RO-280

RISK ASSESSMENT REPORT

November 20, 2002

Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California

Prepared for:

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1.0 INTRODUCTION

The following is a Risk-Based Corrective Action (RBCA) evaluation for the Scooter's Auto Repair facility located at 3600 MacArthur Boulevard in Oakland, California as was requested by the Alameda County Health Care Services Agency (ACHCSA). This risk assessment is based on the ASTM Standard E1739-95, *Risk-Based Corrective Action at Petroleum Release Sites* (RBCA), the California Regional Water Quality Control Board's (RWQCB) *Application of Risk-Based Screening Levels and Decision Making to Sites With Impacted Soil and Groundwater* (Interim Final - December 2001), and the City of Oakland's *Oakland Risk-Based Corrective Action: Technical Background Document,* January 1, 2000.

The purpose of this RBCA is to determine if further site corrective action is warranted based on the contaminants of concerns (COC) at the site, their status, and regional and site specific conditions such as present and potential groundwater use, hydrogeological conditions, human and biological receptors, and potential for plume migration.

2.0 SITE DESCRIPTION

The site is in Oakland, California, on the southeastern corner of the intersection of MacArthur Boulevard and Magee Avenue. It lies approximately 0.2 mile northeast of Interstate 580 and 0.5 mile northwest of High Street. The site elevation is approximately 200 feet above mean sea level (NGVD, 1929). It is approximately 0.23 acre in area and currently owned by the Estate of Mr. Henry Hall (Alameda County Assessor's Parcel Number 30-1903-15-1). The property is currently used as an automobile repair facility. Mr. Hall operated the site as a service station from approximately 1973 to 1988. Prior to this, the site was a Phillips 66 service station. Underground storage tanks (USTs) used to store gasoline, diesel, and waste oil existed on site until March 1994. The site is zoned for commercial use. The surrounding parcels are zoned for commercial use (northwest and southwest) and residential use (northeast and southeast).

3.0 GEOLOGY AND HYDROGEOLOGY

The site is in the East Bay Plain Groundwater Basin (CRWQCB Basin Plan; 1995, Proposed Amendments, 1998, and the East Bay Plain Groundwater Basin Beneficial Use Report, (CRWQCB, 1999)). The site is located at the eastern edge of the basin, approximately 2,000 feet southwest of the Hayward Fault. The East Bay Plain is regionally subdivided into two major basins, The San Pablo Basin and the San Francisco Basin. The site lies within the San Francisco Basin and is a part of the Oakland Sub-Area, defined by a series of alluvial fans ranging from 300 to 700 feet deep, all overlying a west sloping bedrock surface. There are no well-defined aquitards in this area. Soils beneath the site consist of silty clay with trace amounts of sand to 4.5 fbg, underlain by clays, silts, and sand with gravel to a maximum explored depth of approximately 15 feet below grade (fbg).

Groundwater in this basin is designated beneficial for municipal, industrial, and agricultural uses; although there is no historical evidence that groundwater supplies are sufficient for municipal

use, primarily due to low recharge rates. There are no current or planned uses of groundwater as a drinking water source; however, groundwater may be used for backyard irrigation. Groundwater beneath the site flows to the southwest at 0.02 to 0.03 foot/foot. Depth to groundwater has been between 1.5 fbg and 8.4 fbg, and has fluctuated approximately two feet in each monitoring well from November 1998 to June 2000.

The area has a Mediterranean climate, with an average rainfall of 24 inches, occurring predominantly between November and March. The watershed area for the East Bay Plain is over 100 square miles along the western slope of the Coast Ranges. The nearest surface water body is Peralta Creek, flowing in the southwesterly direction and located approximately 1,000 feet northwest of the site (Appendix A, Figure 1). San Francisco Bay lies approximately 2 miles to the west.

4.0 PREVIOUS INVESTIGATIONS

1994 Tank Removal

In March 1994, two 8,000-gallon gasoline USTs, one 6,000-gallon diesel UST, and one 100-gallon waste oil UST were removed. Soil samples collected at the approximate center of each sidewall of the former fuel tank cavity at approximately 7 fbg contained up to 5,000 milligrams per kilogram (mg/Kg) total petroleum hydrocarbons (TPH) as gasoline, 330 mg/Kg TPH as diesel (TPH-D), and 1.2 mg/Kg benzene. The groundwater sample collected in the former fuel tank cavity contained 2 milligrams per liter (mg/L) TPH-G, 75 mg/L TPH-D, and 0.016 mg/L benzene. The groundwater sample collected in the former waste oil tank cavity contained 0.6 mg/L TPH-G, 69 mg/L TPH-D, and 0.0006 mg/L benzene. The laboratory results of the soil and groundwater samples collected during the UST removal activities are summarized in Tables 1 through 4 located in Appendix B. The soil removed from the tank cavities was used as backfill following UST removal. Based on the December 1998 HK2/SEMCO *Site Characterization* Report, the product piping was not removed in 1994, but later grouted in place in 1999. However, no report detailing these activities was located in the filed reviewed by Kodiak.

1998 Soil and Groundwater Investigation

In November 1998, SEMCO drilled five soil borings (B1 to B5) up to approximately 15 fbg and converted three of the borings to 2-inch-diameter groundwater monitoring wells (MW-1 to MW-3). Soil samples collected in B1 through B4 between 4.5 and 12 fbg contained up to 930 mg/Kg TPH-G, 390 mg/Kg TPH-D, and 10 mg/Kg benzene. No methyl tertiary-butyl ether (MTBE) was detected.

Groundwater Sampling

The three onsite monitoring wells have been sampled four times from November 1998 through June 2000. The gradient appears to be toward the west and southwest at approximately between 0.025 and 0.031 foot/foot. This is consistent with interpretation of topographic maps and flow gradient directions from other UST sites (DWR Well Survey, 2001). Depth to water is very shallow beneath the site, ranging from just over one fbg to less than 5 fbg. Concentrations of TPH-G, TPH-D, and BTEX have historically been detected only in MW-1, downgradient from the former USTs. The gasoline- and diesel-range hydrocarbon concentrations have decreased

from November 1998 through June 2000 and it is likely that the dissolved-phase plume is shrinking. Maximum dissolved-phase concentrations in MW-1 were 6,200 µg/L TPH-G, 540 µg/L TPH-D, 420 µg/L benzene (November 1998). Total dissolved solids were measured in MW-3 at 1,200 mg/L. Laboratory analytical results of soil and groundwater samples and fluid-level monitoring data are summarized in the attached Tables located in Appendix B.

1999-2000 Subsurface Utility Survey

In June 1999 though January 2000, SEMCO performed a site vicinity subsurface utility survey to evaluate the potential of off-site migration of dissolved-phase hydrocarbons via subsurface utility corridors. As groundwater beneath the site is very shallow, the subsurface utility trenches located on and adjacent to the site may act as preferential, off-site, migratory pathways for residual dissolved-phase hydrocarbons contaminants. A copy of the plotted utilities is presented in Appendix A.

2001 DWR Well Survey

In April 2001, a Department of Water Resources (DWR) well survey search was performed for the area within ¼ mile of the site. The DWR located 38 well drillers reports, of which 35 were identified as shallow groundwater monitoring wells, one was a cathodic protection well, and one was abandoned. One irrigation well was identified at 3397 Arkansas Street, in Oakland, approximately 1,500 feet west of the site. This well is described as an irrigation well, drilled in 1977 to 62 fbg. The 6-inch diameter well is screened from 20 to 24 fbg, with blank casing extending to 62 fbg. The well is sealed with cement from 20 fbg to surface. It is not known whether this well is still in use at this time.

5.0 RESIDUAL SOURCES AND CONSTITUENTS OF CONCERN

Gasoline and its components (benzene, toluene, ethylbenzene, and xylenes) are constituents of concern (COCs) for this site. Diesel has also been detected at the site. Of the many compounds occurring in gasoline, benzene, toluene, ethylbenzene, and xylenes (BTEX) are the most important in terms of human toxicity. Of these, benzene is considered the only **Class A** carcinogen (i.e. known human carcinogen). MTBE was not detected at this site by EPA Method 8260, and is not considered a COC.

Benzene is considered the primary COC at this site. TEX and TPH will be considered in overall risk. A lengthy review of the potential toxicity of benzene is beyond the scope of this report. The source of the COCs at the site originated from leaking dispensers or product piping and leaking underground storage tanks. Subsequent assessment work showed that gasoline and diesel had impacted shallow groundwater downgradient of the former dispenser island and the former USTs. All sources have been stopped when the tanks, dispensers, and associated piping were removed.

The COCs occupy the soil and groundwater beneath the site. Groundwater is very shallow and most soil beneath the site is likely saturated. While soil samples will be considered in overall risk, the bulk of the contamination is resent in groundwater. The dissolved-phase plume likely

occupies an area approximately 2,400 ft^2, downgradient of the former USTs and southern end of the northern dispenser islands. An approximation of the aerial extent of the plume is shown on a figure included in Appendix A.

5.1 Location of Human and Environmental Receptors

Human receptors are one to five workers onsite and in the onsite auto repair building, customers, pedestrians passing on the adjacent sidewalks, and potential residential occupants downgradient of the site. Construction workers would also be receptors if excavation was carried out onsite or beneath the potentially-impacted area beneath MacArthur Boulevard. The irrigation well identified 1,500 feet west of the site is considered a potential receptor for this assessment, although it is not likely at risk due to its distance from the site, the COCs at the site, and the moderate groundwater gradient. All other areas occupied by humans are outside the affected area. Other biological receptors such as fish and fowl are not at risk due to the distance of the nearest receptor, Peralta Creek, located 1,000 feet northwest of the site. Water for domestic use is supplied by the East Bay Municipal Utilities District (EBMUD), originating from EBMUD's water supply system in the Sierra's Mokelumne River watershed.

5.2 Transport and Exposure Pathways

The following site conditions are used to determine transport and exposure pathways:

- Most of the site is covered with asphalt and concrete, except the former tank cavities, which are gravel to surface grade.
- Groundwater is very shallow.
- The aquifer is not used as a domestic, commercial, or agricultural water supply (although it may be used for backyard irrigation, there are no known irrigation well for at least 1,500 feet downgradient of the site. Several UST sites and associated groundwater monitoring wells are located throughout the area. (DWR Well Survey, 2001).
- The aquifer does not discharge to a stream, pond, lake, or other waterway.
- The groundwater velocity has been calculated to be between 0.02 and 0.03 foot/foot.
- The groundwater plume appears to be stable and passively degrading (shrinking).
- The area directly downgradient of the site is zoned for commercial use; however, residential properties exist further southwest, and to the northeast and southeast.

With the above stated site conditions, it can be safely asserted that no direct exposure pathways exists to humans or other biological receptors, except groundwater ingestion via the offsite well. In this case, most of the primary transport mechanisms and exposure pathways are indirect, via vapor migration from the dissolved-phase groundwater plume to outdoor air and indoor air within the auto repair facility (nearest receptor). In order to ensure that exposure from shallow soils to construction workers does not pose a future threat, this pathway was also considered. The COCs appear to have reached equilibrium in the groundwater; therefore, future migration in these mediums will be limited and the threat of offsite receptors being affected is unlikely. An exposure scenario flowchart is presented in Appendix C.

6.0 TIER 1 RISK-BASED SCREENING LEVEL LOOK-UP TABLE

In accordance with the RBCA guidelines a risk-based screening level (RBSL) look-up table was generated. The pathways correspond to the identified pathways described in Section 5.2 of this report, or more stringent pathways based on general Tier 1 criteria. The screening levels presented in the table below are taken from the RWQCB's *Application to Risk-Based Screening Levels and Decision Making to Sites with Impacted Soil and Groundwater, Interim Final, December 2001*. Maximum soil and groundwater concentrations were used for this Tier 1 table.

