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FINAL TECHNICAL MEMORANDUM FOR SUMMARY OF BASEWIDE WELL REPAIR AND ABANDONMENT ACTIVITIES AT SITES 7, 8, 9, 10, 11, 11A, 12, 13 AND SOLID WASTE MANAGEMENT UNIT 3 JEB LITTLE CREEK VA

07/01/2011

CH2M HILL

Final Technical Memorandum

Summary of Basewide Well Repair and Abandonment Activities at Sites 7, 8, 9, 10, 11, 11a, 12, 13 and SWMU 3

Joint Expeditionary Base (JEB) Little Creek-Fort Story
JEB Little Creek
Virginia Beach, Virginia

NAVFAC
Naval Facilities Engineering Command

Prepared for

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Summary of Basewide Well Repair and Abandonment Activities at Sites 7, 8, 9, 10, 11, 11a, 12, 13, and SWMU 3, Joint Expeditionary Base (JEB) Little Creek-Fort Story, JEB Little Creek, Virginia Beach, Virginia

PREPARED FOR: Joint Expeditionary Base Little Creek Partnering Team

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This memorandum presents a summary of the basewide repair activities completed at Joint Expeditionary Base (JEB) Little Creek (**Figure 1**) from October 18 to November 10, 2010. Repair activities were completed at Environmental Restoration (ER) Sites 7, 8, 9, 10, 11, 11a, 12, 13, and Solid Waste Management Unit (SWMU) 3; the specific objectives of the repair activities are presented as follows. The repair activities were performed in accordance with the memorandum titled *Project Instructions: Well Repair and Abandonment at Sites 7, 8, 9, 10, 11, 11a, 12, 13, and SWMU 3, Joint Expeditionary Base (JEB) Little Creek-Fort Story, Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia* (CH2M HILL, 2010a), which was provided to the JEB Little Creek Partnering Team on October 7, 2010. This project was conducted for the Mid-Atlantic Division of the Naval Facilities Engineering Command (NAVFAC) under the Comprehensive Long-Term Environmental Action—Navy (CLEAN) 1000 contract number N62470-08-D-1000, Contract Task Order (CTO) 006.

Introduction

On October 1, 2009, Hampton Roads' first Joint Base was established. This new installation comprises the former Naval Amphibious Base (NAB) Little Creek and the Army Post Fort Story; the new name is JEB Little Creek-Fort Story. With the forming of this new command, the Navy assumes responsibility for managing both properties and will now merge public meetings regarding the ongoing ER. However, separate records will be maintained to ensure the integrity of ongoing efforts at both properties. When required for public notices and distributions, the former bases are identified jointly as JEB Little Creek-Fort Story. For ER Program documents, the bases are referred to separately as JEB Little Creek or JEB Fort Story.

JEB Little Creek (**Figure 1**) was placed on the National Priorities List in May 1999 (United States Environmental Protection Agency [USEPA] ID #VA5170022482), and the Federal Facilities Agreement for Little Creek was signed in November 2003 (Navy, 2003). Following desktop audits and/or site inspections by the Navy, USEPA, and the Virginia Department of Environmental Quality (VDEQ), 121 sites warranted No Further Action (NFA).

Final Records of Decision (RODs) have been signed for nine sites at JEB Little Creek:

- **SWMU 7a—**No Action ROD for soil and groundwater
- **SWMU 8—**No Action ROD for soil, groundwater, surface water, and sediment
- **Site 7** – Action ROD for land use controls (LUCs) and groundwater monitoring
- **Site 8—**No Action ROD for soil, groundwater, surface water, and sediment
- **Sites 9 and 10—**Action ROD for LUCs and groundwater monitoring
- **Site 11—**Action ROD for enhanced reductive dechlorination (ERD) with LUCs and post-treatment groundwater monitoring
- **Site 12—**Action ROD for ERD with LUCs and post-treatment groundwater monitoring
- **Site 13—**Action ROD for ERD with LUCs and post-treatment groundwater monitoring

Currently, three sites—Site 11a, SWMU 3, and SWMU 7b—are in the Remedial Investigation and Feasibility Study phase of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) process. Details of investigation history are presented in the Site Management Plan for NAB Little Creek (CH2M HILL, 2010b), which is updated annually and is available in the Administrative Record file.

In accordance with the LUC Remedial Designs (RDs) for sites with action RODs (Sites 9, 10, 11, 12, and 13), LUC inspections are conducted to verify LUCs and the remedy components are maintained. Although a ROD has been signed for Site 7, the LUC RD has not been finalized and thus remedy implementation has not yet been completed. Inspections are conducted at Sites 7 and 11a and SWMUs 3 and 7b to ensure unauthorized activities do not take place and monitoring wells are intact. For sites with a final LUC RD (Sites 9, 10, 11, 12, and 13) the findings from the site inspections and the recommendations for corrective actions are documented in letter reports provided to USEPA and VDEQ. In addition to regularly scheduled inspections, a site visit was conducted by the Navy, USEPA, and VDEQ as part of the 2009 Five-Year Review. The *Five Year Review for Naval Amphibious Base Little Creek, Virginia Beach, Virginia* (CH2M HILL, 2009) documents the inspection findings and corrective action recommendations.

Objectives

The objectives of the monitoring well repair and abandonment activities were to:

- Complete maintenance and repair work recommended in site inspection letter reports and the Five-year Review report.
- Abandon 50 monitoring and application (or injection) wells no longer used for CERCLA activities.

Basewide well abandonment and repair activities were completed at the following sites:

- Site 7—Amphibious Base Landfill (**Figure 2**)
- Site 8—Demolition Debris Landfill (**Figure 3**)
- Site 9—Driving Range Landfill (**Figure 4**)
- Site 10—Sewage Treatment Plant Landfill (**Figure 4**)
- Site 11—School of Music Plating Ship (**Figure 5**)
- Site 11a—Building 3033 Former Waste Oil Tank (**Figure 6**)
- Site 12—Exchange Laundry Waste Disposal Area (**Figure 7**)
- Site 13—Public Works PCP Dip Tank and Wash Rack (**Figure 8**)
- SWMU 3—Pier 10 Sandblast Yard (**Figure 9**)

The monitoring and application wells requiring abandonment were located at Site 8, Site 10, Site 11a, and Site 12 (**Figures 3, 4, 6, and 7**, respectively). Four monitoring wells at Site 8 were designated for abandonment because an NFA ROD has been signed for this site, and continued monitoring is therefore not required. One monitoring well at Site 10 was designated for abandoned because the monitoring well is located within the landfill boundary; monitoring within the landfill boundary is no longer necessary. Thirty-five application wells (25 locations) at Site 11a and 10 multi-level wells at Site 12 were designated for abandonment. Based on the construction and/or location of the Site 11a application wells and Site 12 multi-level wells, the wells are not anticipated to be used for the Site 11a or Site 12 remedial action.

Pre-mobilization Activities

A field kickoff was held prior to mobilization to discuss the field activities and relevant health and safety topics. Health and safety meetings were held daily during repair and abandonment activities to discuss worker responsibilities, review the Health and Safety Plan, and to review the specifics of the work task. The activity hazard analyses were also reviewed and signed by field staff.

Methods and Summary of Corrective Actions

A summary of the well repair and abandonment details is included in **Table 1** and site layouts are presented in **Figure 2** through **Figure 9.** The following tasks were completed as part of the monitoring well repairs and abandonment activities:

Well Repair

- Replacement of damaged and/or non-functioning bolts, well caps, and padlocks.
- Removal of existing concrete pads and installation of new concrete pads to replace damaged bollards, broken pads, or broken and/or mislabeled manhole casings.
- Repair of stripped flanges using a HeliCoil Thread Repair Kit.
- Application of weather-resistant stickers to the polyvinyl chloride (PVC) well riser within the manhole casing on all monitoring wells and injection wells.

