

# Massachusetts Military Reservation Cleanup Update

Summer 2010



## Cleanup Update-Summer 2010



Water is sampled using a shallow water-capture system known as a lysimeter.

**Keeping Informed:** The MMR cleanup programs use Web sites, public meetings, news releases, neighborhood notices and other publications to update community members throughout the process and to solicit their input on cleanup actions. For more information on opportunities for public comment, see Upcoming Decisions on page 8. Information on opportunities to learn more about the cleanup is on page 11.

Cleanup at the Massachusetts Military Reservation (MMR) continues to move forward. Actions are underway to address most areas of groundwater contamination and efforts to select remedies for those that remain are in progress. In all cases, measures are in place to protect against exposure to unsafe levels of contamination and to make sure that public or private water supplies are not affected.

Two environmental cleanup programs at the MMR are addressing areas of groundwater contamination, known as plumes, and their sources. One program, managed by the Air Force, is addressing contamination found primarily on the southern portion of the MMR, and the other, managed by the Army, is addressing contamination from the northern portion of the installation. Both of these programs' efforts are being conducted with oversight from the U.S. Environmental Protection Agency (EPA) and the Massachusetts Department of Environmental Protection (MassDEP).

Groundwater plumes are being addressed through treatment and monitored natural attenuation, which uses the natural process of dilution, dispersion and sorption. Treatment generally involves pumping contaminated groundwater from the aquifer, treating it using granular activated carbon, ion exchange resin or both to remove contamination, and returning treated water to the aquifer. Both options use routine groundwater monitoring to make sure contamination is being reduced as predicted. They also rely on land-use controls; which include enforcement of regulations and other protective measures designed to prevent development or use of drinking water supplies in areas affected by the plumes.

Source areas, those areas of contaminated soil or other materials that contributed contamination to the groundwater, are usually addressed by removal and treatment, or off-site disposal of the soil, munitions and other items.

## Installation Restoration Program

The Air Force Center for Engineering and the Environment's Installation Restoration Program (IRP) has all decisions on how to address contamination made and remedial actions in place (Remedies in Place) for the groundwater plumes and source areas related to its program. The IRP began cleaning up groundwater contamination primarily related to the southern portion of the MMR in 1993. Interim treatment systems were used to begin addressing many of the program's 12 plumes while final decisions on how to address the contamination were ongoing. There are 80 locations on the MMR that have been evaluated as part of the Air Force cleanup efforts. Many of those locations were confirmed as source areas that contributed to soil and/or groundwater contamination at some point in the past and 77 have been cleaned up.



This process allowed cleanup of close to 50 billion gallons of groundwater and delisting of 61 source areas while the selection of final remedial actions was completed. This resulted in all IRP remedies being in place before signing of the program's final two decisions in September 2009. Records of Decision are the official documents detailing the selected response actions for the IRP sites.

IRP treatment systems currently treat 14 million gallons of groundwater per day and those systems and the groundwater in the area of each plume are regularly monitored to verify that cleanup goals are being achieved. The program continually looks at ways to optimize system operations and cleanup actions, and will be working with regulators to determine when cleanup efforts are complete and systems can be shut down.

As part of its cleanup efforts, the IRP replaced impacted drinking water supplies and connected over 1,100 homes in the area of groundwater plumes to municipal water. In addition, the IRP conducts extensive reviews to identify and evaluate private wells in the vicinity of the plumes. Any questions regarding this program should be addressed to the IRP contact on page 12.

For additional information on IRP background and activities, please visit their Web site at [www.mmr.org](http://www.mmr.org).

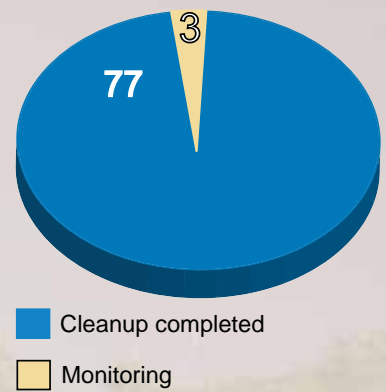
## Impact Area Groundwater Study Program

The Army Environmental Command's Impact Area Groundwater Study Program (IAGWSP) has remedies or interim treatment systems in place on plumes at seven of the nine sites where groundwater contamination related to its program has been identified. Most of these plumes are confined to the MMR and homes in the areas where plumes have migrated beneath the installation boundary are on town water.

