TETRA TECH

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Project No. 112G00373

Mr. Howard Hickey
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201 Decatur Avenue
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Reference: CLEAN Contract No. N62467-04-D-0055
Contract Task Order No. 021

Subject: ***Final*** – Statement of Basis (SB) for Solid Waste Management Unit (SWMU) 3 – Ammunition Burning Grounds (ABG) / Old Jeep Trail (OJT)
Naval Support Activity Crane, Crane, Indiana

Dear Mr. Hickey:

Enclosure is a copy of the subject document. This version incorporates Tom Brent's August 2010 e-mail comments on the draft document. An electronic version (.pdf) of the document has been transmitted via e-mail.

Please contact the undersigned at (412) 921-8308 (email: Ralph.Basinski@tetratech.com) or Valerie Plachy at (412) 921-8389 (email: Valerie.Plachy@tetratech.com) regarding any questions or comments.

Sincerely,

Ralph R. Basinski

Ralph R. Basinski
Task Order Manager

RRB:VJP/clm
Enclosures

cc: Mr. Tom Brent, NSA Crane (letter and enclosures)
Mr. Ralph Basinski, Tetra Tech (letter and enclosures)
Ms. Valerie Plachy, Tetra Tech (letter only)
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United States Environmental Protection Agency Statement of Basis For Corrective Measures At Solid Waste Management Unit #03/10 Ammunition Burning Ground Naval Support Activity Crane Crane, Indiana

Introduction

This Statement of Basis (SB) was prepared to satisfy requirements of the Resource Conservation and Recovery Act (RCRA) corrective measures process, which is designed to identify sites that are known to be, or may be, hazardous to human health or the environment and to propose and implement corrective measures for correcting unacceptable environmental conditions. This introduction describes the site to which this SB applies, the environmental conditions at the site, and the actions that are proposed to ensure future protection of human health and the environment.

Facility Name and Description

This SB applies to the Ammunition Burning Ground (ABG), located in the eastern portion of Naval Support Activity (NSA) Crane along Little Sulfur Creek (LSC). NSA Crane (Figure 1) is located in a rural, sparsely populated region in south-central Indiana, United States of America (USA). Most of NSA Crane is forested, and the surrounding area is wooded or farm land. NSA Crane provides support for equipment, shipboard weapons systems, and ordnances for the United States Navy. In addition, NSA Crane supports the Crane Army Ammunitions Activity (CAAA) with production, renovation, storage, shipment, demilitarization, and disposal of conventional ammunitions.

The ABG is listed as Solid Waste Management Unit (SWMU) #03/10 in NSA Crane's RCRA permit (IN, 2007). Historically, SWMU #03/10 has been referred to as the ABG or SWMU 3 (this latter term is used throughout this SB). Located within the ABG are the Main Treatment Area (MTA), Old Jeep Trail (OJT), and surface water including Springs A, A', B, and C and LSC (Figure 2).

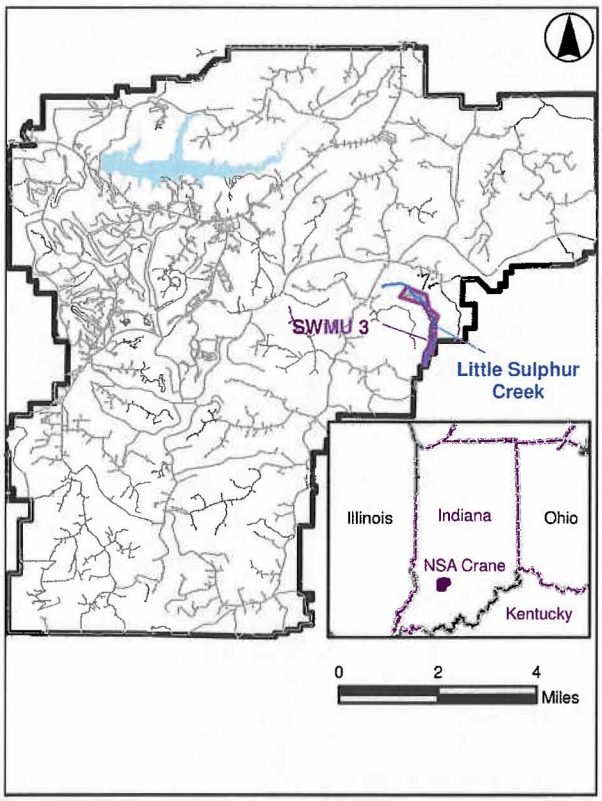

Figure 1: NSA Crane and SWMU 3 (Ammunition Burning Grounds)

Purpose of Document

This SB:

- Is a mechanism and basis for gathering public comments on the proposed corrective measures to correct unacceptable environmental conditions at the MTA, OJT, and LSC portions of SWMU 3 as documented in the Corrective Measures Proposal (CMP) (Tt, 2010).
- Describes contaminants specific to the MTA, OJT, and LSC portions of SWMU 3.
- Summarizes information that can be found in greater detail in the Initial Assessment Study (IAS) of Naval Weapons Support Center report (NEESA, 1983), Current Contamination Conditions Risk Assessment (CCCRA) for SWMU 3 (ABG), 7(Old Rifle Range, ORR), and SWMU 6 (Demolition Range, DR) (B&RE, 1997), final RCRA Facility Investigation, Phase III Report (USACE, 1994), Phase III Study, Part 2 (USACE, 1998), Corrective Measures Study Field Investigation report (Tt, 2004), Human Health Risk Screening Evaluation for SWMU 3, (Tt, 2005a), Annual Groundwater Monitoring Reporting reports for ABG, ORR, and DR calendar years 2000 through 2003 (SAIC, 2002a, 2002b, 2003a, and 2003b), RCRA Facility Investigation for SWMU 3 (Tt, 2005b), CMP (Tt, 2006b), and other documents contained in the Administrative Record for NSA Crane.

- Provides information on how the public can be involved in the corrective measure selection process.

Importance of Public Comment

The "public" includes the general public, the owner or operator of NSA Crane, and other parties (e.g., public interest groups and regulatory agencies). Because of a slight potential for exposure of the public to SWMU 3 contaminants, the public may have an interest in understanding the environmental conditions at SWMU 3 and the reasons why the proposed corrective measures are needed to protect human health and the environment.

The Navy and United States Environmental Protection Agency (EPA) may modify the proposed corrective measures or select other corrective measures based on new information or public comments. Therefore, the public is encouraged to review and comment on all proposed corrective measures described in this document.

Facility Background

Description of NSA Crane SWMU 3

Figure 2 shows the layout of SWMU 3 and relative locations of the MTA, OJT, and LSC. Each of these three areas is described in more detail below.

Main Treatment Area

The MTA, an active RCRA-permitted hazardous waste treatment facility, is approximately 50 acres located in the eastern part of the NSA Crane (Figure 3. The MTA is used extensively to destroy, through open burning (OB), waste military munitions, and waste contaminated with or containing explosives.

As an active RCRA permitted hazardous waste treatment facility, the MTA is required to take corrective measures to mitigate potential risks to human health or the environment from any groundwater contamination resulting from treatment operations. Additionally, all RCRA-permitted facilities are subject to RCRA closure requirements; therefore, at the end of the MTA's operating life, a clean closure or closure as a RCRA landfill is required under 40 Code of Federal Regulations (CFR) 264, Subpart F. MTA operations are expected to continue until at least the year 2050.

