Ditch Pond Carolina Bay Restoration Project: Phase I Progress Report

by

Scott Harder
Joseph A. Gellici
Andrew Wachob

State of South Carolina
Department of Natural Resources

Land, Water and Conservation Division
Open-File Report 11
2006

CONTENTS

FIGURES

TABLES

APPENDICES

Introduction

Ditch Pond Heritage Preserve, located along the border between Aiken and Barnwell Counties near Williston, S.C., contains a 25-acre Carolina bay. Water levels in the bay are believed to be approximately 1 ft (foot) below normal, based on the high-water marks of trees along the perimeter of the bay, which indicate prolonged periods of standing water. Though relatively undisturbed as compared to most of the Carolina bays in South Carolina, the hydrology at Ditch Pond Bay has been altered to some degree by a shallow ditch, along the northern section of the bay, which extends from the interior of the bay to a drainage culvert underneath Weeks road (State Road 215). The length of the ditch is approximately 1,200 ft. Several dams along the ditch that may be of natural or artificial origins may impede surface flow to the culvert. Surface water outflow from the bay through this ditch may only be occurring during periods of high water levels in the bay. A larger ditch, which drains an adjacent Carolina bay (White Pond Bay) on the southwest side of Ditch Pond, may also be impacting the water levels by reducing lateral ground-water seepage to Ditch Pond. This ditch also drains to the main culvert underneath Weeks Road and has almost completely drained White Pond Bay.

Objectives

The degree to which the ditches along Ditch Pond Bay and White Pond Bay are influencing the water levels in Ditch Pond is not well understood. These uncertainties, along with the possible impacts on a private tract of land in the northwestern part of Ditch Pond, highlight the need for baseline data prior to developing and implementing a restoration plan. The objectives of this study are 1) to acquire baseline data on the existing hydrologic dynamics of Ditch Pond Bay and 2) to develop and implement a restoration strategy to return Ditch Pond Bay to its normal water levels. This document serves to summarize the progress made on Phase I of the project and to present preliminary data collected at the site. Phase I consisted of the installation of monitoring equipment that was used to assess the current hydrologic dynamics at the site.

Instrumentation

Nine monitoring wells have been installed along the perimeter and in the upland areas of Ditch Pond Bay (labeled DP1, DP2 …DP9) (Figure 1). These installations began in mid-March 2006 and were completed by early April. Boreholes, with a diameter of approximately 4 in, were drilled manually with a hand auger, and their depths ranged from 10.5 to 16.2 ft below ground surface, depending on the ground-surface elevation at each site. Wells located in the upland areas were typically 15 to 16 ft in depth, and the wells closer to the bay or north of the bay, where surface elevations are generally lower, ranged from 10.5 to 14 ft in depth. Wells were constructed of 2-in, schedule 40 PVC casing and 2-in PVC, 10-slot screen. In general, the lower 10 ft of the borehole was screened. Gravel packs consisting of #2 sand were packed around the well casing, generally to a depth of 1 to 3 ft below ground surface. Cement grout was added to the top 1 to 3 ft of the borehole to serve as a seal that prevents rainwater and/or surface water from draining down the sides of the well. The wells extend 2 to 5 ft above ground

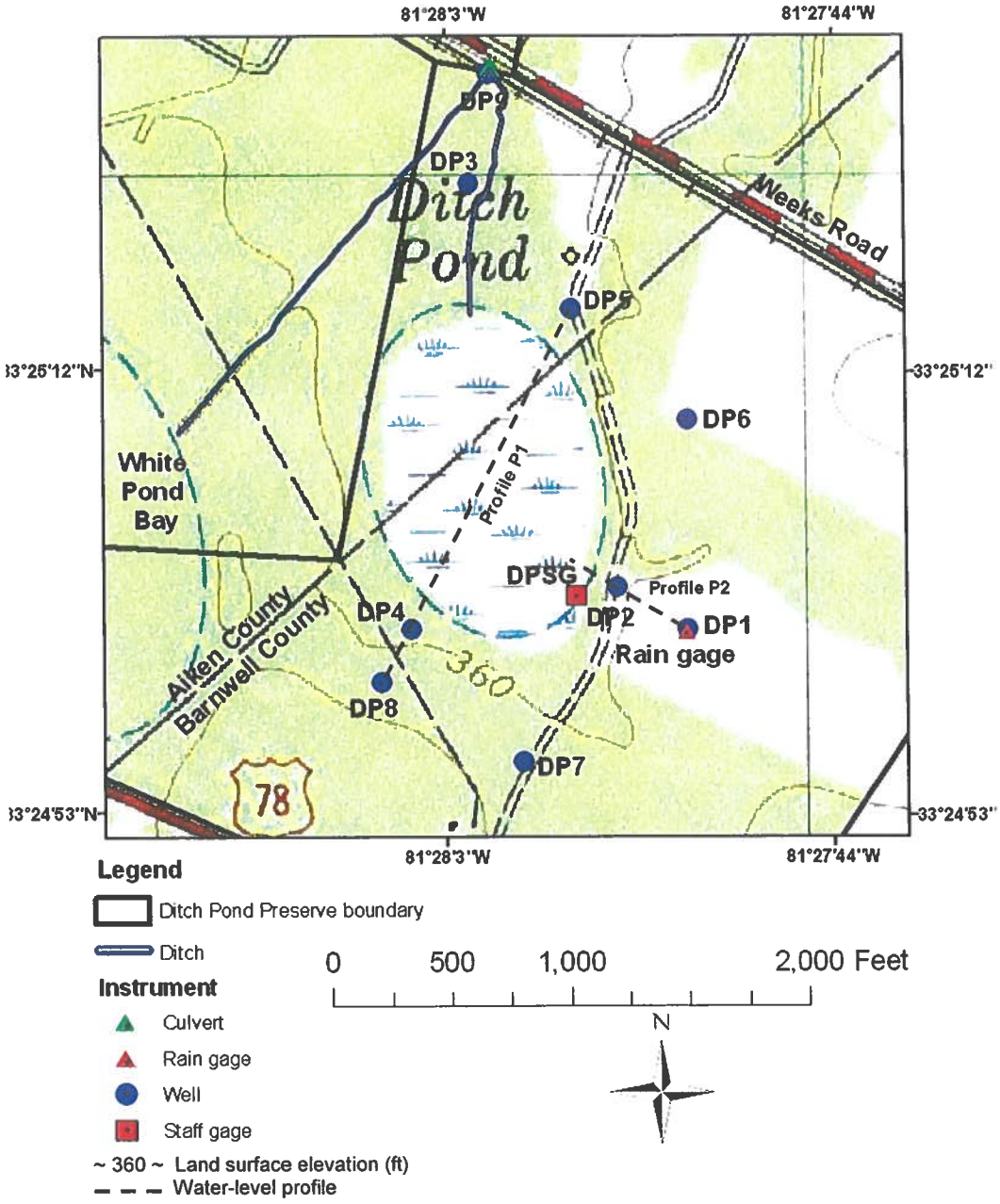


Figure 1. Instrumentation at Ditch Pond Bay.

surface. All nine wells have been surveyed to obtain water-table elevations in feet above mean sea level, and manual water-table measurements have been made on a weekly to biweekly schedule. Schematic diagrams and installation details for each well are provided in Appendix I.

Well locations are shown in Figure 1. Site selections were chosen to obtain water-table data that would provide information on the general direction of lateral-ground water flow. Measurements from these nine wells will help in answering several key questions: How does the local water table influence water levels in the bay? Is Ditch

Pond a "perched" system or a ground-water flow-through system? Is the bay recharging the local water table or is the water table recharging the bay? To address the direction of lateral ground-water flow, many of the wells were located along profiles extending across the bay. These profiles were designed to include water levels in a well located in an upland area, water levels of the bay itself, and water levels in additional wells close to the perimeter of the bay. Well DP8 (upland well), DP4 (perimeter well) and DP5 (perimeter well) form a profile (P1) oriented in a southwest to northeast direction and DP1 (upland well) and DP2 (perimeter well) form a partial profile (P2) in the southeastern area of the bay. This partial profile will eventually extend to the northwest perimeter of the bay with the installation of additional monitoring wells. Wells DP6 and DP7 will add additional information on water-table positions in the upland areas surrounding the bay. Well DP3 is approximately halfway between the bay and the main outlet culvert, and DP9 is very close to the culvert between the White Pond and Ditch Pond ditches. These wells will help characterize ground-water seepage from the bay to the culvert and will also help to determine the influence of the ditches on the surrounding water table.

Soil samples were collected approximately every 0.5 to 1 ft during the well installation at each site. Samples were also taken from a 6-ft borehole augered along the south rim of the bay. A description of each sample was made in the laboratory to characterize sediment content and distribution. This soil data will provide information on any zones of high clay content that may serve as confining layers and may help in the interpretation of the ground-water hydrodynamics at the site. Sand and loamy sand in the top 5 to 8 ft that overlie alternating layers of sandy clay loam and sandy clay characterized most of sites. Details of this analysis for each sample can be found in Appendix II.

A tipping-bucket rain gage with an automatic data logger (Unidata) has been installed in an upland clearing on the southeastern side of the bay. This gage has a resolution of 0.01 in and is located approximately 500 ft from the edge of the bay (Figure 1). The data logger has been recording rainfall totals every 15 minutes since mid-March 2006. These 15-minute rainfall totals can be used to calculate hourly, daily and monthly rainfall totals. Rainfall is most likely the dominant water input to the bay, and these measurements will be used to analyze the response of water levels in the bay to rainfall events. A picture of the rain gage and the adjacent well (DP1) is presented in Figure 2. Water levels in the bay have been monitored since mid-March 2006 through the installation of a staff gage in the southeastern area of the bay (Figure 1). A picture of the staff gage is shown in Figure 3. The gage has been surveyed to obtain water levels in feet above mean sea level. In addition, a monitoring well (DP1) several feet from the rain gage, as well as additional wells installed around the bay, will provide information on the response of the water table to rainfall events.

Observations

Daily rainfall totals measured at Ditch Pond are illustrated in Figure 2. There have been only three significant rainfall events (defined here as approximately 1.00 in or

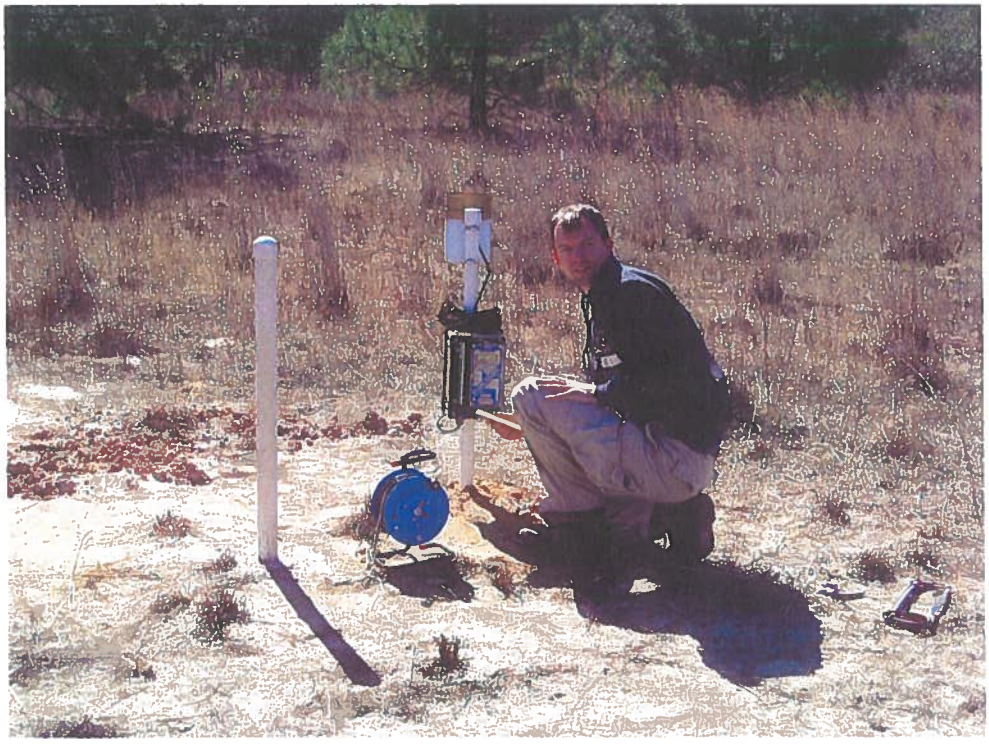


Figure 2. Well DP1 (PVC post on left) and automatic rain gage.

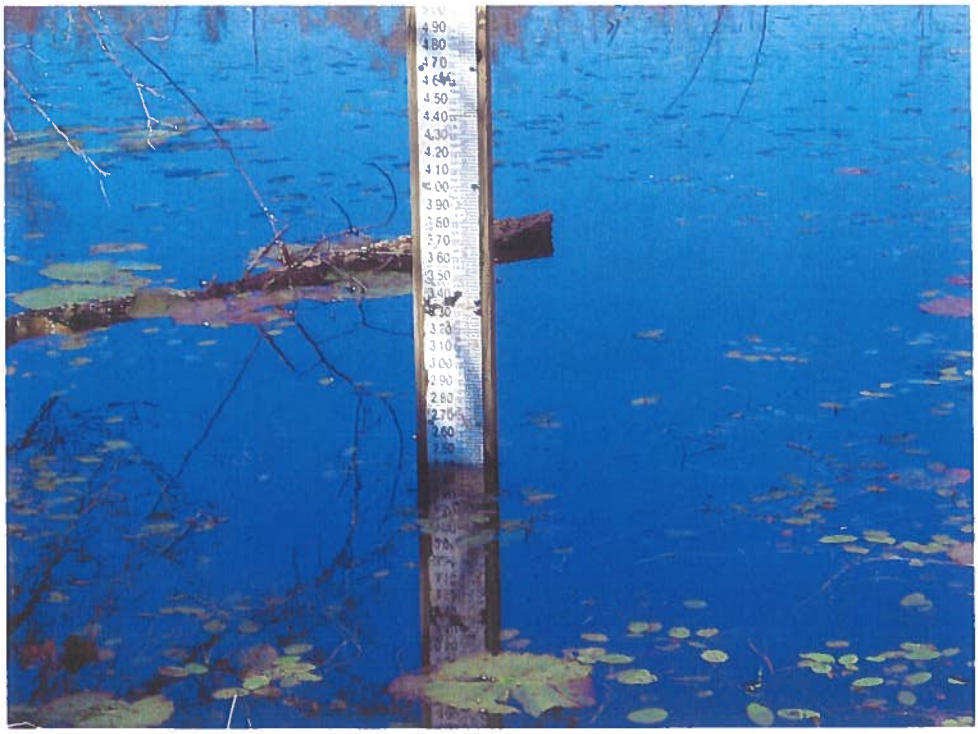


Figure 3. Staff gage used to measure water levels in the bay.

greater) since monitoring began in mid-March. These events occurred on March 21 (2.57 in), April 26 (0.98 in), and June 12-14 (4.36 in). The closest weather station to Ditch Pond Bay that has current and historic rainfall data is located in the city of Aiken approximately 15 miles northwest of the site. April and May rainfall totals for the Aiken station in 2006 were 1.79 in and 1.11 in, respectively, compared to the long-term averages of 3.41 in and 3.50 in, respectively. Monthly rainfall totals measured at the Ditch Pond rain gage were 2.11 in for April and 1.00 in for May, which is in reasonable agreement with the Aiken totals, considering there will be some spatial variation in rainfall between the two sites. The April and May measurements at the Ditch Pond gage, as compared to the long-term averages at the Aiken gage, show that rainfall amounts are below normal on the order of 3 to 4 in at Ditch Pond Bay for these two months.

