FAIRMONT CITY POTENTIAL WETLAND COMPENSATION SITE: HYDROGEOLOGIC CHARACTERIZATION REPORT

Collinsville Road, Fairmont City
St. Clair County, Illinois
(Federal Aid Project 999)

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Submitted Under Contract No. IDOT SW WIP FY02 ANT to
Illinois Department of Transportation
Bureau of Design and Environment, Wetlands Unit
2300 South Dirksen Parkway
Springfield, IL 62764

March 14, 2003

Illinois State Geological Survey
Open File Series 2003-4

Abstract

In June 2000, the Illinois Department of Transportation tasked the Wetlands Geology Section of the Illinois State Geological Survey to conduct a hydrogeologic characterization of the Fairmont City potential wetland compensation site in St. Clair Co., Illinois. Data collected were analyzed to determine the geology and hydrology of the site and if wetland hydrology could be restored or created. Field work at this site began in August 2000 with the installation of a network of monitoring wells, staff gauges, and data loggers.

The results of this investigation indicate that the site has a high potential for wetland restoration and creation. Most of the site is mapped as non-wetland and the hydrology has been altered by drainage ditches and berms. In addition, portions of the site were inundated in both 2001 and 2002, which indicates that precipitation and runoff are retained on the site. Options for restoring wetland include filling drainage ditches and removing berms, which will help retain more precipitation and runoff on the site and possibly allow water from adjacent areas to flow onto the site, and excavation, which may enlarge the area of inundation.

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Introduction

This report was prepared by the Illinois State Geological Survey (ISGS) to provide the Illinois Department of Transportation (IDOT) with conclusions regarding the hydrogeologic conditions in a potential wetland compensation site (SW ¼, Section 4, T2N, R9W, St. Clair County) located near Fairmont City, Illinois (Figure 1). The site covers 32.4 hectares (80.0 acres) and was formerly used as a golf course.

The purpose of this report is to provide IDOT with data regarding the hydrogeologic conditions of the study site and to make recommendations regarding restoration and/or creation of wetlands. Therefore, for IDOT's convenience, the report presents conclusions and design recommendations first, followed by a discussion of the methods and supporting data. The supporting data include ground- and surface-water level data and precipitation data collected from October 2000 to September 2002, and geologic data collected during the installation of monitoring wells.

Data collection at the site is ongoing and will continue until terminated by IDOT. The data currently being collected will be used to compare the pre- and post-construction hydrology of the site and to determine the impact of hydrologic alterations on the area and the duration of wetland hydrology.

Summary and Conclusions

The following factors indicate that the potential for wetland restoration and creation at this site is high.

- The site is mostly mapped as non-wetland (Figure 1) and the hydrology of the site has been altered by drainage ditches and berms (Figure 2).
- There are potential off-site sources of water, such as the wetlands northeast of the site (Figure 1).
- The dominant soil type is the Darwin silty clay (Figure 3), which is on both the state and county lists of hydric soils (USDA 1991, USDA 1995). The permeability of the Darwin soil is very low, ranging from <0.06 in/hr to 0.20 in/hr (USDA 2000), which facilitates perching of surface water and long-term inundation and saturation.
- A geologic cross-section (Figure 4) shows that the site is underlain by at least 9 m of silty and clayey sediments of the Cahokia Formation and at least 6 m of sandy sediments of the Henry Formation.
- Portions of the site were inundated in both 2001 and 2002 (Figure 5). The difference in the area of inundation appears to depend on the amount and timing of precipitation. While annual precipitation in both years was near the 30-year average, 94% of average in 2001 and 98% of average in 2002, seasonal precipitation shows distinct differences (Table 1) which indicate that the larger area of inundation in 2002 was the result of the timing of precipitation rather than an overall surplus of precipitation.

Year	Winter	Spring	Summer	Fall	Annual
2001	47%	80%	128%	113%	94%
2002	93%	110%	109%	74%	98%

Table 1: Percent of average precipitation (Midwest Climate Center 2002).

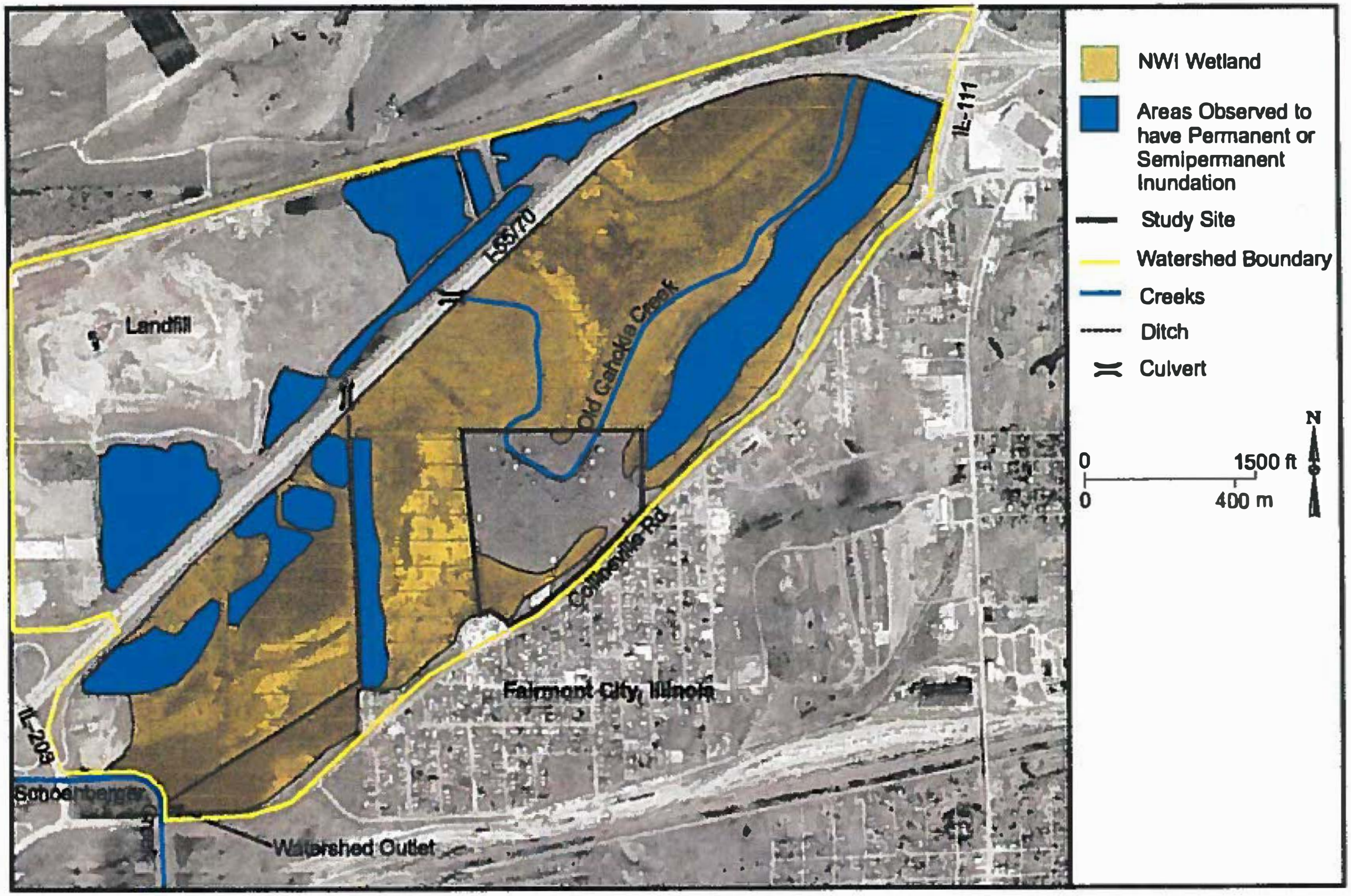

Figure 1: Old Cahokia Creek watershed. Aerial photography from the U.S. Geological Survey, Digital Orthophoto Quarter Quadrangle, Monks Mound, SW. Wetland boundaries from the National Wetland Inventory, Monks Mound 7.5-Minute Quadrangle Map.

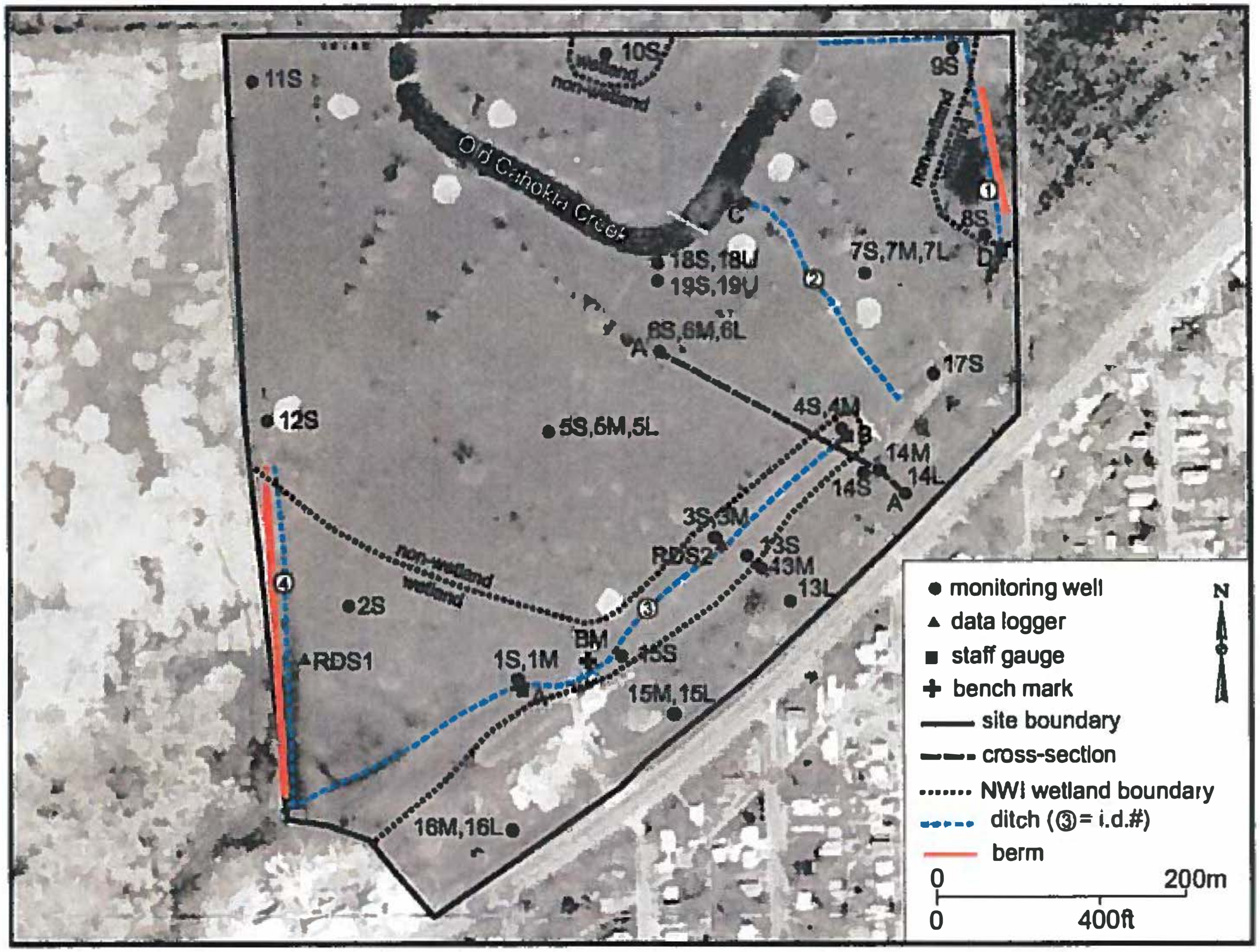

Figure 2: Site map. Surface- and ground-water monitoring network and on-site hydrologic alterations are shown. Aerial photography from the U.S. Geological Survey, Digital Orthophoto Quarter Quadrangle, Monks Mound, SW.

