REMEDY SELECTION PLAN FOR L RANGE

May 2010

The United States Environmental Protection Agency (EPA) seeks public comment on this Remedy Selection Plan for the L 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 soil and groundwater contamination at the L Range and has issued reports on the investigations, along with a feasibility study presenting alternatives for addressing the contamination at the site.

The Army's work 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 is seeking public comment over the next 30 days (May 6 through June 4, 2010). Please review this Remedy Selection Plan, and send your comments to the EPA point of contact provided on page 13. 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.

HOW TO PARTICIPATE

You can provide written comments on this Remedy Selection Plan from May 6, 2010 through June 4 2010, and you are invited to a public informational meeting on May 19, 2010 at 5:00 p.m. at the Forestdale School to learn more about the groundwater contamination at the L Range, and the proposed remedy. EPA, MassDEP and Army representatives will be available at the meeting or by phone (see page 13 for contact information) to respond to questions regarding the site and proposed remedy. You can also provide oral comments at a public hearing that will immediately follow the public meeting. 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

May 6, 2010 through June 4, 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 June 4, 2010.

Public Information Meeting/Public Hearing
May 19, 2010

Forestdale School
Route 130
Forestdale, MA

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

Or sent by:
Fax: (617) 918-0020
Email: falvey.jeanethe@epa.gov

GROUNDWATER REMEDIAL INVESTIGATION AND FEASIBILITY STUDY

The Remedial Investigation and Feasibility Study (RI/FS) report for the L Range is the document used to summarize activities conducted to characterize soil and groundwater contamination and evaluate a range of remedial alternatives. Based on recent sampling data collected from the site, no further action is necessary with regard to soils. (The L Range source area was recently remediated under a $1.5 million source response action.) However, response actions were deemed necessary to address contaminants detected in groundwater associated with the site. The groundwater at the L Range has been contaminated by RDX and perchlorate. These chemicals are associated with the use 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 contaminant of concern (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.

The groundwater cleanup level used is 0.6 parts per billion (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). This cleanup level is more protective than the EPA Lifetime Health Advisory (concentrations that are not expected to cause any adverse non-cancer effects for a lifetime of exposure) for RDX (2 ppb) and the Massachusetts Contingency Plan groundwater cleanup standard of 1 ppb. The groundwater cleanup level for perchlorate is 2 ppb, which is the Massachusetts drinking water standard (Maximum Contaminant Level).

As a result of the soil response action taken, the soil concentrations at the L 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 source-area cleanup or control. The response action already taken also addressed the majority of UXO. Further response is not anticipated at this time. However, the remedy will include groundwater monitoring to verify that any possible remaining UXO will not pose a threat to groundwater.

The feasibility study evaluated three alternatives for achieving the groundwater cleanup objectives: No Action, Monitored Natural Attenuation and Land-use Controls, and Focused Extraction. For more details on the alternatives see the Remedial Investigation/Feasibility Study report.

The Army developed conceptual designs for these three alternatives, including:

- Number, location, and sampling frequency of existing monitoring wells needed to monitor the plume;
- 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 based on groundwater analytical data;
- Modeling predictions of groundwater flow and contaminant fate and transport;
- Use of modular treatment systems with 50 gallons per minute influent flow rate and 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) 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 contingencies and 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. In this case, the land-use controls would restrict well drilling. Land-use controls would be monitored to ensure effectiveness. The goal of the long-term monitoring is to determine if the remedy is performing as planned as 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 L 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 any 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 7.

BACKGROUND

The L Range is located southeast of the impact area, between the J-1 and J-3 Ranges on Camp Edwards. The L Range Study Area includes the L Range proper and three adjacent areas, which are only related to the L Range by proximity (referred to as Area 46, Cleared Area 11 and Area 79).

The L Range was used as a 40mm grenade launcher range. The terrain at L Range is flat, with a series of firing points located atop an earthen berm at the southern end of the range. Firing occurred from firing points at the southeastern portion of the range near the range parking area. Grenades were fired downrange toward multiple targets that were located at varying distances to the north along the range floor, which is bounded by low earthen berms.

Area 46 is located south of the L Range across Greenway Road. This area was included in the L Range study area as part of an effort to identify the source of explosives contamination in groundwater collected from a nearby monitoring well. Available records did not identify any evidence of military activities. Cleared Area 11 is an approximately 1-acre area located along Greenway Road between the L Range and the J-3 Range. This area was identified because it appeared as a cleared area on historic photographs, and currently contains few trees. Area 79 is an area defined by soil samples collected as part of the investigation of the Former H Range. It is located immediately adjacent to Cleared Area 11.

