

**Pinellas Environmental
Restoration Project**

**Closure Monitoring Plan for the
Northeast Site and 4.5 Acre Site**

August 2009



U.S. DEPARTMENT OF
ENERGY

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LMS/PIN/N01401

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1.0 Introduction

The U.S. Department of Energy (DOE) has completed source removal and groundwater remediation activities at both the Northeast Site at the Young - Rainey Science, Technology, and Research (STAR) Center and the adjacent 4.5 Acre Site. Therefore, DOE is proceeding to close both sites under the Florida Department of Environmental Protection's (FDEP's) Risk-Based Corrective Action (RBCA) rules (Chapter 62-780.680 *Florida Administrative Code* [F.A.C.]). This document describes the closure monitoring that is necessary under RBCA, according to the requirements for Post Active Remediation Monitoring (Chapter 62-780.750 F.A.C.).

2.0 Summary of Source Removal Activities

One of the requirements for site closure under RBCA is that free product (non-aqueous phase liquids [NAPL]) not be present. DOE has made a considerable effort to ensure that free product, as well as any contaminants that are sorbed to soil at concentrations that could act as a source to groundwater, is not present in the subsurface at either site.

The locations of the contaminant source areas at each site are well defined. Electromagnetic surveys in the 1980s and 1990s identified areas where drums had been buried in the subsurface, and drums were excavated from each site. Very detailed soil characterization events, the most recent of which are described in the following text, have further defined the source areas.

At the Northeast Site, DOE conducted two thermal NAPL remediation projects at northern and southern areas of the site from 2002 to 2006. Because elevated groundwater contaminant concentrations persisted in a few spots at the southern area following thermal NAPL remediation, DOE conducted soil characterization events in 2007 and 2008 wherein 754 soil samples were collected from 85 soil borings to define the areas of soil containing elevated contaminant concentrations. In 2008 and 2009, DOE conducted soil excavation using the large-diameter auger (LDA) method and removed 3,700 cubic yards of contaminated soil.

At the 4.5 Acre Site in 2007, DOE collected 1,172 soil samples from 138 soil borings installed to delineate the areas of elevated contaminant concentrations. In 2009, DOE conducted soil excavation using the LDA method and removed 2,570 cubic yards of contaminated soil.

In summary, a considerable effort has been made to remove NAPLs and any elevated contaminant concentrations sorbed to soil. Therefore, it seems reasonable to assume no significant contaminant source remains at either site.

In addition to these aggressive remediation techniques, DOE plans to implement enhanced bioremediation around the soil excavation areas in 2010 to address any elevated contaminant concentrations that may have been missed during soil characterization. Emulsified vegetable oil will be injected along with a *Dehalococcoides ethenogenes* culture in a reactive treatment zone configuration. In addition, enhanced bioremediation will also be implemented in the highest groundwater concentration areas in the downgradient plume.

3.0 Delineation of Contaminant Plumes

The downgradient contaminant plumes are also well defined at each site. The monitoring well networks at each site have provided detailed information defining groundwater flow direction and velocity, as well as the vertical and horizontal extent of the plumes and the magnitude of contaminant concentrations within the plumes. Figures 1 through 4 show current water levels and groundwater flow direction for the shallow and deep portions of the surficial aquifer at each site. Figures 5 and 6 show the current contaminant plumes. Additional groundwater flow maps and plume maps for individual contaminants of potential concern (COPCs) are included in the Semiannual Reports (DOE 2009a and 2009b), which can be viewed at: <http://www.lm.doe.gov/land/sites/fl/pinellas/pinellas.htm>.

4.0 Closure Monitoring

The closure monitoring program for the Northeast Site and the 4.5 Acre Site follows the requirements for Post Active Remediation Monitoring described in Chapter 62-780.750 F.A.C. The closure plan requirements listed in this regulation are summarized as follows.

- A minimum of two monitoring wells is required, one at the downgradient edge of the plume and one in the area of highest groundwater contaminant concentrations.
- The wells will be sampled quarterly for analysis of COPCs. A different sampling frequency may be allowed with FDEP approval.
- Water level measurements in all designated wells must be made within 24 hours of initiating each sampling event.
- A Monitoring Report must be submitted that includes laboratory analytical reports, chain-of-custody forms, COPC data tables, a site map illustrating analytical results, and water level flow maps and data tables.
- Monitoring wells must be resampled within 30 days if action levels are exceeded.
- A minimum of four groundwater sampling events is required, and the last two events must meet No Further Action criteria.

DOE plans to conduct closure monitoring at 9 wells at the Northeast Site and 13 wells at the 4.5 Acre Site. This includes two new wells (yet to be installed) at the Northeast Site and five new wells at the 4.5 Acre Site. The closure monitoring wells are highlighted on Figures 7 and 8 and are listed in Tables 1 and 2. In general, the wells exist (or will be installed) as deep and shallow pairs, but a few single wells are also included. Figures 7 and 8 also show the locations of the concrete plugs remaining as a result of LDA activities. Currently, DOE is conducting a water level study to determine if groundwater flow has been changed by the presence of these plugs, but the overall flow direction at each site is expected to remain consistent with past observations.

The seven new wells are scheduled for installation in late September or early October 2009 and therefore will not be sampled during the first closure monitoring event, which is also the wet season semiannual sampling event, scheduled for August 24–September 4, 2009. These new wells will be sampled for COPCs soon after they are installed. The August–September sampling event and the new-well sampling event together will serve as the initial closure monitoring event.