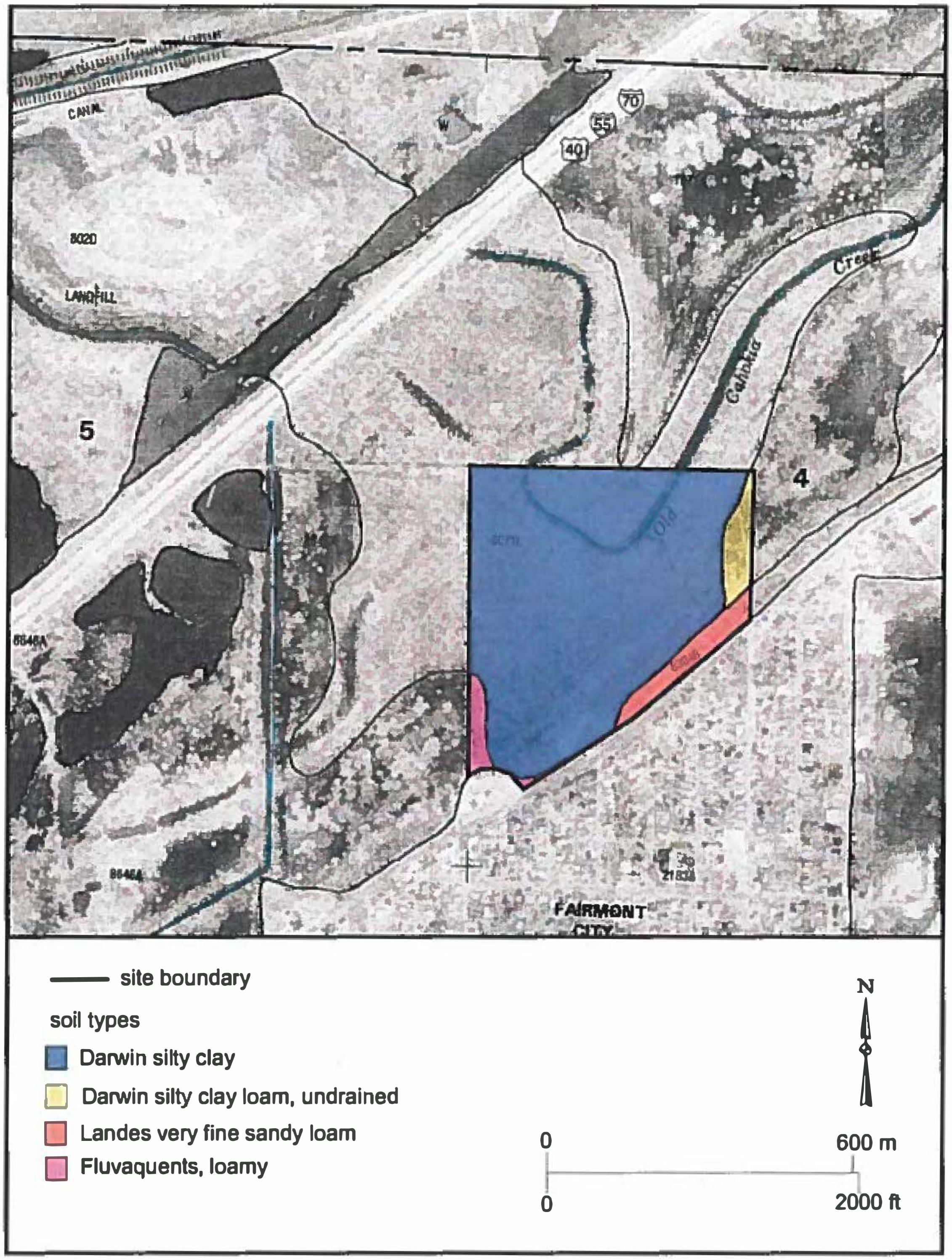

Figure 3: Soil types (Source: U. S. Department of Agriculture, 2000, Soil Survey of St. Clair County, Illinois, Soil Map, Sheet 2 of 61, Scale 1:12,000).

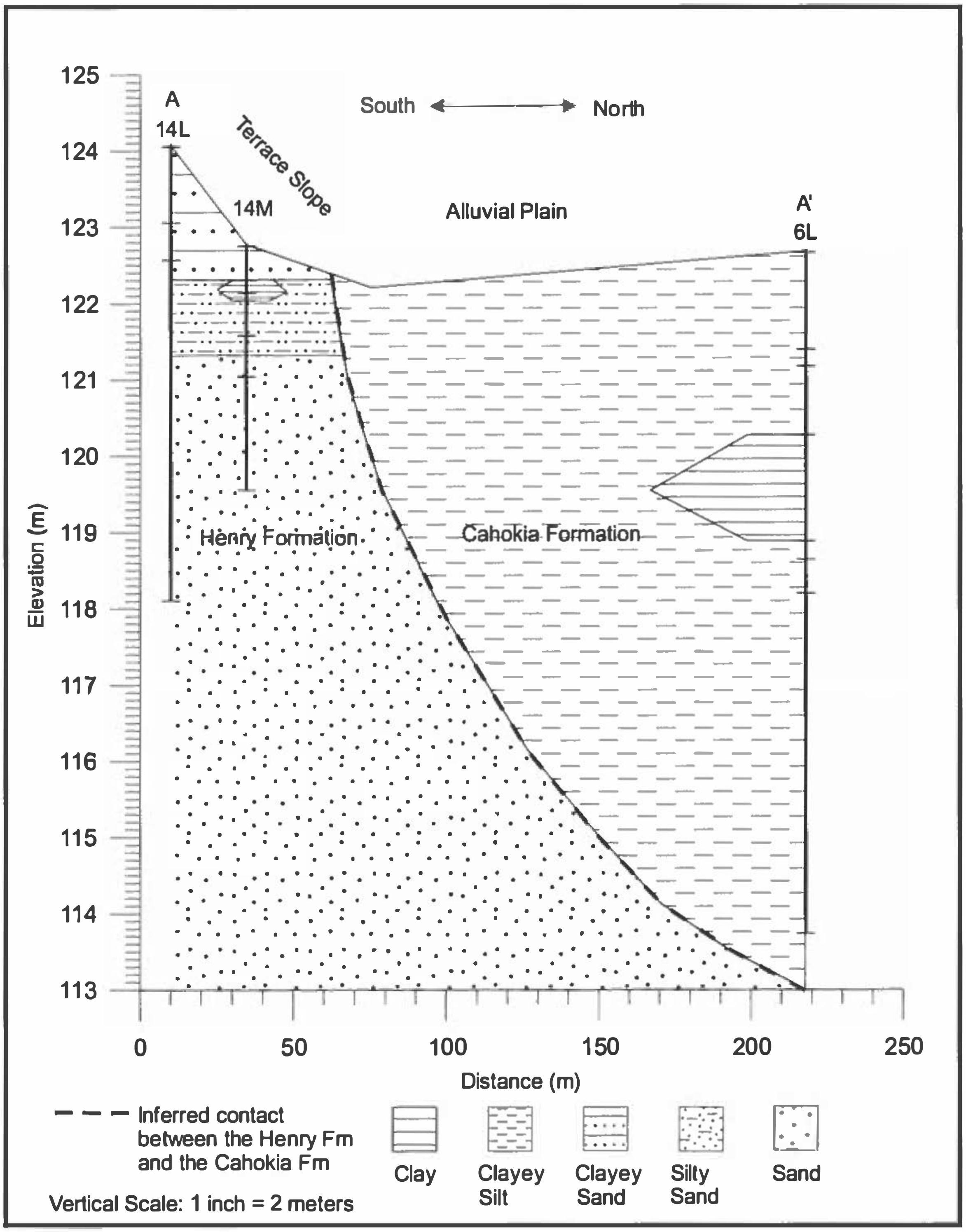

Figure 4: Cross-section A-A'. See figure 2 for location of cross-section.

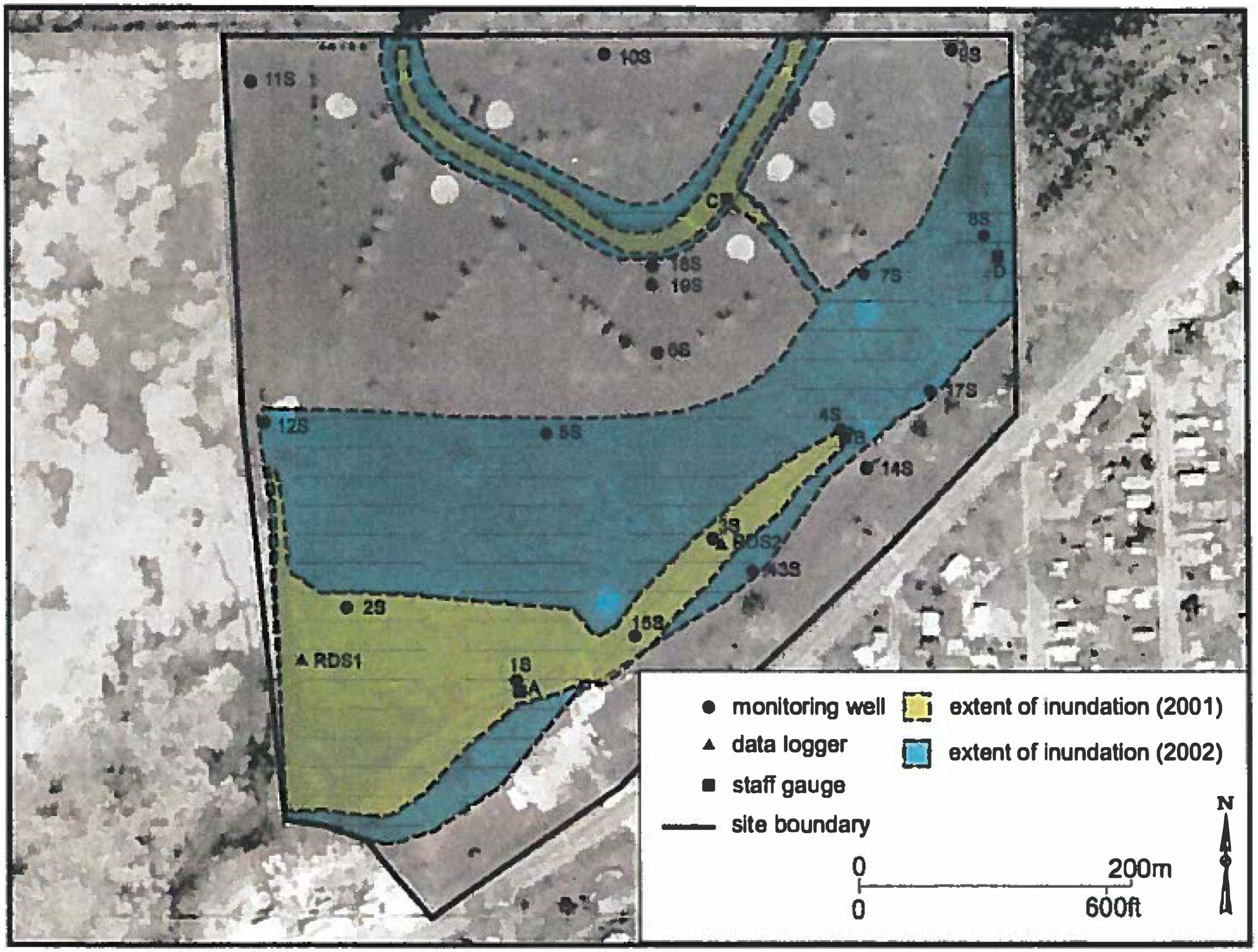

Figure 5: Areas of inundation.

- Long-term (weeks to months) trends in ground-water elevations indicate that saturation occurs in areas of the site that were not inundated. In these areas, ground-water elevations indicate that wetland hydrology due to saturation occurred in both 2001 and 2002.

Wetland Restoration/Creation

The following options for restoring and/or creating wetland on the site are based on the geologic and hydrologic data collected at the site:

- Option 1: Wetland hydrology could be restored by filling drainage ditches #1 and #2 and removing the berm along the east boundary of the site. Both of these ditches discharge into Old Cahokia Creek. Figure 6 shows that, except in Spring 2002, surface-water elevations in ditch #1 were generally higher than in Old Cahokia Creek. Surface-water elevations were not monitored in ditch #2, however, water in the ditch has been observed flowing toward the creek. Therefore, filling ditch #1 and ditch #2 would stop the discharge of water into Old Cahokia Creek and increase the volume of precipitation and runoff retained on the site.

  Removing the berm along the east boundary of the site might allow surface-water from the wetlands northeast of the site to flow onto the site. Water has been observed in these wetlands during every site visit and evidence of past inundation found on the east side of the berm indicates that the water can extend at least as far as the berm.

- Option 2: In addition to option 1, the area of wetland hydrology could be enlarged by excavation. Analysis of surface-water data (Figure 7) reveals that the portions of the site that were inundated in 2001 and 2002 were inundated for periods long enough during the growing season to satisfy the criteria for jurisdictional wetland hydrology. Precipitation data (Table 1) indicate that the difference in the areas of inundation may be due to the timing of precipitation, rather than to an overall surplus or deficit of precipitation. This suggests that, if ground-surface elevations were lower, then the area of inundation in 2001 might have been as large as in 2002.

  The hydroperiod of the excavated area will depend on its surface elevation. In 2001, areas at or below an elevation of 122.0 m were inundated for at least 16% of the growing season (Table 2), which is long enough to conclusively satisfy the criteria for jurisdictional wetland hydrology.

Elevation (m)	121.8	121.9	122.0	122.1	122.2
Period of inundation (days)	78	60	32	15	0
Percent of growing season	38.8	29.8	15.9	7.5	0.0

Table 2: Period of inundation in 2001.

  The area and depth of excavation will ultimately depend on how much wetland acreage is needed, the cost of excavating, and the desired types of plant communities. Some areas of the site will need little excavation to reach the desired elevation. For example, ground elevation at well cluster 5 ranges from 122.43 m to 122.49 m (appendix A). In order to create an area that will be inundated for long periods in most years (elevation = 122.0 m), the depth of excavation would range from 0.43 m to 0.49 m. On the other hand, excavation in higher portions of the site would be less cost effective. For example, well cluster 19 is at an elevation of 122.99 m (Appendix A). Therefore, excavating the area around this well cluster to an elevation of 122.0 m would require the removal of nearly 1 m of sediment.