To complete some of the repair activities, the height of the well casing was altered for select wells (**Table 1**). Wells with casing elevations that were altered during the repair effort were subsequently resurveyed. The survey data is presented in **Table 2**.

Well Abandonment

Well abandonment was completed for a total of 49 wells in accordance with the procedures outlined in *Virginia Department of Environmental Quality Storage Tank Program Fact Sheet: Monitoring Well Abandonment* and 12 VAC5-630-450 450 (**Attachment A**), with the exception that the wells were not chlorinated. The chlorination step was omitted to prevent the potential generation of chlorination byproducts (chloroform, bromoform, dichlorobromomethane, and dibromochloromethane) typically analyzed for during environmental sampling. Additionally, for sites where ERD was implemented as the remedy, the omission of the chlorination step precludes the potential for the chlorine to damage the dechlorinating microbial populations established as part of remedy systems.

Prior to well abandonment, water levels were collected from each well and the depth of each well was confirmed. Monitoring and application well information, including the water level data, are presented in **Table 3**.

The abandonment of each well consisted of the removal of all protective casings, concrete pads, and bollards where present. Additionally, each well was inspected to ensure no obstructions were present that may impact sealing efforts. The PVC well risers were cut off below grade to an elevation that prevented future exposure. PVC well casings were then filled with a fluid bentonite grout mixture (approximately 7.5 pounds of bentonite grout mixture per gallon of water) using a tremie pipe. The tremie pipe remained submerged in the grout mixture during filling to avoid bridging and gapping within the casing. Following placement of the bentonite grout mixture, bentonite chips were placed to cap the abandon well and the ground surface was restored to match the surrounding area with topsoil and grass seed, asphalt, or concrete, as appropriate.

All materials removed were placed in a 40-cubic-yard roll-off waste container. The waste material included metal casings, PVC piping, tubing, concrete pads, asphalt, and bollards. Waste generated during well repairs and abandonment was disposed of by Waste Management, Inc. at a Subtitle D landfill.

The surveyed coordinates for the wells abandoned under this project are provided in **Attachment B.** Previous survey data were not available for the Site 11a application wells; therefore a survey was completed during the abandonment activities to document well locations. All other wells abandoned during this field event were surveyed during previous investigation or remediation field activities.

Results and Recommendations

During the completion of the planned repair activities and the concurrent completion of the October 2010 ER and LUC site inspections, additional items requiring repairs were noted. When possible, the repairs were completed during this field event. **Table 1** provides a full summary of the well repair and abandonment activities, including whether repairs were fully addressed or require further attention. Of the various repair activities proposed, the

following repairs were not completed due to the accessibility issues described or time constraints. Recommendations are provided for items still requiring attention.

- **LS07-MW02 (Site 7)—**Bollards were not painted. The bollards are scheduled to be painted during the next round of quarterly site inspections.
- **LS07-MW04 (Site 7)—**Bollards were not painted. The bollards are scheduled to be painted during the next round of quarterly site inspections.
- **LS07-MW05 (Site 7)—**Bollards were not in optimal condition and require replacement. The bollards should be replaced and painted during the next appropriate field event.
- **LS11-MW05S (Site 11)—**Stripped flanges were identified and require repair. Stripped flanges should be repaired during the next appropriate field event.
- **LS11-MW06S (Site 11)—**A stripped flange was identified and requires repair. The stripped flange should be repaired during the next appropriate field event.
- **LS11A-AW17 (Site 11a)—**A vehicle was parked directly over the well throughout the repair activities and was not able to be relocated. As a result of access restriction, the abandonment of this application well was not completed. This well should be abandoned during the next appropriate field event. Until abandoned, this well should continue to be included in the ER inspections.
- **LS12-MW09T (Site 12)—**Bollards were not present. Bollards should be installed and painted during the next appropriate field event.
- **LS13-MW08S/D (Site 13)—**Abandonment of these wells is documented in *Final Contractor Closeout Report for PCP Contaminated Soil Removal, Site 13, NAB Little Creek, Virginia Beach, VA* (OHM, 1999). Therefore, no additional action is required.
- **All Wells (Site 13)** - Well labels were not applied to all Site 13 monitoring and injection wells due to time constraints. Site 13 well labels are scheduled to be applied to all Site 13 monitoring and injection wells during the next round of quarterly site inspections.
- **LW03-MW01 (SWMU 3)—**A facility office trailer is positioned directly above the well, and relocation of the office trailer was not feasible during the time the repair activities were completed. As a result of the access restriction, the broken manhole casing was not replaced. This well should be included in the ER inspections until repair or abandonment is completed during the next appropriate field event.
- **LW03-MW05 (SWMU 3)—**This well was unable to be located during the repair activities; therefore the integrity of the well could not be assessed. This well should continue to be included in the ER inspections until it can be located and its functionality assessed.

ER and LUC inspections should continue as scheduled to monitor the effectiveness of the repair activities, complete the items still requiring action, and note any additional items requiring repairs as time progresses.

References

CH2M HILL. 2009. *Five Year Review for Naval Amphibious Base Little Creek, Virginia Beach Virginia*. March.

CH2M HILL. 2010a. *Project Instructions: Well Repair and Abandonment at Sites 7, 8, 9, 10, 11, 11a, 12, 13, and SWMU 3, Joint Expeditionary Base (JEB) Little Creek-Fort Story, Naval Amphibious Base (NAB) Little Creek, Virginia Beach, Virginia.* October 7.

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OHM Remediation Services Corp. (OHM). 1999. *Final Contractor Closeout Report for PCP Contaminated Soil Removal, Site 13, NAB Little Creek, Virginia Beach, VA*. July.

List of Attachments

Attachments

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TABLE 1
Well Repair and Abandonment Details
Basewide Well Repair and Abandonment Summary
Joint Expeditionary Base (JEB) Little Creek
Virginia Beach, Virginia

Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
Site 7	LS07-MW01	Protective bollards require painting	Painted four bollards	None
Site 7	LS07-MW02	Two protective bollards broken	Installed two protective bollards, re-poured concrete pad	Paint four bollards
Site 7	LS07-MW03	Protective bollards require painting	Painted four bollards	None
Site 7	LS07-MW04	Protective bollards require painting	None	Paint four bollards
Site 7	LS07-MW05	Protective bollards require painting; one broken bollard **	Painted three bollards	Replace and paint broken bollard
Site 7	LS07-MW06	Protective bollards require painting	Painted four bollards	None
Site 7	LS07-MW07	Protective bollards require painting	Painted four bollards	None
Site 7	LS07-MW08	Protective bollards require painting	Painted four bollards	None
Site 7	LS07-MW09	Protective bollards require painting	Painted four bollards	None
Site 8	LS08-MW01	Well abandonment	Abandoned monitoring well	None
Site 8	LS08-MW02	Well abandonment	Abandoned monitoring well	None
Site 8	LS08-MW04	Well abandonment	Abandoned monitoring well	None
Site 8	LS08-MW05	Well abandonment	Abandoned monitoring well	None
Site 9	LS09-MW01 *	Lid not labeled as monitoring well	Replaced with 12" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 9	LS09-MW02	Protective bollards require painting	Painted four bollards	None
Site 9	LS09-UST 03	Protective bollards require painting	Painted four bollards	None
Site 9	LS09-MW04	Protective bollards require painting	Painted four bollards	None
Site 9	LS09-MW05	Protective bollards require painting	Painted four bollards	None
Site 9	LS09-MW06	Protective bollards require painting	Painted four bollards	None
Site 9	LS09-MW07 *	Broken flange/casing	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 10	LS10-MW04	Protective bollards require painting	Painted four bollards	None
Site 10	LS10-MW05	Two protective bollards broken; bollards require painting	Installed two protective bollards, re-poured concrete pad and painted four bollards	None
Site 10	LS10-MW06 *	Broken flange/casing; protective bollards require painting	Replaced casing with 4" stick-up casing, painted four bollards	None
Site 10	LS10-MW07	Well abandonment	Abandoned monitoring well	None

