

ANNUAL REPORT FOR 2001



**Ballance Farm Mitigation Site
Currituck County
Project No. 6.049008T
TIP No. R-2228WM**



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SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Ballance Farm Mitigation Site. This is the third year the site has been monitored for vegetation and hydrologic success. The site must demonstrate both hydrologic and vegetation success for a minimum of five years.

The Ballance Farm site contains 28 groundwater monitoring gauges and 12 surface gauges. The original 17 gauges were placed soon after the site was constructed. The site was extremely wet and gauges were installed in the drier, and therefore higher, locations across the site. NCDOT installed an additional 11 groundwater gauges across the site at more elevation-representative locations. The site also contains 21 plots monitoring trees and 500 plots monitoring the marsh area.

Success criteria are based on federal guidelines for wetland mitigation (as well as a comparison to the hydrology of an undisturbed coastal marsh reference ecosystem located along Tull Creek and an undisturbed forested wetland reference ecosystem referred to as the Richard's property). These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. Gauges were not installed on the Richard's property for the first two years of monitoring. Groundwater monitoring gauges were installed at the Richard's property in early 2001, and the gauges indicated that the reference forested wetland had groundwater within 12 inches of the surface for greater than 220 days. Since the reference forested wetland showed greater than 92% hydrology during a year with below average rainfall, it is doubtful that the reference site's hydrology will drop below that figure or has historically dropped below that figure. Therefore, the Department proposes that the 2001 monitoring year be the third year of hydrologic monitoring for the restored forested wetland since the reference forested wetland site is extremely wet regardless of climatic rainfall events. This would keep the forested wetland hydrological monitoring on the same timeline as the coastal marsh hydrological monitoring. Surface gauges BFSG-2 and BFSG-9 are located in the reference coastal marsh onsite at Ballance Farm located along Tull Creek, and they showed inundation for 57.7% and 60.7% of the growing season. According to the plan, the success of the coastal marsh depends on groundwater levels occurring at depths concluded in the water budget analysis and similar to those in the reference marsh.

Hydrologic monitoring indicated that of the 28 groundwater gauges on site, 18 showed saturation for over 12.5% of the growing season, 3 gauges showed saturation between 8 – 12.5% of the growing season, 2 gauges showed between 5 – 8%, and 5 gauges BF-10 and BF-16 did not show saturation to within 12 inches of the surface for the entire growing season. Of the ten gauges that recorded less than the 12.5% threshold, seven of them were from the original group of seventeen installed at a higher local elevation than the surrounding topography, two experienced serious battery problems during the first half of the growing season, and the remaining gauge recorded 11.7% and 11.3% hydrology during the year. Ten of the 12 surface gauges recorded inundation for greater

than 12.5% of the growing season, and the remaining two gauges showed inundation for 7.1% and 7.5% of the growing season.

In the 2001-monitoring year, the site experienced three months of average rainfall (March, June, and August), and the remaining months experienced rainfall well below average.

This is the third year of vegetative monitoring for the forested restoration areas. Of the 430 acres of this site, approximately 223 involved tree planting. There were 21 (50' x 50') plots established throughout the planting areas, encompassing all plant communities. The vegetation monitoring of the planted area revealed the average density to be 443 trees per acre, which is well above the 320 trees per acre required by the minimum success criteria for three years.

This year was the second vegetative monitoring year for the marsh area since the area was re-planted in June 2000. Success will be determined in accordance with NMFS Guidelines. Of the 430 acres of this site, approximately 48 acres involved marsh grass planting. There were 500 random (1m x 1m) plots established throughout the planting areas, encompassing all plant communities. These plots were located with GPS. At year 5, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of herbaceous species, not including invasive species. A minimum of 70% of the plots should contain the target (planted) species. This year the vegetative cover scale value is 3.71, and the vegetative frequency of target species is well above the success criteria of 70%. The coverage has increased since planting. The percent frequency of target species (planted species) is 86.5% as monitored.

Based on the hydrologic and vegetation monitoring, the Ballance Farm Mitigation Site met success criteria across the majority of the site during the 2001-growing season. NCDOT recommends that monitoring continue.

1.0 INTRODUCTION

1.1 Project Description

The Ballance Farm Mitigation Site is located in Currituck County (Figure 1). The property was originally a 469-acre site out of which NCDOT purchased 430 acres. The mitigation site consisted of 297 acres of agricultural fields, 50 acres of tidal freshwater marsh, 51 acres of forested wetland, 5.3 acres of forested uplands, and 26 acres of roads, ditches and so on. It was designed to mitigate for the widening of NC 168 (TIP Project R-2228); the project includes the creation of coastal marsh wetland and the preservation of forested wetlands and forested upland areas. According to the Ballance Farm Mitigation Plan, implementation of the site was to provide 61 acres of marsh creation, 236 acres of forested wetland restoration, 51 acres of forested wetland preservation, 50 acres of coastal marsh preservation, and 5.3 acres of upland habitat preservation. However, based on recent GPS data and ground observation, approximately 13 acres of the zone C1 marsh creation area appears to have been graded incorrectly. NCDOT obtained controlled aerial photography of the mitigation site to determine the as-built condition of the site. This map will be presented at the monitoring review meeting in 2002.

The Final Mitigation Plan for this site was issued on April 1, 1996. Initial construction was completed in late 1998. The site was planted and monitoring gauges installed in early 1999. This monitoring report presents the third year results of hydrologic monitoring and vegetation monitoring.

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 (as well as a comparison to the hydrology of an undisturbed coastal marsh reference ecosystem and an undisturbed-forested wetland reference ecosystem). These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during the year 2001 at the Ballance Farm Mitigation Site as well as local climate conditions throughout the growing season.

1.3 Project History

Fall 1998	Site Constructed
Spring 1999	Site Planted
March – November 1999	Hydrology Monitoring (1 yr.)
November 1999	Vegetation monitoring (1 yr.)
March – November 2000	Hydrology Monitored (2 yr.)
March 2000	Hardwood Herbicide Treatment
June 2000	Marsh Re-planted
October 2000	Hardwood Vegetation Monitoring (2 yr.)
October-November 2000	Marsh Vegetation Monitoring (1 yr.)
March – November 2001	Hydrology Monitored (3 yr.)
July 2001	Hardwood Vegetation Monitoring (3 yr.)
July 2001	Marsh Vegetation Monitoring (2 yr.)

1.4 Debit Ledger

Ballance Farm	Mit. Plan			Ratios	TIP DEBIT	TIP DEBIT	TIP DEBIT	TIP DEBIT	TIP DEBIT
Currituck Co. Habitat	Acres at Start:	Acres Remaining	Percent Remaining		R-2228BA & A	R-2228 mod.	Div. 1	Div. 1	B-3445
FWM Creation	48	37.25	77.60			10.65			0.1
FWM Preservation	50	50	100.00						
BLH Restoration	225	195.63	86.95		17.5	10.6	0.27	1	
BLH Preservation	51	49.65	97.35				1.35		
Upland Mgmt.	5.3	5.3	100.00						
TOTAL	379.3	337.83	89.07						

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 day percentage of 12.5% of the growing season. Areas inundated or saturated for less than 5% of the growing season are always classified as non-wetlands. Areas inundated or saturated between 5% - 12.5% of the growing season can be classified as wetlands depending upon factors such as the presence of wetland vegetation and hydric soils.

The growing season in Currituck County begins March 20 and ends November 13. These dates correspond to a 50% probability that temperatures will drop to 28°F or lower after March 20 and before November 13.¹ The growing season is 239 days; therefore, optimum hydrology requires 12.5% of this season, or at least 30 consecutive days. Local climate must also represent average conditions for the area.

Based on the Ballance Farm Mitigation Plan, hydrologic success of the created coastal marsh is dependent on the groundwater levels occurring at depths concluded in the water budget analysis and similar to those in the adjoining reference coastal marsh. Success will also be determined by comparison of hydrology with the reference coastal marsh.

Based on coordination with the Corps of Engineers after completion of the Ballance Farm Mitigation Plan, the created forested wetland will be considered successful if hydrology on-site is consistent with reference ecosystem referred to as the Richards' property. The plan also states that hydrologic success of the created-forested wetland is dependent on the groundwater levels occurring at depths concluded in the water budget analysis and similar to those in the reference forested wetland.

2.2 Hydrologic Description

In early 1999, seventeen monitoring gauges, one rain gauge, and fourteen surface water gauges were installed. In early 2000, eleven additional groundwater-monitoring gauges were installed, and seven surface water gauges were either removed or relocated to more adequately monitor the marsh area. The number of surface water gauges on-site is twelve (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth and the surface gauges record daily readings of surface water depth.

¹ Natural Resources Conservation Service, Soil Survey of Currituck County, North Carolina, p.71.

The Ballance Farm site involved the construction and planting of a tidal marsh system by grading the site to match the topography of the existing system located along Tull Creek and by constructing large channels connecting Roland Creek, Tull Creek, and a tributary to Tull Creek. This connectivity will allow for tidal flushing of the constructed coastal marsh. This work created a 400-foot wide band of coastal marsh area that resulted in approximately 61 acres of coastal marsh created. In the existing agricultural fields, the field crowns were graded down, the field ditches were filled and plugged, and this area planted resulting in the restoration of approximately 236 acres of forested wetlands.

This should provide adequate hydrologic input from the adjacent creeks and rainfall to sustain the necessary hydrology for this site. The hydrologic monitoring should show the reaction of the groundwater level to specific tidal and rainfall events.



FIGURE 1: VICINITY MAP

2001 Ballance Farm Gauge Locations

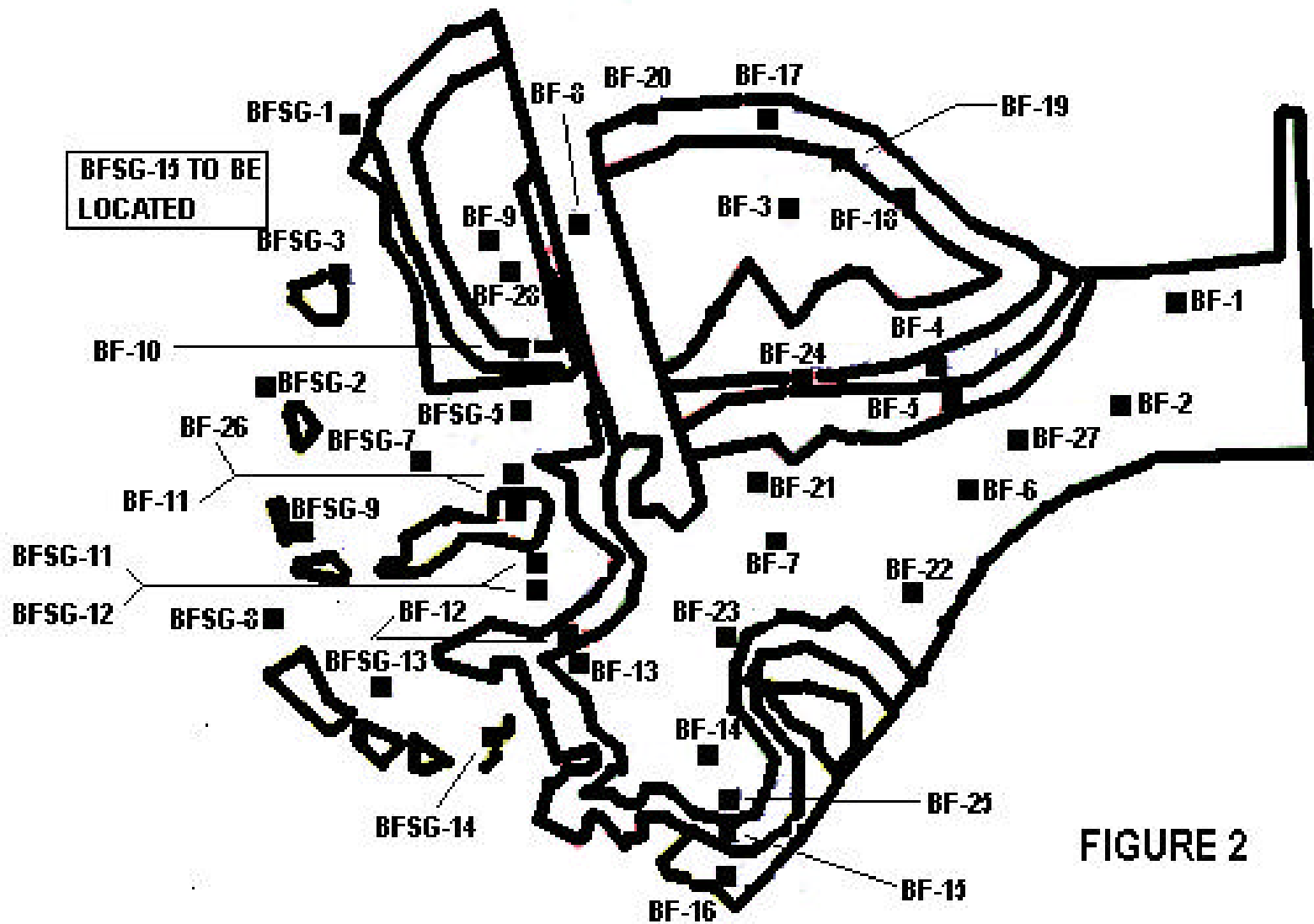


FIGURE 2

2001 BALLANCE FARM HYDROLOGIC MONITORING RESULTS

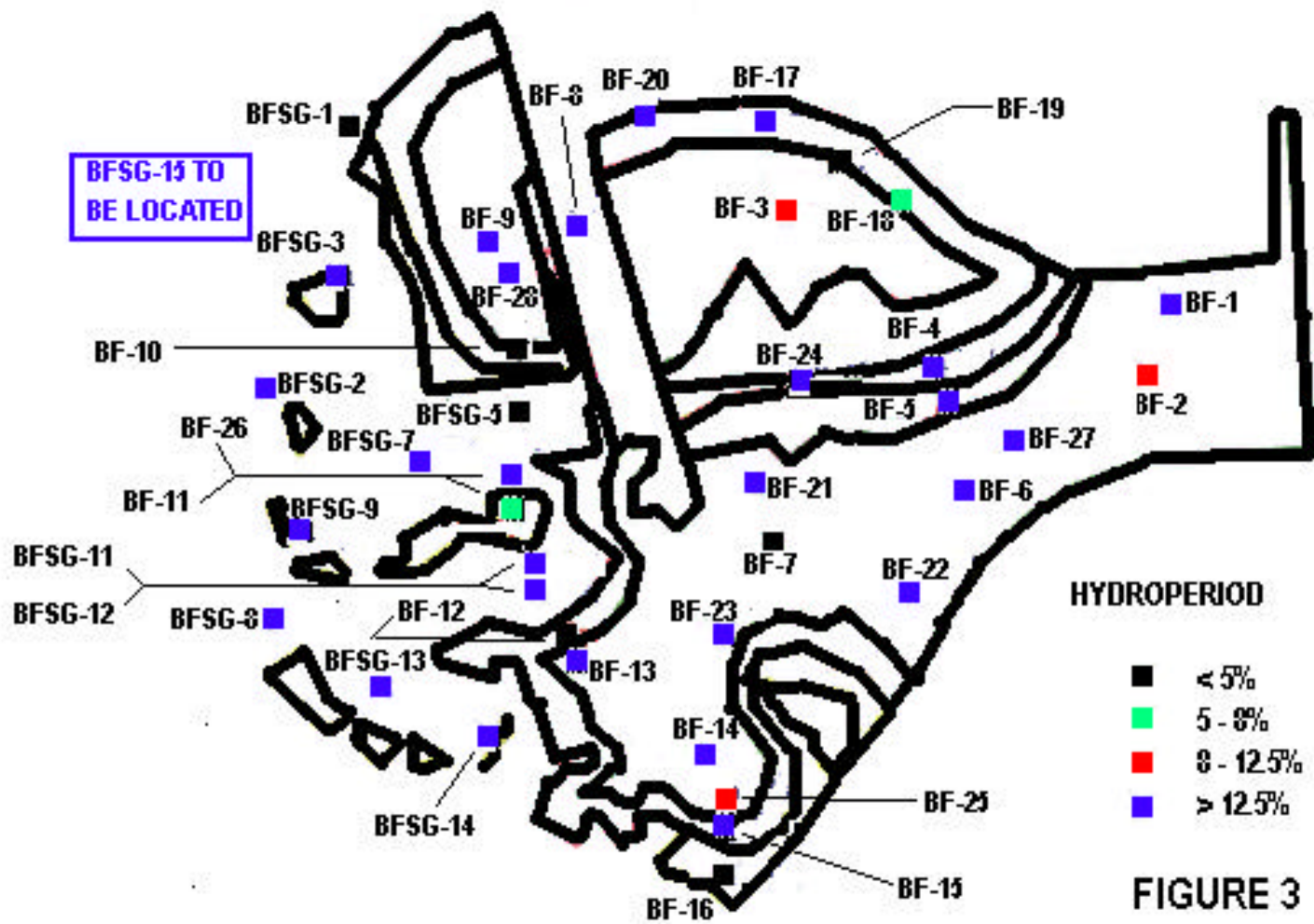


FIGURE 3

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 239-day growing season. The results are presented in Tables 1A and 1B. Appendix A contains a plot of the groundwater depth for each monitoring gauge and the surface water depth recorded by the surface gauge. The maximum number of consecutive days is noted on each graph. The Infinities rain gauge that is currently located on the site was utilized for the 2001 monitoring season, thus eliminating the need to use official rainfall information on the monitoring gauge graphs. Historical rainfall data was obtained from the North Carolina State Climatic Office. Figure 3 is a graphical representation of the hydrologic monitoring results.

Table 1A
HYDROLOGIC MONITORING RESULTS (GROUNDWATER GAUGES)

Monitoring Gauge	< 5%	5% - 8%	8% - 12.5%	> 12.5%	Actual %	Success Dates
BF-1				✓	18.8	Mar. 20 – May 3
BF-2			✓		11.7	Mar. 20-Apr. 16
BF-3			✓		8.8	Mar. 20-Apr. 9
BF-4				✓	24.3 17.6 25.1	Mar. 20 – May 16 June 7-Jul. 18 Aug 19-Oct. 17
BF-5				✓	13.4	Mar. 20-Apr. 20
BF-6				✓	18 15.9	Mar. 20-May 1 May 27-Jul. 3
BF-7	✓				2.1	Aug. 18-Aug. 27
BF-8				✓	14.6	Mar. 20 - May 11
BF-9				✓	14.6 13.0	Apr. 15 – May 7 May 29-Jun. 28
BF-10	✓				0	None
BF-11		✓			5.9	Apr. 15 – May 7
BF-12	✓				4.6	Mar 31-Apr. 10
BF-13				✓	19.2 17.2	Mar. 20-May 4 May 27-Jul. 6
BF-14				✓	14.6 15.1	Mar 20-Apr. 23 May 27-Jul. 1
BF-15				✓	19.2 18.0 12.1	Mar. 20 –May 4 May 27-Jul. 8 Aug. 14-Sep. 11
BF-16	✓				0	None
BF-17				✓	17.6	Mar. 20-Apr. 30
BF-18		✓			5.9	Aug. 19-Sep. 1
BF-19	✓				2.5	Aug. 18-Aug. 23
BF-20				✓	18.8 13.0	Mar. 20-May 3 Jun. 2-Jul. 2
BF-21				✓	14.6 15.5	Mar. 20-Apr. 23 May 27-Jul. 2
BF-22				✓	19.2 16.7	Mar. 20-May 4 May 27-Jul. 5

BF-23				✓	23 13	Mar. 20-May 27 Jun. 4-Jul. 4
BF-24				✓	19.7 16.7	Mar. 20-May 5 May 27-Jul. 5
BF-25			✓		11.7 11.3	Mar. 20-Apr. 16 Jun. 2-Jun. 28
BF-26				✓	75.7 23.0	Mar. 20-Sep. 16 Sep. 20-Nov. 13
BF-27				✓	17.2 17.2	Mar. 20-Apr. 29 May 27-Jul. 6
BF-28				✓	18.4 13.4	Mar. 20-May 2 Jun. 6-Jul. 7

The gauges above are located in the created forested wetland areas of the Ballance Farm site with the exception of gauges BF-8 and BF-26 which are located in the preserved forested wetland areas. The elevations taken in the vicinity of each gauge in the created-forested wetland ranged from 3.3 feet to 6.2 feet with the majority of the elevations in the 4.5-foot range. Of the 28 gauges installed, 18 gauges showed saturation for at least 12.5% of the growing season, 3 gauges showed saturation for at least 8% of the growing season, 2 gauges (BF-10 and BF-16) showed no saturation within 12 inches of the surface, and gauge BF-7 malfunctioned four times causing data loss. Gauge BF-7 was replaced in July 2001.

Gauge BF-10 is situated at a 5.5-foot elevation and the groundwater was recorded consistently greater than 20 inches below the surface. This is consistent with its 2000 performance. Reviewing the closest adjacent gauges, BF-9 and BF-28, BF-9 is at elevation 5.1 feet and recorded groundwater within 12 inches of the surface for 14.6% of the growing season. BF-28 is at elevation 4.4 feet and recorded groundwater within 12 inches of the surface for 18.4% of the growing season. There is a difference in elevation of 13 inches between BF-10 and BF-28. BF-28 is situated at an elevation that is more representative of the surrounding area where BF-10 is situated in a locally high area that is not representative of the surrounding area.

As noted previously, the reference forested wetland (the Richards' property) for the created-forested wetland had gauges installed prior to the 2001-monitoring season. These gauges showed hydrology within twelve inches of the surface for over 92% of the growing season during a below-average-rainfall-year. On two trips to the property, the site has exhibited evidence of soil saturation over an extended period of time in excess of the 12.5% of the growing season standard; that is, the reference ecosystem is very wet (the reference site was wet during the 2001 monitoring season which was a below normal rainfall year).

Table 1B
HYDROLOGIC MONITORING RESULTS (SURFACE GAUGES)

Monitoring Gauge	< 5%	5% - 8%	8% - 12.5%	> 12.5%	Actual %	Success Dates
BFSG-1		✓			7.5	Aug. 5 – Aug. 22
BFSG-2 (Ref)	■	■	■	✓	57.7	May 19 – Oct. 3
BFSG-3				✓	62.3	May 8 – Oct. 3
BFSG-5		✓			2.9	Sep. 21 – Sep. 27
BFSG-7				✓	22.6	July 23 – Sep. 14
BFSG-8				✓	13.8	July 24 – Aug. 25
BFSG-9 (Ref)	■	■	■	✓	60.7	May 12 – Oct. 3
BFSG-11				✓	49.8	May 19 – Sep. 1
BFSG-12				✓	57.8	May 19 – Oct. 3
BFSG-13				✓	82.8	Mar. 26 – Oct 3
BFSG-14				✓	24.3	May 21 – July 17
BFSG-15				✓	60.3	May 13 – Oct. 3

The surface gauges are located in the existing and created coastal marsh. The surface gauges not pulled or relocated remained in place and in use for the 2001 monitoring period. The surface gauges in the created marsh show the hydrology is consistent with the reference marsh.

Specific problems: Groundwater monitoring gauge BF-7 experienced battery problems on four occasions and did not record data for a portion of the growing season. It was replaced in late July 2001. Data for gauge number BF-18 could not be retrieved during a site visit. The gauge was replaced in early June 2001. Gauge BF-19 experienced battery problems and recorded erroneous data for nearly 2 months at the beginning of the growing season. Gauges BF-2, BF-16, BF-23 and BF-28 stopped recording data due to dead batteries during the last download of the growing season. Data was not recorded for one week in early October for all of the surface monitoring gauges.

2.3.2 Climatic Data

Figure 4 represents an examination of the local climate in comparison with historical data to determine whether 2001 was “normal” in terms of climate conditions. The figure compares the rainfall from 2001 with that of historical rainfall (data collected between 1948 and 1996). All rainfall data was collected from the NC State Climate Office. The graph shows 2001 rainfall totals from January 2001 through the end of November 2001 which includes the growing season for this site. In the year 2001, February, March, and October had extremely below normal rainfall; July and November were below normal. May and June, showed significantly above average rainfall.

In 1999, 5 of 17 groundwater-monitoring gauges showed groundwater within 12 inches of the surface for 12.5% of the growing season during a below average rainfall year. In 2001, 10 of these same 17 gauges recorded groundwater within 12 inches of the surface for at least 12.5% of the growing season, while 5 of the 7 remaining gauges recorded at least 9.2%. Of the eleven additional groundwater gauges installed in 2000, all except BF-23 recorded groundwater elevation within 12 inches of the surface for at least 12.5% of the growing season. This is a marked improvement during a 9-month 2000-monitoring period that experienced 4 above average rainfall months, 4 below average rainfall months, and 1 average rainfall month. Also consider that a majority of the 1999 gauges are situated in locally elevated areas of the site that are not representative of the surrounding topography. The months of April, May, June, and August exhibited rainfall at or above the normal range with the May and June data being substantially above normal. These results contributed to the longer periods of saturation exhibited by the gauges. However, groundwater levels were maintained through the more normal rainfall periods of July, August and September and even into the low rainfall periods during October and November.

**Balance Farm 2001 30-70 Percentile Graph
Elizabeth City, NC**

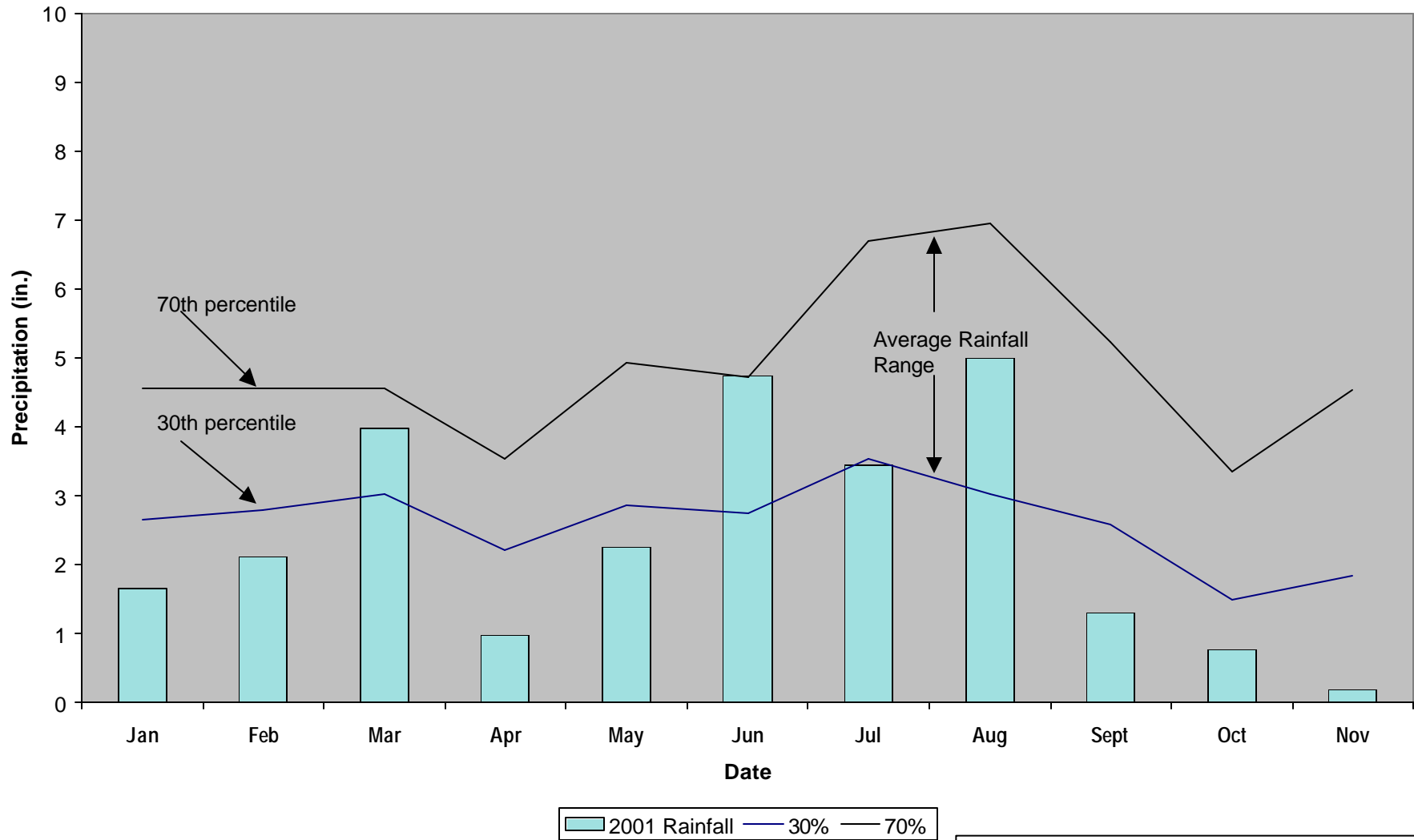


FIGURE 4: 30-70 Percentile Graph

2.4 Conclusions

The year 2001 represents the third growing season that the hydrologic data has been examined. The majority of the monitoring gauges on site have shown saturation and inundation for long periods of time. Hydrologic monitoring data in 2001 met or exceeded the success criteria for jurisdictional wetland hydrology. The hydrology in the created coastal marsh is consistent with the hydrology in the coastal marsh reference ecosystem. Jurisdictional hydrology was achieved in the created-forested wetland at 20 of the 28-groundwater gauge locations. The 2001 monitoring year experienced a below average rainfall year.

