Vers. 7.4B

U.S. Environmental Protection Agency
Region 10
Office of Environmental Cleanup
Five-Year Review
Idaho National Engineering and Environmental Laboratory
Subsurface Disposal Area
Organic Contamination of the Vadose Zone
Operable Unit 7-08

I. Introduction

EPA Region 10 conducted this review pursuant to the provisions of the Record of Decision (ROD) for the Subsurface Disposal Area (SDA) Organic Contamination of the Vadose Zone (OCVZ), Operable Unit (OU) 7-08 located at the Radioactive Waste Management Complex (RWMC) within the Idaho National Engineering and Environmental Laboratory (December 2, 1994). The purpose of this review is to comply with the review requirements identified in the 1994 ROD and to ensure that the remedial action remains protective of human health and the environment and is functioning as designed. This document will become a part of the site file.

Although the INEEL Site Wide Review included OCVZ, this is the first five-year review specifically performed for the OCVZ site. The triggering action for this review was the initiation of the remedial action on January 4, 1996. This review is required due to the fact that hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use and unrestricted exposure. In addition to the five year review required by CERCLA, the ROD also anticipated periodic review of the remedy's performance in the form of reviews every 2 years, i.e. at the end of each phase of the project. However, once the remedy was implemented it became apparent that the "phases" would last more than two years. Therefore, reports were generated on a two year basis that provided a review of the past years actions. The results of these reports provide much of the support and analysis for this review.

Appendix A is a list of documents that formed the basis for this review.

II Site Chronology

1950 Radioactive Waste Management Complex established
1952-1970 Transuranic (TRU) waste buried at the Subsurface Disposal Area (SDA). Associated with the TRU waste are large quantities of volatile organic compounds (VOCs).
1987-1992 Shallow gas survey identifies VOCs in subsurface.
1987 $_{CCl4}$ detected in the aquifer above MCL south of SDA (USGS Well 88)
July 14, 1989 INEEL listed on NPL
December 9, 1991 Federal Facility Agreement/Consent Order (FFA/CO) signed
July 1992-March 1993 Vapor port monitoring wells in RWMC identify the extent and concentration of contaminants in the subsurface
1993 RI/FS estimated approximately 88,400 gals of containerized waste, including 24,000 gals (325,000 lbs) of CCl_4 and 25,000 gals of TCE, TCA and Chloroform, are estimated to be buried in the SDA's Pits and Trenches.
December 2, 1994 Record of Decision (ROD) signed
December 1995 prefinal inspection of the Recuperative Flameless Thermal Oxidation (RFTO) units completed

January 4, 1996 Baseline subsurface vapor sampling completed
January 11-26, 1996 RFTO units A, B, and C started
September 11, 1998 First failure of Unit C. Unit is rebuilt
May 14, 2000, Final failure of Unit C.
Spring 2001 Inventory of VOCs revised. New estimate-2,420,000 lbs of VOCs, (1,800,000 lbs of CCl_4).
July 17-18, 2001, Prefinal inspection of Unit D, (catalytic oxidation unit). Replaces Unit C.
January 8, 2002, following a break in period Unit D begins continuous operations.

III. Site Location and Description

The INEEL is located 32 miles west of Idaho Falls, Idaho and occupies 890 square miles of the northeastern portion of the Eastern Snake River Plain. In 1950 the RWMC was established as a site for the disposal of solid low level radioactive waste generated by INEEL operations. In the southwest corner of the RWMC is the Subsurface Disposal Area (SDA). The SDA is a series of pits and trenches, designed to dispose of hazardous substances including organic waste such as CCl_4, and radioactive waste, such as transuranic waste (TRU waste). TRU waste was disposed in the SDA from 1952-1970.

OCVZ is defined as that part of the vadose zone beneath and within the RWMC where there are organic contaminants in the vapor state. As such, this site extends from the surface to the top of the Snake River Plain Aquifer, approximately 580 feet below ground surface. The presence of vapors in vadose zone is a result of the burial and breach of drums containing radionuclides and organic waste that was shipped to the SDA between 1966 and 1970 from the Rocky Flats processing plant in Colorado. This waste includes carbon tetrachloride (CCl_4), other chlorinated compounds such as TCE, and Texaco Regal Oil. It was originally estimated that 325,000 lbs. of CCl_4. were disposed of in the SDA. Based on new information from Rocky Flats, this estimate was revised to 1,800,000 lbs. of CCl_4 in the spring of 2001.

Although radionuclides are buried at the SDA, they are not very mobile in soil, especially when compared to the organic vapors. No radionuclides have been detected on the HEPA filters located on the inlet to the treatment units. This confirms that organics and not radionuclides are being extracted from the vadose zone by the vacuum system.

