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FINAL FOCUSED FEASIBILITY STUDY OPERABLE UNIT 2 (OU 2) SITE 10 HOT SPOT 2 REVISION 1 MCAS CHERRY POINT NC

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RHEA ENGINEERS & CONSULTANTS

FINAL
FOCUSED FEASIBILITY STUDY – REVISION 1

OPERABLE UNIT 2, SITE 10, HOT SPOT 2
MARINE CORPS AIR STATION
CHERRY POINT, NORTH CAROLINA

Contract No. N40085-08-D-1409
CTO 0001
Rhēa Project No. 383

FEBRUARY 2011

PREPARED FOR:

NAVFAC Mid-Atlantic
NC IPT, Code OPCEV
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ABBREVIATIONS AND ACRONYM LIST

2nd FSSG	Second Force Service Support Group
AGVIQ	AGVIQ Environmental Services
ARAR	Applicable or Relevant and Appropriate Requirement
bgs	Below Ground Surface
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
COC	Constituent of Concern
CFR	Code of Federal Regulation
DOT	Department of Transportation
DRMO	Defense Reutilization and Marketing Office
EAD	Environmental Affairs Department
FFS	Focused Feasibility Study
FMF	Fleet Marine Force
FRCE	Fleet Readiness Center East
FS	Feasibility Study
HHRA	Human Health Risk Assessment
HI	Hazard Index
LTM	Long-Term Monitoring
LTRA	Long-Term Remedial Action
LUC	Land Use Control
MAW	Marine Aircraft Wing
MCAS	Marine Corps Air Station
NADEP	Naval Aviation Depot
NAVFAC	Naval Facilities Engineering Command
NC	North Carolina
NC 2B	North Carolina 2B Surface Water Standards
NC 2L	North Carolina 2L Groundwater Quality Standards
NCAC	North Carolina Administrative Code

NCDENR	North Carolina Department of Environment and Natural Resources
NCGS	North Carolina General Statute
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	Operations and Maintenance
OHM	OHM Remediation Services Corporation
OU	Operable Unit
OVA	Organic Vapor Analyzer
Partnering Team	MCAS Cherry Point Tier I Partnering Team
POL	Petroleum, Oil, and Lubricants
PPE	Personal Protective Equipment
PRAP	Proposed Remedial Action Plan
RAA	Remedial Action Alternative
RAB	Restoration Advisory Board
RAO	Remedial Action Objective
RAR	Remedial Action Report
RCRA	Resource Conservation Recovery Act
Rhēa	Rhēa Engineers & Consultants, Inc.
RI	Remedial Investigation
ROD	Record of Decision
SSL	Soil Screening Level
STP	Sewage Treatment Plant
SVE	Soil Vapor Extraction
TBC	To Be Considered
TCE	Trichloroethene
TMS	TMS Environmental Services, Inc.
TTNUS	Tetra Tech NUS
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Operable Unit 2 (OU2) is located in the west-central portion of the Marine Corps Air Station (MCAS), Cherry Point, North Carolina and includes four sites: Site 10 – Old Sanitary Landfill, Site 44A – Former Sludge Application Area, Site 46 – Polishing Ponds No. 1 and No. 2, and Site 76 – Vehicle Maintenance Area [Hobby Shop]. The Old Sanitary Landfill, a portion of which is the subject of this document, served as the primary disposal site at the Air Station from 1955 until the early to mid-1980s. Contaminated material and petroleum, oil, and lubricants (POLs) were land-applied, burned, stored in unlined pits, and buried at the landfill. The southern part of Site 10 was used for fire-training exercises.

The Old Sanitary Landfill was investigated and characterized between 1994 and 1996. Based on characterization results, a Feasibility Study (FS) and Proposed Remedial Action Plan (PRAP) identified remedial technologies and recommended strategies leading to site closure. A Record of Decision (ROD) was signed for OU2 in August 1999. The remedy selected for OU2 was monitored natural attenuation and institutional controls for groundwater and in-situ soil treatment by soil vapor extraction (SVE) at four known major soil "hot spots" (i.e., Hot Spots 1, 2, 3, and 4) that were contaminated with organics along with institutional controls. This Focused Feasibility Study (FFS) is being performed to evaluate remedial alternatives for the soils in the southern portion of Hot Spot 2. The groundwater remedy (monitored natural attenuation and institutional controls) is ongoing and will not be addressed by this FFS.

The SVE system prescribed in the ROD was designed to remediate volatile organic compounds (VOCs) from the soils at the Hotspot Areas in Site 10. The soil performance standards identified in the ROD (i.e., North Carolina S-3 Target Concentration for Protection of Groundwater) were obtained at Hotspots 1, 3, and 4. The SVE system did not effectively remediate soil in the southern portion of Hot Spot 2. Several constituents of concern (COCs), including benzene, vinyl chloride, chlorobenzene, 1,4-dichlorobenzene (p-dichlorobenzene), cis-1,2-dichlorobenzene, ethylbenzene, methylene chloride, naphthalene, and trichloroethene (TCE), remain in the mixed soil/waste at concentrations above the North Carolina Soil Screening Levels (NC SSLs), which supercede the S-3 Standards.

The Remedial Action Objective (RAO) of the SVE component of the selected soil remedy was to mitigate migration of contaminants from the soil to the environment (ROD, 1998). Based on this RAO and an evaluation of the existing site conditions, remedial alternatives were developed and screened for applicability. Three remedial approaches were selected for evaluation to satisfy the final remediation goal: No Action

(RAA 1), Excavation with Off-Site Disposal (RAA 2), and Soil Cover and Enhanced Groundwater Monitoring (RAA 3). The remedial alternatives were evaluated against the nine Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) feasibility criteria. RAA 2 and RAA 3 are both readily implementable. RAA 2 provides the most potential for short-term risk to site workers due to the excavation of site soils and landfill materials. There are fewer short-term risks associated with RAA 3 that may impact human health or the environment because of limited exposure to waste.

Samples collected since approval of the ROD in 1999 indicate Hot Spot 2 has a greater concentration of waste and less soil cover than the other hot spots within the landfill. Based on the additional data collected since 1999 and future land use, the application of the NC SSLs to this area of OU2 is not appropriate. Following acceptance of one of the actions proposed in this FFS and then accepted through the Proposed Plan process, the ROD will be amended to remove the application of the SSLs to this landfill.

1.0 INTRODUCTION

The Feasibility Study (FS) process, under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), serves to ensure appropriate remedial alternatives are developed and evaluated, so that pertinent information concerning remedial action options can be presented and an appropriate remedy selected. A Focused Feasibility Study (FFS) is a FS that focuses on a single site and/or matrix within the defined Operable Unit (OU). This FFS addresses site soils at Marine Corps Air Station (MCAS) Cherry Point, North Carolina (Figure 1), within OU2 (Figure 2), Site 10, Hot Spot 2 (Figure 3), takes into account the earlier remedial actions implemented at the site and is based upon present site conditions. Groundwater will continue to be addressed separately under the current Record of Decision (ROD) remedy.

Documents previously issued for Site 10 include, but are not limited to, the Final Remedial Investigation (RI) (Brown & Root Environmental, 1996), the Final Feasibility Study (Brown & Root Environmental, 1997), and the Record of Decision (Tetra Tech NUS [TTNUS], 1998). The ROD identified selected remedies for groundwater (Alternative 2 – Natural Attenuation and Institutional Controls) and soil (Alternative 3 – Soil Vapor Extraction [SVE] and Institutional Controls).

This FFS presents an evaluation of remedial alternatives to mitigate volatile organic compound (VOC) constituents of concern (COCs). Specific COCs in the soil include benzene, vinyl chloride, chlorobenzene, 1,4-dichlorobenzene (p-dichlorobenzene), cis-1,2-dichlorobenzene, ethylbenzene, methylene chloride, naphthalene, and trichloroethene (TCE). The SVE system prescribed in the ROD was designed to remediate VOCs from the soils at four hot spots in Site 10. It was determined that the SVE system was not effective in the southern portion of Hot Spot 2; therefore, this FFS is being performed to evaluate remedial alternatives for the soils in this area.

This FFS has been prepared by Rhēa Engineers & Consultants, Inc. (Rhēa) in accordance with United States Environmental Protection Agency (USEPA) guidance including "Conducting Remedial Investigations and Feasibility Studies under CERCLA" (USEPA 1988) and the requirements in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) 300.430 *et. seq.* under Contract N40085-08-D-1409, Task Order 0001 for Naval Facilities Engineering Command (NAVFAC) Mid-Atlantic Division, for submittal to NAVFAC Mid-Atlantic, MCAS Environmental Affairs Department (EAD), USEPA Region 4, and the North Carolina Department of Environment and Natural Resources (NCDENR). NAVFAC, EAD, USEPA, and NCDENR work jointly as the MCAS Cherry Point Tier I Partnering Team (Partnering Team).

1.1 REPORT PURPOSE AND ORGANIZATION

The primary purpose of this FFS is to identify the remedial alternatives, based on the present site conditions, that are protective of human health and the environment and that cost-effectively attain appropriate federal and state requirements that are applicable or relevant and appropriate (ARAR).

This FFS is organized into four sections. The Introduction (Section 1.0) presents the purpose of the report and pertinent site background information, including a summary of the nature and extent of contamination remaining at Site 10. Section 2.0 presents the ARARs, the remedial action objectives (RAOs), and remediation goals that have been established for this site. Sections 3.0 and 4.0 present the development, detailed analysis, and comparison of remedial action alternatives. The detailed analysis is based on a set of nine criteria in accordance with the National Contingency Plan – these are: short- and long-term effectiveness; implementability; cost; reduction of toxicity, mobility and volume; compliance with applicable or relevant and appropriate requirements; overall protection of human health and the environment; state acceptance; and community acceptance.

1.2 FACILITY DESCRIPTION

MCAS Cherry Point (Figure 1) is a military installation in southeastern Craven County, North Carolina, just north of the town of Havelock. The Air Station encompasses approximately 13,164 acres and is situated on a peninsula north of Core and Bogue sounds and south of the Neuse River. It is bound on the east by Hancock Creek, on the south by North Carolina Highway 101, on the west by an irregular boundary line approximately three-quarters of a mile west of Slocum Creek, and on the north by the Neuse River.

The MCAS was commissioned in 1942 to maintain and support facilities, services, and materials of a Marine Aircraft Wing (MAW) and other activities and units as designated by the Commandant of the Marine Corps. Tenants of the Air Station include the second MAW, the Fleet Readiness Center East, or FRCE (formerly known as the Naval Aviation Depot [NADEP]), the Combat Service Support Detachment 21 of the Second Force Service Support Group (2nd FSSG), the Naval Air Maintenance Training Group Detachment, and the Defense Reutilization and Marketing Office (DRMO). The Air Station has facilities for training and support of the Fleet Marine Force (FMF) Atlantic aviation units and is also designated as a primary aviation supply point.

1.3 SITE DESCRIPTION

Site 10 (Figure 3), the Old Sanitary Landfill, is located west of Roosevelt Boulevard, south of the sewage treatment plant (STP), and east of Slocum Creek. Site 10 is divided by Turkey Gut, a small perennial stream that flows northwest into Slocum Creek. The site consists of a sanitary landfill, former sludge impoundments, and a former drum storage area. The sanitary landfill is the largest part of the site and covers approximately 40 acres.

The Old Sanitary Landfill served as the primary disposal site at the Air Station from 1955 until the early to mid-1980s. Contaminated material and petroleum, oil, and lubricants (POLs) were land-applied, burned, stored in unlined pits, and buried at the landfill. The southern part of Site 10 was used for fire-training exercises. The former sludge impoundments were located in the north-central part of the landfill. These impoundments, which were closed in the mid-1980s, were used for disposal of Resource Conservation Recovery Act (RCRA) hazardous wastes, including metal filings, plating sludge, paints, organic solvents, oil and grease, and miscellaneous chemicals. Closure of the sludge impoundments consisted of excavating the sludge to about 9.5 feet below ground surface (bgs), backfilling the excavations with soil, and capping with two feet of clay and two feet of topsoil. The former petroleum drum storage area is no longer used to store drums of petroleum products and the drums were removed. This area is fenced, lined, and covered with gravel.

1.4 PREVIOUS INVESTIGATIONS AND CONCLUSIONS

1.4.1 Historical Remedial Action Summary

The OU2, Site 10 area was investigated and characterized between 1994 and 1996 by Brown & Root Environmental (now TTNUS). Based on characterization results, a FS and Proposed Remedial Action Plan (PRAP) identified remedial technologies and recommended strategies leading to site closure. A ROD was signed in August 1999 to address VOCs in soil and identified the following major components of the remedy:

- Monitored natural attenuation of groundwater (utilizing long-term monitoring to evaluate the effectiveness of the natural attenuation process);
- Soil vapor extraction at major soil hot spots (secondary source areas to groundwater); and
- Institutional controls that include land and groundwater use restrictions.

Previous investigations identified VOCs in soils (Hot Spots 1, 2, 3, and 4) at concentrations indicating a potential for leaching to groundwater. The Navy and USEPA, with

concurrence from NCDENR, concluded that an SVE system would be the most effective remedial alternative for reducing levels of VOCs in the soil. Construction and installation of the SVE system is documented in a Remedial Action Report (RAR) (OHM Remediation Services Corporation [OHM]/IT, December, 2000).

