Keefe Environmental Services Superfund Site, Epping, NH

U.S. EPA | SUPERFUND CLEANUP PROGRAM AT EPA NEW ENGLAND

THE SUPERFUND PROGRAM protects human health and the environment by locating, investigating, and cleaning up abandoned hazardous waste Sites and engaging communities throughout the process. Many of these Sites are complex and need long-term cleanup actions. Those responsible for contamination are held liable for cleanup costs. EPA strives to return previously contaminated land and groundwater to productive use.

YOUR OPINION COUNTS: OPPORTUNITIES TO COMMENT ON THE PLAN

EPA[1], as the lead agency, will be accepting public comments on this proposed cleanup plan from August 14, 2017 through September 13, 2017. You don't have to be a technical expert to comment. If you have a concern, suggestion, or preference regarding the Proposed Plan, EPA wants to hear from you before making a final decision on how to protect your community.

Comments can be sent by mail, email or fax. People also can offer oral or written comments at the formal public hearing (see page 17 for details). If you have specific needs for the public meeting or hearing, questions about the facility and its accessibility, or questions on how to comment, please contact Jim Murphy (see below).

Public Informational Meeting immediately followed by a Formal Public Hearing

MONDAY, AUGUST 28, 2017 AT 7:15PM

BOTH WILL TAKE PLACE AT: Epping Town Hall
157 Main Street, Epping, NH 03042
(603) 679-5441

[1]New Hampshire Department of Enviornmental Services (NHDES) is the support agency for the Site.

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law that established the Superfund program, this document summarizes EPA's cleanup proposal.
Detailed information on the investigations, cleanup and other documents contained in the Site's Administrative Record, and are available for review online at epa.gov/superfund/keefe

CLEANUP PROPOSAL SNAPSHOT

This Proposed Plan presents EPA's fundamental change to the current cleanup remedy for the Keefe Environmental Services Superfund Site (Site or Keefe Site) in Epping, NH. In a 1988 Record of Decision (ROD), EPA selected a cleanup remedy for the entire Site (for both soil and groundwater) which required the extraction and on-Site treatment of groundwater contaminated with volatile organic compounds (VOCs), predominately tetrachloroethylene (PCE), trichloroethylene (TCE), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA), and benzene, and vacuum extraction of VOCs from the soil. Prior to the issuance of the 1988 ROD, EPA required over 6,100 drums, four 5,000 gallon and four 10,000 gallon above-ground tanks to be

continued >

KEY CONTACTS:

CHERYL SPRAGUE
EPA New England
Remedial Project Manager
(617) 918-1244
sprague.cheryl@epa.gov

JIM MURPHY
EPA New England
Team Leader
Community Involvement
(617) 918-1028
murphy.jim@epa.gov

MICHAEL SUMMERLIN
NHDES
Project Manager
(603) 271-3649
michael.summerlinjr@des.nh.gov

GENERAL INFO:

EPA NEW ENGLAND
5 Post Office Square
Suite 100
Boston, MA 02109-3912
(617) 918-1111

TOLL-FREE CUSTOMER SERVICE
1-888-EPA-7341
epa.gov/superfund/keefe

EPA Uni i I Protecti

August 2017

printed on 100% recycled paper, with a minimum of 50% post-consumer waste, using vegetable-based inks

removed, the 700,000 gallon lined lagoon to be drained, and highly contaminated soils near the lagoon to be excavated and disposed of off-Site to stabilize Site conditions. A 1990 Explanation of Significant Differences (ESD) augmented the 1988 cleanup by removing a requirement for the vacuum extraction of Site soils as subsequent sampling showed that the concentrations of contaminants in the soils were already below the soil cleanup standards specified in the ROD. The remedy was again augmented in a 2005 ESD following the identification of a new contaminant, 1,4-dioxane, in groundwater. That ESD set forth a cleanup level of 3 ug/l and a system change from air-stripping to high pressure oxidation for the treatment of Site related VOCs, including 1,4-dioxane.

While these cleanup actions, performed since 1981, have significantly removed contaminant mass and reduced contaminant concentrations, groundwater contamination still remains elevated above drinking water standards at the Site. EPA is proposing to amend the 1988 ROD. The revised groundwater remedy will include monitored natural attenuation (MNA) of groundwater as a new component to attain cleanup in groundwater instead of extraction and on-Site treatment because MNA is expected to attain groundwater cleanup levels in a similar timeframe while retaining original components of the remedy which require restoration and management of the migration of contaminants.

New Remedial Components

- Reducing contaminant concentrations in groundwater through natural physical and biological processes (natural attenuation);
- Monitoring and assessing the natural attenuation of contaminants in groundwater within the Groundwater Management Zone (GMZ), where drinking water standards will eventually be achieved; and
- Managing the use of contaminated groundwater within the GMZ until cleanup levels are met in the future.

Retained Components from 1988 ROD remedy

- Controlling migration of contaminants in groundwater; and
- Restoring groundwater to meet cleanup levels.

Role of this Proposed Plan

Remedial actions have made significant progress towards reducing the mass and extent of contamination in groundwater which in turn, has lowered risk to potential receptors. Following the change in 2005 to address 1,4-dioxane, the groundwater treatment system operated for several years before periods of intermittent shut downs were implemented to better understand non-pumping conditions at the Site. At that time, concentrations of contaminants extracted from the groundwater were also decreasing to drinking water standards, to the point that operation of the pump and treat system was deemed to be no longer cost effective. However, because contaminant concentrations in groundwater remained in excess of drinking water standards, EPA and NHDES have undertaken investigations to ensure that the extent of contamination had stabilized (stopped spreading) under non-pumping conditions, that concentration trends were decreasing and to understand the ability of natural processes to further reduce concentrations to cleanup levels.

EPA's proposed amended remedy, including long term monitoring, has an estimated total cost of $1.67 million in the net present value[2]. The proposed remedy is expected to prevent the ingestion of contaminated groundwater at the Site while allowing natural processes to reduce residual concentrations to drinking water levels. It is expected that the lower concentration areas of the Site will attain cleanup levels in approximately 34 years while the higher concentration (central source) area may require up to 175 years to attain cleanup levels.

Because the extent of the groundwater contamination has stabilized, migration of contaminants beyond the current GMZ boundary is not expected. The Site is also ready for re-use. A more detailed description of this proposal is outlined in this document.

[2] "Present Value" is the amount of money set aside today to ensure that enough money is available over the expected life of the project, assuming certain conditions (e.g., inflation). The discount rate applied was 7% over 30 years.

Figure 1


MID 2000s AERIAL
1983 AERIAL
SOURCE:
AERIAL IMAGERY TAKEN FROM BING MAPS.
THIS MAP IS SUBJECT TO MICROSOFT'S
TERMS OF SERVICE, AND MICROSOFT IS
THE OWNER OF RIGHTS THEREIN.
SOURCE:
EPA
AERIAL IMAGERY COMPARISON
FOCUSED FEASIBILITY STUDY
KEEFE ENVIRONMENTAL SERVICES SITE
256 EXETER ROAD, EPPING, NEW HAMPSHIRE
CONCORD
NEW HAMPSHIRE
NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
Environmental Services
BEG
APR 2017
FIGURE 1
M:\Design\DWG\NHDES\Keefe\2016\FFS\aerials.dwg, FIG x-x, 4/4/2017 4:28:11 PM, GRARDEB, 1:1

SUMMARY OF THE PROPOSED PLAN

Following active remediation, including 18 years of extraction and on-Site treatment of contaminated groundwater under the Site, and following a careful study of the remaining contamination within the groundwater, EPA has determined it would be appropriate to change the remedy from pump and treat to monitored natural attenuation (MNA) as the final cleanup measure for groundwater. This change is appropriate because:

- ✓ There are no current users of ground water at the Site, and therefore there are no current risks;
- ✓ Studies performed since 2008 indicate that pump and treat is no longer an efficient means to reduce contamination to cleanup levels, and MNA would attain cleanup levels in approximately the same time frame;
- ✓ The plume has stabilized at the current boundaries following the shut down of the pump and treat system in 2011, and studies show that natural processes including dispersion, advection, along with natural occurring bacterial populations present in groundwater, will support the continued degradation of the chlorinated organics as well as the primary groundwater contaminant, 1,4-dioxane; and
- ✓ Institutional Controls, such as a Groundwater Management Permit and Groundwater Management Zone (GMZ) under New Hampshire regulations or a local ordinance, will be maintained and/or established for groundwater contamination associated with the Site. Within the GMZ, the use of groundwater, as well as the contaminant concentrations and remedy progress, will be monitored until drinking water standards are met.

