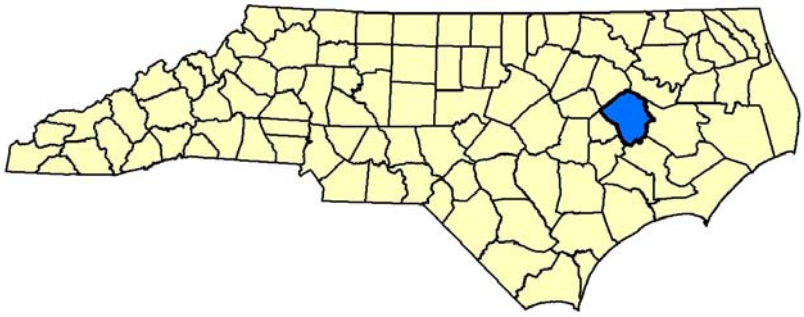
ANNUAL REPORT FOR 2005



Grimesland Sand Pit Phase I Site
Pitt County
Project No. 8.T221801
TIP No. R-2510WM
Monitoring Year 4 of 5

Ecosystem Enhancement PROGRAM

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SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year for Phase I of the Grimesland Sand Pit Mitigation Site. This site was constructed to serve as a wetland mitigation site for roadway project impacts in the Lower Tar River portion of the Tar-Pamlico River Basin in North Carolina. The site consists of three phases. Phase I construction was completed in January of 2000 and planting was completed in March of 2000. In March 2002, the Phase I area was replanted.

The site is monitored for hydrology using five groundwater-monitoring gauges, two surface water gauges, and one rain gauge. The site is monitored for vegetation using four vegetation plots that are representative of the 7.8 acres planted in trees. The 2005-year represents the fourth year of hydrology and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the project is deemed successful.

Results for both hydrologic and vegetation monitoring indicate that the site is meeting success. The hydrologic data for 2005 shows that the Phase I site was saturated and met jurisdictional success with all five groundwater gauges meeting the 12.5% success criteria. Vegetation monitoring for the fourth year yielded 452 trees per acre, which is above the minimum requirement of 290 trees per acre in year four (4).

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The 550-acre Grimesland Sand Pit Mitigation Site (herein after referred to as "the site") is located in Pitt County near the community of Grimesland. The site is currently owned and mined by NCDOT. It is bounded on the north and the east by Grindle Creek, on the west by croplands and pine plantation, and on the south by the floodplain of the Tar River and the Tar River itself (Figure 1). The site serves as a regional wetland mitigation site for NCDOT roadway projects that would impact similar sites located in the Lower Tar River Sub-Basin. The site includes the creation of 58 acres of forested riverine wetlands (cypress-gum swamp and coastal plain bottomland hardwoods), the creation of 2 acres of emergent wetlands on submerged benches, the preservation of 348 acres of riverine wetland ecosystem, the preservation of 29.59 acres of riparian buffer and the enhancement of aquatic habitat within 80 acres of flooded abandoned borrow pits.

1.2 PURPOSE

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until success criteria are satisfied. 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 the 2005-growing season at the Grimesland Sand Pit Site Phase I.

1.3 PROJECT HISTORY

Date	Task Accomplished
2000	
January	Construction- Phase 1
March	Phase I Planted
2001	
August	Vegetation Monitoring (1 yr.)
2002	
March	Phase I Replanted
March-November	Hydrologic Monitoring (1 yr.)
June	Vegetation Monitoring (1 yr. Restart)
2003	
March-November	Hydrologic Monitoring (2 yr.)
June	Vegetation Monitoring (2 yr.)
2004	
March-November	Hydrologic Monitoring (3 yr.)
June	Vegetation Monitoring (3 yr.)
2005	
March-November	Hydrologic Monitoring (4 yr.)
June	Vegetation Monitoring (4 yr.)

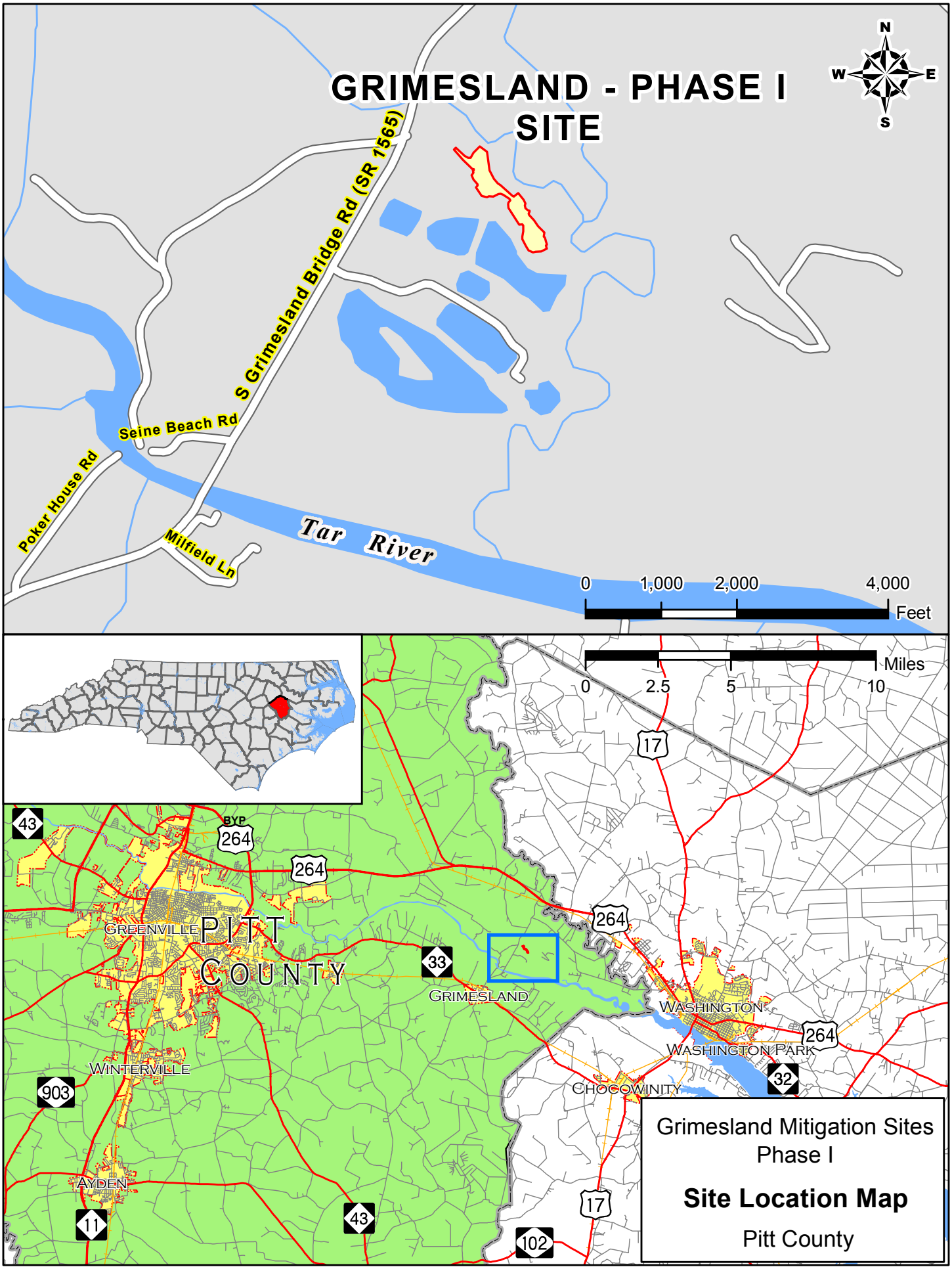

GRIMESLAND - PHASE I SITE
N
W
E
S
S Grimesland Bridge Rd (SR 1565)
Seine Beach Rd
Poker House Rd
Milfield Ln
Tar River
0
1,000
2,000
4,000
Feet
Miles
0
2.5
5
10
PITT COUNTY
GREENVILLE
GRIMESLAND
WINTERVILLE
AYDEN
WASHINGTON
WASHINGTON PARK
CHOCOWINITY
BYP
264
17
33
43
903
11
32
102
Grimesland Mitigation Sites
Phase I
Site Location Map
Pitt County

