

# ANNUAL REPORT FOR 2000



**Casey Tract Mitigation Site  
Currituck County  
Project No. 6.049009T  
TIP No. R-2228**



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December 2000

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## SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Casey Tract Mitigation Site. This is the third year the vegetation has been monitored, and it is the second year the site has been monitored for hydrologic success. The site must demonstrate both hydrologic and vegetation success for five years.

The Casey Tract contains four surface gauges, one rain gauge and six monitoring gauges. An Infinities rain gauge was installed and programmed to start recording data on August 30, 2000. Surface gauge 3 was replaced and programmed to start recording data on April 26, 2000. The site also contains 3 vegetation monitoring transects.

The daily rainfall on the gauge data graphs is recorded at an Elizabeth City rain gauge, maintained by the NC State Climate Office. This data is being used because the original on-site rainfall gauge was replaced in August 2000 with a more reliable rain gauge. Rain data from the Elizabeth City rain gauge is being used in order to be consistent while comparing rainfall data to groundwater data during the growing season.

Hydrologic monitoring indicated that of the ten gauges on site, eight indicated inundation or saturation for over 12.5% of the growing season. Monitoring gauge 5 indicated saturation between 8 and 12.5%. Monitoring gauge 3 is located in the upland portion of the site; therefore, saturation occurred for less than 5% of the growing season. The NCDOT recommends removing gauge 3 from the site due to its location in the upland area.

In December 2000, NCDOT representatives delineated the open water at the Casey Tract. Existing open water comprises approximately 1.4 acres of the site. According to the original plan sheets, open water comprised approximately 0.9 acres. This is a gain of 0.5 acres of open water. See Figure 3 for a representation of the discrepancy between the existing open water and the original open water on-site. Although additional area is noted by open water than the original mitigation plan, and based on the added fisheries benefits of having the channel on-site, the Department would submit to include this area in the calculation of the entire site. This is also consistent with other similar marsh mitigation sites that are currently in place.

Vegetation monitoring was performed on the approximately 5 acres of marsh creation on this site. Based on the results of the third year monitoring, the percent frequency of target species is 92.6%. Coverage has increased since last year's monitoring. This is above the required frequency (70%) stated in the success criteria. 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) specie.

Based on the monitoring results from the 2000 growing season, NCDOT recommends that hydrologic and vegetation monitoring continue.

## 1.0 INTRODUCTION

### 1.1 Project Description

The Casey Tract Mitigation Site is located in Currituck County (Figure 1) and is approximately 24 acres in size. It is designed to mitigate for the widening of NC 168; the project includes the creation of coastal marsh wetland and the preservation of forested wetlands and forested upland areas.

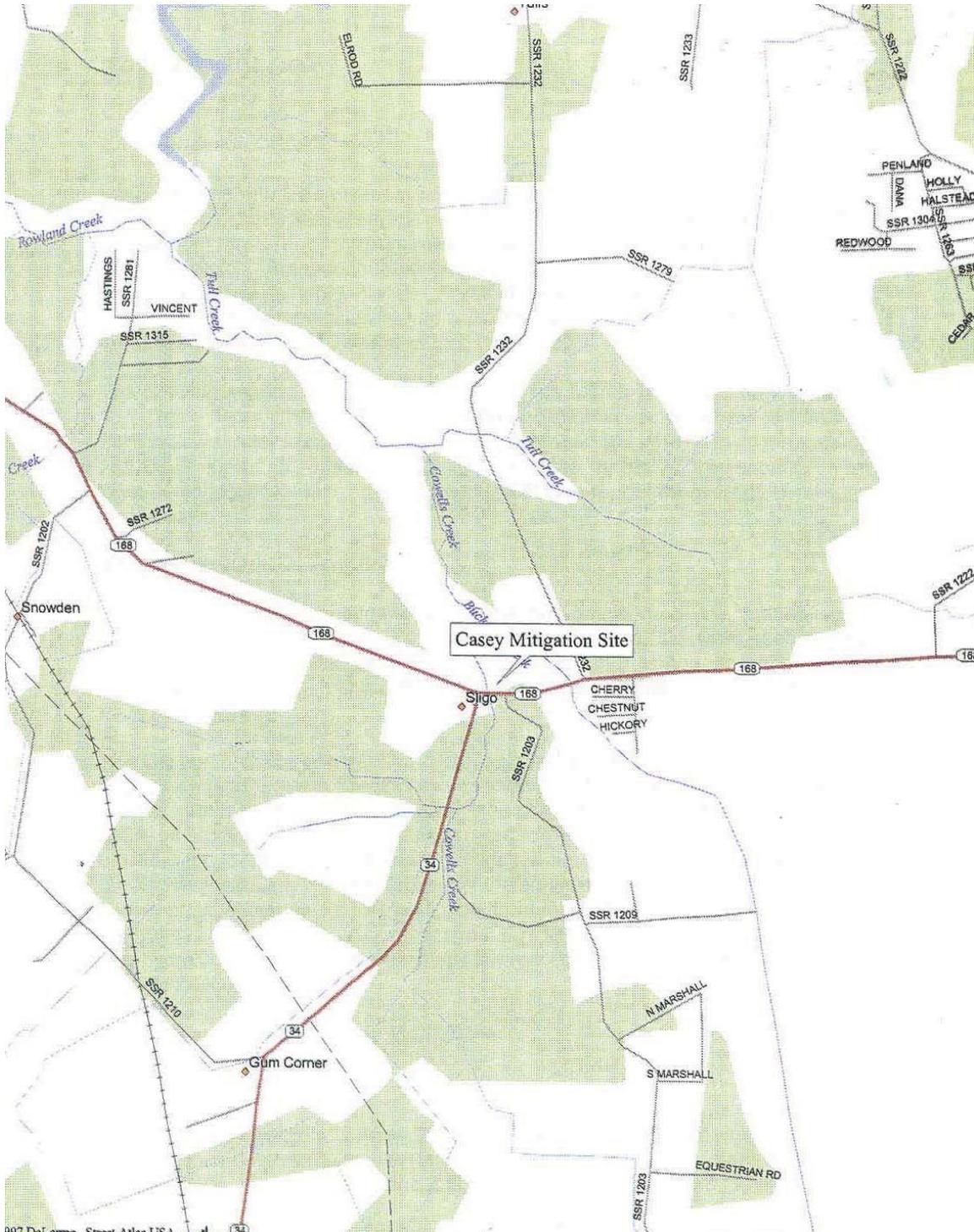
The site was first monitored for vegetation in 1998. In August of 1998, NCDOT installed monitoring gauges to be used for hydrologic monitoring. In December 2000, NCDOT representatives delineated the open water at the Casey Tract. Existing open water comprises approximately 1.4 acres of the site. According to the original plan sheets, open water comprised approximately 0.9 acres. This is a gain of 0.5 acres of open water. The 2000 annual monitoring report includes the results of both hydrologic (second year) and vegetation (third year) monitoring for the site.

### 1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for five consecutive 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 vegetative monitoring during 2000 at the Casey Tract Mitigation Site as well as local climate conditions throughout the growing season.

### 1.3 Project History

November 1997	Site Constructed
January 1998	Site Planted
August 1998	Monitoring Gauges Installed
October 1998	Vegetation monitoring (1 yr.)
October 1999	Vegetation Monitoring (2 yr.)
November 1999	Hydrologic monitoring (1 yr.)
August 2000	Vegetation Monitoring (3 yr.)
November 2000	Hydrologic Monitoring (2 yr.)
December 2000	Open Water Delineated



**Figure 1**  
**Site Location Map**

## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology states that the area must be inundated or saturated (within 12" of the surface) by surface or groundwater for at least a consecutive 12.5% of the growing season. Areas inundated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Currituck County begins March 20 and ends November 13. These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 20 and before November 13.<sup>1</sup> The growing season is 239 days; therefore, optimum hydrology requires 12.5% of this season, or at least 29.88 consecutive days (rounded to 30 days). A consecutive 8% would be equivalent to 19.12 days (rounded to 19 days) and a consecutive 5% would be equivalent to 11.95 days (rounded to 12 days). Local climate must also represent average conditions for the area.

### **2.2 Hydrologic Description**

In August 1998, six groundwater monitoring gauges, one rain gauge and three surface water gauges were installed (Figure 2). In August 2000, the original rain gauge was replaced with an Infinities rain gauge. The automatic monitoring gauges record daily readings of groundwater depth. Three of these groundwater-monitoring gauges are located within the reference wetland on site.

The Casey Tract site involved the construction of a channel network connected to Buckskin and Cowells Creeks and the lowering of site elevations to create coastal marsh areas to the elevations of the coastal marsh Reference Ecosystem areas. In addition, ditches were constructed to form hydrologic connections between the roadside ditches and the ditch in the northern end of the site. This connectivity will allow for tidal flushing of the constructed coastal marsh. This should provide adequate hydrologic input from the adjacent creeks, groundwater, and rainfall to sustain the necessary hydrology for coastal marsh wetland areas. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events.

According to the Casey Tract Mitigation Plan, the ditch cutting through the site should have been constructed as a four foot ditch with a bottom elevation of approximately -0.3 feet msl, with side slopes graded to an approximate elevation of 0.4 feet above msl. NCDOT has requested that the Locations and Surveys

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<sup>1</sup> Natural Resources Conservation Service, Soil Survey of Currituck County, North Carolina, p.71.

