FINAL
CERCLA FIVE-YEAR REVIEW REPORT ADDENDUM OPERABLE UNITS 1A, 1B SOUTH, AND 4B LOW CONCENTRATION SITES (INSTALLATION RESTORATION PROGRAM SITES 13S, 3, 11, 13W, AND MMS-04)

FORMER MARINE CORPS AIR STATION TUSTIN, CALIFORNIA

March 2013

Prepared for:
Base Realignment and Closure
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Final CERCLA Five-Year Review Report Addendum

For

Operable Units 1A, 1B South, and 4B Low Concentration Sites

(Installation Restoration Program Sites 13S, 3, 11, 13W, and MMS-04)

Former Marine Corps Air Station Tustin

Orange County, California

March 2013

PREPARED FOR:

Base Realignment and Closure

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San Diego, California

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Date: MARCH 29, 2013

Executive Summary

This Addendum to the Final Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Review Report for Former Marine Corps Air Station (MCAS) Tustin (Figure 1-1) completed in October 2011 (United States Department of the Navy [DoN] 2011a) presents re-evaluations of estimated vapor intrusion (VI) risks at Operable Units (OU) 1A and 1B South (Installation Restoration Program [IRP] Sites 13S and 3, respectively) to account for updated toxicity criteria for trichloroethene (TCE), published in the United States Environmental Protection Agency's (U.S. EPA's) Integrated Risk Information System (IRIS) on September 28, 2011. Time did not allow for a rigorous evaluation of the updated criteria in the Final CERCLA Five-Year Review Report (DoN 2011a) given the statutory requirement to finalize the Report prior to October 31, 2011. This Addendum also presents protectiveness determinations for three OU-4B Sites, termed "Low Concentration" Sites (IRP-11, -13W, and Miscellaneous Major Spill [MMS]-04). These OU-4B Sites were acknowledged in the Final CERCLA Five-Year Review Report (DoN 2011a), but protectiveness determinations were not completed.

The selected remedy for the three Low Concentration OU-4B Sites is institutional controls (ICs). The remedy for MMS-04 was completed in 2011. The agency-concurred Final Remedial Action Completion Report (RACR) (AIS-TN&A JV 2011a) documented that the terms of the Final Record of Decision/Remedial Action Plan (ROD/RAP) were met for MMS-04; and the remedial action objectives (RAOs) and remediation goal (RG) have been achieved for groundwater. The Final RACR also documented that soil at MMS-04 requires no further action (NFA); therefore, the Site was protective of human health and the environment.

This Addendum was prepared by DoN in accordance with the U.S. EPA guidance and DoN policy for conducting Five-Year Reviews pursuant to Section 121(C) of CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) at 40 Code of Federal Regulations (CFR) § 300.430(f)(4)(ii) (DoN 2011b and U.S. EPA 2001).

ES 1 OU-1A and OU-1B South

ES 1.1 Technical Assessment

The updated technical assessment summary for OU-1A and OU-1B South is as follows:

Technical Assessment Summary

Question	Answer	Comments
A: Is the remedy functioning as intended by the decision documents?	**Affirmative**	The hydraulic containment remedies for OU-1A and OU-1B South are functioning as intended by their respective ROD/RAPs. Additional details can be found in the Final CERCLA Five-Year Review Report (DoN 2011a).
B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?	**Negative**	Toxicity criteria for TCE was recently updated and published in U.S. EPA's IRIS on September 28, 2011. The exposure assumptions, cleanup levels and RAOs used at the time of the remedy still remain valid. Additional details can be found in the Final CERCLA Five-Year Review Report

		(DoN 2011a).
C: Has any other information come to light that could call into question the protectiveness of the remedy?	**Negative**	No additional information has come to light that effects the protectiveness of the remedies. Additional details can be found in the Final CERCLA Five-Year Review Report (DoN 2011a).

ES 1.2 Re-Evaluation of VI Risk

In re-evaluating the protectiveness of the remedies under residential and industrial exposure scenarios, the VI risks were evaluated on a point-by-point basis using results for volatile organic compounds (VOCs) in groundwater samples from individual monitoring wells. Consistent with the Final CERCLA Five-Year Review Report (DoN 2011a), risk assessments were conducted using a dual-tracking approach in which each data point was evaluated using both U.S. EPA and California Environmental Protection Agency (Cal/EPA) methodologies and toxicity criteria. Estimates of incremental cancer risks and non-cancer hazard quotients (HQs) using the Fourth Quarter 2011 groundwater monitoring data were used to estimate cumulative risk and Hazard Index (HI) at each monitoring well. The results are summarized in the tables below:

Summary of Estimated Incremental Cancer Risk and Estimated Hazard Index
Residential Scenario

Operable Unit	**U.S. EPA Cancer Risk Range**	**Cal/EPA Cancer Risk Range**	**Hazard Index Range**
OU-1A	7×10^{-9} to 3×10^{-6}	7×10^{-7} to 7×10^{-5}	0.001 to 1
OU-1B South	1×10^{-8} to 4×10^{-5}	1×10^{-7} to 4×10^{-5}	0.002 to 11

Summary of Estimated Incremental Cancer Risk and Estimated Hazard Index
Industrial Scenario

Operable Unit	**U.S. EPA Cancer Risk Range**	**Cal/EPA Cancer Risk Range**	**Hazard Index Range**
OU-1A	2×10^{-10} to 5×10^{-8}	4×10^{-9} to 4×10^{-7}	0.0002 to 0.03
OU-1B South	3×10^{-10} to 7×10^{-7}	3×10^{-10} to 7×10^{-7}	0.0003 to 0.2

Under a residential exposure scenario, estimated maximum cancer risks for OU-1A and OU-1B South are within the NCP risk management range (10^{-6} to 10^{-4}). The maximum non-cancer HI for OU-1B South exceeds the acceptable threshold of 1. Under an industrial exposure scenario, estimated maximum cancer risks for OU-1A and OU-1B South are below the point of departure (10^{-6}). The maximum non-cancer HI for OU-1B South is below the acceptable threshold of 1. Baseline human-health risk assessments (HHRAs) conducted for residential and industrial scenarios at the Feasibility Study (FS) Report stage also produced estimated risks that were within the NCP risk management range. These

residential and industrial land-use scenarios were determined to be protective for the VI pathway as documented in respective regulatory agency-concurred final ROD/RAPs for these Sites.

In reviewing recent VI risk management decisions, regulatory agencies have indicated a preference for multiple lines of evidence to ensure the protectiveness of the remedies. Multiple lines of evidence may include using site-specific measurements for VI model input parameters verses default parameters such as: groundwater data, soil gas data, indoor air quality data, and/or other site-specific parameters that may be substituted for model default parameters (California Department of Toxic Substances Control [DTSC 2011]).

ES 1.3 Issues and Recommendations

In March 2012, the United States Department of Defense (DoD) issued the following policy to all DoD components (Defense Environmental Restoration Program [DERP] Manual [DoD 2012]):

- The DoN shall provide notice of potential VI risks to non-DoD property owners in writing, and as appropriate, include such notices in decision documents and transfer documents (DoD 2012 Enclosure 3 §6c(4)(a) p48).
- The transferee should address the potential for VI in future structures at its own expense by adding appropriate mitigating measures during construction or by demonstrating that there is no unacceptable risk under applicable law. Decision documents and transfer documents shall reflect such obligations, as appropriate (DoD 2012 Enclosure 3 §6c(4)(b) p48).

The following two recommendations are provided based on previous agency comments on the Final CERCLA Five-Year Review Report (DoN 2011a) and on the Draft Five-Year Review Report Addendum (DoN 2012), on regulatory agency preference for multiple lines of evidence, and in consideration of DoD policy:

- For OU-1A and OU-1B South, provide notice of potential VI risk consistent with the DERP Manual (DoD 2012).
- For OU-1A and OU-1B South, prepare Explanations of Significant Differences (ESDs) to document ICs for potential VI risk for residential and sensitive use scenarios. Sensitive use scenarios, as defined by DTSC, include schools [K-12], day care facilities, hospitals, and college housing. A Land Use Control (LUC) Remedial Design (RD) Amendment will also be prepared to address and describe IC implementation and associated maintenance actions including reporting requirements. Both the ESDs and the LUC RD Amendment will be submitted to the regulatory agencies for review and concurrence. The Areas Requiring Institutional Controls (ARICs) for potential VI risk for Carve-Out (CO) Areas 5 and 6 will be determined in consultation with the Federal Facility Site Remediation Agreement (FFSRA) signatories and documented in the ESDs.

These ICs will be documented in an ESD and implemented in coordination with the regulatory agencies.

ES 1.4 Protectiveness Statements

The remedies for OU-1A and OU-1B South are determined to be protective under current site conditions based on technical information available at the time of the Final CERCLA

Five-Year Review Report, the revised technical evaluation presented in this Addendum, and consistent with DTSC's technical evaluation presented in their January 10, 2012 letter (DTSC 2012). The long-term protectiveness of the remedies at OU-1A and OU-1B South will be addressed by establishing additional ICs for potential VI risk.

ES 2 OU-4B Low Concentration Sites

ES 2.1 Purpose

This Section summarizes the five-year review process completed subsequent to the Final CERCLA Five-Year Review Report for OU-4B Sites IRP-11, -13W, and MMS-04; including technical assessments, any identified issues, recommendations, and protectiveness determinations. Protectiveness determinations for these three OU-4B Sites were acknowledged but not completed in the Final CERCLA Five-Year Review Report (DoN 2011a).

ES 2.2 Five-Year Review Process

The five-year review process for IRP-11, -13W, and MMS-04 consisted of the following:

- Administrative components;
- Community notifications and involvement;
- Document reviews;
- Data reviews;
- Site Inspections;
- Interviews; and
- Protectiveness determinations.

ES 2.3 Technical Assessments

Technical assessment summaries for IRP-11, -13W, and MMS-04 are as follows:

Technical Assessment Summary

Question	Answer	Comments
A: Is the remedy functioning as intended by the decision documents?	**Affirmative**	The remedies for IRP-11 and -13W are functioning as intended by the ROD/RAP. The remedy for MMS-04 was completed in 2011 as documented in the agency concurred Final RACR. Additional details can be found in this Addendum.
B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?	**Negative**	Toxicity criteria for TCE was recently updated and published in U.S. EPA's IRIS on September 28, 2011. The exposure assumptions, cleanup levels and RAOs used at the time of the remedy decision still remain valid.

C: Has any other information come to light that could call into question the protectiveness of the remedy?	**Negative**	No additional information has come to light that effects the protectiveness of the remedies. Additional details can be found in this Addendum.

The toxicity criteria for TCE have changed since the RAOs were established; therefore the answer to Question B is negative. An evaluation of the change in TCE criteria is included in this Addendum.

Based on the monitoring data and documents reviewed, the site inspection, and interviews, the remedy for IRP-11 and -13W is functioning as intended by the ROD/RAP (DoN 2010). The remedy for MMS-04 was completed in 2011 as documented in the agency concurred Final RACR (AIS-TN&A JV 2011a). Groundwater monitoring data indicate that TCE groundwater concentrations are low and relatively stable. Site inspections and interviews revealed no evidence of any activities at the Site that are inconsistent with the land-use restrictions established in the Finding of Suitability for Early Transfer (FOSET) (DoN 2007) and in the Draft LUC RD (AIS-TN&A JV 2011b). The evaluation of the applicable or relevant and appropriate requirements (ARARs) which were documented in the ROD/RAP indicated that there were no significant changes to the standards/requirements identified as ARARs that could negatively affect the protectiveness of the remedy at the Sites. Additionally, no newly promulgated standards were identified that could negatively affect the protectiveness of the remedy.

The remedy for IRP-11, -13W, and MMS-04 was designed to prevent contact with TCE impacted groundwater through ICs. The ICs do not specifically address the VI pathway, and updated toxicity criteria for TCE were published in September 2011; therefore, this review included an evaluation of VI risk employing the updated TCE toxicity criteria. Using the maximum TCE groundwater concentration reported in the Fourth Quarter 2011 groundwater monitoring event, the estimated maximum VI cancer risk and non-cancer HI are below regulatory levels of concern. There is no other information that calls into question the protectiveness of the remedy.

ES 2.4 Issues and Recommendations

No issues have been identified for IRP-11 and -13W that currently or in the future would prevent the respective remedies at these Sites from being protective of human health and the environment.

Since MMS-04 has received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a), no subsequent five-year reviews are required for MMS-04.

ES 2.5 Protectiveness Statement

Based on these findings, the remedies at IRP-11 and -13W are being implemented in accordance with the ROD/RAP (DoN 2010) and are protective of human health and the environment. The remedy for MMS-04 was completed in 2011 as documented in the agency concurred Final RACR.

In accordance with the U.S. EPA guidance, DoN policy, and Final CERCLA Five Year Review Report; future five-year reviews are not required for MMS-04.

SUMMARY FORM

CERCLA FIVE-YEAR REVIEW REPORT ADDENDUM

FORMER MARINE CORPS AIR STATION TUSTIN, CALIFORNIA

SITE IDENTIFICATION		
Site name *(from Waste LAN)*: Former Tustin Marine Corps Air Station		
U.S. EPA ID *(from Waste LAN)*: CA9170090022		
Site areas addressed in this CERCLA Five-Year Review Report Addendum: IRP-13S (OU-1A), IRP-3 (OU-1B South), IRP-11, IRP-13W, and MMS-04 (OU-4B Low Concentration Sites)		
Region: 9	**State:** CA	**City/County:** Tustin/Orange
SITE STATUS		
NPL status: ☐Final ☐ Deleted ☒Other (specify) Former MCAS Tustin is not an National Priority List (NPL) site		
Remediation status (choose all that apply): ☐ Under Construction ☒ Operating ☐ Complete		
Multiple OUs? ☒ YES ☐ NO	**Construction completion date:** N/A	
Has site been put into reuse? ☒ YES ☐NO *(a portion of IRP-13S and -13W has been transferred; balance of areas remain under DoN control and/or Lease-in-Furtherance-of-Conveyance [LIFOC])*		
REVIEW STATUS		
Lead agency: ☐ U.S. EPA ☐ State ☐ Tribe ☒ Other Federal Agency _DoN		
Author name: DoN Base Realignment and Closure (BRAC) Program Management Office (PMO) West		
Author title:	**Author affiliation:**	
Review period: N/A (Addendum)		
Date(s) of inspection:		
Type of review: ☒ Post-SARA ☐ Pre-SARA ☐ NPL-Removal only ☒ Non-NPL Remedial Action Site ☐ NPL State/Tribe-lead ☐ Regional Discretion		
Review number: ☐ 1 (first) ☐2 (second) ☐ 3 (third) ☒ Other (specify)__1st for OU-4B Sites, Addendum to 2nd Review for OU-1A and -1B South		
REVIEW STATUS - CONTINUED		
Triggering action (for the entire Former MCAS Tustin): ☐ Actual Remedial Action Onsite Construction at OU #____ ☐ Construction Completion ☒ ROD/RAP for IRP-1 (remedy in progress as of ROD/RAP date) ☒ Previous Five-Year Review Report ☐ Other		
Triggering action date *(for the entire Former MCAS Tustin)*: December 20, 2001 (date of ROD/RAP – IRP-1 remedy already in progress); October 31, 2006 (signature date of first five-year review for IRP-1)		
Due date *(five years after triggering action date)*: October 31, 2011 (five years from signature date of first five-year review for IRP-1). Addendum is due one year after the CERCLA Five-Year Review Report or October 31, 2012		

SUMMARY FORM

CERCLA FIVE-YEAR REVIEW REPORT ADDENDUM

FORMER MARINE CORPS AIR STATION TUSTIN, CALIFORNIA

Issues and Recommendations:

IRP-13S and IRP-3 (OU-1A and OU-1B South)

In March 2012, the United States Department of Defense (DoD) issued the following policy to all DoD components DERP Manual (DoD 2012):

- The DoN shall provide notice of potential VI risks to non-DoD property owners in writing, and as appropriate, include such notices in decision documents and transfer documents (DoD 2012 Enclosure 3 §6c(4)(a) p48).

- The transferee should address the potential for VI in future structures at its own expense by adding appropriate mitigating measures during construction or by demonstrating that there is no unacceptable risk under applicable law. Decision documents and transfer documents shall reflect such obligations, as appropriate (DoD 2012 Enclosure 3 §6c(4)(b) p48).

The following two recommendations are provided based on previous agency comments on the Final CERCLA Five-Year Review Report (DoN 2011a) and on the Draft Five-Year Review Report Addendum (DoN 2012), on regulatory agency preference for multiple lines of evidence, and in consideration of DoD policy:

- For OU-1A and OU-1B South, provide notice of potential VI risk consistent with the DERP Manual (DoD 2012).
- For OU-1A and OU-1B South, prepare ESDs to document ICs for potential VI risk for residential and sensitive use scenarios. Sensitive use scenarios, as defined by DTSC, include schools [K-12], day care facilities, hospitals, and college housing. A LUC RD Amendment will also be prepared to address and describe IC implementation and associated maintenance actions including reporting requirements. Both the ESDs and the LUC RD Amendment will be submitted to the regulatory agencies for review and concurrence. The ARICs for potential VI risk for CO Areas 5 and 6 will be determined in consultation with the FFSRA signatories and documented in the ESDs.

These ICs will be documented in an ESD and implemented in coordination with the regulatory agencies.

IRP-11, -13W, and MMS-04 (OU-4B Low Concentration Sites)

No issues have been identified for IRP-11and -13W that currently or in future would prevent the respective remedies at these Sites from being protective of human health and the environment.

Since MMS-04 has received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a), no subsequent five-year reviews are required for this Site.

Protectiveness Statements:

IRP-13S and IRP-3 (OU-1A and OU-1B South)

The remedies for OU-1A and OU-1B South are determined to be protective under current site conditions based on technical information available at the time of the Final CERCLA Five-Year Review Report, the revised technical evaluation presented in this Addendum, and consistent with DTSC's technical evaluation presented in their January 10, 2012 letter (DTSC 2012). The long-term protectiveness of the remedies at OU-1A and OU-1B South will be addressed by establishing additional ICs for potential VI risk.

IRP-11, -13W, and MMS-04 (OU-4B Low Concentration Sites)

Based on these findings, the remedies at IRP-11 and -13W are being implemented in accordance with the ROD/RAP (DoN 2010) and are protective of human health and the environment. The remedy for MMS-04 was completed in 2011 as documented in the agency concurred Final RACR.

In accordance with the U.S. EPA guidance, DoN policy, and Final CERCLA Five Year Review Report; future five-year reviews are not required for MMS-04.

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FIGURES

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
ARIC	area requiring institutional controls
BCT	BRAC Cleanup Team
BEC	BRAC Environmental Coordinator
BEI	Bechtel Environmental, Inc.
BNI	Bechtel National, Inc.
BRAC	Base Realignment and Closure
ºC	degrees Celsius
Cal/EPA	California Environmental Protection Agency
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CEG	Certified Engineering Geologist
CFR	Code of Federal Regulations
CHG	Certified Hydrogeologist
cm	centimeter
CO	carve-out
COC	chemical of concern
COPC	chemical of potential concern
CRUP	covenant to restrict use of property
CSM	conceptual site model
DERP	Defense Environmental Restoration Program
DoD	United States Department of Defense
DoN	United States Department of the Navy
DSS	disposal, sanitary sewer
DTSC	California Department of Toxic Substances Control
ECS	Enviro Compliance Solutions, Inc.
ESDs	Explanation of Significant Differences
ESI	expanded site inspection
FEAD	Facility Engineering and Acquisition Division
FFSRA	Federal Facility Site Remediation Agreement
FOSET	Finding of Suitability for Early Transfer
FS	feasibility study
ft	feet
HHRA	human-health risk assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
i.e.	that is

IRIS	Integrated Risk Information System
IRP	Installation Restoration Program
J&E	Johnson and Ettinger (vapor intrusion model)
LIFOC	Lease-in-Furtherance-of-Conveyance
LTM	long-term monitoring
LUC RD	land-use control remedial design
MAE	miscellaneous, air emissions
MCAS	Marine Corps Air Station
MCL	maximum contaminant level in drinking water
MDA	miscellaneous, potential disposal area
µg/L	micrograms per liter
MOA	Memorandum of Agreement
MPA	Mingled Plumes Area
MMS	miscellaneous, major spill
NAVFAC	Naval Facilities Engineering Command
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	National Priorities List
NTCRA	non-time critical removal action
O&M	operation and maintenance
OPS	operating properly and successfully
OU	operable unit
OSWER	Office of Solid Waste and Emergency Response
PAH	polycyclic aromatic hydrocarbon, also polynuclear aromatic hydrocarbon
PE	licensed professional engineer
PG	registered professional geologist
PMO	Program Management Office
RAB	Restoration Advisory Board
RACR	remedial action completion report
RAO	remedial action objective
RAP	remedial action plan
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFA	RCRA facility assessment
RG	remediation goal
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
RME	reasonable maximum exposure
ROD/RAP	record of decision/remedial action plan
RPM	Remedial Project Manager
RWQCB	California Regional Water Quality Control Board, Santa Ana Region

SARA	Superfund Amendments and Reauthorization Act
§	section
SP/RP	Specific Plan/Reuse Plan
ST	storage, temporary
TCE	trichloroethene
TCP	trichloropropane
TOW	treatment, oil/water separator
TPH	total petroleum hydrocarbons
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride
VI	vapor intrusion
VOC	volatile organic compound
WBZ	water-bearing zone

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1. Introduction

This Addendum to the Final Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Review Report for Former Marine Corps Air Station (MCAS) Tustin (Figure 1-1) completed in October 2011 (United States Department of the Navy [DoN] 2011a) presents re-evaluations of estimated vapor intrusion (VI) risks at Operable Units (OU) 1A and 1B South (Installation Restoration Program [IRP] Sites 13S and 3, respectively) to account for updated toxicity criteria for trichloroethene (TCE), published in the United States Environmental Protection Agency's (U.S. EPA's) Integrated Risk Information System (IRIS) on September 28, 2011. Time did not allow for a rigorous evaluation of the updated criteria in the Final CERCLA Five-Year Review Report (DoN 2011a) given the statutory requirement to finalize the Report prior to October 31, 2011. This Addendum also presents protectiveness determinations for three OU-4B Sites, termed "Low Concentration" Sites (IRP-11, -13W, and Miscellaneous Major Spill [MMS]-04) as shown in Figures 1-2 and 1-3. These OU-4B Sites were acknowledged in the Final CERCLA Five-Year Review Report (DoN 2011a), but protectiveness determinations were not completed.

The selected remedy for the three Low Concentration OU-4B Sites is institutional controls (ICs). The remedy for MMS-04 was completed in 2011. The agency-concurred Final Remedial Action Completion Report (RACR) (AIS-TN&A JV 2011a) documented that the terms of the Final Record of Decision/Remedial Action Plan (ROD/RAP) were met for MMS-04; and the remedial action objectives (RAOs) and remediation goal (RG) have been achieved for groundwater. The Final RACR also documented that soil at MMS-04 requires no further action (NFA); therefore, the Site was protective of human health and the environment.

This CERCLA Five-Year Review Report Addendum was prepared by DoN Naval Facilities Engineering Command (NAVFAC) Southwest Division. The DoN is the lead agency for implementing cleanup at Former MCAS Tustin pursuant to CERCLA and the United States Department of Defense (DoD) Environmental Restoration Program (DERP). DERP policies and procedures were recently revised and updated in March 2012 and are set forth in the DERP Manual (DoD 2012).

Section 2 of this Addendum presents the re-evaluation of VI risk for OU-1A and -1B South given the updated TCE toxicity criteria. Section 3 presents a revised technical assessment based on the risk re-evaluation, and Section 4 presents revised protectiveness determinations for OU-1A and OU-1B South. Section 5 presents the review of the OU-4B Low Concentration Sites. Section 6 presents references cited.

Attachments 1 and 2 present details of the VI evaluation methodology and results. Attachment 3 presents OU-4B site inspection checklists, Attachment 4 presents OU-4B site inspection photographs, Attachment 5 presents OU-4B interview documentation, and Attachment 6 presents the responses to comments.

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2. Additional Evaluation of Vapor Intrusion Risk for OU-1A and -1B South

Toxicity criteria for TCE were updated and published in IRIS on September 28, 2011. Since the estimated VI risk calculations for the Final CERCLA Five-Year Review Report (DoN 2011a) had already been completed using the previous criteria, and the Report was in the final stages of preparation, time did not permit evaluation of the effects of the updated criteria within that report. Therefore, the Base Realignment and Closure (BRAC) Cleanup Team (BCT) concurred that an Addendum would be prepared addressing the updated criteria. It was further concurred that the re-evaluation would address only OU-1A and -1B South (IRP-13S and -3) since those were the only Sites with monitoring wells at which incremental cancer risk was within the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) "generally acceptable range" (10^{-4} to 10^{-6}) under the previous criteria, i.e., no monitoring wells at OU-1B North exceeded an incremental cancer risk of 10^{-6}.

2.1 METHODOLOGY

The methodology followed for this Addendum conforms to DoN policy and U.S. EPA guidance for conducting five-year reviews under CERCLA since it is an extension of the five-year review process enumerated in the Final CERCLA Five-Year Review Report (DoN 2011a). The results of this re-evaluation of VI risk are employed in an updated Technical Assessment presented in Section 3, and an updated Protectiveness Determination for OU-1A and OU-1B South presented in Section 4.

The VI risk at OU-1A and OU-1B South was re-evaluated using the updated TCE toxicity criteria for both the residential use scenario, and an industrial use scenario based on the baseline risk assessment industrial parameters previously reported in the OU-1B Feasibility Study (FS) Report (Bechtel National, Inc. [BNI] 2002).

2.1.1 Residential Use Scenario

The VI risk at OU-1A and OU-1B South for the residential use scenario was estimated utilizing the California Department of Toxic Substances Control (DTSC) version of the Johnson and Ettinger VI model (J&E 1991). The version of the model downloaded from the DTSC website in February 2012, had been updated by DTSC as of December 2, 2011, and included the updated U.S. EPA TCE criteria published in IRIS.

The evaluation utilized groundwater monitoring well data from three recent monitoring events in order to evaluate the time-dependent nature of VI risk, if any. The selected events were: Third Quarter 2011 (Enviro Compliance Solutions, Inc. [ECS] 2012b), Fourth Quarter 2011 (ECS 2012b), and First Quarter 2012.(ECS 2012a) This approach also enabled evaluation of groundwater contaminant concentrations in wells that are not sampled every quarter. Since the Fourth Quarter data set is the most complete of the three, the Protectiveness Determination presented in Section 4 is based on evaluation of the Fourth Quarter 2011 data set.

As was the case in the Final CERCLA Five-Year Review Report (DoN 2011a), the re-evaluation used a dual tracking approach in which each data point was evaluated using U.S. EPA methodology and toxicity criteria, then separately using DTSC methodology and toxicity criteria. This distinction is important because the U.S. EPA does not recommend route-to-route extrapolation, whereas the California Environmental Protection Agency (Cal/EPA) does utilize route-to-route extrapolation for 1,2,3-trichloropropane (TCP). In the

case of VI risk from 1,2,3-TCP at OU-1A; this difference leads to different VI risk results and the dual tracking approach allows the differences to be evaluated.

The site-specific input parameters utilized in the evaluation are summarized below:

Factor	Assumption	Remarks
Depth to groundwater	OU-1A: 243.84 centimeter (cm) OU-1B South: 152.4 cm	Assumed constant
Soil layering	OU-1A: Layer A: silt/clay mixture 121.92 cm Layer B: clay 121.92 cm OU-1B South: Layer A: silt/clay mixture 60.96 cm Layer B: clay 91.44 cm	Based on review of boring logs - weighted average of soil parameters used as single layer in model
Soil lithology directly above water table	OU-1A: clay OU-1B South: clay	Based on review of boring logs
Av. soil/groundwater temperature	24.2 degrees Celsius (°C)	Based on measured values
Soil properties	default	
Building properties	default	

The soil lithology and layering parameters are the same as the DTSC concurred parameters utilized in the Final CERCLA Five-Year Review Report (DoN 2011a).

The methodology employed the J&E VI model to estimate incremental cancer risk and hazard quotient (HQ) per unit concentration in groundwater (i.e. incremental risk and HQ for 1 micrograms per liter [μg/L] of each chemical of concern [COC] in groundwater). This was done using both the U.S. EPA and DTSC methodologies and toxicity criteria. Attachment 1 presents the details of the VI evaluation.

For OU-1A; incremental risk and HQ were estimated for unit concentrations of TCE; 1,2,3-TCP; and vinyl chloride (VC). For OU-1B South; incremental risk and HQ were estimated for unit concentrations of TCE and VC. The model spreadsheets are presented in Attachment 1. The resulting values along with the corresponding indoor air concentrations for each volatile organic compound (VOC) at each site are shown in Attachment 2 Tables 2-1 through 2-4.

The risk and HQ values per unit COC groundwater concentration were then multiplied by the corresponding VOC concentrations at each monitoring well for each quarter. The individual cancer risk and HQ for each VOC were then summed at each monitoring well for each quarter. The summed HQs produce the cumulative hazard index (HI) for each monitoring well. The results are detailed in Attachment 2 Tables 2-5 through 2-22.

2.1.2 Industrial Use Scenario

The VI risk at IRP-13S and -3 for the industrial use scenario was estimated utilizing the U.S. EPA version of the J&E VI model (J&E 1991). The model was downloaded from the U.S. EPA website in July 2012, and was updated with the TCE criteria published in IRIS.

There are a variety of possible commercial/industrial scenarios that could be considered. The OU-1B FS Report used an industrial scenario based on a typical industrial building found at a Navy installation. The exposure assumptions and building parameters used in the FS Report are listed below.

Parameter	Assumption	Remarks
Exposure Duration	25 years	U.S. EPA default
Exposure Frequency	8 hours/day (83 days per year)	U.S. EPA default
Averaging Time	70 years - cancer risk 25 years - non-cancer hazard	U.S. EPA default
Building Height	1,000 cm	FS
Building Length	6,038 cm	FS
Building Width	2,898 cm	FS
Floor Thickness	30 cm	FS
Floor-Wall Seam Crack Width	0.1 cm	U.S. EPA default
Indoor Air Exchange Rate	0.75	FS

(See Attachment 1 for additional parameters)

The OU-1A baseline risk assessment reported in the OU-1A FS Report (Bechtel Environmental, Inc. [BEI] 2003) did not include an industrial exposure scenario. Therefore, for this re-evaluation, the industrial parameters used for OU-1B were also used for OU-1A.

Similar to the residential use scenario, the industrial scenario also utilized groundwater monitoring well data from three recent monitoring events (Third Quarter 2011, Fourth Quarter 2011, and First Quarter 2012) to evaluate the time-dependent nature of VI risk, if any. Since the Fourth Quarter data set is the most complete of the three, the Protectiveness Determination presented in Section 4 is based on evaluation of the Fourth Quarter 2011 data set.

As was the case in the Final CERCLA Five-Year Review Report (DoN 2011a), the re-evaluation used a dual tracking approach in which each data point was evaluated using both U.S. EPA and Cal/EPA methodologies and toxicity criteria.

The site-specific input data utilized in the evaluation are summarized below:

Factor	Assumption	Remarks
Depth to groundwater	OU-1A: 243.84 cm OU-1B South: 152.4 cm	Assumed constant
Soil layering	OU-1A: Layer A: silt/clay mixture 121.92 cm Layer B: clay 121.92 cm OU-1B South: Layer A: silt/clay mixture 60.96 cm Layer B: clay 91.44 cm	Based on review of boring logs - U.S. EPA model uses 2 soil layers, as opposed to single layer in DTSC model
Soil lithology directly above water table	OU-1A: clay OU-1B South: clay	Based on review of boring logs
Av. soil/groundwater temperature	24.2 °C	Based on measured values
Soil properties	default	
Building properties	default	

The methodology employed the J&E VI model to estimate incremental cancer risks and HIs per unit concentration in groundwater (i.e. incremental risk and HI for 1 μg/L of each COC in groundwater). This was done using both the U.S. EPA and DTSC methodologies and toxicity criteria. Attachment 1 presents the details of the VI evaluation.

For OU-1A; incremental risk and HQ were estimated for unit concentrations of TCE; 1,2,3-TCP; and VC. For OU-1B South, incremental risk and HQ were estimated for unit concentrations of TCE and VC. The model spreadsheets are presented in Attachment 1. The resulting values along with the corresponding indoor air concentrations for each VOC at each site are shown in Attachment 2 Tables 2-23 through 2-26.

The risk and HQ values per unit COC groundwater concentration were then multiplied by corresponding reported concentrations at each monitoring well for each quarter. The individual cancer risks and HQ for each VOC were then summed at each monitoring well for each quarter. The resulting cumulative risks and HIs are detailed in Attachment 2 Tables 2-27 through 2-44.

2.2 DISCUSSION OF RESULTS

2.2.1 Residential Use Scenario

Estimated incremental cancer risks and HIs are presented in Attachment 2 Tables 2-5 through 2-22. Each table in Attachment 2 is color coded to highlight results that exceed screening levels, and each table identifies the relative location of each monitoring point with respect to the COC groundwater plume.

At OU-1A; the estimated incremental cancer risk is greater using the Cal/EPA methodology and criteria than using the U.S.EPA methodology and criteria because Cal/EPA uses a route-to-route extrapolation of the 1,2,3-TCP oral reference dose for inhalation and the U.S. EPA does not recommend route-to-route extrapolation. The maximum incremental cancer risk estimated at OU-1A (Cal/EPA criteria) in the Fourth Quarter 2011 was 7 $x10^{-5}$ at hot spot monitoring well IS72MW17S (Attachment 2 – Table 2-9). By contrast, the maximum risk using U.S. EPA criteria was 3 x 10^{-6} in the Fourth Quarter 2011 (Attachment 2 - Table 2-6) at hot spot monitoring well IS72MW17S.

The maximum estimated HI at OU-1A was 1 at hot spot well IS72MW17S in the Fourth Quarter 2011 using both the U.S. EPA and Cal/EPA criteria (Attachment 2 - Tables 2-12 and 2-15).

At OU-1B South; 1,2,3-TCP is not present; consequently the results obtained using both agency approaches are comparable. The maximum incremental cancer risk occurred at hot spot monitoring well I003MW07S in the Fourth Quarter 2011. The estimated risk was 4$x10^{-5}$ (Attachment 2 - Tables 2-21 and 2-18, respectively).

The maximum estimated HI at OU-1B South was 11 at hot spot well I003MW07S in the Fourth Quarter 2011 using both the U.S. EPA and Cal/EPA criteria (Attachment 2 - Tables 2-18 and 2-21).

Overall, the re-evaluation of incremental cancer risk from the VI pathway using the updated TCE toxicity criteria produces results generally similar to those in the Final Five-Year Report obtained using the previous criteria. The maximum incremental cancer risk is still in the 10^{-5} range using the Cal/EPA methodology and criteria (lower using U.S. EPA methodology and criteria).

The re-evaluation of non-cancer HI using the updated TCE toxicity criteria shows a marked increase in HI from below 1 using the previous toxicity criteria, to as high as 11 at the OU-1B South hot spot using the updated toxicity criteria.

Estimates of incremental cancer risks and non-cancer HIs for the residential exposure scenario using the Fourth Quarter 2011 groundwater monitoring data are summarized in the table below:

Summary of Estimated Incremental Cancer Risk and Estimated Hazard Index
Residential Scenario

Operable Unit	U.S. EPA Cancer Risk Range	Cal/EPA Cancer Risk Range	Hazard Index Range
OU-1A	7 x 10^{-9} to 3 x 10^{-6}	7 x 10^{-7} to 7 x 10^{-5}	0.001 to 1
OU-1B South	1 x 10^{-8} to 4 x 10^{-5}	1 x 10^{-7} to 4 x 10^{-5}	0.002 to 11

2.2.2 Industrial Use Scenario

Estimated incremental cancer risks and HIs are presented in Attachment 2 Tables 2-27 through 2-44. Each table in the attachment is color coded to highlight results that exceed

regulatory levels of interest, and each table identifies the relative location of each monitoring point with respect to the COC groundwater plume.