1.4.2 SVE System Operation Summary

The SVE system was operated by Shaw/OHM until September 2003, at which time TMS Environmental Services, Inc. (TMS) took over Site 10 operations. A RAO Optimization Report (URS, December, 2003) indicated that the system was approaching asymptotic conditions and was no longer contributing to contaminant cleanup of the soil. In July 2003, the system was deactivated with concurrence of USEPA and NCDENR. Additional details regarding the activities leading to the deactivation of the SVE system are included in the *Final Quarterly Operation and Maintenance (O&M) Report 3rd Quarter 2003 (July 2003 through September 2003)* and *Annual Status Report (October 2002 through September 2003)*, (AGVIQ Environmental Services [AGVIQ]/CH2M HILL, 2006). The SVE system was decommissioned in April 2010 in accordance with the *Final Work Plan for Operable Unit 2, Soil Vapor Extraction System, MCAS Cherry Point, North Carolina* (Rhēa, March 2010). No SVE system components remain at the site.

1.4.3 Historical Site 10 Soil Sampling

Initial site characterization soil sampling was performed during the RI phase of the remediation process. Subsequent soil sampling conducted at the site was performed to evaluate the SVE effectiveness at achieving the required clean up goals identified in the ROD. The criteria for determining system performance and effectiveness was reduction of certain VOCs in soil below target cleanup levels (i.e., ROD standards, S-3 Soil Screening Levels) in each of the four Hot Spot Areas. The Long-Term Remedial Action Plan, OU2 Site 10 Soils (LTRA) (OHM, May 1999/Rev. February 2000, April 2002) identified the soil sampling procedures to be followed at the Site 10 Hot Spot Areas.

Upon implementation of the SVE system, two rounds of soil sampling were performed in 2000 and 2003 to evaluate the effectiveness of the SVE remediation. The VOC concentrations in the soil samples collected at Hot Spots 1, 2, 3, and 4 in 2000 were greater than the North Carolina Soil Screening Levels (NC SSLs) (May 2005), which supercede the S-3 Soil Screening Levels identified in the ROD. The January 2003 soil sampling data indicated that VOCs were not detected above the NC SSLs, except for one exceedance of methylene chloride at Hot Spot 2. Additional soil sampling was performed between 2004 and 2006 and is described in the paragraphs below.

2004 Sampling

In January 2004, additional soil samples were collected at Hot Spots 1, 2, 3, and 4 to further quantify the contamination levels present in soils. These samples were collected in close proximity to previous soil sampling locations in accordance with the LTRA. VOC concentrations exceeded cleanup target concentrations as defined in the ROD at Hot Spots 2 and 3, but did not exceed the target concentrations at Hot Spots 1 and 4. It was recommended in the *Technical Memorandum Report, Operable Unit 2 – Site 10, SVE System – Hot Spot Areas 1, 2, 3, and 4, January 2004 Sampling* (Rhēa, 2005), that soil sampling be continued within Hot Spots 2 and 3 in areas where contamination was detected.

2005 Sampling

Soil sampling and analysis were performed in April 2005 at the locations within Hot Spots 2 and 3. Analytical results indicated that VOCs were below the ROD cleanup goals at Hot Spot 3, but were above the ROD cleanup goals at Hot Spot 2. It was recommended in the *Technical Memorandum Report, OU2 – Site 10, SVE System – Hot Spot Areas 1, 2, 3, and 4, April 2005 Soil Sampling* (Rhēa, August 2005), that sampling should continue at three Hot Spot 2 sample locations at the same sample depths where the exceedances occurred (3 to 5 feet bgs), and that sampling be discontinued at Hot Spot 3 since the remedial goals set in the ROD had been met for this hot spot. The Navy, in partnership with the USEPA and NCDENR agreed with the recommendation.

2006 Sampling

Soil sampling from the same locations and depths (three to five feet bgs) as the 2005 sampling event was performed at Hot Spot 2 in January 2006. Analytical results indicated that benzene, vinyl chloride, chlorobenzene, 1,4-dichlorobenzene (p-dichlorobenzene), cis-1,2-dichlorobenzene, ethylbenzene, methylene chloride, naphthalene, and TCE were detected above the cleanup goals.

Soil sampling and analysis were also performed in November of 2006. Analytical results indicated that benzene, vinyl chloride, chlorobenzene, 1,4-dichlorobenzene (p-dichlorobenzene), cis-1,2-dichlorobenzene, ethylbenzene, methylene chloride, naphthalene, and TCE concentrations were detected above the cleanup goals.

Based on the results observed in the OU2, Site 10, November 2006 soil sampling event and the fluctuations in VOC detection over the past sampling events, it was recommended that additional soil samples be collected around the three soil boring locations at the same depth as these locations (three to five feet bgs) to determine the lateral extent of soil contamination in the southern portion Hot Spot 2.

1.4.4 Supplemental Soil Sampling

Additional soil samples were collected from Hot Spot 2 during three separate sampling events, completed in July 2007, December 2007, and July/August 2008, to further define (i.e., delineate) the extent of VOC contamination. Soil sampling was conducted in accordance with the methods and procedures presented in the *Final Sampling Strategy for OU2, Site 10, Hot Spot No. 2* (Rhēa 2007). Samples were analyzed for benzene, chlorobenzene, 1,4-dichlorobenzene, cis-1,2-dichloroethene, ethylbenzene, methylene chloride, naphthalene, TCE, and vinyl chloride, or a subset of these constituents. Analytical data was compared to the NC SSLs after each round of sampling, and additional sampling events were completed until a "no exceedance" boundary was determined based upon samples with concentrations less than the NC SSLs.

Several samples collected in 2007 and 2008 were located in a low-lying area and coincided with strong odors and organic vapor analyzer (OVA) concentrations in excess of 100 parts per million. Various types of waste, including wood, glass, and paper, were present within the surface soil and retrieved in the sample cores. Low-lying areas may represent areas where the original soil cover eroded or was not placed properly, or areas of waste decomposition.

Table 1 summarizes the analytical results of the delineation sampling. Sampling locations are identified in Figure 4.

1.5 NATURE AND EXTENT OF CONTAMINATION REMAINING

The VOCs benzene, chlorobenzene, 1,4-dichlorobenzene, cis-1,2-dichloroethene, methylene chloride, naphthalene, TCE, and vinyl chloride were detected in soils at concentrations above the NC SSLs within the southern portion of Hot Spot 2 during the supplemental sampling performed in 2007 and 2008. As indicated in Section 1.4.4, supplemental soil sampling was conducted until a "no exceedance" boundary could be developed based upon samples with concentrations less than the NC SSLs. The area of soil contamination above the NC SSLs within the southern portion of Hot Spot 2 is approximately 9,000 square feet based on the analytical data obtained during the supplemental soil sampling.

The southern portion of Hot Spot 2 is partially wooded and several depressions and undulations are present that may indicate soil erosion or consolidation of subsurface waste. The surficial material at OU2 consists of both fill (sand, silt, and clay mixed with refuse consisting of domestic trash, wood, plastic, rubber, glass, asphalt, concrete, and metal fragments) and natural materials (ROD, 1998). Sampling activities conducted in 2007 and 2008 confirmed the presence of waste, including wood, glass, and paper, within the surficial material at Hot Spot 2. The area of impacted soil is shown in Figure 4. Photographs of the area are included as Appendix A.

One groundwater monitoring well, OU2-MW21, is located within the southern portion of Hot Spot 2. Analytical results for groundwater collected from this well have indicated elevated concentrations of benzene, chlorobenzene, naphthalene, vinyl chloride, 2-methylnaphalene, and arsenic above the North Carolina Water Quality Standards (NC 2L Standards) during the Long-Term Monitoring (LTM) groundwater sampling from 2004 through 2009. These constituents have been detected above the NC 2L Standards at other well locations within OU2 and are being addressed in a separate groundwater study for OU2.

The topography at Hot Spot 2 includes depressions and undulations and varies from the generally flat topography present at the other identified former soil hot spots within Site 10. The surface undulations in Hot Spot 2 suggest that the original soil cover has eroded, was not placed properly, or that there are areas of waste decomposition. Also, the debris that was encountered during soil sampling suggests that significant waste is present in Hot Spot 2; therefore, the NC SSLs are not appropriate for this area.

1.6 CHEMICAL FATE AND TRANSPORT

As detailed in Section 1.4, various VOCs are present in the soil at Hot Spot 2 above the applicable NC SSLs. VOCs are typically considered to be fairly soluble and have a low capacity for retention to soil organic carbon; therefore, they have the potential to leach to groundwater. These chemicals may migrate through the soil column to groundwater as infiltrating precipitation solubilizes them. The low-lying areas within the southern portion of Hot Spot 2 will likely increase the infiltration of surface water through the contaminated soil. More detailed chemical fate and transport information is discussed in Section 5.0 of the RI Report.

1.7 HUMAN HEALTH RISK ASSESSMENTS

The Human Health Risk Assessment (HHRA) completed as part of the RI evaluated potential exposures associated with site soils for maintenance and construction workers, adolescent trespassers, full time employees, adult resident (six year exposure), child/adult resident (30 year exposure), and child resident receptors with respect to current and future land use scenarios. Potential soil exposures may include direct contact with contaminated soil, incidental ingestion, and dermal absorption. The RI concluded that risks associated with surface soil were exceeded for receptors and exposure pathways outside of the USEPA "acceptable" risk range (i.e., cancer risk of 1E-6 to 1E-4 and Hazard Index [HI] below 1.0) for future residents. The selected soil remedy documented in the ROD was SVE with Institutional Controls. The SVE component of the remedy was anticipated to mitigate migration of contaminants from the soil to the environment, while the Institutional Controls component of the remedy was anticipated to prevent exposure to contaminated soil and buried waste (ROD, 1998).

2.0 REMEDIAL ACTION OBJECTIVE AND REMEDIATION GOALS

This section presents, for Site 10, Hot Spot 2, general and site-specific RAOs and identifies ARARs and "to be considered" (TBC) criteria.

2.1 PRESENT LAND USE CONSIDERATIONS

OU2 is fenced to prevent access to unauthorized personnel and is marked with restricted access signs. The site is mostly wooded or covered by thick vegetation and grass and is currently not used for any purpose. In accordance with the ROD, land use controls (LUCs) are in place restricting both the land and aquifer use.

2.2 REMEDIAL ACTION OBJECTIVES

RAOs are media-specific and/or site-specific goals established for protecting human health and the environment. At Site 10, Hot Spot 2, the environmental media to be addressed by the FFS remedial actions is VOC-contaminated soil that is mixed with waste. The following RAOs as presented in the existing OU2 ROD are:

- Prevent exposure to contaminated soil and buried waste;
- Restrict current and future land use at OU2;
- Prevent exposure to contaminated groundwater at OU2;
- Prevent future potential use of the groundwater at OU2;
- Allow for natural attenuation of the groundwater at OU2; and
- Mitigate migration of contaminants from the soil (major secondary source areas) to the environment.

The SVE component of the soil remedy was prescribed in the ROD to meet the last RAO of the preceding list, to "mitigate migration of contaminants from the soil (major secondary source areas) to the environment." The SVE system remedy achieved this RAO at Hot Spots 1, 3, and 4, but did not achieve this RAO at Hot Spot 2; therefore, the RAO for Hot Spot 2 is to "mitigate migration of contaminants from the soil (major secondary source areas) to the environment." The other RAOs identified in the ROD are being met through the existing LUCs and the LTM program.

2.3 Applicable or Relevant and Appropriate Requirements

Regulatory requirements and standards that are applicable or relevant and appropriate to the response action are referred to as ARARs. ARARs are defined and described in general in Section 2.3.1. Section 2.3.2 presents and describes specific ARARs applicable or relevant and appropriate to Site 10, Hot Spot 2.

2.3.1 Definition of ARARs and TBC Requirements

Under Section 121(d) of CERCLA, on-site remedial actions are required to comply with federal environmental ARARs, or more stringent state environmental ARARs, throughout the remedial action. Remedial actions must attain a degree of cleanup that assures protection of human health and the environment. Additionally, CERCLA remedial actions that leave any hazardous substances, pollutants, or contaminants on site must meet, upon completion of the remedial action, a level or standard of control that at least attains standards, requirements, limitations, or criteria that are "applicable or relevant and appropriate" under the circumstances of the release. ARARs are derived from federal and state laws and are categorized as chemical-specific, location-specific, and action-specific. Federal, state, or local permits are not necessary for removal or for remedial actions to be implemented on site, but their substantive requirements or ARARs must be met. ARARs prescribed for a specific site are dependent on the detected contaminants, specific site characteristics, and the particular remedial actions proposed for the site.

- Chemical-specific ARARs (Table 2) include requirements which set health or risk-based concentration limits or ranges for specific hazardous substances, pollutants, or contaminants. These requirements generally set protective cleanup concentrations for the chemicals of concern in the designated media or set safe concentrations of discharge for remedial activity;

- Location-specific ARARs (Table 3) set restrictions on activities based upon the characteristic of the site. Such restrictions may include restrictions on remedial actions within particularly hydro-geologically, historically, or ecologically sensitive areas; and

- Action-specific ARARs (Table 4) include requirements that set controls or restrictions on particular activities related to the management of hazardous substances, pollutants, or contaminants. Such requirements are usually technology-based or activity-based, that define acceptable treatment and disposal procedures for hazardous substances.

