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STATEMENT OF BASIS/ PROPOSED FINAL GROUNDWATER REMEDY DECISION SOLID
WASTE MANAGEMENT UNIT 54 NAVAL ACTIVITY PUERTO RICO

6/1/2012
CH2MHILL

**STATEMENT OF BASIS /
PROPOSED FINAL GROUNDWATER REMEDY DECISION**

**REGION 2
ID# PR2170027203**

**NAVAL ACTIVITY PUERTO RICO (former Naval Station Roosevelt Roads)
Ceiba, Puerto Rico
(June 2012)**

Facility/Unit Type: SWMU 54 Benzene/Ethylbenzene Area (former NEX repair/maintenance shop)

Contaminants:

Groundwater: Benzene and ethylbenzene.

Proposed Final Remedy:

Biosparging.

FACILITY BACKGROUND

SWMU 54 is the Former Naval Exchange Repair/Maintenance Shop (Building 1914), which was constructed in 1979. It has been demolished, but was located on approximately 1 acre of land in the Bundy Area of NAPR. An underground storage tank (UST) was present at the site and used to store fuel until its removal in December 1992. The date of installation and type of fuel stored is unknown, but is assumed to be gasoline. The building was used to perform maintenance on vehicles, including oil changes and lubrications. No wastes are known to have been disposed of at the unit and there are no known releases related to the unit (Baker, 2005).

According to the Corrective Measures Study (Baker, 2005), two areas of groundwater contamination were identified at SWMU 54: a trichloroethene (TCE) plume east of Bairoko Street and a benzene plume west of Bairoko Street (Figure 1). This statement of basis focuses only on the SWMU 54 benzene area. The TCE area is discussed in the SWMU 54 TCE Plume Statement of Basis.

PROPOSED REMEDY

The site cleanup will be accomplished through installation of a biosparge system. Sparge wells will be installed in both the shallow and deep zones and air will be injected at low rates to enhance aerobic degradation of benzene and ethylbenzene in groundwater.

Current land use controls (LUCs), including restricted access to the SWMU 54 area through security fencing and prohibited use of groundwater, will be maintained until the CAOs are achieved in both the TCE area and the benzene/ethylbenzene area. When corrective action is complete, LUCs must be maintained including:

- No permanent residences may be installed on the property.
- No groundwater extraction wells may be installed by the deed grantee.

- Potential for vapor intrusion must be considered by the developer and addressed by the developer, as needed.
- The grantee may not interfere with any existing or future groundwater remedial systems.
- The grantee must complete annual inspections of the property to ensure all LUCs are being complied with and provide written certification of the inspection.
- The grantee must comply with the Resource Conservation and Recovery Act (RCRA) Administrative Order on Consent for this property (provided to the Puerto Rico Local Redevelopment Authority [LRA] by the U.S. Navy).
- Release of environmental conditions and grantee covenants can be considered only with U.S. Environmental Protection Agency (EPA) concurrence.
- In order to develop, improve, use, or maintain the property in a manner inconsistent with the LUCs, the grantee must submit a written request seeking approval to the Director at the NAVFAC Base Realignment and Closure (BRAC) Program Management Office, Southeast.

Additionally, the extent of ethylbenzene in groundwater will be verified prior to installation of the biosparge system. Characterization of the southeast portion of the plume will also be completed prior to installation of the biosparge system.

The extent of benzene in groundwater is shown in Figure 2.

SUMMARY OF FACILITY RISKS

Historical releases of benzene/ethylbenzene are thought to have been periodic spills and no additional releases are occurring.

According to data collected during pilot-scale testing in 2009 and 2010 and the CMS, no soil contamination exists in the benzene area, though benzene and ethylbenzene were identified in groundwater.

