REMEDY SELECTION PLAN FOR J-2 RANGE

July 2013

The United States Environmental Protection Agency (EPA) seeks your feedback on this Remedy Selection Plan for the J-2 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 Army National Guard'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 report presenting alternatives for addressing the contamination at the site.

The Army National Guard'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 17 through August 16, 2013). Please review this Remedy Selection Plan, and send your comments 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 17 through August 16, 2013, and you are invited to a public informational session during the MMR Cleanup Team meeting on July 24, 2013 at 6:00 p.m. at Building 1805 on the MMR to learn more about the groundwater contamination at the J-2 Range, and the proposed remedy. You can also provide oral comments at 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 17, 2013 through August 16, 2013

Oral comments may be offered at the Public Meeting or written comments may be submitted by U.S. mail or email no later than August 16, 2013.

Public Information Meeting/Public Hearing
July 24, 2013
Massachusetts Military Reservation
Building 1805 West Outer Road
Camp Edwards, MA 02542

Written comments should be mailed to:
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US EPA Region 1
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J-2 RANGE REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The Remedial Investigation and Feasibility Study (RI/FS) report for the J-2 Range is the document used to summarize activities conducted to characterize possible sources of contamination (i.e. soil and munitions), determine the impacts of these sources on groundwater, and evaluate a range of remedial alternatives to address any contamination identified. During the RI, several different sources of contamination were identified including disposal pits containing unexploded ordinance (UXO) as well as soil contamination from training and testing activities on the range. Generally, the various sources of contamination were removed as they were discovered during the investigation. Based on the work conducted during the investigation, it is assumed that most of the significant sources of contamination have been removed. However, the RI Report concluded that this assumption should be verified with additional soil sampling and UXO clearance and if additional sources are found, they should be removed as part of the long term remedy.

The feasibility study focused on the development and evaluation of a range of potential response actions necessary to address contaminants detected in groundwater associated with the site. The groundwater at the J-2 Range has been contaminated by RDX and perchlorate. These chemicals are associated with the use and disposal of military munitions and fireworks.

Since the groundwater contamination from the J2 Range is located up-gradient from a current public water supply, the groundwater cleanup objectives for the site are as follows:

- to restore the useable groundwater to its beneficial use wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site and 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;
- to prevent ingestion and inhalation of groundwater containing the contaminants of concern (COCs) (RDX and perchlorate), 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.
- to protect the current water supply by preventing groundwater in excess of Health Advisories, drinking water equivalent levels (DWELs), applicable State standards or an unacceptable excess lifetime cancer risk or non-cancer Hazard Index from migrating past Gibbs Road located on Camp Edwards.

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).

The feasibility study evaluated the following 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 available on EPA's web 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 trenches, 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 using groundwater modeling;
- Use of treatment systems with ion exchange resin and/or granular activated carbon vessels (similar to those currently in use by the IAGWSP).
- Continuation of groundwater monitoring (where applicable) for three years after cleanup objectives are achieved.

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

- Capital costs, which are expenditures required to initiate and install a remedial action. The cost estimates do not include costs associated with the previously constructed treatment systems;
- Operation and maintenance (O&M) and Land Use Controls costs, which are post-implementation costs, such as monitoring, labor, reporting, 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 groundwater alternatives presented for the J-2 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-2 Plume, page 12 for the eastern J-2 Plume.

BACKGROUND

The J-2 Range is located adjacent to and partially within the Impact Area and is the northernmost of four former military training and defense contractor test ranges that operated from the 1930s until the 1980s. The J-2 Range is approximately 1,200 meters long and between 100- and 150-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.

Military activities conducted in the area of the J-2 Range primarily involved small arms training from the 1930s to the late 1980s. The N Range small arms range will be further evaluated as a component of the Small Arms Range Operable Unit. Defense contractor testing activities conducted from the 1950s to late 1980s included propellant and fuze testing, testing of mortar fin assemblies, penetration testing for various munitions, including rockets, and other miscellaneous testing activities. The predominant firing positions were near the southern portion of the range. Target areas have been documented by the presence of UXO and soil contamination at berms on the range as well as at various other locations throughout the range.

Excess explosives, propellant, and munitions were also burned and buried on the J-2 Range. These areas included Disposal Area 2 and numerous burial pits located throughout the southern and central portion of the range. The conceptual site model, based on known range use, activities and the distribution of UXO and soil contaminants suggests burning and disposal activities at Disposal Area 2 as the major source of the J-2 Range northern plume, and firing, munitions testing and disposal activities as the major source of the J-2 eastern plume.

