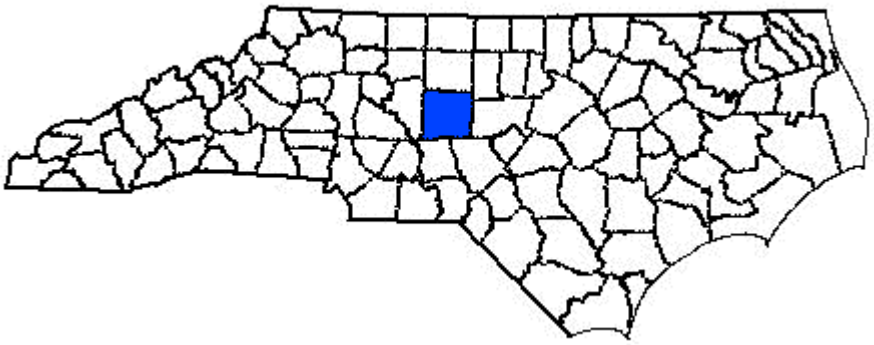
ANNUAL REPORT FOR 2004



Sandy Creek Mitigation Site
Randolph County
Project No. 8.U492301
TIP no. I-2402WM

Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
December 2004

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EXECUTIVE SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Sandy Creek Mitigation Site. This site was constructed in 2000. Monitoring activities in 2004 represent the fourth year of monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the project is deemed successful.

The site is monitored with six groundwater-monitoring gauges, one rain gauge, and three vegetation plots.

For 2004, rainfall data has been collected by an onsite rain gauge. Also, daily rainfall data recorded from a rain gauge maintained by the NC State Climate Office in Randleman, NC was used for comparison.

Hydrologic monitoring indicated that five of the six monitoring gauges exceeded the jurisdictional wetland criteria of saturation within twelve inches of the surface for 12.5% of the growing season. One gauge recorded saturation for 6.6% of the monitoring period. The 2004-monitoring year experienced an average rainfall year.

The three vegetation-monitoring plots revealed an average density of 284 trees per acre. This average is above the minimum success criteria of 260 trees per acre.

Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

1.0 INTRODUCTION

1.1 Project Description

The Sandy Creek Mitigation Site is located approximately four miles southwest of Liberty in Randolph County (Figure 1). It is situated on the south floodplain of Sandy Creek, 1.5 miles upstream of SR 2442. Prior to construction, the site was a nearly level floodplain with ditching and raised beds. It had been converted for hay production.

The site encompasses 12.9 acres, of which 10 acres were planted. Originally, it was designed as a mitigation site primarily for the Greensboro Outer Loop (I-2402). However, it is now intended to provide mitigation for the Sanford Bypass (R-2417, COE Action I.D. No. 199502036).

1.2 Purpose

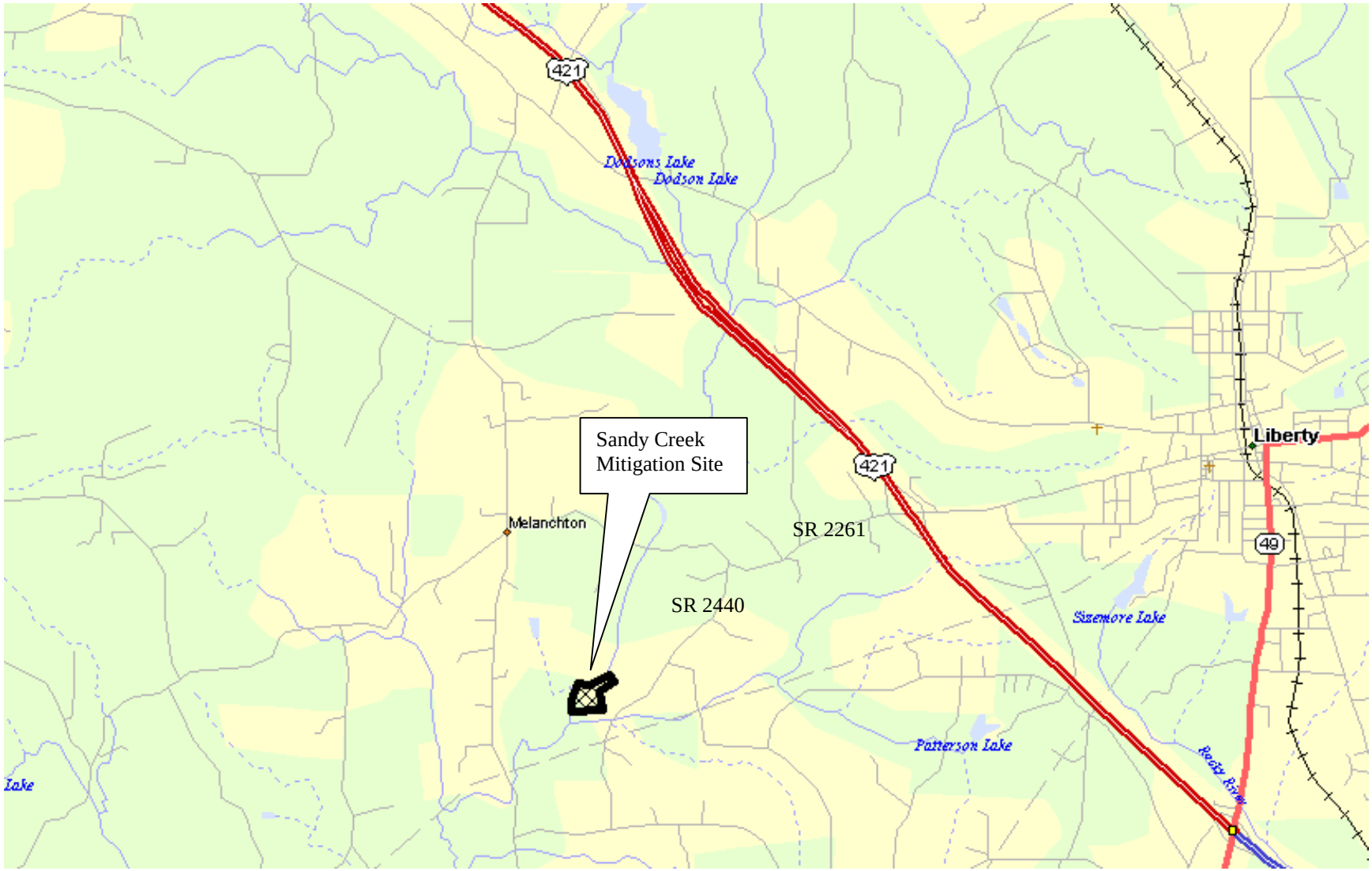
In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until the success criteria are fulfilled. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2004 at the Sandy Creek Mitigation Site.

