UCRL-AR-122585

The United States Department of Energy Presents the Proposed Plan for Remediation of the Lawrence Livermore National Laboratory Site 300 General Services Area

Introduction

The United States Department of Energy (DOE) and Lawrence Livermore National Laboratory (LLNL) request public comments on the Proposed Plan for remediating soil and ground water in the General Services Area (GSA) at the LLNL Site 300 Experimental Test Facility. Site 300 is located in the Altamont Hills, in San Joaquin and Alameda counties, approximately 17 miles east of Livermore and 8.5 miles southwest of Tracy (Figs. 1 and 2).

This Proposed Plan summarizes site conditions and remedial alternatives analyzed for the site, and presents the rationale for selecting the preferred remedial alternative. This document solicits your input, which will be considered in decisions made about the final remediation plan.

The Proposed Plan was prepared to comply with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendment and Reauthorization Act (SARA) of 1986, and is required by the LLNL Site 300 *Federal Facility Agreement* signed by DOE, the U.S. Environmental Protection Agency (U.S. EPA), the California Department of Toxic Substances Control (DTSC), and the Central Valley Regional Water Quality Control Board (RWQCB) in 1992.

The CERCLA process is summarized in Figure 3. For the GSA, DOE/LLNL have completed a detailed environmental investigation (referred to as a Remedial Investigation), and a thorough screening and evaluation of possible

Note: Italicized words are defined in the Glossary.

Public Meeting

DOE/LLNL encourage the public to attend a meeting at 6:00 pm on April 24, 1996 in the Crystal Room at the Tracy Inn, West 11th Street, Tracy, CA. Representatives from DOE/LLNL, U.S. EPA, and the State of California will discuss the proposed remediation plan, hear your concerns, and answer your questions during the meeting.

A 30-day public review and comment period on this document begins on April 10, 1996, and ends May 10, 1996. All interested members of the public are encouraged to review and comment on the preferred remedy, and on all remedial alternatives considered, if desired. You can submit your comments verbally at the public meeting or in writing. Written comments should be sent to Donna Sutherland, Site 300 Remedial Project Manager, DOE (see page 16 for address) by May 10, 1996.

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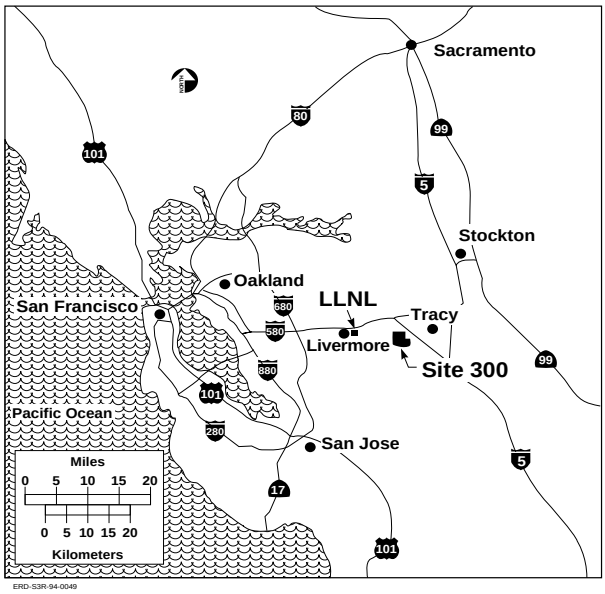

Figure 1. Locations of LLNL Main Site and Site 300.

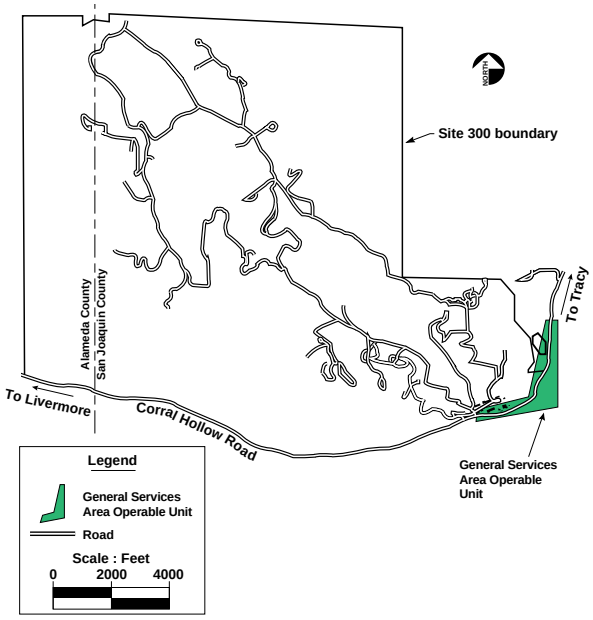

Figure 2. Location of the General Services Area Operable Unit at LLNL Site 300.

remediation alternatives (referred to as a Feasibility Study). This Proposed Plan solicits input and provides the opportunity for public review and comment on all the remedial alternatives analyzed in the Feasibility Study (FS).

Following the public comment period, DOE/LLNL will select a remediation plan and describe it in a document called the Record of Decision (ROD) which will be submitted to the regulatory agencies for approval. All comments received at the public meeting and during the public comment period will be considered and used, as appropriate, to write the ROD. In addition, all public comments will be addressed in the Responsiveness Summary section of the ROD. The ROD will document the remedial action plan for the GSA, and stipulate that the effectiveness of remediation is to be evaluated every 5 years. The 5-year review period provides for a change of approach, if, at that time, the implemented remedy does not perform effectively or a revision of remediation goals is warranted by additional site data. The draft ROD is scheduled to be submitted to the regulatory agencies on July 15, 1996, with the final ROD submittal scheduled for December 31, 1996. Following the ROD, DOE/LLNL will prepare a Remedial Design document and implement the selected remedy in the GSA.

Information summarized in this document can be found in greater detail in Chapters 6 and 14 of the Site-Wide Remedial Investigation Report (Webster-Scholten, 1994), the Feasibility Study for the GSA Operable Unit (Rueth and Berry, 1995), as well as other documents available to the public in the Information Repository at the LLNL Visitors Center and the Tracy Library (see page 17 for addresses and telephone numbers). DOE/LLNL and the regulatory agencies encourage the public to review these documents to better understand the site and the investigative and remedial actions that have been completed.

Site 300/General Services Area Project Milestones

Preliminary Assessment/ Site Investigation

1982: DOE/LLNL starts investigation.

1986: DOE/LLNL starts evaluating remediation technologies.

NPL Ranking/ Listing

August 1990: U.S. EPA places Site 300 on National Priority List.

June 1992: Federal Facility Agreement signed by DOE, U.S. EPA, DTSC, and RWQCB.

