Printpack inc.
4335 WENDELL DR., S.W. • ATLANTA, GA 30336-1622 • 404-691-5830
P.O. BOX 43687 • ATLANTA, GA 30378-4201

Ms. Eva Chu, Hazardous Materials Specialist
Alameda County
Environmental Health Services
1131 Harbor Bay Parkway, Suite 250
Alameda, CA 94502-6577

June 5,2001

RE: Groundwater Monitoring & Modeling - 2101 Williams Street

Dear Ms. Chu:

As promised in my recent e-mail, Printpack, Inc. is herein providing Alameda County with a copy of CTEC-ESCM, Inc.'s modeling analysis of the chlorinated plume under the Donald Jones property at 2101 Williams Street. This analysis persuasively demonstrates that the plume is of off-site origin

This analysis includes monitoring data from the March 2001 sampling event that you observed. Printpack has authorized CTEC- ESCM to perform a final sampling event in June 2001. Printpack will provide that data to Alameda County when it is available.

We understand that the Alameda County Health Department may choose to turn this project over to the State instead of closing as previously agreed. If that is the County's decision, please transfer this modeling analysis along with all other applicable files to the appropriate State contact.

I am available to discuss this matter at your convenience. As discussed previously, Printpack Inc.'s position is that future monitoring of whatever nature is the responsibility of the current owner, The Donald L. Jones Company.

Sincerely

Douglas Cook, Director
Environmental Affairs

cc: Mr. August Franchini, Printpack, w/o enclosure
Mr. Edward Shaw, CTEC-ESCM, w/o enclosure

CHLORINATED SOLVENT PLUME REPORT

Don Jones Property
(Formerly Printpack)
2101 Williams Street
Alameda County
San Leandro, California

May 2001

Prepared for:

Alameda County Health Care Services Agency
Department of Environmental Health
1131 Harbor Bay Parkway, Suite 250
Alameda, California 94502-6577

and

Printpack, Inc.
4335 Wendell Drive, S.W.
Atlanta, Georgia 30336

Prepared by:

CTEC-ESCM, INC.
P.O. BOX 271
PINELLAS PARK, FL
May 25, 2001

TABLE OF CONTENTS

Chlorinated Solvent Plume Report
Printpack, Inc., Facility, 2101 Williams Street
Alameda County, San Leandro, California
May 25, 2001

I. INTRODUCTION

CTEC-ESCM, Inc. was commissioned by Printpack, Inc. to conduct environmental remediation work at their San Leandro, California facility. Printpack sold the facility to Don Jones Company in 2000. The facility is located at 2101 Williams Street, Alameda County, San Leandro, California (Figure 1). The facility was previously owned by the James River Corporation.

Previously submitted sampling data and reports have documented that there are no environmental risks associated with the constituents of concern previously identified for this site. (i.e., BTEX, MIBK, and acetone) The Alameda County Health Care Services Agency Department of Environmental Health identified an offsite release of chlorinated solvents (i.e., Tetrachloroethene and Trichloroethene) up gradient of the facility and determined that the groundwater beneath the Don Jones property should also be tested for these constituents. Two quarterly rounds of groundwater sampling have confirmed the presence of tetrachloroethene and its degraded daughter compounds trichloroethene and 1,2-cis, dichloroethene in the groundwater beneath the facility. The Alameda County Health Care Services Agency Department of Environmental Health has indicated that they require proof that the dissolved chlorinated solvents are not originating from a release from the Don Jones property and have previously suggested that a chlorinated solvent release may have occurred from the old tankpit area adjacent to monitor well, W-8. This report provides proof that the release occurred off-site, up-gradient of the facility and that no chlorinated solvent releases from the Don Jones property have contributed (or are contributing) to the dissolved chlorinated solvent plume beneath the property. (See Figure 2 for facility layout with monitor well locations).

II. HYDRO-GEOLOGICAL CONSIDERATIONS:

Geologic and Hydro-geologic maps of Alameda and the surrounding counties were obtained from the U.S. Department of the Interior, U.S. Geologic Survey internet web page. (See Figures 3, 4, and 5). The Don Jones property is located in the Niles Subarea of the Fremont Ground Water Area in the South Bay Ground Water Basin. According to the State of California Department of Water Resources (i.e., Bulletin No. 118-12) there is no usable groundwater in the vicinity of the Don Jones property. The Hayward fault provides an effective barrier to groundwater movement between the productive areas east of the fault and the non-productive silty-clay aluvium sands west of the fault in the Niles Subarea. Near the eastern extremity of the subarea, in the vicinity of Niles, the aluvium is mostly gravel and quite conducive to water withdrawal. Grain size decreases and intervening clay beds increase with westwardly movement which results in a sharp reduction in the overall transmissivity of the alluvium near San Francisco Bay.

The characteristics of the groundwater aquifer beneath the facility were determined by conducting slug test in monitor well, TW-2, on January 22, 1997. Two rising head and one falling head slug tests were conducted. The data indicated that the average hydraulic conductivity of the aquifer beneath this site is 3.39×10^{-3} cm/sec (9.62 ft/day) with a hydraulic gradient across the site of approximately 0.0045. (See Appendix A). The laboratory reported that the average soil porosity is 0.398, and the effective porosity was estimated at 0.35. An average groundwater seepage velocity of 45.1 feet per year was calculated using hydraulic conductivity, effective porosity, and the groundwater gradient. The groundwater gradient for the site (See Figure 6) has consistently remained westwardly during all groundwater sampling events. The well log data for the most recent groundwater sampling is provided in Appendix B in regards to the groundwater gradient.

III. CHLORINATED CONSTITUENTS OF CONCERN

A drawing (Figure7) has been constructed which depicts groundwater sampling data for the Don Jones property and for the up-gradient Watkins Terminal (Now Blue Water Services) property. The drawing shows concentrations of tetrachloroethene (PCE), trichloroethene (TCE) 1,2, cis-dichloroethene (DCE) and vinyl chloride (VC) detected in the groundwater during various sampling events from October 1995 through March 2001.

A partial copy of a report titled "Preliminary Investigation Watkins Terminals, Inc." prepared by Atlantic Geoscience, Inc., and dated February 24, 1997, is included in Appendix C. This reports depicts the presence of significant concentrations of PCE and TCE on the immediately up-gradient Watkins Terminal property. A report titled "Quarterly Groundwater Sampling and Analysis for Blue Water Services, Inc" [formerly Watkins Terminal], prepared by basics Environmental, dated April 5, 2001, is included in Appendix D. This report provides a brief chronology of groundwater sampling activities at the Watkins Terminal (Now Blue Water Services) property. Both Atlantic Geoscience and basics Environmental concluded that a chlorinated solvent release had occurred on the up-gradient (i.e., Watkins Terminal) property in the vicinity of the Watkins Terminal monitor well MW-10 (identified as WT-MW-10 in this report). Basic Geosiciences report describes that nineteen(19) passive vapor extraction wells have been placed upon the Watkins Terminal property and concludes that the PCE has either naturally degraded in the surface soils or that the chlorinated constituents have sunk through the subsurface.

Tetrachlorethene (molecular formula C_2Cl_4) reductively dechlorinates under anaerobic conditions to trichloroethene (moleclar formula C_2HCl_3). Trichloroethene reductive dechlorinates anaerobically to cis-1,2,dichloroethene ($C_2H_2Cl_2$)which in turn reductively dechlorinates anaerobically to vinyl

chloride (C_2H_3Cl) and then on to ethene (C_2H_4). The literature suggests that the anaerobic biodegradation half-life of PCE is 34 to 230 days, the anaerobic biodegradation half-life of TCE is 32 to 230 days, the anaerobic biodegradation half-life of cis-1,2 DCE is 88 to 339 days, and the anaerobic biodegradation half-life of vinyl chloride is 60 days. Conversely the literature suggests that the abiotic hydrolysis dehydrohalogenation half-life of these same constituents is 380,000,000 years, 490,000 years, 8,500,000,000 years, and 10 years respectively.

The collected data clearly depicts that reductive dehalogenation has occurred and is occurring. The TCE, DCE, and VC constituents detected in the down-gradient monitor wells clearly show that anaerobic reductive degradation is occuring. The data coupled with computer models (See Appendices E, F, and G) prove conclusivley that not only is anaerobic reductive dehalogenation occurring, but shows that it is occurring as the plume moves down-gradeint from the Watkins Terminal property onto the Don Jones property.

- FATE AND TRANSPORT MODEL -

Biochlor is a model that simulates the anaerobic reductive dehalogenation of chlorinated solvents.. Biochlor is published by the U.S. Environmental Protection Agency. (EPA/600/R-00/008)

Biochlor was used to run models of the anaerobic reductive dehalogenation of PCE from the Watkins Terminal as it crossed onto the Don Jones property. Three models were selected to present in conjunction with this report. One shows the concentrations of the chemicals of concern on the Watkins Terminal property in November 1998 and shows what types of concentrations would be expected down gradient on the Don Jones property in November 2000. Another Model shows the

concentrations of the chemicals of concern on the Watkins Terminal property in May 2000 and shows what types of concentrations would be expected down gradient on the Don Jones property in March 2001. A third Biochlor model was run to show what type of concentrations could be expected down-gradient from monitor well TW-1 since the solvents are 100% soluble in the non-hazardous food grade oil that was released in the vicinity of TW-1 and will not anaerobically degrade while dissolved into the oil matrix.

A. BIOCHLOR MODEL DISCUSSION

Biochlor is based upon the Domenico analytical solute transport model and has the ability to simulate one dimension advection, three dimension dispersion, linear adsorption, and biotransformation via anaerobic reductive dechlorination. Anaerobic reductive dechlorination is assumed to follow a sequential first-order decay process. Biochlor includes three model types:

I. Solute transport without decay

II. Solute transport with biotransformation as a sequential first-order decay process

III. Solute transport with biotransformation as a sequential first-order decay process with two different reaction zones. (There is no evidence that two differing reaction zones are occurring on this plume - thus this part of the model was not used.)

Domenico developed a semi-analytical solution for reactive transport with first-order decay in a two dimensional geometry in 1987. Biochlor uses this Domenico solution with improvements by Martin-Hyden and Robins (1997). Biochlor evaluates conter line concentrations and assumes reactions occur

only in the aqueous phase. The model equation, boundary conditions, assumptions, and limitations are shown as:

$$C(x,y,z,t) = [C_0/8]f_x f_y f_z$$

Where:

$$f_x = \exp\left\{\frac{x[1-(1+4\lambda\acute{\alpha}_x/\acute{\upsilon}_x)^{0.5}]}{2\acute{\alpha}_x}\right\} * \operatorname{erfc}\left\{\frac{x-\acute{\upsilon}t(1+4\lambda\acute{\alpha}_x/\acute{\upsilon}_x)^{0.5}}{2(\acute{\alpha}_x\acute{\upsilon}t)^{0.5}}\right\} + \exp\left\{\frac{x[1-(1+4\lambda\acute{\alpha}_x/\acute{\upsilon}_x)^{0.5}]}{2\acute{\alpha}_x}\right\} * \operatorname{erfc}\left\{\frac{x-\acute{\upsilon}t(1+4\lambda\acute{\alpha}_x/\acute{\upsilon}_x)^{0.5}}{2(\acute{\alpha}_x\acute{\upsilon}t)^{0.5}}\right\}$$

$$f_y = \operatorname{erf}\left\{\frac{(y+Y/2)}{2(\acute{\alpha}_y x)^{0.5}}\right\} - \operatorname{erf}\left\{\frac{(y+Y/2)}{2(\acute{\alpha}_y x)^{0.5}}\right\} \qquad f_z = \operatorname{erf}\left\{\frac{z+Z}{2(\acute{\alpha}_z x)^{0.5}}\right\} - \operatorname{erf}\left\{\frac{z+Z}{2(\acute{\alpha}_z x)^{0.5}}\right\}$$

Definitions:

$C(x,y,z,t)$	Concentration at distance x downstream of source and distance y off centerline of plume at time r (mg/L)
C_0	Concentration in source Area at t=0 (mg/L)
x	Distance down-gradient of source (ft)
y	Distance from plume centerline of source (ft)
z	Distance from top of saturated zone to measurement point
$\acute{\alpha}_x$	Longitudinal groundwater dispersivity (ft)
$\acute{\alpha}_y$	Transverse groundwater dispersivity (ft)
$\acute{\alpha}_z$	Vertical groundwater dispsersivity (ft)

Definitions: (Continued)

ύ	Chemical Velocity (ft/yr)
$ύ_s$	Seepage Velocity (ft/yr)
λ	First-order degradation coefficient
Y	Source Width (ft)
Z	Source Depth (ft)

Biochlor solves a set of coupled partial differential equations to describe the reactive transport of chlorinated solvent species, such as PCE, TCE, DCE, VC, and ETH, in saturated groundwater systems. The equations describe one dimensional advection, three dimensional dispersion, linear sorption, and sequential, first-order biotransformation. All equations, except the first, are coupled to a parent species equation through the reaction term as shown below:

$$R_1(\partial c_1/\partial t) = D_x[(\partial^2 c_1/\partial x^2)] + D_y[(\partial^2 c_1/\partial y^2)] + D_z[(\partial^2 c_1/\partial z^2)] - v_s(\partial c_1/\partial x) - k_1 c_1$$

$$R_2(\partial c_2/\partial t) = D_x[(\partial^2 c_2/\partial x^2)] + D_y[(\partial^2 c_2/\partial y^2)] + D_z[(\partial^2 c_2/\partial z^2)] - v_s(\partial c_2/\partial x) - k_2 c_2 + y_1 k_1 c_1$$

$$R_3(\partial c_3/\partial t) = D_x[(\partial^2 c_3/\partial x^2)] + D_y[(\partial^2 c_3/\partial y^2)] + D_z[(\partial^2 c_3/\partial z^2)] - v_s(\partial c_3/\partial x) - k_3 c_3 + y_2 k_2 c_2$$

$$R_4(\partial c_4/\partial t) = D_x[(\partial^2 c_4/\partial x^2)] + D_y[(\partial^2 c_4/\partial y^2)] + D_z[(\partial^2 c_4/\partial z^2)] - v_s(\partial c_4/\partial x) - k_4 c_4 + y_3 k_3 c_3$$

$$R_5(\partial c_2/\partial t) = D_x[(\partial^2 c_5/\partial x^2)] + D_y[(\partial^2 c_5/\partial y^2)] + D_z[(\partial^2 c_5/\partial z^2)] - v_s(\partial c_5/\partial x) - k_5 c_5 + y_4 k_4 c_4$$

where c_1, c_2, c_3, c_4, and c_5 are concentrations of PCE, TCE, DCE, VC, AND ETH respectively in mg/L. D_x, D_y, and D_z are the hydrodynamic dispersion coefficients [ft^2/yr]. k is the first-order degradation coefficient. y is a yield coefficient (i.e., y would represent the mg of TCE produced per unit of PCE destroyed annually). R_1, R_2, R_3, R_4, and R_5, are respective retardation factors.

What concentrations are used at Watkins Terminal

4,600 ppb PCE

120 ppb TCE

Since the last five equations are coupled equations, the Dominico solution cannot be used to solve them. Therefor, transformation equations are used by Biochlor to uncouple and solve the equations. The transformation equations used are:

$$a_2 = c_2 + (y_1 k_1/[k_1-k_2])c_1$$

$$a_3 = c_3 + (y_2 k_2/[k_2-k_3])c_3 + \{c_1\}\{(y_1 y_2 k_1 k^2)/[(k_1-k_3)(k_2-k_3)]\}$$

$$a_4 = c_4 + (y_3 k_3/[k_3-k_4])c_3 + \{c_2\}\{(y_2 y_3 k_2 k_3)/[(k_2-k_4)(k_3-k_4)]\} + \{c_1\}\{[y_1 y_2 y_3 k_2 k_3 k_4]/(k_1-k_4)(k_2-k_4)(k_3-k_4)\}$$

$$a_5 = c_5 + (y_4 k_4/[k_4-k_5])c_4 + \{c_3\}\{(y_3 y_4 k_3 k_4)/[(k_3-k_5)(k_4-k_5)]\} + \{c_2\}\{[y_2 y_3 y_4 k_2 k_3 k_4]/(k_2-k_5)(k_3-k_5)(k_4-k_5)\} + \{c_1\}\{[y\, y_1 y_2 y_3 y_4 k_1 k_2 k_3 k_4]/(k_1-k_5)(k_2-k_5)(k_3-k_5)(k_4-k_5)\}$$

A computer makes these calculations much faster than they can be completed manually. Biochlor performs this task.

B. THE NOVEMBER 1998 MODEL

The November 1998 model uses the concentrations of PCE and TCE present on the Watkins Terminal site in November 1998 and runs a two year model projection to compare with downgradient concentrations detected on the Don Jones property in November 2000. The model projects that the PCE concentration at 400 feet downgradient will be "non-detect". At 380 feet downgradient (W-10) the PCE concentration is 0.1 mg/L. The model projects that the TCE concentration at 300 feet down

gradient will be "non-detect". At 380 feet downgradient (W-10) the TCE concentration is 0.071 mg/L. The model projects the TCE concentration at 240 feet downgradient to be 0.01 mg/L; the concentration at approximately 300 feet downgradient (W-6) is 0.11mg/L. This model coupled with the TCE, DCE, and VC daughter copmpounds detected in the downgradient monitor wells over time (See Figure 6) clearly depict that the chlorinated solvent plume originates off site and has migrated over several years onto the Don Jones property. (See Appendix E)

An additional model was run using the seepage velocity used by the Watkins Terminal consultants (i.e., 65 ft/year) The results of this run appear to be better correlated to the actual samples collected from the field. (See Appendix F)

D. THE MAY 2000 MODEL

The May 2000 model uses the concentrations of PCE and TCE present on the Watkins Terminal site in May 2000 and runs a one year model projection to compare with downgradient concentrations detected on the Don Jones property in March 2001. The model projects that the PCE concentration at 240 feet downgradient will be "non-detect". At 200 feet downgradient (WT-MW-16) the PCE concentration is 0.24 mg/L. The model projects that the TCE concentration at 240 feet downgradient will be "non-detect". At 200 feet downgradient (WT-MW-16) the TCE concentration is "non-detect". If strictly dispersion were affecting the concentrations (i.e., no bio-degredation) then TCE would be "non-detect at approximately 170 feet down-gradient. At one hundred feet downgradient, the TCE should be detected in concentrations of approximately 0.008mg/L or less; however in WT-MW-15 (approximately 100 feet down-gradient) the concentrations of TCE were detected at 0.016 mg/L. This projection shows a PCE concentration of 0.2 mg/L at 100 feet down-gradient; the field reading is 0.24

If PCE at W10, 380 feet from source at Watkins, is projected to ~~should be~~ ~~at~~ near ND (actually at 100 ppb in Dec 2000), how do you ~~assume~~ account for ~~23~~00 ppb PCE in TW-1? In 1995, there was 3,700 ppb PCE in W-5, upgradient of TW-1 - could this be a release from use of RR trackers?

This model assumes 5,000 ppb PCE in TW-1, dissolved in oil.

mg/L. Again, this model coupled with the TCE, DCE, and VC daughter copmpounds detected in the down gradient monitor wells over time (See Figure 6) clearly depict that the chlorinated solvent plume originates off site and has migrated over several years onto the Don Jones property. (Appendix E)

An additional model was run using the seepage velocity used by the Watkins Terminal consultants (i.e., 65 ft/year) The results of this run appear to be better correlated to the actual samples collected from the field. The predicted PCE concentration at 160 feet down gradient is 0.027 mg/L while the field measured concentration is 0.10 mg/L at 150 feet down gradient. The predicted TCE concentration at 160 feet down gradient is 0.026 mg/L while the field measured concentration is 0.071 mg/L at 150 feet down gradient. Again this shows that the chlorinated plume originates from an up-gradient, off site source and is migrating onto the Don Jones property. (See Appendix F)

D. THE TW-1 (oil) MODEL

This model was run in order to see what effect non-degredation and limited dispersion would have. The PCE and TCE chemicals are 100% soluble in the food processing oil released several years ago near monitor well TW-1. It will not bio-degrade anaerobically while dissolved in the oil. The seepage velocity was changed to 450 ft/year in lieu of the actual 45 ft/year. This was done in order to avoid Biochlor calculations for vertical plume dispersions while maintaining a semblance of longitudinal and transverse dispersivity. The model projects a downgradient PCE concentration at TW-3 of approximately 0.317 mg/L; the actual field sample showed a concentration of PCE of 0.58 mg/L. The model projects non-detect for TCE at TW-3, while actual field measurments were 0.12 mg/L. This data coupled with the detected daughter compounds over time again conclusively show that the chlorinated solvent plume originated up-gradient and off site from the Don Jones property. (See Appendix E)

W.6 is upgradient of ink room excavation
and W.7 is cross-gradient of " " "

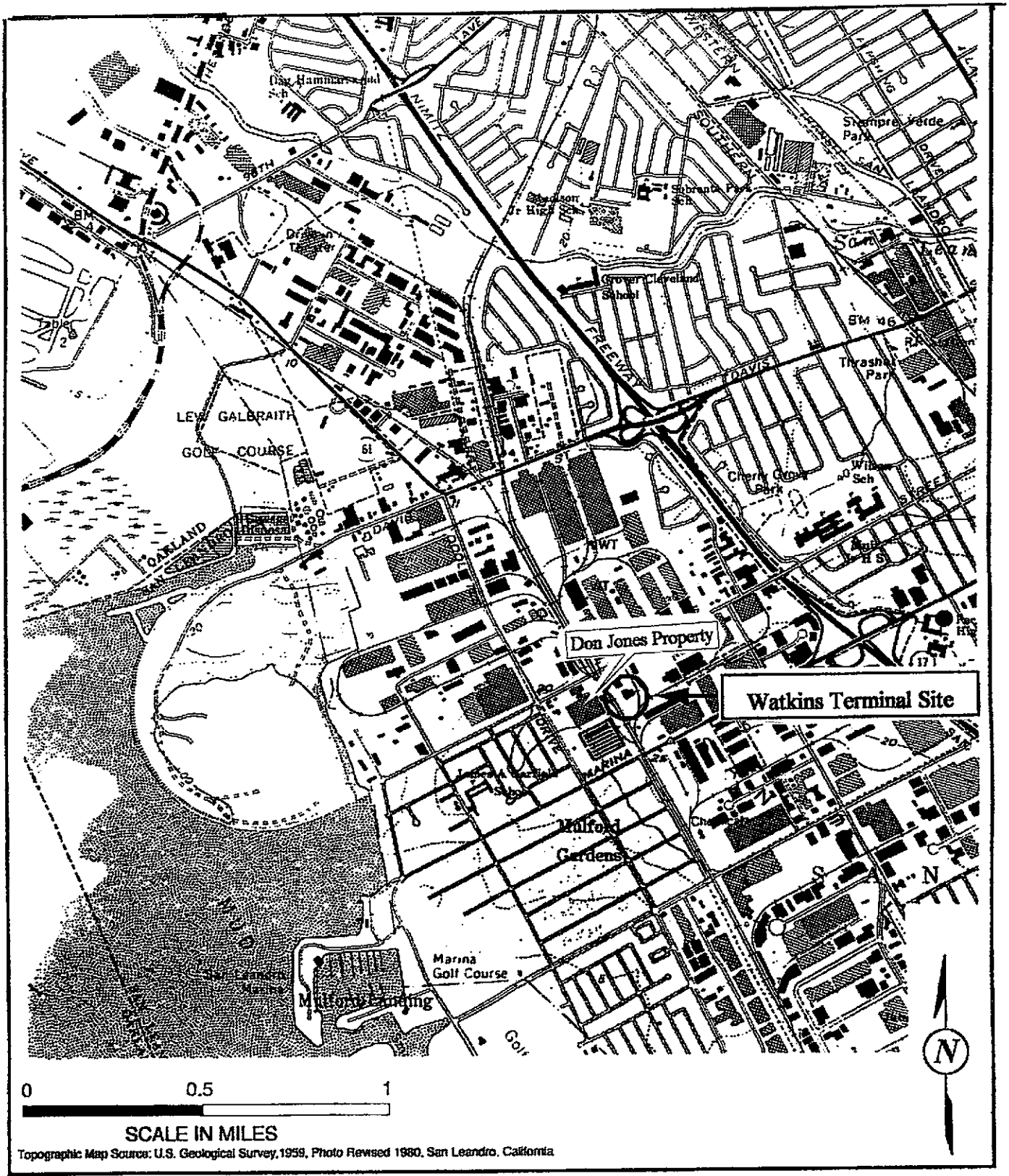
An additional model was run using the seepage velocity used by the Watkins Terminal consultants (i.e., 65 ft/year) The results of this run appear to be better correlated to the actual samples collected from the field. The predicted PCE concentration at 200 feet down gradient is 0.458 mg/L while the field measured concentration is 0.580 mg/L at 240 feet down gradient. This data tends to corraborate the correc usage and prediction of the models. (It is noted that the model projects a very low TCE concentration at 200 feet down gradient; however, this was not used as there is no degredation of PCE to TCE within the constraints of the non-hazardous oil matrix. (See Appendix F)

IV. CONCLUSIONS/RECOMMENDATIONS

The data collected and presented in this report shows that a chlorinated solvent release (i.e., primarily tetrachloroethene or PCE) occurred sometime in the past on the Watkins Terminal property and possibly on properties further east of the Watkins property. The PCE plume has migrated and is continuing to migrate. The PCE has undergone and continues to undergo anaerobic reductive dehalogenation and is degrading into its daughter compound of trichloroethene. The trichloroethene has degraded and continues to degrade into 1,2 cis-dichloroethene which has degraded to vinyl chloride. There is no indication that a release of these solvents ever occurred on the Don Jones property. Any release that might have occurred on the Don Jones property from the underground tanks near monitor well, W-8, would have been detected in W-8 or W-7 in concentrations sufficient to determine that such a release had occurred. This is not the case; groundwater samples collected from W-8 have consistently shown non-detect for the constituents of concern. However, minor amounts of vinyl chloride and 1,2 cis-dichloroethene were detected in 1995 in samples collected from this well. And minor amounts of PCE, TCE, DCE, and VC have been detected ovet time in monitor well, W-7, showing that the PCE constituent is degrading up-gradient and its daughter compounds are being detected in down-gradient groundwater samples.

In view of the foregoing, and in light of past investigative work that has been completed at this site and presented to the Alameda County Health Care Services Agency Department of Environmental Health, and in consideration of the acknowledgement by Watkins Terminal and Blue Water Services consultants that up-gradient, off-site releases have occurred, it does not appear that any further investigative or remediation work is justified at this site on behalf of Printpack with regards to these chlorinated solvents. And as agreed previously between Printpack and the Alameda County Health Care Services Agency Department of Environmental Health no additional investigation remediation is warranted concerning any other chemicals of concern on this property. Therefore, it is recommended and requested that the Alameda County Health Care Services Agency Department of Environmental Health provide Printpack with a letter notifying them that no further work is required at this site.