Advisories, criteria, or guidance documents that do not meet the definition of ARARs, but may be considered to determine what is protective or are useful in developing CERCLA remedies are referred to TBC requirements. The ARARs preamble [40 CFR Part 300.400(g)(3)] describes three types of TBC requirements: health effects, information with a high degree of credibility, technical information on how to perform or evaluate site investigations or remedial actions, and policy. TBC requirements are

advisories or guidance issued by federal or state government that are not legally binding and do not have the status of potential ARARs, but may be considered during evaluation of potential remedial alternatives.

2.3.2 Potential ARARs/TBCs

The chemical-specific, location-specific, and action-specific ARARs and TBCs identified for remedial actions at Site 10, Hot Spot 2 are described below and presented in Tables 2, 3, and 4.

Chemical-Specific ARARs

Potential federal and state chemical-specific ARARs identified for the soil/waste at Site 10, Hot Spot 2 are summarized in Table 2. The potentially applicable chemical-specific ARARs identified for Site 10, Hot Spot 2 remedial actions can be categorized as follows:

- Surface water quality standards; and
- Management of hazardous oil products.

Surface Water Quality Standards

The ARARs pertaining to the quality standards of surface water (15A North Carolina Administrative Code [NCAC] 2B. 200; North Carolina 2B Surface Water Standards [NC2B]) help to establish a series of classification and water quality standards for surface water with the purpose of protecting the public health and welfare as well as enhancing water quality. This is considered "applicable" since the stormwater runoff may potentially flow off-site to surface water bodies or groundwater may migrate into the surface water bodes (e.g. Slocum Creek).

Management of Hazardous Oil Products

The ARARs pertaining to hazardous oil products (North Carolina General Statute [NCGS] Ch. 143, Article 21A, Part 1,2) establish criteria for protecting land and waters of North Carolina from pollution by oil, oil-based products, and any other hazardous substances. These ARARs are considered "relevant and appropriate" because it is not known if the waste will be determined hazardous due to previous oil products disposed of or applied to the site.

Location-Specific ARARs

Potential federal location-specific ARARs identified for Site 10 are summarized in Table 3. The only location-specific ARAR identified as being TBC for Site 10, Hot Spot 2 is associated with floodplain impacts.

Action-Specific ARARs

Potential state and federal action-specific ARARs identified for Site 10 are summarized in Table 4. Potentially applicable action-specific ARARs identified for Site 10 can be categorized as follows:

- Monitoring well installation, operation, and abandonment;
- General construction standards for land disturbing activities, including:
  - Fugitive dust emissions;
  - Characterization of solid waste;
  - Storage of solid waste;
  - Characterization of hazardous waste;
  - Temporary storage of hazardous waste in containers;
  - Soil erosion prevention;
  - Use and storage of hazardous waste in containers; and
- Waste treatment and disposal.

Monitoring Well Installation, Operation, and Abandonment

The ARARs associated with monitoring wells (15A NCAC .02C.0108 to 0113) address installation, operation, and abandonment. These ARARs are considered "applicable" because there is a monitoring well within Site 10, Hot Spot 2 that may need to be modified or replaced, depending on the remedy.

General Construction Standards for Land-Disturbing Activities

The ARARs associated with land-disturbing activities address various aspects of land-disturbing activities including:

- Fugitive dust emissions (15A NCAC 02D.0540);
- Characterization of solid waste (40 CFR 262.11);
- Storage of solid waste (15A NCAC 13B.0104);
- Characterization of hazardous waste (40 CFR 264.13, 40 CFR 268.9, 40 CFR 268.7, and 40 CFR 268.9);
- Temporary storage of hazardous waste in containers (40 CFR 262.34);
- Use and storage of hazardous waste in containers (40 CFR 265.171, 172, and 173); and
- Management of storm water from land disturbing activities (NCGS Ch. 113A-157(3) 15A NCAC 4B.0105.

These ARARs are considered "applicable" or "relevant and appropriate" (see Table 4), depending on the citation.

Waste Treatment and Disposal

The ARARs associated with the disposal of solid waste (15A NCAC 13B.0106) applied to off-site disposal of solid waste. These ARARs are considered "relevant and appropriate" for alternatives that involve generating soil mixed with waste for off-site removal and disposal.

The ARARs associated with the disposal of hazardous waste (40 CFR 268.40 and 268.49) help to design and operate specifications for hazardous waste treatment, storage, and disposal units. These ARARs are considered "applicable" for alternatives that involve generating soil/waste or water for off-site removal and disposal, because it is not known if the waste associated with the remedy will be determined hazardous.

3.0 DEVELOPMENT OF REMEDIAL ACTION ALTERNATIVES

This section discusses the development of potential remedial alternatives to address the RAO described in Section 2. Three remedial action alternatives (RAAs) were developed to address the RAO.

Existing LUCs are in place restricting the land use at OU2 to industrial use with the stipulation of no intrusive activities unless prior approval has been obtained from USEPA and NCDENR. The existing LUCs will remain in place under each of the three RAAs.

The three RAAs are listed below and the subsections that follow describe each RAA:

- RAA 1 – No Action;
- RAA 2 – Excavation with Off-Site Disposal; and
- RAA 3 – Soil Cover and Enhanced Groundwater Monitoring.

For the two action alternatives evaluated (RAA 2 and RAA 3), the work scopes include the following:

- RAA 2 is the excavation and disposal of approximately 2,500 tons of contaminated soil/waste with disposal in a solid waste landfill; and
- RAA 3 includes installation of a soil cover over Hot Spot 2 areas that exceed the NC SSLs. This alternative also includes modifying the groundwater monitoring (i.e., LTM) to include a comparison of the sampling results of the wells located adjacent to Slocum Creek to 10-times the applicable NC 2B or USEPA national criteria to ensure that the waste left in place does not negatively impact Slocum Creek.

3.1 RAA 1 – NO ACTION

The No Action alternative is required by the NCP to provide a baseline for comparison with other RAAs that provide a greater level of response. RAA 1 would leave impacted soil/waste in place at Site 10, and there would be no additional monitoring or restrictions at the site. There are no capital or O&M costs for the No Action alternative. RAA 1 would not satisfy the RAO of mitigating the migration of contaminants from the soil to the environment. Mitigating migration of contaminants requires that an action be taken, as described in the next two alternatives. The retention of the No Action alternative satisfies CERCLA requirements, but will not mitigate risk from the contaminated soils.

3.2 RAA 2 – EXCAVATION WITH OFF-SITE DISPOSAL

This RAA includes excavation of approximately 2,500 tons of soil and municipal solid waste materials that contain VOC contaminant concentrations in excess of the NC SSLs.

Prior to excavation, additional trees and vegetation would be cleared to provide access to the removal area, and erosion and sedimentation controls would be implemented to minimize the potential for contaminants to migrate from the removal area.

Soil/waste exceeding the NC SSLs would be mechanically removed and staged in accordance with MCAS Cherry Point and State requirements. Samples would be collected to determine the disposal requirements. Excavated soil/waste meeting the criteria for disposal as a non-hazardous waste would be transported to a licensed facility. Based on the concentrations of VOCs detected in soil/waste samples collected from the area, it is anticipated that removed soil/waste can be disposed of as non-hazardous waste. Soil sampling performed in 2007 and 2008 delineated soils above and below the NC SSLs; therefore, no post-excavation sampling would be necessary. Soil/waste would be removed to the limit of 2007/2008 sample locations that were below the NC SSLs (Figure 4). Monitoring well OU2-MW21, located within the removal area, would be properly abandoned prior to soil/waste removal.

Following the excavation operation, the site would be restored by placing clean backfill to bring the site back to original grade. Clean backfill will be obtained from a certified, clean source, or appropriate analytical testing will be conducted to verify that the soil is suitable for use. It is assumed that the majority of backfill would be obtained from an on-base borrow source and would be mixed with topsoil as necessary to provide an acceptable growth medium. Backfill will be compacted with heavy equipment in six-inch lifts. All disturbed areas would be revegetated with native grasses and plant species to control erosion. Access roads and other infrastructure that are disturbed or destroyed in the excavation process would be restored.

3.3 RAA 3 – SOIL COVER AND ENHANCED GROUNDWATER MONITORING

This RAA includes installation of a soil cover over areas that exceed the NC SSLs to limit infiltration and migration of contamination to groundwater. A minimum two-feet-thick clean backfill soil cover will be placed over the area and will extend a minimum of 10 feet beyond the area of concern (Figure 5). The disturbed areas would be revegetated with native grasses to control erosion. Access roads or other infrastructure that are disturbed in the backfilling process would be restored and improved to allow vehicular access for future inspections. A soil cover will control erosion and migration of contaminated soil. The cover will be contoured to control erosion and sedimentation and will be compacted with heavy equipment in six-inch lifts. The soil cover will be vegetated with native grasses and plant species. It is assumed that the majority of backfill would be obtained from an on-base borrow source and would be mixed with topsoil as necessary to provide an acceptable growth medium. Monitoring well OU2-MW21, located within the soil cover area, would be properly abandoned prior to soil cover placement.

The RAO for the soil of OU2 is to "mitigate migration of contaminants from the soil and waste to the environment." The soil cover in this alternative will aid the mitigation of rainwater migration through the soil/waste left in place. This can be monitored through the existing LTM and by enhancing the LTM by comparing the results of the groundwater wells along Slocum Creek to 10-times the applicable NC 2B standard or national USEPA surface water criteria. It is proposed through RAA 3 that immediate action will be taken if the groundwater results in wells adjacent to Slocum Creek exceed 10-times the applicable standard. The applicable groundwater action level for the protection of surface water will be 10-times the most stringent of the NC 2B Saltwater Aquatic Life or Human Health criteria, or, if no NC 2B criteria are available, 10-times the national USEPA surface water criteria. The groundwater action levels for the protection of surface water are summarized in Table 5. As shown in Table 5, applicable NC 2B and USEPA criteria are not available for some constituents. In these cases, NCDENR will determine if a groundwater action level for the protection of surface water should be calculated.

4.0 DETAILED ANALYSIS OF REMEDIAL ACTION ALTERNATIVES

This section presents the detailed analysis of the RAAs that were developed in Section 3.0. The evaluation criteria used for the detailed analysis is presented below. An individual and comparative detailed analysis of the RAAs can be found in Sections 4.2 and 4.3, respectively.

The detailed analysis of alternatives was conducted in accordance with the "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA" and the NCP, including the February 1990 revisions. In conformance with the NCP, the following nine criteria were used for the detailed analysis:

- Overall protection of human health and the environment;
- Compliance with ARARs;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume through treatment;
- Short-term effectiveness;
- Implementability;
- Cost;
- State acceptance; and
- Community acceptance.

4.1 OVERVIEW OF EVALUATION CRITERIA

The following paragraphs describe the evaluation criteria that are used in the detailed analysis. Both CERCLA and the NCP require that the selected remedy meet the "threshold criteria" of overall protection of human health and the environment and compliance with identified ARARs.

Overall Protection of Human Health and the Environment

The primary criterion that a remedial action must meet is the overall protection of human health and the environment. If a remedy is adequate in eliminating, reducing or controlling current and potential site risks, it is considered protective. Each exposure pathway at the site must be analyzed when evaluating a remedy. If a hazardous substance remains on site without engineering or institutional controls, there is a constant human health and environmental exposure risk. Engineering or industrial controls must be employed in a manner that ensures the adequate protection of both human health and environmental health, over time. Ideally, a remedial action should not incur unacceptable short-term risks or cross-media impacts that can affect human health and the environment.

Compliance with ARARS

Compliance with ARARs is a statutory requirement that must be met for any remedial action. In the event that an ARAR is not met by a remedial action, there must be a sound and rational cause for waiving the ARAR. The detailed analysis presented in this Section will analyze the three remedial action alternatives based on federal and state ARARs.

Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence as a criterion evidences CERCLA's concern for ensuring protection of human health and the environment. Residual on-site risks must be accounted for, even after a remedial action has been completed. Evaluating this criterion includes consideration of the following:

- Degree of threat posed by hazardous substances left in place;
- Adequacy of controls to manage the exposure to hazardous substances remaining at the site;
- Reliability of those controls; and
- Potential impacts on human health and the environment, in the event that the remedy would fail.

Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment, as a criterion, addresses the statutory preference for treatment as a principal remedial action. This criterion ensures that the treatment efficiency of remedial alternatives is considered and evaluated by analyzing the magnitude, significance, and irreversibility of a treatment-mediated reduction in toxicity, mobility or volume of contamination.

Short-Term Effectiveness

Short-term effectiveness as a criterion examines the efficacy of a remedial action in the immediate future. Even when the long-term impacts of a remedial action are verifiably beneficial, it must be contrasted against the immediate effects of implementing that alternative. Evaluating short-term effectiveness includes considering the potential threats that excavation, treatment, and transportation may pose to human health and the environment. Potential cross-media impacts, ecosystem disruption, and the time required to achieve human health and environmental protection are all to be considered.

Implementability

Implementability as a criterion considers the technical and administrative feasibility, and the availability of resources to execute a remedial alternative. Implementability also considers suitable timing for proposed remedial actions to occur and compliance with appropriate permitting regulations and requirements.

Cost

The cost of implementing a remedial alternative is a critical criterion that must account for the present worth of the capital cost and annual O&M costs. Cost-efficiency is a critical component when balancing the remedial goals to be achieved and the financial means by which it is achieved. The USEPA Guidance (USEPA, 1988) predicts that the cost estimate proposed in a preliminary remediation scope will have a -30 to +50 percent accuracy, depending on the information available and the budgetary assumptions made in developing the cost estimates.

