REMEDY SELECTION PLAN FOR J-1 RANGE

July 2010

The United States Environmental Protection Agency (EPA) seeks your feedback on this Remedy Selection Plan for the J-1 Range site located on the Camp Edwards portion of the Massachusetts Military Reservation (MMR). The Remedy Selection Plan explains the cleanup alternatives considered for the site, which alternative is proposed, and why.

The U.S. Army's Impact Area Groundwater Study Program (IAGWSP), under the oversight of EPA and the Massachusetts Department of Environmental Protection (MassDEP), has investigated potential soil and groundwater contamination at the site and has issued reports on those investigations, along with a feasibility study presenting alternatives for addressing the contamination at the site.

The Army's work at the site was conducted under the authority of EPA's Safe Drinking Water Act Administrative Orders (SDWA 1-97-1019 and SDWA 1-2000-0014), and in consideration of the substantive cleanup standards of the Massachusetts Contingency Plan (MCP).

EPA wants your feedback and is seeking public comment over the next 30 days (July 19 through August 17, 2010). Please review this Remedy Selection Plan, and send your comments on it to us. After the comment period ends, EPA will consider the public comments, consult with MassDEP, and issue a Decision Document providing the details of the remedial actions selected for the site. With the Decision Document, EPA will include a Responsiveness Summary that provides responses to comments received during the public comment period. MassDEP will issue its' official position in a comment letter after the public comment period has ended.

HOW TO PARTICIPATE

You can provide written comments on this Remedy Selection Plan from July 19, 2010 through August 17, 2010, and you are invited to a public informational meeting on August 2, 2010 at 6:00 p.m. at the Sandwich town offices at 16 Jan Sebastian Drive Forestdale, MA to learn more about the groundwater contamination at the J-1 Range, and the proposed remedy. You can also provide oral comments at a public hearing that will immediately follow the public meeting. EPA, MassDEP and Army representatives will be available at the meeting or by phone (see page 15 for contact information) to respond to questions regarding the site and proposed remedies. A summary of comments and the responses to those comments will be provided as part of the Decision Document.

Public Comment Period for the Remedy Selection Plan

July 19, 2010 through August 17, 2010

Oral comments may be offered at the Public Hearing or written comments may be submitted by U.S. mail or email no later than August 17, 2010.

Public Information Meeting/Public Hearing
August 2, 2010
16 Jan Sebastian Drive
Off Route 130
Forestdale, MA

Written comments should be mailed to:
Jeanethe Falvey
US EPA Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912

Or sent by:

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J-1 RANGE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The Remedial Investigation and Feasibility Study (RI/FS) report for the J-1 Range is the document used to summarize activities conducted to characterize soil and groundwater contamination, assess the risk to human health, safety, welfare, and the environment and evaluate a range of remedial alternatives to address any contamination identified. Based on recent sampling data collected from the site, the RI determined that no further action was necessary with regards to soils. (The J-1 Range source area was recently remediated under a response action.) However, the development and evaluation of a range of potential response actions was deemed necessary to address contaminants detected in groundwater associated with the site. The groundwater at the J-1 Range has been contaminated by RDX and perchlorate. These chemicals are associated with use and disposal of military munitions.

The cleanup objectives for the site are to restore the useable groundwater to its beneficial use wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site; to provide a level of protection in the aquifer that takes into account that the Cape Cod Aquifer, including the Sagamore Lens, is a sole source aquifer that is susceptible to contamination; and to prevent ingestion and inhalation of groundwater containing the contaminants of concern (COCs) (RDX at the southern J-1 plume, perchlorate and RDX at the northern J-1 Plume), in excess of federal maximum contaminant levels (MCLs), Health Advisories, drinking water equivalent levels (DWELs), applicable State standards or an unacceptable excess lifetime cancer risk or non-cancer Hazard Index.

The groundwater cleanup levels used in the Feasibility Study are 2 parts per billion (ppb) for perchlorate, which is the Massachusetts drinking water standard (Maximum Contaminant Level, or MMCL), and 0.6 ppb for RDX, which is the concentration in drinking water that would be expected to cause an increased lifetime cancer risk of one in a million (sometimes called the 10^{-6} cancer risk level). These cleanup levels are more protective than the EPA Lifetime Health Advisories (concentrations that are not expected to cause any adverse non-cancer effects for a lifetime of exposure) for perchlorate (15 ppb) and RDX (2 ppb).

As a result of the soil response actions taken, the concentrations of COCs in the soil at the J-1 Range meet applicable state and federal standards. No further release of contamination from soil to groundwater is expected, so the alternatives do not include any additional measures for soil cleanup or control. The source area response actions already taken also addressed the majority of unexploded ordnance (UXO). Further response actions are not anticipated at this time. However, the remedy will include groundwater monitoring to verify that any possible remaining sources will not pose a threat to groundwater. The feasibility study evaluated alternatives for achieving the groundwater cleanup objectives: No Further Action, Monitored Natural Attenuation and Land-use Controls, and alternatives with Focused Extraction. For more details on the alternatives see the Remedial Investigation/Feasibility Study report for the site.

The Army developed conceptual designs for these alternatives, including:

- Number, location, and sampling frequency of existing locations needed to monitor the plumes;
- Number and location of any new monitoring wells, if needed;
- Number and location of extraction and injection wells, and estimated groundwater extraction flow rates;
- Type, size, and location of treatment facilities;
- Preliminary schedule for construction and operation; and
- Preliminary cost estimate.

The conceptual designs for the alternatives are based on the following information:

- Plume extent and concentrations as delineated based on the most up to date groundwater analytical data;
- Predictions of groundwater flow and contaminant fate and transport as estimated by groundwater modeling;
- Use of modular treatment systems with ion exchange resin and/or granular activated carbon vessels (similar to those previously used by the IAGWSP).
- Continuation of groundwater monitoring (where applicable) for three years after cleanup objectives are achieved.

Preliminary cost estimates were prepared for each alternative. Each estimate includes the following components:

- Capital costs, which are expenditures required to initiate and install a remedial action;
- Operation and maintenance (O&M) and Land-use control costs, which are post-implementation costs, such as monitoring, labor, reporting and electricity, costs, equipment replacement, and disposal of treatment residuals, necessary to ensure the continued effectiveness of the remedial action.
- Present worth analyses; and
- Indirect costs, including engineering services.

