Proposed Plan

For Source Area Groundwater Cleanup at the NASA Jet Propulsion Laboratory, Pasadena, California

Final November 1, 2005

INTRODUCTION

NASA encourages the public to comment on its proposed cleanup remedy for the *groundwater* source area at the Jet Propulsion Laboratory (JPL). NASA proposes to use an expanded pump and treat system to remove chemicals from the groundwater and inject the cleaned water back underground (Note: a list of acronyms and abbreviations is on page 9 and definitions of italicized words are in a glossary on page 9.)

This document summarizes the NASA *Proposed Plan* for cleaning up groundwater located directly beneath the JPL facility, referred to as the "source area." The source area is the area where the majority of the chemicals are located in the groundwater, which is an eight-acre by 100-foot-thick portion of the aquifer beneath the north-central part of the JPL facility (see Figure 1). Cleaning (or *remediating*) the source is a critical part of the overall strategy for restoring the aquifer.

This Proposed Plan is for an interim action to address the source area only. NASA will prepare a separate Proposed Plan for an interim action to address chemicals moving off of NASA JPL property (anticipated in Spring 2006). These interim actions will be followed by a *Feasibility Study (FS)* and Proposed Plan to address an integrated approach to the permanent final remedy for groundwater cleanup.

Public Meeting and Comment Period Mark Your Calendar

Public Comment Period: November 1, 2005 to December 15, 2005.
Public Meeting: 7– 9 p.m. Wednesday, November 16, 2005 at Altadena Community Center, 730 E. Altadena Drive, Altadena.

NASA invites public comment on the actions described in this Proposed Plan. Supporting technical documents are available by visiting any of the public information repositories listed on the last page of this summary or at the NASA JPL Groundwater Cleanup website at http://JPLwater.nasa.gov.

The public may also call (**818) 393-0754** for more information. Comments on NASA's Proposed Plan may be submitted electronically to mfellows@nasa.gov or by mail to the attention of **Merrilee Fellows, NASA Water Cleanup Outreach Manager, Jet Propulsion Laboratory, NASA Management Office, 180-801, 4800 Oak Grove Drive, Pasadena, CA 91109.**

No specific format for the comments is necessary. All comments must be submitted either electronically by midnight December 15, 2005, or, if comments are posted by mail, the comments must bear a postmark of no later than December 15, 2005.