State Acceptance

State acceptance as a criterion is a statutory requirement that requires state involvement. For all MCAS Cherry Point CERCLA projects, including this project, state involvement is achieved by including the State Remedial Project Manager in a Partnering Team that meets routinely throughout the entire remedial process. Comments from the state are invited and addressed throughout the CERCLA process.

Community Acceptance

Community acceptance as a criterion allows all interested parties to express their comments and concerns about pending remedial actions. Throughout the remedial process, community involvement is invited through the MCAS Cherry Point Restoration Advisory Board (RAB) that consists of members from the community and meets periodically. Formal public comments will be received following the public comment period for the OU2, Site 10, Hot Spot 2 PRAP.

4.2 INDIVIDUAL ANALYSIS OF ALTERNATIVES

Each RAA has been individually analyzed, in detail, as presented in the following subsections. The analysis of each RAA will include a brief description and an examination of how it ranks against the evaluation criteria described in Section 4.1.

4.2.1 RAA 1 – No Action

The No Action remedial alternative implies that Site 10, Hot Spot 2 will remain as is, without the implementation of any additional remedial actions or additional monitoring. The No Action alternative is retained as a basis for comparison to other RAAs. This alternative does not meet the threshold criteria; it is not overall protective to human health and the environment. It does not provide long-term effectiveness and permanence and there is no active measure to reduce toxicity, mobility, or volume. There is no cost associated with a No Action alternative.

4.2.2 RAA 2 – Excavation and Off-Site Disposal

RAA 2 involves excavation of soil/waste containing VOCs in excess of the NC SSLs. Excavated soil/waste would be disposed of at an appropriate solid waste facility. Following site excavation, site restoration would occur to re-establish the site's pre-excavation elevations and vegetative conditions. Existing LUCs established in accordance with the ROD will remain intact at the site.

Overall Protection of Human Health and the Environment

RAA 2 will provide overall protection through mitigation of the COCs within Hot Spot 2 by removing them.

Compliance with ARARs

RAA 2 complies with the chemical-specific ARARs by achieving soil concentrations that permit high occupancy or low occupancy land use. Action-specific ARARs under NCGS and NCAC Department of Transportation (DOT) would be relevant for RAA 2 due to the need for excavating, staging, transporting and disposing of VOC-contaminated soil/waste. Site activities will be implemented in a way consistent with meeting ARAR requirements.

Long-Term Effectiveness and Permanence

RAA 2 may be effective in the long-term in relation to the VOC contamination of the identified material by removing the identified VOC contaminated soil/waste from Hot Spot 2.

The conditions of appropriate waste disposal facilities eliminate the potential exposure of human receptors to contaminated substances.

Reduction of Toxicity, Mobility, or Volume through Treatment

Treatment is not a component of RAA 2; however, the toxicity, mobility and volume are reduced by the physical removal of impacted material and transportation of that material to an approved landfill facility.

Short-Term Effectiveness

The short-term effectiveness of RAA 2 is dependent on removing the impacted material without a contaminant release to the environment. During the excavation activities required for RAA 2, there is increased risk to workers and the surrounding community because of the soil/waste excavation and off-site transport during implementation of this alternative. In part, these risks are due to the unknown distribution of refuse within the landfill and truck transport of material through the community for off-site disposal. While considerable sampling has been conducted throughout Hot Spot 2, landfills are typically heterogeneous and types of debris and contaminants can vary over relatively short distances and depths. The unknowns increase the risk of potential exposure to high concentrations of known and unknown contaminants.

If RAA 2 is effectively implemented with no uncovering of high concentrations (e.g. drums) of contaminants, then this alternative would have short-term effectiveness. If

through the excavating process, a high concentration of a contaminant is released to the environment, the remedy would be ineffective in the short-term.

Implementability

Although excavation and backfill activities are routine operations, removal and transportation of contaminated soil comingled with waste from an existing landfill to a secondary landfill is not routine. The unknown extent and distribution of the refuse contained in Hot Spot 2 potentially increases the difficulty of segregating the waste from the soil; thus, it is more difficult to implement the project. The removal area is within a landfill (i.e., typically heterogeneous in nature); therefore, it may be difficult to obtain approval to dispose of this comingled material at an appropriately permitted facility. Multiple waste streams could potentially be generated. Any intact or partially intact drums discovered during excavation activities would have to be characterized and addressed separately. Tires, aluminum cans, batteries, and white goods are not permitted to be disposed of at non-hazardous waste (i.e., Subtitle D) facilities and would have to be addressed separately.

Cost

A detailed cost estimate for RAA 2 is presented in Table 6. The estimated net present worth cost for RAA 2 is $540,217.

4.2.3 RAA 3 – Soil Cover and Enhanced Groundwater Monitoring

RAA 3 involves the placement of a minimum two-foot soil cover over the area with soil contamination greater than the NC SSLs. The soil cover limits were delineated by confirmation sampling results in 2007 and 2008. This soil cover will be at least two-feet-thick in the higher elevation areas and thicker in the low-lying areas, where the original cover may have eroded or waste decomposed. As a result the area will have no undulations, and will be graded so that it gently slopes to the west, which will reduce the rainwater infiltration into the existing low-lying areas and restrict leaching contaminants from contaminating the groundwater. Existing LUCs are in place restricting the land use at OU2 to industrial use with the stipulation of no intrusive activities unless prior approval has been obtained from USEPA and NCDENR.

The RAO for the soil of OU2 is to "mitigate migration of contaminants from the soil and waste to the environment." The soil cover in this alternative will aid the mitigation of rainwater migration through the waste left in place. This can be monitored through the LTM in place and by comparing the groundwater monitoring results from wells adjacent to Slocum Creek to 10-times the applicable NC 2B standard or national USEPA surface water criteria. It is proposed through this alternative that immediate action will be taken if the groundwater results in wells adjacent to Slocum Creek exceed the applicable standard (see Table 5). NCDENR will determine if a groundwater action level for the

protection of surface water should be calculated for constituents where applicable NC 2B or USEPA surface water criteria are not available.

Overall Protection of Human Health and the Environment

RAA 3 is protective of human health and the environment by mitigating the migration of contaminants from the soil and waste to the environment by installing a clean two-feet (minimum) soil cover. Although institutional controls are in place that prevent exposure to contaminated soil and buried waste, the installation of the soil cover also provides a secondary means of preventing human contact (i.e., site worker, trespasser) with soils/waste in this area. Human health exposures are prevented with proper implementation of RAA 3.

Compliance with ARARs

Chemical-specific ARARs are met with RAA 3 because clean surface soils will be placed at the hot spot. Site activities will be consistent with meeting location-specific ARARs. The action-specific ARARs associated with RAA 3 will be met.

Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence of RAA 3 is achieved with a soil cover. Following installation, intrusive activities will be prevented by existing LUCs to ensure that the soil cover will prevent human receptors from access to the contaminated soil/waste. Assuming existing LUCs are followed, RAA 3 is an effective long-term remedy. The long-term effectiveness will be monitored through the existing LTM program and by comparing the results to 10-times the applicable NC 2B standard or national USEPA criteria (see Table 5). NCDENR will determine if a groundwater action level for the protection of surface water should be calculated for constituents where applicable NC 2B or USEPA surface water criteria are not available.

Reduction of Toxicity, Mobility, or Volume through Treatment

RAA 3 does not involve the use of an active treatment process or technology; however, the soil cover minimizes water infiltration and erosion, and wind erosion that may contribute to migration and transport of VOC-contaminated soil.

Short-Term Effectiveness

To prevent any short-term risks associated with the implementation of RAA 3, construction workers will utilize personal protective equipment (PPE) and establish erosion and sediment control measures. RAA 3 does not require intrusive activities, but the use of heavy equipment on site and compaction of the soil cover may induce dust releases that will be addressed by established dust controls. Upon completion of RAA 3,

this alternative will immediately be effective in protecting human health and the environment.

Implementability

Construction activities required for RAA 3 are routine operations that involve readily accessible equipment and trained personnel.

Cost

A detailed cost estimate for RAA 3 is presented in Table 7. The estimated net present worth cost for RAA 3 is $246,000.

4.3 COMPARATIVE ANALYSIS OF ALTERNATIVES

This section presents a comparative analysis of the three RAAs for soil at Site 10, Hot Spot 2. The purpose of the comparative analysis is to identify the relative advantages and disadvantages of each RAA; thus, the criteria used in Section 4.2 for the detailed analysis will be the basis for the following comparative analysis.

4.3.1 Overall Protection of Human Health and the Environment

Each alternative will protect human health and the environment for the current and future land use with the exception of RAA 1, the No Action alternative. RAA 2 is protective of human health and the environment because soil/waste exceeding the remediation goals is removed from the site, but provides the most short-term risk to site workers and the environment of the three alternatives. For RAA 3, protection of human health and the environment will be achieved by mitigating the migration of contaminants from the soil and waste to the environment with the implementation of a soil cover (in areas with soil contamination greater than the NC SSLs), and existing LUCs restricting intrusive activities.

4.3.2 Compliance with ARARs

All of the RAAs, except for No Action, meet the applicable ARARs/TBC requirements.

Long-Term Effectiveness and Permanence

The No Action alternative will not be effective over the long-term as the contaminants will remain at the site and will not be contained, removed, treated, nor controlled. RAA 2 is effective because contaminated soil/waste up to five feet in depth will be removed from the site. RAA 3 will also be effective in the long-term because the soil cover will be protected from intrusive activities by existing LUCs, and the enhanced groundwater monitoring will detect any exceedances that are above 10-times the applicable NC 2B

standard or national USEPA criteria (see Table 5) prior to the groundwater entering Slocum Creek. NCDENR will determine if a groundwater action level for the protection of surface water should be calculated for constituents where applicable NC 2B or USEPA surface water criteria are not available.

Reduction of Toxicity, Mobility, or Volume through Treatment

None of the three alternatives will reduce toxicity, mobility, or volume of contaminants through treatment. RAA 2 includes removal and disposal of VOC-contaminated soil in approved landfills. RAA 3, which includes soil cover, will reduce contact with contaminated soil/waste by human receptors and will reduce groundwater infiltration through the waste and soil.

4.3.3 Short-Term Effectiveness

While the No Action alternative RAA 1 will not cause increased risk for workers and community members, it is not effective for protecting human health and the environment. For RAA 2 and RAA 3 to be effective in the short-term, worker and environmental protection plans will need to be in place. Because of the amount of excavation required for RAA 2 (and inherent unknowns due to the longevity of the landfill operations and disposition of the municipal waste material), there is a possibility of increased risk for workers and community members when removing and transporting the material. There is also risk of disturbing contained material (e.g., drum) and releasing the contamination to the environment. RAA 3 will not disturb the surface and will be physically effective in protecting human health and the environment in a shorter time frame than RAA 2.

4.3.4 Implementability

The No Action alternative does not require the coordination or availability of resources, services, or technologies; however, it will not meet the threshold criteria. Due to the unknown distribution of the municipal waste material within Hot Spot 2, efforts in coordinating excavation and off-site disposal (including waste characterization, DOT requirements, disposal facility requirements, and trucking arrangements), RAA 2 will be more difficult to implement than RAA 3.

4.3.5 Cost

Estimated capital and O&M costs for each active RAA are presented in Tables 6 and 7.

The estimated total net present worth cost for each RAA is provided below:

RAA No.	RAA Name	RAA Cost
RAA 1	No Action	$0
RAA 2	Excavation and Off-Site Disposal	$540,200
RAA 3	Soil Cover and Enhanced Groundwater Monitoring	$246,000

The cost to implement RAA 1 is $0. RAA 2 has a medium cost efficiency because it meets the RAO but at a cost that is higher than RAA 3. RAA 3 is the most cost-efficient alternative because it meets the RAO at a lower cost than RAA 2.

4.3.6 Relative Rankings of Alternatives

Below is a visual comparison of the three alternatives as discussed above:

CERCLA Criteria	No Action	Excavation and Off-Site Disposal	Soil Cover and Enhanced Groundwater Monitoring
Overall Protection of Human Health and the Environment	□	■	■
Compliance with ARARs	□	■	■
Long-Term Effectiveness and Performance	□	■	■
Reduction in Toxicity, Mobility, and Volume through Treatment	□	□	□
Short-Term Effectiveness	□	◘	■
Implementability	□	◘	■
Cost (Total Present Worth)	$0	$540,200	$246,000

Ranking: □Low ◘Moderate ■High
Rankings are provided as qualitative descriptions of the relative compliance of each alternative with the criteria.
Note:
Alternative RAA 1 – No Action
Alternative RAA 2 – Excavation and Off-Site Disposal
Alternative RAA 3 – Soil Cover and Enhanced Groundwater Monitoring

4.3.7 Summary of Comparative Analysis

All of the RAAs, except for No Action, are protective of human health and the environment and compliant with applicable ARARS.

RAA 2 and RAA 3 are both readily implementable, although RAA 3 is easier to implement than RAA 2. RAA 2 provides the most potential for short-term risk to site workers due to the excavation of site soils and landfill materials. There are fewer short-term risks associated with RAA 3 that may impact human health or the environment because of limited exposure to waste. RAA 3 is the most cost-efficient alternative.