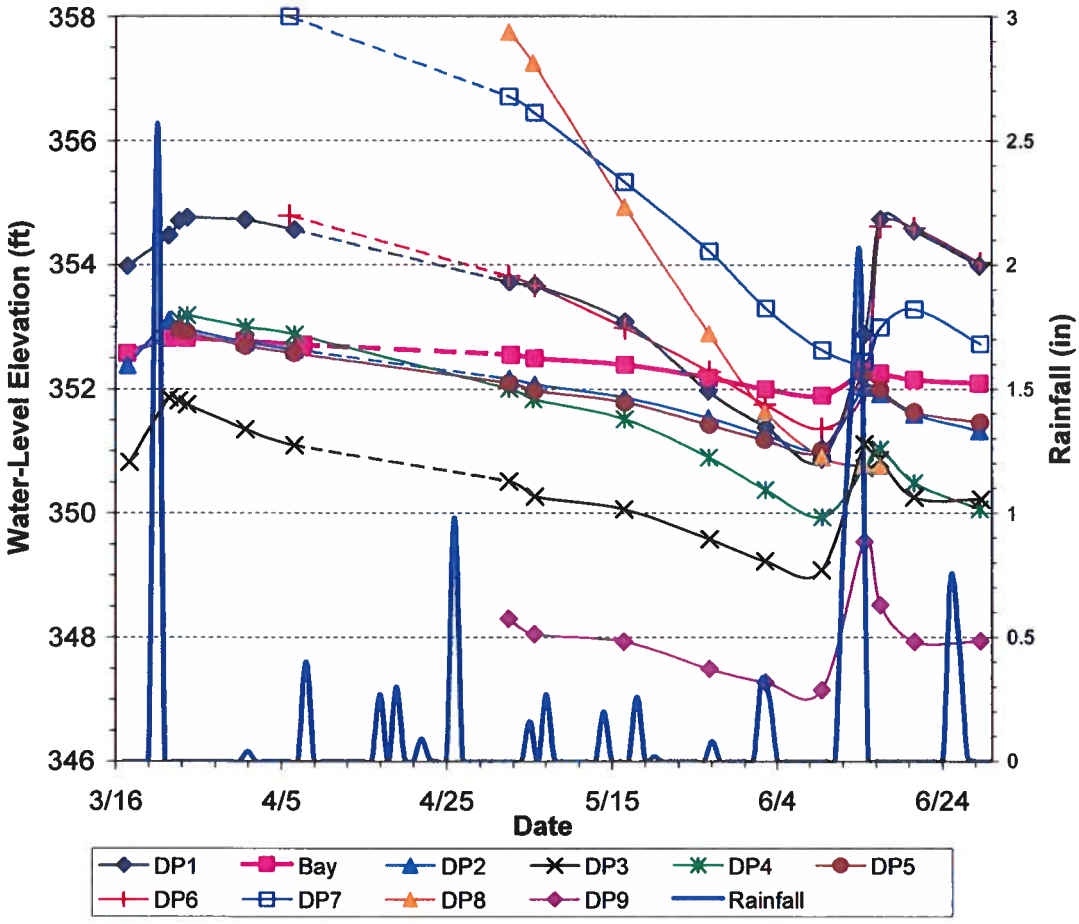


Figure 4. Daily rainfall and well-water levels at Ditch Pond Bay.

Bay water levels and manual water-table measurements from all nine monitoring wells are plotted in Figure 4 and listed in Table 1 for the period from mid-March to late June. Water levels in the bay generally have less variability than the water levels measured in the monitoring wells. The rainfall event of 2.57 in on March 21 resulted in noticeable increases in bay levels and water-table levels at wells DP1, DP2 and DP3 (the only wells installed prior to the rain event). In the week following this storm event, all wells but DP3 had water levels higher than the levels in the bay.

Water levels in all nine wells and the bay showed a general decline through the month of April and into early May; however, no measurements were made near the time of the rainfall event of 0.98 in on April 26 that may have caused a temporary rise in the water levels. Beginning in mid-May, water levels declined more rapidly, which is most likely due to a combination of increased evapotranspiration rates and lack of significant rainfall events. By the first week of June, all wells except DP7 had water levels lower than the level in the bay. The large rainfall event associated with Tropical Storm Alberto caused substantial rises in bay level and most well water levels surrounding the bay. This

Table 1. Well and staff gage water-level elevations (measured in feet above mean sea level)

Date	DP1	DP2	DP3	DP4	DP5	DP6	DP7	DP8	DP9	Staff Gage
03/15/06	354.04									
03/17/06	353.98	352.38	350.82							352.58
03/22/06	354.47	353.10	351.86							352.82
03/23/06	354.71	352.98	351.81	353.11	352.95					352.83
03/24/06	354.76	352.96	351.75	353.18	352.91					352.82
03/31/06	354.72	352.75	351.35	352.99	352.69					352.77
04/06/06	354.56	352.63	351.09	352.87	352.57	354.79	357.99			352.71
05/02/06	353.72	352.16	350.51	352.00	352.09	353.81	356.70	357.74	348.30	352.55
05/05/06	353.67	352.07	350.27	351.83	351.97	353.66	356.44	357.25	348.05	352.49
05/16/06	353.08	351.86	350.06	351.51	351.78	352.98	355.33	354.93	347.93	352.39
05/26/06	351.96	351.53	349.58	350.89	351.42	352.28	354.21	352.89	347.49	352.18
06/02/06	351.38	351.25	349.23	350.37	351.18	351.75	353.29	351.63	347.27	352.00
06/09/06	350.86	351.04	349.08	349.93	351.01	351.36	352.62	350.90	347.15	351.89
06/14/06	352.88	352.03	351.11	350.72	352.25	352.00	352.43	350.76	349.54	352.29
06/16/06	354.73	351.92	350.86	351.02	351.99	354.62	352.99	dry	348.52	352.25
06/20/06	354.54	351.59	350.25	350.48	351.63	354.59	353.28	dry	347.93	352.15
06/28/06	353.98	351.32	350.22	350.06	351.46	354.03	352.72	dry	347.94	352.09

rainfall event of 4.36 in resulted in an increase of 0.4 ft in the bay water level. Despite the large amount of rain associated with this event, only the water levels in wells DP1, DP6, and DP7 rose above the level of the bay.

Water-level fluctuations in the upland wells of DP1, DP6, and DP7 are similar, though DP1and DP6 were observed to have stronger responses to the tropical-storm event than DP7. Water levels at upland well DP8 declined rapidly through the month of May, which was a substantially different behavior from that observed at the other three upland wells. Water levels at DP8 also had little to no response to the large tropical-storm event. DP2 and DP5, wells located along the northeast and southeast margins of the bay, respectively, had similar water levels for this three-month period. DP4, located in the southwest margin of the bay, had a water-level behavior similar to DP2 and DP5 through March and April; however, the water level at DP4 began to decline more rapidly in mid-May. Wells DP3 and DP9 had similar rates of water-level decline through May and early June and also had a similar response to the tropical-storm event.

Water levels measured along profile P1, which includes DP8, DP4, the bay, and DP5, are illustrated in Figure 5 for selected dates. Water levels on March 24, several days after the 2.57-in rain event, showed small hydraulic gradients from DP4 and DP5 towards the bay. By the beginning of May, however, water levels at DP4 and DP5 had declined below the bay while levels at the upland well, DP8, remained several feet above

the bay. Through May and early June, DP4 and DP5 continued to drop farther below bay levels, and DP8 experienced a relatively rapid decline. By the first week of June, DP8 had also dropped below the level in the bay. The tropical-storm event on June 13-14 caused DP5 to approach bay level while DP4 remained nearly 1.5 ft below bay level. DP8 showed no response to this rain event.

Water levels measured along the profile P2, which includes DP1, DP2, and the bay, are shown in Figure 6. After the large rain event on March 24, water levels in DP1 and DP2 showed a hydraulic gradient toward the bay. Through the months of April and May the water level in DP2 dropped below the bay while DP1 steadily declined but remained above the bay. By the second week of June, DP1 had also dropped below the bay. The large tropical-storm event on June 13-14 caused DP2 to rise nearly 1 ft but the level remained below the bay level. The rain event caused DP1 to rise several feet immediately after the storm, putting it several feet above the bay.

Phase II Project Objectives

Phase I of this study consisted of the installation of instruments designed to provide information on rainfall, bay-water levels, and water-table levels surrounding the bay. This instrumentation provides a general overview of the current ground-water dynamics at the site.

Phase II will include the installation of automatic data recorders in three of the wells and a fourth recorder in the bay itself. These recorders should be installed by mid-July and will record water levels on an hourly basis, providing detailed data on the response of the bay and water table to rain events. Phase II will also include the installation of several additional monitoring wells. Two wells will be added to the northwest side of the bay along a profile from Ditch Pond to the ditch that drains White Pond Bay. These wells will provide information on the effects of the White Pond ditch on the surrounding water table and on the water level in Ditch Pond Bay. One or two wells will be installed between Ditch Pond and White Pond to provide additional water-table data on the western side of the system.

In addition to the installation of monitoring instruments, topographic profiles of the bay and sections of the ditch will be constructed. Bay profiles will be obtained with a GPS unit and a measuring rod while walking profiles across the bay. Sections of the Ditch Pond ditch will also be surveyed to evaluate the ditch's influence on water levels in the bay. One question that should be answered is how often a surface-water connection between the bay and the main outlet culvert exists. Several dams of either natural or artificial origins exist along the ditch, and their current effectiveness must be assessed as well.

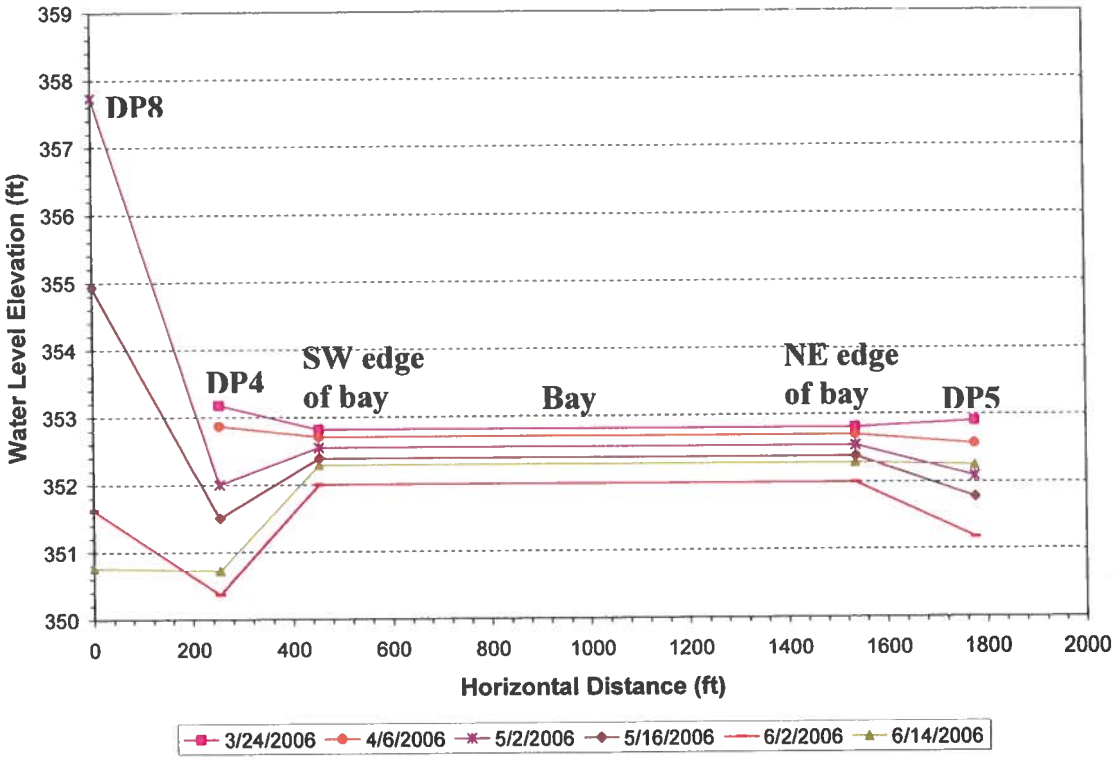


Figure 5. Water levels at profile P1 for selected dates.

