

ANNUAL REPORT FOR 2001

**Friedburg Marsh Mitigation Site
Forsyth County
Project NO. 6.628001T
TIP No. R-2247**

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SUMMARY

The following reports the monitoring activities that have occurred in 2001 at the Friedburg Marsh mitigation site. Friedburg Marsh was constructed in winter of 1999 and spring of 2000. Monitoring activities in 2001 represent the first full year of monitoring following construction. The site must demonstrate hydrologic success during the five-year monitoring period.

Friedburg Marsh is composed of existing wetlands, upland buffer areas, wetland restoration areas, and wetland creation areas. A total of 12 groundwater monitoring gauges are installed in the site. There are no permanent vegetation plots.

Hydrologic data indicate that all of the Friedburg Marsh gauge locations met the hydrology success criteria during the 2001 growing season. Periods of inundation/saturation lasted from 8.8 to 64.0 percent of the growing season. Higher than normal rainfall in March may have influenced the duration of inundation/saturation.

The daily rainfall depicted on the well data graphs is obtained from the NC Climate Office, Greensboro Airport weather station. The historical rainfall data used in the 30-70 graph was also obtained from the NC Climate Office, Greensboro Airport weather station.

Monitoring will continue through the 2005 growing season.

1.0 INTRODUCTION

1.1 Project Description

The Friedburg Marsh mitigation site, located in southern Forsyth County (Figure 1), is the easternmost known location (in North Carolina) for the bog turtle (*Clemmys muhlenbergii*). The southern population of bog turtle is federally listed as a Threatened Species due to Similarity of Appearance. Due to the diverse wetland communities at this marsh, the Piedmont Land Conservancy and the North Carolina Natural Heritage Program consider the site a regionally significant natural site. The Friedburg Marsh Mitigation Plan calls for the preservation and enhancement of the existing wetland habitat as well as restoration and creation of additional bog turtle habitat.

The Friedburg Marsh mitigation site consists of existing wetlands (3.8 acres), upland buffer (38 acres), and wetland restoration/creation areas (5.7 acres). The restoration/creation areas were constructed in 1999/2000 to increase hydrology and improve bog turtle habitat. Construction activities involved filling ditches, constructing ditch plugs, grading to reflect groundwater profiles, removing invasive woody vegetation, and installing a new outlet for the upper pond area. No vegetation planting was conducted.

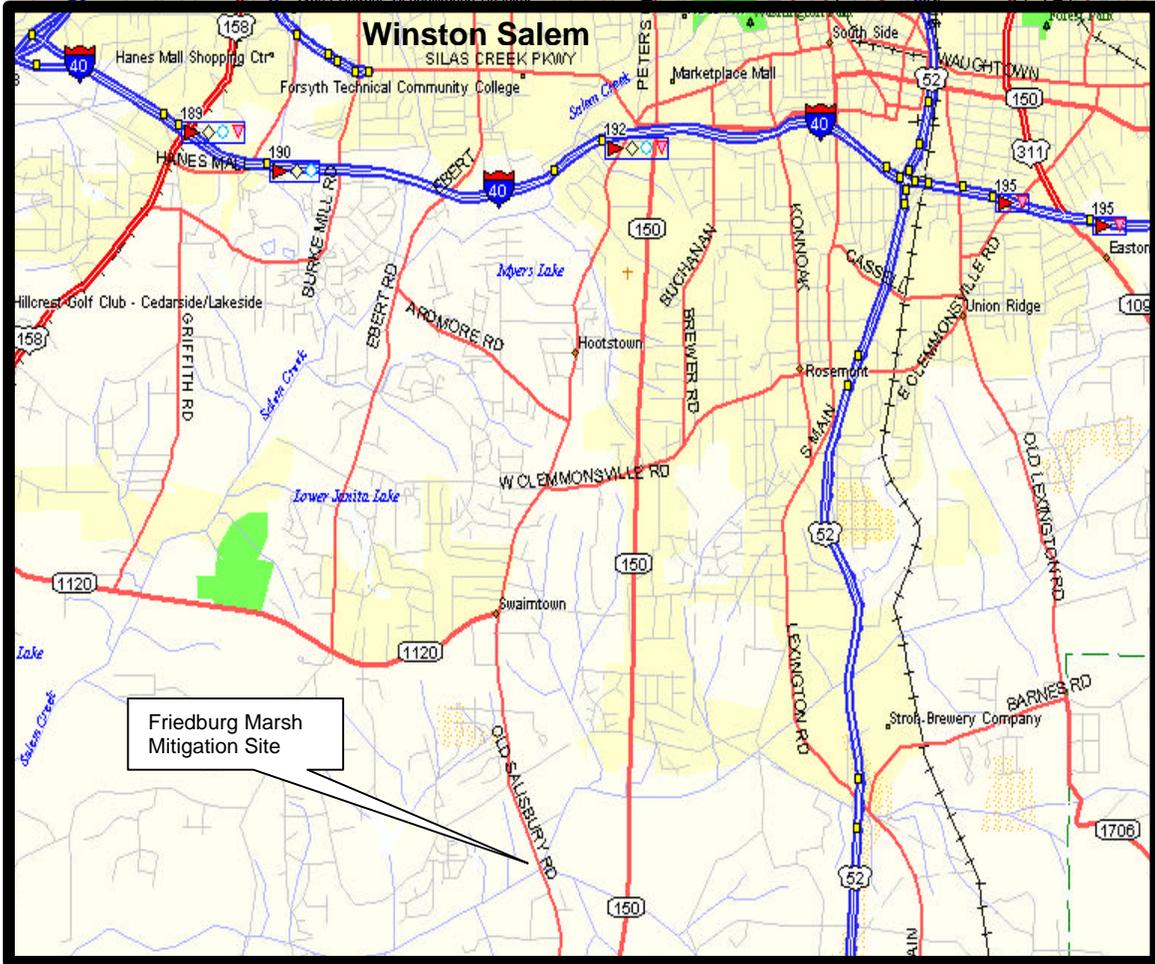
Friedburg Marsh is located in the Muddy Creek portion of the Yadkin River basin. This site was created to offset wetland impacts associated with the Winston-Salem Outer Loop (TIP No. R-2247).

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic criteria must be met during the five years of monitoring. The following report details the results of hydrologic and vegetative monitoring during the year 2001 at the Friedburg Marsh mitigation site.

Year 2001 is the first full year of monitoring following site development in 2000. Included in this report are analyses of hydrology and vegetation monitoring results as well as local climate conditions throughout the growing season.

Figure 1. Friedburg Marsh Vicinity Map



1.3 Project History

May 1997	Feasibility Study Conducted
November 1997	Site Purchased by NCDOT, Initial Monitoring Wells Installed
1999	Mitigation Plan Developed
Winter-Spring 2000	Grading and Construction
March 2000	Additional Monitoring Wells Installed
March-November 2001	Hydrology Monitoring

2.0 HYDROLOGY

2.1 Success Criteria

The success criteria for hydrology states that wetland hydrology will be established when water inundates or saturates (within 12 inches of the surface) the mitigation area consecutively for 5.0 percent of the growing season.

The growing season in Forsyth County begins March 28 and ends 10 November (228 days). These dates correspond to a 50 percent probability that temperatures will drop to 28F or lower after March 28 and before 10 November (Soil Survey of Forsyth County, 1976, p63). The 5.0 percent of the growing season stipulated in the success criteria translate to 12 consecutive days of inundation or saturation.

Local rainfall must be within normal limits to qualify hydrology as successful.

2.2 Hydrologic Description

RDS WL40 and WL20 units record all groundwater and surface water data (Figure 2). Depth to groundwater is recorded daily at 7:00 AM. The RDS units are downloaded in the field on a monthly basis. In November 1997 six groundwater gauges were installed at Friedburg Marsh to monitor pre-construction hydrology and develop a mitigation plan, of which one gauge location (2139CD) was installed to record surface water and groundwater depths. Following construction six additional groundwater gauges were installed, of which one gauge location (2139BB) was installed to record surface water and groundwater depths.