Samples from all closure monitoring wells at each site will be submitted for analysis of volatile organic compounds (VOCs) using EPA SW-846 Method 8260b. In addition, iron and aluminum will be analyzed in samples from wells at the Northeast Site using EPA SW-846 Method 6010b. The analyses will be conducted by TestAmerica-Tampa, a state-certified analytical laboratory.

Closure monitoring events will be conducted on a quarterly schedule starting with the August 24–September 4, 2009, sampling event. The September and March sampling events will coincide with the routine semiannual sampling events as described in the Annual Monitoring Plan, included as an appendix in the *Long-Term Surveillance and Maintenance Plan for the Pinellas Site* (DOE 2008). Additional closure monitoring events will be conducted in December and June to complete the quarterly sampling schedule.

The August 24–September 4, 2009, sampling event will be conducted as described in the Annual Monitoring Plan. Thereafter, only the wells listed in Tables 1 and 2 will be sampled. This August–September sampling event will aid the transition from routine sampling to closure monitoring by providing a final snapshot of contaminant concentrations and will help to evaluate any changes to the contaminant plume that potentially were caused by the LDA activities.

Water levels will be measured in all existing wells during each closure monitoring event, within 24 hours of the start of the event, as required. Measuring water levels in all existing wells instead of just the closure monitoring wells will provide a much clearer evaluation of groundwater flow direction and velocity.

Closure monitoring data reports will be written quarterly to report the results of each sampling event to FDEP. As required, these reports will include laboratory analytical reports, chain-of-custody forms, COPC data tables, a site map illustrating analytical results, and water level flow maps and data tables.

DOE does not plan to define numeric action levels at this time, as specified in the Post Active Remediation Monitoring requirements. This is mainly due to the fact that most wells located adjacent to the excavation areas were destroyed during LDA activities, so new monitoring wells need to be installed in these areas of relatively high contaminant concentrations. Once these wells are installed and sampled for two quarterly closure-monitoring events, DOE will evaluate the data to determine the need for establishing actions levels. In lieu of action levels in the interim, DOE will quickly and closely review the closure monitoring data and will immediately notify FDEP if contaminant concentrations change significantly in any existing wells. Subsequently, consultation with FDEP will determine if resampling needs to be conducted with the 30-day time period.

DOE plans to continue closure monitoring for a minimum of four quarterly events. After four events, if the contaminant plumes appear stable, DOE will proceed with submittal of a No Further Action closure proposal as defined in the RBCA rules. Additional analysis and demonstration of plume stability, including groundwater modeling if necessary, will be included in the No Further Action proposal.

One potential complication to closure monitoring is the enhanced bioremediation project that DOE plans to implement around the former source areas and in the downgradient plumes at both

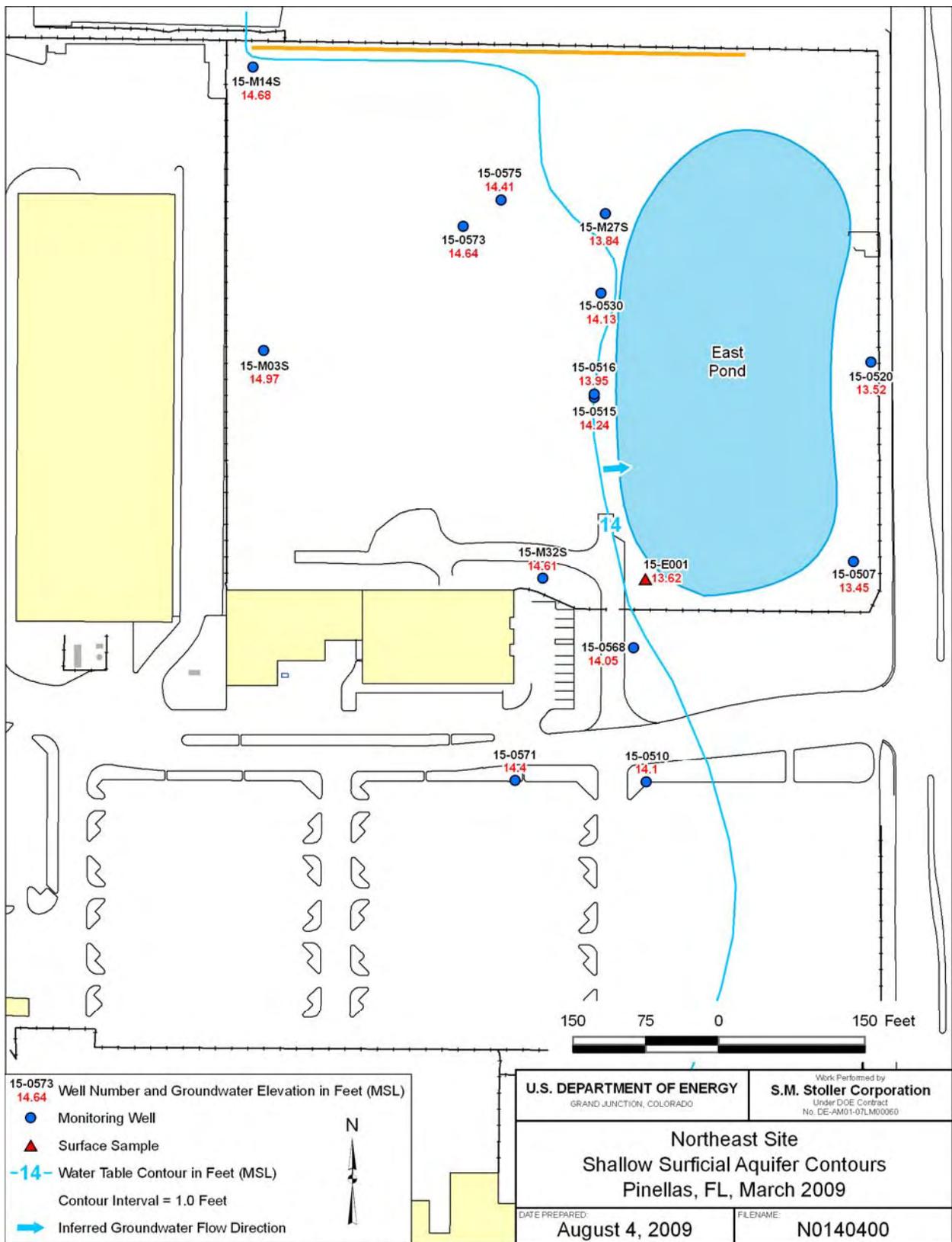
sites. This activity is scheduled for January 2010, after the initial two quarterly closure monitoring events. DOE plans to inject an emulsified vegetable oil as a polishing step following LDA activities. This involves the injection of a significant amount of liquid (approximately 350 gallons of oil/water mixture over a 20-foot vertical interval), with a total of 150 injection points on 15-foot centers. Injecting this much liquid could temporarily affect the local groundwater flow. In addition, it has been documented in the literature that contaminant concentrations may initially increase following oil injection due to desorption of contaminants from the soil and increased rates of biodegradation. If contaminant concentrations change significantly following oil injection, DOE will consult with FDEP to determine the impact to closure monitoring.