The IAGWSP began addressing groundwater contamination related to its sites in 2004. The program also is removing potential sources of contamination. Interim treatment systems were employed to allow cleanup to begin quickly on the plumes that had the highest levels of contamination or any potential to impact public or private drinking water supplies. These sites are considered to have Treatment in Place until a Decision Document is completed and the final remedial action is implemented. Decision Documents are the equivalents of the IRP's Records of Decision.

Final decisions on how to address the remaining plumes and their source areas are expected in 2010. Alternatives for addressing plumes from the L Range, the J-1 Range (which has an interim treatment system on one plume) and the Central Impact Area have been presented to the EPA and MassDEP for review. All IAGWSP remedies are expected to be in place in 2012. See pages 8 and 9 for more details on individual sites and opportunities for public input. For additional information on IAGWSP background and activities, please visit their Web site at [groundwaterprogram.army.mil](http://groundwaterprogram.army.mil).

### IRP Source Area Status



The IRP cleanup is regulated under the Comprehensive Environmental Response, Compensation and Liabilities Act of 1980 (CERCLA).

The IAGWSP cleanup is regulated under the Safe Drinking Water Act (SDWA) established to ensure the quality of America's drinking water.

For more information, visit EPA's Web site at [www.epa.gov](http://www.epa.gov).



A drive-point drill rig is used to collect groundwater samples.

# Records of Decision/Decision Documents Signed and Remedies in Place


Plume Name & Status	Treatment/Remedy in Place Date	Projected Remedy Complete Date*	Contaminants of Concern
<b>Ashumet Valley Plume</b>			
The Ashumet Valley plume source areas have been cleaned up and groundwater cleanup is ongoing. Mitigation of phosphorus in Ashumet Pond is being conducted.	1999/2009	2018	PCE, TCE, Mn, thallium
<b>CS-4 Plume</b>			
The CS-4 plume source area has been cleaned up and a ground-water pump and treat system is in operation.	2005	2014	PCE, TCE, 1,1,2,2-TeCA, EDB
<b>CS-10 Plume</b>			
The CS-10 plume's multiple source areas have been cleaned up and groundwater treatment is ongoing. Surface water at Ashumet and Johns Ponds is tested twice annually. Results show the ponds are safe for recreational purposes.	1999/2009	2055	PCE, TCE
<b>CS-19 Plume</b>			
The CS-19 plume's source area has been cleaned up. The plume is not expected to move beyond the base boundary and is being addressed through monitored natural attenuation and land-use controls.	2009	2037	RDX
<b>CS-20 Plume</b>			
No continuing source was identified for the CS-20 plume. A treatment system is addressing the plume.	2006	2017	PCE
<b>CS-21 Plume</b>			
No continuing source was identified for the CS-21 plume. A treatment system is addressing the plume.	2006	2027	TCE
<b>CS-23 Plume</b>			
No continuing source was identified for the CS-23 plume. A treatment system is addressing the plume.	2006/2007	2018	TCE, CCl <sub>4</sub>
<b>FS-1 Plume</b>			
The FS-1 plume is currently being treated. Source area groundwater continues to be monitored to make sure there are no exceedences of lead.	1999/2000	2020	EDB (plume), Lead, toluene, thallium (source area)


\*Monitoring will continue for a specified period after cleanup levels are achieved in order to ensure cleanup goals have been met.

