Final Range Condition Assessment Report

Range Sustainability Environmental Program
Range Condition Assessment

Naval Explosive Ordnance Disposal Technology Division

Naval Support Activity South Potomac
Naval Support Facility Indian Head
Stump Neck Annex
Indian Head, MD

March 2010

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Prepared for:

Naval Explosive Ordnance Disposal Technology Division
Naval Support Activity South Potomac
Naval Support Facility Indian Head
Stump Neck Annex
Indian Head, MD

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EXECUTIVE SUMMARY

The Range Sustainability Environmental Program Assessment (RSEPA) process developed by the Chief of Naval Operations (CNO) N45 is one of the Navy's initiatives to sustain operational readiness while assessing the potential risk to human health and the environment posed by Navy ranges. The purpose of RSEPA is to support the sustainment of Navy ranges by assessing and managing the present environmental condition of each land-based operational range under the Navy's control where munitions were used, are used, and will continue to be used. Knowledge of range-specific environmental conditions will assist operators in making informed range management decisions.

The Navy RSEPA process is a phased approach that provides a framework for informed decisions about when and how to proceed with a comprehensive assessment and protective measures, if necessary. The Navy RSEPA process consists of the following three parts:

- Range Condition Assessment (RCA);
- Comprehensive Range Evaluation (CRE), and
- Sustainable Range Oversight (SRO).

The Naval Explosive Ordnance Disposal Technology Division (EODTECHDIV) located at Naval Support Facility (NSF), Indian Head, Stump Neck Annex, is required to conduct a RCA, which is the first part of the RSEPA process. The RCA uses the following three phases to determine the current status of land-based ranges with respect to compliance and the potential for range operations to cause an off-range release of munition constituents (MCs) of potential concern:

- Phase I (Range Selection);
- Phase II (Pre-Site Visit Information Collection); and
- Phase III (Onsite Visit Information Collection).

The three phases of the RCA culminate at a decision point (hereinafter referred to as "Decision Point 1") to determine if protective measures are needed, whether further evaluation is warranted and whether the RCA will be considered complete (to be revisited in 5 years). This report presents the methods, results, conclusions, and recommendations needed to address the following two key RCA Decision Point 1 questions:

1. Are further steps required to maintain compliance?
2. Is further analysis required to assess risk of an off-range release?

The final recommendations provided in this report will then be evaluated by the Management Team to determine which one or combination of the following options will be exercised:

- No Further Action (NFA) decision and the next RCA will be conducted in 5 years.
- Implement one or several protective measures if further steps are needed to achieve or maintain compliance or prevent a probable off-range release.
- Proceed to the CRE portion of the RSEPA process if further scientific investigation is necessary to analyze the potential risk of a release.

In summary, two land-based ranges under the oversight of the EODTECHDIV Command were selected for assessment under this RCA. Major activities of the selected two land-based ranges include the following:

- Range 2 – Flash x-ray photography of the detonation of the following items: bulk propellant, bulk high explosives, demolition charges, primers, detonators, fuses, and squibs.

- Range 3 – Research and develop field procedures for defeating roadside bombs, explosively formed projectiles (EFPs), and foreign ordnance.

Upon completion of the RCA at Decision Point 1, the technical team recommended the following:

- Range 2 requires no further action; therefore, the RCA is considered complete and no further action is required for the next five years; and

- Range 3 requires further analysis to assess the risk of an off-range release of pollutants through stormwater runoff.

In September 2008, based on a site visit from the Chief of Navy Operations (CNO) Office, the Management Team recommended that the Technical Team proceed in conducting limited multi-media on-range sampling at Range 3 to definitively determine the risk of an off-range release of residual MCs potentially present in the topsoil at Range 3.

In October 2009, an addendum to the EODTECHDIV RCA report was written to summarize the sampling methods and results associated with the August 2009 multi-media sampling activities conducted at Range 3. Refer to the EODTECHDIV RCA Addendum – Summary of Results for Multi-Media Sampling at Range 3 (ERG, 2009) for sampling objectives and procedures, the range specific Quality Assurance Project Plan (QAPP), and an analysis of results associated with the sampling activities at Range 3.

In summary, based on the analyses presented in the EODTECHDIV RCA Addendum, the Technical Team concluded that antimony and arsenic were the only pollutants present above levels of concern at Range 3. The technical team concluded that elevated arsenic concentrations were consistent with background arsenic concentrations at NSF Indian Head's Stump Neck Annex, and therefore not a result of range operations. They also concluded that antimony was not likely to migrate off-range at levels of concern.

Based on these conclusions, the technical team recommends that Range 3 requires no further action; therefore, the EODTECHDIV RCA is considered complete and no further action is required for the next five years.

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AICUZ	Air Installation Compatible Use Zone
ARPA	Archaeological Resources Protection Act
BMP	Best Management Practice
CAD	Cartridge Actuated Device
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CNIC	Commander, Navy Installations Command
CNO	Chief of Naval Operations
CRE	Comprehensive Range Evaluation
CSM	Conceptual Site Model
CWA	Clean Water Act
CWAP	Comprehensive Work Approval Process
CZMA	Coastal Zone Management Act
DNT	2,4-Dinitrotoluene
DoD	U.S. Department of Defense
DoDD	DoD Directive
DoDI	DoD Instruction
DODIC	Department of Defense Identification Code
EFP	Explosively Formed Projectiles
EHW	Explosive Hazardous Waste
EO	Executive Order
EOD	Explosive Ordnance Disposal
EODTECHDIV	Explosive Ordnance Technical Division
EPA	U.S. Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act
ESA	Endangered Species Act
ESI	Explosive Safety Inspection
ESQD	Explosive Safety Quantity Distance
FEHM	Finite Element Heat and Mass Transfer Code
FOTW	Federally Owned Treatment Works
FRP	Facility Response Plan
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
ICRMP	Integrated Cultural Resources Management Plan
IHDIV	Indian Head Division
INRMP	Integrated Natural Resources Management Plan
IR	Installation Restoration
IRP	Installation Restoration Program
IWP	Industrial Waste Processor
JATOS	Jet-Assisted Take Off
kg/m^3	kilogram per cubic meter
m	meter
m^2	square meter
MACT	Maximum Achievable Control Technology
MDE	Maryland Department of the Environment
MDEP	Massachusetts Department of Environmental Protection
MDNR	Maryland Department of Natural Resources

MGD	millions of gallons per day
MMPA	Marine Mammal Protection Act
MPa	megapascal
MR	Munitions Rule
MRP	Munitions Response Program
MTV	Magnesium-Teflon-Viton
NAGPRA	Native American Graves Protection and Repatriation Act
NAVEODTECHDIV	Naval Explosive Ordnance Disposal Technology Division
NAVFAC	Naval Facilities Engineering Command
NDCEE	National Defense Center for Energy and Environment
NDW	Naval District Washington
NEODTC	Naval Explosive Ordnance Disposal Technology Center
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NFA	No Further Action
NFPA	National Fire Protection Association
NHPA	National Historic Preservation Act
NOSSA	Naval Ordnance Safety and Security Activity
NPCI	NAVSEA Performance and Compliance Inspection
NRCS	Natural Resources Conservation Service
NSF Indian Head	Naval Support Facility Indian Head
NSWC	Naval Surface Warfare Center
OPNAVINST	Operational Navy Instruction
ORSM	Operational Range Site Model
PAD	Propellant Actuated Device
POC	Point of Contact
POL	Petroleum, Oil, and Lubricants
PPA	Pollution Prevention Act
PWS	Public Water System
RAB	Restoration Advisory Board
RAICUZ	Range Air Installation Compatible Use Zone
RCA	Range Condition Assessment
RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RFI/VI	RCRA Facility Investigation/Verification Investigation
RMP	Range Management Plan
RSEPA	Range Sustainability Environmental Program Assessment
SARA	Superfund Authorization and Reauthorization Act
SDWA	Safe Drinking Water Act
SHPO	State Historic Preservation Officer
SOP	Standard Operating Procedure
SPCC	Spill Prevention, Control, and Countermeasure
SPPP	Stormwater Pollution Prevention Plan
SWMU	Solid Waste Management Unit
TEELS	Temporary Emergency Exposure Limits
TSCREEN	Toxic Screening
USACE	U.S. Army Corps of Engineers
USGS	U.S. Geological Survey

UXO	Unexploded Ordnance
VLA	Vertical Launch Anti-Submarine

1.0 INTRODUCTION

A Range Condition Assessment (RCA) was conducted for the Explosive Ordnance Disposal Technology Division (EODTECHDIV) Command land-based operational ranges located at Naval Support Facility (NSF), Indian Head. This RCA is the first effort in the Chief of Naval Operations (CNO) Navy Range Sustainability Environmental Program Assessment (RSEPA) process. The RSEPA process is a consistent and defensible approach for assessing the environmental conditions of land-based operational ranges where munitions are used or were used, excluding small arms ranges, within the United States and its territories.

1.1 Installation Overview

Naval Support Facility Indian Head (NSF Indian Head) is a Naval Support Activity South Potomac (NSASP) facility within the Naval District Washington (NDW) Region. NSF Indian Head occupies a 3,500-acre peninsula located on the eastern bank of the Potomac River in Charles County, Maryland, approximately 30 miles south of Washington, D.C. The property consists of two parcels of land, Cornwallis Neck (main-side portion of the installation) and Stump Neck, which are separated by the Mattawoman Creek. Stump Neck is less than 1 mile south across the Mattawoman Creek from Cornwallis Neck and 13 miles by existing roads. The remainder of the installation comprises two small islands in the Mattawoman Creek (Marsh and Thoroughfare Islands) and an undeveloped parcel of land southeast of Cornwallis Neck (Bullitt Neck). Figure 1-1 presents the location of NSF Indian Head in the Washington, D.C. metropolitan area.

Cornwallis Neck

The United States (U.S.) Navy established the Naval Proving Ground at Cornwallis Neck (a portion of which was known as Indian Head) in 1890. The Proving Ground tested guns, armor, shells, and mounts for the growing Fleet. In 1900, the Navy expanded its activities at Cornwallis Neck by establishing a factory for manufacturing smokeless powder. During the early 1900s, the Navy further expanded its activities at Cornwallis Neck to include standardization of shells and powder as well as chemical research. When the United States entered World War I in 1917, the powder factory was a major producer of smokeless powder for the Navy.

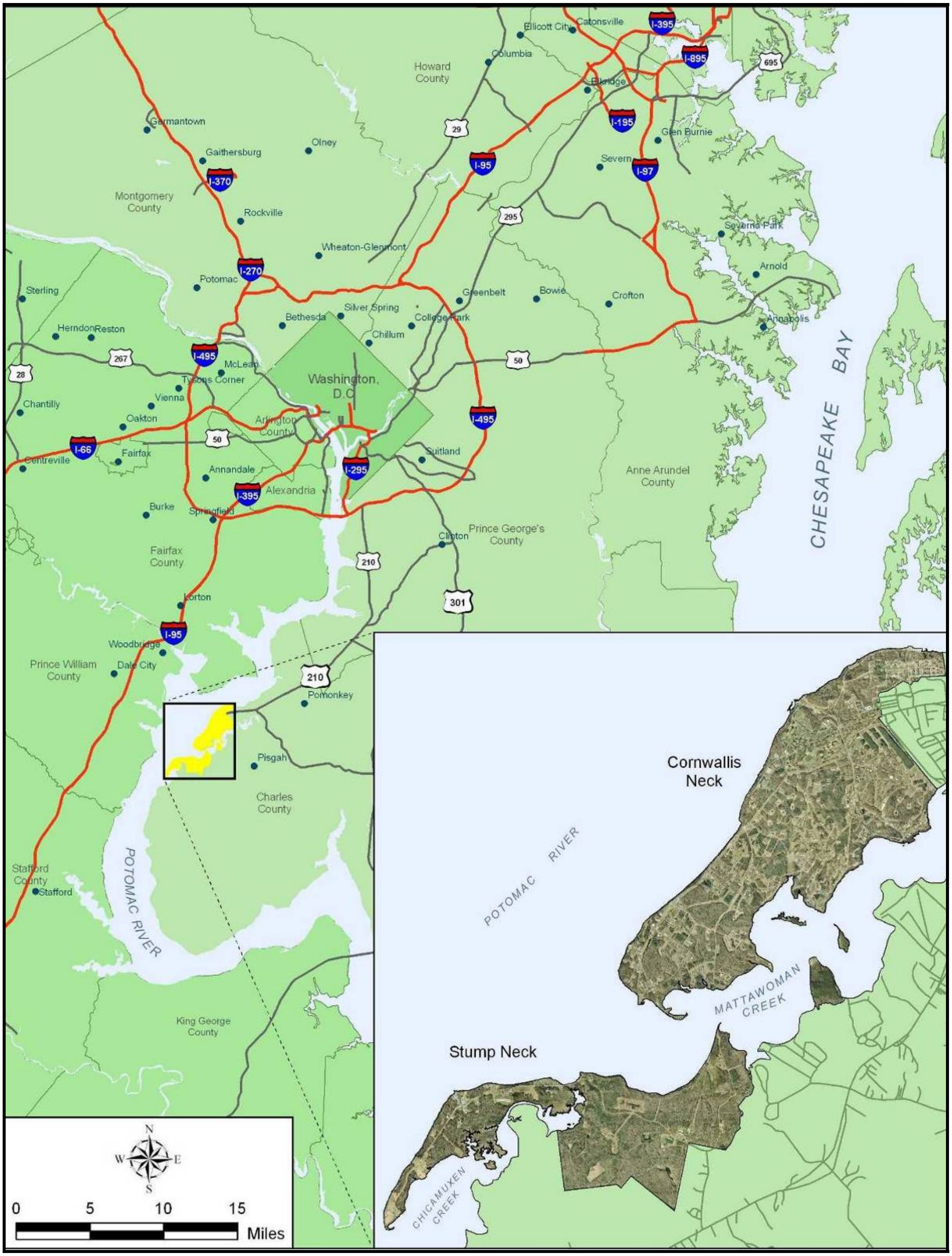

Figure 1-1. Location of NSF Indian Head in the Washington, D.C. Metropolitan Area

The Naval Proving Ground was renamed the Naval Powder Factory in 1923, following the closure of proving ground activities at Cornwallis Neck. During the 1940s, the Navy further expanded the mission of the Naval Powder Factory to include an extrusion plant for pressing powder into rocket grains, a Research and Development Department, and pilot-scale production plants. During World War II, the Navy established an explosives investigation laboratory to examine captured enemy ordnance. Since the 1950s, the Naval Powder Factory (renamed the Naval Propellant Plant in 1958 and the Naval Ordnance Station in 1966) has produced a wide range of energetic materials such as nitroglycerin, missile fuel for the long-range Polaris missile, Otto Fuel II for high-speed torpedoes, plastic explosive C-3, and propellants for emergency ejection mechanisms. In 1992, the Naval Ordnance Station became the Indian Head Division (IHDIV), Naval Surface Warfare Center.

IHDIV is known as the principal Energetics Center for the Department of Defense (DoD) and provides quality and responsive research, development, test, evaluation, and production of energetic materials (e.g., explosives, propellants, and pyrotechnics) and energetic systems to the Fleet and other operating forces. IHDIV is unique among its counterparts (both military and commercial) because its mission focuses on the entire lifecycle of weapons systems, from laboratory-scale research and scale-up to full-scale manufacture, quality assurance, and demilitarization.

Stump Neck

The Navy has conducted operations at the portion of land known as Stump Neck since it purchased the land in the early 1900s to enhance security and allow for the expansion of Navy activities to the south of Cornwallis Neck. During World War II, the Navy established an explosives investigation laboratory to examine captured enemy ordnance. Following the war, this laboratory expanded into the Explosive Ordnance Disposal (EOD) School and Technical Center, which conducted operations on both Cornwallis Neck and Stump Neck. In 1999, the Navy relocated the EOD School to Eglin Air Force Base in Florida, but the Technical Center remained and evolved into the Naval EOD Technology Division (NAVEODTECHDIV) (hereinafter referred to as “EODTECHDIV”) that resides on Stump Neck today.

Mission activities of EODTECHDIV include the following: providing EOD technicians world-wide with real-time information to detect, identify, and counter explosives threats; developing EOD procedures, tools, and equipment; and conducting in-service engineering, management, and repair of EOD tools and equipment.

Commander, Navy Installations Command (CNIC)

In October 2003, the Navy formed the Commander, Navy Installations Command (CNIC) organization to manage and oversee all installation-support activities. With that formation, IHDIV and EODTECHDIV became mission-oriented supported commands of the Naval District Washington (NDW), a regional entity of CNIC. The mission of NDW is to sustain combat readiness through effective and efficient shore installation management and support. The Naval Support Activity South Potomac (NSASP), the NDW regional activity that comprises Naval Support Facilities at Indian Head, Andrews Air Force Base, Fort Belvoir, and Dahlgren, is the host activity responsible for supporting shore installation management for all supported commands residing at NSF Indian Head. An additional supported command, Naval Facilities

Engineering Command (NAVFAC), is responsible for managing the planning, design, construction, contingency engineering, real estate, environmental, and public works support for the facilities at NSF Indian Head.

1.2 RSEPA Policy Implementation

The U.S. Navy RSEPA Policy Implementation Manual provides the requirements and procedures necessary for implementing RSEPA at all Navy land-based operational ranges. Although the RSEPA approach is the same for all Navy ranges, the decisions and outcomes in the RSEPA process are situation- and site-specific. The Technical Team identified the following components of the RCA process that did not apply directly to range operations:

- The RSEPA manual makes frequent use of the term "off-range release." Due to the geographic location of the ranges of concern, an off-range release does not necessarily constitute a release to the outside environment[1].
- During the RCA, each range is assessed for potential environmental compliance deficiencies (e.g., EPCRA, Hazardous Waste Management, Storage Tank Management). Because all of the ranges are located at NSF Indian Head, in some cases the Technical Team made installation-wide compliance determinations.
- A majority of the testing that occurs at NSF Indian Head is research-oriented; therefore, it was necessary for the Technical Team to make assumptions about the composition of some of the items tested at the ranges in lieu of published data while conducting predictive modeling.
- The majority of testing operations at NSF Indian Head are static and therefore have very little issues associated with UXO and low-order detonations that are common with typical Navy test ranges (Gamble, 2008).

This RCA Report consolidates the Technical Teams findings at the completion of Phase I, Phase II, and Phase III of the RCA and addresses the following key RCA Decision Point 1 questions:

1. Are further steps required to maintain compliance?
2. Is further analysis required to assess risk of an off-range release?

The following discussion of each RCA Phase is divided into three subsections: Purpose, Methods, and Results. In addition, the effectiveness of current and past protective measures designed to abate, prevent, minimize, stabilize, or eliminate the release or the threat of release of MCs and degradants to off-range areas will be addressed. Based on the outcome of the key questions above, recommendations were made to proceed to CRE and/or implement protective measures, or consider the RCA complete (no further action (NFA) is required for the next five years).

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[1] As it is used above, "the outside environment" refers to all areas outside of Naval Support Facility (NSF) Indian Head.

2.0 RCA PHASE I OVERVIEW – RANGE SELECTION

Purpose

The purpose of RCA Phase I is to develop a list of active Navy land-based ranges to undergo the RSEPA process. The RSEPA Policy Implementation Manual clearly defines a "range" as the following:

> *"A designated land and water area set aside, managed, and used to conduct research on, develop, test, and evaluate military munitions and explosives, other ordnance, or weapon systems, or to train military personnel in their use and handling. Ranges include firing lines and positions, maneuver areas, firing lanes, test pads, detonation pads, impact areas, and buffer zones with restricted access and exclusionary areas. The definition of a range does not include airspace, water, or land areas underlying airspace used for training, testing, or research and development where military munitions have not been used."*

Method

On 29 January 2008, the EODTECHDIV Management Team and Technical Team convened to determine which facilities/areas to include in the RCA. The following criteria were used to evaluate all facilities/areas:

- Does the area/facility have munitions present (as defined by the RSEPA manual);
- Does the area/facility have MCs present by definition;
- Does the area/facility have range activities present by definition;
- Does the area/facility meet the definition of a range; and
- Is there a pathway to the environment?

This evaluation resulted in the preliminary selection of three facilities/areas to be further investigated for inclusion in the RCA. The Technical Team conducted background research and developed a preliminary interview questionnaire that was used to screen each facility/area. At the completion of the initial screening phase, the Technical Team determined that one of the facilities/areas did not meet the criteria above and was removed from further analysis. On 16 April 2008, the EODTECHDIV Technical Team recommended that the remaining two ranges be included in the RCA. This selection was approved by the Management Team and a summary of the selected EODTECHDIV Stump Neck land-based ranges for which the RCA was conducted is included below in Table 2-1. Figure 2-1 presents the EODTECHDIV land-based ranges for which the RCA was conducted at Stump Neck.

Table 2-1. EODTECHDIV RCA Facilities/Areas

Facility/Area Name	Command	Parcel
Range 2	EODTECHDIV	Stump Neck
Range 3	EODTECHDIV	Stump Neck

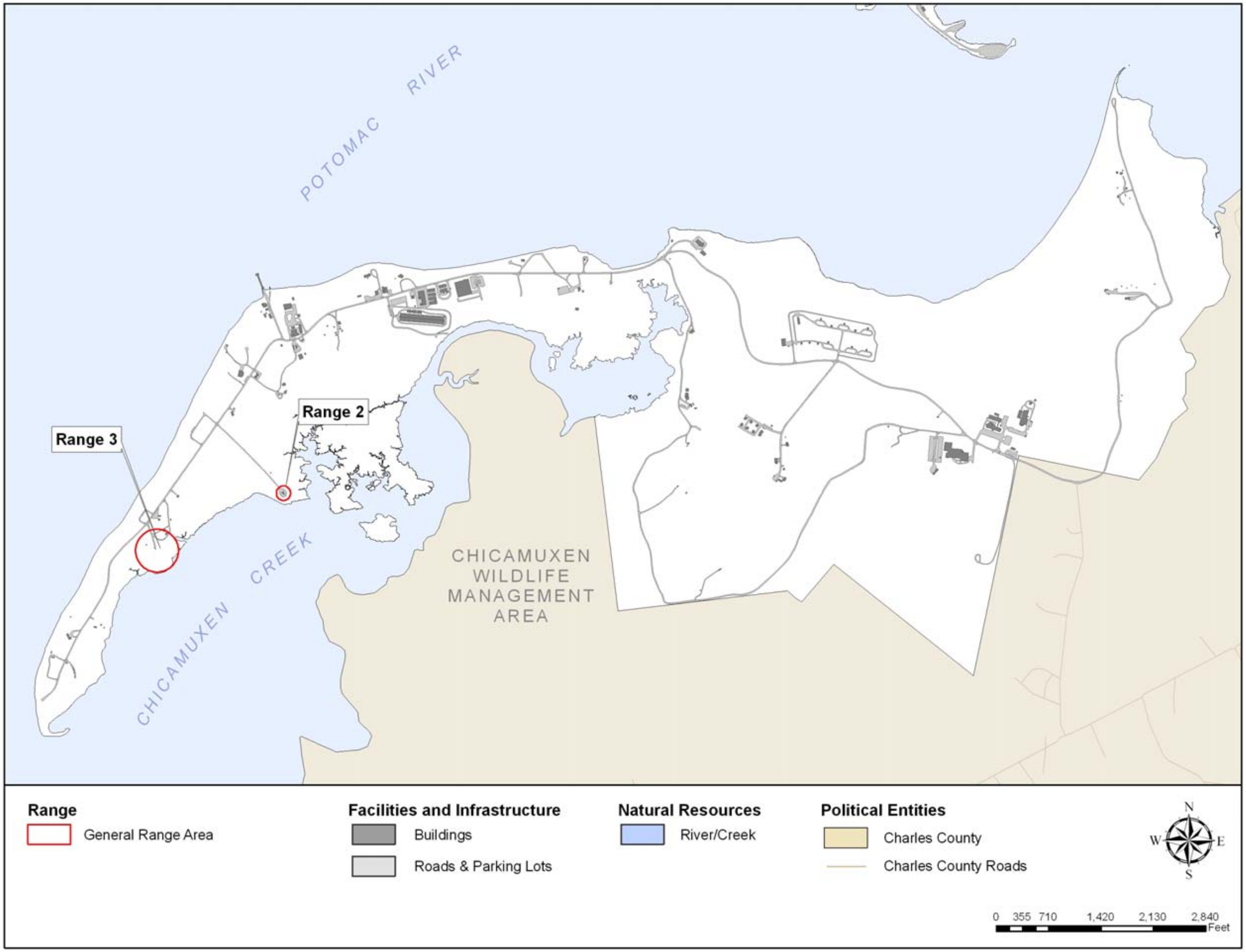

Figure 2-1. RCA Facilities/Areas at Stump Neck

3.0 RCA PHASE II OVERVIEW – PRE-SITE VISIT INFORMATION COLLECTION

Purpose

The purpose of RCA Phase II is for the Technical Team to compile all available operational and environmental range information, prior to conducting onsite range visits. Objectives of RCA Phase II include the following:

- Compile available information including past range assessment activities, general range characteristics, environmental characteristics, and operational history and usage;

- Identify potential impacts of environmental regulations on the use of munitions and Navy range operations by conducting a compliance and operational impact review of Federal and State laws that may directly or indirectly impact present and future range-specific activities;

- Develop a Phase II Pre-Site Visit Information Collection Synopsis identifying data gaps and applicable regulations; and

- Develop a Phase III Onsite Visit Information Collection and Review Plan of Action.

Method

The Technical Team initiated Phase II by requesting background information from the range operational points of contact (POCs). The Technical Team coordinated with Navy personnel at NSF Indian Head to compile and review relevant operational and environmental information using Form 2 (General Range Information), Form 3 (RCA On-Range Visit Plan-of-Action), and Form 4 (RCA Activity Notification). The Technical Team then assessed the existing information for completeness while concurrently conducting a compliance and operational impact review of Federal and State laws that may directly or indirectly impact range operations on a general or range-specific basis for current and future requirements. See Appendix A for RSEPA Forms 1 – 4 for EODTECHDIV ranges.

3.1 Pre-Site Visit Information Collection Synopsis

To summarize the information for each range, the Technical Team used Form 2 (General Range Information) to develop a document that would serve as both the Pre-Site Visit Information Collection Synopsis and the Onsite Visit Interview Questionnaire for each range. Upon the completion of review of applicable documentation during Phase II, the questionnaire was used to identify data gaps that needed to be addressed during the Phase III onsite range interviews.

During the Pre-Site Visit Information Collection Synopsis, the Technical Team gathered and summarized the following for each range:

- General range information (e.g., points of contact, range description);
- Operational information (e.g., operational history, munitions usage);

- Environmental regulatory applicability; and
- Relevant operational and environmental information sources.

The following subsection presents an overview of general range information, operational, information, environmental regulation applicability, and relevant information sources collected by the Technical Team during RCA Phase II.

3.1.1 General Range Information

Table 3-1 below, summarizes general range information for the EODTECHDIV Command. EODTECHDIV ranges are shown below in Figure 3-1 through Figure 3-3.

Table 3-1. Description of Ranges

Command	Range	Point(s) of Contact	Range Description
EODTECHDIV	Range 2	Larry Kijek	• Hyper-velocity test building (Building 2107) • An arena which consists of a cement pad, two permanent walls, two moveable walls, and a roof
	Range 3	Larry Kijek	• Large open test arena • 2 burn pans • Capture test pot • Explosive containment walls (permanent and movable)

EODTECHDIV Command Range Photos

Figure 3-1. Range 2 Building 2107

Figure 3-2. Range 2 Partially Enclosed Test Arena

Figure 3-3. Range 3 Main Containment Wall

3.1.2 Range Operations

Major activities of the selected two land-based ranges include the following:

- Range 2 – Flash x-ray photography of the detonation of the following items: bulk propellant, bulk high explosives, demolition charges, primers, detonators, fuses, and squibs.

- Range 3 – Research and develop field procedures for defeating roadside bombs, explosively formed projectiles (EFPs), and foreign ordnance.

Although the ranges have been performing similar functions since their inception, the majority of testing at the ranges has evolved over time to meet the needs of the Navy's mission.

During Phase II the Technical Team gathered operational range information. Table 3-2 summarizes the past and present operations at each range.

3.1.3 Environmental Regulatory Applicability

One of the goals of the RSEPA program is to ensure that Navy ranges are in compliance with the applicable environmental laws, regulations, and directives developed by the U.S. government, individual states, and Navy/DOD to protect the environment, as well as human health and safety. Many of these laws, particularly the National Environmental Policy Act (NEPA), identify processes to evaluate the environmental impacts of various testing and training alternatives. Table 3-3 summarizes the environmental regulations that the Technical Team reviewed for applicability to range operations.

For reference, Appendix B of the RSEPA manual provides a brief description of the Federal environmental regulations and requirements that are most applicable to Navy ranges and installations.

Table 3-2. EODTECHDIV Current and Past Range Operations

	Current Operations	Past Operations
EODTECHDIV Command		
Range 2	Flash x-ray photography of the detonation of the following items: bulk propellant, bulk high explosives, demolition charges, primers, detonators, fuses, and squibs.	Past operations are comparable to current operations.
Range 3	EOD testing facility used to research and develop field procedures for defeating roadside bombs, explosively formed projectiles (EFPs), and foreign ordnance. Testing to develop appliqué armor to defend against EFPs. Explosive hazardous waste (EHW) is decontaminated onsite in burn pans.	Past operations are comparable to current operations. In addition to the current operations at Range 3, a historic dump site known as "Dump Site A" received wastes during a time period unknown to operational personnel. The exact boundaries of the dump site and the types of wastes that it received are unknown.

Table 3-3. Environmental Regulations Reviewed for Applicability to Ranges

Regulation	Applicable (Y/N)	Area of Compliance
36 CFR 79. Curation of Federally Owned and Administered Archaeological Collections	Y	Cultural Resources
Archaeological Resources Protection Act of 1979 (ARPA)	Y	Cultural Resources
Clean Air Act (CAA), 42 United States Code (U.S.C.) 7401 et seq.	Y	Air Quality, Military Munitions/Solid Waste/Hazardous Materials/ Hazardous Waste
Clean Water Act of 1987 (CWA), Section 404	Y	Water Quality, Natural Resources
Coastal Zone Management Act of 1972 (CZMA), 16 U.S.C. 1451 et seq.	Y	Natural Resources, Range Encroachment
Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601 to 9675	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste, Installation Restoration
Coral Reef Protection, Executive Order 13089	N	N/A
Department of the Navy, Installation Restoration Manual (Draft) 2001 Update	Y	Installation Restoration
DoD Instruction 4715.3, Environmental Conservation Program (May 1996)	Y	Cultural Resources, Natural Resources
Emergency Planning and Community Right-to-Know Act (EPCRA), 42 U.S.C. 11001 to 11050	Y	EPCRA
EO 11593, Protection and Enhancement of the Cultural Environment	Y	Cultural Resources
EO 13148, Greening the Government through Leadership in Environmental Management	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
Federal Endangered Species Act of 1973 (ESA)	Y	Natural Resources
Federal General Conformity Rule (GCR), 1993	Y	Air Quality
Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, as amended	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
Federal Underground Storage Tank (UST) Law	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste, Storage Tank and Petroleum Oil and Lubricant (POL) Management
Federal Water Pollution Control Act of 1977, 33 U.S.C. Sect 1251 to 1387	Y	Water Quality
Marine Mammal Protection Act (MMPA), 16 U.S.C. 1401	N	N/A
Migratory Bird Treaty Act, 16 U.S.C. 703	Y	Natural Resources
Military Munitions Rule (MR), 1997	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
National Emission Standards for Hazardous Air Pollutants (NESHAP), Asbestos ("Asbestos NESHAP"), 42 U.S.C. 7401, 7412, 7414, 7416, 7601 (40 CFR part 61, Subpart M)	Y	Air Quality
National Environmental Policy Act (NEPA), 42 U.S.C. 4321 to 4370e	Y	Natural Resources, Environmental Planning
National Historic Preservation Act of 1966, as amended (NHPA)	Y	Cultural Resources

Table 3-3. Environmental Regulations Reviewed for Applicability to Ranges

Regulation	Applicable (Y/N)	Area of Compliance
Native American Graves Protection and Repatriation Act of 1990 (NAGPRA)	N	N/A
Navy Perchlorate Sampling and Management Policy	Y	Water Quality
Occupational Safety and Health Act (OSHA)	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
Oil Pollution Act of 1990	Y	Water Quality, Military Munitions/ Solid Waste/Hazardous Materials/ Hazardous Waste, Storage and POL Management
Operational Range Clearance Policy for Navy Ranges	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
OPNAVINST 11010.36A, Air Installation Compatible Use Zone (AICUZ) Program	Y	Environmental Planning
OPNAVINST 3550.1, Range Air Installation Compatible Use Zone (RAICUZ) Program	Y	Environmental Planning
OPNAVINST 5090.1B Ch-4	Y	Air Quality, Water Quality, Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste, Cultural Resources, EPCRA, Environmental Planning, Storage Tank and POL Management
Pollution Prevention Act of 1990 (PPA)	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
Resource Conservation and Recovery Act (RCRA), 42 U.S.C. 6901 to 6992k	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste, Installation Restoration
Safe Drinking Water Act (SDWA), 42 U.S.C. 300f-300j-26	Y	Water Quality, Safe Drinking Water
Sikes Act Improvement Act (SAIA)	Y	Natural Resources
Superfund Authorization and Reauthorization Act (SARA)	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste, Installation Restoration
Supplemental Environmental Planning Policy	Y	Environmental Planning
The National Fire Code, Flammable and Combustible Liquids Code, National Fire Protection Association (NFPA) 30	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste
U.S. Department of Defense Directive (DoDD) 4715.11	Y	Range Environmental and Explosives Safety Management
U.S. Hazardous Materials Transportation Act of 1975	Y	Military Munitions/Solid Waste/ Hazardous Materials/Hazardous Waste

3.1.4 Relevant Information Sources

The Technical Team relied heavily on range operational POCs and environmental personnel at NSF Indian Head to obtain the appropriate information sources. Relevant information sources obtained during RCA Phase II include but are not limited to the following resources:

- Standard Operating Procedures (SOPs);
- Informational Databases;
- State Environmental Permits;
- Environmental Investigations of Activities at NSF Indian Head;
- Munition Constituent Transport Studies;
- Biological Opinions; and
- Installation Management Plans.

A complete list of the resources obtained can be found in Form 5 (On-Range Visit) in Appendix B.

4.0 RCA PHASE III OVERVIEW – ONSITE VISIT INFORMATION COLLECTION AND REVIEW

Purpose

The purpose of RCA Phase III is to address data gaps identified during Phase II by conducting site visits and onsite interviews with key personnel responsible for range operations and NSF Indian Head Environmental Office staff. The impact of range operations on the environment is the focus of these visits with emphasis on munitions use. The objectives of Phase III include the following:

- Complete a comprehensive review of historical records, conduct interviews with range users, and visit the range;
- Evaluate and document the effectiveness of operational accommodations and protective measures that have been implemented and make recommendations to continue, reduce, change, or eliminate accommodations and protective measures as necessary;
- Complete Forms 5 through 18 in Appendix B of the RSEPA Policy Implementation Manual, containing range environmental, safety and management regulations and compliance;
- Develop an Operational Range Site Model (ORSM) for each range;
- Conduct Predictive Modeling of munition constituent (MC) transport for each range; and
- Develop an Onsite Visit Information Collection and Review Synopsis.

Method

Methods to meet the purpose of RCA Phase III are summarized in the following subsections:

- Section 4.1 Onsite Visit Information Collection and Review;
- Section 4.2 Operational Range Site Models;
- Section 4.3 Predictive Modeling; and
- Section 4.4 Protective Measures.

4.1 Onsite Visit Information Collection and Review

During Phase III, the Technical Team identified and conducted onsite visits with personnel including range operators, EOD personnel, NSF Indian Head Environmental Office staff, natural and cultural resource managers, and the Public Affairs Officer (PAO). The Technical Team used Forms 6 through 16 to document past and present range operations, actions that have resulted in or have the potential to result in adverse environmental impacts to the range or surrounding areas, and current management practices and the extent of these practices to address environmental regulatory requirements. See Appendix A for RSEPA Forms 6 – 16 for EODTECHDIV ranges.

Table 4-1 summarizes the formal environmental management program interviews conducted by the Technical Team. Although formalized interviews were conducted, the Technical Team continuously interacted with key range and NSF Indian Head Environmental Office personnel throughout the RCA. Table 4-2 provides an overview of the noncompliance issues identified during the Onsite Information Collection and Review.

Table 4-1. Summary of Environmental Management Program Interviews

Date	Contact (Organization)	Environmental Management Programs
May 15	Diana Rose (NAVFAC), Glen Faini (NAVFAC)	Water/Wastewater
May 15	Mark Yeaton (NAVFAC), Joe Rogerson (IHDIV), Ken Gamble (IHDIV), Keith Chamberlain (EODTECHDIV), Joe Rothernberger (EODTECHDIV)	Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste
May 15	Mark Yeaton (NAVFAC)	EPCRA
May 15	Bobby Harrison (NAVFAC)	Storage Tank and POL Management
May 15	Kathy Frey (NAVFAC)	Safe Drinking Water
May 22	Seth Berry (NAVFAC), Rachel Gittman (ERG)	Natural Resources
June 5	Patrick Goodwin (ERG) on behalf of NAVFAC	Cultural Resources
June 5	Patrick Goodwin (ERG) on behalf of NAVFAC	Environmental Planning
June 5	Shawn Jorgenson (Naval Ordnance Safety and Security Activity (NOSSA))	Installation Restoration
June 11	Glen Faini (NAVFAC), Catherine Edwards (ERG)	Air Quality
July 1	Joe Rogerson (IHDIV), Ken Gamble (IHDIV), Keith Chamberlain (EODTECHDIV), Joe Rothernberger (EODTECHDIV)	Range Environmental and Explosives Safety Management

Table 4-2. Summary of Noncompliance Status for Ranges

Type of Noncompliance	**Statute/ Regulation or Defense Requirement**	**Describe Potential Noncompliance (Specify Location)**	**Categorize Each Deficiency**			**Navy Compliance Project Category**
			Significant	**Major**	**Minor**	
Air Quality	-	None				-
Water/Wastewater	Clean Water Act of 1987 (CWA)	Used test items are stored on the ground and/or uncovered on-range; these items may be a source of pollutants contributing to stormwater contamination.			X	Class I
Military Munitions/ Solid Waste/ Hazardous Materials/ Hazardous Waste	42 USC 6901 to 6992k	The Navy is currently preparing an installation-wide Hazardous Waste Management Plan.			X	Class I
	40 CFR 761.180	The installation-wide PCB Management Plan has lapsed.			X	Class I
Cultural Resources	-	None				-
Natural Resources	-	None				-
EPCRA	-	None				-
Environmental Planning	-	None				-
Range Environmental and Explosives Safety Management	DoDD 4715.11	None of the ranges under the RCA have a Range Management Plan addressing long-term sustainable range management objectives.			X	Class I
Installation Restoration	-	None				-
Storage Tank and POL Management	-	None				-
Safe Drinking Water	-	The installation-wide Operations and Maintenance Plan for the public drinking water supply system needs to be updated.			X	Class I
Range Encroachment	-	None				-

Notes:

Class I: Ranges are currently out of compliance with established regulatory deadlines.

Class II: Ranges will be out of compliance at a specific, impending deadline if no action is taken.

Class III: Ranges need to take action to meet DoD, Assistant Secretary of the Navy, and CNO goals related to environmental protection or cost effectiveness.

The RSEPA Manual defines ‘significant’, ‘major’, and ‘minor’ deficiencies as follows:

Significant Deficiency – Requires immediate action. These deficiencies pose, or have a high likelihood of posing, a direct and immediate threat to human health, safety, the environment, or the mission of the range. Some administrative issues can be categorized as "significant." For example, failure to report known migration of MCs of potential concern off range that has an adverse impact on human health could be a significant deficiency for a range.
Major Deficiency – Requires action, but not necessarily immediately. This category identifies conditions that usually represent violations of environmental statutes and may result in an NOV. Major findings may pose a future threat to human health, safety, the environment, or the ability to accomplish the mission. Immediate threats must be categorized as "significant." For example, failure to complete EPCRA TRI reporting, if required, could be a major deficiency for a range.
Minor Deficiency – Mostly administrative in nature, minor deficiencies also may involve temporary or occasional instances of noncompliance with environmental statutes. For example, filing an incomplete discharge monitoring report required by the CWA could be a minor deficiency for a range.

A more detailed summary of the following environmental regulatory compliance and range assessment areas are provided below:

- Air Quality;
- Water/Wastewater;
- Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste;
- Cultural Resources;
- Natural Resources:
- EPCRA;
- Environmental Planning;
- Range Environmental and Explosives Safety Management;
- Installation Restoration;
- Storage Tank and POL Management; and
- Safe Drinking Water.

4.1.1 Air Quality

Status

All ranges are in compliance with applicable air regulations.

Summary

Air quality can be defined by ambient air concentrations of specific pollutants determined by EPA to be of concern to the health and welfare of the general public and the environment. EPA defines ambient air in guidelines established in 40 CFR 50 as "that portion of the atmosphere, external to buildings, to which the general public has access." Changes in air quality due to air pollution can damage human health, property, aesthetics, vegetation, fish, wildlife, and other natural resources. Air pollution can be caused by a variety of stationary and mobile sources, including stationary sources such as factories, power plants, and smelters, and mobile sources such as cars, trucks, and heavy-duty construction equipment.

Under the authority of Title I, Part A, Section 109 of the Clean Air Act (42 U.S.C. 7409), EPA has established health-based National Ambient Air Quality Standards (NAAQS) for the criteria pollutants carbon monoxide (CO), nitrogen dioxide (NO_2), ozone(O_3), particulate matter (PM), lead (Pb), and sulfur dioxide (SO_2). EPA categorizes criteria pollutants as primary or secondary pollutants. Primary pollutants are directly emitted into the atmosphere and contribute to ambient air concentrations of criteria pollutants. Secondary pollutants are formed through atmospheric photochemical reactions acting upon precursor pollutants. For instance, ozone forms from a chemical reaction between volatile organic compounds (VOCs) and nitrogen oxides (NOx) in the presence of heat and sunlight. Typically, these precursors (i.e., VOC and NOx) are targeted to control the level of ozone in the ambient air.

To monitor and meet the NAAQS, the CAA divides the United States into geographic areas called "air quality control regions" (AQCRs). These AQCRs are established areas, such as counties, urbanized areas, and consolidated metropolitan statistical areas. An AQCR in which levels of a criteria air pollutant meet the health-based NAAQS is defined as an *attainment* area for the pollutant, while an area that does not meet the NAAQS is designated a *nonattainment* area for the pollutant. An area that was once designated a nonattainment area but was later reclassified as an attainment area is known as a *maintenance* area. An area may have an acceptable level for one criteria air pollutant but may have unacceptable levels for other criteria air pollutants. Thus, an area could be attainment, maintenance, and nonattainment at the same time for different pollutants. Table 4-3 specifies the attainment status by pollutant for Charles County, MD.

Table 4-3. Criteria Pollutants and Charles County Attainment Status

Criteria Pollutant	Category	Charles County Attainment Status [a]
Carbon monoxide (CO)	Primary	Attainment
Nitrogen dioxide (NO_2)	Secondary	Attainment
Ozone (O_3)	Secondary	Moderate Nonattainment
Particulate matter (PM_{10} and $PM_{2.5}$)		
$PM_{2.5}$ [b]	Primary and Secondary	Nonattainment
PM_{10} [c]	Primary and Secondary	Attainment
Lead (Pb)	Primary	Attainment
Sulfur dioxide (SO_2)	Primary	Attainment

a - Charles County is part of the Metropolitan Washington AQCR, for which attainment status is defined.
b - $PM_{2.5}$ refers to particles 2.5 microns or less in diameter.
c - PM_{10} refers to particles 10 microns or less in diameter and is inclusive of $PM_{2.5}$.

Nonattainment AQCRs are responsible for submitting a State Implementation Plan (SIP), which specifies the manner in which NAAQS will be achieved and maintained. Charles County is located in the Metropolitan Washington AQCR, which is managed by the Metropolitan Washington Air Quality Committee (MWAQC). On May 23, 2007, the MWAQC approved the *Plan to Improve Air Quality in the Washington, DC-MD-VA Region, State Implementation Plan (SIP) for 8-hour Ozone Standard*, which addresses how the Metropolitan Washington AQCR will achieve attainment with the 8-hour ozone standard.[2] The designation of Charles County as a nonattainment area for $PM_{2.5}$ became effective on April 5, 2005. MWAQC approved a *Plan to*

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[2] Based on a court ruling and consent decree, EPA issued a new 8-hour ozone rule on March 12, 2008, which strengthens the NAAQS for ozone from 0.08 ppm to 0.075 ppm. EPA anticipates that it will designate area attainment status in 2010, and states subsequently will have three years to submit a revised SIP. Because only the May 23, 2007 SIP is available, the General Conformity Rule applicability analysis for the Proposed Action relies on the emission inventories in this SIP and is based on the AQCR's designation as a moderate nonattainment area.

Improve Air Quality in the Washington, DC-MD-VA Region: State Implementation Plan (SIP) for Fine Particle ($PM_{2.5}$) Standard and 2002 Base Year Inventory for the Washington DC-MD-VA Nonattainment Area on March 7, 2008, and the plan was submitted to EPA by the states before the April 5, 2008 deadline. While air monitors in the AQCR indicated compliance with the $PM_{2.5}$ standard in 2005 and 2006, the SIP goes beyond the requirements of the CAA to attain further reductions in fine particle pollution.

Federal actions located in nonattainment areas also are required to demonstrate compliance with the federal General Conformity Rule (GCR), codified in 40 CFR Part 93. The GCR was established to prevent federal activities from resulting in any of the following:

- A new violation of any NAAQS in any area;
- An increase in the frequency or severity of any existing violation of any NAAQS in any area; or
- A delay in the timely attainment of any NAAQS or any required SIP interim emission reductions or other SIP milestones in any area.

NSF Indian Head is located in a moderate nonattainment area for ozone and a nonattainment area for PM 2.5. The facility holds a Title V permit but the stationary emissions sources covered by this permit are not located on any of the operational ranges being assessed under the RCA. The facility does not operate any mobile air emission sources. Navy ranges are subject to Maximum Achievable Control Technologies (MACTs) under CAA Title III; however none of these are applicable to the operations at the ranges of concern.

According to Environmental Protection Agency (EPA) Enforcement & Compliance History Online (ECHO), Maryland Department of the Environment (MDE) performed a Title V compliance certification review for NSF Indian Head in April 2008. The review noted deviations, but resulted in a determination that the base was in compliance with its Title V permit.

Health and safety policies and procedures at NSF Indian Head are established in accordance with U.S. Navy regulations. The occupational safety and health (OSH) program references criteria from OPNAVINST 5100.23, "Navy Occupational Safety and Health Program Manual." These documents incorporate federal OSHA regulations and apply them more specifically to Navy activities. The Federal Asbestos NESHAP regulation is applicable at NSF Indian Head. Since a comprehensive installation-wide survey has not been conducted at NSF Indian Head, asbestos abatement is handled on a case-by-case basis. An asbestos survey by properly certified contractors is performed on every building that undergoes renovation or demolition to minimize the release of asbestos containing material.

4.1.2 Water/Wastewater

Status

Test equipment stored uncovered and on the ground at Range 3 may be a potential source of pollutants for stormwater runoff. As part of the best management practices (BMPs) under the

Stormwater Pollution Prevention Plan (SWPPP) for NSF Indian Head, Range 3 operators should consider covering these materials and storing them off the ground. Aside from the potential issue with test equipment storage, all ranges are in compliance with water and wastewater regulations.

Summary

NSF Indian Head is located approximately 35 miles south of Washington, DC at the confluence of the Potomac River and the Mattawoman Creek. Cornwallis Neck is bounded on the west by the Potomac River and on the east by the Mattawoman Creek. Stump Neck is bounded on the north by the Mattawoman Creek, west by the Potomac River, and south by the Chicamuxen Creek. NSF Indian Head has approximately 15 miles of shoreline.

Groundwater is present in four water-bearing formations underlying Charles County. From deepest to shallowest, they are the Patuxent, Patapsco, Magothy, and Aquia formations (Charles County Water Advisory Committee, 2006). The Patuxent and Patapsco formations comprise the Potomac group, upon which the base relies primarily for its groundwater. The Potomac group is the lowermost and most widespread formation of the Coastal Plain aquifer system. Because of its vast size, many other counties in North Carolina, Virginia, Maryland, Delaware, and New Jersey also pull groundwater from aquifers within the Potomac group.

Sanitary and process wastewater from Cornwallis Neck is treated by the Federally Owned Treatment Works (FOTW) located on the west side of the Cornwallis Neck peninsula. This FOTW has an average daily flow rate of 0.35 million gallons per day (MGD) and a capacity of 0.50 MGD. The wastewater generated by Range 3 is treated by the FOTW. Range 2 contains a portable sanitary facility.

In addition to the installation-wide SWPPP, the Environmental Office at NSF Indian Head has a Spill Prevention, Control, and Countermeasure (SPCC) Plan; and an Oil and Hazardous Substances Facility Response Plan (FRP) in place. All of the ranges comply with these installation management plans. None of the ranges covered in the program have exceeded stormwater discharge permit limits within the past year. No discharges from the FOTW have exceeded wastewater discharge permit limits within the past year.

4.1.3 Military Munition/Solid Waste/Hazardous Material/Hazardous Waste

Status

Existing procedures comply with military munitions, solid waste, hazardous materials, and hazardous waste regulations.

At the time of this assessment, the Environmental Office was in the process of developing an installation-wide Hazardous Waste Management Plan for all resident commands at NSF Indian Head. In addition to the Hazardous Waste Management Plant, NSF Indian Head previously developed an installation-wide PCB Management Plan. However, this plan has since lapsed and needs to be updated. A PCB Detection Study, including sampling, is currently underway as a result of a MDE detection of PCBs from a sample taken at the Sewage Treatment Plant in February 2006. Research for the PCB Detection Study indicated that there are no known industrial process sources of PCBs. The only past use of PCBs was a coolant/insulator in transformers unrelated to range operations at Range 2 or Range 3.

Summary

Supported commands at NSF Indian Head, including EODTECHDIV ranges, participate in a Hazardous Material Control and Management Plan, Authorized Users List and a Hazard Communication program. Range facilities use appropriately sited facilities to store explosive materials to be used in a single day. Any materials that are not used in that day are taken back to the magazine for storage.

The range personnel are aware of the hazard material requirements and specific instructions are covered by individual range SOPs. The installation as a whole is considered a Class I generator of hazardous waste and therefore the ranges are not classified individually.

MDE conducts yearly inspections of permitted sites at NSF Indian Head. MDE, which oversees more than 400 sites at NSF Indian Head, has not inspected any of the ranges of concern. However, EODTECHDIV is required to do self-assessments on an as-needed basis. EODTECHDIV does annual assessments for explosive safety and environmental issues at each of the EODTECHDIV ranges.

4.1.4 Cultural Resources

Status

The EODTECHDIV ranges are in compliance with cultural resource regulations. An Integrated Cultural Resources Management Plan (ICRMP) was prepared for NSF Indian Head in 1998 and an updated plan is currently being prepared.

Summary

A preliminary archeological reconnaissance survey was performed at NSF Indian Head in 1985. Since then, several Phase I archeological surveys have been performed, covering portions of Cornwallis Neck and the entirety of Stump Neck. The Navy performs Phase I archeological surveys of any areas that would be disturbed by construction, renovation, decontamination or demolition activities and have not been previously disturbed or surveyed. Additionally, and as funds become available, the Navy performs Phase I archeological surveys of areas that are believed to have high potential for archeological resources. All survey work is carried out by a qualified professional archeologist and performed in accordance with the *Standards and Guidelines for Archeological Investigations in Maryland* (Shaffer and Cole, 1994).

Several historic architectural surveys have been performed at NSF Indian Head to determine the historic value of certain buildings and structures. These surveys are generally performed to evaluate buildings that are approximately 50 years old and may therefore be approaching eligibility for the National Register of Historic Places. As of May 2008, the Navy has performed historic architectural surveys of 1,078 buildings and structures at NSF Indian Head.

Cultural resources management is conducted by the NSF Indian Head Environmental Office, with additional contractor support for archeological and historic architectural studies. All proposed actions (e.g., new construction, renovation, demolition, earth disturbance) at NSF Indian Head are subject to review for compliance with the National Historic Preservation Act (NHPA) under the installation Comprehensive Work Approval Process (CWAP). This process identifies any cultural resource management requirements for a proposed action.

The Navy has a Memorandum of Agreement (MOA) with the Maryland Archaeological Conservation Laboratory and Jefferson Patterson Park and Museum, operated by the Maryland Historical Trust, for curation of archaeological project records and artifacts.

4.1.5 Natural Resources

Status

The EODTECHDIV ranges are in compliance with natural resource regulations. The Integrated Natural Resources Management Plan (INRMP) at NSF Indian Head was recently updated and is awaiting approval from MDNR.

Summary

The primary biological constraints at NSF Indian Head include issues relating to rare species and wetlands protection, which are driven by federal and state regulatory requirements. Currently, approximately 1,403 acres at NSF Indian Head are constrained by bald eagle (Haliaeetus leucocephalus) protection zones. Wetlands cover approximately 161 acres at NSF Indian Head, and areas of ecological significance cover a total of 528 acres.

Bald eagles have been known to nest at NSF Indian Head since at least 1989. Between 1989 and 2007, the number of nests documented at NSF Indian Head has increased from one to the current number of ten. In addition to these nesting sites, NSF Indian Head is host to a large bald eagle roost area, as well as a common foraging area. Until recently, the bald eagle was federally listed as a threatened species under the Endangered Species Act (ESA). However, it is still under the protection of the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act, both of which applied prior to the bald eagle's listing under the ESA. As shown in Table 4-4, Range 2 is located within the ¼ mile arc of a bald eagle nest.

Table 4-4. Range Within ¼ mile of Bald Eagle Nest

Range	Command	Nest Activity in 2008	Location	Nest Name
Range 2	EODTECHDIV	Yes	Stump Neck	Hypervelocity No. 2 Nest

The installation-wide Comprehensive Work Approval Process (CWAP) evaluates all actions (e.g., new construction, renovation, demolition, earth disturbance, change in operations) to ensure species disturbance is considered prior to the implementation of any range activities. EODTECHDIV personnel are responsible for day-to-day range compliance. The NSF Indian Head Public Works and Environmental Offices are responsible for review and approval of any changes that may affect compliance.

4.1.6 EPCRA

Status

All EODTECHDIV range activities fall under the lab exemption (40 CFR 372.38(d)) for EPCRA Toxics Release Inventory (TRI) except for the open burning of reactive hazardous wastes at Range 3.

Summary

NAVFAC Environmental staff calculated toxic pollutant releases to be reported to TRI for Cornwallis Neck and Stump Neck separately. Although the sum of all operations at Cornwallis Neck occasionally meets the reporting threshold for lead compounds, Stump Neck operations have not exceeded TRI reporting thresholds in the past ten years. In addition, most operations at EODTECHDIV Ranges 2 and 3 are exempt as laboratory activities.

The small amount of open burning that EODTECHDIV performs at Range 3 does not qualify for the laboratory exemption. NAVFAC Environmental staff estimate the total quantity of each TRI chemical handled in the material disposed of via open burning every year. Because these estimates are orders of magnitude below reporting thresholds, they do not significantly influence reporting threshold determinations for Stump Neck.

4.1.7 Environmental Planning

Status

All ranges are in compliance with applicable environmental planning regulations.

Summary

Actions at NSF Indian Head are evaluated under CWAP to assess NEPA requirements by providing review for all planned work before it is started to determine if there are any environmental, cultural, safety, or facility issues that planners and workers need to consider; and ensuring that all appropriate permits and outside approvals are obtained early in the project development process.

As part of its partnership with the NSWC Dahlgren Division, EODTECHDIV uses the data gathered by the Sound Impact Prediction System (SIPS) at Dahlgren to predict noise impacts. The use of SIPS at Stump Neck has resulted in a decrease in the number of noise-related complaints received by EODTECHDIV.

4.1.8 Range Environmental and Explosives Safety Management

Status

None of the range operations have a Range Management Plan (RMP) addressing long-term sustainable range management objectives as required by DoD Directive, *Environmental and Explosives Safety Management on Operational Ranges Within the United States,* DoDD 4715.11. However, the EODTECHIDV ranges are meeting the intent of this directive through documentation that supports explosives safety, OSH, and environmental programs, but not via an established, consolidated range specific plan.

In addition to documentation for the above programs, the ranges of concern undergo Explosive Safety Inspections (ESIs) on odd years and self assessments as necessary.

All explosive materials used at the ranges are stored in explosively sited locations. Inert test equipment used in range operations is periodically certified as safe (5X) material.

Summary

The EODTECHDIV ranges are meeting the intent of the DoD Range Management Plan Directive.

The majority of the environmental and explosive safety requirements are addressed in the range SOPs. The EODTECHDIV ranges do not have any direct contact with the public, but an installation Public Affairs Officer is available to communicate with the public, should the need arise. The Test Readiness Review Board addresses threats to human health prior to approving all range operations.

4.1.9 Installation Restoration

Status

All ranges are in compliance with applicable installation restoration regulations. Currently, neither Range 2 nor Range 3 contains any active IR sites[3]. .

Summary

A number of potentially contaminated sites, called installation restoration (IR) sites, have been identified at NSF Indian Head. An Initial Assessment Study (IAS) performed in 1983 identified 29 potential IR sites at NSF Indian Head (Naval Energy and Environmental Support Activity, 1983). A supplemental preliminary assessment (PA) report prepared in 1992 identified 17 additional potential sites (Naval Energy and Environmental Support Activity, 1992).

At Range 3, the Range 3 Burn Point (IR Site 58, Solid Waste Management Unit (SWMU) 2) and Chicamuxen Creek's Edge Dump Site A (IR Site 59, SWMU 3) were both identified as IR sites and were examined under the RCRA Field Investigation/Verification Investigation (RFI/VI) as required by the Naval Explosive Ordnance Disposal Technology Center (NEODTC) RCRA Corrective Action Permit in 1998. The Thermal Treatment Tank (SWMU 16) is identified as an IR Area of Concern and was examined according to the 1990 EPA RCRA Corrective Action Permit. It was included in the January 2002 Desktop Audit Decision Document, which concluded that the unit would be investigated as part of the Remedial Investigation for Site 58. However, because Range 3 is an active range, none of these sites will be addressed under the IR program. Based on this information, it was determined that there are no active IR sites on Range 3.

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[3] "Active IR" site here refers to sites with currently active remediation; "active range" here refers to sites with currently active range operations

In the past, two IR sites were identified on Range 2 - Site 31 (Old Demolition Range) and Site 60 (Chicamuxen Creek's Edge Dump Site B). However, the Old Demolition Range is currently designated as Munitions Response Program (MRP) site UXO 000007 and the Chicamuxen Creek's Edge Dump Site B is designated as part of the same MRP site. The MRP site was investigated under the Final Preliminary Assessment, which was completed in September 2005. Since the site is co-located with an active range (i.e., Range 2), it is ineligible for further action under CERCLA.

4.1.10 Storage Tank and POL Management

Status

NSF Indian Head has a current Tank Management Plan, Spill Prevention Control and Countermeasures (SPCC) Plan, and an Oil and Hazardous Substances Facility Response Plan (FPR).

Summary

The ranges do not contain any aboveground storage tanks. Range 2 contains one 550-gallon double-walled fiberglass underground storage tank containing #2 fuel oil. The tank is equipped with spill/overflow prevention equipment.

4.1.11 Safe Drinking Water

Status

The Operations and Maintenance Plan for the public drinking water supply system needs to be updated. This plan applies to the installation as a whole.

Summary

NSF Indian Head is the owner/operator of a Public Water System (PWS) and it monitors all analytes in the primary standards routinely. Analytes in the secondary standards are sampled once every three years. Water is treated with chlorine prior to distribution to the community.

The PWS has a cross connection control program that was approved by MDE. This program focuses on backflow preventers at the well, but is working to implement backflow preventers for all downstream users.

The public works utilities group at NSF Indian Head compiled an Operations and Maintenance Plan for the PWS in the early 1990s. According to NAVFAC Environmental Staff, the plan is now slightly outdated and needs to be updated; however, staffing shortages with the public works utilities group have slowed development of a new plan.

The closest sole source aquifer is 34 miles from NSF Indian Head.

4.1.12 Encroachment

Status

The technical team does not anticipate significant potential for range encroachment from any of the following (Department of the Navy, 2007)[4]:

- Urban development;
- Airborne noise (see Section 4.1.7);
- Threatened and endangered species (see Section 4.1.5);
- Safety arcs and footprints;
- Air quality (see Section 4.1.1); and
- Water quality (see Section 4.1.2).

Despite the limited potential for encroachment, NSF Indian Head has procedures in place to mitigate encroachment in each of these areas

Summary

The EODTECHDIV ranges are located on a narrow peninsula that is connected to the rest of Charles County by a narrow strip of land. The area immediately adjacent to the peninsula is sparsely populated, undeveloped land that is isolated from major transportation routes. Therefore, the technical team does not anticipate significant potential for range encroachment due to urban development now or in the near future.

The EODTECHDIV ranges are located on a peninsula composed of explosives safety arcs associated with the Navy mission. These arcs compose surrounding surface waters and land areas managed by the Navy. Therefore, the technical team does not anticipate significant potential for range encroachment due to the land use limitations resulting from explosive safety arcs.

4.2 Operational Range Site Models

During Phase III the Technical Team developed Operational Range Site Models (ORSMs) for each range. ORSMs provide decision-makers with information in a format to assist in determining the type, location, and degree of field analysis and risk assessment that might be required later in the RSEPA process.

ORSMs are analogous to conceptual site models (CSMs) that are used in the Installation Restoration Program (IRP), except that ORSMs are prepared for operational ranges and include mission-related information. At early points in the RSEPA process, ORSMs include range boundaries, topography, vegetation, hydrology, and potential migration pathways for MCs of potential concern to the extent that they are known through existing information and the range tour. ORSMs are refined throughout the RSEPA process as conditions change and additional information becomes available. Effective ORSMs present what is currently known or suspected about a range at a particular point in time, about the operations, pathways, and potential receptors. The following information is included as part of the ORSM:

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[4] Only those types of range encroachment applicable to NSF Indian Head are listed.

- Operational Profile – types and frequencies of operations that have occurred, are occurring, and will occur, and describe where they are on the range;
- Facility Profile – all manmade features located on or near the range;
- Physical Profile – factors at the range complex that may affect contaminant release, fate and transport, and potential receptors;
- Release Profile – the potential pathways for MC migration in environmental media;
- Land Use and Exposure Profile – information that could identify and evaluate the applicable exposure scenarios and receptor locations; and
- Ecological Profile – the physical relationship between developed and undeveloped portions of the range, uses of the undeveloped portions, and ecological receptors in those areas.

The Technical Team developed ORSMs in various representations to allow multiple users to evaluate information relative to their specific need or interest. A combination of the following ORSMs were used by the Technical Team:

- Narrative ORSM;
- Tabular ORSM;
- Pictorial ORSM; and
- Wire-Diagram.

In general, the team used information from pre-site visit information collection, onsite interviews, and spatial data from the Geographic Information System (GIS) at NSF Indian Head to compile the ORSMs. Table 4-5 summarizes the known or suspected source of MCs, available pathways, and potential receptors for each range assessed under the RCA.

Table 4-5. Summary of EODTECHDIV Range ORSMs

	Potential Source of MCs	Available Pathways	Potential Receptors
Range 2	• Test arena	• Surface water • Air dispersion	• Recreational fishermen • Fish species • Sub-aqueous vegetation
Range 3	• Main test area • Auxiliary test area • Burn pans 1 and 2 • Capture test pot • Temporary storage area • Dump Site A	• Groundwater infiltration • Surface water • Air dispersion	• Recreational fishermen • Fish species • Sub-aqueous vegetation

The following subsections present an overview of the Narrative, Tabular, Pictorial, and Wire-Diagram ORSMs. Appendices C through F present the Narrative, Tabular, and Pictorial ORSMs for each EODTECHDIV range.

4.2.1 Narrative ORSM

Purpose

The Narrative ORSM format includes a written description of the ORSM with supporting photographs, maps, figures, and tables. Narrative descriptions include a summary of information on sources, pathways, and receptors.

Method

The information necessary to generate a Narrative ORSM for each range was obtained during the pre-site visit information collection and the onsite visit interviews. Personnel interviews and operational log books provided information regarding past and current operations at each range. Onsite visits allowed the team to become familiar with the characteristics of each range.

Results

Narrative ORSMs for the EODTECHDIV ranges evaluated under the RCA are located in Appendix C.

4.2.2 Tabular ORSM

Purpose

The Tabular ORSM format includes more specific details than the other illustration-based ORSM representations presented in the RSEPA manual. It enables each element of the general ORSM framework to be depicted. This method displays a large amount of information in an easy-to-follow format.

Method

The Technical Team developed Tabular ORSMs using the template that was provided in Appendix C of the RSEPA manual. Four types of munition-related activities are assessed in the Tabular ORSM including range maintenance, munition handling and/or storage, weapons testing, and sanctioned munition disposal. At a minimum, each range utilizes three of the four activities listed above. The Tabular ORSMs are developed from information obtained from range personnel interviews, historical firing data log books, and onsite visits.

Results

Tabular ORSMs for the EODTECHDIV ranges evaluated under the RCA are located in Appendix D.

4.2.3 Pictorial ORSM

Purpose

The Pictorial ORSM is a simplified graphical format frequently used to communicate source-migration or source-pathway-receptor relationships to non-technical audiences.

Method

Throughout the RSEPA process the Technical Team generated and refined maps of each range in a GIS format to identify important physical characteristics of the range such as topography, firing points, range boundaries, outfalls, and range buildings. Topographical maps were adapted to provide Pictorial ORSMs of each range.

Results

Pictorial ORSMs for the EODTECHDIV ranges evaluated under the RCA are located in Appendix E.

4.2.4 Wire-Diagram ORSM

Purpose

The Wire-Diagram ORSM format explicitly identifies pathways of release, migration, or potential exposure. In addition, it identifies pathways that are incomplete and that may be omitted from analysis.

Method

The Technical Team developed the Wire-Diagram ORSM using the template that was provided in Appendix C of the RSEPA manual. In addition to the pathways provided in the example, the Technical Team identified pathways associated with air dispersion for the general Wire-Diagram ORSM.

Results

Secondary sources, transport migration mechanisms, exposure media, and exposure routes are consistent for all ranges; therefore, the Technical Team developed one Wire-Diagram ORSM for the EODTECHDIV ranges evaluated under the RCA. The Wire-Diagram ORSM for all ranges is located in Appendix F.

4.3 Predictive Modeling

To characterize and predict the environmental impacts of range operations, fate and transport modeling was performed for the following media:

- Air;
- Surface water; and
- Soil and groundwater.

The munition constituents modeled include 2,4-DNT, HMX, RDX, TNT, and perchlorate. Potential concentrations of the constituents above in environmental media were estimated using mass-loading principals (e.g., munitions usage data, dud and low-order detonation rates, assumptions about targets). To calculate these inputs, a mass loading model was developed which accounted for the types of munitions tested at each range and the testing frequency of each munition.

To facilitate decision making at the end of the RCA, predictive modeling was used to provide information in support of Decision Point 1. Predicted pollutant concentrations in various environmental media were generated by the predictive models and compared to appropriate action levels (e.g., soil screening levels, risk-based concentrations).

Data Quality Objectives (DQOs) for predictive modeling were considered during development of the model inputs and determined by the weight of an erroneous result on Decision Point 1. Sensitivity analyses were performed on each of the predictive models to identify inputs for which the model outputs would be highly sensitive. Due to the cost of data collection (e.g., soil sampling, stream gauging, exploratory well construction) the Technical Team determined that using conservative assumptions for sensitive parameters would be the most appropriate action for the modeling conducted in the RCA. For this reason, the models presented in this report are viewed as screening-level tools to determine whether or not the costs of additional data collection are justified.

The following sections describe the development of the mass loading and fate and transport models.

4.3.1 Mass Loading

Purpose

The mass loading models provide inputs for the air, surface water, and soil and groundwater models. The model predicts the mass of potential residual MCs deposited on the ground at each range, as well as the emission rate of all chemicals in the Toxic Release Inventory-Data Delivery System (TRI-DDS) database.

Method

The first step in developing the mass loading model was to identify the type and quantity of munitions tested at each range. This list of quantity of munitions tested at each range is termed munitions usage. The Technical Team requested that the range operators supply the most detailed information possible about the past and present munitions usage at each range. The responses from EODTECHDIV range operators varied from annual estimates to detailed day-to-day log books. In general, lists of munitions and the quantities tested were compiled and then annualized. The Technical Team determined that annual loads would provide the best inputs to the other models.

To obtain constituent information for munitions tested at the ranges of concern from the databases compiled by the Department of Defense, the Technical Team attempted to ascertain the unique Department of Defense Identification Code (DODIC) for each munition item. The Technical Team performed an exhaustive literature search to identify the DODIC associated with each munition, however not all DODICs were identified. Because operations at the ranges of concern often involve Research, Development, Testing and Evaluation (RDT&E) and the use of some foreign ordnance, DODICs did not exist for many items. To internally track munitions without DODICs, EODTECHDIV assigns a local stock number.

Once the munitions usage list was completed for each range, the Munitions Items Disposition Action System (MIDAS) was consulted to obtain the most accurate information regarding the chemical composition of each munition. The MIDAS online database contains – among other things – a list of the Propellants, Explosives and Pyrotechnics (PEP) for a significant portion of the items in the munitions usage list. By assigning the PEP to each munition, the munition composition list was generated. This list contains all munitions tested at each range and the chemical composition of the energetic material in those munitions.

The next step by the Technical Team was to determine the dud and high-order and low-order detonation rates for each munition. The National Defense Center for Energy and Environment (NDCEE) has compiled the Ammunition Dud and Low-Order Detonation Rate Database. Detonation rates that could not be found in the NDCEE database were determined using the following baseline rates provided in the RSEPA manual:

- High-order detonation rate of 97 percent;
- Dud rate of 3 percent; and
- Low-order detonation rate of 0.06 percent for all munitions.

To estimate residual masses of MCs, the following residual mass multiplier guidance obtained from the RSEPA manual was applied:

- Assume that 0.001 percent of mass of the energetic filler remains following high-order detonations (Hewitt et al. 2003, Jenkins et al. 2000); and

- Assume that 50 percent of the mass of energetic filler remains following low-order detonations.

Using the residual mass multipliers, high-order (HO) detonation, low-order (LO) detonation and dud rates in combination with the munitions usage list and munition composition list the Technical Team was able to generate the Residual Masses of Munition Constituents list. Equation 1 was used to perform the calculations.

$$\text{Residual Mass of MC} = (\text{Weight of MC Tested} \times (\text{LO rate} \times 0.5 + \text{HO rate} \times 0.00001)) \quad \textbf{(1)}$$

To estimate air emissions from each of the ranges of concern, the Technical Team used annualized counts of munitions tested at each range and multiplied them by the emissions data obtained in the TRI-DDS database.

A Microsoft Access database was created as the platform for the mass-loading model.

Results

Table 4-6 presents the residual mass of MC outputs from the mass loading models. For Range 3, these estimates were used to conduct the surface water and the soil and groundwater modeling. Although no surface water or soil and groundwater modeling was performed for Range 2, the technical team estimated residual MC quantities using the mass loading model to better understand the magnitude of the operations conducted at Range 2.

Table 4-6. Residual MCs by Range

Range	Munition Constituent	Load (lb/yr)
EODTECHDIV Command		
Range 2	RDX	4.2E-3
	HMX	4.3E-4
Range 3	RDX	1.4
	HMX	0.318
	TNT	0.29
	DNT	5.3E-4
	Perchlorate	2.9E-4

Appendix G presents the emission outputs used in the air models for EODTECHDIV ranges.

4.3.2 Fate and Transport Modeling

Using historical munitions usage data and the outputs from the mass loading models, the following fate and transport models were developed at each range:

- Range 2 – Air; and
- Range 3 – Air, surface water, and soil and groundwater.

Surface water and soil and groundwater models were not constructed for Range 2 based on the lack of transport pathways to these media. Specifically, the arena in which all testing occurs is located on a concrete pad with a permanent roof and four walls. In addition, range operators sweep up all residual matter from testing and dispose of it as explosive hazardous waste.

The model outputs for each media consist of either statistical summaries of pollutant concentrations or concentrations at specific points in space. These outputs were compared to human health screening values to determine whether or not significant environmental impact is likely due to operations at each range.

Air - Acute

Purpose

The acute air model represents the worst-case concentration of each pollutant based on the maximum hourly air emissions from a range. This serves as a screening tool to identify if an acute air release exists and if the necessity exists to develop a chronic air model.

Method

As recommended by the RSEPA manual, the Technical Team chose to use the toxic screening (TSCREEN) modeling suite developed by EPA's Office of Air and Radiation to perform acute air dispersion modeling. This model estimates peak downwind concentrations under worst-case meteorological conditions for distances up to 30 kilometers (km). This model is a screening tool; therefore, when assumptions were made precautions were taken to ensure conservative, yet representative results were obtained from the model. Sensitivity analysis is one such precaution that was used. The following inputs were identified for sensitivity analysis:

- Source diameter;
- Pollutant phase;
- Temperature of material released;
- Ambient temperature;
- Total material emission rate; and
- Exit velocity.

The results of the sensitivity analysis for the acute air models can be found in Appendix H.

Results

Table 4-7 presents the acute air modeling results for Range 2 and Range 3. In summary, none of the acute air model results predicted acute concentrations above the human health screening values developed by the U.S. Department of Energy (U.S. DOE, 2005).

Table 4-7. Acute Air Modeling Results

Range	Pollutant [a]	Guidance Level (μg/m^3)	Maximum Concentration Off-Range (μg/m^3)
EODTECHDIV Command			
Range 2	Lead compounds (inorganic)	50	1.6E-3
	Nickel compounds	1000	2.3E-5
	Barium compounds	500	1.1E-6
Range 3	Lead compounds (inorganic)	50	4.4E-4
	Hydrochloric acid	813	4.3E-3
	Barium compounds	500	8.7E-4

a – The pollutants listed for each range represent the top three maximum concentrations of pollutants associated with each range operation.

Air – Chronic

Due to the results of the acute air models – which indicated no exceedances of human health thresholds – chronic air models were not developed for Range 2 or Range 3. This course of action is consistent with the modeling protocol described in *Screening Procedures for Estimating the Air Quality Impact of Stationary Sources, Revised* (EPA, 1992).

Unsaturated Soil/Groundwater

Purpose

The unsaturated soil and groundwater model illustrates the likely transport of MCs through the vadose zone and into the groundwater located beneath each range area. The model is developed as a screening tool, where conservative inputs are used to determine whether the likelihood of significant contamination at the groundwater table exists. If the model predicts significant contamination at the groundwater table, the Technical Team has the flexibility to refine conservative inputs (e.g., soil porosity, groundwater table depth) using realistic (i.e., less conservative) environmental data obtained from further investigation of the range area.

Method

As recommended by the RSEPA manual, the Technical Team chose to use the Finite Element Heat and Mass Transfer Code (FEHM) developed by Los Alamos National Laboratory. This model is a three-dimensional, time-dependent, multiphase, reactive flow model that predicts and describes transport processes in both unsaturated and saturated soil. This model is a screening tool; therefore, when assumptions were made precautions were taken to ensure conservative, yet representative results were obtained from the model. The Technical Team performed sensitivity analyses on all appropriate input parameters to evaluate the potential of each parameter to affect model outputs. Parameters tested in the sensitivity analysis include the following:

- Porosity;
- Distribution coefficient;
- Molecular diffusion coefficient;
- Permeability; and
- Point source/Non-point source loading.

The results of the sensitivity analysis for the Range 3 soil and groundwater model can be found in Appendix I.

Soil and groundwater parameters for predictive modeling of Range 3 were assumed by the technical team using the soil types and geometries from subsurface soil investigations conducted at Ranges 2 and 3 in 1997 (Brown and Root Environmental, 1998). To simplify the model, the Technical Team assumed layer cake stratigraphy[5] beneath Range 3. The soil and groundwater model for Range 3 used the parameters listed in Table 4-8 to characterize the soils beneath Range 3.

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[5] Layer cake stratigraphy assumes that soil horizons are continuous in the horizontal dimensions (i.e., they do not pinch out in certain areas, but maintain constant thickness).

Table 4-8. Soil Properties used in the Predictive Modeling of Soil and Groundwater

Depth Interval (ft)	Material	Permeability (m2)	Density (kg/m3)	Rock Specific Heat (MJ/kgK)	Porosity
0-3.5	Red Clay	2.5E-17	2,000	2,700	0.44
3.5-5	Gray Sandy Clay	4.8E-16	1,800	2,700	0.42
5-7.5	Brown Gravelly Sand	6.2E-10	1,600	2,400	0.3
7.5-8.5	Gray Clay	2.5E-17	2,000	2,700	0.44
8.5-11	Peat	2.1E-16	650	2,700	0.44
11-17	Gray Clayey Sand	2.1E-14	1,700	2,700	0.27
17-21	Gray Sand	2.1E-12	1,600	2,750	0.23

The relative depth to the groundwater table of the surficial aquifer plays an important role in determining model results. The Technical Team assumed that the groundwater table was 1.7 meters below the ground surface at all ranges. This assumption is based on the observations recorded from the monitoring wells at Range 3.

Mass loading inputs for the Range 3 soil and groundwater model were taken from the mass loading database discussed at the beginning of the section. Range operators provided data to represent all past and current operations at each range to the best of their knowledge. Due to the lack of more detailed data, the soil and groundwater models assume a constant mass loading rate for every year of operation.

Although the mass loading database calculates an annual load of residual MCs deposited on the ground surface (in lbs/yr), the FEHM code requires that pollutants be input into the system in concentration form. For the mass loading parameters of the models, the Technical Team assumed that all MC residue was absorbed into the infiltrating precipitation, and verified that this assumption did not violate the solubility limits for each MC.

Initial time for the soil and groundwater models (Day 1 of the model run-time) was set using the approximate date of first operations gathered during the onsite visit. The approximate date when operations began at Range 3 is 1970.

Modeling outputs were processed and analyzed for January 1st 2009 at Range 3. In cases where the results indicated a possibility of off-range contamination the outputs from 2029 were also processed and analyzed.

Results

Maximum pollutant concentrations at the groundwater table for January 1, 2009 at Range 3 are presented in Table 4-9. More detailed results for the soil and groundwater models for Range 3 are presented in Appendix J.

Table 4-9. Soil and Groundwater Modeling Results by Range

Command	**Munitions Constituent**	**RDX**	**HMX**	**TNT**	**DNT**	**Perchlorate**
	Screening Value	**0.61**	**400**	**2.2**	**73**	**3.6**
EOD	Range 2	NM	NM	NM	NM	NM
EOD	Range 3	<0.001	<0.001	<0.001	<0.001	<0.001

Notes:
NM: Not modeled.
Screening values are taken from RSEPA Manual November 2006, Appendix D - Master Quality Assurance Project Plan.
Concentrations are in µg/l.

Surface Water

Purpose

The surface water model predicts the fate and transport of pollutants in surface water adjacent to each of the range areas. This serves as a screening tool to identify whether surface water and/or sediment sampling may be required at each range.

Method

As recommended by the RSEPA manual, the Technical Team chose to use the Exposure Analysis Modeling System (EXAMS) developed by EPA's Ecosystem Research Division. The EXAMS software application is a fate and transport model that is used to rapidly evaluate fate, transport, and exposure concentrations of pollutants in surface water. The models developed in EXAMS estimate steady-state concentrations in a system assuming constant mass-loading and environmental parameters. As with the other numerical models described above, the Technical Team used this model as a screening tool to identify the likelihood of pollutant contamination off-range. The Technical Team performed sensitivity analyses on all appropriate input parameters to evaluate the potential of each parameter to affect model outputs. Parameters tested in the sensitivity analysis include the following:

- Model cell size;
- Stream flow;
- Organic carbon fraction in sediments;
- Octanol-water partitioning coefficient; and
- Henry's law coefficient.

The results of the sensitivity analysis for surface water models can be found in Appendix K.

In developing the environmental inputs for the surface water models, the Technical Team reviewed reports from government agencies on the Potomac River and Mattawoman and Chicamuxen Creeks. In cases where environmental data for the Mattawoman and Chicamuxen Creeks were unavailable, the Technical Team made judicious assumptions for environmental inputs or substituted data from the Potomac River where appropriate. Table 4-10 summarizes the key environmental inputs used in the surface water models. There is no data for the Chicamuxen Creek, so it was excluded from Table 4-10.

Table 4-10. Environmental Inputs for EXAMS Model

Parameter	Value	Source
Installation Data		
KO2 - Oxygen Exchange Constant (cm/h)	5	Liss and Slater, 1974
WIND (m/s)	2.07	National Weather Service, 2008
Average Precipitation (mm/mo)	81.33	National Weather Service, 2008
Potomac River Data		
Total Depth (feet)	10	Department of the Navy, 2008
Total Suspended Solids (mg/L)	35.8	U.S. EPA, 2008
Bulk Sediment Density (g/cm^3)	1.78	U.S. Geological Survey, 2003
Moisture Content of Benthic Sediments (%)	150	U.S. EPA, 2000
FROC - organic carbon fraction of solids	0.02	U.S. EPA, 2002
Stream flow (m^3/hr)	1,230,000	U.S. Geological Survey, 2006a
Horizontal Eddy Diffusivity (m^2/s)	200	Davie et al., 1999
Vertical Eddy Diffusivity (m^2/hr)	2.7	U.S. Geological Survey, 1998
EVAP - Evaporation Rate (mm/mo)	95.25	University of Arizona, 2004
Mattawoman Creek Data		
Total Depth (feet)	3	Department of the Navy, 2003
Stream flow (m^3/hr)	6,400	U.S. Geological Survey, 2006b

Results

Maximum, steady-state pollutant concentrations in surface water are presented for each of the surface water models in Table 4-11.

Table 4-11. Predicted Surface Water Concentrations of Modeled MCs by Range

Contaminant	Screening Level	Range 2	Range 3
RDX	0.6	NM	0.73
TNT	2.2	NM	0.085
HMX	400	NM	<0.001
DNT	73	NM	<0.001
Perchlorate	3.6	NM	<0.001

Notes:
NM: Not modeled.
Screening levels are taken from RSEPA Manual November 2006, Appendix D - Master Quality Assurance Project Plan.
Concentrations are in µg/l.

The Range 3 surface water model predicts elevated concentrations of RDX and TNT in the Chicamuxen Creek. Although the surface water sampling done at Chicamuxen Creek in 1997 did not return any detections of RDX or TNT, the concentrations listed above are below the method detection limit for each of the analytes (Massachusetts Department of Environmental Protection (MDEP), 2004).

4.3.3 Potential Off-Range Releases

The results of the predictive modeling identified Range 3 as a range where the release of MCs of concern off-range is probable either at present or in the future. These results are summarized below in Table 4-12.

Table 4-12. Form 20 – Summary of RSEPA Potential Off-Range Releases

Locations of Munitions Training	Status of Release [a]	Release Pathway [b]	Potential Receptors	Evidence
EODTECHDIV Command				
Range 3	Possible	Surface Water	Ecological	**Present** Surface water RDX concentrations above the Human Health Standard predicted by the surface water model for year 2009.

a – Status of release is:

- Documented (e.g., confirmed by sampling and chemical analysis);
- Suspected, but has not yet been documented;
- Possible; or
- Unknown.

b – A release pathway is the environmental medium or matrix through which a contaminant or hazard migrates or contacts a receptor. Environmental pathways typically correspond to the medium where the contaminant is released, and to fate and transport processes following the release. Examples of environmental pathways are groundwater, surface soil, subsurface soil, sediment, surface water, and air. The biotic pathway occurs through uptake, accumulation, or concentration of contaminants by organisms, and subsequent transport of that contaminant through the food chain.

5.0 PROTECTIVE MEASURES

Protective Measures are defined by the RSEPA manual as “actions or best management practices implemented on-range and designed to abate, prevent, minimize, stabilize, or eliminate the release or the threat of a release of MCs and degradants to off-range areas.” They may involve changes to operational parameters, implementation of environmental requirements, or a combination of both.

The Technical Team used the information gathered during the preliminary records search and onsite interviews to compile a summary of the protective measures that have already been implemented at NSF Indian Head and specifically for each range included in the RCA.

Forms 6 through 16 of Appendix A were used to identify areas of noncompliance with applicable regulations. The results of the predictive modeling were used to identify ranges where there may be a release of MCs of concern off-range that poses a threat to human health or the environment. Forms 23 through 25 were then completed to evaluate the recommended protective measures in response to these areas of concern and off-range releases, if applicable. See Appendix A for RSEPA Forms 6 – 16 and Forms 23 – 25 for EODTECHDIV ranges.

The results of this evaluation are discussed in the sections to follow.

5.1 Existing Protective Measures

The Navy has taken an active approach to protecting human health and the environment and to maintain compliance with applicable regulations at NSF Indian Head. In summary:

- Public access by land to Cornwallis Neck and Stump Neck is restricted by a perimeter fence and guarded access gates.

- Range personnel have develop SOPs specific to the operations at each range. These SOPs are followed closely and must be updated and reviewed every four years.

- Explosive Safety Quantity Distance (ESQD) arcs, which determine the potential radius of impact from a detonation, are required for structures/areas where explosives are handled, manufactured, or stored at the installation. These ESQD arcs also establish a net explosive weight limit for testing at each building.

- The Navy has conducted a thorough investigation of potential IR and MRP sites according to RCRA guidelines. In addition, a Restoration Advisory Board (RAB) was established to communicate with and address concerns expressed by the public regarding installation restoration.

