Eco & Associates, Inc. ▪ 1855 W. Katella Ave. ▪ Suite 340 ▪ Orange ▪ CA ▪ 92867 ▪ phone (714) 289-0995 ▪ fax (714) 289-0965

Environmental Excellence

August 9, 2012

Ms. Cecilia Horner, PE
United States Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza, NE
Albuquerque, NM 87109-3435

via FedEx

SUBJECT: **SUBMITTAL OF FINAL MONITORED NATURAL ATTENUATION REPORT**
BROWN & BRYANT SUPERFUND SITE IN ARVIN, CALIFORNIA
CONTRACT NO. W912PP-10-D-0014
TASK ORDER NO. 0008

Dear Ms. Horner:

Please find enclosed one copy of the Final Monitored Natural Attenuation Report for the Brown & Bryant Superfund Site at 600 S. Derby Street in Arvin, CA, prepared by Eco & Associates, Inc. for your records.

We appreciate the opportunity to work with you and your colleagues on this project. If you have any questions, please do not hesitate to contact us at (714) 289-0995.

Sincerely,
ECO & ASSOCIATES, INC.

Mohammad Estiri, Ph.D.
Project Director

cc: Ms. Brunilda Davila, USEPA (1 CD copy)
Mr. Glenn Bruck, USEPA (1 CD copy)
Mr. Alejandro Diaz, USEPA (2 copies)
Ms. Carol Wies-Brewer, USACE, Albuquerque District (1 copy)
Mr. Thad Fukushige/Mr. Richard Lainhart, USACE, Los Angeles District (1 copy)

Enclosure

MONITORED NATURAL ATTENUATION EVALUATION REPORT

•FINAL•

August 9, 2012

Brown & Bryant Superfund Site
600 South Derby Street
Arvin, California
Contract No. W912PP-10-D0014
Task Order 0008

Prepared for:
U.S. Army Corps of Engineers
Albuquerque District
4101 Jefferson Plaza, NE
Albuquerque, NM 87109-3435

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August 9, 2012

Project No.: Eco-11-481

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ABBREVIATIONS & ACRONYMS

1,2-DCP	1,2-Dichloropropane
1,3-DCP	1,3-Dichloropropane
B&B	Brown & Bryant, Inc.
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylenes
CL	Cleanup Level
COC	chemical of concern
DBCP	1,2-Dibromo-3-chloropropane
Eco	Eco & Associates, Inc.
EDB	Ethylene dibromide
ft/ft	feet per foot
gpm	gallon per minute
H&A	Hargis & Associates
Log C(t)	log of concentration
m/d	meters per day
m/m	meters per meter
MNA	Monitored Natural Attenuation
MSL	mean sea level
NAS	Natural Attenuation Software
OU	operable unit
RCRA	Resource and Conservation Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
R^2	coefficient of determination
ROD	Record of Decision
t	time
TCP	1,2,3-Trichloropropane
TOR	time of remediation
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey

MONITORED NATURAL ATTENUATION EVALUATION REPORT

•FINAL•

Brown & Bryant Superfund Site
600 South Derby Street
Arvin, California
Contract No. W912PP-10-D0014
Task Order 0008

1.0 INTRODUCTION

This report provides the evaluation of the Monitored Natural Attenuation (MNA) for the B-Zone groundwater at the former Brown & Bryant, Inc. (B&B) Superfund Site located in the City of Arvin, Kern County, California (hereafter, referred to as "Site"; see Figure 1, Site Regional Map and Figure 2, Site Vicinity Map). MNA was selected as the remedy for the OU-2 B-zone groundwater at the Site, as described and documented in the Record of Decision (ROD) (EPA 2007).

Groundwater at the Site was impacted with chlorinated solvents, herbicides, and pesticides during B&B's occupancy. Eco & Associates, Inc. (Eco) was retained by the United States Army Corps of Engineers (USACE) to provide environmental engineering services at the Site.

This report was prepared in general conformance with the MNA Evaluation Workplan prepared by Eco (Eco 2012). The report purposes and objectives are described below in Section 1.1.

1.1 REPORT PURPOSES AND OBJECTIVES

A preliminary evaluation of the MNA at the Site is performed based on the application of the United States Geological Survey's (USGS's) Natural Attenuation Software (NAS) model using site-specific data and evaluation of the data for performing trend analysis. The MNA evaluation addresses whether natural attenuation is occurring at the Site based on the estimated rate of attenuation for each chemical of concern (COC).

The main objective of the evaluation was to assess that the B-zone groundwater Cleanup Levels (CLs) can be reached and that the estimated timeframe to reach these CLs is reasonable.

1.2 REPORT ORGANIZATION

This Evaluation Report has the following major components:

Introduction – Describes the purpose and scope of the evaluation report.

Site Conditions and Background – Summarizes the history of the property; describes previous environmental investigations and physical characteristics of the Site including physiography, geology, topography, hydrology, and hydrogeology.

Groundwater Monitoring Network – Describes the groundwater monitoring well network, specifically, the data needed for performance monitoring. Groundwater sampling and analyses are covered in other project plans and are referenced but not repeated herein.

Implementation of the NAS Model and Results – This section describes the following:

- Description of the NAS model (its advantages and limitations)
- Description of the conceptual Site model
- Collection of data required for model input
- Implementation of the NAS model and the results of the model analysis
- Trend Analysis
- Uncertainties with NAS Modeling and Trend Analysis results

Conclusions – This section summarizes the evaluation findings and conclusions, and,

References

Backup information for this report is presented in the following appendices:

- Appendix A: Groundwater Monitoring Results for B-zone through October 2011
- Appendix B: Input Parameters for NAS Model
- Appendix C: NAS Parameters Sensitivity Analysis
- Appendix D: NAS Model Results
- Appendix E: Trend Analysis Results

2.0 SITE CONDITIONS AND BACKGROUND

2.1 SITE LOCATION

The B&B Arvin facility, located at 600 South Derby Road in Arvin, California is about 18 miles southeast of the City of Bakersfield (Figure 1, Site Vicinity Map). The Site is located on the east side of Arvin in a light industrial and commercial area. A residential area is located across the street from the facility.

2.2 SITE OPERATIONAL HISTORY

The B&B facility operated as a pesticide re-formulator and custom applicator facility from 1960 to 1989. The facility formulated agricultural chemicals including pesticides, herbicides, fumigants, and fertilizers for sale to the local farming community between 1960 and 1968. In 1981, the facility was licensed under the Resource and Conservation Recovery Act (RCRA) as a hazardous waste transporter. Contamination of soil and groundwater resulted from inadequate procedural controls, chemical spills during operations, and leaks from a surface wastewater pond and sumps. The largest releases onsite were from the waste pond, a sump area, and a dinoseb spill area.

The waste pond located in the southwest portion of the Site was originally excavated as an unlined earthen pond in 1960. The pond was used to collect run-off water from the yard and from two sumps (since excavated). The pond was also used to collect rinse water from rinsing tanks used for fumigants. Excess pond water and rainwater run-off also collected in a topographically low area to the east and south of the pond. In addition, ponded water from precipitation and irrigation from the east has occasionally breached the berm in the southeast corner of the pond and drained into the pond. The pond was double lined with a synthetic liner in November 1979. The liner and additional soil were excavated in August 1987. Approximately 640 cubic yards of soil that showed visible signs of contamination were removed from the pond at that time. The depths of this excavation ranged from approximately one and one-half feet on the sides to five feet on the bottom.

In 1960, an unlined earthen sump was constructed in the center of the Site (near wells AMW-2P and AMW-4R). The sump was used to collect wash water from a pad where equipment and tanks used for liquid fertilizers and fumigants were washed. Water from the sump was drained to the pond through an underground pipeline. In 1980, the sump was replaced with two double-lined sumps, and two lined sand traps were installed west of the pond. Dinoseb was stored in a smaller tank storage area along the eastern fence, just north of the pond.

In 1983, there was a significant dinoseb spill in this area. As a result, the soil and groundwater underlying this portion of the Site has been reported with the highest concentrations of dinoseb. The United States Environmental Protection Agency (USEPA) excavated highly contaminated soil from this area in the mid-1990s. In 1989, the Site was listed on the National Priorities List. Subsequently, various emergency and removal actions were initiated to minimize or eliminate immediate threats to human health and the environment.

2.3 CURRENT SITE STATUS

Currently the Site is vacant. A warehouse and a metal shed are located on the property. The property is secured by a chain-link fence and paved with asphalt concrete. The asphalt concrete is a RCRA cap in the southern portion and a non-RCRA cap in the northern portion.

2.4 PREVIOUS INVESTIGATIONS

Eco's background information is based on data presented in previous project reports. These reports, dated between 1987 and 1999, generally present the results of on-Site soil and groundwater investigations, feasibility studies, and remedial action plans. A brief review of some of the more pertinent studies is provided below.

The earliest document reviewed, prepared by Hargis & Associates (H&A) in June 1987, presented an Evaluation Report to assess the extent of soil and groundwater contamination by the release of on-Site chemicals. This Evaluation Report presented the results of shallow soil sampling and groundwater testing (Wells AMW-1 through AMW-4) conducted in 1984 by H&A. The water and soil collected from these wells/borings were noted as having elevated concentrations of COCs. This data was used to plan further on-Site assessment. H&A implemented this Evaluation Report in 1987 and 1988. H&A's investigation included sampling vadose zone soils and the installation of six monitoring wells (AP-1 through AP-5, and AR-1).

COCs were detected in each of the wells. Tables 1 and 2 provide the COC analytical results for Site wells (A-zone and B-zone, respectively) through the sampling event in April 2011.

The shallow impacted soils (up to 12-foot depths) beneath the former on-Site sumps and pond were excavated in August 1987 by Canonie Environmental. Soil samples collected from the base of the excavations were noted as containing elevated concentrations of the COCs. Groundwater monitoring and sampling was not conducted during this remedial action. EPA divided the Site into two operable units (OUs).

OU-1

The first operable unit (OU-1) consists of the following:

- Original source area of contamination (facility waste pond, tanks, sump area, and the dinoseb spill area)
- Surface soils
- Subsurface soils to the first water bearing unit (A-zone soils and the first water bearing unit)
- A-zone groundwater located approximately 65 to 70 feet below ground surface (bgs)

The ROD for the OU-1 was signed November 8, 1993. The selected OU-1 remedy included extraction and treatment of the A-zone groundwater. However, based on design studies and additional information collected during the remedial action phase of the project, the A-zone groundwater extraction and treatment was not implemented.

OU-2

The OU-2 includes subsurface soil from the base of the A-zone groundwater to the second water-bearing unit (B-zone groundwater), and the B-zone groundwater. Subsurface investigations conducted onsite during OU-1 and OU-2 investigations have confirmed the presence of a number of potentially hazardous substances in the groundwater. Fifty-six organic compounds were found within the A-zone groundwater samples and 11 were found in the B-zone groundwater samples. The following seven primary COCs were identified during the OU-1 investigation:

TABLE 1: B-ZONE CONTAMINATIONS OF CONCERN AND CLEANUP LEVELS

CONTAMINATION OF CONCERN	CLEANUP LEVELS (µg/L)
1,2-Dichloropropane (1,2-DCP)	5
1,3-Dichloropropane (1,3-DCP)	0.5
1,2,3-Trichloropropane (TCP)	0.005
Chloroform	80
Dinoseb	7
1,2-Dibromo-3-chloropropane (DBCP)	0.2
Ethylene dibromide (EDB)	0.05

Notes:
1,2-DCP = 1,2-Dichloropropane: Clean-up level based on Federal National Primary Drinking Water Standards - 40 Code of Federal Regulations, Part 141 or 40CFR141.
1,3-DCP = 1,3-Dichloropropane: California Safe Drinking Water Act (CCR, Title 22, Sec 64444).
1,2,3-TCP = 1,2,3-Trichloropropane: Notification level set by California Office of Environmental Health Hazard Assessment, August 2009.
Chloroform: 40CFR141 - total trihalomethanes (sum of bromodichloromethane, dibromochloromethane, bromoform and chloroform).
Dinoseb: 40CFR141.
DBCP = 1,2-Dibromo-3-chloropropane: 40CFR141.
EDB = Ethylene dibromide; also called 1,2-Dibromoethane: 40CFR141.

These same chemicals were COCs for B-zone groundwater as identified in OU-2 investigations. The contamination in the A-zone perched groundwater poses a potential threat to the underlying unconfined regional aquifer (B-zone), and the confined C-zone aquifer that is used for municipal drinking water. The OU-2 ROD was signed in September 2007.

2.5 OPERABLE UNIT OU-2 REMEDY

The OU-2 Remedial Investigation/Feasibility Study (RI/FS) evaluated 7 alternatives for the B&B Site. The Remedial Action Objectives for OU-2 were identified as follows:

- To remove or control groundwater contamination source in the A-zone
- To restore B-zone groundwater to its potential beneficial use
- To prevent future exposure to contaminated groundwater from the A-zone

Additionally, the relocation of the Arvin City Well CW-l to prevent exposure to contaminated groundwater is part of all alternatives except the No Action Alternative. A combination of Alternatives 2 (Monitored Natural Attenuation for B-zone groundwater) and Alternative 3 (A-zone Groundwater Source Reduction) were selected as the OU-2 remedy.

2.6 SUMMARY DESCRIPTION OF THE OU-2 REMEDY

Three main components of the selected remedial actions for the B&B Site OU-2 as described in the ROD (EPA 2007) are briefly presented below:

1. <u>Relocate the Arvin City Well CW-1:</u> Discontinued use of the Arvin City Well CW-1 (proper plugging and abandonment of the well) will eliminate the only known potential pathway for contamination in the A-zone and B-zone groundwater to infiltrate to the C-zone aquifer. The Arvin City Well will be relocated to an alternative location a suitable distance from the known B&B Site contaminant plume.

2. <u>Monitored Natural Attenuation for Groundwater:</u> The ultimate objective for the groundwater remedial action is to restore contaminated groundwater in the B-zone to its beneficial use. The B-zone groundwater could be used as a future source of drinking water, but it is not being used currently for this purpose either onsite or offsite. MNA for the groundwater in the B-zone is considered by USEPA to be an alternative means of achieving remediation objectives that may be appropriate for specific, well-documented Site circumstances where its use meets the applicable statutory and regulatory requirements. MNA is the reliance on natural attenuation processes to achieve

site-specific remediation objectives within a period that is reasonable compared to that offered by other more active methods.

3. A-zone Groundwater Source Reduction: This alternative consists of source reduction and control by dewatering the A-zone and treating the extracted groundwater.

The remedy to relocate the City Well CW-1 is independent of other site remedial actions and is mostly an institutional decision in the interest of the community. CW-1 is periodically being pumped for city use mostly during the summer months. This pumping has the potential to alter the MNA remedy in the B-zone, as it appears to influence the hydraulic gradient in that zone. Continued pumping of CW-1 as currently conducted may require reevaluation of MNA as a remedy for the B-zone.

Effective A-zone groundwater source reduction is an essential component of the expected ability of MNA to be effective in the B-zone.

2.7 SITE CONDITIONS

These sections provide the Site geology and groundwater conditions at the Site. The section also provides a summary description of the groundwater monitoring of the onsite and offsite wells that are used to periodically sample and analyze for COCs in both the A-zone and B-zone aquifers.

2.8 SITE GEOLOGY AND HYDROGEOLOGY

The geology at the Site is an alluvial deposit of alternating layers and mixtures of unconsolidated sands, silts, and clay. Soil underlying the Site to a depth of 80 feet generally consists of silty fine sand to fine sandy silt. Clean, well-graded sand lenses and thin seams of silty clay occur locally within these soils. The soils are thinly interbedded, with textural changes occurring every few vertical inches. These textural changes are also believed to occur laterally.

Two hydrogeologic units have been studied at the site: the A-zone and the B-zone:

A-ZONE

The A-Zone includes unsaturated soil to depths of 65 to 75 feet bgs and includes the first water bearing unit, the A-zone groundwater. The depth to the saturated zone varied between 65 and 85 feet bgs during the January 2004 groundwater sampling event. The base of the A-zone is a thin sandy clay layer from 75 to 85 feet bgs. The clay layer and the A-zone groundwater occurs under the entire Site but disappear approximately 900 feet south of the Site. Groundwater in the A-zone flows in a generally southern direction with some mounding of the water table observed from the southwest corner of the Site extending south. The saturated thickness of the A-zone groundwater ranges from 0 to 10 feet. The groundwater velocity in the A-zone has been estimated at 53 feet per year. Slug test results suggest that a yield of less than 100 gallons per day can be expected for wells in the A-zone. Aquifer testing of three of the on-Site extraction wells showed a groundwater yield of approximately ¼ gallon per minute (gpm). This yield was unsustainable during the testing.

The October 2011 groundwater monitoring shows that the A-zone groundwater flows in a generally southwesterly direction. Periodic and localized changes in flow directions occur beneath the Site. Several groundwater depressions exist south of the Site toward which groundwater flow occurs. These groundwater depressions provide pathways for vertical flow of groundwater from the A-zone into the B-zone. The soils under the A-zone and at the top of the B-zone are unsaturated to a depth of approximately 140 feet (or Elevation 286 mean sea level [MSL]), where the top of the saturated B-zone occurs.

B-ZONE

The B-Zone includes unsaturated soil below the A-zone and the second water-bearing unit (B-zone groundwater) at depths between 150 and 165 feet bgs. The B-zone extends to at least 250 feet bgs and ends at a clay layer at, or below, that depth. The clay layer under the B-zone confines the drinking water aquifer below it. The thickness of this clay layer beneath the Site is unknown.

The B-zone groundwater is comprised of a series of water-bearing units. All of the wells in the B-zone were installed in the water-bearing unit located at approximately 170 feet bgs. The direction of flow in this unit is to the south, and the gradient is very flat (0.0004 meters per meter [m/m]). The hydraulic conductivity of the B-zone is evaluated to be much higher than that for the A-zone. Pump tests in the B-zone indicate that wells in this zone may be pumped at 7 gpm for extended periods without appreciable water drawdown.

For reference, a schematic showing the typical thickness for the A-zone and B-zone is shown in Figure 3 and a cross-section across the Site is presented in Figure 4. These figures were adapted from the OU-2 RI/FS report (Panacea 2008).

2.9 GROUNDWATER MONITORING WELLS

There are 44 groundwater monitoring wells at the Site and on the adjoining properties that were constructed between 1984 and 2007 at locations designed to assess the extent of the contaminant plume, contaminant concentrations, and aquifer characteristics. Another 4 wells (PWB-13A through PWB-16) were installed at the Site in 2010.

The 48 wells (14 onsite and 34 offsite) are used to sample for A- & B-zone groundwater and to assess the COCs in groundwater. The COCs concentration data was used for the MNA Evaluation Report. Twenty-five of these wells are screened within the A-zone aquifer, and 23 are screened within the B-zone aquifer.

The wells sampled during this study are spaced widely within the known contaminant plume and along portions of the plume's perimeter. These wells were intended to provide sufficient data to delineate the on-Site and off-Site extent of the 7 COCs listed in Section 2.4 of this report.

For the purposes of the MNA evaluation, the study focused on the COCs in the groundwater monitoring wells screened in the B-zone. Figure 5 shows the monitoring well locations for the wells in the B-zone.

Groundwater sampling results for COC's for some of the wells are reported as early as 1987. A complete set of COC data that is available for this assessment is presented in Appendix A. These results include those reported in the October 2011 Groundwater Monitoring Report.

3.0 IMPLEMENTATION OF THE NAS MODEL

This section describes the application of USGS's NAS to the Site for the evaluation of the occurrence of natural attenuation in the B-zone Aquifer. A brief description of the NAS model, the data requirements, and the NAS simulation results is provided in the following sections.

3.1 DESCRIPTION OF THE NAS MODEL

A brief description of the model is provided with model advantages and limitations. The USGS, Virginia Polytechnic Institute, Virginia Tech State University, and the U.S. Navy have developed a software package that can be used to evaluate the MNA in the groundwater. Specifically the NAS model estimates how far plumes will migrate by natural attenuation processes and how long the natural attenuation processes will take to clean up groundwater contamination. The software package is an interactive computer-screening tool written in Microsoft Visual Basic that requires input for the Site hydrogeology, contaminant characteristics, and Site-specific remediation goals. The software allows for the following:

- Evaluation of source area contaminant concentrations at which the natural attenuation is protective of the environment
- Estimate of time for the contamination plume to shrink to an acceptable configuration when contaminant concentrations in the source area are lowered
- Estimate of time for a given mass of contaminants to dissolve and disperse at the Site

The NAS model is designed for application to groundwater systems consisting of porous, relatively homogeneous, saturated media such as sands and gravels and assumes that groundwater flow is uniform and unidirectional. NAS consists of a combination of analytical and numerical solute transport models. Natural attenuation processes that NAS models include advection, dispersion, sorption, non-aqueous phase liquid dissolution, and biodegradation. NAS determines redox zonation. It also estimates and applies varied biodegradation rates from one redox zone to the next.

The main purpose of using this software is to obtain the estimate of time for a given mass of contaminants to dissolve and disperse at the Site due to the natural attenuation processes. The use of this package for this Site has been pre-approved by USACE and USEPA.

The logic flowchart for the implementation of the NAS model is depicted in Figure 6 below:

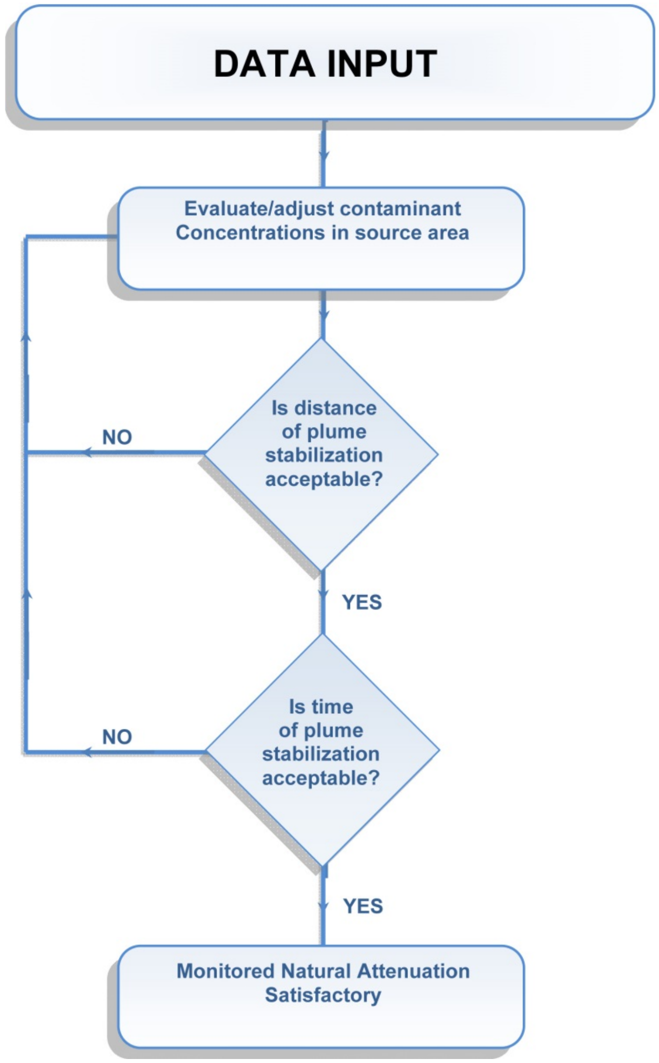

Figure 6: Logic Diagram for Implementation of the NAS Model

Once the contaminant concentrations have been identified in the source area and the plume geometry is defined, the model simulations are run to assess the distance for stabilization and the time for stabilization.

3.2 NAS MODEL SELECTION

The NAS model has been a joint development effort between academia and an end-user (U.S. Navy) since 2004. Although the model has been initially projected for use primarily for fuel hydrocarbons, authors have indicated that the software is applicable for all solutes. It has the functionality for use on this project. It was selected as the software package for use on this project during the workplan phase in consultation with the EPA and USACE.

3.3 MODEL INPUT DATA

Groundwater quality data have been collected from the groundwater monitoring wells screened in the B-Zone. For the NAS model, subsets of these data were used that provided necessary alignments of wells along with the flow direction of groundwater. Because the flow direction in the B-zone is not known to be consistent, analyses were completed along two directions:

1. The first is identified as direction A is generally along the 6 wells: WB2-1, WB2-3, PWB-8, PWB-5, PWB-9, and WB2-4 (see Figure 5 for well locations and the alignment of the flow for this assessment). This flow direction is estimated to be about 30 degrees west of south, or 210 degrees.
2. The second is identified as direction B and is generally along the 6 wells: WB2-1, PWB-7A, PWB-13A, PWB-14, PWB-15, and PWB-16 (see Figure 5 for well locations and the alignment of the flow for this assessment). This flow direction is estimated to be about 8 degrees east of south, or 172 degrees. This second direction was selected, as the larger COC concentrations appeared aligned in this general direction.

Whereas these directions are selected for MNA assessment purposes, as additional Site data are collected during periodic monitoring, it is expected that one of these directions will be selected as the primary flow direction or hypothetical flow direction for purposes of monitoring MNA progress.

Groundwater monitoring has provided the concentration of COCs along the plume/s. This data is available through the sampling conducted in October 2011. A tabulated copy of these results is presented in Appendix A.

3.4 THE SITE NAS MODEL

The site-specific data described in this section was incorporated to the software to create a NAS model for the Site. As described above, the NAS model simulates natural attenuation as a number of naturally occurring processes that degrade contaminants and limit their movement in the subsurface. Natural attenuation processes can control contaminant movement and concentrations in environmental media including soil, sediment, air, surface water, and groundwater. The NAS model for the Site provides estimates of the time of attenuation for the Site COCs. The NAS model uses the site-specific input data to calculate the necessary groundwater flow parameters such as dispersivity (transverse and longitudinal), dispersivity ratio, and estimated plume length. The NAS model calculations estimate the attenuation rates for each chemical in each dataset. The data requirements for the NAS model are described below.

3.4.1 MODEL DATA REQUIREMENTS

NAS model requires Site-specific data related to hydrogeologic properties of groundwater. These parameters are necessary to run NAS simulations successfully. The most significant among these parameters are hydraulic conductivity and porosity. The rest of the parameters are secondary, as they do not significantly affect the calculated results from the model, based on the sensitivity analysis described in Attachment 3. Site information about hydrogeology, redox conditions, and contaminant concentrations are required as input to the NAS software. Table 2 below provides a summary of the basic Site data required by NAS and the source of this data for the implementation of the NAS model.

TABLE 2: DESCRIPTION OF PARAMETERS AND DATA SOURCES

PARAMETER DESCRIPTION	DATA SOURCE
Hydraulic Conductivity	Site-specific use RI/FS fate and transport data (see RI/FS document Appendix B).
Hydraulic Gradient	Determine gradients from plots of B-zone water elevation contours; verify that the estimated gradients are comparable; estimate the average of three estimated gradients.
Weight Percent Organic carbon	Site-specific use RI/FS fate and transport data (see RI/FS document Appendix B). Assume the TOC in B-zone is same as that in A-zone.
Total Porosity	Site-specific use RI/FS fate and transport data (see RI/FS document Appendix B).
Effective Porosity	Estimate effective porosity based on total porosity values and based on professional judgment.
Contaminant Source Width	Best estimate based on plot for contaminant in the B-zone.
Contaminant source length	Best estimate based on plot for contaminant in the B-zone.
Average Saturated Thickness Impacted by Contamination	Use minimum, average, and maximum impacts in the B-zone.
Redox Indicators	
Concentration: Dissolved Oxygen, Ferrous Iron, Sulfate	Values from 1 or more wells along the solute plume axis (see Figure 5).
Concentration: Nitrate, Sulfide, Methane, Dissolved Hydrogen	Values from 1 or more wells along the solute plume axis (see Figure 5).
Contaminant	
Concentration: Contaminant	Values from 3 wells along the solute plume flow path (see Figure 5).

3.4.2 PARAMETERS OBTAINED FOR NAS MODEL USE

The Site-specific data as presented in project reports was used in identifying the following parameters for use in the NAS model:

TABLE 3: VALUE(S) USED IN THE NAS MODEL

PARAMETER DESCRIPTION	VALUE(S) TO BE USED IN THE MODEL
Hydraulic Conductivity	7.5 m/d*
Hydraulic Gradient	0.0004 m/m*
Weight Percent Organic Carbon	0.00001
Total Porosity	0.48

PARAMETER DESCRIPTION	VALUE(S) TO BE USED IN THE MODEL
Effective Porosity	0.25 *
Contaminant Source Width	78 meters
Contaminant source length	94 meters
Average Saturated Thickness Impacted by Contamination	Range between 2 and 15 meters: assume thickness of 8 meters for analysis.
Redox Indicators	
Concentration: Dissolved Oxygen, Ferrous Iron, Sulfate	Mean of values from Fall 2011 Groundwater Monitoring event (along the axis of the plume).
Concentration: Nitrate, Sulfide, Methane, Dissolved Hydrogen	Mean of values from Fall 2011 Groundwater Monitoring event (along the axis of the plume).
Contaminant	
Concentration for COCs	Mean of values from Fall 2011 Groundwater Monitoring event (along the axis of the plume).

Notes:
m/d meters per day
m/m meters per meter
* These values are taken from the OU-2 RI/FS Report, Section 2.2.5.2, page 7, and OU-1 Report- page RI-3-8

The following points are pertinent to the parameters identified above:

1. All data identified above is from prior project reporting. Backup for these parameters is provided in Appendix B.
2. For COC concentrations, the results of the October 2011 sampling event are included for analysis and presented in Appendix A.
3. The B-zone consists of a heterogeneous aquifer wherein the flow as identified from the monitoring well observations is not consistent. The B-zone may have differentiated layering of sandy zones and the flow in this zone may vary amongst its sub-zones. For purposes of this evaluation and for analysis, the B-zone is considered as one homogenous zone with properties as described above.
4. The flow requires idealization for purposes of analysis. For analysis, two idealized flow and flow directions are considered as presented in Figure 5 and as discussed in Section 3.2 above.
5. The contaminant source is the Site footprint when viewed along the B-zone water flow direction; the width would be the Site dimension traverse to the flow, and the length would be the Site length along the flow. It is assumed that this source has contributed to the B-zone and that another Site remedy will control the source in a manner such that there is no added contribution to the B-zone. In other words, the analysis does not consider added COC loading at the source.
6. Well WB2-2 is located immediately downgradient and to the south of the Site. Because of the well's location, it is identified as the source condition or the starting point for the COC plume/s in the B-zone.

7. For purposes of the MNA analysis, the plume thickness was taken to be the upper 8 meters of the B-zone. Plume thickness was not specifically analyzed except as part of model sensitivity analysis. The sensitivity analysis showed that larger thicknesses did not materially alter the MNA results.