Under the industrial use scenario, the estimated incremental cancer risks using the Cal/EPA and U.S. EPA methodologies are below the NCP point of departure (10^{-6}) at both OU-1A and OU-1B South at all wells for the Fourth Quarter 2011. Similarly, the non-cancer HI at OU-1A and OU-1B South is below 1 at all wells for the Fourth Quarter 2011.

Estimates of incremental cancer risks and non-cancer HIs for the industrial exposure scenario using the Fourth Quarter 2011 groundwater monitoring data are summarized in the table below:

Summary of Estimated Incremental Cancer Risk and Estimated Hazard Index
Industrial Scenario

Operable Unit	U.S. EPA Cancer Risk Range	Cal/EPA Cancer Risk Range	Hazard Index Range
OU-1A	2×10^{-10} to 5×10^{-8}	4×10^{-9} to 4×10^{-7}	0.0002 to 0.03
OU-1B South	3×10^{-10} to 7×10^{-7}	3×10^{-10} to 7×10^{-7}	0.0003 to 0.2

2.3 VAPOR INTRUSION SUMMARY

Re-evaluation of VI risk at OU-1A and OU-1B South using the Fourth Quarter 2011 data set with the recently updated TCE toxicity criteria leads to the following conclusions:

- Incremental cancer risk for residential use at OU-1A using the updated TCE toxicity criteria is similar to that reported in the Final CERCLA Five-Year Review Report (maximum estimated risk in the 10^{-5} range at hot spot monitoring well IS72MW17S). This is within the NCP "generally acceptable range."

- The non-cancer HI for residential use at OU-1A has increased as a result of the updated TCE toxicity criteria (maximum estimated non-cancer HI of 0.9 at hot spot monitoring well IS72MW17S in the Fourth Quarter 2011), which is equal to the NCP acceptable HI of 1.

- Both the incremental cancer risk and non-cancer hazard decreased markedly at OU-1A between the Fourth Quarter 2011 and the First Quarter 2012 (refer to Attachment 2 - Tables 2-6, 2-7, 2-9, 2-10, 2-12, 2-13, 2-15, and 2-16). Reduction of risk over longer time periods is expected given ongoing remediation and natural attenuation of COCs with time.

- Incremental cancer risk for residential use at OU-1B South using the updated TCE toxicity criteria is similar to that reported in the Final 2011 CERCLA Five-Year Review Report (maximum estimated risk in the 10^{-5} range at hot spot monitoring well I003MW07S). This is within the NCP "generally acceptable range."

- The non-cancer HI for residential use at OU-1B South has increased as a result of the updated TCE toxicity criteria (maximum estimated non-cancer HI of 11 at hot spot monitoring well I003MW07S in the Fourth Quarter 2011). This value exceeds the NCP acceptable HI of 1.

- The incremental cancer risk and non-cancer hazard did not decrease markedly at OU-1B South between the Third Quarter 2011 and the First Quarter 2012 as they did at OU-1A (refer to Attachment 2 - Tables 2-18, 2-19, 2-21, and 2-22). As with OU-1A, TCE concentrations and risk are expected to decrease over longer time periods due to ongoing remediation and natural attenuation of COCs.

- The incremental cancer risk and non-cancer hazard HI under the FS Report industrial exposure scenario are below the NCP point of departure (10^{-6}) and 1, respectively, at all wells at OU-1A and OU-1B South.

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3. Technical Assessment for OU-1A and -1B South

In accordance with DoN policy (DoN 2011b), DoD policy (DoD 2012), and U.S. EPA guidance on five-year reviews (U.S EPA 2001), the technical assessments for OU-1A and OU-1B South conducted for this Addendum focused on a re-evaluation of the responses to the following three key questions addressed in the Final CERCLA Five-Year Review Report (DoN 2011a):

1) Question A: Is the remedy functioning as intended by the decision documents?
2) Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?
3) Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The updated responses to these questions for OU-1A and OU-1B South are discussed below.

Technical Assessment Summary

Question	Answer	Comments
A: Is the remedy functioning as intended by the decision documents?	**Affirmative**	The hydraulic containment remedies for OU-1A and OU-1B South are functioning as intended by their respective ROD/RAPs. Additional details can be found in the Final CERCLA Five-Year Review Report (DoN 2011a).
B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?	**Negative**	Toxicity criteria for TCE was recently updated and published in U.S. EPA's IRIS on September 28, 2011. The exposure assumptions, cleanup levels and RAOs used at the time of the remedy still remain valid. Additional details can be found in the Final CERCLA Five-Year Review Report (DoN 2011a).
C: Has any other information come to light that could call into question the protectiveness of the remedy?	**Negative**	No additional information has come to light that effects the protectiveness of the remedies. Additional details can be found in the Final CERCLA Five-Year Review Report (DoN 2011a).

3.1 QUESTION A: IS THE REMEDY FUNCTIONING AS INTENDED BY THE DECISION DOCUMENTS?

The hydraulic containment remedies for OU-1A and OU-1B South are functioning as intended by their respective ROD/RAPs (DoN 2004a and DoN 2004b), as evidenced by results of groundwater monitoring data, capture zone analyses, document reviews, site inspections, interviews; and on continuing operation and maintenance (O&M) activities as reported in the Final CERCLA Five-Year Review Report (DoN 2011a). As noted in the Final Operating Properly and Successfully (OPS) Demonstration Report (ECS 2010), the

remedies are functioning as described in the ROD/RAPs (DoN 2004a and DoN 2004b). Nothing in this Addendum changes that conclusion.

The answer to Question A remains affirmative.

3.2 QUESTION B: ARE THE EXPOSURE ASSUMPTIONS, TOXICITY DATA, CLEANUP LEVELS, AND RAOS USED AT THE TIME OF REMEDY SELECTION STILL VALID?

As discussed previously, updated TCE toxicity criteria were posted by the U.S. EPA in IRIS on September 28, 2011, prompting the re-evaluation of VI risk presented in Section 2 of this Addendum. Exposure assumptions, cleanup levels, and RAOs were addressed in the Final CERCLA Five-Year Review Report (DoN 2011a)

Therefore, the answer to Question B is negative.

This finding is addressed further and recommendations are provided in Section 4.2.

3.3 QUESTION C: HAS ANY OTHER INFORMATION COME TO LIGHT THAT COULD CALL INTO QUESTION THE PROTECTIVENESS OF THE REMEDY?

Other than the updated TCE toxicity criteria that triggered the need for this Addendum discussed in Section 2 and in the response to Question C, no other information has come to light for this Addendum that calls into question the protectiveness of the remedies for OU-1A or OU-1B South

The answer to Question 3 therefore remains negative.

4. Protectiveness Determination for OU-1A and -1B South

4.1 ISSUES AND RECOMMENDATIONS

In March 2012, DoD issued the following policy to all DoD components (DoD 2012):

- The DoN shall provide notice of potential VI risks to non-DoD property owners in writing, and as appropriate, include such notices in decision documents and transfer documents (DoD 2012 Enclosure 3 §6c(4)(a) p48).
- The transferee should address the potential for VI in future structures at its own expense by adding appropriate mitigating measures during construction or by demonstrating that there is no unacceptable risk under applicable law. Decision documents and transfer documents shall reflect such obligations, as appropriate (DoD 2012 Enclosure 3 §6c(4)(b) p48).

The following two recommendations are provided based on previous agency comments on the Final CERCLA Five-Year Review Report (DoN 2011a) and on the Draft Five-Year Review Report Addendum (DoN 2012), on regulatory agency preference for multiple lines of evidence, and in consideration of DoD policy:

- For OU-1A and OU-1B South, provide notice of potential VI risk consistent with the DERP Manual (DoD 2012).
- For OU-1A and OU-1B South, prepare Explanations of Significant Differences (ESDs) to document ICs for potential VI risk for residential and sensitive use scenarios. Sensitive use scenarios, as defined by DTSC, include schools [K-12], day care facilities, hospitals, and college housing. A Land Use Control (LUC) Remedial Design (RD) Amendment will also be prepared to address and describe IC implementation and associated maintenance actions including reporting requirements. Both the ESDs and the LUC RD Amendment will be submitted to the regulatory agencies for review and concurrence. The Areas Requiring Institutional Controls (ARICs) for potential VI risk for Carve-Out (CO) Areas 5 and 6 will be determined in consultation with the Federal Facility Site Remediation Agreement (FFSRA) signatories and documented in the ESDs.

These ICs will be documented in an ESD and implemented in coordination with the regulatory agencies.

4.2 PROTECTIVENESS STATEMENT

The remedies for OU-1A and OU-1B South are determined to be protective under current site conditions based on technical information available at the time of the Final CERCLA Five-Year Review Report, the revised technical evaluation presented in this Addendum, and consistent with DTSC's technical evaluation presented in their January 10, 2012 letter (DTSC 2012). The long-term protectiveness of the remedies at OU-1A and OU-1B South will be addressed by establishing additional ICs for potential VI risk.

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5. OU-4B Low Concentration Sites

5.1 SITE DESCRIPTIONS

5.1.1 General

The following subsections summarize information from CERCLA documents that have been finalized.

OU-4B is one of six OUs (1A, 1B, 2, 3, 4A, and 4B) at Former MCAS Tustin designated for environmental restoration. Environmental investigations began at Former MCAS Tustin, including OU-4B, in 1991. A Remedial Investigation (RI) Report for OU-1 and OU-2 was completed in 1997, including OU-4B Sites IRP-5S(a), IRP-6, and IRP-13W. In 2004, OU-4 was separated into OU-4A (Sites requiring NFA for soil and groundwater) and OU-4B (Sites requiring further action for groundwater and NFA for soil). A ROD/RAP for OU-4A NFA Sites was finalized in December 2004. A Final FS Report for OU-4B was completed in September 2008 (BEI 2008).

OU-4B was further separated into two groups designated as low and moderate concentration sites, to take advantage of common site characteristics, allowing a more efficient alternative screening process, and detailed analysis and comparison of alternatives that are best suited and applicable to each group. IRP-11, IRP-13W, and MMS-04 are the Low Concentration Sites, with VOCs in groundwater at concentrations generally less than 20 µg/L. IRP-5S(a), IRP-6, and the Mingled Plumes Area (MPA) are the moderate concentration sites, with VOCs in groundwater at concentrations exceeding 20 µg/L. The five-year review process has not yet been triggered for the Moderate Concentration Sites; therefore, they will be covered in a subsequent Five-Year Review.

The following sections provide descriptions and background information on IRP-11, -13W, and MMS-04.

5.1.2 IRP-11

IRP-11, Drum Storage Area No. 1, is located in the north-central portion of Former MCAS Tustin at the northwest corner of Copeland Road and Calnan Street (Figure 5-1). IRP-11 is located within CO 5 and consists of undeveloped land.

Maximum reported TCE concentrations in groundwater have decreased over time from 15 µg/L in 1996 (BNI 1997) to 7.9 µg/L in 2011 (Trevet 2012). The approximate areal extent of TCE in first water-bearing zone (WBZ) groundwater at concentrations exceeding the maximum contaminant level (MCL) in drinking water (5 µg/L) is 190 by 50 feet (ft), with the long axis trending north-south (see Figure 5-1). The mass of TCE in groundwater was estimated in the FS Report (BEI 2008) at approximately 0.12 kilograms. Groundwater modeling presented in the FS Report (BEI 2008) indicated that TCE could migrate approximately 150 ft downgradient. Modeling also showed that, assuming natural attenuation, maximum TCE concentrations would decrease below the MCL in approximately 18 years.

5.1.3 IRP-13W

IRP-13W, Drum Storage Area No. 3, includes Areas of Concern (AOCs) Miscellaneous Air Emissions (MAE)-4, and Treatment Oil/Water Separator (TOW)-X7, both located within former Building 98; and Storage Temporary (ST)-14A, ST-14B, ST-14C, and ST-15 located at or near former Buildings 575 and 47T (Figure 5-1). The majority of IRP-13W is

undeveloped land within CO-5 and has been leased to the City of Tustin under a Lease-in-Furtherance-of-Conveyance (LIFOC). The remaining portion of IRP-13W was conveyed as an early transfer pursuant to a Finding of Suitability for Early Transfer (FOSET) (DoN 2007) and is currently developed as residential property.

Maximum reported TCE concentrations in groundwater decreased from 25 µg/L in 1996 (BNI 1997) to 8.9 µg/L in 2011 (Trevet 2012). The approximate areal extent of TCE in first-WBZ groundwater at concentrations exceeding the MCL (5 µg/L) is 270 by 150 ft, with the long axis trending northeast-southwest (see Figure 5-2). The mass of TCE in groundwater was estimated at approximately 0.71 kilograms. The downgradient portion of the TCE plume is comingled with the northern upgradient portion of a 1,2,3-TCP plume from IRP-13S. Groundwater modeling completed for the FS Report indicated that maximum TCE concentrations would decrease from 16 to below the MCL of 5 µg/L within approximately 36 years under the baseline scenario (BEI 2008). The IRP-13W plume would attenuate more quickly (before 30 years) under natural attenuation. The plume at IRP-13W is in close proximity to OU-1A and would be completely contained and captured by its operating hydraulic containment system and remain entirely within the area of ICs established for OU-1A (BEI 2008).

5.1.4 MMS-04

MMS-04 consists of Area B and TOW-18-2 at the former Auto Hobby Shop, which was formerly used by station personnel for vehicle maintenance. Area B was described as the area within the fence line of the shop that contained a waste oil underground storage tank (UST). TOW-18-2 is located adjacent to Area B (Figure 5-2). MMS-04 is located within CO-5 and consists of undeveloped land.

TCE was reported in two groundwater grab samples collected from the first WBZ at one location at concentrations of 18 µg/L in 1996 (BNI 1997) and 7.4 µg/L in 2003 (BEI 2008). The approximate areal extent of TCE in the first WBZ at concentrations exceeding the MCL (5 µg/L) was 20 by 12 ft, trending northeast-southwest (see Figure 5-2). The mass of TCE in groundwater was estimated at approximately 0.026 kilograms. Groundwater modeling completed for the FS Report (BEI 2008), indicated that the concentration of TCE would decrease from 7.4 µg/L to below the MCL within approximately 5 years under both the baseline and natural attenuation scenarios. The plume at MMS-04 was in close proximity to OU-1A and would be completely contained and captured by its operating hydraulic containment system and remain entirely within the area of ICs established for OU-1A. Based on discussions with regulatory agencies, one monitoring well (MM4MW01S) was installed in the first WBZ at this location and sampled for VOCs for one year; if concentrations of TCE reported in this well did not exceed 5 µg/L, then the site would be recommended for NFA.

5.2 SITE CHRONOLOGY

The following table lists important events and milestones pertinent to environmental response actions taken by the DoN for IRP-11, -13W, and MMS-04.

Chronology of Response Actions

Date	Investigation/	Objective	Summary of Findings
1994-1995	Expanded site inspection (ESI)	Evaluate nine IRP Sites and AOCs (IRP-2, -6, -8, -9, -11, -15, MMS-03, -04, and -05), including soil and groundwater sampling, fate and transport analysis, baseline risk assessment, and screening risk assessment associated with future impacts on groundwater (due to potential leaching of chemicals of potential concern (COPCs) in soil).	NFA was recommended for soil at IRP-8, -11, -15, MMS-03, -04, and -05. NFA was recommended for soil at IRP-2 and -9. Further evaluation was recommended for soil at IRP-6. NFA was recommended for groundwater at IRP-9, -15, and MMS-03. IRP-2, -6, -8, -11, MMS-04 and -05 were recommended for further evaluation in the RI station-wide groundwater program, based on the risk assessment and evaluation of COPCs in groundwater (BNI 1997).
1997	Removal action at IRP-13W	Excavate and treat total petroleum hydrocarbons (TPH) and polycyclic aromatic hydrocarbon (PAH)-contaminated soil.	Approximately 4,000 tons of soil was removed, and site restoration activities (paving and fencing) were performed as part of a non-time critical removal action (NTCRA) at IRP-13W. Activities were completed in November 1997. Following this NTCRA, IRP-13W was recommended for an NFA in the OU-1/OU-2 RI (BNI 1997).
1999	BCT meeting 23 September 1999	Modify recommended action for six IRP Sites and six AOCs.	Recommended a focused FS for IRP-5, -6, -8, -11, -13W, and -16, and AOCs Disposal, Sanitary Sewer (DSS)-01, DSS-02, Miscellaneous, Potential Disposal Area (MDA)-02, MMS-04, MMS-05, and ST-67 due to the presence of contaminants in shallow groundwater at concentrations exceeding regulatory limits. These Sites/AOCs were included in newly designated OU-1A.

Date	Investigation/	Objective	Summary of Findings
2003-2004	OU-4 Technical Memorandum	Shallow groundwater investigation of selected sites.	Recommended IRP-5N, -5S(b), -8, -11 (Area A), -16, and MMS-04 (Areas A and C) for an NFA; these Sites became OU-4A. Recommended IRP-5S(a), -6, -11 (Area B), -13W, MMS-04 (Area B), and MPA for further action for groundwater; these Sites became OU-4B.
2008	OU-4B FS Report	Evaluation of remedial alternatives; groundwater contaminant transport modeling for OU-4B groundwater plumes.	Recommended an NFA for soil, and recommended ICs with groundwater monitoring for Low Concentration Sites IRP-11, -13W, and MMS-04.
2010	ROD/RAP for OU-4B	ROD and Selected RAP for OU-4B (IRP-5S(a), -6, -11, -13W, and MMS-04).	Stipulated NFA for soil, and groundwater remedy of ICs for Low Concentration Sites IRP-11, -13W, and MMS-04. Stipulated groundwater remedy of in-situ bioremediation with ICs for moderation concentration Sites IRP-5S(a), and -6.
2011	Final RACR, MMS-04	Document the MMS-04 Site closeout.	Following four consecutive quarters of groundwater with TCE below the RG, response action is complete and an NFA is warranted for groundwater (AIS-TN&A JV 2011a).

5.3 IRP-11, 13W, AND MMS-04

5.3.1 Land and Resource Use

IRP-11 is located within CO-5 and consists of undeveloped land. According to the City of Tustin Specific Plan/Reuse Plan (SP/RP)[1], IRP-11 is located in an area designated for reuse as an urban regional park. The majority of IRP-13W is undeveloped land within CO-5 and has been leased to the City of Tustin under a LIFOC. A portion of IRP-13W was conveyed as an early transfer pursuant to a FOSET (DoN 2007) and is currently developed as residential property. According to the City of Tustin SP/RP, the portion of IRP-13W within CO-5 is designated for reuse as a community park. MMS-04 is in an area designated for reuse as a sheriff's law enforcement training facility.

[1] The Specific Plan/Reuse Plan can be found online at:
http://www.tustinca.org/departments/commdev/documents/planningandzoning/MCASTustinSpecificPlan.pdf

5.3.2 History of Response Actions

The principal response actions for IRP-11, -13W, and MMS-04 included:

- Removal action at IRP-13W. In 1997, approximately 4,000 tons of soil was removed, and site restoration activities (paving and fencing) were performed as part of a NTCRA at IRP-13W. Activities were completed in November 1997.

- Shallow groundwater investigation led to designation of IRP-5S(a), -6, -11, -13W, MMS-04, and the MPA as OU-4B, with IRP-11, -13W, and MMS-04 recently designated "Low Concentration Sites" (TCE groundwater concentrations generally less than 20 μg/L).

- ROD/RAP for OU-4B selected ICs as the remedy for IRP-11, -13W, and MMS-04 in 2010.

- Following four quarters of groundwater TCE concentrations below the RG, a Final RACR was prepared for MMS-04 accomplishing an NFA for the Site. BCT concurrence was received in 2011.

- Inspection of compliance with ICs and groundwater monitoring continue at IRP-11 and -13W.

These response actions and their basis are discussed further in the following sections.

5.3.3 ROD/RAP Basis for Taking Action

5.3.3.1 SUMMARY OF BASELINE HUMAN HEALTH RISK ASSESSMENT

The conceptual site model (CSM) for each of the OU-4B Low Concentration Sites are similar. Primary release sources included the following: drums of chemicals and various fluids at IRP-11 and IRP-13W, and former waste oil UST and TOW at MMS-04. Primary release mechanisms to the environment at the Sites included infiltration and percolation through the unsaturated zone to the groundwater table. No secondary sources or release mechanisms are known to exist. The exposure medium and potential exposure pathways for human and ecological receptors were refined in the CSM based on risk assessments.

As reported in finalized CERCLA documents, the OU-4B Low Concentration Sites were initially investigated during the ESI, the Resource Conservation and Recovery Act (RCRA) Facility Assessment (RFA), and the RI for OU-1 and OU-2 (see Chronology of Response Action Table in Section 3.2)). A baseline human-health risk assessment (HHRA) was conducted for IRP-11, IRP-13W, and MMS-04 during the OU-4 shallow groundwater investigation in 2003. The HHRA performed a dual-calculation of risk based on U.S. EPA and Cal/EPA toxicity values. A hypothetical residential exposure scenario, the most conservative scenario, was evaluated during the HHRA. Sites that do not pose a risk under a residential exposure would not pose a risk under other lower exposure frequency and intensity land-use scenarios such as industrial or recreational. Exposure conditions used in the estimation of risk were chosen to represent reasonable maximum exposure (RME) conditions; this tends to overestimate risk, and was done deliberately to provide a margin of safety when making risk management decisions. The risk assessments were designed to provide a margin of safety to protect human health by using conservative assumptions so that risks are not underestimated. An example of a conservative exposure assumption is that a person would ingest soil for 350 days per year for 30 years. The NCP requires the

baseline risk assessment to provide risk managers with an understanding of the actual or potential risks to human health and the environment and uncertainties associated with the assessment. The total risk using all the potential exposure pathways represent the total lifetime cancer risk which include ingestion of soil; dermal contact with soil; inhalation of particulates released from soil; inhalation of chemical vapors released from soil to indoor air; inhalation of chemical vapors released from groundwater to indoor air during household water use (showering, laundering, dishwashing, etc.); ingestion of groundwater; and dermal contact with groundwater.

The NCP[2] states that, for known or suspected carcinogens, acceptable exposure levels are those that represent an excess upper-bound lifetime cancer risk to an individual of between 10^{-4} and 10^{-6}. The role of the U.S. EPA Office of Solid Waste and Emergency Response (OSWER) Directive (9355.0-30) is to clarify risk management decisions. It points out that the upper boundary of the risk range (10^{-4}) is not a discrete line and risk estimates around this value may be considered acceptable based on site-specific conditions. The 10^{-6} value is used as the point of departure for determining RGs when applicable or relevant and appropriate requirements (ARARs) are not available or are not sufficiently protective because of the presence of multiple contaminants at a site or multiple exposure pathways. The maximum acceptable exposure for noncancer risk has been interpreted as one that is equal to the maximum estimated nontoxic exposure level. Accordingly, an HI less than 1 is acceptable.

For a residential exposure scenario, total U.S. EPA lifetime cancer risks for all OU-4B Sites exceeded the generally acceptable cancer risk range of between 10^{-4} and 10^{-6} (IRP-11: 3×10^{-4}; IRP-13W: 5×10^{-4}; MMS-04: 7×10^{-4}). Non-cancer HIs for the sites exceeded the threshold value of 1 (IRP-11: 4; IRP-13W: 6; MMS-04: 7).

The baseline risk assessment evaluated medium-specific cancer risks and HIs separately for soil and groundwater at each of the sites to evaluate if further action was warranted.

5.3.3.1.1 Soil

IRP-11. For a residential exposure scenario, the total U.S. EPA lifetime cancer risk for soil was estimated at 3×10^{-6} which is within the NCP generally acceptable range (10^{-6} to 10^{-4}); the noncancer HI was estimated to be 2. The only principal non-cancer risk driver in soil is manganese, a naturally occurring mineral in soil; it occurs within background concentrations at the site and is not site-related. On this basis, the Navy and their BCT regulatory partners determined that soil at IRP-11 warranted an NFA (DoN 2010).

IRP-13W. For a residential exposure scenario, the total U.S. EPA lifetime cancer risk for soil was estimated at 3×10^{-5} which is within the NCP generally acceptable range (10^{-6} to 10^{-4}); the noncancer HI was estimated to be 3. The only principal non-cancer risk driver in soil is manganese, a naturally occurring mineral in soil; it occurs within background concentrations at the site and is not site-related. On this basis, the Navy and their BCT regulatory partners determined that soil at IRP-13W warranted an NFA (DoN 2010).

MMS-04. For a residential exposure scenario, the total U.S. EPA lifetime cancer risk for soil was estimated at 6×10^{-7} and does not exceed the NCP point of departure for acceptable risks (10^{-6}); the noncancer HI was estimated to be 2. Although the noncancer HI exceeds

[2] NCP 300.430(e)(2)(i)(A)(*2*).

the HI threshold value of 1, the only principal risk driver is iron. There is no historic evidence of on-site disposal of iron, and concentrations of iron in soil were reported to be below background threshold values reported in the ESI Report. On this basis, the Navy and their BCT regulatory partners determined that soil at MMS-04 warranted an NFA (DoN 2010).

5.3.3.1.2 Groundwater

For a residential exposure scenario, the total U.S. EPA lifetime cancer risk for groundwater at all of the OU-4B Low Concentration Sites exceeded the generally acceptable cancer risk range (IRP-11: 3×10^{-4}; IRP-13W: 5×10^{-4}; MMS-04: 7×10^{-4}). The groundwater risks are essentially the same as the total risks because the soil risks are at least one order of magnitude lower. The HIs for the sites exceeded the threshold value of 1 (IRP-11: 2; IRP-13W: 3; MMS-04: 5). Groundwater cancer risk at all the sites is driven by TCE. On this basis, further action was recommended for groundwater at all three OU-4B Low Concentration Sites (DoN 2010).

5.3.3.1.3 Indoor Air Inhalation Pathway

As part of the FS Report for OU-4B, the HHRA was updated to exclusively evaluate indoor air inhalation risk under a scenario assuming no residential consumption of groundwater. Consequently, there would be no pathways associated with inhalation of vapors volatilizing from groundwater during bathing, laundering, etc. under this scenario. This represented a more reasonable approach, given that shallow groundwater at Former MCAS Tustin is of poor quality and yield and is unlikely to be used as a future domestic water supply. Moreover, the selected remedies for the OU-4B Sites included ICs, which would prevent exposure to contaminated groundwater.

The indoor air inhalation exposure pathway consists of volatilization of VOCs from both soil and groundwater, followed by vertical migration of the soil vapor from the subsurface through a building slab/concrete (especially seams and cracks), and intrusion into the hypothetical future residential building space. Indoor air concentrations were estimated using U.S. EPA's J&E VI model. Risks estimated from the 2004 HHRA were used to evaluate migration from subsurface soil. Maximum concentrations of volatile COPCs in groundwater were used to estimate risks for groundwater.

The total U.S. EPA lifetime cancer risks for soil and groundwater combined for a potential indoor air inhalation pathway assuming no domestic groundwater use were acceptable (10^{-4} or less) for the three OU-4B Sites (IRP-11: 3×10^{-6}; IRP-13W: 2×10^{-6}; MMS-04: 9×10^{-7}). Estimated noncancer HIs for the sites were well below the threshold value of 1. These estimated risk values were primarily driven by the use of a then-provisional U.S. EPA toxicity factor for TCE. Soil gas data (not available) are generally preferred by U.S. EPA for estimating vapor migration, and usually result in lower estimated risks than when groundwater data are used because the groundwater model does not incorporate any factors for attenuation of VOC concentrations in soil during upward migration. U.S. EPA cancer risks for IRP-11 and IRP-13W that exceed 10^{-6} were associated with TCE in soil samples collected in 1995-1996, and VOC concentrations in soil at the time of the baseline risk assessment were expected to be lower than the 1995-1996 data.

5.3.3.2 ROD/RAP BASIS FOR TAKING ACTION

The Navy, in partnership with U.S. EPA, DTSC, and the California Regional Water Quality Control Board, Santa Ana Region (RWQCB), considered all pertinent factors in accordance with CERCLA and NCP remedy selection criteria and determined in the ROD/RAP for OU-4B that remedial action was necessary to clean up groundwater at the OU-4B Low

Concentration Sites. This determination was made because (1) COCs in groundwater exceeded MCLs and (2) HHRA results for groundwater indicated estimated cancer risks exceeded 10^{-4}.

5.4 REMEDIAL ACTIONS

This section summarizes the selected remedial actions for IRP-11, -13W, and MMS-04. It includes discussions of remedy selection, implementation, O&M and monitoring.

For each of the sites, the remedy selection process was done in accordance with CERCLA evaluation criteria based on requirements promulgated in the NCP. These evaluation criteria are stated in the NCP (40 CFR § 300.430[f]), and are arranged in the following hierarchical manner: threshold criteria, primary balancing criteria, and modifying criteria.

Detailed discussions of the application of the selection criteria for each site are included in the OU-4B ROD/RAP (DoN 2010).

5.4.1 Remedial Action Objectives

The RAOs for groundwater contaminant plumes at the OU-4B Low Concentration Sites are as follows:

- Protect human health by limiting the use of shallow groundwater containing COCs at concentrations exceeding health-protective levels.
- Reduce concentrations of COCs in shallow groundwater at areas of attainment for OU-4B Sites to health-protective levels.

5.4.2 Remedy Selection

The remedy selection process for the response action at IRP-11, -13W, and MMS-04 is documented in the Proposed Plan (DoN 2009) and in the agency-concurred ROD/RAP (DoN 2010). The selected remedy for the three sites consisted of ICs to prevent on-site activities that could result in exposures to contaminated groundwater.

ICs were the preferred alternative in the FS because it meets the RAOs and the threshold criteria and provides the best balance of tradeoffs with respect to the balancing and modifying criteria. This remedy protects human health by (1) preventing domestic use of groundwater by prohibiting installation of groundwater supply wells, and (2) maintaining the integrity of the remedial action until RGs have been achieved. This alternative assumes that natural physical, biological, and chemical processes should continue to reduce concentrations of COCs in groundwater until RGs are achieved.

5.4.3 Remedy Implementation

ICs will prevent exposure to contaminated groundwater, and maintain the integrity of the remedial action for OU-4B until RGs have been achieved. The ICs are documented in the Draft LUC RD (AIS-TN&A JV 2011b). Specifically, ICs will be put in place to:

- allow the Navy and its contractors access to site(s) and components of the remedy;
- prohibit the installation of new groundwater supply wells and extraction of groundwater (unless approved in writing by the Navy and regulatory agencies); and
- prohibit the alteration, disturbance, or removal of groundwater monitoring and remediation systems (as applicable) without prior written approval from the Navy and regulatory agencies.

ICs will be maintained until concentrations of COCs in groundwater are such that they allow for unlimited use and residential exposure. Implementation of ICs includes requirements for monitoring, inspections, and reporting to ensure compliance with land use and activity restrictions.

The Navy has determined that it will rely on proprietary controls in the form of environmental restrictive covenants as provided in the "Memorandum of Agreement Between the United States Department of the Navy and the California Department of Toxic Substances Control" and attached covenant models (Navy and DTSC 2000) (hereinafter referred to as the "Navy/DTSC Memorandum of Agreement [MOA]").

More specifically, land use and activity restrictions will be incorporated into two separate legal instruments as provided in the Navy/DTSC MOA:

1) Restrictive covenants included in one or more "quitclaim deeds" from the Navy to the property recipient.
2) Restrictive covenants included in one or more "Covenant to Restrict Use of Property" (CRUP) entered into by the Navy and DTSC as provided in the Navy/DTSC MOA and consistent with the substantive provisions of California Code of Regulations title 22 § 67391.1.

The CRUPs have incorporated or will incorporate the land use restrictions into environmental restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The quitclaim deed(s) will include the identical land use and activity restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the Navy against future transferees.

Land use restrictions will be applied to specified portions of the property and described as applicable in findings of suitability to transfer, findings of suitability for early transfer, "Covenant(s) to Restrict Use of Property" between the Navy and DTSC, and any "quitclaim deed(s)" conveying real property containing OU-4B Sites.

OU-4B Sites are located in portions of the former station:

- that are currently retained by the Navy without a lease (IRP-11);
- that have been leased to the City of Tustin under a LIFOC and that will be conveyed by deed in the future (MMS-04, and a portion of IRP-13W); and
- that has already been transferred as an "early transfer" pursuant to a FOSET (a portion of IRP-13W).

The following land-use restrictions will be incorporated into the legal instruments provided above:

- prohibit the installation of new groundwater supply wells and extraction of groundwater including installation of any structure or improvement that has the potential to affect plume migration unless approved in writing by the Navy and regulatory agencies; and
- prohibit the alteration, disturbance, or removal of groundwater monitoring and/or remediation system components without written approval from the Navy and regulatory agencies.

A groundwater monitoring program, including periodic reviews, has been implemented to provide information about groundwater concentrations for comparison to RGs. The long-term groundwater monitoring plan (LTM) is documented in the LUC RD/LTM (AIS-TN&A JV 2011b). Groundwater monitoring will continue and ICs will remain in place until monitoring results indicate that RGs for TCE in groundwater have been achieved and the appropriate regulatory agencies have determined that monitoring and ICs are no longer necessary.

5.5 PROBLEMS ENCOUNTERED

No significant problems have been reported to date for the OU-4B Low Concentration Sites remedy implementation.

5.6 PROGRESS SINCE THE LAST REVIEW

This is the first five-year review for IRP-11, -13W, and MMS-04.

5.7 FIVE-YEAR REVIEW PROCESS

This Section discusses the activities performed during the five-year review process for IRP-11, -13W, and MMS-04. The DoN conducted five-year reviews at these Sites in accordance with the following guidance documents:

- *Comprehensive Five-Year Review Guidance* (U.S. EPA 2001)
- *Department of Navy Policy for Conducting Five-Year Reviews Under the Installation Restoration Program* (DoN 2011b)

The five-year review process consisted of the following:

- Administrative components;
- Community notifications and involvement;
- Document reviews;
- Data reviews;
- Site Inspections;
- Interviews; and
- Protectiveness determinations.

5.7.1 Administrative Components

The lead agency for this five-year review is the DoN; the five-year review team was led by Mr. Louie Cardinale, Professional Engineer (PE) as the DoN's Remedial Project Manager (RPM); Mr. James Callian, Professional Geologist (PG), Certified Hydrogeologist (CHG), and Certified Engineering Geologist (CEG) as the BRAC Environmental Coordinator (BEC):

- ECS – technical experts such as civil/environmental engineers, geologists, hydrogeologists, and risk assessors.

During February 2012, the five-year review team established the schedule for each of the IRP Sites addressed in this Addendum. The components of the five-year review included:

- Community notification and involvement;

- Review of relevant documents pertaining to IRP-11, -13W and MMS-04;
- Review and evaluation of relevant data for IRP-11, -13W and MMS-04;
- Inspection of IRP-11, -13W and MMS-04;
- Interviews of knowledgeable persons; and
- Preparation of the CERCLA Five-Year Review Report Addendum.

The schedule for CERCLA Five-Year Review Report Addendum of IRP-13S, -3, -11, and MMS-04 included issuance of the Draft Addendum in September 2012, receipt of comments, resolution of comments, and submittal of the final Addendum in March 2013.

5.7.2 Community Notification and Involvement

In 1994, the Restoration Advisory Board (RAB) was established to provide interested parties from local communities a channel for participation in the environmental restoration process at Former MCAS Tustin. Since 1994, there have been 95 RAB meetings. These RAB meetings occur on a routine basis and are scheduled in the evenings after normal working hours (6:30 to 9:00 p.m.) and presently at the Tustin Senior Center. RAB meetings are open to the public and include representatives from the DoN, City of Tustin, regulatory agencies, and other interested parties. By sharing information from the regular meetings with the groups they represent, RAB members help increase awareness of the IRP process; in addition, members of the public can contact RAB members to obtain information or express concerns to be discussed at subsequent meetings.