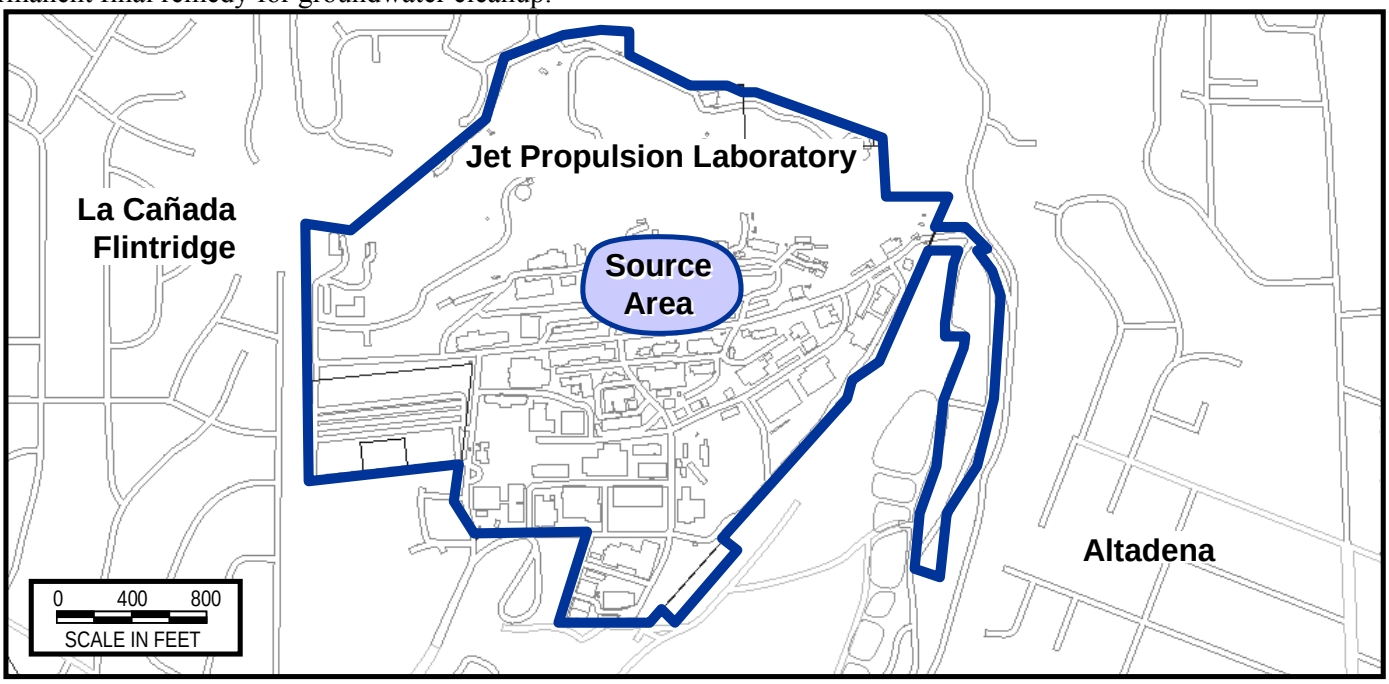


Figure 1. Location Map

In addition to describing NASA's Preferred Alternative, this document also briefly describes the other cleanup alternatives that NASA evaluated for use at the source area. Finally, this document describes how members of the public can comment on the proposed action and participate in the public meeting.

NASA will make a final selection of the source area cleanup remedy after reviewing and considering all information submitted during a 45-day public comment period (November 1 to December 15, 2005). NASA may modify its Preferred Alternative based on public comments before issuing a *Record of Decision (ROD)*.

NASA proposes to expand the existing system so it can more than double the amount of water being treated from a rate of approximately 150 gallons per minute (gpm) to a rate of approximately 350 gpm. Figure 2 shows the layout of the existing demonstration study system and the proposed expansion. One to two new extraction wells and one more injection well will be installed as part of the proposed expansion. The actual number and location of wells will be determined as part of the design phase. The system uses two different technologies to remove the chemicals present: liquid-phase granular activated carbon (LGAC) to remove *volatile organic compounds (VOCs)* and a fluidized bed reactor (FBR) to remove perchlorate.

This Proposed Plan summarizes information that NASA has collected over a number of years. All project-related documentation can be found in the *Administrative Record*. Copies of the Administrative Record are also available at the *information repositories* listed on page 10 and on the project website at http://jplwater.nasa.gov