IV. Remedial Objectives

The NPL listing of the INEEL occurred on July 14, 1989. The ROD for OCVZ was signed on December 2, 1994. This ROD determined that extraction and destruction of organic vapors (CCl_4, et cetera), in the vadose zone beneath the SDA would reduce direct exposure to the contaminants. Also, this action would prevent migration of the contaminants to the groundwater in such concentrations that would result in future groundwater concentrations that exceed Federal and State MCLs. The MCLs for the various organic compounds are the PRGs for protection of this aquifer. This action ensures protection of human health and the environment. This decision was based on the results of the human health and ecological risk assessments.

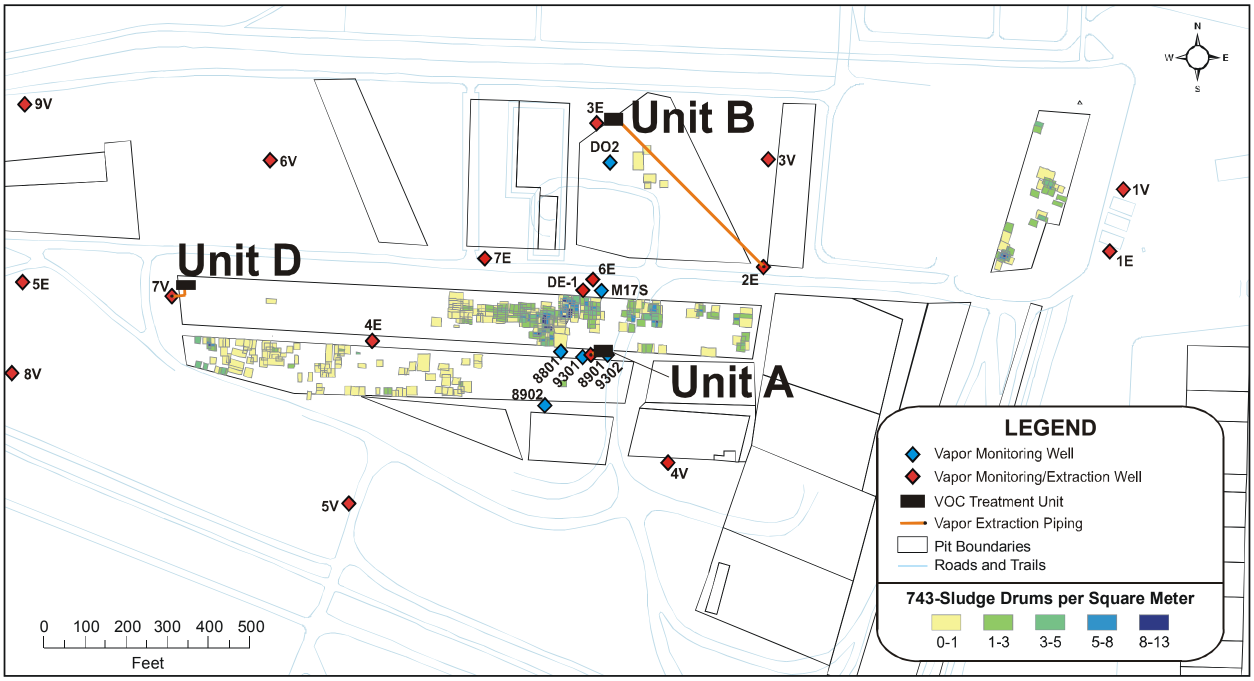

Figure 1. Vapor vacuum extraction with treatment system, extraction, and monitoring well locations.

To implement the selected remedy described in the OU 7-08 ROD, three recuperative flameless thermal oxidation units (RFTO) were installed within the SDA. Operation of the RFTO units began in 1996. Units A and B were designed to extract and treat vapors from two extraction wells each. Unit C was designed to extract and treat vapors from one extraction well. During the spring of 2001, Unit C was decommissioned and replaced by Unit D, an electrically heated catalytic oxidizer (cat ox) which was installed at the Unit C location. Currently, Unit A treats vapors from Extraction Well 8901D, Unit B treats vapors from Extraction Well 2E, and Unit D treats vapors from Extraction Well 7V. The current restrictions at the RWMC, such as signs, restricted access, and maintenance of fences/barriers were found to provide adequate institutional controls. It is assumed that these controls will remain in place through 2091.

Because the decision of the ROD resulted in hazardous substances remaining on site above health-based levels, the ROD also specified that a review of the remedy would be conducted by DOE, EPA, and IDEQ to ensure that human health and the environment are being protected and that the assumption on which the decision was based remain valid.

V. Post-ROD Activities

The remedial action is effective at reducing the volatile organic contaminant concentrations in the vadose zone. The areal extent of the contaminant plume has decreased since the beginning of remedial action operations (see Fig 3). The carbon tetrachloride concentration in the vapor plume has been reduced by an order of magnitude at most sampling locations within the Subsurface Disposal Area (SDA). The majority of the sampling locations are above the 240 ft. interbed. There are limited sampling locations below this interbed only one which, DE-1, is within the SDA. The concentrations found at this monitoring point are very low

(< 5ppmv). Given the “noise” in the data it not possible to discern if the slight changes in concentrations indicate influences from the treatment unit. Also, it is has not been determined if the concentrations below the 240 ft interbed represent a potential threat to the aquifer. However, five additional deep wells are being completed within the SDA which should help address the problem of limited data collection points.