5.0 References

DOE (U.S. Department of Energy), 2008. *Long-Term Surveillance and Maintenance Plan for the Pinellas Site*, LMS/PIN/N01058, U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado.

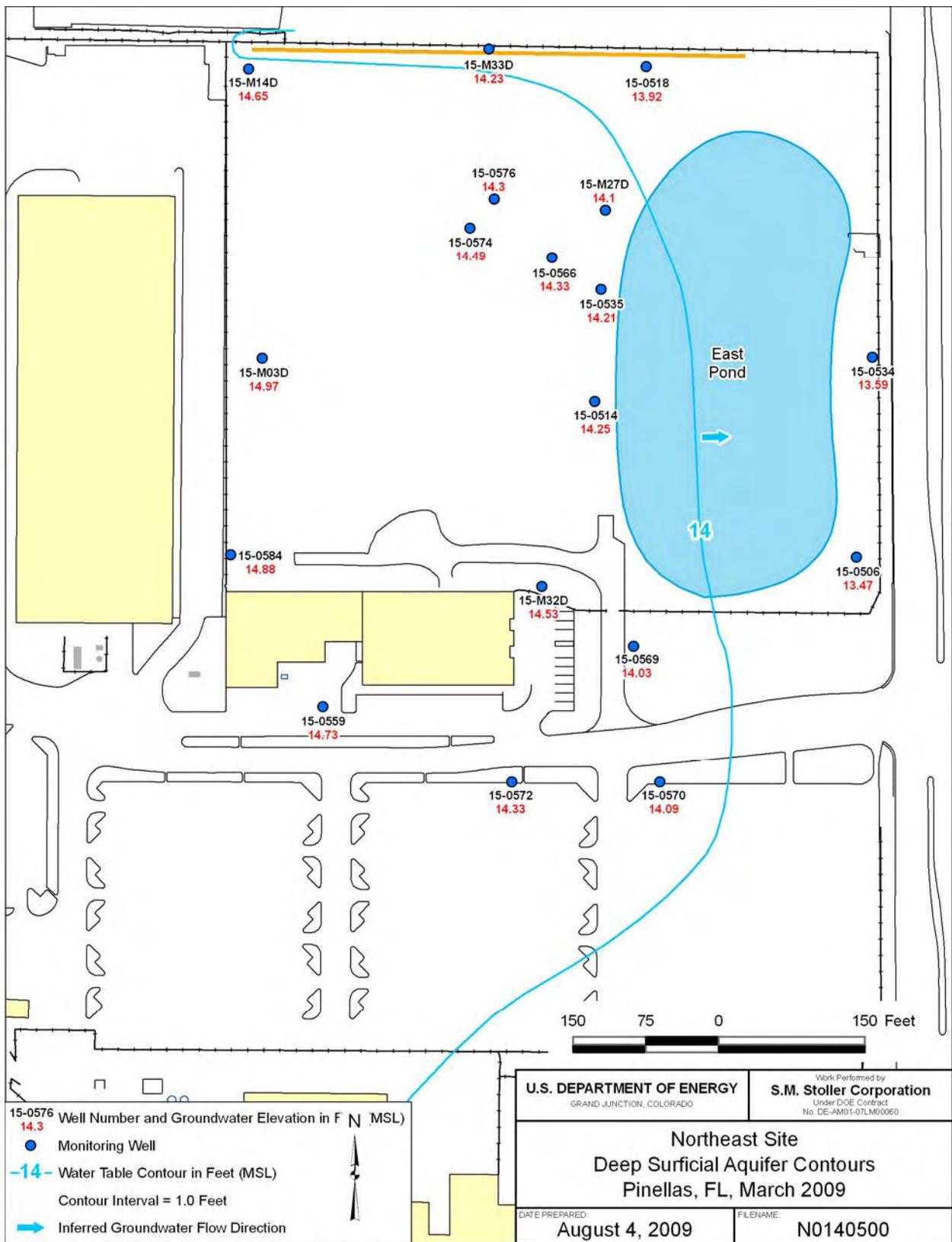
DOE (U.S. Department of Energy), 2009a. *Semiannual Progress Report for the 4.5 Acre Site December 2008 through May 2009*, LMS/PIN/N01350, U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado, June.