EPA supports the use of an MNA approach for groundwater at the Keefe Site as the final action to protect human health and the environment.

A CLOSER LOOK AT EPA'S PROPOSAL

The 2017 Focused Feasibility Study (FFS) Report summarizes the recent collection of studies which collectively define the current understanding of the nature and extent of the contamination at the Site. (See Figure 2). Because active operations have already been employed at the Site, the FFS compares the use of MNA to attain cleanup against the current pump and treat groundwater remedy. The FFS also compares cleanup actions against a "no action" alternative as a basis for comparison. Based upon the alternatives evaluated in the FFS, EPA is proposing the following long-term cleanup approach for the entire Site:

Groundwater

EPA's preferred alternative for the groundwater cleanup is detailed in the FFS as Alternative MM-3: Monitored Natural Attenuation.

The term "Monitored Natural Attenuation" refers to the reliance on natural attenuation processes to achieve Site remediation objectives within a timeframe that is reasonable compared to that offered by other or more active methods. The natural attenuation processes include physical, chemical and biological processes that, under favorable conditions, act to reduce the mass, toxicity, mobility, volume or concentrations of contaminants. These processes include biodegradation, dispersion, dilution, sorption, transformation, degradation and destruction of contaminants.

An MNA remedy at the Site would include the following components:

- Long term monitoring to evaluate the efficacy of MNA to attain cleanup levels.
- Establishment and/or maintenance of institutional controls (e.g., GMZ, local ordinance) to eliminate the potential drinking water exposure pathway. Continuation of the GMP and GMZ which require monitoring of groundwater at the Site for concentration reduction, monitoring at the Site boundaries for plume migration and managing the use of groundwater until cleanup levels have been attained.
- Five-Year Reviews to assess protectiveness of the remedy.

The estimated total present value[2] of this proposed cleanup approach, including operation and maintenance and long term monitoring, is approximately $1.67 million. Each component of the preferred remedy is discussed in greater detail in the FFS.

Scope of the Proposed Plan

EPA's preferred alternative addresses residual groundwater contamination at the Keefe Site through monitored natural attenuation, ICs and Five-Year Reviews to attain the Remedial Action Objectives (RAOs) for the Site. The proposed revised RAOs call for the cleanup of groundwater over time to beneficial reuse standards, the limitation of migration of contaminants beyond their current extent, and the prevention of exposure to contaminated groundwater until the cleanup standards are achieved. This Proposed Plan includes monitoring to determine the progress and

efficacy of MNA to achieve cleanup standards over time. This monitoring will be used to inform a potential future decision to implement a contingent action if it is determined that the MNA remedy is not performing as expected, will not attain cleanup goals in the time frames expected, or is not protective.

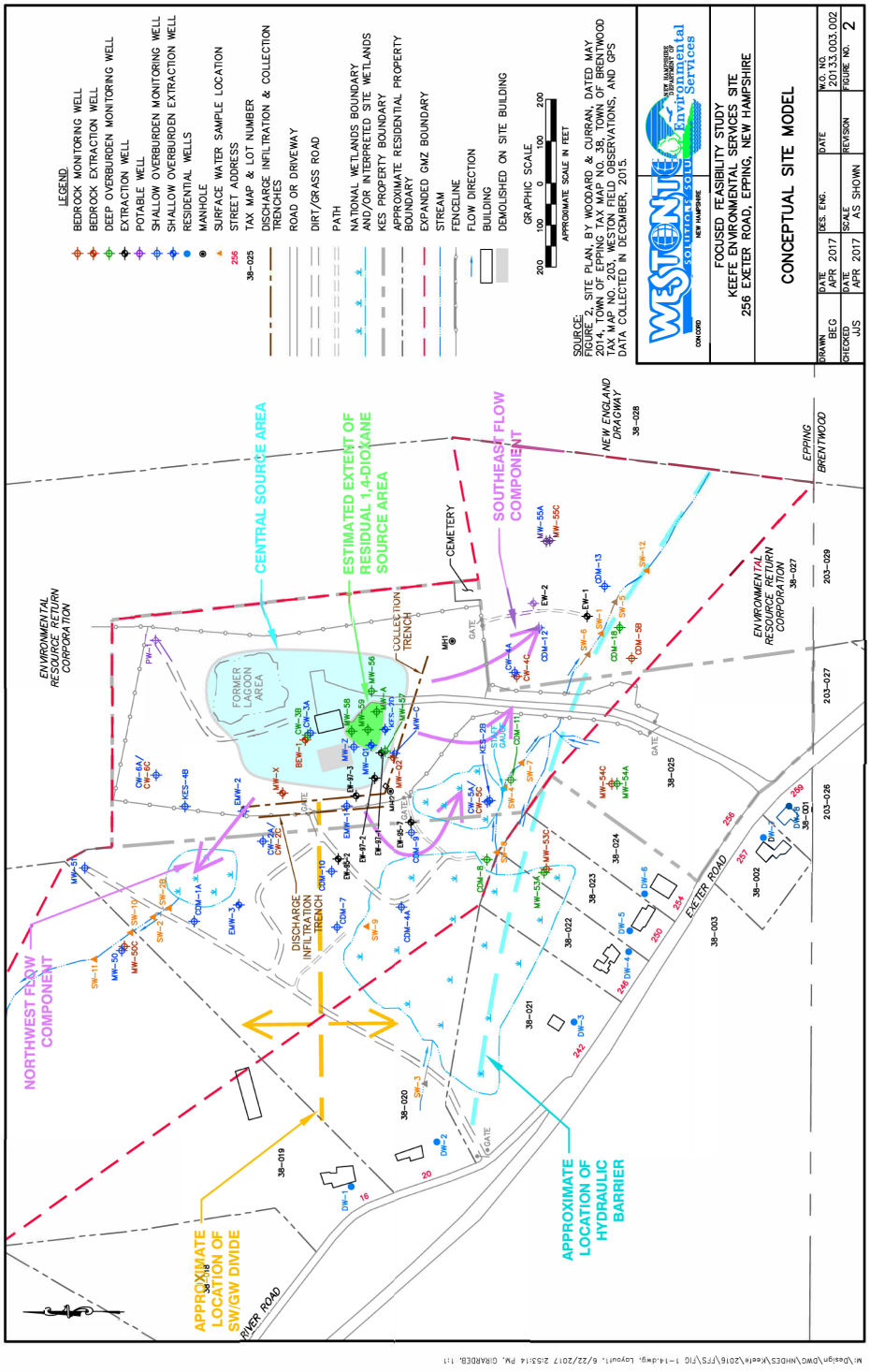
Institutional controls, such as a GMP and GMZ under New Hampshire regulations or a local ordinance, will be maintained and/or established for groundwater contamination associated with the Site. The current GMZ (See red dotted line in Figure 2) covers approximately 8 acres and accounts for the bifurcation of the groundwater flow from the central portion of the Site, towards the northwest, south and south-east boundaries. NHDES currently monitors the status of this GMZ to insure that use of groundwater use is managed and that contaminant concentrations are monitored until cleanup levels are met.

Five-Year Reviews will continue to be required to assess the protectiveness of the remedy under this alternative until groundwater cleanup standards are achieved.

SITE DESCRIPTION AND HISTORY

Keefe Environmental Services operated from 1979-1980 as a storage and treatment facility specializing in the handling of hazardous waste. This included the storage of hazardous substances in various sized drums and containers as well as use of a 700,000-gallon lined lagoon to provide a consistent waste stream for disposal.

