PLUM CREEK WETLAND MITIGATION PROJECT
2010 MONITORING REPORT
MONITORING YEAR 2 OF 5

Brunswick County, NC
Lumber River Basin
Cataloging Unit: 03040207
EEP Project Number D06040-A

Prepared for:

North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, North Carolina 27699-1652

2010 Monitoring Report – Year 2 of 5
Final

Project Construction Completed: 2008
Data Collection for Monitoring Year 2 of 5: 2010
Report Submitted: February 2011

Prepared for:

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1. Executive Summary/Project Abstract

The goals of the Plum Creek Wetland Mitigation Project (Appendix A, Figure 1) are to re-establish wetland functions at the Site by restoring wetland hydrology, plant community composition and structure, and wildlife habitat. The project will increase surface water residence time which will improve groundwater recharge. Much of the water budget is influenced by precipitation, as surface flow enters the site from adjoining parcels. A longer residence time will lead to improved biochemical treatment resulting in improved water quality. Restoration of a native wetland vegetative community will enhance floral and faunal habitat diversity benefiting both terrestrial and aquatic wildlife. In order to achieve project goals, the following objectives were implemented:

- The lateral ditches and southern perimeter ditch on the Site were plugged. The west ditch and Boggy Branch were left intact to prevent hydrologic trespass on adjoining properties. Soil to construct ditch plugs was excavated from the Site and the borrow pits were graded to form small, shallow vernal pools.
- Existing vegetation (loblolly pine) was sheared, drum chopped, and left on Site to promote organic matter decomposition. There was no re-grading of the contours of the Site.
- Habitat benefits on Site will be achieved for both terrestrial and aquatic species by increasing micro-habitat diversity and vegetation diversity.

Overall, the Site met the criteria of 320 planted stems per acre with an average sampled density of 348 planted stems per acre. In Year 1, planted and volunteer stems had a sampled density of 1,929 stems per acre; therefore, it was not necessary to perform another count in Year 2. Visual inspection during Year 2 monitoring efforts confirmed that the volunteer stem count and species remained consistent. No vegetation problem areas were noted during monitoring Year 2. Vegetation plot data can be found in the summary table below and in Appendix C.

The Site met the vegetation survival rate success criteria in 8 of the 9 monitoring plots. The results from Year 1 had shown that three plots did not meet the criteria; Plots 4, 6, and 7. Year 2 monitoring results showed that Plots 4 and 7 now meet the criteria because stems that had been labeled missing in Year 1 or were not included in the As-Built inventory were located in Year 2. Plot 6 was one stem less than the 320 stems per acre target and therefore did not meet the criteria.

No wells on Site recorded soil saturation within the upper 12 inches for greater than 12.5 percent of the growing season. However, 78 percent of the Site recorded hydrology within the upper 12 inches between 5 percent and 12.5 percent of the growing season (see summary table below and Appendix D). It is believed that the Site is still recovering from the severe drought that lasted several years in the region. Precipitation measured well below average for the first 197 days (79%) of the 249 day growing season. On day 198, the site received five days of rainfall totaling 17.74 inches or >41% of the rainfall received for the entire growing season. Precipitation data can be found in Appendix D. Reference well locations can be found on Appendix A, Figure 1. Soil profiles were dug at each well location. All profiles displayed hydric soil characteristics of low chroma soil color. Pedon description sheets for each soil profile can be found in Appendix E.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan)

documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

Summary Table: Vegetation Attainment Data Plum Creek Wetland Restoration EEP Project Number: D06040-A					
Summary of Stems per Acre Results for Years 1 through 5					
Veg Plot	**Success Criteria Achieved / Total Stems (Stems per acre)**				
	Year 1 (2009)	**Year 2 (2010)**	**Year 3 (2011)**	**Year 4 (2012)**	**Year 5 (2013)**
1	Yes /11 stems (445)	Yes / 12 stems (485)			
2	Yes / 8 stems (320)	Yes / 8 stems (320)			
3	Yes / 9 stems (364)	Yes / 8 stems (320)			
4[1]	Yes / 7 stems (283)	Yes / 8 stems (320)			
5	Yes / 8 stems (320)	Yes / 8 stems (320)			
6[2]	No / 7 stems (283)	No / 7 stems (283)			
7[1]	Yes / 7 stems (283)	Yes / 8 stems (320)			
8	Yes / 9 stems (364)	Yes / 9 stems (364)			
9	No / 8 stems (320)	Yes / 8 stems (320)			

[1] - During Year 1 monitoring, these plots did not make vegetation criteria due to missing stems. These stems were found during this year's monitoring efforts.

[2] - One stem short of meeting the 320 stem/ac threshold.

Summary Table: Wetland Gauge Attainment Data – >5 percent and <12.5 percent criteria Plum Creek Wetland Restoration EEP Project Number: D06040-A					
Summary of Groundwater Gauge Results for Years 1 through 5					
Gauge	**Success Criteria Achieved / Max Consecutive Days During Growing Season (Percentage)**				
	Year 1 (2009)	**Year 2 (2010)**	**Year 3 (2011)**	**Year 4 (2012)**	**Year 5 (2013)**
PCW1	No / 3 days (1.2 percent)	No / 9 days (3.6 percent)			
PCW2	Yes / 19 days (7.6 percent)	Yes / 19 days (7.6 percent)			
PCW3	No / 9 days (3.6 percent)	Yes / 15 days (6 percent)			
PCW4	Yes / 22 days (8.8 percent)	Yes / 18 days (7.2 percent)			
PCW5	Yes / 41 days (16.5 percent)	Yes / 20 days (8 percent)			

Summary Table: Wetland Gauge Attainment Data – >5 percent and <12.5 percent criteria Plum Creek Wetland Restoration EEP Project Number: D06040-A					
PCW6	No / 3 days (1.2 percent)	No / 8 days (3.2 percent)			
PCW7	Yes / 24 days (9.6 percent)	Yes / 18 days (7.2 percent)			
PCW8	Yes / 22 days (8.8 percent)	Yes / 19 days (7.6 percent)			
PCW9	No / 12 days (4.8 percent)	Yes / 15 days (6 percent)			

2. Methodology

2.1. Vegetation

Vegetative data will be sampled every monitoring year for five years. Survival criteria of planted woody stems will be 320 stems per acre in Year 3, 288 stems per acre in Year 4, and 260 stems per acre at the completion of the project monitoring period at Year 5.

Nine vegetation plots were established on Site. All plots are 10 meters by 10 meters in size. Plots were established at each monitoring well location (Appendix B, Figure 2). Each plot is identified by its corresponding well as shown on Appendix B, Figure 2. The plots were established throughout the Site in order to gain a representative view of the overall success of the plant community.

The CVS-EEP Level 1 was used for assessing vegetative success (Lee *et al.,* 2006). Level 1 is the inventory of planted stems. Berger is only required to perform a Level 1 assessment under the existing contract. Although Berger performed a Level 2 assessment in Year 1, it was not done in Year 2. Visual inspection during Year 2 monitoring efforts confirmed that the volunteer stem count and species remained consistent; therefore, a Level 2 assessment was not necessary.

2.2. Hydrology

Hydrology will be considered successful by two metrics, per the USACE wetland delineation manual (Environmental Laboratory, 1987). One criterion provides for hydrologic success if the soil is ponded, flooded, or saturated within 12 inches of the soil surface continuously for at least 12.5 percent of the growing season, assuming normal precipitation. The second alternative measurement of success would be to attain ponded, flooded, or saturated conditions within 12 inches of the soil surface continuously between 5 and 12.5 percent of the growing season, provided the hydric soil and hydrophytic vegetation wetland criteria are also met. In Brunswick County, the growing season is typically 249 days, assuming a temperature of above 28 degrees F and a frequency of 5 of 10 years (NRCS, 2009). The growing season in Brunswick County typically occurs between approximately March 15 and November 18 in a given calendar year. As a result, 5 to 12.5 percent of the growing season is 12 to 31 days.

The groundwater hydrology of the Plum Creek Site will be monitored during the growing season in accordance with USACE guidelines through the use of shallow monitoring wells

with automatic data loggers (USACE, 2003). Groundwater data will be collected from 15 monitoring wells. Nine wells were established throughout the site to accurately obtain a representative view of the groundwater hydrology. Six additional wells were installed in the western central portion of the site, perpendicular the western border ditch (Appendix B**,** Figure 2). The purpose of these wells is to show the linear extent of drawn down effect of this ditch on the wetland.

A stream gauge was installed in Boggy Branch, within the property boundaries, for informational purposes only. The stream gauge will keep records of the level of water in Boggy Branch. No success criteria are attached to the gauge.

2.3. Photo Stations

Eight fixed photo stations were established throughout the Site. These locations are presented in Figure 2. Photographs were taken during the monitoring efforts in November 2010. Photographs can be found in Appendix B.

3. References

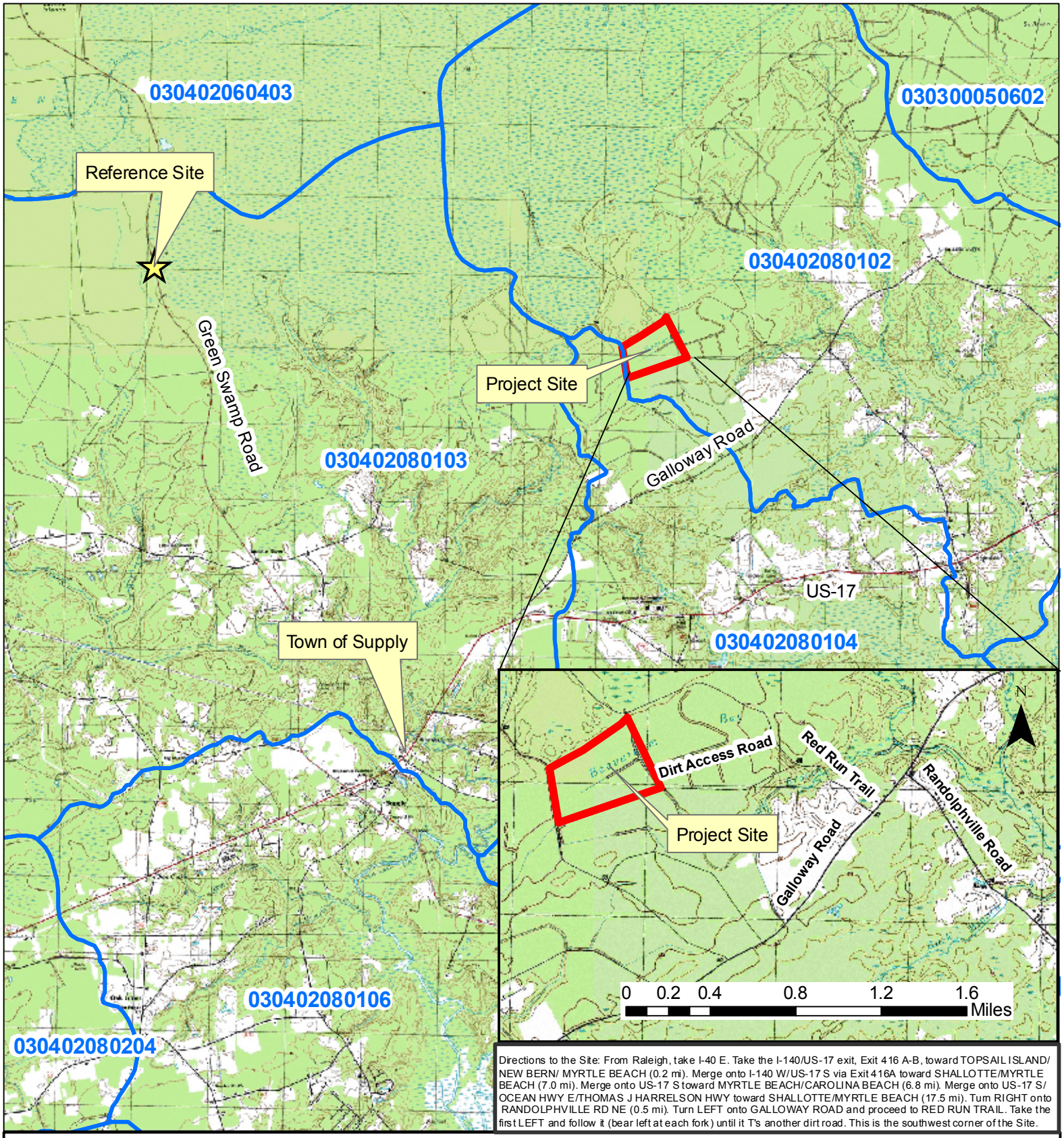
Environmental Laboratory, 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, MS.

Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 Available URL: http://cvs.bio.unc.edu/methods.htm.

Natural Resources Conservation Service. Climate Information – Wetlands Retrieval for North Carolina. Brunswick County. Available URL: http://www.wcc.nrcs.usda.gov/cgibin/getwetco.pl?state=nc. Accessed: January 15, 2009.

US Army Corps of Engineers, 2003. Stream Mitigation Guidelines. Prepared by: USACE, NCDWQ, USEPA, NCWRC.

Appendix A:
Project Vicinity Map and Background Tables



Directions to the Site: From Raleigh, take I-40 E. Take the I-140/US-17 exit, Exit 416 A-B, toward TOPSAIL ISLAND/ NEW BERN/ MYRTLE BEACH (0.2 mi). Merge onto I-140 W/US-17 S via Exit 416A toward SHALLOTTE/MYRTLE BEACH (7.0 mi). Merge onto US-17 S toward MYRTLE BEACH/CAROLINA BEACH (6.8 mi). Merge onto US-17 S/ OCEAN HWY E/THOMAS J HARRELSON HWY toward SHALLOTTE/MYRTLE BEACH (17.5 mi). Turn RIGHT onto RANDOLPHVILLE RD NE (0.5 mi). Turn LEFT onto GALLOWAY ROAD and proceed to RED RUN TRAIL. Take the first LEFT and follow it (bear left at each fork) until it T's another dirt road. This is the southwest corner of the Site.

The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.