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Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
Site 11	LS11-IW01	Two broken bolts **	Replaced bolts	None
Site 11	LS11-IW15	One broken bolt	Replaced bolt	None
Site 11	LS11-MW01T	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 11	LS11-MW03T	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 11	LS11-MW04D	Three stripped flanges	Repaired stripped flanges	None
Site 11	LS11-MW05S	Three stripped flanges **	None	Repair stripped flange
Site 11	LS11-MW05D	Two stripped flanges	Repaired stripped flanges, replaced 2" j-plug and lock **	None
Site 11	LS11-MW06S	One stripped flange **	None	Repair stripped flange
Site 11	LS11-MW10D	Three stripped flanges	Repaired stripped flanges	None
Site 11	LS11-MW11D	Three stripped flanges; rusted lock**	Repaired stripped flanges, replaced 2" j-plug and lock	None
Site 11	LS11-MW12D	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 11	LS11-MW13D	Broken flange/casing	Replaced with new 8" manhole well casing labeled monitoring well. Re-poured concrete pad using a sonotube	None
Site 11	LS11-MW14D	One stripped flange	Repaired stripped flange	None
Site 11	LS11-MW18Y	Broken flange/casing	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 11	LS11-MW23D	Two stripped flanges	Repaired stripped flanges	None
Site 11	LS11-MW24D	Broken flange/casing	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 11	LS11-MW25D	Broken flange/casing	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 11	LS11-MW27D	Broken flange/casing	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 11	LS11-MW28D	One stripped flange; missing well cap	Repaired stripped flange, replaced 4" j-plug	None
Site 11	LS11-MW29D	Broken flange/casing	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad using a sonotube	None
Site 11	LS11-MW30D	One stripped flange	Repaired stripped flange	None
Site 11	LS11-MW36D	One broken bolt, rusted lock	Replaced bolt, replaced 2" j-plug and lock	None
Site 11	LS11-MW37D	Two broken bolts	Replaced bolts	None

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Virginia Beach, Virginia

Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
Site 11a	LS11A-AW01	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW02	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW03	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW04	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW05	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW06	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW07	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW08	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW09	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW10	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW11	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW12	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW13	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW14/15	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW16	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW17	Well abandonment	Inaccessible; vehicle parked over well	Abandon well
Site 11a	LS11A-AW18	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW19	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW20/21	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW22/23	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW24/25	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW26/27	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW28/29	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW30/31	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW32/33	Well abandonment	Abandoned application well	None
Site 11a	LS11A-AW34/35	Well abandonment	Abandoned application well	None

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Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
Site 11a	LS11-MW16D	One stripped flange	Repaired stripped flange	None
Site 11a	LS11-MW17D	Three stripped flanges **	Repaired stripped flanges	None
Site 11a	LS11-MW20D	One stripped flange	Repaired stripped flange	None
Site 11a	LS11-MW21D	One stripped flange	Repaired stripped flange	None
Site 11a	LS11-MW22D	Three stripped flanges	Repaired stripped flanges	None
Site 11a	LS11-MW31D	Two stripped flanges	Repaired stripped flanges	None
Site 11a	LS11-MW32D	One broken bolt	Replaced bolt	None
Site 11a	LS11-MW33D	Two broken bolts	Replaced bolts	None
Site 11a	LS11A-MW37D	Broken lock **	Replaced lock	None
Site 11a	LS11A-MW38D	Two stripped flanges **	Repaired stripped flanges	None
Site 12	LS12-I06 *	Missing bolts	Installed two bolts	None
Site 12	LS12-I07 *	Two broken bolts	Replaced with 12" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 12	LS12-I08S *	Broken flange/casing **	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 12	LS12-I13	One broken bolt	Replaced bolt	None
Site 12	LS12-I14 *	Broken flange/casing; cracked concrete pad	Replaced with 12" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 12	LS12-I18	Cracked concrete pad	None; cracks are surficial, well integrity is not compromised	None
Site 12	LS12-I19 *	Broken flange/casing; cracked concrete pad **	Replaced with 2" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 12	LS12-I20	One broken bolt	Replaced bolt	None
Site 12	LS12-I21	Two broken bolts; missing lock	Replaced bolts and lock	None
Site 12	LS12-I25	Two broken bolts **	Replaced bolts	None
Site 12	LS12-I27	Two broken bolts **	Replaced bolts	None
Site 12	LS12-I28	One broken bolt	Replaced bolt	None

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Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
Site 12	LS12-ML10	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML11	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML12	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML13	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML14	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML15	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML19	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML20	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML21	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-ML22	Well abandonment	Abandoned multi-level well	None
Site 12	LS12-MW02Y	Protective bollards require painting	Painted four bollards	None
Site 12	LS12-MW03D	Protective bollards require painting	Painted four bollards	None
Site 12	LS12-MW03S	Protective bollards require painting	Painted four bollards	None
Site 12	LS12-MW04S	Protective bollards require painting	Painted four bollards	None
Site 12	LS12-MW09T	Missing protective bollards **	None	Install bollards
Site 12	LS12-MW17D	One stripped flange	Repaired stripped flange	
Site 12	LS12-MW18T	Protective bollards require painting	Painted four bollards	None
Site 12	LS12-MW20D	Three stripped flanges **	Repaired stripped flange(s)	None
Site 12	LS12-MW24S/D	Two broken bolts	Replaced bolts	None
Site 12	LS12-MW25S/D	Two broken bolts **	Replaced bolts	None
Site 12	LS12-MW26T	Two stripped flanges **	Repaired stripped flanges	None
Site 12	LS12-MW27S/D	Two broken bolts	Replaced bolts	None
Site 12	LS12-MW32S/D	One stripped flange	Repaired stripped flange	None
Site 12	LS12-MW33D	Two broken bolts **	Replaced bolts	None
Site 12	LS12-MW35S	One broken bolt	Replaced bolt	None
Site 12	LS12-MW36S/D	Missing protective bollards ** protective bollards require painting	Installed and painted six protective bollards	None

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Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
Site 13	LS13-MW01T *	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, extended PVC height with 4" of PVC and PVC riser, concrete pad re-poured using sonotube, j-plug and lock replaced	None
Site 13	LS13-MW02T *	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, extended PVC height with 4" of PVC and PVC riser, concrete pad re-poured using sonotube, j-plug and lock replaced	None
Site 13	LS13-MW03T *	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad.	None
Site 13	LS13-MW04T	Lid not labeled as monitoring well **	Replaced with appropriate well cover	None
Site 13	LS13-MW05S *	Missing lock, broken well cap	Repaired broken well cap by removing cap and extending PVC height with 4" of PVC and PVC riser, replaced lock and j-plug	None
Site 13	LS13-MW06S *	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 13	LS13-MW08S/D	Buried flush mount well	None; identified documentation of well abandonment	None
Site 13	LS13-MW09S *	Broken flange/casing	Replaced with 8" manhole well casing labeled monitoring well, re-poured concrete pad	None
Site 13	LS13-MW10T *	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad, replaced lock and j-plug	None
Site 13	LS13-MW11D	One stripped flange	Repaired stripped flange	None
Site 13	LS13-MW11S *	Lid not labeled as monitoring well	Replaced with 8" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 13	LS13-MW12S *	Two broken bolts **	Replaced with 8" manhole well casing labeled monitoring well, re-poured concrete pad	None
Site 13	LS13-MW12D	Three stripped flanges	Repaired stripped flanges	None
Site 13	LS13-MW13S *	Lid not labeled as monitoring well	Incorrect lid was removed and replaced with a new 8" manhole well head casing labeled monitoring well, re-poured concrete pad	None
Site 13	LS13-MW16T	Protective bollards require painting	Painted four bollards	None
Site 13	LS13-MW18T	Three stripped flanges	Repaired stripped flanges	None
Site 13	LS13-MW29D *	Two broken bolts	Replaced with 8" manhole well casing labeled monitoring well, re-poured concrete pad using a sonotube	None