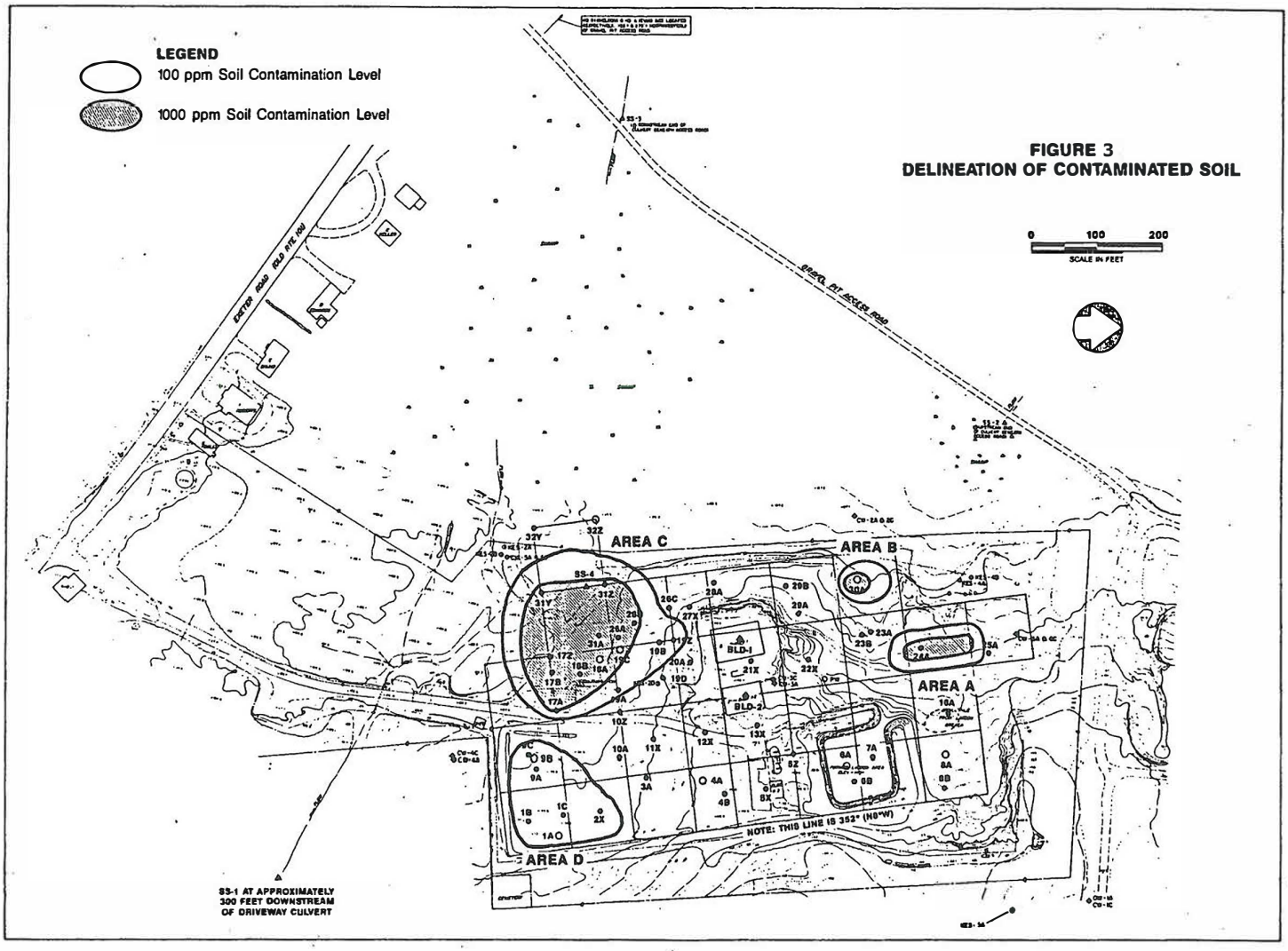
Figure 2



The predominant treatment activity consisted of bulking and blending of materials for disposal. Releases to the environment occurred primarily in the drum bulking area behind the buildings in the central portion of the Site as well as from lagoon overflow and runoff. This runoff traveled to several low areas at the property boundaries, however primarily travelled west towards a wetland at the edge of the property and into the nearby stream. (See Figure 3) Significant concentrations of chlorinated and other organic compounds and petroleum related aromatics were released into the soils and migrated into groundwater as a result.

Groundwater contamination from the central bulking area currently diffuses out from the lower till materials and migrates north-west towards the Piscassic River as well as south/south-east toward the Fresh River. The primary residual contaminant found in groundwater at the Site is 1,4-dioxane, although several products from the degradation of chlorinated solvents are also present. The initial treatment system was not able to treat 1,4-dioxane, and as a result this compound was circulated through the system and back into groundwater for many years. The change in treatment to high pressure oxidation in 2005 greatly reduced the mass, distribution and concentration of 1,4-dioxane present at the Site.

Figure 3



Groundwater at the Site is considered a potential drinking water source. The residual contamination resides primarily in the overburden and shallow bedrock aquifers. The Human Health Risk Assessment (HHRA), conducted as part of the original Remedial Investigations (RI) and updated in 2005, indicated that while there is no current use or exposure to groundwater at the Site and therefore no current Site risk, future hypothetical risks are related to the potential ingestion of contaminated groundwater by future users of the Site.

Several nearby residents utilize deep bedrock wells for their drinking water supply. These residential supply wells have been sampled routinely since 2003 and annually since 2008. Concentrations of Site related contamination has never been detected, indicating there is no exposure pathway to nearby residential receptors through the ingestion of Site groundwater.

An upgradient, on-Site deep bedrock well (comparable to the depths of the nearby residential properties) has also been monitored annually which has indicate no Site related contamination. This well does exhibit elevated arsenic, a naturally occurring metal found in groundwater across the State of New Hampshire. This deep bedrock well supplied non-potable water to facilities at the treatment plant during operation.

Both a groundwater and surface water divide are evident on Site which affects the direction of flow of groundwater as well as the migration of contaminants. Groundwater also flows in a downward direction within the central source area of the Site, and decreases in downward gradient as it approaches the current GMZ boundaries, until in the southern portion of the Site, groundwater has an upward gradient, discharging water into the nearby intermittent streams. (See Figure 2).

Remedial Activities

The 1983 action requiring the removal of the on-Site waste containers, the draining of the 700,000 gallon lined lagoon, and the excavation and off-Site disposal of highly contaminated soils near the lagoon removed the significant threat of further environmental release at the Site. During the 1993-2011 operations, over 149 million gallons of groundwater have been extracted, treated and re-infiltrated back into the ground.

In 1992, soils, excavated from near the source area to construct the infiltration trench for the groundwater treatment system, were placed into the former lagoon. From 1993 until 2005 precipitation percolated through these soils and the resulting leachate captured and treated within the groundwater treatment system, until contamination was no longer detected in the leachate. As part of the 2005 ESD, soil sampling confirmed only a small volume of these soils still contained semi-volatile organic compounds at levels of potential concern related to future contact and ingestion, and as such, these soils were excavated and disposed of in an off-Site landfill. That action was followed by the dismantling of the lagoon system and regrading and reseeding of this area, thus completing the cleanup for Site soils.

In 2017, additional soil samples were collected within the central source area as part of FFS. Based on those results, which were below risk based screening levels, EPA determined that potential exposure to Site soils via future residential or recreational use would not result in an unacceptable risk.

Because contaminants are present in groundwater above drinking water levels, institutional controls (ICs) are required for the protection of human health from potential ingestion of contaminated groundwater. A GMP and GMZ were first established at the Site in 2006 and have continued to be an integral component of the remedy. The GMZ allows for exceedances of groundwater contaminants to be addressed through remediation and/or monitoring, until those exceedances no longer exist. The GMP requires a contingency plan to provide potable drinking water within the GMZ, if needed. The current GMZ includes the former Keefe property, now a town-owned property, as well as portions of abutting properties. (See Figure 2)

Recent Investigations

Pump and treat operations have dramatically reduced the extent and concentrations of VOCs originally found released into the groundwater at the Site. In addition, the natural degradation of chlorinated compounds into degraded chlorinated "daughter products" has altered the chemical composition of the compounds which remain in the groundwater.