The NAS model for the Site was implemented with the ranges of parameters presented in Table 4 below:

TABLE 4: RANGES OF PARAMETERS IMPLEMENTED IN THE MODEL SIMULATIONS

HYDROGEOLOGIC PARAMETERS	MAXIMUM	AVERAGE	MINIMUM
Hydraulic Conductivity (m/d)	20	7.5	1.0
Hydraulic Gradient (m/m)	0.001	0.0004	0.0001
Total Porosity (-)		0.48	
Effective Porosity (-)		0.25	
Groundwater Velocity (m/d)	0.08	0.012	0.004

Notes:
m/d meters per day
m/m meters per meter

3.5 MODEL SENSITIVITY ANALYSIS

During the preparation phase of the analysis, a model sensitivity analysis was performed to test the impact of the different input parameters. The following parameters were reviewed during this analysis with values that are in the range of those that may be expected at the site:

1. Hydraulic conductivity
2. Hydraulic gradient
3. Weight Percent Organic Carbon
4. Total Porosity / Effective porosity
5. Sorption Parameter (Fraction Organic Carbon)
6. Source length
7. Source width
8. Contaminated aquifer thickness

At the time when the sensitivity analysis was completed, Eco did not use the Site COCs, but used the common chemicals for which the model was designed by the authors: primarily fuel-related volatiles or benzene, toluene, ethylbenzene, and xylenes (BTEX). The sensitivity analysis was therefore limited to BTEX in the Site environment. Results of the sensitivity analysis are presented in Appendix C.

The sensitivity analysis provides the following results:

- Hydraulic conductivity and gradients have small impact on time of remediation (TOR). Their impact is less as values increases.
- The sensitivity of TOR to total porosity is very low.

- In the range considered for effective porosity, TOR sensitivity appeared relatively low.

As a result of this sensitivity analysis, the general conclusion is that the parameters of the study, even though affecting the TOR assessment to some degree, were not significant to the point that the results would require very accurate input for the parameters. The parameters that were available from prior work at the Site, as well as those parameters that might be available from readily available literature on materials similar to those at the Site, would be sufficient for the MNA assessment.

3.6 THE RESULTS OF THE MODEL ANALYSIS

The NAS model simulation results are available in the form of bit-mapped plots as well as a spreadsheet of input and output conditions. The plots and the spreadsheet data may be captured for presentation purposes but are not directly prepared as such for reporting the modeling results. Eco has captured the modeling run results to spreadsheets. These spreadsheets are not easily converted to presentation tables. They are instead presented as Appendix D.

NAS model simulations were performed using the input parameters as described above. The NAS model estimates site-specific ground-water flow rates, biodegradation rates, and sorption properties. Based on the range of estimates of attenuation rates, analytical solutions for the time to remediation are calculated for each COC. The NAS model simulation provides estimation of the rates of attenuation with respect to time, and provides the expected TOR for each COC.

The results of the simulations are presented as follows:

1. The TOR for W2-1, when flow is along the flow direction A, is presented in Figures 7 through 13 for all Site COCs. Figures 14 through 20 present plots for effects of natural attenuation capacity on contaminant concentration declines along the groundwater flow path along direction A.
2. The TOR for W2-1, when flow is along the flow direction B, is presented on Figures 21 and 22 for dinoseb and 1,2,3-TCP, respectively. These two chemicals were considered for model simulation along this flow direction. Other COCs may be analyzed following the review of this report. Plots for effects of natural attenuation capacity on contaminant concentration along the groundwater flow path B are presented on Figures 23 and 24.

The plots represent the degradation of a given COC with respect to time along the two flow directions. The simulation time is from year 2001 to 2026 along direction A and 2001 through 2045 for flow along direction B.

The results are as follows:

Along Direction A:

- 1,3-DCP, DBCP, & EDB show small or little degradation. This may be because concentrations for these compounds are low and below their CLs.
- The remaining chemicals show degradation with time with most the attenuation occurring over the first 10 years.
- The attenuation is presented as occurring over approximately 400 meters from the source well, WB2-1.

Along Direction B:

- For both dinoseb and 1,2,3-TCP, the attenuation occurs slower and extends to about the year 2040. This is because of the higher concentrations of the two COCs along this flow path.
- The attenuation is presented as occurring over approximately 400 meters from the source well, WB2-1.

The degradation of COCs is estimated by the model to occur within a period of about 12 years from now along flow direction A. In flow direction B, this period extends further to about the year 2040, or approximately 30 years from now.

The results of the NAS modeling and the uncertainties associated with the results are further discussed in Section 5.0.

4.0 TREND ANALYSIS

4.1 QUANTITATIVE ANALYSIS (METHODOLOGY)

Assuming the absence of any seasonal effect on the process of natural attenuation in the B-zone aquifer, a non-parametric statistical test (Mann-Kendall) was applied to assess contaminant trends. In addition to the Mann-Kendall test a linear regression statistical analysis was also performed. A summary of the methodologies used in the trend analysis is provided in the following sections. Results of the Trend Analysis are presented in Appendix E.

4.2 Mann-Kendall Test

The statistical significance of the presence of a trend, if any, is determined using the S- and t-statistics respectively. The most robust and the least dataset demanding statistical test for the determination of a trend is a Mann-Kendall test. For less than 40 data points, the S statistic (Mann Kendall Test value) for the Mann Kendall test can be computed. The null hypothesis of no trend is tested against the alternative hypothesis of negative trend. A negative magnitude of S indicates the possibility of decreasing trend, while a positive value of S indicates an increasing trend. Negative trends of the COC concentrations are indicative of natural attenuation processes contributing to the degradation of COCs.

4.3 REGRESSION ANALYSIS

Linear regression was also used in the trend analysis to regress COC concentrations with respect to time.

The actual regression analysis is performed on the log of concentration [Log C(t)] and time (t). A t-test of significance is conducted to ascertain statistical significance of the trend.

A positive or a negative value of the slope of the linear equation describing the trend indicates a positive or a negative trend for the analyzed data, respectively. The nature of the trend cannot be assumed descriptive of the true nature of the trend unless it is confirmed by the conclusions of the t-test and its statistical significance. Only a statistically significant trend can be considered an indication of the existence of the trend for the analyzed problem. Goodness of fit is provided by the coefficient of determination (R^2). The higher the value of R^2, the closer to the line is the behavior of the sampling data. Low R^2 defies the assumption of the existence of correlation between the quantitative parameters under the consideration, the time, and the concentration. Only the positive and statistically significant trend with high R^2 would indicate that the assumption of the natural attenuation occurring at a given location may be questioned and should be further studied.

4.4 DATA DESCRIPTION FOR TREND ANALYSIS

For the trend analysis, Eco used all wells that had more than three years of available data. The wells where the COCs were consistently below the respective detection limits were not included in this analysis. For the wells that have more than ten years of data, only the last ten years of data have been extracted from the dataset. Furthermore, for some wells, the dataset was narrowed down due to COCs showing the level of contamination below the detection limits.

The sampling data that was chosen for the trend analysis are the contaminant concentrations for the ten-year period between February 2002 and November 2011. The data amounts to thirteen sampling events of data for wells AR-1, AMW-3R, AMW-4R, WB2-1, WB2-2, WB2-3, WB2-4; nine sampling events of data for wells PWB-8,PWB-9,PWB-10, eight sampling events of data for well PWB-11; and five sampling events of data for wells PWB-7A and PWB-12. The trend analyses have been conducted only for the above listed wells.

4.5 TREND ANALYSIS RESULTS

4.5.1 MANN-KENDALL TEST

Based on the Mann-Kendall test results, statistical significance of the trend indicates whether the particular trend, positive or negative, can be considered as the indication of the general trend at that location. If the trend has no statistical significance, no conclusion about the trend at that location, in general, can be made.

Among the wells screened in the B-zone that were analyzed for the trend analysis, groundwater monitoring wells AR-1, AMW-3R, WB2-1, WB2-2, PWB-1, PWB-3, PWB-4 PWB-5 and PWB-8 exhibit statistically significant negative trends. Significantly higher negative trends are shown for 1,2-DCP at wells AR-1, AMW-3R, PWB-3, and PWB-8, and DBCP at well WB2-1. This is in part due to the consistently below CL concentrations of these COCs at these wells. Therefore, the significance of the negative trend is even higher. Potential ineffectiveness of the MNA is seen in a positive trend for the following Site COCs:

- 1,2-DCP at WB2-2, WB2-4, PWB-2, PWB-5, and PWB-11
- 1,2,3-TCP at PWB-2, PWB-5, PWB-11, and PWB-12
- Chloroform and Dinoseb at PWB-5 and PWB-12

Table 5 presents the Mann-Kendall Test results including trends and statistical significances for the Site COCs. No trend for concentrations of COCs was observed for some wells. However, the concentration levels in these wells are below the corresponding CLs, therefore the lack of the trend has no significance. (e.g., 1,2-DCP at well PWB-10 and chloroform at wells WB2-2 and PWB-4).

4.5.2 REGRESSION ANALYSIS

A regression analysis was performed at the B&B Site; the coefficients of determination and the confidence levels for each of these trends have been calculated. Table 5 shows the coefficient of determination R^2 for the Site COCs at corresponding wells.

The wells that showed positive trend with high coefficients of determination were as follows:

- 1,2-DCP at wells WB2-4 and PWB-2
- All COCs at wells PWB-5
- 1,2,3-TCP at well PWB-1
- Chloroform and dinoseb at well PWB-12.

These wells should be monitored most closely for the performance of MNA at the Site.

TABLE 5: MANN-KENDALL TEST AND REGRESSION ANALYSIS RESULTS FOR SITE COCS

WELL	CHEMICAL	MANN-KENDAL	TREND	SIGNIFICANCE	R^2
AR-1	1,2-DCP	- 48	negative	Yes	0.787797
	1,2,3-TCP	- 23	negative	Yes	0.309722
AMW-3R	1,2-DCP	- 49	negative	Yes	0.779274
	1,2,3-TCP	- 27	negative	Yes	0.374102
AMW-4R	1,2-DCP	- 6	positive	No	0.110134
	1,2,3-TCP	2	positive	No	0.000116
	DBCP	13	positive	No	0.011912
WB2-1	1,2-DCP	- 60	negative	Yes	0.801035
	1,2,3-TCP	- 67	negative	Yes	0.809752
	DBCP	- 38	negative	No	0.053502
	Chloroform	- 39	negative	Yes	0.623404
	Dinoseb	- 41	negative	Yes	0.661571
WB2-2	1,2-DCP	25	positive	Yes	0.025485
	1,2,3-TCP	29	positive	No	0.166341
	DBCP	22	positive	No	0.002338
	Chloroform	16	positive	No	0.096333
	Dinoseb	26	positive	No	0.176569
WB2-3	1,2-DCP	- 12	negative	No	0.015088
	1,2,3-TCP	19	positive	Yes	0.4301
	Chloroform	- 65	negative	Yes	0.545249
WB2-4	1,2-DCP	32	positive	Yes	0.847908
	1,2,3-TCP	25	positive	No	0.01557
PWB-1	1,2-DCP	- 57	negative	Yes	0.502905
	1,2,3-TCP	- 38	negative	No	0.236027
PWB-2	1,2-DCP	59	positive	Yes	0.721747
	1,2,3-TCP	44	positive	Yes	0.451527
	Chloroform	15	positive	No	0.009301
PWB-3	1,2-DCP	- 59	negative	Yes	0.406698
	1,2,3-TCP	- 54	negative	Yes	0.296235
	DBCP	- 51	negative	No	0.262913
PWB-4	1,2-DCP	- 33	negative	Yes	0.624053
	1,2,3-TCP	- 13	negative	Yes	0.340913

WELL	CHEMICAL	MANN-KENDAL	TREND	SIGNIFICANCE	R^2
	DBCP	- 42	negative	Yes	0.798607
	Chloroform	- 5	negative	No	0.085416
	Dinoseb	- 12	negative	No	0.224003
PWB-5	1,2-DCP	37	positive	Yes	0.568338
	1,2,3-TCP	22	positive	Yes	0.51781
	DBCP	15	positive	Yes	0.652598
	Chloroform	43	positive	Yes	0.386726
	Dinoseb	4	positive	Yes	0.417582
PWB-7A	1,2-DCP	- 1	negative	No	0.149077
	1,2,3-TCP	- 2	negative	No	0.138246
	DBCP	- 6	negative	Yes	0.629227
	Chloroform	- 3	negative	No	0.237604
	Dinoseb	- 2	negative	No	0.5303
PWB-8	1,2-DCP	- 18	negative	Yes	0.462609
	1,2,3-TCP	- 1	negative	Yes	0.470384
PWB-10	1,2-DCP	12	positive	No	0.052766
	1,2,3-TCP	14	positive	No	0.039335
	DBCP	2	positive	No	0.023901
	Chloroform	- 7	negative	No	0.314396
PWB-11	1,2-DCP	18	positive	No	0.391226
	1,2,3-TCP	12	positive	Yes	0.707643
	Dinoseb	9	positive	No	0.237712
PWB-12	1,2-DCP	- 2	negative	No	0.148802
	1,2,3-TCP	4	positive	No	0.426117
	DBCP	4	positive	No	0.10105
	Chloroform	7	positive	Yes	0.669826
	Dinoseb	8	positive	Yes	0.96162

5.0 DISCUSSION

Groundwater systems are complex, exhibiting significant heterogeneity across multiple scales, multiple interacting processes, and non-linear behaviors. Groundwater systems are also open, often with poorly defined boundaries and time-dependent, uncertain boundary conditions. Consequently, a model cannot be expected to reflect the complex system. Groundwater models are calibrated using site-specific hydrogeology data to represent the groundwater flow conditions (e.g., groundwater velocity, gradients both horizontal and vertical, fluxes, etc.). The availability of site-specific data to describe the complex system and the accuracy of the data are paramount to using mathematical models to reasonably accurate representation of the natural systems. Additionally, sensitivity analyses are performed to test the sensitivity of the model to input data. The sensitivity analysis results are useful in the evaluation of the uncertainty associated with the model parameters and are often used to qualify the model predictions. This means that the model predictions can be affected by deviations in model assumptions and/or the accuracy of the model input parameters as well as the challenge of representing the inherently complex natural groundwater systems such as the groundwater system prevailing at the Site. Similarly, there are uncertainties associated with the limited data used in the trend analysis and the underlying assumptions for the statistical inferences leading to conclusions arrived at this report.

5.1 UNCERTAINTY ASSOCIATED WITH NAS MODEL RESULTS

The USGS NAS model utilizes companion software packages such as MODFLOW to simulate groundwater flow conditions in the evaluation of MNA. Model calibration for groundwater flow conditions in its true sense as commonly performed in groundwater modeling efforts is not required for the NAS model. A range of hydrogeologic data (e.g., hydraulic conductivity and groundwater gradient) are used and MNA simulations are performed that produce model results using the average values as compared to the lower and higher values of the hydrogeologic parameters to ultimately estimate degradation rates and the TOR for the Site COCs. At best, the NAS model is for use as a screening tool for evaluation of contaminant attenuation.

The preliminary sensitivity analysis, Appendix C, was performed in part to evaluate uncertainties associated with NAS modeling results. The sensitivity analysis mainly showed that the NAS model is most sensitive to the hydraulic conductivity data. The hydraulic conductivity values used in the NAS model are based on site-specific data, but there are always uncertainties related to *in-situ* conditions. It would be common for this to be quite variable in an alluvial setting such as that of the B&B site. Such variance would alter the predicted COC attenuation greatly. Additional hydrogeologic data, in particular, the hydraulic conductivity values for the B-zone based on further field testing may provide added assurance for the range of *in-situ* values of this parameter. Such testing may not provide added confidence in the ability to provide a predictive model for COC attenuation.

5.2 UNCERTAINTY ASSOCIATED WITH TREND ANALYSIS

Trend analysis assumes a random distribution of the sample and an empirical approach to model the COC attenuation. All uncertainties associated with the collection of sampling data are necessarily incorporated into the analysis and normalized in the analysis interpretation. The statistical methodology provides a suitable, qualitative approach to understanding the disposition of the COCs over time. If sampling events are suitably timed during the year, it is also possible to interpret seasonal effects of flow and recharge. By definition, this includes the dynamic loading at the source, which is difficult to quantify in other approaches.

The trend analysis results reported in Section 4 show a strong negative trend for concentrations of the COCs at the Site. Deviations from the underlying assumptions in the trend analysis are not expected to alter the general conclusion on the trend analysis. Qualitatively, this analysis provides a good method to form a general impression of attenuation in the B-zone.

6.0 CONCLUSIONS

MNA in the B-zone was evaluated by use of the NAS modeling software and by use of trend analysis. The attenuation of COCs in the B-zone has been assessed quantitatively and qualitatively. On a preliminary basis, the evaluation shows that all COCs appear to be naturally attenuating. Along flow direction B, the attenuation is expected to take another 30 years or more. There is less contamination along flow direction A and this will likely attenuate over the next 10 to 15 years.

The use of the NAS software was to conduct the analysis and report the results for preliminary evaluation as to whether the model is suitable for use in MNA assessment of the B-zone. The results have provided TOR along the considered flow paths. Additional simulations may need to be completed for a more comprehensive evaluation on a well-by-well basis. Additional analysis may also be necessary as the B-zone boundary conditions are better defined for COCs where there are concentrations greater than the CLs in the outermost well.

Based on the trend analysis results using Mann-Kendall and regression statistical analyses of the available data in the B-zone groundwater monitoring wells, the natural attenuation processes appear to be contributing to the degradation of COCs in B-zone aquifer. The concentrations of COCs in most of the groundwater monitoring wells show a statistically significant negative trend for most of the COCs.

The following items need consideration because of this preliminary evaluation of MNA in the B-zone:

1. The MNA evaluation assessment has been made using the NAS software tool that, so far, is a suitable approach for use at the B&B site. There are many ways to assess MNA progress at the Site. As additional Site data becomes available, it may be appropriate to re-evaluate the use of this tool in comparison to other tools that are available for modeling contaminant attenuation.
2. Since source control in the A-zone is essential, it is difficult to compute B-zone MNA because added loading at the source is not known and not incorporated into the analysis. The timing for further MNA quantitative assessment should be evaluated in relationship to the effective implementation of source control in the A-zone.

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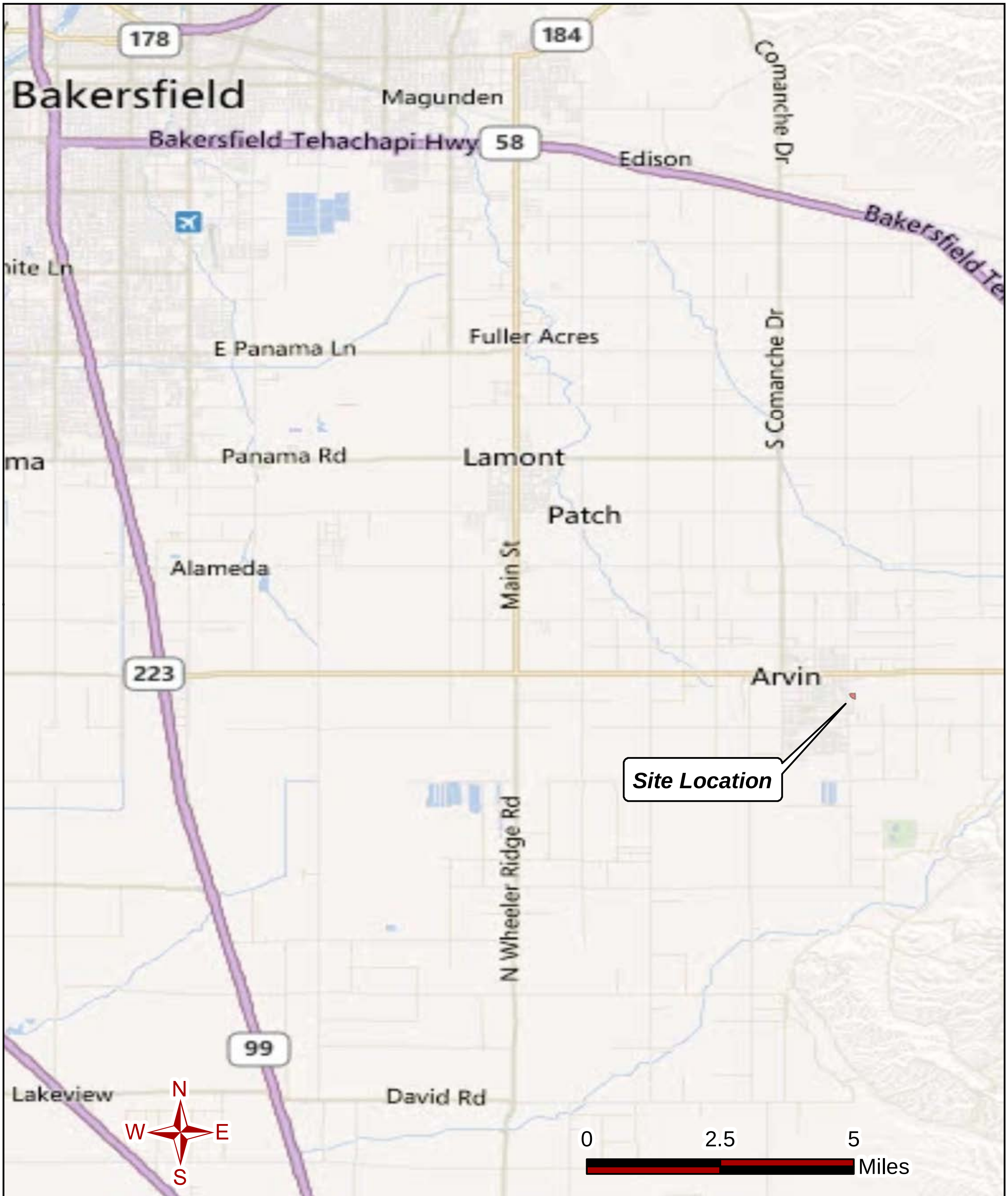
Figures



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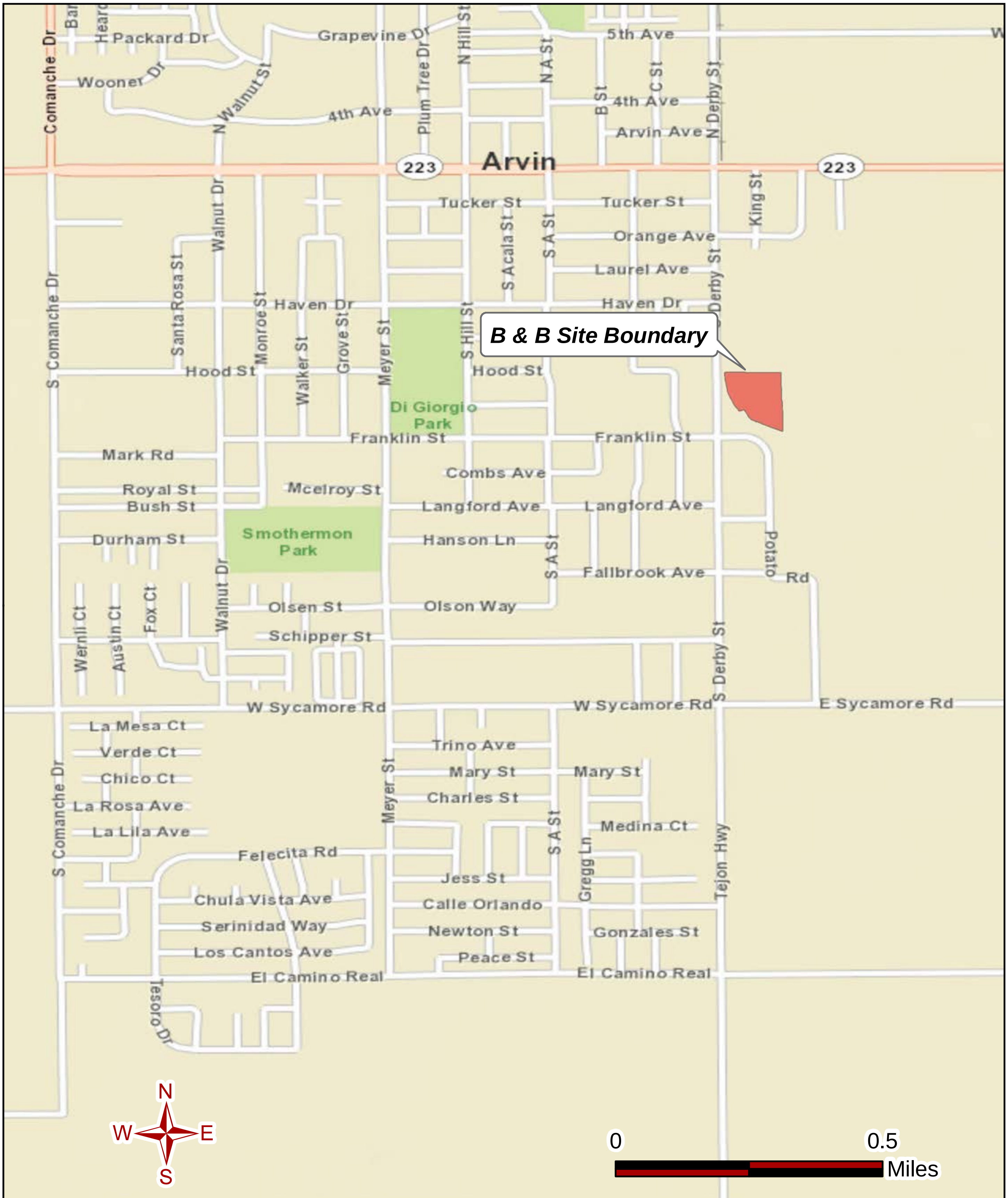
REGIONAL LOCATION MAP
Brown & Bryant Superfund Site
600 South Derby Street, Arvin, CA

Project No. Eco-11-481 Dated August 2012

FIGURE 1



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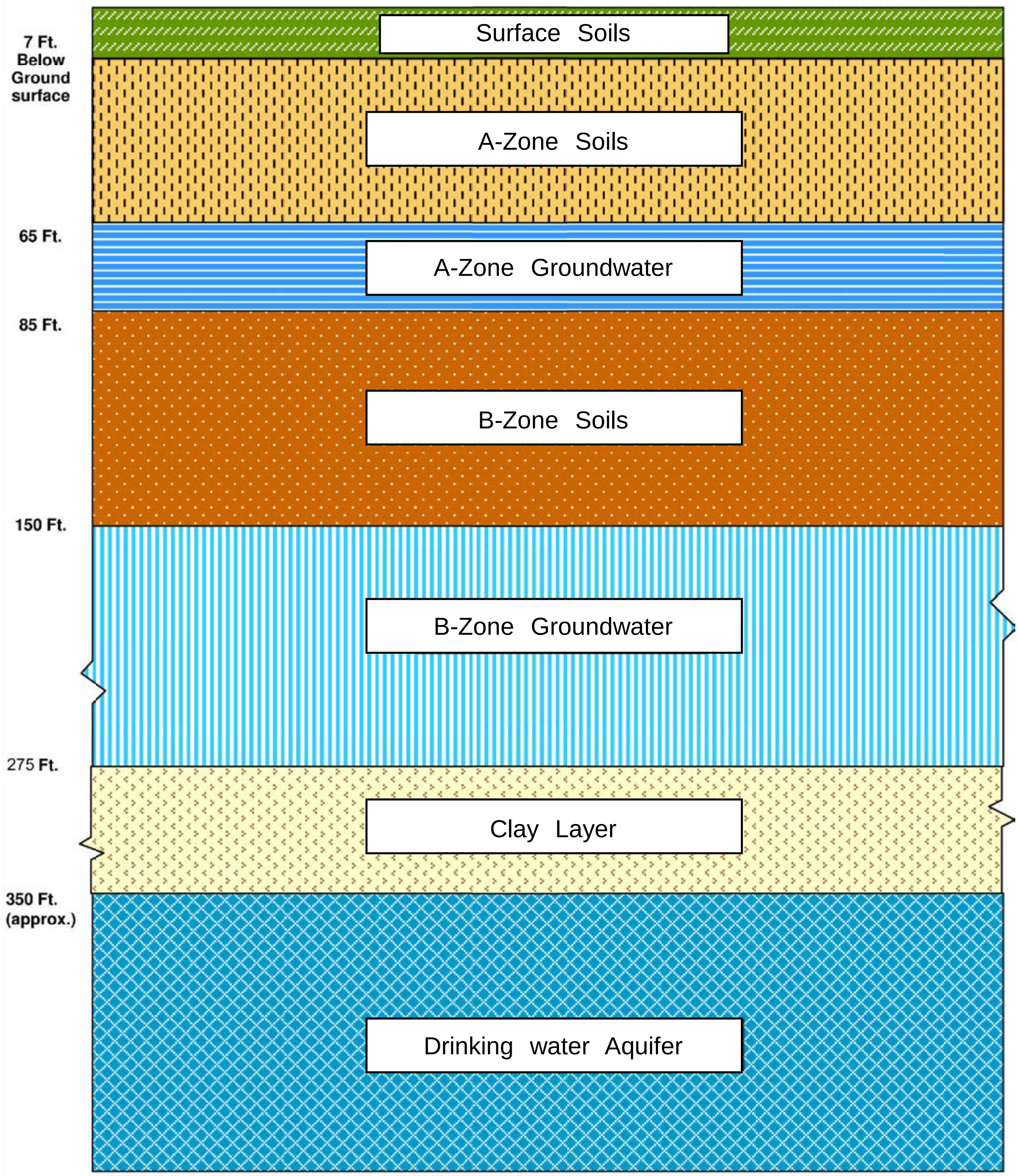
SITE VICINITY MAP

Brown & Bryant Superfund Site
600 South Derby Street, Arvin, CA

Project No. Eco-11-481 | Dated August 2012

FIGURE 2



Adapted from Figure in RI/ FS Report (Panacea 2005)