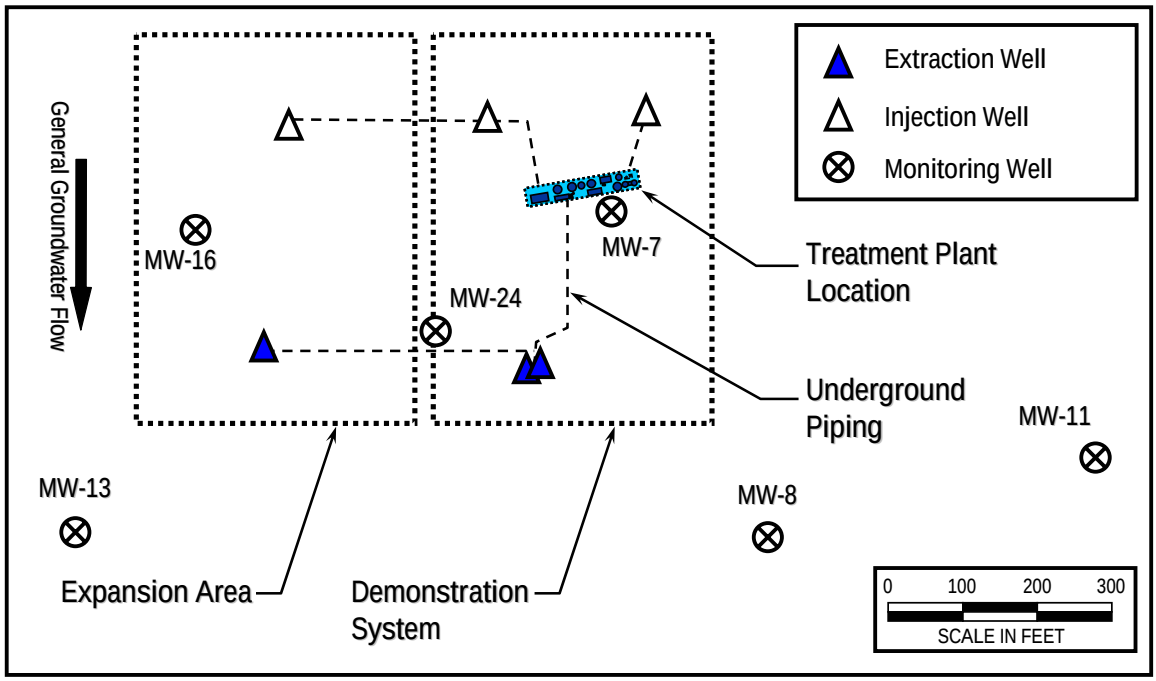


Figure 2. Layout of the Existing Demonstration System and the Proposed Expansion

SITE BACKGROUND

In the 1940s and 1950s, liquid wastes from materials used and produced at JPL (such as solvents, solid and liquid rocket propellants, cooling tower chemicals, and analytical laboratory chemicals) were disposed of into seepage pits, a common practice at that time. Some of these chemicals, including VOCs and perchlorate, have been found in groundwater beneath the north-central portion of JPL and in certain areas adjacent to JPL.

NASA has been investigating and taking actions to clean up the groundwater associated with historic practices since the mid-1980s. In October 1992 the site was placed on the U. S. Environmental Protection Agency (EPA) *National Priorities List (NPL)* of sites governed by the federal *Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)*, as amended by the Superfund Amendments and Reauthorization Act (SARA). NASA entered into a *Federal Facility Agreement (FFA)* with the EPA and appropriate state agencies and NASA was designated the lead agency responsible for carrying out the CERCLA investigation and cleanup process at JPL. The government agencies included in the FFA are NASA, EPA, the California Department of Toxic Substances Control (DTSC), and the California Regional Water Quality Control Board, Los Angeles Region (RWQCB).

PREVIOUS ACTIONS

CERCLA requires a thorough and often lengthy process to fully investigate and determine the best methods for cleanup. As the responsible agency, NASA has conducted a number of detailed investigations and studies on the site and adjacent areas since the early 1990s. All CERCLA documentation associated with the JPL site can be found at the information repositories listed on page 10 and in the Administrative Record found at http://jplwater.nasa.gov.

These studies have helped NASA identify and understand the type and extent of chemicals in soil and groundwater. As part of this effort, NASA divided the site into three separate areas referred to as *Operable Units (OUs)*. OU-1 refers to on-facility groundwater (the source area), OU-2 refers to on-facility soils, and OU-3 refers to off-facility groundwater adjacent to JPL.

In September 2002, NASA signed the *Record of Decision (ROD)* for OU-2. *Soil Vapor Extraction (SVE)* was identified as the Preferred Alternative for OU-2 to remove VOCs from the soil and prevent migration to the groundwater. SVE has proven to be effective in removing the VOCs from on-facility soils and is nearly complete.

As part of the thorough site investigation activities for both OU-1 and OU-3, NASA performed the following:

- Conducted *Remedial Investigation (RI)* from 1994 to 1998. The RI report, which characterized the nature and extent of the chemicals in the groundwater, was completed in the fall of 1999. The RI for OU-1 and OU-3 contained a *human health and ecological risk assessment*.
- Initiated a groundwater monitoring program in August 1996 analyzing for VOCs and inorganics, including metals, anions, cations, and other field parameters. Analytical results are summarized in quarterly reports and technical memoranda that are available in the information repositories and on the project website.
- Conducted geotechnical and environmental investigations at and adjacent to JPL to characterize groundwater flow.
- Funded treatment facilities for the Lincoln Avenue Water Company (LAWC) and City of Pasadena drinking water wells that have been affected by chemicals in groundwater.

