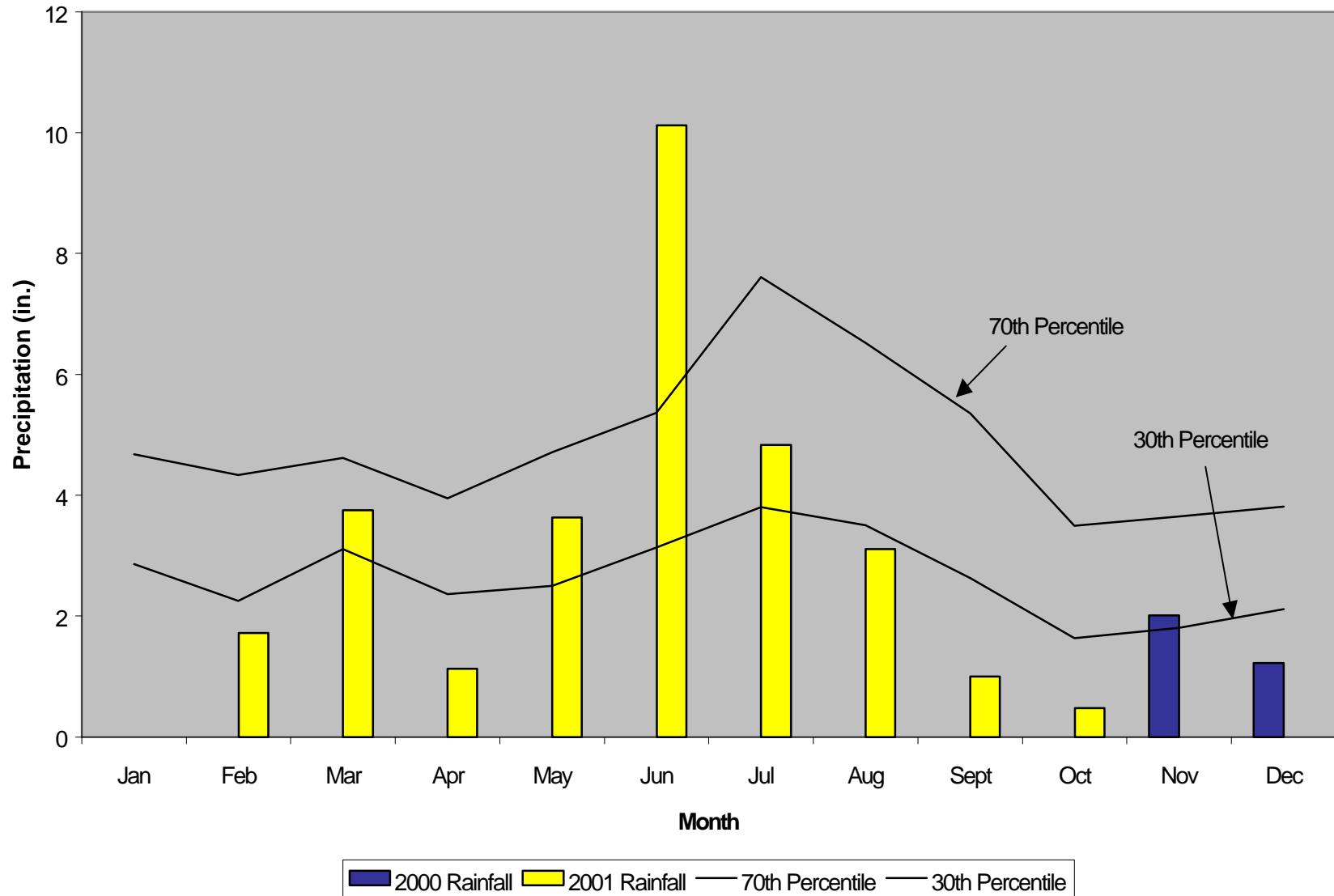


Figure 4. Huskanaw Swamp 30-70 Percentile Graph, Williamston, NC



2.4 CONCLUSIONS

In 2001, all of the monitoring gauges recorded saturation within one foot of the surface for at least 12.5% of the growing season, with gauge, HS-1, showing saturation for 16.0% of the season and the other two gauges, HS-3 and HS-4, showing saturation for 13.1% of the growing season. These results are similar to the 1999 results, in which HS-1 recorded saturation for 13.1% of the growing season while the remaining two gauges recorded saturation for at least 9.4% of the season and the 2000 results in which HS-1 recorded saturation for 21.7% of the season, with the other two gauges, HS-3 and HS-4, showing saturation for 11.5% and 9.4% of the growing season.

All of the gauges met the 12.5% minimum in 2001 during months with normal to below normal rainfall. This is the fourth consecutive year in which all groundwater gauges located on the site have met the minimum hydrologic success criteria of 8% for “transitional areas” as defined in the mitigation plan, dated October, 1994.

3.0 Vegetation: Huskanaw Mitigation Site (Year 4 Monitoring)

3.1 SUCCESS CRITERIA

Success criteria states that there must be a minimum of 320 trees per acre living for at least three consecutive years.

3.2 DESCRIPTION OF SPECIES

The following tree species were planted on the site:

Zone 1: Wet Hardwood Forest (56.6 acres)

Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus falcata, Southern Red Oak
Quercus nigra, Water Oak
Nyssa aquatica, Water Tupelo

Zone 2: Oak/Hickory Forest (19.2 acres)

Quercus alba, White Oak
Quercus nigra, Water Oak
Quercus falcata, Southern Red Oak
Carya tomentosa, Mockernut Hickory
Carya glabra, Pignut Hickory
Quercus palustris, Post Oak
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus phellos, Willow Oak
Quercus michauxii, Swamp Chestnut Oak
Carya cordiformis, Bitternut Hickory