Legend

- Reference Site
- 12 Digit HUC
- Project Easement Boundary
- Roads

N

0 0.5 1 2 Miles

Source: USGS 7.5 Minute Topographic Map: Bolivia, NC

North Carolina
Ecosystem Enhancement Program

Plum Creek Wetland Mitigation Site
Brunswick County
EEP Project No. D06040-A

Project Vicinity Map

The Louis Berger Group, Inc.
1001 Wade Avenue, Suite 400
Raleigh, NC 27605

FIGURE 1
December 2010

Table 1: Project Components and Mitigation Credits Plum Creek Wetland Mitigation Project EEP Project Number: D06040-A				
Project Component or Reach ID	**Total Acres***	**Type**	**Restoration Level and Ratio**	**Comment**
Planting Zone 1	77	Non-riverine/ Non-riparian	Restoration 1:1	Pond Pine Woodland Community
Existing Wetland WA	6	Non-riverine/ Non-riparian	Enhancement 2:1	Pond Pine Woodland Community
Mitigation Unit Summations				
Non-Riparian Wetland – 80 acres				

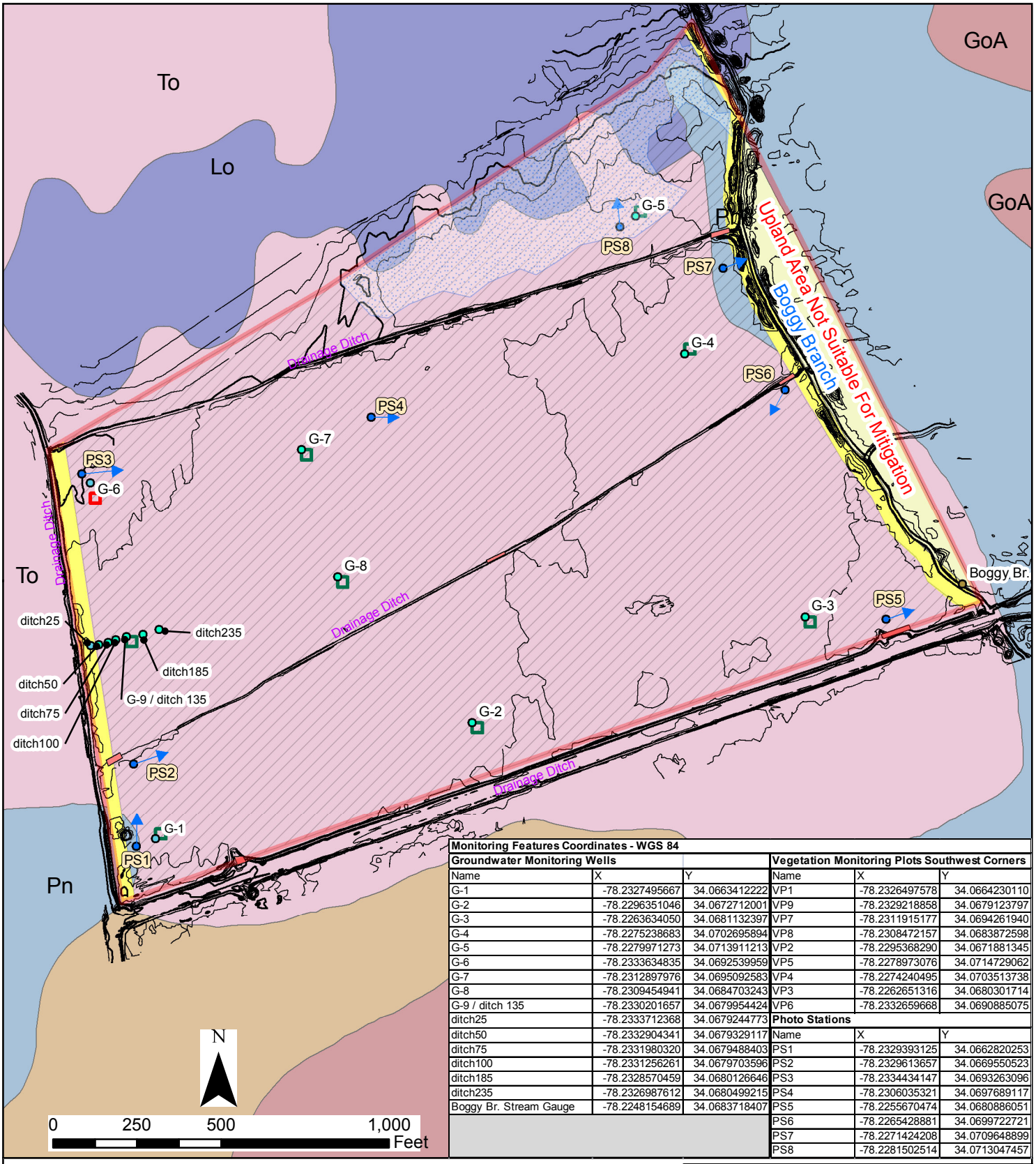
* The remaining acreage is either unsuitable for mitigation or will remain as upland.

Table 2: Project Activity and Reporting History Plum Creek Wetland Mitigation Project EEP Project Number: D06040-A		
Elapsed Time Since Vegetation Removal Complete: 2 yrs 5 months Elapsed Time Since Planting Complete: 2 yrs Number of Reporting Years: 2		
Activity or Report	**Data Collection Complete**	**Completion or Delivery**
Technical Proposal	January 2006	March 2006
Categorical Exclusion	January 2007	February 2007
Restoration Plan	April 2008	July 2008
Existing Vegetation Removal	N/A	July 2008
Construction	N/A	October 2008
Planting	N/A	December 2008
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	January 2009	April 2009
Year 1 Monitoring	November 2009	February 2010
Year 2 Monitoring	November 2010	February 2011

Table 3: Project Contacts Table Plum Creek Wetland Mitigation Project EEP Project Number: D06040-A	
Designer Primary project design POC	The Louis Berger Group, Inc. 1001 Wade Avenue, Suite 400 Raleigh, North Carolina 27605 Michael O'Rourke (919-866-4421)
Construction Contractor Construction contractor POC	River Works, Inc 4117 Pleasant Garden Road Greensboro, NC 27406 Bill Wright (336-279-1002)
Planting Contractor Planting contractor POC	Superior Forestry Services, Inc. 36462 Highway 27 Tilley, AR 72679 John Foley (870-496-2442)
Nursery Stock Suppliers	Division of Forest Resources – Claridge Nursery (919-731-7988) Coastal Plain Nursery (252-482-5707)
Monitoring Performers	The Louis Berger Group, Inc. 1001 Wade Avenue, Suite 400 Raleigh, North Carolina 27605
Stream Monitoring POC	N/A
Vegetation Monitoring POC	Ray Bode, PWS (919-866-4420) Tina Sekula, PWS (919-866-4439)
Wetland Monitoring POC	Ray Bode, PWS (919-866-4420) Tina Sekula, PWS (919-866-4439)

Table 4: Project Background Table Plum Creek Wetland Mitigation Project EEP Project Number: D06040-A			
Project Information			
Project Name	Plum Creek Wetland Mitigation Project		
County	Brunswick County		
Project Area (acres)	Approximately 89 acres		
Project Coordinates (latitude and longitude)	34.068850, -78.229486		
Project Watershed Summary Information			
Physiographic Province	Middle Atlantic Coastal Plain		
River Basin	Lumber River		
USGS Hydrologic Unit 8-digit	03040208		
USGS Hydrologic Unit 12-digit	030402080102		
NCDWQ Sub-basin	Long Bay Subbasin		
Project Drainage area (acres)	110 acres		
Project Drainage Area Percentage of Impervious Area	0%		
CGIA Land Use Classification	Other Needleleaf Evergreen Forests		
Wetland Summary Information			
Size of Wetland (acres)	83 acres		
Wetland Type	Non-Riparian, non-riverine		
Mapped Soil Series	Torhunta Mucky Fine Sandy Loam		
Drainage class	Very poorly drained soils		
Soil Hydric Status	Hydric		
Source of Hydrology	Precipitation / Groundwater		
Hydrologic Impairment	Previous Ditching		
Native Vegetation Community	Pond Pine Woodland Community		
Percent Composition of exotic invasive vegetation	5%		
Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	Jurisdictional Determination
Waters of the Unites States – Section 401	No		
Endangered Species Act	No		
Historic Preservation Act	No		
CZMA / CAMA	No		
FEMA Floodplain Compliance	No		
Essential Fisheries Habitat	No		

Appendix B:
Visual Assessment Data



Monitoring Features Coordinates - WGS 84					
Groundwater Monitoring Wells			**Vegetation Monitoring Plots Southwest Corners**		
Name	X	Y	Name	X	Y
G-1	-78.2327495667	34.0663412222	VP1	-78.2326497578	34.0664230110
G-2	-78.2296351046	34.0672712001	VP9	-78.2329218858	34.0679123797
G-3	-78.2263634050	34.0681132397	VP7	-78.2311915177	34.0694261940
G-4	-78.2275238683	34.0702695894	VP8	-78.2308472157	34.0683872598
G-5	-78.2279971273	34.0713911213	VP2	-78.2295368290	34.0671881345
G-6	-78.2333634835	34.0692539959	VP5	-78.2278973076	34.0714729062
G-7	-78.2312897976	34.0695092583	VP4	-78.2274240495	34.0703513738
G-8	-78.2309454941	34.0684703243	VP3	-78.2262651316	34.0680301714
G-9 / ditch 135	-78.2330201657	34.0679954424	VP6	-78.2332659668	34.0690885075
ditch25	-78.2333712368	34.0679244773	**Photo Stations**		
ditch50	-78.2332904341	34.0679329117	Name	X	Y
ditch75	-78.2331980320	34.0679488403	PS1	-78.2329393125	34.0662820253
ditch100	-78.2331256261	34.0679703596	PS2	-78.2329613657	34.0669550523
ditch185	-78.2328570459	34.0680126646	PS3	-78.2334434147	34.0693263096
ditch235	-78.2326987612	34.0680499215	PS4	-78.2306035321	34.0697689117
Boggy Br. Stream Gauge	-78.2248154689	34.0683718407	PS5	-78.2255670474	34.0680886051
			PS6	-78.2265428881	34.0699722721
			PS7	-78.2271424208	34.0709648899
			PS8	-78.2281502514	34.0713047457

Legend

- Project Easement Boundary
- Wetland Enhancement
- Photo Station and View Direction
- Contours
- Ditch Plugs
- Non-Restored Upland Area
- Pond Pine Woodland
- Nonriverine Wet Hardwood Forest

Groundwater Monitoring Wells

- hydrology greater than 12.5 percent
- hydrology >5 percent and <12.5 percent
- hydrology not met
- Boggy Branch Gauge

Vegetation Monitoring Plots

- Veg Survival Met
- Veg Survival Not Met

USDA Soil

- Goldsboro Fine Sandy Loam, 0 To 2 Percent Slopes
- Leon Fine Sand, 0 To 2 Percent Slopes
- Lynchburg Fine Sandy Loam
- Pantego Mucky Loam
- Rains Fine Sandy Loam
- Torhunta Mucky Fine Sandy Loam

North Carolina
Ecosystem Enhancement Program

Plum Creek Wetland Mitigation Site
Brunswick County
EEP Project No. D06040-A

Current Condition Plan View

The Louis Berger Group, Inc.
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FIGURE 2
December 2010

Vegetation Monitoring Plot Photos

Veg Plot 1, view from southwest corner
January 7, 2009

Veg Plot 1, view from southwest corner
November 15, 2010

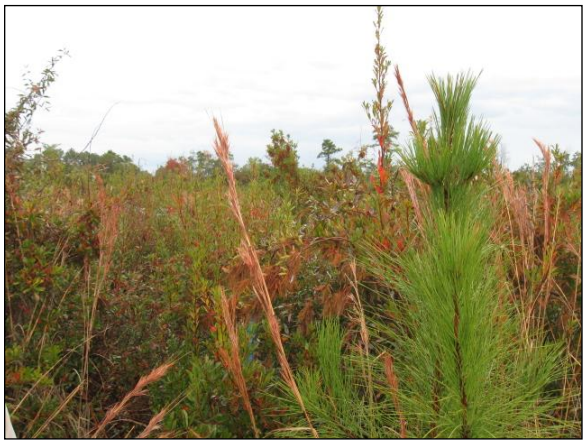
Veg Plot 2, view from southwest corner
January 7, 2009

Veg Plot 2, view from southwest corner
November 15, 2010

Veg Plot 3, view from southwest corner
January 8, 2009

Veg Plot 3, view from southwest corner
November 16, 2010

Veg Plot 4, view from southwest corner
January 8, 2009



Veg Plot 4, view from southwest corner
November 16, 2010

Veg Plot 5, view from southwest corner
January 8, 2009

Veg Plot 5, view from southwest corner
November 15, 2010

Veg Plot 6, view from southwest corner
January 7, 2009

Veg Plot 6, view from southwest corner
November 15, 2010

Veg Plot 7, view from southwest corner
January 7, 2009

Veg Plot 7, view from southwest corner
November 15, 2010

Veg Plot 8, view from southwest corner
January 7, 2009

Veg Plot 8, view from southwest corner
November 15, 2010

Veg Plot 9, view from southwest corner,
January 7, 2009

Veg Plot 9, view from southwest corner
November 15, 2010

Photo Stations

Photo Station 1, view looking north
October 28, 2009

Photo Station 1, view looking north
November 15, 2010

Photo Station 2, view looking east
October 28, 2009

Photo Station 2, view looking east
November 15, 2010

Photo Station 3, view looking east
October 28, 2009

Photo Station 3, view looking east
November 15, 2010

Photo Station 4, view looking east
October 29, 2009

Photo Station 4, view looking east
November 15, 2010

Photo Station 5, view looking east
October 29, 2009

Photo Station 5, view looking east
November 15, 2010

Photo Station 6, view looking west
October 29, 2009

Photo Station 6, view looking west
November 15, 2010

Photo Station 7, view looking east
October 29, 2009

Photo Station 7, view looking east
November 15, 2010

Photo Station 8, view looking north
October 29, 2009

Photo Station 8, view looking north
November 15, 2010

Appendix C:
Vegetation Plot Data

Table 5: Veg Plot Criteria Attainment Plum Creek Wetland Restoration EEP Project Number: D06040-A				
Tract	**Veg Plot ID**	**Stems Per Acre**	**Veg Survival Threshold Met? (320 stems per acre)**	**Tract Mean**
Plum Creek Wetland Restoration Site	1	485	Y	**89%**
	2	320	Y	
	3	320	Y	
	4	320	Y[1]	
	5	320	Y	
	6	280	N[2]	
	7	320	Y[1]	
	8	364	Y	
	9	320	Y	

[1] - During Year 1 monitoring, these plots did not make vegetation criteria due to missing stems. These stems were found during this year's monitoring efforts.
[2] - One stem short of meeting the 320 stem/ac threshold.