DOE (U.S. Department of Energy), 2009b. *Sitewide Environmental Monitoring Semiannual Progress Report for the Young - Rainey STAR Center December 2008 through May 2009*, LMS/PIN/N01347, U.S. Department of Energy Office of Legacy Management, Grand Junction, Colorado.



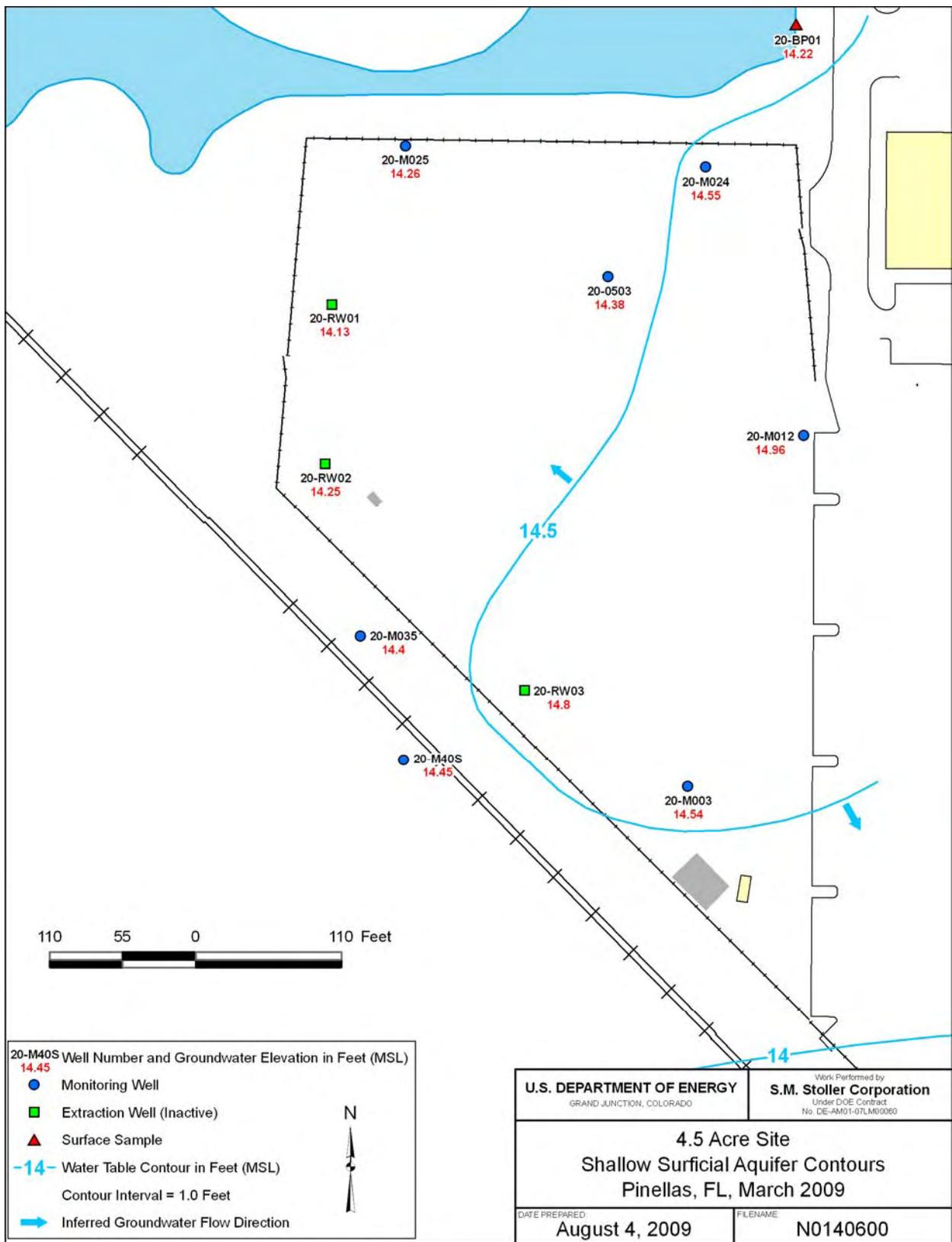
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Figure 1. Northeast Site Shallow Surficial Aquifer Flow, March 2009