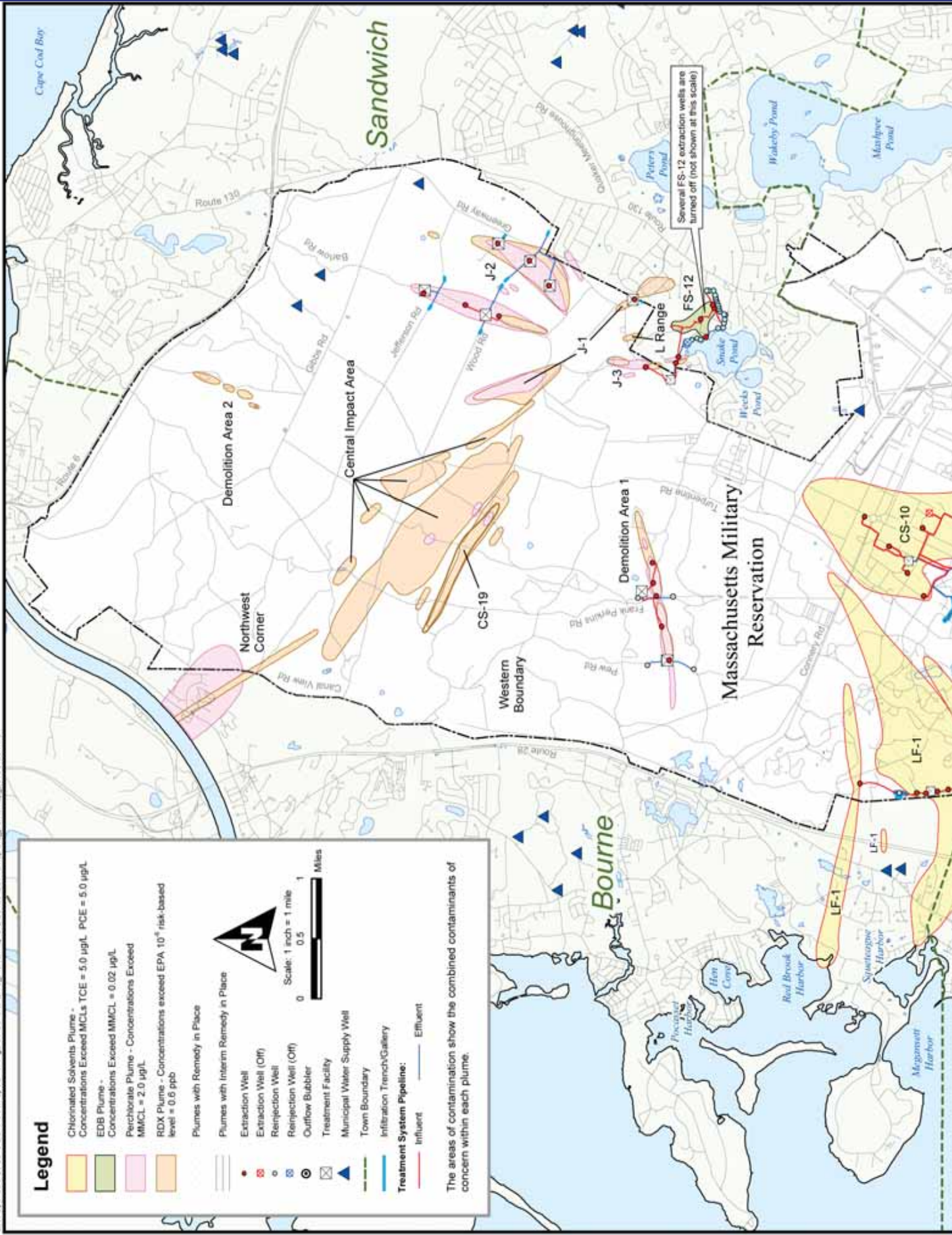
■ IRP program-related plumes (Records of Decision)

■ IAGWSP program-related plumes (Decision Documents)

Plume Name & Status	Treatment/ Remedy in Place Date	Projected Remedy Complete Date	Contaminants of Concern
<b>FS-12 Plume</b>			
The FS-12 source area was removed and the groundwater plume is being treated. Snake Pond is tested twice annually. Results show the pond is safe for recreational use.	1997/2006	2048	EDB, Benzene
<b>FS-28 Plume</b>			
The source of the FS-28 plume is unknown. The plume, which has two southern lobes, is being treated. The Coonamessett River in Falmouth remains free of EDB and cranberry farming continues.	1997/2000	2047	EDB
<b>FS-29 Plume</b>			
The FS-29 plume's source is unknown. The plume is being treated.	2006	2018	EDB, CCl <sub>4</sub>
<b>LF-1 Plume</b>			
The landfill that was the source of the LF-1 Plume has been capped, and the plume is being treated. Red Brook and Squeague harbors are tested annually. Results show they are safe for recreational purposes.	1999/2007	2047	PCE, TCE, CCl <sub>4</sub> , EDB, 1,1,2,2-TeCA, VC, 1,4-DCB, Mn
<b>Demolition Area 1</b>			
The Demolition Area 1 source area has been excavated and a treatment system is addressing the plume.	2004/2007	2018	RDX, Perchlorate
<b>BA-4 Disposal Area</b>			
Soil contamination at the BA-4 Disposal Area was removed. No related groundwater contamination was identified.	2009	2009	Lead, in soil.
<b>Western Boundary</b>			
The source of the Western Boundary plume has been depleted. Monitored natural attenuation and land-use controls are being used to address this plume, which is predicted to already be below risk-based levels.	2010	2010	Perchlorate
<b>Demolition Area 2</b>			
The Demolition Area 2 source area was removed. The plume, which is not expected to move beyond the MMR boundary, is being addressed through monitored natural attenuation and land-use controls.	2010	2013	RDX
<b>Northwest Corner</b>			
The Northwest Corner source area appears to be depleted. The plume is dissipating into the Cape Cod Canal and being addressed through monitored natural attenuation and land-use controls. All homes in the area are on town water.	2010	2022	RDX, Perchlorate