Table 6: CVS Vegetation Metadata Table Plum Creek Wetland Restoration EEP Project Number: D06040-A	
3. Report Prepared By	4. Tina Sekula
5. Date Prepared	6. 12/10/2010 14:28
7.	8.
9.	10.
11. database name	12. The Louis Berger Group-Plum Year 2.mdb
13. database location	14. G:\JR_PROJECTS\JR5155_Plum_Creek_W_Rest\Monitoring_Data\2010\veg_data
15. computer name	16. RAL-TSEKULA-X
17. file size	18. 37466112
19.	20.
21.	22.
23. DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	24.
25. Metadata	26. Description of database file, the report worksheets, and a summary of project(s) and project data.
27. Proj, planted	28. Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
29. Proj, total stems	30. Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
31. Plots	32. List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
33. Vigor	34. Frequency distribution of vigor classes for stems for all plots.

Table 6: CVS Vegetation Metadata Table Plum Creek Wetland Restoration EEP Project Number: D06040-A	
35. Vigor by Spp	36. Frequency distribution of vigor classes listed by species.
37. Damage	38. List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
39. Damage by Spp	40. Damage values tallied by type for each species.
41. Damage by Plot	42. Damage values tallied by type for each plot.
43. Planted Stems by Plot and Spp	44. A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
45.	46.
47.	48.
49. PROJECT SUMMARY----------	50.
51. Project Code	52. 92549
53. project Name	54. Plum Creek Wetland Restoration Site
55. Description	56. The project involves the construction of approximately 80 acres of non-riverine wetland restoration.
57. River Basin	58. Lumber
59. length(ft)	60.
61. stream-to-edge width (ft)	62.
63. area (sq m)	64.
65. Required Plots (calculated)	66.
67. Sampled Plots	68. 0

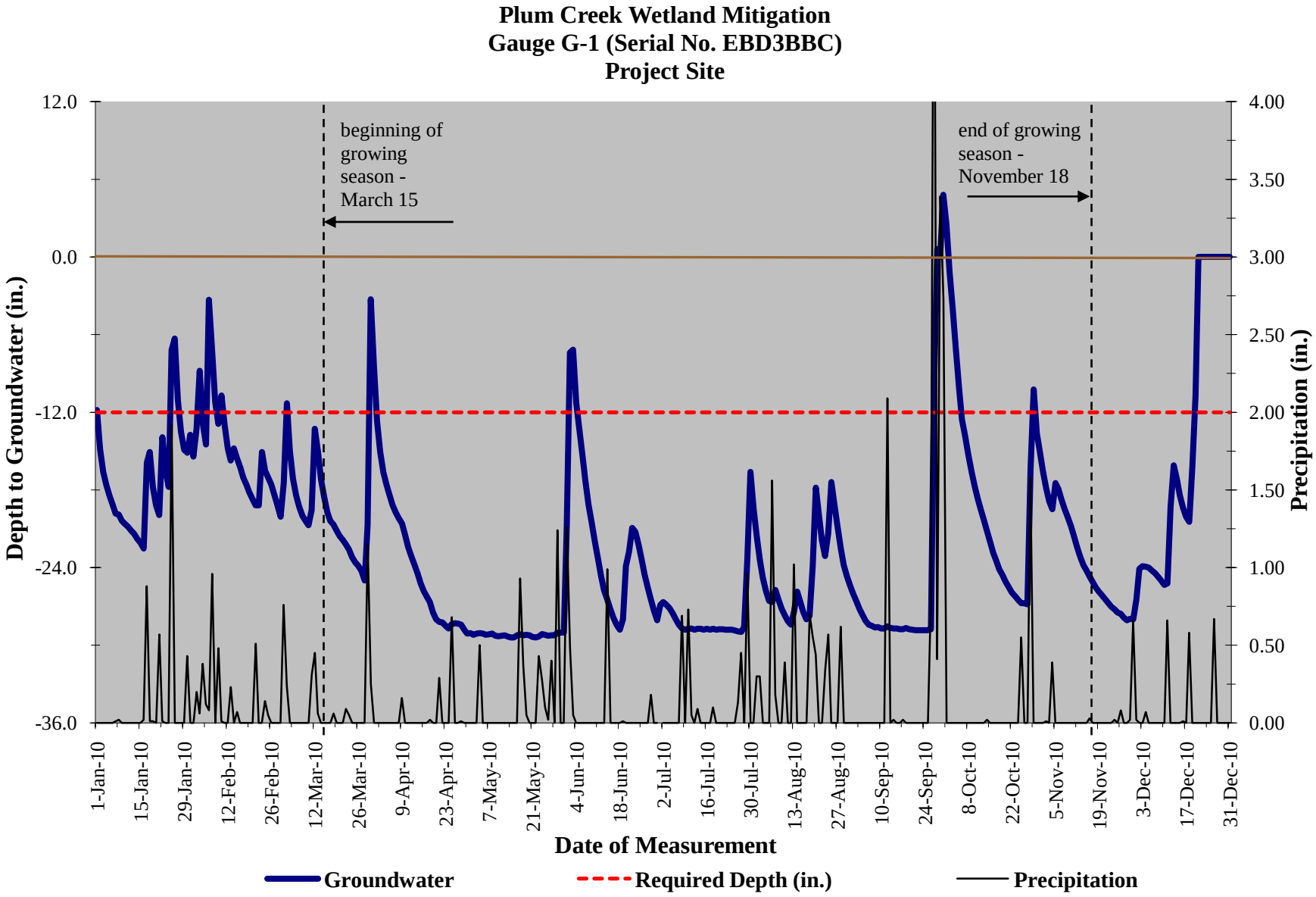
Table 7: CVS Stem Count Total and Planted by Plot and Species
Plum Creek Wetland Restoration
EEP Project Number: D06040-A

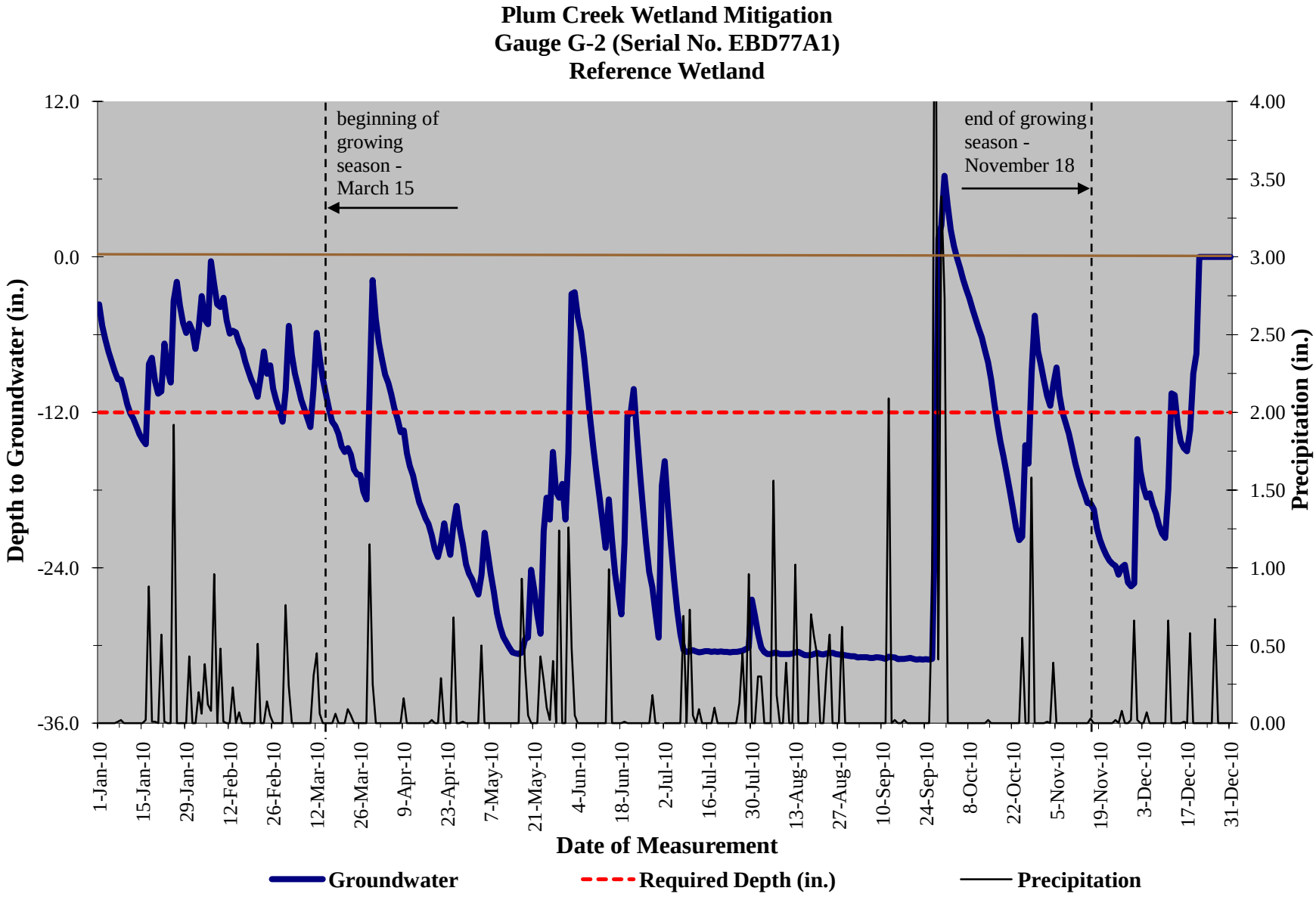
	Comment	Species	Common Name	Total Planted Stems	# plots	avg# stems	plot 92549-01-1-year:2	plot 92549-01-2-year:2	plot 92549-01-3-year:2	plot 92549-01-4-year:2	plot 92549-01-5-year:2	plot 92549-01-6-year:2	plot 92549-01-7-year:2	plot 92549-01-8-year:2	plot 92549-01-9-year:2
		Chamaecyparis thyoides	Atlantic white cedar	4	3	1.33			1		2				1
		Gordonia lasianthus	loblolly bay	10	7	1.43	1	1	1	2	2			1	2
		Pinus serotina	pond pine	60	9	6.67	9	7	6	6	4	7	8	8	5
		Quercus laurifolia	laurel oak	1	1	1	1								
		Quercus michauxii	swamp chestnut oak	1	1	1	1								
TOT:	**0**	**5**	**5**	**76**	**5**		**12**	**8**	**8**	**8**	**8**	**7**	**8**	**9**	**8**

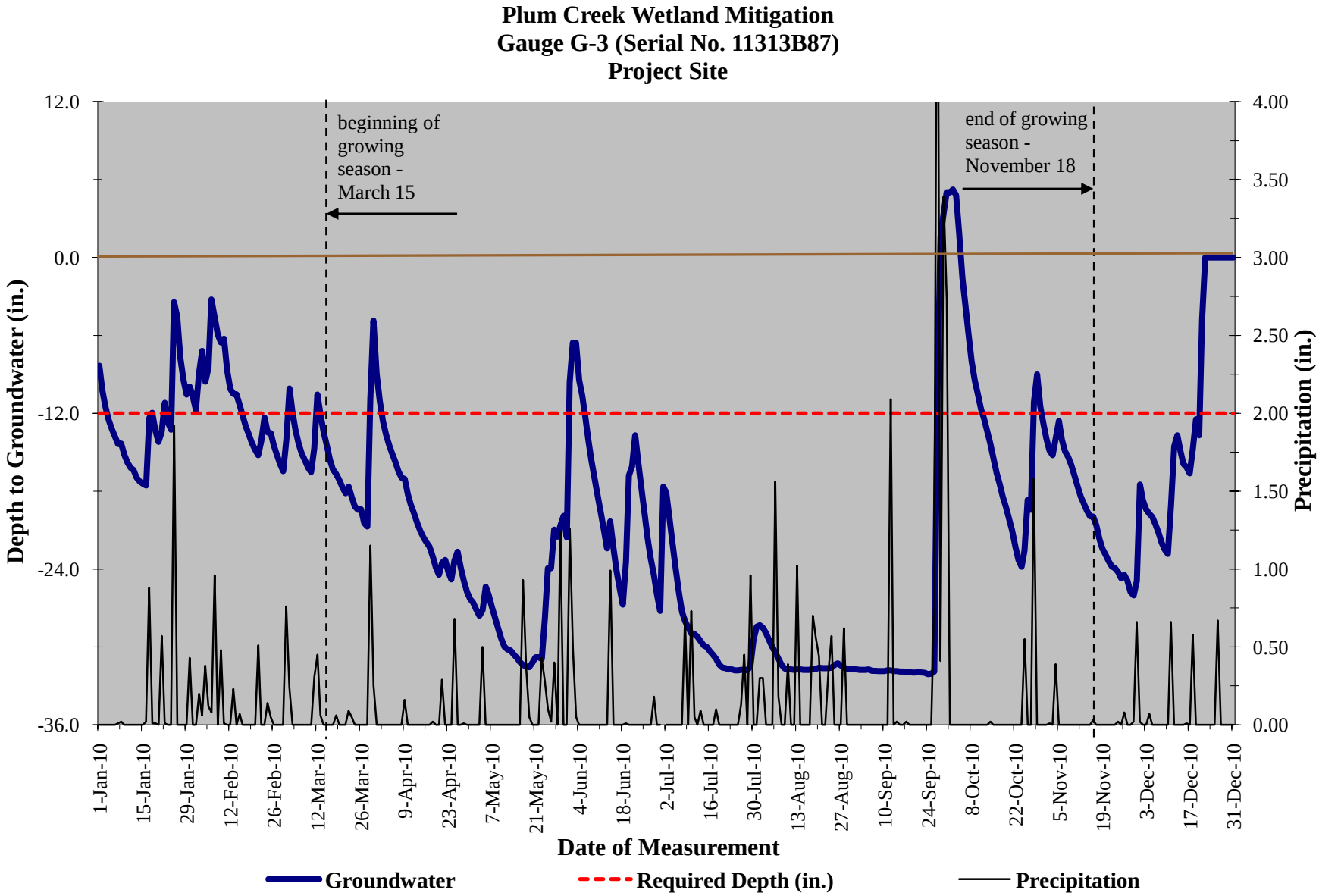
Project Code	**Project Name**	**River Basin**	**Year 2 Stem Count**
92549	Plum Creek Wetland Restoration Site	Lumber	341.734543