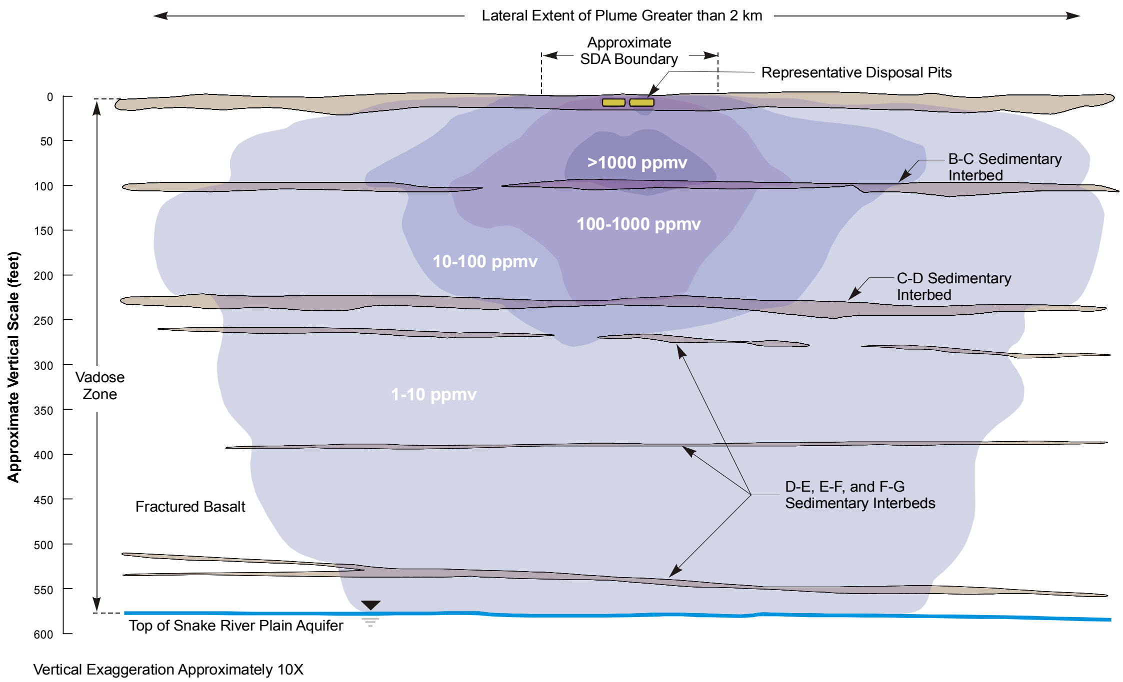

Figure 2. Conceptual drawing of a cross section of the SDA showing interbeds between basalt flows. Also a conceptual drawing of the volatile organic compound plume before remedial operations.

Note: Concentrations are based on carbon tetrachloride soil gas data

The remedial action at OCVZ consists of three treatment units drawing vapors from various extraction wells in the shallow portion of the vadose zone i.e. within 110 feet of the ground surface. The original design had the two treatment units (Units A and B) drawing from 2 wells each. Unit C was plumbed to just one extraction well. However, over time the wells have plugged and currently each unit is extracting from 1 well each. Also Unit C has been replaced by Unit D. Unit D has the ability to extract from 4 wells.

Since startup of the vapor vacuum extraction and treatment (VVET) system in January 1996, the VVET units have operated for a combined total of 85,732 hours out of the 129,503 available operating hours through December 31, 2002 (Housley, 2003 and McMurtrey 2003). As of June 12, 2003, 143,233 lbs. of VOCs and 89,047 lbs of CCl4 have been removed (Harvego, 2003). Phase One of the remedial action lasted two years from January 1996 to January 1998. During that period of time 18,500 lbs of CCl_4 was removed. The extraction of vapors from the vadose zone continued via the RFTO units during Phase Two. Operation of these units was increased to continuous versus the cycling of the units in Phase One. Also, another unit, using catalytic oxidation, was added as a replacement for Unit C in the summer of 2001.

Phase II remedial action operations have continued since January 1998, the end-date of the Phase I Remedial Action report. To date, Units A and B remain operational. Unit B went down for approximately 7 months (January through August) in 1999 as a result of failure of the oxidizer tubes and was again taken out of service for approximately 12 months (May 2000 to April 2001) for repair of high temperature damage to the oxidizer shell. Unit B was rebuilt, restarted, and has been operational since April 2001. Unit C went down on September 11, 1997, because of sustained high temperature operation and improper assembly of the unit by the manufacturer. Unit C was rebuilt, but subsequently failed again on December 17, 1998, because of excessive propane feed. Unit C failed a final time on May 31, 2000, because of a system design flaw leading to damage of the oxidizer feed tubes. Unit C was removed and replaced with Unit D. Unit D has been in full-scale operation since January 2002. Unit B was taken off line in February 2003. A cat ox replacement unit is scheduled to be on line by late summer of 2003. Unit A is also planned to be replaced by a cat ox unit in the 2003 calendar year.

