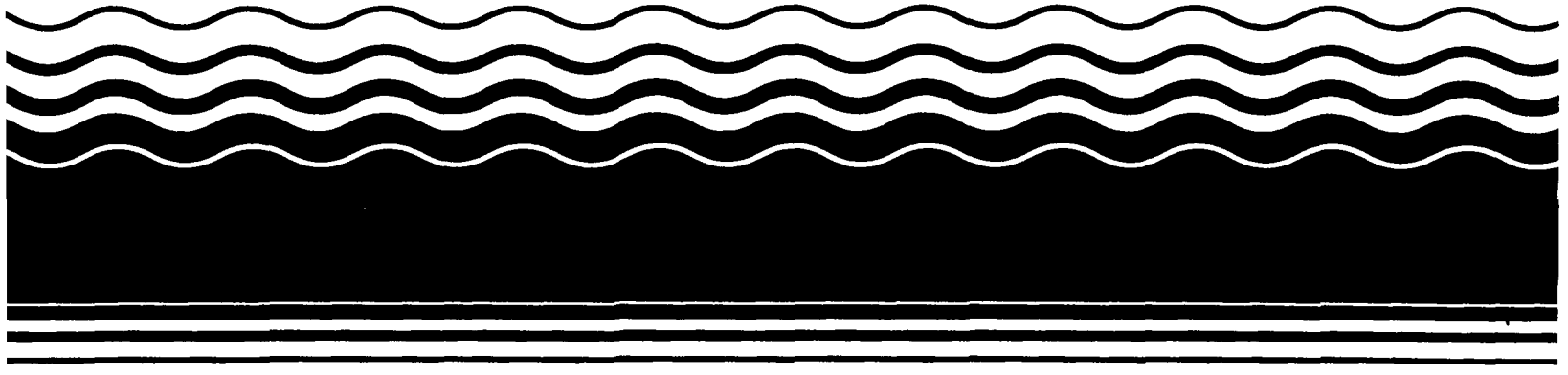
PB97-963112
EPA/541/R-97/036
March 1998

EPA Superfund
Explanation of Significant Difference for the Record of Decision:

Lawrence Livermore Laboratory (USDOE) (Treatment Facilities A & B) Livermore, CA 4/16/1997



UCRL-AR-125555

Explanation of Significant Differences for Treatment Facilities A and B Lawrence Livermore National Laboratory Livermore Site

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April 1997

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1. Introduction

On August 5, 1992, the Record of Decision (ROD) (Department of Energy [DOE], 1992) was signed, documenting the final cleanup plan for the Lawrence Livermore National Laboratory (LLNL) Livermore Site in Livermore, California. As required under Section 117(c) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendment and Reauthorization Act of 1986 (SARA), and pursuant to 40 Code of Federal Regulations (CFR) Section 300.435 (c)(2)(i) (Fed. Reg. Vol. 55, No. 46 [March 8, 1990]), this Explanation of Significant Differences (ESD) describes a change from an ultraviolet/hydrogen peroxide (UV/H_2O_2) and air stripping ground water treatment system for volatile organic compounds (VOCs) described in the ROD, to air stripping only at Treatment Facilities A and B (TFA and TFB) (Fig. 1). An ESD is required when significant, but not fundamental, changes are made to the final remedial action plan described in the ROD.

The lead regulatory agency for this ESD is the U.S. Environmental Protection Agency (EPA). In addition to the EPA, the San Francisco Bay Regional Water Quality Control Board (RWQCB) and the California Department of Toxic Substances Control (DTSC) oversee the LLNL Livermore Site cleanup and have commented on this ESD. All comments and DOE/LLNL responses are presented in Section 4.

This ESD includes a brief summary of the remedy selected in the ROD, a description of the proposed change, and a description of why DOE/LLNL are making this change to the selected remedy. This ESD was prepared according to EPA guidance (EPA, 1991; 1992).

The changes described in this ESD were presented to the Community Work Group on August 14, 1996. Pursuant to 40 CFR Section 300.435(c)(2)(i), a public comment period is not required for an ESD, and all regulatory agencies overseeing the Livermore Site agreed that a public comment period was not necessary for this ESD. A notice will be published in local newspapers (*The Independent, Tri-Valley Herald,* and *Valley Times*) that briefly summarizes this ESD.