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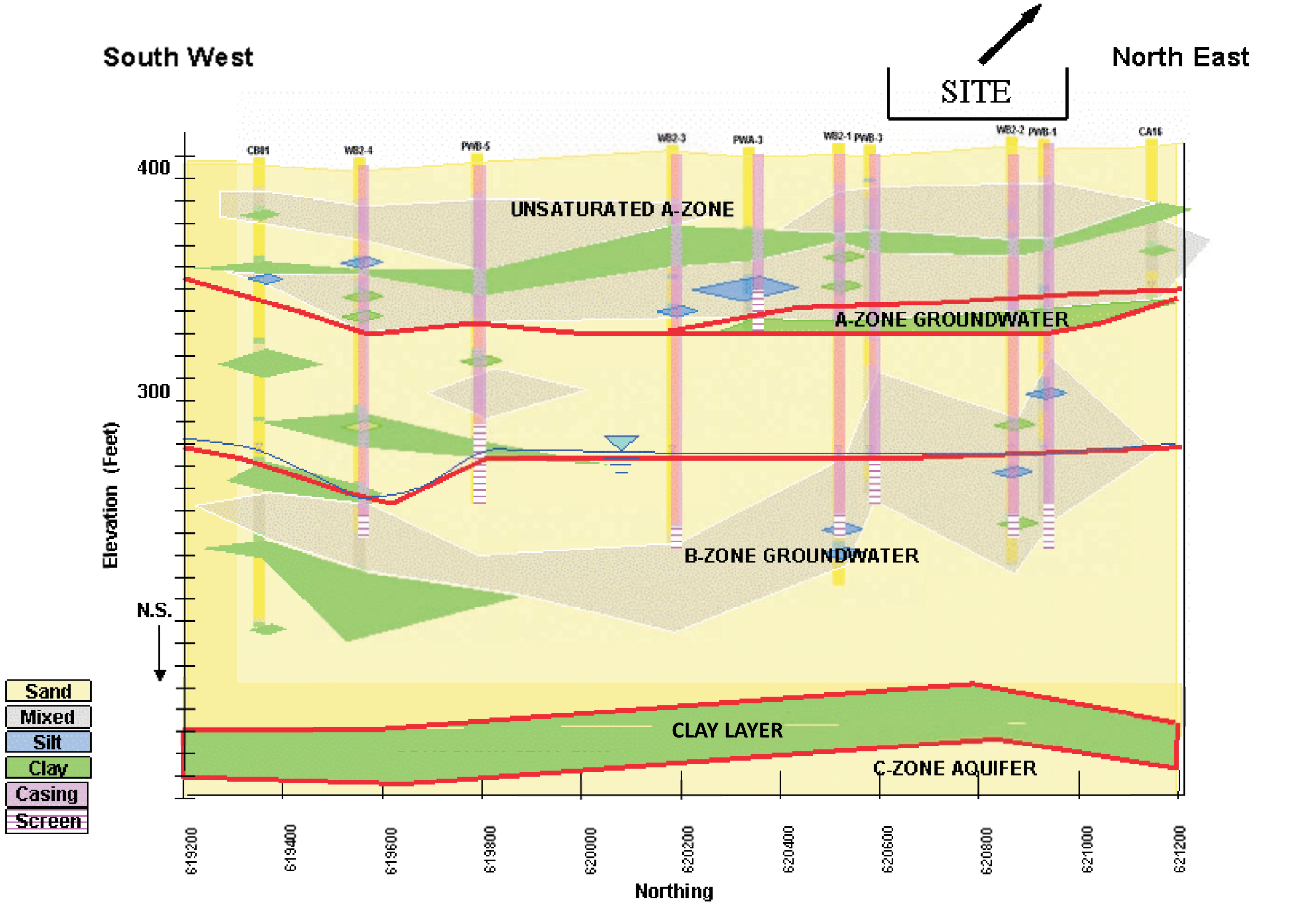
Soil Profile Showing A-Zone and B-Zone Thickness

Brown and Bryant Site, Arvin, CA

Project No.: Eco-11-481 | Dated August 2012

FIGURE 3



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STRATOGRAPHIC DETAILS FOR A-ZONE AND B-ZONE

Brown & Bryant Superfund Site
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Arvin, California

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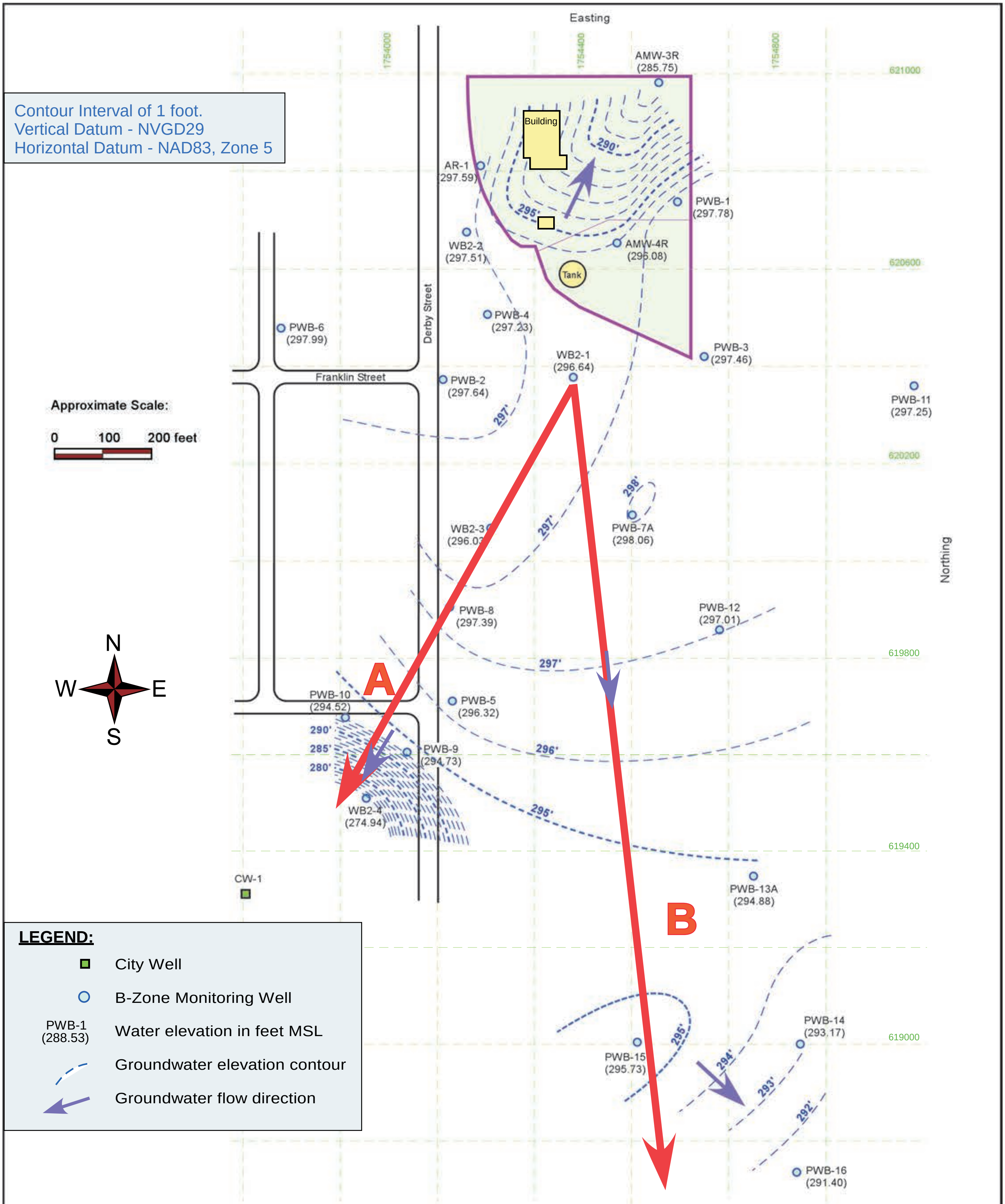
DATED August 2012

FIGURE 4



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B-ZONE GROUNDWATER FLOW DIRECTIONS