Figure 1

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 groundwater for consecutive days lasting at least 12.5% of the growing season. Areas inundated less than 5% of the growing season are always classified as nonwetlands. Areas inundated between 5% - 12.5% of the growing season can be classified as wetlands depending upon other factors, such as the presence of hydrophytic vegetation and hydric soils.

The growing season in Pitt County begins March 15 and ends November 16. These dates correspond to a 50% probability that temperatures will remain above 28^{o} F or higher after March 15 and before November 16[1]. The growing season is 247 days; therefore, the optimum duration for wetland hydrology is 31 days. Also, local climate must represent average conditions for the area.

2.2 HYDROLOGIC DESCRIPTION

Five groundwater and two surface water gauges were installed in the Phase I section in March of 2000 (Figure 2). The automatic monitoring gauges record daily readings of the groundwater depth, while the surface water gauges record water depth every three hours. A rain gauge installed onsite records daily rainfall totals; these rain events were incorporated into the monitoring results to examine how the site's groundwater level responded to rainfall.

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 groundwater-monitoring gauge. This number was converted into a percentage of the 247-day growing season (March 15 – November 16).

Table 1 shows the hydrologic results for 2005; Figure 3 is an aerial photograph with the gauges shown as a blue dot indicating the gauge showed success for more than 12.5% of the growing season; a red dot, between 8 and 12.5%; a green dot, between 5 and 8%, and a black dot, less than 5%. All gauges met the 12.5% criterion.

[1] Soil Conservation Service, Soil Survey of Pitt County, North Carolina, p.71.

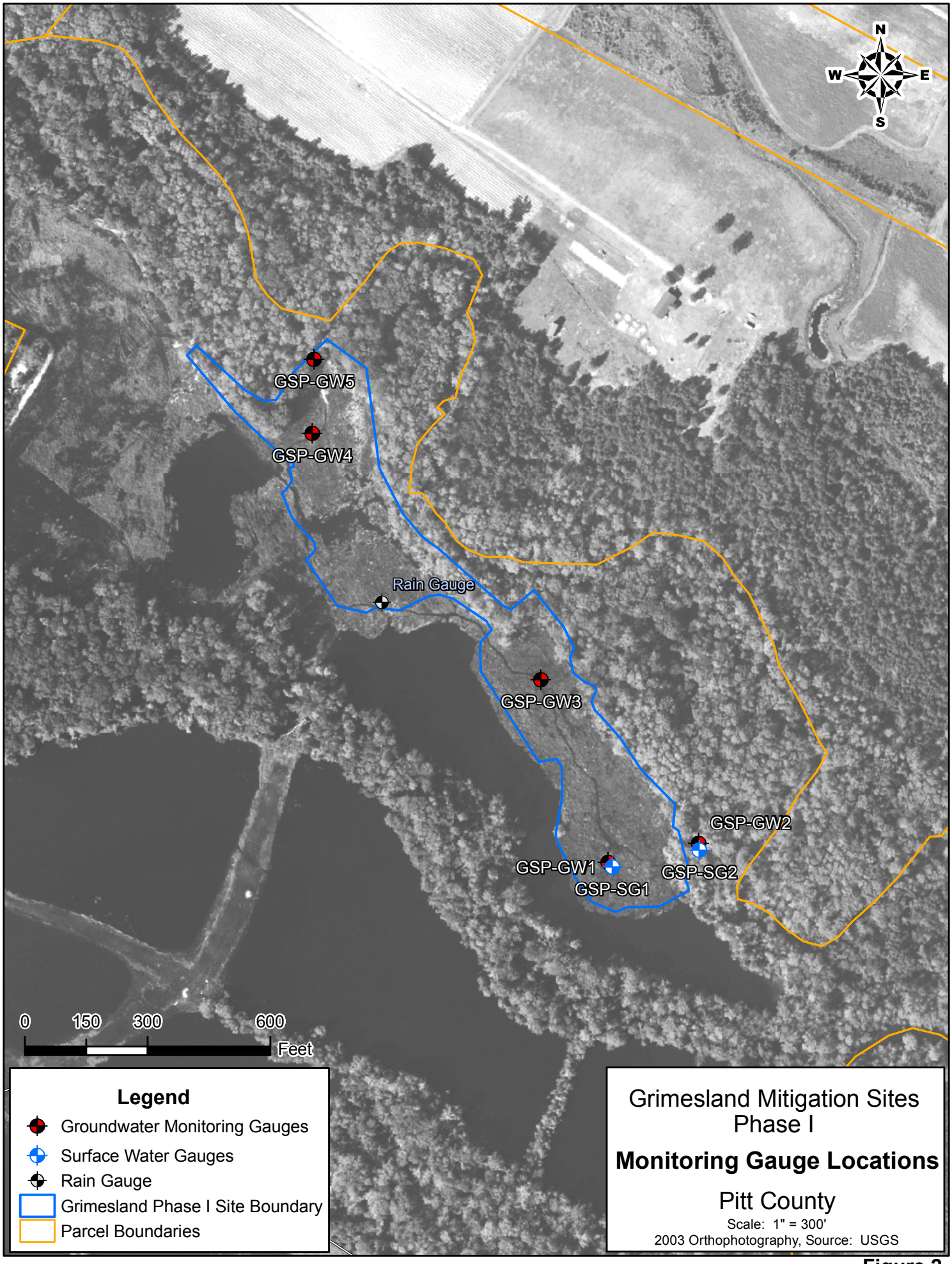

N
W
E
S
GSP-GW5
GSP-GW4
Rain Gauge
GSP-GW3
GSP-GW2
GSP-GW1
GSP-SG2
GSP-SG1
0
150
300
600
Feet
Legend
Groundwater Monitoring Gauges
Surface Water Gauges
Rain Gauge
Grimesland Phase I Site Boundary
Parcel Boundaries
Grimesland Mitigation Sites
Phase I
Monitoring Gauge Locations
Pitt County
Scale: 1" = 300'
2003 Orthophotography, Source: USGS

Figure 2

Table 1. 2005 Phase I Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5 – 8%	8 – 12%	> 12.5%	Actual %	Success Dates
GSP-GW1+				**x**	99.6	March 15-May 2 May 4-November 16
GSP-GW2+				**x**	82.2	March 15-April 26 June 10-November 16
GSP-GW3+				**x**	100	March 15-November 16
GSP-GW4+				**x**	77.7	March 15-September 22
GSP-GW5+				**x**	100	March 15-November 16

+ Gauge met the success criterion during an average rainfall month (March, April, May, July and September).