FIGURES:



Topographic Map Source: U.S. Geological Survey, 1959, Photo Revised 1980, San Leandro, California

FIGURE 1

USGS QUAD

DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA

Drawn By: R.A. Shaw, CTEC-ESCM, Inc., Clearwater,FL — May 19, 2001

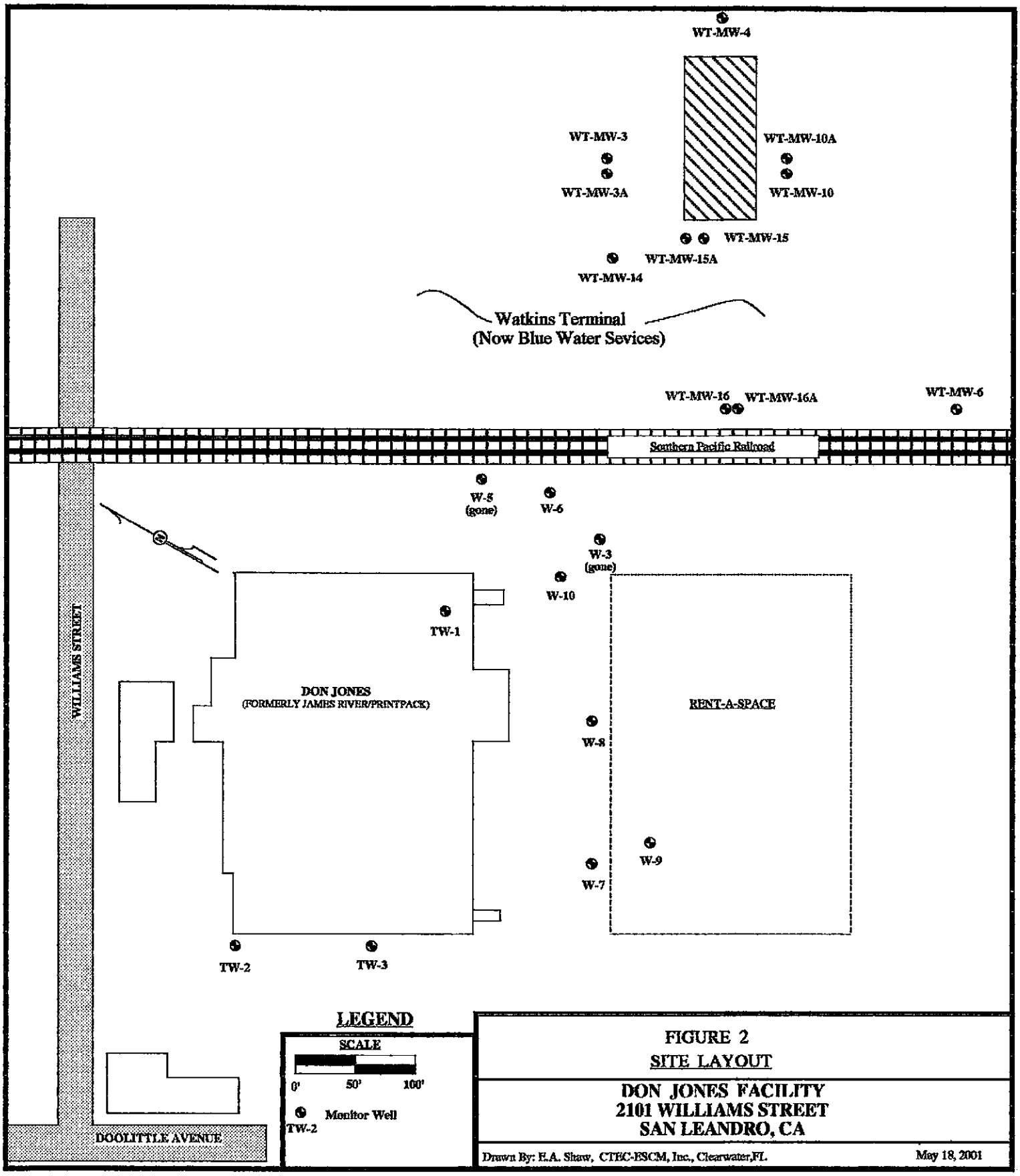
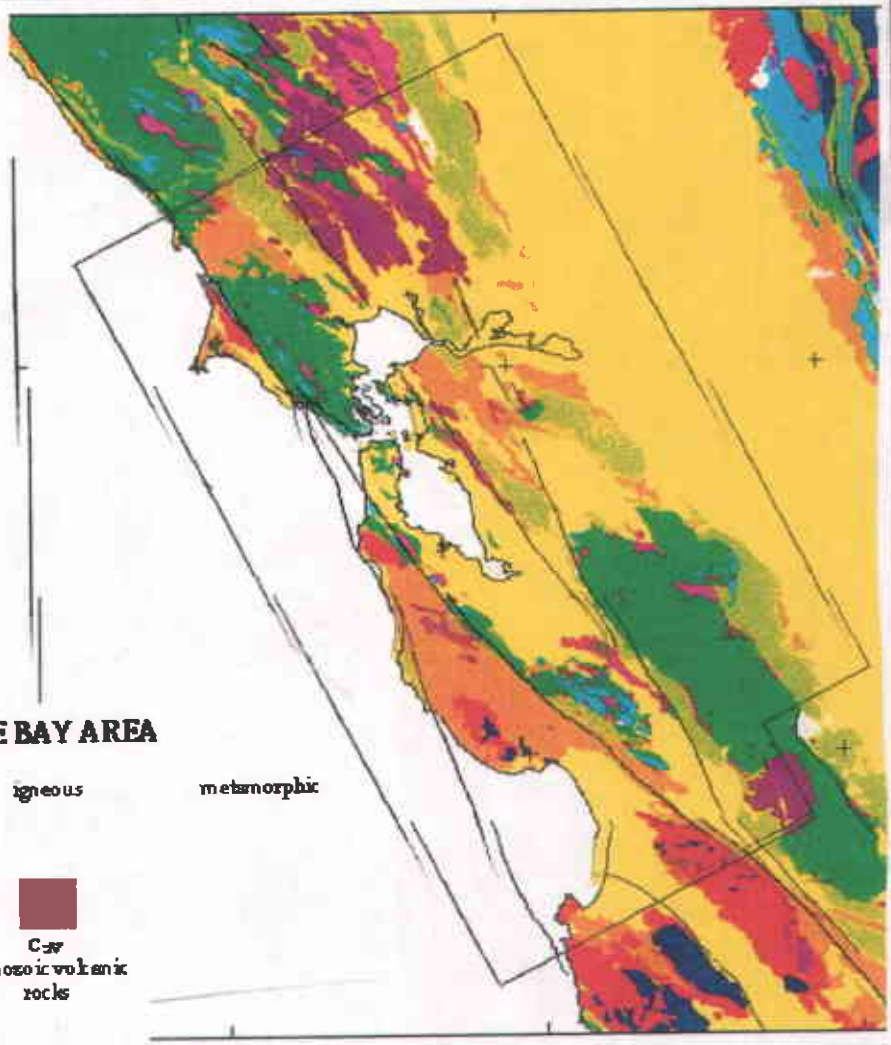


FIGURE 2

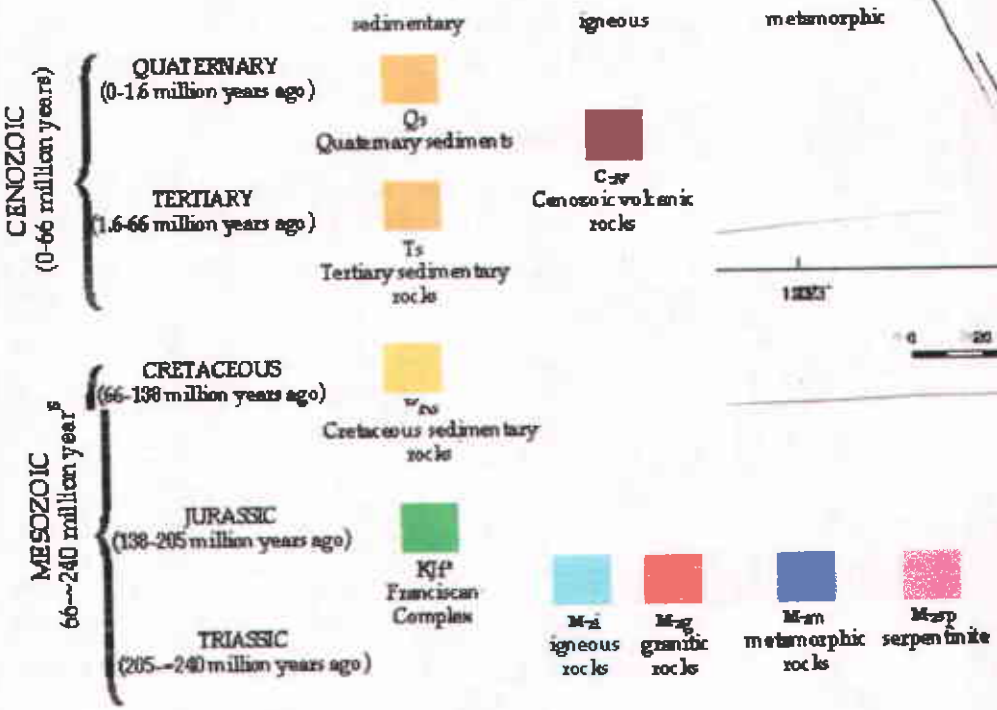
SITE LAYOUT

DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA

Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater,FL. May 18, 2001



GEOLOGY OF THE BAY AREA



A geologic map shows the distribution of rocks exposed on the surface. The chart above is a key to the geologic units shown on the color geologic map. The units are ordered by age (the vertical axis) and rock type (the horizontal axis).

FIGURE 3
AREA LITHOLOGY

DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA

Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater,FL

May 19, 2001

FIGURE 4

AREA GROUNDWATER

DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA

Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater,FL

May 19, 2001

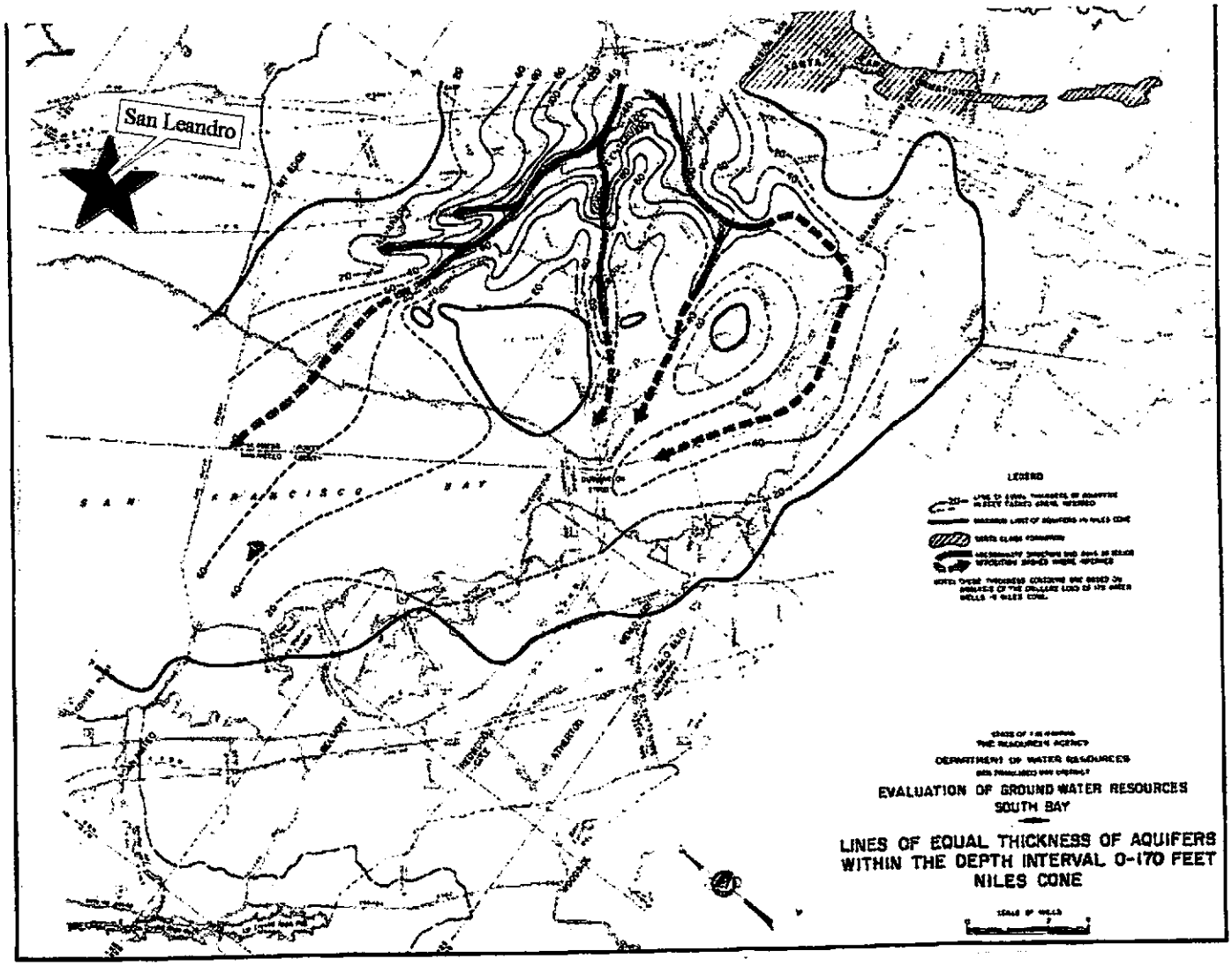


FIGURE 5

AREA GROUNDWATER ISOPACH

DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA

Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater,FL

May 25, 2001

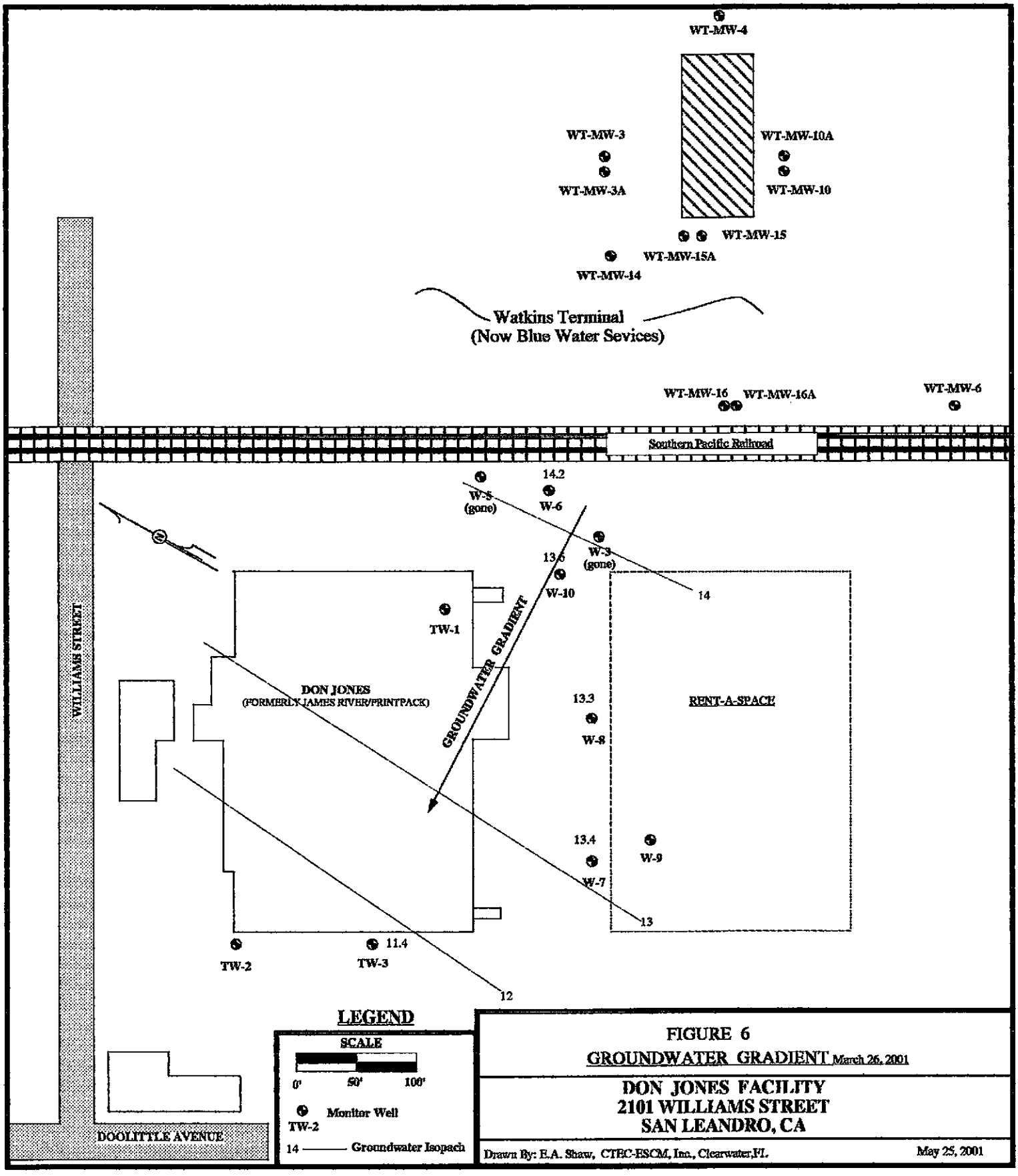
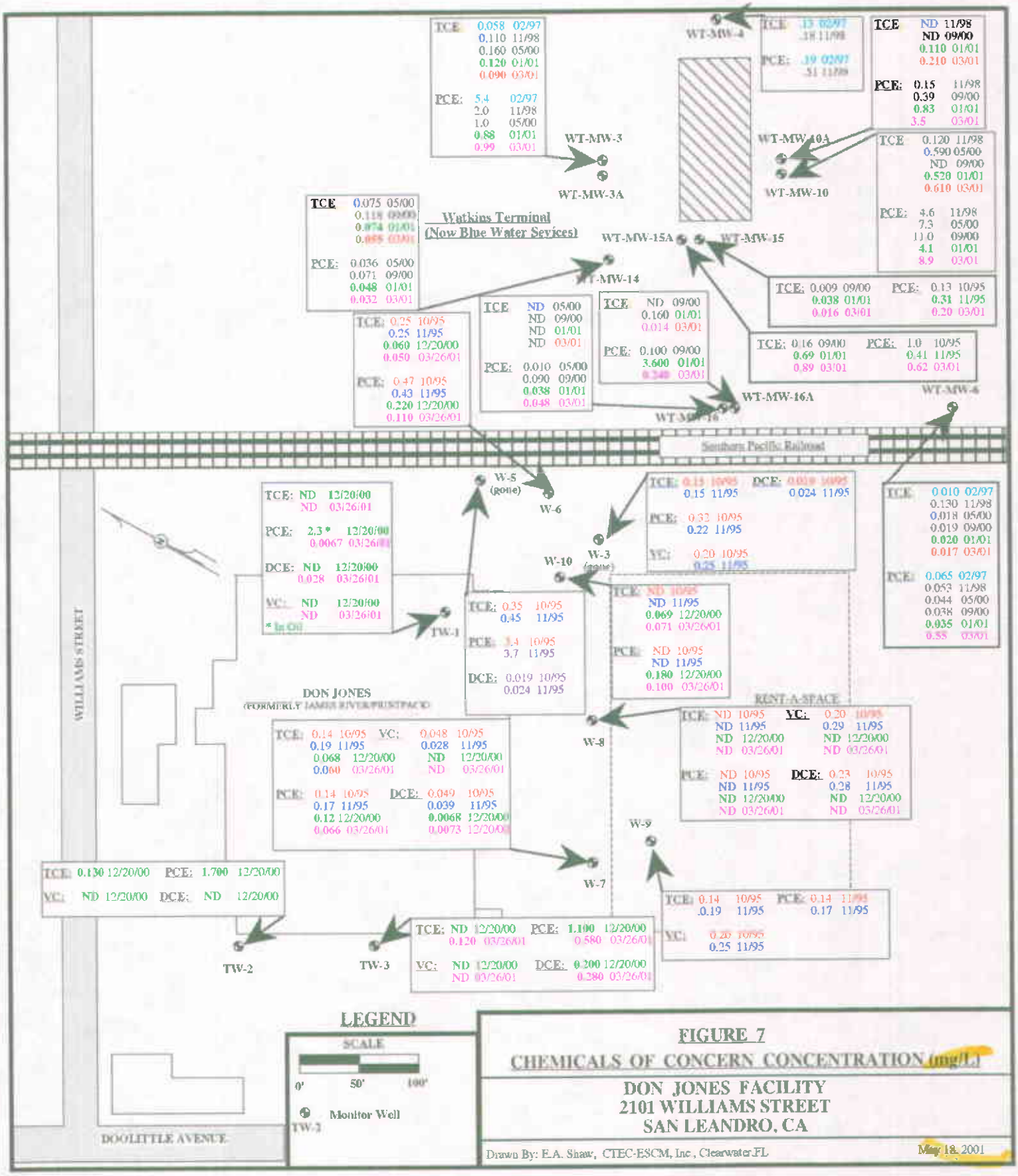


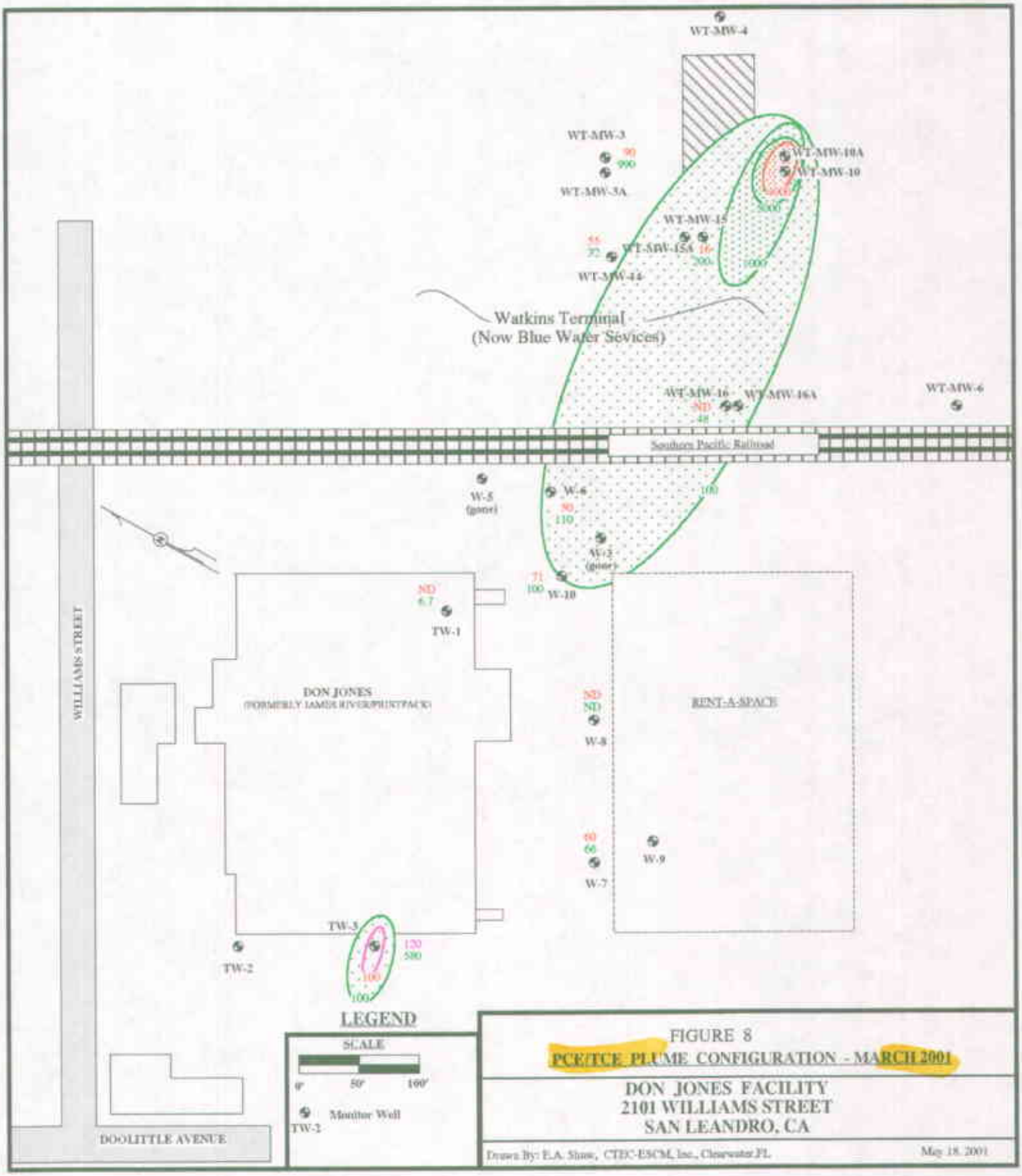
FIGURE 6

GROUNDWATER GRADIENT March 26, 2001

DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA

Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater,FL. May 25, 2001


WT-MW-4
WT-MW-3
WT-MW-3A
WT-MW-10A
WT-MW-10
Watkins Terminal
(Now Blue Water Sevices)
WT-MW-15A
WT-MW-15
WT-MW-14
WT-MW-16A
WT-MW-16
WT-MW-6
Southern Pacific Railroad
W-5
(gone)
W-6
W-3
(gone)
W-10
W-8
W-9
W-7
TW-1
TW-2
TW-3
DON JONES
(FORMERLY JAMES RIVER/PRINTPACK)
RENT-A-SPACE
WILLIAMS STREET
DOOLITTLE AVENUE
LEGEND
SCALE
0'
50'
100'
Monitor Well
TW-2
FIGURE 7
CHEMICALS OF CONCERN CONCENTRATION (mg/L)
DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA
Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater FL
May 18, 2001


WT-MW-4
WT-MW-3
90
990
WT-MW-3A
WT-MW-10A
WT-MW-10
WT-MW-15
55
37
WT-MW-15A
16
200
WT-MW-44
1000
Watkins Terminal
(Now Blue Water Sevices)
WT-MW-16
ND
48
WT-MW-16A
WT-MW-6
Southern Pacific Railroad
W-5
(gone)
W-6
80
110
100
W-2
(gone)
71
100
W-10
ND
6.7
TW-1
WILLIAMS STREET
DON JONES
(FORMERLY JAMES RIVER/PRINTPACK)
RENT-A-SPACE
ND
ND
W-8
60
66
W-7
W-9
TW-3
120
500
100
100
TW-2
DOOLITTLE AVENUE
LEGEND
SCALE
0'
50'
100'
Monitor Well
TW-2
FIGURE 8
PCE/TCE PLUME CONFIGURATION - MARCH 2001
DON JONES FACILITY
2101 WILLIAMS STREET
SAN LEANDRO, CA
Drawn By: E.A. Shaw, CTEC-ESCM, Inc., Clearwater FL
May 18, 2001

TABLES:

TABLE 1 GROUND-WATER ELEVATION March 26, 2001

TABLE 1
GROUND-WATER ELEVATION March 26, 2001
DON JONES PROPERTY
2101 WILLIAMS STREET
SAN LEANDRO, CALIFORNIA

MONITOR WELL	GROUNDWATER ELEVATION
W-6	14.2
W-7	13.4
W-8	13.3
W-10	13.6
TW-1	Not Measured
TW-2	Not Measured - Covered with Large Manure Pile
TW-3	11.7

APPENDICES:

A. Slug Test Analyses - Hydraulic Conductivity
B. Laboratory Data for March 2001
C. Atlantic Geosience Report for Watkins Terminal - February 1997
D. basics Environmental Report for Watkins Terminal - April 2001
E. BIOPLUME MODLES - 45.1 ft/year Seepage Velocity
F. BIOPLUME MODELS - 61 ft/year Seepage Velocity

A. Slug Test Analyses - Hydraulic Conductivity

Horslev unconfined slug test where L/R>8, Calculate K.