Notification of the five-year review process was provided to the RAB by e-mail in February 2012, and by means of a presentation at a RAB meeting on May 23, 2012. The e-mail and RAB presentation notifications included invitations to participate and provide comments.

Following completion, the CERCLA Five-Year Review Report Addendum including community input will be placed in the information repository. A brief summary of the Addendum will be made available to the stakeholders. This summary will include short descriptions of the remedial actions at IRP-11, -13W and MMS-04, and the results of the five-year review including the determinations of whether the remedies at the sites are protective of human health and the environment. The summary will also provide the location of site information repository where the complete copy of the Addendum can be obtained, and will provide the date of the next five-year review.

A brief summary of the results of the five-year review, including acknowledgment of the completion of the remedy at MMS-04, will also be presented to the RAB members and interested community members in a RAB meeting.

5.7.3 Document Review

Numerous documents were reviewed for IRP-11, -13W and MMS-04 as part of the reviews for these sites. The objective of the document review was to obtain relevant information and data that could be used as the basis for assessment of the performance of the remedies implemented at IRP-11, -13W and MMS-04. The types of documents reviewed included the following:

- Documents containing the basis for the response actions including remedy decision documents such as ROD/RAP, remedial investigation/feasibility study (RI/FS)

reports, toxicological and chemical characteristics databases, and federal and state statutory and regulatory requirements identified as ARARs in the remedy decision documents.

- Documents containing monitoring data and information that can be used to assess whether the remedial action continues to operate and function as designed.

Documents cited in the report text are listed in Section 7 - References.

5.7.4 Data Review

5.7.4.1 GROUNDWATER LEVEL DATA

Water levels have been measured in select Site monitoring wells dating back to the RI, and are currently routinely measured as a part of the ongoing long-term groundwater monitoring program. Results have been published in routine groundwater monitoring reports, with the most recent being the results of the Third and Fourth Quarter 2011 monitoring events (Trevet 2012). These data indicate that the first WBZ has experienced seasonal water level fluctuations as recharge from upgradient sources ebbs and flows throughout the area, and that the direction of groundwater flow is generally towards the south.

Groundwater elevation contours in the first WBZ for the Fourth Quarter 2011 are shown in Figure 5-3. Groundwater elevation contours in the second WBZ for the Fourth Quarter 2011 are shown in Figure 5-4.

5.7.4.2 GROUNDWATER CONCENTRATION DATA

Review of the groundwater concentration data indicates the following:

- TCE groundwater concentrations were below the RG of 5 μg/L at MMS-04 for more than four consecutive quarters, consequently a Final RACR was prepared establishing an NFA for MMS-04 (AIS-TN&A JV 2011a).

- TCE groundwater concentrations at IRP-11 have been generally stable with the maximum concentration ranging between a maximum of 9.4 μg/L in 2009 to a maximum of 7.9 μg/L in the Fourth Quarter 2011 (Trevet 2012). These concentrations slightly exceed the RG of 5 μg/L.

- TCE groundwater concentrations at IRP-13W have been generally stable with the maximum concentration ranging between 8.7 μg/L (Third Quarter 2009) and 8.9 μg/L in the Fourth Quarter 2011 (Trevet 2012). These concentrations slightly exceed the RG of 5 μg/L.

Groundwater TCE concentrations in the first WBZ at IRP-11 and -13W are shown on Figure 5-5.

5.7.4.3 IC COMPLIANCE DATA

Monitoring for compliance with ICs has been conducted at IRP-13W in accordance with the requirements of the LIFOC. The data review indicated that site inspection checklists have been completed and submitted to DoN. Copies of these documents are provided in Attachment 3. The Draft LUC RD specifies ICs for IRP-11 and -13W (AIS-TN&A JV 2011b). Interim surveillance mechanisms include observations by the DoN Facility Engineering and Acquisition Division (FEAD) representative for Former MCAS Tustin, and by onsite Navy

contractors. MMS-04 has received an NFA determination; therefore, IC inspections are not required.

A review of completed checklists for IRP-13W indicates that no activities were conducted that are inconsistent with the land-use restrictions documented in the LIFOC or LUC RD.

5.7.5 Site Inspections

Site inspections were conducted for IRP-11, -13W, and MMS-04 as part of the five-year review to provide information about the status of these sites, and to visually confirm and document the conditions of the remedies, the sites, and the surrounding areas. The first inspection event was conducted by ECS and DoN representatives on May 17, 2012. A second inspection covering IRP-11 and 13W was conducted by a team consisting of representatives from the DoN, ECS, and DTSC on May 23, 2012. The following table presents a list of participants for this inspection.

Sites	Inspection Date	Inspection Participants
IRP-11, -13W	May 23, 2012	DoN • James Callian (BEC) • Content Arnold (Lead RPM) • Louie Cardinale (RPM) Regulatory Agencies • Ram Peddada (RPM, DTSC) DoN Five-Year Review Contractor (ECS) • Michael Wolff (Project Manager)

The inspections indicated that groundwater monitoring wells are in good condition and functioning as designed. Site conditions indicate that ICs are being properly implemented. Photographs taken during the inspection event on May 17, 2012 are presented in Attachment 4.

5.7.6 Interviews

Interviews were conducted as part of the five-year review with various stakeholders to provide additional information about the status of IRP-11, -13W, and MMS-04. A list of interviewees is presented in the following table.

Interviewee Name	Title	Affiliation
James Callian	BEC/RAB Co-Chair	DoN BRAC Program Management Office (PMO) West
Content Arnold	Lead RPM	DoN BRAC PMO West
Louie Cardinale	RPM	DoN BRAC PMO West
James Ricks	RPM	U.S. EPA
John Broderick	RPM	RWQCB
Ram Peddada	RPM	DTSC

Interviewee Name	Title	Affiliation
Matt West	Redevelopment Project Manager	City of Tustin

Detailed interview documentation for each interviewee is presented in Attachment 5. The documentation includes the name of the interviewee, the relevant site or sites, date and time of the interview, contact information, and responses to interview questions. Specific interview results for the three IRP Sites addressed in this CERCLA Five-Year Review Report Addendum are discussed below.

Overall Performance/Impression of the Remedy

Mr. James Callian (BEC, DoN BRAC PMO West), and Ms. Content Arnold (Lead RPM, DoN BRAC PMO West) indicated that the remedies implemented at IRP-11 and -13W are being implemented as presented in the ROD/RAP, and that no significant problems have been identified regarding the implemented remedies. The remedy for MMS-04 was implemented as presented in the ROD/RAP, and, following more than four consecutive quarters of groundwater monitoring data with TCE in groundwater at concentrations below the RG, the Site received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a).

Mr. James Ricks of the U.S. EPA, Mr. John Broderick of the RWQCB, and Mr. Ram Peddada of the DTSC all commented that they are aware of all available information pertaining to the sites, and that they are not aware of any changes in site conditions that might adversely affect the remedies, any violations of LUCs, any community concerns, and none offered comments or suggestions regarding management of the remedies.

Other respondents reported generally favorable impressions of the remedies; none reported negative impressions.

Community Concerns/Effects

None of the respondents indicated that they were aware of any community concerns regarding IRP-11, -13W, and MMS-04 or their operation and administration.

Effectiveness of Land-Use Controls

None of the respondents indicated that they were aware of any problems with the effectiveness of LUCs at IRP-1, -3, -12, and -13S.

Communication of Site Activities and Progress

Respondents were generally complimentary regarding the Navy's communication efforts.

Other Comments/Suggestions/Recommendations

There were no other comments, suggestions or recommendations.

5.8 TECHNICAL ASSESSMENT

In accordance with DoN policy (DoN 2011b) and U.S. EPA guidance on five-year reviews (U.S EPA 2001), the technical assessments conducted for this five-year review focused on responses to the following three key questions for IRP-11, -13W, and MMS-04:

4) Question A: Is the remedy functioning as intended by the decision documents?
5) Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?
6) Question C: Has any other information come to light that could call into question the protectiveness of the remedy?

The responses to these questions are discussed for each of the IRP Sites below.

Technical Assessment Summary

Question	Answer	Comments
A: Is the remedy functioning as intended by the decision documents?	**Affirmative**	The remedies for IRP-11 and -13W are functioning as intended by the ROD/RAP. The remedy for MMS-04 was completed in 2011 as documented in the agency concurred Final RACR. Additional details can be found in this Addendum.
B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of remedy selection still valid?	**Negative**	Toxicity criteria for TCE was recently updated and published in U.S. EPA's IRIS on September 28, 2011. The exposure assumptions, cleanup levels and RAOs used at the time of the remedy decision remain valid.
C: Has any other information come to light that could call into question the protectiveness of the remedy?	**Negative**	No additional information has come to light that effects the protectiveness of the remedies. Additional details can be found in this Addendum.

5.8.1 Question A: Is the Remedy Functioning as Intended by the Decision Documents?

The remedy at IRP-11 and -13W is functioning as intended by the ROD/RAP, as evidenced by results of monitoring data and document reviews, site inspections, and interviews. As discussed above, MMS-04 has already received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a).

The selected remedy for IRP-11, -13W, and MMS-04 is ICs to prevent contact with contaminated groundwater. The ICs consist of land use restrictions that are the subject of the LUC RD that is currently in preparation for IRP-11 and -13W. A portion of IRP-13W was transferred early pursuant to a FOSET that also contains restrictions on contact with impacted groundwater. MMS-04 is closed and no longer requires ICs since groundwater TCE concentrations are below the RG.

The performance of the ICs was evaluated in this Addendum by conducting site inspections and interviews with stakeholders, and by reviewing IC compliance certifications. The data review, site inspection, and interviews revealed no evidence of any activities that were inconsistent with the land-use restrictions.

The response to Question A for IRP-11, -13W, and MMS-04 is "affirmative."

5.8.2 Question B: Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

5.8.2.1 EXPOSURE ASSUMPTIONS

The exposure assumptions considered during the remedy selection for IRP-11, -13W, and MMS-04 are consistent with current Site conditions and remain unchanged. No changes to Site conditions have occurred that would negatively affect the remedy performance.

5.8.2.2 TOXICITY DATA AND EFFECT ON HEALTH RISK

The primary risk driver at IRP-11, -13W, and MMS-04 is TCE in groundwater. As discussed in Section 2, updated toxicity criteria for TCE were published in IRIS on September 28, 2011. The baseline HHRA employed the previous TCE toxicity criteria; therefore this review focused on a re-evaluation of cancer risk and non-cancer hazard resulting from the updated toxicity criteria under the residential scenario. The review focused on the risk from the VI pathway because there are no specific ICs addressing VI, and because IRP-13W has already been transferred and its current use is residential.

The evaluation of VI risk utilized the DTSC version of the J&E VI model (J&E 1991). The model was downloaded from the DTSC website in February 2012, and had been updated by DTSC as of December 6, 2011. This version included the updated U.S. EPA TCE criteria published in IRIS.

The evaluation utilized monitoring well data from the Fourth Quarter 2011, the most recent monitoring event. The evaluation used the maximum TCE groundwater concentration for IRP-11 and -13W (MMS-04 concentrations are below the RG) of 8.9 μg/L. Since the DTSC and U.S. EPA toxicity criteria for TCE are identical, the evaluation did not need to follow a dual tracking approach as used for the re-evaluation of OU-1A discussed in Section 2.

The significant assumptions utilized in the evaluation are summarized below:

Factor	Assumption	Remarks
Depth to groundwater	419.4 cm	Based on Fourth Quarter 2011 measurement at I13WMW04S (max. TCE concentration location)
Soil type	clay	Based on review of nearby boring logs
Soil lithology directly above water table	clay	Based on review of boring logs
Av. soil/groundwater temperature	21.94 °C	Based on Fourth Quarter 2011 measurement at I13WMW04S
Soil properties	default	DTSC defaults

Factor	Assumption	Remarks
Building properties	default	DTSC defaults

The methodology employed the J&E VI model to estimate incremental cancer risk and HI for the maximum TCE concentration in groundwater at IRP-11 and -13W for the Fourth Quarter 2011. The results are as follows:

IRP-11:

Incremental cancer risk = 4×10^{-8}

HI = 0.01

IRP-13W:

Incremental cancer risk = 4×10^{-8}

HI = 0.01

These results indicate that both the cancer risk and non-cancer hazard for the VI pathway using the maximum measured TCE concentration in groundwater in the Fourth Quarter 2011, and the updated TCE toxicity criteria, are below regulatory levels of concern.

5.8.2.3 CLEANUP LEVELS AND RAOS

The ARARs identified in the IRP-11, -13W, and MMS-04 ROD/RAP (DoN 2010) were evaluated to determine whether there have been any changes in these standards that may affect the protectiveness of the remedy at the Sites. Based on the evaluation conducted for this five-year review, there have been no significant changes to the standards/requirements identified as ARARs in the ROD/RAP that could affect the protectiveness of the remedy. Additionally, no newly promulgated laws or regulations were identified that could negatively affect the protectiveness of the remedy.

Since updated TCE toxicity criteria were published in IRIS as discussed in Section 5.8.2.2, the response to Question B for IRP-11, -13W, and MMS-04 is: "negative;" however, the risk and HIs at the low concentration sites do not exceed regulatory levels of concern. Therefore, the negative response to Question B does not present a concern regarding the protectiveness of the remedies.

5.8.3 Question C: Has any other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

The document and data reviews, site inspection and interviews identified no information that would call into question the protectiveness of the remedy implemented for IRP-11, -13W, and MMS-04. In addition, there have been no technology developments, or advances in science that have come to light to call into question the protectiveness of the remedy.

The response to Question C for IRP-11, -13W, and MMS-04 is: "negative."

5.8.4 Technical Assessment Summary

Based on the monitoring data and documents reviewed, the site inspection, and interviews, the remedy for IRP-11-and -13W is functioning as intended by the ROD/RAP. Groundwater monitoring data indicate that TCE groundwater concentrations are low and relatively stable. Site inspections and interviews revealed no evidence of any activities at the Site that are inconsistent with the land-use restrictions established in the FOSET and anticipated in the LUC RD (in preparation). The evaluation of the ARARs which were documented in the ROD/RAP indicated that there were no significant changes to the standards/requirements identified as ARARs that could negatively affect the protectiveness of the remedy at the Sites. Additionally, no newly promulgated standards were identified that could negatively affect the protectiveness of the remedy.

The remedy for IRP-11, -13W, and MMS-04 was designed to prevent contact with TCE impacted groundwater through ICs. The ICs do not specifically address the VI pathway, and updated toxicity criteria for TCE were published in September 2011; therefore, this review included an evaluation of VI risk employing the updated TCE toxicity criteria. Using the maximum TCE groundwater concentration reported in the Fourth Quarter 2011 groundwater monitoring event, the estimated maximum VI cancer risk and non-cancer hazard are well below regulatory levels of concern. There is no other information that calls into question the protectiveness of the remedy.

5.9 ISSUES

No issues have been identified for IRP-11 and -13W that currently or in the future would prevent the respective remedies at these Sites from being protective of human health and the environment.

Since MMS-04 has received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a), no subsequent five-year reviews are required for MMS-04.

5.10 RECOMMENDATIONS AND FOLLOW-UP ACTIONS

No issues have been identified for IRP-11, -13W, and MMS-04 that currently or in the future would prevent the respective remedies at these Sites from being protective of human health and/or the environment; therefore, no follow-up actions are required to ensure protectiveness of the remedies for these Sites.

Since MMS-04 has received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a), no subsequent five-year reviews are required for MMS-04.

5.11 PROTECTIVENESS STATEMENT

Based on these findings, the remedies at IRP-11 and -13W are being implemented in accordance with the ROD/RAP (DoN 2010) and are protective of human health and the environment.

MMS-04 has already received an NFA determination as documented in the Final RACR (AIS-T&N JV 2011a).

5.12 NEXT REVIEW

The next five-year review for Former MCAS Tustin will be completed by October 31, 2016, five years from the signature date of the Final CERCLA Five-Year Review Report (DoN

2011a). In accordance with the U.S. EPA guidance, DoN policy, and Final CERCLA Five-Year Review Report; future five-year reviews will not be conducted for MMS-04.

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6. Responses to Comments

The Navy has received comments on the Draft version of this report from interested stakeholders. These comments along with the Navy's responses are included in Attachment 6

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7. References

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_____. 2009, *Proposed Plan, Draft Remedial Action Plan, Operable Unit 4B, Former Marine Corps Air Station, Tustin, California.* February.

_____. 2010. *Final Record of Decision/Remedial Action Plan, Operable Unit 4B, IRP-5, -6, -11, -13W, MMS-04, and MPA, Former Marine Corps Air Station, Tustin, California.* March.

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_____ 2011b. *Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Five-Year Reviews.* June 7.

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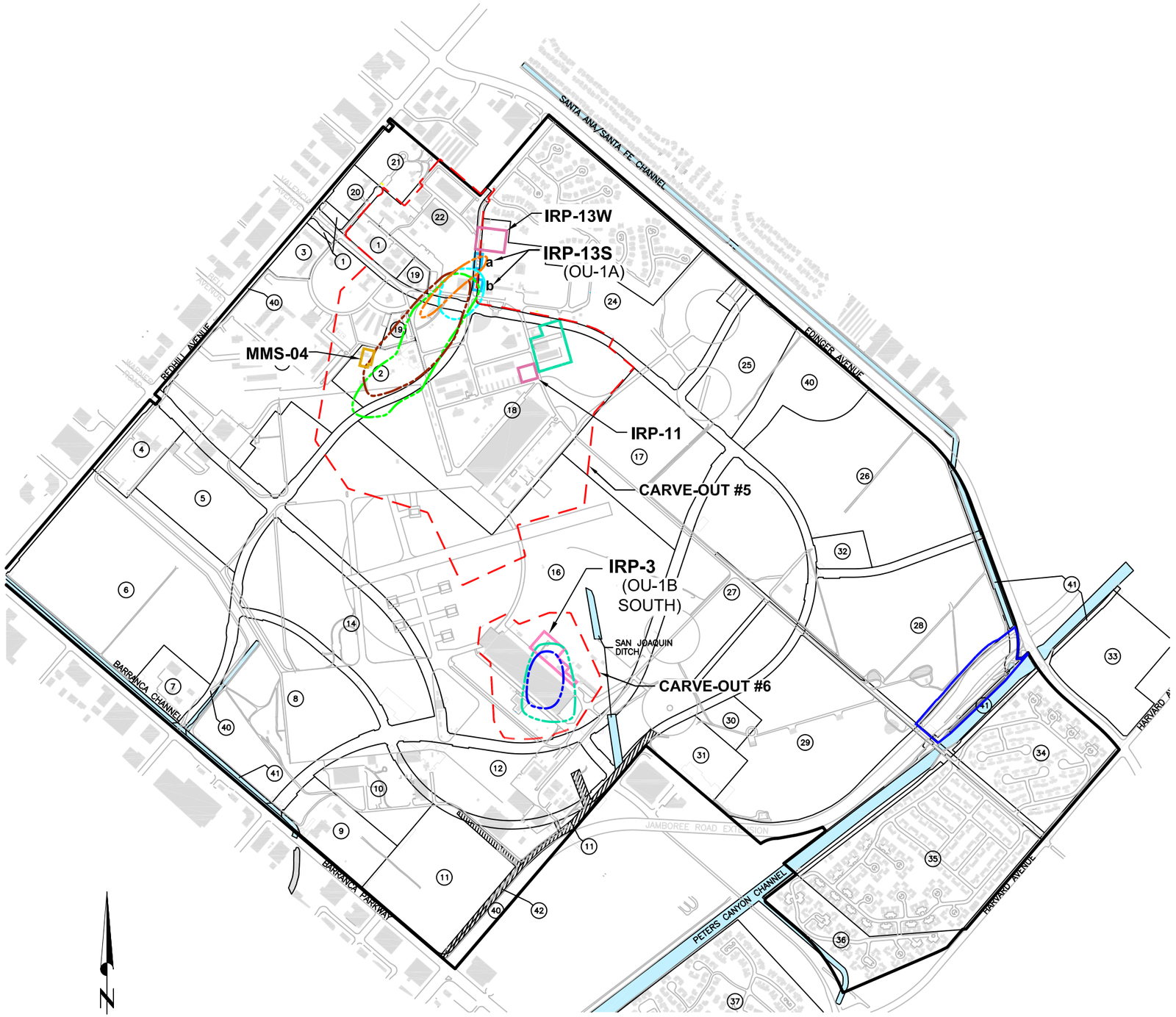
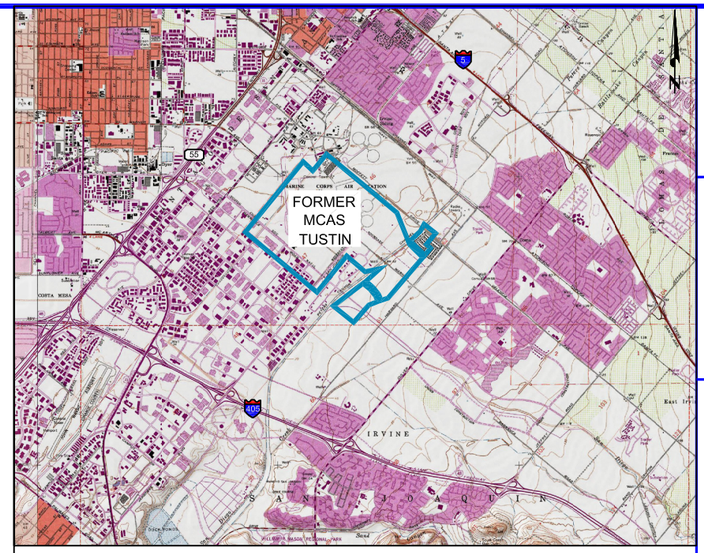
FIGURES





VICINITY MAP

0 .5 1 Mile

LEGEND:

- FORMER MCAS TUSTIN BOUNDARY
- ROAD OR PAVED AREA
- RAILROAD
- SURFACE CHANNEL
- BOX CULVERT CHANNEL
- BUILDING OR STRUCTURE
- (2) PARCEL NUMBER
- PARCEL BOUNDARY
- CARVE-OUT AREA
- a TEMPORARY STORAGE AREA ST-72
- b MISCELLANEOUS WASH AREA MWA-18
- IRP INSTALLATION RESTORATION PROGRAM
- OU OPERABLE UNIT
- TCE TRICHLOROETHENE
- 1,2,3 TCP 1,2,3 TRICHLOROPROPANE
- PLUME OUTLINE_TCE_FIRST WBZ_OU-1A
- PLUME OUTLINE_TCE_FIRST WBZ_OU-1B SOUTH
- PLUME OUTLINE_TCE_SECOND WBZ_OU-1A
- PLUME OUTLINE_TCE_SECOND WBZ_OU-1B SOUTH
- PLUME OUTLINE_TCP_FIRST WBZ_OU-1A
- PLUME OUTLINE_TCP_SECOND WBZ_OU-1A

FIGURE 1-1

Base Realignment and Closure
Program Management Office West

FORMER MARINE CORPS AIR STATION
TUSTIN, CALIFORNIA

FIVE - YEAR REVIEW ADDENDUM
IRP-3, -11, -13S, -13W, and MMS-04

FORMER MCAS TUSTIN LOCATION MAP

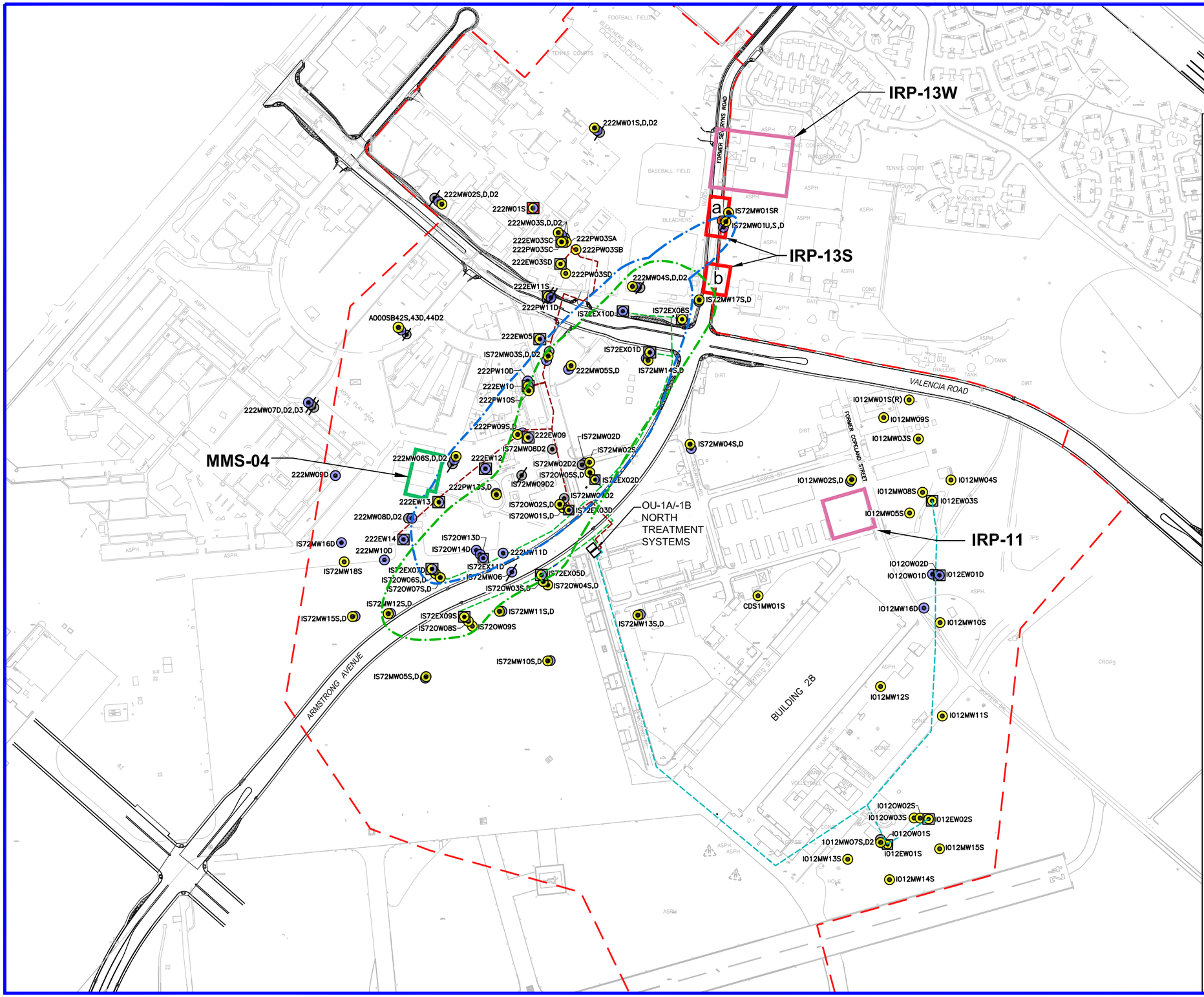
Enviro Compliance Solutions, Inc.
1571 Parkway Loop, Suite B
Tustin, CA 92780
PHONE No.: 714 - 259 - 0295
FAX No.: 714 - 259 - 0296

FIGURE 1-2

Base Realignment and Closure
Program Management Office West

FORMER MARINE CORPS AIR STATION
TUSTIN, CALIFORNIA

FIVE - YEAR REVIEW ADDENDUM
IRP-3, -11, -13S, -13W, and MMS-04
IRP-11, -13S, -13W, and MMS-04 SITE PLAN



LEGEND:

- Groundwater Monitoring Well (Upper Clay)
- Groundwater Monitoring Well (First WBZ)
- Groundwater Monitoring Well (Second WBZ)
- Groundwater Monitoring Well (Third WBZ)
- Infiltration Well (First & Second WBZ)
- Groundwater Extraction Well (First WBZ)
- Groundwater Extraction Well (Second WBZ)
- Groundwater Extraction Well (First & Second WBZ)
- Slash Through Well Symbol Indicates Properly Destroyed Well
- VOC Plume First WBZ
- VOC Plume Second WBZ
- Conveyance Piping (PCAP)
- Conveyance Piping (OU-1A)
- Conveyance Piping (OU-1B North)
- Carve-Out #5 Boundary

WELL ID SUFFIX

U = Upper Clay
S, SA, SB, SC, SD, SR = First WBZ
D = Second WBZ
D2 = Third WBZ

ABBREVIATIONS

a = Temporary Storage Area ST-72
b = Miscellaneous Wash Area MWA-18
OU = Operable Unit
WBZ = Water-Bearing Zone

NOTE:

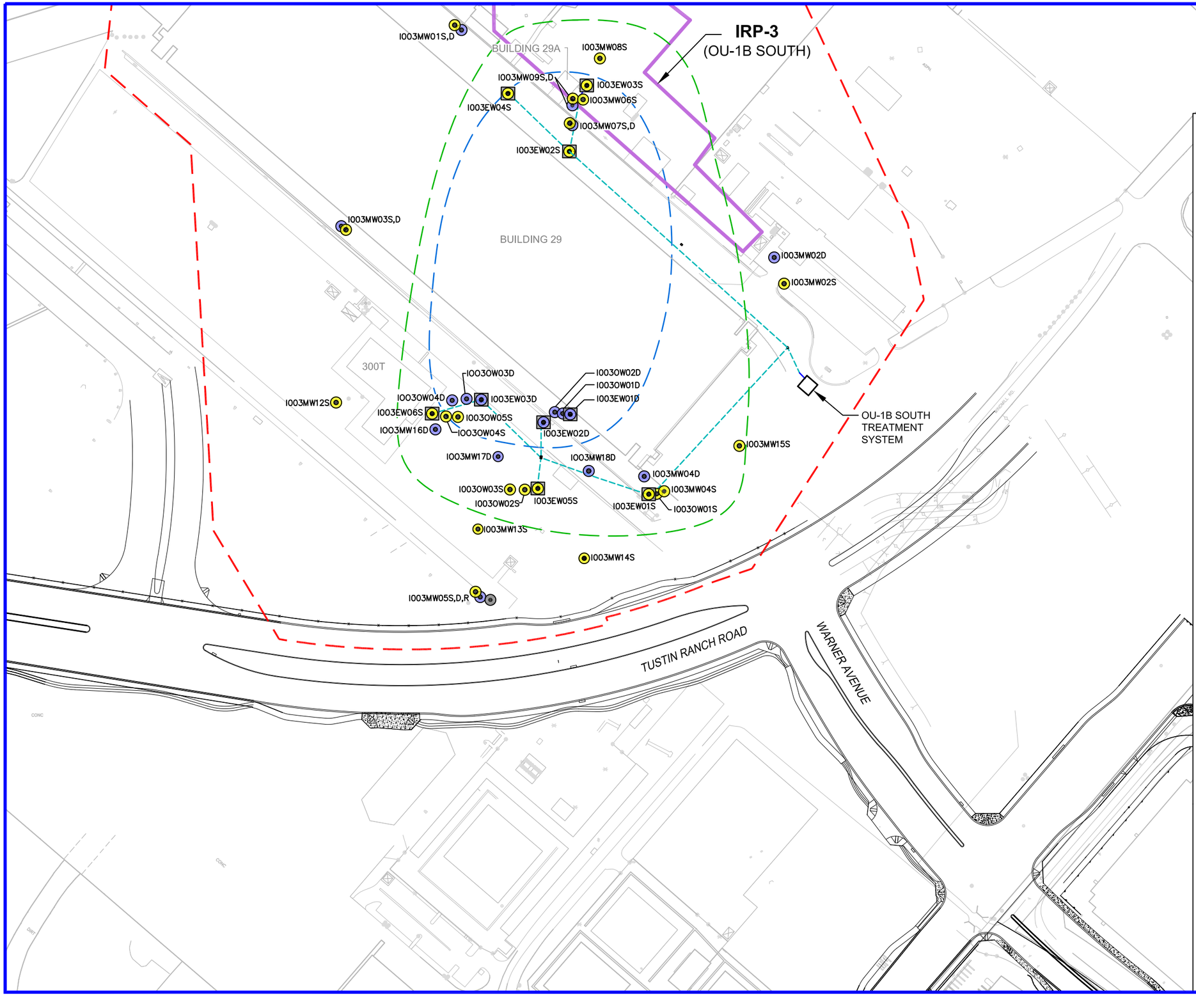
1. VOC Plume boundaries include 1,2,3-Trichloropropane and Trichloroethene

N

0 200 400

APPROXIMATE SCALE IN FEET

Enviro Compliance Solutions, Inc.
1571 Parkway Loop, Suite B
Tustin, CA 92780
Phone No.: 714-259-0295
Fax No.: 714-259-0296



LEGEND:

- Groundwater Monitoring Well (First WBZ)
- Groundwater Monitoring Well (Second WBZ)
- Groundwater Monitoring Well (Third WBZ)
- Groundwater Extraction Well (First WBZ)
- Groundwater Extraction Well (Second WBZ)
- Carve-Out #6 Boundary
- Conveyance Piping (OU-1B South)
- Plume outline TCE First WBZ
- Plume outline TCE Second WBZ

WELL ID SUFFIX

S = First WBZ
D = Second WBZ
R = Third WBZ

ABBREVIATIONS

4Q = 4th Quarter
OU = Operable Unit
TCE = Trichloroethene
WBZ = Water-Bearing Zone