Prior to construction and use of clay-lined steel pans within the MTA for OB/OD operations, explosives, propellants, and wastes, including chlorinate organic solvents, contaminated with explosives and propellants were spread and ignited on unlined pads or in unlined pits.

Three MTA surface impoundments, that were initially unlined and later lined with plastic, were used to remove liquids from otherwise combustible sludges generated during blending and loading of munitions, have been partially removed and will be closed when SMWU 3 undergoes RCRA closure. Removal of two underground storage tanks (USTs) formerly used to store impoundment runoff and leachate occurred in 1994. Removal of a former stockpile of burn residue (also known as the "ash pile") occurred between July 1986 and February 1987 pursuant to a RCRA closure plan.

Thermal treatment of ammunition components (such as small impact-sensitive primers) and pyrotechnic munitions formerly occurred in the now decommissioned "primer burn box." The operations that previously occurred in a primer burn box now occur in primer pits and an incendiary cage.

All current MTA treatment operations take place in containment facilities; no treatment operations have taken place on the ground surface since the 1980s.

The following materials, which are generated at various locations throughout NSA Crane, are currently treated by OB at the MTA:

- Desensitized waste scrap pyrotechnics
- Desensitized scrap black powder
- Red phosphorus and No. 2 Fuel Oil waste mixture
- Pyrotechnic devices and components
- Suspect explosives-contaminated materials
- Select explosives and pyrotechnic-contaminated sludges from production operations
- Phosphorus-contaminated sludge

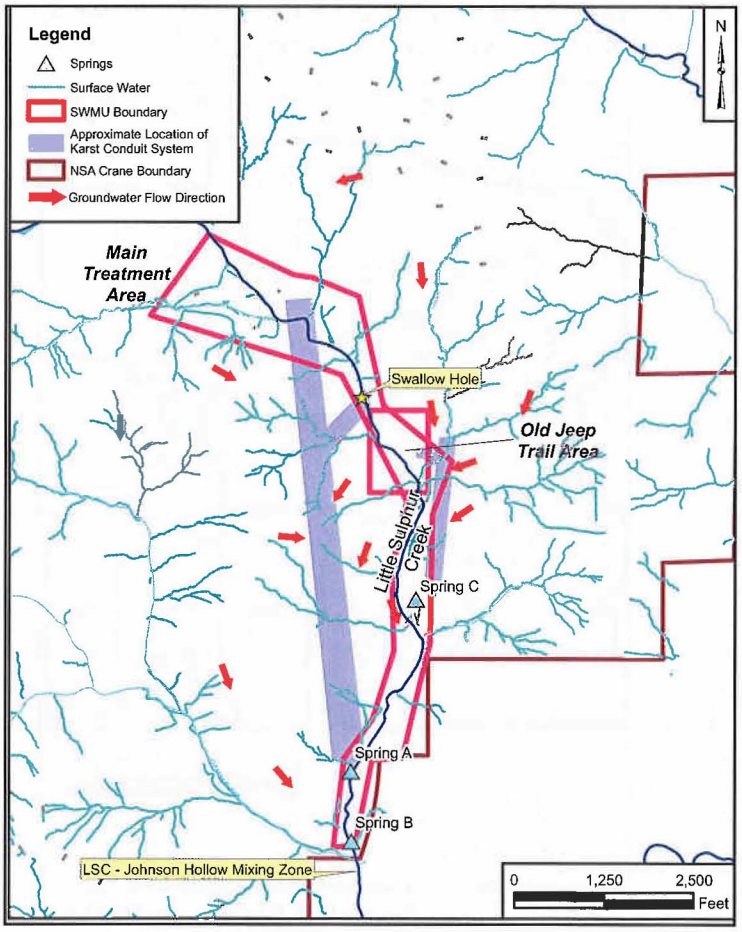

Figure 2: SWMU 3 Layout

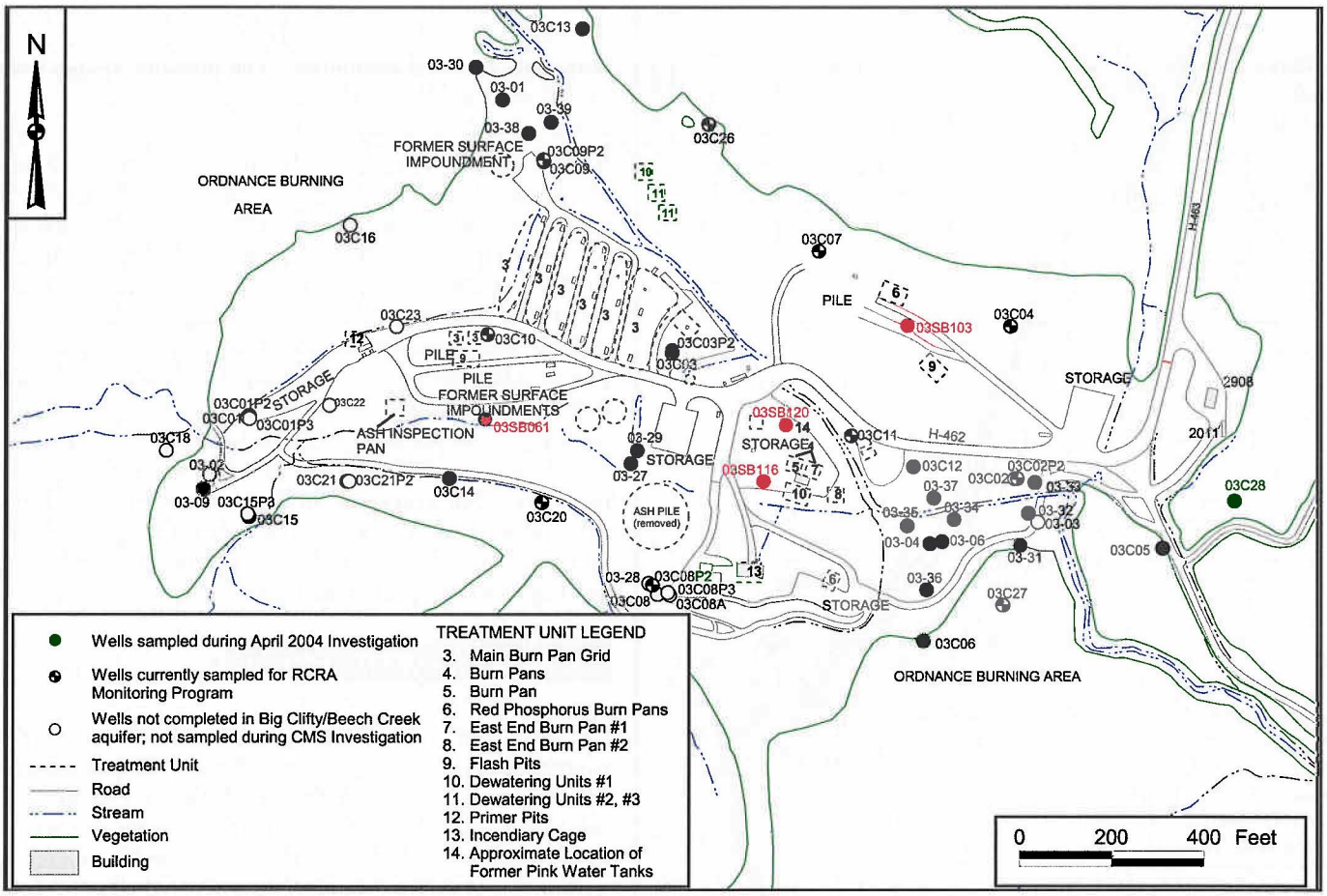

Figure 3: Main Treatment Area Detail

Old Jeep Trail

The OJT, an inactive area currently used as a vehicle route and inert storage area is adjacent to and downstream (in the LSC valley) of the MTA. Figure 4 shows the location of the OJT on the south-southeast side of the MTA along with OJT groundwater monitoring wells.