Branch survey the Casey Tract to determine if construction of the site complies with the Mitigation Plan.

In December 2000, NCDOT representatives delineated the open water at the Casey Tract. To delineate the open water, NCDOT assumed all areas inside the wrack line and lacking vegetation represented inundated areas. Existing open water comprises approximately 1.4 acres of the site. According to the original plan sheets, open water comprised approximately 0.9 acres. This is a gain of 0.5 acres of open water. Figure 3 illustrates the discrepancy between the existing open water and the original open water on-site. The thick black line represents the original open water at the Casey Tract; however, the fingers breaking off from the main ditch are not shown. All of the area outlined in red represents the existing open water.

The measurements show that there is an additional area of open water on the site in comparison to the original plan sheets. However as is the case with other marsh mitigation areas, several resource agencies often request that the Department incorporate additional swales/shallow channels for fisheries enhancement throughout the site. This is often not shown in the original mitigation plan, but is added during the design or construction phase of the project. It is understood by all, that the lower elevations of these swales will prevent the target species from surviving. It has also been the case that when these swales are added that the area of the site that is inundated with water is not subtracted from the total area of the site, due to the benefits that are provided by their presence. This being the case, the Department would submit to leave the additional area occupied by the open water in the calculation of the mitigation area.

## **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 239-day growing season. The results are presented in Table 1. Appendix A contains a plot of the groundwater depth for each monitoring gauge and the surface water depth recorded by the surface gauges. The maximum number of consecutive days is noted on each graph. The individual precipitation events, shown on the monitoring well graphs as bars, represent data collected from an Elizabeth City weather station. This data was provided by the NC State Climate Office. The Infinities rain gauge currently located on the site was installed in August 2000; therefore, the Elizabeth City rainfall information was used on the monitoring gauge graphs. Figure 4 represents the hydrologic monitoring results.

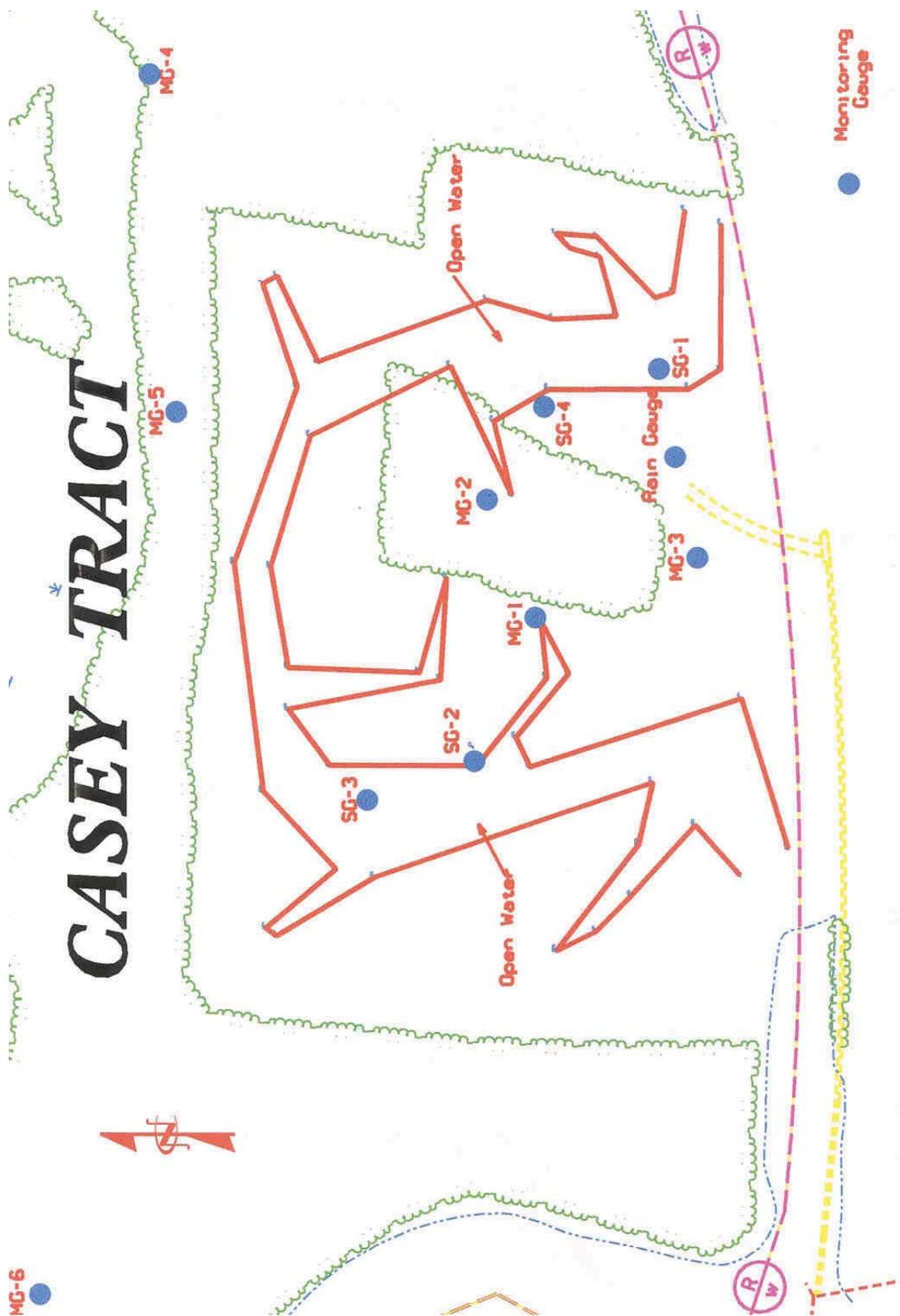
Table 1  
HYDROLOGIC MONITORING RESULTS

Monitoring Gauge	< 5%	5% - 8%	8% - 12.5%	12.5%	Actual %	Success Dates
MG-1				✓	83.3	Mar 25-Oct 9
MG-2				✓	91.2	Mar 25-Oct 28
MG-3	✓				0.4	Jun 29, Sep 5, Sep 26
MG-4 (RG)				✓	87.4	Mar 20-Oct 14
MG-5 (RG)			✓		7.9*	Jul 25-Aug 12
MG-6 (RG)				✓	89.5	Mar 20-Oct 19

RG refers to the reference gauges located in the reference wetland.

\* This discrepancy is due to rounding 19.12 days down to 19 days.

The surface gauges have shown consistent surface water throughout the growing season. Monitoring gauge 3 is located in the upland area of the site at the entrance to the site, so it would not show hydrologic success at this elevated location. Monitoring gauge 5, located in the reference wetland, indicated saturation within 12 inches of the surface for 19 consecutive days. Four of the six monitoring gauges indicated saturation within 12 inches of the surface or less for over 30 consecutive days of the growing season.



