UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION I
5 POST OFFICE SQUARE, BOSTON, MA 02109

Enforcement Confidential Materials Attached

MEMORANDUM

DATE:

SUBJ: Request for a Non-Time Critical Removal Action at the Nuclear Metals, Inc. Superfund Site, Concord, Massachusetts -- **ACTION MEMORANDUM**

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THRU: Bob Cianciarulo, Chief
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TO: Nancy Barmakian, Acting Director
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I. PURPOSE

The purpose of this Action Memorandum is to request and document approval of a non-time critical removal action (NTCRA) for the Nuclear Metals, Inc. Superfund Site (the "Site"), located at 2229 Main Street, Concord, Massachusetts. This NTCRA is expected to be completed within one to five years of mobilization at a cost of approximately $5.2 million (up to one year of construction and up to four years of monitoring, operation, and maintenance). This NTCRA is necessary to prevent, minimize, stabilize, and mitigate potential threats to human health and the environment posed by a release of hazardous substances to the environment.

In particular, this NTCRA will address migration of contaminated groundwater. The location and layout of the Site is shown in Figure E-3 of the Record of Decision (ROD). The Site includes a 46-acre Nuclear Metals, Inc. property (the "NMI Property") and surrounding areas where contamination has come to be located. In the fall of 2014, EPA completed a Remedial Investigation and Feasibility Study for the Site, which determined that groundwater contaminated with 1,4–dioxane was migrating away from the NMI Property under the Assabet River. The Assabet wellfield, one of the public water supply wellfields for the town of Acton, Massachusetts, could be impacted if the groundwater plume continues to migrate. This NTCRA is consistent with the long-term remedial strategy for this Site to minimize exposure to and migration of contaminants.

This NTCRA will ensure that EPA can provide a timely response to effectively minimize threats to public health or welfare or the environment which may result from the continuing release and/or threat of release of hazardous substances from the site.

While this NTCRA will accelerate the overall Site cleanup by reducing site contamination, it does not constitute the complete cleanup plan for the Site. EPA has issued a Record of Decision (ROD) concurrent with this Action Memorandum. The ROD selects a remedy to address the full nature and extent of contamination at the Site not addressed by this NTCRA or the on-going building NTCRA, prior time-critical removal actions, or the prior removal action by the Massachusetts Department of Environmental Protection (MassDEP).

II. SITE CONDITIONS AND BACKGROUND

CERCLIS Identifier: MAD062166335
Site Identifier: 017D
Removal Category: Non-Time Critical
NPL status: Listed on NPL on June 14, 2001

A. Site Description

1. Removal site evaluation

The portion of the Site addressed by this action is groundwater contaminated with 1,4-dioxane and VOCs that has migrated off the NMI property and is headed towards a public water supply. Other areas of the Site not addressed by this removal action are the 46-acre NMI property, which includes: a five-section interconnected building and several other storage buildings (which altogether have a current footprint of approximately 185,000 square feet); a holding basin and a small landfill (which have both been covered with a temporary cap by EPA as part of a 2002 time-critical removal action); site soils; a sphagnum bog; a cooling water recharge pond; a "sweepings" pile, and DU and uranium groundwater contamination. These areas are being addressed under the ROD that is being issued concurrently with this Action Memorandum.

Currently, a NTCRA is on-going which requires the removal of all contents of the facility buildings and demolition of the buildings themselves. Most of the facility contents have been removed and the buildings are scheduled for demolition in fall 2015/spring 2016.

Anecdotal information indicates that volatile organic compounds (VOCs) used as solvents and degreasers were discharged through floor drains of the facility buildings to an on-site cooling water pond, resulting in contamination of an on-site supply well. The VOCs likely contained 1,4-dioxane as a stabilizer. The Remedial Investigation and Feasibility Study that was completed in the fall of 2014 determined that a groundwater plume of 1,4-dioxane was migrating away from the NMI Property towards the one of the public water supply wellfields for the town of Acton. Due to the rate at which the 1,4-dioxane plume is moving, EPA is requesting Non-Time Critical

Removal Authority to address the contaminated groundwater migrating off the Starmet property. EPA signed an approval memorandum for performance of an Engineering Evaluation and Cost Analysis (EE/CA) equivalent in September 2015. The completed Feasibility Study is serving as the EE/CA equivalent as it evaluates the necessary groundwater remedial alternatives. The RI/FS was performed by potentially responsible parties (PRPs) pursuant to an Administrative Order by Consent for RI/FS (RI/FS AOC), signed on June 13, 2003.[1] The RI/FS reports can be found in the administrative record for the ROD and on the Nuclear Metals EPA website: http://www.epa.gov/region1/superfund/sites/nmi. EPA anticipates that performance of this NTCRA would be performed on a PRP-lead basis. A more detailed description of the Site history can be found in Section B of the ROD and Section 1 of the Feasibility Study.