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Basewide Well Repair and Abandonment Summary
Joint Expeditionary Base (JEB) Little Creek
Virginia Beach, Virginia

Site	Well Identification	Identified for Repair/Abandonment	Well Repairs Completed	Future Repairs Identified
SWMU 3	LW03-MW01	Broken flange/casing	Inaccessible; office trailer located over well	Repair flange/casing
SWMU 3	LW03-MW02	Protective bollards require painting	Painted four bollards	None
SWMU 3	LW03-MW03	One stripped flange	Repaired stripped flange	None
SWMU 3	LW03-MW04 *	Broken flange/casing	Replaced existing manhole casing with 8" manhole casing labeled monitoring well, re-poured concrete pad and replaced j-plug	None
SWMU 3	LW03-MW05	Buried flush mount well	None	Continue to attempt to locate
SWMU 3	LW03-MW06	Three stripped flanges **	Repaired stripped flanges	None
SWMU 3	LW03-MW07	Three stripped flanges **	Repaired stripped flanges	None
SWMU 3	LW03-MW08	One stripped flange	Repaired stripped flange	None
SWMU 3	LW03-MW12 *	One broken bolt	Replacing with 8" manhole casing labeled monitoring well, re-poured concrete pad	None

Notes:
* Top of casing was altered during well repair; well needs to be resurveyed
** Identified during completion of concurrent repair and site inspection activities
With the exception of Site 13, weather-resistant stickers were applied to the PVC well riser within the manhole casing of monitoring wells and injection wells
Bollards were painted by scraping existing paint and/or rust using sandpaper and adding two heavy coats of yellow paint to protective bollarc
Unless otherwise noted, broken bolt and stripped flange repairs were completed by overdrilling the broken bolt(s) and using a HeliCoil thread repair kit
Where present, bollards were removed during well abandonment

TABLE 2
Well Survey Data
Basewide Well Repair and Abandonment Summary
Joint Expeditionary Base (JEB) Little Creek
Virginia Beach, Virginia

Site	Well Number	Top of Well (ft msl)	Top of Casing (ft msl)	Northing	Easting
Site 9	LS09-MW01	6.98	5.96	3,504,108.27	12,168,416.52
	LS09-MW07	6.50	6.24	3,504,059.27	12,168,058.65
Site 10	LS10-MW06	11.37	10.77	3,503,533.17	12,166,624.77
Site 11	LS11-MW01T	8.18	7.28	3,501,038.24	12,169,492.63
	LS11-MW03T	6.92	5.58	3,501,088.21	12,169,525.24
	LS11-MW12D	8.61	7.85	3,500,774.37	12,169,653.51
	LS11-MW13D	7.84	7.55	3,500,684.15	12,169,137.57
	LS11-MW18Y	8.23	7.91	3,501,206.11	12,169,558.85
	LS11-MW24D	7.73	7.43	3,501,048.80	12,169,511.07
	LS11-MW25D	7.36	6.97	3,501,059.24	12,169,503.62
	LS11-MW27D	7.01	6.61	3,501,062.87	12,169,527.72
	LS11-MW29D	7.56	7.25	3,501,050.65	12,169,499.21
Site 12	LS12-106	11.33	11.05	3,499,320.36	12,171,475.00
			11.08		
	LS12-107	10.62	10.29	3,499,291.32	12,171,457.57
			10.29		
	LS12-108S	10.41	9.95	3,499,278.85	12,171,446.93
	LS12-114	10.70	10.40	3,499,281.23	12,171,625.72
			10.37		
	LS12-119	10.62	10.30	3,499,271.81	12,171,682.36
			10.31		
Site 13	LS13-MW01T	6.61	6.14	3,501,416.15	12,168,899.38
	LS13-MW02T	5.91	5.45	3,501,377.67	12,168,777.86
	LS13-MW03T	6.96	6.28	3,501,260.51	12,168,792.61
	LS13-MW05S	6.88	6.49	3,501,326.79	12,168,961.83
	LS13-MW06S	7.23	6.57	3,501,169.23	12,168,736.63
	LS13-MW09S	7.26	6.96	3,501,113.71	12,168,773.13
	LS13-MW10T	7.08	6.35	3,501,122.12	12,168,729.26
	LS13-MW11S	7.46	6.66	3,501,073.25	12,168,667.36
	LS13-MW12S	7.02	6.60	3,501,003.71	12,168,745.68
SWMU 3	LW03-MW04	6.01	5.72	3,500,754.84	12,159,615.55
	LW03-MW12	6.77	6.37	3,500,930.28	12,159,638.94

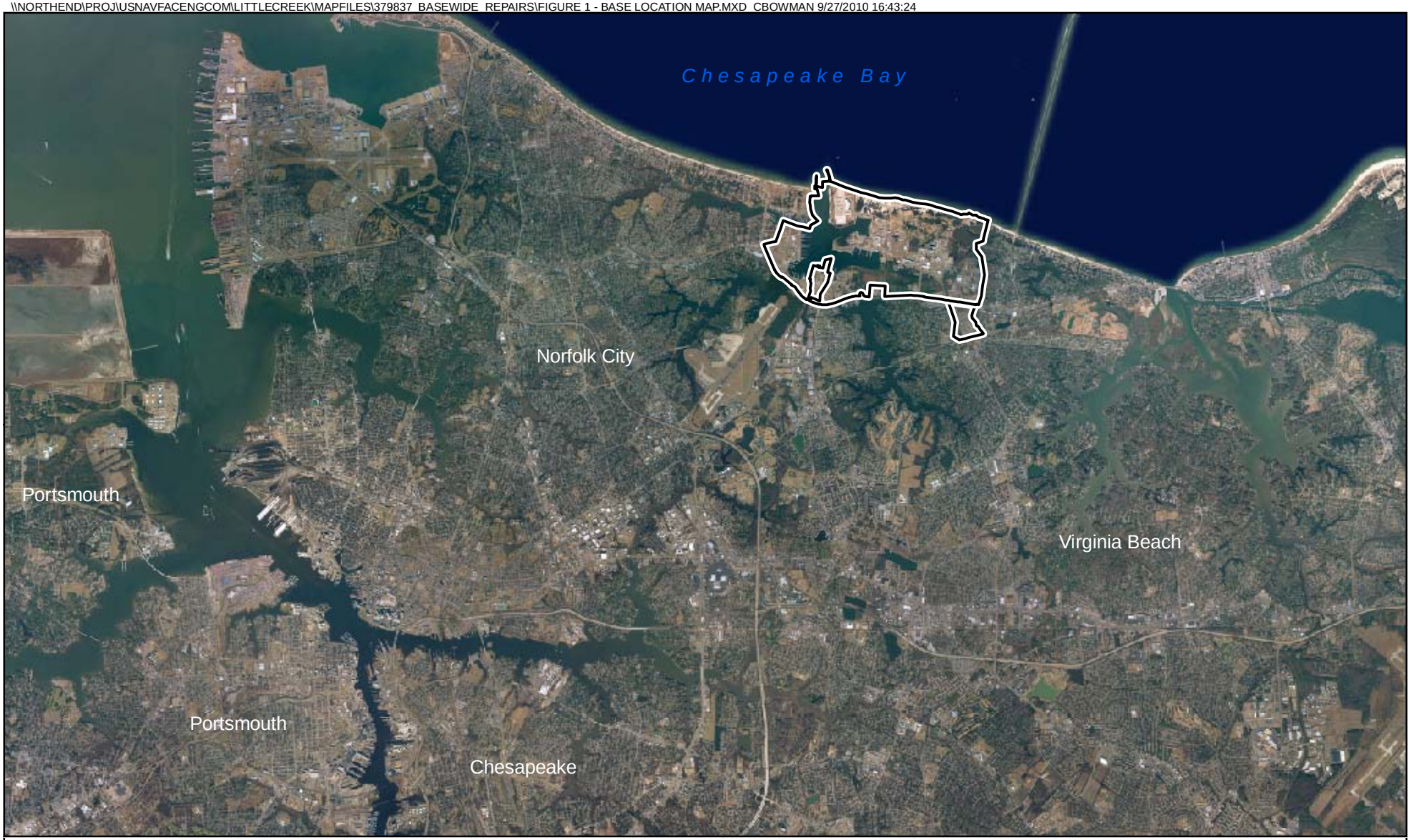
TABLE 3
Well Abandonment Details
Basewide Well Repair and Abandonment Summary
Joint Expeditionary Base (JEB) Little Creek
Virginia Beach, Virginia

