3rd Semi-Annual Report to EPA

Sparta Aquifer Recovery Study

Union County, Arkansas

October 2003 - February 2004

U.S. EPA Grant X-976090-01-0

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Burns & McDonnell
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UNION COUNTY
WATER CONSERVATION BOARD

3rd SEMI-ANNUAL REPORT

SPARTA AQUIFER RECOVERY STUDY

October 2003 - February 2004

U.S. EPA Grant X-976090-01-0

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On behalf of

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1.0 INTRODUCTION

The Union County Water Conservation Board (Board) is conducting the Sparta Aquifer Recovery Study (Study) for the purpose of monitoring water level and water quality changes in the aquifer as three area industries currently using groundwater from the Sparta aquifer convert their raw water source to the Ouachita River. The study area includes all of Union County, Arkansas and parts of adjacent counties in Arkansas and Louisiana. Funding for the study is provided by a $997,800 grant from the U.S. Environmental Protection Agency (EPA) with matching funds by the Board in the amount of $52,516. Burns & McDonnell Engineering Co. (B&McD) is managing the Study for the Board, with partnership by the U.S. Geological Survey (USGS) and the Union County Conservation District (UCCD).

1.1 BACKGROUND

The Sparta aquifer is an important source of groundwater for northern Louisiana and southeastern Arkansas. The major pumping centers are located in Hodge and Monroe, Louisiana; and El Dorado and Magnolia, Arkansas. The Sparta aquifer in Union County, Arkansas is a confined aquifer consisting of a sequence of unconsolidated sand units that are contained within the Sparta Sand formation (Hays, 2000).

Previous studies have concluded that the rate of withdrawal in some areas exceeds the aquifer recharge rate causing rapid water level declines. Consequently, there is a large cone of depression in the Sparta aquifer under the south-central and Grand Prairie regions of Arkansas, including Union County as well as in the north-central portion of Louisiana in the vicinity of the City of Monroe.

Figure 1-1 illustrates groundwater potentiometric contours based on 2001 water level data. An observation well hydrograph presented in Figure 1-2 shows the effect of groundwater pumping, at high rates of withdrawal in excess of recharge from the Sparta aquifer over the past 60 years. The hydrograph indicates that groundwater levels measured at Monsanto Industries in El Dorado declined nearly 255 feet between 1942 and 2001, representing an average decline of over 4 feet per year. Water levels in pumping centers in north central Louisiana have shown similar declines. Water levels in the aquifer have begun to recover, with groundwater rising to levels not observed since the early- to mid-1990s recently recorded in the Monsanto well.

Additionally, in some areas the overdraft is causing upwelling (upward movement of water from underlying aquifers), and lateral migration of high-salinity water. Specific conductance (a physical parameter directly related to the amount of dissolved minerals in solution) is fairly low in Jefferson

Figure 1-1. Potentiometric surface in Sparta aquifer, Spring 2001.

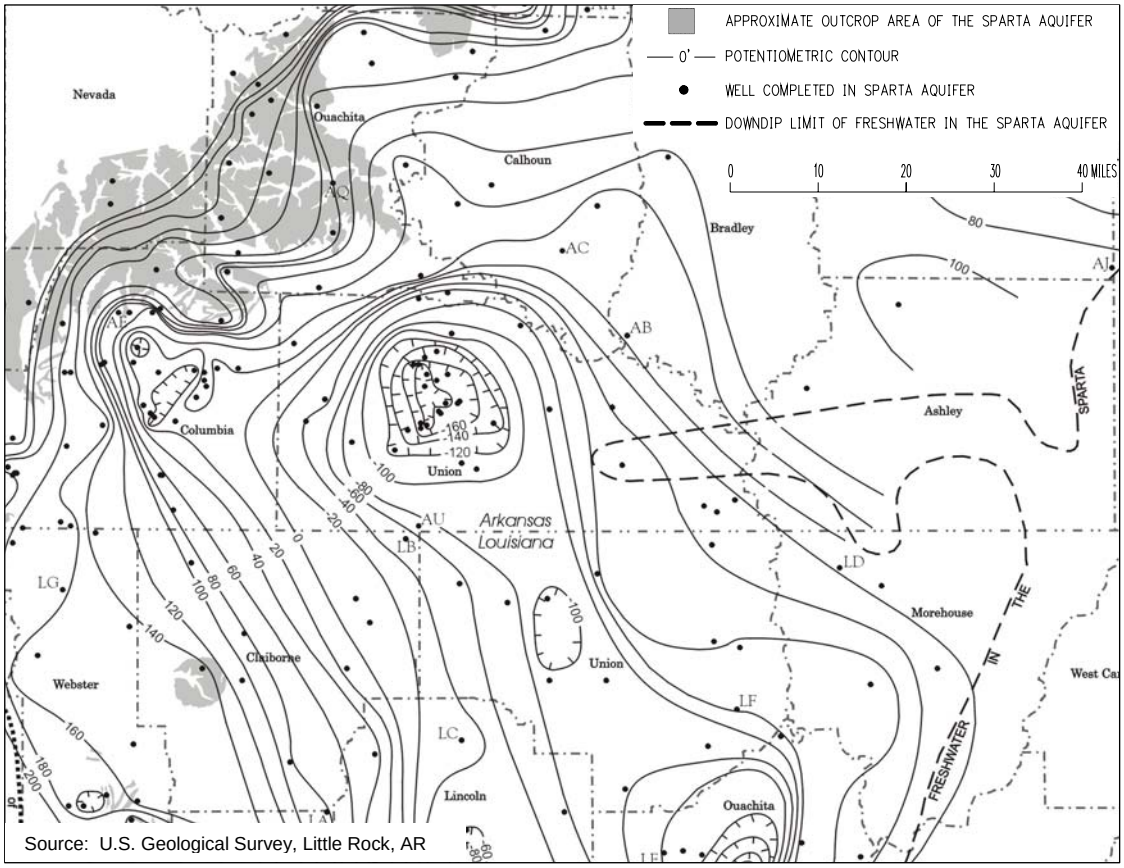
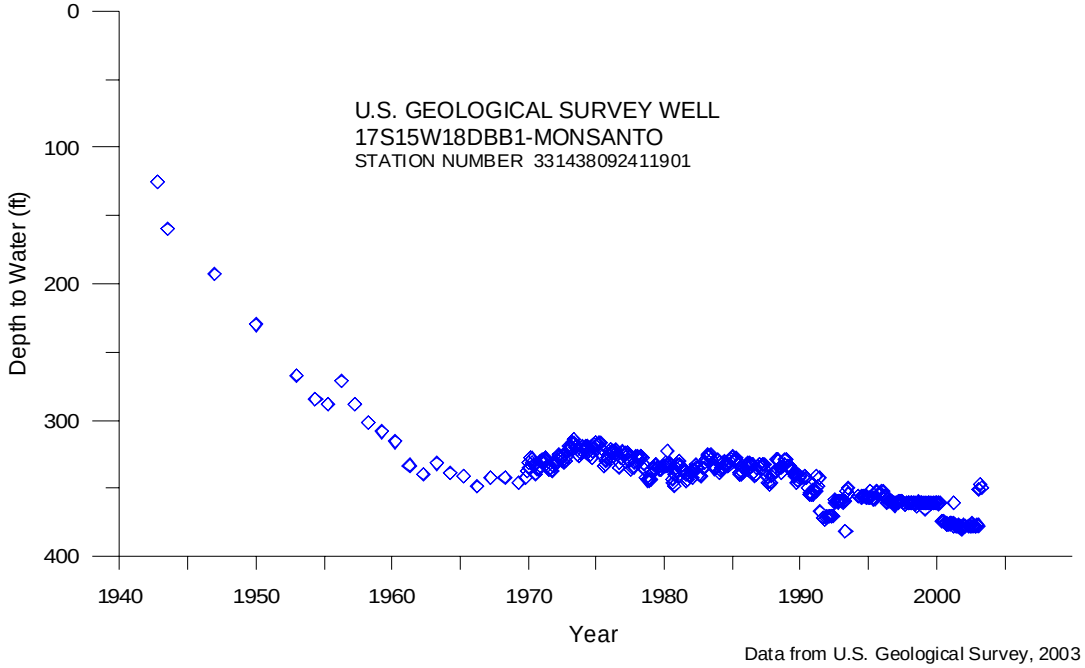