Zone 3: Long Leaf-Oak/Hickory Forest (11.1 acres)

Pinus palustris, Longleaf Pine
Quercus marilandica, Blackjack Oak
Quercus phellos, Willow Oak
Quercus stellata, Post Oak
Carya tomentosa, Mockernut Hickory
Carya glabra, Pignut Hickory
Quercus michauxii, Swamp Chestnut Oak
Quercus alba, White Oak
Quercus nigra, Water Oak
Quercus falcata, Southern Red Oak
Carya cordiformis, Bitternut Hickory

3.3 RESULTS OF VEGETATION MONITORING

| ZONE | Plot # | Green Ash | Cherrybark Oak | Swp. Chestnut Oak | Willow Oak | Water Oak | Post Oak | Mockernut Hickory | Bitternut Hickory | Southern Red Oak | Water Tupelo | Blackjack Oak | Longleaf Pine | Laurel Oak | White Oak | Pignut Hickory | Total | Total (at planting) | Density (Tree/Acre) | |
|-------------------------------|--------|-----------|----------------|-------------------|------------|-----------|----------|-------------------|-------------------|------------------|--------------|---------------|---------------|------------|-----------|----------------|-------|---------------------|---------------------|------------|
| 1 | 1 | 3 | 2 | 1 | 5 | | | | | | 3 | | | 3 | | | 17 | 18 | 642 | |
| | 3 | | 1 | 4 | | 1 | | | | | 2 | | | 1 | | | 9 | 21 | 291 | |
| | 5 | 1 | | 2 | 1 | | | | | | 7 | | | | | | 11 | 18 | 416 | |
| | 6 | 7 | 15 | 7 | 3 | | | | | 1 | | | | 1 | | | 34 | 42 | 550 | |
| | 8 | 18 | 8 | 6 | 3 | | | | | 1 | | | | 3 | | | 39 | 42 | 631 | |
| ZONE 1 AVERAGE DENSITY | | | | | | | | | | | | | | | | | | | | 506 |
| 2 | 4 | | 4 | 3 | 6 | | | 8 | 2 | | | | | | 5 | 2 | 30 | 34 | 600 | |
| | 7 | | 7 | | | | 4 | 7 | 12 | 9 | | | | | 1 | | 40 | 40 | 680 | |
| ZONE 2 AVERAGE DENSITY | | | | | | | | | | | | | | | | | | | | 640 |
| 3 | 2 | | | | 12 | | 1 | 1 | 3 | 5 | | 10 | 2 | | | | 34 | 36 | 642 | |
| ZONE 3 AVERAGE DENSITY | | | | | | | | | | | | | | | | | | | | 642 |
| TOTAL AVERAGE DENSITY | | | | | | | | | | | | | | | | | | | | 557 |