As this NTCRA is not anticipated to cost more than $6 million, consultation with the Office of Superfund Remediation and Technology Innovation (OSRTI) and the Office of Emergency Management (OEM) in accordance with the national guidance document "Use of Non-Time Critical Removal Authority in Superfund Response Actions", dated February 14, 2000, is not required.

In October 2014, EPA issued a Proposed Plan outlining the cleanup plan at the Site to local communities. In addition to seeking comments on the proposed overall cleanup plan, the Proposed Plan also asked for comments on the proposal to accelerate a portion of the groundwater cleanup of 1,4-dioxane and VOCs as a NTCRA. On December 10, 2014, EPA held a public hearing to discuss the cleanup alternatives in the Proposed Plan and Feasibility Study, and EPA's preferred alternative for the cleanup plan and accelerated groundwater cleanup for 1,4-dioxane and VOCs. From November 13, 2014 to January 14, 2015, EPA held a public comment period. Responses to significant comments related to this NTCRA proposal are provided in Part 3 of the ROD along with responses to other comments received on EPA's proposed cleanup plan. Additional supporting documentation can be found in the Administrative Record.

2. Physical location

The Site is located at 2229 Main Street, in Concord, Massachusetts. The NMI Property consists of approximately 46 acres, including five interconnected buildings, a tank house, a hydrogen peroxide tank house, four "Butler" buildings, and two gas cylinder storage huts. The property is bordered by residential properties to the east and northeast, a commercial property to the west, Main Street (Route 62) to the north and to the south and southwest by conservation land/woodlands and the Thoreau Hills Summer Camp (a children's day camp).

The closest residence is located within 200-300 feet of the Site**.** The Assabet River is approximately 300 feet north from the northern perimeter of the property. Both the town of Concord and the adjacent town of Acton are on public water supplies that have not been impacted by site-contaminated groundwater; however, 1,4-dioxane has been found in monitoring wells approximately 300 feet from the town of Acton's Assabet wellfield.

[1] The RI/FS AOC was amended on February 13, 2008 and again on October 2, 2012.

3. Site characteristics

From 1958 to the present, the Site was used by various operators as a specialized research and metal manufacturing facility, which was licensed to possess radioactive substances. At various times, Site operators used depleted uranium, beryllium, titanium, zirconium, copper, acids, solvents, and other substances. Although the source of the DU is known, sources of other contaminants at the Site can only be hypothesized. It is thought that the PCBs were used at the Site within the machinery, and VOCs were used as solvents at the Site and those VOCs likely contained 1,4-dioxane as a stabilizer. Other areas of the Site investigated as part of the RI/FS include: site soils, site groundwater, a cooling water recharge pond, a sphagnum bog, the northeast wetland, the former waste holding basin, a small landfill, and a waste pile referred to as the "sweepings" pile that contains dredged material from the cooling water recharge pond.

Since 1972, Starmet Corp. (Starmet), formerly known as Nuclear Metals, Inc., or one of its wholly-owned subsidiaries, owned and/or operated the Site. Starmet previously manufactured penetrator bullets from depleted uranium as a defense contractor for the U.S. Army under a license to possess radioactive materials by the MADPH-RCP[2]. Starmet vacated the Site in early November 2011 (in accordance with the terms of a Consent Decree with the MADPH-RCP), Starmet's radioactive materials licenses were terminated by MADPH-RCP on November 8, 2011, and the company is now defunct.

The Site lies within the Assabet River basin. No natural streams are present on-site. The only apparent surface water body that pre-dates development of the Site is a Sphagnum Bog located in the eastern-central portion of the Site. The Assabet River flows in an easterly direction and merges with the Sudbury River to form the Concord River approximately 3.5 miles downstream of the Site. A surface water divide is located in the upland to the south of the Site. Surface water runoff from areas north of this divide flow north to the Assabet River. Surface water runoff from areas south of this divide flow south to Second Division Brook, which flows in an easterly direction, and then north to join with the Assabet River. Groundwater is found both in the unconsolidated and bedrock formations and migrates north/northwest, towards the Assabet River.

Groundwater data suggest that DU migrated to the overburden groundwater, natural uranium migrated to the bedrock groundwater, and chlorinated VOCs, and 1,4-dioxane migrated to the overburden and bedrock groundwater. The groundwater flow is toward the north and northwest, resulting in overburden and bedrock plumes of VOCs and 1,4-dioxane that extend off the facility property toward and beneath the Assabet River. The 1,4-dioxane plume associated with the Site extends to deeper overburden as evidenced by monitoring results from wells located just south and northwest of the Assabet River.

[2] The Commonwealth of Massachusetts became a Nuclear Regulatory Commission (NRC) "agreement state" licensee in 1997.