Figure 1-2. Monsanto Observation Well Hydrograph.



County along the western limit of the Sparta aquifer in that area, but increases to the northeast and gradually to the south. This gradual increase in specific conductance continues toward the Louisiana state line with higher specific conductance values potentially corresponding to the cones of depression in Union and Columbia Counties. Specific conductance values greater than 2,000 microSiemens per centimeter (µS/cm) for groundwater from the Sparta aquifer have been documented in Union County (Joseph, 2000).

In 1999, the Union County Water Conservation Board was formed to develop a plan to conserve and restore the Sparta aquifer. The Board developed a conservation plan, the Ouachita River Water Supply Project to provide water from the Ouachita River to industrial users as an alternative to groundwater. The project is anticipated to reduce withdrawals from the Sparta aquifer by an average of nearly 9 million gallons per day. Appendix A contains a description of the Project.

1.2 PURPOSE OF STUDY

Timely monitoring of water levels and water quality in the aquifer is critical to evaluating the success of this conservation project and determining the need for future improvements. Phase 1, consisting of a 65-million gallon per day (MGD) intake on the Ouachita River and a pipeline to the Union Power Station, has been built. Phase 2, consisting of a pump station, a 3-MG storage tank, and pipeline with service connections to three area industries is nearing completion and is anticipated to be complete by June 30, 2004.

This Study will provide the Board with data to evaluate the success of Phases 1 and 2 of the Water Supply Project, and to determine if Phase 3, consisting of additional industries being connected to the pipeline is required.

1.3 SUMMARY OF STUDY ACTIVITIES

Major activities related to the Study since August 2003 include automated and manual water level monitoring, and water quality sampling.

1.3.1 Groundwater Level Monitoring

Groundwater levels are collected hourly from the eight real-time water level monitoring wells. A central computer at the U.S. Geological Survey communicates with each data logger via cellular telephone modem and automatically retrieves data from the entire real-time network four times daily. This data is

available to anyone with access to the Internet at the USGS web site (http://waterdata.usgs.gov/ar/nwis/current/?type=gw) or via a link on the Study web site (www.ucwcb.org).

Additionally, data from over 250 wells in southern Arkansas and northern Louisiana that are part of the Sparta Aquifer Validation Project being conducted by the Union County Conservation District (UCCD) are included in the Study. The data is available on the Study web site. Seven to eight of these wells will be equipped with automated data loggers that would be downloaded monthly. The remaining wells will continue to be measured manually three to four times per year. Data is periodically uploaded to the Study web site after it is collected and processed.

1.3.2 Groundwater Quality Monitoring

Samples are collected twice annually from each of the 12 water quality monitoring wells. To date, three sampling rounds have been conducted. Part 2.1 of this report discusses water quality monitoring activities and results since the start of the project.

1.3.3 Project Web Site

A project web site has been active since May 2003. Through an agreement with the Board, the Institute for Economic Advancement (IEA) at the University of Arkansas-Little Rock is hosting and maintaining the web site. The site contains program information describing the Study, and provides direct access to water level data from wells in the project area. Ongoing work to maintain and improve the web site is described in Part 2.3.

