Juniper Bay Wetland Mitigation Site
Robeson County, NC

2007 Annual Monitoring Report
Year 2 of 5

NCEEP Project Number 201

Submitted To:
NCDENR/Ecosystem Enhancement Program
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Executive Summary

The Juniper Bay Mitigation Site (JBMS) is a Carolina bay located in Robeson County, North Carolina comprising 728.5 acres. The site was constructed by the North Carolina Department of Transportation and is managed by the North Carolina Ecosystem Enhancement Program in order to provide compensatory wetland mitigation credits in the Lumber River Basin. The site previously was used for agricultural production with a drainage ditch network constructed to drain the site. The goal of the mitigation plan is to restore the hydrologic functions and re-vegetate the site with wetland forest vegetation. The two community types planned for establishment are Peatland Atlantic White Cedar Forest/Bay Forest and Pond Pine Woodland/Bay Forest.

The site was monitored for two primary wetland parameters: hydrology and vegetation. Forty-three automated groundwater monitoring gauges are installed across the site. The hydrologic success criterion requires the soil to be ponded, flooded, or saturated within 12 inches of the surface for a least 12.5% of the growing season during years with normal precipitation. The growing season extends from March 25th to November 4th in Robeson County (225 days). Vegetation success criterion is monitored using 20 (10 meter X 10 meter) vegetative plots. Species composition and density are noted. The minimum survival rates for vegetative success are as follows: 320 stems/acre of target species at end of Year 3, 290 stems/acre at end of Year 4, and 260 stems/acre at end of Year 5.

In 2007, 11 of the 20 plots (45.0%) did not meet the 320 stems/acre success criterion that would be required for Year 3 monitoring. The high rate of unsuccessful vegetation plots is potentially the result of lack of uniform planting as opposed to unfavorable conditions. The baseline stem counts conducted during the 2006 monitoring event indicate nine of the unsuccessful plots could not meet the success criteria for year three with 100 percent survival rates due to existing low stem counts. The lack of damaged or dead stems found in these plots indicates the initial planting rates in these plots were likely too low to meet the success criteria.

During the 2007 monitoring period, 37 of the 43 monitoring gauges met the hydrology success criterion (Table VI.), an 86.0% success rate. However, based on the JBMS Mitigation Plan, there are 13 gauges located adjacent to the perimeter ditch, which are not expected to be restored to jurisdictional status. Eight of the 13 perimeter gauges met jurisdictional hydrology. A collapsed culvert at the outlet of this perimeter ditch potentially raised water levels creating the higher than expected success rate for the perimeter gauges. Of the remaining 30 interior gauges, 29 met the hydrology success criterion, a 96.7% success rate.

I. Project Background

1.0 Project Objectives

The goal of the Juniper Bay Mitigation Site (JBMS) is to restore natural wetland functions, processes, structure, and species composition to the site for compensatory wetland mitigation due to highway construction impacts in the Lumber River Basin. The objectives for this site entail restoring the predicted conditions which existed on site prior to human disturbance. The mitigation plan is accomplished through elimination of the drainage ditch network, grading the land surface to eliminate field crowns and promote microtopography, and establishing wetland forest vegetation on site. The pre-disturbance site conditions are based upon reference system analysis, hydrology monitoring and modeling, soil investigations, and published literature.

2.0 Project Structure, Restoration Type, and Approach

This 728.5 ac site was constructed to provide compensatory mitigation for several projects including Transportation Improvement Projects (TIP) R-513, R-2593, and R-3333 in the Lumber River Basin (Hydrologic Unit 03040203). Initially, only 1.6 percent of the Juniper Bay property was jurisdictional due to the extensive drainage. Therefore, the majority of the compensatory mitigation will qualify as nonriverine wetland restoration.

The site was originally cleared and ditched over a period of 15 years beginning between 1966 and 1972 to facilitate agricultural production. A drainage ditch network running in a north-south direction was initially established. This system was established along the western third of the site. As of 1981, the entire site had been cleared, and the current northwest to southeast ditch network had been established. Additionally, another drainage ditch runs along the entire perimeter of the site. In 1994, longleaf pine was planted in three large fields on the southern portion of the property. The site was used for agricultural production until being purchased by the North Carolina Department of Transportation (NCDOT) in January 2000. The site was constructed by the NCDOT in 2006 and is managed by the North Carolina Ecosystem Enhancement Program (EEP).

The site is a Carolina bay comprising 728.5 acres of which 567.7 acres are part of the mitigation component where jurisdictional hydrology is to be enhanced or restored. The remaining 160.8 acres are considered to be non-restorable areas due to the perimeter ditch that has been left open in order to avoid hydrologic trespass issues. Mitigative measures are not expected to return jurisdictional hydrology to these areas and they effectively serve as an upland buffer.

The hydrologic restoration plan involves systematically plugging and backfilling the interior ditch network to increase surface and subsurface water storage capacity and to increase the retention of water onsite. The wetland vegetation restoration plan is to establish two natural community types: Peatland Atlantic White Cedar Forest/Bay Forest and Pond Pine Woodland/Bay Forest. The Peatland Atlantic White Cedar Forest/Bay Forest community was planted in low lying areas dominated by organic soils and the Pond Pine Woodland/Bay Forest community was planted in areas with higher elevation dominated by sandy soils.

Table I lists the estimated wetland acreage by community type to be restored or enhanced on the JBMS. The proposed mitigation plan provides for the restoration and enhancement of 567.7 acres of nonriverine wetlands.

Table I. Project Restoration Components Juniper Bay Wetland Mitigation Site-EEP # 201		
Community Type	**Mitigation Type**	**Acreage**
Peatland Atlantic White Cedar Forest	Restoration	264.8
Peatland Atlantic White Cedar Forest	Enhancement	11.8
Pond Pine Woodland	Restoration	291.1
	Total	**567.7**
Non-restorable areas	**Total**	**160.8**
Juniper Bay Mitigation Site	**Total**	**728.5**

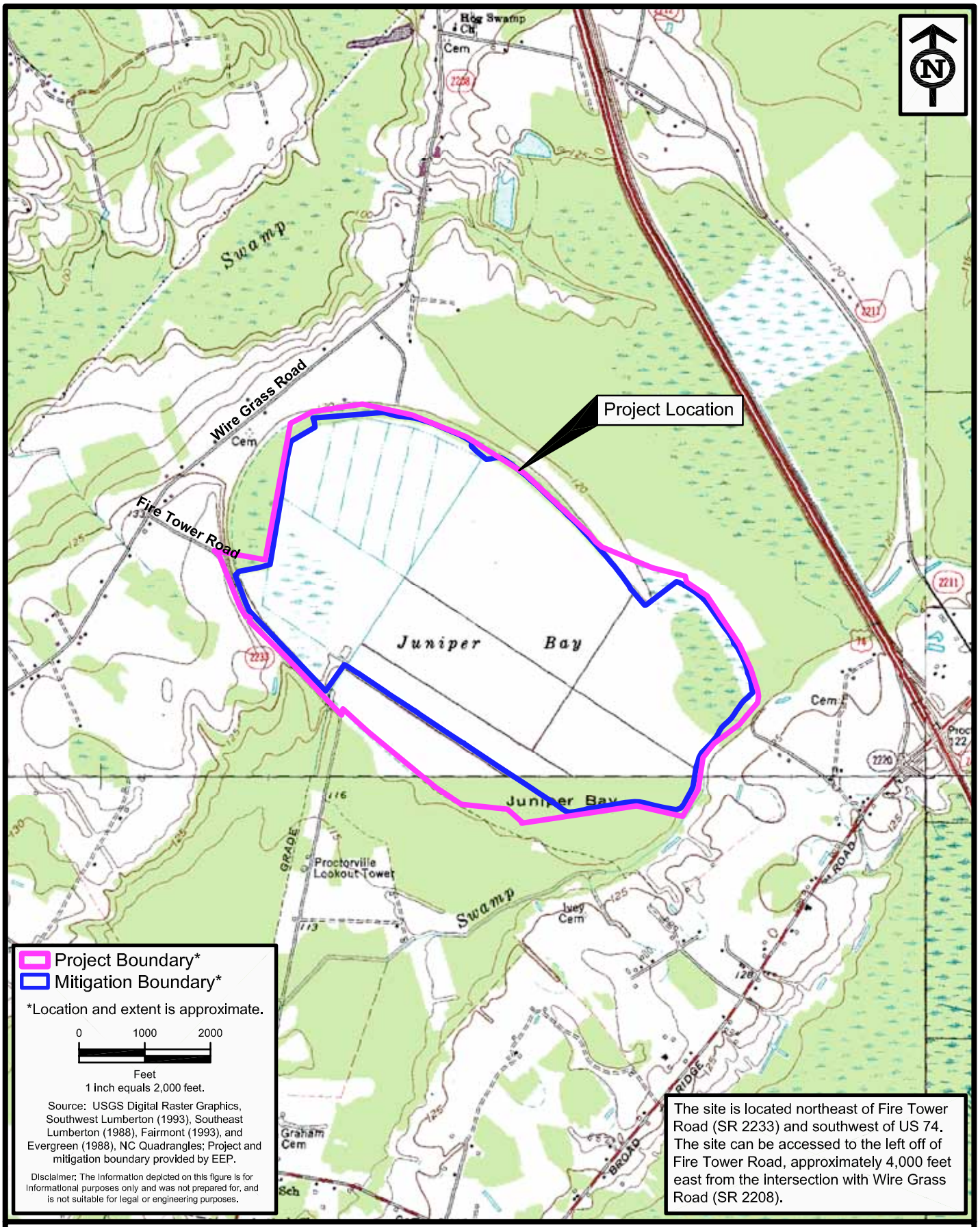
In order to demonstrate successful mitigation, hydrologic and vegetation monitoring is to be conducted for a minimum of five years. Relic hydric soils are present at the site negating the necessity for soil monitoring. Successful hydrological criterion requires the soil be ponded, flooded, or saturated within 12 inches of the surface for at least 12.5% of the growing season during a year with normal precipitation levels. The growing season for Robeson County is from March 25th to November 4th (225 days), therefore in order to demonstrate success, a gauge must have saturated conditions for a minimum of 28 consecutive days during the growing season.

According to the JBMS Mitigation Plan, the appropriate species mixes were planted at a rate of 680 stems/acre. Success criterion for vegetation restoration states there must be a minimum of 320 stems/acre of target species at the end of the third year of monitoring, 290 stems/acre at the end of Year 4, and 260 stems/acre for the end of Year 5. Using the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006), the vegetation plots will be monitored for success criterion for a minimum of five years. Photographs of the vegetation plots from the same viewpoints annually will provide a visual record of plot growth. Vegetative data will be correlated with the appropriate hydrologic data from the groundwater monitoring gauges to determine if success criteria are being met.

Planted seedlings and natural recruitment of the target species are included in the vegetation survival criterion. Survival and density of planted tree stock and natural recruitment will be reported and evaluated relative to the success criterion. At least six different representative tree species should be present on the entire site. If vegetation success criterion is not met, the reasons for failure will be examined and appropriate corrective action will be taken.

3.0 Location and Setting

The Juniper Bay Wetland Mitigation Site is located in eastern Robeson County, North Carolina approximately 7.5 miles south of Lumberton, North Carolina and 4.5 miles east of Fairmont, North Carolina in the Coastal Plain physiographic region. The site is located in an interstream divide between two streams, Hog Swamp and Big Branch. The surrounding land use consists primarily of managed forest and agricultural production. Few residential properties are located along Wiregrass Road and Fire Tower Road.



Project Boundary*
Mitigation Boundary*

*Location and extent is approximate.

0 1000 2000

Feet
1 inch equals 2,000 feet.

Source: USGS Digital Raster Graphics, Southwest Lumberton (1993), Southeast Lumberton (1988), Fairmont (1993), and Evergreen (1988), NC Quadrangles; Project and mitigation boundary provided by EEP.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes.

The site is located northeast of Fire Tower Road (SR 2233) and southwest of US 74. The site can be accessed to the left off of Fire Tower Road, approximately 4,000 feet east from the intersection with Wire Grass Road (SR 2208).

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Ecosystem Enhancement

Composite Vicinity Map
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 2

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	AJS/GT
Figure:	1

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4.0 Project History and Background

Table II provides the timeline for data collection completion and for actual completion of various construction and monitoring milestones of the JBMS. The dates for several of these activities were unavailable at the time of report submission.

Table II. Project Activity and Reporting History
Juniper Bay Wetland Mitigation Site-EEP # 201

Activity or Report	Data Collection Complete	Actual Completion
Restoration Plan	N/A	N/A
Final Design-90%	N/A	N/A
Construction	N/A	Phase I Feb 2004; Phase II Jan 2006
Temporary S&E mix applied to entire site	N/A	N/A
Permanent Seed mix applied	N/A	N/A
Mitigation Plan/ As-built (Year 0 Monitoring- baseline)	N/A	Feb 2006
Year 1 Monitoring	Nov 2006	Dec 2006
Year 2 Monitoring	Nov 2007	Dec 2007
Year 3 Monitoring	N/A	N/A
Year 4 Monitoring	N/A	N/A
Year 5 Monitoring	N/A	N/A

The point of contact for various phases and for the monitoring of the JBMS are provided in Table III.

Table III. Project Contacts
Juniper Bay Wetland Mitigation Site-EEP # 201

Designer Primary project design POC	N.C. Department of Transportation Natural Environment Unit Arcadis
Construction Contractor Construction contractor POC	NCDOT Division 6 Robeson County Maintenance Eugene McKeithan, Highway Maintenance Engineer
Planting Contractor Planting contractor POC	Professional Consolidated, LLC Henry Rozo
Seeding Contractor Seeding contractor POC	NCDOT Division 6 Roadside Environmental Unit James Barnes, Division Roadside Environmental Engineer
Nursery Stock Suppliers	NC Forestry Service (hardwoods); Coastal Plain Conservation Nursery (bays); Hillis Nursery (bays)
Monitoring Performers Wetland and Vegetation POC	Environmental Services, Inc. 524 S. New Hope Road Raleigh, North Carolina 27610 Gail Tyner (919) 212-1760

Relevant project background information for the JBMS is provided in Table IV. The Cowardin classification is based upon a typical Carolina bay system. The current U.S. Fish and Wildlife Service National Wetlands Inventory mapping for the site is based upon the previous drained status of the site. The North Carolina Division of Water Quality (NCDWQ) classification for Project and Reference was unavailable at the time of report submission.

Table IV. Project Background Juniper Bay Wetland Mitigation Site-EEP # 201	
Project County	Robeson County
Drainage Area	904 Acres; 756 acres within the site perimeter
Drainage impervious cover estimate (%)	1%
Physiographic Region	Coastal Plain
Ecoregion	651 Atlantic Southern Loam Plain
Cowardin Classification	PFOB4/6
Dominant soil types	Ponzer muck, Leon sand, Rutledge loamy sand, Pantego fine sandy loam
Reference site ID	Tatum Millpond Bay, Bladen County, NC
USGS HUC for Project and Reference	03040203
NCDWQ Sub-basin for Project and Reference	03-07-54
NCDWQ classification for Project and Reference	N/A
Any portion of the project 303d listed?	No
Any upstream portion 303d listed?	No
% of project easement fenced	Gate at access road

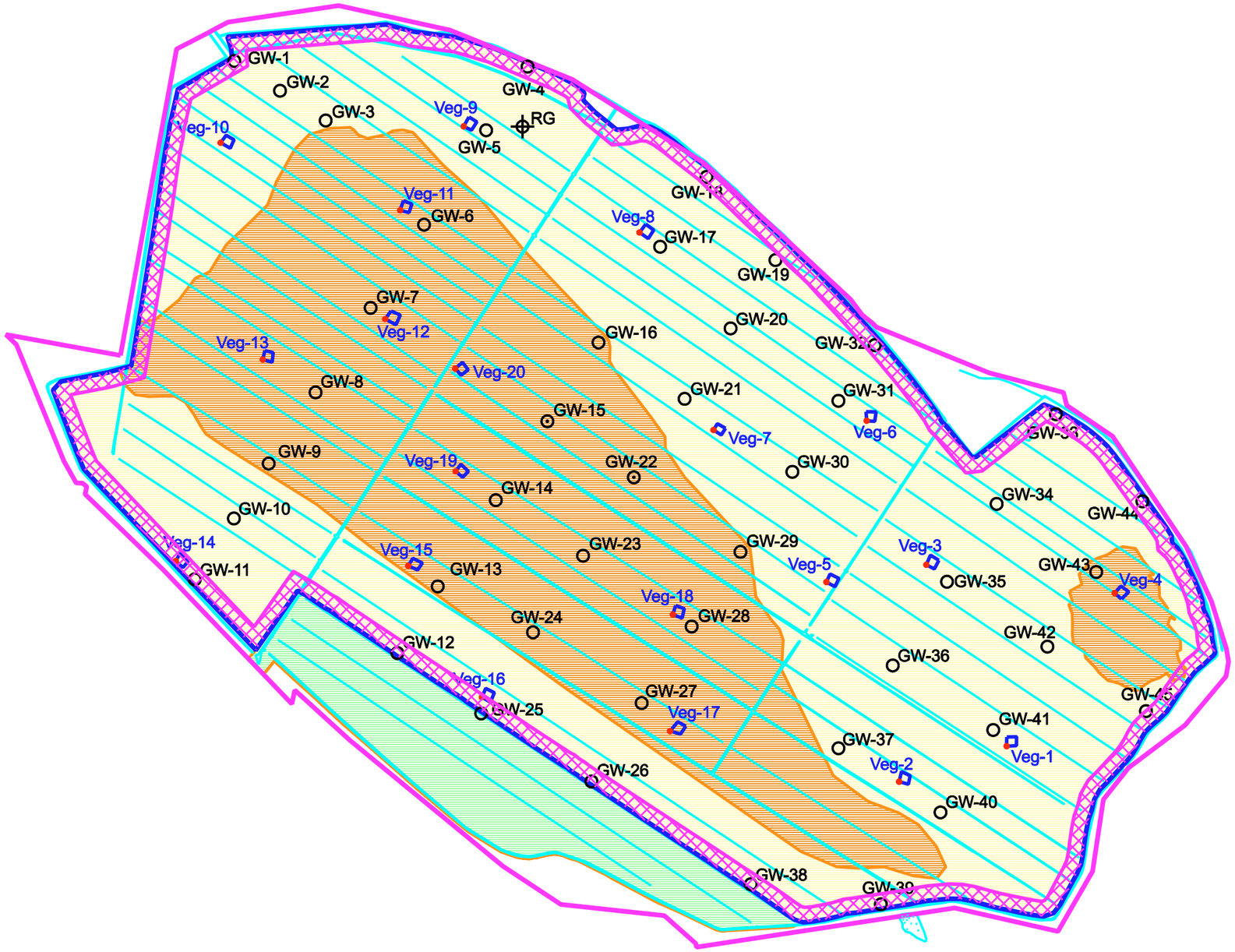
5.0 Monitoring Plan View

In 2006, hydrologic monitoring was initiated across the site. Environmental Services, Inc. installed 43 groundwater gauges. Gauges GW-15 and GW-22 were not installed due to high water conditions. There are 30 gauges installed within the Pond Pine Woodland/ Bay Forest community, and 13 gauges installed within the Peatland Atlantic White Cedar Forest/Bay Forest community. Groundwater monitoring is conducted onsite to determine if the hydrologic success criterion for a wetland mitigation site is being met.

One rain gauge is installed onsite. This precipitation data will be compared to data from the National Oceanic & Atmospheric Administration (NOAA) gauge station in Lumberton, North Carolina to determine the reliability of the onsite data.

The vegetation monitoring is conducted using 20 plots as representative samples of the entire site. The vegetation plots are 10 meters by 10 meters. For each plot, species composition and density are recorded to determine if vegetative success criterion is met.

Figures 2A-D provide plan views of the site showing the location of all monitoring features including groundwater gauges, vegetation plots, photo points, and the rain gauge.



- Project Boundary*
- Mitigation Boundary*
- Non-Restorable Area*
- Pond Pine Woodland / Bay Forest*
- Peatland Atlantic White Cedar Forest / Bay Forest*
- Longleaf Pine Stand*
- Ditch*
- Vegetation Plot*
- Photo Location*
- Monitoring Well - Installed*
- Monitoring Well - Not Installed*
- Rain Gauge*

*Location and extent is approximate.

0 400 800
Feet
1 inch equals 800 feet.

Source: Ecosystem Enhancement Program.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	KT/GT
Figure:	2a

Monitoring Plan View - Monitoring Gauges and Vegetation Plots

Juniper Bay

Robeson County, North Carolina

Monitoring Report Year 2

Ecosystem Enhancement Program

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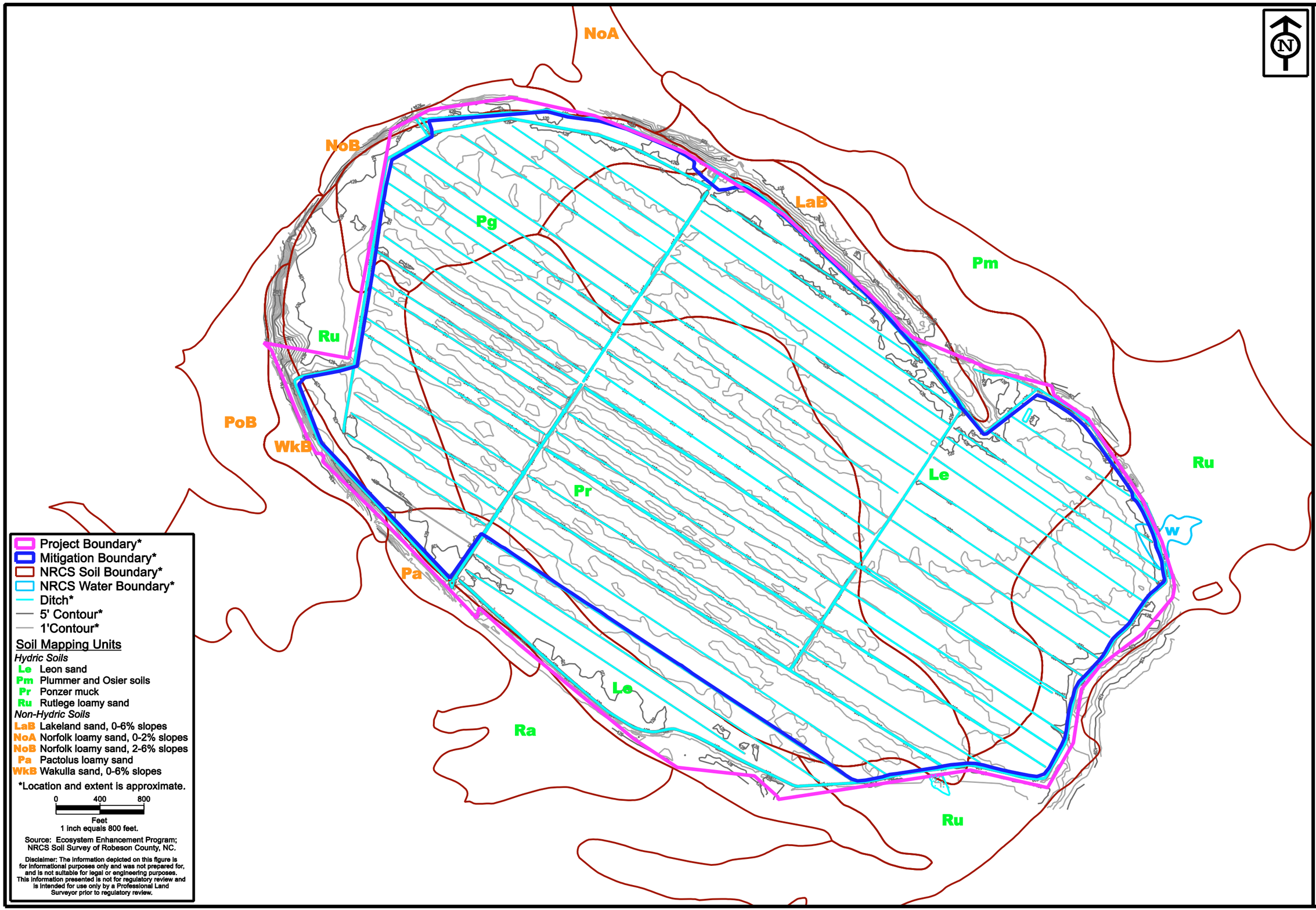

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	AJS/GT
Figure:	2b

Monitoring Plan View - NRCS Soils and Contours

Juniper Bay

Robeson County, North Carolina

Monitoring Report Year 2

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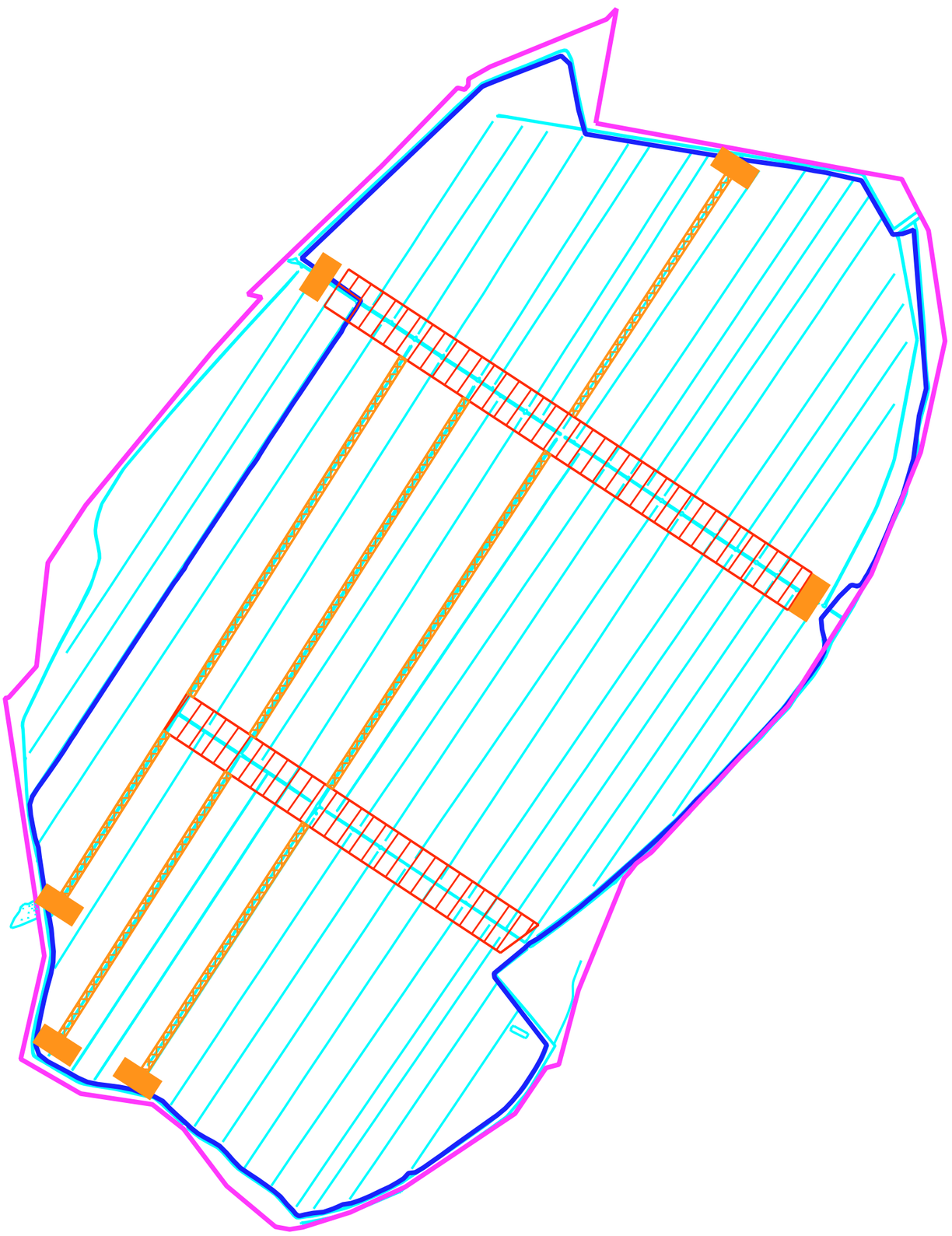

Project Boundary*
Mitigation Boundary*
Ditch Backfilling*
Grading Area*
Ditch Plug*
Ditch*

*Location and extent is approximate.

0 400 800
Feet
1 Inch equals 800 feet.

Source: Ecosystem Enhancement Program.

