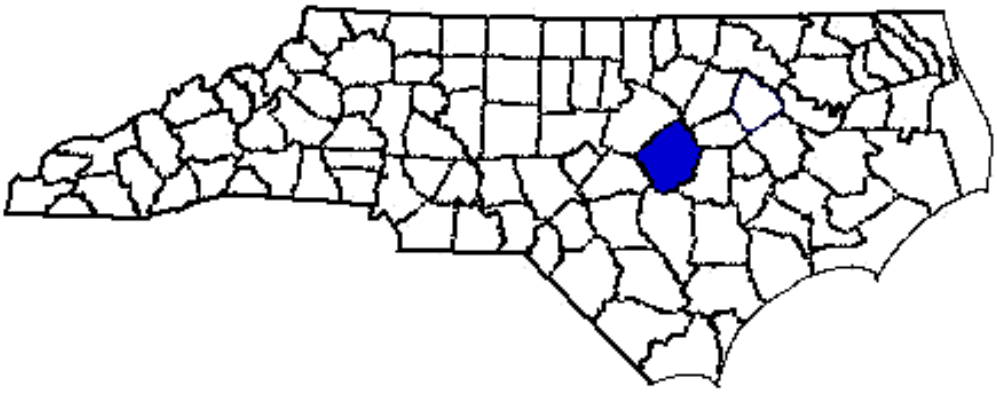
ANNUAL REPORT FOR 2002



Benson Grove Mitigation Site
Johnston County
Project No. 8.1402211
TIP No. R-2547WM

Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2002

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Summary

The following report summarizes the monitoring activities that have occurred in the past year at the Benson Grove Mitigation Site. Site construction was completed in March 2002. Monitoring activities in 2002 represent the first year of monitoring for the site. The site must demonstrate both hydrologic and vegetation success for a minimum of five years or until success criteria are met

The site contains 11 ground monitoring gauges, three surface gauges, and 10 vegetation plots.

This report utilizes rainfall data from both an on site rain gauge and a local weather station. The NC State Climate Office provided the historical data for the Smithfield weather station.

All 11 ground water gauges had saturation levels above 12.5% for the growing season. The 2002 vegetation monitoring of the site revealed an average tree density of 355 trees per acre. This average is above the minimum success criteria of 320 trees per acre. However, due to the low tree counts for year one, the site is scheduled to be supplementally planted in 2003.

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

1.0 Introduction

1.1 PROJECT DESCRIPTION

The Benson Grove Site is just west on NC 50 on SR 1319 (Zacks Mill Rd) in Johnston County. The site is situated in the Neuse River Basin, in the Black Creek sub-basin. This site mitigates for wetland impacts associated with transportation improvement projects R-2000 (Raleigh Outer Loop), R-2541 (Holly Springs Bypass), and R-2552 (Clayton Bypass).

The site will provide 31.41 acres of SWP/BLH restoration and 50.5 acres of preservation.

1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of 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 2002 growing season at the Benson Grove Mitigation Site.

Activities in 2002 reflect the first year of monitoring following the restoration efforts. 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

December 2001	Herbicide Application I
January 2001	Site Constructed
February 2002	Herbicide Application II
March 2002	Site Planted
June 2002	Vegetation Monitoring (1 yr.)
March – November 2002	Hydrologic Monitoring (1yr.)

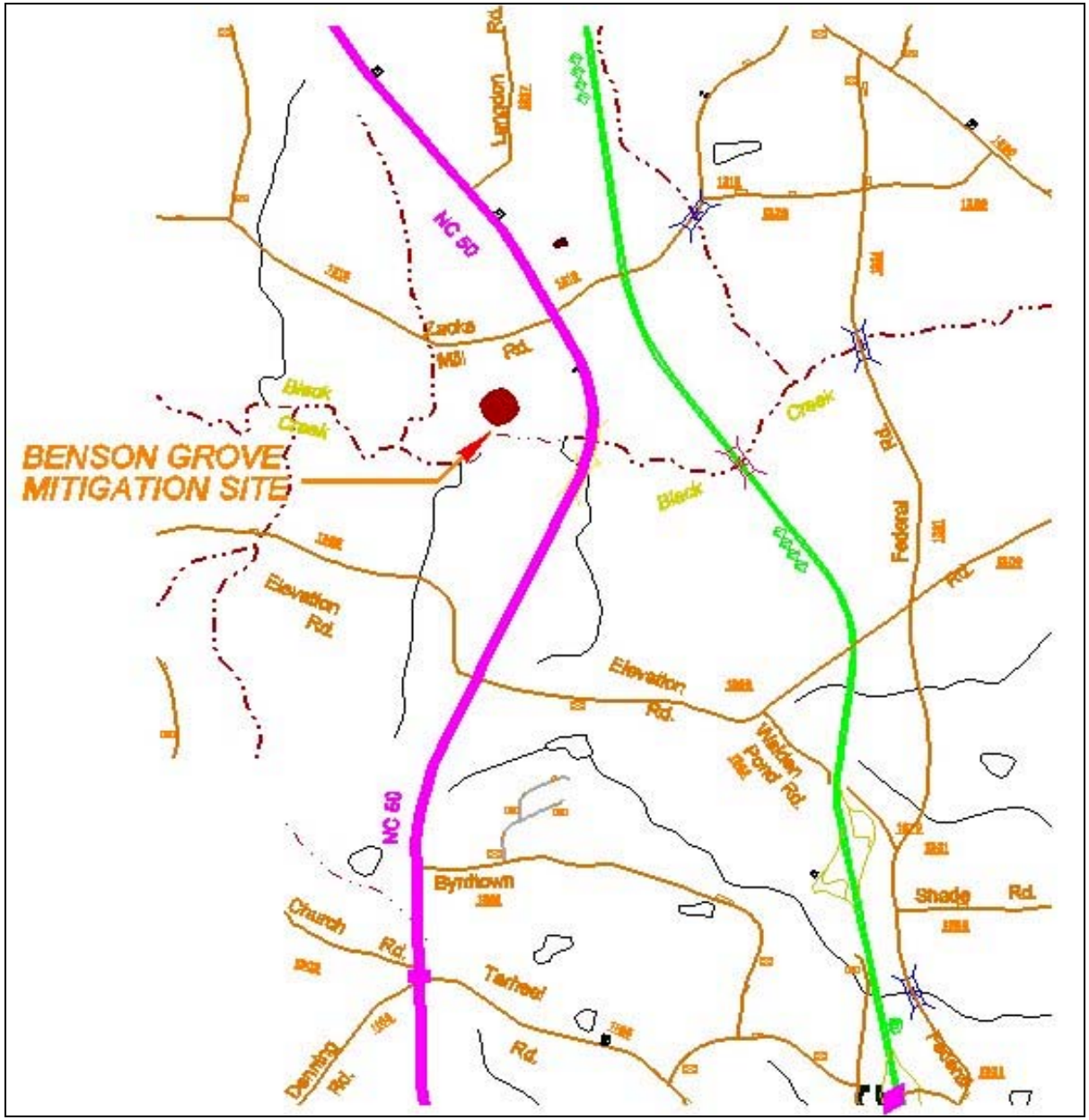


Figure 1. Site Location Map

1.4 DEBIT LEDGER

Table 1. Benson Grove Mitigation Debit Ledger

Site Habitat	Mitigation Plan		TIP Debit	
	Acres at Start	Acres Remaining	R2000F/G R-2547	Remainder Proposed for R2000AB/AC
SWP/BLH Restoration	31.41		30.41	1
BLH Preservation	50.5		50.50	

SPH: Swamp Hardwood BLH: Bottomland Hardwood

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 during a normal precipitation year.

The growing season in Johnston County begins March 26 and ends November 10. These dates correspond to a 50% probability that temperatures will not drop to 28°F or lower after March 26 and before November 10.[1] The growing season is 229 days; therefore, optimum hydrology requires 12.5% of this season, or at least 29 consecutive days. Local climate must also represent average conditions for the area.