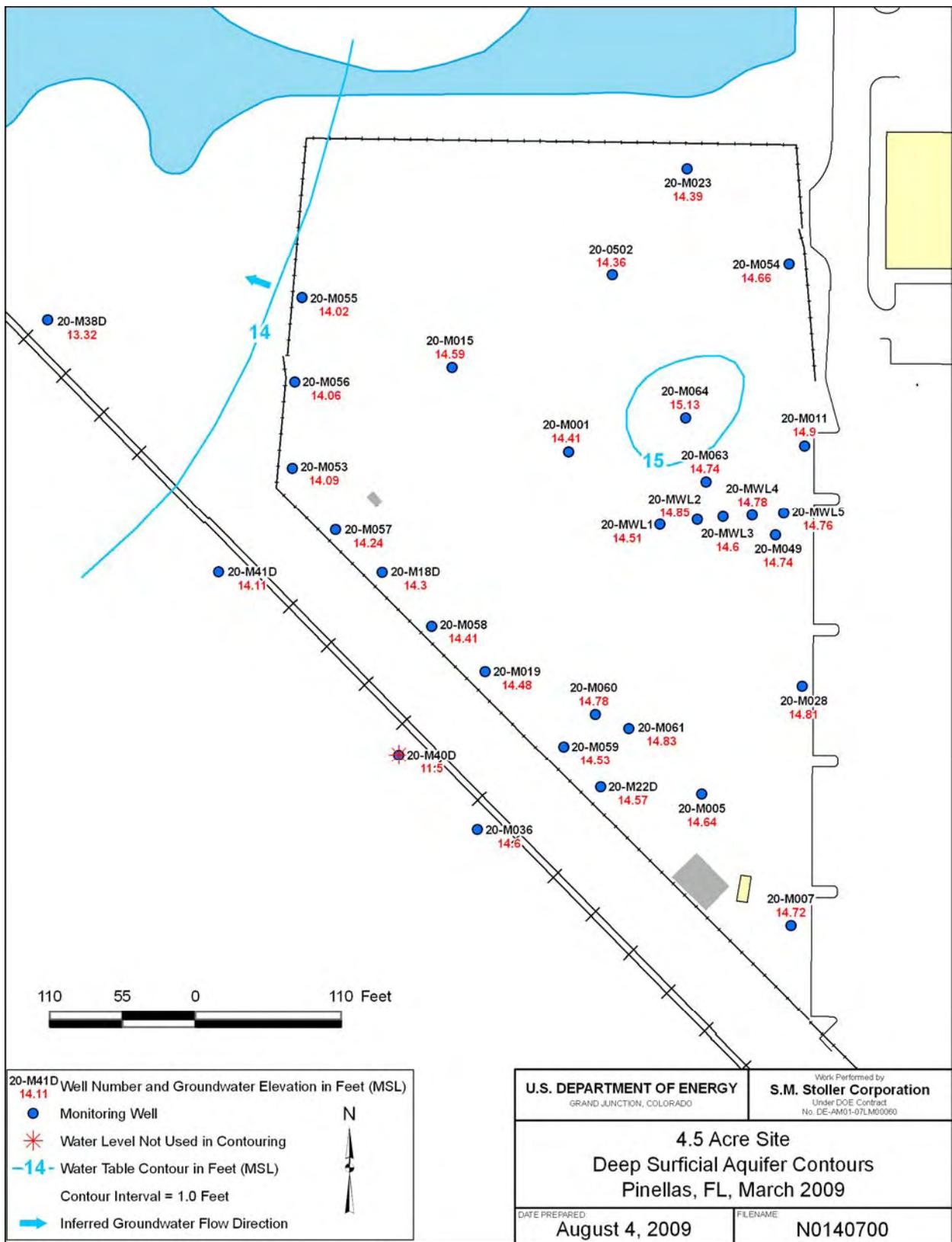
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Figure 2. Northeast Site Deep Surficial Aquifer Flow, March 2009