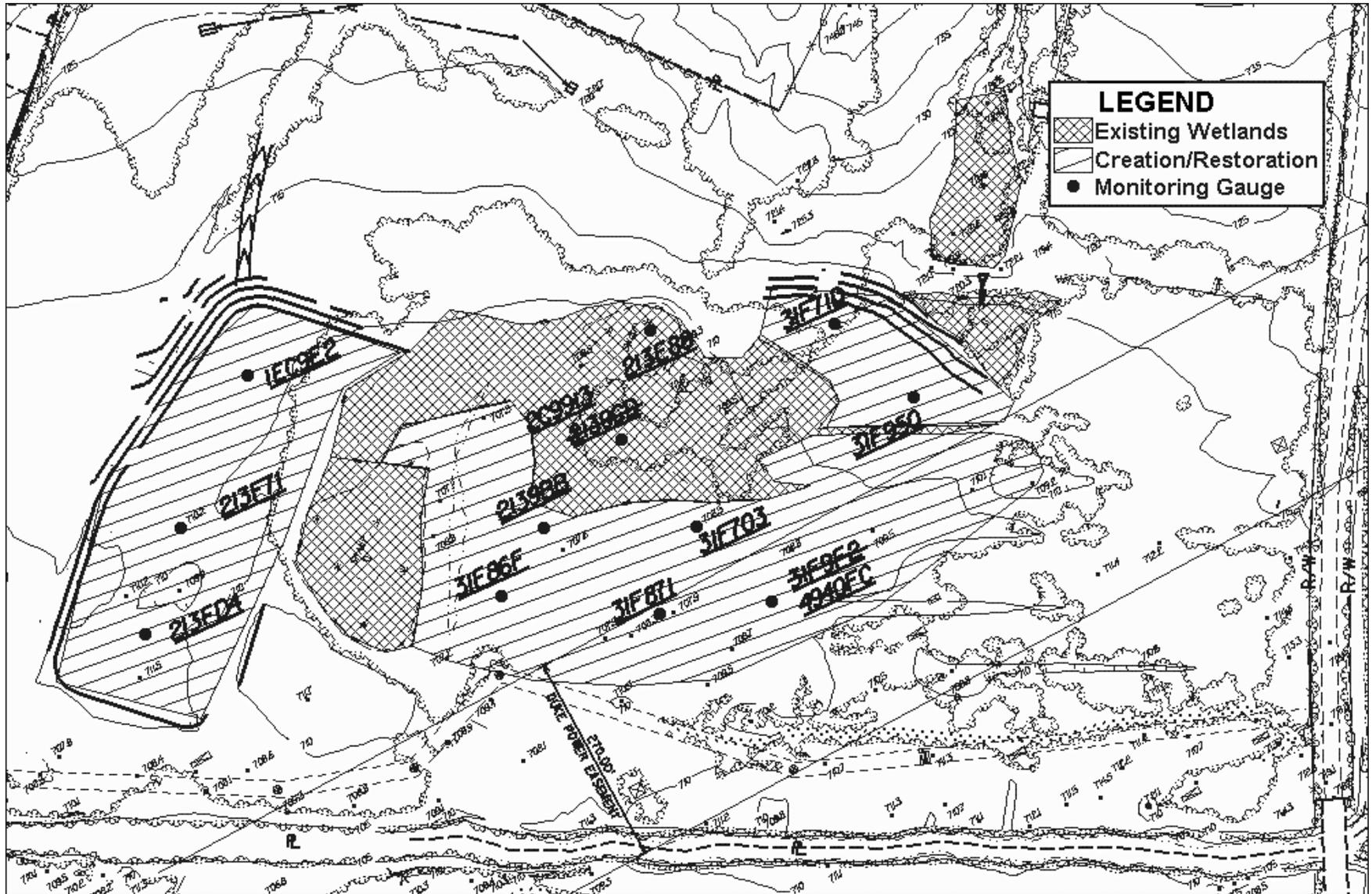
All rainfall data is obtained from the NC Climate Office. The nearest weather station is the Greensboro Airport, approximately 20 miles east-northeast of Friedburg Marsh.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was then converted into a percentage of the 228 day growing season. The results are presented in Table 1 and Figure

Figure 2. Friedburg Marsh Monitoring Gauge Location



3. Additionally, Appendix A contains a plot of the groundwater depth for each gauge. The maximum number of consecutive days and percentage of growing season of inundation/saturation is noted on each plot.

The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data provided by the NC Climate Office.

Although not being specifically monitored, the riser in the old pond wetland area is leaking slowly. Also, when the old pond is inundated, water is escaping over the old dam to the east of the riser. Water that should be leaving via the riser and entering a restoration/creation area is instead being diverted into an upland area.

Table 1. Hydrologic Monitoring: Friedburg Marsh Mitigation Site

Monitoring Gauge	<5%	5% - 8%	8% - 12.5%	>12.5%	Actual %	Success Dates
1EC9E2				✓	63.6	Mar. 28 – 19 Aug.
2139BB				✓	43.0	Mar. 28 – Jul. 3
2139CD/ 2C9913				✓	24.6	Mar. 28 – 22 May
213E88				✓	64.0	Mar. 28 – Aug. 20
213F71			✓		9.6	Mar. 28 – Apr. 18
213FD4			✓		8.8	Mar. 28 – Apr. 16
31F703				✓	32.5	Mar. 28 – Jun. 9
31F71D				✓	15.8	Mar. 28 – May 2
31F86F				✓	41.7	Mar. 28 – 30 Jun.
31F871				✓	31.6	Mar. 28 – Jun. 7
31F950			✓		10.1	Mar. 28 – Apr. 19
31F9F2/ 4940FC				✓	18.9	Mar. 28 – May 9

Hydrologic data indicates that the site meets the hydrologic criteria. All monitoring gauge locations were continuously inundated or saturated for more that 5 percent (12 days) of the growing season.

Specific Problems:

2139CD: Data was lost due to an unknown malfunction from May 23 to June 21, when 2C9913 was installed in that location.

2C9913: Data was lost due to battery failure from October 8 to November 1.

- 31F86F: Data was lost due to battery failure from November 5 to November 30.
- 31F9F2: Data was lost due to an unknown malfunction from July 12 to November 1, when 4940FC was installed in that location.

2.3.2 Climatic Data

Figure 4 represents an examination of year 2001 rainfall in comparison with historical rainfall data in order to determine whether 2001 was “average” in terms of precipitation. The historical rainfall data was collected from 1968 through 1997 (30 years). All rainfall data was collected from the NC Climate Office, Greensboro Airport weather station.

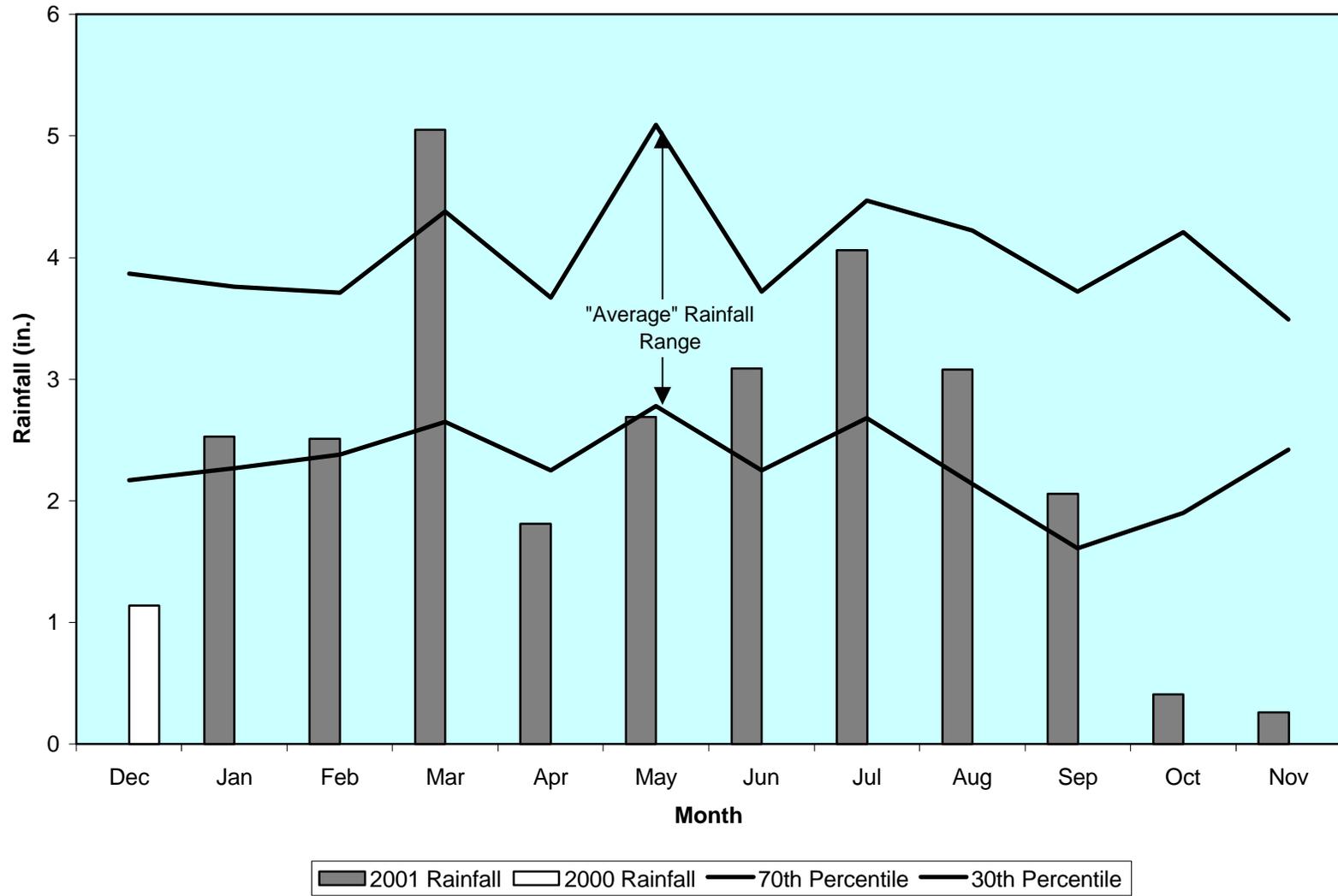
The monthly rainfall totals for the period of December 2000 through November 2001 are shown in Figure 4. The data for this period shows rainfall within average limits for six months (January, February, June, July, August, and September), and below average limits for four months (December, April, October, and November). March rainfall was 0.67 inches above the average limit. The observed cumulative rainfall of 28.69 inches is far below the 30-year average rainfall range of 38.43 to 45.47 inches.