The last two evaluation criteria, state acceptance and community acceptance, will be considered when input is received from NCDENR on this FFS and input is received from the community through the evaluation of the Proposed Plan.

TABLES

TABLE 1
Summary of Delineation Soil Analytical Results
Focused Feasibility Study
OU2, Site 10, Hot Spot 2
MCAS Cherry Point, North Carolina

Sample Identification:	**NC SSLs [a] (ug/kg)[b]**	**10-HS2-S-ISP1**	**10-HS2-S-ISP2**	**10-HS2-S-ISP3**	**10-HS2-S-ISP4**	**10-HS2-S-ISP5**	**10-HS2-S-ISP6**	**10-HS2-S-ISP7**	**10-HS2-S-ISP8**
Date Collected:		7/11/2007	7/11/2007	7/11/2007	7/11/2007	7/11/2007	7/11/2007	7/11/2007	7/12/2007
Volatile Organic Compounds (8260)									
Benzene	5.62	3.3J[c]	3.6J	ND	**230J**	ND	ND	**6.9**	ND
Chlorobenzene	438	ND[d]	ND	ND	ND	**783**	ND	ND	**42,200J**
cis-1,2-Dichloroethylene	350	29.6	13.4	6.5	**2,150**	201J	ND	3.9J	**1730J**
p-Dichlorobenzene	23	ND	ND	ND	ND	**310J**	ND	ND	**14,300J**
Ethylbenzene	4,570	ND	ND	ND	2,920	718	ND	ND	1680J
Methylene chloride	20	ND	ND	7.5J	**5,220**	**421J**	ND	ND	**3410J**
Naphthalene	585	ND	ND	ND	**6,860**	**2,830**	ND	ND	**5860J**
Trichloroethylene	18.3	**85.9[e]**	**60.2**	3.3J	**6,560**	ND	ND	ND	**490J**
Vinyl chloride	0.0952	ND	ND	ND	ND	ND	ND	ND	ND

TABLE 1
Summary of Delineation Soil Analytical Results
Focused Feasibility Study
OU2, Site 10, Hot Spot 2
MCAS Cherry Point, North Carolina

Sample Identification:	**NC SSLs [a] (ug/kg)[b]**	**10-HS2-S-ISP9**	**10-HS2-S-ISP10**	**10-HS2-S-ISP11**	**10-HS2-S-OSP1**	**10-HS2-S-OSP2**	**10-HS2-S-OSP3**	**10-HS2-S-OSP5**	**10-HS2-S-OSP6**
Date Collected:		7/12/2007	7/12/2007	7/12/2007	7/11/2007	7/12/2007	7/12/2007	7/12/2007	7/12/2007
Volatile Organic Compounds (8260)									
Benzene	5.62	**6.3J** / ND[f]	**12.1**	ND	--[g]	ND	**72.4**	--	--
Chlorobenzene	438	45.1 / 319J	**1,600**	ND	ND	--	**880**	ND	--
cis-1,2-Dichloroethylene	350	178 / **3,030**	14.5	ND	--	11.7	--	--	**29,700**
p-Dichlorobenzene	23	22 / **268J**	**147**	ND	ND	ND	**64.9**	ND	--
Ethylbenzene	4,570	3.9J / 325J	535	ND	--	--	--	--	--
Methylene chloride	20	**22.2 / 1,780**	ND	ND	ND	14.3	--	ND	--
Naphthalene	585	9.9J / ND	198	ND	6.4	--	--	ND	--
Trichloroethylene	18.3	**41.7 / 1,280**	ND	ND	--	4.4J	--	2.6J	**3,330**
Vinyl chloride	0.0952	**37.7J** / ND	**14.4**	ND	--	ND	ND	--	--

TABLE 1
Summary of Delineation Soil Analytical Results
Focused Feasibility Study
OU2, Site 10, Hot Spot 2
MCAS Cherry Point, North Carolina

Sample Identification:	**NC SSLs [a] (ug/kg)[b]**	**10-HS2-S-OSP9**	**10-HS2-S-OSP10**	**10-HS2-S-OSP11**	**10-HS2-S-OSP12**	**10-HS2-S-OSP13**	**10-HS2-S-OSP14**	**10-HS2-S-OSP15**
Date Collected:		7/13/2007	7/13/2007	7/13/2007	7/13/2007	7/13/2007	7/13/2007	7/13/2007
Volatile Organic Compounds (8260)								
Benzene	5.62	ND	ND	ND	--	ND	ND / 2.4J	--
Chlorobenzene	438	ND	ND	--	ND	ND	--	--
cis-1,2-Dichloroethylene	350	--	--	ND	ND	ND	8.2 / 16.8	--
p-Dichlorobenzene	23	ND	ND	ND	ND	ND	--	--
Ethylbenzene	4,570	--	--	--	--	--	--	--
Methylene chloride	20	--	--	ND	ND	ND	ND / ND	--
Naphthalene	585	--	--	--	ND	ND	ND / ND	--
Trichloroethylene	18.3	--	--	ND	ND	ND	ND / ND	ND
Vinyl chloride	0.0952	ND	ND	ND	--	--	--	--

TABLE 1
Summary of Delineation Soil Analytical Results
Focused Feasibility Study
OU2, Site 10, Hot Spot 2
MCAS Cherry Point, North Carolina

Sample Identification:	**NC SSLs [a] (ug/kg)[b]**	**10-HS2-S-PSP-1**	**10-HS2-S-PSP-2**	**10-HS2-S-PSP-3**	**10-HS2-S-PSP-4**	**10-HS2-S-PSP-5**	**10-HS2-S-EPSP-1**	**10-HS2-S-PSP-6**	**10-HS2-S-PSP-7**
Date Collected:		12/12/2007	12/12/2007	12/12/2007	12/12/2007	12/12/2007	12/12/2007	7/31/2008	7/31/2008
Volatile Organic Compounds (8260)									
Benzene	5.62	ND	ND	--	--	**23.6J**	--	ND / ND	ND
Chlorobenzene	438	**70,500**	ND	--	--	3.3J	**688**	--	--
cis-1,2-Dichloroethylene	350	--	--	**17,300**	ND / ND	**5,600J**	--	ND / ND	**17,100**
p-Dichlorobenzene	23	**12,700**	2.7J	--	--	ND	**321J**	--	--
Ethylbenzene	4,570	--	--	--	--	--	--	--	--
Methylene chloride	20	--	--	--	--	--	--	--	--
Naphthalene	585	--	--	--	--	--	--	--	--
Trichloroethylene	18.3	--	--	**1,960**	ND / ND	**3,340J**	--	ND / ND	**347J**
Vinyl chloride	0.0952	--	--	--	--	--	--	--	--

TABLE 1
Summary of Delineation Soil Analytical Results
Focused Feasibility Study
OU2, Site 10, Hot Spot 2
MCAS Cherry Point, North Carolina

Sample Identification:	**NC SSLs [(a)] (ug/kg)[(b)]**	**10-HS2-S-PSP-8**	**10-HS2-S-PSP-9**	**10-HS2-S-PSP-10**	**10-HS2-S-PSP-11**	**10-HS2-S-PSP-12**	**10-HS2-S-PSP-13**	**10-HS2-S-EPSP-3**	**10-HS2-S-EPSP-4**	**10-HS2-S-EPSP-8**
Date Collected:		7/31/2008	7/31/2008	7/31/2008	7/31/2008	7/31/2008	7/31/2008	7/31/2008	8/1/2008	8/1/2008
Volatile Organic Compounds (8260)										
Benzene	5.62	ND	ND	--	--	--	--	--	--	--
Chlorobenzene	438	--	--	ND	ND	**5,310**	**438**	ND	ND	--
cis-1,2-Dichloroethylene	350	ND	ND	--	--	--	--	--	--	ND
p-Dichlorobenzene	23	--	--	ND	ND	**3,010 J**	ND	ND	--	--
Ethylbenzene	4,570	--	--	--	--	--	--	--	--	--
Methylene chloride	20	--	--	--	--	--	--	--	--	--
Naphthalene	585	--	--	--	--	--	--	--	--	--
Trichloroethylene	18.3	ND	ND	--	--	--	--	--	--	ND
Vinyl chloride	0.0952	--	--	--	--	--	--	--	--	--

Notes:

(a) NC SSLs are the North Carolina Soil Screening Levels, May 2005.

(b) All SSLs and data are in micrograms per kilogram (ug/kg), or parts per billion (ppb).

(c) A "J" value indicates the constituent was detected at the estimated value shown.

(d) ND indicates the constituent was not detected above the laboratory detection limits.

(e) A **Bold** value indicates an exceedance of the NC SSL.

(f) "x / x" indicates a duplicate sample was collected at this location.

(g) "--" indicates the constituent was not reported.

TABLE 2
Chemical-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
	NC Surface Water Quality Standards		
Protection of adjacent surface water body	Monitor and undertake management practices for sources of pollution so that water quality standards and best usage of receiving waters and all downstream waters will not be impaired.	Indirect discharges of waste or other source of water pollution into surface waters — **applicable**	15A NCAC 02B .0203
Protection of adjacent surface water body	The concentrations of toxic substances, either alone or in combination with other wastes, in surface waters shall not render waters injurious to aquatic life or wildlife, recreational activities, public health, or impair the waters for any designated uses.	Nonpoint discharges into surface waters — **applicable**	15A NCAC 02B .0208
Protection of adjacent surface water body	Shall not exceed 25 NTU turbidity level (unless due to natural background conditions). Compliance with this standard can be met when land management activities employ Best Management Practices [as defined by Rule .0202 of this Section]. Toxic substances: shall not exceed the numerical quality standards (maximum permissible levels) provided in subparagraphs (i) through (xi) to protect aquatic life.	Nonpoint discharges into Class C, fresh surface waters— **applicable** **applicable**	15A NCAC 02B .0211(3)(k) 15A NCAC 02B .0211(3)(l)
	Oil Pollution & Hazardous Control Act		
Protecting land and water from oil product pollution	Establishes criteria for protecting land and water from pollution by oil, oil products and hazardous substances.	Management of materials that meet the definition hazardous waste or oil products — **relevant and appropriate**	N.C.G.S Ch. 143, Article 21A Part 1, 2

TABLE 3
Location-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Location	Requirement	Prerequisite	Citation
Floodplain Management			
Presence of floodplain designated as such on a map	Shall consider alternatives to avoid, to the extent possible, adverse effects and incompatible development in the floodplain.	Federal actions that involve potential impacts to, or take place within, floodplains. — **TBC**	Executive order 11988 Section 2 (a)(2)

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
Monitoring Well Installation, Operation, and Abandonment			
Construction of groundwater monitoring well(s)	No well shall be located, constructed, operated, or repaired in any manner that may adversely impact the quality of groundwater.	Installation of wells (including temporary) other than for water supply — **applicable**	15A NCAC 02C .0108(a)
	Shall be located, designed, constructed, operated and abandoned with materials and by methods which are compatible with the chemical and physical properties of the contaminants involved, specific site conditions, and specific subsurface conditions.	**applicable**	15A NCAC 02C .0108(c)
	Must comply with general requirements for construction of a well as provided in 15A NCAC 02C .0108(c)(1) through (12).	**applicable**	15A NCAC 02C .0108(c)
	Shall be constructed in such a manner as to preclude the vertical migration of contaminants with and along borehole channel.	**applicable**	15A NCAC 02C .0108(f)
Implementation of groundwater monitoring system	Shall be constructed in a manner that will not result in contamination of adjacent groundwaters of a higher quality.	Installation of monitoring system to evaluate effects of any actions taken to restore groundwater quality, as well as the efficacy of treatment — **applicable**	15A NCAC 02L .0110 (b)

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
Maintenance of groundwater monitoring well(s)	Every well shall be maintained by the owner in a condition whereby it will conserve and protect groundwater resources, and whereby it will not be a source or channel of contamination or pollution to the water supply or any aquifer. Broken, punctured, or otherwise defective or unserviceable casing, screens, fixtures, seals, or any part of the well head shall be repaired or replaced, or the well shall be abandoned pursuant to 15A NCAC 02C .0113. All materials used in the maintenance, replacement, or repair of any well shall meet the requirements for new installation.	Installation of wells (including temporary wells) other than for water supply — **applicable** **applicable** **applicable**	15A NCAC 02C .0112(a) 15A NCAC 02C .0112(c) 15A NCAC 02C .0112(b)
Abandonment of groundwater monitoring well(s)	Shall be abandoned in accordance with the requirements of 15A NCAC 02C .0113(b)(1) and (2).	Permanent abandonment of wells (including temporary wells) other than for water supply — **applicable**	15A NCAC 02C .0113(b))

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
	General Construction Standards — Land-disturbing Activities (i.e., excavation, clearing, grading, etc.)		
Managing fugitive dust emissions	Shall not cause or allow fugitive dust emissions to cause or contribute to substantive complaints, or visible emissions in excess of that allowed under paragraph (e) of this Rule.	Activities within facility boundary that will generate fugitive dust emissions — **relevant and appropriate**	15A NCAC 02D.0540(c)
	Implement methods (e.g. wetting dry soils) to control dust emissions that could travel beyond the facility boundary.	**relevant and appropriate**	15A NCAC 02D.0540(g)
Characterization of solid waste	Must determine if solid waste is hazardous waste or if waste is excluded under 40 CFR 261.4(b); and	Generation of solid waste as defined in 40 CFR 261.2 and which is not excluded under 40 CFR 261.4(a) —**applicable**	40 CFR 262.11(a)
	Must determine if waste is listed under 40 CFR Part 261; or	**applicable**	40 CFR 262.11(b)
	Must characterize waste by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used.	**applicable**	40 CFR 262.11(c)
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous —**applicable**	40 CFR 262.11(d)