Beginning in 1997, NASA conducted pilot testing of technologies to address dissolved perchlorate in groundwater. These technologies included reverse osmosis, FBR, packed bed reactor, in-situ bioremediation, and ion exchange. The pilot testing was completed in 2002 at which time NASA conducted a technical evaluation to determine the best remedial technique for the source area groundwater. The results of the evaluation indicated that the preferred remedial technique was pumping of groundwater through a treatment system and re-injecting the treated groundwater.

DEMONSTRATION TREATMENT PLANT

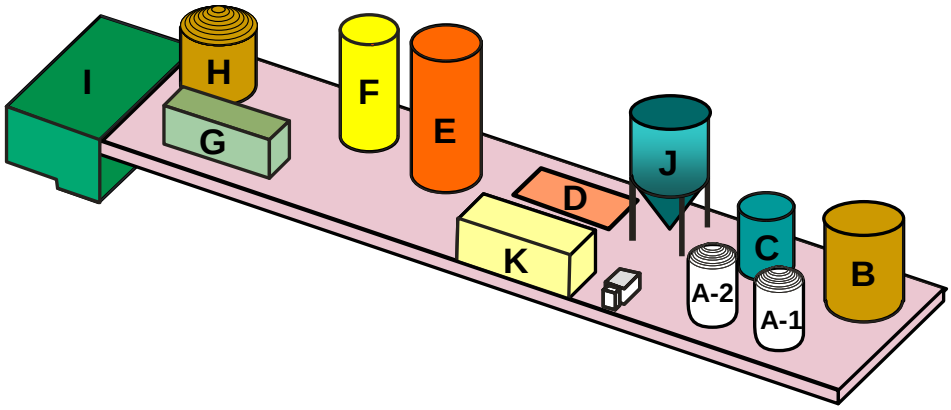
Based on all the earlier studies conducted, NASA installed a demonstration treatment plant (see Figure 3) in early 2005, utilizing FBR treatment for perchlorate and LGAC treatment for VOCs. The water is pumped out of the ground, treated, and injected back into the ground approximately 330 feet north of the extraction wells (see Figure 2). Figure 4 shows the layout and describes the different components of the existing demonstration treatment system.

Construction of the demonstration treatment plant system was completed in early 2005 with design flow operations commencing in March 2005. Operations through October 2005 show that the system has been very effective in removing VOCs and destroying perchlorate. About 400 pounds of perchlorate and more than 10 pounds of VOCs have been removed since commencing operation of the demonstration study. This system has been successful in its demonstration phase and is what NASA now proposes to expand. Operational summary reports are available in the information repositories listed on page 10.

SUMMARY OF SITE RISKS

The chemicals are in groundwater located several hundred feet below the ground surface and groundwater beneath the facility is not used for drinking water. The only way for the public to come in contact with the water is through pumping of drinking water production wells located off-facility. The closest water production wells are owned by the City of Pasadena and are located in the Arroyo Seco. These have been shut down and will remain closed until the water meets State and federal requirements. The next closest wells are owned by Lincoln Avenue Water Company and the water from those wells is treated to meet State and federal standards prior to distribution to customers.

Figure 3. Picture of the Existing Source Area Groundwater Treatment Facility



Name	Label	Description
LGAC	A-1, A-2	LGAC vessels to remove VOCs
T-202	B	LGAC backwash water and feed tank
T-201	C	FBR feed tank
FBR Skid	D	Skid with FBR fluidization pumps
FBR	E	Anoxic biological reactor used to remove perchlorate
T-401	F	Aeration tower
F-401	G	Tri-media filter
T-501	H	Treated water tank
T-801	I	Sump for holding F-401's backwash flush water.
Clarifier	J	Condenses solids prior to sanitary sewer discharge
Controls Trailer	K	Trailer contains system controls and on-site laboratory

Figure 4. Components of the Demonstration Study Treatment System

REMEDIAL ACTION OBJECTIVES

The remedial action objectives for NASA's Proposed Plan are as follows:

- Remove chemicals in groundwater and prevent the further spread of VOCs and perchlorate from the groundwater source area.
- Reduce the amount of chemicals distributed in the source area groundwater to improve the effectiveness and efficiency – and reduce costs – of the final cleanup remedy selected for off-facility groundwater.