All alternatives outlined in this Remedy Selection Plan, except Alternative 1 (No Further Action), include land-use controls and long-term monitoring. Land-use controls consist of measures that would prevent human exposure to plume contaminants and prevent actions that would interfere with the remedy. In this case, the land-use controls would restrict well drilling or other activities that could expose individuals to contaminated groundwater. Land-use controls would be monitored to ensure effectiveness. The long-term monitoring would consist of groundwater monitoring to determine if the remedy is performing as planned and when contaminant concentrations reach cleanup levels. Reporting on monitoring results and periodic updating of the sampling plan also are included.

CRITERIA FOR EVALUATING THE CLEANUP REMEDY

As documented in the feasibility study, a detailed analysis was performed on all of the alternatives presented for the J-1 Range. The evaluation used the EPA evaluation criteria listed below to select the proposed response action for the site. These nine criteria are summarized as follows:

1. Overall protection of human health and the environment; which includes prevention of the movement of contaminants into the aquifer and its preservation as a public drinking water supply: Will the remedy protect human health? Will it restore the aquifer?

2. Compliance with regulations: Does the remedy meet all applicable federal and state standards?

3. Long-term effectiveness and permanence: What are the remaining risks after completion of the remedial action? What is the adequacy and suitability of controls, if any, that are used to manage untreated contaminants remaining at the site?

4. Reduction of toxicity, mobility, and volume through treatment: What is the expected reduction in toxicity, mobility or volume? What are the type and quantity of treatment residuals that will remain following treatment?

5. Short-term effectiveness: Is the community protected during the remedial action? Are workers protected during the remedial action? What are the environmental impacts to natural resources? How long will it be before remedial response objectives are achieved?

6. Implementability: Is it technically and administratively feasible to design and construct the technology? How reliable is it? Can effectiveness be monitored? Are the services and materials available?

7. Cost: What are the capital costs of the remedy? What are the operations and maintenance costs? What is the net present value of the costs?

8. State Acceptance: What issues and concerns might the State have regarding each alternative? This criterion will be evaluated throughout the development, screening and evaluation of alternatives based on comments and input received from MassDEP.

9. Community Acceptance: What issues and concerns might the public have regarding each alternative? This criterion will be evaluated based on public feedback, such as comments made at the public hearing, or written comments submitted during the public comment period or at the public hearing.

A summary of the comparison of each alternative's strength and weakness with respect to the nine evaluation criteria is included on page 8 for the Northern J-1 Plume, page 12 for the Southern J-1 Plume.

BACKGROUND

The J-1 Range is located in the southeast portion of the MMR adjacent to and partially within the Impact Area. It is bounded to the north by the J-2 Range and to the south by the J-3 and L Ranges. The J-1 Range is approximately 2,000 meters long and between 50- and 250-meters wide. The range is oriented southeast to northwest, with the southeastern "uprange" end near Greenway Road and the northeastern "downrange" end extending several hundred meters beyond Chadwick Road into the Impact Area.

From 1935 through the mid-1950s, the area was used for various training activities. From 1957 through the late 1980s, the J-1 Range was used as a test range of various caliber munitions by defense contractors. The predominant firing positions are believed to have been along the berm located near the entrance to the range, and next to the 1,000-m berm located downrange from Greenway Road. In addition, hazard classification tests were conducted between the 1,000-m and 150-m berms. Fuels were used to ignite munitions during these "cook-off" tests.

Excess explosives, propellant and munitions were also burned and buried on the J-1 Range. These locations included areas along the range road near the firing points, cook-off test location, steel-lined pit, popper kettle/wastewater disposal area, and numerous burn and burial pits within the Interberm Area of the range. These activities resulted in releases of explosives compounds and perchlorate to the soil, which are the likely sources of both soil and groundwater contamination.

INVESTIGATIONS AND FINDINGS

Investigations in the J-1 Range included soil sampling, geophysical surveys, groundwater sampling, and a robotics technology demonstration. Soil and groundwater sampling has been ongoing since 1997.

Some of the groundwater underlying and downgradient of the J-1 Range is contaminated by RDX and perchlorate. For groundwater investigation and analysis purposes, the J-1 Range has been divided into two sub-areas, the northern area and the southern area. The J-1 source area sits on top of the groundwater mound and groundwater flows radially from this area.

In the northern area, a groundwater contaminant plume consists of perchlorate and RDX. The perchlorate contamination is detached from the source area, has migrated further than the RDX plume and has the highest concentrations in the downgradient portion of the plume. The RDX portion of the plume has the higher concentrations closer to the source. The maximum concentrations in the northern plume as of 2009 are 13 ppb for RDX and 54.5 ppb for perchlorate. The maximum historical detections were 32 ppb for RDX in 2004 and 78 ppb for perchlorate in 2008.

J-1 Range prior to clearance at berms

Based on the nature and extent of contamination, RDX and perchlorate are considered as the groundwater contaminants of concern for cleanup of the northern plume.

Investigations in the Interberm Area, the source of the J-1 northern plume, revealed soil contamination in three burn pits and a burial pit located along the southern edge of the range, two structures formerly used to burn items – a steel-lined pit and popper kettle, and numerous other disposal pits and burn pits located on either side of the range road. The highest concentrations of explosives detected were: 65 parts per million (ppm) for RDX and 35 ppm for HMX. Perchlorate was detected as high as .06 ppm. Approximately 1,000 cubic yards of contaminated soils were removed from these areas during investigations and have been disposed of off-site. Scrap and other debris were disposed of off-site at permitted facilities. The extent of the J-1 northern plume is consistent with source areas in these locations.

Soil sampling conducted more recently (2009) identified additional contamination in the Interberm Area. Samples from this area were analyzed for explosives and perchlorate. Analytical results indicated concentrations of 2,4-DNT, RDX and HMX in these soils. These soils have been removed as discussed on page 5, "Response Actions."

In 2008, a robotics technology demonstration was conducted at the range to evaluate the effectiveness of using remotely operated equipment to safely remove UXO. Soil was removed from the uprange faces of the range berms. A remotely operated excavator equipped with a rotating, two inch slotted-screen bucket attachment was used to separate rocks and any munitions from finer soil materials. UXO were segregated and disposed of, and a post-robotics confirmatory geophysical survey was conducted on the berm faces followed by intrusive investigations. No additional UXO were identified.