- The installation has an appointed Public Affairs Officer to address health and safety concerns expressed by the public. During a 1998 Public Health Assessment conducted at NSF Indian Head, several public health hazards and potential health hazards were identified. The Navy took appropriate steps to address each of these health hazards and to inform the public. Hazards identified that are applicable to the RCA and steps taken to address these hazards are as follows:

- ***Fish in the Mattawoman and Chicamuxen Creeks*** – The Navy connected industrial wastewater discharges to the sanitary sewer system; constructed sediment erosion controls at wastewater outfalls; connected central sewage system at Stump Neck to eliminate septic tank discharges; initiated clean-up activities to reduce contaminated soil runoff and discharges of contaminated shallow groundwater to the creeks and rivers; and

- ***Drinking Water Supply in the Patapsco and Patuxent Aquifers*** – The Navy implemented a wellhead protection program to prevent groundwater wells from conducting shallow contaminated groundwater to deeper aquifers.

Protective measures that have already been implemented at the ranges of concern are discussed below and summarized in Table 5-1.

Table 5-1. EODTECHDIV Existing and Historic Protective Measures

	Range Access and Control	UXO, Military Munitions, and Waste Military Munitions Management	Environmental Protection and Human Health and Safety	Community Relations and Public Outreach
EODTECHDIV Command				
Range 2, Hyper-Velocity Test Building	• Posted signs along shoreline • Siren and warning lights initiated before testing	• Sweep area and dispose of material after testing	• Test area enclosed by concrete walls, a roof and moveable barricades	NA
Range 3	• Closed gate during operations • Surveillance cameras • Posted signs along shoreline	• Burn pans • Clearance operations after testing	• Permanent explosives containment wall • Moveable explosives containment walls • Weather constraints for testing • Storage of munitions in off-range magazines	• Addressed noise concerns related to testing

5.1.1 Range 2

Range Access and Control

Access to Range 2 is restricted by the Stump Neck main gate. Additional precautions include explosives warning signs that are posted along the shoreline. There is also a warning system with lights and a siren to alert boaters to clear the area for testing operations.

UXO, Military Munitions, and Waste Military Munitions Management

The facility has a service locker where they keep explosive materials to be used in a single day. Any materials that are not detonated that day are taken back to the magazine for storage. No onsite overnight storage is permitted at Range 2.

After testing is complete, the area is swept thoroughly to remove residue and the remnants are disposed of as EHW.

Personnel and Public Safety

The test area for Range 2 is located on a concrete pad protected on two sides by permanent concrete walls and overhead by a roof. The other two sides are protected by moveable, wood barricades. Detonation of ordnance is initiated remotely from inside the protected control room.

5.1.2 Range 3

Range Access and Control

In addition to the main gate and fence at Stump Neck, access to Range 3 is restricted by a gate which is closed during testing operations. Surveillance cameras have been installed to observe the testing area and to watch for boaters or fishermen in the Chicamuxen Creek within the vicinity of the testing area. Signs are posted along the shoreline and a bull horn is used to warn boaters of testing.

UXO, Military Munitions, and Waste Military Munitions Management

The use of burn pans to treat EHW was implemented to reduce the release of contaminants to the soil, which might in turn be transported off-range. Although the burn pans may treat material generated by the research and testing operations at Range 3, the operation of the burn pans is separate and distinct from the research and testing operations. The burn pans are set on concrete blocks and covered with lids. In the event of flooding, the burn pans are moved to higher ground. Samples of the material remaining after a burn are tested for explosive residue. If any explosive ash remains, it is dumped into 55-gallon drums and the drums are transported off-site for disposal every two years. As an additional precaution, no burning is conducted when wind speeds exceed 15 mph.

An operational load (the amount to be used in one month) of ordnance is stored in three magazines located near the range. Only enough explosives to be tested in a single day are removed from the magazines and transported to the range for testing. These explosives are stored in a temporary storage area on the range.

After testing and burn operations are completed, the remnants of exploded ordnance are picked up. The dirt in the test area is re-graded to ensure a smooth surface for the next test.

Personnel and Public Safety

In 1984, a permanent explosives containment wall was constructed to partially contain the fragments released during testing. A portable fragment wall is used for additional containment. The detonation of ordnance for each test is initiated remotely from a protected control room.

Community Relations and Public Outreach

The community neighboring NSF Indian Head has expressed concerns and voiced complaints regarding the level of noise disturbance caused by test operations at Range 3. Officials responded to these concerns by visiting the homes of the individuals during testing to observe the level of disturbance. Range managers responded by adjusting the weather condition constraints for testing to minimize the noise disturbance to the surrounding public.

5.2 Recommended Protective Measures

5.2.1 Purpose

Protective measures are implemented to sustain operations, maintain environmental compliance, and address migration of MCs of potential concern off range. They may involve changes in operational parameters, implementation of environmental controls, or a combination of both, and can be implemented at any point in the RSEPA process. The protective measures discussed in this section address the potential off-range releases summarized in Table 4-13.

5.2.2 Approach

Forms 23 through 25 of Appendix A-2 were used to evaluate the need for instituting protective measures at Range 3[6]. Using Form 23 (Identification and Screening of Protective Measure Options), the Technical Team identified and screened protective measures that could address the potential for each of the off-range releases. The RSEPA manual also recommends using this form to evaluate protective measure options that address compliance deficiencies. However, with one exception, the Technical Team determined that all of the compliance deficiencies described in Table 4-2 had only one viable remedy – to create or update the appropriate plan – and that evaluation of additional protective measures was unnecessary. In most cases, these deficiencies are already being addressed. The one area of concern that does not fall into this category is the issue of storage of uncovered test equipment on the ground at Range 3. Protective measures to address this issue were evaluated using Forms 23 through 25. See Appendix A-2 for RSEPA Forms 23 – 25 for Range 3.

After identifying and screening protective measures in Form 23 (Identification and Screening of Protective Measure Options), the Technical Team used Form 24 (Evaluation and Ranking of Protective Measure Options) to evaluate and rank viable mitigation options for each potential off-range release with regard to five objectives. Each objective was assigned a weight, with the

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[6] The Technical Team did not identify a need for additional protective measures at Range 2.

most important objective receiving a weight of 5 and the least important objective receiving a weight of 1. The objectives were weighted as follows:

- Operational Objectives = 5;
- Safety Objectives = 4;
- Public Health/Community Objectives = 3;
- Environmental Objectives = 2; and
- General Objectives = 1.

While safety is paramount, ensuring sustained, unencumbered, and non-degraded testing and training operations on Navy ranges is the primary objective of RSEPA. Therefore, Operational Objectives received the highest weight, with Safety Objectives receiving the next highest weight. Protecting public health and the environment are essential to ensuring the sustainment of Navy ranges, therefore Public Health/Community Objectives and Environmental Objectives received the next highest weights. General Objectives, which takes into account the cost, technical practicality, and duration of protective measure options was assigned the lowest weight.

After evaluating viable mitigation options in Form 24 (Evaluation and Ranking of Protective Measure Options), the Technical Team used Form 25 (Selection of Preferred Protective Measure Options) to identify and recommend the preferred protective measure for each potential off-range release. The RSEPA manual describes policy requirements for selecting preferred protection measures and assigns a corresponding requirement score of 1, 5 or 10. The requirement score is used in Form 25 to calculate the final score for each proposed protective measure and identify the preferred option. The preferred protective measures are summarized in Table 5-2 and discussed in further detail below.

Table 5-2. EODTECHDIV Recommended Protective Measures

Range	Description of Release/Area of Concern	Recommended Protective Measure
EODTECHDIV Command		
Range 2	Not applicable	Not applicable
Range 3	Release – Surface water RDX concentrations above the Human Health Standard predicted by the surface water model for year 2009.	If RDX mitigation is required, EODTECHDIV will submit a research and development proposal for RDX biodegradation.
	Area of Concern – Test equipment is left on the ground and uncovered; this equipment may be a source of pollutants for stormwater contamination.	Cover test equipment and store it off the ground.

5.2.3 Results

Range 2

There were no findings in this investigation that prompted the Technical Team to evaluate additional protective measures for Range 2.

Range 3

The results of the surface water predictive modeling indicate concentrations of RDX in surface water above the Human Health Standard for the year 2009. If RDX mitigation is required, EODTECHDIV will submit a research and development proposal for RDX biodegradation. As discussed in section 4.1.2, the storage of test equipment on the ground and uncovered may potentially contaminate stormwater runoff from the range. The Technical Team recommends that Range 3 operators cover test equipment and store it off the ground to eliminate the potential for stormwater contamination.

6.0 DECISION POINT 1

These recommendations will address the following two key questions for RCA Decision Point 1:

1. Are further steps required to maintain compliance?
2. Is further analysis required to assess risk of an off-range release?

The Management and Executive Teams will evaluate the recommendations made by the Technical Team for Decision Point 1 and determine which one or combination of the following options will be exercised:

A. NFA decision – The next RCA will be conducted in 5 years.
B. Implement one or several protective measures (see Section 5.2 Recommended Protective Measures) if further steps are needed to achieve or maintain compliance or prevent a probable off-range release.
C. Proceed to the CRE portion of the RSEPA process if further scientific investigation is necessary to analyze the potential risk of a release.

6.1 Compliance Status

Legal compliance status is determined by regulatory environmental agencies (State or EPA) or advisory agencies (State Historic Preservation Officer (SHPO)). During this assessment, legal and regulatory issues were assessed through the evaluation of range procedures, personnel interviews, and documentation review. Recommended measures to maintain or achieve compliance are presented in this section. With the exception of the storage of uncovered test equipment on the ground at Range 3, there were no range-specific compliance issues. Rather, all concerns and issues were installation-wide issues for NSF Indian Head. Areas of concern and recommended actions are presented below.

Water/Wastewater

- Storage of used test items
    - Concern: At the time of this investigation, used test items are stored on the ground and/or uncovered on-range; these items may be a source of pollutants contributing to stormwater contamination.
    - Recommended Action: Operators cover test equipment and store it off the ground to eliminate the potential for stormwater contamination.

Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste

- Hazardous Waste Management Plan
    - Concern: At the time of this investigation, an approved plan did not exist.
    - Recommended Action: A plan is currently being prepared and therefore no additional action is recommended.

- PCB Management Plan
    - Concern: The installation-wide plan has lapsed.

  - Recommended Action: Update the plan based on the results of the PCB Detection Study.

Range Environmental and Explosives Safety Management

- Range Management Plan
  - Concern: A formal plan does not exist for any of the operational ranges investigated under RCA.
  - Recommended Action: The intent of the plan is being met by other documentation. Use existing information to prepare a plan that meets the requirements of DoDD 4715.11.

Safe Drinking Water

- Operations and Maintenance Plan
  - Concern: The Operations and Maintenance Plan for the public drinking water supply system is not current.
  - Recommended Action: Update of the Operations and Maintenance Plan for the public drinking water supply system is necessary.

6.2 Risk of Release

There is no documented release or evidence of release at any of the EODTECHDIV ranges, therefore the risk of release was determined by predictive modeling. Range 2 did not show any significant potential for release of MCs off-range and into the environment. Range 3 showed a potential risk of off-range release. The source of those releases and recommended future actions are addressed in this section and summarized in Figure 6-1 in a decision tree format.

6.2.1 Range 2

There were no findings in this investigation that prompted the Technical Team to recommend further investigation. A NFA decision is recommended.

6.2.2 Range 3

Source and Potential Risk of Off-Range Release

There are two issues that require further analysis to definitively assess the risk of an off-range release of munition constituents at Range 3:

- Predictive modeling has indicated that the operations at Range 3 have the potential to cause a significant impact to surface water quality in the Chicamuxen Creek. Surface water modeling results predict that the concentration of RDX in surface water will be above the Human Health Standard for the year 2009.

- The extent of the contamination due to current and past operations, as well as the material buried at Dump Site A, is not fully known.

Recommendations for Future Actions

Upon completion of the RCA at Decision Point 1, the Technical Team recommends further analysis at Range 3 to assess the risk of an off-range release.

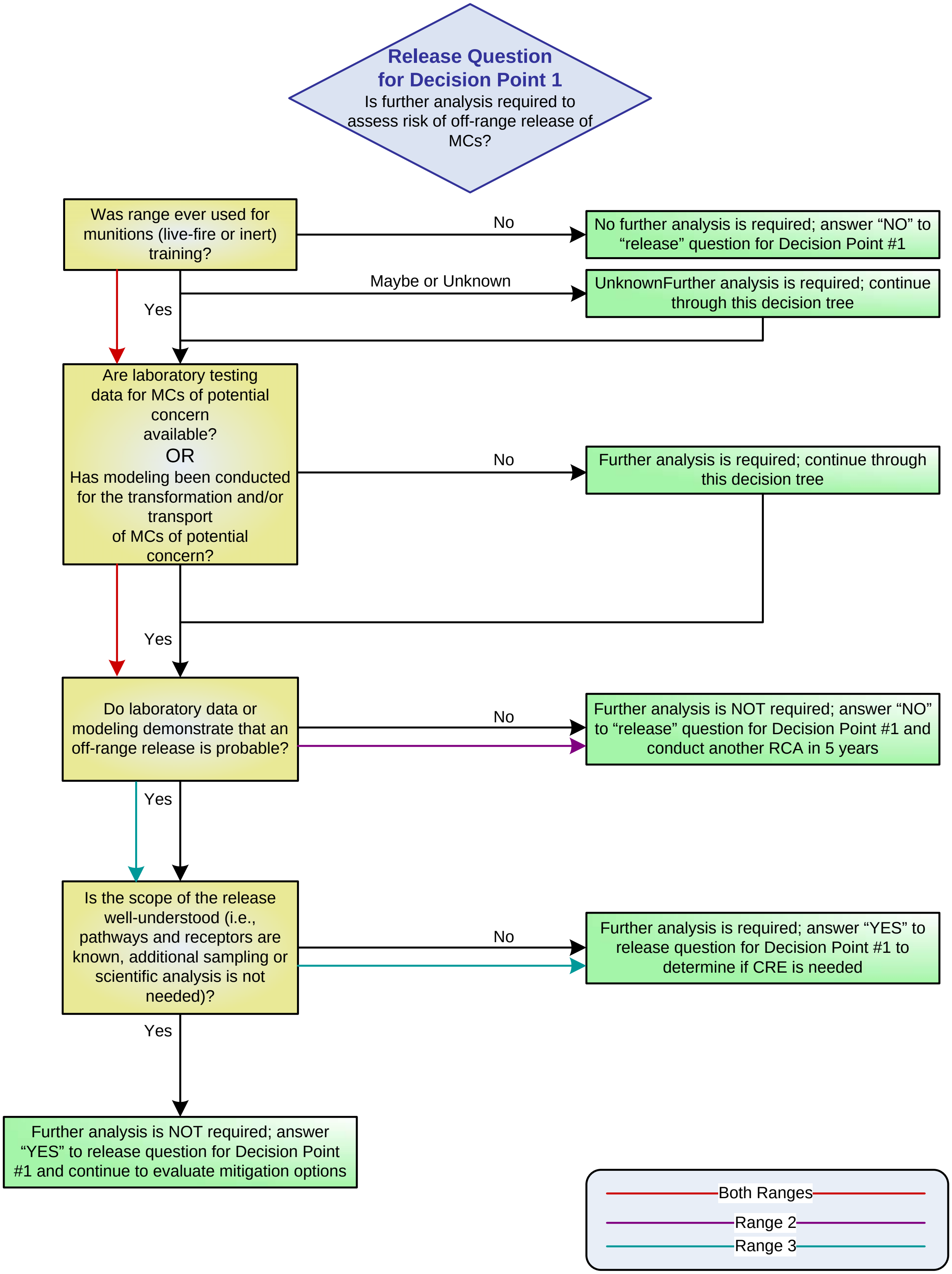

Figure 6-1. EODTECHDIV Decision Tree

7.0 RECOMMENDATIONS

Upon completion of the RCA at Decision Point 1, the technical team recommended the following:

- Range 2 requires no further action; therefore, the RCA is considered complete and no further action is required for the next five years; and

- Range 3 requires further analysis to assess the risk of an off-range release of pollutants through stormwater runoff.

In September 2008, based on a site visit from the Chief of Navy Operations (CNO) Office, the Management Team recommended that the Technical Team proceed in conducting limited multi-media on-range sampling at Range 3 to definitively determine the risk of an off-range release of residual MCs potentially present in the topsoil at Range 3.

In October 2009, an addendum to the EODTECHDIV RCA report was written to summarize the sampling methods and results associated with the August 2009 multi-media sampling activities conducted at Range 3. Refer to the EODTECHDIV RCA Addendum – Summary of Results for Multi-Media Sampling at Range 3 (ERG, 2009) for sampling objectives and procedures, the range specific Quality Assurance Project Plan (QAPP), and an analysis of results associated with the sampling activities at Range 3.

In summary, based on the analyses presented in the EODTECHDIV RCA Addendum, the Technical Team concluded that antimony and arsenic were the only pollutants present above levels of concern at Range 3. The technical team concluded that elevated arsenic concentrations were consistent with background arsenic concentrations at NSF Indian Head’s Stump Neck Annex, and therefore not a result of range operations. They also concluded that antimony was not likely to migrate off-range at levels of concern.

Based on these conclusions, the technical team recommends that Range 3 requires no further action; therefore, the EODTECHDIV RCA is considered complete and no further action is required for the next five years.

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APPENDIX A

EODTECHDIV
RSEPA Forms 1 – 4 and Forms 6 – 25

APPENDIX A-1

EODTECHDIV Range 2
RSEPA Forms 1 – 4 and Forms 6 – 25

Form 1. Basic Project and Contact Information

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	*Stump Neck*	*Range 2 (Hyper-velocity) Test Building*

Location (Municipality, State, UIC):

Indian Head, MD, USA

Range Boundaries:

See Pictorial ORSM

Major Training Operations:

None

Operational Scheduling Authority Contact and Organization: *Capt. Brett A. Reissener*	Address: ***2008 Stump Neck Road , Indian Head, MD 20640*** Phone Number: ***(301) 744-6803*** E-Mail Address: ***brett.reissener@navy.mil***
Fleet Commands and other Echelon II Commands Contact and Organization: *Ms. Vickie Writt*	Address: ***Issacc Hull Ave SE, Bldg 197, Rm 4W1811, Washington Navy Yard, DC 20376*** Phone Number: ***(202) 781-1855*** E-Mail Address: ***vickie.writt@navy.mil***
Installation Contact: *Mr. Lawrence A. Kijek*	Address: ***4217 Hanlon Road, Indian Head, MD 20640*** Phone Number: ***(301) 744-6799*** E-Mail Address: ***raymond.geckle@navy.mil***
Local Engineering Field Division/ Activity Contact and Organization: *Mr. Jeff Bossart*	Address: ***3972 Ward Road, Suite 101, Indian Head, MD 20640*** Phone Number: ***(301) 744-4705*** E-Mail Address: ***jeffrey.bossart@navy.mil***
Regional Commander and Organization: *Capt. Catherine Hanft*	Address: ***6509 Sampson Rd, Building 101, Dahlgren, VA 22448*** Phone Number: ***(540) 653-8203*** E-Mail Address: ***catie.hanft@navy.mil***
Range Manager: *Mr. Lawrence A. Kijek*	Address: ***2008 Stump Neck Road, Indian Head, MD 20640*** Phone Number: ***(301) 744-6871*** E-Mail Address: ***lawrence.kijek@navy.mil***
Public Works Environmental Office: *Mr. Jeff Bossart*	Address: ***3972 Ward Road, Suite 101, Indian Head, MD 20640*** Phone Number: ***(301) 744-4705*** E-Mail Address: ***jeffrey.bossart@navy.mil***
Other:	Address: Phone Number: E-Mail Address:

Form 1. Basic Project and Contact Information (Continued)

Other:	Address: Phone Number: E-Mail Address:
Other:	Address: Phone Number: E-Mail Address:

Form 2. General Range Information

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	***Stump Neck***	***Range 2 (Hyper-velocity) Test Building***

General (attach map of range)	
Owner	***EODTECHDIV***
Location	***Indian Head, MD***
Type of range	***Land-based test range***
Types of munitions used on the range	***Bulk propellant. Bulk high explosives, demolition charges, primers, detonators, fuses, and squibs.***
Size (acres)	***0.46***
How long has range been in existence?	***1950s***
Is the range currently operational?	***Yes***
Operational	
Describe the types of operations, past and present, conducted on the range (e.g., air-to-ground live ordnance training)	***History of RCRA research indicated that the area against the tree line was a detonation range in the 40's and 50's. Building 2107 was used in the 50s, 60s, and 70s for flash x-ray (same as current operations). This range was inactive for several years, but began testing again in 2003. In 2003, testing occurred 3-5 times / week. Now it has slowed to only a few times/year. Shot records only exist from 2003.***
Describe if and how public access to the range is restricted	***The facility has explosive signs and a warning system (lights and a siren). The facility is located in the restricted area. The facility has a perimeter fence protecting it from unauthorized access. There is a fence that partially surrounds the area, but the backside is open to the creek.***
Describe range clearance practices in terms of frequency and scope (e.g., annual surface clearance)	***Residue, etc. is swept up after testing. There is no wash down. Items are static fired so range clearance is not employed.***
Identify the annual costs of maintaining and operating the range (i.e., excluding environmental costs for the purpose of developing and evaluating protective measures)	***$141,400***
List the records used to answer the questions above	***Interviews with Larry Kijek (EODTECHDIV) and Chris Lopez (EODTECHDIV). Final Preliminary Assessment - Stump Neck Annex.***
Environmental	
Identify the locations of wetlands, if applicable, on the range (attach map)	***None on range***
Identify the location of ongoing or completed environmental investigations/cleanups/responses	***RCRA research was conducted in an area adjacent to the Building. History indicated that the area was a detonation range in the 40's and 50's. Monitoring wells were installed in the area of research. MDE visits the facility once a year. The area surrounding and including the range falls within the MRP program.***
Identify any known environmental impacts/considerations of concern to regulators or stakeholders	***None known***
Identify the annual costs of fulfilling environmental requirements (e.g., compliance, restoration)	***$6,200***

Form 2. General Range Information (Continued)

Identify any environmental sampling or testing conducted on the range	***Surface soil, subsurface soil, and groundwater samples were collected as part of the RCRA RFI/VI study. Two monitoring wells were set up as part of the site survey for the superfund investigation.***
List the records used to answer the questions above	***Interviews with Larry Kijek (EODTECHDIV) and Chris Lopez (EODTECHDIV). Final Preliminary Assessment - Stump Neck Annex.***

Form 3. RCA On-Range Visit Plan-of-Action

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	*Stump Neck*	*Range 2 (Hyper-velocity Test Building)*

Summary of Documents Reviewed During Pre-Site Visit Information Collection

The following documents and sources were reviewed during pre-site visit information collection:

1. *Environmental Department Records*
2. *Final Preliminary Assessment – Stump Neck, NDW, Indian Head (Sept 2005)*
3. *Navy Closed, Transferred, Transferring, Active, and Inactive Range Survey (Jan 2000)*
4. *RCRA Facility Investigation/Verification Investigation Report for Stump Neck, IH Div, NSWC, Indian Head, Maryland (Jan 1998)*
5. *Safety Department Records (Building Files)*
6. *Site Management Plan for Installation Restoration Program (Aug 2007)*

Personnel to be Interviewed	Date/Time	Phone Number
Larry Kijek (EODTECHDIV) and Chris Lopez (EODTECHDIV)	*Friday, 29 February 2008, 0830 Hours*	*Larry Kijek ((301) 744-6871), Chris Lopez ((301) 744-5180)*
Mark Yeaton (NAVFAC)	*Thursday, 15 May 2008, 0800 Hours*	*(301) 744-2272*
Robert Harrison (NAVFAC)	*Thursday, 15 May 2008, 1300 Hours*	*(301) 744-2259*
Kathy Frey (NAVFAC)	*Thursday, 15 May 2008, 1300 Hours*	*(301) 744-2258*
Glenn Faini (NAVFAC)	*Thursday, 15 May 2008, 1430 Hours*	*(301) 744-2257*
Seth Berry (NAVFAC)	*Thursday, 22 May 2008, 1300 Hours*	*(301) 744-2273*
Shawn Jorgensen (NAVFAC)	*Thursday, 5 June 2008, 1300 Hours*	*(301) 744-6055*
Patrick Goodwin (ERG)	*Thursday, 5 June 2008, 1400 Hours*	*(703) 633-1667*
Catherine Edwards (ERG)	*Wednesday, 11 June 2008, 1300 Hours*	*(703) 633-1600*

List of Ranges to Visit

Range 2 (Hyper-velocity Test Building)

Form 4. RCA Activity Notification

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	*Stump Neck*	*Range 2 (Hyper-velocity) Test Building*
Location (Municipality, State):		
Indian Head, Maryland		
Management Team Members	**Organization**	**Phone Numbers**
Cmdr. Kevin S. Gillam	*EODTECHDIV*	*(301) 744-6803 x 243*
Drew Koban	*EODTECHDIV*	*(301) 744-1195*
Chris O'Donnell	*EODTECHDIV*	*(301) 744-2400*
Capt. Brett A. Reissener	*EODTECHDIV*	*(301) 744-4401*
Jason Shaffer	*EODTECHDIV*	*(301) 744-4301*
EODCM William Spoor	*EODTECHDIV*	*(301) 744-1548*
Debbie Strickland	*EODTECHDIV*	*(301) 744-4568*
Technical Team Members	**Organization**	**Phone Numbers**
Anthony Brown	*EODTECHDIV*	*(301) 744-6840*
Larry Kijek	*EODTECHDIV*	*(301) 744-6871*
Susan Yates	*EODTECHDIV*	*(301) 744-6872*
Adam Humphreys	*ERG*	*(703) 633-1695*
Chris Krejci	*ERG*	*(703) 633-1646*
Joshua Moore	*ERG*	*(703) 633-1702*
Alison Poe	*ERG*	*(703) 633-1697*
Arrival/Departure Dates/Times		
Arrival: Friday, 29 February 2008 (Onsite Range Visit)		
Departure: Friday, 29 February 2008 (Onsite Range Visit)		
Visit Request Submitted		
Yes		

Form 5. On-Range Visit

[See RCA Report Appendix B]

Form 6. Air Quality Interview Record

Point of Contact (POC) Information

1. Date: ***11Jun 2008***

2. Time: ***1300 hours***

3. Location: ***ERG Office (Chantilly, VA)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Catherine Edwards***

8. POC Title: ***Environmental Scientist***

9. E-mail Address: ***catherine.edwards@erg.com***

10. Phone Number: (***703) 633-1600***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) [✓ ***Yes***] No

14. Name and Affiliation of Interviewer: ***Joshua Moore - ERG (Navy Contractor)***

Stationary Air Emission Sources

15. Is this range in a National Ambient Air Quality Standards nonattainment area? (circle) [✓ ***Yes***] No
Charles County is within the Washington, DC-VA-MD Metropolitan area, which is a moderate nonattainment area for ozone and a nonattainment area for PM2.5.

16. Are there any stationary emission sources on operational range areas? (circle) Yes [✓ ***No***]
If no, proceed to question 18. Otherwise, Describe:

17. Are stationary emission sources that are located in operation range areas permitted?
(circle) Yes No [✓ ***N/A***] Describe:

18. Do you have any stationary emission sources that are in nonoperational range support areas (i.e., facilities side of range)? (circle) Yes [✓ ***No***] If no, proceed to question 20.
If yes, list only major range support source types:

19. Are range support stationary emission sources permitted? (circle) Yes No [✓ ***N/A***]
If yes, what Federal, State, or local agency administered permit(s)?
If no, why are they not permitted?

20. Does the range have a CAA Title V Permit? (circle) [✓ ***Yes***] No
If yes, what stationary emission source type(s) and major source pollutant(s) triggered the Title V permit requirement? ***NSF Indian Head consists of approximately 90 significant sources, however none are on this range. The emission sources at NSF Indian Head include: a steam plant, various tanks, solvent usage, painting, degreasing, mixing, and wrapping processes. The major source threshold for triggering Title V permitting requirements in Charles County, where NSF Indian Head is located, is 25 tons-per-year for NOx and VOC, 10 tons-per-year for a single Hazardous Air Pollutant (HAP), 25 tons-per-year of any combination of HAPs, and 100 tons-per-year for any other criteria pollutant. NSF Indian Head's potential emissions are greater than the major source thresholds for NOx, SOx, CO, and PM10.***
Where is/are the stationary emission source type(s) located? ***The sources are located at various plant facilities throughout the base but none on this range.***
If no, explain:

21. Is the range subject to any source category MACT standards promulgated under CAA Title III (Hazardous Air Pollutants)? (circle) [✓ ***Yes***] No
Explain: ***NSF Indian Head is subject to two MACTs: 40 CFR 63 Subpart T—National Emission Standards for Halogenated Solvent Cleaning and 40 CFR Part 63 Subpart GG—National Emission Standards for Aerospace Manufacturing and Rework Facilities. This range is unaffected by this standard.***

22. Do any **OB/OD** or other range-related burning activities occur on the range? (circle) Yes [✓ ***No***]
If yes, does the range have a permit for this activity? (circle) Yes No [✓ ***N/A***]
If no permit, why not?

23. Is fugitive dust control an issue on the range? (circle) Yes [✓ ***No***] Explain:
Fugitive dust emissions typically only occur during heavy-duty construction activities. The Navy is required to take reasonable precautions to prevent PM from becoming airborne, per COMAR 26.11.06.03D. These precautions may include a number of air quality best management practices, which limit fugitive dust impacts to temporary, minimal health or environmental effects. These practices include, but are not limited to, the following:

- ***Watering down active construction areas to reduce fugitive dust emissions;***
- ***Stabilizing exposed or graded areas (e.g., by paving roads and hydroseeding open areas) as soon as possible upon completion of grading;***
- ***Properly covering trucks hauling fill material or maintaining at least two feet of free-board;***
- ***Limiting truck speeds on unpaved areas of the site to 15 miles-per-hour or less;***
- ***Grading sites in phases, thereby limiting the time that disturbed soil is exposed; and***
- ***Temporarily halting construction activities when winds exceed 25 miles per hour.***

Form 6. Air Quality Interview Record (Continued)

24. Is this range subject to CAA, Title III, Section 112r, Accidental Release Prevention? (circle) Yes [✓ No]
If no, please explain why the range is not subject to this Federal regulation: ***NSF Indian Head was once subject to this regulation based on its storage of Oleum (fuming sulfuric acid). Their RMP was cancelled effective 12 Dec 07 because they no longer store Oleum on-base.***
If yes, does this range participate in a Risk Management Plan (RMP)? (circle) Yes No [✓ N/A]
Explain:

25. Does the Air Quality Office oversee compliance with the Asbestos NESHAPs? (circle) Yes [✓ No] If no, state what office on base has this responsibility: ***The Safety Office oversees the asbestos program. Dennis Tomlinson is POC for Naval Support Activity South Potomac (NSASP), and Ray Geckle is POC for the Naval Surface Warfare Center (NSWC).***
If yes, for what types of activities has this office submitted Federal Asbestos Abatement Notifications?
Is this office complying with all reporting requirements and deadlines? (circle) [✓ Yes] No N/A ***Compliance is assumed because all contractors performing asbestos work are properly certified.***
If yes, proceed to next question. If no, explain noncompliance:

26. Has the range been inspected by an air quality regulatory agency within the past 5 years? (circle) [✓ Yes] No
If yes, state name of agency and any deficiencies noted in most recent inspection report: ***According to EPA Enforcement & Compliance History Online (ECHO), MDE performed a Title V compliance certification review for NSF Indian Head on 04 Apr 08. The review noted deviations but resulted in a determination that the base was in compliance with its Title V permit.***

27. Has the range been issued any air quality Notices of Violation (NOVs)? (circle) Yes [✓ No]
If yes, who issued the NOV, what was the NOV for, and how is the NOV being resolved?

28. Are there additional applicable air quality regulations that have not yet been addressed during this interview? (circle) [✓ Yes] No If yes, please list applicable regulations and administering agency. ***The Installation is subject to additional air quality regulations involving open burning activities; however, this regulation is not applicable to the ranges at NSF Indian Head. The Installation must obtain an Open Fire Permit from Charles County prior to initiating open burning activities (e.g., thermal decontamination of buildings) in order to inform the county of its activities. In addition, MDE bans open fires from June 1–August 31 in Charles County (COMAR 26.11.07.03B).***

29. Have any Federal, State, or local air quality regulations negatively impacted range operations? (circle) Yes [✓ No] If yes, please state the regulation and negative impacts.

Mobile Air Emission Sources[1]

30. List types of mobile emission sources in operational range areas: ***None***

31. List types of mobile emission sources in nonoperational range support areas: ***None***

32. Have Federal, State, or local air quality agencies made requirements of mobile emission sources that have impacted range operations? (circle) Yes [✓ No] If yes, please describe:

Air Quality Conformity

33. Are there plans to change the frequency or type of range operations in such a way that would impact air emissions? (circle) Yes [✓ No] If no, go to next question.
If yes, has the issue of increased/decreased air emissions been addressed at the Federal, State, or local air quality agency level? (circle) Yes [✓ No] If yes, describe:

34. Has an air quality conformity applicability study (CAA General Conformity Rule) ever been performed for any activities on this range? (circle) Yes [✓ No] If no, go to question 36.
If yes, for what year and action was this done?
What major emission sources were included in this analysis?

35. From the conformity applicability study, was a full conformity determination then required? (circle) Yes [✓ No]
If no, explain why no full conformity determination was required: ***The estimated annual emissions from the proposed actions were below the de minimis levels set forth in the GCR. Estimated emissions also were far below regional significance thresholds.***
If yes, what was the conclusion of the determination and did the State make any requirements?

Off-Range Release

36. Has the Navy, regulatory agency, or public expressed any concerns regarding toxic air emissions from range operations and their possible negative impact off range? (circle) Yes [✓ No]
If yes, please describe:

37. Have any off-range releases of air contaminants occurred that have negatively impacted air quality for the surrounding community or environment? (circle) Yes [✓ No] Explain:
If yes, describe:

Form 6. Air Quality Interview Record (Continued)

Documents
38. Do you have copies, preferably electronic, of any documents that address range air quality issues including, but not limited to, a Title V permit; mobile emissions calculations; range air quality inspection report; letters from Federal, State, or local air quality regulatory agencies; and conformity applicability and determination documents. List copies of air quality documents obtained: ***Title V permit (See Form 5)***

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[1] Examples of mobile emission sources include ground support equipment, motor vehicles, tanks, aircraft over-flights, marine vessels (if applicable), chaff, and live ordnance use.

Form 7. Water/Wastewater Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***

2. Time: ***1430 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Glenn Faini***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***glenn.d.faini@navy.mil***

10. Phone Number: ***(301) 744-2257***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ No]

7. Name of POC Interviewed: ***Diana Rose***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***Diana.rose@navy.mil***

10. Phone Number: ***(301) 744-2267***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ No]

14. Name and Affiliation of Interviewer: ***Adam Humphreys, Christopher Krejci, Joshua Moore, and Alison Poe; ERG (Navy Contractor)***

Range Surface Water & Groundwater Information

15. Does this range have any groundwater? (circle) [✓ Yes] No
If no, proceed to next question. If yes, what is the depth to groundwater and is the groundwater used for drinking water or irrigation? ***Groundwater is pumped from the Patapsco Aquifer (Average 240 ft to Top of Upper Contact) and the Patuxent Aquifer (Average 1000 ft to Top of Upper Contact) Groundwater is used for drinking water and other domestic purposes.***

16. Does the range have any surface water on or nearby the range? (circle) [✓ Yes] No If no, proceed to next question. If yes, describe surface water and uses of surface water by humans or wildlife. **The range is located adjacent to the Chicamuxen Creek.** ***The creek is used by humans primarily for recreational fishing and boating. The Mattawoman Creek is used by Large-Mouthed Bass as a spawning ground.***

Point Source Discharges

17. Does this range have a Federally Owned Treatment Works (FOTW)? (circle) Yes [✓ No]
If no, proceed to question 18. If yes, answer the following questions about the FOTW:
a) What is the FOTW average daily flow rate and capacity?
b) Into what body of water does the FOTW discharge?
c) Is the collection system to FOTW "combined" (i.e., receives both wastewater and stormwater)? (circle) Yes No
d) How is sewage sludge disposed of?
e) Does the FOTW have an NPDES, State, or local wastewater discharge permit? (circle) Yes No
If yes, state the name of the permit issuing agency and proceed to question 18.
If no, explain why the FOTW does not have an NPDES or other wastewater discharge permit (then proceed to question 18):

18. Does this range discharge wastewater into a Publicly Owned Treatment Works (POTW) collection system? (circle) Yes [✓ No] If no, proceed to question 19.
If yes, does this range or any operations on the range have a discharge permit with the POTW? (circle) Yes No
If yes, proceed to next question. If no, briefly explain why the range does not have a POTW discharge permit:

19. If applicable, briefly describe the types of discharges the FOTW or POTW receives (i.e., domestic, industrial, stormwater) from this range: ***N/A***

20. Does the FOTW/POTW receive any discharges from military operational range areas? (circle) Yes [✓ No] N/A
If no, proceed to next question. If yes, briefly describe these types of discharges:

21. Does the range have any onsite disposal systems (e.g., spray irrigation, evaporation lagoons, septic tanks)? (circle) Yes [✓ No] If no, proceed to question 22. If yes, describe disposal system:
Is the disposal system permitted? (circle) Yes No If yes, what is the type of permit and who is the permitting agency?

22. Does the range have any other Federal, State, or local wastewater discharge permits for point source discharges? (circle) [✓ Yes] No If no, proceed to next question. If yes, state the type of permit, issuing agency, description of discharge, and whether any discharges are from military operational range areas: ***The base has and industrial wastewater permit which allows it to discharge industrial wastewater including non-contact and process wastewater as well as stormwater. No discharges from military operational range areas are currently permitted.***

Form 7. Water/Wastewater Interview Record (Continued)

Nonpoint Source Discharges

23. Does the range have any NPDES, State, or local stormwater discharge permits? (circle) ***Yes*** No

If no, proceed to next question. If yes, state the type of permit, issuing agency, and sources of stormwater runoff: ***The base has a Multi-Sector General Permit (MSGP) for stormwater called the municipal sewer separate system (MS4) permit issued by MDE.***

24. Are stormwater discharges from military operational range areas being monitored? (circle) Yes ***No***

If no, proceed to next question. If yes, state names of operational range areas that are being monitored for stormwater runoff and describe any contaminants in this stormwater:

25. Does this range have a current Stormwater Pollution Prevention Plan (PPP)? (circle) ***Yes*** No

26. Are there protective measures in place? (circle) Yes ***No***

No existing protective measures address nonpoint source discharges.

If no, proceed to question 27. If yes, do protective measures extend to military operational range areas? (circle) Yes No

If no, proceed to question 27. If yes, describe protective measures employed in military operational range areas:

27. Does this range have a current Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent spills of oil and hazardous substances into navigable waters? (circle) ***Yes*** No

28. Does this range have a current Oil and Hazardous Substances Facility Response Plan (FRP)? (circle) ***Yes*** No

Regulatory Impacts on Range

29. Has the range exceeded any wastewater or stormwater discharge permit limits within the past year? (circle) Yes ***No*** N/A If no, proceed to next question. If yes, for what analyte(s) did the range exceed its permit limit(s) and what measures are being taken to eliminate future exceedances?

30. Has the range been inspected by a water quality regulatory agency within the past 5 years? (circle) Yes ***No***

If no, proceed to next question. If yes, state name of agency and any deficiencies noted in most recent inspection report:

31. Has the range been issued any wastewater discharge Notices of Violation (NOVs)? (circle) Yes ***No***

If no, proceed to next question. If yes, who issued the NOV, what was the NOV for, and how is the NOV being resolved?

32. Are there additional required water quality regulations or plans that have not yet been addressed during this interview? (circle) Yes ***No*** If yes, list applicable regulations, plans, and administering agency:

33. Have any Federal, State, or local water quality regulations negatively impacted range operations? (circle) *Yes* ***No***

If yes, state the regulation and negative impacts:

Off-Range Release

34. Has the Navy, regulatory agency, or public expressed any concerns regarding the off-range migration of munitions residues? (circle) *Yes* ***No***

Explain:

35. Have any off-range releases of MCs of potential concern occurred that have negatively impacted water quality for the surrounding community or environment? (circle) *Yes* ***No*** Explain:

Documents

36. Do you have copies, preferably electronic, of any documents that address water quality issues that impact the range including, but not limited to, Stormwater PPP, annual stormwater reports, water quality inspection report, water or sediment monitoring reports, FRP, or SPCC Plan? ***Industrial Storm Water Permit (See Form 5); Stormwater Pollution Prevention Plan and Spill Prevention, Control, and Countermeasures Plan unavailable electronically, see Environmental Program Office for these documents.***

Form 8. Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***
2. Time: ***0800 hours***
3. Location: ***Environmental Office (B289)***
4. Tactical Theater Name: ***Naval Support Facility Indian Head***
5. Range Complex Name: ***Stump Neck***
6. Range Name: ***Range 2***
7. Name of POC Interviewed: ***Mark Yeaton***
8. POC Title: ***Environmental Engineer***
9. E-mail Address: ***mark.b.yeaton@navy.mil***
10. Phone Number: ***(301) 744-2272***
11. POC Navy Command Affiliation: ***NAVFAC Washington***
12. Dept./Div./Branch: ***Environmental Program Office***
13. Contractor? (circle) Yes [✓ No]
14. Name of POC Interviewed: ***Keith Chamberlain***
15. POC Title: ***Admin / Tech Specialist***
16. E-mail Address: ***keith.chamberlain@navy.mil***
17. Phone Number:
18. POC Navy Command Affiliation: ***NAVFAC Washington***
19. Dept./Div./Branch: ***50/513/5132***
20. Contractor? (circle) Yes [✓ No]
21. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Military Munitions[1]

Questions 22 - 30 below, regarding military munitions, will need to be addressed by both environmental and range managers. Answer questions with respect to the individual roles of range and environmental managers and describe instances when range and environmental managers work together in the management of military munitions.

22. Describe the handling and storage practices for unused munitions: ***Unused munitions are always returned to the range's magazine***

23. What is done with unused munitions that are deemed defective or damaged? ***Defective/damaged munitions are destroyed onsite at Range Three which is immediately adjacent to Range Two.***

24. Once munitions have been used for their "intended purposes" (i.e., fired, jettisoned, dropped, launched, detonated on range, or otherwise used), what is done with any resulting munitions fragments (e.g., shrapnel, fins, casings)? ***Munitions fragments are flashed at Range 3 and certified 5X by Range 3 personnel. The military function is removed.***

25. Describe the process for recycling used munitions fragments: ***5X fragments are placed in designated storage container and transported to NSA South Potomac Indian Head MD for recycling through DRMO.***

26. If used munitions fragments are transported off range to an approved munitions recycling facility (such as a military depot), are they ever manifested? If so, under what circumstances are they manifested? ***In accordance with local guidance, a Form 2271 (Decontamination Tag) is generated to certify that an item is no longer contaminated with explosives.***

27. Describe range maintenance practices with regard to UXO. ***UXO is rare at Range Two. Ordnance items are usually strapped or clamped into place during test operations – they are not dropped or fired through the air.***

28. Describe the process for responding to fired munitions that have landed off range. ***Munitions are not fired from Range 2, therefore fired munitions have never landed off range.***

29. Are you aware of used or unused munitions being buried for disposal purposes? (circle) Yes [✓ No]
Explain:

30. Does the range keep permanent EOD off-range response records? (circle) Yes No [✓ N/A]

Solid Waste

31. Does this range have a landfill? (circle) Yes [✓ No] If no, proceed to next question. If yes, what types of waste does this landfill accept and where is the landfill located?

32. Describe any solid wastes (as defined under RCRA) that are generated from the range and what is done with them: ***Explosives are treated at the Strauss Avenue Thermal Treatment Point. Metals containing small explosive contamination are explosively decontaminated at the Solid Waste Recycler. Other waste is disposed of through property disposal as appropriate.***

Hazardous Materials

33. Does this range participate in a Hazardous Material Control and Management (HMC&M) Plan, Authorized Users List (AUL), and a Hazard Communication (HAZCOM) program (required of Navy ranges)? (circle) [✓ Yes] No
If yes, proceed to next question. If no, explain why the range does not participate in these HM management programs.

34. Has this range submitted a toxics release inventory (TRI) report under SARA, Title III EPCRA reporting requirements? (circle) Yes [✓ No] If yes, proceed to EPCRA Interview Form 11, if appropriate.
Is the range exempt from EPCRA reporting requirements? (circle) [✓ Yes] No
If no, explain why the range has not submitted a TRI report:

Form 8. Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste Interview Record (Continued)

Hazardous Waste

35. Does this range generate HW? (circle) [✓ Yes] No If no, proceed to question 37. If yes, briefly list what types of HW are generated from the range: ***Only a misfire would potentially cause hazardous waste. The range has the potential to generate hazardous waste in this way. See #23***

36. What classification of HW generator is this range?[2] (circle) [✓ Class I] *Class II* Class III
Naval Support Facility Indian Head is classified as a Class I generator, the ranges do not receive individual classification.

37. Does this range store HW onsite prior to disposal? (circle) Yes [✓ No] N/A If no, proceed to question 39. If yes, does the range have satellite accumulation points? (circle) Yes No

38. Is this range in compliance with all Federal, State, or local HW accumulation time periods? (circle) [✓ Yes] No N/A
If yes, proceed to next question. If no, describe deficiency and what is being done to resolve it:

39. Does this range dispose of HW onsite? (circle) Yes [✓ No] N/A
If no, proceed to next question. If yes, briefly describe what HW is disposed of onsite and the disposal method:

40. Does this range have a Treatment, Storage, and Disposal Facility (TSDF) Permit? (circle) [✓ Yes] No N/A
If yes, proceed to question 41.
If no, is the range considered to fall under a TSDF permit (under an affiliated Navy base)? (circle) Yes No N/A
If yes, proceed to question 41. If no, explain why not and proceed to question 42:

41. Is this range in compliance with all TSDF permit requirements? (circle) [✓ Yes] No N/A
If yes, proceed to question 42. If no, describe deficiency and what is being done to resolve it:

42. Has all HW been disposed of according to Federal, State, or local regulations? (circle) [✓ Yes] No N/A
If yes, proceed to next question. If no, describe deficiency and what is being done to resolve it:

43. Does this range participate in or have a HW Management Plan (HWMP)? (circle) Yes [✓ No] N/A
If yes, proceed to next question. If no, explain why this range does not participate in or have a HWMP:
The base is currently developing a base-wide HWMP

Specifically Regulated Toxic Substances

44. Does this range have a PCB Management Plan that addresses storage, labeling, handling, and disposal practices consistent with Federal, State, and Navy requirements? (circle) [✓ Yes] No N/A
Explain: ***The base used to have a plan, but it has since lapsed. There was a detection of PCBs from a sample taken at the Sewage Treatment Plant in February 2006 by MDE that has resulted in a PCB Detection Study and required sampling.***

45. Does this range have a designated Asbestos Program Manager (APM) and a current Asbestos Management Plan (AMP)? (circle) [✓ Yes] No N/A
Explain: ***The Safety Office oversees the asbestos program. Dennis Tomlinson is POC for Naval Support Activity South Potomac (NSASP), and Ray Geckle is POC for the Naval Surface Warfare Center (NSWC).***

46. Have all facilities on this range been surveyed for asbestos-containing material (ACM) and the condition of ACM material? (circle) *Yes* [✓ No] N/A If yes, are there any buildings/structures on this range or in range support areas that have ACM or have had ACM abated? (circle) Yes *No* N/A Explain:

47. Have all facilities on this range been surveyed for lead-based paint (LBP)? (circle) Yes [✓ No] N/A
If yes, are there any buildings/structures on the range or in range support areas that have LBP or have had LBP abated? (circle) Yes No N/A Explain:

48. If PCB-containing items, ACM, or LBP are removed from range equipment, utilities, or structures, are all processed according to Federal and State laws and Navy requirements for safe handling, containment, labeling, manifesting, and disposal practices? (circle) [✓ Yes] No N/A
Explain: ***Indian Head has licensed professional remove items, which are triple-bagged according to TSCA requirements.***

Regulatory Impacts on Range

49. Has this range been inspected by an agency that regulates HM or HW within the past 5 years?
(circle) [✓ Yes] No N/A
If yes, state name of agency or agencies and any deficiencies noted in most recent inspection report(s):
Maryland Department of the Environment (MDE) comes out yearly to inspect permitted sites only. MDE has not inspected any of the 8 ranges of concern because Indian Head has more than 400 sites including their satellite accumulation areas. NSWC is also required to do self-assessments at a frequency they determine.

50. Have Federal, State, or local HM or HW regulators issued this range any Notice of Violation (NOV)? (circle) Yes [✓ No] N/A
If no, proceed to next question. If yes, who issued the NOV, what was the NOV for, and how are deficiencies being resolved?

Form 8. Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste Interview Record (Continued)

51. Are there additional applicable HM or HW regulations that have not yet been addressed during this interview? (circle) Yes ***No*** If yes, list applicable regulations and administering agency:

Is there a conditional exemption for the storage of WMM off range? (circle) Yes No

52. Have any Federal, State, or local HM or HW regulations negatively impacted range operations? (circle) Yes ***No***

If yes, state the regulation(s) and negative impacts:

53. Are there plans to change the frequency or type of range operations in such a way that would impact the quantity of wastes generated from this range? (circle) Yes ***No***

If no, go to next question. If yes, what types of wastes do you expect to increase or decrease as a result of changes in range operations?

Off-Range Release

54. Has the Navy, regulatory agency, or public expressed any concerns about fired munitions landing off range or the off-range migration of residual MCs of potential concern and their impact on surrounding communities or environment? (circle) Yes ***No*** Explain: ***There have not been any formal concerns expressed.***

55. Have any off-range releases of munitions or their constituents occurred that have negatively impacted the surrounding community or environment? (circle) Yes ***No*** Explain:

Documents

56. Do you have copies, preferably electronic, of any documents that address HM or HW that impact this range including, but not limited to, a Navy Hazardous Waste Annual Report, any EPA or State program reports, copies of program management plans (e.g., HMC&M Plan, HWMP, AMP, PCB Management Plan), and inspection reports? List copies of documents obtained: ***PCB Elimination Plan***

[1] Refer to Military Munitions Rule [Federal Register: February 12, 1997 (Volume 62, Number 29)] and DoD Policy to Implement EPA's Military Munitions Rule, 1 July 1998.

[2] HW generator: Any person, by site, act, or process produces HW or whose act first causes an HW to become subject to regulation.

HW generator classifications:

Class I = (Large Quantity Generator). Monthly generation quantity of 1,000 kilograms (kg) (2,200 pounds [lbs]) or more HW or 1 kg (2.2 lbs) or more acute HW.

Class II = (Small Quantity Generator). Monthly generation quantity of 100 – 1,000 kg (220 - 2,200 lbs) HW and less than 1 kg (2.2 lbs) acute HW.

Class III = (Conditionally Exempt Small Quantity Generator). Monthly generation quantity less than 100 kg (220 lbs) HW or less than 1 kg (2.2 lbs) of acute HW. Such generators are exempt from substantially all RCRA requirements.

(Source: OPNAVINST 5090.1B CH-4, Navy Environmental and Natural Resources Program Manual, Chapter 12, Hazardous Waste Management Ashore).

Form 9. Cultural Resources Interview Record

Point of Contact (POC) Information

1. Date: ***05 June 2008***

2. Time: ***1400 hours***

3. Location: ***ERG Office (Chantilly, VA)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Patrick Goodwin***

8. POC Title: ***Environmental Scientist***

9. E-mail Address: ***patrick.goodwin@erg.com***

10. Phone Number: ***703.633.1667***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) [✓ ***Yes***] No

14. Name and Affiliation of Interviewer: ***Joshua Moore, ERG (Navy Contractor)***

General Cultural Resources

15. Briefly describe the current cultural resource program at this range, if any: ***This range is located at NSF Indian Head in Indian Head, Maryland. Cultural resources management at NSF Indian Head is handled by the Environmental Office, with contractor support for archeological and historic architectural studies.***

16. Is there a current Integrated Cultural Resource Management Plan (ICRMP), Cultural Resource Management Plan (CRMP), and/or a Historic and Archaeological Resources Protection (HARP) Plan? Can you provide copies, preferably electronic, of these documents? ***A Draft Overview of the Cultural Resource Program was prepared in 1996. A Preliminary Draft HARP was prepared in 1998. Several archeological and historic architectural studies have taken place since these documents were prepared. The Navy is currently preparing an updated ICRMP, which will include updated HARP categorizations for all structures on base.***

Archaeological Resources

17. Briefly describe the number and types of known archaeological resources at this range (e.g., general time periods, preservation conditions, unique qualities). ***None***

18. Have cultural resource surveys been conducted on the operational ranges? If so, has the entire range(s) been systematically surveyed? ***No***

19. Are there known archaeological resources located on an operational range? If so, have they been evaluated for National Register of Historical Places (NRHP) eligibility? ***None known***

20. What procedures are in place to avoid, minimize, or mitigate effects of future undertakings, especially if located on an active range? ***New undertakings at NSF Indian Head are subject to review under the Comprehensive Work Approval Process (CWAP). This process would identify cultural resource management requirements for any proposed undertaking. The Navy would initiate Section 106 consultation with the Maryland Historical Trust for any future undertakings that could affect known archeological resources. The Navy would perform Phase I archeological surveys for any future undertakings that could disturb previously unsurveyed and undisturbed soil.***

21. Where are archaeological collections and their associated records housed, and does this repository meet 36 CFR 79 (Curation of Federally Owned and Administered Archaeological Collections) requirements? ***The Navy has a Memorandum of Agreement (MOA) with the Maryland Archaeological Conservation Laboratory and Jefferson Patterson Park and Museum, operated by the Maryland Historical Trust, for curation of archaeological project records and artifacts. This facility meets 36 CFR 79 requirements.***

Historic Built Environment

22. Are there any buildings or structures located on an operational range? If so, have they been evaluated for NRHP eligibility (including those related to the Cold War era)? ***No***

23. Are there any National Historic Landmarks or State/local designated historic sites (e.g., State Historic Landmark, State Register of Historic Places) located on an operational range? ***No***

24. What procedures are in place to avoid, minimize, or mitigate effects of future undertakings, especially if located on an active range? ***New undertakings at NSF Indian Head are subject to review under the Comprehensive Work Approval Process (CWAP). This process would identify cultural resource management requirements for any proposed undertaking. The Navy would initiate Section 106 consultation with the Maryland Historical Trust for any future undertakings that could affect known historic buildings or districts. The Navy would perform historic architectural surveys for any future undertakings that could adversely affect buildings that are at least 50 years old and have not yet been surveyed.***

Native American Consultation

25. What Federally recognized Native American/Hawaiian groups have expressed interest in cultural resource issues related to this range? ***None***

26. Are there any known tribal resources or sacred sites located on an operational range? If so, what type of Native American/Hawaiian consultation has been conducted related to these resources? ***No***

27. Has any group requested visitation rights to any known tribal resource or sacred site at this operational range? If so, has the Navy complied with these requests? ***No***

28. Has a NAGPRA-related *Summary* and *Inventory* been completed for collections related to this operational range? What are the pending repatriation issues, if any? **No**

Form 9. Cultural Resources Interview Record (Continued)

29. What procedures are taken to consult with Native American/Hawaiian groups during NEPA and NHPA Section 106 processes? ***The Navy would consult with the Maryland Historical Trust to determine whether Native American consultation is appropriate for a given undertaking.***

30. Are Native American/Hawaiian monitors employed during archaeological surveys or excavation work? ***No***

Regulatory Compliance

31. Who is responsible for compliance issues regarding cultural resource regulations and general management of cultural resources at this range? ***Mr. Jeffrey Bossart (Environmental Program Director, Naval Support Activity South Potomac)***

32. What procedures are taken to evaluate proposed actions for their potential impacts to cultural resources on an operational range? ***New undertakings at NSF Indian Head are subject to review under the Comprehensive Work Approval Process (CWAP). This process would identify cultural resource management requirements for any proposed undertaking.***

33. Have NEPA and NHPA Section 106 studies been conducted for the operational use of all operational ranges? How does the range implement procedures for public involvement per 36 CFR 800? ***No NEPA or Section 106 studies have been prepared for range operations. If a Section 106 consultation were to be performed for a given range, the Navy would consult with the Maryland Historical Trust to determine whether public involvement is appropriate for a given undertaking.***

34. What procedures are in place to comply with Section 110 of NHPA?

The Navy satisfies the requirements of Section 110 by performing the following:

a. Continuing to use historic buildings that satisfy mission requirements;

b. Routinely performing archeological and historic architectural surveys to identify and preserve historic properties; and

c. Developing MOAs with the Maryland Historical Trust and the Advisory Council on Historic Preservation and performing mitigation and recordation for any projects that adversely affect historic properties.

35. Does this range have a Programmatic Agreement (PA) with SHPO? If so, are activities associated with the operational use of all active ranges covered under this PA? ***No***

36. Is this range currently in noncompliance with any Federal regulations related to cultural resources? ***No***

37. Has SHPO, a Native American/Hawaiian group, or any other interested party expressed concern about either direct impacts on cultural resources from range use (e.g., bombing, tracked-vehicle use) or indirect impacts from toxic releases related to ordnance? ***No***

Documents

38. Do you have copies, preferably electronic, of any documents that address cultural resource issues that impact the range including, but not limited to, an ICRMP, CRMP, HARP plan, PA, or cultural resource overviews? List all documents received: ***Draft Overview of the Cultural Resource Program (1996) and Preliminary Draft HARP (1998). (See Form 5)***

Form 10. Natural Resources Interview Record

Point of Contact (POC) Information

1. Date: ***22 May 2008***

2. ***Time: 1300 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Seth Berry***

8. POC Title: ***Natural Resources Specialist***

9. E-mail Address: ***seth.m.berry@navy.mil***

10. Phone Number: ***301-744-2273***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ ***No***]

14. Name and Affiliation of Interviewer: ***Christopher Krejci and Joshua Moore; ERG (Navy Contractor)***

General Natural Resources

15. Is there a current INRMP for this range? Is this range or range complex covered in the INRMP? (Ranges must review and update these plans every 5 years.) ***There is an INRMP for the installation that covers all of NSF Indian Head. A 2008 revision is currently waiting approval from MDNR.***

16. Briefly describe any current natural resource programs at this range, especially if they involve any operational ranges (e.g., conservation programs, native species restoration, propagation programs). ***Bald Eagle Management Plan***

Biological Resources

17. Briefly describe any biological/habitat surveys that have been conducted on an operational range.
1. Master Plan Update – Naval Ordnance Station, Indian Head, Maryland - Chesapeake Division NAVFAC (1990)
2. Rare, Threatened, and Endangered Plant Species - Maryland Natural Heritage Program(1991-1992)
3. Urban Forest Management Plan. Naval Surface Warfare Center, Indian Head, Maryland. - Virginia Polytechnic Institute. (1995)
4. Indian Head Naval Surface Warfare Center Amphibian Survey – IHDIV (1999)
5. Secretary of the Navy Environmental Award Submission for FY97-FY99: Natural Resources Conservation - Small Installation. Natural Resources Office, Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland (1999)
6. Rare, Threatened, and Endangered Species Survey - NSF-IH. (2006)

18. Identify all sensitive species (threatened or endangered species, species of concern, State sensitive species) that are known residents or seasonal visitors on an operational range: ***See Table 1 below for a list of sensitive species that are known residents or seasonal visitors of Naval Support Facility Indian Head.***

19. Is there any designated critical habitat located on an operational range? Is there any known potentially suitable unoccupied habitat present for a threatened or endangered species, even if not officially designated as critical habitat? ***No***

20. What procedures are in place to protect species from disturbance, especially if located on an operational range? Do these procedures include periodic monitoring? ***The base-wide Comprehensive Work Approval Process is in place to ensure species disturbance is considered. Procedures include periodic monitoring.***

21. What is the status of USFWS/NMFS consultation regarding the operational use of all operational ranges? Have any Biological Opinions (BOs) been issued by USFWS/NMFS? ***The USFWS has issued a Biological Opinion based on a review of the U.S. Navy's biological assessment of impacts to bald eagles.***

Other Resource Areas

22. Have all potential wetland areas at the operational range been formally delineated? Are there any jurisdictional wetlands, natural springs, riparian areas, wet areas, vernal pools, or areas of sensitive resources on an active range? If so, what procedures are in place regarding wetland protection? ***All wetland areas have been formally delineated. There are no wetlands identified on this range.***

23. Are the operational range(s) located in a designated floodplain? If so, what procedures are in place regarding floodplain management? ***The range is located in the 100-year Floodplain. NAVFAC Washington is currently developing a floodplain management plan.***

24. Are you aware of any other pertinent natural resource issues applicable to this operational range (e.g., migratory birds, anadromous fish, noxious weeds, wild or scenic rivers, designated wilderness)? ***Migratory birds, anadromous fish and noxious weeds are known issues at Naval Support Facility Indian Head.***

Compliance

25. Who is responsible for compliance issues regarding natural resource regulations and general management of natural resources at this operational range? ***NSWC personnel are responsible for day-to-day compliance. The Public Works Office and Environmental Office are responsible for review and approval of any changes that may affect compliance.***

26. What procedures are taken to evaluate actions for the potential impact on natural resources, especially those planned on operational ranges? ***The base-wide Comprehensive Work Approval Process is in place to ensure steps are taken to evaluate actions for the potential impact on natural resources.***

Form 10. Natural Resources Interview Record (Continued)

27. Is this operational range currently in noncompliance with any Federal regulations related to natural resources? ***No***
28. Has any outside party (including nongovernment organizations) threatened or instigated legal action against the Navy with regard to natural resources at this operational range? ***No***
29. Has the USFWS/NMFS, an environmental group, or any other interested party expressed concern about direct impacts on natural resources from range use (e.g., bombing, tracked-vehicle use) or indirect impacts from toxic releases related to munitions? ***None known.***
Documents
30. Do you have copies, preferably electronic, of any documents that address natural resource issues that impact the range including, but not limited to, the INRMP, BOs, Biological Assessments (BAs), Environmental Assessments (EAs), Environmental Impact Statements (EISs), survey reports, and wetland delineation reports? List all documents received:

Table 1

Rare Flora Found at NSF Indian Head

Common Name	Scientific Name	Location at NSFIH	Federal Status	State Status	Global/State Rank	Last Documented
Swamp Beggars-tick	*Bidens discoidea*	Stump Neck Beaver Pond	No Status	Endangered	G5/S3	1992
Narrow Melicgrass	*Melica mutica*	Rum Point	No Status	Threatened	G5/S1	2004
Climbing Cucumber	*Melothria pendula*	Cornwallis Neck	No Status	Endangered	G5?/S1	2004
Eastern Arborvitae	*Thuja occidentalis*	Urban Area	No Status	Threatened	G5/S1	2007

Rare Fauna Found at NSF Indian Head

Common Name	Scientific Name	Federal Status	State Status	Global/State Rank	Last Documented
Bald Eagle	*Haliaeetus leucocephalus*	No Status	Threatened	G4/S2S3B	2007
Least Bittern	*Ixobrychus exilis*	No Status	In Need of Conservation	G5/ S2S3B	1992
Bobcat	*Lynx rufus*	No Status	In Need of Conservation	G5/S3	1992
Southeastern Shrew	*Sorex longirostris*	No Status	In Need of Conservation	G4/S2	1992
Shortnose Sturgeon	*Acipenser brevirostrum*	Endangered	Endangered	G3/S1	2005
Frosted Elfin	*Callophrys (Incisalia) irus*	No Status	Endangered	G3/S1	1992

Global Ranks:

G3 = Either very rare and local throughout its range or found locally in a restricted range.
G4 = Apparently secure globally, though it may be quite rare in parts of its range.
G5 = Demonstrably secure globally, though it may be rare in parts of its range.

State Ranks:

S1 = Critically imperiled in the state because of extreme rarity, equivalent to being ranked as state rare.
S2 = Imperiled in the state because or rarity; equivalent to being ranked state rare.
S3 = Rare or uncommon in the state; equivalent to being ranked as watch list.
S4 = Apparently secure in the state, with many occurrences.
S5 = Demonstrably secure in Maryland under present conditions.
SU = Possibly rare in Maryland, but of uncertain status.

Form 11. EPCRA Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***

2. Time: ***0800 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Mark Yeaton***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***mark.b.yeaton@navy.mil***

10. Phone Number: ***(301) 744-2272***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ ***No***]

14. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Section 313 Reporting on Munitions Activities[1]

15. What operational range areas are being evaluated for EPCRA TRI applicability? ***This range falls under the lab exemption (40 CFR 372.38(d)) for EPCRA TRI.***

16. Do operational range areas have 10 or more full-time employees[2] (or 20,000 manhours/yr)? (circle) Yes [✓ ***No***]
If yes, proceed to next question. If no, Navy is exempt from reporting under EPCRA Section 313 for munitions. Determine if Navy has documented employee man-hour exemption.

17. Were activities performed at operational range areas involving munitions during the calendar year? (circle) Yes No [✓ ***N/A***]
If yes, proceed to next question. If no, reporting is not required under EPCRA Section 313 for munitions. Determine if Navy has documented exemption.

18. What types of munitions-related activities were evaluated for toxic chemical threshold determination for the past calendar year? ***N/A***

19. List all toxic chemicals that met threshold quantities and indicate if any are persistent, bioaccumulative, and toxic (PBT): ***N/A***

20. Was a Form R submitted for TRI reporting? (circle) Yes No [✓ ***N/A***]
If yes, proceed to next question. If no, explain:

21. Have Section 313 reporting deadlines been met for munitions-related activities? (circle) Yes No [✓ ***N/A***]
If yes, proceed to next question. If no, explain:

EPCRA Reporting on Nonmunitions (Installation) Activities

22. Was a Form R submitted for TRI reporting for nonmunitions activities?
(circle) Yes No [✓ ***N/A***] If yes, proceed to next question. If no, explain:

23. List all toxic chemicals that met threshold quantities and indicate if any were PBT: ***N/A***

24. Have reporting deadlines been met for all operational ranges EPCRA reporting (including emergency release notifications and Sections 311, 312, and 313 reporting)? (circle) Yes No [✓ ***N/A***] Explain:

Regulatory Impacts on Range

25. Have Federal or State regulators issued this range any NOVs for EPCRA noncompliance? (circle) Yes [✓ ***No***]
If no, proceed to next question. If yes, who issued the NOV, what were the deficiencies, and how are the deficiencies being resolved?

26. Have any EPCRA compliance requirements from DoD, Navy, or a regulatory agency negatively impacted range operations? (circle) Yes No [✓ ***N/A***] If yes, state the requirements and negative impacts.

27. Are there plans to change the frequency or type of range operations in such a way that would impact the quantity of toxic chemicals released from munitions activities? (circle) Yes [✓ ***No***]
If no, go to next question. If yes, what toxic chemicals do you expect to see an increase or decrease in release as a result of changes in range operations?

Off-Range Release

28. Is there a concern by the Navy, regulatory agency, and/or public, regarding the off-range release of toxic chemicals and their possible impact on sensitive receptors off range? (circle) Yes [✓ ***No***]
If yes, describe:

Form 11. EPCRA Interview Record (Continued)

Documents
29. Do you have copies, preferably electronic, of any EPCRA-related documents that pertain to this range including, but not limited to, Section 313 Form R, documented toxic chemical threshold determinations, and NOVs and letters from regulatory agencies pertaining to EPCRA munitions reporting. List all documents received: ***Guidance for Implementing the Emergency Planning and Community Right-to-Know Act (EPCRA) to Munitions Activities, Department of the Navy, Office of the Chief of Naval Operations, June 1998. (See Form 5)***

[1] "Munitions activities that may involve some toxic chemicals include (but are not limited to): manufacture and assembly; chemical manufacture; load and pack; maintenance of munitions; painting and component replacement; proficiency and qualification training; live fire; propellant bag burning at firing ranges; aerial bombing; obscurant and smoke training; demolition training; testing of munitions, weapons systems, and components (most are exempt); demilitarization: disassembly, recovery, reclamation, resale, or recycle; disposal: open burning (OB) of propellant for destruction; open detonation (OD); incineration; chemical neutralization; detonation and destruction of UXO; and waste treatment activities such as chemical neutralization of pink water and other wastes." (Source: EPCRA Munitions Reporting Handbook for the U.S. Army, May 2002).

[2] "Range employees are persons who spend time on the range and whose responsibilities include operating, managing, or maintaining the range. Examples of such employees are target construction and maintenance crews, contractors or military personnel who perform range clearance sweeps or cleanup activities, natural resources managers, range control officers, and range safety officers. Civilian and military personnel using a range to conduct training exercises or testing activities do not count as range employees." (Source: DoD Final Range Policy Guidance, March 2000).

Form 12. Environmental Planning Interview Record

Point of Contact (POC) Information

1. Date: ***05 June 2008***
2. Time: ***1400 hours***
3. Location: ***ERG Office (Chantilly, VA)***
4. Tactical Theater Name: ***Naval Support Facility Indian Head***
5. Range Complex Name: ***Stump Neck***
6. Range Name: ***Range 2***
7. Name of POC Interviewed: ***Patrick Goodwin***
8. POC Title: ***Environmental Scientist***
9. E-mail Address: ***patrick.goodwin@erg.com***
10. Phone Number: ***(703) 633-1667***
11. POC Navy Command Affiliation: ***NAVFAC Washington***
12. Dept./Div./Branch: ***Environmental Program Office***
13. Contractor? (circle) [✓ Yes] No
14. Name and Affiliation of Interviewer: ***Joshua Moore - ERG (Navy Contractor)***

National Environmental Policy Act (NEPA)

13. Have the environmental impacts from operations at this range been addressed in a CATEX, EA, or EIS? (circle) Yes [✓ No]
If no, explain: ***Range operations were initiated prior to the development of NEPA requirements. An EA is currently being prepared that will provide an environmental baseline for all existing operations at NSF Indian Head, including range operations.***
If yes, give CATEX, EA, or EIS title and, if applicable, date of Record of Decision (ROD):
Is EIS current? (circle) Yes No
Does this CATEX, EA, or EIS cover all operations at the range? (circle) Yes No
If no, explain:

14. Are individual range operations covered by EAs? (circle) Yes [✓ No]
If no, are range operations incorporated under an EIS?

15. Did mitigation measures result from existing NEPA documentation? (circle) Yes [✓ No]
If yes, are mitigation measures being adhered to? (circle) Yes No
Explain:

16. Have NEPA compliance requirements from DoD, Navy, or a regulatory agency negatively impacted range operations? (circle) Yes [✓ No]
If yes, state the requirements and negative impacts:

17. Does this range have a process for reviewing new or modified range operations for compliance with existing NEPA documentation? (circle) [✓ Yes] No
Explain: ***Actions at NSF Indian Head are evaluated under the Comprehensive Work Approval Process (CWAP) to assess NEPA requirements.***

18. Are there plans to change the frequency or type of range operations in such a way that additional NEPA documentation would be required? (circle) Yes [✓ No]
If no, go to next question. If yes, describe:

19. Has any outside party threatened or instigated legal action or waged a negative media campaign against the Navy with regard to NEPA compliance at this range? (circle) Yes [✓ No]
Explain:

20. Would you consider this range to be in compliance with NEPA? (circle) Yes [✓ No]
Explain:

21. What were the issues of concern expressed during public hearings (required by the NEPA process)?
N/A

Land Use

22. Has an AICUZ or RAICUZ study been performed on this range? (circle) Yes [✓ No]
If yes, when?
If no, proceed to question 23.

23. Did either study identify any Accident Potential Zone (APZ) or noise level problem areas outside the fence line? (circle) Yes No [✓ N/A]
If no, proceed to next question. If yes, explain problem areas and how they are being addressed:

24. Does the Navy range owner work with city/county planning departments to promote land use planning that is compatible with range operations? (circle) Yes [✓ No]
Explain:

Form 12. Environmental Planning Interview Record (Continued)

25. Are there any conflicts between local community-desired land use and range operations? (circle) Yes [✓ No]
Explain:

26. Is encroachment by residential and commercial development impinging upon range operations? (circle) Yes [✓ No]
Explain:

27. Does the range have a program or procedures in place to address public safety concerns, noise complaints and any other public concerns related to range operations? (circle) [✓ Yes] No
Explain: ***As part of its partnership with the Dahlgren Division, IHDIV uses the data gathered by the Sound Impact Prediction System (SIPS) at Dahlgren to predict noise impacts. The use of SIPS at Stump Neck has resulted in a decrease in the number of noise-related complaints received.***

28. Have measures been taken to mitigate the impact of noise on surrounding communities? (circle) [✓ Yes] No
Explain: ***SIPS incorporates weather and atmospheric information into a computer model that predicts the intensity and direction of sound waves. This information is used to determine how noise will travel and what impacts it might have on a community. The information allows range operations to postpone until more favorable atmospheric conditions exist.***

29. Is noise a risk to sustained range operations due to public complaints? (circle) Yes [✓ No]
Explain: ***The use of SIPS has mitigated this risk.***

30. Have any existing NEPA documents determined that noise from this range's operations has a significant impact on surrounding wildlife? (circle) Yes [✓ No]
Explain:

Off-Range Release

31. Does the Navy, regulatory agency, or public have any concerns with regard to the off-range release of chemicals, past or present, that could limit land use, now or in the future? (circle) Yes [✓ No]
Explain:

32. Have any off-range releases of munitions or their constituents occurred that have negatively impacted the surrounding community or environment? (circle) Yes [✓ No]
Explain:

Documents

33. Do you have copies, preferably electronic, of any documents that include, but are not limited to, CATEXs, EAs, EISs, AICUZ/RAICUZ studies/models, maps, noise mitigation measures/plans, letters from regulatory agencies pertaining to the range and environmental planning? ***See Environmental Program Office for these documents.***

Form 13. Range Environmental and Explosives Safety Management Interview Record

Point of Contact (POC) Information

1. Date: ***23 June 2008***

2. Time: ***1300 hours***

3. Location: ***Mr. Chamberlain's Office***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Keith Chamberlain***

8. POC Title: ***Admin/Tech Specialist***

9. E-mail Address: ***keith.chamberlain@navy.mil***

10. Phone Number: ***(301) 744-5182***

11. POC Navy Command Affiliation: ***EODTECHDIV***

12. Dept./Div./Branch: ***50/513/5132***

13. Contractor? (circle) Yes [✓ ***No***]

14. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Administrative Requirements

15. Does this range have a management plan[1] addressing the requirements of DoDD 4715.11 that includes long-term sustainable range management objectives? (circle) Yes [✓ ***No***] Explain: ***RSEPA is the first management plan that addresses long-term range sustainment.***

16. Does this range keep permanent records of munitions expended, including dud rate, by type quantity, location, and using organization? (circle) Yes [✓ ***No***] Explain: ***Range 2 does not expend munitions. Range 2 does keep records on the type and quantity of munitions tested.***

17. Does this range keep permanent records of all UXO clearance operations and EOD incidents on range? (circle) Yes [✓ ***No***] Explain: ***After each munitions test, personnel will sweep the test area for explosive hazards. The size of the test area is approximately 10 feet by 10 feet.***

18. Has this range conducted UXO surveys that are kept current? (circle) Yes [✓ ***No***] Explain: ***See response to question number 17 above.***

Explosives Safety Management

19. Is range access restricted? (circle) [✓ ***Yes***] No If yes, by what means: ***Located on Stump Neck, which is a fenced and guarded installation. Additionally, there is a gate at Archer Ave that is closed when Range 3 is in use. Otherwise, access to the area is not controlled once on the installation. There is no fence along the Chicamuxen Creek shoreline; therefore, the area is potentially accessible to trespassers via the creek. The facility has explosive signs and a warning system (lights and a siren).***

20. Do individuals who are authorized access to this range receive explosives safety training before entering the range? (circle) [✓ ***Yes***] No Explain: ***Safety briefs are given to all visitors.***

21. Is there a procedure in place to determine when individuals who are authorized access to this range will be escorted? (circle) [✓ ***Yes***] No Explain: ***Range 2 SOPs require all personnel to check in with range control.***

22. Are sole use target/impact areas designated to segregate munitions use? (circle) Yes [✓ ***No***] Explain: ***Munitions are not fired at Range 2 or dropped onto Range 2. Munitions are manually placed onto the range and then tested.***

23. Are submunitions and depleted uranium use restricted to specifically designated areas? (circle) Yes [✓ ***No***] Explain: ***Submunitions and depleted uranium are not tested at Range 2.***

24. Has this range established procedures for range clearance operations, including clearance frequency and degree? (circle) [✓ ***Yes***] No Explain: ***Clean up procedures are conducted at the end of each test day.***

25. Is a hazard assessment conducted before any range clearance operations are conducted? (circle) [✓ ***Yes***] No Explain: ***Every explosive operation conducted at Range 2 is covered by a SOP which includes a hazard assessment.***

26. Does this range conduct appropriate range clearance operations prior to changing the use of a range area? (circle) Yes [✓ ***No***] Explain: ***Range 2 has not changed its use. If its use were to change, range clearance operations would be conducted at that time.***

27. Has this range established safe and practical methods[2] for recycling and disposing of range residues[3], such that range residues do not contain ammunition, explosives, or other dangerous articles prior to public release? (circle) [✓ ***Yes***] Explain: **See 25**

28. Does this range have an established procedure for responding promptly to protect personnel and property from explosives hazards on and off range? (circle) [✓ ***Yes***] No Explain: ***Munitions are manually placed and then detonated on Range 2. Fragmentation distances are determined for each detonation prior to initiation to ensure that all fragments remain within inhabited building distance. All personnel involved in testing are accounted for and the area checked for unauthorized personnel prior to each detonation.***

Range Environmental Management

29. Is a program or procedure in place to assess the environmental impacts of munitions use on this range? (circle) [✓ ***No***] Explain:

30. Does this range use targets that do not contain hazardous materials, such as petroleum, lubricants, radium dials, and batteries? (circle) Yes No [✓ ***N/A***] Explain: ***This range does not use targets at all.***

Form 13. Range Environmental and Explosives Safety Management Interview Record (Continued)

31. Describe the use of controlled burning[4] on this range: ***Controlled burning is not performed at this range.***

Range Explosives Safety Communication

32. Does this range provide appropriate information to local officials regarding compatible use of land surrounding the range? (circle) [✓ Yes] No Explain: ***The CFR §334.240 Potomac River, Mattawoman Creek and Chicamuxen Creek; U.S. Naval Surface Weapons Center, Indian Head Division, Indian Head, MD.***

33. Does this range have an established procedure for notifying Range Management personnel and the public of off-range explosives hazards? (circle) Yes [✓ No] Explain: ***There is no documented procedure, however in general the range manager will inform the Safety and Environmental Offices if there is an incident.***

34. Does this range participate in a public-involvement program that provides a forum for the Navy and the public to discuss explosives hazards and other range issues that affect or have the potential to affect surrounding communities? (circle) Yes [✓ No] Explain:

35. Does this range have a Public Outreach Plan? (circle) [✓ Yes] No Explain: ***The Public Affairs Office communicates regularly with the public.***

36. Does this range have a program in place to educate DoD personnel, their dependents, and private citizens living near this range on explosives hazards? (circle) Yes [✓ No] Explain: ***There is no documented program, however the Public Affairs Office communicates regularly with the public.***

Off Range Release

37. Does this range have a procedure in place for responding to a release or substantial threat of release of MCs of potential concern off range, when such a release poses an imminent and substantial threat to human health or the environment? (circle) [✓ Yes] No
Explain: ***The Test Readiness Review Board addresses threats to human health prior approving range operations.***

Documents

38. Do you have copies, preferably electronic, of any documents that pertain to this range including, but not limited to, a Range Management Plan, an Operations Management Plan, a Range Safety Plan, a range clearance policy, a Range Public Outreach Plan, AICUZ/RAICUZ study/maps, a munitions off-range release response plan, environmental assessments of munitions affect on range environment, munitions records, Range Maintenance Plans, and UXO survey?
List all documents obtained:

Release – Munitions or MCs of potential concern that escape into the environment beyond the defined range boundary.

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[1] Section 5.4.4 specifies that plans, at a minimum, will address long-term sustainable use, management procedures, recordkeeping, standards, monitoring, public outreach, public participation programs (if required), technology requirements to ensure sustainable range management, integration with other range planning processes, and resources.

[2] In accordance with DoD Manual 4160.M (reference f).

[3] Examples of range residues include cartridge cases, ordnance-derived wastes, and targets.

[4] Per DoDD 4715.11, controlled burning of vegetation as a method of UXO clearance is prohibited. Controlled burning may be used to control dense brush and undergrowth to make UXO clearance operations safe for personnel conducting clearance.

Form 14. Installation Restoration Interview Record

Point of Contact (POC) Information

1. Date: ***05 June 2008***

2. Time: ***1300 hours***

3. Location: ***Conducted via Email***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name*:* ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Shawn Jorgensen***

8. POC Title: ***Safety Engineer; formerly, Installation Restoration Program Manager for the Environmental Program Office***

9. E-mail Address: ***shawn.a.jorgensen@navy.mil***

10. Phone Number: ***(301) 744-6055***

11. POC Navy Command Affiliation: ***Naval Ordnance Safety and Security Activity***

12. Dept./Div./Branch: ***NAVSEA***

13. Contractor? ***No***

14. Name and Affiliation of Interviewer: ***Adam Humphreys, ERG (Navy Contractor)***

Release & CERCLA[1]

15. Has a release[1] of hazardous substances[2], pollutants[3], contaminants, or petroleum-based products occurred on range? ***Suspected***

If yes, describe releases (number of sites, locations on range, chemicals, and quantities) and whether and to whom releases were reported:

There are no known records of reported releases. However, according to the results of the RFI/VI report, explosives and metals were detected in shallow groundwater within the boundaries of the Old Demolition Range, indicating a suspected release from previous activities conducted on the range.

16. Have hazardous substances, pollutants, contaminants, or petroleum-based products from the range been released off range? ***No***

If yes, describe releases (number of sites, location of on-range source of release, location of off-range site, chemicals, and quantities) and whether and to whom releases were reported:

17. Does this range have any sites where munitions were buried for disposal? ***Yes***

If yes, describe sites:

Chicamuxen Creek's Edge Dump Site B, which is located in the immediate vicinity of the Old Demolition Range, was used as a dump site, but facility representatives were uncertain of the exact nature of the materials disposed.

18. Are any of the sites listed above designated IR sites? ***No***

If yes, describe:

There are 2 IR sites identified on Range 2 - Site 31 (Old Demolition Range) and Site 60 (Chicamuxen Creek's Edge Dump Site B). However, the Old Demolition Range is currently designated as MRP site UXO 000007 and the Chicamuxen Creek's Edge Dump Site B is designated as part of the same MRP site. The MRP site was investigated under the Final Preliminary Assessment, which was completed in September 2005. Since the site is co-located with an active range, it is ineligible for further action under CERCLA and a Decision Document which recommended no further action was signed in October 2005. Based on this information, we determined that there are no designated IR sites on Range 2.

19. Have any steps been taken to characterize, contain, or remediate range IR sites? ***N/A***

Explain*:* ***See answer to question 18. The sites were investigated and determined to be ineligible for further action under CERCLA because they are co-located with an active range. Therefore no containment or remediation has occurred.***

20. Has the range determined if any IR sites pose a substantial threat to public health or the environment? ***N/A***

Explain: ***See answer to question 18.***

If yes, what is being done to mitigate risks to public and environment?

21. Is there a concern, by the Navy, regulatory agency, and/or public, regarding the off-range release of toxic chemicals and their possible impact on the surrounding community and environment? ***No***

If yes, describe:

Public Involvement

22. Does the range have a Restoration Advisory Board (RAB) for any of the IR sites? ***N/A***

If yes, explain:

23. In addition to or in lieu of a RAB, does the range have a proactive public involvement program that allows the Navy and public to exchange information and concerns regarding IR sites and off-range releases? ***N/A***

Explain:

24. Is a procedure in place for receiving and responding to all public inquiries regarding the range and IR sites? ***N/A***

Explain:

Form 14. Installation Restoration Interview Record (Continued)

25. What are the issues of concern expressed by the public? ***There*** **are no known issues of concern expressed by the public.**

Describe:

Regulatory Impacts on Range

26. Have Federal or State regulators issued the range any NOV for CERCLA noncompliance? ***No***

If no, proceed to next question. If yes, who issued the NOV, what were the deficiencies and how are deficiencies being resolved?

27. Have any requirements from the Navy or a regulatory agency regarding IR site management negatively impacted range operations? ***No***

If yes, state the requirements and negative impacts:

Documents

28. Do you have copies, preferably electronic, of any range IR related documents including, but not limited to, list of IR sites, any release notifications, any communications regarding IR sites, Public Outreach Plan, description of RAB, and any studies or reports pertaining to IR sites? ***Yes***

List all documents obtained:

(1) Site Management Plan for Installation Restoration Program, NSF-IH, Fiscal Year 2007-2008 (Revised August 2007), submitted by Tetra Tech NUS, Inc.

(2) Final Preliminary Assessment, Stump Neck Annex, NDW-IH, September 2005, prepared by Malcolm Pirnie, Inc. (see Form 5)

[1] As defined by Section 101(22) of CERCLA, release means "any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment (including the abandonment or discarding of barrels, containers and other closed receptacles, containing any HS, pollutant or contaminant), but excludes any release that results in exposure to persons solely within a workplace…." 'For purposes of the NCP (National Contingency Plan, release also means threat of release.' (Source: OPNAVINST 5090.1B CH-4, Chapter 15, Installation Restoration, 9 September 1999).