Materials were treated in two separate regions of the OJT: the burn area and the burn pit, which was a trench or natural depression. The exact sizes, shapes, and locations of the burn pit and the burn area are unknown; Figure 4 shows their approximate sizes and locations.

In the Burn Area of OJT, empty bomb casings were burned using black powder to remove any explosive residue. In the Burn Pit of OJT explosives contaminated materials including small munition items and components, solvent-contaminated rags, and packaging material were burned using wood dunnage in the pit. The ash was periodically removed and taken to the MTA for disposal.

At the burn area, empty bomb casings (i.e., from the bulk of explosives had been removed) were filled with initiating powder, tilted on end toward a hillside east of the OJT, and flashed to complete the demilitarization process. Some munitions are thought to have been lashed to a horizontally positioned utility pole (that may have been creosote treated) prior to flashing.

Little Sulphur Creek (LSC)

LSC is a small stream whose headwaters originate in channels on the north, west, and south of SWMU 3. These ephemeral channels run through SWMU 3 and converge on the eastern side of the SWMU. From the MTA, a single channel meanders south-southeastward to the OJT area and continues southward to the installation boundary (Figure 2).

LSC is approximately 4.6 miles long from its northernmost headwaters to its intersection with Sulphur Creek south of NSA Crane approximately 2 miles south of where LSC leaves NSA Crane. Several intermittent tributaries discharge into LSC from both sides of the stream, including the Johnson Hollow tributary, which intersects with LSC near the NSA Crane boundary.

As previously noted, groundwater could become contaminated via leaching of operations-related chemicals, if present, from soils. Dye tracer studies have shown that the groundwater from the MTA and OJT discharges into LSC. Groundwater in the Big Clifty Sandstone/Beech Creek (BC/BC) Limestone aquifer beneath the MTA flows southeastward and into a karst conduit system and is rapidly conveyed southeastward and discharges into LSC at Springs A and A' and probably Spring B (Figure 2). Groundwater within the OJT area flows east-southeastward within collapse breccia and discharges into LSC at Spring C. The LSC channel is usually dry south (downstream) of the MTA and north (upstream) of Spring C; LSC first becomes a perennial stream at Spring C. Consequently, contaminated groundwater constitutes most of the water in LSC when it exits Crane property, except when diluted by storm water.

Sulphur Creek flows southward from its confluence with LSC and empties into Indian Creek. Indian Creek drains into the East Fork of the White River and then flows southwestward into the Wabash

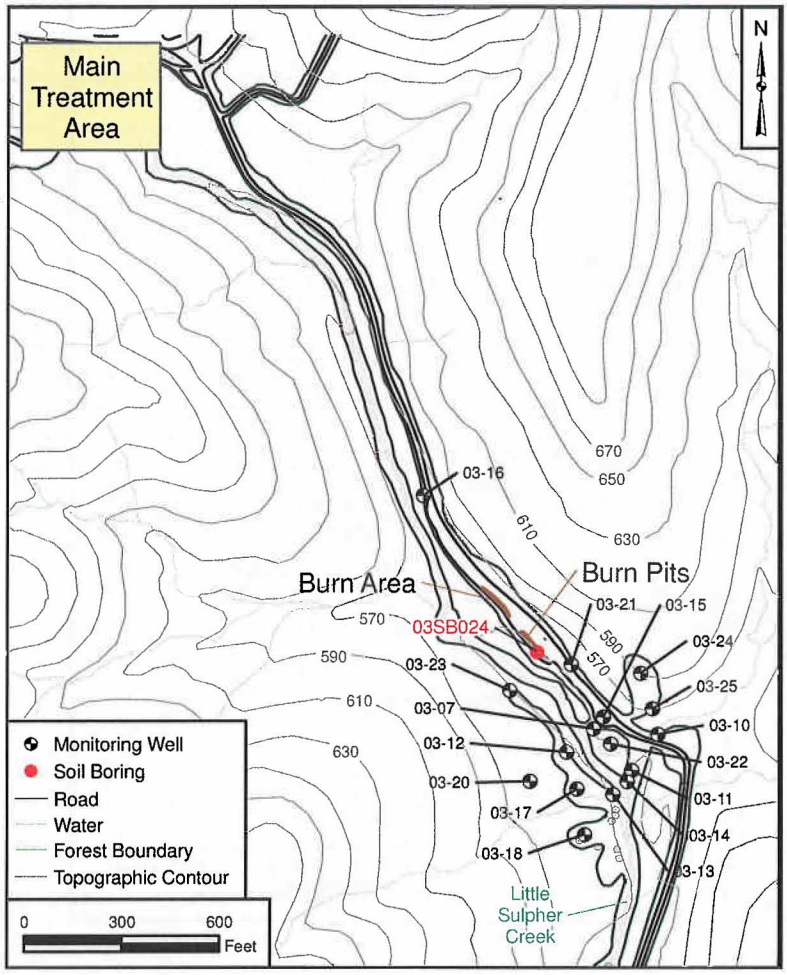

Figure 4: Old Jeep Trail

River. Based on information from the United States Geological Survey (USGS), the closest public drinking water intake is the Shoals, Indiana drinking water intake, which is located on the East Fork of the White River (Figure 5).

Investigations Conducted at SMWU 3

Various investigations and data evaluations were conducted at SWMU 3 from the early 1980s to 2010 as part of multi- and single-SWMU investigations. Documents produced during these investigations are listed in bullet three of the "Purpose of Document" section on page 1 of this SB. The early investigations involved document reviews and interviews with NSA Crane personnel, and limited sampling. More intensive sampling and analysis of soil, sediment, groundwater, and surface water was conducted during the RFI and subsequent investigations. Samples were collected from numerous locations throughout SMWU 3 in the MTA, OJT, and LSC and were analyzed for a wide range of organic and inorganic chemicals to assess the extent of contamination and the level of risks that could be incurred from exposure of humans and ecological receptors to contaminated environmental media.