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Ecosystem Enhancement

Monitoring Plan View - Ditch Network and Application
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 2

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	AJS/GT
Figure:	2c

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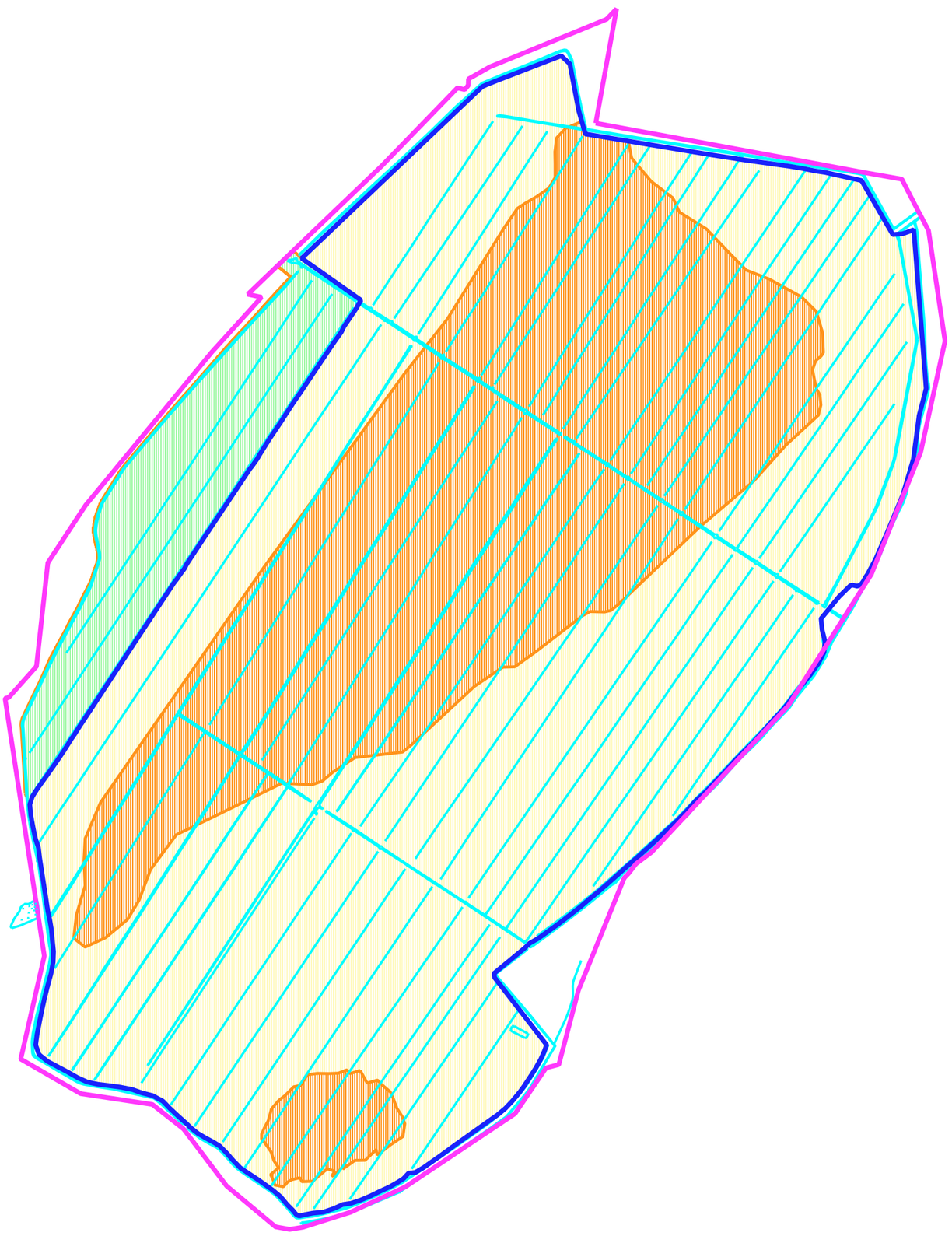

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Ecosystem Enhancement

Monitoring Plan View - Plant Communities
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 2

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	AJS/GT
Figure:	**2d**

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II. Project Condition and Monitoring Results

1.0 Vegetation Assessment

The vegetation success criteria were developed in accordance with Environmental Protection Agency guidelines detailed in Mitigation Site Type documentation and U.S. Army Corps of Engineers Compensatory Hardwood Mitigation Guidelines. Two community types were planned at the site: Peatland Atlantic White Cedar Forest/Bay Forest and Pond Pine Woodland/Bay Forest. The target species are based on the Tatum Millpond Bay reference site and North Carolina Natural Heritage Program (NCNHP) community descriptions. The appropriate species mix was planted in the two specified communities at a rate of 680 stems/acre (Table V).

Table V. Species for Each Community Type		
Peatland Atlantic White Cedar Forest/ Bay Forest		
Atlantic white cedar	*Chamaecypari thyoides*	OBL
Loblolly bay	*Gordonia lasianthus*	FACW
Swamp tupelo	*Nyssa sylvatica* var. *biflora*	OBL
Bald cypress	*Taxodium distichum*	OBL
Sweetbay	*Magnolia virginiana*	FACW+
Pond pine	*Pinus serotina*	FACW+
Swamp red bay	*Persea palustris*	FACW
Pond Pine Woodland/ Bay Forest		
Pond pine	*Pinus serotina*	FACW+
Loblolly bay	*Gordonia lasianthus*	FACW
Sweetbay	*Magnolia virginiana*	FACW+
Atlantic white cedar	*Chamaecyparis thyoides*	OBL
Loblolly pine	*Pinus taeda*	FAC
Swamp red bay	*Persea palustris*	FACW
Overcup oak	*Quercus lyrata*	OBL

Using the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (Lee et al. 2006), 20 (10 meter X 10 meter) plots were designated across the site based on proximity to groundwater gauges and representative conditions for the site as a whole. Stem counts by species were conducted for each plot, including vigor and damage estimates. Volunteer trees were not included in the stem counts, although natural recruitment of target species is included. The 2007 monitoring event for the JBMS represents the second year of monitoring. There is no vegetative success criterion for Years one and two. However, the third year success criterion is 320 stems/acre of target species. Therefore, any plots with stem counts less than 320 stems/acre will not be considered to have met the vegetative success criterion.

1.1 Vegetative Problem Areas

Nine of the 20 (45.0%) vegetation plots met the Year 3 success criteria of 320 stems/acre after the second year of monitoring. Two of the 9 (22.2%) plots in the Peatland Atlantic White Cedar Forest/ Bay Forest community met the vegetative success criterion. Seven of the 11 (63.6%) plots in the Pond Pine Woodland/ Bay Forest community met the vegetative success criterion (Table VI).

It is assumed for monitoring purposes that the appropriate species mix was planted in the two specified communities at a rate of 680 stems/acre. However, due to the low numbers of damaged or dead trees found in the plots not meeting the success criterion, there is a possibility that the original planting distribution may not have been 680 stems/acre across the

entire site. The high rate of unsuccessful vegetation plots appears to be due more to the lack of uniform planting as opposed to unfavorable conditions.

Plots 7, 9, 13, 14, 15, 16, and 19 did not meet the Year 3 success criterion of 320 stems/acre although these plots had 100 percent survival rates. The baseline stem counts for these plots during the 2006 monitoring event indicate these plots cannot meet the success criteria for monitoring years three and four even with a 100 percent stem survival rate. This is potentially due to the lack of uniform planting rates lower than the success criterion as evidenced by the lack of damaged or dead stems. Plots 9, 15, and 19 cannot meet the Year 5 survival criterion of 260 stems/acres with 100 percent stem survival rates.

Plots 4 and 20 did not meet the Year 3 success criterion of 320 stems/acre. Plots 4 and 20 each had one dead stem for the 2007 monitoring event. However, had these two plots had 100 percent survival, they would not have met the Year 3 success criterion due to low stem counts. Plots 4 and 20 are located in areas of the site with the highest water levels, often exceeding 12 inches, which potentially contributed to the sapling mortality. Plot 4 is located in a topographic depression underlain by a clayey subsoil and is located too far from a primary ditch outlet to receive complete drainage. Further compounding the high water levels experienced in these areas was a collapsed culvert at the outlet of a primary perimeter ditch. The collapsed culvert resulted in water levels higher than expected within the site. Plot 11 had one dead stem and Plot 18 had two dead stems. These plots also normally experience high water levels, but with the raised water levels resulting from the collapsed culvert, it is possible the dead stems were the result of higher than normal water levels.

Plot 5, although successful in meeting the 320 stems/acre criterion, experienced significant loss of stems. Twenty of the 42 stems were recorded as missing during the 2007 monitoring event. The bald cypress stems were the only species which survived. All swamp tupelo (8), overcup oak (5), and swamp red bay (7) stems were missing from the plot. Plot 5 is located on the edge of one of the graded southwest to northeast ditches. It appears that low water levels due to drought conditions late in the growing season have enabled all-terrain vehicular (ATV) traffic to travel through this area causing the high stem missing rate. The vehicular traffic through this plot has been resolved by flagging the perimeter and instructing others on-site to avoid this area.

The effects of drought conditions late in the growing season were observed in multiple plots, primarily in the form of leaf scorch. Low vigor scores were attributed to the drought conditions for multiple plots. It is unknown what effects the drought will have upon the survival rates of stems for the 2008 monitoring event.

Herbaceous competition and vine strangulation in plots 12 and 15 could potentially become an issue in the future. Although, not reflected in the vigor scores for the 2007 monitoring event, climbing hempweed (*Mikania scandens*) has begun to blanket areas of these plots which could affect survival rates of the stems.

The overall vegetation success rate is low and is not expected to increase in the upcoming monitoring years. The areas not meeting the vegetative success criterion warrant further investigation.

Representative photographs of drought, traffic, submergence, and herbaceous problem areas are identified in Table 6 of Appendix A.

1.2 Vegetative Problem Area Plan View

Figure 3A in Appendix A provides an overview of all vegetative problem areas with regard to the scale and layout of the entire project.

Refer to Appendix A for additional vegetation related data and information.

2.0 Wetland Assessment

In accordance with federal guidelines for wetland mitigation, the success criterion for hydrologic restoration states that the soil must be ponded, flooded, or saturated within 12 inches of the surface for at least 12.5% of the growing season during years with normal precipitation. The growing season for this site extends from March 25th to November 4th (225 days). Therefore, in order to demonstrate success, a gauge must have saturated conditions within 12 inches of the surface for a minimum of 28 consecutive days during the growing season.

There are a total of 43 automated groundwater monitoring gauges installed across the site. The gauges are installed in each community type in accordance with federal guidelines. Precipitation data was collected by an onsite rain gauge. For comparative purposes, precipitation data is also obtained from a NOAA gauge station in Lumberton, North Carolina.

2.1 Wetland Problem Areas

During the 2007 monitoring period, 37 of the 43 monitoring gauges met the hydrology success criteria (Table VI.), an 86.0% success rate. However, based on the JBMS Mitigation Plan, there are 13 gauges located adjacent to the perimeter ditch that area not expected to be restored to jurisdictional status. Eight of the 13 perimeter gauges met jurisdictional hydrology. Of the remaining 30 interior gauges, 29 met the hydrology success criterion, a 96.7% success rate. Hydrographs for the individual monitoring gauges can be found in Appendix B.

There are 13 perimeter gauges that are located adjacent the perimeter ditch in the Pond Pine Woodland/ Bay Forest community. The perimeter ditch remains open in order to avoid hydrologic trespass issues. The location of these 13 gauges represents portions of the site which are not expected to meet the wetland criterion due to the adjacent ditch's zone of influence. Additionally, Carolina bay topography is somewhat bowl shaped. The center of the mitigation site has a lower elevation, but slopes outward to a dry sand ridge, which encloses the bay. These 13 gauges are all located in this drier sand ridge area. Five of the 13 perimeter gauges did not meet the hydrologic success criterion. This higher than expected success rate for the perimeter gauges reflect the higher than expected water levels due to the collapsed culvert at the outlet of this perimeter ditch. The culvert was repaired in September 2007.

Of the 17 remaining gauges in the Pond Pine Woodland/ Bay Forest community; 16 (94.1%) met the hydrological success criterion. Gauge GW-41 did not meet the hydrologic success criterion. The soils within this community type are sandy with higher infiltration rates than those in the Peatland Atlantic White Cedar Forest/ Bay Forest community. The hydrograph

for GW-41 reflects the high infiltration rate for these soils in that the water levels tend to peak after a rain event but quickly drop within days of the event.

Of the 13 gauges in the Peatland Atlantic White Cedar Forest/ Bay Forest community, 13 (100%) met the hydrological success criterion. The Peatland Atlantic White Cedar Forest/ Bay Forest community was designated for areas of the site with the lowest elevations and often wetter conditions. The soils in this community type are primarily poorly drained organic soils.

Gauges GW-1, GW-20, and GW-43 malfunctioned for short periods of the growing season and were replaced. These three gauges met the hydrologic success criterion regardless of the periods of missing data. The missing data for Gauges GW-1 and GW-20 does not affect the longest consecutive hydroperiod. Gauge GW-43 recorded 60 consecutive days of jurisdictional hydrology with one data gap. Using adjacent data points to extrapolate missing data, it can be assumed that Gauge GW-43 would have made jurisdictional hydrology for 57.3% of the growing season.

The collapsed culvert at the outlet of the perimeter ditch appears to have contributed to greater success levels in 2007 when compared to 2006. This increase is most evident along the perimeter of the site and within the Pond Pine Woodland/ Bay Forest community. The 2007 hydrographs, when compared to the 2006 hydrographs, consistently display increased water levels early in the growing season with less dramatic increases and decreases. The higher and relatively stable water levels experienced early in the growing season of 2007 enabled many areas to achieve the necessary 28 consecutive days of water within 12 inches of the surface early in the season. Meeting the success criterion early in the season is significant because the 2007 hydrographs reveal a severe decrease in water levels due to drought conditions beginning as early as June and extending through the end of the growing season.

2.2. Problem Areas Plan View (Wetland)

Figure 4 in Appendix B provides an overview of all hydrologic problem areas with regard to the scale and layout of the entire project.

Refer to Appendix A for additional vegetation related data and information. Gauges are identified in terms of meeting hydrologic success criteria.

Table VI. Wetland Criteria Attainment by Community Type Juniper Bay Wetland Mitigation Site-EEP# 201					
Peatland Atlantic White Cedar Forest/ Bay Forest					
Gauge	**Hydrology Success Met**	**Community Type Mean**	**Vegetation Plot**	**Vegetative Success Met**	**Community Type Mean**
GW-6	Y	100%	Veg-4	N	22.2%
GW-7	Y		Veg-11	N	
GW-8	Y		Veg-12	Y	
GW-9	Y		Veg-13	N	
GW-13	Y		Veg-15	N	
GW-14	Y		Veg-17	Y	
GW-15	Not Installed		Veg-18	N	
GW-16	Y		Veg-19	N	
GW-22	Not Installed		Veg-20	N	
GW-23	Y				
GW-24	Y				
GW-27	Y				
GW-28	Y				
GW-29	Y				
GW-43	Y				

Table VI. (continues)

Table VI. (concluded) Pond Pine Woodland/Bay Forest					
Perimeter Gauges					
Gauge	**Hydrology Success Met**	**Community Type Mean**	**Vegetation Plot**	**Vegetative Success Met**	**Community Type Mean**
GW-1	Y	61.5%			N/A
GW-4	N				
GW-11	N				
GW-12	Y				
GW-18	Y				
GW-25	Y				
GW-26	Y				
GW-32	N				
GW-33	N				
GW-38	Y				
GW-39	Y				
GW-44	N				
GW-45	Y				
Wetland Criteria Attainment by Community Type Juniper Bay Wetland Mitigation Site-EEP# 201					
Pond Pine Woodland/Bay Forest					
Interior Ditches					
Gauge	**Hydrology Success Met**	**Community Type Mean**	**Vegetation Plot**	**Vegetative Success Met**	**Community Type Mean**
GW-2	Y	94.1%	Veg-1	Y	63.6%
GW-3	Y		Veg-2	Y	
GW-5	Y		Veg-3	Y	
GW-10	Y		Veg-5	Y	
GW-17	Y		Veg-6	Y	
GW-19	Y		Veg-7	N	
GW-20	Y		Veg-8	Y	
GW-21	Y		Veg-9	N	
GW-30	Y		Veg-10	Y	
GW-31	Y		Veg-14	N	
GW-34	Y		Veg-16	N	
GW-35	Y				
GW-36	Y				
GW-37	Y				
GW-40	Y				
GW-41	N				
GW-42	Y				

III. Methodology Section

The second year of monitoring for JBMS occurred in 2007. Using the CVS-EEP Protocol for Recording Vegetation, Version 4.0 (CVS Methods) (Lee et al. 2006), 20 (10 meter X 10 meter) plots were designated across the site based on proximity to groundwater gauges and representative conditions for the site as a whole. Stem counts by species were conducted for each plot, including vigor and damage estimates. Volunteer trees were not included in the stem counts, although natural recruitment of target species is included. The taxonomic standard for vegetation that was applied was the Manual of the Vascular Flora of the Carolinas (Radford 1968). No deviations regarding sampling procedures occurred.

IV. References

Lee, Michael T., Peet, Robert K., Roberts, Steven D., Wentworth, Thomas R. 2006. CVS-EEP Protocol for Recording Vegetation Version 4.0. Retrieved September 1 2007, from: http://cvs.bio.unc.edu/methods.htm.

Radford, Albert E., H.E. Ahles, and C.R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill, NC. 1183 pp.

Appendix A

Vegetation Data Tables

Vegetation Photos

1. Vegetation Data Tables

Table 1. Vegetation Metadata

Report Prepared By	Todd Milam
Date Prepared	9/14/2007 9:56
database name	Juniper Bay Baseline_and_Year 1.mdb
database location	C:\Program Files\EEP.CVS.Entrytool
computer name	ES01171

DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------

Metadata	This worksheet, which is a summary of the project and the project data.
Proj, planted	Each project is listed with its PLANTED stems, for each year. This excludes live stakes and lists stems per acre.
Proj, total stems	Each project is listed with its TOTAL stems, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. Listed in stems per acre.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
ALL Stems by Plot and spp	Count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.

PROJECT SUMMARY----------

Project Code	201
project Name	Juniper Bay
Description	A Carolina bay mitigation site
River Basin	Lumber
area (sq m)	
Sampled Plots	20

Table 2. Vegetation Vigor by Species							
	Species	**4**	**3**	**2**	**1**	**0**	**Missing**
	Chamaecyparis thyoides	2					
	Nyssa aquatica	6			1		8
	Persea palustris						7
	Pinus serotina	10	3	2	1	3	1
	Pinus taeda	48	1		2	1	
	Quercus lyrata	15		2	5		5
	Taxodium distichum	44	4	6	1	3	
	Magnolia virginiana	7		1			
Tot:	**8**	**132**	**8**	**11**	**10**	**7**	**21**

Table 3. Vegetation Damage by Species								
	Species	**All Damage Categories**	**No damage**	**Drought**	**Site Too Wet**	**Unknown**	**Vine Strangulation**	**other damage**
	Chamaecyparis thyoides	2	2					
	Magnolia virginiana	8	7					1
	Nyssa aquatica	15	14	1				
	Persea palustris	7	7					
	Pinus serotina	20	15		2			3
	Pinus taeda	52	49		1	1	1	
	Quercus lyrata	27	20	7				
	Taxodium distichum	58	48	6		4		
Tot:	**8**	**189**	**162**	**14**	**3**	**5**	**1**	**4**

Table 4. Vegetation Damage by Plot

	plot	All Damage Categories	No damage	Drought	Site Too Wet	Unknown	Vine Strangulation	Other damage
	00201-01-0001-year:2	10	7	3				
	00201-01-0002-year:2	9	8	1				
	00201-01-0003-year:2	15	10	5				
	00201-01-0004-year:2	6	6					
	00201-01-0005-year:2	42	38			4		
	00201-01-0006-year:2	8	7	1				
	00201-01-0007-year:2	7	7					
	00201-01-0008-year:2	10	6	4				
	00201-01-0009-year:2	4	3			1		
	00201-01-0010-year:2	10	10					
	00201-01-0011-year:2	8	5					3
	00201-01-0012-year:2	9	8				1	
	00201-01-0013-year:2	7	7					
	00201-01-0014-year:2	7	7					
	00201-01-0015-year:2	6	6					
	00201-01-0016-year:2	7	7					
	00201-01-0017-year:2	11	11					
	00201-01-0018-year:2	8	5		2			1
	00201-01-0019-year:2	4	4					
	00201-01-0020-year:2	1			1			
Tot:	**20**	**189**	**162**	**14**	**3**	**5**	**1**	**4**

Table 5. Stem Count by Plot and Species

	Species	Total Planted Stems	# plots	avg# stems	plot 00201-01-0001-year:2	plot 00201-01-0002-year:2	plot 00201-01-0003-year:2	plot 00201-01-0004-year:2	plot 00201-01-0005-year:2	plot 00201-01-0006-year:2	plot 00201-01-0007-year:2	plot 00201-01-0008-year:2	plot 00201-01-0009-year:2	plot 00201-01-0010-year:2	plot 00201-01-0011-year:2	plot 00201-01-0012-year:2	plot 00201-01-0013-year:2	plot 00201-01-0014-year:2	plot 00201-01-0015-year:2	plot 00201-01-0016-year:2	plot 00201-01-0017-year:2	plot 00201-01-0018-year:2	plot 00201-01-0019-year:2
	Chamaecyparis thyoides	2	1	2																2			
	Magnolia virginiana	8	3	2.67														2	3			3	
	Nyssa aquatica	7	5	1.4				1		1	1									1		3	
	Pinus serotina	16	4	4				3							5					1	7		
	Pinus taeda	51	11	4.64	6	5				2	5	2	3	10		5	7	5	1				
	Quercus lyrata	22	6	3.67	3		12			1		2	1							3			
	Taxodium distichum	55	13	4.23	1	4	3	1	20	4	1	5			2	4			2		4		4
Tot:	**7**	**161**	**7**		**10**	**9**	**15**	**5**	**20**	**8**	**7**	**9**	**4**	**10**	**7**	**9**	**7**	**7**	**6**	**7**	**11**	**6**	**4**

Table 6. Vegetative Problem Areas			
Feature/Issue	Plot	Probable Cause	Photo #
Leaf scorch	1	Drought conditions	VPA 1
Human trampled with high mortality	5	Area potentially driven/walked through	VPA 2
Vine strangulation and herbaceous competition	15	Vine and herbaceous growth is overtopping stems	VPA-3
High water levels	20	Plot submerged with water depth exceeding 16”.	VPA 4

Source: Ecosystem Enhancement Program; USGS 1998 Color Infrared Image.

Disclaimer: The information depicted on this figure is for informational purposes only and was not prepared for, and is not suitable for legal or engineering purposes. This information presented is not for regulatory review and is intended for use only by a Professional Land Surveyor prior to regulatory review.

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	KT/GT
Figure:	3a

Vegetation Problem Areas
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 2

ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

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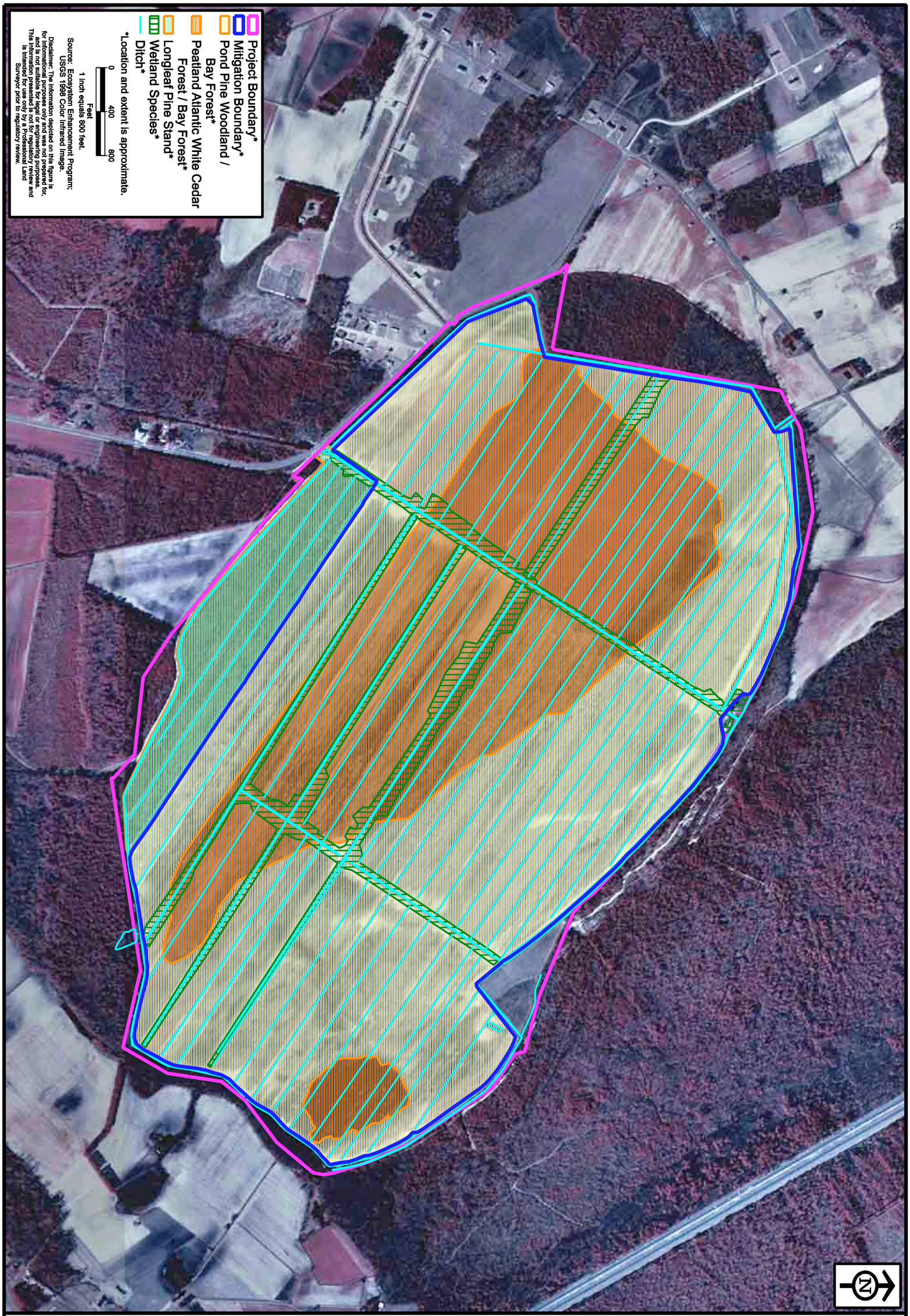


ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

Ecosystem Enhancement

Planting Plan
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 2

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	KT/GT
Figure:	3b

P:\GeoGra\Projects\2006\040\MS\Fig_success_v03.dgn; 02/27/07; 9:00 AM

1. Vegetation Problem Area Photos

VPA-1
Plot 1

Photo Taken 9/10/07

VPA-2
Plot 5

Photo Taken 9/10/07

VPA-3
Plot-15

Photo Taken 9/11/07

VPA-4
Plot 20

Photo Taken 9/11/07

3. Vegetation Monitoring Plot Photos

PLOT 1

2006

Photo Taken 9/19/06

2007

Photo Taken 9/11/07

PLOT 2

2006

Photo Taken 9/19/06

2007

Photo Taken 9/11/07

PLOT 3

2006

Photo Taken 9/19/06

2007

Photo Taken 9/10/07

PLOT 4

2006

Photo Taken 9/21/06

2007

Photo Taken 9/10/07

PLOT 5

2006

Photo Taken 9/19/06

2007

Photo Taken 9/11/07

PLOT 6

2006

Photo Taken 9/19/06

2007

Photo Taken 9/11/07

PLOT 7

2006

Photo Taken 9/19/06

2007

Photo Taken 9/11/07

PLOT 8

2006

Photo Taken 9/19/06

2007

Photo Taken 9/11/07

PLOT 9

2006

Photo Taken 9/18/06

2007

Photo Taken 9/12/07

PLOT 10

2006

Photo Taken 9/18/06

2007

Photo Taken 9/12/07

PLOT 11

2006

Photo Taken 9/18/06

2007

Photo Taken 9/12/07

PLOT 12

2006

Photo Taken 9/18/06

2007

Photo Taken 9/12/07

PLOT 13

2006

Photo Taken 9/18/06

2007

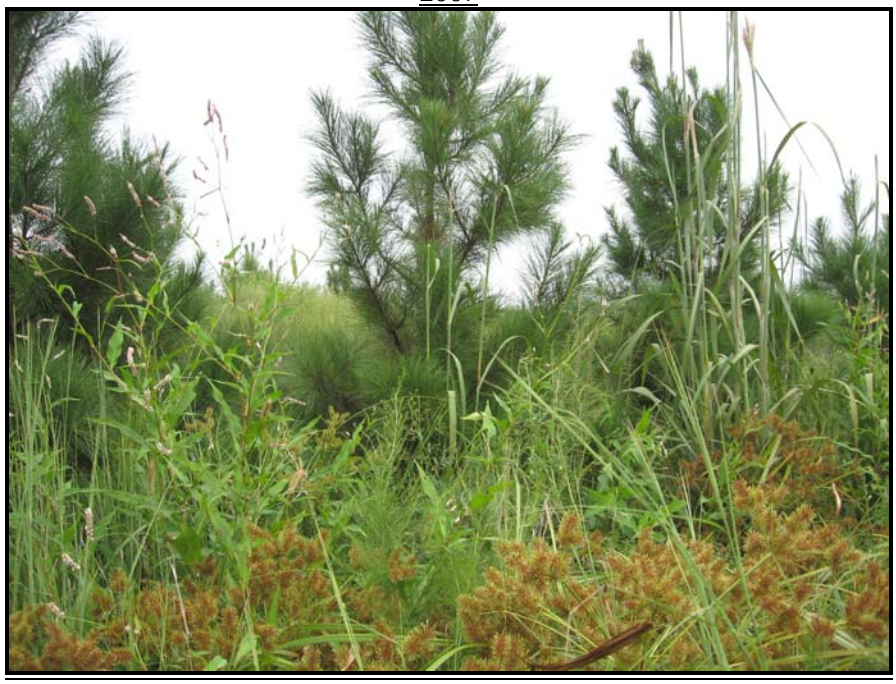


Photo Taken 9/12/07

PLOT 14

2006

Photo Taken 9/18/06

2007

Photo Taken 9/12/07

PLOT 15

2006

Photo Taken 9/20/06

2007

Photo Taken 9/11/07

PLOT16

2006

Photo Taken 9/20/06

2007

Photo Taken 9/10/07

PLOT 17

2006

Photo Taken 9/20/06

2007

Photo Taken 9/11/07

PLOT 18

2006

Photo Taken 9/20/06

2007

Photo Taken 9/11/07

PLOT 19

2006

Photo Taken 9/20/06

2007

Photo Taken 9/11/07

PLOT 20

2006

Photo Taken 9/21/06

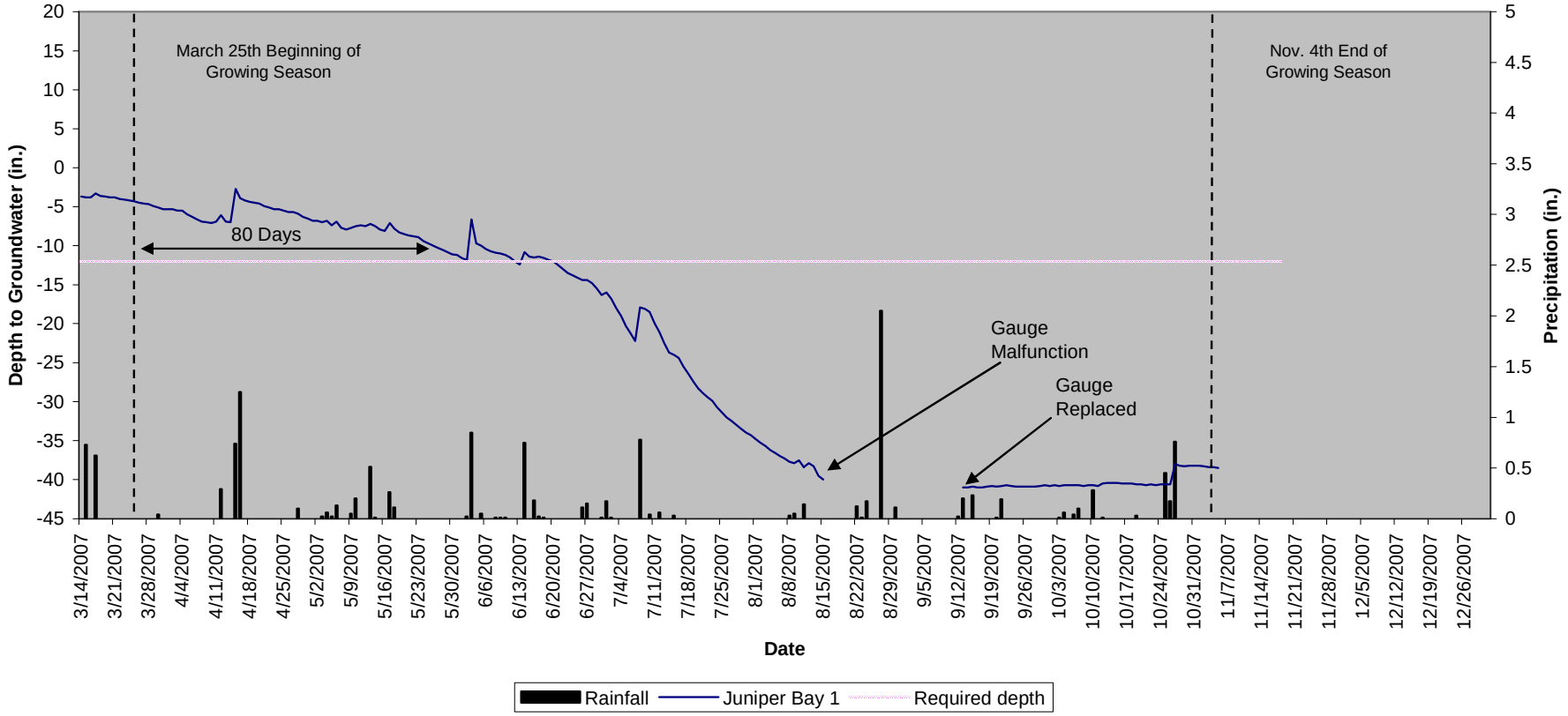
2007

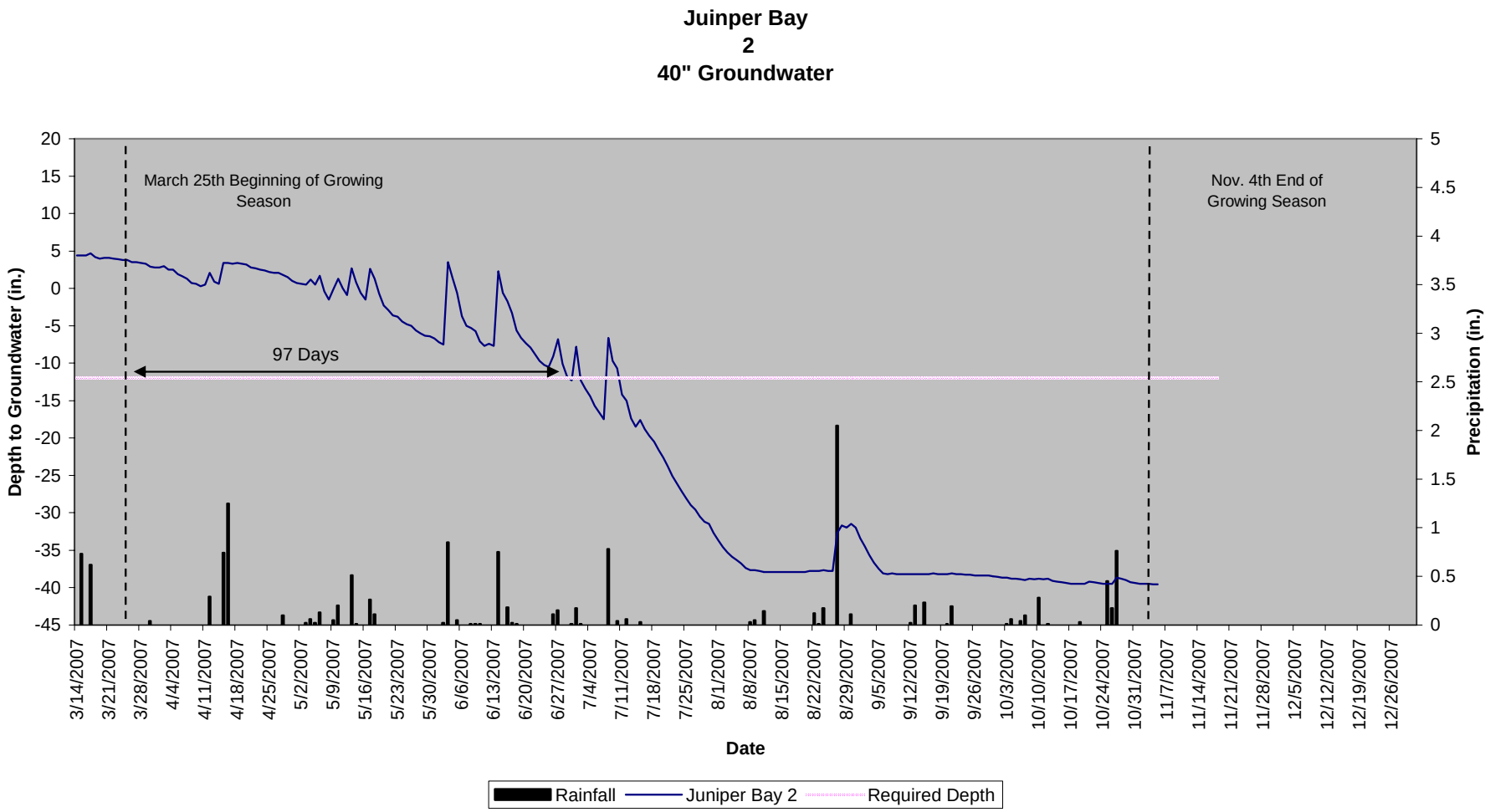
Photo Taken 9/11/07

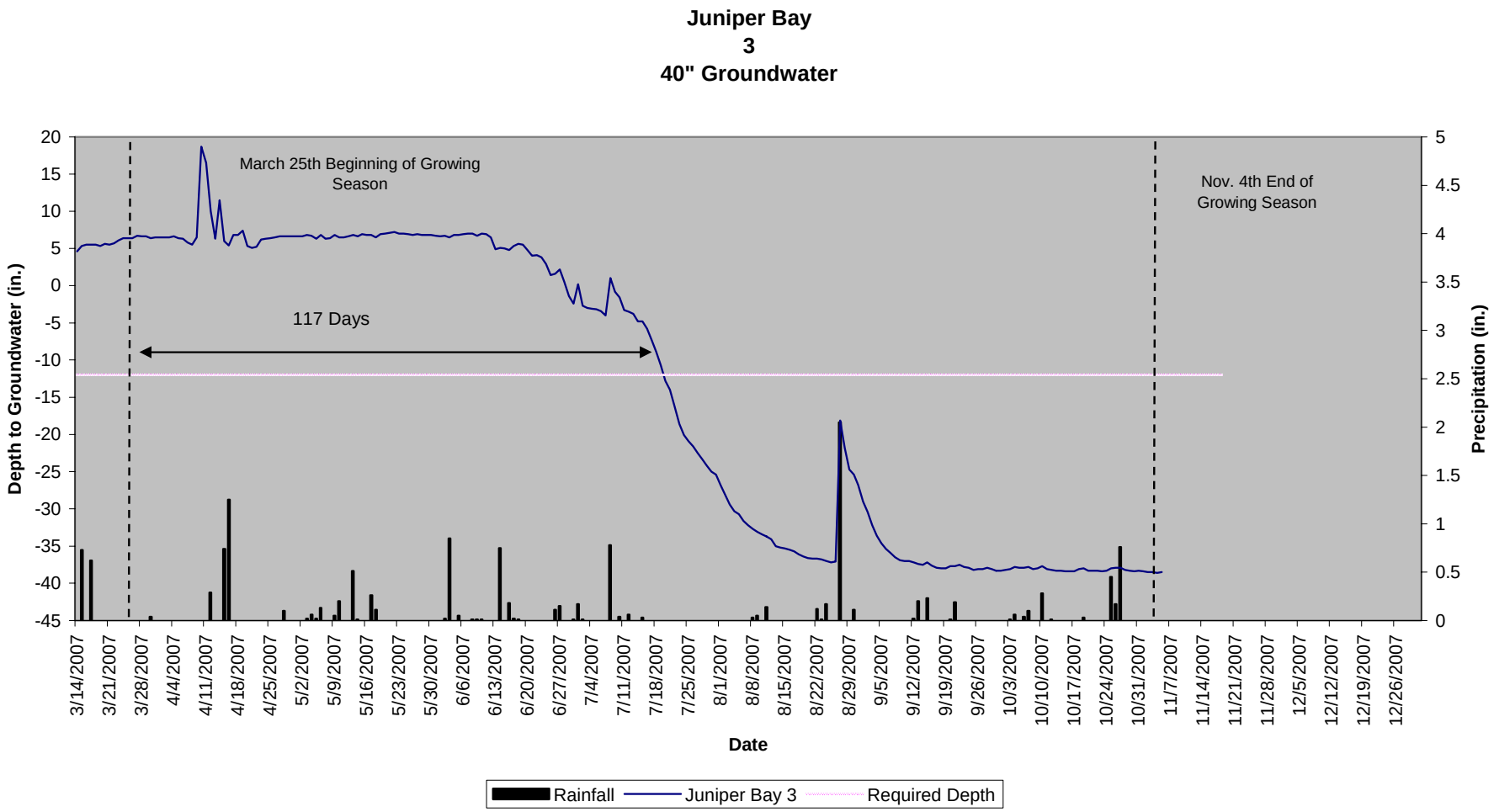
Appendix B

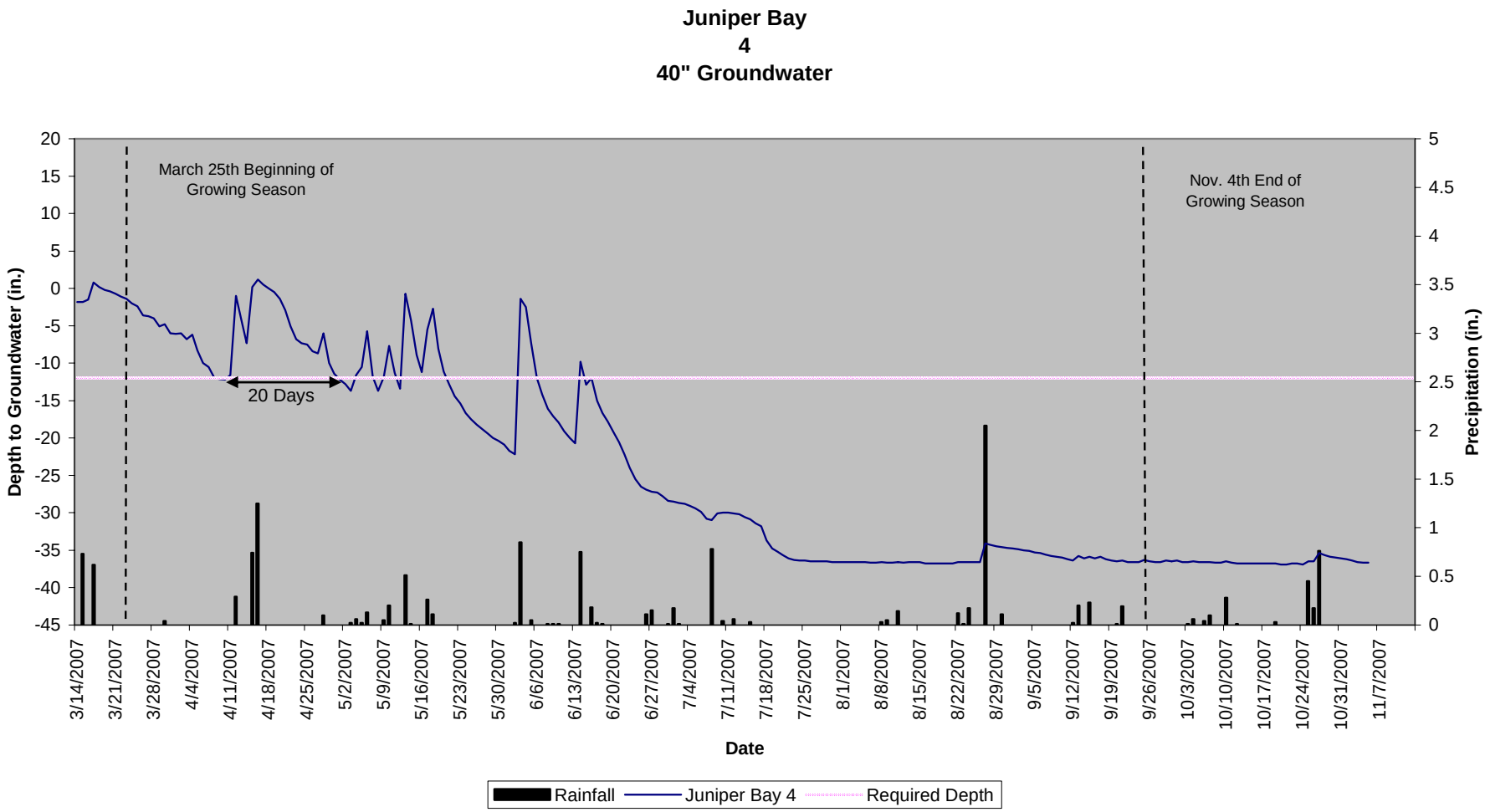
Data Tables for Hydrological Data

Juniper Bay
1
40" Groundwater




Juinper Bay
2
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
97 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 2
Required Depth


Juniper Bay
3
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
117 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 3
Required Depth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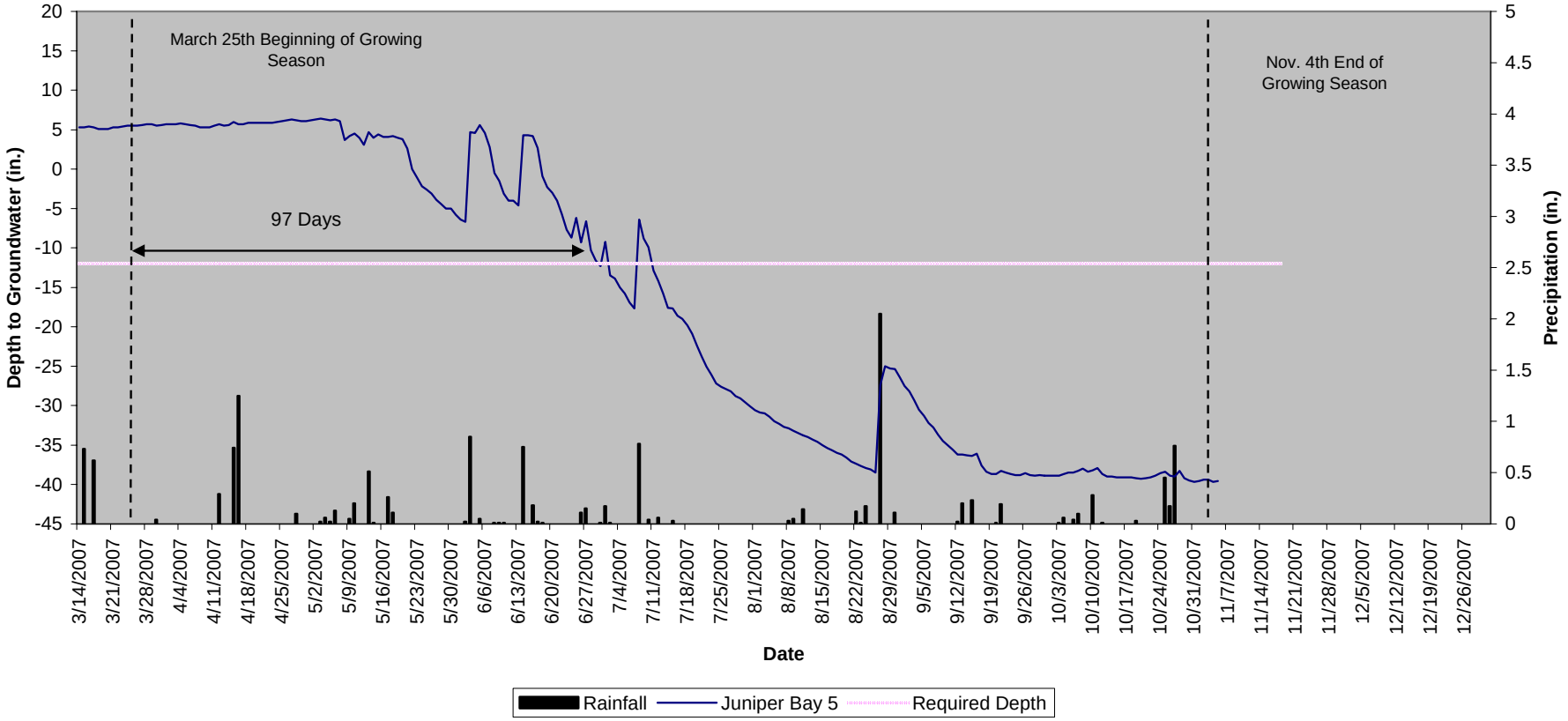
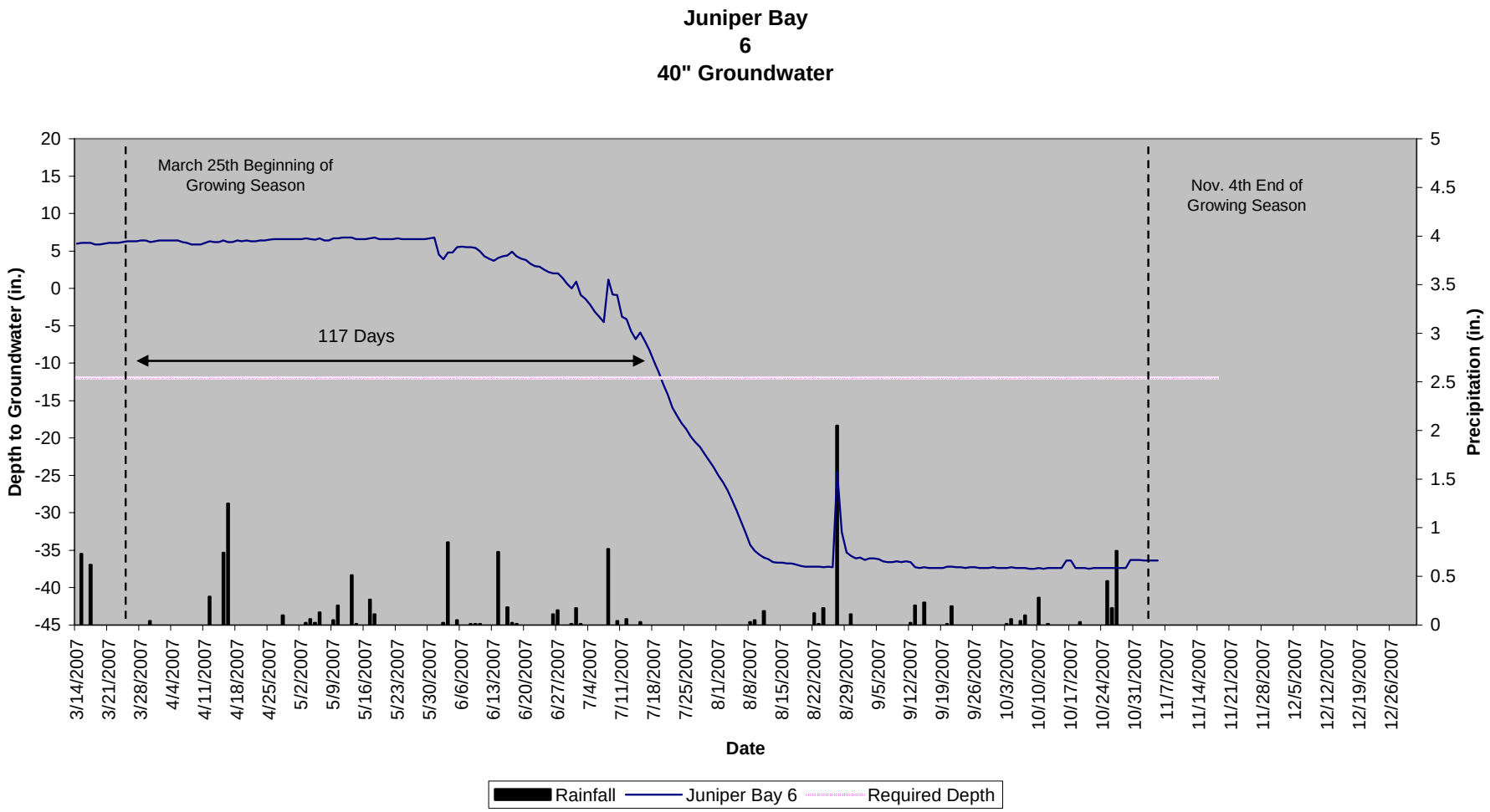
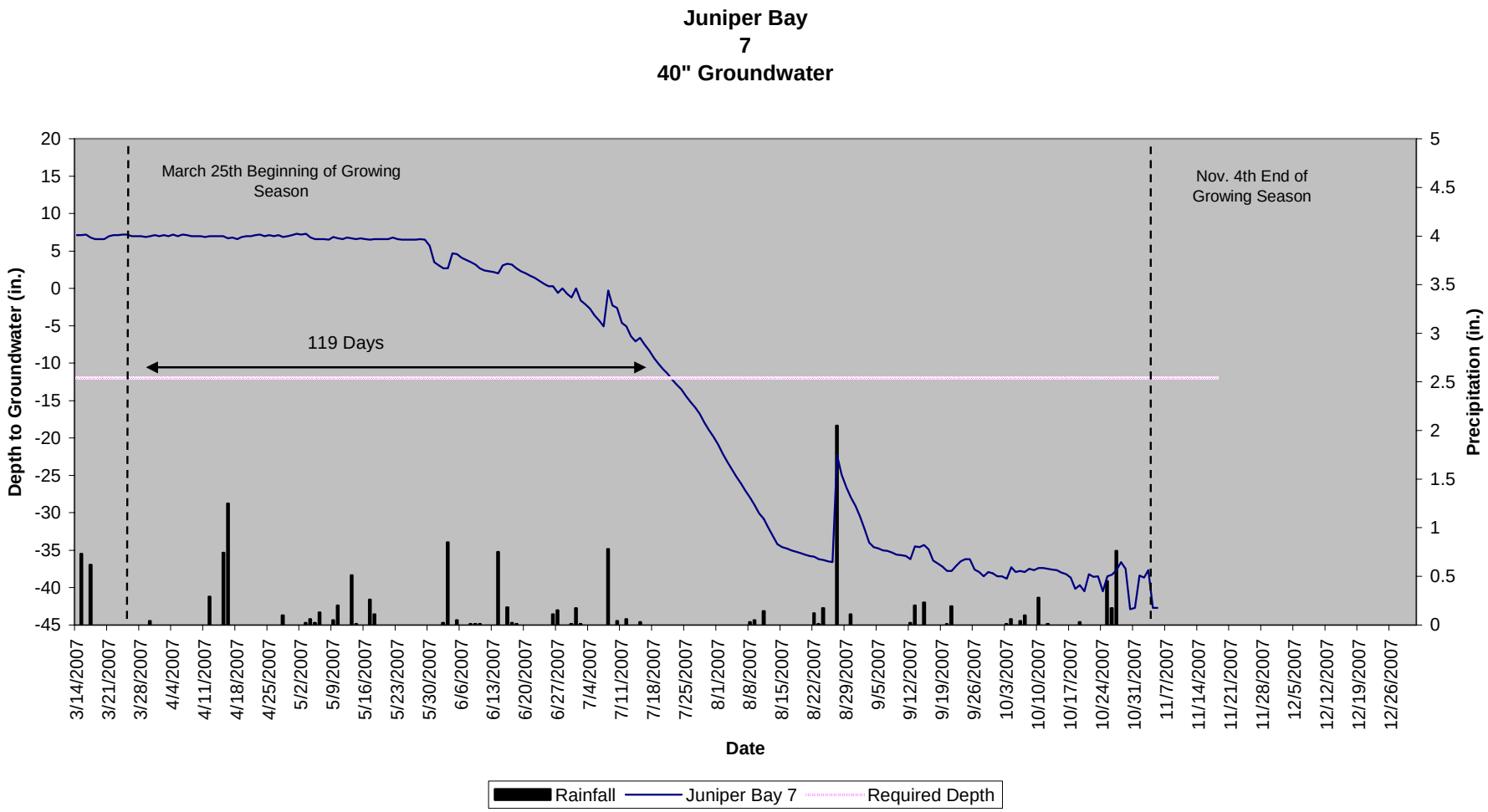
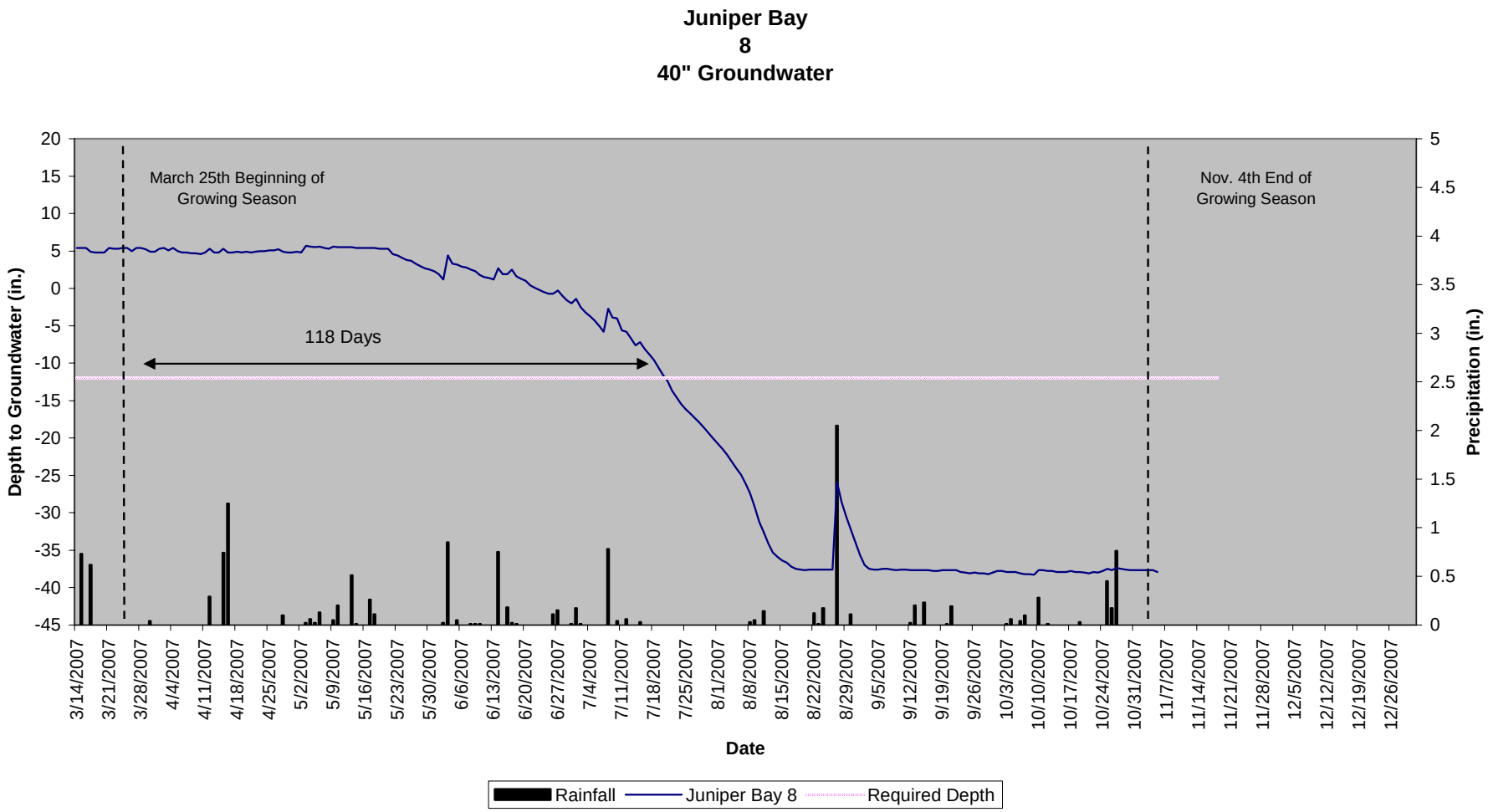
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
20 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 4
Required Depth