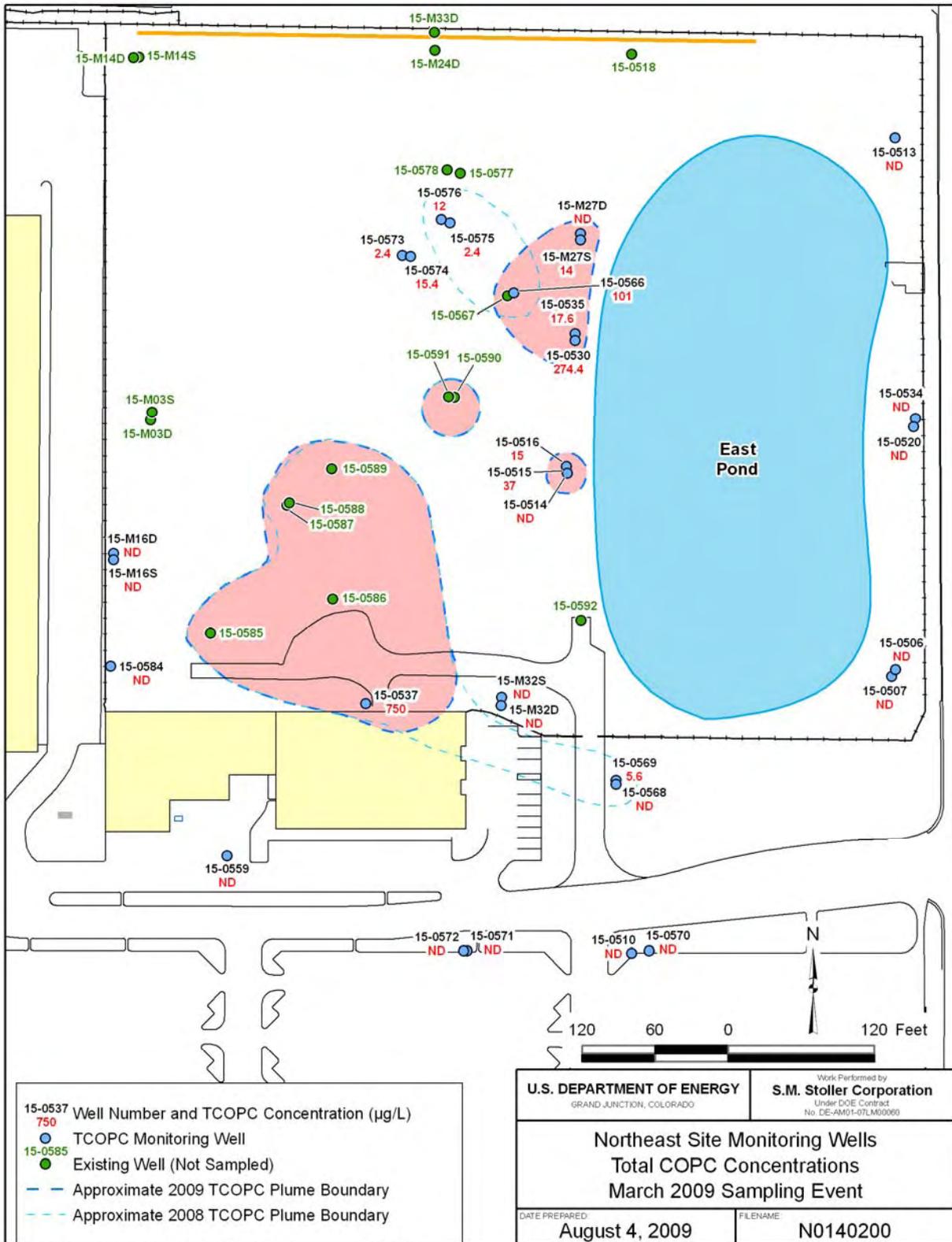
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Figure 3. 4.5 Acre Site Shallow Surficial Aquifer Flow, March 2009



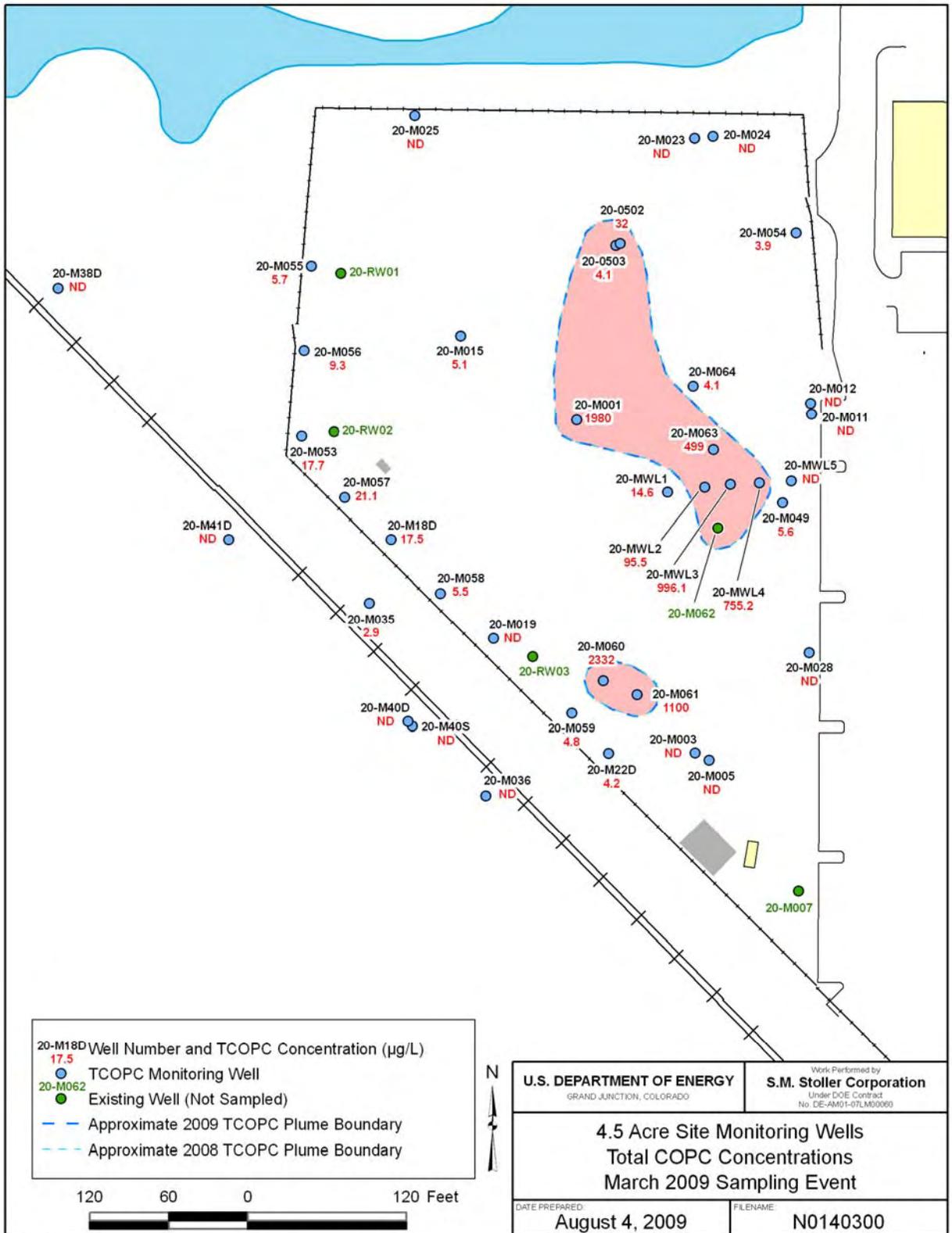
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Figure 4. 4.5 Acre Site Deep Surficial Aquifer Flow, March 2009