See p. 196 of Fetter

Enter the following in column F

	For: Well TW-2 Withdrawl Method
r is the well casing radius	0.16666
R is the well screen (see photocopy) radius	0.33333
L is the length of the well screen (gravel pack below water table)	5.01
L/R ratio > 8 validate equation	15.0302
To is time takes for the water level to rise or fall 37 percent of the initial change	60

K = 0.00013 feet/sec = 3.82E-03 cm/sec

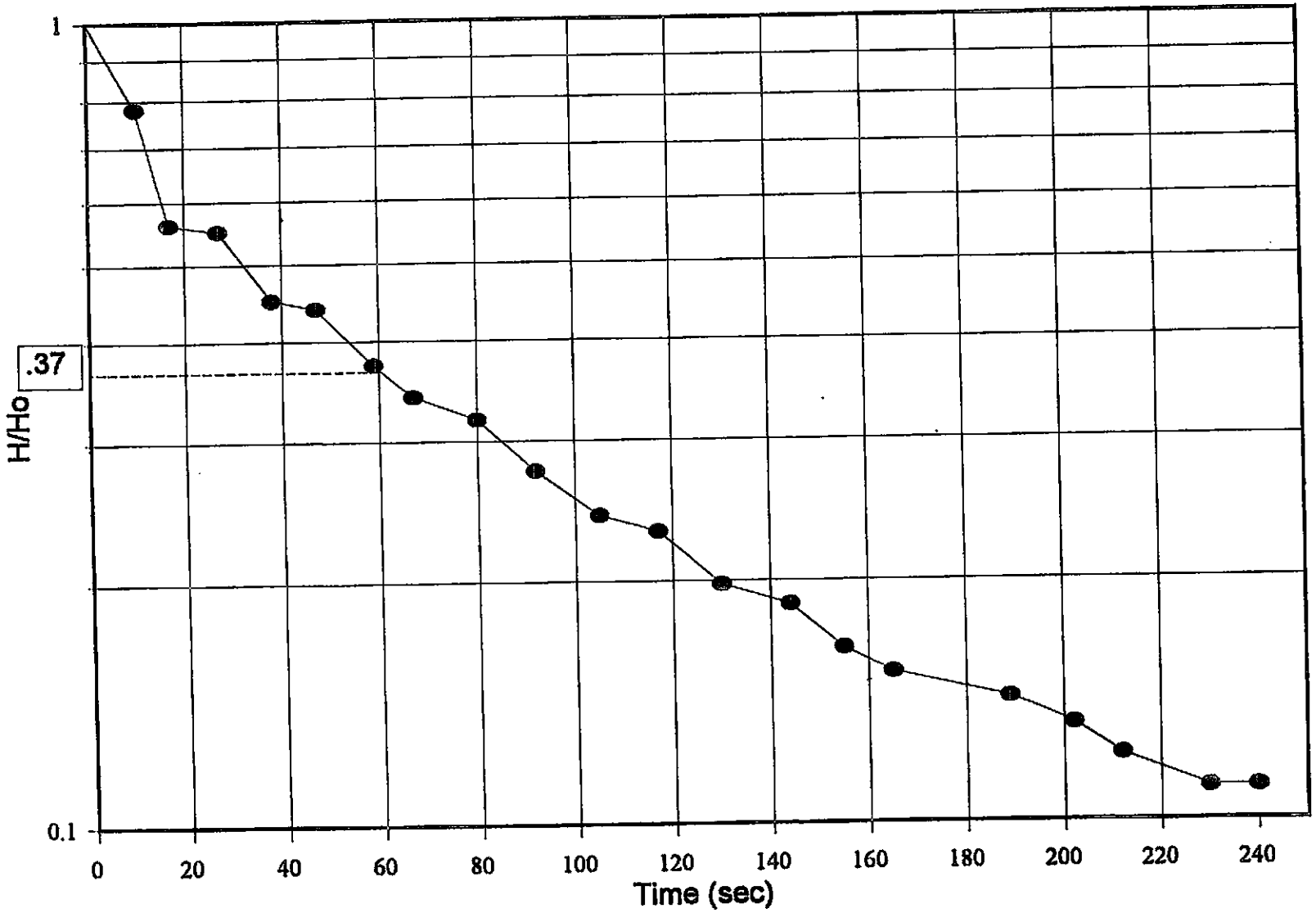
= 10.8177 feet/day

PRINT PACK - SAN LEANDRO, CA. 12/14/96

TW-2 - WITHDRAWL METHOD

ime Seconds	Depth to Water	TEST # 2 Delta lev. water		H/Ho
Static	14.99	0		
0	15.9	0.91	= Ho	1
10	15.7	0.71		0.7802198
17	15.5	0.51		0.5604396
27	15.49	0.5		0.5494505
38	15.4	0.41		0.4505495
47	15.39	0.4		0.4395604
59	15.33	0.34		0.3736264
67	15.3	0.31		0.3406593
80	15.28	0.29		0.3186813
92	15.24	0.25		0.2747253
105	15.21	0.22		0.2417582
117	15.2	0.21		0.2307692
130	15.17	0.18		0.1978022
144	15.16	0.17		0.1868132
155	15.14	0.15		0.1648352
165	15.13	0.14		0.1538462
189	15.12	0.13		0.1428571
202	15.11	0.12		0.1318681
212	15.1	0.11		0.1208791
230	15.09	0.1		0.1098901
240	15.09	0.1		0.1098901
240	15.09	0.1		0.1098901
258	15.08	0.09		0.0989011
270	15.07	0.08		0.0879121
325	15.05	0.06		0.0659341
520	15.03	0.04		0.043956

TW-2



Horslev unconfined slug test where L/R>8, Calculate K.
See p. 196 of Fetter

Enter the following in column F

For: Well TW-2 Injection Method

r is the well casing radius	0.16666
R is the well screen (see photocopy) radius	0.33333
L is the length of the well screen (gravel pack below water table)	5.01
L/R ratio > 8 validate equation	15.03
To is time takes for the water level to rise or fall 37 percent of the initial change	70

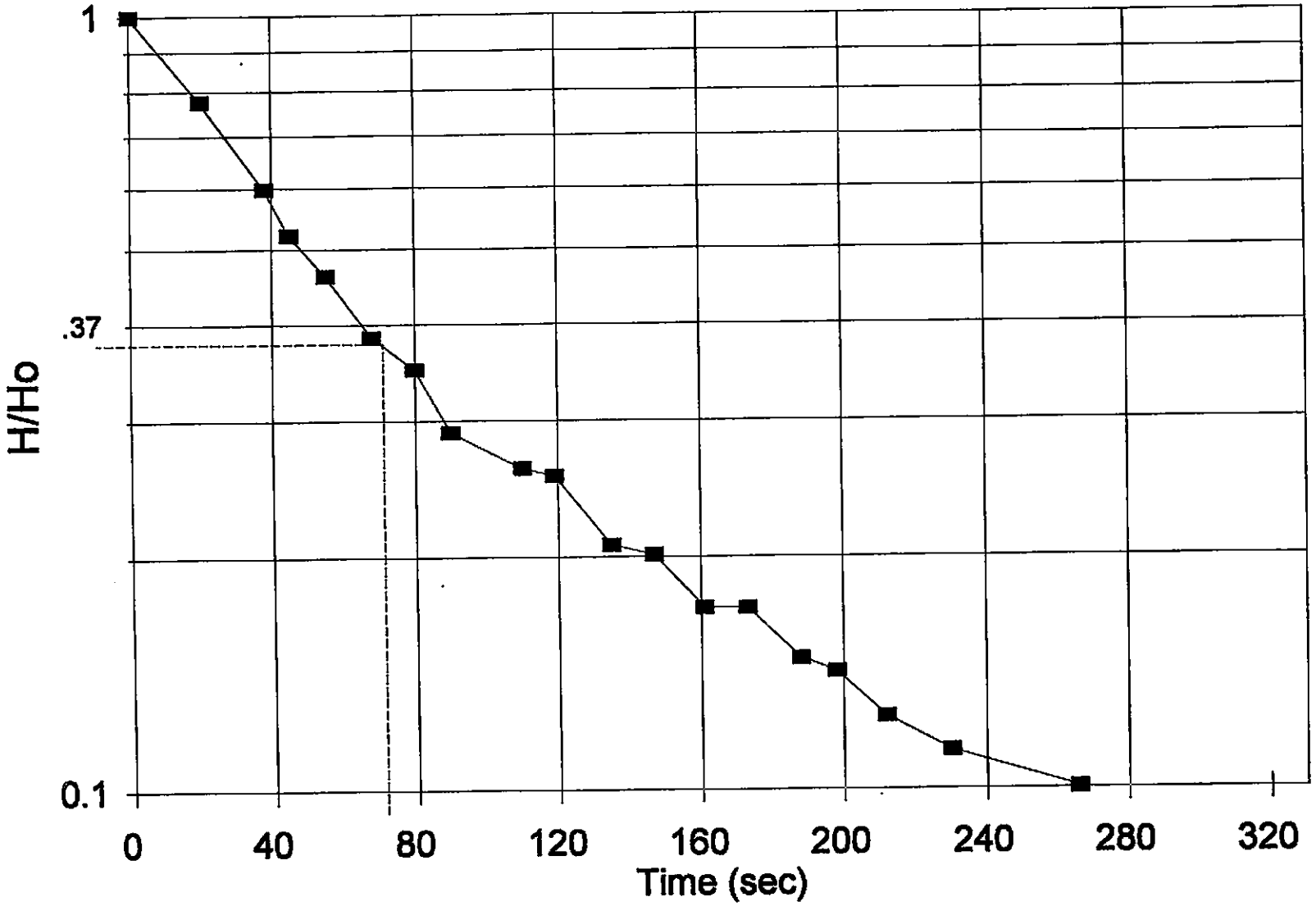
K = 0.00011 feet/sec = 3.27E-03 cm/sec

= 9.27231 feet/day

TW-2 - Injection Method

Time Seconds	Depth to Water	TEST # 3 Delta lev. (absolute) water - H		H/Ho
Static	14.99	0		
0	13.3	1.69	= Ho	1
20	13.68	1.31		0.775148
38	13.98	1.01		0.597633
45	14.11	0.88		0.52071
55	14.21	0.78		0.461538
68	14.34	0.65		0.384615
80	14.4	0.59		0.349112
90	14.5	0.49		0.289941
110	14.55	0.44		0.260355
119	14.56	0.43		0.254438
135	14.64	0.35		0.207101
147	14.65	0.34		0.201183
161	14.7	0.29		0.171598
173	14.7	0.29		0.171598
188	14.74	0.25		0.147929
198	14.75	0.24		0.142012
212	14.78	0.21		0.12426
230	14.8	0.19		0.112426
266	14.82	0.17		0.100592
280	14.84	0.15		0.088757
300	14.85	0.14		0.08284
330	14.88	0.11		0.065089
360	14.89	0.1		0.059172

TW-2 - Injection -



B. Laboratory Data for March 2001

SEVERN TRENT SERVICES
STL Savannah
5102 LaRoche Avenue • Savannah, GA 31404 • Tel: 912 354 7858 • Fax: 912 352 0165 • www.stl-inc.com

LOG NO: S1-11904
Received: 29 MAR 01
Reported: 02 APR 01

Mr. Ed Shaw
ESCM
P.O. Box 387
Monroe, UT 84754

Client PO. No.: EAS032601

Project: PPSL032601/San Leandro, CA, PP
Sampled By: Client
Code: 15031042

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
11904-1	MW-6	03-26-01/09:00
11904-2	MW-10	03-26-01/09:15
11904-3	MW-8	03-26-01/09:45
11904-4	MW-7	03-26-01/10:00
11904-5	TW-3	03-26-01/10:15

PARAMETER	11904-1	11904-2	11904-3	11904-4	11904-5
Volatiles by GC/MS (8260)					
Chloromethane, ug/l	<10	<10	<10	<10	<50
Bromomethane (Methyl bromide), ug/l	<10	<10	<10	<10	<50
Vinyl chloride, ug/l	<10	<10	<10	<10	<50
Chloroethane, ug/l	<10	<10	<10	<10	<50
Methylene chloride (Dichloromethane), ug/l	<5.0	<5.0	<5.0	<5.0	<25
Acetone, ug/l	<50	<50	<50	<50	<250
Carbon disulfide, ug/l	<5.0	<5.0	<5.0	<5.0	<25
1,1-Dichloroethene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
1,1-Dichloroethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
cis-1,2-Dichloroethene, ug/l	13	13	16	7.3	280
trans-1,2-Dichloroethene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Chloroform, ug/l	<5.0	<5.0	<5.0	<5.0	<25
1,2-Dichloroethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
2-Butanone (MEK), ug/l	<25	<25	<25	<25	<120
1,1,1-Trichloroethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Carbon tetrachloride, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Bromodichloromethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25

SEVERN TRENT SERVICES
STL Savannah
5102 LaRoche Avenue • Savannah, GA 31404 • Tel: 912 354 7858 • Fax: 912 352 0165 • www.stl-inc.com

LOG NO: S1-11904
Received: 29 MAR 01
Reported: 02 APR 01

Mr. Ed Shaw
ESCM
P.O. Box 387
Monroe, UT 84754

Client PO. No.: EAS032601

Project: PPSL032601/San Leandro, CA, PP
Sampled By: Client
Code: 15031042

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
11904-1	MW-6	03-26-01/09:00
11904-2	MW-10	03-26-01/09:15
11904-3	MW-8	03-26-01/09:45
11904-4	MW-7	03-26-01/10:00
11904-5	TW-3	03-26-01/10:15

PARAMETER	11904-1	11904-2	11904-3	11904-4	11904-5
1,1,2,2-Tetrachloroethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
1,2-Dichloropropane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
trans-1,3-Dichloropropene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Trichloroethene, ug/l	50	71	<5.0	60	120
Dibromochloromethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
1,1,2-Trichloroethane, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Benzene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
cis-1,3-Dichloropropene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Bromoform, ug/l	<5.0	<5.0	<5.0	<5.0	<25
2-Hexanone, ug/l	<25	<25	<25	<25	<120
4-Methyl-2-pentanone (MIBK), ug/l	<25	<25	<25	<25	<120
Tetrachloroethene, ug/l	110	100	<5.0	66	580
Toluene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Chlorobenzene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Ethylbenzene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Styrene, ug/l	<5.0	<5.0	<5.0	<5.0	<25
Xylenes, Total, ug/l	<10	<10	<10	<10	<50
Dilution Factor	1	1	1	1	5
Analysis Date	03.30.01	03.30.01	03.30.01	03.30.01	04.01.01
Batch ID	1A0330	1A0330	1A0330	1A0330	1A0401

5102 LaRoche Avenue • Savannah, GA 31404 • Tel: 912 354 7858 • Fax: 912 352 0165 • www.stl-inc.com

STL Savannah

LOG NO: S1-11904
Received: 29 MAR 01
Reported: 02 APR 01

Mr. Ed Shaw
ESCM
P.O. Box 387
Monroe, UT 84754

Client PO. No.: EAS032601

Project: PPSL032601/San Leandro, CA, PP
Sampled By: Client
Code: 15031042

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
11904-6	TW-1	03-26-01/09:30
11904-9	Trip Blank	03-26-01

PARAMETER	11904-6	11904-9
Volatiles by GC/MS (8260)		
Chloromethane, ug/l	<10	<10
Bromomethane (Methyl bromide), ug/l	<10	<10
Vinyl chloride, ug/l	<10	<10
Chloroethane, ug/l	<10	<10
Methylene chloride (Dichloromethane), ug/l	<5.0	<5.0
Acetone, ug/l	250	<50
Carbon disulfide, ug/l	<5.0	<5.0
1,1-Dichloroethene, ug/l	<5.0	<5.0
1,1-Dichloroethane, ug/l	<5.0	<5.0
cis-1,2-Dichloroethene, ug/l	28	<5.0
trans-1,2-Dichloroethene, ug/l	<5.0	<5.0
Chloroform, ug/l	<5.0	<5.0
1,2-Dichloroethane, ug/l	<5.0	<5.0
2-Butanone (MEK), ug/l	<25	<25
1,1,1-Trichloroethane, ug/l	<5.0	<5.0
Carbon tetrachloride, ug/l	<5.0	<5.0
Bromodichloromethane, ug/l	<5.0	<5.0
1,1,2,2-Tetrachloroethane, ug/l	<5.0	<5.0
1,2-Dichloropropane, ug/l	<5.0	<5.0
trans-1,3-Dichloropropene, ug/l	<5.0	<5.0
Trichloroethene, ug/l	<5.0	<5.0

5102 LaRoche Avenue • Savannah, GA 31404 • Tel: 912 354 7858 • Fax: 912 352 0165 • www.stl-Inc.com

STL Savannah

LOG NO: S1-11904
Received: 29 MAR 01
Reported: 02 APR 01

Mr. Ed Shaw
ESCM
P.O. Box 387
Monroe, UT 84754

Client PO. No.: EAS032601

Project: PPSL032601/San Leandro, CA, PP
Sampled By: Client
Code: 15031042

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , LIQUID SAMPLES	DATE/ TIME SAMPLED
11904-6	TW-1	03-26-01/09:30
11904-9	Trip Blank	03-26-01

PARAMETER	11904-6	11904-9
Dibromochloromethane, ug/l	<5.0	<5.0
1,1,2-Trichloroethane, ug/l	<5.0	<5.0
Benzene, ug/l	<5.0	<5.0
cis-1,3-Dichloropropene, ug/l	<5.0	<5.0
Bromoform, ug/l	<5.0	<5.0
2-Hexanone, ug/l	<25	<25
4-Methyl-2-pentanone (MIBK), ug/l	<25	<25
Tetrachloroethene, ug/l	6.7	<5.0
Toluene, ug/l	6.2	<5.0
Chlorobenzene, ug/l	<5.0	<5.0
Ethylbenzene, ug/l	<5.0	<5.0
Styrene, ug/l	<5.0	<5.0
Xylenes, Total, ug/l	<10	<10
Dilution Factor	1	1
Analysis Date	03.30.01	03.30.01
Batch ID	1A0330	1A0330

5102 LaRoche Avenue • Savannah, GA 31404 • Tel: 912 354 7858 • Fax: 912 352 0165 • www.stl-inc.com

STL Savannah

LOG NO: S1-11904
Received: 29 MAR 01
Reported: 02 APR 01

Mr. Ed Shaw
ESCM
P.O. Box 387
Monroe, UT 84754

Client PO. No.: EAS032601

Project: PPSL032601/San Leandro, CA, PP
Sampled By: Client
Code: 15031042

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED
11904-7	Method Blank	
11904-8	Lab Control Standard % Recovery	

PARAMETER	11904-7	11904-8
Volatiles by GC/MS (8260)		
Chloromethane, ug/l	<10	---
Bromomethane (Methyl bromide), ug/l	<10	---
Vinyl chloride, ug/l	<10	---
Chloroethane, ug/l	<10	---
Methylene chloride (Dichloromethane), ug/l	<5.0	---
Acetone, ug/l	<50	---
Carbon disulfide, ug/l	<5.0	---
1,1-Dichloroethene, ug/l	<5.0	96 %
1,1-Dichloroethane, ug/l	<5.0	---
cis-1,2-Dichloroethene, ug/l	<5.0	---
trans-1,2-Dichloroethene, ug/l	<5.0	---
Chloroform, ug/l	<5.0	---
1,2-Dichloroethane, ug/l	<5.0	---
2-Butanone (MEK), ug/l	<25	---
1,1,1-Trichloroethane, ug/l	<5.0	---
Carbon tetrachloride, ug/l	<5.0	---
Bromodichloromethane, ug/l	<5.0	---
1,1,2,2-Tetrachloroethane, ug/l	<5.0	---
1,2-Dichloropropane, ug/l	<5.0	---
trans-1,3-Dichloropropene, ug/l	<5.0	---
Trichloroethene, ug/l	<5.0	106 %

SEVERN TRENT SERVICES
STL Savannah
5102 LaRoche Avenue • Savannah, GA 31404 • Tel: 912 354 7858 • Fax: 912 352 0165 • www.stl-inc.com

LOG NO: S1-11904
Received: 29 MAR 01
Reported: 02 APR 01

Mr. Ed Shaw
ESCM
P.O. Box 387
Monroe, UT 84754

Client PO. No.: EAS032601

Project: PPSL032601/San Leandro, CA, PP
Sampled By: Client
Code: 15031042

REPORT OF RESULTS

LOG NO	SAMPLE DESCRIPTION , QC REPORT FOR LIQUID SAMPLES	DATE/ TIME SAMPLED
11904-7	Method Blank	
11904-8	Lab Control Standard % Recovery	

PARAMETER	11904-7	11904-8
Dibromochloromethane, ug/l	<5.0	---
1,1,2-Trichloroethane, ug/l	<5.0	---
Benzene, ug/l	<5.0	104 %
cis-1,3-Dichloropropene, ug/l	<5.0	---
Bromoform, ug/l	<5.0	---
2-Hexanone, ug/l	<25	---
4-Methyl-2-pentanone (MIBK), ug/l	<25	---
Tetrachloroethene, ug/l	<5.0	---
Toluene, ug/l	<5.0	90 %
Chlorobenzene, ug/l	<5.0	112 %
Ethylbenzene, ug/l	<5.0	---
Styrene, ug/l	<5.0	---
Xylenes, Total, ug/l	<10	---
Dilution Factor	1	1
Analysis Date	03.30.01	03.30.01
Batch ID	1A0330	---

These test results meet all the requirements of NELAC. All questions regarding this test report should be directed to the STL Project Manager who signed this test report.
SW-846, Test Methods for Evaluating Solid Waste, Third Edition, September 1986, and Updates I, II, IIA, IIB, and III.

Gloria D. Fulwood

Gloria D. Fulwood, Project Manager

Final Page Of Report

Serial Number 006455

SEVERN TRENT SERVICES

ANALYSIS REQUEST AND CHAIN OF CUSTODY RECORD

Severn Trent Laboratories, Inc.

- [X] 5102 LaRoche Avenue, Savannah, GA 31404 — Phone: (912) 354-7858 — Fax: (912) 352-0165
- [ ] 2846 Industrial Plaza Drive, Tallahassee, FL 32301 — Phone: (850) 878-3994 — Fax: (850) 878-9504
- [ ] 900 Lakeside Drive, Mobile, AL 36693 — Phone: (334) 666-6633 — Fax: (334) 666-6696
- [ ] 6712 Benjamin Road, Suite 100, Tampa, FL 33634 — Phone: (813) 885-7427 — Fax: (813) 885-7049

PROJECT REFERENCE: PPSL032601	PROJECT NO.: PPSL	PROJECT LOCATION (STATE): UT	MATRIX TYPE	REQUIRED ANALYSIS
STL (LAB) PROJECT MANAGER:	P.O. NUMBER: EA-032601	CONTRACT NO.:		
CLIENT (SITE): San Leandro, CA, PP	CLIENT PHONE: (435) 896-5242	CLIENT FAX: /5246		
CLIENT NAME: CIEC-ESCM	CLIENT E-MAIL:			
CLIENT ADDRESS: P.O. Box 397, Monroe, UT				
COMPANY CONTRACTING THIS WORK (if applicable):				

PAGE 1 OF 1

STANDARD REPORT DELIVERY [X]
DATE DUE

EXPEDITED REPORT DELIVERY (SURCHARGE) [ ]
DATE DUE

NUMBER OF COOLERS SUBMITTED PER SHIPMENT: 1

8260 / 1C PRESERVATIVE

SAMPLE DATE	SAMPLE TIME	SAMPLE IDENTIFICATION	LIQUID	NUMBER CONTAINERS SUBMITTED	REMARKS
3/26/01	9:00 AM	MW-6	X		
3/26/01	9:15 AM	MW-10	X		
3/26/01	9:45 AM	MW-8	X		
3/26/01	10:00 AM	MW-7	X		
		~~MW-9~~			
3/26/01	10:15 AM	TW-3	X		
3/26/01	9:30 AM	TW-1	X		
		Trip Blank *	X		

RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME	RELINQUISHED BY: (SIGNATURE)	DATE	TIME
EMPTY BOTTLES	3/18/01							
RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME	RECEIVED BY: (SIGNATURE)	DATE	TIME
EMPTY CONTAINERS	3/20/01							

LABORATORY USE ONLY

RECEIVED FOR LABORATORY USE BY: (SIGNATURE)	DATE	TIME	CUSTODY INTACT YES / NO	CUSTODY SEAL NO.	STL SL LOG NO.	LABORATORY REMARKS
	3/29/01	9:35			SL-11904	* Analyze trip blanks per Ed Straw. G. Fulwood 3/28/01

C. Atlantic Geosience Report for Watkins Terminal - February 1997

Engineering and Environmental Consultants

AGI Atlantic Geoscience, Inc. • 3005 Riverbend Drive • Snellville, Georgia 30278 • (770) 979-5275

PRELIMINARY INVESTIGATION

WATKINS TERMINALS, INC.
2075 WILLIAMS STREET
SAN LEANDRO, CALIFORNIA

AGI Job No. HC-96-002

Prepared by:

Atlantic Geoscience, Inc.

John T. Caudill,
Project Manager

Hugh Dougalas, PG,
Senior Geologist

February 24, 1997

TABLE OF CONTENTS

1.0 INTRODUCTION

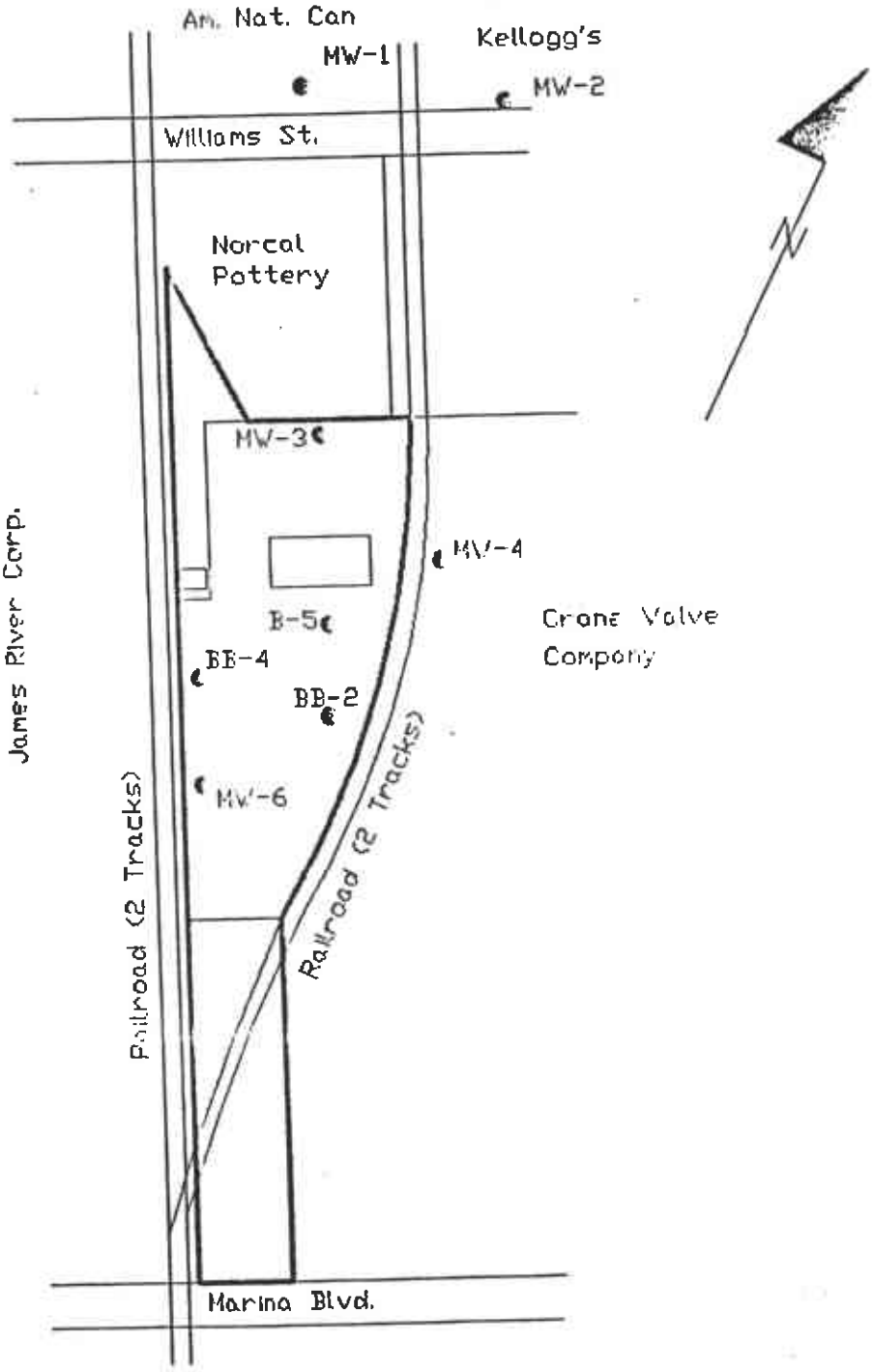
1.1 Background

During a real estate transaction, Watkins Terminals, Inc. discovered potential contamination on their property located at 2075 Williams Street in San Leandro, CA (Figure 1). Blymyer Engineers performed two environmental investigations on the site, a Phase I Environmental Assessment, and a Subsurface Investigation. The results of the Phase I investigation recommended the collection of groundwater data on the site. The subsurface investigation included the drilling of four soil borings by geoprobe and the collection of both soil and groundwater samples. Groundwater was encountered at an approximate depth of 16 feet in each of the borings. Two of the groundwater samples were selected for analytical testing. Both groundwater samples detected the presence of Trichloroethylene (TCE) and Tetrachloroethlyene (PCE). The concentrations were elevated along the eastern boundary of the site which is presumed to be the upgradient portion of the site. The source of the TCE and PCE is not known but may be from an off-site source.