Table 1 includes the cleanup levels set in 1988 for the original compounds, the cleanup level for 1,4-dioxane set in the 2005 ESD, as well as the proposed cleanup level for degradation daughter products which currently exceed their drinking water standards.

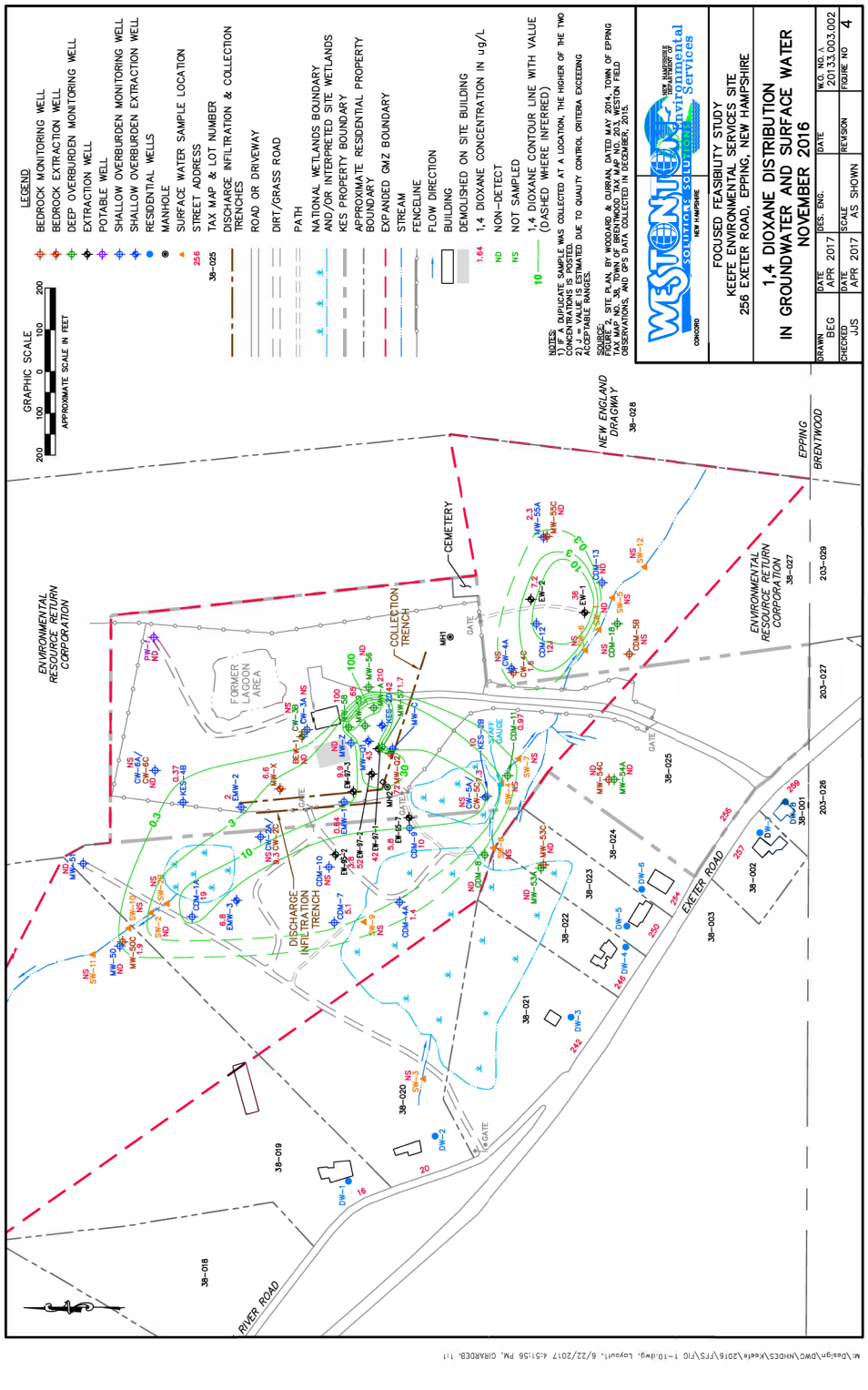
The overall lateral extent of 1,4-dioxane remaining in groundwater is shown in Figure 4. The lateral extent of the 1,4-dioxane is significantly larger than that of other VOCs, which is typical for this compound due to its increased solubility

and mobility in groundwater. As such, understanding 1,4-dioxane was the focus for recent groundwater investigations and basis for this Proposed Plan.

Chlorinated solvents, such as TCE and PCE, can be reduced to lesser chlorinated compounds through natural attenuation and de-chlorination under anaerobic (low oxygen) conditions. 1,4-dioxane is a stable compound, not typically amenable to natural attenuation in those same conditions, does not form daughter products, and does not readily volatilize. As such, it tends to stay dissolved in groundwater, moving easily through aquifers ahead of other compounds.

Following years of active remediation to control the migration of contaminants and reduce the mass and concentration of contaminants, it has become apparent that the current pump and treat remedy has performed as expected, however will not be a cost effective means to complete the attainment of cleanup standards in groundwater. The 1988 cleanup remedy expected the pump and treat operations to continue until influent and groundwater concentrations attained cleanup standards. The 1988 Remedy expected the Site to attain cleanup within five years; however, the pump and treat system operated for 18 years. Currently the residual source of contamination, located within tight soil materials in the central source area, is not easily removed by continuous operations, as pumping pulls groundwater from cleaner, more transmissive areas toward the treatment operations in much greater volume than from the contaminated, tighter central source area. EPA investigated the use of MNA as final cleanup measure toward attainment of cleanup levels after determining that

Figure 4



the plume has stabilized, concentration trends were primarily decreasing across the Site, and because the time frame to reach cleanup levels for MNA is comparable to continued pump and treat operations for less cost.

Recent studies indicate that 1,4-dioxane could degrade in the subsurface by naturally occurring bacterial populations under aerobic conditions. From 2013 through 2014, a Site specific study was performed to evaluate whether conditions existed which would allow for natural biodegradation processes to reduce concentrations of 1,4-dioxane to drinking water standards.

The 2014 MNA Technical Memorandum (Woodard & Curran) details the two phases of this study. Phase 1 assessed the Site's groundwater for the presence of 1,4-dioxane degrading bacteria/enzymes. The results of this initial phase indicated that despite the prevalence of anaerobic conditions, bacterial genes and enzymes were found in elevated amounts within the plume area, suggesting that natural bacteria capable of degrading 1,4-dioxane were present. Phase 2 utilized a unique carbon fraction (^{13}C), 1,4-dioxane baited column, placed into groundwater monitoring wells within the contaminated plume. Using stable isotope probing methods, these baited traps indicated that the persistent bacterial population present in the groundwater at the Site, actively incorporated 1,4-dioxane into its lifecycle in a growth capacity. In addition, the study found that the propensity to support bacterial community growth is direct evidence that the biological degradation processes are self-sustaining and that the on-going degradation of 1,4-dioxane will retard its migration along groundwater flow paths, providing plume stability.

Following the collection of this information, modeling was performed to ascertain contaminant transport and thus an estimate of the time required to achieve cleanup goals for VOCs and 1,4-dioxane, as well as to predict the extent of the plume under non-pumping conditions. These model results indicate that lower concentration areas of the Site would attain cleanup levels in approximately 34 years and, in the meantime, the extent of the 1,4-dioxane plume will remain within the current GMZ boundary.