This ESD will be placed in the LLNL repositories for interested members of the public to review. One repository is located at the Livermore Public Library, 1000 South Livermore Avenue. Library hours are Monday through Thursday, 10:00 a.m. to 9:00 p.m.; Friday, 10:00 a.m. to 6:00 p.m.; Saturday, 10:00 a.m. to 5:00 p.m.; and Sunday 1:00 to 5:00 p.m. The second repository is at the LLNL Visitors Center on Greenville Road. Visitor Center hours are Monday through Friday, 1:00 to 4:00 p.m. The Visitors Center also contains the Administrative Record, which contains all documents that form the basis for the Livermore Site cleanup plan.

The site description and history are described in the Livermore Site Remedial Investigation Report (Thorpe et al., 1990), the Feasibility Study (Isherwood et al., 1990), the ROD (DOE, 1992), and the Remedial Action Implementation Plan (Dresen et al., 1993).

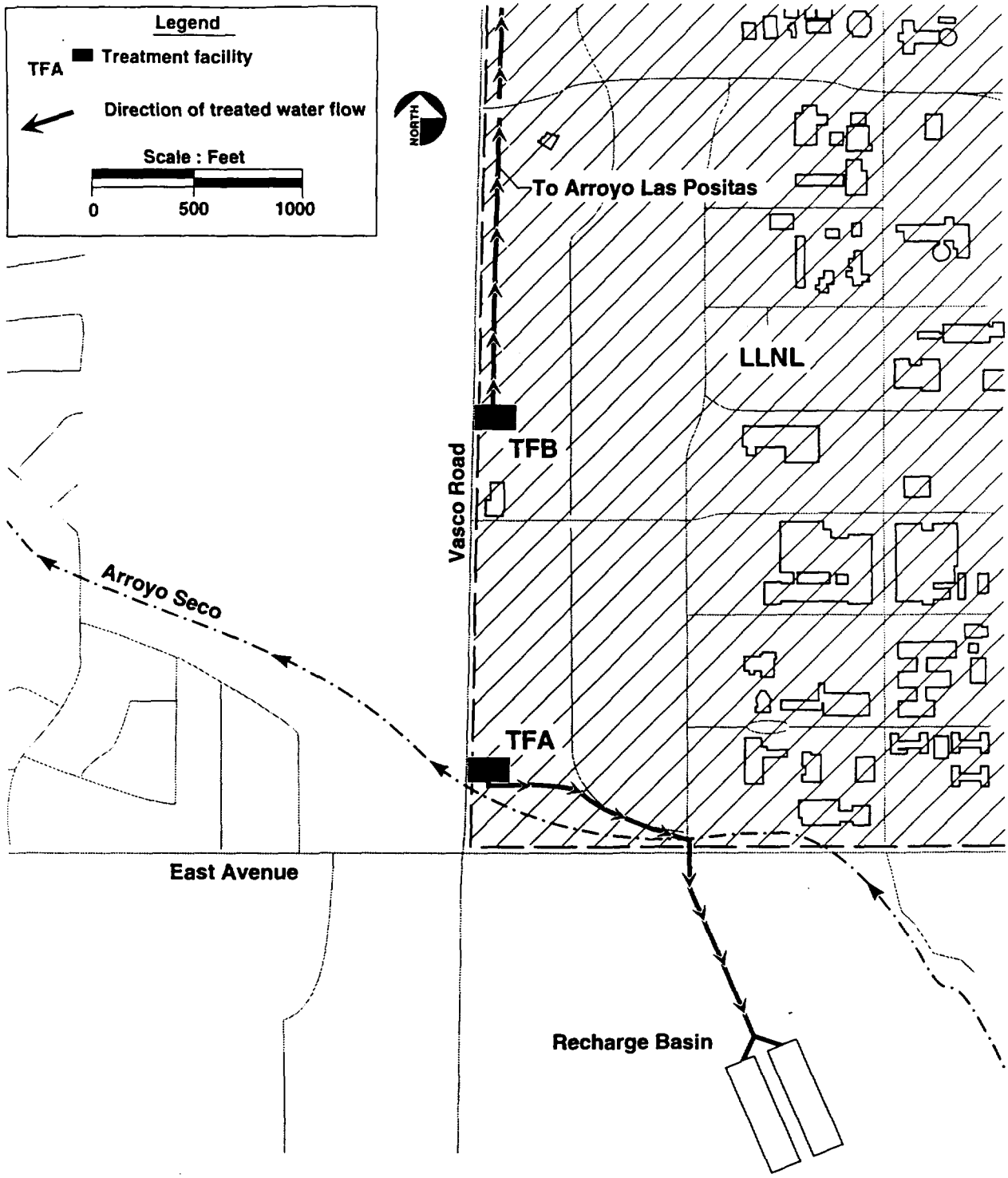

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Figure 1. Location of Treatment Facilities A and B at the Livermore Site.

2. Remedy Selected in the ROD

TFA and TFB are designed and operated to treat ground water containing VOCs and to hydraulically control the western and southwestern offsite plumes. TFA began operating in September 1989, and TFB began operating in October 1990. The primary VOCs in ground water at TFA are tetrachloroethylene (PCE) and 1,1-dichloroethylene (1,1-DCE). Trichloroethylene (TCE) and carbon tetrachloride are the primary VOCs at TFB. Design influent concentrations for both facilities are discussed in Boegel et al. (1993).

TFA consists of a commercially available UV/H_2O_2 ground water treatment system and an air stripper. The original facility was designed to treat 100 gallons per minute (gpm). Early remediation concentrations were as high as 230 parts per billion (ppb) PCE and 14 ppb 1,1-DCE at TFA. Recently the facility was modified and is now treating up to 300 gpm at concentrations of about 34 ppb PCE and 5 ppb 1,1-DCE (September 1996) as new wells and pipelines are connected to the facility. Treated ground water from TFA is discharged to a recharge basin south of East Avenue (Fig. 1).

TFB also consists of a commercially available UV/H_2O_2 ground water treatment system and an air stripper. Early remediation concentrations were as high as 140 ppb TCE and 4 ppb carbon tetrachloride, and concentrations are currently about 42 ppb TCE and 1.5 ppb carbon tetrachloride (September 1996). Treated effluent is discharged to a surface drainage ditch that flows north into Arroyo Los Positas in the northwest corner of the Livermore Site.