Activities in 2004 reflect the fourth year of monitoring following the construction. 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

June 2000	Construction Completed
March 2001	Tree Planting
March-November 2001	Hydrologic Monitoring (Year 1)
July 2001	Vegetation Monitoring (Year 1)
March 2002	Supplemental Planting
March-November 2002	Hydrologic Monitoring (Year 2)
June 2002	Vegetation Monitoring (Year 2)
March-November 2003	Hydrologic Monitoring (Year 3)
June 2003	Vegetation Monitoring (Year 3)
March-November 2004	Hydrologic Monitoring (Year 4)
July 2004	Vegetation Monitoring (Year 4)

Figure 1. Sandy Creek Mitigation Site Location



2.0 HYDROLOGY

2.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or ground water for at least 12.5% of the growing season. Areas inundated 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 hydrophytic vegetation and hydric soils.

There is no published soil survey for Randolph County. The growing season for Moore County (directly southeast of Randolph County) was determined to be the best comparison to the Randolph County growing season. The Moore County growing season begins March 23rd and ends November 7th. The dates correspond to a 50% probability that temperatures will drop to 28^{o} F or lower after March 23 and before November 7. The growing season is 228 days; therefore, the optimum duration for wetland hydrology is 29 days. Local climate must represent average conditions for the area.

2.2 Hydrologic Description

Historically, wetlands on the tract were created by a combination of rainfall, runoff, and groundwater seepage from up-gradient areas. After an extensive study of the site's hydrology, it was concluded that the placement of impermeable plugs along drainage features and removal of the raised beds would elevate the groundwater to a level that would saturate the soil stratum within the required twelve inches. It was predicted that this, in addition to surface water and runoff, would be sufficient to restore wetland hydrology.

Six groundwater-monitoring gauges were installed in February 2001 (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth.

Rainfall data was collected by an onsite rain gauge. Also, daily rainfall data recorded from a rain gauge maintained by the NC State Climate Office in Randleman, NC was used for comparison.

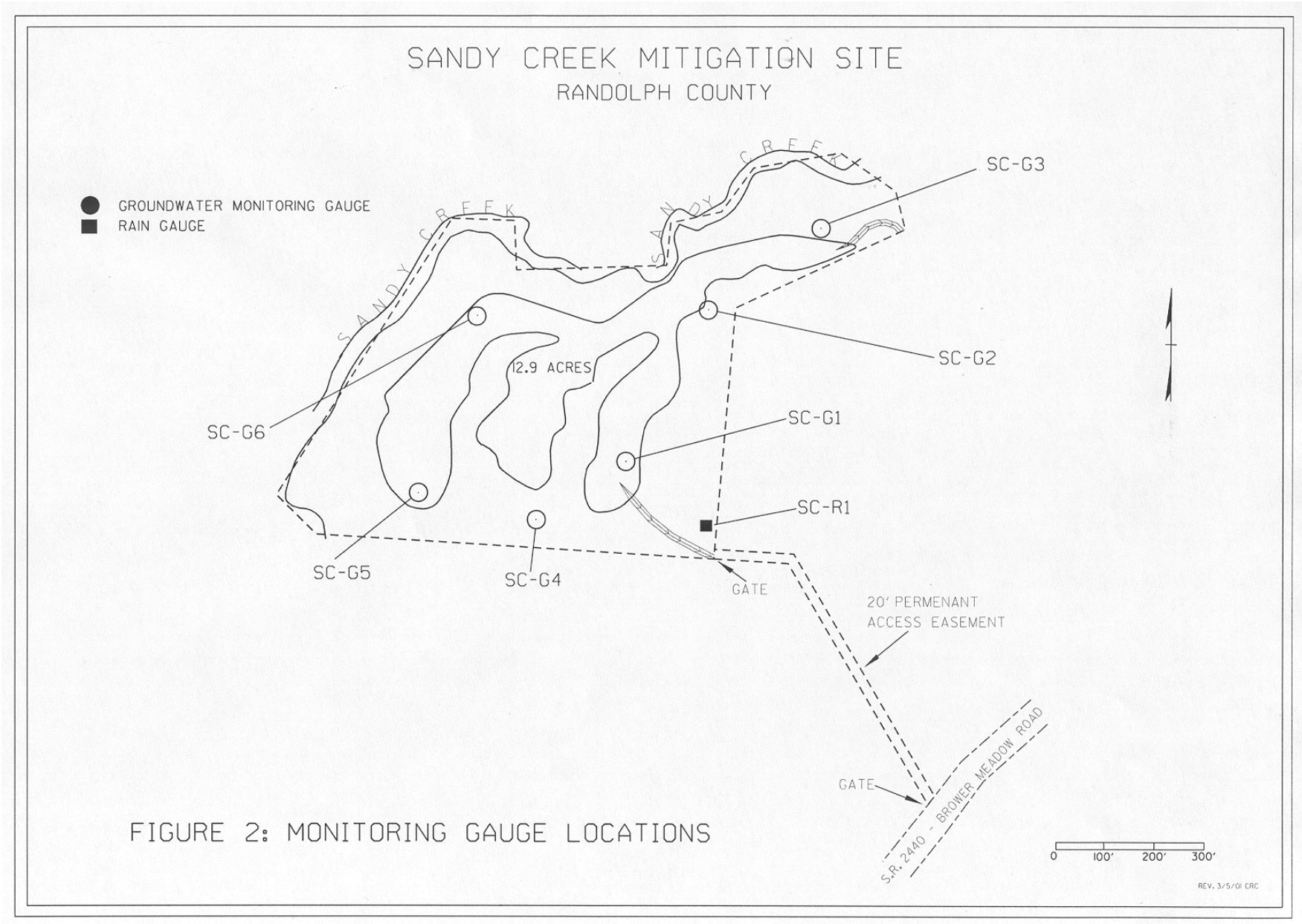


FIGURE 2: MONITORING GAUGE LOCATIONS

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 228-day growing season. Table 1 presents the 2004 results.

Appendix A contains a graph of the groundwater depth for each monitoring gauge. The maximum number of consecutive days is noted on each graph. Local precipitation events are included on the graphs as bars.

Table 1. 2004 HYDROLOGIC MONITORING RESULTS

Monitoring Gauge	< 5%	5 - 8%	8 - 12.5%	> 12.5%	Actual %	Dates Meeting Success
SC-G1+				✕	18.0	Sept 28-Nov 7
SC-G2+				✕	30.7	March 23-April 27 Aug 30-Nov 7
SC-G3+				✕	30.7	March 23-April 25 Aug 30-Nov 7
SC-G4		✕			6.6	March 23-April 6
SC-G5+				✕	37.3	Aug 15-Nov 7
SC-G6+				✕	14.9	Aug 30-Oct 10

+Gauge met during an average rainfall month (February, April, June, July, August, October, and November)

Specific Gauge Problems:

- Gauge 4 malfunctioned during the period from July 17 - October 10.

Figure 3 is a graphical representation of the hydrologic monitoring results for this year. A blue dot represents wetland hydrology for more than 12.5% of the growing season; a red dot indicates hydrology between 8% and 12.5%; and a green dot represents hydrology between 5% and 8%.