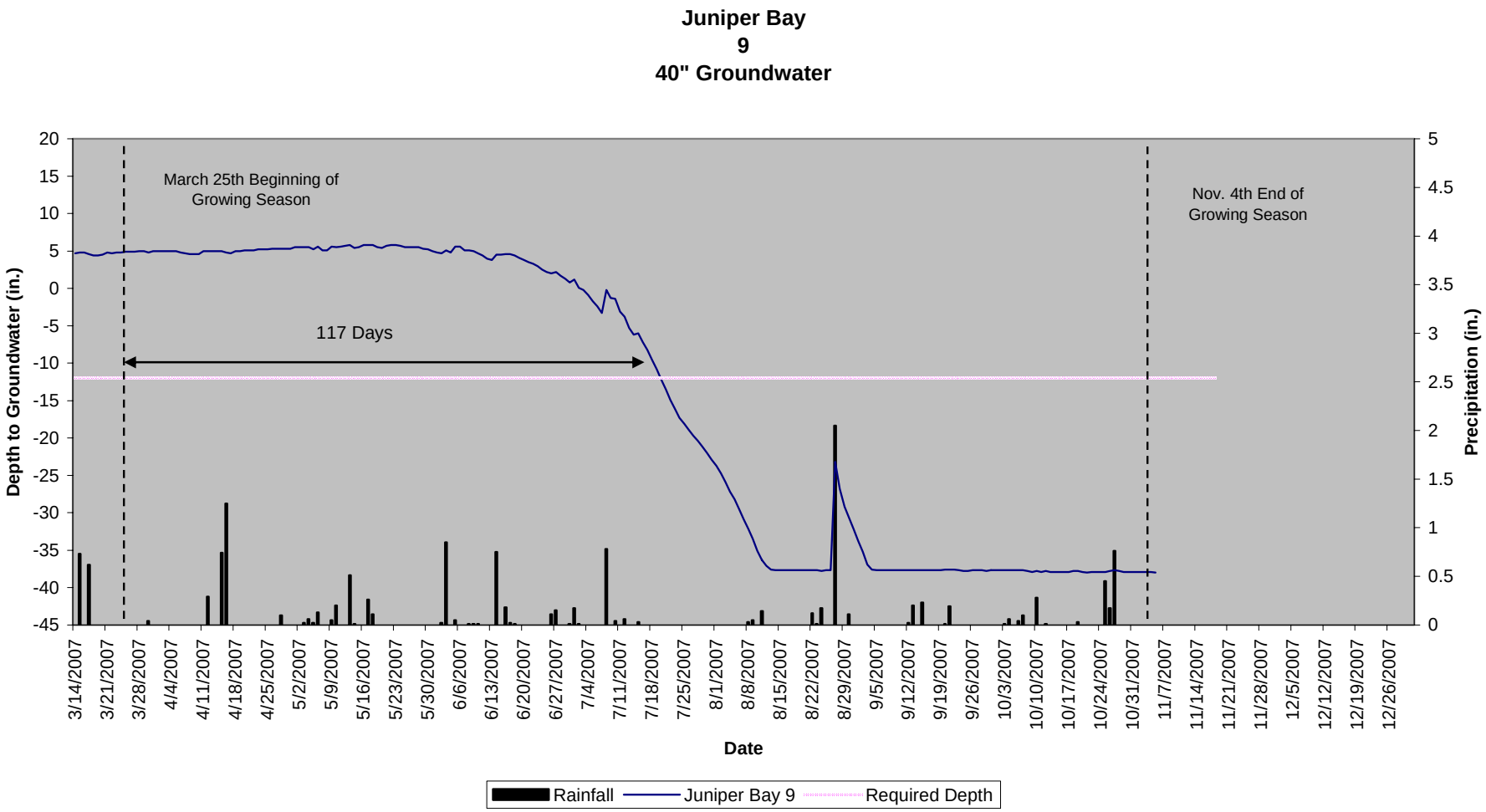
Juniper Bay
5
40" Groundwater

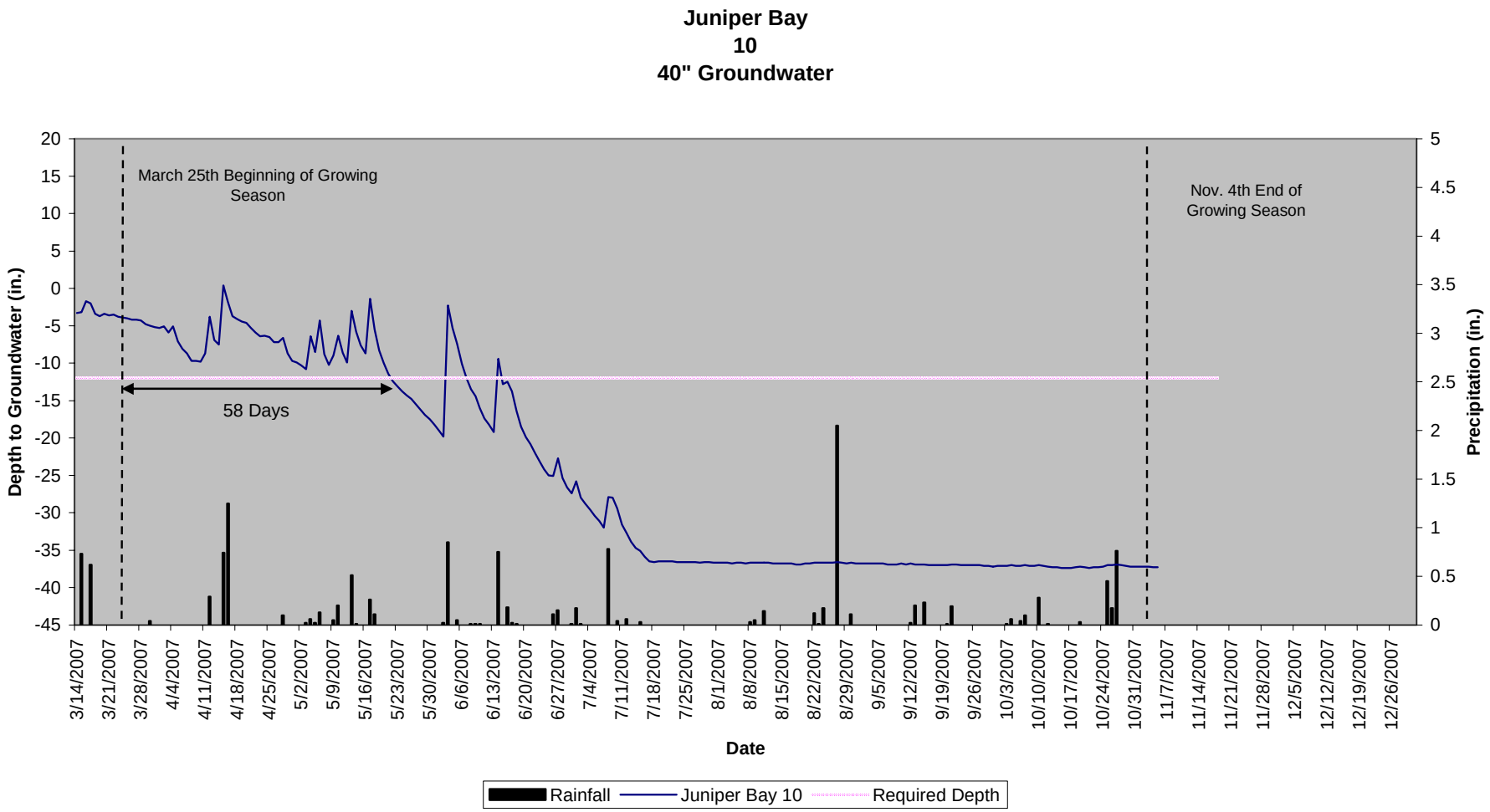



Juniper Bay
6
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
117 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 6
Required Depth


Juniper Bay
7
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
119 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 7
Required Depth


Juniper Bay
8
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
118 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 8
Required Depth


Juniper Bay
9
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
117 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 9
Required Depth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10
40" Groundwater
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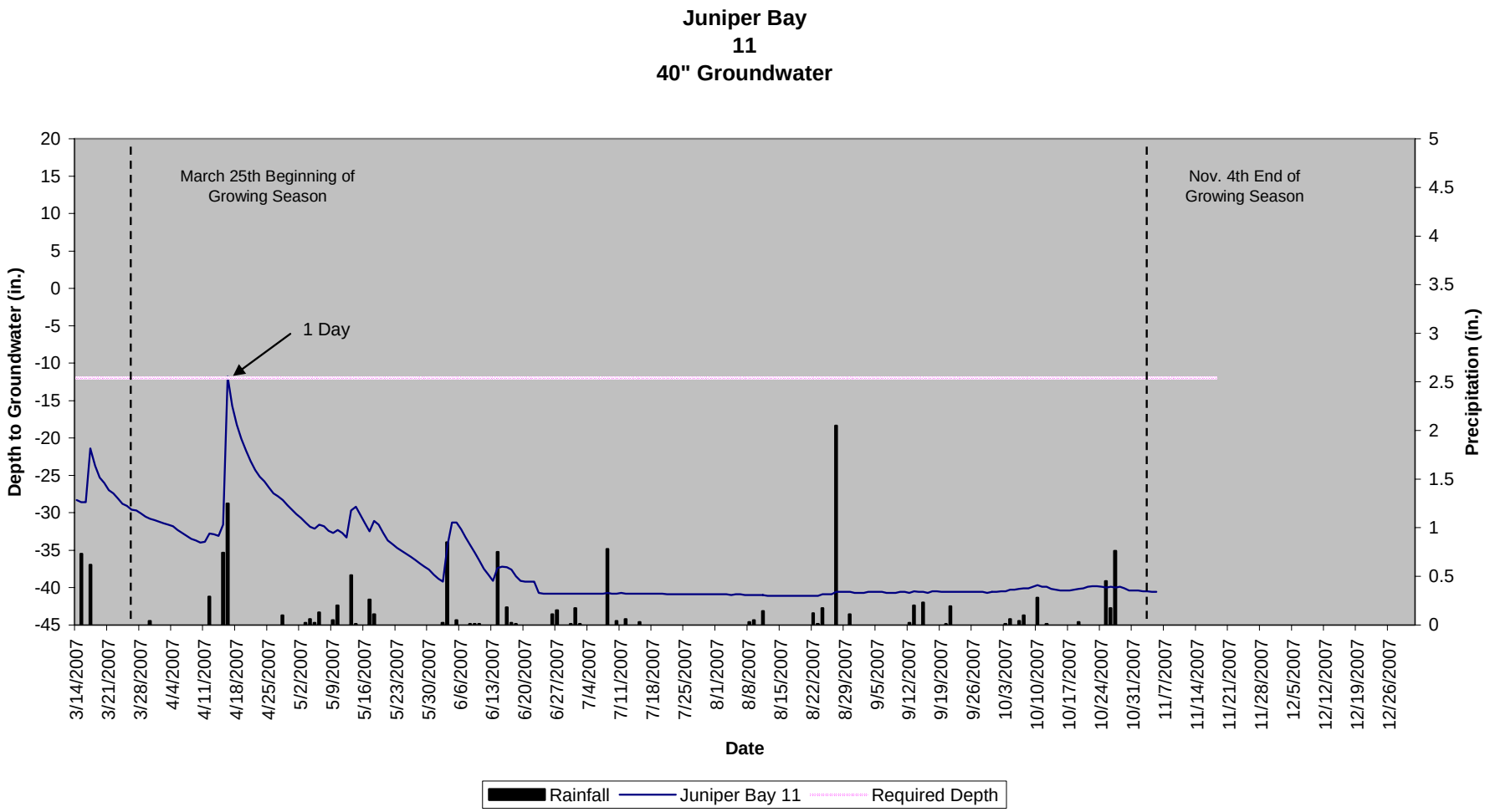
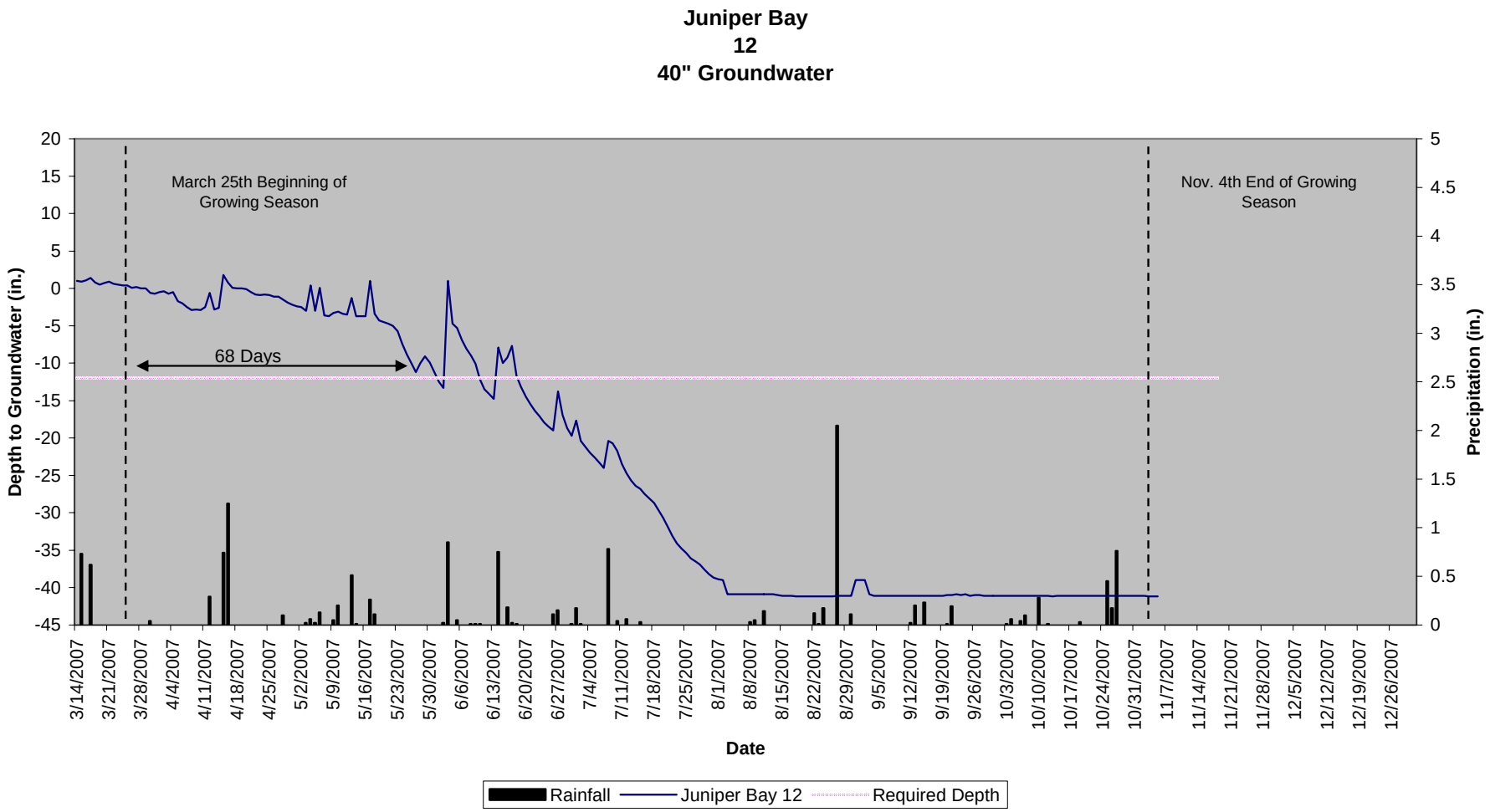
Nov. 4th End of Growing Season
58 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 10
Required Depth


Juniper Bay
11
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
1 Day
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 11
Required Depth


Juniper Bay
12
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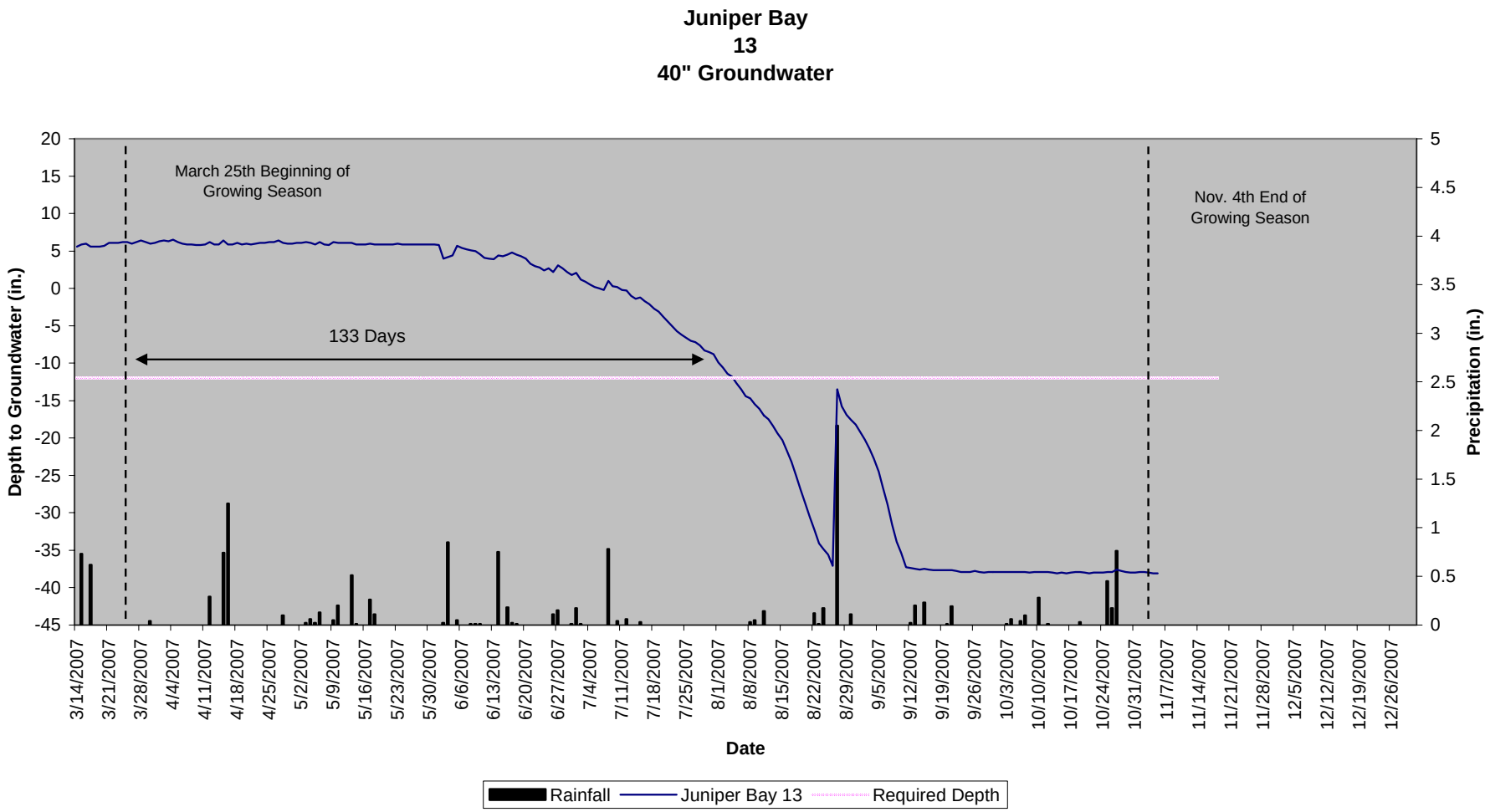
Nov. 4th End of Growing Season
68 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 12
Required Depth


Juniper Bay
13
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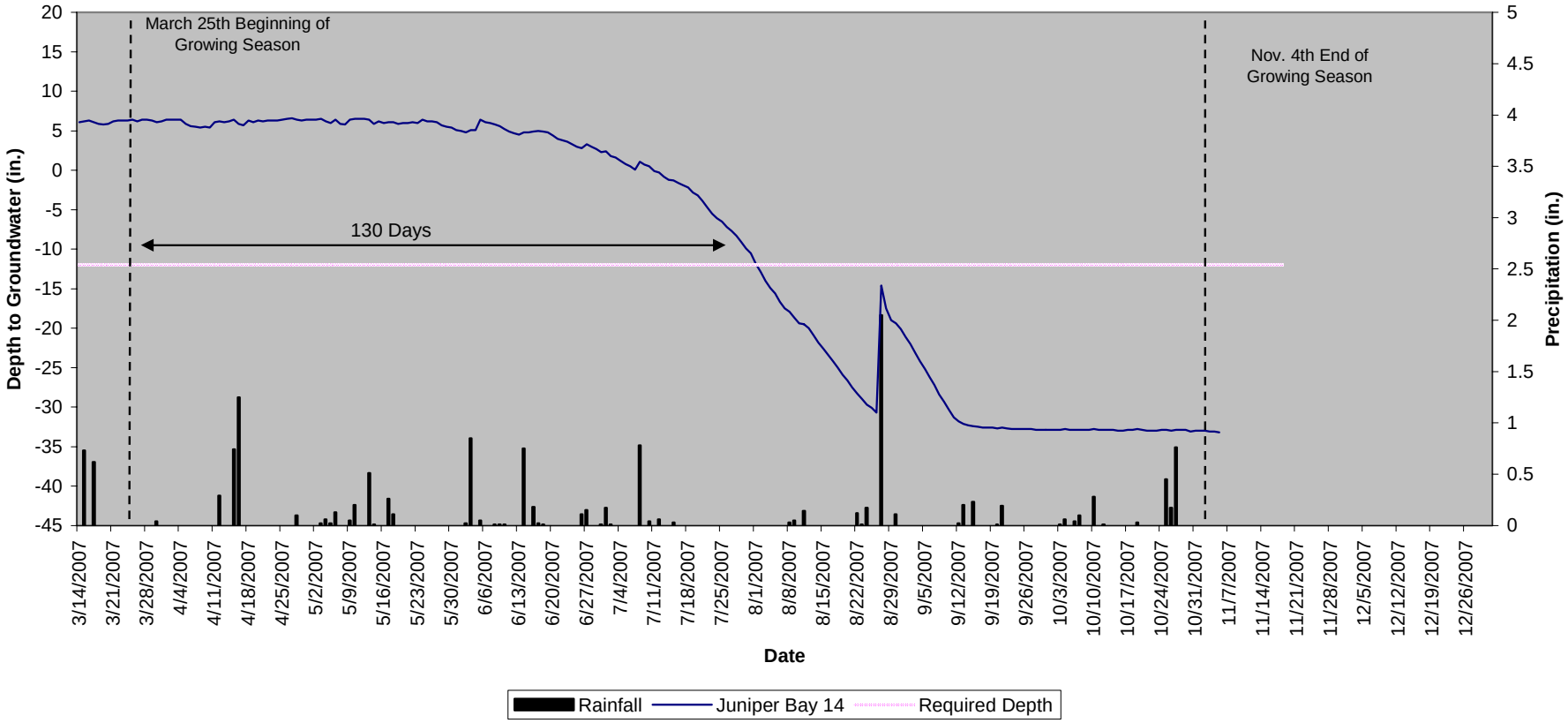
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
133 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 13
Required Depth

Juniper Bay
14
40" Groundwater



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16
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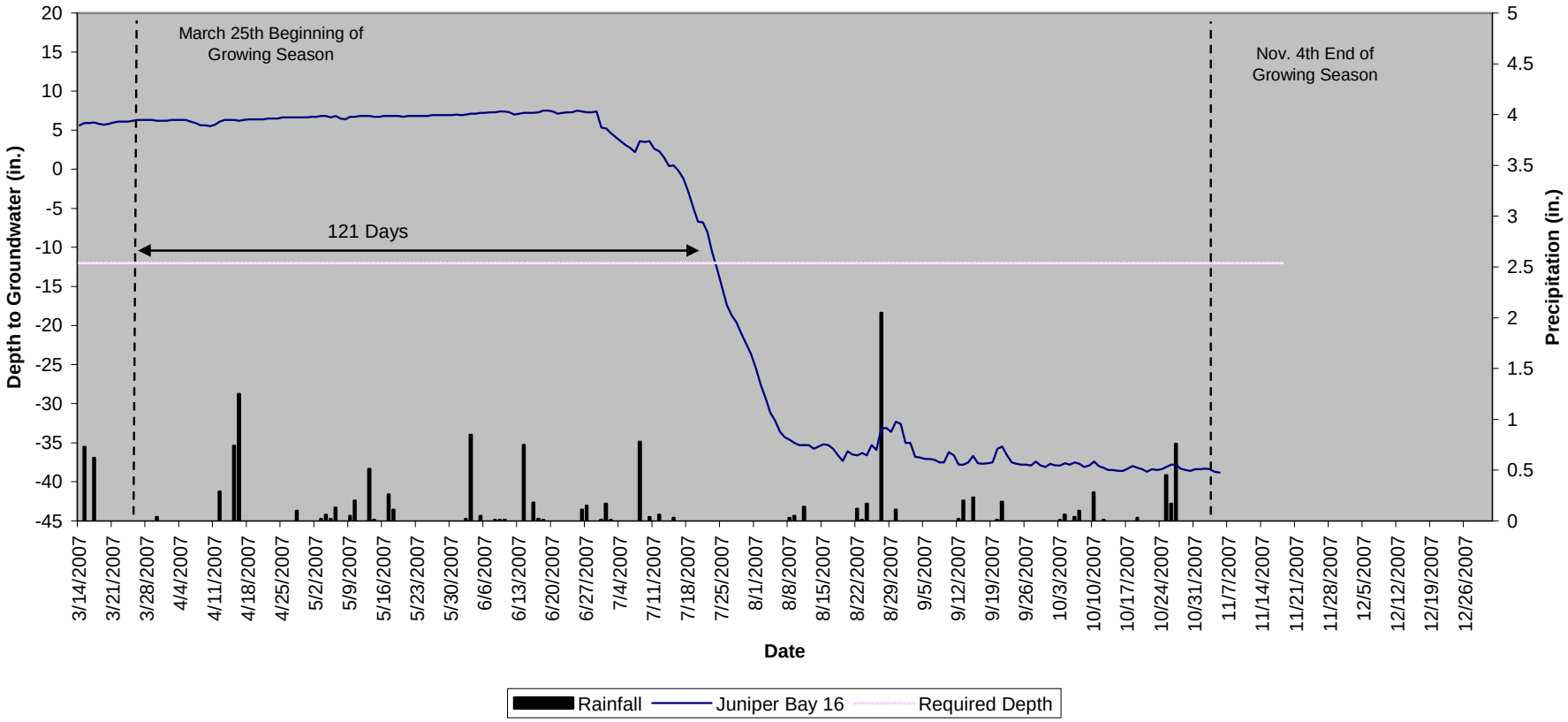