This remedial action, as described in the ROD, is designed to add additional phases as needed. A new phase represents a major change to system. An example would be expanding the zone of extraction or adding additional treatment units. For cost estimation purposes, the ROD assumed there would be three phases with each phase having a duration of 2 years. In practice this has proven to not be the case, e.g. to date Phase Two has been operating for five years.

A monitoring plan was developed and approved in accordance with the provisions of the ROD for this site: (Organic Contamination in the Vadose Zone Remedial Design/Remedial Action Work Plan Operable Unit 7-08 Radioactive Waste Management Complex Subsurface Disposal Area, Organic Contamination in the Vadose Zone Phase II Remediation Strategy, INEEL/EXT-97-01229, Field Sampling Plan for Operations and Monitoring Sampling for OCVZ, Sept. 2000). The vadose zone monitoring program included the collection and analysis of the contaminants of concern through vapor ports, soil gas monitoring, and flux chamber monitoring. Samples are collected from 99 vapor ports within and in the immediate vicinity of the SDA boundary on a monthly basis. An additional 25 ports outside the SDA boundary are used to monitor the vapor concentrations at various locations ranging up to 9,100 ft from the VOC source area at quarterly intervals (Sondrup et al 2003). Modeling of subsurface transport of vapors was refined based on the results of this monitoring.

The effectiveness of the remedial action is based on predictions of the migration rate of VOCs to the groundwater using computer modeling which are presented in the OU 7-08 ROD. Post ROD investigation indicates that the amount of VOCs deposited in the trenches and pits is about 7 times greater than determined during the remedial investigation. The expected results are summarized in the OU 7-08 modeling report (Sondrup, 1998). The results of recalculating the model using actual data from monitoring the vadose zone indicates that the remedial action may be required for a longer period of time than the preliminary model predicted. The ROD, for costing purposes, estimated that this action would take six years. Based on the revised source term, the rate of failure of the drums containing the waste, the rate of release to the atmosphere, and the effectiveness of the system it is anticipated that the OCVZ system may have to operate for more than 30 years.

Another Operable Unit at RWMC, OU 7-13/14 is evaluating the possibility of addressing the waste buried in the Pits and Trenches. The implementation of this WAG's remedy will affect the need for the long term operation of this action. If WAG 7-13/14 can remove much of the source term in timely fashion, the time for completion of the OCVZ action will be reduced, since, with removal of the source term, the slow release of solvents to the vadose zone would be eliminated.

There is currently a need to replace some of the extraction wells and this effort should be completed in the FY 03. However, as long as the system continues to operate this will be an ongoing need. By monitoring pressures changes in the piping from the well to the treatment unit and monitoring the concentrations entering the treatment units, plugging of the wells can be detected. If such plugging is suspected, the wells can be viewed via video logging to see if the well screens are plugged or other obstructions are blocking the flow from the formation. Two wells (4E and 3E) are plugged and another well (7V) has limited ability to extract vapors. Video logs indicate that biofouling has plugged the well screens wells 4E and 3E. The 7V well appears to clogged with mud from extracting a packer from the well. It is expected that this problem with biofouling will continue in the future. It is hoped, that by drilling open holes, the biofouling problem will be addressed. Open holes eliminate the need for well screens and the potential for the mesh to be clogged by microbes. At the conclusion of this drilling program, Unit A will be able to extract from 8 wells, Unit B, from 9 wells and Unit D from 4 wells. The treatment units can extract from all the well simultaneously or rotation among the extraction wells can be done to allow wells with low concentrations to rebound.

Monitoring of the emissions from the stacks of the treatment units has been performed. This monitoring tracked emissions in the breathing zones of personnel operating the units and of workers located in the area but not directly associated with operation of the system. The results of the monitoring indicated that standards for worker protection were not exceeded. Also, the nearest site where members of the public may be, at the EBF-1 display at the boundary of the RWMC, was also monitored. This monitoring also indicated no impacts to human health. The following emissions were monitored; HCl, CCl_4, TCE, and chloroform.