Currently, the properties of the glacial till unit in the central source area prevent the efficient withdrawal of the remaining residual contaminants by pumping. Reverse matrix diffusion, or back diffusion, now controls the rate that groundwater will be cleaned up in the central source area. Because the back diffusion of contaminants from the low-permeability till into the more transmissive zones is controlled largely by the contaminant concentration gradient, it is a slow process. As a result, it is anticipated that the areas of the plume farthest from the central source area will attenuate via dilution, dispersion, and biodegradation processes and attain cleanup levels faster than the near source areas where the back diffusion processes are expected to maintain higher concentrations longer.

Matrix Diffusion modeling was conducted in 2016 to ascertain the timeframe for 1,4-dioxane to attain cleanup in the central residual source area, where elevated concentrations of 1,4-dioxane remain at depths 15 to 80 feet below ground within the till material which exhibits a very low hydraulic conductivity (water movement of less than 0.5 feet per day). It is estimated that within the roughly 7,600 square feet of this material, 1.3 pounds of 1,4-dioxane remain dissolved, yielding concentrations in the central source area groundwater currently up to 390 ug/l. The results of this model indicate that back diffusion of 1,4-dioxane from the till material will keep concentrations in groundwater in this area above the 3 ug/l cleanup level for approximately 175 years.

Comparatively, it is estimated that the remainder of the much larger, lower concentration plume area contains a total residual mass of roughly 12.8 pounds of 1,4-dioxane and concentrations currently ranging from non-detect to 52 ug/l. The overall extent of the plume is stable, and decreasing concentration trends are seen in monitoring wells, downgradient of the central residual source area. The hydrology at the Site further supports plume stabilization by minimizing the migration of contaminants in groundwater under non-pumping conditions.

WHY CLEANUP IS NEEDED

Releases which occurred to the environment as a result of past operations at the Keefe Site resulted in the contamination of groundwater in the overburden aquifer which has the potential to be used in the future as a drinking water. VOCs above acceptable levels for drinking were found in the groundwater. Remediation efforts have reduced the volume and extent of the contamination; however, additional actions are required to address the potential human health risk associated with future ingestion associated with the level of contamination in groundwater. The remedy currently being implemented at the Site, pump and treat, has been deemed to no longer be cost effective, following 18 years of operation.

Risk and Exposure Pathways Considered

Exposures occur when people eat, drink, breathe or have direct skin contact with a substance or waste material. Based on existing or reasonably anticipated future land use, EPA develops different exposure scenarios to determine potential risks, and appropriate cleanup actions, as needed to meet the Site cleanup goals. Currently, the Town of Epping owns the former Keefe property at the Site.

The HHRA was originally conducted as part of the 1988 RI, included an evaluation of potential cancer risks and non-cancer health effects as a result of exposure to Site contaminants in groundwater and soils (assuming no additional remediation was performed) and helped evaluate whether or not remedial response actions were warranted. A 2005 HHRA re-evaluated current and potential future risks at the Site to youth trespassers from exposures to Site soil, surface water and sediments as well as for future workers from exposure to Site soil, groundwater and indoor air.

Because there are currently no residents or other users of groundwater at the Site, and no off-Site or nearby residents known to be exposed to contaminated groundwater from the Site, there is no current exposure to groundwater and therefore no current risk. There are also no ecological exposure concerns at the Site, nor vapor intrusion pathways of concern (volatilization of contaminants from groundwater), nor pathways of concern related to the remaining soils at the Site.

The collective Human Health Risk Assessments, summarized in the FFS, determined that human health risk exists only for future potential exposure to contaminants from drinking contaminated groundwater.

How is Risk to People Expressed?

In evaluating risk to humans, estimates for risk from carcinogens and non-carcinogens (chemicals that may cause adverse health effects other than cancer) are expressed differently.

For carcinogens, risk estimates are expressed in terms of probability. For example, exposure to a particular carcinogenic chemical may produce an increased chance of causing 1 excess cancer in 10,000 exposed individuals over an estimated lifetime of 70 years. This can also be expressed as 1×10^{-4}. The EPA acceptable risk range for carcinogens is 1×10^{-6} (1 in 1,000,000) to 1×10^{-4} (1 in 10,000). In general, calculated risks higher than this range would require consideration of clean-up alternatives.

For non-carcinogens, exposures are first estimated and then compared to a reference dose (RfD). RfDs are developed by EPA scientists to estimate the amount of a chemical a person (including the most sensitive person) could be exposed to over a lifetime without developing adverse health effects. The exposure dose is divided by the RfD to calculate the measure known as a hazard index (HI) (a ratio). An HI greater than 1 suggests that adverse effects may be possible.

CLEANUP ALTERNATIVES CONSIDERED

Cleanup alternatives were developed to address the potential future risks related to groundwater and to achieve the RAOs for the Site.

The 1988 ROD identified the following RAOs for groundwater at the Site:

- Prevent or mitigate migration of contaminants beyond their current extent.
- Eliminate or minimize the threat posed to the public health, welfare and environment from the current extent of contaminant migration.

These groundwater RAOs were further modified for this proposed cleanup plan to the following:

- Prevent potential ingestion by a future worker or recreational user to groundwater impacted by the Site with VOCs (including 1,4-dioxane), semivolatile organic compounds or inorganic contaminants at concentrations that exceed applicable or relevant and appropriate requirements (ARARs) or risk-based standards.
- Restore groundwater within the GMZ to its beneficial use as a potential drinking water supply by meeting ARARs including federal MCLs, State ambient groundwater quality standards (AGQS), or in their absence, by meeting risk-based standards.
- Limit migration of VOCs (including 1,4-dioxane), semivolatile organic compounds, and inorganic compounds in groundwater beyond the GMZ at concentrations that exceed ARARs or risk-based standards.

KEEFE ENVIRONMENTAL SERVICES SUPERFUND SITE HISTORY

Following the 1983 Site Stabilization Actions and the 1988 ROD, the major events, in addition to annual monitoring of Site groundwater and completion of Five-Year Reviews in 1993, 1997, 2003, 2008, and 2013, were:

- **1993:** Construction and operation of the groundwater collection and treatment plant to manage migration of groundwater containing VOCs.
- **1994:** The existing groundwater collection system was optimized to improve plume capture through the addition of two extraction wells.
- **1997:** Groundwater collection was again optimized through the addition of three addition extraction wells
- **2003:** The emerging contaminant 1,4-dioxane was first analyzed in groundwater and found to be present at high concentrations in discharge water from the groundwater treatment system.
- **2005:** The existing groundwater treatment system was replaced with an advanced oxidation component to treat the 1,4-dioxane. An ESD was issued that established a cleanup level of 3.0 micrograms per liter (µg/L) for 1,4-dioxane. 893 tons of contaminated soil placed in the former lagoon, along with the lagoon liner and piping materials were excavated and removed from the Site and transported to regulated facilities, allowing grading and final closure of the former lagoon area.
- **2006:** A Groundwater Management Permit (GMP) was issued for the Site requiring regular monitoring of groundwater and surface water at the Site. The GMP established a Groundwater Management Zone (GMZ) around the plume that delineated the area of impacted groundwater subject to monitoring under the GMP.
- **2006:** In December, operation of the groundwater treatment plant was temporarily suspended to assess contaminant rebound under static (non-pumping) conditions.
- **2009:** Operation of the groundwater treatment plant was re-started as continuous operations after 28 months of cyclic intermittent pumping which allowed for a rebound study. Operations were optimized to include the use of several source area monitoring wells for additional groundwater extraction.
- **2011:** Operation of the groundwater treatment plant was suspended to allow for a study to assess contaminant migration, contaminant concentration reduction through natural attenuation, plume stability, and an evaluation of a potential MNA remedy protectiveness under non-pumping conditions.

A detailed description and analysis of each alternative developed to meet these RAOs are presented in the FFS, available for public review. (See Page 17 for information on where you can find Site related documents) The proposed cleanup levels provided in Table 1 for groundwater are protective of human health. Below is a summary of the focused development and comparison of the current ROD remedy (pump and treat) to both a No Action alternative and the proposed MNA alternative.

MM1: No Action – This alternative does not include any additional actions to monitor the levels of contamination that remain in the groundwater.