Site-Wide Remedial Investigation

April 1994: DOE/LLNL issues a Site-Wide Remedial Investigation report that characterizes contamination at Site 300, including the General Services Area.

General Services Area Operable Unit Feasibility Study

October 1995: DOE/LLNL issues Feasibility Study report evaluating potential remedial alternatives for the General Services Area.

Proposed Plan

March 1996: Proposed Plan for remediating the General Services Area is presented to public for review and comment.

April 24, 1996: Public meeting to be held at the Tracy Inn, Tracy, California.

Record of Decision

December 1996: DOE/LLNL, in conjunction with U.S. EPA and State of California, will issue a ROD document describing the selected remedy for the General Services Area. Public comments on the Proposed Plan will be addressed here.

Remediation

DOE/LLNL will issue a Remedial Design document and implement the selected remedy at the General Services Area.

Completed | We are here | To be done

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Figure 3. The General Services Area remediation process under CERCLA.

Role of the Regulatory Agencies

As part of the Federal Facility Agreement for DOE/LLNL Site 300, the U.S. EPA and the State of California DTSC and RWQCB provide guidance to DOE/LLNL on the investigation and remediation of *contaminants* at the GSA. Specifically, the three regulatory agencies review and comment on all CERCLA compliance reports prepared by DOE/LLNL, provide applicable or relevant and appropriate requirements (*ARARs*) for the site, review and evaluate remedial technologies and alternatives, participate in the selection of the final remedy, and provide oversight and enforcement of state and federal environmental regulations. In addition, the regulatory agencies monitor and review public acceptance of the proposed remedy. In doing so, the regulatory agencies will actively participate at the public meeting in the Crystal Room at the Tracy Inn for the GSA on April 24, 1996.

Site Background

The GSA is composed of a cluster of eleven buildings that were constructed in the late 1950s to support Site 300 activities. Undetermined quantities of solvents containing *trichloroethylene* (*TCE)*, a suspected human *carcinogen*, and other volatile organic compounds (*VOCs*) were released to the ground as a result of past activities in the craft shops, equipment fabrication and repair facilities in the GSA and are present in the soil/rock and ground water in the area. For purposes of discussion, the GSA has been divided into two subareas: the central GSA and eastern GSA, based on differences in hydrogeology, contaminant source areas, and the location of ground water VOC plumes. Two primary release sites were identified: 1) a former dry well area located in the central GSA near Building 875, and 2) the debris burial trench area located in the eastern GSA. Four other release sites have also been identified in the GSA including a decommissioned drum storage rack, a steam cleaning/sink area, and two former dry wells.

In 1982, DOE/LLNL discovered the contamination at the site and began an investigation under the guidance of the RWQCB. The Site 300 Experimental Test Facility was placed on the EPA National Priority List in August 1990, and DOE entered into a Federal Facility Agreement with the U.S. EPA Region IX, DTSC, and RWQCB in June 1992. Since then, all remedial investigations have been conducted under the guidance of these regulatory agencies. To determine the extent of contamination in the GSA, DOE/LLNL drilled 75 boreholes to collect soil samples. Ninety-eight ground water *monitor wells* have been installed for water-level measurements and water sample collection.

Geologic and hydrogeologic data were collected and field parameters were measured during the drilling and installation of monitor wells to characterize the subsurface properties of the GSA. As shown in Figure 4, the central GSA is underlain by a shallow water-bearing zone (*aquifer*). This shallow water-bearing zone is underlain by a thick, low-permeability layer (also referred to as an *aquitard*) that, where present, prevents downward migration of water to the regional aquifer in this area. In the eastern GSA, the aquitard is not present, and the shallow water-bearing zone directly overlies the *regional aquifer*.

Extent of Soil and Ground Water Contamination

The remedial investigation determined that VOC releases in the GSA had affected ground water in both the shallow water-bearing zone

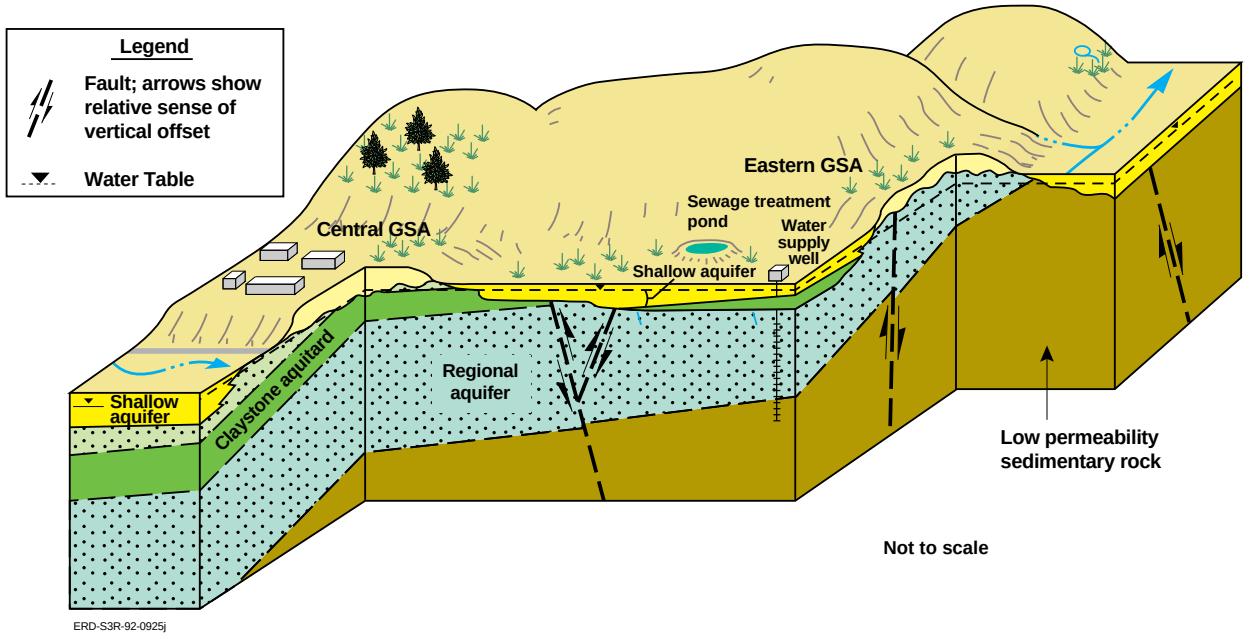

Figure 4. Conceptual hydrogeologic model of the General Services Area.

and regional aquifer beneath the GSA, creating ground water VOC *plumes.* As shown in Figure 5, a shallow ground water VOC plume originates near the buildings in central GSA and extends about 200 ft to the east-southeast from the dry well source area. TCE has also been detected in ground water in the regional aquifer west of the Site 300 sewage treatment pond (Fig. 5). TCE concentrations have generally been decreasing in the regional aquifer in the central GSA since 1990.