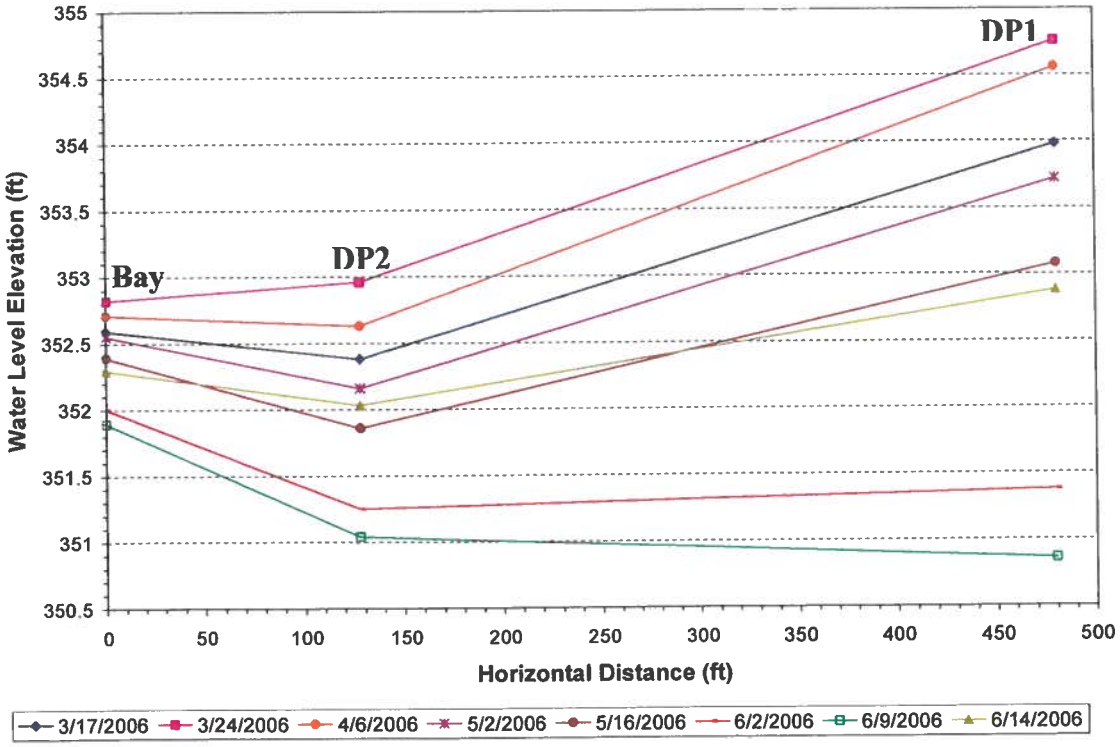
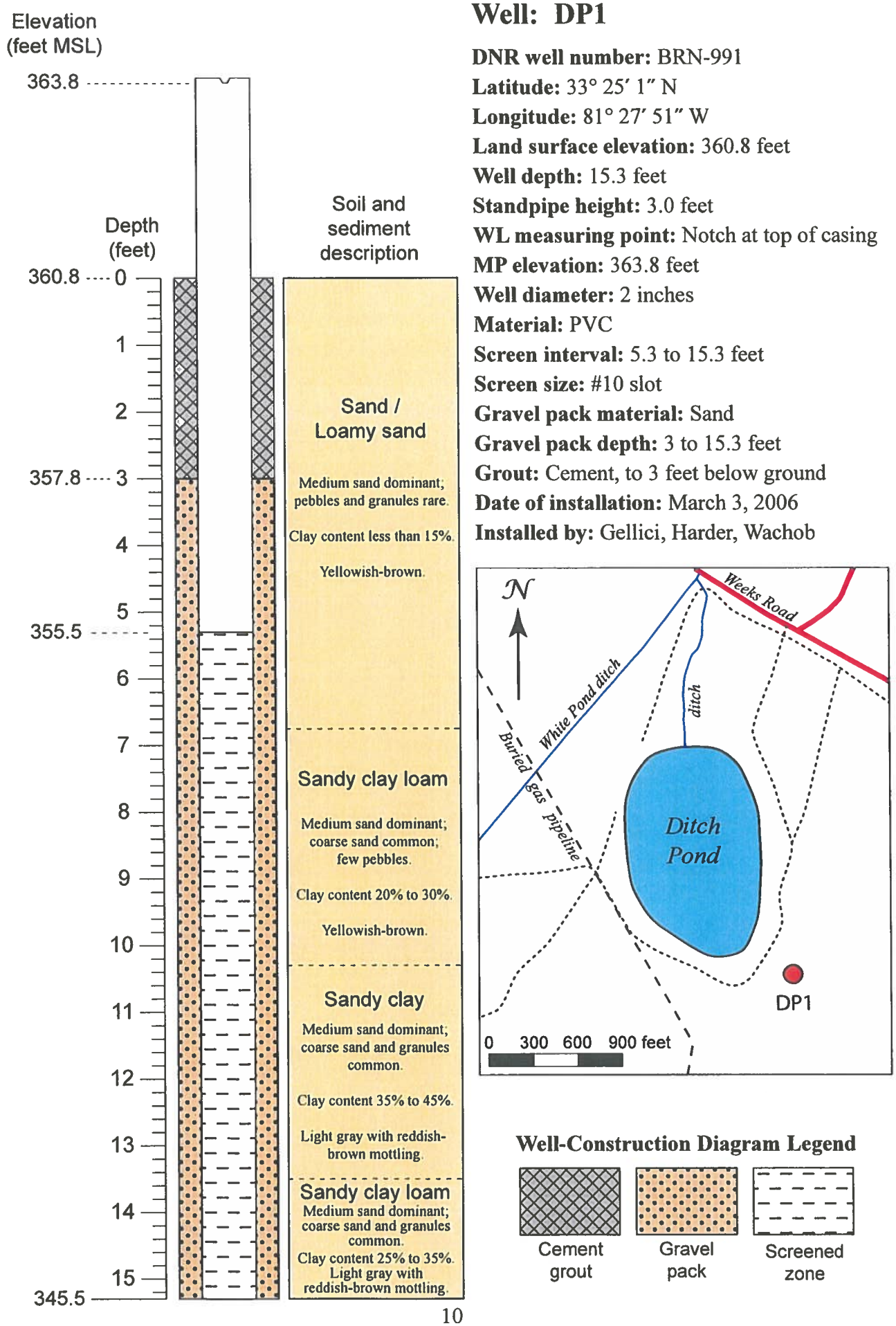


Figure 6. Water levels at profile P2 for selected dates.

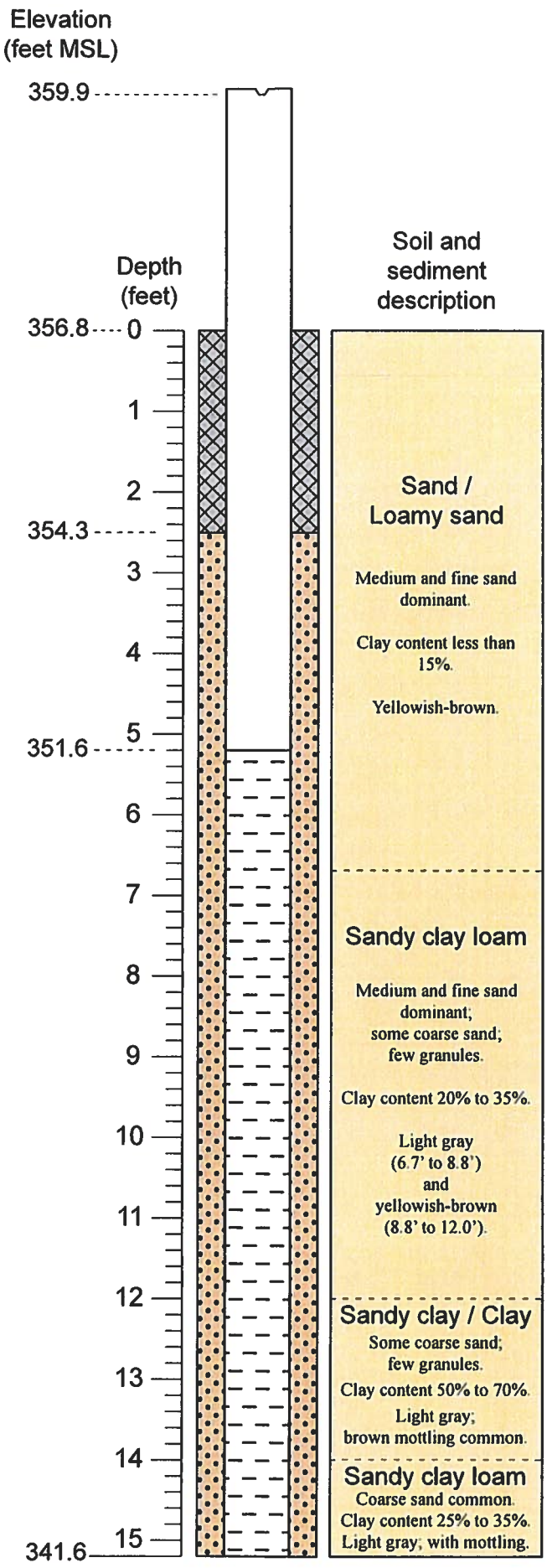
Appendix I. Schematic Well Diagrams

Well: DP1

DNR well number: BRN-991
Latitude: 33° 25′ 1″ N
Longitude: 81° 27′ 51″ W
Land surface elevation: 360.8 feet
Well depth: 15.3 feet
Standpipe height: 3.0 feet
WL measuring point: Notch at top of casing
MP elevation: 363.8 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 5.3 to 15.3 feet
Screen size: #10 slot
Gravel pack material: Sand
Gravel pack depth: 3 to 15.3 feet
Grout: Cement, to 3 feet below ground
Date of installation: March 3, 2006
Installed by: Gellici, Harder, Wachob

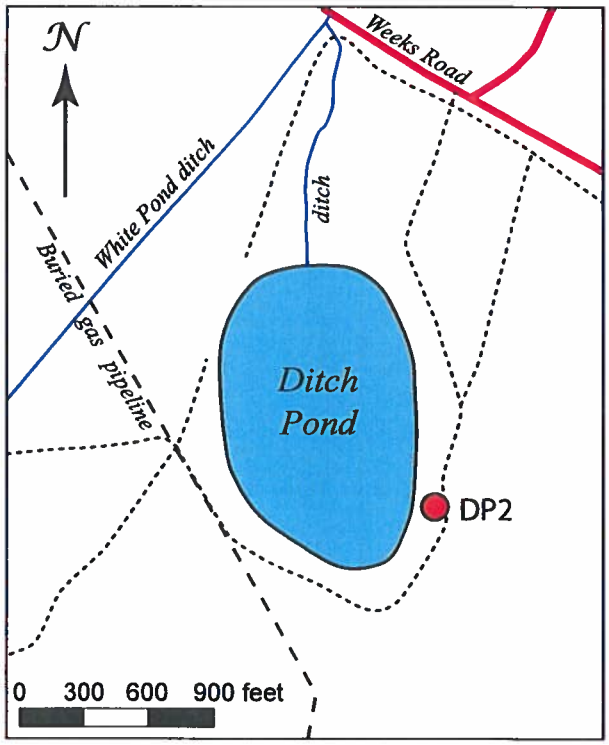


Well-Construction Diagram Legend

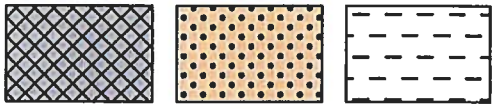


Well: DP2

DNR well number: BRN-992
Latitude: 33° 25′ 3″ N
Longitude: 81° 27′ 55″ W
Land surface elevation: 356.8 feet
Well depth: 15.2 feet
Standpipe height: 3.0 feet
WL measuring point: Notch at top of casing
MP elevation: 359.9 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 5.2 to 15.2 feet
Screen size: #10 slot
Gravel pack material: Sand
Gravel pack depth: 2.5 to 15.2 feet
Grout: Cement, to 2.5 feet below ground
Date of installation: March 16, 2006
Installed by: Gellici, Harder, Wachob