Soil treatment operations – winter 2009

Southern J-1 Range Treatment Unit – Installed under a Rapid Response Action in October 2007

The primary contaminant of concern in the J-1 Range groundwater southern area is RDX. The southern RDX plume is defined by an on-base portion, which extends from the source area and terminates at the base boundary at an extraction well; and a downgradient portion that extends approximately 1,000 feet beyond the base boundary, beneath a residential area. There is no exposure to the plume as all residences in the off-base area of the plume are connected to the municipal water supply. The maximum RDX concentration in the on-base portion of the plume as of 2009 is 14 ppb. The maximum RDX concentration in the off-base portion of the plume as of 2009 is 20 ppb. The maximum historical concentration in the plume was 130 ppb in 2006. Recent data obtained during investigations conducted during the winter and spring of 2010 found RDX at 71 ppb along Grand Oak Road and 44 ppb in a location along Windsong Road. This most recent data will be considered during the remedy selection process.

A treatment system installed at the base boundary has been actively treating the southern RDX plume since 2007. Over 81 million gallons of water have been treated through 2009. The objective of the J-1 southern system was to mitigate further migration of the plume by capturing and treating contaminated water at the base boundary until the entire plume extent was determined.

Investigations in the southernmost portion of the range, the source of the J-1 southern plume, revealed numerous burn and burial pits. Soil sampling conducted in 2009 identified soil contamination in the area between the firing points and 100-m target berm. Samples were analyzed for explosives and perchlorate from this area and analytical results indicated concentrations of RDX and HMX. Perchlorate was detected but only at levels below relevant standards throughout this area.

RESPONSE ACTIONS

Soil samples collected from the screened soil stockpiles generated from the robotics technology demonstration at the 150-m berm exhibited concentrations of explosives. Approximately 150 cubic yards of soil was disposed of at a permitted off-site facility. Contaminated soils were removed from the 2,000-m berm area, Interberm Area and southern grids in 2009/2010 as part of Camp Edwards-wide ongoing removal actions for on-site treatment. The contaminated soil was excavated from depths ranging from 6 inches to 18 inches below ground surface and materials greater than 1-inch in size were screened out.

A treatment cell was constructed on the L Range using concrete blocks stacked and aligned to form an 80' wide X 280' long X 4' high containment cell. A liner was installed in the containment area to create a treatment cell with an impermeable base. A 1,000-gallon leachate collection/storage vault was installed below grade, outside the treatment cell. A pugmill was used to mix hydrated lime and water into the soil. A front end loader transported screened soil from the onsite stockpile to the pugmill where hydrated lime was added from a silo connected to the pugmill. Approximately 2,400 cubic yards of screened soil is being treated by alkaline hydrolysis using hydrated lime. The lime mineralizes the explosives compounds to more elemental compounds of nitrogen and carbon dioxide.

UXO clearance in support of the cumulative investigations and removal actions resulted in the removal of significant quantities of munitions, munitions debris, and range residue debris from those portions of the range responsible for development of the J-1 northern and southern groundwater plumes. While it is unlikely there are a significant number of UXO remaining on the range, UXO may remain in portions of the range that were not completely cleared. Remaining sources are unlikely to pose a significant threat to groundwater. This assumption can be verified by long term monitoring of the groundwater.

J-1 RANGE NORTHERN PLUME ALTERNATIVES

J-1 Northern Plume - Alternative 1 – No Further Action

Capital Cost	$ 74,827
Operations &Maintenance (O&M) Costs	$ 0
Site closeout and documentation	$ 69,300
Total	$ 144,127

Alternative 1 provides for no further action to address groundwater contamination associated with the Northern J-1 Range plume. Under this alternative:

- Model predictions could not be confirmed due to abandonment of existing monitoring wells.
- Land-use controls would not be implemented and so would not ensure against exposure until cleanup is achieved.
- Site close-out documentation would be completed.
- Contamination within the plume is expected to drop below the 2 ppb MMCL for perchlorate by 2080 and is expected to reach background levels after 2109. RDX concentrations are expected to decrease below the 10^{-5} risk based level of 6 ppb by 2027, the HA of 2 ppb by 2053, the 10^{-6} risk-based level after 2109 and background after 2109.

J-1 Northern Plume Alternative 2 – Monitored Natural Attenuation (MNA) and Land-use Controls (LUCs)

Capital Cost	$ 1,535,013
O&M Costs	$ 1,903,379
Site closeout and documentation	$ 2,759
Total	$ 3,441,151

Alternative 2 would provide optimized monitoring of J-1 Range groundwater until concentrations of contaminants within the plume reach risk-based levels. Under this alternative:

- Long-term monitoring would continue.
- Land-use controls would be implemented to prevent use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site close-out documentation would be completed.
- Contamination within the plume is expected to drop below the 2 ppb MMCL for perchlorate by 2080 and is expected to reach background levels after 2109. RDX concentrations are expected to decrease below the 10^{-5} risk based level of 6 ppb by 2027, the HA of 2 ppb by 2053, the 10^{-6} risk-based level after 2109 and background after 2109.

J-1 Northern Plume Alternative 3a and 3b – Focused Extraction with One Well, MNA and LUCs

3a

Capital Cost	$ 2,988,445
O&M Costs	$ 9,427,002
Site closeout and documentation	$ 23,873
Total	$12,439,320

3b

Capital Cost	$ 2,985,450
O&M Costs	$ 8,756,170
Site closeout and documentation	$ 22,040
Total	$11,763,660

Alternative 3 would provide for extraction and treatment of the groundwater. Under this alternative:

- A 125-gallon-per-minute (gpm) pump and treat system would be installed that would include:
  - o One extraction well operating at a rate of 125 gpm.
  - o Treatment with granular activated carbon and ion-exchange resin at a mobile treatment unit.
  - o Infiltration of the treated water via an infiltration trench.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- The alternative was evaluated using two different operational scenarios for the extraction well; in alternative 3a the extraction well operates until the influent concentrations decrease below the method detection limit. In alternative 3b the extraction well operates until 2030 which would clean up the plume by the expiration of the current Army lease in 2051.
- For alternative 3a, contamination within the plume is expected to drop below the 2 ppb MMCL for perchlorate by 2042 and is expected to reach background levels after 2109. RDX concentrations are expected to decrease below the 10^{-5} risk based level of 6 ppb by 2025, the HA of 2 ppb by 2038, the 10^{-6} risk-based level by 2048 and background by 2057. For alternative 3b, contamination within the plume is expected to drop below the 2 ppb MMCL for perchlorate by 2043 and is expected to reach background levels after 2109. RDX concentrations are expected to decrease below the 10^{-5} risk based level of 6 ppb by 2025, the HA of 2 ppb by 2040 the 10^{-6} risk-based level by 2051 and background by 2061.