In the eastern GSA, TCE in ground water extends eastward from the debris burial trench area and has migrated northward in the Corral Hollow shallow water-bearing zone. The plume extends approximately 2,300 feet from the debris burial trench release site in this shallow aquifer (Fig. 6). TCE has also been detected in ground water in the regional aquifer in the vicinity of the debris burial trenches. For the most part, TCE in the regional aquifer is limited to portions of the regional aquifer which underlie the shallow water bearing zone that contains VOCs.

Dissolved and undissolved TCE has been identified as the primary chemical of concern because it has been most frequently detected in soil and ground water in relatively high concentrations (up to 360,000 *parts per billion* [*ppb*] in soil and 240,000 ppb in ground water). Thirteen other VOCs have been less frequently detected at significantly lower concentrations in soil and ground water.

Ongoing Remedial Actions

LLNL has implemented CERCLA Removal Actions to remediate VOCs in soil and ground water in the central GSA and in ground water in the eastern GSA. To date, approximately 25 pounds of VOCs have been extracted and treated.

Since April 1993, a *ground water extraction* and treatment system has been in operation in the central GSA at the former Building 875 dry well area. Over 270,000 gallons of ground water have been extracted and treated. Since ground water remediation activities were initiated, TCE concentrations in ground water samples from monitor wells in the dry well area have decreased from a historical maximum concentration of 240,000 ppb to a maximum concentration of only 10,000 ppb by third quarter 1994.

Following *dewatering* of the shallow water-bearing zone at the dry well area through ground

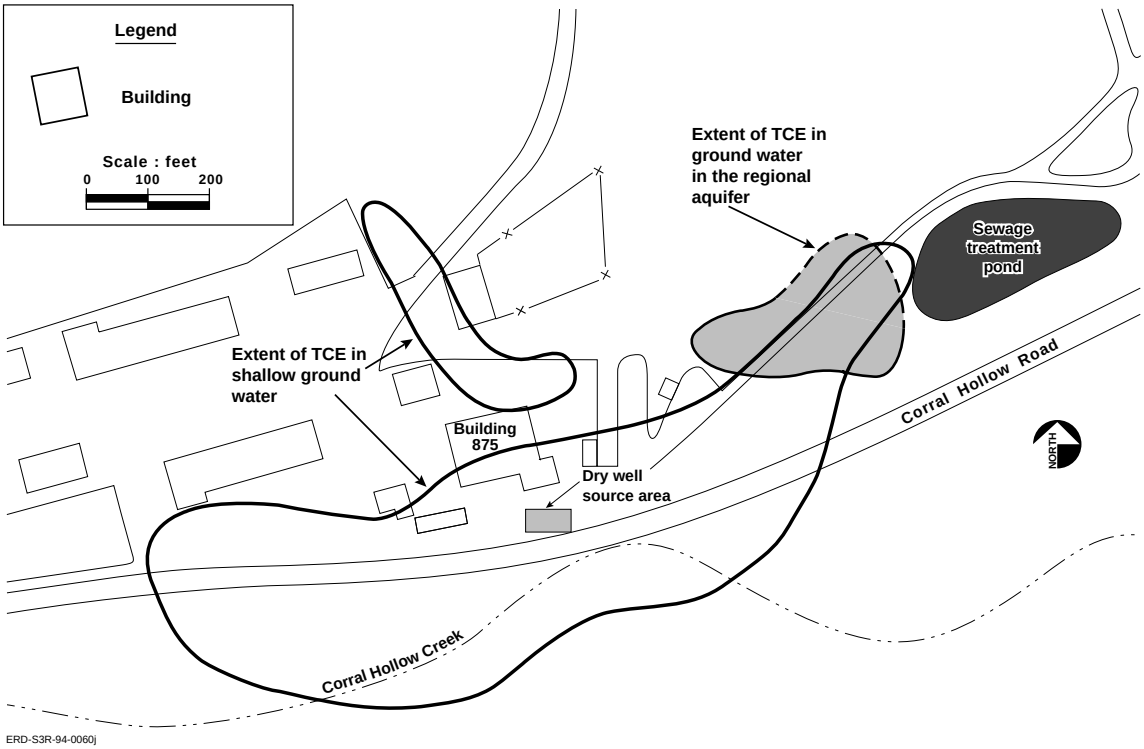

Figure 5. TCE in ground water in the shallow and regional aquifers at concentrations above 1 ppb in the central GSA, third quarter 1994.

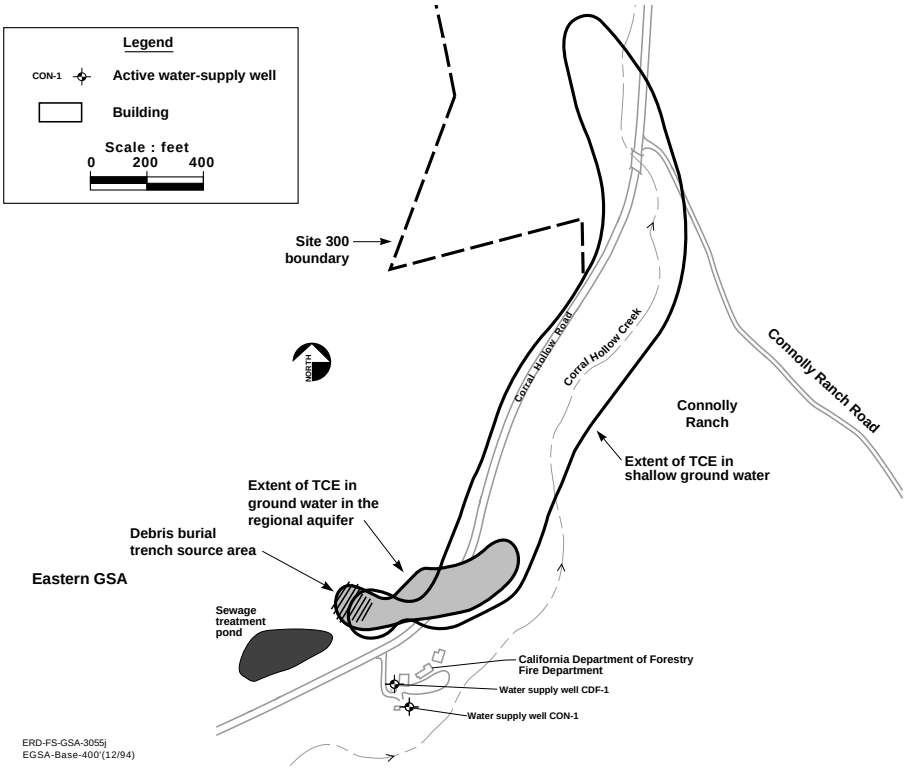

Figure 6. TCE in ground water in the shallow and regional aquifers at concentrations above 1 ppb in the eastern GSA, third quarter 1994.

water extraction, *soil vapor extraction* and treatment was initiated in July 1994. Soil vapor extraction is needed in the central GSA to 1) reduce soil VOC concentrations, 2) address the possible presence of residual adsorbed contaminants in the dewatered zone, and 3) reduce VOC concentrations in soil vapor to mitigate inhalation risk inside Building 875. Analytic data from vapor extraction wells in the vicinity of Building 875 indicate that VOC concentrations in *soil vapor* are decreasing significantly over time. The total mass of VOCs removed from ground water and soil through third quarter 1994 is approximately 20 pounds.