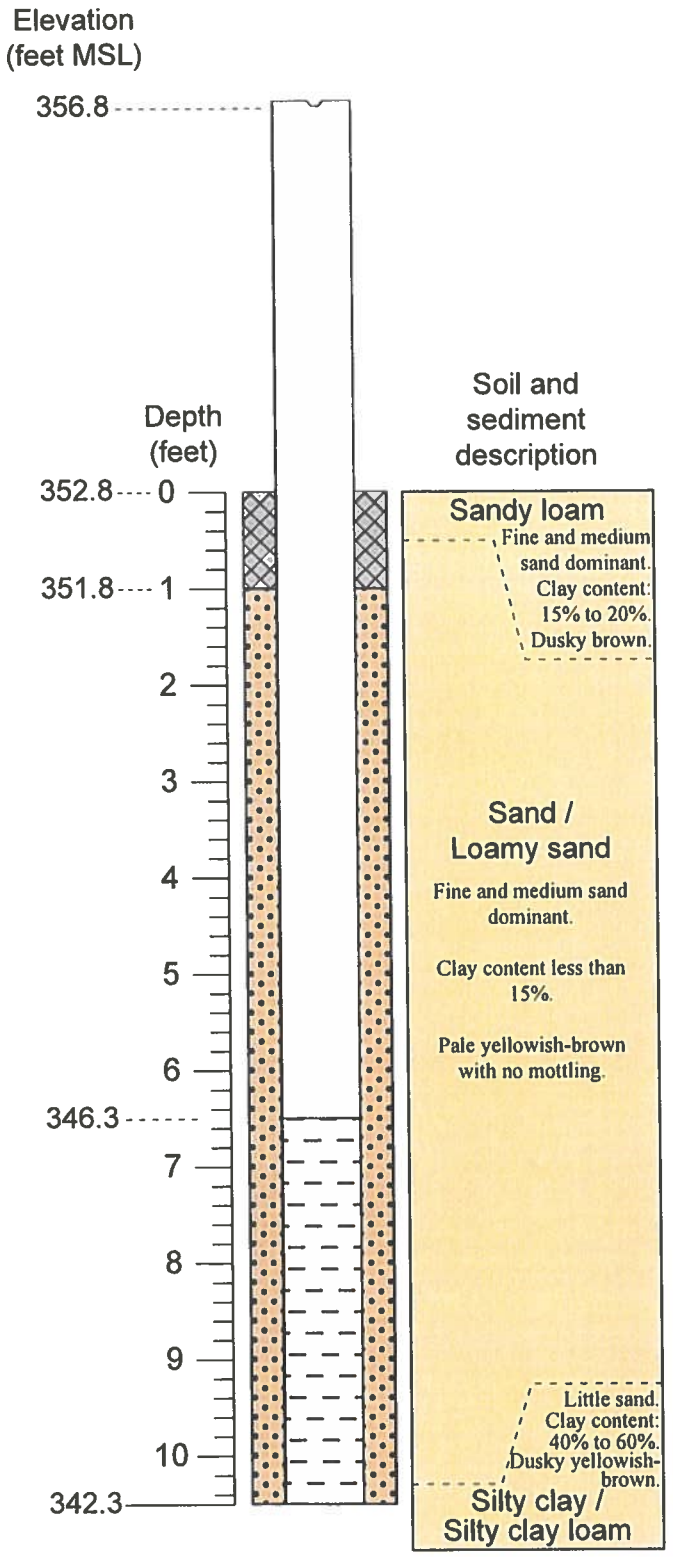


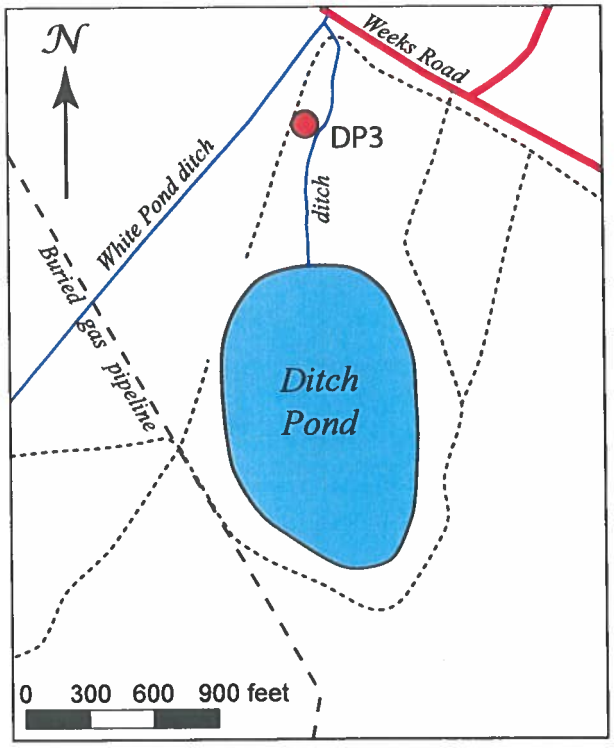
Well-Construction Diagram Legend



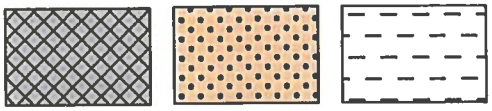
Well: DP3

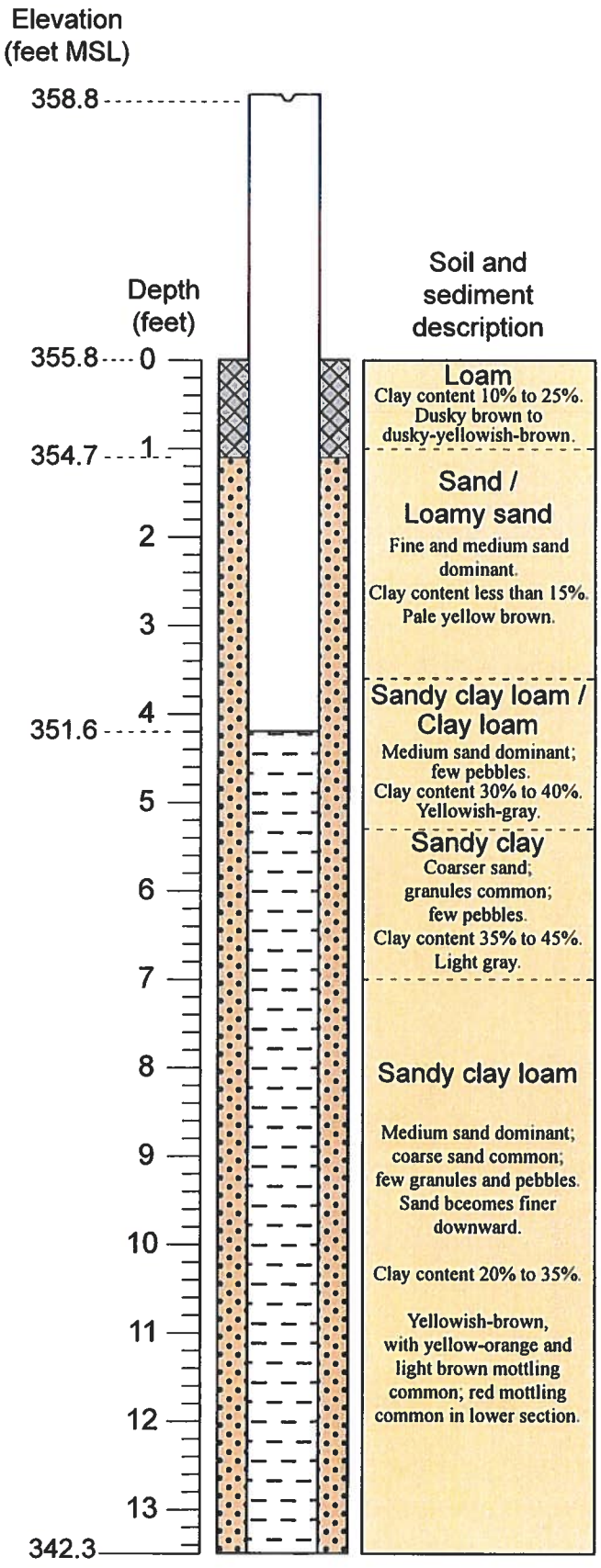
DNR well number: AIK-2613
Latitude: 33° 25′ 20″ N
Longitude: 81° 28′ 2″ W
Land surface elevation: 352.8 feet
Well depth: 10.5 feet
Standpipe height: 4.0 feet
WL measuring point: Notch at top of casing
MP elevation: 356.8 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 6.5 to 10.5 feet
Screen size: #10 slot
Gravel pack material: Sand
Gravel pack depth: 1 to 10.5 feet
Grout: Cement, to 1 foot below ground
Date of installation: March 17, 2006
Installed by: Gellici, Harder, Wachob





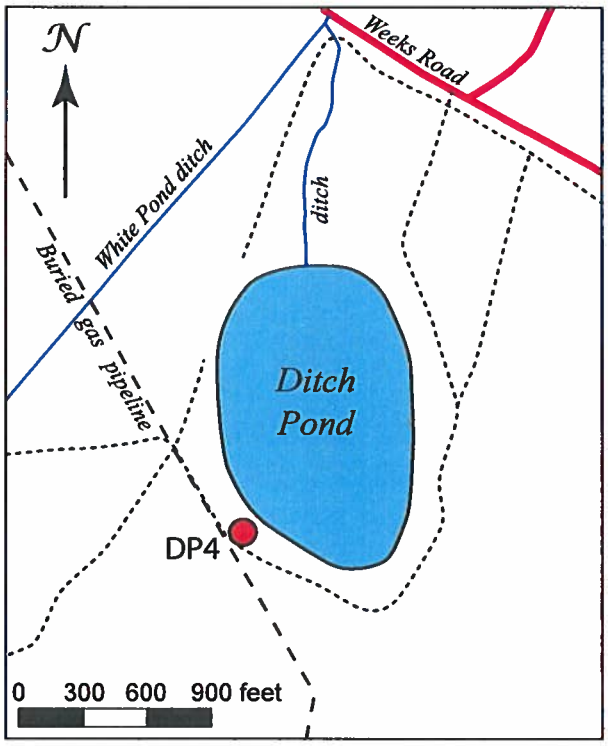
Well-Construction Diagram Legend



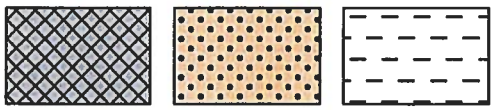


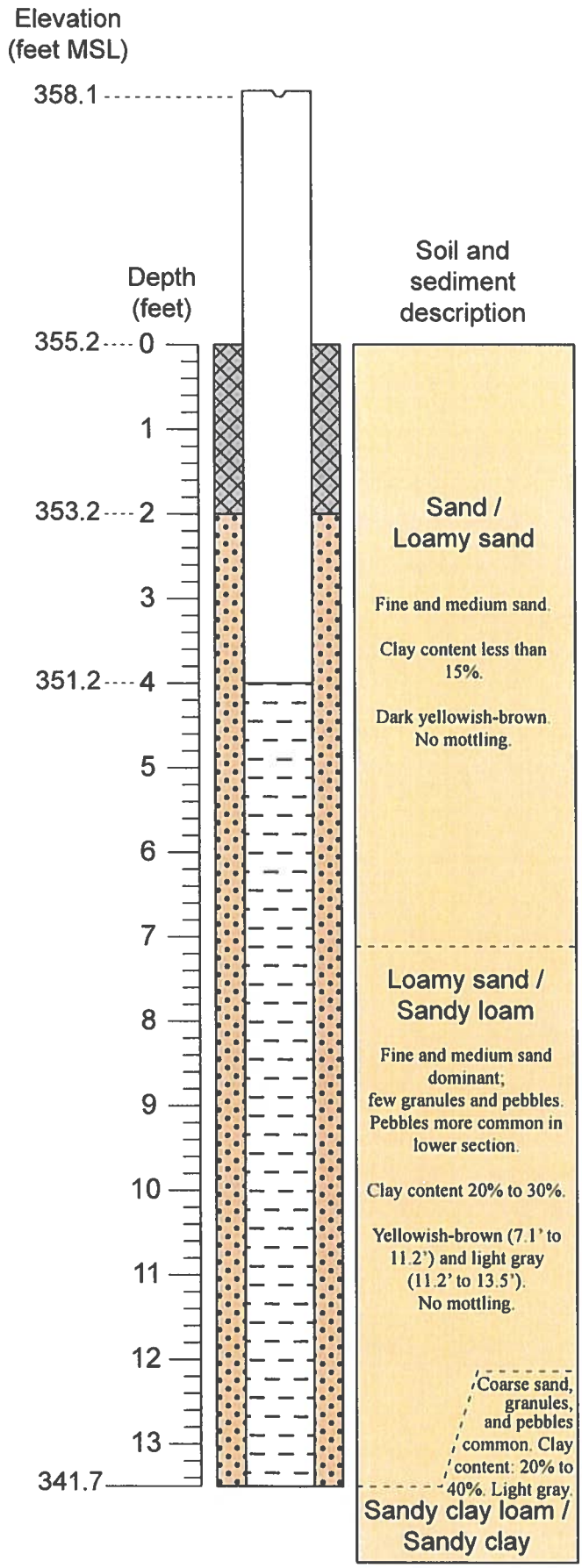
Well: DP4

DNR well number: BRN-993
Latitude: 33° 25′ 1″ N
Longitude: 81° 28′ 5″ W
Land surface elevation: 355.8 feet
Well depth: 13.5 feet
Standpipe height: 3.0 feet
WL measuring point: Notch at top of casing
MP elevation: 358.8 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 4.2 to 13.5 feet
Screen size: #10 slot
Gravel pack material: Sand
Gravel pack depth: 1.1 to 13.5 feet
Grout: Cement, to 1.1 feet below ground
Date of installation: March 22, 2006
Installed by: Gellici, Harder, Wachob



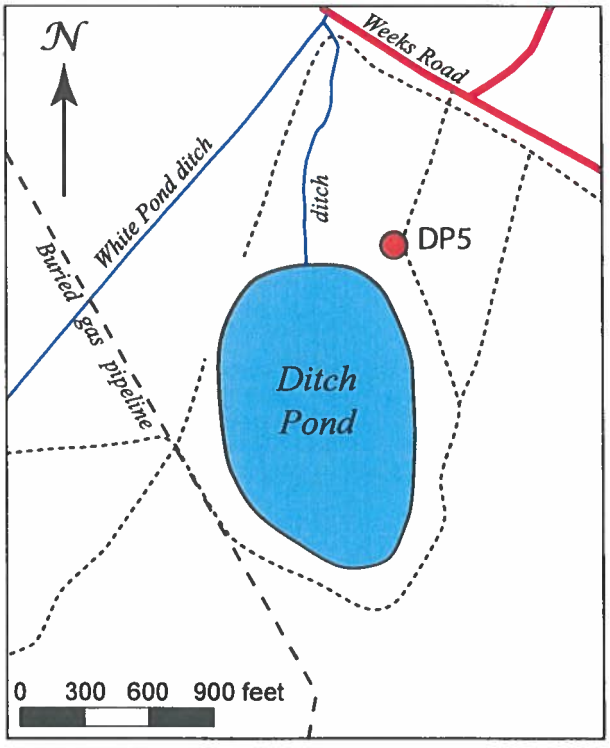
Well-Construction Diagram Legend



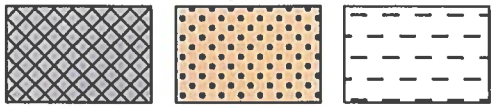


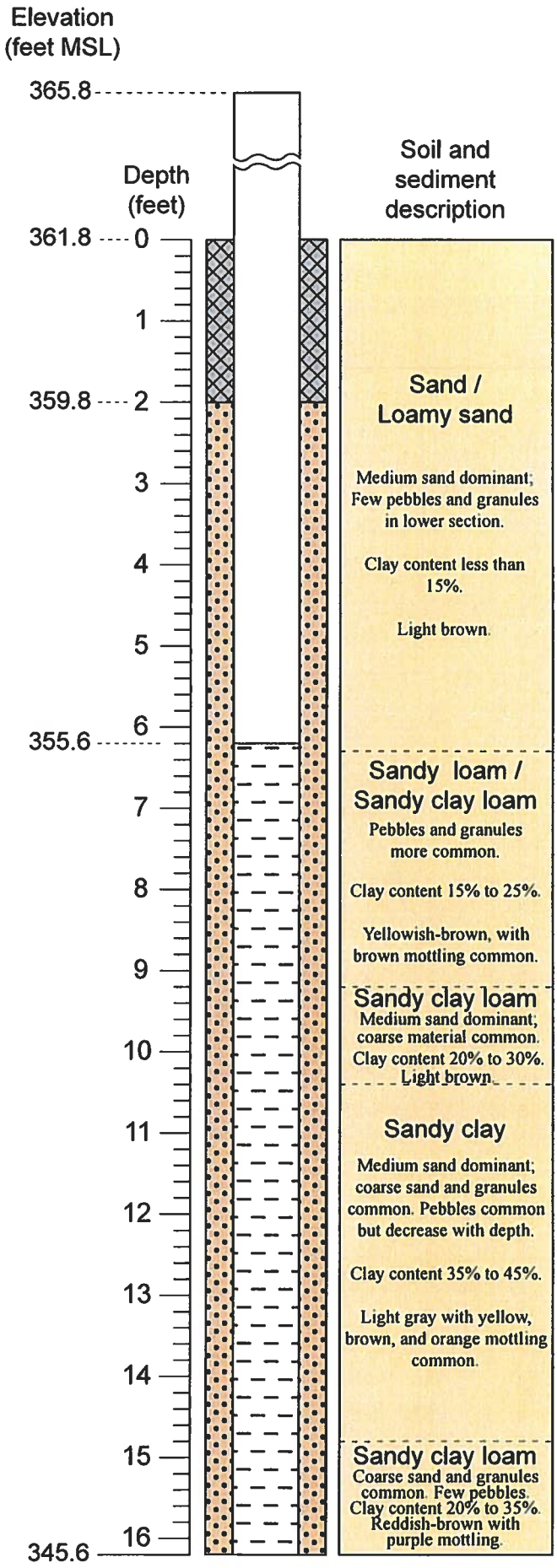
Well: DP5

DNR well number: AIK-2614
Latitude: 33° 25′ 14″ N
Longitude: 81° 27′ 57″ W
Land surface elevation: 355.2 feet
Well depth: 13.5 feet
Standpipe height: 2.9 feet
WL measuring point: Notch at top of casing
MP elevation: 358.1 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 4.0 to 13.4 feet
Screen size: #10 slot
Gravel pack material: Sand
Gravel pack depth: 2 to 13.5 feet
Grout: Cement, to 2 feet below ground
Date of installation: March 23, 2006
Installed by: Gellici, Harder, Wachob