Appendix A contains plots of the groundwater depth at each monitoring gauge location during 2005. In addition to documenting the groundwater level relative to the ground surface (within 12”), these monitoring gauge graphs are designed to show the reaction of the groundwater level to specific rainfall events. The maximum number of consecutive days that the gauge indicates successful hydrology is noted on each graph. Precipitation events recorded by the onsite rain gauge are included on each graph. Plots of the data recorded at each of the two surface water gauges are also included in Appendix A.

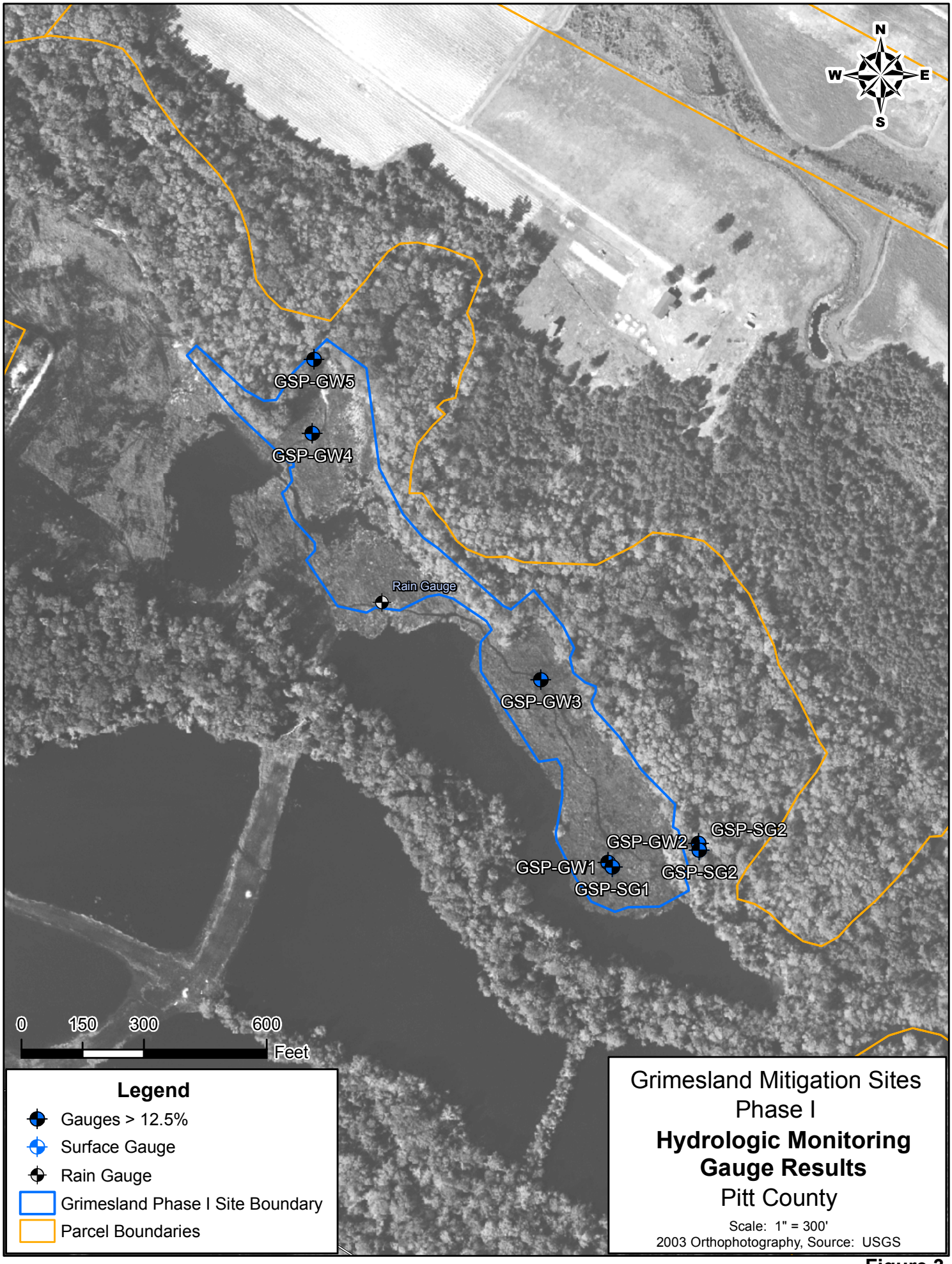

N
W
E
S
GSP-GW5
GSP-GW4
Rain Gauge
GSP-GW3
GSP-SG2
GSP-GW2
GSP-GW1
GSP-SG2
GSP-SG1
0
150
300
600
Feet
Legend
Gauges > 12.5%
Surface Gauge
Rain Gauge
Grimesland Phase I Site Boundary
Parcel Boundaries
Grimesland Mitigation Sites
Phase I
Hydrologic Monitoring Gauge Results
Pitt County
Scale: 1" = 300'
2003 Orthophotography, Source: USGS

Figure 3

2.3.2 Climatic Data

Figure 4 is a graph of monthly rainfall for the period of November 2004 through October 2005 compared to historical precipitation data (collected between 1973 and 2004) for Washington, North Carolina. The onsite rain gauge provided rainfall data and the NC State Climate Office provided the historical rainfall data. The comparison of 2005 rainfall versus historical values gives an indication of how 2005 compares to historical climate conditions.

For the 2005 monitoring year, October experienced above average rainfall. The months of January, February, and August recorded below average rainfall for the site. November (04'), December (04'), March, April, May, June, July, and September experienced average rainfall. Overall, 2005 experienced an average rainfall year.

2.4 CONCLUSIONS

In 2005, all five groundwater-monitoring gauges indicated success for at least 12.5% of the growing season. The two surface gauges provided data showing the consistent presence of surface water throughout the growing season. It is recommended that EEP continue monitoring at the Grimesland Phase I Mitigation Site for the 2006 monitoring year.