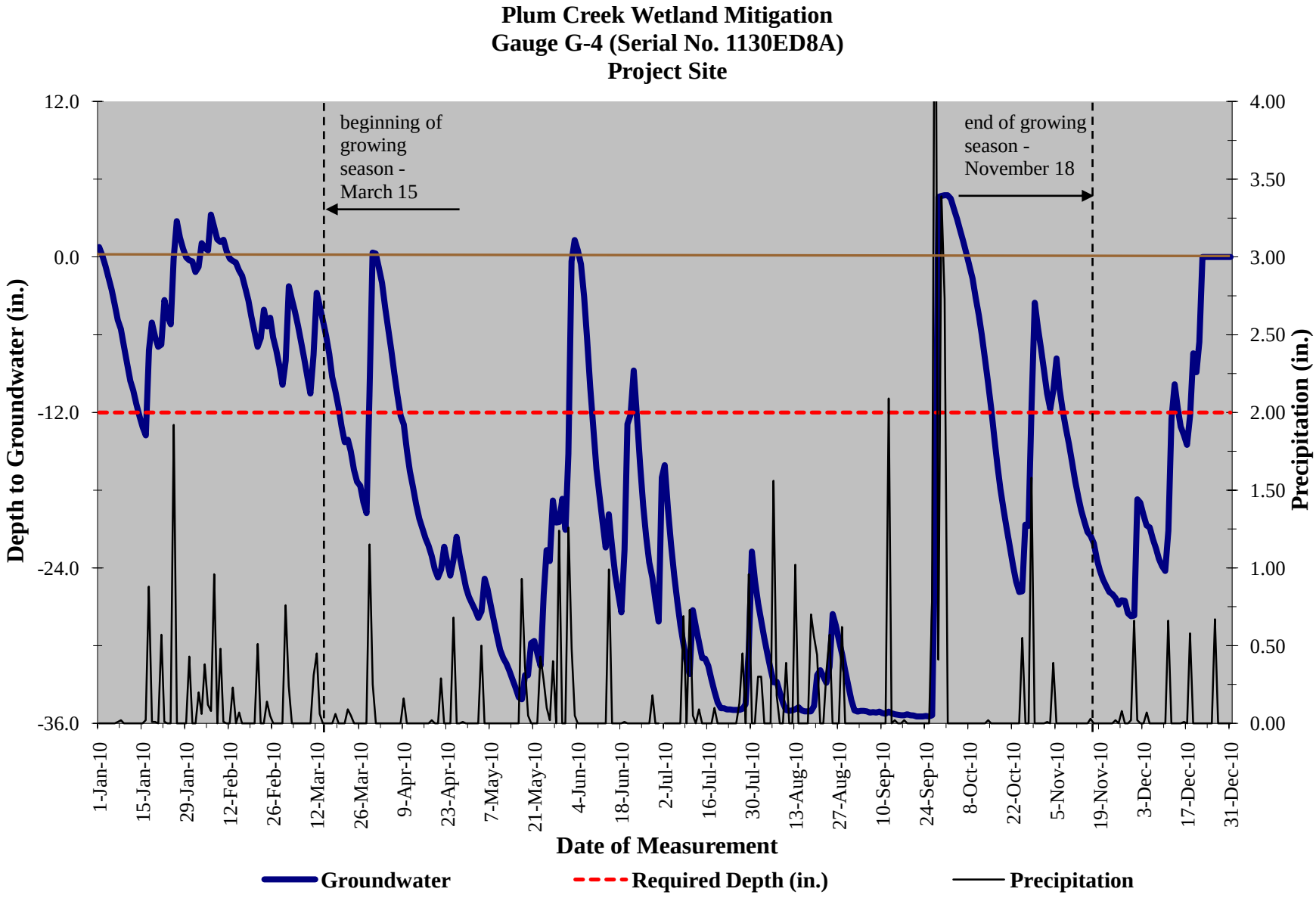
Appendix D:
Hydrologic Data

Table 8: Wetland Gauge Attainment Data – >5 percent and <12.5 percent criteria Plum Creek Wetland Restoration EEP Project Number: D06040-A					
Summary of Groundwater Gauge Results for Years 1 through 5					
Gauge	**Success Criteria Achieved / Max Consecutive Days During Growing Season (Percentage)**				
	Year 1 (2009)	**Year 2 (2010)**	**Year 3 (2011)**	**Year 4 (2012)**	**Year 5 (2013)**
PCW1	No / 3 days (1.2 percent)	No / 9 days (3.6 percent)			
PCW2	Yes / 19 days (7.6 percent)	Yes / 19 days (7.6 percent)			
PCW3	No / 9 days (3.6 percent)	Yes / 15 days (6 percent)			
PCW4	Yes / 22 days (8.8 percent)	Yes / 18 days (7.2 percent)			
PCW5	Yes / 41 days (16.5 percent)	Yes / 20 days (8 percent)			
PCW6	No / 3 days (1.2 percent)	No / 8 days (3.2 percent)			
PCW7	Yes / 24 days (9.6 percent)	Yes / 18 days (7.2 percent)			
PCW8	Yes / 22 days (8.8 percent)	Yes / 19 days (7.6 percent)			
PCW9	No / 12 days (4.8 percent)	Yes / 15 days (6 percent)			

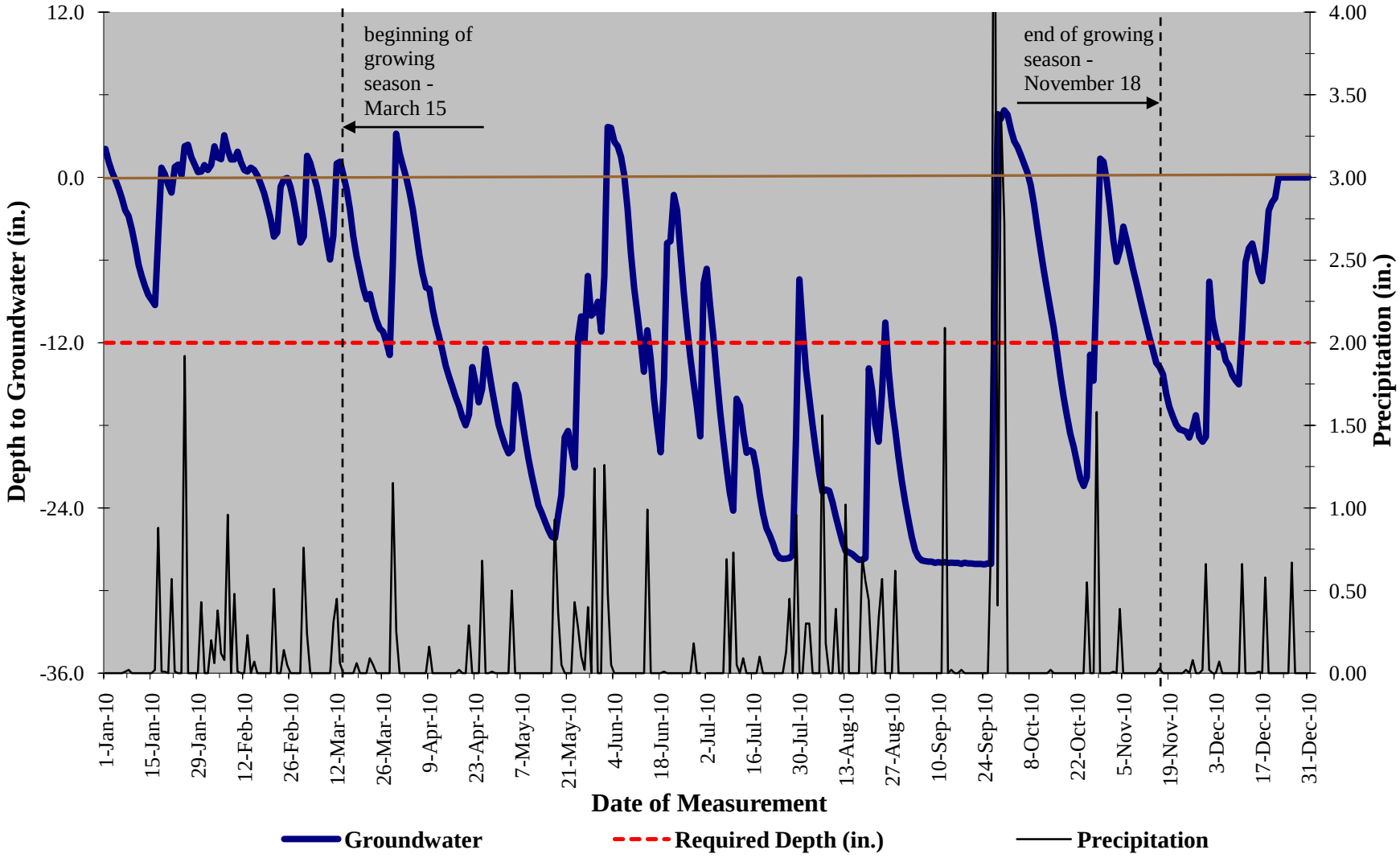

Plum Creek Wetland Mitigation
Gauge G-1 (Serial No. EBD3BBC)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

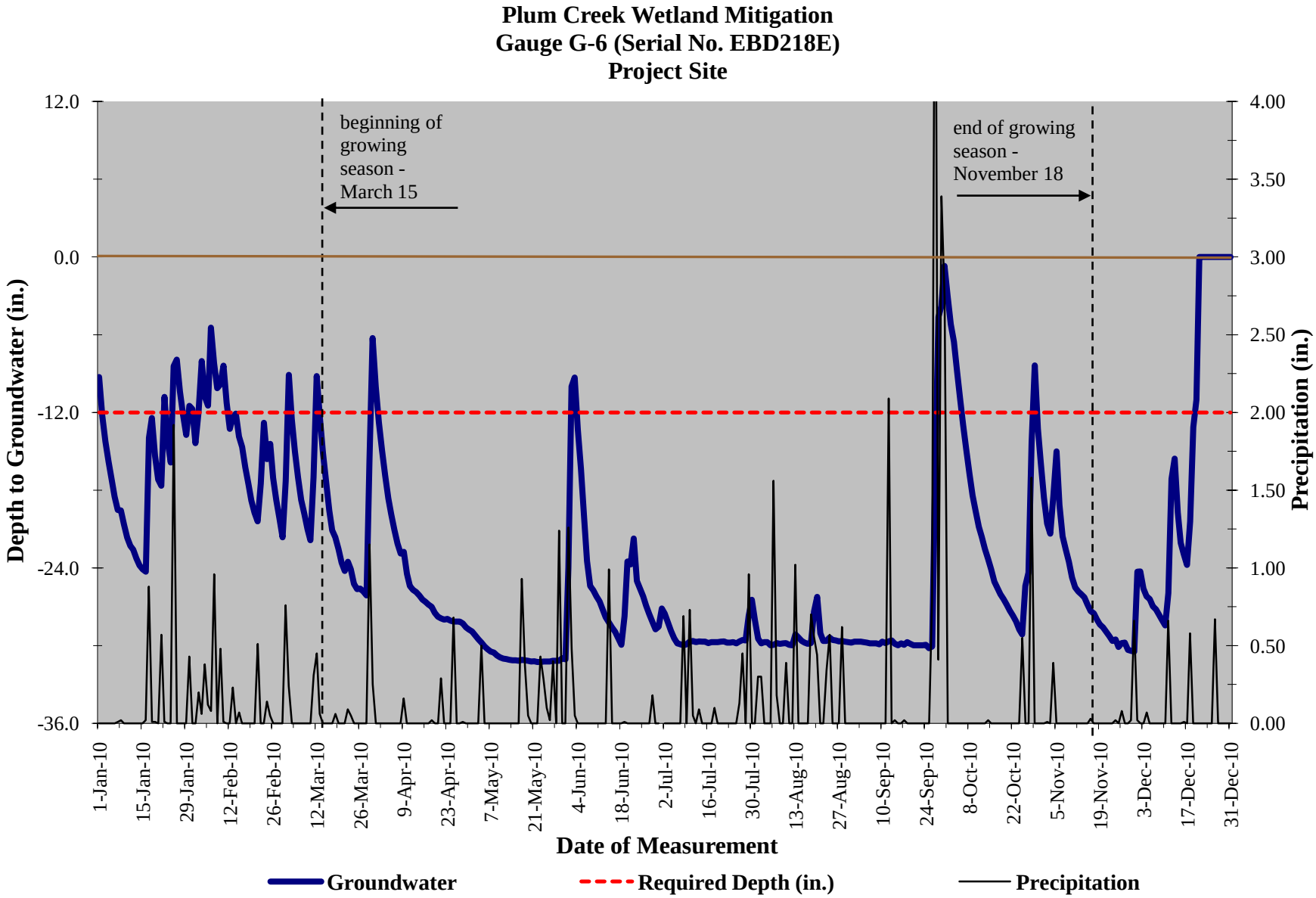

Plum Creek Wetland Mitigation
Gauge G-2 (Serial No. EBD77A1)
Reference Wetland
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation


Plum Creek Wetland Mitigation
Gauge G-3 (Serial No. 11313B87)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

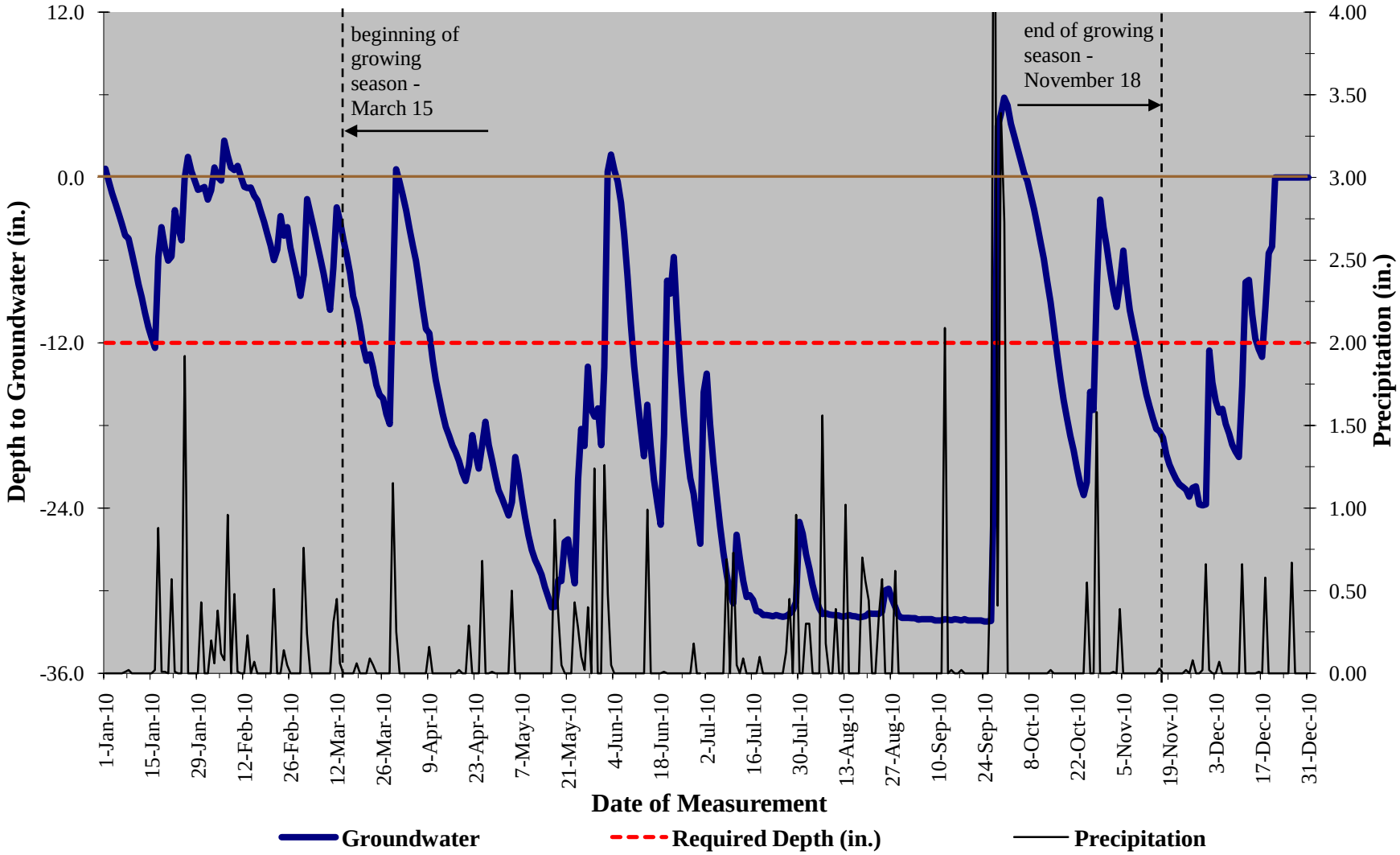

Plum Creek Wetland Mitigation
Gauge G-4 (Serial No. 1130ED8A)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