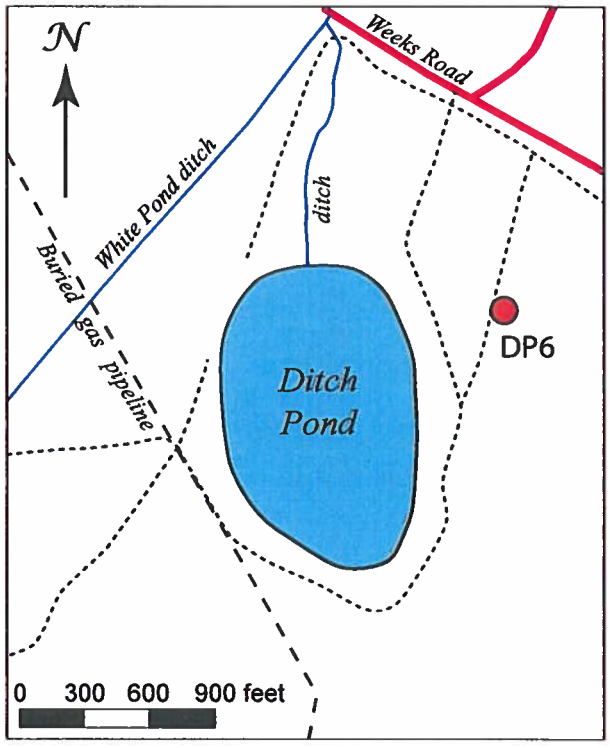
Well-Construction Diagram Legend





Well: DP6

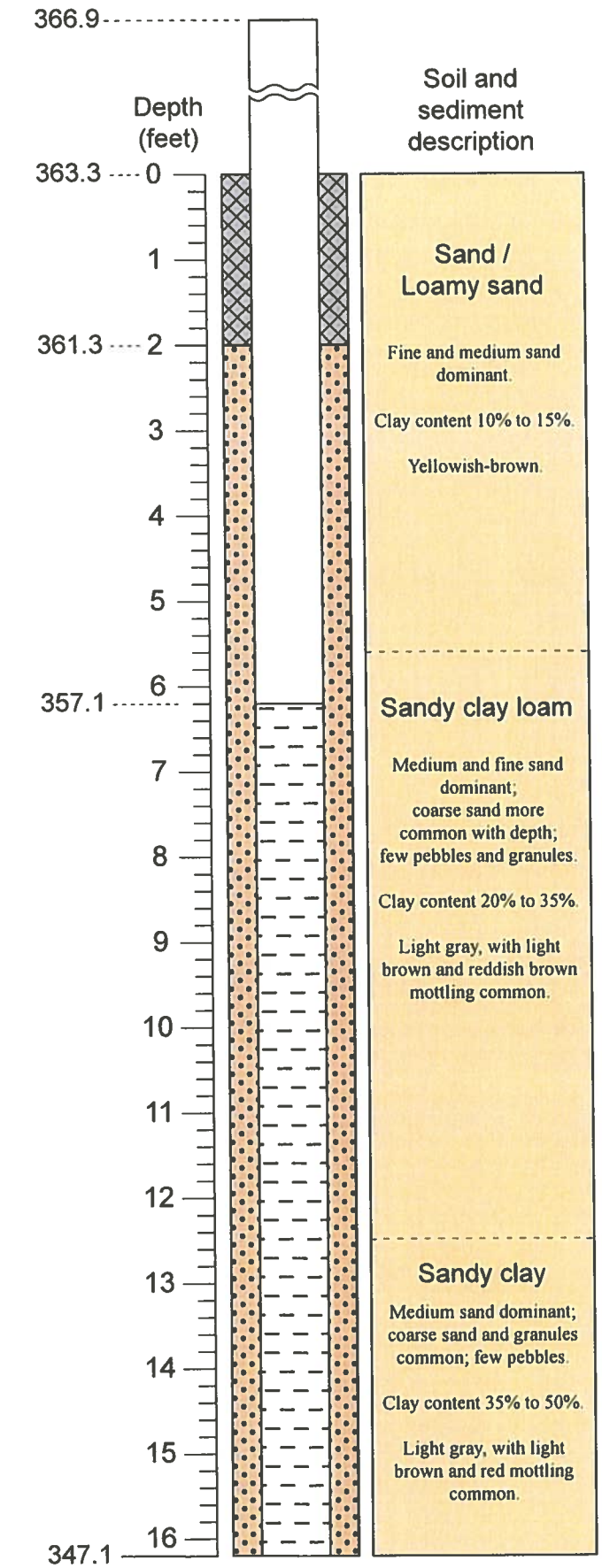
DNR well number: BRN-994
Latitude: 33° 25′ 10″ N
Longitude: 81° 27′ 51″ W
Land surface elevation: 361.8 feet
Well depth: 16.2 feet
Standpipe height: 4.0 feet
WL measuring point: Top of casing
MP elevation: 365.8 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 6.2 to 16.2 feet
Screen size: #10 slot
Gravel pack material: #2 Sand
Gravel pack depth: 2 to 16.2 feet
Grout: Cement, to 2 feet below ground
Date of installation: April 5, 2006
Installed by: Gellici, Harder, Wachob

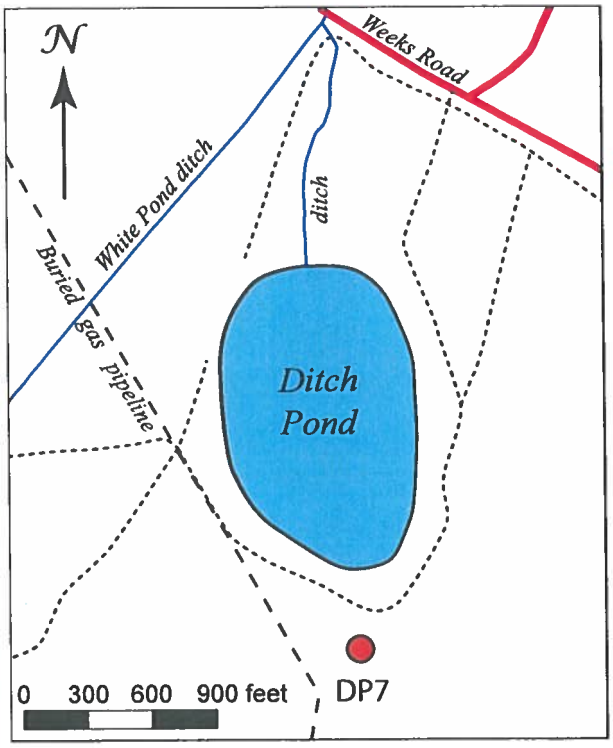


Well-Construction Diagram Legend

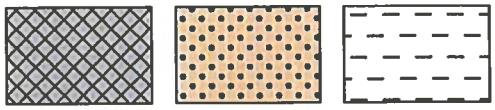
Well: DP7

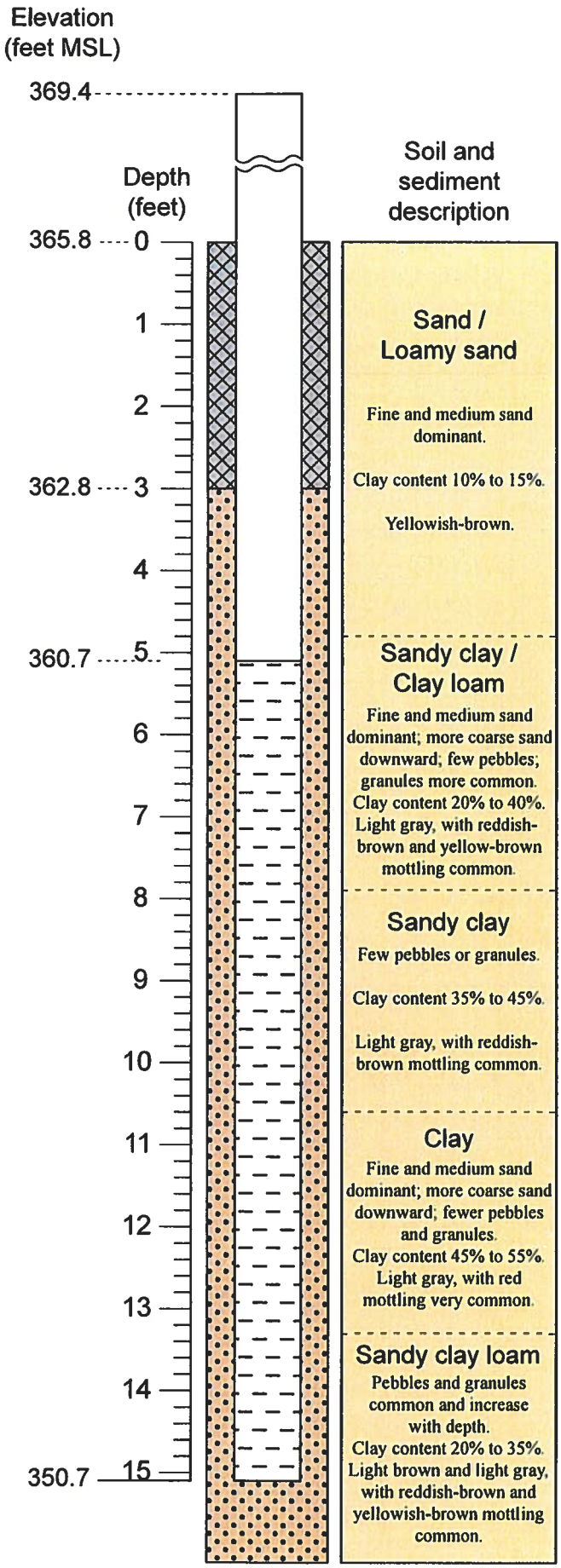
DNR well number: BRN-995
Latitude: 33° 24′ 55″ N
Longitude: 81° 27′ 59″ W
Land surface elevation: 363.3 feet
Well depth: 16.2 feet
Standpipe height: 3.6 feet
WL measuring point: Top of casing
MP elevation: 366.9 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 6.2 to 16.2 feet
Screen size: #10 slot
Gravel pack material: #2 Sand
Gravel pack depth: 2 to 16.2 feet
Grout: Cement, to 2 feet below ground
Date of installation: April 5, 2006
Installed by: Gellici, Harder, Wachob





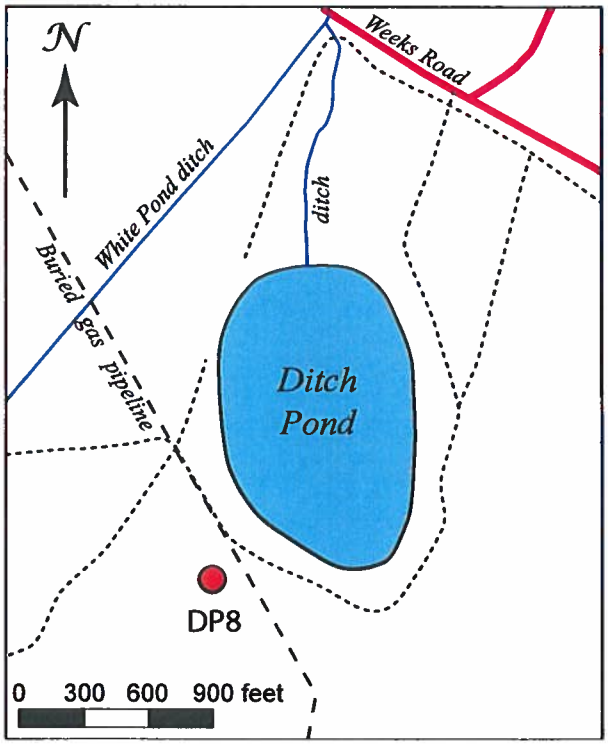
Well-Construction Diagram Legend



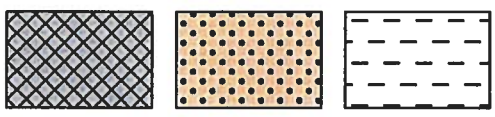


Well: DP8

DNR well number: BRN-996
Latitude: 33° 24′ 59″ N
Longitude: 81° 28′ 6″ W
Land surface elevation: 365.8 feet
Well depth: 15.1 feet
Standpipe height: 3.6 feet
WL measuring point: Top of casing
MP elevation: 369.4 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 5.1 to 15.1 feet
Screen size: #10 slot
Gravel pack material: #2 Sand
Gravel pack depth: 3.0 to 15.1 feet
Grout: Cement, to 3.0 feet below ground
Date of installation: April 7, 2006
Installed by: Gellici, Harder