4. Release or threatened release into the environment of a hazardous substance or pollutant or contaminant

The last round of groundwater sampling results shows that the 1,4-dioxane plume is migrating away from the NMI property under the Assabet River. Previous sampling results had shown that the 1,4-dioxane plume was contained with no signs of migration. Addressing 1,4-dioxane (which will address VOCs simultaneously) in groundwater as a non-time critical removal action (NTCRA) in advance of implementing the full remedy for the Site could contain this plume from expanding further, thereby protecting human health and avoiding the increase in time and cost for this component of the cleanup action. There is a release or threatened release of hazardous substances into the environment posed by the contamination of groundwater with 1,4-dioxane in the near vicinity of public supply wells. Recent sampling of monitoring wells in the vicinity of the public supply wells has shown concentrations of 1,4-dioxane between 2 and 14 ug/l, which is in exceedance of the ROD groundwater cleanup level of 0.46 ug/l for 1,4-dioxane.

5. NPL status

This Site is listed on the National Priorities List (NPL). The Site was proposed for listing on the NPL on July 27, 2000, and was listed on the NPL on June 14, 2001 with the concurrence of the Governor of Massachusetts.

B. Other Actions to Date

1. EPA Region 1 Emergency Planning and Response Branch (EPRB) Actions

EPA's EPRB has been involved at the Site since mid-2000. Through investigations of past activities and EPRB's subsequent Preliminary Assessment/Site Investigations (PA/SIs), two discrete buried drum areas were identified: one was located between the holding basin and the water cooling recharge pond, and one is located within the old landfill area immediately south of the sphagnum bog. (See Figure E-3 in the ROD showing the locations of the cooling water recharge pond, holding basin, and sphagnum bog.)

From April 23, 2002 to April 30, 2003, the EPRB conducted a time-critical removal action that included the installation of a cap over the old landfill area, and the installation of a liner over the holding basin. In addition, a fence was erected around the old landfill area. A small buried drum area located within a fenced area near the holding basin was not addressed as part of this removal action because trespasser access to the buried materials was limited and the materials were not at or near the surface. As explained below, the buried materials were removed from the Site in December 2004. The 2002 removal action prevented the direct contact threat with the contaminated surface soils located in the landfill area, eliminated contaminated dust migration from the holding basin, and prevented precipitation from infiltrating the soils within the holding basin.

Due to a fire that occurred at the Site in June 2007, EPA's EPRB conducted a second time-critical removal action in early 2008 to remove hazardous and flammable materials from within the facility buildings at the request of the Concord Fire Department.

2. Remedial Branch Actions

In 2003, EPA entered into an Administrative Order by Consent to perform a Remedial Investigation/Feasibility Study (RI/FS AOC) with several potentially responsible parties (PRPs) for the Site. In 2014, the Respondents under the RI/FS AOC completed the RI/FS at the Site. The drums discovered during the 2002 time-critical removal action were removed in December 2004 as part of the activities performed under the RI/FS AOC. In addition, as another activity performed under the RI/FS AOC, the Respondents completed an EE/CA which evaluated alternatives for addressing contamination related to buildings on the Site. An Action Memorandum for a NTCRA to remove of all contents of the facility buildings and demolish the buildings themselves (the "Building NTCRA") was signed on September 23, 2008. Subsequently, an Administrative Settlement Agreement and Order on Consent for NTCRA was signed in August 2011 which requires several PRPs to perform the Building NTCRA. Most of the facility contents have been removed and the buildings are scheduled for demolition beginning in fall 2015/spring 2016. A comprehensive remedy for the Site is being selected concurrent with this Action Memorandum, as outlined in the ROD.

C. State and Local Authorities' Roles

1. State and local actions to date

From about the late 1980s to 2000, Starmet, performed certain Site investigations and a partial cleanup under the oversight of MADEP. In 1997, Starmet, with the financial support of the U.S. Army, and oversight by MADEP and MADPH-RCP, excavated approximately 8,000 cubic yards of soil contaminated with depleted uranium and copper from the on-site holding basin and disposed of these soils at an off-site, low-level radioactive waste disposal facility. The cleanup halted in late 1998 when Starmet determined that the cleanup level required by MADEP could not be met without excavating significantly more material.

In the spring of 2006, MADEP conducted a removal action, with proceeds obtained by the State through a settlement with the U.S. Army, which consisted of the removal of more than 3,800 drums and containers containing depleted uranium from within the facility.

On May 22, 2007, MADPH-RCP and Starmet entered into a Consent Decree in which Starmet agreed to vacate the Site by October 31, 2007. Starmet's related companies (i.e., the Starmet Parties), also operating at the Site, were required to vacate the Site on the same date.

On June 26, 2007, the Concord Fire Department, MADPH-RCP, MADEP, and EPA responded to a fire at the Starmet facility. Subsequently, the Concord Fire Department issued two orders to Starmet to correct various violations of the state fire code at the Site. In November 2007, after Starmet failed to comply with the orders, the Concord Fire Department sent a letter to EPA requesting assistance with removing these materials from the Starmet facility, concluding that the continued existence of these materials within the facility constitutes an imminent threat to public health and safety. EPA completed a time-critical removal action in early 2008 which removed hazardous and flammable materials from within the facility buildings.