INVESTIGATIONS AND FINDINGS

Investigations in the J-2 Range included soil sampling, geophysical surveys, intrusive investigations and groundwater sampling. Soil and groundwater sampling and investigation activities have been ongoing since 1999.

Some of the groundwater underlying and downgradient of the J-2 Range is contaminated by RDX and perchlorate. For groundwater investigation and analysis purposes, the J-2 Range has been divided into two sub-areas, the northern groundwater plume area and the eastern groundwater plume area. This division is based on the locations of the source areas for each groundwater plume and their distinctly different migration patterns.

In the northern area, the groundwater plume consists of perchlorate and RDX. The main body of the perchlorate groundwater plume is approximately 8,100 feet long by 850-feet wide at its widest point and is becoming segmented due to the operation of the J-2 northern extraction, treatment and infiltration (ETI) system. The extent of the main RDX groundwater plume has diminished due to mass removal from the ETI system and natural attenuation. Concentrations of RDX above 0.6 ppb were detected in two wells in 2012. The maximum detected concentrations in the northern groundwater plume as of 2013 are 115 ppb for perchlorate and 2.9 ppb for RDX. The maximum historical detections were 198 ppb for perchlorate and 16.1 ppb for RDX.

J-2 Range

Investigations in the north central portion of the range revealed soil contamination and UXO in and around Disposal Area 2. The highest concentrations of explosives detected were 11 milligrams/kilogram (mg/Kg) for RDX and .14 mg/Kg for TNT. Perchlorate was detected as high as 4.68 mg/Kg. These soils have been removed from the site. The extent of the J-2 northern groundwater plume is consistent with a source area in this location.

Soil sampling conducted more recently (2009/2010) identified additional contamination in the northern portion of the range known as the J-2 Extension area. Analytical results indicated concentrations of HMX in these soils. These soils have been removed as discussed on page 5, "Response Actions".

The J-2 eastern groundwater plume is also comprised primarily of perchlorate and RDX. The extent of the main body of the eastern groundwater plume is approximately 5,800 feet long and approximately 1,700 feet wide at its widest point and is becoming segmented due to operation of the J-2 Eastern ETI system. The maximum detected concentrations in the eastern groundwater plume as of 2013 are 44 ppb for perchlorate and 14 ppb for RDX. The maximum historical detections were 88 ppb for perchlorate and 17 ppb for RDX.

Investigations in the southern and south central portions of the range revealed contaminated soils and numerous burial pits containing UXO.

The highest concentrations of explosives detected were 8.6 mg/Kg for RDX and 990 mg/Kg for HMX. Perchlorate was detected as high as 0.5 mg/Kg. Most of the contaminated soils have been removed from the site. The conceptual site model, based on known range use activities and the presence of soil contaminants, suggests munitions firing, testing and disposal activities as the major source of the eastern groundwater plume.

Soil treatment operations – winter 2009

MTUs E and F at the J-2 northern plume – Installed under an interim response action in 2006

RESPONSE ACTIONS

GROUNDWATER

Since the Upper Cape Cod Water Supply Cooperative wells WS-1 and WS-2 are located downgradient from the J-2 northern and eastern plumes, interim treatment systems were installed to provide accelerated protection of the water supply wells and aquifer restoration by capturing and treating contaminated groundwater until the long-term remedy could be selected for the plumes.

In 2005, a rapid response action was initiated to address the J-2 northern plume. The $3 million J-2 northern system consisted of three extraction wells situated along the plume axis operating at a combined flow rate of 375 gallons per minute (gpm). Water is treated using granular activated carbon and ion exchange resins in two modular treatment units (MTUs) and one stand-alone treatment system. The treated groundwater is returned to the aquifer via four infiltration trenches. The system became operational in September 2006 and over 1.2 billion gallons of groundwater have been treated to date.

In May 2007, construction began on a second system to address the J-2 eastern plume. The $5.6 million J-2 eastern system consisted of three extraction wells oriented along the plume axis operating at a combined flow rate of 425 gpm. Water is treated using granular activated carbon and ion exchange resins in four MTUs. The treated groundwater is returned to the aquifer via three infiltration trenches. The system began operating in August of 2008 and has treated over 950 million gallons of contaminated groundwater to date.