Juniper Bay
17
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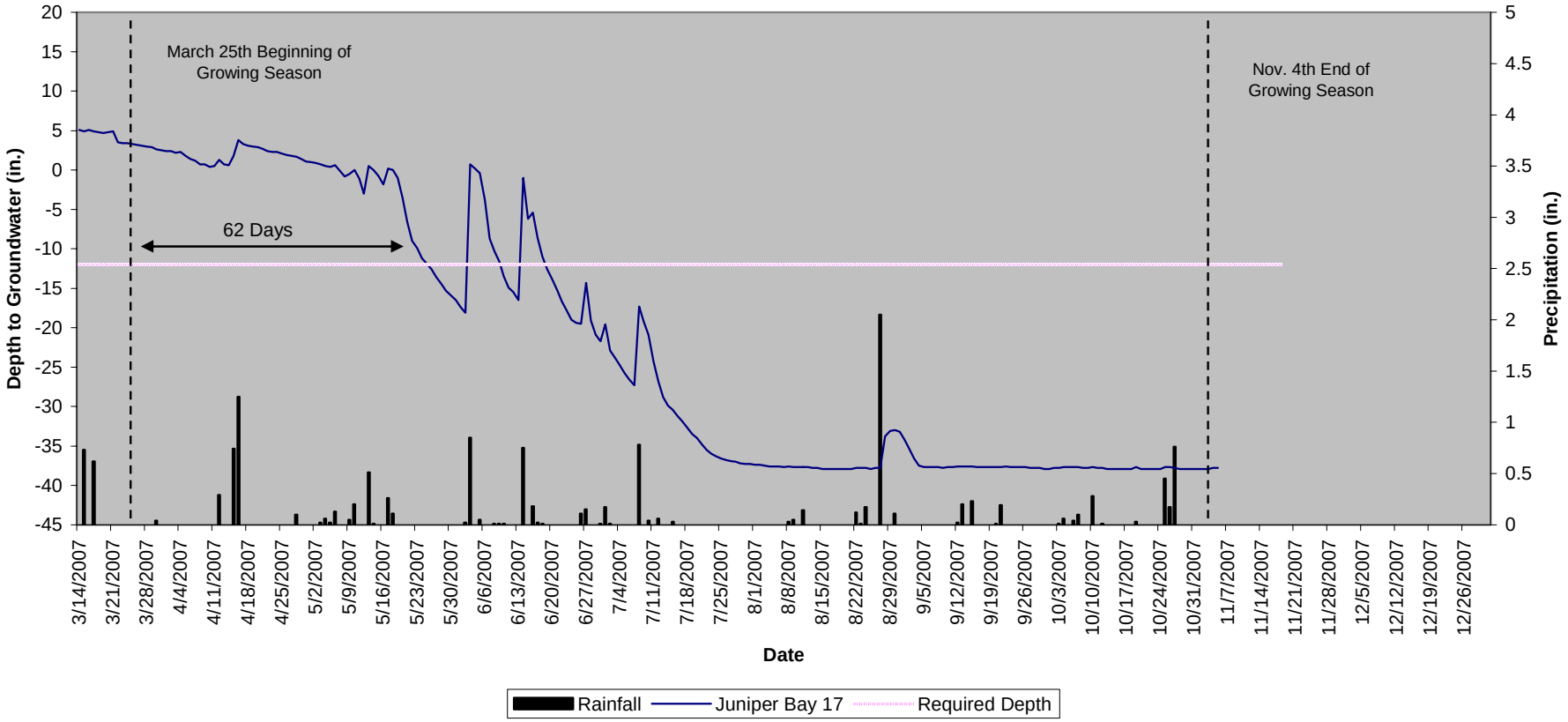

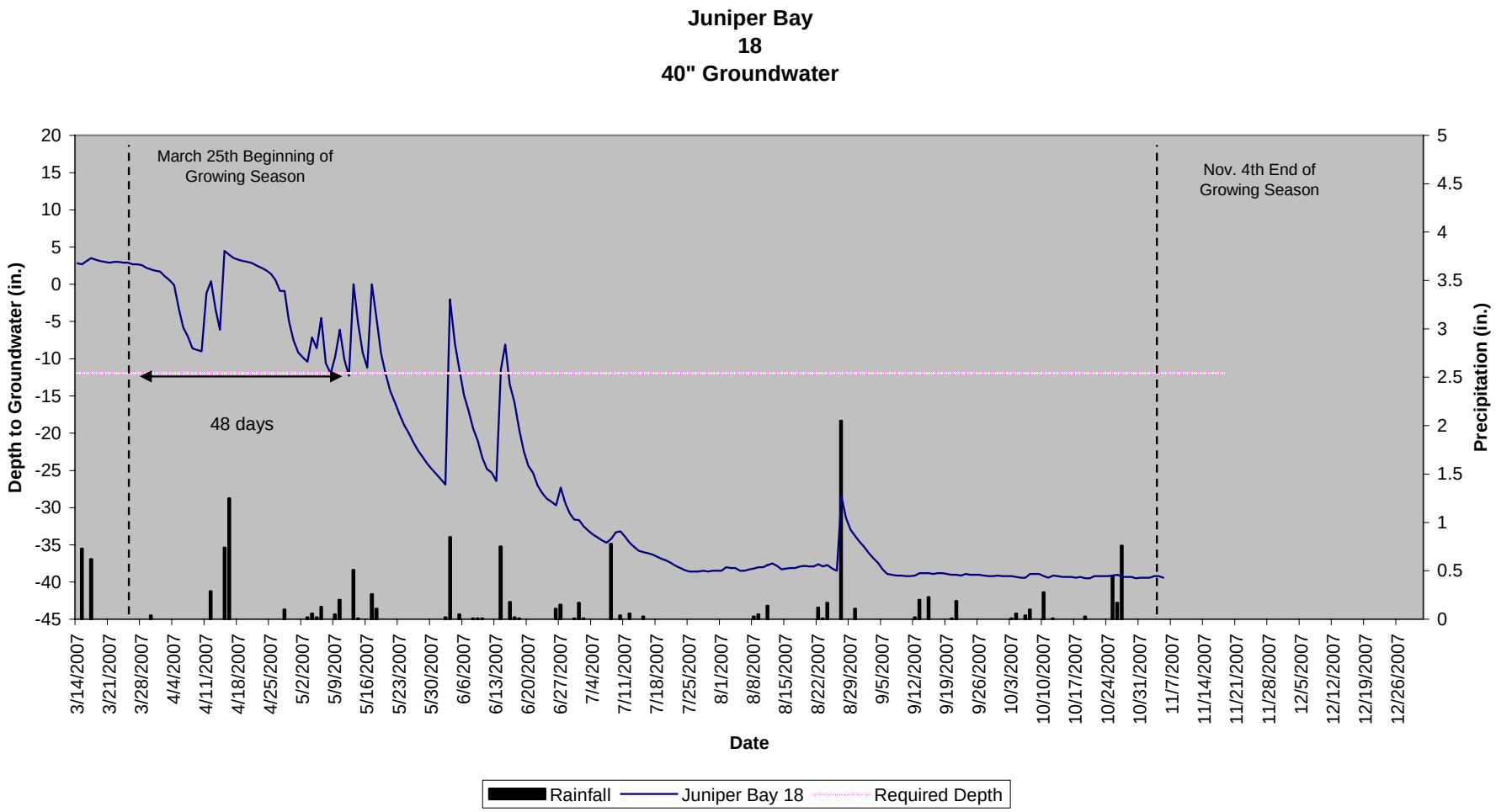
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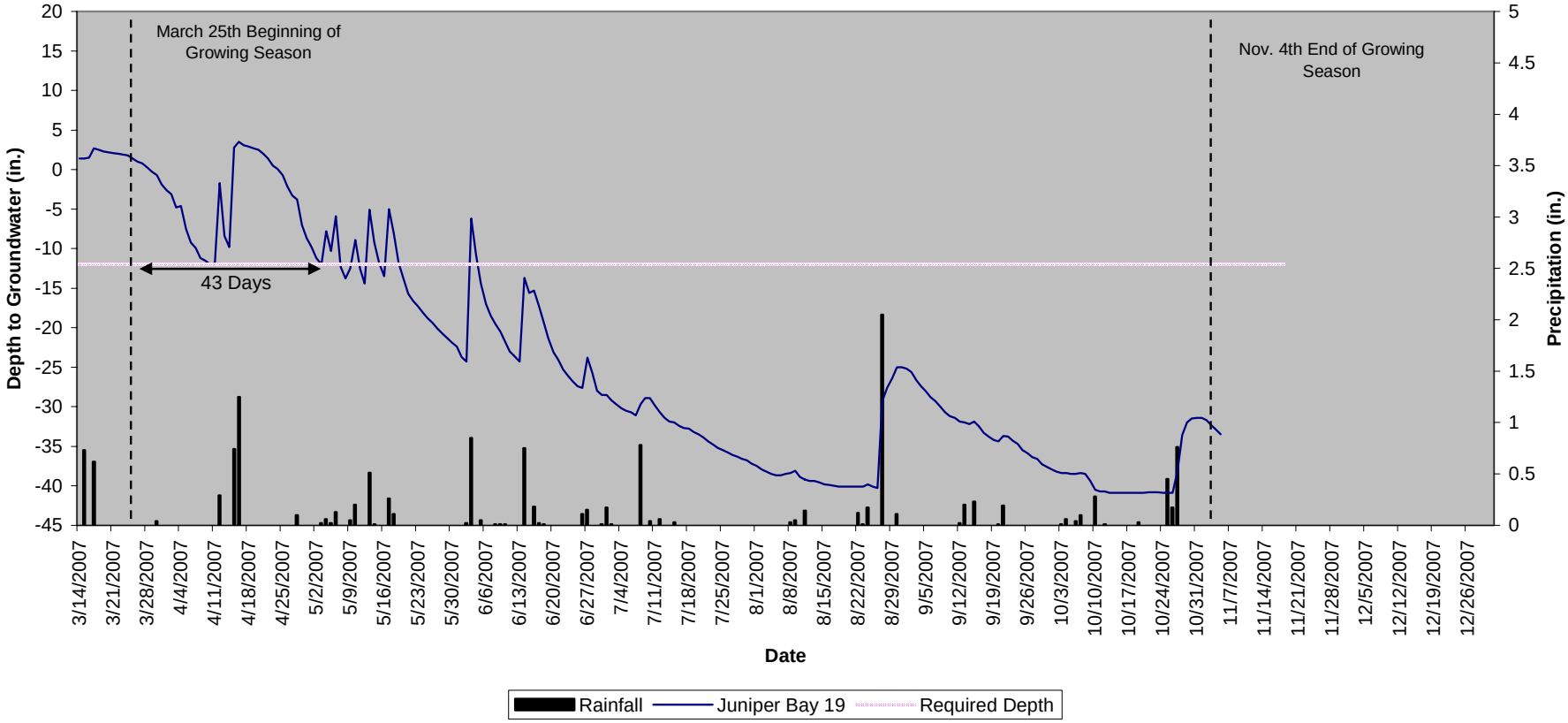
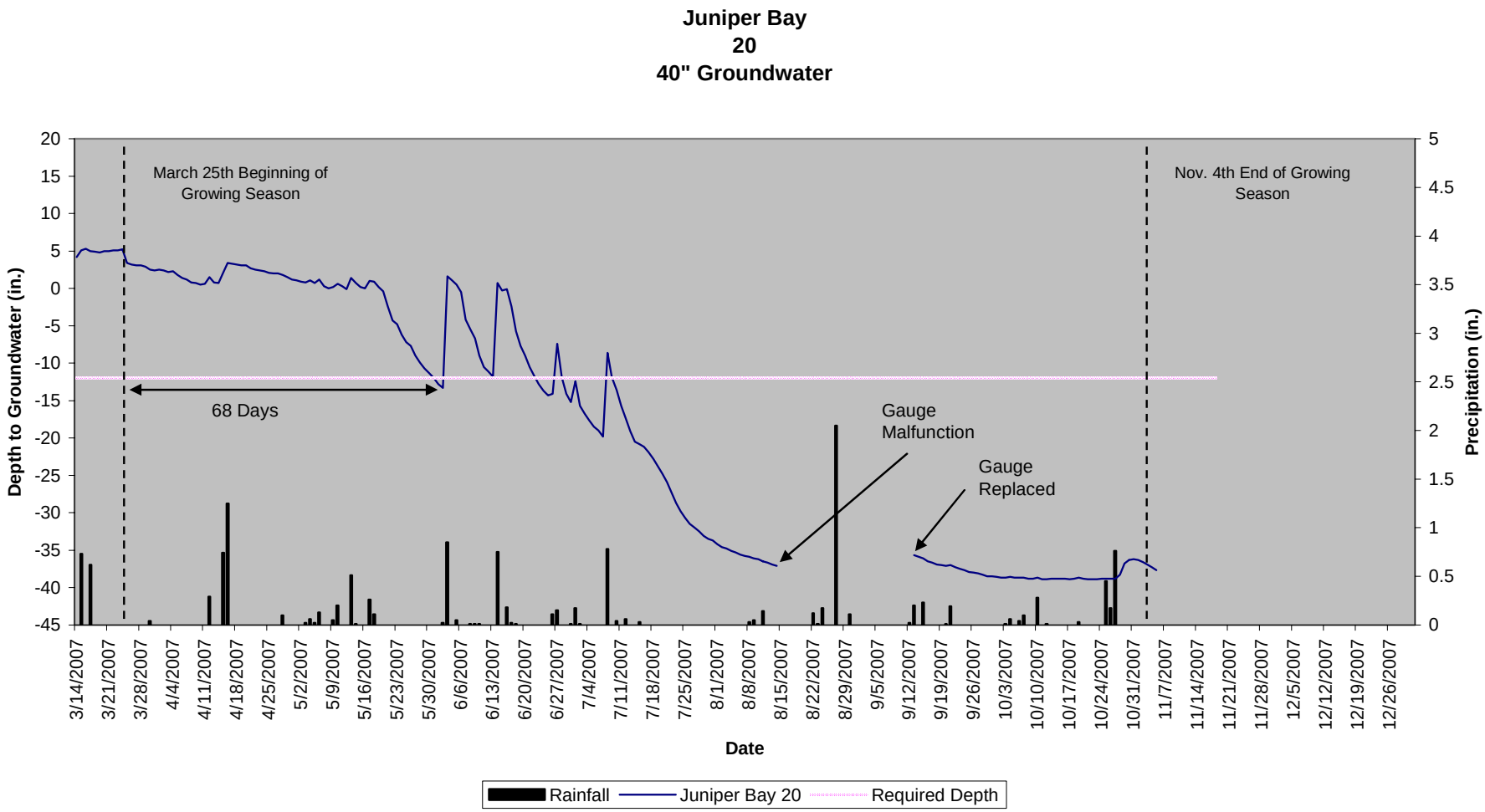
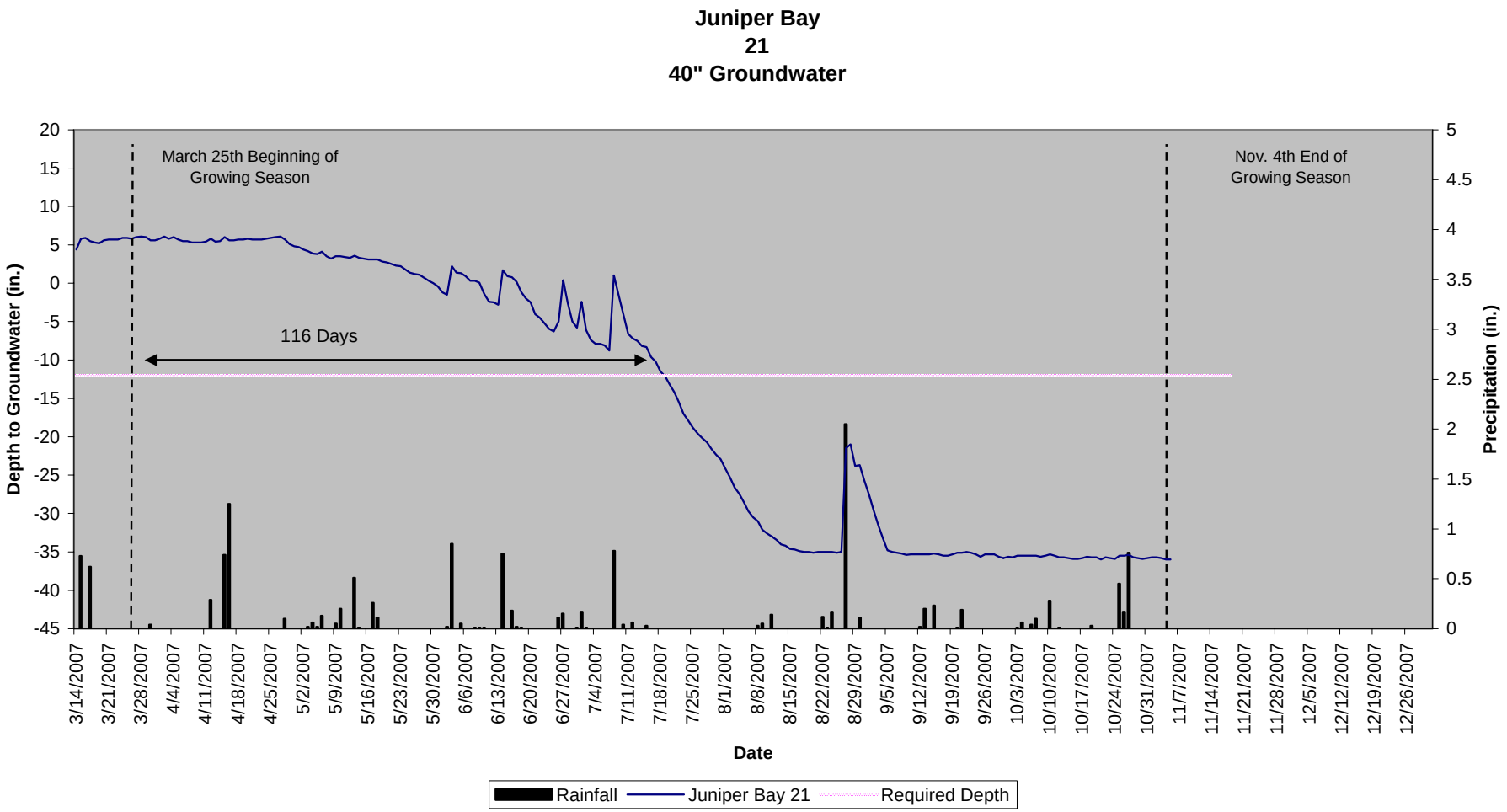
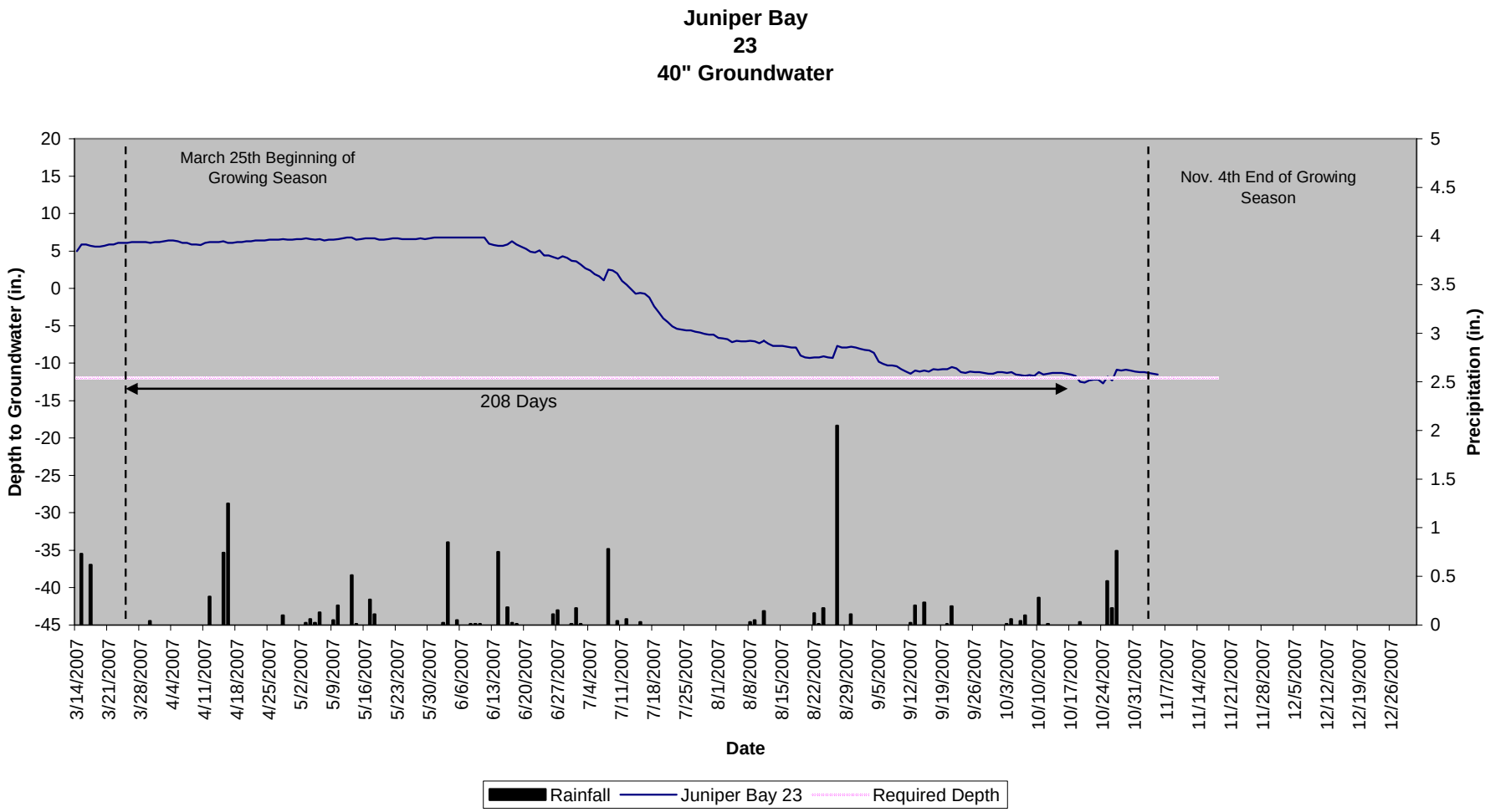
18
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
48 days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 18
Required Depth

Juniper Bay
19
40" Groundwater




Juniper Bay
20
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
68 Days
Gauge Malfunction
Gauge Replaced
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 20
Required Depth


Juniper Bay
21
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
116 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 21
Required Depth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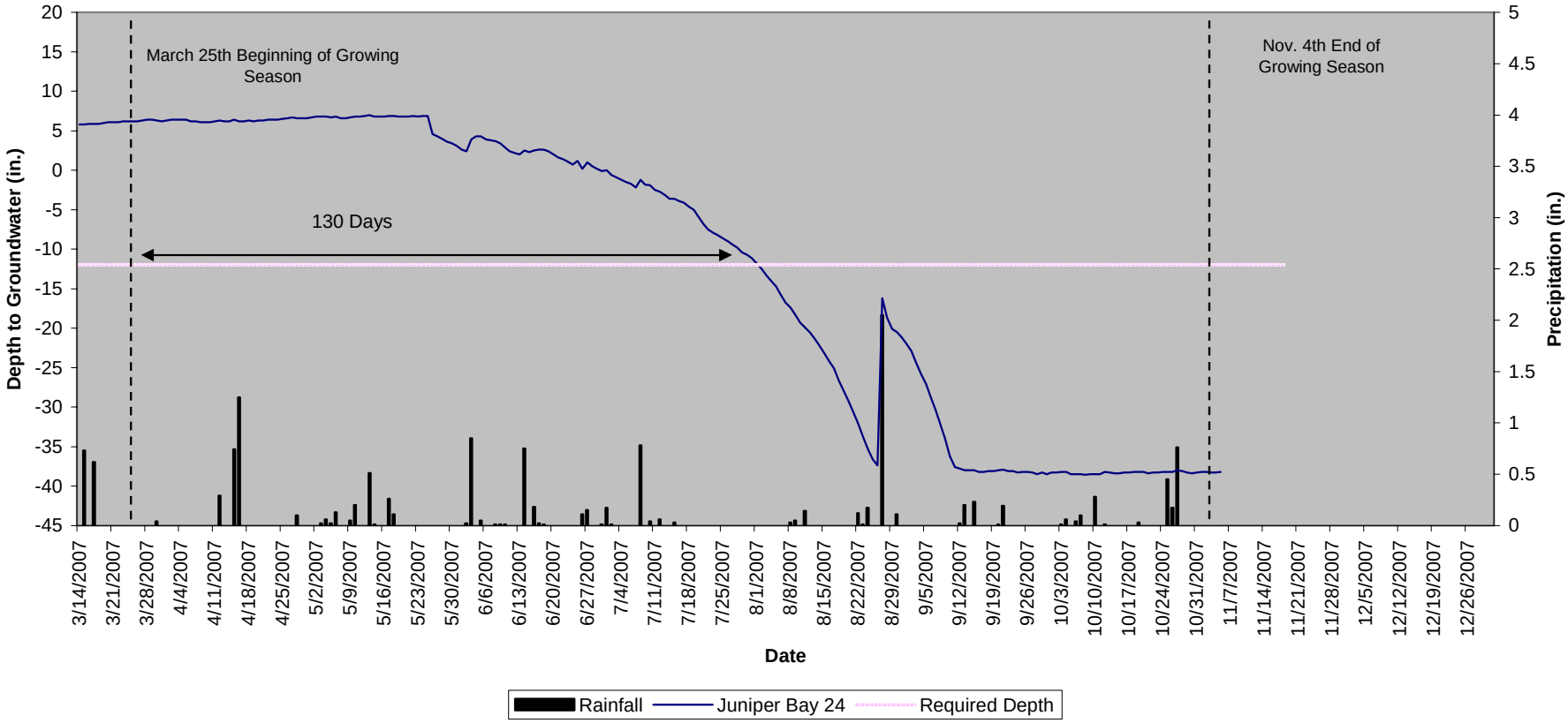
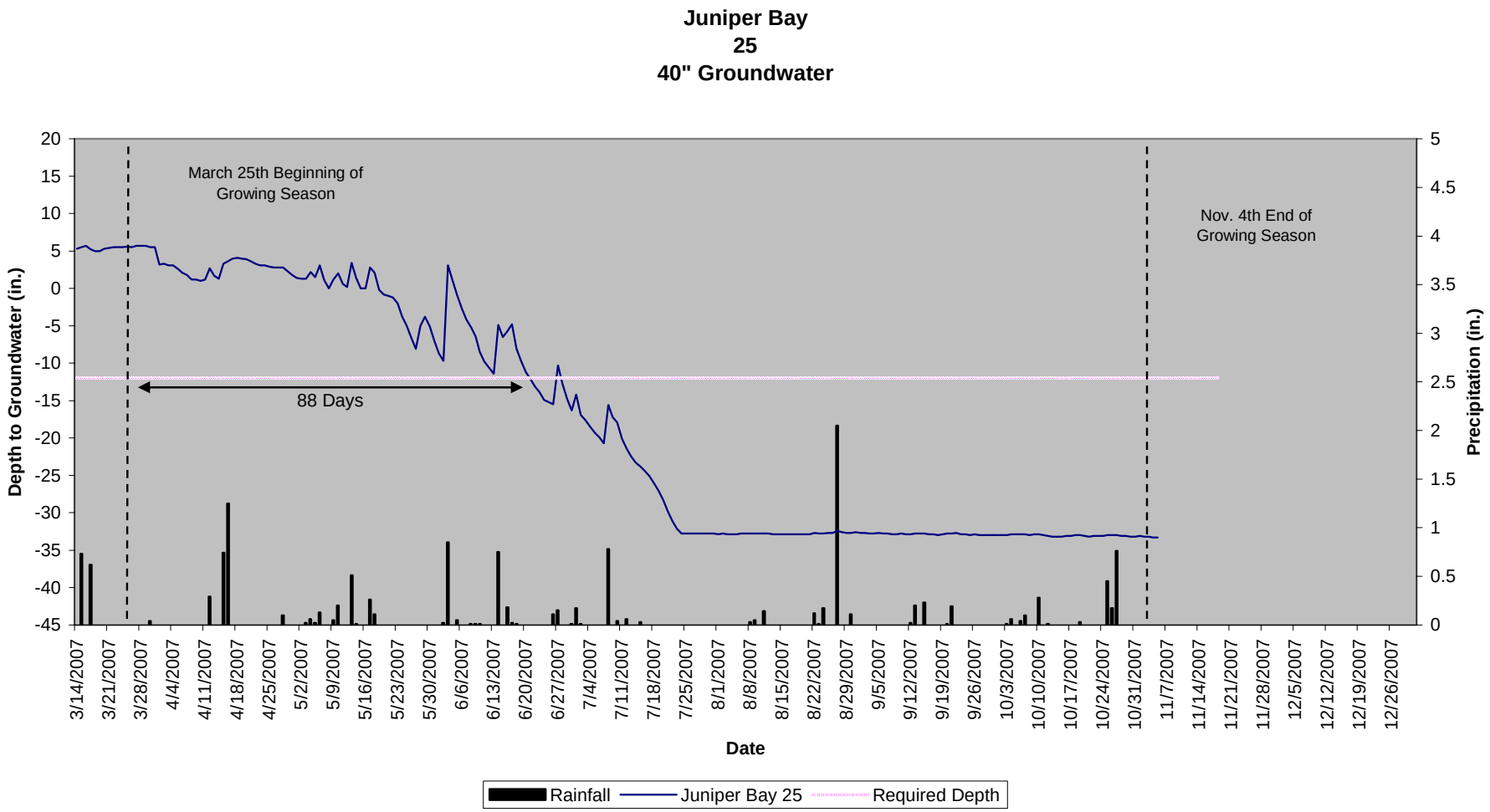
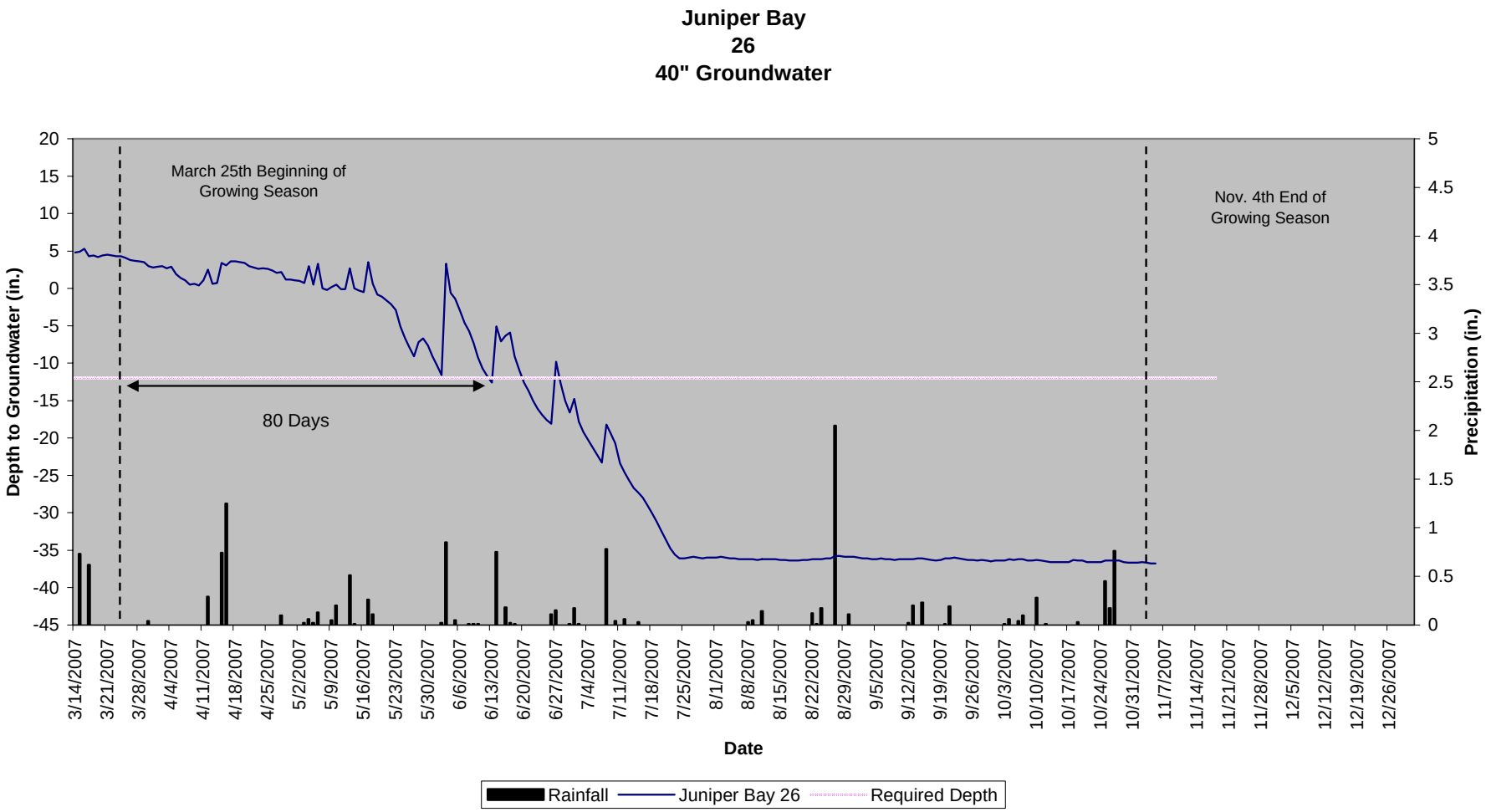
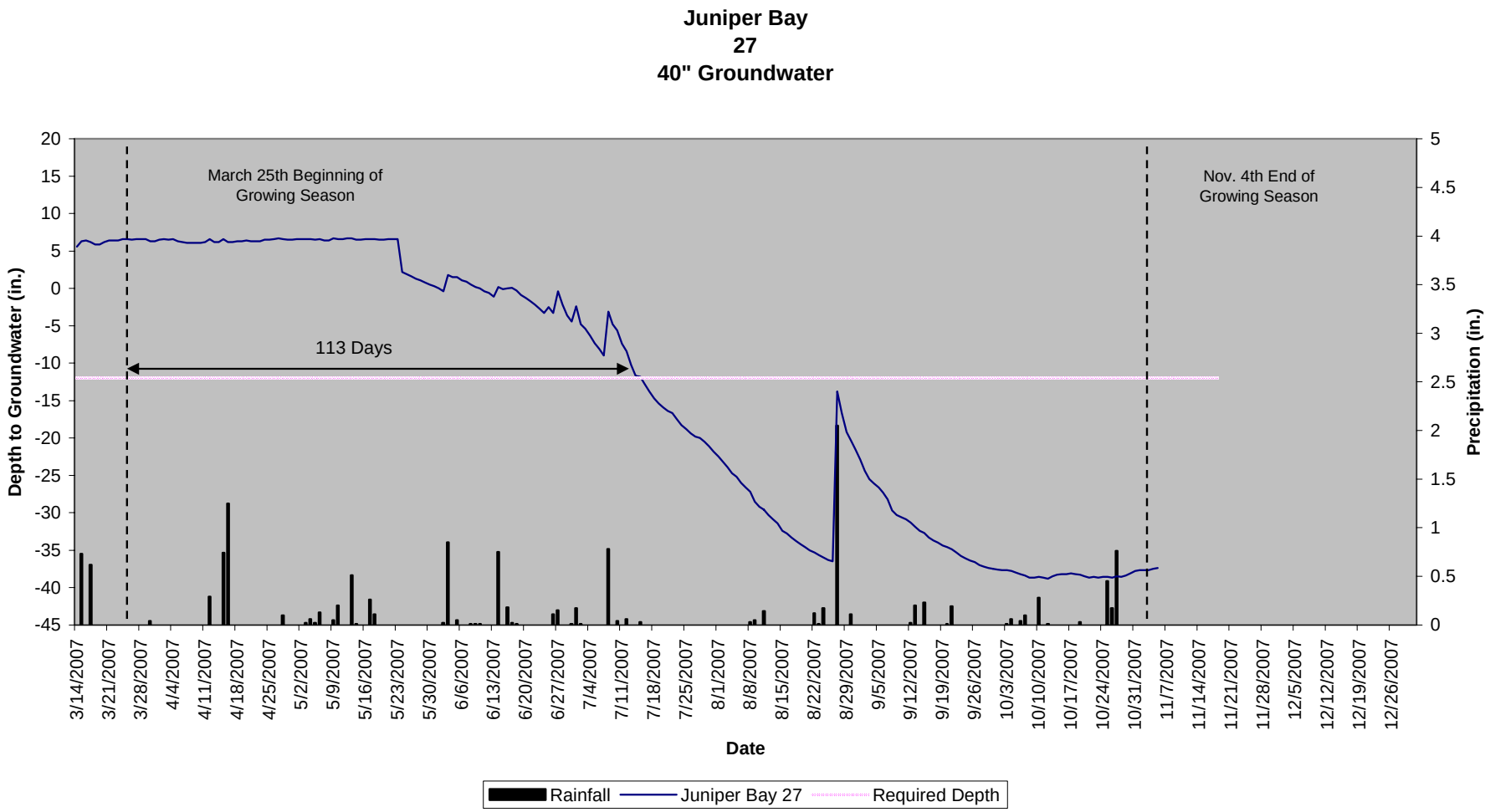
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
208 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 23
Required Depth