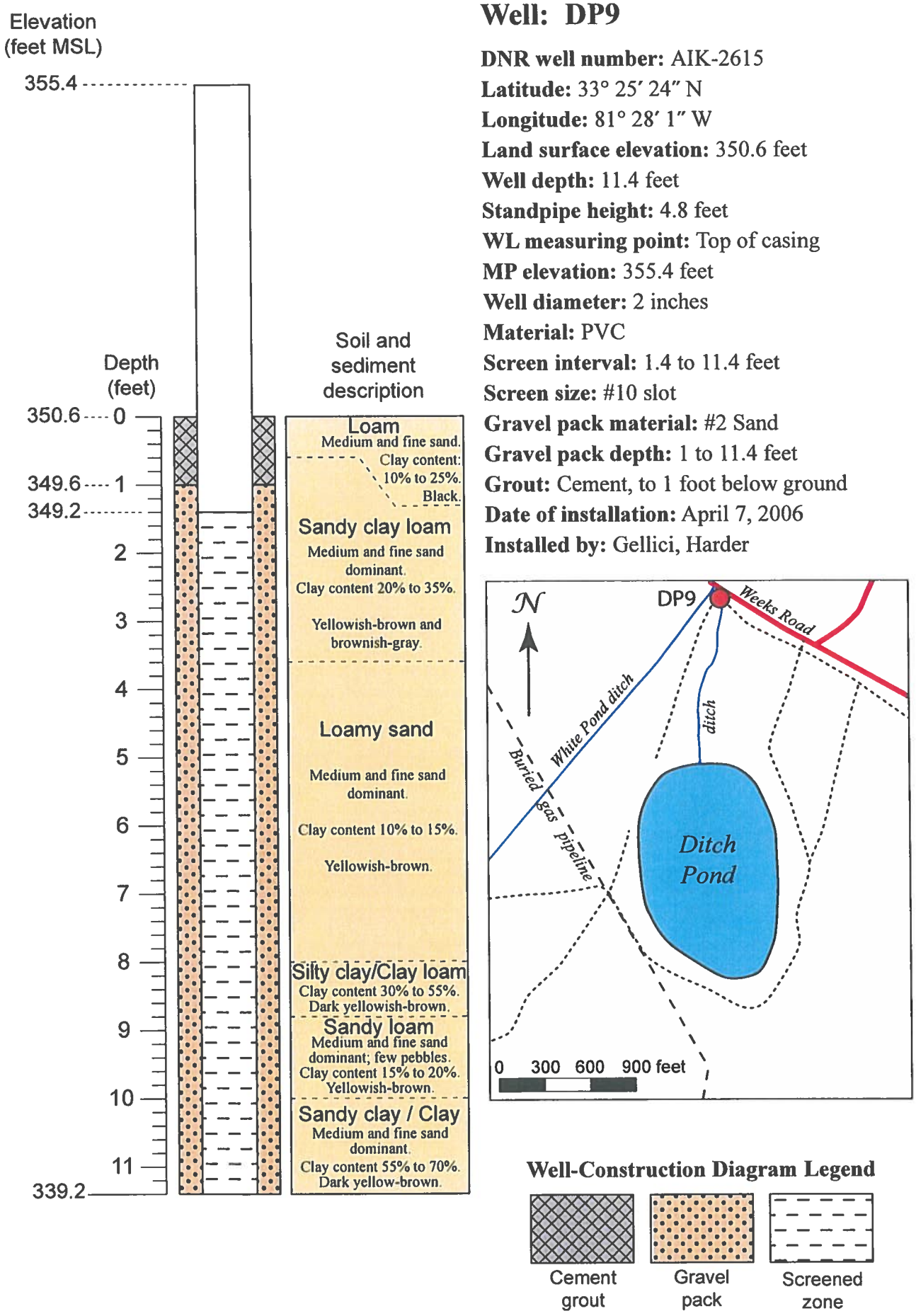


Well-Construction Diagram Legend



Well: DP9

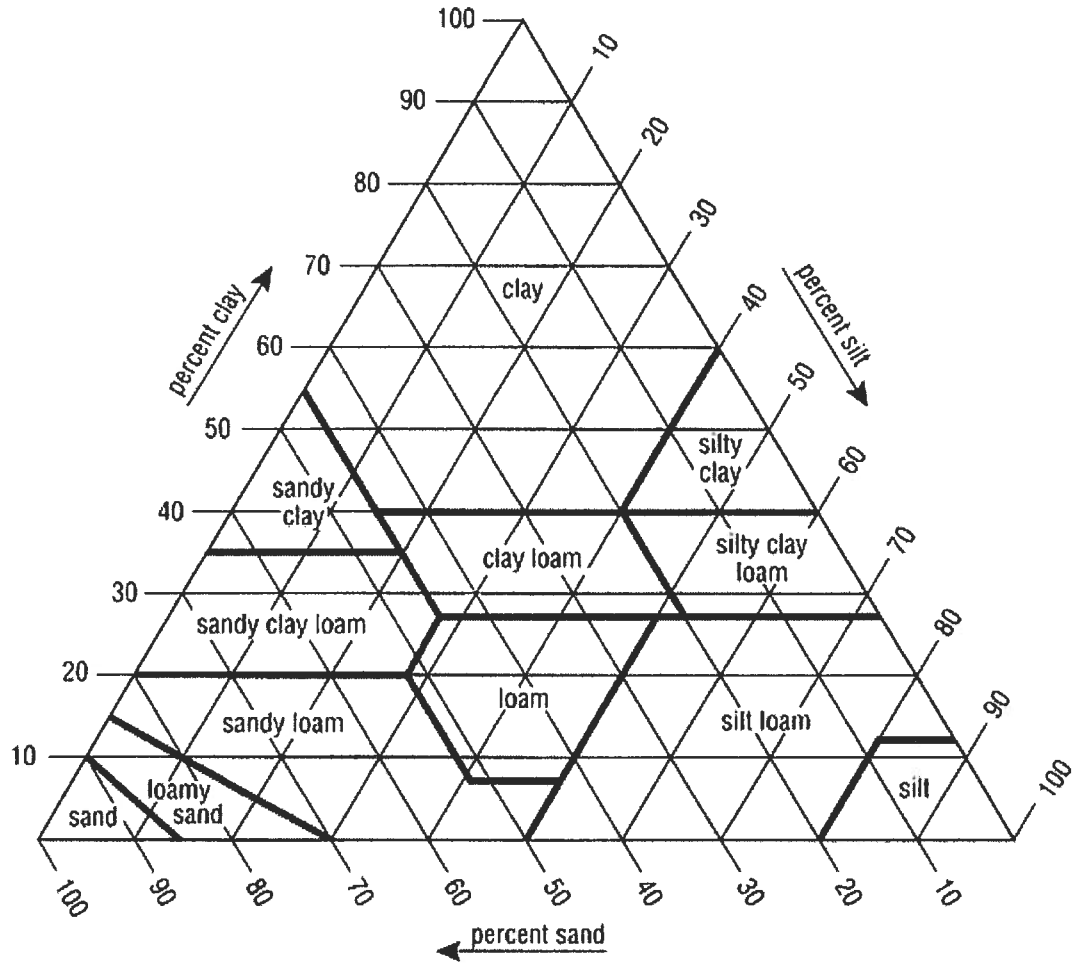
DNR well number: AIK-2615
Latitude: 33° 25′ 24″ N
Longitude: 81° 28′ 1″ W
Land surface elevation: 350.6 feet
Well depth: 11.4 feet
Standpipe height: 4.8 feet
WL measuring point: Top of casing
MP elevation: 355.4 feet
Well diameter: 2 inches
Material: PVC
Screen interval: 1.4 to 11.4 feet
Screen size: #10 slot
Gravel pack material: #2 Sand
Gravel pack depth: 1 to 11.4 feet
Grout: Cement, to 1 foot below ground
Date of installation: April 7, 2006
Installed by: Gellici, Harder



Well-Construction Diagram Legend

Appendix II. Analysis of Soil Samples Collected from Well Boreholes.

Soil texture for each sample was analyzed by feel based on a method used by the USDA Forest Service from which percentages of sand, silt, and clay were estimated. From these percentages each sample was classified as one of the soil groups shown in the figure below. Soil colors were reported by using the Rock-Color Chart, and any mottling or redox concentrations (areas of highly oxidized material) were described. Grain sizes were also reported for any sand, granules, and pebbles found in a sample, as well as their degree of sorting.



Well: DP1	Described by: S. Harder			Date: 5/19/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
1.0	loamy sand 10-15% clay	f-vc, medium sand dominant	vp	trace heavy minerals	moderate yellowish brown (10YR 5/4)	iron-coated sand
3.5	loamy sand 10-15% clay	f-vc, medium-coarse sand dominant	vp	trace heavy minerals	light brown (5YR 5/6)	
4.5	sand 0-10% clay	f-vc, subrounded	p	trace heavy minerals and feldspar	grayish orange (10YR 6/2)	no iron coating
5.8	loamy sand 10-15% clay	vf-vc, subrounded	p	trace heavy minerals	moderate yellowish brown (10YR 4/2)	
6.5	sandy loam 15-20% clay	f-vc, pebble (6mm)	vp	trace heavy minerals	moderate yellowish brown (10YR 5/4)	
7.0	sandy clay loam 20-30% clay	f-vc, subrounded	vp	trace heavy minerals, feldspar	moderate brown (5YR 4/4)	iron-coated sand
7.8	sandy clay loam 20-30% clay	f-vc, few pebbles (4-6mm), few granules	vp	trace heavy minerals	moderate brown (5YR 4/4)	iron-coated sand
8.2	sandy clay loam 20-30% clay	f-vc, pebbles (7mm), coarse sand abundant, subangular	vp	trace heavy minerals	moderate yellowish brown (10YR 5/4)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP1		Described by: S. Harder			Date: 5/19/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
9.0	sandy clay loam 20-30% clay	f-vc, subrounded, medium sand dominant, few granules	p	trace heavy minerals	moderate yellowish brown (10YR 5/4)	
9.7	sandy loam to sandy clay loam 20% clay	f-vc, subrounded, few granules, few pebbles (1.5cm)	vp	trace heavy minerals	moderate yellowish brown (10YR 5/4)	
10.0	sandy clay loam 20-30% clay	f-vc, subrounded	vp	trace heavy minerals	moderate yellowish brown (10YR5/4), some light gray (N7), a few reddish clumps	red clumps - evidence of mottling
10.6	sandy clay 35-45% clay	f-vc, subangular, coarse sand / granules common	vp	more minerals (larger size)	moderate yellowish brown (10YR5/4), light gray (N7)	moderate reddish brown mottles (common)
12.6	sandy clay 35-45% clay	f-vc, subrounded, few small pebbles (< 1cm), coarse sand / granules common	p	trace heavy minerals	moderate red (5R 4/6), some light gray (N7)	moderate red mottles (common)
13.0	sandy clay 35-45% clay	f-vc, subrounded, coarse sand / granules common	vp	mica, feldspar	moderate reddish brown (10R 5/6), moderate pink (5R 7/4), very light gray (N8)	moderate reddish brown, moderate pink mottles
14.0	sandy clay 25-35% clay	f-vc, slightly less clay than above, coarse sand / granules common	vp	trace heavy minerals, mica	pale reddish brown (10R 5/4), some moderate pink (5R 7/4), light gray (N7)	pale reddish brown, moderate pink mottles
15.2	sandy clay to sandy clay loam 25-35% clay	f-vc, subrounded, coarse sand / granules common	vp	trace heavy minerals	pale reddish brown (10R 5/4), some moderate pink (5R 7/4), some light grey (N8)	pale reddish brown, moderate pink mottles

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP2		Described by: S. Harder			Date: 5/23/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
0.5	loamy sand 10-15% clay	vf-c, medium-coarse dominant, subrounded	p		dark yellowish brown (10YR 4/2)	fine roots
1.0	loamy sand 10-15% clay	vf-vc, medium-fine dominant, subrounded	p		dark yellowish brown (10YR 4/2)	roots
1.5	loamy sand 10-15% clay	vf-c, medium-fine dominant, subrounded	p		moderate yellowish brown (10YR 5/4)	few roots
2.2 - 2.8	loamy sand approx. 10% clay	vf-c, medium-fine dominant, subrounded	p		moderate to dark yellowish brown (10YR 5/4-10YR 4/2)	few roots
3.5	loamy sand approx. 10% clay	vf-vc, medium-fine dominant, subrounded	p		pale yellowish brown (10R 6/2)	few brown spots - mottling
4.1	loamy sand 10% clay	vf-vc, subrounded	vp		pale yellowish brown (10R 6/2)	
4.6	loamy sand 10% clay	vf-vc, subrounded, few granules	vp		pale yellowish brown (10R 6/2)	
5.0	loamy sand 10% clay	vf-vc, subrounded, few granules	vp		pale yellowish brown (10R 6/2)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP2		Described by: S. Harder			Date: 5/23/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
5.6	loamy sand 10% clay	vf-vc, subrounded, few granules	vp		white to light gray (N9-N8)	
6.0 - 6.2	loamy sand approx. 10% clay	vf-vc, subrounded, few granules, few small pebbles	vp		white to light gray (N9-N8)	
7.2	sandy loam to sandy clay loam 20-25% clay	sand f-vc	p		light gray (N7)	significant increase in clay
8.0	sandy clay loam 25-35% clay	sand f-vc, medium fine dominant, few granules	p		light gray (N7)	almost clay loam
8.5	sandy clay loam 35-40% clay				light gray (N7)	
9.2	sandy clay loam 25-30% clay				moderate yellowish brown (10YR 5/4)	brown mottles
9.7	sandy clay loam 20-25% clay				moderate yellowish brown (10YR 5/4)	brown mottles
10.0	sandy clay loam 20-25% clay				moderate yellowish brown (10YR 5/4)	brown mottles