SOIL

During response actions conducted from 2004 to 2006, approximately 6,474 cubic yards of soil contaminated with explosives and perchlorate were excavated from the central and southern portions of the J-2 Range and treated onsite by thermal desorption.

In 2009 and 2010, approximately 1,100 cubic yards of contaminated soil was removed from the J-2 extension area and treated by alkaline hydrolysis at the on-site treatment cell located at the L Range. Alkaline hydrolysis involves raising the pH of the soil by blending it with water and hydrolyzed lime to degrade (mineralize) the explosive compounds into more elemental compounds of inorganic nitrogen and carbon dioxide. Finally, approximately 1,120 additional cubic yards of contaminated soils, generated as a result of various intrusive investigations of geophysical anomalies, were disposed of off-site at permitted facilities.

These targeted soil removal actions have likely removed most of the soil contamination that was posing as active sources of groundwater contamination. However, additional soil sampling is necessary to confirm that all potential sources have been addressed.

MUNITIONS

Geophysical investigations were conducted from 1997 through 2009 in several different phases and utilized several approaches to identify and remove munitions. Many of the investigations focused on identifying and removing disposal pits. Over the course of these ongoing removal actions, approximately 21,600 munitions containing high explosives were removed. In addition, approximately 11,100 munitions containing small quantities of explosives were removed along with 114,000 pounds of range debris. These targeted removals of munitions have likely removed most of the items posing as active sources of groundwater contamination. However, additional targeted geophysical work is necessary to confirm that all sources have been addressed.

DEVELOPMENT OF GROUNDWATER ALTERNATIVES

The remedies evaluated for groundwater in the J-2 Range Feasibility Study are monitored natural attenuation and focused extraction. These remedies include technologies already proven to be effective at the Massachusetts Military Reservation. The technology selected for the alternatives is groundwater extraction, treatment with granular activated carbon (GAC) for RDX and ion exchange resin for perchlorate contaminated groundwater, and return of treated water back into the aquifer via infiltration trenches or infiltration galleries.

Since the extent of the J-2 northern RDX plume has decreased to the point that it is fully enveloped by the larger perchlorate plume, cleanup of RDX is expected to occur simultaneously with the perchlorate cleanup. Separate estimates of RDX remediation timeframes for the J-2 northern alternatives were not developed. A qualitative estimate based upon information previously developed is that RDX is predicted to decrease below 0.6 ppb by 2020.

All the alternatives assume that there is no continuing source to groundwater contamination. This assumption must be verified as part of the final remedy.

J-2 RANGE NORTHERN PLUME ALTERNATIVES

Alternative 1 – No Further Action

Capital Cost	$ 129,000
Operations &Maintenance (O&M) Costs	$ 0
Site closeout and documentation	$ 84,000
Total Present Value	$ 213,000

Alternative 1 provides for no further action to address the J-2 Range Northern groundwater contamination. Under this alternative:

- Model predictions could not be confirmed due to abandonment of existing treatment units and 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 is predicted to drop below the 2 ppb MMCL for perchlorate by 2065 and is expected to reach background levels after 2113.

Alternative 2 – Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs)

Capital Cost	$ 565,000
O&M Costs	$ 3,000,000
Site closeout and documentation	$ 84,000
Total Present Value	$ 2,783,000

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 is predicted to drop below the 2 ppb MMCL for perchlorate by 2065 and is expected to reach background levels after 2113.

Alternative 3 - Focused Extraction with Three Wells, MNA and LUCs (Continued Operation of Current System)

Capital Cost	$ 565,000
O&M Costs	$ 5,534,000
Site closeout and documentation	$ 84,000
Total Present Value	$ 5,825,000

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

- Contamination would be remediated through the long term operation of the current extraction system consisting of:
  - A flow rate of 75 gpm at J2EW0001, 175 gpm at J2EW0002, and 125 gpm at J2EW0003 for a total combined pumping rate of 375 gpm.
  - Treatment with granular activated carbon and ion-exchange resin at two treatment units and one treatment facility.
  - Infiltration of the treated water via four infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs 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 & site-closeout documentation would be completed.

Contamination within the plume is predicted to drop below the 2 ppb MMCL for perchlorate by 2029 and is expected to reach background levels by 2071.