* * * * *

2.0 RECENT ACTIVITIES

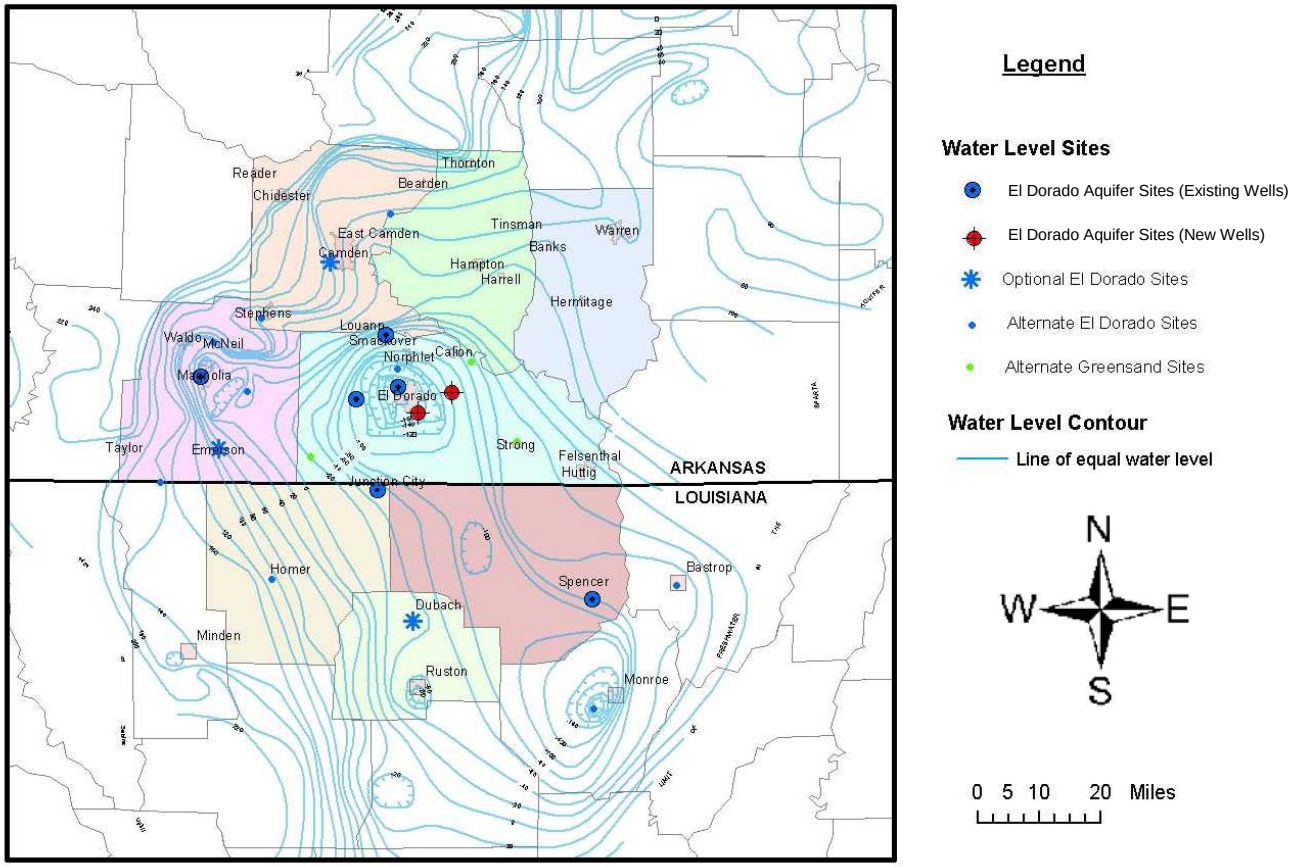
2.1 GROUNDWATER LEVEL MONITORING

This section describes activities related to water level monitoring efforts for the Study. Real-time sites have been active since late summer of 2003. Six wells have been selected for deployment of automated data loggers by UCCD, and additional candidate wells continue to be evaluated to determine their suitability for these instruments. Routine, manual water level measurements by UCCD continue as well.

2.1.1 Real-Time Monitoring Sites

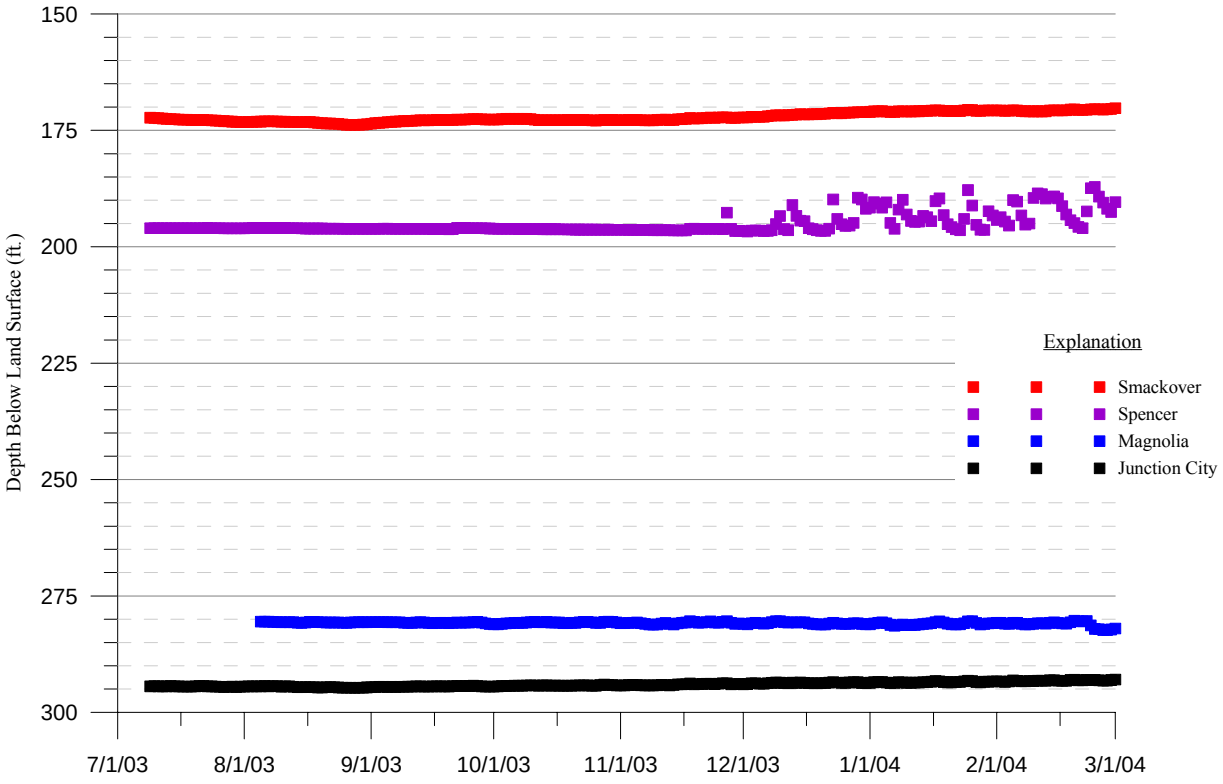
USGS maintains eight wells in the region equipped with real-time water-level monitoring equipment, at shown in Figure 2-1. Figure 2-2 shows the results of water level monitoring since installation of the data loggers. As the graphs indicate, slight increases in water levels have occurred at some sites since installation of the data loggers. Although water levels appear to be recovering in some areas, possibly as