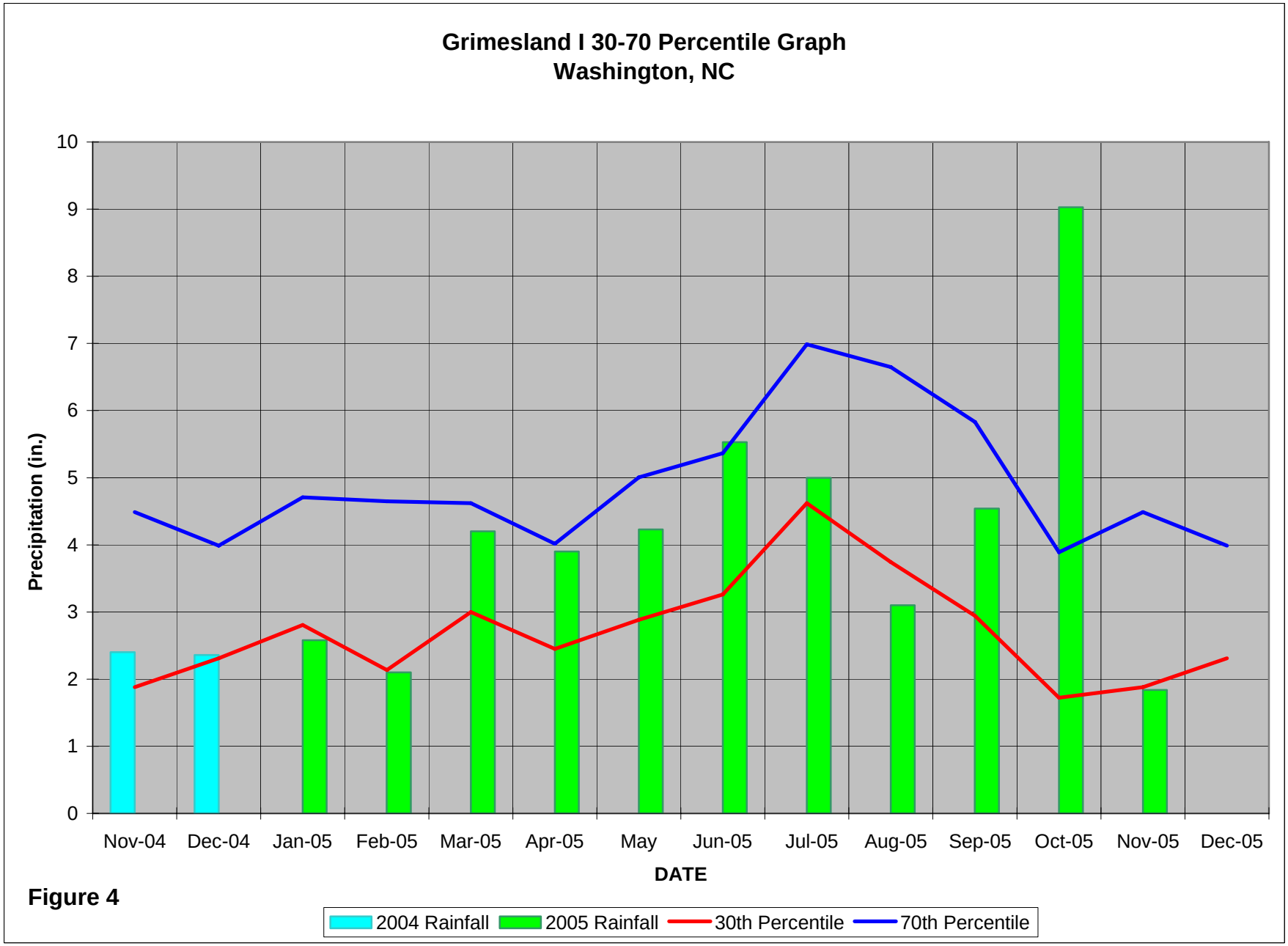

Grimesland I 30-70 Percentile Graph
Washington, NC
Precipitation (in.)
10
9
8
7
6
5
4
3
2
1
0
Nov-04
Dec-04
Jan-05
Feb-05
Mar-05
Apr-05
May
Jun-05
Jul-05
Aug-05
Sep-05
Oct-05
Nov-05
Dec-05
DATE
2004 Rainfall
2005 Rainfall
30th Percentile
70th Percentile

Figure 4

3.0 VEGETATION (YEAR 4 MONITORING)

3.1 SUCCESS CRITERIA

The success criteria state that there must be a minimum density of 320 trees per acre after three years of initial planting. A minimum of 290 trees per acre must be living at the end of year 4 and a minimum count of 260 trees per acre must be surviving at five years after initial planting.

3.2 DESCRIPTION OF SPECIES

The following species were planted in the Wetland Restoration Area:

Phase I:

Nyssa sylvatica var. *biflora*, Swamp Blackgum
Fraxinus pennsylvanica, Green Ash
Nyssa aquatica, Water Tupelo
Quercus phellos, Willow Oak
Quercus nigra, Water Oak
Taxodium distichum, Baldcypress
Carpinus caroliniana, American Hornbeam

3.3 RESULTS OF VEGETATION MONITORING

Table 2. 2005 Vegetation Monitoring Results

Plot #	Baldcypress	Green Ash	Swamp Blackgum	Water Tupelo	Sycamore	Hornbeam	Total (Year 4)	Total (at planting)	Density (Trees/Acre)
1	6	2	9	5			22	40	374
2	24		13	3	1	2	42	49	583
3	3	12	16	2		3	36	47	521
4	1	5	10		4	5	21	43	332
	AVERAGE TREE DENSITY								**452**

Site Notes: Other species noted: black willow, *Juncus* sp., woolgrass, cattail, *Cyperus* sp., *Scirpus* sp., smartweed, sycamore, volunteer swamp blackgum, and various grasses.

3.4 CONCLUSIONS

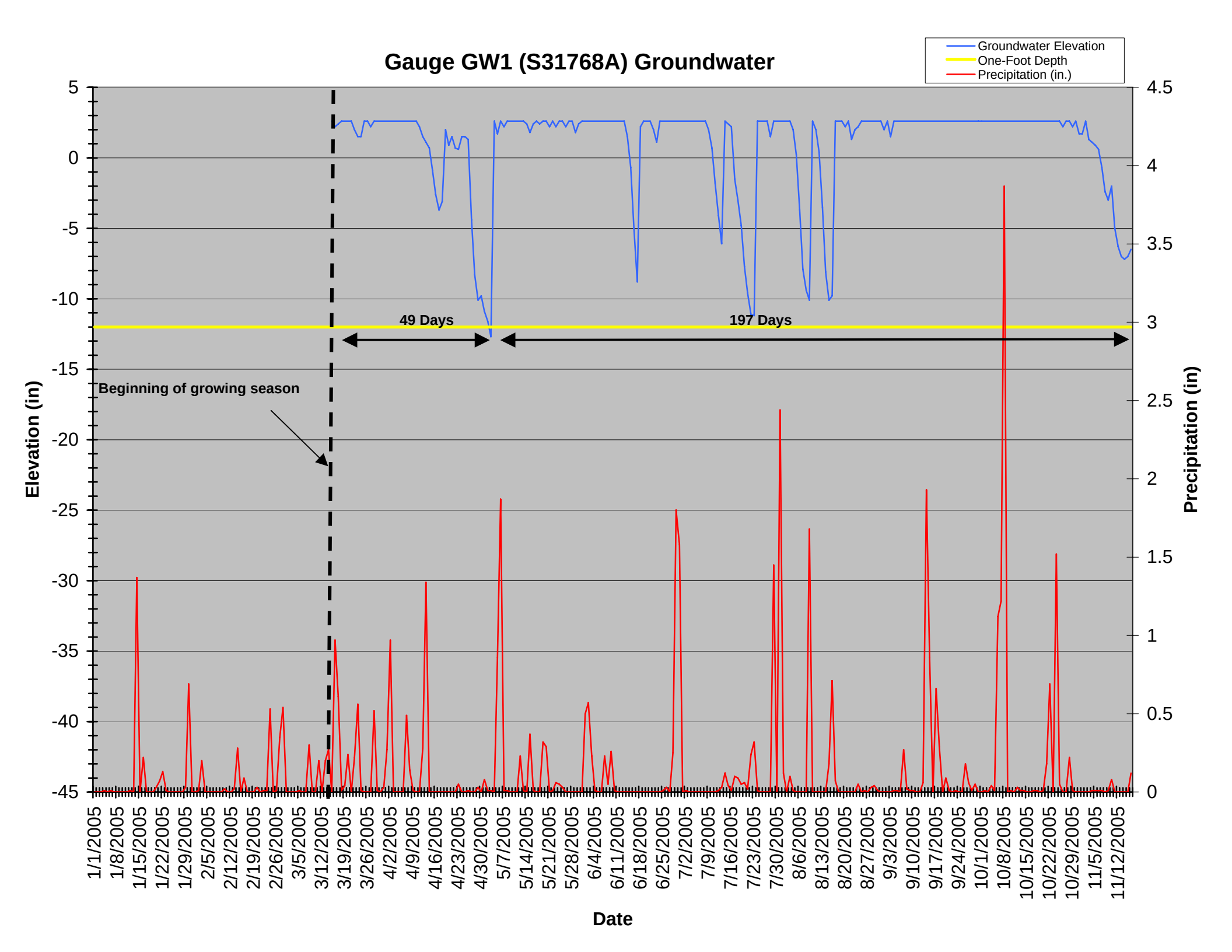
Phase I consisted of approximately 7.8 acres of tree planting. There were four vegetation-monitoring plots established throughout the Phase I planting areas. The site is well vegetated with a variety of wetland grasses. The 2005 vegetation monitoring of the site revealed an average tree density of 452 trees per acre within Phase I. This average is above the minimum success criteria of 290 trees per acre at the end of year four (4).