Since June 1991, LLNL has operated a ground water extraction and treatment system in the vicinity of the eastern GSA debris burial trench area. With this system, LLNL has significantly reduced VOC concentrations in ground water in this area. Over 50 million gallons of ground water have been extracted and treated with approximately 5 pounds of VOCs removed from ground water. In addition, the length of the eastern GSA ground water plume with TCE concentrations above drinking water standards (5 ppb) has been decreased by over 4,000 feet since the initiation of remediation (Fig. 7).

Summary of Site Risks

As part of the Remedial Investigation, a *baseline risk assessment* was conducted to evaluate the potential risk and hazard to people, and plants and animals that may be exposed to VOCs in soil, air and/or ground water.

What Is a Baseline Risk Assessment?

Risk assessments evaluate toxicological and environmental data, and use those data to predict the extent, if any, of adverse health effects on people and plant and animal species under given exposure conditions.

Risk for humans is expressed as the probability of developing cancer over a lifetime and as the potential for noncancer adverse health effects (e.g., effects to central nervous system, liver, kidney) to occur due to long-term exposures. For example, an excess cancer risk of one in one million means that a person exposed to a chemical over the course of a lifetime could potentially increase his or her cancer risk by one in one million above the cancer risk of one in three for Californians (American Cancer Society, 1994). An excess cancer risk of 10^{-6} (one in one million) is an acceptable level according to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). An excess cancer risk between 10^{-4} (one in ten thousand) and 10^{-6} may be acceptable provided risk is sufficiently managed.

An ecological assessment evaluates the potential for adverse impact to plants and animals from long-term exposure to chemicals. The ecological assessment focuses on potential reproductive damage and reductions in reproductive life span rather than the risk of developing cancer.

Baseline risk assessments typically use conservative assumptions that favor protecting public health and the environment. Therefore, actual human or nonhuman exposures and risks are likely to be much less than those calculated for the risk assessments.

General Service Area Baseline Risk Assessment

The General Services Area baseline risk assessment determined that two *exposure routes* could potentially result in unacceptable risk to the community and workers on site. For ground water ingestion and inhalation of TCE vapor inside Building 875, the baseline risk assess-

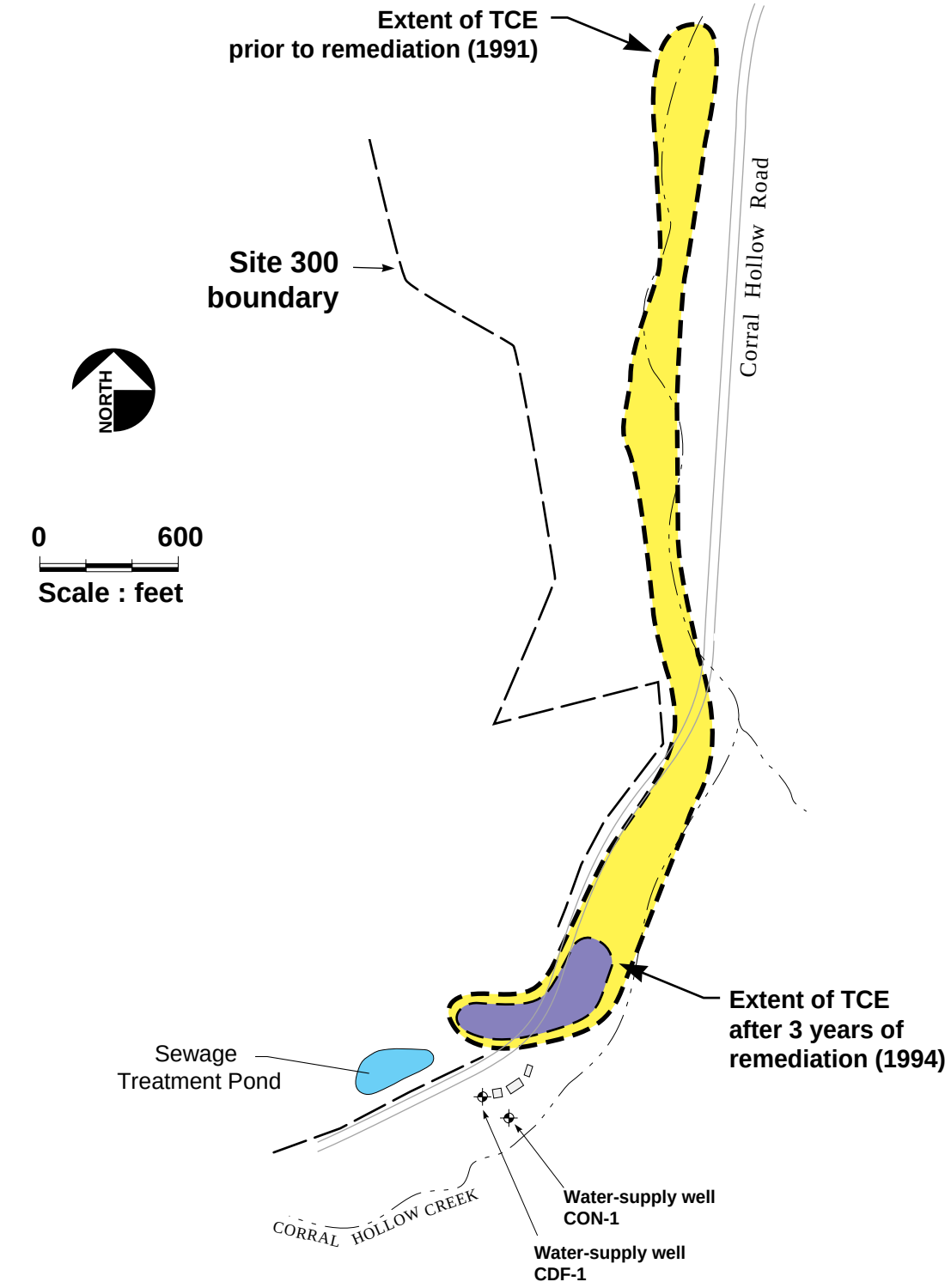

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Figure 7. Reduction in extent of TCE in shallow ground water at concentrations above drinking water standards (5 ppb) since initiation of ground water remediation.

ment determined that there is an unacceptable potential excess risk of cancer and noncancer adverse health effects.