Starmet and its related companies vacated the Site on November 1, 2011 and Starmet's radioactive materials licenses were terminated by MADPH-RCP on November 8, 2011. Starmet is now defunct but remains the current owner of the NMI Property.

2. Potential for continued State/local response

MassDEP is the lead agency for the Commonwealth of Massachusetts. MassDEP has limited funds available to address the Site. There is no state response mechanism available with sufficient funds to perform this NTCRA.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

Based on Site conditions and information available on the hazardous substances present, the Site poses the following threats to public health, welfare, or the environment:

A. <u>Threats to Public Health or Welfare or the Environment</u>

"Actual or potential exposure to nearby human populations, animals or the food chain from hazardous substances or pollutants or contaminants" [40 CFR 300.415(b)(2)(i)];

The NMI Property is bordered by residential properties to the east, a commercial property to the west, Main Street (Route 62) to the north and to the south and southwest by conservation land/woodlands and the Thoreau Hills Summer Camp. The 1,4-dioxane plume extends off the NMI Property, across Main Street to the northern side of the Assabet River. This groundwater plume has elevated concentrations of 1,4-dioxane in exceedance of EPA's risk-based cleanup level of 0.46 ug/l.

"Actual or potential contamination of drinking water supplies or sensitive ecosystems" [40 CFR 300.415(b)(2)(ii)];

As stated above, Site groundwater is contaminated at levels exceeding risk-based cleanup levels, as well as MCLs. Concentrations approaching EPA's risk based cleanup level of 0.46 ug/l for 1,4-dioxane have been detected in the vicinity of the Acton Water District supply wells.

"The availability of other appropriate federal or state response mechanisms to respond to the release" [40 CFR 300.415(b)(2)(vii)];

EPA is the lead agency at the Site. The Site was listed on the NPL on June 14, 2001. MassDEP has limited funds available to address the Site and there are no state response mechanisms available with sufficient funding to respond to the release.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances at or from the Site, if not addressed by implementing the response action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health and welfare.

V. EXEMPTION FROM STATUTORY LIMITS

It is expected that this removal action will be performed with PRP funds. However, if it were to be performed as a Fund-lead response, it would require funding above $2 million and more than one year to implement, thereby exceeding the statutory money and time limits on Fund-financed removal actions established under Section 104(c) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (CERCLA), and Section 300.415(b)(5) of the National Oil and Hazardous Substances Pollution Contingency Plan, as amended (NCP). The proposed NTCRA is projected to cost approximately $5.2 million and take one to five years to complete. In the event that the removal action were to be performed as a Fund-lead response, a "consistency" exemption is invoked through this Action Memorandum to allow for the proposed removal action to exceed the $2 million ceiling and 12-month time limit for Fund-financed removal actions.

Section 104(c) of CERCLA, 42 U.S.C. § 9604(c), states that removal actions can exceed the $2 million and 12 month statutory limits if conditions meet either the "emergency exemption" criteria or the "consistency exemption" criteria. The consistency exemption requires that the proposed removal be appropriate and consistent with the remedial action to be taken. As described below conditions and proposed actions at the Site meet the criteria for a consistency exemption.

A. Appropriateness

EPA OSWER Directive 9360.0-12A, "Final Guidance on Implementation of the 'Consistency' Exemption to the Statutory Limits on Removal Actions," June 12, 1989, states that an action is appropriate if the activity is necessary for any *one* of the following reasons:

1. To avoid a foreseeable threat;
2. To prevent further migration of contaminants;
3. To use alternatives to land disposal, or,

4. To comply with the off-site policy.

The NTCRA described in Section VI below meets criteria one and two identified above. The proposed removal action abates the foreseeable threat posed by the migrating 1,4-dioxane groundwater plume. In addition, by addressing the off-property contaminated groundwater in advance of the full Remedial Design/Remedial Action, the removal action will minimize the scope and cost of the final remedial action and the potential for migration of contaminants to a public water supply.

The proposed removal action is therefore appropriate and necessary.

B. Consistent With the Remedial Action

The proposed NTCRA is also consistent with anticipated remedial actions to minimize exposure to and migration of contaminants. As indicated in EPA's 1989 guidance (p. 3), "the 'remedial action to be taken' is the remedial action that, prior to the start of the removal action, was planned or could reasonably have been expected to be taken."