INVESTIGATIONS AND FINDINGS

Investigations in the L Range Study Area included soil sampling, geophysical surveys, groundwater sampling, and a robotics technology demonstration. Soil and groundwater sampling in the L Range study area has been ongoing since 1999.

In 2008, a robotics technology demonstration was conducted at the L Range to evaluate the effectiveness of using remotely operated equipment to safely remove unexploded ordnance (UXO). The robotics technology demonstration was performed over the entire L Range floor, where the former targets were located, and therefore, where there was the greatest probability of finding UXO.

This work, which included an EM-61 survey of the range floor, resulted in the removal of vegetation, targets and munitions from the range floor. A total of 53 potentially high explosive grenades and more than 12,000 pounds of munitions debris (thousands of practice grenades) were recovered from the mid-range area. Intrusive investigations in the area outside the range floor found no UXO.

After completion of the robotics demonstration, multi-increment soil samples were collected from a total of 23 areas in the up-range, mid-range and down-range areas of the L Range and analyzed for explosives and perchlorate. Analytical results indicated concentrations of explosives, including RDX, HMX and TNT in the mid-range area of the range. None of the sampled collected from the three up-range or five down-range areas had any detections of explosives. Perchlorate was detected but only at levels below relevant standards throughout the range. A second round of multi-increment soil samples were collected in May 2009 from the mid-range areas. Results from these samples confirmed the presence of explosives in this portion of the range.

More than 70 groundwater monitoring wells in the area have been sampled. Results of this sampling indicate the presence of low levels of perchlorate and RDX.

The perchlorate and RDX contamination occurs as isolated and noncontiguous lobes detached from upgradient source areas. While there are no residences in the vicinity, residences downgradient are connected to the municipal water supply.

The maximum historic detections were 9 ppb for RDX and 3 ppb for perchlorate. Based on recent data, perchlorate and RDX concentrations have decreased or remained stable in almost all of the downgradient monitoring wells. Perchlorate is no longer detected above 2 ppb in any monitoring well. L Range groundwater contamination currently consists of two RDX lobes and four areas with low levels of perchlorate. The current maximum detection of RDX is 2.8 ppb, perchlorate is 0.69 ppb.

There have been no significant site-related detections of semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs), pesticides, polychlorinated biphenyls (PCBs), herbicides, or inorganic constituents. Modeling indicates that, as a result of natural processes, maximum RDX concentrations within the L Range plume will be below the 2 ppb Health Advisory by 2013 and below the 10^{-6} level by 2027. It is extremely unlikely that RDX from the L range area will ever reach the northern FS-12 extraction wells at detectable concentrations.