Alternative 4 – Focused Extraction with Three Wells, MNA and LUCs (Optimization of Current System)

Capital Cost	$ 565,000
O&M Costs	$ 5,000,000
Site closeout and documentation	$ 84,000
Total Present Value	$ 5,346,000

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

- The pump and treat system would include:
  - A flow rate of 150 gpm at J2EW0001 100 gpm at J2EW0002, and 125 gpm at J2EW0003 for a total combined pumping rate of 375 gpm. Treatment with granular activated carbon and ion-exchange resin.
  - Infiltration of the treated water via four infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs 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 predicted to drop below the 2 ppb MMCL for perchlorate by 2027 and is expected to reach background levels by 2071.

Alternative 5 – Focused Extraction with Five Wells, MNA and LUCs

Capital Costs	$ 3,760,000
O&M Costs	$ 7,174,000
Site closeout and documentation	$ 84,000
Total Present Value	$10,690,000

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

- The pump and treat system would include:
  - A flow rate of 150 gpm at J2EW0001, 200 gpm at J2EW0002 125 gpm at J2EW0003, and the addition of two extraction wells near J2EW0001 (100 gpm at a shallow well and 50 gpm at a deep well) for a total combined pumping rate of 625 gpm.
  - Treatment with granular activated carbon and ion-exchange resin by expanding the treatment units.
  - Infiltration of the treated water by expanding the infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs 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 predicted to drop below the 2 ppb MMCL for perchlorate by 2024 and to reach background levels by 2059.

EVALUATION OF GROUNDWATER ALTERNATIVES FOR THE J-2 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 5 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 5 add provisions for plume monitoring and Land Use Controls to help prevent future exposure to contaminated groundwater. Alternatives 3, 4, and 5 add extraction and treatment components 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 ensure that applicable standards are met.

LONG-TERM EFFECTIVENESS AND PERMANENCE

All alternatives are expected to provide long-term effectiveness and permanence; however, the timeframes differ. Additional soil sampling and UXO clearance shall be performed to confirm that the source area has been removed so residual soil contamination is unlikely to compromise the permanence of the remedial alternatives once completed. Alternatives 2 through 5 also include long term groundwater monitoring to verify the effectiveness of the soil and UXO removal.

Alternative	Predicted Perchlorate Cleanup Times *MMCL* 2 ppb
1	2065
2	2065
3	2029
4	2027
5	2024

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. Modeling estimates that Alternatives 3, 4, and 5 would extract 13.9, 13.2, and 11.6 pounds of perchlorate respectively through the use of extraction wells.

SHORT-TERM EFFECTIVENESS

Alternative 1 would have the least impact on workers and the environment because construction is minimal. Alternative 5 may have the greatest impact because of the 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

Alternative 1 is the most easily implemented alternative since it requires no further action other than abandoning system infrastructure, groundwater monitoring wells and preparing close out documentation. Alternatives 2, 3, and 4 are the next most easily implemented alternatives with groundwater monitoring, O&M of the existing ETI system (for Alternative 3) and Land Use Controls. Alternative 5 would require installation of new extraction wells.

COST

The costs of alternatives increase as the amount of treatment increases. Alternative 1 has a total estimated cost of $213,000, Alternative 2 - $2,783,000, Alternative 3 - $5,825,000, Alternative 4 - $5,346,000, and Alternative 5 - $10,690,000.

EVALUATION OF GROUNDWATER ALTERNATIVES FOR THE J-2 RANGE NORTHERN PLUME (CONT.)

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-2 RANGE NORTHERN GROUNDWATER PLUME

FOCUSED EXTRACTION WITH THREE WELLS, MONITORED NATURAL ATTENUATION AND LAND USE CONTROLS (OPTIMIZATION OF CURRENT SYSTEM)

Alternative 4, Focused Extraction with Three Wells, Monitored Natural Attenuation and Land Use Controls, provides the best balance of the criteria used to evaluate the cleanup alternatives. However, to strengthen this alternative, EPA has recommended an Enhanced Alternative 4. This Enhanced Alternative 4 includes:

- Extraction and treatment of groundwater by shifting pumping stress between the existing extraction wells within the current system design, and/or expanding the system to ensure complete containment of the plume upgradient of each extraction well; treatment with granular activated carbon and ion exchange resin at the existing and/or expanded treatment units; and infiltration of the treated water at a minimum of four infiltration trenches. A work plan will be developed and implemented as part of the remedy, after approval by EPA and Mass DEP, and will include the installation of additional monitoring wells to determine if each extraction well is achieving containment. The work plan will also explain how the extraction and treatment system will be altered and augmented to insure that containment at each extraction well is achieved.
- A contingency for additional active treatment in the area of Gibbs Road on Camp Edwards, and modifying the system to optimize the system performance to ensure protection of the Upper Cape Water Supply. A work plan will be developed and implemented as part of the remedy, after approval by EPA and Mass DEP, and will include the installation of monitoring wells to verify that contamination will not migrate past Gibbs Road. The work plan will include monitoring and modeling work necessary to make this demonstration periodically. If monitoring data or modeling suggests that contamination above federal or state regulatory or risk-based levels for COCs will likely migrate past Gibbs Road, additional extraction wells will be installed and begin operation within 12 months of that determination.
- Confirmatory soil sampling and UXO clearance in select areas of the range to verify source removal is complete. A work plan will be developed and implemented as part of the remedy, after approval by EPA and Mass DEP, which includes soil sampling and geophysical investigations in areas of the range known to have contributed to groundwater contamination. Soil contamination and munitions posing a threat to groundwater shall be removed.
- Long-term groundwater monitoring at existing and new monitoring wells to verify the effectiveness of the soil and UXO removal; to ensure that groundwater modeling predictions regarding the reduction and migration of contamination are correct; and to ensure that any remaining contamination remains below risk-based levels.
- Implementation and verification of Land Use Controls to prevent use of contaminated portions of the aquifer for drinking water until contamination is reduced to below risk-based levels and to prevent actions that would interfere with the remedy.
- Five year reviews will be conducted to ensure that the remedy remains protective and is achieving the goals established in the RSP.

The remedy is predicted to achieve a perchlorate level of 2 ppb by 2027 as site contaminants in groundwater are reduced through treatment and natural processes. RDX was estimated to reach a level of 0.6 ppb by 2020.

This alternative is proposed because it achieves permanent cleanup of RDX and perchlorate in groundwater in the J-2 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.

The estimated cost of the proposed remedy is approximately $5,346,000. This cost would increase if the current system needs to be expanded to meet the containment objective and/or if the contingency remedy is required.

J-2 RANGE EASTERN PLUME ALTERNATIVES

Alternative 1 – No Further Action

Capital Cost	$	161,450
O&M Costs	$	0
Site closeout and documentation	$	84,000
Total Present Value	$	246,000

Alternative 1 provides for no further action to address any remaining groundwater contamination associated with the J-2 Range eastern plume. Under this alternative:

- Model predictions could not be verified due to abandonment of existing monitoring wells and treatment systems.
- 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 predicted to drop below the 2 ppb MMCL for perchlorate by 2104 and is expected to reach background levels after 2113. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2055 and background after 2113.

Alternative 2 – Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs)

Capital Cost	$	797,000
O&M Costs	$	3,793,000
Site closeout and documentation	$	84,000
Total Present Value	$	3,231,000

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 predicted to drop below the 2 ppb MMCL for perchlorate by 2104 and is expected to reach background levels after 2113. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2055 and background after 2113.

Alternative 3 – Focused Extraction with Three Wells, MNA and LUCs (Continued Operation of Current

Capital Cost	$	797,000
O&M Costs	$	4,987,000
Site closeout and documentation	$	84,000
Total Present Value	$	5,526,000

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

- Contamination would be remediated through the long-term operation of the current groundwater extraction system consisting of:
  - A flow rate of 90 gpm at J2EW0004, 210 gpm at J2EW0005, and 125 gpm at J2EW0006 for a total combined pumping rate of 425 gpm.
  - Treatment with granular activated carbon and ion-exchange resin at 4 treatment units.
  - Infiltration of the treated water via three 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 predicted to drop below the 2 ppb MMCL for perchlorate by 2027 and is expected to reach background levels by 2058. RDX concentrations are expected to decrease below 10^{-6} risk-based level of 0.6 ppb by 2023 and background by 2031.

Alternative 4 – Focused Extraction with Three Wells, MNA and LUCs (Optimization of Current System)

Capital Cost	$	797,000
O&M Costs	$	5,467,000
Site closeout and documentation	$	84,000
Total Present Value	$	5,980,000

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

- The pump and treat system would include:
  - A flow rate of 120 gpm at J2EW0004 250 gpm at J2EW0005, and 125 gpm at J2EW0006 for a total combined pumping rate of 495 gpm.
  - Treatment with granular activated carbon and ion-exchange resin by expanding the treatment units.
  - Infiltration of the treated water by expanding the infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs 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 predicted to drop below the 2 ppb MMCL for perchlorate by 2027 and is expected to reach background levels by 2066. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2022 and background by 2030.