On February 5, 1997 Atlantic Geoscience, Inc. initiated this investigation to further evaluate the possible source and extent of contamination at the site.

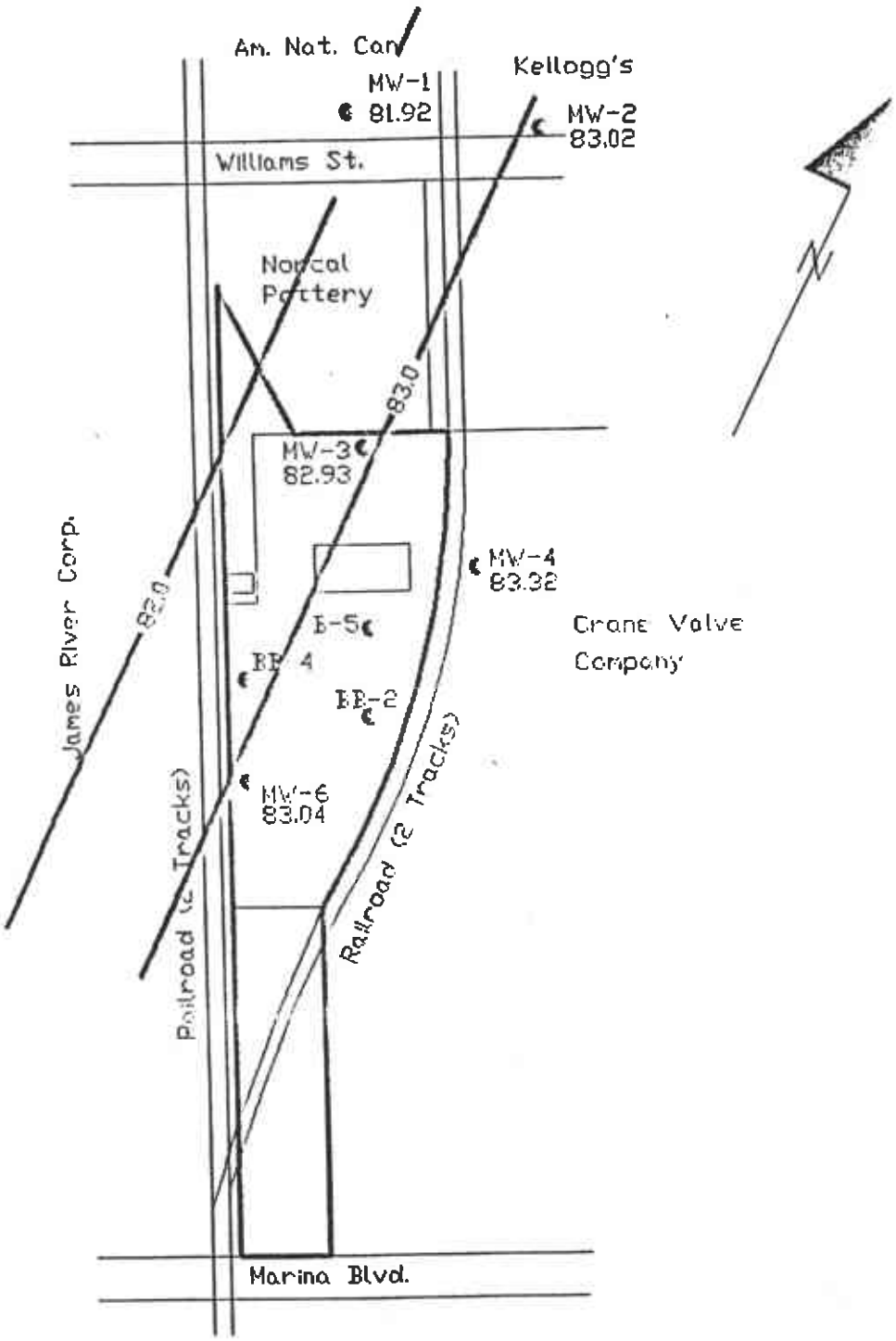
1.2 Investigative Method

The site was investigated under an approved work plan previously submitted to the California Regional Water Quality Control Board. This investigation included the drilling of five monitor wells and one soil boring on both the Watkins Terminals, Inc. property and on adjacent off-site properties. Figure 2 shows the location of each boring and the approximate locations of the previous investigation's borings. Prior to drilling, the drilling materials were steam cleaned. As the drilling advanced, soil samples were collected at 1', 6', 10', 15', 20', and 25' by use of a previously cleaned split barrel sampler and described by a site geologist. The depth of drilling was to a depth of approximately 15 feet below the groundwater table. Five of the borings were subsequently constructed into a permanent monitor well. The wells were constructed by placing fifteen feet of 2-inch diameter 0.020 inch slot PVC screen into the well boring with the appropriate riser so that the screened interval crossed the soil/water interface. The annular space between the boring wall and screen was filled with sand to an approximate depth of two feet above the screened interval. A two foot bentonite seal was then placed above the sand pack. The remainder of the annular space was grouted to within one foot of the surface. The well was finished with a locking cap and protective vault.



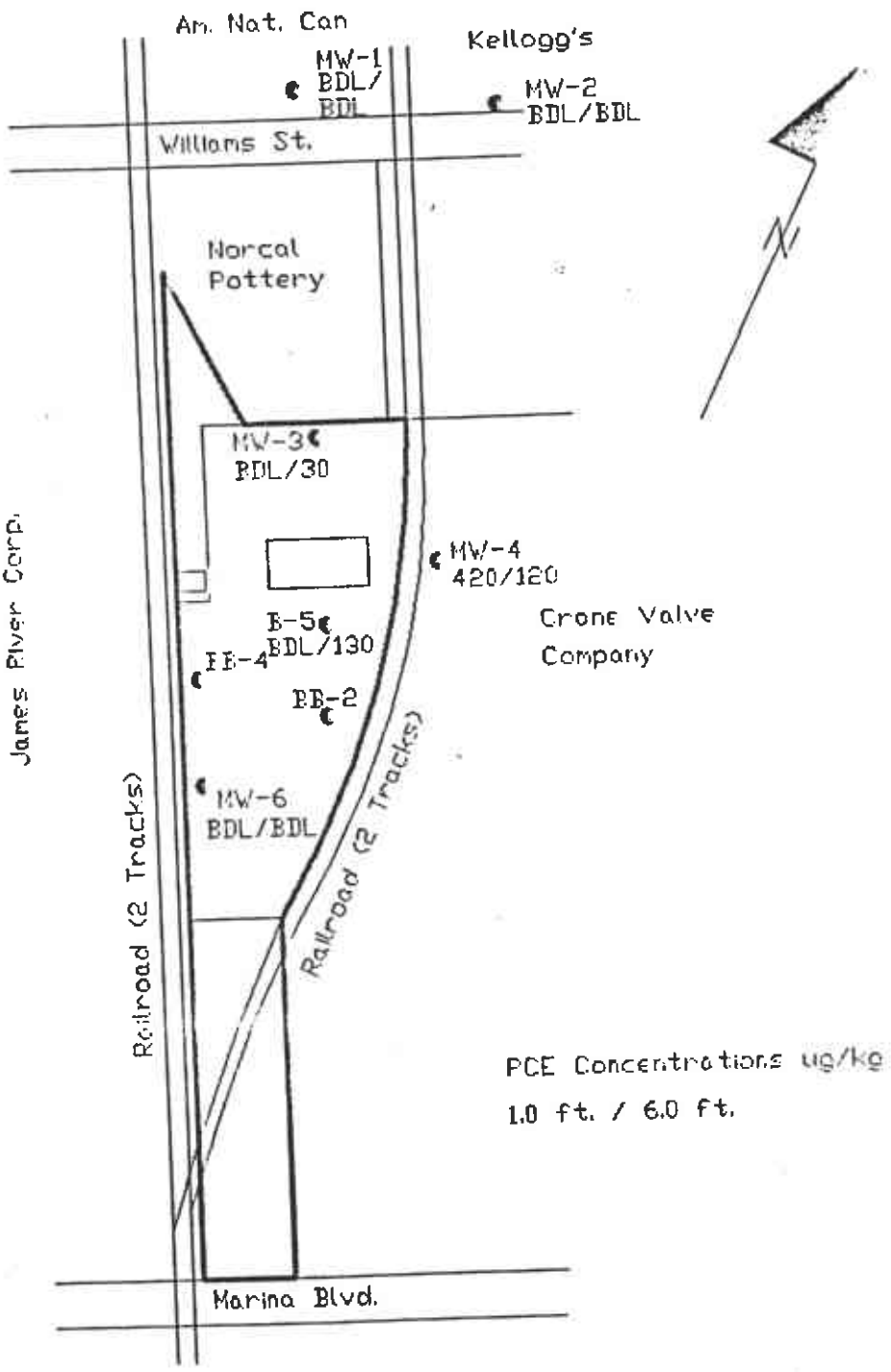
AGI Atlantic Geoscience, Inc.

Figure 2
Site Map
Watkins Terminals
AGI Job No. EA-96-002
Scale: 1"=200'



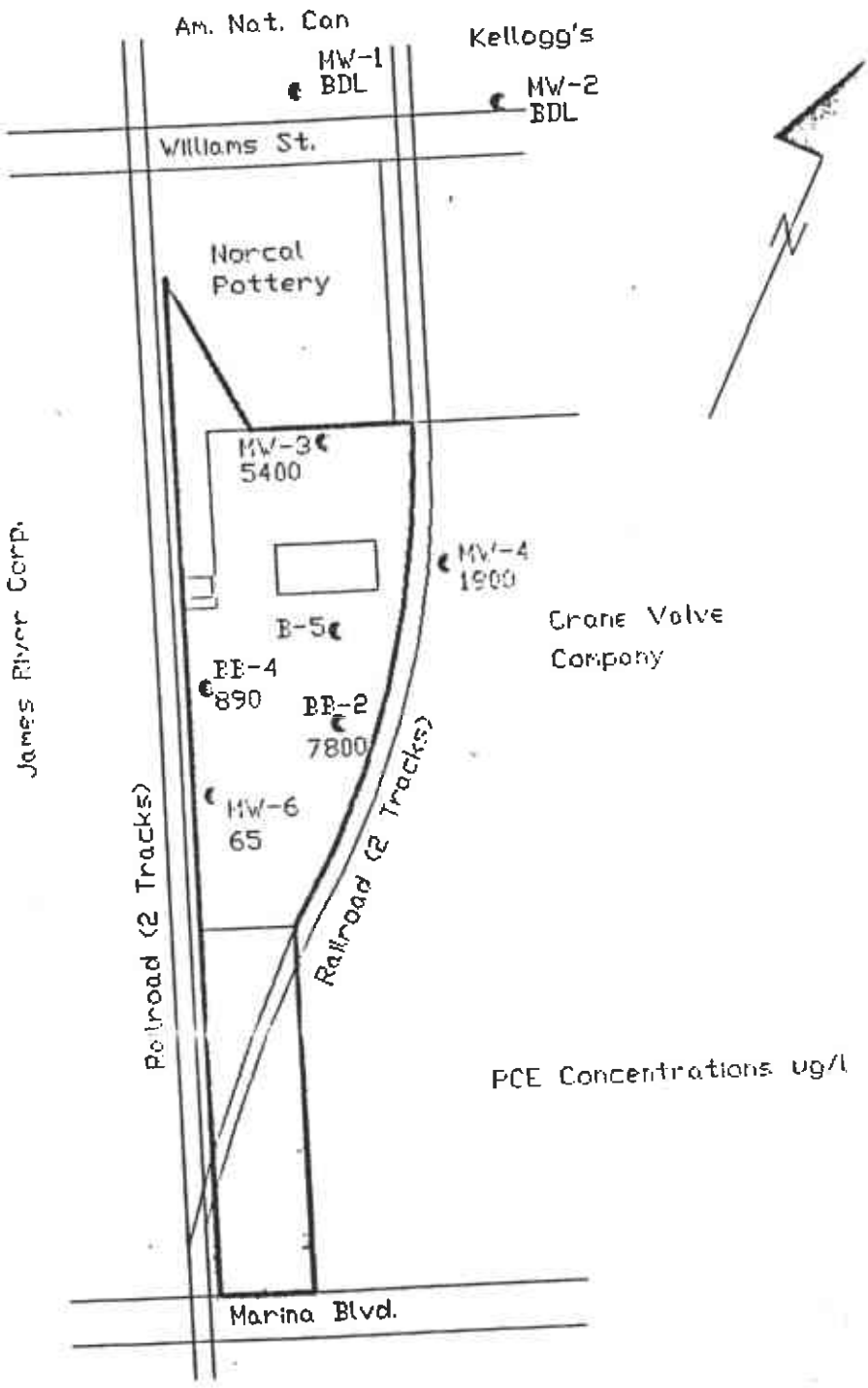
AGI Atlantic Geoscience, Inc.

Figure 3
Potentiometric Surface
Watkins Terminasl
AGI Job No. HC-96-002
Scale: 1"=200'



AGI Atlantic Geoscience, Inc.

Figure 4
Soil Contamination
Watkins Terminals
AGI Job No. HC-96-002
Scale: 1"=200'



AGI Atlantic Geoscience, Inc.

Figure 5
Groundwater Contam.
Watkins Terminals
AGI Job No. HC-96-002
Scale: 1"=200'

D. basics Environmental Report for Watkins Terminal - April 2001

APR 1 1 2001

[redacted]

QUARTERLY GROUND WATER SAMPLING AND ANALYSIS

2075 WILLIAMS STREET
SAN LEANDRO
CALIFORNIA

FOR

BLUE WATER SERVICES, INC.
OAKLAND
CALIFORNIA

basics
ENVIRONMENTAL

APRIL 5, 2001
99-ENV187F

116 GLORIETTA BLVD • ORINDA, CA • 94563 • TEL / FAX 925-258-9099 / 9098

SITE CONTACTS

Site Name:	Former Freight Terminals Facility
Site Address:	2075 Williams Street San Leandro, California 94577
Owner:	Chris Kirschenheuter Bluewater Services Inc. 727 77th Avenue Oakland, California 94621 (800) 536-6702
Owner's Consultant:	Basics Environmental 116 Glorietta Boulevard Orinda, California 94563 (925) 258-9099
Project Manager:	Donavan G. Tom
Former Owner:	Michael D. Kevitch Watkins Motor Lines, Inc. 1144 W. Griffin Road Lakeland, Florida 33804-5002
Former Owner's Consultant:	Atlantic Geosciences, Inc. 1300 S. Rossiter Terrace Watkinsville, Georgia 30677 (706) 310-0319
Regulatory Oversight:	Roger Brewer Regional Water Quality Control Board San Francisco Bay Region 1515 Clay Street, Suite 1400 Oakland, California 94612 (510) 622-2374 Eva Chu Alameda County Environmental Health Department 1131 Harbor Bay Parkway, 2nd Floor Alameda, California 94502 (510) 567-6770 Michael Bakaldin City of San Leandro San Leandro Environmental Services 835 East 14th Street, Suite 200 San Leandro, California 94577 (510) 577-3319 ext. 31

TABLE OF CONTENTS

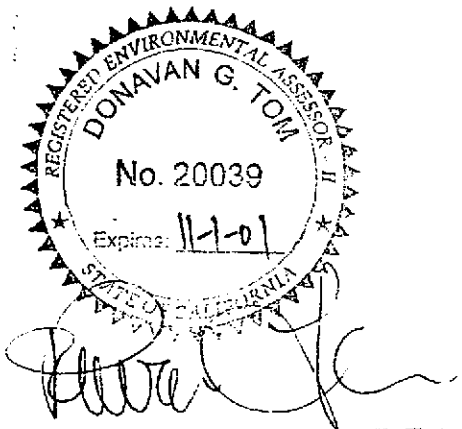
PROFESSIONAL CERTIFICATION

REPORT
QUARTERLY GROUND WATER
SAMPLING AND ANALYSIS
BLUEWATER SERVICES, INC.
2075 WILLIAMS STREET
SAN LEANDRO, CALIFORNIA
99-ENV187F
APRIL 5, 2001

This report has been prepared by the staff of Basics Environmental (Basics) under the professional supervision of the Principal Consultant whose seal and signature appears hereon. The findings, interpretations of data, recommendations, specifications or professional opinions are presented within the limits prescribed by available information at the time the report was prepared, in accordance with generally accepted professional engineering and geologic practice and within the requirements by the Client. There is no other warranty, either expressed or implied.

The data and findings of this report are based on the data and information obtained from the agreed upon scope of work between Basics and the Client. Because contamination is not necessarily evenly distributed across the property's soils and ground water, it can easily remain undetected. Additional scope of services (at greater cost) may or may not disclose information which may significantly modify the findings of this report. We accept no liability on completeness or accuracy of the information presented and or provided to us, or any conclusions and decisions which may be made by the Client or others regarding the subject site.

This report was prepared solely for the benefit of Basic's Client. Basics consents to the release of this report to third parties involved in the evaluation of the property for which the report was prepared, including without limitation, lenders, title companies, public institutions, attorneys, and other consultants. However, any use of or reliance upon this report shall be solely at the risk of such party and without legal recourse against Basics, or its subcontractors, affiliates, or their respective employees, officers, or directors, regardless of whether the action in which recovery of damage is sought is based upon contract, tort (including the sole, concurrent or other negligence and strict liability of Basics), statute or otherwise. This report shall not be used or relied upon by a party that does not agree to be bound by the above statements.



Donavan G. Tom, M.B.A., R.E.A. II
Principal Consultant

1.0 INTRODUCTION

1.1 Purpose of Investigation

Basics Environmental (Basics) has performed this Ground Water Well Monitoring for Blue Water Services, Inc. pursuant to our letter of engagement signed March 9, 2001. The "subject site" is at 2075 Williams Street, San Leandro, California (See Drawing 1).

1.2 Background

On June 23 1995, a Phase I Environmental Site Assessment was performed by Blymer Engineers for Freight Terminals, Inc. Potential environmental concerns were indicated at the property located at 2075 Williams Street in San Leandro, CA. As a result, Blymer Engineers performed a Subsurface Investigation which included the drilling of four soil borings (B-1 through B-4) by geoprobe and the collection of both soil and ground water samples. Ground water was encountered at an approximate depth of 16 feet in each of the borings. Two of the ground water samples were selected for analytical testing. Both ground water samples detected the presence of Trichloroethylene (TCE) and Tetrachloroethlyene (PCE). The concentrations were elevated along the eastern boundary of the site which is presumed to be the up gradient portion of the site. The source of the TCE and PCE was not known but was thought to be from an off-site source.

On February 5, 1997 Atlantic Geoscience, Inc. (AGI) performed an preliminary investigation which included the drilling of six additional soil borings (SB-1 through SB-6) by geoprobe and the collection of both soil and ground water samples to further evaluate the possible source and extent of contamination at the site. Five of the six borings were converted to ground water monitoring wells (MW-1, MW-2, MW-3, MW-4 and MW-6). The investigation determined that the direction of ground water flow was to the west, towards the San Francisco Bay at a depth of approximately 15 feet. The plume was found to extend beyond the property boundaries in both the up-gradient and down gradient directions. Soils were analyzed and found to contain low concentrations of both PCE and TCE with the most elevated concentrations detected up gradient from the site property. However, the most elevated PCE and TCE concentrations in the ground water were detected near the center of the site. The report concluded that the origin of the source for the contaminants was unknown and that a more thorough investigation would be required.

AGI submitted a second work plan to the Regional Water Quality Control Board (RWQCB). This plan included a review of data from the adjacent PRINTPAC property, located down gradient from the site. The PRINTPAC data indicated that the extent of the plume was near the center of their property and that the ground water gradient was also generally to the west. In addition, the PRTNTPAC data indicated that the ground water velocity was approximately 1 ft/day. AGI then submitted a revised work plan to further evaluate the horizontal and vertical extent of the contaminant plume. This report is a summary of the second investigation.

On November 30, 1998, AGI performed additional investigation under an approved work plan submitted to the RWQCB. This investigation included the drilling of four additional geoprobe wells and the collection of both soil and ground water samples at various depths. Two borings (SB-11 and SB-13) were drilled on the adjacent up gradient property (Crane Valve Co.) with two borings (SB-10 and SB-12) drilled on the Freight Terminals property. One of the four borings was converted to a ground water monitoring well (MW-10). Prior to drilling, the drilling materials were cleaned using an Alconox solution. As the drilling advanced, soil samples were collected at 5', 10', and 15' intervals by use of a previously cleaned tube sampler and described by a site geologist. Borings SB-10 and SB-11 were drilled to an approximate depth of 50 feet while borings B-12 and B-13 were drilled to an approximate depth of 18 feet. Water samples were collected from each of the borings at a depth of 18 feet. In addition a water sample from borings B-12 and B-13 were also collected at depths of 33 feet and 50 feet. After drilling operations, the borings were sealed with bentonite and a concrete plug was place at the surface. In addition to the drilling program, AGI also collected ground water samples from the existing wells MW-3, MW-4, and MW-6 to evaluate the contaminant plume shape and change over time.

In June and September 2000, AGI implemented an interim remedial action plan under an approved work plan submitted to the RWQCB. This plan included the drilling of seven additional geoprobe wells (SB-3a, SB-10a, SB-14, SB-15, SB-15a, SB-16 and SB-16a) and the collection of both soil and ground water samples at various depths. All of the seven of the borings were converted to ground water monitoring wells (MW-3a, MW-10a, MW-14, MW-15, MW-15a, MW-16 and MW-16a). MW-3a, MW-10a, MW-15a and MW-16a are 1-inch wells specifically installed to address the impact to ground water within the deeper sand zone at the subject site. In addition, 19 passive vapor extraction wells were installed in a perimeter surrounding the terminal building

where the bulk of the contaminants appear to be located. The passive wells were constructed using slotted 2-inch PVC pipe from a depth of 41 feet to 42 feet with 31 feet the most common. However, in vapor well/monitoring MW-15 the sand was encountered at a depth of 42 to 59 feet. As such the vapor well was extended to a depth of 60 feet in this location. A 1/4-inch vapor vent was installed to allow the vapors to discharge.

In January 2000, Basics Environmental was retained by the new owner, Blue Water Services, Inc., to continue the quarterly ground water monitoring program for onsite wells MW-3, MW-3A, MW-6, MW-10, MW-10A, MW-14, MW-15, MW-15A, MW-16 and MW-16A

1.3 Site Geology and Hydrogeology

The site is located San Francisco Bay region approximately 3000 ft. east of San Francisco Bay. The area is characterized by a flat lying terrain with a relief on the order of 50 feet (elev. 0 + to elev. 50 ±). The site is at approximate elev. 20. The land slopes to the south and southwest towards San Francisco Bay.

The San Francisco Bay area is a northwest-southeast trending region within the Coast Range Province. Rocks within the region range from Jurassic aged sedimentary, metamorphic, and plutonic basement rocks to Holocene alluvium. The geologic structure of the region is controlled by several fault systems. The San Andreas system is located on the western side of the bay while the Hayward system is on the east side of the bay. These faults are a result of the tectonic forces that uplifted the Coast Range and dropped the section now covered by San Francisco Bay and associated alluvium deposits.

The site is located on Quaternary Alluvium. This Alluvium includes the Temescal Formation overlying the San Antonio Formation. These formations generally consist of unconsolidated gravel, sand and clay. Soils at the site include the Danville silty clay loam. Ground water in the area is a part of the San Leandro Cone Subarea. The direction of ground water flow is usually to the west or southwest towards San Francisco Bay under unconfined conditions.

The materials encountered in the borings varied from location to location. In general the materials included dark gray, dark brown and medium brown slightly silty clay to approximately 10 feet. A shallow sand lense was encountered in MW-4 from 10 to 19.5 feet; MW-6, MW-10, and MW-11 from 27 to 28 feet; MW-13 from the surface to a depth of at least 15 feet; MW-15 from

10 to 59 feet. A deeper sand lense was encountered MW-3a from 50 to 56 feet; MW-10a from 28 to 42 feet; MW-6a from 30-42 feet;. Clay was then encountered in the borings.

Ground water historically has been encountered at an approximate depth of 12 to 15 feet in each boring. The top of each well was surveyed in 1997 as to relative elevation based on an assigned instrument elevation of 100 ft. The ground water gradient was calculated by AGI in 1997 and found to flow to the west at a gradient of 0.67 ft/ft.

2.0 GROUND WATER SAMPLING

2.1 Field Activities

On March 27, 2001, the following scope of work was completed.

- The ground water in wells MW-3, MW-3A, MW-6, MW-10, MW-10A, MW-14, MW-15, MW-15A, MW-16 and MW-16A was monitored for floating product, and the depth to water in the well was measured with an optical interface probe and recorded on well gauging data sheets, which are included in Appendix A.

- Prior to sampling, the wells were purged using PVC pipes connected to a truck mounted vacuum pump. At least three casing volumes were extracted from each well. Temperature, pH, conductivity, and visual observations of the ground water for the well was recorded on a well monitoring data sheet, which is included in Appendix A.

- A ground water sample was collected from each of the wells and submitted to McCampbell Analytical, a California-certified laboratory, for petroleum hydrocarbon analysis to quarterly reporting requirements.

The ground water samples were collected using disposable bailers. The water samples were transferred from the bailers into appropriate pre-preserved containers supplied by the analytical laboratory. The samples were labeled to include the job number, sample identification, collection date and time, analysis, preservation (if any), and the sample collector's initials. The water samples were then placed in a cooler, maintained at 4° C for transport to the laboratory. Once collected in the field, the samples were maintained under chain of custody until delivered to the laboratory.

The chain of custody document includes the job number, type of preservation, if any, analysis requested, sample identification, date and time collected, and sample collector's name. The chain of custody was signed and dated (including time of transfer) by each person who received or surrendered the sample, beginning with the field personnel and ending with the laboratory personnel.

3.0 CHEMICAL ANALYSES AND RESULTS

3.1 Chemical Analyses

The ground water sample taken from the monitoring well was analyzed for the following:

- Volatile Halocarbons (California EPA Method 8010).

3.2 Analytical Results

Results of chemical analyses on ground water sample collected on March 27, 2001 are presented in **boldface** type in Table 1, along with previous results. Certified laboratory reports are presented in Appendix B, including chain-of-custody record data.