Facility component specifications and Process and Instrument Diagrams for TFA and TFB are presented in Boegel et al. (1993).

3. Description of the Significant Differences and the Basis for the Differences

The significant differences between the remedy presented in the ROD and the proposed remedy are described below.

3.1. Description

Because of increasing flow rates from the wellfield to enhance offsite plume capture, TFA has recently become less efficient in remediating VOCs (Lamarre and Ko, 1996). Although effluent concentrations occasionally exceed the 5 ppb total VOC discharge limit, they have never exceeded Maximum Contaminant Levels for any individual VOC. In the summer of 1996, DOE/LLNL began investigating a higher efficiency air stripper. When reviewing the specifications for a higher efficiency air stripper, DOE/LLNL determined that they could remediate all VOCs below discharge limits at TFA without operating the UV/H_2O_2 unit. It was also determined that a similar change at TFB would eliminate the need for the TFB UV/H_2O_2 unit. This change also reduces the costs and hazards involved in operating and maintaining the UV/H_2O_2 units.

During preparation of the ROD, the Community Work Group indicated a preference for ground water remediation by UV/H_2O_2 because it destroys VOCs, whereas air stripping removes VOCs and collects them on granular activated carbon (GAC). VOCs on GAC are then destroyed during regeneration, or the GAC is disposed. Due to higher initial PCE and 1,1-DCE concentrations and the community preference, UV/H_2O_2 was incorporated into the original design to destroy many of the VOCs prior to air stripping. With the initially high VOC concentrations, air stripping alone would not have been as effective for the anticipated flow rates. Because VOC concentrations have been reduced by an order of magnitude (Section 2), and flow rate has increased from 50 gpm to greater than 300 gpm, the system is not designed for current conditions, and the cost and chemical hazards of using UV/H_2O_2 no longer favor this technology.

The benefits for the proposed remedy include:

- Meeting cleanup objectives faster by increasing the capacity of the treatment facility;
- Increased safety by eliminating the handling of hazardous material (H_2O_2);
- Cost reduction through eliminating purchase of H_2O_2, reduced equipment maintenance, and reduced electrical cost; and
- Using an accepted and proven technology.