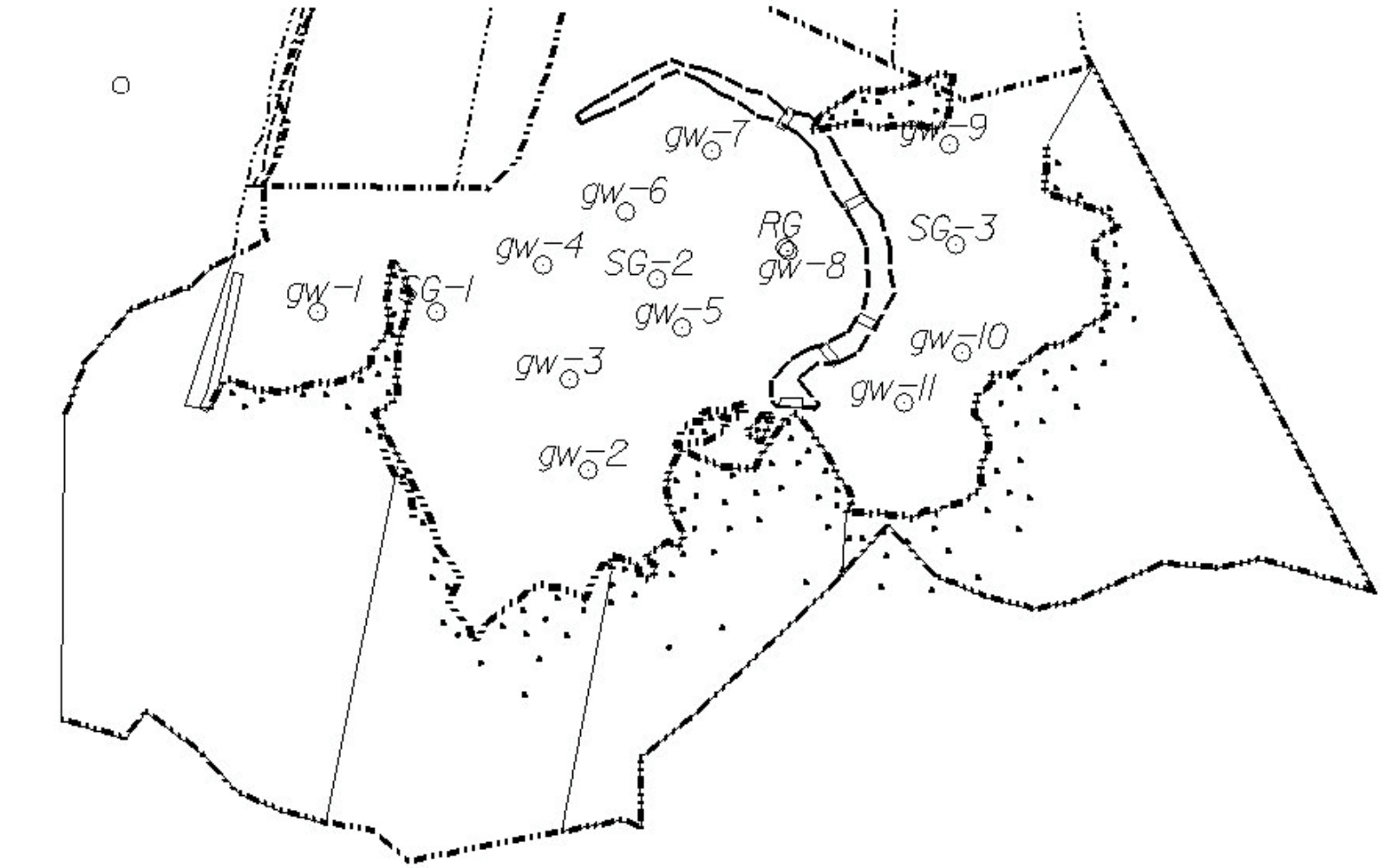
2.2 HYDROLOGIC DESCRIPTION

In March 2002, 11 groundwater gauges, 3 surface gauges, and 1 onsite rain gauge was installed throughout the site. (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. This represents the first full growing season that the monitoring gauges have been in place.

The Benson Grove site was designed to receive hydrologic input from rainfall and water accessing the floodplain. The hydrologic monitoring should show the reaction of the groundwater level to specific rainfall events.

[1] Natural Resources Conservation Service, Soil Survey of Wake County, North Carolina, p. 79.

Figure 2. Monitoring Gauge Location Map



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 well. This number was converted into a percentage of the 229-day growing season (March 26 – November 10). The results are presented in Table 2.

Appendix A contains charts of the groundwater depth for each monitoring gauge during 2002. These monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. The maximum number of consecutive days is noted on each graph.

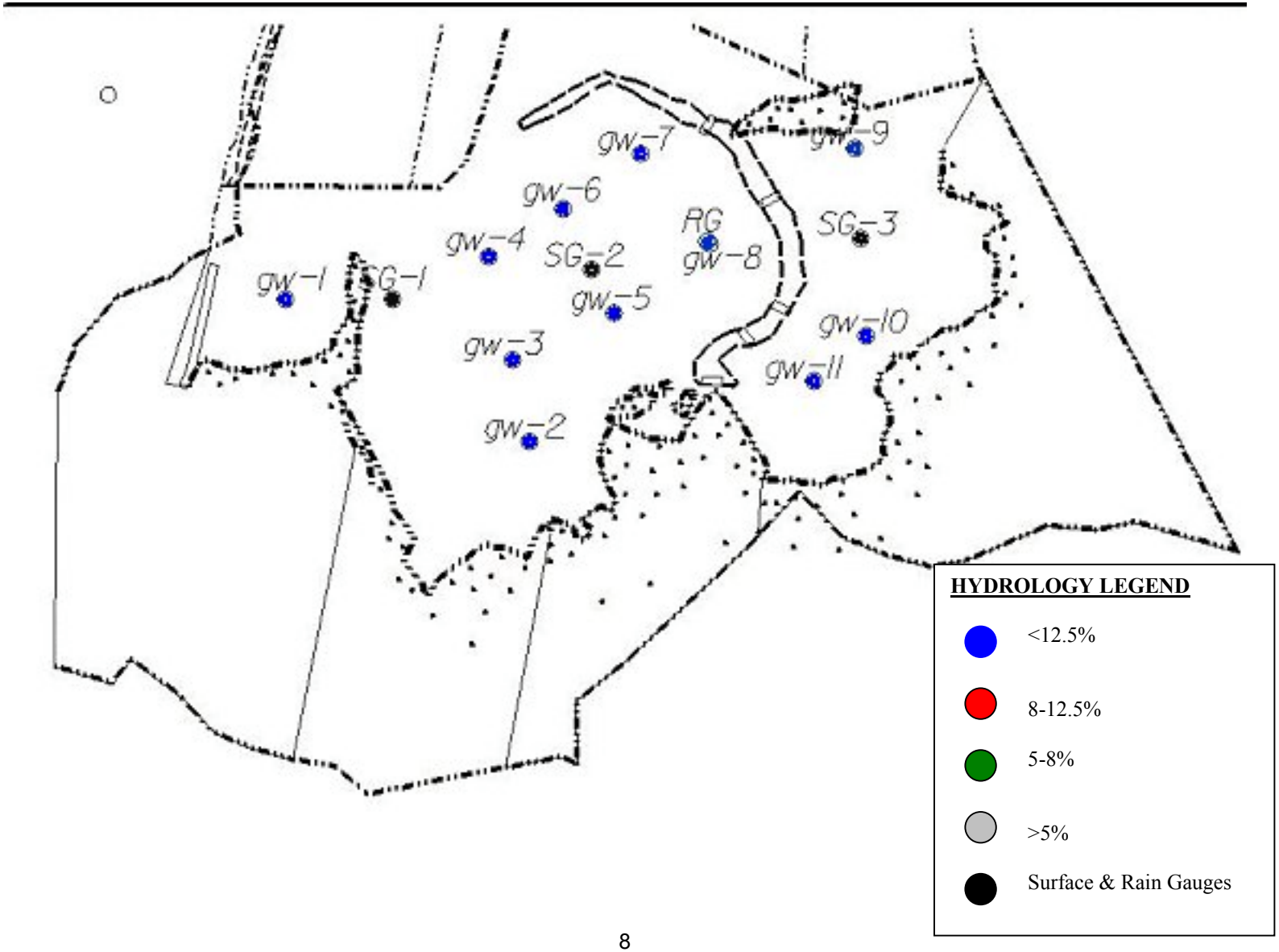
Figure 3 represents a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the season, while those in green indicate hydrology between 5% and 8% of the season. Gauges highlighted in gray indicate no wetland hydrology (less than 5% of the growing season).

Table 2. **Benson Grove Hydrologic Monitoring Results**

Monitoring Well	<5%	5-8%	8-12.5%	>12.5%	Actual %	Success Dates
BGGW-1				✓	13.1	Oct 12-Nov 10
BGGW-2				✓	13.1	Oct 12-Nov 10
BGGW-3				✓	13.1	Oct 12-Nov 10
BGGW-4				✓	13.1	Oct 12-Nov 10
BGGW-5				✓	13.1	Oct 12-Nov 10
BGGW-6				✓	13.1	Oct 12-Nov 10
BGGW-7				✓	33.6	March 26-May 2 Aug 26-Nov 10
BGGW-8				✓	13.1	March 26-April 22 Oct 12-Nov 10
BGGW-9				✓	13.5	March 26-April 25 Oct 11-Nov 10
BGGW-10				✓	13.1	Oct 12-Nov 10
BGGW-11				✓	13.1	Oct 12-Nov 10

All 11 groundwater gauges met the success criteria of 12.5% for the growing season. Also all 3 surface water gauges indicated a consistent presence of surface water throughout the growing season.

Figure 3 . Monitoring Gauge Hydrologic Results



2.3.2 Climatic Data

Figure 4 represents an examination of the local climate in comparison with historical data in order to determine whether 2002 was “average” in terms of rainfall. The two lines represent the 30th and 70th percentiles of monthly precipitation for Smithfield. The bars are the monthly rainfall totals for parts of 2001 and 2002. The historical data and monthly rainfall was collected by the National Climatic Data Center.

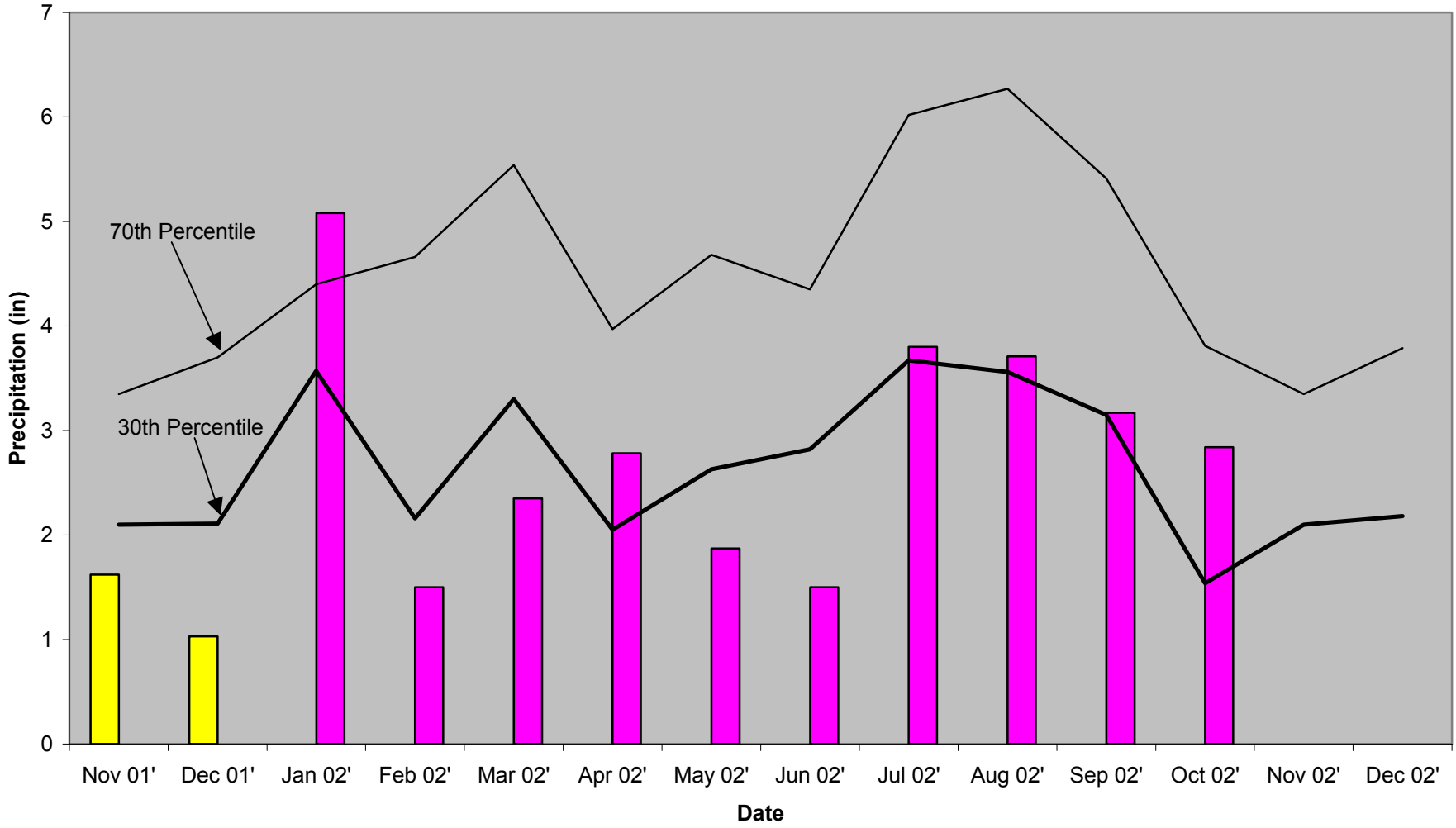
Months with below average rainfall include November (01’), December (01’) February, March, May, and June. April, July, August, September, and October experienced normal rainfall. January experienced above normal rainfall. Overall the site experienced below average rainfall in 2002.