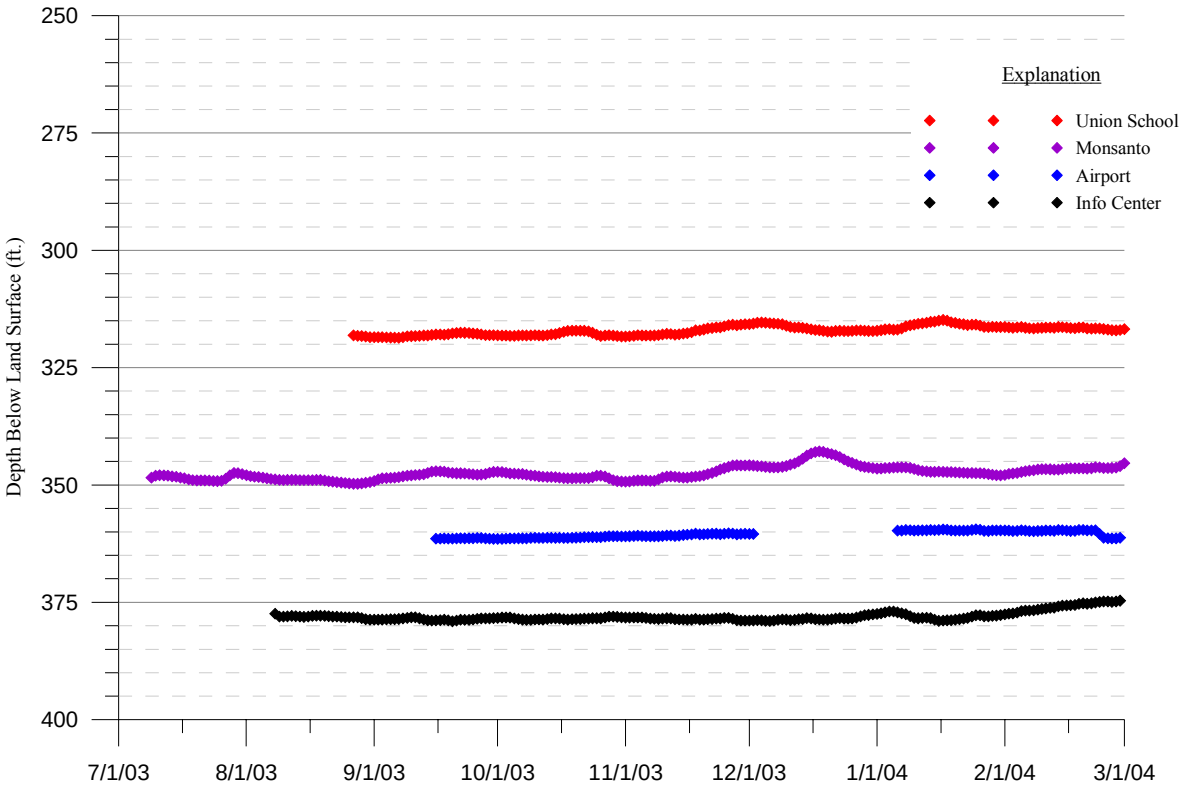
Figure 2-1. USGS Water Level Monitoring Sites



Source: U.S. Geological Survey, Little Rock, AR

Figure 2-2. Real-Time Water Levels





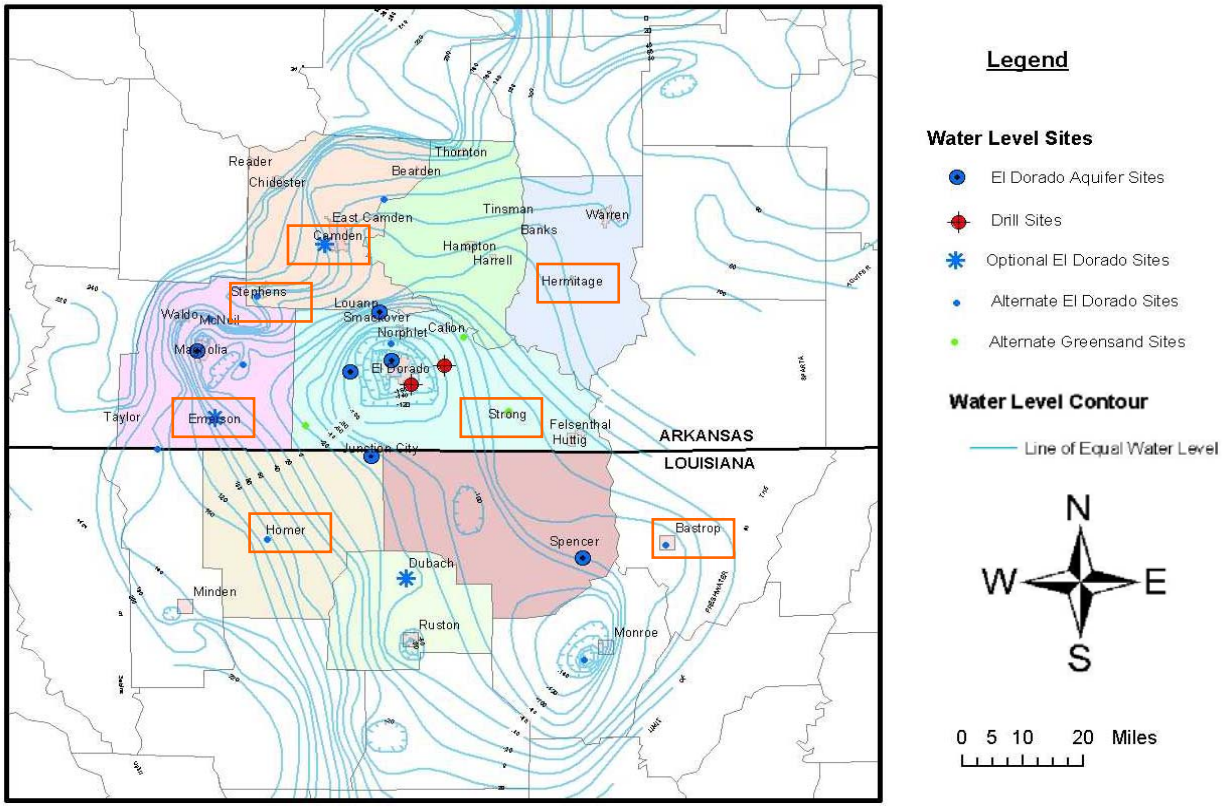
a result of voluntary conservation due to increased awareness of water level declines in the Sparta, the primary measure (Phase 2 of the Board's Ouachita River Water Supply Project) has not yet begun operation.