  Excavating to an elevation higher than 122.0 m would require removing less sediment, but may not result in jurisdictional wetland hydrology. Table 2 shows that areas higher than 122.0 m

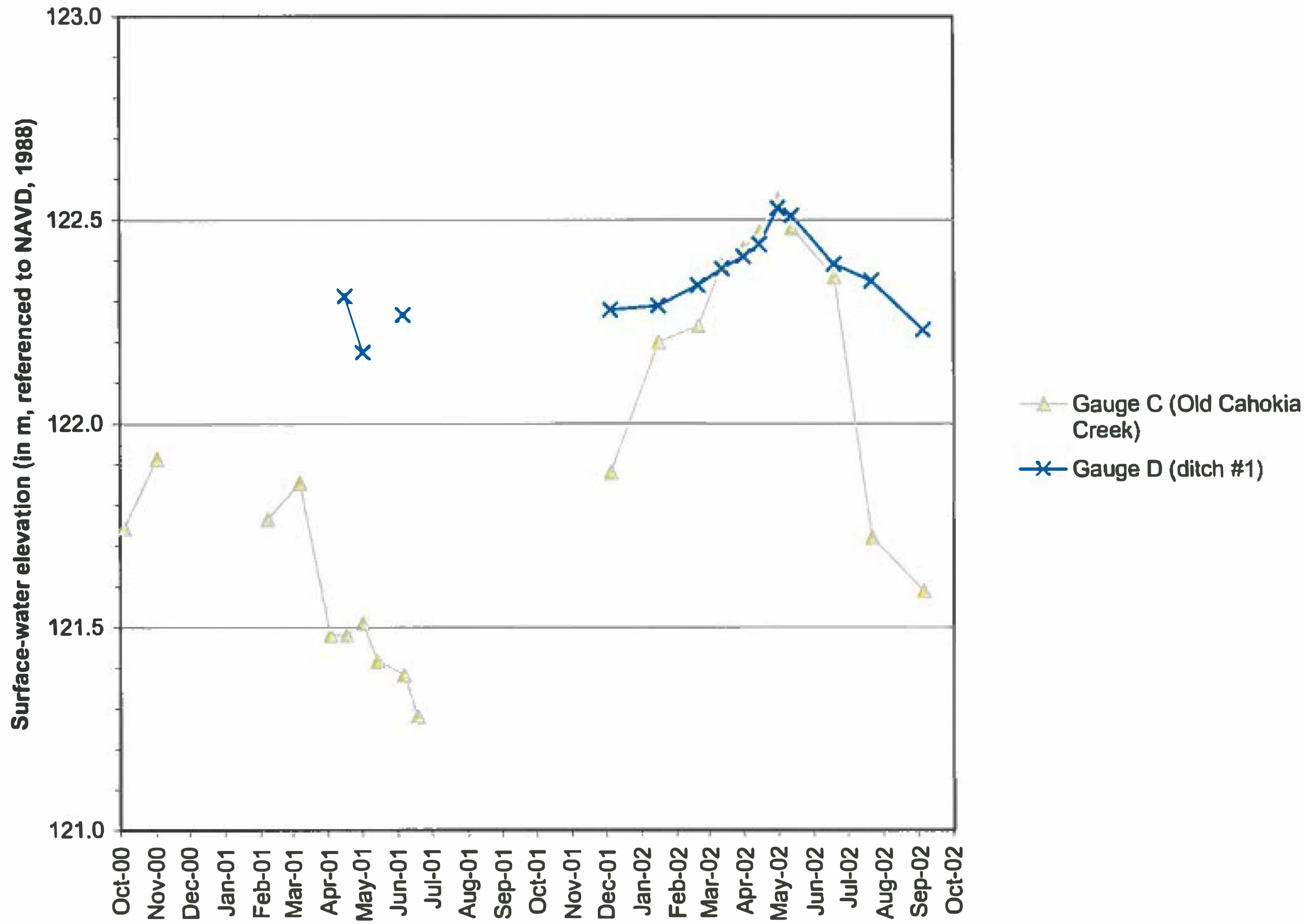

Figure 6: Surface-water elevations in Old Cahokia Creek and ditch #1

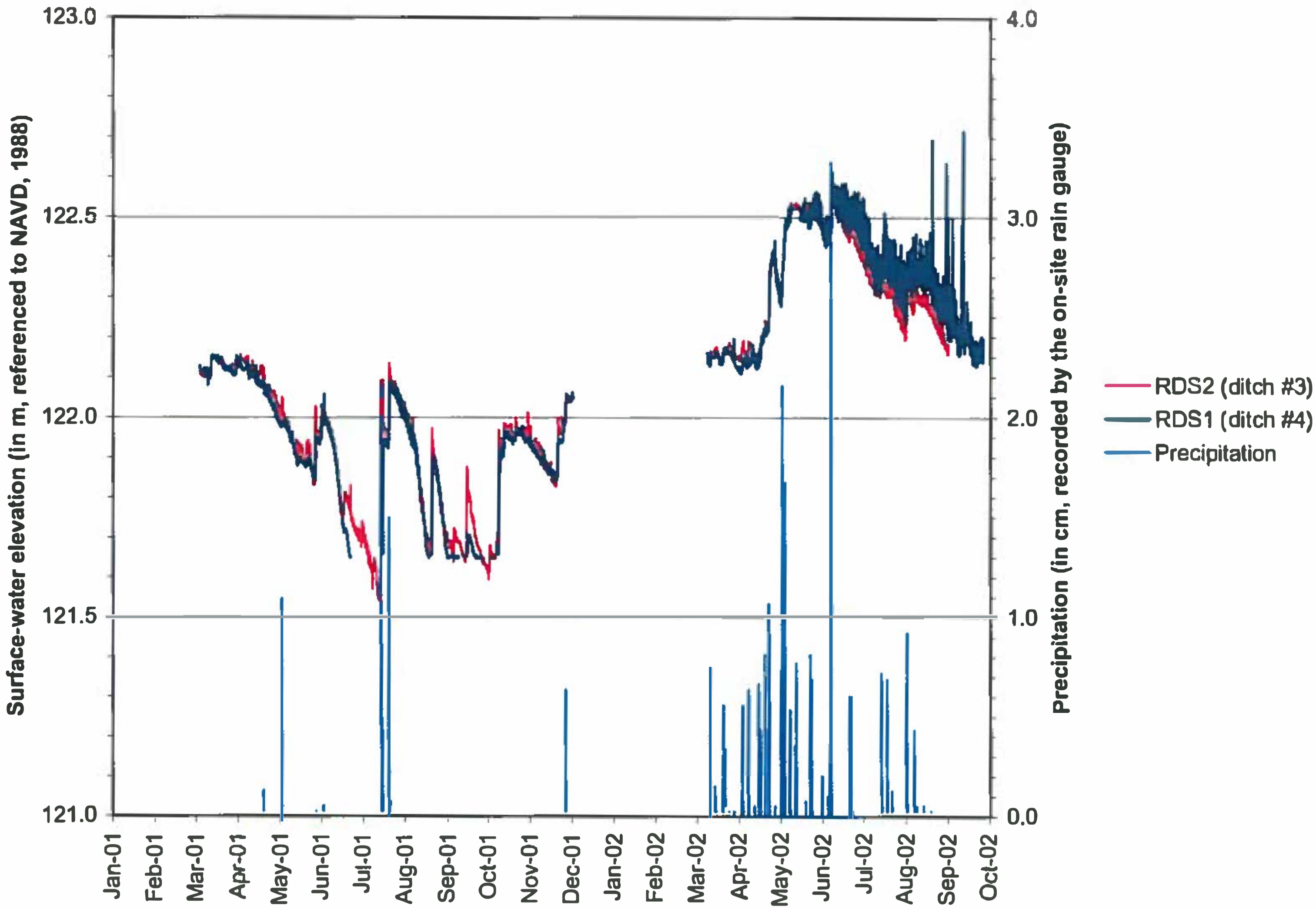

Figure 7: *Surface-water elevations in ditch #3 and ditch #4*

were not inundated for periods long enough to satisfy the jurisdictional criteria. The combined periods of inundation and saturation might have been long enough to satisfy the criteria, but, given the uncertainties associated with saturation at this site, it cannot be stated that the combination of inundation and saturation was long enough to satisfy the criteria.

Recommendations

- We recommend that a staff gauge be installed northeast of the berm along the east side of the site. The purpose of this gauge will be to determine if removing the berm will allow the flow of surface-water onto the site. If the data indicate that surface-water would flow onto the site, then we further recommend that option 1 be implemented as soon as is feasible. This will allow us to determine if option 2 is needed.

- If removing the berm would not result in another source of water for on-site wetlands, we still recommend that ditch #1 and ditch #2 be filled. This will prevent the discharge of surface-water into Old Cahokia Creek and retain more precipitation and runoff on the site. This will also allow us to determine if option 2 is needed.

- We recommend that surface-water data be collected from the property west of the site. These data will be used to determine if the berm along the west side of the site should be removed. Figure 5 shows that the southwest corner of the site and the area adjacent to ditch #3 (Figure 2) were inundated in both 2001 and 2002. This is probably due to the fact that these ditches do not have an outlet. Ditch #3 is not connected to ditch #2 and there appears to be no culvert in the berm. If the surface-water data from the property to the west reveals that water would flow onto the site, then it is recommended that the berm be removed. On the other hand, if the data show that water would flow off the site, then it is recommended that the berm not be removed.

- If excavation is done at this site, we recommend that the excavated areas not be connected to Old Cahokia Creek. The creek is the main drainageway in the watershed and connecting the excavated areas to the creek could result in drainage of wetlands.

- We recommend that acquisition of the entire Old Cahokia Creek Watershed south of I-55/70 be considered. Figure 1 shows that most of this area is mapped as wetland. However, the ISGS (Benton et al. unpublished report) and the Illinois Natural History Survey (Busemeyer et al. unpublished report) found that portions of the watershed west and north of the site are not wetland, lacking either hydrophytic vegetation, wetland hydrology, or both. The INHS also found large numbers of *Boltonia decurrens*, a state listed endangered plant species, on the property west of the study site (Busemeyer et al. unpublished report). Therefore, acquiring the watershed would provide opportunities for preservation and/or restoration credits, protect possible sources of water for wetlands on the current study site, and increase options for restoration of wetlands if offsite concerns no longer exist.

Methods

A total of 35 monitoring wells at nineteen locations were installed on the site (Figure 2). Details of well construction can be found in Appendix A. The shallow (S) wells were designed to monitor near-surface water levels and were used to determine where wetland hydrology was occurring on the site. The middle (M) and lower (L) wells were used to determine if there were vertical hydraulic gradients.

Depth to water in the wells was measured on a biweekly basis in April, May, and June and monthly during the remainder of the monitoring period (appendix B). Ground-water elevations (appendix C) are relative to ground surface and were calculated by subtracting the difference between the elevation of the top of the well and ground-surface elevation from the depth to water in the well.

A pressure transducer, equipped with a data logger, was installed in well 6S in Spring 2002. The transducer measured the height of the water column in the well, and the data logger was programmed to record the height in 1 hour intervals. The height of the water column was converted to ground-water elevation by adding the height to the elevation of the bottom of the well. The purpose was to determine if a measurement interval shorter than the monthly and biweekly intervals could detect the presence/absence of wetland hydrology in an area of the site that did not appear to have wetland hydrology in 2001.

In addition to the monitoring wells, four staff gauges (A, B, C, and D) and two electronic data loggers (RDS1 and RDS2) were installed on the site (Figure 2). Surface-water depths at the gauges were measured on a biweekly basis in April, May, and June and monthly during the remainder of the monitoring period. Surface-water depths at the data loggers were recorded at 3 hour intervals. Water depth was converted to elevation by subtracting the water depth from the elevation of the staff gauge and logger. The purpose of the gauges and data loggers was to monitor surface-water fluctuations in Old Cahokia Creek (gauge C) and in the drainage ditches on the site (gauges A, B, D, RDS1, and RDS2) and to determine directions of surface water flow.

On-site precipitation data were collected with a tipping-bucket rain gauge equipped with a data logger. The on-site data were supplemented with precipitation data recorded at the Southern Illinois University Research Center in Belleville, IL (Station# 110510). These data were obtained from the National Water and Climate Center (NWCC) of the Natural Resources Conservation Service (NRCS) and from the Midwestern Climate Center (MCC) at the Illinois State Water Survey (ISWS). The precipitation data were used to determine the effect of monthly, seasonal, and annual precipitation trends on surface- and ground-water and wetland hydrology.

Temperature data for Belleville, IL were also obtained from the NWCC. These data were used to determine the length of the growing season for the region. The growing season (Environmental Laboratory 1987) is the period between the last occurrence of 28°F temperatures in the spring and the first occurrence in the fall. According to the data, the median length (5 out of 10 years) of the growing season for the region was 201 days, with the median starting date on April 3 and the median ending date on October 21 (NWCC 2002).

The elevations of the staff gauges, water-level meters, and monitoring wells were measured relative to a benchmark established on site by the ISGS. The elevation of the benchmark was measured relative to the North American Vertical Datum of 1988 by IDOT. A Sokkia B-1 automatic level and a fiberglass extending rod were used to measure elevations on the site. In addition, the geographic locations of the staff gauges, water-level meters and monitoring wells were determined using a Trimble Pro XR/XRS receiver and TSC1 Asset Surveyor. In order to increase position accuracy, the locations were differentially corrected using the Trimble Pathfinder software.

Site Characterization

Setting

The study site is located in a watershed which, for the purposes of this report, is called the Old Cahokia Creek watershed. The watershed is in the southern arm of the Horseshoe Lake Meander in the American Bottoms of the Mississippi River (Munson 1974, USGS 1993), and is defined by the Cahokia Canal on the north, Illinois 111 on the east, a terrace to the south, and Schoenberger Creek and Illinois 203 to the west (Figure 1).

Surface-water flow in the Old Cahokia Creek watershed is generally toward the west. Old Cahokia Creek, which loops through the northern part of the site (Figure 2), conveys water from the eastern portion of the watershed to a culvert under I-55/70. The culvert discharges into a pond north of the highway. This pond is connected to a series of ponds which discharge, via another culvert under I-55/70, into a drainage ditch south of the highway. The drainage ditch discharges, via two outlets, one of which is above normal creek level, into Schoenberger Creek.