Table 3. Vegetation Monitoring Statistics, by zone and plot

Site Notes:

Zone 1: Other species noted: broomsedge, *Juncus* sp., blackberry, grapevine, fennel, sumac, red maple, sweetgum, tulip poplar, holly, various grasses, trumpet creeper, volunteer pine, ragweed, and horse-nettle. River birch noted in plot 3.

Zone 2: Other species noted: broomsedge, sicklepod, bermuda grass, fennel, ragweed, red maple, and sweetgum. White oak noted in plots 4 and 7. Swamp white oak and pignut hickory also noted in plot 4.

Zone 3: Other species noted: broomsedge, ragweed, fennel, poplar, *Aster* sp., and bermuda grass. Average tree height is 5 to 7 feet. No red maple or sweetgum noted.

Overall: Broomsedge throughout site. Red maple and sweetgum throughout cut over areas.

3.4 CONCLUSIONS

A total of 87 acres on this site involved tree planting. The 2001 vegetation monitoring of the planted areas revealed an average density of 506 trees per acre for Zone 1, 640 trees per acre for Zone 2, and 642 trees per acre for Zone 3. All zones exceed the minimum requirement of 320 trees per acre.

It was noted in last year's comments from the agencies that red maple and sweetgum were invading the site and could affect the desired species. Based on the plot data, red maple and sweetgum have not affected the success of the planted trees.

4.0 Overall Conclusions and Recommendations

- One of the three monitoring gauges showed saturation for more than 16.0% of the growing season while the remaining two indicated saturation for 13.1% of the season during normal to below normal rainfall months. This is the fourth consecutive year in which all groundwater gauges located on the site have met the minimal hydrologic success criteria, as stated in the associated permits.
- Vegetation monitoring yielded an average plot density of 557 trees per acre, with all but one of the eight plots showing successful stem counts. All of the plots exceed the typical fourth year reduced standard of 290 trees per acre. This is the fourth consecutive year in which average plot density has exceeded the minimal criteria for success, as stated in the associated permit.