VI. Sampling Results Summary

Monitoring results indicate that the amount of VOCs in the subsurface is decreasing, especially the amount of VOCs further from the source areas and above the 110' interbed (Figure 3). Thus, the VVET system appears to be effective at reducing VOC concentrations. More than 130,000 lbs of VOCs have been removed as of January 2003. Data indicate that the extraction wells may directly influence concentrations as far away as 1,000 ft, if not greater. Between 50 to 150 ft. below land surface, the concentrations at nearly every vapor port in the SDA have been reduced from levels measured before remedial operations. Below 150 ft, there are limited sampling points. Thus, it is difficult to determine the how much influence this system has at depth. However, while the extraction wells have a large horizontal influence, it appears the vertical influence is limited. Modeling is being planned to estimate what, if any, impact the concentration of vapors below 150' may have on the groundwater. The additional monitoring wells that are being installed will provide additional information that can be used to calibrate the modeling.

Continuous operation draws down concentrations while the unit is operating but, following shutdown, the concentrations in some wells rebounded to levels nearly as great as when operations began. This behavior occurs primarily in wells close to VOC source areas (e.g., Wells 8801, 8902, 9301, 2E, 7V). In wells removed from VOC source areas (e.g., Wells 6V, 8V, 9V, 10V, DO2) the concentration appears to be going down consistently with continued operations. With additional wells a more effective process for extracting vapors can be developed, such as pulsing individual wells while the Units continue to operate.

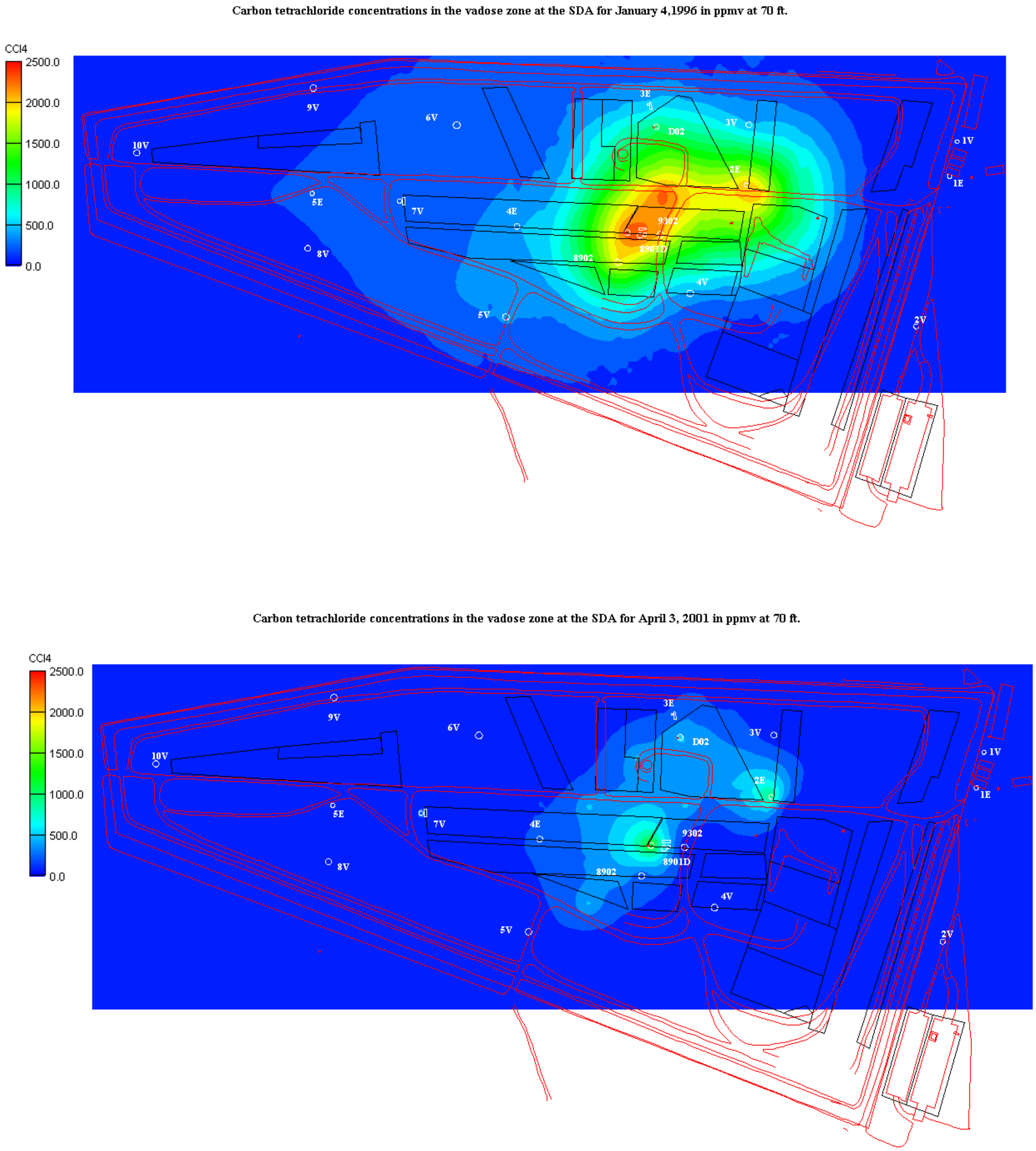

Figure 3. Comparison of carbon tetrachloride concentrations at the 21-m (70-ft) depth at the beginning of retrieval operations in 1996 and after 5 years of retrieval operations in 2001.