Table 1: Tier 1 RBSL Look-Up Table
Groundwater IS a Potential Source of Drinking Water (Coarse-Grained Soils)
Target Level: Cancer Risk = 1 x 10^{-6}, Hazard Quotient = 0.2

Exposure Pathway	TPH (Gasoline)	Benzene	Toluene	Ethylbenzene	Xylenes
Direct Exposure Soils Residential Table K-1	500 mg/Kg	0.018 mg/Kg	120 mg/Kg sat	230 mg/Kg sat	210 mg/Kg sat
Direct Exposure Soils Commercial Table K-2	11,000 mg/Kg	0.39 mg/Kg	120 mg/Kg sat	230 mg/Kg sat	210 mg/Kg sat
Maximum Site Soil Concentration	**5,000 mg/Kg**	**1.2 mg/Kg**	26 mg/Kg	27 mg/Kg	75 mg/Kg
Inhalation of Vapors from Groundwater Table F-2	--	84 µg/L	76,000 µg/L	170,000 µg/L	150,00 µg/L
Drinking Water Screening Level Table F-3	100 µg/L	1.0 µg/L	150 µg/L	700 µg/L	1,750 µg/L
Maximum Site Groundwater Concentrations	**6,200 µg/L**	**420 µg/L**	47 µg/L	240 µg/L	46 µg/L

The highest recorded benzene concentration in groundwater beneath the site was 420 µg/L (Appendix B, Table 2), which exceeds the above RBSL. The dissolved-phase TPH-G suggested no adverse affect level (SNARL) was also exceeded, although there is no drinking water standard for TPH. The TPH level was also exceeded for soil, but it must be noted that this is based on the highest concentration, and most other samples were below 10 mg/Kg of TPH. Based on the above table a Tier 2 look-up table was developed for benzene.

7.0 TIER 2 SITE SPECIFIC TARGET LEVELS (SSTL) LOOK -UP TABLE

In order to better evaluate the potential of risk of soil and vapors to potential construction workers, the potential of vapors to migrate into the building and outdoor air from soil and groundwater, and the risk to a potential offsite domestic well, a Tier 2 Site-Specific Target Level (SSTL) Table was constructed. Where possible, site specific input parameters were used. The

default parameters used were based on the accepted values in the Oakland, RWQCB, and ASTM RBCA guidelines, and were used where non site-specific data was available or where site conditions were very similar to the default parameters. The RBCA input values are provided in Output Table 1 located in Appendix D.

7.1 Soil Parameters

Depth to Top of Affected Subsurface Soils: All soils below 1.5 fbg are considered saturated, although the soil analytical sample used was collected from 7 fbg.

Soil Density: The soil density was default value of *1.59 g/cm^3 for sandy silts* from the Oakland RBCA.

Fraction of Organic Carbon: The fraction of organic carbon (Foc) Oakland RBCA default value of *0.015 g/g* was used.

Soil Porosity in the Capillary Fringe: The soil porosity Oakland RBCA default value of *0.40 cm^3 /cm^3* was used.

Volume of Water in the Capillary Fringe: The volume of water in the capillary fringe Oakland RBCA default value of *0.25 cm^3 /cm^3* was used.

7.2 Groundwater Parameters

Groundwater Darcy Velocity: The groundwater Darcy Velocity default value from the Oakland RBCA document was used. The Oakland default value is *60 cm/year*.

Groundwater Seepage Velocity: The seepage velocity was calculated using the Darcy velocity above and a soil porosity of 0.40, and was 150 *cm/year*.

Groundwater Plume Width: The calculated plume width at the source area was approximately 40 feet and is shown on a figure in Appendix B.

Representative Soil and Groundwater Concentrations: Maximum soil benzene concentration of 1.2 mg/Kg was used in the Tier 2. Representative dissolved-phase benzene concentrations were calculated using the mean of all benzene concentrations over four quarters from well MW-1 and the values for benzene in MW-2 and MW-3 during the last sampling event in June 2000. The plume appears to be stable and the concentrations decreasing, therefore it would be expected that the groundwater concentrations would be lower at this point. The following soil and groundwater concentrations were used in the Tier 2 evaluation:

Sample	Benzene Concentration
Tank Cavity Sample B - 7 feet	**1.2 mg/Kg**
Mean, MW-1 (11/12/98, 4/1/99, 10/1/99, 6/30/00), MW-2 (6/30/00), and MW-3 (6/30/00)	**0.15 mg/L**

The Tier 2 was performed using software from Groundwater Services, Inc (GSI, 1997). Residential and commercial receptor scenarios were used in order to evaluate any potential land use restrictions. The target risk level used was 1.0×10^{-6}. The GSI worksheets are presented in Appendix D and the SSTLs and pathways summarized below in Table 2. Initially, residential scenarios were used for all onsite and offsite receptors. The calculated site-specific target level (SSTL) of 15 mg/kg benzene for surface soil for inhalation of volatiles and construction workers was met with the soil concentrations of 1.2 mg/Kg benzene under a residential scenario.

Initial evaluation of the risk of the groundwater contamination was performed using a residential scenario for onsite and offsite receptors. The representative benzene concentration was below the SSTL for groundwater ingestion at a receptor 1,500 away; however, the California-corrected SSTL of 0.0093 mg/L, calculated for *groundwater volatization to indoor air and outdoor air* was exceeded under a residential scenario. The SSTLs were recalculated using an onsite commercial scenario (with and without permissible exposure limits [PEL] back-calculated) and offsite residential scenarios. In the case where the PEL limit was back-calculated, the calculated SSTLs were not exceeded by the representative groundwater benzene concentration of 0.15 mg/L. The following tables summarize the SSTLs and scenarios evaluated:

Tier 2 Look-Up Tables
Site Specific Target Levels (SSTLs)
Carcinogenic Risk = 1E-06; HQ = 1

Table 2A: Surface Soil Residential Receptor Scenario

Medium	Representative Concentration	Exposure Pathway		SSTLs	California-Corrected SSTLs	SSTL Exceeded
Surface Soil	1.2 mg/Kg	Soil Leaching to Groundwater		>RES	--	NO
		Inhalation of Volatiles	Residential 100 ft	15 mg/Kg	4.3 mg/Kg	NO
			Commercial Onsite	21 mg/Kg	6.1 mg/Kg	NO
		Construction Worker		24 mg/Kg	7.0 mg/Kg	NO

Table 2B: Groundwater Residential Receptor Scenario

Medium	Representative Concentration	Exposure Pathway		SSTLs	California-Corrected SSTLs	SSTL Exceeded
Groundwater	0.15 mg/L	Groundwater Ingestion, Residential 1,500 ft, No onsite receptor		>SOL	522 mg/L	NO
		Groundwater Volatization to Indoor Air	Residential Onsite	0.032 mg/~~Kg~~	0.0093 mg/Kg	YES
		Groundwater Volatization to Outdoor Air	Residential Onsite	1.8 mg/~~Kg~~	0.52 mg/Kg	NO

Table 2C: Groundwater Residential Commercial Scenario (NO PEL)

Medium	Representative Concentration	Exposure Pathway		SSTLs	California-Corrected SSTLs	SSTL Exceeded
Groundwater	0.15 mg/L	Groundwater Ingestion, Residential 1,500 ft, No onsite receptor		>SOL	522 mg/L	NO
		Groundwater Volatization to Indoor Air	Commercial Onsite	0.01 mg/Kg	0.029 mg/Kg	YES
		Groundwater Volatization to Outdoor Air	Commercial Onsite	3.1 mg/Kg	0.90 mg/Kg	NO

Table 2D: Groundwater Residential Commercial Scenario (PEL)

Medium	Representative Concentration	Exposure Pathway		SSTLs	California-Corrected SSTLs (Solubility x 0.29)	SSTL Exceeded
Groundwater	0.15 mg/L	Groundwater Ingestion, Residential 1,500 ft, No onsite receptor		>SOL	522 mg/L	NO
		Groundwater Volatization to Indoor Air	Commercial Onsite	>SOL	522 mg/L	NO
		Groundwater Volatization to Outdoor Air	Commercial Onsite	>SOL	522 mg/L	NO

PEL = Permissible Exposure Limit
HQ = Hazard quotient
SOL = Selected risk level is not exceed for pure compound for all possible dissolved levels

8.0 FINDINGS

The findings presented below are based on a review of previous work at the site and this RBCA evaluation:

- The subject site is an active auto repair facility. Most of the site is covered with asphalt and concrete, except for the former UST excavations, which remain unpaved.
- Soils beneath the site consist of silty clay with trace amounts of sand to 4.5 fbg, underlain by clays, silts, and sand with gravel.
- All gasoline and waste oil USTs, dispensers and associated piping have been removed from the site.
- Five excavation soil samples have been collected during assessment and excavation activities and five soil borings have been advanced at the site. Three borings were

converted to groundwater monitoring wells. The work was performed during several investigations from 1994 to 1998.

- The extent of residual hydrocarbons in soil is difficult to estimate, as most soil is likely saturated. It is expected that residual soil hydrocarbons are located within the general area of the former USTs and dispenser.
- The former UST excavations were backfilled with the soil removed from the UST excavations. The soil that was used to backfill the fuel UST cavity contained no hydrocarbons. Soil used to backfill the waste oil UST cavity contained extractable hydrocarbons to 177 mg/Kg, but did not contain benzene.
- The total aerial extent of the dissolved-phase hydrocarbon plume is estimated at approximately 2,500 ft^2 downgradient of the former USTs and dispenser island and beneath MacArthur Boulevard.
- Depth to water is very shallow beneath the site, ranging from just over one fbg to less than 5 fbg.
- Benzene is the primary COC at the site. The COC is present in soil and groundwater beneath the site.
- Groundwater beneath the site is designated beneficial for municipal, industrial, and agricultural uses.
- The aquifer does not discharge to a stream, pond, lake, or other waterway.
- The groundwater velocity has been calculated to be between 0.02 and 0.03 foot/foot.
- One irrigation well was identified to be approximately 1,500 feet west of the site.
- The groundwater plume appears to be stable and passively degrading (shrinking).
- The site and surrounding area is mixed commercial and residential.
- Potential human receptors are one to five workers present in the auto repair facility located at the site, customers, pedestrians on nearby sidewalks, construction workers, offsite residences, and someone who may ingest the water from the irrigation well.
- Maximum benzene concentrations in soil do not exceed the California-corrected source area SSTL of 4.3 mg/Kg
- Benzene concentrations in groundwater do exceed the California-corrected source area SSTLs of 0.029 mg/L using a residential scenario, but do not exceed the SSTLs under a commercial scenario with offsite residential receptors. The commercial scenario includes back-calculating the permissible exposure limits, and not using the target health risk limits.
- While the utility trenches beneath MacArthur Boulevard may act as preferential pathways to contaminants, the utilities are perpendicular to the general groundwater gradient direction and migration will likely be minimal. Biological degradation will likely continue to shrink the plume.

9.0 RECOMMEDATIONS

Based on the findings of this Tier 1 and Tier 2 RBCA evaluation and previous investigations at the site case closure of the subject site is recommended, with no further remedial or investigation action required. This closure should include a restriction of future land use to commercial use. If the property is to be considered without future land use restrictions, Kodiak recommends one additional event of groundwater sampling at the site. The sampling should also include collection of secondary biodegradation parameters such as dissolved oxygen and oxidation-reduction potential.

10.0 LIMITATIONS

This report has been prepared in accordance with generally accepted environmental practices exercised by professional geologists, scientists, and engineers. No warranty, either expressed or implied, is made as to the professional advice presented herein. Kodiak's liability is limited to the dollar amount of the work performed. The findings and recommendations contained in this report are based upon information contained in previous reports of soil assessment activities performed at the subject property and based upon site conditions as they existed at the time of the evaluation, and are subject to change. If actual conditions are found to differ from those described in this report, or if new environmental information regarding the site is obtained, our office should be notified and additional recommendations, if required, will be provided.