2.4 CONCLUSIONS

2002 represents the first year for hydrologic monitoring. All 11 gauges indicated saturation within 12” of the ground for greater than 12.5% of the growing season. NCDOT will continue to monitor this site for hydrology.

Figure 4

Benson Grove 30-70 Percentile Graph 2002
Smithfield, NC



3.0 VEGETATION: BENSON GROVE MITIGATION SITE (YEAR 1 MONITORING)

3.1 Success Criteria

Success Criteria states that at least 320 stems per acre must survive after the completion of the third growing season and 240 stems per acre after the fifth growing season. If desired vegetation has not been established, NCDOT will notify the appropriate agencies and will implement corrective measures.

3.2 Description of Species

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

Fraxinus pennsylvanica, Green Ash

Quercus falcata var. *pagodaefolia*, Cherrybark Oak

Quercus laurifolia, Laurel Oak

Quercus lyrata, Overcup Oak

Quercus nigra, Water Oak

Liriodendron tulipifera, Tulip Poplar

Quercus phellos, Willow Oak

Taxodium distichum, Baldcypress

Nyssa aquatica, Water Tupelo

3.3 Results of Vegetation Monitoring

Plot #	Green Ash	Cherrybark Oak	Laurel Oak	Overcup Oak	Water Oak	Tulip Poplar	Willow Oak	Baldcypress	Water Tupelo	Total (1 year)	Total (at planting)	Density (Trees/Acre)
1		1		15	6	8	1			31	44	479
2	2			6						8	38	143
3	6	4	1	6	3	1	4			25	37	459
4	1			2			2			5	38	89
5	5	2	1	6	1	1	1			17	45	257
6	1	3		3	2					9	39	157
7	4					1		15	5	25	26	654
8	1		3	8			12			24	36	453
9	3			1				23	1	28	36	529
10	1		1	10	1		7			20	41	332
					Total Density Average							355

Site Notes: Other species noted: sweetgum, red maple, *Baccharis halimifolia*, ragweed, thistle, and horse-nettle. Standing water was noted at time of planting. Site was dry at monitoring.

3.4 Conclusions

Of the 81.9 acres on this site, approximately 31.5 acres involved tree planting. There were 10 vegetation monitoring plots established throughout the planting areas. The 2002 vegetation monitoring of the site revealed an average tree density of 355 trees per acre. This average is above the minimum success criteria of 320 trees per acre. However, due to the low tree counts for year one, the site is scheduled to be supplementally planted in 2003.

NCDOT will continue vegetation monitoring at the Benson Grove Mitigation Site.

4.0 Overall Conclusions/Recommendations

For 2002, all 11 gauges indicated saturation within 12" of the ground for greater than 12.5% of the growing season. The 2002 vegetation monitoring of the site revealed an average tree density of 355 trees per acre. The site is scheduled for supplemental planting in winter 2003, due to low tree counts.

NCDOT will continue to monitor the Benson Grove mitigation site for both vegetation and hydrology for the 2003-year.