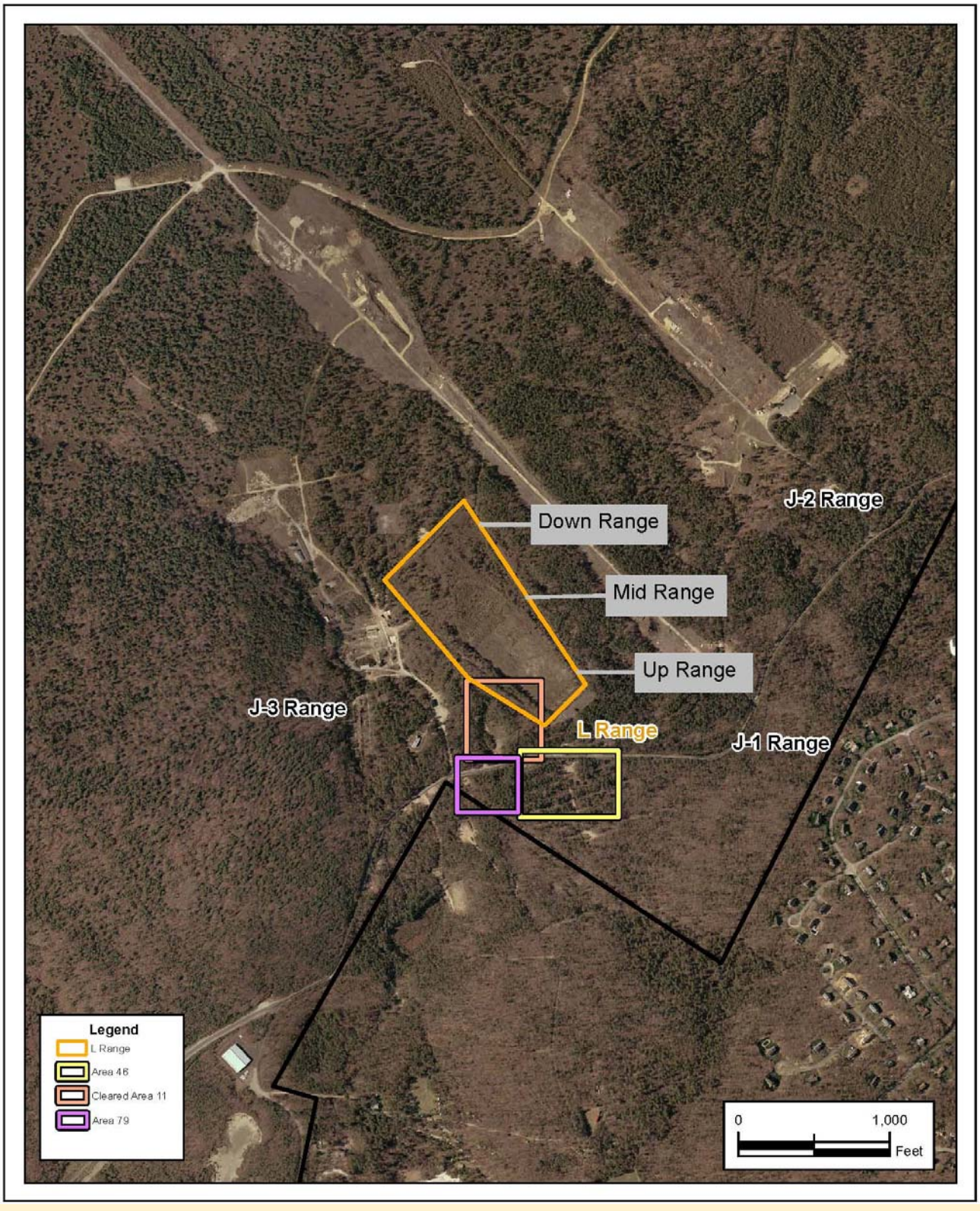
SOURCE AREA RESPONSE ACTION

Contaminated soils were removed from the mid-range area in the fall of 2009 as part of Camp Edwards-wide on-going removal actions for on-site treatment. The contaminated soil was excavated to a depth of 6 inches below ground surface and materials greater than 1-inch in size were screened out.