Plum Creek Wetland Mitigation
Gauge G-5 (Serial No. 11313B7D)
Project Site

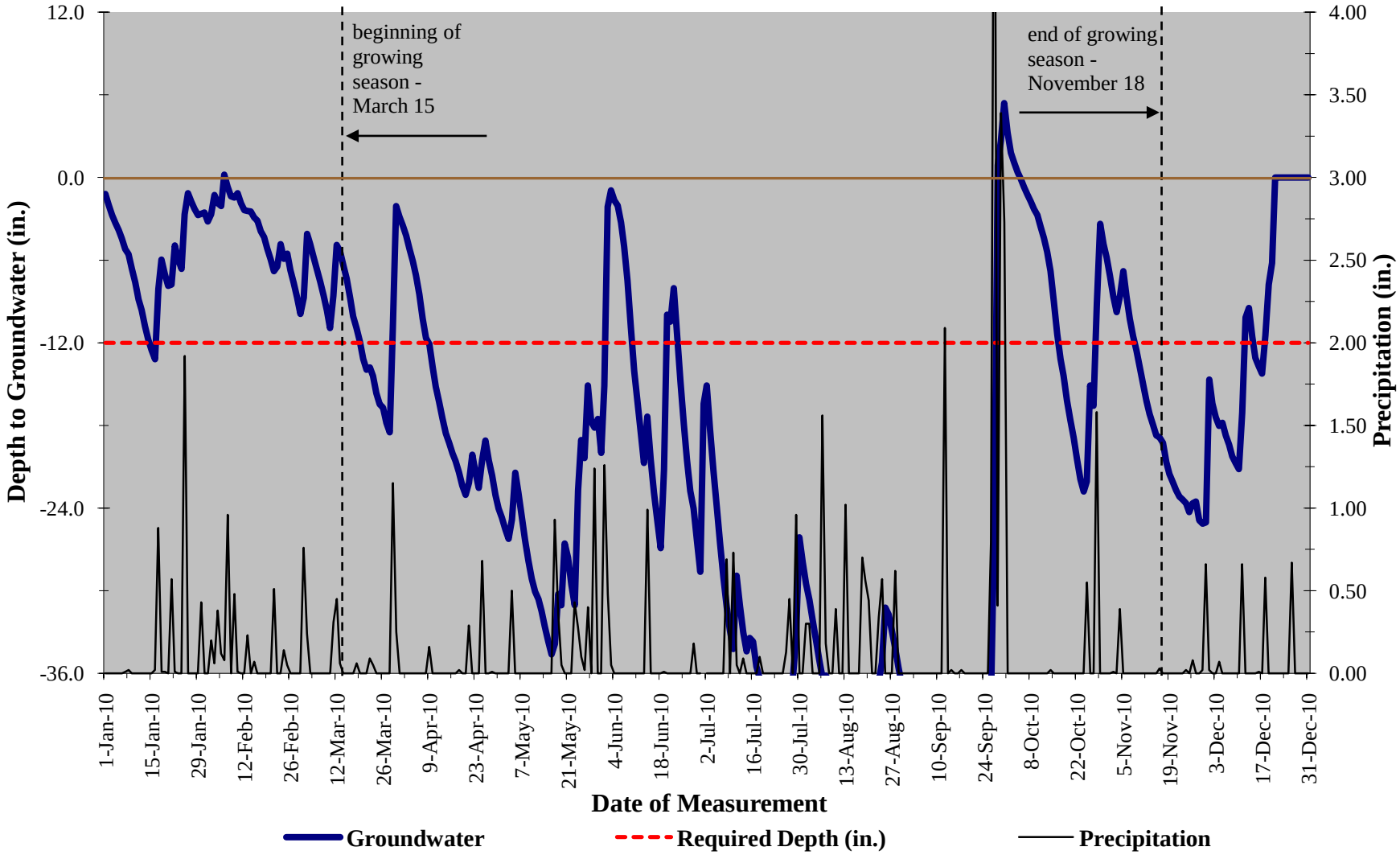



Plum Creek Wetland Mitigation
Gauge G-6 (Serial No. EBD218E)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

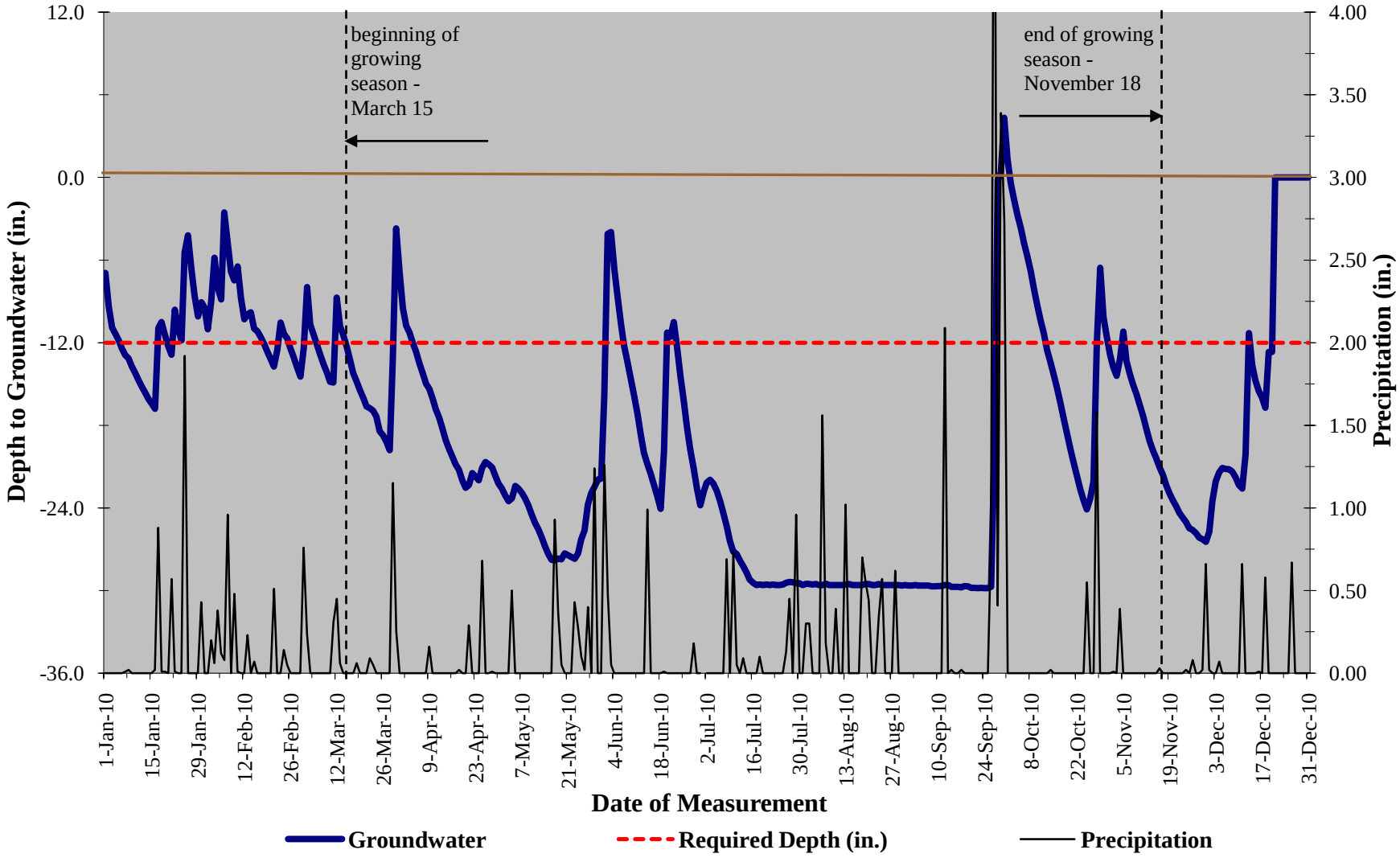
Plum Creek Wetland Mitigation
Gauge G-7 (Serial No. EBD2A12)
Project Site