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REFERENCES

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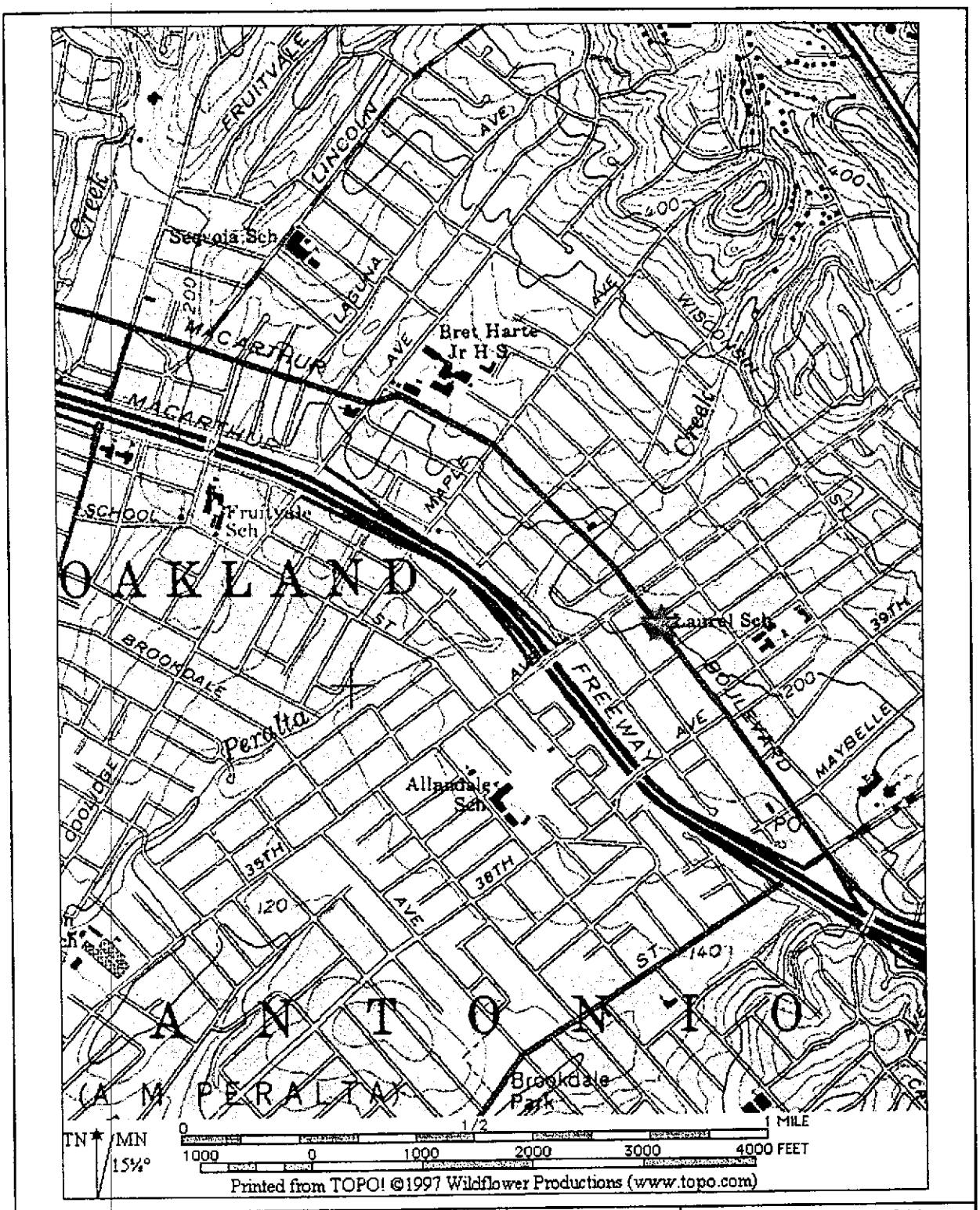
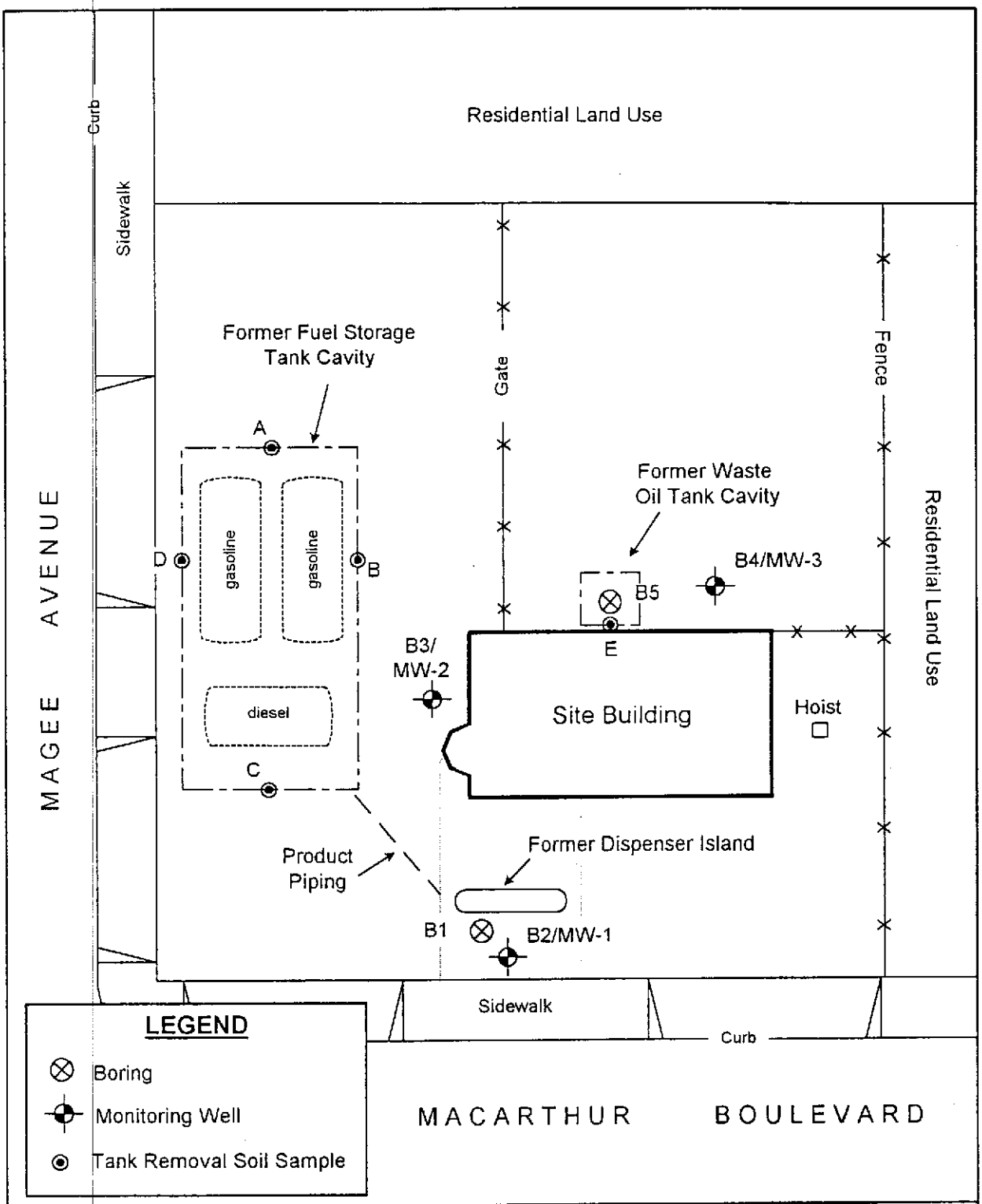
Todd, David Keith, 1980. Groundwater Hydrology, Second Edition, John Wiley and Sons, New York, Chichester, Brisbane, Toronto, Singapore.



HK2,Inc./SEMCO 70 Chemical Way Redwood City, CA 94063	☆ SITE LOCATION	**SITE LOCATION** Scooter's Auto Repair 3600 MacArthur Boulevard Oakland, California
Project 97-0187.1		**FIGURE 1**
FN: 97-0187.1.SC.F1 *DRWG: BAW/7.98*		

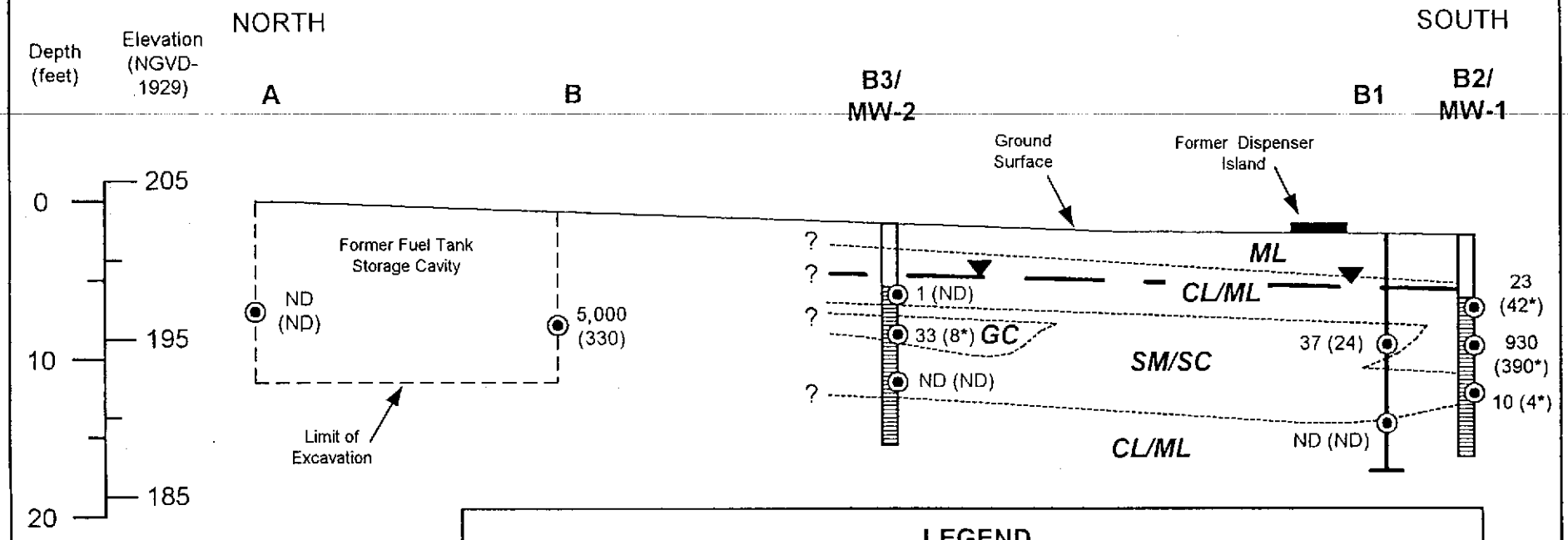


HK2, Inc./SEMCO
70 Chemical Way
Redwood City, CA. 94063

Project 97-0187.1.sc.F2

Scale in Feet
(approximate)
0 5 10 20

SITE PLAN
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
FIGURE 2



*NOTE: TPH-G = total petroleum hydrocarbons as gasoline; TPH-D = total petroleum hydrocarbons as diesel. ND = below lab reporting limits. * = chromatogram does not match typical diesel pattern. Refer to Tables 1 and 2 for additional soil sample laboratory results.*

LEGEND

- Groundwater monitoring well showing slotted interval
- Boring
- Lithologic contact
- *ML* — Clayey silt or sandy, clayey silt
- *CL/ML* — Sandy, silty clay/clayey silt with sporadic fine gravel
- Estimated depth to groundwater on November 12, 1998
- Soil sample showing TPH-G and (TPH-D) concentration in milligrams per kilogram
- *SM/SC* — Clayey, silty sand with gravel
- *GC* — Silty, clayey gravel with sand