Multiple inorganic and organic contaminants related to SMWU 3 operations were detected at potentially unacceptable concentrations in various locations. For example, the RFI Report concluded that several wells within the MTA were contaminated with chlorinated volatile organic compounds (VOCs), an explosive [hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)], barium, and other less frequently detected chemicals. The previous studies helped to delineate the extent of contamination at the MTA, OJT, and LSC and to estimate risks for human and ecological receptors exposed or potentially exposed to the contamination in various environmental media. Additional risk evaluations were conducted subsequent to the RFI and are documented in the CMP (Tt, 2010). The CMP identifies the MTA as an active RCRA-permitted hazardous waste treatment facility and that this unit is subject to RCRA closure requirements. The MTA will be clean closed or closed as a RCRA landfill at the end of its active life; therefore, evaluation of human health risks was limited to current risks for site workers, construction workers, and trespassers potentially exposed to contaminants. Access to and use of the MTA is prevented for other potential human receptors. An evaluation of future human health risk was deferred until the MTA is closed as a RCRA unit. Current risks for the MTA, and current and future potential risks for the OJT and LSC are described in the next section.

Summary of SWMU 3 Risks

The two major types of human health risks evaluated during environmental investigations include cancer risk and non-cancer risk. These risks were evaluated for surface and subsurface soil, sediment, groundwater, and surface water at SWMU 3. In addition, ecological risks were evaluated for surface soil, sediment, and surface water to determine whether ecological receptors would be adversely affected by contaminants in these media. Risks to ecological receptors are not evaluated for subsurface soil because ecological receptors are not exposed to

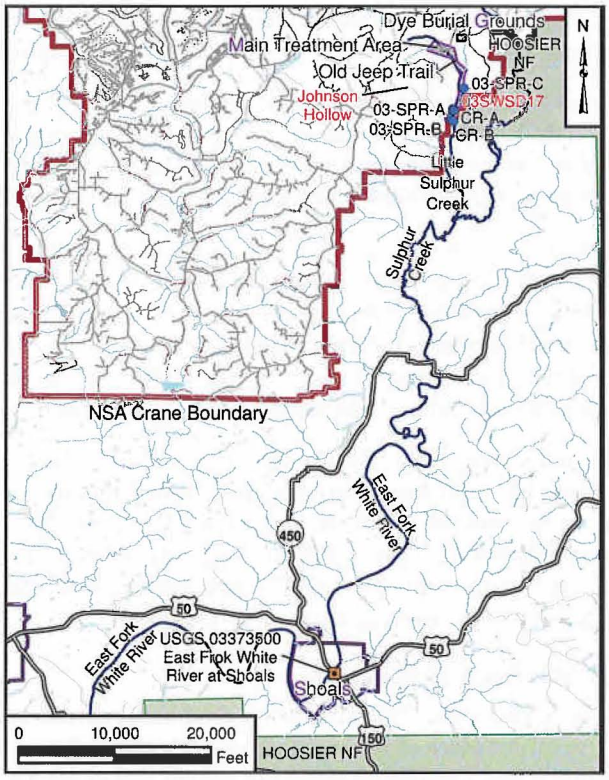

Figure 5: LSC Layout

this medium.

For cancer-causing chemicals, human health risk is estimated as a probability. For example, exposure to a certain chemical (or chemicals) may present a 1 in 10,000 chance (expressed as $1x10^{-4}$) of developing cancer over an estimated lifetime of 70 years, in addition to the normal chance of developing cancer. The EPA evaluates acceptable carcinogenic risk based on a range of probability of one additional person in 1,000,000 (1×10^{-6}) to one additional person in 10,000 (1×10^{-4}) developing cancer over an estimated lifetime of 70 years. Some chemicals may produce adverse effects in humans other than cancer (i.e., non-cancer effects). For those chemicals, the dose to which someone may be exposed is estimated and compared to a reference dose developed by EPA scientists. The reference dose represents an estimate of the amount of a chemical to which someone could be exposed over a lifetime without experiencing adverse effects. The estimated dose of the chemical is divided by the reference dose and if this value (i.e., the Hazard Index, HI) is greater than 1, there is a concern that adverse effects are possible. If multiple non-carcinogenic contaminants contribute to the total risk, a similar ratio is computed for each chemical and the ratios are added together. If this sum of chemical-specific ratios exceeds 1.0, there may be a concern that adverse effects are possible. A similar approach is used for evaluating ecological risks.

Several organic and inorganic chemicals were identified during the RFI and the CMP as chemicals of potential concern (COPCs) at SWMU 3. COPCs are chemicals that require further evaluation to determine whether they present an unacceptable level of risks to receptors exposed to COPC-contaminated environmental media. Current and future human health and ecological risks were evaluated for the OJT and LSC. For the MTA, only current risks were evaluated for reasons explained in the following text. Estimated levels of risk for each of these three areas within SWMU 3 (Tt, 2010) are summarized below.

MTA:

Human Health Risks

Current military/industrial land use limits human exposure to soil at the MTA because access to the MTA is restricted. Future risk may involve exposure to groundwater, surface water, and sediment in addition to surface and subsurface soil, but future risks are likely to be significantly different from current risks because of natural attenuation of contaminant concentrations and reconfiguration of the site over time. Therefore, MTA risks were evaluated only for current potential receptors (site workers, construction workers, and trespassers) and for the most sensitive potential future receptor (hypothetical future child residents). Risks incurred by hypothetical future receptors will be estimated in risk assessments conducted in support of the eventual RCRA closure of the MTA. Risks associated with receptor exposure to groundwater, surface water, or sediments at the MTA were not evaluated because current receptors are not exposed to these media. The results of the risk assessment are as follows:

- Cancer risks for exposure to explosives, chlorinated organic chemicals, and metals in surface and subsurface soils do not exceed the EPA target cancer risk of $1x10^{-4}$ for site workers, construction workers, or trespassers.
- Non-cancer risk estimates for exposure to explosives, chlorinated organic chemicals, and metals in surface soil for the site worker and trespasser are less than the EPA HI threshold of 1. These receptors are not exposed to subsurface soil and non-cancer risks are acceptable for these receptors.
- Risk for exposure to lead in soils is unacceptable for construction workers in the southeastern quadrant of the MTA near soil borings 03SB116 and 03SB120 (colored red on Figure 3). The mean lead concentration (681 milligrams per kilogram (mg/kg)) in this area exceeds the calculated maximum allowed site-specific screening value of 550 mg/kg for the construction worker.

Although not specifically identified above, it is recognized that TCE, RDX, and TNT concentrations in groundwater could change. An increase in concentrations could present a human health concern because MTA groundwater discharges through the karst system into the LSC at Spring C and this surface water flows to the Shoals drinking water intake. Potential chemical breakdown products of these contaminants and related chemicals are also a concern for surface water ingestion downstream of the point at which LSC exists the Crane boundary.

Ecological Risks

No unacceptable ecological risks exist at the MTA based on past investigations.

OJT AND LSC

Human Health Risks

Groundwater underlying the OJT is contaminated with RDX and TCE and this contamination is distributed among overburden soil, bedrock, and the karst geologic system (Figure 2). However, under current industrial/military land use, no significant potential human health risks are expected from exposure to soil, sediment, surface water, or groundwater at the OJT.

Under future land use, the results of risk assessments for the OJT and LSC were as follows:

- Risk for a future on-site child resident exposed to surface soils would be unacceptable, primarily as a result of high lead concentrations at a single surface soil sampling location (03SB024 shown in red on Figure 4). The lead-contaminated soil at this location is scheduled to be removed as part of a Voluntary Interim Measure (VIM); therefore, this risk will be eliminated with the implementation of the VIM.
- Non-cancer risks exceeding an HI of 1.0 and/or Incremental Lifetime Cancer Risks (ILCRs) exceeding $1x10^{-4}$ were identified for future on-site child and adult residents using OJT surface water as a potable water source, mainly as a result of samples collected from location 03SWSD17 (Figure 5). This location is downstream of Spring A, which is a direct conduit for contaminated groundwater from the MTA. The major contributors to the elevated risks for surface water are

2,4,6-trinitrotoluene (TNT), and TNT degradation products 2-amino-4,6-dinitrotoluene (2AmDNT) and 4-amino-2,6-dinitrotoluene (4AmDNT) and RDX.