Data continues to be collected at these sites and transmitted by cellular modem to the USGS web site four times daily. Initial difficulties related to communication protocol issues between the cellular modems and Alltel Communications, a local service provider were recently resolved following several months of investigation which resulted in installation of new modems compatible with the service provider's network.

2.1.2 Automated Water Level Monitoring Sites

In addition to the real-time water level monitoring sites, groundwater levels will be measured daily and downloaded monthly at approximately seven to eight other sites utilizing automated data loggers. Figure 2-2 shows the locations of wells being considered, indicated by rectangular boxes around the vicinity of the well. These wells were selected from those that were evaluated by USGS and eliminated as real-time

Figure 2-3. Potential Automated Data Logger Sites



Source: U.S. Geological Survey, Little Rock, AR

monitoring sites. Table 2-1 provides additional information about the wells being considered. Thus far, five wells have been selected for use in this network. Permission is still being sought for wells at

Table 2-1
Potential Automated Data Logger Locations

Well Location	USGS Well ID	Total Depth	Sparta Unit
Hermitage, AR	Not assigned	600[1]	El Dorado Sand
Camden, AR[2]	14S17W05CAD1	223	El Dorado Sand
Stephens, AR[2]	15S19W21CDD2	300	El Dorado Sand
Emerson, AR[2]	19S20WDAD1	451	Greensand[3]
Strong, AR[4]	NA	363	El Dorado Sand
Homer, LA[2]	CL-58	482	El Dorado Sand
Bastrop, LA[2]	MO-5	860	El Dorado Sand
Truxno, LA	UN-84	696	El Dorado Sand

[1] Approximate total depth. Information and approval being sought from well's owner, Texas Eastern.
[2] Permission has been received from owner; well will be used in study..
[3] Well possibly completed in Greensand, a water-bearing unit of the Sparta Fm. above the El Dorado Sand.
[4] A new monitoring well is planned at Strong.

Hermitage and Truxno. Additionally, a detailed inspection of the municipal well at Strong (Well No. 2) determined it to be unsuitable for use as a monitoring well in the Study. The well base is constructed in such a manner as to prevent data logger access to the well. The Board has proposed to construct a new monitoring well in the Strong area and a site for a new monitoring well is being sought.

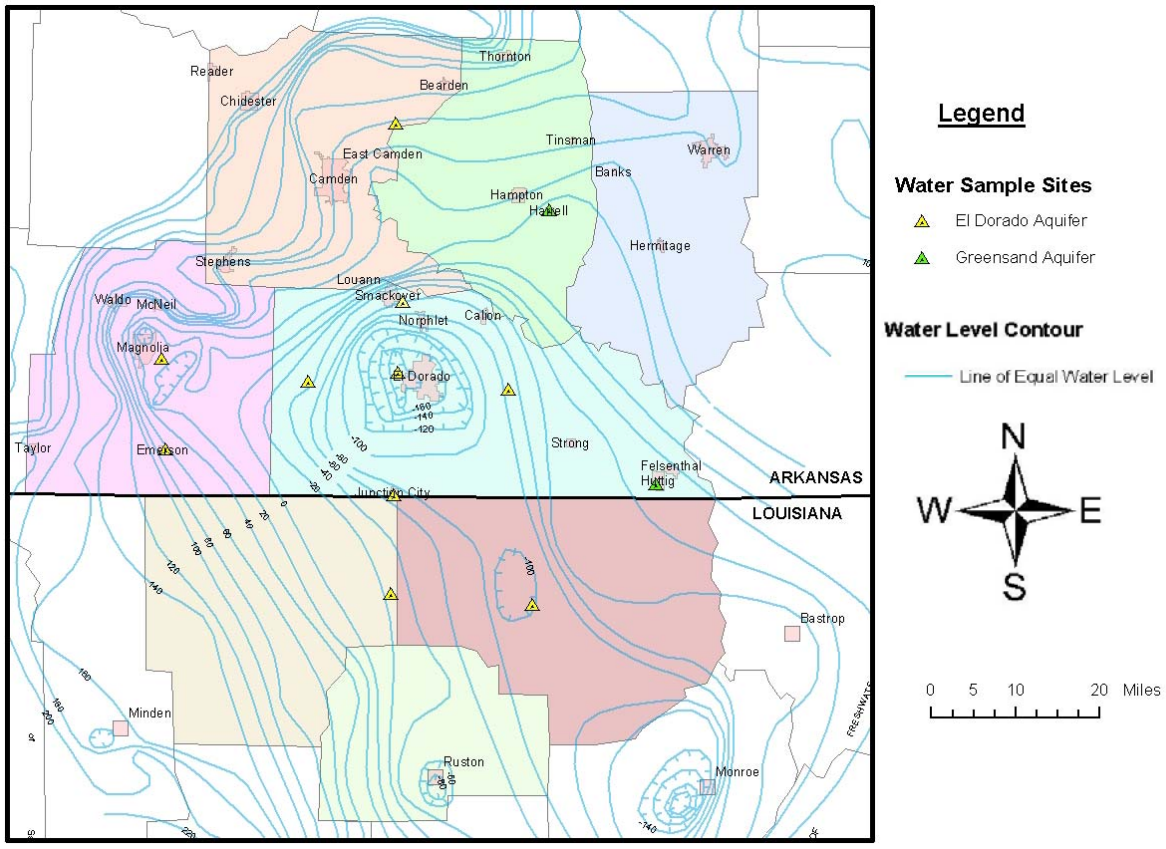
Six miniTroll (In-Situ, Inc.) data loggers were purchased in February 2004 to be installed in the wells in the automated date logger network. An additional one to two units will be purchased once the final site(s) are determined.

2.2 GROUNDWATER QUALITY MONITORING

The most recent round of sampling was performed on January 2004 by USGS personnel at sites shown in Figure 2-4. Table 2-2 is a summary of the analytical results and provides a comparison of results between the Study's first two rounds of sampling. Tabulated lab results for the 3rd round are contained in Appendix B.