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Figure 5. Northeast Site Contaminant Plumes
TCOPCs are the sum of individual COPC concentrations.



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Figure 6. 4.5 Acre Site Contaminant Plumes
 TCOPCs are the sum of individual COPC concentrations.

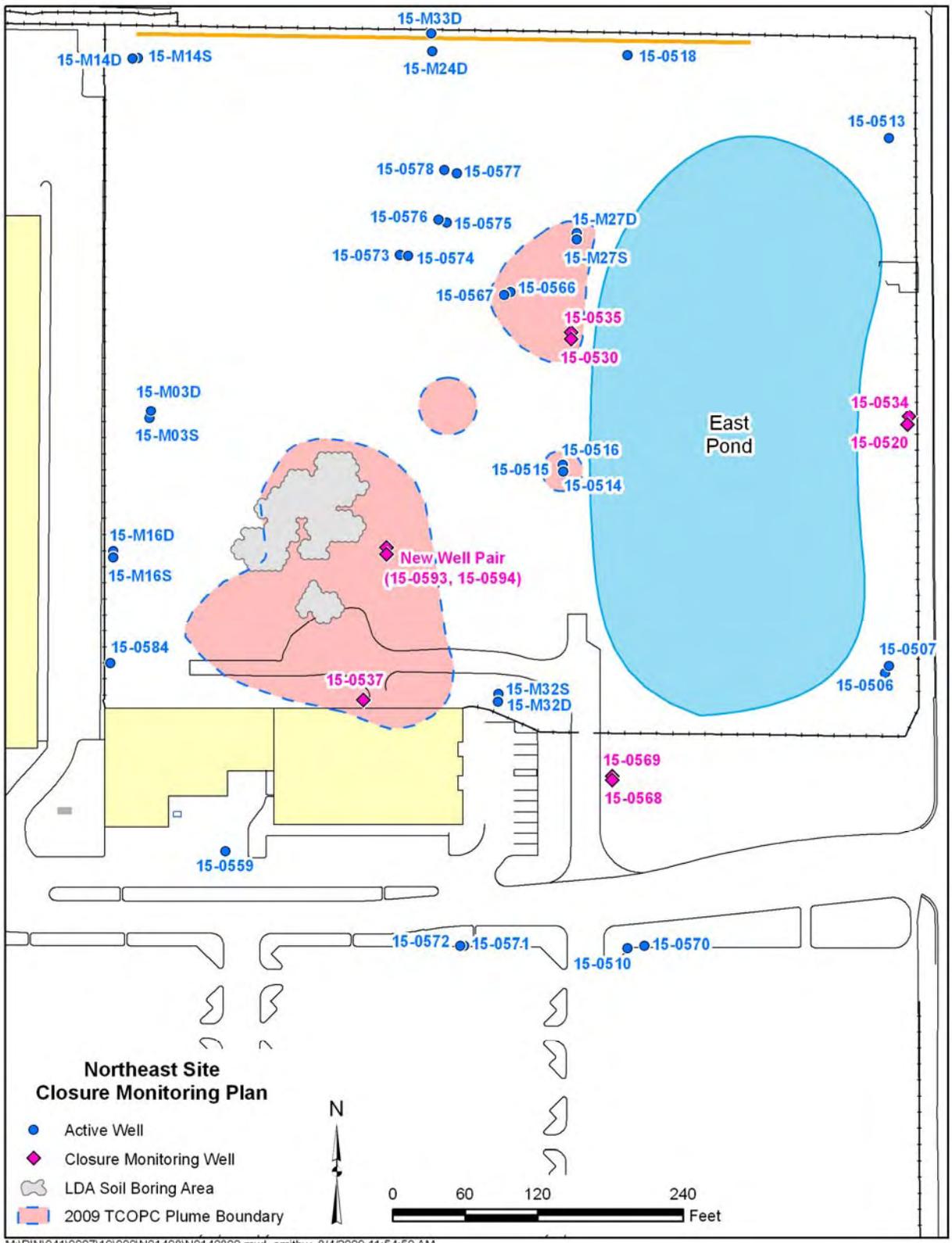
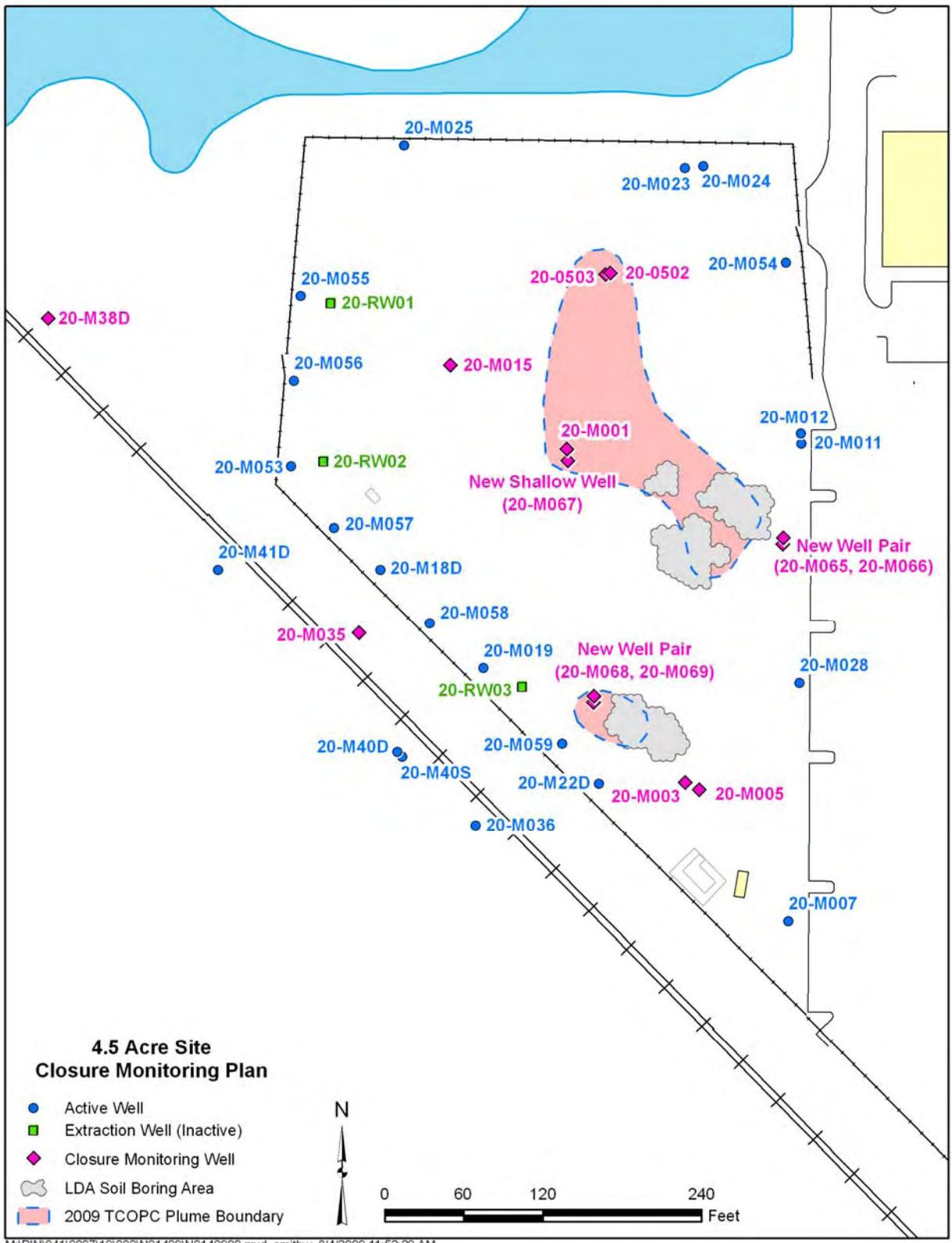