**Figure 2**  
**Monitoring Gauge**  
**Location Map**

# CASEY TRACT

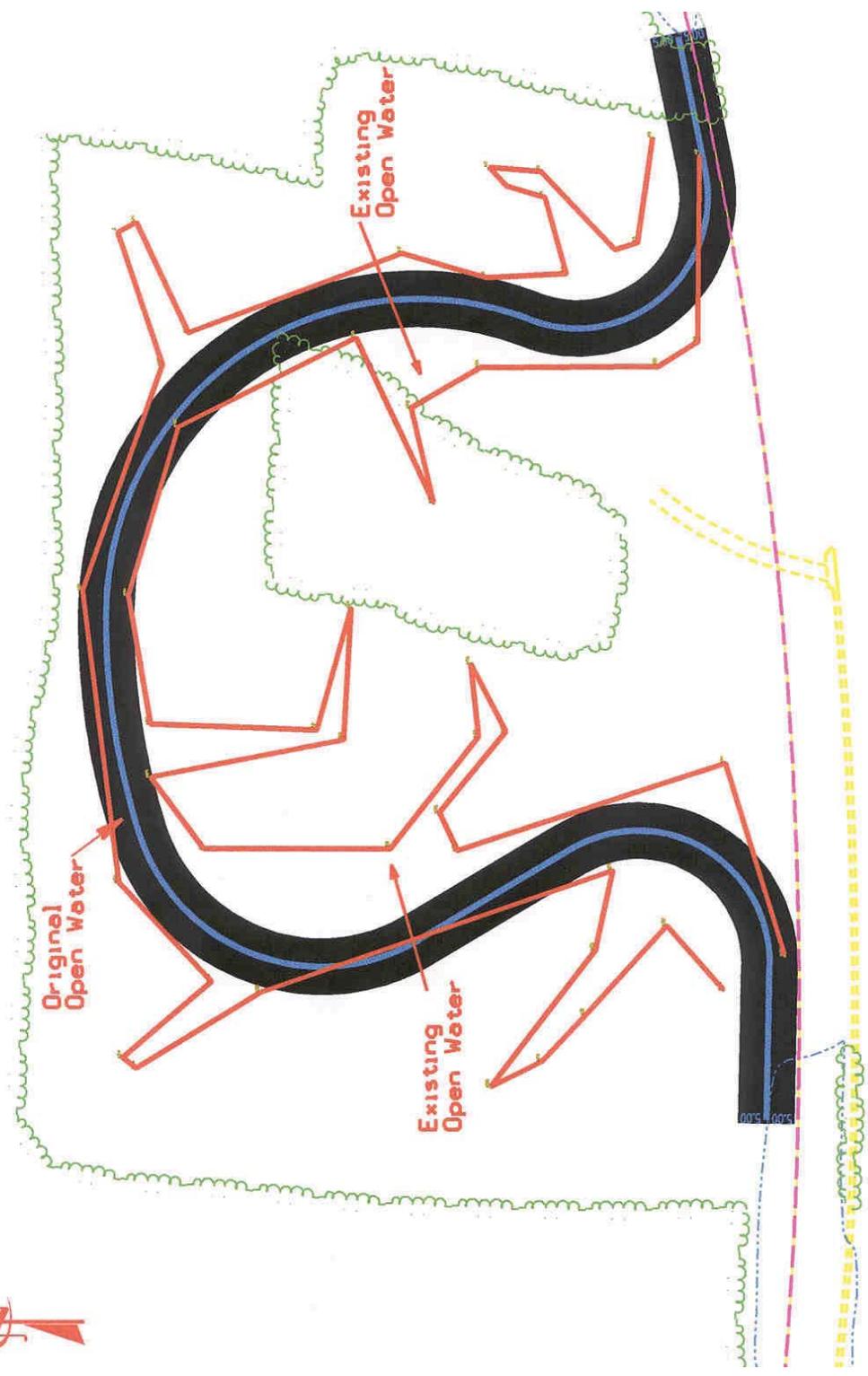


Figure 3  
Open Water Map

*Specific problems:* Surface gauge 3 stopped recording data on April 5. The gauge was replaced and programmed to begin recording data on April 26.

The battery in surface gauge 4 was replaced in October, however the gauge did not record any data from September 3 to October 5 and from October 17 through the remainder of the growing season. The gauge did record from the beginning of the growing season and indicated inundation at the site.

### **2.3.2 Climatic Data**

Figure 5 represents an examination of the local climate in comparison with historical data in order to determine whether 2000 was “average” in terms of climate conditions. The figure compares the rainfall from 2000 with that of historical rainfall (data collected between 1946 and 1983). All rainfall data was collected from the NC State Climate Office. The graph shows 2000 rainfall totals from January 2000 through November 2000, which includes the growing season for this site. February, March and October exhibit rainfall totals well below the average monthly rainfall totals, while July and November were slightly below. April, May, June and August exhibit above average totals. January and September were within the average range.

## **2.4 Conclusions**

2000 represents the second full growing season that the hydrologic data has been examined. The monitoring gauges on site have shown saturation and inundation for long periods of time. This is expected from a site built as a coastal marsh.

NCDOT representatives delineated the open water at the Casey Tract. Existing open water comprises approximately 1.4 acres of the site. According to the original plan sheets, open water comprised approximately 0.9 acres. This is a gain of 0.5 acres of open water. Although additional area is noted by open water and based on the fisheries benefits of having the channel on-site, the Department would submit to include this area in the calculation of the entire site. This is also consistent with other similar marsh mitigation sites that are currently in place.

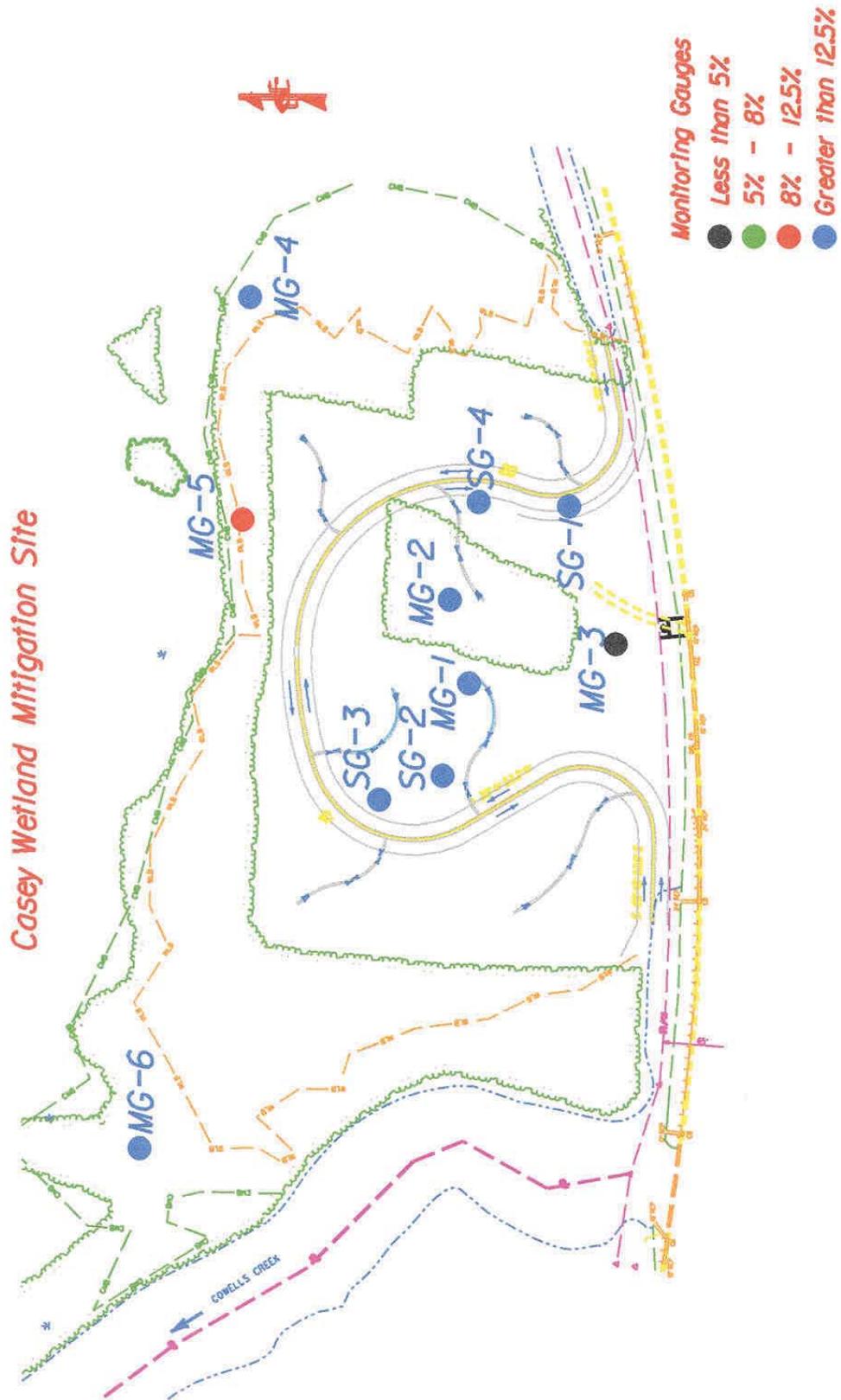
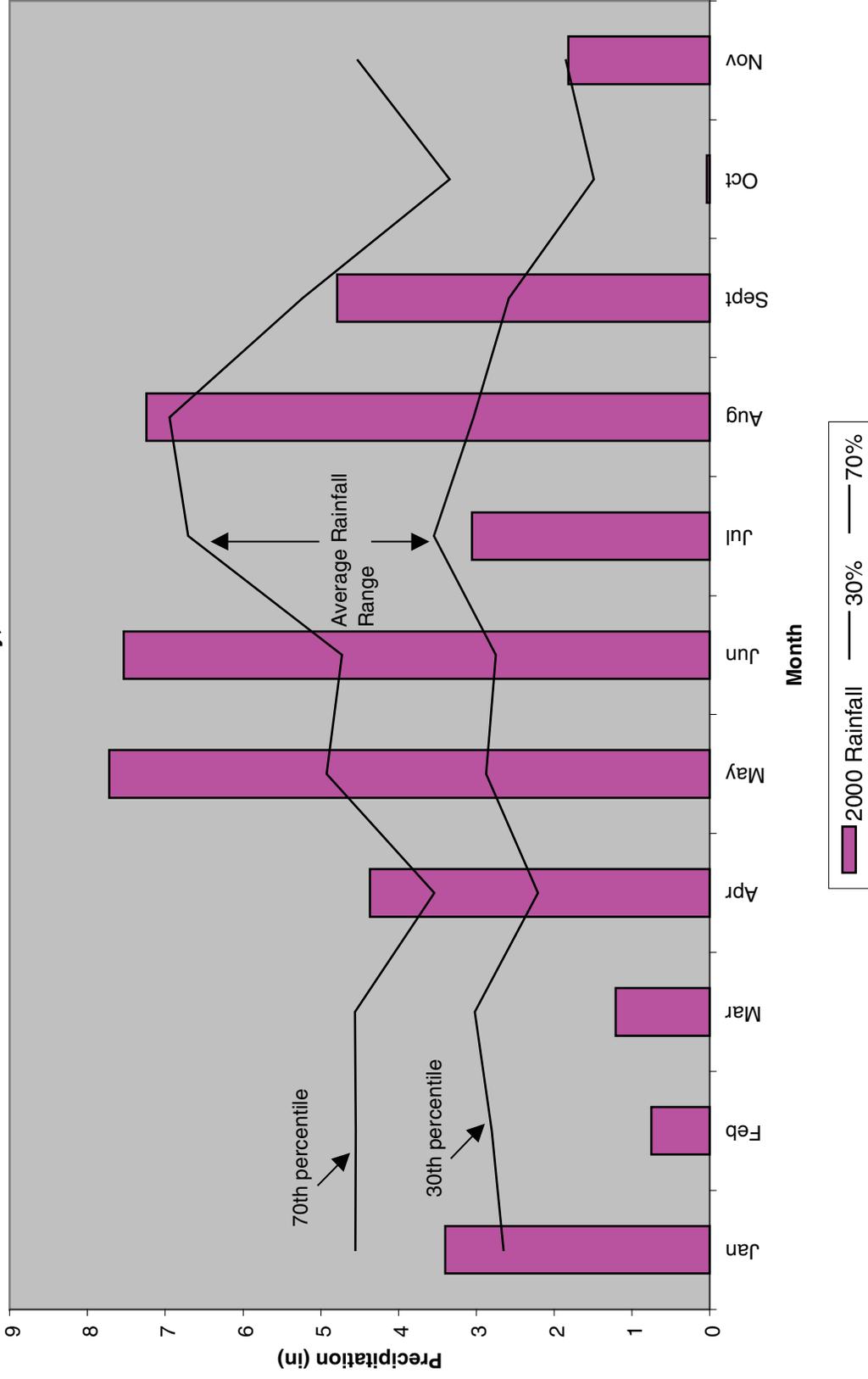