Well ID	Site	Date Abandoned	Diameter (in.)	Depth to Water (ft)	Depth to Bottom (ft)	Restoration	Casing Type
LS08-MW01	Site 8	10/27/2010	2	10.80	17.4	Woods/Marsh	Stick-up
LS08-MW02	Site 8	10/27/2010	2	4.98	15.0	Woods/Marsh	Stick-up
LS08-MW04	Site 8	10/27/2010	2	4.80	15.0	Woods/Marsh	Stick-up
LS08-MW05	Site 8	10/27/2010	2	4.83	20.0	Woods/Marsh	Stick-up
LS10-MW07	Site 10	10/21/2010	2	8.13	15.7	Grass	Flush mount
LS11A-AW01	Site 11a	10/26/2010	2	6.10	26.0	Grass	Flush mount
LS11A-AW02	Site 11a	10/26/2010	2	5.20	26.0	Grass	Flush mount
LS11A-AW03	Site 11a	10/22/2010	2	5.20	26.0	Grass	Flush mount
LS11A-AW04	Site 11a	10/26/2010	2	5.40	26.0	Grass	Flush mount
LS11A-AW05	Site 11a	10/26/2010	2	5.61	26.0	Grass	Flush mount
LS11A-AW06	Site 11a	10/22/2010	2	5.20	26.0	Grass	Flush mount
LS11A-AW07	Site 11a	10/26/2010	2	5.40	26.0	Grass	Flush mount
LS11A-AW08	Site 11a	10/26/2010	2	5.41	26.0	Grass	Flush mount
LS11A-AW09	Site 11a	10/26/2010	2	5.40	26.0	Grass	Flush mount
LS11A-AW10	Site 11a	10/26/2010	2	5.62	26.0	Grass	Flush mount
LS11A-AW11	Site 11a	10/22/2010	2	5.90	26.0	Grass	Flush mount
LS11A-AW12	Site 11a	10/22/2010	2	5.30	26.5	Grass	Flush mount
LS11A-AW13	Site 11a	10/22/2010	2	5.10	26.0	Grass	Flush mount
LS11A-AW14/15	Site 11a	10/26/2010	2	5.76	26 / 16	Asphalt	Flush mount
LS11A-AW16	Site 11a	10/26/2010	2	5.20	26.0	Asphalt	Flush mount
LS11A-AW18	Site 11a	10/28/2010	2	4.70	26.0	Asphalt	Flush mount
LS11A-AW19	Site 11a	10/28/2010	2	5.00	26.0	Asphalt	Flush mount
LS11A-AW20/21	Site 11a	10/28/2010	2	3.40	26 / 16	Asphalt	Flush mount
LS11A-AW22/23	Site 11a	10/28/2010	2	4.40	26 / 16	Asphalt	Flush mount
LS11A-AW24/25	Site 11a	10/28/2010	2	4.30	26 / 16	Asphalt	Flush mount
LS11A-AW26/27	Site 11a	10/28/2010	2	4.39	26 / 16	Asphalt	Flush mount
LS11A-AW28/29	Site 11a	10/22/2010	2	6.30	26 / 16	Grass	Flush mount
LS11A-AW30/31	Site 11a	10/22/2010	2	6.10	25.8 / 16	Grass	Flush mount
LS11A-AW32/33	Site 11a	10/22/2010	2	6.00	26 / 16	Grass	Flush mount
LS11A-AW34/35	Site 11a	10/22/2010	2	6.10	26 / 16	Grass	Flush mount
LS12-ML10 *	Site 12	10/28/2010	2	7.80	23.0	Concrete	Flush mount
LS12-ML11 *	Site 12	10/28/2010	2	7.52	24.0	Asphalt	Flush mount
LS12-ML12 *	Site 12	10/27/2010	2	5,90	22.0	Grass	Flush mount
LS12-ML13 *	Site 12	10/27/2010	2	2.92	23.0	Grass	Flush mount
LS12-ML14 *	Site 12	10/27/2010	2	8.35	22.0	Grass	Flush mount
LS12-ML15 *	Site 12	10/27/2010	2	8.50	22.5	Grass	Flush mount
LS12-ML19 *	Site 12	10/27/2010	2	7.35	24.2	Grass	Flush mount
LS12-ML20 *	Site 12	10/27/2010	2	7.50	24.0	Asphalt	Flush mount
LS12-ML21 *	Site 12	10/27/2010	2	5.83	22.0	Grass	Flush mount
LS12-ML22 *	Site 12	10/27/2010	2	6.95	22.0	Grass	Flush mount

Notes:
* Dedicated tubing inside well

Figures

\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 1 - BASE LOCATION MAP.MXD CBOWMAN 9/27/2010 16:43:24



Legend

Installation Boundary

N
W E
S

0 5,000 10,000 20,000
Feet

Figure 1
Base Location Map
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 2 - SITE 7 BASE LANDFILL.MXD CBOWMAN 12/14/2010 13:30:40

Legend

- Sign Location
- Monitoring Well
- Land Use Control Boundary
- Installation Boundary

N
W E
S

0 100 200 400
Feet

Figure 2
Site 7 Amphibious Base Landfill
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 3 - SITE 8 DEMOLITION DEBRIS LANDFILL.MXD CBOWMAN 12/14/2010 13:32:52

Legend
- Monitoring Well
- Area of Investigation
- Installation Boundary

N
W E
S

0 100 200
Feet

Figure 3
Site 8 Demolition Debris Landfill
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 4 - SITE 9 DRIVING RANGE LANDFILL AND SITE 10 SEWAGE TREATMENT PLANT LANDFILL.MXD CBOWMAN 12/14/2010 13:33:12

Legend

- Monitoring Well
- Small Sign (2' x 2')
- Large Sign (6' x 3')
- Shoreline
- Installation Boundary
- LUC boundary