3.0 VEGETATION: BALLANCE FARM MITIGATION SITE HARDWOOD (YEAR 3 MONITORING) MARSH (YEAR 2 MONITORING)

3.1A Success Criteria

(Bottomland Hardwood Area)

NCDOT will monitor the site for five years. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

3.1B Success Criteria

(Marsh Grass Area)

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count toward the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met.

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

3.2A Description of Planted Areas

The following plant communities were planted in the Bottomland Hardwood Area:

Zone 1: (approximately 44 acres)

Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Fraxinus pennsylvanica, Green Ash
Quercus lyrata, Overcup Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus nigra, Water Oak
Quercus phellos, Willow Oak

Zone 2: (approximately 67 acres)

Fraxinus pennsylvanica, Green Ash
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak

Quercus nigra, Water Oak
Quercus laurifolia, Laurel Oak
Quercus lyrata, Overcup Oak

Zone 3: (approximately 27 acres)

Taxodium distichum, Baldcypress
Fraxinus pennsylvanica, Green Ash
Quercus lyrata, Overcup Oak
Nyssa aquatica, Tupelo Gum

3.2B Description of Planted Areas

The following plant communities were planted in the Marsh Grass Area:

Zone 1: (approximately 44 acres in zone 1 and 2)

Scirpus cyperinus, Woolgrass
Juncus effusus, Soft rush

Zone 2:

Cladium jamaicense, Sawgrass
Juncus roemerianus, Black Needle Rush
Scirpus americanus
Scirpus atrovirens
Carex lurida, Shallow Sedge
Carex vulpinoidea, Fox Sedge
Scirpus robustus
Scirpus pogens
Juncus gerardi, Blackgrass
Distichlis spicata, Spikegrass

Zone 3: (approximately 4 acres)

Spartina cynosuroides, Big Cordgrass

3.3A Results of Vegetation Monitoring (Bottomland Hardwood Area)

ZONE	Plot #	Overcup Oak	Tupelo Gum	Green Ash	Baldcypress	Willow Oak	Laurel Oak	Cherrybark Oak	Swp. Chestnut Oak	Water Oak	Total	Total (at planting)	Density (Tree/Acre)
1	4	4		7		3		9	2		25	39	436
	5	9		4		6		9	1	1	30	40	510
	8			13				1	4		18	44	278
	9	17		3		3		5	1		29	39	506
	11	5				3		6	7		21	38	376
	12	3		1		5		8	6	1	24	42	389
	15			3		5		7	9		24	37	441
	16	3		1		11		6	13		34	41	564
	17	10				8		11	9	1	39	41	647
	20	2		2				1			5	45	76
	21	6		2		3		3	5		19	39	331
ZONE 1 AVG.												414	

2	3	14		3		4	3		4	1	29	39	506
	6			8		4		1		1	14	38	251
	10			6		1	2	2	13		24	36	453
	13	1				11	3	3	5	1	24	41	398
	14					8	3	1	7		19	37	349
	18	1		10		5		1	10		27	39	471
ZONE 2 AVG.												405	

3	1		13	5	20						38	40	646
	2		8	13	14						35	36	661
	7	3		28		6					37	37	680
	19	10		1							11	23	325
ZONE 3 AVG												578	

TOTAL AVG.												443
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Site Notes:

Zone 1: Other species noted: sedges, broomsedge, various grasses, cattails, *Juncus* sp., trumpet creeper, fennel, briars, *Baccharis halimifolia*, Queen-Anne's-lace, ragweed, *Aster* sp., *Sesbania* sp., horse-nettle, redbay, red maple, and sweetgum. Plot 4 is overgrown with heavy trumpet creeper and broomsedge making trees difficult to find. There was evidence of standing water in plot 11. The grasses made the small trees difficult to find.

Zone 2: Other species noted: sedges, *Baccharis halimifolia*, various grasses, few volunteer hickory, pine, red maple and sweetgum, trumpet creeper, panicum grass, broomsedge, *Juncus* sp., briars, *Sesbania* sp., fennel, Queen-Anne's-lace, redbay, and *Aster* sp. There was evidence of standing water in plot 6.

Zone 3: Other species noted: broomsedge, various grasses and sedges, cattails, *Juncus* sp., *Baccharis halimifolia*, switch grass, Queen-Anne's-lace, black willow, volunteer pine, and few red maple. Plot 7 has evidence of deer browsing. Plot 19 has heavy switch grass.

Plot #	Scale Factor	<i>Juncus effusus</i>	<i>Scirpus cyperinus</i>	<i>Juncus roemerianus</i>	<i>Scirpus substrictus</i>	<i>Scirpus purpureus</i>	<i>Scirpus americanus</i>	<i>Scirpus atrovirens</i>	<i>T. Indifirm</i>	<i>graminaceae</i>	<i>Juncus gerardi</i>	<i>Dicladella spicivata</i>	<i>Carex lapida</i>	<i>Carex</i>	<i>californica</i>	<i>Spartina cynosuroides</i>	Frequency
181	4.0																✓
182	4.0																✓
183	3.0				✓												✓
184	4.0				✓												✓
185	2.0										✓						✓
186	2.0										✓						✓
187	5.0										✓						✓
188	4.0	✓									✓						✓
189	3.0										✓						✓
190	3.0										✓						✓
191	2.0								✓		✓						✓
192	3.0										✓						✓
193	3.0										✓						✓
194	3.0										✓						✓
195	4.0			✓							✓						✓
196	2.0										✓						✓
197	3.0										✓						✓
198	3.0	✓															✓
199	3.0	✓						✓									✓
200	5.0	✓	✓														✓
201	3.0	✓						✓									✓
202	3.0	✓									✓						✓
203	5.0												✓	✓			✓
204	1.0																
205	4.0				✓												✓
206	2.0										✓						✓
207	5.0	✓															✓
208	3.0											✓					✓
209	2.0										✓						✓
210																	OW
211	4.0										✓						✓
212	0.5																
213	5.0										✓						✓
214	3.0								✓								✓
215	4.0	✓		✓					✓	✓							✓
216	4.0									✓							✓
217	4.0										✓						✓
218	4.0				✓												✓
219	3.0																
220	4.0				✓												✓
221	4.0								✓	✓							✓
222	3.0									✓							✓
223	0.5																
224	3.0								✓	✓							✓
225	4.0									✓							✓
226	4.0									✓							✓
227	5.0																
228	4.0			✓					✓	✓							✓
229	2.0									✓							✓
230																	OW
231	5.0	✓				✓											✓
232	5.0									✓							✓
233	4.0	✓															✓
234	1.0																
235	2.0								✓	✓							✓
236	0.5									✓							✓
237	4.0								✓								✓
238	4.0				✓					✓							✓
239	4.0												✓				✓
240	3.0				✓												✓

Plot #	Seale Factor	<i>Atractia affinis</i>	<i>Nelepus</i>	<i>Physiculus</i>	<i>Atractia</i>	<i>Proconstrucinus</i>	<i>Nelepus</i>	<i>Subbacus</i>	<i>Nelepus pugnax</i>	<i>Nelepus</i>	<i>amantissimus</i>	<i>Nelepus</i>	<i>apicipes</i>	<i>Chalcid</i>	<i>Proconstrucinus</i>	<i>Atractia gressoli</i>	<i>Physiculus</i>	<i>Spicaria</i>	<i>C. arex triplata</i>	<i>C. arex</i>	<i>Scalpiriella</i>	<i>Spartina</i>	<i>Pyraustoides</i>	Frequency
301	2.0																							✓
302	5.0	✓			✓																			✓
303	3.0					✓																		✓
304	3.0											✓				✓								✓
305	4.0	✓										✓												✓
306	3.0															✓								✓
307	3.0															✓								✓
308	2.0															✓								✓
309	1.0					✓																		✓
310	3.0															✓								✓
311	5.0	✓																						✓
312	4.0																					✓		✓
313	2.0																							
314	5.0																							
315	0.5															✓								✓
316	4.0				✓											✓								✓
317	3.0															✓								✓
318	2.0																							
319	5.0	✓																						✓
320	5.0					✓			✓							✓								✓
321	3.0		✓																					✓
322	5.0	✓																						✓
323	4.0																							
324	4.0												✓			✓								✓
325	5.0				✓											✓								✓
326	4.0	✓											✓											✓
327	3.0															✓								✓
328	3.0											✓												✓
329	4.0	✓																						✓
330	3.0															✓								✓
331	3.0															✓								✓
332																								OW
333	2.0	✓																						✓
334	4.0																				✓			✓
335	4.0															✓								✓
336	4.0																✓			✓				✓
337	5.0	✓														✓								✓
338	5.0				✓																			✓
339	1.0															✓								✓
340	4.0	✓																						✓
341																								OW
342	4.0	✓																						✓
343	3.0	✓																						✓
344	3.0	✓				✓					✓													✓
345	4.0	✓																						✓
346	2.0		✓																					✓
347	5.0					✓										✓								✓
348	4.0															✓								✓
349	3.0											✓				✓								✓
350	3.0															✓								✓
351	2.0		✓																					✓
352																								OW
353	3.0																							
354	2.0	✓														✓								✓
355	2.0															✓								✓
356	5.0	✓																						✓
357	5.0	✓			✓																			✓
358	5.0		✓			✓										✓								✓
359	4.0					✓										✓								✓
360	5.0	✓														✓								✓

Plot #	Scale Factor	<i>Juncus effluvis</i>	<i>Najas</i>	<i>Cyperus</i>	<i>Juncus roemerianus</i>	<i>Najas subulata</i>	<i>Najas</i>	<i>Ruppia</i>	<i>Najas</i>	<i>amariculus</i>	<i>Najas</i>	<i>arvensis</i>	<i>Cardium</i>	<i>Junonia</i>	<i>Juncus gerardi</i>	<i>Dicella</i>	<i>epitola</i>	<i>Carex lupida</i>	<i>Carex</i>	<i>virginiana</i>	<i>Spartina</i>	<i>Syntherisma</i>	Frequency
361	5.0	✓																					✓
362	4.0				✓	✓																	✓
363	5.0	✓													✓								✓
364	5.0		✓												✓								✓
365	2.0														✓								✓
366	3.0											✓			✓								✓
367	5.0				✓	✓									✓								✓
368	3.0														✓								✓
369	4.0					✓									✓								✓
370	5.0					✓									✓								✓
371	2.0														✓								✓
372	4.0														✓						✓		✓
373	3.0														✓								✓
374	5.0				✓										✓								✓
375	3.0														✓								✓
376	3.0	✓																					✓
377	4.0		✓												✓								✓
378																							OW
379	2.0										✓				✓								✓
380	4.0	✓													✓								✓
381	4.0																						
382	2.0																						
383	5.0														✓								✓
384	4.0														✓								✓
385	3.0	✓									✓												✓
386	3.0										✓	✓			✓								✓
387	2.0														✓								✓
388	2.0														✓								✓
389	3.0														✓								✓
390	2.0																						
391	3.0	✓																					✓
392	3.0										✓										✓		✓
393	5.0				✓																		✓
394	4.0					✓																	✓
395	4.0	✓				✓																	✓
396	3.0				✓														✓				✓
397	5.0									✓													✓
398	3.0	✓									✓												✓
399	4.0										✓												✓
400	4.0																				✓		✓
401	5.0	✓																					✓
402	3.0	✓	✓									✓	✓		✓								✓
403	5.0											✓	✓		✓								✓
404	4.0					✓						✓											✓
405	4.0	✓																					✓
406	3.0				✓						✓												✓
407	3.0														✓								✓
408	5.0	✓																					✓
409																							OW
410	3.0	✓																					✓
411	4.0										✓												✓
412	5.0	✓																					✓
413	5.0		✓												✓								✓
414	3.0																						
415	3.0	✓																					✓
416	5.0				✓						✓												✓
417	5.0									✓													✓
418	4.0	✓										✓		✓									✓
419	4.0																				✓		✓
420	4.0					✓																	✓

Site Notes: The following species were also noted in the monitoring plots. The percentage of plots the species was found in is following the species in parentheses (i.e. 25% of the plots contain goldenrod).

Goldenrod (25), barnyard grass (36), *Aster* sp. (33), smartweed (38), baldcypress (9), cattail (1), *Juncus* sp. (11), phragmites (1), *Ptilimnium* sp. (12), *Pluchea* sp. (12), *Hypericum* sp. (11), bluestem (.6), ragweed (2), *Eleocharis* sp. (11), *Baccharis halimifolia* (4), *Krigia* sp. (6), beakrush (.8), *Cyperus* sp. (.8), *Ludwigia* sp. (2), *Sesbania* sp. (1), buttercup (.2), red maple (2), pine (.8), cattail (1), duck potato (4), cardinal flower (.6), green ash (.2), blackberry (.2), fennel (1), plantain (.2), whitetop sage (.2), tearthumb (.6), rice cut grass (.4), spike rush (.2), metabeauty (.4), iris (.2), centella (4), *Eragrostis* sp. (.2), *Ptilimnium* sp. (15), beakrush (.2), *Spartina patens* (.2), *Scirpus* sp. (.8), *Sagittaria* sp. (.8), *Carex* sp. (1), redtop (.2), *Rotala* sp. (.4), pennywort (.6), horseweed (.2), *Diodia* sp. (.4), eupatorium (.2), and *Bidens* sp. (.6).

3.4 Conclusions

A. Bottomland Hardwood Area

Of the 430 acres of this site, approximately 223 involved tree planting. There were 21 plots established throughout the planting areas, encompassing all plant communities. The 2001 vegetation monitoring of the planted area revealed an average density of 443 trees per acre, which is well above the 320 trees per acre required by the minimum success criteria.

B. Marsh Grass Area

- Percent Frequency of Target Species (planted species) **86.5%**
Frequency of 70% required.
- Vegetative Cover Scale Value **3.71**

Scale Value of 5 required for year 5.

Of the 430 acres of this site, approximately 48 acres involved marsh grass planting. There were 500 random plots established throughout the planting areas, encompassing all plant communities. These plots were located with GPS. The marsh was replanted in June of 2000. The plantings are continuing to increase in cover.

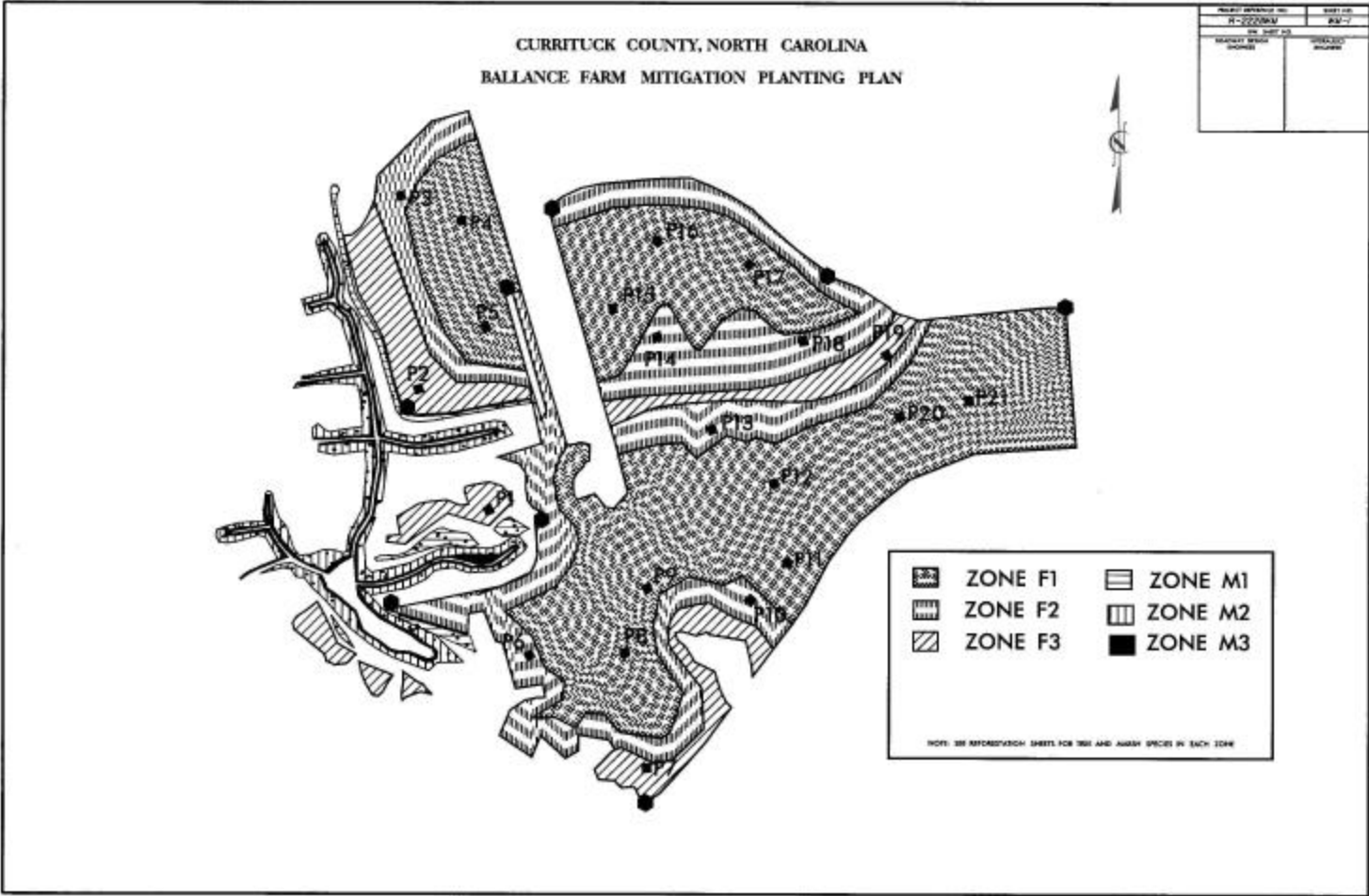


FIGURE 5

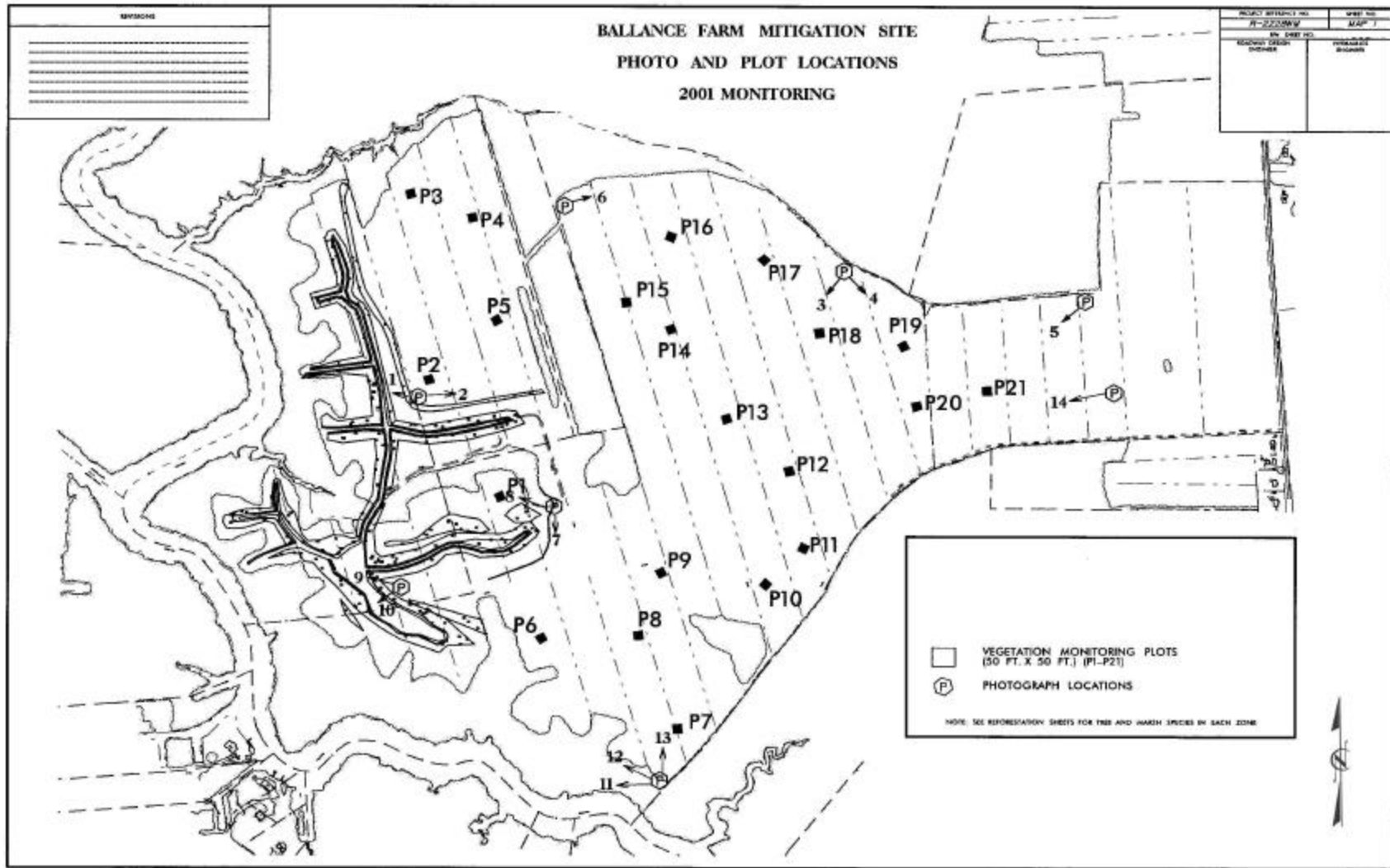


Figure 6

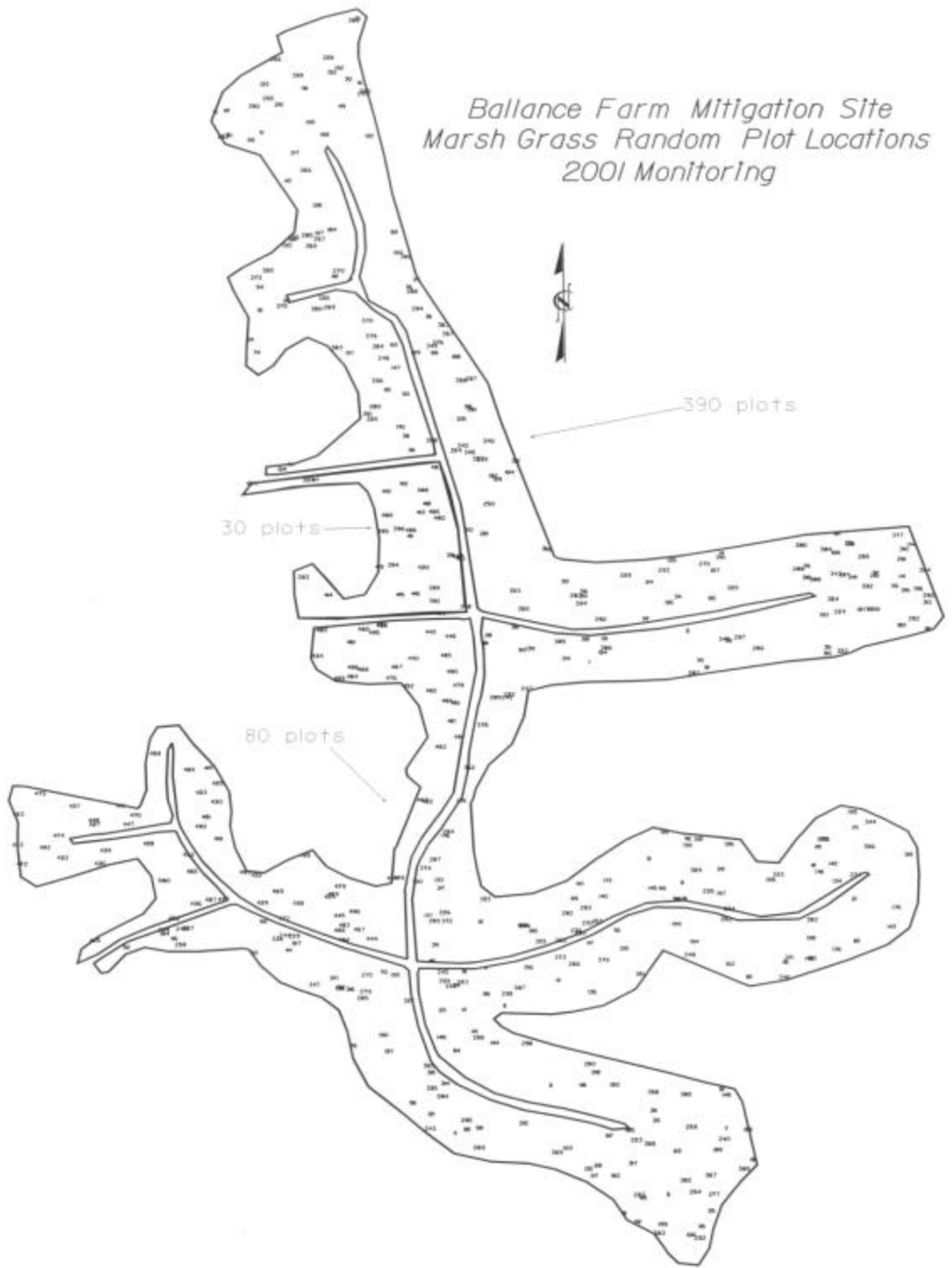


FIGURE 7

4.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS

The year 2001 represents the third growing season that the hydrologic data has been examined. The majority of the monitoring gauges on site have shown saturation and inundation for long periods of time. Hydrologic monitoring data in 2001 met or exceeded the success criteria for jurisdictional wetland hydrology. The hydrology in the created coastal marsh is consistent with the hydrology in the coastal marsh reference ecosystem. Jurisdictional hydrology (greater than 12.5%) was achieved in the created forested wetland at 20 of the 28 groundwater gauge locations. Of the ten gauges that showed less than 12.5%, seven were the original seventeen gauges installed on locally high areas that were not representative of the topography of the site. Groundwater monitoring gauges installed at the forested wetland reference ecosystem located on the Richards' property prior to the 2001 monitoring period showed hydrology greater than 92% of the growing season during a below average rainfall year. The average elevation of the monitoring gauge locations on this reference site is at 1.53 feet. The elevation in the restored forested wetland ranges from 3.4 feet to well over 6 feet based on survey data. Therefore, the reference-forested wetland will always be wetter than the restored-forested wetland. The reference and restored-forested wetlands reacted similarly to the periods of drought this monitoring year. However, the lower elevation of the reference site lessened the effect to groundwater elevations that the lack of rainfall had. The restored-forested wetland located at a higher elevation showed a greater response to the lack of rainfall in its groundwater elevations. This will not change.