Groundwater samples were analyzed for chloride, temperature, and specific conductance. Temperature and specific conductance were measured in the field. All samples were analyzed for chloride by the

Figure 2-4. Water Quality Sampling Sites



USGS laboratory in Ocala, Florida. Procedures used to obtain and analyze the samples are described in the Quality Assurance Project Plan (QAPP) (B&McD, October 2002).

No significant changes in water quality have occurred in any of the wells being monitored during the first three rounds of sampling. There appears to be a downward trend in chloride levels in samples collected from the Farmerville well. It is anticipated that as groundwater levels recover, chloride levels in some portions of the aquifer will decline due to increased hydrostatic heads in the Sparta. This should minimize or prevent upward movement of water from higher-salinity zones underlying the Sparta, and lateral migration from poorer-quality areas of the Sparta. As chloride (and specific conductance) data are accumulated, they will be analyzed to determine if such a trend is observed.

2.3 PROJECT WEB SITE

The Sparta Aquifer Recover Study web site has been active since May 1, 2003. The web site can be accessed at www.ucwcb.org.

Table 2-2
Groundwater Analytical Results

Well ID	Sample Date	Temp. (°C)	Sp. Cond. (:S/cm)	Chloride (mg/L)
D'Arbonne Well 5	01/30/03	23.5	737	45
	07/24/03	25.6	533	44
	01/14/04	23.3	531	44
El Dorado Well 17	01/30/03	21.3	574	23
	07/24/03	21.9	433	23
	01/14/04	20.4	443	23
Emerson Water 2	01/29/03	21.9	248	3
	07/24/03	23.2	232	3
	01/14/04	20.8	229	3
Farmerville Well 7	01/30/03	24.3	1777	216
	07/24/03	25.2	1250	212
	01/14/04	22.2	1157	204
Harrell Well 1*	01/29/03	22.8	494	15
	07/24/03	23.4	452	14
	01/13/04	20.9	457	15
Huttig Well 2*	01/29/03	22.5	1268	215
	07/24/03	22.6	1170	210
	01/13/04	21.8	1144	213
Junction City Well 2	01/29/03	23.2	633	92
	07/24/03	24	578	92
	01/14/04	22.5	574	93
Lawson-Urbana Well2	01/30/03	24.3	1006	83
	07/24/03	25.4	726	83
	01/13/04	19	726	85
Magnolia Well 8	01/29/03	21.1	414	6
	07/24/03	22	392	6
	01/14/04	20.6	381	10
Marysville Well 1	01/29/03	24.7	377	10
	07/24/03	25.3	332	10
	01/14/04	23.3	337	10
Shumaker Well 4	01/29/03	18.2	216	7
	07/24/03	21.0	218	7
	01/13/04	18.7	214	7
Smackover Well 7	01/29/03	20.9	479	20
	07/24/03	21.5	455	20
	01/13/04	20.5	457	20

NOTE: °C = degrees Celsius; :S/cm = microSiemens per centimeter; mg/L = milligrams per liter

Web site activities for this reporting period consisted of web site improvements, further evaluation of existing data and web pages, and data updates. The most important change to the web site consisted of a reference line representing the depth to the top of the Sparta aquifer added to the water level graphs that can be viewed via the Study web site. Recovery of the Sparta aquifer water levels to the top of the aquifer is considered a benchmark for project success.

* * * * *

3.0 FUTURE ACTIVITES

Activities planned during the next reporting period (February 2004 through August 2004) are described in this section. Appendix C contains a list of milestones and completion/anticipated completion dates.

3.1 GROUNDWATER LEVEL MONITORING

Groundwater levels will continue to be collected either manually or by automated processes throughout the 5-year duration of the project.

Water-level measurements will continue to be made hourly by real-time data loggers and uploaded to the USGS web site every six hours. Real-time water level data is placed in the USGS National Water Information System (NWIS) computer database and made available through the USGS Division of Water Resources, Ground-Water Data for Arkansas web site (http://waterdata.usgs.gov/ar/nwis/current/?type=gw), as well as via a link from unique well icons on the Study web site (www.ucwcb.org).

It is anticipated that several automated data loggers will be installed in spring 2004. Once installed, these units will measure water levels daily, and will be downloaded monthly by UCCD. The data will be processed and uploaded to the Study web site, where it will continue to be available by clicking on a well icon on the web site's interactive map.

Manual water level measurements will continue to be collected three to four times per year by UCCD. This data will be entered by UCCD, transmitted to B&McD for processing, then uploaded to the web site after each round of measurements.

3.2 GROUNDWATER QUALITY MONITORING

The fourth round of groundwater sampling is planned for July 2004. All 12 wells in the network will be sampled and analyzed by the USGS laboratory in Ocala, Florida for chloride. Field measurements of temperature and specific conductance will also be made.

Chloride data will continue to be tabulated, tracked, and compared with historic data to determine if changes in aquifer water quality are occurring. During the course of the study, analysis of other chemical parameters will also be performed if required for proper assessment of aquifer recovery. If it is

determined that additional analytes, such as bromide, will be useful for purposes of the study, they will be incorporated and the QMP and QAPP will be revised.

After review by the USGS, water quality data will be made available to users and interested parties on the Internet, stored in the NWIS database. USGS data specific to the Study can be retrieved via USGS' Water Resources of Arkansas web page at http://ar.water.usgs.gov/, where it can be viewed and downloaded in tabular or graphic format. Links from the Study web site will also direct the user to this data.

A summary of the data will be published in the USGS annual data report. Data will also be included in a USGS Fact Sheet summarizing the results.

3.3 PROJECT WEB SITE

Evaluation and enhancement of the web site will continue throughout the study period. Future web page improvements include direct links from web site maps to USGS real-time water level monitoring wells. Other improvements include modifications to the database that will ease data entry and eliminate entry format errors, and the addition of new spatial layers to the map including land use, bridges, dams, airports, water basins, oil tanks, soil areas, and others that may be considered useful to web site users.

During the next reporting period, work will be include database entry changes to facilitate the data entry process and reduce potential entry errors, and enhancement of selected web pages. This will include creating a direct link from well icons representing USGS real-time monitoring wells to the USGS web site containing the real-time data. By clicking on a monitoring well icon on the map pages of the Study web site the user will be taken directly to the USGS web page for that monitoring well, where data can be viewed and downloaded in tabular or graphic format.