Brown & Bryant Superfund Site, Arvin, CA

Project No.: Eco-11-481

Dated August 2012

FIGURE 5

FIGURES INCLUDED FROM NAS MODEL RESULTS

Figure 7 – Simulated Degradation Rates for 1,2 – DCP Along Flow Direction A

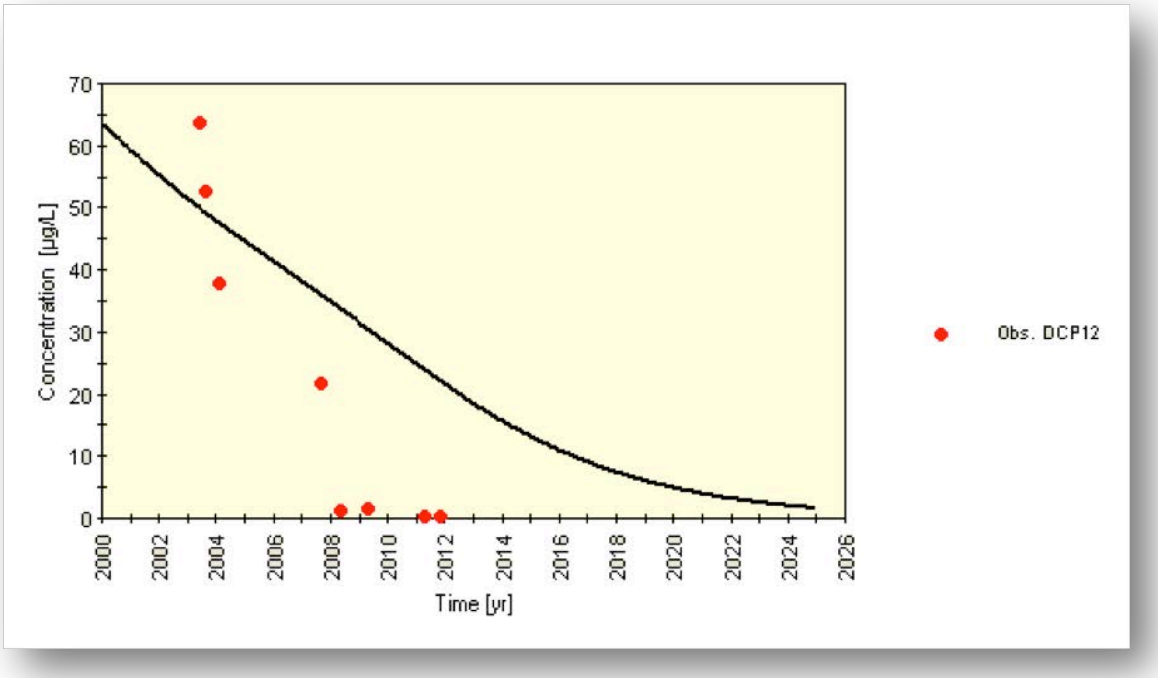


Figure 8 – Simulated Degradation Rates for 1,3 – DCP Along Flow Direction A

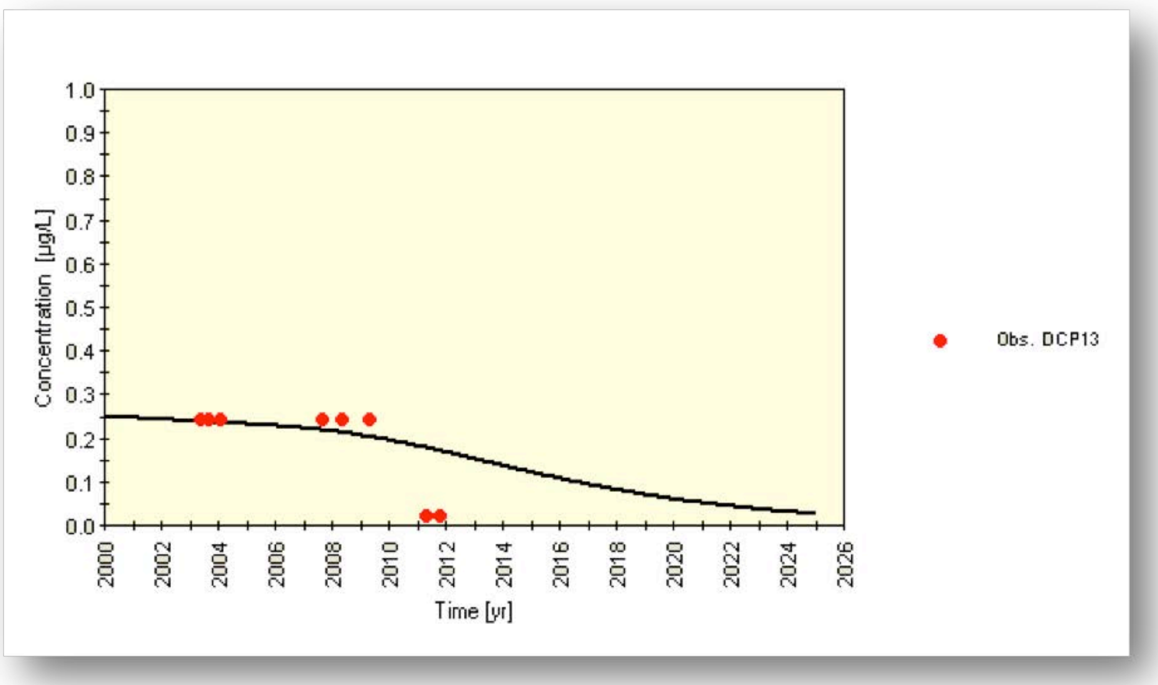


Figure 9 – Simulated Degradation Rates for 1,2,3 – TCP Along Flow Direction A

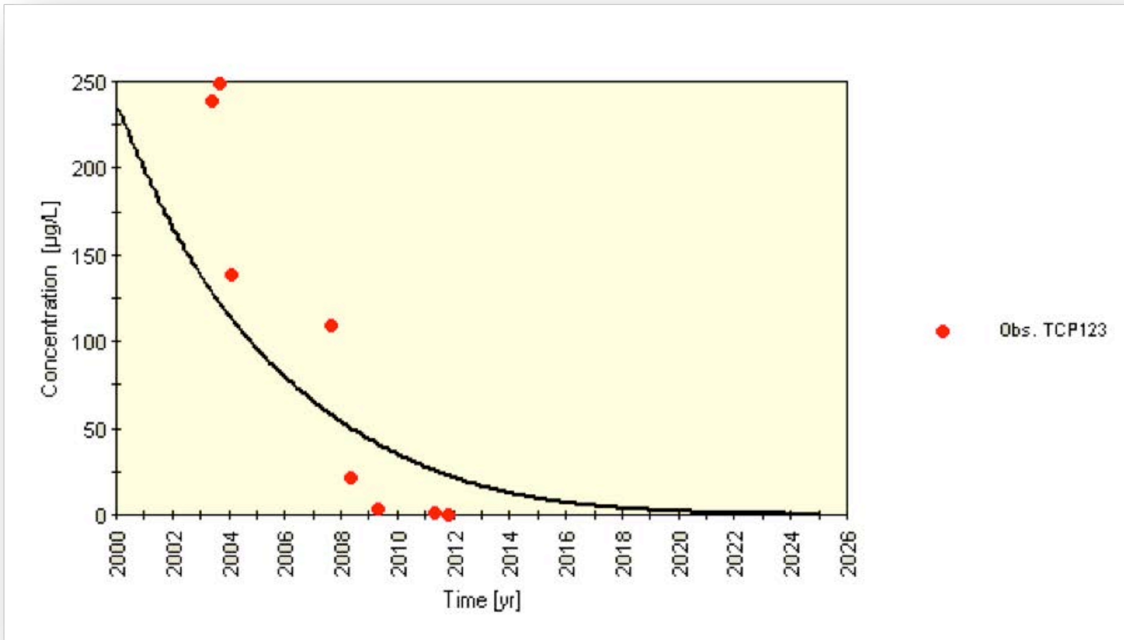


Figure 10 – Simulated Degradation Rates for Chloroform Along Flow Direction A

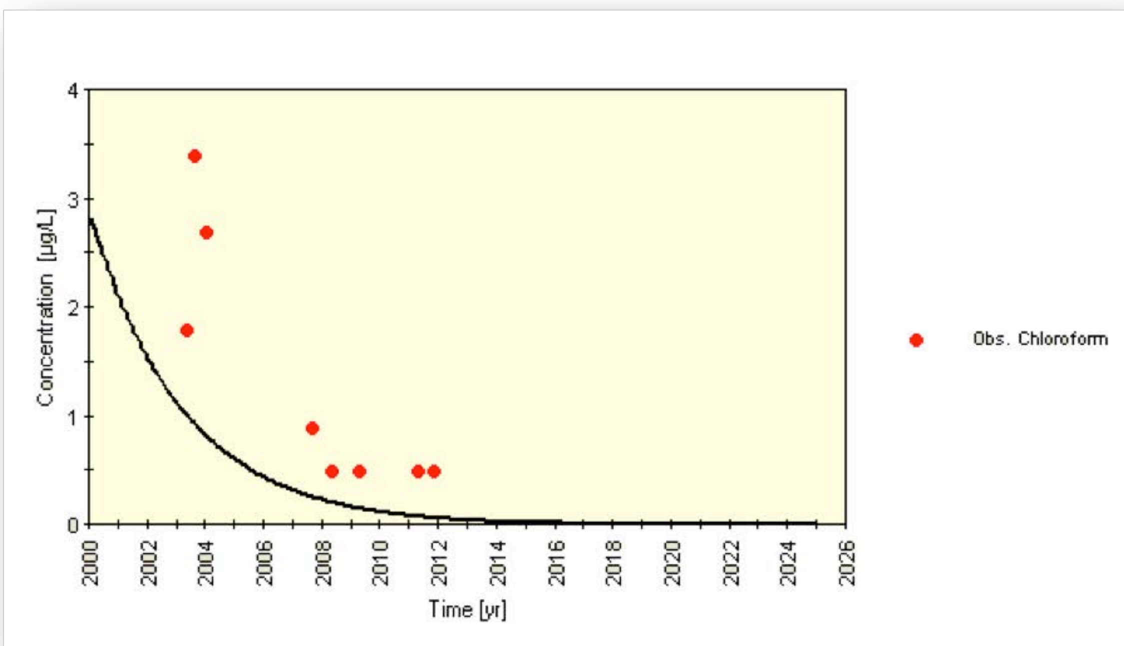


Figure 11 – Simulated Degradation Rates for DBCP Along Flow Direction A

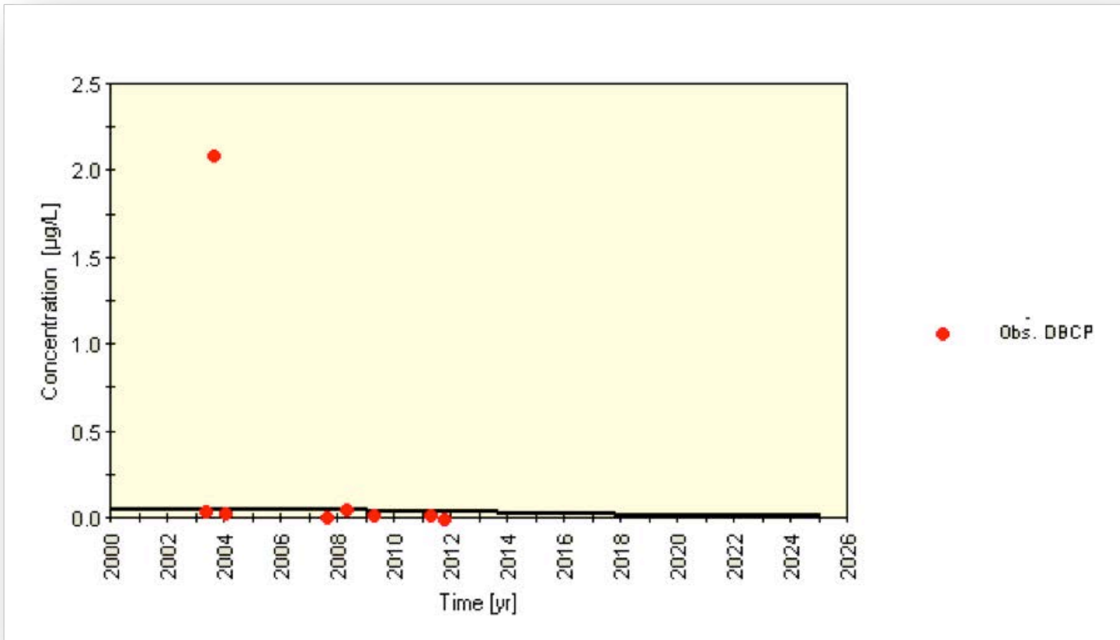


Figure 12 – Simulated Degradation Rates for Dinoseb Along Flow Direction A

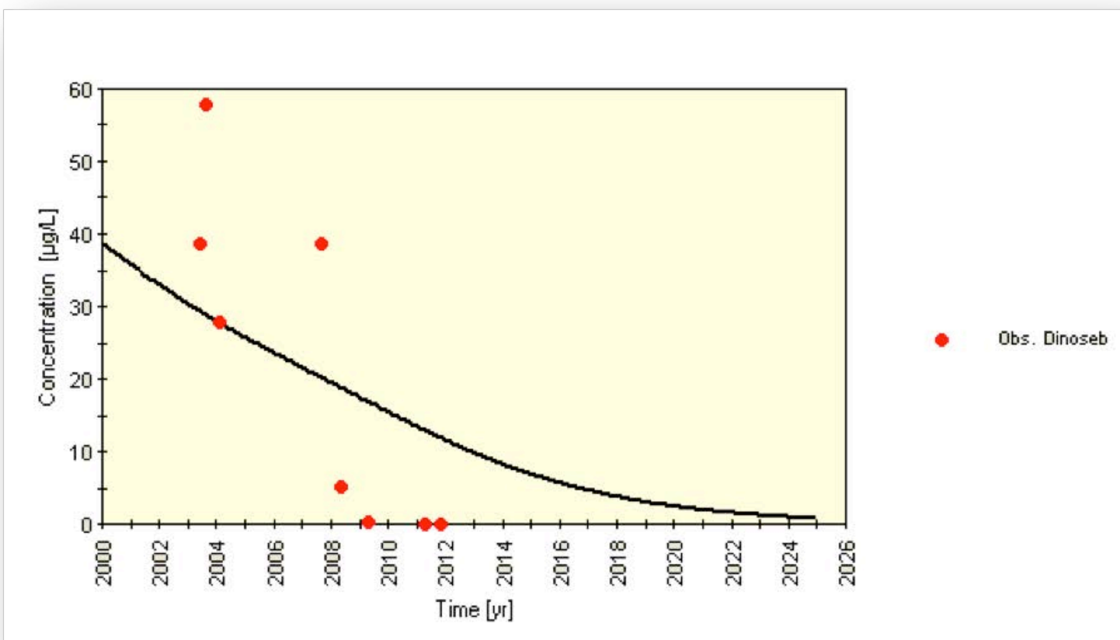


Figure 13 – Simulated Degradation Rates for EDB Along Flow Direction A

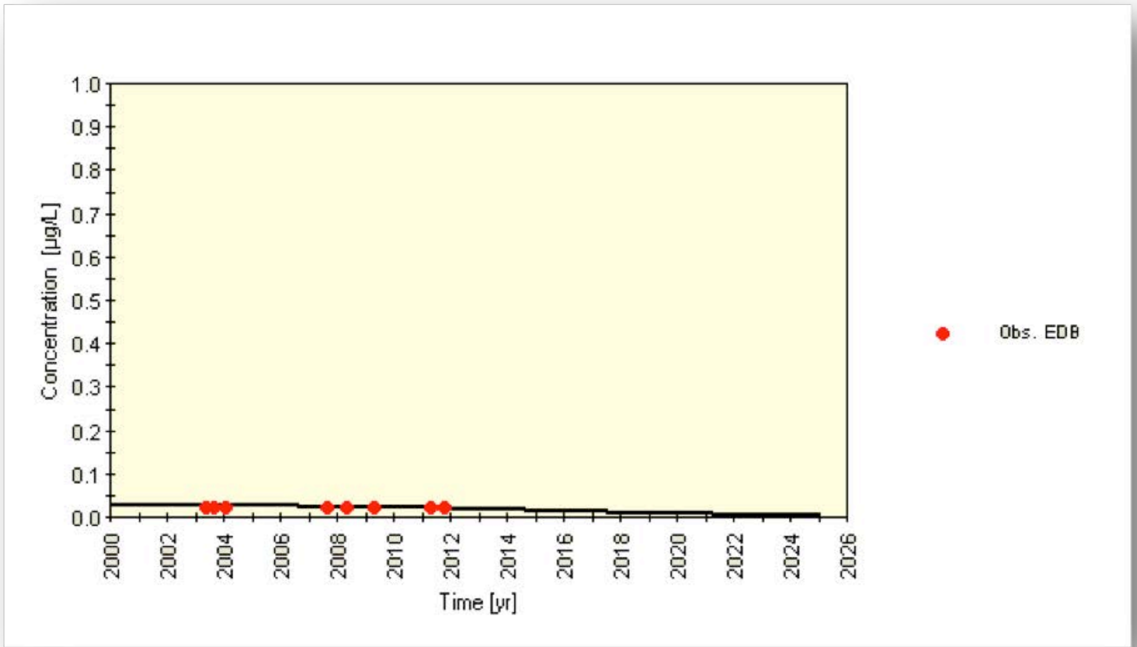


Figure 14 – Simulated Degradation Rates for 1,2 – DCP Along Flow Direction B

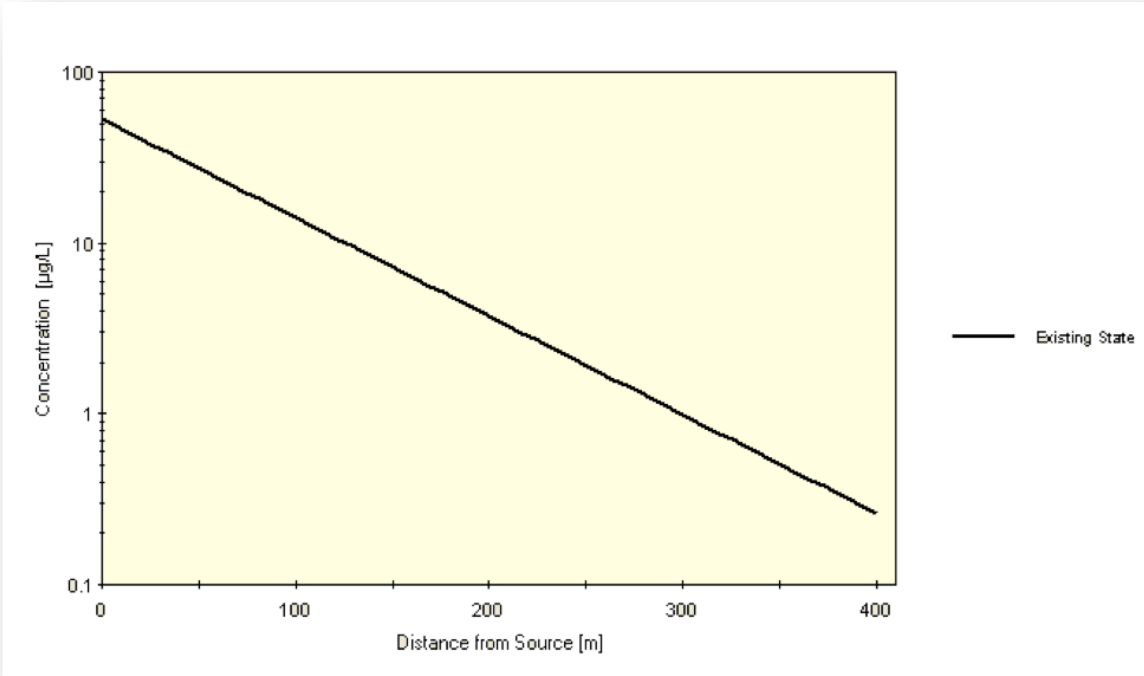


Figure 15 – Simulated Degradation Rates for 1,3 – DCP Along Flow Direction B

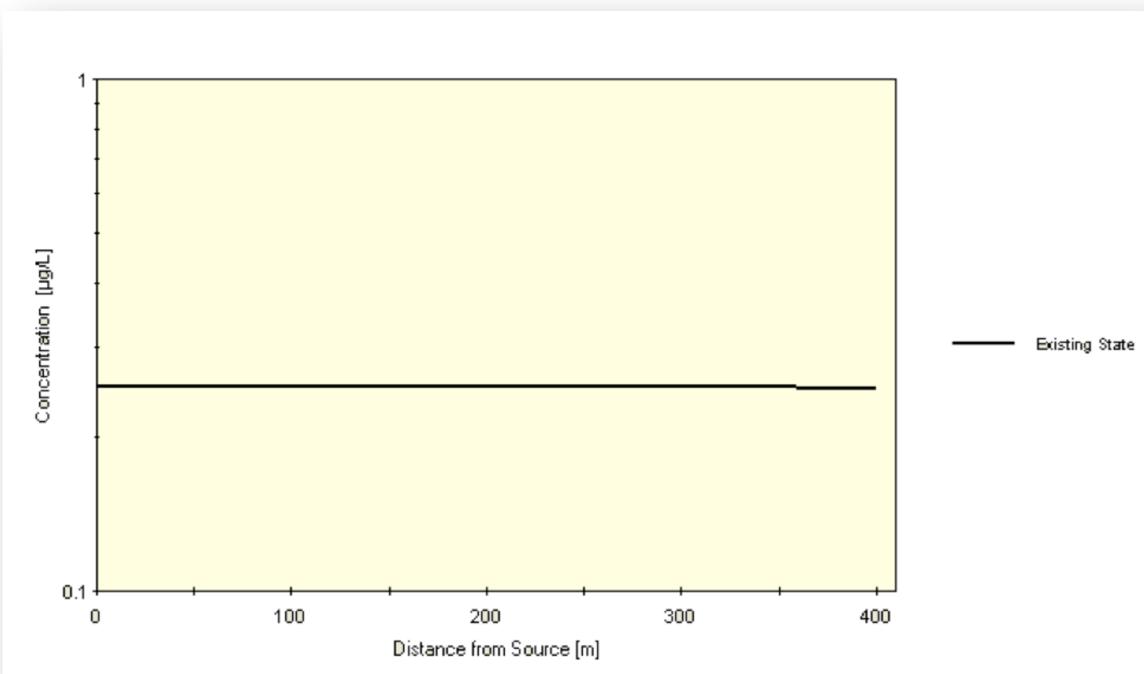


Figure 16 – Simulated Degradation Rates for 1,2,3 – TCP Along Flow Direction B

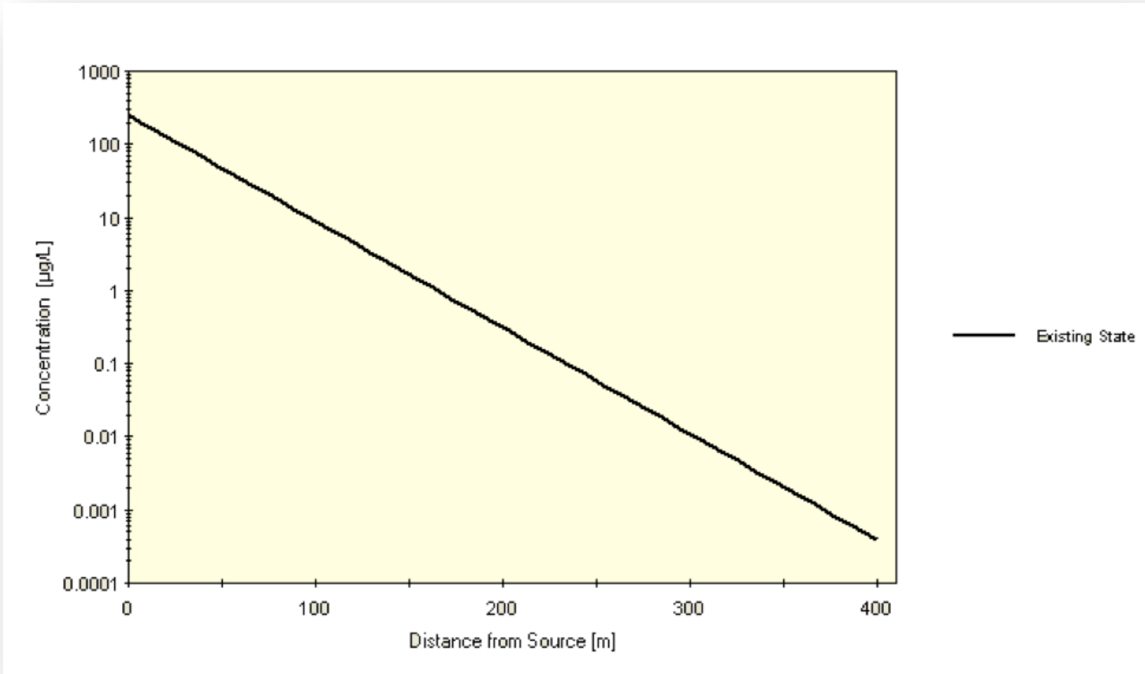


Figure 17 – Simulated Degradation Rates for Chloroform Along Flow Direction B

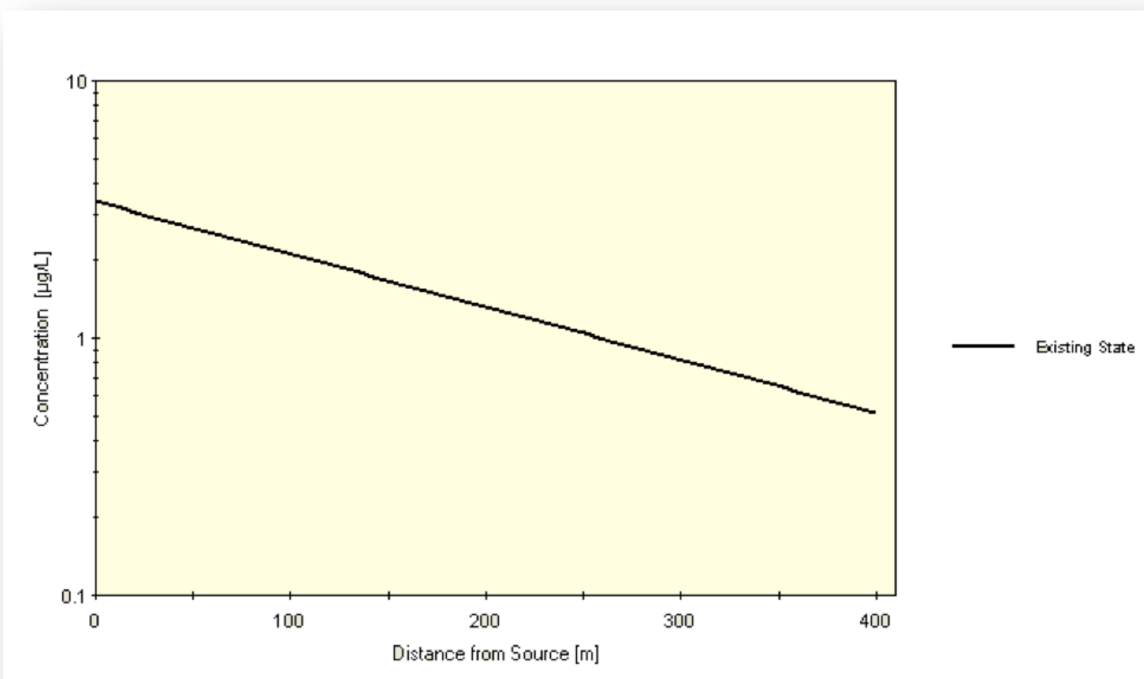


Figure 18 – Simulated Degradation Rates for DBCP Along Flow Direction B

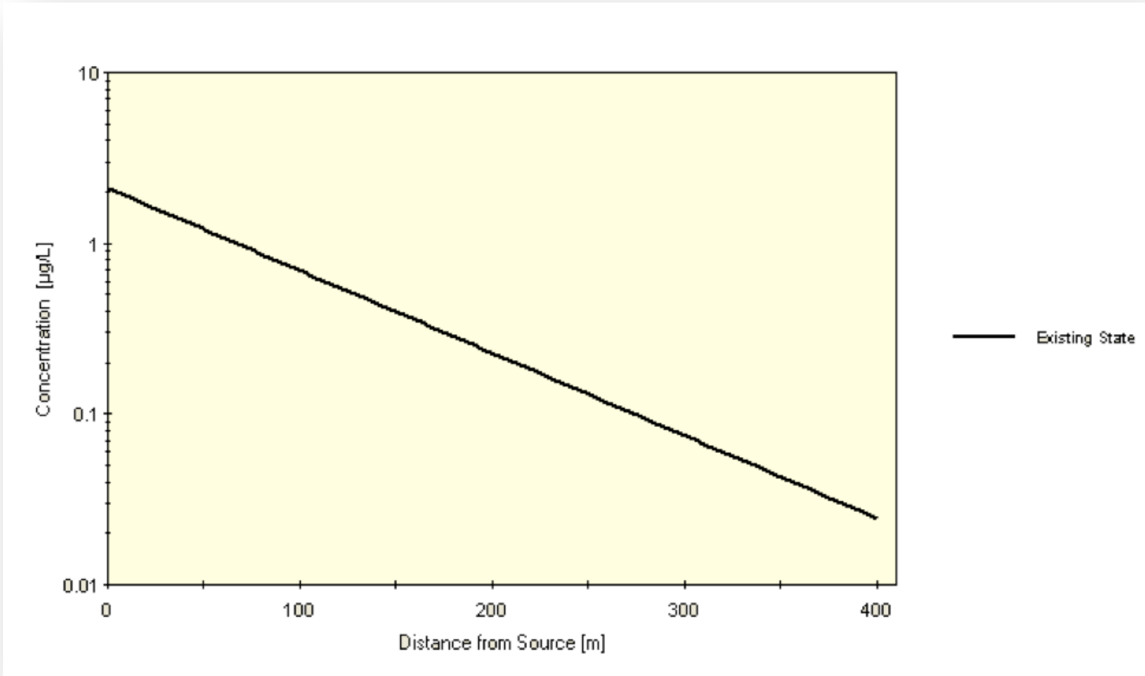


Figure 19 – Simulated Degradation Rates for Dinoseb Along Flow Direction B

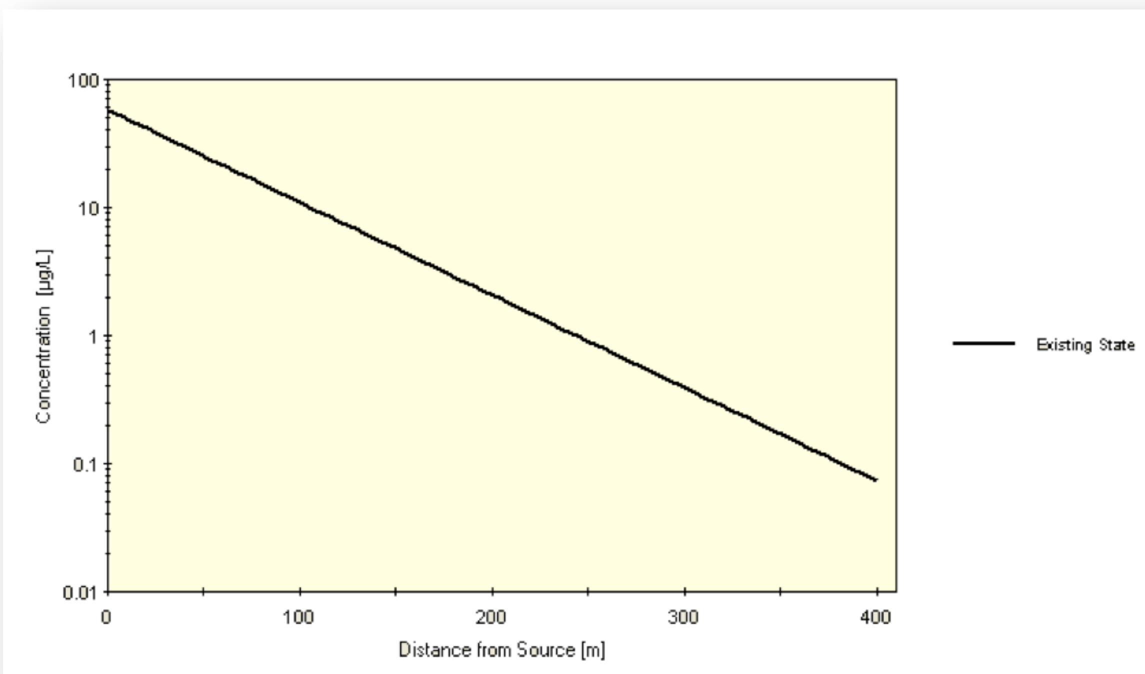


Figure 20 – Simulated Degradation Rates for EDB Along Flow Direction B

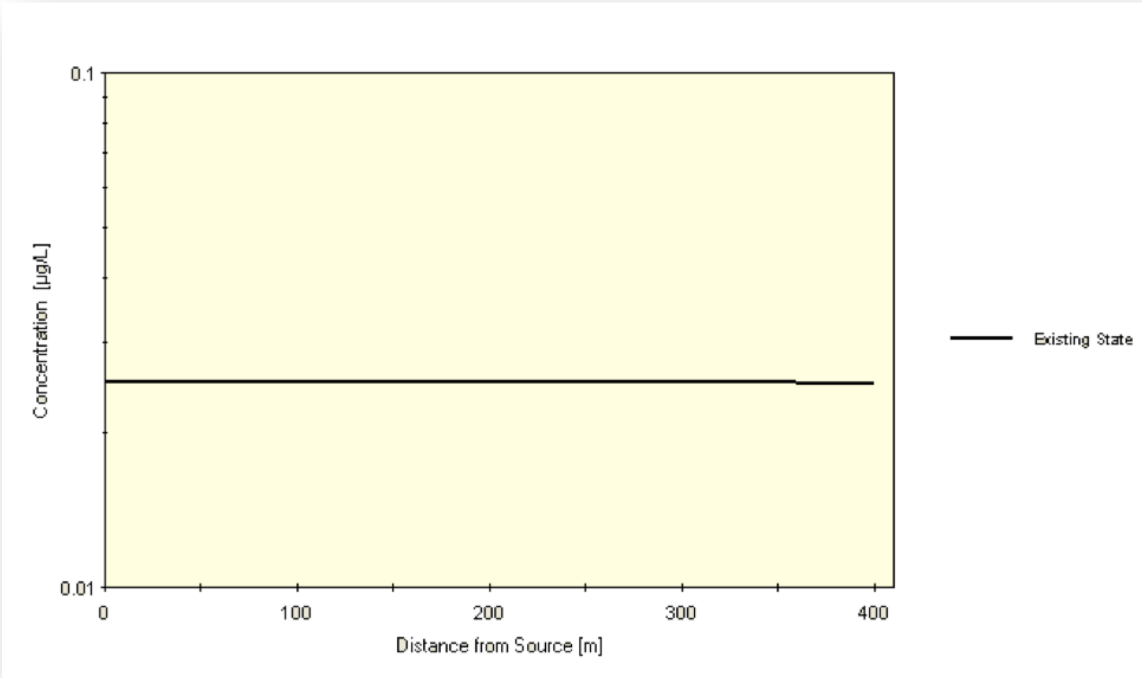


Figure 21 – Simulated Degradation Rates for Dinoseb Along Flow Direction B

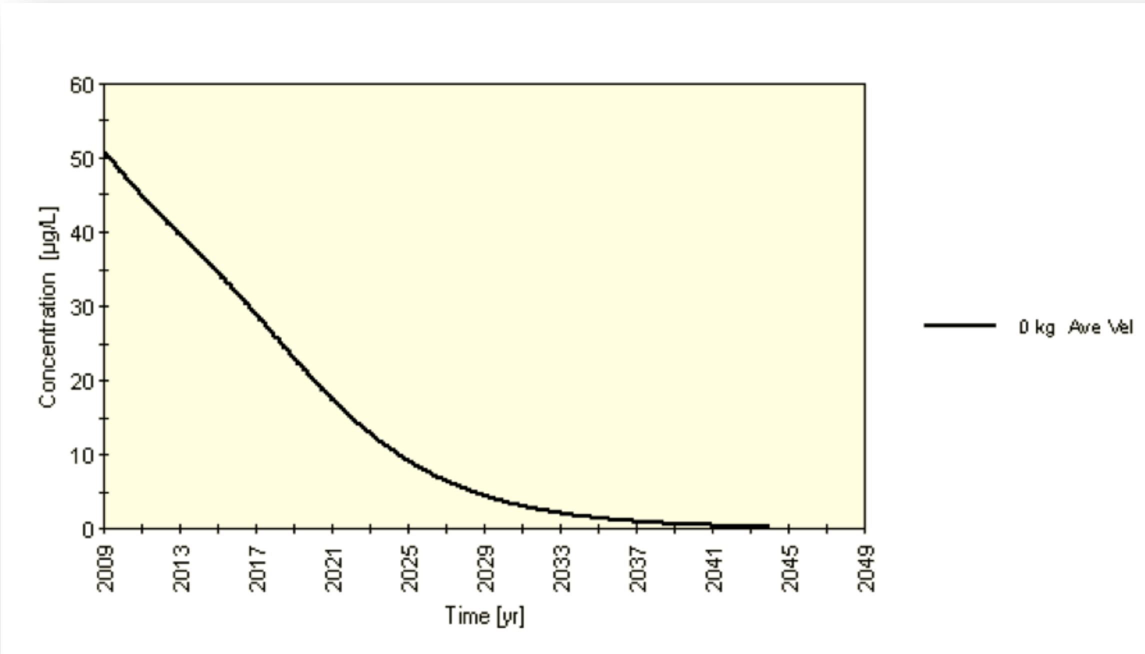


Figure 22 – Simulated Degradation Rates for 1,2,3 - TCP Along Flow Direction B

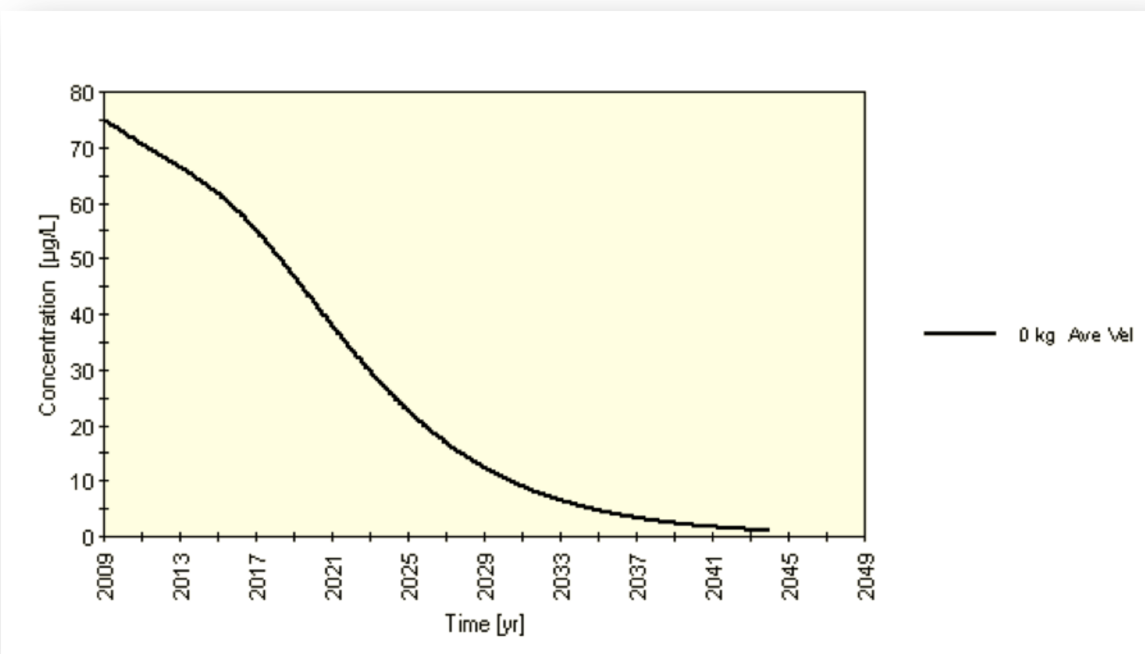


Figure 23 – Simulated Degradation Rates for Dinoseb Along Flow Direction B

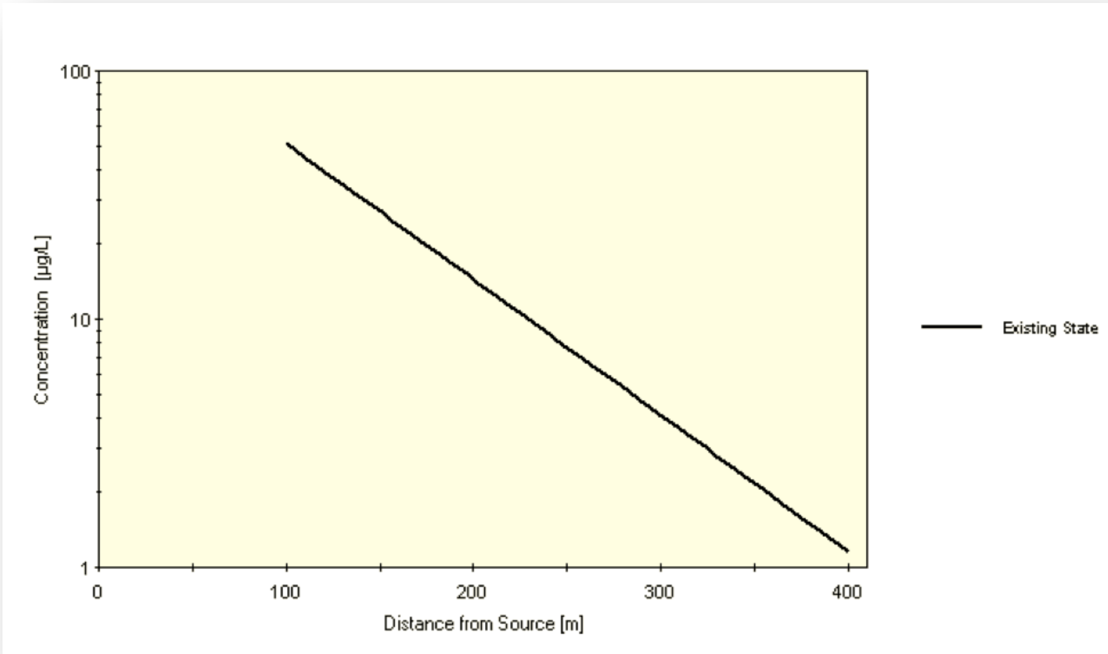
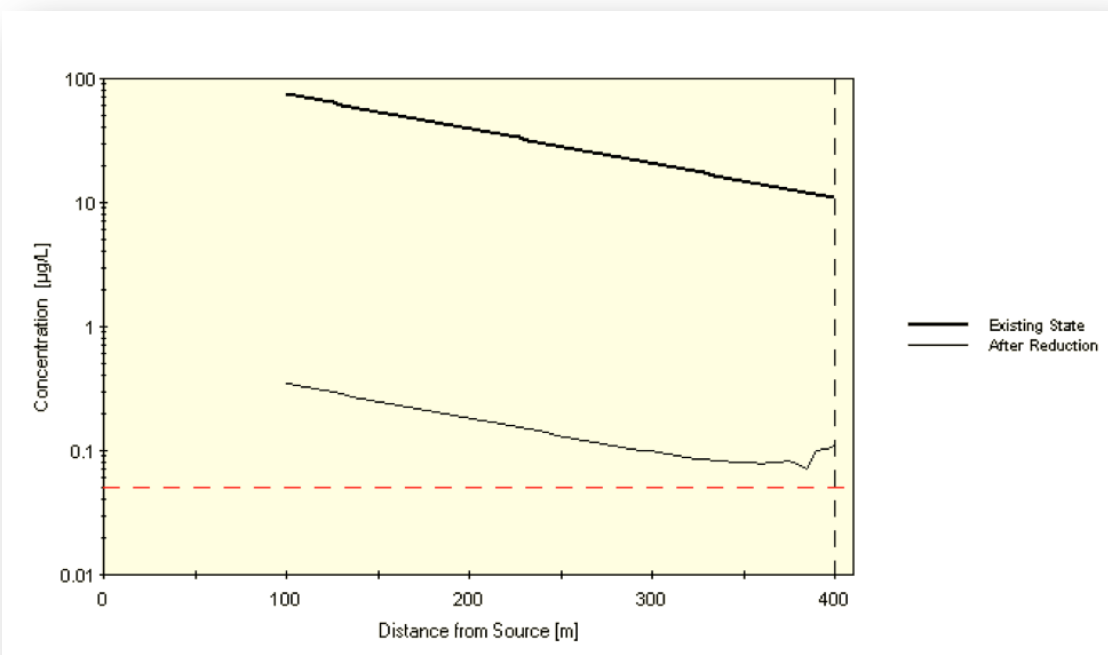


Figure 24 – Simulated Degradation Rates for 1,2,3 - TCP Along Flow Direction B



APPENDIX A

BACKGROUND RESULTS FOR B-ZONE

TABLE A-1: Background Results for B-Zone Groundwater

Brown Bryant Superfund Site, Arvin, CA

Well No.	Chemical	DATE SAMPLED AND CONCENTRATION (µg/L)																																			B-zone Cleanup Level (µg/L)	Cleanup Standard Used
		Sep 87	Oct 87	Feb 88	Mar 88	Jan 91	Apr 91	Jul 91	Dec 91	Apr 92	Jul 92	Aug 94	Mar 95	Nov 95	Nov 96	May 97	Jan 98	Jul 98	Jul 00	Nov 00	Mar 01	Jul 01	Oct 01	Feb 02	May 02	Jul 02	Oct 02	Feb 03	May 03	Aug 03	Jan 04	Aug 07	Apr 08	Apr 09	Apr 11	Oct 11		
AR-1	1,2-DCP			18.0	16.0	12.0	10.00	8.00	6.00	5.00	4.00		3.00	62.0	3.00	3.00	2.00	5.10	<0.2	<0.2	<0.2	<0.2	2.50	1.50	1.30	1.00	1.00	1.30	1.30	0.93	1.10	<0.2	0.47	<0.2	<0.2	<0.2	5	FNPDWS
	1,3-DCP			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	0.20	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP			<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025		<0.0025	7.00	<0.0025	0.30	<0.0025	1.20	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.56	0.44	<0.0025	0.34	0.54	0.49	0.37	0.70	<0.0025	0.41	0.18	0.11	0.13	0.005	NL-OEHHA
	Chloroform			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	0.30	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.13	0.089	0.46	0.14	0.35	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	12.0	0.010	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.0059	<0.02	<0.02	<0.02	<0.02	0.021	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.20			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	0.010	<0.2	<0.2	<0.2	<0.2	7	FNPDWS
	EDB			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		0.20	0.31	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
AMW-3R	1,2-DCP	5.00	3.00			0.70	0.60	0.90	2.00	1.00	0.70	4.00	2.00	8.00	3.00	1.00	1.00	<0.2	13.0	<0.2	<0.2	<0.2	<0.2	1.60	1.90	2.60	2.00	1.30	1.70	2.10	1.20	1.30	0.41	<0.2	0.31	0.22	5	FNPDWS
	1,3-DCP	<0.2	3.00																<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP	<0.0025	8.00			<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.40	<0.0025	1.00	0.90	<0.0025		<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.36	0.38	0.31	0.36	0.34	0.43	0.60	0.39	<0.0025	0.35	0.23	0.21	0.20	0.005	NL-OEHHA
	Chloroform	<0.2	<0.2																<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.088	0.18	0.22	0.17	0.25	0.35	0.47	0.18	0.21	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP	<0.02	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	1.90	0.020	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.014	0.029	0.042	<0.02	<0.02	0.2	FNPDWS
	Dinoseb	<0.2	<0.2				0.40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.010	<0.2	<0.2	7	FNPDWS
	EDB	<0.02	0.020			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	2.00	<0.02	0.030	<0.02	<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
AMW-4R	1,2-DCP	6.00	4.00			1.00	2.00	3.00	4.00	2.70	6.00	2.00	330	39.0	0.40	340	210	6.60	<0.2	11.0	34.0	47.0	45.0	36.0	2.00	3.20	2.50	4.50	3.50	<0.2	1.70	<0.2	7.20	2.50	0.68	65.0	5	FNPDWS
	1,3-DCP	<0.2	<0.2																<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP	<0.0025	<0.0025			<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.20	0.40	3.00	<0.0025	<0.0025	<0.0025	4.60	<0.0025	<0.0025	<0.0025	<0.0025	1.30	1.20	0.27	0.30	0.38	<0.0025	<0.0025	<0.0025	0.67	<0.0025	0.80	0.41	0.34	0.36	0.005	NL-OEHHA
	Chloroform	<0.2	1.00			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	4.00	0.20	<0.2	3.00	5.00	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.47	0.17	0.32	0.18	0.22	0.17	<0.2	0.43	0.19	0.30	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP	<0.02	<0.02			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.030	0.050	7.00	0.020	<0.02			<0.02	<0.02	0.030	<0.02	<0.02	0.075	0.017	0.017	0.021	0.013	<0.02	<0.02	<0.02	0.014	<0.02	0.035	<0.02	<0.02	0.2	FNPDWS
	Dinoseb	<0.2	<0.2			<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	<0.2		4.76	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	0.030	<0.2	0.13	<0.2	<0.2	7	FNPDWS
	EDB	<0.02	0.030			<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.80	<0.02	<0.02		<0.02	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.011	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
WB2-1	1,2-DCP									1,700	890	5.00	3.00	4.00	5.00	8.00	18.0	93.0	34.0	44.0	47.0	62.0	72.0	86.0	87.0	110	120	88.0	64.0	53.0	38.0	22.0	1.50	1.90	1.00	0.67	5	FNPDWS
	1,3-DCP							60.0		1.00	1.00		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP									72.0	60.5	1.00	0.70	0.90	0.80	1.00	8.00	52.0	110	143	153	311	283	330	320	330	480	280	240	250	140	110	23.0	4.30	1.70	1.50	0.005	NL-OEHHA
	Chloroform									<0.2	<0.2	<0.2	<0.2	0.40	0.28	0.20	1.00	3.90	<0.2	<0.2	<0.2	<0.2	1.50	2.00	1.90	2.00	2.00	1.40	1.80	3.40	2.70	0.90	<0.2	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP									30.0	27.0	0.10	<0.02	0.40	0.28	0.30	2.50		<0.02	<0.02	0.24	<0.02	<0.02	0.34	0.077	0.093	0.079	<0.02	0.045	2.10	0.035	0.011	0.053	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb									4.00	3.50	<0.2	0.20	<0.2	<0.2	<0.2	7.90		18.2	20.0	22.1	20.8	22.7	32.0	45.0	69.0		78.0	39.0	58.0	28.0	39.0	5.40	0.62	0.28	<0.2	7	FNPDWS
	EDB									<0.02	0.60	1.00	<0.02	<0.02	<0.02	<0.02	0.60		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
WB2-2	1,2-DCP									47.0	40.0	17.0	11.0	8.00	60.0	4.00	5.00	23.0	<0.2	<0.2	<0.2	<0.2	3.40	2.80	0.83	1.20	5.20	7.00	19.0	18.0	17.0	20.0	20.0	11.0	10.00	1.30	5	FNPDWS
	1,3-DCP																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP									19.0	19.0	21.0	20.0	17.0	<0.0025	2.00	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	3.40	0.75	0.17	0.58	8.50	21.0	44.0	42.0	40.0	58.0	48.0	40.0	35.0	12.0	0.005	NL-OEHHA
	Chloroform									<0.2	<0.2	<0.2	<0.2	0.80	<0.2	<0.2	0.10	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.15	0.18	0.60	0.46	0.70	0.65	0.64	0.50	0.53	<0.2	80	FNPDWS
	DBCP									7.00	7.00	5.00	4.50	5.60	0.75	0.30	<0.02		<0.02	<0.02	0.12	<0.02	<0.02	0.040	<0.02	0.10	1.20	3.00	6.70	4.90	4.70	4.80	5.00	3.10	1.50	0.56	0.2	FNPDWS
	Dinoseb									2.00	8.00	<0.2	0.50	<0.2	<0.2	<0.2	<0.2		<0.2	0.15	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		2.90	6.50	5.80	4.60	10.00	6.50	12.0	4.30	1.70	7	FNPDWS
	EDB									<0.02	<0.02	<0.02	<0.02	<0.02	0.070	0.10	<0.02		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
WB2-3	1,2-DCP									0.80	0.80	9.00	13.0	6.00	12.0	15.0	14.0	<0.2	<0.2	<0.2	<0.2	<0.2	4.10	3.50	3.90	4.20	4.00	4.30	2.20	<0.2	2.10	0.52	2.00	0.85	4.80	3.60	5	FNPDWS
	1,3-DCP																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	0.23	0.5	CSDRA
	1,2,3-TCP									<0.0025	<0.0025	<0.0025	0.50	<0.0025	<0.0025	0.70	<0.0025	2.60	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.29	0.22	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.035	0.075	0.72	1.10	0.005	NL-OEHHA
	Chloroform									<0.2	<0.2	7.00	6.00	9.00	<0.2	6.00	7.00	7.00	<0.2	9.00	9.20	9.90	10.00	11.0	9.40	9.90	6.50	5.10	2.10	1.70	1.20	<0.2	<0.2	<0.2	0.22	0.52	80	FNPDWS
	DBCP									<0.02	<0.02				4.00	0.040	<0.02		<0.02	<0.02	0.030	<0.02	<0.02	0.016	0.0097	0.0066	0.0054	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.32		<0.2	0.57	<0.2	<0.2	0.030	<0.2	0.080	<0.2	<0.2	7	FNPDWS
	EDB									<0.02	<0.02	0.20	0.20	0.11	0.10	0.10	<0.02		<0.02	<0.02	0.030	<0.02	<0.02	0.029	0.023	0.019	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
WB2-4	1,2-DCP										0.30	0.60	<0.2	0.20	<0.2	<0.2	0.40	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.22	<0.2	0.34	0.31	1.10	1.20	1.80	1.70	1.40	5	FNPDWS
	1,3-DCP																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																1.00	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.20	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.042	0.067	0.079	0.076	0.005	NL-OEHHA
	Chloroform																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.16	<0.2	0.24	0.42	80	FNPDWS
	DBCP																		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.055	<0.02	<0.02	0.097	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																26.0		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.020	<0.2	<0.2	7	FNPDWS
	EDB																		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-1	1,2-DCP																							1.10	1.10	1.10	2.20	1.10	0.77	1.00	0.62	<0.2	0.79	<0.2	0.37	0.27	5	FNPDWS
	1,3-DCP																							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																							0.33	0.40	1.30	1.30	0.48	0.35	0.31	<0.0025	<0.0025	0.37	0.28	0.17	0.13	0.005	NL-OEHHA
	Chloroform																							0.72	<0.2	<0.2	<0.2	<0.2	<0.2	0.17	0.25	<0.2	<0.2	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP																							<0.02	0.0080	0.22	0.19	0.017	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																							<0.2	<0.2	0.63		<0.2	<0.2	<0.2	<0.2	0.060	0.010	<0.2	<0.2	<0.2	7	FNPDWS
	EDB																							<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-2	1,2-DCP																							2.20	2.90	4.10	1.30	6.80	8.10	11.0	16.0	21.0	26.0	18.0	21.0	19.0	5	FNPDWS
	1,3-DCP																							<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	2.00	<0.2	0.5	CSDRA
	1,2,3-TCP																							<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	0.48	0.20	0.22	0.25	2.10	0.005	NL-OEHHA
	Chloroform																							4.10	4.70	7.20	1.70	6.80	6.70	7.60	9.80	9.20	9.50	5.70	5.00	5.00	80	FNPDWS
	Dinoseb																							<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	0.010	<0.2	<0.2	<0.2	0.61	7	FNPDWS
	DBCP																							<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.2	FNPDWS
	EDB																							<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS

TABLE A-1: Background Results for B-Zone Groundwater

Brown Bryant Superfund Site, Arvin, CA

Well No.	Chemical	DATE SAMPLED AND CONCENTRATION (µg/L)																																	B-zone Cleanup Level (µg/L)	Cleanup Standard Used
		Sep 87	Oct 87	Feb 88	Mar 88	Jan 91	Apr 91	Jul 91	Dec 91	Apr 92	Jul 92	Aug 94	Mar 95	Nov 95	Nov 96	May 97	Jan 98	Jul 98	Jul 00	Nov 00	Mar 01	Jul 01	Oct 01	Feb 02	May 02	Jul 02	Oct 02	Feb 03	May 03	Aug 03	Jan 04	Aug 07	Apr 08	Apr 09	Apr 11	Oct 11		
PWB-3	1,2-DCP																					2.50	3.00	3.40	3.10	0.69	0.54	<0.2	0.44	0.68	<0.2	0.43	0.34	0.27	5	FNPDWS
	1,3-DCP																					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																					**1.40**	**6.10**	**7.20**	**6.20**	**0.64**	**1.00**	<0.0025	**0.53**	**0.46**	**0.32**	**0.27**	**0.25**	**0.24**	0.005	NL-OEHHA
	Chloroform																					<0.2	0.11	0.15	0.083	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP																					0.13	**1.20**	**1.20**	**1.30**	0.090	0.040	0.060	<0.02	0.034	0.036	0.013	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																					<0.2	0.87	0.80		<0.2	<0.2	<0.2	<0.2	0.070	0.020	0.018	<0.2	<0.2	7	FNPDWS
	EDB																					**0.10**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-4	1,2-DCP																					**50.0**	**37.0**	**74.0**	**80.0**	**64.0**	**72.0**	**110**	**80.0**	**47.0**	**31.0**	**16.0**	4.20	3.40	5	FNPDWS
	1,3-DCP																					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																					**160**	**130**	**200**	**210**	**200**	**220**	**350**	**290**	**340**	**140**	**70.0**	**19.0**	**12.0**	0.005	NL-OEHHA
	Chloroform																					1.50	1.50	1.60	2.00	1.50	1.60	2.10	5.10	4.10	2.10	1.20	0.35	0.31	80	FNPDWS
	DBCP																					**31.0**	**32.0**	**29.0**	**44.0**	**40.0**	**36.0**	**41.0**	**16.0**	**2.60**	**3.10**	**4.10**	**0.37**	**0.25**	0.2	FNPDWS
	Dinoseb																					**15.0**	**19.0**	**21.0**		**39.0**	**33.0**	**61.0**	**36.0**	**50.0**	**30.0**	**9.00**	2.00	1.10	7	FNPDWS
	EDB																					<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**4.90**	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-5	1,2-DCP																					2.50	2.10	0.79	2.30	1.90	2.90	2.70	2.70	4.70	3.70	4.00		3.50	5	FNPDWS
	1,3-DCP																					<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2		<0.2	0.5	CSDRA
	1,2,3-TCP																					**0.19**	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	**1.20**	**2.50**		**20.0**	0.005	NL-OEHHA
	Chloroform																					0.19	0.20	<0.2	0.25	0.27	0.64	0.41	0.84	1.30	0.94	1.30		0.48	80	FNPDWS
	DBCP																					<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.013	0.059	0.024	**0.40**		**0.68**	0.2	FNPDWS
	Dinoseb																					<0.2	<0.2	<0.2		<0.2	<0.2	<0.2	<0.2	0.080	0.030	0.43		7.00	7	FNPDWS
	EDB																					<0.02	<0.02	0.013	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02		<0.02	0.05	FNPDWS
PWB-6	1,2-DCP																									<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	5	FNPDWS
	1,3-DCP																									<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																									<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	**0.089**	**0.58**	<0.0025	0.0047	0.005	NL-OEHHA
	Chloroform																									<0.2	<0.2	<0.2	0.29	<0.2	<0.2	<0.2	<0.2	0.24	80	FNPDWS
	DBCP																									<0.02	<0.02	<0.02	<0.02	<0.02	**0.67**	0.096	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																									<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	7	FNPDWS
	EDB																									<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-7	1,2-DCP																									**930**									5	FNPDWS
	1,3-DCP																									<0.2									0.5	CSDRA
	1,2,3-TCP																									**110**									0.005	NL-OEHHA
	Chloroform																									8.10									80	FNPDWS
	DBCP																									**130**									0.2	FNPDWS
	Dinoseb																									<0.2									7	FNPDWS
	EDB																									<0.02									0.05	FNPDWS
PWB-7A	1,2-DCP																													**12.0**	**50.0**	<0.2	**7.80**	**12.0**	5	FNPDWS
	1,3-DCP																													<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																													**37.0**	**44.0**	**75.0**	**26.0**	**32.0**	0.005	NL-OEHHA
	Chloroform																													0.44	0.73	<0.2	<0.2	0.36	80	FNPDWS
	DBCP																													**24.0**	**16.0**	**31.0**	**1.30**	**0.89**	0.2	FNPDWS
	Dinoseb																													**31.0**	**37.0**	**51.0**	<0.2	**11.0**	7	FNPDWS
	EDB																													<0.02	0.017	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-8	1,2-DCP																									4.00	2.90	3.60	2.30	0.95	0.87	1.60	2.20	1.70	5	FNPDWS
	1,3-DCP																									<0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																									**0.73**	**0.76**	**0.67**	**0.26**	<0.0025	**0.060**	<0.0025	**6.50**	**7.70**	0.005	NL-OEHHA
	Chloroform																									0.091	0.091	0.091	0.29	<0.2	0.19	0.61	0.48	0.46	80	FNPDWS
	DBCP																									<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	**0.72**	**0.41**	0.2	FNPDWS
	Dinoseb																									<0.2	<0.2	<0.2	<0.2	0.10	0.010	0.041	1.00	1.20	7	FNPDWS
	EDB																									**0.070**	<0.02	0.025	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-9	1,2-DCP																									<0.2	<0.2	<0.2	<0.2	<0.2	0.48	<0.2	1.10	1.80	5	FNPDWS
	1,3-DCP																									<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																									<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	**0.091**	<0.0025	**3.00**	**4.70**	0.005	NL-OEHHA
	Chloroform																									2.30	2.90	2.90	2.50	2.20	3.10	<0.2	<0.2	0.22	80	FNPDWS
	DBCP																									<0.02	<0.02	0.031	<0.02	<0.02	0.011	<0.02	0.030	0.046	0.2	FNPDWS
	Dinoseb																									<0.2	<0.2	<0.2	<0.2	0.060	0.020	<0.2	1.20	1.40	7	FNPDWS
	EDB																									<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-10	1,2-DCP																									0.20	<0.2	0.31	0.30	1.00	**5.70**	1.70	0.36	0.37	5	FNPDWS
	1,3-DCP																									<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																									<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	**13.0**	**1.60**	**0.33**	**0.23**	0.005	NL-OEHHA
	Chloroform																									4.30	4.90	4.60	5.30	7.20	7.70	<0.2	<0.2	0.22	80	FNPDWS
	DBCP																									<0.02	<0.02	<0.02	<0.02	0.0070	**5.10**	0.18	0.037	0.021	0.2	FNPDWS
	Dinoseb																									<0.2	<0.2	<0.2	<0.2	0.020	1.90	0.36	<0.2	<0.2	7	FNPDWS
	EDB																									<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS

TABLE A-1: Background Results for B-Zone Groundwater

Brown Bryant Superfund Site, Arvin, CA

Well No.	Chemical	DATE SAMPLED AND CONCENTRATION (µg/L)																																			B-zone Cleanup Level (µg/L)	Cleanup Standard Used
		Sep 87	Oct 87	Feb 88	Mar 88	Jan 91	Apr 91	Jul 91	Dec 91	Apr 92	Jul 92	Aug 94	Mar 95	Nov 95	Nov 96	May 97	Jan 98	Jul 98	Jul 00	Nov 00	Mar 01	Jul 01	Oct 01	Feb 02	May 02	Jul 02	Oct 02	Feb 03	May 03	Aug 03	Jan 04	Aug 07	Apr 08	Apr 09	Apr 11	Oct 11		
PWB-11	1,2-DCP																												0.27	0.39	<0.2	0.19	0.53	1.10	0.73	0.74	5	FNPDWS
	1,3-DCP																												<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																												**0.18**	**0.16**	<0.0025	<0.0025	**1.20**	**4.00**	**3.30**	**3.30**	0.005	NL-OEHHA
	Chloroform																												0.12	<0.2	0.28	<0.2	<0.2	<0.2	<0.2	<0.2	80	FNPDWS
	DBCP																												<0.02	<0.02	<0.02	<0.02	0.067	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																												<0.2	<0.2	<0.2	0.020	0.12	0.97	0.45	0.47	7	FNPDWS
	EDB																												<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-12	1,2-DCP																															**6.00**	4.80	**5.20**	4.70	**5.40**	5	FNPDWS
	1,3-DCP																															<0.2	<0.2	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																															**17.0**	**17.0**	**17.0**	**17.0**	**18.0**	0.005	NL-OEHHA
	Chloroform																															0.38	0.54	0.38	0.64	1.00	80	FNPDWS
	DBCP																															**3.30**	**4.00**	**2.10**	**2.90**	**3.10**	0.2	FNPDWS
	Dinoseb																															**9.20**	**9.40**	**16.0**	**25.0**	**24.0**	7	FNPDWS
	EDB																															0.017	<0.02	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-13A	1,2-DCP																																	**23.0**	**19.0**	**17.0**	5	FNPDWS
	1,3-DCP																																	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																																	**7.90**	**8.20**	**8.00**	0.005	NL-OEHHA
	Chloroform																																	21.0	20.0	20.0	80	FNPDWS
	DBCP																																	0.13	<0.02	**0.45**	0.2	FNPDWS
	Dinoseb																																	0.49	1.10	1.20	7	FNPDWS
	EDB																																	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-14	1,2-DCP																																	**29.0**	**21.0**	**20.0**	5	FNPDWS
	1,3-DCP																																	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																																	**5.90**	**3.30**	**3.00**	0.005	NL-OEHHA
	Chloroform																																	8.70	9.20	10.00	80	FNPDWS
	DBCP																																	**1.10**	**0.35**	**0.33**	0.2	FNPDWS
	Dinoseb																																	0.75	0.52	0.79	7	FNPDWS
	EDB																																	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-15	1,2-DCP																																	5.00	**5.30**	**6.20**	5	FNPDWS
	1,3-DCP																																	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																																	**0.45**	**0.30**	**0.27**	0.005	NL-OEHHA
	Chloroform																																	19.0	13.0	12.0	80	FNPDWS
	DBCP																																	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																																	<0.2	<0.2	<0.2	7	FNPDWS
	EDB																																	<0.02	<0.02	<0.02	0.05	FNPDWS
PWB-16	1,2-DCP																																	**8.10**	**10.00**	**9.70**	5	FNPDWS
	1,3-DCP																																	<0.2	<0.2	<0.2	0.5	CSDRA
	1,2,3-TCP																																	**3.00**	**2.50**	**2.60**	0.005	NL-OEHHA
	Chloroform																																	1.00	1.10	1.50	80	FNPDWS
	DBCP																																	<0.02	<0.02	<0.02	0.2	FNPDWS
	Dinoseb																																	<0.2	0.72	0.85	7	FNPDWS
	EDB																																	<0.02	<0.02	<0.02	0.05	FNPDWS
CW-1	1,2-DCP																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					5	FNPDWS
	1,3-DCP																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2					0.5	CSDRA
	1,2,3-TCP												<0.0025	<0.0025	<0.0025	<0.0025	**1.00**		<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	**0.18**	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025	<0.0025					0.005	NL-OEHHA
	Chloroform																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.27	<0.2	<0.2	<0.2					80	FNPDWS
	DBCP																		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					0.2	FNPDWS
	Dinoseb																		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.29		<0.2	<0.2	<0.2	<0.2	0.020					7	FNPDWS
	EDB																		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02					0.05	FNPDWS

Notes:

Contaminants of Concern & Basis for Clean-up Levels:
1,2-DCP = 1,2-Dichloropropane
1,3-DCP = 1,3-Dichloropropane
1,2,3-TCP = 1,2,3-Trichloropropane
Chloroform = *total trihalomethanes (sum of bromodichloromethane, dibromochloromethane, bromoform, and chloroform)*
DBCP = 1,2-Dibromo-3-chloropropane

FNPDWS = *Clean-up level based on Federal National Primary Drinking Water Standards - 40 Code of Federal Regulations, Part 141 or 40CFR141.*
CSDRA = *Clean-up level based on California Safe Drinking Water Act (CCR, Title 22, Sec 64444).*
NL-OEHHA = *Notification Level set by California Office of Environmental Health Hazard Assessment, August 2009.*

Analytical Methods:
1,2-DCP, 1,3-DCP, & Chloroform = Method 8260B
1,2,3-TCP; DBCP; & EDB = Method 8260SIM
Dinoseb = Method 8151A

Analyses performed by EMAX Laboratories, Inc.

Results:
µg/L = micrograms per liter
" <" = non-detect analytes reported as less than the method detection limit (MDL).

Blank cell means the sample was not collected because the well was not installed, it was dry, or well no longer present.
Reported results in bold font are in excess of compound Clean-up Level.
Reported results highlighted grey are results reported as qualified by the laboratory – see laboratory results for qualifiers.

All results prior to 2010 are assumed analyzed at the same detection limit as current analyses.
Some results prior to 2011 are reported below current method detection limits because they were performed by a different laboratory or were performed on diluted samples.

References:
Data source: Hargis+Associates, Inc. (data collected between 9/87 and 3/88), USEPA (data collected between 4&5/90 and 12/92), Ecology and Environment, Inc. (between 8/94 and 7/98), Panacea, Inc. (between 7/00 and 8/07), Eco & Associates, Inc. (from 4/08 to present).
Electronic file obtained from Ralph Lambert of Ecology and Environment, Inc., file name ALLCHEM.XLS.

APPENDIX B

PARAMETERS FOR MNA MODEL

APPENDIX B

Appendix B contains selected pages and tables from the RI/FS document (Panacea 2005) and the Fate and Transport Study that was part of the RI. Table 4 from the Fall 2011 Groundwater Monitoring Report is included for total organic carbon and other site-specific measurements.

This data serves as backup to the parameters that have been identified in Tables 2 and 3 of the current report.

TABLE 2

HYDRAULIC CONDUCTIVITY OF SILT AND CLAY MATERIAL MEASURED IN SAMPLES OBTAINED FROM RECENTLY DRILLED BOREHOLES AT THE SITE

Well	Depth	Hydraulic Conductivity
	ft	cm/sec
PWA-2	45	2.39E-08
PWA-2	65	5.47E-06
PWA-4	65	1.68E-05
PWA-4	80	5.05E-07
PWB-1	70	3.53E-05
PWB-3	70	1.03E-06
PWB-3	85	1.05E-06
PWB-3	150	6.15E-07
PWB-4	45	7.86E-06
PWB-4	65	1.67E-06
PWB-4	150	6.76E-06
PWB-5	40	8.19E-09
PWB-5	95	6.93E-06
PWB-5	135	2.76E-07

Harmonic Mean	Arithmatic Mean	Geometric Mean
Vertical	Vertical	Vertical
8.03E-08	6.02E-06	1.29E-06

TABLE 3

RESULTS OF SOIL PROPERTIES TEST FROM PREVIOUS STUDIES (MK, 1999a)

SAMPLE NO.	DEPTH (ft)	MOISTURE CONTENT (%) ASTM D2218	DRY DENSITY (pcf) ASTM D2937	SPECIFIC GRAVITY ASTM D854	EFFECTIVE POROSITY SWRCB	PERMEABILITY (cm/sec) USEPA 9100	REMARKS
Q72/AP-6	72.0	17.7	101.8	-	-	8.50E-05	Ver.Perm
Q82/AP-6	82.0	23.73	101.6	2.74	-	1.70E-08	Ver.Perm
R82/AP-15	82.0	14.51	110.7	2.73	-	5.50E-07	Ver.Perm
S82/AP-7	82.0	23.08	106.4	-	-	4.50E-08	Ver.Perm
T85/AR-2	85.0	14.78	114.7	2.77	N/A	7.30E-08	Ver.Perm
T85/AR-2	85.0	-	-	-	-	1.00E-08	Hor.Perm
T88/AR-2	88.0	15.95	110.2	-	-	1.50E-06	Ver.Perm
U84/AP-17	84.0	16.49	127	-	-	2.20E-07	Ver.Perm
U87/AP-17	87.0	11.18	113	2.71	-	7.50E-05	Ver.Perm
SB26/NN084	84.0	15.09	115.3	-	-	3.90E-08	Ver.Perm
SB26/NN084	84.0	-	-	-	-	1.00E-08	Hor.Perm
SB26/NN087	87.0	13.98	106.6	2.83	0.087	4.70E-05	Ver.Perm
SB26/NN0125	125.0	22.53	101.7	-	-	4.00E-08	Ver.Perm
SB27/MM084	84.0	16.43	110.7	-	-	1.90E-07	Ver.Perm
SB27/MM084	84.0	-	-	-	-	N/A	Hor.Perm
SB27/MM087	87.0	14.07	110.9	2.77	0.072	1.30E-07	Ver.Perm
SB27/MM087	87.0	-	-	-	-	2.20E-07	Hor.Perm
SB27/MM125	125.0	16.2	111.2	-	-	2.20E-06	Ver.Perm
AP-12-A	75.0	22.2	99.9	-	-	1.00E-05	Hor.Perm
AP-12-B	80.0	14.07	108.7	2.65	0.11	5.50E-07	Ver.Perm
AP-14-B	80.0	21.78	104.3	-	-	6.00E-07	Ver.Perm
AP-16-B	80.0	15.11	102.5	2.71	-	5.00E-07	Hor.Perm
AP-16-C	85.0	16.28	113.6	2.71	0.059	3.00E-07	Ver.Perm
N-55-B	N/A	5.15	116	2.69	-	-	
P-55-B	N/A	14		-	-	-	
N-40-D	N/A	16	95.4	-	-	-	
O-55-D	N/A	21.81	105	2.78	-	-	
O-40-D	N/A	16.88	92.1	-	-	-	
P-40-A	N/A	25.06	90.7	-	-	-	

Harmonic Mean		Arithmatic Mean		Geometric Mean	
Vertical	Horizontal	Vertical	Horizontal	Vertical	Horizontal
9.84E-08	2.42E-08	1.26E-05	2.15E-06	5.37E-07	1.62E-07

TABLE 4

TOTAL AND EFFECTIVE POROSITY FROM PREVIOUS STUDIES AT THE SITE (MK, 1999a)

Well	Depth	Total Porosity	Effective Porosity
	ft	%	%
IW-1	70.0-72.0	0.446	0.395
IW-2	65.0-67.0	0.396	0.396
MW-1	65.0-67.0	0.478	0.411
MW-2	70.0-72.0	0.449	0.411
MW-3	60.0-62.0	0.441	0.349
MW-4	75.0-77.0	0.482	0.429

TABLE 5

MOISTURE CONTENT AND CORRESPONDING SATURATION VALUES FOR VARIOUS SAMPLES AT THE SITE

Well	Depth	Moisture Content	Dry Density	Grain Density (pcf)	Porosity	Saturation Water Content	Satration (fraction)
	ft	%	pcf	Assumed			
PWB-1	70	16.84	97.95	165.36	0.41	0.41	0.41
PWA-2	45	17.27	112.33	165.36	0.32	0.32	0.54
PWA-2	65	21.90	101.87	165.36	0.38	0.38	0.57
PWA-4	65	10.21	109.34	165.36	0.34	0.34	0.30
PWA-4	80	17.08	113.47	165.36	0.31	0.31	0.54
PWB-1	70	16.84	97.95	165.36	0.41	0.41	0.41
PWB-3	70	28.32	97.32	165.36	0.41	0.41	0.69
PWB-3	85	14.12	119.02	165.36	0.28	0.28	0.50
PWB-3	150	22.55	103.94	165.36	0.37	0.37	0.61
PWB-4	45	18.28	97.75	165.36	0.41	0.41	0.45
PWB-4	65	32.64	90.32	165.36	0.45	0.45	0.72
PWB-4	150	15.22	113.04	165.36	0.32	0.32	0.48
PWB-5	40	21.47	106.80	165.36	0.35	0.35	0.61
PWB-5	95	16.22	95.69	165.36	0.42	0.42	0.38
PWB-5	135	21.57	108.20	165.36	0.35	0.35	0.62
IW-1	55.0-56.5	7.30	ND				
IW-1	60.0-61.5	6.70	ND				
IW-1	65.0-66.5	26.20	ND				
IW-1	70.0-72.0	27.80	ND				
IW-1	73.5-74.0	26.60	ND				
IW-1	75.0-77.0	32.40	ND				
IW-1	77.0-78.5	31.40	ND				
IW-2	55.0-56.5	14.10	ND				
IW-2	60.0-61.5	18.10	ND				
IW-2	65.0-67.0	17.20	ND				
IW-2	70.0-72.0	28.60	ND				
IW-2	72.0-72.5	30.20	ND				
IW-2	76.0-76.5	33.20	ND				
IW-2	77.0-77.3	32.70	ND				
IW-2	77.3-78.3	21.20	ND				
IW-2	79.5-80.0	13.20	ND				
MW-1	53.0-55.0	21.10	ND				
MW-1	62.0-63.5	25.20	ND				
MW-1	65.0-67.0	28.20	ND				
MW-1	70.0-72.0	30.20	ND				
MW-1	72.0-73.5	29.50	ND				
MW-1	73.5-75.0	24.30	ND				
MW-1	78.0-80.0	29.70	ND				
MW-2	53.0-55.0	12.30	ND				
MW-2	62.0-63.5	18.90	ND				
MW-2	65.0-67.0	27.60	ND				
MW-2	70.0-72.0	29.70	ND				
MW-2	72.0-73.5	29.60	ND				
MW-2	78.0-80.0	29.90	ND				

TABLE 6

MOISTURE CONTENT VALUES FOR VARIOUS SAMPLES AT THE SITE FROM PREVIOUS STUDIES

Well	Depth	Moisture Content
	ft	%
MW-3	55.0-56.0	14.30
MW-3	60.0-62.0	20.90
MW-3	65.0-67.0	27.50
MW-3	70.0-72.0	28.90
MW-3	73.5-75.0	26.40
MW-3	75.0-76.5	25.60
MW-3	76.5-78.0	25.80
MW-3	78.0-80.0	26.40
MW-4	55.0-56.5	8.40
MW-4	60.0-61.5	2.70
MW-4	65.0-66.5	16.60
MW-4	72.0-73.5	25.00
MW-4	75.0-77.0	28.00
MW-4	78.5-80.0	24.90

TABLE 4: RESULTS OF WET CHEMISTRY ANALYSES
600 South Derby Street, Arvin, California

Well No.	Analyte	DATE SAMPLED AND CONCENTRATION (mg/L)		MCL (mg/L)
		Apr-11	Oct-11	
AR-1	Nitrate-N		23.9	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		155.0	**250**
	Sulfide		ND<0.1	-
	TOC		0.959J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
AMW-3R	Nitrate-N		26.7	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		141.0	**250**
	Sulfide		ND<0.1	-
	TOC		0.982J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
AMW-4R	Nitrate-N	28.6	27.5	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	138.0	131.0	**250**
	Sulfide		ND<0.1	-
	TOC	0.811J	1.080	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
WB2-1	Nitrate-N	28.7	28.1	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	137.0	143.0	**250**
	Sulfide		ND<0.1	-
	TOC	0.809J	0.836J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
WB2-2	Nitrate-N	59.3	46.8	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	79.7	92.2	**250**
	Sulfide		ND<0.1	-
	TOC	0.853J	0.875J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-

TABLE 4: RESULTS OF WET CHEMISTRY ANALYSES
600 South Derby Street, Arvin, California

Well No.	Analyte	DATE SAMPLED AND CONCENTRATION (mg/L)		MCL (mg/L)
		Apr-11	Oct-11	
WB2-3	Nitrate-N	0.1J	2.7	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	84.2	90.7	**250**
	Sulfide		ND<0.1	**-**
	TOC	0.934J	0.903J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		4.5	**-**
	Dis. Hydrogen		ND<1.0	**-**
WB2-4	Nitrate-N		10.5	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		45.1	**250**
	Sulfide		ND<0.1	**-**
	TOC		0.605J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-1	Nitrate-N		25.5	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		149.0	**250**
	Sulfide		ND<0.1	**-**
	TOC		0.911J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-2	Nitrate-N	28.1	27.4	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	94.2	94.1	**250**
	Sulfide		ND<0.1	**-**
	TOC	0.630J	0.744J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-3	Nitrate-N	26.6	25.9	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	89.6	92.6	**250**
	Sulfide		ND<0.1	**-**
	TOC	0.728J	0.849J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**

TABLE 4: RESULTS OF WET CHEMISTRY ANALYSES
600 South Derby Street, Arvin, California

Well No.	Analyte	DATE SAMPLED AND CONCENTRATION (mg/L)		MCL (mg/L)
		Apr-11	Oct-11	
PWB-4	Nitrate-N	48.7	40.2	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	96.2	105.0	**250**
	Sulfide		ND<0.1	-
	TOC	0.837J	1.030	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
PWB-5	Nitrate-N		52.2	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		82.9	**250**
	Sulfide		ND<0.1	-
	TOC		0.914J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		1.0	-
	Dis. Hydrogen		ND<1.0	-
PWB-6	Nitrate-N		12.3	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		131.0	**250**
	Sulfide		ND<0.1	-
	TOC		0.672J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
PWB-7A	Nitrate-N		46.6	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		70.5	**250**
	Sulfide		ND<0.1	-
	TOC		0.871J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
PWB-8	Nitrate-N		29.7	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		168.0	**250**
	Sulfide		ND<0.1	-
	TOC		1.190	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-

TABLE 4: RESULTS OF WET CHEMISTRY ANALYSES
600 South Derby Street, Arvin, California

Well No.	Analyte	DATE SAMPLED AND CONCENTRATION (mg/L)		MCL (mg/L)
		Apr-11	Oct-11	
PWB-9	Nitrate-N		30.5	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		53.1	**250**
	Sulfide		ND<0.1	**-**
	TOC		0.705J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-10	Nitrate-N		38.1	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		126.0	**250**
	Sulfide		ND<0.1	**-**
	TOC		0.860J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-11	Nitrate-N		35.9	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		84.8	**250**
	Sulfide		ND<0.1	**-**
	TOC		0.671J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-12	Nitrate-N	53.8	56.0	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	62.8	58.5	**250**
	Sulfide		ND<0.1	**-**
	TOC	0.820J	1.010	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**
PWB-13A	Nitrate-N	33.2	33.8	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	163.0	151.0	**250**
	Sulfide		ND<0.1	**-**
	TOC	0.902J	0.944J	**-**
	Ferrous Iron		ND<2.0	**-**
	Dis. Methane		ND<1.0	**-**
	Dis. Hydrogen		ND<1.0	**-**

TABLE 4: RESULTS OF WET CHEMISTRY ANALYSES
600 South Derby Street, Arvin, California

Well No.	Analyte	DATE SAMPLED AND CONCENTRATION (mg/L)		MCL (mg/L)
		Apr-11	Oct-11	
PWB-14	Nitrate-N		11.4	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate		65.1	**250**
	Sulfide		ND<0.1	-
	TOC		0.725J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
PWB-15	Nitrate-N	21.1	21.6	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	68.9	74.1	**250**
	Sulfide		ND<0.1	-
	TOC	0.578J	0.877J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-
PWB-16	Nitrate-N	1.2	1.1	**10**
	Nitrite-N		ND<0.1	**1**
	Sulfate	76.8	79.7	**250**
	Sulfide		ND<0.1	-
	TOC	0.928J	0.868J	-
	Ferrous Iron		ND<2.0	-
	Dis. Methane		ND<1.0	-
	Dis. Hydrogen		ND<1.0	-

NOTES:

NOTATIONS:

All reported results at milligrams per liter (mg/L)
MCL – Maximum Contaminant Level
TOC – Total Organic Carbon
Dis. – Dissolved
ND – Not Detected to stated concentration

ANALYSES:

Method 300.0 – Nitrate - N, Nitrite - N, & Sulfate
Method SM45002D – Sulfide
Method 415.1 – Total Organic Carbon (TOC)
Method SM3500 – Ferrous iron
Method RSK175 – Dissolved gasses: methane & hydrogen
Analyses performed by EMAX Laboratories, Inc. RSK175 analyses performed by Air Technologies Laboratories, Inc. as subcontractor to EMAX.

ANALYTES AND THEIR MCLS:

Nitrate and Nitrite – Title 22, California Code of Regulations (CCR) 63341
Sulfate – Title 22 CCR 64449; recommended MCL with an upper maximum of 500 mg/L

APPENDIX C

SENSITIVITY ANALYSIS OF NATURAL ATTENUATION SOFTWARE (NAS)

APPENDIX C

SENSITIVITY ANALYSIS OF NATURAL ATTENUATION SOFTWARE (NAS)

NATURAL ATTENUATION SOFTWARE (NAS)

ASSUMPTIONS

Natural Attenuation model assumes that:

1. The source of contamination is constant in time
2. The plume becomes steady in time
3. The parameters (speed and coefficient of dispersion) are constant.

MODEL/ SOLUTIONS

Natural Attenuation model is described by the two-dimensional mass-balance equation

$$C(x,0,t) = \exp\{-(NAC)x\}\left\{\mathrm{erf}\left[\frac{Y}{4\sqrt{\alpha_Y x}}\right]\right\}\{(C_0 - \frac{\Delta C_0}{2})erfc\left[\frac{x - v_c t\sqrt{\left(1+\frac{4\lambda\alpha_x}{v_c}\right)}}{2\sqrt{\alpha_x v_c t}}\right]\}$$

where NAC is the one-dimensional natural attenuation capacity given by

$$NAC = \frac{-v_c + \sqrt{{v_c}^2 + 4\lambda\alpha_x v_c}}{2\alpha_x v_c}$$

SENSITIVITY ANALYSIS

TSC (Target Source Concentration) = Maximum source concentration that will result in the below the RCC concentration at POC downgradient.