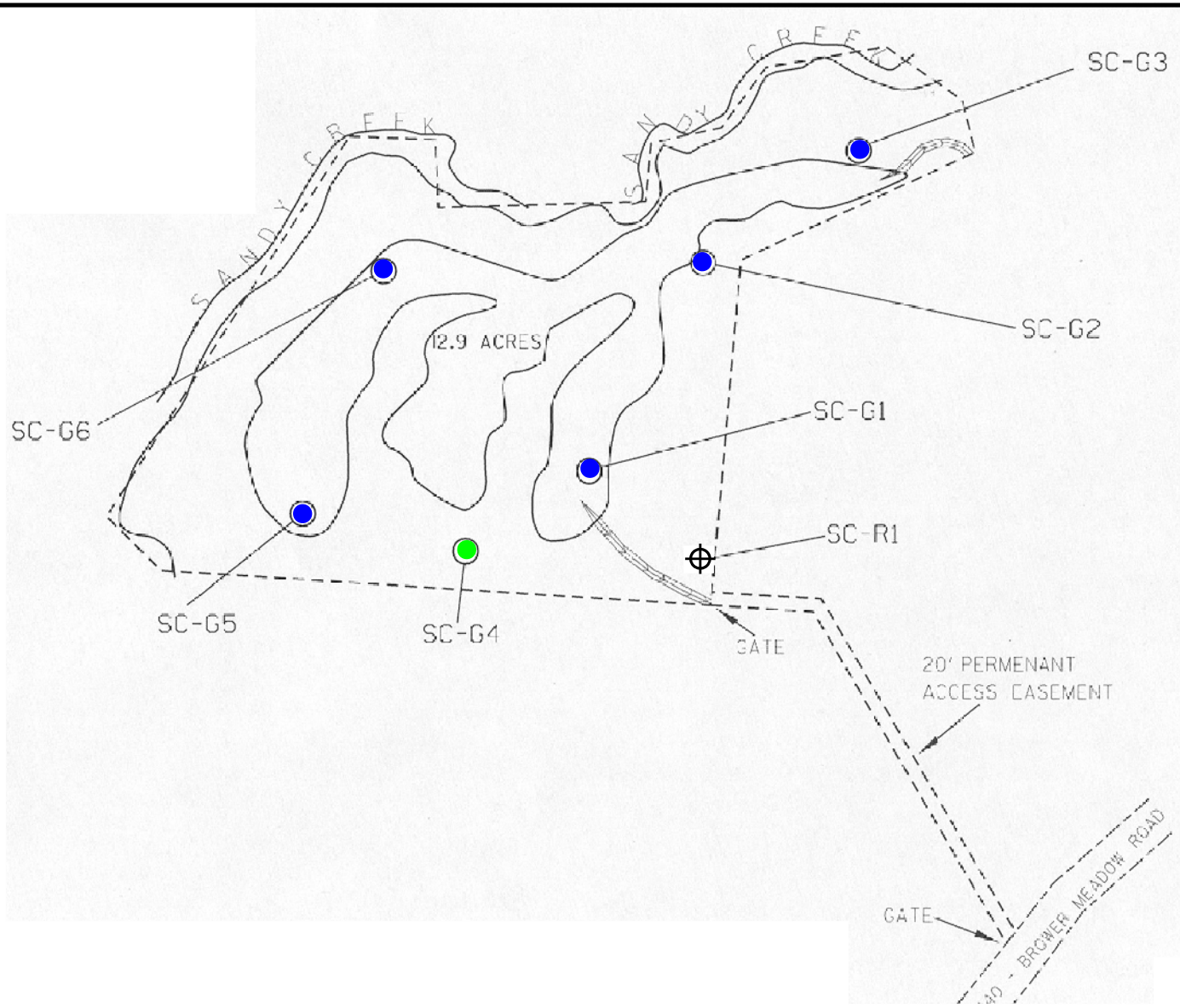


Figure 3. 2004 Hydrologic Monitoring Gauge Results

Hydrology Results

- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

Rain Gauge
Surface Gauge

N

Not to Scale

2.3.2 Climatic Data

Figure 4 provides an evaluation of the 2004 rainfall in comparison with historical rainfall data in order to determine whether 2004 was “average” in terms of precipitation. The historical rainfall data was collected from 1973 through 2004 (30 years). All rainfall data used in this analysis was obtained from the NC State Climate Office, Randleman weather station.

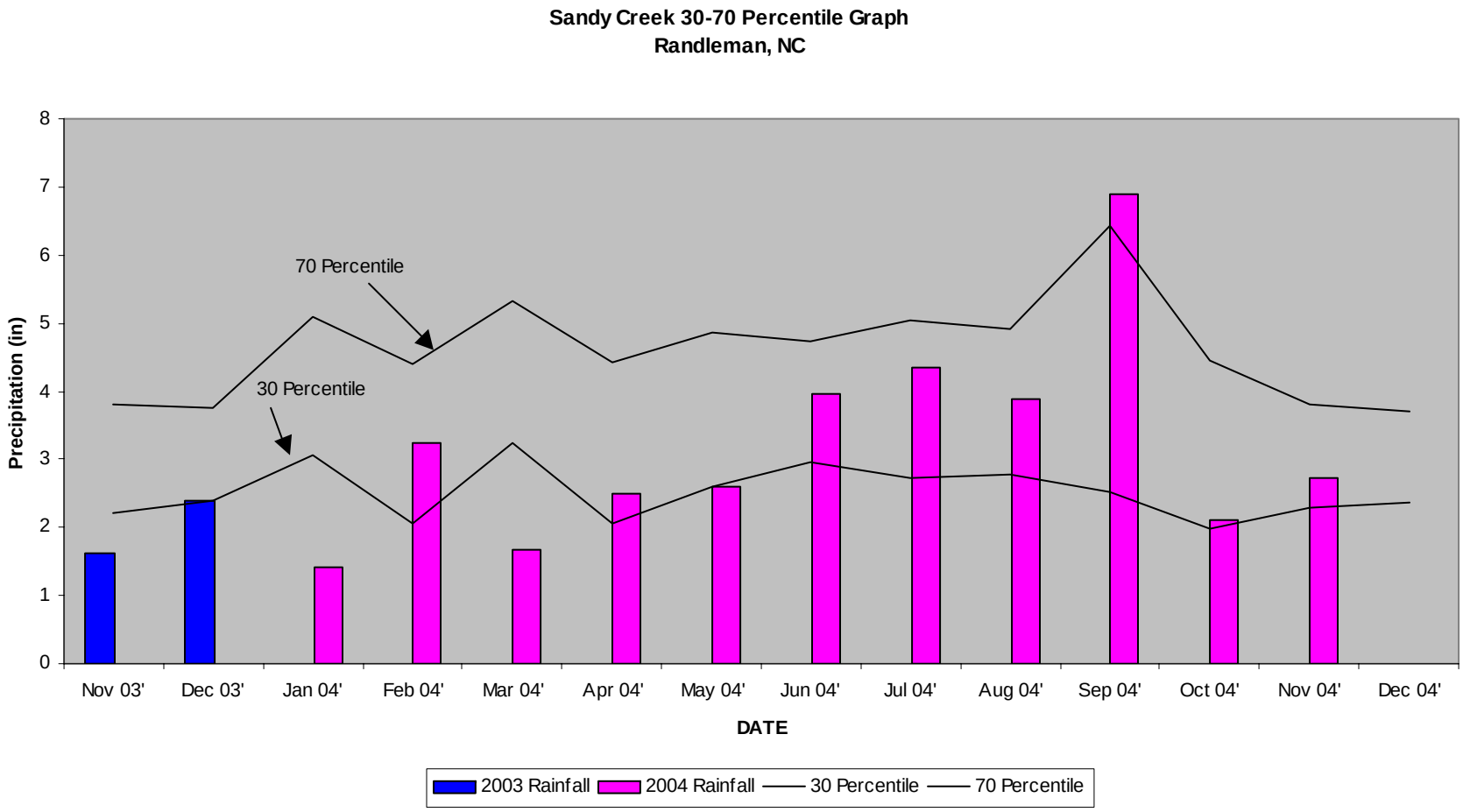
For the 2004-year, November (03’), January, March, and May experienced below average rainfall. December (03’), February, April, June, July, August, October, and November all recorded average rainfall for the site. September was the only month to experience above average rainfall. Overall, 2004 experienced an average rainfall year.