N

0 80 160

APPROXIMATE SCALE IN FEET

FIGURE 1-3

Base Realignment and Closure
Program Management Office West

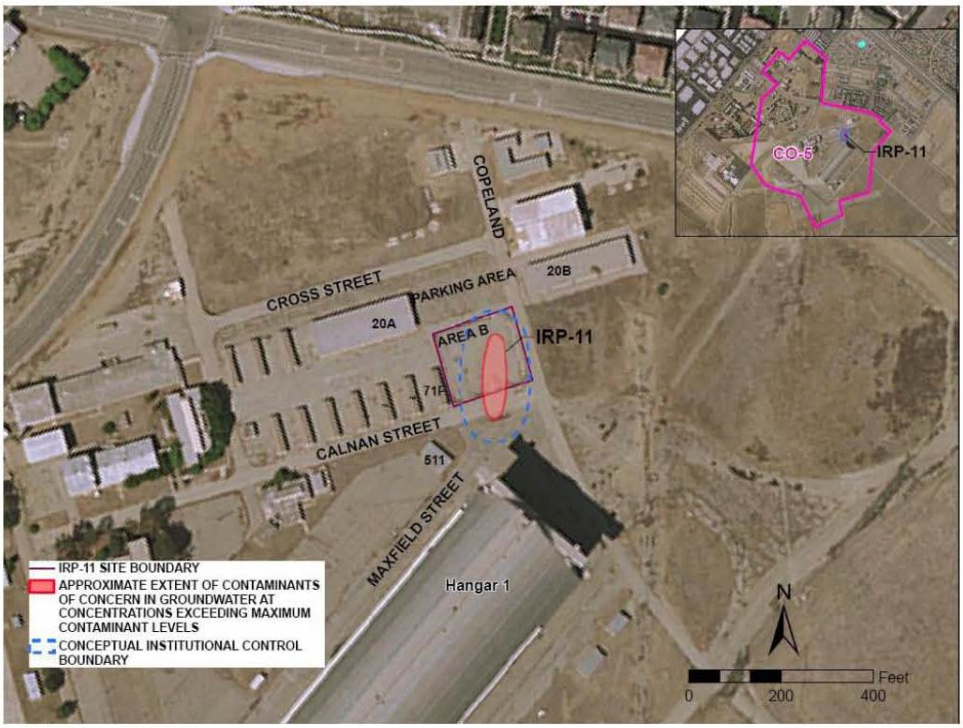
TUSTIN, CALIFORNIA

FORMER MARINE CORPS AIR STATION

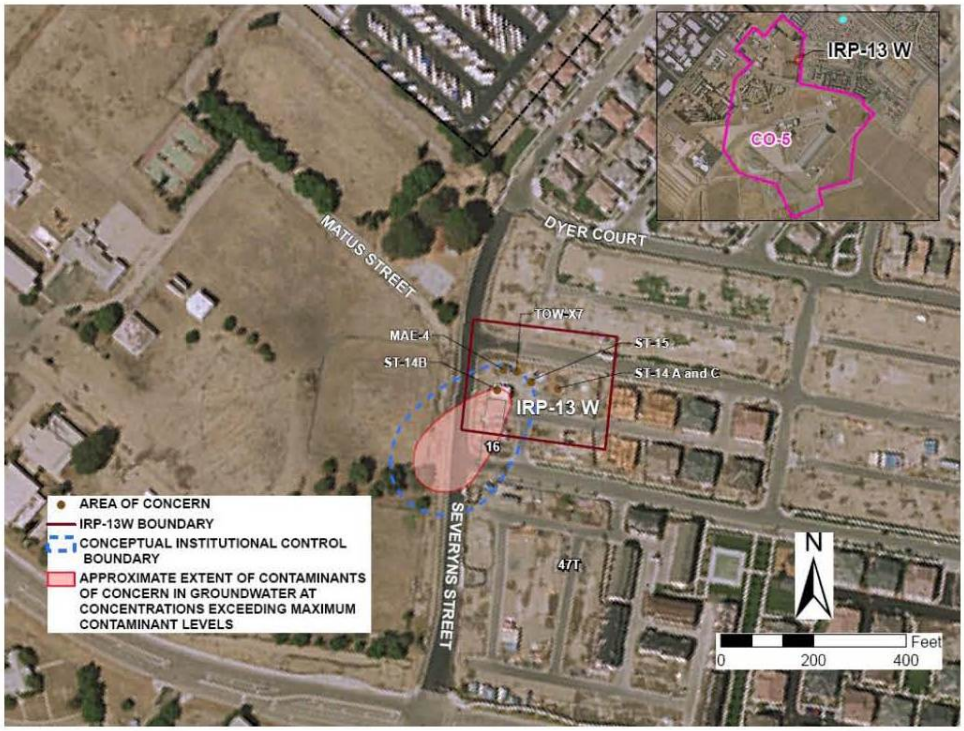
FIVE - YEAR REVIEW ADDENDUM
IRP-3, -11, -13S, -13W, and MMS-04

IRP-3 SITE PLAN

Enviro Compliance Solutions, Inc.
1571 Parkway Loop, Suite B
Tustin, CA 92780
Phone No.: 714-259-0295
Fax No.: 714-259-0296



IRP-11 LOCATION MAP



IRP-13W LOCATION MAP

Enviro Compliance Solutions, Inc.
1571 Parkway Loop, Suite B
Tustin, CA 92780

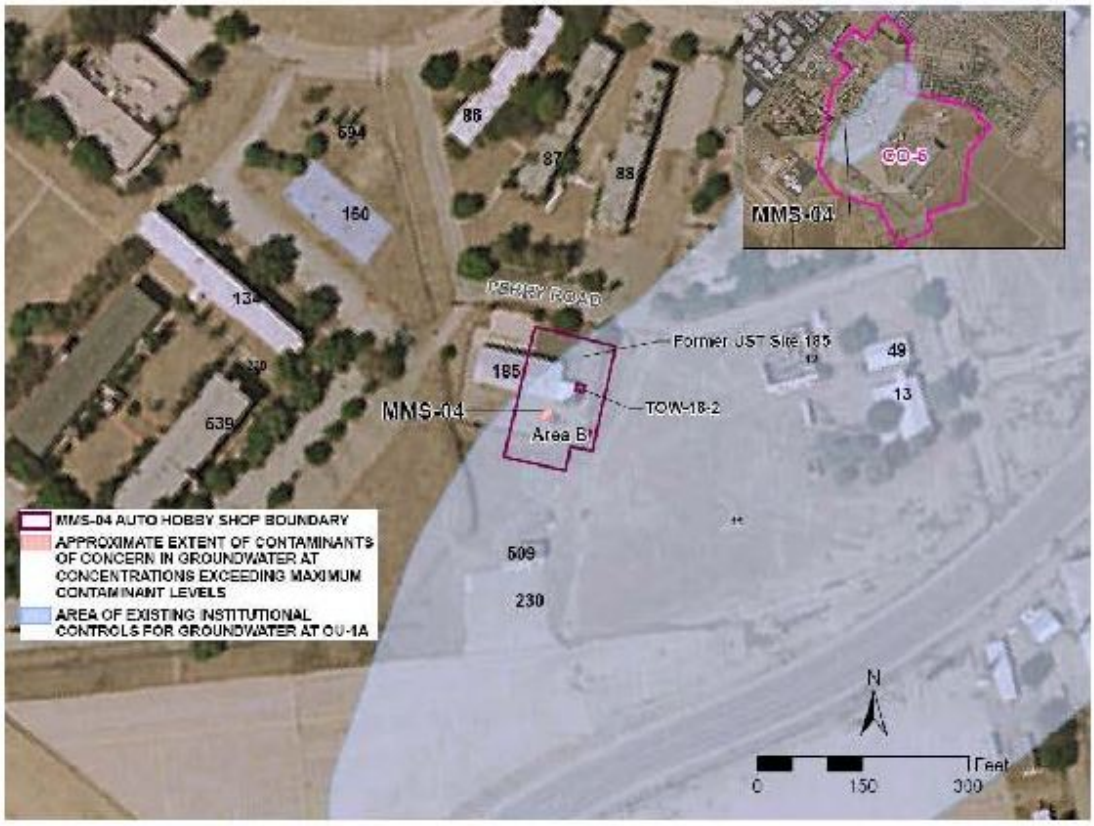
FORMER MARINE CORPS AIR STATION TUSTIN, CALIFORNIA

FIVE-YEAR REVIEW ADDENDUM

IRP-11 & -13W Site Location Map

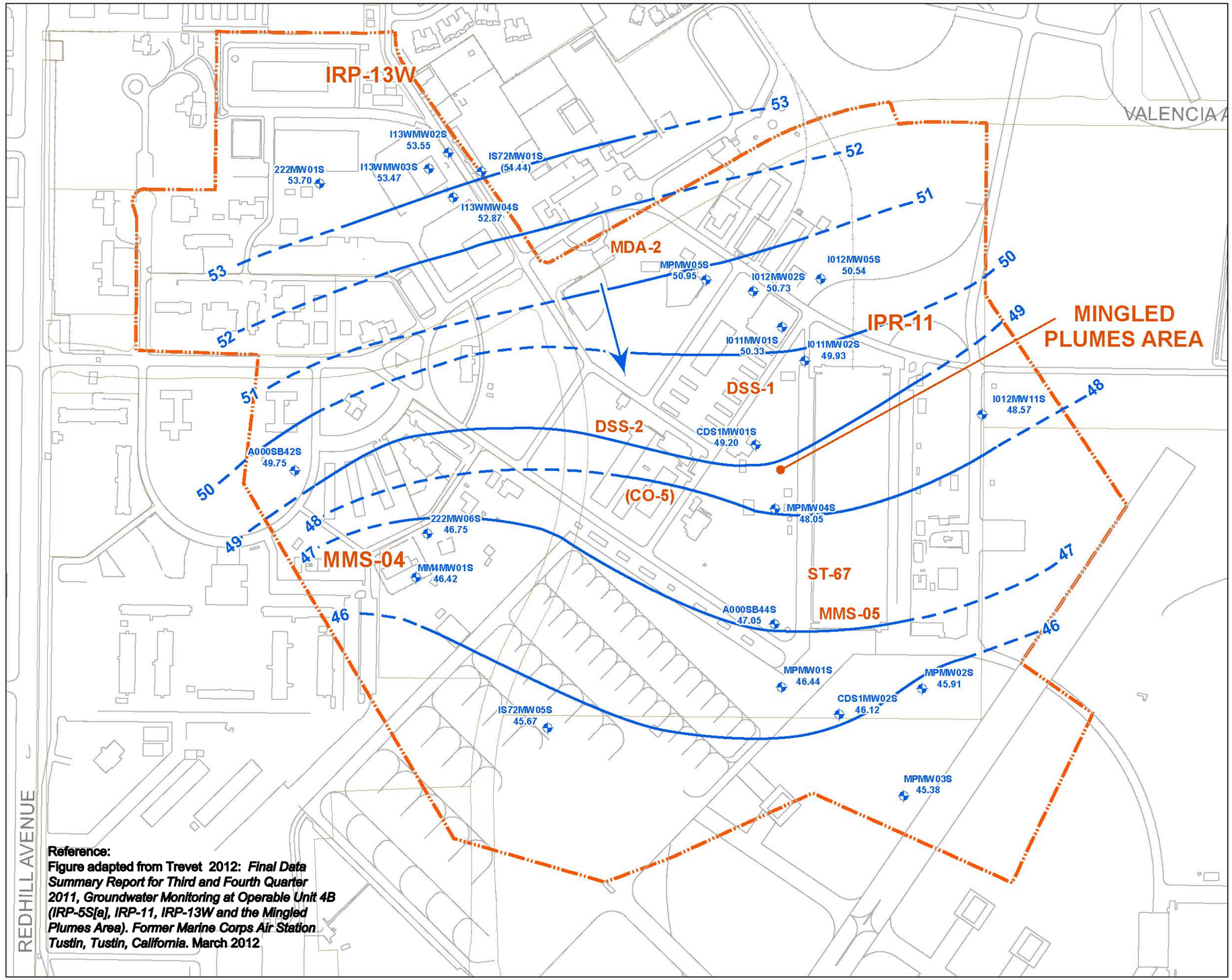
Base Realignment and Closure Program Management Office West

FIGURE 5-1



MMS-04 LOCATION MAP

Reference:
Figures 3-1 and 3-2 were adapted from DoN 2010: Final Record of Decision/Remedial Action Plan for Operable Unit 4B, Former Marine Corps Air Station, Tustin, California. January 15.



Reference:
Figure adapted from Trevet 2012: *Final Data Summary Report for Third and Fourth Quarter 2011, Groundwater Monitoring at Operable Unit 4B (IRP-5S[a], IRP-11, IRP-13W and the Mingled Plumes Area). Former Marine Corps Air Station Tustin, Tustin, California.* March 2012

LEGEND

- I13WMW02S — MONITORING WELL: FIRST WATER-BEARING ZONE
- 53.7 — GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (BASED ON 02 NOVEMBER 2011 GROUNDWATER LEVEL MEASUREMENTS)
- (54.44) — NOT USED FOR CONTOURING
- 53 — GROUNDWATER ELEVATION CONTOUR (DASHED WHERE APPROXIMATE)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- NAVY PROPERTY CARVE-OUT BOUNDARY
- NEW ROAD ALIGNMENT

NOTES:

CO - CARVE-OUT
DSS - DISPOSAL SANITARY SEWER
IRP - INSTALLATION RESTORATION PROGRAM
MDA - MISCELLANEOUS DISPOSAL AREA
MMS - MISCELLANEOUS MAJOR SPILL
OU- OPERABLE UNIT
ST - STORAGE, TEMPORARY

GRAPHIC SCALE
0 200 400 800
(IN FEET)
1 INCH = 400 FEET

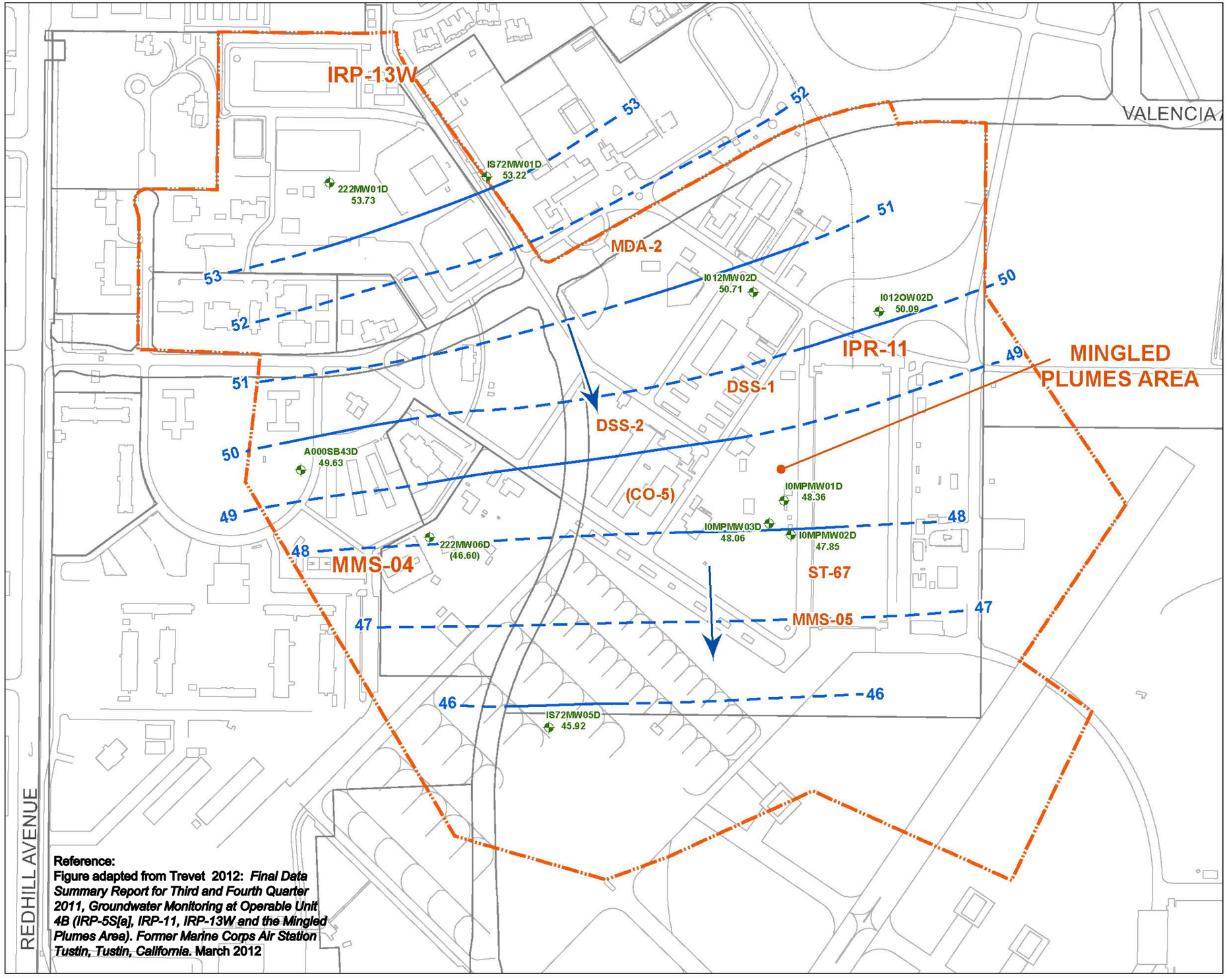
DEPARTMENT OF THE NAVY — SAN DIEGO, CALIFORNIA
NAVFAC SOUTHWEST

DATA SUMMARY REPORT FOR THIRD AND FOURTH QUARTER
2011 GROUNDWATER MONITORING, OU-4B
FORMER MARINE CORPS AIR STATION TUSTIN
TUSTIN, CALIFORNIA
WATER LEVEL ELEVATIONS - FIRST WATER-BEARING ZONE, IRP-11, IRP-13W, MMS-04, AND THE MINGLED PLUMES AREA, FOURTH QUARTER 2011

FIGURE 5-3

ENVIRO COMPLIANCE SOLUTIONS, INC.
Env Engineering • Construction • Remediation

Date: 3/2/2012 Path: N:\GIS_Projects\Tustin\Figs_GW_3rd4th_2011_2-12\Fig8_3rd4th_OU4B_2011_2-12.mxd



Reference:
Figure adapted from Trevet 2012: *Final Data Summary Report for Third and Fourth Quarter 2011, Groundwater Monitoring at Operable Unit 4B (IRP-5S[a], IRP-11, IRP-13W and the Mingled Plumes Area). Former Marine Corps Air Station Tustin, Tustin, California.* March 2012

LEGEND

- 222MW01D — MONITORING WELL: SECOND WATER-BEARING ZONE
- 53.73 — GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (BASED ON 02 NOVEMBER 2011 GROUNDWATER LEVEL MEASUREMENTS)
- (46.60) — NOT USED FOR CONTOURING
- 53 — GROUNDWATER ELEVATION CONTOUR (DASHED WHERE APPROXIMATE)
- APPROXIMATE GROUNDWATER FLOW DIRECTION
- NAVY PROPERTY CARVE-OUT BOUNDARY
- NEW ROAD ALIGNMENT

NOTES:

CO - CARVE-OUT
DSS - DISPOSAL SANITARY SEWER
IRP - INSTALLATION RESTORATION PROGRAM
MDA - MISCELLANEOUS DISPOSAL AREA
MMS - MISCELLANEOUS MAJOR SPILL
OU- OPERABLE UNIT
ST - STORAGE, TEMPORARY

GRAPHIC SCALE
0 200 400 800
(IN FEET)
1 INCH = 400 FEET

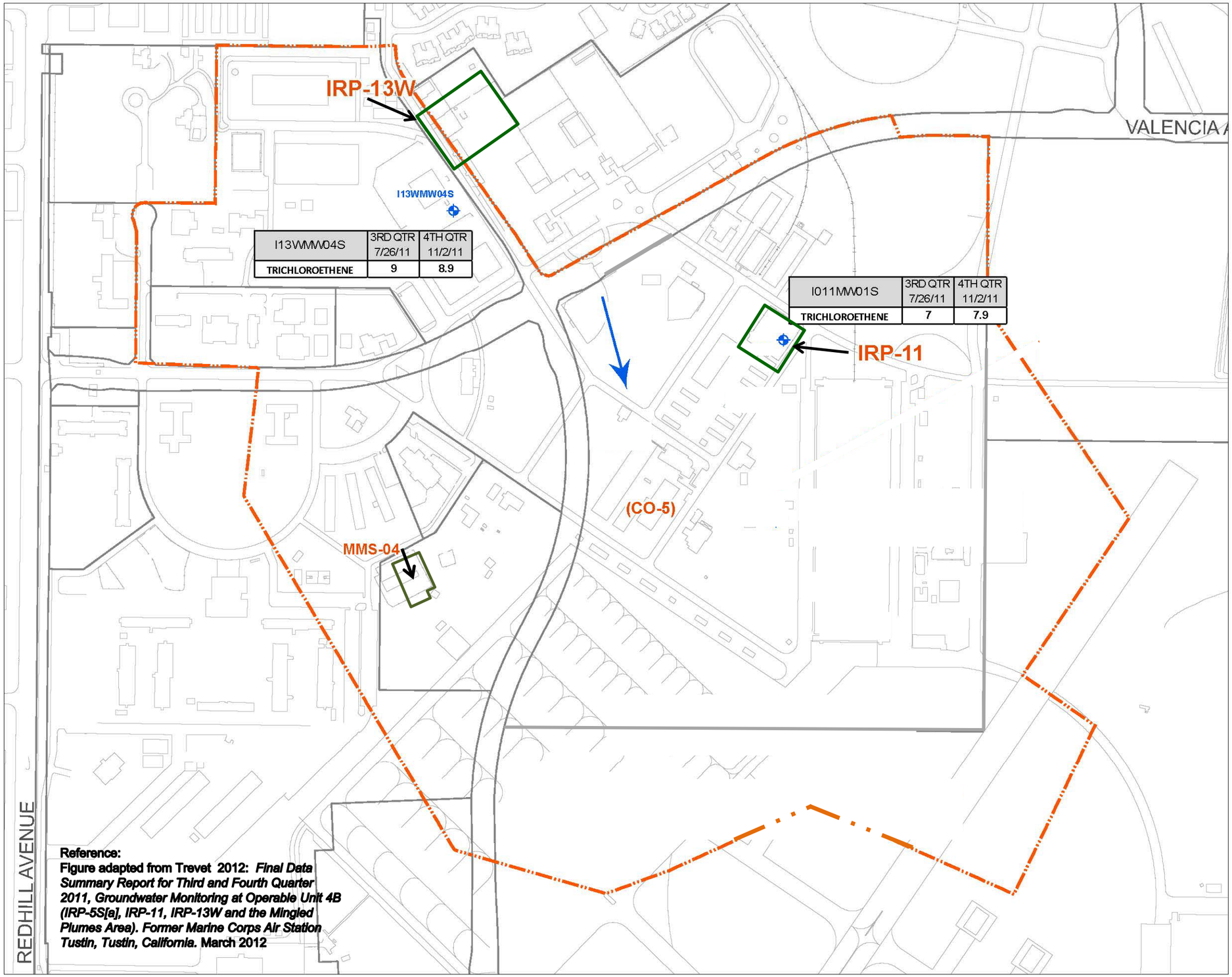
DEPARTMENT OF THE NAVY — SAN DIEGO, CALIFORNIA
NAVFAC SOUTHWEST

DATA SUMMARY REPORT FOR THIRD AND FOURTH QUARTER
2011 GROUNDWATER MONITORING, OU-4B
FORMER MARINE CORPS AIR STATION TUSTIN
TUSTIN, CALIFORNIA
WATER LEVEL ELEVATIONS - SECOND WATER-BEARING ZONE, IRP-11, IRP-13W, MMS-04, AND THE MINGLED PLUMES AREA, FOURTH QUARTER 2011

FIGURE 5-4

ENVIRO COMPLIANCE SOLUTIONS, INC.
Env Engineering • Construction • Remediation

Date: 3/2/2012 Path: N:\GIS_Projects\Tustin\Figs_GW_3rd4th_2011_2-12\Fig10_3rd4th_OU4B_2011_2-12.mxd



LEGEND

I13WMW04S — MONITORING WELL: FIRST WATER-BEARING ZONE

APPROXIMATE GROUNDWATER FLOW DIRECTION

NAVY PROPERTY CARVE-OUT BOUNDARY

NEW ROAD ALIGNMENT

MONITORING WELL IDENTIFICATION

MPMW04S	3RD QTR 7/26/11	4TH QTR 11/2/11
TRICHLOROETHENE	14	15

ANALYTE (BOLD IF EXCEEDS MCL)

CONCENTRATION IN MICROGRAMS PER LITER (ug/l)

NOTES:

CO - CARVE-OUT
DSS - DISPOSAL SANITARY SEWER
IRP - INSTALLATION RESTORATION PROGRAM
MCL - MAXIMUM CONTAMINANT LEVEL
MDA - MISCELLANEOUS DISPOSAL AREA
MMS - MISCELLANEOUS MAJOR SPILL
ST - STORAGE, TEMPORARY
OU- OPERABLE UNIT
QTR - QUARTER
TRICHLOROETHENE MCL = 5 ug/L

GRAPHIC SCALE
0 200 400 800
(IN FEET)
1 INCH = 400 FEET

DEPARTMENT OF THE NAVY — SAN DIEGO, CALIFORNIA

NAVFAC SOUTHWEST

DATA SUMMARY REPORT FOR THIRD AND FOURTH QUARTER
2011 GROUNDWATER MONITORING, OU-4B
FORMER MARINE CORPS AIR STATION TUSTIN
TUSTIN, CALIFORNIA

TRICHLOROETHENE IN THE FIRST WATER-BEARING ZONE, IRP-11, IRP-13W, AND THE MINGLED PLUMES AREA, THIRD AND FOURTH QUARTER 2011

FIGURE 5-5

ENVIRO COMPLIANCE SOLUTIONS, INC.
Get it Done Safely — Env Engineering • Construction • Remediation

Date: 2/29/2012 Path: N:\GIS_Projects\Tustin\Figs_GW_3rd4th_2011_2-12\Fig12_3rd4th_OU4B_2011_2-12.mxd

ATTACHMENT 1

VAPOR INTRUSION MODEL SPREADSHEETS

DATA ENTRY SHEET

GW-SCREEN
Version 3.0; 04/03

Reset to Defaults

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 12/6/2011)

Incremental Cancer Risks and Health Quotient per Unit Concentration Factors for OU-1A
Estimated Using USEPA Toxicity Values - RESIDENTIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.00E+00	Trichloroethene
96184	1.00E+00	1,2,3-Trichloropropane
75014	1.00E+00	Vinyl chloride (chloroethene)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	243.84	C	24.2	5

MORE

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS (Lookup Soil)	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
		1.00E-08	C	1.399	0.473	0.216

MORE

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)
Trichloroethene	7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.0E-06	2.0E-03	228.84	0.257	#N/A
1,2,3-Trichloropropane	7.10E-02	7.90E-06	4.08E-04	25	9,171	430.00	652.00	2.20E+01	1.75E+03	0.0E+00	3.0E-04	228.84	0.257	#N/A
Vinyl chloride (chloroethene)	1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	4.4E-06	1.0E-01	228.84	0.257	#N/A

Incremental Cancer Risks and Health Quotient per Unit Concentration Factors for OU-1A
Estimated Using USEPA Toxicity Values

Chemical	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)
Trichloroethene	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	8,380
1,2,3-Trichloropropane	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	10,917
Vinyl chloride (chloroethene)	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	4,838

Incremental Cancer Risks and Health Quotient per Unit Concentration Factors for OU-1A
Estimated Using USEPA Toxicity Values

Chemical	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{v} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_{T} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethene	9.89E-03	4.05E-01	1.80E-04	3.84E-03	1.99E-05	5.53E-05	228.84	15	4.05E+02	1.25	8.33E+01	3.84E-03	5.00E+03	7.16E+18	7.11E-06
1,2,3-Trichloropropane	3.88E-04	1.59E-02	1.80E-04	3.46E-03	1.36E-04	3.56E-04	228.84	15	1.59E+01	1.25	8.33E+01	3.46E-03	5.00E+03	7.96E+20	4.51E-05
Vinyl chloride (chloroethene)	2.63E-02	1.08E+00	1.80E-04	5.15E-03	2.21E-05	6.14E-05	228.84	15	1.08E+03	1.25	8.33E+01	5.15E-03	5.00E+03	1.13E+14	7.90E-06

Incremental Cancer Risks and Health Quotient per Unit Concentration Factors for OU-1A
Estimated Using USEPA Toxicity Values

Chemical	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	
Trichloroethene	2.88E-03		4.0E-06	2.0E-03	4.7E-09	1.4E-03	END
1,2,3-Trichloropropane	7.17E-04		NA	3.0E-04	NA	2.3E-03	END
Vinyl chloride (chloroethene)	8.53E-03		4.4E-06	1.0E-01	1.5E-08	8.2E-05	END

Incremental Cancer Risks and Health Quotient per Unit Concentration Factors for OU-1A
Estimated Using USEPA Toxicity Values

DATA ENTRY SHEET

GW-SCREEN
Version 3.0; 04/03

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 12/6/2011)

Incremental Cancer Risks and Health Quotient Per Unit Concentration Factors for OU-1A Estimated Using Cal-EPA Toxicity Values - RESIDENTIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.00E+00	Trichloroethene
96184	1.00E+00	1,2,3-Trichloropropane
75014	1.00E+00	Vinyl chloride (chloroethene)

MORE

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	243.84	C	24.2	5

MORE

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type Lookup Soil	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
		1.00E-08	C	1.399	0.473	0.216

MORE

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)
Trichloroethene	7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03	228.84	0.257	#N/A
1,2,3-Trichloropropane	7.10E-02	7.90E-06	4.08E-04	25	9,171	430.00	652.00	2.20E+01	1.75E+03	8.6E-03	3.0E-04	228.84	0.257	#N/A
Vinyl chloride (chloroethene)	1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	7.8E-05	1.0E-01	228.84	0.257	#N/A

Incremental Cancer Risks and Health Quotient Per Unit Concentration Factors for OU-1A

Estimated Using Cal-EPA Toxicity Values

Chemical	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)
Trichloroethene	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	8,380
1,2,3-Trichloropropane	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	10,917
Vinyl chloride (chloroethene)	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	4,838

Incremental Cancer Risks and Health Quotient Per Unit Concentration Factors for OU-1A

Estimated Using Cal-EPA Toxicity Values

Chemical	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{v} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_{T} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethene	9.89E-03	4.05E-01	1.80E-04	3.84E-03	1.99E-05	5.53E-05	228.84	15	4.05E+02	1.25	8.33E+01	3.84E-03	5.00E+03	7.16E+18	7.11E-06
1,2,3-Trichloropropane	3.88E-04	1.59E-02	1.80E-04	3.46E-03	1.36E-04	3.56E-04	228.84	15	1.59E+01	1.25	8.33E+01	3.46E-03	5.00E+03	7.96E+20	4.51E-05
Vinyl chloride (chloroethene)	2.63E-02	1.08E+00	1.80E-04	5.15E-03	2.21E-05	6.14E-05	228.84	15	1.08E+03	1.25	8.33E+01	5.15E-03	5.00E+03	1.13E+14	7.90E-06

Incremental Cancer Risks and Health Quotient Per Unit Concentration Factors for OU-1A

Estimated Using Cal-EPA Toxicity Values

Chemical	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	
Trichloroethene	2.88E-03		4.1E-06	2.0E-03	4.9E-09	1.4E-03	END
1,2,3-Trichloropropane	7.17E-04		8.6E-03	3.0E-04	2.5E-06	2.3E-03	END
Vinyl chloride (chloroethene)	8.53E-03		7.8E-05	1.0E-01	2.7E-07	8.2E-05	END

Incremental Cancer Risks and Health Quotient Per Unit Concentration Factors for OU-1A

Estimated Using Cal-EPA Toxicity Values

DATA ENTRY SHEET

GW-SCREEN
Res 3.0; 04/03

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 12/6/2011)

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using USEPA Toxicity Values - RESIDENTIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.00E+00	Trichloroethene
75014	1.00E+00	Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	152.4	C	24.2	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
		1.00E-08	C	1.410	0.468	0.215

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)
Trichloroethene	7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.0E-06	2.0E-03	137.4	0.252	#N/A
Vinyl chloride (chloroethene)	1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	4.4E-06	1.0E-01	137.4	0.252	#N/A

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using USEPA Toxicity Values

Chemical	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)
Trichloroethene	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	8,380
Vinyl chloride (chloroethene)	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	4,838

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using USEPA Toxicity Values

OU-1B SOUTH - RESIDENTIAL SCENARIO

Chemical	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{V} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_{T} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent o equivalent foundation Peclet number, exp(Pe^f) (unitless)	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethene	9.89E-03	4.05E-01	1.80E-04	3.69E-03	1.99E-05	3.34E-05	137.4	15	4.05E+02	1.25	8.33E+01	3.69E-03	5.00E+03	4.34E+19	7.15E-06
Vinyl chloride (chloroethene)	2.63E-02	1.08E+00	1.80E-04	4.95E-03	2.21E-05	3.71E-05	137.4	15	1.08E+03	1.25	8.33E+01	4.95E-03	5.00E+03	4.34E+14	7.93E-06

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using USEPA Toxicity Values

Chemical	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	
Trichloroethene	2.90E-03		4.0E-06	2.0E-03	4.8E-09	1.4E-03	END
Vinyl chloride (chloroethene)	8.57E-03		4.4E-06	1.0E-01	1.5E-08	8.2E-05	END

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using USEPA Toxicity Values

DATA ENTRY SHEET

GW-SCREEN
Res 3.0; 04/03

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 12/6/2011)

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using Cal-EPA Toxicity Values - RESIDENTIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.00E+00	Trichloroethene
75014	1.00E+00	Vinyl chloride (chloroethene)

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
15	152.4	C	24.2	5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
		1.00E-08	C	1.410	0.468	0.215

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

END

Chemical	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)
Trichloroethene	7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03	137.4	0.252	#N/A
Vinyl chloride (chloroethene)	1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	7.8E-05	1.0E-01	137.4	0.252	#N/A

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using Cal-EPA Toxicity Values

Chemical	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)	Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)
Trichloroethene	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	8,380
Vinyl chloride (chloroethene)	#N/A	#N/A	1.00E-08	81.52	0.459	0.047	0.412	4,000	3.39E+04	1.00E+06	5.00E-03	15	4,838

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using Cal-EPA Toxicity Values

Chemical	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_{V} (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_{T} (cm^2/s)	Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)
Trichloroethene	9.89E-03	4.05E-01	1.80E-04	3.69E-03	1.99E-05	3.34E-05	137.4	15	4.05E+02	1.25	8.33E+01	3.69E-03	5.00E+03	4.34E+19	7.15E-06
Vinyl chloride (chloroethene)	2.63E-02	1.08E+00	1.80E-04	4.95E-03	2.21E-05	3.71E-05	137.4	15	1.08E+03	1.25	8.33E+01	4.95E-03	5.00E+03	4.34E+14	7.93E-06

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using Cal-EPA Toxicity Values

Chemical	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)		Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)	
Trichloroethene	2.90E-03		4.1E-06	2.0E-03	4.9E-09	1.4E-03	END
Vinyl chloride (chloroethene)	8.57E-03		7.8E-05	1.0E-01	2.7E-07	8.2E-05	END

Incremental Cancer Risks and Health Quotients per Unit Concentration Factors for OU-1B South Estimated Using Cal-EPA Toxicity Values

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^{-3}/cm^{-3})	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

LOOKUP Table
Using USEPA Toxicity Values

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 12/02/2011 DTSC/HERO)

Original EPA Values

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.1E+01	5.81E+01		X	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	5.3E-06	**3.0E-01**	1.19E+02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	5.0E+00	1.33E+02			0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.8E-06	9.0E-02	5.05E+01			1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01			0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?		8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**4.4E-06**	1.0E-01	6.25E+01			8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01			2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01			0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	**3.0E-02**	4.41E+01		?	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	7.0E-01	9.90E+01		X	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.2E-03	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X
79016	Trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.0E-06	**2.0E-03**	1.31E+02			1.1E-04	4.0E-02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02			0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02			0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	0.0E+00	3.0E-04	1.47E+02	X		5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X

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98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		
100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02			0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	**9.0E-01**	1.04E+02			0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	1.0E-03	1.27E+02	?		4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	**8.0E-04**	1.88E+02			6.0E-04	9.0E-03		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	**1.7E-04**	2.0E-03	5.41E+01			3.0E-05	0.0E+00		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01			0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	**4.0E-01**	9.90E+01			2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	**2.9E-04**	2.0E-03	5.31E+01			6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	**2.0E-01**	8.61E+01			0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02			0.0E+00	8.0E-02		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	**3.0E-01**	9.21E+01			0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	**1.0E+00**	1.13E+02			0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01			0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	**7.1E-04**	0.0E+00	1.43E+02			3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	**0.0E+00**	4.0E-03	1.81E+02			0.0E+00	2.0E-01		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	**2.7E-05**	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			3.0E-06	0.0E+00		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	**1.1E-04**	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	**1.1E-05**	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	**4.9E-03**	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X
319846	TBD	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	0.0E+00	0.0E+00	2.91E+02			1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X	0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	**1.6E-05**	2.0E-02	1.11E+02			4.0E-06	2.0E-02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X	7.4E-06	1.1E-01		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	**2.6E-07**	3.0E+00	8.82E+01			0.0E+00	3.0E+00		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02			0.0E+00	3.0E-04		

VLOOKUP TABLES

Soil Properties Lookup Table							Bulk Density		
SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	(g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

LOOKUP Table
Using Cal-EPA Toxicity Values

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (ast updated 12/02/2011 DTSC/HERO)

Original EPA Values

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.1E+01	5.81E+01		X	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	5.3E-06	**3.0E-01**	1.19E+02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	**5.0E+00**	1.33E+02			0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.8E-06	9.0E-02	5.05E+01			1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01			0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?		8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01			8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01			2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01			0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	**3.0E-02**	4.41E+01		?	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	7.0E-01	9.90E+01		X	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.2E-03	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X
79016	Trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.1E-06	**2.0E-03**	1.31E+02			1.1E-04	4.0E-02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02			0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02			0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	8.6E-03	3.0E-04	1.47E+02	X		5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02			0.0E+00	1.0E+00			
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	**9.0E-01**	1.04E+02			0.0E+00	1.0E+00			
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	1.0E-03	1.27E+02	?		4.9E-05	0.0E+00	X		
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X	
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X	
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X	
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01			
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			0.0E+00	8.0E-01			
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	**8.0E-04**	1.88E+02			6.0E-04	9.0E-03			
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	**1.7E-04**	2.0E-03	5.41E+01			3.0E-05	0.0E+00			
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01			0.0E+00	2.0E-05			
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	**4.0E-01**	9.90E+01			2.6E-05	0.0E+00			
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	**2.9E-04**	2.0E-03	5.31E+01			6.8E-05	2.0E-03			
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	**2.0E-01**	8.61E+01			0.0E+00	2.0E-01			
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02			0.0E+00	8.0E-02			
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01			
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03			
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00			
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	**3.0E-01**	9.21E+01			0.0E+00	4.0E-01			
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	**1.0E+00**	1.13E+02			0.0E+00	6.0E-02			
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X	0.0E+00	1.4E+00		X	
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X	
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01			0.0E+00	2.0E-01			
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	**7.1E-04**	0.0E+00	1.43E+02			3.3E-04	0.0E+00			
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X	
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X	
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	**0.0E+00**	4.0E-03	1.81E+02			0.0E+00	2.0E-01			
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X		
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	**2.7E-05**	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X	
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04			
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03			
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			3.0E-06	0.0E+00			
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X	
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X	
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X	
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X	
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X	
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X	0.0E+00	7.0E-02		X	
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	**1.1E-04**	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X		
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	**1.1E-05**	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X		
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	**4.9E-03**	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X	
319846	TBD	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	0.0E+00	0.0E+00	2.91E+02			1.8E-03	0.0E+00			
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X	0.0E+00	1.1E-01		X	
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	**1.6E-05**	2.0E-02	1.11E+02			4.0E-06	2.0E-02			
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X	7.4E-06	1.1E-01		X	
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	**2.6E-07**	3.0E+00	8.82E+01			0.0E+00	3.0E+00			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02			0.0E+00	3.0E-04			

DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

OU-1A INDUSTRIAL SCENARIO

MORE ↓

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.00E+00	trichloroethene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
			Totals must add up to value of L_{WT} (cell G28)							
24	15	243.8	61	91.4		B	C	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-fillec porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
30	40	6038	2898	1000	0.1	0.75	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	83	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	228.8	0.265	0.244	0.244	0.284	1.52E-09	0.844	1.28E-09	81.52	0.459	0.047	0.412	17,872

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
3.65E+06	1.75E+07	1.02E-04	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.10E-03	3.42E-03	0.00E+00	1.99E-05	5.58E-05	228.8

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4.02E+02	0.10	5.62E+00	4.10E-03	1.79E+03	9.68E+09	6.65E-07	2.67E-04	4.1E-06	2.0E-03

END

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.9E-11	3.0E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

ERROR: Combined thickness of all soil strata must be = depth below grade to water table, or enter correct soil stratum directly above water table.