The extent of the benzene plume has been defined, but there is no current baseline data for ethylbenzene. However, both compounds are constituents of gasoline and share similar properties, so it is assumed it will be associated with the benzene plume. Ethylbenzene tends to be more sorbed to soils and less soluble in groundwater when compared to benzene, so migration of ethylbenzene will be more limited than benzene. The rate of groundwater flow has been determined to be very slow at about 1 foot per year. Thus, contaminated groundwater is not migrating outside the SWMU 54 area and no surface water discharge is expected from the plume at SWMU 54. Also, there are no surface water bodies within or near to SWMU 54 that could be contaminated by groundwater from SWMU 54.

The groundwater beneath SWMU 54 was demonstrated to be unusable as a potable water supply because of the brackish/saline nature of the area groundwater, with high levels of total dissolved solids and salinity, as detailed in the Groundwater Usability Assessment, Naval Activity Puerto Rico, Ceiba, Puerto Rico Technical Memorandum (Appendix D of the SWMU 54 Corrective Measures Study Addendum [AGVIQ, CH2M HILL, 2012a]).

Under current land use, no direct exposure to site groundwater is occurring. Additionally, the area downgradient of SWMU 54 is undeveloped and no potential for groundwater exposure exists in this area. However, indirect exposure pathway through volatilization of benzene/ethylbenzene to ambient air and indoor air could occur in the SWMU 54 benzene/ethylbenzene plume area. Therefore, this indirect exposure pathway was considered complete for deriving the cleanup criteria for the site groundwater.

The cleanup criteria were developed for industrial (indoor) worker and construction worker scenarios as presented in the Revised Corrective Action Objectives for Solid Waste Management Units 7&8, 54, and 55 Technical Memorandum (Appendix C of the SWMU 54 Corrective Measures Study Addendum [AGVIQ-CH2M HILL, 2012a]).

SCOPE OF CORRECTIVE ACTION

Two shallow groundwater monitoring wells will be installed to complete the definition of the southeast portion of the plume.

Twenty-six vertical air injection wells will be installed within the contaminant plume. The wells will be installed at two different levels to address shallow and deep contamination. The proposed locations of the shallow and deep injection wells are depicted on Figures 3 and 4, respectively. The wells will be placed in rows oriented perpendicular to the direction of groundwater flow. The well spacing or number of injection wells may be revised after the baseline benzene and ethyl benzene data are acquired.

Air will be injected into the biosparge wells at a low flow rate with the goal of increasing oxygen levels in groundwater to stimulate aerobic biodegradation of benzene and ethylbenzene. The biosparge system will be programmed to inject air in short pulses to minimize channeling effects, minimize vapor migration potential, save electricity, and increase system performance. The system will be equipped with a wireless telemetry unit to monitor system performance and notify the operator if a fault condition occurs.

SUMMARY OF ALTERNATIVES

Based on the 2005 data, four clean up alternatives were evaluated in the CMS (Baker, 2005), including:

- Alternative 1 No Action
- Alternative 2 Monitored natural attenuation (MNA), including LUCs
- Alternative 3 Enhanced bioremediation and MNA, including LUCs
- Alternative 4 In situ chemical oxidation and MNA, including LUCs

Except for Alternative 1, each alternative addresses benzene and ethylbenzene in groundwater at SWMU 54. LUCs and MNA are components of each alternative except Alternative 1. Alternative 1 was evaluated due to the small probability of groundwater exposure at SWMU 54. Alternative 2 consists solely of LUCs and MNA. This alternative would provide an assessment of naturally occurring degradation processes as the benzene and ethylbenzene are monitored with time. In addition, LUCs in the form of a deed restriction on groundwater extractions would protect human health. Alternative 3 utilizes enhanced bioremediation with optional bioaugmentation and MNA to reduce contaminant concentrations in groundwater. Enhanced bioremediation includes the addition of oxygen to the contaminated groundwater to promote benzene and ethylbenzene degradation. Alternative 4 includes oxidation of contaminants through the use of an oxidizing agent such as permanganate or hydrogen peroxide.

The corrective action is described in detail in the SWMU 54 Benzene and Ethylbenzene Corrective Measures Implementation Plan (AGVIQ-CH2M HILL, 2012b).