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
Storage of solid waste	All solid waste shall be stored in such a manner as to prevent the creation of a nuisance, nsanitary conditions, or a potential public health hazard.	Generation of solid waste which is determined not to be hazardous — **relevant and appropriate**	15A NCAC 13B.0104(f)
	Containers for the storage of solid waste shall be maintained in such a manner as to prevent the creation of a nuisance or insanitary conditions.		
	Containers that are broken or that otherwise fail to meet this Rule shall be replaced with acceptable containers.	**relevant and appropriate**	15A NCAC 13B.0104(e)
Characterization of hazardous waste	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 CFR 264 and 268.	Generation of RCRA-hazardous waste for storage, treatment or disposal —**applicable**	40 CFR 264.13(a)(1)
	Must determine the underlying hazardous constituents [as defined in 40 CFR 268.2(i)] in the waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal — **applicable**	40 CFR 268.9(a)
	Must determine if the waste is restricted from land disposal under 40 CFR 268 *et seq.* by testing in accordance with prescribed methods or use of generator knowledge of waste.	**applicable**	40 CFR 268.7
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 CFR 268.40 *et. seq*.	**applicable**	40 CFR 268.9(a)

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
Temporary storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that:	Accumulation of RCRA hazardous waste on site as defined in 40 CFR 260.10 — **applicable**	40 CFR 262.34(a)
	Waste is placed in containers that comply with 40 CFR 265.171-173;	**applicable**	40 CFR 262.34(a)(1)(i)
	The date upon which accumulation begins is clearly marked and visible for inspection on each container;	**applicable**	40 CFR 262.34(a)(2)
	Container is marked with the words “hazardous waste”; and	**applicable**	40 CFR 264.34(a)(3)
	Container may be marked with other words that identify the contents.	Accumulation of 55 gal. or less of RCRA hazardous waste at or near any point of generation — **applicable**	40 CFR 262.34(c)(1)
Use and management of hazardous waste in containers	If container is not in good condition (e.g. severe rusting, structural defects) or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers — **applicable**	40 CFR 265.171
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.	**applicable**	40 CFR 265.172
	Keep containers closed during storage, except to add/remove waste.	**applicable**	40 CFR 265.173(a)
	Open, handle and store containers in a manner that will not cause containers to rupture or leak.	**applicable**	40 CFR 265.173(b)

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
Managing storm water runoff from land-disturbing activities	Shall install erosion and sedimentation control devices and practices sufficient to retain the sediment generated by the land-disturbing activity within the boundaries of the tract during construction.	Land-disturbing activity (as defined in N.C.G.S Ch. 113A-53) of more than 1 acre of land **—relevant and appropriate**	N.C.G.S.Ch. 113A-157(3)
	Shall plant or otherwise provide permanent ground cover sufficient to restrain erosion after completion of construction.		N.C.G.S.Ch. 113A-157(3)
	Shall take all reasonable measures to protect all public and private property from damage caused by such activities.	Land-disturbing activity (as defined in N.C.G.S. Ch. 113A-52) of more than 1 acre of land **—relevant and appropriate**	15A NCAC 4B.0105

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
Waste treatment and disposal—primary wastes (excavated contaminated soils)			
Disposal of solid waste	Shall ensure that waste is disposed of at a site or facility which is permitted to receive the waste.	Generation of solid waste intended for off-site disposal — **relevant and appropriate**	15A NCAC 13B.0106(b)
Disposal of RCRA hazardous waste in a land-based unit	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 CFR 268.40 before land disposal. Must be treated according to the alternative treatment standards of 40 CFR 268.49(c); or Must be treated according to the UTSs [specified in 40 CFR 268.48 Table UTS] applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 CFR 268.2, of restricted RCRA waste — **applicable** Land disposal, as defined in 40 CFR 268.2, of restricted hazardous soils — **applicable**	40 CFR 268.40(a) 40 CFR 268.49(b)

TABLE 4
Action-Specific ARARs/TBC
Focused Feasibility Study
OU2, Site 10, Hotspot 2
MCAS Cherry Point, North Carolina

Action	Requirement	Prerequisite	Citation
	Transportation of Wastes		
Transportation of hazardous waste on-site	The generator manifesting requirements of 40 CFR 262.20-262.32(b) do not apply. Generator or transporter must comply with the requirements set forth in 40 CFR 262.30 and 263.31 in the event of a discharge of hazardous waste on a private or public right-of-way.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way — **applicable**	40 CFR 262.20(f)
Transportation of hazardous waste off-site	Must comply with the generator requirements of 40 CFR 262.20-23 for manifesting, Sect. 262.30 for packaging, Sect.262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number. Must comply with the requirements of 40 CFR 262.11-263.31. A transporter who meets all applicable requirements of 49 CFR 171-179 and the requirements of 40 CFR 263.11 and 263.31 will be deemed in compliance with 40 CFR 171-180.	Off-site transportation of RCRA-hazardous waste — **applicable** Transportation of hazardous waste within the Unites States requiring a manifest — **applicable** **applicable**	40 CFR 262.10(h) 40 CFR 262.10(a)
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMTA and DOT HMR at 49 CFR 171-180.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material — **applicable**	49 CFR 171.1(c)

TABLE 5
Summary of Groundwater Action Levels for Protection of Surface Water
OU2, Site 10, Hot Spot 2
MCAS Cherry Point, North Carolina

	Saltwater Aquatic Life µg/L	Human Health µg/L	Action Level µg/L	Data Reference for Saltwater Aquatic Life and Human Health Values
Chemical Name				
Volatile Organic Compounds				
1,1-Dichloroethane	--	170,000	1,700,000	Handbook of Environmental Data-Vershueren/RAIS 1/07
1,1-Dichloroethene	--	7,100	71,000	NRWQC 06/ECOTOX & RAIS 1/07
1,2-Dibromo-3-chloropropane	--	0.13	1.3	ECOTOX/RIS/RAIS 1/07
1,2-Dichloroethane	--	37	370	NRWQC 06/ECOTOX & RAIS 4/09
1,2-Dichloropropane	--	15	150	NRWQC 06
1,4-Dichlorobenzene	--	190	1,900	NRWQC 06/ECOTOX & RAIS 1/07
2-Butanone	20,000	--	200,000	ECOTOX/RAIS/IRIS 1/07
2-Hexanone	--	--	*	--
Acetone	300,000	--	3,000,000	ECOTOX/RAIS/IRIS 1/07
Benzene	--	51	510	NC 2B
Chlorobenzene	(LD)	--	*	--
Chloroform	--	170	1,700	NRWQC 06/RAIS 1/07
Chloromethane	--	--	*	--
cis-1,2-Dichloroethene	--	4,900	49,000	ECOTOX & RAIS 1/07
Ethylbenzene	130	--	1,300	ECOTOX & RAIS 2/07
Hexachlorobutadiene	--	18	180	NC 2B
Naphthalene	52	--	520	ECOTOX/IRIS/RAIS 2/07
Tetrachloroethene	--	3.3	33	NC 2B
Trichloroethene	--	30	300	NC 2B
Vinyl chloride	--	2.4	24	NC 2B
Semivolatile Organic Compounds				
1,4-Dichlorobenzene	--	190	1,900	NRWQC 06/ECOTOX & RAIS 1/07
2,4-Dimethylphenol	66 (N)	--	660	ECOTOX & RAIS 1/07
2-Chlorophenol	--	--	*	--
2-Methylnaphthalene	(LD)	80	800	IRIS/RAIS/ECOTOX 1/08
2-Methylphenol	--	--	*	--
3- and 4-Methylphenol	--	--	*	--
4-Methylphenol	--	--	*	--
bis(2-Ethylhexyl)phthalate	--	2.2	22	NRWQC 06
Hexachlorobutadiene	--	18	180	NC 2B
Naphthalene	52	--	520	ECOTOX/IRIS/RAIS 2/07
n-Nitrosodiphenylamine	--	6	60	NRWQC 06/IRIS & RAIS 2/07
Phenol	(N)	300	3,000	NC 2B/NRWQC 06
Total Metals				
Arsenic	50	10	100	NC 2B
Cadmium	5(N)	--	50	NC 2B
Chromium	20	--	200	NC 2B
Iron	(LD)	--	*	--
Lead	25(N)	--	250	NC 2B
Manganese	--	--	*	--
Zinc	86(AL)	--	860	NC 2B

Notes:
µg/L = micrograms per liter
-- = value not available
(N) Narrative Standard - 15A NCAC 2B .0211
(AL) Action Level Standard - 15 NCAC 2B .0211
(LD) Limited Data Available
Red values are 15 NCAC 2B Values.
Action Level is 10-times the most stringent of the NC 2B Saltwater Aquatic Life or Human Health values, when available.
Blue values are USEPA national criteria. These are used to calculate an action level when an appropriate NC 2B value is not available.
* No appropriate NC 2B or USEPA criteria is available. NCDENR shall be contacted to determine if an action level can be calculated for the constituent.
ECOTOX = USEPA ECOTOXicology Database System
IRIS = USEPA Integrated Risk Information System
NRWQC 06 = USEPA 2006 National Recommended Water Quality Criteria
RAIS = Risk Assessment Information System; Toxicology & Chemical Specific Factors Database

TABLE 6 Cost Estimate: RAA 2 - Excavation and Off-Site Disposal

PRELIMINARY COST ESTIMATE

Assumptions:

For Comparison Purposes Only

Contingency will be added to final Alternative

Site: **Site 10, Hot Spot 2**
Location: **Cherry Point MCAS**
Phase: **Remedy Evaluation**
Base Year: **2011**
Date: **6/2/2010**

Prepared by: BAM Date: 6/2/2010

Checked by: ELSD Date: 6/2/2010

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL FACTORED PRICE
CONTRACTOR SERVICES				
Mobilization/Site Prep/Site Setup (includes vegetation clearance and road)	1	EA	$60,000.00	$ 60,000.00
Soil Excavation (assume excavation to 5 ft bgs)	1,667	CY	$10.00	$ 16,670.00
40% contingency if performed in Level B PPE or higher	1	LS	$6,668.00	6,668.00
Dispose of soil in an off-site landfill (assumes non-hazardous disposal)	2,500	Ton	$60.00	$ 150,000.00
Haul clean soil to use as cover (assumes 5' depth for soil replacement)	1,667	CY	$15.00	$ 25,005.00
Place and grade soil	1,667	CY	$7.00	$ 11,669.00
Surveying	1	LS	$10,000.00	$ 10,000.00
Disposal sampling	10	EA	$1,000.00	$ 10,000.00
Site restoration & demobilization	1	LS	$10,000.00	$ 10,000.00
SUBTOTAL CONTRACTOR SERVICES				**$ 300,012.00**
PROFESSIONAL SERVICES				
Project Management	5%			$ 15,000.60
Work plans, permits, reporting, deliverables	15%			$ 45,001.80
Construction oversight	15%			$ 45,001.80
SUBTOTAL PROFESSIONAL SERVICES				**$ 105,004.20**
SUBTOTAL CONTRACTOR AND PROFESSIONAL SERVICES				**$ 405,016.20**
G&A	5.44%			$ 22,032.88
Fee	10%			$ 42,704.91
Contingency	15%			$ 70,463.10
			TOTAL CAPITAL COSTS	**$ 540,217.09**

SUBSEQUENT YEAR OPERATIONS AND MAINTENANCE

REPORTING				
Reporting labor	1	report	$0.00	$ 0.00
SUBTOTAL REPORTING				**$ 0.00**
G&A	5.44%			$ 0.00
Fee	10%			$ 0.00
SUBTOTAL REPORTING				**$ 0.00**
PROFESSIONAL SERVICES				
Project Management	5%			$ 0.00
Technical Support	10%			$ 0.00
SUBSEQUENT YEARS O&M COST				**$ 0.00**

PRESENT WORTH VALUE ANALYSIS

Number of Years of Maintenance =	30
Effective Interest Rate =	4.5%
Yearly Cost =	$0.00
Present Worth O&M Cost =	**$0.00**
TOTAL PRESENT WORTH COST	**$540,217.09**

*This estimate is not intended to function as guarantee of fixed costs for field implementation. It is intended strictly as a relative comparison between various remediation options presented.

NOTE: THIS IS AN ORDER OF MAGNITUDE COST ESTIMATE AND IS EXPECTED TO BE ACCURATE TO +50% / -30%.