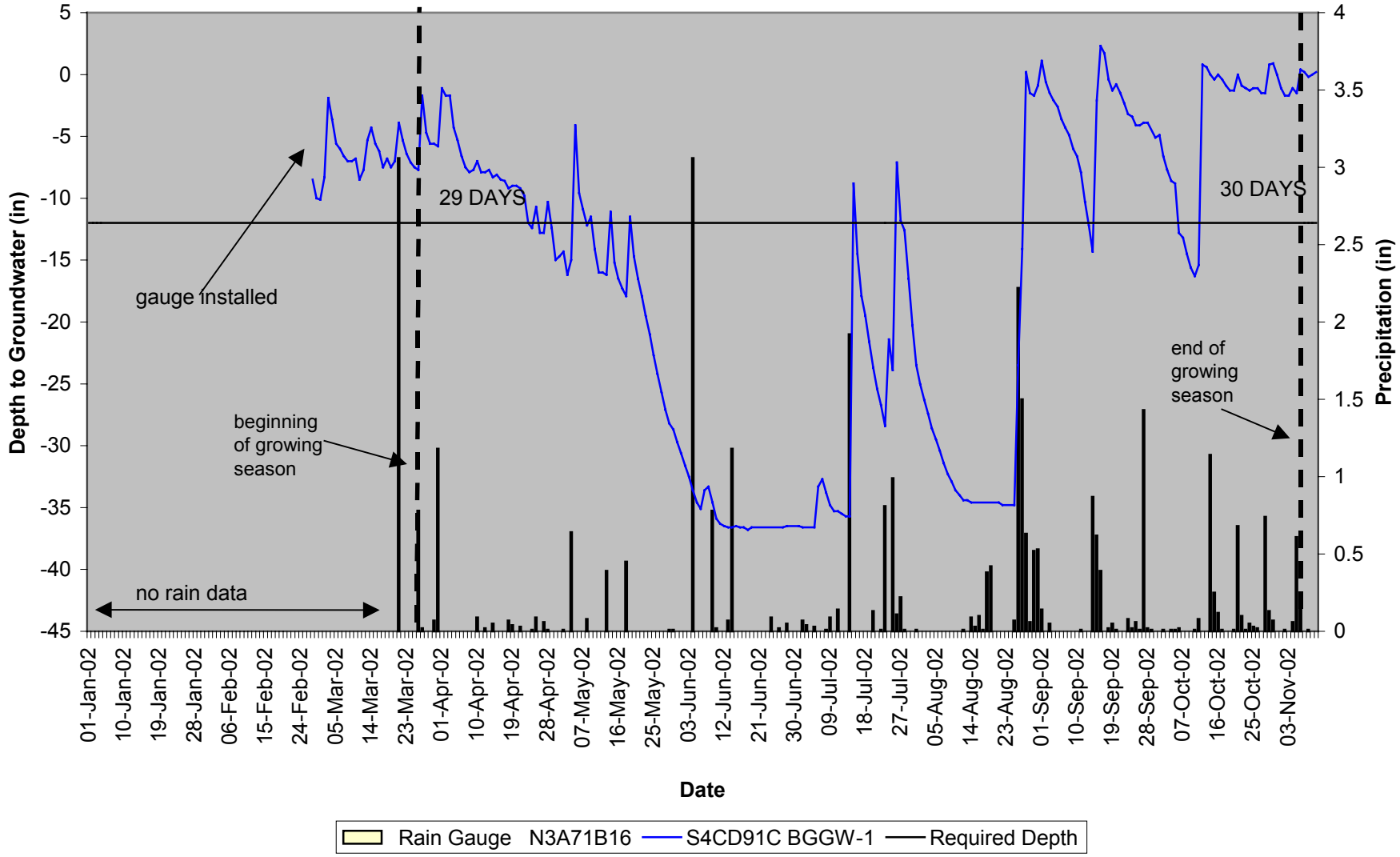
APPENDIX A

DEPTH TO GROUNDWATER GRAPHS

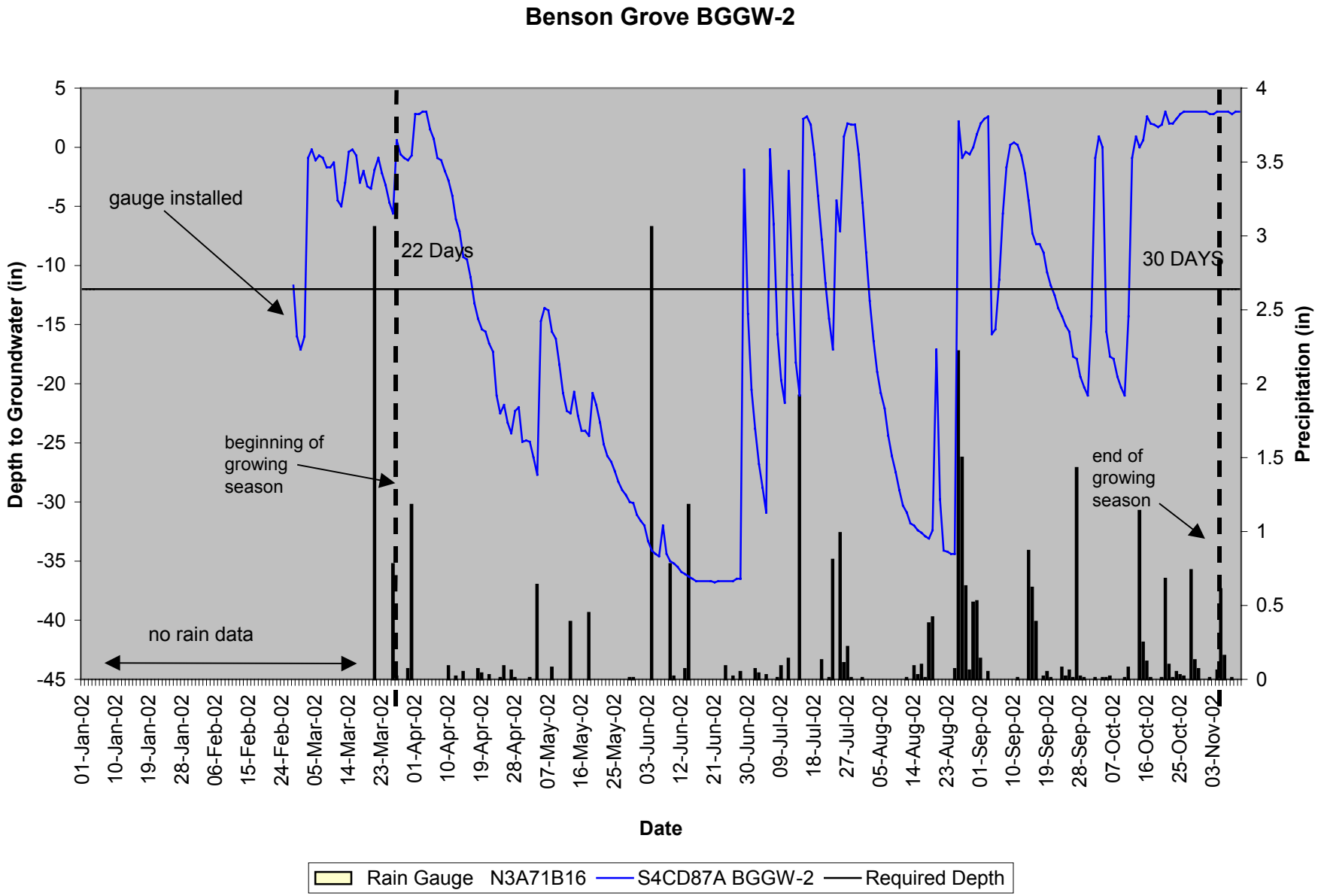
Benson Grove Monitoring Gauge Graphs

BENSON GROVE GROUNDWATER GAUGE GRAPHS

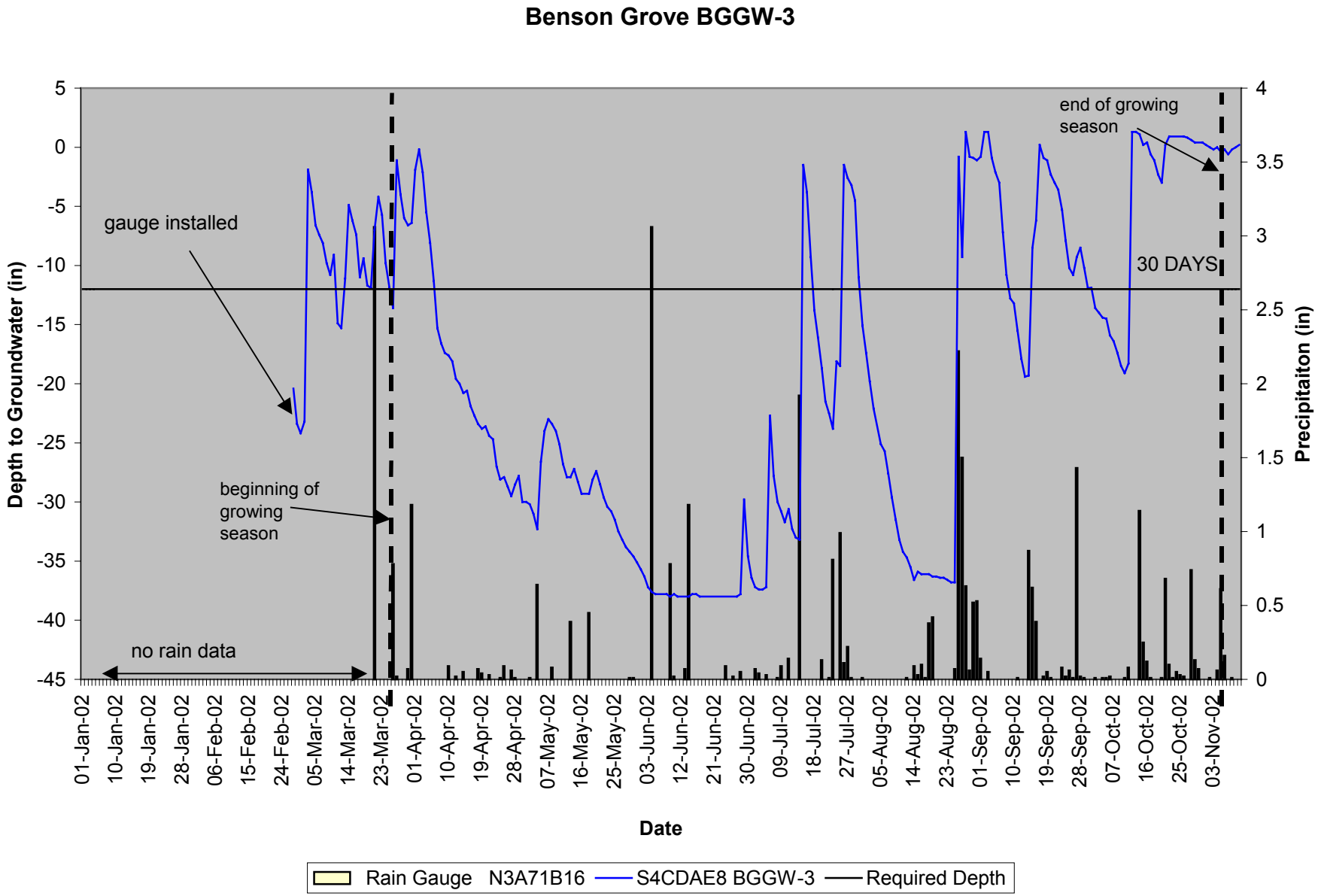
Benson Grove BGGW-1



Benson Grove Monitoring Gauge Graphs



Benson Grove Monitoring Gauge Graphs



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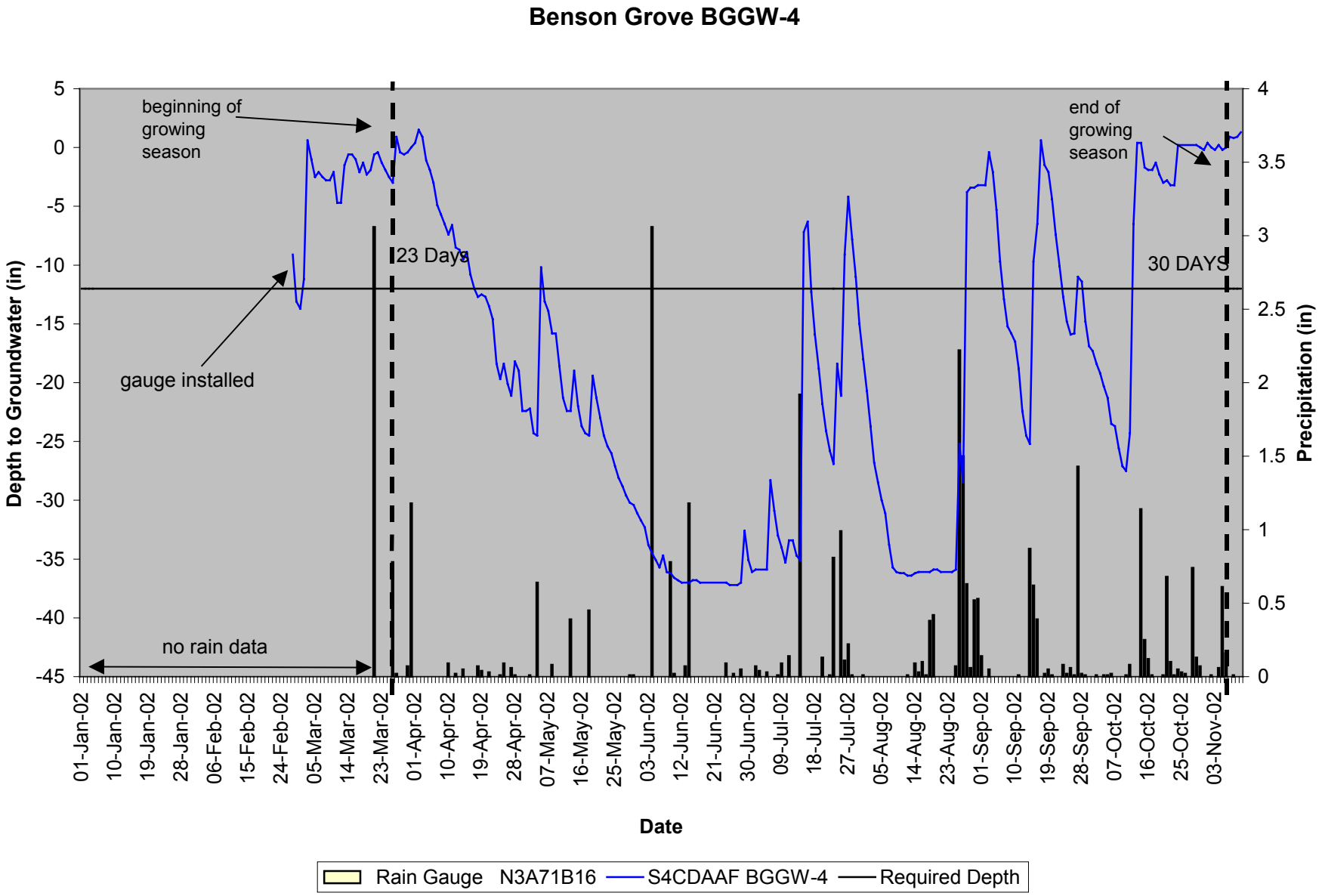