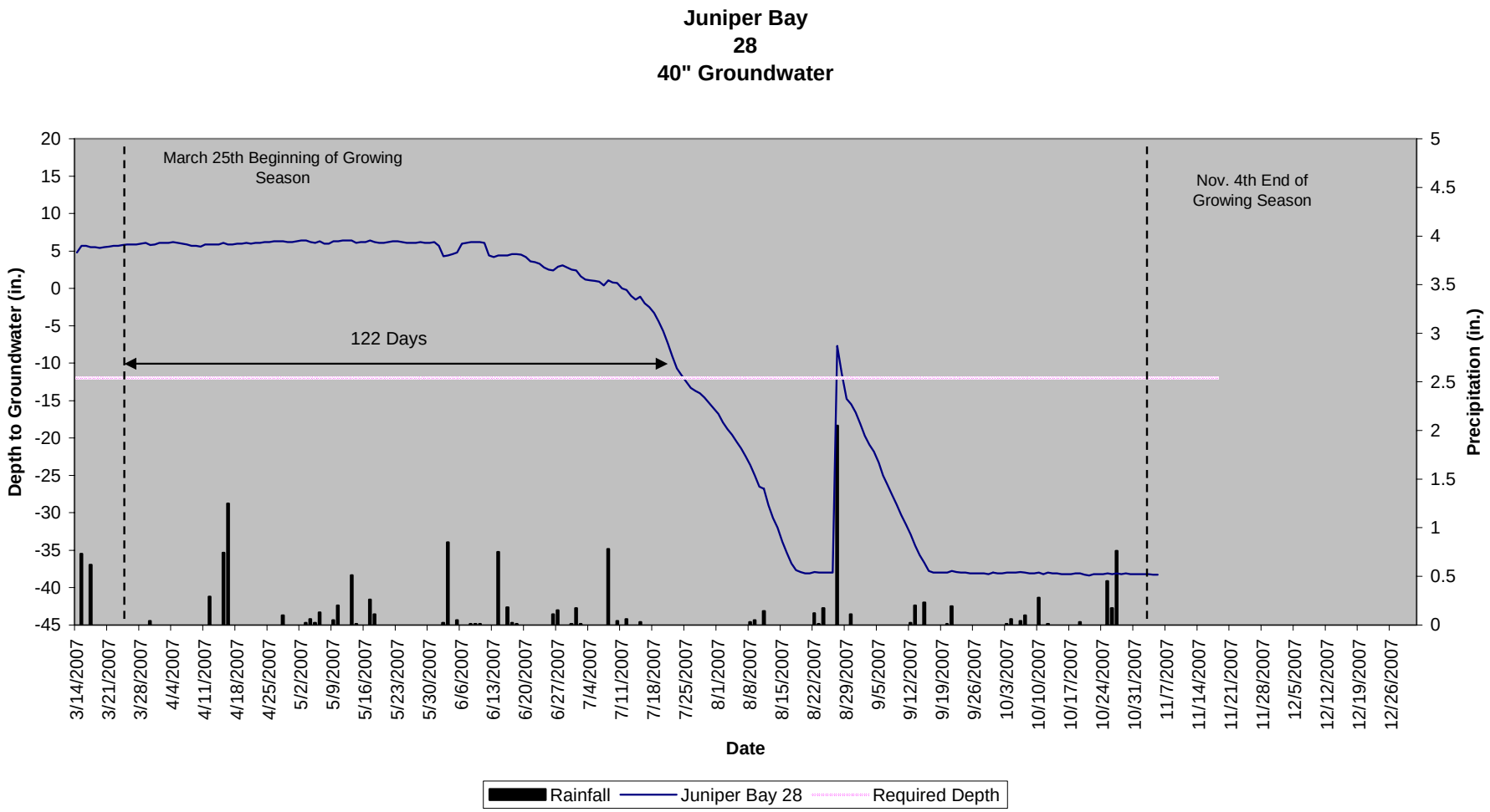
Juniper Bay
24
40" Groundwater

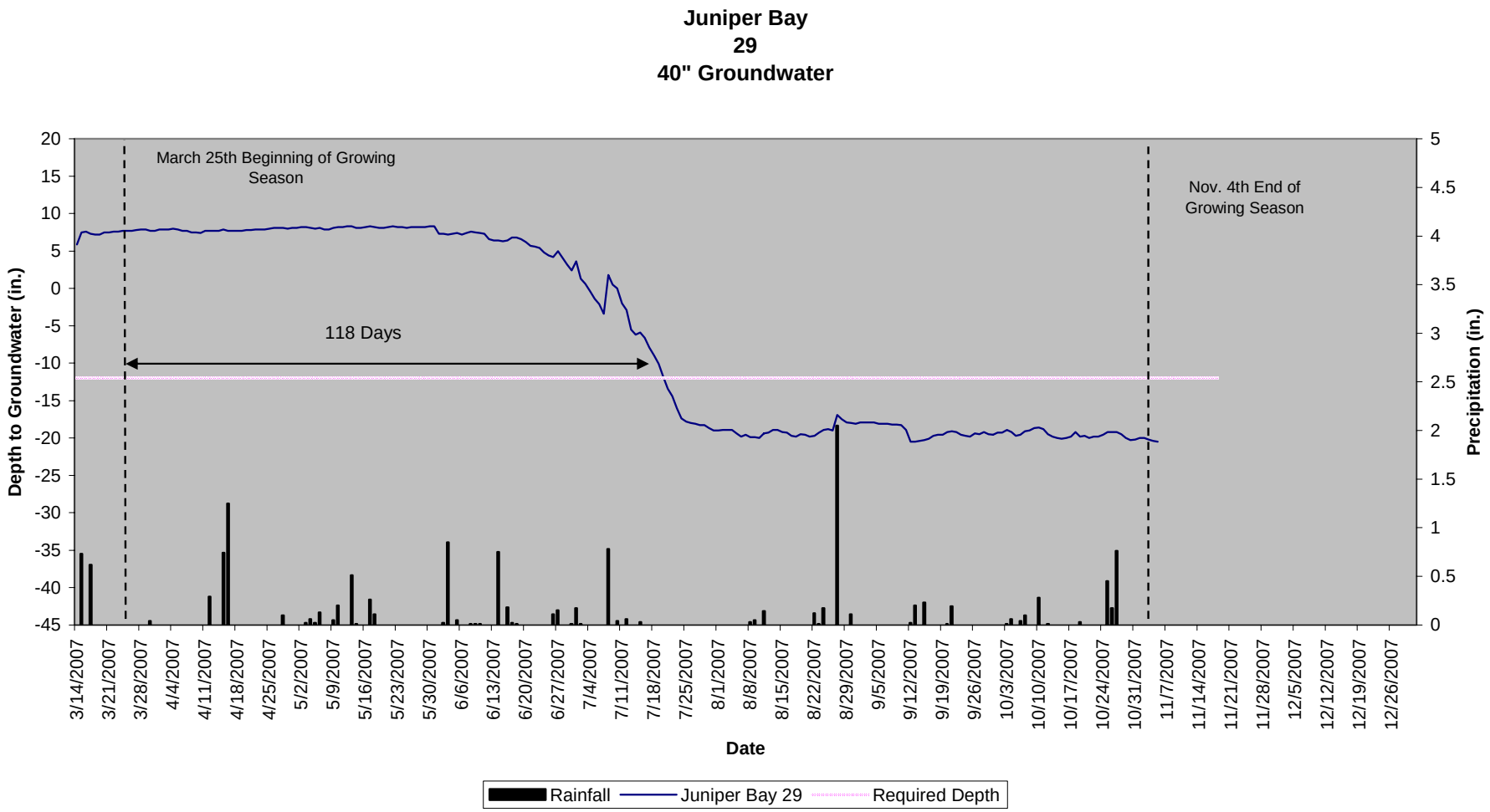


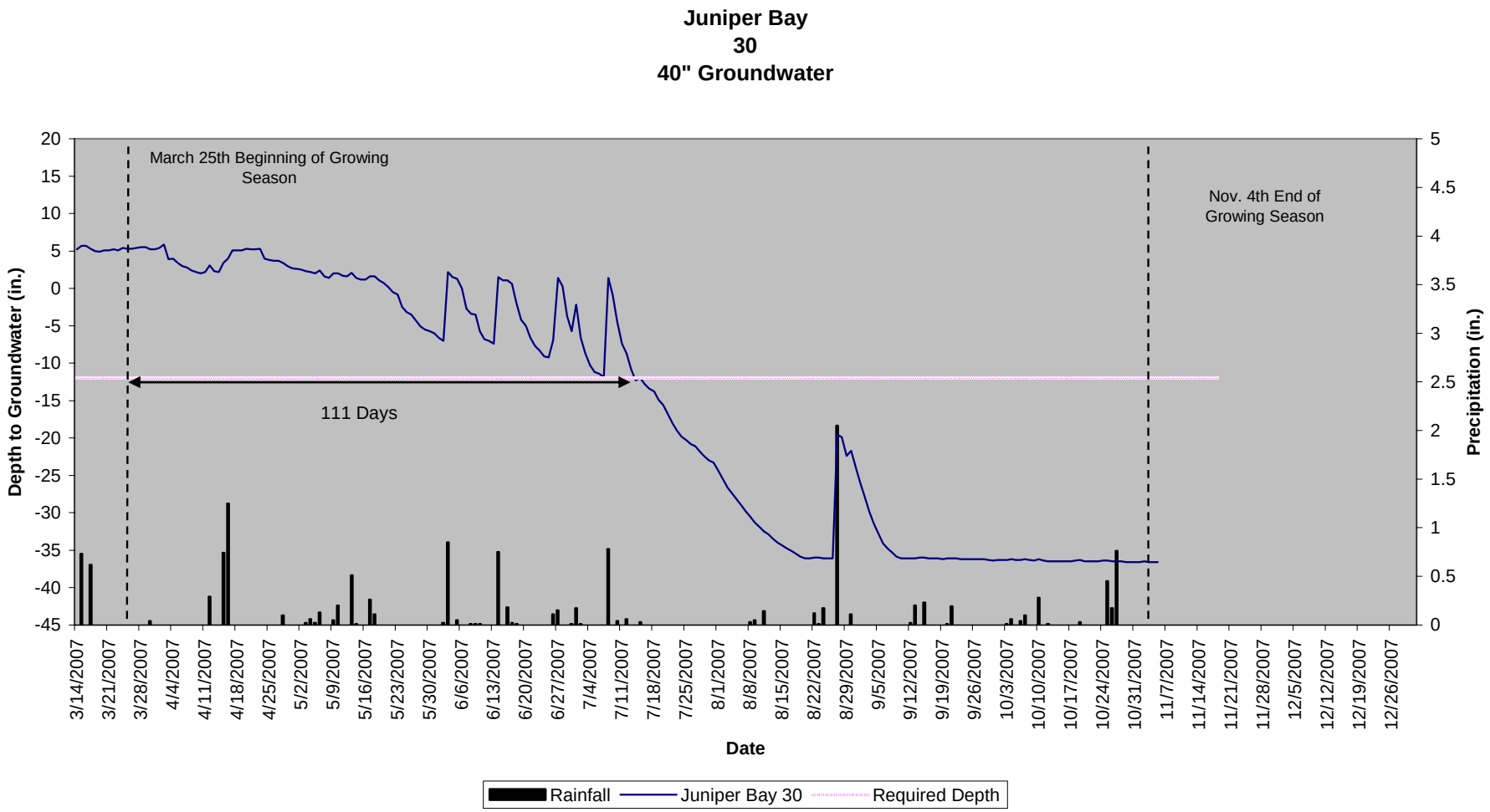

Juniper Bay
25
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
88 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 25
Required Depth

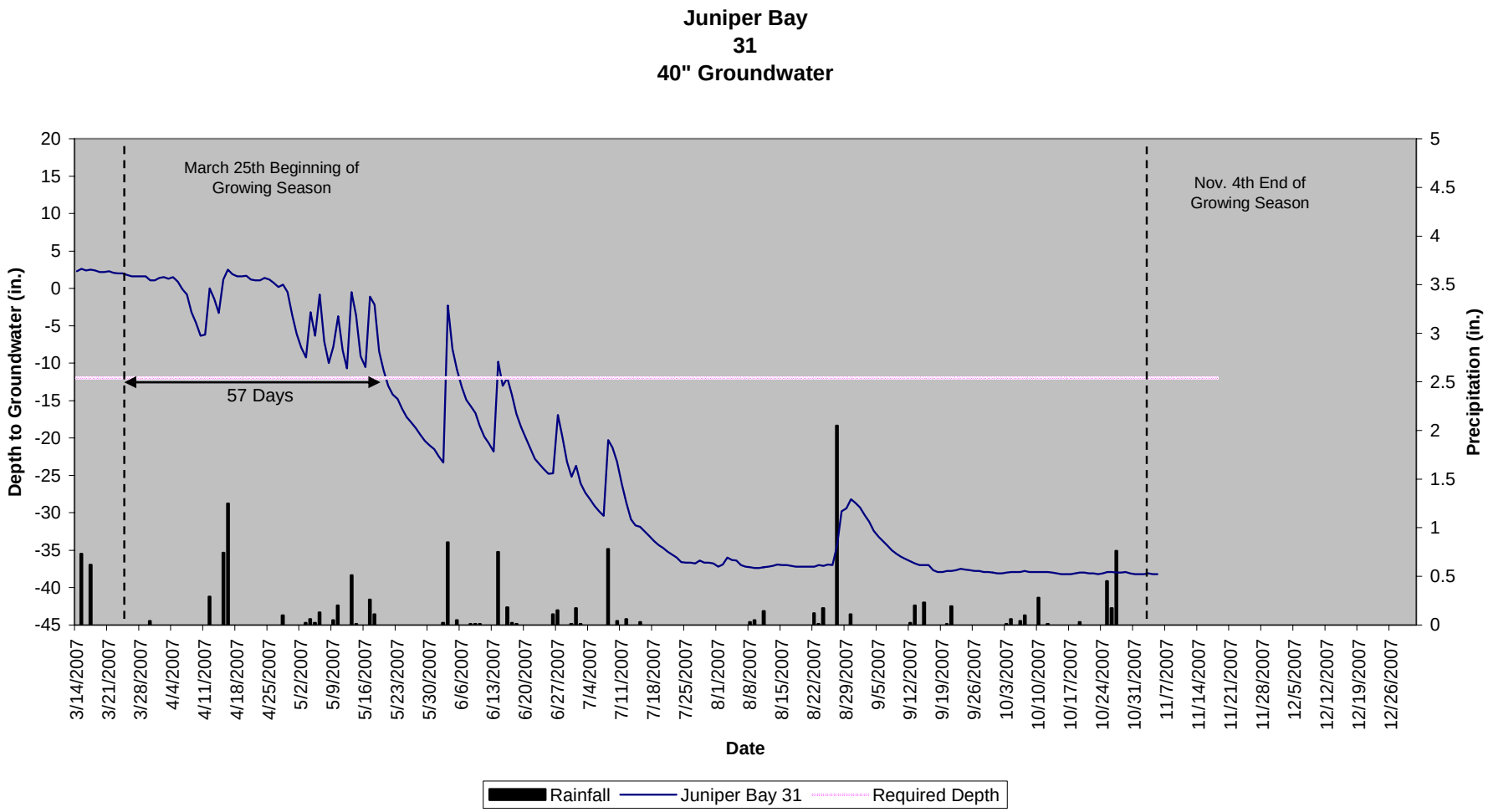

Juniper Bay
26
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
80 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 26
Required Depth

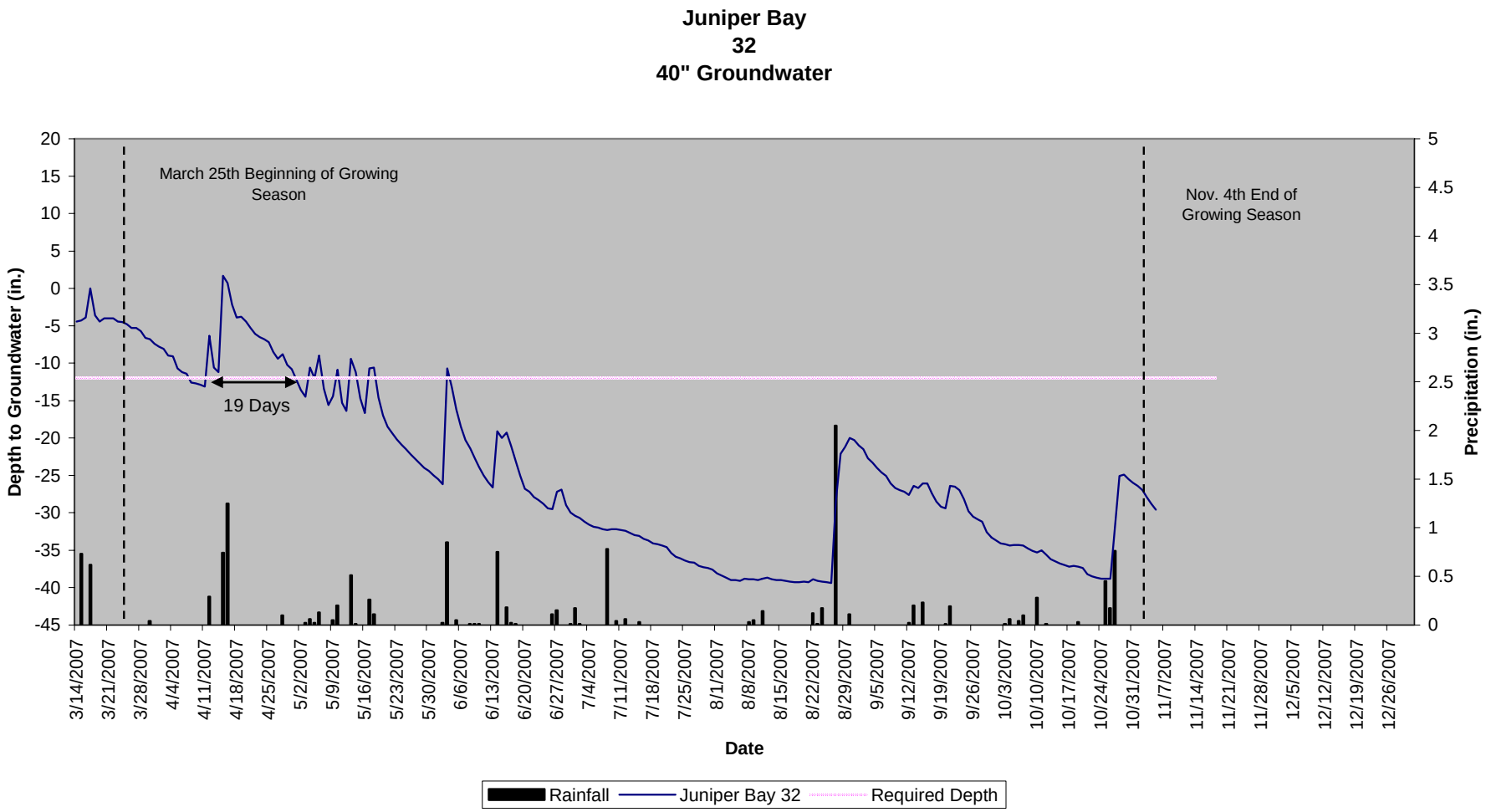

Juniper Bay
27
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
113 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 27
Required Depth

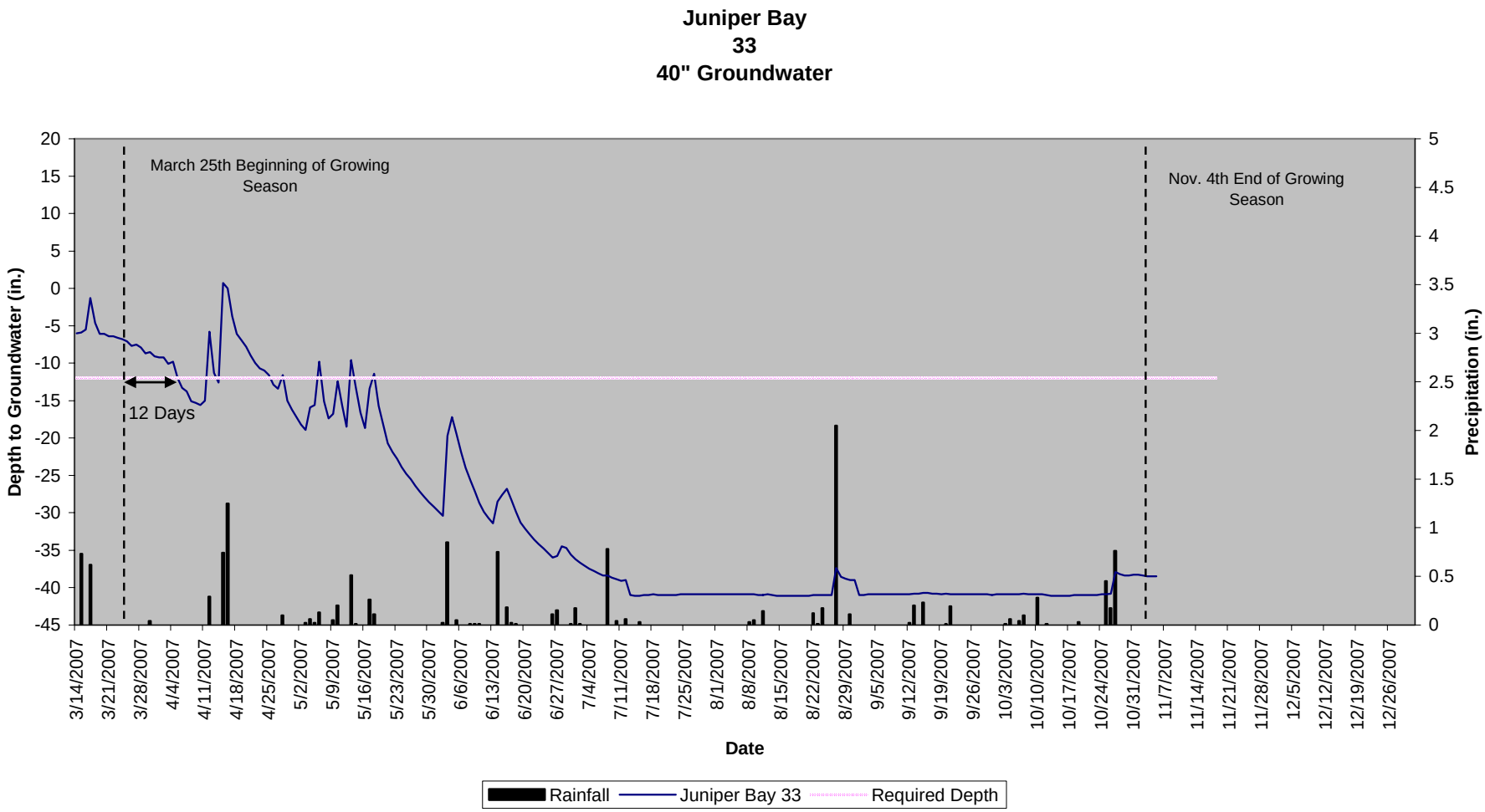

Juniper Bay
28
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
122 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 28
Required Depth