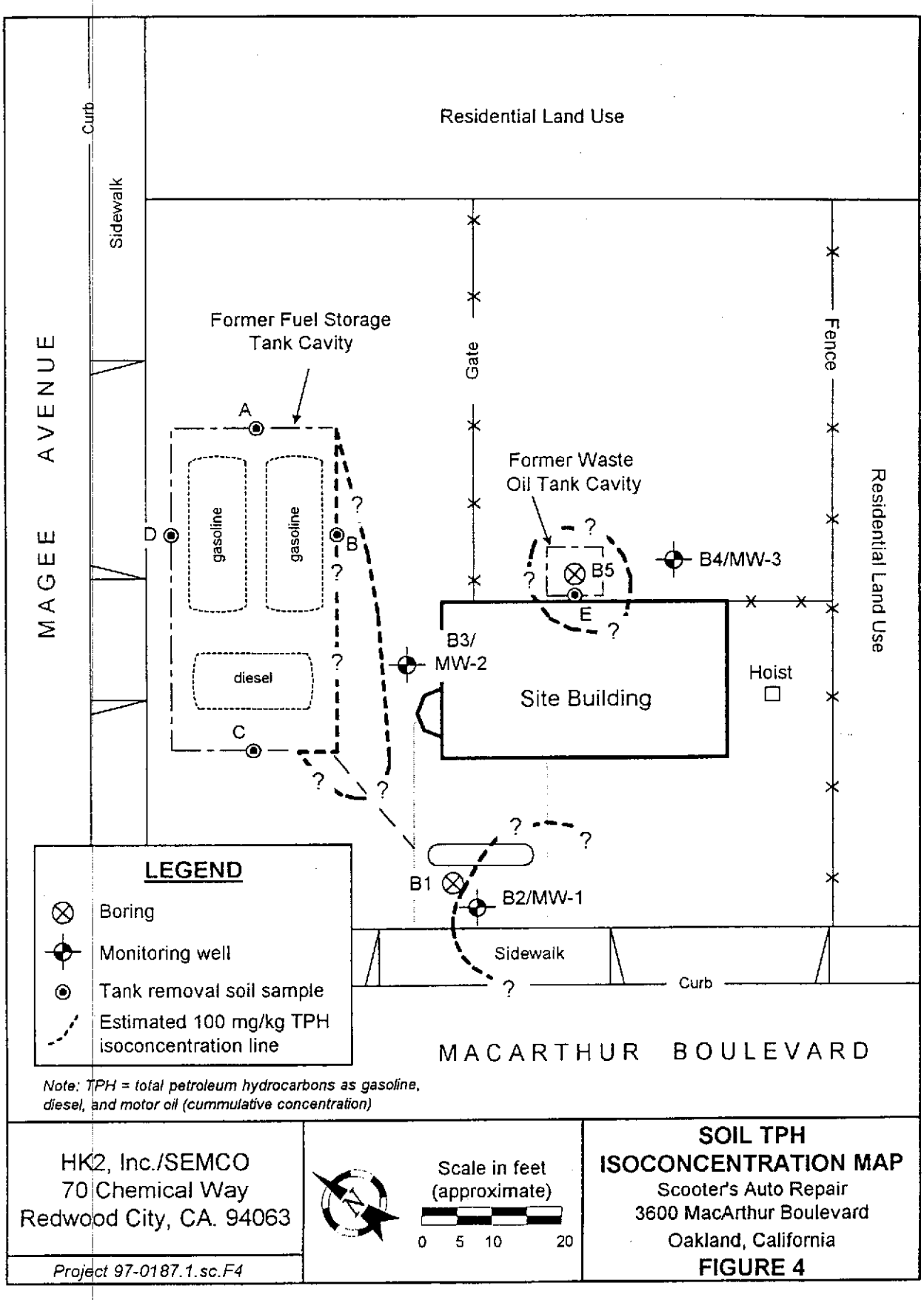
HK2, Inc./SEMCO
70 Chemical Way
Redwood City, California

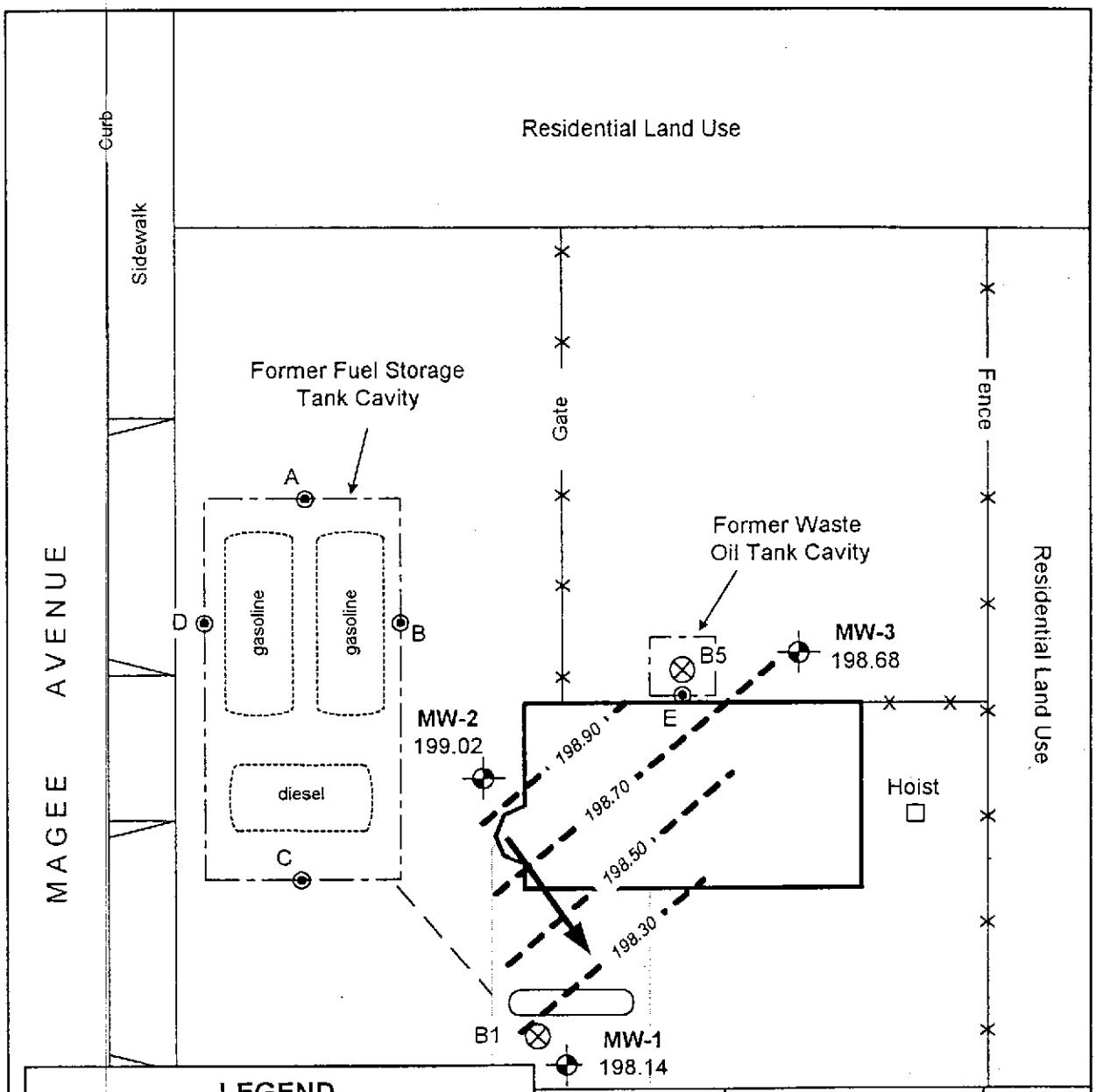
Project 97-0131.1sc.F3

Horizontal and Vertical Scale
(Feet)

0 2 5 10

CROSS-SECTION
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
FIGURE 3

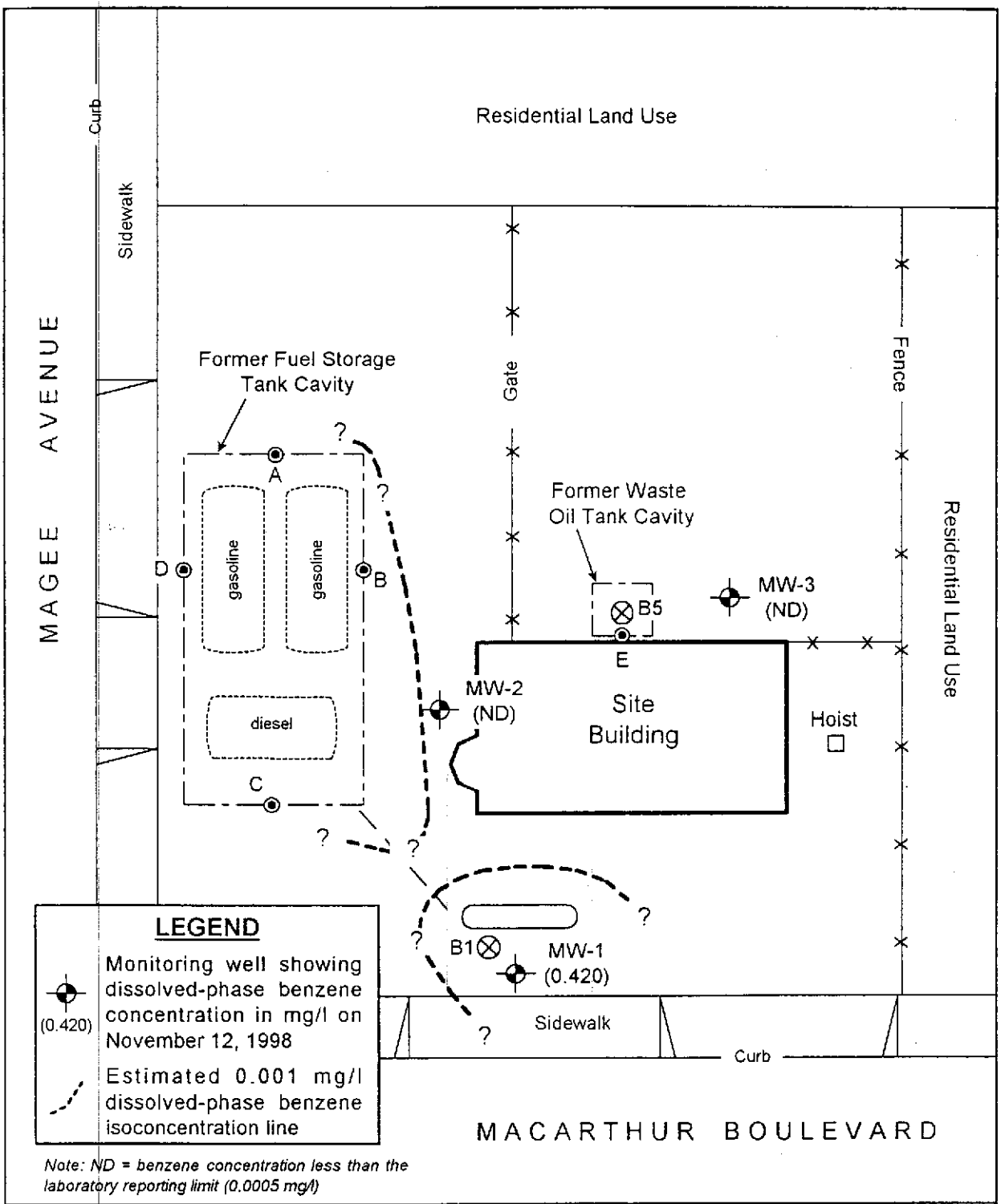

Residential Land Use
Curb
Sidewalk
MAGEE AVENUE
Former Fuel Storage Tank Cavity
Gate
Fence
Residential Land Use
A
gasoline
gasoline
D
B
Former Waste Oil Tank Cavity
B5
B4/MW-3
E
B3/ MW-2
diesel
Site Building
Hoist
C
B1
B2/MW-1
Sidewalk
Curb
MACARTHUR BOULEVARD
LEGEND
Boring
Monitoring well
Tank removal soil sample
Estimated 100 mg/kg TPH isoconcentration line
Note: TPH = total petroleum hydrocarbons as gasoline, diesel, and motor oil (cummulative concentration)
HK2, Inc./SEMCO
70 Chemical Way
Redwood City, CA. 94063
Project 97-0187.1.sc.F4
Scale in feet (approximate)
0 5 10 20
SOIL TPH ISOCONCENTRATION MAP
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
FIGURE 4