- Non-cancer risks exceeding an HI of 1.0 and/or ILCRs exceeding $1x10^{-4}$ were estimated for occupational workers, child recreational users, and on-site child and adult residents using groundwater as a potable water source. 1,1,2,2-Tetrachloroethane (PCA), trichloroethylene (TCE), and 2AmDNT are the major contributors to the elevated risks.

No unacceptable risks were identified for LSC sediments or surface water for any current or future human receptors. However, there is a concern that contaminated LSC surface water, which is contaminated in part from MTA groundwater flowing to LSC through the karst system, could migrate to the Shoals drinking water intake located downstream of SWMU 3 and thus pose an unacceptable human health risk for those consuming that water. Consequently, concentrations were computed that are protective of human health when applied at the downstream limit of the mixing zone of LSC and Johnson Hollow.

Ecological Risks

No unacceptable ecological risks were identified for the OJT or LSC based on past investigations.

Scope of Corrective Measure

Unacceptable levels of risk require corrective measures. The corrective measure objectives established in the CMP for contaminated environmental media and the additional considerations for contamination in LSC water migrating to the Shoals drinking water intake are presented below by ABG area and environmental medium within each area.

MTA

Soil

- Prevent human exposure (ingestion and dermal contact) to contaminated soil with lead concentrations greater than EPA-established remediation objectives.
- Comply with chemical-specific, location-specific, and action-specific criteria.
- ***Groundwater***
- Prevent human exposure (ingestion and dermal contact) to groundwater with contaminant concentrations greater than EPA-established remediation objectives. Contaminants of concern COCs) are TCE, RDX, and TNT.
- Monitoring to demonstrate compliance with chemical-specific, location-specific, and action-specific criteria.

OJT

Soil

- Prevent human exposure (ingestion and dermal contact) to contaminated soil with lead concentrations greater than EPA-established remediation objectives.
- Monitoring to demonstrate compliance with chemical-specific, location-specific, and action-specific criteria.

Groundwater

- Prevent human exposure (ingestion and dermal contact) to groundwater with contaminant concentrations greater than EPA-established remediation objectives.
- Monitoring to demonstrate compliance with chemical-specific, location-specific, and action-specific criteria.

LSC

Surface Water

- Prevent human exposure (ingestion and dermal contact) to surface water with contaminant concentrations greater than EPA-established remediation objectives.
- Monitoring to demonstrate compliance with chemical-specific, location-specific, and action-specific criteria. This includes criteria applicable to downstream limit of the LSC-Johnson Hollow mixing zone.

These objectives may be achievable through various mechanisms such as land use controls (LUCs) that are designed to prevent exposure, and monitoring to verify that exposures are not unacceptable. Based on these objectives, media cleanup standards (MCSs) for chemicals of concern (COCs) in these environmental media are presented in Table 1 for each of the SWMU 3 areas and the downstream limit of the LSC-Johnson Hollow mixing zone. These concentrations represent upper acceptable limits for two groups of chemicals. One group of chemicals is the COCs identified as contributing significantly to unacceptable levels of risk and the other group represents chemicals that could present an unacceptable level of risk if they enter the Shoals drinking water intake at unacceptable levels. When concentrations less than or equal to the MCSs are achieved, the remediation process will be considered complete.

Corrective Measures Alternatives Evaluation Process

The evaluation of corrective measure alternatives is documented in the CMP (Tt, 2010). The range of possible actions considered was no action to limited action. The evaluations are summarized below:

MTA

Soil

Alternative MTA-S1: No Action. Alternative MTA-S1 would maintain the site as is and was evaluated as a baseline for comparison to the other alternatives. This alternative, would involve no action and would be readily implementable but would not prevent unacceptable exposure. This alternative would not be reliable and effective in the long term and would not necessarily attain **MCSs**. A localized area of lead contamination would remain near soil borings 03SB116 and 03SB120 (Figure 3), there would be no controls to prevent changes in land use or construction activities, and no monitoring would be conducted to warn of potential contamination migration. There would be no cost associated with implementing this alternative.

Alternative MTA-S2: Limited Action - Land Use Controls. Alternative MTA-S2 would use LUCs to prevent current and future receptor exposure to contaminated soil as long as lead concentrations remain unacceptable. This alternative would be reliable and effective in the long term for protection of human receptors from lead concentrations in soil that exceed MCSs. LUCs would reliably and effectively prevent potential current and future exposure to contaminated soils until RCRA closure and would ensure that LUCs are not modified without EPA approval. LUCs would be readily implementable because the MTA is completely contained within NSA Crane, and the LUCs are similar to those implemented at other environmental sites within NSA Crane. Additional risk evaluations would be required for the MTA in conjunction with RCRA closure.

Groundwater

Alternative MTA-GW1: No Action. Alternative MTA-GW1 would maintain the site as is and was evaluated as a baseline for comparison to other corrective measures. This alternative would not be effective and reliable in the long term. No monitoring or restrictions would be in place to prevent exposure to contaminated groundwater, but this alternative, would be readily implementable. TCE, TNT, and RDX concentrations in groundwater are expected to decrease as a result of natural attenuation. The effectiveness of this attenuation process and attainment of MCSs, however, would not be verified through monitoring. A potential threat to human health and the environment would persist because there would be no controls to prevent future groundwater use from the BC/BC aquifer and no monitoring to warn of potential contamination migration.

Alternative MTA-GW2: Limited Action - Land Use Controls And Long-Term Monitoring. This alternative would prevent current and future receptor usage of, and exposure to, contaminated groundwater in the short and long terms. Short-term human health risks under this alternative would be minimal. Monitoring would also protect human health and the environment in the long term by verifying the progress of groundwater natural attenuation and by warning of potential contamination migration. Removal or control of the source of explosives contamination in soil is not part of this alternative because no significant sources of MTA soil TNT and RDX contamination have been identified. Although localized TCE soil contamination has been identified within the MTA in subsurface soils at 03SB061 and 03SB103 (See Figure 3), the distribution of TCE between bedrock and overburden is unknown. Remediation of a source of groundwater TCE contamination by removing TCE contaminated soil would not reduce TCE groundwater exposure risks to acceptable levels and would not eliminate TCE contamination in bedrock because the bedrock cannot be remediated. Additionally, remediation in the active RCRA-permitted MTA would be impractical and could present safety hazards to the remediation workers in this active RCRA unit. This alternative involves limited action and is readily implementable within approximately 12 months, in part because the MTA is completely contained within NSA Crane. The time required to attain MCSs under this alternative is unknown. This alternative, however, is similar to other corrective measures implemented at NSA Crane and this similarity would facilitate its implementation.