2.4 Conclusions

The year 2001 is the first growing season that the monitoring gauges have been in place post construction. All Friedburg Marsh gauge locations exceeded the five percent hydroperiod criteria. Above average rainfall in March certainly contributed to this success but several gauge locations exhibited inundation and saturation well into the summer. Gauge locations with shortened hydroperiods (below 12.5 percent) were located in creation areas where compacted soil may be preventing infiltration. The installation of surface water gauges in these areas may demonstrate that inundation is occurring.

Hydrologic monitoring of the Friedburg Marsh mitigation site will continue through the 2005 growing season.

Figure 4: Friedburg Marsh 30-70 Percentile Graph, Forsyth County, NC



3.0 VEGETATION

No planting of trees or herbaceous species was undertaken as part of the Friedburg Marsh mitigation. As a result, no quantitative vegetation monitoring is required. Qualitative observations of common species have been made in conjunction with hydrologic monitoring.

A fence was set around the perimeter of the site. Eastern red cedar trees were planted as a perimeter screen on the west side of the site by a new subdivision known as Saponi Village and along the east side of the site by Old Salisbury Road. NCDOT seeded erosion control areas on March 2001. On April 2001, NCDOT mowed and cut areas on site and sprayed multiflora rose at the request of Dennis Herman.

Wetland plants dominate the restoration areas. Commonly occurring species in the restoration areas are spikerush (*Eleocharis obtusa*), pickerelweed (*Pontederia cordata*), Bulrush (*Scirpus cyperinus*), and rush (*Juncus coriaceus*). These areas were consistently inundated or saturated from the start of the growing season through the summer months.

The creation areas lack the consistent hydrology of the restoration areas and upland plant species are more common. Species in the creation areas are foxtail grass (*Setaria glauca*), broomsedge (*Andropogon virginicus*), beggar's ticks (*Bidens frondosa*), and barnyard grass (*Echinochloa crusgalli*). The presence of upland species in these areas does not affect the overall quality of bog turtle habitat at Friedburg Marsh. These areas were commonly inundated following rain events but did not exhibit long periods of inundation or saturation.

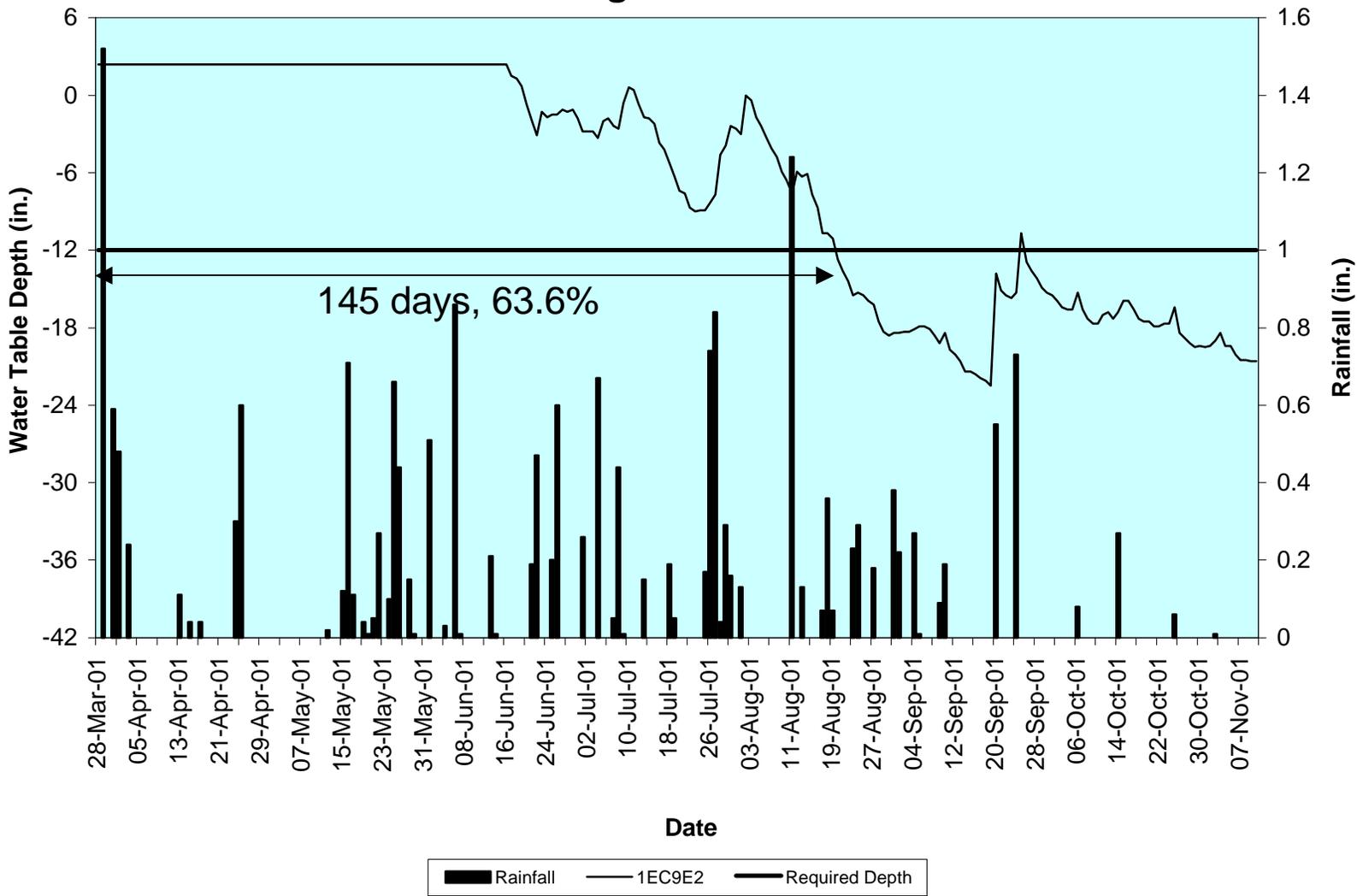
4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

- All groundwater and surface water gauges in Friedburg Marsh met the hydrologic success criteria.
- Additional surface water gauges may more accurately reflect periods of inundation.
- The riser and dam elevation of the old pond wetland area should be repaired to increase hydrologic input to the restoration/creation areas.
- Vegetation in the restoration areas is dominated by wetland plant species.
- Vegetation in the creation areas is currently dominated by upland plant species.
- NCDOT will continue to monitor the site for hydrologic success.