CLEANUP LEVELS

The Preferred Alternative would remove chemicals from extracted groundwater before reinjection. CERCLA requires that chemicals in groundwater be removed to meet State and federal standards called maximum contaminant levels (MCLs). The MCLs for VOCs detected in groundwater associated with JPL are listed in Table 1.

For perchlorate, no level has been established by either the federal government or the State of California as a drinking water standard. Currently the demonstration system is meeting the State public health goal (PHG) for perchlorate. Once the final drinking water standard is established, the source area treatment system will meet that level.

Table 1. Standards for Chemicals in Groundwater [units reported in parts per billion (ppb)]

Chemical	Federal Standard	State Standard	State PHG	Highest Level in the Source Area* (July/August 2005)
Carbon tetrachloride	5	0.5		11.2
Trichloroethylene (TCE)	5	5		2.6
Perchlorate			6	13,000.0

* MW 7, 16, and 24

SUMMARY OF ALTERNATIVES EVALUATED

In January 2000, NASA completed a draft Feasibility Study that identified and evaluated various groundwater cleanup alternatives for both the source area and in offsite areas adjacent to the JPL facility. As part of this effort, NASA also conducted a number of different tests to see which technologies might be the most promising for use at the JPL site. The technologies tested included reverse osmosis, FBR, packed bed reactors, in-situ bioremediation, and ion exchange. Due to the depth and extent of the chemicals in groundwater, in-situ (below ground) treatment is not cost-effective at the JPL site; therefore, groundwater must be pumped from the ground, treated above ground, and reinjected.

The best above-ground perchlorate treatment is dependent on several factors including the perchlorate concentrations that exist, specific site conditions, and other considerations. Two perchlorate treatment processes have proven to be effective at JPL and other sites: FBR and ion exchange. FBR is cost-effective for relatively high concentrations of perchlorate and at locations where continuous operation can be achieved, such as the source area beneath JPL. The FBR contains carbon particles covered with a coating of bacteria that destroy perchlorate. The primary advantages of this system are the destruction of perchlorate and relatively low operational cost.

Ion exchange consists of small plastic beads, or resin, in a tank. As the water passes through the tank, perchlorate attaches to the resin. After enough perchlorate attaches to the resin, the resin is removed and sent to a licensed disposal facility, and new resin is added. Ion exchange is the only perchlorate removal technology that has been used for drinking water systems in California and is performing well at the NASA-funded LAWC system. Ion exchange is more cost-effective at low perchlorate levels, such as those found in groundwater offsite, and it is more appropriate for operations where the flow rate is varied.

The EPA has identified air stripping and LGAC as the best technologies to use for aboveground treatment of groundwater containing VOCs, referring to these as "presumptive technologies." EPA expects these technologies to be used for removal of VOCs at "all appropriate sites." LGAC treatment is currently in place and working effectively as part of the existing source area demonstration treatment system.

EVALUATION OF THE PREFERRED ALTERNATIVE

Nine evaluation criteria were developed by the U.S. EPA under the *National Oil and Hazardous Substances Pollution Contingency Plan (NCP)* for evaluation of remedial action alternatives. The NCP governs response actions (cleanup actions) under CERCLA. The nine criteria are categorized into three groups: threshold criteria, primary balancing criteria, and modifying criteria, as follows:

Threshold Criteria

- Overall Protection of Human Health and the Environment
- Compliance with *Appropriate or Relevant and Applicable Requirements (ARARs)*

Primary Balancing Criteria

- Long-Term Effectiveness and Permanence
- Reduction of Toxicity, Mobility, or Volume of Contaminants
- Short-Term Effectiveness
- Implementability
- Cost

Modifying Criteria

- State Acceptance
- Community Acceptance

The threshold criteria must be satisfied in order for an alternative to be eligible for selection. The primary balancing criteria are used to weigh major tradeoffs among alternatives. The modifying criteria are generally taken into account after the public comment period has ended and all comments have been reviewed and considered (in this case, by NASA) to determine if the Preferred Alternative remains the most appropriate remedial action.