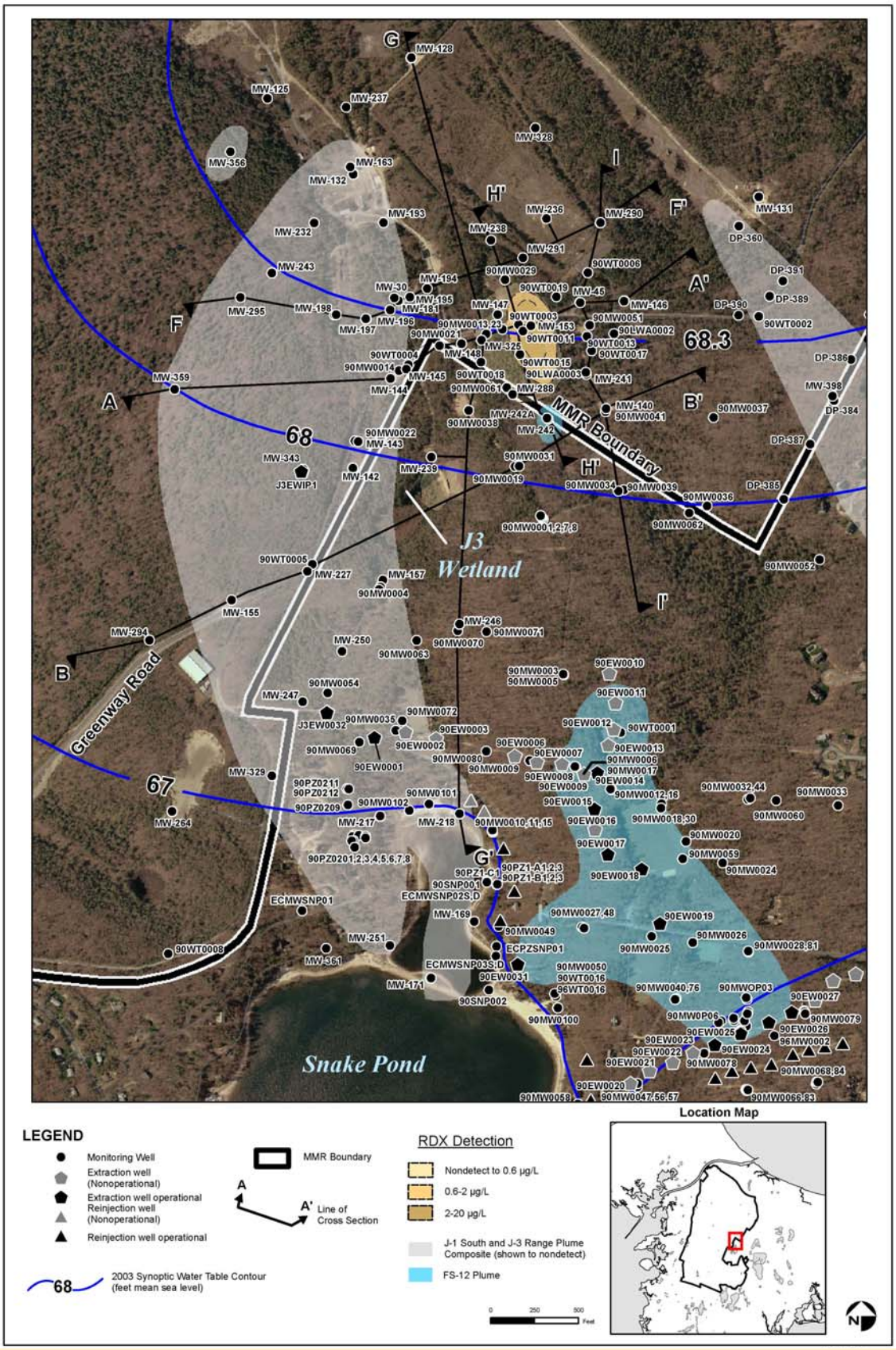
A treatment cell was constructed on the L Range using concrete blocks stacked and aligned to form an 80’ wide x 280’ long x 4’ high containment cell. A liner was installed in the containment area to create a treatment cell with an impermeable base. A 1,000 gallon leachate collection/storage vault was installed below grade, outside the treatment cell. Upon completion of treatment cell construction, a pugmill was mobilized 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 2,700 cubic yards of screened soil were treated by alkaline hydrolysis using hydrated lime. The lime mineralizes the explosive compounds to more elemental compounds of nitrogen and carbon dioxide.

The excavation of soils in the mid-range area to remove soil contamination and the removal of anomalies in the floor of the excavation have further reduced the probability of UXO remaining in the target areas. Several high-explosive grenades were found during the excavation indicating that the robotics technology demonstration was not 100% effective. Portions of the up-range and down-range areas were intrusively investigated and no high explosive grenades and only two smoke grenades with potential live fuzes were found outside the mid-range area. While it is unlikely there is a significant number of UXO remaining on the range floor, a number of UXO may remain in portions of the range that were not completely cleared of UXO.