2.4 Conclusions

Hydrologic monitoring indicated that five of the six monitoring gauges exceeded the jurisdictional wetland criteria of saturation within twelve inches of the surface for 12.5% of the growing season. One gauge recorded saturation for 6.6% of the monitoring period. The 2004 monitoring year experienced an average rainfall year.

EEP will begin monitoring the hydrology at the Sandy Creek Mitigation Site in 2005.

Figure 4: 30-70 Percentile Graph



3.0 VEGETATION: SANDY CREEK MITIGATION SITE (YEAR 4 MONITORING)

3.1 Success Criteria

The success criteria state that there must be a minimum of 260 trees per acre living for at least five consecutive years.

3.2 Description of Species

The following species were planted in the Wetland Restoration Area (approx. 10 acres)

Nyssa sylvatica var*. sylvatica*, Blackgum

Fraxinus pennsylvanica, Green Ash

Quercus phellos, Willow Oak

Betula nigra, River Birch

Quercus falcata var*. pagodaefolia*, Cherrybark Oak

Quercus nigra, Water Oak

Quercus falcata var*. falcata*, Southern Red Oak

Liriodendron tulipifera, Tulip Poplar

3.3 Results of Vegetation Monitoring

Table 2. 2004 VEGETATION MONITORING RESULTS

Plot #	Blackgum	Green Ash	Willow Oak	River Birch	Cherrybark Oak	Water Oak	Tulip Poplar	Southern Red Oak	Total (4 year)	Total (at planting)	Density (Trees/Acre)
1		19	2	3					24	56	291
2		16		1					17	55	210
3		12	4	10	2	2			30	58	352
								AVERAGE DENSITY			**284**

Site Notes: Other species noted: Heavy smartweed in plot 1; fescue, barnyard grass, various grasses, sedges, jewelweed, tear-thumb, volunteer sycamore, multiple volunteer green ash, fennel, horse-nettle, box elder, *Baccharis* sp., and sweetgum.

3.4 Conclusions

Tree planting occurred on approximately 10 of the 12.9 acres. There were three vegetation-monitoring plots established within the planting areas. The site was supplemental planted in March 2002. The 2004 vegetation monitoring of the site revealed an average tree density of 284 trees per acre. This average is above the minimum success criteria of 260 trees per acre.

EEP will begin monitoring the vegetation at the Sandy Creek Mitigation Site for the 2005 monitoring year.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

Hydrologic monitoring indicated that five of the six monitoring gauges exceeded the jurisdictional wetland criteria of saturation within twelve inches of the surface for 12.5% of the growing season. One gauge recorded saturation for 6.6% of the monitoring period. The 2004-monitoring year experienced an average rainfall year.