Of the 430 acres of this site, approximately 223 involved tree planting. There were 21 plots established throughout the planting areas, encompassing all plant communities. The vegetation monitoring of the planted area revealed the average density to be 443 trees per acre, which is well above the 320 trees per acre required by the minimum success criteria.

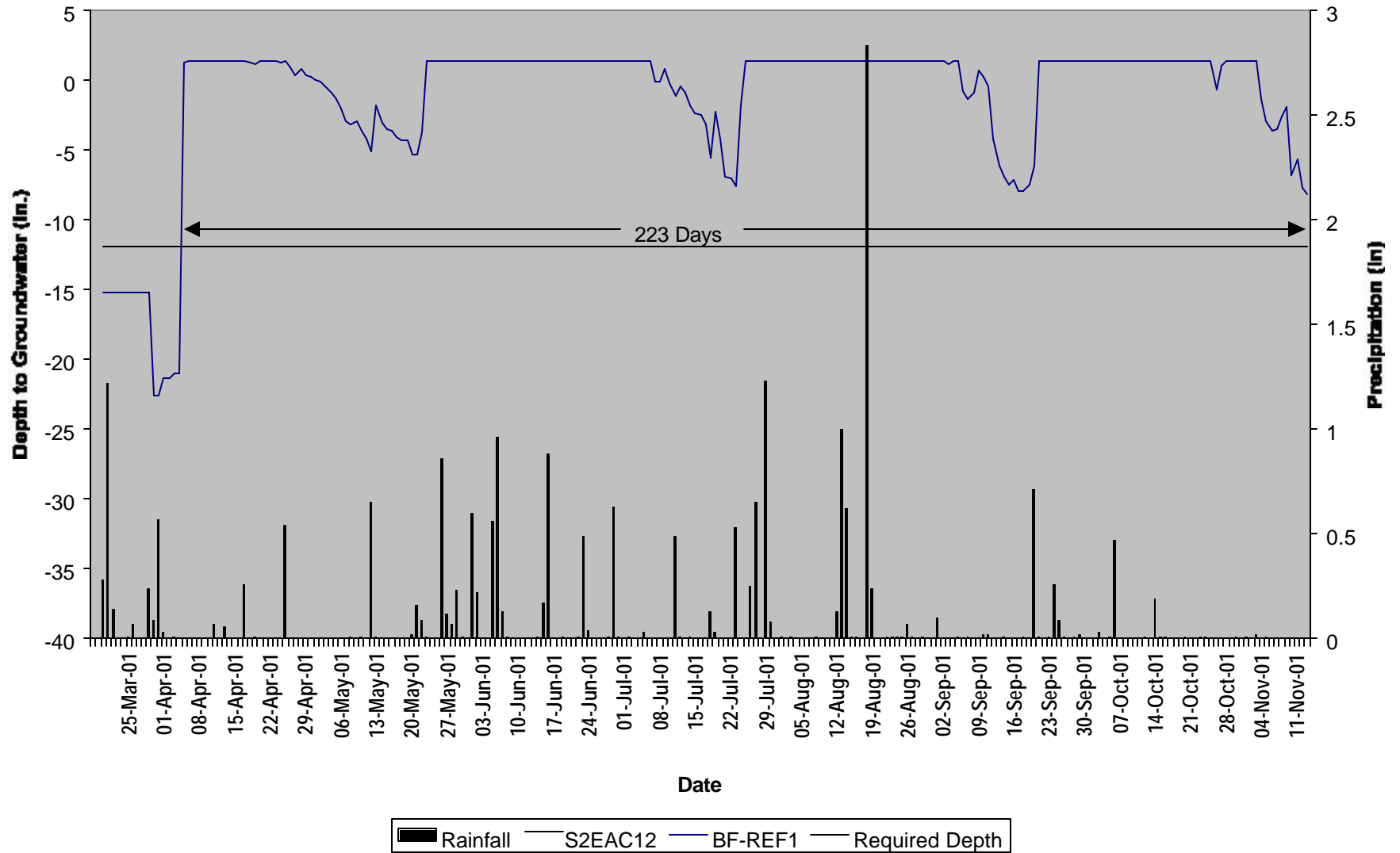
Of the 430 acres of this site, approximately 48 acres involved coastal marsh grass planting. There were 500 random plots established throughout the planting areas, encompassing all plant communities. These plots were located with GPS. The marsh was replanted in June. The percent frequency of target specie (planted species) is 86.5% as monitored. The success criteria requirement is 70%. The initial plantings are continuing to increase in cover. The vegetative cover scale value is 3.71, and the required vegetative scale value for year 5 is 5.

An aerial photo showing topography and gauge locations will be presented at agency meeting. Monitoring activities will continue for another year.

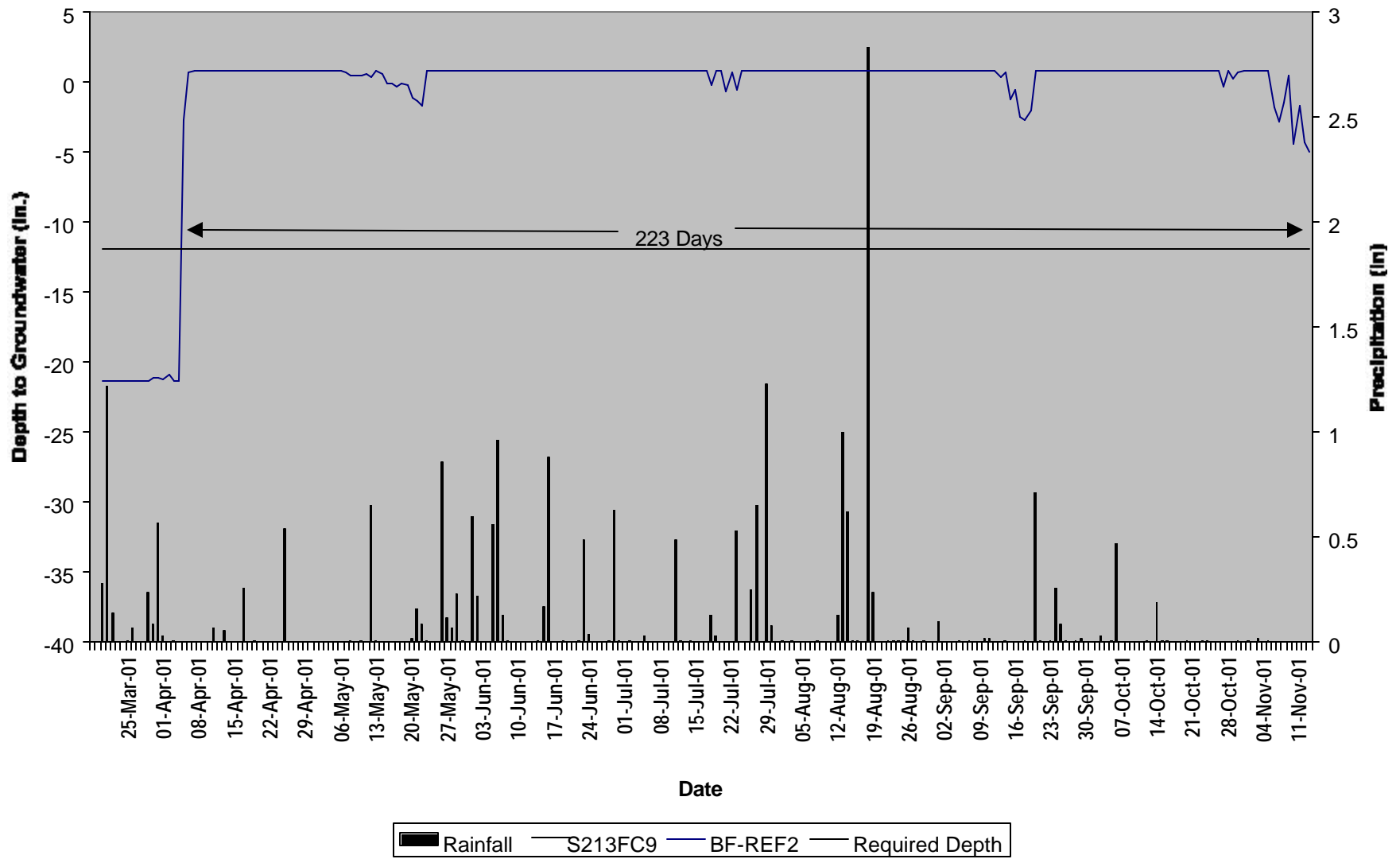
APPENDIX A

**DEPTH TO GROUNDWATER
And
SURFACE GAUGE PLOTS**

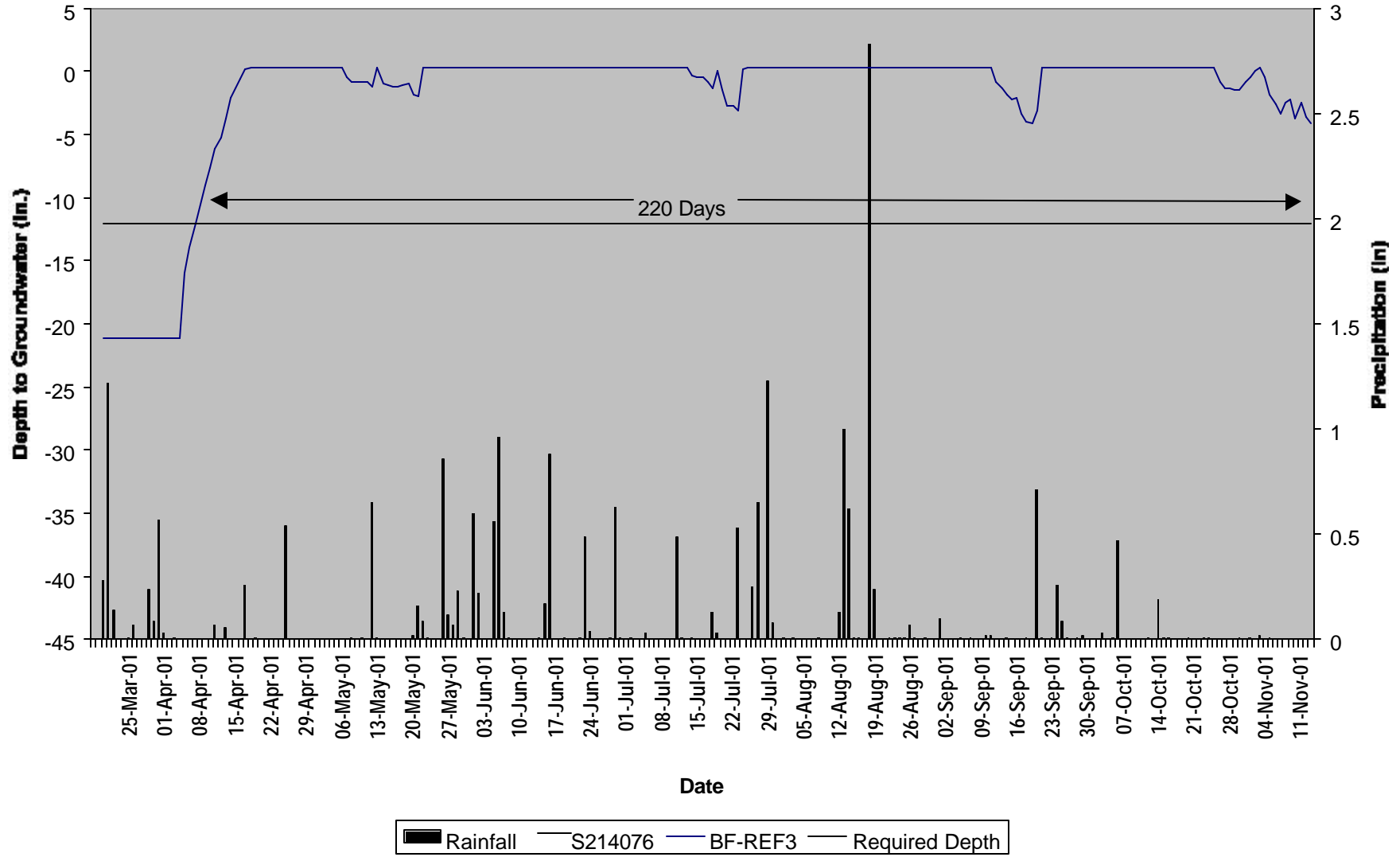
Ballance Reference Monitoring Gauge BF-REF1



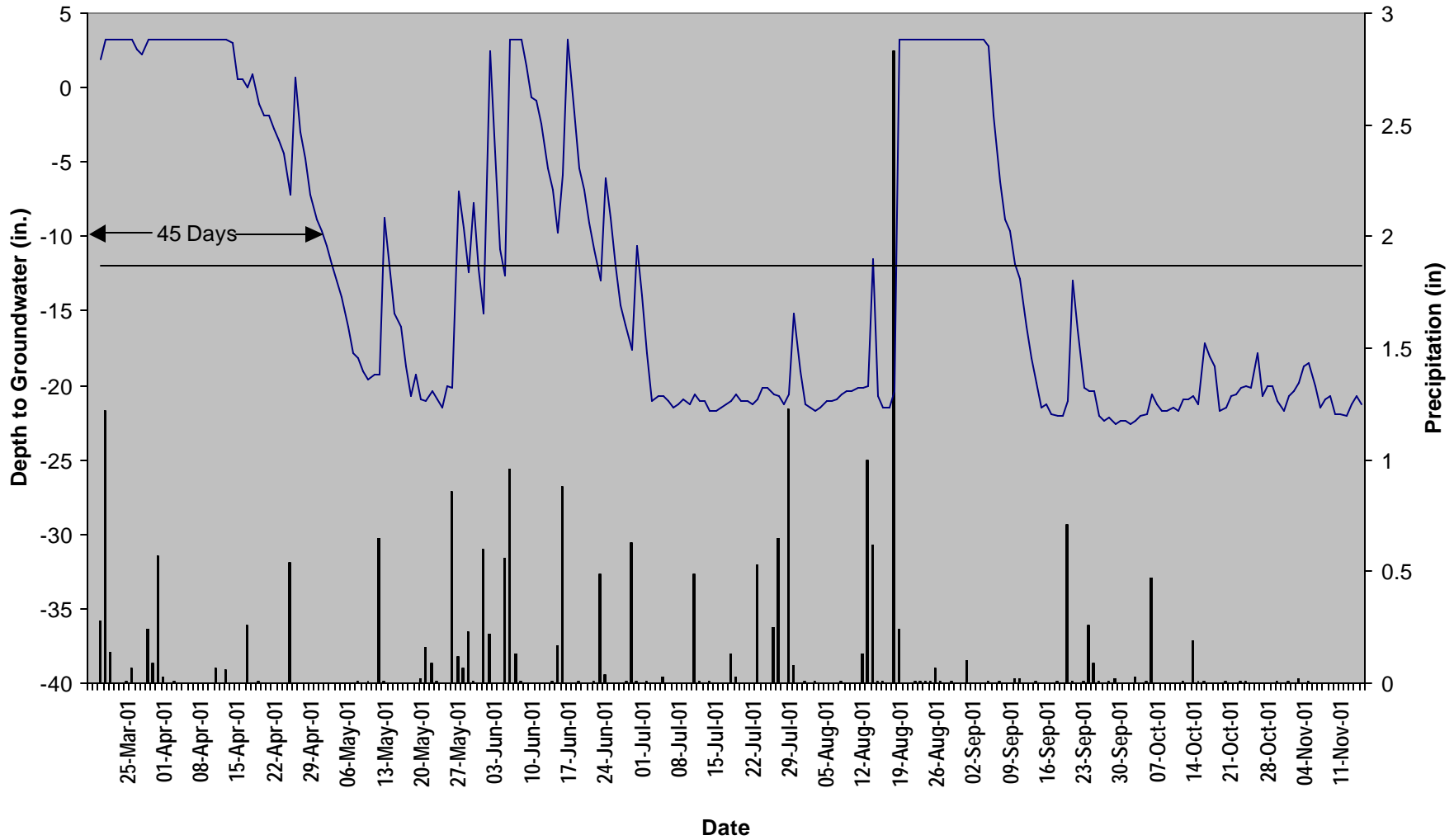
Ballance Reference Monitoring Gauge BF-REF2



Ballance Reference Monitoring Gauge BF-REF3

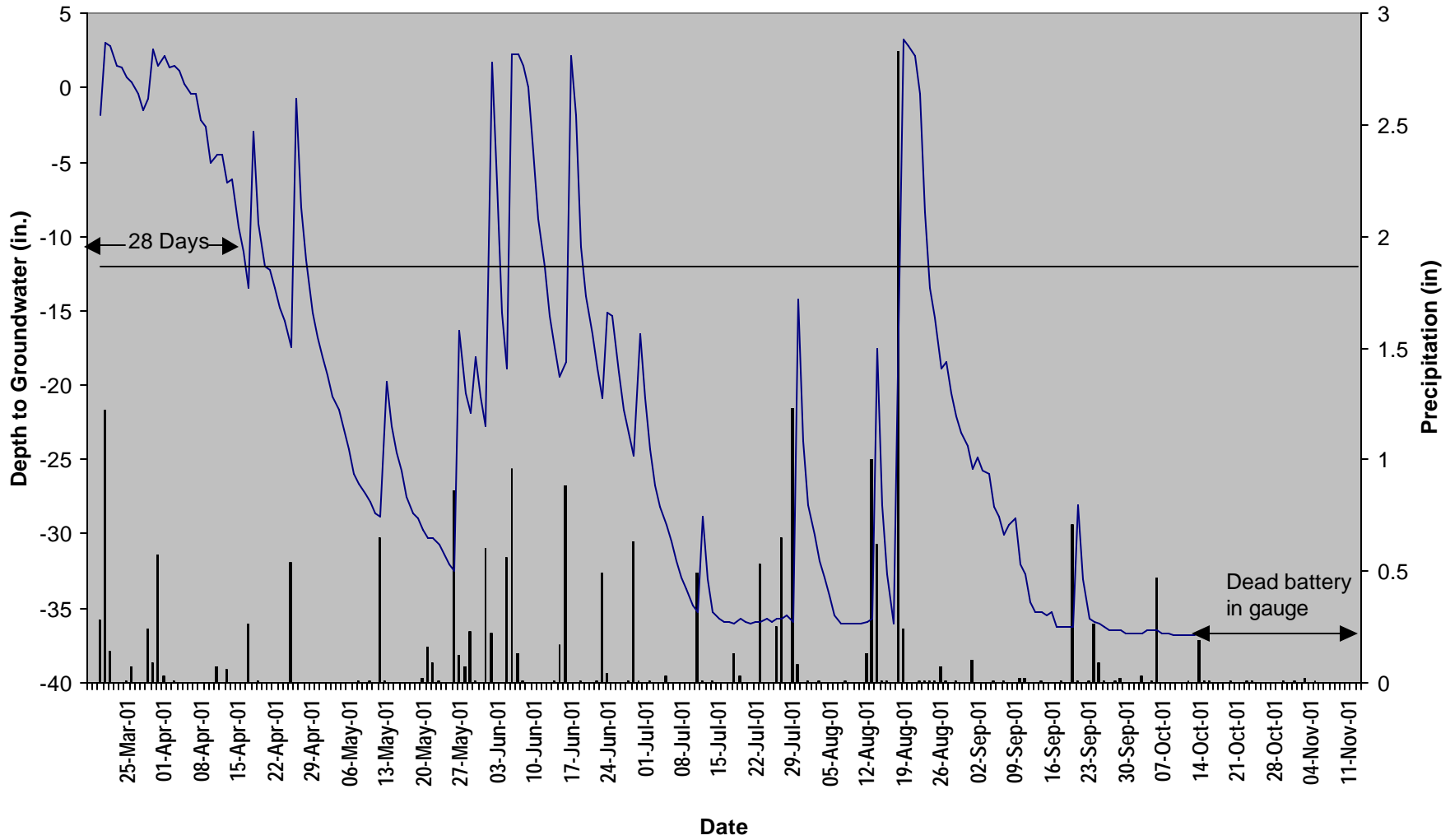


Ballance Farm Monitoring Gauge BF-1



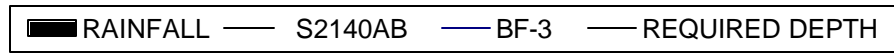
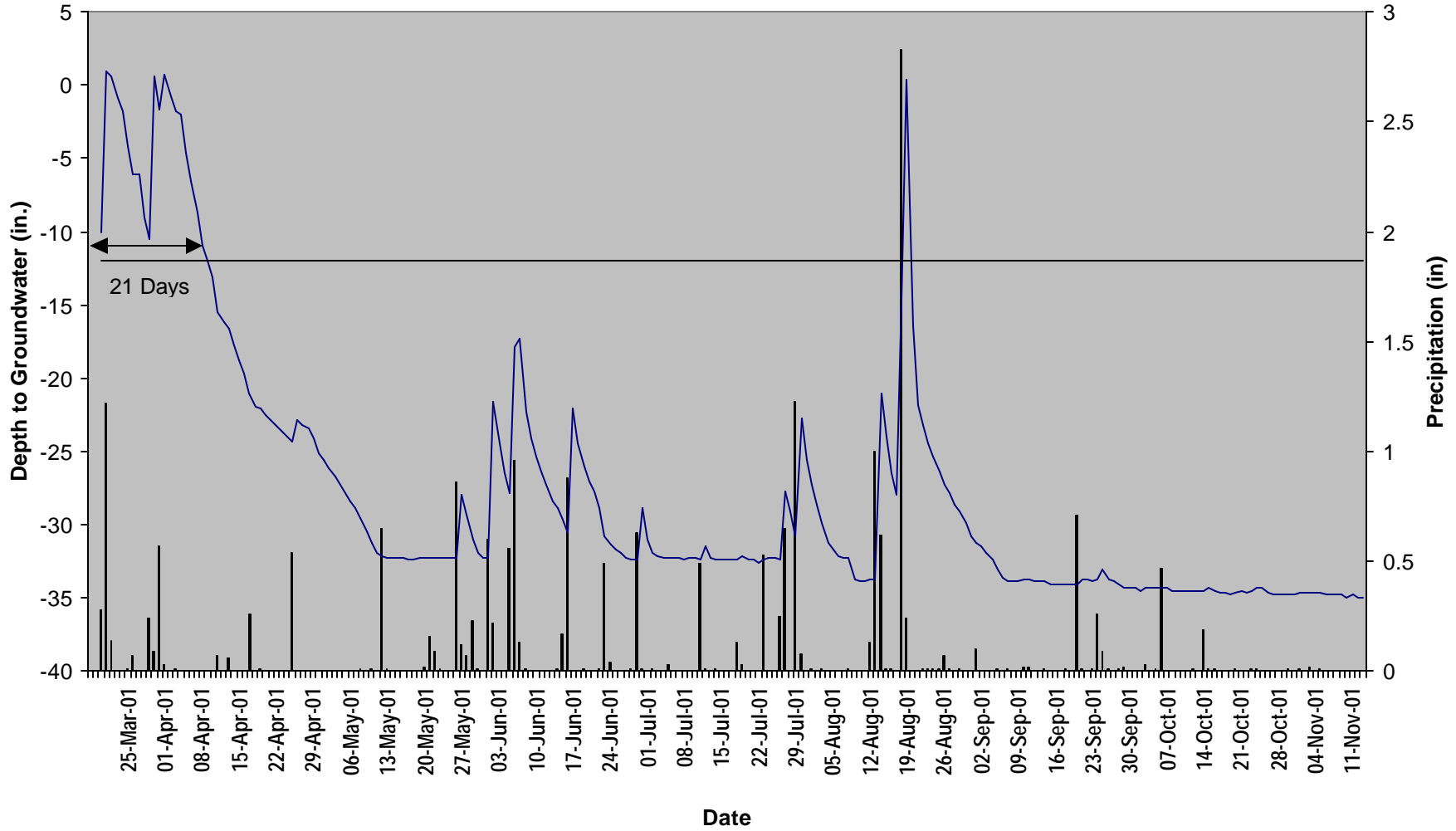
■ RAINFALL — S31F74E — BF-1 — REQUIRED DEPTH