J-1 Northern Plume Alternative 4a and 4b – Focused Extraction with Two Wells, MNA and LUCs

4a	
Capital Cost	$ 4,180,453
O&M Costs	$ 8,836,229
Site closeout and documentation	$ 32,003
Total	$ 13,057,684

4b	
Capital Cost	$ 4,165,419
O&M Costs	$ 7,435,822
Site closeout and documentation	$ 22,635
Total	$11,623,876

Alternative 4 would provide for extraction and treatment of the groundwater. Under this alternative:

- A 250 gpm pump and treat system would be installed that would include:
  - Two extraction wells operating at a rate of 125 gpm each.
  - Treatment with granular activated carbon and ion-exchange resin at two mobile treatment units.
  - Infiltration of the treated water via two infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- The alternative was evaluated using two different operational scenarios for the extraction well; in alternative 4a the extraction wells operate until the influent concentrations decrease below the method detection limit. In alternative 4b the upgradient extraction would be turned off in 2015 and the downgradient extraction well operates until 2023 which would clean up the plume by the expiration of the current Army lease in 2051.
- For alternative 4a, contamination is expected to drop below the 2 ppb MMCL for perchlorate by 2037 and is expected to reach background levels after 2109. RDX concentrations are expected to decrease below the 10^{-5} risk-based level of 6 ppb by 2019, the HA of 2 ppb by 2027, the 10^{-6} risk-based level by 2035 and background by 2048. For alternative 4b, contamination within the plume is expected to drop below the 2 ppb MMCL for perchlorate by 2045 and is expected to reach background levels after 2109. RDX concentrations are expected to decrease below the 10^{-5} risk-based level of 6 ppb by 2020, the HA of 2 ppb by 2031 the 10^{-6} risk-based level by 2050 and background by 2096.

J-1 Northern Plume Alternative 5 – Focused Extraction with Two Wells, MNA and LUCs

Capital Cost	$ 4,029,838
O&M Costs	$ 10,618,541
Site closeout and documentation	$ 24,518
Total	$ 14,935,898

Alternative 5 would provide for extraction and treatment of the groundwater. Under this alternative:

- A 250 gpm pump and treat system would be installed that would include:
  - Two extraction wells operating at a rate of 125 gpm each.
  - Treatment with granular activated carbon and ion-exchange resin at two mobile treatment units.
  - Infiltration of the treated water via two infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- Contamination is expected to drop below the 2 ppb MMCL for perchlorate by 2035 and reach background levels by 2048. RDX concentrations are expected to decrease below the 10^{-5} risk-based level of 6 ppb by 2024, the HA of 2 ppb by 2037, the 10^{-6} risk-based level by 2047 and background by 2059.

J-1 Northern Plume Alternative 6 – Focused Extraction with Five Wells, MNA and LUCs

Capital Cost	$ 7,031,958
O&M Costs	$12,669,328
Site closeout and documentation	$ 51,528
Total	$19,752,815

Alternative 6 would provide for extraction and treatment of the groundwater. Under this alternative:

- A 625 gpm pump and treat system would be installed that would include:
  - Five extraction wells operating at a rate of 125 gpm each.
  - Treatment with granular activated carbon and ion-exchange resin at five mobile treatment units.
  - Infiltration of the treated water via two infiltration trenches
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- Contamination within the plume is expected to drop below the 2 ppb MMCL for perchlorate by 2020 and reach background by 2035. RDX concentrations are expected to decrease below the 10^{-5} risk-based level of 6 ppb by 2014, the HA of 2 ppb by 2018, the 10^{-6} risk-based level by 2020 and background by 2026.

EVALUATION OF ALTERNATIVES FOR THE J-1 RANGE NORTHERN PLUME

Below is a summary of how the alternatives were evaluated in the Feasibility Study.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 2 through 6 would be protective of human health and the environment. Alternative 1, however, would not be protective because it offers no monitoring or confirmation of existing land-use controls to ensure that future exposures do not occur. Alternative 2 through 6 add provisions for plume monitoring and land-use controls to help prevent future exposure to contaminated groundwater.

COMPLIANCE WITH REGULATIONS

All alternatives are expected to eventually result in compliance with applicable regulations. Alternatives 1 and 2 would meet chemical-specific regulations when contaminant concentrations decrease below the cleanup standards by natural attenuation. Alternative 2 includes monitoring to confirm this occurs; Alternative 1 does not. Alternative 3, 4 5 and 6 include active treatment to shorten the time until cleanup standards are met. Alternatives 2 through 6 would comply with location and action specific regulations. Alternative 1 involves no action; no location or action specific regulations apply.

LONG-TERM EFFECTIVENESS AND PERMANENCE

All alternatives are expected to provide long-term effectiveness and permanence; however, the timeframes differ. The source areas have been removed so residual soil contamination is unlikely to compromise the permanence of the remedial alternatives once completed.

Alternative	RDX Cleanup Times			Perchlorate Cleanup Times	
	6 µg/L	2 µg/L	0.6 µg/L	15 µg/L	2 µg/L
1	2027	2053	>2109	2024	2080
2	2027	2053	>2109	2024	2080
3a	2025	2038	2048	2018	2042
3b	2025	2040	2051	2018	2043
4a	2019	2027	2035	2023	2037
4b	2020	2031	2050	2024	2045
5	2024	2037	2047	2017	2035

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternatives 1 and 2 are not treatment alternatives and, therefore, do not reduce toxicity, mobility, or volume through treatment. However, the toxicity and volume of the contaminated groundwater would be reduced through natural processes. Alternative 3, would remove 6.0 Kg (61%) of perchlorate and 2.1 Kg (55%) of RDX. Alternative 4 would remove 7.1 Kg (72%) of perchlorate and 2.5 Kg (66%) of RDX. Alternative 5 would remove 8.9 Kg (91%) of perchlorate and 2.3 Kg (60%) of RDX. Alternative 6 would reduce the toxicity, mobility and volume of perchlorate and RDX: however; it was not simulated in the groundwater model therefore, mass capture can only be estimated.