Figure 4  
Hydraulic Monitoring Map

**Figure 5**  
**Casey 30 - 70 Percentile Graph**  
**Elizabeth City, NC**



### 3.0 VEGETATION: CASEY MITIGATION SITE (YEAR 3 OF 5)

#### 3.1 Success Criteria

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) specie.

#### 3.2 Description of Species

The following marsh grass species were planted in the Wetland Restoration Area:

##### Zone 1: (0.63 acres)

*Juncus effusus*, Common Rush

*Scirpus cyperinus*, Woolgrass

##### Zone 2: (3.43 acres)

*Cladium jamaicense*, Saw Grass

*Spartina cynosuroides*, Giant Cordgrass

#### 3.3 Results of Vegetation Monitoring

##### Transects

Zone	Transect	Area Coverage (1 yr)	Area Coverage (2 yr)	Area Coverage (3 yr)
1,2	1P	16.2%	43.7%	68.3%
2	2P	1.8%	7.0%	17.5%
1,2	3P	19.2%	58.3%	51.6%
	<b>AVG/TRAN</b>	<b>12.4%</b>	<b>36.3%</b>	<b>45.8%</b>

**Site Notes:** Three 30 meter transects were established across the mitigation site to include both zones. Along each transect, a 1 meter sample plot was sampled every 6 meters. Transects #1 contained a combination of: sawgrass in all the plots; juncuses and cattails in 2 of the plots; and black willow, scirpus, woolgrass, and smartweed in one of the plots. Transect #2 sample plots contained: sawgrass in two plots; and juncus, scirpus, robustus, cypernerius and smartweed in one plot. The 6m plot is located at the edge of channel and the 0m plot is in open water. Visual observation of the surrounding area indicates transect #2 continues not to be indicative of site. Transect #3 contained: juncus in 4 plots; smartweed in two plots; aster, big cordgrass and cattails in one of the plots. The 6m plot is located at the edge of channel and the 0m plot is in open water. As expected the percentage of coverage has increased.

### Random Plots

ZONE	Plot #	Scale Factor	Juncus effusus, Common Rush	Spartina cyperinus, Woolgrass	Cladium jamaicense, Sawgrass	Spartina cynosuroides, Big cordgrass	Frequency	Notes
2	1	5.0		✓	✓		✓	Pickeral, smartweed
2	2	0.0						Open water
2	3	0.0						Open water
2	4	0.0						Open water
2	5	3.0	✓				✓	Smartweed
2	6	0.0						Open water
2	7	0.0						Open water
2	8	0.0						Open water
1	9	0.0						Foxtail, panicum grass
2	10	5.0	✓	✓			✓	Aster
2	11	5.0		✓			✓	
2	12	0.0						Open water
2	13	0.0						Open water
2	14	3.0	✓				✓	Cattails, vines
2	15	3.0	✓		✓		✓	Aster
2	16	0.0						Open water
2	17	0.0						Open water
2	18	0.0						Open water
2	19	0.0						Open water
2	20	4.0			✓		✓	Smartweed
2	21	0.0						Open water
2	22	0.0						Open water
2	23	0.0						Open water
1	24	2.0		✓			✓	Aster, surface water
2	25	0.5						Other juncus, edge open water
2	26	4.0		✓			✓	
2	27	0.0						Open water
2	28	0.0						Open water
1	29	3.0		✓			✓	Aster, other juncus
2	30	3.0	✓	✓			✓	Pickeral
2	31	0.0						Open water
2	32	0.0						Open water
2	33	0.5						Other juncus, smartweed
2	34	2.0	✓		✓		✓	
2	35	0.0						Open water
2	36	3.0			✓		✓	Smartweed
2	37	0.0						Open water
1	38	3.0		✓			✓	
2	39	3.0	✓				✓	Smartweed
2	40	0.0						Open water
2	41	3.0			✓		✓	Black willow, smartweed
2	42	0.0						Open water
2	43	4.0	✓				✓	
2	44	4.0		✓			✓	Cattails
2	45	5.0		✓	✓		✓	



and is on track for the third year of monitoring. The percent frequency of target species exceeds the minimum requirement and percent coverage continues to increase.

#### **4.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS**

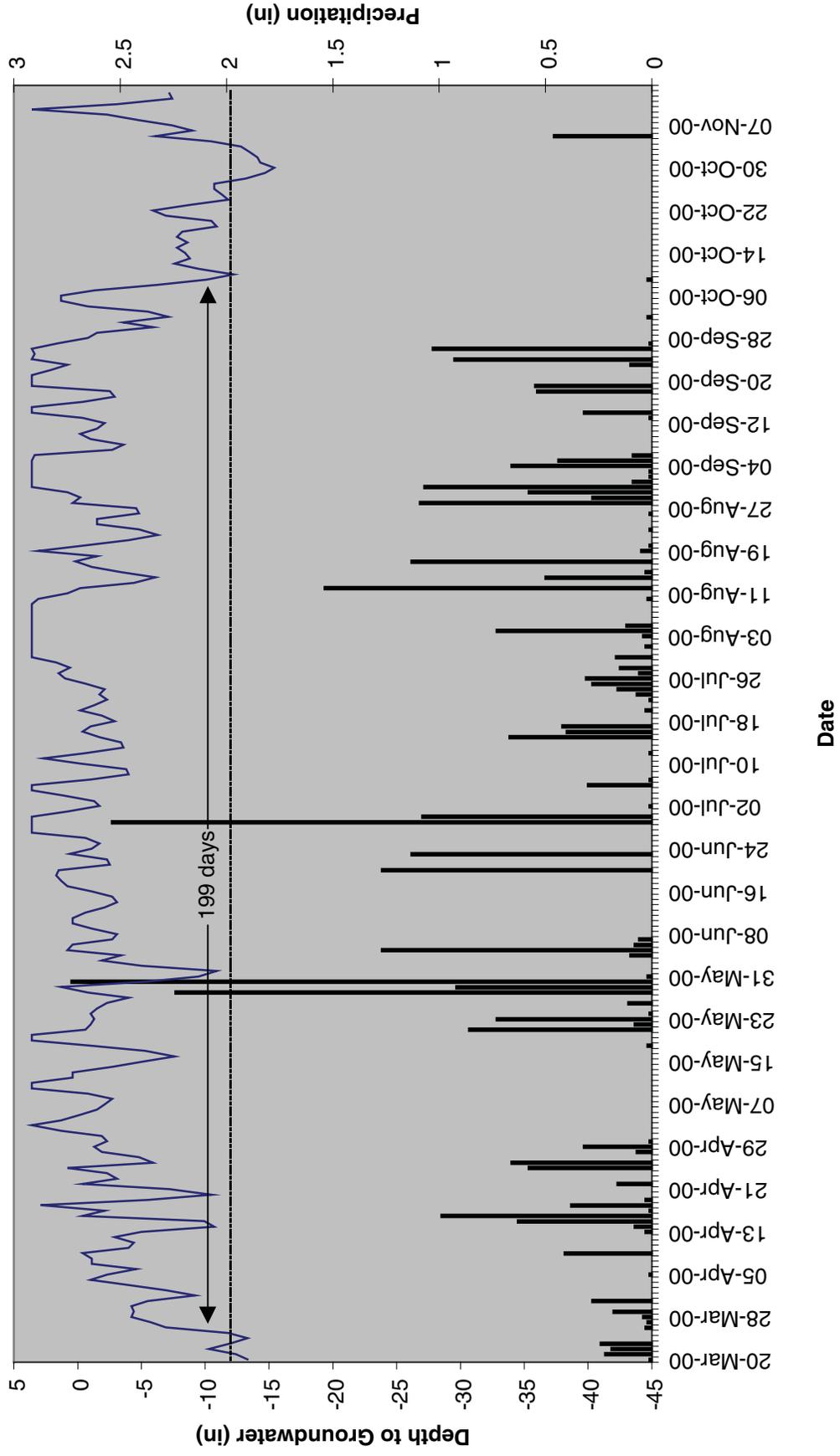
In the second full year of monitoring, four of six monitoring gauges indicated saturation for more than 12.5% of the growing season and one indicated saturation between 8 and 12.5 %. The NCDOT recommends removing monitoring gauge 3 (less than 5% hydrologic success) from the site due to it's location in the upland portion of the site. Vegetation monitoring yielded a percent frequency of target specie of 92.6%.