Under this alternative, no further action related to the treatment, reduction, or monitoring of contaminants in groundwater would occur. Any reduction in the toxicity, mobility, or volume of contaminants would occur as a result of on-going natural attenuation processes; however, because the Site contamination would not be monitored, any further reduction or potential migration of groundwater contamination would not be known. No Five-Year Reviews would be performed to assess protectiveness and no monitoring of institutional controls would occur. This alternative represents the minimum proposed remedial action for addressing the remaining contamination at the Site.

There are no costs associated with this alternative.

MM2: Groundwater Extraction and Treatment Alternative – This alternative is the current groundwater remedy. The 1988 ROD indicated that cleanup levels would be attained in approximately 5

years; however, system optimization and rebound studies have been required, and operations have continued for 18 years.

In April 2009, additional monitoring wells, located within the central source area, were converted to extraction wells to increase influent concentrations and reduce source concentrations. At the time of the shutdown in December 2011, the groundwater concentrations entering the system were already at or near drinking water standards and further treatment was not deemed to be cost effective. As such, resuming operation of the groundwater extraction and treatment system would be primarily to actively manage the migration of contaminated groundwater.

Resuming operation would require restoration and/or optimization or modification of the current system; upgrading, repairing, or replacing broken and aged equipment; obtaining the necessary supplies for day-to-day operations; and Operation and Maintenance (O&M). Recharge of the treated groundwater would continue through the infiltration trench and/or through spray irrigation. In addition, this alternative would include:

- Long-term groundwater monitoring.
- Maintaining or establishing new institutional controls (e.g., GMZ, local ordinance) to monitor groundwater concentrations and use.
- Five-Year Reviews to assess remedy protectiveness.

The time required to achieve cleanup goals in all areas of the Site under this alternative is estimated to be 34 to 175 years, however for the purpose of alternative comparisons within the FFS, a remedial period of 30 years was used as the basis for the cost estimate. The continued operations of the current remedy will cost approximately $537,000 in capital costs and $3,133,000 in operation and maintenance.

MM3: Monitored Natural Attenuation: This alternative includes reliance on naturally occurring hydraulic barriers to manage the extent of downgradient migration, while allowing for natural attenuation of the contaminants within the GMZ to attain cleanup levels. This alternative includes performance monitoring and consideration of a contingency remedy should it be deemed necessary in the future.

As the basis for the consideration of the MNA alternative, several lines of evidence which indicate that:

1. active reductive dechlorination of chlorinated volatile organic compounds (CVOCs) has reduced the area and concentrations of CVOCs in groundwater at the Site;
2. sufficient quantities of aerobic bacteria that utilize 1,4-dioxane as a substrate for growth are present at the Site in sufficient quantities, resulting in the degradation of 1,4-dioxane within the plume;
3. the Site-specific hydraulics and MNA processes are currently managing the migration of the plume such that groundwater can be monitored effectively within the GMZ boundary;
4. the lateral extent of the plume is considered to be stable while interior portions continue to adjust to non-pumping conditions, and, overall, concentrations continue to decrease;
5. the discharge of the plume into the surface water at the Site results in concentrations of 1,4-dioxane at very low levels, which pose no significant risk to human health or the environment;
6. Site specific modeling suggests that attainment of cleanup levels is likely within the majority of the plume in less than 34 years, although back diffusion associated with residual source contamination trapped within a low permeability layer will extend the time required to achieve cleanup goals in the immediate vicinity of the central source area until the 1,4-dioxane mass within the low permeability layer is eventually depleted; and
7. in the meantime, the on-Site use of groundwater will be monitored under a GMZ until cleanup levels are attained or deemed otherwise protective.

EPA believes ten years of performance monitoring will be needed to determine the effectiveness of this MNA alternative to meet the RAOs as expected. An evaluation of the performance monitoring data against decision criteria towards overall effectiveness and attainment of the RAOs will allow for a future consideration of a contingency action, if deemed necessary. The performance monitoring would be reviewed against the following Decision Criteria:

Decision Criteria 1: Contaminant concentrations across the entire plume are not decreasing at a sufficiently rapid rate such that the RAOs may not be attained, or are otherwise exhibiting an increasing trend not originally predicted such that the MNA remedy is no longer considered to be effective or protective.

Decision Criteria 2: Wells near the presumed source area exhibit concentrations that are deemed to 1) increase the time to attain cleanup standards; or 2) otherwise prevent the effectiveness of MNA in downgradient areas to reach cleanup levels; or 3) allow for the migration of contaminants to areas not originally predicted; or 4) otherwise call into question the protectiveness of the MNA remedy.

Decision Criteria 3: The detection of contaminants in monitoring wells located outside of the GMZ boundary or other compliance monitoring location indicate the migration of VOCs, including 1,4-dioxane, in groundwater beyond the GMZ at concentrations that are deemed to exceed ARARs or risk-based standards and pose unacceptable risks to off-Site receptors.

If it is determined that the MNA remedy is not performing as expected through the review of the three decision criteria, a future decision document will be issued that changes the remedy to meet protectiveness and ARARs standards.

The time required to achieve cleanup goals in all areas of the Site under this alternative is estimated to also be 34 to 175 years, however for the purpose of alternative comparisons within the FFS, a remedial period of 30 years was used as the basis for the cost estimate. This alternative will cost approximately $131,000 in capital costs and $1,506,000 in maintenance and monitoring.

COMPARISON OF CLEANUP ALTERNATIVES

The alternatives considered for groundwater were compared with each other to identify how well each alternative meets EPA's evaluation criteria. The following discussion and Table 2 present a general comparison

THE NINE CRITERIA FOR CHOOSING A CLEANUP PLAN

EPA uses nine criteria to evaluate cleanup alternatives and select a final cleanup plan. EPA has already evaluated how well each of the cleanup alternatives developed for the Keefe Superfund Site meets the first seven criteria in the Focused Feasibility Study. Once comments from the state and the community are received and considered, EPA will select the final cleanup plan.

1. **Overall Protection of human health and the environment:** Will it protect you and the plant and animal life on and near the Site? EPA will not choose a cleanup plan that does not meet this basic criterion.
2. **Compliance with Applicable and Relevant and Appropriate Requirements (ARARs):** Does the alternative meet all federal and state environmental statutes, regulations and requirements? The cleanup plan must meet this criterion unless a waiver is invoked.
3. **Long-term effectiveness and permanence:** Will the effects of the cleanup plan last or could contamination cause contamination cause future risk?
4. **Reduction of toxicity, mobility or volume through treatment:** Using treatment, does the alternative reduce the harmful effects of the contaminants, the spread of contaminants and the amount of contaminated material?
5. **Short-term effectiveness:** How soon will Site risks be adequately reduced? Could the cleanup cause short-term hazards to workers, residents or the environment?
6. **Implementability:** Is the alternative technically feasible? Are the right goods and services (i.e. treatment equipment, space at an approved disposal facility) available?
7. **Cost:** What is the total cost of an alternative over time? EPA must select a cleanup plan that provides the necessary protection for a reasonable cost.
8. **State Acceptance:** Do State environmental agencies agree with EPA's proposal?
9. **Community Acceptance:** What support, objections, suggestions or modifications did the public offer during the public comment period?

of the alternatives. More detailed evaluations and comparisons of alternatives are included in the 2017 FFS.

Overall Protection of Human Health and the Environment

Each of the alternatives, except MM1: No Action, will be protective of human health and the environment by providing protection from contaminated groundwater through the implementation of institutional controls. The No Action alternative, MM-1, would not be protective because no monitoring or evaluation of the contamination that remains in the aquifer would occur and no institutional controls would remain in place monitoring the use of groundwater.

Alternative MM-2 would be the most protective in the short term as the use of the pump and treat system would actively manage the migration of the contaminants at the Site, while MM-3 allows for natural passive processes to reduce contaminant concentration and migration at the Site. Both Alternatives MM-2 and MM-3 would be equally protective in the long term because both require an extended timeframe (34 to 175 years) to reduce 1,4-dioxane concentrations to below the cleanup goal in all areas of the Site.