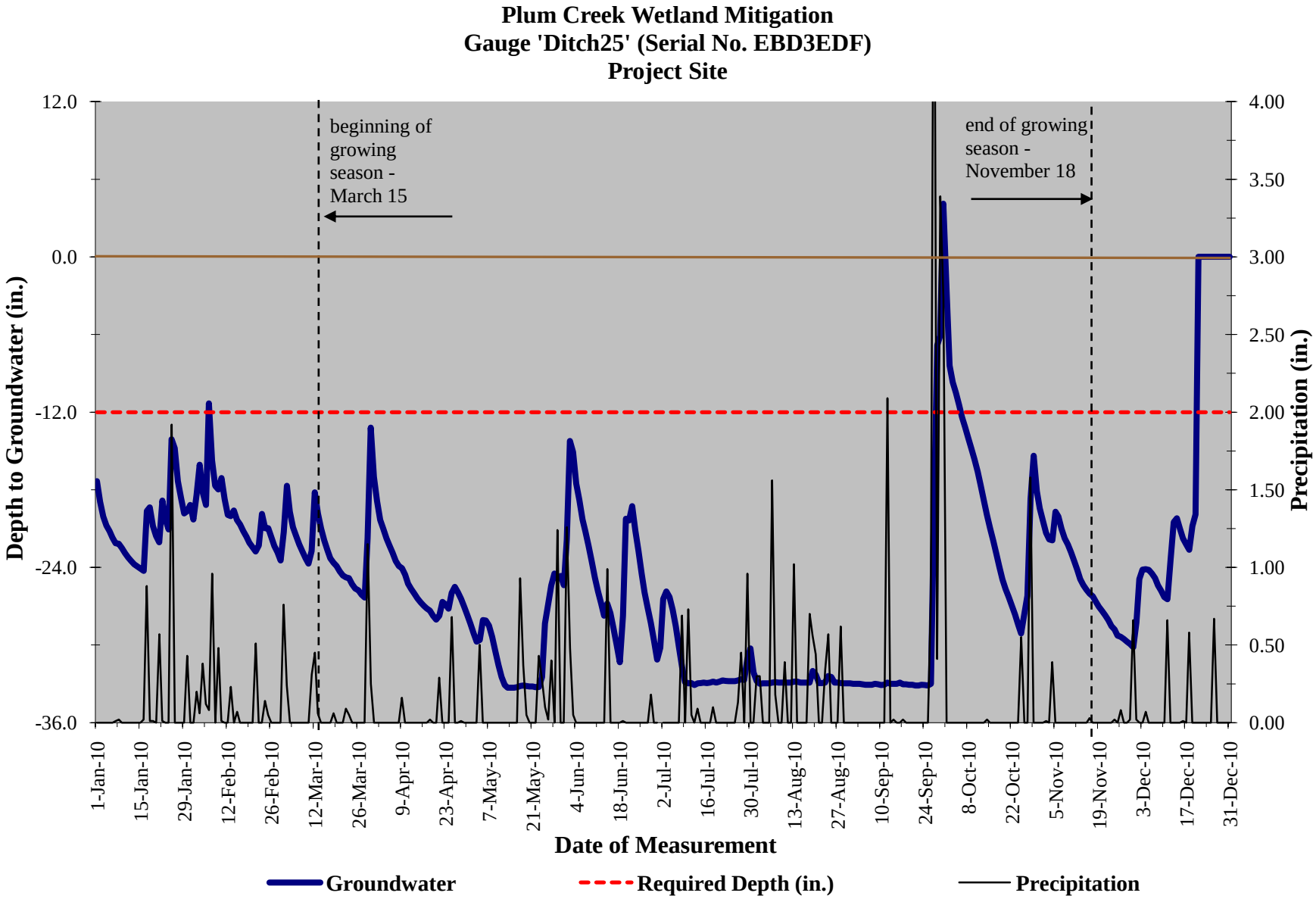


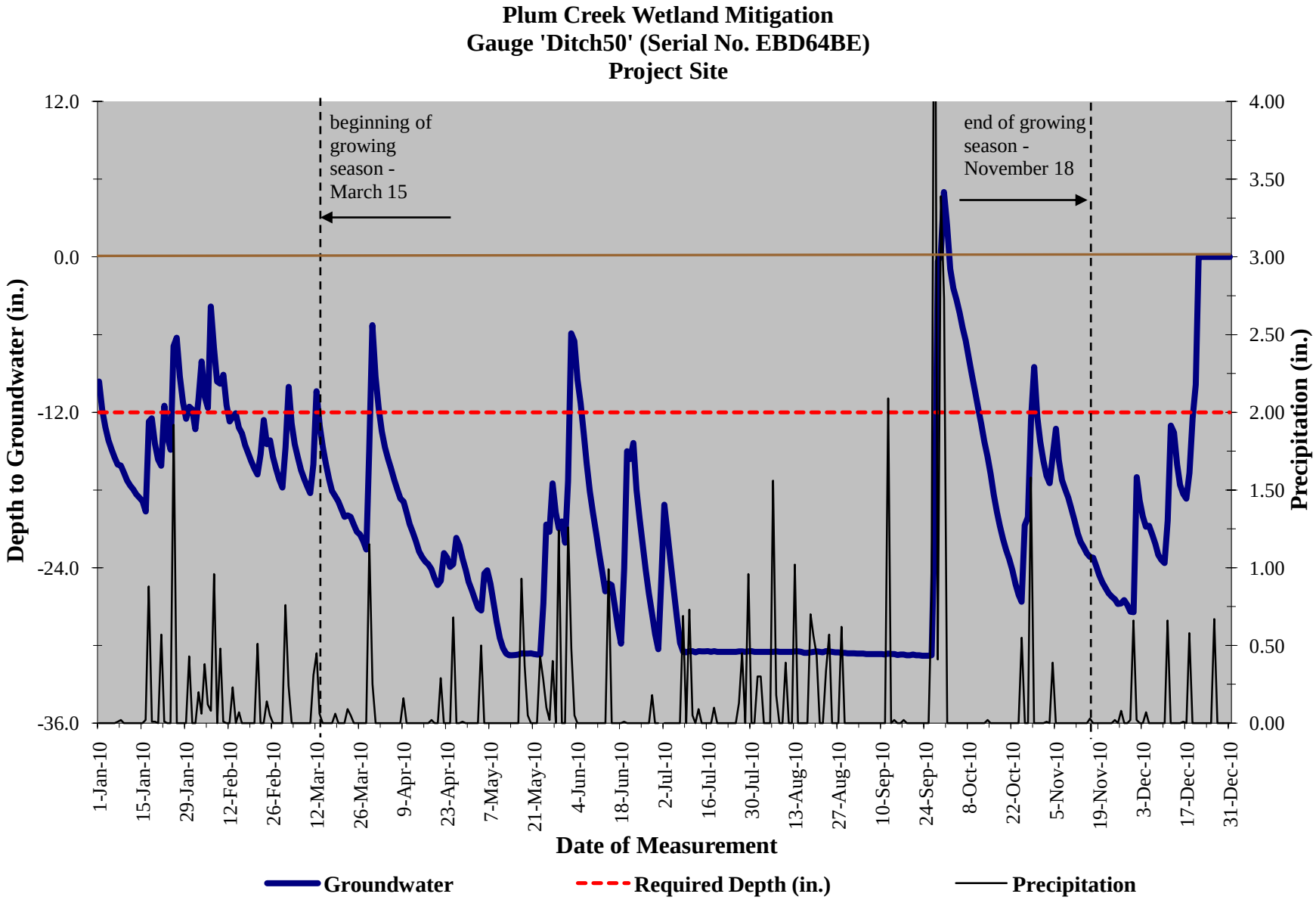
Plum Creek Wetland Mitigation
Gauge G-8 (Serial No. 1130ED80)
Project Site

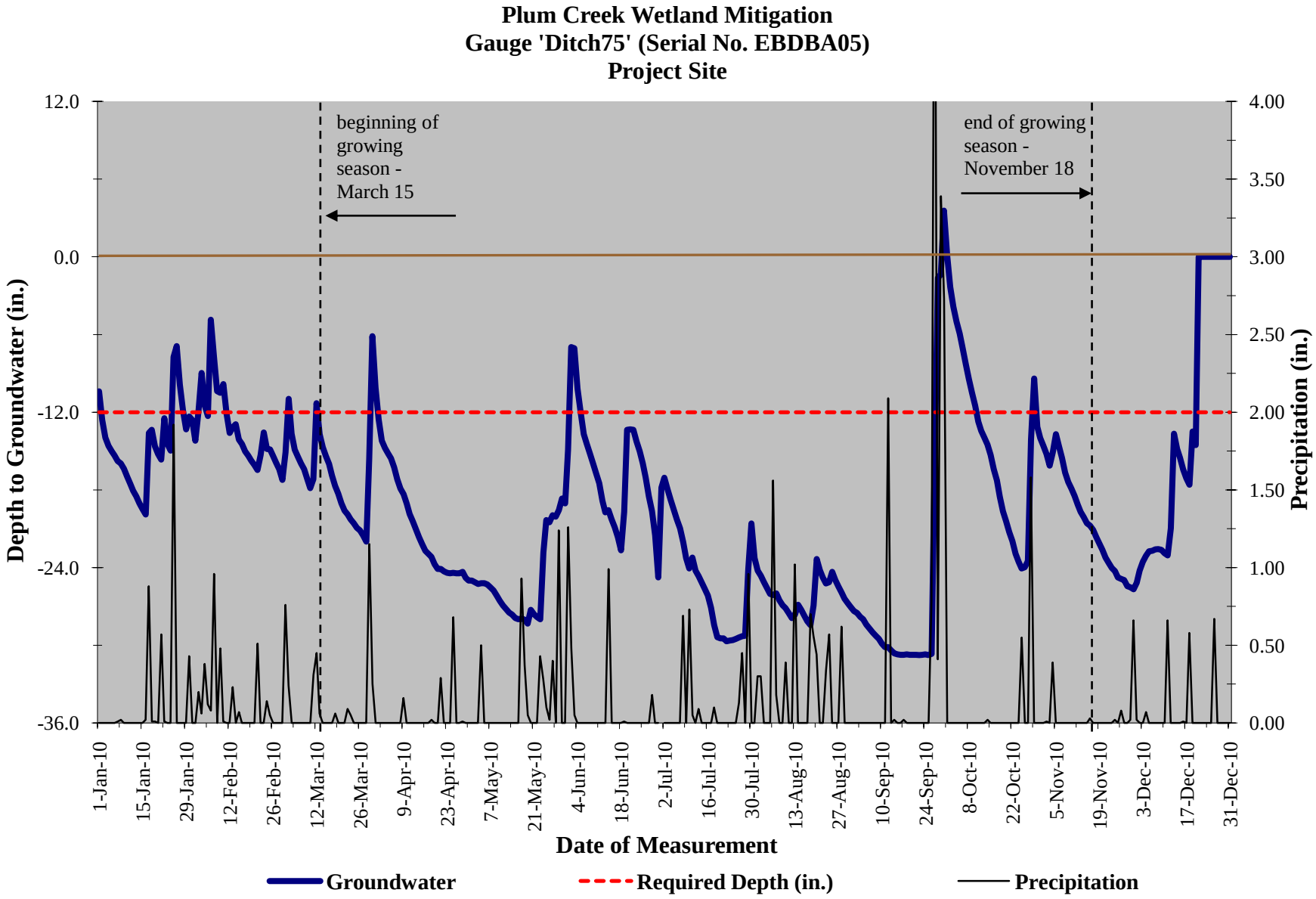


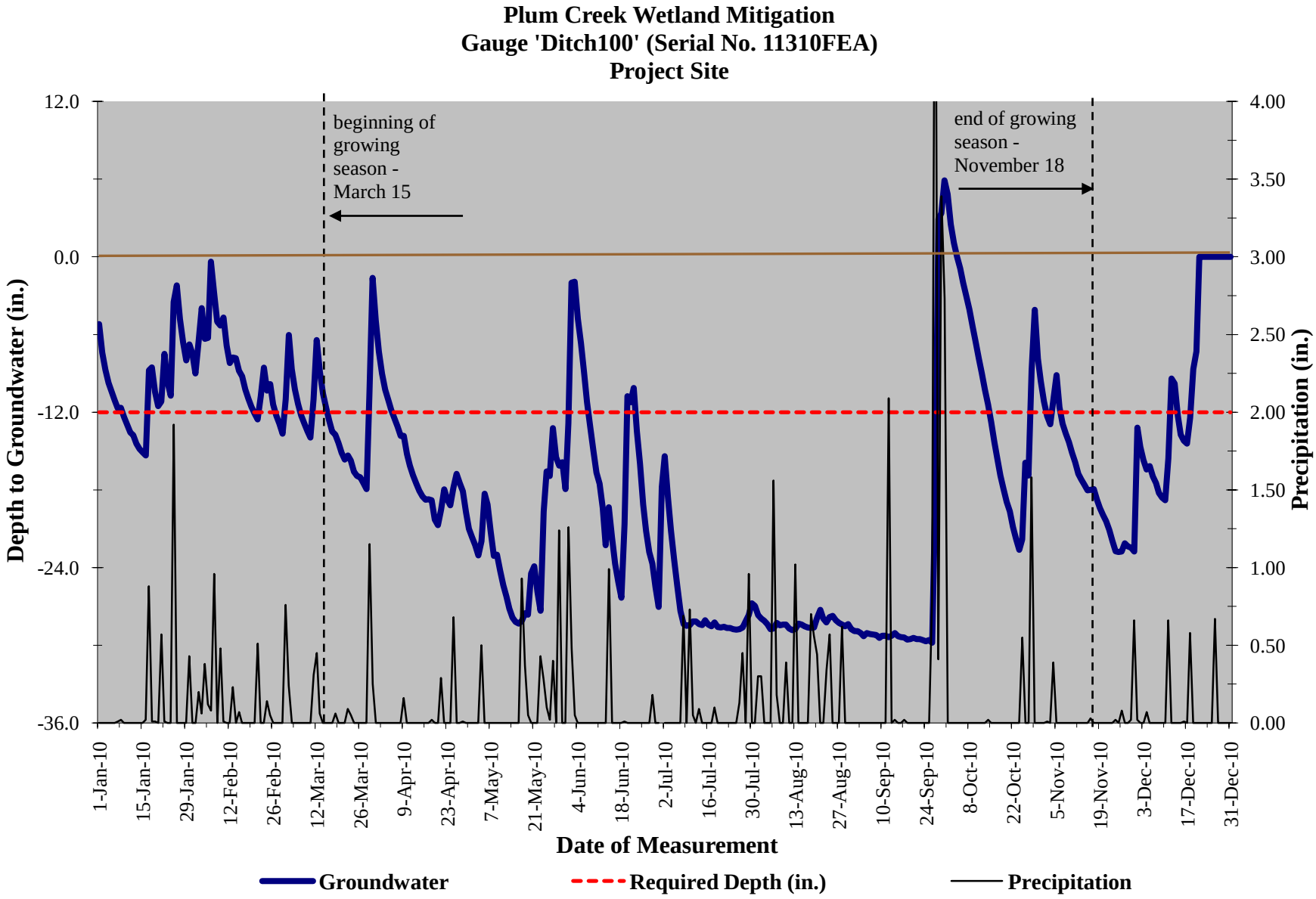
Plum Creek Wetland Mitigation
Gauge G-9 (Serial No. EBD5020)
Project Site