[2] **Hazardous Substance**. For the purposes of the IR Program, hazardous substance is as defined in CERCLA Section 101(14) and designated under reference (b). This includes materials that, "because of quantity, concentration, physical, chemical or infectious characteristics, may pose a substantial hazard to human health or the environment when released or spilled." (Source: OPNAVINST 5090.1B CH-4, Chapter 15, Installation Restoration, 9 September 1999).

[3] **Pollutant**. As defined by Section 101(33) of CERCLA, pollutant includes, but is not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions or physical deformation, in such organisms or offspring.' (Source: OPNAVINST 5090.1B CH-4, Chapter 15, Installation Restoration, 9 September 1999).

Form 15. Storage Tank and POL Management Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***

2. Time: ***1300 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Robert Harrison***

8. POC Title: ***Environmental Protection Specialist***

9. E-mail Address: ***Robert.w.harrison1@navy.mil***

10. Phone Number: ***(301) 744-2259***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ No]

14. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Storage Tanks (UST)

15. Does this range have any USTs or ASTs? (circle) [✓ Yes] No
Are any of the USTs or ASTs located on operational range areas? (circle) [✓ Yes] No N/A
If yes, state number, type, and location of each tank: ***One 550-gallon tank containing #2 fuel oil.***

16. Does this range have a current Tank Management Plan? (circle) [✓ Yes] No N/A

17. Do all range USTs have secondary containment? (circle) [✓ Yes] No N/A

18. Do all range UST systems[1] have corrosion protection systems, such as cathodic protection, that are routinely inspected and maintained? (circle) Yes No [✓ N/A]
The tank is double-walled fiberglass (not required).

19. Are all range UST systems equipped with spill/overfill prevention equipment and have an approved method of release detection? (circle) [✓ Yes] No N/A
6-gallon spill bucket and overflow valve – only filled to 95 percent.

20. Do all ASTs have a release detection system in place? (circle) Yes No [✓ N/A]

21. Have any storage tanks been removed from the range? (circle) [✓ Yes] No N/A
If yes, have any of these tanks leaked and resulted in an IR site? Explain:
One 270-gallon steel tank was removed on 9 March, 1994. There were no visible holes in the tank and pollutant sampling data from the tank removal were non-detect.

POL

22. Does this range have a current Spill Prevention Control and Countermeasure (SPCC) Plan? (circle) [✓ Yes] No

23. Does this range have a current Oil and Hazardous Substances Facility Response Plan (FRP)? (circle) [✓ Yes] No

24. Does this range have a spill response training program in place? (circle) [✓ Yes] No

25. Have any POL spills occurred within the past 3 years at either range or range support facilities? (circle) Yes [✓ No]
If yes, how many of these spills were reported and to what agencies?

Regulatory Impacts on Range

26. Have Federal or State regulators issued the range any NOVs for noncompliance with Federal or State UST, AST, or POL laws? (circle) Yes No [✓ N/A]
If no, proceed to next question. If yes, what agency issued the NOV, what were the deficiencies, and how were the deficiencies resolved?

27. Have any requirements from the Navy or a regulatory agency regarding UST/AST/POL management negatively impacted range operations? (circle) Yes No [✓ N/A]
If yes, state the requirements and negative impacts on range operations:

Documents

28. Do you have copies, preferably electronic, of any range storage tank or POL management -related documents that include, but are not limited to the following: SPCC Plan, Spill Contingency Plan (SPC), FRP, Tank Management plan, NOVs, and regulatory agency inspection reports?
List all documents obtained: ***See Environmental Program Office for these documents.***

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[1] UST System per OPNAVINST 5090.1B CH-4 is an underground storage tank and its piping.

Form 16. Safe Drinking Water Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***

2. Time: ***1300 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 2***

7. Name of POC Interviewed: ***Kathy Frey***

8. POC Title: ***Environmental Protection Specialist***

9. E-mail Address: ***mary.frey@navy.mil***

10. Phone Number: ***(301) 744-2258***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ No]

14. Name and Affiliation of Interviewer: ***Adam Humphrey, Christopher Krejci, Joshua Moore, and Alison Poe; ERG (Navy Contractor)***

Potable Water

15. Is there a source of potable water located on this range? (circle) Yes [✓ No]
If yes, is it surface water and/or groundwater?
If no, where is the closest source of potable water from this range? ***Well 2012 (5174 ft away)***

16. Does the closest source of potable water serve Navy personnel, Navy housing, or nearby civilian , communities? (circle) [✓ Yes] No
Describe all who use water and for what purposes: ***Navy personnel use potable water nearby for domestic and industrial uses.***

17. Is the closest source of potable water drawing from a designated sole source aquifer? (circle) Yes [✓ No]
Where is this range located with respect to groundwater flow from the range?

18. Is this range located in a recharge zone for a designated sole source aquifer? (circle) Yes [✓ No]

19. Does this range oversee the use of this closest source of potable water? (circle) [✓ Yes] No
If yes, proceed to next question. If no, who does?.

20. Does the range fit the SDWA description of owner or operator of a Public Water System (PWS)[1,]? (circle) [✓ Yes] No

Both Indian Head and Stump Neck meet the requirements of owner/operator of a PWS; however, no individual range fulfills this responsibility.

If yes, describe the PWS ("community"[3], "noncommunity nontransient"[4], or "noncommunity transient"[5]), the source, how many people it serves, and other uses of this PWS: If no, proceed to question 25. ***Noncommunity, nontransient water system pumping from both the Patapsco and Patuxent aquifers. This PWS serves approximately 300 people on a regular basis.***

21. Does this range, as PWS owner/operator, treat water prior to distribution? (circle) [✓ Yes] No
Describe the treatment methods: ***Chlorination at the well bore using NaOCl.***

22. Does this range, as PWS owner/operator, monitor water prior to distribution for EPA primary drinking water standards and total coliform? (circle) [✓ Yes] No
If yes, describe analytes that are routinely monitored: ***All analytes in the primary standards are routinely monitored. Analytes in the secondary standards are sampled once every three years.***

23. Has the PWS water exceeded MCL standards in the past year? (circle) Yes [✓ No]
If yes, what analytes exceeded MCL standards, were any NOVs issued, were any public notifications required, and what was done to correct exceedance(s)? ***PWS did exceed***

24. Has the PWS water exceeded action levels for lead and copper in the past year? (circle) Yes [✓ No]
If yes, was public notification required and what was done to correct exceedance(s)?

25. Does the range as PWS owner/operator have a cross connection control program? (circle) [✓ Yes] No
Explain: ***The program was approved by MDE. The program focuses on backflow preventers at the well, but is working to implement backflow preventers for all downstream users.***

26. Does this range as PWS owner/operator keep current records of all sampling results and analysis, monitoring, sanitary survey reports, actions taken to correct violations of drinking water standards, and any written reports or communications to Federal or State regulatory agency? (circle) [✓ Yes] No
If no, explain:

27. Does the range have a current operation and maintenance program for its PWS? (circle) [✓ Yes] No
Describe: ***The program is a bit outdated (from the1990s). Staffing problems have made the development of a new program difficult.***

28. Does the range have a source of potable water that is not considered a "public water system" yet is still used for drinking water? (circle) Yes [✓ No]
If yes, describe the potable water source, any State or local safe drinking water requirements, who uses the water, and for what purpose(s).

Form 16. Safe Drinking Water Interview Record (Continued)

29. Does this range receive potable water from a city water supply or from water that is transported via tank? (circle)
Yes ***No*** Explain:

Nonpotable Water

30. Does this range have a source of nonpotable water? (circle) Yes ***No***
If yes, describe who uses water and for what purpose(s), if any.

Source Water Protection

31. Has the Navy assessed whether any range military operations or range support facilities/operations could directly or indirectly contaminate a sole source aquifer through its recharge zone? (circle) Yes ***No***
Explain: ***There are no sole source aquifers within 34 miles of NSF Indian Head. The Navy has studied the migration of MCs through groundwater at the Strauss Avenue Thermal Treatment Point.***

32. Has the Navy, regulatory agency, or the public expressed concerns regarding the release of MCs of potential concern or other chemicals off range that might contaminate a drinking water source? (circle) Yes ***No***
Explain:

33. Has the Navy, a regulatory agency, or the public expressed concerns regarding the release of MCs of potential concern or other chemicals that might contaminate a range drinking water source? (circle) Yes ***No***
Explain:

Regulatory Impacts on Range

34. Have Federal or State regulators issued this range any NOVs for noncompliance with Federal, State, or local drinking water standards? (circle) Yes ***No***
If no, proceed to next question. If yes, what agency issued the NOV, what were the deficiencies and how are deficiencies being resolved?

35. Have any requirements from the Navy or a regulatory agency regarding safe drinking water management negatively impacted range operations? (circle) Yes ***No***
If yes, state the requirements and negative impacts on range operations:

Documents

36. Do you have copies, preferably electronic, of any safe drinking water management-related documents that include, but are not limited to, the following: Operations & Management Plan, sampling and analytical reports, public notification of noncompliance with drinking water standards, Sanitary Survey Report, NOVs, and regulatory agency inspection reports? ***No documents readily available in electronic format. See Environmental Program Office for these documents.***
List all documents obtained:

---

[1] Public Water System (PWS) – a public system for the provision of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Such system includes any collection, treatment, storage, and distribution facilities under the control of the operator of such system and is used primarily in connection with such system, and any collection or pretreatment storage facilities not under such control that are used primarily in connection with such system. A public water system is either a “community water system” or a “noncommunity water system.” (Source: OPNAVINST 5090.1B CH-4, Chapter 8, “Drinking Water Systems and Water Conservation”)

[2] Facilities that meet all the criteria listed below are not required to comply with the requirements of the SDWA since, by definition, they are not public water systems (40 CFR 141.3):

- System consists only of distribution and storage facilities and does not have any collection and treatment facilities
- The facility gets all of its water from a public water system that is owned or operated by another party
- The facility does not sell water to any party.

(Source: U.S. TEAM Guide, Section 13, Water Quality Management, December 2000)

[3] Community water system – a public water system that serves the same people year round.

[4] Noncommunity nontransient water system – a public water system that serves the same people more than 6 months, but not year round (i.e., a school with its own water supply).

[5] Noncommunity transient water system – a public water system that does not serve the same people for more than 6 months (i.e., a rest area or campground with its own water supply).

(Source for 3-5: EPA Safe Drinking Water Act Fact Sheet, “Understanding the Safe Drinking Water Act.”)

Form 17a. Operational Range Site Model – Operational Component

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility-Indian Head	***Stump Neck***	***Range 2***

Range Complex Location:

Stump Neck Peninsula

Boundaries (Bottom/Top and Latitude/Longitude) and Size (acres for land/square miles for water):

Lower: ***Groundwater Table***
Upper: ***Ground Surface***
Northern: ***38.549***
Southern: ***38.545***
Eastern: ***-77.234***
Western: ***-77.235***
Area: ***0.458***

Installation Universal Identification Code (UIC):

N0464A

Regional Commander (Management):

Name: ***Catherine Hanft***
Command: ***Naval Support Activity South Potomac***
Title/Position: ***Captain***
Address: ***6509 Sampson Rd, Building 101, Dahlgren, VA 22448***
Phone Number: ***(540) 653-8203***
E-mail address: ***catie.hanft@navy.mil***

Installation, Fleet Commands, and Other Echelon II Commands (Scheduling Authority):

Captain Brian Brakke (EODTECHDIV)

Who are the primary users of the range? List training groups, squadrons, other services, foreign countries, etc.

EODTECHDIV

Other Range-Related Facilities:

Old Demolition Range, Dump Site B

How long has this range been under military control?	Month/Year: _***1962***____________
When was this range last used?	***Currently in Use***

When in use, how often was it used (check one)?

Daily
[✓ ***Weekly***]
Monthly
Unknown
Other: _________________

How would you classify this range (check all that apply)?

[✓ ***Research, Development, Testing, Evaluation***]
Training
Other: ___________________________

What types of training and/or testing operations are conducted? (Select all that apply.)

Air-to-air
Air-to-land
Air-to-water
Airborne surface attack
Amphibious warfare
Anti-submarine warfare
Electronic warfare
Land-to-air
Land-to-land
Land-to-water
Mine laying/countermeasures training
[✓ ***Open burning/open detonation***]
Small-arms training
Special warfare
Water-to-air
Water-to-land
Water-to-water
Other: ___________________________

Form 17a. Operational Range Site Model – Operational Component (Continued)

What types of ordnance/military devices were used at this range? (Select all that apply.)

Live	Inert	Device	Live	Inert	Device
		Ballistic missiles	X		Primers, detonators, fuzes, squibs
X		Bombs			Projected grenades
X		Bulk high explosives, demolition charges			Projectiles
		Bulk propellant, propellant charges			Pyrotechnics (flares, signals, simulators)
		Guided missiles			Rifle grenades
		Cartridge Actuated Devices (CADs) and Propellant Actuated Devices (PADs)			Riot control agents
		Chaff			Rockets
		Depth charges			Small arms ammunition (.50 cal or under)
		Hand grenades			Submunitions
		Large rocket motors (> 1,000 lbs)			Torpedoes
		Mines			Warheads
		Mortars			Other:

What type of targets were used at this range? (Select all that apply.)

Stationary
Mobile
<u>None</u>
Unknown

If targets are/were used, please provide details including types and locations:

Enclose a geographical map illustrating the following (check which apply):

√Range location
√Range boundaries
√Target locations

Range areal extent, including the following:
Counties Tribal reservations Independent cities/towns/States

Is this range, including the impact area, undergoing or has it undergone any type of investigation, cleanup, or response action for unexploded ordnance (UXO) or MCs?

<u>Yes, Range 2 has undergone a RCRA Facility Investigation/Verification Investigation (1997) including soil, sediment, groundwater, and surface water sampling.</u>

No

Form 17b. Operational Range Site Model – Land Use Component

Who is the owner and who are other users of the range/Operational area (OPAREA)?

Owner	User	
EOD TECHDIV	***EOD TECHDIV***	Navy (Identify): ***EODTECHDIV***____ Other DoD component (Identify): ***N/A***_____________________ Other Federal agency (Identify): ***N/A***_______________________ State, city, or other municipality (Identify): ***N/A***_______________ Tribe (Identify): ***N/A***____ Commercial activity (Identify): ***N/A***____ Private individual or organization (Identify): ***N/A***___________________________ If Navy is not owner, when does lease, land withdrawal, or agreement to use land expire? ***N/A***___________________________

What are the current land uses? (Check on range/off range for all that apply.)

On	Off	Use	On	Off	Use
		None, no access authorized		*X*	***Vehicle parking***
	X	***Wildlife refuge***			Surface supply storage
		Livestock grazing			Commercial
		Agriculture			Residential
	X	***Surface recreation***			Construction
		Subsurface recreation			Other ___________________________

How is access controlled? (Select all that apply.)

Access key maintained by security/range officer
Fencing around entire range/site
Locked/secured gates
Log-in book
No controls

Partial fencing
Patrolled by aircraft
Patrolled by Navy vessel
Patrolled by security officer or other official
Signs
Other: _____________

Form 17c. Operational Range Site Model – Environmental Component

List the predominant soil type (select one).

Clay-sand/clay-silt

Clay/sand with stone
Gravel/gravel-sand
Rock

Sand/gravely-sand

Sand-silt/sand-clay

Silt/silty clay
Water range/site
Other: ____________________________

List the predominant topography.

Flat ***(from topographic contours)***
Flat with gorges or gullies
Gently rolling
Heavily rolling

Mountainous
Rolling with gorges or gullies
Water range/site
Other: ____________________________

List the predominant vegetation.

Barren or low grass
Heavy grass and many shrubs
Heavy shrubs and trees ***(1997 Satellite Imagery)***
Low grass and few shrubs

Shrubs and some trees
Heavily wooded
Water range/site
Other: ____________________________

What is the depth to shallowest groundwater and bedrock?

Groundwater: ___*8*_______ feet below ground surface
Bedrock: ___*>1000*_______ feet below ground surface

Is the closest (i.e., shallowest) aquifer actually used as a drinking water or other type of source?

Drinking Water

Yes
No ***(Aquifers used at the range are from the Patapsco and Patuxent Groups)***
Unknown

Other (e.g., irrigation)

Yes
No
Unknown

Based on sampling data, estimate the level of surface or groundwater contamination as a result of range operations.

Non-detectable
Significant

Minimal
No data available

Moderate
Unknown

Based on investigations or other data, estimate any adverse impacts on sensitive ecosystems as result of past operations conducted on this range.

Non-detectable
Significant/substantial

Minimal
Samples not taken

Moderate
Unknown

Form 17c. Operational Range Site Model – Environmental Component (Continued)

Is there any information indicating the presence of any potential or known threatened/endangered species – flora and fauna – on this range?

Yes
[✓ ***No***]
Unknown

If yes, identify species: ____

Based on investigations or other data, estimate any adverse impacts to natural resources as a result of past operations conducted on this range.

[✓ ***Non-detectable***] Significant/substantial	Minimal No data available	Moderate Unknown

Estimate the potential for hazardous releases to the air as a result of past operations conducted on this range.

[✓ ***Non-detectable***] Significant/substantial	Minimal Unknown	Moderate

Have any NEPA documents that address range operations been prepared?

Yes

[✓ ***No***] ***(An EA is currently being prepared that will provide an environmental baseline for all existing operations at NSF Indian Head, including range operations.)***

Unknown

If yes, please identify documents:

Form 18. Encroachment Review

Are there environmental restrictions on where training operations are performed?

N/A – Military training is not conducted at this range.
Avoidance areas
Rise in altitudes for flight training

If yes, please specify: ____
If others, please specify: ____

Are there environmental restrictions on what training operations are performed?

N/A – Military training is not conducted at this range.
Weapons application
New technologies

If yes, please specify: ____
If others, please specify: ____

Are there environmental restrictions on how training operations are performed?

N/A – Military training is not conducted at this range.
Frequency spectrum encroachment
Underwater noise constraints
Size constraints
Additional duties assigned to personnel
Additional costs
If yes, please specify: ____
If others, please specify: ____

Are there environmental restrictions on when training operations are performed?

N/A – Military training is not conducted at this range.
Available training days/times
Night and all-weather training
Reduction in flexibility/ increase in planning required to gain access

If yes, please specify: ____
If others, please specify:

Are there environmental restrictions on how training operations are managed/overseen?

N/A – Military training is not conducted at this range.
Additional management requirements
Additional costs
Permits
Property negotiations/agreements (e.g., buffer zones)
Legal consul
Negotiations over regulations
Public relations activities

If yes, please specify: ____
If others, please specify: ____

Form 19. Summary of RSEPA Noncompliance Status for Range

Type of Noncompliance	Statute/Regulation or Defense Requirement	Describe Potential Noncompliance (Specify Location)	Categorize Each Deficiency			Navy Compliance Project Category
			Significant	Major	Minor	
Air Quality		None				
Water/Wastewater		None				
Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste	42 USC 6901 to 6992k	Although not yet completed, the Navy is currently developing a base-wide Hazardous Waste Management Plan.			X	Class I
	40 CFR 761.180	The base-wide PCB Management Plan has lapsed.			X	Class I
Cultural Resources		None				
Natural Resources		None				
EPCRA		None				
Environmental Planning		None				
Range Environmental and Explosives Safety Management	DoDD 4715.11	None of the ranges at the base have a Range Management Plan addressing long-term sustainable range management objectives.			X	Class I
Installation Restoration		None				
Storage Tank and POL Management		None				
Safe Drinking Water	OPNAVINST 5090.1B, Chapter 8, 8-5.8	The Operations and Maintenance Plan for the public drinking water supply system needs to be updated.			X	Class I
Range Encroachment		None				

Form 20. Summary of RSEPA Potential Off-Range Releases

Locations of Munitions Training	Status of Release[1]	Release Pathway[2]	Potential Receptors	Evidence
Range 2	None	N/A	N/A	N/A

[1] Status of release is

- Documented (e.g., confirmed by sampling and chemical analysis)
- Suspected, but has not yet been documented (e.g., observation of floating product near range boundaries)
- Possible (e.g., live-fire impact area uphill from surface water body)
- Unknown.

[2] A release pathway is the environmental medium or matrix through which a contaminant or hazard migrates or contacts a receptor. Environmental pathways typically correspond to the medium where the contaminant is released, and to fate and transport processes following the release. Examples of environmental pathways are groundwater, surface soil, subsurface soil, sediment, surface water, and air. The biotic pathway occurs through uptake, accumulation, or concentration of contaminants by organisms, and subsequent transport of that contaminant through the food chain.

Form 21. Comparison of Screening Values for MCs to Concentrations in Soil and Sediment Samples*

Munition Constituent	Soil Residential[1] (mg/kg)	Cancer/ Noncancer	Soil Industrial[1] (mg/kg)	Exceeds Screening Value (Yes/No)	List Locations of Exceedances
2-Amino-4,6-dinitrotoluene	12	NC	120	No	
4-Amino-2-6-dinitrotoluene	12	NC	120	No	
1,3-Dinitrobenzene (1,3-DNB)	6.1	NC	62	No	
2,4-Dinitrotoluene (2,4-DNT)	120	NC	1,200	No	
2,6-Dinitrotoluene (2,6-DNT)	61	NC	615	No	
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.4	C	16	No	
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	610	NC	6,200	No	
Nitrobenzene (NB)	20	NC	100	No	
Nitroglycerin (NG)	35	C	120	Not Tested	
2-Nitrotoluene (2-NT)	0.9	NC	2.2	No	
3-Nitrotoluene (3-NT)	733	NC	1,000	No	
4-Nitrotoluene (4-NT)	12	C	30	No	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	3,100	NC	31,000	No	
Perchlorate[2]	7.8	NC/C	100	Not Tested	
1,3,5-Trinitrobenzene (1,3,5-TNB)	1,800	NC	18,000	No	
2,4,6-Trinitrotoluene (TNT)	16	C	57	No	

* Some laboratory methods may provide results for constituents that are not MCs as defined in RSEPA, but may be related to testing and training.

[1] EPA Region 9 Preliminary Remediation Goal Tables, 12/28/2004. Available at http://www.epa.gov/region9/waste/sfund/prg/index.html.

[2] Detections of perchlorate should be verified using confirmatory methods such mass spectrometry (MS) in accordance with Navy Perchlorate Sampling and Management Policy. DoD and CNO will continue to develop guidance and provide information on more accurate and reliable methods for sampling and testing.

Form 22. Comparison of Screening Values for MCs to Concentrations in Groundwater and Surface Water Samples*

Munition Constituent	Tap Water (µg/L)	CMC[3] (µg/L)	CCC[3] (µg/L)	Exceeds Screening Value (Yes/No)	List Locations of Exceedances
2-Amino-4,6-dinitrotoluene 7.3	7.3	—	—	No	
4-Amino-2-6-dinitrotoluene 7.3	7.3	—	—	No	
1,3-Dinitrobenzene (1,3-DNB)	3.6	110[4,6]	30[4,6]	No	
2,4-Dinitrotoluene (2,4-DNT)	73	—	—	No	
2,6-Dinitrotoluene (2,6-DNT) 36.5	36.5	—	—	No	
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.61	4,000[4,5]	190[4,6]	Yes	DSBMW001U001 (7.4 µg/l); DSBMW002U001 (3.8 µg/l)
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	365	—	—	No	
Nitrobenzene (NB)	3.4	27,000[4,5,7]		No	
Nitroglycerin (NG)	4.8[2]	1,700[4,5]	200[4,5]	Not Tested	
2-Nitrotoluene (2-NT)	0.05	— —		No	
3-Nitrotoluene (3-NT)	12	—	—	No	
4-Nitrotoluene (4-NT)	0.7	—	—	No	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	400[2]	—	330[4,6]	No	
Perchlorate[8]	3.6	—	—	Not Tested	
1,3,5-Trinitrobenzene (1,3,5-TNB) 1,100	1,100	30[4.6]	14[4.6]	No	
2,4,6-Trinitrotoluene (TNT)	2.2	560[4,5]	<40[4,5]	No	

* Some laboratory methods may provide results for constituents that are not MCs as defined in RSEPA, but may be related to testing and training.

[1] EPA Region 9 Preliminary Remediation Goal Tables, 12/28/2004. Available at http://www.epa.gov/region9/waste/sfund/prg/index.html.

[2] U.S. Environmental Protection Agency. Winter 2004. *2004 Edition of the Drinking Water Standards and Health Advisories*, EPA 822-B-04-005, Office of Water, Washington, DC.

[3] CMC, the criteria maximum concentration, will protect against acute effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 1-hour average not to be exceeded more than once every 3 years on average. CCC, the criteria continuous concentration, will protect against chronic effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 4-day average not to be exceeded more than once every 3 years on average.

[4] Lowest-observable-adverse-effect level (LOAEL). Not enough data to develop criteria.

[5] Burrows, E.P., D.H. Rosenblatt, W.R. Mitchell, and D.L. Parmer. 1989. *Organic Explosives and Related Compounds: Environmental and Health Considerations*, U.S. Army Biomedical Research and Development Laboratory.

[6] Talmage, S.S., and D.M. Opresko. 1995. *Draft Ecological Criteria Documents for Explosives*, Oak Ridge National Laboratory, Oak Ridge, TN.

[7] U.S. Environmental Protection Agency. 1994. Water Quality Standards Handbook, Washington, DC.

[8] Detections of perchlorate should be verified using confirmatory methods such mass spectrometry (MS) in accordance with Navy Perchlorate Sampling and Management Policy. DoD and CNO will continue to develop guidance and provide information on more accurate and reliable methods for sampling and testing.

Form 23. Identification and Screening of Protective Measure Options

[Not Applicable to this Range.]

Form 24. Evaluation and Ranking of Protective Measure Options

[Not Applicable to this Range.]

Form 25. Selection of Preferred Protective Measure Options

[Not Applicable to this Range.]

APPENDIX A-2

EODTECHDIV Range 3
RSEPA Forms 1 – 4 and Forms 6 – 25

Form 1. Basic Project and Contact Information

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	***Stump Neck***	***Range 3***

Location (Municipality, State, UIC):
Indian Head, MD, USA

Range Boundaries:
See Pictorial ORSM

Major Training Operations:
None

Operational Scheduling Authority Contact and Organization: ***Capt. Brett A. Reissener***	Address: ***2008 Stump Neck Road , Indian Head, MD 20640*** Phone Number: ***(301) 744-6803*** E-Mail Address: ***brett.reissener@navy.mil***
Fleet Commands and other Echelon II Commands Contact and Organization: ***Ms. Vickie Writt***	Address: ***Issacc Hull Ave SE, Bldg 197, Rm 4W1811, Washington Navy Yard, DC 20376*** Phone Number: ***(202) 781-1855*** E-Mail Address: ***vickie.writt@navy.mil***
Installation Contact: ***Mr. Lawrence A. Kijek***	Address: ***4217 Hanlon Road, Indian Head, MD 20640*** Phone Number: ***(301) 744-6799*** E-Mail Address: ***raymond.geckle@navy.mil***
Local Engineering Field Division/ Activity Contact and Organization: ***Mr. Jeff Bossart***	Address: ***3972 Ward Road, Suite 101, Indian Head, MD 20640*** Phone Number: ***(301) 744-4705*** E-Mail Address: ***jeffrey.bossart@navy.mil***
Regional Commander and Organization: ***Capt. Catherine Hanft***	Address: ***6509 Sampson Rd, Building 101, Dahlgren, VA 22448*** Phone Number: ***(540) 653-8203*** E-Mail Address: ***catie.hanft@navy.mil***
Range Manager: ***Mr. Lawrence A. Kijek***	Address: ***2008 Stump Neck Road, Indian Head, MD 20640*** Phone Number: ***(301) 744-6871*** E-Mail Address: ***lawrence.kijek@navy.mil***
Public Works Environmental Office: ***Mr. Jeff Bossart***	Address: ***3972 Ward Road, Suite 101, Indian Head, MD 20640*** Phone Number: ***(301) 744-4705*** E-Mail Address: ***jeffrey.bossart@navy.mil***
Other:	Address: Phone Number: E-Mail Address:

Form 1. Basic Project and Contact Information (Continued)

Other:	Address: Phone Number: E-Mail Address:
Other:	Address: Phone Number: E-Mail Address:

Form 2. General Range Information

Operating Area Name	**Range Complex Name**	**Range Name(s)**
Naval Support Facility Indian Head	***Stump Neck***	***Range 3***

General (attach map of range)	
Owner	***NAVEODTECHDIV***
Location	***Indian Head, MD***
Type of range	***Land-based test range***
Types of munitions used on the range	***C4 (RDX- cyclonite or cyclotrimethylene trinitramine) is the most common. This range may test anything that the enemy does or could use. EHW is explosively decontaminated on-site (2500 pounds explosively decontaminated in 2007).***
Size (acres)	***2.4***
How long has range been in existence?	***Building 2108 is 32 years old (built in 1976), however testing most likely began prior to the building's existence. The main wall was constructed in 1984.***
Is the range currently operational?	***Yes, the facility operates daily, performing on average two or three shots on one item.***
Operational	
Describe the types of operations, past and present, conducted on the range (e.g., air-to-ground live ordnance training)	***Range 3 is an EOD testing facility (research road-side bombs, RPGs, and ways to protect against and defeat these weapons in the field). Weapons are disassembled to be analyzed and then tested. A procedure for defeating the ordnance in the field is developed and performed successfully 10 times before it is considered successful. Explosives limit is 60 lbs. High-order detonations are conducted against the main wall. Facility also used to develop appliqué armor to defend against EFPs (Explosively Formed Projectiles – molten material travels at 7,000-8,000 ft/sec, which is approximately 3 times the speed of a rifle bullet). EHW is explosively decontaminated in two burn pans set on railroad ties and covered with lids. The burn pans can be moved during flooding. All the material remains in the pan during burning. No burning is conducted when winds are 15mph or higher.***
Describe if and how public access to the range is restricted	***This area has a 2500ft fragment distance arc. Half of the range boundary shares the shoreline of the Mattawoman Creek. Public access via roads is restricted by the Stump Neck front access gate and an additional gate which is closed during testing operations. The facility is not protected from boater access. There are surveillance cameras, signs and a bull horn to warn individuals when testing occurs.***
Describe range clearance practices in terms of frequency and scope (e.g., annual surface clearance)	***Remnants of exploded ordnance are picked up after testing and burned. Material remaining in burn pan after burning is analyzed for explosive residue. Explosives ash is dumped into 55 gallon drums and carried offsite about every 2 years. Copper frags from exploded ordnance remain in dirt berms. There is a fair amount of large inert ordnance sitting out on the boundary of the ranges, by the water. There are bins for contaminated and uncontaminated metals. The soil on the range area is recycled. Dirt is stockpiled behind the permanent fragment wall and is reused on the range to make sure the range area is smooth for testing. Uncontaminated metal/armor from testing and inert items from past testing are located behind the permanent fragment wall.***

Form 2. General Range Information (Continued)

Identify the annual costs of maintaining and operating the range (i.e., excluding environmental costs for the purpose of developing and evaluating protective measures)	***$753,000***
List the records used to answer the questions above	***Interviews with Larry Kijek (EODTECHDIV) and Joe Rothenburger (EODTECHDIV). Final Preliminary Assessment - Stump Neck Annex.***
Environmental	
Identify the locations of wetlands, if applicable, on the range (attach map)	***None located on range but the range is surrounded by wetlands (see pictorial ORSM).***
Identify the location of ongoing or completed environmental investigations/cleanups/responses	***The range is currently under the MRP program.***
Identify any known environmental impacts/considerations of concern to regulators or stakeholders	***The Maryland Department of Environment visits the range twice per year.***
Identify the annual costs of fulfilling environmental requirements (e.g., compliance, restoration)	***$129,200***
Identify any environmental sampling or testing conducted on the range	***Monitoring wells were placed at the Range 3 facility during the shutdown of the Pink Water Facility (Building 2057). It is believed that the wells were monitored 5-6 years after the shutdown of the Pink Water Facility. According to Mr. Rothenberger, these wells have not been monitored for the past 3 to 4 years.***
List the records used to answer the questions above	***Interviews with Larry Kijek (EODTECHDIV) and Joe Rothenburger (EODTECHDIV). Final Preliminary Assessment - Stump Neck Annex.***

Form 3. RCA On-Range Visit Plan-of-Action

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	*Stump Neck*	*Range 3*

Summary of Documents Reviewed During Pre-Site Visit Information Collection

The following documents and sources were reviewed during pre-site visit information collection:

1. *Environmental Department Records*
2. *Final Preliminary Assessment – Stump Neck, NDW, Indian Head (Sept 2005)*
3. *Navy Closed, Transferred, Transferring, Active, and Inactive Range Survey (Jan 2000)*
4. *Range 3 Test Firing Log Books*
5. *RCRA Facility Investigation/Verification Investigation Report for Stump Neck, IH Div, NSWC, Indian Head, Maryland (Jan 1998)*
6. *Safety Department Records (Building Files)*
7. *Site Management Plan for Installation Restoration Program (Aug 2007)*

Personnel to be Interviewed	Date/Time	Phone Number
Larry Kijek (EODTECHDIV), Anthony Brown (EODTECHDIV) and Joe Rothenberger (EODTECHDIV)	*Friday, 29 February 2008, 0830 Hours*	*Larry Kijek ((301) 744-6871), Anthony Brown ((301) 744-6840) and Joe Rothenberger ((301) 744-6868)*
Mark Yeaton (NAVFAC)	*Thursday, 15 May 2008, 0800 Hours*	*(301) 744-2272*
Robert Harrison (NAVFAC)	*Thursday, 15 May 2008, 1300 Hours*	*(301) 744-2259*
Kathy Frey (NAVFAC)	*Thursday, 15 May 2008, 1300 Hours*	*(301) 744-2258*
Glenn Faini (NAVFAC)	*Thursday, 15 May 2008, 1430 Hours*	*(301) 744-2257*
Seth Berry (NAVFAC)	*Thursday, 22 May 2008, 1300 Hours*	*(301) 744-2273*
Shawn Jorgensen (NAVFAC)	*Thursday, 5 June 2008, 1300 Hours*	*(301) 744-6055*
Patrick Goodwin (ERG)	*Thursday, 5 June 2008, 1400 Hours*	*(703) 633-1667*
Catherine Edwards (ERG)	*Wednesday, 11 June 2008, 1300 Hours*	*(703) 633-1600*

List of Ranges to Visit

Range 3

Form 4. RCA Activity Notification

Operating Area Name	**Range Complex Name**	**Range Name(s)**
Naval Support Facility Indian Head	*Stump Neck*	*Range 3*
Location (Municipality, State):		
Indian Head, Maryland		
Management Team Members	**Organization**	**Phone Numbers**
Cmdr. Kevin S. Gillam	*EODTECHDIV*	*(301) 744-6803 x 243*
Drew Koban	*EODTECHDIV*	*(301) 744-1195*
Chris O'Donnell	*EODTECHDIV*	*(301) 744-2400*
Capt. Brett A. Reissener	*EODTECHDIV*	*(301) 744-4401*
Jason Shaffer	*EODTECHDIV*	*(301) 744-4301*
EODCM William Spoor	*EODTECHDIV*	*(301) 744-1548*
Debbie Strickland	*EODTECHDIV*	*(301) 744-4568*
Technical Team Members	**Organization**	**Phone Numbers**
Anthony Brown	*EODTECHDIV*	*(301) 744-6840*
Larry Kijek	*EODTECHDIV*	*(301) 744-6871*
Susan Yates	*EODTECHDIV*	*(301) 744-6872*
Adam Humphreys	*ERG*	*(703) 633-1695*
Chris Krejci	*ERG*	*(703) 633-1646*
Joshua Moore	*ERG*	*(703) 633-1702*
Alison Poe	*ERG*	*(703) 633-1697*
Arrival/Departure Dates/Times		
Arrival: Friday, 29 February 2008 (Onsite Range Visit)		
Departure: Friday, 29 February 2008 (Onsite Range Visit)		
Visit Request Submitted		
Yes		

Form 5. On-Range Visit

[See RCA Report Appendix B]

Form 6. Air Quality Interview Record

Point of Contact (POC) Information

1. Date: ***11Jun 2008*** | 2. Time: ***1300 hours*** | 3. Location: ***ERG Office (Chantilly, VA)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck*** | 6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Catherine Edwards***

8. POC Title: ***Environmental Scientist***

9. E-mail Address: ***catherine.edwards@erg.com*** | 10. Phone Number: ***703.633.1600***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office*** | 13. Contractor? (circle) [✓ ***Yes***] No

14. Name and Affiliation of Interviewer: ***Joshua Moore - ERG (Navy Contractor)***

Stationary Air Emission Sources

15. Is this range in a National Ambient Air Quality Standards nonattainment area? (circle) [✓ ***Yes***] No
Charles County is within the Washington, DC-VA-MD Metropolitan area, which is a moderate nonattainment area for ozone and a nonattainment area for PM2.5.

16. Are there any stationary emission sources on operational range areas? (circle) Yes [✓ ***No***]
If no, proceed to question 18. Otherwise, Describe:

17. Are stationary emission sources that are located in operation range areas permitted?
(circle) Yes No [✓ ***N/A***] Describe:

18. Do you have any stationary emission sources that are in nonoperational range support areas (i.e., facilities side of range)? (circle) Yes [✓ ***No***] If no, proceed to question 20.
If yes, list only major range support source types:

19. Are range support stationary emission sources permitted? (circle) Yes No [✓ ***N/A***]
If yes, what Federal, State, or local agency administered permit(s)?
If no, why are they not permitted?

20. Does the range have a CAA Title V Permit? (circle) [✓ ***Yes***] No
If yes, what stationary emission source type(s) and major source pollutant(s) triggered the Title V permit requirement? ***NSF Indian Head consists of approximately 90 significant sources, however none are on this range. The emission sources at NSF Indian Head include: a steam plant, various tanks, solvent usage, painting, degreasing, mixing, and wrapping processes. The major source threshold for triggering Title V permitting requirements in Charles County, where NSF Indian Head is located, is 25 tons-per-year for NOx and VOC, 10 tons-per-year for a single Hazardous Air Pollutant (HAP), 25 tons-per-year of any combination of HAPs, and 100 tons-per-year for any other criteria pollutant. NSF Indian Head's potential emissions are greater than the major source thresholds for NOx, SOx, CO, and PM10.***
Where is/are the stationary emission source type(s) located? ***The sources are located at various plant facilities throughout the base.***
If no, explain:

21. Is the range subject to any source category MACT standards promulgated under CAA Title III (Hazardous Air Pollutants)? (circle) [✓ ***Yes***] No
Explain: ***NSF Indian Head is subject to two MACTs: 40 CFR 63 Subpart T—National Emission Standards for Halogenated Solvent Cleaning and 40 CFR Part 63 Subpart GG—National Emission Standards for Aerospace Manufacturing and Rework Facilities. This range is unaffected by this standard.***

22. Do any **OB/OD** or other range-related burning activities occur on the range? (circle) Yes [✓ ***No***]
If yes, does the range have a permit for this activity? (circle) Yes No [✓ ***N/A***]
If no permit, why not?

23. Is fugitive dust control an issue on the range? (circle) Yes [✓ ***No***] Explain:
Fugitive dust emissions typically only occur during heavy-duty construction activities. The Navy is required to take reasonable precautions to prevent PM from becoming airborne, per COMAR 26.11.06.03D. These precautions may include a number of air quality best management practices, which limit fugitive dust impacts to temporary, minimal health or environmental effects. These practices include, but are not limited to, the following:

- ***Watering down active construction areas to reduce fugitive dust emissions;***
- ***Stabilizing exposed or graded areas (e.g., by paving roads and hydroseeding open areas) as soon as possible upon completion of grading;***
- ***Properly covering trucks hauling fill material or maintaining at least two feet of free-board;***
- ***Limiting truck speeds on unpaved areas of the site to 15 miles-per-hour or less;***
- ***Grading sites in phases, thereby limiting the time that disturbed soil is exposed; and***
- ***Temporarily halting construction activities when winds exceed 25 miles per hour.***

Form 6. Air Quality Interview Record (Continued)

24. Is this range subject to CAA, Title III, Section 112r, Accidental Release Prevention? (circle) Yes [✓ No]
If no, please explain why the range is not subject to this Federal regulation: ***NSF Indian Head was once subject to this regulation based on its storage of Oleum (fuming sulfuric acid). Their RMP was cancelled effective 12 Dec 07 because they no longer store Oleum on-base.***
If yes, does this range participate in a Risk Management Plan (RMP)? (circle) Yes No [✓ N/A]
Explain:

25. Does the Air Quality Office oversee compliance with the Asbestos NESHAPs? (circle) Yes [✓ No] If no, state what office on base has this responsibility: ***The Safety Office oversees the asbestos program. Dennis Tomlinson is POC for Naval Support Activity South Potomac (NSASP), and Ray Geckle is POC for the Naval Surface Warfare Center (NSWC).***
If yes, for what types of activities has this office submitted Federal Asbestos Abatement Notifications?
Is this office complying with all reporting requirements and deadlines? (circle) [✓ Yes] No N/A ***Compliance is assumed because all contractors performing asbestos work are properly certified.***
If yes, proceed to next question. If no, explain noncompliance:

26. Has the range been inspected by an air quality regulatory agency within the past 5 years? (circle) [✓ Yes] No
If yes, state name of agency and any deficiencies noted in most recent inspection report*:* ***According to EPA Enforcement & Compliance History Online (ECHO), MDE performed a Title V compliance certification review for NSF Indian Head on 04 Apr 08. The review noted deviations but resulted in a determination that the base was in compliance with its Title V permit.***

27. Has the range been issued any air quality Notices of Violation (NOVs)? (circle) Yes [✓ No]
If yes, who issued the NOV, what was the NOV for, and how is the NOV being resolved?

28. Are there additional applicable air quality regulations that have not yet been addressed during this interview? (circle) [✓ Yes] No If yes, please list applicable regulations and administering agency. ***The Installation is subject to additional air quality regulations involving open burning activities; however, this regulation is not applicable to the ranges at NSF Indian Head. The Installation must obtain an Open Fire Permit from Charles County prior to initiating open burning activities (e.g., thermal decontamination of buildings) in order to inform the county of its activities. In addition, MDE bans open fires from June 1–August 31 in Charles County (COMAR 26.11.07.03B).***

29. Have any Federal, State, or local air quality regulations negatively impacted range operations? (circle) Yes [✓ No] If yes, please state the regulation and negative impacts.

Mobile Air Emission Sources[1]

30. List types of mobile emission sources in operational range areas: ***None***

31. List types of mobile emission sources in nonoperational range support areas: ***None***

32. Have Federal, State, or local air quality agencies made requirements of mobile emission sources that have impacted range operations? (circle) Yes [✓ No] If yes, please describe:

Air Quality Conformity

33. Are there plans to change the frequency or type of range operations in such a way that would impact air emissions? (circle) Yes [✓ No] If no, go to next question.
If yes, has the issue of increased/decreased air emissions been addressed at the Federal, State, or local air quality agency level? (circle) Yes [✓ No] If yes, describe:

34. Has an air quality conformity applicability study (CAA General Conformity Rule) ever been performed for any activities on this range? (circle) Yes [✓ No] If no, go to question 36.
If yes, for what year and action was this done?
What major emission sources were included in this analysis?

35. From the conformity applicability study, was a full conformity determination then required? (circle) Yes [✓ No]
If no, explain why no full conformity determination was required*:* ***The estimated annual emissions from the proposed actions were below the de minimis levels set forth in the GCR. Estimated emissions also were far below regional significance thresholds.***
If yes, what was the conclusion of the determination and did the State make any requirements?

Off-Range Release

36. Has the Navy, regulatory agency, or public expressed any concerns regarding toxic air emissions from range operations and their possible negative impact off range? (circle) Yes [✓ No]
If yes, please describe:

37. Have any off-range releases of air contaminants occurred that have negatively impacted air quality for the surrounding community or environment? (circle) Yes [✓ No] Explain:
If yes, describe:

Form 6. Air Quality Interview Record (Continued)

Documents
38. Do you have copies, preferably electronic, of any documents that address range air quality issues including, but not limited to, a Title V permit; mobile emissions calculations; range air quality inspection report; letters from Federal, State, or local air quality regulatory agencies; and conformity applicability and determination documents. List copies of air quality documents obtained: ***Title V permit (See Form 5)***

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[1] Examples of mobile emission sources include ground support equipment, motor vehicles, tanks, aircraft over-flights, marine vessels (if applicable), chaff, and live ordnance use.

Form 7. Water/Wastewater Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008*** 2. Time: ***1430 hours*** 3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck*** 6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Glenn Faini***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***glenn.d.faini@navy.mil*** 10. Phone Number: ***(301) 744-2257***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office*** 13. Contractor? (circle) Yes [✓ ***No***]

7. Name of POC Interviewed: ***Diana Rose***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***Diana.rose@navy.mil*** 10. Phone Number: ***(301) 744-2267***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office*** 13. Contractor? (circle) Yes [✓ ***No***]

14. Name and Affiliation of Interviewer: ***Adam Humphreys, Christopher Krejci, Joshua Moore, and Alison Poe; ERG (Navy Contractor)***

Range Surface Water & Groundwater Information

15. Does this range have any groundwater? (circle) [✓ ***Yes***] No
If no, proceed to next question. If yes, what is the depth to groundwater and is the groundwater used for drinking water or irrigation? ***Groundwater is pumped from the Patapsco Aquifer (Average 240 ft to Top of Upper Contact) and the Patuxent Aquifer (Average 1000ft to Top of Upper Contact) Groundwater is used for drinking water and other domestic purposes.***

16. Does the range have any surface water on or nearby the range? (circle) [✓ ***Yes***] No If no, proceed to next question. If yes, describe surface water and uses of surface water by humans or wildlife. **The range is adjacent to the Chicamuxen Creek.** ***The creek is used by humans primarily for recreational fishing and boating. The*** **Chicamuxen Creek** ***is used by Large-Mouthed Bass as a spawning ground.***

Point Source Discharges

17. Does this range have a Federally Owned Treatment Works (FOTW)? (circle) Yes [✓ ***No***]
If no, proceed to question 18. If yes, answer the following questions about the FOTW:
a) What is the FOTW average daily flow rate and capacity?
b) Into what body of water does the FOTW discharge?
c) Is the collection system to FOTW "combined" (i.e., receives both wastewater and stormwater)? (circle) Yes No
d) How is sewage sludge disposed of? e) Does the FOTW have an NPDES, State, or local wastewater discharge permit? (circle) *Yes* No
If yes, state the name of the permit issuing agency and proceed to question 18. If no, explain why the FOTW does not have an NPDES or other wastewater discharge permit (then proceed to question 18):

18. Does this range discharge wastewater into a Publicly Owned Treatment Works (POTW) collection system? (circle) Yes [✓ ***No***] If no, proceed to question 19.
If yes, does this range or any operations on the range have a discharge permit with the POTW? (circle) Yes No
If yes, proceed to next question. If no, briefly explain why the range does not have a POTW discharge permit:

19. If applicable, briefly describe the types of discharges the FOTW or POTW receives (i.e., domestic, industrial, stormwater) from this range: ***N/A***

20. Does the FOTW/POTW receive any discharges from military operational range areas? (circle) Yes [✓ ***No***] N/A
If no, proceed to next question. If yes, briefly describe these types of discharges:

21. Does the range have any onsite disposal systems (e.g., spray irrigation, evaporation lagoons, septic tanks)? (circle) Yes [✓ ***No***] If no, proceed to question 22. If yes, describe disposal system:
Is the disposal system permitted? (circle) Yes No If yes, what is the type of permit and who is the permitting agency?

22. Does the range have any other Federal, State, or local wastewater discharge permits for point source discharges? (circle) [✓ ***Yes***] No If no, proceed to next question. If yes, state the type of permit, issuing agency, description of discharge, and whether any discharges are from military operational range areas: ***The base has an industrial wastewater permit which allows it to discharge industrial wastewater including non-contact and process wastewater as well as stormwater. No discharges from military operational range areas are currently permitted.***

Form 7. Water/Wastewater Interview Record (Continued)

Nonpoint Source Discharges

23. Does the range have any NPDES, State, or local stormwater discharge permits? (circle) [✓ ***Yes***]   No
If no, proceed to next question. If yes, state the type of permit, issuing agency, and sources of stormwater runoff: ***The base has a Multi-Sector General Permit (MSGP) for stormwater called the municipal sewer separate system (MS4) permit issued by MDE.***

24. Are stormwater discharges from military operational range areas being monitored? (circle) Yes   [✓ ***No***]
If no, proceed to next question. If yes, state names of operational range areas that are being monitored for stormwater runoff and describe any contaminants in this stormwater:

25. Does this range have a current Stormwater Pollution Prevention Plan (PPP)? (circle) [✓ ***Yes***]   No

26. Are there protective measures in place? (circle) [✓ ***Yes***]   No
If no, proceed to question 27. If yes, do protective measures extend to military operational range areas? (circle) [✓ ***Yes***]   No
If no, proceed to question 27. If yes, describe protective measures employed in military operational range areas: ***Staff utilize burn pans for open burning. The pans are covered to prevent contamination to the surrounding area by stormwater.***

27. Does this range have a current Spill Prevention, Control, and Countermeasure (SPCC) Plan to prevent spills of oil and hazardous substances into navigable waters? (circle) [✓ ***Yes***]   No

28. Does this range have a current Oil and Hazardous Substances Facility Response Plan (FRP)? (circle) [✓ ***Yes***]   No

Regulatory Impacts on Range

29. Has the range exceeded any wastewater or stormwater discharge permit limits within the past year? (circle) Yes   [✓ ***No***]   N/A   If no, proceed to next question. If yes, for what analyte(s) did the range exceed its permit limit(s) and what measures are being taken to eliminate future exceedances?

30. Has the range been inspected by a water quality regulatory agency within the past 5 years? (circle) Yes [✓ ***No***]
If no, proceed to next question. If yes, state name of agency and any deficiencies noted in most recent inspection report:

31. Has the range been issued any wastewater discharge Notices of Violation (NOVs)? (circle) Yes   [✓ ***No***]
If no, proceed to next question. If yes, who issued the NOV, what was the NOV for, and how is the NOV being resolved?

32. Are there additional required water quality regulations or plans that have not yet been addressed during this interview? (circle) Yes   [✓ ***No***]   If yes, list applicable regulations, plans, and administering agency:

33. Have any Federal, State, or local water quality regulations negatively impacted range operations? (circle) *Yes*   [✓ ***No***]
If yes, state the regulation and negative impacts:

Off-Range Release

34. Has the Navy, regulatory agency, or public expressed any concerns regarding the off-range migration of munitions residues? (circle) *Yes*   [✓ ***No***]
Explain:

35. Have any off-range releases of MCs of potential concern occurred that have negatively impacted water quality for the surrounding community or environment? (circle) *Yes*   [✓ ***No***]   Explain:

Documents

36. Do you have copies, preferably electronic, of any documents that address water quality issues that impact the range including, but not limited to, Stormwater PPP, annual stormwater reports, water quality inspection report, water or sediment monitoring reports, FRP, or SPCC Plan? ***Industrial Storm Water Permit (See Form 5); Stormwater Pollution Prevention Plan and Spill Prevention, Control, and Countermeasures Plan unavailable electronically, see Environmental Program Office for these documents.***

Form 8. Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008*** | 2. Time: ***0800 hours*** | 3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck*** | 6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Mark Yeaton***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***mark.b.yeaton@navy.mil*** | 10. Phone Number: ***(301) 744-2272***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office*** | 13. Contractor? (circle) Yes [✓ No]

14. Name of POC Interviewed: ***Joe Rothenberger***

15. POC Title: ***Admin/Tech Specialist***

16. E-mail Address: ***joseph.rothenberger@namy.mil*** | 17. Phone Number: ***301-744-6868***

18. POC Navy Command Affiliation: ***NAVFAC Washington***

19. Dept./Div./Branch: ***20/201/2014*** | 20. Contractor? (circle) Yes [✓ No]

21. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Military Munitions[1]

Questions 22 - 30 below, regarding military munitions, will need to be addressed by both environmental and range managers. Answer questions with respect to the individual roles of range and environmental managers and describe instances when range and environmental managers work together in the management of military munitions.

22. Describe the handling and storage practices for unused munitions: ***Unused munitions are always returned to the NSWC EODTECHDIV magazines for storage.***

23. What is done with unused munitions that are deemed defective or damaged***? If the munitions are determined to be defective or damaged to the point where they can not be used to fabricate and validate EOD Render Safe Procedures (RSP's), then they will be used to validate EOD disposal procedures. If the munitions are so badly defective or damaged that they can not be used to validate RSP's and/or disposal procedures then it becomes a safety issue and the munitions will be destroyed on Range 3.***

24. Once munitions have been used for their "intended purposes" (i.e., fired, jettisoned, dropped, launched, detonated on range, or otherwise used), what is done with any resulting munitions fragments (e.g., shrapnel, fins, casings)? ***Munitions fragments are certified 5X by Range 3 personnel. The military function is removed.***

25. Describe the process for recycling used munitions fragments: ***5X fragments are placed in designated storage container and transported to NSA South Potomac (NSASP) Indian Head for recycling through DRMO.***

26. If used munitions fragments are transported off range to an approved munitions recycling facility (such as a military depot), are they ever manifested? If so, under what circumstances are they manifested? ***In accordance with local guidance, a Form 2271 (Decontamination Tag) is generated to certify that an item is no longer contaminated with explosives.***

27. Describe range maintenance practices with regard to UXO. ***UXO is rare at Range 3. Ordnance items are destroyed in-place during test operations or in burn pans during thermal treatment; they are not dropped or fired through the air.***

28. Describe the process for responding to fired munitions that have landed off range. ***Munitions are not fired from Range 3; therefore, fired munitions have never landed off range.***

29. Are you aware of used or unused munitions being buried for disposal purposes? (circle) Yes [✓ No]
Explain:

30. Does the range keep permanent EOD off-range response records? (circle) Yes [✓ No] ***Range 3 has never encountered an EOD off-range response. A record would be kept if such an incident occurred.***

Solid Waste

31. Does this range have a landfill? (circle) Yes [✓ No] If no, proceed to next question. If yes, what types of waste does this landfill accept and where is the landfill located?

32. Describe any solid wastes (as defined under RCRA) that are generated from the range and what is done with them: ***Waste from spill cleanup (oils, lubricants). Non hazardous wastes not authorized for disposal as general trash is packaged per DOT and Navy requirements and transported to NSASP Indian Head for disposal through DRMO.***

Hazardous Materials

33. Does this range participate in a Hazardous Material Control and Management (HMC&M) Plan, Authorized Users List (AUL), and a Hazard Communication (HAZCOM) program (required of Navy ranges)? (circle) [✓ Yes] No
If yes, proceed to next question. If no, explain why the range does not participate in these HM management programs.

Form 8. Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste Interview Record (Continued)

34. Has this range submitted a toxics release inventory (TRI) report under SARA, Title III EPCRA reporting requirements? (circle) Yes [✓ No] If yes, proceed to EPCRA Interview Form 11, if appropriate.
Is the range exempt from EPCRA reporting requirements? (circle) [✓ Yes] No
If no, explain why the range has not submitted a TRI report:

Hazardous Waste

35. Does this range generate HW? (circle) [✓ Yes] No If no, proceed to question 37. If yes, briefly list what types of HW are generated from the range: ***K044 ash from the thermal treatment of explosive sludge.***

36. What classification of HW generator is this range?[2] (circle) [✓ Class I] *Class II* Class III
Naval Support Facility Indian Head is classified as a Class I generator, the ranges do not receive individual classification.

37. Does this range store HW onsite prior to disposal? (circle) [✓ Yes] No N/A If no, proceed to question 39. If yes, does the range have satellite accumulation points? (circle) Yes [✓ No]

38. Is this range in compliance with all Federal, State, or local HW accumulation time periods? (circle) [✓ Yes] No N/A
If yes, proceed to next question. If no, describe deficiency and what is being done to resolve it:

39. Does this range dispose of HW onsite? (circle) Yes [✓ No] N/A
If no, proceed to next question. If yes, briefly describe what HW is disposed of onsite and the disposal method:

40. Does this range have a Treatment, Storage, and Disposal Facility (TSDF) Permit? (circle) [✓ Yes] No N/A
If yes, proceed to question 41.
If no, is the range considered to fall under a TSDF permit (under an affiliated Navy base)? (circle) Yes No N/A
If yes, proceed to question 41. If no, explain why not and proceed to question 42:

41. Is this range in compliance with all TSDF permit requirements? (circle) [✓ Yes] No N/A
If yes, proceed to question 42. If no, describe deficiency and what is being done to resolve it:

42. Has all HW been disposed of according to Federal, State, or local regulations? (circle) [✓ Yes] No N/A
If yes, proceed to next question. If no, describe deficiency and what is being done to resolve it:

43. Does this range participate in or have a HW Management Plan (HWMP)? (circle) Yes [✓ No] N/A
If yes, proceed to next question. If no, explain why this range does not participate in or have a HWMP:
The base is currently developing a base-wide HWMP

Specifically Regulated Toxic Substances

44. Does this range have a PCB Management Plan that addresses storage, labeling, handling, and disposal practices consistent with Federal, State, and Navy requirements? (circle) [✓ Yes] No N/A
Explain: ***The base used to have a plan, but it has since lapsed. There was a detection of PCBs from a sample taken at the Sewage Treatment Plant in February 2006 by MDE that has resulted in a PCB Detection Study and required sampling.***

45. Does this range have a designated Asbestos Program Manager (APM) and a current Asbestos Management Plan (AMP)? (circle) [✓ Yes] No N/A
Explain: ***The Safety Office oversees the asbestos program. Dennis Tomlinson is POC for Naval Support Activity South Potomac (NSASP), and Ray Geckle is POC for the Naval Surface Warfare Center (NSWC).***

46. Have all facilities on this range been surveyed for asbestos-containing material (ACM) and the condition of ACM material? (circle) *Yes* [✓ No] N/A If yes, are there any buildings/structures on this range or in range support areas that have ACM or have had ACM abated? (circle) Yes *No* N/A Explain:

47. Have all facilities on this range been surveyed for lead-based paint (LBP)? (circle) Yes [✓ No] N/A
If yes, are there any buildings/structures on the range or in range support areas that have LBP or have had LBP abated? (circle) Yes No N/A Explain:

48. If PCB-containing items, ACM, or LBP are removed from range equipment, utilities, or structures, are all processed according to Federal and State laws and Navy requirements for safe handling, containment, labeling, manifesting, and disposal practices? (circle) [✓ Yes] No N/A
Explain: ***Indian Head has licensed professional remove items, which are triple-bagged according to TSCA requirements.***

Form 8. Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste Interview Record (Continued)

Regulatory Impacts on Range

49. Has this range been inspected by an agency that regulates HM or HW within the past 5 years?
(circle) [✓ Yes] No N/A
If yes, state name of agency or agencies and any deficiencies noted in most recent inspection report(s):
Maryland Department of the Environment (MDE) conducts yearly inspections of permitted sites at NSF Indian Head. MDE, which oversees more than 400 sites at NSF Indian Head, has not inspected Building 544. IHDIV does annual assessments for explosive safety and environmental issues at each of the IHDIV ranges, and NAVSEA does an environmental compliance inspection every two years.

50. Have Federal, State, or local HM or HW regulators issued this range any Notice of Violation (NOV)? (circle) Yes [✓ No] N/A
If no, proceed to next question. If yes, who issued the NOV, what was the NOV for, and how are deficiencies being resolved?

51. Are there additional applicable HM or HW regulations that have not yet been addressed during this interview? (circle) Yes [✓ No] If yes, list applicable regulations and administering agency:
Is there a conditional exemption for the storage of WMM off range? (circle) Yes No

52. Have any Federal, State, or local HM or HW regulations negatively impacted range operations? (circle) Yes [✓ No]
If yes, state the regulation(s) and negative impacts:

53. Are there plans to change the frequency or type of range operations in such a way that would impact the quantity of wastes generated from this range? (circle) Yes [✓ No]
If no, go to next question. If yes, what types of wastes do you expect to increase or decrease as a result of changes in range operations?

Off-Range Release

54. Has the Navy, regulatory agency, or public expressed any concerns about fired munitions landing off range or the off-range migration of residual MCs of potential concern and their impact on surrounding communities or environment? (circle) Yes [✓ No] Explain: ***There have not been any formal concerns expressed.***

55. Have any off-range releases of munitions or their constituents occurred that have negatively impacted the surrounding community or environment? (circle) Yes [✓ No] Explain: ***No off-range releases have occurred or been detected by Range Three personnel.***

Documents

56. Do you have copies, preferably electronic, of any documents that address HM or HW that impact this range including, but not limited to, a Navy Hazardous Waste Annual Report, any EPA or State program reports, copies of program management plans (e.g., HMC&M Plan, HWMP, AMP, PCB Management Plan), and inspection reports? List copies of documents obtained: ***PCB Elimination Plan***

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[1] Refer to Military Munitions Rule [Federal Register: February 12, 1997 (Volume 62, Number 29)] and DoD Policy to Implement EPA's Military Munitions Rule, 1 July 1998.

[2] HW generator: Any person, by site, act, or process produces HW or whose act first causes an HW to become subject to regulation.

HW generator classifications:

Class I = (Large Quantity Generator). Monthly generation quantity of 1,000 kilograms (kg) (2,200 pounds [lbs]) or more HW or 1 kg (2.2 lbs) or more acute HW.

Class II = (Small Quantity Generator). Monthly generation quantity of 100 – 1,000 kg (220 - 2,200 lbs) HW and less than 1 kg (2.2 lbs) acute HW.

Class III = (Conditionally Exempt Small Quantity Generator). Monthly generation quantity less than 100 kg (220 lbs) HW or less than 1 kg (2.2 lbs) of acute HW. Such generators are exempt from substantially all RCRA requirements.

(Source: OPNAVINST 5090.1B CH-4, Navy Environmental and Natural Resources Program Manual, Chapter 12, Hazardous Waste Management Ashore).

Form 9. Cultural Resources Interview Record

Point of Contact (POC) Information

1. Date: ***05 June 2008***

2. Time: ***1400 hours***

3. Location: ***ERG Office (Chantilly, VA)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Patrick Goodwin***

8. POC Title: ***Environmental Scientist***

9. E-mail Address: ***patrick.goodwin@erg.com***

10. Phone Number: (***703) 633.1667***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) [✓ ***Yes***] No

14. Name and Affiliation of Interviewer: ***Joshua Moore, ERG***

General Cultural Resources

15. Briefly describe the current cultural resource program at this range, if any: ***This range is located at NSF Indian Head in Indian Head, Maryland. Cultural resources management at NSF Indian Head is handled by the Environmental Office, with contractor support for archeological and historic architectural studies.***

16. Is there a current Integrated Cultural Resource Management Plan (ICRMP), Cultural Resource Management Plan (CRMP), and/or a Historic and Archaeological Resources Protection (HARP) Plan? Can you provide copies, preferably electronic, of these documents? ***A Draft Overview of the Cultural Resource Program was prepared in 1996. A Preliminary Draft HARP was prepared in 1998. Several archeological and historic architectural studies have taken place since these documents were prepared. The Navy is currently preparing an updated ICRMP, which will include updated HARP categorizations for all structures on base.***

Archaeological Resources

17. Briefly describe the number and types of known archaeological resources at this range (e.g., general time periods, preservation conditions, unique qualities). ***None***

18. Have cultural resource surveys been conducted on the operational ranges? If so, has the entire range(s) been systematically surveyed? ***No***

19. Are there known archaeological resources located on an operational range? If so, have they been evaluated for National Register of Historical Places (NRHP) eligibility? ***None known***

20. What procedures are in place to avoid, minimize, or mitigate effects of future undertakings, especially if located on an active range? ***New undertakings at NSF Indian Head are subject to review under the Comprehensive Work Approval Process (CWAP). This process would identify cultural resource management requirements for any proposed undertaking. The Navy would initiate Section 106 consultation with the Maryland Historical Trust for any future undertakings that could affect known archeological resources. The Navy would perform Phase I archeological surveys for any future undertakings that could disturb previously unsurveyed and undisturbed soil.***

21. Where are archaeological collections and their associated records housed, and does this repository meet 36 CFR 79 (Curation of Federally Owned and Administered Archaeological Collections) requirements? ***The Navy has a Memorandum of Agreement (MOA) with the Maryland Archaeological Conservation Laboratory and Jefferson Patterson Park and Museum, operated by the Maryland Historical Trust, for curation of archaeological project records and artifacts. This facility meets 36 CFR 79 requirements.***

Historic Built Environment

22. Are there any buildings or structures located on an operational range? If so, have they been evaluated for NRHP eligibility (including those related to the Cold War era)? ***No***

23. Are there any National Historic Landmarks or State/local designated historic sites (e.g., State Historic Landmark, State Register of Historic Places) located on an operational range? ***No***

24. What procedures are in place to avoid, minimize, or mitigate effects of future undertakings, especially if located on an active range? ***New undertakings at NSF Indian Head are subject to review under the Comprehensive Work Approval Process (CWAP). This process would identify cultural resource management requirements for any proposed undertaking. The Navy would initiate Section 106 consultation with the Maryland Historical Trust for any future undertakings that could affect known historic buildings or districts. The Navy would perform historic architectural surveys for any future undertakings that could adversely affect buildings that are at least 50 years old and have not yet been surveyed.***

Native American Consultation

25. What Federally recognized Native American/Hawaiian groups have expressed interest in cultural resource issues related to this range? ***None***

26. Are there any known tribal resources or sacred sites located on an operational range? If so, what type of Native American/Hawaiian consultation has been conducted related to these resources? ***No***

27. Has any group requested visitation rights to any known tribal resource or sacred site at this operational range? If so, has the Navy complied with these requests? ***No***

28. Has a NAGPRA-related *Summary* and *Inventory* been completed for collections related to this operational range? What are the pending repatriation issues, if any? ***No***

Form 9. Cultural Resources Interview Record (Continued)

29. What procedures are taken to consult with Native American/Hawaiian groups during NEPA and NHPA Section 106 processes? ***The Navy would consult with the Maryland Historical Trust to determine whether Native American consultation is appropriate for a given undertaking.***
30. Are Native American/Hawaiian monitors employed during archaeological surveys or excavation work? ***No***
Regulatory Compliance
31. Who is responsible for compliance issues regarding cultural resource regulations and general management of cultural resources at this range? ***Mr. Jeffrey Bossart (Environmental Program Director, Naval Support Activity South Potomac)***
32. What procedures are taken to evaluate proposed actions for their potential impacts to cultural resources on an operational range? ***New undertakings at NSF Indian Head are subject to review under the Comprehensive Work Approval Process (CWAP). This process would identify cultural resource management requirements for any proposed undertaking.***
33. Have NEPA and NHPA Section 106 studies been conducted for the operational use of all operational ranges? How does the range implement procedures for public involvement per 36 CFR 800? ***No NEPA or Section 106 studies have been prepared for range operations. If a Section 106 consultation were to be performed for a given range, the Navy would consult with the Maryland Historical Trust to determine whether public involvement is appropriate for a given undertaking.***
34. What procedures are in place to comply with Section 110 of NHPA? ***The Navy satisfies the requirements of Section 110 by performing the following:*** ***a. Continuing to use historic buildings that satisfy mission requirements;*** ***b. Routinely performing archeological and historic architectural surveys to identify and preserve historic properties; and*** ***c. Developing MOAs with the Maryland Historical Trust and the Advisory Council on Historic Preservation and performing mitigation and recordation for any projects that adversely affect historic properties.***
35. Does this range have a Programmatic Agreement (PA) with SHPO? If so, are activities associated with the operational use of all active ranges covered under this PA? ***No***
36. Is this range currently in noncompliance with any Federal regulations related to cultural resources? ***No***
37. Has SHPO, a Native American/Hawaiian group, or any other interested party expressed concern about either direct impacts on cultural resources from range use (e.g., bombing, tracked-vehicle use) or indirect impacts from toxic releases related to ordnance? ***No***
Documents
38. Do you have copies, preferably electronic, of any documents that address cultural resource issues that impact the range including, but not limited to, an ICRMP, CRMP, HARP plan, PA, or cultural resource overviews? List all documents received: ***Draft Overview of the Cultural Resource Program (1996) and Preliminary Draft HARP (1998). (See Form 5)***

Form 10. Natural Resources Interview Record

Point of Contact (POC) Information

1. Date: ***22 May 2008***

2. Time: ***1300 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Seth Berry***

8. POC Title: ***Natural Resources Specialist***

9. E-mail Address: ***seth.m.berry@navy.mil***

10. Phone Number: (***301) 744-2273***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ ***No***]

14. Name and Affiliation of Interviewer: ***Christopher Krejci and Joshua Moore; ERG (Navy Contractor)***

General Natural Resources

15. Is there a current INRMP for this range? Is this range or range complex covered in the INRMP? (Ranges must review and update these plans every 5 years.) ***There is an INRMP for the installation that covers all of NSF Indian Head. A 2008 revision is currently waiting approval from MDNR.***

16. Briefly describe any current natural resource programs at this range, especially if they involve any operational ranges (e.g., conservation programs, native species restoration, propagation programs). ***Bald Eagle Management Plan***

Biological Resources

17. Briefly describe any biological/habitat surveys that have been conducted on an operational range.
1. Master Plan Update – Naval Ordnance Station, Indian Head, Maryland - Chesapeake Division NAVFAC (1990)
2. Rare, Threatened, and Endangered Plant Species - Maryland Natural Heritage Program(1991-1992)
3. Urban Forest Management Plan. Naval Surface Warfare Center, Indian Head, Maryland. - Virginia Polytechnic Institute. (1995)
4. Indian Head Naval Surface Warfare Center Amphibian Survey – IHDIV (1999)
5. Secretary of the Navy Environmental Award Submission for FY97-FY99: Natural Resources Conservation - Small Installation. Natural Resources Office, Indian Head Division, Naval Surface Warfare Center, Indian Head, Maryland (1999)
6. Rare, Threatened, and Endangered Species Survey - NSF-IH. (2006)

18. Identify all sensitive species (threatened or endangered species, species of concern, State sensitive species) that are known residents or seasonal visitors on an operational range: ***See Table 1 below for a list of sensitive species that are known residents or seasonal visitors of Naval Support Facility Indian Head.***

19. Is there any designated critical habitat located on an operational range? Is there any known potentially suitable unoccupied habitat present for a threatened or endangered species, even if not officially designated as critical habitat? ***No***

20. What procedures are in place to protect species from disturbance, especially if located on an operational range? Do these procedures include periodic monitoring? ***The base-wide Comprehensive Work Approval Process is in place to ensure species disturbance is considered. Procedures include periodic monitoring.***

21. What is the status of USFWS/NMFS consultation regarding the operational use of all operational ranges? Have any Biological Opinions (BOs) been issued by USFWS/NMFS? ***The USFWS has issued a Biological Opinion based on a review of the U.S. Navy's biological assessment of impacts to bald eagles.***

Other Resource Areas

22. Have all potential wetland areas at the operational range been formally delineated? Are there any jurisdictional wetlands, natural springs, riparian areas, wet areas, vernal pools, or areas of sensitive resources on an active range? If so, what procedures are in place regarding wetland protection? ***All wetland areas have been formally delineated. There are no wetlands identified on this range.***

23. Are the operational range(s) located in a designated floodplain? If so, what procedures are in place regarding floodplain management? ***The range is located in the 100-year Floodplain. NAVFAC Washington is currently developing a floodplain management plan.***

24. Are you aware of any other pertinent natural resource issues applicable to this operational range (e.g., migratory birds, anadromous fish, noxious weeds, wild or scenic rivers, designated wilderness)? ***Migratory birds, anadromous fish and noxious weeds are known issues at Naval Support Facility Indian Head.***

Compliance

25. Who is responsible for compliance issues regarding natural resource regulations and general management of natural resources at this operational range? ***NSWC personnel are responsible for day-to-day compliance. The Public Works Office and Environmental Office are responsible for review and approval of any changes that may affect compliance.***

26. What procedures are taken to evaluate actions for the potential impact on natural resources, especially those planned on operational ranges? ***The base-wide Comprehensive Work Approval Process is in place to ensure steps are taken to evaluate actions for the potential impact on natural resources.***

Form 10. Natural Resources Interview Record (Continued)

27. Is this operational range currently in noncompliance with any Federal regulations related to natural resources? ***No***

28. Has any outside party (including nongovernment organizations) threatened or instigated legal action against the Navy with regard to natural resources at this operational range? ***No***

29. Has the USFWS/NMFS, an environmental group, or any other interested party expressed concern about direct impacts on natural resources from range use (e.g., bombing, tracked-vehicle use) or indirect impacts from toxic releases related to munitions? ***State and Federal concerns have been expressed about the sites undergoing MRP and CERCLA.***

Documents

30. Do you have copies, preferably electronic, of any documents that address natural resource issues that impact the range including, but not limited to, the INRMP, BOs, Biological Assessments (BAs), Environmental Assessments (EAs), Environmental Impact Statements (EISs), survey reports, and wetland delineation reports? List all documents received: ***Biological Opinion / U.S. Navy Support Facility Indian Head. USFWS (August 2007) and INRMP, NSWC – IHDIV, (January 2008). (See Form 5)***

Table 1

Rare Flora Found at NSF Indian Head

Common Name	Scientific Name	Location at NSFIH	Federal Status	State Status	Global/State Rank	Last Documented
Swamp Beggars-tick	*Bidens discoidea*	Stump Neck Beaver Pond	No Status	Endangered	G5/S3	1992
Narrow Melicgrass	*Melica mutica*	Rum Point	No Status	Threatened	G5/S1	2004
Climbing Cucumber	*Melothria pendula*	Cornwallis Neck	No Status	Endangered	G5?/S1	2004
Eastern Arborvitae	*Thuja occidentalis*	Urban Area	No Status	Threatened	G5/S1	2007

Rare Fauna Found at NSF Indian Head

Common Name	Scientific Name	Federal Status	State Status	Global/State Rank	Last Documented
Bald Eagle	*Haliaeetus leucocephalus*	No Status	Threatened	G4/S2S3B	2007
Least Bittern	*Ixobrychus exilis*	No Status	In Need of Conservation	G5/ S2S3B	1992
Bobcat	*Lynx rufus*	No Status	In Need of Conservation	G5/S3	1992
Southeastern Shrew	*Sorex longirostris*	No Status	In Need of Conservation	G4/S2	1992
Shortnose Sturgeon	*Acipenser brevirostrum*	Endangered	Endangered	G3/S1	2005
Frosted Elfin	*Callophrys (Incisalia) irus*	No Status	Endangered	G3/S1	1992

Global Ranks:

G3 = Either very rare and local throughout its range or found locally in a restricted range.
G4 = Apparently secure globally, though it may be quite rare in parts of its range.
G5 = Demonstrably secure globally, though it may be rare in parts of its range.

State Ranks:

S1 = Critically imperiled in the state because of extreme rarity, equivalent to being ranked as state rare.
S2 = Imperiled in the state because or rarity; equivalent to being ranked state rare.
S3 = Rare or uncommon in the state; equivalent to being ranked as watch list.
S4 = Apparently secure in the state, with many occurrences.
S5 = Demonstrably secure in Maryland under present conditions.
SU = Possibly rare in Maryland, but of uncertain status.

Form 11. EPCRA Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***

2. Time: ***0800 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Mark Yeaton***

8. POC Title: ***Environmental Engineer***

9. E-mail Address: ***mark.b.yeaton@navy.mil***

10. Phone Number: ***(301) 744-2272***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ No]

14. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Section 313 Reporting on Munitions Activities[1]

15. What operational range areas are being evaluated for EPCRA TRI applicability? ***With the exception of the open burning operations, all areas at this range fall under the lab exemption (40 CFR 372.38(d)) for EPCRA TRI.***

16. Do operational range areas have 10 or more full-time employees[2] (or 20,000 manhours/yr)? (circle) Yes [✓ No]
If yes, proceed to next question. If no, Navy is exempt from reporting under EPCRA Section 313 for munitions. Determine if Navy has documented employee man-hour exemption.

17. Were activities performed at operational range areas involving munitions during the calendar year? (circle) Yes [✓ No] *N/A*
If yes, proceed to next question. If no, reporting is not required under EPCRA Section 313 for munitions. Determine if Navy has documented exemption.

18. What types of munitions-related activities were evaluated for toxic chemical threshold determination for the past calendar year? ***N/A***

19. List all toxic chemicals that met threshold quantities and indicate if any are persistent, bioaccumulative, and toxic (PBT): ***N/A***

20. Was a Form R submitted for TRI reporting? (circle) Yes No [✓ N/A]
If yes, proceed to next question. If no, explain:

21. Have Section 313 reporting deadlines been met for munitions-related activities? (circle) Yes No [✓ N/A]
If yes, proceed to next question. If no, explain:

EPCRA Reporting on Nonmunitions (Installation) Activities

22. Was a Form R submitted for TRI reporting for nonmunitions activities?
(circle) Yes No [✓ N/A] If yes, proceed to next question. If no, explain:

23. List all toxic chemicals that met threshold quantities and indicate if any were PBT: ***N/A***

24. Have reporting deadlines been met for all operational ranges EPCRA reporting (including emergency release notifications and Sections 311, 312, and 313 reporting)? (circle) Yes No [✓ N/A] Explain:

Regulatory Impacts on Range

25. Have Federal or State regulators issued this range any NOVs for EPCRA noncompliance? (circle) Yes [✓ No]
If no, proceed to next question. If yes, who issued the NOV, what were the deficiencies, and how are the deficiencies being resolved?

26. Have any EPCRA compliance requirements from DoD, Navy, or a regulatory agency negatively impacted range operations? (circle) Yes No [✓ N/A] If yes, state the requirements and negative impacts.

27. Are there plans to change the frequency or type of range operations in such a way that would impact the quantity of toxic chemicals released from munitions activities? (circle) Yes [✓ No]
If no, go to next question. If yes, what toxic chemicals do you expect to see an increase or decrease in release as a result of changes in range operations?

Off-Range Release

28. Is there a concern by the Navy, regulatory agency, and/or public, regarding the off-range release of toxic chemicals and their possible impact on sensitive receptors off range? (circle) Yes [✓ No]
If yes, describe:

Form 11. EPCRA Interview Record (Continued)

Documents
29. Do you have copies, preferably electronic, of any EPCRA-related documents that pertain to this range including, but not limited to, Section 313 Form R, documented toxic chemical threshold determinations, and NOVs and letters from regulatory agencies pertaining to EPCRA munitions reporting. List all documents received: ***Guidance for Implementing the Emergency Planning and Community Right-to-Know Act (EPCRA) to Munitions Activities, Department of the Navy, Office of the Chief of Naval Operations, June 1998. (See Form 5)***

[1] "Munitions activities that may involve some toxic chemicals include (but are not limited to): manufacture and assembly; chemical manufacture; load and pack; maintenance of munitions; painting and component replacement; proficiency and qualification training; live fire; propellant bag burning at firing ranges; aerial bombing; obscurant and smoke training; demolition training; testing of munitions, weapons systems, and components (most are exempt); demilitarization: disassembly, recovery, reclamation, resale, or recycle; disposal: open burning (OB) of propellant for destruction; open detonation (OD); incineration; chemical neutralization; detonation and destruction of UXO; and waste treatment activities such as chemical neutralization of pink water and other wastes." (Source: EPCRA Munitions Reporting Handbook for the U.S. Army, May 2002).

[2] "Range employees are persons who spend time on the range and whose responsibilities include operating, managing, or maintaining the range. Examples of such employees are target construction and maintenance crews, contractors or military personnel who perform range clearance sweeps or cleanup activities, natural resources managers, range control officers, and range safety officers. Civilian and military personnel using a range to conduct training exercises or testing activities do not count as range employees." (Source: DoD Final Range Policy Guidance, March 2000).

Form 12. Environmental Planning Interview Record

Point of Contact (POC) Information

1. Date: ***05 June 2008***

2. Time: ***1400 hours***

3. Location: ***ERG Office (Chantilly, VA)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Patrick Goodwin***

8. POC Title: ***Environmental Scientist***

9. E-mail Address: ***patrick.goodwin@erg.com***

10. Phone Number: ***(703) 633-1667***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) [✓ ***Yes***] No

14. Name and Affiliation of Interviewer: ***Joshua Moore - ERG (Navy Contractor)***

National Environmental Policy Act (NEPA)

13. Have the environmental impacts from operations at this range been addressed in a CATEX, EA, or EIS? (circle) Yes [✓ ***No***]
If no, explain: ***Range operations were initiated prior to the development of NEPA requirements. An EA is currently being prepared that will provide an environmental baseline for all existing operations at NSF Indian Head, including range operations.***
If yes, give CATEX, EA, or EIS title and, if applicable, date of Record of Decision (ROD):
Is EIS current? (circle) Yes No
Does this CATEX, EA, or EIS cover all operations at the range? (circle) Yes No
If no, explain:

14. Are individual range operations covered by EAs? (circle) Yes [✓ ***No***]
If no, are range operations incorporated under an EIS?

15. Did mitigation measures result from existing NEPA documentation? (circle) Yes [✓ ***No***]
If yes, are mitigation measures being adhered to? (circle) Yes No
Explain:

16. Have NEPA compliance requirements from DoD, Navy, or a regulatory agency negatively impacted range operations? (circle) Yes [✓ ***No***]
If yes, state the requirements and negative impacts:

17. Does this range have a process for reviewing new or modified range operations for compliance with existing NEPA documentation? (circle) [✓ ***Yes***] No
Explain: ***Actions at NSF Indian Head are evaluated under the Comprehensive Work Approval Process (CWAP) to assess NEPA requirements.***

18. Are there plans to change the frequency or type of range operations in such a way that additional NEPA documentation would be required? (circle) Yes [✓ ***No***]
If no, go to next question. If yes, describe:

19. Has any outside party threatened or instigated legal action or waged a negative media campaign against the Navy with regard to NEPA compliance at this range? (circle) Yes [✓ ***No***]
Explain:

20. Would you consider this range to be in compliance with NEPA? (circle) Yes [✓ ***No***]
Explain:

21. What were the issues of concern expressed during public hearings (required by the NEPA process)? ***N/A***

Land Use

22. Has an AICUZ or RAICUZ study been performed on this range? (circle) Yes [✓ ***No***] If yes, when?
If no, proceed to question 23.