 IRP program-related plumes (Records of Decision)

 IAGWSP program-related plumes (Decision Documents)



**Legend**

- Chlorinated Solvents Plume - Concentrations Exceed MCLs TCE = 5.0 µg/L PCE = 5.0 µg/L
- EDB Plume - Concentrations Exceed MMCL = 0.02 µg/L
- Pechlorate Plume - Concentrations Exceed MMCL = 2.0 µg/L
- RDX Plume - Concentrations exceed EPA 10<sup>-6</sup> risk-based level = 0.6 ppb
- Plumes with Remediation in Place
- Plumes with Interim Remediation in Place
- Extraction Well
- Rejection Well (Off)
- Rejection Well (Off)
- Outflow Bubbler
- Treatment Facility
- Municipal Water Supply Well
- Town Boundary
- Infiltration Trench/Gallery
- Treatment System Pipeline:
  - Influent
  - Effluent

The areas of contamination show the combined contaminants of concern within each plume.



## Massachusetts Military Reservations Groundwater Findings

Issued April 2010

Contaminant of Concern (COC)	Type of Contaminant	Risk-Based Level
TCE – trichloroethene	solvent	MCL = 5 µg/L
PCE – perchloroethene	solvent	MCL = 5 µg/L
CCl <sub>4</sub> – carbon tetrachloride	solvent	MCL = 5 µg/L
EDB – ethylene dibromide	fuel-related compound	MMCL = 0.02 µg/L
benzene	fuel-related compound	MCL = 5 µg/L
vinyl chloride	solvent	MCL = 2 µg/L
1,1,2-trichloroethane	solvent	GW-1 = 2 µg/L
1,4-dichlorobenzene	solvent	MCL = 5 µg/L
manganese	metal	EPA Health Advisory = 300 µg/L
thallium	metal	MCL = 2 µg/L
lead	metal	15 µg/L (treatment technique action level for water distribution systems)
toluene	fuel	MCL = 1,000 µg/L
RDX - hexahydro-1,3,5-trinitro-1,3,5-triazine	explosive	HA = 2 µg/L
perchlorate	oxidizer	GW-1 = 1 µg/L 10 <sup>-6</sup> = 0.6 µg/L HA = 15 µg/L MMCL = 2 µg/L

MCL – Maximum Contaminant Level  
 MMCL – Massachusetts Maximum Contaminant Level  
 HA – Federal Lifetime Health Advisory  
 GW-1 – State default cleanup value to be used in lieu of site-specific risk-based level  
 10<sup>-6</sup> – EPA level resulting in an excess cancer risk of one in a million

Note: ppb = parts per billion and is a measure of concentration. It is approximately equivalent to micrograms per liter (µg/L).