EVALUATION OF THE PROPOSED REMEDY AND ALTERNATIVES

To complete the CMS, a technical evaluation of the alternatives was completed and the alternatives were ranked based on technical merits, human health benefits, environmental benefits, and cost. The technical merits evaluated included performance, reliability, implementability, and safety of each alternative. Alternative 2 was ranked highest in most of the evaluation categories, including cost. However,

this alternative did not meet the desired time frame to complete the corrective action and the next highest ranking was Alternative 3.

As prescribed in the CMS, additional characterization and pilot testing were conducted in the benzene area (AGVIQ-CH2M HILL, 2012a). The work was based on the CMS and focused only on benzene. The investigation included installation of 32 additional monitoring wells to determine the horizontal and vertical extent of benzene in groundwater.

Because the magnitude and extent of the benzene plume were greater than expected, it was determined that the selected remedy in the CMS, aerobic in situ bioremediation through injection of oxygen-releasing compounds would not adequately treat the benzene plume because it would be technologically difficult and costly to install the required volume of material in groundwater. Therefore, an air sparge (AS) pilot-scale test was performed to evaluate the feasibility of injecting air into the aquifer to address benzene in groundwater through volatilization and biodegradation.

AS pilot-scale testing was performed in May 2010. During the pilot-scale test, air was injected into a single well at varying pressures and flows, and changes in water level, dissolved oxygen (DO), and oxidation-reduction potential (ORP) were monitored to evaluate air distribution. Data from the pilot-scale test demonstrated that air could be adequately distributed in the ground, but the flow rates should be limited to minimize potential exposure of site workers to contaminant vapors. Therefore, a biosparge system was recommended to enhance aerobic degradation of contaminants.

PUBLIC PARTICIPATION

Public review and comment on the proposed remedy for SWMU 54 will be implemented as part of the public comment period for the proposed Administrative Order on Consent between the Navy and EPA. A public notice of that public comment period will be published in both Spanish and English in select Puerto Rico newspapers.

NEXT STEPS

Following completion of public review and comment on the proposed remedy, the EPA will advise of any required modifications based on the public comments, or its acceptability.

KEY DOCUMENTS

AGVIQ-CH2M HILL. 2012a. Corrective Measures Study Addendum for SWMU 54 Benzene and Ethylbenzene Plume, Naval Activity Puerto Rico. June.

AGVIQ-CH2M HILL. 2012b. Corrective Measures Implementation Plan for SWMU 54 Benzene and Ethylbenzene Plume, Naval Activity Puerto Rico. June.

Baker Environmental, Inc. 2005. Final Corrective Measures Study Final Report for SWMUs 54 and 55.

FURTHER INFORMATION

The key documents may be reviewed at:

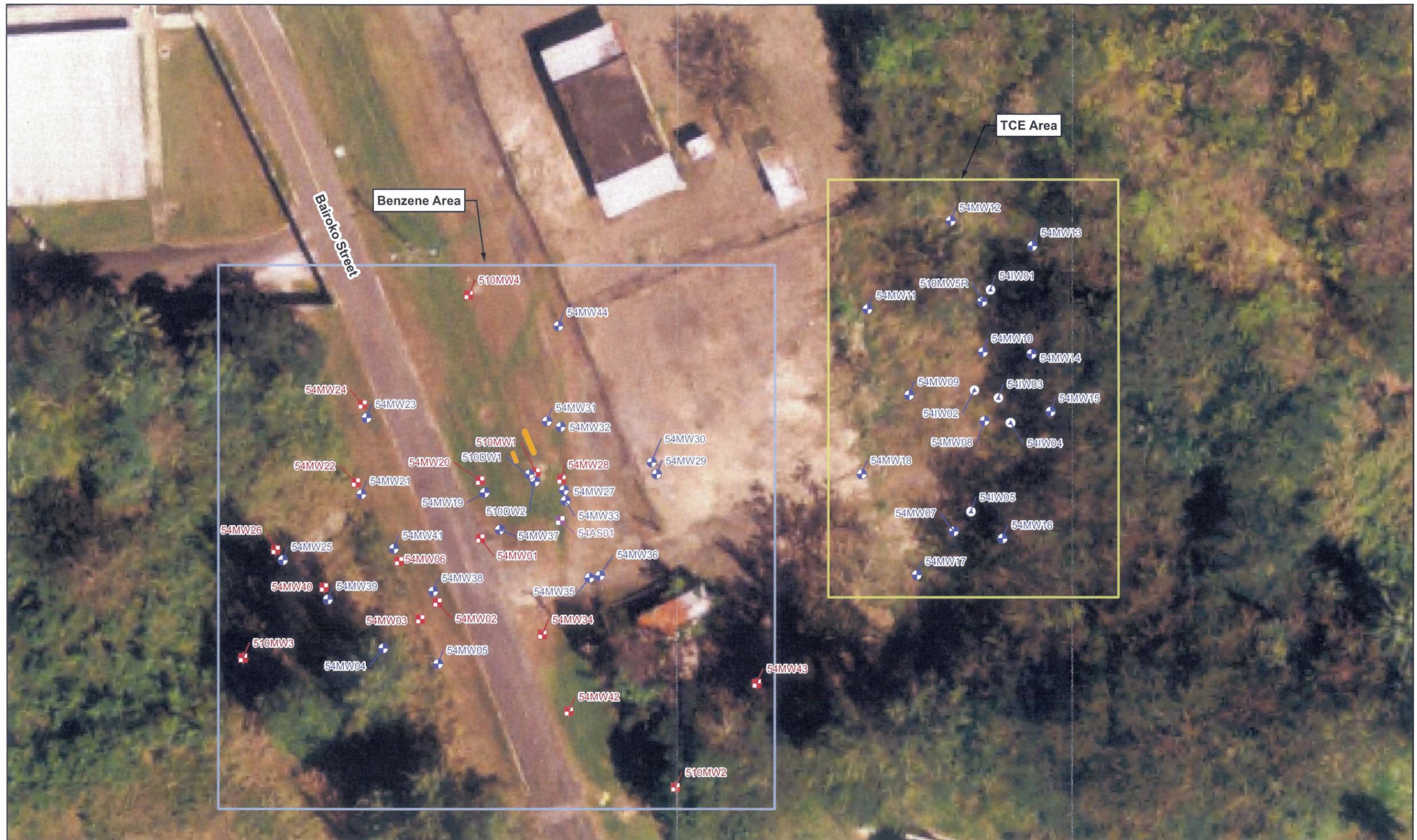
U. S. Environmental Protection Agency
Region 2
RCRA File Room
290 Broadway, 15th floor
New York, NY 1007-1866
Attn: Mr. David Abrines
Phone: 212-637-3043

U. S. Environmental Protection Agency
Caribbean Environmental Protection Division
City View Plaza II – Suite 7000
#48 RD. 165 km 1.2
Guaynabo, PR 00968-8069
Attn: Mr. Luis Negron
Phone: 787-977-5870

Puerto Rico Environmental Quality Board
Oficina del Presidente – Piso 5
Ave. Ponce de Leon #1308
Carr Estatal 8838
Sector El Cinco
Rio Piedras, PR 00926
Attn: Ms. Wilmarie Rivera
Phone: 787- 767-8181 ext. 6141

Or at the following internet web page address:

<http://nsrr-ir.org/>



- Monitoring Well Screened Primarily Less than 15 ft bgs
- Monitoring Well Screened Primarily Greater than 15 ft bgs
- Injection Well Screened 17-27 ft bgs
- Air Sparge Injection Well
- Groundwater Flow