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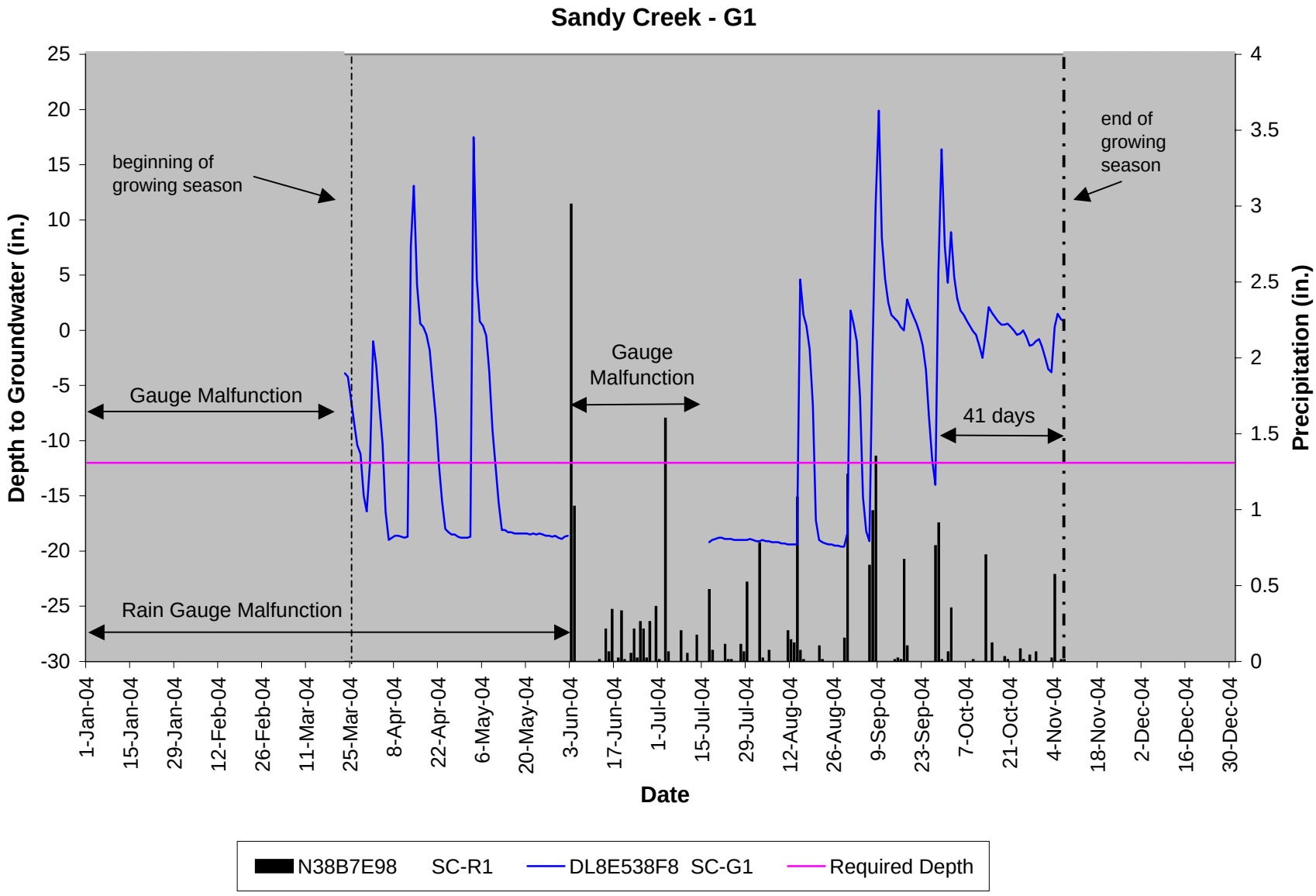