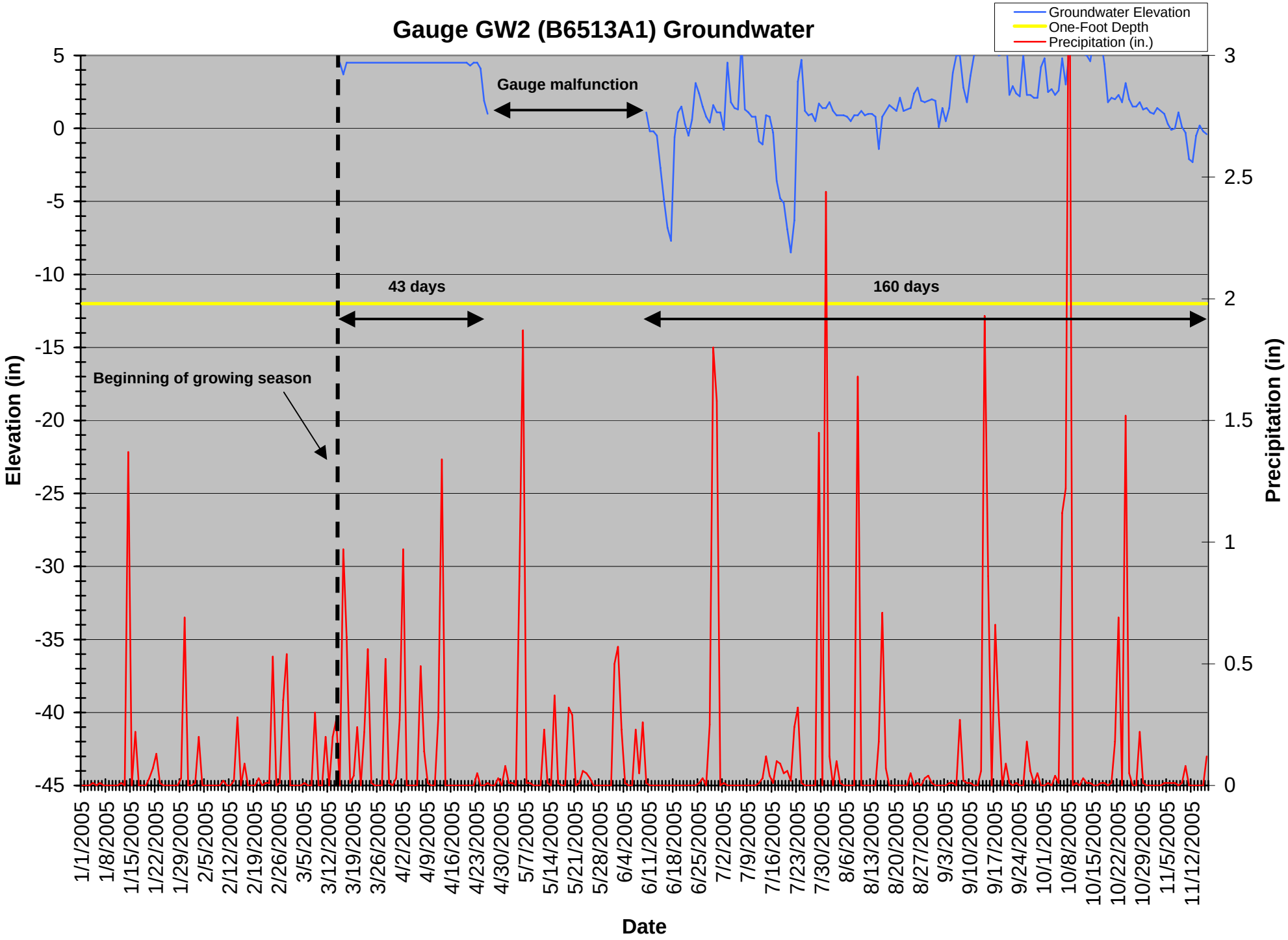
4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

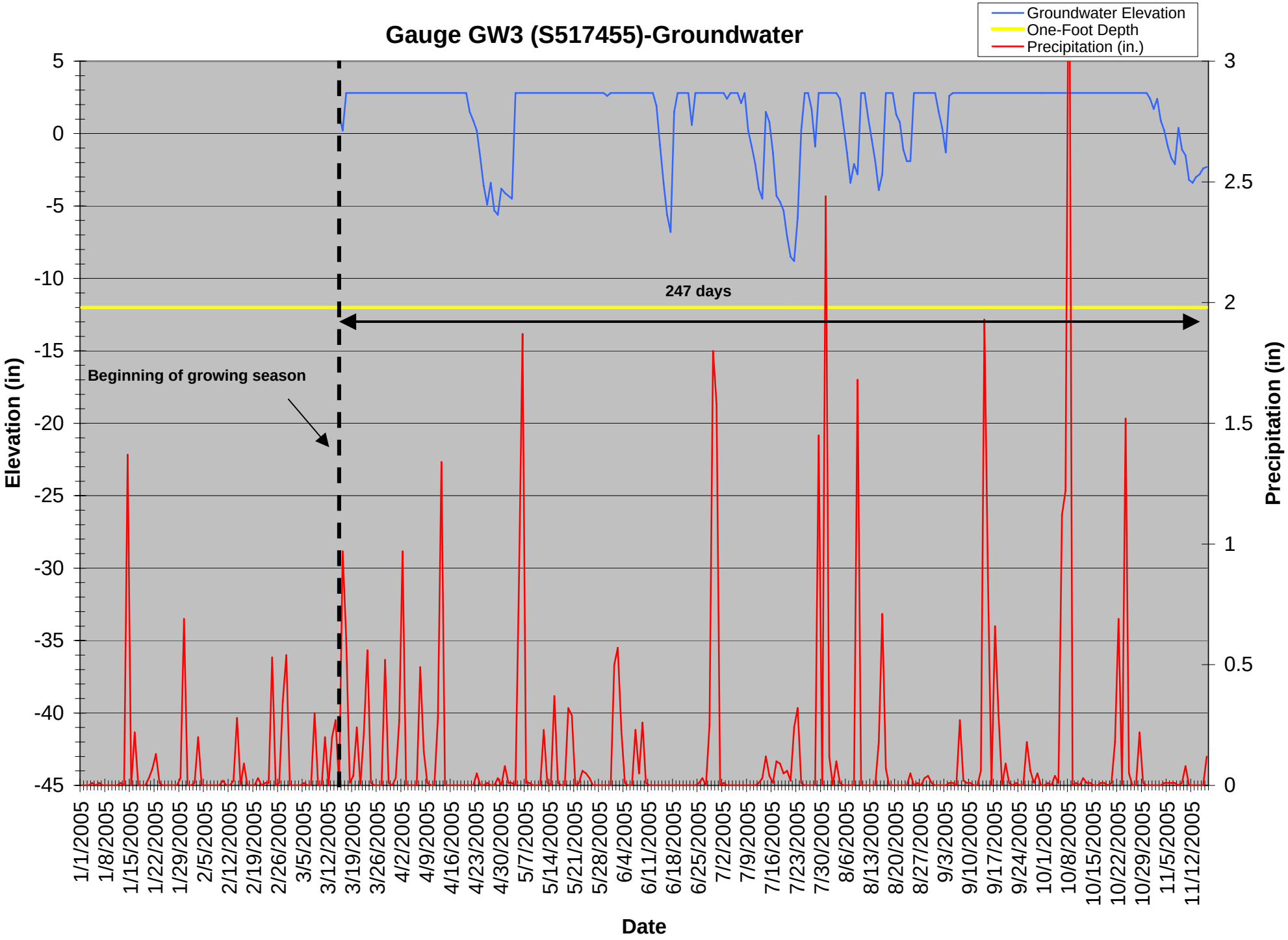
The Grimesland Sand Pit Phase I Mitigation Site was monitored for the fourth year in 2005. All five groundwater-monitoring gauges indicated jurisdictional success (at least 12.5%) for the 2005-monitoring year. The two site surface water gauges indicated the presence of surface water throughout the growing season. An analysis of rainfall in nearby Washington, NC shows that the region experienced average rainfall for the year. Therefore, the site met the jurisdictional success criteria under average climatic conditions.