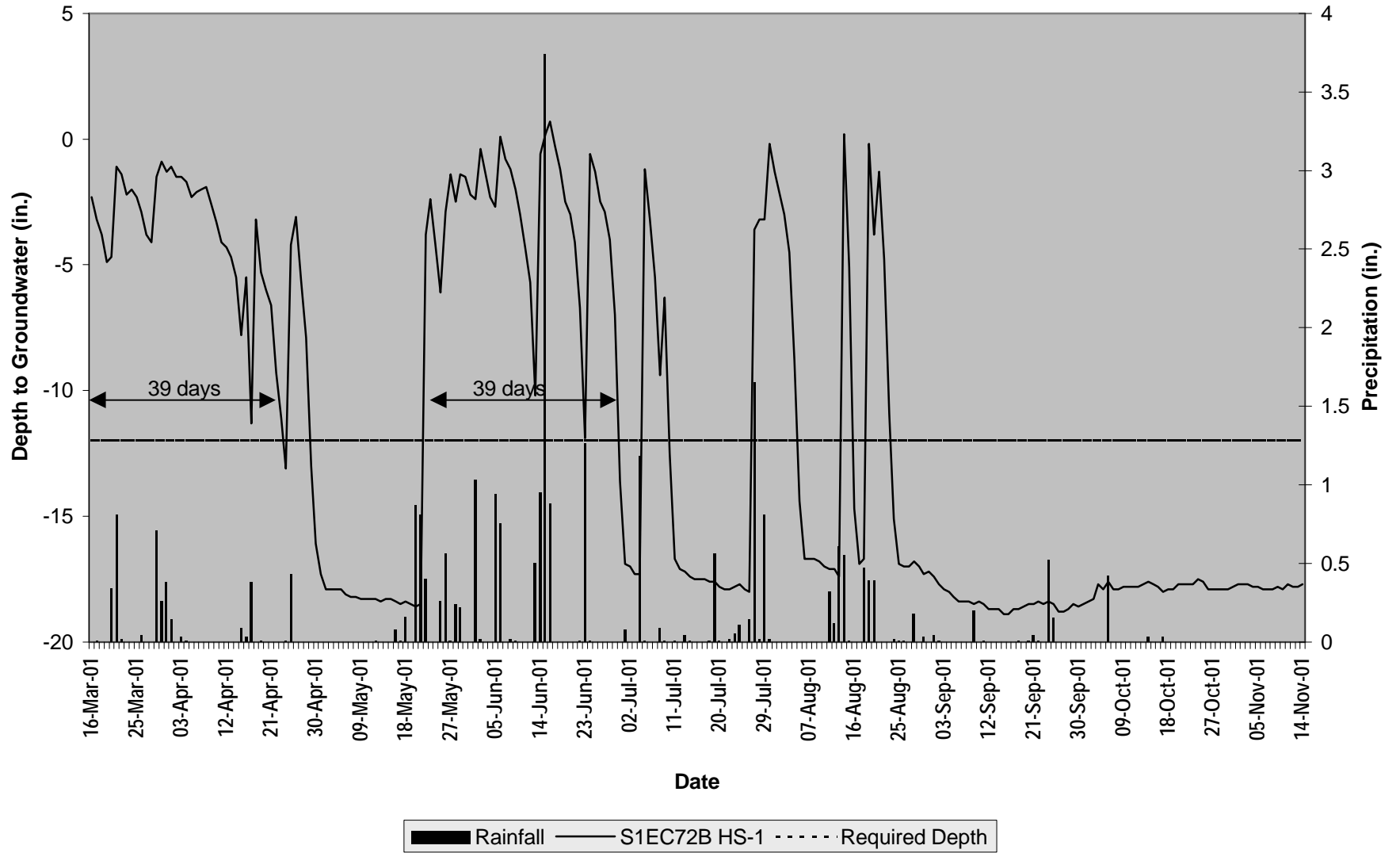
RECOMMENDATIONS

- Based on the hydrologic and vegetation success observed over the past four years, the NCDOT proposes to discontinue monitoring of the Huskanaw Mitigation site.