NCDOT representatives delineated the open water at the Casey Tract. Existing open water comprises approximately 1.4 ac of the site. According to the original plan sheets, open water comprised approximately 0.9 acres. This is a gain of 0.5 acres of open water. Although additional area is noted by open water and based on the fisheries benefits of having the channel on-site, the Department would submit to include this area in the calculation of the entire site. This is also consistent with other similar marsh mitigation sites that are currently in place.

Hydrologic monitoring will continue for a third year, and vegetation monitoring will continue for a fourth year in 2001 at the Casey Tract Mitigation Site.

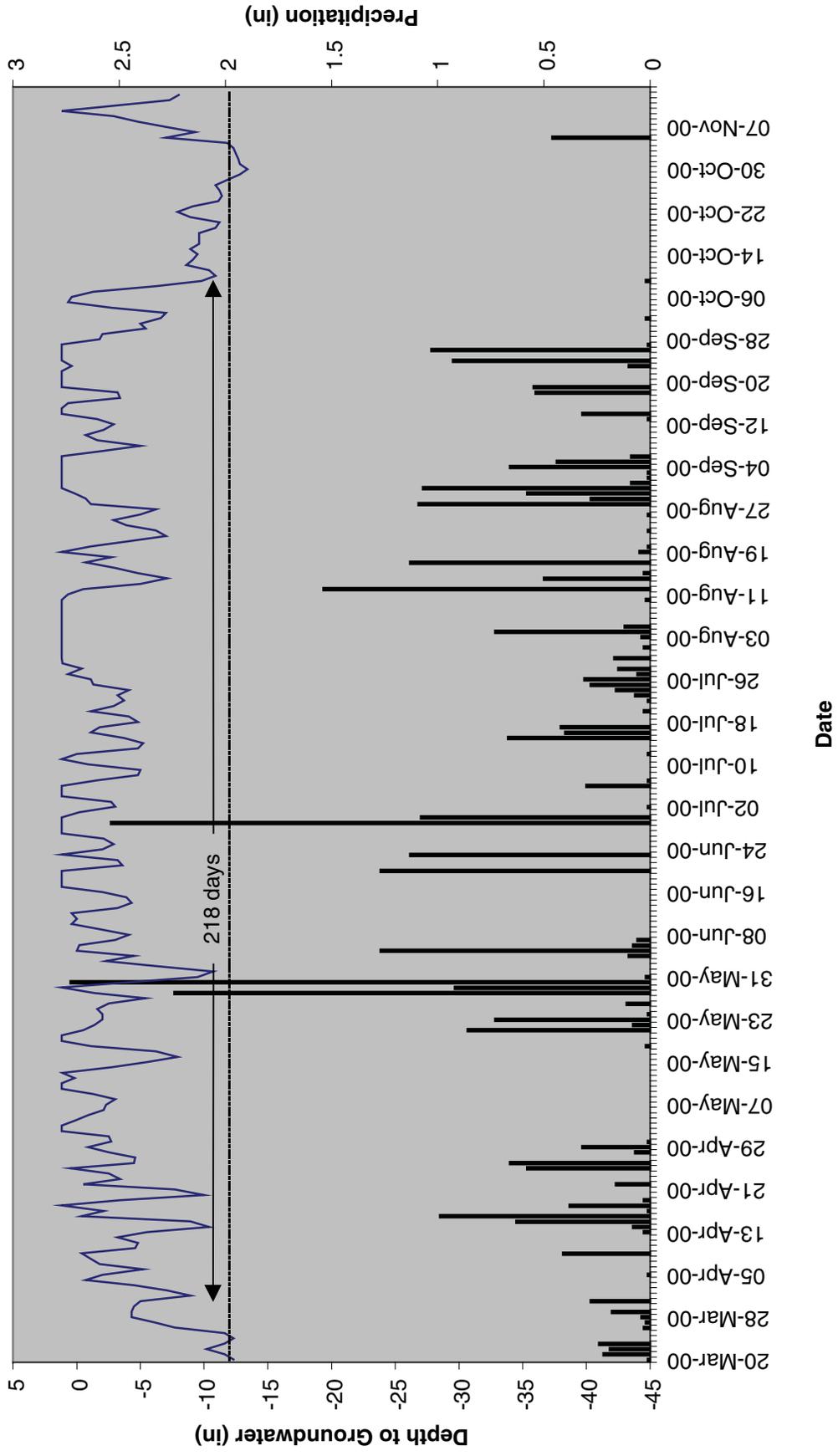
**APPENDIX A**  
**DEPTH TO GROUNDWATER PLOTS**

### Casey Tract Monitoring Gauge MG-1



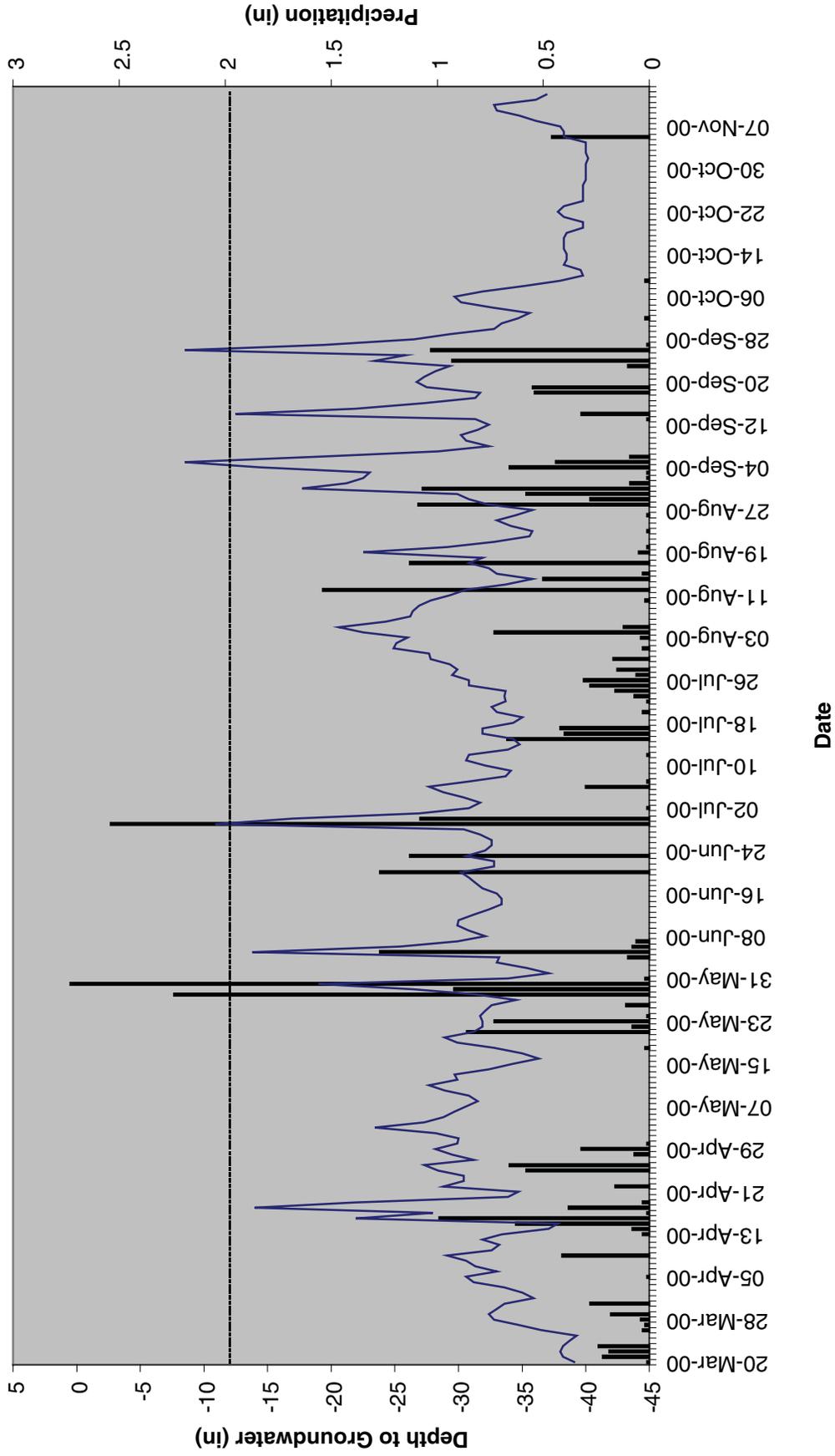
■ Precipitation — MG-1 - - - - Required Depth