HK2, Inc./SEMCO
70 Chemical Way
Redwood City, CA. 94063

Project 97-0187.1.sc.F5

GROUNDWATER ELEVATION CONTOUR MAP
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
FIGURE 5



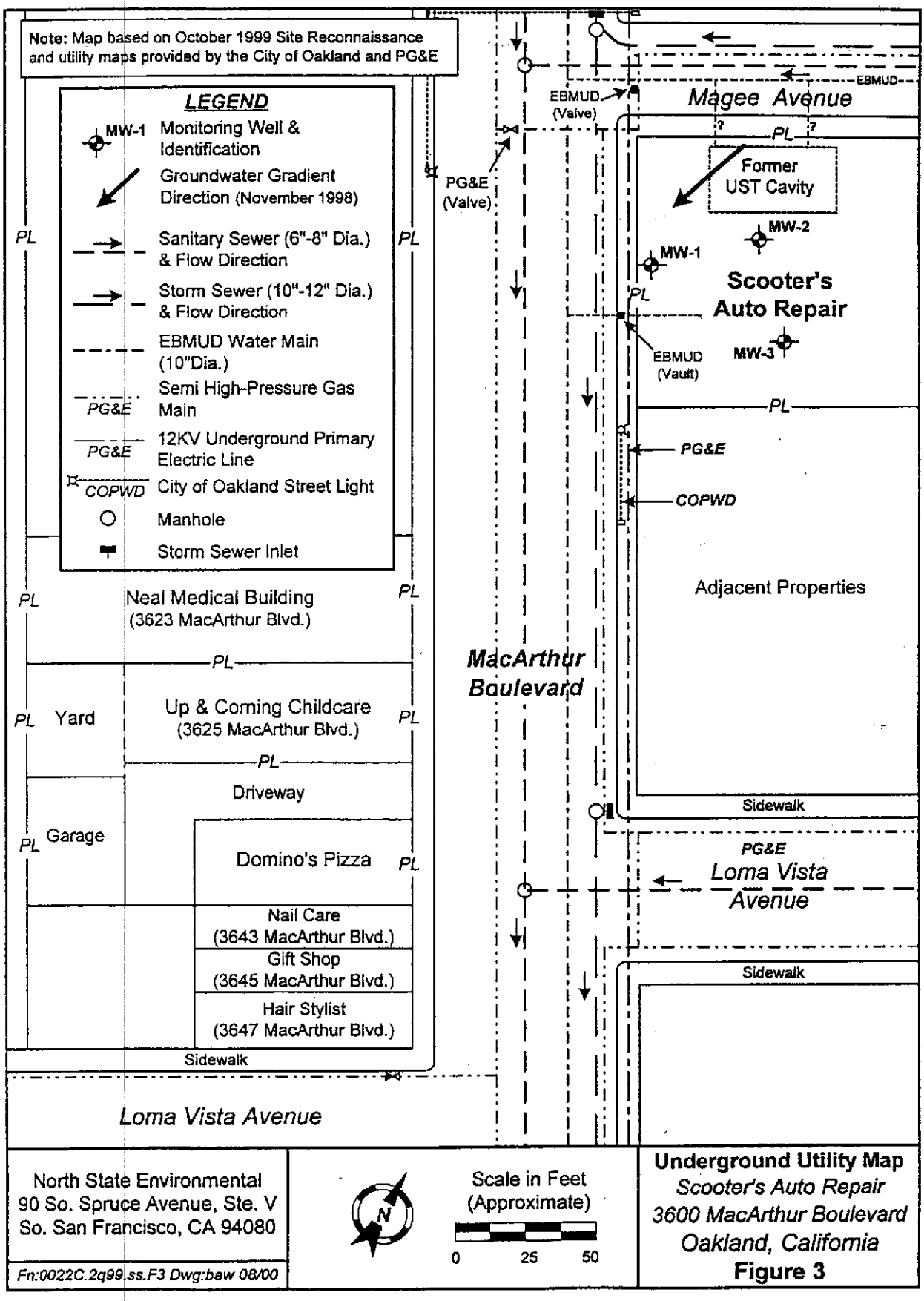
HK2, Inc./SEMCO
70 Chemical Way
Redwood City, CA. 94063

Project 97-0187.1.sc.F6

GROUNDWATER BENZENE ISOCONCENTRATION MAP

Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California

FIGURE 6

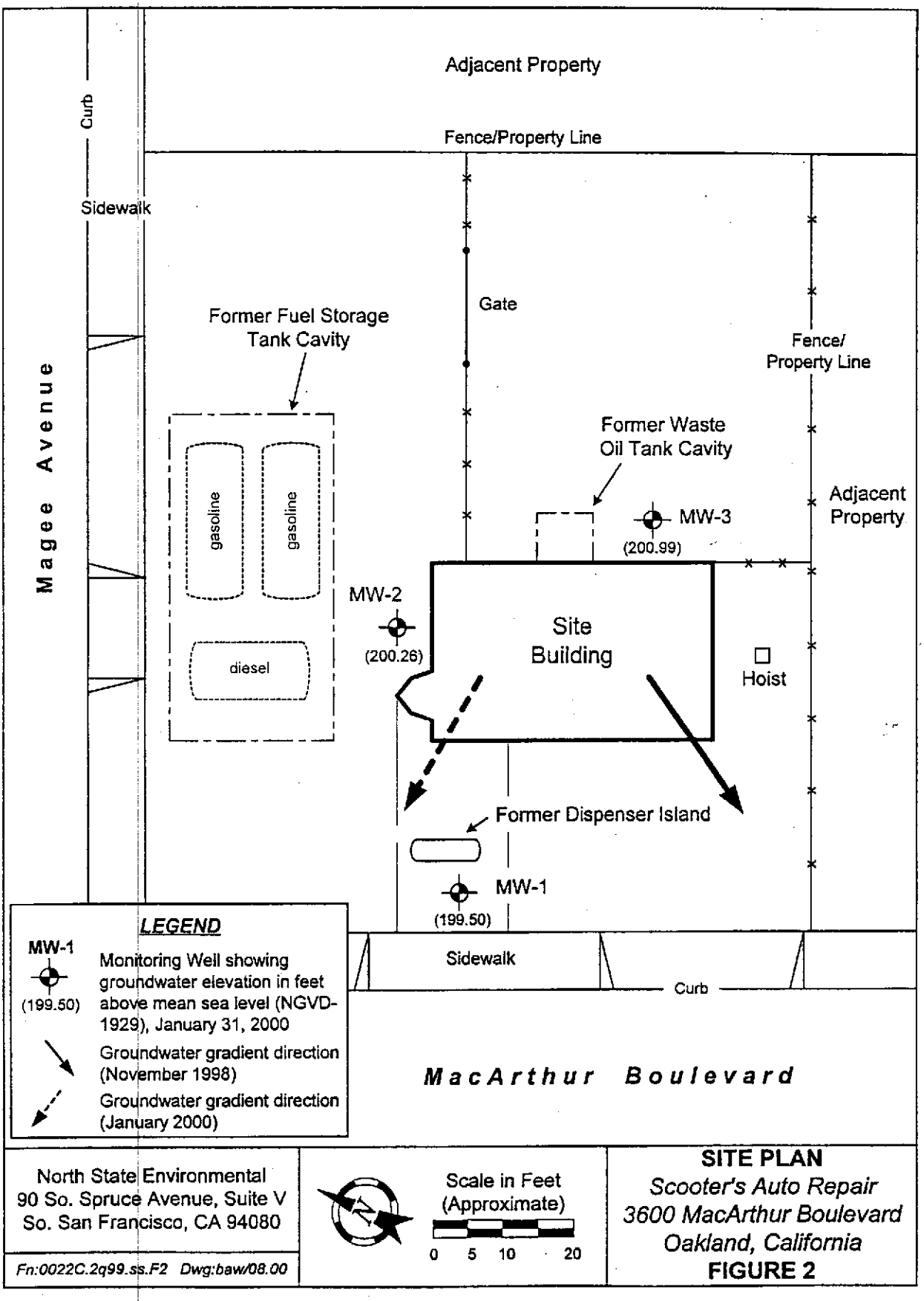


North State Environmental
90 So. Spruce Avenue, Ste. V
So. San Francisco, CA 94080

Fn:0022C.2q99.ss.F3 Dwg:baw 08/00

Scale in Feet (Approximate)
0 25 50

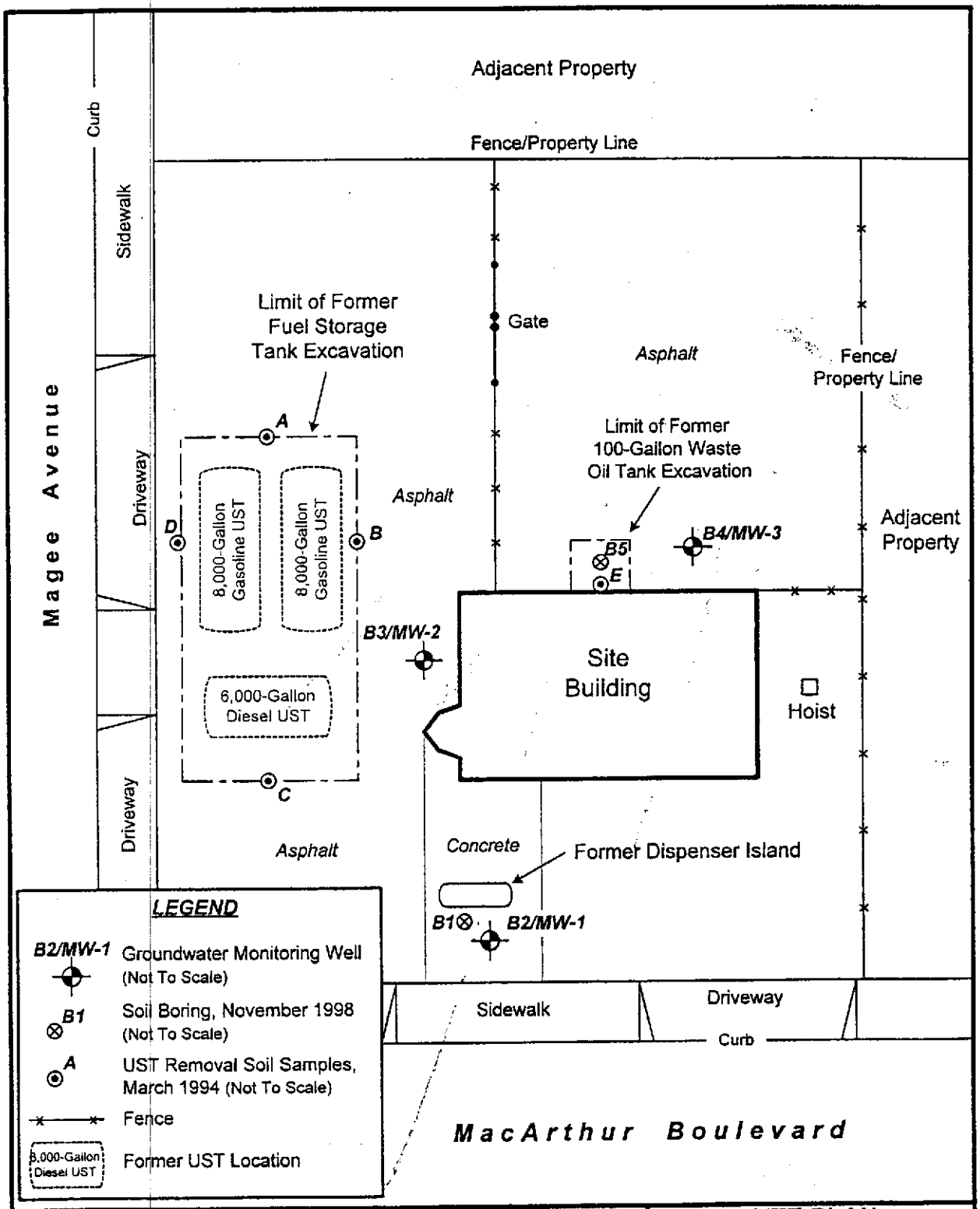
Underground Utility Map
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
Figure 3



North State Environmental
90 So. Spruce Avenue, Suite V
So. San Francisco, CA 94080