SHORT-TERM EFFECTIVENESS

Alternative 1 would have the least impact on workers and the environment because construction is minimal. Alternative 6 would have the greatest impact because of the large amount of construction involved. None of the alternatives are anticipated to have significant short-term impacts to the community since work is on-base.

IMPLEMENTABILITY

None of the alternatives are limited by administrative feasibility. Alternative 1 is the most easily implemented alternative since it requires no further action other than abandoning groundwater monitoring wells and preparing close out documentation. Alternatives 3, 4, 5, and 6 are the most difficult alternatives to implement since they include the installation of extraction well(s), treatment facilities, new piping/power lines, and infiltration trench(es) in an environment with the potential for munitions and maintenance of systems down range from small arms firing ranges.

EVALUATION OF ALTERNATIVES FOR THE J-1 RANGE NORTHERN PLUME (CONT.)

COST

The costs of alternatives increase as the amount of treatment increases. Alternative 1 has a total estimated cost of $144,127, Alternative 2 - $3,441,151, Alternative 3a - $12,439,320, Alternative 3b - $11,763,660, Alternative 4a - $13,057,684, Alternative 4b - $11,623,876, Alternative 5 - $14,935,898, and Alternative 6 - $19,752,815.

STATE ACCEPTANCE

This criterion is continually evaluated as MassDEP participates in all aspects of the evaluation and selection of a remedy. MassDEP will issue its' official position in a comment letter after the public comment period has ended.

COMMUNITY ACCEPTANCE

This criterion will be evaluated based on all public comments received on the Remedy Selection Plan.

PROPOSED REMEDY FOR THE J-1 RANGE NORTHERN PLUME

FOCUSED EXTRACTION WITH TWO WELLS, MONITORED NATURAL ATTENUATION AND LAND-USE CONTROLS

Focused Extraction with Two Wells, Monitored Natural Attenuation and Land-use Controls provides the best balance of the criteria used to evaluate the cleanup alternatives. The proposed remedy can be viewed as a variation on Alternatives 4 and 5, with certain details (where wells are located, and when they are turned off) to be determined later. Like Alternatives 4 and 5, the proposed remedy consists of a 250 gpm focused extraction system (two extraction wells operated at a rate of 125 gpm each), treatment with granular activated carbon and ion exchange resin at two mobile treatment units, and infiltration of the treated water via two infiltration trenches. The exact location of the extraction wells will be determined based on the most recent groundwater sampling data and will be optimized to achieve the best balance between efficiency, cleanup time, cost, implementability and environmental and worker impacts. The location of the treatment systems and pipeline will be based on the well locations. The estimated cost of the proposed remedy is approximately $13,000,000.

- The response actions taken to date to address soil and UXO are expected to have removed any continuing source of contamination to groundwater. However, long-term groundwater monitoring will be conducted to verify the effectiveness of the soil and UXO response.
- The remedy is expected to achieve a perchlorate level of 2 ppb between 2035 and 2045 and an RDX level of 0.6 ppb between 2047 and 2050. The remedy is expected to achieve a perchlorate level of 2 ppb between 2035 and 2045 as site contaminants in groundwater are reduced through treatment and natural processes.
- Human health is protected through the use of groundwater monitoring to ensure that groundwater modeling predictions regarding the reduction and migration of contamination are correct and that any remaining contamination remains below risk-based levels.
- Human health will be further protected through the implementation and verification of land-use controls. Although the plume remains in a military munitions impact area, these controls will further prevent use of contaminated portions of the aquifer for drinking water until contamination is reduced to below risk-based levels.

This alternative is proposed because it achieves permanent cleanup of RDX and perchlorate in groundwater in the J-1 Range Northern area economically and in a reasonable timeframe without excessive environmental and worker impacts. Through continued monitoring and enforcement of land-use controls that would prevent exposure to contaminated groundwater, the proposed remedy ensures protection of human health and the environment.

J-1 RANGE SOUTHERN PLUME ALTERNATIVES

J-1 Southern Plume - Alternative 1 – No Further Action

Capital Cost	$ 38,444
O&M Costs	$ 0
Site closeout and documentation	$ 72,765
Total	$ 111,209

Alternative 1 provides for no further action to address any remaining groundwater contamination associated with the J-1 Range southern plume. Under this alternative:

- Model predictions could not be verified due to abandonment of existing monitoring wells.
- Land-use controls would not be implemented and so would not ensure against exposure until cleanup is achieved.
- Site close-out documentation would be completed.
- Contamination within the plume is expected to drop below the 10^{-5} risk based level of 6 ppb by 2019, the 2 ppb HA for RDX by 2032, the 10^{-6} risk-based level by 2050 and background after 2074.

J-1 Southern Plume Alternative 2 – Monitored Natural Attenuation (MNA) and Land-use Controls (LUCs)

Capital Cost	$ 687,904
O&M Costs	$ 843,926
Site closeout and documentation	$ 23,766
Total	$ 1,555,596

Alternative 2 would provide optimized monitoring of groundwater until concentrations of contaminants within the plume reach risk-based levels. Under this alternative:

- Long-term monitoring would continue.
- Land-use controls would be implemented to prevent use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site close-out documentation would be completed.
- Contamination within the plume is expected to drop below the 10^{-5} risk based level of 6 ppb by 2019, the 2 ppb HA for RDX by 2032, the 10^{-6} risk-based level by 2050 and background by 2074 due to natural processes.

J-1 Southern Plume - Alternative 3 – Focused Extraction with One Well, MNA and LUCs

Capital Cost	$ 573,959
O&M Costs	$ 2,002,594
Site closeout and documentation	$ 25,067
Total	$ 2,061,620

Alternative 3 would provide for continued treatment of the plume via the existing extraction system. Under this alternative:

- An existing 45 gallons per minute (gpm) pump and treat system would continue to operate.
  - o One extraction well at the base boundary operating at a rate of 45 gpm.
  - o Treatment with granular activated carbon at a mobile treatment unit.
  - o Infiltration of the treated water via two infiltration trenches.
- Long-term groundwater monitoring would continue and be optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- Contamination within the plume is expected to drop below the 10^{-5} risk based level of 6 ppb by 2019, the 2 ppb HA for RDX by 2032, the 10^{-6} risk-based level by 2048 and is expected to reach background levels after 2071.