3.4 TREND ANALYSIS WITH GROUNDWATER MODELING

In the mid-1980's, the USGS developed and calibrated a groundwater model for the Sparta aquifer using MODFLOW. Since then, the model has been updated and re-verified (Hays et al., 1998). The model covers 40,000 square miles in southern Arkansas and northern Louisiana. In 2001, the USGS model was refined by the Union County Water Conservation Board to obtain greater resolution of individual well impacts in Union County for planning of Phase 2 of the Ouachita River Water Supply project.

USGS recently modified, reconstructed and recalibrated its previous Sparta aquifer groundwater model (McKee and Clark, 2003). The Board plans to use the model to further evaluate impacts on the aquifer due to various water usage scenarios in Union County. The Board's goals for continually updating and refining the model include:

- Projecting the impacts of removing selected large users from groundwater.
- Predicting when groundwater usage has been sufficiently reduced to allow aquifer recovery.
- Determining the need for implementation of Phase III of the Ouachita River Water Supply project.

* * * * *

4.0 PROJECT SCHEDULE

The 5-year Study commenced on August 7, 2002 with award of the grant by EPA. Significant delays have occurred affecting installation of automated data loggers. These were primarily due to difficulty in locating and obtaining permission for use of suitable existing wells as monitoring points for the automated data logger network. A significant portion of this network should be in place prior to start up of Phase 2 operation, allowing some background water level measurement at those locations prior to commencement of surface water use by the three major industries.

Milestones completed to date include:

- Submittal of QMP and QAPP.
- Three rounds of semi-annual groundwater sampling.
- Web site development, host selection, and web site launch.
- Installation of two monitoring wells for real-time water level monitoring.
- Installation of real-time water-level monitoring equipment at eight locations, including the two new monitoring wells.

Milestones to be completed during the next reporting period include:

- Installation of several automated data loggers in existing monitoring wells (March-April 2004).
- Semi-annual groundwater sampling (July 2004).
- Progress report No. 4 (September 2004).

Appendix C contains a milestone list that shows the starting and ending/anticipated completion date for each task. The decision to retain the Institute for Economic Advancement (IEA) to host and maintain the Study web site (www.ucwcb.org) permitted the elimination of Milestone 3.2, (purchase of web-site hosting equipment).

* * * * *

5.0 REFERENCES

Hays, P.D., Lovelace, J.K., and Reed, T.B., 1998. *Simulated Response to Pumping Stress in the Sparta Aquifer of Southeastern Arkansas and North-Central Louisiana, 1998-2027.* U.S. Geological Survey Water-Resources Investigations Report 98-4121. Little Rock, Arkansas.

Hays, P.D., 2000. *Sustainable-Yield Estimation for the Sparta Aquifer in Union County, Arkansas.* U.S. Geological Survey Water-Resources Investigations Report 99-4274. Little Rock, Arkansas.

McKee, P.W. and Clark, B.R., 2003. *Development and Calibration of a Ground-Water Flow Model for the Sparta Aquifer of Southeastern Arkansas and North-Central Louisiana and Simulated Response to Withdrawals, 1998-2027.* U.S. Geological Survey Water-Resources Investigations Report 03-4132. Little Rock, Arkansas.

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Appendix A

Sparta Aquifer Project Description

Project to Restore Aquifer

Union County Water Conservation Board – El Dorado, Arkansas

Relevant Tasks

- Hydrogeologic Modeling
- Evaluate Alternative Supplies
  - Aquifer Storage and Recovery
  - Dam and Reservoir
  - Wastewater Reuse
  - River Supply
- 65-MGD River Intake
- Industrial Pretreatment Facility
- Ground Storage and Booster Pump
- 23 Miles of 16" to 48" Pipeline
- 32.5-MGD Pretreatment Solids Settling
- Storage Reservoir & Pump Station
- Property Ownership Easement Procurement
- Regulatory Agencies Coordination
- Rate Analysis
- Financial Planning

Completion Date

2003

Construction Cost

$52,300,000 (Estimated)

Client Reference

Mr. Robert Reynolds, President
Union County Water Conservation Board
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El Dorado, Arkansas 71730
(870) 863-7234

South Central Arkansas obtains its raw water supply from the Sparta Aquifer. Over the past 50 years the Sparta has been declining with the cone of depression centered under El Dorado, Union County Arkansas. In April 1999, the Arkansas legislature passed Act No. 1050 authorizing the creation of groundwater conservation boards in counties designated as "critical groundwater areas". The first county to form such a board was Union County in south central Arkansas, bordering Louisiana. A U.S.G.S. monitoring well near the center of the county recorded a static water level in 1942 of 60 feet *above* sea level. By 1999, the static level in the same well had dropped to 180 feet *below* sea level. This represents an average depletion of 4.2 feet per year over the 57 years of records.

The Board retained the services of engineering consultants Burns and McDonnell to develop a master plan to supply raw water from the Ouachita River to area industries and thereby eliminate the need for industries to use groundwater. The Ouachita River supports barge traffic and is a controlled release waterway by means of a Corps of Engineers Lock and Dam upstream of El Dorado, Arkansas. This surface water supply carries high solids concentrations during the spring rainy season. The master plan recommended that a settling facility be constructed to allow industries to utilize this raw water source and to lessen the cost for future potable water treatment. Preliminary design of a 65-MGD River Intake and pump station, settling facilities and 5 miles of 48-inch pipeline was completed in several contracts and constructed by others through the design-build method in Phase I.

Hydrogeologic modeling performed by the U.S. Geological Survey of the Sparta aquifer covering southern Arkansas and northern Louisiana predicted that the groundwater usage must be reduced from a maximum of 25 million gallons per day (MGD) to an average of approximately 7 MGD to restore the aquifer to its original levels over in 30 years.

The Board refined the USGS model of the Sparta aquifer to represent the information collected in Union County, which covers over 1000 square miles. Nearly all water use in Union County comes from the Sparta aquifer. There are seven cities, 22 rural water associations and eleven major industries using Sparta water. Many wells were metered as a part of this project, as Arkansas legislation allowed the County to charge $ 0.24 per 1000 gallons for all water pumped from the Sparta. This revenue source allowed the Board to develop a master plan to "Save the Sparta."