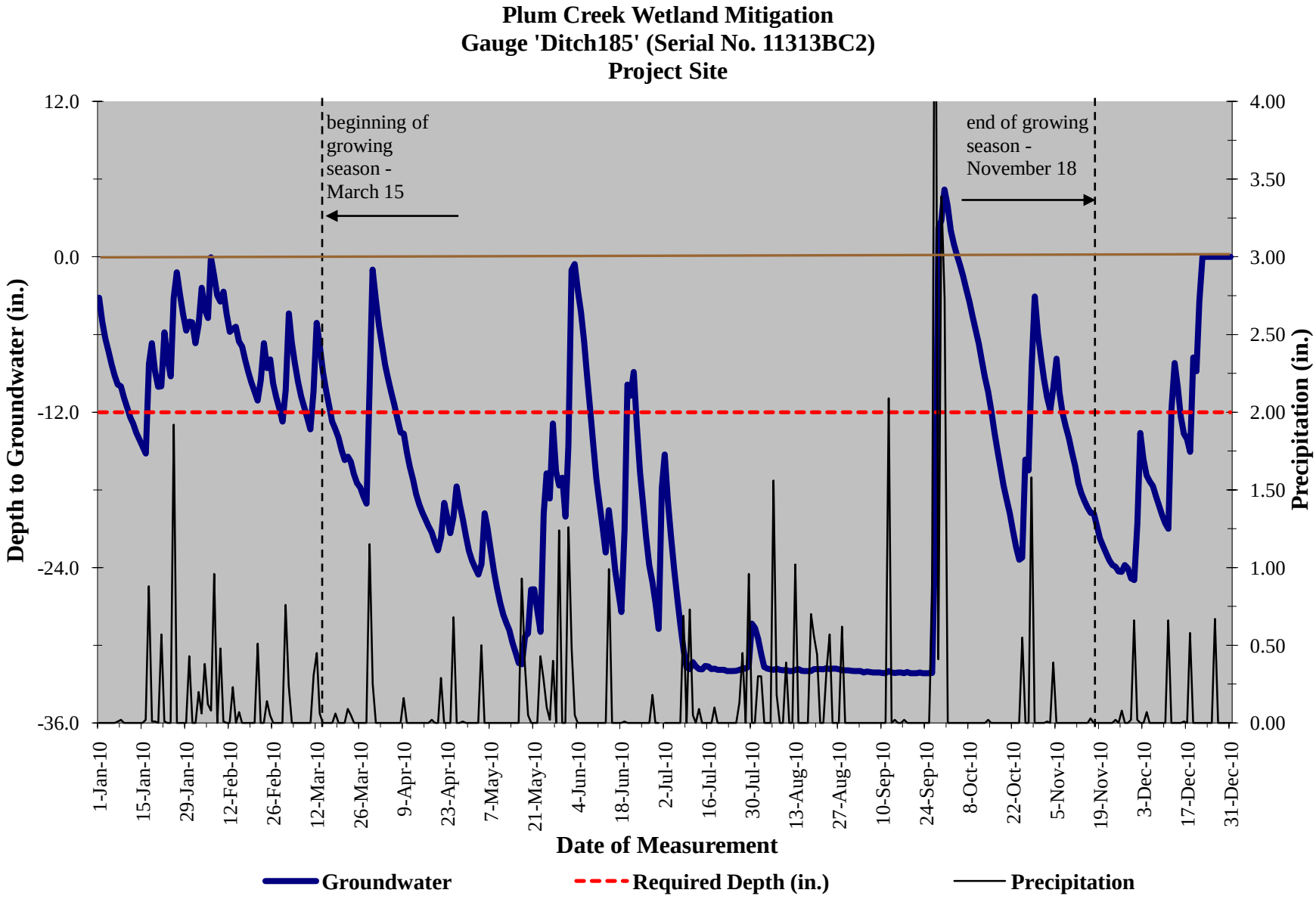


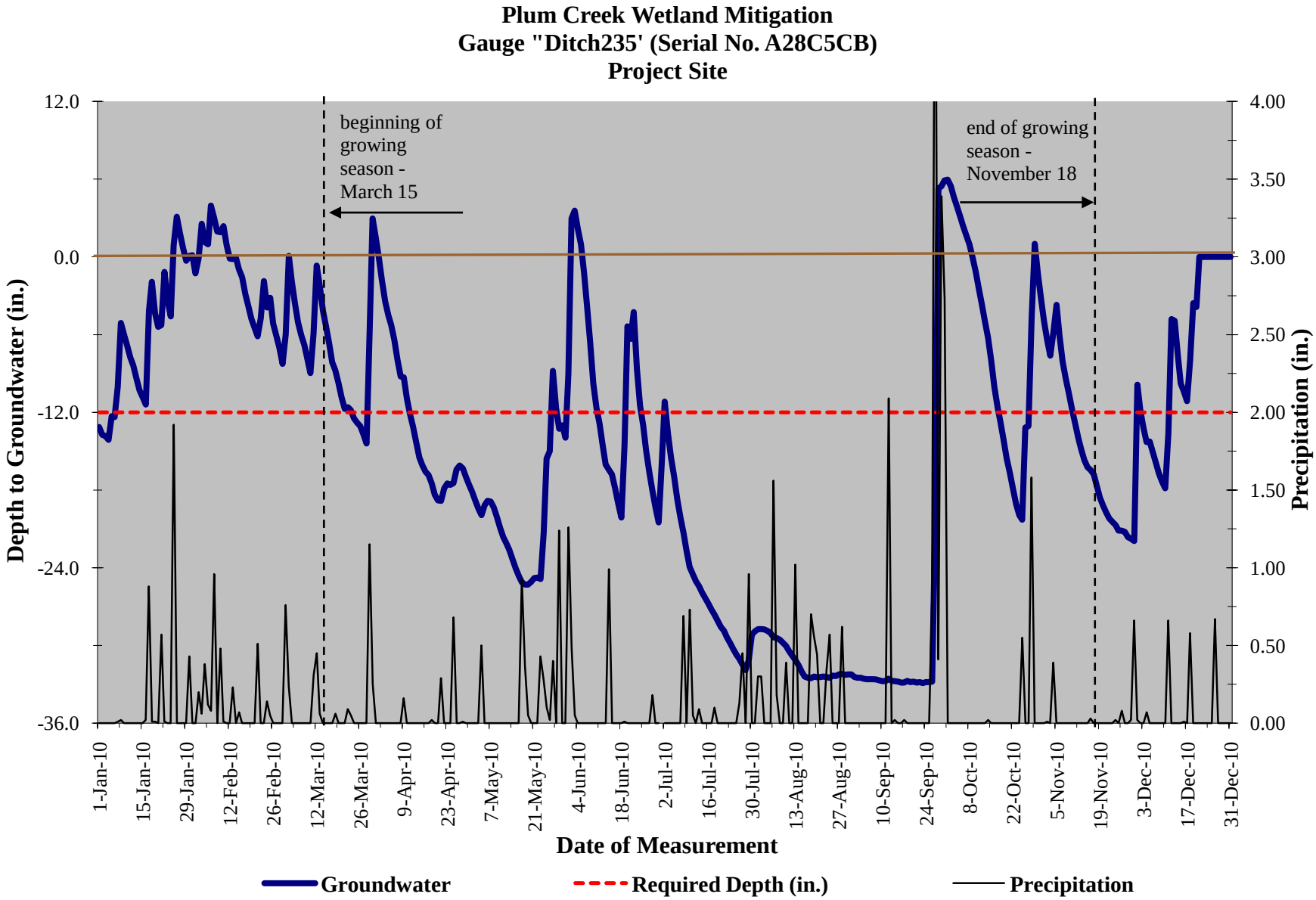

Plum Creek Wetland Mitigation
Gauge 'Ditch25' (Serial No. EBD3EDF)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation


Plum Creek Wetland Mitigation
Gauge 'Ditch50' (Serial No. EBD64BE)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

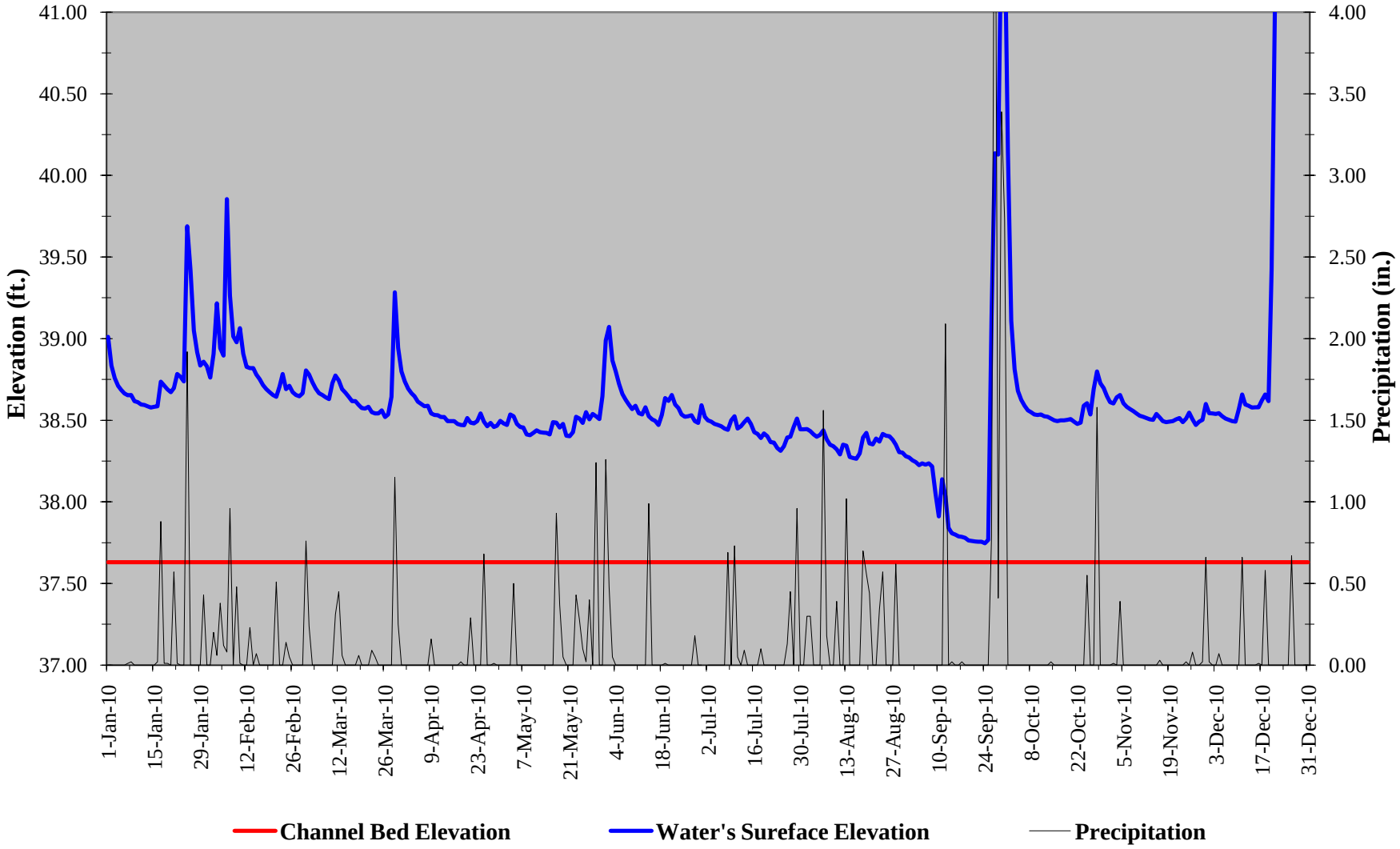

Plum Creek Wetland Mitigation
Gauge 'Ditch75' (Serial No. EBDBA05)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation


Plum Creek Wetland Mitigation
Gauge 'Ditch100' (Serial No. 11310FEA)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

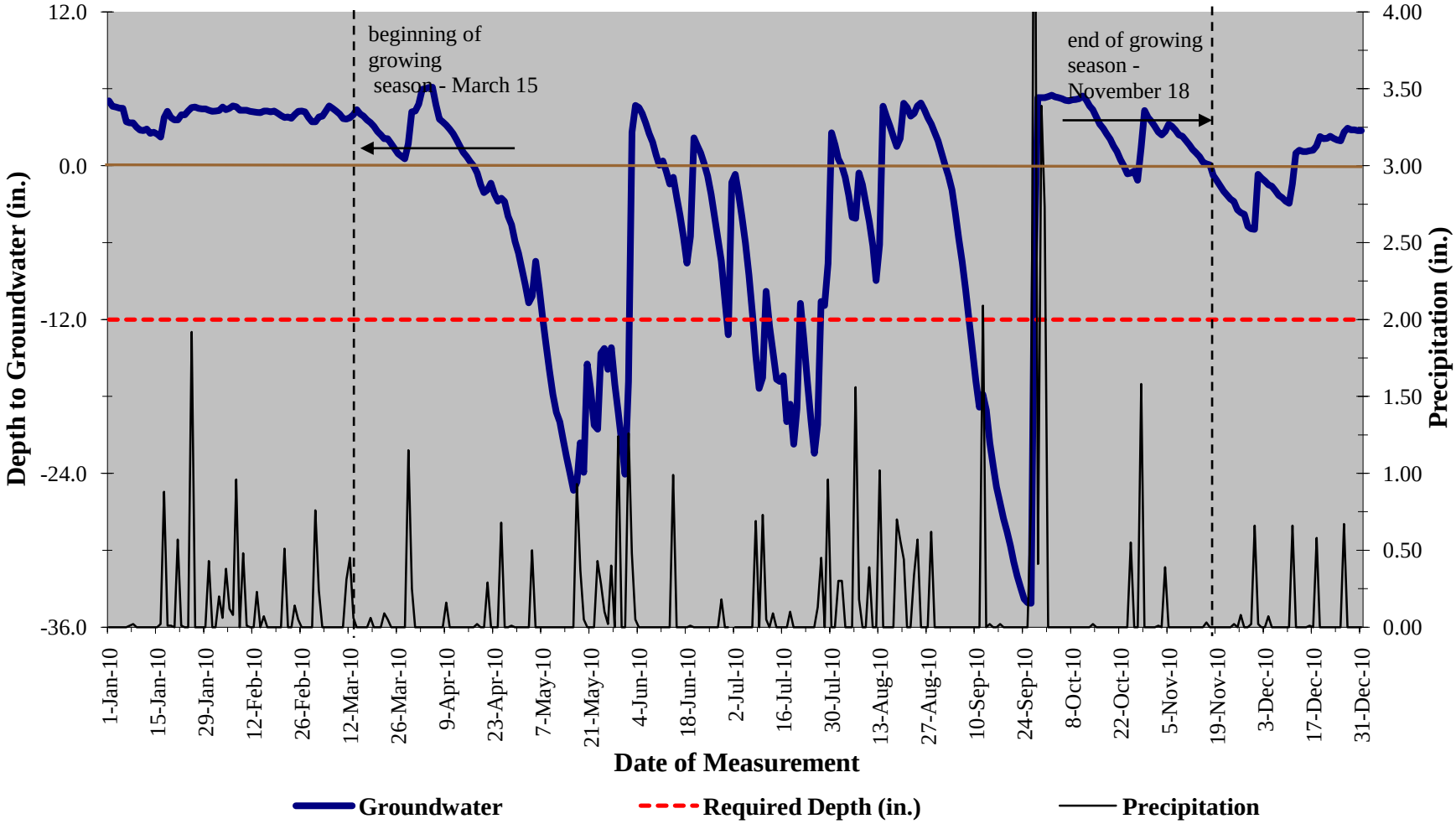

Plum Creek Wetland Mitigation
Gauge 'Ditch185' (Serial No. 11313BC2)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation


Plum Creek Wetland Mitigation
Gauge "Ditch235' (Serial No. A28C5CB)
Project Site
beginning of growing season - March 15
end of growing season - November 18
Depth to Groundwater (in.)
Precipitation (in.)
12.0
0.0
-12.0
-24.0
-36.0
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
1-Jan-10
15-Jan-10
29-Jan-10
12-Feb-10
26-Feb-10
12-Mar-10
26-Mar-10
9-Apr-10
23-Apr-10
7-May-10
21-May-10
4-Jun-10
18-Jun-10
2-Jul-10
16-Jul-10
30-Jul-10
13-Aug-10
27-Aug-10
10-Sep-10
24-Sep-10
8-Oct-10
22-Oct-10
5-Nov-10
19-Nov-10
3-Dec-10
17-Dec-10
31-Dec-10
Date of Measurement
Groundwater
Required Depth (in.)
Precipitation

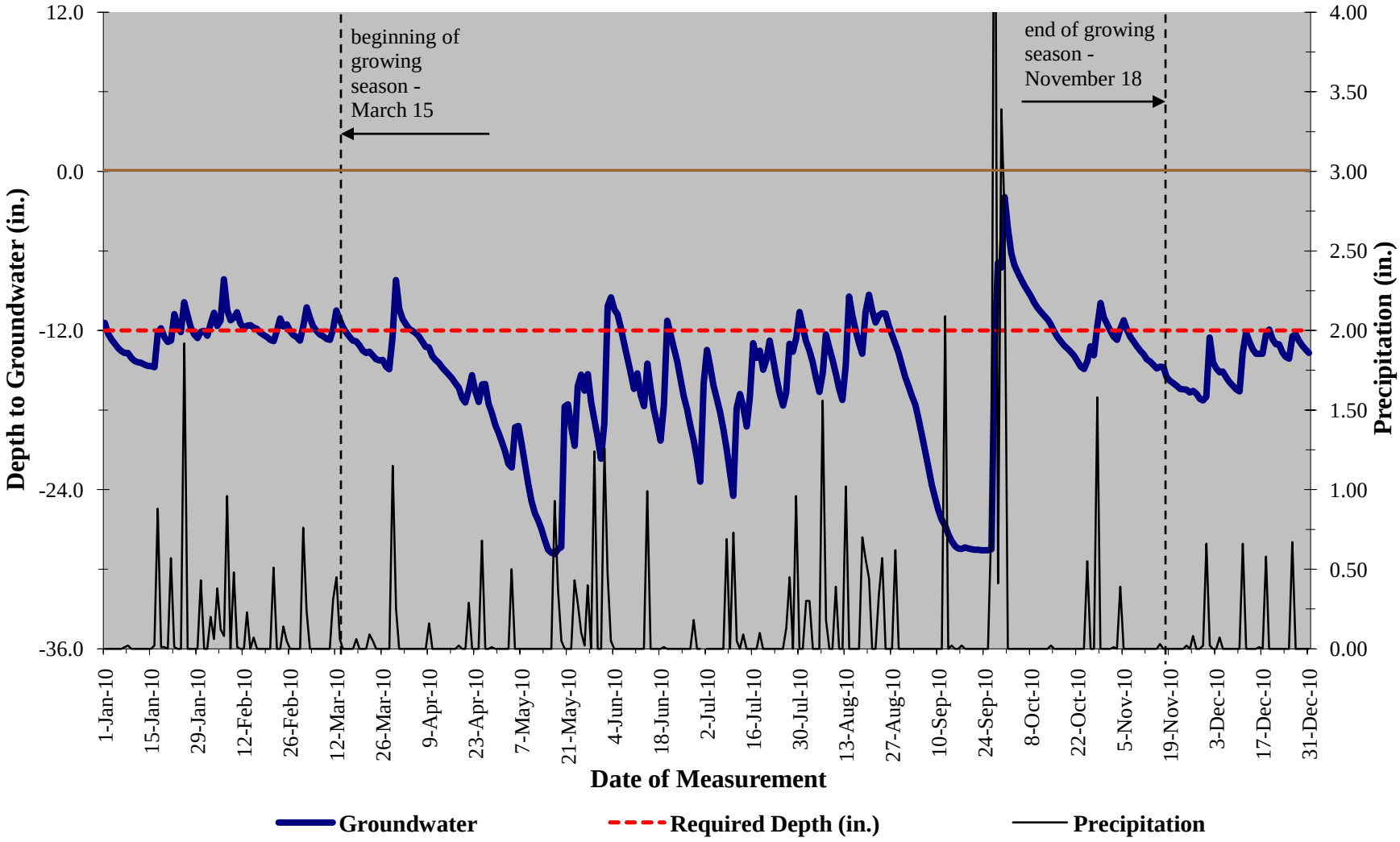
Plum Creek Mitigation Site
Stream Gauge SG-1 (Serial No. 9DE767F)