Ballance Farm Monitoring Gauge BF-2

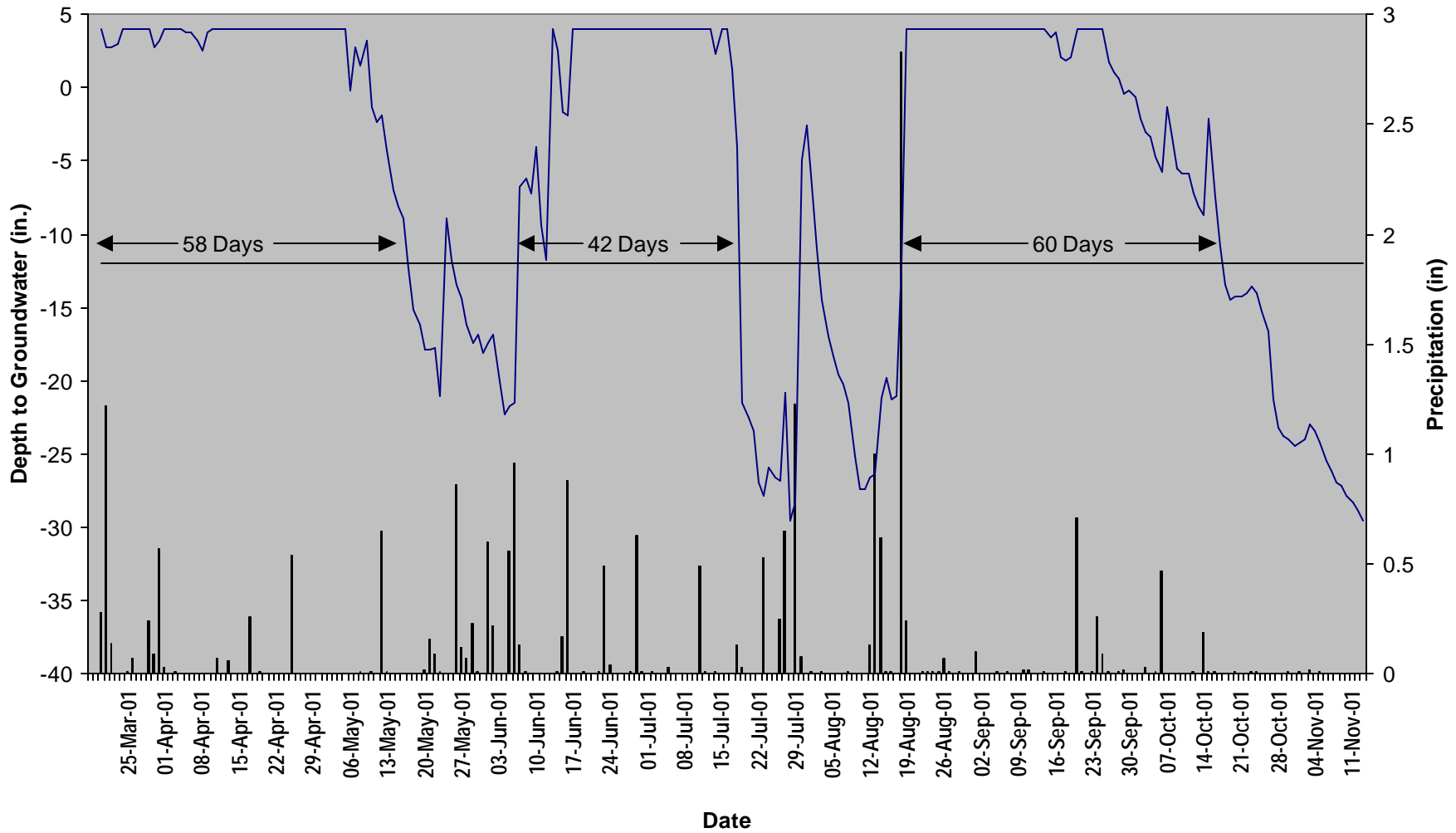


■ RAINFALL — S2B232F — BF-2 — REQUIRED DEPTH

Ballance Farm Monitoring Gauge BF-3

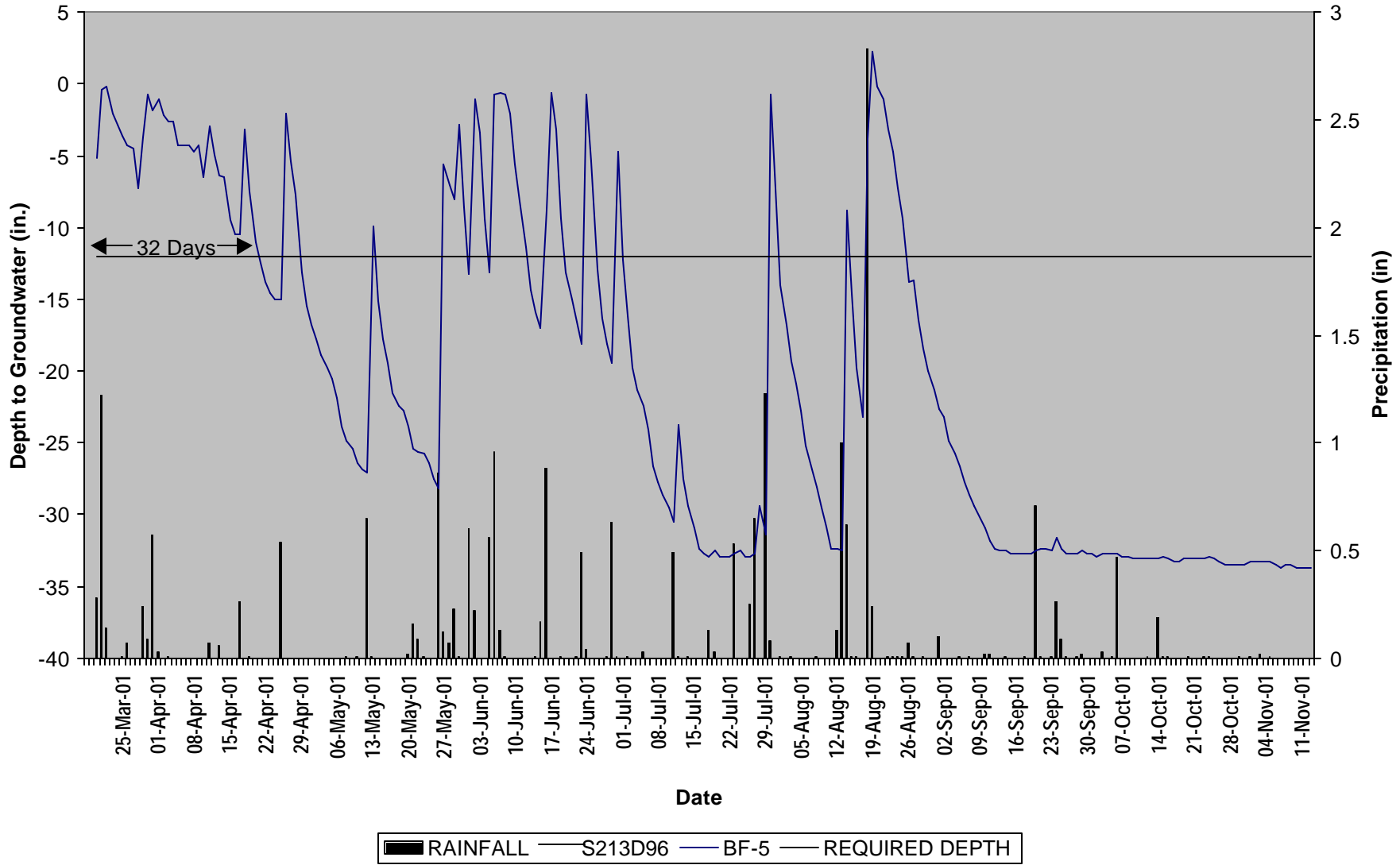


Ballance Farm Monitoring Gauge BF-4

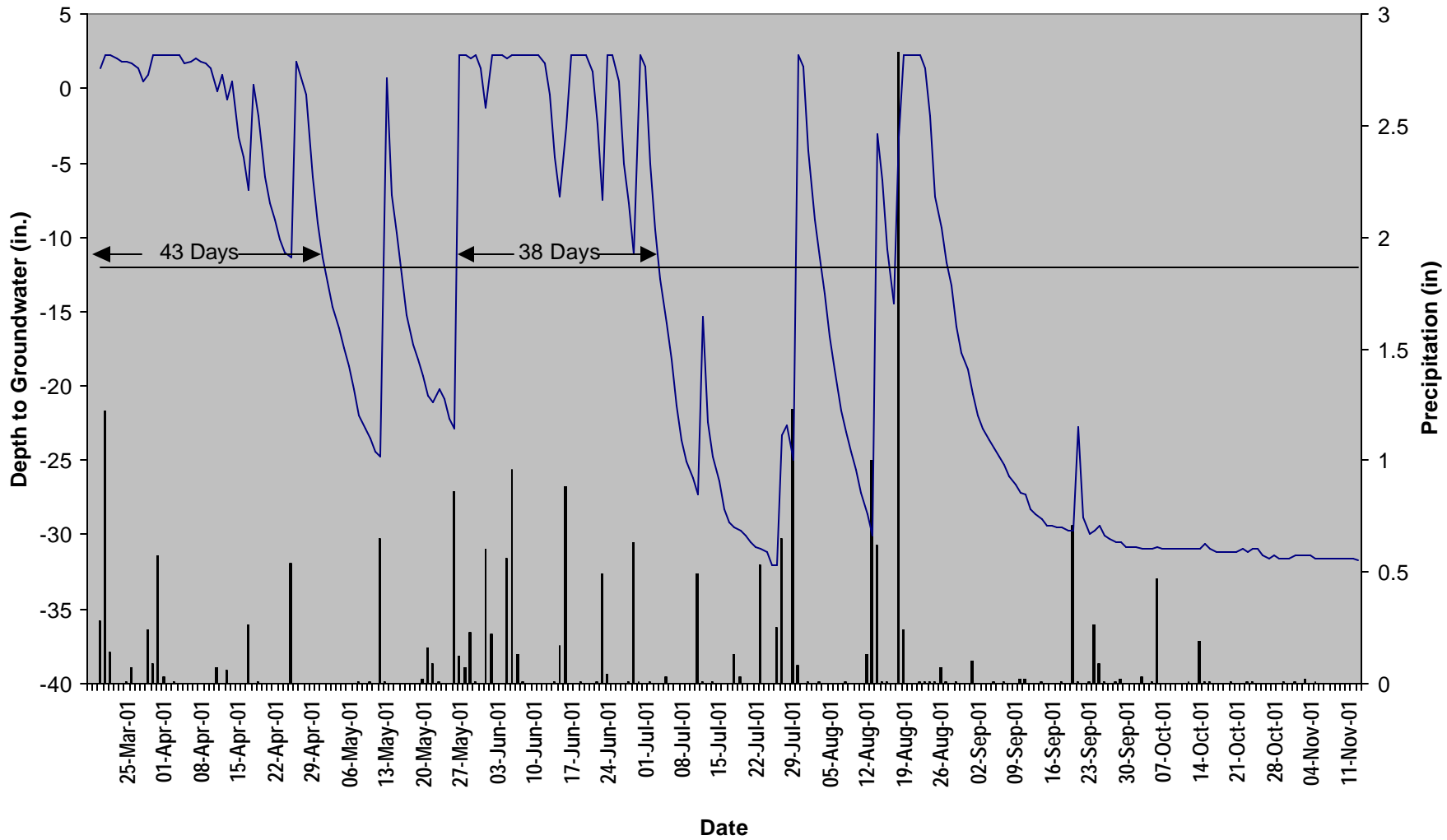


RAINFALL
 S31F804
 BF-4
 REQUIRED DEPTH

Ballance Farm Monitoring Gauge BF-5

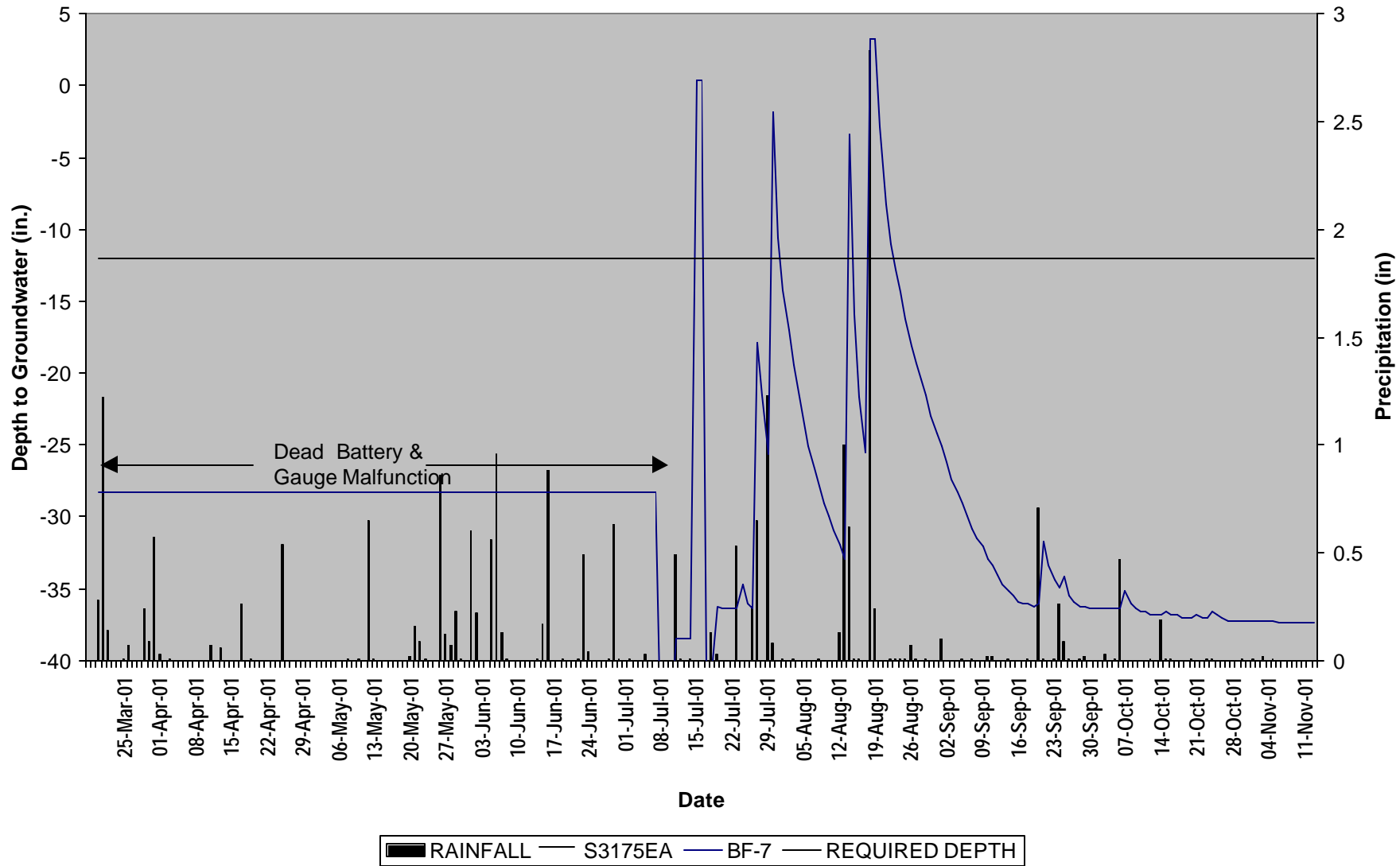


Ballance Farm Monitoring Gauge BF-6

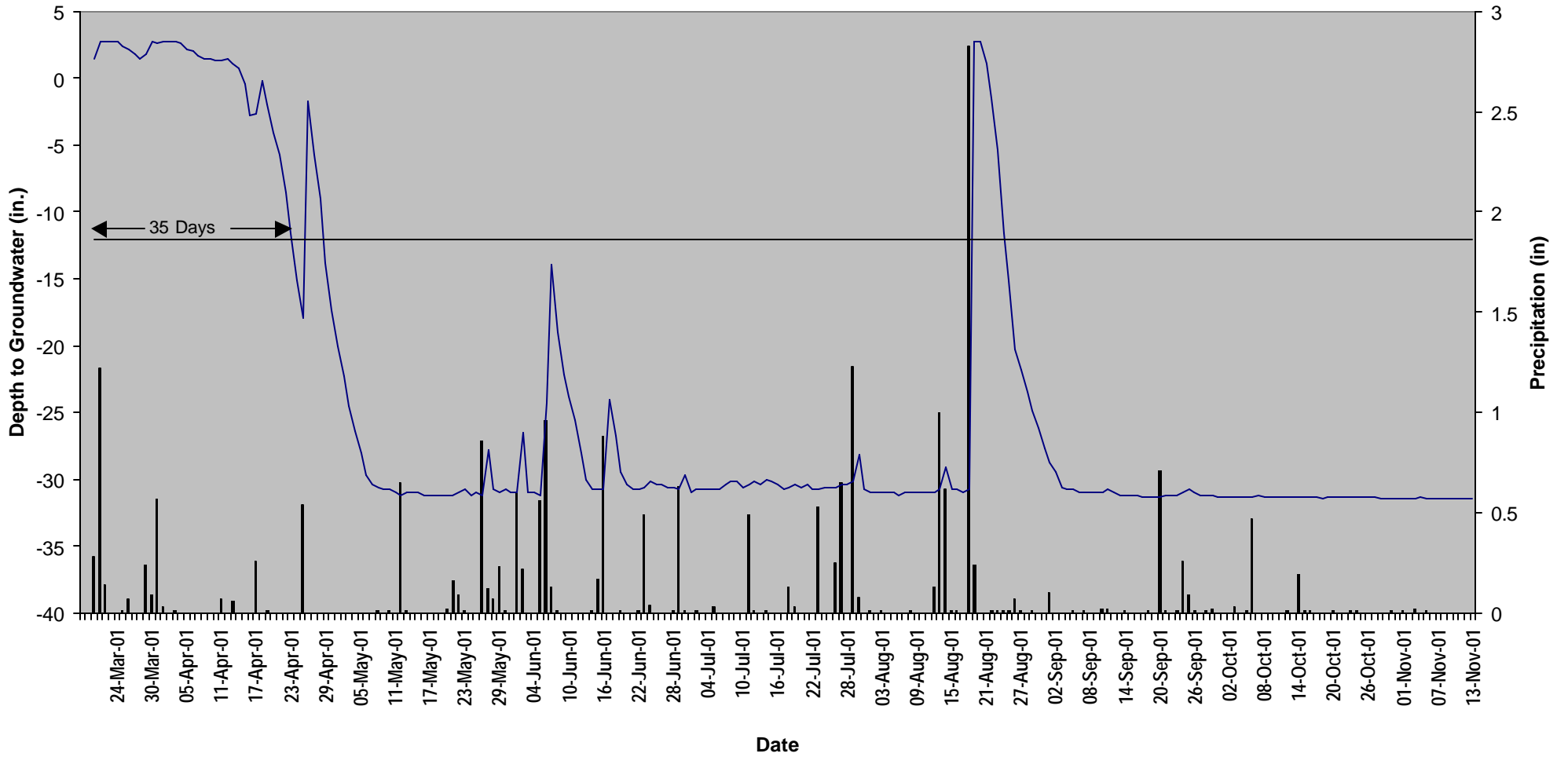


■ RAINFALL — S2B220F — BF-6 — REQUIRED DEPTH

Ballance Farm Monitoring Gauge BF-7