23. Did either study identify any Accident Potential Zone (APZ) or noise level problem areas outside the fence line? (circle) Yes No [✓ ***N/A***] If no, proceed to next question. If yes, explain problem areas and how they are being addressed:

24. Does the Navy range owner work with city/county planning departments to promote land use planning that is compatible with range operations? (circle) Yes [✓ ***No***]
Explain:

25. Are there any conflicts between local community-desired land use and range operations? (circle) Yes [✓ ***No***]
Explain:

Form 12. Environmental Planning Interview Record (Continued)

26. Is encroachment by residential and commercial development impinging upon range operations? (circle) Yes [✓ No]
Explain:

27. Does the range have a program or procedures in place to address public safety concerns, noise complaints and any other public concerns related to range operations? (circle) [✓ Yes] No
Explain: ***As part of its partnership with the Dahlgren Division, IHDIV uses the data gathered by the Sound Impact Prediction System (SIPS) at Dahlgren to predict noise impacts. The use of SIPS at Stump Neck has resulted in a decrease in the number of noise-related complaints received.***

28. Have measures been taken to mitigate the impact of noise on surrounding communities? (circle) [✓ Yes] No
Explain: ***SIPS incorporates weather and atmospheric information into a computer model that predicts the intensity and direction of sound waves. This information is used to determine how noise will travel and what impacts it might have on a community. The information allows IHDIV to postpone range operations until more favorable atmospheric conditions exist.***

29. Is noise a risk to sustained range operations due to public complaints? (circle) Yes [✓ No] Explain: ***The use of SIPS has mitigated this risk.***

30. Have any existing NEPA documents determined that noise from this range's operations has a significant impact on surrounding wildlife? (circle) Yes [✓ No]
Explain:

Off-Range Release

31. Does the Navy, regulatory agency, or public have any concerns with regard to the off-range release of chemicals, past or present, that could limit land use, now or in the future? (circle) Yes [✓ No]
Explain:

32. Have any off-range releases of munitions or their constituents occurred that have negatively impacted the surrounding community or environment? (circle) Yes [✓ No]
Explain:

Documents

33. Do you have copies, preferably electronic, of any documents that include, but are not limited to, CATEXs, EAs, EISs, AICUZ/RAICUZ studies/models, maps, noise mitigation measures/plans, letters from regulatory agencies pertaining to the range and environmental planning? ***See Environmental Program Office for these documents.***

Form 13. Range Environmental and Explosives Safety Management Interview Record

Point of Contact (POC) Information

1. Date: ***01 July 2008***

2. Time: ***1300 hours***

3. Location: ***Mr. Rogerson's Office***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Joe Rothenberger***

8. POC Title: ***Admin/Tech Specialist***

9. E-mail Address: ***joseph.rothenberger@namy.mil***

10. Phone Number: ***(301) 744-6868***

11. POC Navy Command Affiliation: ***EODTECHDIV***

12. Dept./Div./Branch: ***20/201/2014***

13. Contractor? (circle) Yes [✓ No]

14. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Administrative Requirements

15. Does this range have a management plan[1] addressing the requirements of DoDD 4715.11 that includes long-term sustainable range management objectives? (circle) Yes [✓ No] Explain: ***RSEPA is the first management plan that addresses long-term range sustainment.***

16. Does this range keep permanent records of munitions expended, including dud rate, by type quantity, location, and using organization? (circle) Yes [✓ No] Explain: ***Range 3 does not expend munitions. Range 3 does keep records on the type and quantity of munitions tested.***

17. Does this range keep permanent records of all UXO clearance operations and EOD incidents on range? (circle) Yes [✓ No] Explain: ***After each munitions test personnel sweep the range for explosive hazards and destroy any explosive hazards as part of the disposal validation process.***

18. Has this range conducted UXO surveys that are kept current? (circle) Yes [✓ No] Explain: ***See response to question number 17 above.***

Explosives Safety Management

19. Is range access restricted? (circle) [✓ Yes] No If yes, by what means: ***Located on Stump Neck, which is a fenced and guarded installation. Additionally, there is a gate at Archer Ave that is closed when Range 3 is in use. Half of the range boundary shares the shoreline of the Mattawoman Creek. The facility is not protected from boater access but 33CFR334.240 does warn boaters of the hazards associated with this area. There are surveillance cameras, warning lights, signs and a bull horn to warn individuals when testing occurs.***

20. Do individuals who are authorized acc0ess to this range receive explosives safety training before entering the range? (circle) [✓ Yes] Explain: ***Safety briefs are given to all visitors.***

21. Is there a procedure in place to determine when individuals who are authorized access to this range will be escorted? (circle) [✓ Yes] No Explain: ***Range 3 SOPs require all personnel to check in with range control.***

22. Are sole use target/impact areas designated to segregate munitions use? (circle) Yes [✓ No] Explain: ***Munitions are not fired at Range 3 or dropped onto Range 3. Munitions are manually placed onto the range and then tested.***

23. Are submunitions and depleted uranium use restricted to specifically designated areas? (circle) Yes [✓ No] Explain: ***Depleted uranium is not tested on Range3. Submunitions may be tested on this range but they are manually placed, not dropped or fired.***

24. Has this range established procedures for range clearance operations, including clearance frequency and degree? (circle) Yes [✓ No] Explain: ***Range 3 is not a typical range where munitions are dropped or fired upon. Munitions are manually placed and then detonated. After each detonation, personnel will sweep the range and gather all explosive hazards to validate disposal procedures.***

25. Is a hazard assessment conducted before any range clearance operations are conducted? (circle) [✓ Yes] No Explain: ***Every explosive operation conducted at Range 3 is covered by a SOP which includes a hazard assessment.***

26. Does this range conduct appropriate range clearance operations prior to changing the use of a range area? (circle) Yes [✓ No] Explain: ***Range 3 has never changed its use. If its use were to change, range clearance operations would be conducted at that time.***

27. Has this range established safe and practical methods[2] for recycling and disposing of range residues[3], such that range residues do not contain ammunition, explosives, or other dangerous articles prior to public release? (circle) [✓ Yes] Explain: ***See 25***

28. Does this range have an established procedure for responding promptly to protect personnel and property from explosives hazards on and off range? (circle) [✓ Yes] No Explain: ***Munitions are manually placed and then detonated on Range 3. Fragmentation distances are determined for each detonation prior to initiation to ensure that all fragments remain within inhabited building distances.***

Range Environmental Management

29. Is a program or procedure in place to assess the environmental impacts of munitions use on this range? (circle) [✓ No] Explain:

Form 13. Range Environmental and Explosives Safety Management Interview Record (Continued)

30. Does this range use targets that do not contain hazardous materials, such as petroleum, lubricants, radium dials, and batteries? (circle) Yes No [✓ ***N/A***] Explain: ***This range does not use targets at all.***
31. Describe the use of controlled burning[4] on this range: ***No controlled burning is utilized.***
Range Explosives Safety Communication
32. Does this range provide appropriate information to local officials regarding compatible use of land surrounding the range? (circle) [✓ ***Yes***] No Explain: ***The CFR §334.240 Potomac River, Mattawoman Creek and Chicamuxen Creek; U.S. Naval Surface Weapons Center, Indian Head Division, Indian Head, MD.***
33. Does this range have an established procedure for notifying Range Management personnel and the public of off-range explosives hazards? (circle) Yes [✓ ***No***] Explain: ***There is no documented procedure, however in general the range manager will inform the Safety and Environmental Offices if there is an incident.***
34. Does this range participate in a public-involvement program that provides a forum for the Navy and the public to discuss explosives hazards and other range issues that affect or have the potential to affect surrounding communities? (circle) Yes [✓ **No**] Explain:
35. Does this range have a Public Outreach Plan? (circle) [✓ ***Yes***] No Explain: ***The Public Affairs Office communicates regularly with the public.***
36. Does this range have a program in place to educate DoD personnel, their dependents, and private citizens living near this range on explosives hazards? (circle) Yes [✓ ***No***] Explain: ***There is no documented program, however the Public Affairs Office communicates regularly with the public.***
Off Range Release
37. Does this range have a procedure in place for responding to a release or substantial threat of release of MCs of potential concern off range, when such a release poses an imminent and substantial threat to human health or the environment? (circle) [✓ ***Yes***] No Explain: ***The Test Readiness Review Board addresses threats to human health prior approving range operations.***
Documents
38. Do you have copies, preferably electronic, of any documents that pertain to this range including, but not limited to, a Range Management Plan, an Operations Management Plan, a Range Safety Plan, a range clearance policy, a Range Public Outreach Plan, AICUZ/RAICUZ study/maps, a munitions off-range release response plan, environmental assessments of munitions affect on range environment, munitions records, Range Maintenance Plans, and UXO survey? List all documents obtained:

Release – Munitions or MCs of potential concern that escape into the environment beyond the defined range boundary.

[1] Section 5.4.4 specifies that plans, at a minimum, will address long-term sustainable use, management procedures, recordkeeping, standards, monitoring, public outreach, public participation programs (if required), technology requirements to ensure sustainable range management, integration with other range planning processes, and resources.

[2] In accordance with DoD Manual 4160.M (reference f).

[3] Examples of range residues include cartridge cases, ordnance-derived wastes, and targets.

[4] Per DoDD 4715.11, controlled burning of vegetation as a method of UXO clearance is prohibited. Controlled burning may be used to control dense brush and undergrowth to make UXO clearance operations safe for personnel conducting clearance.

Form 14. Installation Restoration Interview Record

Point of Contact (POC) Information

1. Date: ***05 June 2008***

2. Time: ***1300 hours***

3. Location: ***Conducted via Email***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Shawn Jorgensen***

8. POC Title: ***Safety Engineer; formerly, Installation Restoration Program Manager for the Environmental Program Office***

9. E-mail Address: ***shawn.a.jorgensen@navy.mil***

10. Phone Number: ***(301) 744-6055***

11. POC Navy Command Affiliation: ***Naval Ordnance Safety and Security Activity***

12. Dept./Div./Branch: ***NAVSEA***

13. Contractor? ***No***

14. Name and Affiliation of Interviewer: ***Adam Humphreys, ERG (Navy Contractor)***

Release & CERCLA[1]

15. Has a release[1] of hazardous substances[2], pollutants[3], contaminants, or petroleum-based products occurred on range? ***Suspected***

If yes, describe releases (number of sites, locations on range, chemicals, and quantities) and whether and to whom releases were reported:

The Range 3 Burn Point (IR Site 58) is used to periodically burn or thermally treat explosive wastes generated at the facility. The wastes are burned either directly on bare soil using gasoline as an ignition source or in the Capture Test Pot (SWMU 16) that rests on bare soil approximately 15-30 feet from the Creek's edge.

16. Have hazardous substances, pollutants, contaminants, or petroleum-based products from the range been released off range? ***No***

If yes, describe releases (number of sites, location of on-range source of release, location of off-range site, chemicals, and quantities) and whether and to whom releases were reported:

17. Does this range have any sites where munitions were buried for disposal? ***Yes***

If yes, describe sites:

Chicamuxen Creek's Edge Dump site A is located directly under the Range 3 Burn Point. There are indications that the earthen area which comprises this unit and the Range 3 Burn Point are man-made fill areas, but exactly what was dumped there is unknown.

18. Are any of the sites listed above designated IR sites? ***No***

If yes, describe:

Range 3 Burn Point (IR Site 58, SWMU 2) and Chicamuxen Creek's Edge Dump Site A (IR Site 59, SWMU 3) are both identified as IR sites and were examined under the RFI/VI as required by the NEODTC RCRA Corrective Action Permit in 1998. The Capture Test Pot (SWMU 16) is identified as an IR Area of Concern and was examined according to the 1990 EPA RCRA Corrective Action Permit. It was included in the January 2002 Desktop Audit Decision Document, which concluded that the unit would be investigated as part of the Remedial Investigation for Site 58. However, because Range 3 is an active range, all three of these sites will not be addressed under the IR program. Based on this information, we determined that there are no designated IR sites on Range 3.

19. Have any steps been taken to characterize, contain, or remediate range IR sites? ***N/A***

Explain: ***See answer to question 18. The sites were investigated and determined to be ineligible for further action under CERCLA because they are co-located with an active range. Therefore no containment or remediation has occurred.***

20. Has the range determined if any IR sites pose a substantial threat to public health or the environment? ***N/A***

Explain: ***See answer to question 18.***

If yes, what is being done to mitigate risks to public and environment?

21. Is there a concern, by the Navy, regulatory agency, and/or public, regarding the off-range release of toxic chemicals and their possible impact on the surrounding community and environment? ***No***

If yes, describe:

Public Involvement

22. Does the range have a Restoration Advisory Board (RAB) for any of the IR sites? ***N/A***

If yes, explain:

23. In addition to or in lieu of a RAB, does the range have a proactive public involvement program that allows the Navy and public to exchange information and concerns regarding IR sites and off-range releases? ***N/A***

Explain:

Form 14. Installation Restoration Interview Record (Continued)

24. Is a procedure in place for receiving and responding to all public inquiries regarding the range and IR sites? ***N/A***
Explain:

25. What are the issues of concern expressed by the public?
Describe: ***There have been complaints about excessive noise from detonations.***

Regulatory Impacts on Range

26. Have Federal or State regulators issued the range any NOV for CERCLA noncompliance? ***No***
If no, proceed to next question. If yes, who issued the NOV, what were the deficiencies and how are deficiencies being resolved?

27. Have any requirements from the Navy or a regulatory agency regarding IR site management negatively impacted range operations? ***No***
If yes, state the requirements and negative impacts:

Documents

28. Do you have copies, preferably electronic, of any range IR related documents including, but not limited to, list of IR sites, any release notifications, any communications regarding IR sites, Public Outreach Plan, description of RAB, and any studies or reports pertaining to IR sites? ***Yes***
List all documents obtained:

(1) Site Management Plan for Installation Restoration Program, NSF-IH, Fiscal Year 2007-2008 (Revised August 2007), submitted by Tetra Tech NUS, Inc.

***(2) Final* Preliminary Assessment, Stump Neck Annex, NDW-IH, September 2005, prepared by Malcolm Pirnie, Inc. (see Form 5)**

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[1] As defined by Section 101(22) of CERCLA, release means “any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping or disposing into the environment (including the abandonment or discarding of barrels, containers and other closed receptacles, containing any HS, pollutant or contaminant), but excludes any release that results in exposure to persons solely within a workplace….” ‘For purposes of the NCP (National Contingency Plan, release also means threat of release.’ (Source: OPNAVINST 5090.1B CH-4, Chapter 15, Installation Restoration, 9 September 1999).

[2] **Hazardous Substance**. For the purposes of the IR Program, hazardous substance is as defined in CERCLA Section 101(14) and designated under reference (b). This includes materials that, “because of quantity, concentration, physical, chemical or infectious characteristics, may pose a substantial hazard to human health or the environment when released or spilled.” (Source: OPNAVINST 5090.1B CH-4, Chapter 15, Installation Restoration, 9 September 1999).

[3] **Pollutant**. As defined by Section 101(33) of CERCLA, pollutant includes, but is not limited to, any element, substance, compound, or mixture, including disease-causing agents, which after release into the environment and upon exposure, ingestion, inhalation, or assimilation into any organism either directly from the environment or indirectly by ingestion through food chains, will or may reasonably be anticipated to cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions or physical deformation, in such organisms or offspring.’ (Source: OPNAVINST 5090.1B CH-4, Chapter 15, Installation Restoration, 9 September 1999).

Form 15. Storage Tank and POL Management Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***
2. Time: ***1300 hours***
3. Location: ***Environmental Office (B289)***
4. Tactical Theater Name: ***Naval Support Facility Indian Head***
5. Range Complex Name: ***Stump Neck***
6. Range Name: ***Range 3***
7. Name of POC Interviewed: ***Robert Harrison***
8. POC Title: ***Environmental Protection Specialist***
9. E-mail Address: ***Robert.w.harrison1@navy.mil***
10. Phone Number: ***(301) 744-2259***
11. POC Navy Command Affiliation: ***NAVFAC Washington***
12. Dept./Div./Branch: ***Environmental Program Office***
13. Contractor? (circle) Yes [✓ ***No***]
14. Name and Affiliation of Interviewer: ***Chris Krejci and Josh Moore, ERG (Navy Contractor)***

Storage Tanks (UST)

15. Does this range have any USTs or ASTs? (circle) Yes [✓ ***No***]
Are any of the USTs or ASTs located on operational range areas? (circle) Yes No N/A
If yes, state number, type, and location of each tank:

16. Does this range have a current Tank Management Plan? (circle) Yes No [✓ ***N/A***]

17. Do all range USTs have secondary containment? (circle) Yes No [✓ ***N/A***]

18. Do all range UST systems[1] have corrosion protection systems, such as cathodic protection, that are routinely inspected and maintained? (circle) Yes No [✓ ***N/A***]

19. Are all range UST systems equipped with spill/overfill prevention equipment and have an approved method of release detection? (circle) Yes No [✓ ***N/A***]

20. Do all ASTs have a release detection system in place? (circle) Yes No [✓ ***N/A***]

21. Have any storage tanks been removed from the range? (circle) Yes No [✓ ***N/A***]
If yes, have any of these tanks leaked and resulted in an IR site? Explain:

POL

22. Does this range have a current Spill Prevention Control and Countermeasure (SPCC) Plan? (circle) [✓ ***Yes***] No

23. Does this range have a current Oil and Hazardous Substances Facility Response Plan (FRP)? (circle) [✓ ***Yes***] No

24. Does this range have a spill response training program in place? (circle) [✓ ***Yes***] No

25. Have any POL spills occurred within the past 3 years at either range or range support facilities? (circle) Yes No [✓ ***N/A***]
If yes, how many of these spills were reported and to what agencies?

Regulatory Impacts on Range

26. Have Federal or State regulators issued the range any NOVs for noncompliance with Federal or State UST, AST, or POL laws? (circle) Yes No [✓ ***N/A***]
If no, proceed to next question. If yes, what agency issued the NOV, what were the deficiencies, and how were the deficiencies resolved?

27. Have any requirements from the Navy or a regulatory agency regarding UST/AST/POL management negatively impacted range operations? (circle) Yes No [✓ ***N/A***]
If yes, state the requirements and negative impacts on range operations:

Documents

28. Do you have copies, preferably electronic, of any range storage tank or POL management -related documents that include, but are not limited to the following: SPCC Plan, Spill Contingency Plan (SPC), FRP, Tank Management plan, NOVs, and regulatory agency inspection reports?
List all documents obtained: ***See Environmental Program Office for these documents.***

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[1] UST System per OPNAVINST 5090.1B CH-4 is an underground storage tank and its piping.

Form 16. Safe Drinking Water Interview Record

Point of Contact (POC) Information

1. Date: ***15 May 2008***

2. Time: ***1300 hours***

3. Location: ***Environmental Office (B289)***

4. Tactical Theater Name: ***Naval Support Facility Indian Head***

5. Range Complex Name: ***Stump Neck***

6. Range Name: ***Range 3***

7. Name of POC Interviewed: ***Kathy Frey***

8. POC Title: ***Environmental Protection Specialist***

9. E-mail Address: ***mary.frey@navy.mil***

10. Phone Number: ***(301) 744-2258***

11. POC Navy Command Affiliation: ***NAVFAC Washington***

12. Dept./Div./Branch: ***Environmental Program Office***

13. Contractor? (circle) Yes [✓ No]

14. Name and Affiliation of Interviewer: ***Adam Humphrey, Christopher Krejci, Joshua Moore, and Alison Poe; ERG (Navy Contractor)***

Potable Water

15. Is there a source of potable water located on this range? (circle) Yes [✓ No]
If yes, is it surface water and/or groundwater?
If no, where is the closest source of potable water from this range? ***Well 2012 (7100 ft away)***

16. Does the closest source of potable water serve Navy personnel, Navy housing, or nearby civilian , communities? (circle) [✓ Yes] No
Describe all who use water and for what purposes: ***Navy personnel use potable water nearby for domestic and industrial uses.***

17. Is the closest source of potable water drawing from a designated sole source aquifer? (circle) Yes [✓ No]
Where is this range located with respect to groundwater flow from the range?

18. Is this range located in a recharge zone for a designated sole source aquifer? (circle) Yes [✓ No]

19. Does this range oversee the use of this closest source of potable water? (circle) Yes No
If yes, proceed to next question. If no, who does?.

20. Does the range fit the SDWA description of owner or operator of a Public Water System (PWS)[1,2]? (circle) [✓ Yes] No
Both Indian Head and Stump Neck meet the requirements of owner/operator of a PWS; however, no individual range fulfills this responsibility.
If yes, describe the PWS ("community"[3], "noncommunity nontransient"[4], or "noncommunity transient"[5]), the source, how many people it serves, and other uses of this PWS: If no, proceed to question 25. ***Noncommunity, nontransient water system pumping from both the Patapsco and Patuxent aquifers. This PWS serves approximately 300 people on a regular basis. (Envirofacts (http://oaspub.epa.gov/enviro))***

21. Does this range, as PWS owner/operator, treat water prior to distribution? (circle) [✓ Yes] No
Describe the treatment methods: ***Chlorination at the well bore using NaOCl.***

22. Does this range, as PWS owner/operator, monitor water prior to distribution for EPA primary drinking water standards and total coliform? (circle) [✓ Yes] No
If yes, describe analytes that are routinely monitored: ***All analytes in the primary standards are routinely monitored. Analytes in the secondary standards are sampled once every three years.***

23. Has the PWS water exceeded MCL standards in the past year? (circle) Yes [✓ No]
If yes, what analytes exceeded MCL standards, were any NOVs issued, were any public notifications required, and what was done to correct exceedance(s)? ***PWS did exceed***

24. Has the PWS water exceeded action levels for lead and copper in the past year? (circle) Yes [✓ No]
If yes, was public notification required and what was done to correct exceedance(s)?

25. Does the range as PWS owner/operator have a cross connection control program? (circle) [✓ Yes] No
Explain: ***The program was approved by MDE. The program focuses on backflow preventers at the well, but is working to implement backflow preventers for all downstream users.***

26. Does this range as PWS owner/operator keep current records of all sampling results and analysis, monitoring, sanitary survey reports, actions taken to correct violations of drinking water standards, and any written reports or communications to Federal or State regulatory agency? (circle) [✓ Yes] No
If no, explain:

27. Does the range have a current operation and maintenance program for its PWS? (circle) [✓ Yes] No
Describe: ***The program is a bit outdated (from the1990s). Staffing problems have made the development of a new program difficult.***

28. Does the range have a source of potable water that is not considered a "public water system" yet is still used for drinking water? (circle) Yes [✓ No]
If yes, describe the potable water source, any State or local safe drinking water requirements, who uses the water, and for what purpose(s).

Form 16. Safe Drinking Water Interview Record (Continued)

29. Does this range receive potable water from a city water supply or from water that is transported via tank? (circle)
Yes [✓ No] Explain:

Nonpotable Water

30. Does this range have a source of nonpotable water? (circle) Yes [✓ No]
If yes, describe who uses water and for what purpose(s), if any.

Source Water Protection

31. Has the Navy assessed whether any range military operations or range support facilities/operations could directly or indirectly contaminate a sole source aquifer through its recharge zone? (circle) Yes [✓ No]
Explain: ***There are no sole source aquifers within 34 miles of NSF Indian Head. The Navy has studied the migration of MCs through groundwater at the Strauss Avenue Thermal Treatment Point.***

32. Has the Navy, regulatory agency, or the public expressed concerns regarding the release of MCs of potential concern or other chemicals off range that might contaminate a drinking water source? (circle) Yes [✓ No]
Explain:

33. Has the Navy, a regulatory agency, or the public expressed concerns regarding the release of MCs of potential concern or other chemicals that might contaminate a range drinking water source? (circle) Yes [✓ No]
Explain:

Regulatory Impacts on Range

34. Have Federal or State regulators issued this range any NOVs for noncompliance with Federal, State, or local drinking water standards? (circle) Yes [✓ No]
If no, proceed to next question. If yes, what agency issued the NOV, what were the deficiencies and how are deficiencies being resolved?

35. Have any requirements from the Navy or a regulatory agency regarding safe drinking water management negatively impacted range operations? (circle) Yes [✓ No]
If yes, state the requirements and negative impacts on range operations:

Documents

36. Do you have copies, preferably electronic, of any safe drinking water management-related documents that include, but are not limited to, the following: Operations & Management Plan, sampling and analytical reports, public notification of noncompliance with drinking water standards, Sanitary Survey Report, NOVs, and regulatory agency inspection reports? ***No documents readily available in electronic format. See Environmental Program Office for these documents.***
List all documents obtained:

[1] Public Water System (PWS) – a public system for the provision of piped water for human consumption, if such system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year. Such system includes any collection, treatment, storage, and distribution facilities under the control of the operator of such system and is used primarily in connection with such system, and any collection or pretreatment storage facilities not under such control that are used primarily in connection with such system. A public water system is either a “community water system” or a “noncommunity water system.” (Source: OPNAVINST 5090.1B CH-4, Chapter 8, “Drinking Water Systems and Water Conservation”)

[2] Facilities that meet all the criteria listed below are not required to comply with the requirements of the SDWA since, by definition, they are not public water systems (40 CFR 141.3):

- System consists only of distribution and storage facilities and does not have any collection and treatment facilities
- The facility gets all of its water from a public water system that is owned or operated by another party
- The facility does not sell water to any party.

(Source: U.S. TEAM Guide, Section 13, Water Quality Management, December 2000)

[3] Community water system – a public water system that serves the same people year round.

[4] Noncommunity nontransient water system – a public water system that serves the same people more than 6 months, but not year round (i.e., a school with its own water supply).

[5] Noncommunity transient water system – a public water system that does not serve the same people for more than 6 months (i.e., a rest area or campground with its own water supply).

(Source for 3-5: EPA Safe Drinking Water Act Fact Sheet, “Understanding the Safe Drinking Water Act.”)

Form 17a. Operational Range Site Model – Operational Component

Operating Area Name	Range Complex Name	Range Name(s)
Naval Support Facility Indian Head	***Stump Neck***	***Range 3***

Range Complex Location:

Stump Neck Peninsula

Boundaries (Bottom/Top and Latitude/Longitude) and Size (acres for land/square miles for water):

Lower: ***Groundwater Table***
Upper: ***Ground Surface***
Northern: ***38.544***
Southern: ***38.543***
Eastern: ***-77.240***
Western: ***-77.241***
Area: ***2.438***

Installation Universal Identification Code (UIC):

N0464A

Regional Commander (Management):

Name: ***Catherine Hanft***
Command: ***Naval Support Activity South Potomac***
Title/Position: ***Captain***
Address: ***6509 Sampson Rd, Building 101, Dahlgren, VA 22448***
Phone Number: ***(540) 653-8203***
E-mail address: ***catie.hanft@navy.mil***

Installation, Fleet Commands, and Other Echelon II Commands (Scheduling Authority):

Captain Brian Brakke (EODTECHDIV)

Who are the primary users of the range? List training groups, squadrons, other services, foreign countries, etc.

EODTECHDIV

Other Range-Related Facilities:

Pinkwater Facility (Closed), Dump Site A

How long has this range been under military control?	Month/Year: ***1976***
When was this range last used?	Currently in Use

When in use, how often was it used (check one)?

[✓ ***Daily***]
Weekly
Monthly
Unknown
Other: ___________________

How would you classify this range (check all that apply)?

[✓ ***Research, Development, Testing, Evaluation***]
Training
Other: _____________________________

What types of training and/or testing operations are conducted? (Select all that apply.)

Air-to-air
Air-to-land
Air-to-water
Airborne surface attack
Amphibious warfare
Anti-submarine warfare
Electronic warfare
Land-to-air
Land-to-land
Land-to-water
Mine laying/countermeasures training
[✓ ***Open burning/open detonation***]
Small-arms training
Special warfare
Water-to-air
Water-to-land
Water-to-water
Other: _____________________________

Form 17a. Operational Range Site Model – Operational Component (Continued)

What types of ordnance/military devices were used at this range? (Select all that apply.)

Live	Inert	Device	Live	Inert	Device
		Ballistic missiles	X		Primers, detonators, fuzes, squibs
X		Bombs			Projected grenades
X		Bulk high explosives, demolition charges		X	Projectiles
		Bulk propellant, propellant charges			Pyrotechnics (flares, signals, simulators)
		Guided missiles			Rifle grenades
		Cartridge Actuated Devices (CADs) and Propellant Actuated Devices (PADs)			Riot control agents
		Chaff			Rockets
		Depth charges			Small arms ammunition (.50 cal or under)
		Hand grenades			Submunitions
		Large rocket motors (> 1,000 lbs)			Torpedoes
		Mines			Warheads
		Mortars			Other:

What type of targets were used at this range? (Select all that apply.)

Stationary
Mobile
None
Unknown

If targets are/were used, please provide details including types and locations:

Enclose a geographical map illustrating the following (check which apply):

√Range location
√Range boundaries
√Target locations

Range areal extent, including the following:
Counties Tribal reservations Independent cities/towns/States

Is this range, including the impact area, undergoing or has it undergone any type of investigation, cleanup, or response action for unexploded ordnance (UXO) or MCs?

Yes, Range 3 has undergone a RCRA Facility Investigation/Verification Investigation (1997) including soil, sediment, groundwater, and surface water sampling.

No

Form 17b. Operational Range Site Model – Land Use Component

Who is the owner and who are other users of the range/Operational area (OPAREA)?		
Owner	**User**	
EODTECHDIV	***EODTECHDIV***	Navy (Identify): ***EODTECHDIV*** ____ Other DoD component (Identify): ***N/A*** ____________________ Other Federal agency (Identify): ***N/A*** ______________________ State, city, or other municipality (Identify): ***N/A*** ______________ Tribe (Identify): ***N/A*** ____ Commercial activity (Identify): ***N/A*** _____________________________________ Private individual or organization (Identify): ***N/A*** __________________________ If Navy is not owner, when does lease, land withdrawal, or agreement to use land expire? ***N/A*** __________________________

What are the current land uses? (Check on range/off range for all that apply.)					
On	**Off**	**Use**	**On**	**Off**	**Use**
		None, no access authorized		X	***Vehicle parking***
	X	***Wildlife refuge***		X	***Surface supply storage***
		Livestock grazing			Commercial
		Agriculture			Residential
	X	***Surface recreation***			Construction
		Subsurface recreation			Other _________________________

How is access controlled? (Select all that apply.)

Access key maintained by security/range officer
Fencing around entire range/site
Locked/secured gates
Log-in book
No controls

Partial fencing
Patrolled by aircraft
Patrolled by Navy vessel
Patrolled by security officer or other official
Signs
Other: ____________

Form 17c. Operational Range Site Model – Environmental Component

List the predominant soil type (select one).

Clay-sand/clay-silt

Clay/sand with stone
Gravel/gravel-sand
Rock

Sand/gravel-sand

Sand-silt/sand-clay

Silt/silty clay
Water range/site
Other: ____________________________

List the predominant topography.

Flat ***(from topographic contours)***
Flat with gorges or gullies
Gently rolling
Heavily rolling

Mountainous
Rolling with gorges or gullies
Water range/site
Other: ____________________________

List the predominant vegetation.

Barren or low grass ***(1997 Satellite Imagery)***
Heavy grass and many shrubs
Heavy shrubs and trees
Low grass and few shrubs

Shrubs and some trees
Heavily wooded
Water range/site
Other: ____________________________

What is the depth to shallowest groundwater and bedrock?

Groundwater: ___*6*________ feet below ground surface
Bedrock: _____*>1000*________ feet below ground surface

Is the closest (i.e., shallowest) aquifer actually used as a drinking water or other type of source?

Drinking Water	Other (e.g., irrigation)
Yes	Yes
No ***(Aquifers at the range are from the Patapsco and Patuxent Groups)***	No
Unknown	***Unknown***

Based on sampling data, estimate the level of surface or groundwater contamination as a result of range operations.

Non-detectable
Significant

Minimal
No data available

Moderate
Unknown

Based on investigations or other data, estimate any adverse impacts on sensitive ecosystems as result of past operations conducted on this range.

Non-detectable
Significant/substantial

Minimal
Samples not taken

Moderate
Unknown

Form 17c. Operational Range Site Model – Environmental Component (Continued)

Is there any information indicating the presence of any potential or known threatened/endangered species – flora and fauna – on this range?

Yes
[✓ ***No***]
Unknown

If yes, identify species: ____

Based on investigations or other data, estimate any adverse impacts to natural resources as a result of past operations conducted on this range.

[✓ ***Non-detectable***] Significant/substantial	Minimal No data available	Moderate Unknown

Estimate the potential for hazardous releases to the air as a result of past operations conducted on this range.

Nondetectable Significant/substantial	[✓ ***Minimal***] Unknown	Moderate

Have any NEPA documents that address range operations been prepared?

Yes

[✓ ***No***] ***(An EA is currently being prepared that will provide an environmental baseline for all existing operations at NSF Indian Head, including range operations.)***

Unknown

If yes, please identify documents:

Form 18. Encroachment Review

Are there environmental restrictions on <u>where</u> training operations are performed?

N/A – Military training is not conducted at this range.
Avoidance areas
Rise in altitudes for flight training

If yes, please specify: _______________________________________
If others, please specify: _______________________________________

Are there environmental restrictions on <u>what</u> training operations are performed?

N/A – Military training is not conducted at this range. Weapons application
New technologies

If yes, please specify: _______________________________________
If others, please specify: _______________________________________

Are there environmental restrictions on <u>how</u> training operations are performed?

N/A – Military training is not conducted at this range.
Frequency spectrum encroachment
Underwater noise constraints
Size constraints
Additional duties assigned to personnel
Additional costs

If yes, please specify: ____
If others, please specify: ____

Are there environmental restrictions on <u>when</u> training operations are performed?

N/A – Military training is not conducted at this range.
Available training days/times
Night and all-weather training
Reduction in flexibility/ increase in planning required to gain access

If yes, please specify: _______________________________________
If others, please specify:

Are there environmental restrictions on how training operations are managed/overseen?

N/A – Military training is not conducted at this range.
Additional management requirements
Additional costs
Permits
Property negotiations/agreements (e.g., buffer zones)
Legal consul
Negotiations over regulations
Public relations activities

If yes, please specify: _______________________________________
If others, please specify: _______________________________________

Form 19. Summary of RSEPA Noncompliance Status for Range

Type of Noncompliance	Statute/Regulation or Defense Requirement	Describe Potential Noncompliance (Specify Location)	Categorize Each Deficiency			Navy Compliance Project Category
			Significant	Major	Minor	
Air Quality		None				
Water/Wastewater	Clean Water Act of 1987 (CWA)	Used test items are stored on the ground and/or uncovered on-range; these items may be a source of pollutants contributing to stormwater contamination.			X	Class I
Military Munitions/Solid Waste/Hazardous Materials/Hazardous Waste	42 USC 6901 to 6992k	Although not yet completed, the Navy is currently developing a base-wide Hazardous Waste Management Plan.			X	Class I
	40 CFR 761.180	The base-wide PCB Management Plan has lapsed.			X	Class I
Cultural Resources		None				
Natural Resources		None				
EPCRA		None				
Environmental Planning		None				
Range Environmental and Explosives Safety Management	DoDD 4715.11	None of the ranges at the base have a Range Management Plan addressing long-term sustainable range management objectives.			X	Class I
Installation Restoration		None				
Storage Tank and POL Management		None				
Safe Drinking Water	OPNAVINST 5090.1B, Chapter 8, 8-5.8	The Operations and Maintenance Plan for the public drinking water supply system needs to be updated.			X	Class I
Range Encroachment		None				

Form 20. Summary of RSEPA Potential Off-Range Releases

Locations of Munitions Training	Status of Release[1]	Release Pathway[2]	Potential Receptors	Evidence
Range 3	Suspected	Surface Water	Ecological	**Present**
				Surface water RDX concentrations above the Human Health Standard predicted by the surface water model for year 2009.

[1] Status of release is

- Documented (e.g., confirmed by sampling and chemical analysis)
- Suspected, but has not yet been documented (e.g., observation of floating product near range boundaries)
- Possible (e.g., live-fire impact area uphill from surface water body)
- Unknown.

[2] A release pathway is the environmental medium or matrix through which a contaminant or hazard migrates or contacts a receptor. Environmental pathways typically correspond to the medium where the contaminant is released, and to fate and transport processes following the release. Examples of environmental pathways are groundwater, surface soil, subsurface soil, sediment, surface water, and air. The biotic pathway occurs through uptake, accumulation, or concentration of contaminants by organisms, and subsequent transport of that contaminant through the food chain.

Form 21. Comparison of Screening Values for MCs to Concentrations in Soil and Sediment Samples*

Munition Constituent	Soil Residential (mg/kg)[1]	Cancer/ Noncancer	Soil Industrial (mg/kg)[1]	Exceeds Screening Value (Yes/No)	List Locations of Exceedances
2-Amino-4,6-dinitrotoluene	12	NC	120	No	
4-Amino-2-6-dinitrotoluene	12	NC	120	Not Tested	
1,3-Dinitrobenzene (1,3-DNB)	6.1	NC	62	Not Tested	
2,4-Dinitrotoluene (2,4-DNT)	120	NC	1,200	Not Tested	
2,6-Dinitrotoluene (2,6-DNT)	61	NC	615	Not Tested	
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.4	C	16	Yes	(6.3 mg/kg) RN3FT27
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	610	NC	6,200	Not Tested	
Nitrobenzene (NB)	20	NC	100	Not Tested	
Nitroglycerin (NG)	35	C	120	Not Tested	
2-Nitrotoluene (2-NT)	0.9	NC	2.2	Not Tested	
3-Nitrotoluene (3-NT)	733	NC	1,000	Not Tested	
4-Nitrotoluene (4-NT)	12	C	30	Not Tested	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	3,100	NC	31,000	No	`
Perchlorate[2]	7.8	NC/C	100	Not Tested	
1,3,5-Trinitrobenzene (1,3,5-TNB)	1,800	NC	18,000	No	
2,4,6-Trinitrotoluene (TNT)	16	C	57	Yes	(19.4 mg/kg) RN3FT37;

* Some laboratory methods may provide results for constituents that are not MCs as defined in RSEPA, but may be related to testing and training.

[1] EPA Region 9 Preliminary Remediation Goal Tables, 12/28/2004. Available at http://www.epa.gov/region9/waste/sfund/prg/index.html.

[2] Detections of perchlorate should be verified using confirmatory methods such mass spectrometry (MS) in accordance with Navy Perchlorate Sampling and Management Policy. DoD and CNO will continue to develop guidance and provide information on more accurate and reliable methods for sampling and testing.

Form 22. Comparison of Screening Values for MCs to Concentrations in Groundwater and Surface Water Samples*

Munition Constituent	Tap Water (µg/L)	CMC [3] (µg/L)	CCC [3] (µg/L)	Exceeds Screening Value (Yes/No)	List Locations of Exceedances
2-Amino-4,6-dinitrotoluene 7.3		— —		Not Tested	
4-Amino-2-6-dinitrotoluene 7.3		—	—	Not Tested	
1,3-Dinitrobenzene (1,3-DNB)	3.6	110[4,6]	30[4,6]	Not Tested	
2,4-Dinitrotoluene (2,4-DNT)	73	—	—	Not Tested	
2,6-Dinitrotoluene (2,6-DNT) 36.5		—	—	Not Tested	
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.61 4,000	[4,5]	190[4,6]	Yes	(1.2 µg/l) RN3MW001U001
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	365 —		—	Not Tested	
Nitrobenzene (NB)	3.4	27,000[4,5,7]		Not Tested	
Nitroglycerin (NG)	4.8[2]	1,700[4,5]	200[4,5]	Not Tested	
2-Nitrotoluene (2-NT)	0.05	— —		Not Tested	
3-Nitrotoluene (3-NT)	12	—	—	Not Tested	
4-Nitrotoluene (4-NT)	0.7	—	—	Not Tested	
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	400[2]	— 330	[4.6]	Not Tested	
Perchlorate[8]	3.6 —		—	Not Tested	
1,3,5-Trinitrobenzene (1,3,5-TNB) 1,100		30[4.6]	14[4.6]	Not Tested	
2,4,6-Trinitrotoluene (TNT)	2.2	560[4,5]	<40[4,5]	Not Tested	

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* Some laboratory methods may provide results for constituents that are not MCs as defined in RSEPA, but may be related to testing and training.

[1] EPA Region 9 Preliminary Remediation Goal Tables, 12/28/2004. Available at http://www.epa.gov/region9/waste/sfund/prg/index.html.

[2] U.S. Environmental Protection Agency. Winter 2004. *2004 Edition of the Drinking Water Standards and Health Advisories*, EPA 822-B-04-005, Office of Water, Washington, DC.

[3] CMC, the criteria maximum concentration, will protect against acute effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 1-hour average not to be exceeded more than once every 3 years on average. CCC, the criteria continuous concentration, will protect against chronic effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 4-day average not to be exceeded more than once every 3 years on average.

[4] Lowest-observable-adverse-effect level (LOAEL). Not enough data to develop criteria.

[5] Burrows, E.P., D.H. Rosenblatt, W.R. Mitchell, and D.L. Parmer. 1989. *Organic Explosives and Related Compounds: Environmental and Health Considerations*, U.S. Army Biomedical Research and Development Laboratory.

[6] Talmage, S.S., and D.M. Opresko. 1995. *Draft Ecological Criteria Documents for Explosives*, Oak Ridge National Laboratory, Oak Ridge, TN.

[7] U.S. Environmental Protection Agency. 1994. Water Quality Standards Handbook, Washington, DC.

[8] Detections of perchlorate should be verified using confirmatory methods such mass spectrometry (MS) in accordance with Navy Perchlorate Sampling and Management Policy. DoD and CNO will continue to develop guidance and provide information on more accurate and reliable methods for sampling and testing.

Form 23. Identification and Screening of Protective Measure Options

Noncompliance/ Off-Range Release	Protective Measure Options	Advantages	Disadvantages	Eliminate? (yes/no)
Range 3 Noncompliance – Test equipment which may be a source of pollutants for stormwater runoff is left on the ground and uncovered.	Option 1) Cover test equipment and store it off the ground to mitigate the potential for stormwater contamination.	Addresses noncompliance, improves public health and safety, and protects the environment.	Stringent existing requirements and lack of resources could limit the implementation of this option.	No
	Option 2) Construct bunkers for temporary storage of test equipment.	Addresses noncompliance, improves public health and safety, and protects the environment.	Finding a location for the bunker may be difficult, given current ESQD arcs and restrictions. This is a temporary solution to a growing problem.	No
Range 3 Release – Surface water RDX concentrations above the Human Health Standard predicted by the surface water model for year 2009.	Option 1) Pave main test area.	Reduces the amount of MCs that come into contact with the soil. Makes residual contaminants more visible, thus allowing for more thorough clean-up of spent munitions.	Construction would likely interfere with operations. May impact testing results.	No
	Option 2) Periodically excavate soil in the immediate vicinity of testing.	Reduces the amount of residual MCs that could potentially be released off-range.	Soil excavation on a periodic basis may be expensive and impact operations. Depending on frequency of excavation, contaminants may be released in runoff and/or leach into groundwater before removal.	No

Form 24. Evaluation and Ranking of Protective Measure Options (Range 3 Noncompliance)

Objectives	Weight (W)*	Option 1	Score (S)	W x S	Option 2	Score (S)	W x S
Operational Objectives	5	Should not impact current operations and will ensure long-term sustainment of range operations.	2	10	May disrupt operations during construction or placement of storage bunkers.	1	5
Safety Objectives	4	No significant contribution to safety objectives.	1	4	No significant contribution to safety objectives.	1	4
Public Health/ Community Objectives	3	Reduces the threat to public health by removing potential sources of contamination.	3	9	Reduces the threat to public health by containing potential sources of contamination.	2	6
Environmental Objectives	2	Reduces the threat to the environment by removing potential sources of contamination.	3	6	Reduces the threat to the environment by containing potential sources of contamination.	2	4
General Objectives	1	This is most likely the least expensive option and most technically practical, but will take time after each testing operation to implement.	3	32	This is likely to cost more than option 1 and is less technically practical, but it may take less time to implement.	2	2
Weighted Rank (sum of W x S for each option)				40			21
Option 1 = 40 Option 2 = 21							

* The Weight (W) for each objective was determined on a scale of 1 to 5 (1 = lowest, 5 = highest) by the Technical Team.

Form 24. Evaluation and Ranking of Protective Measure Options (Range 3 Release)

Noncompliance/Release: Surface water RDX concentrations above the Human Health Standard predicted by the surface water model for year 2009.
Protective Measure Option 1: Pave main test area.
Protective Measure Option 2: Periodically excavate soil in the immediate vicinity of testing.

Objectives	Weight (W)*	Option 1	Score (S)	W x S	Option 2	Score (S)	W x S
Operational Objectives	5	Construction of the paved test area would temporarily disrupt operations. Testing on a paved surface, rather than bare soil, could negatively affect test results.	1	5	Excavation of dirt could minimally disrupt operations on a periodic basis.	2	10
Safety Objectives	4	Testing on a paved surface, rather than bare soil, could cause a greater risk to worker safety.	1	4	Removal of MCs would improve worker safety.	2	8
Public Health/ Community Objectives	3	Paved surface would reduce the amount of contaminants that reach groundwater aquifers, thus protecting public health.	2	6	Excavating the top soil periodically would reduce the amount of contamination reaching groundwater aquifers, but not as effectively as option 1.	1	3
Environmental Objectives	2	Paved surface would reduce the amount of contaminants that reach groundwater aquifers, thus protecting the environment.	2	4	Excavating periodically would reduce the amount of contamination reaching groundwater aquifers, but not as effectively as option 1.	1	2
General Objectives	1	Paving the test area could entail a high short-term cost and long duration. In addition, it may not be technically practical.	1	1	Periodic excavation of soil would have high cumulative long-term costs, but would take minimal time for each excavation. This option may be more technically practical than option 1.	2	2
Weighted Rank (sum of W x S for each option)				20			25
Option 1 = 20 Option 2 = 25							

* The Weight (W) for each objective was determined on a scale of 1 to 5 (1 = lowest, 5 = highest) by the Technical Team.

Form 25. Selection of Preferred Protective Measure Options

Noncompliance/Release	Protective Measure Options	Weighted Rank	Requirement Score	Weighted Rank X Requirement Score	Preferred? (yes/no)
Range 3 Noncompliance – Test equipment which may be a source of pollutants for stormwater runoff is left on the ground and uncovered.	Option 1) Cover test equipment and store it off the ground to mitigate the potential for stormwater contamination.	32	10	320	Yes
	Option 2) Construct bunkers for temporary storage of test equipment.	21	5	105	No
Range 3 Release – Surface water RDX concentrations above the Human Health Standard predicted by the surface water model for year 2009.	Option 1) Pave main test area.	20	5	100	No
	Option 2) Periodically excavate soil in the immediate vicinity of testing.	25	5	125	Yes

APPENDIX B

RSEPA Form 5

Table B-1. RSEPA Form 5

Title of document	Date of document	Document version (e.g., draft/draft final/final)	Author of document	Driver for document (e.g., regulatory requirement, ad hoc basis)	Organization for which document was completed	Person who obtained the document	Who/where document was obtained from	Date document was obtained	Format of document (e.g., electronic format or hard copy)	Location of document in Range Data Folder (e.g., folder/subfolder(s)/filename, or office location)	Data quality (e.g., were data validated?)
33 CFR §334.240 Potomac River, Mattawoman Creek and Chicamuxen Creek; U.S. Naval Surface Weapons Center, Indian Head Division, Indian Head, MD	1997	Final	Federal Register, Records Administration Office	Title 33: Navigation and Navigable Waters	Not Applicable	Josh Moore (ERG)	http://ecfr.gpoaccess.gov	May, 2008	Electronic	http://ecfr.gpoaccess.gov	H
A Hydrodynamic Model Calibration Study of the Savannah River Estuary with an Examination of Factors Affecting Salinity	1999	Final	Davie, Mendelsohn, Peene, Yassuada	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://cedb.asce.org/cgi/WWWdisplay.cgi?0003270	July, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	M
A Preliminary Archeological Reconnaissance Survey of the Naval Ordnance Station Indian Head, Maryland. Vol. 1: Cornwallis Neck, Bullitt Neck and Throughfare Island - DRAFT	1985	Draft	William P. Barse	National Historic Preservation Act of 1966 (Public Law 89-665)	Depart of the Navy Chesapeake Division Naval Facilities Command	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Application for the Alteration of Any Tidal Wetland in Maryland	2008	Draft	NAVFAC Environmental	CWA §404	Department of the Navy	Alison Poe (ERG)	Indian Head Environmental Office	April, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	M
Application to MDE for Discharge under Permit MD0003158A	2003	Final	NSF Indian Head	Clean Water Act	Department of the Navy	Chris Krejci (ERG)	Indian Head Environmental Office	December, 2007	Hardcopy	Indian Head Environmental Office	L
Biological Opinion / U.S. Navy Support Facility Indian Head. U.S. Department of the Interior. Fish and Wildlife Service	2007	Final	John Wolfin (USDI - Fish and Wildlife Service)	Section 7 of the Endangered Species Act of 1973	Naval Support Facility, Indian Head	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
BRAC Relocation of Operations from Yorktown to Indian Head under BRAC 2005 Environmental Assessment	2008	Draft	ERG	National Environmental Policy Act	Naval Support Facility, Indian Head	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Climate Data for the State of Maryland	2008	Final	National Oceanic and Atmospheric Administration’s National Weather Service (NWS).	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://weather.noaa.gov/	May, 2008	Electronic	http://weather.noaa.gov/	M
Naval Support Facility (NSF) Indian Head Comprehensive Work Approval Process (CWAP)	Ongoing	-	Not Applicable	National Environmental Policy Act; National Historic Preservation Act of 1966 (Public Law 89-665)	Naval Support Facility, Indian Head	Josh Moore (ERG)	Indian Head Environmental Office	April, 2008	Electronic	Indian Head Environmental Office	L
Conceptual Model for the Transport of Energetic Residues from Surface Soil to Groundwater by Range Activities	2006	Final	U.S. Army Corps of Engineers (USACE)	Not Applicable	Not Applicable	Josh Moore (ERG)	www.crrel.usace.army.mil/library/technicalreports/TR-06-18.pdf	April, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	H
Enforcement & Compliance History Online (ECHO)	Ongoing	-	Not Applicable	Not Applicable	EPA, Office of Enforcement and Compliance Assistance	Josh Moore (ERG)	www.epa-echo.gov/echo/	May, 2008	Electronic	www.epa-echo.gov/echo/	M

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Envirofacts	Ongoing	-	Not Applicable	Not Applicable	EPA	Josh Moore (ERG)	http://oaspub.epa.gov/enviro	May, 2008	Electronic	http://oaspub.epa.gov/enviro	L
Environmental Background of Small Motor Test (November 2001)	2001	Final	Amanda Thepvongs (ERG)	Not Applicable	NSWC IHDIV	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Hard copy	Indian Head Environmental Office	L
Exposure Analysis Modeling System (EXAMS): User Manual and System Documentation	2000	Final	U.S. EPA, Office of Research and Development	GPRA Goal 4, Objective 4.3, Subobjective 4.3.4, Task 6519, Advanced Pesticide Risk Assessment Technology	Not Applicable	Chris Krejci (ERG)	http://www.epa.gov/ATHENS/publications/reports/EPA_600_R00_081.pdf	May, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	H
Final Preliminary Assessment, Stump Neck Annex, NDW-IH	2005	Final	Malcolm Pirnie, Inc.	IR Program	NAVFAC Environmental	Adam Humphreys (ERG)	Indian Head Environmental Office	February, 2008	Electronic	Indian Head Environmental Office	L
Flux of Gases across the Air-Sea Interface	1974	Final	Liss, P.S., and P.G. Slater	Not Applicable	Not Applicable	Chris Krejci (ERG)	www.nature.com/nature/journal/v247/n5438/abs/247181a0.html	July, 2008	Electronic	www.nature.com/nature/journal/v247/n5438/abs/247181a0.html	M
Geotechnical, Rock and Water Resources Library: Evaporation	2004	Final	The University of Arizona, Tucson	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://www.grow.arizona.edu/Grow--GrowResources.php?ResourceId=208	August, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	M
Guidance For Implementing The Emergency Planning And Community Right-To-Know Act (EPCRA) To Munitions Activities	1998	Final	Chief of Naval Operations	Emergency Planning and Citizens Right-to-Know Act	Department of the Navy	Alison Poe (ERG)	Indian Head Environmental Office	September, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	H
Historical and Architectural Investigation of 1950s - era Industrial Areas and Miscellaneous Buildings Indian Head Division, Naval Surface Warfare Center, Indian Head, Charles County, MD	2005	Final	Kathryn M. Kuranda (R. Christopher Goodwin & Associates, Inc.)	Section 110 of the National Historic Preservation Act (NHPA) of 1966	NSWC IHDIV	Patrick Goodwin (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Indian Head Cultural Resources Database	Ongoing	-	ERG	National Historic Preservation Act of 1966 (Public Law 89-665)	Naval Support Facility, Indian Head	Patrick Goodwin (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Indian Head Environmental Office Industrial Outfall Records	Ongoing	-	NAVFAC Environmental	Clean Water Act	Maryland Department of the Environment	Adam Humphreys (ERG)	Indian Head Environmental Office	May, 2008	Hardcopy	Indian Head Environmental Office	L

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Integrated Natural Resources Management Plan (INRMP), Naval Surface Warfare Center (NSWC), Indian Head Division (IHDIV)	2008	Draft	Geo-Marine, Inc.	DoD Instruction 4715.3 – Environmental Conservation Program, Navy Instruction OPNAVINST 5090.1B – Environmental and Natural Resources Program Manual, 16 U.S. Code (USC) § 670 a-f – Sikes Act, as amended, and 32 Code of Federal Regulations (CFR) Part 190 – DoD Natural Resources Management Program	Naval Support Facility Indian Head	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Mattawoman Creek Study	2004	Final	Tetra Tech NUS, Inc.	IR Program	Department of the Navy	Alison Poe (ERG)	Indian Head Environmental Office	July, 2007	Electronic	Indian Head Environmental Office	M
Mid-Atlantic Integrated Assessment (MAIA) Estuaries 1997-98	2002	Final	U.S. EPA, Office of Research and Development	Clean Water Act	Not Applicable	Chris Krejci (ERG)	EPA Headquarters	May, 2008	Hardcopy	ERG Library	H
NPDES Discharge Permit MD0020885 (WWTP)	2001	Final	Maryland Department of the Environment	Clean Water Act	Naval Support Facility Indian Head	Chris Krejci (ERG)	Indian Head Environmental Office	April, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	H
NPDES Discharge Permit MD003158A	2004	Draft	Maryland Department of the Environment	CWA Title IV	Naval Support Facility Indian Head	Chris Krejci (ERG)	Indian Head Environmental Office	July, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	M
Phase I Cultural Resources Survey of Stump Neck Annex and Supplemental Architectural Investigations, Indian Head Naval Surface Warfare Center, Charles County, Maryland	1998	Final	Christopher R. Polglase (R. Christopher Goodwin & Associates, Inc.)	National Historic Preservation Act of 1966 (Public Law 89-665)	NSWC IHDIV	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Quality Assurance and Quality Control Requirements for SW-846 Method 8330, Nitroaromatics and Nitramines by High Performance Liquid Chromatography (HPLC) for the Massachusetts Contingency Plan (MCP)	2004	Final	Massachusetts Department of Environmental Protection, Bureau of Waste Site Cleanup (MDEP)	Not Applicable	Not Applicable	Chris Krejci (ERG)	www.mass.gov/dep/cleanup/laws/8330mcp.pdf	July, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	H
NSF Indian Head Range SOPs	Various	Final	Various	Health and Safety Requirement	NSWC Safety Office	Adam Humphreys (ERG)	NSWC Safety	March, 2008	Electronic	Naval Support Facility Indian Head	L

Table B-1. RSEPA Form 5

Title of document	Date of document	Document version (e.g., draft/draft final/final)	Author of document	Driver for document (e.g., regulatory requirement, ad hoc basis)	Organization for which document was completed	Person who obtained the document	Who/where document was obtained from	Date document was obtained	Format of document (e.g., electronic format or hard copy)	Location of document in Range Data Folder (e.g., folder/subfolder(s)/filename, or office location)	Data quality (e.g., were data validated?)
RCRA Facility Investigation/Verification Investigation Report for Stump Neck Annex, IH Div, NSWC, Indian Head, Maryland	1998	Draft	Leeann Sinagoga (Brown & Root Environmental)	RCRA	Engineering Field Activity Chesapeake Environmental Branch Code 18 Naval Facilities Command	Alison Poe (ERG)	Indian Head Environmental Office	February, 2008	Hard copy	Indian Head Environmental Office	M
Region 3 Sole Source Aquifer Map	2007	Final	EPA Region 3 GIS Team, Environmental Assessment & Innovation Division	Safe Drinking Water Act § 1424	Not Applicable	Chris Krejci (ERG)	http://www.epa.gov/reg3wapd/presentations/ssa/index.htm	May, 2008	Electronic	http://www.epa.gov/reg3wapd/presentations/ssa/index.htm	H
Sampling Results: Soil and Groundwater Screening, Biazzi and Moser Plants	2002	Final	ERG	Not Applicable	Department of the Navy	Chris Krejci (ERG)	Indian Head Environmental Office	August, 2008	Hard copy	Indian Head Environmental Office	L
Screening Procedures for Estimating the Air Quality Impact of Stationary Sources	1992	Final	U.S. EPA, Office of Air and Radiation	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://mainegov-images.informe.org/dep/air/meteorology/screening_guidance.pdf	May, 2008	Electronic	http://mainegov-images.informe.org/dep/air/meteorology/screening_guidance.pdf	H
Simulation Model for Open-Channel Flow and Transport	1998	Final	U.S. Geological Survey	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://smig.usgs.gov/SMIG/features_0998/branch.html	July, 2008	Electronic	http://smig.usgs.gov/SMIG/features_0998/branch.html	H
Site Management Plan for Installation Restoration Program, NSF-IH, Fiscal Year 2007-2008	2007	Final	George Latulippe (Tetra Tech NUS, Inc.)	Final	NAVFAC	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Stream flow Data for the Potomac River Near Washington, DC., USGS Station 01646500	2006	Final	U.S. Geological Survey	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://waterdata.usgs.gov/dc/nwis/uv/?site_no=01646500&PARAmeter_cd=00400,00095,00010/	May, 2008	Electronic	http://waterdata.usgs.gov/dc/nwis/uv/?site_no=01646500&PARAmeter_cd=00400,00095,00010/	M
Temporary Emergency Exposure Limits (TEELs)	2005	Draft	U.S. Department of Energy (U.S. DOE)	Health and Safety Requirement	Not Applicable	Chris Krejci (ERG)	http://www.eh.doe.gov/chem_safety/teel.html.	May, 2008	Electronic	http://www.eh.doe.gov/chem_safety/teel.html.	H
Title V Permit. Naval Support Facility Indian Head	2005	Final	Maryland Department of the Environment	Clean Air Act	NDW-Indian Head	Chris Krejci (ERG)	Indian Head Environmental Office	February, 2007	Electronic	Indian Head Environmental Office	H
Urban Hydrology for Small Watersheds	1986	Final	U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)	Not Applicable	Not Applicable	Lisa Biddle (ERG)	www.usda.gov	March, 2008	Electronic	Range Data Folder\EOD\[Range]\Phase III - Onsite Interviews\Supporting Documentation\RSEPA Form 5	H
Waste Water Database	Ongoing	-	NAVFAC Environmental	Not Applicable	NAVFAC Environmental	Josh Moore (ERG)	Indian Head Environmental Office	May, 2008	Electronic	Indian Head Environmental Office	L
Water Data Report. Mattawoman Creek Near Pomonkey, MD. USGS Station 01658000	2006	Final	U.S. Geological Survey	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://waterdata.usgs.gov/dc/nwis/uv/?site_no=01646500&PARAmeter_cd=00400,00095,00010/	May, 2008	Electronic	http://waterdata.usgs.gov/dc/nwis/uv/?site_no=01646500&PARAmeter_cd=00400,00095,00010/	M

Table B-1. RSEPA Form 5

Title of document	Date of document	Document version (e.g., draft/draft final/final)	Author of document	Driver for document (e.g., regulatory requirement, ad hoc basis)	Organization for which document was completed	Person who obtained the document	Who/where document was obtained from	Date document was obtained	Format of document (e.g., electronic format or hard copy)	Location of document in Range Data Folder (e.g., folder/subfolder(s)/filename, or office location)	Data quality (e.g., were data validated?)
Water Investigations Report 03-4123: A Summary Report of Sediment Processes in Chesapeake Bay and Watershed	2003	Final	U.S. Geological Survey	Not Applicable	Not Applicable	Chris Krejci (ERG)	http://www.mgs.md.gov/coastal/pub/	July, 2008	Electronic	http://www.mgs.md.gov/coastal/pub/	H
Water Quality Measurement Data	2008	Final	U.S. EPA	Clean Water Act	Not Applicable	Chris Krejci (ERG)	http://oaspub.epa.gov/coastal/coast.links?yr_str=,&datagrp_str=,&prov_str=,&state_str=,&system_str=,&start_ct=0&format_in=TABLE&link_str=display.wqm_list&tablename_str=WATER_QUALITY_MEASUREMENTS&title_str=Water%20Quality%20Data%20By%20Station	August, 2008	Electronic	http://oaspub.epa.gov/coastal/coast.links?yr_str=,&datagrp_str=,&prov_str=,&state_str=,&system_str=,&start_ct=0&format_in=TABLE&link_str=display.wqm_list&tablename_str=WATER_QUALITY_MEASUREMENTS&title_str=Water%20Quality%20Data%20By%20Station	M

APPENDIX C

Narrative ORSMs for EODTECHDIV Ranges

1. OPERATIONAL RANGE SITE MODEL FOR RANGE 2, EODTECHDIV

Range 2 is an EOD testing facility located on the Stump Neck Peninsula immediately adjacent to Chicamuxen Creek. All testing occurs inside of Building 2107, the hyper-velocity test building (see Figure E-1 of Appendix E). Attached to the southeast side of the building is an arena which consists of a cement pad, two permanent walls, two moveable walls, and a roof.

1.1 Description of Range Operations

Current Operations

Current operations at Range 2 include flash x-ray photography of the following items:

- Bulk propellant;
- Bulk high explosives;
- Demolition charges;
- Primers;
- Detonators;
- Fuses; and
- Squibs.

Range 2 is an EOD testing facility with a net explosive weight limit of 2 lbs. According to facility personnel, Range 2 has been in operation periodically for the past 32 years. When the range is operational, testing occurs as much as 4-5 days per week.

Past Operations

Little is known about the past operations at the Old Demolition Range, which encompasses the current boundaries of Range 2. In the past, the site was used by the EOD training school, which likely tested a variety of ordnance items. A historic dump site known as “Dump Site B” is located between Range 2 and the Chicamuxen Creek. Current personnel are not aware of the types of material that were disposed of in Dump Site B.

In the past, two IR sites were identified on Range 2 - Site 31 (Old Demolition Range) and Site 60 (Chicamuxen Creek's Edge Dump Site B). However, the Old Demolition Range is currently designated as MRP site UXO 000007 and the Chicamuxen Creek's Edge Dump Site B is designated as part of the same MRP site. The MRP site was investigated under the Final Preliminary Assessment, which was completed in September 2005. Since the site is co-located with an active range, it is ineligible for further action under CERCLA and a Decision Document which recommended no further action was signed in October 2005.

1.2 Sources of MCs

The test arena appears to be the primary source of MCs. According to range personnel, only one testing operation associated with Range 2 has recently occurred outside of the arena. The testing event that occurred outside the arena used less than four ounces of explosive.

1.3 Available Pathways and Receptors

Because of the confined nature of the operations at Range 2, there do not appear to be pathways to ecological and human receptors that could affect significant off-range migration of MCs. The close proximity of the range to Chicamuxen Creek introduces the possibility of surface water contamination, although stormwater does not appear to come into contact with the testing area during normal precipitation events.

Air dispersion is likely the most significant pathway for MCs of concern to come into contact with off-range receptors; however, the comparatively small amount of munitions fired at the range do not likely pose a significant threat to human health or the environment.

The Chicamuxen Creek is a popular spot for recreational fishing and hosts a variety of fish species. Human and ecological receptors include recreational fishermen, a variety of fish species, and sub-aqueous vegetation which provide habitat for fish and other biota.

2. OPERATIONAL RANGE SITE MODEL FOR RANGE 3, EODTECHDIV

Range 3 is an EOD testing facility located on the Stump Neck Peninsula immediately adjacent to Chicamuxen Creek. The range area is physically delineated by a cleared area that borders the Chicamuxen Creek, a wooded area, and grassland. Control buildings and facilities for the operational staff are located to the north end of the range (see Figure E-2 of Appendix E).

2.1 Description of Range Operations

Current Operations

Range 3 is a testing facility with a net explosive weight limit of 60 lbs. All major testing occurs in the area in front of the main wall, which is a crescent-shaped barrier constructed of railroad ties approximately 30 ft tall.

Current operations at Range 3 include the following:

- Treatment of explosive hazardous waste (EHW) in burn pans;
- Development of appliqué armor to defend against explosively formed projectiles (EFPs); and
- Field procedures for defeating roadside bombs, EFPs, and foreign ordnance.

Testing operations at Range 3 occur on a daily basis, with an average of 2 to 3 shots performed of one ordnance item per day. All testing occurs in the immediate vicinity of the primary testing area (in front of the main wall), and the facility uses moveable barriers to contain explosive tests.

Burn pans used to treat EHW rest on cinder blocks and are covered with lids when not in use. The pans can be moved in the event of potential flooding. According to range personnel, all material remains in the pans during burning events.

Past Operations

In addition to the current operations at Range 3, a historic dump site known as “Dump Site A” received wastes during a time period unknown to operational staff. The exact boundaries of the dump site and the types of wastes that it received are unknown. Range 3 Burn Point (IR Site 58, SWMU 2) and Chicamuxen Creek’s Edge Dump Site A (IR Site 59, SWMU 3) are both identified as IR sites and were examined under the RCRA Facility Investigation/Verification Investigation (RFI/VI) as required by the Naval Explosive Ordnance Disposal Technology Center (NEODTC) RCRA Corrective Action Permit in 1998. However, because Range 3 is an active range, both of these sites will not be addressed under the IR program.

2.2 Sources of MCs

Potential sources of MCs at Range 3 include the following:

- Main test area;
- Auxiliary test area;
- Burn pans 1 and 2;
- Capture test pot;
- Temporary storage area; and
- Dump Site A.

There is a mobile auxiliary testing area outside of the main test area. Range personnel have the flexibility to test in multiple areas because they use portable structures to contain the test operations, although such testing is usually conducted in the area northwest of the main wall. These tests are potential sources of MCs.

2.3 Available Pathways and Receptors

Due to the permeability of the exposed soils at the surface of the range and the shallow depth of the groundwater table, groundwater infiltration has the potential to be a significant transport pathway for MCs of concern at Range 3.

Because of its proximity to Chicamuxen Creek, flooding and overland flow are likely transport pathways for MCs at the range

The majority of the testing at the range involves bulk explosive charges of C4, which exhibit comparatively greater rates of high-order detonations than other ordnance items tested at the base[1]. This fact, in conjunction with the extremely high explosive limit set for the range (60 lbs NEW), leads the technical team to believe that air has the potential to be an important pathway for MCs to migrate off-range.

The Chicamuxen Creek is a popular spot for recreational fishing and hosts a variety of fish species. Human and ecological receptors include recreational fishermen, a variety of fish species, and sub-aqueous vegetation which provide habitat for fish and other biota.

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[1] Dauphin and Doyle, 2001. Report of Findings for: Phase II Study of Ammunition Dud and Low Order Detonation Rates.

APPENDIX D

Tabular ORSMs for EODTECHDIV Ranges

Table D-1. Tabular ORSM for Range 2

Munition-Related Activity	Primary Source	Primary Release Mechanism	Expected Munition Contamination	Secondary Source
Munition Handling and/or Storage	Temporary Storage Area	Mishandling/Loss	Unfired (fuzed or unfuzed) munition	Surface
Weapons Testing	Impact/Target Areas	Mishandling/Loss	Unfuzed (fuzed or unfuzed) Munition	Surface
		Firing - Incomplete Detonation	Munition Fragments, Solid Pieces of MC	Surface
				Subsurface
				MC Leachate
			Dispersed MCs	Air
		Firing - Complete Detonation	Munition Fragments	Surface
				Subsurface
			Dispersed MCs	Air
	Range Safety Fans	Firing - Incomplete Detonation	Munition Fragments, Solid Pieces of MC	Surface
				Subsurface
				MC Leachate
Sanctioned Munition Disposal	Transfer Point for Industrial Waste Processor	Exposed/Uncovered Spent Munitions or Explosively Contaminated Equipment	Incompletely Burned MCs, MC Residue	Surface
				Subsurface
				MC Leachate
	Mass Burial - Dump Site B	Burial	Unfired (fuzed or unfuzed) munition, possibly retrograde; UXO; MC	Surface
				Subsurface
				MC Leachate

Table D-2. Tabular ORSM for Range 3

Munition-Related Activity	Primary Source	Primary Release Mechanism	Expected Munition Contamination	Secondary Source
Munition Handling and/or Storage	Temporary Storage Area	Mishandling/Loss	Unfired (fuzed or unfuzed) munition	Surface
Weapons Testing	Firing Points	Mishandling/Loss	Unfuzed (fuzed or unfuzed) Munition	Surface
		Firing - Incomplete Detonation	Munition Fragments, Solid Pieces of MC	Surface
				Subsurface
				MC Leachate
			Dispersed MCs	Air
		Firing - Dud Fired*	UXO, UXO Components	Surface
				Subsurface
				MC Leachate
		Firing - Complete Detonation	Munition Fragments	Surface
				Subsurface
			Dispersed MCs	Air
	Range Safety Fans	Firing - Incomplete Detonation	Munition Fragments, Solid Pieces of MC	Surface
				Subsurface
				MC Leachate
		Firing - Incomplete Detonation	Munition Fragments	Surface
				Subsurface
Sanctioned Munition Disposal	Transfer Point for Industrial Waste Processor	Exposed/Uncovered Spent Munitions or Explosively Contaminated Equipment	Incompletely Burned MCs, MC Residue	Surface
				Subsurface
				MC Leachate
	Mass Burial - Dump Site A	Burial	Unfired (fuzed or unfuzed) munition, possibly retrograde; UXO; MC	Surface
				Subsurface
				MC Leachate

APPENDIX E

Pictorial ORSMs for EODTECHDIV Ranges

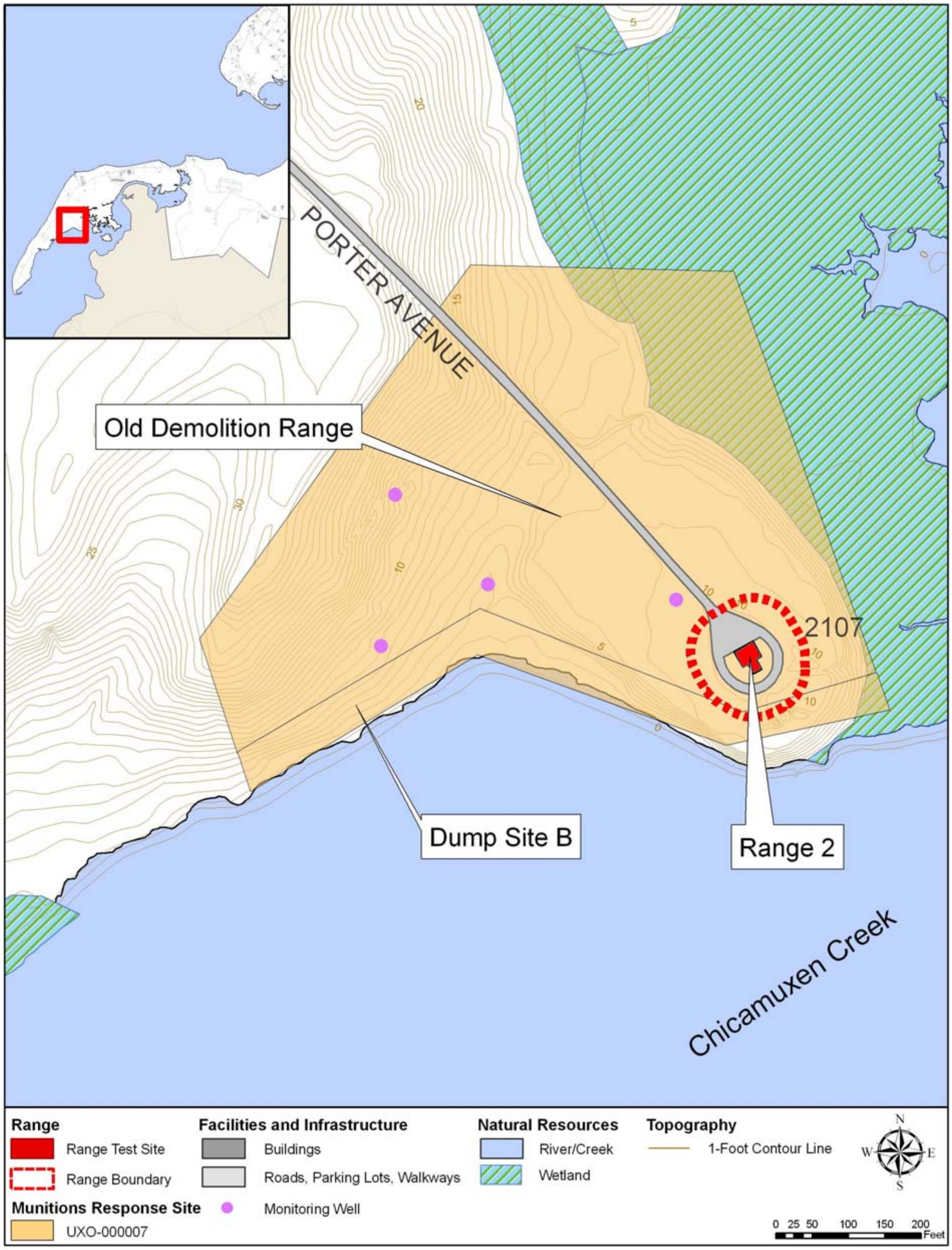


Figure E-1. Pictorial ORSM for Range 2

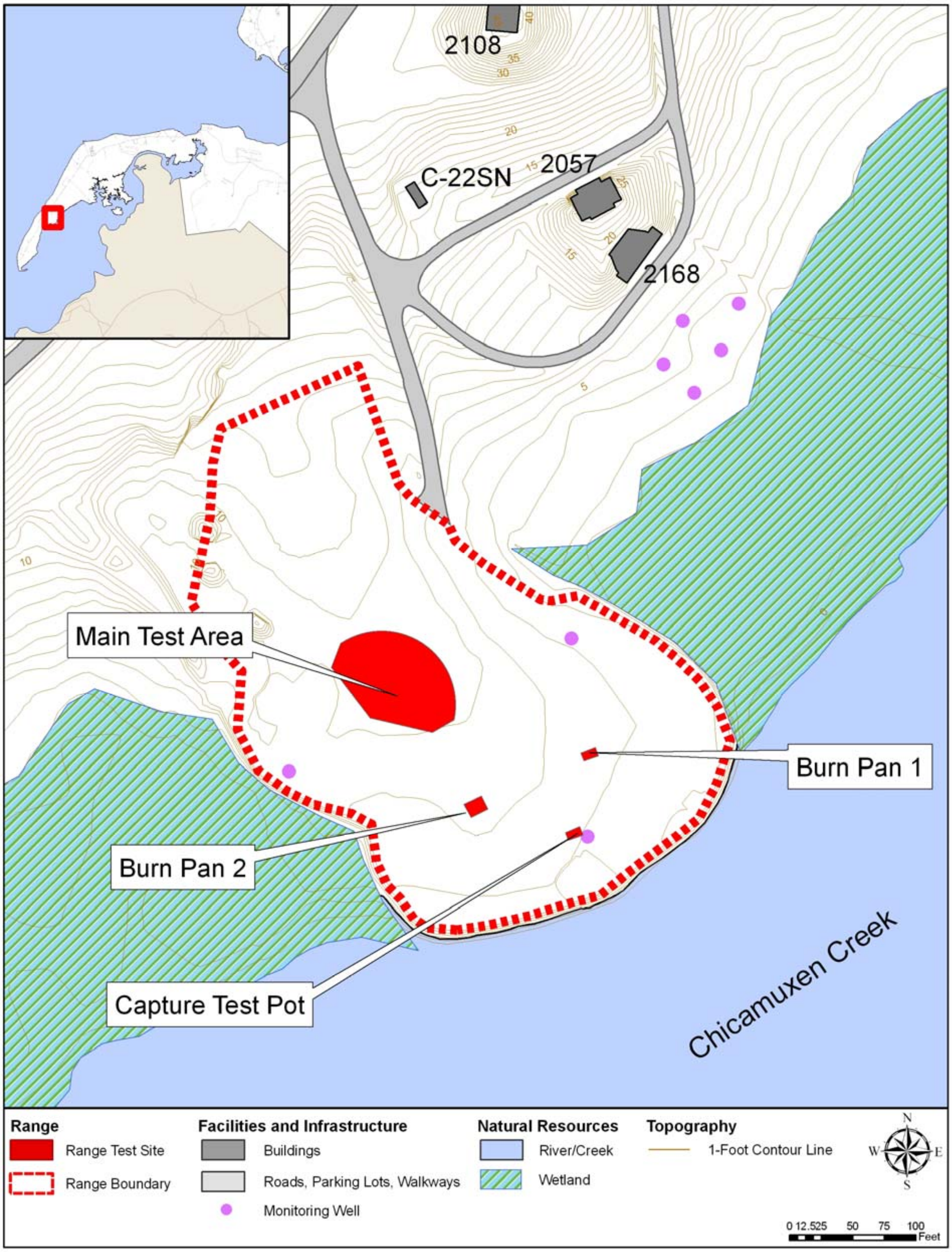
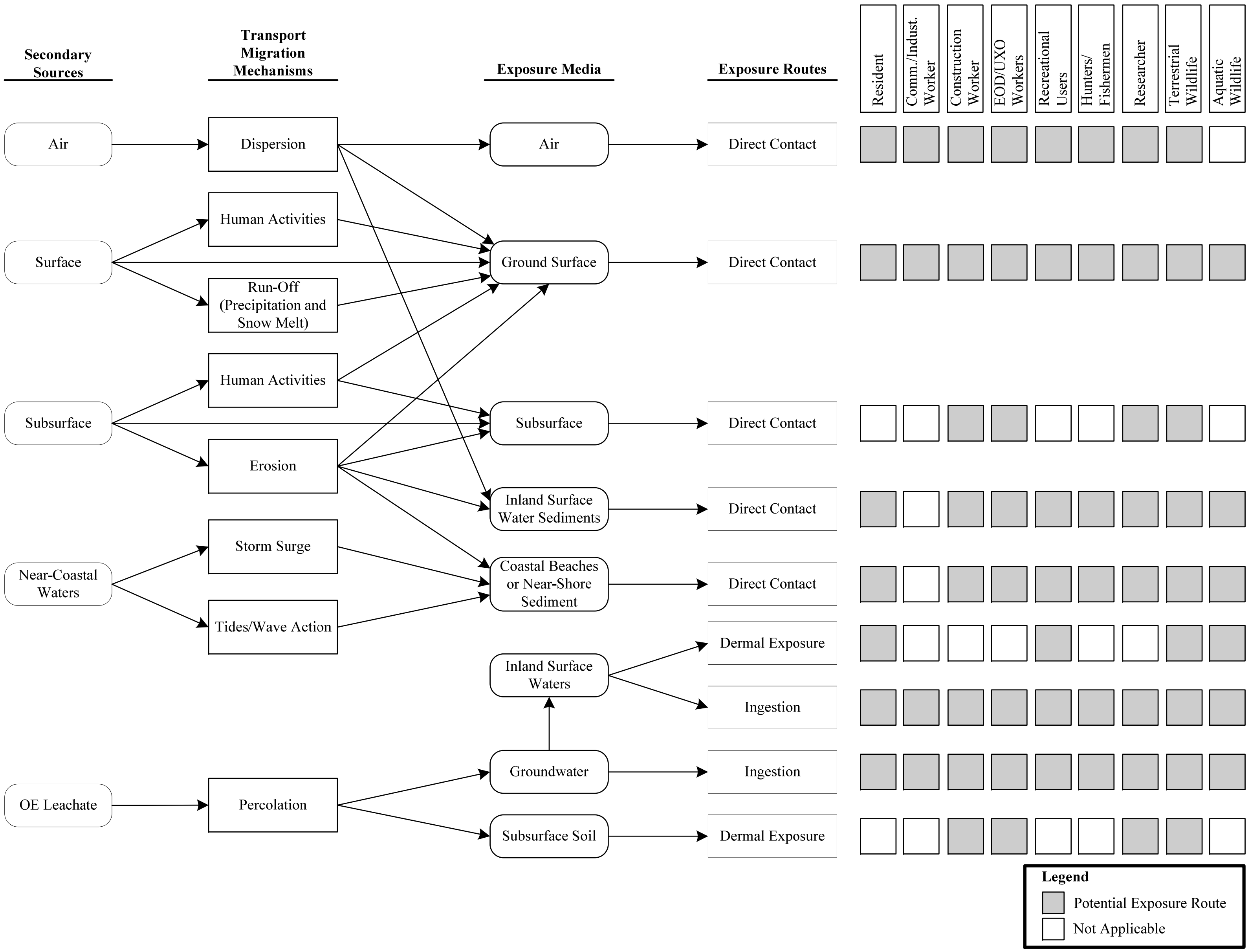


Figure E-2. Pictorial ORSM for Range 3

APPENDIX F

General Wire-Diagram ORSM for All Ranges



Exposure Media	Exposure Routes	Resident	Comm./Indust. Worker	Construction Worker	EOD/UXO Workers	Recreational Users	Hunters/ Fishermen	Researcher	Terrestrial Wildlife	Aquatic Wildlife
Air	Direct Contact	▨	▨	▨	▨	▨	▨	▨	▨	☐
Ground Surface	Direct Contact	▨	▨	▨	▨	▨	▨	▨	▨	▨
Subsurface	Direct Contact	☐	☐	▨	▨	☐	☐	▨	▨	☐
Inland Surface Water Sediments	Direct Contact	▨	☐	▨	▨	▨	▨	▨	▨	▨
Coastal Beaches or Near-Shore Sediment	Direct Contact	▨	☐	▨	▨	▨	▨	▨	▨	▨
Inland Surface Waters	Dermal Exposure	▨	☐	☐	☐	▨	☐	☐	▨	▨
Inland Surface Waters	Ingestion	▨	▨	▨	▨	▨	▨	▨	▨	▨
Groundwater	Ingestion	▨	▨	▨	▨	▨	▨	▨	▨	▨
Subsurface Soil	Dermal Exposure	☐	☐	▨	▨	☐	☐	▨	▨	☐

Legend

▨ Potential Exposure Route

☐ Not Applicable

Figure F-1. General Wire-Diagram ORSM for All Ranges

APPENDIX G

Emissions Estimates from Munitions Loading Models for EODTECHDIV Ranges

Table G-1. Emissions from Range 2

Chemical	Emission Rate (lbs/yr)
Acetaldehyde	5.5E-4
Ammonia	6.4E-6
Antimony compounds	6.9E-3
Barium compounds	1.2E-2
Benzene	1.3E-6
Carbon disulfide	2.9E-5
Carbon tetrachloride	5.8E-7
Carbonyl sulfide	2.3E-5
Chlorine	3.6E-7
Chlorine dioxide	2.8E-7
Chloroform	4.9E-7
Chloromethane (Methyl chloride)	2.1E-7
Chromium (III) compounds	1.0E-2
Cyanide compounds	9.1E-5
Cyclohexane	5.3E-7
Dichloromethane (Methylene chloride)	3.3E-7
Ethylene	5.4E-4
Formaldehyde	5.5E-4
Hexachloroethane	8.3E-7
Hydrazine	1.1E-3
Hydrochloric acid	6.1E-4
Hydrogen cyanide	5.4E-4
Lead compounds (inorganic)	1.7E+1
Molybdenum trioxide	2.0E-5
n-Hexane	1.1E-6
Nickel compounds	2.5E-1
Nitric acid	1.1E-3
Ozone	5.5E-4
Propylene (Propene)	5.5E-4
Sulfuric acid	9.6E-5
Tetrachloroethylene (Perchloroethylene)	5.8E-7
Toluene	3.8E-6

Table G-2. Emissions from Range 3

Chemical	Emission Rate (lbs/yr)
1,3-Butadiene	3.0E-2
Acetaldehyde	4.5E-2
Ammonia	2.4E-2
Antimony compounds	2.3E-2
Barium compounds	1.9E+1
Benzene	8.5E-2
Carbon disulfide	8.0E-4
Carbon tetrachloride	7.0E-5
Carbonyl sulfide	6.6E-4
Chlorine	3.8E+0
Chlorine dioxide	4.8E-4
Chloroform	5.5E-5
Chloromethane (Methyl chloride)	2.3E-5
Chromium (III) compounds	1.8E+1
Copper compounds	1.6E-2
Cyanide compounds	4.1E-2
Cyclohexane	2.6E-2
Dichloromethane (Methylene chloride)	3.9E-5
Ethylbenzene	1.2E-2
Ethylene	4.1E-1
Fluorine	3.9E-6
Formaldehyde	4.5E-2
Hexachloroethane	1.1E-4
Hydrazine	9.1E-2
Hydrochloric acid	9.3E+1
Hydrogen cyanide	3.0E-2
Hydrogen fluoride	4.8E-3
Lead compounds (inorganic)	9.7E+0
Manganese compounds	1.1E-3
Molybdenum trioxide	2.8E-1
n-Hexane	2.4E-2
Nickel compounds	6.9E+0
Nitric acid	6.9E-2
Ozone	4.7E-2
Propylene (Propene)	4.6E-2
Styrene	2.2E-2
Sulfuric acid	2.5E-3
Tetrachloroethylene (Perchloroethylene)	7.4E-5
Toluene	1.0E-1

APPENDIX H

Sensitivity Analysis for Acute Air Models

Table H-1. Source Diameter vs Pollutant Concentration

Diameter of Release Point (m)	Max. Conc. (μg/m^3)
0.1	2.88E-04
1	5.35E-05
8	1.30E-05
15	8.51E-06
22.5	6.48E-06
29	5.47E-06

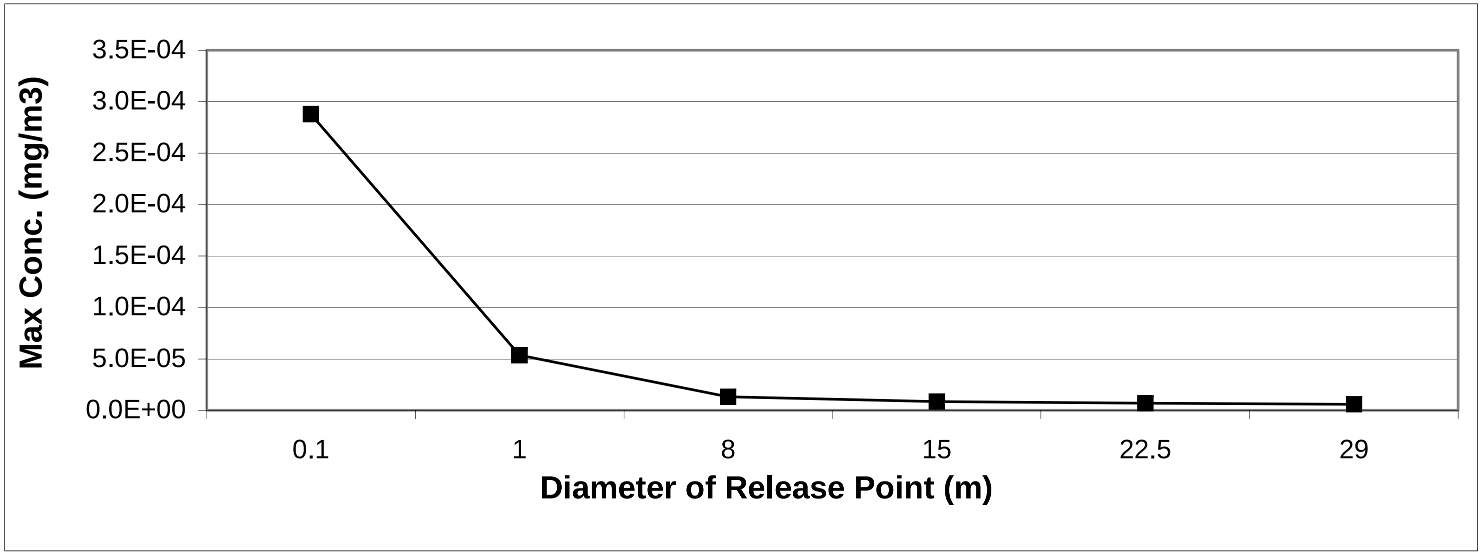


Figure H-1. Source Diameter vs. Pollutant Concentration

Table H-2. Temperature of Material Released vs Pollutant Concentration

Temperature (°K)	Max. Conc. (µg/m^3)
400	4.65E-05
500	5.02E-05
600	5.35E-05
700	5.64E-05
800	5.91E-05
900	6.16E-05