For this response action, the Preferred Alternative of expanding the existing demonstration study system is evaluated against the *no-action alternative*.

Threshold Criteria

Overall Protection of Human Health and the Environment. This criterion assesses whether a remedial alternative provides adequate public health and environmental protection and describes how health and environmental risks posed by the site will be eliminated, reduced, or controlled through treatment, engineering controls, or other means.

Under current conditions, the risks to JPL employees and local residents associated with VOCs and perchlorate in groundwater are negligible. The groundwater pumped from the aquifer for drinking water purposes is treated to meet strict State and federal water quality standards prior to distribution to consumers. However, because a lack of action does not prevent the spread of chemicals, it does not protect the aquifer, and therefore does not protect the environment. Only expanding the existing demonstration system alternative is protective of human health and the environment.

Also, treatment of the source area is necessary to prevent further spread of VOCs and perchlorate from the groundwater source area to existing drinking water wells located offsite.

Compliance with Appropriate or Relevant and Applicable Requirements (ARARs). Compliance with ARARs addresses whether a remedial action alternative meets all pertinent federal and state environmental statutes and requirements. An alternative must comply with ARARs or be covered by a waiver to be acceptable.

For the proposed response action, ARARs include requirements such as the Safe Drinking Water Act; various resolutions, guidance documents, and plans set forth by the RWQCB. While NASA will not do a separate evaluation under the National Environmental Policy Act (NEPA), it will evaluate the relative impacts of the proposed response action on the environment. This evaluation will be made available for public review in a later step in the CERCLA process, during the review of the ROD. The ROD is the required decision document that will document NASA's selection of the clean up remedy for the source area groundwater.

The no-action alternative does not meet ARARs because chemicals are left in place and the beneficial uses of the groundwater aquifer are not protected. Expanding the demonstration system does comply with all identified ARARs and prevents further migration of VOCs and perchlorate out of the source area. Since the no-action alternative does not meet the Threshold Criteria, it is not considered further.

Primary Balancing Criteria

Long-Term Effectiveness. Long-term effectiveness addresses the ability of a remedial alternative to maintain reliable protection of human health and the environment over time, after the remedial action objectives have been accomplished.

Expansion of the demonstration system is effective for the long term. The system permanently removes chemicals from groundwater by extracting the groundwater, treating it to remove VOCs and perchlorate, and reinjecting clean water back into the same aquifer. Thus, long-term effectiveness is achieved.

Reduction of Toxicity, Mobility, or Volume of Contaminants. The evaluation of this criterion addresses the statutory preference for selecting remedial actions that employ treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of chemicals in groundwater.

The Preferred Alternative permanently and irreversibly removes chemicals from the groundwater. Thus, the

treatment system reduces the volume and mobility of chemicals in groundwater at JPL. The results of the demonstration study, during which about 400 pounds of perchlorate and more than10 pounds of VOCs have been removed from the source area groundwater, show that the extent of chemical removal can be significant.

Short-Term Effectiveness. The evaluation of short-term effectiveness addresses how well human health and the environment are protected from impacts during the construction and implementation of a remedial alternative.

Expansion of the demonstration study system presents minimal risks to workers, the public, and environment. Construction of the additional injection and extraction wells and operation of the system will be performed under strict health and safety requirements. The system is designed to shut down in case of malfunction and automatically alerts operating staff if a shutdown occurs. The system is set up to automatically notify JPL Security under pre-determined conditions. Control equipment has been installed to reduce the potential for nuisance hydrogen sulfide odors that can be produced by the biological system. The chemicals in the extracted water will be removed by the aboveground treatment system in accordance with state and local regulations. Construction and operation activities will generate associated noises, which will be reduced to the extent possible to minimize disturbance to workers near the plant. The plant does not generate noise that would be heard off-facility

Implementability. Evaluation of implementability addresses the technical and administrative feasibility of implementing an alternative, including an evaluation of the availability of technologies, services, and materials required during implementation.