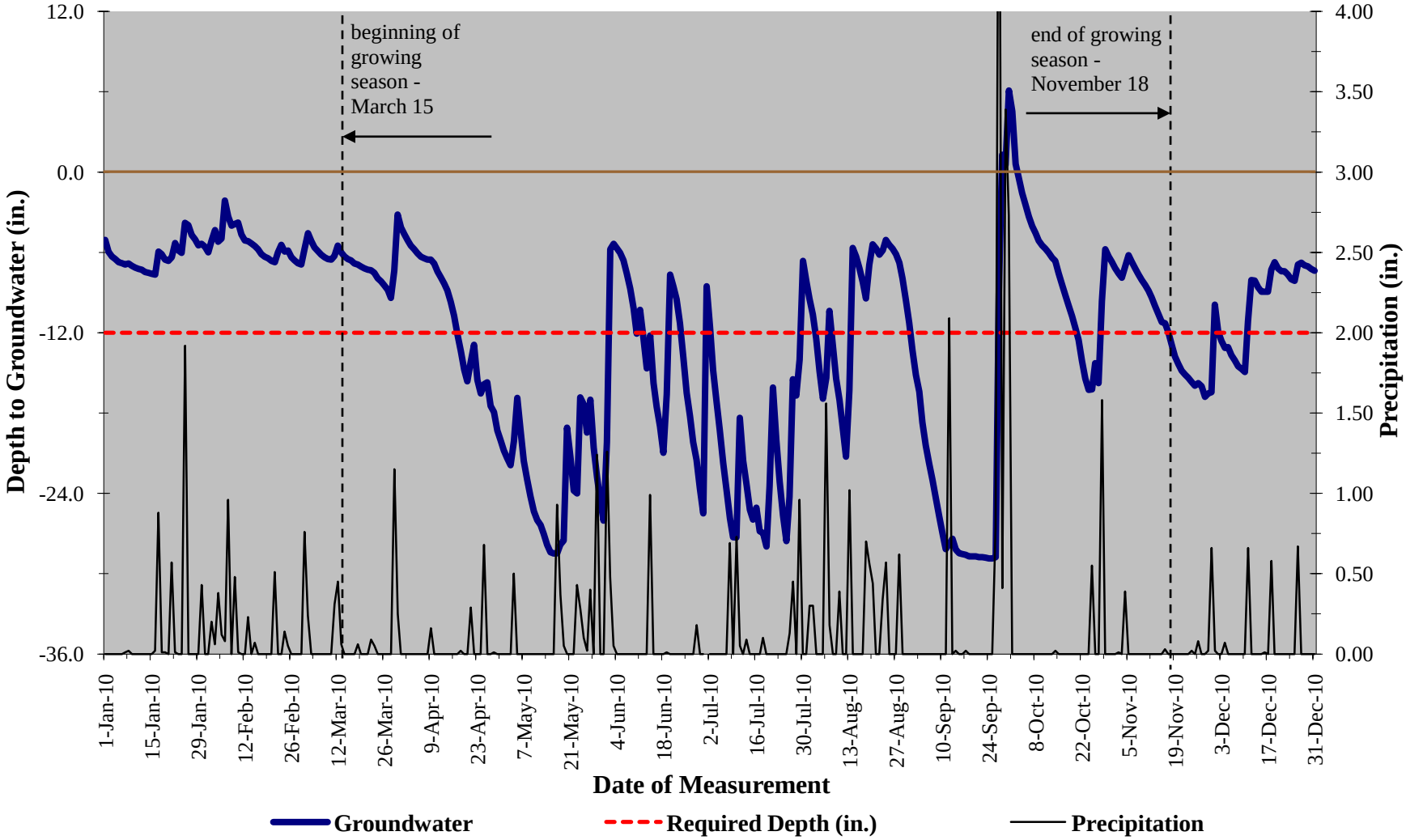
Plum Creek Wetland Mitigation Reference Site
FOREST GUAGE {Formerly REF 2} (Serial No. EBCFCF6)



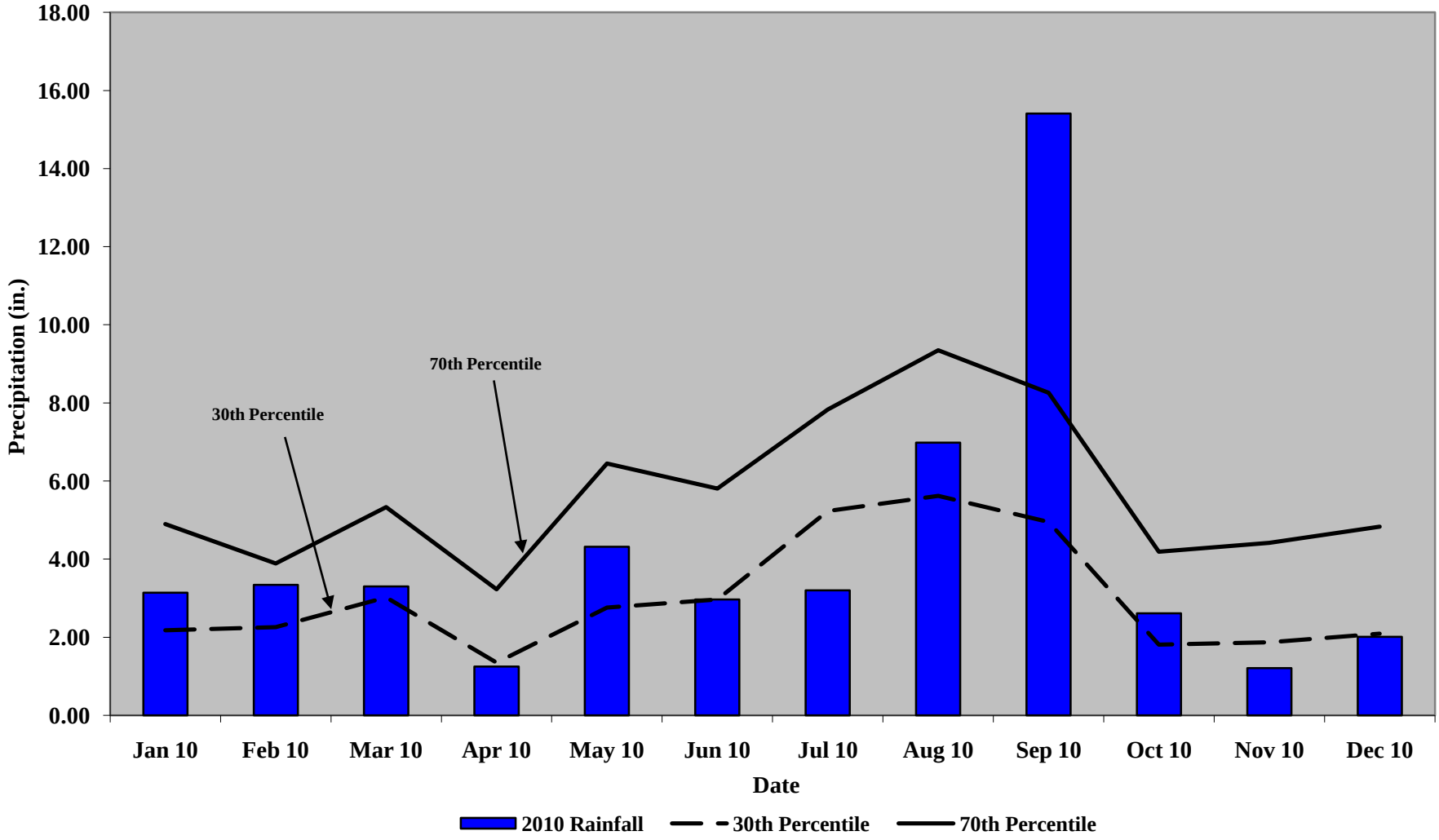
Plum Creek Wetland Mitigation Reference Site
POND GUAGE {Formerly PC-REF1} (Serial No. EBD2B2F)



Plum Creek Wetland Mitigation Reference Guage
ROAD GUAGE {Formerly PLUM REF} (Serial No. 9DE6C99)



Plum Creek 30-70 Percentile Graph
Shallotte, North Carolina



Appendix E:
Pedon Description Sheets

Pedon Description Sheet

Sampling Location: Well 1		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 11in and free water at 20in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No Hydric Soil Indicator: F7	
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
1.5" - 0			organic matter	
0-9"	10 YR 2/1		sandy clay loam	
9"-21"	10 YR 3/1		sandy clay	
21"-25"	10 YR 3/2		sandy clay	
25"-36"	10 YR 4/2	5% / 7.5YR 5/6 / matrix	fine sandy clay	oxidized rhizospheres
36"-40"	10 YR 5/2	25% / 10 YR 6/8 / matrix	sandy clay	oxidized rhizospheres
40"-48"	10 YR 6/2	20% / 10 YR 6/8 / matrix	fine sandy clay	
		20% / 5 YR 4/6 / matrix		
		5% / 2.5 Y 5/6 / matrix		

Pedon Description Sheet

Sampling Location: Well 2		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 11in and free water at 15in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: Yes No	Hydric Soil Indicator: F7
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
1"-0			organic matter	
0-20"	10 YR 2/1		sandy clay loam	
20"-38"	10 YR 4/2	5% / 7.5 Y 6/8 / matrix	sandy clay	
38"-48"	10 YR 5/2 (50%)		sandy clay	
	10 YR 2/1 (50%)	20% / 7.5Y 6/8 / matrix		

Pedon Description Sheet

Sampling Location: Well 3		Time: 2-5PM	Date: 12/21/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 10in and free water at 20in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No	Hydric Soil Indicator: F7
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
0-16"	10 YR 2/1		sandy clay loam	
16"-23"	10 YR 3/1		sandy clay	
23"-47"	10 YR 4/2	10% / 10 YR 6/6 / matrix	sandy clay	oxidozed rhizospheres
47"-48"	10 YR 5/2	20% / 7.5 YR 5/8 / matrix	sandy clay	

Pedon Description Sheet

Sampling Location: Well 4		Time: 2-5PM	Date: 12/21/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 6in and free water at 8in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: Yes (circled) No Hydric Soil Indicator: F7	
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
0-16"	10 YR 2/1		sandy clay loam	
16"-23"	10 YR 3/1		sandy clay	
23"-47"	10 YR 4/2	10% / 10 YR 6/6 / matrix	sandy clay	oxidozed rhizospheres
47"-48"	10 YR 5/2	20% / 7.5 YR 5/8 / matrix	sandy clay	

Pedon Description Sheet

Sampling Location: Well 5		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 3in and free water at 6in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No	Hydric Soil Indicator: F7
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
2"-0			organic matter	
0-17"	10 YR 2/1		sandy clay loam	
17"-36"	10 YR 3/2		sandy clay	oxidized rhizospheres
36"-48"	10 YR 4/2		sandy clay	oxidized rhizospheres

Pedon Description Sheet

Sampling Location: Well 6		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 11in and free water at 20in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No Hydric Soil Indicator: F7	
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
2"-0			organic matter	
0-34"	10 YR 2/1		sandy clay loam	
34"-48"	10 YR 3/2		sandy clay	oxidized rhizospheres

Pedon Description Sheet

Sampling Location: Well 7		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 12in and free water at 14in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No Hydric Soil Indicator: F7	
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
1"-0			organic matter	
0-27"	10 YR 2/1		sandy clay loam	
27"-36"	10 YR 4/2	20% / 10 YR 6/8 / matrix	sandy clay	oxidized rhizospheres
36"-41"	10 YR 5/2	50% / 10 YR 5/8 / matrix	sandy clay	
41"-48"	10 YR 6/2	20% / 10 YR 5/8 / matrix	sandy clay	

Pedon Description Sheet

Sampling Location: Well 8		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 9in and free water at 9in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No	Hydric Soil Indicator: F7
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
1"-0			organic matter	
0-24"	10 YR 2/1		sandy clay loam	
24"-30"	10 YR 5/2		sandy clay	oxidized rhizospheres
30"-48"	10 YR 6/2		sandy clay	

Pedon Description Sheet

Sampling Location: Well 9		Time: 2-5PM	Date: 12/20/2010	Weather: 40°F Sunny
Describer: Sekula/Bode			Landscape Position: Headwater wetland	
Depth to Saturation or Free Water: saturation at 10in and free water at 14in			Vegetative Cover: Scrub-shrub	
Parent Material(s):			Hydric Soil: (Yes) No	Hydric Soil Indicator: F7
Soil Series: Torhunta			HGM Wetland Class: Slope	
Depth:	Matrix Color/Colors:	Redox Concentrations percent/size/color/location/type	Texture % rock frags & size	Roots size & abundance
1"-0				
0-11"	10 YR 2/1		sandy clay loam	
11"-17"	10 YR 2/2		sandy clay	oxidized rhizospheres
17"-22"	10 YR 3/2		sandy clay	oxidized rhizospheres
22"-34"	10 YR 4/2		fine sandy clay	oxidized rhizospheres
34"-48"	10 YR 5/2	2% / 2.5 Y 5/6	sandy clay	oxidized rhizospheres