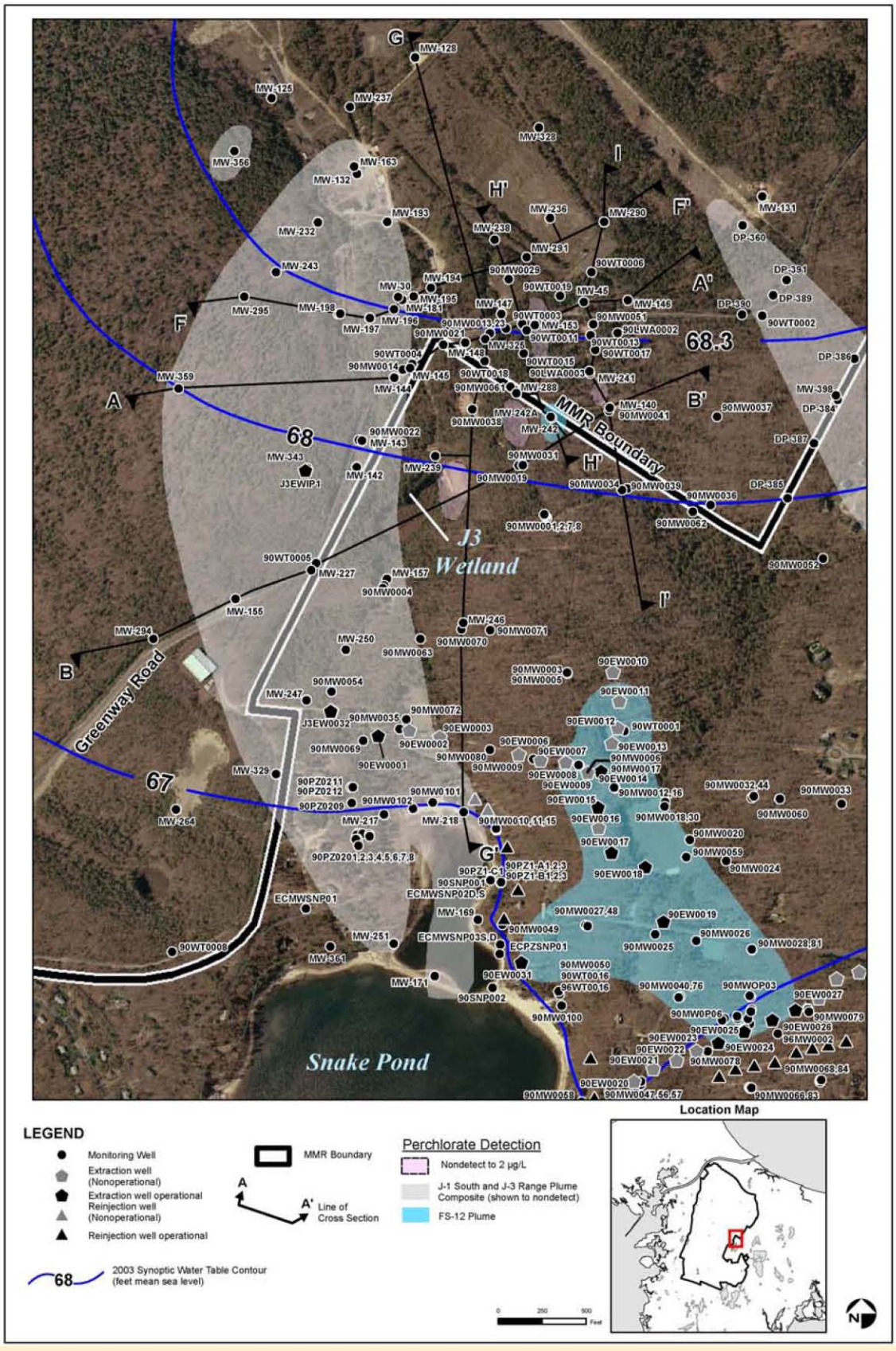
The few remaining UXO that may be present will not likely pose a threat to groundwater. This assumption can be verified by long term monitoring of the groundwater.



Location of L Range Study Areas



L Range RDX Groundwater Contamination



L Range Perchlorate Groundwater Contamination

L RANGE GROUNDWATER ALTERNATIVES

Alternative 1 – No Further Action

Capital Cost	$ 40,425
Operation and Maintenance	$ 0
Site close-out and documentation	$ 69,300
Total	$ 109,725

Alternative 1 considers a no further action alternative to address the L Range plumes. Under this alternative:

- Model predictions could not be confirmed due to abandonment of existing monitoring wells.
- Land-use controls would not be implemented and would not ensure against exposure.
- Site close-out documentation would be completed.
- RDX contamination is expected to drop below the 2 ppb health advisory by 2013, the 0.6 ppb 10^{-6} risk-based level by 2027, and the 0.25 ppb background concentration by 2040.

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

Capital Cost	$ 112,969
Operation and Maintenance	$ 1,720,566
Site close-out and documentation	$ 39,891
Total	$ 1,873,426

Alternative 2 would provide optimized monitoring of L 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.
- Monitoring, reporting and site close-out documentation would be completed.
- RDX contamination is expected to drop below the 2 ppb health advisory by 2013, the 0.6 ppb 10^{-6} risk-based level by 2027, and the 0.25 ppb background by 2040.

Alternative 3 – Focused Extraction with MNA and LUCs

Capital Cost	$ 2,272,146
Operation and Maintenance	$ 1,409,374
Site close-out and documentation	$ 55.006
Total	$ 3,736,526

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

- A 50-gallon-per-minute (gpm) pump and treat system would be installed that would include:
  - One extraction well operated at a pumping rate of 50 gpm
  - Treatment with granular activated carbon at a modular treatment unit to remove contaminants
  - Reinjection of treated water into the aquifer.
- A long-term groundwater monitoring plan would be implemented and optimized as required.
- Land-use controls would be implemented to prevent use of contaminated portions of the aquifer for drinking water.
- Monitoring, reporting and site close-out documentation would be completed.
- The extraction well would operate for approximately one year.
- RDX contamination is expected to drop below the 2 ppb health advisory by 2012, the 0.6 ppb 10^{-6} risk-based level by 2016, and the 0.25 ppb background concentration by 2024.