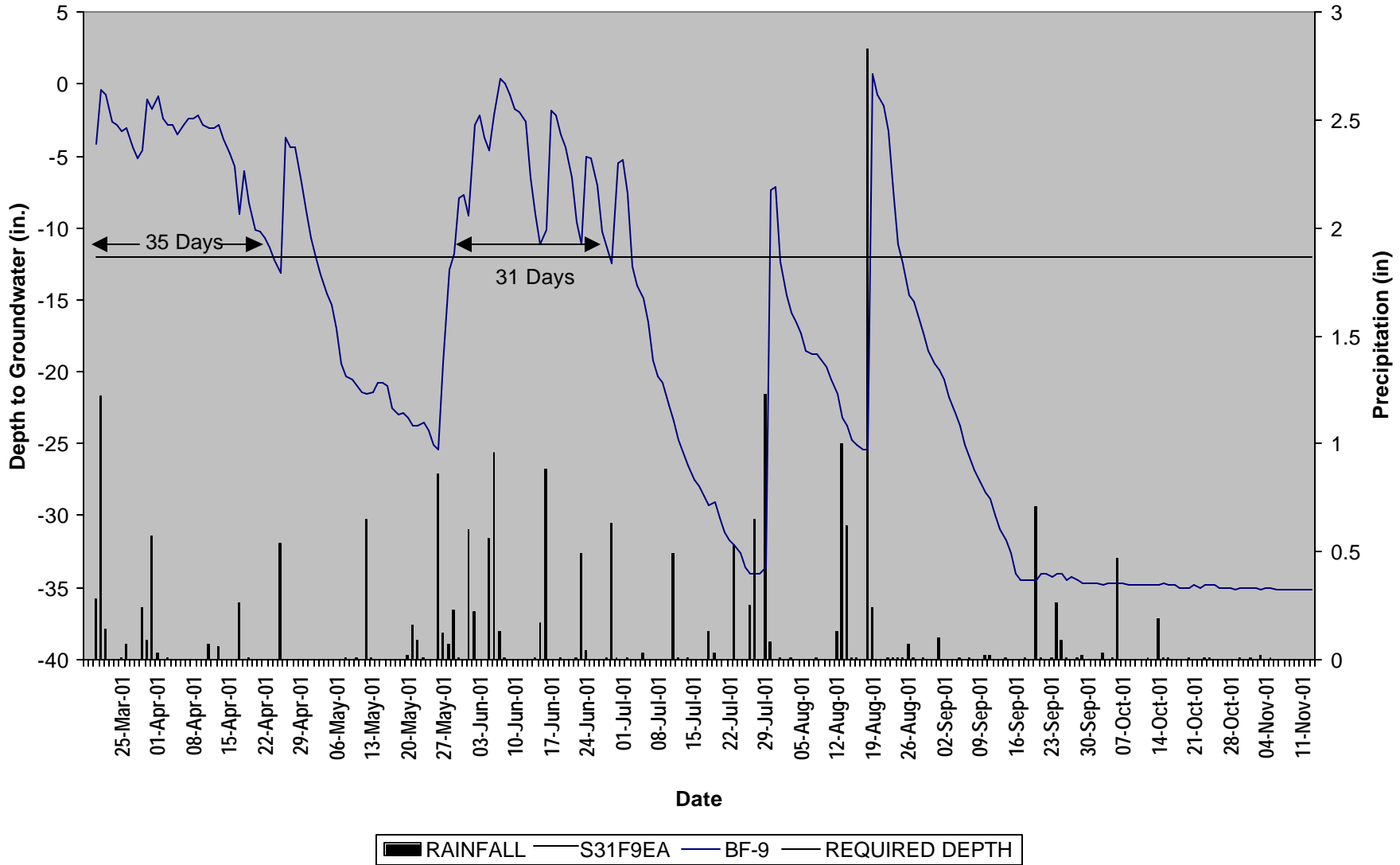


Ballance Farm Monitoring Gauge BF-8

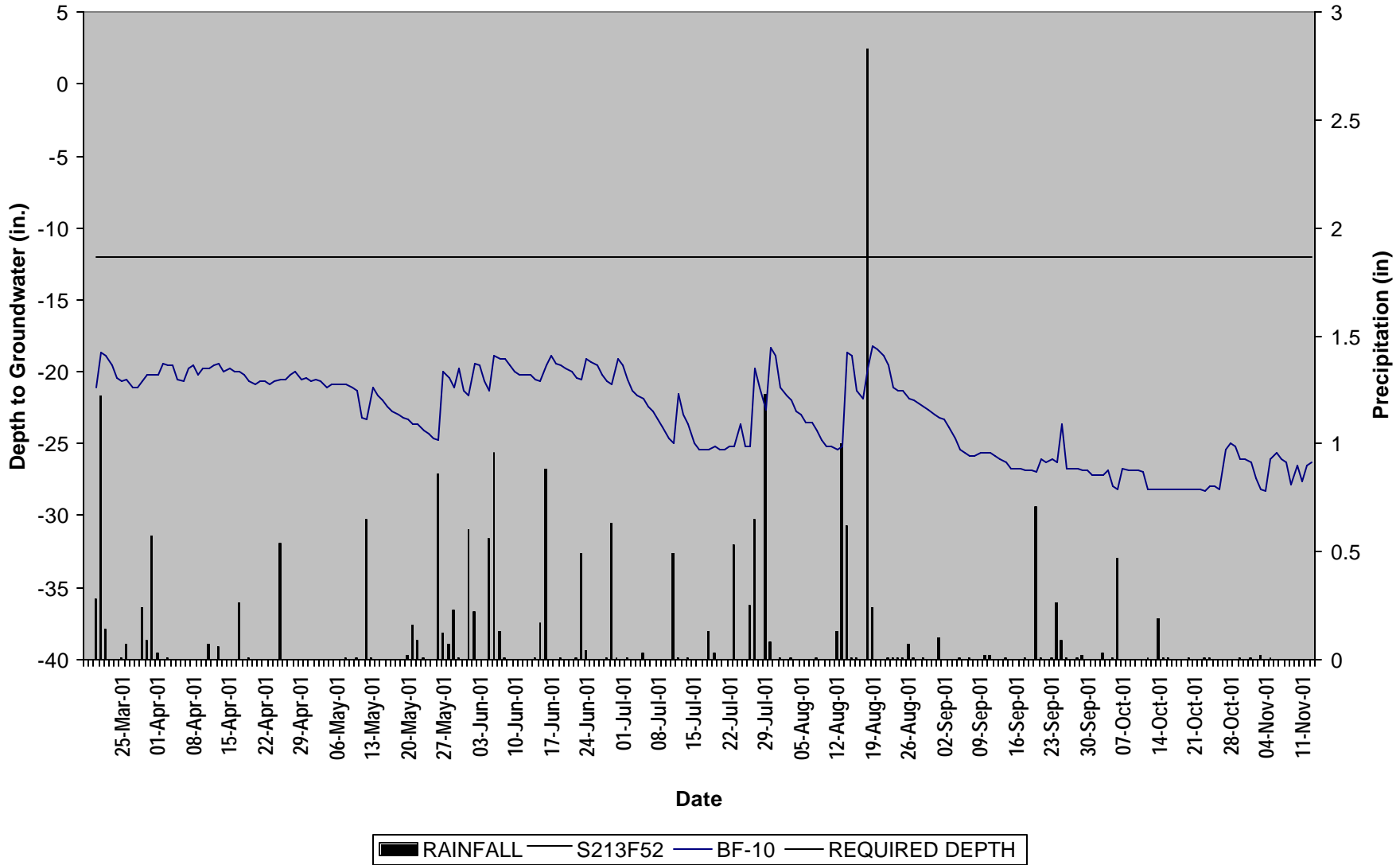


■ RAINFALL — S31F987 — BF-8 — REQUIRED DEPTH

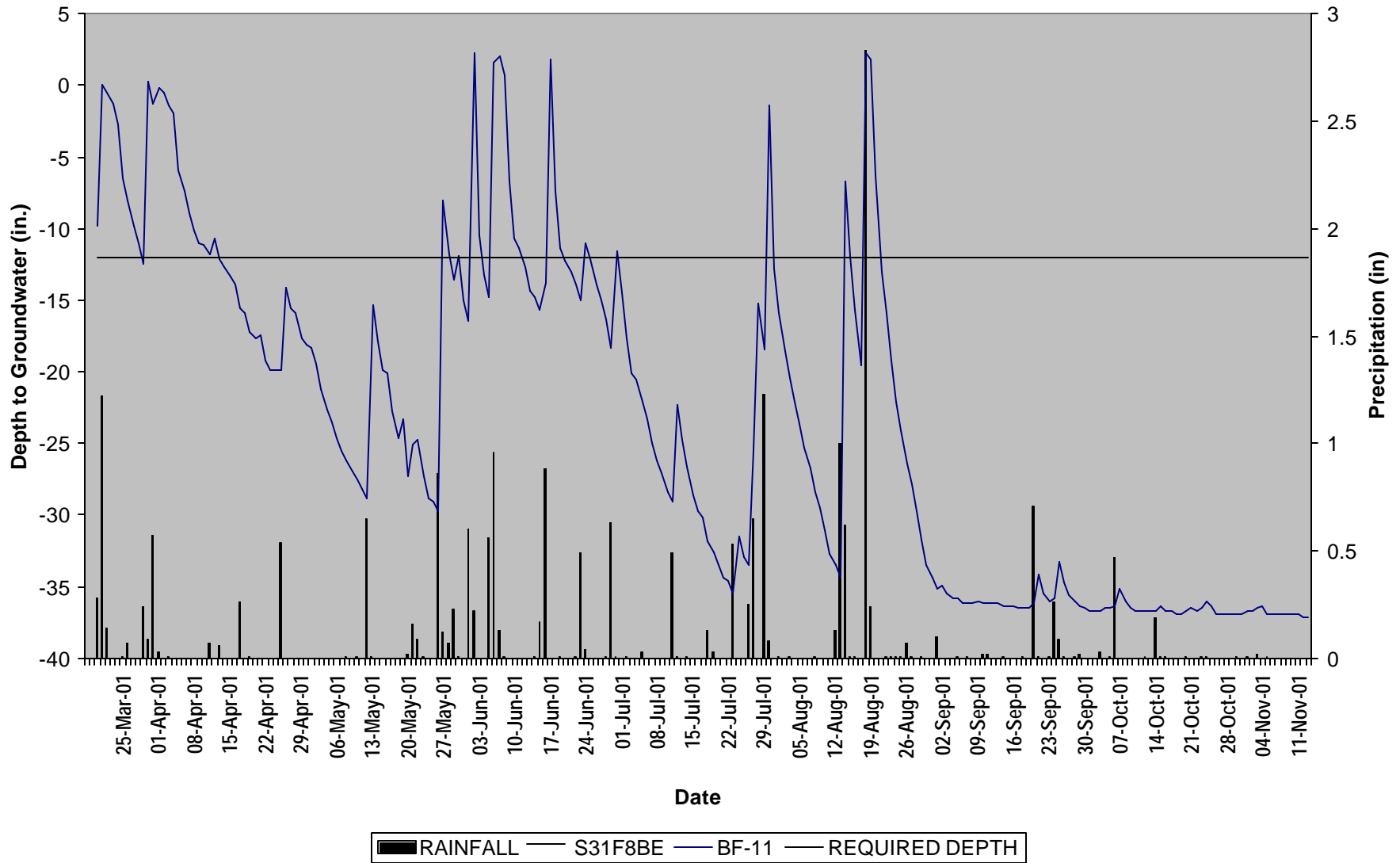
Ballance Farm Monitoring Gauge BF-9



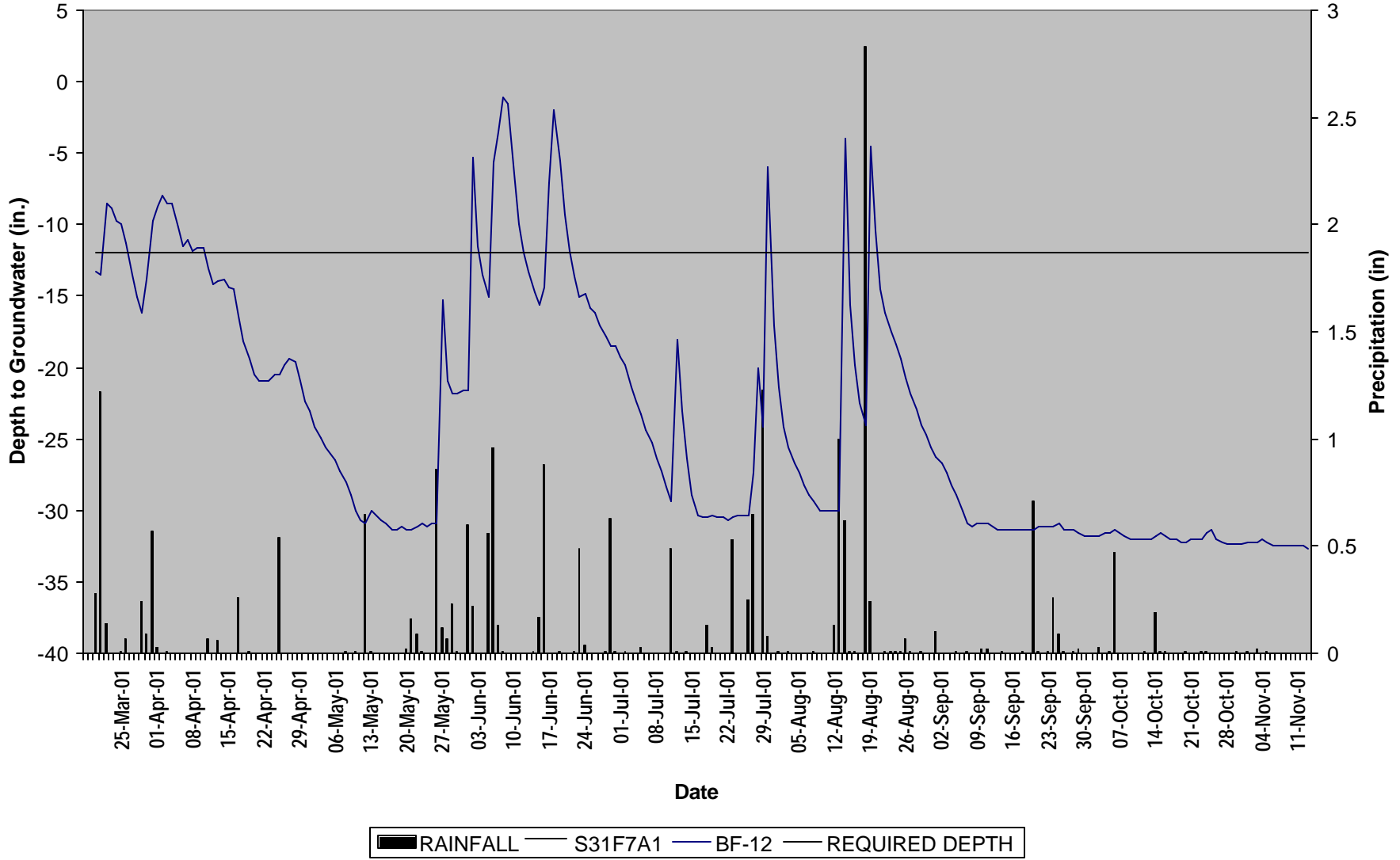
Ballance Farm Monitoring Gauge BF-10



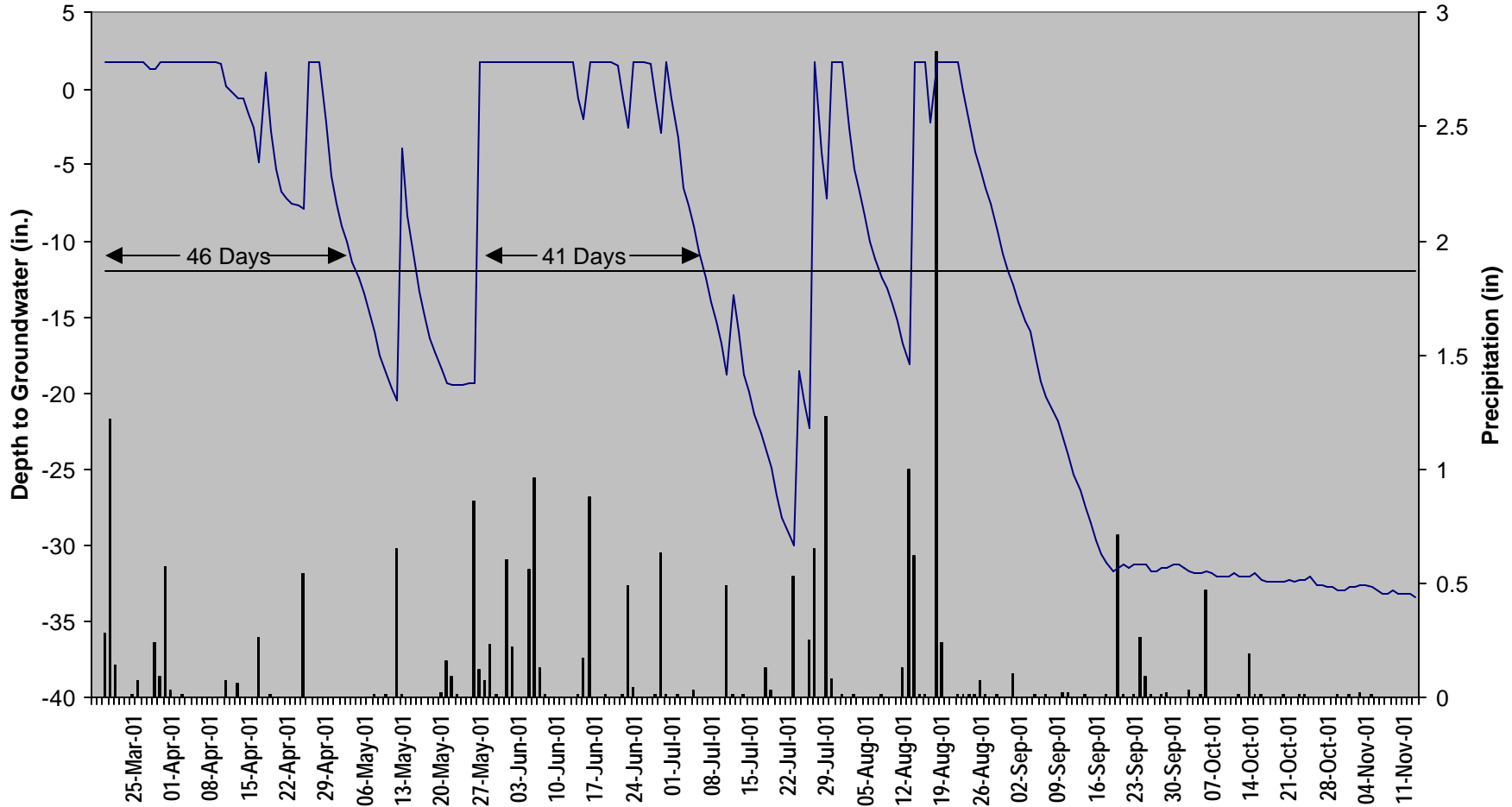
Ballance Farm Monitoring Gauge BF-11



Ballance Farm Monitoring Gauge BF-12

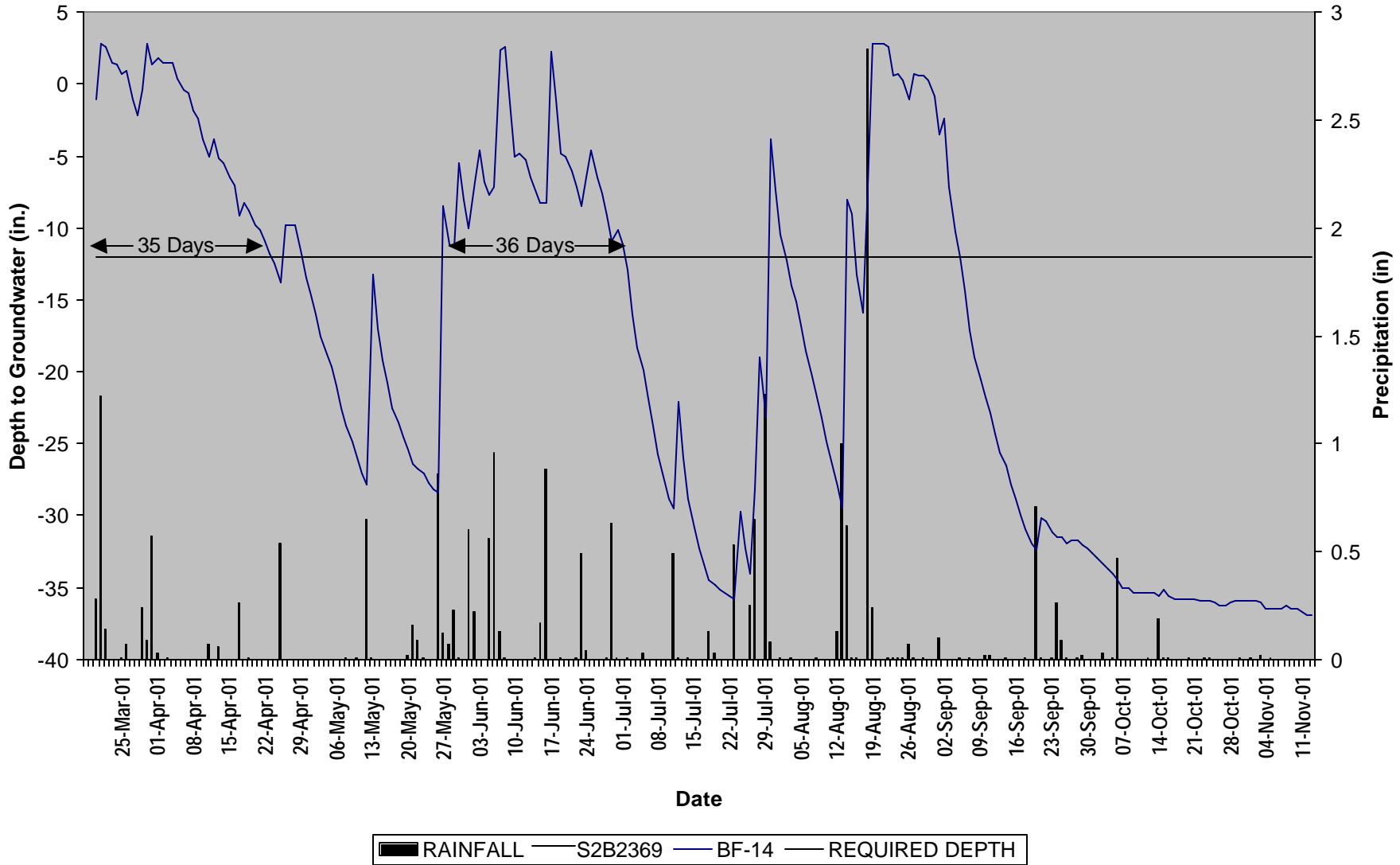


Ballance Farm Monitoring Gauge BF-13

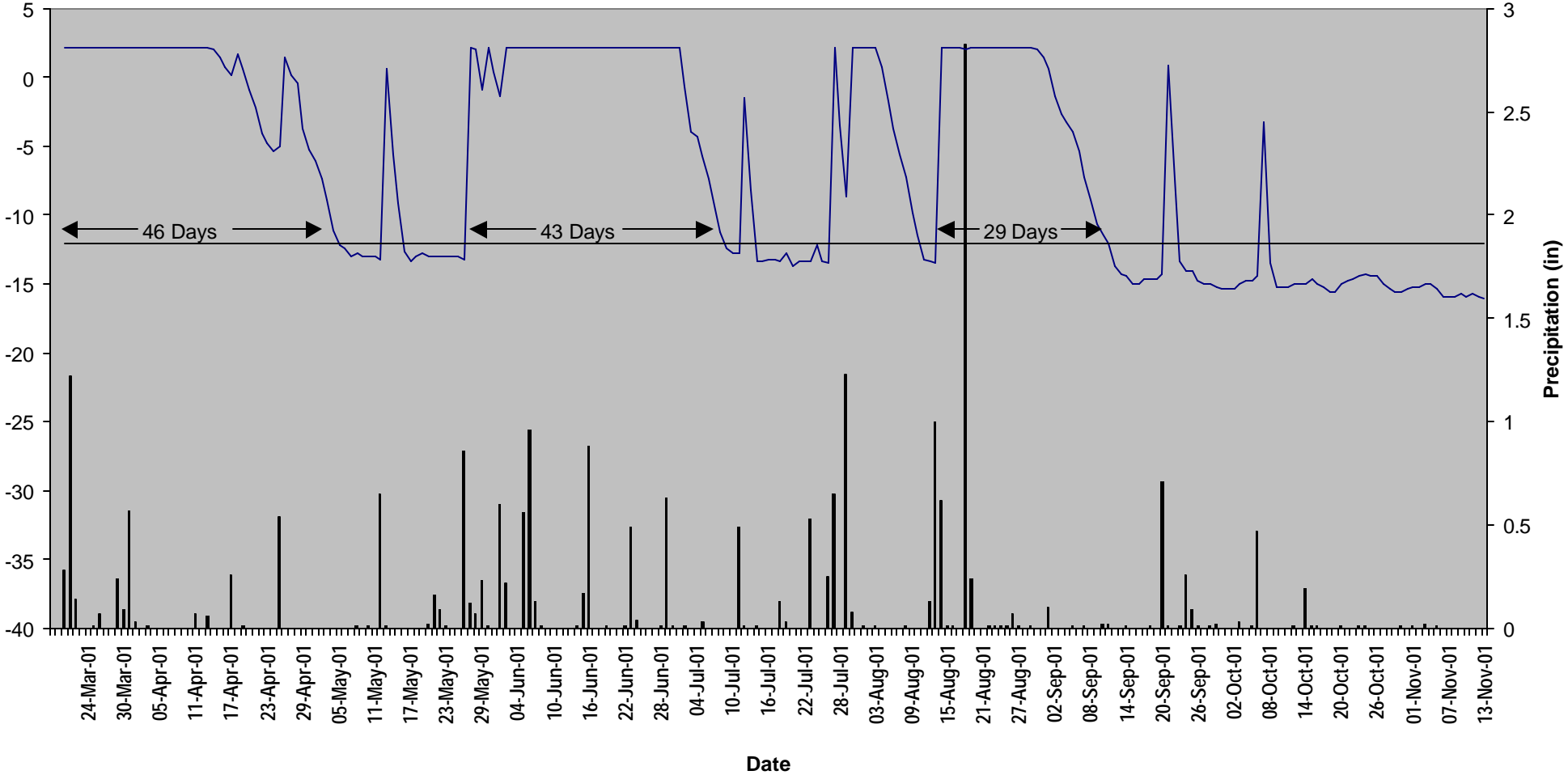


■ RAINFALL — S214059 — BF-13 — REQUIRED DEPTH