In addition, a new merchant power plant was planned for the County that will have an average daily demand of around 20 MGD, supplied by the Ouachita River. Well location data and pumping information were used to model the aquifer for several alternatives. Alternatives considered for supplemental supply included the Ouachita River; aquifer storage and recovery; (five) dams and surface water reservoirs; and wastewater reuse.

The selected alternative was to provide non-potable water to the new power plant and to major industries in Union County by constructing a 65-MGD intake on the Ouachita River. Water treatment is limited to coagulation and sedimentation. The settled water is pumped to the power plant, then on to a storage tank and pump station near El Dorado, where it will be boosted to serve the largest industries.

Conventional design, bid, and construction methods are being used on the 3-million gallon tank, pumping station and 14-mile pipeline for Phase II. A rate study established the recommended base rate of cost for the raw water supply to the industries. Phase II design is nearing completion and construction is anticipated to begin in late summer 2002.

The 14-mile transmission system needed to support the delivery of non-potable water for these industrial users consists of pipeline ranging in size from 12 inches to 48 inches. Design and permit considerations included state roadway crossings, railroad crossings, lake crossings and wetland construction issues. The pipeline alignment was selected with consideration being given to existing development and the ability to construct the pipeline. Most of the pipeline alignment is parallel to overhead power transmission systems. Temporary construction area was provided on the power line right-of-way with specific safety requirements stipulated by the power utility. Permanent easements for pipeline and temporary construction easements are less costly when obtained adjacent to existing easements.

Construction in wetland areas is closely monitored and provisions must be provided to assure that the insitu material is segregated and replaced within the same strata. The natural flow of water in the wetland must be maintained across the

work area. Temporary fill material is allowed, however it must be removed within 90 days following installation of the pipeline. This prevents permanent damage to the wetland and assures that minimal disturbance has occurred.

Groundwater levels will be monitored for several years to determine the rate of recovery of the aquifer from Phases I and II of the project. If the rate of recovery is not acceptable, then a second tier of industrial users will be taken off groundwater and added to the non-potable surface supply as Phase III of the project. Phase IV, if needed, will be to provide a membrane water treatment plant near the storage tank to provide potable water to a portion of the County.

Appendix B

USGS Laboratory Results
January 2004

LABID	FIELD ID	STATION ID	NAME	DATE	PROJECT	QC	Temp	SC uS/cm @25C	Cl conc (mg/L)	spike (mg/L)	recovery (%)
200402220	14S 13W12CCB	333040092240301.00	HARRELL #1	01/13/2004 10:00	85789WL00		20.9	457	14.52		
200402221	12516W26AND	333944092430401.00	SCHUMAKER #4	01/13/2004 11:15	85789WL00		18.7	214	6.78		
200402222	12516W26AAD1	333944092430401.00	SCHUMAKER #4	01/13/2004 11:20	85789WL00	MS	18.7	214	16.96	10	101.8
200402223	12S16W26AAD1	333944092430401.00	SCHUMAKER #4	01/13/2004 11:25	85789WL00	MSD	18.7	214	17	10	102.2
200402224	16S16W01DDD1	332113092421001.00	SMACKOVER #7	01/13/2004 13:15	85789WL00		20.5	457	19.93		
200402225	16S16W01DDD1	332113092421001.00	SMACKOVER #7	01/13/2004 13:25	85789WL00	MS	20.5	457	30.24	10	103.1
200402226	16S16W01DDD1	332113092421001.00	SMACKOVER #7	01/13/2004 13:20	85789WL00	MSD	20.5	457	30.22	10	102.9
200402227	19S11W25AAA1	330219092111201.00	HUTTIG #2	01/13/2004 15:25	85789WL00		21.8	1144	212.71		
200402228	19S11W25AAA	330219092111201.00	HUTTIG #2	01/13/2004 15:30	85789WL00	DUP	21.8	1144	212.55		
200402229	17S13W31BAD1	331203092290801.00	LAWSON URBANA #2	01/13/2004 16:45	85789WL00		19	726	84.65		
200402230	17S16W24BDB1	331358092424301.00	EL DORADO #17	01/14/2004 7:30	85789WL00		20.4	443	22.86		
200402231	17S17W30DCD1	331351092572701.00	MARYSVILLE #1	01/14/2004 8:10	85789WL00		23.3	337	9.66		
200402232	17S20W17CDA1	331519093115901.00	MAGNOLIA #8	01/14/2004 9:30	85789WL00		20.6	381	10.26		
200402233	19S20W09CBD1	330555093112801.00	EMERSON #2	01/14/2004 10:20	85789WL00		20.8	229	3.33		
200402234	19S16W350DCC	330107092432301.00	JUNCTION CITY #2	01/14/2004 11:50	85789WL00		22.5	574	92.94		
200402235	19S16W35DDC1	330107092432301.00	JUNCTION CITY #2	01/14/2004 11:55	85789WL00	DUP	22.5	574	92.97		
200402236	CL-150	325103092434901.00	DARBONNE #5	01/14/2004 12:35	85789WL00		23.3	531	44.37		
200402237	UN-202	325004092260801.00	FARMERVILLE #7	01/14/2004 13:30	85789WL00	BLANK			0		
200402238	UN-202	325004092260801.00	FARMERVILLE #7	01/14/2004 13:25	85789WL00		22.2	1157	204.26		

Appendix C

Milestone List

Appendix C - Milestone List

Task Number	Subtask Number	Description	Start Date	Completion Date
1	**1.1**	Installation of two new monitoring wells	08/05/2003	08/12/2003
	1.2	Installation of real-time monitoring equipment in new and existing monitoring wells	07/15/2003	08/15/2003
	1.3	Installation of automated data loggers in existing monitoring wells	12/01/03	12/31/03
2	**2.1**	Groundwater sampling, semi-annual	01/31/2003	07/31/2007[1]
3	**3.1**	Web site development	11/01/2002	04/30/2003
	3.2	Web site hosting equipment purchase	03/01/2003	Milestone eliminated[2]
4	**4.1**	Submittal of Quality Management Plan	06/19/2002	06/19/2002
	4.2	Submittal of Quality Assurance Project Plan	10/01/2002	10/01/2002
	4.3	Progress reports to EPA, semi-annual	01/31/2003	01/31/2007[1]
	4.4	Final report	03/30/2007[1]	03/30/2007[1]

[1] Anticipated completion date
[2] Contract to UALR-IEA for web site hosting eliminated need for equipment purchase