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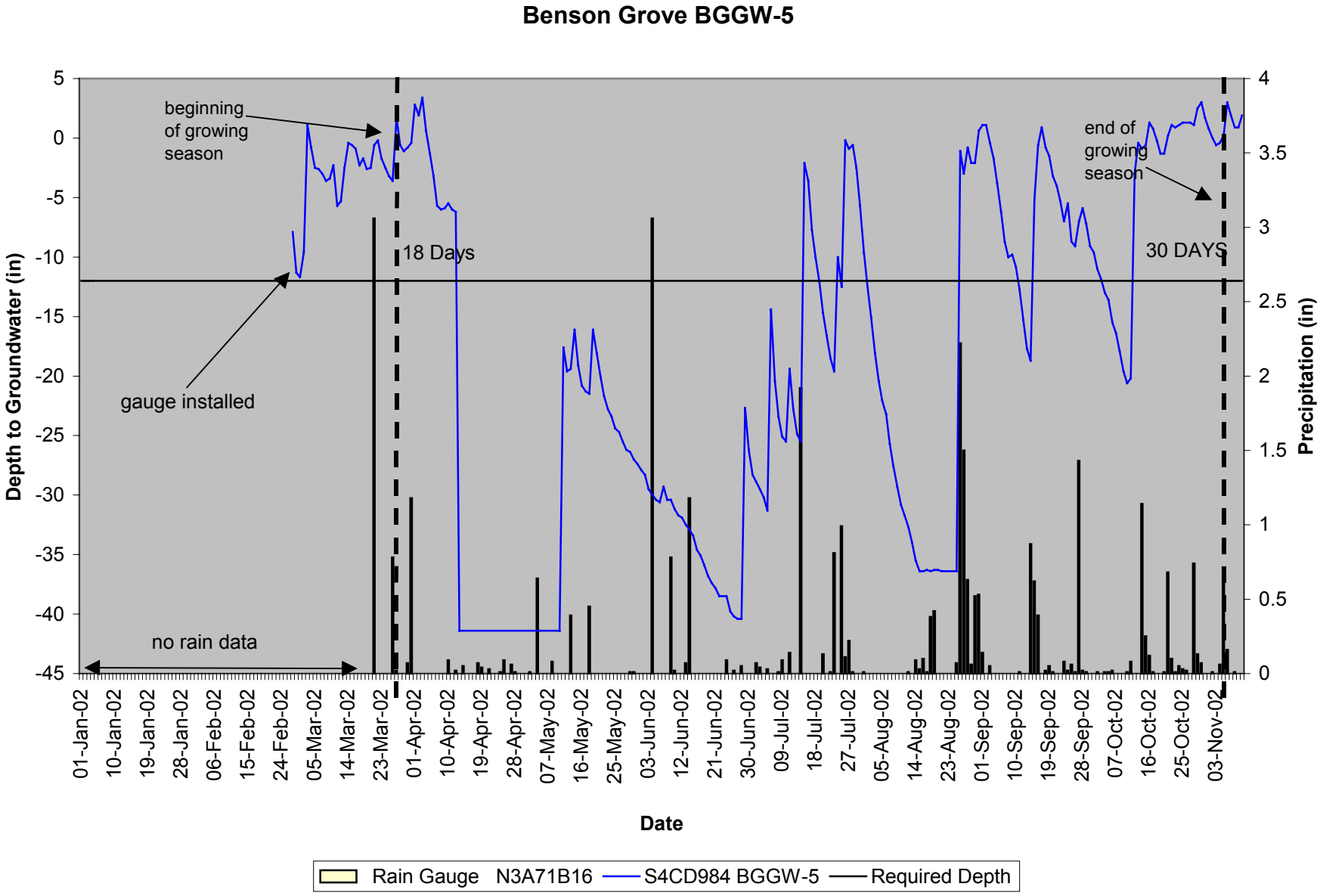
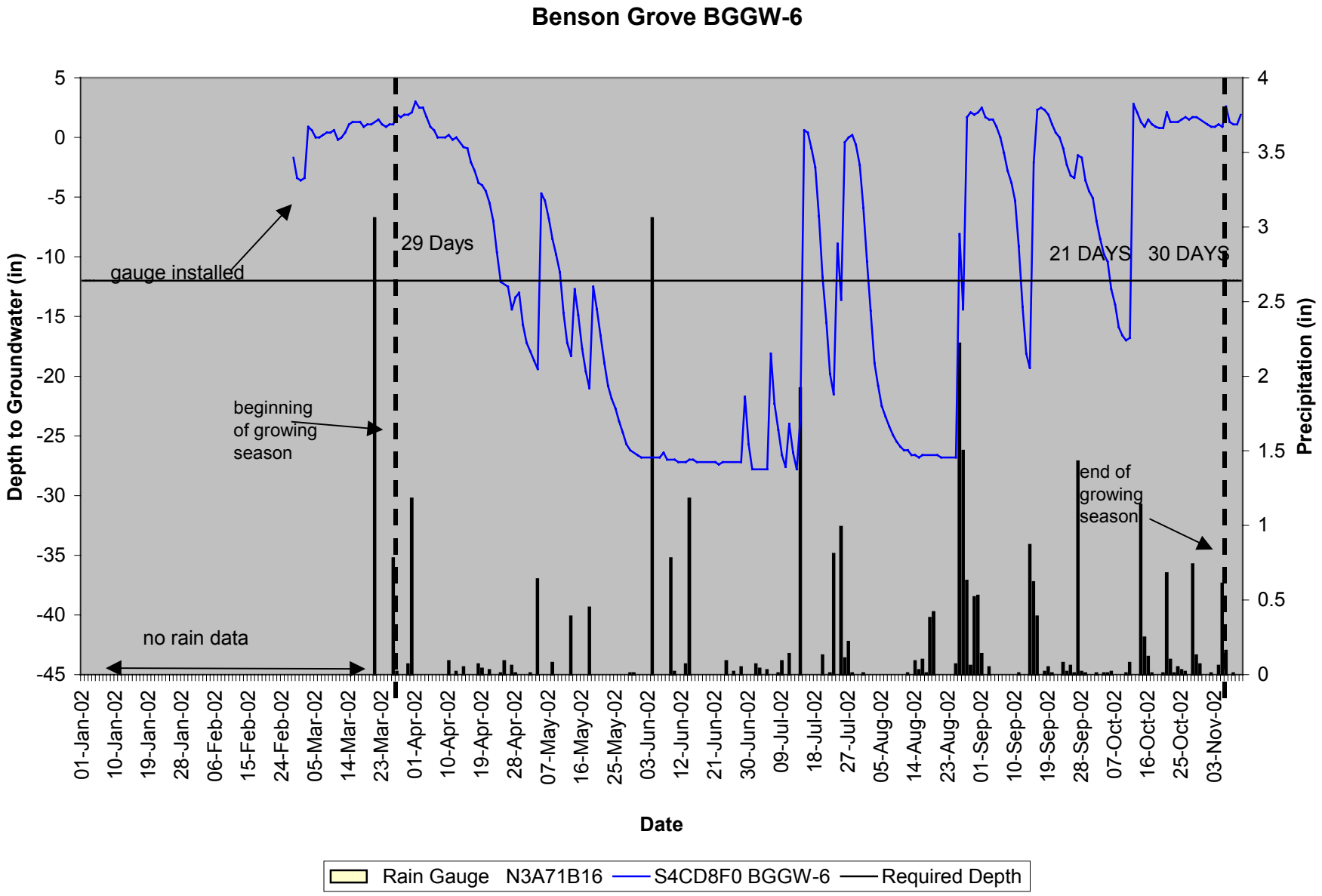