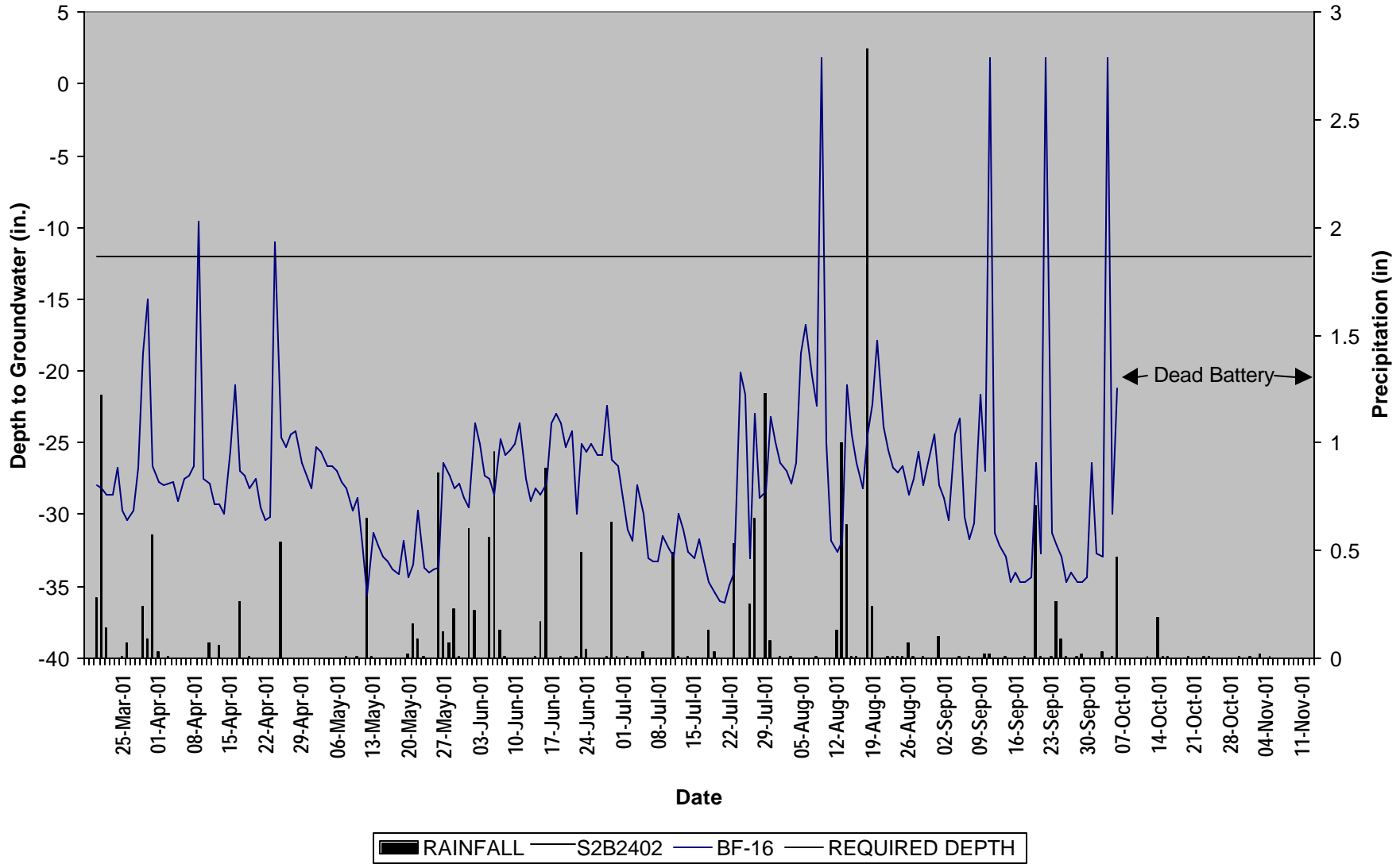
Ballance Farm Monitoring Gauge BF-14



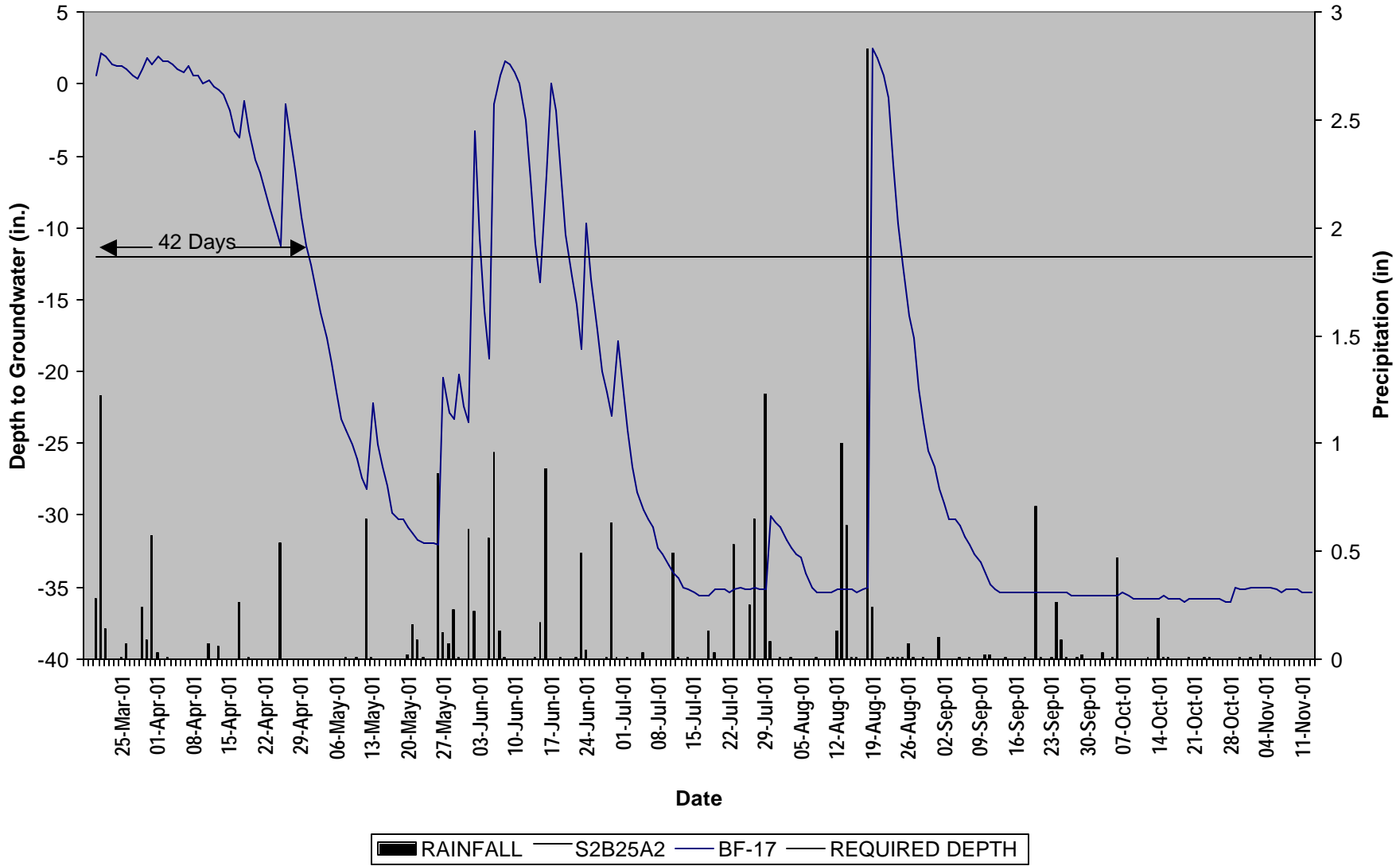
Ballance Farm Monitoring Gauge BF-15



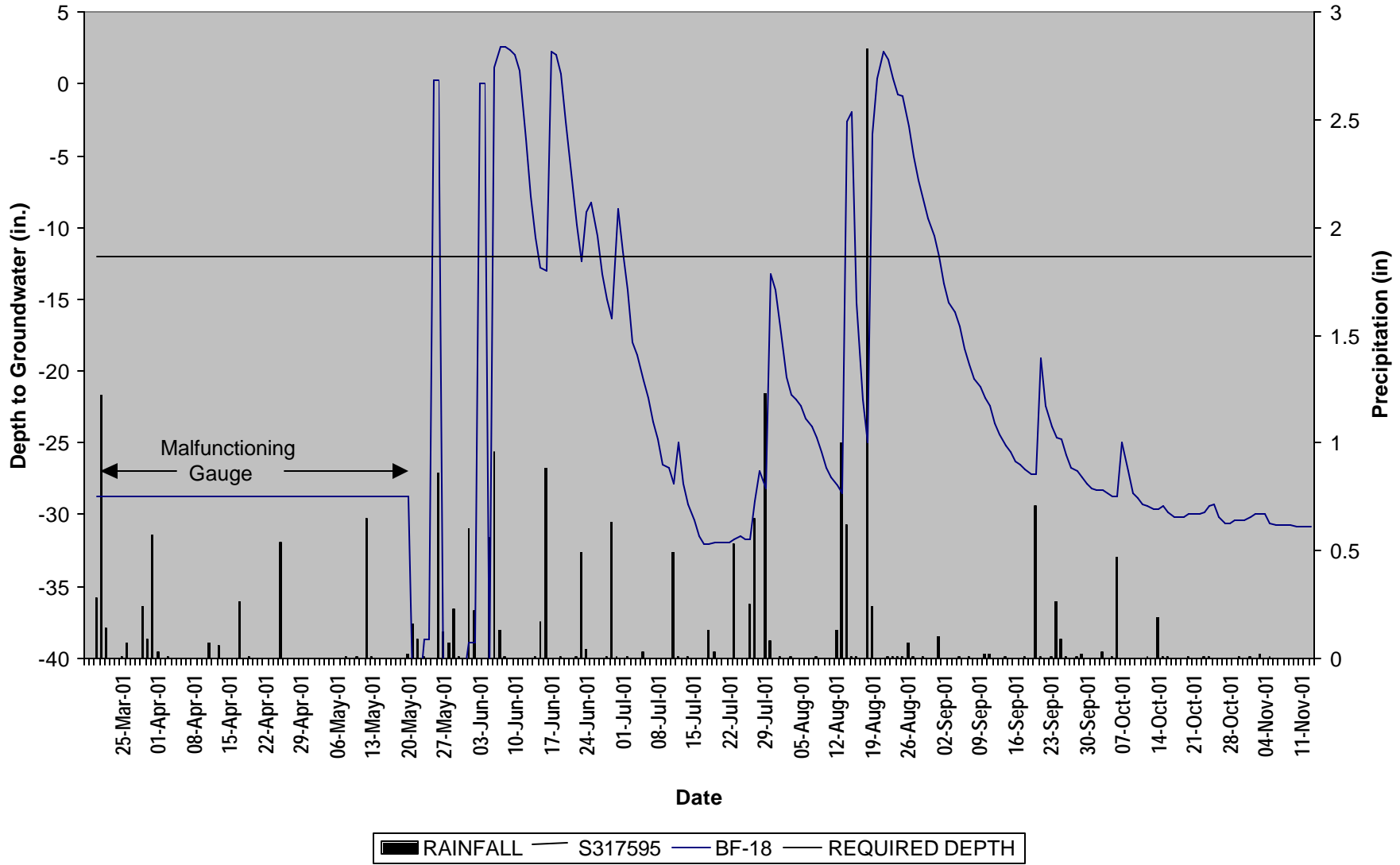
Ballance Farm Monitoring Gauge BF-16



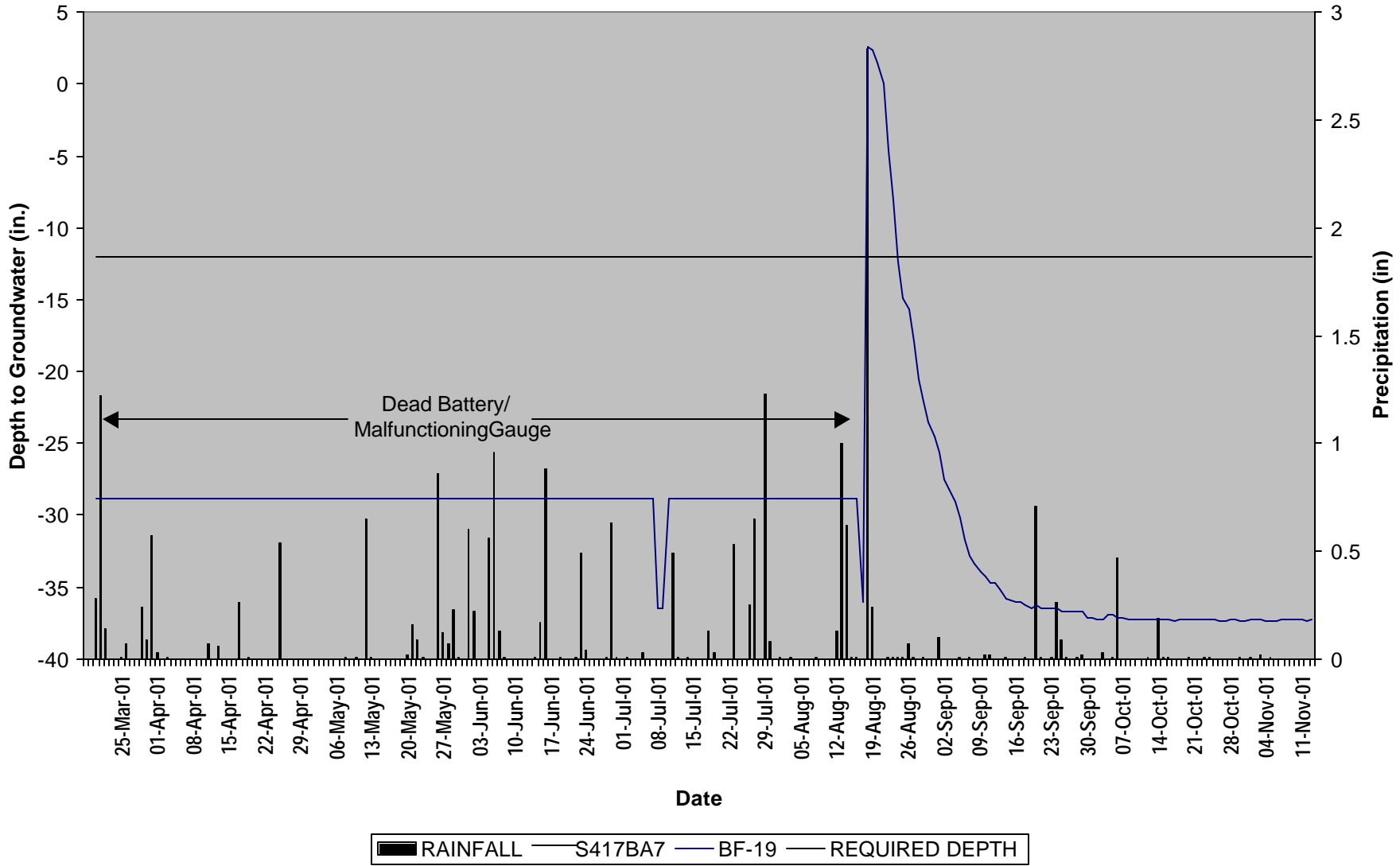
Ballance Farm Monitoring Gauge BF-17



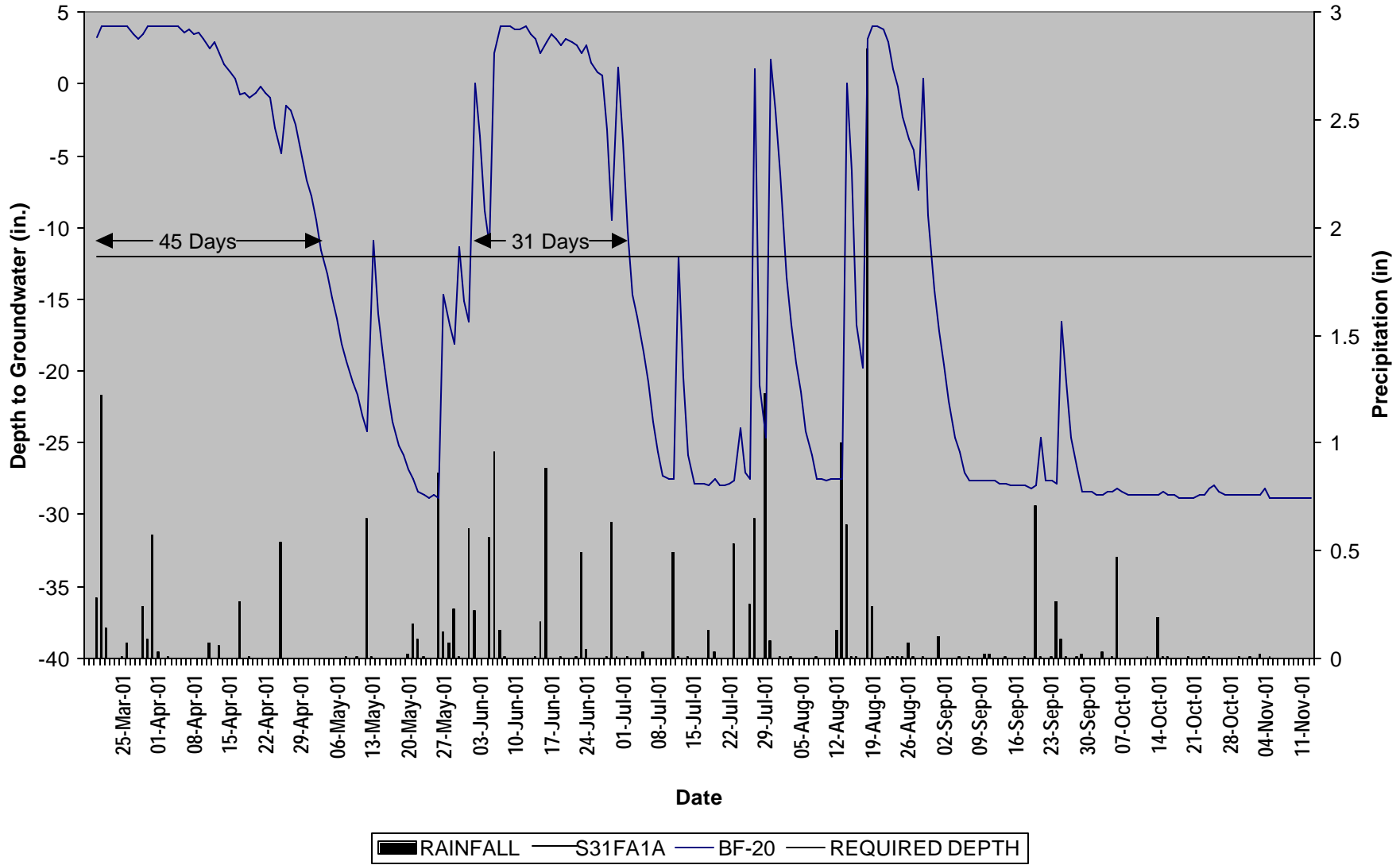
Ballance Farm Monitoring Gauge BF-18



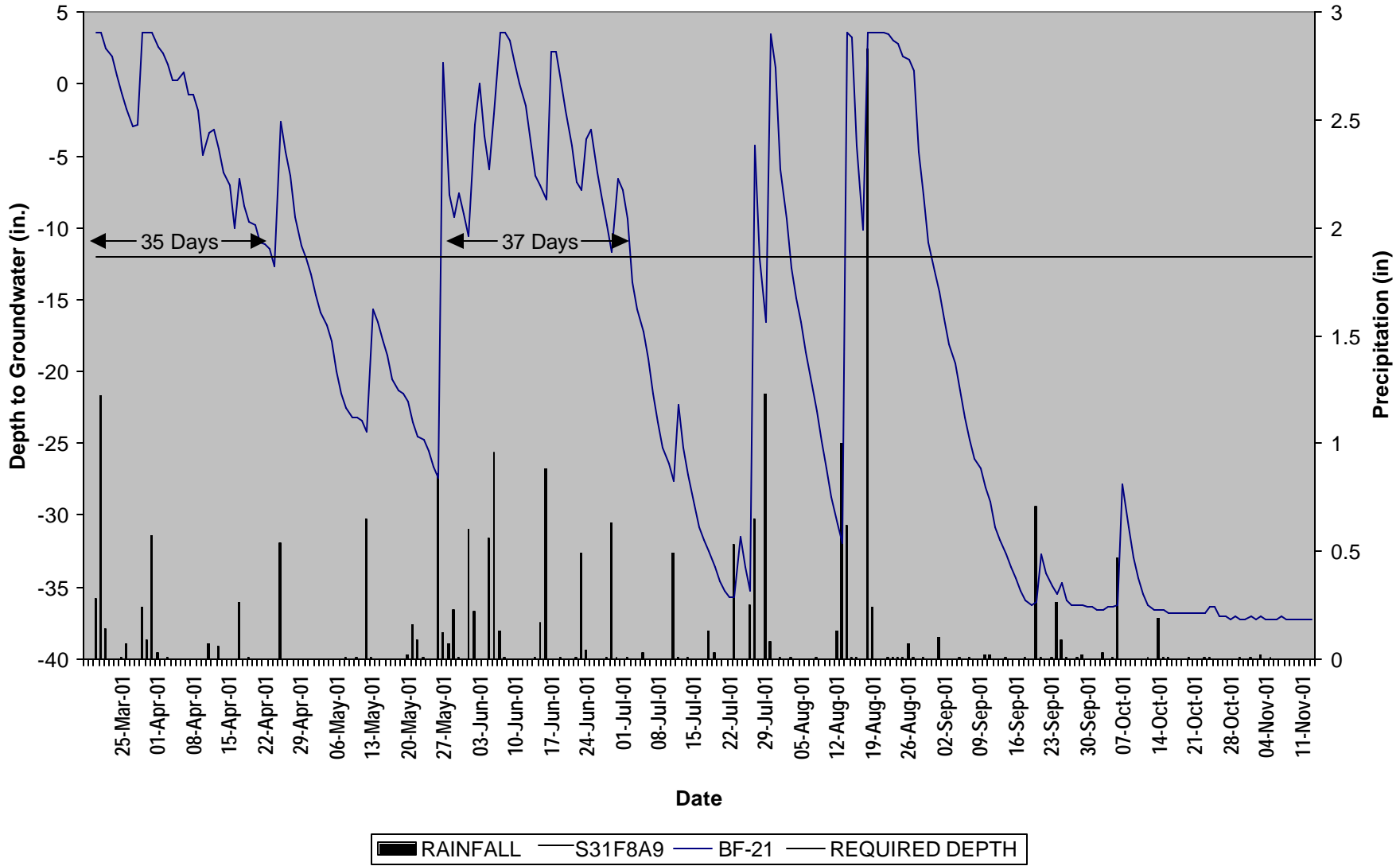
Ballance Farm Monitoring Gauge BF-19



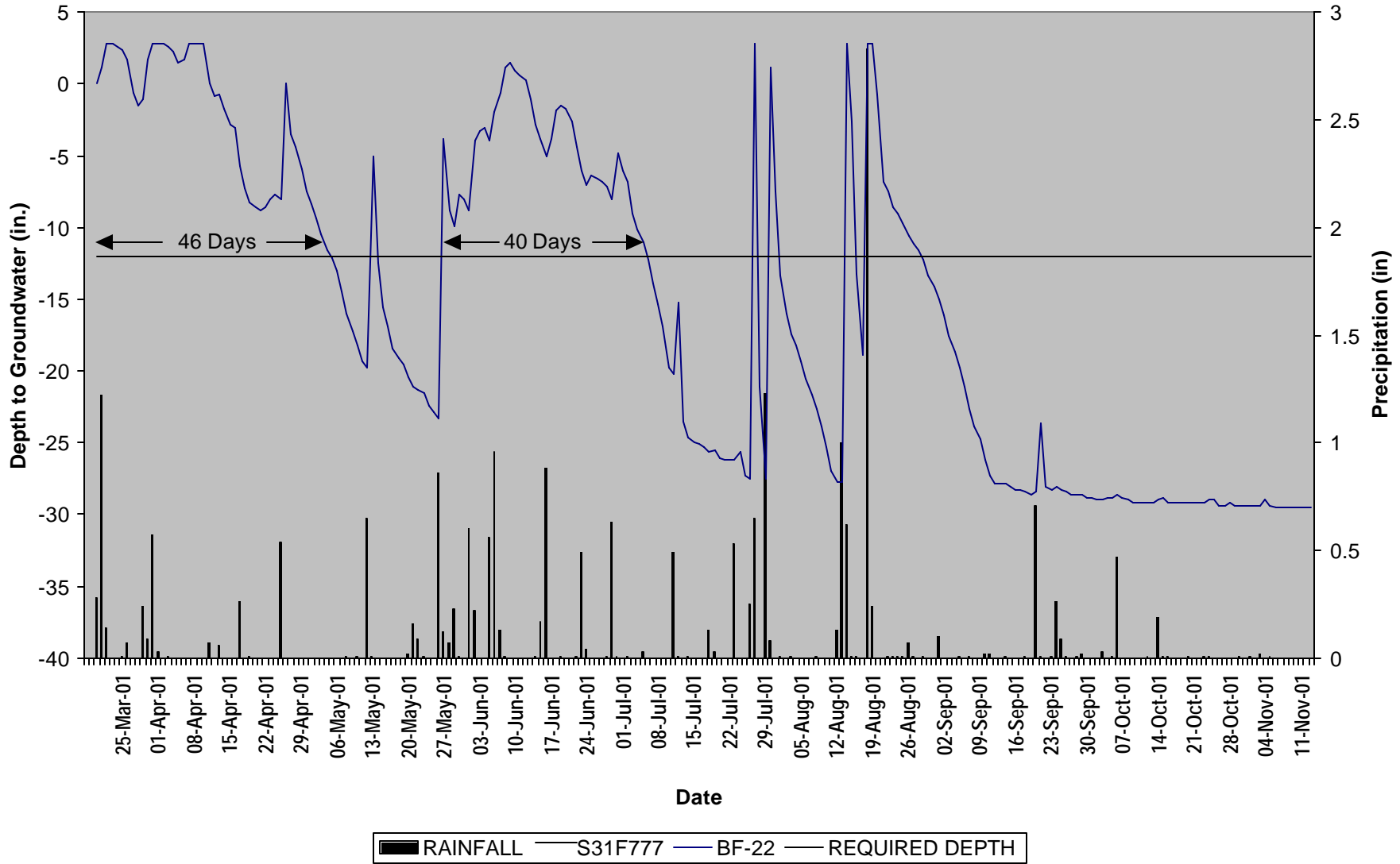
Ballance Farm Monitoring Gauge BF-20