Fn:0022C.2q99.ss.F2 Dwg:baw/08.00

SITE PLAN
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
FIGURE 2

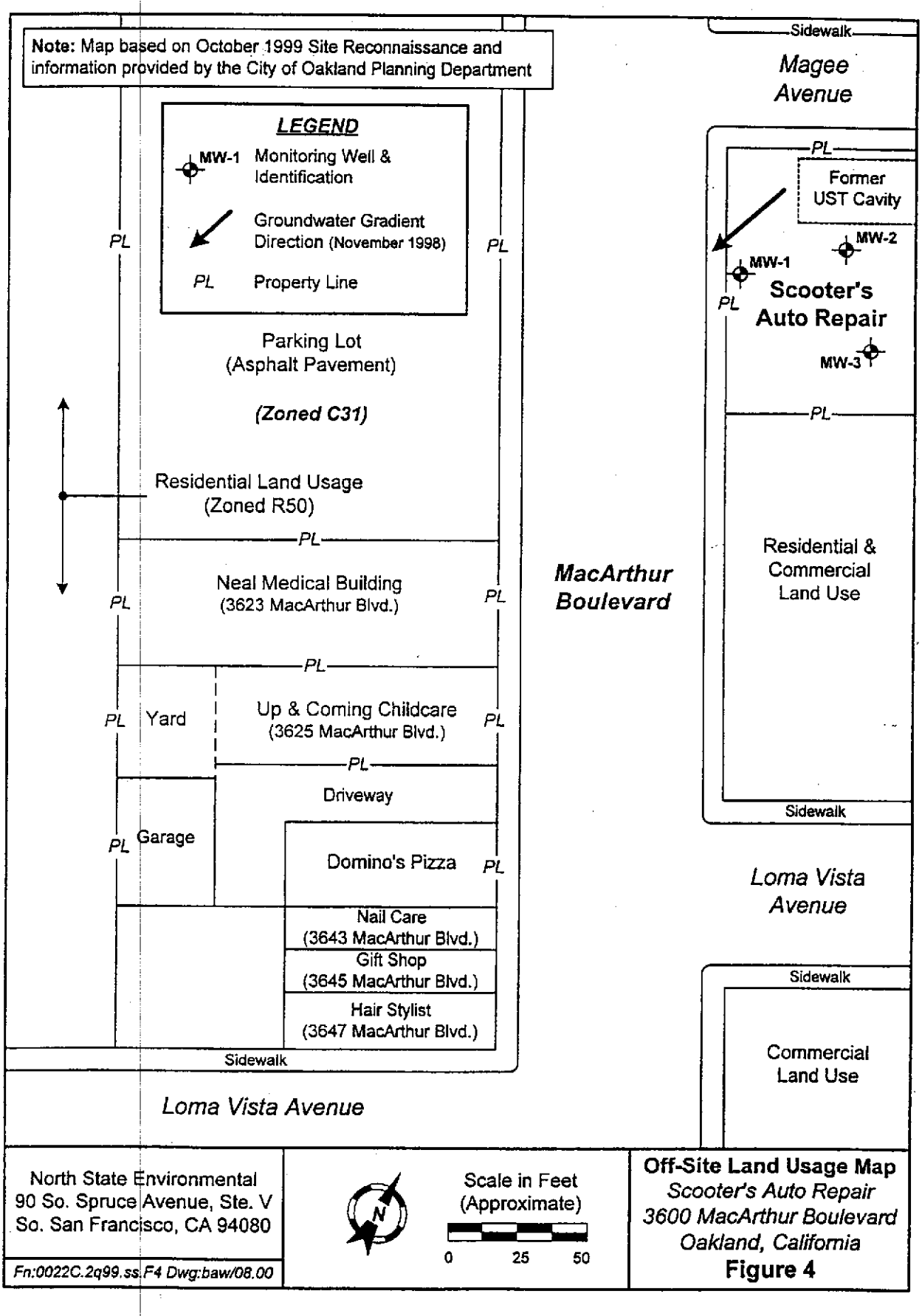


North State Environmental
90 So. Spruce Avenue, Suite V
So. San Francisco, CA 94080

Fn:0022C.2q00.gw.F2 Rev:baw/01.01

Scale in Feet
(Approximate)
0 5 10 20

SITE PLAN
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
FIGURE 2



North State Environmental
90 So. Spruce Avenue, Ste. V
So. San Francisco, CA 94080

Fn:0022C.2q99.ss.F4 Dwg:baw/08.00

Off-Site Land Usage Map
Scooter's Auto Repair
3600 MacArthur Boulevard
Oakland, California
Figure 4

Depth (fbg)	Recovery/ Sample ID	Blow Counts	Organic Vapor (ppm)	USCS Soil Type	Description	Boring Backfill Detail
1		(Hand Auger)			Concrete (6 inches)	Concrete
					Pea gravel	
	B1-2		166	ML	Moist, olive gray (5Y 3/2), clayey **SILT**	
	NR					
5	NR				Rock fragments in split-spoon shoe	
	B1-7		87	SM/SC	Moist, grayish olive (10Y 4/2), clayey, silty **SAND** with gravel	Portland Type I-II Cement
	NR				Rock fragments in split-spoon shoe	
10	NR				Rock fragments in split-spoon shoe	
	B1-12		0	SM/SC	Moist, moderate olive brown (5Y 4/4), clayey, silty **SAND** with gravel	
	NR				Rock fragments in split-spoon shoe	
	B1-14		0	ML/CL	Moist, moderate yellowish brown (10YR 5/4) to dark yellowish orange (10YR 6/6), sandy, clayey, **SILT** / silty **CLAY** with gravel (rock fragments)	Native Soil (Caved Formation)
15					**Total Boring Depth = 15 fbg**	2 inches
20						
25						

BORING NUMBER: B1

LOCATION: Scooter's Auto Repair
3600 MacArthur Blvd., Oakland, CA
PROJECT NO: 97-0187.1
DRILLING CONTRACTOR: HK2, Inc./SEMCO
DRILLING METHOD: Percussion
DRILLING DATE: October 6, 1998
LOGGED BY: B. Wheeler / D. Milano

LEGEND:

fbg = feet below grade
ppm = parts per million
NR = no recovery

Depth (fbg)	Recovery/ Sample ID	Blow Counts	Organic Vapor (ppm)	USCS Soil Type	Description	Well Construction Detail
1		(Hand Auger)			Concrete (5 inches)	Traffic Box; Locking Well Cap; Concrete
				ML	Moist, brownish black (5YR 2/1), slightly clayey **SILT**	
	B2-2.5		0	ML	Moist, olive gray (5Y 3/2), clayey **SILT**	2-Inch-Diameter Schedule 40 PVC; Bentonite Chips
▼						
	B2-4.5		0	CL	Moist, moderate olive brown (5Y 4/4), silty **CLAY**	
5						
	B2-7	10,21,26	7,300	CL	Moist, stiff to hard, moderate olive brown (5Y 4/4) to light olive gray (5Y 5/2), sandy, silty **CLAY** with gravel	#2/16 Sand
						2-Inch-Diameter Schedule 40 PVC (0.010 Screen)
10	B2-10	13,15,15	767	SM/SC	Wet, medium dense, pale yellowish brown (10YR 6/2) and grayish yellow (5Y 8/4), clayey, silty **SAND** with gravel	
	B2-13	13,13,23	0	CL	Wet, very stiff, light brown (5YR 5/6), sandy, silty **CLAY**	Bottom Cap
15					**Total Depth of Boring = 14 fbg** **Total Well Depth = 14 fbg**	8.25 inches
20						
25						

BORING / WELL NUMBER: **B2 / MW-1**

LOCATION: Scooter's Auto Repair
3600 MacArthur Blvd., Oakland, CA
PROJECT NO: 97-0187.1
DRILLING CONTRACTOR: V&W Drilling, Inc.
DRILLING METHOD: 4.25-inch-I.D. Hollow-stem Auger
DRILLING DATE: November 4, 1998
LOGGED BY: B. Wheeler / D. Milano

LEGEND:

fbg = feet below grade
ppm = parts per million
▼ = approximate depth to groundwater measured on November 12, 1998.

Depth (fbg)	Recovery/ Sample ID	Blow Counts	Organic Vapor (ppm)	USCS Soil Type	Description	Well Construction Detail
1		(Hand Auger)			Asphalt (4 inches)	Traffic Box; Locking Well Cap; Concrete
	B3-2.5		0	CL	Moist, moderate yellowish brown (10YR 5/4), silty **CLAY** with trace sand	2-Inch-Diameter Schedule 40 PVC; Bentonite Chips
5	B3-4.5		0	CL	Moist, pale olive (10Y 6/2), silty **CLAY** with trace sand and fine gravel	
	B3-7	16,30,35	313	GC	Moist to wet, silty, clayey **GRAVEL** with sand; matrix predominantly grayish olive (10Y 4/2)	#2/16 Sand
10	B3-10	18,14,10	0	SM/SC	Wet, medium dense, moderate yellowish brown (10YR 5/4), clayey, silty **SAND** with gravel	2-Inch-Diameter Schedule 40 PVC (0.010 Screen)
	B3-13	14,18,20	0	ML	Moist to wet, very stiff to hard, dark yellowish orange (10YR 6/6) to light brown (5YR 5/6), sandy, clayey **SILT** with trace gravel	Bottom Cap
15					**Total Depth of Boring = 14 fbg** **Total Well Depth = 14 fbg**	8.25 inches
20						
25						

BORING / WELL NUMBER: B3 / MW-2

LOCATION: Scooter's Auto Repair
3600 MacArthur Blvd., Oakland, CA
PROJECT NO: 97-0187.1
DRILLING CONTRACTOR: V&W Drilling, Inc.
DRILLING METHOD: 4.25-inch-I.D. Hollow-stem Auger
DRILLING DATE: November 4, 1998
LOGGED BY: B. Wheeler / D. Milano

LEGEND:

fbg = feet below grade
ppm = parts per million
▼ = approximate depth to groundwater measured on November 12, 1998.

Depth (fbg)	Recovery/ Sample ID	Blow Counts	Organic Vapor (ppm)	USCS Soil Type	Description	Well Construction Detail
					Asphalt (3 inches)	Traffic Box; Locking Well Cap
1		(Hand Auger)		SM	Silty **SAND** with gravel	Concrete
	B4-2.5		0	CL	Damp, moderate yellowish brown (10YR 5/4), silty **CLAY** with trace sand	2-Inch-Diameter Schedule 40 PVC; Bentonite Chips
▼						
	B4-4.5		0	GC / SC	Moist, moderate yellowish brown (10YR 5/4), silty, clayey **GRAVEL** with a trace amount of sand and moist, dusky yellow (5Y 6/4), silty, clayey **SAND** with gravel	
5						
	B4-7	15,17,21	0	SC	Moist, medium dense, moderate yellowish brown (10YR 5/4), clayey, fine- to coarse-grained **SAND** with gravel	#2/16 Sand
						2-Inch-Diameter Schedule 40 PVC (0.010 Screen)
10	B4-10	11,14,26	0	SM/SC	Moist, very stiff to hard, dark yellowish orange (10YR 6/6), clayey, silty **SAND** with gravel (Rock fractured with split spoon?)	
	B4-13	9,11,13	0	ML / CL	Wet, very stiff, moderate yellowish brown (10YR 5/4), sandy, clayey **SILT** with trace gravel and sandy, silty **CLAY** with a trace amount of gravel	Bottom Cap
15					**Total Depth of Boring = 14 fbg** **Total Well Depth = 14 fbg**	8.25 inches
20						
25						

BORING / WELL NUMBER: B4 / MW-3

LOCATION: Scooter's Auto Repair
3600 MacArthur Blvd., Oakland, CA
PROJECT NO: 97-0187.1
DRILLING CONTRACTOR: V&W Drilling, Inc.
DRILLING METHOD: 4.25-inch-I.D. Hollow-stem Auger
DRILLING DATE: November 4, 1998
LOGGED BY: B. Wheeler / D. Milano

LEGEND:

fbg = feet below grade
ppm = parts per million
▼ = approximate depth to groundwater measured on November 12, 1998.