The proposed NTCRA is one part of a phased approach to address concerns at the Nuclear Metals, Inc. Superfund Site. The other past and future components are (1) a time-critical removal action conducted in 2002 including: installation of a permanent fence around an area containing buried drums where local residents and a summer camp had direct access; capping of beryllium-contaminated soils overlying the same buried drum area; and lining of the holding basin with a temporary cover; (2) a MassDEP removal action that has addressed the 3,800 stored drums and containers of depleted uranium in the facility through an agreement reached with the U.S. Army; (3) a time-critical removal action conducted in 2008 to remove containers of flammable and other hazardous substances from the Site that constitute a threat of fire and/or explosion; (4) an on-going NTCRA to address contaminated buildings on the NMI Property; (5) the RI/FS completed in 2014 which characterized the Site contaminants; and (6) the ROD for the Site, issued concurrently with this Action Memorandum, which will address site-wide contamination not addressed in prior actions.

Because the proposed NTCRA is both appropriate and consistent with the remedial action to be taken, EPA finds that the requirements of the consistency exemption under Section 104(c) of CERCLA have been met.

VI. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Action

EPA issued a Feasibility Study Report in November 2014 which found that groundwater at the Site is contaminated with 1,4-dioxane and VOCs most likely from the use of VOCs as solvents at the Site. The VOCs used likely contained 1,4-dioxane as a stabilizer. The Feasibility Study Report, also functioning as the Engineering Evaluation and Cost Analysis ("EE/CA") equivalent

for this NTCRA, evaluated several alternatives for addressing VOCs and 1,4-dioxane in groundwater. EPA issued a proposed cleanup plan ("Proposed Plan") for public comment on October 31, 2014 which outlined EPA's proposed cleanup approach for the Site and summarized the alternative cleanup approaches considered. The proposed plan recommended hydraulic containment (by pumping from overburden and bedrock extraction wells) and ex-situ treatment to address 1,4-dioxane and VOCs in groundwater. An estimate of the total pumping rate needed to hydraulically contain and cut off further migration of 1,4-dioxane is ~12 gallon per minute (gpm). Treatment at this relatively low flow rate, while not inexpensive, is feasible and this alternative is readily implemented. The Proposed Plan was based on findings from the Remedial Investigation (April 2014) and Feasibility Study Reports issued by EPA.

The Proposed Plan also sought comment on accelerating the 1,4-dioxane and VOC groundwater extraction and *ex-situ* treatment portion of the proposed remedy as a NTCRA. This accelerated action was proposed because recent sampling has shown that the 1,4-dioxane plume at the Site may be migrating away from the NMI Property under the Assabet River, and taking early action to contain the plume could prevent the further migration. Previous sampling results had shown that the 1,4-dioxane plume was contained with no signs of migration.

The ROD selected the remedy proposed in the Proposed Plan and EPA has elected to issue this Action Memorandum to accelerate a portion of the groundwater remedy. This NTCRA includes extraction of overburden and bedrock groundwater with *ex-situ* treatment for VOCs and 1,4-dioxane and discharge to surface water or underground injection. The estimated cost of this portion of the groundwater remedy is $5.2 million. This includes design, construction and up to four years of monitoring, operation, and maintenance. Long-term operation and maintenance and long-term monitoring of this portion of the groundwater remedy is included as part of the remedial action for the Site.

1. Removal Action Objectives

Prevent Release to the Environment

Prevent the further migration of contaminated groundwater.

Prevent Direct Exposure to Contaminants

Prevent direct contact with, ingestion of, contaminated groundwater that present an unacceptable risk to human health and the environment. This NTCRA is designed to address the cleanup of contaminated groundwater in exceedance of the ROD cleanup levels for 1,4-dioxane (0.46ug/l), 1,1-dichloroethane (2.7ug/l), Tetrachloroethene (5ug/l), Tricholorethene (5ug/l), and Vinyl Chloride (2ug/l).

Contribute to the Efficient Performance of Remedial Activities

To the extent practicable, contribute to the efficient performance of the anticipated long-term remedial action with respect to the release concerned, as outlined in the ROD.

2. Proposed action description

The alternatives that were subject to detailed analysis in the FS as the EE/CA equivalent are summarized below. As noted below, only certain portions of these alternatives are the subject of this NTCRA.

Removal Action Alternatives:

GW-1: No Action

Alternative GW-1 is the no action alternative. This alternative provides no active groundwater treatment. Concentrations of VOCs and 1,4-dioxane in groundwater would be reduced somewhat through natural attenuation via dispersion, dilution, and volatilization. There is no cost estimated as part of this alternative.

GW-2: Limited Actions / Institutional Controls

Alternative GW-2 includes: (1) implementation of institutional controls to and (2) long-term groundwater monitoring for DU, VOCs/1,4-dioxane and natural uranium to monitor the plumes and evaluate concentration decreases due to natural attenuation. The total estimated present value cost of this alternative is approximately $2.9 million. Since there is no provision for active treatment in this alternative, there would be no cost for this NTCRA action under this alternative.