RCC (REGULATORY COMPLIANCE CONCENTRATION)

POC (Point of Compliance) = Point downgradient where the level of concentration is equal to RCC

$$C(x) = (C_0 - \Delta C_0)\exp\{-(NAC)x\}$$

$$TSC = (RCC)\exp\{-(NAC)L_{POC}\}^{-1}$$

TOS (Time of Stabilization) = Time required for the level of concentration at POC to reach RCC.

$$TOS = \frac{L_{POC}}{v_c[2\alpha_x(NAC) + 1]}$$

SENSITIVITY ANALYSIS

The primary objective of the NAS model is to estimate the time of remediation that in this case is the same as the time of stabilization (TOS). The sensitivity of this estimate to the parameters that are needed to estimate it can be determined by examining the formula for TOS:

$$TOS = \frac{L_{POC}}{\sqrt{{v_c}^2 + 4\lambda\alpha_x v_c}}$$

None of the parameters is singled out from the equation above even though quantitively their variation affects differently the TOS. Depending on their specific values, some of these parameters can be approximated by their generic value without losing much precision in determining TOS.

NUMERICAL SIMULATIONS

A numerical simulation is another method of estimating the sensitivity of the results of interest (TOR, Attenuation Rates) to the parameters that they depend upon. Some parameters are based on field measurements and the remaining parameters are calculated theoretically.

The parameters that are measured in the field or are obtained from site-specific sampling are:

1. Hydraulic conductivity
2. Hydraulic gradient
3. Weight Percent Organic Carbon

4. Total Porosity / Effective porosity
5. Sorption Parameter (Fraction Organic Carbon)
6. Source length
7. Source width
8. Contaminated aquifer thickness

The software (NAS) requires that dissolved oxygen, ferrous iron, and sulfate concentrations be measured in the field. We assume that this requirement is met.

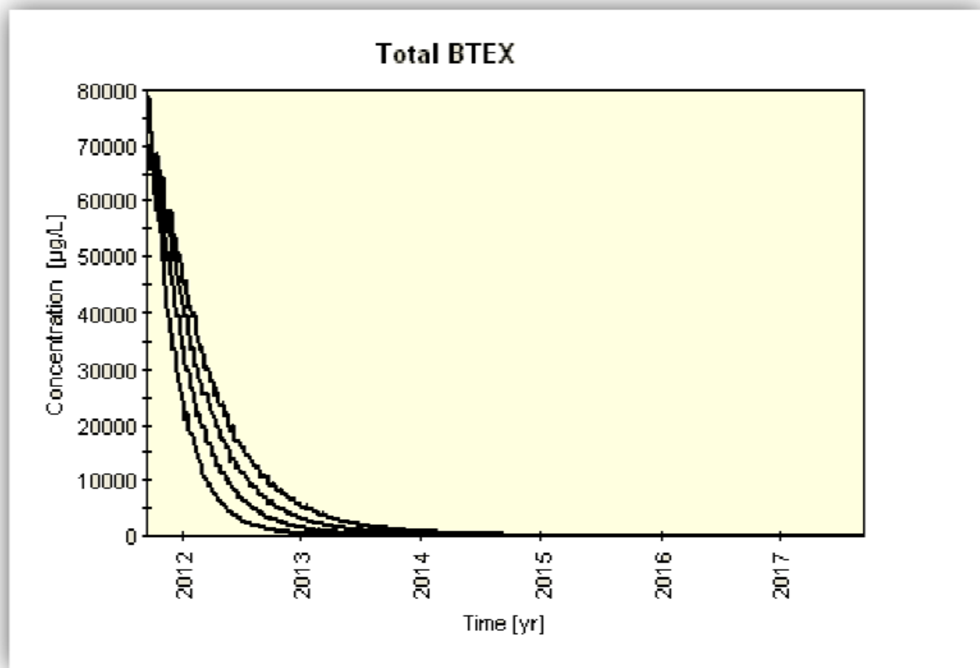
The above parameters are analyzed on the effect they have on the numerical results. Their effect on the result is measured by the change in the result caused by the change in the parameter. The measure of natural attenuation is taken to be the time of remediation (TOR). The full analysis of this problem requires much more in-depth analysis of the multivariate problem natural attenuation.

THE INITIAL DATASET

Parameter	**Value**
Hydraulic Conductivity [m/d]	10.0
Hydraulic Gradient [m/m]	0.002
Total Porosity	0.35
Effective Porosity	0.3
Fraction Organic Carbon	0.0001

HYDRAULIC CONDUCTIVITY

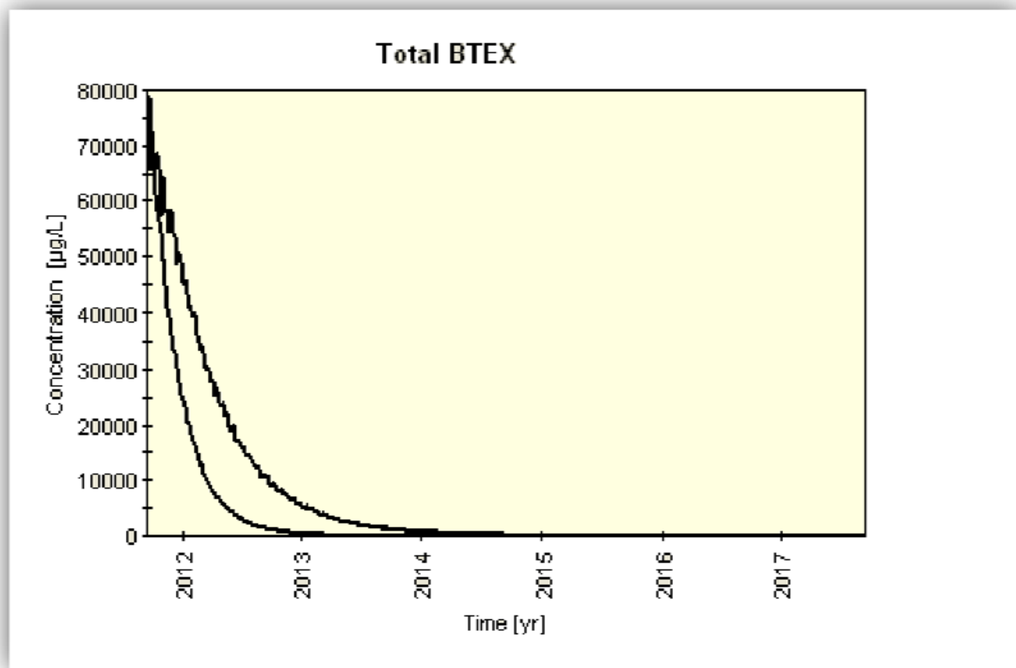
Hydraulic Conductivity	**Attenuation Rate**	**TOR (yr)**
10.0	0.0021	5.1
12.0	0.0025	4.3
15.0	0.0031	3.4
20.0	0.0041	2.5



Conclusion: Sensitivity analysis for the Hydraulic conductivity indicates that hydraulic conductivity has some effect on the time of remediation (TOR) when it is small (10.0) and less so when it is large (20.0).

HYDRAULIC GRADIENT

Hydraulic Gradient	Attenuation Rate	TOR (yr)
0.002	0.0021	5.1
0.004	0.0041	2.5

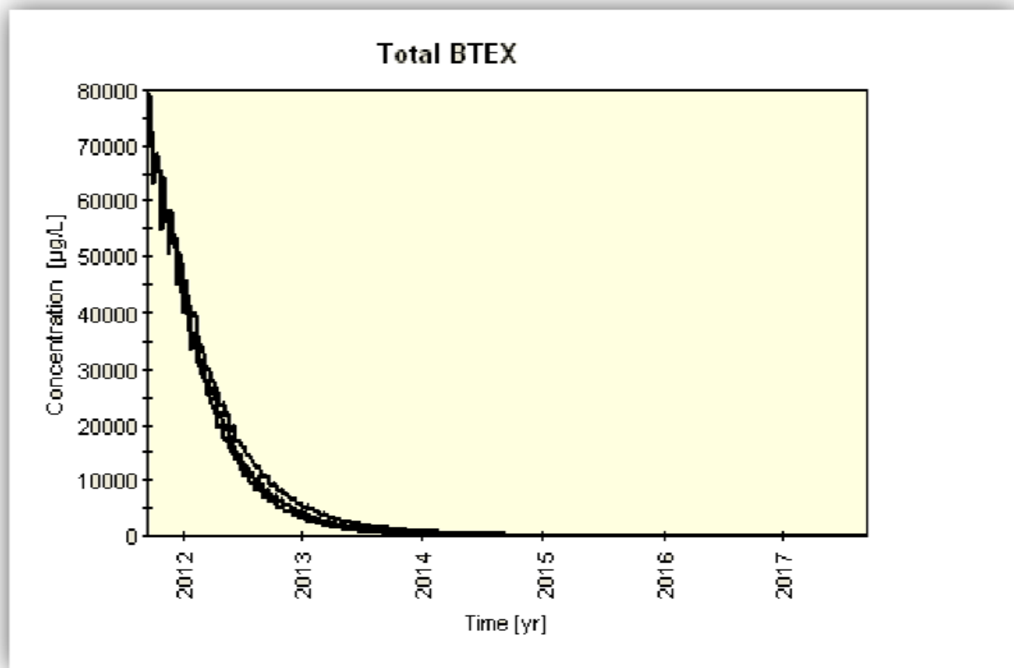


Note: TOR has same sensitivity to hydraulic gradient as to hydraulic conductivity. These two parameters define groundwater velocity and enter final equation through that velocity.

Conclusion: Sensitivity analysis for the hydraulic gradient indicates that hydraulic gradient has some effect on the time of remediation (TOR) when it is small (0.002) and less so when it is large (0.004).

TOTAL POROSITY

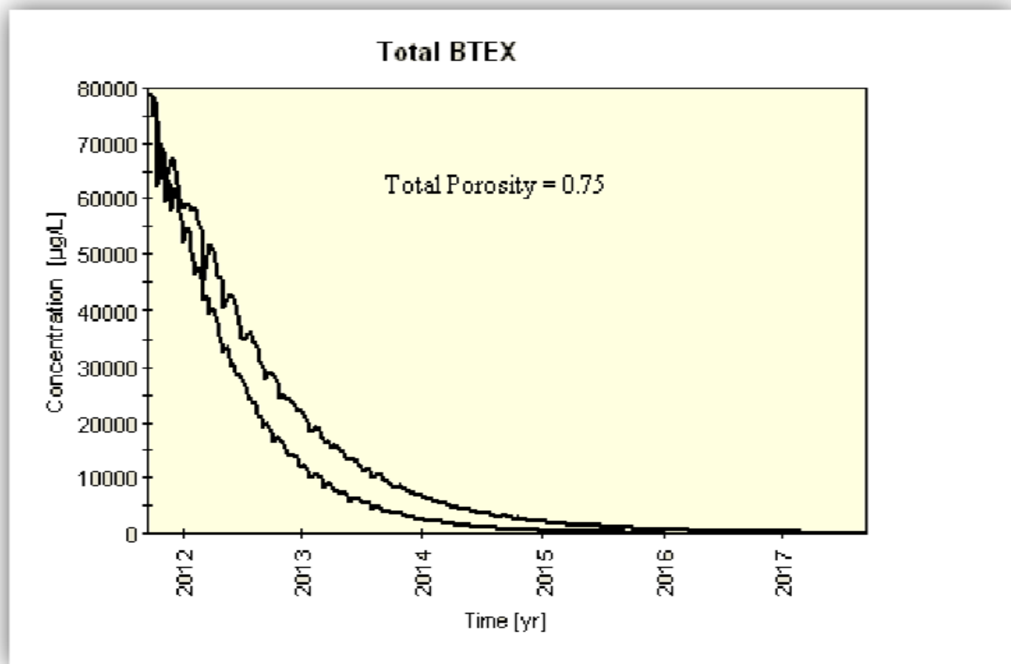
Total Porosity	Attenuation Rate	TOR (yr)
0.35	0.0021	5.1
0.7	0.0021	4.2
0.9	0.0021	3.8



Conclusion: The sensitivity of TOR to total porosity is very low compared to the sensitivity of TOR to hydraulic conductivity and hydraulic gradient.

EFFECTIVE POROSITY

Effective Porosity	Total Porosity	Attenuation Rate	TOR (yr)
0.3	0.35	0.0021	5.1
0.5	0.75	0.0012	6.4
0.7	0.75	0.009	8.8
0.5	0.9	0.0012	6.2
0.7	0.9	0.009	8.5



Conclusion: Effective porosity has the sensitivity that is higher when total porosity is lower. But in general this parameter has some effect on TOR.

SUMMARY

Eco conducted sensitivity analysis of the time of remediation (TOR) based on numerical simulations. The result of this study is a general conclusion that the parameters of the study, even though affecting to some degree the TOR, can safely be approximated by the values available in the research literature on the subject.

Attachment

Dataset

Units

Length:	meters
Time:	days
Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydraulic Conductivity [m/d]	110.0	10.0	1.0
Hydraulic Gradient [m/m]	0.009	0.002	0.0019
Total Porosity [-]		0.35	
Effective Porosity [-]		0.3	
Groundwater Vel. [m/d]	3.3	0.067	0.006

NAPL Source Data

	NAPL Source
NAPL Source Length [m]	15.0
NAPL Source Width [m]	15.0
Contaminated Aquifer Thickness [m]	5.0

Dispersion Parameters

Estimated Plume Length [m]	1580.4
Longitudinal Dispersivity [m]	13.74
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.69

Contaminant Concentration Profiles (9/14/2011)

	Distance	Total BTEX
Well Name	[m]	[µg/L]
1	0	80000.
3	25	65401.
4	40	47059.
2	80	16828.
5	120	1484.
8	145	88.
7	270	17.27
6	400	2.92
9	480	0.39

Redox Indicator Concentration Profiles (9/13/2011)

	Distance	Oxygen	Iron(II)	Sulfate	Redox
Well Name	[m]	[mg/L]	[mg/L]	[mg/L]	Condition
1	0	BD	1.	1.	SO4/CO2-red.
2	30	BD	1.	1.	SO4/CO2-red.

	Distance	Oxygen	Iron(II)	Sulfate	Redox
3	80	BD	1.	1.	SO4/CO2-red.
4	120	BD	10.	BD	Ferrogenic
5	200	BD	10.	BD	Ferrogenic
6	270	BD	10.	BD	Ferrogenic

Attenuation Rates

	Total BTEX
NAC (Single Zone) [1/m]	0.0235
Decay Rate [1/d]	
Maximum	0.1025
Average	0.0021
Minimum	0.0002

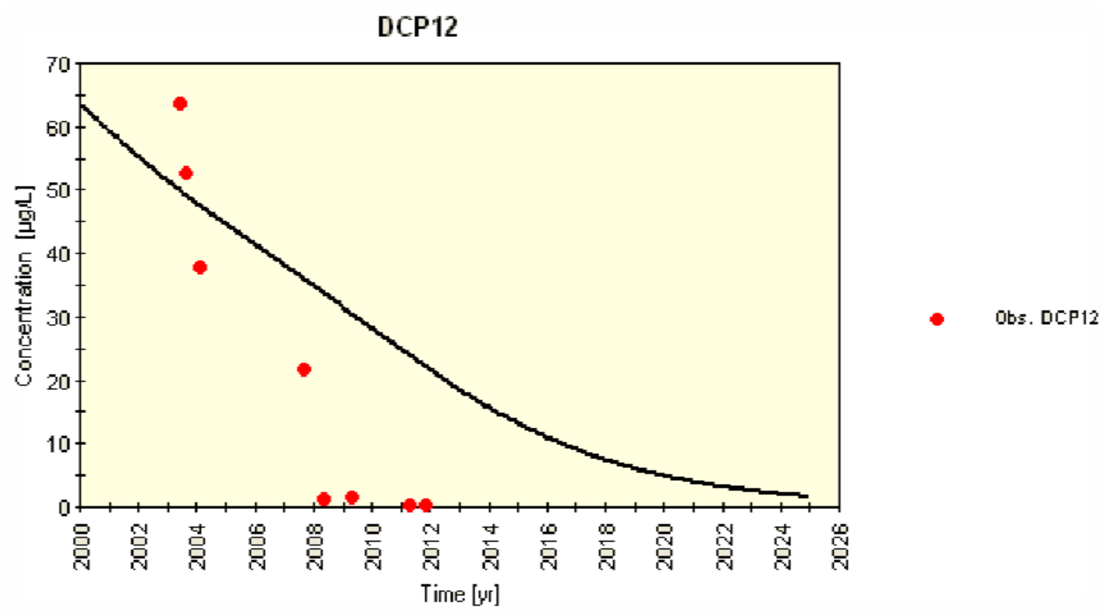
Time of Remediation (TOR) Calculations

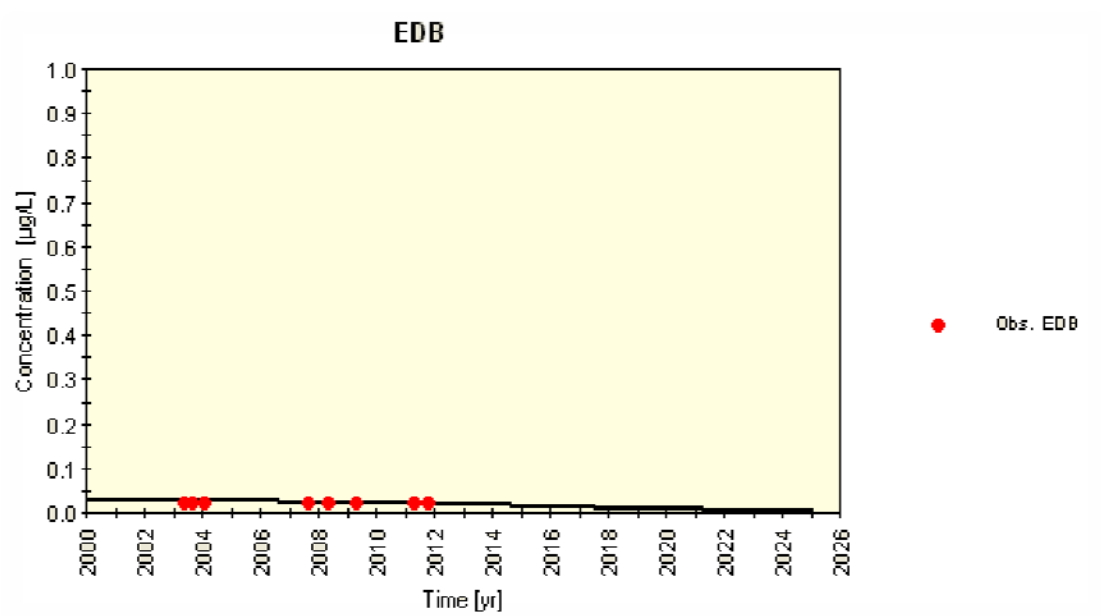
	Mass	Solubility	Molecular
NAPL Component	Fraction[-]	[mg/L]	Weight[g/mole]
Total BTEX	0.00	0.0	0.0
Benzene	0.01	1750.0	78.1
Toluene	0.08	535.0	92.1
Ethylbenzene	0.05	152.0	106.2
Xylene	0.12	175.0	106.2
MTBE	0.03	48000.0	88.2

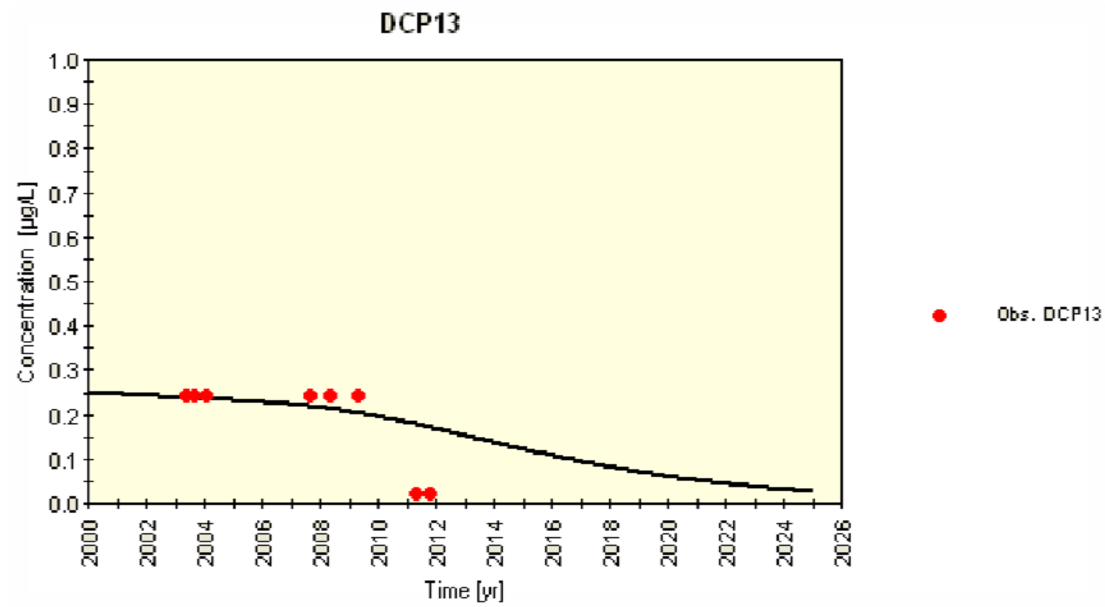
APPENDIX D

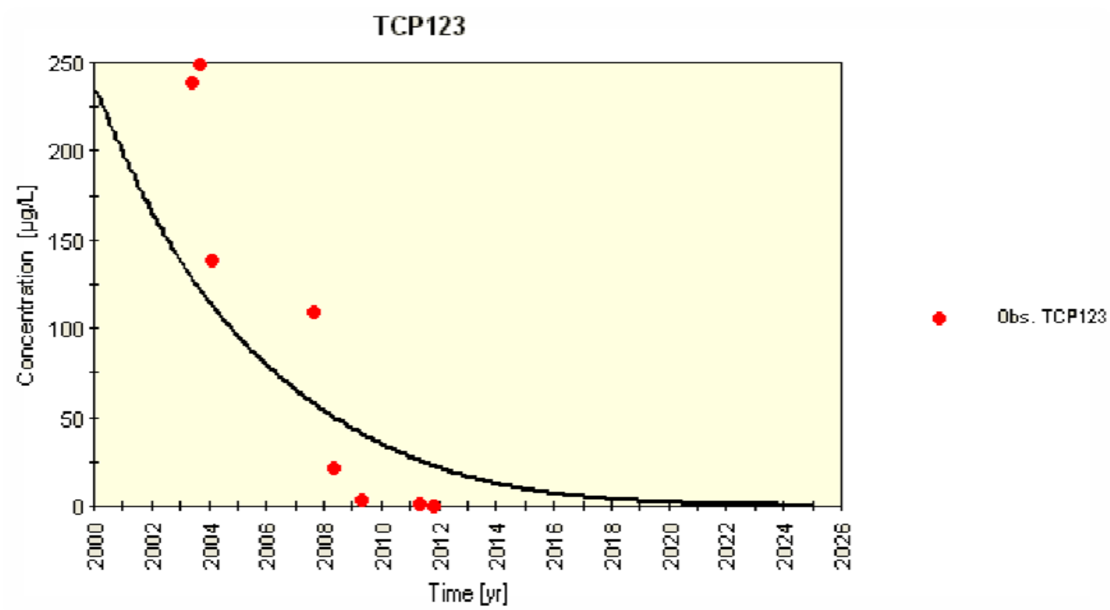
NAS MODEL RESULTS

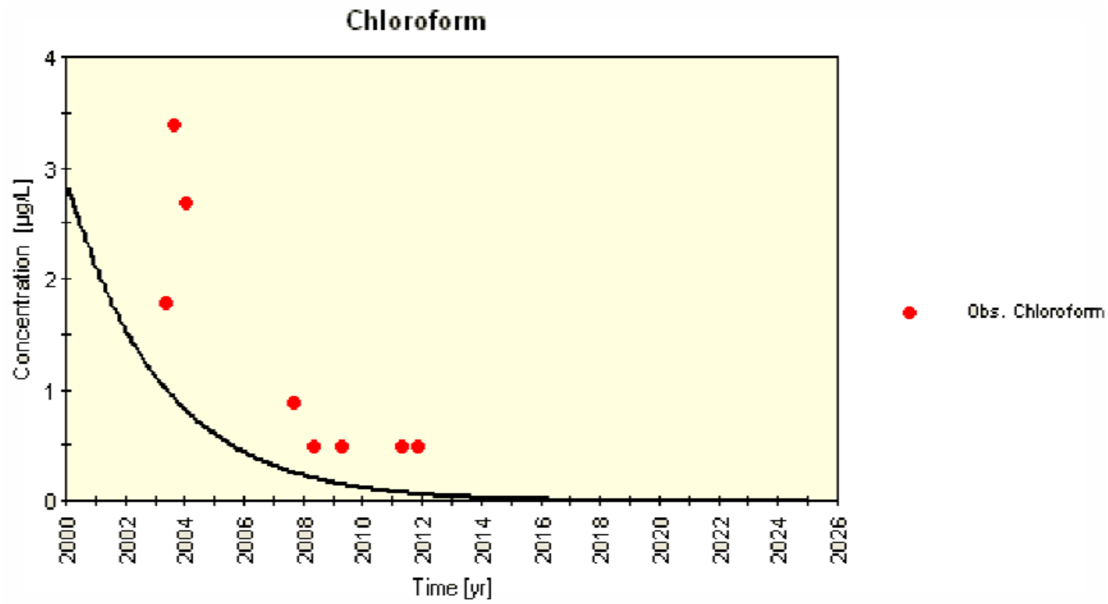
NAS MODELING RESULTS

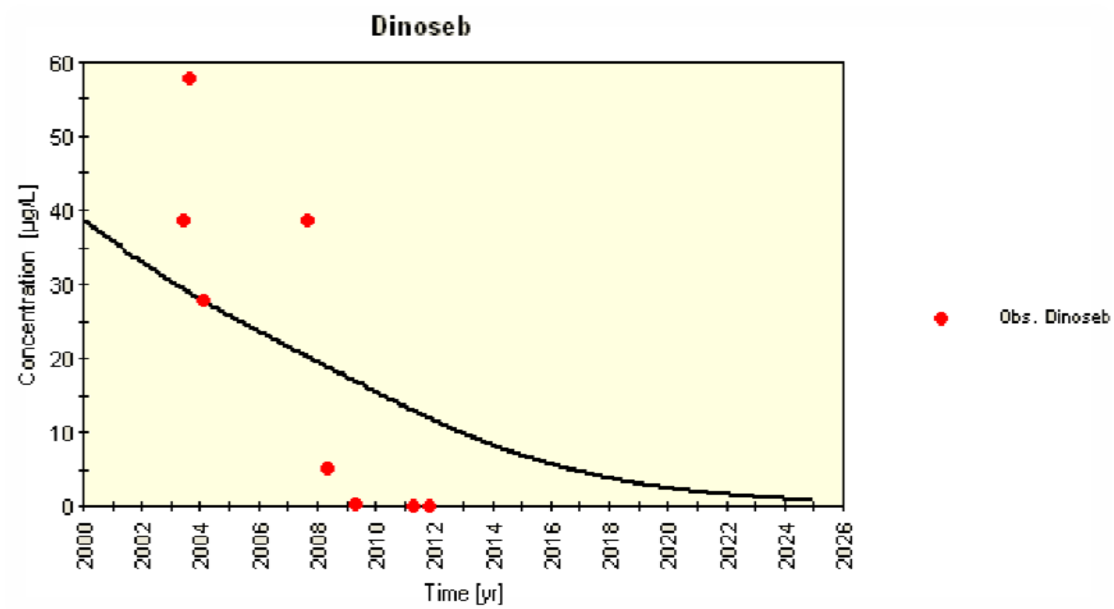


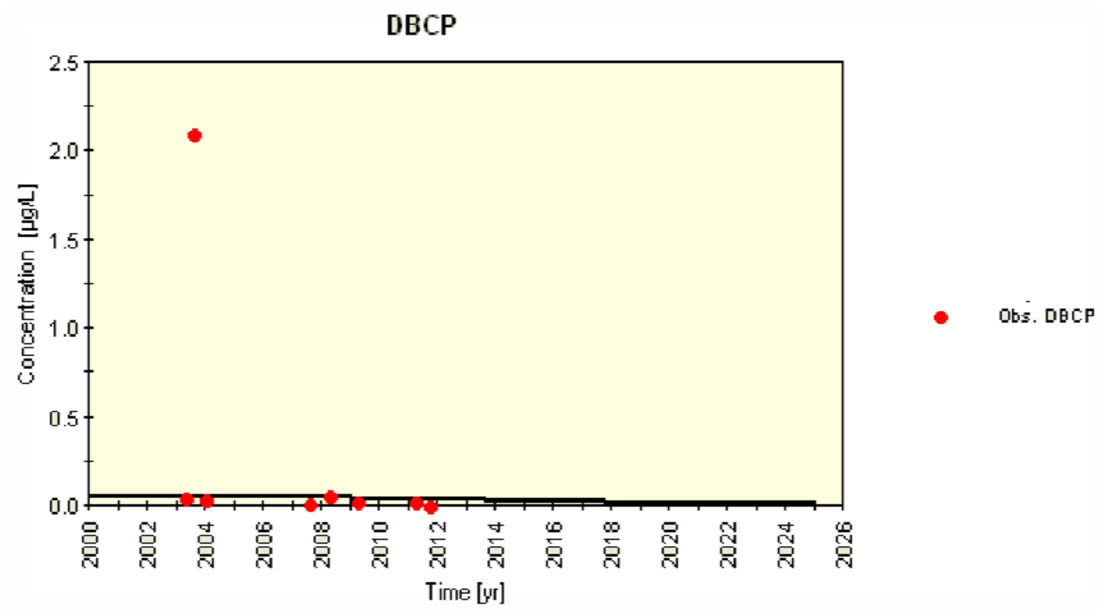



DCP13
Concentration [µg/L]
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
Time [yr]
Obs. DCP13


TCP123
Concentration [µg/L]
250
200
150
100
50
0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
Time [yr]
Obs. TCP123


Chloroform
Concentration [µg/L]
Time [yr]
Obs. Chloroform


Dinoseb
Concentration [µg/L]
Time [yr]
Obs. Dinoseb


DBCP
Concentration [µg/L]
2.5
2.0
1.5
1.0
0.5
0.0
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020
2022
2024
2026
Time [yr]
Obs. DBCP

Facility Name:	Eco		Length:	meters
Site Name:	B&B		Time:	days
Additional Description:	MNA		Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [m/d]	20.0	7.5	1.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001
Total Porosity [-]		0.48	
Effective Porosity [-]		0.25	
Groundwater Vel. [m/d]	0.08	0.012	0.0

	NAPL Source
NAPL Source Length [m]	78.0
NAPL Source Width [m]	94.0
Contaminated Aquifer Thickness [m]	8.5

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	279.6
Longitudinal Dispersivity [m]	7.20
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.36

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (5/1/2003)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	64.	0.25	240.	1.8	0.045	39.	0.025
WB2-3	100	2.2	0.25	0.003	2.1	0.025	0.57	0.025
PWB-8	172	2.9	NS	0.76	0.091	0.025	0.2	0.025
PWB-5	218	2.9	0.25	0.003	0.64	0.025	0.2	0.025
PWB-9	259	0.5	0.025	0.003	2.9	0.025	0.2	0.025
WB2-4	293	0.5	0.25	0.003	0.5	0.025	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.
PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.
WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.