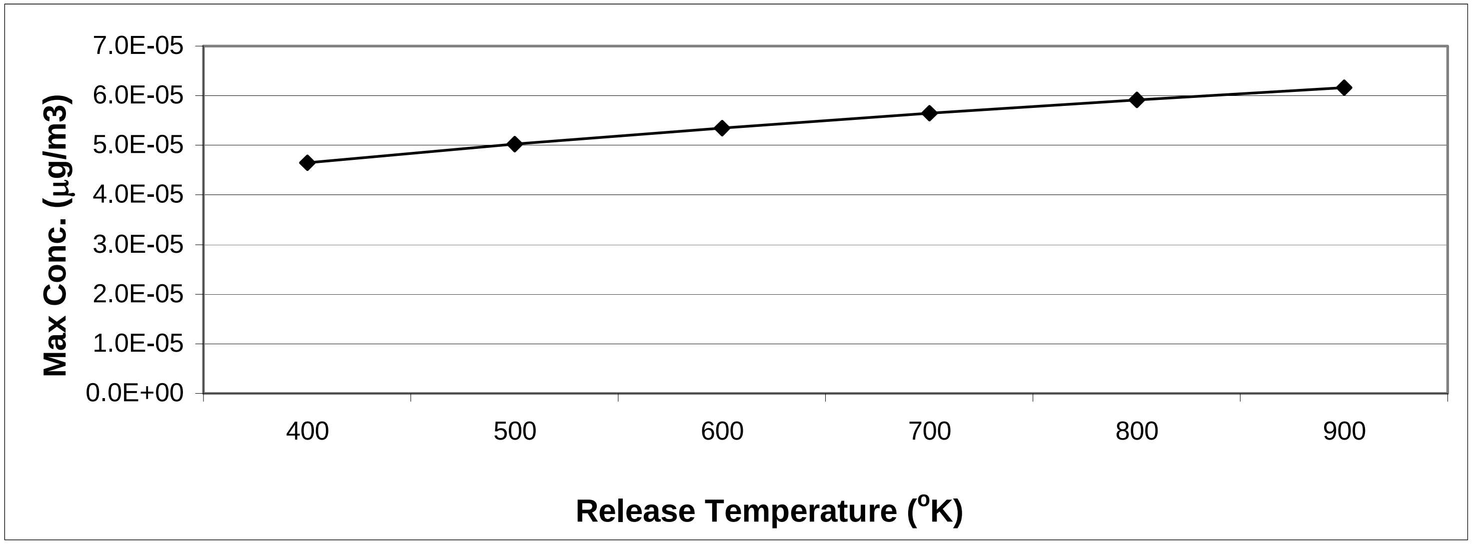


Figure H-2. Temperature of Material Released vs. Pollutant Concentration

Table H-3. Ambient Temperature vs. Pollutant Concentration

Temperature (^{o}K)	Max. Conc. (µg/m^{3})
263	5.97E-05
273	5.86E-05
283	5.75E-05
293	5.64E-05
303	5.55E-05
313	5.45E-05

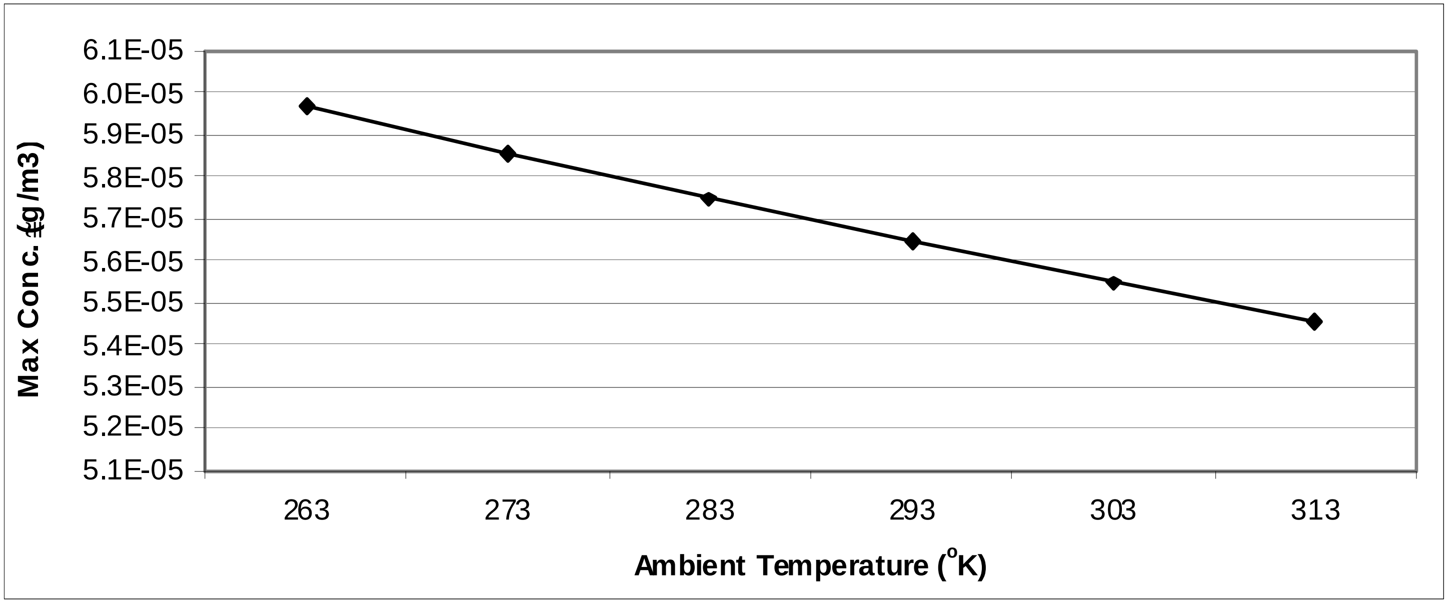


Figure H-3. Ambient Temperature vs. Pollutant Concentration

Table H-4. Total Emission Rate vs Pollutant Concentration

Temperature (ºK)	Max. Conc. (μg/m³)
400	4.65E-05
500	5.02E-05
600	5.35E-05
700	5.64E-05
800	5.91E-05
900	6.16E-05

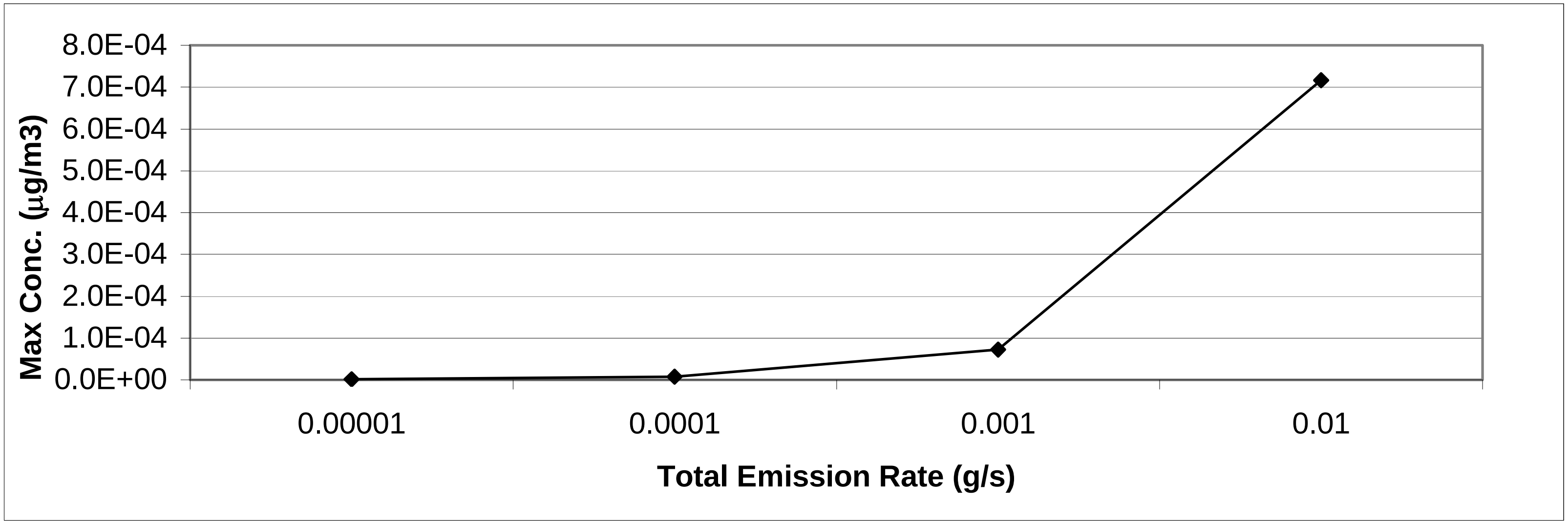


Figure H-4. Total Emission Rate vs. Pollutant Concentration

Table H-5. Exit Velocity vs Pollutant Concentration

Exit Velocity (m/s)	Max. Conc. (µg/m^3)
1000	2.86E-04
3000	1.07E-04
5000	7.41E-05
7000	5.86E-05
9000	4.92E-05

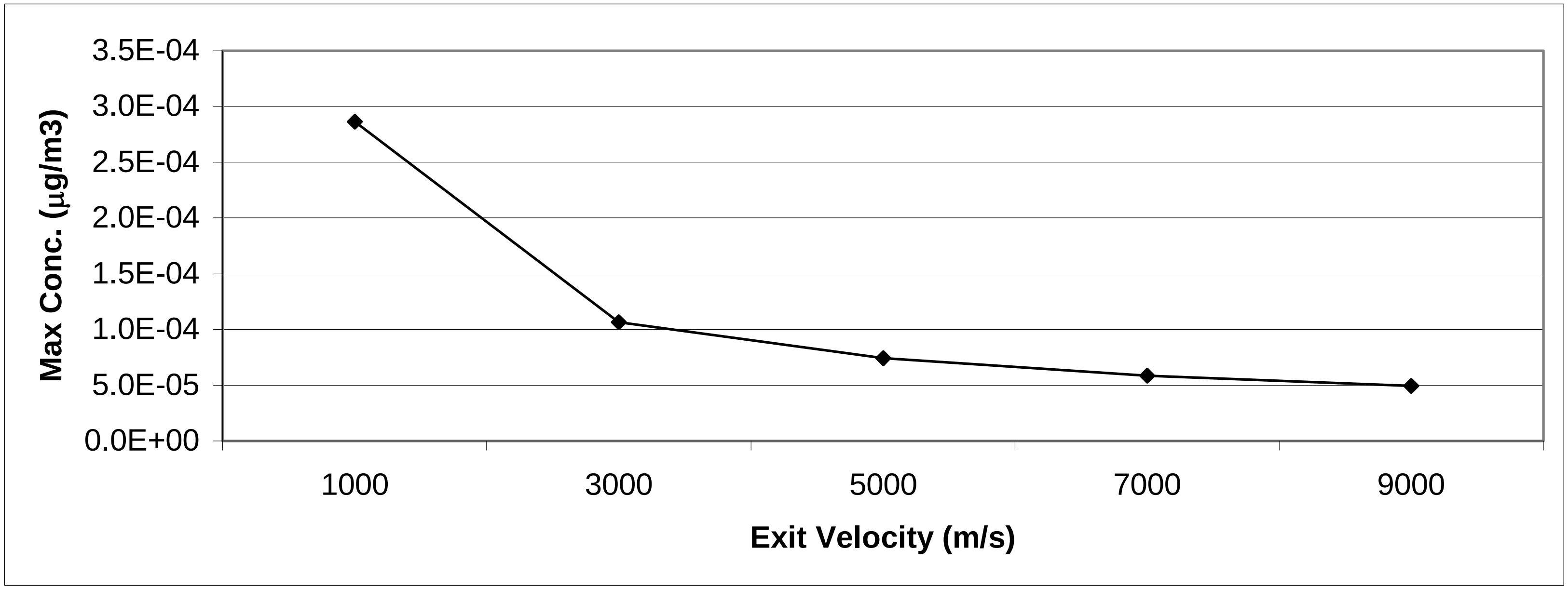


Figure H-5. Exit Velocity vs. Pollutant Concentration

APPENDIX I

Sensitivity Analysis for Soil and Groundwater Models

Table I-1. Model Run Time vs. Pollutant Concentration

Time Step (Years)	Observed Concentration (ug/l)
1	7E-45
2	3E-39
3	5E-36
4	1E-33
5	9E-32

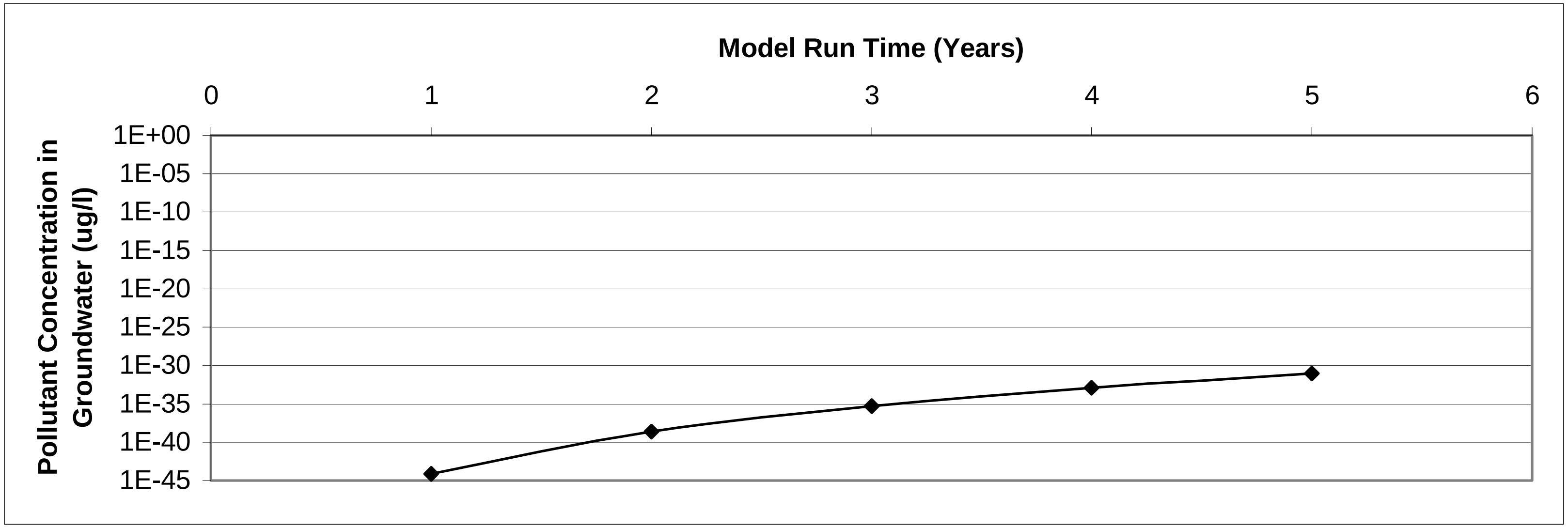


Figure I-1. Model Run Time vs. Pollutant Concentration

Table I-2. Molecular Diffusion Coefficient vs. Pollutant Concentration

Molecular Diffusion Coefficient (m^2/s)	Observed Concentration (ug/l)
8E-11	0.018
8E-10	0.18
8E-9	1.80
8E-8	18.00
8E-7	180.00

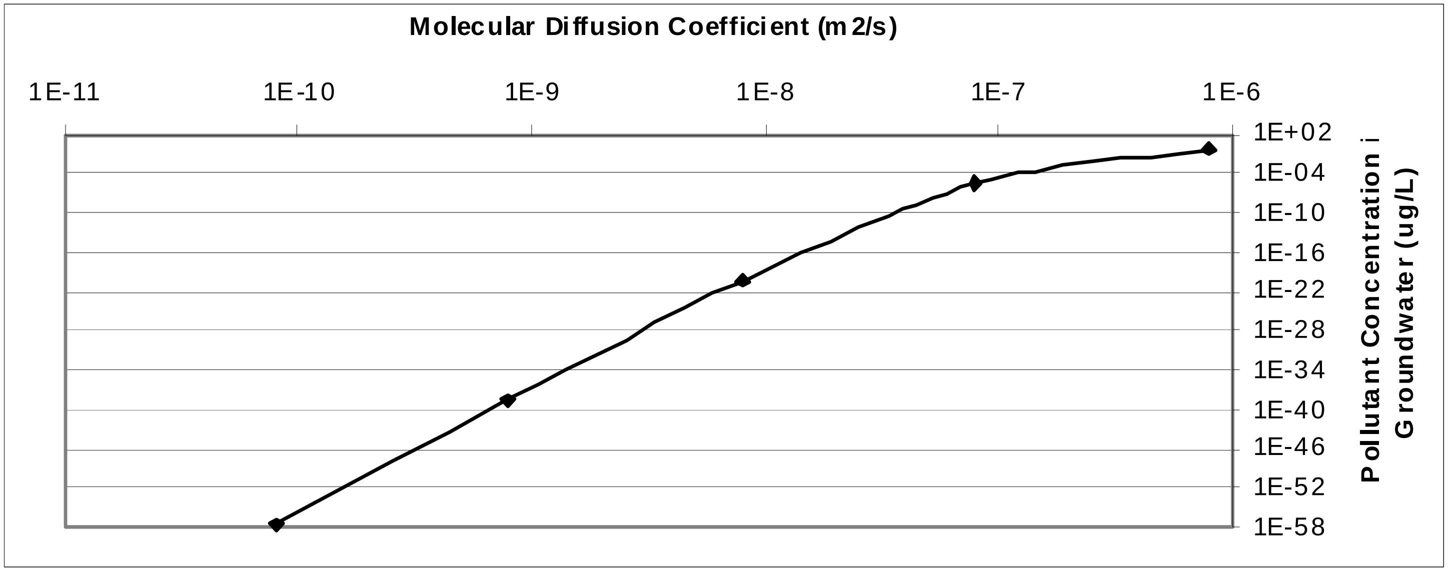


Figure I-2. Molecular Diffusion Coefficient vs. Pollutant Concentration

Table I-3. Porosity vs. Pollutant Concentration

Porosity	Observed Concentration (ug/l)
0.25	5.6E+7
0.3	6.7E+7
0.35	7.8E+7
0.4	8.9E+7
0.45	1.0E+8

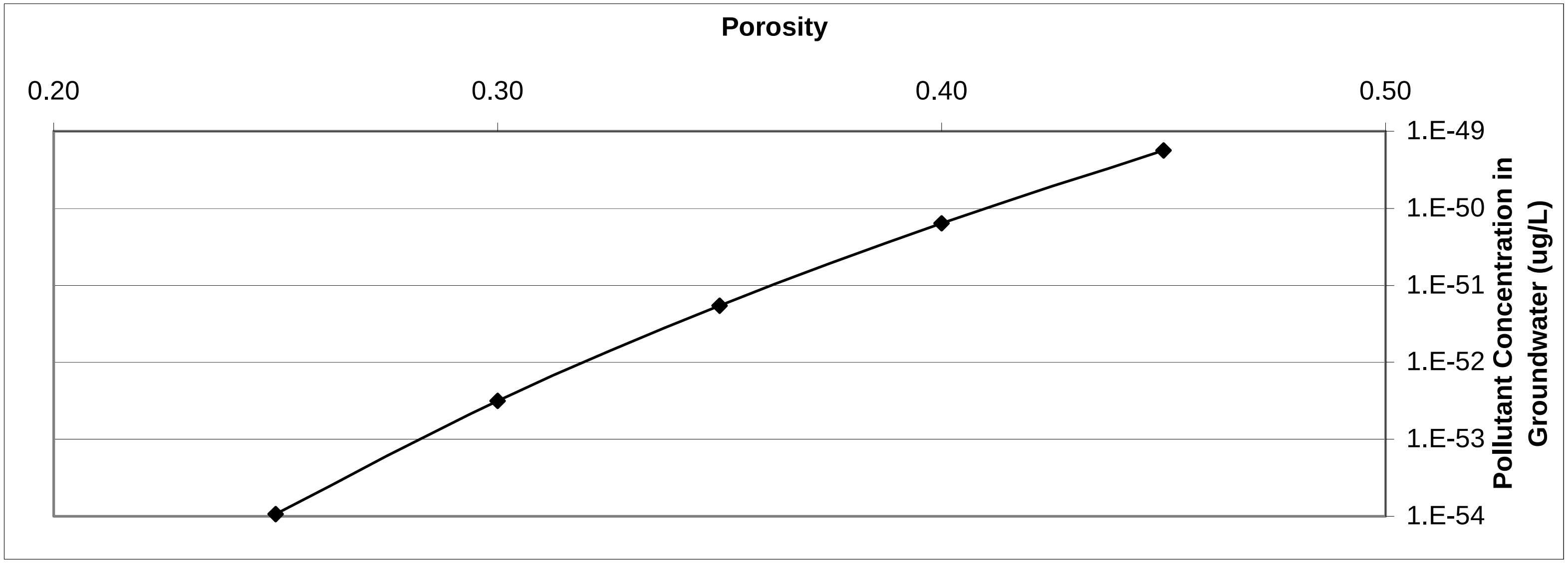


Figure I-3. Porosity vs. Pollutant Concentration

Table I-4. Distribution Coefficient vs. Pollutant Concentration

Distribution Coefficient	Observed Concentration (ug/l)
2	4E+8
5	1E+9
10	2E+9
20	4E+9
50	1E+10

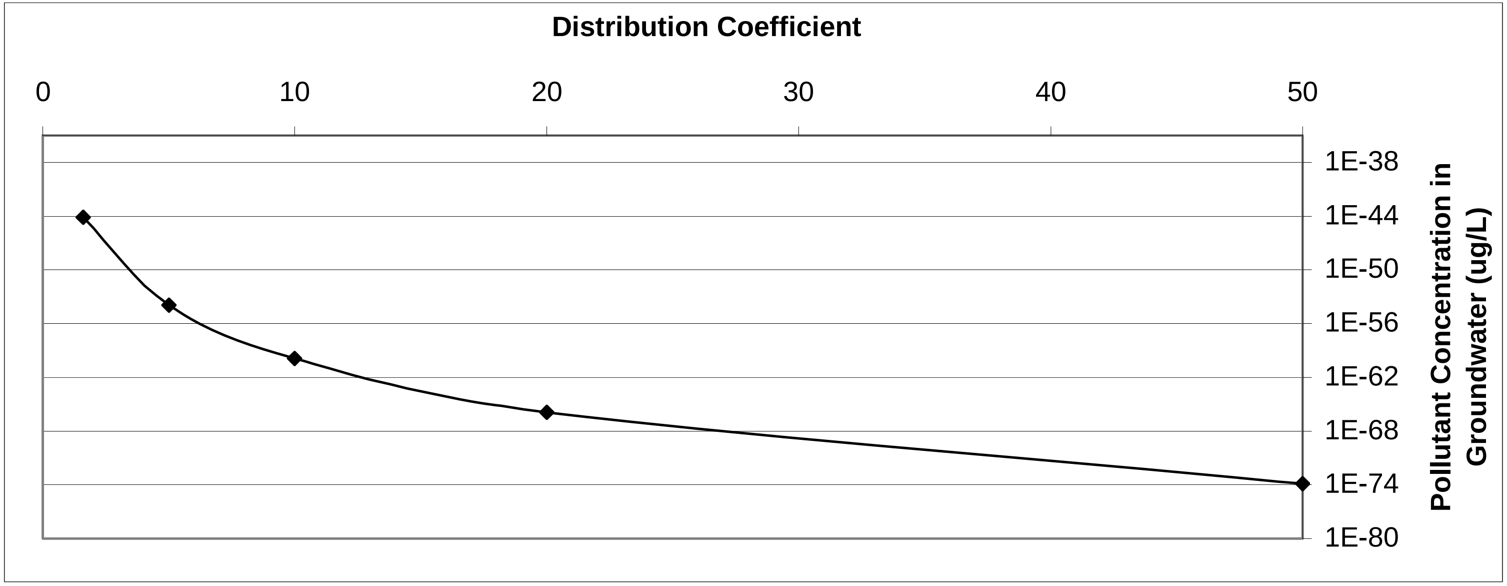


Figure I-4. Distribution Coefficient vs. Pollutant Concentration

Table I-5. Mass Loading Area vs. Pollutant Concentration

Mass Loading Area (m^2)	Observed Concentration (ug/l)
100	2E+10
900	2E+11
2,500	6E+11
62,500	1E+13

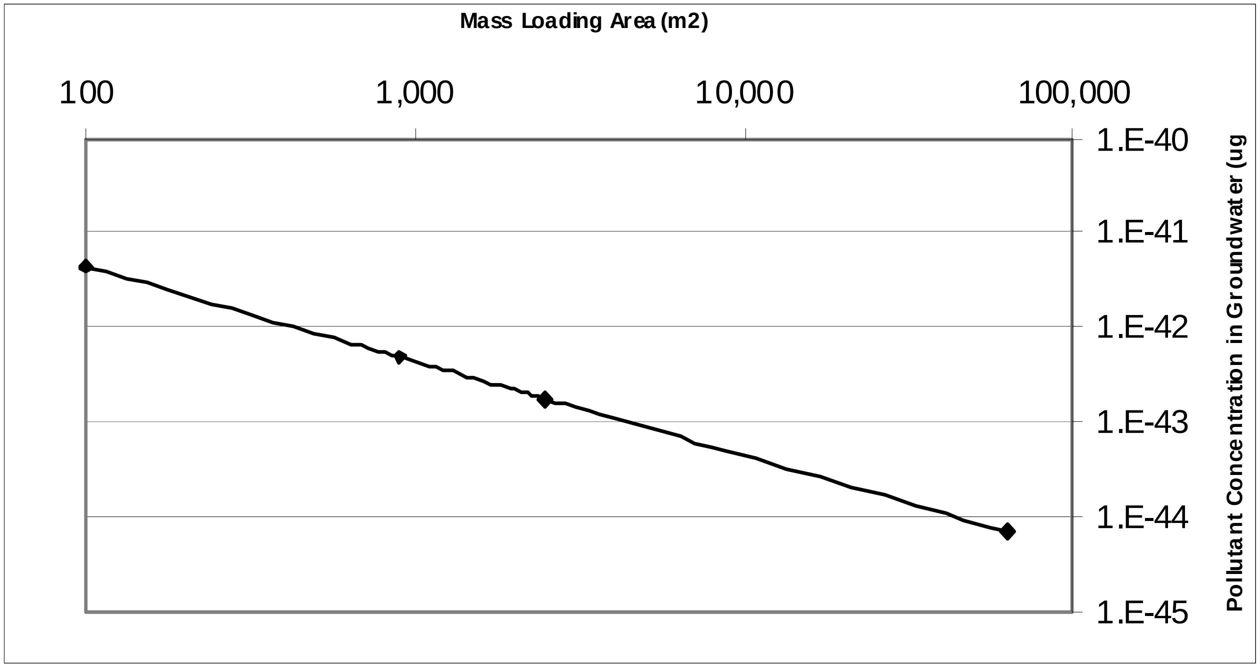


Figure I-5. Mass Loading Area vs. Pollutant Concentration

APPENDIX J

Data from Soil and Groundwater Models for EODTECHDIV Ranges

Table J-1. Predicted Groundwater Concentrations for EODTECHDIV Ranges

Depth (m)	Range 3				
	RDX	HMX	TNT	DNT	ClO_4
0	5.2E+03	3.8E+02	6.9E+01	7.7E-01	1.5E+00
0.1	2.1E+03	3.3E+01	1.2E+00	1.3E-01	8.2E-01
0.2	6.9E+02	2.0E+00	1.4E-02	1.5E-02	4.2E-01
0.3	1.9E+02	9.0E-02	1.3E-04	1.4E-03	1.9E-01
0.4	4.6E+01	3.3E-03	9.7E-07	1.1E-04	8.0E-02
0.5	9.6E+00	1.1E-04	6.0E-09	7.3E-06	3.0E-02
0.6	1.8E+00	2.9E-06	3.2E-11	4.2E-07	1.1E-02
0.7	3.0E-01	7.1E-08	1.5E-13	2.1E-08	3.4E-03
0.8	4.5E-02	1.6E-09	6.6E-16	9.7E-10	1.0E-03
0.9	6.3E-03	3.1E-11	2.6E-18	4.0E-11	2.8E-04
1	8.1E-04	5.8E-13	9.2E-21	1.6E-12	7.1E-05
1.1	8.7E-05	9.7E-15	3.0E-23	5.3E-14	1.5E-05
1.2	1.5E-05	2.7E-16	1.7E-25	3.1E-15	4.7E-06
1.3	2.6E-06	7.3E-18	9.0E-28	1.7E-16	1.5E-06
1.4	4.2E-07	1.8E-19	4.5E-30	8.6E-18	4.3E-07
1.5	6.4E-08	4.4E-21	2.1E-32	4.2E-19	1.3E-07
1.6	9.4E-09	1.0E-22	9.5E-35	2.0E-20	3.4E-08
1.7	8.2E-10	1.9E-24	4.0E-37	6.9E-22	4.8E-09
1.8	3.7E-10	2.9E-25	1.5E-38	1.8E-22	2.8E-09
1.9	1.7E-10	4.2E-26	5.5E-40	4.4E-23	1.7E-09
2	7.6E-11	6.2E-27	2.0E-41	1.1E-23	9.6E-10
2.1	3.4E-11	8.7E-28	6.8E-43	2.6E-24	5.6E-10
2.2	1.5E-11	1.2E-28	2.3E-44	6.0E-25	3.2E-10
2.3	6.5E-12	1.6E-29	7.3E-46	1.4E-25	1.8E-10
2.4	2.8E-12	2.2E-30	2.3E-47	3.2E-26	1.0E-10
2.5	1.2E-12	2.8E-31	7.0E-49	7.2E-27	5.9E-11
2.6	5.2E-13	3.6E-32	2.1E-50	1.6E-27	3.3E-11
2.7	2.2E-13	4.5E-33	6.1E-52	3.5E-28	1.9E-11
2.8	9.6E-14	5.5E-34	1.7E-53	7.6E-29	1.1E-11
2.9	4.7E-14	7.0E-35	4.9E-55	1.8E-29	7.1E-12
3	2.3E-14	1.2E-35	2.1E-56	5.0E-30	4.3E-12
3.1	1.1E-14	2.0E-36	9.3E-58	1.4E-30	2.5E-12
3.2	5.1E-15	3.4E-37	3.9E-59	3.9E-31	1.5E-12
3.3	2.4E-15	5.6E-38	1.6E-60	1.1E-31	8.9E-13
3.4	1.2E-15	9.1E-39	6.7E-62	2.9E-32	5.3E-13
3.5	5.6E-16	1.5E-39	2.7E-63	8.1E-33	3.2E-13
3.6	1.5E-16	7.6E-41	2.7E-65	8.1E-34	1.3E-13
3.7	3.9E-17	3.7E-42	2.6E-67	8.0E-35	5.5E-14
3.8	1.0E-17	1.8E-43	2.5E-69	7.7E-36	2.2E-14
3.9	2.6E-18	8.4E-45	2.4E-71	7.3E-37	9.0E-15
4	6.4E-19	3.9E-46	2.2E-73	6.8E-38	3.6E-15
4.1	1.6E-19	1.8E-47	2.0E-75	6.3E-39	1.4E-15
4.2	3.9E-20	8.1E-49	1.8E-77	5.7E-40	5.5E-16

Table J-1. Predicted Groundwater Concentrations for EODTECHDIV Ranges

Depth (m)	Range 3				
	RDX	HMX	TNT	DNT	ClO_4
4.3	9.5E-21	3.6E-50	1.6E-79	5.1E-41	2.1E-16
4.4	2.3E-21	1.6E-51	1.6E-81	4.5E-42	8.3E-17
4.5	5.4E-22	6.7E-53	2.4E-82	3.9E-43	3.2E-17
4.6	1.3E-22	2.8E-54	2.3E-82	3.4E-44	1.2E-17
4.7	2.9E-23	1.2E-55	2.3E-82	2.8E-45	4.5E-18
4.8	6.8E-24	4.9E-57	2.3E-82	2.4E-46	1.7E-18
4.9	1.5E-24	2.0E-58	2.3E-82	1.9E-47	6.2E-19
5	3.5E-25	8.1E-60	2.3E-82	1.6E-48	2.3E-19
5.1	7.7E-26	3.2E-61	2.3E-82	1.3E-49	8.3E-20
5.2	1.7E-26	1.3E-62	2.3E-82	1.0E-50	3.0E-20
5.3	3.7E-27	4.9E-64	2.3E-82	8.0E-52	1.1E-20
5.4	8.1E-28	1.9E-65	2.3E-82	6.2E-53	3.8E-21
5.5	1.7E-28	7.2E-67	2.3E-82	4.8E-54	1.4E-21
5.6	3.8E-29	2.7E-68	2.3E-82	3.7E-55	4.9E-22
5.7	7.5E-30	9.3E-70	2.3E-82	2.6E-56	1.6E-22
5.8	1.5E-30	3.1E-71	2.3E-82	1.8E-57	5.4E-23
5.9	2.9E-31	1.0E-72	2.3E-82	1.2E-58	1.8E-23
6	5.6E-32	3.4E-74	2.3E-82	8.0E-60	5.9E-24
6.1	1.1E-32	1.1E-75	2.3E-82	5.4E-61	1.9E-24
6.2	2.0E-33	3.6E-77	2.3E-82	3.5E-62	6.1E-25
6.3	3.8E-34	1.2E-78	2.3E-82	2.3E-63	2.0E-25
6.4	7.2E-35	3.8E-80	2.3E-82	1.5E-64	6.2E-26
6.5	1.3E-35	1.5E-81	2.3E-82	9.7E-66	2.0E-26
6.6	2.5E-36	3.3E-82	2.3E-82	6.2E-67	6.2E-27
6.7	4.5E-37	3.0E-82	2.3E-82	3.9E-68	2.0E-27
6.8	8.5E-38	3.0E-82	2.3E-82	2.5E-69	6.6E-28
6.9	3.0E-38	3.0E-82	2.3E-82	3.1E-70	3.7E-28

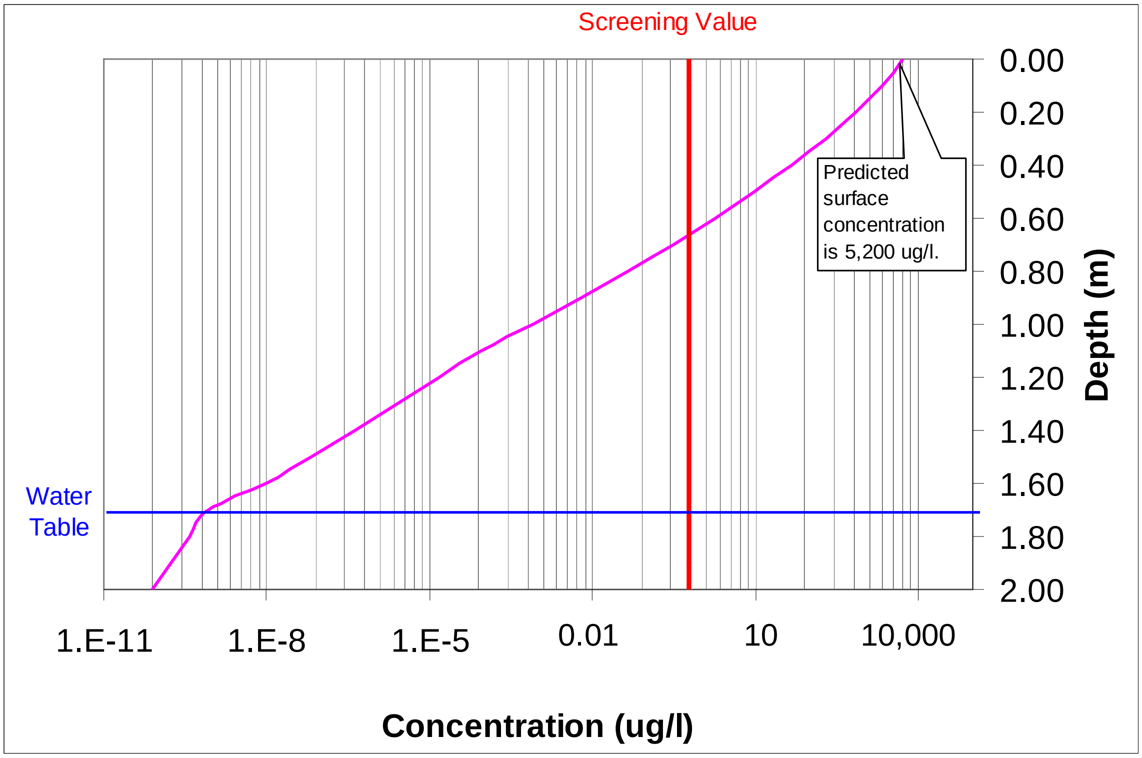


Figure J-1. Predicted RDX Concentrations in Groundwater at Range 3

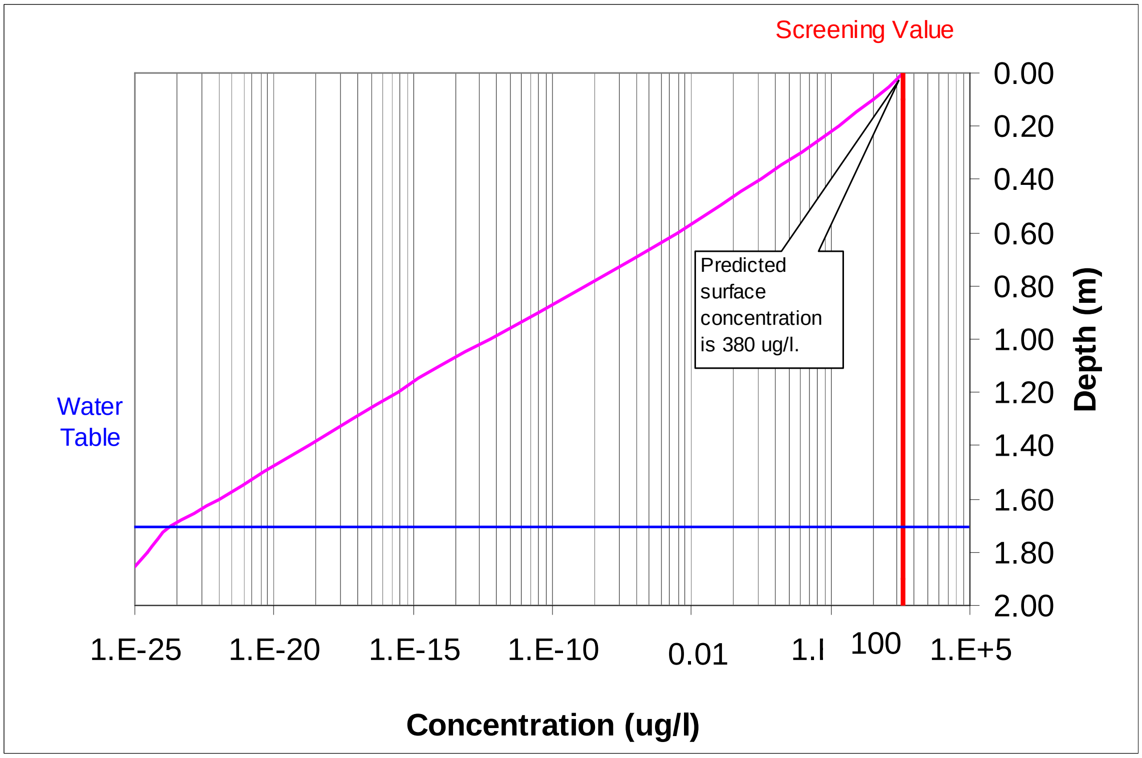


Figure J-2. Predicted HMX Concentrations in Groundwater at Range 3

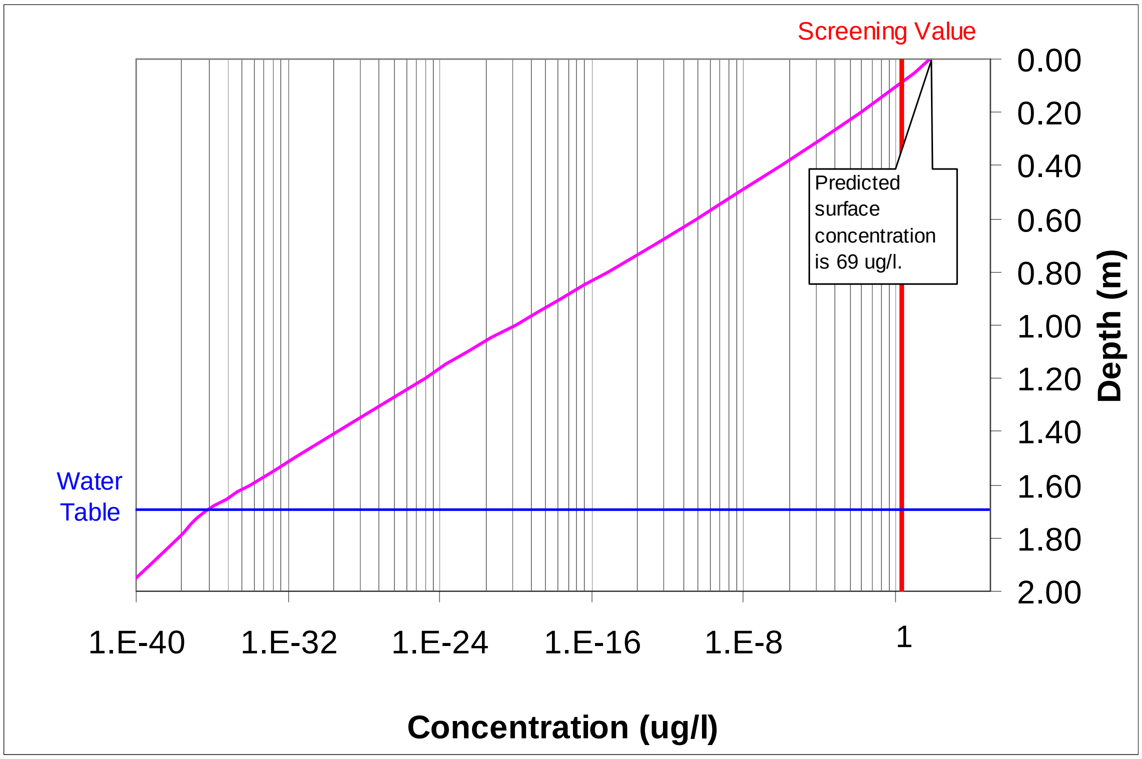


Figure J-3. Predicted TNT Concentrations in Groundwater at Range 3

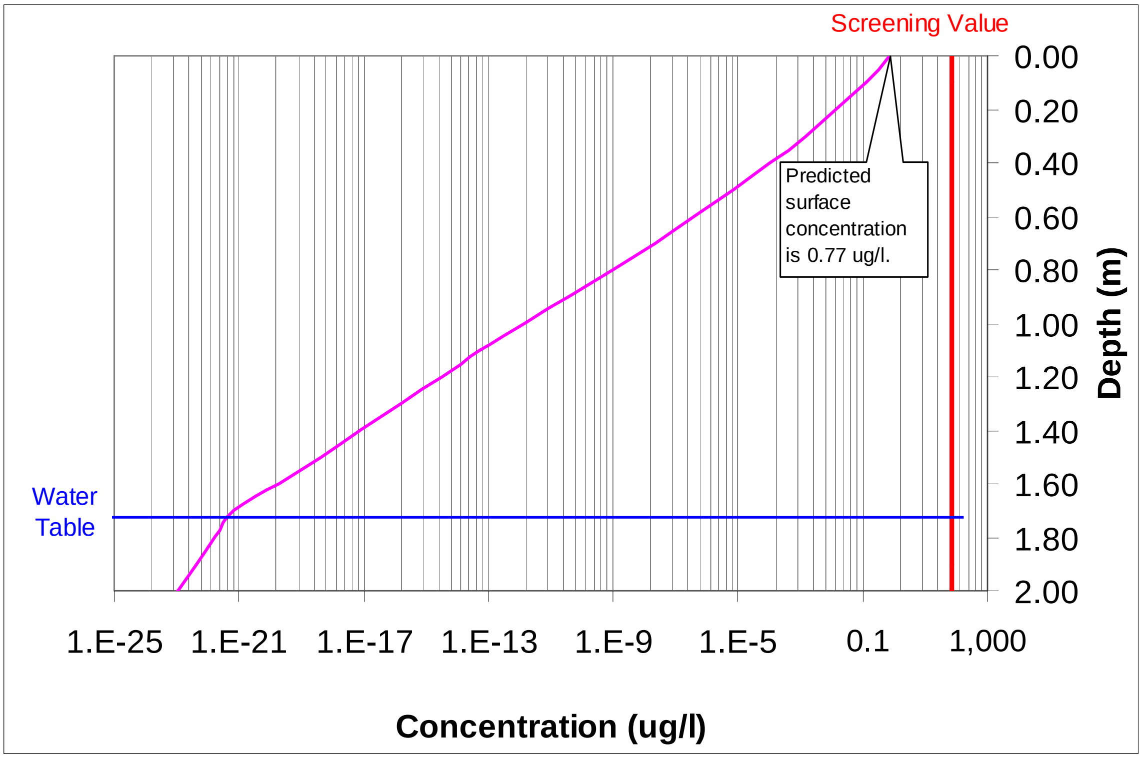


Figure J-4. Predicted DNT Concentrations in Groundwater at Range 3

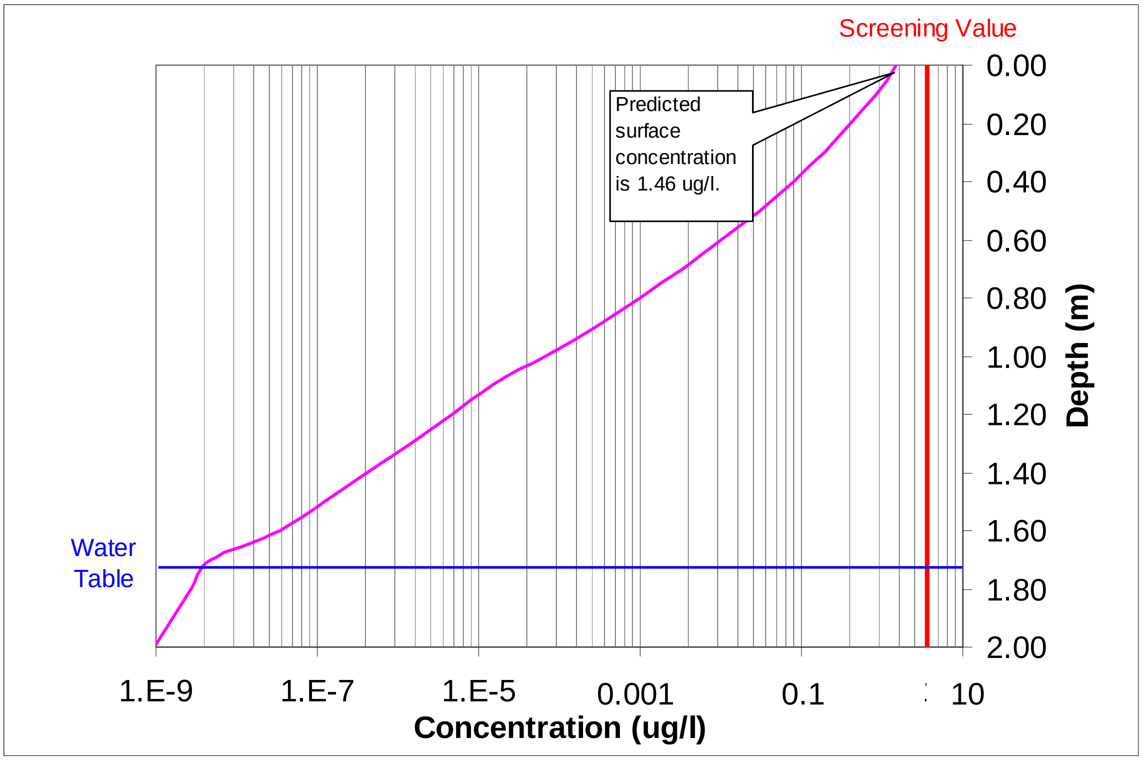


Figure J-5. Predicted Perchlorate Concentrations in Groundwater at Range 3

APPENDIX K

Sensitivity Analysis for Surface Water Models

Table K-1. Cell Area vs. Pollutant Concentration

Area (m^3)	Max. Conc. (mg/l)
6.0E+2	3.7E-8
6.0E+3	3.7E-8
6.0E+5	3.7E-8
1.0E+10	1.9E-10

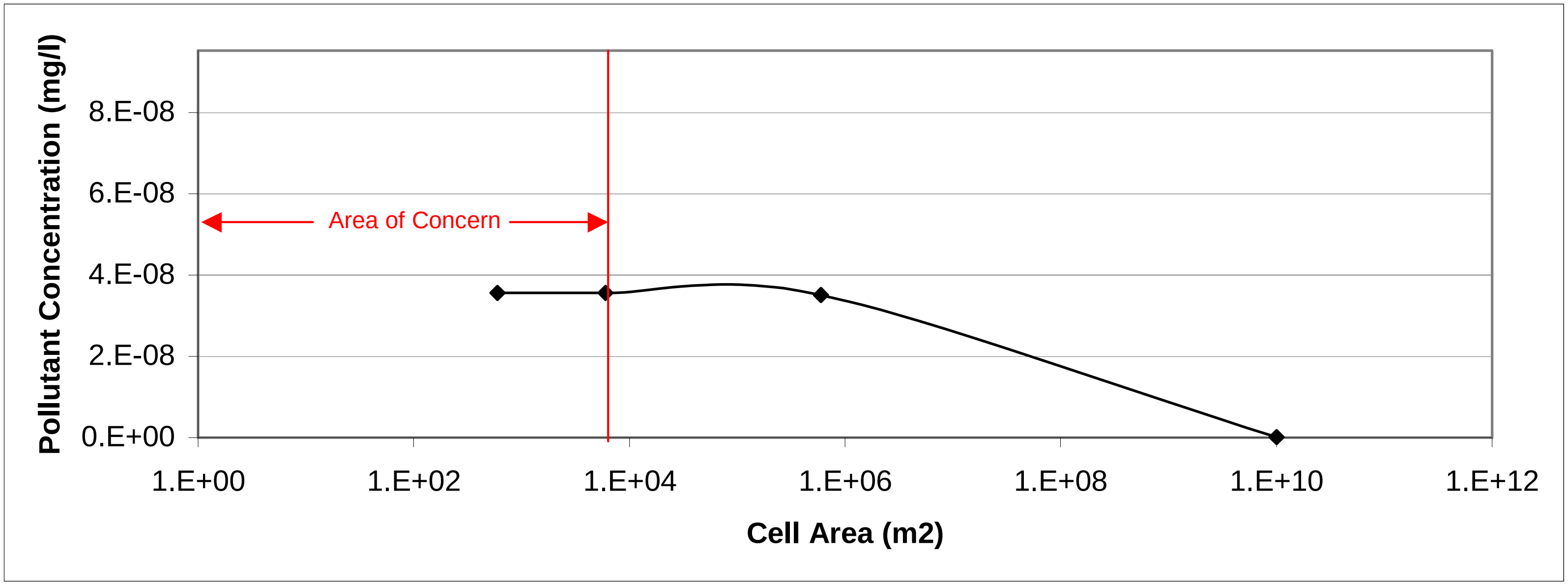


Figure K-1. Cell Area vs. Pollutant Concentration

Table K-2. Streamflow vs. Pollutant Concentration

Streamflow (m^3/hr)	Max. Conc. (mg/l)
5.0E+3	1.5E-5
7.0E+3	1.1E-5
1.0E+4	7.4E-6
3.0E+4	2.5E-6
5.0E+4	1.5E-6

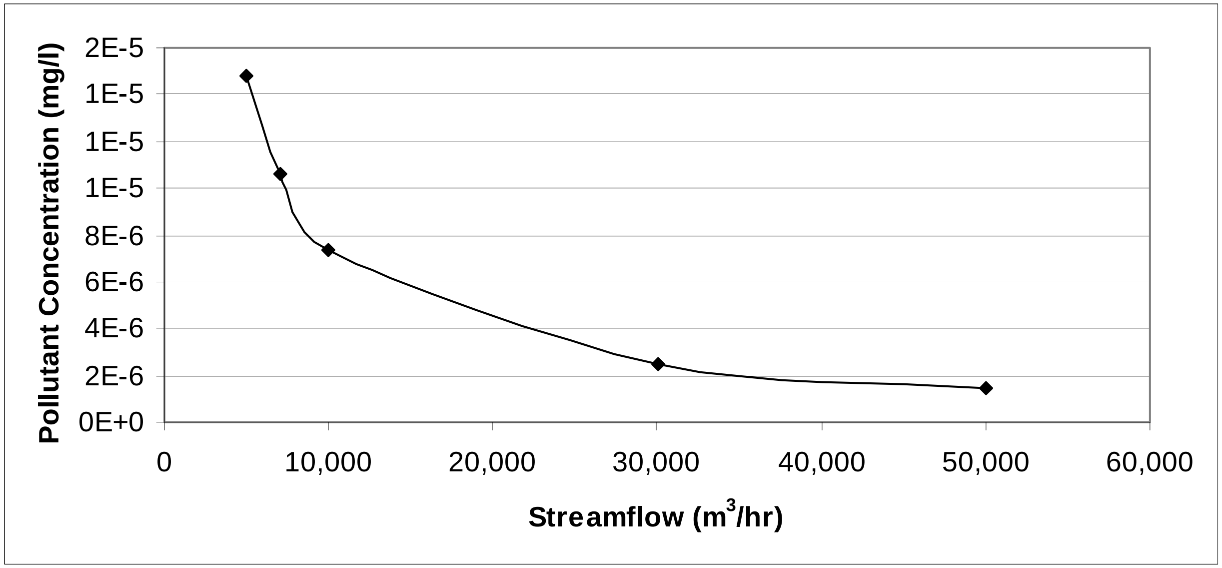


Figure K-2. Streamflow vs. Pollutant Concentration

Table K-3. Chemical Load vs. Pollutant Concentration

Chemical Load (kg/s)	Max. Conc. (mg/l)
1E-10	2E-11
2E-7	4E-8
1E-5	2E-6
1E-3	2E-4
1E+0	2E-1

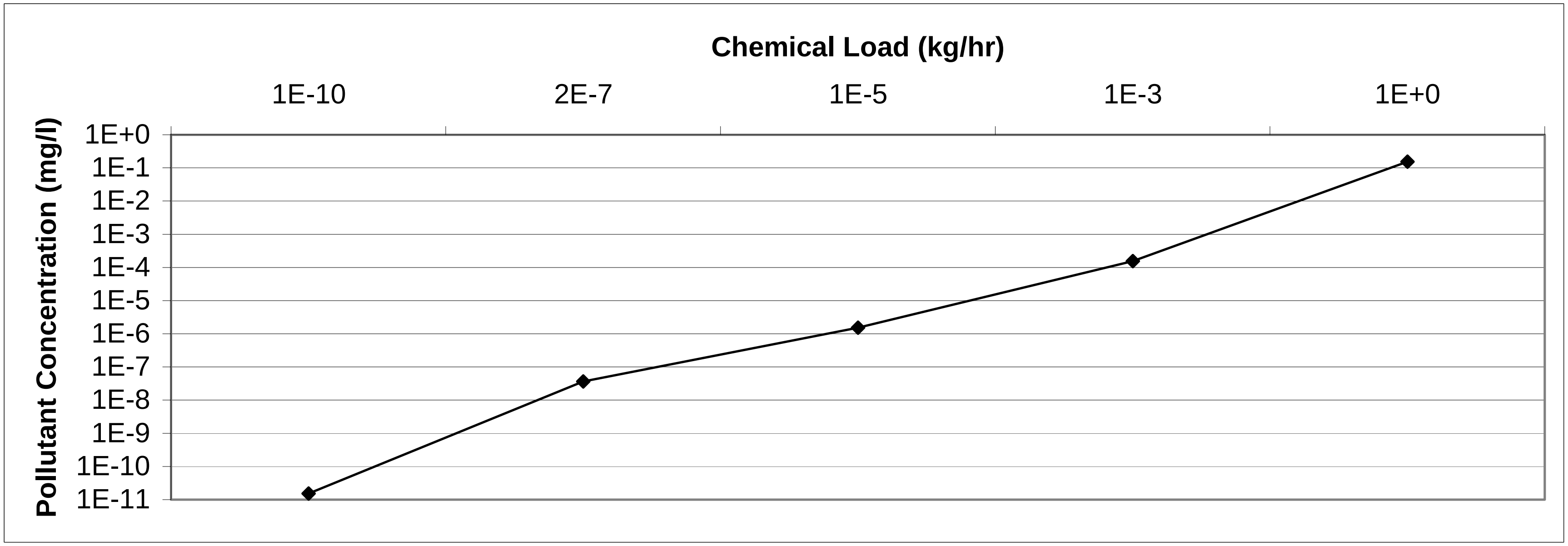


Figure K-3. Chemical Load vs. Pollutant Concentration

Table K-4. Organic Carbon Fraction vs. Pollutant Concentration

Chemical Load (kg/s)	Max. Conc. (mg/l)
0.02	4E-8
0.04	6E-8
0.06	7E-8
0.08	9E-8
0.10	1E-7

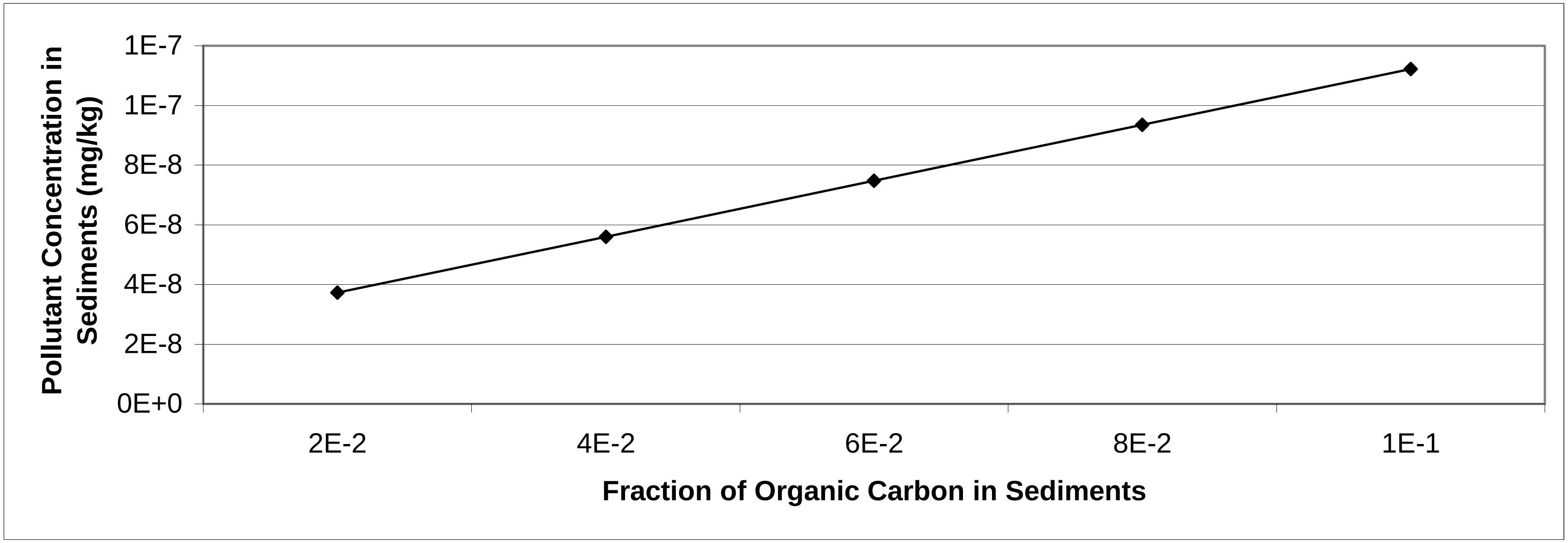


Figure K-4. Organic Carbon Fraction vs. Pollutant Concentration

Range Condition Assessment (RCA) Report Addendum

Summary of Results for Multi-Media Sampling at Range 3

Range Sustainability Environmental Program

Naval Explosive Ordnance Disposal Technology Division

Naval Support Activity South Potomac
Naval Support Facility, Indian Head
Stump Neck Annex
Indian Head, MD

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Chantilly, VA 20151-1102

August 2009

TABLE OF CONTENTS

1.0 INTRODUCTION

During Fiscal Year 2008, a Range Condition Assessment (RCA) was conducted for land-based operational ranges at Naval Support Facility Indian Head (NSFIH) under the Navy's Range Sustainability Environmental Program Assessment (RSEPA). This RCA included Explosive Ordnance Disposal Technology Division (EODTECHDIV) Range 3 located on the Stump Neck Annex of NSFIH. As part of this RCA, the technical team (composed of personnel from EODTECHDIV and their contractor, Eastern Research Group, Inc. (ERG)), performed multi-media sampling at Range 3 to better understand the effect of range operations on the surrounding environment and identify any possible contamination at the site due to range operations. This addendum was written in addition to the RCA Final Report to summarize the sampling activities performed at Range 3 in August 2009.

2.0 SUMMARY OF RCA FINDINGS PRIOR TO SAMPLING

To minimize unnecessary costs associated with sampling activities and lab analyses, the technical team performing the RCA developed predictive models to evaluate the potential for environmental impacts from range operations using worst-case-scenario assumptions.

The technical team developed fate and transport models for the following media (modeling code and developer in parenthesis):

- Air (TSCREEN – EPA Office of Air and Radiation);
- Surface water (EXAMS – EPA Ecosystem Research Division); and
- Soil and groundwater (FEHM – Los Alamos National Laboratory).

The pollutants modeled were all munitions constituents (MCs) identified by the RSEPA Program as priority pollutants at operational ranges, including 2,4-DNT, HMX, RDX, TNT, and perchlorate. Potential concentrations of the pollutants in environmental media were estimated using mass-loading principals (e.g., munitions usage data, dud and low-order detonation rates, assumptions about targets). To calculate these inputs, a mass loading model was developed which accounted for the types of munitions tested at each range and the testing frequency of each munition.

Although the results of the air and soil and groundwater models did not predict concentrations of any pollutants of concern above detectable levels, the surface water model indicated the possibility that both RDX and TNT from Range 3 activities could accumulate in Chicamuxen Creek at detectable levels under the worst-case scenario. The model predicted that 1,3,5-Trinitro-1,3,5-triazacyclohexane (RDX) and 2,4,6-Trinitrotoluene (TNT) could reach concentrations of 0.73 and 0.085 micrograms per liter (ug/L) in the Chicamuxen Creek, respectively. The worst-case RDX concentration (0.73 ug/L) was above the screening level used during the modeling phase (0.61 ug/L), but the TNT concentration (0.085 ug/L) was well below the TNT screening level (2.2 ug/L). Based on the modeled conditions, these pollutants could reach levels of concern in the creek water, but would not be a problem in the creek's sediments.

Based on these results, the technical team concluded at the end of predictive modeling that the operations at Range 3 had the potential to concentrate RDX in Chicamuxen Creek above the Human Health Standard.

3.0 SAMPLE DESIGN

Based on discussions with staff from the Chief of Navy Operations (CNO) Office, the technical team proceeded in developing a sample design for limited on-range sampling to determine whether or not MCs were migrating away from operational areas at levels of concern. The sample design adhered to RSEPA Program guidance.

In developing the sample design, the technical team planned to collect soil and groundwater samples to verify the absence of MCs above levels of concern (as predicted by the soil and groundwater model). In addition to verifying the absence of MCs above levels of concern, the technical team also planned to collect soil samples to assess the quantity of residual MCs remaining from range operations. By quantifying residual MCs in topsoil, the technical team would be better able to evaluate the pathways through which MCs could migrate off-range into the Chicamuxen Creek.

The locations for all soil samples were determined by the Visual Sample Plan (VSP) software; for more detail on this aspect of the sample design, see the Final Sampling and Analysis Plan for Range Condition Assessment at NSFIH, Stump Neck Annex – Range 3 (see Appendix B). The technical team planned to obtain groundwater samples from existing monitoring wells. All samples would be analyzed for the MCs listed in Table 5-1.

4.0 SAMPLE COLLECTION

Soil and groundwater sampling were conducted in accordance with the Final Sampling and Analysis Plan for Range Condition Assessment at NSFIH, Stump Neck Annex – Range 3 (see Appendix B).

Soil samples were collected from the first two inches of topsoil via multiple increment soil sampling. Multiple increment soil sampling is discussed in more detail in SOP-001 (included in the sampling plan). The technical team collected 25 soil sub-samples and homogenized them to form one sample as part of the multiple increment sampling. A total of four native samples were prepared for lab analysis in this manner (100 sub-samples). Note that two additional samples (50 sub-samples) were collected as duplicates to evaluate the analyses of the original samples. Groundwater samples were collected from three on-site wells down-gradient of the main testing area. Samples were obtained via bailer and directly placed into the sample containers[1]. All samples were analyzed for the MCs listed in Table 5-1.

For further information regarding specific sampling point locations, sampling methodologies, analytes of concern, schedule, and logistics for sampling at Range 3, please refer to the Final Sampling and Analysis Plan.

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[1] Perchlorate samples were filtered with sterile equipment prior to placement in sample containers to eliminate bacteria which might degrade perchlorate prior to analysis.

5.0 SUMMARY OF RESULTS

This section summarizes the analytical results associated with the soil and groundwater samples collected from Range 3.

5.1 Data Assessment

The technical team performed a data assessment of the analytical results package received from the laboratory as specified in the RSEPA manual and the Range 3 Sampling Project QAPP (see Appendix A, Quality Assurance Project Plan for Range Condition Assessment Sampling at Naval Support Facility – Indian Head Stump Neck Annex – Range 3). Quality issues associated with the data are summarized in Appendix C. At the conclusion of the data assessment, the technical team determined that all data were suitable for the intended use.

5.2 Summary and Interpretation of Results

Table 5-1 summarizes maximum concentrations by analyte and media for the samples collected at Range 3 (for the complete set of analytical results, see Appendix D).

Table 5-1. Maximum Pollutant Concentrations in Soil and Groundwater Compared to Range-Specific Screening Levels

Pollutant	Groundwater			Soil		
	Max. Conc. (ug/L)	**Screening Level (ug/L)**	**Screening Level Source**	**Max. Conc. (mg/kg)**	**Screening Level (mg/kg)**	**Screening Level Source**
1,3,5-Trinitrobenzene	ND (<0.01)	1,100	RBC	ND (<0.25)	1,800	RSEPA
1,3-Dinitrobenzene	ND (<0.15)	3.7	RBC	ND (<0.25)	6.1	RSEPA
TNT	ND (<0.15)	2.2	RBC	0.25	16	RSEPA
2,4-Dinitrotoluene	ND (<0.15)	0.22	RBC	0.024 J PG	1.6	RBC
2,6-Dinitrotoluene	ND (<0.15)	3.7	MDE	ND (<0.25)	7.8	MDE
2-Amino-4,6-dinitrotoluene	ND (<0.3)	73	RBC	0.11 J	12	RSEPA
2-Nitrotoluene	ND (<0.15)	0.049	RSEPA	ND (<0.25)	0.9	RSEPA
3-Nitrotoluene	ND (<0.5)	121.7	RSEPA	ND (<0.25)	733	RSEPA
4-Amino-2,6-dinitrotoluene	ND (<0.15)	73	RBC	0.099 J	12	RSEPA
4-Nitrotoluene	ND (<1)	0.66	RSEPA	ND (<0.5)	12	RSEPA
Antimony	ND (<6)	6	MDE	**4**	3.1	MDE
Arsenic	**11.9**	10	MCL	**3.6**	0.39	RBC
Barium	148	2,000	MCL	32.1	15,000	RBC
Boron	99	7,300	RBC	3.8 B	16,000	RBC
Cadmium	1.7	5	MCL	0.3	3.9	MDE
Chromium	21.3	100	MCL	15.1	23	MDE
Copper	20.7	1,300	MCL	56	310	MDE
HMX	ND (<0.15)	1,825	DWS	1.2	3,100	RSEPA
Lead	14	15	MCL	113	400	RBC
Mercury	0.27 B	2	MCL	0.16	2.3	MDE
Nickel	49.5	73	MDE	9.8	160	MDE
Nitrobenzene[1]	ND (<0.15)	0.12	RBC	ND (<0.25)	4.4	RBC
Nitroglycerin	ND (<1)	4.8	DWS	1.9	6.1	RBC
Perchlorate	ND (<0.5)	2.6	MDE	0.38	7.82	RSEPA
RDX	ND (<0.25)	0.61	RBC	1.8	4.4	RSEPA
Selenium	1.9 B	50	MCL	0.29 B	39	MDE
Silver	ND (<0.3)	100	MDE	0.17	39	MDE
Strontium	215	22,000	RBC	7.2	47,000	RBC
Tetryl	ND (<0.15)	150	RBC	0.024 J	240	RBC
Zinc	102	5,000	MDE	42.8	2,300	MDE

[1] Although the screening level is below the reporting limit, it is above the method detection limit (0.05 ug/L). For this reason, the technical team concluded that nitrobenzene is not present in groundwater above the screening level.

RBC: EPA Region III RBC – tap water RBC used for groundwater and residential soil RBC used for soil (EPA Region III, 2009).
MDE: MDE Cleanup Standard (MDE, 2008).
RSEPA: RSEPA Implementation Manual Rev. 1 (EPA Region IX Preliminary Remediation Goals (EPA Region IX, 2004)).
MCL: EPA Maximum Contaminant Level (EPA, 2009).
DWS: EPA Drinking Water Standard (2004).
B, J: Estimated result; result is less than reporting limit.
PG: The percent difference between the original and confirmation analyses is greater than 40%.

Based on the analysis and comparisons prescribed by the RSEPA Program, the technical team compared results from the on-range sampling to range-specific screening levels specified for each pollutant. The technical team used the most stringent of the following standards to determine the appropriate screening levels for Range 3:

- Maximum Contaminant Levels (MCLs);
- MDE Generic Numeric Cleanup Standards for Groundwater;
- EPA Region III Risk-Based Concentrations (RBCs) calculated for tap water ingestion; and
- RSEPA Screening Levels (based primarily on EPA Region IX Preliminary Remediation Goals).

Table 5-1 above summarizes the initial screening step that the technical team used to identify analytes with levels of concern in the sampling data. As illustrated in this table, the technical team initially compared the screening levels to the maximum concentrations identified for each pollutant in both soil and groundwater samples. The analytical results show that all but two pollutants (antimony and arsenic) are below levels of concern in the soil and groundwater samples collected from Range 3. Based on this observation, the technical team has concluded that all pollutants except the two above screening levels are not likely to migrate off-range at levels of concern.

Both antimony and arsenic are commonly found in military munitions in small quantities; therefore, operations at Range 3 could be a potential source for these pollutants. Antimony was only detected above the range-specific screening level in one sample (and the associated field duplicate), and it only exceeded the screening level by a small margin (4 ppm compared to a screening level of 3.1 ppm). In addition, antimony was not detected in any of the groundwater samples taken from the surficial aquifer beneath the range. For these reasons, the technical team concludes that antimony is not likely to migrate off-range at levels of concern.

Although arsenic was detected above screening levels in multiple soil samples and one groundwater sample, the technical team does not believe that range operations are causing arsenic to migrate off-range. All detections of arsenic in soil are below the 95 percent upper tolerance limit value established for basewide background surface soils (4.25 mg/kg) (Brown and Root, 1998). Based on discussions with staff at the NSFIH Environmental Department, elevated background concentrations of arsenic in soils at the base are likely due to the widespread use of arsenic-containing herbicides in the 1940’s to control plant growth and create firebreaks. Although one groundwater sample exceeded the screening level for arsenic (11.9 ug/L compared to 10 ug/L), the exceedance was small and likely due to the elevated background soil concentrations unassociated with range operations.

6.0 CONCLUSIONS

Based on the analyses presented in the previous section, the technical team concluded that antimony and arsenic were the only pollutants present above levels of concern at Range 3 and therefore the only pollutants with the potential to migrate off-range at levels of concern.

Although antimony exceeded the soil screening level in one sample, the technical team has concluded that it is not likely to migrate off-range at levels of concern; this conclusion is based on the limited number of exceedances observed (one out of four), the relatively small magnitude of the exceedance (less than 30 percent above the screening level), and the fact that antimony was not detected in the groundwater samples taken from the surficial aquifer beneath the range.

The technical team determined that elevated arsenic concentrations are not likely caused by range operations; these concentrations are equivalent to background concentrations and are likely the result of arsenic-containing herbicides used throughout the installation in the 1940s.

Based on these conclusions, the technical team recommends that no further action be taken under the current RCA.

7.0 REFERENCES

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4. Department of the Navy, 2006. US Navy RSEPA Policy Implementation Manual (Rev. 1). November, 2006.

APPENDIX A

QUALITY ASSURANCE PROJECT PLAN FOR RANGE CONDITION ASSESSMENT SAMPLING AT NAVAL SUPPORT FACILITY INDIAN HEAD, STUMP NECK ANNEX, RANGE 3

Quality Assurance Project Plan for Range Condition Assessment Sampling at Naval Support Facility – Indian Head Stump Neck Annex – Range 3

Prepared for:

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August 2009

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1. INTRODUCTION

This range-specific Quality Assurance Project Plan (QAPP) addresses environmental data collection and quality assurance (QA) objectives and procedures for sampling activities to be performed at Range 3, Naval Support Facility (NSF) Indian Head, Stump Neck Annex, as part of the U.S. Navy Range Sustainability Environmental Program Assessment (RSEPA) Range Condition Assessment (RCA) initiated by the Naval Explosives Ordnance Disposal Technical Division (EODTECHDIV). This range-specific QAPP was developed in accordance with the Master Quality Assurance Project Plan for Sampling and Testing at Operational Ranges (Master QAPP).

Range 3 is an EOD testing facility used to research and develop field procedures for defeating roadside bombs, explosively formed projectiles (EFPs), and foreign ordnance. Past testing to develop appliqué armor to defend against EFPs has occurred at the range. EODTECHDIV also uses Range 3 to thermally decontaminate explosive hazardous waste (EHW) in a set of two burn pans.

2. PROJECT MANAGEMENT ELEMENTS

This section addresses project management, including project history and objectives, roles and responsibilities, and project goals. In addition, this section presents the mechanisms ERG will use to ensure that all participants understand the goals and the approach to be used. In addition to the Master QAPP guidance, the *EPA Requirements for Quality Assurance Project Plans* identifies nine elements to be discussed in this section. Element A.2, Table of Contents, has been provided earlier in this document. The remaining elements are presented below and in Appendix A, Range-Specific QAPP Worksheets.

2.1 Element A.3: Distribution List

This QAPP will be distributed to the EODTECHDIV Project Manager, the EODTECHDIV Safety Officer, and to all ERG staff providing support on the project (refer to Appendix A, Worksheet 2 - Controlled Distribution List).

2.2 Element A.4: Project Organization

Project Organization for ERG's support of the Range 3 sampling event is depicted in Figure 2-1 (refer to Appendix A, Worksheet 5 - Project Organization Chart). The ERG Program Manager will be responsible for management and administrative aspects of the work performed. The ERG Project Manager will be responsible for ensuring that the quality of work, schedule, and budget meet the requirements of the EODTECHDIV. The ERG Project Manager will provide technical direction to ERG, will be responsible for the daily activities on the project, and will obtain appropriate technical review of all deliverables. The ERG Project Manager will ensure deliverables conform to the appropriate technical review requirements (see Appendix C). The ERG Project Manager will be the principal contact for the EODTECHDIV Project Manager on project issues, deliverables, and schedule. The ERG Project Manager will also keep the Project QA Coordinator advised of any quality problems that arise.

The Project QA Coordinator will be responsible for the development and execution of QA activities throughout the course of the project, including work plan development and execution, data analysis, and data reporting. The Project QA Coordinator will also ensure that the ERG Project Manager is obtaining appropriate technical review of all deliverables.

The ERG Project Manager will provide senior technical support for the project activities and the ERG project staff will support all tasks.

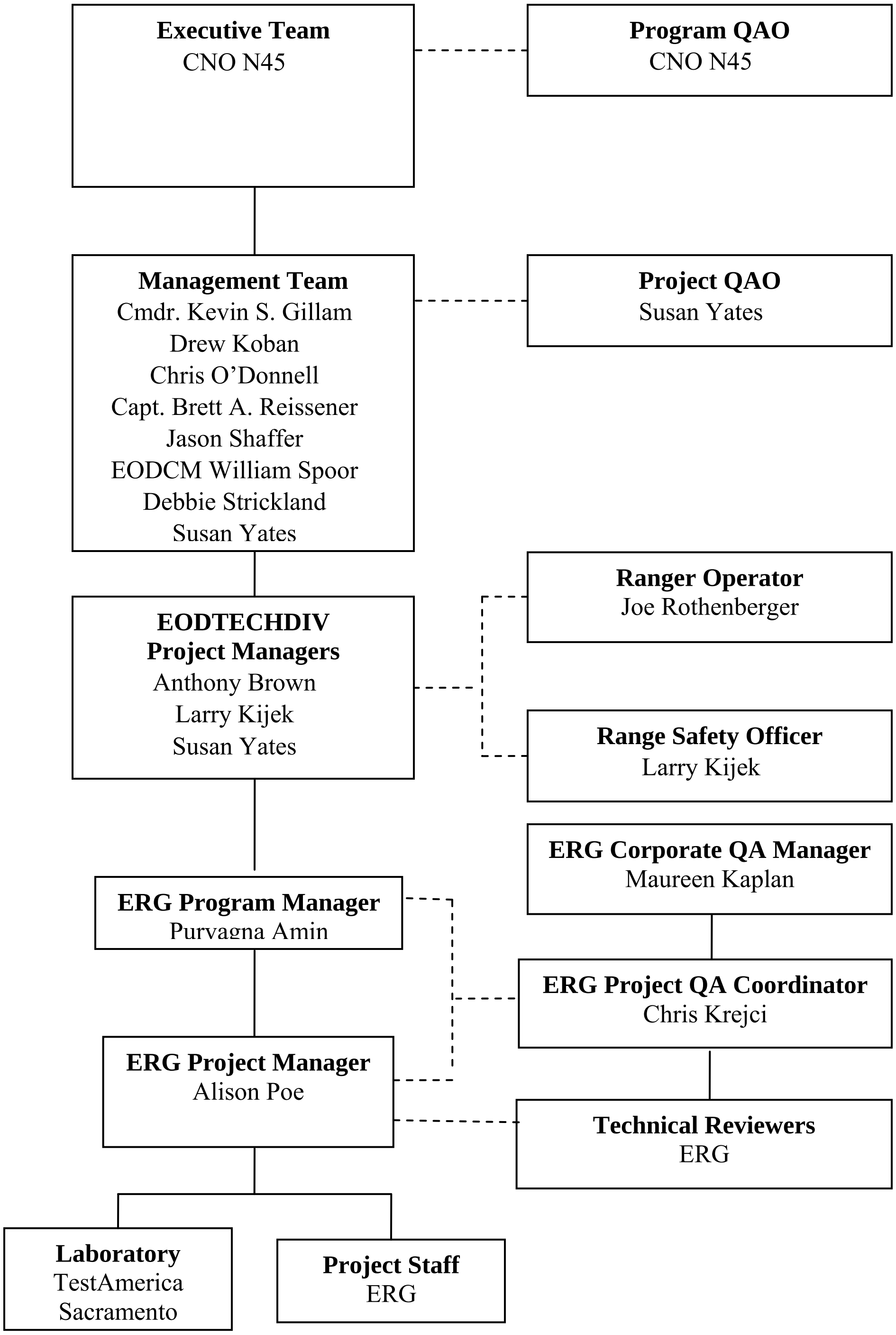

Figure 2-1. Project Level QA Organization for ERG's Range 3 Sampling Support

2.3 Element A.5: Problem Definition/Background

This section explains the purpose of the Range 3 sampling event. It also presents a brief overview of the history and operations at Range 3 to date, including a summary of historical compliance information.

2.3.1 Background[1]

Range 3 is an EOD testing facility located on the Stump Neck Peninsula immediately adjacent to Chicamuxen Creek, which flows southeast to the Potomac River. The range area is physically delineated by a cleared area that borders the Chicamuxen Creek, a wooded area, and grassland. Figure 2-2 provides an overview map of the range and its location on the Stump Neck Peninsula.

Range 3 has a net explosive weight limit of 60 lbs and is used to research and develop field procedures for defeating roadside bombs, explosively formed projectiles (EFPs), and foreign ordnance. Testing operations occur on a daily basis, with an average of two to three shots performed of one ordnance item per day. Past testing to develop appliqué armor to defend against EFPs has occurred at the range. EODTECHDIV also uses Range 3 to thermally decontaminate explosive hazardous waste (EHW) in a set of two burn pans.

Past operations at Range 3 are comparable to current operations. In addition to the current operations at Range 3, a historic dump site known as “Dump Site A” received wastes during a time period unknown to operational personnel. The exact boundaries of the dump site and the types of wastes that it received are unknown.

ERG is currently supporting EODTECHDIV in assessing the condition of its operational ranges at NSF Indian Head’s Stump Neck Annex under the Navy’s Range Sustainability and Environmental Program Assessment (RSEPA). As part of this effort, ERG developed predictive models of the off-range transport of munitions constituents (MCs) at Range 3 for the following media (ERG 2009a):

- Air:
- Surface water; and
- Soil and groundwater.

The majority of the testing at the range involves bulk explosive charges of C4, which exhibit comparatively greater rates of high-order detonations than other ordnance items tested at the base. This fact, in conjunction with the extremely high explosive limit set for the range (60 lbs NEW), leads the technical team to believe that air has the potential to be an important pathway for MCs to migrate off-range.

Because of its proximity to Chicamuxen Creek, flooding and overland flow are likely transport pathways for MCs at the range

Due to the permeability of the exposed soils at the surface of the range and the shallow groundwater table (between 5 to 10 feet depth in most areas), groundwater infiltration has the potential to be a significant transport pathway for MCs of concern at Range 3.

The Chicamuxen Creek is a popular spot for recreational fishing and hosts a variety of fish species. Human and ecological receptors include recreational fishermen, a variety of fish species, and sub-aqueous vegetation which provide habitat for fish and other biota.

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[1] Refer to Appendix A, Worksheet 4 - Project Description

The predictive models of the off-range transport of MCs at Range 3 make stochastic predictions of present and future concentrations of MCs using conservative assumptions which represent worst-case scenario. Because the surface water model predicted maximum concentrations in Chicamuxen Creek that exceeded RSEPA screening levels using worst-case scenarios, ERG recommended that EODTECHDIV move forward with limited environmental sampling to characterize and better understand the potential impacts of Range 3's operations to the surrounding environment.

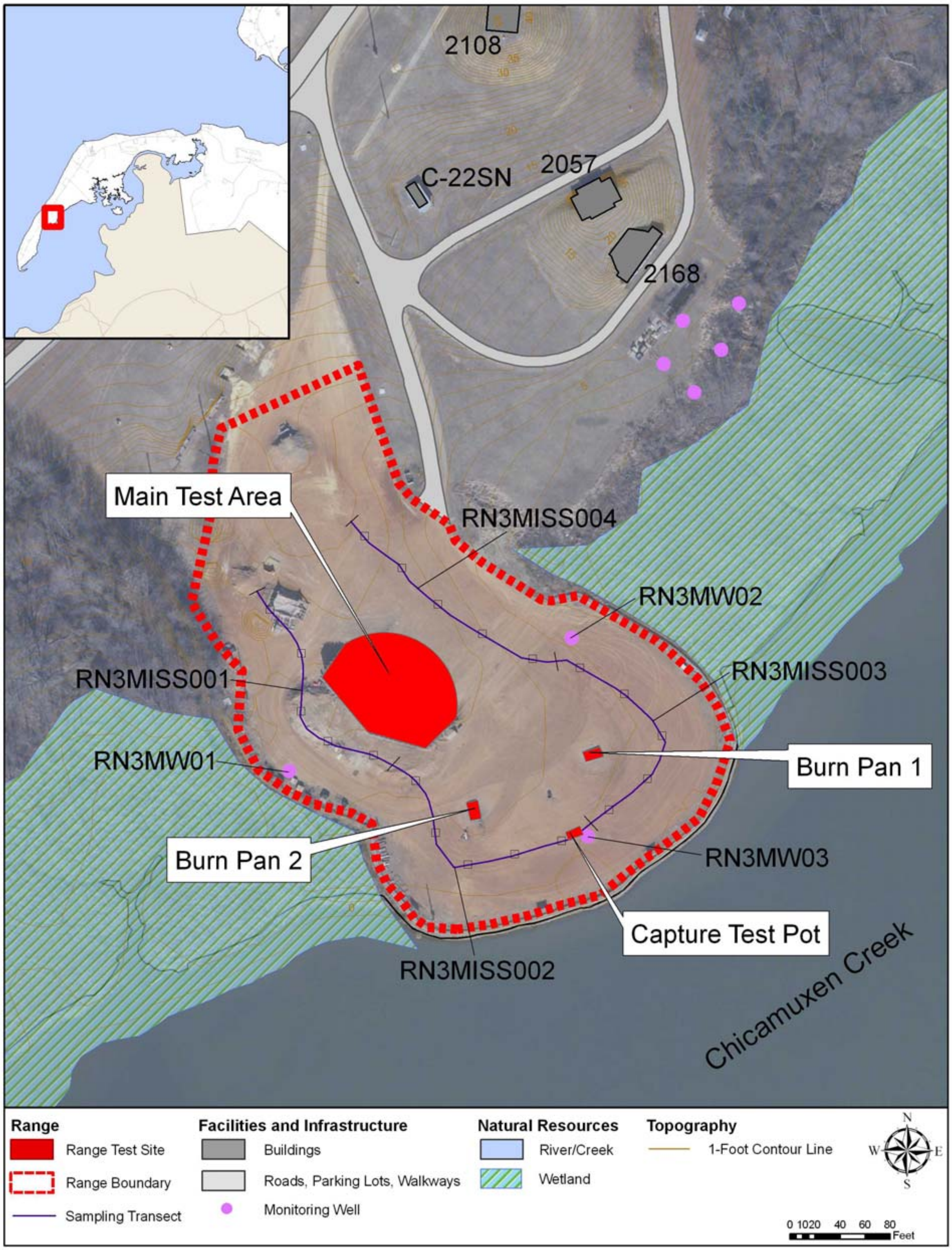

Figure 2-2. Overview Map of Range 3

2.3.2 Statement of Key Questions and Project Outcome

EODTECHDIV has directed ERG to provide technical support to coordinate environmental sampling at Range 3 as part of the RCA described in the RCA Report for EODTECHDIV (ERG, 2009a). The primary objective of the RCA is to determine whether or not significant off-range releases of MCs is occurring or has occurred and to determine the range's compliance with local, state, and federal environmental regulations.