The calculated excess cancer risks for potential residential use of ground water in the vicinity of the eastern GSA debris burial trenches or at off-site wells is 10^{-5} (one in one hundred thousand). The potential excess cancer risk for use of ground water from a hypothetical well that could potentially be installed at the site boundary near Building 875 was calculated to be 7×10^{-2} (seven in one hundred). These values indicate that if ground water from a well at this location was consumed on a regular basis, it may present an unacceptable risk. However, no water-supply wells currently exist at the site boundary location, and ground water in the area is not used for drinking water. In addition, Removal Actions are underway to remove ground water contaminants. Existing off-site water-supply wells are monitored monthly for VOCs, but none have ever been detected in these wells above Federal or State drinking water standards (*MCLs*). These wells are located approximately 400 ft south-southeast from the eastern GSA debris burial trench source area. The predominate ground water flow and plume migration direction in this area is to the north-northeast.

The baseline risk assessment also determined that there is an unacceptable potential excess risk of cancer and noncancer adverse health effects to workers inside Building 875 who may inhale TCE vapors possibly evaporating from subsurface soil. This conservatively assumes that a person works inside Building 875 for 8 hours a day, 5 days a week for 25 years. This potential exposure route is limited to employees working on site inside Building 875. The baseline risk assessment also determined that no other Site 300 workers or nearby residents are affected or potentially affected by contaminated soil or soil vapor in the Building 875 area.

Elevated excess human cancer risk from inhalation of TCE vapor at Building 875 in the GSA was calculated to be 10^{-5} indoors. This means that a person spending 8 hours a day, 5 days a week, for 25 years inside Building 875 may have one in one hundred thousand increased chance of contracting cancer. However, this excess cancer risk was based on VOC concentrations from soil samples collected at the dry well release site prior to the startup of the soil vapor extraction system. It is likely, due to ongoing soil vapor remediation activities, that current VOC concentrations are lower than those used to calculate the 10^{-5} excess cancer risk inside Building 875.

U.S. EPA requires that excess cancer risks above one in one million must be addressed by the various risk management measures and/or remedial actions presented in the FS. The baseline ecological assessment, conducted to evaluate the potential for adverse impact to plants and animals from long-term exposure to chemicals in the GSA, determined that VOCs do not pose ecological risk in this area. This determination was based on estimates of potential hazard from exposure to contaminants that were calculated for mammal and aquatic species that could potentially inhabit this area, as well as biological surveys conducted to determine which species actually inhabit or migrate through the GSA.

Summary of Cleanup Alternatives

The FS presents a detailed discussion and analysis of remedial alternatives for addressing contamination and potential risk at the GSA. It also evaluates each alternative based on finding the best balance among these criteria. The remedial alternatives evaluated for the GSA are summarized below.

Alternative 1

Alternative 1, no action, is required by

CERCLA to provide a basis from which to develop and evaluate the other remedial alternatives. Under the no-action alternative, all remedial activities in the GSA would cease. Sampling and analysis of ground water from monitor wells in the area would continue to monitor TCE and other VOCs in the subsurface. Administrative controls would provide a degree of protection to human health by restricting access to or activities in certain areas of contamination. Modeling indicates that ground water VOC concentrations would be reduced to drinking water standards through natural attenuation and degradation after 75 years under the Alternative 1 scenario. Ground water monitoring will be conducted for the 75-year period plus 5 years of post-"remediation" monitoring.

Estimated 80-year present-worth cost = $4,270,000.

Alternative 2

Alternative 2 focuses on preventing human exposure to TCE and other contaminants through ingestion of ground water from existing water-supply wells.

Alternative 2 includes:

- Monitoring.
- Contingency point-of-use treatment using aqueous-phase carbon adsorption for three off-site water-supply wells.
- Restrictions on access and procedures for construction in the area.

As with Alternative 1, reduction of VOC concentrations in ground water through natural attenuation and degradation would take approximately 75 years under the Alternative 2 scenario. Ground water monitoring will be conducted for the 75 year period plus 5 years of post-"remediation" monitoring.

Estimated 80-year present-worth cost = $4,570,000.

Alternative 3

Alternative 3 includes all the elements of Alternatives 1 and 2 and adds ground water and soil vapor extraction to remove TCE and other VOCs from ground water, soil and rock. Alternative 3 is divided into two scenarios: Alternatives 3a and 3b. Both are the same with respect to the objective and method of subsurface soil/rock remediation but differ in their ultimate objectives for ground water remediation.

Both Alternatives 3a and 3b include:

- All elements of Alternatives 1 and 2, plus
- Soil vapor extraction and treatment by carbon adsorption in the central GSA dry well source area.
- Extraction and treatment of ground water by air stripping and/or carbon adsorption in the central GSA dry well area and the eastern GSA debris burial trenches area.

Under Alternatives 3a and 3b, DOE/LLNL will continue to operate the existing soil vapor extraction system at the central GSA dry well area to reduce VOC concentrations in soil vapor to levels protective of ground water (i.e., MCLs) and to mitigate VOC inhalation risk inside Building 875. DOE/LLNL expect that soil vapor extraction will reduce soil vapor concentrations in the Building 875 area to the remediation goal of 360 $ppb_{v/v}$ within 10 years. Modeling indicates that this soil vapor concentration is protective of ground water by preventing contamination of ground water at concentrations above drinking water standards. Alternatives 3a and 3b are discussed further below.

Alternative 3a

Under Alternative 3a, DOE/LLNL will expand the existing ground water extraction and treatment system in the central GSA dry well

area to prevent migration of VOCs above drinking water standards (MCLs) into the regional aquifer. In addition, ground water in the eastern GSA debris burial trenches area and the debris burial trench area west of the sewage treatment pond will be extracted and treated to reduce VOC concentration to drinking water standards (MCLs) in the alluvial and regional aquifers. Modeling indicates that ground water TCE concentrations in the shallow aquifer in the central GSA dry well area need to be reduced to 100 ppb to ensure long-term protection of the regional aquifer. After the 100 ppb remediation goal is achieved, ground water extraction is discontinued and natural attenuation is relied upon to reduce VOC concentrations in the shallow water-bearing zone to the remediation goal of drinking water standards.