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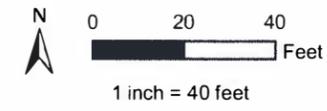
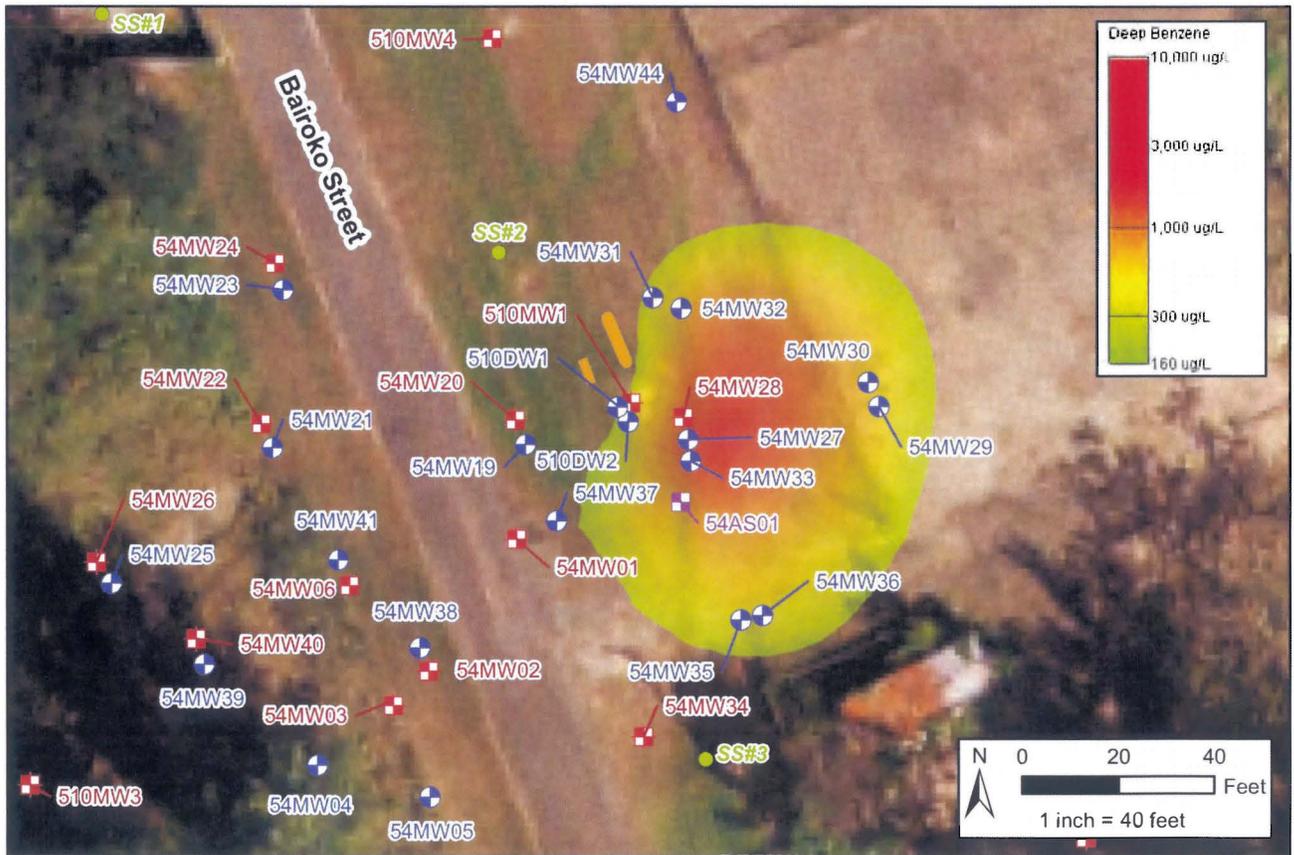
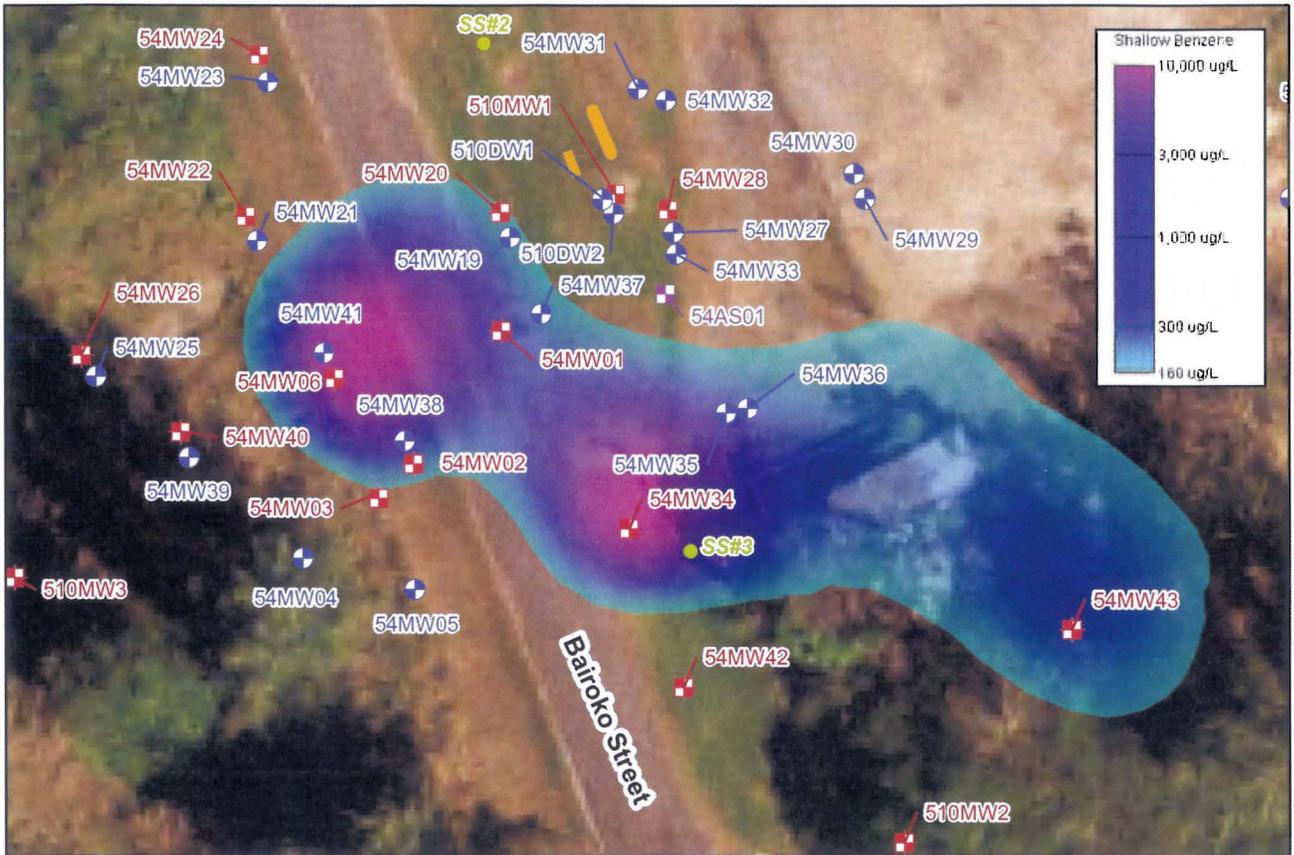