As noted earlier, the estimate of the source term for CCl_4 has increased seven fold since the ROD was signed. The original estimate in the ROD was based on the amount of lathe coolant received for processing each month at Rocky Flat Plant (based on a document by Kudera, 1987) and an assumption of the volumetric percent of carbon tet in the lathe coolant. Later information gathered in 1997, including interviews with Rocky Flats personnel and the newly discovered documents that provide quantitative information on the volumetric percentage of CCl_4 indicated that the amount of CCl_4 estimated to be buried in the SDA to be nearly 7X as great as estimated in 1987 by Kudera. This increase in inventory is consistent with modeling that was calibrated to field data.

It is unclear if enough VOCs are below the 240' interbed to present a threat of contamination to the groundwater. Early modeling indicated this. However, while current data below the 240' interbed is limited, it does not support the results predicted by the model. A more detailed modeling effort is being performed and should be completed by the summer of 2003. Regardless, given the increase in the source term and the possible migration of VOC below the 240' interbed, the remedial action needs to continue. To that end, DOE purchased an electrically powered thermal catalytic oxidation (cat ox) unit. It replaces the failed Unit C. Two additional cat ox units will replace Units A and B this fiscal year (FY 03). Also additional wells are being added. Two thirds of these wells are designed for extraction below the 110' interbed.

Table 1. Carbon tetrachloride inventory history.

Estimate Source	Estimate Mass (kg)	Description
Kudera 1987	1.5E+05	Used for the OCVZ RI/FS (Duncan, Troutman, and Sondrup 1993).
Historical Data Task (HDT) (LMITCO 1995)	1.13E+05	Reduced the Kudera estimate by 25% to account for possible evaporation of the volatile components during waste processing and storage. Kudera (1987) estimate listed as upper bound.
Interim Risk Assessment (IRA) (Becker et al. 1998)	2.26E+05	IRA modeling indicated the HDT inventory estimate was probably low. The inventory estimate was arbitrarily doubled (2x) to get the IRA fate and transport model to calibrate.
Miller and Navratil (1998)	4.9E+05 kg	Monthly rather than yearly shipping records were reviewed and inconsistencies in the records were identified. Assumptions were made to resolve inconsistencies with Kudera (1987).
Miller and Varvel (2001)	8.20E+05 kg	Used new sources of information that became available following inquiries made during the Miller and Navratil 1998 investigation.

Table 2. Final estimate of initial volatile organic compound inventory.

Constituent	Mass (kg)
Carbon tetrachloride	8.2E+05 (± 1.4E+05)
Total volatile organic compounds	1.1E+06 (± 2.0E+05)

Varvel (2001) estimated the amount of non-carbon tetrachloride VOCs in the 743-series waste by assuming the non-carbon tetrachloride fraction reported by Miller and Varvel (2001) was made up of equal volumes of tetrachloroethene, trichloroethene, and 1,1,1-trichloroethane. Based on this assumption, Varvel estimated the original inventory to be as shown in Table 3.

Table 3. Estimated non-carbon tetrachloride volatile organic compound inventory.

Constituent	Mass (kg)
Tetrachloroethene	9.8E+04
Trichloroethene	8.9E+04
1,1,1-Trichloroethane	8.1E+04

VII. Five Year Review Process

Document Review

This review consisted of reviewing relevant documents including the O&M records and the monitoring data (Attachment A). ARARs that must still be met include the MCLs and SDWA.

Community Involvement

DOE will distribute a notice to the public identifying that this review is complete and available to the public. The notice will also provide the location where the document can be reviewed.

Review of Monitoring Results for the Vadose Zone and the Aquifer

Based on monitoring results concentrations of contaminants are decreasing in the vast majority of the subsurface monitoring points and monitoring of the groundwater shows few results even slightly above the MCLs (Table 4).

No other information has come to light that to call into question the protectiveness of the remedy.

Technical Assessment

Question A Is the remedy functioning as intended in the decision document?

As noted earlier in the document, the remedy selected in the ROD continues to operate and is currently protective of the environment. Based on monitoring results concentrations of contaminants are decreasing in the vast majority of the subsurface monitoring points and monitoring of the groundwater indicates few results even slightly above the MCLs.

While there are concerns with the ability of the RFTO units, they continue to operate. This concern came to the forefront in the fourth quarter of 1997, when Unit C experienced a downtime of 94%. A root cause analysis was performed on Unit C and several concerns were noted. The fabrication and assembly of Unit C did not match the design specifications, resulting inadequate insulation of various components of the unit. This resulted in destruction of metal components within the unit which, in turn, resulted in failure of the unit.