The existing ground water extraction and treatment system in the eastern GSA debris burial trenches area will continue to operate to reduce VOC concentrations in ground water to MCLs in the shallow and regional aquifers. Modeling indicates that ground water extraction will reduce ground water VOC concentrations in the Building 875 and debris burial trenches areas to the remediation goal within 30 years and 10 years, respectively. Modeling also indicates that an additional 35 years may be required to reduce VOC concentrations to MCLs in the shallow aquifer through natural attenuation and degradation. Ground water monitoring will be conducted throughout this 65-year period to achieve MCLs in both the shallow and regional aquifer plus 5 years of post-remediation monitoring.

Estimated 70-year present-worth cost for Alternative 3a = $18,050,000.

Alternative 3b

Alternative 3b consists of all components of Alternative 3a but continues active ground water extraction and treatment in the central GSA dry well area until drinking water standards (MCLs) are reached in both the regional and shallow aquifer. Modeling indicates that ground water extraction in the central GSA dry well area will reduce VOC concentrations to current MCLs in 55 years. Ground water monitoring will be conducted throughout the 55 years of remediation plus 5 years of post-remediation monitoring.

Estimated 60-year present-worth cost for Alternative 3b = $19,750,000.

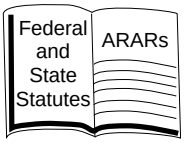
Evaluation of Alternatives

Nine EPA-specified criteria are used for evaluating remedial alternatives under CERCLA. Figure 8 presents an overview of these criteria. The FS compares the remedial alternatives by analyzing each alternative against the evaluation criteria except for state and public acceptance criteria which will be evaluated following the public review period. Table 1 summarizes the results of that analysis. As specified by EPA, the two most important criteria are adequate protection of public health and environment, and compliance with all federal and state ARARs.

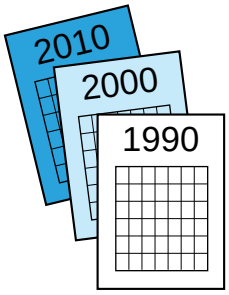
Each remedial alternative was assessed against the nine CERCLA evaluation criteria described below. Using results of this assessment, DOE/LLNL compared the alternatives and selected a preferred alternative for the site.

1. **Overall Protection of Human Health and the Environment:** Addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs):** Addresses whether a remedy will meet all ARARs of federal and state environmental statutes and/or provide grounds for invoking a waiver.

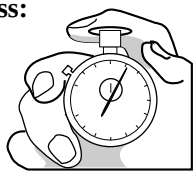


3. **Long-term Effectiveness and Permanence:** Refers to the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met.

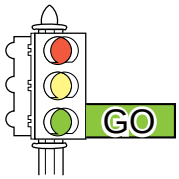


4. **Reduction of Toxicity, Mobility, or Volume Through Treatment:** Refers to the anticipated ability of a remedy to reduce the toxicity, mobility, or volume of the hazardous components present at the site.

5. **Short-term Effectiveness:** Addresses the period of time needed to complete the remedy, and any adverse impact on human health and the environment that may be posed during the construction and implementation period.



6. **Implementability:** Refers to the technical administrative feasibility of a remedy, including the availability of materials and services needed to carry out a particular option.



7. **Cost:** Evaluates the estimated capital, and operation and maintenance costs of each alternative.

8. **State Acceptance:** Indicates whether, based on its review of the information, the state concurs with, opposes, or has no comment on the preferred alternatives.

9. **Community Acceptance:** Indicates whether community concerns are addressed by the remedy and whether the community has a preference for a remedy. Although public comment is an important part of the final decision, EPA is compelled by law to balance community concerns with all of the previously mentioned criteria.

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Figure 8. The nine CERCLA evaluation criteria.

Table 1. Comparative evaluation of remedial alternatives for the General Services Area.

Alternative	Overall protection of human health and environment	Compliance with ARARs	Long-term effectiveness and permanence	Reduction in volume, toxicity, and mobility	Short-term effectiveness	Implementability	Cost[a]
Alternative 1 No Action	Human health: No Environment: No	Criterion may be met[b]	Not effective.	Dependent on natural attenuation and degradation.	No immediate impact to general public. Protective equipment may be required during well monitoring. Site risks not addressed.	Implementable	4.27
Alternative 2 Exposure control	Human health: Air: No Ground water: Yes[c] Environment: No	Criterion may be met[b]	Effective for ground water risks at existing water-supply wells.	Dependent on natural attenuation and degradation.	No impact to general public. Protective equipment may be required during well installation. Addresses ground water risk with point-of-use treatment or replacement of existing water-supply wells.	Implementable	4.57
Alternative 3a Remediation and protection of the regional aquifer	Human health: Air: Yes Ground water: Yes Environment: Yes	Criterion may be met	Effective for air and ground water risks. Ground water and soil vapor extraction increases source removal effectiveness.	Reduction in shallow unsaturated zone, and shallow and deep aquifer contamination; partially dependent on natural attenuation and degradation.	No impact to general public. Protective equipment may be required during construction activities. Addresses site risks with active remediation of soil and ground water.	Implementable	18.05
Alternative 3b Ground water and soil remediation	Human health: Air: Yes Ground water: Yes Environment: Yes	Criterion met	Effective for air and ground water risks. Ground water and soil vapor extraction addresses all soil and ground water contamination.	Reduction in shallow unsaturated zone, and shallow and deep aquifer contamination.	No impact to general public. Protective equipment may be required during construction activities. Addresses site risks with active remediation of soil and ground water.	Implementable	19.75

[a] Estimated total present worth in millions of 1995 dollars. Overall cost is highly dependent on the required length of pumping time.

[b] Relies solely on natural attenuation and degradation to comply with Safe Drinking Water Act, Basin Plan, and State Resolutions 68-16 and 92-49.

[c] Protective of human health for ingestion of ground water from existing water-supply wells.

Preferred Remedial Alternative

DOE/LLNL, U.S. EPA, RWQCB, and DTSC believe that Alternative 3b is the best remedial alternative, considering the CERCLA evaluation criteria.