### Casey Tract Monitoring Gague MG-2

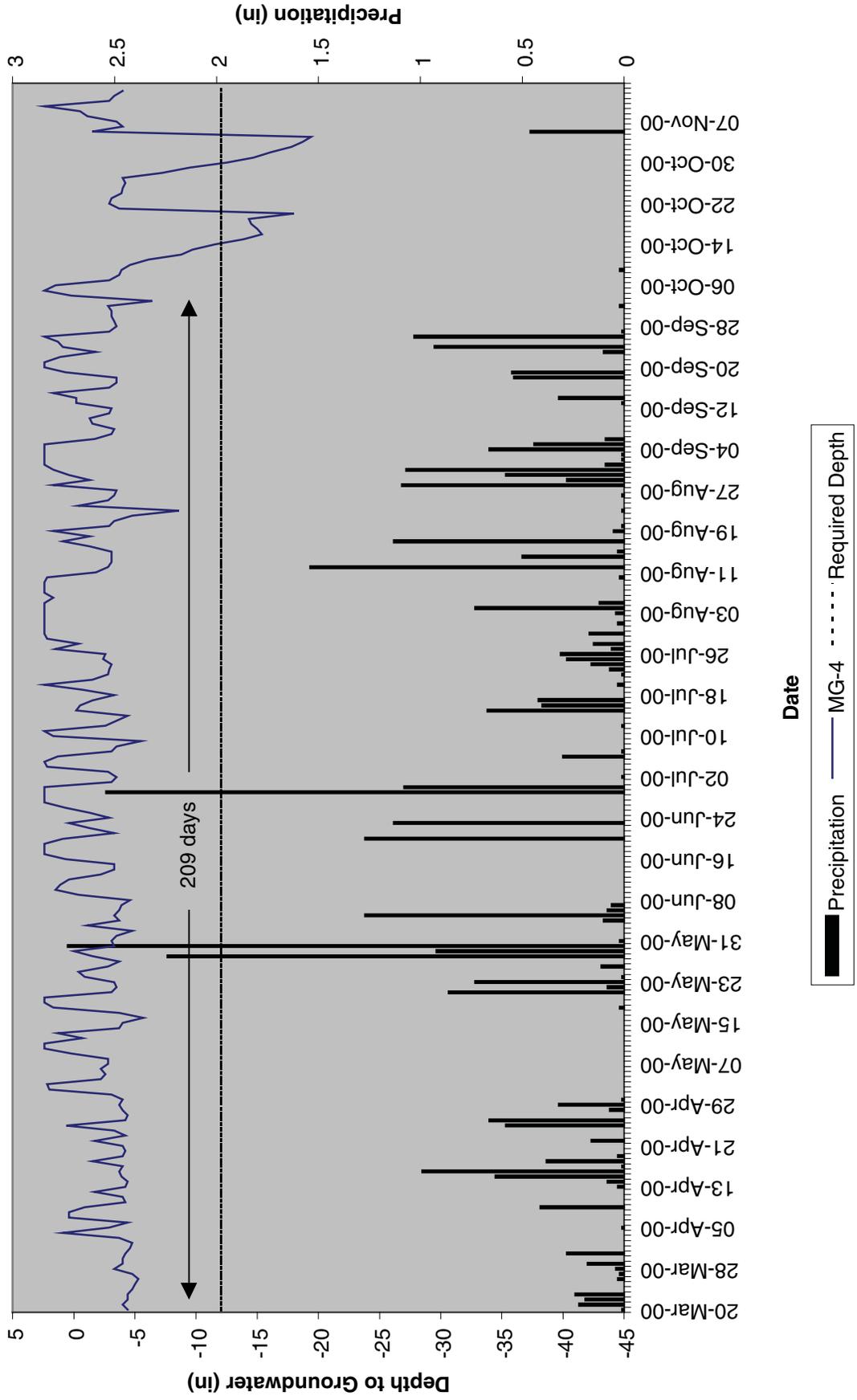


■ Precipitation — MG-2 - - - - - Required Depth

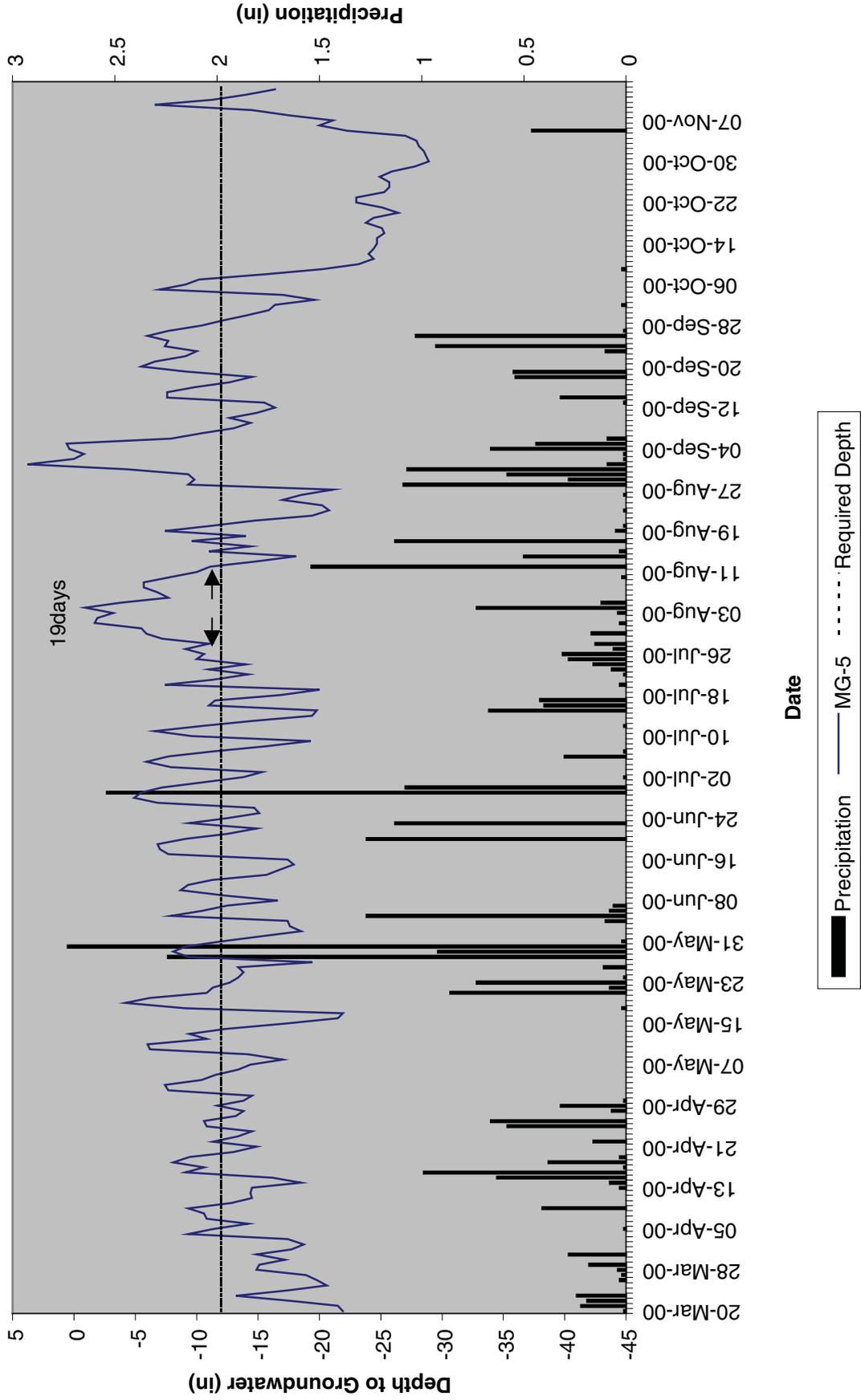
### Casey Tract Monitoring Gague MG-3



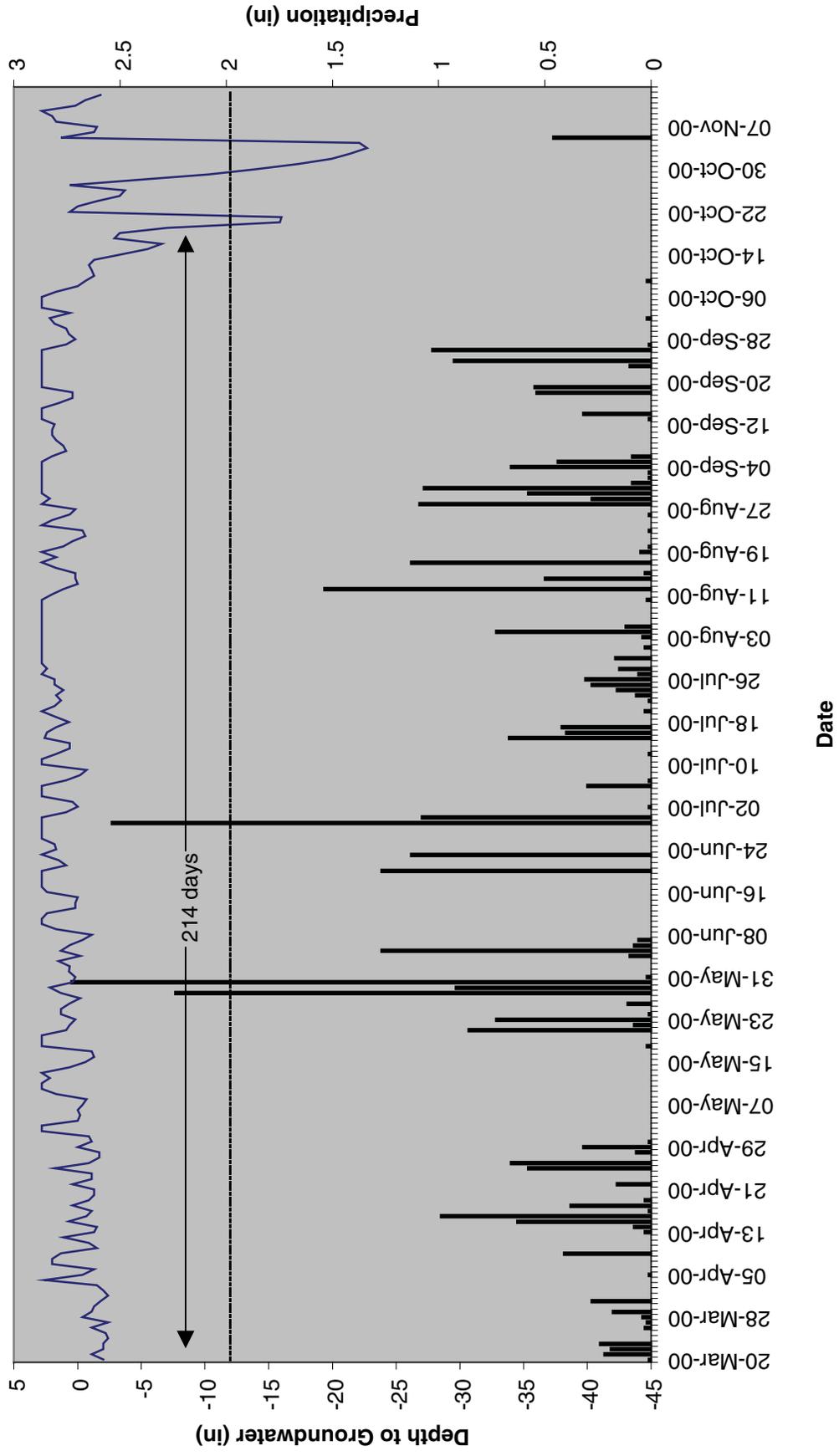