In addition, further investigation revealed that propane controls were inadequate. Excess propane was being injected into the units. All three units were shut down and Units A and B were also inspected for heat related metal fatigue. The results of the inspection and the Root Cause Analysis Report resulted in more precise metering of the propane flow to the units, increased number of thermocouples in the units to more precisely monitor internal temperatures, reduction of the operating temperature, and the addition of insulation to the reaction chambers. Also, as noted earlier, Unit C was replaced with a catalytic oxidation unit which has operated consistently since July 2001. The remain two RFTO units are scheduled to be replaced in calendar year 2003.

Based on the good record of uptime of the current cat ox unit it is anticipated that the new units will require less maintenance and upkeep that the RFTO units. This should allow better cumulative up time for the treatment system.

Cost to date have been below projected costs in the ROD, (Table 4). These cost include projected cost of the new treatment units and the cost to install 10 additional wells.

Table 4. Actual Costs and ROD Estimate Costs

Cost for Phase 1		
	Actual Project	ROD (estimate)
Construction (including capital cost)	$2,200,000	$3,013,00
O&M (including monitoring costs)	$3,600,000	$9,842,000
Total	$5,800,000	$12,860,000
Total Cost Projected Through FY 03 (includes 3 replacement units & 15 new wells)		
	Actual Project	ROD (estimate)
Construction (including capital cost)	$ 6,125,000	$14,942,000
O&M (including monitoring costs)	$16,816,000	$35,467,000
Total	$22,931,000	$50,409,000

Monitoring of the site has occurred as required. The results are contained in the numerous Year End Reports generated by DOE's contractor. This monitoring of the aquifer, as required in the ROD, indicates few wells with concentrations of CCl_4 above the MCL of 5 ug/l and on well does CCl_4 exceed 8 ug/l. Also, the trend for all wells indicates decreasing concentrations of CCl_4. Institutional controls, such as controlled access and fencing, are in place and remain effective based on periodic inspections and monitoring of the site.

<u>Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?</u>

There have been no changes in the physical conditions of the site that would affect the protectiveness of the remedy. There have been no changes in the ARARs found in the decision document and no new standards or TBCs affecting the protectiveness of the remedy.

The exposure assumptions used to develop the Human Health Risk Assessment have not changed. There have been no changes in the toxicity factors for the contaminants of concern. These assumptions are considered to be conservative and reasonable in evaluating the risk and developing risk based cleanup levels. The remedy is progressing as expected with the exception of the increase in source term. Thus, it is uncertain when this action will be complete. The increase in source term coupled with the uncertainty regarding the amount of VOCs that have migrated to the surface and released to atmosphere and the degree of failure of the drums containing the waste from Rocky Flats contribute to this uncertainty. The degree of drum failure could be resolved by the excavation of one or more of the pits and trenches.

With the additional data that has been collected over the life of this project, the modeling to better define the clean up levels for contaminants in the vadose zone that will not adversely impact the aquifer will be rerun in 2003. The results of this modeling will result in determining target concentrations at various locations throughout the vadose zone so that attainment of remedial action objectives can be achieved. The ROD stated that remedial action objectives were to insure that the risks to future groundwater users are within acceptable guidelines and that future contaminant concentrations remain below Federal and State safe drinking water standards.

The exposure assumptions used to develop the human health risk assessment included both current use exposures (workers) and future use exposures (residential use) with and without institutional controls. An eco-risk assessment was not conducted since an analysis of the pathways indicated slight to nonexistent contact of COCs by plants and/or animals. A more quantitative ecological risk assessment will be performed in Comprehensive WAG 7 RI/FS. There have been no changes to warrant revising the risk assessment or indicate that the remedy is not protective.

<u>Question C. Has any other information come to light that could call into question the protectiveness of the remedy?</u>

The issue of the increase in source term, while not directly indicating that the remedy is not protective, does raise an issue regarding the time till remediation is complete. However, even with a 7 fold increase in the source term, monitoring indicates that the areal extent of contamination is decreasing.

VIII. Recommendations

ISSUES	AFFECTS PROTECTIVE NESS?	
	CURRENT?	FUTURE?
Limited or insufficient data below 240'	NO	YES
Too much down time and low reliability of treatment units	NO	YES
Failure to install additional wells	NO	YES

No additional work done to determine if the vadose zone vapor cleanup level is protective of the groundwater	NO	YES

Issue	Recommendations/ Follow-Up Actions	Party Responsible	Oversight Agency	Milestone Date	Affects Protectiveness? (Y/N) Current/Future
Increase in the source term	Refine modeling to determine impacts/remove VOC source	DOE	EPA/Idaho DEQ	Summer '03 for modeling	N N
Poor reliability of RFTO units	Replace units with Cat. Ox units	DOE	EPA/ Idaho DEQ	Summer '03	N Y
Lack of extraction wells for treatment units	Drill Additional Wells	DOE	EPA/Idaho DEQ	FY 03	N Y
Inadequate monitoring data below 240' interbed	Install deep wells for monitoring	DOE	EPA/ Idaho DEQ	FY 03	N Y
	Collect sufficient data to revise contaminant transport model			FY05	
Inadequate monitoring of exhaust gases	Revise O&M Plan to address this need	DOE	EPA/Idaho DEQ	FY 03	N Y