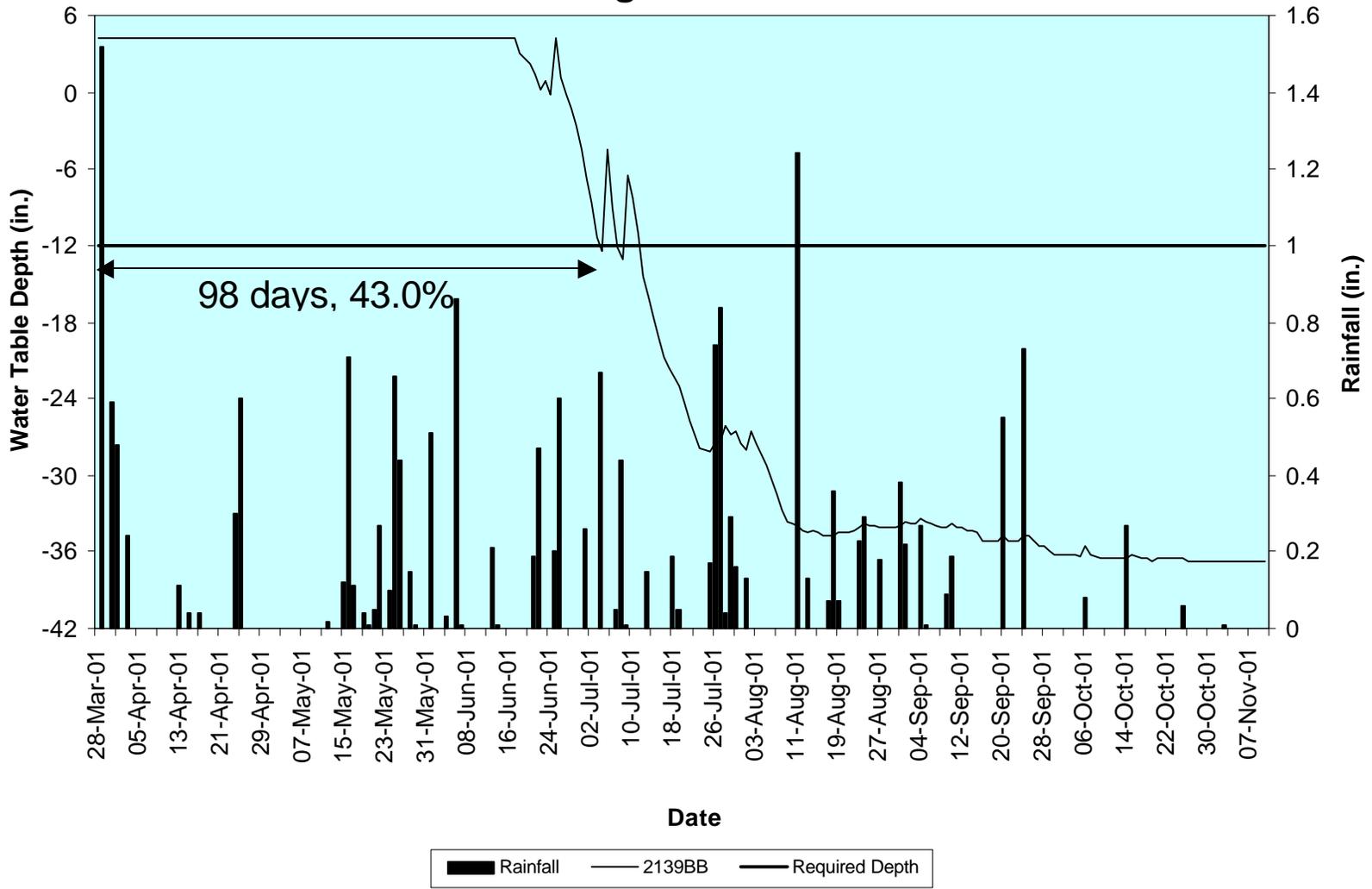
APPENDIX A

DEPTH TO GROUNDWATER PLOTS

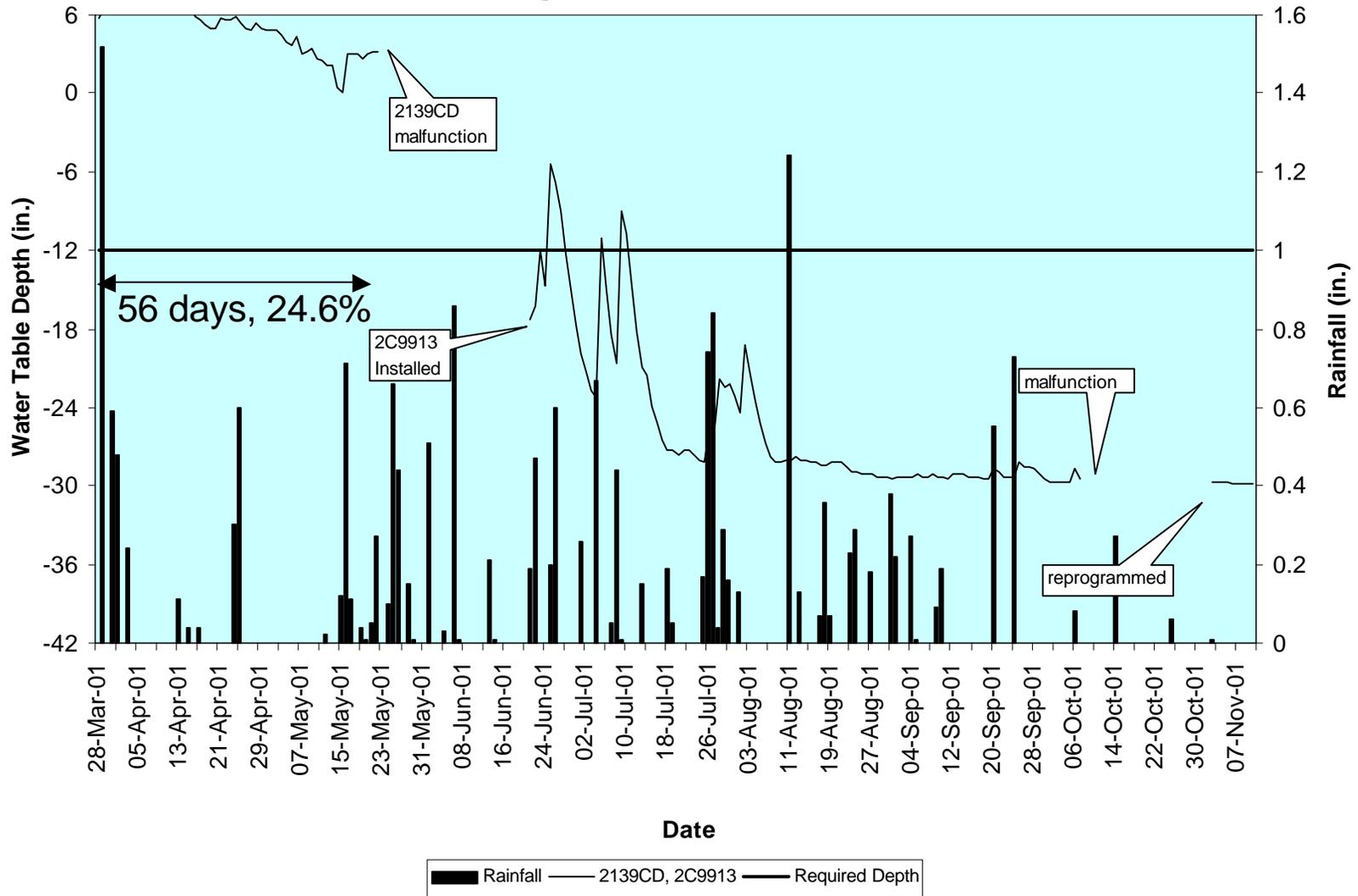
Friedburg Marsh 1EC9E2



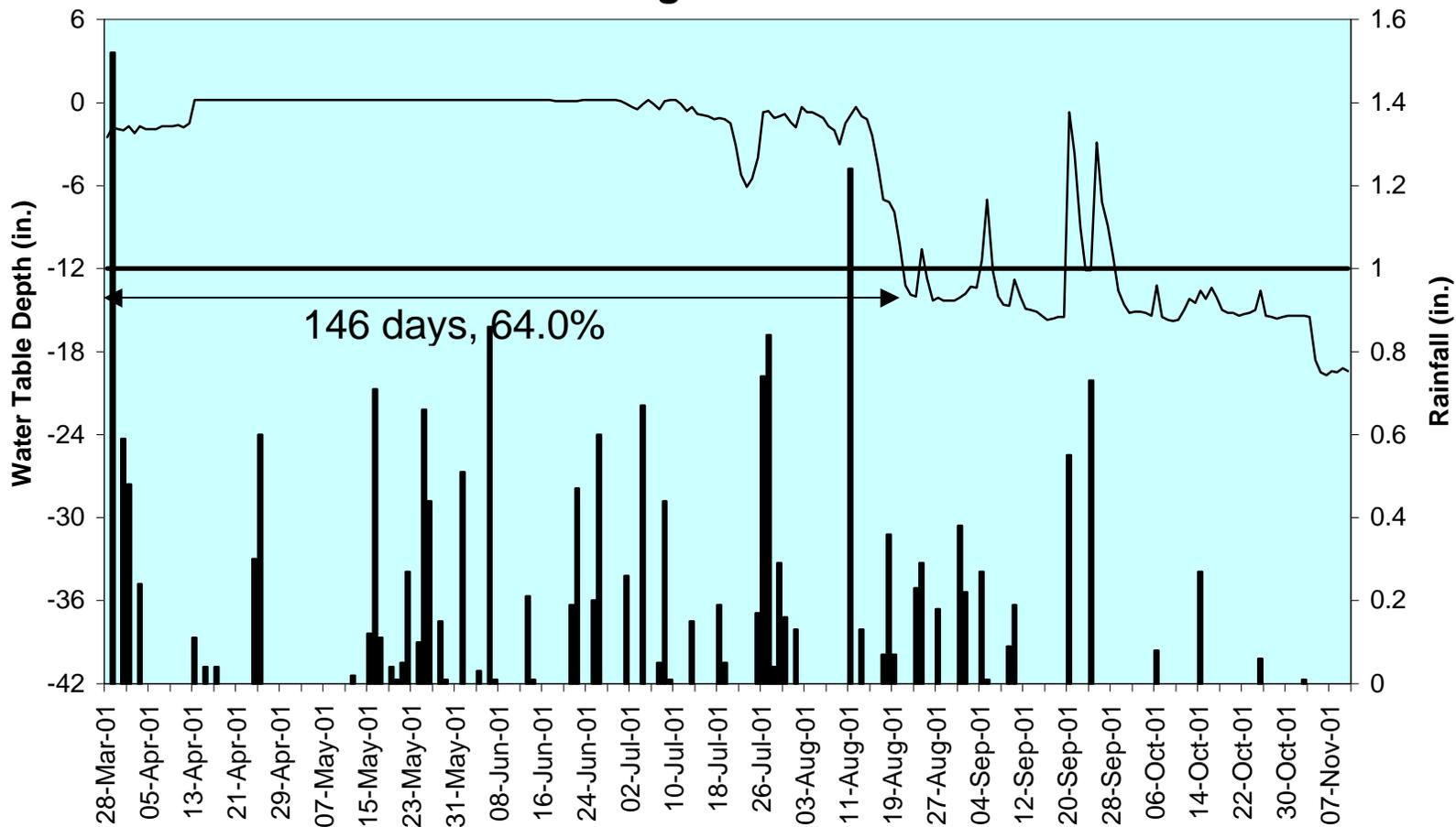
Friedburg Marsh 2139BB