J-1 Southern Range Plume Alternative 4 – Focused Extraction with Two Wells, MNA and LUCs

Capital Cost	$ 1,226,760
O&M Costs	$ 3,613,646
Site closeout and documentation	$ 49,016
Total	$ 4,889,422

Alternative 4 would provide for extraction and treatment of the groundwater. Under this alternative:

- A 125 gpm pump and treat system would be installed that would include:
  - Continued operation of the existing extraction well located at the MMR boundary operating at a rate of 45 gpm
  - Installation of a downgradient extraction well in the vicinity of Little Acorn Lane in Forestdale operating at a rate of 80 gpm
  - Treatment with granular activated carbon at the mobile treatment unit at the base boundary.
  - Infiltration of the treated water via two infiltration trenches
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- Contamination is expected to drop below the 10^{-5} risk based level of 6 ppb by 2016, the 2 ppb HA for RDX by 2019, the 10^{-6} risk-based level by 2024 and background by 2030.

J-1 Southern Range Plume Alternative 5 – Focused Extraction with Three Wells, MNA and LUCs

Capital Cost	$ 2,180,213
O&M Costs	$ 3,497,716
Site closeout and documentation	$ 51,498
Total	$ 5,729,427

Alternative 5 provides for extraction and treatment of the groundwater. Under this alternative:

- A 250 gpm pump and treat system would be installed that would include:
  - Continued operation of the existing extraction well located at the MMR boundary operating at a rate of 45 gpm.
  - Installation of a two additional extraction wells in Forestdale operating at a rate of 205 gpm
  - Treatment with granular activated carbon at two mobile treatment units.
  - One extensive pipeline network.
  - Infiltration of the treated water via two infiltration trenches
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent the use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy.
- Monitoring, reporting and site-closeout documentation would be completed.
- Contamination is expected to drop below the 10^{-5} risk based level of 6 ppb by 2015, the 2 ppb HA for RDX by 2018, the 10^{-6} risk-based level by 2022 and background by 2028.

EVALUATION OF ALTERNATIVES FOR J-1 RANGE SOUTHERN PLUME

Below is a summary of how the alternatives were evaluated in the Feasibility Study.

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 2 through 5 would be protective of human health and the environment. Alternative 1, however, offers no monitoring or confirmation of existing land-use controls to ensure that future exposures do not occur. Alternative 2 through 5 adds provisions for plume monitoring and land-use controls to help prevent future exposure to contaminated groundwater. Alternatives 3 through 5 add treatment and achieve risk-based concentrations earlier.

COMPLIANCE WITH REGULATIONS

All alternatives are expected to eventually result in compliance with applicable regulations. Alternatives 1 and 2 would meet chemical-specific regulations when contaminant concentrations decrease below the cleanup standards by natural attenuation. Alternative 2 includes monitoring to confirm this occurs; Alternative 1 does not. Alternatives 3, 4 and 5 include active treatment to shorten the time until applicable standards are met. Alternatives 2 through 5 would comply with location and action specific regulations. Alternative 1 involves no action; no location or action specific regulations apply.

LONG-TERM EFFECTIVENESS AND PERMANENCE

All alternatives are expected to provide long-term effectiveness and permanence; however, the timeframes differ. The source area has been removed so residual soil contamination is unlikely to compromise the permanence of the remedial alternatives once completed.

Alternative	RDX Cleanup Times		
	6 µg/L	2 µg/L	0.6 µg/L
1	2019	2032	2050
2	2019	2032	2050
3	2019	2032	2048
4	2016	2019	2024
5	2015	2018	2022

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

Alternatives 1 and 2 are not treatment alternatives and, therefore do not reduce toxicity, mobility or volume through treatment. However, the toxicity and volume of the contaminated groundwater would be reduced through natural processes. Alternative 3 would remove 0.08 Kg (11%) of RDX. Alternative 4 would remove 0.58 Kg (76%) of RDX. Alternative 5 would remove 0.56 Kg (73%) of RDX.

SHORT-TERM EFFECTIVENESS

Alternative 1 would have the least impact on workers and the environment because construction is minimal. Alternative 5 would cause the greatest impact to the environment, community, and workers and includes the installation of two extraction wells, an MTU, and an infiltration trench. Alternatives 1 and 2 would have the least secondary impact since no additional operation and maintenance or plume monitoring would be required.

IMPLEMENTABILITY

Alternative 1 is the most easily implemented alternative since it requires no further action other than abandoning groundwater monitoring wells and preparing close out documentation. Alternatives 2 and 3 are the next most easily implemented alternatives with groundwater monitoring, O&M of the existing pump and treat system (for Alternative 3) and land-use controls. Alternatives 4 and 5 would be the most difficult to implement since they require installation of extraction wells in a residential neighborhood.

EVALUATION OF ALTERNATIVES FOR J-1 RANGE SOUTHERN PLUME (CONT.)

COST

The costs of alternatives increase as the amount of treatment increases. Alternative 1 has a total estimated cost of $111,209, Alternative 2 - $1,55,596, Alternative 3 - $2,601,620, Alternative 4 - $4,889,422, and Alternative 5- $5,729,427.

STATE ACCEPTANCE

This criterion is continually evaluated as MassDEP participates in all aspects of the evaluation and selection of a remedy. MassDEP will issue its' official position in a comment letter after the public comment period has ended.

COMMUNITY ACCEPTANCE

This criterion will be evaluated based on all public comments received on the Remedy Selection Plan.

PROPOSED REMEDY FOR THE J-1 RANGE SOUTHERN PLUME

FOCUSED EXTRACTION WITH TWO WELLS, MONITORED NATURAL ATTENUATION AND LAND-USE CONTROLS

The Focused Extraction with Two Wells, Monitored Natural Attenuation and Land-use Controls alternative, as presented in the feasibility study, provides the best balance of the criteria used to evaluate cleanup alternatives based on current information. The exact location of the off-base extraction well will be determined based on the most recent groundwater sampling data and will be optimized to achieve the best balance between efficiency, cleanup time, cost, implementability and environmental and worker impacts. The location of the pipeline will be based on the well location.