Benson Grove Monitoring Gauge Graphs



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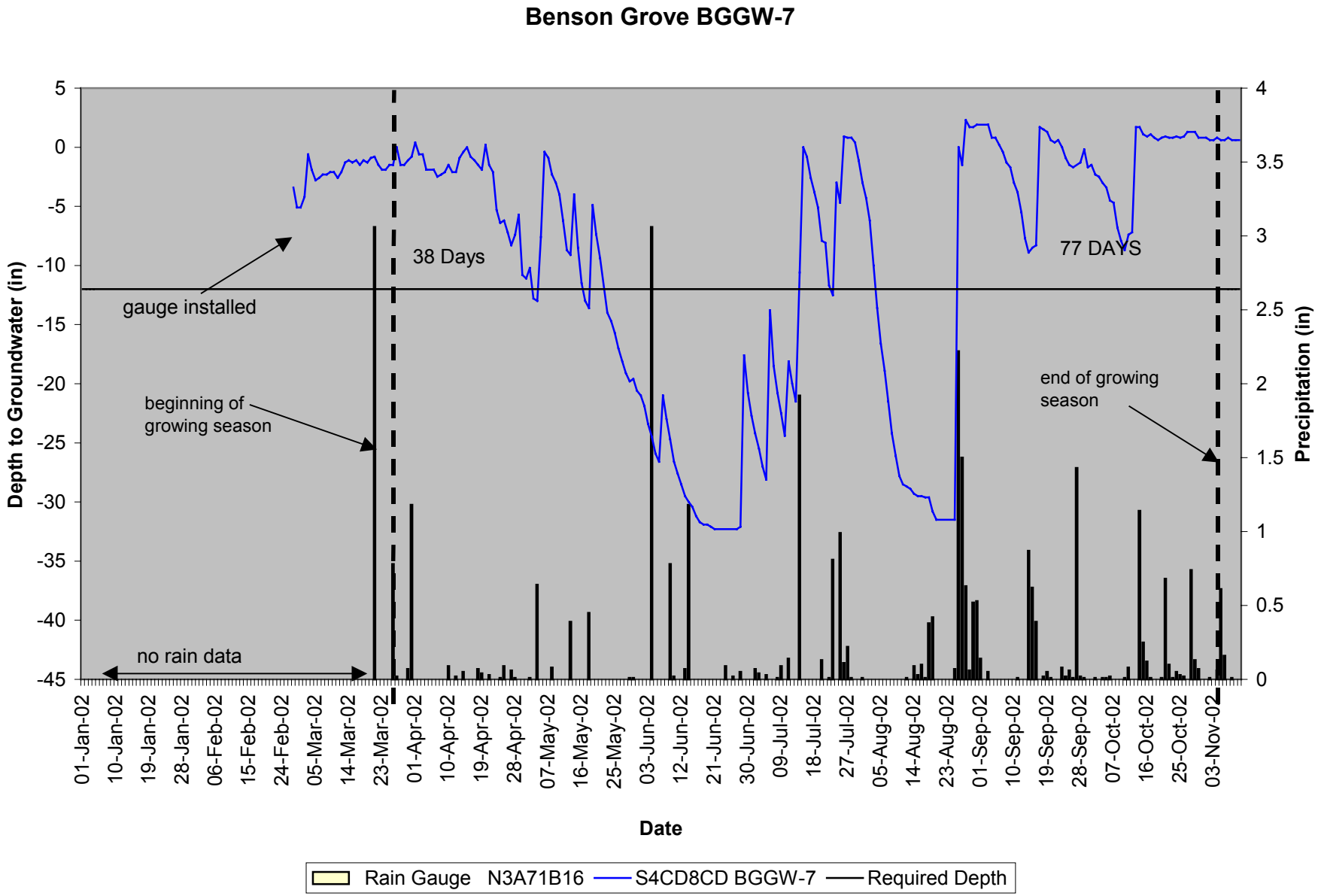
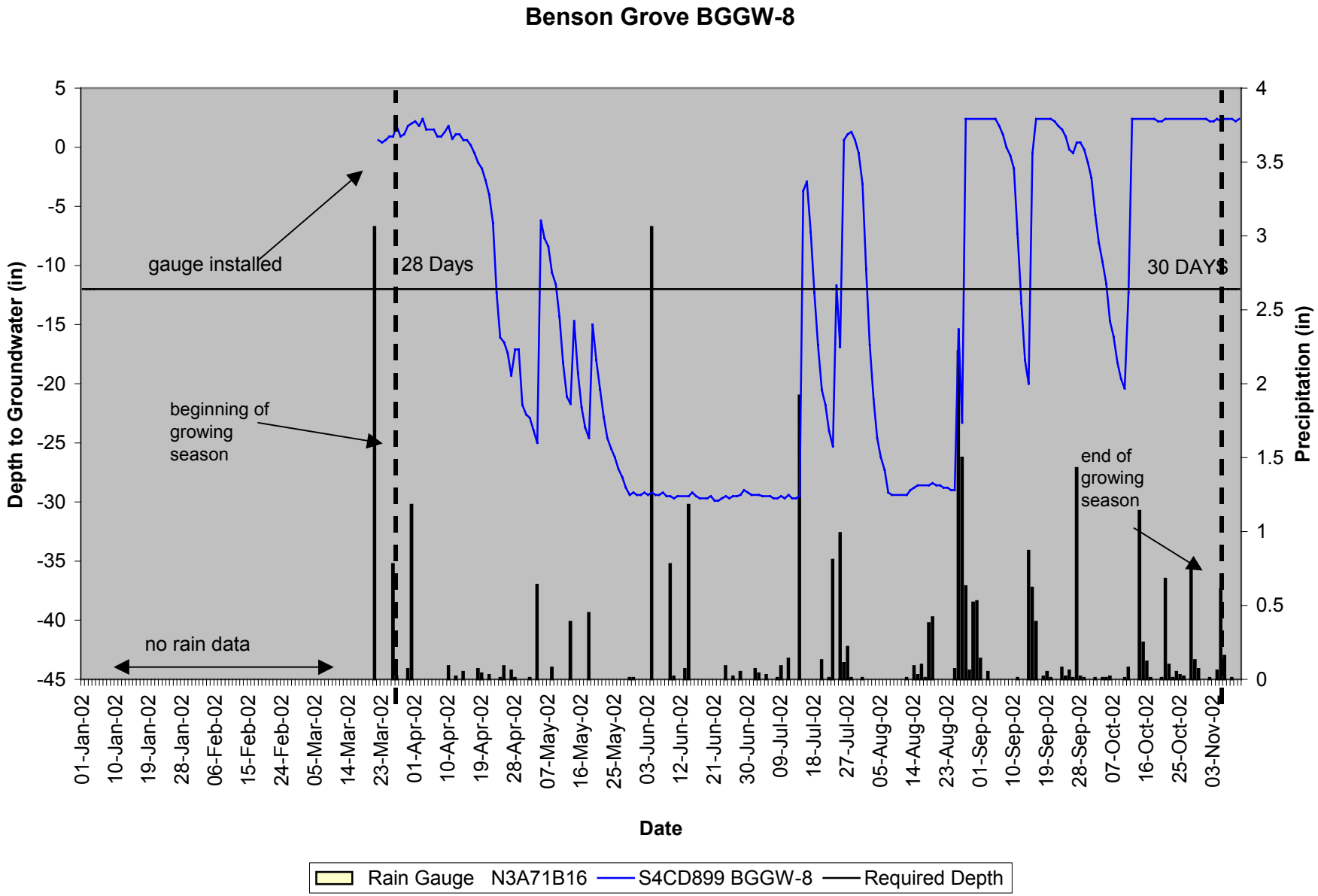
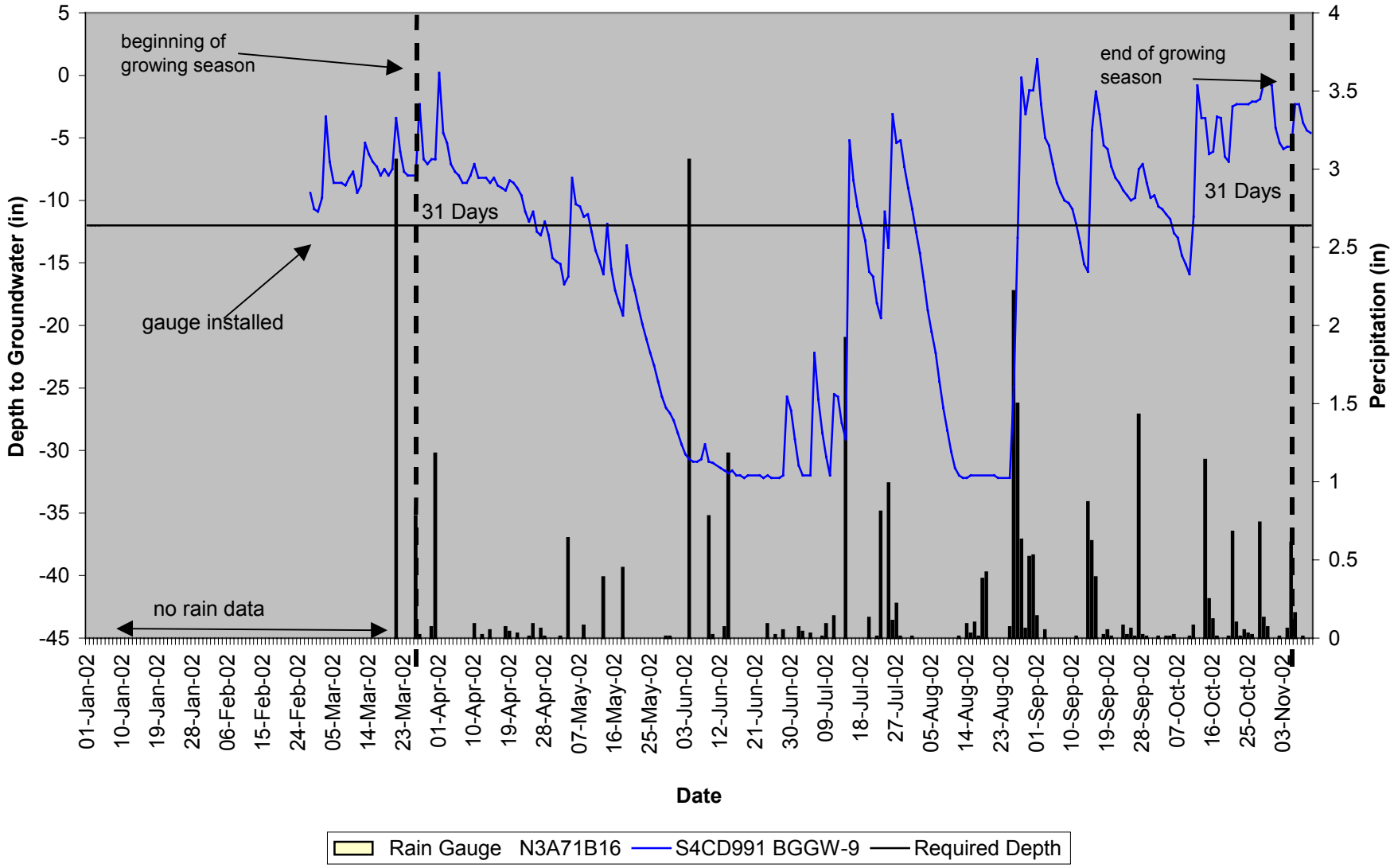