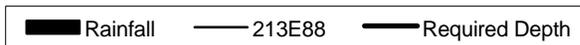
Friedburg Marsh 2139CD, 2C9913



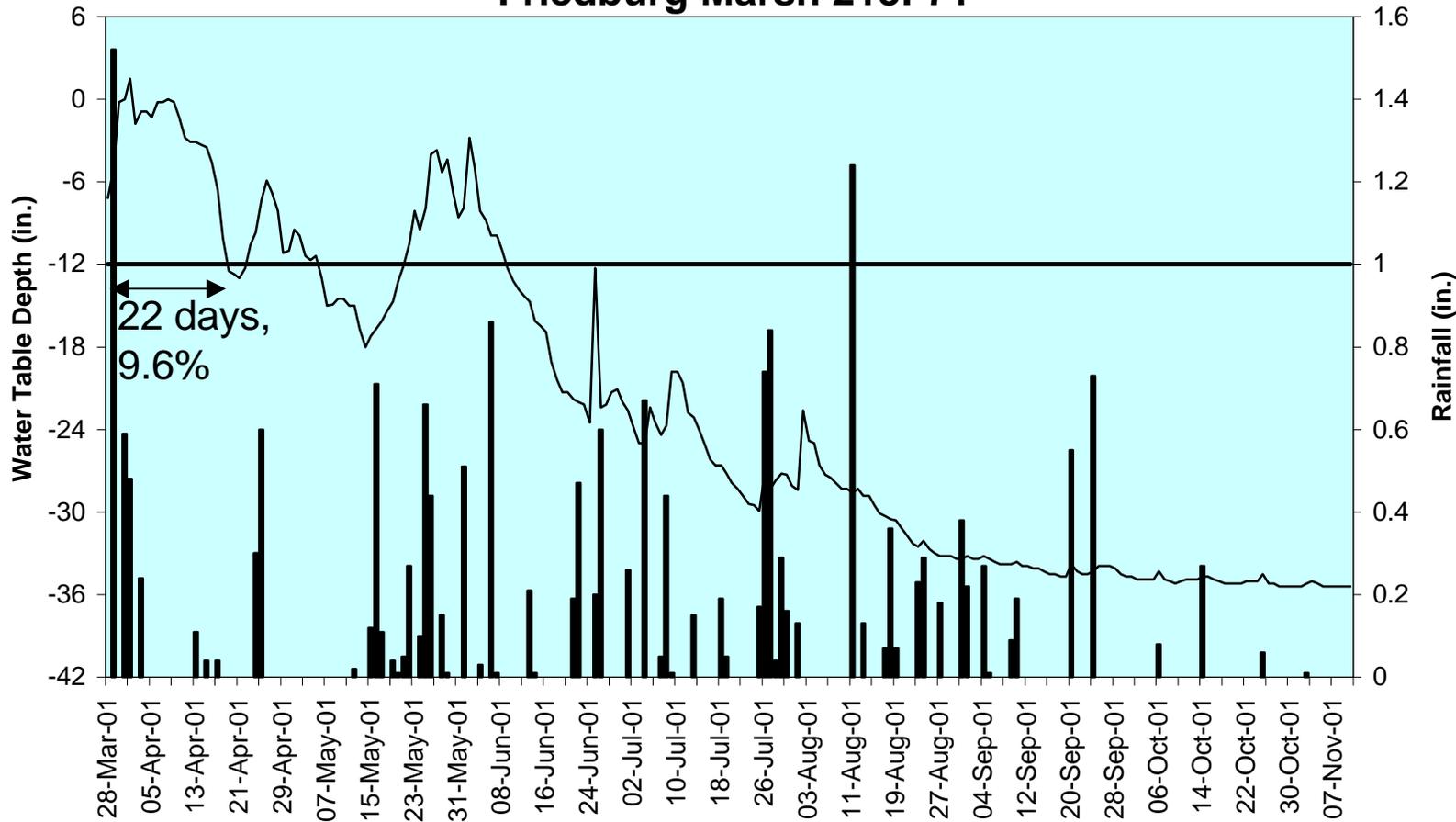
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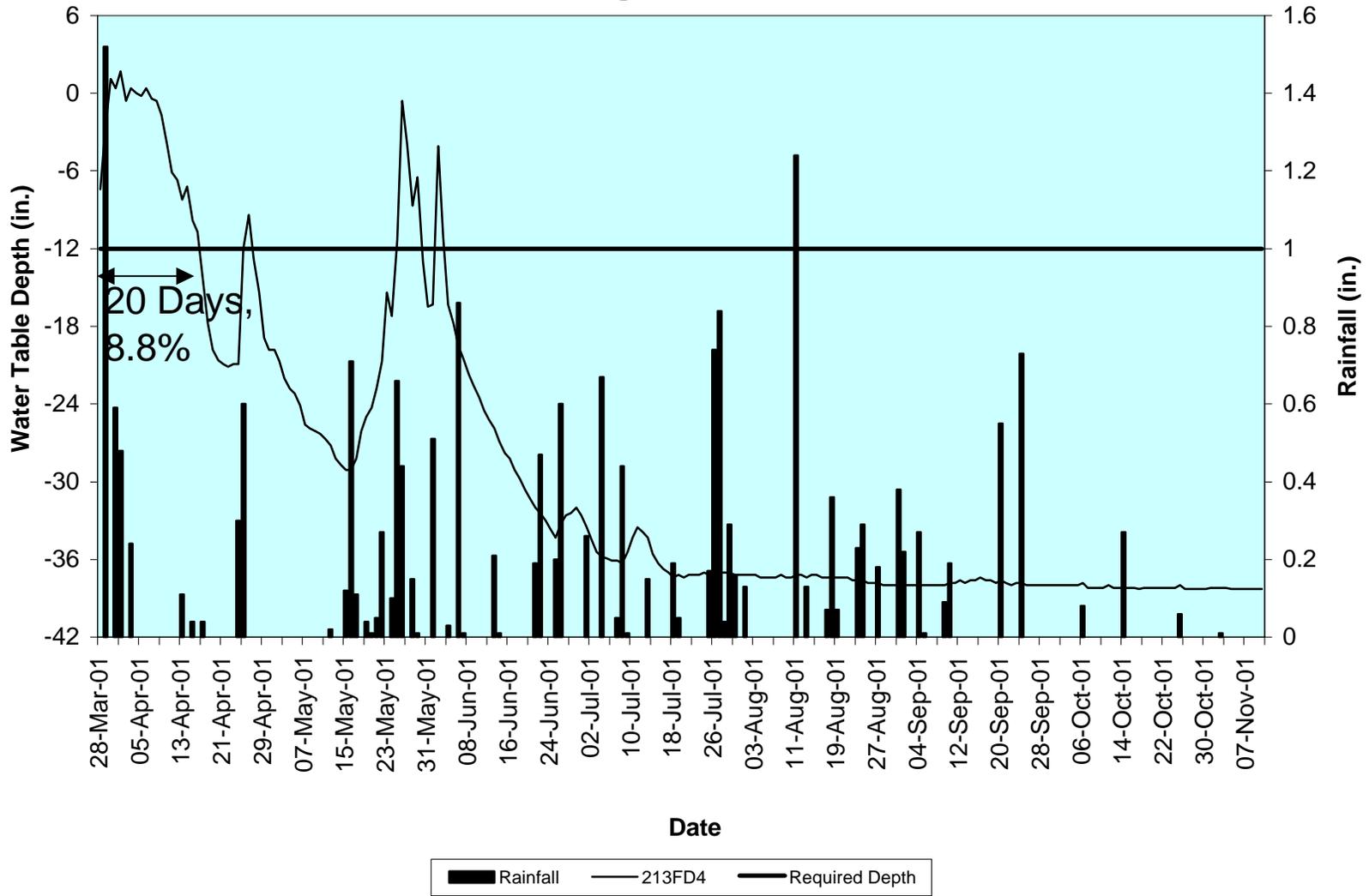