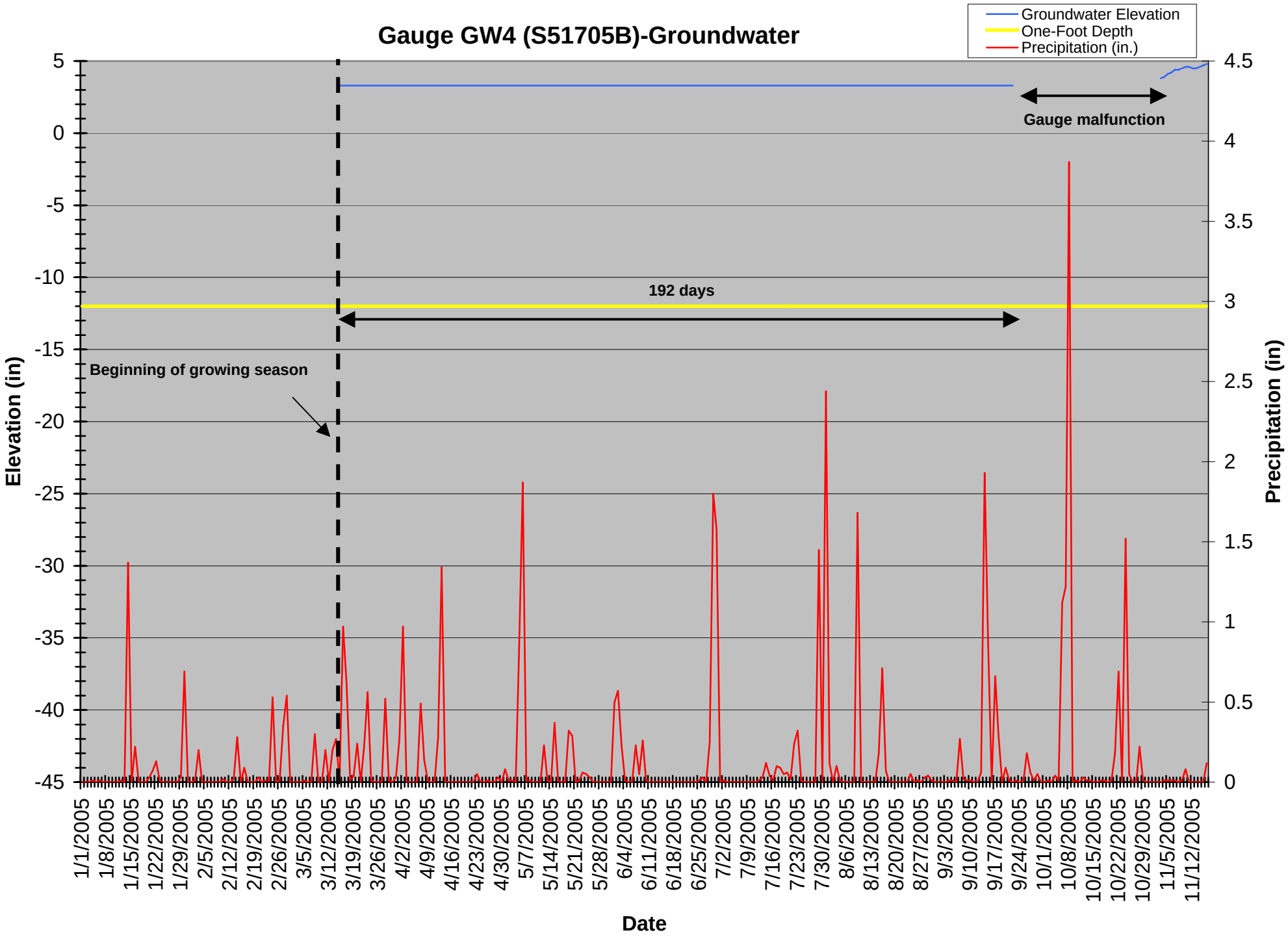
Approximately 7.8 acres of the site were planted; four vegetation plots within this area are used for vegetation monitoring. The established success criteria stated that a minimum of 290 trees per acre must be living at year 4. Monitoring results showed an average survival rate of 452 trees per acre in the fourth year. Therefore, the vegetation exceeds the minimum success criteria.