N
W E
S

0 200 400
Feet

Figure 4
Site 9 Driving Range Landfill and Site 10 Sewage Treatment Plant Landfill
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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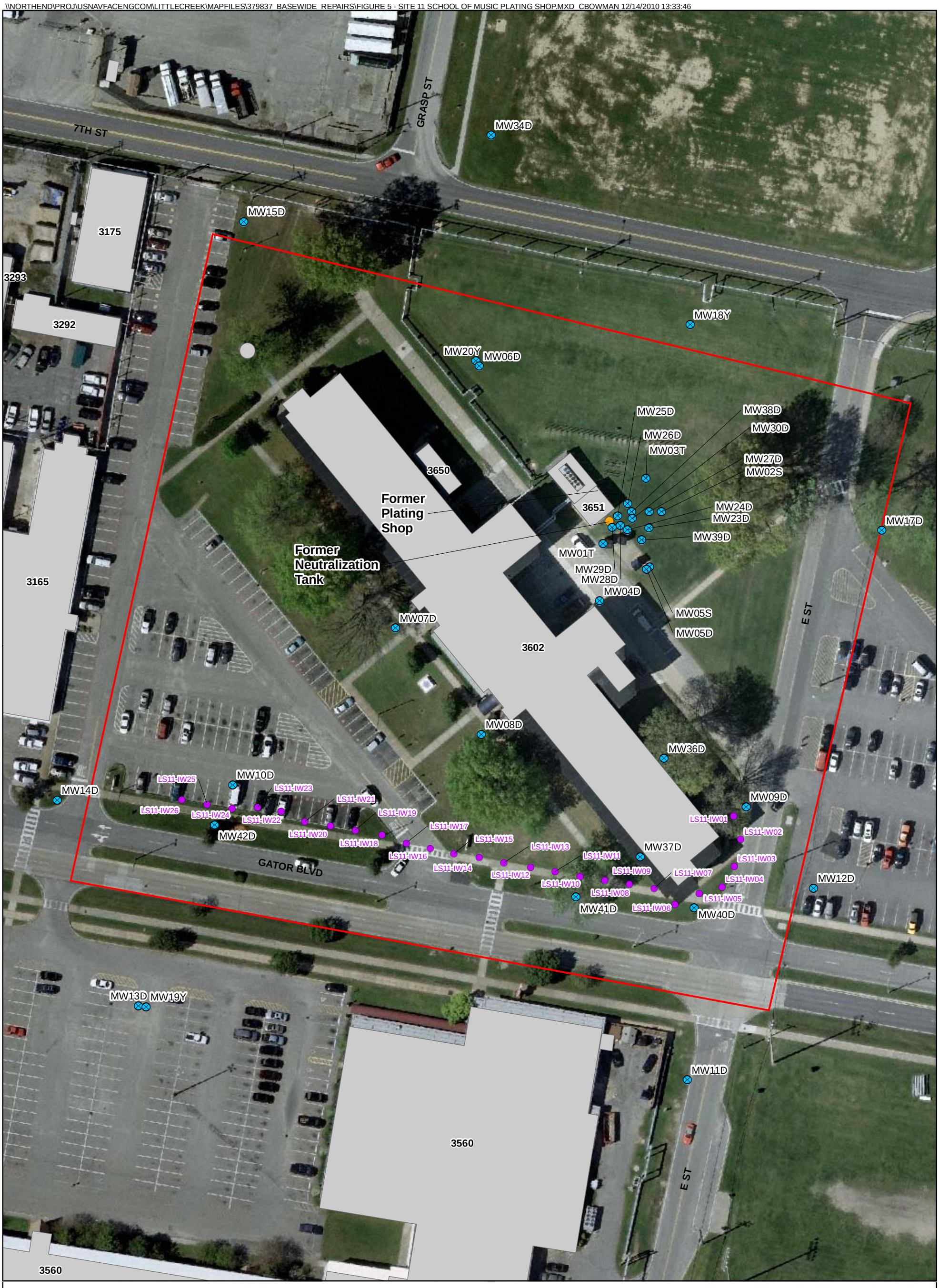
\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 5 - SITE 11 SCHOOL OF MUSIC PLATING SHOP.MXD CBOWMAN 12/14/2010 13:33:46



Legend

- Injection Well
- Monitoring Well
- Land Use Control Boundary
- Buildings

N
W E
S

0 35 70 140
Feet

Figure 5
Site 11 School of Music Plating Shop
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

Note:
Monitoring Well IDs are truncated on this figure:
Actual well IDs start with "LS11-"

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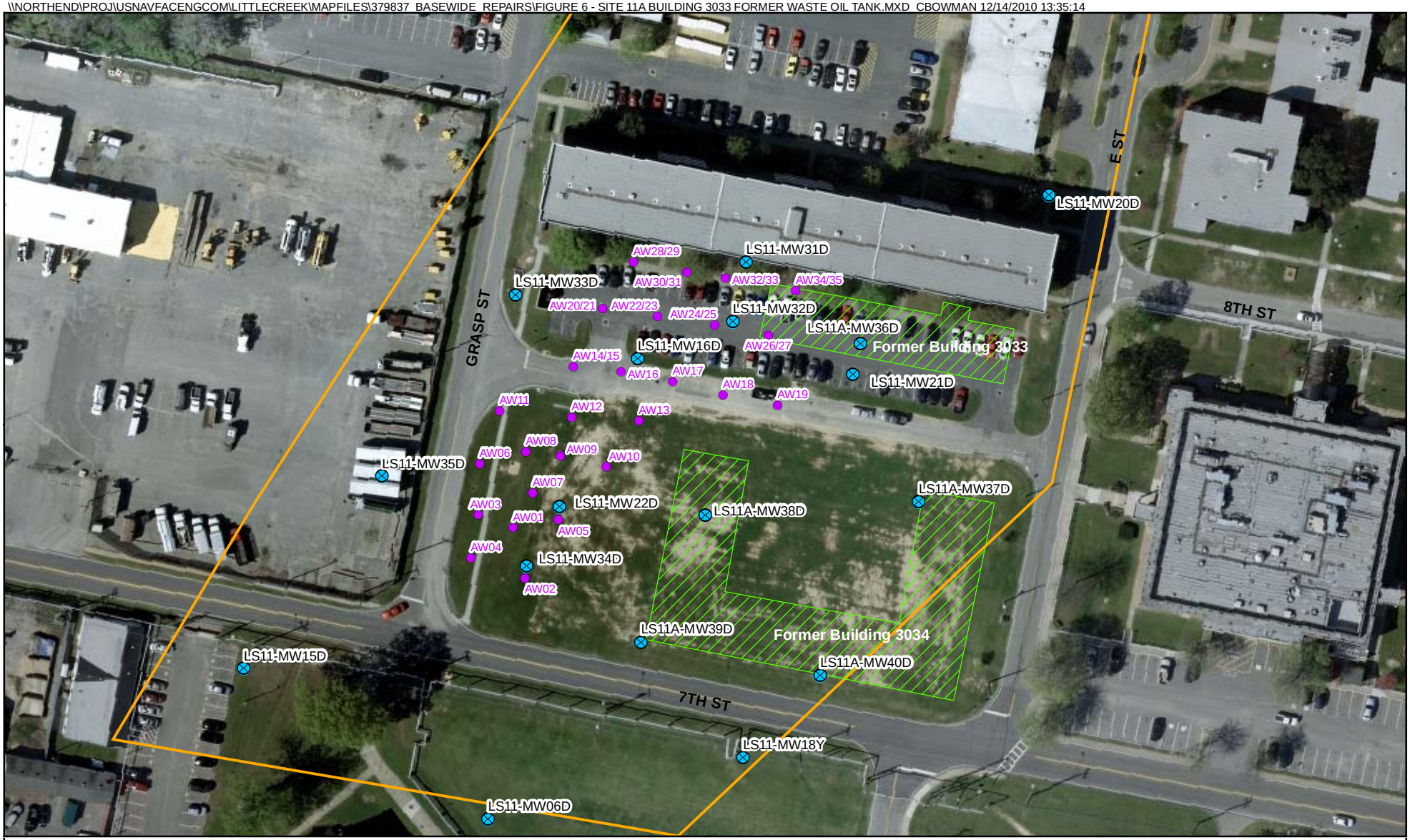
\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 6 - SITE 11A BUILDING 3033 FORMER WASTE OIL TANK.MXD CBOWMAN 12/14/2010 13:35:14