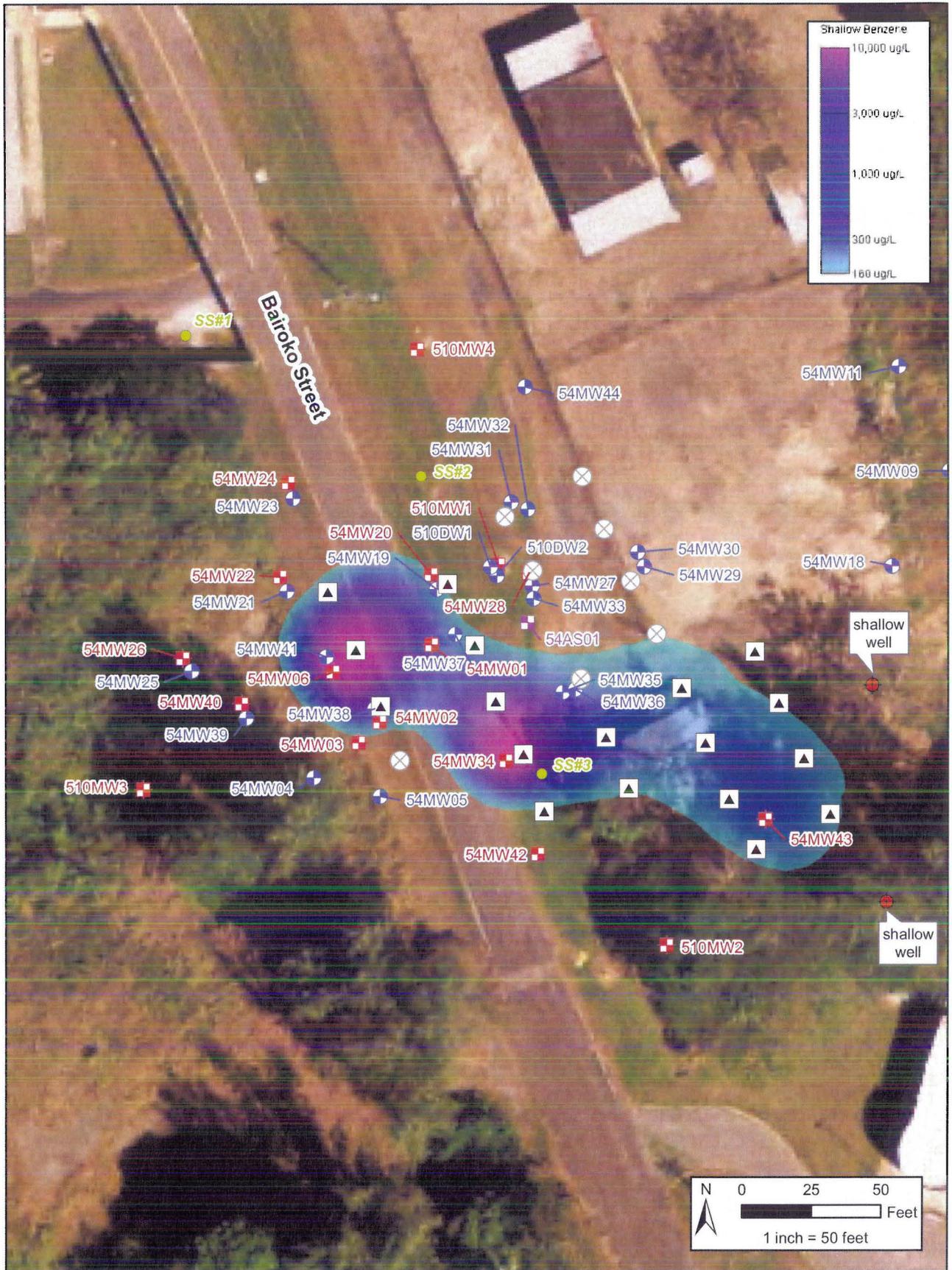
FIGURE 1
 Site Layout
 SWMU 54
 Naval Activity Puerto Rico