Figure 1 shows that most of the watershed south of I-55/70 is mapped as wetland. The only portions not mapped as wetland are most of the study site and the slope of the terrace. Figure 1 shows that the boundaries of the mapped wetlands generally follow the margins of the site. Much of the watershed north of I-55/70 is also mapped as wetland (NWI 1988), but most of this area no longer appears to be wetland. Figure 1 also shows that portions of the watershed are permanently inundated or inundated for long periods of time. Some of the inundated areas appear to be flooded excavations, while others, such as the area northeast of the study site, may be natural depressions that trap precipitation and runoff.

Geomorphology

The site can be divided into two geomorphic areas, an alluvial plain and a terrace. Most of the site lies on the alluvial plain, which is relatively flat and is at a general elevation of about 122 m (400 ft) (USGS 1993). The terrace, which forms the southern margin of the site, has a relatively steep slope and rises to an average elevation of about 128 m (420 ft). Ground-surface elevations measured at the monitoring wells and staff gauges (Appendix A) and a topographic map of the site (IDOT 2001) show that the lowest areas on the site are Old Cahokia Creek and in the vicinity of ditch #3 (Figure 2). Both of these areas lie below an elevation of 122 m (400 ft).

Geology

The geology of the site was characterized by collecting samples from several boreholes (appendix D) drilled using a CME truck-mounted drilling rig. A core-barrel sampler (154.2 cm long x 10.2 cm diameter) was used to collect continuous samples from ground surface to the base of the boring. The samples were examined in the field for color, texture, and structure.

In the American Bottoms, the unconsolidated sediments consist of the Cahokia Formation overlying the Henry Formation (Berg and Kempton 1987, Hansel and Johnson 1996, Lineback 1979). The Cahokia is a silty alluvial formation recently deposited in flood plains (Willman and Frye 1970). The Henry is a glacial outwash formation (Willman and Frye 1970) consisting of stratified sand and gravel deposited along the fronts of moraines and in river valleys (Hansel and Johnson 1996).

A geologic cross-section (Figure 4) shows that the alluvial plain at the site is underlain by clay and clayey silt > 9 m thick, and the terrace slope by sand and silty and clayey sand > 6 m thick. The clay and clayey silt are interpreted as belonging to the Cahokia Formation, while the sandy sediments are interpreted as being part of Henry Formation (Berg and Kempton 1987).

Munson states that the Horseshoe Lake Meander was active prior to 900 years before the present (B.P.) (Munson 1974). Therefore, deposition of the Cahokia Formation at this site probably occurred after 900 B.P. In his work on the geology of the St. Louis area, Fenneman suggests that the terrace south of the site is a Wisconsinan depositional feature (Fenneman 1912). Though he did not state when the terrace was deposited during that stage, the cross-section suggests that the Henry was eroded during the active phase of the Horseshoe Lake Meander.

Soils

In the American Bottoms, the soil types fall into two associations, the Landes-Riley Association and the Darwin Association (USDA 1978). The Landes-Riley Association includes nearly level to sloping, well drained to somewhat poorly drained soils that formed in loamy and sandy alluvium. The Darwin Association includes nearly level, poorly drained soils that formed in clayey alluvium.

Four soil types are mapped on the site (Figure 3), the Darwin silty clay, Darwin silty clay loam, and Fluvaquents on the alluvial plain and the Landes very fine sandy loam on the terrace slope (USDA

2000). Both of the Darwin soils are on the state (USDA 1991) and county (USDA 1995) lists of hydric soils in Illinois, whereas the Fluvaquents and the Landes are non-hydric soils. Table 1 shows the hydrologic properties of these soils.

Soil Type	Hydric	Permeability (in/hr)	Flooding	Water Table
Darwin silty clay loam, undrained (1071A)	yes	0-64 in: 0.01-0.06 64-80 in: 0.06-0.20	Frequent, very long duration, Jan-Jun	Depth: 0.0-0.5 ft Type: apparent Period: Oct-Dec
Darwin silty clay (8071L)	yes	0-62 in: 0.00-0.06 62-80 in: 0.06-0.20	Occasional, long duration, Jan-Jun	Depth: 0.0-1.0 ft Type: apparent Period: Nov-May
Landes very fine sandy loam (8304B)	no	0-39 in: 2.0-6.0 39-80 in: 6.0-20.0	Occasional, brief duration, Feb-May	Depth: 0.5-2.0 ft Type: not listed Period: not listed
Fluvaquents, loamy (8646A)	no	0-60 in: 0.6-2.0	Occasional, long duration, Jan-Dec	Depth: 0.0-1.0 ft Type: apparent Period: Nov-May

Table 3: Hydrologic properties of on-site soil types (USDA 2000).

Sediment samples examined during the installation of monitoring wells reveal that soil colors at this site range from dark gray (10YR4/1) to very dark gray (10YR3/1) to black (10YR2/1). Redox concentrations, generally starting at a depth of about 15 cm, range in color from gray (10YR5/1) to brown (10YR3/3). Soil structure is generally subangular blocky (appendix D) and the root zone is generally 15 cm to 30 cm thick.

Hydrology

Figure 8 shows monthly precipitation during the monitoring period. A total of 14 months had near or above average precipitation, with the longest periods occurring from July 2002 to October 2002, followed by March 2002 to May 2002. A total of 13 months were below average, with the longest period occurring from December 2000 to April 2001. Total precipitation during the monitoring period was 208.34 cm, which was 93% of average. Annual precipitation in 2001 was 93.19 cm (94% of average) and in 2002 it was 97.12 cm (98% of average).

Figures 9 and 10 show ground-water elevations in the M-wells and L-wells on the slope of the terrace and on the alluvial plain (Figure 2), respectively. The wells on the terrace slope are screened in the Henry Formation, while the wells on the alluvial plain are screened in the Cahokia Formation.

The figures show the highest ground-water elevations were recorded in May 2002, which was the wettest month during the monitoring period (Figure 8). Precipitation in May was 16.76 cm (6.60 in), which was 163% of average. The lowest ground-water elevations were recorded in either July 2001 or October 2001, despite the fact that July 2001 was the second wettest month during the monitoring period and precipitation in October 2001 was above average (Figure 8). The data show that there was an overall decrease in ground-water levels starting in April 2001. Part of this decrease is probably due to below average precipitation in March, April, and June 2001. Other factors which probably contributed to the decrease are evaporation and transpiration.

Figures 9 and 10 also show that ground-water elevations in Spring 2002 were higher than in Spring 2001. This is probably the result of greater amounts of seasonal precipitation. Table 1 shows that precipitation in Spring 2002 was above average, while in Spring 2001 it was below average.

Periods of above or below average precipitation also appear to affect the increase in ground-water elevations that start in the fall and culminate in the spring. Figures 9 and 10 show that the increase from Fall 2001 to Spring 2002 is much greater than from Fall 2000 to Spring 2001. Table 1 shows that precipitation was above average in Fall 2001 and Spring 2002 and near average in Winter 2002. Conversely, precipitation was below average in Fall 2000, and in Winter 2001 and Spring 2001 (Table 1).

Surface-water elevations show the same relationship to precipitation. Appendix C shows that the highest surface-water elevations were recorded in May 2002, and the lowest in either June 2001 or July 2001. In addition, figures 6 and 7 show that surface-water elevations in Spring 2002 were higher than in Spring 2001, and, despite a lack of data, the amount of increase from Fall 2001 to Spring 2002 appears to have been greater than from Fall 2000 to Spring 2001.

A comparison of surface- and ground-water elevations and precipitation also reveals a relationship with individual storm events. Figure 11 shows ground-water elevations in well 6S in 2001 and 2002, and precipitation recorded by the on-site rain gauge. The figure shows that peaks in ground-water elevation correspond directly to precipitation events. The same relationship, though more subdued, is also apparent on Figure 7.

The fluctuations in ground-water elevation apparently reflect changes in hydrostatic pressure rather than changes in the position of the water-table (David Larson, pers. comm.). If this is the case, then the weight of water on the surface would cause an almost instantaneous change in the water level in the well. On the other hand, if the change in water level was the result of the physical movement of water through the sediments, then there should be a delay in the response, the duration of which would depend on the permeability of the sediments and the depth of the well screen below ground surface.

The water-level data for well 6S (Figure 11) show two trends - short-term changes in water level which last a few hours or days, and long-term increases and decreases in water level which last weeks to months. The short-term changes correspond to precipitation events. Analysis of the water-level and precipitation data reveal that water-levels in the well start to rise at about the same time as the start of the precipitation event, and that water levels, as the result of the events, sometimes rise above ground surface. If the rise in the water level was caused by the physical movement of water through the sediments, then the permeability of the Darwin soil (Table 3) indicates that water levels in the well, which is screened about 40 cm below ground surface (Appendix A), should not start to rise for at least 3 days. Therefore, it appears that the short-term water level changes are caused by changes in hydrostatic pressure, and water levels above ground surface reflect the temporary ponding of water on the surface during precipitation events.

While the short-term water level changes may be the result of hydrostatic pressure changes, the long-term trends are probably the result of actual changes in the position of the water table. Some of the water from each storm event percolates down to the water table causing it to rise. This is probably the cause of the long-term increase in the water-level in well 6S that started in January 2002 and lasted until about June 2002. The decrease from June 2002 to September 2002 probably reflects water being removed by evaporation and transpiration.