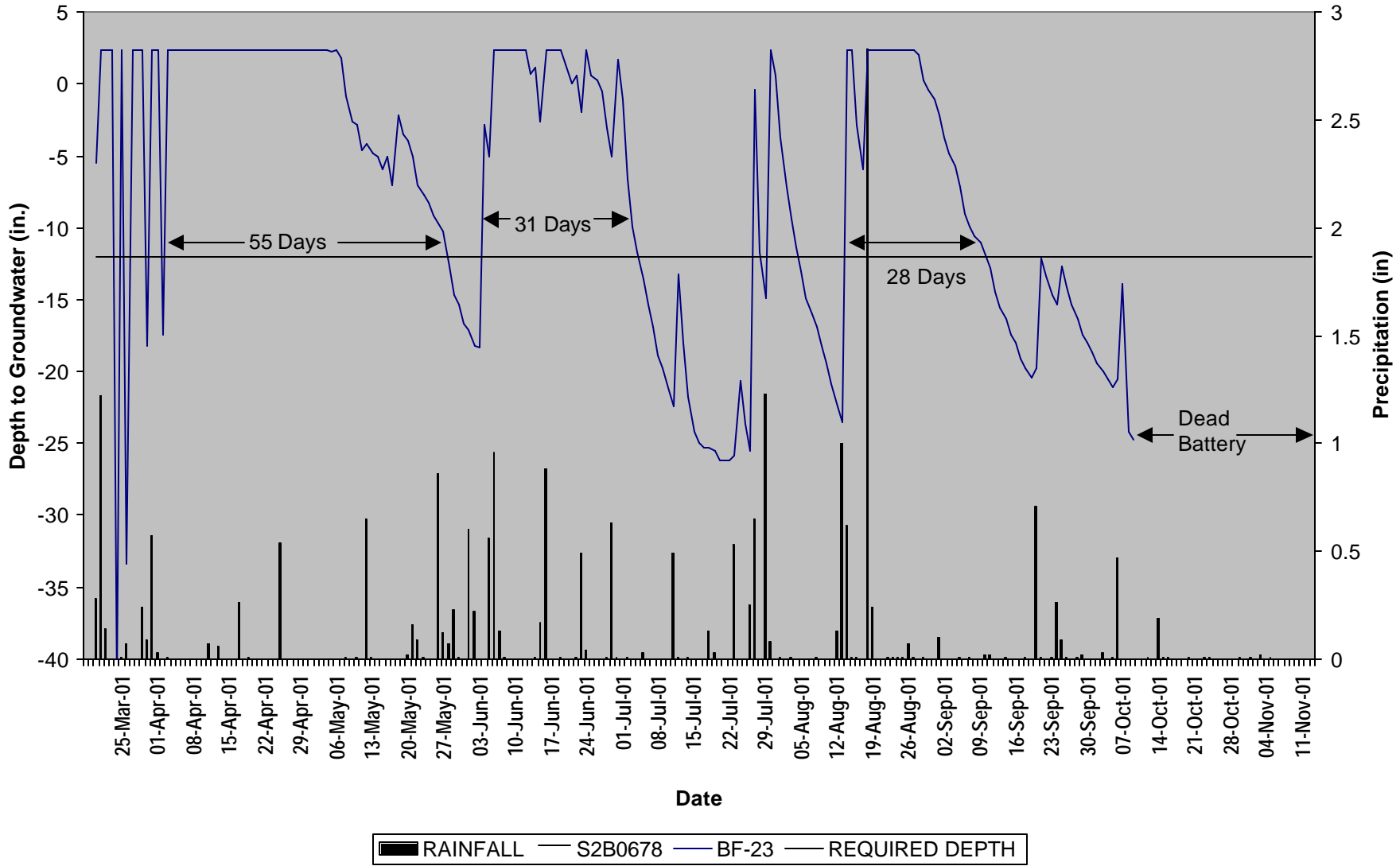
Ballance Farm Monitoring Gauge BF-21



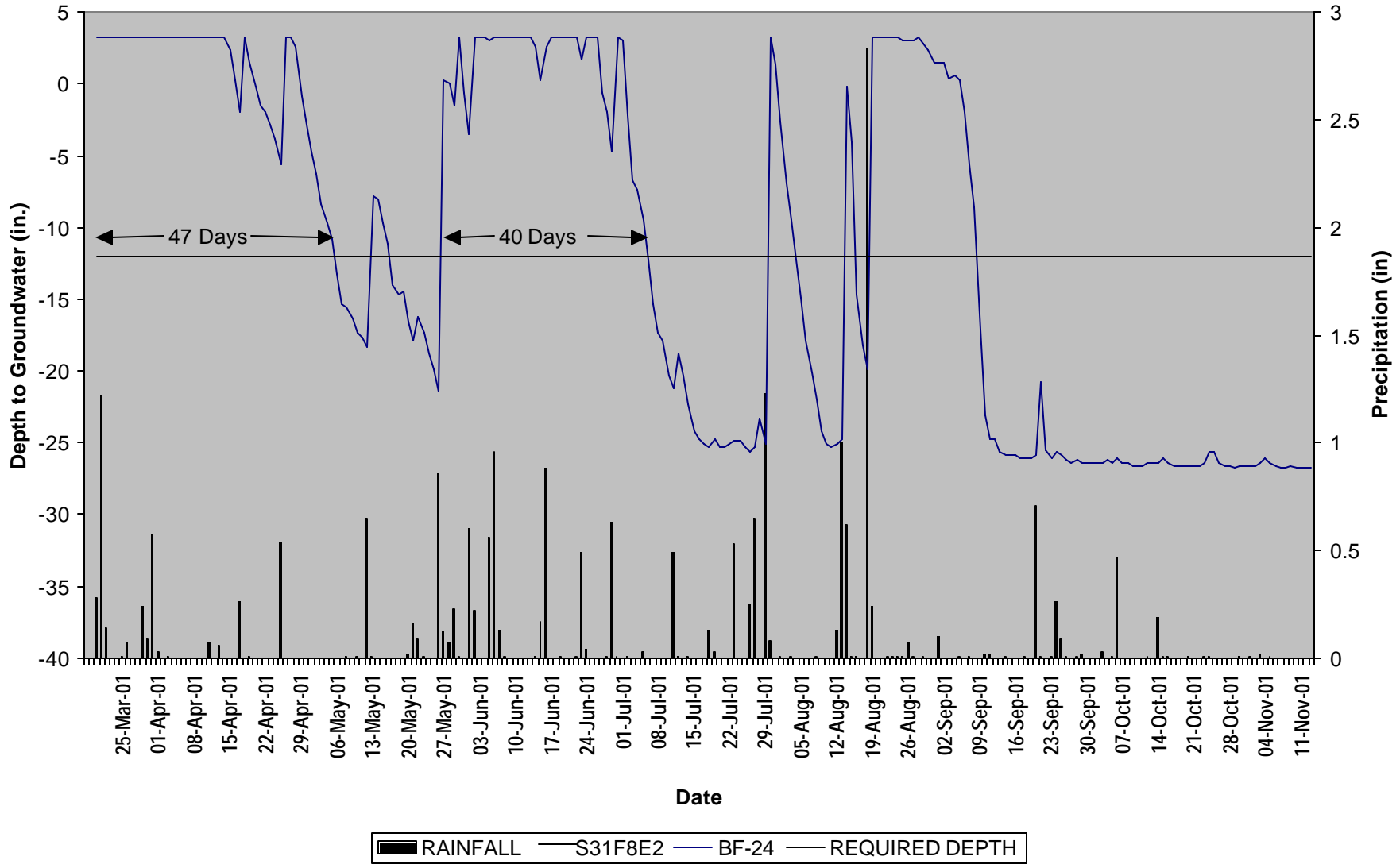
Ballance Farm Monitoring Gauge BF-22



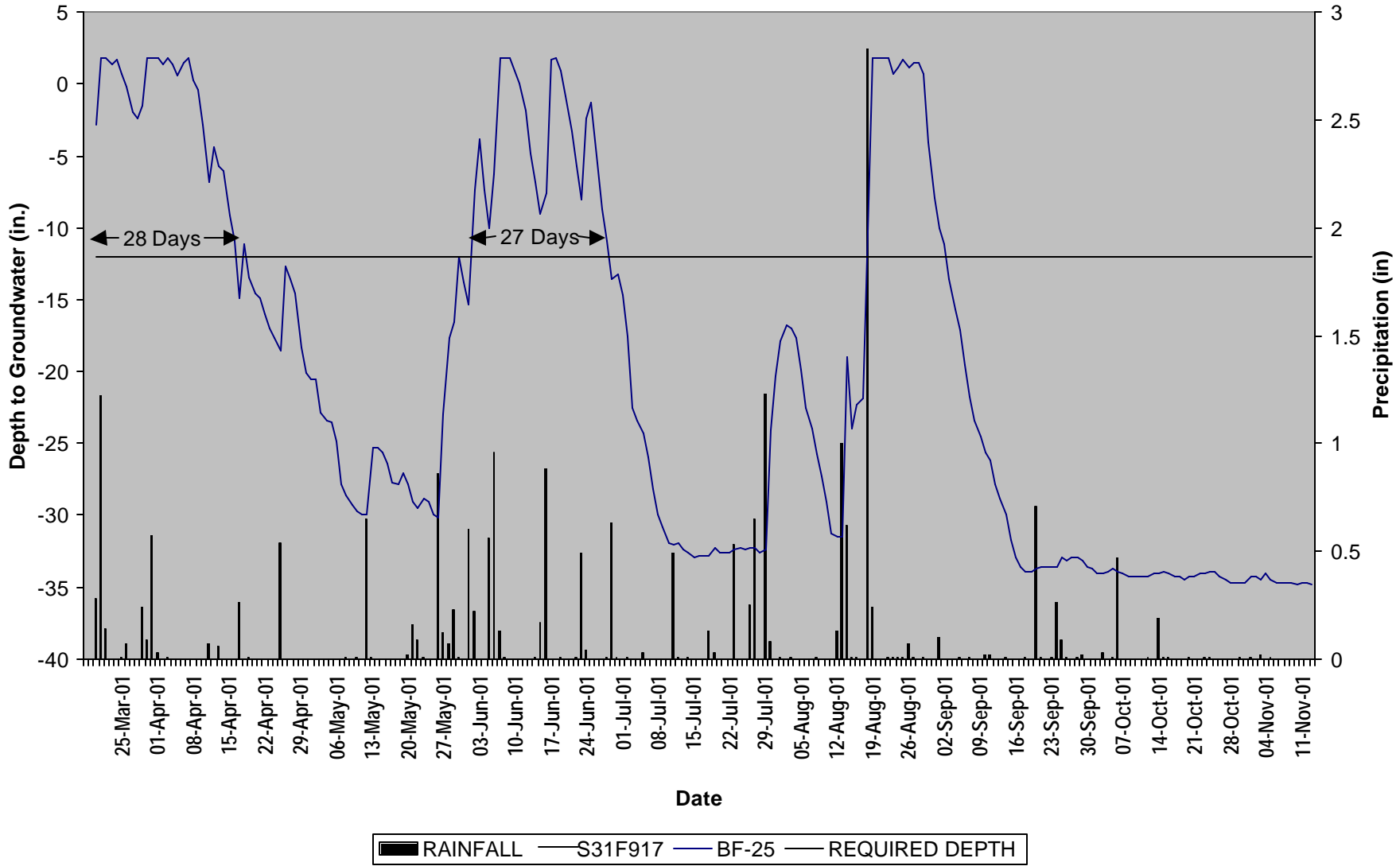
Ballance Farm Monitoring Gauge BF-23



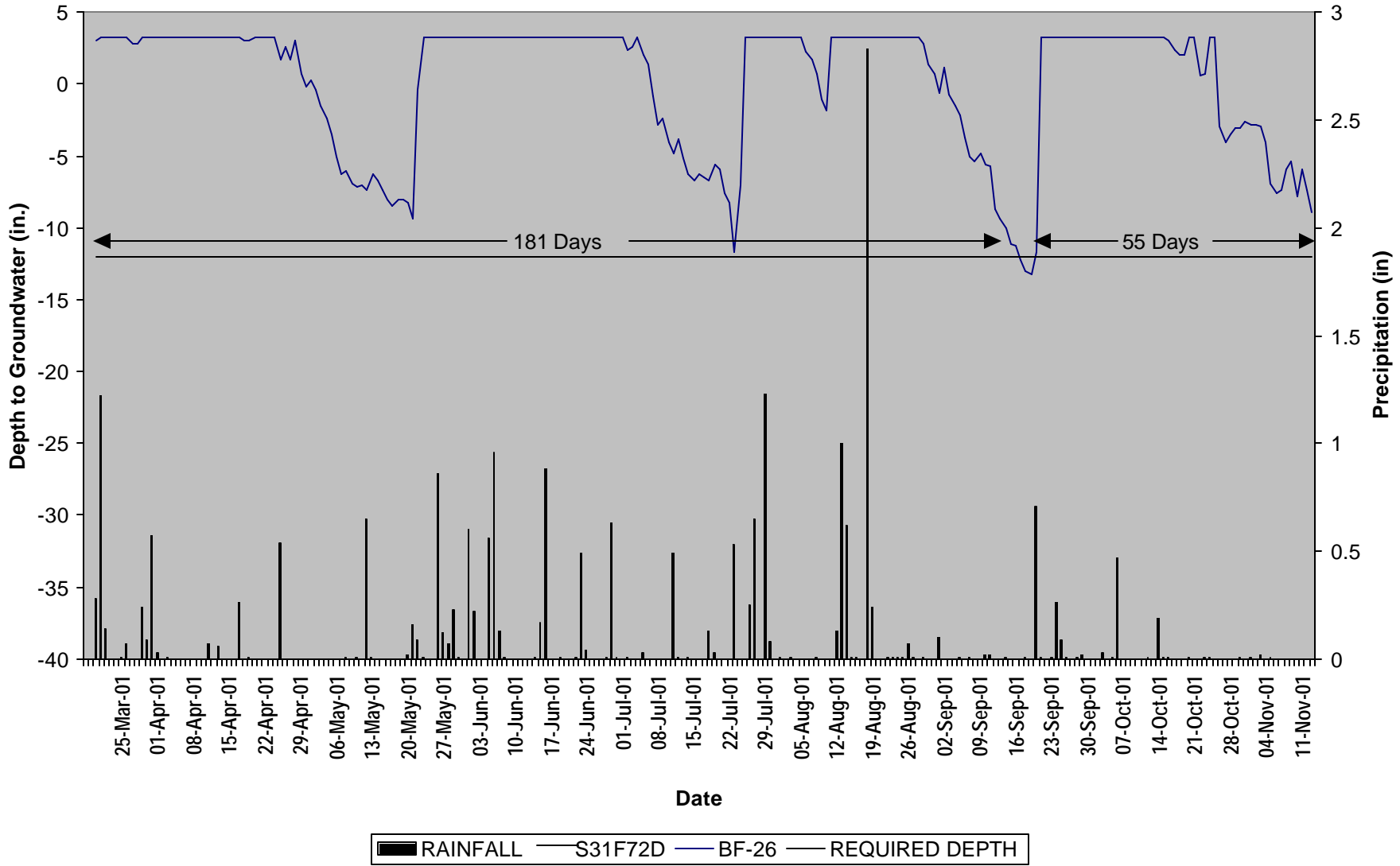
Ballance Farm Monitoring Gauge BF-24



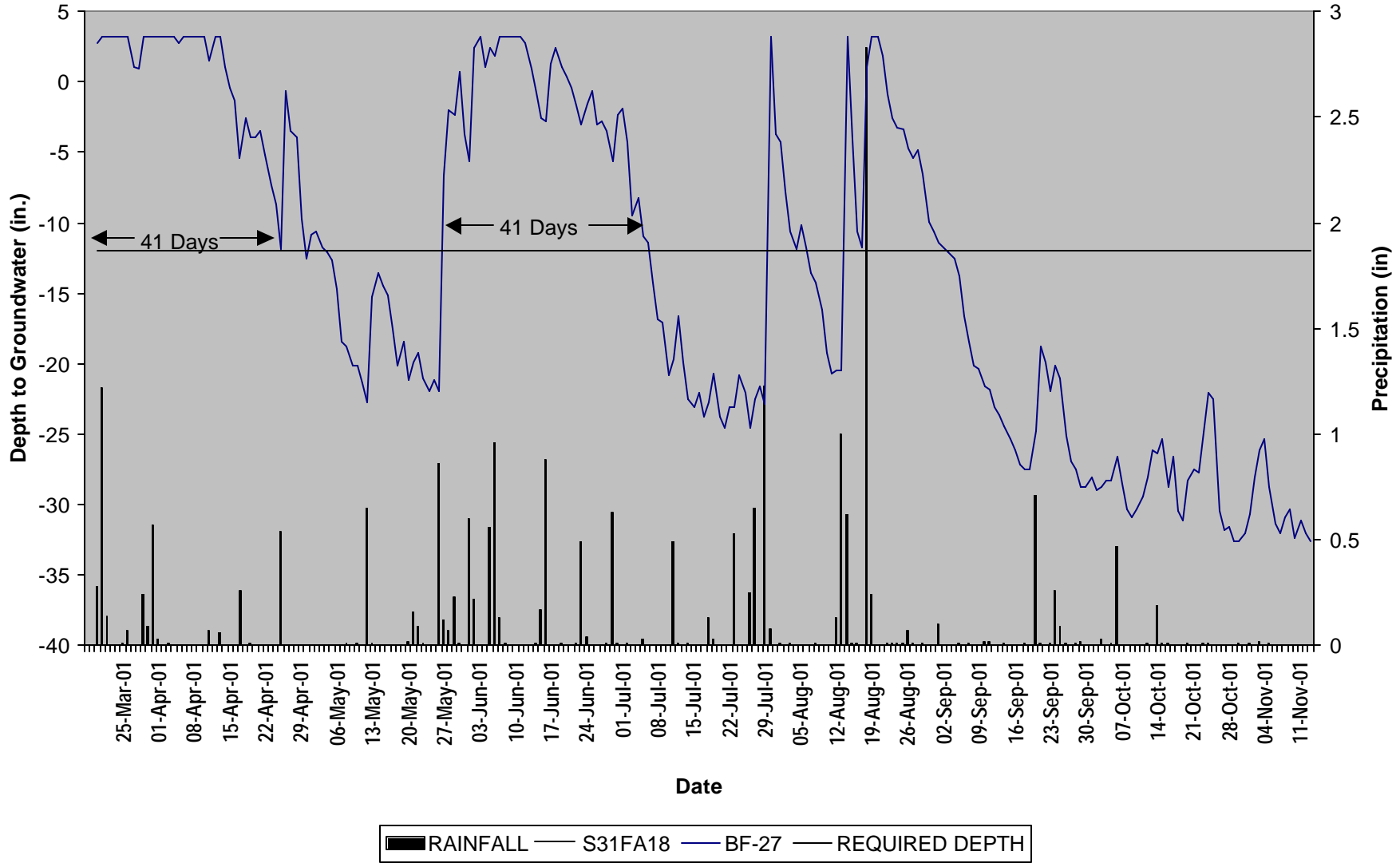
Ballance Farm Monitoring Gauge BF-25



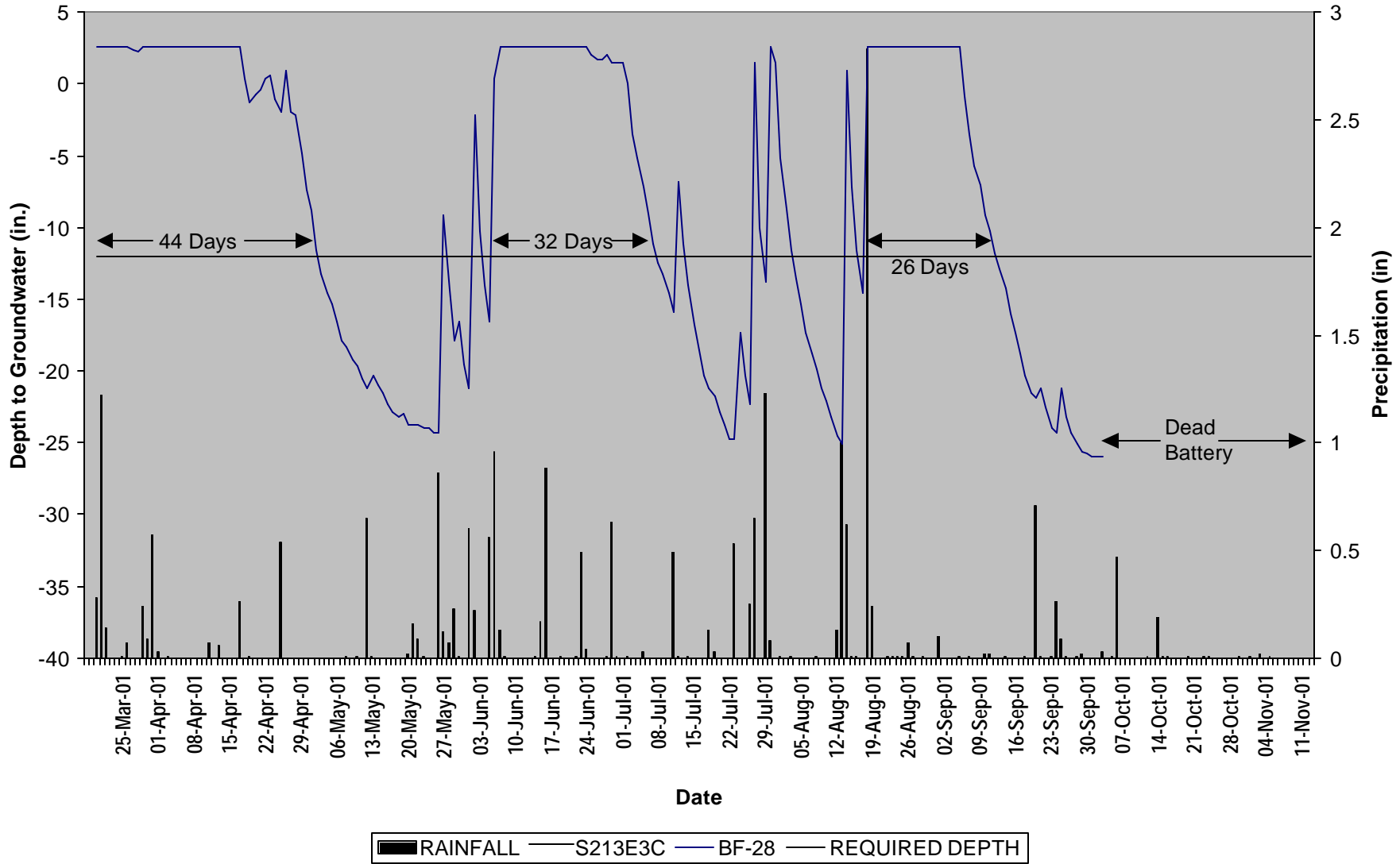
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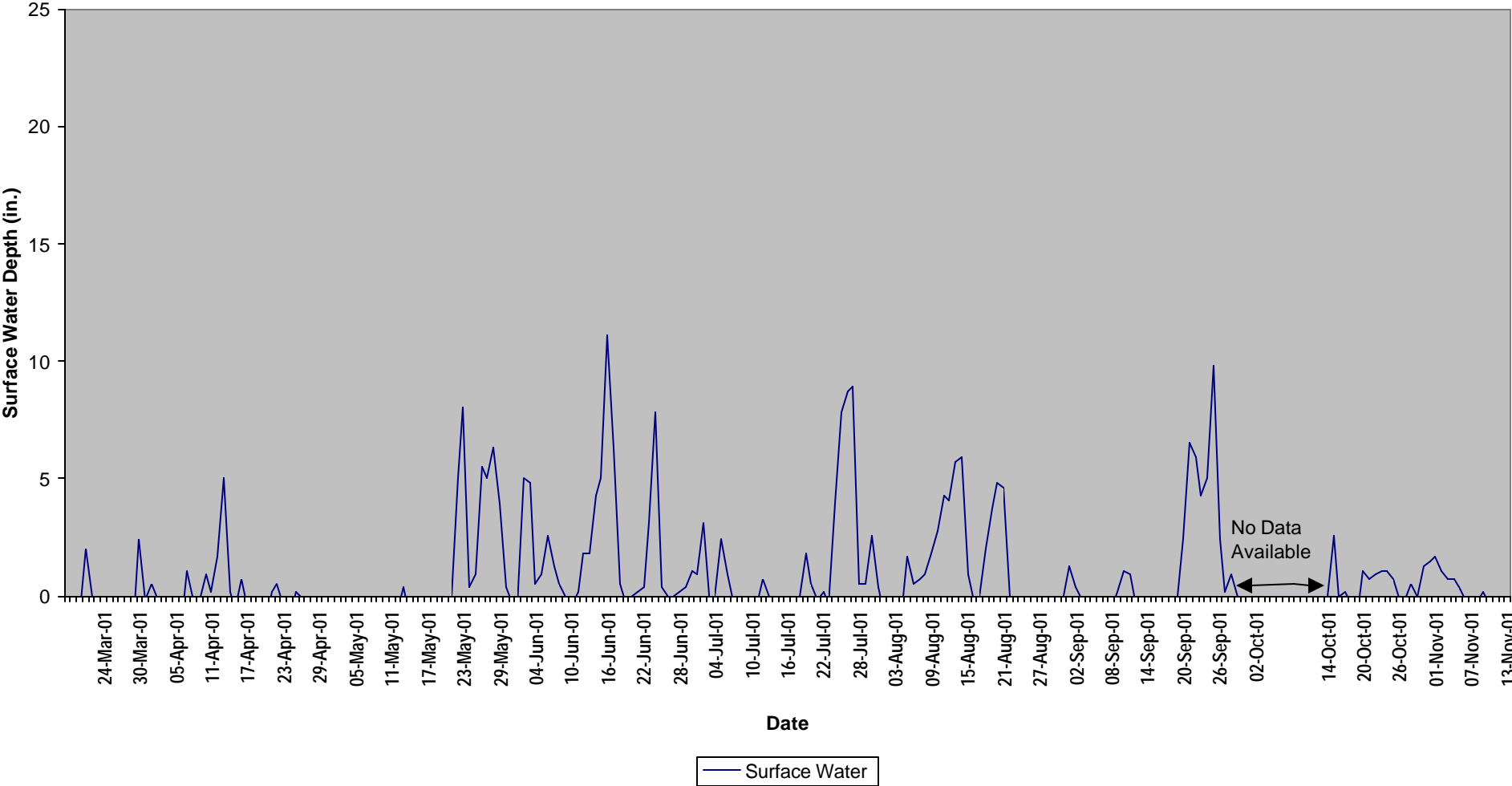
Ballance Farm Monitoring Gauge BF-27