ERG is providing environmental and planning support to EODTECHDIV in conducting sampling for the RCA. This range-specific QAPP addresses technical tasks to be performed as part of that support. ERG's main tasks under this project include:

- Collecting soil and groundwater samples at Range 3;
- Contracting labs and coordinating laboratory analysis of soil and groundwater samples for pollutants of concern;
- Reviewing analytical data quality;
- Analyzing laboratory results to further characterize environmental conditions at Range 3; and
- Documenting and reporting the analyses of all samples.

ERG will not be responsible for repairing monitoring wells at Range 3. ERG is also not responsible for developing remediation plans, nor is ERG responsible for collecting surface water samples.

Primary Objectives/Key Questions

The Range 3 sampling event will focus on characterization of environmental conditions at Range 3 based on samples collected from soil and the on-site groundwater monitoring wells. ERG will support EODTECHDIV in answering the following key questions:

1. What (if any) are the pollutants of concern in the soil and groundwater at Range 3?
2. Are the soil and groundwater at Range 3 below RSEPA screening levels for all pollutants of concern?
3. What sampling locations (if any) contribute to exceedances of RSEPA screening levels?

2.4 Element A.6: Project/Task Description

This section provides a management level overview of the work to be performed by ERG to support the EODTECHDIV's RCA sampling at Range 3, as well as ERG's approach to accomplishing the project objectives and the project schedule. ERG will use existing information and data provided by EODTECHDIV and the Environmental Office at NSF Indian Head; data obtained from a previous sampling episode (Brown and Root Environmental, 1998); data obtained from existing databases (e.g., DoD's Online Perchlorate Database); and other existing data sources. The acceptance criteria ERG will use to identify information and data that can be used to accomplish the project objectives are discussed in Section 2.5.

2.4.1 Range 3 Site Visits and Sampling

ERG is supporting EODTECHDIV in planning and conducting sampling at Range 3 as part of the RCA that began in the fall of 2007. The primary goal of the sampling effort is to characterize the environmental conditions at Range 3 to determine whether further action is needed to address the objectives of the RCA. Specifically, the RCA focuses on ensuring the sustainability of the operations at Range 3 by verifying that no significant releases of MCs off-range is occurring.

Information and data from the sampling event will be documented in a brief sampling report to be appended to the original RCA Report. The sampling report will document the analysis and comparison of all findings. It will also contain any conclusions made from these analyses, which will be used to answer key questions 1-3 (see Section 2.3.2).

Additionally, all project meetings will be documented according to Appendix A, Worksheet 8 - Project Meeting Attendance Sheet.

2.5 Element A.7: Quality Objectives and Acceptance Criteria

This range-specific QAPP is intended to ensure that data collected for the RCA sampling at Range 3 are of the quality necessary to support EODTECHDIV in determining whether or not further action is needed to achieve the objectives of the RCA and the RSEPA Program. Factors ERG will consider in reviewing data quality include accuracy and precision, completeness, representativeness, and comparability.

2.5.1 Groundwater and Soil Sampling

ERG will support EODTECHDIV in designing a sample plan, coordinating sample collection, and coordinating sample analysis at an appropriate laboratory. ERG will also review the analytical data and the QA/QC package provided by the lab against the project sampling plan and will identify those data which are acceptable for use in the data analysis for the RCA.

ERG will perform a cursory QC review of the laboratory results using the package provided by the lab, and will identify laboratory QC requirements. ERG is also responsible for ensuring the samples are analyzed using the appropriate methods and protocols.

ERG will consider the accuracy, precision, completeness, representativeness, and comparability of the sampling data in determining their use in the detailed study. The methods by which these factors are measured against the program's acceptance criteria are described further in the sections below.

Accuracy

Accuracy is a measure of the agreement between a measured value and a reference of "true" value. Because the "true" concentration of an analyte in a field sample is never known, spiked samples (e.g., a matrix spike (MS)) are used to evaluate accuracy. Laboratories prepare an MS by adding known amounts of the compounds of interest to the field sample. The spiked samples receive the same handling, extraction, cleanup, and analysis steps as the field samples. The laboratories then perform a percent recovery (%R) calculation to determine their accuracy:

$$\%R = \left(\frac{SSR - SR}{SA} \right) \times 100 \qquad \textbf{(2-1)}$$

where:

SSR = Spiked sample result;
SR = Sample result; and
SA = Spike added.

Labs evaluate the percent recovery results to determine if they meet predetermined specifications, and communicate the result of this evaluation to ERG in the QA/QC summary reports. In consultation with the EODTECHDIV project manager, ERG will use the results of laboratory analysis of samples collected to the maximum extent possible.

Precision

Precision is a measure of the agreement among repeated measurements. To evaluate precision, the laboratories calculate the relative percent difference (RPD) among the results from one or more types of "duplicate" analyses using the following equation:

$$RPD = \frac{|S - D|}{1/2(S + D)} \times 100 \qquad \textbf{(2-2)}$$

where:

S = First sample result; and
D = Duplicate sample result.

Laboratories use the analytical results of laboratory duplicate samples to evaluate the precision of their operations. Laboratories often use MS/matrix spike duplicate (MSD) samples to evaluate both precision and accuracy. The precision of the analytical procedure is assessed by calculating the RPD between the results of the MS and MSD samples using Equation 2-2.

Labs evaluate the relative percent difference results to determine if they meet predetermined specifications, and communicate the result of this evaluation to ERG in QA/QC summaries. In consultation with the EODTECHDIV project manager, ERG will use the results of laboratory analysis of samples collected to the maximum extent possible.

The analysis of field duplicate samples provides data to measure the precision of the entire sample collection, handling, preparation, and analysis process. ERG anticipates 10 percent of all samples collected will be collected as field duplicates. The results of the RPD analysis and the context will be examined to determine the precision of the data.

Completeness

Completeness is defined in terms of the percentage of data planned to be collected that are 1) collected and 2) deemed to be acceptable for use in this project. Sampling completeness is the number of samples collected relative to the number of samples planned for collection. ERG will document sampling completeness in the summary report. ERG will also check that data for all samples collected are received from the lab after their review and that the QC results are such that the data are acceptable for use in the RCA. ERG expects 95% or better completeness of sample collection and expects to use all data results with any appropriate caveats.

Representativeness

The primary goal of the sampling effort is to characterize the environmental conditions at Range 3 and evaluate the possibility of past or present off-range releases of MCs.

ERG will assist EODTECHDIV in designing a sampling plan for collecting data that will assist in making determinations regarding any necessary further actions to meet RSEPA goals, and in controlling procedures for sample collection, preservation, and handling. Field sampling crews will collect samples for this project using the procedures described in the Sampling and Analysis Plan for Range 3 (ERG, 2009c) and in SOPs developed for each sampling and analysis procedure. Where possible, ERG will compare results with past analytical data collected for Range 3 to confirm the presence of specific pollutants.

2.5.2 Analysis of Monitoring Data

This section presents how ERG will evaluate data collected for this project to characterize the environmental conditions at Range 3 and make determinations regarding necessary further actions under RSEPA. ERG will perform basic analyses on the data that are collected, consisting primarily of a series of statistical calculations to determine which (if any) analytes are above range-specific screening levels, and whether any analytes are present in higher concentrations at specific locations within the site. If the analyte concentrations are found to be lower than the screening levels specified in the RCA Report, than no further action will be required for Range 3 under RSEPA and the RCA will be complete for the next five years.

ERG's responsibilities for the completeness, accuracy, and reasonableness checks are outlined below.

Completeness

Completeness is defined in terms of the percentage of data collected that are used in the subsequent analysis. ERG expects to use all analytical data with appropriate caveats.

Accuracy

ERG will utilize analytical data from laboratories that are judged to be reliable. ERG will review the information provided in the labs QA\QC reports to ensure that the accuracy of the analytical methods used has been demonstrated.

Reasonableness

ERG will review the analysis of analytical data and verify that the conclusions are appropriate using reasonableness tests. These tests will include simple checks of individual steps (e.g., verifying that the statistical mean is within the range of reported values) as well as internal peer review.

2.6 Element A.8: Special Training/Certification[2]

Sample Collection Training. All staff supporting sampling for the Range 3 sampling event will be trained in soil and groundwater sample collection techniques.

Health and Safety Training. ERG will determine if additional health and safety training is required for sampling staff after sampling and safety considerations have been discussed with EODTECHDIV. All sampling staff supporting the sampling event have received annual health and safety training.

2.7 Element A.9: Documents and Records

ERG has developed and instituted document control mechanisms for the review, revision, and distribution of QAPPs. Each QAPP has document control format (shown below) that appears in the header of each page:

Date	Revision No.

During the course of the project, any revision to the QAPP will be circulated to everyone supporting this project.

Standard controls for project-related data, documents, and records are presented in Section 5 of ERG's 2002 Corporate QMP. ERG's Project Manager is responsible for designating an individual to maintain all project files. She is also responsible for ensuring that project team members use ERG SOPs, including documenting all data sources used. This centralized record contains all data collected or accessed from other sources, and documents analyses of data collected.

Management of project data is specifically described in Section 3.3.2 of this QAPP.

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[2] Refer to Appendix A, Worksheet 7 - Specialized Training or Certification/Licensing/Registration Requirements

3. DATA GENERATION AND ACQUISITION

This section addresses how ERG plans to ensure that appropriate methods for data collection, generation, and acquisition are employed and documented. This section discusses the following nine elements:

- B.1: Sampling process design;
- B.2: Sampling methods;
- B.3: Sample handling and custody;
- B.4: Analytical methods;
- B.5: Quality control;
- B.6: Instrument/equipment testing, inspection and maintenance;
- B.7: Instrument/equipment calibration and frequency;
- B.8: Inspection/acceptance of supplies and consumables; and
- B.9: Data Management.

In addition, range specific Data Quality Objectives (DQOs) that define the types, quality, and quantities of data required to answer the specific Range 3 environmental questions and to support the environmental decision making process are presented in Appendix B, Data Quality Objectives.

3.1 Sampling and Analysis

This section provides detailed descriptions of the methods ERG will use to support EODTECHDIV's RCA sampling event. All eight data generation and acquisition elements apply.

3.1.1 Element B.1 - Sampling Process Design

ERG will conduct one sampling episode at Range 3 in August 2009. ERG will support EODTECHDIV in selecting pollutants of concern to be analyzed in the collected samples.

Sections 1 and 2 of the sampling plan describes the planned sampling approach, including analyte selection, bottle sets, and sample collection procedures; sample collection methodology including collection of quality assessment samples; sample preservation, shipping, and analysis; field measurements and engineering data collection; sample labeling; chain-of-custody recording; and Quality Assurance/Quality Control. Additional information on health and safety procedures are provided in the Health and Safety Plan (ERG, 2009b).

ERG has identified the following pollutants of concern for analysis:

- Total metals (including mercury);
- Explosives; and
- Perchlorate.

<u>Modifications to Sampling Process Design</u>. Unforeseen conditions at the site may result in modifications to the planned sampling methodology. All deviations from the sampling plan will be approved by the sampling crew chief at the sampling episode and documented in both the

samplers' field notes and in site-specific sampling episode reports that document the information and data collected during sampling episodes.

3.1.2 Element B.2 - Sampling Methods

This section describes the following:

- Information that will be included in the sampling plan;
- Training staff in sample collection methods;
- Methods for identifying upset conditions requiring suspension of sampling;
- Methods for minimizing sample contamination; and
- Field sampling equipment and decontamination methods.

Sampling Plan. Section 2.4 of the sampling plan describes the planned field sampling methodology for collecting samples from the various sample points (refer to Appendix A, Worksheet 12 - Sampling Standard Operating Procedures Reference Table and Worksheet 13 - Sampling and Analysis Summary Table). It contains the following information:

- Name and location of site being sampled;
- Sampling points;
- Analytes and analytical methods;
- Quality assurance and quality control procedures and samples;
- Sampling procedures;
- Analytical laboratory contact information; and
- Health and safety precautions.

To ensure that all the tasks for the sampling event are completed, ERG prepares a pre-sampling checklist to follow. These checklists evolve over time and are crucial for the pre-sampling planning.

Training Staff in Sample Collection Methods. Site-specific pre-sampling training will be provided to the sampling team by ERG team members and operational staff at Range 3. The training includes:

- Review of site-specific health and safety requirements including personal protective equipment and procedures.

- Site-specific health and safety training, as required by EODTECHDIV.

- Sampling procedures training for all crew members, including:
    - Sampling preparation;
    - Grab samples (techniques for collecting samples to be analyzed, including trace metals);
    - Preservation (chemicals, ice);
    - Shipping and packing, especially procedures for labeling and preparing bottles and packing coolers; and
    - Field tests, including temperature and pH, conductivity, turbidity, and salinity.

- Sampling crew chief training to expand on topics discussed in general sampling training.

Methods for Minimizing Sample Contamination. ERG will conduct all sampling activities in a manner to minimize potential contamination and cross-contamination of samples. ERG samplers will use non-contaminating pH indicator paper or a pH probe during field tests and preservation. A plastic cup will be filled during collection of each sample set for field measurements to ensure that thermometers and test kits do not contaminate the samples. ERG will measure temperature and pH immediately after the collection of the field measurement aliquot. Section 2.6 of the sampling plan describes the field measurements.

All personnel who collect samples will wear new nitrile gloves at each sampling point to avoid exposure to pollutants and other chemical, physical, and biological hazards, and to prevent cross-contamination of samples. Samplers will use a new pair of gloves at each sampling point each time they collect sample. Samplers will use care not to touch the insides of bottles or lids/caps during sampling.

Sampling Equipment and Decontamination. Typical field sampling equipment that may be used for the sampling event includes: precleaned sample bottles for chemical analyses, pH indicator paper, pH probes, thermometers, and sampling collection devices such as precleaned, disposable bailers (refer to Appendix A, Worksheet 14 - Sampling Equipment Checklist). ERG will receive the appropriate sampling containers for each of the analyses to be performed from the contracted analytical laboratory. ERG will order excess sampling equipment as a contingency against breakage, malfunction, or loss.

ERG will purchase other sampling equipment that directly contacts the samples, such as trowels, mixing bowls, and well bailers. Equipment will either be dedicated to each sample point (preferable), or the crew will decontaminate it before reuse by following these steps:

1. Washing the equipment in a non-phosphate detergent and water solution;
2. Rinsing the equipment with tap water;
3. Rinsing the equipment with Ultra Pure Blank Water DI+^{TM}; and
4. Rinsing the equipment with sample prior to sample collection.

ERG will collect equipment blanks when necessary to verify adequate decontamination procedures.

3.1.3 Element B.3 - Sample Handling and Custody

This section describes the procedures for sample handling and sample custody. The sampling plan also contains information describing the sample handling and sample custody. The sampling plan discusses proper sample handling in the field including:

- Sample collection;
- Sample preservation and shipping;
- Sample labeling;
- Sample set preparation; and
- Sample packing.

Sampling data EODTECHDIV uses to make determinations for RSEPA should be legally defensible. Therefore, the sample must be tracked from sample collection through analysis. ERG will create sample labels to identify and track all samples. In addition, ERG will use field logs to document samples were collected as described in the sampling plan.

ERG will use a chain-of-custody form (refer to Appendix A, Worksheet 17 - Chain-of-Custody Form) to maintain a record of sample collection, sample transfer between personnel, sample shipment, and sample receipt by the laboratory. The sampling crew will complete a chain-of-custody form for each cooler or box that is shipped to a laboratory. Each form will contain the following information:

- Sampling episode number for each well sampled;
- Information about the contents of each cooler or box being shipped;
- Sample number for each sample in shipment;
- Collection date and time for each sample in shipment;
- Preservation (yes or no) and pH after preservation for each sample in shipment;
- Number of containers of each sample in shipment;
- Sample description (environmental matrix) for each sample in shipment;
- Analyses required for each sample;
- Shipment or airbill number;
- Date and method of shipment; and
- The name of the person shipping the samples.

The sampling crew chief or his designee is responsible for completing the chain-of-custody forms, including referencing all applicable blank and QC samples, signing the forms, and noting the date and time of shipment. This individual will also inspect the forms for completeness and accuracy. Any person who makes changes to the form will initial the changes made. The sampling crew chief will retain one copy of the chain of custody and two copies will accompany the sample shipment.

ERG does not anticipate shipping samples collected during this project as dangerous goods. All samples collected during this project are expected to be shipped under the exclusion allowed for transporting laboratory samples in 40 CFR 261.4(d) and under the definition and exception in CFR 49 Part 173.134. For any samples that do not qualify for this exclusion, the field sampling crew will package and label samples for shipment in compliance with current U.S. Department of Transportation and International Air Transport Association dangerous good regulations.

3.1.4 Element B.4 - Analytical Methods

Table 3-1 at the end of this subsection lists the analytical methods that ERG plans to use to characterize soil and groundwater samples. Table 3-2 (also at the end of this subsection) lists the typical volume of sample to be collected, typical container type, and typical preservation required for each parameter. ERG will receive the appropriate sampling containers for each of the analyses to be performed from the contracted analytical laboratory.

3.1.5 Element B.5 - Quality Control

The Range 3 sampling event will include the collection of field quality control samples. The sampling plan will specify the quantities and types of blank and duplicate samples to be collected during each episode.

The following sample blanks and duplicate samples will also be included during each round of sampling:

- One groundwater field duplicate sample for each pollutant;
- One soil duplicate sample for each sample and each pollutant; and
- One matrix spike/matrix spike duplicate sample for each pollutant.

Table 3-3 presents a list of the field quality control samples, the analytes analyzed, the purpose, and the frequency. Note that not all analytical methods require all of the QC measures listed. The sampling plan discusses collection of these samples in greater detail. This section describes each of the field quality control samples that will be collected for the sampling event.

Field Duplicate

At the duplicate sampling point, field duplicate samples will be collected simultaneously from the same location as the original samples. When samples are collected directly into the sample containers, the sampling crew will fill original and duplicate sample bottles one immediately after the other.

Purpose	To evaluate total measurement precision and assess potential sources of data variability, including sample collection, handling, preparation, and analysis.
Recommended Frequency	At least 10% of samples collected over the entire sampling event, or (in the case of multiple increment soil samples) one duplicate for each sample collected.

Matrix Spike/Matrix Spike Duplicate

At the duplicate sampling point, matrix spike/matrix spike duplicate samples will be collected simultaneously from the same location as the original samples. When samples are collected directly into the sample containers, the sampling crew will fill original and duplicate sample bottles one immediately after the other.

Purpose	To evaluate total measurement precision.
Recommended Frequency	At least 10% of samples collected over the entire sampling event.

3.1.6 Element B.6 - Instrument/Equipment Testing, Inspection, and Maintenance

All sampling and field test devices will be inspected prior to use to ensure that they are working properly. Section 2.6 of the sampling plan describes the field test equipment ERG expects to be used during the sampling event. Sampling staff will follow the manufacturer’s instructions in operating this equipment.

3.1.7 Element B.7 - Instrument/Equipment Calibration and Frequency

To control sampling errors, the sampling plan contains specifications for sampling equipment and instructions for use (e.g., field meters, test kits) (refer to Appendix A, Worksheet 15 - Field Equipment Calibration Table). The sampling crew chief is responsible for ensuring that all equipment is maintained in good working condition and that decontamination procedures are properly followed. Prior to each sampling episode, sampling staff will calibrate the field test equipment following the manufacturer's instructions. All variations from the manufacturer's instructions will be fully documented in field logs.

3.1.8 Element B.8 - Inspection/Acceptance Criteria for Supplies and Consumables

Critical supplies and consumables are those that come in contact with samples. These include sample bottles, preservation chemicals, blank water, and sampling equipment. The sampling crew chief is responsible for the purchase of required materials and the inspection of materials upon receipt to ensure they are usable for this project (e.g., no observable breakage, evidence of tampering or contamination).

3.1.9 Element B.9 - Data Management

ERG will adhere to the documentation and data reporting procedures for the sampling event during field data collection operations. Field documentation tools for this project will include sample labels, field logs, and chain of custody recorded on standard data collection sheets completed by the samplers. The sampling crew chief will review all field documentation and ensure that all records are legible and complete.

ERG will assist EODTECHDIV in conducting an overall engineering assessment of the sampling data. This review will consider the detected and nondetected pollutants, pollutant concentrations, laboratory quality control issues described in the data review narrative, and site conditions present during the sampling episode that may have affected the analysis results.

As directed by EODTECHDIV, ERG will prepare a final sampling report for the sampling event. The report will provide descriptions of the wells sampled, sampling points and sample collection, and deviations from the site-specific and generic sampling plan. The report will also present both the in-field measurement data and the analytical results provided by the contracted laboratory, including a brief engineering analysis of the data.

As directed by EODTECHDIV, ERG will develop a sampling database to analyze the analytical data. ERG will follow ERG's SOPs for Databases in developing the database (3,4).

Table 3-1. Standard Analytical Methods and Procedures[3]

Method No.	Title
SW-846 6010C	Inductively Coupled Plasma-Atomic Emission Spectrometry (Total Metals)
SW-846 8330	Nitroaromatics And Nitramines By High Performance Liquid Chromatography (Explosives)

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[3] Refer to Appendix A, Worksheet 18 - Analytical Methods and Standard Operating Procedures

Table 3-1. Standard Analytical Methods and Procedures[3]

Method No.	Title
SW-846 Method 6850	Perchlorate In Water, Soils And Solid Wastes Using High Performance Liquid Chromatography/Electrospray Ionization /Mass Spectrometry
SW-846 7470A	Mercury In Liquid Waste (Manual Cold-Vapor Technique)
SW-846 7471A	Mercury In Solid Waste (Manual Cold-Vapor Technique)

Table 3-2. Summary of Sample Container and Preservation Requirements4

Parameter	Soil Sample Container	Groundwater Sample Container	Soil Preservation	Groundwater Preservation	Hold Time
Metals (except for mercury)	4 oz glass jar	500ml HDPE	None	HNO_3 to pH<2.	6 months
Mercury	4 oz glass jar	500ml HDPE	Refrigerate	HNO_3 to pH<2.	6 months
Explosives	4 oz glass jar	2 1-L Amber Glass Containers	Cool to ≤ 6°C.	Cool to ≤ 6°C.	7 days
Perchlorate (Method 6850)	4 oz glass jar	250ml HDPE	None	Sterile filter using 0.2-µm PTFE membrane filtration.	28 days

Table 3-3. Field Quality Control Samples[5]

Field Quality Control	Analytes	Purpose	Frequency
Equipment blank	All analytes	To monitor potential contamination from precleaned sampling equipment.	Once per pollutant per media.
Field duplicate	All analytes	To evaluate total measurement precision and assess potential sources of data variability, including sample collection, handling, preparation, and analysis.	Once per pollutant per media.
Matrix Spike/Matrix Spike Duplicate	All analytes	To evaluate total measurement precision.	Once per pollutant per media.

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[4] Refer to Appendix A, Worksheet 11 - Sampling Design and Rationale

[5] Refer to Appendix A, Worksheet 16 - Field Quality Control Summary Table

4. ASSESSMENT AND OVERSIGHT ELEMENTS

This section describes the methods ERG will use to assess the quality of the work conducted for the Range 3 sampling event.

4.1 Element C.1: Assessments and Response Actions

This section describes the technical reviews that will be performed during the Range 3 sampling event.

4.1.1 Technical Support

All work conducted for the Range 3 sampling event will be subject to technical review. Technical review is a documented critical review of work that has been performed within the "state-of-the-art." This review will be conducted by Alison Poe, ERG's Project Manager for the Range 3 sampling event. For the sampling plan and sampling report, the review will be conducted by the applicable crew chief and Ms. Poe. Review of project deliverables will be documented in a "Deliverable Sign-Off Sheet." All deliverables will be subsequently reviewed by EODTECHDIV staff.

Chris Krejci will serve as the Project QA Coordinator for this project. He will use the following tools to assess the implementation of QA/QC procedures on this project:

- Review of the QAPP (this document) for completeness and applicability.
- Audit project files to ensure project staff have developed QC procedures and that these procedures are used. Also, to verify that project staff are using appropriate SOPs and that the deliverable review process is documented in sign-off sheets.

At any time, or at the end of the project or work assignment, the Corporate QA Manager, Maureen Kaplan, or her designee, may inspect the project QA files.

4.1.2 Sampling and Analysis

At the completion of the sampling episode, the ERG Project QA Coordinator or his designee will review records of field activities and will evaluate the following elements:

- Overall level of organization and professionalism;

- Compliance of all activities with the site-specific sampling plan and the Health and Safety Plan;

- Compliance with procedures outlined in this QAPP; and

- Completeness of field documentation (i.e., field logs, chain of custody, and data collection sheets).

After the audit, the ERG Project QA Coordinator will discuss any deficiencies with the sampling team and identify any necessary corrective actions for future sampling. If any of these deficiencies may potentially affect the integrity of the samples being collected, the ERG Project QA Coordinator will immediately inform the sampling team and the EODTECHDIV Project Manager, so that any corrective actions can be taken.

4.1.3 Corrective Actions

The sampling plan will guide all field activities conducted by the sampling crew during the sampling event. If deviations from the planned sampling and sample preservation protocols are required, these deviations will be described in the crew chief's field notes. Deviations from standard sample preservation protocols will be noted on the comment section of the chain of custody. All field sampling deviations will also be described and explained in the report along with a discussion of their potential impact on the sample results. If changes to established sampling collection, packaging, or shipping protocols are deemed necessary, they will be discussed with EODTECHDIV representatives and documented in writing as part of the sampling plan.

4.2 Element C.2: Reports to Management

This QAPP will be appended as required. ERG will inform the EODTECHDIV Project Manager of the progress of all work activities on this task order through monthly written reports.

Any quality deficiencies detected by technical reviewers or the Project QA Coordinator will be communicated, in writing, to the ERG Project Manager and Local QA Coordinator. The ERG Project Manager is responsible for ensuring that appropriate corrective action is taken and that these actions are reported to the Local QA Coordinator and EODTECHDIV Project Manager.

5. DATA VALIDATION AND USABILITY ELEMENT

This section describes data review, verification, and validation (refer to Appendix A, Worksheet 21 - Quality Assurance and Assessment Reports and Worksheet 22 - Data Quality Assessment). It also discusses how validated data will be evaluated to determine if they adequately answer the questions posed in Section 2.3.2 and meet the quality objectives stated in Section 2.5.

5.1 Elements D.1 and D.2: Data Review, Verification, and Validation; and Validation Methods

This section discusses how ERG will check information collected during the sampling and analysis portions of this project to determine how they can be used.

5.1.1 Sampling and Analysis

ERG will conduct an overall engineering assessment of the sampling data. This review will consider the detected and non-detected pollutants, pollutant concentrations, laboratory quality control issues described in the data review narratives, and data variability in relation to the samples collected.

To review data for calculation errors, ERG will use its SOPs for engineering calculations in spreadsheets (ERG, 2002) and databases (ERG, 2006a and 2006b) as appropriate for the calculation method used.

ERG will report these measures of quality to the EODTECHDIV Project Manager.

5.2 Element D.3: Reconciliation with User Requirements

Sampling data are primary data sources ERG will use to answer each of the key questions posed in Section 2.3.2. Sampling data will be used in a variety of calculations and analyses throughout the project. All primary data calculations and analyses will be thoroughly documented for the project file in spreadsheets, databases, calculations, database programs and queries, and technical memoranda and documents. Only acceptable data will be used in calculations and analyses, and any data limitations or assumptions will be clearly described to the user.

The data collected during the sampling event can be used to answer the questions posed in Section 2.3.2 by clearly identifying the presence (concentrations of pollutants above the analytical method minimum level) or non-presence (concentrations of pollutants below the analytical method detection level) of analytes in the groundwater and soil samples.

6. REFERENCES

1. Brown and Root Environmental. 1998. RCRA Facility Investigation/Verification Investigation Report for Stump Neck Annex, Indian Head Division. January, 1998.

2. U.S. EPA, 2001. EPA Requirements for Quality Assurance Project Plans QA/R-5, EPA/240/B-01/003, Office of Environmental Information.

3. U.S. EPA, 2001. EPA Requirements for Quality Management Plans QA/R-2, EPA/240/B-01/002, Office of Environmental Information.

4. ERG, 2006a. Standard Operating Procedure for Database Queries: Developing, Documenting, and Evaluating Accuracy, SOP No.: ERG-CHA-004, Revision 1, 22.

5. ERG, 2006b. Standard Operating Procedure for Databases: Developing, Documenting, and Evaluating Accuracy, SOP No.: ERG-CHA-003, Revision 1, 22.

6. ERG, 2002. Standard Operating Procedure for Developing, Documenting, and Evaluating the Accuracy of Spreadsheet Data, SOP No: ERG-CHA-002.

7. ERG, 2002. Standard Operating Procedure for Deliverable Review Sign-Off Sheets, SOP No: ERG-CHA-001.

8. ERG, 2009a. Final Range Condition Assessment Report for Naval Explosives Ordnance Disposal Technical Division, Naval Support Facility Indian Head. October 2009

9. ERG, 2009b. Health and Safety Plan for the Range Condition Assessment Sampling at EODTECHDIV Range 3. August 2009

10. ERG, 2009c. Sampling and Analysis Plan for Range Condition Assessment at Naval Support Facility Indian Head, Stump Neck. August 2009

Appendix A

RANGE-SPECIFIC QAPP WORKSHEETS

Worksheet 1

Title and Approval Page

Range: Range 3

Location: Naval Support Facility – Indian Head (Stump Neck Annex)

Quality Assurance Project Plan for Range Condition Assessment Sampling at Naval Support Facility – Indian Head, Stump Neck Annex, Range 3
Document Title

Naval Explosives Ordnance Disposal Technical Division	Susan Yates
Lead Organization	**Contact Person**

Christopher Krejci, Eastern Research Group, Inc.
Preparer's Name and Organizational Affiliation

14555 Avion Parkway, Suite 200, Chantilly, VA 20151 (512) 407-1835
Preparer's Address and Telephone Number

22 July 2009
Preparation Date (Day/Month/Year)

Approval Signatures: See Worksheet 3 for Approval Signatures

Worksheet 2

Controlled Distribution List

List people who will receive the approved QAPP, QAPP revisions, addenda, and/or amendments.

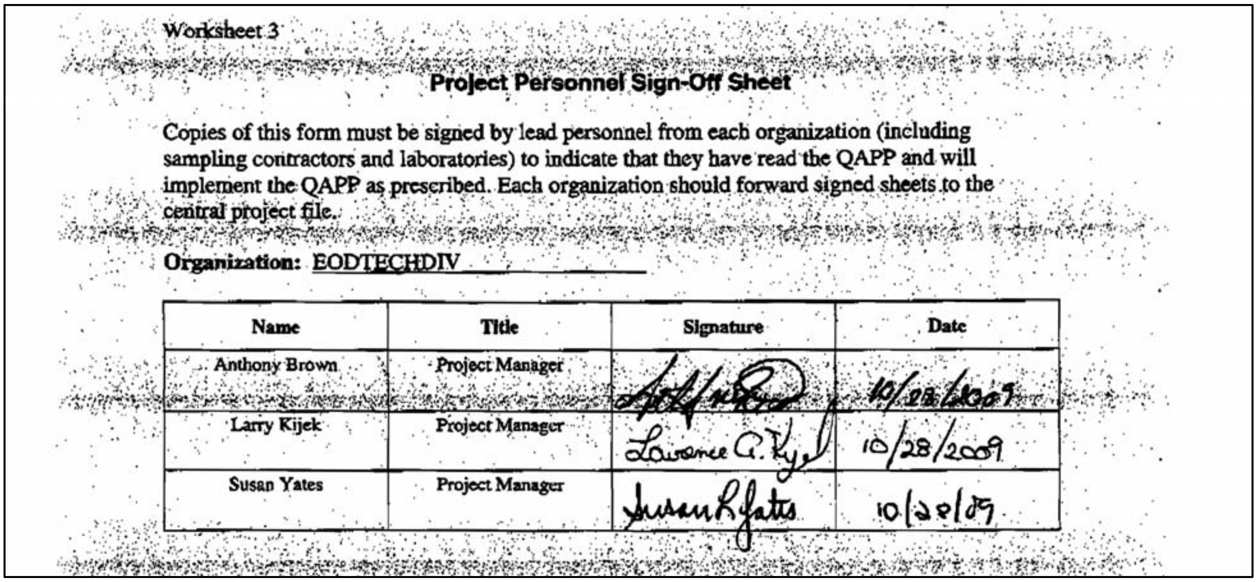
QAPP Recipient	Title	Organization	Document Control Number
Anthony Brown	Project Manager	EODTECHDIV	August 2009, Revision 0
Larry Kijek	Project Manager	EODTECHDIV	August 2009, Revision 0
Susan Yates	Project Manager	EODTECHDIV	August 2009, Revision 0
Alison Poe	Project Manager	Eastern Research Group, Inc.	August 2009, Revision 0
Adam Humphreys	Environmental Scientist	Eastern Research Group, Inc.	August 2009, Revision 0
Chris Krejci	Hydrogeologist	Eastern Research Group, Inc.	August 2009, Revision 0
Mark Briggs	Environmental Engineer	Eastern Research Group, Inc.	August 2009, Revision 0

Worksheet 3

Project Personnel Sign-Off Sheet

Copies of this form must be signed by lead personnel from each organization to indicate that they have read the QAPP and will implement the QAPP as prescribed. Each organization should forward signed sheets to the central project file.

Organization: EODTECHDIV



Worksheet 3

Project Personnel Sign-Off Sheet

Copies of this form must be signed by lead personnel from each organization (including sampling contractors and laboratories) to indicate that they have read the QAPP and will implement the QAPP as prescribed. Each organization should forward signed sheets to the central project file.

Organization: EODTECHDIV

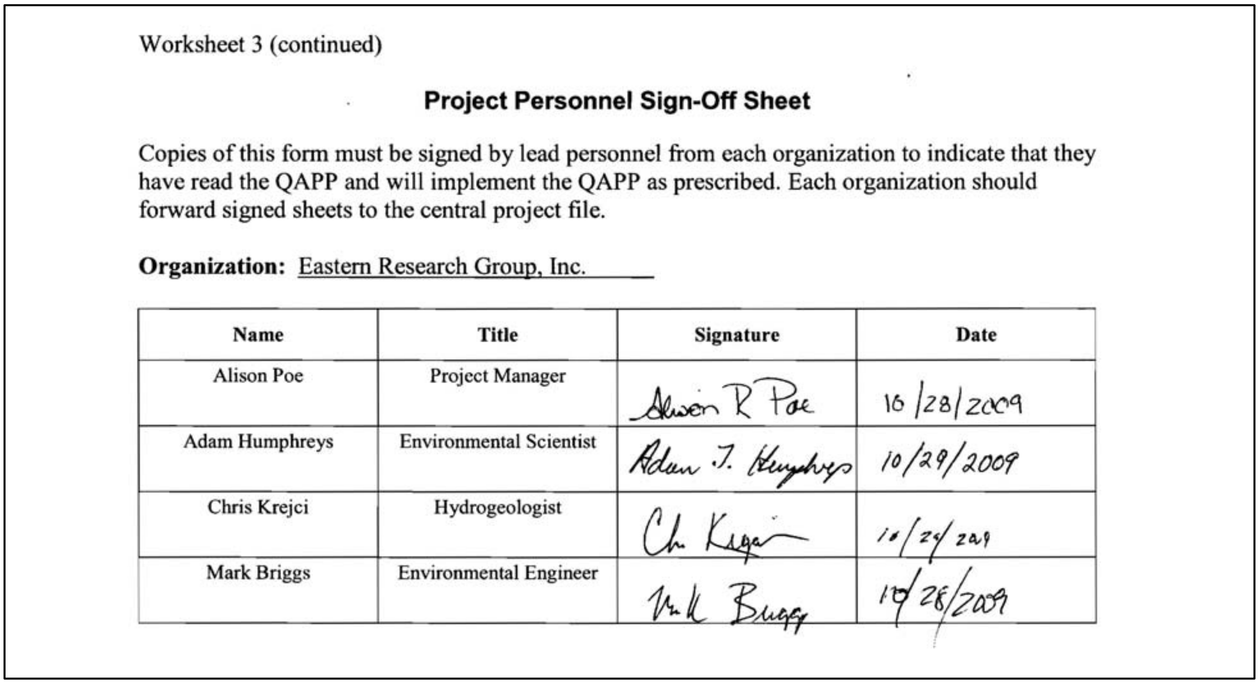
Name	Title	Signature	Date
Anthony Brown	Project Manager		10/28/2009
Larry Kijek	Project Manager	Lawrence G. Ky	10/28/2009
Susan Yates	Project Manager	Susan L Yates	10/28/09

Worksheet 3 (continued)

Project Personnel Sign-Off Sheet

Copies of this form must be signed by lead personnel from each organization to indicate that they have read the QAPP and will implement the QAPP as prescribed. Each organization should forward signed sheets to the central project file.

Organization: Eastern Research Group, Inc.



Worksheet 3 (continued)

Project Personnel Sign-Off Sheet

Copies of this form must be signed by lead personnel from each organization to indicate that they have read the QAPP and will implement the QAPP as prescribed. Each organization should forward signed sheets to the central project file.

Organization: Eastern Research Group, Inc.

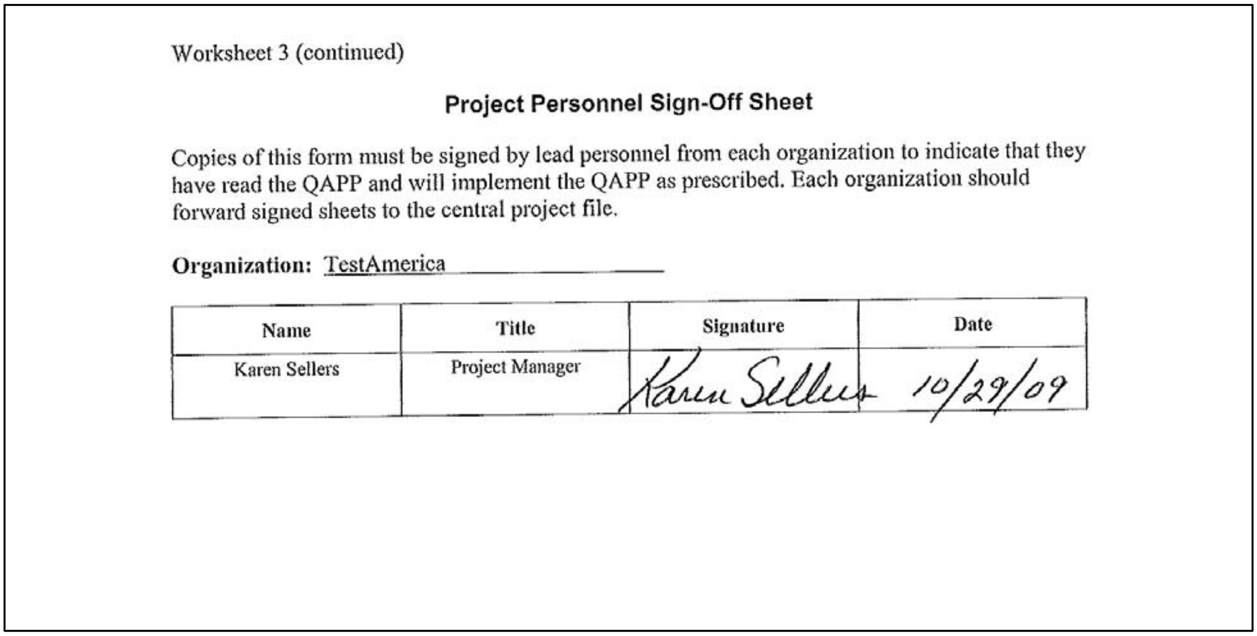
Name	Title	Signature	Date
Alison Poe	Project Manager	Alison R Poe	10/28/2009
Adam Humphreys	Environmental Scientist	Adam J. Humphreys	10/29/2009
Chris Krejci	Hydrogeologist	Chris Krejci	10/29/2009
Mark Briggs	Environmental Engineer	Mark Briggs	10/28/2009

Worksheet 3 (continued)

Project Personnel Sign-Off Sheet

Copies of this form must be signed by lead personnel from each organization to indicate that they have read the QAPP and will implement the QAPP as prescribed. Each organization should forward signed sheets to the central project file.

Organization: TestAmerica, Inc.



Worksheet 3 (continued)

Project Personnel Sign-Off Sheet

Copies of this form must be signed by lead personnel from each organization to indicate that they have read the QAPP and will implement the QAPP as prescribed. Each organization should forward signed sheets to the central project file.

Organization: TestAmerica

Name	Title	Signature	Date
Karen Sellers	Project Manager	Karen Sellers	10/29/09

Worksheet 4

Project Description

Range 3 is an EOD testing facility located on the Stump Neck Peninsula immediately adjacent to Chicamuxen Creek, which flows southeast to the Potomac River. The range area is physically delineated by a cleared area that borders the Chicamuxen Creek, a wooded area, and grassland. Figure 2-2 provides an overview map of the range and its location on the Stump Neck Peninsula.

Range 3 has a net explosive weight limit of 60 lbs and is used to research and develop field procedures for defeating roadside bombs, explosively formed projectiles (EFPs), and foreign ordnance. Testing operations occur on a daily basis, with an average of two to three shots performed of one ordnance item per day. Past testing to develop appliqué armor to defend against EFPs has occurred at the range. EODTECHDIV also uses Range 3 to thermally decontaminate explosive hazardous waste (EHW) in a set of two burn pans.

Past operations at Range 3 are comparable to current operations. In addition to the current operations at Range 3, a historic dump site known as “Dump Site A” received wastes during a time period unknown to operational personnel. The exact boundaries of the dump site and the types of wastes that it received are unknown.

ERG is currently supporting EODTECHDIV in assessing the condition of its operational ranges at NSF Indian Head’s Stump Neck Annex under the Navy’s Range Sustainability and Environmental Program Assessment (RSEPA). As part of this effort, ERG developed predictive models of the off-range transport of munitions constituents (MCs) at Range 3 for the following media (ERG 2008):

- Air;
- Surface water; and
- Soil and groundwater.

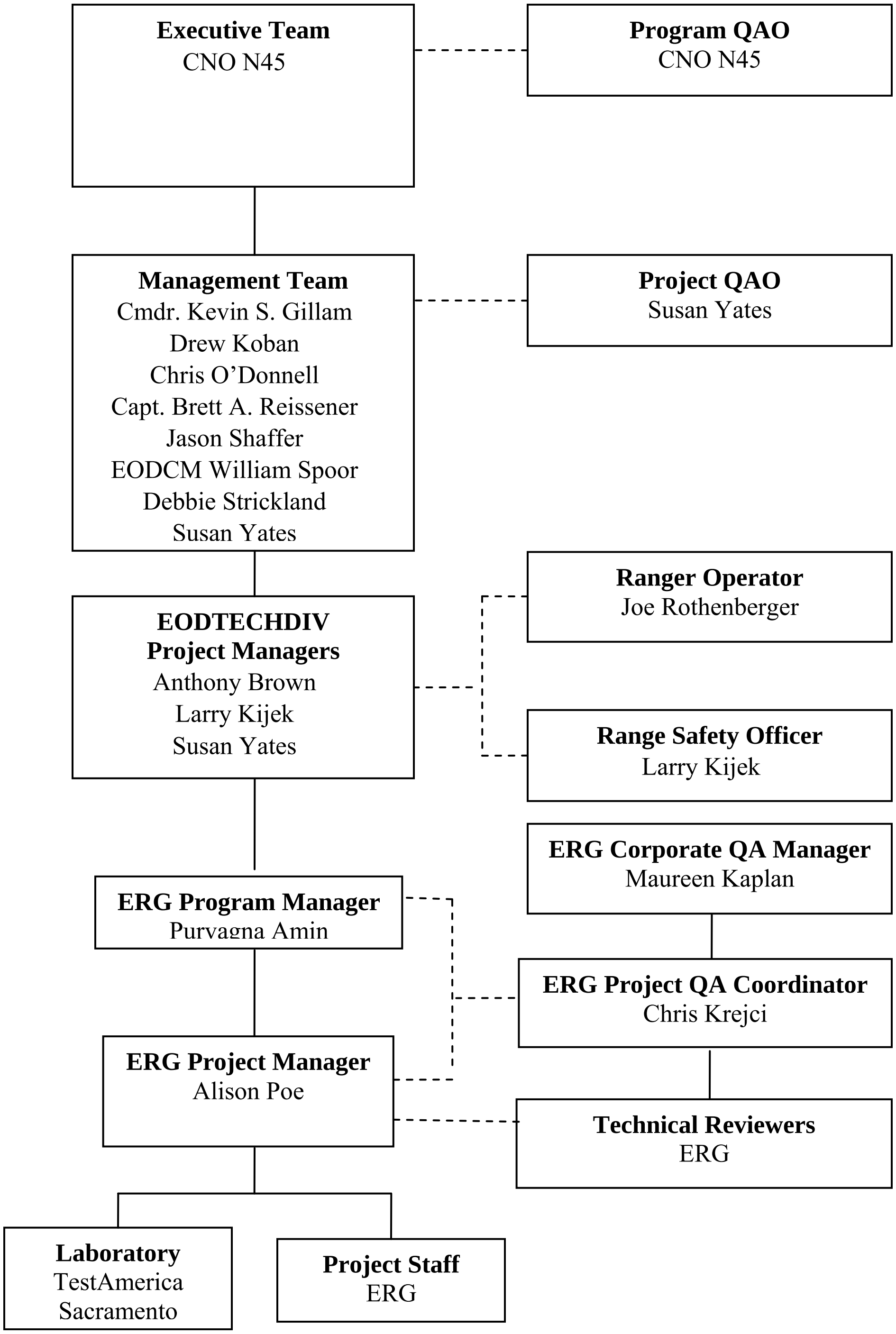
The majority of the testing at the range involves bulk explosive charges of C4, which exhibit comparatively greater rates of high-order detonations than other ordnance items tested at the base. This fact, in conjunction with the extremely high explosive limit set for the range (60 lbs NEW), leads the technical team to believe that air has the potential to be an important pathway for MCs to migrate off-range.

Because of its proximity to Chicamuxen Creek, flooding and overland flow are likely transport pathways for MCs at the range

Due to the permeability of the exposed soils at the surface of the range and the shallow groundwater table (between 5 to 10 feet depth in most areas), groundwater infiltration has the potential to be a significant transport pathway for MCs of concern at Range 3.

Worksheet 5

Project Organization Chart



Worksheet 6

Key Personnel Responsibilities, Qualifications, and Contact Information

Identify key project personnel for each organization participating in responsible project functions.

Organization: EODTECHDIV

Name	Title	Contact Information (e-mail and phone no.)	Project Responsibilities	Education, Certifications, Years Experience
Anthony Brown	Project Manager	anthony.w.brown@navy.mil (301) 744-6840	Review project deliverables and provide technical direction.	-OSH Safety Manager -32 years of government experience
Larry Kijek	Project Manager	lawrence.kijek@navy.mil (301) 744-6871	Review project deliverables and provide technical direction.	-Division Director of Explosives Safety and Environmental -37 years of government experience
Susan Yates	Project Manager	susan.yates@navy.mil (301) 744-6872	Review project deliverables and provide technical direction.	-Environmental Manager -30 years of government experience

Organization: Eastern Research Group, Inc.

Name	Title	Contact Information (e-mail and phone no.)	Project Responsibilities	Education, Certifications, Years Experience
Alison Poe	Project Manager	Alison.poe@erg.com (703) 633-1697	Review project deliverables and provide technical direction.	-B.S., Environmental Science -B.S., Biology -CECOS Environmental Quality Sampling Certified -12 years of experience
Mark Briggs	Environmental Engineer	Mark.briggs@erg.com (989) 345-7595	Provide sampling support.	-M.S., Environmental Engineering -B.S., Chemistry and Biology -16 years of experience
Adam Humphreys	Environmental Scientist	Adam.humphreys@erg.com (703) 633-1695	Develop planning documents, provide sampling support, analyze data, and summarize results.	-B.A. , Environmental Science -5 years of experience
Chris Krejci	Hydrogeologist	Chris.krejci@erg.com; (512) 407-1835	Develop planning documents, provide sampling support, analyze data, and summarize results.	-B.S., Geosystems Engineering and Hydrogeology -2 years of experience

Worksheet 6 (continued)

Organization: TestAmerica Laboratories, Inc.

Name	Title	Contact Information (e-mail and phone no.)	Project Responsibilities	Education, Certifications, Years Experience
Karen Sellers	Project Manager	Karen.sellers@testamericainc.com; (916) 374-4442	Project Manager	-BS, Environmental Science -12 years of experience

Worksheet 7

Specialized Training or Certification/Licensing/Registration Requirements

Project Function	**Specialized Training – Title of Course or Description**	**Training Provided By**	**Training Date**	**Personnel/Groups Receiving Training**	**Personnel Titles/ Organizational Affiliation**	**Location of Training Records/Certificates***
Sampling Coordination	ERG's Quality System Training – ERG Internal	ERG	30 October, 2008	Field Sampling Team	Project Manager, Sampling Technicians (ERG)	ERG Training Files
Sampling Coordination	Quality Assurance Project Plan Development and Implementation – ERG Internal	ERG	13 November, 2008	Field Sampling Team	Project Manager, Sampling Technicians (ERG)	ERG Training Files
Sampling Coordination	Annual Health and Safety Training (Including HASP Development and Implementation) – ERG Internal	ERG	21 – 28 April, 2009	Field Sampling Team	Project Manager, Sampling Technicians (ERG)	ERG Training Files

*If training records or certificates are on file elsewhere, document their location in this column. If training records or certificates do not exist or are not available, then this should be noted.

Worksheet 8

Project Meeting Attendance Sheet

Date of Meeting: 05 January, 2009

Meeting Location: Stump Neck, Building 2151

Name	Title	Organization	Contact Information	Project Role
Anthony Brown	Project Manager	EODTECHDIV	anthony.w.brown@navy.mil (301) 744-6840	Project Manager
Susan Yates	Project Manager	EODTECHDIV	susan.yates@navy.mil (301) 744-6872	Project Manager
Alison Poe	Project Manager	ERG	Alison.poe@erg.com (703) 633-1697	Project Manager
Chris Krejci	Hydrogeologist	ERG	Chris.krejci@erg.com (512) 407-1835	Project Hydrogeologist

Meeting Purpose: Meeting was held to kick-off the sampling effort for Range 3 and to discuss cost and plan ahead. A PowerPoint presentation was used to facilitate discussions. The proposed sampling design was discussed, as well as the need to conduct a brief site visit to Range 3 to test the structural integrity of the wells.

Comments: Mr. Larry Kijek was unable to attend the meeting, but arrived for the last 10 minutes of discussion.

Worksheet 8 (continued)

Project Meeting Attendance Sheet

Date of Meeting: 13 February, 2009

Meeting Location: Stump Neck, Range 3

Name	Title	Organization	Contact Information	Project Role
Anthony Brown	Project Manager	EODTECHDIV	anthony.w.brown@navy.mil (301) 744-6840	Project Manager
Susan Yates	Project Manager	EODTECHDIV	susan.yates@navy.mil (301) 744-6872	Project Manager
Alison Poe	Project Manager	ERG	Alison.poe@erg.com (703) 633-1697	Project Manager
Chris Krejci	Hydrogeologist	ERG	Chris.krejci@erg.com (512) 407-1835	Project Hydrogeologist

Meeting Purpose: In support of the follow-on RCA task, ERG conducted a site visit to Range 3 to check the conditions of the groundwater monitoring wells.

Comments: ERG verified the structural integrity of the three down-gradient monitoring wells at Range 3 by dropping a disposable bailer to the bottom of each well. ERG did not identify any integrity issues with the wells during the initial site visit. The decision was made to redevelop the wells prior to sampling to further verify the structural integrity.

Worksheet 8 (continued)

Project Meeting Attendance Sheet

Date of Meeting: 02 July, 2009

Meeting Location: Stump Neck, Building 2151

Name	Title	Organization	Contact Information	Project Role
Anthony Brown	Project Manager	EODTECHDIV	anthony.w.brown@navy.mil (301) 744-6840	Project Manager
Susan Yates	Project Manager	EODTECHDIV	susan.yates@navy.mil (301) 744-6872	Project Manager
Alison Poe	Project Manager	ERG	Alison.poe@erg.com (703) 633-1697	Project Manager
Chris Krejci	Hydrogeologist	ERG	Chris.krejci@erg.com (512) 407-1835	Project Hydrogeologist

Meeting Purpose: ERG discussed the proposed schedule of well redevelopment and sampling at Range 3. ERG also discussed the systematic planning documents (e.g., Sampling Plan, Health and Safety Plan, Quality Assurance Project Plan) that were being compiled in support of the Range 3 sampling activities. Redevelopment and sampling will occur in August 2009.

Worksheet 9

Target Analytes and Field Parameters

Analyte[6]	Abbr.	CAS Num.	Human Health Screening Values[1]				Federal Ambient Water Quality (µg/L)		Sediment Quality Benchmark (mg/Kg)[8]	Quantitation Limit			
			Residential Soil[1] (mg/kg)	Cancer/ Non-Cancer[1]	Industrial Soil[1] (mg/Kg)	Ground-water (µg/L)	CMC[3]	CCC[3]		Ground-water (µg/L)	Surface Water (µg/L)	Sediment (mg/Kg)	Soil (mg/Kg)
2-Amino-4, 6-dinitrotoluene 7	2-Am-DNT	355-72-78-2	12	NC	120	7.3	—	—	—	0.1	0.1	0.02	0.02
4-Amino-2,6-dinitrotoluene 7	4-Am-DNT	1946-51-0	12	NC	120	7.3	—	—	—	0.1	0.1	0.05	0.05
1,3-Dinitrobenzene	1,3-DNB	99-65-0	6.1	NC	62	3.65	110[4,6]	30[4,6]	0.04	0.09	0.09	0.02	0.02
2,4-Dinitrotoluene	2,4-DNT	121-14-2	120	NC	1200	73	—	—	0.23	0.02	0.02	0.02	0.02
2,6-Dinitrotoluene	2,6-DNT	606-20-2	61	NC	615	36.5	—	—	18.5	0.01	0.01	0.02	0.01
Hexahydro-1,3,5-trinitro-1,3,5-triazine	RDX	121-82-4	4.4	C	16	0.61	4,000[4,5]	190[4,6]	0.19	0.1	0.3	0.01	0.01
Methyl-2,4,6-trinitrophenylnitramine 7	Tetryl	479-45-8	610	NC	6200	365	—	—	—	0.5	0.5	0.02	0.02
Nitrobenzene	NB	98-95-3	20	NC	100	3.4	27,000[4,5]		—	0.03	0.03	0.02	0.02
Nitroglycerin	NG	55-63-0	35	C	120	4.82	1,700[4,5]	200[4,5]	—	0.09	0.09	0.05	0.05
2-Nitrotoluene	2-NT	88-72-2	0.9	NC	2.2	0.049	—	—	—	0.09	0.09	0.02	0.02
3-Nitrotoluene	3-NT	99-08-1	733	NC	1,000	121.7	—	—	—	0.09	0.09	0.02	0.02
4-Nitrotoluene	4-NT	99-99-0	12	C	30	0.66	—	—	—	0.09	0.09	0.05	0.02
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	HMX	2691-41-0	3,100	NC	31,000	1,825[2]		330[4,6]	0.33	3	3	0.05	0.05
Perchlorate		14797-73-0	7.82	C/NC	100	3.65	—	—	—	—[9]			
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	1,800	NC	18,000	1,095	30[4,6]	14[4,6]	0.02	0.03	0.03	0.02	0.02
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	16	C	57	2.2	560[4,5]	<40[4,5]	0.13	0.03	0.03	0.01	0.01

* Some methods may provide results for constituents that are not MCs as defined in RSEPA, but may still be related to testing and/or training operations with munitions.

1. EPA Region 9 Preliminary Remediation Goal Tables, 12/28/2004. Available at http://www.epa.gov/region09/waste/sfund/prg/index.htm.
2. U.S. Environmental Protection Agency. Winter 2004. 2004 Edition of the Drinking Water Standards and Health Advisories, EPA 822-R-04-005, Office of Water, Washington, DC.
3. CMC, the criteria maximum concentration, will protect against acute effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 1-hour average not to be exceeded more than once every 3 years on average. CCC, the criteria continuous concentration, will protect against chronic effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 4-day average not to be exceeded more than once every 3 years on average.
4. Lowest observed adverse effect level (LOAEL). Not enough data to develop criteria.
5. Burrows, E.P., D.H. Rosenblatt, W.R. Mitchell, and D.L. Parmer. 1989. Organic Explosives and Related Compounds: Environmental and Health Considerations, U.S. Army Biomedical Research and Development Laboratory.
6. Talmage, S.S., and D.M. Opresko. 1995. Draft Ecological Criteria Documents for Explosives, Oak Ridge National Laboratory, Oak Ridge, TN.
7. No health- or risk-based screening values are available for these MCs and degradants, but because some of these compounds are highly soluble in water, they should be included in this analysis.
8. Calculated from water toxicity data based on 1% organic matter according to Talmage S.S. and D.M. Opresko. 1995. Draft Ecological Criteria Documents for Explosives, Oak Ridge National Laboratory, Oak Ridge, TN.
9. No acceptable criteria agreed upon. See latest DoD and DON guidance to include Navy Perchlorate Sampling and Management Policy.

Worksheet 9 (continued)

Target Analytes and Field Parameters

Analyte[6]	Abbr.	CAS Num.	Human Health Screening Values[1]				Federal Ambient Water Quality (µg/L)		Sediment Quality Benchmark (mg/Kg)[3]	Quantitation Limit			
			Residential Soil[1] (mg/kg)	Cancer/ Non-Cancer[1]	Industrial Soil[1] (mg/Kg)	Ground-water (µg/L)	CMC[2]	CCC[2]		Ground-water (µg/L)	Surface Water (µg/L)	Sediment (mg/Kg)	Soil (mg/Kg)
Antimony	Sb	7440-36-0	3.1E+01	NC	4.1E+02	1.5E+01	—	—	40	40	20	20	40
Arsenic	As	7440-38-2	3.9E-01	C	1.6E+00	4.5E-02	340	150	30	30	15	15	30
Barium	Ba	7440-38-2	1.5E+04	NC	1.9E+05	7.3E+03	—	—	10	10	5	5	10
Boron	B	7440-42-8	1.6E+04	NC	2.0E+05	7.3E+03	—	—					
Cadmium	Cd	7440-43-9	7.0E+01	NC	8.0E+02	1.8E+01	2.0	0.25	5	5	2.5	2.5	5
Chromium	Cr	7440-47-3	2.8E+02[8]	C[8]	1.4E+03[8]	—	16[9]	11[9]	10	10	5	5	10
Copper	Cu	7440-50-8	3.1E+03	NC	4.1E+04	1.5E+03	13	9	10	10	5	5	10
Lead	Pb	7439-92-1	4.0E+02	—	8.0E+02	—	65	2.5	40	40	20	20	40
Mercury	Hg	7439-97-6	2.3E+01	NC	3.1E+02	1.1E+01	1.4	0.77	0.2	0.2	0.05	0.05	0.2
Nickel	Ni	7440-02-0	1.5E+03	NC	2.0E+04	7.3E+02	470	52	20	20	10	10	20
Selenium	Se	7782-49-2	3.9E+02	NC	5.1E+03	1.8E+02	—	5.0	40	40	20	20	40
Silver	Ag	7440-22-4	3.9E+02	NC	5.1E+03	1.8E+02	3.2	—	10	10	5	5	10
Strontium	St	7440-24-6	4.7E+04	NC	6.1E+05	2.2E+04	—	—	10	10	5	5	10
Zinc	Zn	7440-66-6	2.3E+04	NC	3.1E+05	1.1E+04	120	120		10	10	10	10

1. EPA Region 9 Preliminary Remediation Goal Tables, 12/28/2004. Available at http://www.epa.gov/region09/waste/sfund/prg/index.htm.
2. CMC, the criteria maximum concentration, will protect against acute effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 1-hour average not to be exceeded more than once every 3 years on average. CCC, the criteria continuous concentration, will protect against chronic effects in aquatic life and is the highest in-stream concentration of a priority toxic pollutant consisting of a 4-day average not to be exceeded more than once every 3 years on average.
3. Calculated from water toxicity data based on 1% organic matter according to Talmage S.S. and D.M. Opresko. 1995. Draft Ecological Criteria Documents for Explosives, Oak Ridge National Laboratory, Oak Ridge, TN.
4. Burrows, E.P., D.H. Rosenblatt, W.R. Mitchell, and D.L. Parmer. 1989. Organic Explosives and Related Compounds: Environmental and Health Considerations, U.S. Army Biomedical Research and Development Laboratory.
5. Talmage, S.S., and D.M. Opresko. 1995. Draft Ecological Criteria Documents for Explosives, Oak Ridge National Laboratory, Oak Ridge, TN.
6. Some methods may provide results for constituents that are not MCs as defined in RSEPA, but may be related to testing and training.
7. No health- or risk-based screening values are available for these MCs and degradants, but because some of these compounds are highly soluble in water, they should be included in this analysis.
8. Assumes 1:6 ratio Cr VI : Cr III
9. Assumes 100 percent Chromium VI.

*Lowest observed adverse effect level (LOAEL). Not enough data to develop criteria.

Worksheet 10

Analytical Services (Planning Document)

Complete this worksheet for each medium/matrix, analytical parameter, and expected concentration level (e.g., low, medium, high). Identify all laboratories/organizations that will provide analytical services for the project, including field screening, field analytical, and fixed laboratory analytical work. If applicable, identify the backup laboratory/organization that will be used if the primary laboratory/organization cannot be used.

Medium/ Matrix	**Analytical Parameter**	**Concentration Level**	**Analytical Method/SOP**	**Data Package Turnaround Time**	**Laboratory/Organization (Name and Address: Contact Person and Phone Number)**	**Backup Laboratory/Organization (Name and Address: Contact Person and Phone Number)**
Groundwater	Metals (except for mercury)	Low	SW846 6010B	2 Weeks	TestAmerica West Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605 Karen Sellers, (916) 374-4442	DataChem Salt Lake City, 960 West LeVoy Drive, Salt Lake City, UT 84123 Kevin Griffiths, (801) 835-9597
	Mercury		SW846 7470			
	Explosives		SW-846 8330			
	Perchlorate		SW-846 Method 6850			
Soil	Metals (except for mercury)		SW846 6010B			
	Mercury		SW846 7471A			
	Explosives		SW-846 8330			
	Perchlorate		SW-846 Method 6850			

Worksheet 11

Sampling Design and Rationale

Describe the project sampling design and provide a diagram.

The following describes the methods used to estimate the number of soil and groundwater samples required for analysis at EODTECHDIV Range 3. Figure 1 illustrates the topographic expression at Range 3, with the boundary outlined in red. Shallow groundwater monitoring wells are represented by black circles.

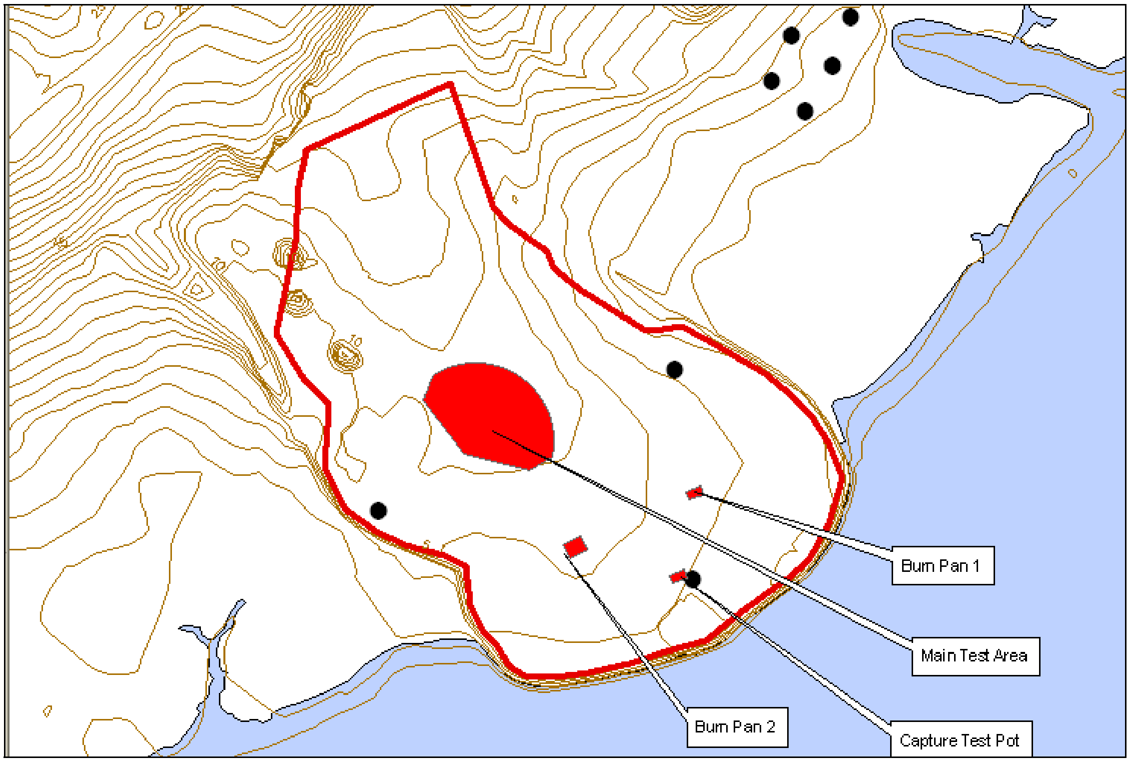


Figure 1. Topographic Map of Range 3.

In accordance with RSEPA Guidance, ERG estimated the source area for munitions constituents (MCs) using historical information from range operators. In the Range Condition Assessment for EODTECHDIV, ERG concluded that stormwater runoff would be the only major transport pathway of concern for MCs from Range 3 to off-site receptors. In Figure 2, the approximate source area for MCs is bounded by a green line – this line is the proposed transect along which samples will be taken. Arrows indicate the general flow of stormwater from the source area off-site. Because a stormwater incident on the northern section of the source area would likely flow south, the northern boundary of the range is not likely a major component of the transport of MCs off range.

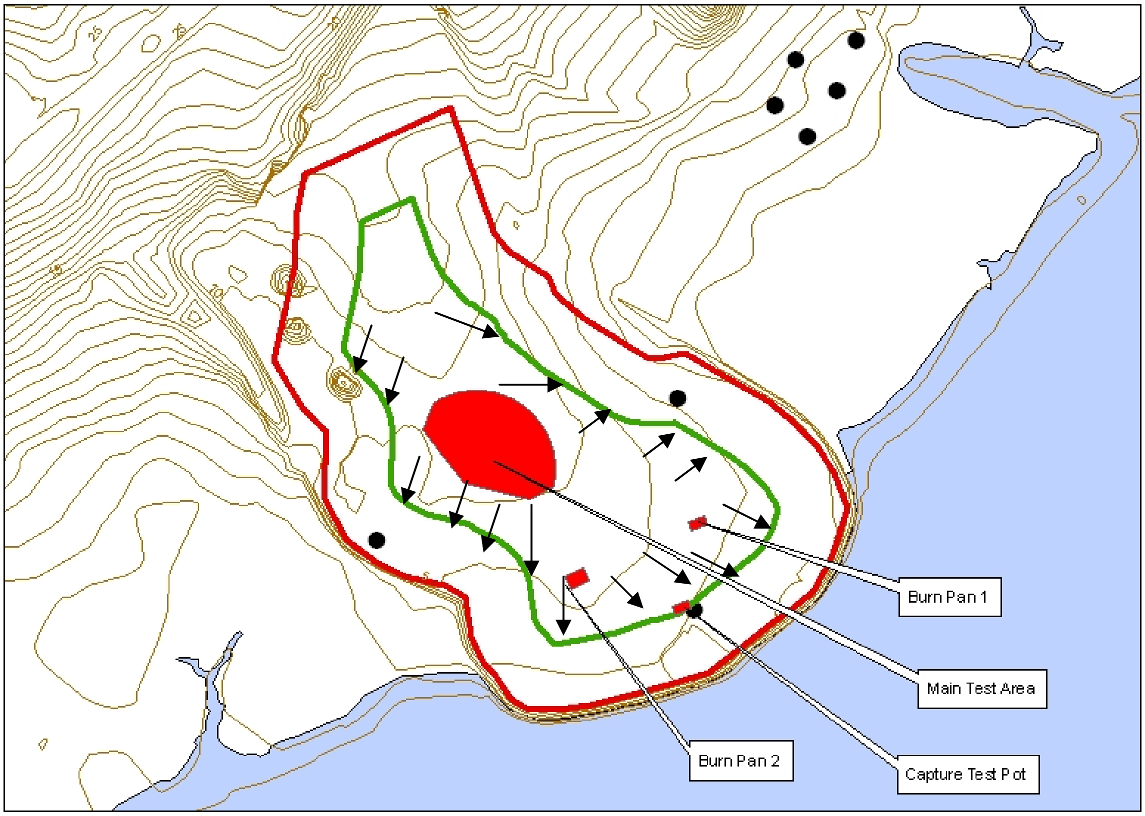
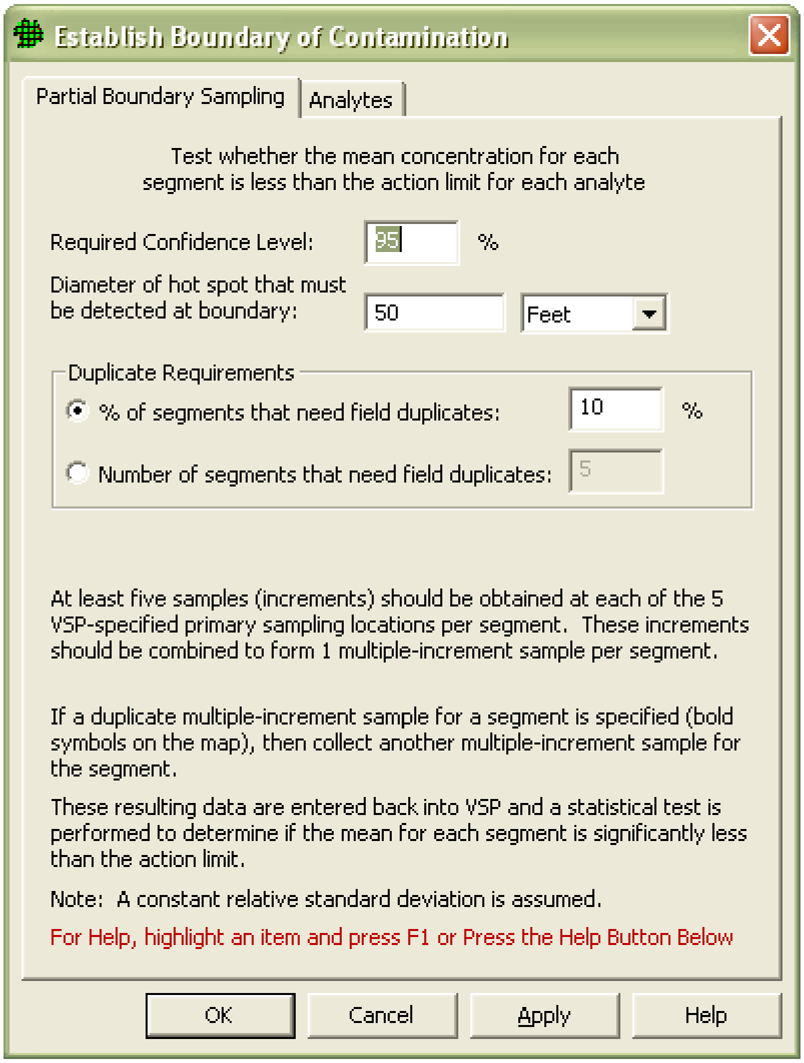


Figure 2. Estimated Stormwater Transport of Munitions Constituents

ERG used the Visual Sampling Plan – Range Sustainability Module (VSP-RSM) software developed by Pacific Northwest Laboratories to facilitate sample planning. The Open-Type Sample Area feature of the VSP-RSM software uses a geometric representation of the boundary line of concern – along with various input parameters – to generate sampling points. Figure 3 shows a screen shot containing the inputs required.

Worksheet 11 (continued)



Test whether the mean concentration for each segment is less than the action limit for each analyte

Required Confidence Level: 95 %

Diameter of hot spot that must be detected at boundary: 50 Feet

Duplicate Requirements

● % of segments that need field duplicates: 10 %

○ Number of segments that need field duplicates: 5

At least five samples (increments) should be obtained at each of the 5 VSP-specified primary sampling locations per segment. These increments should be combined to form 1 multiple-increment sample per segment.

If a duplicate multiple-increment sample for a segment is specified (bold symbols on the map), then collect another multiple-increment sample for the segment.

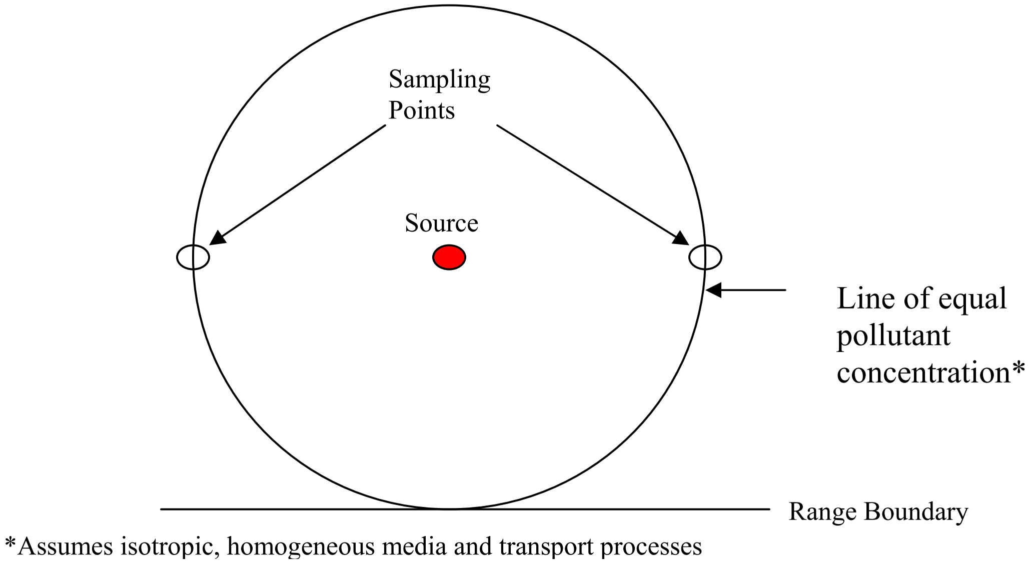
These resulting data are entered back into VSP and a statistical test is performed to determine if the mean for each segment is significantly less than the action limit.

Note: A constant relative standard deviation is assumed.

For Help, highlight an item and press F1 or Press the Help Button Below

Figure 3. Inputs for the Open-Type Sample Area Design Tool in VSP-RSM

The “Required Confidence Level” and “Duplicate Requirements” fields are set by the Range Sustainability Module to fit the RSEPA program. The “Diameter of hot spot…at boundary” field was set by ERG. This field refers to the maximum size of a concentration “hot spot” that is acceptable along the border of the transect line that is sampled. Because the sampling transect is 50 feet from the range boundary at the closest point, the value of 50 feet was used. The statistical assumption implied by using this value is as follows: If a source of MCs creates a concentration spike for any pollutant of concern along the sampling transect directly between two midpoints, the value at the range boundary will not likely exceed the values at the adjacent sampling points (see Figure 4).



*Assumes isotropic, homogeneous media and transport processes

Figure 4. Determination of Acceptable Diameter for Undetected Concentration "Hot Spot"

Using the boundaries over which stormwater flows off-site illustrated in Figure 2 and the input parameters shown in Figure 3, the VSP-RSM Module produced sampling locations as shown below in Figure 5. Each consecutive set of five similar shapes represents a multiple increment (MI) sample. Because the RSEPA program requires that the statistical variance of the sampled population be determined using a prescribed number of field duplicates, all MI samples will each require a field duplicate. For this set of outputs, the VSP-RSM Module estimates 8 soil samples.

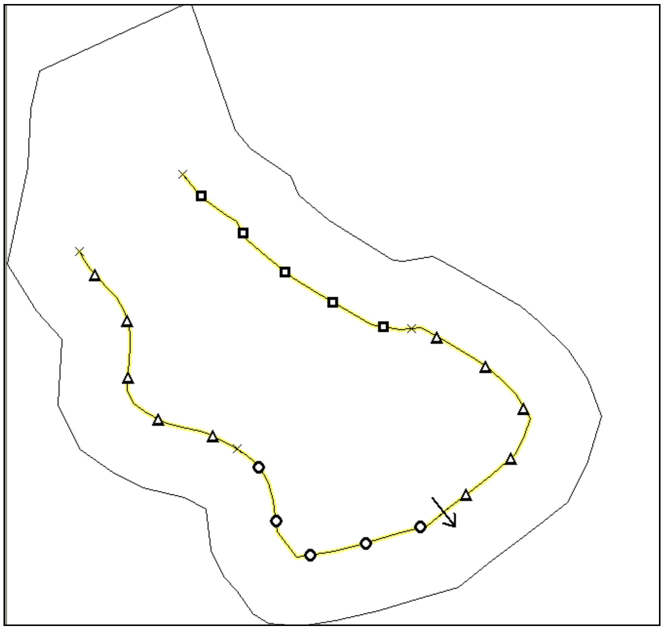


Figure 5. Range 3 Sampling Locations Determined by the VSP-RSM Module

Worksheet 11 (continued)

In addition to the soil samples recommended by the VSP-RSM module, ERG anticipates taking as many as six groundwater samples from the three shallow groundwater monitoring wells located on Range 3 (one field duplicate for each well). These samples will be taken to verify that the assumptions used in the predictive modeling of groundwater at the site were sufficiently conservative (i.e. no migration of MCs to the water table has occurred at significant levels). ERG assumes that the three monitoring wells down-gradient from the source area of MCs (see Figure 2) are accessible and in proper working condition.

Worksheet 12

Sampling Standard Operating Procedures Reference Table

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Comments
1	Standard Operating Procedure for Multiple Increment Surface Soil Sampling using a Trowel	U.S. Navy (Environmental Compliance and Field Testing Procedures Manual)	RSEPA Manual Attachment D-3
2	Standard Operating Procedure for Groundwater Sampling and Well Redevelopment	NAVSEA	Adapted from draft Navy Environmental Compliance Sampling & Field Testing Procedures Manual (NAVSEA T0300-AZ-PRO-010) Chapter 9

Worksheet 13

Sampling and Analysis Summary Table

Complete all required information. Use additional worksheets if necessary.

Sampling Location[1,2]	**Location ID Number**	**Medium/ Matrix**	**Depth (units)**	**Analytical Parameter**	**Sampling SOP**	**Analytical Method/SOP**	**Containers (number, size and type)**	**Preservation Requirements (chemical, temperature, light protected)**	**Maximum Holding Time (preparation/ analysis)**
1	RN3MISS001	Soil	2 (inches)	Metals (except for mercury)	S-1	SW846 6010B	4 oz glass jar	None	6 months
1	RN3MISS001	Soil	2 (inches)	Mercury	S-1	SW846 7471A	4 oz glass jar	Refrigerate	6 months
1	RN3MISS001	Soil	2 (inches)	Explosives	S-1	SW-846 8330	4 oz glass jar	Cool to ≤ 6°C.	7 days
1	RN3MISS001	Soil	2 (inches)	Perchlorate	S-1	SW-846 Method 6850	4 oz glass jar	None	28 days
1	RN3MISS002	Soil	2 (inches)	Metals (except for mercury)	S-1	SW846 6010B	4 oz glass jar	None	6 months
1	RN3MISS002	Soil	2 (inches)	Mercury	S-1	SW846 7471A	4 oz glass jar	Refrigerate	6 months
1	RN3MISS002	Soil	2 (inches)	Explosives	S-1	SW-846 8330	4 oz glass jar	Cool to ≤ 6°C.	7 days
1	RN3MISS002	Soil	2 (inches)	Perchlorate	S-1	SW-846 Method 6850	4 oz glass jar	None	28 days
1	RN3MISS003	Soil	2 (inches)	Metals (except for mercury)	S-1	SW846 6010B	4 oz glass jar	None	6 months
1	RN3MISS003	Soil	2 (inches)	Mercury	S-1	SW846 7471A	4 oz glass jar	Refrigerate	6 months

Sampling Location[1,2]	**Location ID Number**	**Medium/ Matrix**	**Depth (units)**	**Analytical Parameter**	**Sampling SOP**	**Analytical Method/SOP**	**Containers (number, size and type)**	**Preservation Requirements (chemical, temperature, light protected)**	**Maximum Holding Time (preparation/ analysis)**
1	RN3MISS003	Soil	2 (inches)	Explosives	S-1	SW-846 8330	4 oz glass jar	Cool to ≤ 6°C.	7 days
1	RN3MISS003	Soil	2 (inches)	Perchlorate	S-1	SW-846 Method 6850	4 oz glass jar	None	28 days
1	RN3MISS004	Soil	2 (inches)	Metals (except for mercury)	S-1	SW846 6010B	4 oz glass jar	None	6 months
1	RN3MISS004	Soil	2 (inches)	Mercury	S-1	SW846 7471A	4 oz glass jar	Refrigerate	6 months
1	RN3MISS004	Soil	2 (inches)	Explosives	S-1	SW-846 8330	4 oz glass jar	Cool to ≤ 6°C.	7 days
1	RN3MISS004	Soil	2 (inches)	Perchlorate	S-1	SW-846 Method 6850	4 oz glass jar	None	28 days
1	RN3MW03GS001	Groundwater	7.77 (feet)	Metals (except for mercury)		SW-846 6010B	500ml HDPE	HNO_3 to pH<2.	6 months
1	RN3MW03GS001	Groundwater	7.77 (feet)	Mercury		SW-846 7470A	500ml HDPE	HNO_3 to pH<2.	6 months
1	RN3MW03GS001	Groundwater	7.77 (feet)	Explosives		SW-846 8330	2 1-L Amber Glass Containers	Cool to ≤ 6°C.	7 days
1	RN3MW03GS001	Groundwater	7.77 (feet)	Perchlorate		SW-846 Method 6850	250ml HDPE	Sterile filter using 0.2-µm PTFE membrane filtration.	28 days

Sampling Location[1,2]	**Location ID Number**	**Medium/ Matrix**	**Depth (units)**	**Analytical Parameter**	**Sampling SOP**	**Analytical Method/SOP**	**Containers (number, size and type)**	**Preservation Requirements (chemical, temperature, light protected)**	**Maximum Holding Time (preparation/ analysis)**
1	RN3MW02GS001	Groundwater	4.82 (feet)	Metals (except for mercury)		SW-846 6010B	500ml HDPE	HNO_3 to pH<2.	6 months
1	RN3MW02GS001	Groundwater	4.82 (feet)	Mercury		SW-846 7470A	500ml HDPE	HNO_3 to pH<2.	6 months
1	RN3MW02GS001	Groundwater	4.82 (feet)	Explosives		SW-846 8330	2 1-L Amber Glass Containers	Cool to $\leq$ 6°C.	7 days
1	RN3MW02GS001	Groundwater	4.82 (feet)	Perchlorate		SW-846 Method 6850	250ml HDPE	Sterile filter using 0.2-µm PTFE membrane filtration.	28 days
1	RN3MW04GS001	Groundwater	5.79 (feet)	Metals (except for mercury)		SW-846 6010B	500ml HDPE	HNO_3 to pH<2.	6 months
1	RN3MW04GS001	Groundwater	5.79 (feet)	Mercury		SW-846 7470A	500ml HDPE	HNO_3 to pH<2.	6 months
1	RN3MW04GS001	Groundwater	5.79 (feet)	Explosives		SW-846 8330	2 1-L Amber Glass Containers	Cool to $\leq$ 6°C.	7 days
1	RN3MW04GS001	Groundwater	5.79 (feet)	Perchlorate		SW-846 Method 6850	250ml HDPE	Sterile filter using 0.2-µm PTFE membrane filtration.	28 days

1. Indicate critical field sampling locations with “1”.
2. Indicate background sampling locations with “2”.

Worksheet 14

Sampling Equipment Checklist - Range 3

Packing/Labeling Equipment

___Bagged ice

___Shipping bags (Ziploc©)

___Chain-of-custody forms and plastic pouches

___Custody seals

___Double bagged, pre-preserved, pre-labeled sample bottles

___Bubble Wrap

___Shipping coolers

___Waterproof pens

___Sample labels

___Sample seals/cooler seals

___Plastic bags to line cooler

___Pre-printed labels for Fed-Ex

___FedEx Luggage tags for coolers

___Master Airbill

___Packing Tape

Sampling Equipment

___Bailers, disposable

___Depth gauge

___Scoops

___Stainless steel bowls

___Temperature gauge/thermometer

___pH paper to verify preservation (wide range)

___Nylon twine

___Aluminum foil

___In-line, pre-cleaned, 0.20 micron tortuous path filters

Decon/Staging/Waste Collection

___Wash/rinse bottle containing ASTM Type I water

___Contamination control equipment

___Tarp for clean area

___Paper towels

___Tap water (gallon jug)

___Waste bucket

___Waste collection bags

___Waste storage drums

Documents/Miscellaneous

___Tool Box (hammer, sockets, etc.)

___Tape Measure

___Map of Range with Sampling GPS points

___Global Positioning System receiver

___Sampling plan

___Locks and keys for GW wells

___Survey stakes/flags

___Field log book

Personal Protective Equipment

___Gloves, no talc

    ___Wrist length

    ___Arm length

___Tyvek© suits

___Safety glasses

Worksheet 15

Field Equipment Calibration Table

[To be completed by Sampling Crew Chief to reflect actual equipment to be used.]