Legend

- Application Well
- Monitoring Well Location
- Area of Investigation
- Demolished Building

N
W E
S

0 100 200 Feet

Figure 6
Site 11a Building 3033 Former Waste Oil Tank
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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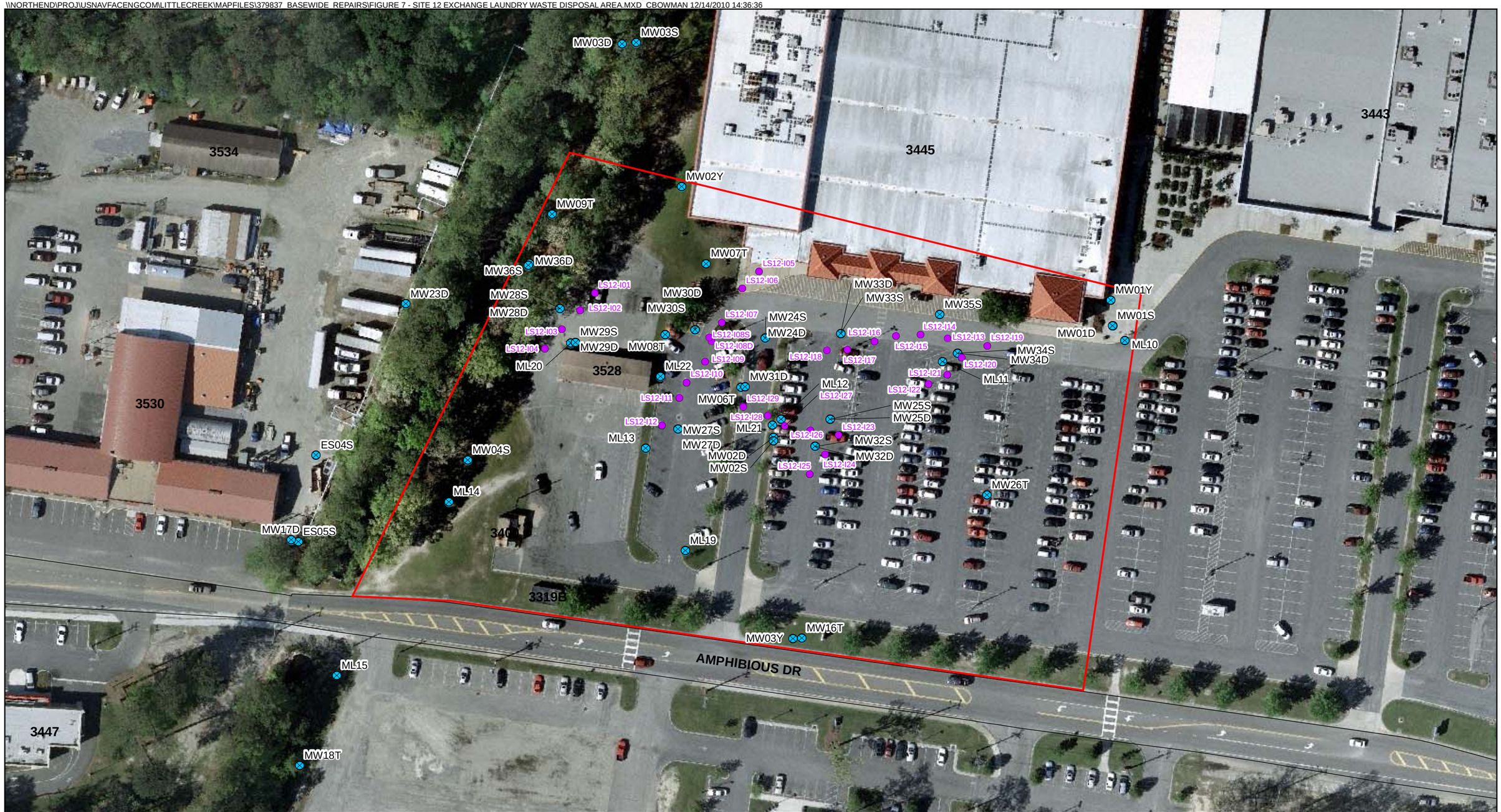
\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 7 - SITE 12 EXCHANGE LAUNDRY WASTE DISPOSAL AREA.MXD CBOWMAN 12/14/2010 14:36:36



Legend

- Injection Well
- Monitoring Well
- LUC Boundary

Note:
Monitoring Well IDs are truncated on this figure:
Actual well IDs start with "LS12-"

N
W E
S

0 40 80
Feet

Figure 7
Site 12 Exchange Laundry Waste Disposal Area
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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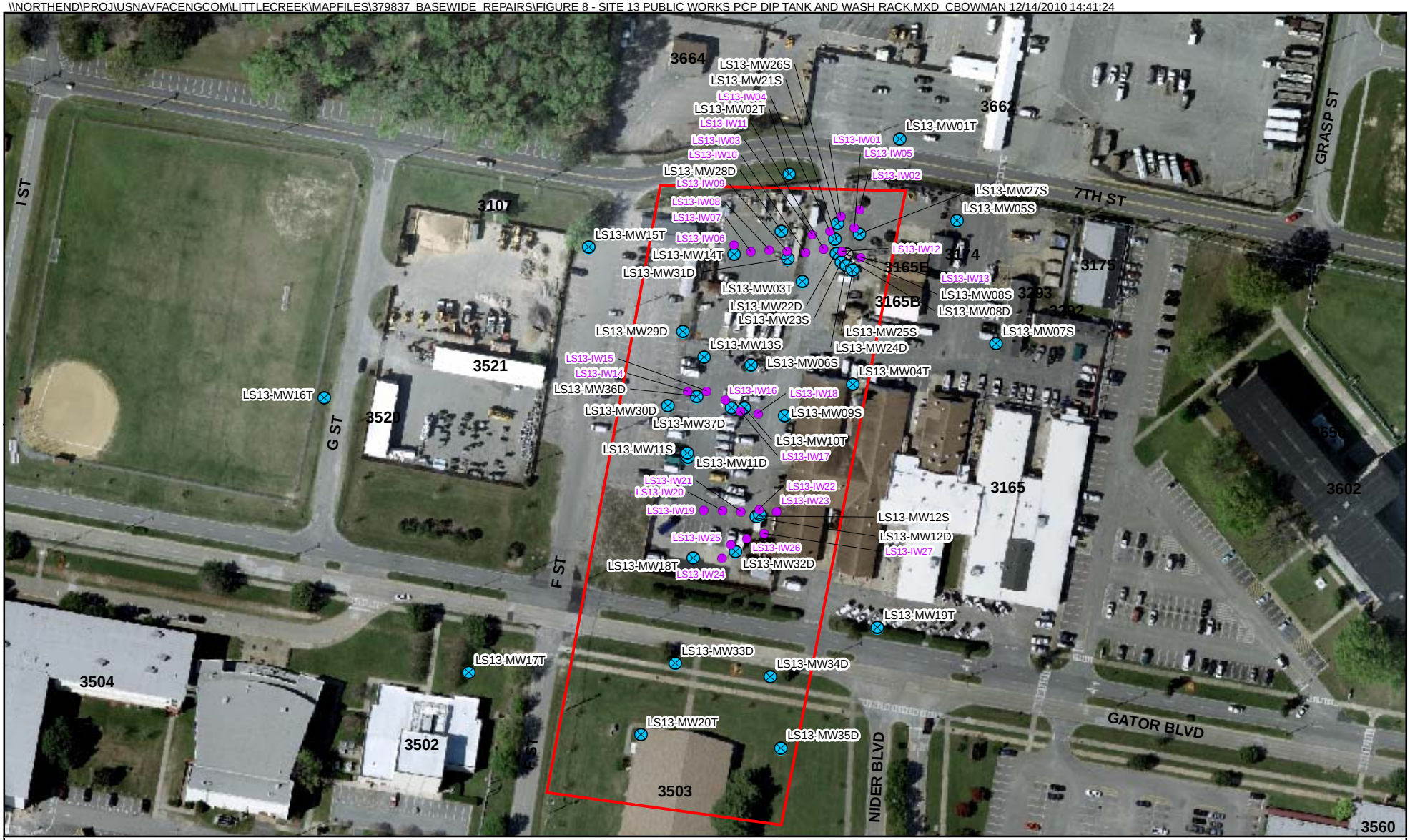
\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 8 - SITE 13 PUBLIC WORKS PCP DIP TANK AND WASH RACK.MXD CBOWMAN 12/14/2010 14:41:24