Table 1
Laboratory Analysis of Soil Samples
Collected During Tank Removal Activities
Scooter's Auto Repair
3600 MacArthur Boulevard, Oakland, California

Sample Location	Depth (fbg)	TPH-G (mg/kg)	TPH-D (mg/kg)	TEPH (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	HVOCs (mg/kg)	SVOCs (mg/kg)	Lead (mg/kg)	Sample Date
A	7	ND	ND	--	ND	ND	ND	ND	--	--	ND	3-31-94
B	7	5,000	330	--	1.2	26	27	75	--	--	ND	
C	7	5.8	ND	--	0.013	0.047	0.035	0.18	--	--	ND	
D	7	2.3*	ND	--	ND	ND	ND	ND	--	--	ND	
E	5	1.4	ND	87	ND	0.012	0.038	0.081	ND	ND	ND**	
Fuel Tank Cavity Stockpile		ND	ND	--	ND	ND	ND	ND	--	--	ND	
Waste Oil Tank Cavity Stockpile		2.5	4	177	ND	0.007	ND	0.032	ND	ND	31**	
Laboratory Reporting Limit		0.5	1	50	0.005	0.005	0.005	0.010	≤0.01	≤1.7	5	

LEGEND:

TPH-G = total petroleum hydrocarbons as gasoline (EPA Methods 5030/Modified 8015); TPH-D = total petroleum hydrocarbons as diesel (EPA Methods 3550/Modified 8015); TEPH = total extractable petroleum hydrocarbons (Standard Method 5520E&F); B,T,E,X = benzene, toluene, ethylbenzene, and total xylenes (EPA Method 8020); HVOCs = halogenated volatile organic compounds (EPA Method 8010); SVOCs = semi-volatile organic compounds (EPA Method 8270); fbg = feet below grade; mg/kg = milligrams per kilogram (parts per million); ND = concentration below the laboratory reporting limit; -- = sample not analyzed for this substance; * = chromatogram did not match typical diesel pattern; ** = sample also contained 57 mg/kg of chromium (Sample E) and 61 mg/kg of chromium (waste oil stockpile sample). Metal results from EPA 6000/7000 Series Methods.

Table 2

Laboratory Analysis of Soil Samples Collected from Borings

Scooter's Auto Repair

3600 MacArthur Boulevard, Oakland, California

Sample Location	Depth (fbg)	TPH-G (mg/kg)	TPH-D (mg/kg)	TPH-MO (mg/kg)	B (mg/kg)	T (mg/kg)	E (mg/kg)	X (mg/kg)	MTBE (mg/kg)	Lead (mg/kg)	Sample Date
B1	7	37	24	ND	0.03	0.018	0.2	0.32	ND	ND (10)	10-6-98
	12	ND	ND	ND	ND	ND	ND	ND	ND	--	
B2	4.5	23	42*	ND	0.054	0.065	1	2	ND	--	11-4-98
	7	930	390*	ND	10	4	25	27	ND (0.125)	13	
	10	10	4*	ND	0.11	ND	0.075	0.07	ND	--	
B3	4.5	1	ND	ND	ND	ND	ND	ND	ND	--	
	7	33	8*	ND	0.32	0.03	0.12	0.5	ND	11	
	10	ND	ND	ND	ND	ND	ND	ND	ND	--	
B4	4.5	ND	4*	ND	ND	ND	ND	ND	ND	--	
	7	1	ND	ND	ND	ND	0.02	0.02	ND	--	
	10	1	ND	ND	ND	ND	ND	ND	ND	--	
B5	2.5	--	--	200	--	--	--	--	--	--**	
Laboratory Reporting Limit		0.5	1	10	0.005	0.005	0.005	0.010	0.005	1	

LEGEND:

TPH-G = total petroleum hydrocarbons as gasoline (EPA Methods 5030/Modified 8015); TPH-D = total petroleum hydrocarbons as diesel (EPA Methods 3550/Modified 8015); TPH-MO = total petroleum hydrocarbons as motor oil (EPA Methods 3550/Modified 8015); B,T,E,X = benzene, toluene, ethylbenzene, and total xylenes (EPA Method 8020); MTBE = methyl tert-butyl ether (EPA Method 8020); fbg = feet below grade; mg/kg = milligrams per kilogram (parts per million); ND = concentration below the laboratory reporting limit; ( ) = laboratory reporting limit if different from value listed in last row of table; -- = sample not analyzed for this substance; * = chromatogram did not match typical diesel pattern; ** = sample also contained a soluble chromium concentration of 0.08 mg/l. Lead results from EPA Method 7420.

Table 1
Fluid-Level Monitoring Data
Scooter=s Auto Repair
3600 MacArthur Boulevard, Oakland, California

Parameter Measured	Date	MW-1	MW-2	MW-3
DTW (Feet Below TOC)	11/12/98	3.24	2.85	3.43
	4/6/99	1.76	1.43	2.91
	10/1/99	3.51	3.29	8.42
	1/31/00	1.88	1.61	1.12
	6/30/00	**2.96**	**2.74**	**1.83**
Free Product Thickness (Feet)	11/12/98	0	0	0
	4/6/99	0	0	0
	10/1/99	0	0	0
	1/31/00	0	0	0
	6/30/00	**0**	**0**	**0**
Relative Elevation of TOC* (Feet)	5/6/98	201.38	201.87	202.11
Relative Groundwater Elevation (Feet)	11/12/98	198.14	199.02	198.68
	4/6/99	199.62	200.44	199.20
	10/1/99	197.87	198.58	193.69
	1/31/00	199.50	200.26	200.99
	6/30/00	**198.42**	**199.13**	**200.28**
Groundwater Gradient & Direction	11/12/98	S19°W at 0.027 foot/foot		
	4/6/99	S18°E at 0.030 foot/foot		
	10/1/99	--		
	1/31/00	N88°W at 0.025 foot/foot		
	6/30/00	**N74°W at 0.031 foot/foot**		

Notes:

DTW = Depth to Groundwater
TOC = Top of Well Casing

* = Top of well casing elevation referenced to City of Oakland bench mark located on top of southern curb return on the southeast corner of the intersection of MacArthur Boulevard and Magee Avenue. Elevations measured in feet above mean sea level and based on NGVD-1929 (City of Oakland datum + 3.00 feet).

-- = Not calculated during this event; The significant difference in DTW and relative groundwater elevation in MW-3 as compared to MW-1 and MW-2 suggests that the localized groundwater was unstable at the time of measurement.

Table 2

Laboratory Results of Groundwater Sample Analyses

Scooter=s Auto Repair

3600 MacArthur Boulevard, Oakland, California

WELL	DATE	TPH-G (ug/l)	TPH-D (ug/l)	TPH-MO (ug/l)	B (ug/l)	T (ug/l)	E (ug/l)	X (ug/l)	MTBE (ug/l)	HVOCs (ug/l)	LEAD (ug/l)	Oxygenates (ug/l)
MW-1	11-12-98	6,200	540	ND	420	47	ND	210	ND	--	ND	--
	4-9-99	4,400	ND	--	320	33	240	240	ND*	--	--	--
	10-1-99	2,600	190	--	290	20	190	46	ND*	--	--	--
	6-30-00	**4,100**	--	--	**260**	**69**	**320**	**510**	**ND***	--	--	**ND**
	7-14-00	--	**1,500[1]**	--	--	--	--	--	--	--	--	--
MW-2	11-12-98	ND	ND	ND	ND	ND	ND	ND	ND	--	ND	--
	4-9-99	ND	ND	--	ND	ND	ND	ND	ND	--	--	--
	10-1-99	ND	110	--	ND	ND	ND	ND	ND	--	--	--
	6-30-00	**130**	--	--	**0.7**	**ND**	**1**	**2**	**ND**	--	--	--
	7-14-00	--	**ND**	--	--	--	--	--	--	--	--	--
MW-3	11-12-98	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND[2]	--
	4-9-99	ND	ND	--	ND	ND	ND	ND	ND	--	--	--
	10-1-99	ND	80	--	ND	ND	ND	ND	ND	--	--	--
	6-30-00	**ND**	--	--	**0.8**	**0.5**	**0.9**	**3**	**ND***	--	--	--
	7-14-00	--	**ND**	--	--	--	--	--	--	--	--	--
CRWQCB MSWQO		None	None	None	1	150	700	1,750	14[3]	Varies	50	Varies
Lab Reporting Limit		50	50	50	0.5	0.5	0.5	1	0.5	≤5	50	≤100

NOTES:

TPH-G = total petroleum hydrocarbons as gasoline (EPA Methods 5030/Modified 8015)

TPH-D and TPH-MO = total petroleum hydrocarbons as diesel and motor oil, respectively (EPA Methods 3510/Modified 8015)

B, T, E, X = benzene, toluene, ethylbenzene, and total xylenes (EPA Methods 5030/ 8020); MTBE = methyl tertiary-butyl ether (EPA Methods 5030/8020)

HVOCs =halogenated volatile organic compounds (EPA Method 8010)

Oxygenates = fuel oxygenates (EPA Method 8260), including MTBE, di-isopropyl ether, tert-butyl alcohol, ethyl tert-butyl ether, and tert-amyl methyl ether

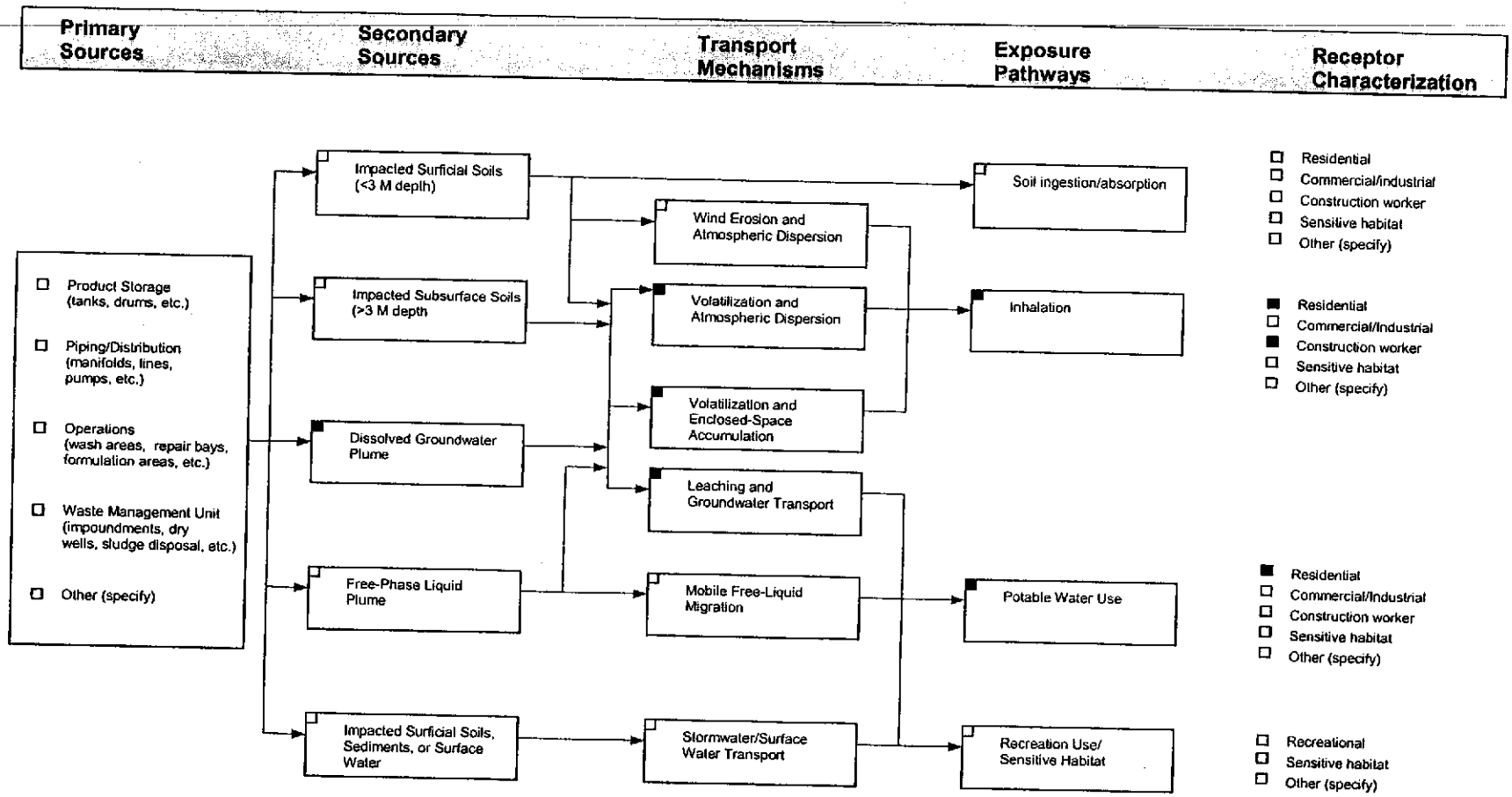
ug/L = micrograms per liter (parts per billion); ND = concentration less than the laboratory reporting limit; * = confirmed by EPA Method 8260

-- = sample not analyzed for this constituent; [1] = Does not match diesel pattern

[2] = cadmium, chromium, nickel, and zinc concentrations in this sample were also below the laboratory reporting limit

[3] = public health goal proposed by the California Office of Environmental Health Hazard Assessment (the California Department of Health Services has proposed establishing a secondary maximum contaminant level of 0.005 mg/l for MTBE)

APPENDIX C - EXPOSURE SCENARIO EVALUATION FLOWCHART
Scooter's Auto Repair, 3600 MacArthur Boulevard, Oakland, CA



KODIAK CONSULTING, LLC

APPENDIX D

RBCA TIER 2 WORKSHEETS

RBCA TIER 1/TIER 2 EVALUATION

Output Table 1

Site Name: Scooter's Auto Repair | Job Identification: 012-001 | Software: GSI RBCA Spreadsheet
Site Location: 3600 MacArthur Blvd | Date Completed: 11/18/2002 | Version: 1.0.1
Completed By: A. Le May

NOTE: values which differ from Tier 1 default values are shown in bold italics and underlined.