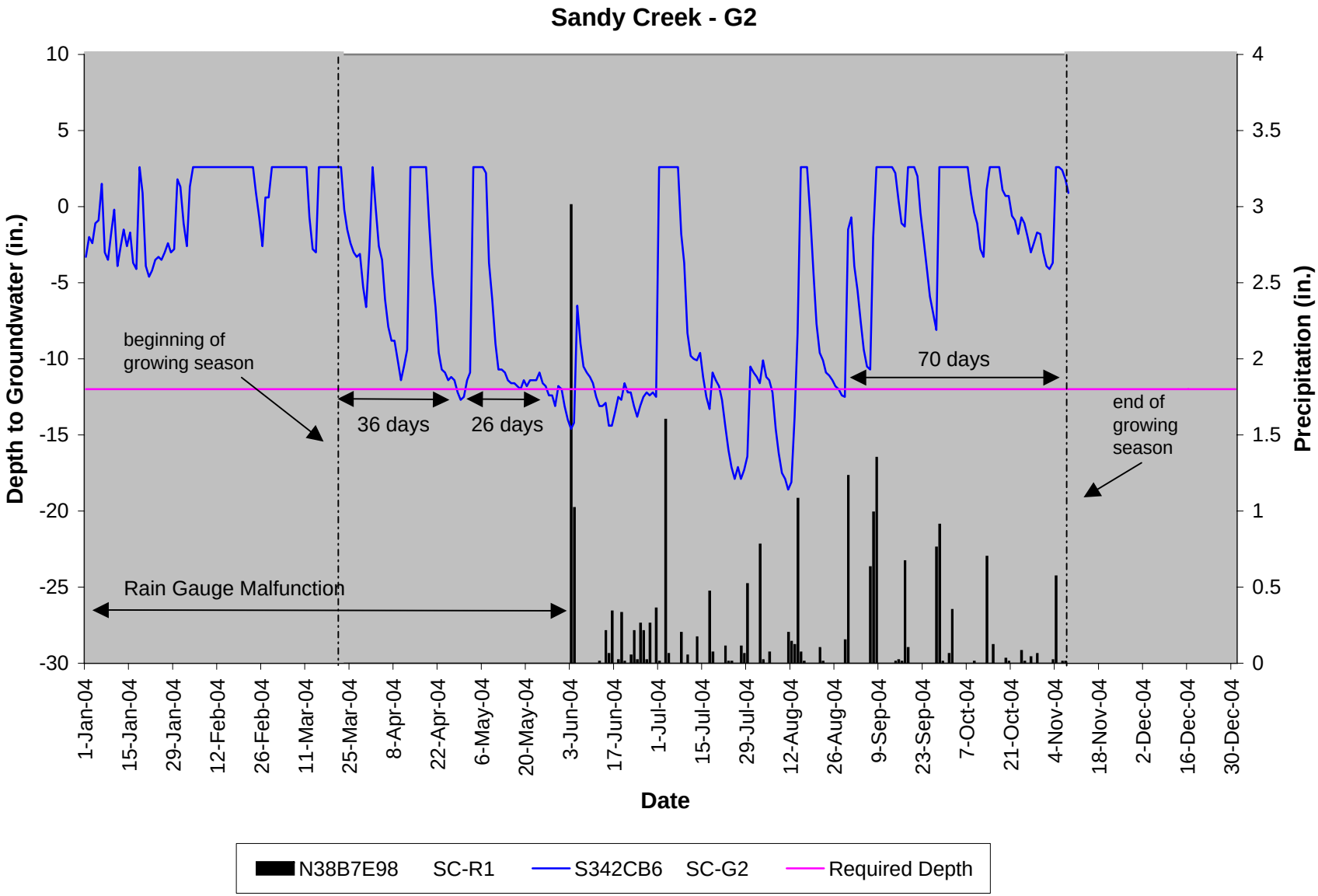
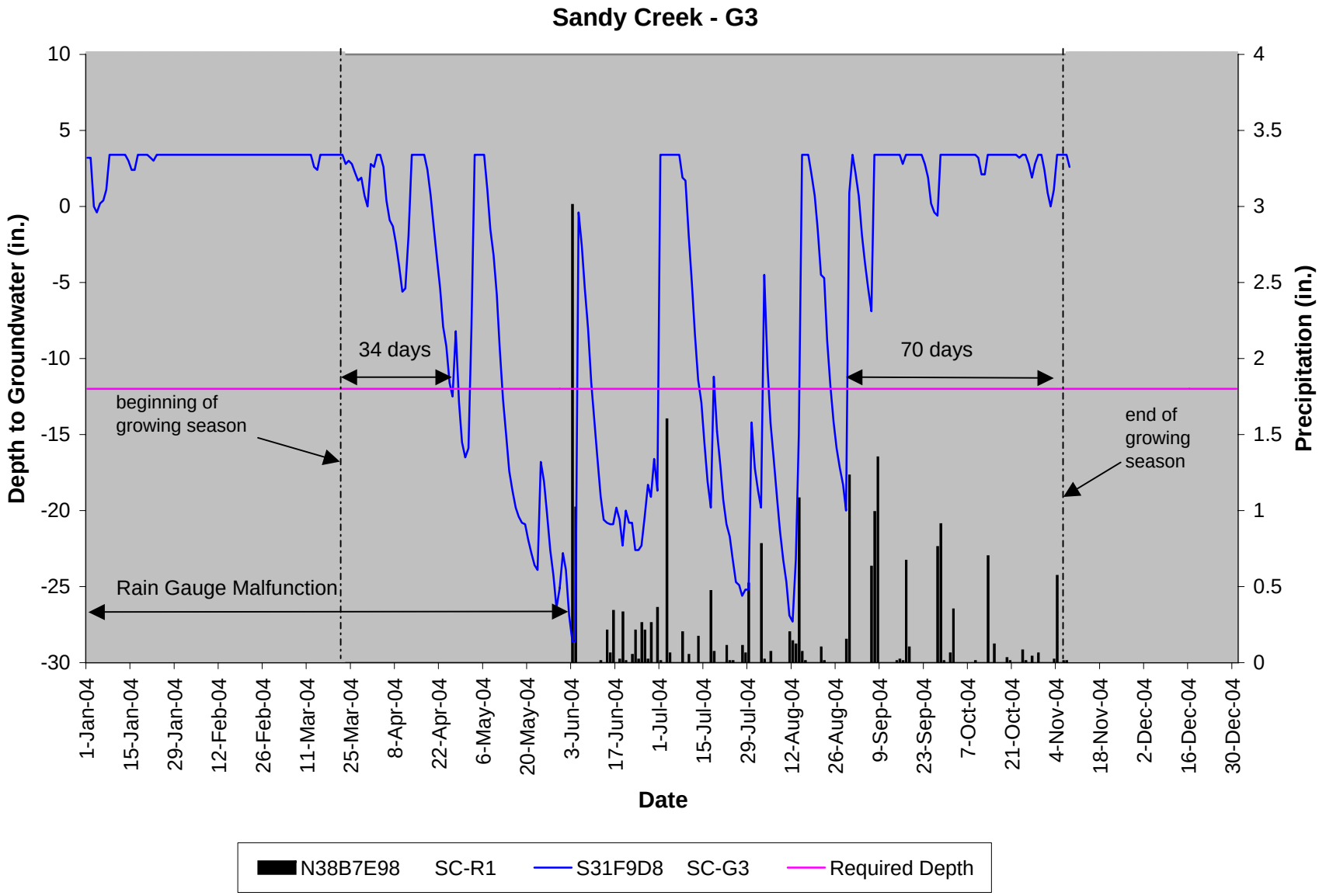
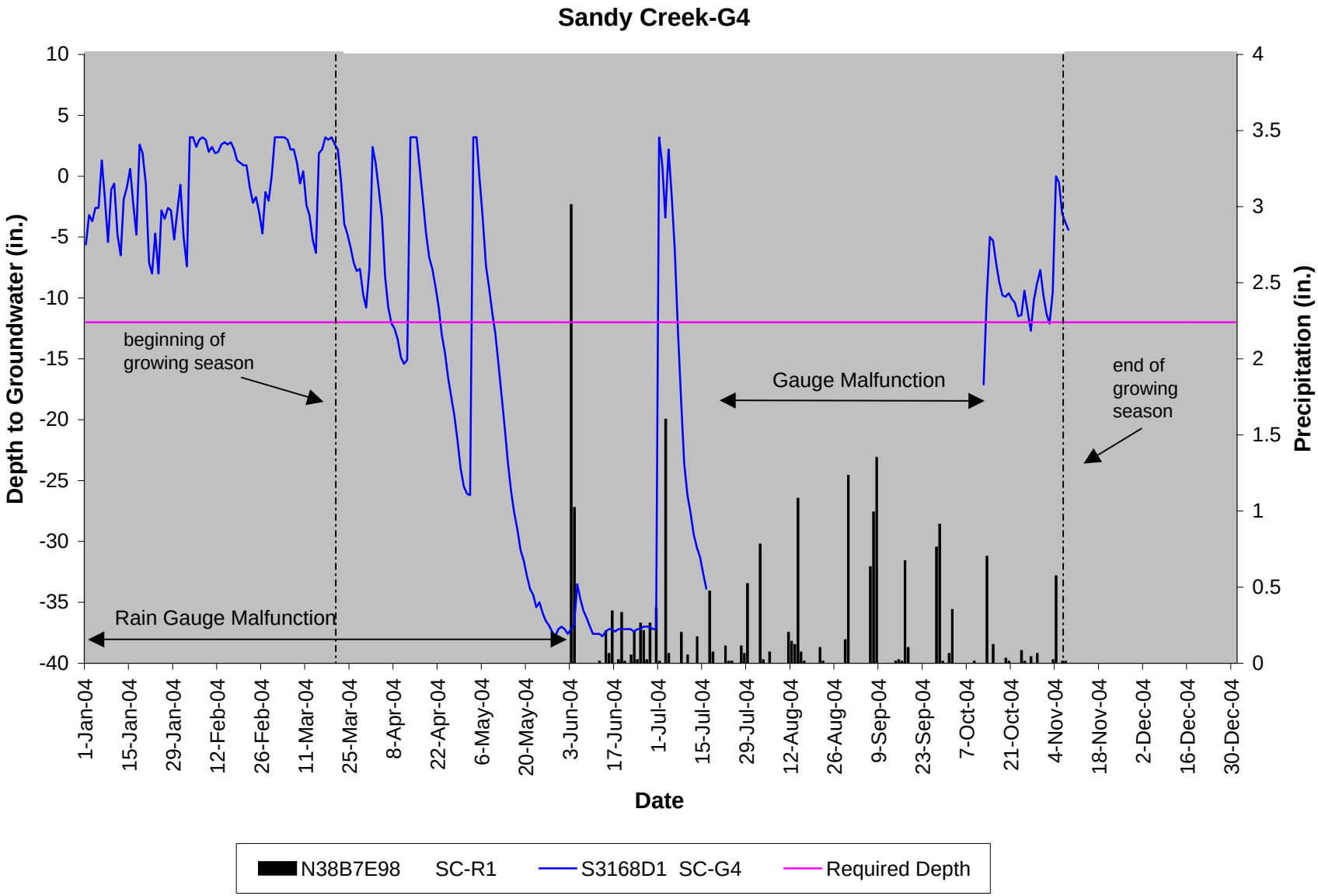
APPENDIX A