Overall, protectiveness would be confirmed through monitoring of the groundwater within the GMZ. In the meantime, use of groundwater at the Site within the GMZ would be addressed by institutional controls. Because MM-3 relies on natural attention processes, and consistent with EPA guidance, this alternative also includes a contingency review to assess the efficacy of MNA to attain cleanup levels and minimize migration and, therefore, maintain protectiveness at the Site. Finally, because contaminants would remain at the Site above drinking water levels, an evaluation of the remedial progress would continue every 5 years to determine whether the remedy continues to be protective of human health and the environment.

Compliance with Applicable or Relevant and Appropriate Requirements

Alternative MM-1 would not comply with chemical specific ARAR requirements because there is no monitoring included to confirm that cleanup levels will be attained in the future.

Alternatives MM-2 and MM-3 are expected to meet all chemical-specific ARAR requirements.

Long-Term Effectiveness and Permanence

Because there is no evaluation of conditions under Alternative MM-1, attainment of cleanup levels cannot be ascertained and the magnitude of the residual risk would be unknown. There is also no monitoring of institutional controls in place to prevent exposure to Site contaminants that could result in a potential future unacceptable risk.

Both Alternatives MM-2 and MM-3 will reduce the concentration of contaminants in groundwater to acceptable levels over a long period of time and, therefore, the magnitude of the residual risk will be gradually reduced. Long-term monitoring would be conducted to confirm that levels continue to decline and attain cleanup levels. Monitoring is a highly-reliable method to evaluate the remaining residual contamination and provide advance notice if changes in contaminant levels and/or extent represent a risk to potential receptors. In addition, both of these alternatives include institutional controls to prevent a potential future unacceptable risk from known groundwater contamination.

Alternative MM-2 is estimated to attain cleanup levels in groundwater between 34 and 175 years. While the matrix diffusion rate may be slightly lower under non-pumping conditions (slightly less water flow), alternative MM-3 is expected to result in a similar cleanup timeframe.

Both the predicted cleanup timeframes for these alternatives provide a range as portions of the Site are expected to attain cleanup standards at different times, with the residual central source area taking the longest to achieve criteria. Therefore, both alternatives are expected to attain cleanup levels equally in the long term, and in the near-term, the Site would remain protective through the implementation of institutional controls on the use of groundwater.

Reduction of Toxicity, Mobility, and Volume Through Treatment

The most significant remaining issue at the Site is that a relatively small residual area of elevated 1,4-dioxane concentrations exists and back diffusion from that area is maintaining elevated concentrations in downgradient groundwater. Alternative MM-1, No Action, would likely reduce the toxicity, mobility, and volume of groundwater contaminants through natural processes, including biodegradation, dilution, and discharge to surface water. However, no monitoring of conditions under MM-1 would occur to verify these presumed reductions of groundwater contaminants.

Alternative MM-2 would actively limit off-Site migration of the groundwater plume through continued operation of the collection and treatment system. The degree of treatment would again be limited by the rate at which 1,4-dioxane back diffuses out of the area of elevated concentrations in the low-permeability layer, and the dilution of influent concentrations via the extraction of progressively cleaner groundwater will continue to reduce concentrations treated. The collected contaminants would be destroyed via the high pressure oxidation process, resulting in residuals for off-Site disposal, while allowing for discharge of treated groundwater back to the ground.

Alternative MM-3 would rely on natural processes including biodegradation, dilution, and discharge to surface water to reduce the toxicity and volume of remaining groundwater contaminants to acceptable levels. Lines of evidence for ongoing natural biodegradation of dissolved contaminant, including 1,4-dioxane, were presented in the FFS. This alternative would rely on natural groundwater flow conditions (groundwater divide and natural hydraulic barrier) to limit mobility of the contaminants, along with biodegradation. Contaminant reductions through natural biodegradation are irreversible. Remediation under MM-3 would not result in any treatment residuals. The 1,4-dioxane plume will achieve dynamic equilibrium with the natural attenuation processes and the back diffusion rate, resulting in a stable plume within the boundaries of the existing GMZ.

Short-Term Effectiveness

Under Alternative MM-1, there would be no short-term impacts from construction/implementation to the community, workers, or the environment because no actions would be undertaken under this alternative. It is assumed that the amount of time needed to achieve cleanup levels would be the same as for Alternatives MM-2 and MM-3, but because this alternative does not include monitoring, there would be no way to confirm that.

Because MM-2 has already been built and does not presently require any new monitoring locations, no significant community or environmental impacts are expected from construction under this alternative. Construction activities associated with implementation of this alternative would include treatment system O&M, establishing and/or maintaining institutional controls, and groundwater sampling.

Construction related to MM-3 would include the decommissioning of the treatment system within the building, as well as trench and extraction well systems. As noted earlier, there are no current or future potential unacceptable risks related to soils and therefore, this construction impact would be temporary and no environmental, worker, or community impacts are expected.

Implementability

The No Action alternative, MM-1, requires no implementation.

The groundwater extraction and treatment system for MM-2 is already in place and was previously operated effectively to control the contaminant plume at the Site. The treatment plant was shut down and winterized in December 2011. The effort required to resume operation would include restoration of winterized equipment, upgrading, repairing or replacing broken and aged equipment, and obtaining supplies necessary for day-to-day operations. Pumping from the existing groundwater extraction network would be expected to manage migration of the current plume.

Although groundwater concentrations would slowly decline and eventually achieve cleanup goals under pumping conditions, reestablishment of the plume would be expected if the system was discontinued before contaminants had been depleted in the residual 1,4-dioxane concentration area within the low-permeability layer. Diffusion of contaminants out of this low-permeability till would be the time-limiting factor in the permanent, long-term attainment of cleanup goals. There are no significant technical issues associated with groundwater monitoring or establishing and/or maintaining institutional controls.

Alternative MM-3, MNA, can be easily implemented, as the existing monitoring well network is considered sufficient in the near-term and there are no significant expected technical issues associated with groundwater monitoring or establishing and/or maintaining the institutional controls. Because of the reliance on newer science related to understanding the potential for natural degradation of 1,4-dioxane in the subsurface and the lack of measureable breakdown products from 1,4-dioxane, it is expected that ten years of performance monitoring is required to verify the success of an MNA alternative including demonstrating that MNA is occurring as expected. Monitoring of groundwater will also verify that the plume is not expanding or impacting receptors; will be needed as part of the institutional controls; and will verify attainment of the cleanup standards. The MM-3

Alternative, as required, includes a future contingency plan review, should monitoring results indicate that MNA is not sufficiently maintaining protectiveness, will not attain cleanup standards in an acceptable timeframe, or otherwise will not meet remedial objectives for the Site.

Cost

Net present value costs based on a 30-year time period and 7% discount rate were developed for comparison of the alternatives. The total net present value costs for these alternatives are presented in the table below:

(see below)

The cost for continued operation of the groundwater collection and treatment system (MM2) is more than double the cost for implementing the MNA alternative(MM3) (not considering possible implementation of a contingency action in the future), primarily due to the ongoing need for O&M of the treatment system.

The MNA alternative remedy provides similar overall protection in a similar timeframe, and allows for performance monitoring and review of remedy progress at significantly lower cost than the continued operation of the groundwater extraction and treatment remedy.

Alternative MM1: No Action:	No Costs
Alternative MM2: Continued ROD Remedy:	$3.670 million
Alternative MM3: MNA:	$1.637 million

State Support:

NHDES, the support agency for Site activities, has been actively involved in all substantive discussions regarding the Site and the cleanup. NHDES has indicated its support for Monitored Natural Attenuation as identified in this Proposed Plan for the groundwater under the Site.

WHY EPA RECOMMENDS THIS CLEANUP PROPOSAL?

EPA recommends that additional cleanup measures are still necessary for groundwater under the Site because while the risk assessment reveals that there is no current threat to public health, there are future risks related to ingestion of contaminated groundwater at the Site. While the former Keefe property is zoned commercial/industrial, reuse of the property for recreation was considered in the EPA evaluation of exposure and risk.