Alternative 5 – Focused Extraction with Five Wells, MNA and LUCs

Capital Cost	$ 3,764,000
O&M Costs	$ 5,868,000
Site closeout and documentation	$ 84,000
Total Present Value	$ 9,486,000

Alternative 5 would provide for extraction and treatment of the J-2 eastern groundwater by optimizing the current groundwater extraction system and the installation of two new extraction wells. Under this alternative:

- The pump and treat system would include:
  - A flow rate of 150 gpm at J2EW0004 , 250 gpm at J2EW0005, 125 gpm at J2EW0006 and installation of two new extraction wells (upgradient of J2EW0005) operating at 175 and 150 gpm for a total combined pumping rate of 850 gpm.
  - Treatment with granular activated carbon and ion-exchange resin by expanding the treatment units.
  - Infiltration of the treated water by expanding the infiltration trenches.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- LUCs 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 predicted to drop below the 2 ppb MMCL for perchlorate by 2022 and is expected to reach background levels by 2035. RDX concentrations are expected to decrease below the 10^{-6} risk-based level of 0.6 ppb by 2021 and background by 2026.

EVALUATION OF GROUNDWATER ALTERNATIVES FOR J-2 RANGE EASTERN 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 add 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. Additional soil sampling and UXO clearance will be performed to confirm that the source area has been removed so residual soil contamination is unlikely to compromise the permanence of the remedial alternatives once completed. Alternatives 2 through 5 also include long term groundwater monitoring to verify the effectiveness of the soil and UXO removal.

Alternative	Predicted RDX Cleanup Times 0.6 ppb *10^{-6} Cancer Risk Level*	Predicted Perchlorate Cleanup Times 2 ppb *MMCL*
1	2055	2104
2	2055	2104
3	2023	2027
4	2022	2027
5	2021	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. Modeling estimates that Alternative 3 would remove 2.9 pounds of RDX and 13 pounds of perchlorate, Alternative 4 would remove 2.8 pounds of RDX and 13.5 pounds of perchlorate, and Alternative 5 would remove 3.1 pounds of RDX and 11.6 pounds of perchlorate.

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 infiltration trenches. Alternatives 2, 3 and 4 have the least impact on workers, the community and the environment since they require only limited construction activities.

IMPLEMENTABILITY

Alternative 1 is the most easily implemented alternative since it requires no further action other than abandoning system infrastructure, groundwater monitoring wells and preparing close out documentation. Alternatives 2, 3 and 4 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. Alternative 5 would require installation of two new extraction wells.

EVALUATION OF GROUNDWATER ALTERNATIVES FOR J-2 RANGE EASTERN PLUME (CONT.)

COST

The costs of alternatives increase as the amount of treatment increases. Alternative 1 has a total estimated cost of $246,000 Alternative 2 - $3,230,000, Alternative 3 - $5,526,000, Alternative 4 - $5,980,000, and Alternative 5- $9,486,000.

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-2 EASTERN GROUNDWATER PLUME

FOCUSED EXTRACTION WITH 3 WELLS, MONITORED NATURAL ATTENUATION AND LAND USE CONTROLS (OPTIMIZATION OF CURRENT SYSTEM)

Alternative 4, Focused Extraction with Three Wells, Monitored Natural Attenuation and Land Use Controls, provides the best balance of the criteria used to evaluate the cleanup alternatives. The proposed remedy consists of the optimization and continued long-term operation of the current J-2 Range eastern groundwater extraction treatment injection system. The J-2 Range eastern groundwater plume ETI system consists of three extraction wells and three infiltration trenches located to the northeast, southeast, and southwest of the plume. Active treatment of the plume removes perchlorate and RDX from the extracted groundwater and returns treated water to the aquifer. This alternative includes modifying the system to optimize the system performance.

In addition, the proposed remedy for the J2 Eastern Groundwater plume also includes the following:

- Confirmatory soil sampling and UXO clearance in select areas of the range to verify source removal is complete. A work plan will be developed and implemented as part of the remedy, after approval by EPA and Mass DEP, which includes soil sampling and geophysical investigations in areas of the range known to have contributed to groundwater contamination. Soil contamination and munitions posing a threat to groundwater shall be removed.
- Long-term groundwater monitoring at existing and new monitoring wells to verify the effectiveness of the soil and UXO removal; to ensure that groundwater modeling predictions regarding the reduction and migration of contamination are correct; and to ensure that any remaining contamination remains below risk-based levels.
- Implementation and verification of Land Use Controls to prevent use of contaminated portions of the aquifer for drinking water until contamination is reduced to below risk-based levels and to prevent actions that would interfere with the remedy.
- Five Year Reviews will be conducted to ensure that the remedy remains protective and is achieving the goals established in the RSP.