TABLE 1 GROUNDWATER MONITORING DATA
2075 WILLIAMS STREET, SAN LEANDRO, CALIFORNIA, 2001

Well No.	Screen (ft)	Date	Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Concentration (µg/L) Tetrachloroethene (PCE)	Trichloroethene (TCE)
B-1	-	Feb-97	NM	12.19	-	ND	ND
B-2	-	Feb-97	NM	12.16	-	ND	ND
MW-3	15-30	Feb-97	NM	15.08	-	5,400	58
		Nov-98	NM	-	-	2,000	110
		May-00	NM	-	-	1,000	160
		Sep-00	NM	25	-	ND	ND
		Jan-01	NM	16.36	-	880	120
		Mar-01	**NM**	**15.55**	**-**	**990**	**90**
MW-3A	?-60	Sep-00	NM	60	-	15	ND
		Jan-01	NM	15.98	-	ND	ND
		Mar-01	**NM**	**15.08**	**-**	**ND**	**ND**
MW-4	13-28	Feb-97	NM	12.69	-	1,900	130
		Nov-98	NM	-	-	510	180
		Jan-01	NM	-	-	NS	NS
		Mar-01	**NM**	**-**	**-**	**NS**	**NS**
MW-6	13-27	Feb-97	NM	11.86	-	65	10
		Nov-98	NM	-	-	53	13
		May-00	NM	-	-	44	18
		Sep-00	NM	25	-	38	19
		Jan-01	NM	13.53	-	35	20
		Mar-01	**NM**	**12.33**	**-**	**550**	**17**
B-10		Nov-98	NM	33	-	4,600	120
MW-10	10-25	May-00	NM	-	-	7,300	590
		Sep-00	NM	25	-	11,000	ND
		Jan-01	NM	15.29	-	4,100	520
		Mar-01	**NM**	**14.52**	**-**	**8,900**	**610**
B-10A		Nov-98	NM	50	-	150	ND
MW-10A	?-42	Sep-00	NM	40	-	390	ND
		Jan-01	NM	15.47	-	830	110
		Mar-01	**NM**	**14.69**	**-**	**3,500**	**210**
B-11	-	Nov-98	NM	33	-	200	49
B-12	-	Nov-98	NM	16	-	ND	90

TABLE 1 (CONT.) GROUNDWATER MONITORING DATA
2075 WILLIAMS STREET, SAN LEANDRO, CALIFORNIA, 2001

Well No.	Screen (ft)	Date	Casing Elevation (ft msl)	Depth to Water (ft)	Groundwater Elevation (ft msl)	Concentration (µg/L) Tetrachloroethene (PCE)	Trichloroethene (TCE)
B-13	-	Nov-98	NM	14.7	-	240	ND
MW-14	10-25	May-00	NM	16	-	36	75
		Sep-00	NM	50	-	71	118
		Jan-01	NM	15.61	-	48	74
		Mar-01	**NM**	**14.81**	**-**	**32**	**55**
SB-15	?-60	Feb-97	NM	16	-	1,000	160
MW-15		Sep-00	NM	60	-	130	9.4
		Jan-01	NM	16.47	-	310	38
		Mar-01	**NM**	**15.59**	**-**	**200**	**16**
MW-15A	?-36	Sep-00	NM	40	-	1,000	160
		Jan-01	NM	16.69	-	410	69
		Mar-01	**NM**	**15.82**	**-**	**620**	**89**
MW-16	10-25	May-00	NM	16	-	10	ND
		Sep-00	NM	25	-	90	ND
		Jan-01	NM	13.91	-	38	ND
		Mar-01	**NM**	**13.08**	**-**	**48**	**ND**
MW-16A	?-38	Sep-00	NM	40	-	100	ND
		Jan-01	NM	13.82	-	3,600	160
		Mar-01	**NM**	**13.07**	**-**	**240**	**14**
Trip Blank		Feb-97				<0.5	<0.5
		Nov-98				<0.5	<0.5

B-# Grab water samples from boring.
MW-# Ground water sample from monitoring well.
ND Analyte NOT DETECTED at or above the reporting limit (<0.5)
NS Not sampled.
NM Not measured.
-- Not analyzed.
µg/L Micrograms per liter.
ft msl Feet relative to mean sea level.

4.0 FINDINGS

4.1 Discussion

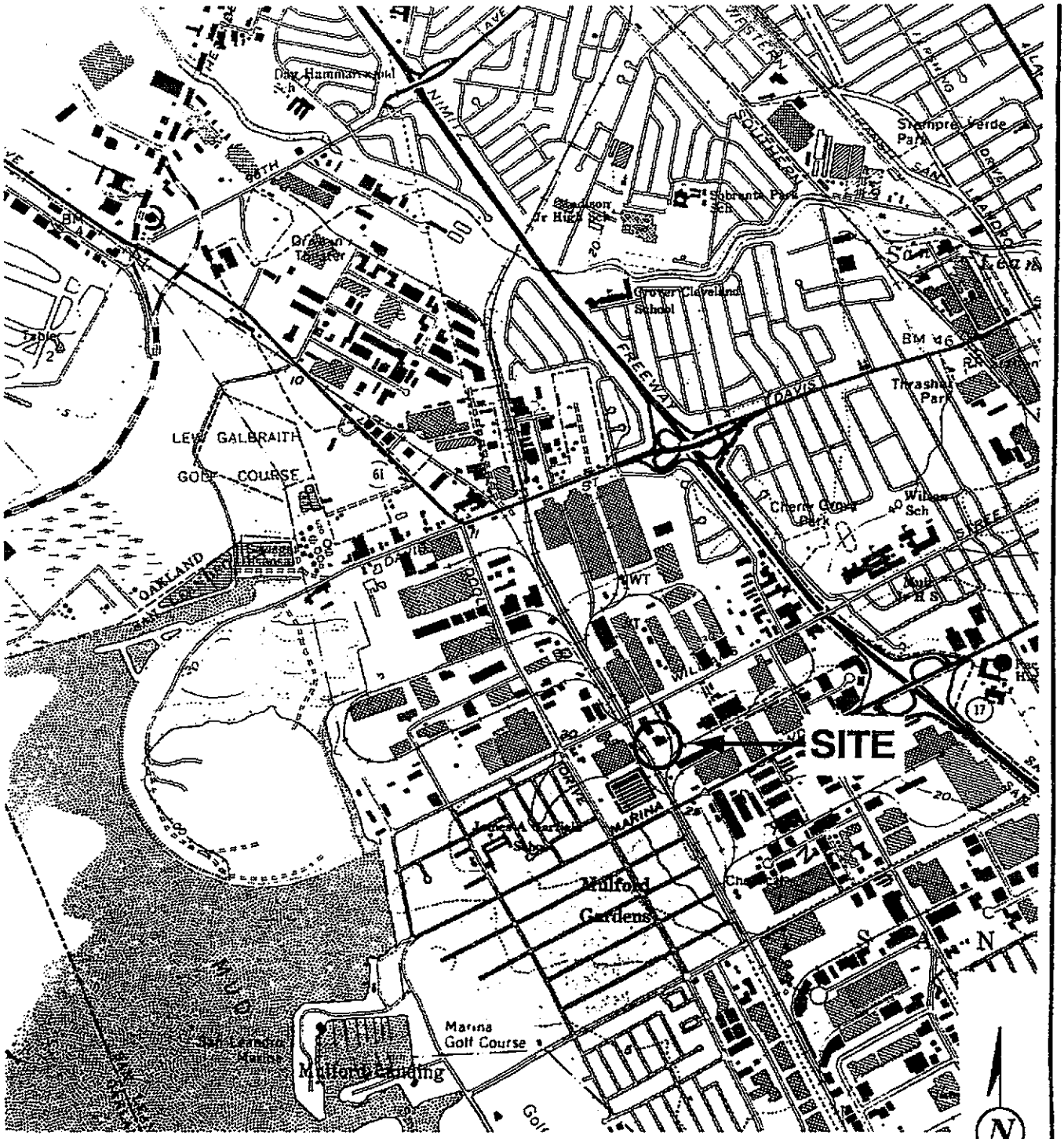
According to AGI, the source of the PCE contamination appears to be from a pre-1977 metal plating operation conducted within a former building located at the subject site. In addition, AGI believes the plume appears to have sunk by gravity downward into a coarse sand horizon.

Source Identification - Based on the soil test borings within the previous investigations, no substantial impact to the shallow subsurface soil has been identified. However, analytical results from shallow surface soil samples collected within the vicinity of MW-4, MW-10 and MW-13 indicate the highest concentrations of PCE (0.420 mg/kg, 0.690 mg/kg and 0.400 mg/kg, respectively). Based on this data, no significant amount of residual source material appear to exists within the vadose zone at the subject site. These levels may have decreased over time due to natural degradation or have sunk through the subsurface.

According to AGI, MW-10 may represent the original area of release due to the significant concentration of PCE (300 mg/kg) found within the soil at 15 feet below ground surface. However, MW-10 soil concentrations between 1 and 10 feet below ground surface were similar to those concentrations detected in the vicinity of MW-4 and MW-13. Due to the saturated zone fluctuating from 12 to 15 feet below ground surface, the elevated levels of PCE within the soil sample collected within MW-10 at 15 feet below ground surface may be due to the influence of the PCE ground water plume.

This reasoning suggests that the original area of release may be a combination of impacts to the subsurface within the vicinity of MW-4, MW-10 and MW-13. MW-4 and MW-13 are located within the adjacent up gradient site (Crane Valve Services). Since comparable levels of PCE have been discovered within the shallow subsurface soil samples collected within the adjacent up gradient site suggest a high probability that the original area of release may be a combination of impacts to the subsurface from the subject site and Crane Valve Services. As such, Crane Valve Services may also be a responsible party liable for ground water remediation.

According to AGI, the shape of the plume suggests that the ground water flow is not a large driving force to move the contaminant plume. In addition, AGI believes the plume appears to radiating outward primarily by dispersion. Based on the documents reviewed, significant levels of



Topographic Map Source: U.S. Geological Survey,1959, Photo Revised 1980, San Leandro, California

PREPARED BY DGT REVIEWED BY DATE 4/2/01

Site Location

basics ENVIRONMENTAL

Quarterly Ground Water Sampling and Analysis
2075 Williams Street
San Leandro, California

PROJECT NO.
99-ENV187F

DRAWING NO
1

T:\LCK (5/28/02)

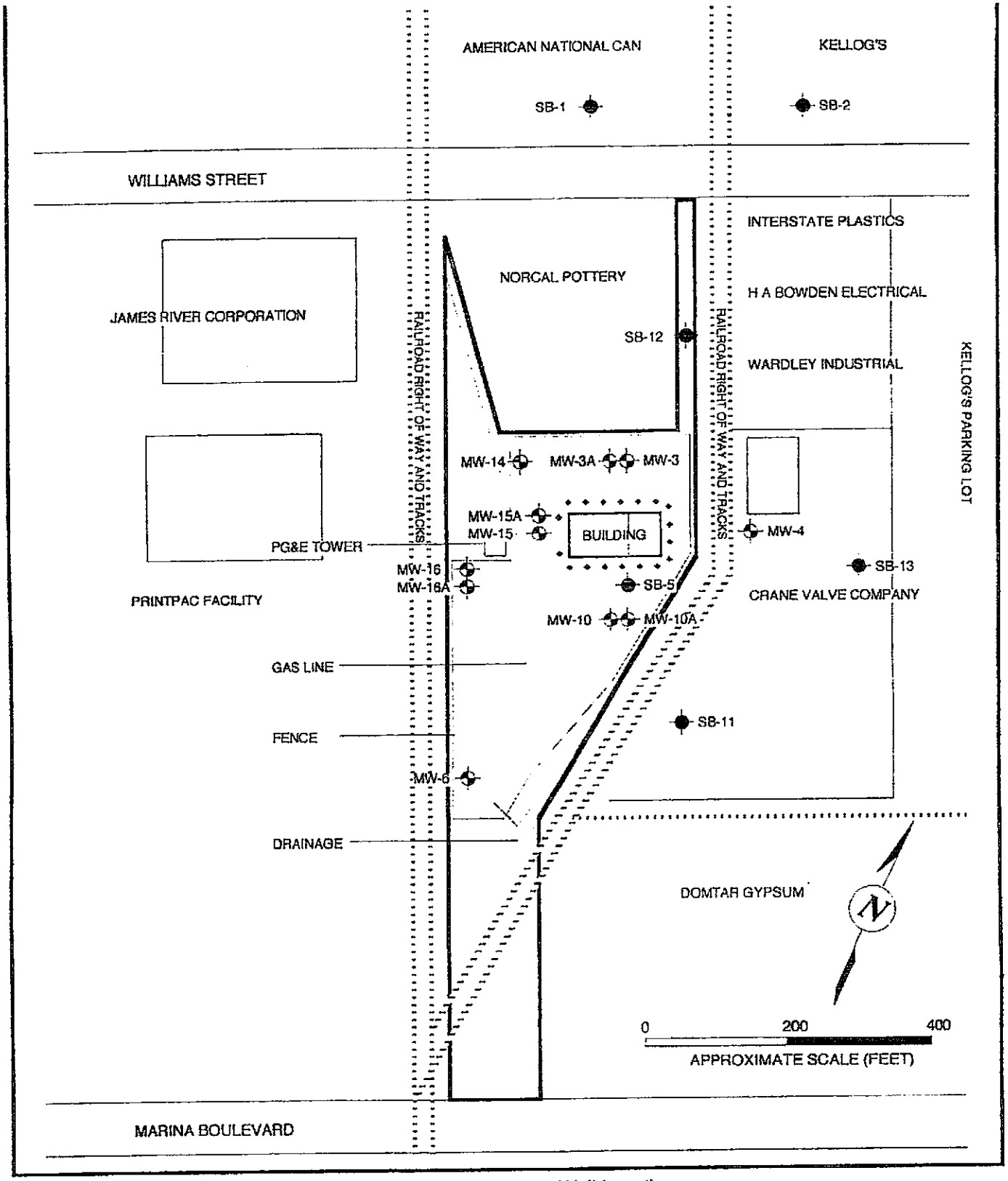
PCE (>200μg/L) have been detected within MW-3, MW-4, MW-10, MW-11, MW-13, W-3, W-5, and W-6. The highest levels of PCE (>2000μg/L) were detected in MW-3, MW-10 and W-5.

W-3, W-5 and W-6 are located on the adjacent down gradient site (James River Site). Additional breakdown components of PCE (TCE, DCA and VC) were also detected within the down gradient wells (W-3, W-5 and W-6), however, analytical results from soil samples collected at the adjacent down gradient James River site have not detected any levels of PCE.

At the time of these reports 1995-1998, the migration of ground water impacted with PCE and its derivatives were attributed to up gradient sources (1964 Williams Street and Caterpillar Tractor), however, recent ground water data suggests off-site migration of the PCE plume is generated from the vicinity of MW-4, MW-10 and MW-13. In addition, this data suggests the plume is influenced by the ground water flow.

The most recent ground water data collected (March 2001) has shown significant levels of PCE (>200μg/L) have been detected within MW-3, MW-6, MW-10, MW-10a, MW-15, MW-15a and MW-16a. The highest level of PCE (>1,000μg/L) was detected only in MW-10 (8,900μg/L). Recent off site ground water data was not available, however, as per the request of the Regional Water Quality Control Board, the latest ground water monitoring event was conducted at the same time as the ground water monitoring at the adjacent James River Corporation site (down gradient position).

Interim Remedial Actions - Based on the information reviewed, the residual source material (original area of release to soil) has decreased over time due to natural degradation or has sunk through the subsurface. The ground water data suggest the PCE ground water plume appears to be centered within the location of the onsite building (location of the 19 passive vapor extraction wells). Based on this information, Basics recommends continued quarterly ground water monitoring to evaluate the progress of the passive ground water remediation system.



Ground Water Monitoring Well Locations

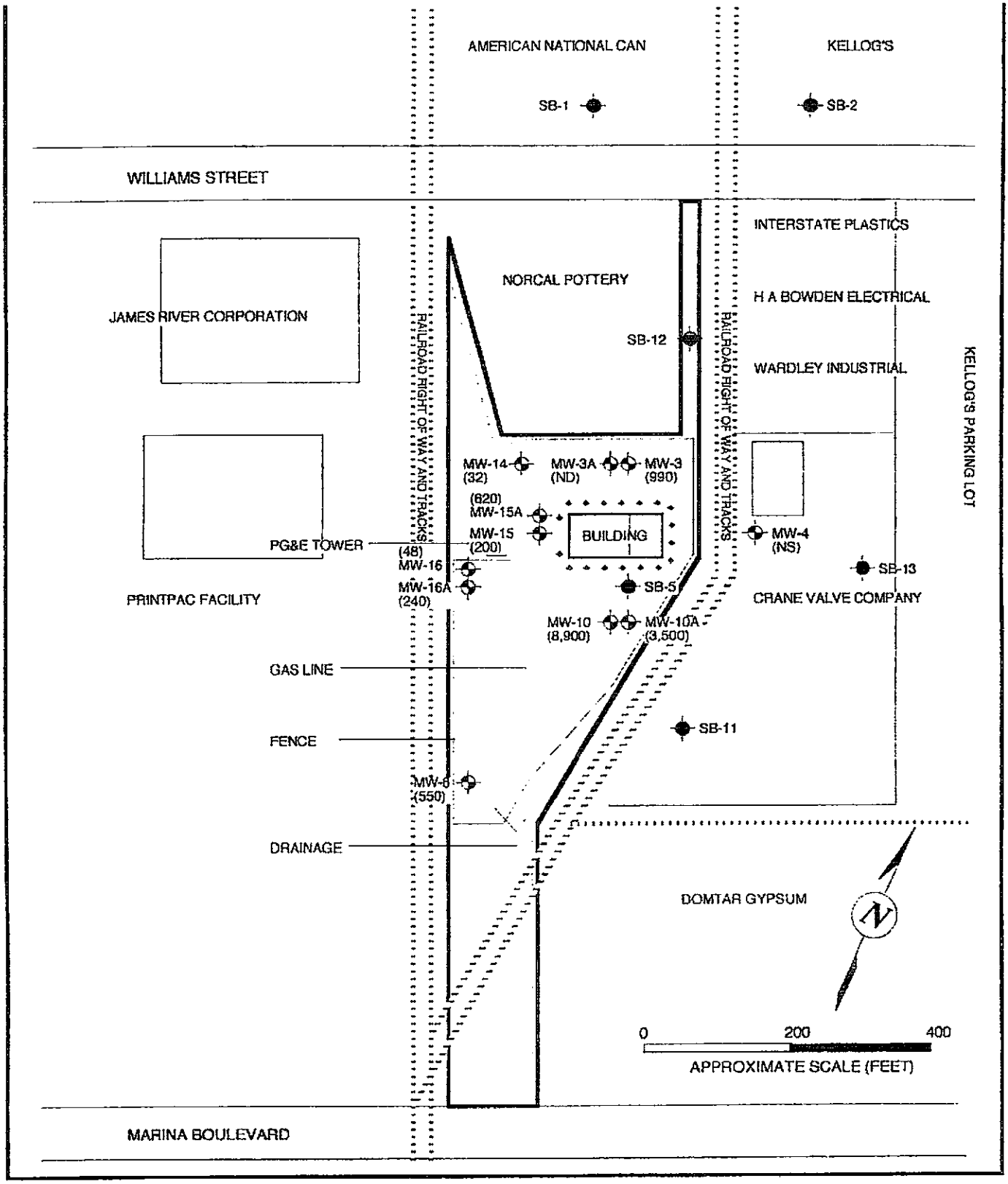
basics ENVIRONMENTAL

Quarterly Ground Water Sampling and Analysis
2075 Williams Street
San Leandro, California

PROJECT NO.
99-ENV187F

DRAWING NO.
2

DATE 2/5/01
REVIEWED BY
PREPARED BY DGT
TBLCK (5/28/92)



PCE Concentrations in Ground Water (µg/L)

DATE 4/2/01 REVIEWED BY PREPARED BY DGT

basics ENVIRONMENTAL

Quarterly Ground Water Sampling and Analysis
2075 Williams Street
San Leandro, California

PROJECT NO.
99-ENV187F

DRAWING NO.
3

TBLCX (5/20/98)

E. BIOPLUME MODLES - 45.1 ft/year Seepage Velocity

BIOCHLOR Natural Attenuation Decision Support System

Date of Run May 21, 2001 | **Run For Nov 98** | *Version 2.0*

Printpack SL
PCE Plume
Run Name

Data Input Instructions:

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in gray cells. Press Enter, then C

(To restore formulas, hit "Restore Formulas" button)

Variable* = Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	45.1	(ft/yr)
or			
Hydraulic Conductivity	K	3.4E-03	(cm/sec)
Hydraulic Gradient	i	0.0045	(ft/ft)
Effective Porosity	n	0.35	(-)

2. DISPERSION

Alpha x*	80	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-03	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	2.95	(-)
TCE	130	(L/kg)	1.59	(-)
DCE	125	(L/kg)	1.57	(-)
VC	30	(L/kg)	1.14	(-)
ETH	302	(L/kg)	2.38	(-)
Common R (used in model)* =			**1.59**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

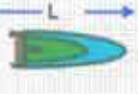
	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	2.000		0.79
TCE → DCE	1.000		0.74
DCE → VC	0.700		0.64
VC → ETH	0.400		0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE			
TCE → DCE			
DCE → VC			
VC → ETH			

λ HELP

5. GENERAL

Simulation Time*	2	(yr)
Modeled Area Width*	200	(ft)
Modeled Area Length*	800	(ft)
Zone 1 Length*	800	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1



6. SOURCE DATA

TYPE: Continuous Single Planar

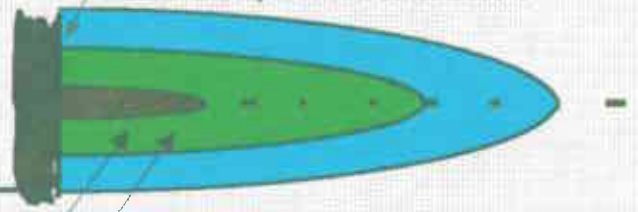
Source Options

Source Thickness in Sat. Zone* 50 (ft)

Y1
Width* (ft) 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	4.6	0
TCE	.12	0
DCE	.1	0
VC	.0	0
ETH	.0	0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	4.6			.18							
TCE Conc. (mg/L)	.12			.69							
DCE Conc. (mg/L)	.1										
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Dist. from Source (ft)	0			300							

8. CHOOSE TYPE OF OUTPUT TO SEE:

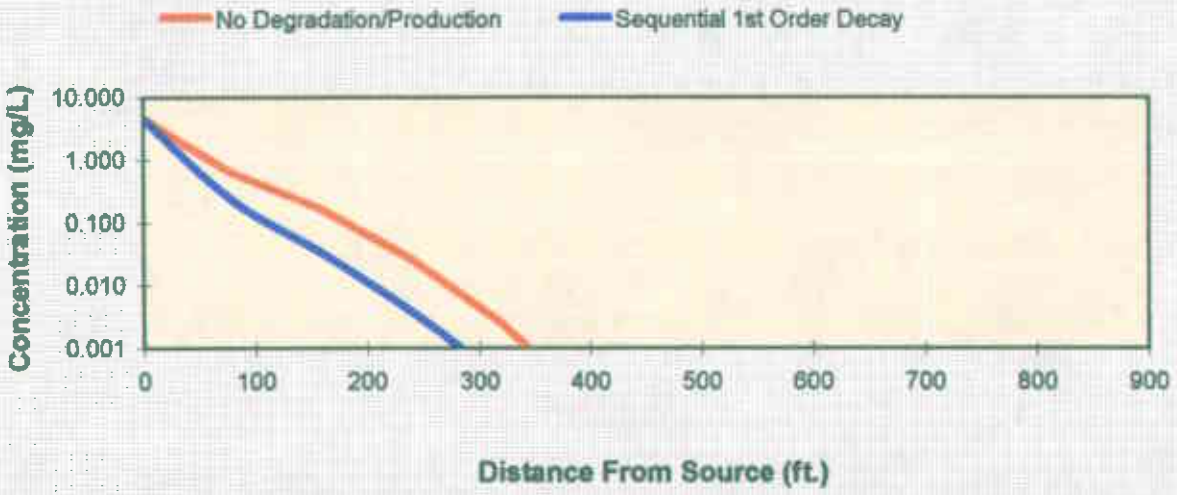
RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 21, 2001 | Printpack, San Lenadro | Run For Nov 98

PCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	4.600	0.616	0.161	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	4.600	0.231	0.032	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0			300							
Field Data from Site	4.600			0.180							



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 2.0 Years

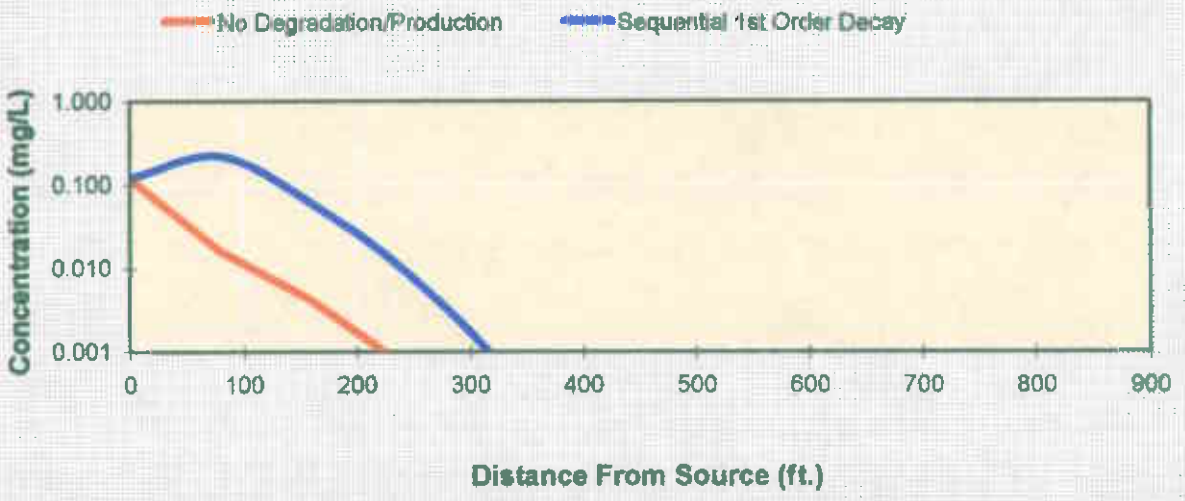
Log ⟺ Linear

Return to Input | To All | To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 21, 2001 — Printpack, San Lenadro — Run For Nov 98

TCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.120	0.016	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.120	0.219	0.061	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	0			300							
Field Data from Site	0.120			0.690							



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 2.0 Years

Log ⟺ Linear

Return to Input | To All | To Array

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For Nov 98** — **Run Date May 21, 2001**

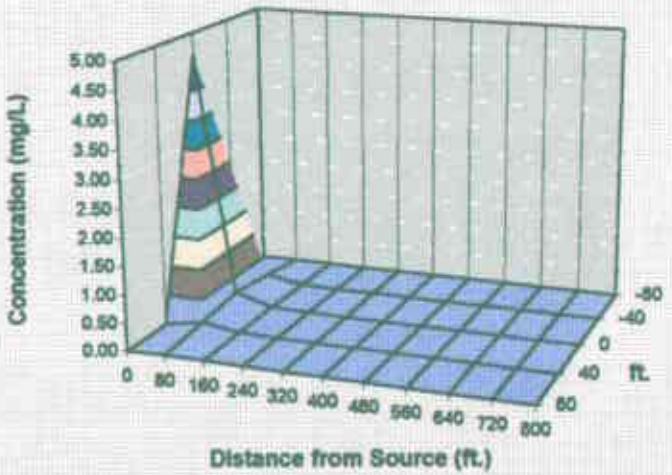
Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.020	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.125	0.024	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	4.600	0.231	0.032	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.125	0.024	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.020	0.009	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 10.8 (Kg)

- Plume Mass If Biotransformation/Production: 7.4 (Kg)

Mass Removed: 3.4 (Kg)

% Biotransformed = +31.5%

% Change in Mass Rate = #VALUE!

Current Volume of Ground Water in Plume: 14.14 acre-ft

Flow Rate of Water Through Source Area: 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up

Clean-Up Time (yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For Nov 98** — **Run Date May 21, 2001**

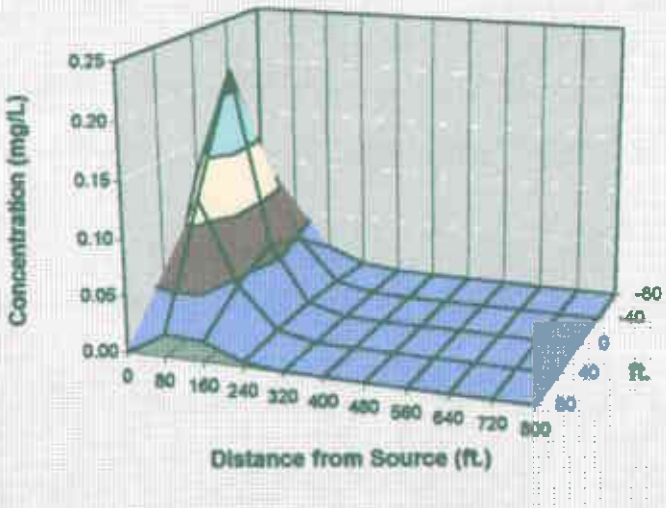
Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.019	0.018	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.119	0.045	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000
0	0.120	0.219	0.061	0.010	0.001	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.119	0.045	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.019	0.018	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation TCE



Plot All Data Plot Data > Target

Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	0.3	(Kg)
- Plume Mass If Biotransformation/Production	2.0	(Kg)
Mass Removed	-1.7	(Kg)
% Biotransformed =	-598.6 %	
% Change in Mass Rate =	#VALUE!	
Current Volume of Ground Water in Plume	18.00	acre-ft
Flow Rate of Water Through Source Area	0.382	acre-ft/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Mass HELP To Centerline Return to Input

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For Nov 98** — **Run Date May 21, 2001**

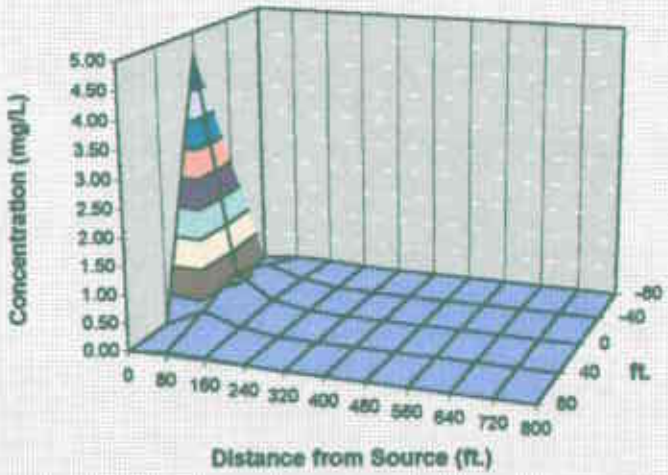
Transverse Distance (ft) ↓ / Distance from Source (ft)	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.054	0.047	0.012	0.001	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.335	0.118	0.022	0.002	0.000	0.000	0.000	0.000	0.000	0.000
0	4.600	0.616	0.161	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.335	0.118	0.022	0.002	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.054	0.047	0.012	0.001	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: No Degradation PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation 10.8 (Kg)

- Plume Mass If Biotransformation/Production 7.4 (Kg)

Mass Removed 3.4 (Kg)

If "Can't Calc", make model area larger

% Biotransformed = +31.5%

% Change in Mass Rate = #VALUE!