OJT

Soil

Alternative OJT-S1: No Action. Alternative OJT-S1 would maintain the site as is and was evaluated as a baseline for comparison to other alternatives. Alternative OJT-S1 would not ensure that land use remains military/industrial (e.g., would not prevent future use of the land for residential development), which could result in unacceptable human health risks. Although current human health risks are acceptable, this alternative would not protect human health in the long term because it would not prevent exposure of sensitive residential receptors to contaminated soil. This alternative would not attain MCSs protective of future hypothetical receptors. This alternative would be readily implementable because it requires no action, and there is no cost associated with implementing this alternative.

Alternative OJT-S2: Limited Action - Land Use Controls. Alternative OJT-S2 would require the implementation of LUCs to prevent unacceptable exposures. This action would protect human health by preventing residential land use and would prevent potential current and future exposure of residents to contaminated soil. Implementation of this alternative would not reduce contaminant toxicity, mobility, or volume but would be reliable and effective in the short and long terms by preventing unacceptable levels of exposure to contaminated soil. This alternative would be readily implementable because the OJT is completely contained within the NSA boundary, and this alternative would involve LUCs similar to those implemented at other environmental sites within NSA Crane.

Development of this alternative was based on the assumption that a voluntary interim measure (VIM) would be conducted to remove lead-contaminated soil from the area around soil boring 03SB024.

Groundwater

Alternative OJT-GW1: No Action. Alternative OJT-GW1 would maintain the site as is was evaluated as a baseline for comparison to other corrective measures. Alternative OJT-GW1 would not prevent future use of the BC/BC aquifer as a drinking water source, which could result in unacceptable future human health risks. Although there is no current evidence that migration of groundwater contaminants to surface water downstream of the MTA ad OJT has resulted in unacceptable human health or ecological risks, continued

TABLE 1
HUMAN HEALTH MEDIA CLEANUP STANDARDS

Chemical	Media Cleanup Standards		
	Surface Soil (mg/kg)	Groundwater (µg/L)	Surface Water (µg/L)
Main Treatment Area			
Construction Worker			
Lead[1] (implemented at RCRA unit closure)	540	N/A	N/A
Old Jeep Trail			
Future Hypothetical Resident			
Lead	400	N/A	N/A
SWMU Occupational Worker			
Trichloroethylene (TCE)	N/A	NA	21
Little Sulphur Creek			
Future Life-Long Resident			
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	4.4	2 [2]	2 [2]
TCE	N/A	5 [3]	5 [3]
2,4,6-Trinitrotoluene (TNT)	N/A	2 [2]	2 [2]
Recreational User			
1,1,1,2-Tetrachloroethane (PCA)	N/A	N/A	0.52 [4]
1,1-Dichloroethene (1,1-DCE)	N/A	N/A	7 [3]
1,3,5-Trinitrobenzene (1,3,5-TNB)	N/A	N/A	11 [2]
1,3-Dinitrobenzene (1,3-DNB)	N/A	N/A	1 [2]
2-Nitrotoluene (2-NT)	N/A	N/A	71 [2]
3-Nitrotoluene (3-NT)	N/A	N/A	42 [2]
4-Nitrotoluene (4-NT)	N/A	N/A	46 [2]
TNT	N/A	N/A	2 [2]
2,4-Diamino-6-nitrotoluene (2,4-DA-6-NT)	N/A	N/A	73 [2]
2,4-Dinitrotoluene (2,4-DNT)	N/A	N/A	1 [2]
2,6-Diamino-4-Nitrotoluene (2,6-DA-4-NT)	N/A	N/A	73 [2]
2,6-Dinitrotoluene (2,6-DNT)	N/A	N/A	5 [2]
2-Amino-4,6-dinitrotoluene (2AmDNT)	N/A	N/A	18 [2]
2,2'-6,6'-Tetranitro-4,4'-azoxytoluene (4,4-TN-AZOXY)	N/A	N/A	18 [2]
3,5-Dinitroaniline (3,5-DNA)	N/A	N/A	70 [2]
4-Amino-2,6-dinitrotoluene (4AmDNT)	N/A	N/A	11 [2]
cis-1,2-Dichloroethene (cis-1,2-DCE)	N/A	N/A	70 [2]
Hexahydro-1,3,5-Dinitroso-1,3,5-triazine (DNX)	N/A	N/A	79 [2]
Hexahydro-1,3,5-mononitroso-1,3,5-triazine (MNX)	N/A	N/A	79 [2]
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	N/A	N/A	2 [2]
Hexahydro-1,3,5-trinitroso-1,3,5-triazine (TNX)	N/A	N/A	79 [2]
Nitrobenzene (1,2-NB/1,3-NB)	N/A	N/A	17 [2]
n-Nitrosodimethylamine (Dimethylnitrosamine) (DMNA)	N/A	N/A	0.0069 [2]
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	N/A	N/A	220 [2]

TABLE 1
HUMAN HEALTH MEDIA CLEANUP STANDARDS

Chemical	Media Cleanup Standards		
	Surface Soil (mg/kg)	Groundwater (µg/L)	Surface Water (µg/L)
LSC (continued)			
Perchloroethylene (PCE)	N/A	N/A	100 (3)
2,4,6-Trinitrophenyl-N-methylnitramine (Tetryl)	N/A	N/A	360 (2)
trans-1,2-Dichloroethene (trans-1,2-DCE)	N/A	N/A	100 (3)
TCE	N/A	N/A	5 (3)
Vinyl chloride (VC)	N/A	N/A	2 (3)
PUBLIC WATER SUPPLY BACK-CALCULATED TO MIXING ZONE CONCENTRATION			
1,1-Dichloroethene (1,1-DCE)	N/A	N/A	248,973 (5)
1,3,5-Trinitrobenzene (1,3,5-TNB)	N/A	N/A	390,310 (5)
1,3-Dinitrobenzene (1,3-DNB)	N/A	N/A	35,483 (5)
2-Nitrotoluene (2-NT)	N/A	N/A	2,524,596 (5)
3-Nitrotoluene (3-NT)	N/A	N/A	1,493,423 (2)
4-Nitrotoluene (4-NT)	N/A	N/A	1,635,654 (2)
Teryl	N/A	N/A	142,279 (5)
TNT	N/A	N/A	71,115 (5)
2,4-DA-6-NT	N/A	N/A	2,590,241 (5)
2,4-DNT	N/A	N/A	39,113 (5)
2,6-DA-4-NT	N/A	N/A	2,590,241 (5)
2,6-DNT	N/A	N/A	117,414 (5)
2AmDNT	N/A	N/A	638,690 (5)
4,4-TN-AZOXY	N/A	N/A	638,690 (5)
3,5-DNA	N/A	N/A	2,489,038 (5)
4AmDNT	N/A	N/A	390,310 (5)
cis-1,2-DCE	N/A	N/A	2,489,820 (5)
DNX	N/A	N/A	2,809,941 (5)
DMNA	N/A	N/A	245 (2)
1,2-NB/1,3-NB	N/A	N/A	603,207 (5)
HMX	N/A	N/A	7,825,170 (5)
MNX	N/A	N/A	2,809,941 (5)
RDX	N/A	N/A	71,128 (5)
TNX	N/A	N/A	2,809,941 (5)
PCE	N/A	N/A	3,556,890 (5)
PUBLIC WATER SUPPLY BACK-CALCULATED TO MIXING ZONE CONCENTRATION (cont.)			
PCA	N/A	N/A	18,486 (5)
trans-1,2-DCE	N/A	N/A	3,556,890 (5)
TCE	N/A	N/A	177,835 (5)
VC	N/A	N/A	71,128 (5)

µg/L - Micrograms per liter.
COC - Chemical of concern.
LSC - Little Sulfur Creek.
MCS - Media cleanup standard.
mg/kg - Milligrams per kilogram.
MTA - Main Treatment Area.
N/A - COC not applicable to this medium.
OJT - Old Jeep Trail.
WQC - Water Quality Criterion.

migration of the explosives plume could potentially lead to such unacceptable risks and, in the absence of monitoring there would be no warning of this. The lack of monitoring would preclude verifying attainment of MCSs. This alternative would be readily implementable because it requires no action , and there would be no cost associated with implementing this alternative.