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP2	Described by: S. Harder			Date: 5/23/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
10.5	sandy clay loam 20-25% clay	few small pebbles (< 1cm), few granules, almost loam-like			moderate yellowish brown (10YR 5/4)	brown mottles
11.0	sandy clay loam 20-25% clay				moderate yellowish brown (10YR 5/4)	brown mottles
11.5	sandy clay loam 20-25% clay	few small pebbles (< 1cm), few granules, almost loam-like			moderate yellowish brown (10YR 5/4)	brown mottles
12.0	sandy clay loam 20-25% clay				moderate yellowish brown (10YR 5/4)	brown mottles
12.3	sandy clay to clay 50-70%	clay, coarse sand, few granules, pebble (1 cm)			light gray (N7)	
12.6	sandy clay to clay 50-70% clay	clay, coarse sand, few granules			light gray (N7)	light brown mottles (common), reddish brown mottles (few)
13.0	sandy clay to clay 50-70% clay	clay, coarse sand, few granules			light gray (N7)	light brown mottles (common), reddish brown mottles (few)
13.5	sandy clay to clay 50-60% clay	sandier than above, slightly less clay than above			light gray (N7)	light brown mottles (common), reddish brown mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP2		Described by: S. Harder			Date: 5/23/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
13.7	sandy clay borderline sandy clay loam 35-40% clay	increase in sand, sand coarse			light gray (N7)	light brown mottles (common), reddish brown mottles (few)
14.3	sandy clay loam 25-30% clay	few pebbles / granules, clay, coarse sand			light gray (N7)	light brown mottles (common), reddish brown mottles (few)
14.7	sandy clay loam 30-35% clay	coarse sand common, few pebbles, granules common, clay			light gray (N7)	light brown mottles (common), reddish brown mottles (few)
15.1	sandy clay loam 30-35% clay	few pebbles, granules common, coarse sand common			light gray (N7)	light brown mottles (common), reddish brown mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP3	Described by: S. Harder			Date: 5/26/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
surface	sandy loam 15-20% clay	vf-c			dusky brown (5YR 2/2)	many roots, organic material
0.7	sand 0-5% clay	vf-c, fine-medium dominant	p	trace heavy minerals	dusky yellowish brown (10YR 2/2)	
1.3	loamy sand 10-15% clay	vf-c, fine-medium dominant, subrounded	p	trace heavy minerals	pale yellowish brown (dry) (10YR 6/2), dark yellowish brown (wet) (10YR 4/2)	
1.9	loamy sand 10-15% clay	vf-c, fine-medium dominant, subrounded	p	trace heavy minerals	pale yellowish brown (dry) (10YR 6/2), dark yellowish brown (wet) (10YR 4/2)	
2.6	loamy sand to sand approx. 10% clay	vf-c, fine-medium dominant, subrounded	vp	trace heavy minerals	pale yellowish brown (dry) (10YR 6/2), dark yellowish brown (wet) (10YR 4/2)	
3.3	sand 0-10% clay	vf-c, fine-medium dominant	p	rare heavy minerals	pale yellowish brown (10YR 6/2)	
3.7	sand 0-10% clay	vf-c				
5.0	sand 0-10% clay	vf-c				

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP3		Described by: S. Harder			Date: 5/26/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
10.5	silty clay or silty clay loam 40-60% clay	silt, clay			dusky yellowish brown (10YR 2/2)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP4	Described by: S. Harder			Date: 5/30/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
0.5	loam 10-25% clay				dusky brown (5YR 2/2)	
0.9	loam 10-25% clay				dusky yellowish brown (10YR 2/2)	
1.3	loamy sand to sand 5-15% clay	vf-vc, subrounded	vp	trace heavy minerals	pale to dark yellowish brown (10YR 6/2-4/2)	
1.8	loamy sand to sand 5-15% clay	vf-vc	vp	trace heavy minerals	pale yellowish brown (10YR 6/2)	
2.2	loamy sand to sand 5-15% clay	vf-c, fine-medium dominant	p	trace heavy minerals	pale yellowish brown (10YR 6/2)	
2.8	loamy sand to sand 5-15% clay					
3.2	loamy sand 10-15% clay					
3.9-4.0	sandy clay loam to sandy clay 30-40% clay	clay, sand, few pebbles (.5-1 cm), medium sand dominant, some coarse, almost loam-like			yellowish gray (5Y 8/1)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP4		Described by: S. Harder			Date: 5/30/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
4.8	clay loam 30-40% clay	clay, some silt and sand		trace heavy minerals	yellowish gray (5Y 8/1)	
5.1	clay loam 30-40% clay	clay, some silt and sand			pale yellowish brown (10YR 6/2)	
5.5	sandy clay to clay 45-55% clay				yellowish gray (5Y 8/1)	small increase in clay from previous two samples
6.1-6.3	sandy loam clay to clay loam 30-40% clay	clay, some silt and sand, granules present, few small pebbles		trace mica	very light gray to light gray(N8-N7), pale yellowish brown (10YR 6/2), light brown (5YR 5/6)	brown, brownish red mottles (common)
6.8	sandy clay to sandy clay loam 35-45% clay	coarse sand, granules				
7.3	sandy clay loam 20-30% clay	clay, silt, sand (vc-f), few granules, few pebbles		trace mica	white to light gray (N9-N7)	light brown mottles (common), moderate brown (few)
7.8	sandy clay loam 20-30% clay					
8.2	sandy clay loam 20-30% clay	clay, silt, few pebbles (~ 1 cm), few granules, coarse sand abundant	vp		dark yellowish orange (10YR 6/6)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP4	Described by: S. Harder			Date: 5/30/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
8.8	sandy clay loam 20-30% clay	clay , silt, sand (less coarse than above-8.2'), few pebbles (.5-1 cm)			dark yellowish orange (10YR 6/6)	
9.2	sandy clay loam 30-35% clay	clay, silt, medium to coarse sand			white to very light gray (N9-N8)	light to moderate brown mottles
9.6	sandy clay loam 30-35% clay	clay, silt, medium to coarse sand		trace mica	very light gray (N8)	dark yellowish orange mottles
10.0	sandy clay loam 30-35% clay	increase in clay from 9.6'			dark yellowish orange dominant (10YR 6/6), some very light gray (N8)	
10.5-10.7	sandy clay loam 30-35% clay				dark yellowish orange dominant (10YR 6/6), some very light gray (N8)	
11.1	sandy clay loam 30-35% clay				very light gray (N8)	grayish orange mottles (common), light brown mottles (few), reddish pink mottles (few and small)
11.6	sandy clay loam 30-35% clay				very light gray (N8)	light brown and yellowish orange mottles common
11.9	sandy clay loam 25-30% clay				very light gray (N8), dark yellowish orange (10 YR 6/6)	light brown and yellowish orange mottles (common)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP4		Described by: S. Harder			Date: 5/30/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
12.3	sandy clay loam to clay 30-40% clay	almost loam-like, medium-fine sand			very light gray (N8)	dark yellowish orange mottles (common)
12.7	sandy clay loam to clay 30-40% clay				very light gray (N8)	more mottles present than above
13.1	sandy clay loam to clay 30-40% clay				very light gray (N8)	dark yellowish orange mottles, light brown mottles (abundant), and moderate red mottles (common)
13.5	sandy clay loam 25-30% clay	coarser sand			dark yellow orange (10YR 6/6)	moderate red mottles (common)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP5	Described by: S. Harder			Date: 6/1/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
surface	sandy loam to loamy sand 10-20% clay	vf-c	p		black (N1)	roots, organics
0.6	loamy sand 10-15% clay	vf-c, subrounded to subangular	p	trace heavy minerals	brownish gray (dry) (5YR 4/1), brownish black (wet) (5YR 2/1)	fine roots, organic matter
1.1	loamy sand 10-15% clay	vf-c, subrounded to subangular, but slightly more silt / clay	vp	trace heavy minerals	dusky brown (5YR 2/2)	few roots
1.6	loamy sand 10-15% clay	vf-c, subrounded to subangular, but slightly more silt / clay		trace heavy minerals	brownish gray (dry) (5YR 4/1), brownish black (wet) (5YR 2/1)	
2.1	loamy sand 10-15% clay	vf-vc, subrounded to subangular	vp	trace heavy minerals	dark yellowish brown (10YR 4/2)	
2.5	loamy sand 10-15% clay	vf-vc, subrounded to subangular	vp	trace heavy minerals	dark yellowish brown (10YR 4/2)	
3.0	loamy sand 10-15% clay	vf-c, fine-medium dominant	p	trace heavy minerals	dark yellowish brown (10YR 4/2)	
3.5	loamy sand 10-15% clay	vf-c, fine-medium dominant	p	trace heavy minerals	dusky yellowish brown (10YR 2/2)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP5		Described by: S. Harder			Date: 6/1/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
4.2	loamy sand 10-15% clay	vf-c	p		dark yellowish brown (10YR 4/2)	
4.8	sand 0-10% clay	vf-c	p	rare heavy minerals	dark yellowish brown (10YR 4/2)	
5.3	sand 0-10% clay	vf-c	p	rare heavy minerals	medium yellowish brown (10YR 5/4)	
6.6	sand 0-10% clay	vf-m	p - mod.	rare heavy minerals	pale yellowish brown (10YR 6/2)	
7.7	loamy sand to sandy loam 10-15% clay	vf-m	p - mod.		black (N1)	
8.1	loamy sand to sandy loam 10-15% clay	vf-c	p		dark yellowish to dusky yellowish brown (10YR 4/2-10YR 2/2)	
9.5	loamy sand 10-15% clay	vf-vc, more clay, medium-fine sand dominant	vp	rare heavy minerals	pale yellowish brown (10YR 6/2)	
11.8	loamy sand 10-15% clay	vf-vc, few granules, few pebbles (1 cm)	vp	rare heavy minerals	white to light gray (dry) (N9-N7)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP5		Described by: S. Harder			Date: 6/1/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
13.0-13.1	sandy loam 15-20% clay	vf-vc, pebbles (~.5 cm) and granules more common	vp	trace heavy minerals	white to light gray (dry) (N9-N7)	
13.3	sandy loam 15-20% clay	vf-vc, pebbles (~.5 cm) and granules more common	vp	trace heavy minerals	white to light gray (dry) (N9-N7)	
13.7	sandy loam to sandy clay loam 15-25% clay	vf-vc, pebbles (~.5 cm) and granules more common	vp	trace heavy minerals	white to light gray (dry) (N9-N7)	
14.0	sandy loam to sandy clay loam 15-25% clay	vf-vc, very few pebbles/granules	vp	trace heavy minerals	white to light gray (dry) (N9-N7)	
14.4	sandy clay loam to sandy clay 30-40% clay	vf-vc, few pebbles/granules, medium to coarse sand dominant	vp	trace heavy minerals	light olive gray (5Y 6/1)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP6		Described by: S. Harder			Date: 6/5/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
1.0	loamy sand 15% clay	vf-vc, subrounded	vp		dark yellowish brown (10YR 5/2)	iron-coated sand
1.7	loamy sand 10-15% clay	vf-vc, subrounded	vp	trace heavy minerals	light brown (5YR 6/2)	iron-coated sand
2.5	sand to loamy sand 0-10% clay	vf-vc, subrounded	vp		light brown (5YR 6/2)	iron-coated sand
3.4	sand to loamy sand 0-10% clay	vf-vc, subrounded				
4.3	sand to loamy sand 0-10% clay					
5.3	sand to loamy sand 0-10% clay	vf-vc, subrounded	vp		dark yellowish orange (10YR 6/6)	
6.1	loamy sand to sandy loam 10-15% clay	vf-vc, subrounded, few pebbles (.5-1 cm), few granules	vp	trace heavy minerals	dark yellowish orange (10YR 6/6)	
6.5	sandy loam 15-20%	pebbles/granules more common, pebbles (1-2 cm), sand vf-vc, increase in clay			moderate yellowish brown (10YR 5/4)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP6	Described by: S. Harder			Date: 6/5/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
7.0	sandy loam to sandy clay loam 20-25% clay	pebbles (0.5-1 cm), granules	vp	trace heavy minerals	pale yellowish brown (10YR 6/2), some light to moderate brown (5YR 5/6-5YR 4/4)	light to moderate brown mottles (common)
7.4	sandy clay loam 30-40% clay	increase in clay, compare to depth above and below				
7.5	similar to 7.8'					
7.8	sandy loam to sandy clay loam 20-25% clay	pebbles (< 1 cm), granules, sand is vf-vc	vp	trace heavy minerals	pale yellowish brown (10YR 6/2), light to mod. brown (5YR 5/6-5YR 4/4), mod. to dark reddish brown (10R 4/6-10R 3/4)	moderate to dark reddish mottles, brown mottles
8.4	sandy loam to sandy clay loam 20-25% clay	pebbles (< 1 cm), granules, sand is vf-vc				
8.7	sandy loam to sandy clay loam 20-25% clay					
9.0	sandy loam to sandy clay loam 20-25% clay	pebbles (< 1 cm), granules, sand is vf-vc	vp	rare heavy minerals	light brown (5YR 5/6)	
9.4	sandy clay loam 20-30% clay	pebbles (< 1 cm), granules, sand is vf-vc, pebbles/granules common, sand is fairly coarse	vp		light brown (5YR 5/6)	moderate reddish brown mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP6		Described by: S. Harder			Date: 6/5/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
10.8	sandy clay 35-45% clay	pebbles/granules common, sand is fairly coarse	vp	rare heavy minerals	white to very light gray (N9-N8)	dark yellowish orange, dark reddish brown, and moderate reddish brown mottles (abundant)
11.5	sandy clay loam 30-35% clay	pebbles (< 1 cm), granules, and coarse sand common, f-vc sand	vp	rare heavy minerals	white to very light gray (N9-N8)	dark yellowish brown mottles (common), pink mottles (few), moderate red mottles (few), reddish brown mottles (few)
12.3	sandy clay 35-45% clay	vc sand, granules abundant, coarse sand common, vf-vc sand, few pebbles (< 1 cm)	vp	rare heavy minerals	white to very light gray (N9-N8)	moderate pink and light red mottles (few)
12.9	sandy clay 35-45% clay	similar to 12.3 ft			white to very light gray (N9-N8)	dark yellowish orange and moderate yellowish brown mottles (common and large), moderate pink to light red mottles (few)
13.9	sandy clay 35-45% clay	similar to 12.9 ft	vp	trace heavy minerals	white to very light gray (N9-N8)	light red, pink mottles (common)
14.4	sandy clay 35-45% clay					
14.8	sandy clay loam to sandy clay 30-40% clay	coarse sand/granules abundant, few pebbles (.5-1 cm)	vp	rare heavy minerals	white to very light gray (N9-N8)	yellowish brown mottles, moderate pink, light red and dark reddish brown mottles (few), no overall distinct color
15.3	sandy clay loam 25-35% clay	coarse sand/granules abundant, few pebbles (.5-1 cm)	vp	rare heavy minerals, mica	very dark red (5R2/6), dark reddish brown (10R 3/4)	reddish orange mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP6	Described by: S. Harder			Date: 6/5/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
16.2	sandy clay loam 30-35% clay	coarse sand/granules abundant, few pebbles (.5-1 cm)	vp	rare heavy minerals	moderate to dark reddish brown (10R 4/6-3/4), some pale purple to grayish purple (5P 6/2 - 5P 4/2)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP7		Described by: S. Harder			Date: 6/5/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
0.5	loamy sand to sandy loam 15% clay	vf-c, medium/fine dominant, subrounded to subangular	p - mod.	trace heavy minerals	pale yellowish brown to dark yellowish brown (10YR 6/2-10YR 4/2)	few coarse sand grains
1.1	loamy sand 10-15%	vf-vc, subrounded to subangular, fine/medium dominant	p		dark yellowish orange to moderate yellowish orange (10YR 6/6-10YR 5/4)	
1.6	loamy sand 10-15%	vc-vf, subrounded, few subangular, few rounded	vp		grayish orange (10YR 7/4)	
2.5	sandy loam to loamy sand 15% clay	vf-vc, subrounded to subangular	vp		moderate brown to moderate yellowish brown (5YR 4/4-10YR 5/4)	
3.6	sandy loam to loamy sand 15% clay	vf-vc, subrounded to subangular			moderate yellowish brown (10YR 5/4)	
4.3	sandy loam to loamy sand 15% clay	vf-c, maybe slightly less clay	vp	trace heavy minerals	dark yellowish orange (10YR 6/6)	
5.4	sandy loam 15-20% clay	vf-vc, medium dominant, increase in clay	p - vp	trace heavy minerals	moderate yellowish brown (10YR 5/4)	first sign of mottles, light to moderate brown mottles (few)
5.8	sandy clay loam 20-35% clay	vf-vc, medium dominant	p - vp		moderate yellowish brown (10YR 5/4)	moderate reddish brown mottles (common), light brown mottles (common)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP7	Described by: S. Harder			Date: 6/5/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
6.0	sandy clay loam 30-35% clay	increase in clay, fine-medium sand, few coarse grains		trace heavy minerals	very light gray (N8)	mottles prominent, pale to moderate reddish brown mottles
6.5	similar to 6.0'	pebbles (few)				
6.7	clay loam 35-40% clay	few pebbles (< 1 cm), few granules			very light gray to light gray (N8-N7)	brown and reddish brown mottles (common)
7.0	sandy clay loam 25-35% clay	few pebbles, few granules			very light gray to light gray (N8-N7)	light brown and moderate reddish brown mottles (common)
8.1	sandy clay loam 25-35% clay				very light gray to light gray (N8-N7)	
8.6	sandy clay loam 25-35% clay	few granules, medium sand dominant		trace heavy minerals		
9.1	sandy clay loam 25-35% clay				overall moderate reddish brown (10R6 4/6), heavily mottled	moderate reddish brown mottles more prominent
9.6	sandy clay loam 25-35% clay	medium fine-coarse seem to be dominant sand grain, no pebbles / granules	p - mod.	trace heavy minerals	very light gray (N8)	moderate reddish brown mottles (few), pink mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP7		Described by: S. Harder			Date: 6/5/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
10.0	sandy loam 15-20% clay				dark yellowish orange (10YR6/6)	moderate reddish brown mottles (common)
10.4	sandy loam 15-20% clay					
10.9	sandy clay loam 20-30% clay				very light gray to light olive gray (N8 - 5Y 6/1)	pale reddish brown and moderate reddish brown mottles
11.5	sandy clay loam 20-30% clay	few pebbles/granules (< 1 cm), few more coarse grain sand			moderate yellowish brown 10YR 5/4, some very light gray to light olive gray (N8 - 5Y 6/1)	pale reddish brown (faint but common), moderate reddish brown mottles (few)
12.0	sandy clay loam 20-30% clay	few granules, more coarse sand, vf-vc, subrounded-subangular	vp		very light gray (N8), some dark yellowish orange (10YR 6/6), moderate yellowish brown (10YR 5/4)	pale reddish brown (faint but common), moderate reddish brown mottles (few)
12.5	sandy clay loam 30-35% clay				moderate red (5R 4/6), little moderate pink (5R 7/4), some light brown (5YR 5/6), light gray (N7)	brown/gray base color with red and pink mottles
12.9	sandy clay 35-45% clay	few granules		trace heavy minerals	light gray (N8), light brown (5YR 5/6)	moderate red mottles (common)
13.3	similar to 12.5' and 13.7'	few granules			very light gray (N8)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP7	Described by: S. Harder			Date: 6/5/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
13.7	sandy clay 40-45% clay				very light gray (N8)	moderate red mottles (very common), light brown mottles (common)
14.0	sandy clay 35-45% clay	noticeably coarser sand grains	vp	trace heavy minerals	yellowish gray (5Y 8/1)	moderate red and light brown mottles (common)
14.5	sandy clay 35-45% clay	pebble (1.5 cm)			very light gray (N8)	moderate red and light brown mottles (common), but red mottles very distinct
15.0	sandy clay 35-45% clay slightly less clay				very light gray (N8)	moderate red and light brown mottles (common), but red mottles very distinct, pink mottles (few)
15.5	same as 15.0'					
15.9	sandy clay 40-50% clay				very light gray (N8)	moderate red and brownish red mottles (common), dark yellowish orange mottles (few)
16.1	clay to clay loam 40-50% clay	less sand			very light gray (N8)	moderate red and brownish red mottles (common), dark yellowish orange mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP8		Described by: S. Harder			Date: 6/6/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
0.7	sand to loamy sand 5-15% clay	vf-vc, medium fine dominant	p		pale to dark yellowish brown (10YR 6/2-10YR 4/2)	
1.3	sandy loam to loamy sand 10-15% clay	vf-c, medium fine dominant, subrounded to subangular	p	trace heavy minerals	moderate yellowish brown (10YR 5/4)	
1.8	sandy loam to loamy sand 10-15% clay	vf-c, medium fine dominant, subrounded to subangular		trace heavy minerals	moderate yellowish brown (10YR 5/4)	
2.5	sandy loam to loamy sand 10-15% clay	vf-c, medium fine dominant, subrounded to subangular			moderate yellowish brown (10YR 5/4)	
3.3	sandy loam to loamy sand 10-15% clay				moderate yellowish brown (10YR 5/4)	
4.3	sandy loam approx. 15% clay	vf-c, medium fine dominant, subrounded to subangular, slightly more clay			moderate yellowish brown (10YR 5/4)	
5.2	sandy clay loam 20-30% clay	vf-c, medium fine dominant, subrounded to subangular, pebbles few, increase in clay			moderate yellowish brown (10YR 5/4)	moderate reddish brown mottles (common)
5.9	sandy clay loam 20-30% clay	few pebbles (< 1 cm), few granules, sand is slightly coarser grained		trace heavy minerals	very light gray (N8), moderate yellowish brown (10YR 5/4)	moderate reddish brown mottles (very common)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP8	Described by: S. Harder			Date: 6/6/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
6.2	clay loam to clay 35-45% clay	few granules, medium fine sand dominant			very light gray (N8), moderate yellowish brown (10YR 5/4)	
6.7	sandy clay loam to clay loam 30-40% clay	few pebbles (< 1 cm), few granules, vf-c sand, subangular to subrounded	p		very light gray (N8)	moderate brown, moderate red, moderate reddish brown, and moderate yellowish brown mottles (common)
7.1	sandy clay loam 25-35% clay	few pebbles, granules more common, coarser sand grains	vp		very light gray (N8)	moderate brown, moderate red, moderate reddish brown (common)
7.5	sandy clay loam 30-35% clay	pebbles (< 1 cm), granules common			very light gray (N8)	moderate brown, moderate red, moderate reddish brown (common)
8.3	sandy clay to clay loam 35-40% clay	few small pebbles (< 1 cm), few granules, vf-c sand, subangular to subrounded	vp		very light gray (N8)	same as 7.5', but moderate red to moderate reddish brown mottles more prominent
9.3	sandy clay 35-45% clay to clay loam	few small pebbles (< 1 cm), few granules, vf-c sand, subangular to subrounded			very light gray (N8)	same as 7.5', but moderate red to moderate reddish brown mottles more prominent
10.2	sandy clay 35-45% clay to clay loam	few small pebbles (< 1 cm), few granules, vf -v c sand, subrounded to subangular	vp		very light gray (N8)	moderate red to moderate reddish brown mottles more prominent, few very hard dark purple clumps (pebble-like)
11.0	clay 45-55% clay				very light gray to yellowish gray (N8 - 5Y 8/1)	moderate red to very dark red mottles (very common), light brown to yellowish brown mottles (few)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP8		Described by: S. Harder			Date: 6/6/06	
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
11.8	clay 45-50% clay				very light gray to yellowish gray (N8 - 5Y 8/1)	reddish mottles more prominent than at 11', few hard purple clumps (pebble-like)
12.7"	clay 45-50% clay	fine/medium dominant, no pebbles/granules			very light gray to yellowish gray (N8 - 5Y 8/1)	reddish mottles more prominent than at 11', few hard purple clumps (pebble-like)
13.8	sandy clay loam 20-30% clay	large decrease in clay, vf-vc, subangular to subrounded	vp		light brown (5YR 5/6), moderate red (5R 4/6)	
14.3	sandy clay loam 25-35% clay				light brown (5YR 5/6), moderate red (5R 4/6)	
15.0	sandy clay loam 30-35% clay approaching sandy clay	few pebbles (> or equal to 1 cm)			light brown (5YR 5/6), moderate red (5R 4/6), some light gray (N7) and pink (5R 7/4)	
15.4	sandy clay loam 30-35% clay approaching sandy clay	pebbles (.5-2 cm) common, granules common			light gray (N7), moderate yellowish brown (10YR 5/4), dark yellowish orange (10YR 6/6)	reddish brown mottles (common but not as distinct)
15.9	sandy loam to sandy clay loam 15-25% clay	many pebble/granules			moderate reddish brown (10R 4/6)	
16.1	sandy clay loam to sandy clay 35-40% clay	fewer pebbles, vf-vc, subangular to subrounded	vp		very light gray (N8) to yellowish gray (5Y 8/1)	moderate red and dark yellowish orange mottles (common)