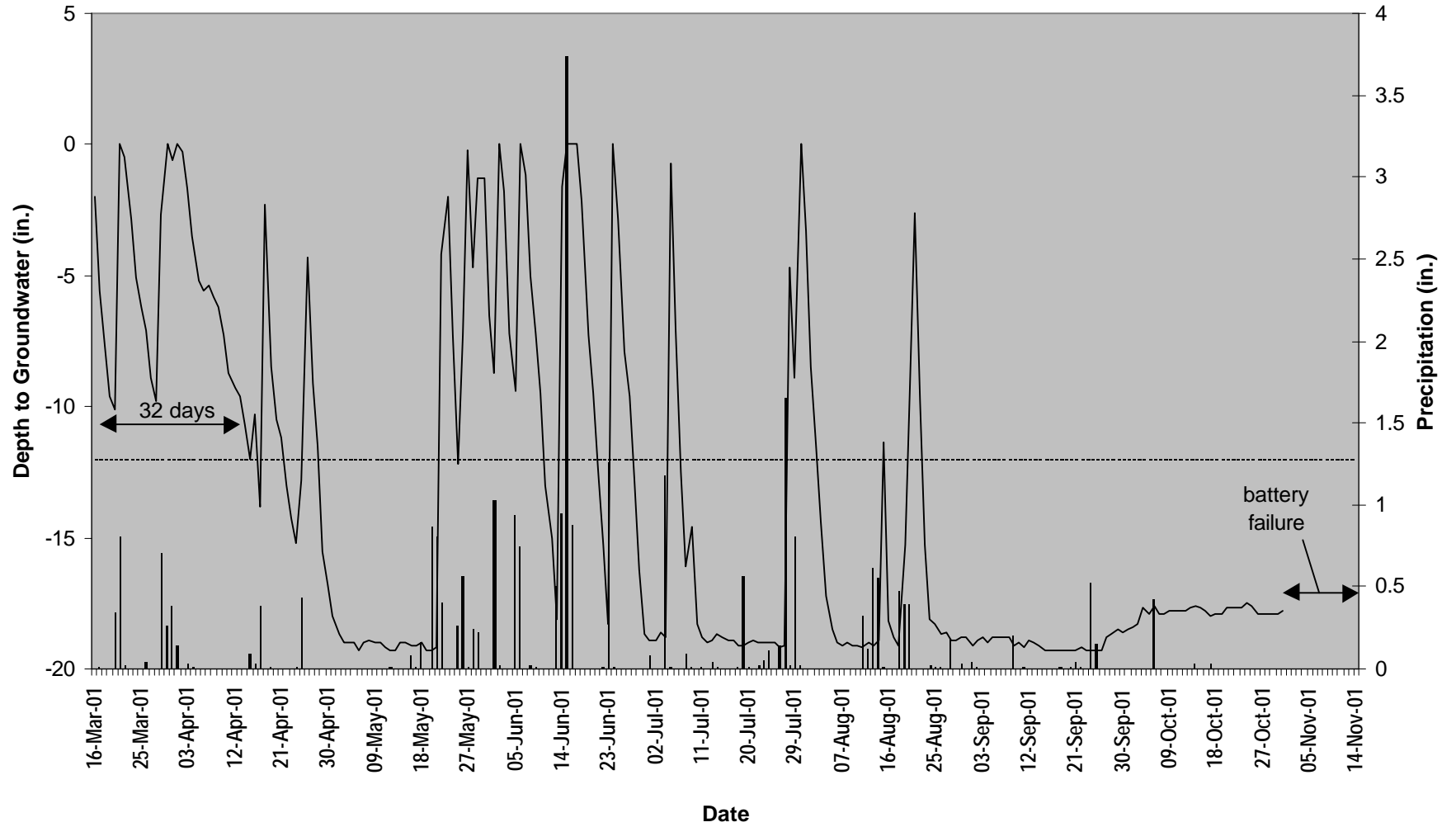
APPENDIX A

DEPTH TO GROUNDWATER CHARTS

Huskanaw Swamp HS-1

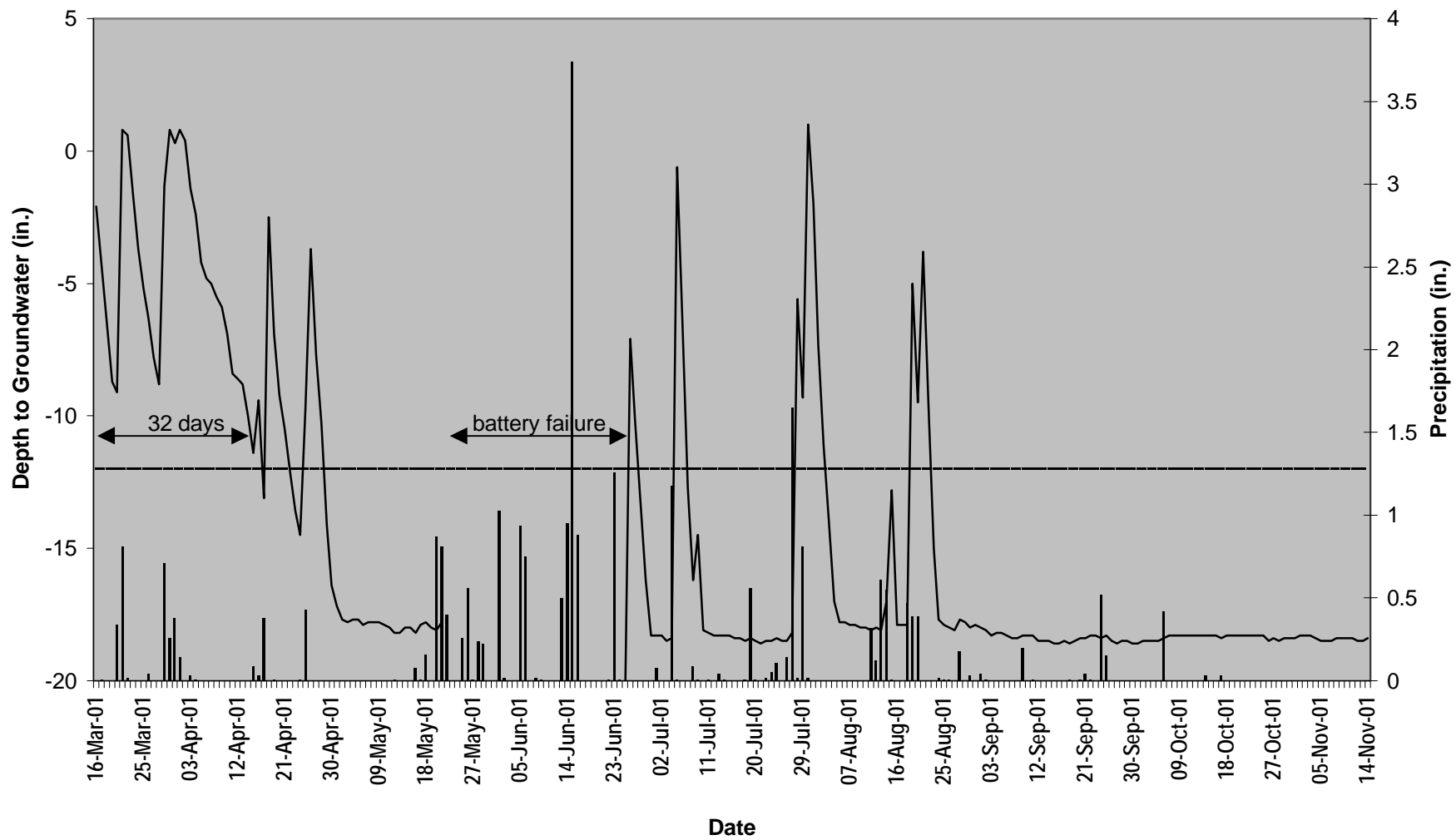


Huskanaw Swamp HS-3



■ Rainfall — S158CB7 HS-3 Required Depth

Huskanaw Swamp HS-4



■ Rainfall — S353A38 HS-4 Required Depth

APPENDIX B

SITE PHOTOS AND PHOTO AND PLOT LOCATIONS MAP