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)	
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00			
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04			
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	X	X	
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01		X	
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04		X	
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01		X	
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00			
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03		X	
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02			
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00			
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02		X	
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	X		
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03			
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02			
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03			
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02		X	
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	X		
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01			
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02			
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03			
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00			
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01			
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00			
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02		X	
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	X	X	
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01			
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01			
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01			
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01			
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01			
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01			
76131	1,1,2-Trichloro-1,2,2-trifluoroethai	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01			
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03		X	
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04			
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00		X	
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	X		
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00			
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02		X	
79016	trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.1E-06	2.0E-03	X		
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00		X	
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01		X	
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02			
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01			
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01		X	
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01		X	
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04		X	
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02		X	
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03			
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02		X	
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01		X	
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01			
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01			
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02		X	
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03			
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	8.6E-03	3.0E-04	X		DTSC
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01		X	
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01		X	
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01		X	
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01			
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01		X	
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03			

VLOOKUP TABLES

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04		

DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

OU-1A - INDUSTRIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
96184	1.00E+00	1,2,3-Trichloropropane

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell G28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
24	15	243.8	121.9	121.9		B	C	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
30	40	6038	2898	1000	0.1	0.75	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	83	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.10E-02	7.90E-06	4.08E-04	25	9,171	430.00	652.00	2.20E+01	1.75E+03	8.6E-03	3.0E-04

END

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	228.8	0.265	0.244	0.244	0.284	1.52E-09	0.844	1.28E-09	81.52	0.459	0.047	0.412	17,872

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
3.65E+06	1.75E+07	1.02E-04	15	10,919	3.83E-04	1.57E-02	1.80E-04	3.70E-03	3.09E-03	0.00E+00	1.37E-04	3.60E-04	228.8

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.57E+01	0.10	5.62E+00	3.70E-03	1.79E+03	1.18E+11	1.28E-06	2.01E-05	8.6E-03	3.0E-04

END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.75E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
1.4E-08	1.5E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroethai	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02		X
79016	trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.1E-06	2.0E-03	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	8.6E-03	3.0E-04	X		DTSC
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03		

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04		

DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

OU-1B SOUTH - INDUSTRIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	1.00E+00	trichloroethene

MORE ↓

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell G28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
24	15	152.4	61	91.4		B	C	SIC		

MORE ↓

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-fillec porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
Lookup Soil				Lookup Soil Parameters				Lookup Soil Parameters			
SIC	1.38	0.481	0.216	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE ↓

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
30	40	6038	2898	1000	0.1	0.75	

MORE ↓

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	83	1.0E-06	1
				Used to calculate risk-based groundwater concentration.	

END

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	137.4	0.265	0.244	0.244	0.284	1.52E-09	0.844	1.28E-09	81.52	0.459	0.047	0.412	17,872

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} (atm-m^3/mol)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
3.65E+06	1.75E+07	1.02E-04	15	8,382	9.80E-03	4.02E-01	1.80E-04	4.10E-03	3.42E-03	0.00E+00	1.99E-05	3.35E-05	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	4.02E+02	0.10	5.62E+00	4.10E-03	1.79E+03	9.68E+09	6.65E-07	2.67E-04	4.1E-06	2.0E-03

END

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.9E-11	3.0E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02		X
79016	trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.1E-06	2.0E-03	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03		

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2-	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04		

DATA ENTRY SHEET

GW-ADV 3.1; 02/04

Reset

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (enter "X" in "YES" box and initial groundwater conc. below)

YES X

OU-1B SOUTH - INDUSTRIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
75014	1.00E+00	Vinyl chloride (chloroethene)

MORE

ENTER Average soil/ groundwater temperature, T_S (°C)	ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER Totals must add up to value of L_{WT} (cell G28) Thickness of soil stratum A, h_A (cm)	ENTER Thickness of soil stratum B, (Enter value or 0) h_B (cm)	ENTER Thickness of soil stratum C, (Enter value or 0) h_C (cm)	ENTER Soil stratum directly above water table, (Enter A, B, or C)	ENTER SCS soil type directly above water table	ENTER Soil stratum A SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined stratum A soil vapor permeability, k_v (cm^2)
24	15	152.4	61	91.4		B	C	SIC		

MORE

ENTER Stratum A SCS soil type	ENTER Stratum A soil dry bulk density, ρ_b^A (g/cm^3)	ENTER Stratum A soil total porosity, n^A (unitless)	ENTER Stratum A soil water-filled porosity, θ_w^A (cm^3/cm^3)	ENTER Stratum B SCS soil type	ENTER Stratum B soil dry bulk density, ρ_b^B (g/cm^3)	ENTER Stratum B soil total porosity, n^B (unitless)	ENTER Stratum B soil water-filled porosity, θ_w^B (cm^3/cm^3)	ENTER Stratum C SCS soil type	ENTER Stratum C soil dry bulk density, ρ_b^C (g/cm^3)	ENTER Stratum C soil total porosity, n^C (unitless)	ENTER Stratum C soil water-filled porosity, θ_w^C (cm^3/cm^3)
SIC	1.38	0.481	0.216	C	1.43	0.459	0.215	C	1.43	0.459	0.215

MORE

ENTER Enclosed space floor thickness, L_{crack} (cm)	ENTER Soil-bldg. pressure differential, ΔP ($g/cm\text{-}s^2$)	ENTER Enclosed space floor length, L_B (cm)	ENTER Enclosed space floor width, W_B (cm)	ENTER Enclosed space height, H_B (cm)	ENTER Floor-wall seam crack width, w (cm)	ENTER Indoor air exchange rate, ER (1/h)	ENTER Average vapor flow rate into bldg. OR Leave blank to calculate Q_{soil} (L/m)
30	40	6038	2898	1000	0.1	0.75	

MORE

ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)	ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)
70	25	25	83	1.0E-06	1

Used to calculate risk-based groundwater concentration.

END

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	8.8E-06	1.0E-01

END

Exposure duration, τ (sec)	Source-building separation, L_T (cm)	Stratum A soil air-filled porosity, θ_a^A (cm^3/cm^3)	Stratum B soil air-filled porosity, θ_a^B (cm^3/cm^3)	Stratum C soil air-filled porosity, θ_a^C (cm^3/cm^3)	Stratum A effective total fluid saturation, S_{te} (cm^3/cm^3)	Stratum A soil intrinsic permeability, k_i (cm^2)	Stratum A soil relative air permeability, k_{rg} (cm^2)	Stratum A soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
7.88E+08	137.4	0.265	0.244	0.244	0.284	1.52E-09	0.844	1.28E-09	81.52	0.459	0.047	0.412	17,872

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Stratum A effective diffusion coefficient, D^{eff}_A (cm^2/s)	Stratum B effective diffusion coefficient, D^{eff}_B (cm^2/s)	Stratum C effective diffusion coefficient, D^{eff}_C (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)	Diffusion path length, L_d (cm)
3.65E+06	1.75E+07	1.02E-04	15	4,840	2.62E-02	1.07E+00	1.80E-04	5.50E-03	4.59E-03	0.00E+00	2.21E-05	3.71E-05	137.4

Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
15	1.07E+03	0.10	5.62E+00	5.50E-03	1.79E+03	2.77E+07	7.04E-07	7.56E-04	8.8E-06	1.0E-01

END

RESULTS SHEET

OU-1B SOUTH - INDUSTRIAL SCENARIO

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	8.80E+06	NA

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
5.4E-10	1.7E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	7.8E-06	3.0E-02		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroethai	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	1.6E-05	1.4E-02		X
79016	trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.1E-06	2.0E-03	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	8.6E-03	3.0E-04	X		DTSC
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.46E-02	25	425.56	631.10	10,335	0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03		

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	0.0E+00	1.0E+00		
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	1.0E+00		
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	4.9E-05	0.0E+00	X	
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01		X
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01		X
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01		X
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01		
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	0.0E+00	8.0E-01		
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	2.2E-04	2.0E-04		
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	3.0E-02	2.0E-03		
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05		
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.6E-05	0.0E+00		
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	6.8E-05	2.0E-03		
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	2.0E-01		
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00		
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01		
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03		
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00		
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	4.0E-01		
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	6.0E-02		
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E+00		X
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03		X
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	2.0E-01		
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	3.3E-04	0.0E+00		
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02		X
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	4.6E-04	2.8E-03		X
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	0.0E+00	4.0E-03		
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	X	
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	2.4E-05	7.0E-02	X	X
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04		
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03		
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	5.9E-06	6.0E-01		
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01		X
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02		X
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01		X
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00		X
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02		X
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	7.0E-02		X
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	2.1E-04	0.0E+00	X	
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	2.1E-06	0.0E+00	X	
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	4.9E-03	1.1E-04		X
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	1.8E-03	0.0E+00		
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01		X
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	4.0E-06	2.0E-02		
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01		X
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	0.0E+00	3.0E+00		
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-04		

DATA ENTRY SHEET

GW-SCREEN
Version 3.0; 04/03

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 12/6/2011)

IRP 11 - RESIDENTIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	7.90E+00	trichloroethene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	419.4	C	21.94

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
C		1.00E-08	C	1.5	0.43	0.15

Lookup Soil

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
404.4	0.280	0.157	2.31E-09	0.918	ERROR	81.52	0.459	0.047	0.412	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
3.39E+04	1.00E+06	5.00E-03	15	8,408	8.87E-03	3.66E-01	1.79E-04	6.16E-03	2.05E-05	1.00E-04

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
404.4	15	2.89E+03	1.25	8.33E+01	6.16E-03	5.00E+03	5.57E+11	7.30E-06	2.11E-02	4.1E-06	2.0E-03

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

MESSAGE SUMMARY BELOW:

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
3.6E-08	1.0E-02

END

VLOOKUP TABLES

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
	Soil Properties Lookup Table									
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (ast updated 12/02/2011 DTSC/HERO)

Original EPA Values

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H (atm-m^3/mol)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF ($\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	3.1E-04	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	3.1E+01	5.81E+01		X	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	5.3E-06	**3.0E-01**	1.19E+02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	5.0E+00	1.33E+02			0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	1.8E-06	9.0E-02	5.05E+01			1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01			0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?		8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01			8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01			2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01			0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	8.8E-05	**3.0E-02**	4.41E+01		?	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	7.0E-01	9.90E+01		X	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	1.2E-03	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	1.0E-05	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X
79016	trichloroethene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	4.1E-06	**2.0E-03**	1.31E+02			1.1E-04	4.0E-02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02			0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02			0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	8.6E-03	3.0E-04	1.47E+02	X		5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		

VLOOKUP TABLES

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02			0.0E+00	1.0E+00			
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-03	2.74E-03	25	418.31	636.00	8,737	0.0E+00	**9.0E-01**	1.04E+02			0.0E+00	1.0E+00			
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	1.0E-03	1.27E+02	?		4.9E-05	0.0E+00	X		
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X	
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X	
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X	
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01			
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			0.0E+00	8.0E-01			
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	**8.0E-04**	1.88E+02			6.0E-04	9.0E-03			
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	**1.7E-04**	2.0E-03	5.41E+01			3.0E-05	0.0E+00			
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01			0.0E+00	2.0E-05			
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	**4.0E-01**	9.90E+01			2.6E-05	0.0E+00			
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	**2.9E-04**	2.0E-03	5.31E+01			6.8E-05	2.0E-03			
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	**2.0E-01**	8.61E+01			0.0E+00	2.0E-01			
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02			0.0E+00	8.0E-02			
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01			
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03			
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00			
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	**3.0E-01**	9.21E+01			0.0E+00	4.0E-01			
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	**1.0E+00**	1.13E+02			0.0E+00	6.0E-02			
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X	0.0E+00	1.4E+00		X	
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X	
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01			0.0E+00	2.0E-01			
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	**7.1E-04**	0.0E+00	1.43E+02			3.3E-04	0.0E+00			
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X	
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X	
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	**0.0E+00**	4.0E-03	1.81E+02			0.0E+00	2.0E-01			
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X		
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	**2.7E-05**	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X	
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04			
126998	2-Chloro-1,3-butadiene (chloropre	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03			
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			3.0E-06	0.0E+00			
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X	
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X	
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X	
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X	
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X	
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X	0.0E+00	7.0E-02		X	
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	**1.1E-04**	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X		
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	**1.1E-05**	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X		
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	**4.9E-03**	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X	
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02			1.8E-03	0.0E+00			
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X	0.0E+00	1.1E-01		X	
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	**1.6E-05**	2.0E-02	1.11E+02			4.0E-06	2.0E-02			
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X	7.4E-06	1.1E-01		X	
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	**2.6E-07**	3.0E+00	8.82E+01			0.0E+00	3.0E+00			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02			0.0E+00	3.0E-04			

DATA ENTRY SHEET

GW-SCREEN
Version 3.0; 04/03

Reset to

CALCULATE RISK-BASED GROUNDWATER CONCENTRATION (enter "X" in "YES" box)

YES [ ]

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION
(enter "X" in "YES" box and initial groundwater conc. below)

YES [X]

DTSC
Vapor Intrusion Guidance
Interim Final 12/04
(last modified 12/6/2011)

IRP 13W - RESIDENTIAL SCENARIO

ENTER Chemical CAS No. (numbers only, no dashes)	ENTER Initial groundwater conc., C_W (µg/L)	Chemical
79016	8.90E+00	Trichloroethylene

MORE ↓

ENTER Depth below grade to bottom of enclosed space floor, L_F (cm)	ENTER Depth below grade to water table, L_{WT} (cm)	ENTER SCS soil type directly above water table	ENTER Average soil/ groundwater temperature, T_S (°C)
15	419.4	C	21.94

ENTER Average vapor flow rate into bldg. (Leave blank to calculate) Q_{soil} (L/m)
5

MORE ↓

ENTER Vadose zone SCS soil type (used to estimate soil vapor permeability)	OR	ENTER User-defined vandose zone soil vapor permeability, k_v (cm^2)	ENTER Vadose zone SCS soil type	ENTER Vadose zone soil dry bulk density, ρ_b^V (g/cm^3)	ENTER Vadose zone soil total porosity, n^V (unitless)	ENTER Vadose zone soil water-filled porosity, θ_w^V (cm^3/cm^3)
C		1.00E-08	C	1.5	0.43	0.15

Lookup Soil

Enter either a vadose zone SCS soil type OR a user-defined permeability.

MORE ↓

ENTER Target risk for carcinogens, TR (unitless)	ENTER Target hazard quotient for noncarcinogens, THQ (unitless)	ENTER Averaging time for carcinogens, AT_C (yrs)	ENTER Averaging time for noncarcinogens, AT_{NC} (yrs)	ENTER Exposure duration, ED (yrs)	ENTER Exposure frequency, EF (days/yr)
1.0E-06	1	70	30	30	350

Used to calculate risk-based groundwater concentration.

CHEMICAL PROPERTIES SHEET

ABC

Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (^oC)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T_B (^oK)	Critical temperature, T_C (^oK)	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	4.1E-06	2.0E-03

END

Source-building separation, L_T (cm)	Vadose zone soil air-filled porosity, θ_a^V (cm^3/cm^3)	Vadose zone effective total fluid saturation, S_{te} (cm^3/cm^3)	Vadose zone soil intrinsic permeability, k_i (cm^2)	Vadose zone soil relative air permeability, k_{rg} (cm^2)	Vadose zone soil effective vapor permeability, k_v (cm^2)	Thickness of capillary zone, L_{cz} (cm)	Total porosity in capillary zone, n_{cz} (cm^3/cm^3)	Air-filled porosity in capillary zone, $\theta_{a,cz}$ (cm^3/cm^3)	Water-filled porosity in capillary zone, $\theta_{w,cz}$ (cm^3/cm^3)	Floor-wall seam perimeter, X_{crack} (cm)
404.4	0.280	0.157	2.31E-09	0.918	ERROR	81.52	0.459	0.047	0.412	4,000

Bldg. ventilation rate, $Q_{building}$ (cm^3/s)	Area of enclosed space below grade, A_B (cm^2)	Crack-to-total area ratio, η (unitless)	Crack depth below grade, Z_{crack} (cm)	Enthalpy of vaporization at ave. groundwater temperature, $\Delta H_{v,TS}$ (cal/mol)	Henry's law constant at ave. groundwater temperature, H_{TS} ($atm\text{-}m^3/mol$)	Henry's law constant at ave. groundwater temperature, H'_{TS} (unitless)	Vapor viscosity at ave. soil temperature, μ_{TS} (g/cm-s)	Vadose zone effective diffusion coefficient, D^{eff}_V (cm^2/s)	Capillary zone effective diffusion coefficient, D^{eff}_{cz} (cm^2/s)	Total overall effective diffusion coefficient, D^{eff}_T (cm^2/s)
3.39E+04	1.00E+06	5.00E-03	15	8,408	8.87E-03	3.66E-01	1.79E-04	6.16E-03	2.05E-05	1.00E-04

Diffusion path length, L_d (cm)	Convection path length, L_p (cm)	Source vapor conc., C_{source} ($\mu g/m^3$)	Crack radius, r_{crack} (cm)	Average vapor flow rate into bldg., Q_{soil} (cm^3/s)	Crack effective diffusion coefficient, D^{crack} (cm^2/s)	Area of crack, A_{crack} (cm^2)	Exponent of equivalent foundation Peclet number, $\exp(Pe^f)$ (unitless)	Infinite source indoor attenuation coefficient, α (unitless)	Infinite source bldg. conc., $C_{building}$ ($\mu g/m^3$)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)
404.4	15	3.26E+03	1.25	8.33E+01	6.16E-03	5.00E+03	5.57E+11	7.30E-06	2.38E-02	4.1E-06	2.0E-03

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)
NA	NA	NA	1.47E+06	NA

MESSAGE SUMMARY BELOW:

INCREMENTAL RISK CALCULATIONS:

Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
4.0E-08	1.1E-02

END

VLOOKUP TABLES

Soil Properties Lookup Table

SCS Soil Type	K_s (cm/h)	α_1 (1/cm)	N (unitless)	M (unitless)	n (cm^3/cm^3)	θ_r (cm^3/cm^3)	Mean Grain Diameter (cm)	Bulk Density (g/cm^3)	θ_w (cm^3/cm^3)	SCS Soil Name
C	0.61	0.01496	1.253	0.2019	0.459	0.098	0.0092	1.43	0.215	Clay
CL	0.34	0.01581	1.416	0.2938	0.442	0.079	0.016	1.48	0.168	Clay Loam
L	0.50	0.01112	1.472	0.3207	0.399	0.061	0.020	1.59	0.148	Loam
LS	4.38	0.03475	1.746	0.4273	0.390	0.049	0.040	1.62	0.076	Loamy Sand
S	26.78	0.03524	3.177	0.6852	0.375	0.053	0.044	1.66	0.054	Sand
SC	0.47	0.03342	1.208	0.1722	0.385	0.117	0.025	1.63	0.197	Sandy Clay
SCL	0.55	0.02109	1.330	0.2481	0.384	0.063	0.029	1.63	0.146	Sandy Clay Loam
SI	1.82	0.00658	1.679	0.4044	0.489	0.050	0.0046	1.35	0.167	Silt
SIC	0.40	0.01622	1.321	0.2430	0.481	0.111	0.0039	1.38	0.216	Silty Clay
SICL	0.46	0.00839	1.521	0.3425	0.482	0.090	0.0056	1.37	0.198	Silty Clay Loam
SIL	0.76	0.00506	1.663	0.3987	0.439	0.065	0.011	1.49	0.180	Silt Loam
SL	1.60	0.02667	1.449	0.3099	0.387	0.039	0.030	1.62	0.103	Sandy Loam

Chemical Properties Lookup Table

CalEPA Toxicity Criteria in bold (last updated 12/02/2011 DTSC/HERO)

Original EPA Values

CAS No.	Chemical	Organic carbon partition coefficient, K_{oc} (cm^3/g)	Diffusivity in air, D_a (cm^2/s)	Diffusivity in water, D_w (cm^2/s)	Pure component water solubility, S (mg/L)	Henry's law constant H' (unitless)	Henry's law constant at reference temperature, H ($atm\text{-}m^3/mol$)	Henry's law constant reference temperature, T_R (°C)	Normal boiling point, T_B (°K)	Critical temperature, T_C (°K)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	Molecular weight, MW (g/mol)	URF extrapolated (X)	RfC extrapolated (X)	Unit risk factor, URF $(\mu g/m^3)^{-1}$	Reference conc., RfC (mg/m^3)	URF extrapolated (X)	RfC extrapolated (X)
56235	Carbon tetrachloride	1.74E+02	7.80E-02	8.80E-06	7.93E+02	1.24E+00	3.03E-02	25	349.90	556.60	7,127	**4.2E-05**	**4.0E-02**	1.54E+02			1.5E-05	0.0E+00		
57749	Chlordane	1.20E+05	1.18E-02	4.37E-06	5.60E-02	1.99E-03	4.85E-05	25	624.24	885.73	14,000	**3.4E-04**	7.0E-04	4.10E+02			1.0E-04	7.0E-04		
58899	gamma-HCH (Lindane)	1.07E+03	1.42E-02	7.34E-06	7.30E+00	5.73E-04	1.40E-05	25	596.55	839.36	15,000	**3.1E-04**	1.1E-03	2.91E+02	?	X	3.7E-04	1.1E-03	X	X
60297	Ethyl ether	5.73E+00	7.82E-02	8.61E-06	5.68E+04	1.35E+00	3.29E-02	25	307.50	466.74	6,338	0.0E+00	7.0E-01	7.41E+01		X	0.0E+00	7.0E-01		X
60571	Dieldrin	2.14E+04	1.25E-02	4.74E-06	1.95E-01	6.18E-04	1.51E-05	25	613.32	842.25	17,000	**4.6E-03**	1.8E-04	3.81E+02		X	4.6E-03	1.8E-04		X
67641	Acetone	5.75E-01	1.24E-01	1.14E-05	1.00E+06	1.59E-03	3.87E-05	25	329.20	508.10	6,955	0.0E+00	**3.1E+01**	5.81E+01		X	0.0E+00	3.5E-01		X
67663	Chloroform	3.98E+01	1.04E-01	1.00E-05	7.92E+03	1.50E-01	3.66E-03	25	334.32	536.40	6,988	**5.3E-06**	**3.0E-01**	1.19E+02			2.3E-05	0.0E+00		
67721	Hexachloroethane	1.78E+03	2.50E-03	6.80E-06	5.00E+01	1.59E-01	3.88E-03	25	458.00	695.00	9,510	**1.1E-05**	3.5E-03	2.37E+02		X	4.0E-06	3.5E-03		X
71432	Benzene	5.89E+01	8.80E-02	9.80E-06	1.79E+03	2.27E-01	5.54E-03	25	353.24	562.16	7,342	**2.9E-05**	3.0E-02	7.81E+01			7.8E-06	0.0E+00		
71556	1,1,1-Trichloroethane	1.10E+02	7.80E-02	8.80E-06	1.33E+03	7.03E-01	1.72E-02	25	347.24	545.00	7,136	0.0E+00	**5.0E+00**	1.33E+02			0.0E+00	2.2E+00		
72435	Methoxychlor	9.77E+04	1.56E-02	4.46E-06	1.00E-01	6.46E-04	1.58E-05	25	651.02	848.49	16,000	0.0E+00	1.8E-02	3.46E+02		X	0.0E+00	1.8E-02		X
72559	DDE	4.47E+06	1.44E-02	5.87E-06	1.20E-01	8.59E-04	2.09E-05	25	636.44	860.38	15,000	**9.7E-05**	0.0E+00	3.18E+02	?		9.7E-05	0.0E+00	X	
74839	Methyl bromide	1.05E+01	7.28E-02	1.21E-05	1.52E+04	2.55E-01	6.22E-03	25	276.71	467.00	5,714	0.0E+00	**5.0E-03**	9.49E+01			0.0E+00	5.0E-03		
74873	Methyl chloride (chloromethane)	2.12E+00	1.26E-01	6.50E-06	5.33E+03	3.61E-01	8.80E-03	25	249.00	416.25	5,115	**1.8E-06**	9.0E-02	5.05E+01			1.0E-06	9.0E-02		
74908	Hydrogen cyanide	3.80E+00	1.93E-01	2.10E-05	1.00E+06	5.44E-03	1.33E-04	25	299.00	456.70	6,676	0.0E+00	3.0E-03	2.70E+01			0.0E+00	3.0E-03		
74953	Methylene bromide	1.26E+01	4.30E-02	8.44E-06	1.19E+04	3.52E-02	8.59E-04	25	370.00	583.00	7,868	0.0E+00	3.5E-02	1.74E+02		X	0.0E+00	3.5E-02		X
75003	Chloroethane (ethyl chloride)	4.40E+00	2.71E-01	1.15E-05	5.68E+03	3.61E-01	8.80E-03	25	285.30	460.40	5,879	8.3E-07	1.0E+01	6.45E+01	?		8.3E-07	1.0E+01	X	
75014	Vinyl chloride (chloroethene)	1.86E+01	1.06E-01	1.23E-05	8.80E+03	1.10E+00	2.69E-02	25	259.25	432.00	5,250	**7.8E-05**	1.0E-01	6.25E+01			8.8E-06	1.0E-01		
75058	Acetonitrile	4.20E+00	1.28E-01	1.66E-05	1.00E+06	1.42E-03	3.45E-05	25	354.60	545.50	7,110	0.0E+00	6.0E-02	4.11E+01			0.0E+00	6.0E-02		
75070	Acetaldehyde	1.06E+00	1.24E-01	1.41E-05	1.00E+06	3.23E-03	7.87E-05	25	293.10	466.00	6,157	**2.7E-06**	**9.0E-03**	4.41E+01			2.2E-06	9.0E-03		
75092	Methylene chloride	1.17E+01	1.01E-01	1.17E-05	1.30E+04	8.96E-02	2.18E-03	25	313.00	510.00	6,706	**1.0E-06**	**4.0E-01**	8.49E+01			4.7E-07	3.0E+00		
75150	Carbon disulfide	4.57E+01	1.04E-01	1.00E-05	1.19E+03	1.24E+00	3.02E-02	25	319.00	552.00	6,391	0.0E+00	7.0E-01	7.61E+01			0.0E+00	7.0E-01		
75218	Ethylene oxide	1.33E+00	1.04E-01	1.45E-05	3.04E+05	2.27E-02	5.54E-04	25	283.60	469.00	6,104	**8.8E-05**	**3.0E-02**	4.41E+01		?	1.0E-04	0.0E+00		
75252	Bromoform	8.71E+01	1.49E-02	1.03E-05	3.10E+03	2.41E-02	5.88E-04	25	422.35	696.00	9,479	1.1E-06	7.0E-02	2.53E+02		X	1.1E-06	7.0E-02		X
75274	Bromodichloromethane	5.50E+01	2.98E-02	1.06E-05	6.74E+03	6.54E-02	1.60E-03	25	363.15	585.85	7,800	**3.7E-05**	7.0E-02	1.64E+02	?	X	1.8E-05	7.0E-02	X	X
75296	2-Chloropropane	9.14E+00	8.88E-02	1.01E-05	3.73E+03	5.93E-01	1.45E-02	25	308.70	485.00	6,286	0.0E+00	1.0E-01	7.85E+01		?	0.0E+00	1.0E-01		
75343	1,1-Dichloroethane	3.16E+01	7.42E-02	1.05E-05	5.06E+03	2.30E-01	5.61E-03	25	330.55	523.00	6,895	**1.6E-06**	7.0E-01	9.90E+01		X	0.0E+00	5.0E-01		
75354	1,1-Dichloroethylene	5.89E+01	9.00E-02	1.04E-05	2.25E+03	1.07E+00	2.60E-02	25	304.75	576.05	6,247	0.0E+00	**7.0E-02**	9.69E+01			0.0E+00	2.0E-01		
75456	Chlorodifluoromethane	4.79E+01	1.01E-01	1.28E-05	2.00E+00	1.10E+00	2.70E-02	25	232.40	369.30	4,836	0.0E+00	5.0E+01	8.65E+01			0.0E+00	5.0E+01		
75694	Trichlorofluoromethane	4.97E+02	8.70E-02	9.70E-06	1.10E+03	3.97E+00	9.68E-02	25	296.70	471.00	5,999	0.0E+00	7.0E-01	1.37E+02			0.0E+00	7.0E-01		
75718	Dichlorodifluoromethane	4.57E+02	6.65E-02	9.92E-06	2.80E+02	1.40E+01	3.42E-01	25	243.20	384.95	9,421	0.0E+00	2.0E-01	1.21E+02			0.0E+00	2.0E-01		
76131	1,1,2-Trichloro-1,2,2-trifluoroetha	1.11E+04	7.80E-02	8.20E-06	1.70E+02	1.97E+01	4.80E-01	25	320.70	487.30	6,463	0.0E+00	3.0E+01	1.87E+02			0.0E+00	3.0E+01		
76448	Heptachlor	1.41E+06	1.12E-02	5.69E-06	1.80E-01	6.05E+01	1.48E+00	25	603.69	846.31	13,000	**1.2E-03**	1.8E-03	3.73E+02		X	1.3E-03	1.8E-03		X
77474	Hexachlorocyclopentadiene	2.00E+05	1.61E-02	7.21E-06	1.80E+00	1.10E+00	2.69E-02	25	512.15	746.00	10,931	0.0E+00	2.0E-04	2.73E+02			0.0E+00	2.0E-04		
78831	Isobutanol	2.59E+00	8.60E-02	9.30E-06	8.50E+04	4.83E-04	1.18E-05	25	381.04	547.78	10,936	0.0E+00	1.1E+00	7.41E+01		X	0.0E+00	1.1E+00		X
78875	1,2-Dichloropropane	4.37E+01	7.82E-02	8.73E-06	2.80E+03	1.15E-01	2.79E-03	25	369.52	572.00	7,590	**1.0E-05**	4.0E-03	1.13E+02	?		1.9E-05	4.0E-03	X	
78933	Methylethylketone (2-butanone)	2.30E+00	8.08E-02	9.80E-06	2.23E+05	2.29E-03	5.58E-05	25	352.50	536.78	7,481	0.0E+00	5.0E+00	7.21E+01			0.0E+00	1.0E+00		
79005	1,1,2-Trichloroethane	5.01E+01	7.80E-02	8.80E-06	4.42E+03	3.73E-02	9.11E-04	25	386.15	602.00	8,322	**1.6E-05**	1.4E-02	1.33E+02		X	1.6E-05	1.4E-02		X
79016	Trichloroethylene	1.66E+02	7.90E-02	9.10E-06	1.47E+03	4.21E-01	1.03E-02	25	360.36	544.20	7,505	**4.1E-06**	**2.0E-03**	1.31E+02			1.1E-04	4.0E-02	X	
79209	Methyl acetate	3.26E+00	1.04E-01	1.00E-05	2.00E+03	4.84E-03	1.18E-04	25	329.80	506.70	7,260	0.0E+00	3.5E+00	7.41E+01		X	0.0E+00	3.5E+00		X
79345	1,1,2,2-Tetrachloroethane	9.33E+01	7.10E-02	7.90E-06	2.96E+03	1.41E-02	3.44E-04	25	419.60	661.15	8,996	**5.8E-05**	1.4E-02	1.68E+02		X	5.8E-05	2.1E-01		X
79469	2-Nitropropane	1.17E+01	9.23E-02	1.01E-05	1.70E+04	5.03E-03	1.23E-04	25	393.20	594.00	8,383	2.7E-03	2.0E-02	8.91E+01			2.7E-03	2.0E-02		
80626	Methylmethacrylate	6.98E+00	7.70E-02	8.60E-06	1.50E+04	1.38E-02	3.36E-04	25	373.50	567.00	8,975	0.0E+00	7.0E-01	1.00E+02			0.0E+00	7.0E-01		
83329	Acenaphthene	7.08E+03	4.21E-02	7.69E-06	3.57E+00	6.34E-03	1.55E-04	25	550.54	803.15	12,155	0.0E+00	2.1E-01	1.54E+02		X	0.0E+00	2.1E-01		X
86737	Fluorene	1.38E+04	3.63E-02	7.88E-06	1.98E+00	2.60E-03	6.34E-05	25	570.44	870.00	12,666	0.0E+00	1.4E-01	1.66E+02		X	0.0E+00	1.4E-01		X
87683	Hexachloro-1,3-butadiene	5.37E+04	5.61E-02	6.16E-06	3.20E+00	3.33E-01	8.13E-03	25	486.15	738.00	10,206	2.2E-05	3.5E-03	2.61E+02		X	2.2E-05	7.0E-04		X
88722	o-Nitrotoluene	3.24E+02	5.87E-02	8.67E-06	6.50E+02	5.11E-04	1.25E-05	25	495.00	720.00	12,239	0.0E+00	3.2E-03	1.37E+02		X	0.0E+00	3.5E-02		X
91203	Naphthalene	2.00E+03	5.90E-02	7.50E-06	3.10E+01	1.98E-02	4.82E-04	25	491.14	748.40	10,373	**3.4E-05**	3.0E-03	1.28E+02			0.0E+00	3.0E-03		
91576	2-Methylnaphthalene	2.81E+03	5.22E-02	7.75E-06	2.46E+01	2.12E-02	5.17E-04	25	514.26	761.00	12,600	0.0E+00	1.4E-02	1.42E+02		X	0.0E+00	7.0E-02		X
92524	Biphenyl	4.38E+03	4.04E-02	8.15E-06	7.45E+00	1.23E-02	2.99E-04	25	529.10	789.00	10,890	0.0E+00	1.8E-01	1.54E+02		X	0.0E+00	1.8E-01		X
95476	o-Xylene	3.63E+02	8.70E-02	1.00E-05	1.78E+02	2.12E-01	5.18E-03	25	417.60	630.30	8,661	0.0E+00	1.0E-01	1.06E+02			0.0E+00	1.0E-01		
95501	1,2-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	1.56E+02	7.77E-02	1.90E-03	25	453.57	705.00	9,700	0.0E+00	2.0E-01	1.47E+02			0.0E+00	2.0E-01		
95578	2-Chlorophenol	3.88E+02	5.01E-02	9.46E-06	2.20E+04	1.60E-02	3.90E-04	25	447.53	675.00	9,572	0.0E+00	1.8E-02	1.29E+02		X	0.0E+00	1.8E-02		X
95636	1,2,4-Trimethylbenzene	1.35E+03	6.06E-02	7.92E-06	5.70E+01	2.52E-01	6.14E-03	25	442.30	649.17	9,369	0.0E+00	7.0E-03	1.20E+02			0.0E+00	6.0E-03		
96184	1,2,3-Trichloropropane	2.20E+01	7.10E-02	7.90E-06	1.75E+03	1.67E-02	4.08E-04	25	430.00	652.00	9,171	8.6E-03	3.0E-04	1.47E+02	X		5.7E-04	4.9E-03	X	
96333	Methyl acrylate	4.53E+00	9.76E-02	1.02E-05	6.00E+04	7.68E-03	1.87E-04	25	353.70	536.00	7,749	0.0E+00	1.1E-01	8.61E+01		X	0.0E+00	1.1E-01		X
97632	Ethylmethacrylate	2.95E+01	6.53E-02	8.37E-06	3.67E+03	3.44E-02	8.40E-04	25	390.00	571.00	10,957	0.0E+00	3.2E-01	1.14E+02		X	0.0E+00	3.2E-01		X
98066	tert-Butylbenzene	7.71E+02	5.65E-02	8.02E-06	2.95E+01	4.87E-01	1.19E-02	25	442.10	1220.00	8,980	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X
98828	Cumene	4.89E+02	6.50E-02	7.10E-06	6.13E+01	4.74E+01	1.16E+00	25	425.56	631.10	10,335	0.0E+00	4.0E-01	1.20E+02			0.0E+00	4.0E-01		
98862	Acetophenone	5.77E+01	6.00E-02	8.73E-06	6.13E+03	4.38E-04	1.07E-05	25	475.00	709.50	11,732	0.0E+00	3.5E-01	1.20E+02		X	0.0E+00	3.5E-01		X
98953	Nitrobenzene	6.46E+01	7.60E-02	8.60E-06	2.09E+03	9.82E-04	2.39E-05	25	483.95	719.00	10,566	0.0E+00	2.0E-03	1.23E+02			0.0E+00	2.0E-03		