GW-3: *Ex-Situ* Treatment

Alternative GW-3 includes: (1) extraction of overburden groundwater downgradient of the Holding Basin (DU source area) with *ex-situ* treatment and discharge to surface water; (2) extraction of overburden and bedrock groundwater in the off-property area between Main Street and the Assabet River with *ex-situ* treatment for 1,4-dioxane and VOCs and discharge to surface water; (3) extraction of groundwater from shallow bedrock at the downgradient end of the natural uranium plume with *ex-situ* treatment for uranium removal and discharge to surface water; (4) implementation of institutional controls; and (5) long-term groundwater monitoring for DU, VOCs/1,4-dioxane and natural uranium to monitor the effectiveness of *in-situ* and *ex-situ* treatment and to evaluate concentration decreases due to natural attenuation. The total estimated present value cost of this alternative is approximately $29.3 million. The portion of this alternative that would be completed as a NTCRA is similar in scope and cost ($5.2 million) to alternative GW-4 below.

GW-4: Ex-Situ Treatment of VOCs/1,4-Dioxane, and *In-Situ* Treatment of DU And Natural Uranium (EPA's Preferred Alternative)

Alternative GW-4 includes: (1) extraction of overburden and bedrock groundwater with *ex-situ* treatment for VOCs and 1,4-dioxane and discharge to surface water or recharge/reinjection into the aquifer; (2) injection of apatite and/or Zero Valent Iron (ZVI) based media in the overburden DU and natural uranium bedrock plumes to remove uranium from groundwater in sorbed and

mineral precipitate forms; (3) long-term groundwater monitoring to monitor effectiveness of *in-* and *ex-situ* treatment and to evaluate concentration decreases due to natural attenuation; (4) implementation of institutional controls. The total estimated present value cost of this alternative is approximately $20.2 million. The portion of this alternative to be completed as a NTCRA, the initial construction and up to 4 years of operation, maintenance and monitoring of the system to capture the 1,4-dioxane and VOC plume, is estimated to cost $5.2 million.

As required under CERCLA and the NCP, during the FS process, all of the alternatives were evaluated independently based upon cost, effectiveness, and implementability. Cost was used to assess options of similar effectiveness and implementability. Effectiveness was based upon the ability of the alternative to meet the removal action objectives. The effectiveness evaluation also involved the assessment of federal and state applicable or relevant and appropriate requirements (ARARs). Implementability involved the assessment of technical feasibility, availability, and administrative feasibility. After comparing these alternatives and weighing the strengths and weaknesses, EPA has selected Alternative GW-4 as presented below as the best balance of human health and environmental protection considering cost, effectiveness, and implementability of each of the alternatives. Immediately below is a comparison of the five alternatives based on effectiveness, implementability, and cost. See the FS Section 6.5 (as the EE/CA equivalent) for a more detailed presentation of the cost and components of each alternative.

Effectiveness
GW-2, GW-3 and GW-4 will prevent human exposure to contaminants in groundwater through institutional controls. GW-1 does not prevent human exposure to contaminants in groundwater at the Site. GW-3 and GW-4 limit migration of contaminants (through *ex-situ* or *in-situ* treatment). GW-1 and GW-2 will not limit migration of contaminants. GW-3 includes hydraulic containment and *ex-situ* treatment of the distal end of the DU plume rather than treatment throughout the plume; therefore, plume flushing times are expected to be longer for GW-3 than for GW-4. GW-4 is likely to achieve the MCLs for DU and natural uranium more quickly (15 years) than the other alternatives (greater than 200 years) because it includes *in-situ* treatment throughout the plumes. The estimated time to reach cleanup levels for VOCs/1,4-dioxane for GW-1 and 2 is greater than 50 years. GW-3 and GW-4 will likely meet cleanup levels for VOCs/1,4-dioxane within 30 years. ARARs for DU and natural uranium will not be achieved within a reasonable timeframe for alternatives GW-1 and GW-2 because they provide no treatment. It is relatively easy to monitor the effectiveness of GW-1, GW-2, GW-3 and GW-4 with long-term monitoring and 5-year reviews.

Implementability
Alternative GW-1 (No Action) is the easiest to implement because it does not involve the construction, operation or maintenance of remedial systems or enforcement of institutional controls. GW-2 is easier to implement than GW-3 or GW-4 because it does not require the construction, operation or maintenance of active remedial systems. However, GW-2 may be less reliable for limiting potential human exposure to contaminants in groundwater than GW-3 or GW-4 because it relies only on institutional controls. Of the active remedial alternatives

considered for groundwater, GW-3 is easier to implement in the short term than GW-4 as the ability to construct the *in-situ* treatment portion of GW-4 depends on subsurface conditions that affect direct-push injection equipment (which would be evaluated during pilot testing in the remedial design phase). The reliability of GW-3 is high because groundwater extraction and *ex-situ* treatment via ion exchange or advanced oxidation and discharge to surface water are relatively routine tasks. The reliability of *in-situ* treatment in alternative GW-4 has been proven at the bench scale for apatite, and ZVI is a proven media. *In-situ* treatment technology allows for a passive remedy that does not depend on long-term manipulation of groundwater geochemistry; and if successful, implementation of GW-4 will not have the long-term operating requirements of the active groundwater extraction and *ex-situ* treatment system included in GW-3.