In summary, the preferred remedial alternative 3b includes the following components:

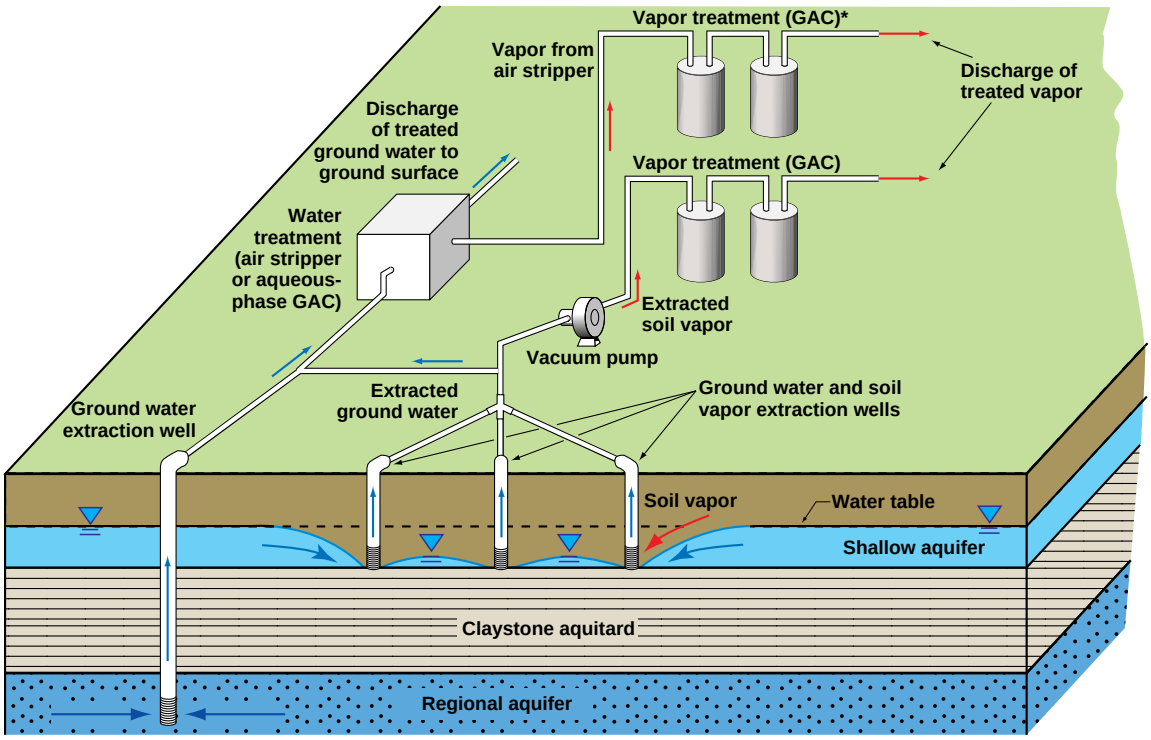
- Monitoring to be conducted throughout the predicted 55 years of remediation plus 5 years of post-remediation monitoring.
- Contingency point-of-use treatment using aqueous-phase carbon adsorption for three off-site water-supply wells.
- Restrictions on access and procedures for construction in the area.
- Soil vapor extraction and treatment by carbon adsorption in the central GSA dry well source area. Soil vapor extraction will be conducted to reduce VOC concentrations in soil vapor to levels protective of ground water (i.e., MCLs) and to mitigate VOC inhalation risk inside Building 875. Modeling indicates that the remediation goal of 360 $ppb_{v/v}$ will be reached within 10 years. The evaluation criteria for reaching the soil vapor extraction remediation goal will be discussed in detail in the ROD.
- Extraction and treatment of ground water by air stripping and/or carbon adsorption in the central GSA dry well area and the eastern GSA debris burial trenches area until MCL drinking water standards (i.e., 5 ppb for TCE) are reached in both the regional and shallow aquifers. Modeling predicts that ground water extraction will reduce ground water VOC concentrations in the central GSA and eastern GSA debris burial trenches area to MCLs within 55 years and 10 years, respectively.

The estimated 60-year present-worth cost for the preferred alternative 3b is $19,750,000.

Alternative 3b is protective of human health and the environment. The risk reduction components of this alternative are readily implementable with modifications to the existing ground water and soil vapor extraction and treatment systems. Figures 9 and 10 show schematic drawings of the proposed soil vapor and/or ground water extraction and treatment systems in the central and eastern GSA, respectively.

Ground water and soil vapor extraction and treatment are established remedial technologies and, since functioning treatment systems are already in place, they will readily fulfill the requirements of the evaluation criteria.

However, other more innovative technologies will continue to be considered for application to the GSA throughout the process of remediation. These technologies may be introduced into the process if site conditions change or technology development and testing indicate a potential for cost-effective and expedited remediation.



* Treatment of vapor from ground water treatment system is not necessary if aqueous-phase GAC is used.

Figure 9. Schematic of the central GSA remediation system proposed in Alternative 3b.

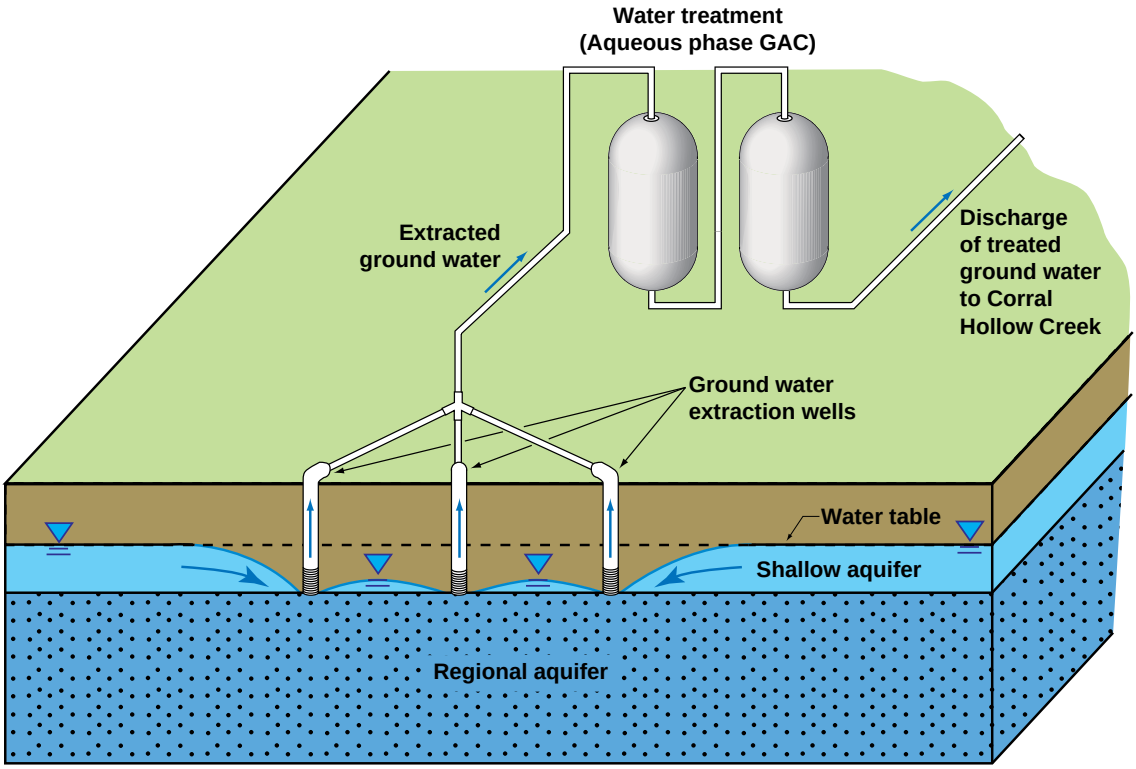


Figure 10. Schematic of the eastern GSA remediation system proposed in Alternative 3b.