Equipment	Calibration SOP	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA
Thermometer	Measure temperature of an ice and water mixture.	Once per trip	Temperature should be within one degree of zero degrees Celsius.	Replace thermometer.	Chris Krejci, ERG
GPS Receiver	Using landmarks and waypoints identified on the site map, verify the location of the GPS receiver.	Once per trip	There should be no noticeable difference between the location of the waypoint measured by the GPS unit and the location of the waypoint indicated on the site map.	Check GPS coordinate system, datum, and satellite reception. Replace GPS meter if necessary.	Chris Krejci, ERG

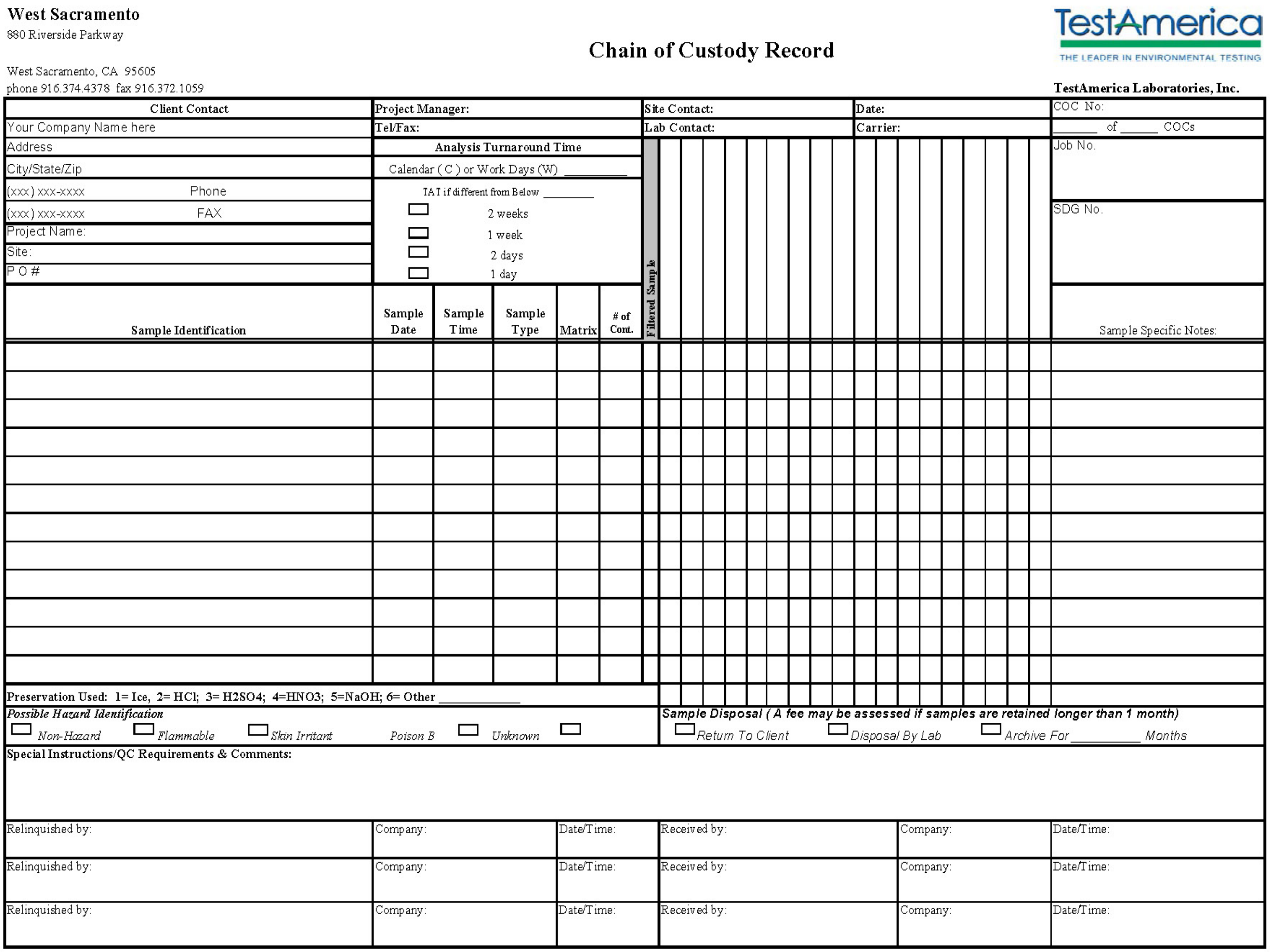
Worksheet 16

Field Quality Control Summary Table
(Planning Document)

Refer to the Sampling and Analysis Plan for Range Condition Assessment at Naval Support Facility – Indian Head Stump Neck Annex – Range 3 (ERG, 2009)

Worksheet 17

Chain-of-Custody Form



West Sacramento
880 Riverside Parkway

West Sacramento, CA 95605
phone 916.374.4378 fax 916.372.1059

Chain of Custody Record

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	_______ of _______ COCs
Address	**Analysis Turnaround Time**			Job No.
City/State/Zip	Calendar (C) or Work Days (W) __________			
(xxx) xxx-xxxx Phone	TAT if different from Below ________			SDG No.
(xxx) xxx-xxxx FAX	☐ 2 weeks			
Project Name:	☐ 1 week			
Site:	☐ 2 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample																			Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____________

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For __________ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

Worksheet 18

Analytical Methods and Standard Operating Procedures

SOP Reference Number	Laboratory	SOP Title and Revision Date	Analytical Parameter	Instrument	SOP Modified for Project? Y or N
SW-846	TestAmerica Sacramento	6010B	Metals (Except for mercury)	Inductively Coupled Plasma-Atomic Emission Spectrometer	N
SW-846	TestAmerica Sacramento	8330	Explosives	High Performance Liquid Chromatograph	N
SW-846	TestAmerica Sacramento	6850	Perchlorate	High Performance Liquid Chromatograph/Electrospray Ionizer /Mass Spectrometer	N
SW-846	TestAmerica Sacramento	7470	Mercury	Manual Cold-Vapor Technique	N
SW-846	TestAmerica Sacramento	7471A	Mercury	Manual Cold-Vapor Technique	N

Worksheet 19

Laboratory-Specific Method Detection Limits and Quantitation Limits

Analyte	Abbreviation	CAS Number	Method	Method Detection Limit		Quantitation Limit*	
				Water (ug/L)	**Soil (mg/kg)**	**Water (ug/L)**	**Soil (mg/kg)**
2-Amino-4,6-dinitrotoluene	2-Am-DNT	355-72-78-2	8330	0.3	0.1	0.3	0.1
4-Amino-2,6-dinitrotoluene	4-Am-DNT	1946-51-0	8330	0.15	0.022	0.25	0.02
1,3-Dinitrobenzene	1,3-DNB	99-65-0	8330	0.15	0.05	0.25	0.05
2,4-Dinitrotoluene	2,4-DNT	121-14-2	8330	0.15	0.05	0.25	0.02
2,6-Dinitrotoluene	2,6-DNT	606-20-2	8330	0.15	0.05	0.25	0.03
HMX	HMX	2691-41-0	8330	0.15	0.027	0.25	0.03
Nitrobenzene	NB	98-95-3	8330	0.15	0.05	0.25	0.05
Nitroglycerin	NG	55-63-0	8330	1	0.15	0.5	0.13
2-Nitrotoluene	2-NT	88-72-2	8330	0.5	0.072	0.25	0.08
3-Nitrotoluene	3-NT	99-08-1	8330	0.5	0.062	0.25	0.07
4-Nitrotoluene	4-NT	99-99-0	8330	0.5	0.072	0.5	0.08
RDX	RDX	121-82-4	8330	0.25	0.065	0.25	0.04
Tetryl	Tetryl	479-45-8	8330	0.15	0.05	0.25	0.05
1,3,5-Trinitrobenzene	1,3,5-TNB	99-35-4	8330	0.1	0.031	0.25	0.02
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	8330	0.15	0.024	0.25	0.02
Antimony	Sb	7440-36-0	6020	6	2	0.6	0.2
Arsenic	As	7440-38-2	6020	3	1	0.5	0.15
Barium	Ba	7440-39-3	6020	1.5	0.5	0.3	0.1
Boron	B	7440-42-8	6020	50	15	5	1.5
Cadmium	Cd	7440-43-9	6020	1.5	0.5	0.15	0.05
Chromium	Cr	7440-47-3	6020	5	1.5	0.6	0.2
Copper	Cu	7440-50-8	6020	3	1	0.5	0.15
Lead	Pb	7439-92-1	6020	2.5	0.6	0.2	0.06
Nickel	Ni	7440-02-0	6020	3	1	0.3	0.1
Selenium	Se	7782-49-2	6020	3	1	0.3	0.1
Silver	Ag	7440-22-4	6020	1	0.3	0.1	0.03
Strontium	Sr	7440-24-6	6020	6	2	0.6	0.2
Zinc	Zn	7440-66-6	6020	12	4	2	0.6
Mercury	Hg	7439-97-6	7470/7471A	0.3	0.1	0.04	0.008
Perchlorate		14797-73-0	6850	0.5	0.082	5	0.83

* The QL cannot be less than the concentration of the lowest calibration standard and must be less than or equal to the range-specific screening level.

Worksheet 20

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Explosives
Analytical Method/SOP Reference:	SW-846 8330 / SW-846 8330B (WS-LC-0009)
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data		Lab bias – contamination control	Method blank <½ reporting limit
Reagent Blank	N/A					
Storage Blank	N/A					
Instrument Blank	N/A					
Laboratory Duplicate	N/A					
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	None. MS effects to be evaluated during data usability phase
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	RPD <30% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data		Lab accuracy	Within DoD LCS Study control limits or lab generated, if DOD limits not available.
LFB	N/A					
Surrogates	As applicable; each sample	Within generated QC control limits	If surrogates outside control limits, reanalyze affected samples or qualify data		Lab accuracy –matrix bias	Within DoD LCS Study control limits or lab generated, if DOD limits not available.
Other: ____________ ___________________	N/A					

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Metals
Analytical Method/SOP Reference:	SW846- 6020; WS-MT-0001
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data	Lab Manager / Analyst	Lab bias – contamination control	Method blank <½ reporting limit
Reagent Blank	N/A					
Storage Blank	N/A					
Calibration Blank	After IC, after CCV calibration, after every 10 samples, and at the end of the sequence	No target analytes detected > LOD.	Correct problem. Re-prepare and reanalyze the blank. All samples following the last acceptable calibration blank must be reanalyzed.	Lab Manager / Analyst	Lab bias – contamination control	No target analytes > LOD.
Laboratory Duplicate	N/A					
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase	Lab Manager / Analyst	Lab precision – matrix bias	MS recovery 80 to 120%
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase	Lab Manager / Analyst	Lab precision – matrix bias	RPD <25% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data	Lab Manager / Analyst	Lab accuracy	Within DoD LCS Study control limits or lab generated,, if DOD limits not available.

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Mercury
Analytical Method/SOP Reference:	SW846- 7470A / SW-846 7471A ; WS-MT-0005 / WS-MT-0007
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data	Lab Manager / Analyst	Lab bias – contamination control	Method blank <½ reporting limit
Reagent Blank	N/A					
Storage Blank	N/A					
After IC	After IC, after CCV calibration, after every 10 samples, and at the end of the sequence	No target analytes > LOD	Correct problem. Re-prepare and reanalyze the blank. All samples following the last acceptable calibration blank must be reanalyzed.	Lab Manager / Analyst	Accuracy	No target analytes > LOD
Laboratory Duplicate	N/A					
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	MS recovery 80 to 120%
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	RPD < 25% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data	Lab Manager / Analyst	Lab accuracy	QC acceptance criteria: 80% to 120% accuracy, 20% precision or laboratory statistically derived control limits.

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix: Soil, Groundwater, Surface Water, Sediment
Analytical Parameter: Perchlorate (LC/MS)
Analytical Method/SOP Reference: SW846- 6850 (WS-LC-0012)
Laboratory Name: TestAmerica Inc.
No. of Sample Locations: Range 3

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data	Lab Manager / Analyst	Lab bias – contamination control	Method blank <½ reporting limit
Reagent Blank	N/A					
Storage Blank	N/A					
Instrument Blank	N/A					
Laboratory Duplicate	N/A					
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase	Lab Manager / Analyst	Lab precision – matrix bias	MS recovery 80 to 120%
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase	Lab Manager / Analyst	Lab precision – matrix bias	RPD <25% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data	Lab Manager / Analyst	Lab accuracy	80-120% recovery
Internal Standards	Every field sample, QC sample and calibration standard.	Areas within -50% to +100% of the midpoint of the last ICAL for each sample and QC	Inspect LCMS for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning	Lab Manager / Analyst	Accuracy/Bias	Meets all EPA Method requirements
Isotope Ratio	Every Sample and QC	83/85 ratio within ± 30% of the mid-range ICAL standard ratio, or within ± 30% of the ratio of the average of the areas from all CCVs in the run, if the ICAL is not run the same day	NA	Lab Manager / Analyst	Qualitative Identification	Meets all EPA Method requirements

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Volatiles
Analytical Method/SOP Reference:	SW-846 8260B (WS-MS-0007)
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data		Lab bias – contamination control	Method blank <½ reporting limit
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	None. MS effects to be evaluated during data usability phase
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	RPD <30% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data		Lab accuracy	Within DoD LCS Study control limits or lab generated, if DOD limits not available.
LFB	N/A					
Surrogates	As applicable; each sample	Within generated QC control limits	If surrogates outside control limits, reanalyze affected samples or qualify data		Lab accuracy –matrix bias	Within DoD LCS Study control limits or lab generated, if DOD limits not available.
Internal standards	Every field sample, QC sample, and calibration standard.	Areas within -50% to +100% of midpoint of the last ICAL for each sample and QC.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Lab Manager / Analyst	Precision and Accuracy/Bias	Meets all EPA Method requirements

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Semivolatiles
Analytical Method/SOP Reference:	SW-846 8270C (WS-MS-0005)
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	**Frequency/ Number**	**Method/SOP QC Acceptance Limits**	**Corrective Action (CA)**	**Person(s) Responsible for CA**	**Data Quality Indicator (DQI)**	**Measurement Performance Criteria**
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data		Lab bias – contamination control	Method blank <½ reporting limit
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	None. MS effects to be evaluated during data usability phase
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	RPD <30% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data		Lab accuracy	Within DoD LCS Study control limits or lab generated, if DOD limits not available.
LFB	N/A					
Surrogates	As applicable; each sample	Within generated QC control limits	If surrogates outside control limits, reanalyze affected samples or qualify data		Lab accuracy –matrix bias	Within DoD LCS Study control limits or lab generated, if DOD limits not available.
Internal standards	Every field sample, QC sample, and calibration standard.	Areas within -50% to +100% of midpoint of the last ICAL for each sample and QC.	Inspect mass spectrometer and GC for malfunctions; mandatory reanalysis of samples analyzed while system was malfunctioning.	Lab Manager / Analyst	Precision and Accuracy/Bias	Meets all EPA Method requirements

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Nitrocellulose
Analytical Method/SOP Reference:	EPA 353.2 Modified (WS-WC-0050)
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data		Lab bias – contamination control	Method blank <½ reporting limit
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	None. MS effects to be evaluated during data usability phase
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	RPD <30% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data		Lab accuracy	Within laboratory generated control limits.

N/A = Not Applicable.

Worksheet 20 (continued)

Analytical Quality Control Summary Table (TestAmerica Inc.)

[To be filled out by the laboratory and verified as part of laboratory selection process.]

Medium/Matrix:	Soil, Groundwater, Surface Water, Sediment
Analytical Parameter:	Perchlorate (Ion Chromatography)
Analytical Method/SOP Reference:	EPA 314.0 (WS-WC-0010)
Laboratory Name:	TestAmerica Inc.
No. of Sample Locations:	Range 3

Laboratory QC:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action (CA)	Person(s) Responsible for CA	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method Blank	1 per batch	None	Identify source of contamination, then reanalyze affected batch samples or qualify data		Lab bias – contamination control	Method blank <½ reporting limit
MCT/IPC	1 per batch	None	Correct problem, then repeat batch. If the IPC continues to fail, re-evaluate MCT study prior to continuing with sample analysis.	Lab Manager/Analyst	Lab bias – contamination control	%D of Area/height ratio between ICV & IPC < 25%; 80-120% Recovery, RT shift< 5% from ICV.
Laboratory Matrix Spike	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	None. MS effects to be evaluated during data usability phase
Matrix Spike Duplicates	1 per batch	None	None. MS/MSD to be evaluated during data usability phase		Lab precision – matrix bias	RPD <30% for MS/MSD pair
LCS/LFB	1 per batch	Within generated QC control limits	If LCS outside control limits, reanalyze affected batch samples or qualify data		Lab accuracy	85-115% recovery

N/A = Not Applicable.

Worksheet 21

Quality Assurance and Assessment Reports

[To be completed by the Project Manager: Identify the frequency and type of planned QA reporting, the projected delivery date, responsible personnel, and report recipients.]

Type of Report [examples]	Frequency (daily, weekly, monthly, quarterly, annually, etc.)	Projected Delivery Date	Responsible Personnel (Title and Organization)	Report Recipients (Title and Organization)
QAPP	1 Draft and 1 Final Deliverable	July 2009	ERG	EODTECHDIV
Laboratory Assessment	1 Draft and 1 Final Deliverable	July 2009	ERG	EODTECHDIV
Data Verification	1 Draft and 1 Final Deliverable	September 2009	ERG	EODTECHDIV
Data Validation	1 Draft and 1 Final Deliverable	September 2009	ERG	EODTECHDIV
Data Usability	1 Draft and 1 Final Deliverable	September 2009	ERG	EODTECHDIV

Worksheet 22

Data Quality Assessment

Type of Assessment	Responsible Person	Procedure/Checklist
Data Verification	Chris Krejci (ERG)	-Collect project documents that contain relevant specifications (QAPP, methods, SOPs) -Compile records to review -Check chain-of-custody -Check that sample holding times/preservation requirements were met -Check that appropriate methods & SOPs were used -Check that results are reported in appropriate units -Check that field & lab records are complete and free of errors -Check that calibrations and QC meet specified limits -Check that lab record is complete, properly formatted, and ready for validation
Data Validation	Chris Krejci (ERG) Alison Poe (ERG)	-Review of all sample and QC results -Check for any anomalies, deficiencies, and QC problems that have been identified -Define the level of quality of data
Data Usability	Chris Krejci (ERG) Alison Poe (ERG) Susan Yates (EODTECHDIV)	-Determine if data has met the data quality objectives.

Worksheet 23

Project Documents and Records

Sample Collection Records	Laboratory Records	Assessment Records
Field Notes	Sample Receipt, Custody, and Tracking Records	Field Sampling Assessment Checklist
Chain-of-Custody Records	Laboratory Report	Laboratory Assessment Checklist
Air Bills	Instrument Printouts (raw data) for Field Samples, Standards, QC Checks, and QC Samples	Data Assessment Notes
Fence Diagrams	Laboratory Internal Data Package Completeness Checklist	Corrective Action Reports
Custody Seals	Electronic Data Deliverable from Laboratory	
Monitoring Well Construction Logs	QC Summary Table	
Site Map		

Appendix B

DATA QUALITY OBJECTIVES

1.0 PROBLEM STATEMENT

The goal of the sampling event at Range 3 is to determine if munitions constituents (MCs) of concern are present at the range above range-specific screening levels ("RSSLs").

Table B-1 lists the RSSLs for the MCs of concern at Range 3.

Table B-1. Range 3 MCs of Concern and Associated RSSLs

	Water (ug/L)		Soil (mg/kg)	
Munition Constituent	**Screening Level**	**Quantitation Limit***	**Screening Level**	**Quantitation Limit***
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	0.61	0.25	4.4	0.04
2,4,6-Trinitrotoluene (2,4,6-TNT)	2.2	0.25	16	0.02
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	400	0.25	3,100	0.03
2,4-Dinitrotoluene (DNT)	73	0.25	120	0.02
Perchlorate	3.6	5	7.8	0.83

* The QL cannot be less than the concentration of the lowest calibration standard and must be less than or equal to the range-specific screening level.

This sampling effort is being funded by the Naval Explosives Ordnance Disposal Technical Division (EODTECHDIV) as a continuation of the Range Condition Assessment (RCA) that began at Naval Support Facility (NSF) Indian Head, Stump Neck Annex in 2007. ERG is supporting EODTECHDIV in coordinating the collection of soil and groundwater samples at Range 3 and conducting an analysis of the results. ERG's subcontractor, TestAmerica Laboratories, Inc., will be performing lab analysis of the samples collected by ERG. See QAPP Worksheet 3 (Appendix A) for a list of lead personnel from each organization. ERG and EODTECHDIV are currently planning to complete the RCA for Range 3 (including sampling and related analysis) by the end of Fiscal Year 2009.

2.0 IDENTIFICATION OF THE DECISIONS POINT(S)

"Determine whether or not MCs of concern at Range 3 are present in concentrations above RSSLs."

At the completion of the sampling event, the project team will use the data collected from the analytical laboratory processing the samples to answer the following question: "Are MCs of concern at Range 3 present at concentrations above RSSLs?"

Based on the project team's decision, the RCA for Range 3 may proceed in one of two ways:

- No exceedance of range-specific screening levels – A finding of "no significant operational impact" will be included in the final report, with a recommendation that the RCA be considered complete for the next five years.

- Exceedance of range-specific screening levels – The Technical Team will assess the data along with other information in the ORSM to develop a recommendation for whether further analysis is necessary to assess the risk of an off-range release of MCs and/or if protective measures should be implemented.

3.0 IDENTIFICATION OF INPUTS

To determine whether MCs of concern at Range 3 are present in concentrations above RSSLs, ERG will collect groundwater samples from the range’s down-gradient wells and soil samples from a transect bordering the main area of operations on the down-gradient side. ERG will send these samples to a laboratory for analysis. ERG will compare the analytical data received from the laboratory with the RSSLs specified in Table B-1 of this document.

The primary input for Decision Point 1 is the analytical data received from the laboratory. See QAPP Worksheet 13 (Appendix A) for a list of the planned sample analyses to be performed under this task.

In order for ERG to be able to determine whether or not RSSLs have been exceeded by the soil and groundwater samples taken, the analytical methods used must be able to detect the MCs of concern at or below the RSSLs. Table B-1 lists the RSSLs for the pollutants of concern along with the laboratory-specified quantitation limits (QLs) from the primary analytical methods to be used. All of the methods to be used have QLs above the RSSLs specified in Table B-1.

Before using the analytical data to address Decision Point 1, ERG will review the data to verify that they are suitable for the decision being made. This will include the following:

- Check sample chain-of-custody;
- Check that sample holding times/preservation requirements were met;
- Check that appropriate methods & SOPs were used;
- Check that lab record is complete and properly formatted;
- Verify that the sample detection limits are less than or equal to the range-specific screening levels for the pollutants of concern; and
- Verify from the lab QA/QC reports and the duplicate/blank analyses that there are no quality issues with the data to be used.

Where quality issues exist, ERG will determine on a case-by-case basis whether the data may be used for Decision Point 1. ERG will appropriately caveat any conclusions drawn from the analysis of such data.

4.0 DEFINITION OF STUDY BOUNDARIES

Range 3 and the surficial aquifer beneath Range 3 comprise the study area. The topsoil at Range 3 areas immediately adjacent to the screened intervals of the shallow monitoring wells are the sections of the surficial aquifer which are being analyzed under this sampling effort. All soil and groundwater samples taken from Range 3 in August 2009 will be reviewed in the study. The data associated with these samples reflect the condition of possible contaminants depositing on topsoil and/or leaching into groundwater over the period of operations at Range 3 (1970 to present). Decision Point 1 will apply to Range 3, and will affect any actions taken at the end of the RCA for Range 3.

Concentrations of the MCs of concern at Range 3 in the topsoil and groundwater of the surficial aquifer at Range 3 comprise the sample population. Decision Point 1 will be addressed for each of the MCs of concern listed in Table B-1.

6 August and 7 August 2009, are the proposed dates for primary data collection (soil and groundwater sampling) occurring as part of this study.

5.0 DECISION RULE

If the concentrations of any MC of concern exceeds its respective RSSL as specified in Table B-1, then EODTECHDIV will continue on to Comprehensive Range Evaluation for Range 3.

6.0 SPECIFICATION OF TOLERABLE LIMITS ON DECISION ERRORS

Table C-2 lists the estimated different errors which may contribute to decision errors for the sampling effort at Range 3.

Table C-2. Examples of Study Errors Which Could Potentially Contribute to a Decision Error

Possible Error	Type of Error	Protective Measures to Control Error
Hot spots of high concentrations are missed during soil sampling	Sampling design error	VSP module inputs were set to generate enough sampling points to detect concentration hot spots with diameters as small as 50 feet
Samples are taken from incorrect locations	Measurement Error	The sampling team will use a WAAS-enabled GPS receiver in addition to a site map with physical reference points to identify sampling locations. Distance between sampling points will be measured manually as an additional check
Sample analyses incorrectly estimate concentrations of MCs of concern	Measurement Error	Only EPA-approved analytical methods will be used in a NELAP-accredited laboratory. Lab and field errors will be evaluated by use of field duplicates as well as matrix spike duplicates

The null hypothesis for Decision Point 1 of the Range 3 Sampling Task is as follows:

“The MCs of concern at Range 3 are not present at levels that exceed their respective RSSLs.”[1]

The Type I decision error for this hypothesis (false positive) would involve concluding that the MCs of concern did not exceed the RSSLs when they actually did exceed the RSSLs. This decision error is the most undesirable because it would endanger the continued operation of Range 3 and could lead to potentially severe social costs, human health and ecological effects, and political and legal ramifications.

The Type II decision error for this hypothesis (false negative) would involve concluding that the MCs of concern exceeded the RSSLs when they actually didn’t exceed the RSSLs. This decision error is less undesirable than the Type I decision error for this hypothesis, but it is also undesirable because it would unnecessarily impact Range 3 operations and potentially increase costs for EODTECHDIV.

Based on the limited funding available for the sample design and the relatively low cost anticipated for the decision errors described above, a five percent false positive and a five percent false negative error are allowable for this study.

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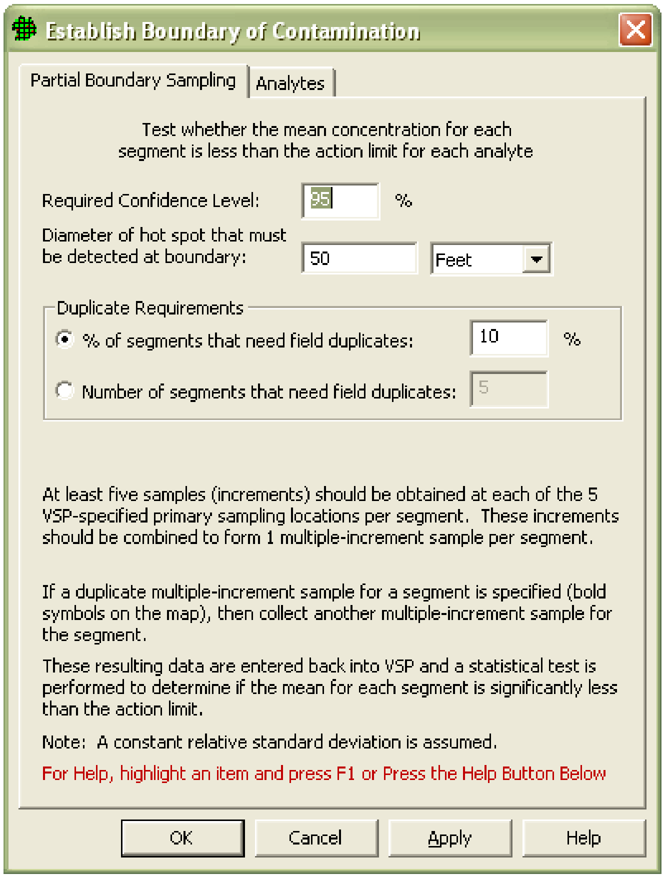
[1] Conversely, the alternative hypothesis for Decision Point 1 of the Range 3 Sampling Task is as follows: “The MCs of concern at Range 3 are present at levels that exceed their respective RSSLs.”

7.0 DESIGN OPTIMIZATION FOR DATA COLLECTION

ERG used the VSP software recommended by the RSEPA manual to optimize the sample design for this project. This software requires assumptions for the following parameters:

- Required confidence level – based on the conditions discussed in the previous section, ERG specified a 95 percent confidence level for sample design.
- Diameter of minimum hot spot to be detected – based on system defaults and the guidance on VSP usage for RSEPA, ERG specified a minimum hot spot size of 50 feet.
- Percent of segments requiring field duplicates – although the generally accepted percent of segments requiring field duplicates is 10 percent, the limited number of multi-increment soil samples to be collected (4) make it necessary to collect one duplicate for each multi-increment soil sample.

Figure C-1 below illustrates the input screen that contains the parameters for design optimization.



Test whether the mean concentration for each segment is less than the action limit for each analyte

Required Confidence Level: 95 %

Diameter of hot spot that must be detected at boundary: 50 Feet

Duplicate Requirements

● % of segments that need field duplicates: 10 %

○ Number of segments that need field duplicates: 5

At least five samples (increments) should be obtained at each of the 5 VSP-specified primary sampling locations per segment. These increments should be combined to form 1 multiple-increment sample per segment.

If a duplicate multiple-increment sample for a segment is specified (bold symbols on the map), then collect another multiple-increment sample for the segment.

These resulting data are entered back into VSP and a statistical test is performed to determine if the mean for each segment is significantly less than the action limit.

Note: A constant relative standard deviation is assumed.

For Help, highlight an item and press F1 or Press the Help Button Below

Figure C - 1. Input Screen for Design Optimization Parameters in VSP

Appendix C

CLARIFICATION OF TERMINOLGY AND TECHNICAL REVIEWS FOR THE RANGE 3 SAMPLING EVENT DELIVERABLES

1.0 OVERVIEW

The sampling event and related environmental support for Range 3 involves the production of several types of written products ranging from deliberative memos to published reports. The general work flow is for to ERG to begin development of these products based on the schedule of the project and the items discussed in the Statement of Work (SOW). EODTECHDIV reviews and revises initial versions of these documents prior to finalization. Several iterations of development, review, and revision may be necessary prior to product finalization. This attachment clarifies the terminology in order to improve the efficiency and effectiveness of the review process.

2.0 CLARIFICATION OF TERMINOLOGY

The sampling event for Range 3 will use the following terms in describing the phase or version of ERG deliverables: Concept Memo, First Draft, and Draft Final. These phases are described below.

2.1 Concept Memo

A document used to present ideas for discussion. The writing style is not necessarily formal and may be as simple as presenting a list of ideas or options. The concept memo is considered an internal deliberative document and may be the result of prior topic discussions (and brainstorming meetings) between EODTECHDIV, ERG, and other stake-holders. ERG does not expect this type of document to have received senior technical review or the input of a technical editor. However, the concept memo is expected to have received some level of review (*e.g.*, an internal ERG “peer-to-peer” review) prior to delivery to EODTECHDIV. Based on past experience, a concept memo is most useful as a tool to guide EODTECHDIV in determining the desired audience and structure of a future work product. Any ERG questions or comments to EODTECHDIV that are made within the document are flagged using the MS Word insert comments function on the reviewing tool bar. EODTECHDIV may search for inserted comments to identify any outstanding questions or issues.

2.2 First Draft

An early version of a document that will ultimately be “public-ready”. The document may still be an internally deliberative product. The writing style is clear but formal. The audience and structure (such as outline or questions to be answered) have been previously defined by and reviewed with EODTECHDIV. This version is considered appropriate for senior technical review (STR), particularly to confirm that the document answers the questions it is meant to address and that the document is appropriate for the intended audience. It is not unreasonable to expect that STR results in further conversations with EODTECHDIV. EODTECHDIV’s review of the deliverable is intended to confirm that ideas and concepts are presented as intended.

2.3 Draft Final

A “public-ready” document that is ready for distribution to an internal audience (*e.g.*, stakeholders at NSF Indian Head) or external audience (*e.g.*, Maryland Department of the Environment). ERG will confirm with EODTECHDIV the intended audience for this document.

This version of the document incorporates EODTECHDIV’s comments on the previous versions of the document.

2.4 Clarification of EODTECHDIV’s Expectations for Deliverables

EODTECHDIV will clearly state its expectations for when STR should take place and the purpose of the STR. Specifically, EODTECHDIV should identify for ERG the “big-picture” objectives and questions for the STR to address. The STR should be able to comment on the clarity of the document and whether the document met the objectives and answered the questions identified by EODTECHDIV.

Final
Sampling and Analysis Plan for Range Condition Assessment at Naval Support Facility – Indian Head Stump Neck Annex – Range 3

Prepared for:

Naval Explosives Ordnance Disposal Technical Division
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Prepared by:

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August 2009

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1. INTRODUCTION

This plan describes the sampling and analysis activities intended to characterize the soil and groundwater at Range 3, Naval Support Facility, Indian Head, Stump Neck Annex, Indian Head, MD. This sampling program is being conducted under the supervision of the Explosives Ordnance Disposal Technical Division (EODTECHDIV). Sampling will be conducted over a two day period and will be used to characterize soil and groundwater conditions at Range 3. Sampling will be conducted by ERG with EODTECHDIV personnel present.

This document presents information on the planned sampling episode and is intended to serve as a guide to the field sampling team and a review mechanism for Navy personnel. This sampling plan was prepared based in communication with the Navy. Tables and figures are presented at the end of each section.

1.1 Purpose/Objective

The primary objective of the RCA is to determine whether or not significant off-range releases of munition constituents (MCs) is occurring or has occurred and to determine the range's compliance with local, state, and federal environmental regulations. The specific objective of the sampling event is to determine whether MCs are present in concentrations greater than the screening levels for Range 3 specified in the original Range Condition Assessment Report for EODTECHDIV.

This evaluation is required to complete the RCA for Range 3. EODTECHDIV will use the information gathered in the sampling event to ensure that operations at Range 3 are sustainable.

1.2 Analyte Selection

Analytes that will be included in this sampling event include those in the following classes of pollutants:

- Total Metals (including mercury);
- Explosives; and
- Perchlorate.

The analytes selected for analysis reflect the current understanding of the potential pollution sources at Range 3, including contributions from high explosives, defeated ordnance, explosive hazardous waste, and other sources. Table 2-1 lists the potential analytes for each sampling point and
Table 2-2 lists the analytical methods that will be used. In addition to these analytes, the sampling crew will conduct field measurements at all sampling points (see Section 2.6).

2. SAMPLING APPROACH

This section contains detailed information regarding specific sampling point locations, sampling methodologies, analytes, sampling frequency and duration, schedule, and logistics for sampling at Range 3.

2.1 Facility Operations

Sampling will be conducted when operations at Range 3 are suspended. The area will be cleaned and prepared for access to contractors prior to the arrival of the sampling crew per Range 3 Standard Operation Procedures. Sampling days will be coordinated in advance with operational personnel. ERG proposes to sample Thursday, 6 August and Friday, 7 August 2009.

2.2 Monitoring Well Preparation and Preliminary Measurements

Prior to the sampling event, the sampling team will visit the site and re-develop the wells to ensure that they are in good condition for sampling. Well re-development will consist of surging water in and out of the well screen to remove fine particles from the water in the sandpack and reduce the turbidity of the water to be sampled. The sampling team will surge the wells by alternately raising and lowering a surge block immediately above the well screen to rapidly force water in and out of the well. After surging the well, the sampling team will pump water from the well to purge the fine-grained sediments that have been liberated from the sandpack and adjacent areas of the well. This process will be repeated until the turbidity of the water pumped from the well stabilizes, or until 10 well volumes have been purged.

Prior to sampling groundwater at Range 3, the sampling team will take groundwater level measurements (from top of casing) for each of the 3 monitoring wells to be sampled using an E-tape. The sampling team will decontaminate the E-tape between each measurement to ensure no cross contamination between wells. Environmental observations (e.g., weather conditions, recent storm occurrences) and groundwater levels will be recorded on the data sheet provided in Figure 2-1.

After taking initial groundwater level measurements, the team will begin purging each well prior to sampling, to ensure that samples are taken directly from the surficial aquifer beneath Range 3. The team will purge three well volumes from the wells using disposable bailers.

Samples will be taken from the three on-site wells down-gradient of the main testing area: MW002, MW003, and MW004. The well logs for each of the monitoring wells are included in Appendix B. The sampling team will visually inspect the wells prior to the beginning of any groundwater sampling to ensure that wells are in good working condition. Any extraordinary conditions will be noted in the space provided on Figure 2-1. In the event that the sampling team determines that sampling is not possible from any one of the three wells, the sampling crew chief will inform and seek approval from the EODTECHDIV representative to refrain from sampling the well of concern.

The following will be required from EODTECHDIV and Range 3 staff to support the sampling event:

1. Access to all groundwater monitoring wells;
2. Sampling workspace of a minimum of 50 sq. ft;
3. Vehicle parking within 150 ft of Range 3; and
4. Storage and disposal for 120 gallons of purge water.

2.3 Sample Collection, Procedures and Schedule

Much of the information about the collection of samples for this sampling program is summarized in a series of tables as follows:

Table 2-1 lists the sampling points, number of samples to be collected, and parameters for analysis;

- Table 2-2 lists the analytical methods being used; and
- Table 2-3 lists the sample container and preservation for each parameter that will be analyzed.

All groundwater samples will be collected from the well via bailer and directly placed into the sample containers. All soil samples will be collected from the first two inches of the topsoil using trowels. Soil samples will be multiple increment samples collected from 5 different points (with 5 sub-samples at each point for a total of 25 sub-samples per sample) and mixed together to homogenize the samples. The sample points will be located using the site map, reference points, and a WAAS-enabled GPS unit. Appendix A contains the Navy's Standard Operating Procedure for multiple increment sampling. The site map in Appendix B indicates the location of each increment for the four multiple increment soil samples.

Each time the sampling team collects a sample they will collect volume into separate bottles to accommodate each of the required analysis as listed in Table 2-3. Sample volumes in each bottle will be preserved according to the techniques specified for their respective analyses in Table 2-3.

After each sample has been collected, they will be stored in ice chests until custody is transferred to the laboratory. The ice chests will be maintained with sufficient ice to cool the samples to their preservation temperature of < 6 °C. Approximately 50 pounds of ice per day will be used by the sampling crew to ensure proper sample cooling.

All sampling at Range 3 will most likely be completed during the two day period.

2.4 Sample Labeling and Documentation

The samplers will code each sample with a unique sample number and attach a written label at the time of collection. The self-adhesive label will be completed in indelible ink and will contain the following information:

- Sample number;
- Sampling point/description (e.g., groundwater);
- Analysis to be performed;
- Sample bottle type;

- Date of sample collection; and
- Required preservation.

Once applied to the sample container, labels will be covered with clear tape to prevent tampering, abrasion, smearing, or loss during transit.

2.5 Sample Custody Record

Sample custody will be maintained by the sampling team from sample collection until handoff to the laboratory's courier service. To maintain a record of sample collection, handoff, and receipt by the laboratory, the sampling team will complete a Chain of Custody/Transmittal Record form, as shown in Figure 2-2, for each batch of samples handed off to the laboratory. These forms will be completed and used to document sample custody transfer from the field to the laboratory.

2.6 Sample Analysis

Sample parameters to be analyzed during the study are total metals (including mercury), explosives, and perchlorate. The laboratory will be used to analyze all sample parameters. The analytical methods to be used are listed in
Table 2-2.

The following sample blanks and duplicate samples will also be included during each round of sampling:

- One groundwater field duplicate sample for each pollutant;
- One soil duplicate sample for each sample and each pollutant; and
- One matrix spike/matrix spike duplicate sample for each pollutant.

ERG's subcontractor, Test America Laboratories, Inc., will perform all laboratory analyses. The baseline laboratory requirements are specified in Appendix D – Master Quality Assurance Project Plan of the Navy's Range Sustainability Environmental Program Assessment (RSEPA) manual.

2.7 Logistics

This section of the sampling plan summarizes facility contacts, analytical laboratory contacts and addresses, and sampling team personnel and support functions.

ERG Contacts

Eastern Research Group
14555 Avion Parkway, Suite 200
Chantilly, VA 20151
703-633-1600

Alison Poe, Project Manager
Alison.Poe@erg.com

Adam Humphreys, Environmental Scientist, Sampling Technician
Adam.Humphreys@erg.com

EODTECHDIV Contacts

EODTECHDIV Safety Office
2008 Stump Neck Road
Indian Head, MD 20460

Susan Yates, Project Manager
Voice: (301) 744-6872
E-Mail: susan.yates@navy.mil

Larry Kijek
Voice: (301) 744-6871
E-Mail: lawrence.kijek@navy.mil

Analytical Laboratory

TestAmerica West Sacramento
880 Riverside Parkway
West Sacramento, CA 95605

Table 2-1. Samples for Collection at Range 3

Sample ID	Metals	Explosives	Perchlorate (Method 6850)
RN3MW001	1	1	1
RN3MW002	1	1	1
RN3MW003	1	1	1
RN3MISS001	1	1	1
RN3MISS002	1	1	1
RN3MISS003	1	1	1
RN3MISS004	1	1	1

.

Table 2-2. Standard Analytical Methods and Procedures

Method No.	Title
SW-846 6010B	Inductively Coupled Plasma-Atomic Emission Spectrometry (Total Metals)
SW-846 8330	Nitroaromatics And Nitramines By High Performance Liquid Chromatography (Explosives)
SW-846 Method 6850	Perchlorate In Water, Soils And Solid Wastes Using High Performance Liquid Chromatography/Electrospray Ionization /Mass Spectrometry
SW-846 7470A	Mercury In Liquid Waste (Manual Cold-Vapor Technique)
SW-846 7471A	Mercury In Solid Or Semisolid Waste (Manual Cold-Vapor Technique)

Table 2-3. Summary of Sample Container and Preservation Requirements

Parameter	Soil Sample Container	Groundwater Sample Container	Soil Preservation	Groundwater Preservation	Hold Time
Metals (except for mercury)	4 oz glass jar	500ml HDPE	None	HNO_3 to pH<2.	6 months
Mercury	4 oz glass jar	500ml HDPE	Refrigerate	HNO_3 to pH<2.	6 months
Explosives	4 oz glass jar	2 1-L Amber Glass Containers	Cool to ≤ 6°C.	Cool to ≤ 6°C.	7 days
Perchlorate (Method 6850)	4 oz glass jar	250ml HDPE	None	Sterile filter using 0.2-µm PTFE membrane filtration.	28 days

Figure 2-1. Water Elevation Measurements and Field Observations Record

Date: ____________________________

Sampling Episode: _______________

Time of Sampling Event:

Start Time _______________ ☐ AM ☐ PM
End Time _______________ ☐ AM ☐ PM

Equipment Used: ____

Samplers Names: ____

Well Number	Elevation of TOC	DTW (ft TOC)	Water Level (ft msl)	Total Depth (ft TOC)	H_{wc} (ft)
MW001	XXX				
MW002	XXX				
MW003	XXX				

DTW: Depth to Water.
TOC: Top of Casing.
H_{wc}: Height of Water Column in Well.
msl: Mean Sea Level.

Observations of Abnormal Well Conditions:

____

____

____

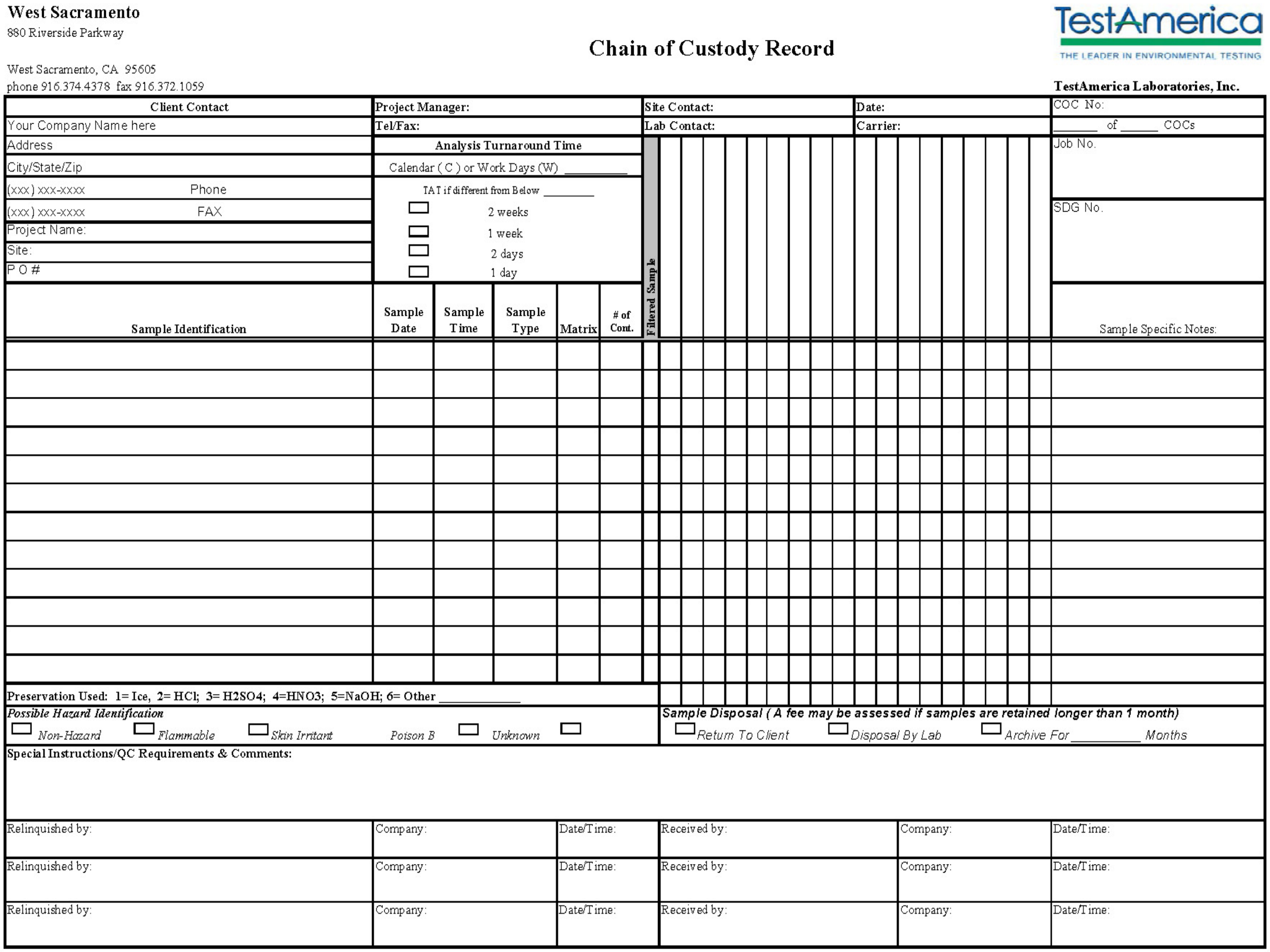
Current Weather Conditions (include obvious recent storm issues):

____

____

____

Figure 2-2. Chain of Custody/Transmittal Record Form



West Sacramento
880 Riverside Parkway

West Sacramento, CA 95605
phone 916.374.4378 fax 916.372.1059

Chain of Custody Record

THE LEADER IN ENVIRONMENTAL TESTING

TestAmerica Laboratories, Inc.

Client Contact	**Project Manager:**	**Site Contact:**	**Date:**	COC No:
Your Company Name here	**Tel/Fax:**	**Lab Contact:**	**Carrier:**	_______ of ______ COCs
Address	**Analysis Turnaround Time**			Job No.
City/State/Zip	Calendar (C) or Work Days (W) __________			
(xxx) xxx-xxxx Phone	TAT if different from Below _________			
(xxx) xxx-xxxx FAX	☐ 2 weeks			SDG No.
Project Name:	☐ 1 week			
Site:	☐ 2 days			
P O #	☐ 1 day			

Sample Identification	Sample Date	Sample Time	Sample Type	Matrix	# of Cont.	Filtered Sample																			Sample Specific Notes:

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4=HNO3; 5=NaOH; 6= Other ____________

Possible Hazard Identification
☐ *Non-Hazard* ☐ *Flammable* ☐ *Skin Irritant* *Poison B* ☐ *Unknown* ☐

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)
☐ *Return To Client* ☐ *Disposal By Lab* ☐ *Archive For__________ Months*

Special Instructions/QC Requirements & Comments:

Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:
Relinquished by:	Company:	Date/Time:	Received by:	Company:	Date/Time:

3. REFERENCES

1. SW-846. 1986. *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods, 3rded.* Office of Solid Waste and Emergency Response, U.S. Environmental Protection Agency, Washington, 11.C.

2. OSWER-9950. 1. 1986. *Resource Conservation and Recovery Act (RCRA) Groundwater Monitoring Technical Enforcement Guidance Document (T1;GD)*. U.S. Environmental Protection Agency, Washington, D.C.

3. ERG, 2009. *Draft Quality Assurance Project Plan for the Range Condition Assessment Sampling Program at Range 3*. Chantilly, Virginia.

4. ERG, 2009. *Draft Health and Safety Plan for the Range Condition Assessment Sampling at Range 3*. Chantilly, Virginia.

5. Brown and Root Environmental. 1998. RCRA Facility Investigation/Verification Investigation Report for Stump Neck Annex, Indian Head Division. January, 1998.

Appendix A

STANDARD OPERATING PROCEDURES

SOP S-1 (MULTIPLE INCREMENT SOIL SAMPLING)

1.0 Scope & Application

This procedure provides for the collection of multiple-increment surface soil samples (0-2 inches) using a non-metallic scoop or trowel. It has been developed for use in conjunction with Visual Sample Plan – Range Sustainability Module (VSP-RSM), as described in Navy's Master Quality Assurance Project Plan for Sampling and Testing at Operational Ranges (refer to Master QAPP, Section D.4).

2.0 Summary

VSP-RSM is used to designate a sampling transect line, which is partitioned into segments containing 5 sampling points each. Five increments are collected for each sample point, resulting in a total of 25 increments per transect segment. Using a non-metallic scoop, the top 2 inches of soil are collected at each increment location and placed in an aluminum foil-lined mixing bowl. After removing debris, the increments are thoroughly mixed and then transferred to the sample container. The sample container is assigned a unique serialized identification number that associates the collected sample with the sampling transect line segment. Sample containers are stored and transported to the laboratory in a cooler maintained at 4 ± 2 °C.

3.0 Health and Safety

Personnel using this procedure are responsible for performing all work in accordance with the range-specific safety and health plan. The Range Safety Officer (RSO) must participate in project planning activities to ensure that appropriate considerations have been made for the safe collection and handling of samples. The RSO must approve the range-specific safety and health plan. The RSO, with assistance from the EOD technician, is responsible for surveying the range for each separate sampling event before any personnel are allowed on the range. Field personnel must inform the RSO immediately of any unanticipated conditions that could affect the health or safety of any personnel.

4.0 Apparatus & Materials

1. Non-metallic scoop or trowel
2. Map of the Operational Range with plotted sampling points
3. GPS to locate sampling points
4. Tape measure
5. Survey stakes or flags
6. Camera and film or equivalent where permitted
7. Stainless steal, plastic, or other appropriate homogenization-mixing bowl, 2-liter capacity
8. Roll of aluminum foil to line mixing bowl
9. Precleaned, glass, wide-mouth sample containers, 1-liter capacity with PTFE-lined caps
10. Bubble wrap
11. Resealable plastic bags
12. Field logbook, field worksheets, and Chain of Custody (CoC) records
13. Black-ink waterproof pen
14. Sample labels (moisture resistant) and clear tape
15. Sample cooler(s) and ice
16. Plastic sheeting
17. Tap water
18. Storage/disposal bags
19. Personnel Protection Equipment (PPE) i.e.: protective gloves, eye protection, and disposable latex/nitrile gloves

5.0 Sampling Procedure

5.1 Locating Sample Points

5.1.1 Use VSP-RSM to designate the sampling transect line, transect line segments, and sampling points (See Master QAPP Section D.4). VSP designates 5 sampling points per transect line segment, and 5 increments are collected per sampling point.

5.1.2 Using a global positioning system (GPS), locate a sampling point for a specific transect line segment.

5.1.3 Stake the sampling point location and record in the sampling logbook the following:

- Project Name
- Sampler(s) identification
- Date and time sample collection was completed
- Transect line location and site of sampling event
- GPS coordinates for each sampling point and distance of each increment from sampling point
- Weather conditions
- Site conditions and observations
- Any unanticipated conditions

5.1.4 Sign and date the bottom of each logbook page upon completion.

5.1.5 Spread plastic sheeting on the ground near the sampling point location to keep sampling equipment decontaminated and prevent cross-contamination.

5.1.6 Don PPE, and prepare sampling equipment and containers. (Use the same scoop or trowel for collecting all increments within the same transect line segment).

5.1.7 Select a location for collecting a soil increment no more than ½ foot from the stake.

5.1.8 Sketch or photograph the sample area and note any recognizable features for future reference.

5.2 Sample Collection

5.2.1 Clear the sample area of any debris (e.g., plant matter, rocks).

5.2.2 Cut grass down to the level of the soil and remove the grass clippings.

5.2.3 Using the trowel, dig a trench at least 2 inches deep around a 2-inch by 2-inch sample block.

5.2.4 Remove the sample block by cutting it loose from the ground using the trowel

5.2.5 Place the soil into an aluminum foil lined mixing bowl.

5.2.6 Remove any remaining debris. Record the amount and kind of material removed in the logbook.

5.2.7 Measure 10 feet north from the stake and collect another increment. Repeat increment collection 10 feet east, south, and west of stake. Place each soil increment in the foil lined mixing bowl.

5.2.8 Using GPS, continue to the other designated sampling points within the segment and repeat the collection of 5 increments per sampling point.

5.2.9 Collect all 25 increments representing one segment of the transect line into the same mixing bowl. Remove all debris as in 5.2.6.

5.3 Sample Homogenization

5.3.1 Mix the sample in the mixing bowl using a scoop and/or gloved hands.

5.3.2 Soil particles should be disaggregated to less than 6mm in diameter as the sample is mixed.

5.3.3 Gather the soil into a pile in the middle of the container and divide into quarters.

5.3.4 Mix each quarter, and then combine soils from opposite corners and mix together.

5.3.5 Partition the soil into quarters again.

5.3.6 Mix each quarter, and this time combine and mix quarters from adjacent sides.

5.3.7 Combine and mix the entire sample.

5.3.8 Repeat the mixing procedures in steps 5.3.1 through 5.3.7 until the sample achieves a consistent physical appearance.

5.3.9 Place the sample representing each transect line segment into a single labeled sample container.

5.3.10 Use a new set of clean gloves, scoop, and foil liner for each transect line segment.

6.0 Documentation

6.1 Record on the sample container label a unique serialized identification number that is traceable to the transect line segment from which the sample was collected, sampler(s) identification, and date and time of sample collection.

6.2 Recorded in the sampling logbook the following: Sampler(s) identification, sample preservation information, date and time sample collection was completed, sample transect line location, site of sampling event, GPS coordinates of each sampling point, and distance of each increment from sampling point. Sign and date the bottom of each logbook page upon completion.

7.0 Handling and Preservation

7.1 Check that a PTFE liner is present in the container cap, and secure the cap tightly.

7.2 Wrap each sample container with bubble wrap, seal in an airtight re-sealable plastic bag, and place it in the storage cooler.

7.3 Store soil samples in a cooler maintained at $4 +2^{o}C$.

7.4 Complete chain of custody (CoC) form for each container. Place CoC inside airtight re-sealable plastic bag and tape to inside lid of shipping container.

7.5 Place Temperature blank labeled “Temperature Control Bottle” in Cooler and seal cooler with shipping tape. Ensure cooler is labeled for identification.

8.0 Records Management

8.1 Label all sample containers and record label information in field logbook.

8.2 Complete a CoC record for each shipping container.

9.0 Quality Control

9.1 A new pair of gloves, non-metallic scoop or trowel, and aluminum foil liner must be used for each transect line segment to prevent cross-contamination between segments.

9.2 Single use spatula, scoop, and aluminum foil liner must be disposed of in a plastic bag.

9.3 Any equipment that is reused must be cleaned, rinsed with deionized water, methanol, and air-dried before reuse.

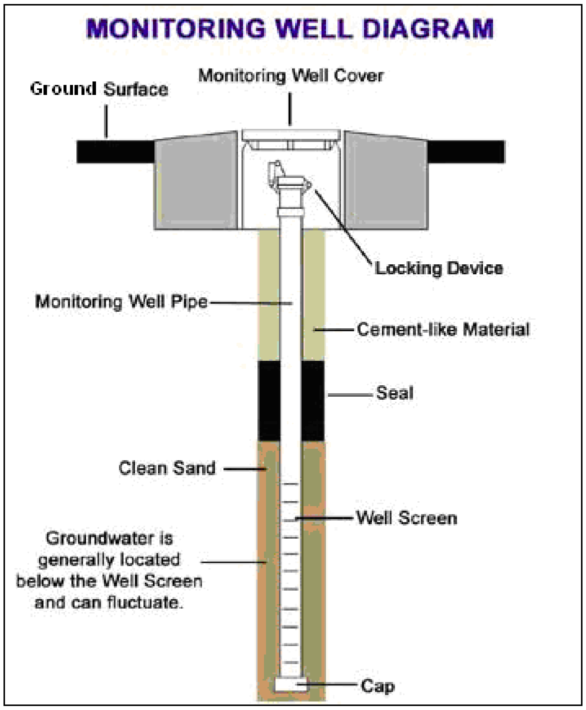
9.4 A member of the sampling team must be designated as the sample custodian, with responsibilities for taking notes in field logbook, completing field worksheets, and CoC records.

9.5 The sampler conducting the work and the sample custodian must initial and date logbook entries.

SOP S-2 (GROUNDWATER SAMPLING AND WELL REDEVELOPMENT)

PURPOSE. This SOP provides procedures for obtaining representative samples of groundwater.

SCOPE. Groundwater monitoring wells, underground injection wells, and industrial wells are the potential sources of groundwater samples. This SOP includes the minimum criteria to be followed to obtain representative samples. Variations from these criteria should be necessary only when required by regulatory practices (e.g., state-specific requirements) or site historical data gathering practices. Analytical data derived from samples obtained in a way that does not follow the documented sampling plan should not be accepted. For construction and design of groundwater monitoring wells (see Figure 1), reference should be made to ASTM D5092-90, *Well Design and Construction.*



Source: Connecticut Department of Environmental Protection

Figure 1. Diagram of a Typical Monitoring Well

FIELD PREPARATION. The key to any successful field sampling program is preparation. This section describes the preparations that should be made prior to personnel entering the field to conduct a groundwater sampling event.

Access and Identification. Access to monitoring wells may be difficult and the wells themselves hard to locate in the field. The field team leader responsible for the groundwater sampling event should obtain recent well location maps prior to the sampling event. In addition, because access to some locations may require permission from current owners or operators of the site, the field team leader should contact the site owner or operator in advance of each sampling event to obtain access and inform those individuals responsible for the site that a groundwater monitoring event is scheduled. Monitoring wells usually have a friction cap or a screw cap and should be locked. Therefore, keys to unlock the wells and tools for removing caps often are necessary.

If several monitoring wells must be sampled, proper identification of each well is essential. The well permit number or any other assigned number should be known. If numbers are not assigned, a precise field description of each well location will avoid confusion of the sample results. When several monitoring wells of known or suspected contamination will be sampled, the least-contaminated well should be sampled first. Subsequent samples then should be collected from wells in an ascending order of contamination. Well head readings using photo or flame ionization detectors (PIDs or FIDs) can aid in determining the order in which wells should be sampled by providing information on contamination levels.

Sampling Equipment Selection. The equipment used for specific groundwater sampling events can vary greatly, depending on the following factors:

- Type of well;
- Depth of well;
- Diameter of well casing;
- Depth to water;
- Contaminants likely to be encountered;

- Analytes of interest;
- Length of open hole (bedrock well);
- Type, slot size, and length of screen; and
- Expected recharge rate of well.

The equipment required for groundwater sampling generally falls into two categories: (1) equipment used to evacuate water in the well casing (i.e., well development) and (2) equipment used to collect a discrete sample for analysis. However, in some instances, the device used for evacuation may be the same as that used for sample collection.

Field Measurement Equipment. Prior to well evacuation, groundwater level measurements are made in each groundwater monitoring well. If either floating or settled organic phases are expected in the groundwater, the thickness of these phases also should be measured. The equipment typically used to measure groundwater levels includes the following:

- Electronic tape that signals to the user when the water level is reached.
- A hydrocarbon interface probe affixed to an electronic tape to measure the depth to either the floating or the settled organic phase, and the thickness of the phase.

Sample Collection Equipment. The types of equipment available for groundwater sample collection include the following:

- Bottom fill bailer (single or double check valve);
- Peristaltic pump;
- Bladder pump;
- Packer pump;
- Inertial pump;
- Syringe sampler; and
- Disposable equipment.

Site-specific sampling conditions will dictate the optimal sampling equipment. Generally, sampling equipment that minimizes agitation, air content, gas exchange, and depressurization is preferred.

A list of additional sample collection equipment is provided at the end of this document.

Equipment Cleaning and Decontamination. For each sampling event, all field measurement and sampling equipment that will enter the well must be cleaned prior to its entry. Field measurement equipment, such as water level indicators, should be cleaned in the following manner:

- Wipe with a paper towel to remove visual debris;
- Wash with tap water and a laboratory-grade glassware detergent;
- Rinse with tap water; and
- Perform an ASTM Type II water rinse.

Sampling equipment should be laboratory-cleaned using documented cleaning procedures, preferably by the laboratory performing the sample analyses. The sampling equipment then should be wrapped in cleaned foil and dedicated to a specific well for the day's sampling. The sampling equipment should remain wrapped in this manner until immediately prior to use. Additionally, bailers and sample bottles must be physically separated from pumps and generators during transport and storage. Pumps and equipment not amenable to laboratory cleaning should be field-cleaned using documented cleaning procedures. Down-hole devices such as water level indicators should not be transported in a vehicle storing gasoline or gasoline powered equipment or other volatile contaminants such as degreasers, cleaning solvents, and other volatile organics.

SAMPLING MONITORING WELLS. This section describes the procedures for sampling monitoring wells. The section describes collection of field measurements, well evacuation procedures, and groundwater sampling procedures.

Field Measurements.

CAUTION

Be certain that the proper well is being selected. The misidentification of a sampling point in the field will result in false data that may affect important decisions.

Physical Measurements. Once a well has been located and properly identified, the field measurements listed below should be noted in the Field Log Book/Field Notes.

- Diameter of protective outer casing;
- Security and integrity of the well;
- Well number and well permit number;
- Inner diameter and construction material of inner well casing; and
- Total depth of well from the top of the inner casing or surveyor's mark, if present (measured to 0.01 foot, or as appropriate).

Water Level Measurements. Well depths and water table depths can be determined using various measuring devices. A commonly used device is the electronic water level indicator. This unit has a tape divided into incremental measurements of 0.01 feet and two conductors forming a probe. When groundwater is encountered, the circuit is completed causing a signal (e.g., light, meter, or audible buzzer) to activate. The depth to groundwater is then measured from this point to the reference mark on the inner casing of the monitoring well.

Water indicator paste/gel acts as a colorimetric test method when the paste comes into contact with water. It is applied to the bottom few feet of a measuring tape or rod. The tape or rod is then lowered into the well and remains for less than one minute. The wetted tape/stick gives the depth to the top of the liquid and the color change section indicates the depth to water. This procedure is accurate to ± 0.02 feet.

Wells with a non-aqueous phase liquid layer on the surface pose a problem when measuring the level of groundwater. A more accurate and easier device to use is the interface probe. This probe uses an optical sensor to determine if the probe is in liquid and a conductivity sensor to determine if the probe is in water. When using this probe, each phase can be measured independently. The hydrocarbon/air interface reading should be taken first, going down from the air to the hydrocarbon surface to prevent any dripping hydrocarbons from enhancing the thickness reading. The hydrocarbon/water reading is best taken going up from the water to the hydrocarbon layer to prevent hydrocarbons from coating the conductivity probe, which also would enhance the hydrocarbon thickness reading. Prior to taking the hydrocarbon/water reading, the probe should be lowered quickly through the hydrocarbon layer, minimizing the contact time of the probe in the hydrocarbon phase.

The key to accurate readings by any method is proper collection of measurements from the same survey point, preferably by the same person and tape to avoid any procedural differences. Each reading should be made three to four times. All well measurements should be performed the same day and prior to evacuation of any wells that could influence groundwater elevations in the area of investigation.

Water level elevation equipment should be properly decontaminated to avoid cross-contamination. In certain circumstances, sensitive components of an interface probe may be compromised by the use of standard decontamination solvents. The manufacturer’s specifications for decontaminating interface probes should be consulted before using any solvent.

For each water level measurement, the following data should be recorded in the Field Log Book/Field Notes:

- Depth from casing top to water (recorded to 0.01 foot, or as appropriate);
- Thickness of floating product, if any; and
- Calculation of the linear feet of water in well by subtracting the depth to water from the total depth of well.

NOTE:

Water levels should be obtained from all wells prior to purging and sampling the first well, thus avoiding interference problems. This procedure also allows personnel to determine if any well is damaged or may pose a problem for sampling.

Using the physical measurements and water level measurements, the amount of water within the entire well casing can be calculated by multiplying the linear feet of water by the volume per foot for the proper diameter casing.

The table below shows the volume of water per liner foot of various casing sizes (inner diameter) of monitoring wells.

Casing Diameter (ft.)	Gallons/Linear foot
2 inch (0.1667)	0.1632
4 inch (0.3333)	0.6528
6 inch (0.5000)	1.4688
8 inch (0.6667)	2.6112
10 inch (0.8333)	4.0800
12 inch (1.0000)	5.8752

Example:

Total depth of well casing:		100 ft.
Depth to water:	-20 ft.	
Linear feet of water:	80 ft.	
2 inch casing:	x 0.1632	
Amount of water in casing:	13 gal.	

The amount of water in the casing then should be multiplied by three to determine the minimum volume to be purged from the well prior to sample collection. The total volume purged should not exceed five times the amount of standing water in the well.

Alternatively, the following formula can be used to determine the number of gallons in any diameter well:

Number of gallons = 5.8752 x C^2 x H
where: C = casing diameter in feet and
H = height of water column in feet.

Physio-Chemical Parameters. Information including specific conductance, pH, temperature, dissolved oxygen, oxidation-reduction potential, and turbidity may be recorded during well purging and before and after sample collection.

Well Development and Purging. Well development and well purging are two similar operations that are conducted to ensure that groundwater from a surrounding formation flows into the monitoring well for sampling. Each of these operations is discussed below.

Well Development. Well development is typically performed shortly after construction of the monitoring well to ensure that free-flowing groundwater will enter the monitoring well. Well development also is designed to provide the following results:

- Removal of drilling fluid residues remaining in the bore hole or surrounding aquifer;
- Removal of imported drilling water lost to the aquifer during the drilling procedure;
- Removal of groundwater in the bore hole or surrounding aquifer that has been affected by the drilling process or drilling or well construction materials; and
- Restoration of the hydraulic properties of the formation immediately surrounding the monitoring well.

The length of time (stabilization period) for groundwater conditions to become representative at and near the monitoring well will vary depending on site hydrogeologic conditions, drilling methods, and monitoring well development methods. Groundwater flow velocities are typically less than one foot per day, and natural flushing rates are generally slow. If a monitoring well is drilled, installed, and developed so that a 14-foot radius around the well was left as unrepresentative, and a natural groundwater flow rate was one foot per day, it would take 14 days for representative groundwater to reach the well. Sampling a monitoring well immediately after development generally will not be representative of the static groundwater quality conditions at the horizontal and vertical location of the monitoring well intake interval. Therefore, all newly constructed and developed monitoring wells should be allowed to stabilize and equalize with the aquifer for a minimum of two weeks prior to sampling.

The installation and construction of monitoring wells may alter the quality of groundwater in the surrounding aquifer. Site-specific subsurface conditions should be used to determine the appropriate well development techniques. Many times, a combination of the techniques discussed below will be necessary to produce a properly developed monitoring well. Also discussed below are certain outcomes inherent to well development techniques that can be mitigated by following the 14-day stabilization period.

- High velocity air jetting, air lift, or surge block development methods may introduce air into the aquifer surrounding the monitoring well. This air has the potential for altering groundwater quality, particularly for VOCs.
- Over-pumping of a monitoring well for development may draw groundwater to the monitoring well from considerable distances. This water may not be representative of the horizontal and vertical location of the monitoring well, especially so for isotropic and/or bedrock aquifers.
- Organic drilling fluid residues and inorganic residues of bentonite have been found to remain in and near wells, even after proper development. These residues have been found to affect water quality, including the chemical oxygen demand of groundwater samples, for up to 100 days after completion of development.
- Non-aqueous phase liquid contaminants may be pushed away or drawn to a monitoring well location during development, depending on the development method, resulting in non-representative groundwater samples.
- Suspended sediment not completely removed by development and not allowed to settle out may affect the quality of groundwater samples obtained from the well. Therefore, a period of time is required to allow a sand/gravel pack to settle around a monitoring well screen.

Groundwater pollution investigations often base expensive site-related investigatory and remedial action decisions on initial (first sampling event after development) groundwater sample analyses. Therefore, before groundwater samples are collected, a complete understanding of the design, construction, and hydrogeological setting of the monitoring well is necessary to properly interpret any analytical results.

Well Purging. It is generally accepted that water in the well casing is non-representative of the formation water and should be purged prior to collection of groundwater samples. Monitoring well purging is a procedure that draws fresh groundwater from the surrounding formation into the well immediately prior to sample collection. Wells are purged to some extent for the following reasons:

- The presence of the air interface at the top of the water column results in an oxygen concentration gradient with depth;
- Loss of volatiles up the water column;
- Leaching from or sorption to the casing or filter pack;
- Chemical changes due to clay seals or backfill; and
- Surface infiltration.

Many methods may be used for well purging. Not all are acceptable under all conditions. The selection of a method is usually dictated by the depth to water and local agency requirements. The preferred and most commonly used methods involve the use of a centrifugal or peristaltic pump (when the depth to water is less than 25 feet) and a submersible pump (when the depth to water is greater than 25 feet).

It is important to ensure that the purging procedure does not cause cross-contamination from one well to the next. Therefore, the preferred method employs dedicated tubing (new dedicated linear polyethylene ASTM drinking water grade) and pumps. Because it may not be practical to dedicate a pump to a specific well, it is permissible to decontaminate this equipment between wells. Methods for decontamination of tubing should be specified in the site-specific sampling and analysis plan.

Prior to purging, check the well for floating product. During purging, the pump intake or tubing should be kept at a maximum distance of six feet below the water level to prevent disturbance of sediment on the bottom of the well. The pump intake or tubing should be lowered as the water level decreases to maintain this distance to ensure sufficient distance from the air/water interface. In instances where the total depth of standing water in the well casing is less than six feet, begin purging near the top of the water column and lower the tubing as stated above. Following this procedure, field sampling personnel should ensure that all static water is removed prior to sampling.

NOTE:

The disposal or discharge of floating product or hydrocarbons, and the discharge of highly contaminated water, may require special purge water collection and disposal procedures.

Regardless of the purging procedure used, the evacuation rate should not exceed that of well development. Such an exceedance would cause a "redevelopment" of the well, resulting in a turbid sample. Cleaned equipment entering the well should not be allowed to contact the ground or any other potentially contaminated surfaces (e.g., gasoline pumps). If contact should occur, the item should not be placed in the well or used for evacuation.

The following information should be recorded in the Field Log Book/Field Notes for each monitoring well sampled:

Before Purging:

- Date, time, and weather conditions;
- Well number and permit number;
- Photo or flame ionization detector (PID or FID) reading taken from the well immediately after the cap is removed;
- Presence and thickness of free product;
- pH, dissolved oxygen, temperature, and specific conductivity;
- Total depth of well from the top of inner casing or surveyors mark if present;
- Depth from the top of inner casing to the top of screen;
- Depth from the top of inner casing to water; and
- Estimated water volume in well.

After Purging:

- Start and end time purging;
- Purge method;
- Purge rate(s);
- Total volume purged; and
- pH, dissolved oxygen, temperature, and specific conductivity.

After Sampling:

- Start and end time for sampling;
- pH, dissolved oxygen, temperature, and specific conductivity; and
- Sampling method.

Any field observations made during the groundwater sampling event (e.g., slow recharge, turbidity, odor, sheens, PID or FID readings) also should be reported.

Air-sensitive parameters such as dissolved oxygen, pH, temperature, and specific conductance are best analyzed with the use of a flow-through cell, eliminating sample exposure to air. However, monitoring of these air-sensitive parameters for well stability may not be a reliable indicator of when to collect a representative sample. Therefore, if a constant monitor is not used during well purging, a sample should be collected within two hours after three to five volumes of water have been purged from the well. The volume evacuated and the evacuation rate should be recorded after each purge and sample event, and repeated for subsequent sampling events. This procedure should provide consistent samples from each well.

Every reasonable effort should be made to keep pumping rates low to avoid over-pumping or pumping the well to dryness. Pump rates may be adjusted and pumping times extended to remove the required three to five well volumes. Sampling should never occur more than 24 hours after purging. To avoid altering the hydrogeological properties of the aquifer in the vicinity of the well, the evacuation rate of a monitoring well should not exceed that of the development of the well.

In some situations, evacuation of three to five volumes may be impractical in wells with slow recoveries. If a well has been pumped to near dryness at a rate of less than 0.5 gallons per minute, the well should be allowed to recover to a volume sufficient for sampling. If necessary, sampling within the two hour limit may be exceeded to allow the well to recover sufficiently for sampling. If a well has been pumped to dryness, a minimum of 20 minutes of waiting time is required prior to sampling or follow regulatory requirements.

There are several reasons why the well should not be pumped below the level at which the groundwater enters the well. In certain formations, water entering the well at the top of the screened area will fall into the pumped dry well. This cascading effect may aerate the groundwater to be sampled, thus resulting in the loss of volatile organic chemicals (VOCs). Secondly, pumping to dryness can cause dehydration of the saturated zone; again, VOCs may be lost due to aeration within this zone. Additionally, other contaminants may absorb to formation materials where a dehydrated zone is created. As a result, samples collected upon the recharge of a well pumped to dryness may not correctly characterize groundwater quality.

Another problem with excessive purging is the entrainment of soils and other solids from the formation into the well. Soils that are otherwise immobile may contain either metals or hydrophobic organic compounds that become entrained into the well, resulting in an overestimation of certain analytes. Soil particles can be filtered from the sample; however, filtration may remove potentially mobile (contaminant-associated) constituents, resulting in artificially low concentrations. One method to reduce entrainment of soil and other particulates into the well is by using low-flow purging and sampling techniques.

The term “low-flow” refers to the velocity with which water enters the pump intake and is imparted to the formation pore water in the immediate vicinity of the well screen. This term does not necessarily refer to the flow rate of water discharged at the surface, which can be affected by flow regulators or restrictions. Water level drawdown provides the best indication of the stress imparted by a given flow rate for a given hydrological situation. The objective is to pump in a manner that minimizes stress (drawdown) to the system to the extent practical, while taking into account established site sampling objectives. Typically, flow rates between 0.1 and 0.5 liters per minute (L/min) are used; however, the selection of an appropriate flow rate is dependent on site-specific hydrogeology.

In general, the advantages of low-flow purging include the following:

- More representative samples of the mobile load of contaminants (dissolved and colloid-associated) present;
- Minimal disturbance of the sampling point, thereby minimizing sampling artifacts;
- Less operator variability, and greater operator control;
- Reduced stress on the formation (minimal drawdown);
- Less mixing of stagnant casing water with formation water;
- Reduced need for filtration and, therefore, less time required for sampling;
- Smaller purging volume, which decreases waste disposal costs and sampling time; and
- Better sample consistency, and reduced artificial sample variability.

Some disadvantages of low-flow purging include the following:

- Higher initial capital costs;
- Greater set-up time in the field;
- Need to transport additional equipment to and from the site; and
- Increased training needs.

There are certain circumstances in which a well should not be screened across the water table, such as the following:

- Wells screened for collection of depth-discrete groundwater samples;
- Bedrock wells with several water-bearing zones; and
- Very slow recovering wells.

In these circumstances, the well must not be pumped such that the groundwater level falls below the zone where water enters the well.

If a well is evacuated to dryness or below the well screen, sample records should document the event because sample integrity may be severely altered.

Hand Bailing Techniques. Hand bailers come in a variety of sizes and volumes to accommodate most well casing diameters (see Figure 2 for an illustration of a bottom fill bailer). Hand bailing may be conducted if no other method of evacuation can accomplish the task and the procedure is specified in the FSP. However, bailing is the **least recommended** procedure for well purging due to the potential for aerating the well water or possibly introducing contaminants during the bailing procedure. Specifically, bailing is the least recommended method of purging when samples are to be collected for VOC analysis.

If hand bailing is the method of evacuation, it must be performed with a laboratory-cleaned and dedicated Teflon® or stainless steel bailer. An additional laboratory-cleaned and dedicated bailer is required for sample collection.

The bailer should be lowered slowly into the well, exercising care to not aerate the groundwater to be sampled. The preferred apparatus is a Teflon®-coated, stainless steel cable attached to a low-gear-ratio winch, which is connected to a tripod standing over the well. This apparatus is preferred because it provides the most reproducible bailing method. If this apparatus is not available, the bailer may be lowered by hand using a Teflon®-coated, stainless steel leader.

NOTE:

Braided stainless steel cable is coated with manufacturing oils that make decontamination difficult; therefore, Teflon®-coated, stainless steel is required for the bailer leader because it will come into contact with the groundwater.

Care should be taken if using stainless steel cable clamps to secure the leader to the bailer. The integrity of the Teflon® may be compromised by compression while tightening the clamps, thus exposing the braided wire. Also, all cut ends of leaders must have an end cap to prevent exposure of the stainless steel wire.

Groundwater Sampling Procedures Using Monitoring Wells. After purging the required volume of water from the well, sampling can begin. If the well is a quick recharger, sampling of the well should occur immediately after evacuation. In most cases, the time lapse between evacuation and sampling should not exceed two hours.

If several monitoring wells must be sampled, proper identification of each well is essential. The well permit number or any other assigned number should be known. If numbers are not assigned, a precise field description of each well location will avoid confusion of the sample results. When several monitoring wells of known or suspected contamination will be sampled, the least-contaminated well should be sampled first. Subsequent samples then should be collected from wells in an ascending order of contamination. Well head readings using photo or flame ionization detectors (PIDs or FIDs) can aid in determining the order in which wells should be sampled by providing information on contamination levels.

Field personnel should pay strict attention to proper decontamination procedures during groundwater sampling.

A variety of techniques and equipment can be used to collect groundwater samples, as discussed in the following subsections. The order in which samples should be collected from each well, regardless of sampling device, is as follows:

1. Volatile organic analytes (VOAs)
2. Purgeable organic carbons (POCs)
3. Purgeable organic halogens (POXs)
4. Total organic halogens (TOXs)
5. Total organic carbon (TOC)
6. Base neutrals/acid extractables
7. Total petroleum hydrocarbons (TPH)/ oil and grease
8. Polychlorinated biphenyls (PCBs)/pesticides
9. Total metals
10. Dissolved metals
11. Phenols
12. Cyanide
13. Sulfate and chloride
14. Turbidity
15. Nitrate and ammonia
16. Preserved inorganics
17. Radionuclides
18. Non-preserved inorganics
19. Bacteria

This collection order takes into consideration the volatilization sensitivity of groundwater samples. Additional information on the order of sample collection can be found in the Resource Conservation and Recovery Act (RCRA) and the *Groundwater Monitoring Technical Enforcement Guidance Document (TEGD)*, September 1986.

Hand Bailers. Bailers come in a variety of sizes and volumes to accommodate most well casing diameters (see Figure 2). Bailers used for sample collection should be constructed of Teflon® or stainless steel. The use of bailers constructed of other materials for groundwater sample collection must be specified in the FSP. Bailing is the least recommended method for sample collection when samples are to be collected for VOC analysis.

If hand bailing has been used to evacuate the monitoring well, an additional laboratory-cleaned and dedicated Teflon® or stainless steel bailer is required for sample collection.

The bailer should be cleaned and wrapped using approved methodologies, preferably by the laboratory performing the analyses. The bailer must be slowly lowered into the well, exercising care to not aerate the groundwater to be sampled. Care also should be taken when transferring water from the bailer to the sample container because this action also presents the risk of sample aeration.

Some bailers have small stopcocks with an attached sample line. The valve is inserted into the bottom of the bailer, pushing the check valve up and supplying water to the sample line. The sample flow for the VOCs may then be reduced to eliminate aeration of the sample. The valve should be in the open position when inserting into the bailer, after which it may be closed. This procedure should prevent an air bubble from rising up inside the bailer through the sample, thereby causing aeration.

Clean sampling equipment and other objects entering the well should not be allowed to contact the ground or any other potentially contaminated surfaces (e.g., gasoline pumps). If contact should occur, the item should not be placed in the well or utilized for sampling. It is good to have extra laboratory-cleaned bailers available at the site. Additionally, bailers and sample bottles must be physically separated from pumps or generators during transport and storage.

CAUTION

> **Dedicating a bailer and leaving it in a well for long-term monitoring is not recommended due to the potential risk of contamination resulting from excessive handling. (It would be necessary to remove the bailer before purging the well, therefore increasing the risk of contamination.)**

SAMPLE HANDLING AND COLLECTION.

This section provides guidance on sample handling procedures, such as filtration, and specific techniques for collection of samples that will be analyzed for various classes of groundwater pollutants (e.g., semi-volatile organics). For detailed sampling procedures and preservation of samples, refer to Appendix H of this manual. It is important to remember that Chain-of-Custody procedures should be followed for all groundwater sampling events and that all samples (except for metals) remain on ice during both sample collection and shipment to the laboratory. Details regarding the use of Chain-of-Custody procedures are provided in Appendix H.

Sampling for Metals. Certain regulations require metals analyses to be performed on unfiltered groundwater samples pursuant to the requirements of the Safe Drinking Water Act and the Clean Water Act. The reason for these requirements is to obtain a representative sample as it actually occurs in the aquifer and to maintain consistency between sample handling for inorganic and organic analyses. If a particular situation demands consideration of dissolved metals, both filtered and non-filtered samples should be collected for analysis. The regulatory document or approved QAP should be consulted for monitoring requirements.

The differences obtained as a result of sample handling (filtered versus non-filtered) are dependent on the type of association between the specific inorganic ion and the particulate matter. Studies show that when an inorganic ion is not closely associated with particulate matter (e.g., sodium), the differences between total and dissolved concentrations are small and random.

Ideally, the sample can be split into two portions, one for filtration and the other for immediate preservation and subsequent analysis for total metals concentration. By analyzing the two fractions separately, differences between dissolved and total metals can be compared.

The decision of whether to filter metals samples should be based on the physical quality of the samples, the objectives of the monitoring program, and the policy of the regulation or agency controlling the sampling event. If filtering is allowed and chosen, it is imperative that it be performed in a manner that will preserve the integrity of the sample and allow for consistent reproduction of technique.

Filtration of groundwater samples for dissolved metals analyses should be performed with a pre-cleaned filtering apparatus. Sampling devices should be cleaned using ultra-pure nitric acid when low-level metals contaminants are being measured. Filtration must be done immediately upon sample collection, prior to preservation. Samples transported to the lab for filtration and preservation should be documented because sample composition will change during transport. The sample should be collected and filtered through a 0.45-micron pore diameter cellulose acetate filter. If the use of a vacuum filter is impractical, pressure filtration must be performed. Care should be taken to follow the manufacturer's recommended procedure if vacuum filtration is used. All filter apparatus should be laboratory-cleaned and dedicated. Disposable filters are acceptable. For each sampling event, a new disposable filter must be used to avoid cross-contamination of samples.

Groundwater samples to be analyzed for both total metals and dissolved metals are collected in plastic bottles and preserved with nitric acid to pH <2. All appropriate data should be recorded in the Field Log Book/Field Notes.

<u>Sampling for Conventional Parameters and Nutrients.</u> Conventional pollutants typically include biochemical oxygen demand (BOD), oil and grease/total petroleum hydrocarbons (O&G/TPH) total organic carbon (TOC), chemical oxygen demand (COD), total dissolved solids (TDS), total suspended solids (TSS), and chloride. Nutrients include ammonia, nitrate, and total phosphorous. Bottle and preservation requirements will differ based on each particular analyte. The procedure for collecting groundwater samples for analysis of conventional pollutants and nutrients is described below:

1. Remove caps from sample bottles. Avoid contact with the inner surface.

2. Fill bottles to about 90-percent full. Add appropriate preservative to the samples per Appendix H of this manual or the FSP.

3. Replace and tighten caps, attach labels, seal in re-sealable bags, and place sample bottles in a cooler with enough bagged ice to cool the samples to 4°C.