Benson Grove Monitoring Gauge Graphs

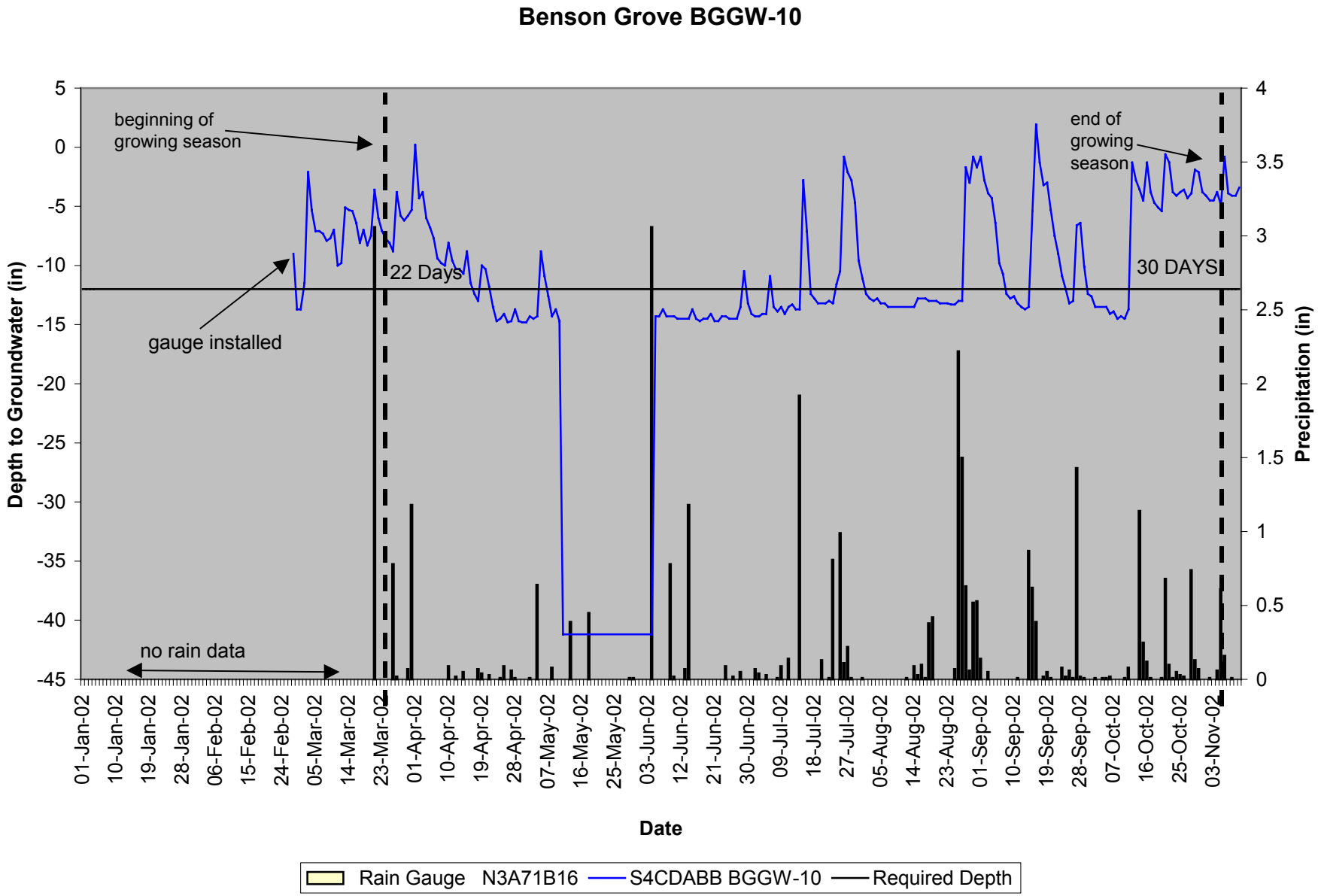


Benson Grove Monitoring Gauge Graphs

Benson Grove BGGW-9



Benson Grove Monitoring Gauge Graphs



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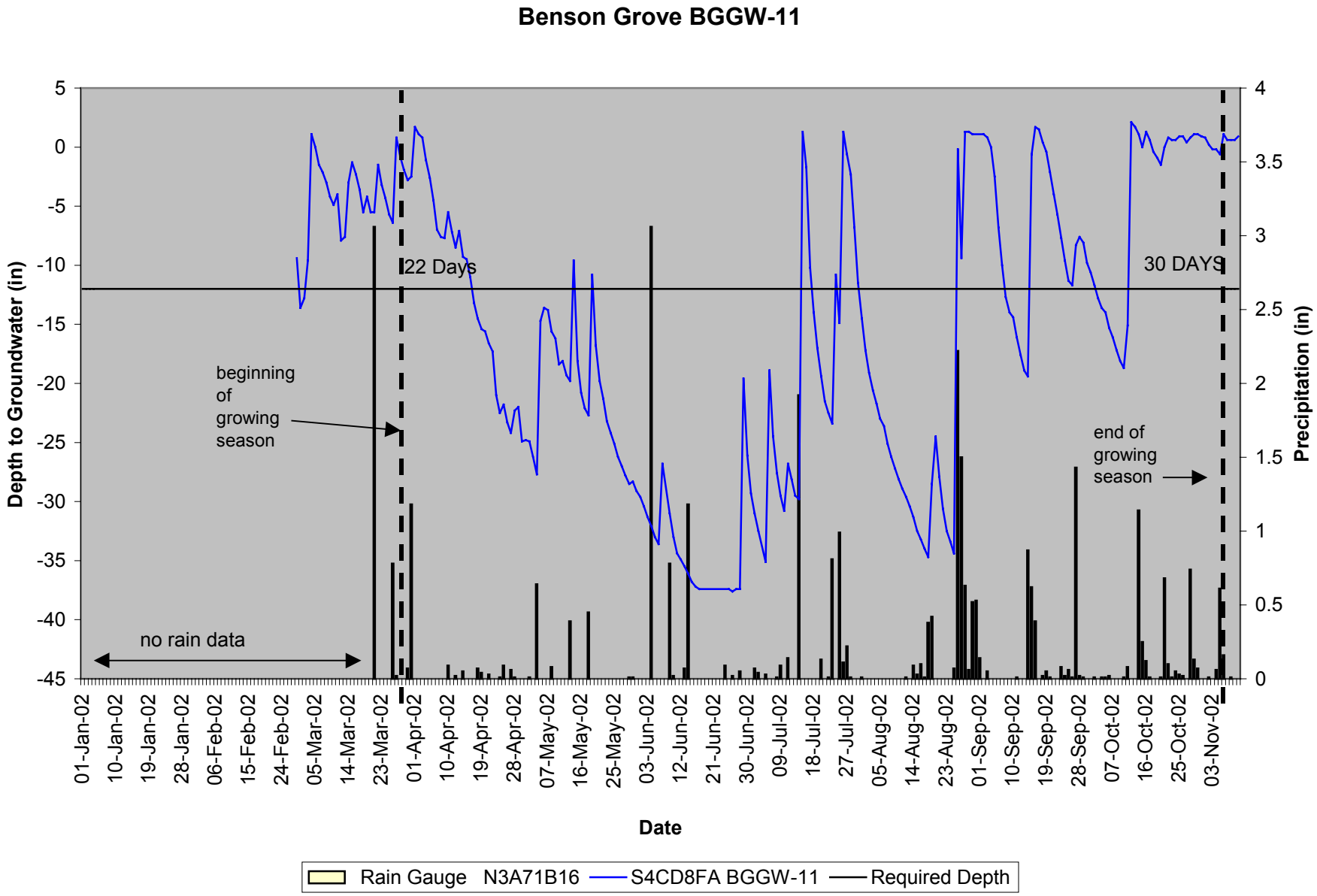
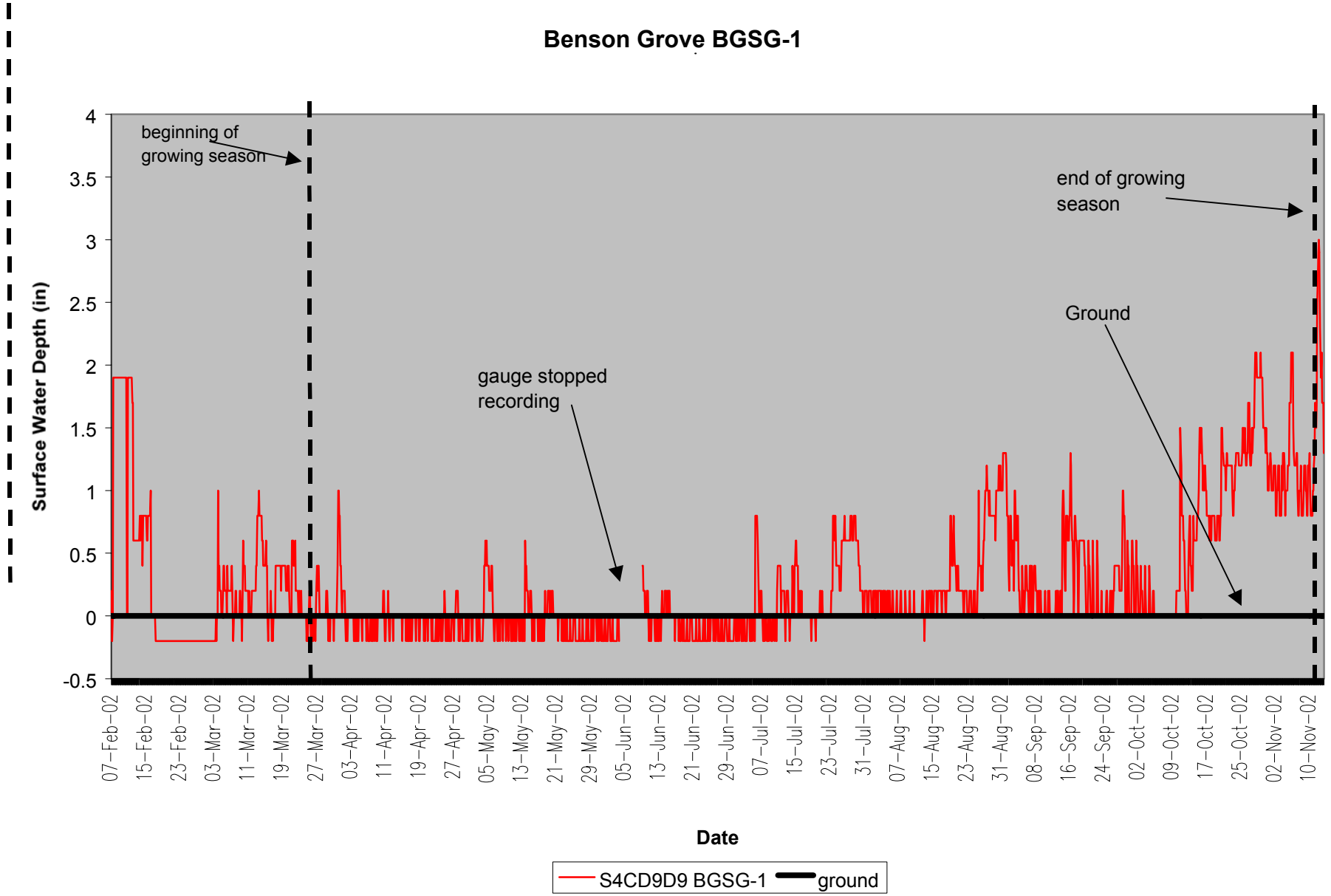
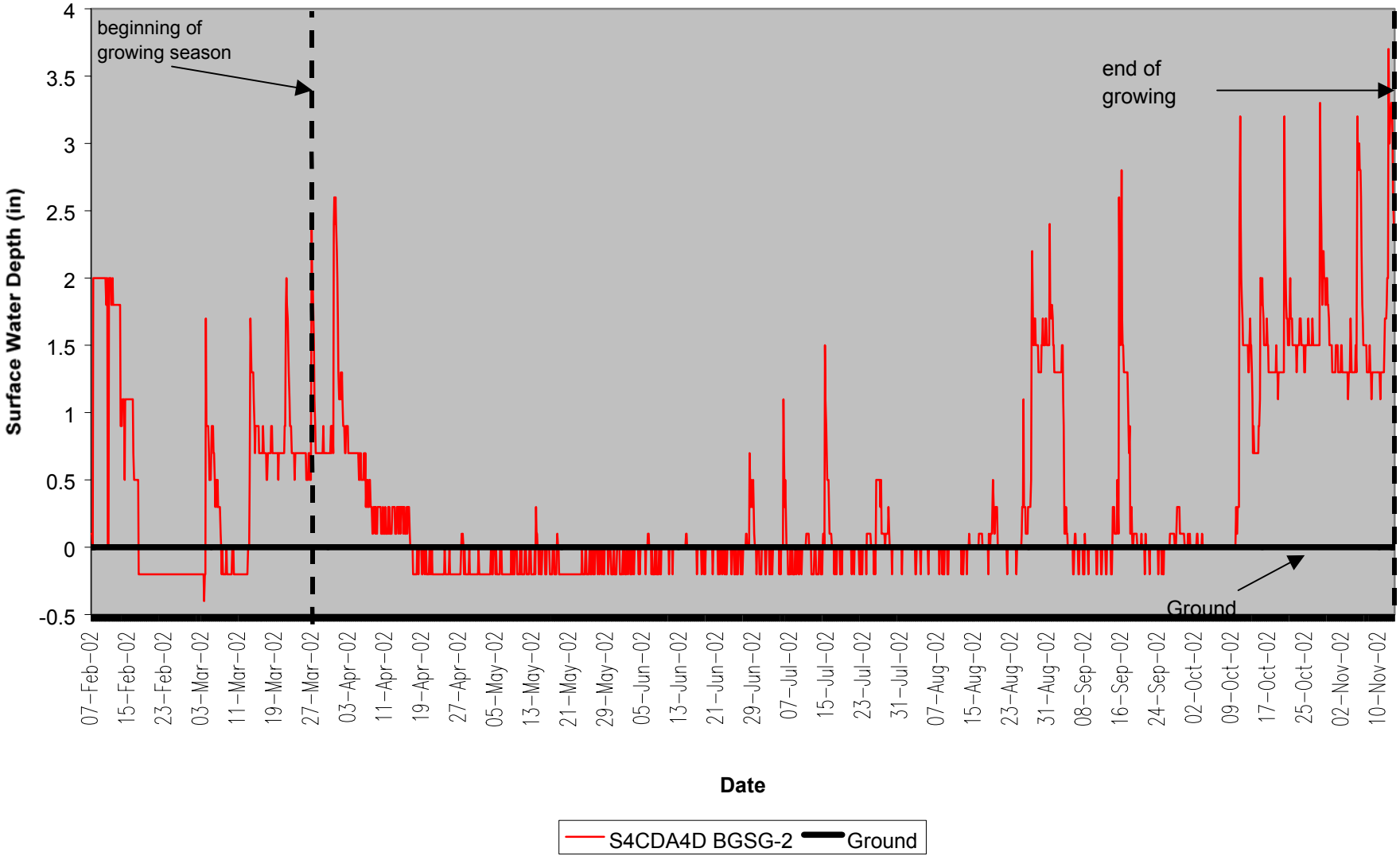