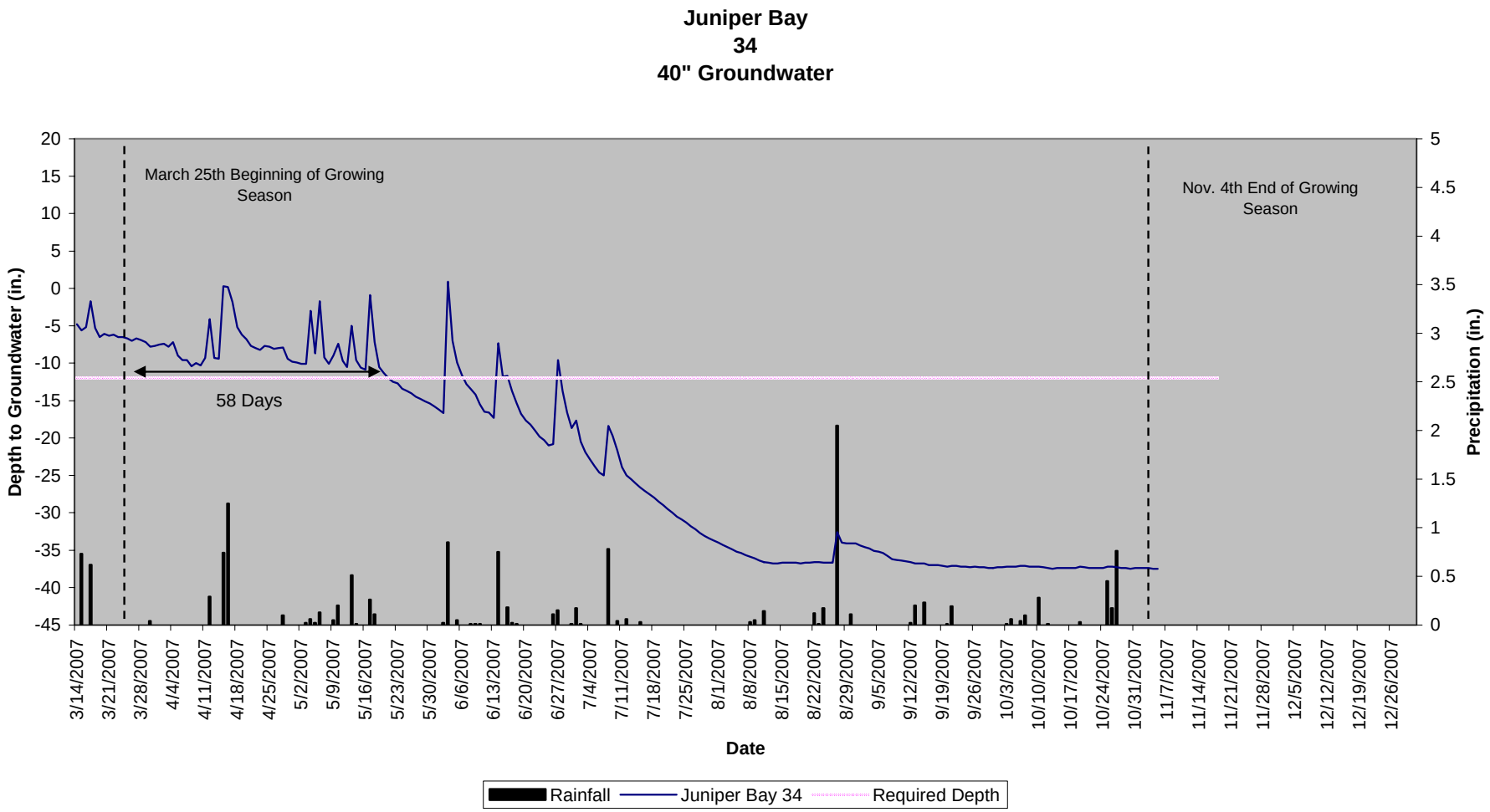

Juniper Bay
29
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
118 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 29
Required Depth

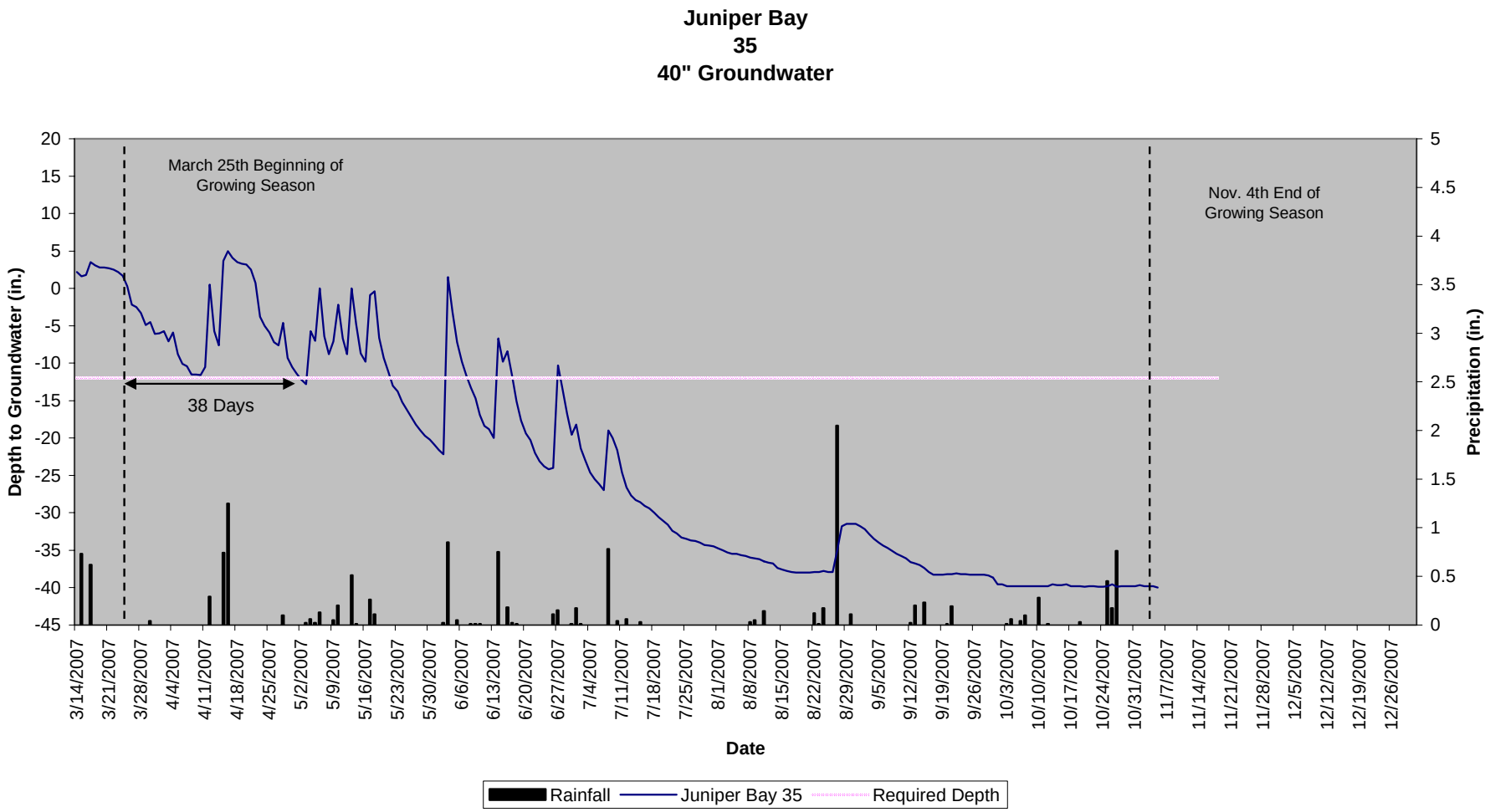

Juniper Bay
30
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
111 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 30
Required Depth

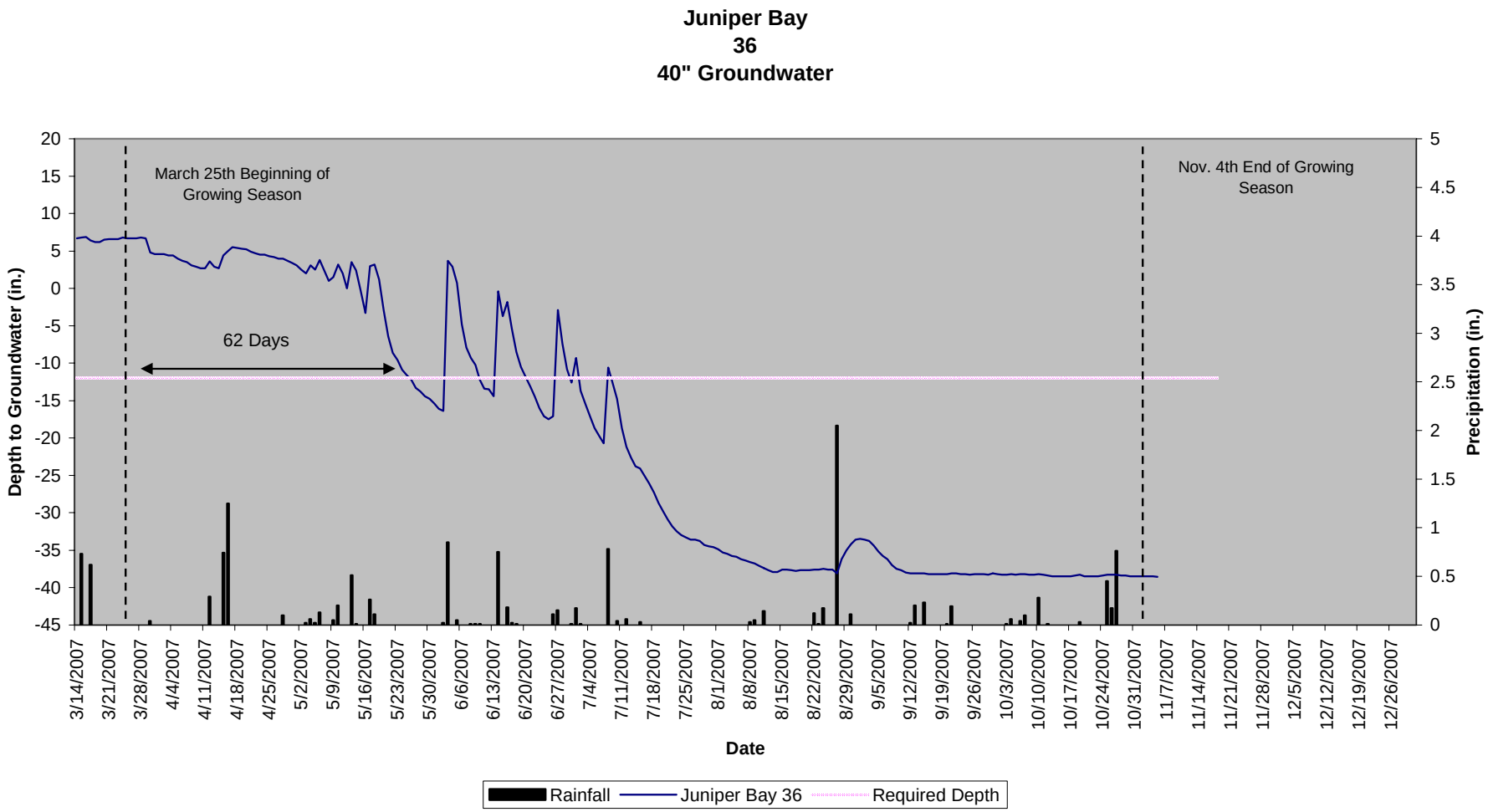

Juniper Bay
31
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
57 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 31
Required Depth

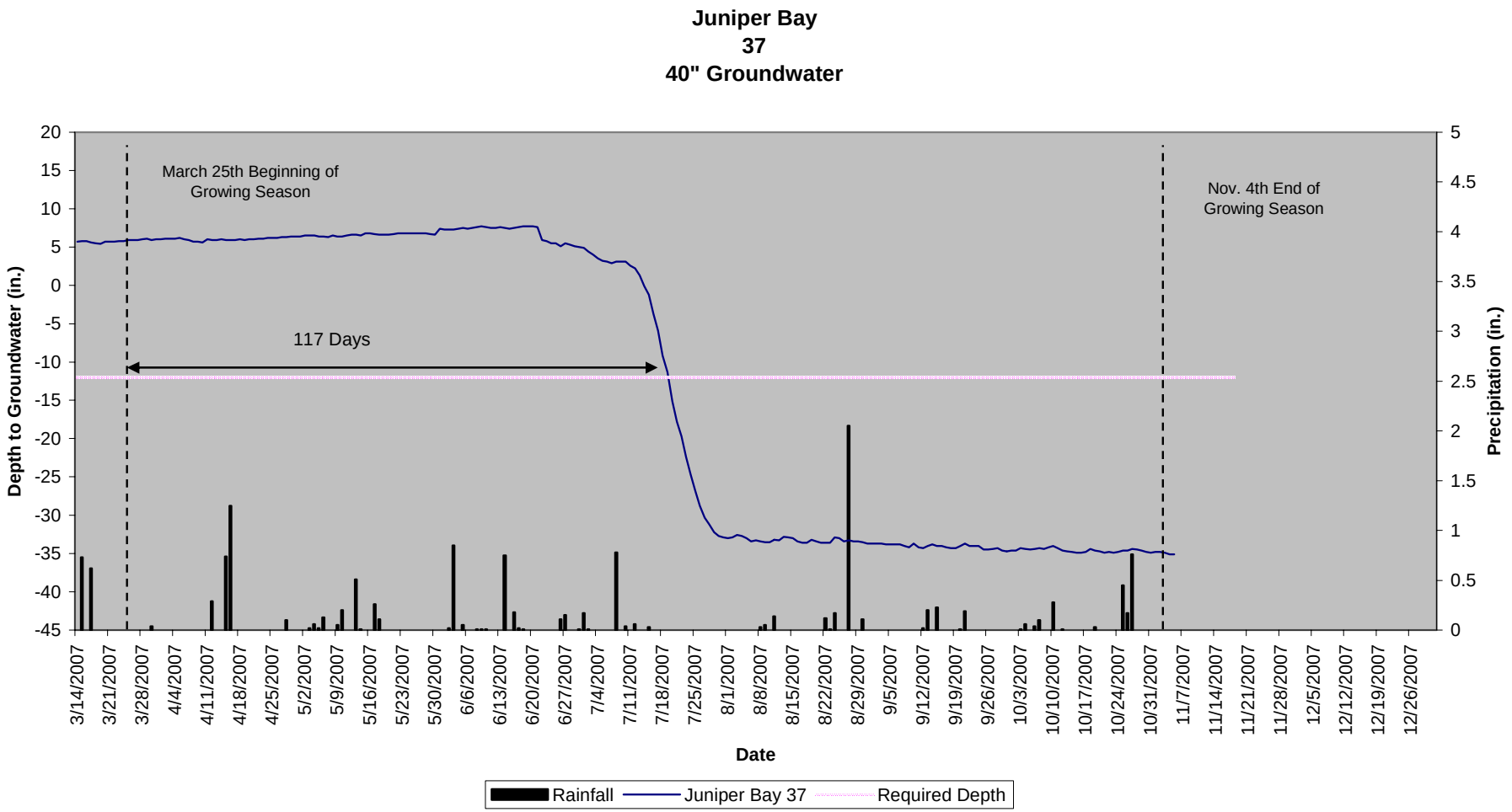

Juniper Bay
32
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
19 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 32
Required Depth

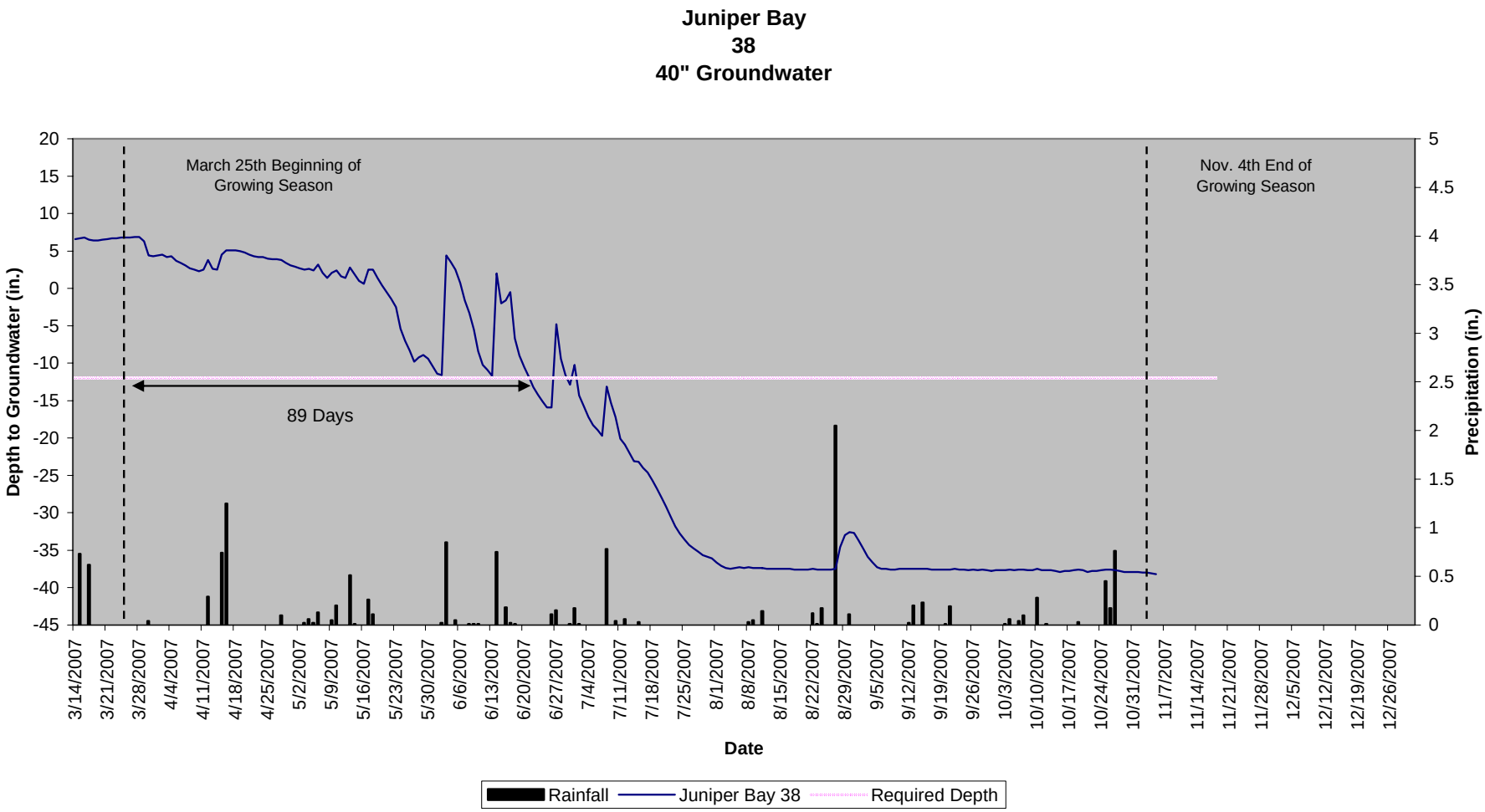

Juniper Bay
33
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
12 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 33
Required Depth

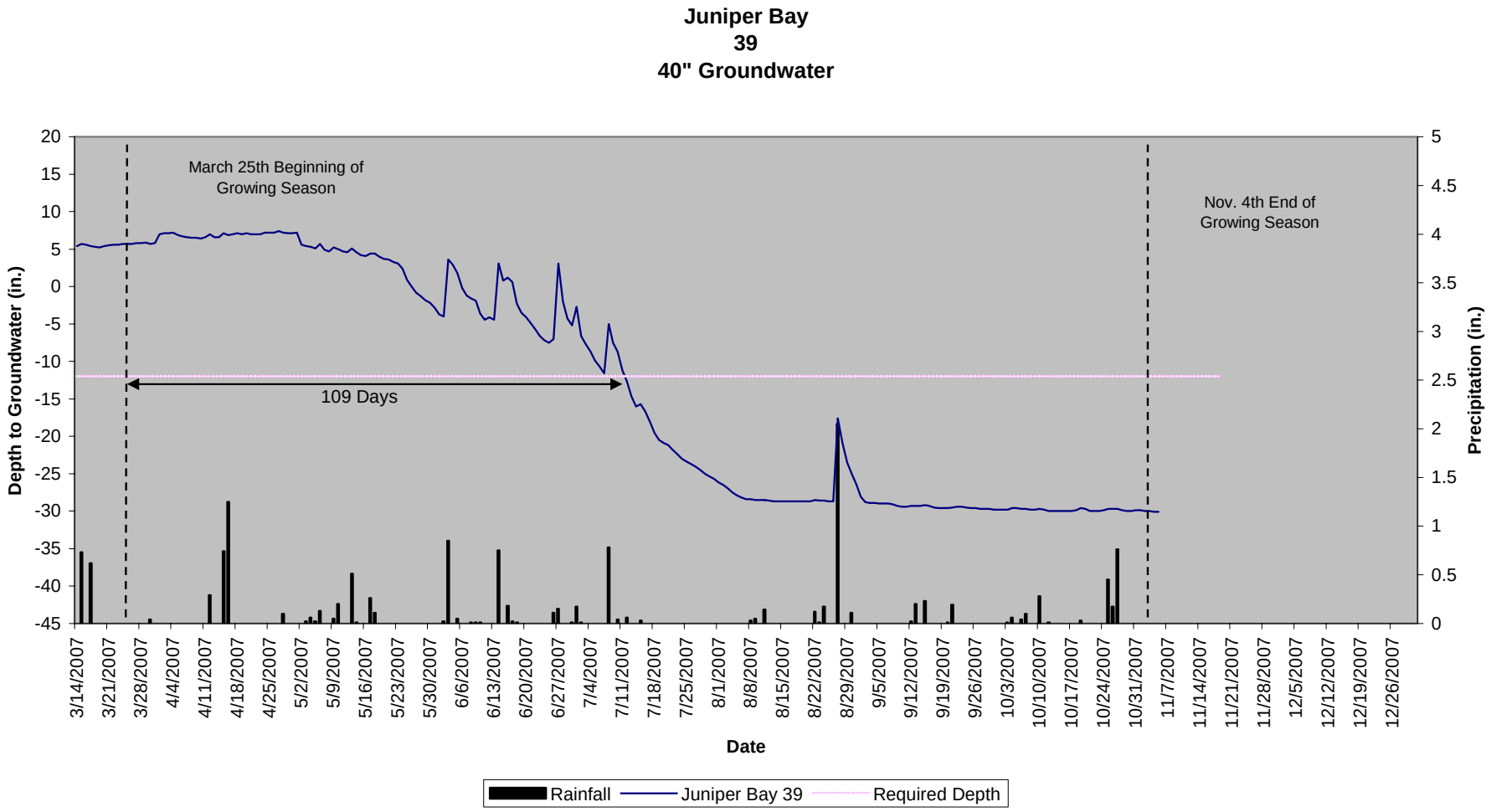

Juniper Bay
34
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
58 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 34
Required Depth

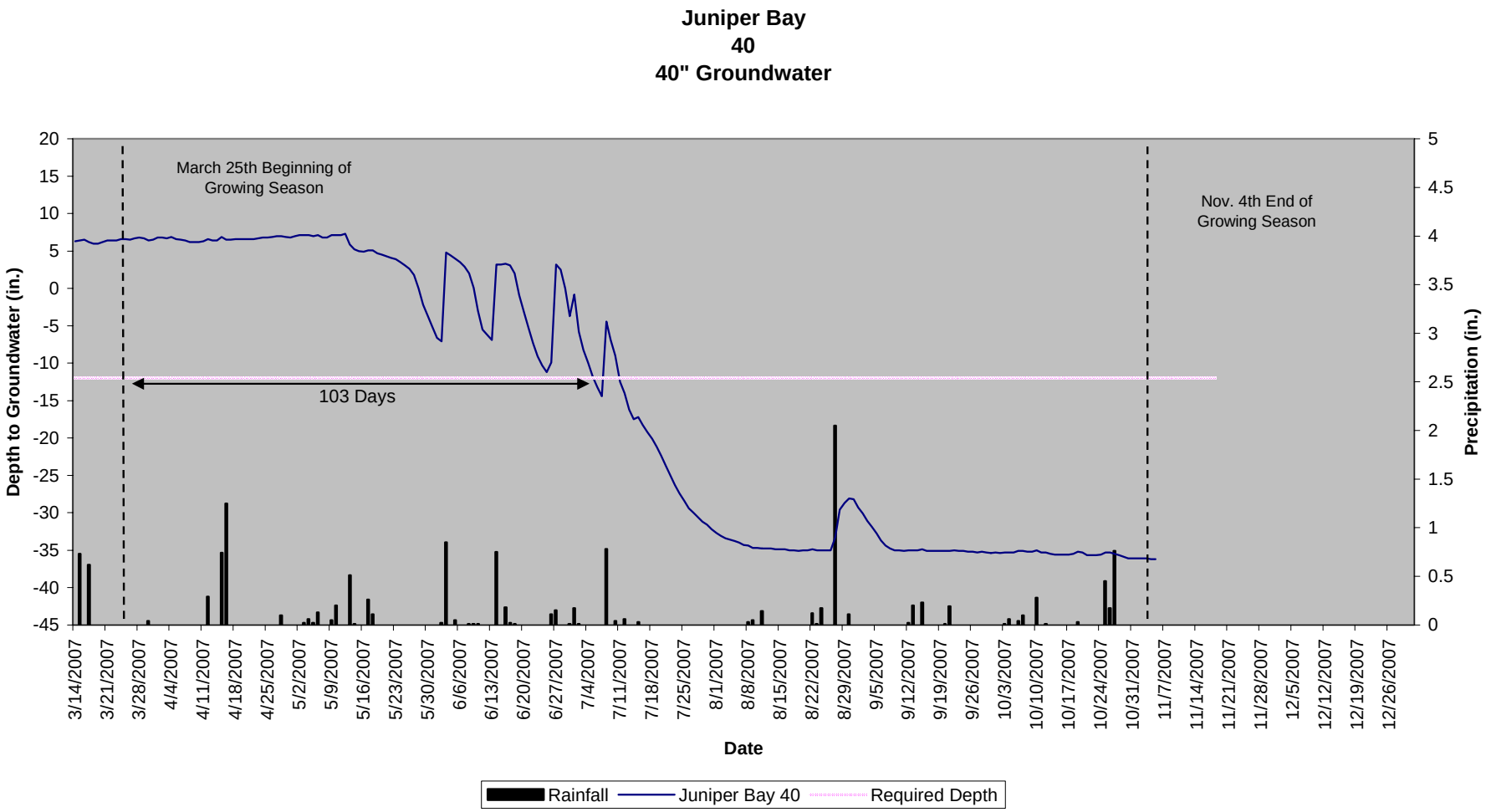

Juniper Bay
35
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
38 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 35
Required Depth