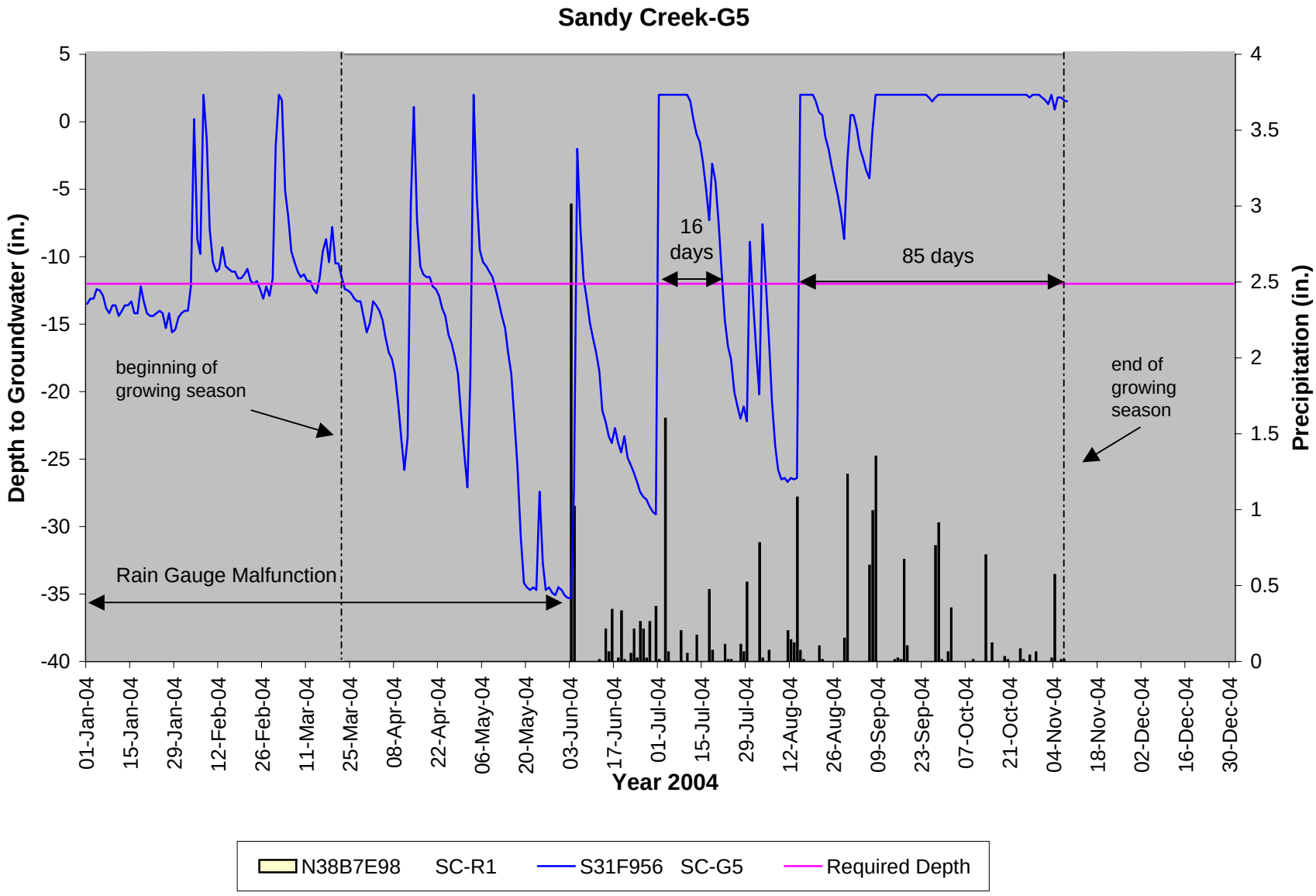
GAUGE DATA GRAPHS

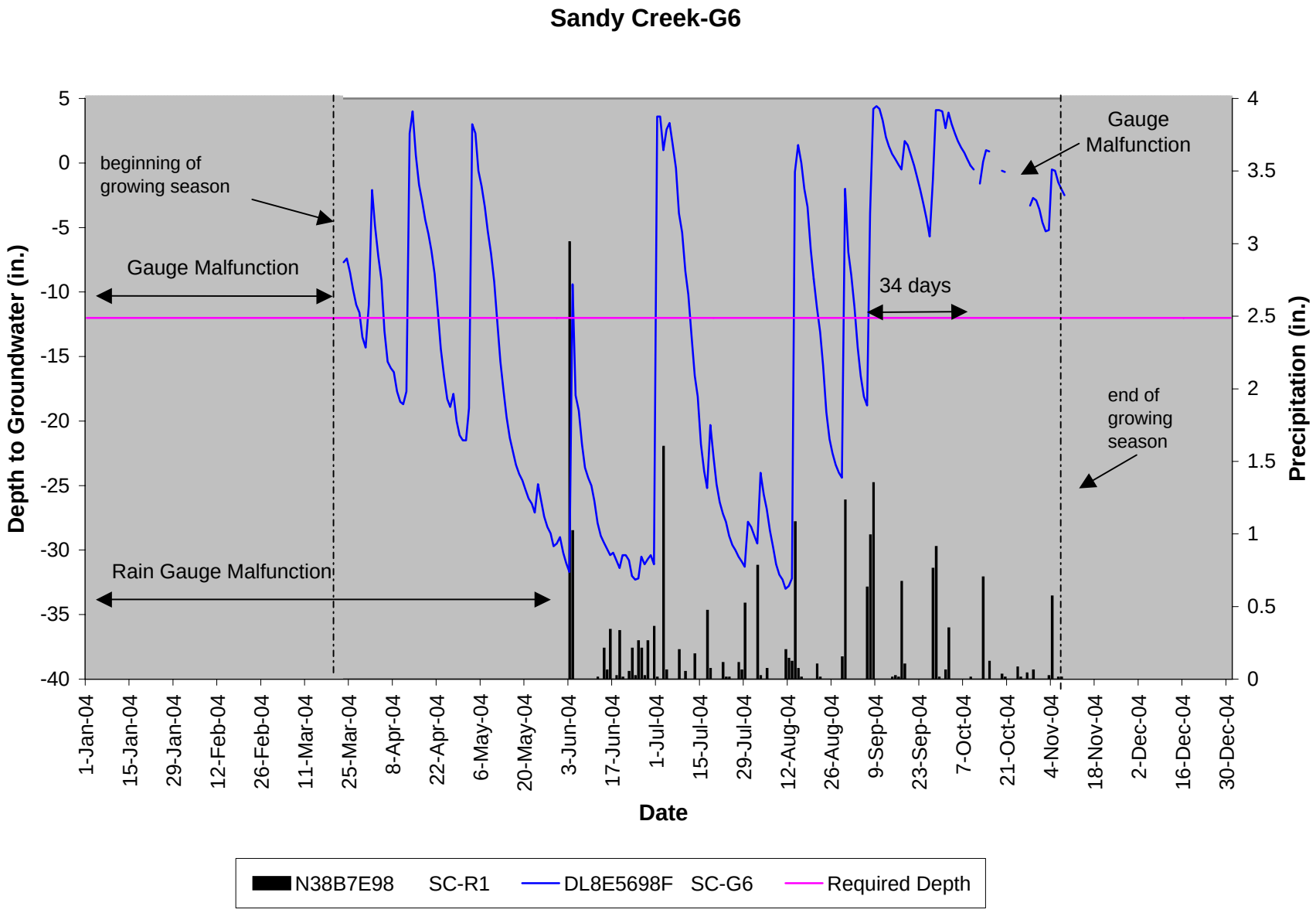

Sandy Creek - G1
Depth to Groundwater (in.)
Precipitation (in.)
Date
beginning of growing season
end of growing season
Gauge Malfunction
Gauge Malfunction
41 days
Rain Gauge Malfunction
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
4
3.5
3
2.5
2
1.5
1
0.5
0
1-Jan-04
15-Jan-04
29-Jan-04
12-Feb-04
26-Feb-04
11-Mar-04
25-Mar-04
8-Apr-04
22-Apr-04
6-May-04
20-May-04
3-Jun-04
17-Jun-04
1-Jul-04
15-Jul-04
29-Jul-04
12-Aug-04
26-Aug-04
9-Sep-04
23-Sep-04
7-Oct-04
21-Oct-04
4-Nov-04
18-Nov-04
2-Dec-04
16-Dec-04
30-Dec-04
N38B7E98 SC-R1
DL8E538F8 SC-G1
Required Depth