Cost

The range in estimated cost for all four alternatives is from $0 for GW-1 (No Action) to $29.3 million for GW-3. A summary of costs for each alternative is provided below:

ALTERNATIVE	**TOTAL COST (IN MILLIONS)**	**NTCRA COST (IN MILLIONS)**
Alternative GW-1 – No Action	$0	$0
Alternative GW-2 – Limited Action – Monitoring and Access Controls	$2.9	$0
Alternative GW-3 – Ex-Situ Treatment	$29.3	$5.2
Alternative GW-4 – Ex-Situ Treatment of VOCs/1,4 Dioxane, and *In-Situ* Treatment of DU And Natural Uranium	$20.2	$5.2

Alternative GW-4 is EPA's selected groundwater remedy in the ROD: Ex-Situ Treatment of VOCs/1,4-Dioxane, and *In-Situ* Treatment of DU And Natural Uranium

Technical Description

The work to be conducted under Alternative GW-4 is discussed in detail in Section 6.4 of the FS. This NTCRA includes extraction of overburden and bedrock groundwater with *ex-situ* treatment for VOCs and 1,4-dioxane and discharge to surface water or underground injection. Extraction and *ex-situ* treatment are proven technologies for reducing 1,4-dioxane and VOCs in groundwater. There are no technical difficulties associated with this technology, and it can be implemented without major obstacles. Groundwater monitoring can easily be undertaken to determine the effectiveness of the treatment. The cost of this portion of the groundwater remedy

is $5.2 million. This includes design, construction and up to four years of operation and maintenance. Long-term operation and maintenance and long-term monitoring of this portion of the groundwater remedy is included as part of the remedial action for the Site.

Since this NCTRA includes only a portion of the GW-4 remedy, the following components of the GW-4 remedy do not apply to this NTCRA but will be completed pursuant to the ROD:

- injection of apatite and/or ZVI based media in the overburden DU and natural uranium bedrock plumes to remove uranium from groundwater in sorbed and mineral precipitate forms;
- long-term groundwater monitoring to monitor effectiveness of *in-* and *ex-situ* treatment and to evaluate concentration decreases due to natural attenuation; and
- implementation of institutional controls.

3. Community relations

In advance of and during performance of this NTCRA, EPA's Community Involvement Office will disseminate information regarding the project to the impacted residents and local citizen groups. There are two very active community groups that EPA meets with bi-monthly to discuss technical issues at the Site, the town-appointed 2229 Main Street Advisory Committee and the Technical Assistance Grant recipient group CREW (Citizens Research and Environmental Watch). EPA will continue to work closely with the town of Concord, CREW, and state officials as the NTCRA progresses.

The town of Concord, CREW, and the Commonwealth of Massachusetts fully support EPA's decision to accelerate the cleanup of 1,4-dioxane in groundwater under this NTCRA. MassDEP concurred with the selected remedy outlined in the ROD, including this NTCRA (attached as Appendix F to the ROD).

4. Contribution to remedial performance

Contribution to the Efficient Performance of Remedial Activities

Under Section 104(a)(2) of CERCLA and Section 300.415(d) of the NCP, removal activities shall, to the extent practicable, contribute to the efficient performance of any anticipated long-term remedial action with respect to the release concerned. See EPA's OSWER Directive 9360.0-13, "Guidance on Implementation of the 'Contribute to Remedial Performance' Provision." This provision was meant to avoid repetitive removal actions that do not take into account their impact on the performance of subsequent remedial actions and to allow for more permanent tasks to be completed under removal authorities. (See NCP Preamble, 53 Federal Register 51409-51410, December 21, 1988). Together, CERCLA Sections 104(a)(2) and 104(c) ("consistency" exemption) are intended to promote and enhance efficiency and continuity.

Section 104(a)(2) of CERCLA and Section 300.415(d) of the NCP require that any removal action should, to the extent deemed practicable, contribute to the efficient performance of any long term remedial action with respect to the release or threatened release concerned. This removal action will contribute to the efficient performance of the long term remedial action by eliminating the potential for further migration of hazardous substances in off-property groundwater near the Acton drinking water public supply wells. Because the performance of this NTCRA portion of groundwater cleanup is part of the selected remedial action, this NTCRA contributes to the efficient performance of the long term remedial action.

5. Description of alternative technologies considered

A detailed description of alternative groundwater treatment technologies is located in Section 3.2.1.3 of the FS (as the EE/CA equivalent). The FS stated that although there are numerous technologies available for treatment of VOCs/1,4-dioxane, groundwater extraction and ex-situ treatment with advanced oxidation or synthetic media adsorption (or similar treatment technologies) are the most effective for removal of 1,4-dioxane from groundwater. Although other technologies are effective for VOC removal (such as air stripping and carbon adsorption), they were less effective for 1,4-dioxane removal, and therefore, were not chosen. A summary of the effectiveness, technical implementability, and cost screening of the technologies for VOCs and 1,4-dioxane in overburden and bedrock groundwater are presented in Table 3.2.2 of the FS.