Expansion of the demonstration system includes common remediation and construction services, such as well drilling, electrical connections, and pipeline installation. Equipment (e.g., pumps) is also readily available from commercial sources.

Cost. Evaluation of cost addresses the total cost of the remedial action, including capital costs and *operation and maintenance (O&M)* costs. Total costs are given in today's dollars.

Costs associated with expanding the current demonstration study system include installation of one to two extraction wells and one injection well, pipeline installation, and integration into the current treatment plant. The new extraction and injection wells will be similar in construction to the existing wells. O&M costs for the Preferred Alternative include an on-site operator, LGAC change-outs, materials, system maintenance, sample analysis, and reporting. The estimated construction cost for the plant expansion is $1,000,000 and the estimated annual operating cost is $800,000.

It is also important to note that reducing chemical mass in source area groundwater will improve the effectiveness and efficiency – and reduce costs – of the eventual final cleanup remedy selected for off-facility groundwater. Chemical mass that is removed at the source will not migrate to off-facility production wells.

Modifying Criteria

State Acceptance. Evaluation of this criterion addresses the apparent acceptability of the alternative to State of California regulatory agencies. The evaluation of state acceptance will be fully addressed during the public comment period and preparation of a ROD.

Community Acceptance. Evaluation of this criterion addresses the apparent acceptability of the alternative to the community. The evaluation of community acceptance will be fully addressed during the public comment period and preparation of a ROD.

SUMMARY OF PREFERRED ALTERNATIVE

Based on the evaluation of the criteria, described above, expansion of the existing demonstration treatment system is the most effective response action for source area groundwater. The no-action alternative is not appropriate because chemicals would continue to migrate in groundwater and, therefore, the remedial action objectives would not be met.

NASA's Preferred Alternative will reduce and remove chemicals from the source area groundwater. Results from NASA's ongoing groundwater monitoring program will be used to determine the effectiveness of the treatment system including the need for any adjustments or additional cleanup actions.

The Preferred Alternative satisfies the statutory requirements in CERCLA that the selected alternative:

- Be protective of human health and the environment
- Comply with ARARs
- Be cost-effective
- Use permanent solutions and alternative treatment technologies to the maximum extent practicable
- Satisfy the statutory preference for treatment as a principal element, or justify not meeting the preference.

COMMUNITY PARTICIPATION

Over the past two years, NASA has reached out to residents of the communities surrounding JPL, updating them about the status of the cleanup by holding several public meetings, sending out newsletters, maintaining a website (http://jplwater.nasa.gov), and meeting with community groups, individuals, health care and local government representatives and water purveyors.

In January 2004, public meetings were held to inform the public and JPL employees about the progress of cleanup activities that included describing several possible alternatives to treat perchlorate beneath the JPL facility. A newsletter on the project was mailed to residents of communities surrounding the JPL site.

In April 2004, another public meeting was held to discuss questions about potential public health effects associated with chemicals in the groundwater near JPL. Additional newsletters were sent out in August 2004 and March 2005 that described clean up actions funded by NASA at two LAWC wells.

A community information session was held in late March 2005, providing an opportunity for attendees to speak one-on-one with and ask questions of NASA project staff and contractors involved in the groundwater cleanup and to view several displays about the overall cleanup effort. The source area demonstration treatment system was discussed at this session.

NASA is now asking for public comment on NASA's Preferred Alternative discussed in this Proposed Plan. A newsletter briefly describing NASA's proposed plan was mailed to area residents in late October 2005. The public meeting regarding NASA's Proposed Plan will be on November 16, 2005 and written comments will be accepted through December 15, 2005.

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ACRONYMS AND ABBREVIATIONS

ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
FBR	fluidized bed reactor
FFA	Federal Facility Agreement
FS	Feasibility Study
gpm	gallons per minute
JPL	Jet Propulsion Laboratory
LAWC	Lincoln Avenue Water Company
LGAC	liquid-phase granular activated carbon
MCL	maximum contaminant level
NASA	National Aeronautics and Space Administration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NEPA	National Environmental Policy Act
NPL	National Priorities List
O&M	operation and maintenance
OU	operable unit
PHG	public health goal
ppb	parts per billion
RI	Remedial Investigation
ROD	Record of Decision
RWQCB	Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SVE	soil vapor extraction
TCE	trichloroethene
VOC	volatile organic compound

GLOSSARY

Administrative Record – A collection of all documents used to select and justify remedial alternatives and selected actions. These documents are available for public review.