Sandy Creek - G2
Depth to Groundwater (in.)
Precipitation (in.)
Date
beginning of growing season
36 days
26 days
70 days
end of growing season
Rain Gauge Malfunction
10
5
0
-5
-10
-15
-20
-25
-30
4
3.5
3
2.5
2
1.5
1
0.5
0
1-Jan-04
15-Jan-04
29-Jan-04
12-Feb-04
26-Feb-04
11-Mar-04
25-Mar-04
8-Apr-04
22-Apr-04
6-May-04
20-May-04
3-Jun-04
17-Jun-04
1-Jul-04
15-Jul-04
29-Jul-04
12-Aug-04
26-Aug-04
9-Sep-04
23-Sep-04
7-Oct-04
21-Oct-04
4-Nov-04
18-Nov-04
2-Dec-04
16-Dec-04
30-Dec-04
N38B7E98 SC-R1
S342CB6 SC-G2
Required Depth


Sandy Creek - G3
Depth to Groundwater (in.)
Precipitation (in.)
Date
34 days
70 days
beginning of growing season
end of growing season
Rain Gauge Malfunction
N38B7E98 SC-R1
S31F9D8 SC-G3
Required Depth


Sandy Creek-G4
Depth to Groundwater (in.)
Precipitation (in.)
Date
beginning of growing season
Rain Gauge Malfunction
Gauge Malfunction
end of growing season
N38B7E98 SC-R1
S3168D1 SC-G4
Required Depth


Sandy Creek-G5
Depth to Groundwater (in.)
Precipitation (in.)
Year 2004
16 days
85 days
beginning of growing season
end of growing season
Rain Gauge Malfunction
N38B7E98 SC-R1
S31F956 SC-G5
Required Depth


Sandy Creek-G6
Depth to Groundwater (in.)
Precipitation (in.)
Date
beginning of growing season
Gauge Malfunction
Gauge Malfunction
34 days
end of growing season
Rain Gauge Malfunction
5
0
-5
-10
-15
-20
-25
-30
-35
-40
4
3.5
3
2.5
2
1.5
1
0.5
0
1-Jan-04
15-Jan-04
29-Jan-04
12-Feb-04
26-Feb-04
11-Mar-04
25-Mar-04
8-Apr-04
22-Apr-04
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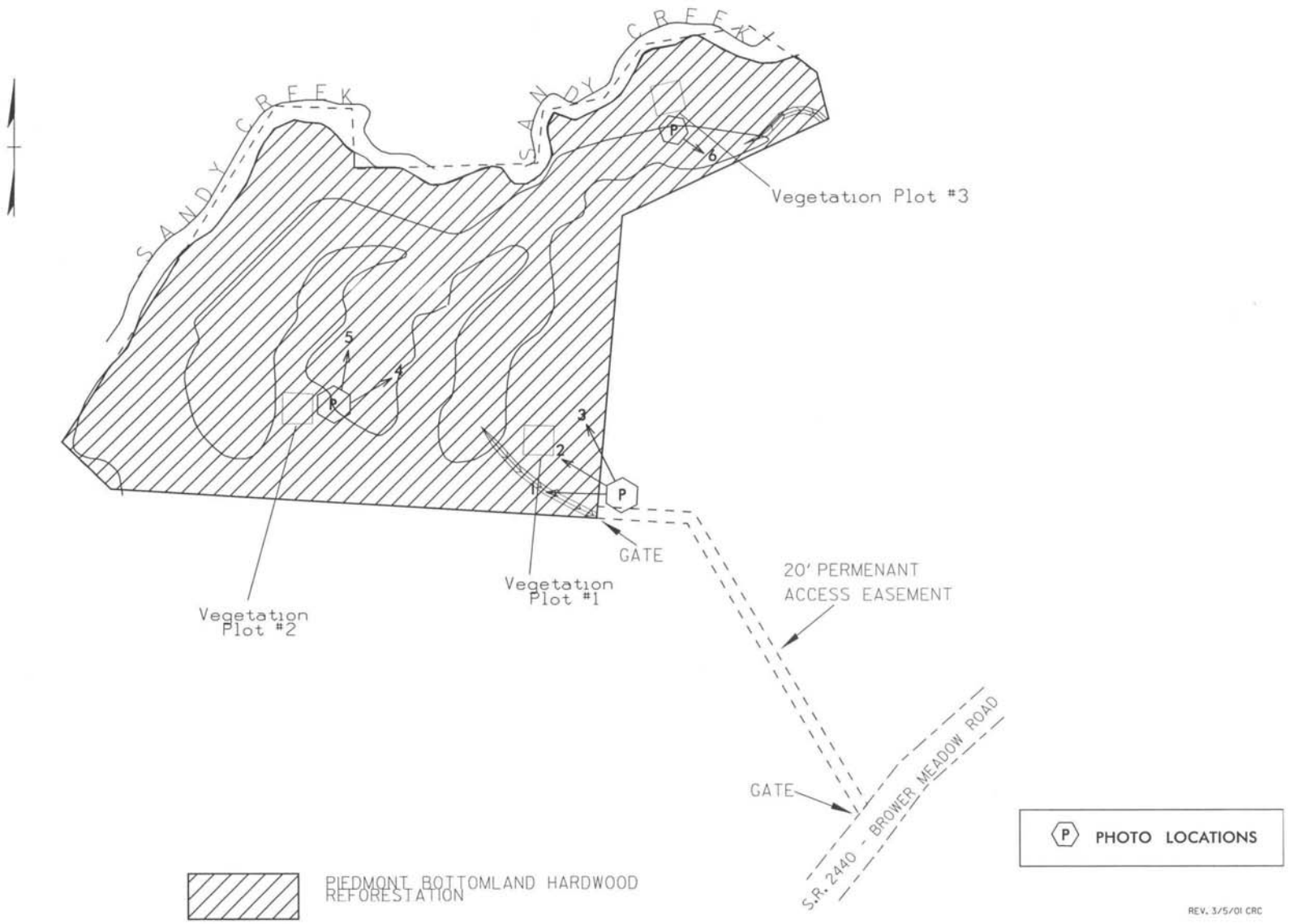
26-Aug-04
9-Sep-04
23-Sep-04
7-Oct-04
21-Oct-04
4-Nov-04
18-Nov-04
2-Dec-04
16-Dec-04
30-Dec-04
N38B7E98 SC-R1
DL8E5698F SC-G6
Required Depth

APPENDIX B

PHOTO AND VEGETATION PLOT LOCATIONS/SITE PHOTOS

SANDY CREEK MITIGATION SITE

Photo and Plot Locations



Sandy Creek

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

2004