Benson Grove Monitoring Gauge Graphs



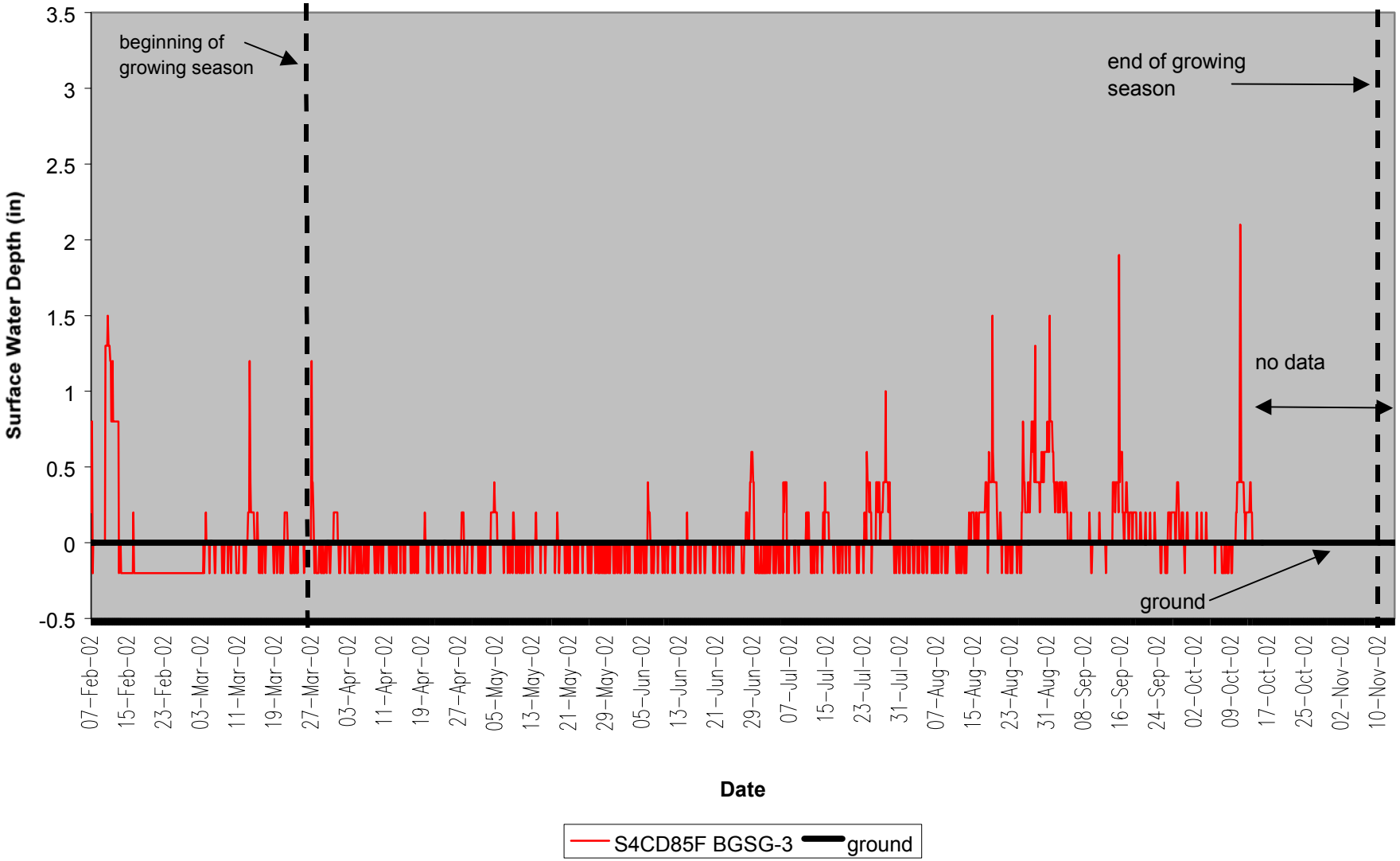
Benson Grove Monitoring Gauge Graphs

Benson Grove BG-S2



Benson Grove Monitoring Gauge Graphs

Benson Grove BGSG-3



APPENDIX B

SITE PHOTOS & PLANTING PLAN

Benson Grove

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2002

Benson Grove

Photo 7

Photo 8

Photo 9

Photo 10

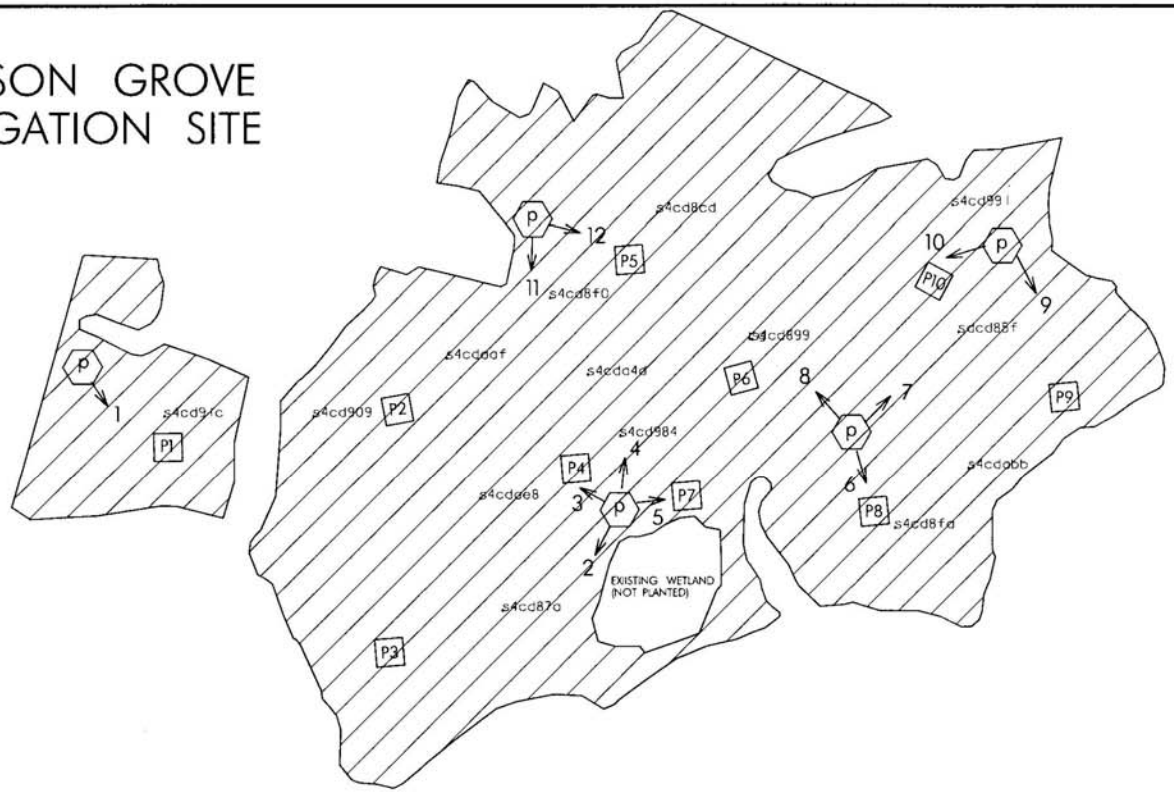
Photo 11

Photo 12

2002

BENSON GROVE MITIGATION SITE

PROJECT REFERENCE NO.	SHEET NO.
R-2541	
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



VEGETATION MONITORING PLOTS

P PHOTOGRAPH LOCATIONS