See MGal

Current Volume of Ground Water in Plume 20.67 acre-ft

Flow Rate of Water Through Source Area 0.382 acre-ft/yr

Compare to Pump and Treat

Pumping Rate (gpm)

Pore Volumes Removed Per Yr. 0.0

Pore Volumes to Clean-Up

Clean-Up Time (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For Nov 98** — **Run Date May 21, 2001**

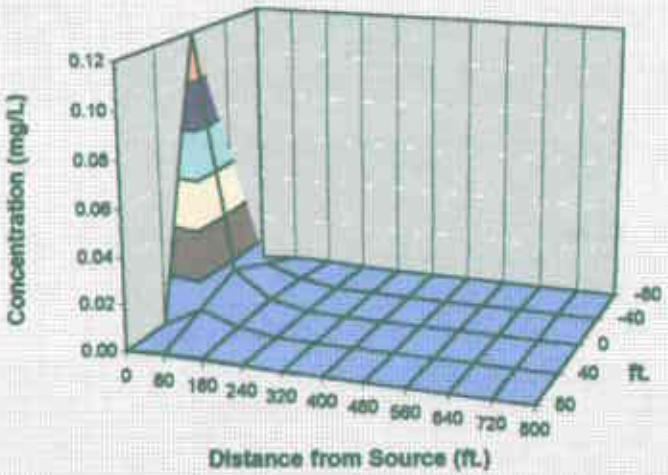
Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.009	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.120	0.016	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.009	0.003	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: No Degradation TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.3 (Kg)

- Plume Mass If Biotransformation/Production: 2.0 (Kg)

Mass Removed: -1.7 (Kg)

If "Can't Calc.", make model area longer

% Biotransformed = -598.6 %

% Change in Mass Rate = #VALUE!

See HGal

Current Volume of Ground Water In Plume: 0.14 acre-ft

Flow Rate of Water Through Source Area: 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

BIOCHLOR Natural Attenuation Decision Support System

Date of Run May 22, 2001 | **Run For May 2000** | *Version 2.0*

Printpack SL
PCE Plume
Run Name

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	45.1	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i	0.0045	(ft/ft)
Effective Porosity	n	0.35	(-)

2. DISPERSION

Alpha x*	80	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-03	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	2.95	(-)
TCE	130	(L/kg)	1.59	(-)
DCE	125	(L/kg)	1.57	(-)
VC	30	(L/kg)	1.14	(-)
ETH	302	(L/kg)	2.36	(-)
Common R (used in model)* =			**1.59**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

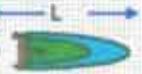
	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	2.000		0.79
TCE → DCE	1.000		0.74
DCE → VC	0.700		0.64
VC → ETH	0.400		0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE			
TCE → DCE			
DCE → VC			
VC → ETH			

λ HELP

5. GENERAL

Simulation Time*	1	(yr)
Modeled Area Width*	200	(ft)
Modeled Area Length*	800	(ft)
Zone 1 Length*	800	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1



6. SOURCE DATA

TYPE: Continuous / Single Planar

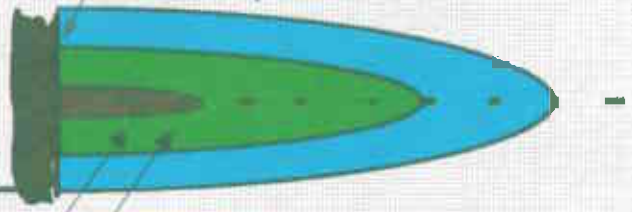
Source Options

Source Thickness in Sat. Zone* 50 (ft)

Width* (ft) Y1: 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	3.6	0
TCE	.16	0
DCE	.1	0
VC	.0	0
ETH	.0	0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	3.6		.1								
TCE Conc. (mg/L)	.16		.071								
DCE Conc. (mg/L)	.1										
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Dist. from Source (ft)	0		150	150							

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Data Input Instructions:

115 ↑ or ↓ 0.02

1. Enter value directly....or
2. Calculate by filling in gray cells. Press Enter, then

(To restore formulas, hit "Restore Formulas" button)

Variable* = Data used directly in model.

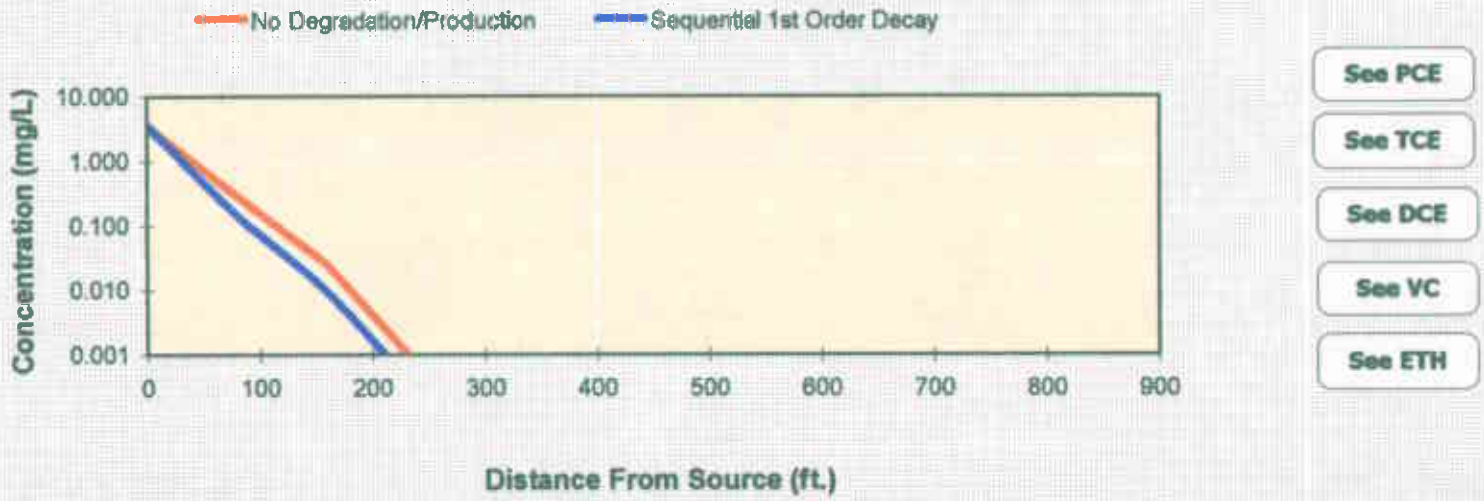
Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 22, 2001 | Printpack, San Lenadro | Run For May 2000

PCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	3.600	0.291	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	3.600	0.147	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0		150	150							
Field Data from Site	3.600		0.100								



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 1.0 Years

Log ⟺ Linear

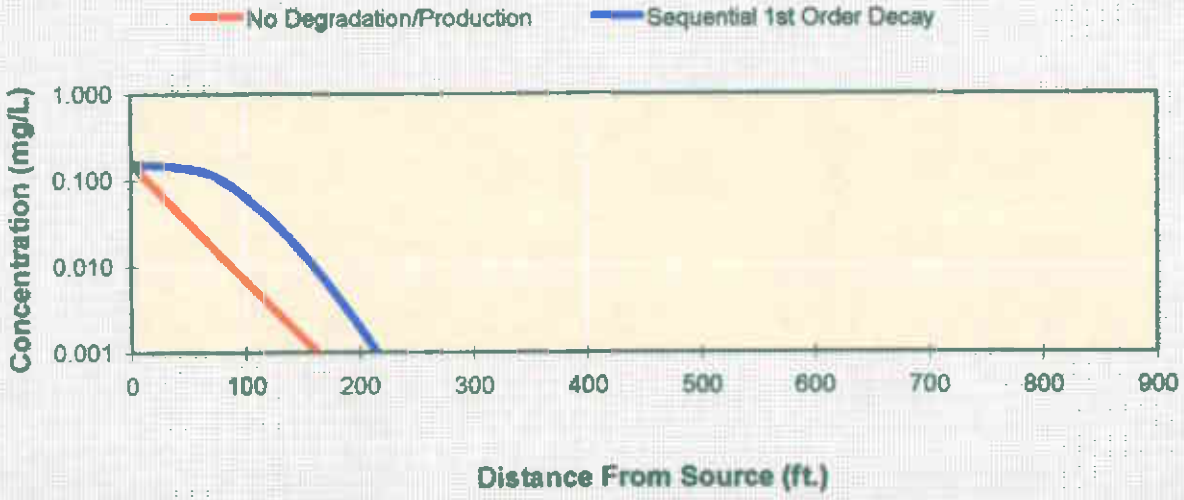
Return to Input | To All | To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 22, 2001 — Printpack, San Lenadro — Run For May 2000

TCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.160	0.013	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.160	0.101	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0		150	150							
Field Data from Site	0.160		0.071								



See PCE
See TCE
See DCE
See VC
See ETH

Prepare Animation

Time:
1.0 Years
Log ⟺ Linear

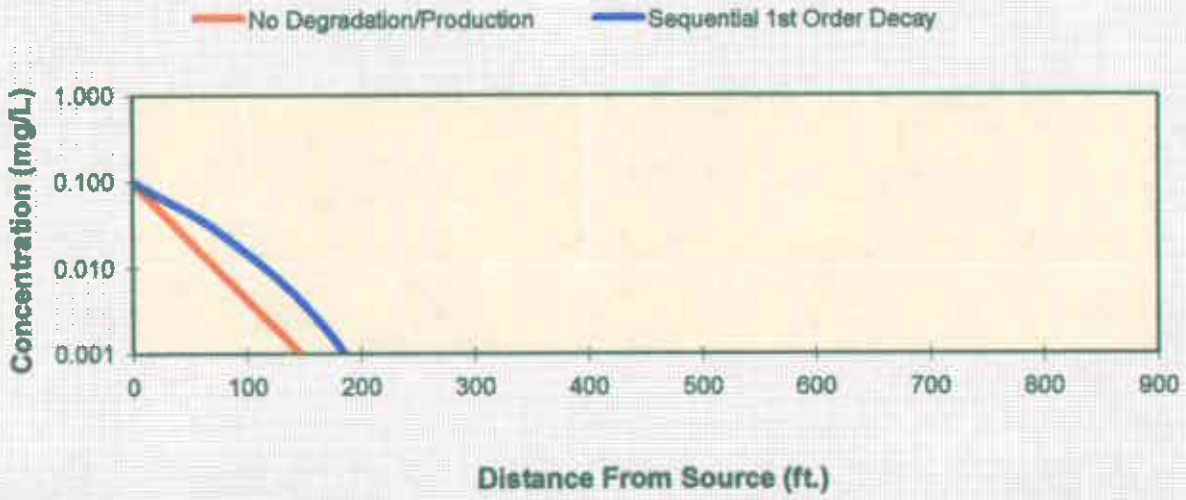
Return to Input
To All
To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 22, 2001 — Printpack, San Lenadro — Run For May 2000

DCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.100	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.100	0.024	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0		150	150							
Field Data from Site	0.100										



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1.0 Years

Log ⟺ Linear

Return to Input

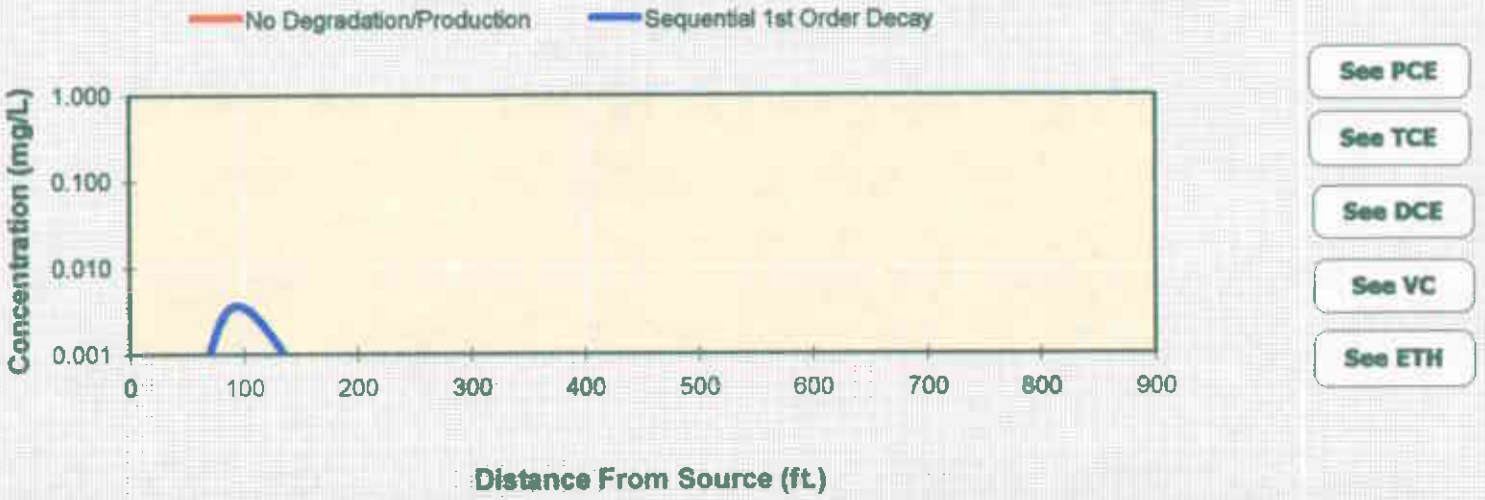
To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 22, 2001 | Printpack, San Lenadro | Run For May 2000

VC	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	0		150	150							
Field Data from Site											



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 1.0 Years

Log ⟺ Linear

Return to Input | To All | To Array

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

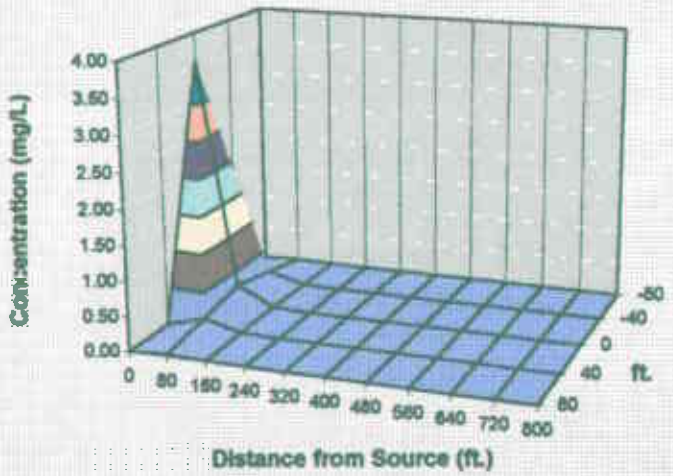
Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.025	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.158	0.018	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	3.600	0.291	0.025	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.158	0.018	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.025	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation 6.4 (Kg)

- Plume Mass If Biotransformation/Production 5.5 (Kg)

Mass Removed 0.9 (Kg)

If "Can't Calc.", make model area larger

% Biotransformed = +14.8%

% Change in Mass Rate = #VALUE!

See HGal

Current Volume of Ground Water in Plume 14.14 acre-ft

Flow Rate of Water Through Source Area 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate (gpm)

Pore Volumes Removed Per Yr. 0.0

Pore Volumes to Clean-Up

Clean-Up Time (yr)

Plot All Data Plot Data > Target

Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

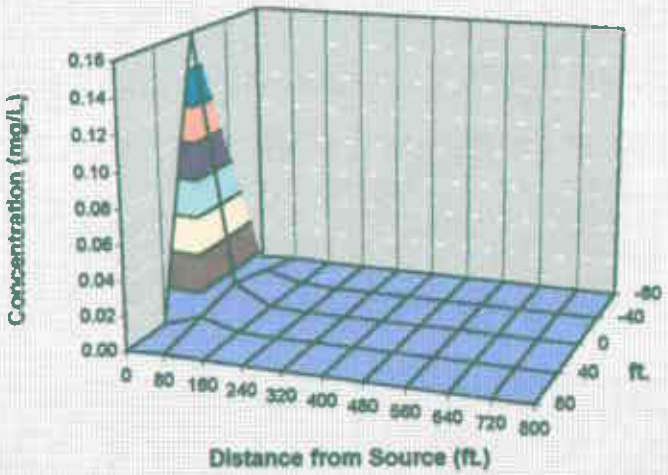
Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.160	0.013	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.007	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	0.3	(Kg)
- Plume Mass If Biotransformation/Production	0.9	(Kg)
Mass Removed	-0.6	(Kg)
% Biotransformed =	-201.4 %	
% Change in Mass Rate =	#VALUE!	

Current Volume of Ground Water in Plume	5.14	acre-ft
Flow Rate of Water Through Source Area	0.362	acre-ft/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target

Mass HELP To Centerline Return to Input

Start Here → ○ PCE ○ TCE ● DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

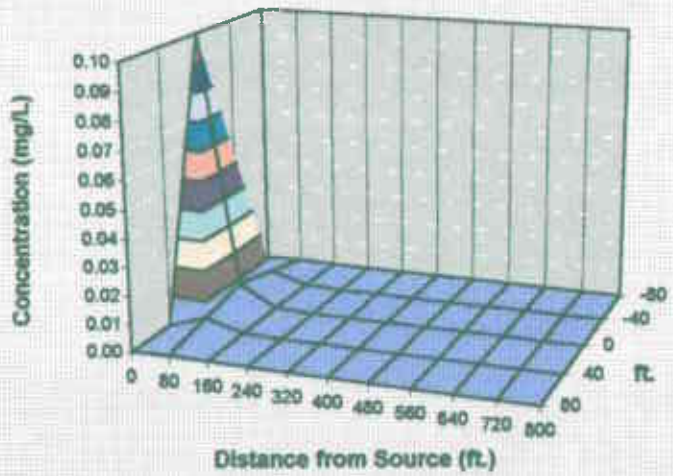
Transverse Distance (ft) ↓ / *Distance from Source (ft)* →

	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.100	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.004	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.070 mg/L Displayed Model: No Degradation Displayed Compound: DCE



Plot All Data | Plot Data > Target

Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	0.2	(Kg)
- Plume Mass If Biotransformation/Production	0.3	(Kg)
Mass Removed	-0.1	(Kg)
% Biotransformed =	-59.2 %	
% Change in Mass Rate =	#VALUE!	

If "Can't Calc.", make model area smaller

See HGet

Current Volume of Ground Water in Plume	2.57	acre-ft
Flow Rate of Water Through Source Area	0.362	(acre-ft)/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Mass HELP | To Centerline | Return to Input

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

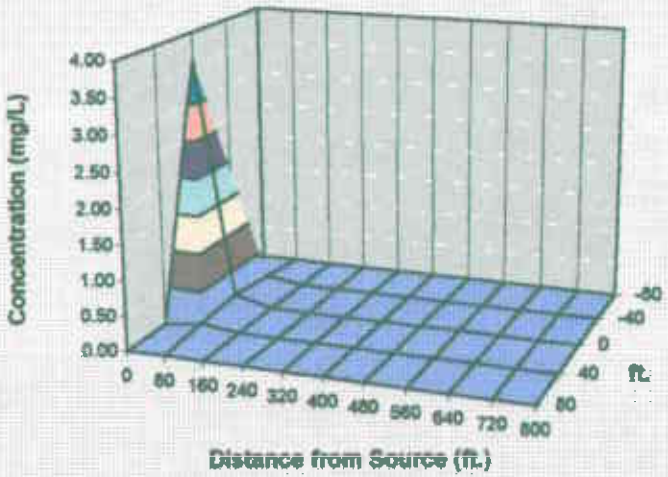
Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.080	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	3.600	0.147	0.009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.080	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	6.4	(lb)
- Plume Mass If Biotransformation/Production	5.5	(lb)
Mass Removed	0.9	(lb)
% Biotransformed =	+14.8%	
% Change in Mass Rate =	#VALUE!	
Current Volume of Ground Water in Plume	11.57	acre-ft
Flow Rate of Water Through Source Area	0.362	acre-ft/yr
Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Compare to Pump and Treat

Plot All Data Plot Data > Target

Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

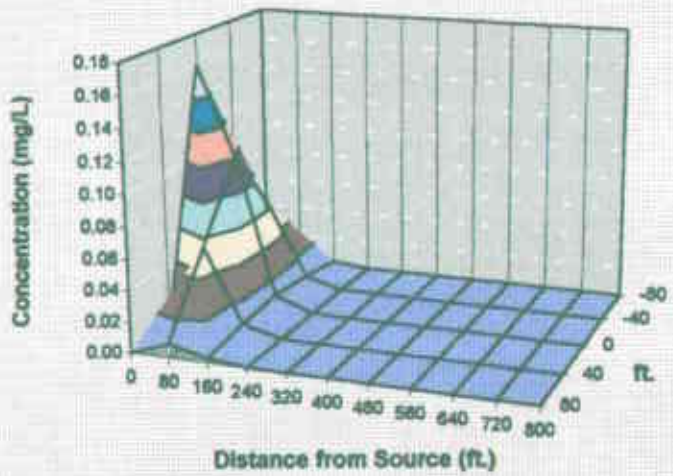
Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.009	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.055	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.160	0.101	0.010	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.055	0.007	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.009	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation TCE



Plot All Data | Plot Data > Target

Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.3 (Kg)

- Plume Mass If Biotransformation/Production: 0.9 (Kg)

Mass Removed: -0.6 (Kg)

If "Can't Calc.", make model area larger

% Biotransformed = -201.4 %

% Change in Mass Rate = #VALUE!

See HCol

Current Volume of Ground Water In Plume: 11.57 acre-ft

Flow Rate of Water Through Source Area: 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Mass HELP | To Centerline | Return to Input

Start Here → ○ PCE ○ TCE ● DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

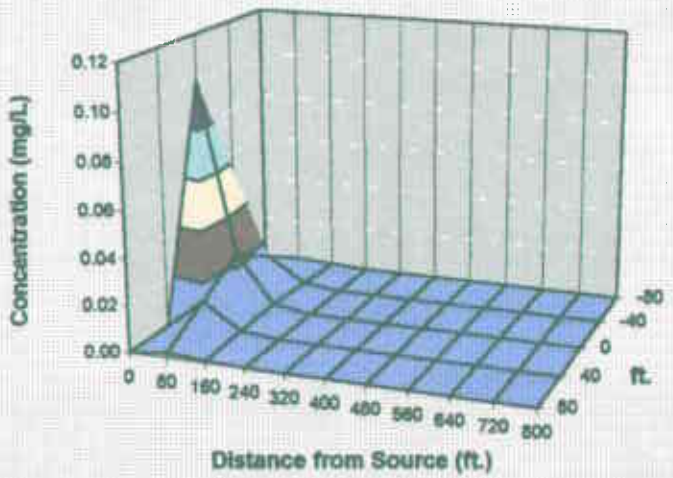
Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.100	0.024	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.070 mg/L Displayed Model: Biotransformation Displayed Compound: DCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.2 (Kg)

- Plume Mass If Biotransformation/Production: 0.3 (Kg)

Mass Removed: -0.1 (Kg)

If "Can't Calc.", make model area longer

% Biotransformed = -59.2 %

% Change in Mass Rate = #VALUE!

See HGal

Current Volume of Ground Water in Plume: 0.14 acre-ft

Flow Rate of Water Through Source Area: 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

Start Here → ○ PCE ○ TCE ○ DCE ● VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

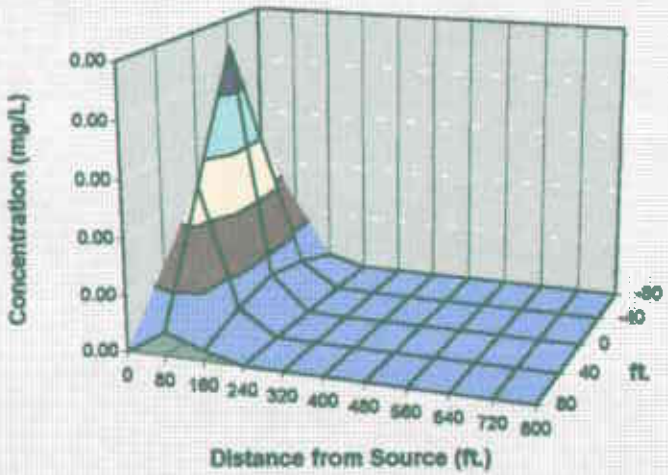
Printpack, San Leandro — **Run For May 2000** — **Run Date May 22, 2001**

Transverse Distance (ft) ↓ / *Distance from Source (ft)*	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.000	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.002 mg/L Displayed Model: Biotransformation Displayed Compound: VC



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	0.0	(Kg)
- Plume Mass If Biotransformation/Production	0.0	(Kg)
Mass Removed	0.0	(Kg)
% Biotransformed =		
% Change in Mass Rate =	#VALUE!	