Table 7 Cost Estimate: RAA 3 - Soil Cover and Enhanced Groundwater Monitoring
Assumptions:
Contingency will be added to final Alternative

PRELIMINARY COST ESTIMATE
For Comparison Purposes Only

Site: **Site 10, Hot Spot 2**
Location: **Cherry Point MCAS**
Phase: **Remedy Evaluation**
Base Year: **2011**
Date: **2/15/2011**

Prepared by: BAM Date: 2/15/2011
Checked by: ELSD Date: 2/15/2011

CAPITAL COSTS

DESCRIPTION	QTY	UNIT	UNIT COST	TOTAL FACTORED PRICE	
CONTRACTOR SERVICES					
Mobilization/Site Prep/Site Setup (includes vegetation clearance and road)	1	EA	$60,000.00	$	60,000.00
Compaction of soil to be capped	9,000	SF	$4.00	$	36,000.00
Grade soil to be capped	9,000	SF	$0.25	$	2,250.00
Haul clean soil to use as cover (assumes 2.0' depth for cover + 25%)	835	CY	$15.00	$	12,525.00
Place and grade soil	835	CY	$7.00	$	5,845.00
Surveying	1	LS	$10,000.00	$	10,000.00
Site restoration & demobilization	1	LS	$10,000.00	$	10,000.00
SUBTOTAL CONTRACTOR SERVICES				**$**	**136,620.00**
PROFESSIONAL SERVICES					
Project Management	5%			$	6,831.00
Work plans, permits, reporting, deliverables	15%			$	20,493.00
Construction oversight	15%			$	20,493.00
SUBTOTAL PROFESSIONAL SERVICES				**$**	**47,817.00**
SUBTOTAL CONTRACTOR AND PROFESSIONAL SERVICES				$	**184,437.00**
G&A	5.44%			$	10,033.37
Fee	10%			$	19,447.04
Contingency	15%			$	32,087.61
	TOTAL CAPITAL COSTS			**$**	**246,005.02**

SUBSEQUENT YEAR OPERATIONS AND MAINTENANCE

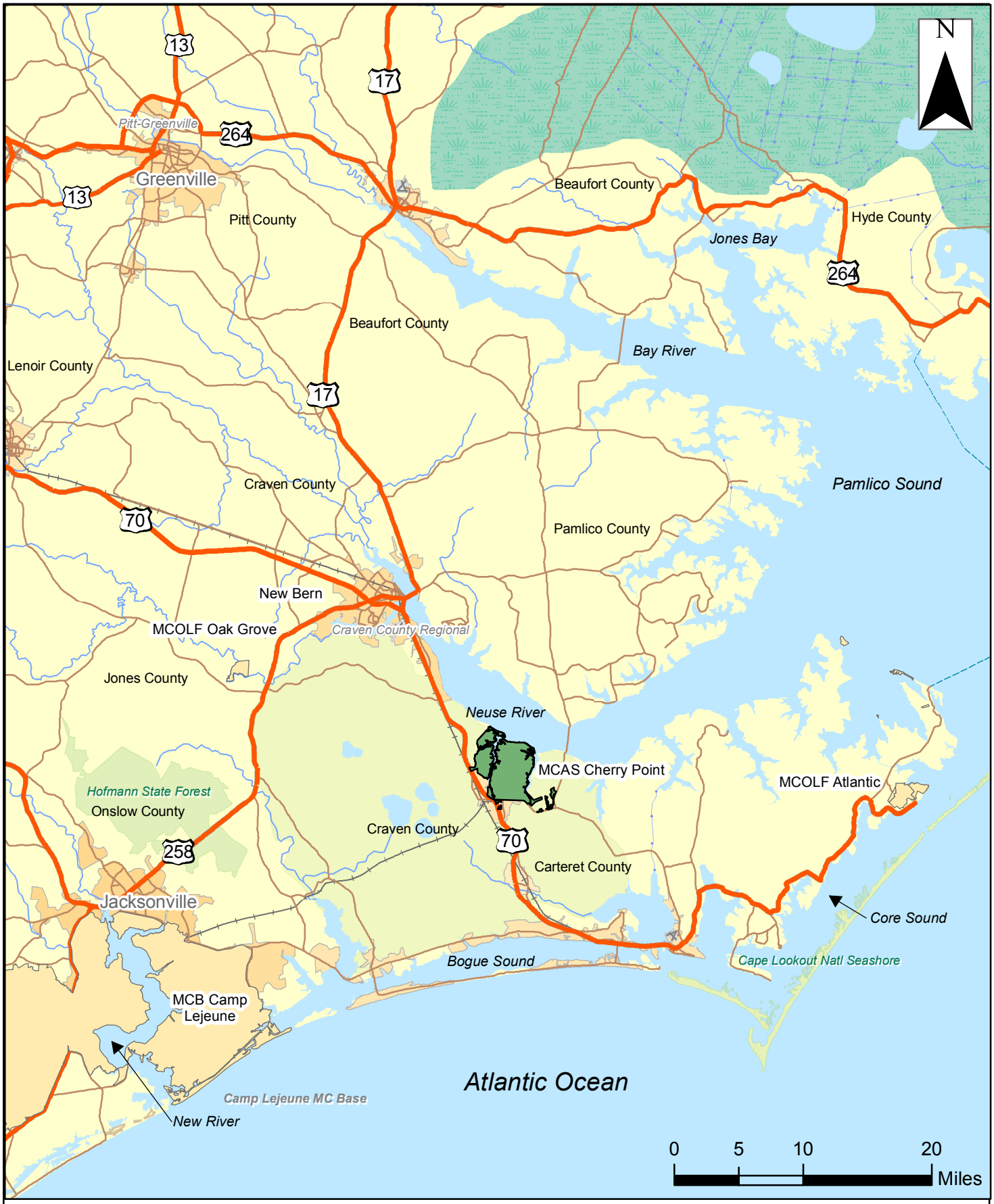
REPORTING					
Reporting	1	report	$0.00	$	0.00
SUBTOTAL REPORTING				**$**	**0.00**
G&A	5.44%			$	0.00
Fee	10%			$	0.00
SUBTOTAL REPORTING				**$**	**0.00**
PROFESSIONAL SERVICES					
Project Management	5%			$	0.00
Technical Support	10%			$	0.00
SUBSEQUENT YEARS O&M COST				**$**	**0.00**

PRESENT WORTH VALUE ANALYSIS

Number of Years of Maintenance =	30
Effective Interest Rate =	4.5%
Yearly Cost =	**$0.00**
Present Worth O&M Cost =	**$0.00**
TOTAL PRESENT WORTH COST	**$246,005.02**

*This estimate is not intended to function as guarantee of fixed costs for field implementation. It is intended strictly as a relative comparison between various remediation options presented.
NOTE: THIS IS AN ORDER OF MAGNITUDE COST ESTIMATE AND IS EXPECTED TO BE ACCURATE TO +50% / -30%.

FIGURES



Legend

- MCAS Cherry Point
- Highway
- Major Road
- Local Road
- Major Railroad Lines
- Stream
- Water Bodies

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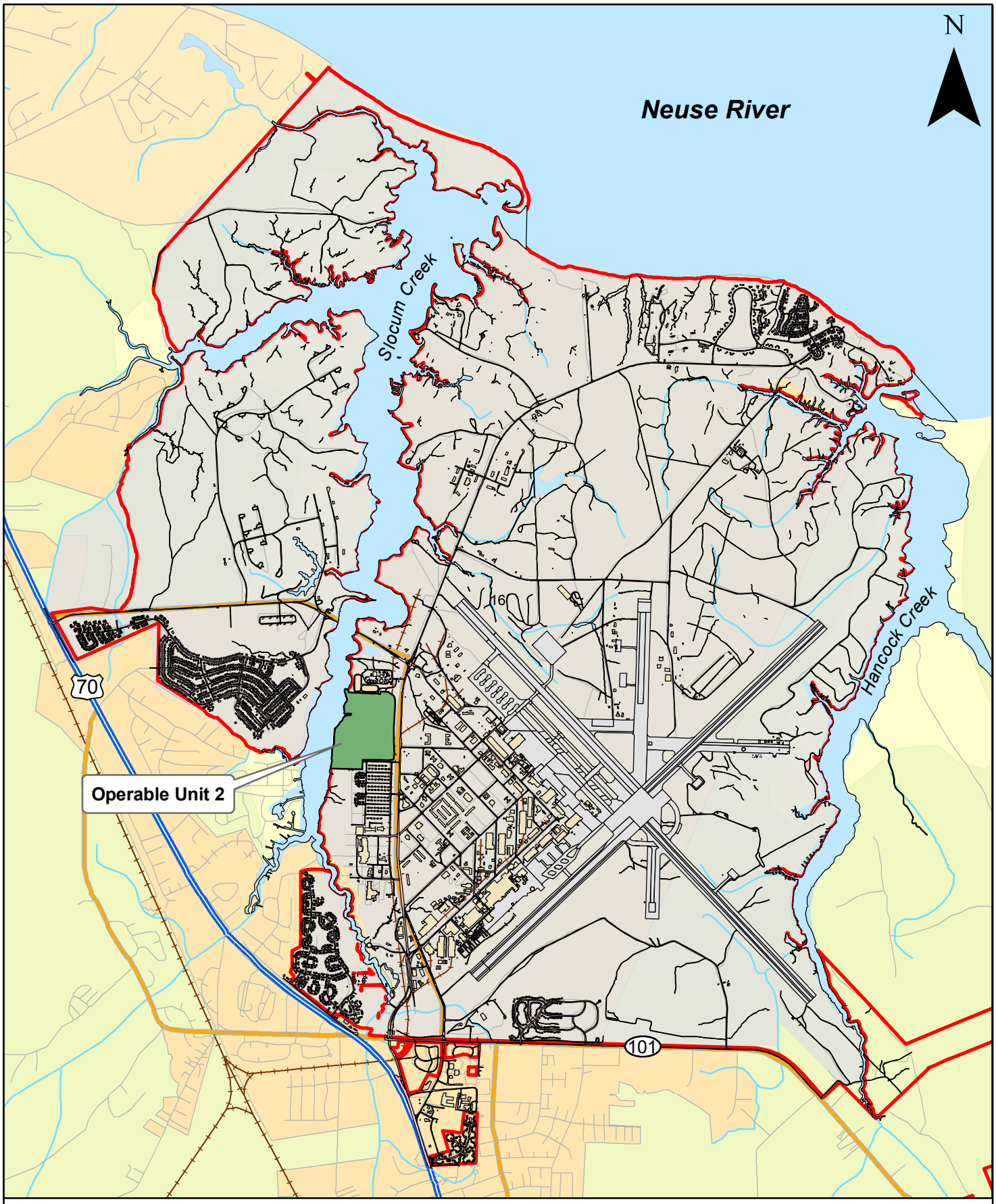
Figure 1
MCAS Cherry Point Location Map
MCAS Cherry Point, North Carolina



Legend

- Operable Unit 2
- Water Bodies
- Buildings
- Base Boundary

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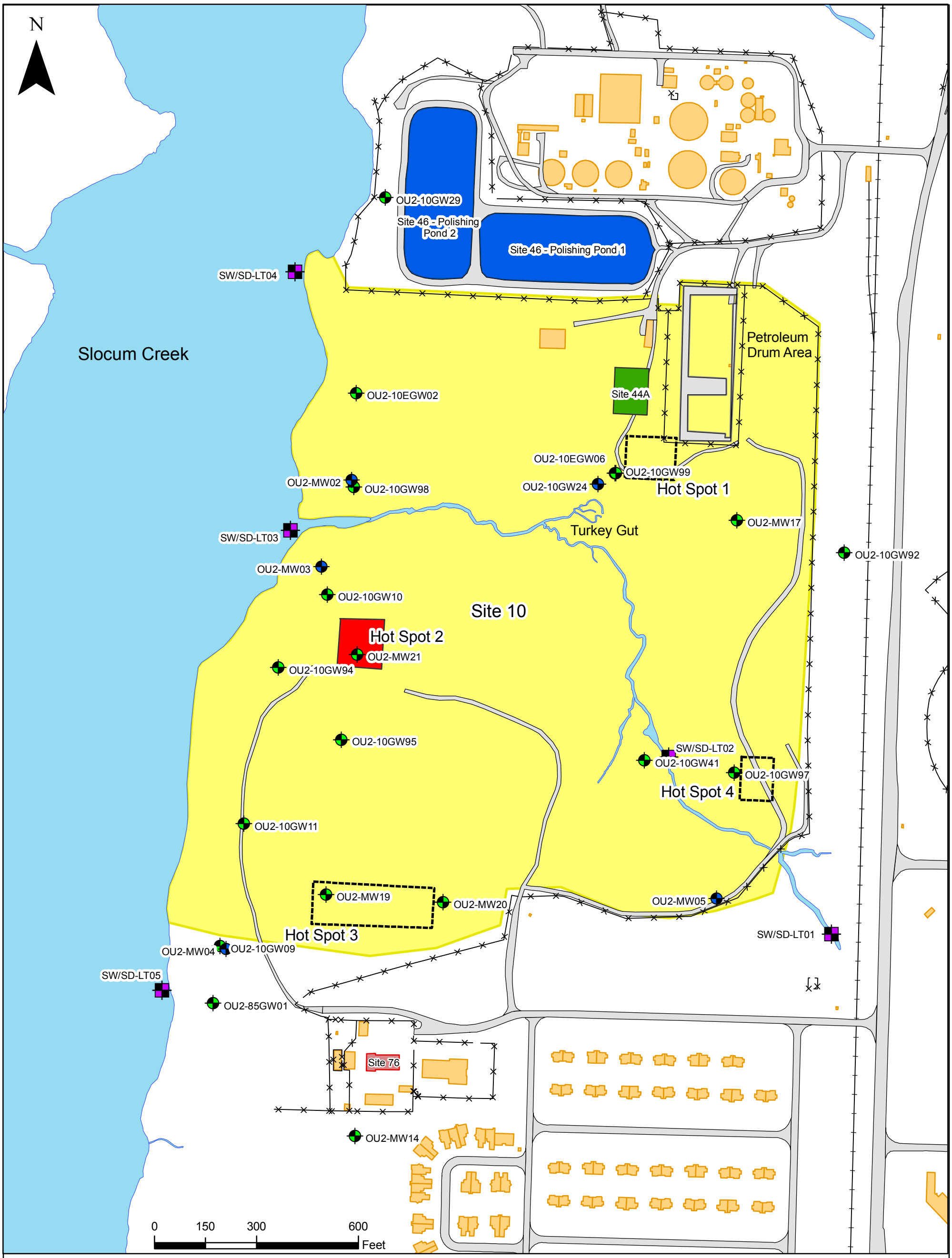
0 2,000 4,000 8,000 Feet