Comment Period

The purpose of this Proposed Plan is to solicit comments from the public on all the proposed remedial alternatives presented in the GSA FS. The public comment period begins on April 10, 1996 and ends on May 10, 1996. The public meeting on the GSA Proposed Plan is scheduled to be held on April 24, 1996, at 6:00 pm in the Crystal Room at the Tracy Inn. Representatives from DOE/LLNL, U.S. EPA, and the State of California will be present to explain the FS and the Preferred Remedial Alternative. The public is encouraged to attend and participate in the public meeting. Comments on the Preferred Remedial Alternative, as well as on all remedial alternatives considered, can be submitted verbally at the public meeting or in writing to the DOE Site 300 Remedial Project Manager.

In accordance with the California Environmental Quality Act (CEQA), DTSC has evaluated the environmental impacts of this action, which are summarized in a CEQA Initial Study and Negative Declaration Report. DTSC seeks public review and comment on the CEQA declaration report, which will be available for public review at both the LLNL Visitors Center and the Tracy Public Library. DTSC encourages comment on the CEQA declaration report at the above-referenced public meeting.

For More Information

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Information Repositories

LLNL Visitors Center
Enter from Greenville Road
Livermore, CA 94551 **(510) 422-9797**

Hours:	Monday, Tuesday	10 am–4 pm
	Wednesday	12 noon–4 pm
	Thursday, Friday	10 am–4 pm

Tracy Public Library
20 East Eaton Avenue
Tracy, CA 95376 (**209**) **835-2221**

Hours:	Monday	1 pm–8 pm
	Tuesday	10 am–5 pm
	Thursday	2 pm–6 pm
	Saturday	12 noon–5 pm

References

American Cancer Society (1994), *California Cancer Facts and Figures 1994*, American Cancer Society, California Division, Inc., Oakland, CA.

Rueth, L., and T. Berry (1995), *Final Feasibility Study for the General Services Area Operable Unit, Lawrence Livermore National Laboratory Site 300*, Lawrence Livermore National Laboratory, Livermore, CA. (UCRL-AR-113860).

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Glossary

Aquifer: Permeable rock or sediment in an underground formation that can store and supply water to wells and springs. Aquifers can be a source of water for domestic, agricultural, and industrial uses. Used synonymously with “water-bearing zone”.

Aquitard: Low-permeability sediment or rock layers typically composed of clay or claystone, through which ground water can move only very slowly.

ARARs: (Applicable or Relevant and Appropriate Requirements): Federal and state standards, requirements, criteria, or limitations pertaining to the proposed remedial action.

Baseline risk assessment: Characterization of the potential adverse health effects of human and nonhuman species exposure to environmental hazards.

Carcinogen: A cancer-causing substance or agent.

Contaminant: A chemical that degrades the natural quality of a substance or environmental medium such as air, water, or soil.

Dewatering: Pumping a water-bearing zone at a sufficient rate to lower the water table either temporarily or permanently.

Exposure route: The means by which a chemical may enter the body. The three main exposure routes generally evaluated are ingestion (drinking or eating), inhalation (breathing), and dermal contact (absorbed through the skin).

Federal Facility Agreement: A document that specifies required actions at a federal facility (such as LLNL Site 300) as agreed upon by various agencies (e.g., DOE, DTSC, EPA, RWQCB).

Ground water extraction: The process of removing ground water from the subsurface, usually accomplished by pumping ground water. Can be used for removal of dissolved contaminants (such as TCE), lowering of the water table, and/or ground water migration control.

MCLs: Maximum contaminant level(s). A drinking water standard.

Monitor well: A well used for the purpose of ground water and/or soil vapor sample collection and water level measurements.

Parts per billion (ppb): A unit of measure for the concentration of a substance in the surrounding medium. For example, one million liters of water containing one gram of TCE has a TCE concentration of one ppb. This can be compared to 1 penny in $10,000,000 or 1 inch in 16,000 miles.

Parts per billion ($ppb_{v/v}$): Parts per billion on a volume-to-volume basis.

Plume: A relatively well-defined area of contamination found in ground water, surface water, soil vapor, soil, sediments, or bedrock.

Present-worth cost: Present-worth analysis is a method of evaluating total costs (i.e., the cost of each remedial alternative) for projects that vary in duration by discounting all costs to a common base year (1995) to adjust for the time value of money. The present-worth cost represents the amount of money, which if invested in the initial year (1995) of the remedial action and dispersed over the life of the project (i.e., 60 years), would be sufficient to cover all associated costs. The discount rate is based on the anticipated difference in investment return (i.e., net interest income) and inflation. The present-worth cost of the Preferred Remedial Alternative (3b) is $19.75 million, assuming a discount rate of 3.5% (i.e., 6.5% interest and 3.0% inflation). However, government project funding is more likely to occur incrementally (i.e., annually) as the project proceeds rather than as a lump sum investment at the beginning of the project. Under this scenario, the equivalent non-present-worth project cost for Alternative 3b is $35.29 million (1995 dollars).

Regional aquifer: The primary water-supply aquifer underlying Site 300 and nearby areas. See also aquifer.

Soil vapor: Vapor in the pore spaces of the unsaturated zone. The vapor can consist of air, water, VOCs, or other compounds.

Soil vapor extraction: A means of removing soil vapor usually accomplished by applying a vacuum to one or more wells or buried horizontal slotted pipes. Typically used for remediation of soil/rock above the water table or in a dewatered zone.

Trichloroethylene (TCE): A commonly used industrial solvent. A liquid at room temperature, TCE is heavier than water and therefore, in high concentrations, can sink through a water-bearing zone. TCE is a suspected human carcinogen.

VOCs: Volatile organic compound(s). A group of organic compounds characterized by their tendency to evaporate easily at room temperature. Some familiar substances containing VOCs are solvents, gasoline, paint thinners, and nail polish remover. TCE, DCE, PCE, and TCA are all VOCs.

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