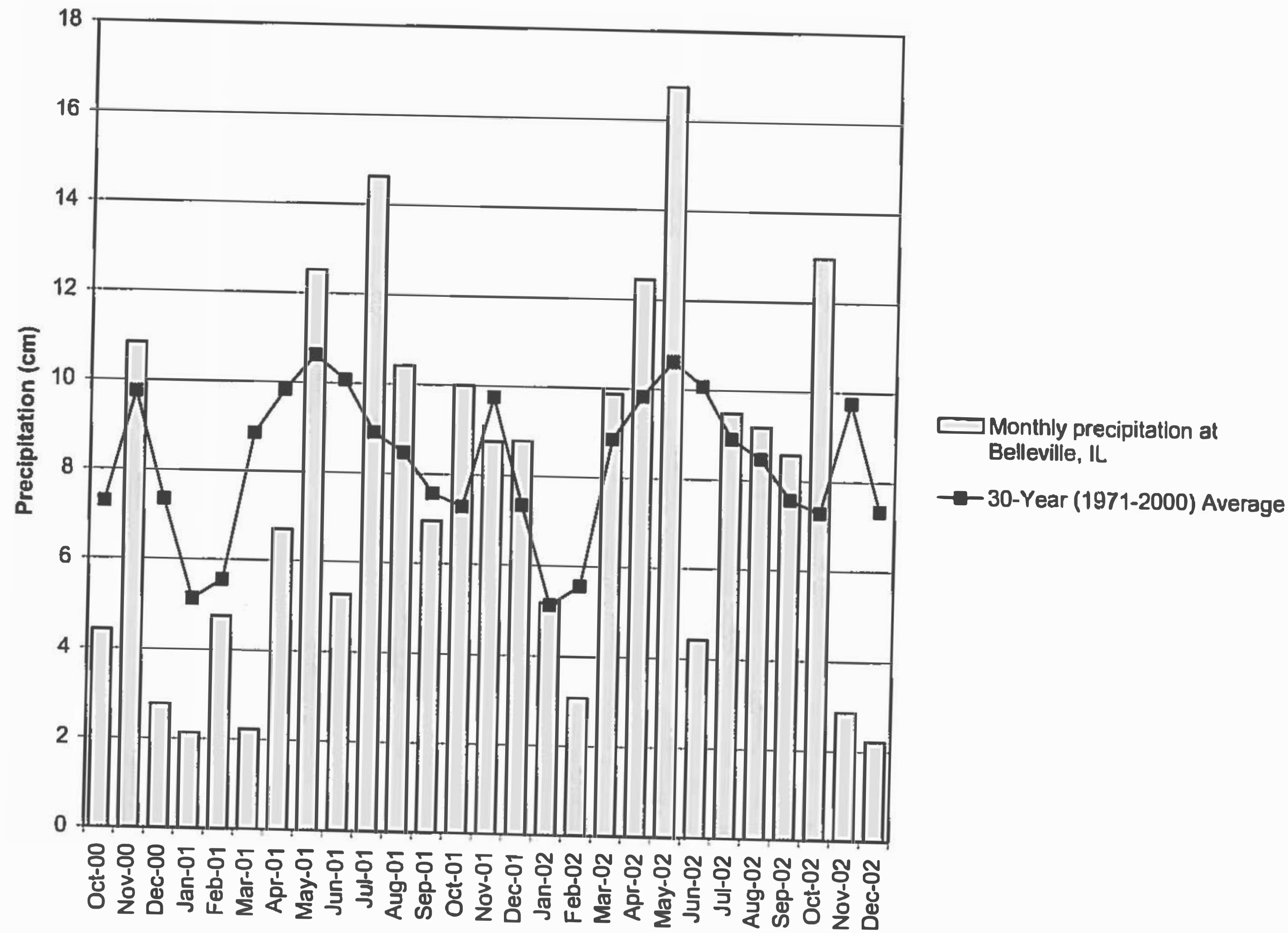

Figure 8: Monthly precipitation

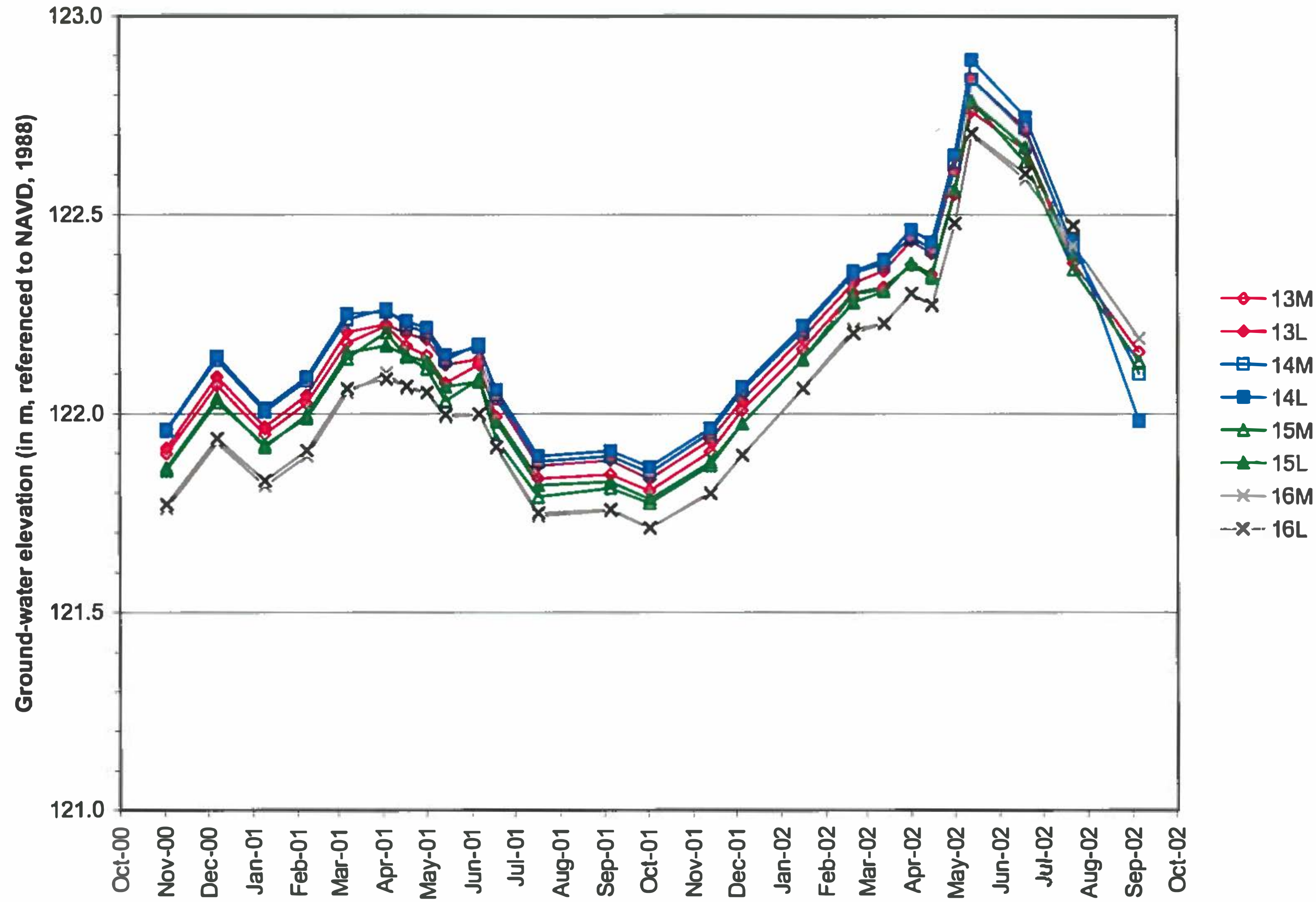

Figure 9: Ground-water elevations in the terrace wells

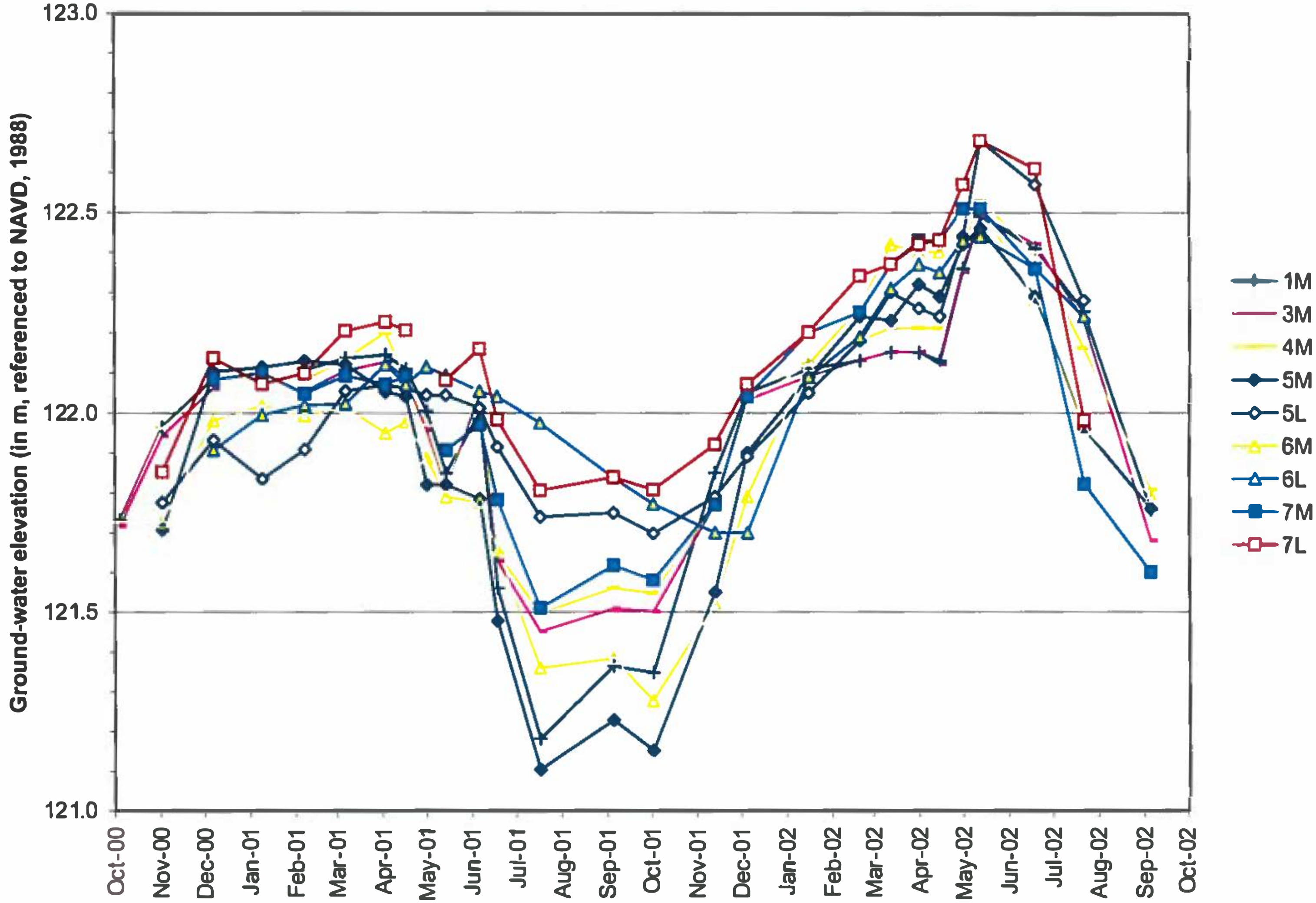

Figure 10: Ground-water elevations in the alluvial plain wells

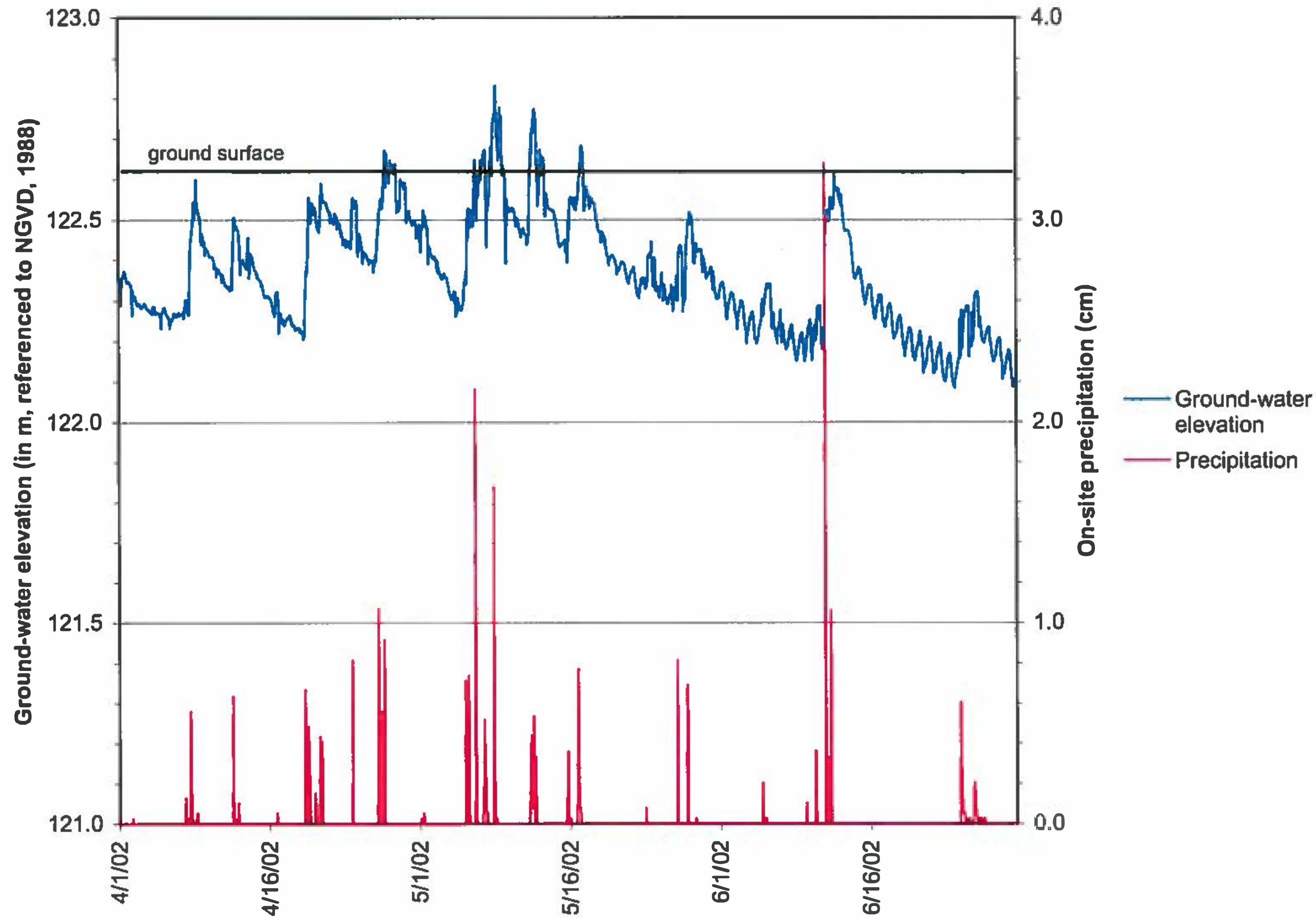

Figure 11: Ground-water elevation in well 6S and on-site precipitation

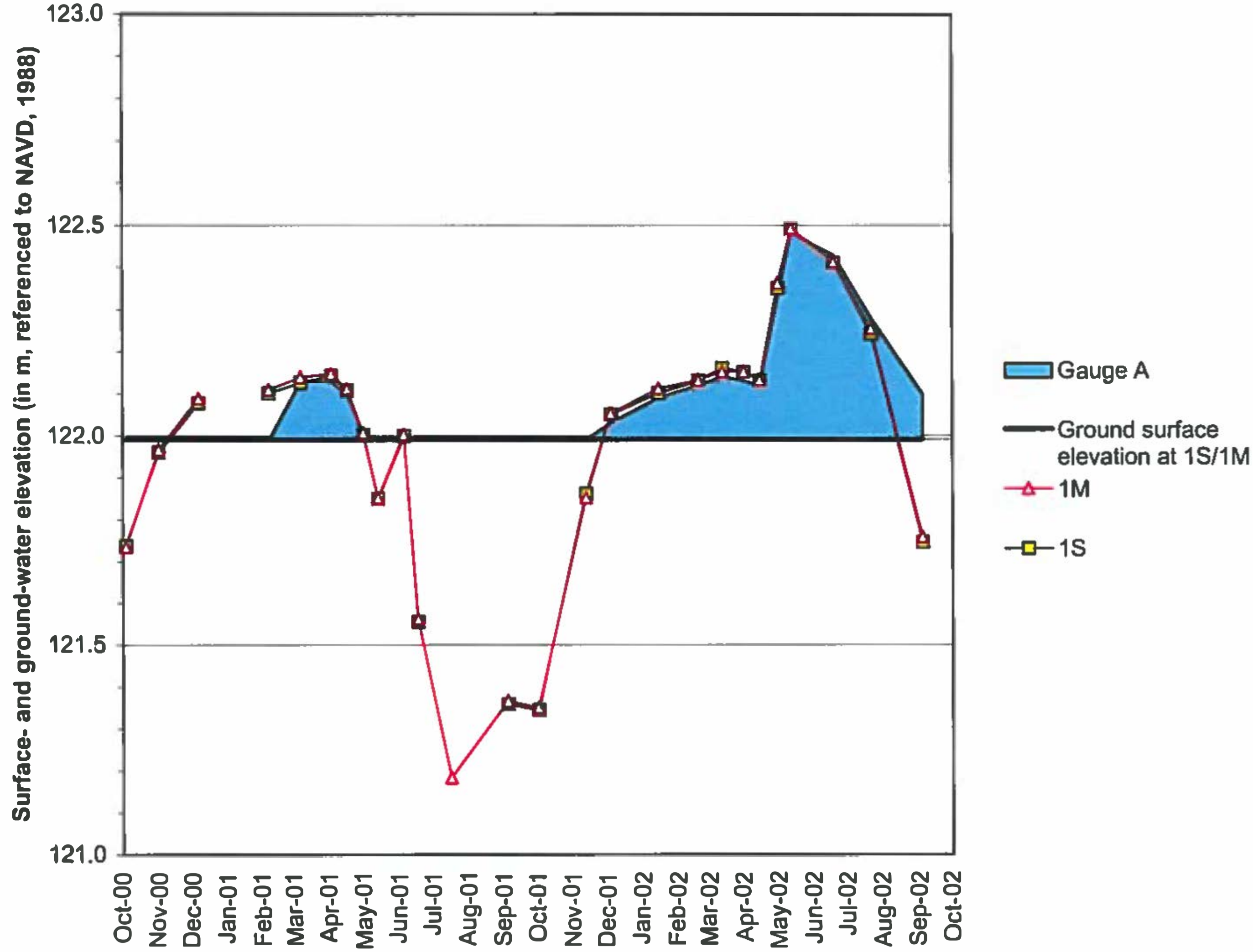

Figure 12: Inundation and ground-water elevation at well cluster #1

Analysis of the long-term trends reveal that wetland hydrology due to inundation and saturation both occur on the site. Figure 12 shows ground-water elevations in wells 1S and 1M and the depth of surface water at these well locations. The period of inundation at these wells, and at other well locations (Figure 5), was long enough to satisfy the criteria for jurisdictional wetland hydrology in 2001 and 2002.