Alternative OJT-GW2: Limited Action - Land Use Controls and Long-Term Monitoring. This alternative consists of LUCs and LTM. The LUCs would prevent current and future exposure to contaminated groundwater. Contaminant source control is not included in this alternative but short-term human health risks would be minimal and natural attenuation would reduce the amount of explosives and VOC concentrations in the groundwater. LTM would verify when explosives and TCE concentrations have attenuated to meet MCSs; therefore, this alternative would be reliable and effective in the long term. The small quantities of waste generated during monitoring would result in easy and cost-effective compliance with waste management regulations. This alternative involves limited action and is readily implementable within approximately 12 months because the OJT is completely contained within NSA Crane. The time required to attain MCSs under this action is unknown. This action, however, is similar to other corrective measures implemented at NSA Crane, and this similarity would facilitate its implementation.

LSC

Surface Water

Alternative LSC-SW1: No Action. Alternative LSC-SW1 would maintain the site as is and was evaluated as a baseline for comparison to other alternatives. Surface water discharges from NSA Crane via LSC into Sulfur Creek and the East Fork of the White River. Although natural attenuation processes would eventually reduce contaminant concentrations to meet MCSs, this alternative, which does not include monitoring, would not prevent or warn of changes in use of LSC for public water supply intake, which could result in unacceptable human health risks. This action would be readily implementable because it requires no action, and there would be no cost associated with implementing this alternative.

Alternative LSC-SW2: Limited Action – Long-Term Monitoring and Usage Evaluation of Public Water Supplies Upstream of the Shoals, Indiana, Drinking Water Intake. The Indiana Department of Environmental Management (IDEM) has established uses for all surface waters, including LSC, and protective criteria [Water Quality Standards (WQCs)] for various constituents based on surface water uses. There are no Indiana WQS for RDX and Am-DNTs; however, the water quality regulations do contain a procedure for calculation of Alternative WQCs for the protection of human receptors (including the recreational user). Locations where the Alternative WQCs apply for human receptors are as follows:

1. For the full-body contact recreational user (i.e., public health criterion incidental water intake), LSC downstream of the location where Springs A, A', B, and C mix with LSC.

2. For protection of public water supplies, the closest location from which LSC surface waters are withdrawn for use as a public water supply (i.e., Shoals drinking water intake).

Alternative LSC-SW2 includes LTM of surface water and evaluation of public water supplies upstream of the Shoals drinking water intake. LTM would verify that RDX and other contaminant concentrations in surface water remain less than MCSs. Evaluation of public water supplies upstream of the Shoals, Indiana, drinking water intake would ensure that the alternative RDX Indiana Water Quality Criteria (WQC) and other monitoring criteria remain valid for the LSC surface water uses or would be used to determine when alternative criteria require development. This corrective measure alternative would not require contaminant source control; however, MCSs have been established for several potential contaminants, and compliance with these MCSs at the downstream limit of the LSC-Johnson Hollow mixing zone would be monitored to ensure that water quality does not change unacceptably. Thus, this alternative would be reliable and effective in the short and long terms. This alternative would be implementable because the headwaters of LSC are contained within the NSA Crane boundary, and this alternative is similar to corrective measures implemented at other environmental sites within NSA Crane. Implementation of public record review procedures would support monitoring of portions of LSC between the Shoals drinking water intake and the NSA Crane boundary.

Cost Evaluation

MTA

There is no cost associated with Alternatives MTA-S1 and MTA-GW1; estimated costs for Alternatives MTA-S2 and MTA-GW2 are presented in Table 2 in terms of present worth (in terms of what they are worth today):

Table 2: Costs for Alternatives MTA-S2 and MTA-GW2

Cost Item	Alternative MTA-S2	Alternative MTA-GW2
Present-Worth[1]	$39,000	$159,000

[1]The present value (or worth) of an investment is the total amount that a number of future payments is worth now, in today's dollars.

OJT

There is no cost associated with Alternatives OJT-S1 and OJT-GW1; estimated for Alternatives OJT-S2 and OJT-GW2 are presented in Table 3 in terms of present worth (in terms of what they are worth today):

Table 3: Costs for Alternative OJT-S2 and OJT-GW2

Cost Item	Alternative MTA-S2	Alternative MTA-GW2
Present Worth[1]	$39,000	$166,000

[1]The present value (or worth) of an investment is the total amount that a number of future payments is worth now, in today's dollars.

LSC

There is no cost associated with Alternatives LSC-SW1; the estimated cost for Alternative LSC-SW2 is presented in Table 4 in terms of present worth(in terms of what they are worth today):

Table 4: Costs for Alternative LSC-SW2

Cost Item	Alternative LSC-SW2
Present Worth[1]	$193,000

[1]*Present value (or worth) of an investment is the total amount that a number of future payments is worth now, in today's dollars.*

During evaluation of corrective measure alternatives, consideration was given to factors such as the level of effort required to monitor and evaluate the monitoring data. Brief details of the evaluation process and the factors that were considered are presented below, and greater details are provided in the CMP (Tt, 2010).

Evaluation of Proposed Corrective Measures and Alternatives

The corrective measure alternatives evaluation process is described below.

Corrective Measures Evaluation Criteria

The alternative corrective measures were evaluated using specific criteria set forth by the EPA (EPA, 1994) as follows:

- Protection of human health and the environment
- Attainment of MCSs
- Control of release sources
- Compliance with applicable standards for waste management

Other factors including:

- Long-term reliability and effectiveness
- Reduction in toxicity, mobility, and volume of wastes
- Short-term effectiveness
- Implementability
- Cost
- Details of these evaluations are provided in the CMP (Tt, 2010).

In addition, the following criteria were evaluated:

- Potential for regulatory acceptance
- Potential for community acceptance

Proposed Corrective Measures and Rationales for Selecting the Proposed Corrective Measures

The proposed corrective measures for the MTA, OJT and LSC generally include LUCs to prevent exposure to contaminants and for monitoring of groundwater or surface water contaminant levels. There are two approaches for controlling exposure to residual chemical contamination: engineered and institutional controls, which are collectively referred to as LUCs. Engineered controls include fences and covers (such as pavement or building slabs) that prevent exposure to contaminated areas. Institutional controls are non-physical legal mechanisms that control land use and activities. The purpose of an institutional control can be two-fold: to prevent damage to engineered controls or corrective measures and/or to prevent adverse human or environmental interaction with the residual contamination. Chemicals addressed by the recommended corrective measure alternative include those that contribute to unacceptable risks as well as chemicals that are believed, by their inclusion, will improve the protection of human health and the environment and are necessary to obtain a comprehensive understanding of site conditions over time. Monitoring criteria are presented in Table 1 for these proposed actions.