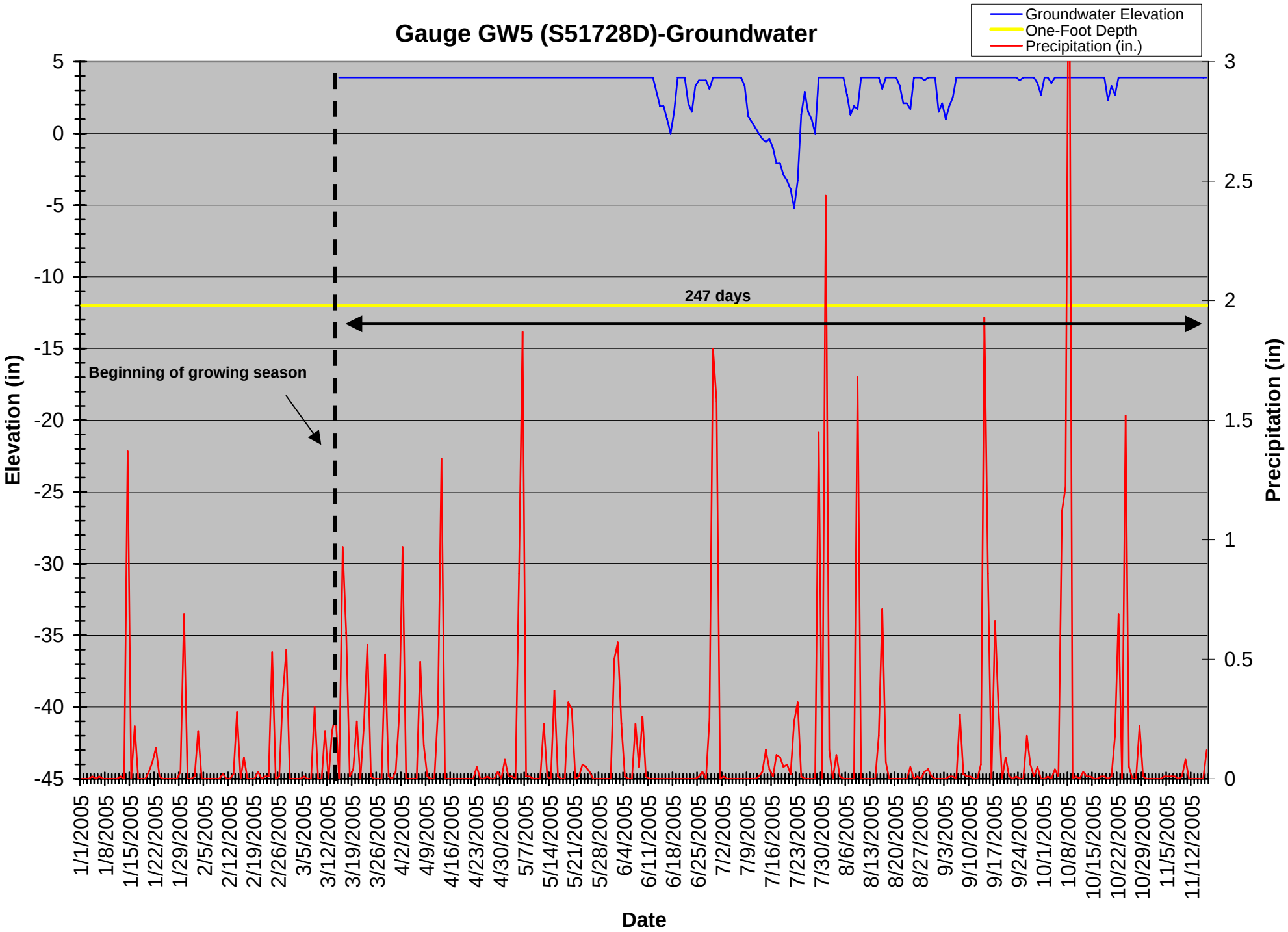
APPENDIX A
DEPTH TO GROUNDWATER
&
SURFACE WATER CHARTS

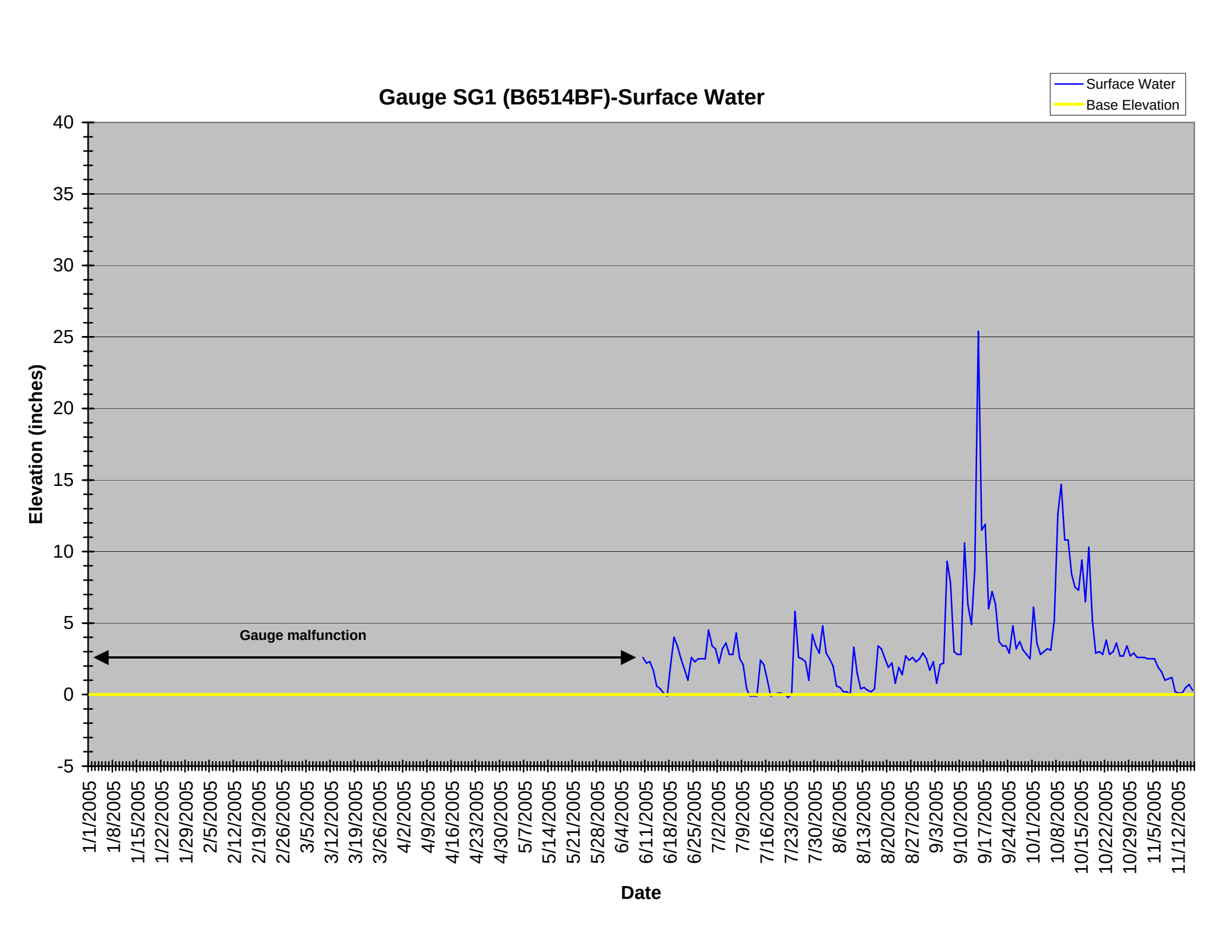

Gauge GW1 (S31768A) Groundwater
Groundwater Elevation
One-Foot Depth
Precipitation (in.)
49 Days
197 Days
Beginning of growing season
Elevation (in)
Precipitation (in)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
5/14/2005
5/21/2005
5/28/2005
6/4/2005
6/11/2005
6/18/2005
6/25/2005
7/2/2005
7/9/2005
7/16/2005
7/23/2005
7/30/2005
8/6/2005
8/13/2005
8/20/2005
8/27/2005
9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005