Attenuation Rates

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
NAC (Single Zone) [1/m]	0.0148	0.0033	0.0333	0.0517	0.0017	0.0168	N/A
Decay Rate [1/d]							
Maximum	0.0013	0.0003	0.0033	0.0057	0.0001	0.0015	N/A
Average	0.0002	0.000	0.0005	0.0009	0.000	0.0002	N/A
Minimum	0.000	0.000	0.000	0.000	0.000	0.000	N/A

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [m]: 400.0

			Source Reduction		Time of Stabilization [years]					
	RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
DCP12	5.0	1	64	No Reduction Required						
DCP13	0.5	1	0	No Reduction Required						
TCP123	0.0	1	240	No Reduction Required						
Chloroform	80.0	5	3	No Reduction Required						
DBCP	0.2	1	0	No Reduction Required						
Dinoseb	7.0	1	39	No Reduction Required						
EDB	0.1	1	0	No Reduction Required						

Time of Remediation(TOR) Calculations

NAPL Component	Mass Fraction[-]	Solubility [mg/L]	Molecular Wght[g/mole]
DCP12	0.00	0.0	0.0
DCP13	0.00	0.0	0.0
TCP123	0.00	0.0	0.0
Chloroform	0.00	0.0	0.0
DBCP	0.00	0.0	0.0
Dinoseb	0.00	0.0	0.0
EDB	0.00	0.0	0.0

Max Time of Analysis [yr]: 25

	SCC	Mass		Removal Plan
				No Removal
	[µg/L]	[kg]		MNA
DCP12	5.0	0		20.0
DCP13	1.0	0		0.0
TCP123	1.0	0		22.2
Chloroform		0		
DBCP		0		
Dinoseb		0		
EDB		0		

Facility Name:	Eco			Length:	meters
Site Name:	B&B			Time:	days
Additional Description:	MNA			Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum		NAPL Source
Hydr. Conductivity [m/d]	20.0	7.5	1.0	NAPL Source Length [m]	78.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001	NAPL Source Width [m]	94.0
Total Porosity [-]		0.48		Contaminated Aquifer Thickness [m]	8.5
Effective Porosity [-]		0.25			
Groundwater Vel. [m/d]	0.08	0.012	0.0		

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	221.1
Longitudinal Dispersivity [m]	6.49
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.32

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (8/1/2003)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	53.	0.25	250.	3.4	2.1	58.	0.025
WB2-3	100	0.5	0.25	0.003	1.7	0.025	0.2	0.025
PWB-8	172	3.6	0.25	0.67	0.091	0.025	0.2	0.025
PWB-5	218	2.7	0.25	0.003	0.41	0.025	0.2	0.025
PWB-9	259	0.5	0.25	0.003	2.9	0.031	0.2	0.025
WB2-4	293	0.34	0.25	0.003	0.5	0.055	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

NAS Output 8-1-2003

Row	1	2	3	4	5	6	7	8	9	10	11
62	PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.	
63	PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.	
64	WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.	
65											
66	**Attenuation Rates**										
67		DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB			
68	NAC (Single Zone) [1/m]	0.0133	N/A	0.0335	0.0047	0.0111	0.0167	N/A			
69	Decay Rate [1/d]										
70	Maximum	0.0012	N/A	0.0033	0.0004	0.001	0.0015	N/A			
71	Average	0.0002	N/A	0.0005	0.0001	0.0001	0.0002	N/A			
72	Minimum	0.000	N/A	0.000	0.000	0.000	0.000	N/A			
73											
74	**Time of Stabilization(TOS) and Max Source Conc. Calculations**										
75											
76	Distance to POC [m]	400.0									
77				Source Reduction			Time of Stabilization [years]				
78		RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
79	Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
80	DCP12	5.0	1	53	No Reduction Required						
81	DCP13	0.5	1	0	No Reduction Required						
82	TCP123	0.0	1	250	No Reduction Required						
83	Chloroform	80.0	1	3	No Reduction Required						
84	DBCP	0.2	1	2	No Reduction Required						
85	Dinoseb	7.0	1	58	No Reduction Required						
86	EDB	0.1	1	0	No Reduction Required						
87											
88	**Time of Remediation(TOR) Calculations**										
89											
90		Mass	Solubility	Molecular							
91	NAPL Component	Fraction[-]	[mg/L]	Wght[g/mole]							
92	DCP12	0.00	0.0	0.0							
93	DCP13	0.00	0.0	0.0							
94	TCP123	0.00	0.0	0.0							
95	Chloroform	0.00	0.0	0.0							
96	DBCP	0.00	0.0	0.0							
97	Dinoseb	0.00	0.0	0.0							
98	EDB	0.00	0.0	0.0							
99											
100	Max Time of Analysis [yr]	25									
101					Removal Plan						
102		SCC	Mass		No Removal						
103		[µg/L]	[kg]		MNA						
105	DCP12	5.0	0		20.0						
108	DCP13	1.0	0		0.0						
111	TCP123	1.0	0		22.5						
114	Chloroform		0								
117	DBCP		0								
120	Dinoseb		0								
123	EDB		0								
125											

NAS Output 1-1-2004

Facility Name:	Eco	Length:	meters
Site Name:	B&B	Time:	days
Additional Description:	MNA	Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [m/d]	20.0	7.5	1.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001
Total Porosity [-]		0.48	
Effective Porosity [-]		0.25	
Groundwater Vel. [m/d]	0.08	0.012	0.0

	NAPL Source
NAPL Source Length [m]	78.0
NAPL Source Width [m]	94.0
Contaminated Aquifer Thickness [m]	8.5

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	224.4
Longitudinal Dispersivity [m]	6.54
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.33

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (1/1/2004)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	38.	0.25	140.	2.7	0.035	28.	0.025
WB2-3	100	2.1	0.25	0.003	1.2	0.025	0.2	0.025
PWB-8	172	2.3	0.25	0.26	0.29	0.025	0.2	0.025
PWB-5	218	2.7	0.25	0.003	0.84	0.013	0.2	0.025
PWB-9	259	0.5	0.25	0.003	2.5	0.025	0.2	0.025
WB2-4	293	0.31	0.25	0.025	0.5	0.025	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

NAS Output 1-1-2004

	1	2	3	4	5	6	7	8	9	10	11
62	PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.	
63	PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.	
64	WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.	
65											
66	**Attenuation Rates**										
67		DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB			
68	NAC (Single Zone) [1/m]	0.0143	N/A	0.0274	0.0033	0.0015	0.0145	N/A			
69	Decay Rate [1/d]										
70	Maximum	0.0012	N/A	0.0026	0.0003	0.0001	0.0013	N/A			
71	Average	0.0002	N/A	0.0004	0.000	0.000	0.0002	N/A			
72	Minimum	0.000	N/A	0.000	0.000	0.000	0.000	N/A			
73											
74	**Time of Stabilization(TOS) and Max Source Conc. Calculations**										
75											
76	Distance to POC [m]	400.0									
77				Source Reduction			Time of Stabilization [years]				
78		RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
79	Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
80	DCP12	5.0	1	38	No Reduction Required						
81	DCP13	0.5	1	0	No Reduction Required						
82	TCP123	0.0	1	140	No Reduction Required						
83	Chloroform	80.0	1	3	No Reduction Required						
84	DBCP	0.2	1	0	No Reduction Required						
85	Dinoseb	7.0	1	28	No Reduction Required						
86	EDB	0.1	1	0	No Reduction Required						
87											
88	**Time of Remediation(TOR) Calculations**										
89											
90		Mass	Solubility	Molecular							
91	NAPL Component	Fraction[-]	[mg/L]	Wght[g/mole]							
92	DCP12	0.00	0.0	0.0							
93	DCP13	0.00	0.0	0.0							
94	TCP123	0.00	0.0	0.0							
95	Chloroform	0.00	0.0	0.0							
96	DBCP	0.00	0.0	0.0							
97	Dinoseb	0.00	0.0	0.0							
98	EDB	0.00	0.0	0.0							
99											
100	Max Time of Analysis [yr]	25									
101					Removal Plan						
102		SCC	Mass		No Removal						
103		[µg/L]	[kg]		MNA						
105	DCP12	5.0	0		17.8						
108	DCP13	1.0	0		0.0						
111	TCP123	1.0	0		23.3						
114	Chloroform		0								
117	DBCP		0								
120	Dinoseb		0								
123	EDB		0								
125											

Facility Name:	Eco			Length:	meters
Site Name:	B&B			Time:	days
Additional Description:	MNA			Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum		NAPL Source
Hydr. Conductivity [m/d]	20.0	7.5	1.0	NAPL Source Length [m]	78.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001	NAPL Source Width [m]	94.0
Total Porosity [-]		0.48		Contaminated Aquifer Thickness [m]	8.5
Effective Porosity [-]		0.25			
Groundwater Vel. [m/d]	0.08	0.012	0.0		

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	277.1
Longitudinal Dispersivity [m]	7.17
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.36

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (8/1/2007)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	22.	0.25	110.	0.9	0.011	39.	0.025
WB2-3	100	0.52	0.25	0.003	0.5	0.025	0.03	0.025
PWB-8	172	0.95	0.25	0.003	0.5	0.025	0.1	0.025
PWB-5	218	4.7	0.25	0.003	1.3	0.059	0.08	0.025
PWB-9	259	0.5	0.25	0.003	2.2	0.025	0.06	0.025
WB2-4	293	1.1	0.25	0.003	0.5	0.025	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.
PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.
WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.

Attenuation Rates

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
NAC (Single Zone) [1/m]	0.0079	N/A	0.0309	0.0436	0.0118	0.0155	N/A
Decay Rate [1/d]							
Maximum	0.0007	N/A	0.003	0.0046	0.001	0.0014	N/A
Average	0.0001	N/A	0.0005	0.0007	0.0002	0.0002	N/A
Minimum	0.000	N/A	0.000	0.000	0.000	0.000	N/A

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [m] 400.0

			Source Reduction		Time of Stabilization [years]					
	RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
DCP12	5.0	1	22	No Reduction Required						
DCP13	0.5	1	0	No Reduction Required						
TCP123	0.0	1	110	No Reduction Required						
Chloroform	80.0	5	2	No Reduction Required						
DBCP	0.2	4	0	No Reduction Required						
Dinoseb	7.0	1	39	No Reduction Required						
EDB	0.1	1	0	No Reduction Required						

Time of Remediation(TOR) Calculations

NAPL Component	Mass Fraction[-]	Solubility [mg/L]	Molecular Wght[g/mole]
DCP12	0.00	0.0	0.0
DCP13	0.00	0.0	0.0
TCP123	0.00	0.0	0.0
Chloroform	0.00	0.0	0.0
DBCP	0.00	0.0	0.0
Dinoseb	0.00	0.0	0.0
EDB	0.00	0.0	0.0

Max Time of Analysis [yr] 25

	SCC	Mass		Removal Plan
				No Removal
	[µg/L]	[kg]		MNA
DCP12	5.0	0		17.9
DCP13	1.0	0		0.0
TCP123	1.0	0		20.8
Chloroform		0		
DBCP		0		
Dinoseb		0		
EDB		0		

Facility Name:	Eco	Length:	meters
Site Name:	B&B	Time:	days
Additional Description:	MNA	Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [m/d]	20.0	7.5	1.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001
Total Porosity [-]		0.48	
Effective Porosity [-]		0.25	
Groundwater Vel. [m/d]	0.08	0.012	0.0

	NAPL Source
NAPL Source Length [m]	78.0
NAPL Source Width [m]	94.0
Contaminated Aquifer Thickness [m]	8.5

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	272.2
Longitudinal Dispersivity [m]	7.11
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.36

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (4/1/2008)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	1.5	0.25	23.	0.5	0.053	5.4	0.025
WB2-3	100	2.	0.25	0.035	0.5	0.025	0.2	0.025
PWB-8	172	0.87	0.25	0.06	0.19	0.025	0.01	0.025
PWB-5	218	3.7	0.25	1.2	0.94	0.024	0.03	0.025
PWB-9	259	0.48	0.25	0.091	3.1	0.011	0.02	0.025
WB2-4	293	1.2	0.025	0.042	0.16	0.097	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.	
PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.	
WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.	

Attenuation Rates

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
NAC (Single Zone) [1/m]	0.0162	0.0046	0.0147	0.0872	N/A	0.0144	N/A
Decay Rate [1/d]							
Maximum	0.0014	0.0004	0.0013	0.0113	N/A	0.0013	N/A
Average	0.0002	0.0001	0.0002	0.0017	N/A	0.0002	N/A
Minimum	0.000	0.000	0.000	0.0001	N/A	0.000	N/A

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [m]: 400.0

			Source Reduction		Time of Stabilization [years]					
	RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
DCP12	5.0	4	4	No Reduction Required						
DCP13	0.5	1	0	No Reduction Required						
TCP123	0.0	1	23	2	2266.3	75.5	11.3	3495.2	116.5	17.5
Chloroform	80.0	5	3	No Reduction Required						
DBCP	0.2	6	0							
Dinoseb	7.0	1	5	No Reduction Required						
EDB	0.1	1	0	No Reduction Required						

Time of Remediation(TOR) Calculations

	Mass	Solubility	Molecular
NAPL Component	Fraction[-]	[mg/L]	Wght[g/mole]
DCP12	0.00	0.0	0.0
DCP13	0.00	0.0	0.0
TCP123	0.00	0.0	0.0
Chloroform	0.00	0.0	0.0
DBCP	0.00	0.0	0.0
Dinoseb	0.00	0.0	0.0
EDB	0.00	0.0	0.0

Max Time of Analysis [yr]: 25

	SCC	Mass	Removal Plan
			No Removal
	[µg/L]	[kg]	MNA
DCP12	5.0	0	0.0
DCP13	1.0	0	0.0
TCP123	1.0	0	22.7
Chloroform		0	
DBCP		0	
Dinoseb		0	
EDB		0	

Facility Name:	Eco			Length:	meters
Site Name:	B&B			Time:	days
Additional Description:	MNA			Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [m/d]	20.0	7.5	1.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001
Total Porosity [-]		0.48	
Effective Porosity [-]		0.25	
Groundwater Vel. [m/d]	0.08	0.012	0.0

	NAPL Source
NAPL Source Length [m]	78.0
NAPL Source Width [m]	94.0
Contaminated Aquifer Thickness [m]	8.5

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	292.2
Longitudinal Dispersivity [m]	7.33
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.37

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (4/1/2009)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	1.9	0.25	4.3	0.5	0.025	0.62	0.025
WB2-3	100	0.85	0.25	0.075	0.5	0.025	0.08	0.025
PWB-8	172	1.6	0.25	0.003	0.61	0.025	0.041	0.025
PWB-5	218	4.	0.25	2.5	1.3	0.4	0.43	0.025
PWB-9	259	0.5	0.25	0.003	0.5	0.025	0.2	0.025
WB2-4	293	1.8	0.25	0.067	0.5	0.025	0.02	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

	1	2	3	4	5	6	7	8	9	10	11
62	PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.	
63	PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.	
64	WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.	
65											
66	**Attenuation Rates**										
67		DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB			
68	NAC (Single Zone) [1/m]	0.012	N/A	0.0141	0.0131	0.038	0.0062	N/A			
69	Decay Rate [1/d]										
70	Maximum	0.001	N/A	0.0012	0.0011	0.0039	0.0005	N/A			
71	Average	0.0002	N/A	0.0002	0.0002	0.0006	0.0001	N/A			
72	Minimum	0.000	N/A	0.000	0.000	0.000	0.000	N/A			
73											
74	**Time of Stabilization(TOS) and Max Source Conc. Calculations**										
75											
76	Distance to POC [m]	400.0									
77				Source Reduction			Time of Stabilization [years]				
78		RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
79	Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
80	DCP12	5.0	4	4	No Reduction Required						
81	DCP13	0.5	1	0	No Reduction Required						
82	TCP123	0.0	1	4	1	2271.6	75.7	11.4	3528.0	117.6	17.6
83	Chloroform	80.0	4	1	No Reduction Required						
84	DBCP	0.2	4	0	No Reduction Required						
85	Dinoseb	7.0	1	1	No Reduction Required						
86	EDB	0.1	1	0	No Reduction Required						
87											
88	**Time of Remediation(TOR) Calculations**										
89											
90		Mass	Solubility	Molecular							
91	NAPL Component	Fraction[-]	[mg/L]	Wght[g/mole]							
92	DCP12	0.00	0.0	0.0							
93	DCP13	0.00	0.0	0.0							
94	TCP123	0.00	0.0	0.0							
95	Chloroform	0.00	0.0	0.0							
96	DBCP	0.00	0.0	0.0							
97	Dinoseb	0.00	0.0	0.0							
98	EDB	0.00	0.0	0.0							
99											
100	Max Time of Analysis [yr]	25									
101					Removal Plan						
102		SCC	Mass		No Removal						
103		[µg/L]	[kg]		MNA						
105	DCP12	5.0	0		0.0						
108	DCP13	1.0	0		0.0						
111	TCP123	1.0	0		14.7						
114	Chloroform		0								
117	DBCP		0								
120	Dinoseb		0								
123	EDB		0								
125											

Facility Name:	Eco			Length:	meters
Site Name:	B&B			Time:	days
Additional Description:	MNA			Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [m/d]	20.0	7.5	1.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001
Total Porosity [-]		0.48	
Effective Porosity [-]		0.25	
Groundwater Vel. [m/d]	0.08	0.012	0.0

	NAPL Source
NAPL Source Length [m]	78.0
NAPL Source Width [m]	94.0
Contaminated Aquifer Thickness [m]	8.5

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	325.7
Longitudinal Dispersivity [m]	7.67
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.38

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (4/1/2011)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	0.5	0.025	1.7	0.5	0.025	0.28	0.025
WB2-3	100	4.8	0.22	0.72	0.22	0.025	0.2	0.025
PWB-8	172	2.2	0.25	6.5	0.48	0.72	1.	0.025
PWB-5	218	NS	NS	NS	NS	NS	NS	NS
PWB-9	259	1.1	0.25	3.	0.5	0.03	1.2	0.025
WB2-4	293	1.7	0.25	0.079	0.24	0.025	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

	1	2	3	4	5	6	7	8	9	10	11
62	PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.	
63	PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.	
64	WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.	
65											
66	**Attenuation Rates**										
67		DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB			
68	NAC (Single Zone) [1/m]	0.0062	N/A	0.031	0.0007	0.0295	0.0527	N/A			
69	Decay Rate [1/d]										
70	Maximum	0.0005	N/A	0.0031	0.0001	0.0029	0.0059	N/A			
71	Average	0.0001	N/A	0.0005	0.000	0.0004	0.0009	N/A			
72	Minimum	0.000	N/A	0.000	0.000	0.000	0.000	N/A			
73											
74	**Time of Stabilization(TOS) and Max Source Conc. Calculations**										
75											
76	Distance to POC [m]	400.0									
77				Source Reduction			Time of Stabilization [years]				
78		RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
79	Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
80	DCP12	5.0	2	5	No Reduction Required						
81	DCP13	0.5	3	0	No Reduction Required						
82	TCP123	0.0	3	7	6	1058.2	35.3	5.3	1810.8	60.4	9.1
83	Chloroform	80.0	1	1	No Reduction Required						
84	DBCP	0.2	3	1	No Reduction Required						
85	Dinoseb	7.0	5	1	No Reduction Required						
86	EDB	0.1	1	0	No Reduction Required						
87											
88	**Time of Remediation(TOR) Calculations**										
89											
90		Mass	Solubility	Molecular							
91	NAPL Component	Fraction[-]	[mg/L]	Wght[g/mole]							
92	DCP12	0.00	0.0	0.0							
93	DCP13	0.00	0.0	0.0							
94	TCP123	0.00	0.0	0.0							
95	Chloroform	0.00	0.0	0.0							
96	DBCP	0.00	0.0	0.0							
97	Dinoseb	0.00	0.0	0.0							
98	EDB	0.00	0.0	0.0							
99											
100	Max Time of Analysis [yr]	25									
101					Removal Plan						
102		SCC	Mass		No Removal						
103		[µg/L]	[kg]		MNA						
105	DCP12	5.0	0		0.0						
108	DCP13	1.0	0		0.0						
111	TCP123	1.0	0		10.3						
114	Chloroform		0								
117	DBCP		0								
120	Dinoseb		0								
123	EDB		0								
125											

NAS Output 10-1-2011

Facility Name:	Eco	Length:	meters
Site Name:	B&B	Time:	days
Additional Description:	MNA	Mass:	kilograms

Hydrogeologic Data and Contaminant Transport Calculations

	Maximum	Average	Minimum
Hydr. Conductivity [m/d]	20.0	7.5	1.0
Hydraulic Gradient [m/m]	0.001	0.0004	0.0001
Total Porosity [-]		0.48	
Effective Porosity [-]		0.25	
Groundwater Vel. [m/d]	0.08	0.012	0.0

	NAPL Source
NAPL Source Length [m]	78.0
NAPL Source Width [m]	94.0
Contaminated Aquifer Thickness [m]	8.5

Contaminant Source Specifications

Source Component	Conc Profile	NAPL Constituent
DCP12	True	False
DCP13	True	False
TCP123	True	False
Chloroform	True	False
DBCP	True	False
Dinoseb	True	False
EDB	True	False

Dispersion Parameters

Estimated Plume Length [m]	261.4
Longitudinal Dispersivity [m]	6.99
Dispersivity Ratio [-]	20.0
Transverse Dispersivity [m]	0.35

Sorption Parameters

Fraction Org. Carbon [-]

Maximum	0.00
Average	0.00
Minimum	0.00

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
Koc [L/kg]	58.88	125.05	389.05	46.77	169.82	1202.86	53.7
Retardation Factor [-]							
Maximum	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Average	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Minimum	1.0	1.0	1.0	1.0	1.0	1.0	1.0

Contaminant Concentration Profiles (10/1/2011)

Well Name	Distance [m]	DCP12 [µg/L]	DCP13 [µg/L]	TCP123 [µg/L]	Chloroform [µg/L]	DBCP [µg/L]	Dinoseb [µg/L]	EDB [µg/L]
WB2-1	0	0.67	0.025	1.5	0.5	0.003	0.2	0.025
WB2-3	100	3.6	0.23	1.1	0.52	0.003	0.2	0.025
PWB-8	172	1.7	0.025	7.7	0.46	0.41	1.2	0.025
PWB-5	218	3.5	0.025	20.	0.48	0.68	7.	0.025
PWB-9	259	1.8	0.025	4.7	0.22	0.046	1.4	0.025
WB2-4	293	24.	1.	61.	0.5	0.003	0.2	0.025

Redox Indicator Concentration Profiles (9/13/2011)

Well Name	Distance [m]	Oxygen [mg/L]	Nitrate [mg/L]	Iron(II) [mg/L]	Sulfate [mg/L]	Sulfide [mg/L]	Methane [mg/L]	Hydrogen [nM]	Redox Condition
WB2-1	0	NS	28.1	BD	143.	BD	BD	BD	SO4/CO2-red.
WB2-3	100	NS	2.7	BD	90.7	BD	4.5	BD	SO4/CO2-red.
PWB-8	172	NS	29.7	BD	168.	BD	BD	BD	SO4/CO2-red.

PWB-9	259	NS	30.5	BD	53.1	BD	BD	BD	SO4/CO2-red.	
PWB-5	218	NS	52.2	BD	82.9	BD	1.	BD	SO4/CO2-red.	
WB2-4	270	NS	10.5	BD	45.1	BD	BD	BD	SO4/CO2-red.	

Attenuation Rates

	DCP12	DCP13	TCP123	Chloroform	DBCP	Dinoseb	EDB
NAC (Single Zone) [1/m]	N/A	N/A	N/A	0.0019	0.0721	0.0471	N/A
Decay Rate [1/d]							
Maximum	N/A	N/A	N/A	0.0002	0.0087	0.005	N/A
Average	N/A	N/A	N/A	0.000	0.0013	0.0008	N/A
Minimum	N/A	N/A	N/A	0.000	0.000	0.000	N/A

Time of Stabilization(TOS) and Max Source Conc. Calculations

Distance to POC [m] 400.0

			Source Reduction		Time of Stabilization [years]					
	RCC		Conc [µg/L]			Breakthrough Time			Time to Equilibrium	
Contaminant	[µg/L]	Well	Current	Target	Maximum	Average	Minimum	Maximum	Average	Minimum
DCP12	5.0	6	24							
DCP13	0.5	6	1							
TCP123	0.0	6	61							
Chloroform	80.0	2	1	No Reduction Required						
DBCP	0.2	4	1	No Reduction Required						
Dinoseb	7.0	4	7	No Reduction Required						
EDB	0.1	1	0	No Reduction Required						

Time of Remediation(TOR) Calculations

NAPL Component	Mass Fraction[-]	Solubility [mg/L]	Molecular Wght[g/mole]
DCP12	0.00	0.0	0.0
DCP13	0.00	0.0	0.0
TCP123	0.00	0.0	0.0
Chloroform	0.00	0.0	0.0
DBCP	0.00	0.0	0.0
Dinoseb	0.00	0.0	0.0
EDB	0.00	0.0	0.0

Max Time of Analysis [yr] 25

	SCC	Mass		Removal Plan
				No Removal
	[µg/L]	[kg]		MNA
DCP12	5.0	0		23.1
DCP13	1.0	0		0.0
TCP123	1.0	0		25+
Chloroform		0		
DBCP		0		
Dinoseb		0		
EDB		0		

APPENDIX E

TREND ANALYSIS RESULTS

TREND ANALYSIS DATA SHEET
Brown Bryant Superfund Site, Arvin, CA

Well No.:	AR-1		AMW-3R		AMW-4R			WB2-1					WB2-2				
Chemical:	1,2-DCP	1,2,3-TCP	1,2-DCP	1,2,3-TCP	1,2-DCP	1,2,3-TCP	DBCP	1,2-DCP	1,2,3-TCP	Chloroform	Dinoseb	DBCP	1,2-DCP	1,2,3-TCP	Chloroform	Dinoseb	DBCP
Sample Date	µg/L		µg/L		µg/L			µg/L					µg/L				
02/02	1.50	0.56	1.60	0.36	36.0	1.20	0.08	86.0	330	2.00	32.0	0.34	2.80	0.75	0.5	0.2	0.04
05/02	1.30	0.44	1.90	0.38	2.00	0.27	0.02	87.0	320	1.90	45.0	0.08	0.83	0.17	0.5	0.2	0.025
07/02	1.00	0.025	2.60	0.31	3.20	0.30	0.02	110	330	2.00	69.0	0.09	1.20	0.58	0.5	0.2	0.10
10/02	1.00	0.34	2.00	0.36	2.50	0.38	0.02	120	480	2.00		0.08	5.20	8.50	0.15		1.20
02/03	1.30	0.54	1.30	0.34	4.50	0.025	0.01	88.0	280	1.40	78.0	0.025	7.00	21.0	0.18	2.90	3.00
05/03	1.30	0.49	1.70	0.43	3.50	0.025	0.025	64.0	240	1.80	39.0	0.04	19.0	44.0	0.60	6.50	6.70
08/03	0.93	0.37	2.10	0.60	0.5	0.025	0.025	53.0	250	3.40	58.0	2.10	18.0	42.0	0.46	5.80	4.90
01/04	1.10	0.70	1.20	0.39	1.70	0.67	0.025	38.0	140	2.70	28.0	0.04	17.0	40.0	0.70	4.60	4.70
08/07	0.5	0.025	1.30	0.025	<1.0	0.025	0.01	22.0	110	0.90	39.0	0.01	20.0	58.0	0.65	10	4.80
04/08	0.47	0.41	0.41	0.35	7.20	0.80	0.025	1.50	23.0	0.5	5.40	0.05	20.0	48.0	0.64	6.50	5.00
04/09	0.5	0.18	0.5	0.23	2.50	0.41	0.04	1.90	4.30	0.5	0.62	0.025	11.0	40.0	0.50	12.0	3.10
04/11	0.5	0.11	0.31	0.21	0.68	0.34	0.025	1.00	1.70	0.5	0.28	0.025	10	35.0	0.53	4.30	1.50
10/11	0.5	0.13	0.22	0.20	65.0	0.36	0.025	0.67	1.50	0.5	0.2	0.025	1.30	12.0	0.5	1.70	0.56

TREND ANALYSIS DATA SHEET
Brown Bryant Superfund Site, Arvin, CA

Well No.:	WB2-3			WB2-4		PWB-1		PWB-2			PWB-3			PWB-4				
Chemical:	1,2-DCP	1,2,3-TCP	Chloroform	1,2-DCP	1,2,3-TCP	1,2-DCP	1,2,3-TCP	1,2-DCP	1,2,3-TCP	Chloroform	1,2-DCP	1,2,3-TCP	DBCP	1,2-DCP	1,2,3-TCP	Chloroform	Dinoseb	DBCP
Sample Date	µg/L			µg/L		µg/L		µg/L			µg/L			µg/L				
02/02	3.50	0.29	11.0	0.5	0.20	1.10	0.33	2.20	0.025	4.10	2.50	1.40	0.13	50.0	160	1.50	15.0	31.0
05/02	3.90	0.22	9.40	0.5	0.025	1.10	0.40	2.90	0.025	4.70	3.00	6.10	1.20	37.0	130	1.50	19.0	32.0
07/02	4.20	0.025	9.90	0.5	0.025	1.10	1.30	4.10	0.025	7.20	3.40	7.20	1.20	74.0	200	1.60	21.0	29.0
10/02	4.00	0.025	6.50	0.5	0.025	2.20	1.30	1.30	0.025	1.70	3.10	6.20	1.30	80.0	210	2.00		44.0
02/03	4.30	0.025	5.10	0.22	0.025	1.10	0.48	6.80	0.025	6.80	0.69	0.64	0.09	64.0	200	1.50	39.0	40.0
05/03	2.20	0.025	2.10	0.5	0.025	0.77	0.35	8.10	0.025	6.70	0.54	1.00	0.04	72.0	220	1.60	33.0	36.0
08/03	<1.0	0.025	1.70	0.34	0.025	1.00	0.31	11.0	0.025	7.60	0.5	0.025	0.06	110	350	2.10	61.0	41.0
01/04	2.10	0.025	1.20	0.31	0.025	0.62	0.025	16.0	0.025	9.80	0.44	0.53	0.025	80.0	290	5.10	36.0	16.0
08/07	0.52	0.025	0.5	1.10	0.025	0.5	0.025	21.0	0.48	9.20	0.68	0.46	0.03	47.0	340	4.10	50.0	2.60
04/08	2.00	0.04	0.5	1.20	0.04	0.79	0.37	26.0	0.20	9.50	0.5	0.32	0.04	31.0	140	2.10	30.0	3.10
04/09	0.85	0.08	0.5	1.80	0.07	0.5	0.28	18.0	0.22	5.70	0.43	0.27	0.01	16.0	70.0	1.20	9.00	4.10
04/11	4.80	0.72	0.22	1.70	0.08	0.37	0.17	21.0	0.25	5.00	0.34	0.25	0.025	4.20	19.0	0.35	2.00	0.37
10/11	3.60	1.10	0.52	1.40	0.08	0.27	0.13	19.0	2.10	5.00	0.27	0.24	0.025	3.40	12.0	0.31	1.10	0.25