Legend

- Injection Well
- Monitoring Well
- Abandoned Monitoring Well
- LUC Boundary

N
W E
S

0 75 150
Feet

Figure 8
Site 13 Public Works PCP Dip Tank and Wash Rack
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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\\NORTHEND\PROJ\USNAVFACENGCOM\LITTLECREEK\MAPFILES\379837_BASEWIDE_REPAIRS\FIGURE 9 - SWMU 3 PIER 10 SANDBLAST YARD.MXD CBOWMAN 12/14/2010 14:20:21

Legend

- Monitoring Well
- Area of Investigation

N
W E
S

0 100 200
Feet

Figure 9
SWMU 3 Pier 10 Sandblast Yard
Basewide Well Repair and Abandonment Summary
JEB Little Creek
Virginia Beach, Virginia

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Attachment A
Virginia Department of Environmental Quality
Well Abandonment Procedures

Virginia Department of Environmental Quality Storage Tank Program
Fact Sheet: Monitoring Well Abandonment

Monitoring wells must be properly abandoned after they have served their intended purpose. The abandonment of monitoring wells which were installed for investigations required under Articles 9 and 11 of State Water Control Law will be administered by staff in the DEQ Regional Offices. Responsible Persons (RP) abandoning monitoring wells as part of the SITE CLOSURE PHASE may be eligible for reimbursement of all or part of the cost of the abandonment if those activities are pre-approved by the DEQ Regional Office.

General Requirements

No permits will be necessary for monitoring wells unless they were previously permitted by the Virginia Department of Health.

The Regional Case Manager should be contacted prior to abandonment and the method of abandonment (tremie grouting, over drilling, etc.) should be approved by the Case Manager on the AAF.

If the RP is seeking reimbursement of costs associated with abandoning monitoring wells, an Activity Authorization Package must be submitted to the Regional Case Manager and approved prior to well abandonment.

After monitoring wells are abandoned, a Site Closure Report that describes well abandonment procedures and addresses other site closure issues identified by the Case Manager should be submitted to the Regional Office.

General Abandonment Procedures

The well construction, depth to water table and hydrologic conditions should be reviewed.

If the monitoring well is a water table aquifer well (does not penetrate a confined aquifer) then the primary purpose of the abandonment will be to prevent surface contamination from reaching the groundwater.

If the monitoring well penetrates a confined (deep) aquifer, the primary purpose of the abandonment will be to restore, as far as possible, the original hydrogeologic conditions, and detailed site specific abandonment procedures will need to be developed.

The majority of monitoring wells are in water table aquifers, are 2-6 inches in diameter and are less than 50 feet deep. The following general abandonment procedures may be followed for those monitoring wells.

The surface completion components (vault, manholes, risers, etc.) should be removed.

The well casing should be cut off below grade at an elevation that is unlikely to be exposed at the surface in the future.

The well casing should be filled with a fluid bentonite grout mixture (1-12 lbs. bentonite/1 gallon water) using a tremie pipe and a permanent cap placed over the well casing.

The excavation created by the removal of well surface components should be filled to grade with materials that are compatible with the surrounding area. The surface of this excavated area should then be restored to conform with the surrounding surface.

Attachment B
Survey Coordinates

Attachment B
Survey Coordinates of Abandoned Wells
Basewide Well Repair and Abandonment Summary
Joint Expeditionary Base (JEB) Little Creek
Virginia Beach, Virginia

Site	Well ID	Northing	Easting
Site 8	LS08-MW01	3499100.18400	12166727.68800
Site 8	LS08-MW02	3499296.57200	12167080.45800
Site 8	LS08-MW04	3499471.41900	12166639.50000
Site 8	LS08-MW05	3499451.03900	12166374.54400
Site 10	LS10-MW07	3503441.03000	12167068.55000
Site 11a	LS11A-AW01	3501390.95799	12169413.58220
Site 11a	LS11A-AW02	3501354.17154	12169422.47890
Site 11a	LS11A-AW03	3501400.53227	12169388.19610
Site 11a	LS11A-AW04	3501368.90023	12169382.94830
Site 11a	LS11A-AW05	3501396.52060	12169446.63000
Site 11a	LS11A-AW06	3501437.62379	12169389.46020
Site 11a	LS11A-AW07	3501416.71380	12169428.10560
Site 11a	LS11A-AW08	3501446.72490	12169422.93840
Site 11a	LS11A-AW09	3501443.72079	12169448.23840
Site 11a	LS11A-AW10	3501435.63816	12169481.64000
Site 11a	LS11A-AW11	3501476.39689	12169403.88300
Site 11a	LS11A-AW12	3501471.64504	12169456.36100
Site 11a	LS11A-AW13	3501469.41560	12169505.23690
Site 11a	LS11A-AW14/15	3501508.80891	12169457.68090
Site 11a	LS11A-AW16	3501504.91001	12169492.48700
Site 11a	LS11A-AW17*	3501497.62369	12169530.08630
Site 11a	LS11A-AW18	3501487.96479	12169566.28470
Site 11a	LS11A-AW19	3501480.29035	12169606.13860
Site 11a	LS11A-AW20/21	3501551.00199	12169478.83120
Site 11a	LS11A-AW22/23	3501545.46741	12169519.13000
Site 11a	LS11A-AW24/25	3501539.15330	12169560.16380
Site 11a	LS11A-AW26/27	3501531.81772	12169599.31120
Site 11a	LS11A-AW28/29	3501584.87398	12169501.27150
Site 11a	LS11A-AW30/31	3501577.34522	12169540.41280
Site 11a	LS11A-AW32/33	3501573.18792	12169567.96480
Site 11a	LS11A-AW34/35	3501563.90666	12169619.29570
Site 12	LS12-ML10 **	3499275.60000	12171798.90000
Site 12	LS12-ML11 **	3499257.93100	12171644.60800
Site 12	LS12-ML12 **	3499208.90000	12171507.60000
Site 12	LS12-ML13 **	3499184.30000	12171393.00000
Site 12	LS12-ML14 **	3499139.30000	12171226.30000
Site 12	LS12-ML15 **	3498992.30000	12171131.20000
Site 12	LS12-ML19 **	3499098.06000	12171426.51000
Site 12	LS12-ML20 **	3499273.36700	12171329.56600
Site 12	LS12-ML21 **	3499204.07200	12171500.36700
Site 12	LS12-ML22 **	3499245.31200	12171405.68500

Notes:

** Application well not abandoned. To be abandoned during future basewide repair event.

* Dedicated tubing inside well

Survey data for wells located at Sites 8, 10, and 12 are based on formerly obtained survey information.

Site 11a application wells were surveyed during this field event (November 10, 2010).

Coordinate System: NAD 1983 State Plane Virginia South

Vertical datum: NAVD 88