MTA

The proposed corrective measure to ensure that controls are in effect to prevent human exposure to soil (identified as "Alternative MTA-S2") is to implement LUCs for lead-contaminated soil

With these controls in place, exposure potential is extremely low. The LUCs will remain in place until contaminant concentrations reach acceptable levels.

The proposed corrective measure to ensure that controls are in effect to prevent human exposure to groundwater (identified as "Alternative MTAGW2") is to implement LTM of groundwater at the MTA and implement LUCs for RDX and TCE contamination in soil, which is believed to be a source of groundwater contamination.

With these controls in place, exposure potential is extremely low. Regular monitoring will establish whether groundwater contaminants are migrating. In the unlikely event that contaminants are migrating, their movement will be detected, and additional corrective measures can be taken if necessary. Available data show that the explosives contaminants have been degrading naturally, and they are expected to continue degrading in this manner. The monitoring data will ensure that LUCs remain in place until contaminant concentrations reach acceptable levels. At the time of RCRA closure, additional evaluations will be conducted to ensure that the closure is protective of human health and the environment.

OJT

The proposed corrective measure to ensure that controls are in effect to prevent human exposure to soil (identified as "Alternative OJTS2") is to implement LUCs for lead contamination.

A one-time VIM will also be implemented to remove lead contamination in soil near soil boring 03SB024. With these controls in place, exposure potential is extremely low. The LUCs will remain in place until contaminant concentrations reach MCSs.

The proposed corrective measure to ensure that controls are in effect to prevent human exposure to groundwater (identified as "Alternative OJTGW2") is to implement LTM and LUCs to prevent exposure to RDX, TNT, 2AmDNT, 4AmDNT and TCE contamination in groundwater.

With these controls in place, exposure potential is extremely low. Regular monitoring will establish whether groundwater contaminants are migrating. In the unlikely event that contaminants are migrating, their movement will be detected, and additional corrective measures can be taken if necessary. Available data show that the explosives contaminants have been degrading naturally, and they are expected to continue degrading in this manner. The monitoring data will ensure that LUCs remain in place until contaminant concentrations reach MCSs.

LSC

Surface Water

Previous groundwater monitoring reports (SAIC, 2002a, 2002b, 2003a, and 2003b) identified RDX, TCE, and barium as the major contaminants present in MTA groundwater. As previously mentioned, MTA groundwater discharges to surface water (LSC) at Springs A and A'.

The proposed corrective measure to ensure that controls are in effect to prevent human exposure to surface water (identified as "Alternative LSC-SW2") is to:

- Implement LTM for RDX, TNT, AmDNTs, and other potential contaminants to verify that concentrations at water intakes remain less than the Alternative WQCs and TCE to verify that concentrations remain less than the MCL.
- Periodically review public records for public water supplies to determine whether any new surface water intakes have been installed on LSC or the East Fork of the White River upstream of the Shoals, Indiana, drinking water intake
- Periodically review LSC surface water uses to determine whether any new uses have occurred.

Land Use Control Objectives

As part of Alternatives MTA-S2, MTA-GW2, OJT-S2, and OJT-GW2, it will be necessary to protect human health by implementing LUCs with the following objectives:

- Prevent access to and use of contaminated soil or groundwater within the MTA; and access to and use of contaminated soil and groundwater within the OJT until MCSs are achieved throughout those areas.
- Maintain the integrity of any current or future remedial system or monitoring system (e.g., monitoring wells).
- Prohibit the development and use of the MTA and OJT properties for residential or other unrestricted use.

Public Participation

Comments on this SB, which describes the proposed corrective measure for SWMU 3, will be accepted for 30 days. The commencement and conclusion date of the 30-day comment period will be posted on the NSA Crane website (http://www.navsea.navy.mil/nswc/crane/community/Pages/Environmental_Restoration.aspx). Members of the public may submit written comments to EPA regarding the proposed corrective measure. Comments may be submitted either by electronic mail (e-mail) to CRAN_RAB@navy.mil or by mail to:

Peter Ramanauskas
United States Environmental Protection Agency – Region 5
77 West Jackson Boulevard (DW-8J)
Chicago, IL 60604

Written comments concerning this proposal should include the name and address of the writer and the supporting relevant facts on which the comments are based. Written comments received will be summarized and responses provided to all persons on the facility mailing list. Written comments should be submitted via e-mail or postmarked by the end of the comment period.

Members of the public interested in reviewing RFI Reports, the CMP, or report summaries, and the justification for the proposed corrective measure (described in this SB), may view these documents at the EPA office listed above or on compact disk at the Bedford Public Library:

1323 K Street
Bedford, IN 47421-3297
(812) 275-4471

In addition, text-only versions of the SB along with the text of the Executive Summaries from the RFI Reports and CMP are available at the NSA Crane website.

References

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List of Acronyms

2AmDNT - 2-amino-4,6-dinitrotoluene

4AmDNT - 4-amino-2,6-dinitrotoluene

ABG - Ammunition Burning Ground

B&RE - Brown and Root Environmental

BC/BC - Big Clifty Sandstone/Beech Creek

CAAA - Crane Army Ammunitions Activity

CFR - Code of Federal Regulations

CM - Corrective Measure

CMP - Corrective Measures Proposal

COC - Chemical of concern

COPC - Chemical of potential concern

DNT - Dinitrotoluene.

DR - Demolition Range

EPA - United States Environmental Protection Agency

HI - Hazard index

HMX - Cyclotetramethylenetetranitramine

IAS - Initial Assessment Study

ILCR - Incremental Lifetime Cancer Risk

LSC - Little Sulphur Creek

LTM - Long term monitoring

LUC - Lnd use control

MCL - Maximum Contaminant Level

MCS - Media Cleanup Standard

mg/kg - milligram per kilogram

MTA - Main Treatment Area

NEESA - Naval Energy and Environmental Support Activity

NSA - Naval Support Activity

OB - Open burning

OJT – USACE

ORR - Old Rifle Range

PCA - 1,1,2,2-Tetrachloroethane

RCRA - Resource Conservation and Recovery Act

RDX - Cyclotrimethyl-trinitramine

RFI - RCRA Facility Investigation

SB - Statement of Basis.

SWMU - Solid Waste Management Unit

TCE - Trichloroethene

TNT - 2,4,6-Trinitrotoluene e

Tt - Tetra Tech NUS, Inc.

USA - United States of America

USACE - United States Army Corps of Engineers

USGS - United States Geological Survey

UST - Underground storage tanks

VIM - Voluntary Interim Measure

VOC - Volatile organic compound

WQC- Water Quality Criteria

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Statement of Basis for SWMU 3 at Navsal Support Activity Crane is important to the Navy and EPA. Comments provided by the public are valuable in helping to select the corrective measures for this site.

You may use the space below to write your comments, then fold and mail.

Name _____

Address _____

City _____

State _____ Zip _____

Telephone _____

FOLD HERE

Place
Stamp
Here

Peter Ramanauskas

United States Environmental Protection Agency - Region 5

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