VLOOKUP TABLES

100414	Ethylbenzene	3.63E+02	7.50E-02	7.80E-06	1.69E+02	3.22E-01	7.86E-03	25	409.34	617.20	8,501	2.5E-06	1.0E+00	1.06E+02			0.0E+00	1.0E+00			
100425	Styrene	7.76E+02	7.10E-02	8.00E-06	3.10E+02	1.12E-01	2.74E-03	25	418.31	636.00	8,737	0.0E+00	**9.0E-01**	1.04E+02			0.0E+00	1.0E+00			
100447	Benzylchloride	6.14E+01	7.50E-02	7.80E-06	5.25E+02	1.70E-02	4.14E-04	25	452.00	685.00	8,773	**4.9E-05**	1.0E-03	1.27E+02	?		4.9E-05	0.0E+00	X		
100527	Benzaldehyde	4.59E+01	7.21E-02	9.07E-06	3.30E+03	9.73E-04	2.37E-05	25	452.00	695.00	11,658	0.0E+00	3.5E-01	1.06E+02		X	0.0E+00	3.5E-01		X	
103651	n-Propylbenzene	5.62E+02	6.01E-02	7.83E-06	6.00E+01	4.37E-01	1.07E-02	25	432.20	630.00	9,123	0.0E+00	1.4E-01	1.20E+02		X	0.0E+00	1.4E-01		X	
104518	n-Butylbenzene	1.11E+03	5.70E-02	8.12E-06	2.00E+00	5.38E-01	1.31E-02	25	456.46	660.50	9,290	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X	
106423	p-Xylene	3.89E+02	7.69E-02	8.44E-06	1.85E+02	3.13E-01	7.64E-03	25	411.52	616.20	8,525	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01			
106467	1,4-Dichlorobenzene	6.17E+02	6.90E-02	7.90E-06	7.90E+01	9.82E-02	2.39E-03	25	447.21	684.75	9,271	**1.1E-05**	**8.0E-01**	1.47E+02			0.0E+00	8.0E-01			
106934	1,2-Dibromoethane (ethylene dibr	2.50E+01	2.17E-02	1.19E-05	4.18E+03	3.04E-02	7.41E-04	25	404.60	583.00	8,310	7.1E-05	**8.0E-04**	1.88E+02			6.0E-04	9.0E-03			
106990	1,3-Butadiene	1.91E+01	2.49E-01	1.08E-05	7.35E+02	3.01E+00	7.34E-02	25	268.60	425.00	5,370	**1.7E-04**	2.0E-03	5.41E+01			3.0E-05	0.0E+00			
107028	Acrolein	2.76E+00	1.05E-01	1.22E-05	2.13E+05	4.99E-03	1.22E-04	25	325.60	506.00	6,731	0.0E+00	2.0E-05	5.61E+01			0.0E+00	2.0E-05			
107062	1,2-Dichloroethane	1.74E+01	1.04E-01	9.90E-06	8.52E+03	4.00E-02	9.77E-04	25	356.65	561.00	7,643	2.1E-05	**4.0E-01**	9.90E+01			2.6E-05	0.0E+00			
107131	Acrylonitrile	5.90E+00	1.22E-01	1.34E-05	7.40E+04	4.21E-03	1.03E-04	25	350.30	519.00	7,786	**2.9E-04**	2.0E-03	5.31E+01			6.8E-05	2.0E-03			
108054	Vinyl acetate	5.25E+00	8.50E-02	9.20E-06	2.00E+04	2.09E-02	5.10E-04	25	345.65	519.13	7,800	0.0E+00	**2.0E-01**	8.61E+01			0.0E+00	2.0E-01			
108101	Methylisobutylketone (4-methyl-2	9.06E+00	7.50E-02	7.80E-06	1.90E+04	5.64E-03	1.38E-04	25	389.50	571.00	8,243	0.0E+00	3.0E+00	1.00E+02			0.0E+00	8.0E-02			
108383	m-Xylene	4.07E+02	7.00E-02	7.80E-06	1.61E+02	3.00E-01	7.32E-03	25	412.27	617.05	8,523	0.0E+00	1.0E-01	1.06E+02		?	0.0E+00	1.0E-01			
108678	1,3,5-Trimethylbenzene	1.35E+03	6.02E-02	8.67E-06	2.00E+00	2.41E-01	5.87E-03	25	437.89	637.25	9,321	0.0E+00	6.0E-03	1.20E+02			0.0E+00	6.0E-03			
108872	Methylcyclohexane	7.85E+01	7.35E-02	8.52E-06	1.40E+01	4.22E+00	1.03E-01	25	373.90	572.20	7,474	0.0E+00	3.0E+00	9.82E+01		?	0.0E+00	3.0E+00			
108883	Toluene	1.82E+02	8.70E-02	8.60E-06	5.26E+02	2.72E-01	6.62E-03	25	383.78	591.79	7,930	0.0E+00	**3.0E-01**	9.21E+01			0.0E+00	4.0E-01			
108907	Chlorobenzene	2.19E+02	7.30E-02	8.70E-06	4.72E+02	1.51E-01	3.69E-03	25	404.87	632.40	8,410	0.0E+00	**1.0E+00**	1.13E+02			0.0E+00	6.0E-02			
109693	1-Chlorobutane	1.72E+01	8.26E-02	1.00E-05	1.10E+03	6.93E-01	1.69E-02	25	351.60	542.00	7,263	0.0E+00	1.4E-01	9.26E+01		X	0.0E+00	1.4E+00		X	
110009	Furan	1.86E+01	1.04E-01	1.22E-05	1.00E+04	2.21E-01	5.39E-03	25	304.60	490.20	6,477	0.0E+00	3.5E-03	6.81E+01		X	0.0E+00	3.5E-03		X	
110543	Hexane	4.34E+01	2.00E-01	7.77E-06	1.24E+01	6.82E+01	1.66E+00	25	341.70	508.00	6,895	0.0E+00	7.0E-01	8.62E+01			0.0E+00	2.0E-01			
111444	Bis(2-chloroethyl)ether	1.55E+01	6.92E-02	7.53E-06	1.72E+04	7.36E-04	1.80E-05	25	451.15	659.79	10,803	**7.1E-04**	0.0E+00	1.43E+02			3.3E-04	0.0E+00			
115297	Endosulfan	2.14E+03	1.15E-02	4.55E-06	5.10E-01	4.58E-04	1.12E-05	25	674.43	942.94	14,000	0.0E+00	2.1E-02	4.07E+02		X	0.0E+00	2.1E-02		X	
118741	Hexachlorobenzene	5.50E+04	5.42E-02	5.91E-06	5.00E-03	5.40E-02	1.32E-03	25	582.55	825.00	14,447	**5.1E-04**	2.8E-03	2.85E+02		X	4.6E-04	2.8E-03		X	
120821	1,2,4-Trichlorobenzene	1.78E+03	3.00E-02	8.23E-06	4.88E+01	5.81E-02	1.42E-03	25	486.15	725.00	10,471	**0.0E+00**	4.0E-03	1.81E+02			0.0E+00	2.0E-01			
123739	Crotonaldehyde (2-butenal)	4.82E+00	9.56E-02	1.07E-05	3.69E+04	7.99E-04	1.95E-05	25	375.20	568.00	9	5.4E-04	0.0E+00	7.01E+01	X		5.4E-04	0.0E+00	X		
124481	Chlorodibromomethane	6.31E+01	1.96E-02	1.05E-05	2.60E+03	3.20E-02	7.81E-04	25	416.14	678.20	5,900	**2.7E-05**	7.0E-02	2.08E+02	?	X	2.4E-05	7.0E-02	X	X	
126987	Methacrylonitrile	3.58E+01	1.12E-01	1.32E-05	2.54E+04	1.01E-02	2.46E-04	25	363.30	554.00	7,600	0.0E+00	7.0E-04	6.71E+01			0.0E+00	7.0E-04			
126998	2-Chloro-1,3-butadiene (chloropra	6.73E+01	8.58E-02	1.03E-05	2.12E+03	4.91E-01	1.20E-02	25	332.40	525.00	8,075	0.0E+00	7.0E-03	8.85E+01			0.0E+00	7.0E-03			
127184	Tetrachloroethylene	1.55E+02	7.20E-02	8.20E-06	2.00E+02	7.53E-01	1.84E-02	25	394.40	620.20	8,288	**5.9E-06**	**3.5E-02**	1.66E+02			3.0E-06	0.0E+00			
129000	Pyrene	1.05E+05	2.72E-02	7.24E-06	1.35E+00	4.50E-04	1.10E-05	25	667.95	936	14370	0.0E+00	1.1E-01	2.02E+02		X	0.0E+00	1.1E-01		X	
132649	Dibenzofuran	5.15E+03	2.38E-02	6.00E-06	3.10E+00	5.15E-04	1.26E-05	25	560	824	66400	0.0E+00	1.4E-02	1.68E+02		X	0.0E+00	1.4E-02		X	
135988	sec-Butylbenzene	9.66E+02	5.70E-02	8.12E-06	3.94E+00	5.68E-01	1.39E-02	25	446.5	679	88730	0.0E+00	1.4E-01	1.34E+02		X	0.0E+00	1.4E-01		X	
141786	Ethylacetate	6.44E+00	7.32E-02	9.70E-06	8.03E+04	5.64E-03	1.38E-04	25	350.26	523.3	7633.66	0.0E+00	3.2E+00	8.81E+01		X	0.0E+00	3.2E+00		X	
156592	cis-1,2-Dichloroethylene	3.55E+01	7.36E-02	1.13E-05	3.50E+03	1.67E-01	4.07E-03	25	333.65	544	7192	0.0E+00	3.5E-02	9.69E+01		X	0.0E+00	3.5E-02		X	
156605	trans-1,2-Dichloroethylene	5.25E+01	7.07E-02	1.19E-05	6.30E+03	3.84E-01	9.36E-03	25	320.85	516.5	6717	0.0E+00	6.0E-02	9.69E+01		X	0.0E+00	7.0E-02		X	
205992	Benzo(b)fluoranthene	1.23E+06	2.26E-02	5.56E-06	1.50E-03	4.54E-03	1.11E-04	25	715.9	969.27	17000	**1.1E-04**	0.0E+00	2.52E+02	?		2.1E-04	0.0E+00	X		
218019	Chrysene	3.98E+05	2.48E-02	6.21E-06	6.30E-03	3.87E-03	9.44E-05	25	714.15	979	16455	**1.1E-05**	0.0E+00	2.28E+02	?		2.1E-06	0.0E+00	X		
309002	Aldrin	2.45E+06	1.32E-02	4.86E-06	1.70E-02	6.95E-03	1.70E-04	25	603.01	839.37	15000	**4.9E-03**	1.1E-04	3.65E+02		X	4.9E-03	1.1E-04		X	
319846	alpha-HCH (alpha-BHC)	1.23E+03	1.42E-02	7.34E-06	2.00E+00	4.34E-04	1.06E-05	25	596.55	839.36	15000	7.7E-04	0.0E+00	2.91E+02			1.8E-03	0.0E+00			
541731	1,3-Dichlorobenzene	1.98E+03	6.92E-02	7.86E-06	1.34E+02	1.27E-01	3.09E-03	25	446	684	9230.18	0.0E+00	1.1E-01	1.47E+02		X	0.0E+00	1.1E-01		X	
542756	1,3-Dichloropropene	4.57E+01	6.26E-02	1.00E-05	2.80E+03	7.24E-01	1.77E-02	25	381.15	587.38	7900	**1.6E-05**	2.0E-02	1.11E+02			4.0E-06	2.0E-02			
630206	1,1,1,2-Tetrachloroethane	1.16E+02	7.10E-02	7.90E-06	1.10E+03	9.90E-02	2.41E-03	25	403.5	624	9768.282525	7.4E-06	1.1E-01	1.68E+02		X	7.4E-06	1.1E-01		X	
1634044	MTBE	7.26E+00	1.02E-01	1.05E-05	5.10E+04	2.56E-02	6.23E-04	25	328.3	497.1	6677.66	**2.6E-07**	3.0E+00	8.82E+01			0.0E+00	3.0E+00			
7439976	Mercury (elemental)	5.20E+01	3.07E-02	6.30E-06	2.00E+01	4.40E-01	1.07E-02	25	629.88	1750	14127	0.0E+00	3.0E-05	2.01E+02			0.0E+00	3.0E-04			

ATTACHMENT 2

VAPOR INTRUSION RISK TABLES

LIST OF TABLES

	OU-1A Cancer Risk	OU-1A HI	OU-1B South Cancer Risk	OU-1B South HI	U.S. EPA Tox. Criteria	Cal/EPA Tox. Criteria	Q3 2011	Q4 2011	Q1 2012
Table 2-5	x				x		x		
Table 2-6	x				x			x	
Table 2-7	x				x				x
Table 2-8	x					x	x		
Table 2-9	x					x		x	
Table 2-10	x					x			x
Table 2-11		x			x		x		
Table 2-12		x			x			x	
Table 2-13		x			x				x
Table 2-14		x				x	x		
Table 2-15		x				x		x	
Table 2-16		x				x			x
Table 2-17			x	x	x		x		
Table 2-18			x	x	x			x	
Table 2-19			x	x	x				x
Table 2-20			x	x		x	x		
Table 2-21			x	x		x		x	
Table 2-22			x	x		x			x

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Table 2-1
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1A
(U.S. EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air (µg/m^3)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	4.7E-09	0.001
1,2,3-Trichloropropane	96184	1.0	7.2E-04	NA	0.002
Vinyl chloride	75014	1.0	8.5E-03	1.5E-08	0.0001

Notes:

CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
µg/m^3 = micrograms per cubic meter
NA = Not applicable or not available

Table 2-2
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1A (Cal/EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	4.9E-09	0.001
1,2,3-Trichloropropane	96184	1.0	7.2E-04	2.5E-06	0.002
Vinyl chloride	75014	1.0	8.5E-03	2.7E-07	0.0001

Notes:

Cal/EPA = California Environmental Protection Agency
CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter

Table 2-3
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1B South (U.S. EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	4.8E-09	0.001
Vinyl chloride	75014	1.0	8.6E-03	1.5E-08	0.0001

Notes:

CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter

Table 2-4
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1B South (Cal/EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	4.9E-09	0.001
Vinyl chloride	75014	1.0	8.6E-03	2.7E-07	0.0001

Notes:

Cal/EPA = California Environmental Protection Agency
CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter

Table 2-5
Incremental Cancer Risks per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	1.0E-08		7.7E-09	1.8E-08
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	4.1E-06		7.7E-09	4.1E-06
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	2.8E-08		7.7E-09	3.6E-08
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	1.5E-08		7.7E-09	2.3E-08
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	1.2E-09		7.7E-09	8.9E-09
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	1.4E-09		7.7E-09	9.1E-09
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	2.4E-09		7.7E-09	1.0E-08
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	1.1E-08		7.7E-09	1.9E-08
222PW13S	<1.0	16	<1.0	0.5	16	0.5	2.4E-09		7.7E-09	1.0E-08
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	2.4E-09		7.7E-09	1.0E-08
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-1
3. U.S. EPA has no inhalation toxicity criterion for 1,2,3-TCP and recommends against route-to-route extrapolation.
4. Calculated using incremental cancer risk from Table 2-1
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-6
Incremental Cancer Risks per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	9.5E-09		7.7E-09	1.7E-08
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	9.5E-09		7.7E-09	1.7E-08
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	2.7E-06		7.7E-09	2.8E-06
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	2.8E-08		7.7E-09	3.6E-08
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	1.3E-08		7.7E-09	2.1E-08
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	1.2E-08		7.7E-09	2.0E-08
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	2.4E-09		7.7E-09	1.0E-08
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	2.4E-09		4.5E-09	6.8E-09
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-1
3. U.S. EPA has no inhalation toxicity criterion for 1,2,3-TCP and recommends against route-to-route extrapolation.
4. Calculated using incremental cancer risk from Table 2-1
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-7
Incremental Cancer Risks per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	1.0E-08		7.7E-09	1.8E-08
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	1.7E-06		7.7E-09	1.7E-06
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	2.7E-08		7.7E-09	3.4E-08
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	1.4E-08		7.7E-09	2.1E-08
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	1.4E-08		7.7E-09	2.1E-08
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	2.4E-09		7.7E-09	1.0E-08
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09		7.7E-09	1.0E-08
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-1
3. U.S. EPA has no inhalation toxicity criterion for 1,2,3-TCP and recommends against route-to-route extrapolation.
4. Calculated using incremental cancer risk from Table 2-1
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-8
Incremental Cancer Risks per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	1.1E-08	6.3E-07	1.4E-07	7.8E-07
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	4.2E-06	8.9E-05	1.4E-07	9.3E-05
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	2.9E-08	3.3E-06	1.4E-07	3.5E-06
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	1.6E-08	1.5E-05	1.4E-07	1.5E-05
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	1.3E-09	1.1E-06	1.4E-07	1.3E-06
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	1.4E-09	1.4E-06	1.4E-07	1.6E-06
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	2.4E-09	1.5E-06	1.4E-07	1.6E-06
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	2.4E-09	4.3E-06	1.4E-07	4.4E-06
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	1.1E-08	3.8E-05	1.4E-07	3.8E-05
222PW13S	<1.0	16	<1.0	0.5	16	0.5	2.4E-09	4.1E-05	1.4E-07	4.1E-05
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	2.4E-09	2.4E-06	1.4E-07	2.5E-06
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-2
3. Calculated using incremental cancer risk from Table 2-2
4. Calculated using incremental cancer risk from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

Cal/EPA	California Environmental Protection Agency
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-9
Incremental Cancer Risks per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	9.7E-09	6.3E-07	1.4E-07	7.8E-07
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	9.7E-09	6.3E-07	1.4E-07	7.8E-07
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	2.8E-06	6.6E-05	1.4E-07	6.9E-05
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	2.9E-08	3.3E-06	1.4E-07	3.5E-06
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	1.4E-08	1.5E-05	1.4E-07	1.5E-05
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	1.2E-08	4.3E-05	1.4E-07	4.3E-05
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	2.4E-09	2.4E-06	1.4E-07	2.5E-06
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	2.4E-09	6.3E-07	7.9E-08	7.1E-07
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-2
3. Calculated using incremental cancer risk from Table 2-2
4. Calculated using incremental cancer risk from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

Cal/EPA	California Environmental Protection Agency
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-10
Incremental Cancer Risks per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	1.1E-08	6.3E-07	1.4E-07	7.8E-07
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	1.7E-06	2.8E-05	1.4E-07	3.0E-05
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	2.7E-08	2.5E-06	1.4E-07	2.7E-06
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	1.4E-08	1.7E-05	1.4E-07	1.7E-05
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	1.4E-08	3.5E-05	1.4E-07	3.6E-05
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	2.4E-09	1.8E-06	1.4E-07	1.9E-06
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	2.4E-09	6.3E-07	1.4E-07	7.7E-07
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-2
3. Calculated using incremental cancer risk from Table 2-2
4. Calculated using incremental cancer risk from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

Cal/EPA	California Environmental Protection Agency
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-11
Incremental Health Hazards per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.003	0.001	0.00004	0.004
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	1.2	0.1	0.00004	1.3
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	0.01	0.003	0.00004	0.01
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	0.004	0.01	0.00004	0.02
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	0.0004	0.001	0.00004	0.001
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	0.0004	0.001	0.00004	0.002
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	0.001	0.001	0.00004	0.002
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	0.001	0.004	0.00004	0.005
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	0.003	0.03	0.00004	0.04
222PW13S	<1.0	16	<1.0	0.5	16	0.5	0.001	0.04	0.00004	0.04
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	0.001	0.002	0.00004	0.003
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-1
3. Calculated using incremental HQ from Table 2-1
4. Calculated using incremental HQ from Table 2-1
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-12
Incremental Health Hazards per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	0.003	0.001	0.00004	0.003
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	0.003	0.001	0.00004	0.003
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	0.8	0.06	0.00004	0.9
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	0.01	0.003	0.00004	0.01
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	0.004	0.01	0.00004	0.02
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	0.003	0.04	0.00004	0.04
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	0.001	0.002	0.00004	0.003
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	0.001	0.001	0.00002	0.001
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-1
3. Calculated using incremental HQ from Table 2-1
4. Calculated using incremental HQ from Table 2-1
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-13
Incremental Health Hazards per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.003	0.001	0.00004	0.004
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	0.5	0.03	0.00004	0.5
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	0.01	0.002	0.00004	0.01
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	0.004	0.02	0.00004	0.02
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	0.004	0.03	0.00004	0.04
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	0.001	0.002	0.00004	0.002
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-1
3. Calculated using incremental HQ from Table 2-1
4. Calculated using incremental HQ from Table 2-1
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-14
Incremental Health Hazards per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.003	0.001	0.00004	0.004
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	1.2	0.08	0.00004	1.3
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	0.01	0.003	0.00004	0.01
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	0.004	0.01	0.00004	0.02
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	0.0004	0.001	0.00004	0.001
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	0.0004	0.001	0.00004	0.002
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	0.001	0.001	0.00004	0.002
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	0.001	0.004	0.00004	0.005
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	0.003	0.03	0.00004	0.04
222PW13S	<1.0	16	<1.0	0.5	16	0.5	0.001	0.04	0.00004	0.04
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	0.001	0.002	0.00004	0.003
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-2
3. Calculated using incremental HQ from Table 2-2
4. Calculated using incremental HQ from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-15
Incremental Health Hazards per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	0.003	0.001	0.00004	0.003
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	0.003	0.001	0.00004	0.003
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	0.8	0.06	0.00004	0.9
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	0.01	0.003	0.00004	0.01
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	0.004	0.01	0.00004	0.02
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	0.003	0.04	0.00004	0.04
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	0.001	0.002	0.00004	0.003
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	0.001	0.001	0.00002	0.001
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-2
3. Calculated using incremental HQ from Table 2-2
4. Calculated using incremental HQ from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-16
Incremental Health Hazards per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.003	0.001	0.00004	0.004
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	0.5	0.03	0.00004	0.5
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	0.01	0.002	0.00004	0.01
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	0.004	0.02	0.00004	0.02
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	0.004	0.03	0.00004	0.04
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	0.001	0.002	0.00004	0.002
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.001	0.001	0.00004	0.001
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-2
3. Calculated using incremental HQ from Table 2-2
4. Calculated using incremental HQ from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-17
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(U.S. EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	6400	0.22J	6400	0.22	3.1E-05	3.4E-09	3.1E-05	8.9	0.00002	8.9
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.00004	0.001
I003MW13S	<1.0	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.00004	0.001
I003MW14S	0.5J	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.00004	0.001
I003MW15S	4.5	<1.0	4.5	0.5	2.1E-08	7.7E-09	2.9E-08	0.006	0.00004	0.006

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-18
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(U.S. EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S	200	<1.0	200	0.5	9.5E-07	7.7E-09	9.6E-07	0.3	0.001	0.3
TCE Pume Source Area:										
I003MW06S	670	<1.0	670	0.5	3.2E-06	7.7E-09	3.2E-06	0.9	0.001	0.9
I003MW07S	7600	<1.0	7600	0.5	3.6E-05	7.7E-09	3.6E-05	11	0.001	11
I003MW09S	1400	<1.0	1400	0.5	6.7E-06	7.7E-09	6.7E-06	2	0.001	2
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S	<1.0	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.001	0.002
I003MW03S	<1.0	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.001	0.002
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.001	0.002
I003MW13S	<1.0	<1.0	0.5	0.5	2.4E-09	7.7E-09	1.0E-08	0.001	0.001	0.002
I003MW14S	0.94	<1.0	0.94	0.5	4.5E-09	7.7E-09	1.2E-08	0.001	0.001	0.002
I003MW15S	4.9	<1.0	4.9	0.5	2.3E-08	7.7E-09	3.1E-08	0.007	0.001	0.008

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range — Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-19
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(U.S. EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	7300	<1.0	7300	0.5	3.5E-05	0.0E+00	3.5E-05	10	0.00004	10
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	2.4E-09	0.0E+00	2.4E-09	0.001	0.00004	0.001
I003MW13S	<1.0	<1.0	0.5	0.5	2.4E-09	0.0E+00	2.4E-09	0.001	0.00004	0.001
I003MW14S	1.1	<1.0	1.1	0.5	5.2E-09	0.0E+00	5.2E-09	0.002	0.00004	0.002
I003MW15S	3.6	<1.0	3.6	0.5	1.7E-08	0.0E+00	1.7E-08	0.005	0.00004	0.005

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-20
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(Cal/EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	6400	0.22J	6400	0.22	3.1E-05	6.0E-08	3.1E-05	9	0.00002	9
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW13S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW14S	0.5J	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW15S	4.5	<1.0	4.5	0.5	2.2E-08	1.4E-07	1.6E-07	0.01	0.00004	0.01

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-21
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(Cal/EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S	200	<1.0	200	0.5	9.8E-07	1.4E-07	1.1E-06	0.3	0.00004	0.3
TCE Pume Source Area:										
I003MW06S	670	<1.0	670	0.5	3.3E-06	1.4E-07	3.4E-06	1	0.00004	1
I003MW07S	7600	<1.0	7600	0.5	3.7E-05	1.4E-07	3.7E-05	11	0.00004	11
I003MW09S	1400	<1.0	1400	0.5	6.8E-06	1.4E-07	7.0E-06	2	0.00004	2
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW03S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW13S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW14S	0.94	<1.0	0.94	0.5	4.6E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW15S	4.9	<1.0	4.9	0.5	2.4E-08	1.4E-07	1.6E-07	0.01	0.00004	0.01

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:
Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-22
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(Cal/EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	7300	<1.0	7300	0.5	3.6E-05	1.4E-07	3.6E-05	10	0.00004	10
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW13S	<1.0	<1.0	0.5	0.5	2.4E-09	1.4E-07	1.4E-07	0.001	0.00004	0.001
I003MW14S	1.1	<1.0	1.1	0.5	5.4E-09	1.4E-07	1.4E-07	0.002	0.00004	0.002
I003MW15S	3.6	<1.0	3.6	0.5	1.8E-08	1.4E-07	1.5E-07	0.01	0.00004	0.01

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:
Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

LIST OF TABLES COMMERCIAL/INDUSTRIAL SCENARIO

	OU-1A Cancer Risk	OU-1A HI	OU-1B South Cancer Risk	OU-1B South HI	U.S. EPA Tox. Criteria	Cal/EPA Tox. Criteria	Q3 2011	Q4 2011	Q1 2012
Table 2-27	x				x		x		
Table 2-28	x				x			x	
Table 2-29	x				x				x
Table 2-30	x					x	x		
Table 2-31	x					x		x	
Table 2-32	x					x			x
Table 2-33		x			x		x		
Table 2-34		x			x			x	
Table 2-35		x			x				x
Table 2-36		x				x	x		
Table 2-37		x				x		x	
Table 2-38		x				x			x
Table 2-39			x	x	x		x		
Table 2-40			x	x	x			x	
Table 2-41			x	x	x				x
Table 2-42			x	x		x	x		
Table 2-43			x	x		x		x	
Table 2-44			x	x		x			x

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Table 2-23
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1A
(U.S. EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	8.9E-11	0.00003
1,2,3-Trichloropropane	96184	1.0	7.2E-04	NA	0.000015
Vinyl chloride	75014	1.0	8.5E-03	5.4E-10	0.000002

Notes:

CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter
NA = Not applicable or not available

Table 2-24
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1A (Cal/EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	8.9E-11	0.00003
1,2,3-Trichloropropane	96184	1.0	7.2E-04	1.4E-08	0.00002
Vinyl chloride	75014	1.0	8.5E-03	5.4E-10	0.000002

Notes:

Cal/EPA = California Environmental Protection Agency
CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter

Table 2-25
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1B South (U.S. EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	8.9E-11	0.00003
Vinyl chloride	75014	1.0	8.5E-03	5.4E-10	0.000002

Notes:

CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter

Table 2-26
Incremental Cancer Risks and Hazard Quotient Per Unit Concentration Factors for OU-1B South (Cal/EPA Toxicity Criteria)

VOC	CAS Number	Exposure to Indoor Air			
		Chemical Concentration in Groundwater (µg/L)	Chemical Concentration in Indoor Air ($\mu g/m^3$)	Cancer Risk (unitless)	Hazard Quotient (unitless)
Trichloroethene	79016	1.0	2.9E-03	8.9E-11	0.00003
Vinyl chloride	75014	1.0	8.5E-03	5.4E-10	0.000002

Notes:

Cal/EPA = California Environmental Protection Agency
CAS = Chemical Abstracts Service
COPC = Chemical of Potential Concern
EPC = Exposure Point Concentration used in the risk and hazard calculations
µg/L = micrograms per liter
$\mu g/m^3$ = micrograms per cubic meter

Table 2-27
Incremental Cancer Risks per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	2.0E-10		2.7E-10	4.7E-10
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	7.7E-08		2.7E-10	7.7E-08
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	5.3E-10		2.7E-10	8.0E-10
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	2.8E-10		2.7E-10	5.5E-10
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	2.3E-11		2.7E-10	2.9E-10
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	2.6E-11		2.7E-10	3.0E-10
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	4.5E-11		2.7E-10	3.1E-10
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	2.0E-10		2.7E-10	4.7E-10
222PW13S	<1.0	16	<1.0	0.5	16	0.5	4.5E-11		2.7E-10	3.1E-10
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	4.5E-11		2.7E-10	3.1E-10
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-1
3. U.S. EPA has no inhalation toxicity criterion for 1,2,3-TCP and recommends against route-to-route extrapolation.
4. Calculated using incremental cancer risk from Table 2-1
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-28
Incremental Cancer Risks per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	1.8E-10		2.7E-10	4.5E-10
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	1.8E-10		2.7E-10	4.5E-10
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	5.2E-08		2.7E-10	5.2E-08
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	5.3E-10		2.7E-10	8.0E-10
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	2.5E-10		2.7E-10	5.2E-10
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	2.2E-10		2.7E-10	4.9E-10
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	4.5E-11		2.7E-10	3.1E-10
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	4.5E-11		1.6E-10	2.0E-10
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-1
3. U.S. EPA has no inhalation toxicity criterion for 1,2,3-TCP and recommends against route-to-route extrapolation.
4. Calculated using incremental cancer risk from Table 2-1
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-29
Incremental Cancer Risks per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	2.0E-10		2.7E-10	4.7E-10
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	3.1E-08		2.7E-10	3.1E-08
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	5.0E-10		2.7E-10	7.7E-10
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	2.6E-10		2.7E-10	5.3E-10
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	2.6E-10		2.7E-10	5.3E-10
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	4.5E-11		2.7E-10	3.1E-10
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11		2.7E-10	3.1E-10
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-1
3. U.S. EPA has no inhalation toxicity criterion for 1,2,3-TCP and recommends against route-to-route extrapolation.
4. Calculated using incremental cancer risk from Table 2-1
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-30
Incremental Cancer Risks per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	2.0E-10	3.5E-09	2.7E-10	4.0E-09
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	7.7E-08	4.9E-07	2.7E-10	5.7E-07
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	5.3E-10	1.8E-08	2.7E-10	1.9E-08
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	2.8E-10	8.4E-08	2.7E-10	8.5E-08
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	2.3E-11	6.3E-09	2.7E-10	6.6E-09
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	2.6E-11	8.0E-09	2.7E-10	8.3E-09
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	4.5E-11	8.1E-09	2.7E-10	8.4E-09
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	4.5E-11	2.4E-08	2.7E-10	2.4E-08
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	2.0E-10	2.1E-07	2.7E-10	2.1E-07
222PW13S	<1.0	16	<1.0	0.5	16	0.5	4.5E-11	2.2E-07	2.7E-10	2.2E-07
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	4.5E-11	1.3E-08	2.7E-10	1.3E-08
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-2
3. Calculated using incremental cancer risk from Table 2-2
4. Calculated using incremental cancer risk from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