- Monitoring Well Screened
Primarily Less than 15 ft bgs
- Monitoring Well Screened
Primarily Greater than 15 ft bgs
- Air Sparge Injection Well

- Storm Sewer
Monitoring Location
- Note: CAO for Benzene = 160 ug/L

FIGURE 2
Benzene Concentrations Exceeding
Corrective Action Objective
August 2009 Through October 2010
SWMU 54
Naval Activity Puerto Rico



- ◆ Proposed Shallow Well
 - Monitoring Well Screened Primarily Less than 15 ft bgs
 - Monitoring Well Screened Primarily Greater than 15 ft bgs
 - ▲ Shallow Biosparge Well
 - ⊗ Deep Biosparge Well
 - Storm Sewer Monitoring Location
- Note: Corrective Action Objective (CAO) for Benzene = 160 µg/L

FIGURE 3
 Proposed Shallow Biosparge Layout
 SWMU 54
 Naval Activity Puerto Rico

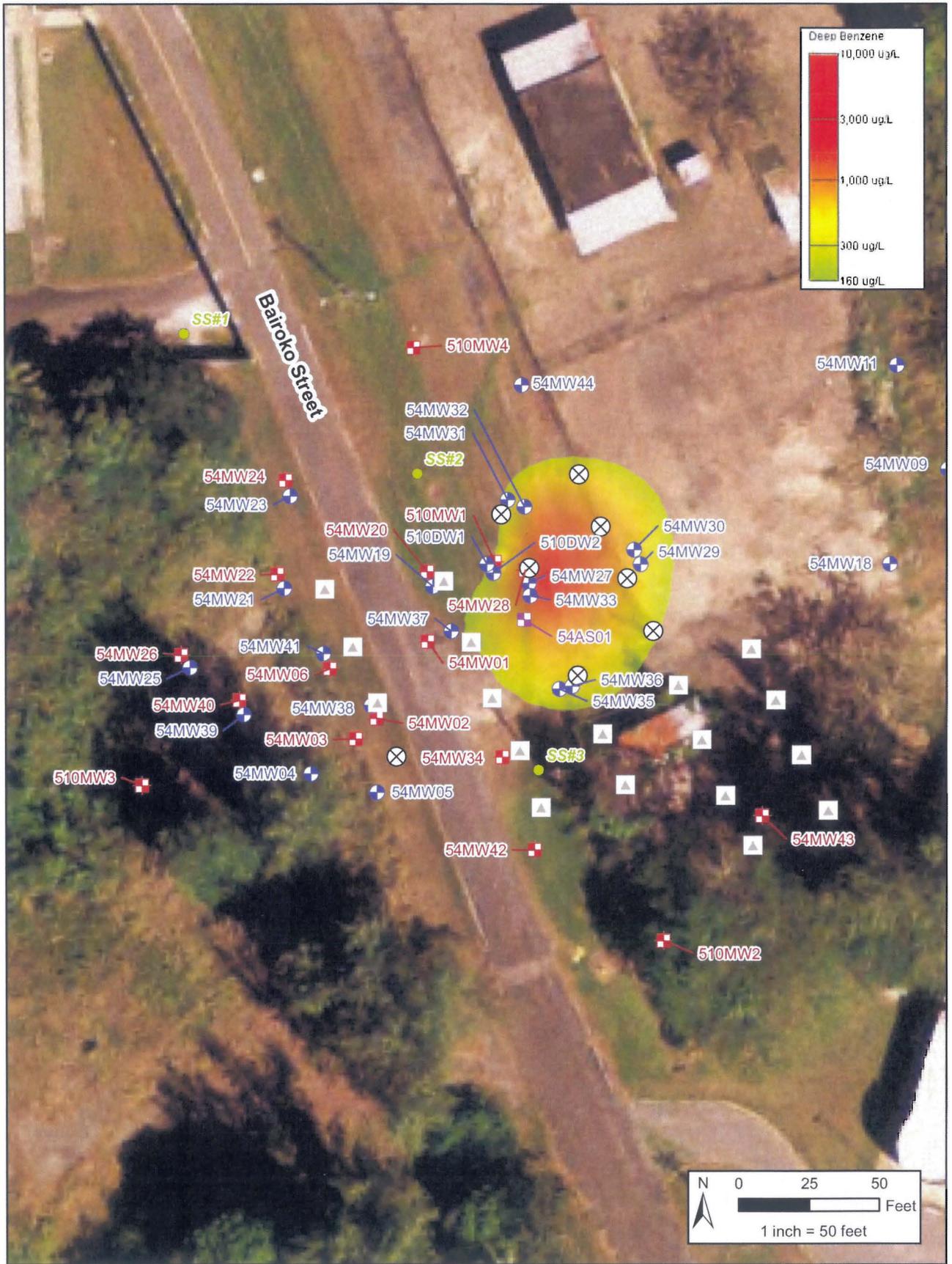


FIGURE 4
 Proposed Deep Biosparge Layout
 SWMU 54
 Naval Activity Puerto Rico