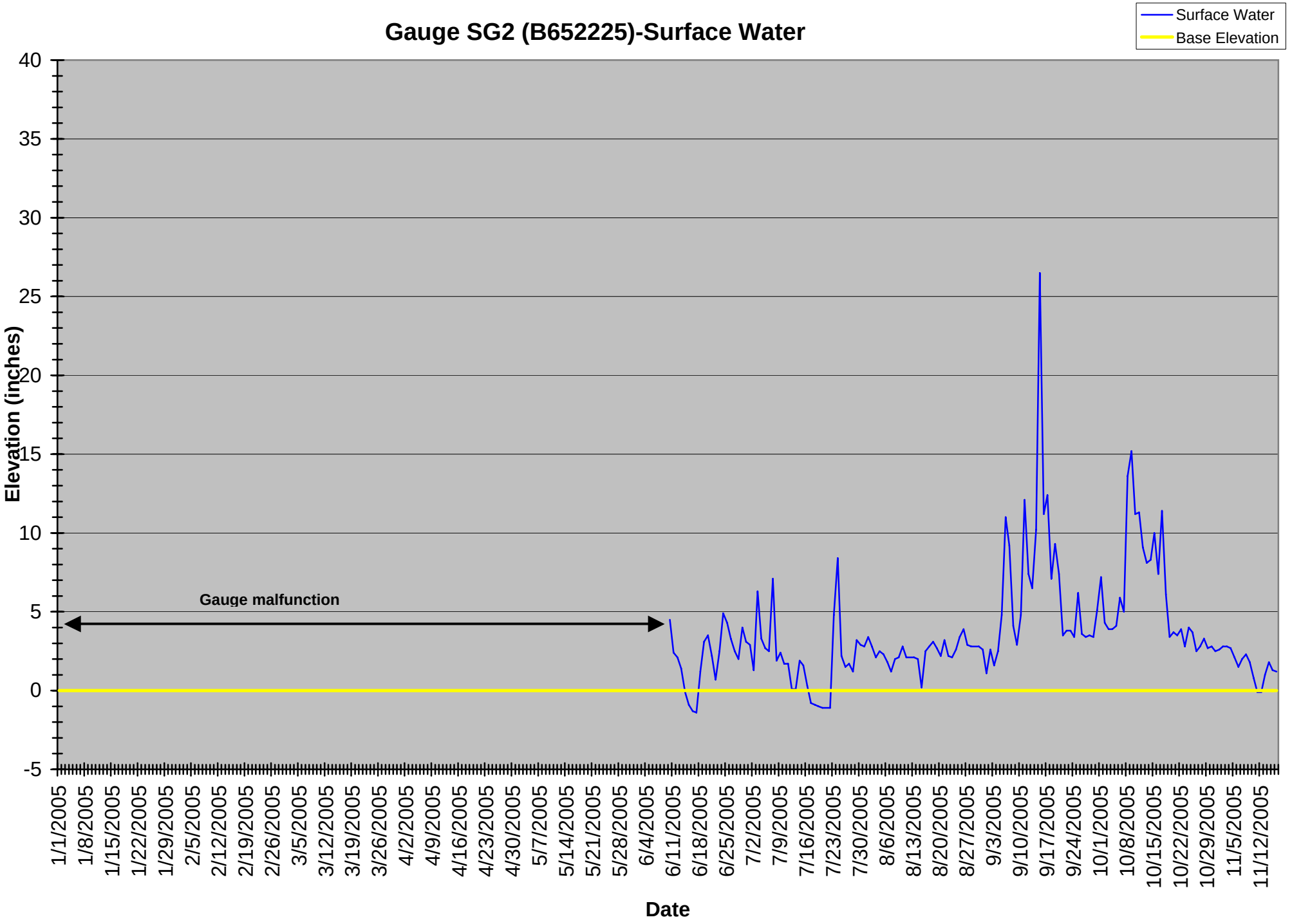

Gauge GW2 (B6513A1) Groundwater
Groundwater Elevation
One-Foot Depth
Precipitation (in.)
Gauge malfunction
43 days
160 days
Beginning of growing season
Elevation (in)
Precipitation (in)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
3
2.5
2
1.5
1
0.5
0
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
5/14/2005
5/21/2005
5/28/2005
6/4/2005
6/11/2005
6/18/2005
6/25/2005
7/2/2005
7/9/2005
7/16/2005
7/23/2005
7/30/2005
8/6/2005
8/13/2005
8/20/2005
8/27/2005
9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005


Gauge GW3 (S517455)-Groundwater
Groundwater Elevation
One-Foot Depth
Precipitation (in.)
247 days
Beginning of growing season
Elevation (in)
Precipitation (in)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
3
2.5
2
1.5
1
0.5
0
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
5/14/2005
5/21/2005
5/28/2005
6/4/2005
6/11/2005
6/18/2005
6/25/2005
7/2/2005
7/9/2005
7/16/2005
7/23/2005
7/30/2005
8/6/2005
8/13/2005
8/20/2005
8/27/2005
9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005


Gauge GW4 (S51705B)-Groundwater
Groundwater Elevation
One-Foot Depth
Precipitation (in.)
Gauge malfunction
192 days
Beginning of growing season
Elevation (in)
Precipitation (in)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
5/14/2005
5/21/2005
5/28/2005
6/4/2005
6/11/2005
6/18/2005
6/25/2005
7/2/2005
7/9/2005
7/16/2005
7/23/2005
7/30/2005
8/6/2005
8/13/2005
8/20/2005
8/27/2005
9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005


Gauge GW5 (S51728D)-Groundwater
Groundwater Elevation
One-Foot Depth
Precipitation (in.)
247 days
Beginning of growing season
Elevation (in)
Precipitation (in)
Date
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
3
2.5
2
1.5
1
0.5
0
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
5/14/2005
5/21/2005
5/28/2005
6/4/2005
6/11/2005
6/18/2005
6/25/2005
7/2/2005
7/9/2005
7/16/2005
7/23/2005
7/30/2005
8/6/2005
8/13/2005
8/20/2005
8/27/2005
9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005


Gauge SG1 (B6514BF)-Surface Water
Surface Water
Base Elevation
Elevation (inches)
40
35
30
25
20
15
10
5
0
-5
Gauge malfunction
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
5/14/2005
5/21/2005
5/28/2005
6/4/2005
6/11/2005
6/18/2005
6/25/2005
7/2/2005
7/9/2005
7/16/2005
7/23/2005
7/30/2005
8/6/2005
8/13/2005
8/20/2005
8/27/2005
9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005
Date


Gauge SG2 (B652225)-Surface Water
Surface Water
Base Elevation
Elevation (inches)
40
35
30
25
20
15
10
5
0
-5
Gauge malfunction
1/1/2005
1/8/2005
1/15/2005
1/22/2005
1/29/2005
2/5/2005
2/12/2005
2/19/2005
2/26/2005
3/5/2005
3/12/2005
3/19/2005
3/26/2005
4/2/2005
4/9/2005
4/16/2005
4/23/2005
4/30/2005
5/7/2005
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9/3/2005
9/10/2005
9/17/2005
9/24/2005
10/1/2005
10/8/2005
10/15/2005
10/22/2005
10/29/2005
11/5/2005
11/12/2005
Date

APPENDIX B
SITE PHOTOS AND PHOTO AND PLOT LOCATIONS MAP

Grimesland Pit – Phase I

Photo 1

Photo 2

Photo 3

Photo 4

Photo 5

Photo 6

Grimesland Pit Mitigation Site

Photo and Plot Locations

Phase 1