Figure 2
Operable Unit 2 Location Map
MCAS Cherry Point, North Carolina



Legend

- Yorktown Aquifer Monitoring Well
- Surficial Aquifer Monitoring Wells
- Surface Water / Sediment Sampling Locations
- Hot Spot 2
- Former Soil Hot Spot Area
- Fence Lines
- Petroleum Drum Area
- Site 44A - Former Sludge Application Area
- Roads
- Buildings
- Site 46 - Polishing Ponds 1 & 2
- Site 10 - Old Sanitary Landfill
- Site 76 - Vehicle Maintenance Area (Hobby Shop)

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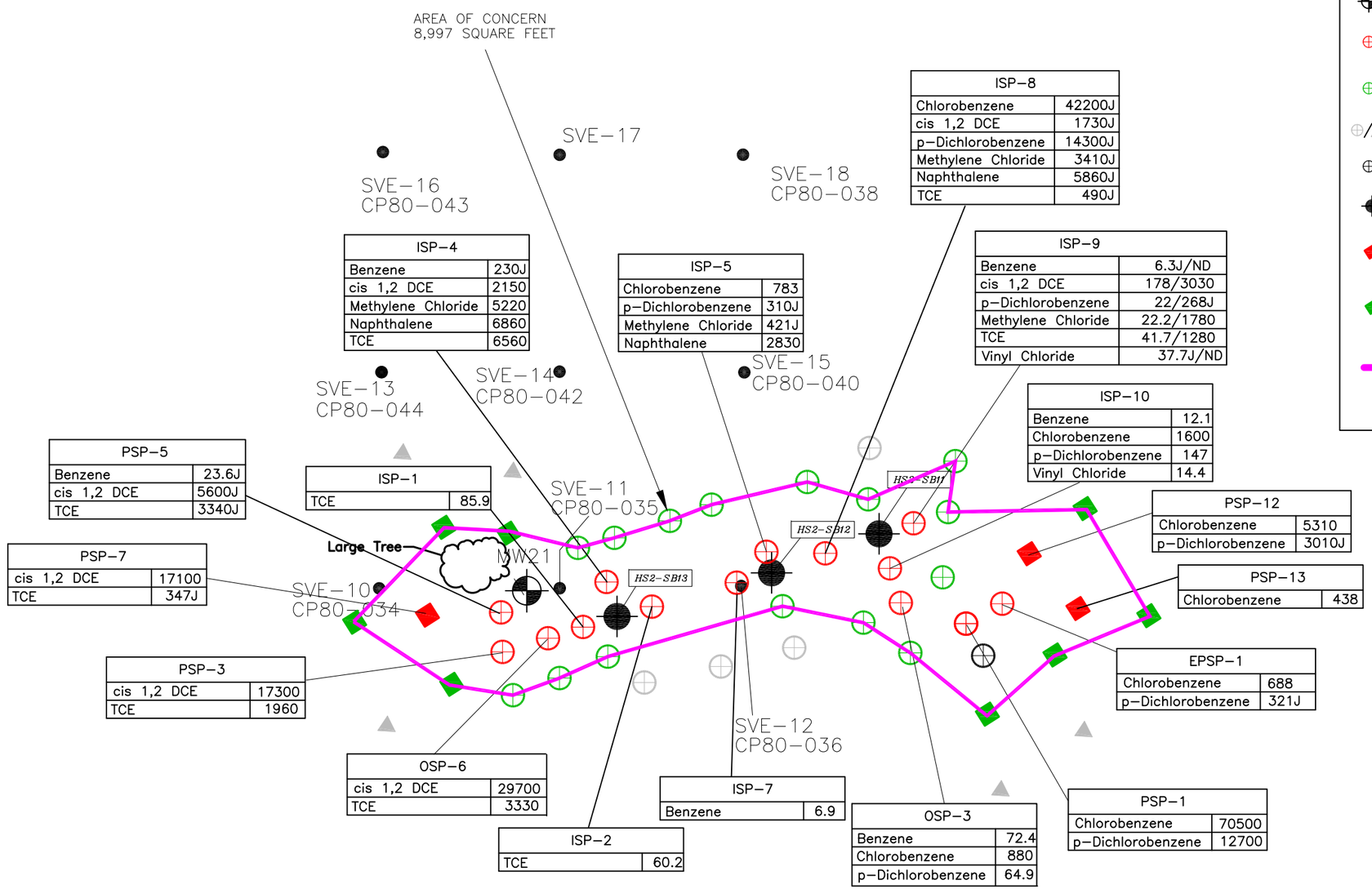
Figure 3
Site 10 Hot Spot Location Map
MCAS Cherry Point, North Carolina



LEGEND:

- VAPOR EXTRACTION WELL
- EXISTING MONITORING WELL
- 2007 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS ABOVE NC SSLs)
- 2007 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS BELOW NC SSLs)
- SAMPLES WERE COLLECTED BUT NOT ANALYZED
- NO SOIL RECOVERY DUE TO TRASH AND DEBRIS
- LOCATION OF LTM SOIL SAMPLING
- 2008 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS ABOVE NC SSLs)
- 2008 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS BELOW NC SSLs)
- APPROXIMATE AREA OF CONCERN

NOTES:

ND INDICATES THAT THE COMPOUND WAS NOT DETECTED.

SAMPLE LOCATIONS ARE BASED ON FIELD MEASUREMENTS AND ARE APPROXIMATE.

J INDICATES THAT THE RESULT IS AN ESTIMATED VALUE BETWEEN THE QUANTITATION AND REPORTING LIMITS.

CONCENTRATIONS ARE REPORTED IN MICROGRAMS PER KILOGRAM (UG/KG).

NC SSLs ARE THE NORTH CAROLINA SOIL SCREENING LEVELS.

P-DICHLOROBENZENE AND 1,4-DICHLOROBENZENE ARE SYNONYMS FOR THE SAME COMPOUND.

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PRINTED DATE:			
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REVISIONS

FIGURE 4
SOIL SAMPLING LOCATIONS AND EXCEEDANCES
OU2, SITE 10 HOT SPOT 2 SOIL DELINEATION
MCAS CHERRY POINT NORTH CAROLINA

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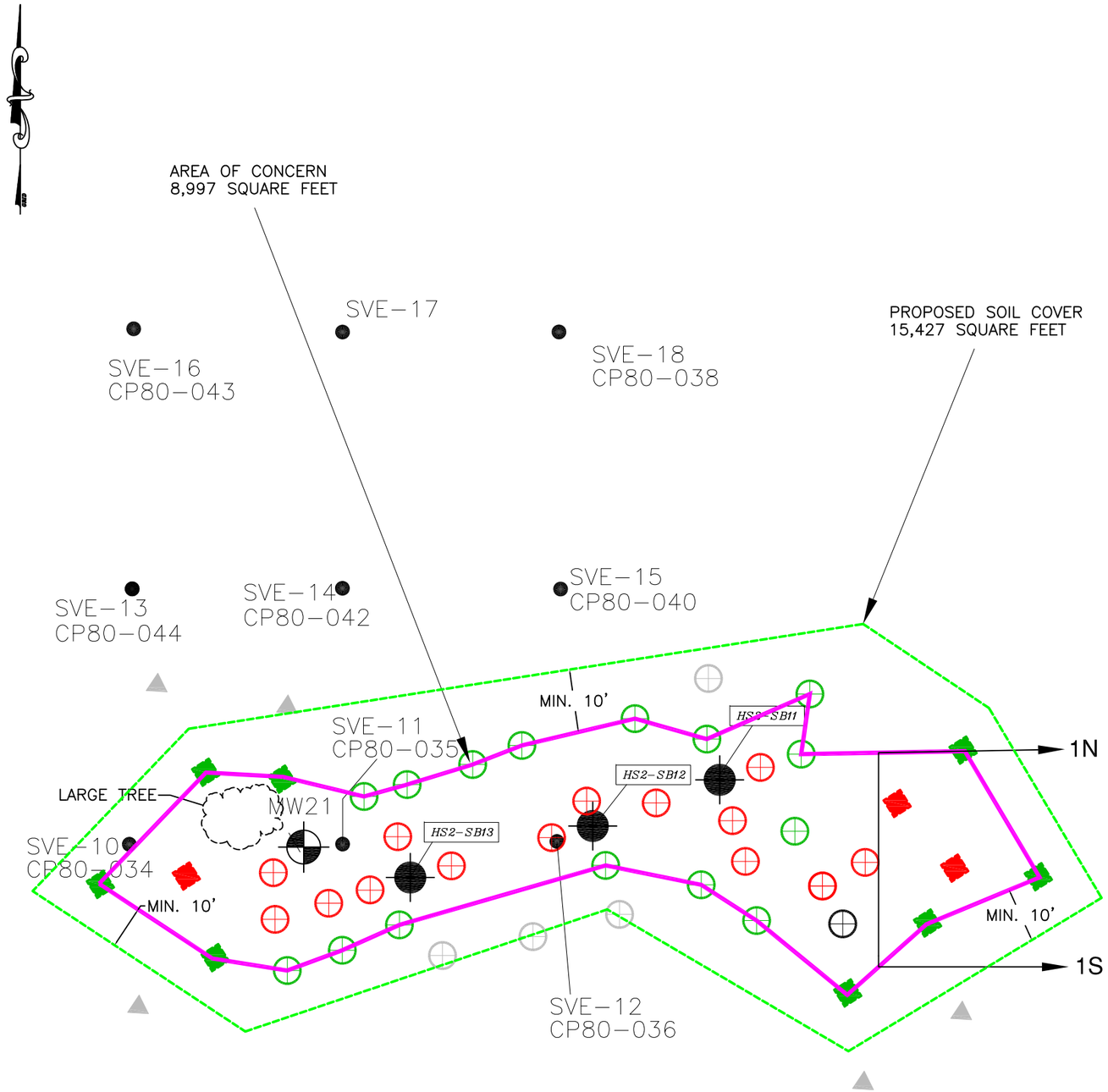
4975 WILLIAM FLYNN HIGHWAY, SUITE 14
GIBSONIA, PA 15044

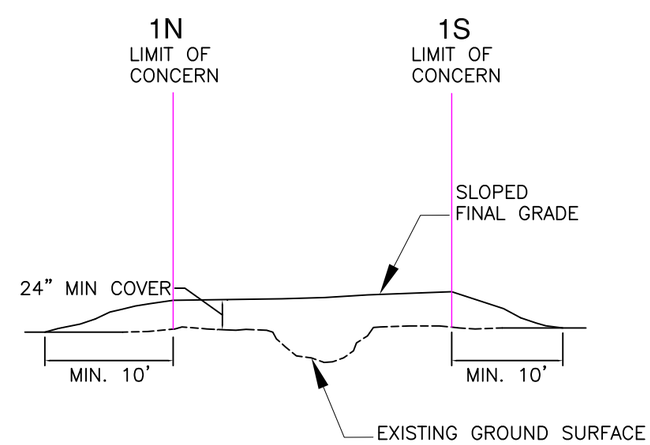
Drawn By	Checked By	Date	Scale	Job	Sheet No.
BAM	ELSD	SEPTEMBER 2009	AS SHOWN	383	F2

NAVFAC 1409/383/REPORTS/R3/Figure 4



LEGEND:

- FORMER VAPOR EXTRACTION WELL LOCATION
- EXISTING MONITORING WELL
- 2007 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS ABOVE NC SSLs)
- 2007 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS BELOW NC SSLs)
- SAMPLES WERE COLLECTED BUT NOT ANALYZED
- NO SOIL RECOVERY DUE TO TRASH AND DEBRIS
- LOCATION OF LTM SOIL SAMPLING
- 2008 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS ABOVE NC SSLs)
- 2008 SOIL DELINEATION SAMPLE LOCATION (ANALYTICAL RESULTS BELOW NC SSLs)
- APPROXIMATE AREA OF CONCERN
- PROPOSED HOT SPOT 2 SOIL COVER



TYPICAL SECTION
(NOT TO SCALE)

SCALE
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NO.	DESCRIPTION	DATE	BY

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FIGURE 5
PROPOSED HOT SPOT 2 SOIL COVER
OU2, SITE 10 HOT SPOT 2
MCAS CHERRY POINT NORTH CAROLINA

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GIBSONIA, PA 15044

Drawn By	Checked By	Date	Scale	Job	Sheet No.
MAL	BAM	8/13/10	AS SHOWN	383	F3

NAVFAC 1409/383/REPORTS/R11/Figure 5

APPENDIX A

SITE PHOTOGRAPHS

HOT SPOT 2 UNDULATIONS – VIEW TOWARDS EAST – MAY 2007

HOT SPOT 2 UNDULATIONS – VIEW TOWARDS EAST – MAY 2007