EPA believes that the proposed fundamental change to the MNA alternative presented in this Proposed Plan will meet the RAOs, protect human health and achieve the best balance among EPA's nine criteria. The final criteria, State and Community acceptance, will be considered following public comment.

The MNA cleanup approach provides short and long-term protection of human health and the environment, and because no additional substantial benefits are associated with resuming groundwater extraction and treatment with respect to a reduction of cleanup timeframe or reduction of human health risks, resuming operation of the groundwater extraction and treatment system does not appear more reasonable or necessary to maintain protectiveness at the Site.

Institutional controls, such as a GMP and GMZ under New Hampshire regulations or a local ordinance, will be maintained and/or established for groundwater contamination associated with the Site. Groundwater at Site will continue to be managed by a GMZ which requires the monitoring of groundwater concentrations and use until cleanup levels are met. It is estimated that approximately 34 years would be required for groundwater to reach cleanup levels for 1,4-dioxane at the GMZ boundary areas and approximately 175 years in the immediate vicinity of the central residual source area. Monitoring within the GMZ is a long term measure, as is the review of remedy protectiveness under the Five-Year Reviews, until cleanup levels are attained.

WHAT IMPACTS WOULD THIS HAVE ON THE LOCAL COMMUNITY?

There are no impacts to the community from this proposal, rather this proposal allows for the Town of Epping to move forward and develop a reuse for the Site.

NEXT STEPS

After the public comment period, EPA expects to review and evaluate all comments received on this proposal and will issue a ROD amendment for groundwater. This ROD amendment, modifying the 1988 ROD, will be a written document that describes the chosen cleanup plan, and includes a summary of responses to any public comments (the Responsiveness Summary). Once signed, this document will then be made available to the public on the EPA WebSite for the Keefe Site. EPA will announce the final decision on the cleanup plan through the local media and via EPA's webSite.

WHAT IS A FORMAL COMMENT?

EPA will accept public comments during a 30-day formal comment period – August 14 through September 13, 2017. EPA considers and uses these comments to improve and understand support for its cleanup approach. EPA will hold an informational meeting prior to the start of the formal Public Hearing. EPA can accept written comments via mail, email, and fax. Additionally, verbal comments may be made during the formal Public Hearing, during which a stenographer will record all offered comments during the hearing. EPA will not respond to your comments during the formal Public Hearing.

EPA will review the transcript of all formal comments received at the hearing, and all written comments received during the formal comment period, before making a final cleanup decision. EPA will then prepare a written response to all the formal written and oral comments received. Your formal comment will become part of the official public record. The transcript of comments and EPA's written responses will be issued in the Responsiveness Summary as part of the final cleanup decision.

FOR MORE DETAILED INFORMATION:

The Administrative Record, which includes all documents that EPA has considered or relied upon in proposing this cleanup plan for groundwater at the Site, is available for public review and comment and can be found on-line, along with other Site information at www.epa.gov/superfund/Keefe

SEND US YOUR COMMENTS

Provide EPA with your written comments about this MNA Proposed Plan for groundwater at the Keefe Superfund Site.

Please email (sprague.cheryl@epa.gov), fax (617-918-0244), or mail comments, postmarked no later than **Wednesday, September 13, 2017** to:

CHERYL SPRAGUE
EPA Region New England
5 Post Office Square, Suite 100
Mail Code OSRR07-1
Boston, MA 02109-3912

Acronyms

AGQS	*Ambient Groundwater Quality Standard*
ARAR	*Applicable or Relevant and Appropriate Requirement*
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act*
EPA	*United States Environmental Protection Agency*
ESD	*Explanation of Significant Differences*
FFS	*2017 Focused Feasibility Study*
GMP	*Groundwater Management Permit*
GMZ	*Groundwater Management Zone*
HHRA	*Human Health Risk Assessment*
HiPOx	*High Pressure Oxidation*
MCL	*Maximum Contaminant Level*
MNA	*Monitored Natural Attenuation*
NHDES	*New Hampshire Department of Environmental Services*
NPL	*National Priorities List*
O&M	*Operation and Maintenance*
RAO	*Remedial Action Objective*
RI	*Remedial Investigation*
ROD	*Record of Decision*
VOC	*Volatile Organic Compound*

Table 1. Summary of Groundwater Cleanup Levels
Keefe Environmental Services Superfund Site Epping, New Hampshire

Chemical of Concern	Date of Establishment	Interim Groundwater Cleanup Level	Amended ROD Groundwater Cleanup Levels	Basis for Cleanup Level	Notes
Benzene	ROD- 3/21/1988	5 µg/	5 µg/L	MCL	Current MCL is still 5 µg/L [MCLG is zero]
1,2-Dichloroethane	ROD - 3/21/1988	5 µg/L	5 µg/L	MCL	Current MCL is still 5 µg/L [MCLG is zero]
1,1-Dichloroethylene	ROD - 3/21/1988	7 µg/L	7 µg/L	MCL	Current MCL is still 7 µg/L
Tetrachloroethylene	ROD - 3/21/1988	5 µg/L	5 µg/L	MCL	Current MCL is still 5 µg/L [MCLG is zero] The 1988 ROD set a cleanup level of 5 ppb for PCE, which is the MCL for TCE, even though an MCL had not yet been promulgated for PCE because PCE has similar chemical, physical and toxicological properties as TCE. In 1991, EPA promulgated the same cleanup level of 5 ppb for PCE.
Tetrachloroethylene	ROD - 3/21/1988	5 µg/L	5 µg/L	MCL	Current MCL is still 5 µg/L [MCLG is zero]
1,4-Dioxane	ESD - 6/30/2005	3 µg/L	3 µg/L	NH AGQS	Emerging contaminant added to the groundwater monitoring program due to known association with chlorinated solvents previously identified in Site groundwater. The 2005 ESD based the 1,4-dioxane cleanup level on available risk data, and in September 2005, the NHDES promulgated the same cleanup level as a State AGQS.
Vinyl Chloride	Proposed: 2017		2 µg/L	MCL	The proposed cleanup level is equal to the current MCL and NH AGQS of 2 µg/L [MCLG is zero]
1,1-Dichloroethane	Proposed: 2017		81 µg/L	NH AGQS	An MCL has not been established for 1,1- dichloroethane. The proposed cleanup level is equal to the NH AGQS.

NOTES:
EPA = UNITED STATES ENVIRONMENTAL PROTECTION AGENCY ROD = RECORD OF DECISION (EPA, 1988)
ESD = EXPLANATION OF SIGNIFICANT DIFFERENCES (EPA, 2005)
µG/L = MICROGRAMS PER LITER (PARTS PER BILLION)
MCL = MAXIMUM CONTAMINANT LEVEL IN DRINKING WATER
MCLG = MAXIMUM CONTAMINANT LEVEL GOAL IN DRINKING WATER
NHDES = NEW HAMPSHIRE DEPARTMENT OF ENVIRONMENTAL SERVICES
AGQS = NHDES AMBIENT GROUNDWATER QUALITY STANDARD

Table 2. Comparison of Alternatives

Nine Criteria	No Action	ROD Remedy	MNA
Protects human health & environment	X	✓	✓
Meets federal & state requirements	X	✓	✓
Provides long-term protection	X	✓	✓
Reduces mobility, toxicity & volume through treatment	√	✓	√
Provides short-term protection	X	✓	✓
Implementable	✓	✓	✓
Cost (millions) ▪ Capital Cost	$0	$ 0.537	$ 0.131
▪ O&M[a]	$0	$ 3.133	$ 1.506
▪ Total Cost	$0	$ 3.670	$ 1.637
State of New Hampshire acceptance	State of NH Supports MNA		
Community acceptance	To be determined after public comment period		

EPA's preferred option

✓ **Meets or exceeds criterion**

√ **Partially meets criterion**

X **Does NOT meet criterion**

Note: This table depicts a summary of the alternatives. It is not a substitute for the detailed analysis included in the Focused Feasibility Study.

[a] *O&M considers Net Present Value and is provided at a discount rate of 7%*