Applicable or Relevant and Appropriate Requirement (ARAR) – A federal or state law or regulation that must be followed during implementation of the remedy selected for site cleanup.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – Legislation from 1980 that authorizes federal action to respond to the release, or the threat of release, into the environment of hazardous substances, pollutants, or chemicals that may present an imminent or substantial danger to public health or welfare or to the environment. Commonly referred to as Superfund.

Ecological Risk Assessment – A quantitative process that estimates the risk to flora and fauna from exposure to chemicals at a site.

Feasibility Study (FS) – An engineering evaluation of technologies that may be used to remediate a site. An FS evaluates site conditions, technical problems, costs, and human and ecological impacts to determine the effectiveness of potentially applicable technologies.

Federal Facility Agreement (FFA) – A legal document that defines the roles and responsibilities of the government agencies associated with a federal facilities CERCLA site.

Groundwater – Water beneath the ground surface that fills spaces between soil particles.

Human Health and Ecological Risk Assessment – A quantitative process that estimates the risk to human health and ecological receptors from exposure to chemicals at a site.

Information Repository – The physical location where a collection of site information is maintained. Documents in an information repository are available for public review.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – A regulation issued by the U.S. EPA to implement the requirements of CERCLA.

National Priorities List (NPL) – A list of uncontrolled hazardous-substance release sites in the United States that are priorities for long-term remedial evaluation and response. The NPL is compiled by the U.S. EPA pursuant to Section 105 of CERCLA.

No-Action Alternative – A conclusion that no additional site environmental activities, beyond an RI and an FS, are needed. No action is used as a baseline for comparison with alternative actions.

Operation and Maintenance (O&M) – Activities and their associated costs that are needed to operate and maintain a site remedial activity or technology.

Operable Unit (OU) – An area designated under NASA's program to identify, investigate, assess, characterize, clean up, or control past releases of hazardous substances.

Proposed Plan – A document that summarizes cleanup information and solicits public input. A proposed plan includes a summary of the environmental conditions at a site, as determined by the RI; describes remedial alternatives for the site; provides a summary of ARARs; and provides a brief analysis to support the Preferred Alternative.

Record of Decision (ROD) – A document that summarizes how a site will be cleaned up and justifies the selection of the cleanup method chosen.

Remedial Investigation (RI) – A field study that includes collecting and analyzing field samples to evaluate the types and concentrations of chemicals present at a site.

Remediation – Any active or passive environmental activity that results in the reduction of toxicity, mobility, or volume of chemicals at a site.

Soil Vapor Extraction (SVE) – A treatment technology in which VOCs are removed from soils by induced airflow.

Volatile Organic Compound (VOC) – A chemical compound that contains the element carbon and that readily evaporates into air at room temperature. Cleaning solvents are a primary example.

For More Information

Documents on NASA's groundwater cleanup activities at JPL are available for review at the following Information Repositories:

La Cañada Flintridge Public Library
4545 Oakwood Ave. ■ La Cañada Flintridge, CA 91011 ■ (818) 790-3330

Pasadena Central Library
285 East Walnut St. ■ Pasadena, CA 91101 ■ (626) 744-4052

Altadena Public Library
600 East Mariposa Ave. ■ Altadena, CA 91001 ■ (626) 798-0833

JPL Library
(JPL Employees Only) ■ Building 111, Room 112 ■ (818) 354-4200

Para más información en español llame a:
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VISIT OUR WEBSITE AT
VISITE NUESTRA PÁGINA WEB
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Postage

NASA's Proposed Plan for Source Area Groundwater Cleanup at JPL

►**Join Us!**
Public Meeting
November 16, 2005
7- 9 p.m.
Altadena Community Center
730 E. Altadena Drive, Altadena

►**¡Asistan!**
Asamblea Público
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