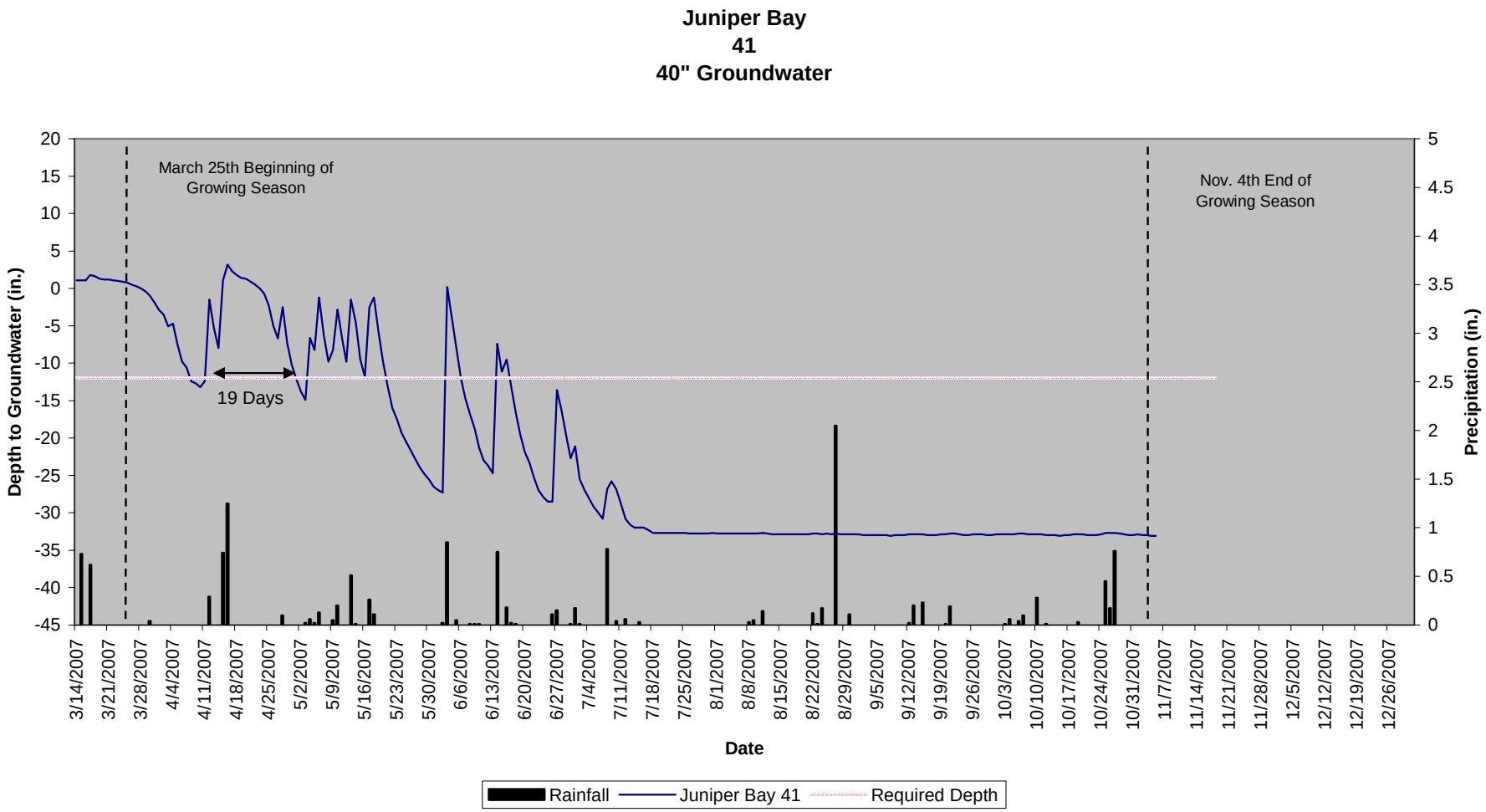

Juniper Bay
36
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
62 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 36
Required Depth

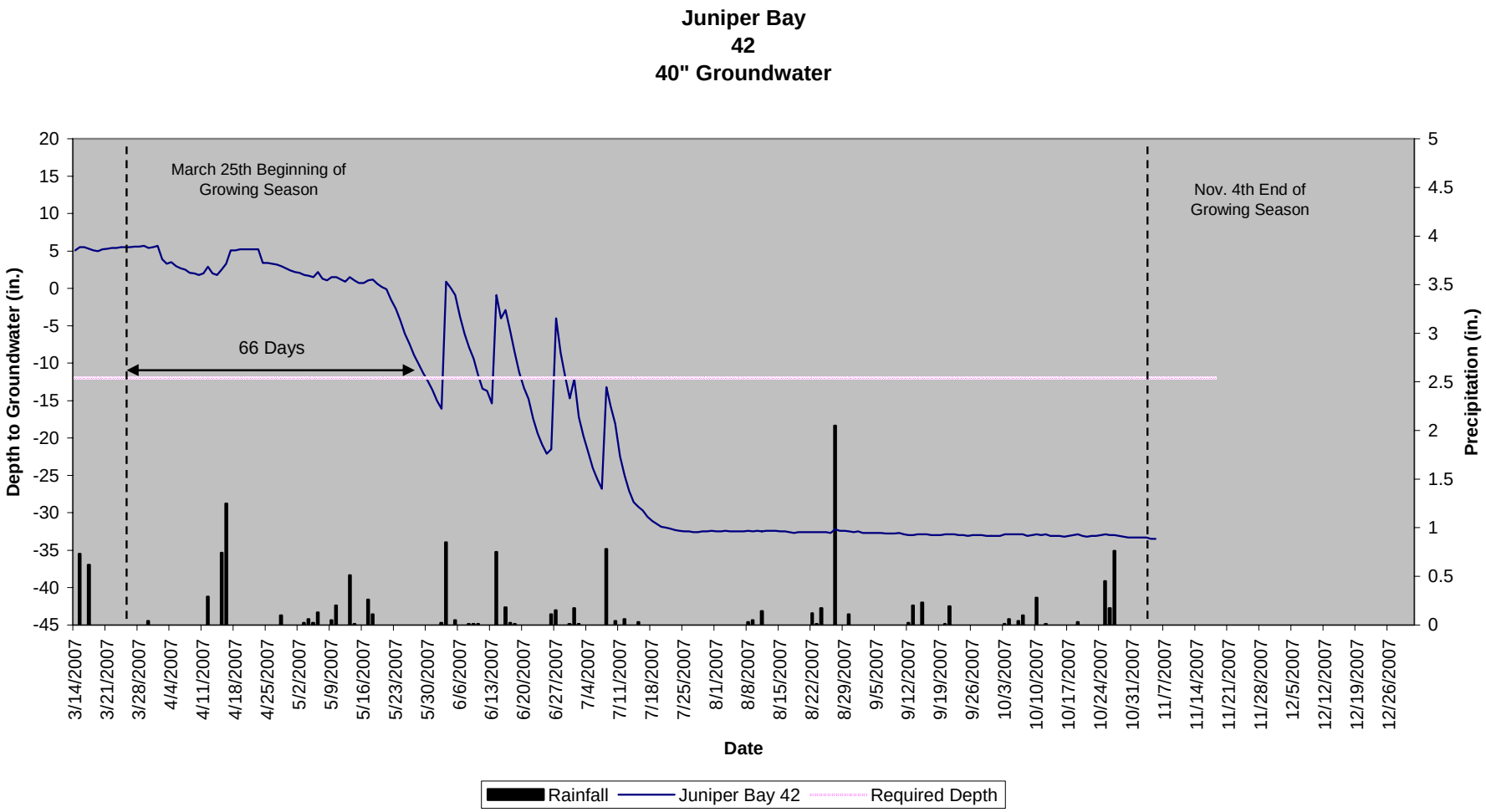

Juniper Bay
37
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
117 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 37
Required Depth

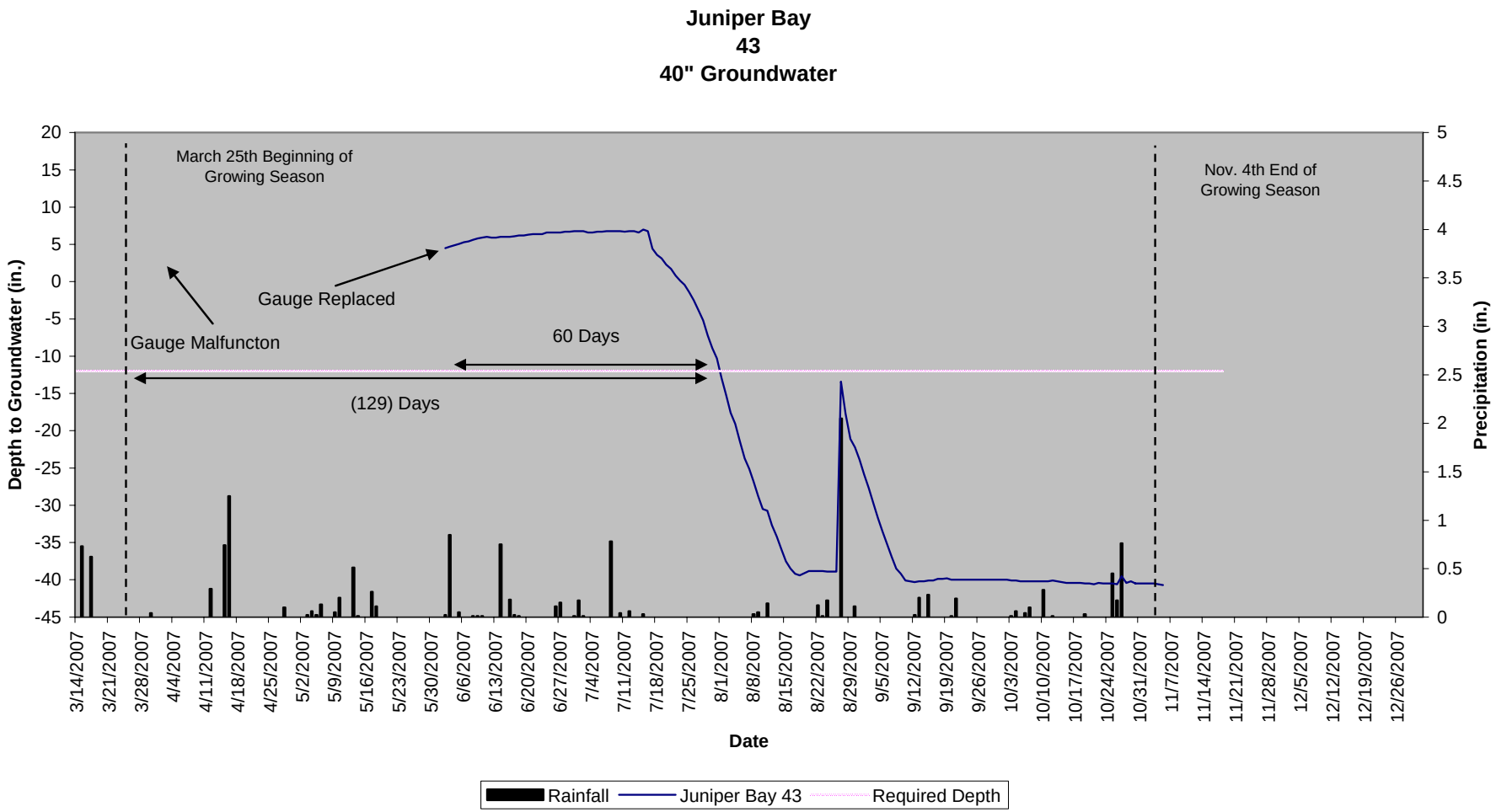

Juniper Bay
38
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
89 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 38
Required Depth

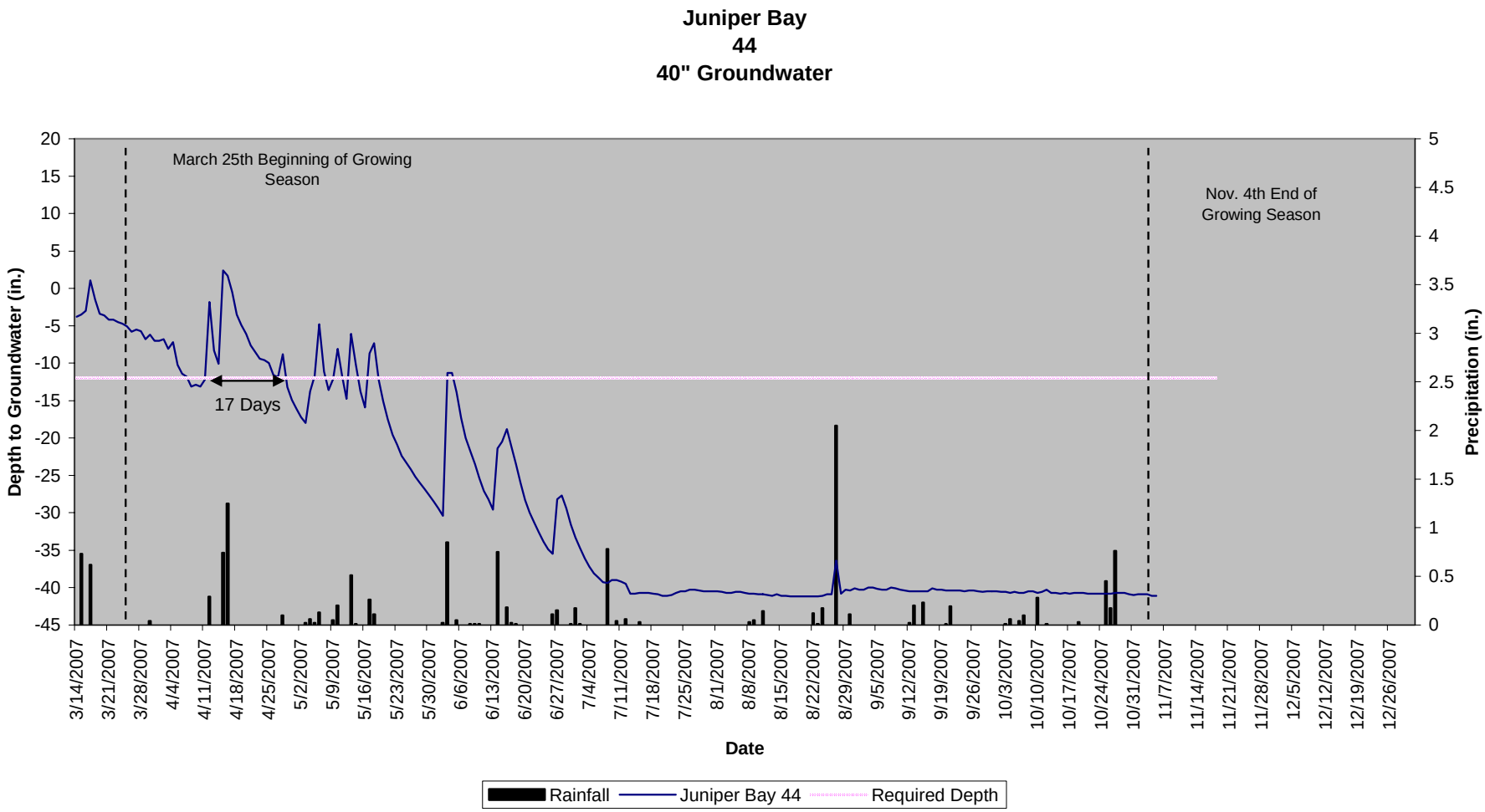

Juniper Bay
39
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
109 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 39
Required Depth


Juniper Bay
40
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
103 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 40
Required Depth


Juniper Bay
41
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
19 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 41
Required Depth


Juniper Bay
42
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
66 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 42
Required Depth


Juniper Bay
43
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
Gauge Replaced
Gauge Malfuncton
60 Days
(129) Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 43
Required Depth


Juniper Bay
44
40" Groundwater
March 25th Beginning of Growing Season
Nov. 4th End of Growing Season
17 Days
Depth to Groundwater (in.)
Precipitation (in.)
Date
Rainfall
Juniper Bay 44
Required Depth

Juniper Bay
45
40" Groundwater

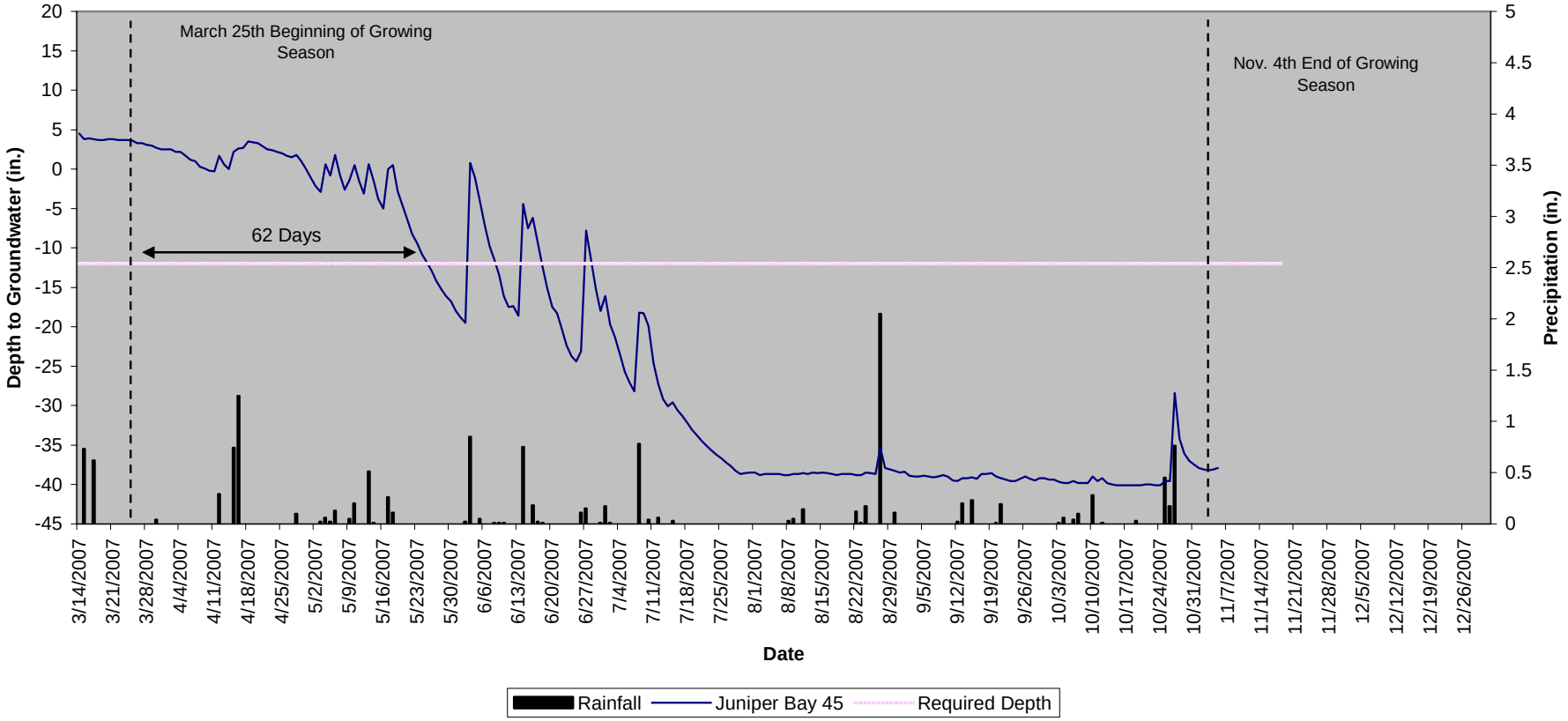


Table B-1. 2007 Hydrologic Monitoring Results				
Gauge	Community Type[a]	Status % of Growing Season	No. Days <12" March 25-November 4	Hydrologic Success
GW-1	PPW/BF	>12.5%	80 [b]	**Yes**
GW-2	PPW/BF	>12.5%	97	**Yes**
GW-3	PPW/BF	>12.5%	117	**Yes**
GW-4	PPW/BF	5-12.5%	20	**No**
GW-5	PPW/BF	>12.5%	97	**Yes**
GW-6	PAWCF/BF	>12.5%	117	**Yes**
GW-7	PAWCF/BF	>12.5%	119	**Yes**
GW-8	PAWCF/BF	>12.5%	118	**Yes**
GW-9	PAWCF/BF	>12.5%	117	**Yes**
GW-10	PPW/BF	>12.5%	58	**Yes**
GW-11	PPW/BF	<5%	1	**No**
GW-12	PPW/BF	>12.5%	68	**Yes**
GW-13	PAWCF/BF	>12.5%	133	**Yes**
GW-14	PAWCF/BF	>12.5%	130	**Yes**
GW-15	PAWCF/BF	N/A	Not Installed	**N/A**
GW-16	PAWCF/BF	>12.5%	121	**Yes**
GW-17	PPW/BF	>12.5%	62	**Yes**
GW-18	PPW/BF	>12.5%	48	**Yes**
GW-19	PPW/BF	>12.5%	43	**Yes**
GW-20	PPW/BF	>12.5%	68 [b]	**Yes**
GW-21	PPW/BF	>12.5%	116	**Yes**
GW-22	PAWCF/BF	N/A	Not Installed	**N/A**
GW-23	PAWCF/BF	>12.5%	208	**Yes**
GW-24	PAWCF/BF	>12.5%	130	**Yes**
GW-25	PPW/BF	>12.5%	88	**Yes**
GW-26	PPW/BF	>12.5%	80	**Yes**
GW-27	PAWCF/BF	>12.5%	113	**Yes**
GW-28	PAWCF/BF	>12.5%	122	**Yes**
GW-29	PAWCF/BF	>12.5%	118	**Yes**
GW-30	PPW/BF	>12.5%	111	**Yes**
GW-31	PPW/BF	>12.5%	57	**Yes**
GW-32	PPW/BF	5-12.5%	19	**No**
GW-33	PPW/BF	5-12.5%	12	**No**
GW-34	PPW/BF	>12.5%	58	**Yes**
GW-35	PPW/BF	>12.5%	38	**Yes**
GW-36	PPW/BF	>12.5%	62	**Yes**
GW-37	PPW/BF	>12.5%	117	**Yes**
GW-38	PPW/BF	>12.5%	89	**Yes**
GW-39	PPW/BF	>12.5%	109	**Yes**
GW-40	PPW/BF	>12.5%	103	**Yes**
GW-41	PPW/BF	5-12.5%	19	**No**

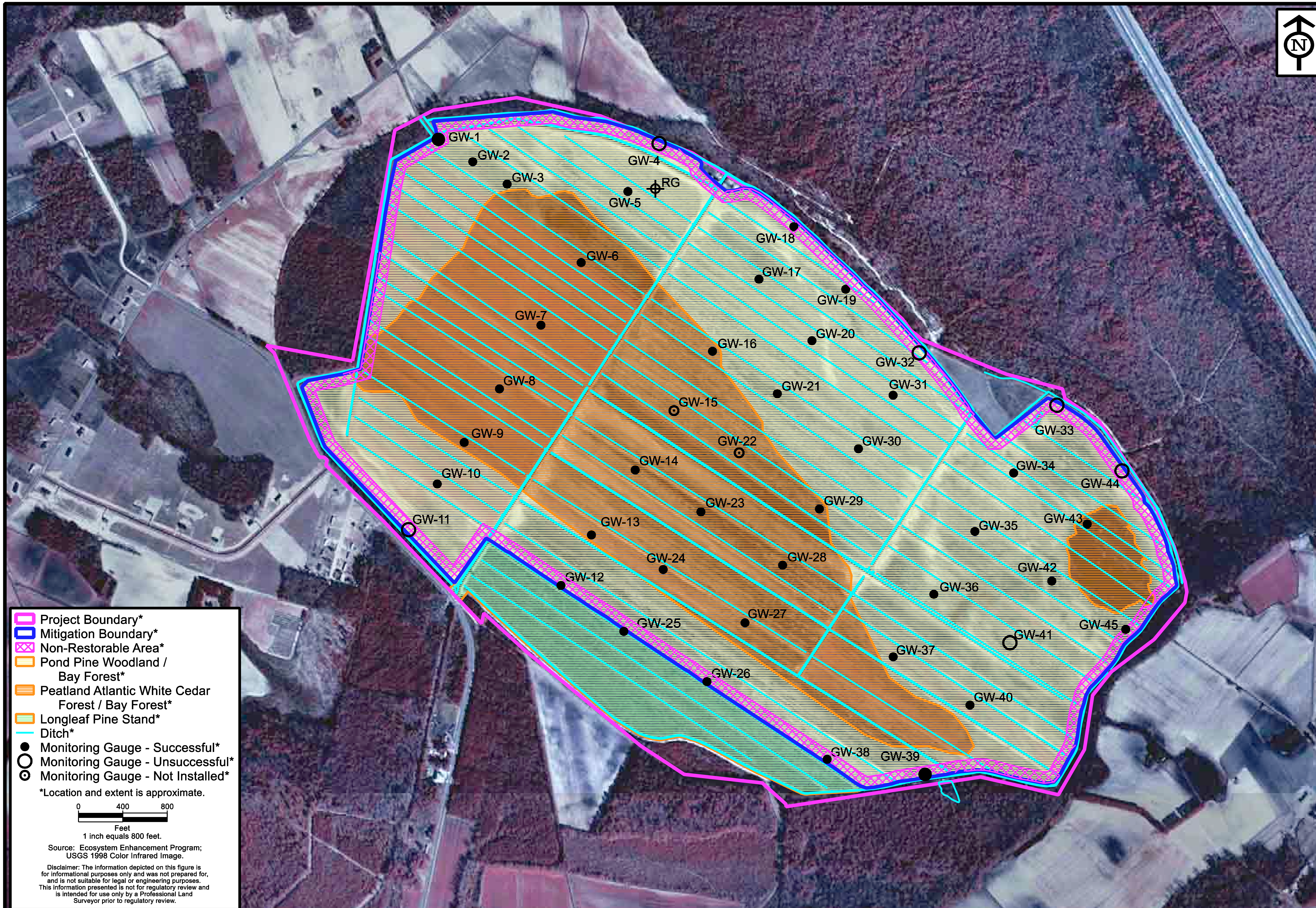
Table B-1 continues.

Table B-1 concluded.

Gauge	Community Type[a]	Status % of Growing Season	No. Days <12" March 25-November 4[b]	Hydrologic Success
GW-42	PPW/BF	>12.5%	66	**Yes**
GW-43	PAWCF/BF	>12.5%	60 (129)[c]	**Yes**
GW-44	PPW/BF	5-12.5%	17	**No**
GW-45	PPW/BF	>12.5%	62	**Yes**

[a] Community Types: PPW/BF-Pine Pond Woodland/Bay Forest, PAWCF/BF- Peatland Atlantic White Cedar Forest/Bay Forest.
[b] Missing data: data does not affect longest hydroperiod.
[C] Missing data: status shown in parenthesis was extrapolated from comparable gauges.

Appendix C
Integrated Overview



Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	KT/GT
Figure:	4

Monitoring Gauge Problem Areas

Juniper Bay

Robeson County, North Carolina

Monitoring Report Year 2

ENVIRONMENTAL SERVICES, INC.
524 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

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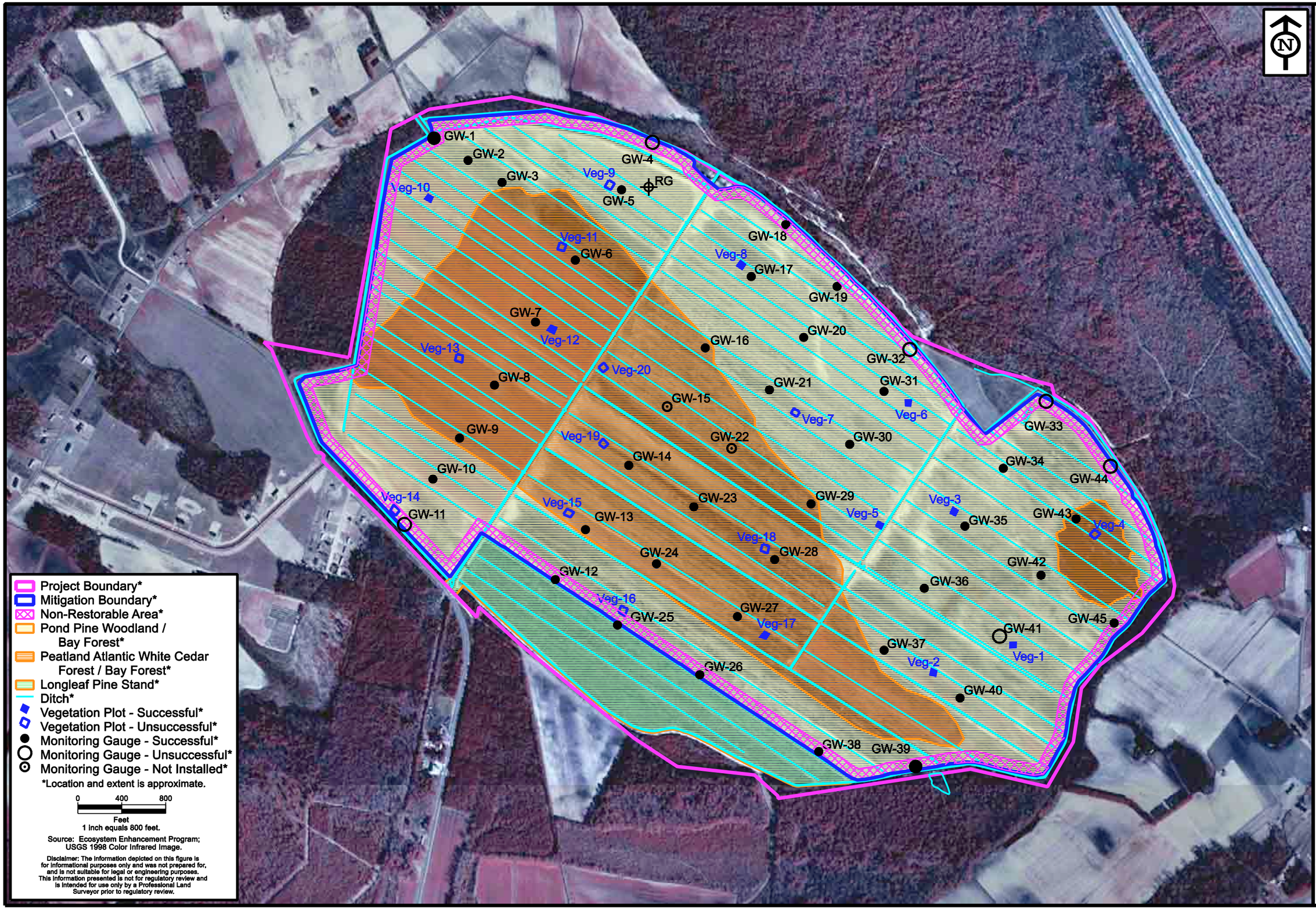

Project:	ER07008.00
Date:	Nov 2007
Drwn/Chkd:	KT/GT
Figure:	5

Overall Problem Areas
Juniper Bay
Robeson County, North Carolina
Monitoring Report Year 2

ENVIRONMENTAL SERVICES, INC.
224 S. New Hope Road
Raleigh, North Carolina 27610
(919) 212-1760
(919) 212-1707 FAX
www.environmentalservicesinc.com

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