## Interim Treatment Systems in Place

Plume Name & Status	Interim Remedy in Place Date	Contaminants of Concern	Projected Remedy in Place Date
<b>J-2 Range</b>			
Removal of source areas completed in 2010. Treatment systems are in place. A Remedy Selection Plan is expected in Spring 2011 (see J-2 Range on page 9).	2006 (Northern) 2008 (Eastern)	RDX, Perchlorate	Fall 2011
<b>J-3 Range</b>			
Source area removal is complete, and a treatment system is addressing the plume. Snake Pond is tested throughout the recreational season and these contaminants have not been detected in pond surface water samples. A Remedy Selection Plan is expected in Spring 2011 (see J-3 Range on Page 9).	2006	RDX, Perchlorate	Fall 2011
<b>J-1 Range</b>			
Removal of source areas completed in 2010. A treatment system is addressing the highest concentrations in the plume emanating from the southern portion of the J-1 Range. All homes in the off-MMR area of the plume are on town water. Selection of the final remedy is expected in Summer 2010.	2007	RDX, Perchlorate	2012*

## Upcoming Decisions


Plume Name & Status	Next Phase	Opportunity for Public Comment	Projected Remedy in Place Date
<b>L Range</b>			
The source area has been removed and the small plumes of RDX and perchlorate contamination in groundwater are being reduced through natural processes.	Remedy Selection	Yes, expected in June 2010	September 2010
<b>J-1 Range</b>			
Removal of source areas completed in 2010. A treatment system is addressing a portion of the southern plume of RDX. The northern RDX and perchlorate plume is confined to the installation.	Remedy Selection	Yes, expected in Summer 2010	2012*

■ IAGWSP program-related treatment systems and upcoming decisions

\* Actual Remedy in Place date will be determined based on the selected remedial action.



Plume Name & Status	Next Phase	Opportunity for Public Comment	Projected Remedy in Place Date
<b>Gun &amp; Mortar Positions</b>			
Source area investigations at the 37 mortar and artillery firing points have been completed. No significant groundwater contamination related to these sites has been identified.	Finalize Investigation Report	Yes, expected in August 2010	Summer 2011
<b>Former A and K Ranges</b>			
Source area removals have been conducted at both ranges. No significant groundwater contamination related to these sites has been identified.	Finalize Investigation Report	Yes, expected in September 2010	Summer 2011
<b>Small Arms Ranges</b>			
Source area investigations at the 24 current and former small-arms training ranges have been conducted. No significant groundwater contamination related to these sites has been identified.	Finalize Investigation Report	Yes, expected in October 2010	Fall 2012
<b>J-2 Range</b>			
Removal of source areas completed in 2010. Treatment systems are in place.	Finalize Investigation Report/ Feasibility Study Report	Yes, expected in November 2010	Fall 2011
<b>Central Impact Area</b>			
Removal of source areas ongoing. The Decision Document will outline the selected remedial actions for addressing both the source area and the multiple, small RDX and perchlorate plumes emanating from the site.	Remedy Selection	Yes, expected in December 2010	2012*
<b>J-3 Range</b>			
Source area removal is complete, and a treatment system is addressing the plume. Snake Pond is tested throughout the recreational season and these contaminants have not been detected in pond surface water samples.	Finalize Investigation Report/ Feasibility Study Report	Yes, expected in January 2011	Fall 2011
<b>Training Areas/Phase IIb</b>			
Source area investigations at additional sites identified through historical records have been completed. No significant groundwater contamination is anticipated.	Finalize Investigation Report	Yes, expected in February 2011	Fall 2012

 IAGWSP program-related treatment systems and upcoming decisions

\* Actual Remedy in Place date will be determined based on the selected remedial action.

# Operations & Maintenance



Surface water sampling on Ashumet Pond.

Ongoing monitoring of treatment plant operations and groundwater wells is in place to observe changes in the plumes and make certain the selected remedies are working as predicted. This phase also includes ensuring land-use controls designed to prevent exposure to contaminated groundwater are being enforced and are effective.

Both programs continually review their systems' performance. In order to find ways to accelerate treatment, improve operations, save resources and reduce environmental impacts, the IRP and IAGWSP look at adjusting monitoring plans, changing flow rates, turning off extraction wells as the plumes shrink, alternating extraction well operation or ways to make their treatment efforts more efficient.

Future decisions regarding each of the plumes will include determining when remediation is complete, when to shut off specific extraction wells or entire treatment systems, and when to discontinue monitoring. The final decisions on when to shut down treatment systems will be presented for public input.



Inspection of granular activated carbon treatment vessel.

Until then, the programs will be looking at ways to expedite cleanup, improve performance, save energy and make the overall operations of treatment systems adhere to the Army's and Air Force's goal of sustainability - protecting resources in a way that preserves them for future use.