Because of these benefits, DOE/LLNL and the regulatory agencies chose to eliminate the UV/H_2O_2 units and replace them with higher efficiency air strippers. The Community Work Group accepts the proposed remedy.

3.2. Basis

Table 1 describes the significant differences between the original and proposed remedy. Air permitting, reporting and analysis costs will remain the same from the original remedy to the proposed remedy.

GAC replacement frequency and costs will not increase due to the proposed remedy. Time estimates for replacing the GAC (Boegel et al., 1993) were based on assumed initial concentrations. However, over the last six years, the GAC effluent has always been below the Bay Area Air Quality Management District's (BAAQMD's) discharge limits and never necessitated GAC replacement. The GAC has been replaced about once a year as part of routine maintenance. The GAC will change from one 200 pound unit to two 1,500 pound units (3,000 pounds total) to accommodate the increased air flow rate. DOE/LLNL will continue to monitor the GAC effluent with an organic vapor analyzer according to the schedule and requirements established by BAAQMD. As soon as effluent concentrations begin to approach BAAQMD discharge limits, the GAC will be replaced.

Table 1. Significant differences between the original and proposed remedies.

Item	Original remedy	Proposed remedy
Equipment	UV/H_2O_2 units and air stripper	Higher efficiency air stripper
Flow rate	TFA was designed for 100 gpm, but is currently operating at 300 gpm (see Section 2 for discussion of influent concentrations); TFB was designed for 100 gpm, and is currently operating at 50 gpm	360 gpm for TFA; 90 gpm for TFB
Electrical costs	$146,000/year at TFA; $70,000/year at TFB	$45,000/year at TFA; $14,500/year at TFB
H_2O_2 costs	$40,000/year at TFA; $5,700/year at TFB	$0 at TFA and TFB
Carbon dioxide costs	$0 at TFA; $500/year at TFB	$0 at TFA and TFB
Ion exchange resin regeneration	$0 at TFA and TFB	$0 at TFA; $3,500/year at TFB
VOCs	Destroyed onsite and collected on GAC, which was regenerated or disposed offsite	Collected on GAC and regenerated or disposed offsite
Maintenance material cost	$15,000/year at TFA; $9,000/year at TFB	$2,000 at TFA; $1,000 at TFB

To minimize the time the treatment facilities would be shut down when removing the UV/H_2O_2 units and replacing them with large capacity air strippers, DOE/LLNL plan to construct the new air strippers while the UV/H_2O_2 units are still operating. The facilities will then be shut down only to switch over piping and wiring.

Table 2 presents a schedule for implementing equipment changes at TFA. Equipment changes will occur at TFB as funding becomes available according to a schedule that will be presented to the regulatory agencies at that time. After the new air strippers are activated, the UV/H_2O_2 equipment will be decommissioned and decontaminated as discussed in the Compliance Monitoring Plan (Nichols et al., 1996), following the decontamination procedures in Standard Operating Procedure 4.5 (Dibley and Depue, 1996).

Table 2. TFA equipment replacement schedule.

Item	Start	End
Order and receive air stripper	10-15-96	1-31-97
Construction	2-18-97	4-11-97
Electrical connections	4-14-97	4-25-97
Activation	4-28-97	5-30-97

3.3. Summary

The benefits of the proposed remedy include the capability to remediate ground water at higher flow rates, thus accomplishing ground water cleanup faster; use of a proven technology that already exists at TFA, TFB, and all of the other LLNL treatment facilities, including Portable Treatment Units; reduction of the use of hazardous material (H_2O_2); significant cost reduction; and rapid return of investment on the capital equipment. The cost to replace the UV/H_2O_2 units at TFA and TFB with air strippers is estimated to be $190,000 and $60,000, respectively. The investment return on the capital equipment is estimated to be 1.2 years for TFA, and 0.9 years for TFB.

4. Support Agency Comments

The following responses address EPA comments dated December 10, 1996, and DTSC comments dated December 4, 1996, on the Draft ESD, as presented in separate letters to DOE. No comments were received from the RWQCB.

4.1. EPA Comments and DOE/LLNL Responses

Comment No. 1: *Page 1, paragraph 2, sentence 1. Either change the phrase "The lead agency..." to "The lead regulatory agency..." or change the "...U.S. Environmental Protection Agency..." to the "...U.S. Department of Energy...".*

This sentence now reads: "The lead regulatory agency...".