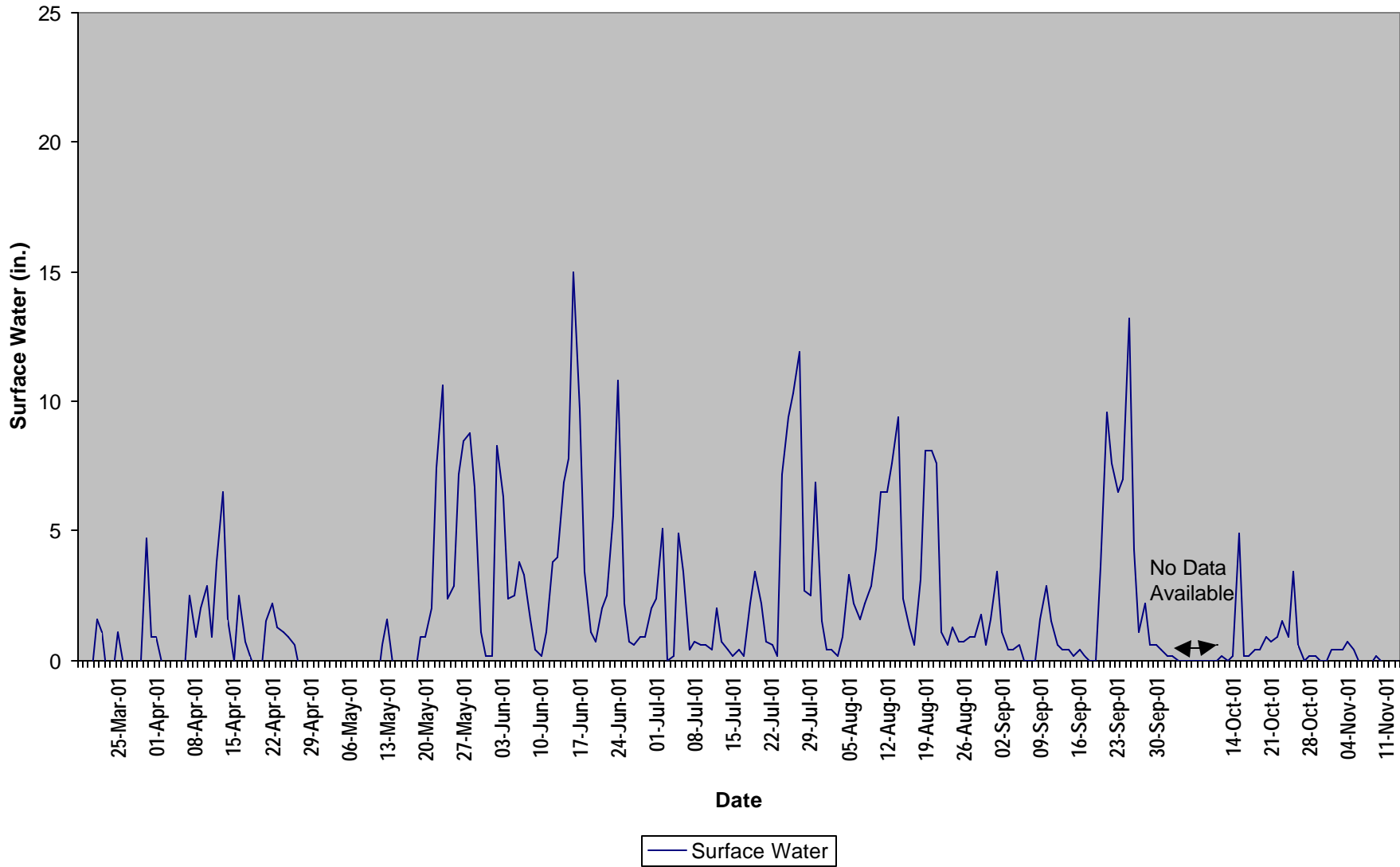
Ballance Farm Monitoring Gauge BF-28



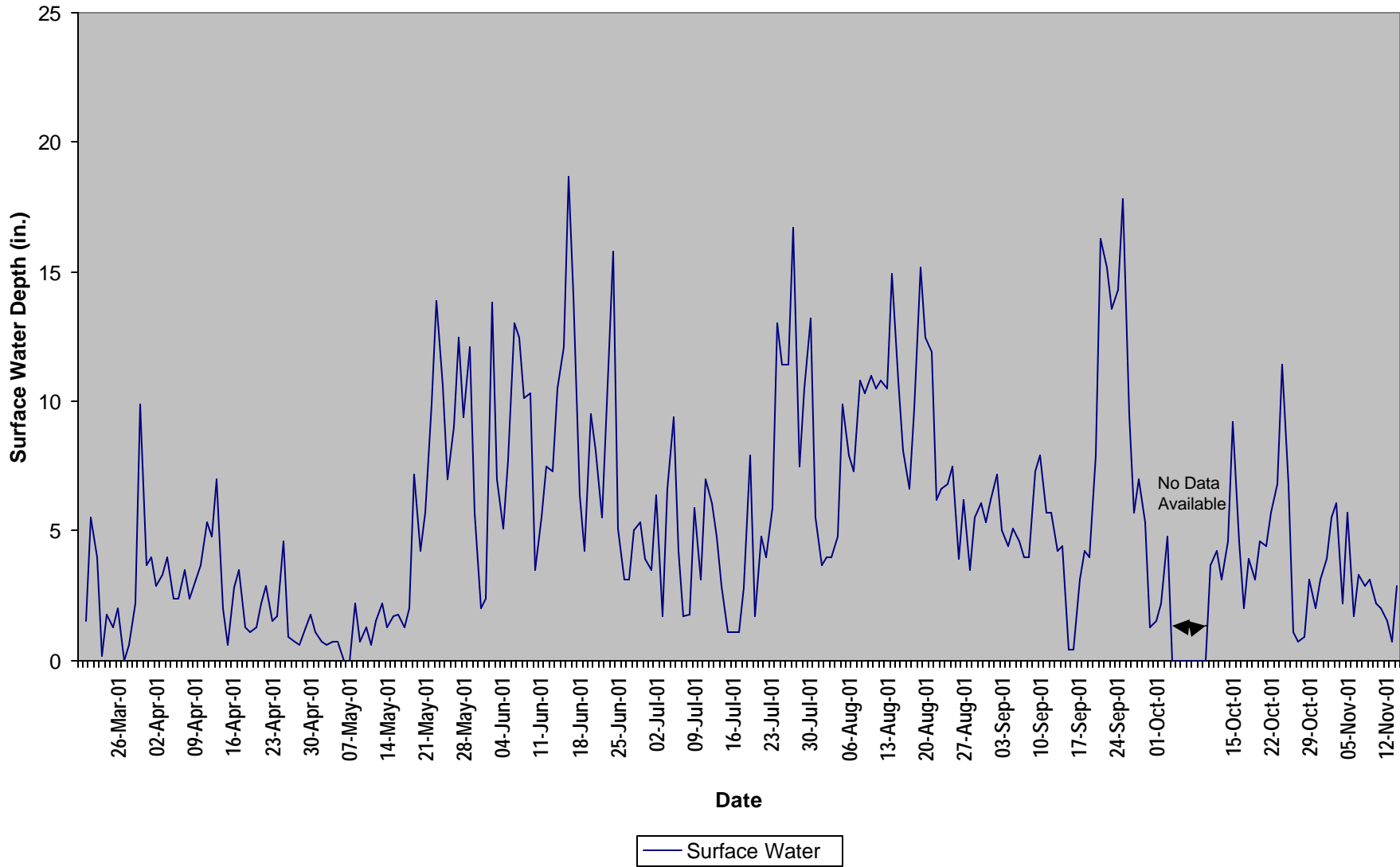
Ballance Farm Monitoring Gauge BFSG-1



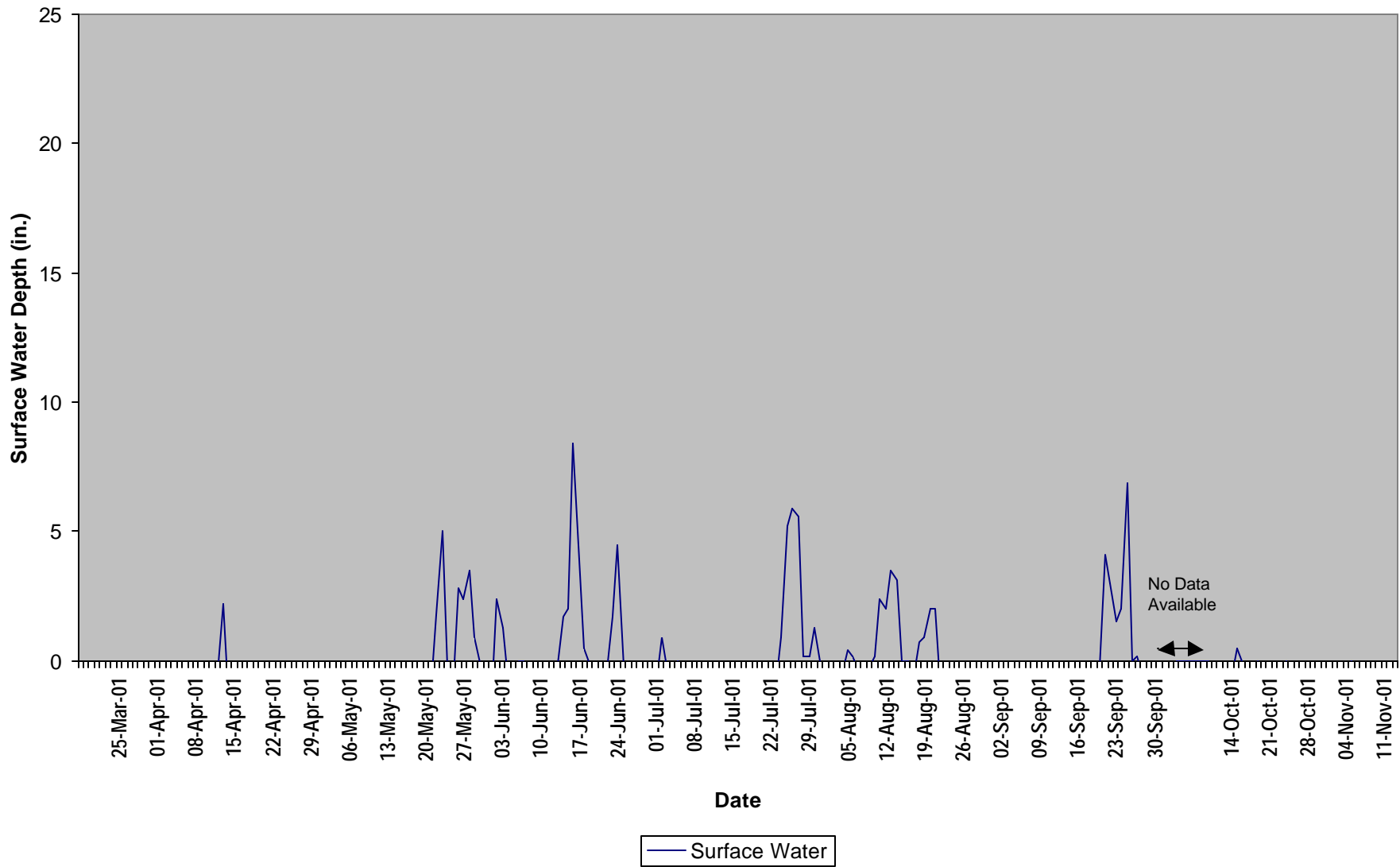
Ballance Farm Monitoring Gauge BFSG-2



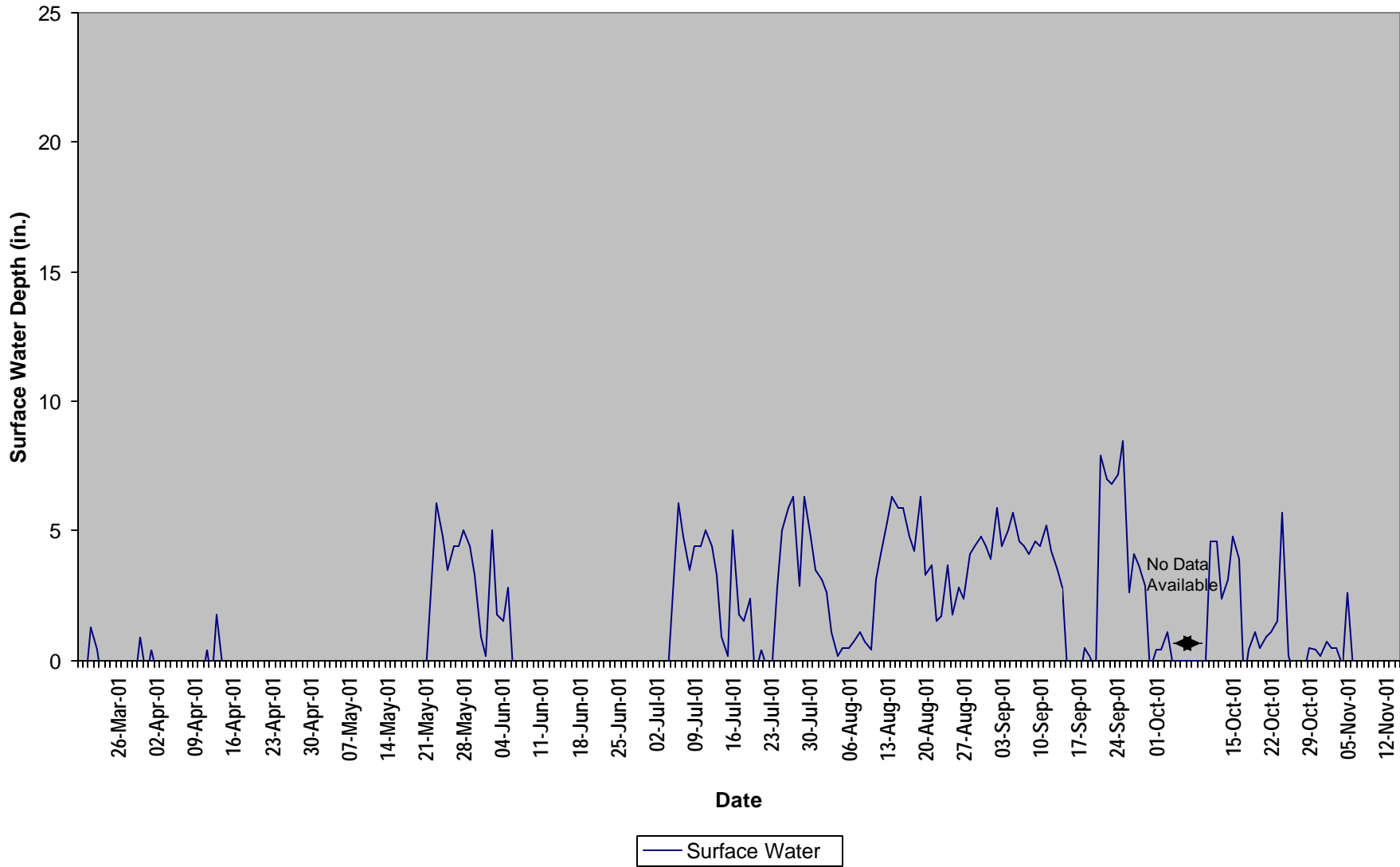
Ballance Farm Monitoring Gauge BFSG-3



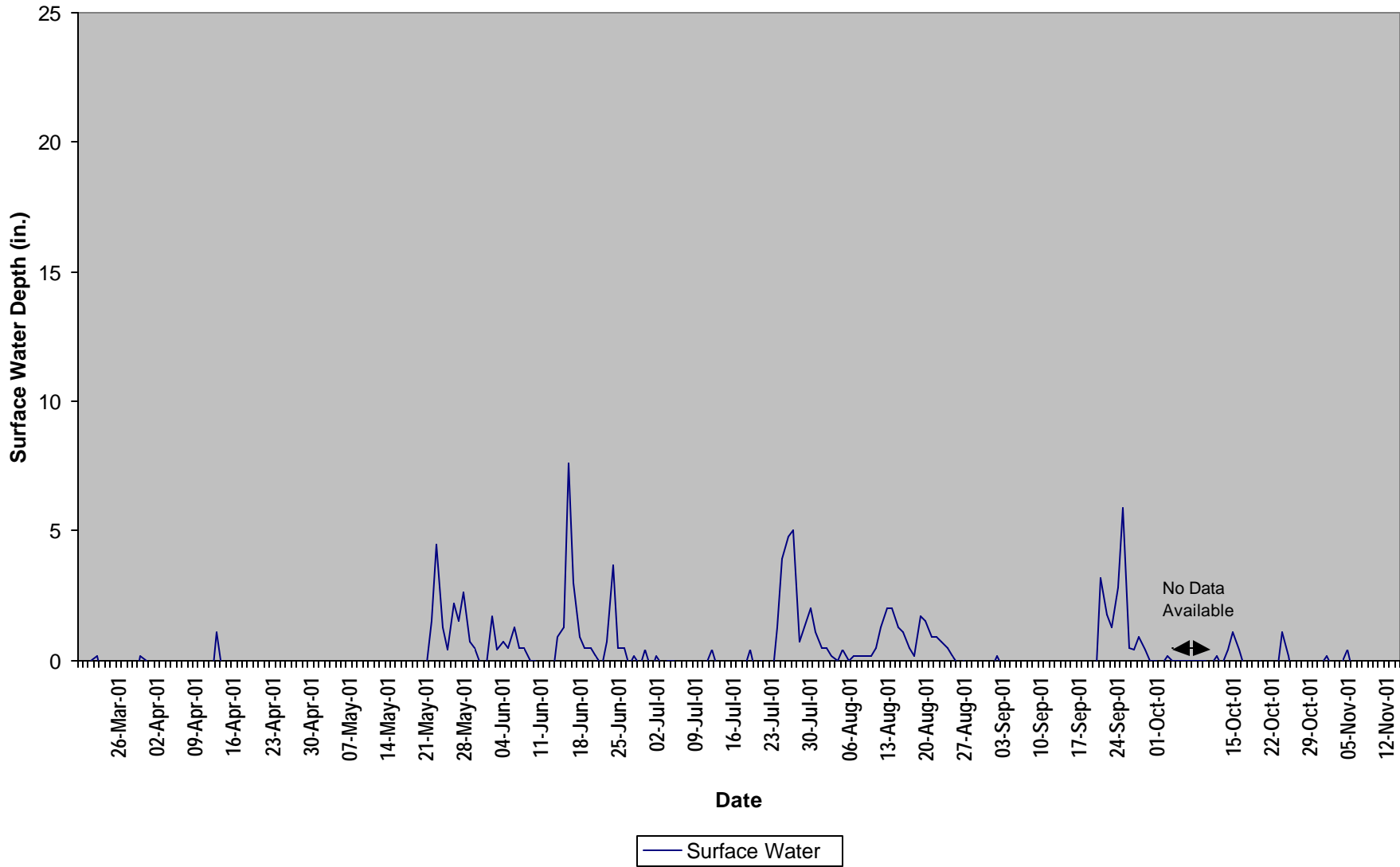
Ballance Farm Monitoring Gauge BFSG-5



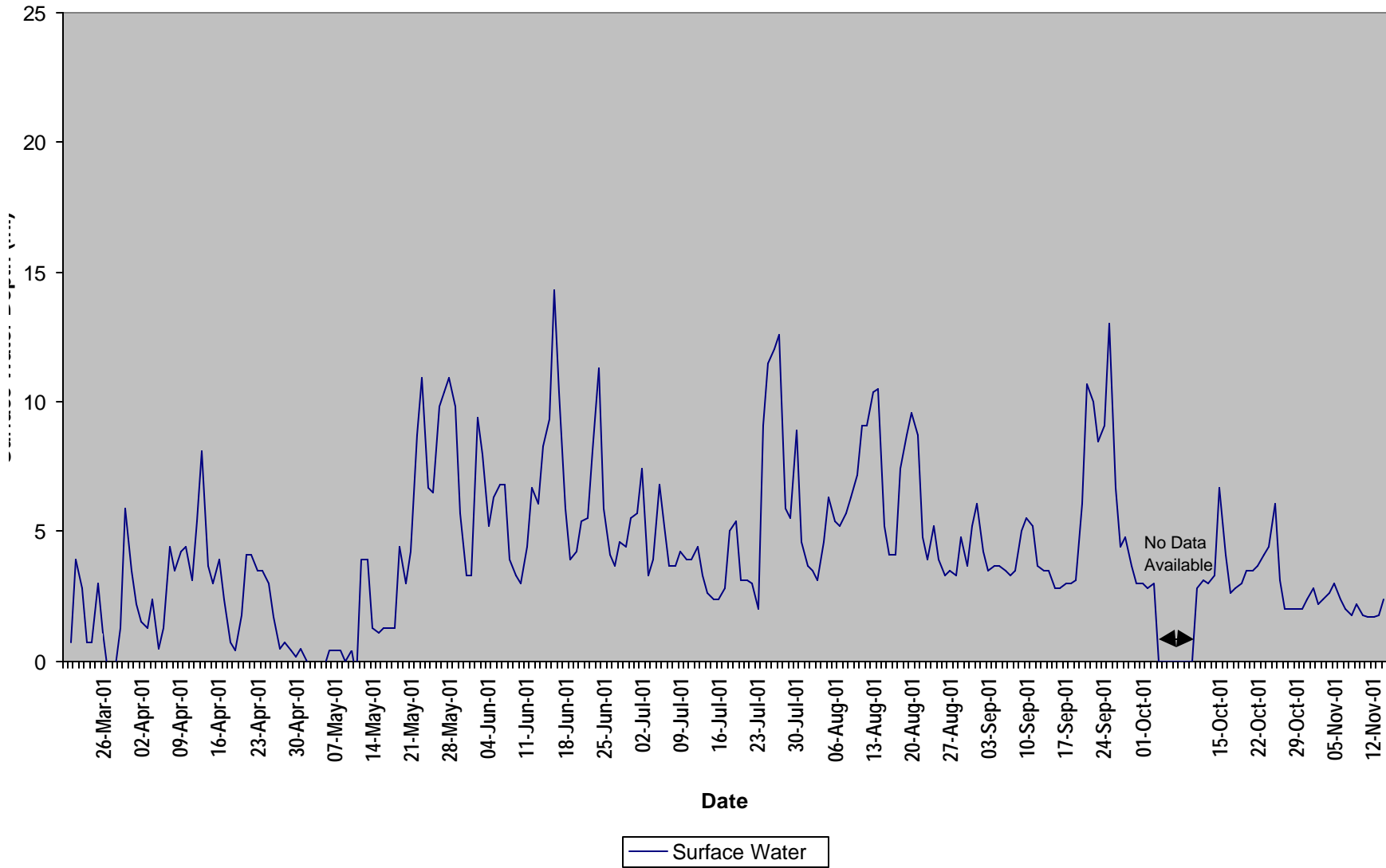
Ballance Farm Monitoring Gauge BFSG-7



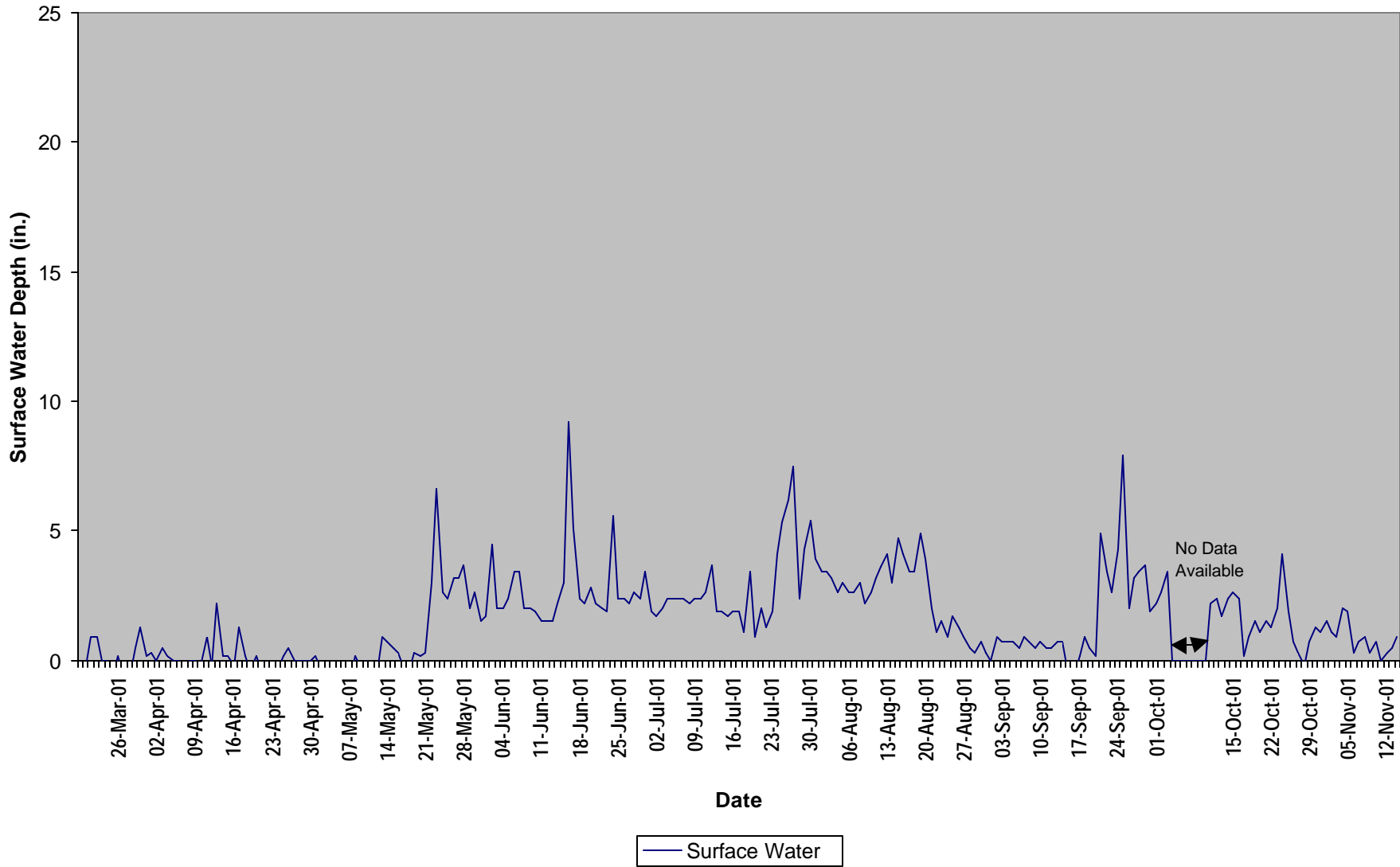
Ballance Farm Monitoring Gauge BFGS-8



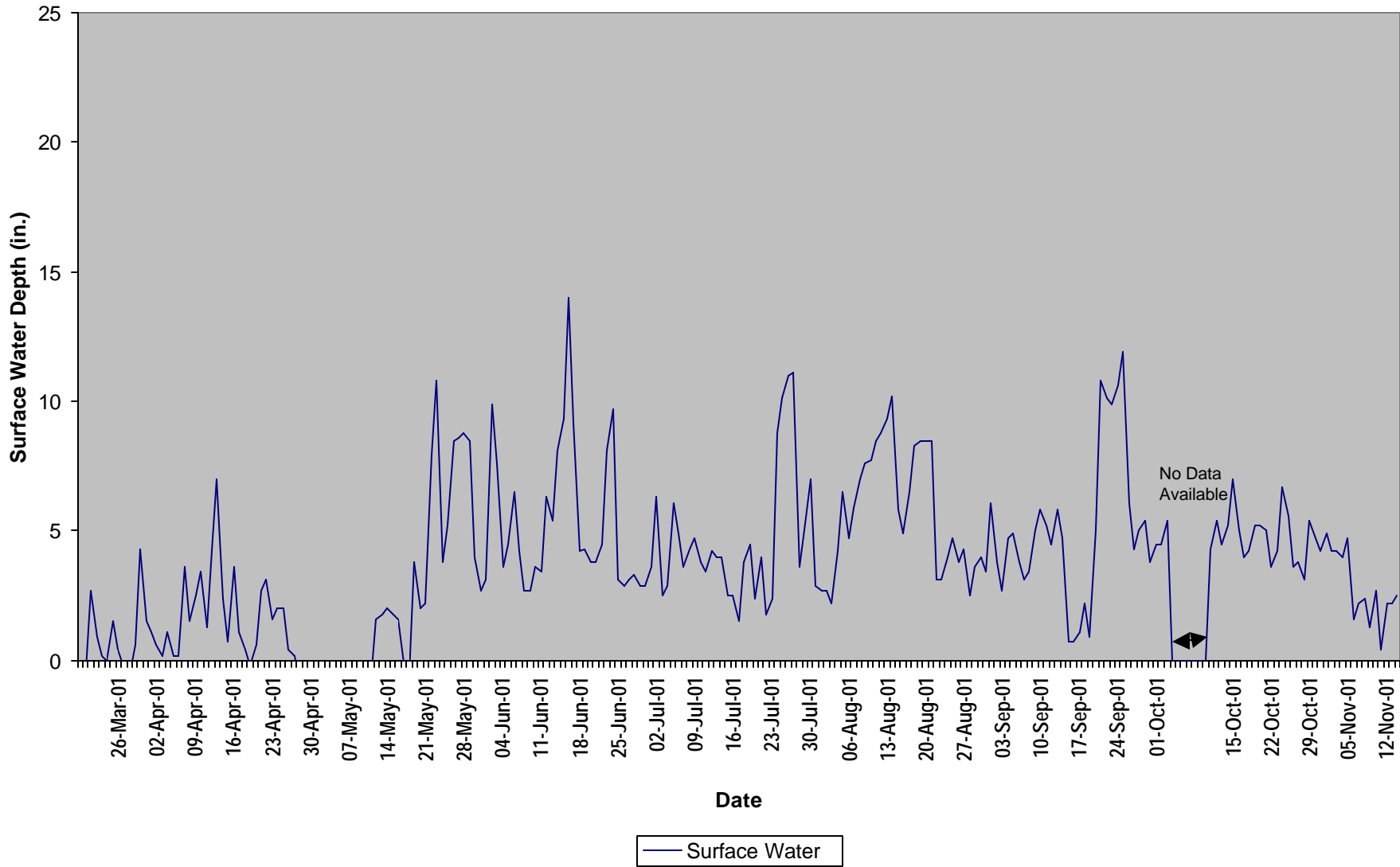
Ballance Farm Monitoring Gauge BFSG-9



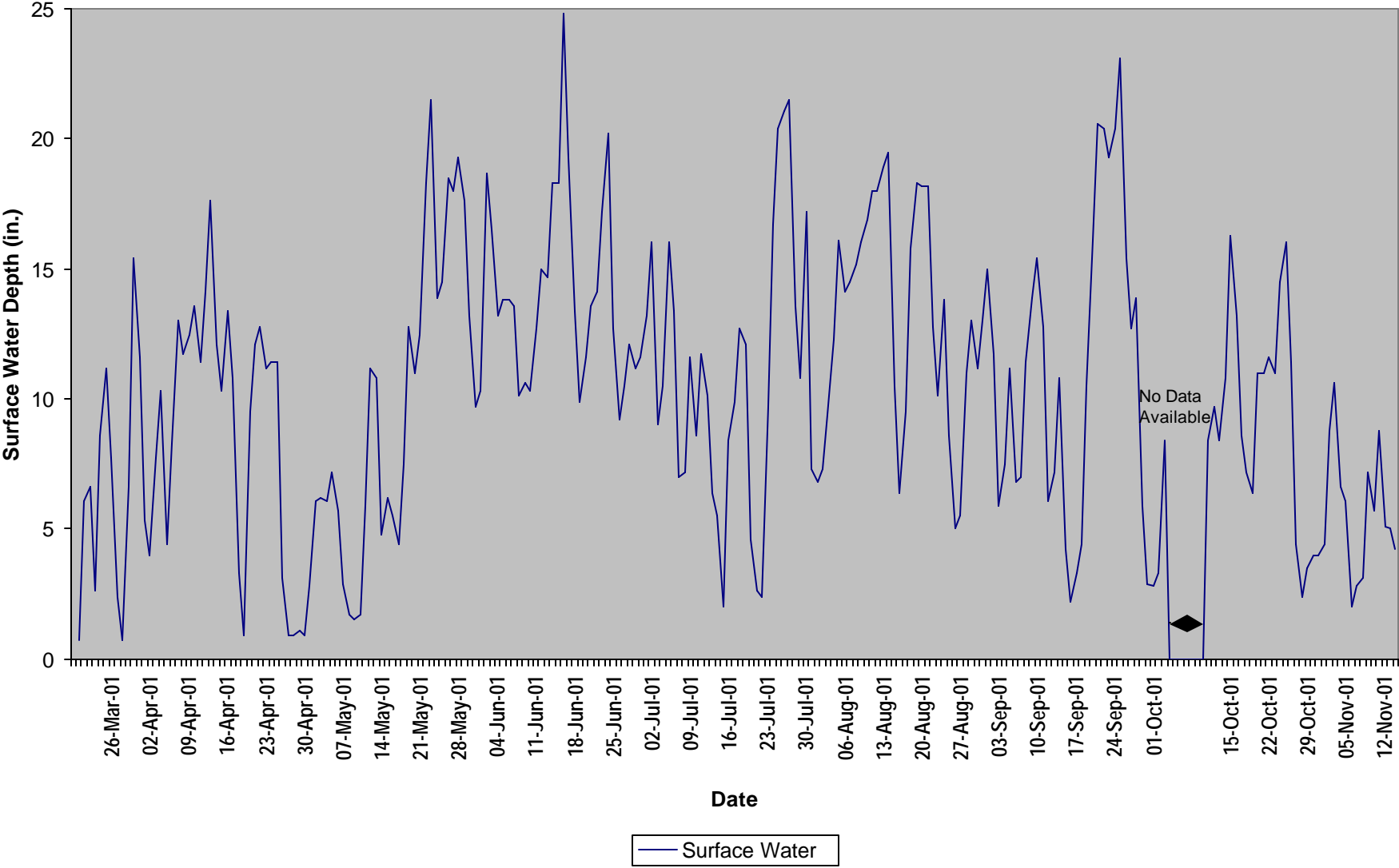
Ballance Farm Monitoring Gauge BFSG-11



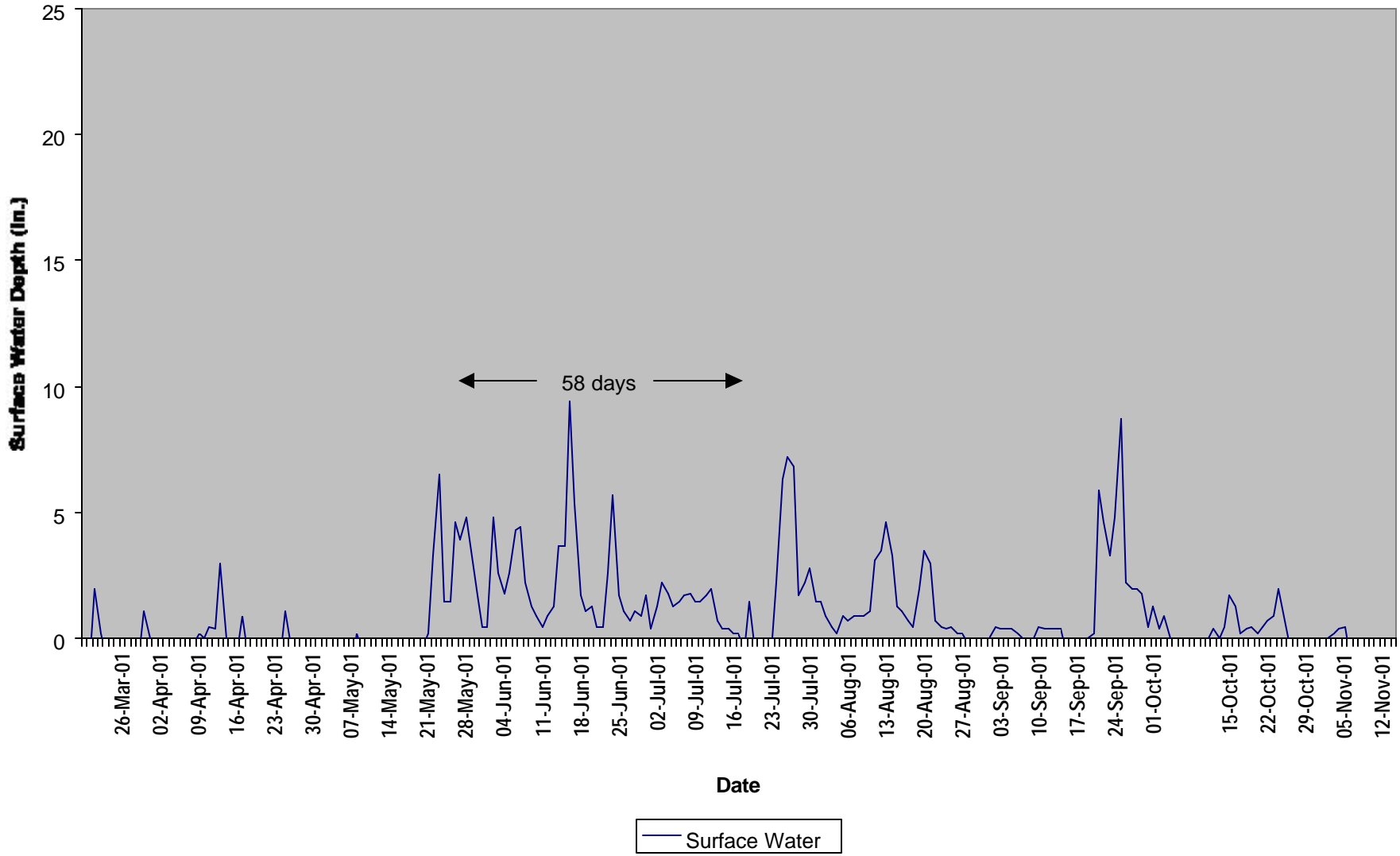
Ballance Farm Monitoring Gauge BFSG-12



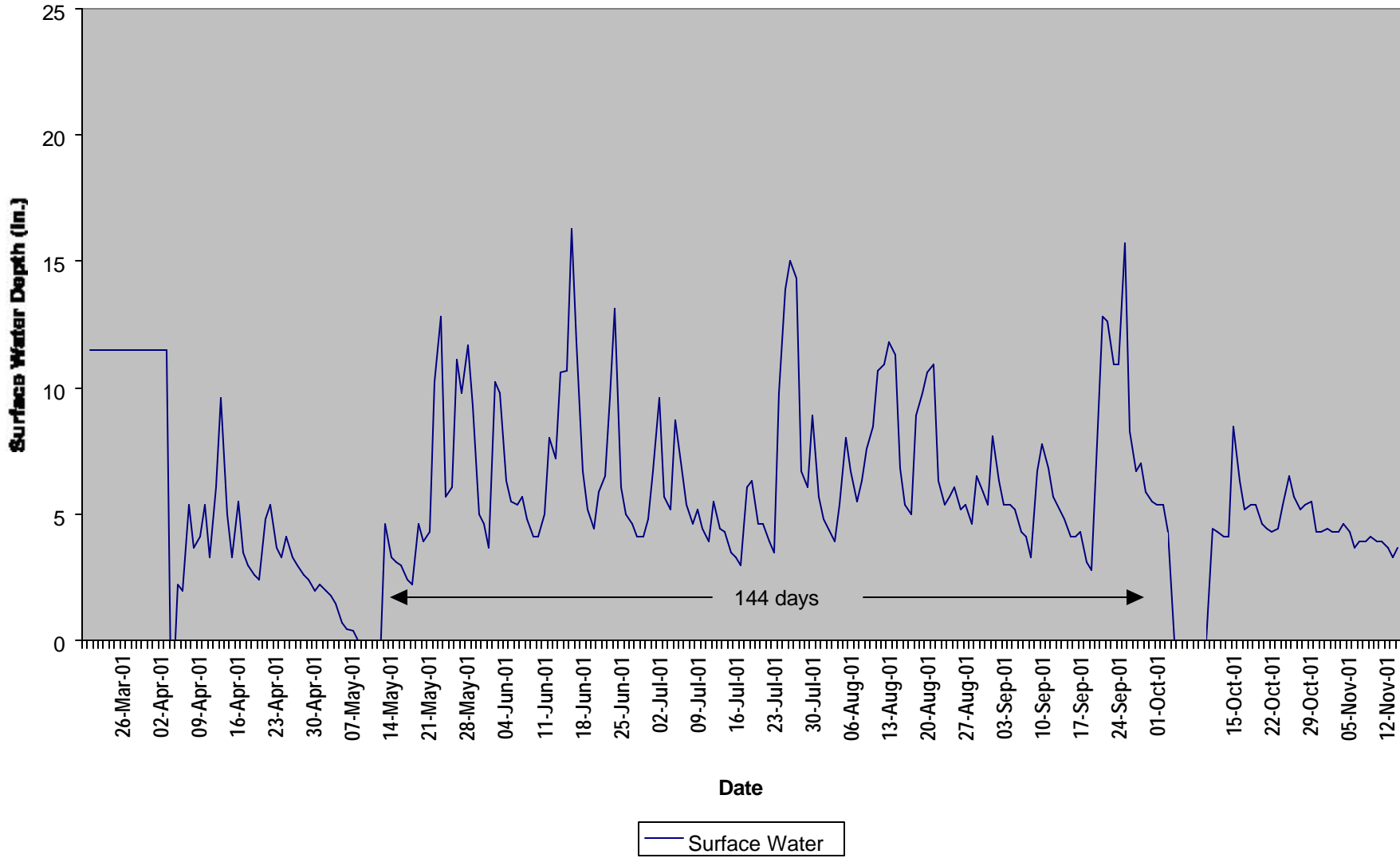
Ballance Farm Monitoring Gauge BFSG-13



Ballance Farm Monitoring Gauge BFSG-14



Ballance Farm Monitoring Gauge BFSG-15



BALLANCE FARM

APPENDIX B SITE PHOTOS

BALLANCE FARM



Photo 1



Photo 2



Photo 3



Photo 4

BALLANCE FARM



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10

BALLANCE FARM



Photo 11



Photo 12



Photo 13



Photo 14