EVALUATION OF ALTERNATIVES

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

OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

Alternatives 2 and 3 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. Alternatives 2 and 3 add provisions for plume monitoring and institutional controls to help prevent future exposure to contaminated groundwater.

COMPLIANCE WITH REGULATIONS

All three 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. Alternative 2 includes monitoring to confirm that this occurs; Alternative 1 does not. Alternative 3 includes active treatment for approximately one year to ensure that cleanup standards are met. Alternatives 2 and 3 would comply with location- and action-specific regulations. Alternative 1 involves no action; no location- or action-specific requirements 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 remedial alternatives once completed. For Alternatives 1 and 2 RDX is expected to be reduced to below 2 ppb by 2013, while RDX would dissipate to below 0.6 µg/L by 2027. Background concentrations would be achieved by 2040. Alternative 3 would achieve the RDX Health Advisory (2 ppb) by 2012, the 10^{-6} risk based level (0.6 ppb) in 2016, and the background concentration (0.25 ppb) by 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. Alternative 3 would remove approximately 0.8 Kg of RDX from the groundwater through treatment over the course of approximately one year of operation.

SHORT-TERM EFFECTIVENESS

Alternative 1 would have the least short-term impact on the community or workers because construction is minimal. Alternative 3 would have the greatest short-term impact because of the construction involved.

IMPLEMENTABILITY

None of the alternatives are limited by administrative or technical feasibility. Alternative 1 would be the most easily implemented since it requires no further action other than abandoning groundwater monitoring wells and preparing site close out documentation and Alternative 3 would be the most difficult to implement since it includes the installation of extraction wells, a treatment system and pipe and power lines. Property access issues could develop in locating extraction wells and associated piping off-site.

COST

Alternative 1 is the least expensive alternative with a total estimated cost of $109,725. Alternative 2 is the next least expensive alternative with a total estimated cost of $1,873,426. Alternative 3 is the most expensive alternative with a total estimated cost of $3,736,526.

STATE ACCEPTANCE

This criterion is continually evaluated as MassDEP participates in all aspects of the evaluation and selection of a remedy. MassDEP's official acceptance will be provided with a concurrence letter on the Decision Document, which will be issued after the public comment period.

COMMUNITY ACCEPTANCE

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

PROPOSED REMEDY FOR L RANGE

ALTERNATIVE 2 - MONITORED NATURAL ATTENUATION AND LAND-USE CONTROLS.

The Monitored Natural Attenuation and Land-use Controls alternative for the L Range, as presented in the feasibility study, provides the best balance of the criteria used to evaluate cleanup alternatives.

- The response actions taken to date to address soil and UXO are expected to remove 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 alternative is expected to achieve cleanup goals in 2027 as site contaminants in groundwater are reduced to risk-based levels through natural processes.
- Human health will be 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 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 L Range area economically and in a reasonable timeframe (RDX would be reduced to the 2 ppb Lifetime Health Advisory by 2013 and the 10^{-6} risk-based level (0.6 ppb) by 2027). The most recent groundwater sampling shows that the levels of contamination within the plume are already decreasing through natural processes. Currently, perchlorate is less than 2 ppb in all monitoring wells and only two monitoring wells contain RDX greater than 0.6 ppb (maximum of 2.8 ppb). Through continued monitoring and the enforcement of land-use controls that prevent exposure to contaminated groundwater, Alternative 2 ensures protection of human health and the environment.

Of the two protective alternatives, Alternative 2 has fewer environmental and community impacts, and will be less costly than treatment while achieving protective results in a reasonable timeframe.

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 L Range, 30-day public comment period will open 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. A public informational meeting and public hearing is scheduled for May 19, 2010.

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 and EPA Web sites at:

http://groundwaterprogram.army.mil

http://www.epa.gov/region01/mmr/

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 L Range site include:

- *Final L Range Remedial Investigation and Feasibility Study*, May 2010
- *Final L Range Interim Source Remediation Report,* April *2010*

OPPORTUNITIES FOR PUBLIC COMMENT

The 30-day public comment period for the Remedy Selection Plan will be May 6, 2010 through June 4, 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
Mail Code HBT
Boston, MA 02109-3912

By e-mail to:
falvey.jeanethe@epa.gov