Comment No. 2: *Page 3, paragraph 2, sentence 4. We believe this sentence should reference levels of PCE instead of TCE. This would then be consistent with the preceding paragraph and the Third Quarter Self-Monitoring Report of November 27, 1996.*

The requested change has been made.

Comment No. 3: *Page 6. In the second line, the phrase "...the EPA believes..." should be changed to read "...EPA and DOE believe...". This is because both parties are signing this ESD.*

The requested change has been made.

4.2. DTSC Comments and DOE/LLNL Responses

Comment No. 1: *Our review of the draft explanation of significant differences (ESD) indicates that your proposed changes to the TFA and TFB treatment systems are not adequately supported. Specifically, the draft ESD does not detail why the reasons that UV/oxidation was originally chosen over air stripping in the ROD are no longer valid. On page Attachment A-57 of the ROD, your response to comment A8j states that UV/oxidation was chosen because it has the advantage of destroying most contaminants, converting them to harmless compounds. The draft ESD indicates that only reason for the treatment change is economics.*

As discussed during previous RPM meetings and during the August 1996 Community Work Group meeting, DTSC is in support of your proposal. However, before we can approve it, the ESD 1) must present the reasons why UV/oxidation was considered in the ROD; 2) indicate how present conditions have changed since the ROD was signed; and 3) detail why the economic issues now outweigh the contaminant destruction issues.

Section 3.1 of the ESD now includes a discussion of: (1) why UV/H_2O_2 was the preferred original remedy, (2) VOC reduction over time, and (3) the benefits of the proposed remedy.

Comment No. 2: *Table 1 must include the additional cost of the GAC regeneration due to the increased VOC loading. In addition, the GAC replacement rate, as detailed in Remedial Design Document #1, is to be recalculated and included in the standard operating procedures for the two treatment facilities.*

GAC replacement frequency and costs will not increase due to the proposed remedy. Time estimates for replacing the GAC (Boegel et al., 1993) were based on assumed initial concentrations. However, over the last six years, the GAC effluent has always been below BAAQMD's discharge limits and never necessitated GAC replacement. The GAC has been replaced about once a year as part of routine maintenance. The GAC will change from one 200 pound unit to two 1,500 pound units (3,000 pounds total) to accommodate the increased air flow rate. DOE/LLNL will continue to monitor the GAC effluent with an organic vapor analyzer according to the schedule and requirements established by BAAQMD. As soon as effluent concentrations begin to approach BAAQMD discharge limits, the GAC will be replaced.

This discussion is included in Section 3.2 of the ESD.

Comment No. 3: *The ESD should state that the UV/oxidation equipment will be decommissioned and decontaminated as per the Compliance Monitoring Plan and SOP #4.5.*

This is included in Section 3.2 of the ESD.

Comment No. 4: *It is not clear how the changeover from UV/oxidation to air stripping will take place. That is, there is a schedule for equipment replacement, but the ESD does not indicate what this equipment replacement entails nor whether the existing facility will be shut down during this replacement.*

As discussed at the Remedial Project Managers' meeting on December 10, 1996, to minimize treatment facility downtime, DOE/LLNL plan to construct the new air stripper while the UV/H_2O_2 units are still operating. The facilities will be shut down only to switch

over piping and wiring. DOE/LLNL anticipate that downtime may be up to two months for each facility.

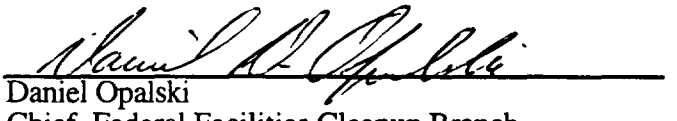
A discussion of this changeover is included in Section 3.2 of the ESD.

4.3. RWQCB Comments and DOE/LLNL Responses

None.

5. Affirmation of the Statutory Determinations

Considering the new information and the changes that will be made to the proposed remedy, the EPA and DOE believe that the remedy remains protective of human health and the environment, complies with Federal and State requirements identified in the ROD as applicable or relevant and appropriate to this remedial action, and is cost effective. In addition, the revised remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practical for this site.



4/16/97

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