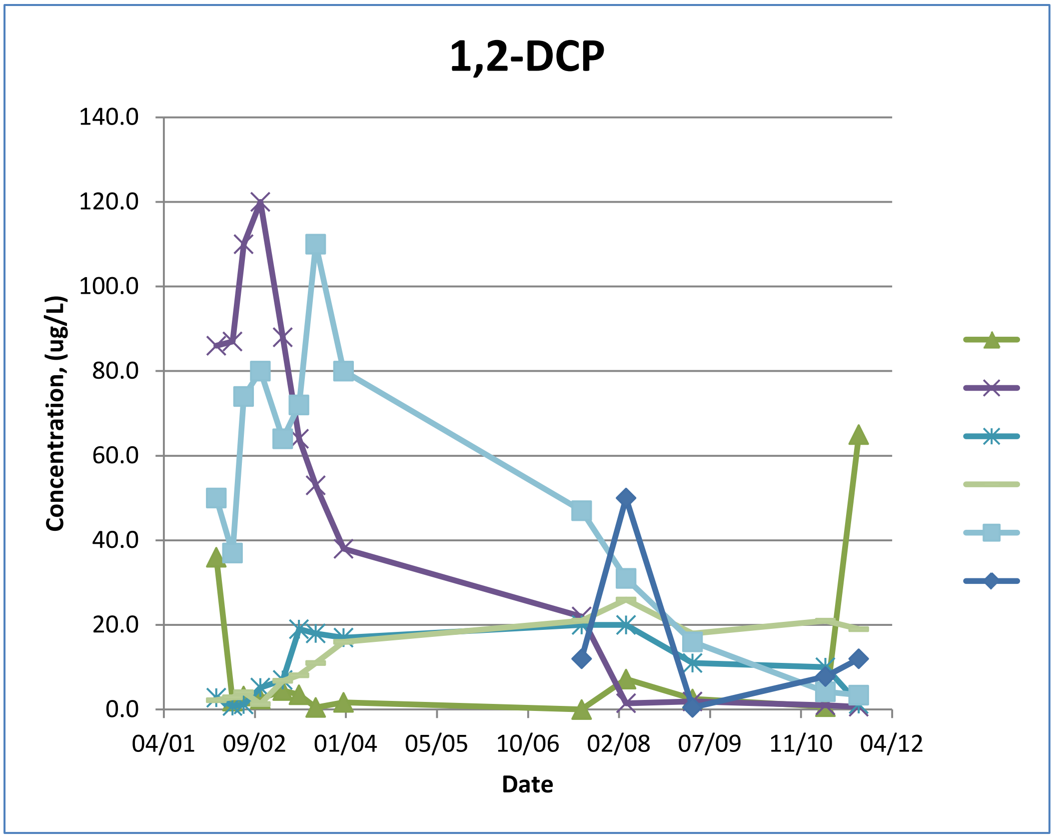
TREND ANALYSIS DATA SHEET
Brown Bryant Superfund Site, Arvin, CA

Well No.:	PWB-5					PWB-7A					PWB-8			PWB-9	PWB-10			
Chemical:	1,2-DCP	1,2,3-TCP	Chloroform	Dinoseb	DBCP	1,2-DCP	1,2,3-TCP	Chloroform	Dinoseb	DBCP	1,2-DCP	1,2,3-TCP	Chloroform	Chloroform	1,2-DCP	1,2,3-TCP	Chloroform	DBCP
Sample Date	µg/L					µg/L					µg/L				µg/L			
02/02	2.50	0.19	0.19	0.2	0.025													
05/02	2.10	0.025	0.20	0.2	0.025													
07/02	0.79	0.025	0.5	0.2	0.025													
10/02	2.30	0.025	0.25		0.025													
02/03	1.90	0.025	0.27	0.2	0.025						4.00	0.73	0.09	2.30	0.20	0.025	4.30	0.025
05/03	2.90	0.025	0.64	0.2	0.025						2.90	0.76	0.09	2.90	0.5	0.025	4.90	0.025
08/03	2.70	0.025	0.41	0.2	0.025						3.60	0.67	0.09	2.90	0.31	0.025	4.60	0.025
01/04	2.70	0.025	0.84	0.2	0.01						2.30	0.26	0.29	2.50	0.30	0.025	5.30	0.025
08/07	4.70	0.025	1.30	0.08	0.06	12.0	37.0	0.44	31.0	24.0	0.95	0.025	0.5	2.20	1.00	0.025	7.20	0.01
04/08	3.70	1.20	0.94	0.03	0.02	50.0	44.0	0.73	37.0	16.0	0.87	0.06	0.19	3.10	5.70	13.0	7.70	5.10
04/09	4.00	2.50	1.30	0.43	0.40	0.5	75.0	0.5	51.0	31.0	1.60	0.025	0.61	0.5	1.70	1.60	0.5	0.18
04/11						7.80	26.0	0.5	0.2	1.30	2.20	6.50	0.48	0.5	0.36	0.33	0.5	0.04
10/11	3.50	20.0	0.48	7.00	0.68	12.0	32.0	0.36	11.0	0.89	1.70	7.70	0.46	0.22	0.37	0.23	0.22	0.02

TREND ANALYSIS DATA SHEET
Brown Bryant Superfund Site, Arvin, CA

Well No.:	PWB-11			PWB-12				
Chemical:	1,2-DCP	1,2,3-TCP	Dinoseb	1,2-DCP	1,2,3-TCP	Chloroform	Dinoseb	DBCP
Sample Date	µg/L			µg/L				
02/02								
05/02								
07/02								
10/02								
02/03								
05/03	0.27	0.18	0.2					
08/03	0.39	0.16	0.2					
01/04	0.5	0.025	0.2					
08/07	0.19	0.025	0.02	6.00	17.0	0.38	9.20	3.30
04/08	0.53	1.20	0.12	4.80	17.0	0.54	9.40	4.00
04/09	1.10	4.00	0.97	5.20	17.0	0.38	16.0	2.10
04/11	0.73	3.30	0.45	4.70	17.0	0.64	25.0	2.90
10/11	0.74	3.30	0.47	5.40	18.0	1.00	24.0	3.10

TREND ANALYSIS CHARTS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100.0
80.0
60.0
40.0
20.0
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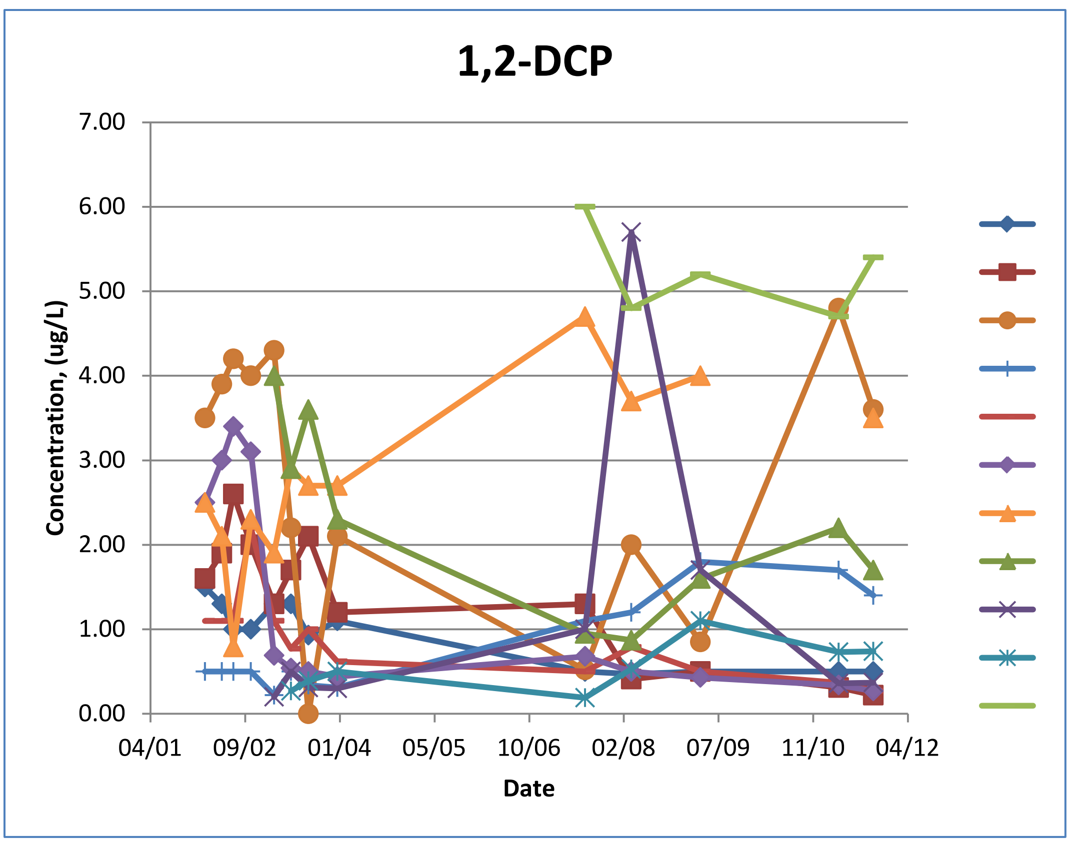
Concentration, (ug/L)
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date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6.00
5.00
4.00
3.00
2.00
1.00
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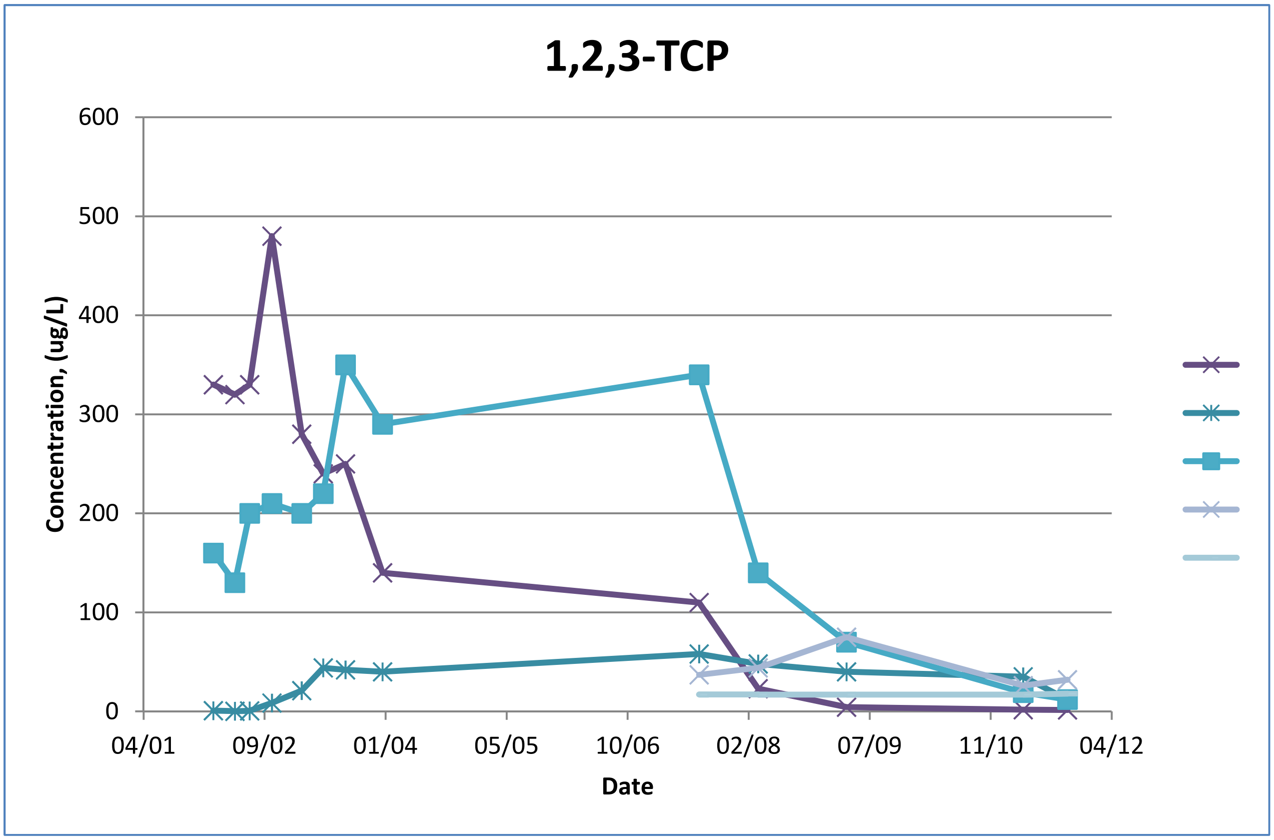
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date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300
200
100
0
Concentration, (ug/L)
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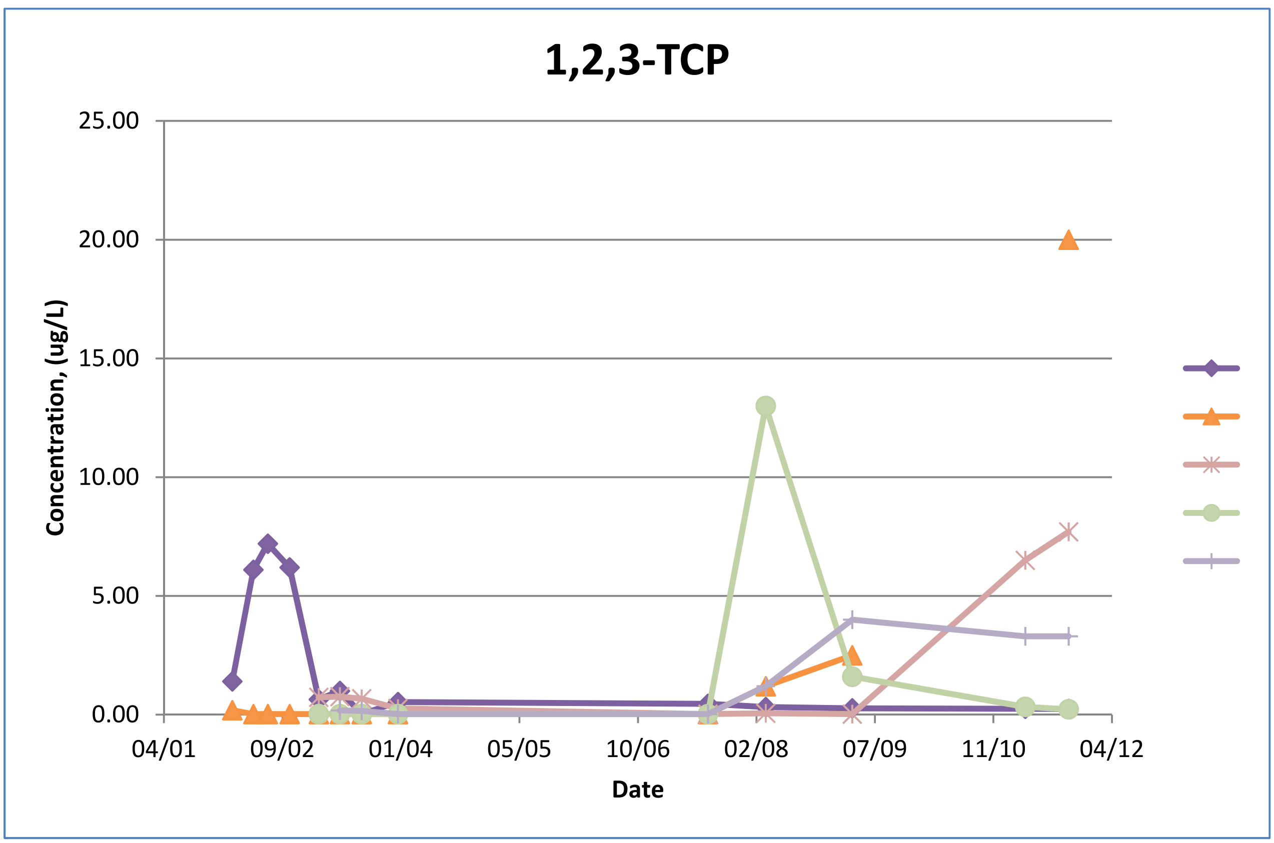
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date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25.00
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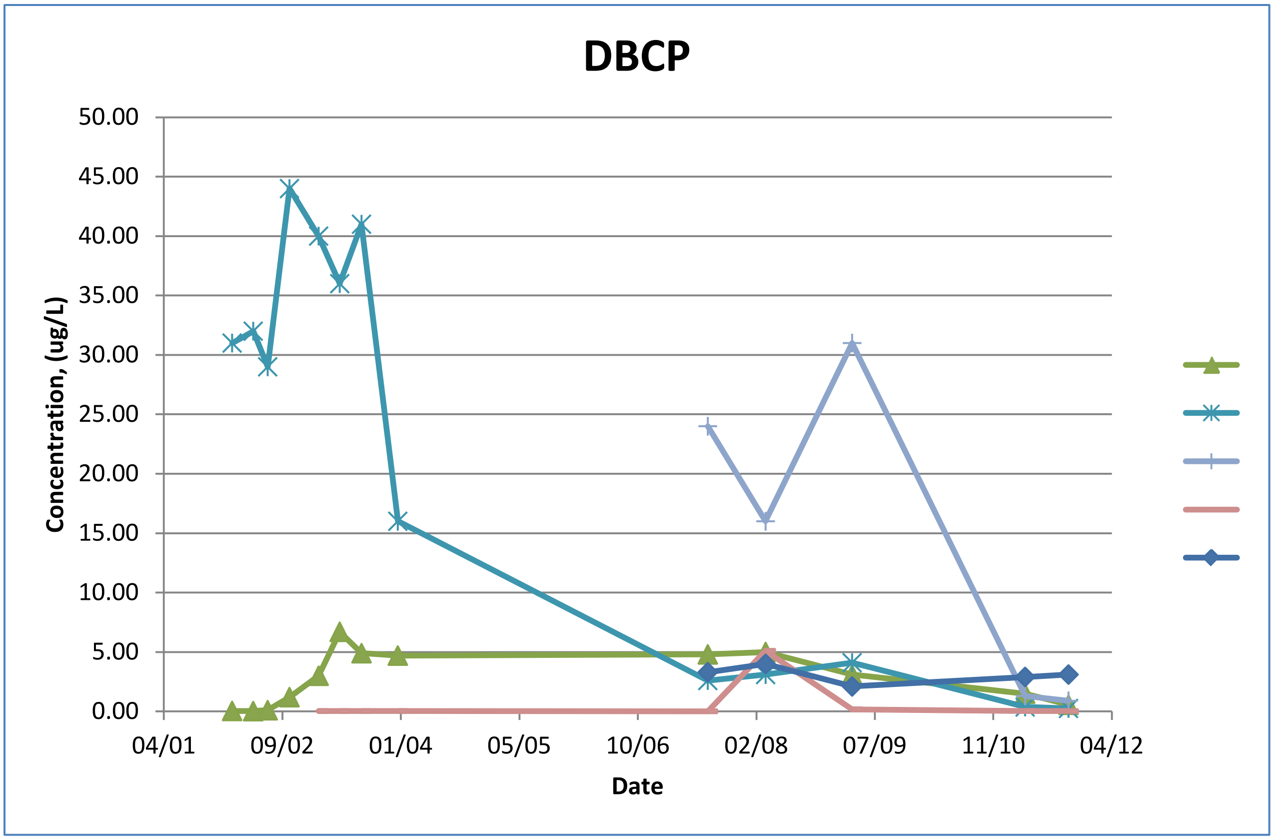
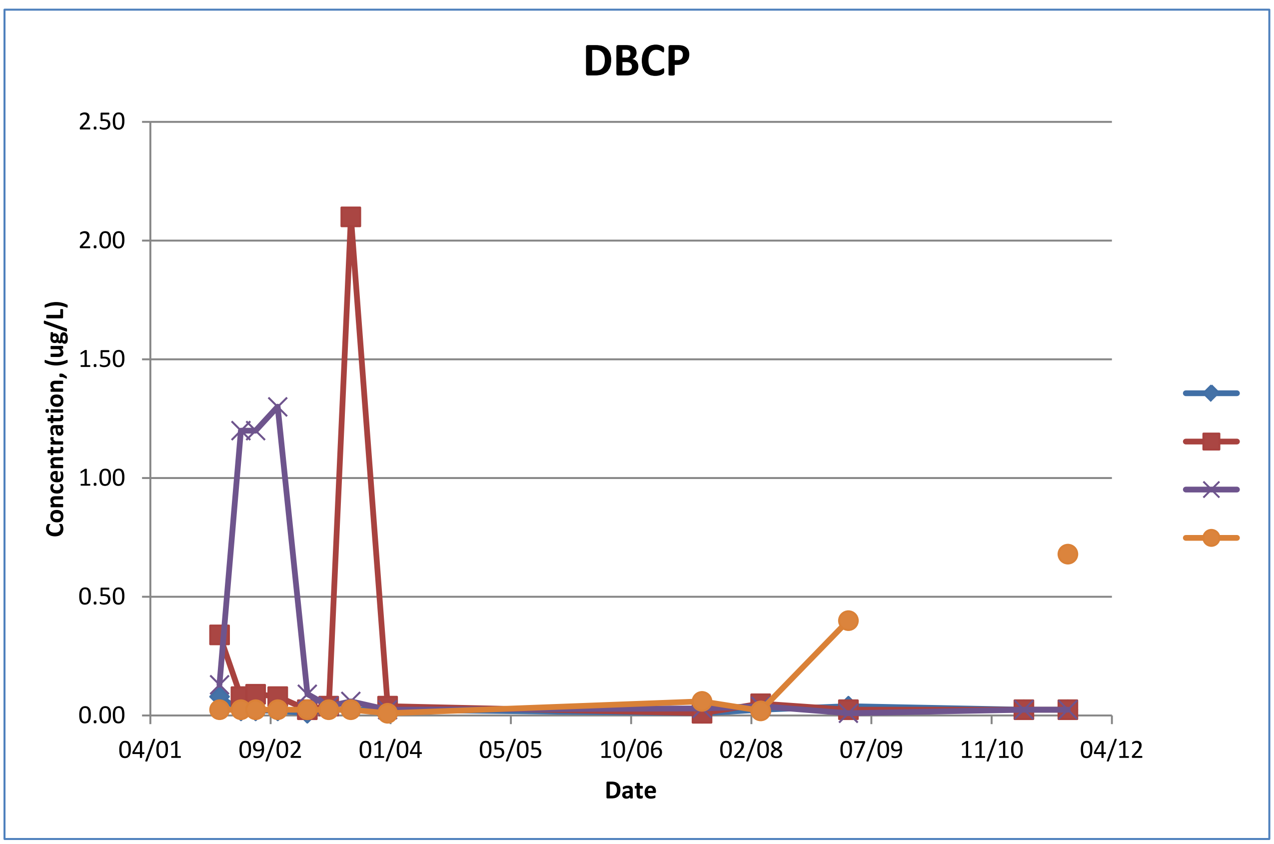
15.00
10.00
5.00
0.00
Concentration, (ug/L)
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date


DBCP
50.00
45.00
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Concentration, (ug/L)
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date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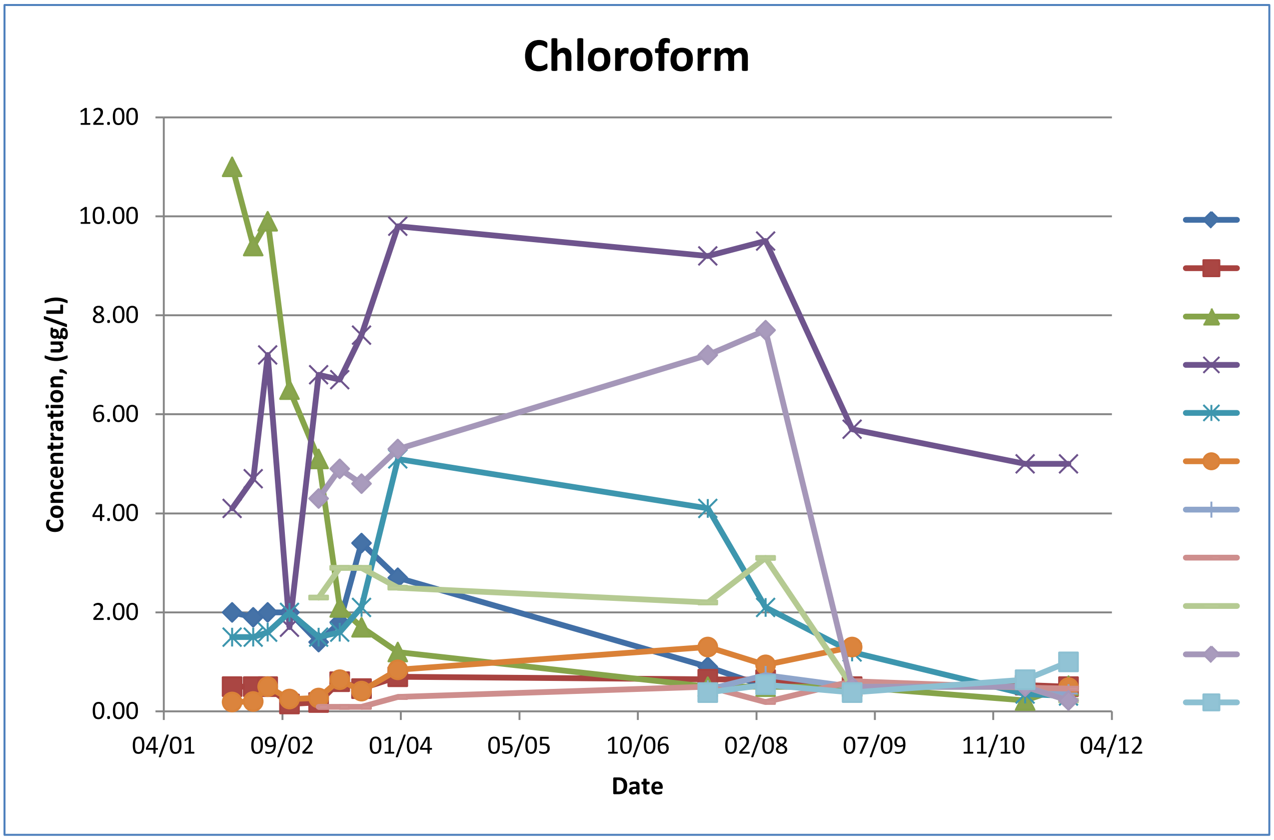
0.00
Concentration, (ug/L)
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date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8.00
6.00
4.00
2.00
0.00
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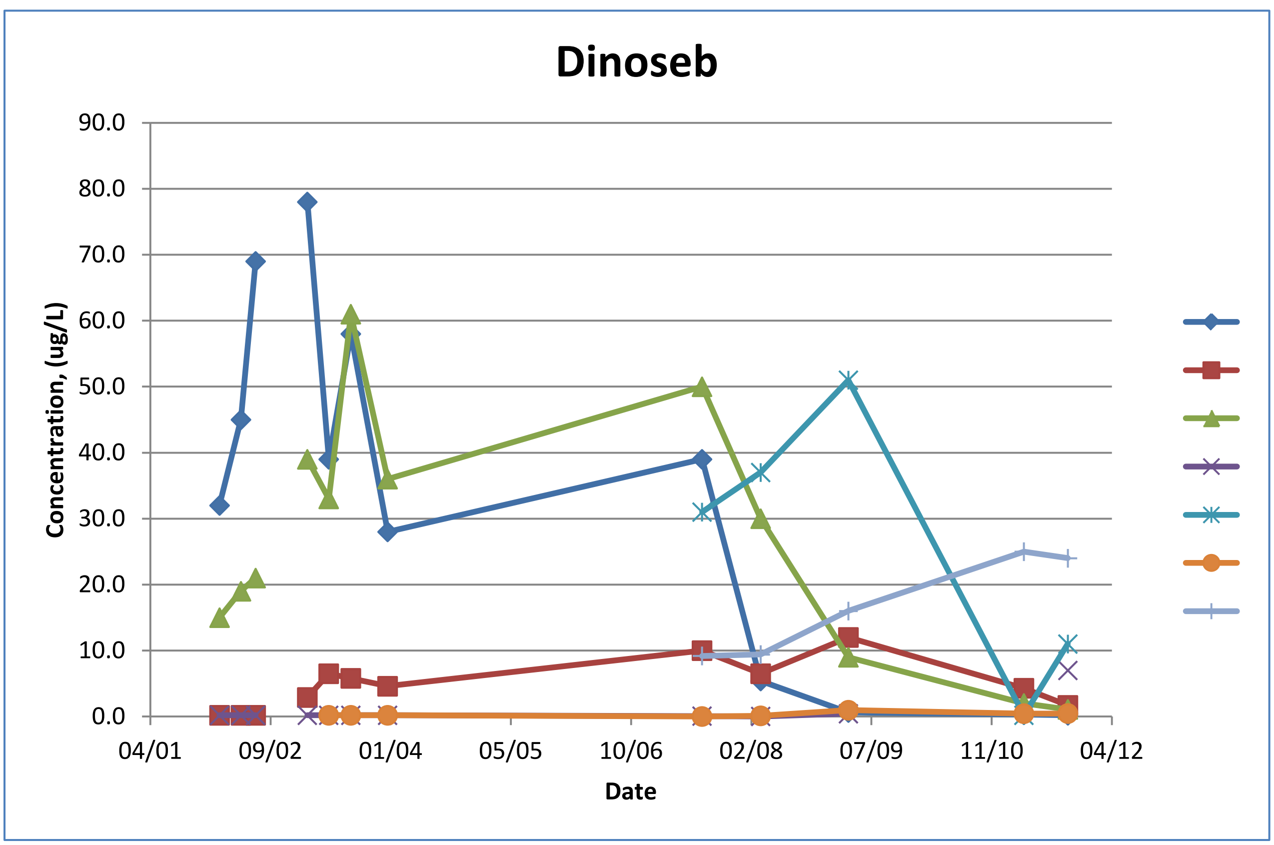
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date


Dinoseb
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
10.0
0.0
Concentration, (ug/L)
04/01
09/02
01/04
05/05
10/06
02/08
07/09
11/10
04/12
Date