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP9	Described by: S. Harder			Date: 6/7/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
0.3	loam 15-25% clay	vf-vc, medium-fine dominant, subrounded to subangular	p		black (N1)	roots, organics
1.0	sandy clay loam 20-25% clay	vf-c, medium-fine dominant, subrounded to subangular	p		dusky yellowish brown (10YR 2/2)	
1.4	sandy loam 15-20% clay	vf-c, medium-fine dominant, subrounded to subangular			dark yellowish brown 10YR 4/2	
1.8	sandy clay loam 20-25% clay	vf-c, medium-fine dominant, subrounded to subangular			brownish gray (5YR 4/1)	
2.4	sandy clay 35-45%clay	vf-vc, subangular to subrounded			brownish gray (5YR 4/1)	
3.0	sandy clay loam 30-35% clay		p		brownish gray (5YR 4/1)	
4.0	loamy sand 10-15% clay	large decrease in clay, vf-c, fine-medium dominant, subangular to subrounded	p		pale yellowish brown (10YR 6/2)	
5.2	loamy sand 10-15% clay	large decrease in clay, vf-c, fine-medium dominant, subangular to subrounded, few coarse or very coarse grains			dark yellowish brown (10YR 4/2)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: DP9	Described by: S. Harder			Date: 6/7/06		
Depth (ft)	Lithology	Grain size	Sorting	Minerology	Color	Remarks
5.7	loamy sand 10-15% clay	large decrease in clay, vf-c, fine-medium dominant, subangular to subrounded, few coarse or very coarse grains			dark yellowish brown (10YR 4/2)	
8.2	clay to silty clay 45-55% clay	clay, silt			dusky brown (5YR 2/2) to dusky yellowish brown (10YR 2/2)	
8.6	sandy clay loam to clay loam 30-40% clay	more sandy, few granules			dusky brown (5YR 2/2) to dusky yellowish brown (10YR 2/2)	
9.1	transitions from sandy loam 15-20% clay to loamy sand 10-15% clay				dusky yellowish brown to pale yellowish brown (10YR 2/2 - 10YR 6/2)	transitional zone
9.8	sandy loam 15-20% clay	few small pebbles (< 1 cm), few granules, vf-vc, subrounded to subangular	vp		pale yellowish brown (10YR 6/2), pinkish gray (5YR 8/1), light brownish gray (5YR 6/1)	some dark gray to brownish gray streaks, semi-hard large clumps when dry
10.3	sandy clay to clay 55-70% clay	vf-vc sand, medium-fine dominant	p - mod.		dark yellowish brown (10YR 4/2)	few light to moderate brown streaks
10.8	sandy clay to clay 55-65% clay similar to 10.3' but maybe slightly less clay					

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: Bay 1 (SE near Staff Gauç	Described by: S. Harder			Date: 6/1/06		
Depth	Lithology	Grain size	Sorting	Minerology	Color	Remarks
surface	loam 10-25% clay	fine-coarse, fine-medium dominant, subrounded	p		black (N1)	roots, organics
0.7	loamy sand 10-15% clay	vf-vc, fine-medium dominant, subrounded	vp		grayish black (N2)	
1.3	sand to loamy sand 5-10% clay	vf-vc, fine-medium dominant, subrounded to subangular	vp			
1.8	loamy sand 10-15% clay	vf-vc, few granules, subrounded, fine-medium dominant	p		dusky brown (wet) (5YR 2/2), moderate yellowish brown (dry) (10YR 5/4)	
2.1	loamy sand 10-15% clay	vf-vc, few granules, subrounded, fine-medium dominant			dark yellowish brown (wet) (10YR 4/2), moderate yellowish brown (dry) (10YR 5/4)	
2.3	loamy sand 10-15% clay	vf-vc, few granules, subrounded, fine-medium dominant	p		dark yellowish brown (wet) (10YR 4/2), moderate yellowish brown (dry) (10YR 5/4)	
2.5	loamy sand 10-15% clay	vf-vc, few granules, subrounded, fine-medium dominant, pebble (< 1 cm)	p			
2.8	loamy sand 10-15% clay	vf-vc, few granules, subrounded, fine-medium dominant, granules, small pebbles (.5 cm)	p		dark yellowish brown (wet) (10YR 4/2), moderate yellowish brown (dry) (10YR 5/4)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate

Well: Bay 1 (SE near Staff Gaug	Described by: S. Harder				Date: 6/1/06	
Depth	Lithology	Grain size	Sorting	Minerology	Color	Remarks
3.6	loamy sand 10-15% clay	vf-vc, medium-fine dominant, subrounded	p	trace heavy minerals	pinkish gray (5YR 8/1)	
4.8	loamy sand 10-15% clay	vf-vc, medium-fine dominant, subrounded, few granules	vp	trace heavy minerals	pinkish gray (5YR 8/1)	
5.8	loamy sand 10-15% clay	vf-vc, medium-fine dominant, subrounded	vp	trace heavy minerals	pinkish gray (5YR 8/1)	
6.1	loamy sand 10-15% clay	vf-vc, medium-fine dominant, subrounded, few pebbles (.5-1 cm)	vp	trace heavy minerals	pinkish gray (5YR 8/1)	

f- fine, vf - very fine, m - medium, c - coarse, vc - very coarse, p - poor, vp - very poor, mod - moderate