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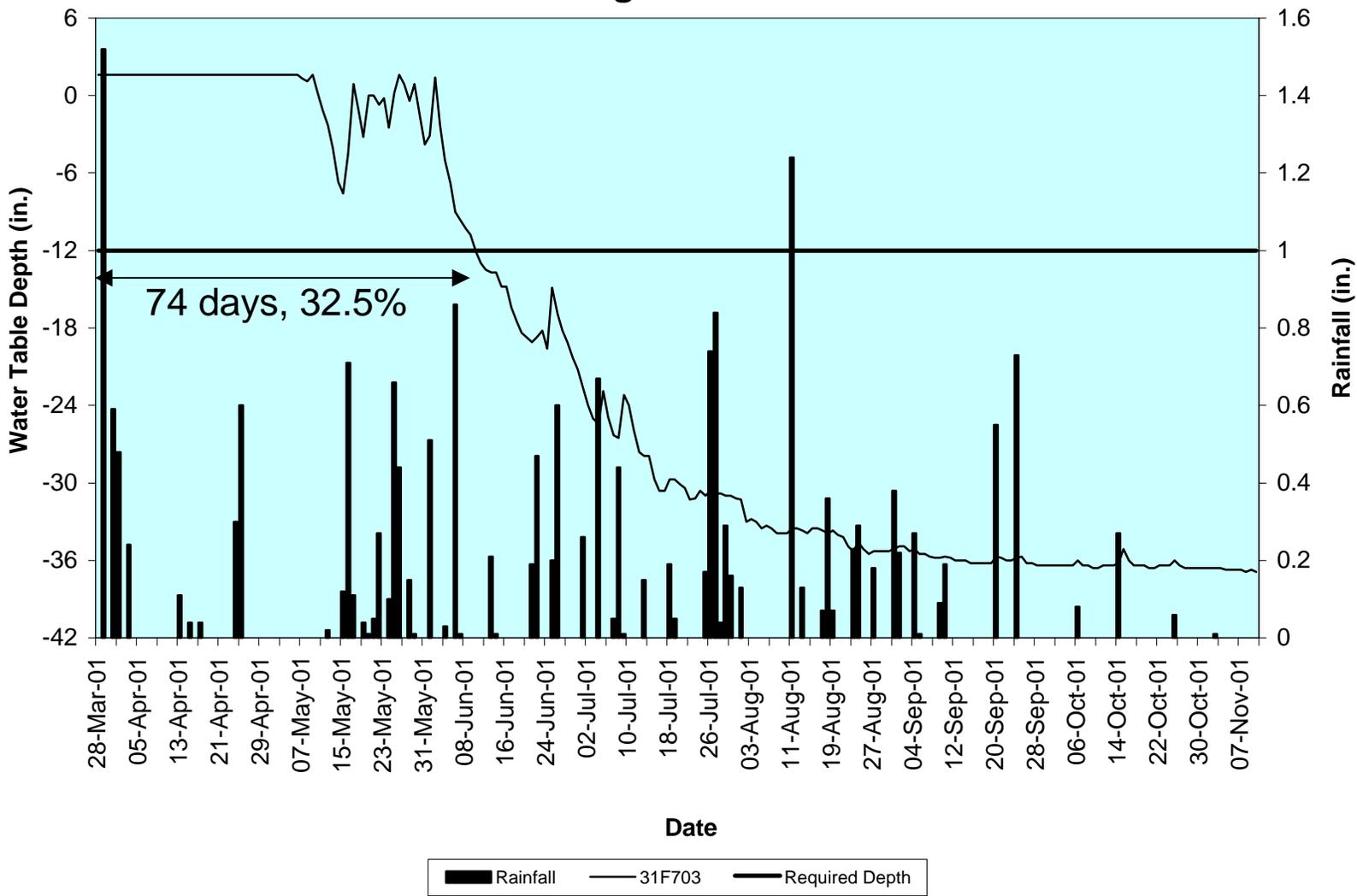
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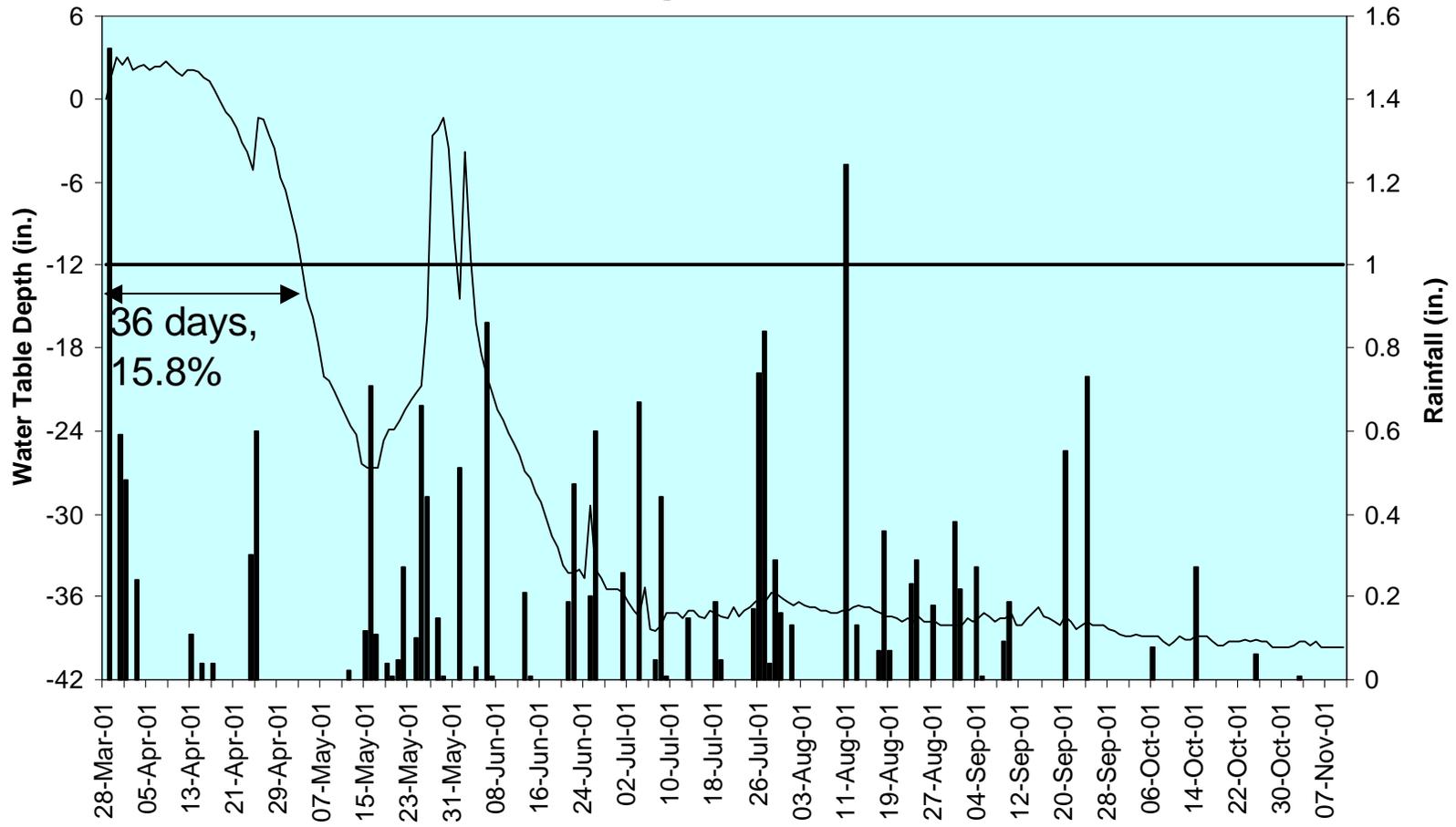
Friedburg Marsh 213FD4