HUSKANAW SWAMP



Photo 1



Photo 2



Photo 3



Photo 5



Photo 4
Photo 6

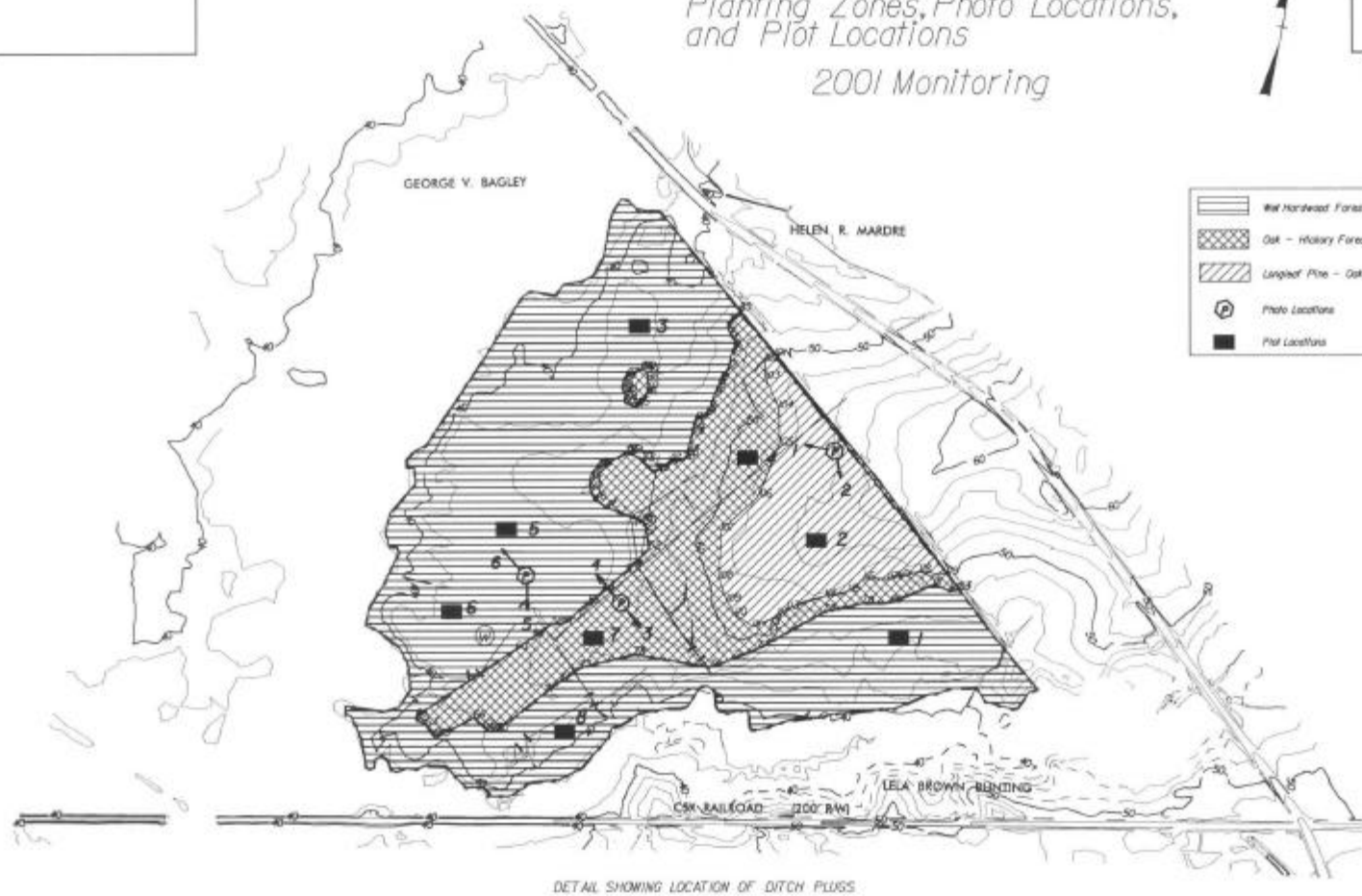
Huskanaw Wetland Mitigation Site
 Planting Zones, Photo Locations,
 and Plot Locations

2001 Monitoring

| | |
|----------------------------------|-----------------------|
| PROJECT REFERENCE NO. W-01296 | SHEET NO. 3 |
| DESIGN SECTION ENGINEER | HYDRAULIC ENGINEER |



| | |
|--|--------------------------------------|
| | Wet Hardwood Forest |
| | Oak - Hickory Forest |
| | Loblolly Pine - Oak - Hickory Forest |
| | Photo Locations |
| | Plot Locations |



DETAIL SHOWING LOCATION OF DITCH PLUS

PRELIMINARY PLANS
 DO NOT USE AND CONSIDERED