### Casey Tract Monitoring Gauge MG-4



### Casey Tract Monitoring Gauge MG-5

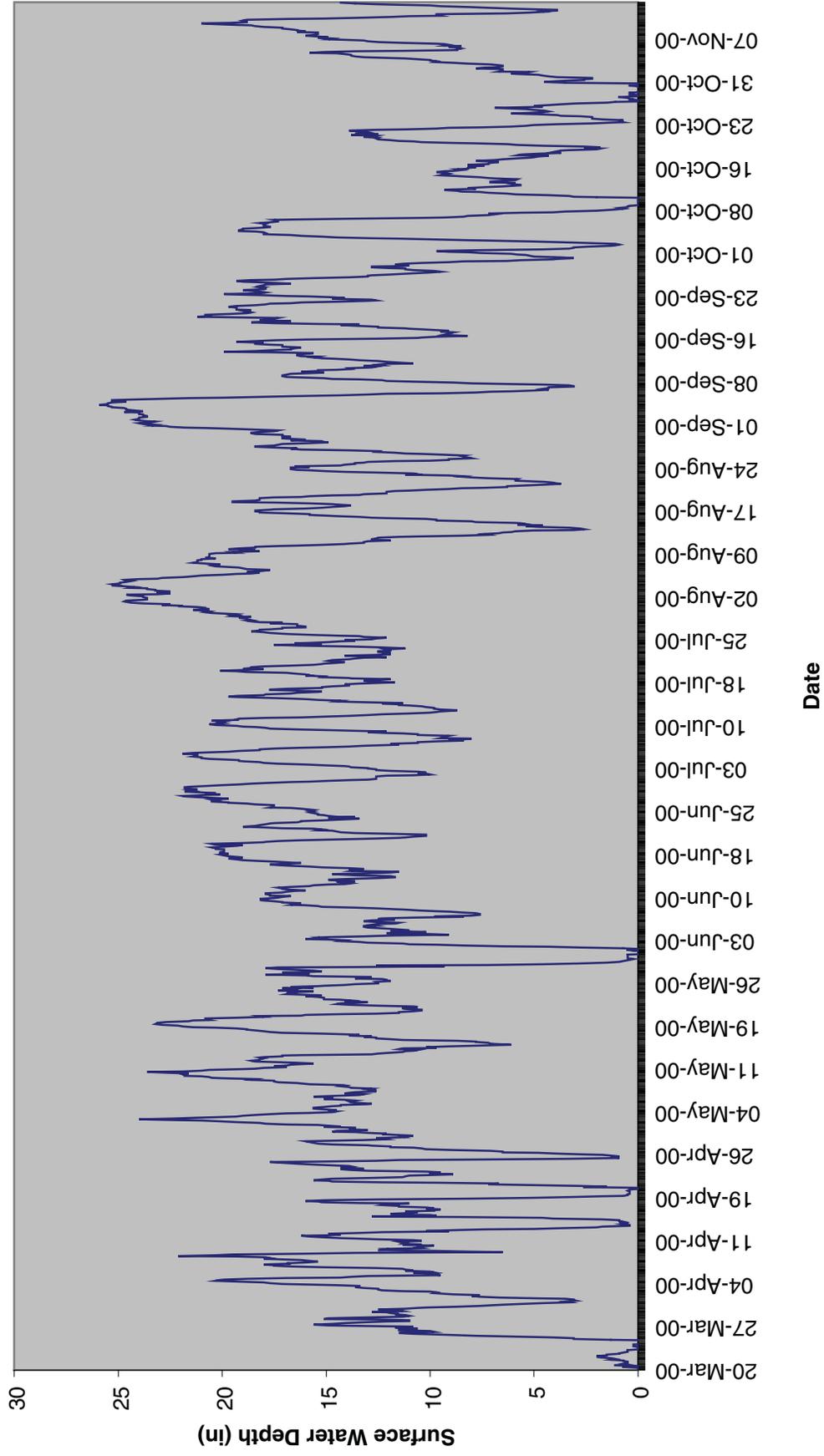


### Casey Tract Monitoring Gauge MG-6



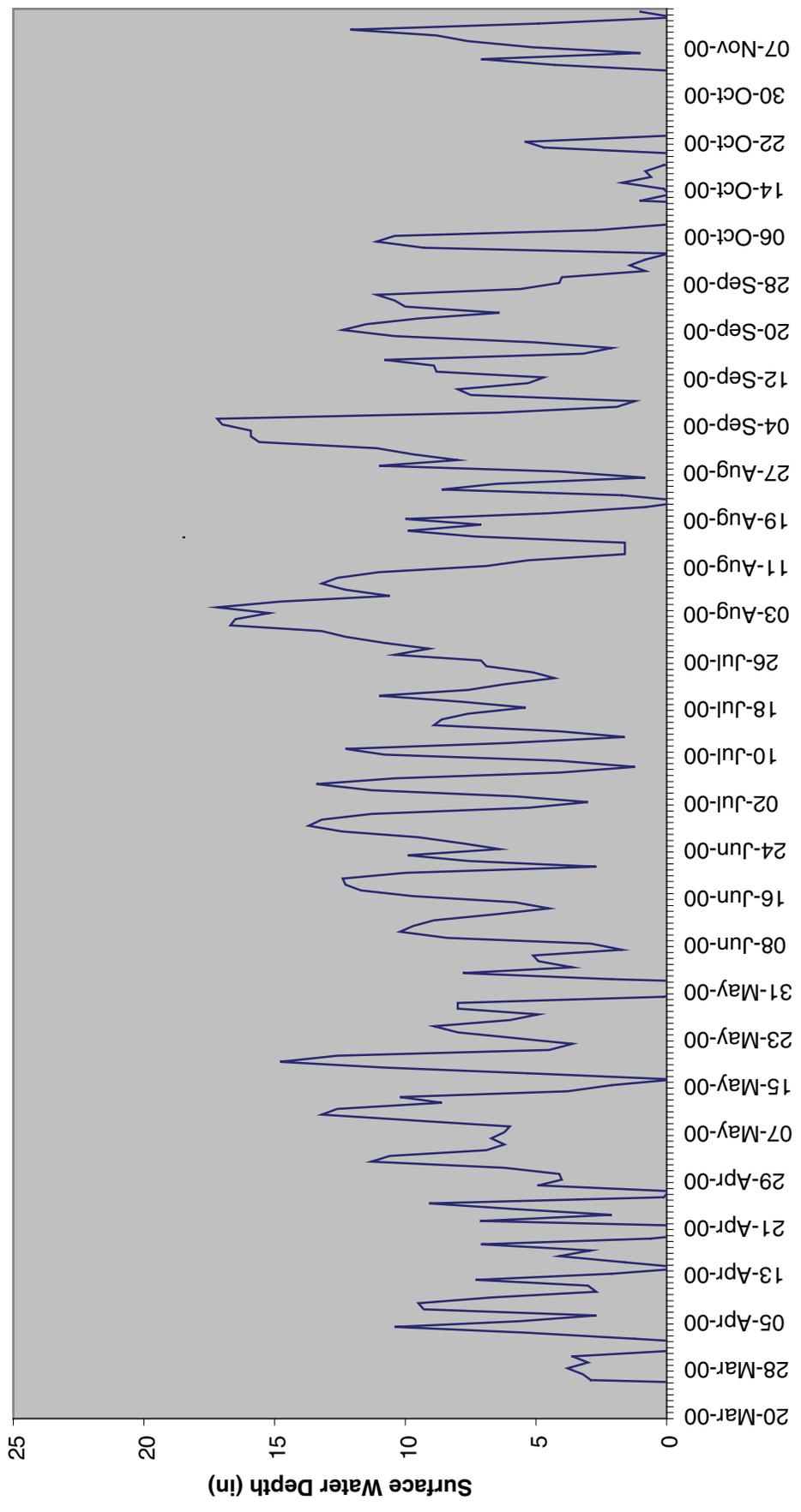
■ Precipitation — MG-6 - - - - - Required Depth