Friedburg Marsh 31F703



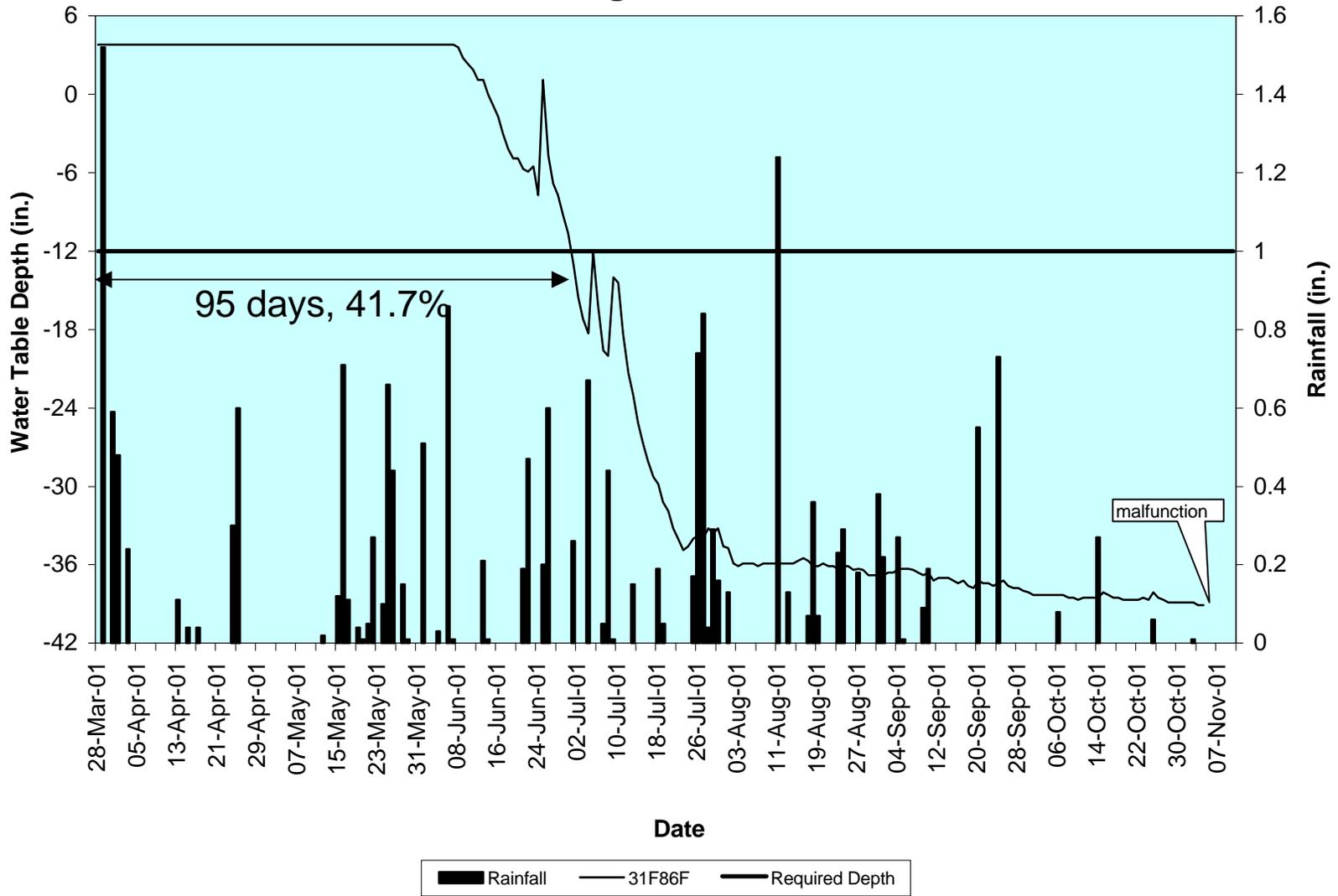
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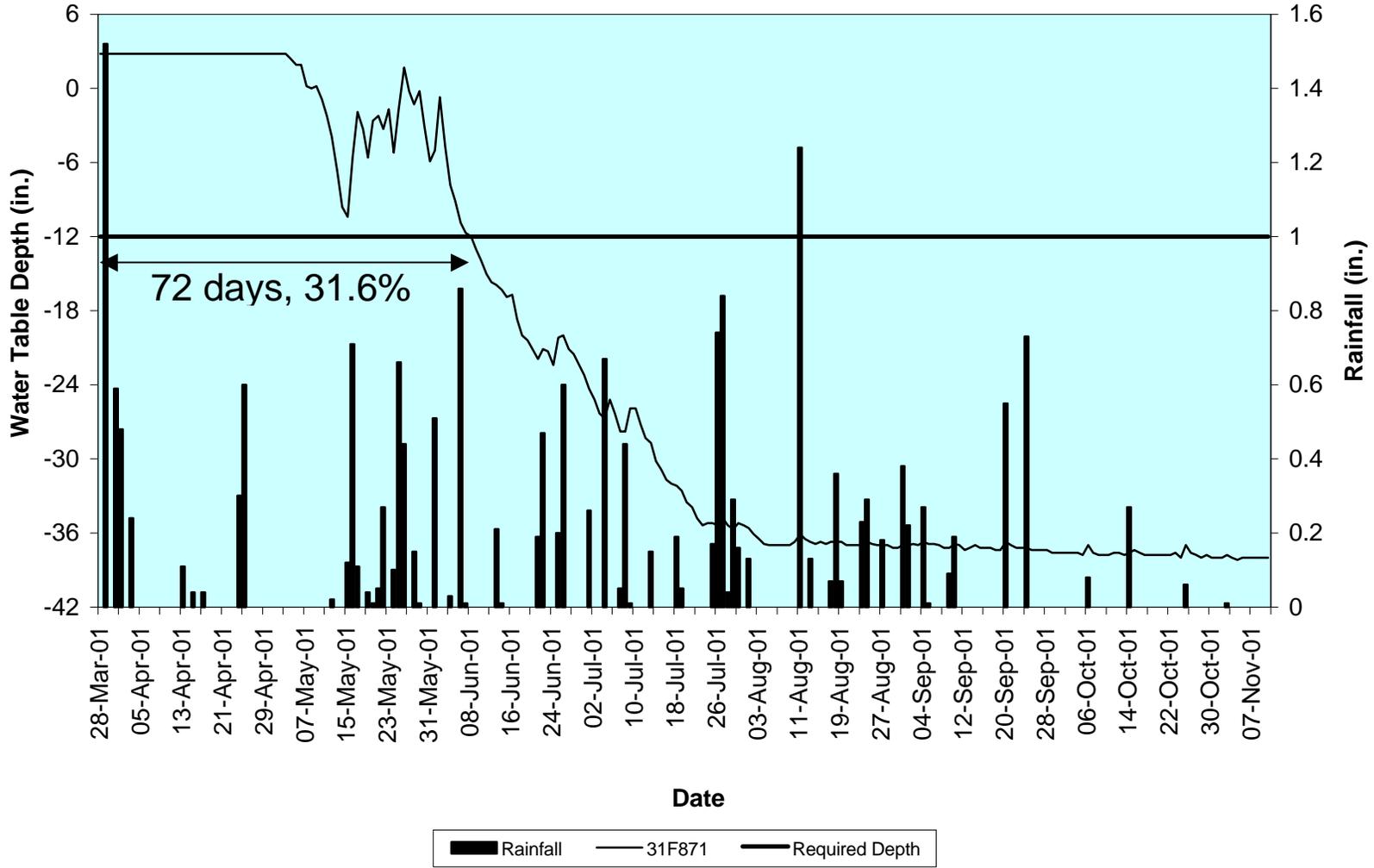
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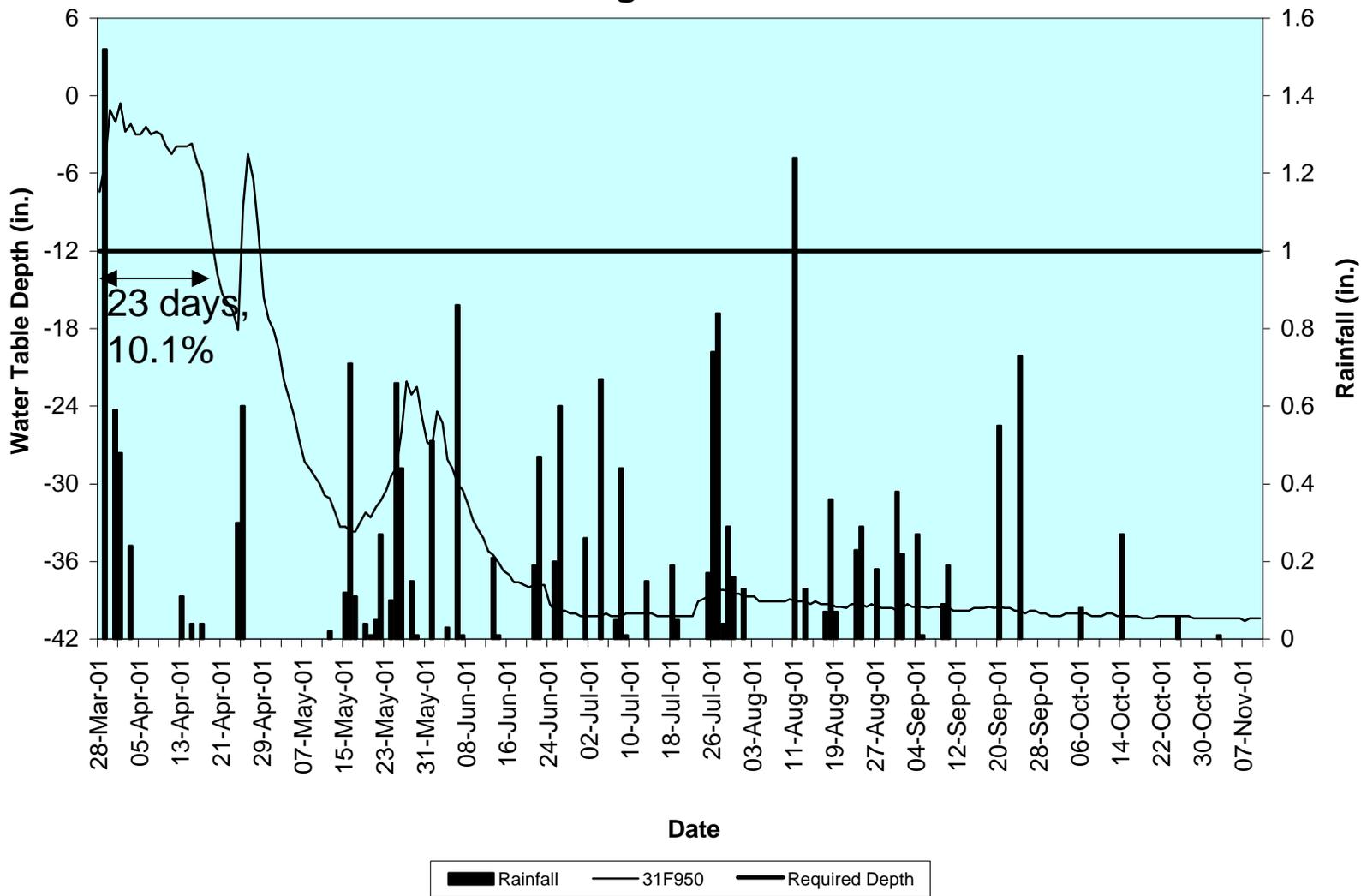