4. Record all appropriate data in the Field Log Book/Field Notes.

<u>WELL DECOMISSIONING AND/OR ABANDONMENT.</u> This section provides an overview of the requirements for well decommissioning and abandonment. It's important that site managers check with State environmental agencies to determine specific requirements.

Unsealed or improperly sealed groundwater monitoring wells, including direct push technology (DPT) wells, may threaten public health and safety and the quality of groundwater resources. Proper well abandonment accomplishes the following: 1) eliminates the physical hazard of the well (the hole in the ground), 2) eliminates a pathway for migration of contamination, and 3) prevents hydrologic changes in the aquifer system, such as the changes in hydraulic head and the mixing of water between aquifers. The proper decommissioning method will depend on both the reason for abandonment and the condition and construction details of the boring or well.

Typically, well abandonment is the responsibility of the property owner and must be done according to state regulations. In the absence of more stringent regulatory standards, the procedures outlined below represent minimum guidelines for proper abandonment of wells and borings. These procedures may be applicable, but not limited, to public and domestic water supply wells, monitoring wells, borings, or drive points drilled to collect subsurface information, test borings for groundwater exploration, and dry wells (drains or borings to the subsurface).

1. The well should be plugged to prevent the entrance of surface water, circulation of water between or among producing zones, or any other process resulting in the contamination or pollution of groundwater resources.

2. The well should be chlorinated prior to abandonment using a chlorine solution with a minimum concentration of 150 ppm.

3. The entire depth of the well should be checked before it is sealed to identify any obstruction that could interfere with sealing operations.

4. The well bore should be filled and sealed completely with bentonite cement grout.

5. The grout material should be placed in a way that prevents voids in the grout or dilution of the grout.

6. The abandoned well or bore should not become a channel for the vertical movement of water or other substance to potable groundwater resources.

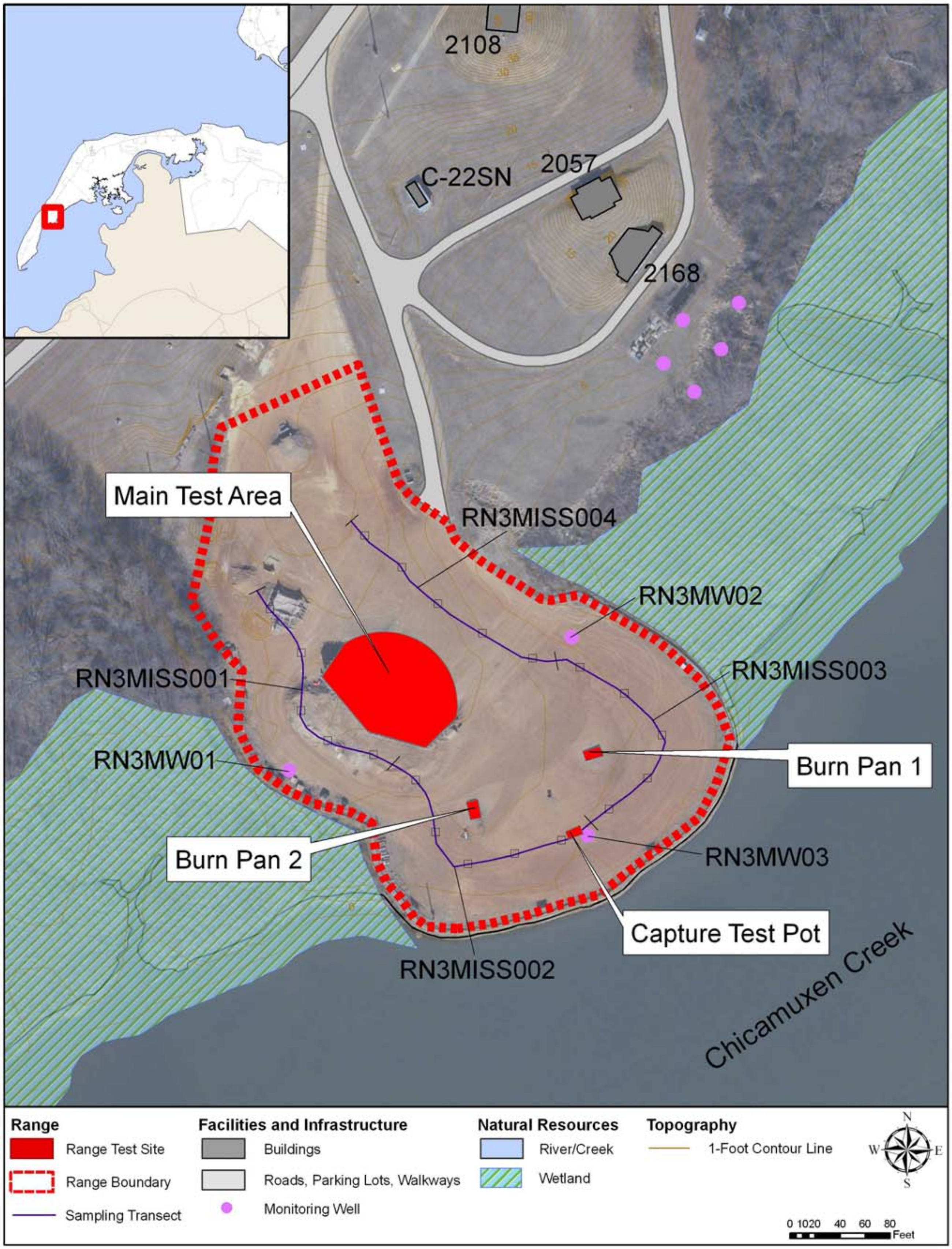
7. Upon completion of well abandonment, the top of the casing and grout material should not be terminated more than four feet below the ground surface of the final grade.

SAMPLE EQUIPMENT LIST. The following list provides additional equipment applicable to groundwater sampling. In most cases, only a portion of the equipment listed below would be required for a given sampling event.

- Water level indicator;
- Steel line and chalk;
- Electric tape (e.g., interface probe, slope indicator, M-scope);
- Well evacuation equipment:
    - Suction lift pump/centrifugal pump,
    - Portable submersible pump,
    - Peristaltic pump,
    - Air lift pump,
    - Bladder pump (Gas Squeeze pump),
    - Packer pump,
    - Gas piston pump,
    - Gas displacement pump; and
    - Inertial pump;
- Groundwater sampling equipment:
    - Passive diffusion bags for VOCs,
    - Bottom fill bailer (single or double check valve),
    - Peristaltic pump,
    - Bladder pump,
    - Packer pump,
    - Inertial pump, and
    - Syringe sampler; and
- Additional equipment:
    - Volatile organics detection devices, such as HNU Photoionization Detector PID or FID,
    - Appropriate hand tools,
    - Keys to locked wells,
    - Filtering devices,
    - Field measurement instrumentation (e.g., temperature, specific conductance, pH, dissolved oxygen, turbidity),
    - Plastic sheeting,
    - Dedicated, pre-cleaned stainless steel pitchers, or an equivalent dipping device,
    - Calibrated bucket for purged water measurement,
    - Distilled/deionized water or ASTM Type II water,
    - Laboratory-grade glassware detergent or cleaning materials,
    - Empty drums for collection of purged water, and
    - Stainless steel clamps.

Appendix B

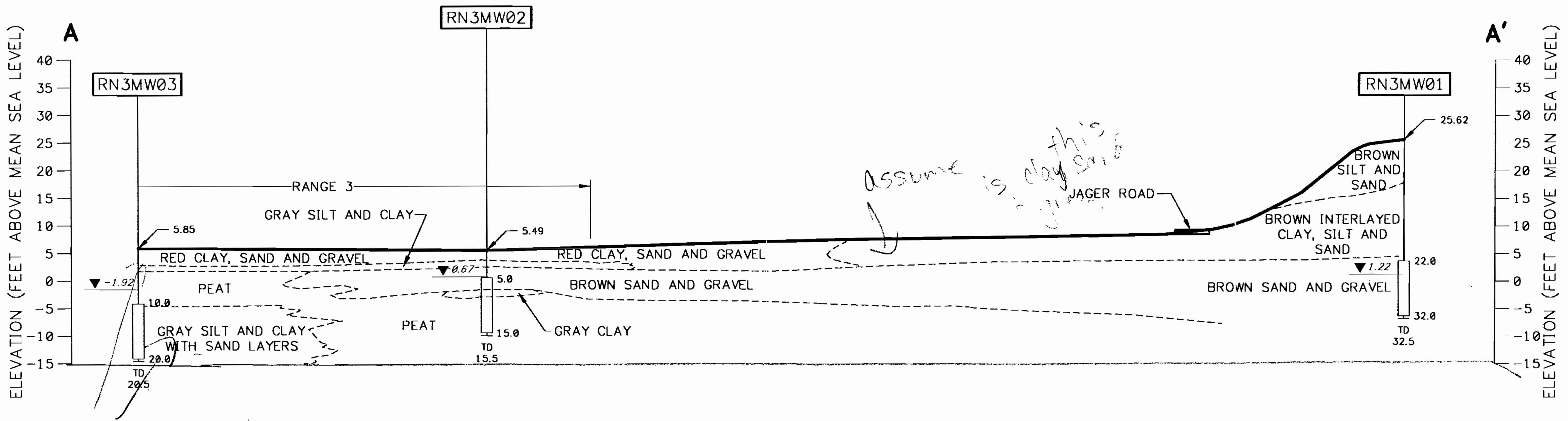
OVERVIEW MAP OF RANGE 3


2108
C-22SN
2057
2168
Main Test Area
RN3MISS004
RN3MW02
RN3MISS001
RN3MISS003
RN3MW01
Burn Pan 1
Burn Pan 2
RN3MW03
Capture Test Pot
RN3MISS002
Chicamuxen Creek
Range
Range Test Site
Range Boundary
Sampling Transect
Facilities and Infrastructure
Buildings
Roads, Parking Lots, Walkways
Monitoring Well
Natural Resources
River/Creek
Wetland
Topography
1-Foot Contour Line
N
W
E
S
0 10 20 40 60 80
Feet

Appendix C

WELL CONSTRUCTION INFORMATION

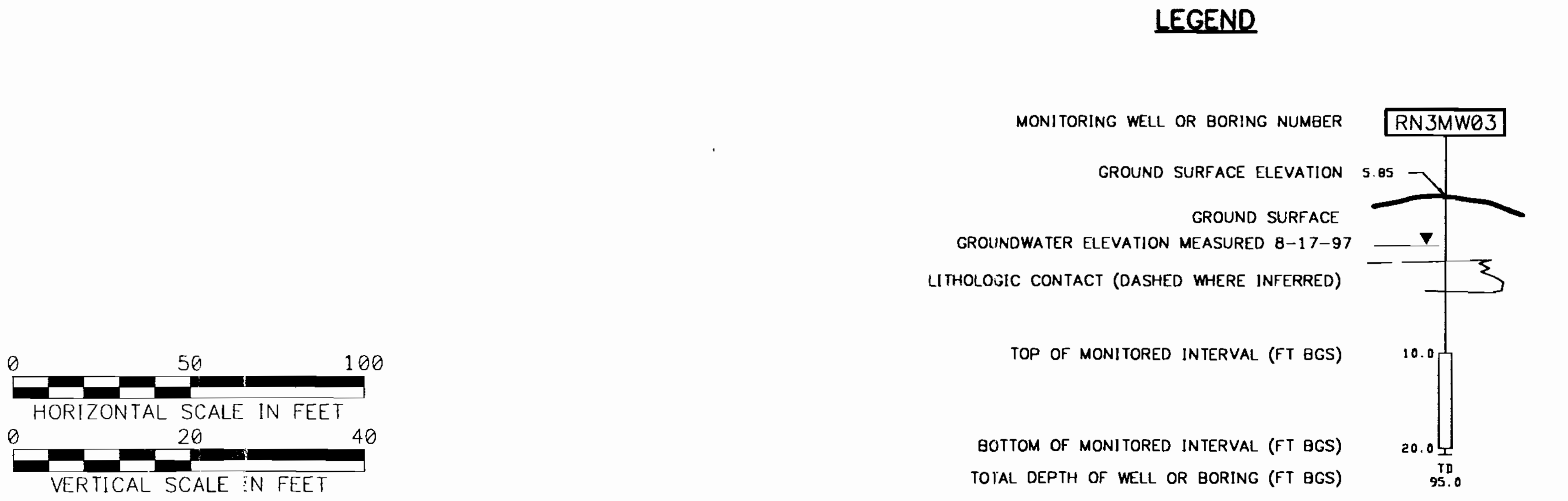
ACAD:K:\CADD\7581\7581cx02.dwg 01/14/98 MF



Assume this is clay silt

Assume these

LEGEND



NOTE: ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL (FT AMSL)

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 10/29/97

CHECKED BY DATE

COST/SCHED-AREA

SCALE AS NOTED

Brown & Root Environmental

GENERALIZED GEOLOGIC CROSS SECTION A-A'
SWMU 2/3 - RANGE 3 BURN POINT/
CHICAMUXEN CREEKS EDGE DUMP SITE A
RFI/VI REPORT
STUMP NECK ANNEX, INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

CONTRACT NO. 7581

OWNER NO. 0287

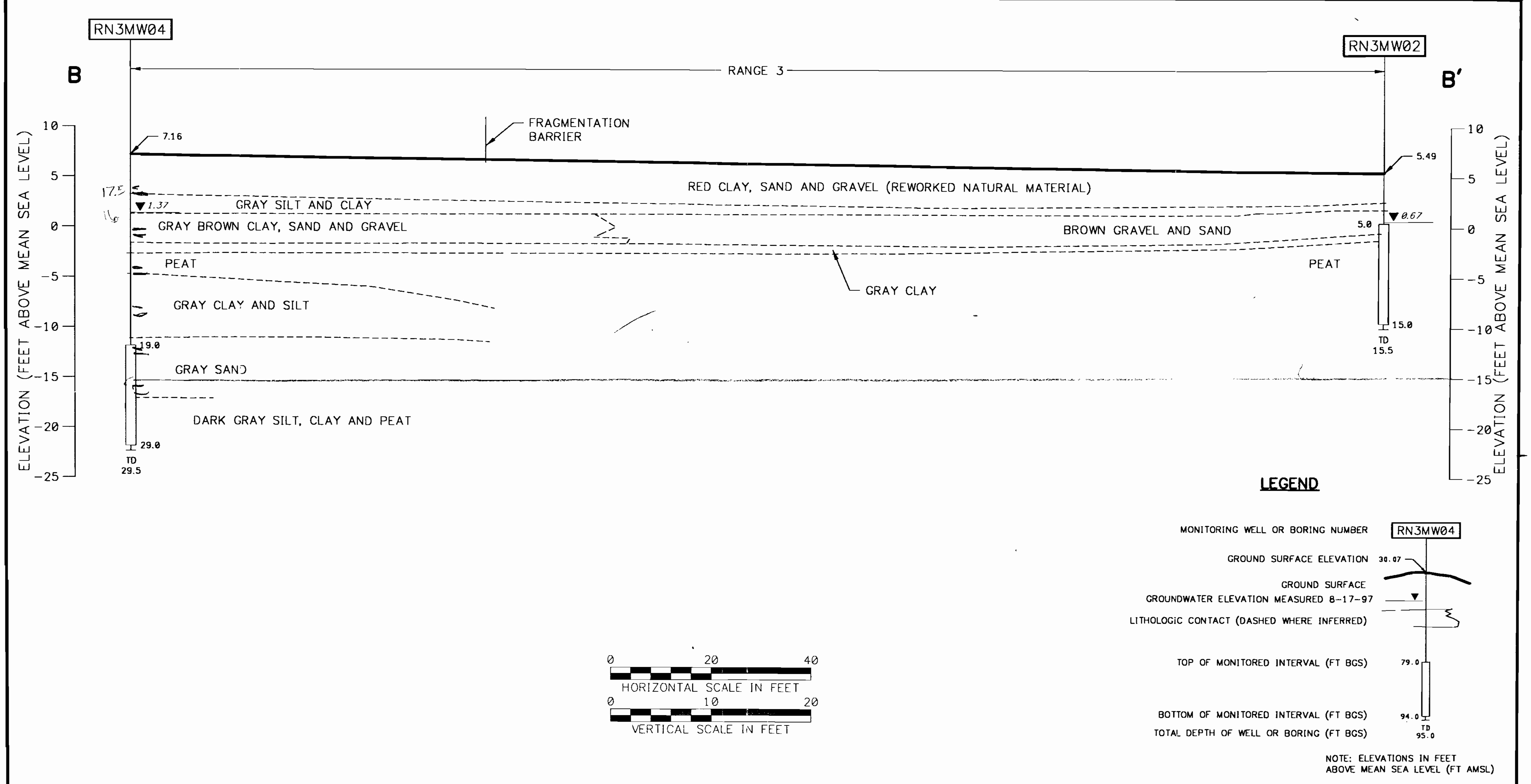
APPROVED BY SUR DATE 1-16-98

APPROVED BY DATE 1-16-98

DRAWING NO. FIGURE 5-6

REV. 0

FORM CADD NO. SOUTH_BH.DGN - REV 0 - 02/11/97



LEGEND

MONITORING WELL OR BORING NUMBER
GROUND SURFACE ELEVATION
GROUND SURFACE
GROUNDWATER ELEVATION MEASURED 8-17-97
LITHOLOGIC CONTACT (DASHED WHERE INFERRED)
TOP OF MONITORED INTERVAL (FT BGS)
BOTTOM OF MONITORED INTERVAL (FT BGS)
TOTAL DEPTH OF WELL OR BORING (FT BGS)

NOTE: ELEVATIONS IN FEET
ABOVE MEAN SEA LEVEL (FT AMSL)

NO.	DATE	REVISIONS	BY	CHKD	APPD	REFERENCES

DRAWN BY HJP DATE 10/30/97
CHECKED BY DATE
COST/SCHED-AREA
SCALE AS NOTED

Brown & Root Environmental

GENERALIZED GEOLOGIC CROSS SECTION B-B'
SWMU 2/3 – RANGE 3 BURN POINT/
CHICAMUXEN CREEK'S EDGE DUMP SITE A
RFI/VI REPORT
STUMP NECK ANNEX, INDIAN HEAD DIVISION
NSWC INDIAN HEAD, MARYLAND

CONTRACT NO. 7581
OWNER NO. 0287
APPROVED BY GUR DATE 1-16-98
APPROVED BY MF DATE 1-16-98
DRAWING NO. FIGURE 5-7
REV

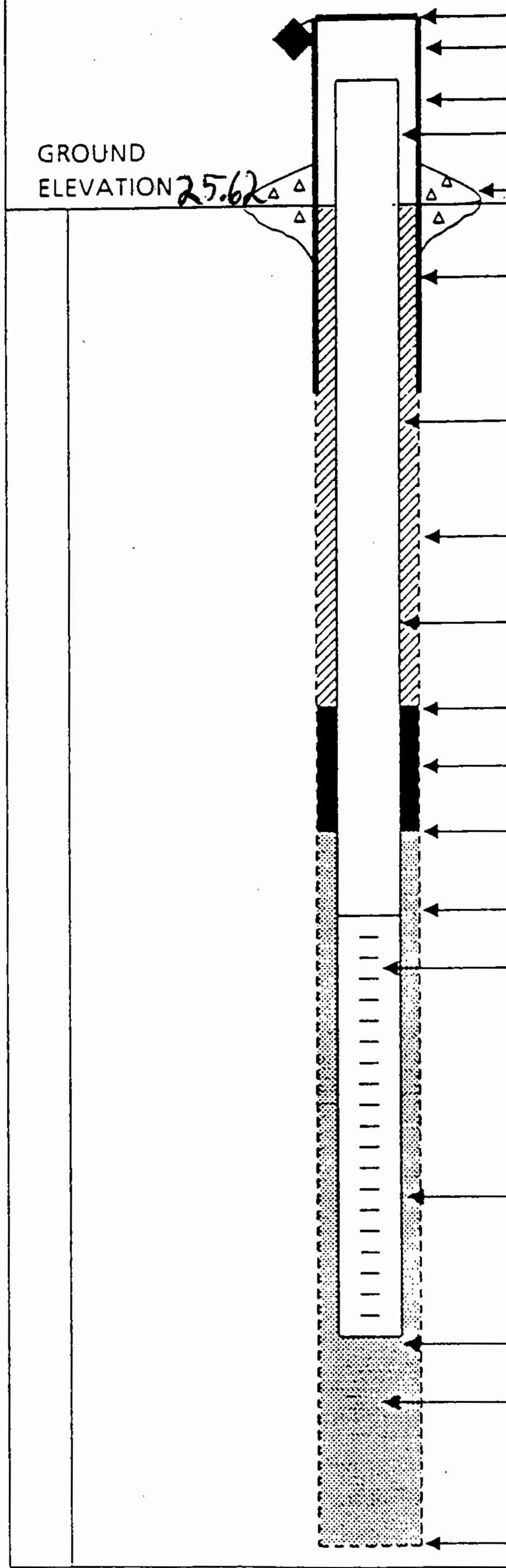
BORING NO.: RN3MW

OVERBURDEN
MONITORING WELL SHEET

PROJECT STUMP NECK RI/VI
PROJECT NO. 7581
ELEVATION
FIELD GEOLOGIST F.W. RAMSER

LOCATION RANGE 3
BORING RN3MW01
DATE 7-8-97

DRILLER D. TAYLOR
DRILLING METHOD 4 1/4 HSA
DEVELOPMENT METHOD PUMP/SURGE



ELEVATION OF TOP OF SURFACE CASING :
ELEVATION OF TOP OF RISER PIPE:
STICK - UP TOP OF SURFACE CASING: 2.5'
STICK - UP RISER PIPE : 2'
TYPE OF SURFACE SEAL: CONCRETE PAD 3' x 3' x 6"
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: SCH. 40 PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
ELEVATION / DEPTH TOP OF SEAL: 7.62 / 18'
TYPE OF SEAL: BENTONITE CHIPS
DEPTH TOP OF SAND PACK: 20'
ELEVATION / DEPTH TOP OF SCREEN: 3.62/22
TYPE OF SCREEN: SCH. 40 PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: #1 (10/20) SILICA SAND
ELEVATION / DEPTH BOTTOM OF SCREEN: -6.38 / 32
ELEVATION / DEPTH BOTTOM OF SAND PACK: -6.88 / 32.
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -6.88 / 32.

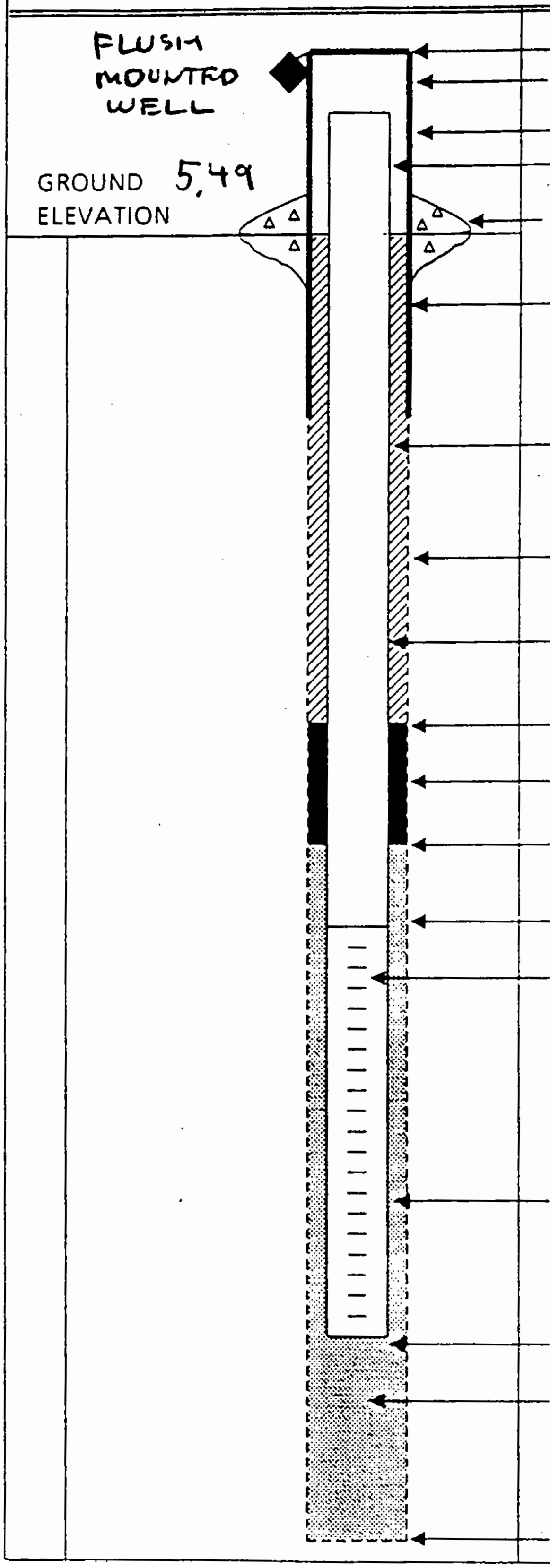
BORING NO.: RN3MWC

OVERBURDEN
MONITORING WELL SHEET

PROJECT STUMP NECK RI/VI
PROJECT NO. 7581
ELEVATION
FIELD GEOLOGIST E. WUDKWYCH

LOCATION RANGE 3
BORING RN3MW02
DATE 7-8-97

DRILLER M. CORRON
DRILLING METHOD 4 1/4 HSA
DEVELOPMENT METHOD PUMP + SURGE



ELEVATION OF TOP OF SURFACE CASING :
ELEVATION OF TOP OF RISER PIPE:

STICK - UP TOP OF SURFACE CASING: ~~2.5~~ RR
STICK - UP RISER PIPE : ~~2~~ AWR
* FLUSH MOUNTED WELL!!

TYPE OF SURFACE SEAL: CONCRETE PAD 3' × 3' × 6"

I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL

RISER PIPE I.D. 2"
TYPE OF RISER PIPE: SCH. 40 PVC

BOREHOLE DIAMETER: 8"

TYPE OF BACKFILL: CEMENT/BENTONITE GROUT

ELEVATION / DEPTH TOP OF SEAL: 3.49 / 2'

TYPE OF SEAL: BENTONITE CHIPS

DEPTH TOP OF SAND PACK: 4'

ELEVATION / DEPTH TOP OF SCREEN: 0.49 / 5'

TYPE OF SCREEN: SCH. 40 PVC

SLOT SIZE x LENGTH: .010" x 10'

I.D. OF SCREEN: 2"

TYPE OF SAND PACK: #1 (10/20) SILICA SAND

ELEVATION / DEPTH BOTTOM OF SCREEN: -9.51 / 15

ELEVATION / DEPTH BOTTOM OF SAND PACK: -10.01 /

TYPE OF BACKFILL BELOW OBSERVATION WELL:

ELEVATION / DEPTH OF HOLE: -10.01 / 15.5

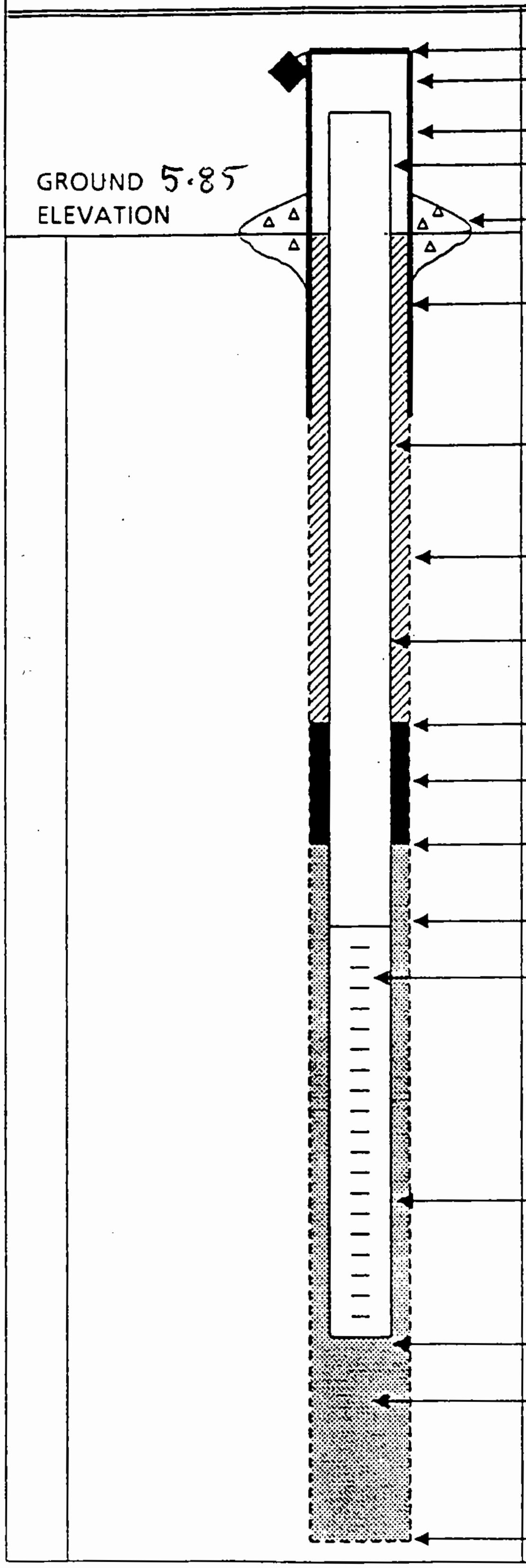
BORING NO.: RN3SBO
RN3MWO

OVERBURDEN
MONITORING WELL SHEET

PROJECT STUMP NECK RI/VI
PROJECT NO. 7581
ELEVATION
FIELD GEOLOGIST F. WUDKWYCH

LOCATION RANGE 3
BORING RN3MW03
DATE 7-8-97

DRILLER M. CORRON
DRILLING METHOD 4 1/4 HSA
DEVELOPMENT METHOD PUMP + SURGE



ELEVATION OF TOP OF SURFACE CASING :
ELEVATION OF TOP OF RISER PIPE:
STICK - UP TOP OF SURFACE CASING: 2.5' FU
STICK - UP RISER PIPE : 2' FW

FLUSH MOUNTED WELL

TYPE OF SURFACE SEAL: CONCRETE PAD 3' x 3' x 6"
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: SCH. 40 PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
ELEVATION / DEPTH TOP OF SEAL: -0.15 / 6'
TYPE OF SEAL: BENTONITE CHIPS
DEPTH TOP OF SAND PACK: -2.15 8
ELEVATION / DEPTH TOP OF SCREEN: -4.15 / 10'
TYPE OF SCREEN: SCH. 40 PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: #1 (10/20) SILICA SAND
ELEVATION / DEPTH BOTTOM OF SCREEN: -14.15/ 2
ELEVATION / DEPTH BOTTOM OF SAND PACK: / 20
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: -14.65 / 20.

BORING NO.: RN3MW

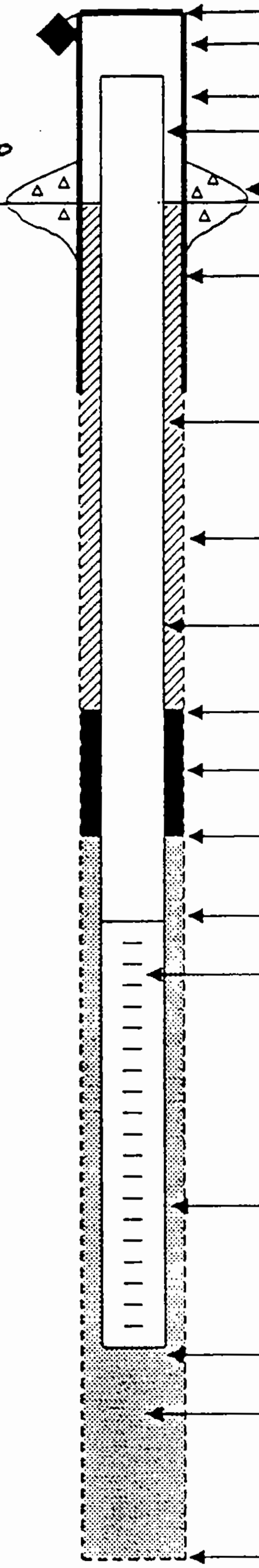
OVERBURDEN
MONITORING WELL SHEET

PROJECT STUMP NECK RI/VI
PROJECT NO. 7581
ELEVATION
FIELD GEOLOGIST E. WUDKWYCH

LOCATION RANGE 3
BORING RN3MW04
DATE 7-8-97

DRILLER D. TAYLOR
DRILLING METHOD 4 1/4 HSA
DEVELOPMENT METHOD PUMP+SURGE

GROUND ELEVATION 7.16



ELEVATION OF TOP OF SURFACE CASING :
ELEVATION OF TOP OF RISER PIPE:
STICK - UP TOP OF SURFACE CASING: 2.5' RvR
STICK - UP RISER PIPE : ~~2'~~
FLUSH MOUNTED WELL
TYPE OF SURFACE SEAL: CONCRETE PAD 3' x 3' x 6"
I.D. OF SURFACE CASING: 6"
TYPE OF SURFACE CASING: STEEL
RISER PIPE I.D. 2"
TYPE OF RISER PIPE: SCH. 40 PVC
BOREHOLE DIAMETER: 8"
TYPE OF BACKFILL: CEMENT/BENTONITE GROUT
ELEVATION / DEPTH TOP OF SEAL: /15
TYPE OF SEAL: BENTONITE CHIPS
DEPTH TOP OF SAND PACK: 17
ELEVATION / DEPTH TOP OF SCREEN: -11.84/19'
TYPE OF SCREEN: SCH. 40 PVC
SLOT SIZE x LENGTH: .010" x 10'
I.D. OF SCREEN: 2"
TYPE OF SAND PACK: #1 (10/20) SILICA SAND
ELEVATION / DEPTH BOTTOM OF SCREEN: -21.84/29'
ELEVATION / DEPTH BOTTOM OF SAND PACK: /
TYPE OF BACKFILL BELOW OBSERVATION WELL:
ELEVATION / DEPTH OF HOLE: /29.5

C 1 **3232** SEQUENCE NO. (MDE USE ONLY)

1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT
FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 97-318-W(M)

ST/CO USE ONLY
DATE Received MM DD YY ___ (8–13)

DATE WELL COMPLETED MM 07 DD 08 YY 97 (15–20)

Depth of Well ___ (22–26) (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WEL
CH - 94 - 151 (28–36)

OWNER Naval Surface Warfare Center (6293)
last name first name
STREET OR RFD STump Neck Road TOWN Indian Head
SUBDIVISION ___ SECTION ___ LOT ___

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
yellowish/brown sand & silt	0	6	
lt brown clayey fine sand	6	10	
yellow/brown silt & sand	10	12	
yellow/brown silt & clay	12	18	
grayish/green sand	18	20	
yellow/brown sand	20	26	
ellow/brown sandy gravel	26	33'	
water @ approx 24'			

NUMBER OF UNSUCCESSFUL WELLS: ___

WELL HYDROFRACTURED yes Y no N

N/A

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M __ D AWD591

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) [✓ Y] yes N no (44)

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [✓ C M] BENTONITE CLAY B C (45 46)

NO. OF BAGS 6 NO. OF POUNDS 60

GALLONS OF WATER 42

DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. (48 TOP 52) to 20 ft. (54 BOTTOM 58)
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below

S T STEEL C O CONCRETE
P L PLASTIC O T OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL (60 61)	2 (63 64)	22 (66 70)

EACH CASING
OTHER CASING (if used)

	diameter inch	depth (feet) from	to
___	___	___	___
___	___	___	___

SCREEN RECORD
screen type or open hole insert appropriate code below

S T STEEL B R BRASS BRONZE H O OPEN HOLE
P L PLASTIC O T OTHER

C 2

EACH SCREEN

DEPTH (nearest ft.)

1	PL (8 9)	22 (11 15)	32 (17 21)
2	(23 24)	(26 30)	(32 36)
3	(38 39)	(41 45)	(47 51)

SLOT SIZE 1 .0 2 1 3 0

DIAMETER OF SCREEN 2 (56 60) (NEAREST INCH)

GRAVEL PACK from 20 to 32
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 ___ (68)

MDE USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 72 74 75 76
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3

PUMPING TEST
N/A

HOURS PUMPED (nearest hour) ___ (8 9)

PUMPING RATE (gal. per minute) ___ (11)

METHOD USED TO MEASURE PUMPING RATE ___

WATER LEVEL (distance from land surface)

BEFORE PUMPING ___ ft. (17 20)

WHEN PUMPING ___ ft. (22 25)

TYPE OF PUMP USED (for test)
A air P piston T turbi
C centrifugal R rotary [✓ O] other (desc below)
J jet S submersible
(27)
MONITORING

PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES [✓ N]

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ___ (29)

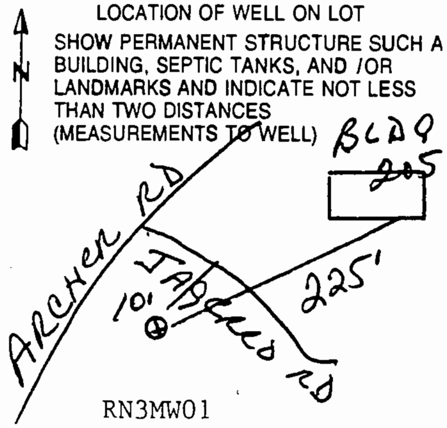
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ___ (31)

PUMP HORSE POWER ___ (37)

PUMP COLUMN LENGTH (nearest ft.) ___ (43)

CASING HEIGHT (circle appropriate box and enter casing height)
[✓ +] above } LAND SURFACE
− below } 02 (50 51) (neare foot
(49)

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH A BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



RN3MW01

C 1 | 3231
1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

SEQUENCE NO. (MDE USE ONLY)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 97-317-W(M)

ST/CO USE ONLY
DATE Received MM DD YY
8 13

DATE WELL COMPLETED MM 07 DD 08 YY 97
15 20

Depth of Well 22 15' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WEL
CH - 94 - 15
28 29 30 31 32 33 34
(6292)

OWNER Naval Surface Warfare Center
last name first name
STREET OR RFD Stump NEck Annex TOWN Indian Head
SUBDIVISION ____ SECTION ____ LOT ____

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
red sand & gravelly clay, tr silt	0	2	
gray clay and silt	2	15'	
water @ approx 4'			

NUMBER OF UNSUCCESSFUL WELLS: ____

WELL HYDROFRACTURED yes Y no N
N/A

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046
DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M D JGD049

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [✓ Y] no N
44 44

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [✓ CM] BENTONITE CLAY BC
45 46 45 46
NO. OF BAGS 2 NO. OF POUNDS 200
GALLONS OF WATER 14
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. to 4 ft.
48 TOP 52 54 BOTTOM 58
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL CO CONCRETE
PL PLASTIC OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	5
60 61	63 64	66 70

OTHER CASING (if used)
EACH CASING diameter inch depth (feet) from to

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL BR BRASS BRONZE HO OPEN HOLE
PL PLASTIC OT OTHER

C 2 DEPTH (nearest ft.)
1 2

EACH SCREEN			
1	PL	5	15
	8 9	11 15	17 21
2			
	23 24	26 30	32 36
3			
	38 39	41 45	47 51

SLOT SIZE 1 0 2 1 3 0

DIAMETER OF SCREEN 2 (NEAREST INCH)
56 60

GRAVEL PACK from 4 to 15
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68
68

MDE USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 72 74 75 76
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3
1 2

PUMPING TEST
N/A

HOURS PUMPED (nearest hour) ____ 8 9
PUMPING RATE (gal. per min.) ____ 11
METHOD USED TO MEASURE PUMPING RATE ____
WATER LEVEL (distance from land surface)
BEFORE PUMPING ____ ft. 17 20
WHEN PUMPING ____ ft. 22 25

TYPE OF PUMP USED (for test)
A air P piston T turbin
C centrifugal R rotary [✓ O] other descr below
J jet S submersible
27
MONITORING

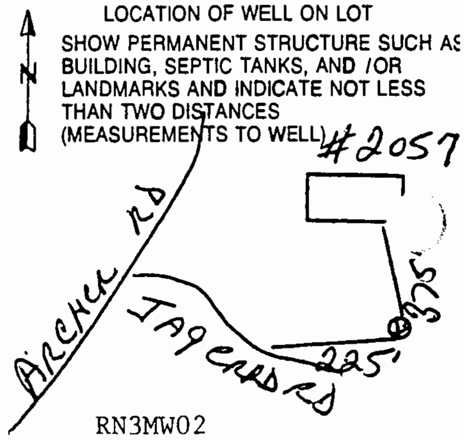
PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES [✓ NO]

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ____ 29
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ____ 31
PUMP HORSE POWER ____ 37
PUMP COLUMN LENGTH (nearest ft.) ____ 43

CASING HEIGHT (circle appropriate box and enter casing height)
+ above 49 LAND SURFACE
[✓ −] below 49
00 (neare foot)
50 51

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



RN3MW02

OF ENVIRONMENT, 2500 BROENING HIGHWAY, BALTIMORE, MARYLAND

C 1 **3233** SEQUENCE NO. (MDE USE ONLY)

1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 97-319-W(M)

ST/CO USE ONLY
DATE Received MM DD YY ______ 8 13

DATE WELL COMPLETED MM 07 DD 08 YY 97 (15 20)

Depth of Well 22 20 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WE
CH - 94 - 1520
28 29 30 31 32 33 34 35

OWNER Naval Surface Warfare Center (6294)
last name first name
STREET OR RFD Stump Neck Annex TOWN Indian Head
SUBDIVISION ______ SECTION ______ LOT ______

WELL LOG
Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
red sand & gravel	0	2	
red/brown clay, some silt	2	4	
dark gray silty clay	4	20'	
water @ approx 4'			

NUMBER OF UNSUCCESSFUL WELLS: ______

WELL HYDROFRACTURED yes ☐ Y no ☐ N

N/A

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M GD 046

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M __ D JGD049

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD
WELL HAS BEEN GROUTED (Circle Appropriate Box) yes [✓ Y] no N 44 44

TYPE OF GROUTING MATERIAL (Circle one)
CEMENT [✓ CM] 45 46 BENTONITE CLAY BC
NO. OF BAGS 3 NO. OF POUNDS 38 45 46
GALLONS OF WATER 21
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. to 8 ft.
48 TOP 52 54 BOTTOM 58
(enter 0 if from surface)

CASING RECORD
casing types insert appropriate code below
ST STEEL CO CONCRETE
PL PLASTIC OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	10
60 61	63 64	66 70

EACH CASING
OTHER CASING (if used)
diameter inch | depth (feet) from | to
______ ______ ______ ______
______ ______ ______ ______

SCREEN RECORD
screen type or open hole insert appropriate code below
ST STEEL BR BRASS BRONZE HO OPEN HOLE
PL PLASTIC OT OTHER

C 2
1 2
EACH SCREEN DEPTH (nearest ft.)
1 PL 10 20
8 9 11 15 17 21
2 ______ ______ ______
23 24 26 30 32 36
3 ______ ______ ______
38 39 41 45 47 51

SLOT SIZE 1 0 2 1 3 0

DIAMETER OF SCREEN 2 (NEAREST INCH)
56 60

GRAVEL PACK from 8 to 20

IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68 ___ 68

MDE USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 ___ TELESCOPE 72 ___ LOG 74 75 76 OTHER DATA

C 3
1 2

PUMPING TEST
N/A

HOURS PUMPED (nearest hour) ______ 8 9
PUMPING RATE (gal. per min.) ______ 11
METHOD USED TO MEASURE PUMPING RATE ______
WATER LEVEL (distance from land surface)
BEFORE PUMPING ______ ft. 17 20
WHEN PUMPING ______ ft. 22 25

TYPE OF PUMP USED (for test)
A air 27 P piston 27 T turl 27
C centrifugal 27 R rotary 27 [✓ O] oth (de bel 27
J jet 27 S submersible 27
MONITORING

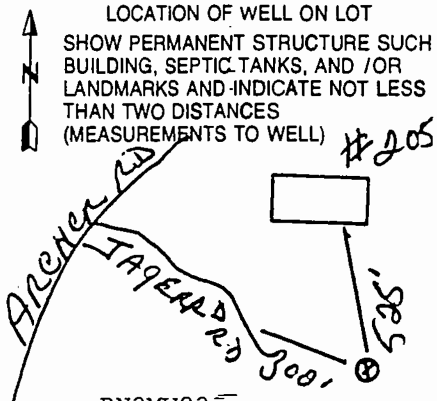
PUMP INSTALLED
DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES

IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. ___ 29
CAPACITY: GALLONS PER MINUTE (to nearest gallon) ______ 31
PUMP HORSE POWER ______ 37
PUMP COLUMN LENGTH (nearest ft.) ______ 43

CASING HEIGHT (circle appropriate box and enter casing heigh
+ above 49
[✓ −] below 49
LAND SURFACE 00 (nea fo
50 51

LOCATION OF WELL ON LOT
SHOW PERMANENT STRUCTURE SUCH BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



RN3MW03

C 1 3234 SEQUENCE NO. (MDE USE ONLY)

1 2 3 6
(THIS NUMBER IS TO BE PUNCHED IN COLS. 3-6 ON ALL CARDS)

STATE OF MARYLAND
WELL COMPLETION REPORT

FILL IN THIS FORM COMPLETELY
PLEASE PRINT OR TYPE

THIS REPORT MUST BE SUBMITTED WITHIN 45 DAYS AFTER WELL IS COMPLETED.

COUNTY NUMBER 97-320-W(M)

ST/CO USE ONLY
DATE Received MM DD YY
8 13

DATE WELL COMPLETED MM 07 DD 08 YY 97
15 20

Depth of Well 22 29' 26 (TO NEAREST FOOT)

PERMIT NO. FROM "PERMIT TO DRILL WEL
CH - 94 -
28 29 30 31 32 33 34

OWNER Naval Surface Warfare Center (6295)
last name first name
STREET OR RFD Stump Neck Annex TOWN Indian Head
SUBDIVISION SECTION LOT

WELL LOG

Not required for driven wells

STATE THE KIND OF FORMATIONS PENETRATED, THEIR COLOR, DEPTH, THICKNESS AND IF WATER BEARING

DESCRIPTION (Use additional sheets if needed)	FEET FROM	FEET TO	check if water bearing
red silty sand, tr gravel	0	4	
gray silty clay, some gravel	4	6	
gray clayey sand, some gravel	6	10	
dark gray sandy clay	10	12	
gray clay and silt	12	18	
gray silty sand	18	27	
dark gray silty clay	27	29'	
water @ approx 19'			

NUMBER OF UNSUCCESSFUL WELLS:

WELL HYDROFRACTURED yes ☐ Y no ☐ N

N/A

CIRCLE APPROPRIATE LETTER
A A WELL WAS ABANDONED AND SEALED WHEN THIS WELL WAS COMPLETED
E ELECTRIC LOG OBTAINED
P TEST WELL CONVERTED TO PRODUCTION WELL

I HEREBY CERTIFY THAT THIS WELL HAS BEEN CONSTRUCTED IN ACCORDANCE WITH COMAR 26.04.04 "WELL CONSTRUCTION" AND IN CONFORMANCE WITH ALL CONDITIONS STATED IN THE ABOVE CAPTIONED PERMIT, AND THAT THE INFORMATION PRESENTED HEREIN IS ACCURATE AND COMPLETE TO THE BEST OF MY KNOWLEDGE.

DRILLERS LIC. NO. M G D 046

DRILLERS SIGNATURE
(MUST MATCH SIGNATURE ON APPLICATION)

LIC. NO. M D AWD591

SITE SUPERVISOR (sign. of driller or journeyman responsible for sitework if different from permittee)

GROUTING RECORD

WELL HAS BEEN GROUTED (Circle Appropriate Box) [✓ yes Y] no N 44

TYPE OF GROUTING MATERIAL (Circle one)
[✓ CEMENT CM] 45 46 BENTONITE CLAY BC

NO. OF BAGS 6 NO. OF POUNDS 600
GALLONS OF WATER 42
DEPTH OF GROUT SEAL (to nearest foot)
from 0 ft. to 17 ft.
48 TOP 52 54 BOTTOM 58
(enter 0 if from surface)

CASING RECORD

casing types insert appropriate code below

ST STEEL CO CONCRETE
PL PLASTIC OT OTHER

MAIN CASING TYPE	Nominal diameter top (main) casing (nearest inch)!	Total depth of main casing (nearest foot)
PL	2	19
60 61	63 64	66 70

EACH CASING OTHER CASING (if used)
diameter inch depth (feet) from to

SCREEN RECORD

screen type or open hole insert appropriate code below

ST STEEL BR BRASS BRONZE HO OPEN HOLE
PL PLASTIC OT OTHER

C 2
1 2

EACH SCREEN DEPTH (nearest ft.)

1	PL	19	29
	8 9	11 15	17 21
2			
	23 24	26 30	32 36
3			
	38 39	41 45	47 51

SLOT SIZE 1 0 2 1 3 0

DIAMETER OF SCREEN 2 (NEAREST INCH)
56 60

GRAVEL PACK from 17 to 29
IF WELL DRILLED WAS FLOWING WELL INSERT F IN BOX 68
68

MDE USE ONLY
(NOT TO BE FILLED IN BY DRILLER)
T (E.R.O.S.) W Q
70 72 74 75 76
TELESCOPE CASING LOG INDICATOR OTHER DATA

C 3
1 2

PUMPING TEST N/A

HOURS PUMPED (nearest hour) 8 9
PUMPING RATE (gal. per min.) 11
METHOD USED TO MEASURE PUMPING RATE
WATER LEVEL (distance from land surface)
BEFORE PUMPING ft. 17 20
WHEN PUMPING ft. 22 25

TYPE OF PUMP USED (for test)
A air 27 P piston 27 T turbin 27
C centrifugal 27 R rotary 27 [✓ O other] (desc below) 27
J jet 27 S submersible
MONITORING

PUMP INSTALLED

DRILLER WILL INSTALL PUMP (CIRCLE) (YES or NO) YES [✓ NO]

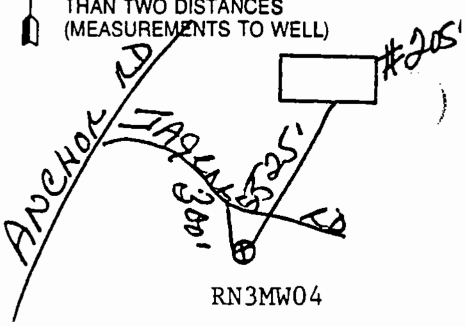
IF DRILLER INSTALLS PUMP, THIS SECTION MUST BE COMPLETED FOR ALL WELLS.

TYPE OF PUMP INSTALLED PLACE (A,C,J,P,R,S,T,O) IN BOX 29. 29
CAPACITY: GALLONS PER MINUTE (to nearest gallon) 31
PUMP HORSE POWER 37
PUMP COLUMN LENGTH (nearest ft.) 43

CASING HEIGHT (circle appropriate box and enter casing height)
+ above 49
LAND SURFACE
[✓ − below] 49 0.0 (nearest foot)
50 51

LOCATION OF WELL ON LOT

SHOW PERMANENT STRUCTURE SUCH AS BUILDING, SEPTIC TANKS, AND /OR LANDMARKS AND INDICATE NOT LESS THAN TWO DISTANCES (MEASUREMENTS TO WELL)



WELL DEVELOPMENT SHEET

PROJECT SITE NAME: STUMPNECK RI/VI
PROJECT NUMBER: 7581
WEATHER: CLEAR
STATIC WATER LEVEL: 26.65
TOTAL WELL DEPTH: 34.00
ONE CASING VOLUME: ~1.3
START TIME: 1400/1410
END TIME: 1530/1535

SITE/LOCATION: RANGE 3
WELL ID.: RN3MW01
DATE: 7-13-97
PERSONNEL: RUR
WELL TYPE: [✓ [PVC]], [S.S.], or
OTHER ______
MEASURING DEVICE: M-SCOPE
ADJUSTMENT FACTOR: N/A

[ ] DOMESTIC WELL, [✓] MONITORING WELL, [ ] OTHER ______

METHOD & REMARKS: SURGED/ SUB PUMP

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
30 GAL	1525	LT BRN CLEAR	5.44	.106	122	—	19.7°	0.00
35 GAL	1530	CLEAR	5.50	.070	72	—	18.8°	000
40	1535	CLEAR	5.50	.066	61	—	18.8°	000

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS: ______

SIGNATURE(s): ______

PAGE ___ OF ___

WELL DEVELOPMENT SHEET

PROJECT SITE NAME: STUMPNECK RI/UI
PROJECT NUMBER: 7581
WEATHER: CLEAR
STATIC WATER LEVEL: 5.58
TOTAL WELL DEPTH: 14.55
ONE CASING VOLUME: 1.5 GALS
START TIME: 1730 HRS
END TIME: 1815

SITE/LOCATION: RANGE 3
WELL ID.: RN3MW02
DATE: 7-13-97
PERSONNEL: RWR
WELL TYPE: [✓ [PVC]], [S.S.], or OTHER
MEASURING DEVICE: M-SCOPE
ADJUSTMENT FACTOR: N/A

[ ] DOMESTIC WELL, [✓] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE/PUMP

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
5 GAL	1745	GREY	6.2	.960	>999	—	24.6	.05
10 GAL	1800	"	6.3	1.10	>999	—	23.1	.07
15 GAL	1815	"	6.3	1.31	>999	—	19.8	.07

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS:

SIGNATURE(s):

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WELL DEVELOPMENT SHEET

PROJECT SITE NAME: STUMPNECK RI/UI
PROJECT NUMBER: 7581
WEATHER: CLEAR
STATIC WATER LEVEL: 2.2
TOTAL WELL DEPTH: 19.50
ONE CASING VOLUME: 2.7
START TIME: 1630
END TIME: 1825

SITE/LOCATION: RANGE 3
WELL ID.: RN3MW03
DATE: 7-13-97
PERSONNEL: RMC
WELL TYPE: [✓ [PVC]], [S.S.], or
OTHER ____
MEASURING DEVICE: M-SCOPE
ADJUSTMENT FACTOR: N/A

[ ] DOMESTIC WELL, [✓] MONITORING WELL, [ ] OTHER

METHOD & REMARKS: SURGE + PUMP PERIODICALLY, WELL CONT. TO GO DRY

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
5 GAL	1650	BRN	6.62	.083	>999	–	21.0	0.00
10 GAL	1730	BRN	6.02	.118	>999	–	20.5	0.00
15 GALS	1825	BRN/GRY	5.91	.119	>999	–	18.5	000

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS ____

SIGNATURE(s): ____

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WELL DEVELOPMENT SHEET

PROJECT SITE NAME: STUMPNECK RI/FS
PROJECT NUMBER: 7581
WEATHER: CLEAR
STATIC WATER LEVEL: 5.64
TOTAL WELL DEPTH: 28.60
ONE CASING VOLUME: 3.8 GAL
START TIME: 1600
END TIME: 1700

SITE/LOCATION: RANGE 3
WELL ID.: RN3MW04
DATE: 7-13-97
PERSONNEL: RUR
WELL TYPE: [✓ [PVC]], [S.S.], or OTHER
MEASURING DEVICE: M-SCOPE
ADJUSTMENT FACTOR: N/A

☐ DOMESTIC WELL, ☑ MONITORING WELL, ☐ OTHER

METHOD & REMARKS SURGE/PUMP

Approximate Volume	Time	Color	pH (S.U.)	Cond. (mS/cm)	Turbidity (NTU)	DO (mg/L)	Temp. (Celcius)	Salinity (%)
100 GAL	1640	GREY	5.71	2.17	620	–	19.6	0.1
110 GAL	1650	GREY	5.77	2.17	106	–	17.0	0.09
115 GALS	1700	GREY/BRN	9.72	2.17	100	–	16.0	0.10

NOTE: All measurements to nearest 0.01 foot measured from top of well riser pipe unless otherwise noted

ADDITIONAL COMMENTS:

SIGNATURE(s):

PAGE___OF___

Appendix C

ANALYTICAL DATA QUALITY ISSUES

The technical team performed a data assessment of the analytical results package received from the laboratory as specified in the RSEPA manual and the Range 3 Sampling Project QAPP. During the data assessment, the team identified the following quality issues associated with the data:

- Some of the soil samples had matrix spike/matrix-spike duplicate (MS/MSD) recoveries outside the established control limits for 2-Amino-4,6-Dinitrotoluene, 4-Amino-2,6-Dinitrotoluene, HMX, RDX, Nitroglycerin, and Nitrobenzene; laboratory control sample (LCS) recoveries were within reasonable limits.

- Some of the soil samples exhibited interference peaks during confirmation analyses for RDX and 2-4-Dinitrotoluene; therefore, it is not possible to confirm the estimated concentrations of these pollutants in certain samples.

- Recoveries of antimony, arsenic, boron, copper, and lead are outside control limits for either MS or MSD in some soil samples; LCS recoveries were within acceptable limits.

- Recoveries of barium and strontium are outside control limits for either MS or MSD in some groundwater samples; LCS recoveries were within acceptable limits.

No other issues were identified with the analytical data for the samples collected at Range 3.

Appendix D

ANALYTICAL RESULTS

Table D-1. Soil Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MISS001	6020	Antimony	7440360	2.3		0.6	0.2	mg/kg
RN3MISS001	6020	Arsenic	7440382	3.1		0.5	0.15	mg/kg
RN3MISS001	6020	Barium	7440393	32.1		0.3	0.1	mg/kg
RN3MISS001	6020	Boron	7440428	2.9	B	5	1.5	mg/kg
RN3MISS001	6020	Cadmium	7440439	0.3		0.15	0.05	mg/kg
RN3MISS001	6020	Chromium	7440473	14.9		0.6	0.2	mg/kg
RN3MISS001	6020	Copper	7440508	48.5		0.5	0.15	mg/kg
RN3MISS001	6020	Lead	7439921	88.5		0.2	0.06	mg/kg
RN3MISS001	6020	Nickel	7440020	8.2		0.3	0.1	mg/kg
RN3MISS001	6020	Selenium	7782492	0.26	B	0.3	0.1	mg/kg
RN3MISS001	6020	Silver	7440224	0.17		0.1	0.03	mg/kg
RN3MISS001	6020	Strontium	7440246	7.2		0.5	0.2	mg/kg
RN3MISS001	6020	Zinc	7440666	41.8		2	0.6	mg/kg
RN3MISS001	6850	Perchlorate	14797730	180		50	2.6	ug/kg
RN3MISS001	7471A	Mercury	7439976	0.16		0.04	0.0086	mg/kg
RN3MISS001	8330B	1,3,5-Trinitrobenzene	99354	ND		0.24	0.0098	mg/kg
RN3MISS001	8330B	1,3-Dinitrobenzene	99650	ND		0.24	0.0041	mg/kg
RN3MISS001	8330B	2,4,6-Trinitrotoluene	118967	0.25		0.24	0.019	mg/kg
RN3MISS001	8330B	2,4-Dinitrotoluene	121142	0.015	J PG	0.24	0.0052	mg/kg
RN3MISS001	8330B	2,6-Dinitrotoluene	606202	ND		0.24	0.0072	mg/kg
RN3MISS001	8330B	2-Amino-4,6-dinitrotoluene	35572782	0.11	J	0.24	0.012	mg/kg
RN3MISS001	8330B	2-Nitrotoluene	88722	ND		0.24	0.013	mg/kg
RN3MISS001	8330B	3-Nitrotoluene	99081	ND		0.24	0.015	mg/kg
RN3MISS001	8330B	4-Amino-2,6-dinitrotoluene	19406510	0.099	J	0.24	0.0098	mg/kg
RN3MISS001	8330B	4-Nitrotoluene	99990	ND		0.49	0.018	mg/kg
RN3MISS001	8330B	HMX	2691410	0.99		0.24	0.012	mg/kg
RN3MISS001	8330B	Nitrobenzene	98953	ND		0.24	0.017	mg/kg
RN3MISS001	8330B	Nitroglycerin	55630	0.5		0.49	0.015	mg/kg
RN3MISS001	8330B	RDX	121824	1.8		0.24	0.012	mg/kg
RN3MISS001	8330B	Tetryl	479458	ND		0.24	0.0098	mg/kg
RN3MISS002	6020	Antimony	7440360	1.4		0.6	0.2	mg/kg
RN3MISS002	6020	Arsenic	7440382	3.3		0.5	0.15	mg/kg
RN3MISS002	6020	Barium	7440393	25.4		0.3	0.1	mg/kg
RN3MISS002	6020	Boron	7440428	3	B	5	1.5	mg/kg
RN3MISS002	6020	Cadmium	7440439	0.2		0.15	0.05	mg/kg
RN3MISS002	6020	Chromium	7440473	13.6		0.6	0.2	mg/kg
RN3MISS002	6020	Copper	7440508	26.2		0.5	0.15	mg/kg
RN3MISS002	6020	Lead	7439921	58		0.2	0.06	mg/kg
RN3MISS002	6020	Nickel	7440020	6.7		0.3	0.1	mg/kg
RN3MISS002	6020	Selenium	7782492	0.29	B	0.3	0.1	mg/kg
RN3MISS002	6020	Silver	7440224	0.12		0.1	0.03	mg/kg
RN3MISS002	6020	Strontium	7440246	3.8		0.5	0.2	mg/kg
RN3MISS002	6020	Zinc	7440666	29.8		2	0.6	mg/kg
RN3MISS002	6850	Perchlorate	14797730	88		25	1.3	ug/kg
RN3MISS002	7471A	Mercury	7439976	0.034	B	0.04	0.0086	mg/kg
RN3MISS002	8330B	1,3,5-Trinitrobenzene	99354	ND		0.26	0.01	mg/kg
RN3MISS002	8330B	1,3-Dinitrobenzene	99650	ND		0.26	0.0043	mg/kg

Table D-1. Soil Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MISS002	8330B	2,4,6-Trinitrotoluene	118967	0.12	J	0.26	0.02	mg/kg
RN3MISS002	8330B	2,4-Dinitrotoluene	121142	0.015	J PG	0.26	0.0054	mg/kg
RN3MISS002	8330B	2,6-Dinitrotoluene	606202	ND		0.26	0.0074	mg/kg
RN3MISS002	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.26	0.013	mg/kg
RN3MISS002	8330B	2-Nitrotoluene	88722	ND		0.26	0.013	mg/kg
RN3MISS002	8330B	3-Nitrotoluene	99081	ND		0.26	0.016	mg/kg
RN3MISS002	8330B	4-Amino-2,6-dinitrotoluene	19406510	0.041	J	0.26	0.01	mg/kg
RN3MISS002	8330B	4-Nitrotoluene	99990	ND		0.51	0.019	mg/kg
RN3MISS002	8330B	HMX	2691410	1.2		0.26	0.012	mg/kg
RN3MISS002	8330B	Nitrobenzene	98953	ND		0.26	0.018	mg/kg
RN3MISS002	8330B	Nitroglycerin	55630	1.9		0.51	0.015	mg/kg
RN3MISS002	8330B	RDX	121824	0.21	J PG	0.26	0.012	mg/kg
RN3MISS002	8330B	Tetryl	479458	0.024	J	0.26	0.01	mg/kg
RN3MISS003	6020	Antimony	7440360	3.5		0.6	0.2	mg/kg
RN3MISS003	6020	Arsenic	7440382	3.4		0.5	0.15	mg/kg
RN3MISS003	6020	Barium	7440393	28.8		0.3	0.1	mg/kg
RN3MISS003	6020	Boron	7440428	2.8	B	5	1.5	mg/kg
RN3MISS003	6020	Cadmium	7440439	0.27		0.15	0.05	mg/kg
RN3MISS003	6020	Chromium	7440473	14		0.6	0.2	mg/kg
RN3MISS003	6020	Copper	7440508	28.9		0.5	0.15	mg/kg
RN3MISS003	6020	Lead	7439921	105		0.2	0.06	mg/kg
RN3MISS003	6020	Nickel	7440020	6.6		0.3	0.1	mg/kg
RN3MISS003	6020	Selenium	7782492	0.21	B	0.3	0.1	mg/kg
RN3MISS003	6020	Silver	7440224	0.12		0.1	0.03	mg/kg
RN3MISS003	6020	Strontium	7440246	3.8		0.5	0.2	mg/kg
RN3MISS003	6020	Zinc	7440666	30.7		2	0.6	mg/kg
RN3MISS003	6850	Perchlorate	14797730	27		5	0.26	ug/kg
RN3MISS003	7471A	Mercury	7439976	0.039	B	0.04	0.0086	mg/kg
RN3MISS003	8330B	1,3,5-Trinitrobenzene	99354	ND		0.25	0.0099	mg/kg
RN3MISS003	8330B	1,3-Dinitrobenzene	99650	ND		0.25	0.0042	mg/kg
RN3MISS003	8330B	2,4,6-Trinitrotoluene	118967	0.095	J	0.25	0.019	mg/kg
RN3MISS003	8330B	2,4-Dinitrotoluene	121142	0.014	J PG	0.25	0.0052	mg/kg
RN3MISS003	8330B	2,6-Dinitrotoluene	606202	ND		0.25	0.0072	mg/kg
RN3MISS003	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.25	0.012	mg/kg
RN3MISS003	8330B	2-Nitrotoluene	88722	ND		0.25	0.013	mg/kg
RN3MISS003	8330B	3-Nitrotoluene	99081	ND		0.25	0.015	mg/kg
RN3MISS003	8330B	4-Amino-2,6-dinitrotoluene	19406510	0.026	J	0.25	0.0099	mg/kg
RN3MISS003	8330B	4-Nitrotoluene	99990	ND		0.5	0.018	mg/kg
RN3MISS003	8330B	HMX	2691410	0.16	J	0.25	0.012	mg/kg
RN3MISS003	8330B	Nitrobenzene	98953	ND		0.25	0.017	mg/kg
RN3MISS003	8330B	Nitroglycerin	55630	0.1	J	0.5	0.015	mg/kg
RN3MISS003	8330B	RDX	121824	0.19	J PG	0.25	0.012	mg/kg
RN3MISS003	8330B	Tetryl	479458	ND		0.25	0.0099	mg/kg
RN3MISS004	6020	Antimony	7440360	2.8		0.6	0.2	mg/kg
RN3MISS004	6020	Arsenic	7440382	3.3		0.5	0.15	mg/kg
RN3MISS004	6020	Barium	7440393	29.7		0.3	0.1	mg/kg
RN3MISS004	6020	Boron	7440428	2.8	B	5	1.5	mg/kg

Table D-1. Soil Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MISS004	6020	Cadmium	7440439	0.27		0.15	0.05	mg/kg
RN3MISS004	6020	Chromium	7440473	14.1		0.6	0.2	mg/kg
RN3MISS004	6020	Copper	7440508	56		0.5	0.15	mg/kg
RN3MISS004	6020	Lead	7439921	108		0.2	0.06	mg/kg
RN3MISS004	6020	Nickel	7440020	9.8		0.3	0.1	mg/kg
RN3MISS004	6020	Selenium	7782492	0.26	B	0.3	0.1	mg/kg
RN3MISS004	6020	Silver	7440224	0.16		0.1	0.03	mg/kg
RN3MISS004	6020	Strontium	7440246	3.8		0.5	0.2	mg/kg
RN3MISS004	6020	Zinc	7440666	42.8		2	0.6	mg/kg
RN3MISS004	6850	Perchlorate	14797730	380		100	5.2	ug/kg
RN3MISS004	7471A	Mercury	7439976	0.057		0.04	0.0086	mg/kg
RN3MISS004	8330B	1,3,5-Trinitrobenzene	99354	ND		0.25	0.0099	mg/kg
RN3MISS004	8330B	1,3-Dinitrobenzene	99650	ND		0.25	0.0042	mg/kg
RN3MISS004	8330B	2,4,6-Trinitrotoluene	118967	0.15	J	0.25	0.019	mg/kg
RN3MISS004	8330B	2,4-Dinitrotoluene	121142	0.024	J PG	0.25	0.0052	mg/kg
RN3MISS004	8330B	2,6-Dinitrotoluene	606202	ND		0.25	0.0072	mg/kg
RN3MISS004	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.25	0.012	mg/kg
RN3MISS004	8330B	2-Nitrotoluene	88722	ND		0.25	0.013	mg/kg
RN3MISS004	8330B	3-Nitrotoluene	99081	ND		0.25	0.015	mg/kg
RN3MISS004	8330B	4-Amino-2,6-dinitrotoluene	19406510	0.053	J	0.25	0.0099	mg/kg
RN3MISS004	8330B	4-Nitrotoluene	99990	ND		0.5	0.018	mg/kg
RN3MISS004	8330B	HMX	2691410	1		0.25	0.012	mg/kg
RN3MISS004	8330B	Nitrobenzene	98953	ND		0.25	0.017	mg/kg
RN3MISS004	8330B	Nitroglycerin	55630	0.42	J	0.5	0.015	mg/kg
RN3MISS004	8330B	RDX	121824	0.79	PG	0.25	0.012	mg/kg
RN3MISS004	8330B	Tetryl	479458	ND		0.25	0.0099	mg/kg
RN3MISS005	6020	Antimony	7440360	4		0.6	0.2	mg/kg
RN3MISS005	6020	Arsenic	7440382	3.4		0.5	0.15	mg/kg
RN3MISS005	6020	Barium	7440393	28.7		0.3	0.1	mg/kg
RN3MISS005	6020	Boron	7440428	3.8	B	5	1.5	mg/kg
RN3MISS005	6020	Cadmium	7440439	0.15		0.15	0.05	mg/kg
RN3MISS005	6020	Chromium	7440473	13.8		0.6	0.2	mg/kg
RN3MISS005	6020	Copper	7440508	31.1		0.5	0.15	mg/kg
RN3MISS005	6020	Lead	7439921	113		0.2	0.06	mg/kg
RN3MISS005	6020	Nickel	7440020	6.4		0.3	0.1	mg/kg
RN3MISS005	6020	Selenium	7782492	0.23	B	0.3	0.1	mg/kg
RN3MISS005	6020	Silver	7440224	0.13		0.1	0.03	mg/kg
RN3MISS005	6020	Strontium	7440246	4		0.5	0.2	mg/kg
RN3MISS005	6020	Zinc	7440666	31.4		2	0.6	mg/kg
RN3MISS005	6850	Perchlorate	14797730	22		5	0.26	ug/kg
RN3MISS005	7471A	Mercury	7439976	0.029	B	0.04	0.0086	mg/kg
RN3MISS005	8330B	1,3,5-Trinitrobenzene	99354	ND		0.24	0.0098	mg/kg
RN3MISS005	8330B	1,3-Dinitrobenzene	99650	ND		0.24	0.0041	mg/kg
RN3MISS005	8330B	2,4,6-Trinitrotoluene	118967	0.077	J	0.24	0.019	mg/kg
RN3MISS005	8330B	2,4-Dinitrotoluene	121142	0.012	J PG	0.24	0.0052	mg/kg
RN3MISS005	8330B	2,6-Dinitrotoluene	606202	ND		0.24	0.0072	mg/kg
RN3MISS005	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.24	0.012	mg/kg

Table D-1. Soil Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MISS005	8330B	2-Nitrotoluene	88722	ND		0.24	0.013	mg/kg
RN3MISS005	8330B	3-Nitrotoluene	99081	ND		0.24	0.015	mg/kg
RN3MISS005	8330B	4-Amino-2,6-dinitrotoluene	19406510	0.029	J	0.24	0.0098	mg/kg
RN3MISS005	8330B	4-Nitrotoluene	99990	ND		0.49	0.018	mg/kg
RN3MISS005	8330B	HMX	2691410	0.21	J	0.24	0.012	mg/kg
RN3MISS005	8330B	Nitrobenzene	98953	ND		0.24	0.017	mg/kg
RN3MISS005	8330B	Nitroglycerin	55630	0.28	J	0.49	0.015	mg/kg
RN3MISS005	8330B	RDX	121824	0.16	J PG	0.24	0.012	mg/kg
RN3MISS005	8330B	Tetryl	479458	ND		0.24	0.0098	mg/kg
RN3MISS006	6020	Antimony	7440360	1.5		0.6	0.2	mg/kg
RN3MISS006	6020	Arsenic	7440382	3.6		0.5	0.15	mg/kg
RN3MISS006	6020	Barium	7440393	29.1		0.3	0.1	mg/kg
RN3MISS006	6020	Boron	7440428	3.5	B	5	1.5	mg/kg
RN3MISS006	6020	Cadmium	7440439	0.24		0.15	0.05	mg/kg
RN3MISS006	6020	Chromium	7440473	15.1		0.6	0.2	mg/kg
RN3MISS006	6020	Copper	7440508	31.1		0.5	0.15	mg/kg
RN3MISS006	6020	Lead	7439921	67.5		0.2	0.06	mg/kg
RN3MISS006	6020	Nickel	7440020	7.1		0.3	0.1	mg/kg
RN3MISS006	6020	Selenium	7782492	0.22	B	0.3	0.1	mg/kg
RN3MISS006	6020	Silver	7440224	0.16		0.1	0.03	mg/kg
RN3MISS006	6020	Strontium	7440246	4.4		0.5	0.2	mg/kg
RN3MISS006	6020	Zinc	7440666	34.6		2	0.6	mg/kg
RN3MISS006	6850	Perchlorate	14797730	100		25	1.3	ug/kg
RN3MISS006	7471A	Mercury	7439976	0.045		0.04	0.0086	mg/kg
RN3MISS006	8330B	1,3,5-Trinitrobenzene	99354	ND		0.24	0.0095	mg/kg
RN3MISS006	8330B	1,3-Dinitrobenzene	99650	ND		0.24	0.004	mg/kg
RN3MISS006	8330B	2,4,6-Trinitrotoluene	118967	0.15	J	0.24	0.018	mg/kg
RN3MISS006	8330B	2,4-Dinitrotoluene	121142	0.011	J PG	0.24	0.005	mg/kg
RN3MISS006	8330B	2,6-Dinitrotoluene	606202	ND		0.24	0.0069	mg/kg
RN3MISS006	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.24	0.012	mg/kg
RN3MISS006	8330B	2-Nitrotoluene	88722	ND		0.24	0.012	mg/kg
RN3MISS006	8330B	3-Nitrotoluene	99081	ND		0.24	0.015	mg/kg
RN3MISS006	8330B	4-Amino-2,6-dinitrotoluene	19406510	0.036	J	0.24	0.0095	mg/kg
RN3MISS006	8330B	4-Nitrotoluene	99990	ND		0.48	0.017	mg/kg
RN3MISS006	8330B	HMX	2691410	0.26		0.24	0.011	mg/kg
RN3MISS006	8330B	Nitrobenzene	98953	ND		0.24	0.017	mg/kg
RN3MISS006	8330B	Nitroglycerin	55630	0.13	J	0.48	0.014	mg/kg
RN3MISS006	8330B	RDX	121824	0.28	PG	0.24	0.011	mg/kg
RN3MISS006	8330B	Tetryl	479458	ND		0.24	0.0095	mg/kg

[1] Table includes results for native samples only (no QC results).

B, J: Estimated result; result is less than reporting limit.

PG: The percent difference between the original and confirmation analyses is greater than 40

Table D-2. Groundwater Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MW001	6020	Antimony	7440360	ND		6	2	ug/L
RN3MW001	6020	Arsenic	7440382	4.4		3	1	ug/L
RN3MW001	6020	Barium	7440393	172		1.5	0.5	ug/L
RN3MW001	6020	Boron	7440428	55		50	15	ug/L
RN3MW001	6020	Cadmium	7440439	ND		1.5	0.5	ug/L
RN3MW001	6020	Chromium	7440473	14		5	1.5	ug/L
RN3MW001	6020	Copper	7440508	9.3		3	1	ug/L
RN3MW001	6020	Lead	7439921	5.2		2.5	0.6	ug/L
RN3MW001	6020	Nickel	7440020	49.5		3	1	ug/L
RN3MW001	6020	Selenium	7782492	1.9	B	3	1	ug/L
RN3MW001	6020	Silver	7440224	ND		1	0.3	ug/L
RN3MW001	6020	Strontium	7440246	215		6	2	ug/L
RN3MW001	6020	Zinc	7440666	101		12	4	ug/L
RN3MW001	6850	Perchlorate	14797730	ND		0.5	0.082	ug/L
RN3MW001	7470A	Mercury	7439976	ND		0.0003	0.00011	mg/L
RN3MW001	8330B	1,3,5-Trinitrobenzene	99354	ND		0.1	0.031	ug/L
RN3MW001	8330B	1,3-Dinitrobenzene	99650	ND		0.15	0.05	ug/L
RN3MW001	8330B	2,4,6-Trinitrotoluene	118967	ND		0.15	0.024	ug/L
RN3MW001	8330B	2,4-Dinitrotoluene	121142	ND		0.15	0.05	ug/L
RN3MW001	8330B	2,6-Dinitrotoluene	606202	ND		0.15	0.05	ug/L
RN3MW001	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.3	0.1	ug/L
RN3MW001	8330B	2-Nitrotoluene	88722	ND		0.15	0.062	ug/L
RN3MW001	8330B	3-Nitrotoluene	99081	ND		0.5	0.072	ug/L
RN3MW001	8330B	4-Amino-2,6-dinitrotoluene	19406510	ND		0.15	0.022	ug/L
RN3MW001	8330B	4-Nitrotoluene	99990	ND		1	0.072	ug/L
RN3MW001	8330B	HMX	2691410	ND		0.15	0.027	ug/L
RN3MW001	8330B	Nitrobenzene	98953	ND		0.15	0.05	ug/L
RN3MW001	8330B	Nitroglycerin	55630	ND		1	0.15	ug/L
RN3MW001	8330B	RDX	121824	ND		0.25	0.065	ug/L
RN3MW001	8330B	Tetryl	479458	ND		0.15	0.05	ug/L
RN3MW002	6020	Antimony	7440360	ND		6	2	ug/L
RN3MW002	6020	Arsenic	7440382	11.9		3	1	ug/L
RN3MW002	6020	Barium	7440393	105		1.5	0.5	ug/L
RN3MW002	6020	Boron	7440428	42.7	B	50	15	ug/L
RN3MW002	6020	Cadmium	7440439	0.58	B	1.5	0.5	ug/L
RN3MW002	6020	Chromium	7440473	11.9		5	1.5	ug/L
RN3MW002	6020	Copper	7440508	8.6		3	1	ug/L
RN3MW002	6020	Lead	7439921	4.6		2.5	0.6	ug/L
RN3MW002	6020	Nickel	7440020	9.4		3	1	ug/L
RN3MW002	6020	Selenium	7782492	1.5	B	3	1	ug/L
RN3MW002	6020	Silver	7440224	ND		1	0.3	ug/L
RN3MW002	6020	Strontium	7440246	174		6	2	ug/L
RN3MW002	6020	Zinc	7440666	62.2		12	4	ug/L
RN3MW002	6850	Perchlorate	14797730	ND		0.5	0.082	ug/L
RN3MW002	7470A	Mercury	7439976	0.00015	B	0.0003	0.00011	mg/L
RN3MW002	8330B	1,3,5-Trinitrobenzene	99354	ND		0.097	0.03	ug/L
RN3MW002	8330B	1,3-Dinitrobenzene	99650	ND		0.15	0.048	ug/L

Table D-2. Groundwater Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MW002	8330B	2,4,6-Trinitrotoluene	118967	ND		0.15	0.023	ug/L
RN3MW002	8330B	2,4-Dinitrotoluene	121142	ND		0.15	0.048	ug/L
RN3MW002	8330B	2,6-Dinitrotoluene	606202	ND		0.15	0.048	ug/L
RN3MW002	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.29	0.097	ug/L
RN3MW002	8330B	2-Nitrotoluene	88722	ND		0.15	0.06	ug/L
RN3MW002	8330B	3-Nitrotoluene	99081	ND		0.48	0.07	ug/L
RN3MW002	8330B	4-Amino-2,6-dinitrotoluene	19406510	ND		0.15	0.021	ug/L
RN3MW002	8330B	4-Nitrotoluene	99990	ND		0.97	0.07	ug/L
RN3MW002	8330B	HMX	2691410	ND		0.15	0.026	ug/L
RN3MW002	8330B	Nitrobenzene	98953	ND		0.15	0.048	ug/L
RN3MW002	8330B	Nitroglycerin	55630	ND		0.97	0.15	ug/L
RN3MW002	8330B	RDX	121824	ND		0.24	0.063	ug/L
RN3MW002	8330B	Tetryl	479458	ND		0.15	0.048	ug/L
RN3MW003	6020	Antimony	7440360	ND		6	2	ug/L
RN3MW003	6020	Arsenic	7440382	9.6		3	1	ug/L
RN3MW003	6020	Barium	7440393	148		1.5	0.5	ug/L
RN3MW003	6020	Boron	7440428	99		50	15	ug/L
RN3MW003	6020	Cadmium	7440439	1.7		1.5	0.5	ug/L
RN3MW003	6020	Chromium	7440473	21.3		5	1.5	ug/L
RN3MW003	6020	Copper	7440508	20.7		3	1	ug/L
RN3MW003	6020	Lead	7439921	14		2.5	0.6	ug/L
RN3MW003	6020	Nickel	7440020	14.8		3	1	ug/L
RN3MW003	6020	Selenium	7782492	1.6	B	3	1	ug/L
RN3MW003	6020	Silver	7440224	ND		1	0.3	ug/L
RN3MW003	6020	Strontium	7440246	192		6	2	ug/L
RN3MW003	6020	Zinc	7440666	55.7		12	4	ug/L
RN3MW003	6850	Perchlorate	14797730	ND		0.5	0.082	ug/L
RN3MW003	7470A	Mercury	7439976	0.00027	B	0.0003	0.00011	mg/L
RN3MW003	8330B	1,3,5-Trinitrobenzene	99354	ND		0.1	0.031	ug/L
RN3MW003	8330B	1,3-Dinitrobenzene	99650	ND		0.15	0.05	ug/L
RN3MW003	8330B	2,4,6-Trinitrotoluene	118967	ND		0.15	0.024	ug/L
RN3MW003	8330B	2,4-Dinitrotoluene	121142	ND		0.15	0.05	ug/L
RN3MW003	8330B	2,6-Dinitrotoluene	606202	ND		0.15	0.05	ug/L
RN3MW003	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.3	0.1	ug/L
RN3MW003	8330B	2-Nitrotoluene	88722	ND		0.15	0.062	ug/L
RN3MW003	8330B	3-Nitrotoluene	99081	ND		0.5	0.072	ug/L
RN3MW003	8330B	4-Amino-2,6-dinitrotoluene	19406510	ND		0.15	0.022	ug/L
RN3MW003	8330B	4-Nitrotoluene	99990	ND		1	0.072	ug/L
RN3MW003	8330B	HMX	2691410	ND		0.15	0.027	ug/L
RN3MW003	8330B	Nitrobenzene	98953	ND		0.15	0.05	ug/L
RN3MW003	8330B	Nitroglycerin	55630	ND		1	0.15	ug/L
RN3MW003	8330B	RDX	121824	ND		0.25	0.065	ug/L
RN3MW003	8330B	Tetryl	479458	ND		0.15	0.05	ug/L
RN3MW004	6020	Antimony	7440360	ND		6	2	ug/L
RN3MW004	6020	Arsenic	7440382	3.6		3	1	ug/L
RN3MW004	6020	Barium	7440393	147		1.5	0.5	ug/L
RN3MW004	6020	Boron	7440428	59.3		50	15	ug/L

Table D-2. Groundwater Sample Analytical Results[1]

Sample ID	Method	Analyte	CAS	Result	Footnotes	RL	MDL	Units
RN3MW004	6020	Cadmium	7440439	ND		1.5	0.5	ug/L
RN3MW004	6020	Chromium	7440473	6		5	1.5	ug/L
RN3MW004	6020	Copper	7440508	5.4		3	1	ug/L
RN3MW004	6020	Lead	7439921	2.8		2.5	0.6	ug/L
RN3MW004	6020	Nickel	7440020	44.8		3	1	ug/L
RN3MW004	6020	Selenium	7782492	ND		3	1	ug/L
RN3MW004	6020	Silver	7440224	ND		1	0.3	ug/L
RN3MW004	6020	Strontium	7440246	201		6	2	ug/L
RN3MW004	6020	Zinc	7440666	102		12	4	ug/L
RN3MW004	6850	Perchlorate	14797730	ND		0.5	0.082	ug/L
RN3MW004	7470A	Mercury	7439976	ND		0.0003	0.00011	mg/L
RN3MW004	8330B	1,3,5-Trinitrobenzene	99354	ND		0.099	0.031	ug/L
RN3MW004	8330B	1,3-Dinitrobenzene	99650	ND		0.15	0.05	ug/L
RN3MW004	8330B	2,4,6-Trinitrotoluene	118967	ND		0.15	0.024	ug/L
RN3MW004	8330B	2,4-Dinitrotoluene	121142	ND		0.15	0.05	ug/L
RN3MW004	8330B	2,6-Dinitrotoluene	606202	ND		0.15	0.05	ug/L
RN3MW004	8330B	2-Amino-4,6-dinitrotoluene	35572782	ND		0.3	0.099	ug/L
RN3MW004	8330B	2-Nitrotoluene	88722	ND		0.15	0.061	ug/L
RN3MW004	8330B	3-Nitrotoluene	99081	ND		0.5	0.071	ug/L
RN3MW004	8330B	4-Amino-2,6-dinitrotoluene	19406510	ND		0.15	0.022	ug/L
RN3MW004	8330B	4-Nitrotoluene	99990	ND		0.99	0.071	ug/L
RN3MW004	8330B	HMX	2691410	ND		0.15	0.027	ug/L
RN3MW004	8330B	Nitrobenzene	98953	ND		0.15	0.05	ug/L
RN3MW004	8330B	Nitroglycerin	55630	ND		0.99	0.15	ug/L
RN3MW004	8330B	RDX	121824	ND		0.25	0.064	ug/L
RN3MW004	8330B	Tetryl	479458	ND		0.15	0.05	ug/L

[1] Table includes results for native samples only (no QC results).

B: Estimated result; result is less than reporting limit.