The MMR cleanup programs have been leading the way in Sustainable Green Remediation. Sustainability efforts being used by one or both of the MMR cleanup programs include use of:

- biofuels
- low-energy pumps
- energy-efficient lighting heating and cooling
- renewable sources of energy (i.e. wind turbines)
- reusable modular treatment units
- beneficial reuse of treated water
- building new treatment systems in existing facilities

These efforts reduce the use of new materials, the destruction of natural habitat and emissions from vehicles, pumps, and equipment.



Interior of a modular treatment unit.

One of the biggest steps taken to make remediation at the MMR more sustainable is the installation of the IRP's 1.5-megawatt wind turbine in fall 2009. The 391-foot turbine will provide approximately 30 percent of the energy used to operate the IRP's treatment plants and reduce the air emissions produced by energy suppliers. Both the IRP and the IAGWSP are evaluating additional turbines or other renewable energy sources (i.e. solar) that would provide 100 percent of the energy needed to operate the treatment systems.

# Learn More

The IRP and IAGWSP strive to keep the local community informed. Additional information is available through the following sources:

## Web Sites

Documents, reports, meeting minutes, fact sheets and other information are available on the IRP Web site: [www.mmr.org](http://www.mmr.org) and the IAGWSP Web site: [groundwaterprogram.army.mil](http://groundwaterprogram.army.mil).

## Information Repositories

Information on the IRP and IAGWSP cleanup programs is available on the individual program Web sites listed on the last page and at the MMR Information Repositories located at public libraries in Bourne, Falmouth and Sandwich. The repositories are updated to ensure that current documents are available. A complete repository of documents is available at the Jonathan Bourne Library in Bourne. Recent documents are available at the other two libraries and all documents are available on CLAMS (Cape Libraries Automated Materials System).

## MMR Cleanup Team and Senior Management Board:

These two citizens' advisory teams meet with members of the IRP, the IAGWSP, the EPA and MassDEP to review program activities and to provide input. For more information on the meetings, which are open to the public, please visit the programs' Web sites: [www.mmr.org](http://www.mmr.org) or [groundwaterprogram.army.mil](http://groundwaterprogram.army.mil).

## Administrative Record

The Administrative Record for the IRP is located at: 322 East Inner Road, Otis ANG Base, MA. Access is by appointment only. Please call AFCEE Community Involvement at (508) 968-4678, x2. It is also available through a link on the main page of the IRP Web site [www.mmr.org](http://www.mmr.org).

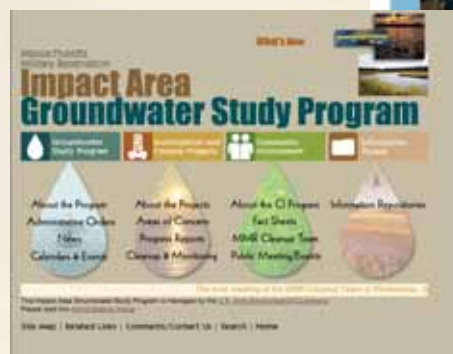
The Administrative Record for the IAGWSP is located at: 1803 West Outer Road, Camp Edwards, MA. Access is by appointment only. Please call the IAGWSP at (508) 968-5630 to arrange base access or for further information.



The IAGWSP's J-3 Range Plume treatment system is located in an unused corner of the IRP's FS-12 treatment facility.



A modular treatment unit is moved for reuse at another plume site.



More information is available on the IRP and IAGWSP Web sites.

# Contact Information

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### **Installation Restoration Program**

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For information on Camp Edwards training and small -arms-range activities, please contact:

### **Massachusetts National Guard Environmental & Readiness Center**

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# Acknowledgments

The Cleanup Update was developed through a collaborative effort of the Air Force Center for Engineering and the Environment's Installation Restoration Program, the U.S. Army Environmental Command Impact Area Groundwater Study Program, the U.S. Environmental Protection Agency, and the Massachusetts Department of Environmental Protection.

Photos on the cover: (Clockwise from Left: The IRP's 1.5-megawatt wind turbine, a bubbler used to return treated groundwater from the IRP's FS-1 Plume treatment plant and a treatment cell used for bioremediation of explosives-contaminated soil excavated from the IAGWSP's L Range site.

Impact Area Groundwater Study Program  
1803 West Outer Road  
Camp Edwards, MA 02542