Figure 12 also shows that there was a relationship between fluctuations in surface- and ground-water elevation. Initially, this may have been the result of changes in hydrostatic pressure. However, over time, the sediments would have become saturated to ground surface, and the water levels in the wells would reflect the actual position of the water table.

Analysis of the long-term trends also shows that wetland hydrology occurred in areas of the site that were not inundated. Table 4 shows that, in 2001, the period of saturation in well 8S was long enough to satisfy the jurisdictional criteria and may have been long enough to satisfy the criteria in wells 9S and 12S. In 2002, the period of saturation was long enough to satisfy the jurisdictional criteria in wells 6S, 9S, 10S, and 14S. At wells 8S and 12S, jurisdictional wetland hydrology was the result of inundation, though the period of inundation was long enough to saturate the sediments.

Growing Season	Period of Saturation (% of growing season)					
	6S	8S	9S	10S	12S	14S
2001	0.0	14.4	9.0	0.0	7.5	na
2002	13.9	inundated	55.7	20.4	inundated	55.7

Table 4: Period of saturation (Based on the median length of the growing season as measured by temperatures recorded at the National Water and Climate Center, WETS Station at Belleville, Illinois over the period 1961-1990)

Conclusions

The following reveals that this site has a high potential for the restoration and creation of wetlands.

- The site is mostly mapped as non-wetland and the surface-water hydrology of the site has been altered. Reversing these alterations would tend to trap more precipitation and runoff on the site and possibly allow the flow of water onto the site.

- Portions of the site were inundated in both 2001 and 2002. The difference in the area of inundation seems to have been due more to the timing of precipitation rather than to an overall lack of precipitation. This suggests that excavation could create a larger area that would be inundated in most years.

- Long term trends in ground-water levels indicate that wetland hydrology due to both inundation and saturation occur at the site.

- Analysis of ground-water fluctuations during precipitation events indicates that water-levels may be affected by changes in hydrostatic pressure during storm events. Data will be collected to determine whether this is so.

Acknowledgments

Funding for this study was provided by the Illinois Department of Transportation (IDOT) under contract# IDOT SW WIP FY02 ANT. Bonnie Robinson, ISGS, collected the surface- and ground-water data, and Charles Dolan, ISGS, provided the drilling services.

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Appendix A: Well Construction

Well#	Depth to bottom of well (cm)	Well Diameter (cm)	Screened Interval (cm)	Sand Pack (cm)	Well Seal (cm)	Well Length (cm)	Screen Length (cm)	Top of Casing Elevation (m)	Ground Elevation (m)
1S	74.0	2.5	70.5-36.8	74-25	25-0	194.5	33.7	123.20	121.99
1M	170.0	2.5	166.5-133.0	170-122	122-0	194.5	33.5	123.20	121.99
2S	80.0	2.5	76.5-49.8	80-34	34-0	190.7	33.9	123.09	121.91
3S	75.0	2.5	71.5-39.4	75-31	31-0	192.4	32.1	123.21	121.99
3M	158.0	2.5	154.5-122.5	158-108	108-0	192.5	32.0	123.36	121.99
4S	77.0	2.5	73.5-41.6	77-31	31-0	193.0	31.9	123.27	122.11
4M	161.0	2.5	157.5-125.4	161-100	100-0	192.4	32.1	123.51	122.11
5S	76.0	2.5	72.5-41.0	76-30	30-0	191.3	31.5	123.58	122.43
5M	457.0	5.0	451.5-420.2	457-326	326-0	536.0	31.3	123.34	122.49
5L	841.2	5.0	835.7-772.9	841.2-701	701-0	934.7	62.8	123.32	122.49
6S	77.0	2.5	73.9-39.8	77-30	30-0	193.6	34.1	123.18	122.61
6U	264.0	2.5	260.6-200.2	264-180	180-0	374.3	60.4	123.68	122.61
6M	457.0	5.0	451.5-427.3	457-387	387-0	499.0	24.2	123.54	122.61
6L	838.2	5.0	832.2-744.7	838.2-762	762-0	1017.0	93.5	123.49	122.61
7S	75.0	2.5	71.2-37.4	75-30	30-0	194.0	33.8	123.61	122.50
7M	442.0	5.0	436.3-403.7	442-305	305-122	558.5	32.6	123.18	122.54
7L	929.6	5.0	925.9-862.1	929.6-731	731-152	1049.0	63.8	123.52	122.54
8S	78.0	2.5	74.5-41.1	78-30	30-0	192.9	33.4	123.53	122.39
9S	74.0	2.5	70.5-37.8	74-28	28-0	193.0	32.7	123.72	122.57
10S	76.0	2.5	72.5-40.3	76-27	27-0	192.7	32.2	124.01	122.85

Well casing is Schedule 40 PVC.
Well screens are 0.010-slot, Schedule 40 PVC.
nm: not measured

Appendix A: continued

Well#	Depth to bottom of well (cm)	Well Diameter (cm)	Screened interval (cm)	Sand Pack (cm)	Well Seal (cm)	Well Length (cm)	Screen Length (cm)	Top of Casing Elevation (m)	Ground Elevation (m)
11S	78.0	2.5	74.5-42.8	78-30	30-0	192.4	31.7	123.85	122.72
12S	79.0	2.5	75.5-43.5	79-30	30-0	192.9	32.0	123.42	122.32
13S	75.0	2.5	70.6-42.0	75-30	30-0	183.5	28.6	123.17	122.07
13M	305.0	5.0	299.0-258.0	305-262	262-0	381.0	62.8	123.16	122.43
13L	600.5	5.0	594.0-531.0	600.5-213	231-0	686.0	62.5	124.46	123.66
14S	77.0	2.5	72.4-41.6	76-30	30-0	184.4	29.8	123.66	122.57
14M	305.0	5.0	299.9-246.0	305-135	135-0	381.0	53.9	123.49	122.68
14L	620.0	5.0	614.0-554.0	620-330	330-60	686.0	60.0	124.89	124.10
15S	76.0	2.5	71.6-39.7	76-30	30-0	189.8	31.7	123.14	122.00
15M	305.0	5.0	299.4-246.1	*305-?*	*?-0*	381.0	53.3	123.58	122.94
15L	620.0	5.0	614.1-544.4	*620-?*	*?-0*	686.0	69.7	124.15	122.95
16M	305.0	5.0	299.2-240.3	305-172	172-0	381.0	58.9	123.62	122.81
16L	620.0	5.0	614.4-550.4	*620-?*	*?-0*	678.0	64.0	123.69	122.88
17S	78.0	2.5	73.5-41.6	78-30	30-0	189.5	31.9	123.36	122.21
18S	77.0	2.5	72.5-43.0	77-30	30-0	186.4	29.5	123.88	122.80
18U	160.0	2.5	155.4-123.4	160-110	110-5	264.5	32.0	123.76	122.79
19S	74.0	2.5	69.3-39.5	74-30	30-0	190.8	29.8	124.15	122.99
19U	193.0	2.5	188.5-164.1	193-146	146-0	310.3	24.4	124.11	122.99

Well casing is Schedule 40 PVC.
Well screens are 0.010-slot, Schedule 40 PVC.

Appendix B: Depth-to-water

Well#	10/4/00	11/2/00	12/6/00	1/9/01	2/7/01	3/7/01	4/3/01	4/17/01	5/1/01	5/14/01	6/6/01	6/18/01	7/17/01	9/5/01
1S	0.26	0.04	-0.08	frozen	-0.10	-0.13	-0.15	-0.12	-0.02	0.14	-0.01	0.43	dry	0.63
1M	0.26	0.02	-0.10	frozen	-0.12	-0.15	-0.16	-0.12	-0.02	0.14	-0.01	0.43	0.81	0.62
2S	0.30	0.01	-0.11	-0.18	-0.13	-0.15	-0.17	-0.13	0.03	0.22	-0.03	0.46	dry	0.64
3S	0.25	0.02	-0.10	frozen	-0.07	-0.12	-0.14	-0.11	0.01	0.15	-0.07	0.34	0.53	0.47
3M	0.26	0.03	-0.09	frozen	-0.08	-0.13	-0.15	-0.10	0.03	0.17	-0.06	0.36	0.53	0.48
4S	0.37	0.14	-0.06	frozen	0.02	-0.03	-0.10	0.01	0.13	0.28	0.03	0.46	0.61	0.54
4M	0.39	0.15	0.04	frozen	0.04	-0.02	-0.10	0.01	0.13	0.28	0.04	0.45	0.60	0.54
5S	dry	dry	0.31	0.20	0.30	0.35	0.14	0.44	dry	dry	0.71	dry	dry	dry
5M	**	0.79	0.39	0.38	0.37	0.38	0.39	0.40	0.62	0.62	0.66	0.96	1.34	1.21
5L	**	0.70	0.55	0.64	0.57	0.42	0.37	0.38	0.40	0.40	0.431	0.53	0.70	0.69
6S	dry	dry	0.60	0.47	0.64	0.66	0.45	0.62	dry	dry	0.71	dry	dry	dry
6U	**	**	**	**	**	**	**	**	**	**	**	**	**	**
6M	**	0.90	0.64	0.61	0.63	0.61	0.64	0.61	0.70	0.80	0.81	0.93	1.23	1.20
6L	**	1.65	0.68	0.59	0.57	0.57	0.47	0.52	0.47	0.49	0.53	0.55	0.61	0.75
7S	dry	0.47	0.44	0.42	0.50	0.45	0.20	0.44	nm	0.71	0.39	dry	dry	dry
7M	**	1.70	0.48	0.46	0.51	0.47	0.42	0.40	nm	0.59	0.52	0.71	0.98	0.87
7L	**	0.69	0.41	0.47	0.45	0.34	0.27	0.29	nm	0.41	0.33	0.51	0.69	0.65
8S	0.43	0.12	0.08	0.12	0.18	0.09	0.02	0.09	0.30	0.49	0.08	0.68	dry	dry
9S	0.61	0.30	0.29	0.33	0.36	0.30	0.17	0.31	0.66	dry	0.30	dry	dry	dry

** well not yet installed
– indicates water above ground surface
nm no measurement
S indicates soil-zone monitoring well
M indicates middle monitoring well
L indicates lower monitoring well
shading depth to water less than or equal to 0.304m

Appendix B: continued

Well#	10/4/00	11/2/00	12/6/00	1/9/01	2/7/01	3/7/01	4/3/01	4/17/01	5/1/01	5/14/01	6/6/01	6/18/01	7/17/01	9/5/01
10S	dry	dry	dry	0.64	dry	dry	0.42	dry	dry	dry	dry	dry	dry	dry
11S	dry	dry	0.58	0.65	0.60	0.48	0.60	dry	dry	dry	dry	dry	dry	dry
12S	dry	0.64	0.11	frozen	0.05	0.08	-0.02	0.15	0.49	dry	0.34	dry	dry	dry
13S	**	**	**	**	**	**	**	**	**	**	**	**	**	**
13M	**	0.48	0.31	0.43	0.35	0.20	0.16	0.22	0.24	0.31	0.26	0.39	0.55	0.54
13L	**	1.71	1.53	1.66	1.58	1.42	1.39	1.42	1.43	1.50	1.48	1.58	1.75	1.74
14S	**	**	**	**	**	**	**	**	**	**	**	**	**	**
14M	**	0.74	0.56	0.69	0.61	0.46	0.42	0.46	0.48	0.54	0.50	0.63	0.80	0.79
14L	**	2.06	1.87	2.00	1.94	1.77	1.78	1.81	1.83	1.89	1.87	1.98	2.15	2.13
15S	**	**	**	**	**	**	**	**	**	**	**	**	**	**
15M	**	1.06	0.87	1.00	0.93	0.80	0.75	0.81	0.84	0.92	0.87	1.02	1.16	1.14
15L	**	1.12	0.95	1.07	0.99	0.83	0.78	0.81	0.83	0.89	0.87	0.98	1.14	1.13
16M	**	1.05	0.88	0.99	0.92	0.76	0.73	0.77	0.78	0.84	0.83	0.92	1.09	1.07
16L	**	1.10	0.94	1.04	0.97	0.81	0.74	0.76	0.78	0.83	0.83	0.91	1.08	1.07
17S	**	**	**	**	**	**	**	**	**	**	**	**	**	**
18S	**	**	**	**	**	**	**	**	**	**	**	**	**	**
18U	**	**	**	**	**	**	**	**	**	**	**	**	**	**
19S	**	**	**	**	**	**	**	**	**	**	**	**	**	**
19U	**	**	**	**	**	**	**	**	**	**	**	**	**	**