Cal/EPA	California Environmental Protection Agency
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-31
Incremental Cancer Risks per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	1.8E-10	3.5E-09	2.7E-10	3.9E-09
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	1.8E-10	3.5E-09	2.7E-10	3.9E-09
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	5.2E-08	3.6E-07	2.7E-10	4.2E-07
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	5.3E-10	1.8E-08	2.7E-10	1.9E-08
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	2.5E-10	8.4E-08	2.7E-10	8.5E-08
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	2.2E-10	2.4E-07	2.7E-10	2.4E-07
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	4.5E-11	1.3E-08	2.7E-10	1.4E-08
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	4.5E-11	3.5E-09	1.6E-10	3.7E-09
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-2
3. Calculated using incremental cancer risk from Table 2-2
4. Calculated using incremental cancer risk from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

Cal/EPA	California Environmental Protection Agency
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-32
Incremental Cancer Risks per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE[2] (unitless)	Estimated Cancer Risk Attributed to 1,2,3-TCP[3] (unitless)	Estimated Cancer Risk Attributed to VC[4] (unitless)	Total Estimated Cancer Risk for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	2.0E-10	3.5E-09	2.7E-10	4.0E-09
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	3.1E-08	1.5E-07	2.7E-10	1.9E-07
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	5.0E-10	1.4E-08	2.7E-10	1.5E-08
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	2.6E-10	9.4E-08	2.7E-10	9.4E-08
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	2.6E-10	2.0E-07	2.7E-10	2.0E-07
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	4.5E-11	9.8E-09	2.7E-10	1.0E-08
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	4.5E-11	3.5E-09	2.7E-10	3.8E-09
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental cancer risk from Table 2-2
3. Calculated using incremental cancer risk from Table 2-2
4. Calculated using incremental cancer risk from Table 2-2
5. Sum of contributions from TCE, 1,2,3-TCP, and VC

Shading Key:

(no shading)	cancer risk is below the point of departure ($<10^{-6}$)
	cancer risk in 10^{-6} range
	cancer risk in 10^{-5} range
	cancer risk in 10^{-4} range
	cancer risk exceeds 10^{-4} range

Generally acceptable range per NCP

Acronyms:

Cal/EPA	California Environmental Protection Agency
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-33
Incremental Health Hazards per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.0001	0.0000	0.0000	0.0001
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	0.03	0.00	0.00	0.03
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	0.0002	0.0000	0.000001	0.0002
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	0.0001	0.000	0.000001	0.000
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	0.00001	0.0000	0.000001	0.0000
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	0.00001	0.0000	0.000001	0.0000
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	0.00002	0.0000	0.000001	0.0000
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	0.00002	0.0000	0.000001	0.0000
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	0.0001	0.000	0.000001	0.000
222PW13S	<1.0	16	<1.0	0.5	16	0.5	0.00002	0.000	0.000001	0.000
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	0.00002	0.0000	0.000001	0.0000
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.000015	0.00000375	0.00000085	0.0000196
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.000015	0.00000375	0.00000085	0.0000196
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.000015	0.00000375	0.00000085	0.0000196
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.000015	0.00000375	0.00000085	0.0000196
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.000015	0.00000375	0.00000085	0.0000196
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.000015	0.00000375	0.00000085	0.0000196

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-23
3. Calculated using incremental HQ from Table 2-23
4. Calculated using incremental HQ from Table 2-23
5. Sum of contributions from TCE, 1.2.3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-34
Incremental Health Hazards per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	0.0001	0.0000	0.000001	0.0001
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	0.0001	0.0000	0.000001	0.0001
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	0.02	0.00	0.000001	0.02
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	0.0002	0.0000	0.000001	0.0002
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	0.0001	0.000	0.000001	0.000
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	0.00008	0.000	0.000001	0.00
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	0.00002	0.0000	0.000001	0.0000
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	0.00002	0.0000	0.000000	0.0000
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-23
3. Calculated using incremental HQ from Table 2-23
4. Calculated using incremental HQ from Table 2-23
5. Sum of contributions from TCE, 1.2.3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-35
Incremental Health Hazards per Monitoring Well for OU-1A
(U.S. EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.0001	0.0000	0.000001	0.0001
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	0.01	0.000	0.000001	0.01
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	0.0002	0.0000	0.000001	0.0002
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	0.0001	0.000	0.000001	0.000
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	0.0001	0.000	0.000001	0.000
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	0.00002	0.0000	0.000001	0.0000
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.0000	0.000001	0.0000
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-23
3. Calculated using incremental HQ from Table 2-23
4. Calculated using incremental HQ from Table 2-23
5. Sum of contributions from TCE, 1.2.3-TCP, and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

HI	Hazard index
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
U.S. EPA	United States Environmental Protection Agency
UST	underground storage tank
VC	vinyl chloride

Table 2-36
Incremental Health Hazards per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.0001	0.000004	0.000001	0.0001
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	860	35	<1.0	860	35	0.5	0.03	0.001	0.000001	0.03
Upgradient Portion of Plume:										
222MW04S	6.0	1.2	<1.0	5.9	1.3	0.5	0.0002	0.00002	0.000001	0.0002
Mid-Plume Area:										
222MW05S	3.2	6	<1.0	3.2	6	0.5	0.0001	0.0001	0.000001	0.0002
IS72MW03S	0.26J	0.45J	<1.0	0.26	0.45	0.5	0.00001	0.00001	0.000001	0.00002
IS72MW03S(dup)	0.29J	0.57J	<1.0	0.29	0.57	0.5	0.00001	0.00001	0.000001	0.00002
222PW09S	<1.0	0.58	<1.0	0.5	0.58	0.5	0.00002	0.00001	0.000001	0.00002
222PW10S	<1.0	1.7	<1.0	0.5	1.7	0.5	0.00002	0.00003	0.000001	0.00004
IS72MW02S	2.3	15	<1.0	2.3	15	0.5	0.0001	0.0002	0.000001	0.0003
222PW13S	<1.0	16	<1.0	0.5	16	0.5	0.00002	0.0002	0.000001	0.0003
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.94	<1.0	0.5	0.94	0.5	0.00002	0.00001	0.000001	0.00003
Outside Plume Boundary - UST 222 Area:										
222MW03S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
222PW03SA	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
222PW03SB	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
222PWO3SC	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
222PW03SD	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S	<1.0	<0.5	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW10S										
IS72MW11S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW15S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW15S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-24
3. Calculated using incremental HQ from Table 2-24
4. Calculated using incremental HQ from Table 2-24
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

Cal/EPA	California Environmental Protection Agency
HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-37
Incremental Health Hazards per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2	<0.50	<1.0	2	0.25	0.5	0.0001	0.000004	0.000001	0.0001
IS72MW01SR(dup)	2	<0.50	<1.0	2	0.25	0.5	0.0001	0.000004	0.000001	0.0001
Plume Source Area:										
IS72MW17S	580	26	<1.0	580	26	0.5	0.02	0.0004	0.000001	0.02
Upgradient Portion of Plume:										
222MW04S	5.9	1.3	<1.0	5.9	1.3	0.5	0.0002	0.00002	0.000001	0.0002
Mid-Plume Area:										
222MW05S	2.8	6	<1.0	2.8	6	0.5	0.0001	0.0001	0.000001	0.0002
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.5	17	<1.0	2.5	17	0.5	0.00008	0.0003	0.000001	0.0003
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.95	<1.0	0.5	0.95	0.5	0.00002	0.00001	0.000001	0.00003
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW10S	<1.0	<0.50	0.29J	0.5	0.25	0.29	0.00002	0.000004	0.000000	0.00002
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW18S(dup)	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-24
3. Calculated using incremental HQ from Table 2-24
4. Calculated using incremental HQ from Table 2-24
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

Cal/EPA	California Environmental Protection Agency
HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-38
Incremental Health Hazards per Monitoring Well for OU-1A
(Cal/EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q1 2012[1] (µg/L)	1,2,3-TCP Detected in Groundwater Q1 2012[1] (µg/L)	VC Detected in Groundwater Q1 2012[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	1,2,3-TCP Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Hazard Quotient (HQ) Attributed to TCE[2] (unitless)	Estimated HQ Attributed to 1,2,3-TCP[3] (unitless)	Estimated HQ Attributed to VC[4] (unitless)	Total Estimated Hazard Index (HI) for Monitoring Well[5] (unitless)
Upgradient from Plume (Outside plume boundary):										
IS72MW01SR	2.2	<0.50	<1.0	2.2	0.25	0.5	0.0001	0.000004	0.000001	0.0001
IS72MW01SR(dup)										
Plume Source Area:										
IS72MW17S	350	11	<1.0	350	11	0.5	0.01	0.0002	0.000001	0.01
Upgradient Portion of Plume:										
222MW04S	5.6	1	<1.0	5.6	1	0.5	0.0002	0.00002	0.000001	0.0002
Mid-Plume Area:										
222MW05S	2.9	6.7	<1.0	2.9	6.7	0.5	0.0001	0.0001	0.000001	0.0002
IS72MW03S										
IS72MW03S(dup)										
222PW09S										
222PW10S										
IS72MW02S	2.9	14	<1.0	2.9	14	0.5	0.0001	0.0002	0.000001	0.0003
222PW13S										
Downgradient Portion of Plume:										
IS72MW12S	<1.0	0.7	<1.0	0.5	0.7	0.5	0.00002	0.00001	0.000001	0.00003
Outside Plume Boundary - UST 222 Area:										
222MW03S										
222PW03SA										
222PW03SB										
222PWO3SC										
222PW03SD										
Outside Plume Boundary - Crossgradient from Mid-Plume Area:										
222MW06S										
IS72MW04S										
IS72MW13S										
IS72MW13S(dup)										
Outside Plume Boundary - Downgradient Portion of Plume:										
IS72MW05S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW10S										
IS72MW11S										
IS72MW15S										
IS72MW15S(dup)										
IS72MW18S	<1.0	<0.50	<1.0	0.5	0.25	0.5	0.00002	0.000004	0.000001	0.00002
IS72MW18S(dup)										

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Calculated using incremental HQ from Table 2-24
3. Calculated using incremental HQ from Table 2-24
4. Calculated using incremental HQ from Table 2-24
5. Sum of contributions from TCE and VC

Shading Key:

(no shading)	HI is below the point of departure (<1)
	HI exceeds 1

Acronyms:

Cal/EPA	California Environmental Protection Agency
HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
OU	operable unit
TCE	trichloroethene
1,2,3-TCP	1,2,3-trichloropropane
UST	underground storage tank
VC	vinyl chloride

Table 2-39 Commercial/Industrial Worker
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(U.S. EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	6400	0.22J	6400	0.22	5.7E-07	1.2E-10	5.7E-07	0.2	0.0000004	0.2
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW13S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW14S	0.5J	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW15S	4.5	<1.0	4.5	0.5	4.0E-10	2.7E-10	6.7E-10	0.0001	0.000001	0.0001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-40 Commercial/Industrial Worker
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(U.S. EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S	200	<1.0	200	0.5	1.8E-08	2.7E-10	1.8E-08	0.006	0.0000	0.006
TCE Pume Source Area:										
I003MW06S	670	<1.0	670	0.5	6.0E-08	2.7E-10	6.0E-08	0.02	0.0000	0.02
I003MW07S	7600	<1.0	7600	0.5	6.8E-07	2.7E-10	6.8E-07	0.2	0.0000	0.2
I003MW09S	1400	<1.0	1400	0.5	1.2E-07	2.7E-10	1.2E-07	0.04	0.0000	0.04
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.0000	0.0000
I003MW03S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.0000	0.0000
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.0000	0.0000
I003MW13S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.0000	0.0000
I003MW14S	0.94	<1.0	0.94	0.5	8.4E-11	2.7E-10	3.5E-10	0.00003	0.0000	0.0000
I003MW15S	4.9	<1.0	4.9	0.5	4.4E-10	2.7E-10	7.1E-10	0.0001	0.0000	0.0002

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-41 Commercial/Industrial Worker
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(U.S. EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	7300	<1.0	7300	0.5	6.5E-07	0.0E+00	6.5E-07	0.2	0.000001	0.2
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	4.5E-11	0.0E+00	4.5E-11	0.00002	0.000001	0.00002
I003MW13S	<1.0	<1.0	0.5	0.5	4.5E-11	0.0E+00	4.5E-11	0.00002	0.000001	0.00002
I003MW14S	1.1	<1.0	1.1	0.5	9.8E-11	0.0E+00	9.8E-11	0.00003	0.000001	0.00003
I003MW15S	3.6	<1.0	3.6	0.5	3.2E-10	0.0E+00	3.2E-10	0.0001	0.000001	0.0001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:
(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-42 Commercial/Industrial Worker
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(Cal/EPA Toxicity Criteria)
Third Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q3 2011[1] (µg/L)	VC Detected in Groundwater Q3 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	6400	0.22J	6400	0.22	5.7E-07	1.2E-10	5.7E-07	0.2	0.0000004	0.2
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW13S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW14S	0.5J	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW15S	4.5	<1.0	4.5	0.5	4.0E-10	2.7E-10	6.7E-10	0.0001	0.000001	0.0001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-43 Commercial/Industrial Worker
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(Cal/EPA Toxicity Criteria)
Fourth Quarter 2011 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S	200	<1.0	200	0.5	1.8E-08	2.7E-10	1.8E-08	0.006	0.000001	0.006
TCE Pume Source Area:										
I003MW06S	670	<1.0	670	0.5	6.0E-08	2.7E-10	6.0E-08	0.02	0.000001	0.02
I003MW07S	7600	<1.0	7600	0.5	6.8E-07	2.7E-10	6.8E-07	0.2	0.000001	0.2
I003MW09S	1400	<1.0	1400	0.5	1.2E-07	2.7E-10	1.2E-07	0.04	0.000001	0.04
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW03S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW13S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW14S	0.94	<1.0	0.94	0.5	8.4E-11	2.7E-10	3.5E-10	0.00003	0.000001	0.00003
I003MW15S	4.9	<1.0	4.9	0.5	4.4E-10	2.7E-10	7.1E-10	0.0001	0.000001	0.0001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

Table 2-44 Commercial/Industrial Worker
Incremental Cancer Risks and Health Hazards per Monitoring Well for OU-1B South
(Cal/EPA Toxicity Criteria)
First Quarter 2012 Data

Monitoring Well Number	TCE Detected in Groundwater Q4 2011[1] (µg/L)	VC Detected in Groundwater Q4 2011[1] (µg/L)	TCE Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	VC Concentration in Groundwater Used in the Vapor Intrusion Calculations (µg/L)	Estimated Cancer Risk Attributed to TCE (unitless)	Estimated Cancer Risk Attributed to VC (unitless)	Estimated Cancer Risk[1] (unitless)	Estimated HQ Attributed to TCE (unitless)	Estimated HQ Attributed to VC (unitless)	Estimated HI[2] (unitless)
Upgradient end of TCE Plume:										
I003MW08S										
TCE Pume Source Area:										
I003MW06S										
I003MW07S	7300	<1.0	7300	0.5	6.5E-07	2.7E-10	6.5E-07	0.2	0.000001	0.2
I003MW09S										
Outside TCE Plume Boundary - Crossgradient from Mid-Plume Area:										
I003MW02S										
I003MW03S										
Outside TCE Plume Boundary - Crossgradient To Downgradient from Leading Edge:										
I003MW12S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW13S	<1.0	<1.0	0.5	0.5	4.5E-11	2.7E-10	3.1E-10	0.00002	0.000001	0.00002
I003MW14S	1.1	<1.0	1.1	0.5	9.8E-11	2.7E-10	3.7E-10	0.00003	0.000001	0.00003
I003MW15S	3.6	<1.0	3.6	0.5	3.2E-10	2.7E-10	5.9E-10	0.0001	0.000001	0.0001

Notes:
1. No concentration indicates the well was not sampled during the quarter.
2. Sum of contributions from TCE and VC

Shading Key:

(no shading) cancer risk is below the point of departure ($<10^{-6}$)
cancer risk in 10^{-6} range
cancer risk in 10^{-5} range
cancer risk in 10^{-4} range
} Generally acceptable range per NCP
cancer risk exceeds 10^{-4} range

HI >1

Acronyms:

HI	Hazard index
HQ	Hazard Quotient
µg/L	micrograms per liter
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
OU	operable unit
TCE	trichloroethene
U.S. EPA	United States Environmental Protection Agency
VC	vinyl chloride

ATTACHMENT 3

SITE INSPECTION CHECKLISTS

CERCLA FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

I. SITE INFORMATION

Site name: Former MCAS Tustin – IRP Sites 11, 13W, and MMS-04	**Date of inspection:** 5/17/12
Location and Region:	**EPA ID:**
Agency, office, or company leading the five-year review:	**Weather/temperature:**

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☑ Access controls
- ☑ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other _____
- ☑ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☑ Site map attached

II. SITE INTERVIEWS (Check all that apply)

1. **O&M site manager** N/A (Name) _____ (Title) _____ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

   Problems, suggestions; ☐ Report attached None

2. **O&M staff** None (Name) _____ (Title) _____ (Date)

   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____

   Problems, suggestions; ☐ Report attached _____

3. [redacted] (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

Agency DTSC, RWQCB, U.S. EPA (BG)
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

Agency _____
Contact _____ _____ _____ _____
Name Title Date Phone no.
Problems; suggestions; G Report attached _____

4. **Other site interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☐ O&M manual	☐ Readily available	☐ Up to date	☑ N/A
☐ As-built drawings	☐ Readily available	☐ Up to date	☑ N/A
☐ Maintenance logs	☐ Readily available	☐ Up to date	☑ N/A

Remarks _____

2. Site-Specific Health and Safety Plan ☐ Readily available ☐ Up to date ☑ N/A
Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☑ N/A
Remarks _____

3. O&M and OSHA Training Records ☐ Readily available ☐ Up to date ☑ N/A
Remarks _____

4. Permits and Service Agreements

Air discharge permit	☐ Readily available	☐ Up to date	☑ N/A
Effluent discharge	☐ Readily available	☐ Up to date	☑ N/A
Waste disposal, POTW	☐ Readily available	☐ Up to date	☑ N/A
Other permits _____	☐ Readily available	☐ Up to date	☑ N/A

Remarks _____

5. Gas Generation Records ☐ Readily available ☐ Up to date ☑ N/A
Remarks

6. Settlement Monument Records ☐ Readily available ☐ Up to date ☑ N/A
Remarks

7. Groundwater Monitoring Records ☐ Readily available ☑ Up to date ☐ N/A
Remarks

8. Leachate Extraction Records ☐ Readily available ☐ Up to date ☑ N/A
Remarks

9. Discharge Compliance Records
Air ☐ Readily available ☐ Up to date ☑ N/A
Water (effluent) ☐ Readily available ☐ Up to date ☑ N/A
Remarks

10. Daily Access/Security Logs ☐ Readily available ☐ Up to date ☑ N/A
Remarks:

IV. O&M COSTS

1. O&M Organization

☐ State in-house ☐ Contractor for State
☐ PRP in-house ☐ Contractor for PRP
☐ Federal Facility in-house ☐ Contractor for Federal Facility
Other N/A

2. O&M Cost Records

☑ Readily available ☐ Up to date

☐ Funding mechanism/agreement in place

Original O&M cost estimate N/A ☐ Breakdown attached

Total annual cost by year for review period if available

From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached
From ________ Date	To ________ Date	________ Total cost	☐ Breakdown attached

3. Unanticipated or Unusually High O&M Costs During Review Period None

Describe costs and reasons:

V. ACCESS AND INSTITUTIONAL CONTROLS ☐ **Applicable** ☐ **N/A**

A. Fencing Yes => 4 Gates, IRP-11 & MMS-04, IRP-13W.

1. Fencing damaged ☐ Location shown on site map ☐ Gates secured ☑ N/A ☐

Remarks ____

B. Other Access Restrictions

1. ☑ Signs and other security measures ☐ Location shown on site map ☐ N/A

Remarks ____

C. Institutional Controls (ICs)

1. Implementation and enforcement

Site conditions imply ICs not properly implemented ☐ Yes ☑ No ☐ N/A

Site conditions imply ICs not being fully enforced ☐ Yes ☑ No ☐ N/A

Type of monitoring (e.g., self-reporting, drive by) Self Reporting for IRP-13W

Frequency Yearly

Responsible party/agency Lennar

Contact _____ _____ _____ _____

Name Title Date Phone no.

Reporting is up-to-date ☑ Yes ☐ No ☐ N/A

Reports are verified by the lead agency ☑ Yes ☐ No ☐ N/A

Specific requirements in deed or decision documents have been met ☑ Yes ☐ No ☐ N/A

Violations have been reported ☐ Yes ☑ No ☐ N/A

Other problems or suggestions: ☐ Report attached

NONE

2. Adequacy ☑ ICs are adequate ☐ ICs are inadequate ☐ N/A

Remarks _____

D. General

1. Vandalism/trespassing ☐ Location shown on site map ☐ No vandalism evident

Remarks None

2. Land use changes on site ☐ N/A

Remarks None

3. Land use changes off site ☐ N/A

Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ☑ Applicable ☐ N/A

1. Roads damaged ☐ Location shown on site map ☐ Roads adequate ☐ N/A
Remarks No

B. Other Site Conditions

Remarks Nothing, Fenced area, Asphalt Paved Road

VII. LANDFILL COVERS ☐ Applicable ☒ N/A

A. Landfill Surface

1. Settlement (Low spots) ☐ Location shown on site map ☐ Settlement not evident
Areal extent _____ Depth _____
Remarks _____

2. Cracks ☐ Location shown on site map ☐ Cracking not evident
Lengths _____ Widths _____ Depths _____
Remarks _____

3. Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent _____ Depth _____
Remarks _____

4. Holes ☐ Location shown on site map ☐ Holes not evident
Areal extent _____ Depth _____
Remarks _____

5. Vegetative Cover ☐ Grass ☐ Cover properly established ☐ No signs of stress
G Trees/Shrubs (indicate size and locations on a diagram)
Remarks _____

6. Alternative Cover (armored rock, concrete, etc.) ☐ N/A

Remarks_____

7. Bulges ☐ Location shown on site map ☐ Bulges not evident

Areal extent_____ Height_____

Remarks_____

8. Wet Areas/Water Damage ☐ Wet areas/water damage not evident

☐ Wet areas ☐ Location shown on site map Areal extent_____

☐ Ponding ☐ Location shown on site map Areal extent_____

☐ Seeps ☐ Location shown on site map Areal extent_____

☐ Soft subgrade ☐ Location shown on site map Areal extent_____

Remarks_____

9. Slope Instability ☐ Slides ☐ Location shown on site map ☐ No evidence of slope instability

Areal extent_____

Remarks_____

B. Benches ☐ Applicable ☐ N/A

(Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)

1. Flows Bypass Bench ☐ Location shown on site map ☐ N/A or okay

Remarks_____

2. Bench Breached ☐ Location shown on site map ☐ N/A or okay

Remarks_____

3. Bench Overtopped ☐ Location shown on site map ☐ N/A or okay

Remarks_____

C. Letdown Channels ☐ Applicable ☒ N/A

(Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)

1. Settlement ☐ Location shown on site map ☐ No evidence of settlement

Areal extent_____ Depth_____

Remarks_____

2. Material Degradation ☐ Location shown on site map ☐ No evidence of degradation
Material type_____ Areal extent_____
Remarks_____

3. Erosion ☐ Location shown on site map ☐ No evidence of erosion
Areal extent_____ Depth_____
Remarks_____

4. Undercutting ☐ Location shown on site map ☐ No evidence of undercutting
Areal extent_____ Depth_____
Remarks_____

5. Obstructions Type_____ ☐ No obstructions
☐ Location shown on site map Areal extent_____
Size_____
Remarks_____

6. Excessive Vegetative Growth Type_____
☐ No evidence of excessive growth
☐ Vegetation in channels does not obstruct flow
☐ Location shown on site map Areal extent_____
Remarks_____

D. Cover Penetrations ☐ Applicable ☐ N/A

1. Gas Vents ☐ Active ☐ Passive
☐ Properly secured/locked G Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance
☐ N/A
Remarks_____

2. Gas Monitoring Probes
☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition
☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A
Remarks_____

3. Monitoring Wells (within surface area of landfill)

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks_____

4. Leachate Extraction Wells

☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition

☐ Evidence of leakage at penetration ☐ Needs Maintenance ☐ N/A

Remarks_____

5. Settlement Monuments ☐ Located ☐ Routinely surveyed ☐ N/A

Remarks_____

E. Gas Collection and Treatment ☐ Applicable ☐ N/A

1. Gas Treatment Facilities

☐ Flaring ☐ Thermal destruction ☐ Collection for reuse

☐ Good condition ☐ Needs Maintenance

Remarks_____

2. Gas Collection Wells, Manifolds and Piping

☐ Good condition ☐ Needs Maintenance

Remarks_____

3. Gas Monitoring Facilities (e.g., gas monitoring of adjacent homes or buildings)

☐ Good condition ☐ Needs Maintenance ☐ N/A

Remarks_____

F. Cover Drainage Layer ☐ Applicable ☐ N/A

1. Outlet Pipes Inspected ☐ Functioning ☐ N/A

Remarks_____

2. Outlet Rock Inspected ☐ Functioning ☐ N/A

Remarks_____

G. Detention/Sedimentation Ponds ☐ Applicable ☐ N/A

1. Siltation Areal extent_____ Depth_____ ☐ N/A
☐ Siltation not evident
Remarks_____

2. Erosion Areal extent_____ Depth_____
☐ Erosion not evident
Remarks_____

3. Outlet Works ☐ Functioning ☐ N/A
Remarks_____

4. Dam ☐ Functioning ☐ N/A
Remarks_____

H. Retaining Walls ☐ Applicable ☐ N/A

1. Deformations ☐ Location shown on site map ☐ Deformation not evident
Horizontal displacement_____ Vertical displacement_____
Rotational displacement_____
Remarks_____

2. Degradation ☐ Location shown on site map ☐ Degradation not evident
Remarks_____

I. Perimeter Ditches/Off-Site Discharge ☐ Applicable ☐ N/A

1. Siltation ☐ Location shown on site map ☐ Siltation not evident
Areal extent_____ Depth_____
Remarks_____

2. Vegetative Growth ☐ Location shown on site map ☐ N/A
☐ Vegetation does not impede flow
Areal extent_____ Type_____
Remarks_____

3. Erosion ☐ Location shown on site map ☐ Erosion not evident
Areal extent_____ Depth_____
Remarks_____

4. Discharge Structure ☐ Functioning ☐ N/A

Remarks_____

_____

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☐ N/A

1. Settlement ☐ Location shown on site map ☐ Settlement not evident

Areal extent_____ Depth_____

Remarks_____

_____

2. Performance Monitoring Type of monitoring_____

☐ Performance not monitored

Frequency_____ ☐ Evidence of breaching

Head differential_____

Remarks_____

_____

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Pumps, Wellhead Plumbing, and Electrical

☐ Good condition☐ All required wells properly operating ☐ Needs Maintenance ☐ N/A

Remarks_____

_____

_____

2. Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good condition☐ Needs Maintenance

Remarks_____

_____

3. Spare Parts and Equipment

☐ Readily available ☐ Good condition☐ Requires upgrade ☐ Needs to be provided

Remarks_____

_____

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

1. Collection Structures, Pumps, and Electrical

☐ Good condition ☐ Needs Maintenance

Remarks_____

_____

2. Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances

☐ Good condition ☐ Needs Maintenance

Remarks_____

_____

3. Spare Parts and Equipment

☐ Readily available ☐ Good condition ☐ Requires upgrade ☐ Needs to be provided

Remarks_____

C. Treatment System ☐ Applicable ☒ N/A

1. Treatment Train (Check components that apply)

☐ Metals removal ☐ Oil/water separation ☐ Bioremediation

☐ Air stripping ☐ Carbon adsorbers

☐ Filters_____

☐ Additive (e.g., chelation agent, flocculent)_____

☐ Others_____

☐ Good condition ☐ Needs Maintenance

☐ Sampling ports properly marked and functional

☐ Sampling/maintenance log displayed and up to date

☐ Equipment properly identified

☐ Quantity of groundwater treated annually_____

☐ Quantity of surface water treated annually_____

Remarks_____

2. Electrical Enclosures and Panels (properly rated and functional)

☒ N/A ☐ Good condition ☐ Needs Maintenance

Remarks_____

3. Tanks, Vaults, Storage Vessels

☒ N/A ☐ Good condition ☐ Proper secondary containment ☐ Needs Maintenance

Remarks_____

4. Discharge Structure and Appurtenances

☒ N/A ☐ Good condition ☐ Needs Maintenance

Remarks_____

5. Treatment Building(s)

☒ N/A ☐ Good condition (esp. roof and doorways) ☐ Needs repair

☐ Chemicals and equipment properly stored

Remarks_____

6. Monitoring Wells (pump and treatment remedy)

☑ Properly secured/locked ☐ Functioning ☑ Routinely sampled ☑ Good condition

☑ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks All GW wells are Secured, Inspected

D. Monitoring Data

1. Monitoring Data

☑ Is routinely submitted on time ☑ Is of acceptable quality

2. Monitoring data suggests:

☑ Groundwater plume is effectively contained ☑ Contaminant concentrations are declining

D. Monitored Natural Attenuation

1. Monitoring Wells (natural attenuation remedy)

☑ Properly secured/locked ☑ Functioning ☑ Routinely sampled ☑ Good condition

☑ All required wells located ☐ Needs Maintenance ☐ N/A

Remarks

X. OTHER REMEDIES

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.

XI. OVERALL OBSERVATIONS

A. Implementation of the Remedy

Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.).

Sites are secured with locks & all the wells are Properly Secured. See attached Photos

B. Adequacy of O&M

Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy.

C. Early Indicators of Potential Remedy Problems
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

SITE INSPECTION ROSTER

1. ~~Michael Wolff, PG~~ ECS, Inc. Mike DeKlotz — Louie Cardinale, BRAC PMO; Sean McCoy BRAC PMO
2. Dhananjay Rawal ECS, Inc.

ATTACHMENT 4

SITE INSPECTION PHOTOGRAPHS

PHOTO 1: Tustin IRP-13W – May 17, 2012 – Photo of Monitoring Well I013MW04S. Well Lid and Gasket are Secured with Bolts

PHOTO 2: Tustin IRP-13W – May 17, 2012 – Photo of Monitoring Well I013MW02S. Well Lid and Gasket are Secured with Bolts

PHOTO 3: Tustin IRP-13W – May 17, 2012 – Photo of Monitoring Well I013MW03S. Well Lid and Gasket are Secured with Bolts

PHOTO 4: Tustin MMS-04 – May 17, 2012 – Photo of Monitoring Well MM4MW01S. Well Lid an Gasket are Secured with Bolts

PHOTO 5 Tustin IRP-11 – May 17, 2012 – Photo of Monitoring Well I011MW02S. Well Lid and Gasket are Secured with Bolts

PHOTO 6: Tustin IRP-11 – May 17, 2012 – Photo of Monitoring Well I011MW01S. Well Lid and Gasket are Secured with Bolts

ATTACHMENT 5

INTERVIEW DOCUMENTATION

INTERVIEW RECORD

FIVE-YEAR REVIEW – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name): Mr. James Callian	**Title:** BRAC Environmental Coordinator	**Organization:** BRAC PMO
Telephone: (619) 532-0952 Fax No.: E-Mail Address: james.callian@navy.mil		**Mailing Address:** 1455 Frazee Rd. Suite 900 San Diego, CA 92108
Subject: Five-Year Review for IRP Sites 11, 13W, and MMS-04		**Date: September 6, 2012** / **Time: 12:00**
Type: □Telephone □ Visit □Other		**Interview Location:**

Contact Made By:

Name: James Callian	**Title: BRAC Environmental Coordinator**	**Organization: BRAC PMO**

Summary of Interview:

1. ***Do you have access to information on the remedies in place at IRP Sites 11, 13W, and MMS-04; and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   Yes. As the Navy's BRAC Environmental Coordinator, one of my responsibilities is to serve as the Co-Chairman of the RAB. I am responsible for hosting regularly scheduled RAB meetings where the Navy provides information to and solicits feedback from interested members of the public on the environmental restoration activities being conducted by the Navy at MCAS Tustin. The Navy distributes and posts RAB meeting announcements and agendas, RAB meeting minutes, and other documents and information on the BRAC PMO website (http://www.bracpmo.navy.mil). Key documents are also provided for public review at the Administrative Record File and the Information repository.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at IRP Sites 11, 13W, and/or MMS-04?***

   No.

3. ***To the best of your knowledge, have there been any violations of the land use controls at IRP Sites 11, 13W, and/or MMS-04; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process)? If so, please provide details.***

   No.

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

5. ***Do you have any comments, suggestions, or recommendations regarding management of the remedies in place at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

INTERVIEW RECORD

FIVE-YEAR REVIEW – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.:**
Individual Contacted (Name): Ms. Content Arnold	**Title:** Lead Remedial Project Manager	**Organization:** BRAC PMO West
Telephone: (619) 532-0790 Fax No.: E-Mail Address: content.arnold@navy.mil		**Mailing Address:** 1455 Frazee Rd. Suite 900 San Diego, CA 92108
Subject: Five-Year Review for IRP Sites 11, 13W, and MMS-04		**Date: September 6, 2012** / **Time: 0633**
Type: □Telephone □ Visit X Other		**Interview Location:**

Contact Made By:

Name:	Title:	Organization:

Summary of Interview:

1. ***Do you have access to information on the remedies in place at IRP Sites 11, 13W, and MMS-04; and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   Yes. I am the Navy's Lead Remedial Project Manager. The Navy has been proactive in providing the community with technical information related to the environmental clean-up efforts at Former MCAS Tustin. Information is provided on the BRAC PMO Website (http://www.bracpmo.navy.mil), at community RAB Meetings, and at the local Information Repository. The RAB continues to meet on a semiannual basis. RAB agendas and meeting minutes are available at the BRAC PMO website.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at IRP Sites 11, 13W, and/or MMS-04?***

   No.

3. ***To the best of your knowledge, have there been any violations of the land use controls at IRP Sites 11, 13W, and/or MMS-04; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process)? If so, please provide details.***

   No.

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No. RAB Meetings continue to be a forum for RAB and Community members to ask questions pertaining to the environmental restoration program. .

5. ***Do you have any comments, suggestions, or recommendations regarding management of the remedies in place at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

INTERVIEW RECORD

FIVE-YEAR REVIEW ADDENDUM– INSTALLATION RESTORATION PROGRAM (IRP) SITES 3, AND 13S

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name): Rene "Louie" Cardinale	**Title: Remedial Project Manager**	**Organization: BRAC PMO West**
Telephone: 619.532.0979 **Fax No.:** **E-Mail Address:** rene.cardinale@navy.mil		**Mailing Address:** 1455 Frazee Road San Diego, CA 92108
Subject: Five-Year Review Addendum for IRP Sites 3, and 13S		**Date: September 5, 2012** / **Time: 1530**
Type: □Telephone □ Visit X Other		**Interview Location:**

Contact Made By:

Name:	**Title:**	**Organization:**

Summary of Interview:

1. ***Do you have access to information on the remedies in place at IRP Sites 3, and 13S; and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   I am the Navy Remedial Project Manager overseeing the Sites covered by this Five-Year Review Addendum. Information, in the form of reports regarding the remedies in place at the subject Sites are readily available at the Administrative Record File/Information Repository. The Navy provides the community with technical information, primarily in the form of presentations, related to the environmental clean-up efforts at Former MCAS Tustin at Restoration Advisory Board (RAB) meetings. Additional information can be accessed on the BRAC PMO Website (http://www.bracpmo.navy.mil). The RAB continues to meet on a regular basis throughout the year. Agendas and meeting minutes are also available at the BRAC PMO website.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at IRP Sites 3, or 13S?***

   No.

3. ***To the best of your knowledge, have there been any violations of the land use controls at IRP Sites 3, and/or 13S; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process); that required a response from your office? If so, please provide details of the events and results of the responses.***

   No.

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies at IRP Sites 3, and/or 13S? If so, please provide details.***

   No.