If "Can't Calc.", make model area longer

See MDal

Current Volume of Ground Water in Plume	0.00	acre-ft
Flow Rate of Water Through Source Area	0.362	acre-ft/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	#DIV/0!	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target

Mass HELP To Centerline Return to Input

BIOCHLOR Natural Attenuation Decision Support System

Date of Run May 20, 2001 | **Run For** TW-1(Oil) | *Version 2.0*

Printpack SL
PCE Plume
Run Name

Data Input Instructions:

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in gray cells. Press Enter, then

(To restore formulas, hit "Restore Formulas" button)

Variable* = Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	450.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i	0.0045	(ft/ft)
Effective Porosity	n	0.35	(-)

2. DISPERSION

Alpha x*	40	(ft)	Calc. Alpha x
(Alpha y) / (Alpha x)*	0.1	(-)	
(Alpha z) / (Alpha x)*	1.E-03	(-)	

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	2.95	(-)
TCE	130	(L/kg)	1.59	(-)
DCE	125	(L/kg)	1.57	(-)
VC	30	(L/kg)	1.14	(-)
ETH	302	(L/kg)	2.38	(-)
Common R (used in model)* =			**1.59**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	0.023	30.00	0.79
TCE → DCE	0.035	20.00	0.74
DCE → VC	0.000		0.64
VC → ETH	0.000		0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

λ HELP

5. GENERAL

Simulation Time*	1	(yr)
Modeled Area Width*	100	(ft)
Modeled Area Length*	400	(ft)
Zone 1 Length*	400	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous / Single Planar

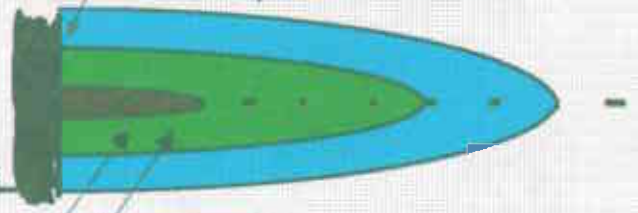
Source Options

Source Thickness in Sat. Zone* 10 (ft)

Width* (ft) Y1: 10

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	5.0	0
TCE	.0	0
DCE	.0	0
VC	.0	0
ETH	.0	0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	5.0					.58					
TCE Conc. (mg/L)	.0					.12					
DCE Conc. (mg/L)	.0										
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Dist. from Source (ft)	0					240					

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

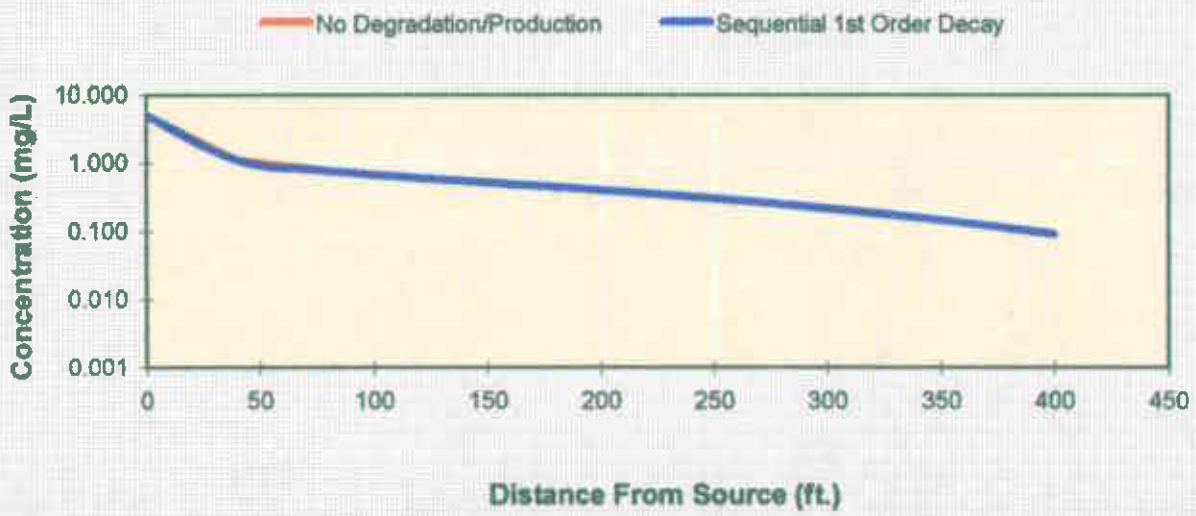
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 20, 2001 | Printpack, San Lenadro | Distance from Source (ft) | Run For TW-1 (Oil)

PCE	0	40	80	120	160	200	240	280	320	360	400
No Degradation	5.000	1.090	0.760	0.598	0.487	0.396	0.317	0.246	0.184	0.132	0.091
Biotransformation	5.000	1.088	0.757	0.595	0.484	0.393	0.314	0.244	0.183	0.131	0.089

Monitoring Well Locations (ft)

	0					240					
Field Data from Site	5.000					0.580					



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 1.0 Years

Log ⟺ Linear

Return to Input | To All | To Array

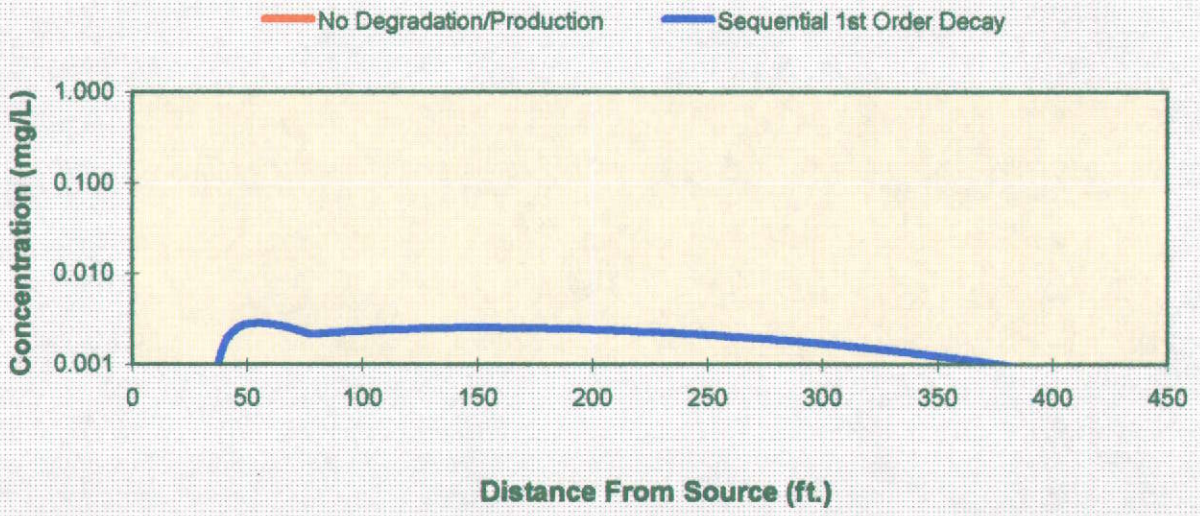
DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 20, 2001 | Printpack, San Lenadro | Distance from Source (ft) | Run For TW-1 (Oil)

TCE	0	40	80	120	160	200	240	280	320	360	400
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.000	0.002	0.002	0.002	0.003	0.002	0.002	0.002	0.001	0.001	0.001

Monitoring Well Locations (ft)

	0					240					
Field Data from Site	0.000					0.120					



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 1.0 Years

Log ⟺ Linear

Return to Input | To All | To Array

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run For TW-1 (Oil)** — **Run Date: May 20, 2001**

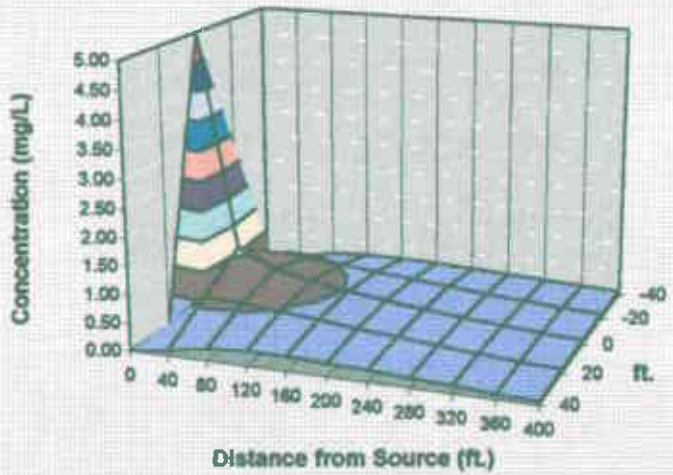
Transverse Distance (ft) ↓ / *Distance from Source (ft)* →	0	40	80	120	160	200	240	280	320	360	400
40	0.000	0.095	0.221	0.262	0.262	0.241	0.209	0.172	0.135	0.100	0.071
20	0.000	0.593	0.558	0.487	0.417	0.350	0.286	0.225	0.171	0.123	0.085
0	5.000	1.090	0.760	0.598	0.487	0.396	0.317	0.246	0.184	0.132	0.091
-20	0.000	0.593	0.558	0.487	0.417	0.350	0.286	0.225	0.171	0.123	0.085
-40	0.000	0.095	0.221	0.262	0.262	0.241	0.209	0.172	0.135	0.100	0.071
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 2.1 (Kg)

- Plume Mass If Biotransformation/Production: 2.1 (Kg)

Mass Removed: 0.0 (Kg)

If "Can't Calc.", make model area larger

% Biotransformed = +0.5%

% Change in Mass Rate = #VALUE!

See HGist

Current Volume of Ground Water in Plume: Can't Calc. acre-ft

Flow Rate of Water Through Source Area: 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.:

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target

Mass HELP | To Centerline | Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

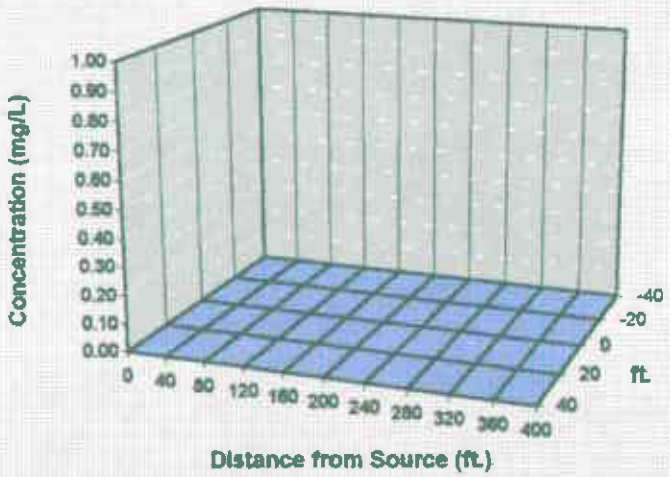
Printpack, San Leandro — **Run For TW-1 (Oil)** — **Run Date: May 20, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	40	80	120	160	200	240	280	320	360	400
40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.0 (Kg)

- Plume Mass If Biotransformation/Production: 0.0 (Kg)

Mass Removed: 0.0 (Kg)

% Biotransformed =

% Change in Mass Rate = #VALUE!

Current Volume of Ground Water in Plume: 0.00 acre-ft

Flow Rate of Water Through Source Area: 0.362 acre-ft/yr

Compare to Pump and Treat

Pumping Rate (gpm)

Pore Volumes Removed Per Yr. #DIV/0!

Pore Volumes to Clean-Up

Clean-Up Time (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

BIOCHLOR Natural Attenuation Decision Support System

Date of Run May 24, 2001 | Run For Nov 98** | *Version 2.0*

Printpack SL
PCE Plume
Run Name

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	65.0	(ft/yr)
or			
Hydraulic Conductivity	K	3.4E-03	(cm/sec)
Hydraulic Gradient	i	0.0045	(ft/ft)
Effective Porosity	n	0.35	(-)

2. DISPERSION

Alpha x*	80	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-03	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho		1.6	(kg/L)	
FractionOrganicCarbon, foc		1.0E-3	(-)	
Partition Coefficient	Koc			
PCE		426	(L/kg)	2.95 (-)
TCE		130	(L/kg)	1.59 (-)
DCE		125	(L/kg)	1.57 (-)
VC		30	(L/kg)	1.14 (-)
ETH		302	(L/kg)	2.38 (-)
Common R (used in model)* =				**1.59**

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

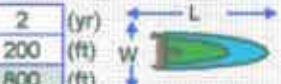
	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	2.000		0.79
TCE → DCE	1.000		0.74
DCE → VC	0.700		0.64
VC → ETH	0.400		0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE			
TCE → DCE			
DCE → VC			
VC → ETH			

λ HELP

5. GENERAL

Simulation Time*	2	(yr)
Modeled Area Width*	200	(ft)
Modeled Area Length*	800	(ft)
Zone 1 Length*	800	(ft)
Zone 2 Length*	0	(ft)

Zone 2= L - Zone 1



6. SOURCE DATA

TYPE: Continuous Single Planar

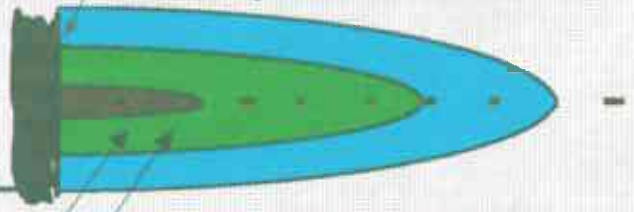
Source Options

Source Thickness in Sat. Zone* 50 (ft)

Y1
Width* (ft) 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	4.6	0
TCE	.12	0
DCE	.1	0
VC	.0	0
ETH	.0	0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	4.6			.18							
TCE Conc. (mg/L)	.12			.69							
DCE Conc. (mg/L)	.1										
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Dist. from Source (ft)	0			300							

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Data Input Instructions:

115 ← 1. Enter value directly....or
↑ or 2. Calculate by filling in gray
0.02 ← cells. Press Enter, then
(To restore formulas, hit "Restore Formulas" button)
Variable* = Data used directly in model.

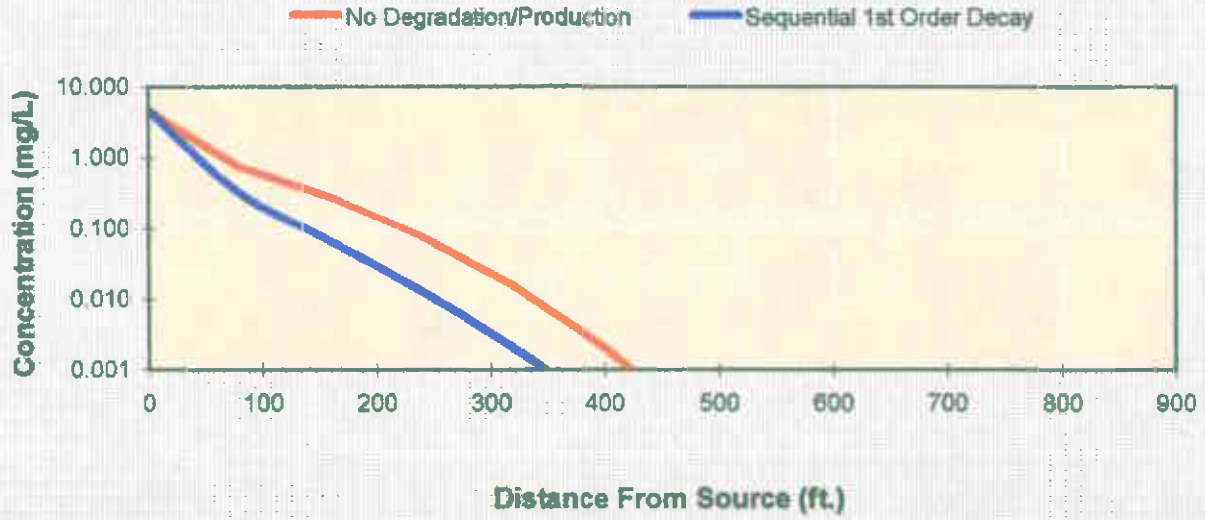
Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 24, 2001 — Printpack, San Lenadro — Run For Nov 98**

PCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	4.600	0.728	0.269	0.078	0.016	0.002	0.000	0.000	0.000	0.000	0.000
Biotransformation	4.600	0.316	0.065	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0			300							
Field Data from Site	4.600			0.180							



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

2.0 Years

Log ⟺ Linear

Return to Input

To All

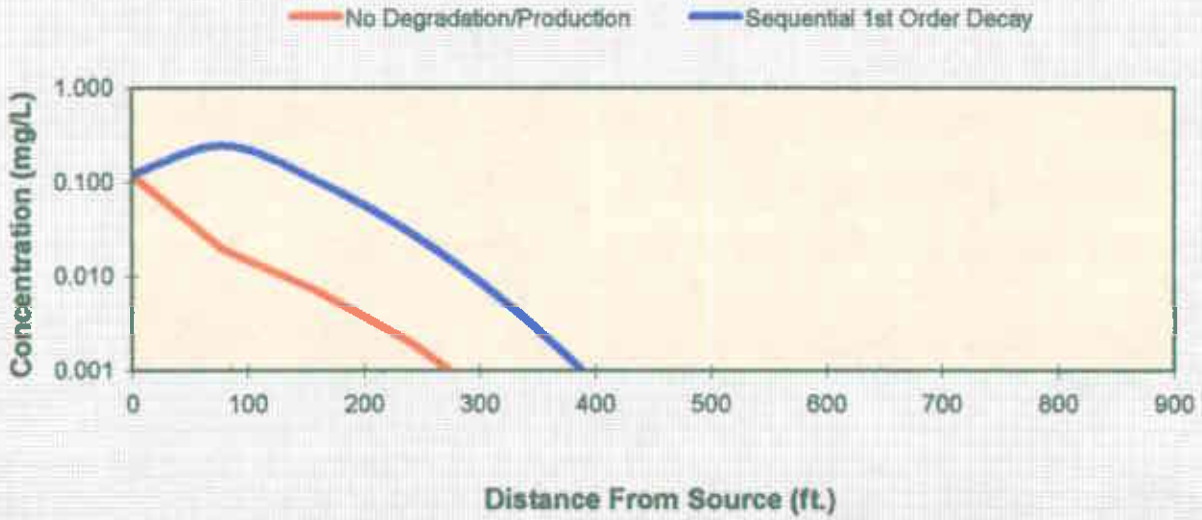
To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 24, 2001 — Printpack, San Lenadro — Run For Nov 98**

TCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.120	0.019	0.007	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.120	0.245	0.103	0.029	0.006	0.001	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0			300							
Field Data from Site	0.120			0.690							



See PCE
See TCE
See DCE
See VC
See ETH

Prepare Animation

Time:
2.0 Years
Log ⟺ Linear

Return to Input
To All
To Array

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

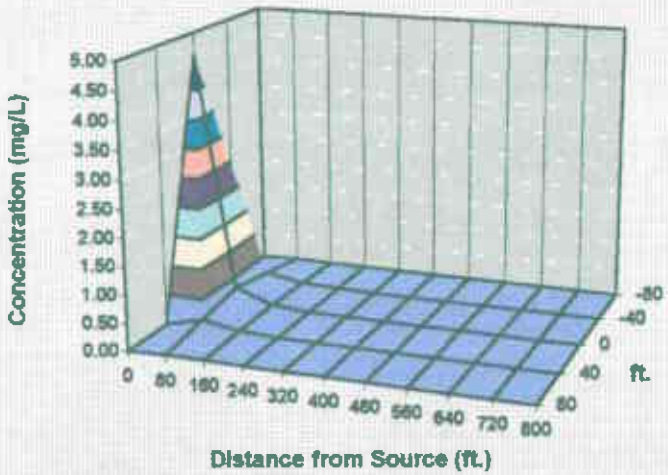
Printpack, San Leandro — **Run for Nov 98**** — **Run Date May 24, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.028	0.019	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.172	0.048	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000
0	4.600	0.316	0.065	0.013	0.002	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.172	0.048	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.028	0.019	0.006	0.001	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass if No Degradation	12.9	(Kg)
- Plume Mass if Biotransformation/Production	8.3	(Kg)
Mass Removed	4.7	(Kg)
% Biotransformed =	+36.1%	
% Change in Mass Rate =	#VALUE!	
Current Volume of Ground Water in Plume	20.57	acre-ft
Flow Rate of Water Through Source Area	0.522	acre-ft/yr
Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Compare to Pump and Treat

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

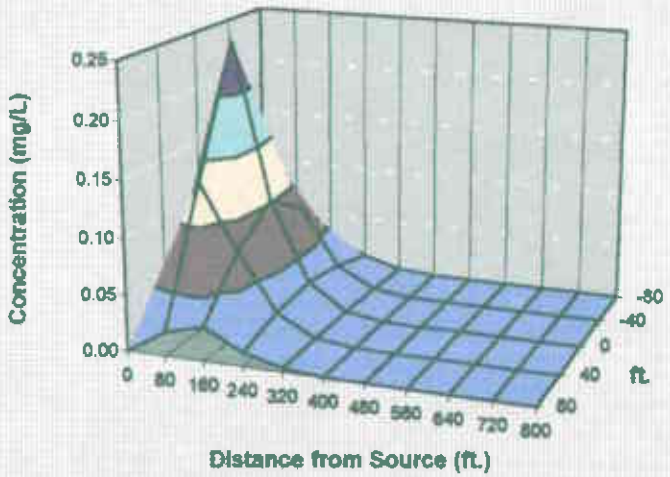
Printpack, San Leandro — **Run for Nov 98**** — **Run Date May 24, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft)	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.021	0.030	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.133	0.076	0.024	0.005	0.001	0.000	0.000	0.000	0.000	0.000
0	0.120	0.245	0.103	0.029	0.006	0.001	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.133	0.076	0.024	0.005	0.001	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.021	0.030	0.013	0.003	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	0.3	(Kg)
- Plume Mass If Biotransformation/Production	2.7	(Kg)
Mass Removed	-2.3	(Kg)
% Biotransformed =	-692.0 %	
% Change in Mass Rate =	#VALUE!	
Current Volume of Ground Water in Plume	21.85	acre-ft
Flow Rate of Water Through Source Area	0.922	acre-ft/yr
Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Compare to Pump and Treat

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ● PCE
○ TCE
○ DCE
○ VC
○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

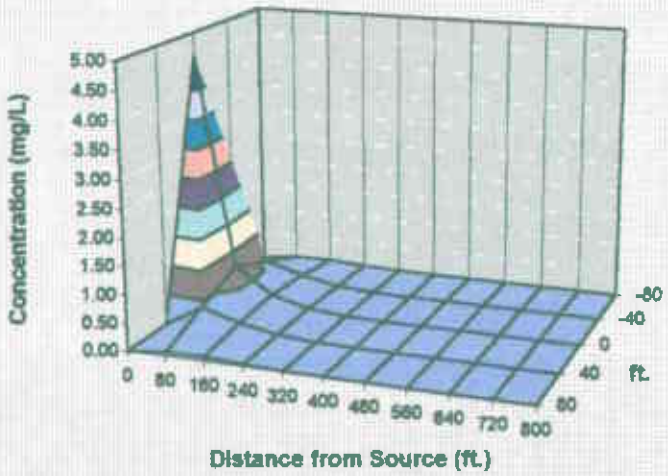
Printpack, San Leandro — **Run for Nov 98**** — **Run Date May 24, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.064	0.078	0.034	0.008	0.001	0.000	0.000	0.000	0.000	0.000
40	0.000	0.396	0.198	0.063	0.013	0.002	0.000	0.000	0.000	0.000	0.000
0	4.600	0.728	0.269	0.078	0.016	0.002	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.396	0.198	0.063	0.013	0.002	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.064	0.078	0.034	0.008	0.001	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: PCE



Plot All Data | Plot Data > Target

Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	12.9	(Kg)
- Plume Mass If Biotransformation/Production	8.3	(Kg)
Mass Removed	4.7	(Kg)
% Biotransformed =	+36.1%	
% Change in Mass Rate =	#VALUE!	
Current Volume of Ground Water in Plume	27.00	acre-ft
Flow Rate of Water Through Source Area	0.522	acre-ft/yr
Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

If "Can't Calc.", make model area longer

See #Gal

Compare to Pump and Treat

Mass HELP | To Centerline | Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run for Nov 98**** — **Run Date May 24, 2001**

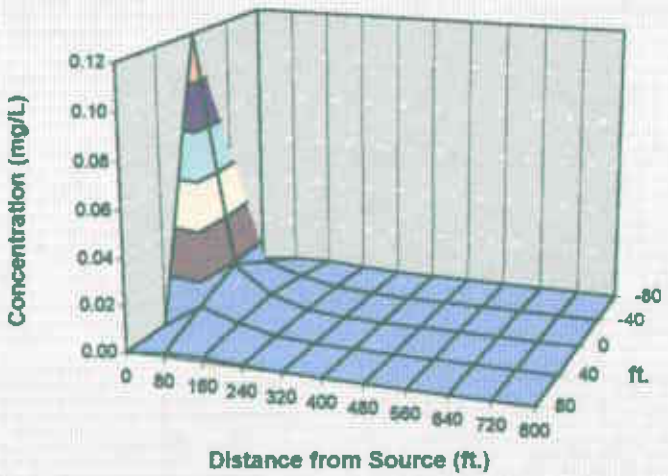
Transverse Distance (ft) ↓ / Distance from Source (ft)	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.010	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.120	0.019	0.007	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.010	0.005	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.002	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound: TCE

Time: 2 yr Target Level: 0.005 mg/L Displayed Model: No Degradation



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass if No Degradation: 0.3 (Kg)

- Plume Mass if Biotransformation/Production: 2.7 (Kg)

Mass Removed: -2.3 (Kg)

% Biotransformed = -692.0 %

% Change in Mass Rate = #VALUE!

See HGal

Current Volume of Ground Water in Plume: 0.00 acre-ft

Flow Rate of Water Through Source Area: 0.622 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

BIOCHLOR Natural Attenuation Decision Support System

Date of Run May 24, 2001 | **Run For May 2009**** | *Version 2.0*

Printpack SL
PCE Plume
Run Name

Data Input Instructions:

115 or 0.02 — 1. Enter value directly....or 2. Calculate by filling in gray cells. Press Enter, then

(To restore formulas, hit "Restore Formulas" button)

Variable* = Data used directly in model.

Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	65.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i	0.0045	(ft/ft)
Effective Porosity	n	0.35	(-)

2. DISPERSION

Alpha x*	80	(ft)	Calc. Alpha x
(Alpha y) / (Alpha x)*	0.1	(-)	
(Alpha z) / (Alpha x)*	1.E-03	(-)	

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho	1.6	(kg/L)		
FractionOrganicCarbon, foc	1.0E-3	(-)		
Partition Coefficient	Koc			
PCE	426	(L/kg)	2.95	(-)
TCE	130	(L/kg)	1.59	(-)
DCE	125	(L/kg)	1.57	(-)
VC	30	(L/kg)	1.14	(-)
ETH	302	(L/kg)	2.38	(-)
Common R (used in model)* =			**1.59**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

Zone 1	λ (1/yr)	half-life (yrs)	Yield
PCE → TCE	2.000		0.79
TCE → DCE	1.000		0.74
DCE → VC	0.700		0.64
VC → ETH	0.400		0.45

Zone 2	λ (1/yr)	half-life (yrs)
PCE → TCE		
TCE → DCE		
DCE → VC		
VC → ETH		

λ HELP

5. GENERAL

Simulation Time*	1	(yr)	
Modeled Area Width*	200	(ft)	W
Modeled Area Length*	800	(ft)	L
Zone 1 Length*	800	(ft)	
Zone 2 Length*	0	(ft)	Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous Single Planar

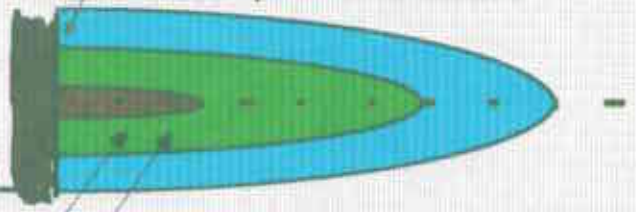
Source Options

Source Thickness in Sat. Zone* 50 (ft)

Width* (ft) Y1: 20

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	3.6	0
TCE	.16	0
DCE	.1	0
VC	.0	0
ETH	.0	0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	3.6		.1								
TCE Conc. (mg/L)	.16		.071								
DCE Conc. (mg/L)	.1										
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Dist. from Source (ft)	0		150	150							

8. CHOOSE TYPE OF OUTPUT TO SEE:

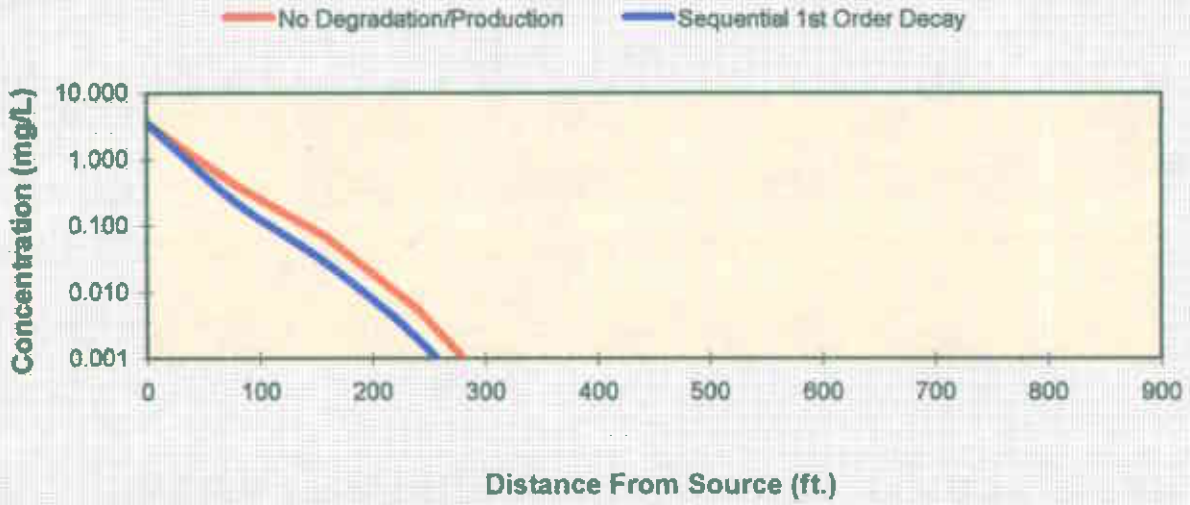
RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 24, 2001 — Printpack, San Lenadro — Run For May 2000**

PCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	3.600	0.394	0.066	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	3.600	0.216	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000

	Monitoring Well Locations (ft)										
	0		150	150							
Field Data from Site	3.600		0.100								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:

1.0 Years

Log ⟺ Linear

Return to Input

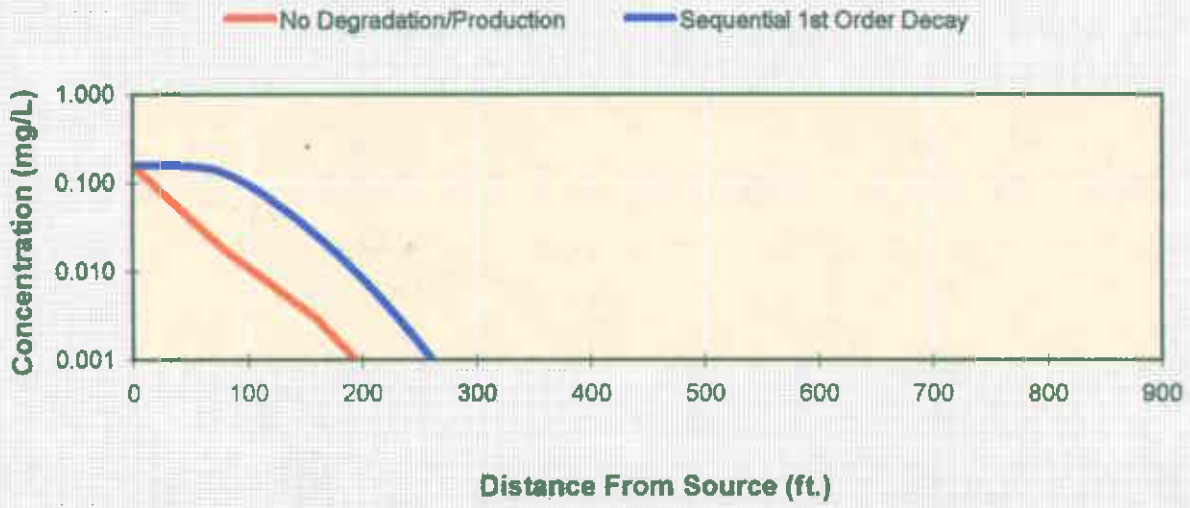
To All

To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 24, 2001 — Printpack, San Lenadro — Run For May 2000**

TCE	Distance from Source (ft)										
	0	80	160	240	320	400	480	560	640	720	800
No Degradation	0.160	0.018	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.160	0.128	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	Monitoring Well Locations (ft)										
	0		150	150							
Field Data from Site	0.160		0.071								



See PCE

See TCE

See DCE

See VC

See ETH

Prepare Animation

Time:
1.0 Years
Log ⟺ Linear

Return to Input

To All

To Array

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run Date for May 2000**** — **Run Date May 24, 2001**

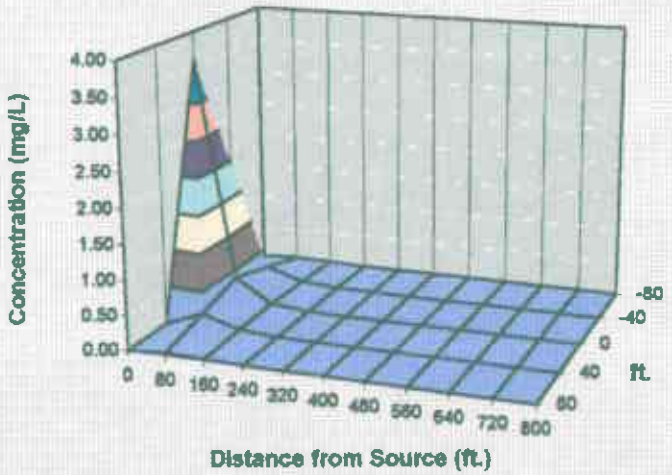
Transverse Distance (ft) ↓ / *Distance from Source (ft)*	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.034	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.214	0.049	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	3.600	0.394	0.066	0.006	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.214	0.049	0.004	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.034	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound: PCE

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 7.4 (Kg)

- Plume Mass If Biotransformation/Production: 6.0 (Kg)

Mass Removed: 1.4 (Kg)

If "Can't Calc.", make model area longer

% Biotransformed = +18.4%

% Change in Mass Rate = #VALUE!

See MGal

Current Volume of Ground Water in Plume: 15.43 acre-ft

Flow Rate of Water Through Source Area: 0.522 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run Date for May 2000**** — **Run Date May 24, 2001**

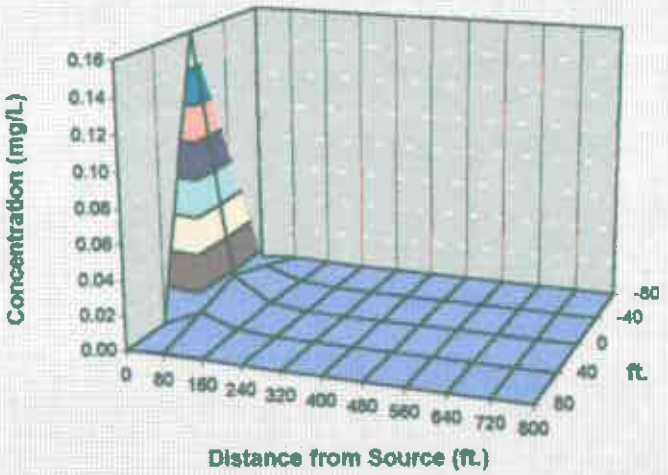
Transverse Distance (ft) ↓ / *Distance from Source (ft)* →

	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.160	0.018	0.003	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.010	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.002	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.3 (Kg)

- Plume Mass If Biotransformation/Production: 1.2 (Kg)

Mass Removed: -0.8 (Kg)

If "Can't Calc.", make model area longer

% Biotransformed = -253.2 %

% Change in Mass Rate = #VALUE!

See HGal

Current Volume of Ground Water in Plume: 5.14 acre-ft

Flow Rate of Water Through Source Area: 0.522 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target

Mass HELP | To Centerline | Return to Input

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run Date for May 2000**** — **Run Date May 24, 2001**

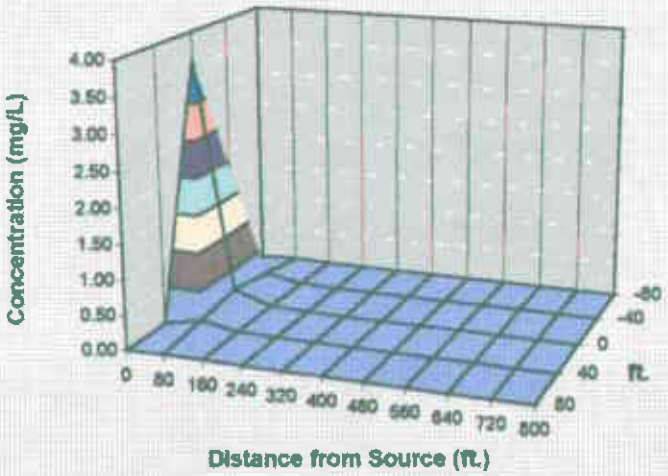
Transverse Distance (ft) ↓ / Distance from Source (ft)	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.019	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.117	0.020	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	3.600	0.216	0.027	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.117	0.020	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.019	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	7.4	(Kg)
- Plume Mass If Biotransformation/Production	6.0	(Kg)
Mass Removed	1.4	(Kg)
% Biotransformed =	+18.4%	
% Change in Mass Rate =	#VALUE!	

If "Can't Calc.", make model area larger

See HGist

Current Volume of Ground Water in Plume	14.14	acre-ft
Flow Rate of Water Through Source Area	0.522	acre-ft/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.	0.0	
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run Date for May 2000**** — **Run Date May 24, 2001**

Transverse Distance (ft) ↓ / *Distance from Source (ft)* →

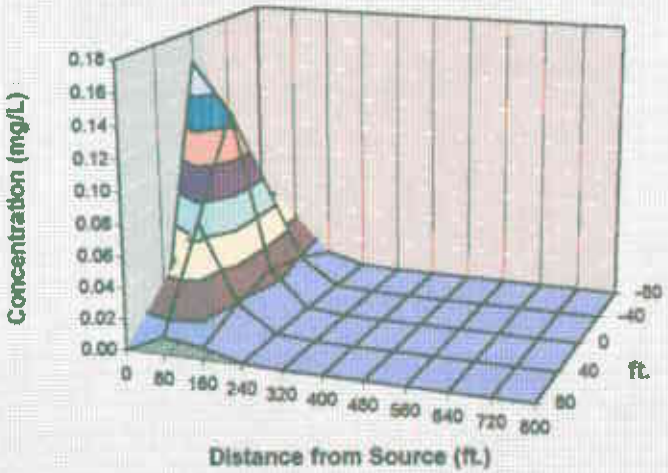
	0	80	160	240	320	400	480	560	640	720	800
80	0.000	0.011	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
40	0.000	0.070	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.160	0.128	0.026	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.070	0.019	0.002	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-80	0.000	0.011	0.008	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Displayed Compound

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.3 (Kg)

- Plume Mass If Biotransformation/Production: 1.2 (Kg)

Mass Removed: -0.8 (Kg)

If "Can't Calc.", make model area larger

% Biotransformed = -253.2 %

% Change in Mass Rate = #VALUE!

See NGal

Current Volume of Ground Water in Plume: 54.14 acre-ft

Flow Rate of Water Through Source Area: 0.522 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: 0.0

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Plot All Data | Plot Data > Target

Mass HELP | To Centerline | Return to Input

BIOCHLOR Natural Attenuation Decision Support System

Date of Run May 24, 2001 | **Run For TW-1(Oil)**** | *Version 2.0*

Printpack SL
PCE Plume
Run Name

TYPE OF CHLORINATED SOLVENT: Ethenes ● Ethanes ○

1. ADVECTION

Seepage Velocity*	Vs	650.0	(ft/yr)
or			
Hydraulic Conductivity	K		(cm/sec)
Hydraulic Gradient	i	0.0045	(ft/ft)
Effective Porosity	n	0.35	(-)

2. DISPERSION

Alpha x*	40	(ft)
(Alpha y) / (Alpha x)*	0.1	(-)
(Alpha z) / (Alpha x)*	1.E-03	(-)

Calc. Alpha x

3. ADSORPTION

Retardation Factor* → R

or

Soil Bulk Density, rho		1.8	(kg/L)	
FractionOrganicCarbon, foc		1.0E-3	(-)	
Partition Coefficient	Koc			
PCE	426	(L/kg)	2.95	(-)
TCE	130	(L/kg)	1.59	(-)
DCE	125	(L/kg)	1.57	(-)
VC	30	(L/kg)	1.14	(-)
ETH	302	(L/kg)	2.38	(-)
Common R (used in model)* =			**1.59**	

4. BIOTRANSFORMATION

-1st Order Decay Coefficient*

	λ (1/yr)	half-life (yrs)	Yield
Zone 1			
PCE → TCE	0.023	30.00	0.79
TCE → DCE	0.035	20.00	0.74
DCE → VC	0.000		0.64
VC → ETH	0.000		0.45
Zone 2	λ (1/yr)	half-life (yrs)	
PCE → TCE	0.000		
TCE → DCE	0.000		
DCE → VC	0.000		
VC → ETH	0.000		

λ HELP

5. GENERAL

Simulation Time*	1	(yr)
Modeled Area Width*	100	(ft)
Modeled Area Length*	400	(ft)
Zone 1 Length*	400	(ft)
Zone 2 Length*	0	(ft)

L, W

Zone 2= L - Zone 1

6. SOURCE DATA

TYPE: Continuous / Single Planar

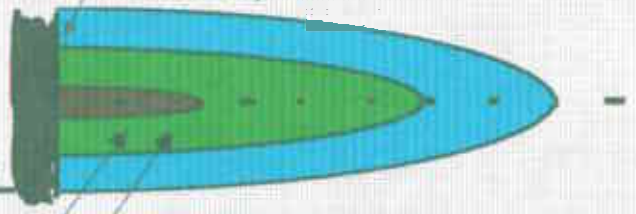
Source Options

Source Thickness in Sat. Zone* 10 (ft)

Width* (ft) Y1: 10

Conc. (mg/L)*	C1	k_s* (1/yr)
PCE	5.0	0
TCE	.0	0
DCE	.0	0
VC	.0	0
ETH	.0	0

Vertical Plane Source: Determine Source Well Location and Input Solvent Concentrations



View of Plume Looking Down

Observed Centerline Conc. at Monitoring Wells

7. FIELD DATA FOR COMPARISON

PCE Conc. (mg/L)	5.0					.58					
TCE Conc. (mg/L)	.0					.12					
DCE Conc. (mg/L)	.0										
VC Conc. (mg/L)											
ETH Conc. (mg/L)											
Dist. from Source (ft)	0					240					

8. CHOOSE TYPE OF OUTPUT TO SEE:

RUN CENTERLINE | RUN ARRAY | Help | Restore Formulas | RESET | SEE OUTPUT | Paste Example

Data Input Instructions:

115 ← 1. Enter value directly....or
↑ or ↓ 2. Calculate by filling in gray
0.02 cells. Press Enter, then
(To restore formulas, hit "Restore Formulas" button)
Variable* ← Data used directly in model.

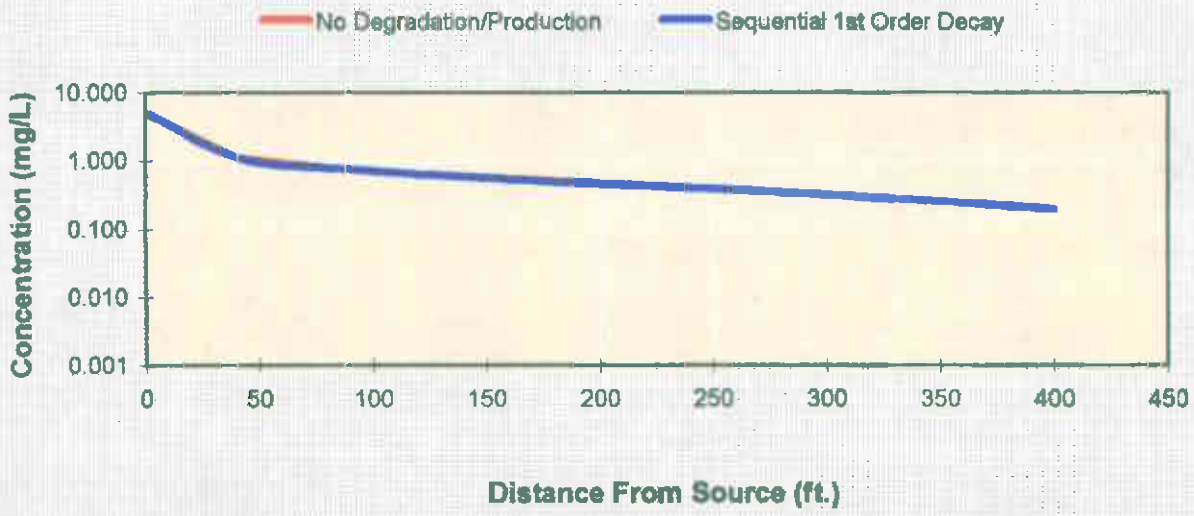
Test if Biotransformation is Occurring → Natural Attenuation Screening Protocol

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 24, 2001 — Printpack, San Lenadro — Run For TW-1 (Oil)**

PCE	Distance from Source (ft)										
	0	40	80	120	160	200	240	280	320	360	400
No Degradation	5.000	1.097	0.776	0.627	0.531	0.458	0.396	0.340	0.288	0.240	0.196
Biotransformation	5.000	1.096	0.774	0.625	0.528	0.455	0.393	0.337	0.286	0.238	0.194

	Monitoring Well Locations (ft)										
	0					240					
Field Data from Site	5.000					0.580					



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 1.0 Years

Log ⟺ Linear

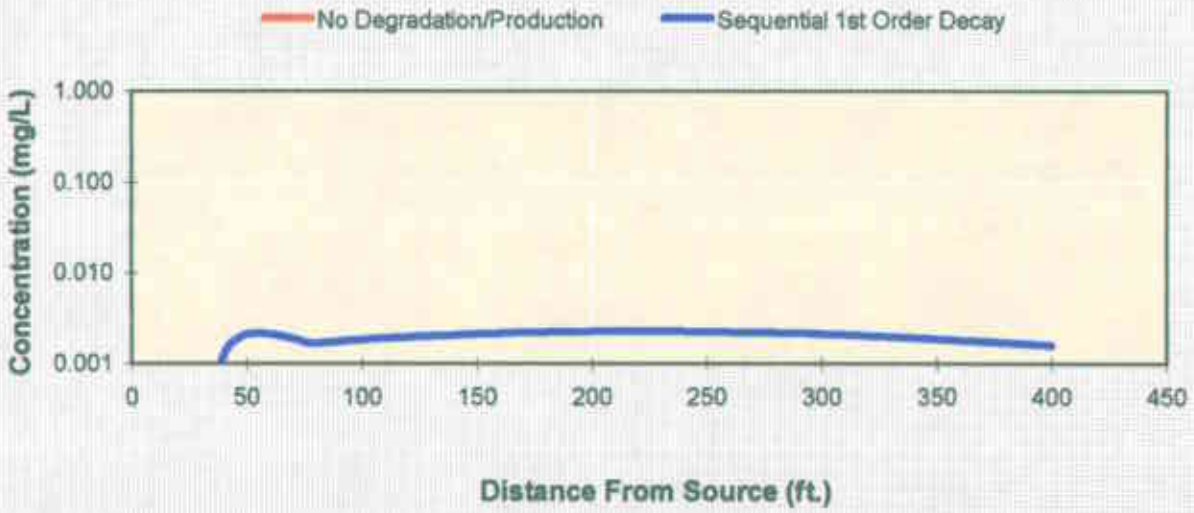
Return to Input | To All | To Array

DISSOLVED CHLORINATED SOLVENT CONCENTRATIONS ALONG PLUME CENTERLINE (mg/L) at Z=0

Run Date May 24, 2001 | Printpack, San Lenadro | Run For TW-1 (Oil)**

TCE	Distance from Source (ft)										
	0	40	80	120	160	200	240	280	320	360	400
No Degradation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Biotransformation	0.000	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002

	Monitoring Well Locations (ft)										
	0					240					
Field Data from Site	0.000					0.120					



See PCE | See TCE | See DCE | See VC | See ETH

Prepare Animation

Time: 1.0 Years

Log ⟺ Linear

Return to Input | To All | To Array

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

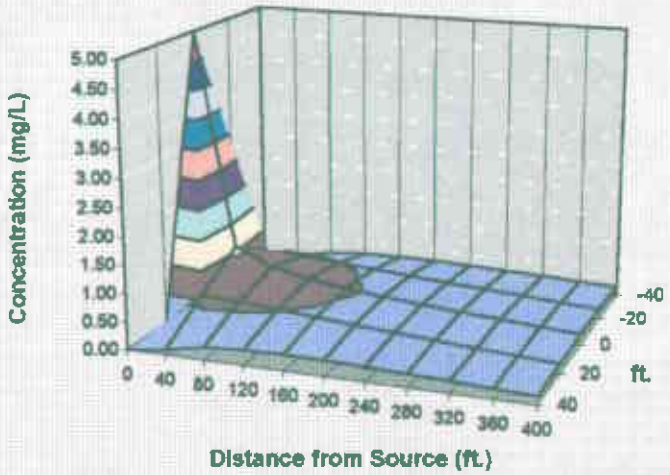
Printpack, San Leandro — **Run for TW-1 (Oil)**** — **Run Date: May 24, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	40	80	120	160	200	240	280	320	360	400
40	0.000	0.098	0.226	0.274	0.285	0.278	0.261	0.238	0.211	0.182	0.153
20	0.000	0.597	0.570	0.510	0.455	0.404	0.357	0.311	0.267	0.224	0.184
0	5.000	1.097	0.776	0.627	0.531	0.458	0.396	0.340	0.288	0.240	0.196
-20	0.000	0.597	0.570	0.510	0.455	0.404	0.357	0.311	0.267	0.224	0.184
-40	0.000	0.096	0.226	0.274	0.285	0.278	0.261	0.238	0.211	0.182	0.153
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	2.5	(Kg)
- Plume Mass If Biotransformation/Production	2.5	(Kg)
Mass Removed	0.0	(Kg)
% Biotransformed =	+0.5%	
% Change in Mass Rate =	#VALUE!	

If "Can't Calc.", make model area longer

See HCal

Current Volume of Ground Water in Plume	Can't Calc.	acre-ft
Flow Rate of Water Through Source Area	0.522	acre-ft/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target

Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

Printpack, San Leandro — **Run for TW-1 (Oil)**** — **Run Date: May 24, 2001**

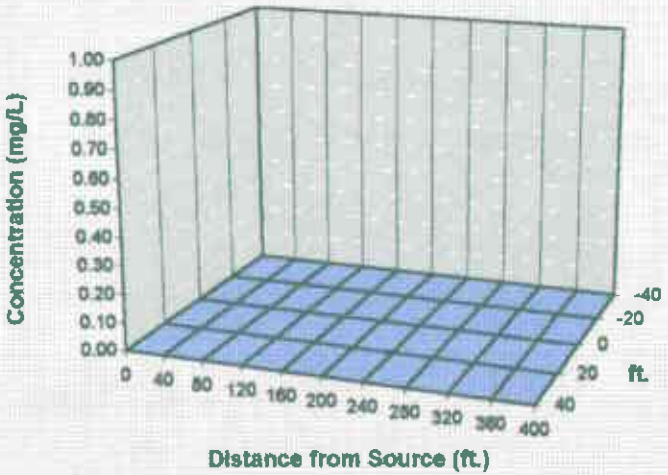
Transverse Distance (ft) ↓ / *Distance from Source (ft)* →

	0	40	80	120	160	200	240	280	320	360	400
40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-20	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
-40	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: No Degradation Displayed Compound: TCE



Plot All Data | Plot Data > Target

Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass if No Degradation: 0.0 (Kg)

- Plume Mass If Biotransformation/Production: 0.0 (Kg)

Mass Removed: 0.0 (Kg)

If "Can't Calc.", make model area larger

% Biotransformed =

% Change in Mass Rate = #VALUE!

See Map

Current Volume of Ground Water in Plume: 0.00 acre-ft

Flow Rate of Water Through Source Area: 0.522 acre-ft/yr

Compare to Pump and Treat

Pumping Rate: (gpm)

Pore Volumes Removed Per Yr.: #DIV/0!

Pore Volumes to Clean-Up:

Clean-Up Time: (yr)

Mass HELP | To Centerline | Return to Input

Start Here → ● PCE ○ TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

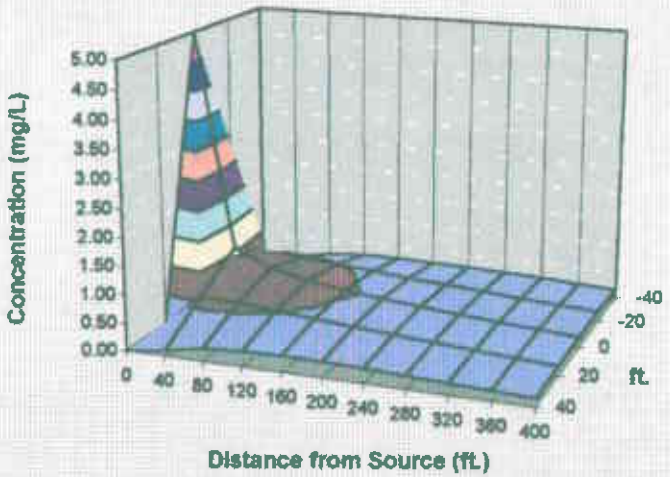
Printpack, San Leandro — **Run for TW-1 (Oil)**** — **Run Date: May 24, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	40	80	120	160	200	240	280	320	360	400
40	0.000	0.096	0.225	0.273	0.284	0.277	0.259	0.236	0.209	0.180	0.151
20	0.000	0.596	0.569	0.508	0.452	0.402	0.354	0.309	0.264	0.222	0.182
0	5.000	1.096	0.774	0.625	0.528	0.455	0.393	0.337	0.286	0.238	0.194
-20	0.000	0.596	0.569	0.508	0.452	0.402	0.354	0.309	0.264	0.222	0.182
-40	0.000	0.096	0.225	0.273	0.284	0.277	0.259	0.236	0.209	0.180	0.151
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: PCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation	2.5	(Kg)
- Plume Mass If Biotransformation/Production	2.5	(Kg)
Mass Removed	0.0	(Kg)
% Biotransformed =	+0.5%	
% Change in Mass Rate =	#VALUE!	

If "Can't Calc.", make model area longer

Current Volume of Ground Water in Plume	Can't Calc.	acre-ft
Flow Rate of Water Through Source Area	0.522	acre-ft/yr

Compare to Pump and Treat

Pumping Rate		(gpm)
# Pore Volumes Removed Per Yr.		
# Pore Volumes to Clean-Up		
Clean-Up Time		(yr)

Plot All Data Plot Data > Target Mass HELP To Centerline Return to Input

Start Here → ○ PCE ● TCE ○ DCE ○ VC ○ ETH

DISSOLVED SOLVENT CONCENTRATIONS IN PLUME

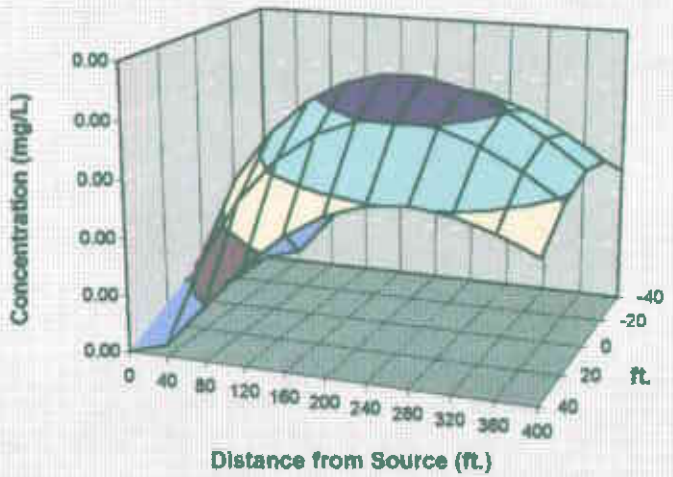
Printpack, San Leandro — **Run for TW-1 (Oil)**** — **Run Date: May 24, 2001**

Transverse Distance (ft) ↓ / Distance from Source (ft) →	0	40	80	120	160	200	240	280	320	360	400
40	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
20	0.000	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001
0	0.000	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
-20	0.000	0.001	0.001	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.001
-40	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.002	0.001	0.001	0.001
MASS RATE (mg/day)	-	-	-	-	-	-	-	-	-	-	-

Show No Degradation

Show Biotransformation

Time: 1 yr Target Level: 0.005 mg/L Displayed Model: Biotransformation Displayed Compound: TCE



Plume Mass (Order-of-Magnitude Accuracy)

See Gallons

Plume Mass If No Degradation: 0.0 (Kg)

- Plume Mass If Biotransformation/Production: 0.0 (Kg)

Mass Removed: 0.0 (Kg)

If "Can't Calc.", make model area larger

% Biotransformed =

% Change in Mass Rate = #VALUE!

See HGs!

Current Volume of Ground Water in Plume: 0.00 acre-ft

Flow Rate of Water Through Source Area: 0.522 acre-ft/yr

Compare to Pump and Treat

Pumping Rate (gpm)

Pore Volumes Removed Per Yr. #DIV/0!

Pore Volumes to Clean-Up

Clean-Up Time (yr)

Plot All Data | Plot Data > Target | Mass HELP | To Centerline | Return to Input