** well not yet installed
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shading depth to water less than or equal to 0.304m

Well#	10/2/01	11/13/01	12/5/01	1/16/02	2/20/02	3/13/02	4/1/02	4/15/02	5/1/02	5/13/02	6/19/02	7/22/02	9/5/02
1S	0.64	0.13	-0.06	-0.11	-0.15	-0.17	-0.16	-0.14	-0.36	-0.50	-0.42	-0.25	0.25
1M	0.64	0.13	-0.06	-0.12	-0.14	-0.16	-0.16	-0.14	-0.36	-0.50	-0.42	-0.26	0.23
2S	dry	0.16	-0.0	-0.12	-0.15	-0.17	-0.18	-0.16	-0.44	-0.57	-0.49	-0.32	0.07
3S	0.48	0.20	-0.06	-0.12	-0.16	-0.18	-0.18	-0.15	-0.37	-0.51	-0.42	-0.25	0.30
3M	0.48	0.21	-0.05	-0.10	-0.15	-0.16	-0.16	-0.14	-0.35	-0.50	-0.42	-0.23	0.32
4S	0.56	0.34	0.06	-0.02	-0.08	-0.10	-0.10	-0.10	-0.29	-0.41	-0.29	-0.05	0.50
4M	0.55	0.33	0.07	-0.02	-0.08	-0.11	-0.11	-0.11	-0.29	-0.41	-0.29	-0.05	0.31
5S	dry	dry	0.33	0.30	0.06	0.05	0.09	0.12	-0.01	-0.08	0.22	dry	dry
5M	1.29	0.89	0.54	0.35	0.21	0.21	0.13	0.15	0.07	0.03	0.21	0.53	0.74
5L	0.74	0.65	0.56	0.40	0.26	0.14	0.18	0.20	0.05	-0.18	-0.07	0.22	1.38
6S	dry	dry	0.69	0.46	0.30	0.17	0.33	0.36	0.11	0.02	0.42	dry	dry
6U	**	**	0.64	0.40	0.18	0.15	0.17	0.20	0.10	-0.01	0.45	0.78	0.96
6M	1.31	1.07	0.79	0.46	0.33	0.17	0.18	0.19	0.11	0.09	0.33	0.65	0.82
6L	0.82	0.89	0.89	0.49	0.40	0.27	0.22	0.24	0.18	0.17	0.25	0.39	2.08
7S	dry	dry	0.44	0.27	0.13	0.08	0.06	0.05	-0.04	-0.04	0.29	dry	dry
7M	0.91	0.72	0.45	0.30	0.25	0.12	0.07	0.07	0.02	0.03	0.17	0.72	0.94
7L	0.69	0.57	0.42	0.30	0.16	0.12	0.07	0.07	-0.03	-0.14	-0.07	0.56	1.78
8S	0.66	0.42	0.10	0.08	0.02	-0.01	-0.04	-0.07	-0.14	-0.13	0.01	-0.13	0.16
9S	dry	0.58	0.31	0.27	0.16	0.17	0.16	0.15	0.03	0.01	0.28	0.14	0.40

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Well#	10/2/01	11/13/01	12/5/01	1/16/02	2/20/02	3/13/02	4/1/02	4/15/02	5/1/02	5/13/02	6/19/02	7/22/02	9/5/02
10S	dry	dry	dry	dry	0.14	0.03	0.13	0.24	0.05	-0.02	dry	0.03	0.26
11S	dry	dry	dry	dry	0.22	0.22	0.25	0.31	0.27	0.09	0.78	0.25	0.48
12S	dry	dry	0.25	0.17	-0.01	0.01	0.07	0.07	0.04	-0.02	0.46	dry	dry
13S	**	**	0.04	-0.03	-0.10	-0.11	-0.12	-0.10	-0.31	-0.47	-0.38	-0.20	0.05
13M	0.58	0.48	0.38	0.22	0.08	0.07	0.01	0.03	-0.12	-0.33	-0.23	0.06	0.28
13L	1.78	1.69	1.59	1.43	1.29	1.26	1.18	1.22	1.05	0.82	0.96	1.25	2.31
14S	**	**	0.52	0.39	0.19	0.22	0.18	0.22	0.02	-0.15	0.03	0.28	0.52
14M	0.83	0.73	0.62	0.47	0.33	0.30	0.23	0.27	0.05	-0.16	-0.04	0.26	0.58
14L	2.17	2.08	1.97	1.82	1.68	1.65	1.58	1.61	1.45	1.21	1.35	1.66	2.12
15S	**	**	-0.02	-0.10	-0.17	-0.18	-0.19	-0.17	-0.37	-0.53	-0.43	-0.24	-0.09
15M	1.18	1.09	0.98	0.82	0.65	0.64	0.58	0.61	0.38	0.16	0.31	0.58	0.81
15L	1.17	1.08	0.98	0.82	0.88	0.65	0.58	0.61	0.43	0.21	0.33	0.60	1.84
16M	1.12	1.03	0.94	0.77	0.62	0.60	0.53	0.56	0.33	0.11	0.22	0.38	0.62
16L	1.12	1.03	0.93	0.77	0.63	0.60	0.53	0.56	0.40	0.17	0.28	0.41	1.65
17S	**	**	0.09	-0.04	-0.13	-0.20	-0.26	-0.26	-0.43	-0.54	-0.39	-0.27	-0.13
18S	**	**	dry	0.60	0.50	0.39	0.35	0.34	0.23	0.27	0.50	dry	dry
18U	**	**	0.90	0.60	0.51	0.40	0.37	0.35	0.25	0.28	0.50	0.84	1.35
19S	**	**	dry	dry	dry	0.58	0.56	0.55	0.43	0.38	0.74	0.66	dry
19U	**	**	1.08	0.78	0.65	0.56	0.54	0.54	0.44	0.40	0.73	1.04	1.05

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M indicates middle monitoring well
L indicates lower monitoring well
shading depth to water less than or equal to 0.304m

Appendix C: Ground-water Elevations and Surface-water Elevations

Well#	10/4/00	11/2/00	12/6/00	1/9/01	2/7/01	3/7/01	4/3/01	4/17/01	5/1/01	5/14/01	6/6/01	6/18/01	7/17/01
1S	121.74	121.96	122.08	frozen	122.10	122.13	122.14	122.11	122.00	121.85	122.00	121.56	dry
1M	121.73	121.97	122.09	frozen	122.11	122.14	122.15	122.11	122.01	121.85	122.00	121.56	121.18
2S	121.66	121.95	122.07	122.15	122.10	122.12	122.14	122.10	121.94	121.75	122.00	121.51	dry
3S	121.73	121.95	122.07	frozen	122.04	122.10	122.12	122.10	121.97	121.83	122.06	121.64	121.46
3M	121.72	121.94	122.06	frozen	122.05	122.10	122.13	122.09	121.96	121.82	122.04	121.63	121.45
4S	121.73	121.96	122.16	frozen	122.08	122.13	122.20	122.09	121.97	121.82	122.07	121.64	121.49
4M	121.73	121.96	122.08	frozen	122.08	122.13	122.20	122.09	121.97	121.82	122.06	121.65	121.50
5S	dry	dry	122.12	122.22	122.12	122.07	122.30	122.00	dry	dry	121.80	dry	dry
5M	**	121.71	122.10	122.11	122.13	122.12	122.05	122.04	121.82	121.82	121.79	121.48	121.10
5L	**	121.78	121.93	121.84	121.91	122.06	122.07	122.06	122.05	122.05	122.01	121.92	121.74
6S	**	dry	121.97	122.10	121.93	121.91	122.14	121.97	dry	dry	121.87	dry	dry
6U	**	**	**	**	**	**	**	**	**	**	**	**	**
6M	**	121.73	121.98	122.02	121.99	122.01	121.95	121.98	121.89	121.79	121.78	121.66	121.36
6L	**	120.94	121.91	122.00	122.02	122.02	122.12	122.07	122.22	122.09	122.06	122.04	121.98
7S	dry	122.03	122.06	122.08	121.99	122.05	122.29	122.05	nm	121.78	122.10	dry	dry
7M	**	120.86	122.08	122.10	122.05	122.09	122.07	122.09	nm	121.91	121.97	121.78	121.51
7L	**	121.85	122.14	122.07	122.10	122.20	122.23	122.21	nm	122.08	122.16	121.98	121.81
8S	121.95	122.25	122.30	122.25	122.20	122.29	122.36	122.29	122.08	121.89	122.30	121.70	dry
9S	121.97	122.28	122.29	122.26	122.22	122.28	122.41	122.27	121.92	dry	122.28	dry	dry
10S	dry	dry	dry	122.20	dry	dry	122.42	dry	dry	dry	dry	dry	dry
11S	dry	dry	dry	122.12	122.05	122.10	122.24	122.11	dry	dry	dry	dry	dry

Well#	9/5/01	10/2/01	11/13/01	12/5/01	1/16/02	2/20/02	3/13/02	4/1/02	4/15/02	5/1/02	5/13/02	6/19/02	7/22/02	9/5/02
1S	121.36	121.34	121.86	122.05	122.10	122.13	122.16	122.15	122.13	122.35	122.49	122.41	122.24	121.75
1M	121.37	121.35	121.85	122.05	122.11	122.13	122.15	122.15	122.13	122.36	122.49	122.41	122.25	121.76
2S	121.33	dry	121.80	122.04	122.09	122.12	122.14	122.15	122.13	122.35	122.49	122.40	122.24	121.84
3S	121.52	121.51	121.78	122.05	122.10	122.15	122.16	122.16	122.14	122.37	122.51	122.42	122.25	121.70
3M	121.51	121.50	121.77	122.03	122.09	122.13	122.15	122.15	122.12	122.35	122.49	122.42	122.23	121.68
4S	121.56	121.54	121.76	122.04	122.12	122.18	122.20	122.20	122.20	122.41	122.53	122.40	122.16	121.61
4M	121.56	121.55	121.77	122.03	122.12	122.18	122.21	122.21	122.21	122.41	122.53	122.40	122.16	121.81
5S	dry	dry	dry	122.11	122.15	122.38	122.39	122.35	122.32	122.44	122.51	122.20	dry	dry
5M	121.23	121.15	121.55	121.90	122.09	122.24	122.23	122.32	122.29	122.42	122.46	122.29	121.96	121.76
5L	121.75	121.70	121.79	121.89	122.05	122.18	122.30	122.26	122.24	122.44	122.68	122.57	122.28	121.11
6S	dry	dry	dry	121.90	122.12	122.28	122.41	122.26	122.23	122.50	122.59	122.19	dry	dry
6U	**	**	**	121.94	122.18	122.40	122.43	122.40	122.37	122.51	122.62	122.16	121.83	121.65
6M	121.38	121.28	121.52	121.79	122.12	122.26	122.42	122.40	122.40	122.50	122.52	122.28	121.96	121.79
6L	121.84	121.77	121.70	121.70	122.09	122.19	122.31	122.37	122.35	122.43	122.44	122.36	122.24	120.53
7S	dry	dry	dry	122.05	122.22	122.36	122.41	122.43	122.44	122.54	122.53	122.21	dry	dry
7M	121.62	121.58	121.77	122.04	122.20	122.25	122.37	122.43	122.43	122.51	122.51	122.36	121.82	121.60
7L	121.84	121.81	121.92	122.07	122.20	122.34	122.37	122.42	122.43	122.57	122.68	122.61	121.98	120.76
8S	dry	121.70	121.96	122.28	122.30	122.36	122.39	122.42	122.45	122.54	122.52	122.38	122.52	122.23
9S	dry	dry	121.99	122.27	122.30	122.42	122.40	122.41	122.42	122.54	122.56	122.29	122.43	122.18
10S	dry	dry	dry	dry	dry	122.70	122.81	122.71	122.60	122.81	122.88	dry	122.82	122.59
11S	dry	dry	dry	dry	dry	122.50	122.49	122.46	122.41	122.45	122.63	121.95	122.47	122.24