5. ***Do you have any comments, suggestions, or recommendations regarding management of the remedies in place at IRP Sites 3, and 13S? If so, please provide details.***

   No.

INTERVIEW RECORD

FIVE-YEAR REVIEW REPORT ADDENDUM – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name): **James Ricks**	**Title:** **Project Manager**	**Organization:** **U.S. Environmental Protection Agency**
Telephone: (415) 972-3023 **Fax No.: (415) 947-3520** **E-Mail Address: ricks.james@epa.gov**		**Mailing Address:** **U.S. Environmental Protection Agency Region IX** **75 Hawthorne Street** **San Francisco, California 94105-390**
Subject: Five-Year Review Report Addendum for IRP Sites 11, 13W, and MMS-04		**Date:** / **Time:**
Type: ☐**Telephone** ☐ **Visit** √ **Other**		**Interview Location: Office BRAC PMO**

Contact Made By:

Name: James Callian	**Title: BEC**	**Organization: BRAC PMO**

Summary of Interview:

1. ***Do you have access to information on the remedies in place at IRP Sites 11, 13W, and MMS-04; and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   Yes: As the Project Manager for the U.S. Environmental Protection Agency (EPA), I have access to information relative to the Five Year Review Report sites, viz., reports and forms of documentation, via the BRAC PMO website (http://www.bracpmo.navy.mil). Primarily access mode is from participation in Project Managers Meetings, technical working sessions and conference calls.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at IRP Sites 11, 13W, and/or MMS-04?***

   No. From the perspective of EPA's oversight role, the Navy's management of the environmental cleanup efforts at the Former MCAS Tustin federal facility has been comprehensive, proactive and collaborative. As a result, there are not any site conditions that would adversely impact the protectiveness of the remedies implemented at IRP Sites 11, 13W, and/or MMS-04.

3. ***To the best of your knowledge, have there been any violations of the land use controls at IRP Sites 11, 13W, and/or MMS-04; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process); that required a response from your office? If so, please provide details of the events and results of the responses.***

   None

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   None. Owing to the aforementioned proactive and collaborative management paradigm of the Navy's BRAC project team at Tustin, information is shared in a timely manner and community concerns and inquiries are responded to with transparency and due diligence.

INTERVIEW RECORD

FIVE-YEAR REVIEW REPORT ADDENDUM – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name):	**Title:**	**Organization:**
James Ricks	**Project Manager**	**U.S. Environmental Protection Agency**

5. Do you have any comments, suggestions, or recommendations regarding management of the remedies in place at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.

The U.S. Environmental Protection Agency has been and remains confident in the Navy's management of the remedies in place at IRP Sites 1, 3, 12, and 13S. The MCAS Tustin Project team continues to exercise appropriate due diligence ensuring protectiveness of the remedies at IRP Sites 11, 13W, and MMS-04.

INTERVIEW RECORD

FIVE-YEAR REVIEW – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name):Anantaramam Peddada	**Title: Project Manger**	**Organization: Department of Toxic Substances Control**
Telephone: (714) 484-5418 **Fax No: 714 484-5437** **E-Mail Address:apeddada@dtsc.ca.gov**		**Mailing Address: 5796 Corporate Avenue** **Cypress, CA 90630**
Subject: Five-Year Review for IRP Sites 11, 13W, and MMS-04		**Date: August 1, 2012** / **Time: 1PM**
Type: √Telephone □ Visit □ Other		**Interview Location: N/A**

Contact Made By:

Name: James Callian	**Title: BRAC Environmental Coordinator**	**Organization: BRAC PMO WEST**

Summary of Interview:

1. ***Do you have access to information on the remedies implemented or to be implemented at IRP Sites 11, 13W, and Miscellaneous Major Spill (MMS-04); and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   As a Project Manager for Former MCAS Tustin I have access to information on the remedy to be installed at IRP Site 11, and those installed at 13W and MMS-04. I also attended RAB meetings where this information was presented.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented or to be implemented at IRP Sites 11, 13W, or MMS-04?***

   No.

3. ***To the best of your knowledge, have there been any violations of the Interim Land Use Restrictions and/or Proposed Final Land Use Restrictions at Sites 11, 13W, and/or MMS-04; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process); that required a response from your office? If so, please provide details of the events and results of the responses.***

   No

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies implemented or to be implemented at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

5. ***Do you have any comments, suggestions, or recommendations regarding management of the remedies implemented or to be implemented at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

INTERVIEW RECORD

FIVE-YEAR REVIEW – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name): **Mr. John Broderick**	**Title:** **Remedial Project Manger**	**Organization:** **California Regional Water Quality Control Board, Santa Ana Region**
Telephone: (951) 782-4494 **Fax No: (951) 781-6288** **E-Mail Address:jbroderick@waterboards.ca.gov**		**Mailing Address:** **3737 Main Street Suite 500** **Riverside, CA 92501**
Subject: Five-Year Review for IRP Sites 11, 13W, and MMS-04		**Date: Sept. 4, 2012** **Time: 12:30**
Type: √Telephone □ Visit □ Other		**Interview Location: N/A**

Contact Made By:

Name: James Callian	**Title: BRAC Environmental Coordinator**	**Organization: BRAC PMO WEST**

Summary of Interview:

1. ***Do you have access to information on the remedies in place at IRP Sites 11, 13W, and MMS-04; and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   Yes.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at IRP Sites 11, 13W, and/or MMS-04?***

   No.

3. ***To the best of your knowledge, have there been any violations of the land use controls at IRP Sites 11, 13W, and/or MMS-04; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process); that required a response from your office? If so, please provide details of the events and results of the responses.***

   No.

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

5. ***Do you have any comments, suggestions, or recommendations regarding management of the remedies in place at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

INTERVIEW RECORD

FIVE-YEAR REVIEW – INSTALLATION RESTORATION PROGRAM (IRP) SITES 11, 13W, AND MMS-04

FORMER MARINE CORPS AIR STATION (MCAS) TUSTIN, CALIFORNIA

Site Name: Former MCAS Tustin		**EPA ID No.: CA9170090022**
Individual Contacted (Name): Mr. Matt West (Primary Contact)	**Title:** Project Manager, City Manager's Office	**Organization: City of Tustin**
Telephone: (714) 573-3116 Fax No.: E-Mail Address: mwest@tustinca.org		**Mailing Address:** 300 Centennial Way, Tustin, CA 92780
Subject: Five-Year Review for IRP Sites 11, 13W, and MMS-04		**Date: September 5, 2012** / **Time: 9:00**
Type: xTelephone ☐ Visit ☐ Other		**Interview Location: telephone interview and email exchange**

Contact Made By:

Name: James Callian	**Title: BRAC Environmental Coordinator**	**Organization: BRAC PMO**

Summary of Interview:

1. ***Do you have access to information on the remedies in place at IRP Sites 11, 13W, and MMS-04; and do you access that information (e.g., at the BRAC PMO Website, Information Repository, Administrative Record File, or at Restoration Advisory Board [RAB] Meetings)?***

   Yes, primarily from the BRAC website, EnviroStor, and at RAB meetings.

2. ***Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies implemented at IRP Sites 11, 13W, and/or MMS-04?***

   No.

3. ***To the best of your knowledge, have there been any violations of the land use controls at IRP Sites 11, 13W, and/or MMS-04; with the exception of previously approved activities (e.g., those approved under the Project Environmental Review Form [PERF] process)? If so, please provide details.***

   No.

4. ***Are you aware of any community concerns regarding the protectiveness of the remedies at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   The City has received requests for information pertaining to IRP-13W from existing and potential homeowners in the proximity of Early Transfer Parcel (ETP) 24-1; however, the City is not aware of any outstanding concerns regarding the protectiveness of the remedy.

5. ***Do you have any comments, suggestions, or recommendations regarding management of the remedies in place at IRP Sites 11, 13W, and/or MMS-04? If so, please provide details.***

   No.

ATTACHMENT 6

RESPONSES TO COMMENTS

Document Title:

Draft CERCLA Five-Year Review Report Addendum, Operable Units (OUs) 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program (IRP) Sites 13S, 3, 11, 13W, and MMS-04, Former MCAS Tustin, California (September 2012)

Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

Comment No.	Section/ Page No.	Comment	Response
Reviewer: Anantaramam Peddada - Cover Letter General Comments			
	Cover Letter - general comment	The Department of Toxic Substances Control (DTSC) has reviewed the subject document, hereinafter referred to as "Addendum." This Addendum to the Final (CERCLA) Five-Year Review Report for Former (MCAS) Tustin, completed in October 2011, presents re-evaluations of estimated vapor intrusion (VI) risks at OUs 1A and 1B South ([IRP] Sites 13S and 3, respectively) to account for updated toxicity criteria for trichloroethene, published in the United States Environmental Protection Agency's Integrated Risk Information System on September 28, 2011. This Addendum also presents protectiveness determinations for three OU-4B Sites, termed "Low Concentration" Sites (IRP-11, -13W, and Miscellaneous Major Spill [MMS]-04). These OU-4B Sites were acknowledged in the Final CERCLA Five-Year Review Report, but protectiveness determinations were not completed. The selected remedy for the three Low Concentration OU-4B Sites is institutional controls. The remedy for MMS-04 was completed in 2011.	The Department of the Navy (DoN) appreciates DTSC's comprehensive review of this Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Five-Year Review Report Addendum (Addendum).
1	General Comment	DTSC does not agree with the Navy's recommendations for OU-1A and OU-1B South, nor does DTSC agree with the protectiveness statements for the long-term protectiveness of the remedies at OU-1A and OU-1B South. Simply providing "...notice of potential VI risks to non-DoD property owners in writing..." per the Defensive Environmental Restoration Program (DERP) Manual is inadequate. In John Scandura's email to Laura Duchnak on March 26, 2012, DTSC stated that: "For IRP-13S (excluding, Early Transfer Parcel 24-1), there is no usable soil gas data for this site. Without soil gas data, we do not know what the true risk is from VI to indoor air. As the actual risk could be	The DoN generally agrees with the position communicated in the March 26, 2012 email cited in DTSC's comment. The DoN intends to incorporate institutional controls (ICs) for potential vapor intrusion (VI) risk for both Operable Unit (OU)-1A and OU-1B South in appropriate decision documents. The DoN will prepare Explanations of Significant Differences (ESDs) (for the Records of Decision [RODs]) and a Land Use Control Remedial Design (LUC RD) Amendment for OU-1A and -1B that will document the inclusion of ICs for potential VI risk. Accordingly, the second paragraph in Sections ES 1.3 and 4.1, Issues and Recommendations, have been revised (revisions in *italics*) as follows: *"The following two recommendations are provided based on previous agency comments on the Final CERCLA Five-Year Review Report*

Document Title:

Draft CERCLA Five-Year Review Report Addendum, Operable Units (OUs) 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program (IRP) Sites 13S, 3, 11, 13W, and MMS-04, Former MCAS Tustin, California (September 2012)

Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

		higher or lower than what was calculated based on groundwater modeling, from VI to indoor air, DTSC must take conservative risk management approach to ensure the public is protected. "DTSC believes additional institutional controls (IC) are necessary to address the VI to indoor air pathway at IRP-13S, specifically for the residential scenario and sensitive use scenarios (i.e., schools [K-12], day care facilities, hospitals, and college housing). For existing buildings under these scenarios, IC need to be in place that prevents occupancy until transferee(s) conducts an indoor air evaluation and demonstrates the buildings are safe for occupancy, either with or without mitigation measures." "Prior to occupancy of any newly constructed buildings under these scenarios, the transferee(s) has to either conduct a soil gas evaluation and show there is no unacceptable risk from VI to indoor air, or mitigate any unacceptable risks. Another option for the transferee(s) is to put the appropriate engineering controls in place that would essentially eliminate any potential unacceptable risks to these receptors, thereby eliminating the need for a soil gas evaluation." "All of the IC would have to include the appropriate oversight and review and approval mechanisms. As to where the additional IC for IRP-13S would be applied; the most practical decision would be to have them cover the same area as the "area requiring institutional controls" or "ARIC" for the IC that is included in the ROD. The ARIC boundary should be concurred upon by the BRAC Closure Team." Based on the TCE evaluation that was conducted as part of the Draft Addendum, OU-1B South (IRP Site 3) also requires additional IC to address the VI to indoor air pathway as described above. IC should be outlined in the transfer document(s),	*(DoN 2011a) and on the Draft CERCLA Five-Year Review Report Addendum (DoN 2012), on regulatory agency preference for multiple lines of evidence, and in consideration of DoD policy:* • *For OU-1A and OU-1B South, provide notice of potential VI risk consistent with the Defense Environmental Restoration Program Manual (DoD 2012).* • *For OU-1A and OU-1B South, prepare Explanations of Significant Differences (ESDs) to document ICs for potential VI risk for residential and sensitive use scenarios. Sensitive use scenarios, as defined by DTSC, include schools [K-12], day care facilities, hospitals, and college housing. A Land Use Control (LUC) Remedial Design (RD) Amendment will also be prepared to address and describe IC implementation and associated maintenance actions including reporting requirements. Both the ESDs and the LUC RD Amendment will be submitted to the regulatory agencies for review and concurrence. The Areas Requiring Institutional Controls (ARICs) for potential VI risk for Carve-Out (CO) Areas 5 and 6 will be determined in conjunction with the Federal Facility Site Remediation Agreement (FFSRA) signatories and documented in the ESDs."* As suggested by DTSC and as a matter of practicality, the ARICs for potential VI risk for Carve-Outs 5 and 6 may cover the same areas as the ARICs for groundwater. The ARICs for potential VI risk may also be modified by the Federal Facilities Site Remediation Agreement (FFSRA) signatories as the groundwater contaminant plumes continue to be remediated and shrink over time. Sections ES 1.4 and 4.2, Protectiveness Statements, have been revised (revisions in *italics*) to read: *"The remedies for OU-1A and OU-1B South are determined to be protective under current site conditions based on technical information available at the time of the Final CERCLA Five-Year Review Report, the revised technical evaluation presented in this Addendum, and consistent with DTSC's technical evaluation presented in their January 10, 2012 letter (DTSC 2012). The long-term protectiveness of the remedies at OU-1A and OU-1B South will be addressed by establishing additional ICs for potential VI risk."*

Document Title:

Draft CERCLA Five-Year Review Report Addendum, Operable Units (OUs) 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program (IRP) Sites 13S, 3, 11, 13W, and MMS-04, Former MCAS Tustin, California (September 2012)

Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

		and IC in the form of restrictions must be incorporated into two separate legal instruments: Covenant to Restrict Use of Property (CRUP) and a quitclaim deed. Additional IC will also require changes to the ROD that incorporated into an Explanation of Significant differences. Please revise all applicable sections of the Addendum to reflect this comment	
Attachment A: Reviewer - Anantaramam Peddada - Specific Comments			
1	Page iii, Section ES 1.3 Issues and Recommendations, last sentence	"These actions will be coordinated with the regulatory agencies during fiscal year 2013." This sentence is vague. Please elaborate.	For clarity, this sentence has been revised as follows: "*These ICs will be documented in an ESD and implemented in coordination with the regulatory agencies.*"
2	Page 5-1 Section 5.1.2, IRP 11, paragraph 1, line 2	Only figure 5-1 should be referenced. Please delete reference to Figure 5-2.	The revision was made as requested.
3	Page 5-1 Section 5.1.2, IRP 11, paragraph 2, line 5.	Please reference Figure 5-1 rather than Figure 5-2.	The revision was made as requested.
4	Page 5-2, Section 5.1.3	Please reference Figure 5-1 rather than Figure 5-2.	The revision was made as requested.
5	Pages 5-2 Section 5.1.4, MMS-04, paragraph 1, line 4.	Please reference Figure 5-2 rather than Figure 5-3.	The revision was made as requested.
6	Pages 5-9 Section 5.4.3 Paragraph 4, Line 2	"Enforceable by DTSC." Navy's Quitclaim deeds(s) are not enforced by DTSC. See Record of Decision OU-4B, Former MCAS Tustin, page 2-29.	Paragraph 4 has been revised to read: *"The CRUPs have incorporated or will incorporate the land use restrictions into environmental restrictive covenants that run with the land and that are enforceable by DTSC against future transferees. The quitclaim deed(s) will include the identical land use and activity restrictions in environmental restrictive covenants that run with the land and that will be enforceable by the Navy against future transferees."*

Document Title:

Draft CERCLA Five-Year Review Report Addendum, Operable Units (OUs) 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program (IRP) Sites 13S, 3, 11, 13W, and MMS-04, Former MCAS Tustin, California (September 2012)

Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

Attachment B: Reviewer - Kimberly C. Day, Ph.D. - Human and Ecological Risk Office (HERO) – Cover Letter – general comments

	Cover Letter - general comments	DOCUMENT REVIEWED: Draft CERCLA Five-Year Review Report Addendum, Operable Units1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program Sites 13S, 3, 11, 13W, and MMS-04), Former Marine Corps Air Station (MCAS) Tustin, California, document dated September 2012. Prepared for Base Realignment and Closure Program Management Office West, San Diego, California. HERO received a copy of the document on September 21, 2012. DOCUMENT PREVIOUSLY REVIEWED: In a memorandum dated October 12, 2011 (K. Day to A Peddada), HERO reviewed the document: Draft CERCLA Five-Year Review Operable Units 1A, 1B North, 1B South, and 3 (Installation Restoration Program Sites 13S, 12, 3, and 1), Former Marine Corps Air Station (MCAS) Tustin, California, July 2011. Prepared for Base Realignment and Closure Program Management Office West, San Diego, California. Prepared by ECS, Enviro Compliance Solutions, Inc., Tustin, California. HERO downloaded a copy of the document from EnviroStor on August 4, 2011. BACKGROUND BASED ON INFORMATION PROVIDED IN THE SUBMISSION: Former Marine Corps Air Station (MCAS) Tustin is located in southern California in Orange County, approximately 40 miles south of downtown Los Angeles. MCAS Tustin operated from 1942 to July 1999 when the facility was closed. Approximately 1,150 acres of the former MCAS Tustin was conveyed to the City of Tustin while the remaining 450 acres is currently undergoing additional remediation or restoration. The areas requiring further investigation and/or response actions are identified as Carve-Out (CO) areas. The groundwater plumes at Installation Restoration Program (IRP) -13S are within C0-5 and the groundwater plumes at IRP-3 are within C0-6. IRP-13S is also known as Operable Unit 1A (OU-1A) and IRP-3 is also known as OU-1B South. Within OU-4B are three sites (IRP-11, -13W, and MMS-04) that have been designated as low concentration sites, where the concentrations of volatile organic compounds (VOCs) in the groundwater are less than 20 µg/L. IRP-11 is located within C0-5 and consists of undeveloped land. IRP-13W is located within C0-5 and is mainly undeveloped land. A portion of the land has	The Department of the Navy (DoN) appreciates DTSC's comprehensive review of this Addendum

Document Title:

Draft CERCLA Five-Year Review Report Addendum, Operable Units (OUs) 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program (IRP) Sites 13S, 3, 11, 13W, and MMS-04, Former MCAS Tustin, California (September 2012)

Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

		been leased to the City of Tustin under a Lease-in-Furtherance-of-Conveyance (LIFOC). The remaining portion of the land was conveyed as an early transfer pursuant to a Finding of Suitability for Early Transfer (FOSET) and is currently developed as residential property. MMS-04 is located within C0-5 and consists of undeveloped land. Three water bearing zones (WBZ) have been identified above the regional aquifer: 1) the first WBZ extends from approximately 5 to approximately 30 feet below ground surface (bgs); 2) the second WBZ extends from approximately 30 to 60 feet bgs; and 3) the third WBZ extends from approximately 60 to 90 feet bgs. The chemicals of concern (COCs) identified for OU-1A are 1,2,3-trichloropropane (TCP) and trichloroethene (TCE), the COCs for OU-1B South and OU-4B are TCE and vinyl chloride. The established remediation goals are 0.5 μg/L for 1,2,3-TCP and 5.0 μg/L for TCE. SCOPE OF REVIEW: HERO's review of the document is limited to those sections concerning human health risk assessment. We assume that regional personnel have evaluated the sampling methods for environmental media, the adequacy of site characterization, analytical chemistry methods, and quality assurance procedures.	
Attachment B: Reviewer - Kimberly C. Day, Ph.D. - Human and Ecological Risk Office (HERO) - General Comments			
1	General Comments Section 2.1.2 – Industrial Use Scenario	a. The table on page 2-3 lists the exposure assumptions used in the Johnson and Ettinger (J&E) Model. For exposure frequency, please place in parentheses 83 days/year as this is the parameter entered into the model. Eighty-three days/year corresponds to working 8 hours/day for 250 days/year. b. For the industrial/commercial scenario, the Navy used exposure assumptions and building parameters established in the OU-1B Feasibility Study Report. Please justify an indoor air exchange rate of 0.75 exchanges per hour. DTSC's Vapor Intrusion Guidance (DTSC 2011) recommends and air exchange rate of 1.0 air exchanges per hour for the commercial/industrial scenario. This should be discussed as	a. The insertion was made as requested. b. The indoor air exchange rate of 0.75 was the rate used in the Feasibility Study (FS). The default value that HERO uses, an air exchange rate of 1, is less conservative (greater air mixing) than 0.75, and produces the same results (incremental cancer risk and non-cancer hazard index under the industrial/commercial scenario are

Document Title:

Draft CERCLA Five-Year Review Report Addendum, Operable Units (OUs) 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program (IRP) Sites 13S, 3, 11, 13W, and MMS-04, Former MCAS Tustin, California (September 2012)

Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

		an uncertainty in the report. Please note HERO briefly ran J&E model under the DTSC default air exchange rate. The incremental cancer risk and non-cancer hazard under the industrial/commercial scenario are below the point of departure of $1x10^{6}$ and less than 1, respectively.	below the point of departure of 10^{6} and less than 1, respectively) as reported in Section 2.2.2.
2	Section 5.1.2 – IRP-11	The text states, "TCE concentrations decreased from 8.5 µg/L to below the MCL of 5 µg/L in less than 24 years under the baseline scenario." Please clarify this statement. Does this statement refer to modeling? This is unclear in the text of the report. Please note, according to the text and Figure 5-5, the concentration of TCE at IRP-11 in monitoring well I011MW01S is 7.9 µg/L in the 4^{th} quarter of 2011. Please make any necessary correction to the document.	The subject sentence was deleted as requested. The revised text now states: *"Groundwater modeling presented in the FS Report (BEI 2008) indicated that TCE could migrate approximately 150 ft downgradient. Modeling also showed that, assuming natural attenuation, maximum TCE concentrations would decrease below the MCL in approximately 18 years."*
3	General Comment	Risk Range and Point of Departure. Please note that the risk range of 10^{-6} to 10^{-4} is not intended to imply that any risk within this range is acceptable. In several sections of the Addendum Five-Year Review Report the terminology "were acceptable (10^{-4} or less)" or "generally acceptable cancer risk range of between 10^{-4} to 10^{-6} " was used. HERO disagrees with the use of "acceptable" or "generally acceptable" and requests that this terminology be removed from the document and to refer to the risk management range. The actual level of acceptable risk is a site-specific risk management decision, with $1X10^{-6}$ as the point of departure for making such decisions. Clear justification must be provided for risk management decisions which result in residual risk levels greater than $1X10^{-6}$. HERO defers to the project manager for risk management decisions.	The term "acceptable risk range" is used throughout the preamble to the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) to describe the risk management range of 10^{-4} to 10^{-6} (for example, see NCP preamble at 55 Fed. Reg. 8717, March 8, 1990). The term "risk management range," though commonly used, is not defined in the NCP. The Addendum has been revised to delete the word "generally" and use the term "acceptable risk range" in order to conform with NCP terminology. It should be further noted that the NCP defines the "point of departure" as 10^{-6} rather than $1x10^{-6}$ (see NCP text at 40 CFR Section 300.430(e)(2)(i)(A)(2) and NCP preamble at 55 Fed. Reg. 8717, March 8, 1990. The Navy justified departure from the 10^{-6} point of departure for VI cancer risks at OU-1A and OU-1B South (see Section 7.2.2.2.3 of the Final CERCLA Five-Year Review Report) in accordance with the factors set forth in the NCP preamble at 55 Fed. Reg. 8717, March 8, 1990.
4	Section 5.7.4.2 and Figure 5-5	Monitoring wells MPMW04S, CDS1MW02S, and MPMW03S are shown on Figure 5-5 and had detected concentrations of TCE of 15 µg/L, 31 µg/L, and 16 µg/L, respectively, in the fourth quarter 2011. However, these wells are not discussed in the text. Are these wells part of IRP-11 or another site? Please clarify why these wells are shown on Figure 5-5, yet, not discussed in the text and have higher concentrations of reported TCE in the groundwater than the monitoring well for IRP-11 that is discussed in the text.	Monitoring wells MPMW04S, CDS1MW02S, and MPMW03S are not associated with IRP-11. These wells are part of the Mingled Plumes Area (MPA) monitoring well network. The MPA is not included in the OU-4B Low Concentration Sites (IRP-11, -13W, and MMS-04). As such, the figure has been revised to delete these data.

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5	Section 5.8.2.2 – Toxicity Data and Effect on Health Risk.	Please state in the text that the reported results for the incremental cancer risk and non-caner hazard for IRP-11 and IRP-13W are for the residential scenario. This information is not mentioned in the text when discussing the results of the vapor intrusion evaluation.	The first paragraph of Section 5.8.2..2 has been revised to state: *"The baseline HHRA employed the previous TCE toxicity criteria; therefore this review focused on a re-evaluation of cancer risk and non-cancer hazard resulting from the updated toxicity criteria under the residential scenario."*
6	OU-4B Low Concentration Sites	The text states that IRP-11 and IRP-13W have been designated as low concentration sites, where the concentrations of volatile organic compounds (VOCs) in the groundwater are less than 20 μg/L. In this report, the only VOC discussed with respect to vapor intrusion is TCE for these sites. Please also discuss, in the document, any other detected VOC in the groundwater with respect to potential vapor intrusion and in terms of cumulative risk.	TCE is the sole chemical of concern (COC) and is the only risk driver for VI at these Sites (see ROD/RAP [referenced in the Addendum]). The only other reported VOCs were cis-1,2-dichloroethene (DCE) at an estimated concentration of 0.25J micrograms per liter (μg/L), and Freon 113 at 1.6 μg/L, both at concentrations significantly less than their maximum contaminant levels (MCLs) of 5 and 1,200 μg/L, respectively (Trevet 2012).

Attachment B: Reviewer - Kimberly Day, Ph.D. - HERO - Specific Comments

1	Section 5.1.2 – IRP-11	The text references Figure 5-2, the approximate areal extent of the TCE plume at IRP-11. Please note, Figure 5-2 is the areal extent of the TCE plume for MMS-04. The text should read Figure 5-1. Please correct.	The text reference has been revised to Figure 5-1. The shaded area shown on Figure 5-2 is the ARIC for OU-1A. There is no plume associated with MMS-04.
2	Figure 5-5	Please label the boundaries for IRP-13W and IRP-11 on Figure 5-5.	Figure 5-5 has been revised as requested to include Site boundaries and Site labels for IRP-11 and IRP-13W.
3	Attachment 1 J&E Spreadsheets	a. Industrial/Commercial Scenario i. Please label the J&E spreadsheets for the industrial/commercial scenario. The spreadsheets for the residential were labeled, i.e., OU-1B South, OU-1A. When reviewing the industrial commercial scenario spreadsheets, there is no indication as to what site the spreadsheets pertain to. ii. The J&E spreadsheet for TCE at OU-1A, lists the incorrect depth below grade to water table. A depth of 152.4 cm is lists on the spreadsheet and it should be 243.8 cm. Please correct. iii. Toxicity Criteria for Vinyl Chloride. For vinyl chloride	a. i. The spreadsheets have been labeled with Site and scenario. ii. The correction has been made. iii. The requested revision is noted; however, the toxicity

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Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

		under the industrial/commercial receptor, HERO recommends using the Cal/EPA OEHHA inhalation unit risk factor of 7.8E-05 per µg/m^3 in lieu of US EPA IRIS toxicity criteria of 8.8E-06 per µg/m^3. Please include this information in the Five-Year Review Addendum Report. Please note, HERO re-ran the J&E Model using our recommended toxicity criteria for vinyl chloride and the conclusions were the same. However, please still provide the J&E spreadsheets using DTSC's recommended toxicity criteria as part of the Five-Year Review Addendum Report. b. OU-4B -IRP-11 and IRP-13W. Please provide the J&E spreadsheets for IRP-11 and IRP-13W in the Five-Year Review Addendum Report. HERO needs these for our review.	value used for vinyl chloride (VC) in this Addendum is consistent with both U.S. EPA and DoN hierarchy for human health toxicity values (2003 U.SEPA OSWER Directive 9285.7-53, 2003, http://www.epa.gov/oswer/riskassessment/pdf/hhmemo.pdf) and http://www.nmcphc.med.navy.mil/downloads/ep/Risk%20Assessment/Chapters%201-12.pdf). This same hierarchy was also accepted by DoD and published in DoD instruction 4715.18 June 11, 2009. (http://www.dtic.mil/whs/directives/corres/pdf/471518p.pdf). The above guidance recommends that the following hierarchy of human health toxicity values should be consulted to obtain toxicity values for use in a risk assessment: Tier 1: U.S. EPA's Integrated Risk Information System (IRIS); Tier 2: U.S. EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs). Tier 3: Other toxicity values, including U.S. EPA and non-U. S. EPA sources. These sources include, but are not limited to, the Health Effects Assessment Summary Tables-Annual Update, California Environmental Protection Agency (CalEPA) toxicity values, and Agency for Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs). Priority in Tier 3 values should be given to sources that provide information on toxicity that is based on similar methods and procedures (including peer review) used to determine Tier 1 and Tier 2 values. Both U.S. EPA and DoD also recognize that there may be other sources of toxicological information outside IRIS, and that data outside of IRIS could be considered and that the Agency should evaluate risk based upon its best scientific judgment and consider all credible and relevant information available to it. It should be noted that Office of Environmental Health Hazard Assessment (OEHHA) toxicity for VC were based on studies performed in 1983 and 1984 (OEHHA. 2009 Technical Support Document for Describing Available Cancer Potency Factors); these references that were available to U.S. EPA at the time VC toxicity were

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Reviewer: Department of Toxic Substances Control, Letter from Anantaramam Peddada Dated: October 30, 2012

			revised and posted in IRIS in 2000. However, in the spirit of collaboration, HERO estimated risk estimate will be presented as footnote to VC risk values presented in this Addendum. b. The Johnson and Ettinger(J&E) spreadsheets for IRP-11 and -13W have been incorporated into Attachment 1 of the Addendum. The concentration of TCE (8.9 μg/L) and depth to water (419.4 centimeters [cm]) are from well I013MW04S (4th Quarter 2011) which is the maximum reported TCE concentration for either Site.
4	Attachment 2 – Vapor Intrusion Tables	a. Risk Range and Point of Departure. Tables 2-5 through 2-10, 2-17 through 2-22, 2-27 through 2-32, and 2-39 through 2-44 use the terminology "Generally acceptable range per NCP". As stated above in our General Comment 3, HERO disagrees with the use of "acceptable" or "generally acceptable cancer risk range" and requests that this terminology be removed from the document. HERO defers to the project manager for risk management decisions. b. Table 2-23. Table 2-23 lists a hazard quotient of 0.001 for 1,2,3- trichloropropane. However, according to the J&E spreadsheet the hazard quotient should be 1.5E-05. Please clarify the discrepancy and make any necessary changes to the table. c. Tables 2-24 and 2-26. The cancer risk listed for vinyl chloride is based on the IRIS toxicity criteria and not the DTSC recommended toxicity criteria. Please revise these tables and all corresponding tables (Tables 2-30 through 2-32 and 2-42 through 2-44) using the DTSC recommended toxicity criteria.	a. Please refer to response to General Comment 3. b. The revision was made as requested. c. Please see response to Specific Comment 3 a iii above.

CONCLUSIONS: HERO has reviewed the document *Draft CERCLA Five-Year Review Report Addendum Operable Units 1A, 1B South, and 4B Low Concentration Sites (Installation Restoration Program Sites 13S, 3, 11, 13W, and MMS-04), Former Marine Corps Air Station (MCAS) Tustin, California* as it relates to human health risk assessment. HERO has identified several issues in our memorandum that need to be addressed. HERO recommends that all of the comments and concerns identified in this memorandum be addressed prior to finalization of the CERCLA Five- Year Review Report Addendum.

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Reviewer: U.S. Navy BRAC PMO West - Dated: March 27, 2013

Comment No.	Section/ Page No.	
Additional Navy Changes		
1	ES page I and page 1-1	Reference to Figure 1-1 was added to the third line of the first sentence from the top of the page.
2	ES page i	To coincide with discussions that lead to a delay in the completion of the Final Addendum, the last sentence of the third paragraph was deleted. That sentence read as follows: "The final version of this Addendum will be completed no later than October 31, 2012."
3	Section 5.7.1	The following sentence was added to the end of the last paragraph in Section 5.7.1 to clarify the change in the submittal date for the Final CERCLA Five-Year Review Report Addendum. *"The submittal date was extended, with concurrence from the agencies, to accommodate additional review and discussion time to finalize the Addendum."*
4	Section 5.8.2.2	To clarify the response to DTSC Comment #5; the following shows the revised text to the 1st paragraph, 2nd sentence of Section 5.8.2.2. The new text is *underlined*: *"The baseline HHRA employed the previous TCE toxicity criteria; therefore this review focused on a re-evaluation of cancer risk and non-cancer hazard resulting from the updated toxicity criteria under the residential scenario*.

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Reviewer: United States Environmental Protection Agency, Letter from James Ricks Dated: December 18, 2012

Comment No.	Section/ Page No.	Comment	Response
Reviewer: James Ricks - Cover Letter General Comments			
	Cover Letter - general comment	The U.S. Environmental Protection Agency does not have any substantive comments on the *Draft CERCLA Five Year Review Report Addendum* dated September 2012. As discussed previously, the CERCLA guidance has no provisions for an addendum. The Agency's initial review of the draft version resulted in concurrence on the *Five Year Review Report* that was completed in October 2011. The Agency determined that the protectiveness of the remedies was not adversely affected by the new trichloroethene (TCE) toxicity criteria published in U.S. EPA's Integrated Risk Information System (IRIS) on September 28, 2011. As the Lead Agency, EPA recognizes and appreciates the Navy's continued demonstrated cooperation to work in partnership with the regulator agencies as reflected in its decision to agree with DTSC's request to re-evaluate the estimated vapor intrusion risks associated with updated toxicity criteria for TCE. Accordingly, the Agency noted that the CERCLA guidance, under these findings, would permit the re-evaluation of the estimated vapor intrusion risks based upon EPA's updated toxicity criteria for TCE to be performed during the existing five year period. The results would be presented as part of the next Five Year Review Report. EPA reaffirms its commitment of working in partnership with the Department of the Navy to expeditiously facilitate the cleanup and transfer of property at the former Marine Corps Air Station Tustin in a manner that is protective of human health and the environment.	The Department of the Navy (DoN) appreciates U.S. EPA's review of this Five-Year Review Report Addendum.

Document Title:

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Reviewer: Santa Ana Regional Water Quality Control Board, Letter from John Broderick Dated: October 4, 2012

Comment No.	Section/ Page No.	Comment	Response
Reviewer: John Broderick - Cover Letter General Comments			
	Cover Letter - general comment	We have completed our review of the above-referenced document, dated September 2012, which was received on September 18, 2012. This addendum report presents re-evaluations of the estimated vapor intrusion risks to account for updated toxicity criteria for trichloroethene, published in the U.S. EPA's Integrated Risk Information System (IRIS) on September 28, 2011. We have no comments on this draft addendum.	The Department of the Navy (DoN) appreciates RWQCB's review of this Five-Year Review Report Addendum.