Probes have recently been installed in the waste zone that contains 743-series waste (Holdren et al. 2002). Once the system has stabilized data will be collected. Some of the probes are capable of taking a vapor sample from the waste zone and other probes can be logged with an instrument to yield the chlorine content in the waste. The chlorine content can be used to estimate the mass of VOCs remaining in the pit. The need and schedule for similar soil gas surveys in the future will be based on sampling of the vapor probes.

The current Operations and Maintenance Plan does not adequately address the need to monitor the stack the emission. These requirements will be included in the revised Operations and Maintenance Plan.

The fifteen new extraction wells must be installed and plumbed to the treatment units in 2003. Otherwise, the timeframe for extraction will increase dramatically. Five of the 15 new wells to be installed will have monitoring and extraction capability below the 240-ft interbed. Vapor monitoring data from these wells will be used to determine if extraction is necessary from the deep vadose zone. Results from a modeling study by Sondrup (1998) suggest that the current soil vapor extraction system may be incapable of preventing future groundwater contamination above current safe drinking water standards because of contamination in the deep vadose zone that is not being impacted by shallow extraction. However, vapor concentration data obtained from a single location in the deep vadose zone since that modeling was performed suggest that the amount of deep contamination may be less than assumed in the model. Additional data from other locations below the 240' interbed are needed for a comprehensive analysis.

IX. Statement on Protectiveness

The remedy is expected to be protective of human health and the environment when the VOCs in vadose zone are removed to a point where they will no longer migrate to the groundwater in such concentrations as to cause possible exceedences of the MCLs. It is expected that this will require more than 30 years, if the VOCs in the pits and trenches are not addressed by WAG 7-13/14. In the interim, exposure pathways that could result in unacceptable risks are being controlled and institutional controls are preventing exposure to, or ingestion of, contaminated groundwater. Contaminated groundwater has not migrated beyond the boundaries of the INEEL. Alternative drinking water sources are available if drinking water supply wells are impacted by the VOCs prior to completion of the clean up.

Long term effectiveness of the remedy will be verified by monitoring the vapor concentrations of VOCs in the vadose zone and monitoring groundwater both within and outside the boundary of the SDA. Current data indicates that the lateral extent of the vapor is decreasing. Also, while groundwater data indicates that while there are occasional exceedences of the MCLs, there is no trend to indicate an increase in VOC concentrations in the groundwater. Monitoring will continue for the foreseeable future and will detect any treads.

X. Next Review.

Monitoring will continue as stated in Appendix B. Annual data reports documenting the removal action will continue. The next review (scheduled to occur in 2008) will be within 5 years from the conclusion of this review. After that time, future reviews will be performed consistent with the OU 7-13/14 ROD. In the event that the planned OU 7-13/14 ROD schedule is not met, the follow up review for OU 7-08 will be performed no later than five years from the date of the 2008 review.

8/18/03
Date

/S/
Michael F. Gearheard, Director
Office of Environmental Cleanup

Appendix A

Basis for Review Documents

Harvego, Lisa, Status Report for the Week Ending 06/12/2003, June 2003.

Housley, L. Todd, Environmental and Operational Year-End Data Report for the OU-7-08 Organic Contamination in the Vadose Zone Project-2002, March 2003

INEEL, Record of Decision for Operable Unit 7-08, Radioactive Waste Management Complex, Subsurface Disposal Area, November 1994

INEEL, OU 7-08 Organic Contamination in the Vadose Zone Phase II Remediation Strategy, December 1997.

INEEL, Organic Contamination in the Vadose Zone Environmental and Operational Data Report Mid-Year Operating/Shutdown Cycle, 1999, July 1999

INEEL, Interim Phase II Remedial Action Report for Organic Contamination in the Vadose Zone Unit 7-08, November 1999

INEEL, Mass Estimates of Organic Compounds Buried in the Subsurface Disposal Area for Operable Units 7-08 and 7-13/14, Engineering Design File, May 31, 2000

INEEL, Organic Contamination in the Vadose Zone Remedial Design/Remedial Action Work Plan, Operable Unit 7-08, Radioactive Waste Management Complex Subsurface Disposal Area, Organic Contamination in the Vadose Zone Phase II Remediation Strategy, Field Sampling Plan for Operations and Monitoring Sampling for OCVZ, Sept. 2000

McMurtrey, Ryan, Organic Contamination in the Vadose Zone Environmental and Operational Year-End Data Report, 2000, January 2001

McMurtrey, Ryan, 2001, Organic Contamination in the Vadose Zone Environmental and Operational Year-End Data Report, 2000.

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