Appendix C: continued

Well#	10/4/00	11/2/00	12/6/00	1/9/01	2/7/01	3/7/01	4/3/01	4/17/01	5/1/01	5/14/01	6/6/01	6/18/01	7/17/01
12S	dry	121.65	122.19	dry	122.25	122.21	122.33	122.17	121.83	dry	121.97	dry	dry
13S	**	**	**	**	**	**	**	**	**	**	**	**	**
13M	**	121.90	122.07	121.95	122.03	122.18	122.22	122.17	122.14	122.08	122.12	121.99	121.84
13L	**	121.91	122.09	121.97	122.05	122.20	122.22	122.20	122.19	122.12	122.14	122.04	121.87
14S	**	**	**	**	**	**	**	**	**	**	**	**	**
14M	**	121.96	122.14	122.01	122.08	122.24	122.26	122.22	122.20	122.14	122.18	122.05	121.88
14L	**	121.96	122.14	122.01	122.09	122.25	122.26	122.23	122.22	122.15	122.17	122.06	121.89
15S	**	**	**	**	**	**	**	**	**	**	**	**	**
15M	**	121.86	122.03	121.92	121.99	122.14	122.21	122.14	122.11	122.03	122.09	121.93	121.79
15L	**	121.86	122.04	121.92	122.00	122.15	122.17	122.15	122.13	122.07	122.08	121.98	121.82
16M	**	121.76	121.93	121.82	121.89	122.05	122.10	122.06	122.05	121.99	122.00	121.91	121.74
16L	**	121.77	121.94	121.83	121.91	122.06	122.09	122.07	122.05	122.00	122.00	121.92	121.75
17S	**	**	**	**	**	**	**	**	**	**	**	**	**
18S	**	**	**	**	**	**	**	**	**	**	**	**	**
18U	**	**	**	**	**	**	**	**	**	**	**	**	**
19S	**	**	**	**	**	**	**	**	**	**	**	**	**
19U	**	**	**	**	**	**	**	**	**	**	**	**	**
A	121.78	121.94	frozen	frozen	frozen	122.13	122.13	122.10	122.01	121.92	121.98	121.65	dry
B			frozen	frozen	frozen	122.21	122.12	122.08	122.00	121.91	121.97	121.74	121.58
C	121.74	121.91	frozen	frozen	121.77	121.85	121.48	121.48	121.51	121.42	121.38	121.28	dry
D	**	**	**	**	**	**	**	**	121.18	dry	122.27	dry	dry

Appendix C: continued

Well#	9/5/01	10/2/01	11/13/01	12/5/01	1/16/02	2/20/02	3/13/02	4/1/02	4/15/02	5/1/02	5/13/02	6/19/02	7/22/02	9/5/02
12S	dry	dry	dry	122.06	122.14	122.32	122.30	122.24	122.25	122.28	122.34	121.86	dry	dry
13S	**	**	**	122.03	122.11	122.17	122.19	122.20	122.18	122.38	122.53	122.45	122.27	122.02
13M	121.85	121.80	121.90	122.01	122.16	122.30	122.32	122.37	122.35	122.55	122.76	122.66	122.38	122.15
13L	122.88	121.83	121.93	122.03	122.19	122.33	122.36	122.43	122.40	122.61	122.84	122.71	122.42	122.36
14S	**	**	**	122.04	122.19	122.37	122.34	122.38	122.34	122.55	122.72	122.54	122.29	122.05
14M	121.89	121.85	121.95	122.06	122.21	122.35	122.38	122.45	122.41	122.63	122.84	122.72	122.42	122.10
14L	121.91	121.87	121.96	122.07	122.22	122.36	122.39	122.46	122.43	122.65	122.89	122.75	122.44	121.98
15S	**	**	**	122.02	122.10	122.17	122.18	122.19	122.16	122.38	122.54	122.43	122.24	122.09
15M	121.81	122.77	121.87	121.98	122.14	122.30	122.31	122.38	122.34	122.56	122.79	122.63	122.36	122.13
15L	121.83	121.78	121.88	121.98	122.14	122.28	122.31	122.38	122.35	122.56	122.79	122.67	122.40	121.16
16M	121.76	121.71	121.80	121.89	122.06	122.21	122.23	122.30	122.27	122.48	122.70	122.59	122.42	122.19
16L	121.76	121.71	121.80	121.90	122.06	122.20	122.23	122.30	122.27	122.48	122.71	122.60	122.47	121.23
17S	**	**	**	122.12	122.25	122.34	122.41	122.47	122.47	122.64	122.75	122.60	122.48	122.34
18S	**	**	**	dry	122.18	122.27	122.39	122.42	122.44	122.56	122.53	122.30	dry	dry
18U	**	**	**	121.87	122.17	122.26	122.38	122.41	122.42	122.55	122.52	122.30	121.96	121.45
19S	**	**	**	dry	dry	dry	122.40	122.42	122.42	122.56	122.61	122.25	122.33	dry
19U	**	**	**	121.87	122.18	122.30	122.39	122.42	122.41	122.55	122.59	122.26	121.95	121.94
A	dry	dry	121.86	122.03	122.09	122.12	122.14	122.13	122.12	122.33	122.48	122.43	122.28	122.10
B	121.66	121.62	121.85	122.02	122.08	122.11	122.11	122.13	122.11	122.34	submerged	122.42	122.24	122.12
C	dry	dry	dry	121.88	122.20	122.24	122.39	122.43	122.47	122.55	122.48	122.36	121.72	121.59
D	dry	dry	dry	122.28	122.29	122.34	122.38	122.41	122.44	122.53	122.51	122.39	122.35	122.23

Appendix D: Geologic Logs

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 5L

Depth	Description
0.00 - 0.66 ft	Black (10YR2/1) clayey SILT, trace sand, roots, subangular blocky structure
0.66 - 3.42 ft	Dark gray (10YR4/1) clayey SILT with few, distinct, brown (10YR4/3) mottles
3.42 - 5.58 ft	Dark gray (10YR4/1), moist, clayey SILT with few, distinct, brown (10YR4/3) mottles, blocky structure
5.58 - 6.66 ft	Dark gray (10YR4/1) soft, sticky, silty CLAY with few, distinct, brown (10YR4/3) mottles
6.66 - 7.83 ft	Very dark gray (10YR3/1) soft, sticky, silty CLAY, no mottles, mollusk and snail shells
7.83 - 9.33 ft	Dark gray, gleyed (4/N), very soft, sticky, CLAY
9.33 - 13.00 ft	Dark greenish gray (4/5GY), gleyed, very soft, sticky, silty CLAY, mollusk and snail shells, massive structure
13.00 - 14.42 ft	Very dark gray (5YR3/1) medium stiff, clayey SILT, calcareous, mollusk and snail shells and a few root traces
14.42 - 17.75 ft	Dark gray (10YR4/1) soft to medium stiff, clayey SILT, calcareous, fewer shells than above
17.75 - 20.25 ft	Dark gray (10YR4/1) very soft, sticky, clayey SILT, trace sand
20.25 - 25.42 ft	Dark gray (10YR4/1), very soft, sticky, clayey SILT, thinly (< 1/8 in) bedded, sand lenses at 20.92 ft and 22.00 ft
25.42 - 30.58 ft	Dark gray (10YR4/1), very soft, sticky, clayey SILT, massive

Appendix D: continued

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 6L

0 - 0.75 ft	Very dark gray (10YR3/1), stiff, dry, clayey SILT
0.75 - 4.33 ft	Very dark gray (10YR3/1), medium stiff, clayey SILT with few, distinct, dark yellowish brown (10YR4/4) mottles, trace sand
4.33 - 5.08 ft	No recovery
5.08 - 6.83 ft	Dark gray (10YR4/1) moist, medium stiff, clayey SILT with numerous, distinct, brown (10YR4/3) mottles
6.83 - 8.17 ft	Dark gray (10YR4/1) medium stiff, clayey SILT with few, distinct, very dark gray (10YR3/1) mottles
8.17 - 12.92 ft	Dark gray (7.5YR4/1), soft, sticky, CLAY to clayey SILT, no mottles, numerous snail shells and organic material
12.92 - 13.75 ft	Dark gray (7.5YR3/1), medium stiff, clayey SILT, weakly bedded, weakly calcareous, shells and woody fragments
13.75 - 15.25 ft	No recovery
15.25 - 30.50 ft	Dark gray(7.5YR3/1) clayey SILT, shells and roottraces, blocky structure from 15.25 ft to 16.92 ft then massive

Appendix D: continued

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 7L

0 - 0.58 ft	Very dark gray (10YR3/1) clayey SILT, root zone, rounded peds
0.58 - 1.17 ft	Very dark gray (10YR3/1)silty CLAY with few, faint, dark brown (10YR3/3) mottles, larger peds than above
1.17 - 4.58 ft	Dark gray (10YR4/1) stiff, moist, silty CLAY with few to numerous, distinct, brown (10YR4/3) mottles, subangular blocky structure
4.58 - 5.08 ft	No recovery
5.08 - 7.17 ft	Dark gray (10YR4/1 to 7.5YR4/1) clayey SILT, subangular blocky structure grading to weakly bedded structure at 6.5 ft
7.17 - 8.33 ft	As above, weakly bedded structure grading to subangular blocky structure
8.33 - 10.17 ft	Dark gray (7.5YR4/1) soft, sticky, clayey SILT, massive, shells and organic material
10.17 - 15.25 ft	Dark greenish gray, gleyed (4/5GY to 3/5GY), soft, sticky, clayey SILT, trace sand, massive to weakly bedded, numerous snail shells
15.25 - 30.50 ft	Dark greenish gray, gleyed (4/5GY) clayey SILT, weakly bedded, few snail shells, sand lens at 18.4 ft

Appendix D: continued

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 13M

0 - 0.58 ft	Black (10YR2/1), moist, silty, sandy, CLAY
0.58 - 2.00 ft	Very dark gray (10YR3/1), moist, soft, slightly sticky, silty CLAY with few, prominent, dark brown (10YR3/3) mottles
2.00 - 10.17 ft	Brown (10YR4/3) moist, loamy SAND with gray reduction halos and root traces

Well# 13L

0 - 0.83 ft	Very dark gray (10YR3/1), dry, hard, sandy, silty, CLAY
0.83 - 1.00 ft	Very dark grayish brown (10YR3/2) dry, sandy, silty, CLAY
1.00 - 2.75 ft	Grayish brown (10YR5/2) to light grayish brown (10YR6/2), dry, sandy, silty CLAY
2.75 - 4.33 ft	Grayish brown (10YR5/2) to dark yellowish brown (10YR3/4), moist, clayey SAND, calcareous
4.33 - 5.08 ft	No recovery
5.08 - 6.50 ft	Grayish brown (10YR5/2) loamy SAND, calcareous
6.50 - 6.83 ft	Grayish brown (10YR5/2) moist, clayey SILT, weakly calcareous
6.83 - 7.75 ft	Brown (10YR4/3), saturated, SAND, calcareous
7.75 - 8.92 ft	Dark gray (10YR4/1), moist, silty SAND, thinly (< 1/4 in) bedded, weakly calcareous
8.92 - 10.16 ft	No recovery
10.16 - 13.08 ft	Dark gray (10YR4/1), moist, silty CLAY, thinly (< 1/4 in) bedded, calcareous
13.08 - 20.33 ft	Dark gray (10YR4/1), moist to saturated, f - vf SAND with black laminae, subrounded to rounded, predominantly quartz

Appendix D: continued

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 14M

0 - 0.75 ft	Very dark gray (10YR3/1) clayey SAND, roots with oxidation halos
0.75 - 1.33 ft	Very dark grayish brown (10YR3/2) CLAY with few, faint, dark brown (10YR3/3) mottles
1.33 - 1.67 ft	Dark grayish brown (10YR4/2) silty CLAY with common, distinct, dark brown (10YR3/3) mottles
1.67 - 3.25 ft	Brown (10YR5/3) silty SAND with oxidation halos
3.25 - 5.08 ft	No recovery
5.08 - 10.17 ft	Brown, saturated, f - m SAND

Well# 14L

0 - 0.83 ft	Very dark gray (10YR3/1), dry, clayey SAND, root zone
0.83 - 3.42 ft	Brown (10YR5/3), slightly moist, silty SAND
3.42 - 5.08 ft	No recovery
5.08 - 20.33 ft	Brown, saturated, f - m SAND with occasional black laminae, weakly bedded from 10.17 - 12.25 ft

Appendix D: continued

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 15L

0 - 0.33 ft	Very dark gray (10YR3/1) silty SAND, root zone
0.33 - 0.75 ft	Dark grayish brown (10YR4/2) sandy SILT, root zone
0.75 - 0.83 ft	coarse SAND and fine GRAVEL
0.83 - 4.42 ft	Grayish brown (10YR5/2) clayey SAND with yellowish brown (10YR4/6) oxidized zones from 1.00 - 1.58 ft and 2.50 to 2.83 ft, weakly bedded, root traces, black laminae
4.42 - 4.92 ft	Gray (10YR4/1) sandy CLAY, weakly bedded, calcareous, plant material throughout sample
4.92 - 5.08 ft	No recovery
5.08 - 9.00 ft	Dark gray (10YR4/1) silty SAND grading into gray, fine SAND. Sandy loam is weakly bedded, calcareous and contains a zone from 6.83 to 7.25 ft which is ~ 50% plant material. Fine sand is cross-bedded
9.00 - 10.16 ft	No recovery
10.16 - 14.17 ft	Dark gray, saturated, f - m SAND, cross-bedded
14.17 - 15.25 ft	No recovery
15.25 - 20.33 ft	Dark gray, saturated, f - m SAND, cross-bedded

Appendix D: continued

Site Name: Fairmont
Location: NW, SW, Section 4, T2N, R9W, Canteen Twp, St. Clair Co., IL

Well# 16L

0 - 5.08 ft	No recovery
5.08 - 6.50 ft	Dark grayish brown (10YR4/2), saturated, silty SAND, cross-bedded from 5.67 to 6.50 ft
6.50 - 7.08 ft	Dark gray (10YR4/1) sandy CLAY with brown oxidation spots (~ 1/4 in diameter), cross-bedded
7.08 - 7.42 ft	Dark gray silty CLAY
7.42 - 8.00 ft	Brown, fine SAND
8.00 - 10.17 ft	No recovery
10.17 - 13.08 ft	Brown, saturated, fine SAND with black laminae
13.08 - 15.25 ft	No recovery
15.25 - 20.33 ft	Dark gray, saturated, f - m SAND with black laminae