RDX is predicted to decrease below 0.6 ppb by 2022 and perchlorate is predicted to decrease below 2 ppb by 2027 as site contaminants in groundwater are reduced through treatment and natural processes.

Alternative 4 is proposed because it is expected to achieve permanent cleanup of perchlorate and RDX in groundwater in the J-2 Range eastern area economically and in a reasonable timeframe. 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.

The estimated cost of the proposed remedy is approximately $5,980,000.

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 (DD)	Document that summarizes the response action selected to address contamination.
Feasibility Study (FS)	Document presenting and evaluating a range of alternatives for addressing contamination.
Granular activated carbon (GAC)	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 (IX)	A treatment medium used to remove perchlorate from groundwater.
Land Use Controls (LUC)	Administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use
Massachusetts Maximum Contaminant Level (MMCL)	Maximum contaminant level for drinking water in the Commonwealth of Massachusetts.
mg/Kg	Milligram per kilogram
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 (RRA)	An interim cleanup action taken to reduce contamination while the investigation and selection of a response action is completed.
Remedial Investigation (RI)	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 (RSP)	The document outlining the cleanup alternatives and the proposed remedy.

NEXT STEPS/UPCOMING ACTIVITIES

Following presentation of the Remedy Selection Plan for the J-2 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 session is scheduled during the MMR Cleanup Team meeting on July 24, 2013 at Building 1805 on the MMR.

FOR MORE INFORMATION

Contact the following individuals for more information:

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

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

Kate Renahan – U.S. Environmental Protection Agency
(617) 918-1491

Or visit the EPA or IAGWSP Web site at:

http://www.epa.gov/region1/mmr/

http://www.mmr-iagwsp.org

Information repositories have been established at the local public libraries in Bourne, Sandwich, and Falmouth to make information on the program available to the public. 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. All documents are available on the CLAMS automated system.

Key documents related to the J-2 Range site include:

- *Final J-2 Range Remedial Investigation and Feasibility Study*, July 2013

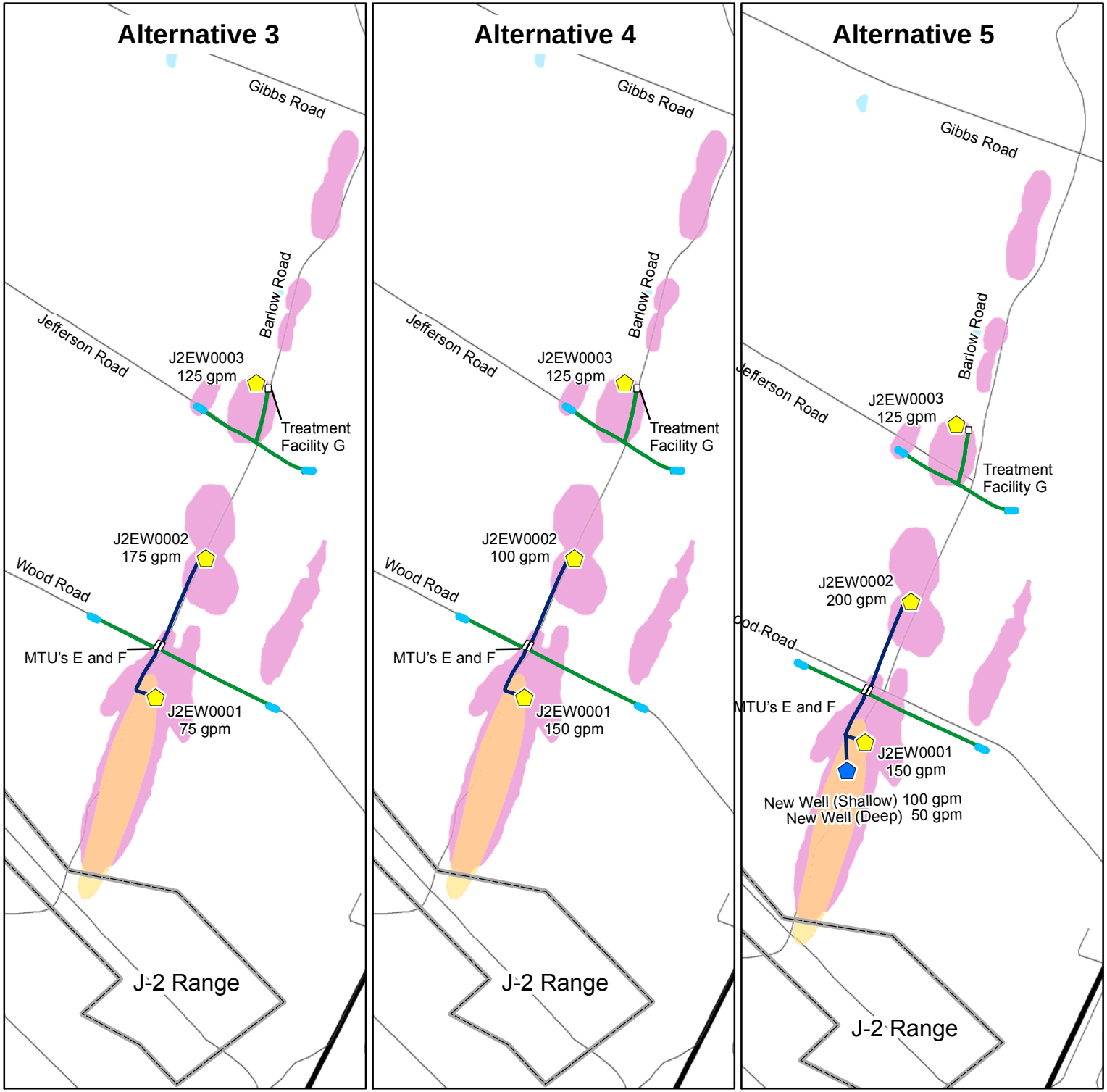
OPPORTUNITIES FOR PUBLIC COMMENT

The 30-day public comment period for the Remedy Selection Plan will be July 17 through August 16, 2013. During the public comment period, comments can be submitted as follows:

By fax to:
(617) 918-0020

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

By email to:
renahan.kate@epa.gov



Impact Area
Groundwater Study Program

LEGEND

- Extraction Well
- Conceptual Extraction Well
- Infiltration Trench
- Influent Piping
- Effluent Piping
- Treatment System
- J-2 Range Boundary
- MMR Boundary
- Perchlorate Plume (shown to 2 ppb)
- RDX Plume (shown to 0.6 ppb)

Plumes: Perchlorate (Revised Jan 2013)
RDX (Existing)

LOCATION MAP

NOTES & SOURCES

Map Coordinate System: NAD83 UTM Zone 19N Meters
Basemap data from US Geological Survey 7 1/2 minute
Topographic Maps: Source: MassGIS

TITLE

J-2 Range Northern
Groundwater Alternatives 3, 4 and 5

0 1,500 Feet

N

US Army Corps of Engineers
New England District

FIGURE 1

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April 8, 2013 DWN: MTW CHKD: KJH

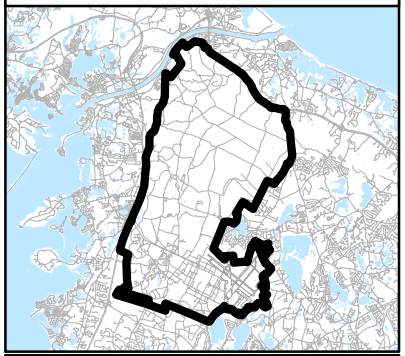
Impact Area Groundwater Study Program

LEGEND

- Extraction Well
- Conceptual Extraction Well
- Infiltration Trench
- Influent Piping
- Effluent Piping
- J-2 Range Boundary
- MMR Boundary
- Perchlorate Plume (shown to 2 ppb)
- RDX Plume (shown to 0.6 ppb)

Plumes: Perchlorate (Revised Oct 2012)
RDX (Revised Oct 2012)

LOCATION MAP



NOTES & SOURCES

Map Coordinate System: NAD83 UTM Zone 19N Meters
Basemap data from US Geological Survey 7 1/2 minute
Topographic Maps: Source: MassGIS

TITLE

J-2 Range Eastern
Groundwater Alternatives 3, 4 and 5

0 2,000 Feet

N

US Army Corps of Engineers
New England District

FIGURE
2

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April 8, 2013 DWN: MTW CHKD: KJH