6. Applicable or relevant and appropriate regulations (ARARs)

The ARARs tables can be found in Appendix D of the ROD.

7. Project schedule

Duration of the removal action shall be one to five years from the day of its commencement.

B. Estimated Costs

The estimated costs associated with this alternative are $5.2 million. A more detailed breakdown of costs associated with this alternative can be found in the attached Table 1.

VII. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

In the absence of the removal action described herein, conditions at the Site can be expected to remain unaddressed until implementation of the remedial action, and threats associated with the presence of contaminated groundwater migrating to public supply wells will continue to pose a threat of release.

VIII. OUTSTANDING POLICY ISSUES

There have been no outstanding policy issues identified to date.

IX. ENFORCEMENT

See attached Enforcement Strategy (for internal distribution only).

X. RECOMMENDATION

This decision document represents the selected removal action for the Nuclear Metals, Inc. Superfund Site in Concord, MA, developed in accordance with CERCLA, as amended, and is not inconsistent with the NCP. The decision is based on documents contained in the Administrative Record for the Site.

Conditions at the Site meet the criteria set out in the NCP Section 300.415(b)(2) due to:

"Actual or potential exposure to nearby human populations, animals or the food chain from hazardous substances or pollutants or contaminants" [§ 300.415(b)(2)(i)];

"Actual or potential contamination of drinking water supplies or sensitive ecosystems" [§ 300.415(b)(2)(ii)]; and

"The availability of other appropriate federal or state response mechanisms to respond to the release" [§ 300.415(b)(2)(vii)].

I recommend that you approve the proposed removal action. Your signature will also reflect that an exemption pursuant to Section 104(c) of CERCLA and Section 300.415(b)(5)(ii) of the NCP has been granted.

APPROVAL: _____ DATE: 09/28/15

DISAPPROVAL: _____ DATE: _____

Table 1: GROUNDWATER NTCRA
COST ESTIMATE SUMMARY

Feasibility Study
Nuclear Metals, Inc. Superfund Site

:Discount Rate **7.00%**

Item	Year	Unit Cost	Total Cost
CAPITAL EXPENDITURES			
Pre-Design Investigation			
Pump Test for 1,4-dioxane Containment System	1	$ 500,000	$ 500,000
Pre-design Investigation Subtotal			$ 500,000
Remedial Design			
Remedial Design	1	$ 165,200	$ 165,200
Remedial Action			
Hydraulic Containment	2	$ 299,700	$ 261,800
Ex-Situ Treatment	2	$ 1,701,800	$ 1,486,400
Groundwater Monitoring Wells	2	$ 81,600	$ 71,300
Professional Labor and Management	2	$ 412,200	$ 360,000
Remedial Action Subtotal			***$ 2,179,500***
Capital Expenditures - Subtotal			***$ 2,844,700***
Contingency (Capital Expenditures)	30%		$ 853,400
CAPITAL EXPENDITURES - TOTAL COST			**$ 3,698,000**
OPERATION, MAINTENANCE, MONITORING & REPORTING (OMM&R) COSTS			
Operation and Maintenance (O&M)			
General Operations	2-5	$ 250,000	$ 573,000
Advanced Oxidation System	2-5	$ 129,900	$ 297,800
Electricity Usage	2-5	$ 33,000	$ 75,600
O&M Subtotal			***$ 946,400***
Project Management			
Project Management	2-5	$ 100,000	$ 229,218
OMM&R Subtotal			***$ 1,175,618***
Contingency (OMM&R)	30%		$ 352,700
OMM&R - TOTAL COST			**$ 1,528,000**
TOTAL PROJECT COST - NET PRESENT VALUE	**7.0%**		**$ 5,226,000**

Notes:

A. Total costs are rounded to the nearest $100.

B. Future capital costs beyond Year 1 are subject to NPV calculation. Future discount rate is subject to change.

Assumptions:

1. Costs assume deed restrictions prohibiting groundwater use will be executed for the Site.
2. Hydraulic containment for the 1,4-dioxane plumes will consist of one (1) overburden extraction well with a depth of 100 ft and pumping rate of 2 gpm and two (2) bedrock wells with depths of 120 ft and pumping rates of approximately 1 gpm each.
3. Nine (9) monitoring wells will be installed in the vicinity of the extraction wells to demonstrate capture of the 1,4-dioxane plumes, three (3) in the overburden and six (6) in the bedrock.
4. Drill cuttings will be disposed on-site.
5. Well development water will be stored on-site and treated in the final system

12. This alternative is illustrated on Figure 3