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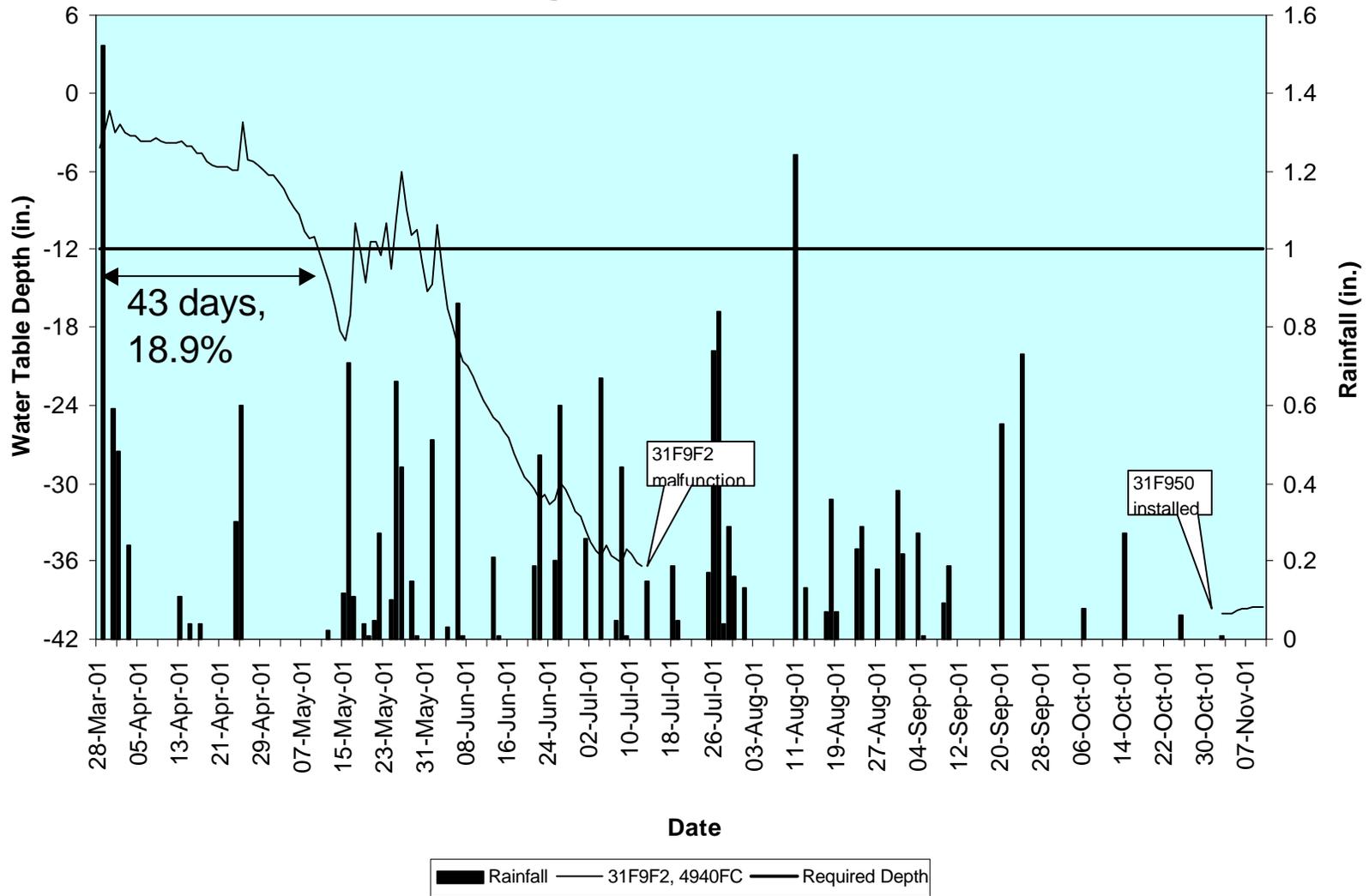
Friedburg Marsh 31F871



Friedburg Marsh 31F950



Friedburg Marsh 31F9F2, 4940FC



APPENDIX B

Site Photos



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11