**Casey Tract Surface Gauge 1**



— Surface Water

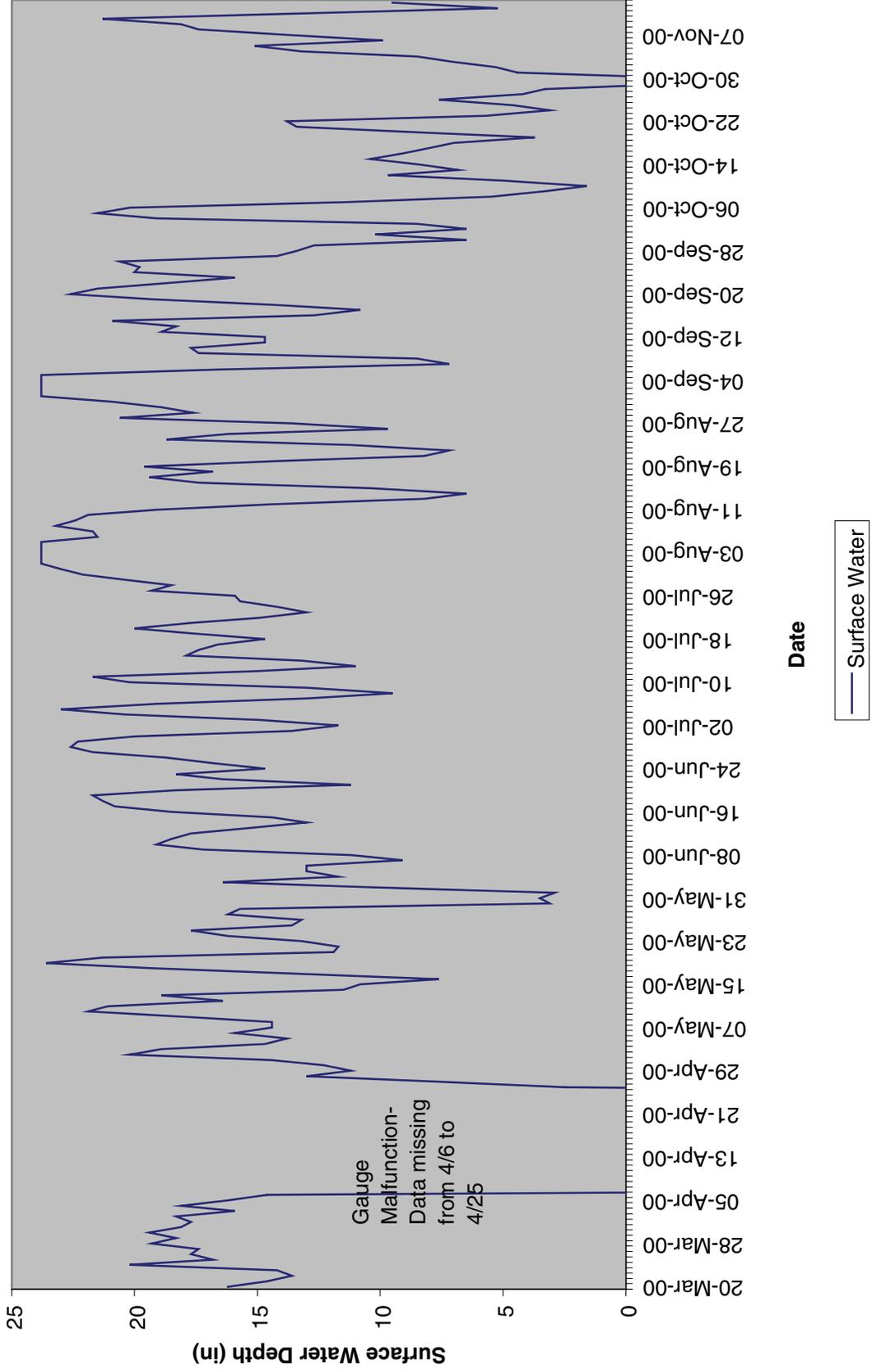
### Casey Tract Surface Gauge 2



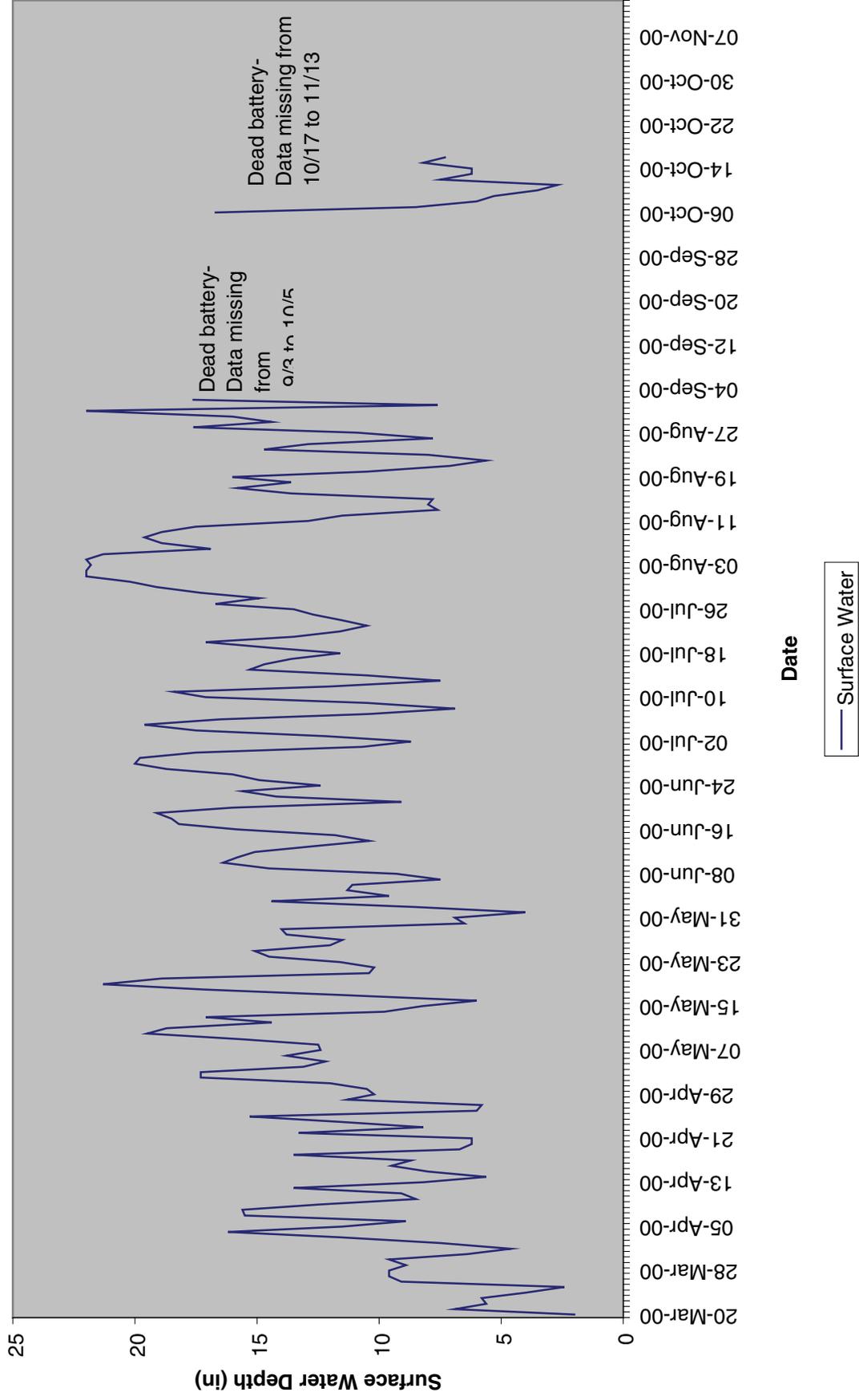
Date

— Surface Water

### Casey Tract Surface Gauge 3



# Casey Tract Surface Gauge 4



**APPENDIX B**  
**SITE PHOTOS**



Photo 1



Photo 2



Photo 3: Grasses within site



Photo 4: Grasses within site



Photo 5: Grasses within site



Photo 6

# Casey



Photo 7



Photo 8

# Casey