Figure 7. Northeast Site Closure Monitoring Wells



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Figure 8. 4.5 Acre Site Closure Monitoring Wells

Table 1. Closure Monitoring Wells at the Northeast Site

Well (all start with PIN15-)	Installation Date	Screened Interval (ft bls)	Location
0530	4/13/87	5–14.5	Northern plume, high concentration area
0535	9/29/98	20.5–30	Northern plume, high concentration area
0520	4/13/87	5–14.5	Northern plume, downgradient edge
0534	9/29/98	19.5–29	Northern plume, downgradient edge
0593	Planned for 9/09	10–20	Southern plume, high concentration area
0594	Planned for 9/09	20–30	Southern plume, high concentration area
0537	9/30/98	17.5–30	Southern plume, high concentration area
0568	1/30/03	10–20	Southern plume, downgradient edge
0569	1/30/03	20–30	Southern plume, downgradient edge

ft bls = feet below land surface

Table 2. Closure Monitoring Wells at the 4.5 Acre Site

Well (all start with PIN20-)	Installation Date	Screened Interval (ft bls)	Location
M065	Planned for 9/09	8–18	Northern plume, high concentration area
M066	Planned for 9/09	18–28	Northern plume, high concentration area
M001	5/17/85	20–25	Northern plume, high concentration area
M067	Planned for 9/09	10–20	Northern plume, high concentration area
0502	3/22/91	21.2–31.2	Northern plume, downgradient edge
0503	3/22/91	13.2–23.2	Northern plume, downgradient edge
M015	8/20/85	20.8–25.8	Northern plume, downgradient edge
M068	Planned for 9/09	8–18	Southern plume, high concentration area
M069	Planned for 9/09	18–28	Southern plume, high concentration area
M035	2/17/86	9–14	Southern plume, downgradient edge
M38D	7/19/89	20–30	Southern plume, downgradient edge
M003	5/20/85	9–14	Southern plume, sentry well for potential groundwater flow to the southeast
M005	5/19/85	25.8–30.7	Southern plume, sentry well for potential groundwater flow to the southeast

ft bls = feet below land surface

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