- The response actions taken to date to address soil and UXO are expected to have removed any continuing source of contamination to groundwater. However, long-term groundwater monitoring will be conducted to verify the effectiveness of the response.
- RDX is expected to decrease below 2 ppb by 2019 and below 0.6 ppb by 2024 as site contaminants in groundwater are reduced through treatment and natural processes.
- Human health is protected through the use of groundwater monitoring to ensure that groundwater modeling predictions regarding the reduction and migration of contamination are correct and that any remaining contamination remains below risk-based levels.
- Human health will be further protected through the implementation and verification of land-use controls. These controls will prevent use of contaminated portions of the aquifer for drinking water and prevent actions that would interfere with the remedy until contamination is reduced to below risk-based levels.

This alternative is proposed because it is expected to achieve permanent cleanup of RDX in groundwater in the J-1 Range southern area economically and in a reasonable timeframe (RDX is expected to be reduced to the 2 ppb Lifetime Health Advisory by 2019 and the 10-6 risk-based level (0.6 ppb) by 2024). Through continued monitoring and the enforcement of land-use controls that prevent exposure to contaminated groundwater and prevent actions that would interfere with the remedy, Alternative 4 ensures protection of human health and the environment.

GLOSSARY OF TERMS AND ACRONYMS

Background	A background level is the concentration of a hazardous substance that represents the level of the substance in an undisturbed environmental setting at or near the site.
Decision Document	Document that summarizes the response action selected to address contamination.
Feasibility Study	Document presenting and evaluating a range of alternatives for addressing contamination.
Granular activated carbon	A treatment medium used to remove contaminants, such as explosives from groundwater.
Lifetime Health Advisory (HA)	Guideline established by EPA that represents the concentration of a chemical in drinking water that, given a lifetime of exposure, is not expected to cause adverse, non-cancerous effects.
Federal Maximum Contaminant Level (MCL)	Federal maximum contaminant level for drinking water.
Ion Exchange Resin	A treatment medium used to remove perchlorate from groundwater.
Massachusetts Maximum Contaminant Level (MMCL)	Maximum contaminant level for drinking water in the Commonwealth of Massachusetts.
Perchlorate	An oxidizer used in some munitions, fireworks, flares, pyrotechnics and other items.
ppb	Parts per billion; used interchangeably with micrograms per liter (µg/L).
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine / Royal Demolition Explosive, a compound commonly used in explosives.
Rapid Response Action	An interim cleanup action taken to reduce contamination while the investigation and selection of a response action is completed.
Remedial Investigation	Document that provides a summary of activities conducted and a synthesis of data gathered for the characterization of soil and groundwater associated with the site.
Remedy Selection Plan	The document outlining the cleanup alternatives and the proposed remedy.

NEXT STEPS/UPCOMING ACTIVITIES

Following presentation of the Remedy Selection Plan for the J-1 Range, EPA is holding a 30-day public comment period to provide an opportunity for public input. After consideration of public comments and consultation with MassDEP, EPA will issue a Decision Document that will detail the selected remedy. MassDEP will issue its' official position in a comment letter after the public comment period has ended. A public informational meeting and public hearing is scheduled for August 2, 2010 at the Town of Sandwich offices at 16 Jan Sebastian Drive, Forestdale MA.

FOR MORE INFORMATION

Contact the following individuals for more information:

Pamela Richardson – Impact Area Groundwater Study Program
(508) 968-5630

Ellie Grillo – Massachusetts Department of Environmental Protection
(508) 946-2866

Jeanethe Falvey – U.S. Environmental Protection Agency
(617) 918-1020

Or visit the IAGWSP Web site at:

http://groundwaterprogram.army.mil

Information repositories have been established at the public libraries in Bourne, Sandwich, and Falmouth to make information on the program available to the public. The repositories are updated to ensure that all necessary documents are available. A complete repository of documents, including copies of work plans, sampling results, site reports, fact sheets, meeting minutes, and other materials, are available at the Jonathan Bourne Library in Bourne. Recent documents are available at the other two libraries and all documents are available on the CLAMS automated system.

Key documents related to the J-1 Range site include:

- *Final J-1 Range Remedial Investigation and Feasibility Study*, July 16, 2010

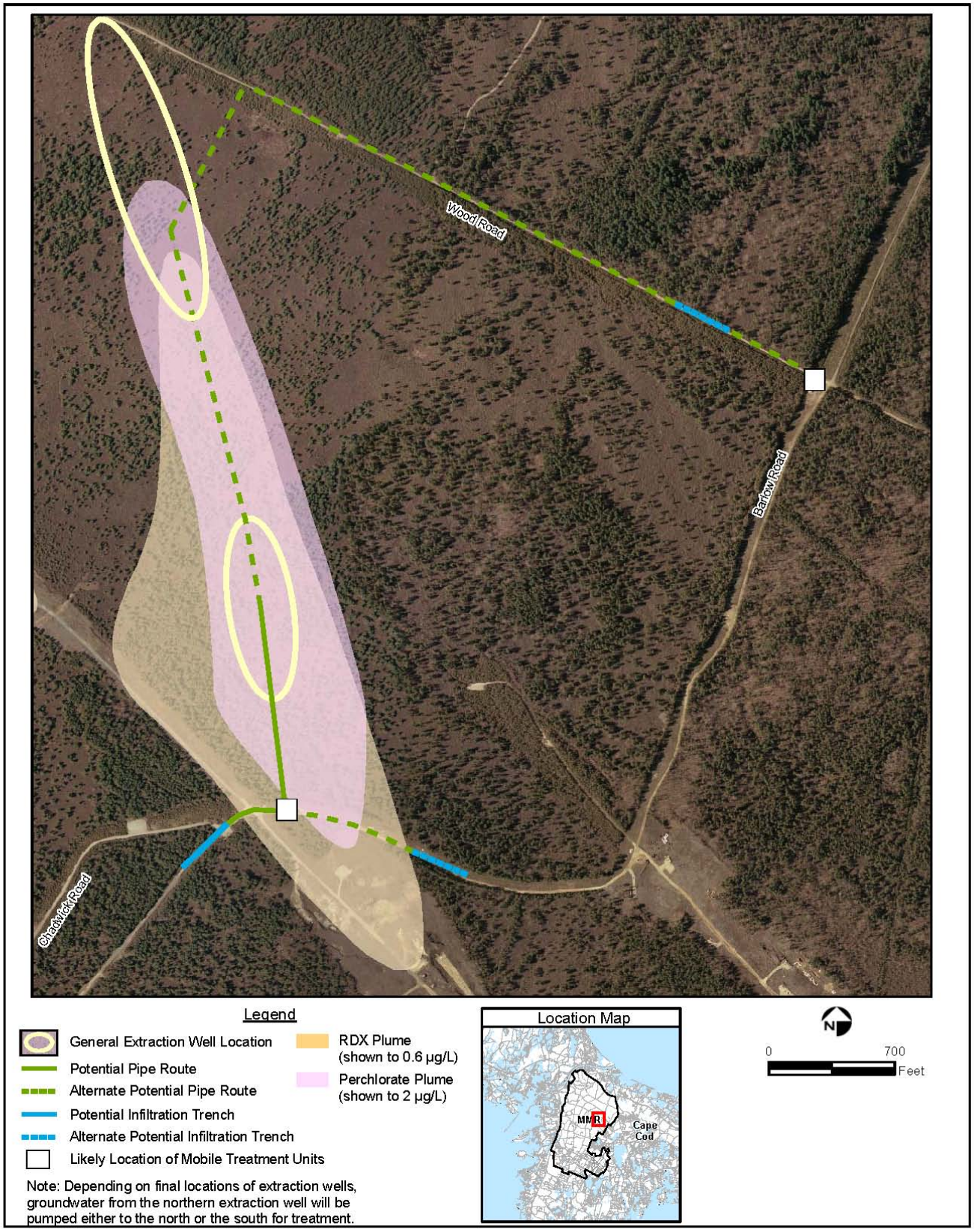
OPPORTUNITIES FOR PUBLIC COMMENT

The 30-day public comment period for the Remedy Selection Plan will be July 19, 2010 through August 17, 2010. During the public comment period, comments can be submitted as follows:

By fax to:
(617) 918-0020

By mail to:
Jeanethe Falvey
US EPA Region 1
5 Post Office Square - Suite 100
Boston, MA 02109-3912

By email to:
falvey.jeanethe@epa.gov



Conceptual J-1 Northern Extraction Well Locations and Pipelines

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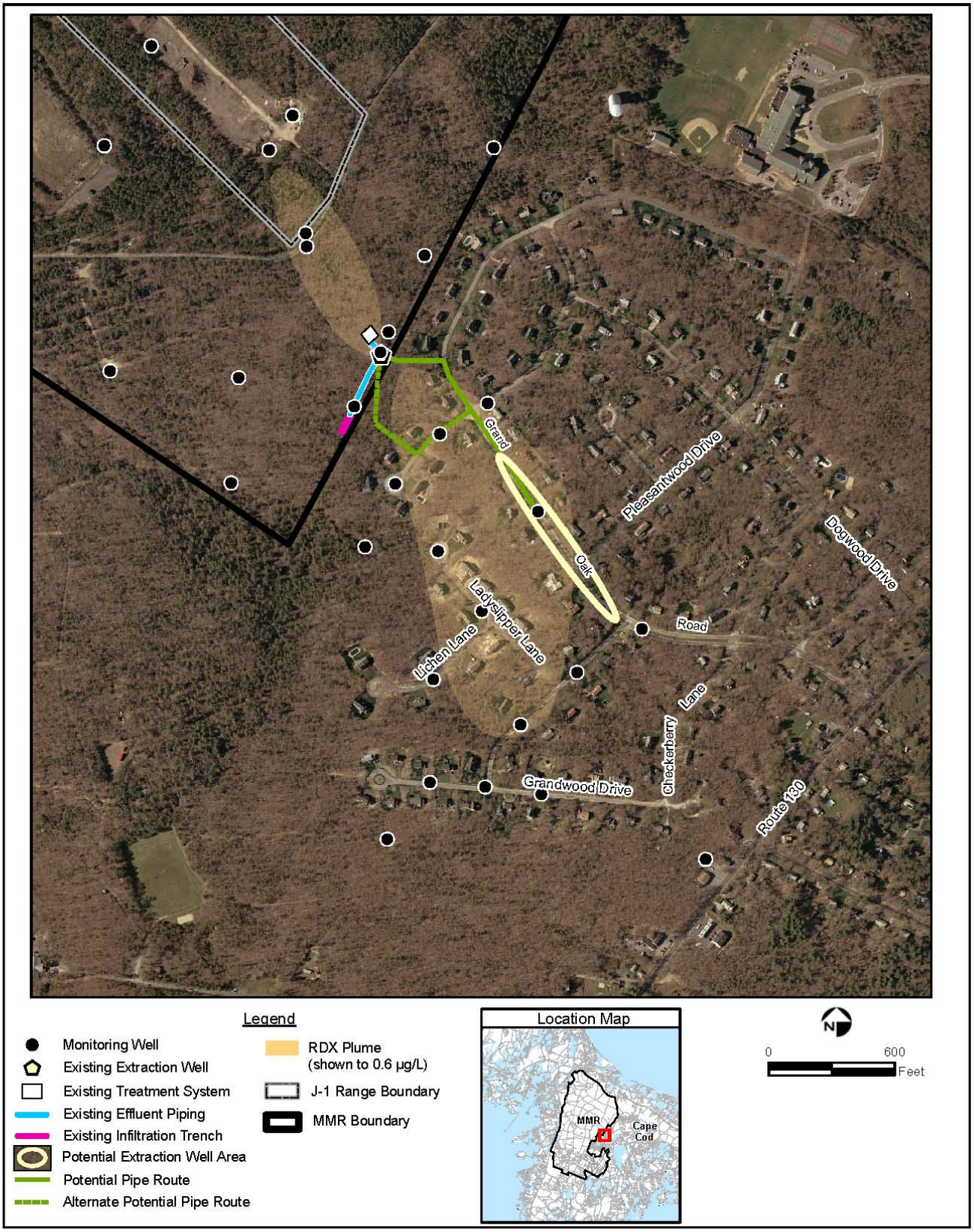
July 6, 2010 DWN: MTW CHKD: DLH

Impact Area Groundwater Study Program



Conceptual J-1 Southern Extraction Well Location and Pipelines

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Impact Area
Groundwater Study Program

FIGURE