Exposure Parameter	Definition (Units)	Residential Adult	Residential (1-6yrs)	Residential (1-16 yrs)	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
ATc	Averaging time for carcinogens (yr)	70				
ATn	Averaging time for non-carcinogens (yr)	30	6	16	25	1
BW	Body Weight (kg)	70	15	35	70	
ED	Exposure Duration (yr)	30	6	16	25	1
t	Averaging time for vapor flux (yr)	30			25	1
EF	Exposure Frequency (days/yr)	350			250	180
EF.Derm	Exposure Frequency for dermal exposure	350			250	
IRgw	Ingestion Rate of Water (L/day)	2			1	
IRs	Ingestion Rate of Soil (mg/day)	100	200		50	100
IRadj	Adjusted soil ing. rate (mg-yr/kg-d)	1.1E+02			9.4E+01	
IRa.in	Inhalation rate indoor (m^3/day)	15			20	
IRa.out	Inhalation rate outdoor (m^3/day)	20			20	10
SA	Skin surface area (dermal) (cm^2)	5.8E+03		2.0E+03	5.8E+03	5.8E+03
SAadj	Adjusted dermal area (cm^2-yr/kg)	2.1E+03			1.7E+03	
M	Soil to Skin adherence factor	1				
AAFs	Age adjustment on soil ingestion	***TRUE***			FALSE	
AAFd	Age adjustment on skin surface area	***TRUE***			FALSE	
tox	Use EPA tox data for air (or PEL based)?	***FALSE***				
gwMCL?	Use MCL as exposure limit in groundwater?	FALSE				

Matrix of Exposed Persons to Complete Exposure Pathways		Residential	Commercial/Industrial Chronic	Commercial/Industrial Constrctn
Outdoor Air Pathways:				
SS.v	Volatiles and Particulates from Surface Soils	TRUE	TRUE	TRUE
S.v	Volatilization from Subsurface Soils	FALSE	FALSE	
GW.v	Volatilization from Groundwater	FALSE	TRUE	
Indoor Air Pathways:				
S.b	Vapors from Subsurface Soils	FALSE	FALSE	
GW.b	Vapors from Groundwater	FALSE	TRUE	
Soil Pathways:				
SS.d	Direct Ingestion and Dermal Contact	FALSE	FALSE	TRUE
Groundwater Pathways:				
GW.i	Groundwater Ingestion	TRUE	FALSE	
S.l	Leaching to Groundwater from all Soils	TRUE	FALSE	

Matrix of Receptor Distance and Location On- or Off-Site		Residential Distance	Residential On-Site	Commercial/Industrial Distance	Commercial/Industrial On-Site
GW	Groundwater receptor (cm)	4.6E+04	FALSE	4.6E+04	FALSE
S	Inhalation receptor (cm)	3.0E+03	FALSE		TRUE

Matrix of Target Risks		Individual	Cumulative
TRab	Target Risk (class A&B carcinogens)	1.0E-06	
TRc	Target Risk (class C carcinogens)	1.0E-05	
THQ	Target Hazard Quotient	1.0E+00	
Opt	Calculation Option (1, 2, or 3)	2	
Tier	RBCA Tier	2	

Surface Parameters	Definition (Units)	Residential	Constrctn
A	Contaminated soil area (cm^2)	2.2E+06	1.0E+06
W	Length of affect. soil parallel to wind (cm)	1.5E+03	1.0E+03
W.gw	Length of affect. soil parallel to groundwater (cm	1.5E+03	
Uair	Ambient air velocity in mixing zone (cm/s)	2.3E+02	
delta	Air mixing zone height (cm)	2.0E+02	
Lss	Thickness of affected surface soils (cm)	1.0E+02	
Pe	Particulate areal emission rate (g/cm^2/s)	6.9E-14	

Groundwater	Definition (Units)	Value
delta.gw	Groundwater mixing zone depth (cm)	2.0E+02
I	Groundwater infiltration rate (cm/yr)	3.0E+01
Ugw	Groundwater Darcy velocity (cm/yr)	***6.0E+01***
Ugw.tr	Groundwater seepage velocity (cm/yr)	***1.5E+02***
Ks	Saturated hydraulic conductivity(cm/s)	
grad	Groundwater gradient (cm/cm)	
Sw	Width of groundwater source zone (cm)	1.2E+03
Sd	Depth of groundwater source zone (cm)	3.0E+02
phi.eff	Effective porosity in water-bearing unit	3.8E-01
foc.sat	Fraction organic carbon in water-bearing unit	***1.5E-02***
BIO?	Is bioattenuation considered?	TRUE
BC	Biodegradation Capacity (mg/L)	

Soil	Definition (Units)	Value		
hc	Capillary zone thickness (cm)	5.0E+00		
hv	Vadose zone thickness (cm)	***4.6E+01***		
rho	Soil density (g/cm^3)	***1.59***		
foc	Fraction of organic carbon in vadose zone	***0.015***		
phi	Soil porosity in vadose zone	***0.4***		
Lgw	Depth to groundwater (cm)	***5.1E+01***		
Ls	Depth to top of affected subsurface soil (cm)	1.0E+02		
Lsubs	Thickness of affected subsurface soils (cm)	2.0E+02		
pH	Soil/groundwater pH	***7.4***		
		capillary	vadose	foundation
phi.w	Volumetric water content	***0.352***	0.13	0.12
phi.a	Volumetric air content	***0.048***	***0.27***	0.26

Building	Definition (Units)	Residential	Commercial
Lb	Building volume/area ratio (cm)	2.0E+02	3.0E+02
ER	Building air exchange rate (s^-1)	1.4E-04	2.3E-04
Lcrk	Foundation crack thickness (cm)	1.5E+01	
eta	Foundation crack fraction	***0.001***	

Transport Parameters	Definition (Units)	Residential	Commercial
Groundwater			
ax	Longitudinal dispersivity (cm)	4.6E+03	
ay	Transverse dispersivity (cm)	1.5E+03	
az	Vertical dispersivity (cm)	2.3E+02	
Vapor			
dcy	Transverse dispersion coefficient (cm)		
dcz	Vertical dispersion coefficient (cm)		

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.1

Site Name: Scooter's Auto Repair
Site Location: 3600 MacArthur Blvd

Completed By: A. Le May
Date Completed: 11/18/2002

SURFACE SOIL SSTL VALUES (< 3.3 FT BGS)

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 2
Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X	Soil Leaching to Groundwater			X	Inhalation of Volatiles and Particulates		X	Construction Worker	Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/kg)		Residential: 1500 feet	Commercial: (on-site)	Regulatory(MCL): 1500 feet		Residential: 100 feet	Commercial: (on-site)		Commercial: (on-site)	(mg/kg)	"■" If yes	Only if "yes" left
71-43-2	Benzene	1.2E+0		>Res	NA	NA		1.5E+1	2.1E+1		2.4E+1	1.5E+1	☐	<1

>Res indicates risk-based target concentration greater than constituent residual saturation value

Software: GSI RBCA Spreadsheet
Version: 1.0.1

Serial: G-273-IBX-894

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Scooter's Auto Repair
Site Location: 3600 MacArthur Blvd

Completed By: A. Le May
Date Completed: 11/18/2002

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
☐ PEL exposure limit?

Calculation Option: 2
Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("x" If Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: 1500 feet	Commercial: (on-site)	Regulatory(MCL): 1500 feet	Residential: (on-site)	Commercial: (on-site)	Residential (on-site)	Commercial: (on-site)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	1.5E-1	>Sol	NA	NA	NA	1.0E-1	NA	3.1E+0	1.0E-1	■	1.0E+00

>Sol indicates risk-based target concentration greater than constituent solubility

CA-Corrected = 0.1 x 0.29
= 0.029 mg/L
Exceeded

Software: GSI RBCA Spreadsheet
Version: 1.0.1

Serial: G-273-IBX-894

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Scooter's Auto Repair
Site Location: 3600 MacArthur Blvd

Completed By: A. Le May
Date Completed: 11/18/2002

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
■ PEL exposure limit?

Calculation Option: 2
Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: 1500 feet	Commercial: (on-site)	Regulatory(MCL): 1500 feet	Residential: (on-site)	Commercial: (on-site) (PEL)	Residential (on-site)	Commercial: (on-site) (PEL)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	1.5E-1	>Sol	NA	NA	3.2E-2	NA	1.8E+0	NA	3.2E-2	■	5.0E+00

>Sol indicates risk-based target concentration greater than constituent solubility

Software: GSI RBCA Spreadsheet
Version: 1.0.1

Serial: G-273-IBX-894

CA - Corrected $= 0.032 \times 0.29$
$= 9.3 \times 10^{-3}$ mg/L

Exceeded

RBCA SITE ASSESSMENT

Tier 2 Worksheet 9.3

Site Name: Scooter's Auto Repair
Site Location: 3600 MacArthur Blvd

Completed By: A. Le May
Date Completed: 11/18/2002

GROUNDWATER SSTL VALUES

Target Risk (Class A & B) 1.0E-6
Target Risk (Class C) 1.0E-5
Target Hazard Quotient 1.0E+0

☐ MCL exposure limit?
■ PEL exposure limit?

Calculation Option: 2
Groundwater DAF Option: Domenico - First Order (One-directional vert. dispersion)

SSTL Results For Complete Exposure Pathways ("x" if Complete)

CONSTITUENTS OF CONCERN		Representative Concentration	X Groundwater Ingestion			X Groundwater Volatilization to Indoor Air		X Groundwater Volatilization to Outdoor Air		Applicable SSTL	SSTL Exceeded ?	Required CRF
CAS No.	Name	(mg/L)	Residential: 1500 feet	Commercial: (on-site)	Regulatory(MCL): 1500 feet	Residential: (on-site)	Commercial: (on-site) (PEL)	Residential (on-site)	Commercial: (on-site) (PEL)	(mg/L	"■" If yes	Only if "yes" left
71-43-2	Benzene	1.5E-1	>Sol	NA	NA	NA	>Sol	NA	>Sol	>Sol	☐	<1

>Sol indicates risk-based target concentration greater than constituent solubility

Software: GSI RBCA Spreadsheet
Version: 1.0.1

Serial: G-273-IBX-894

RBCA ALTERNATE POINT OF COMPLIANCE

Groundwater Pathway

CAS No.	Constituent	Source Zone Groundwater SSTL (mg/L)	SSTLs at Alternate Points of Compliance Enter Distance From Source Below (feet) 10 (ft)	100 (ft)	1000 (ft)	POE Exposure Limit Off-Site Receptor 1500 (ft)
71-43-2	Benzene	>Sol	>Sol	>Sol	1.2E+2	8.5E-4

Serial: G-273-IBX-894

Software: GSI RBCA Spreadsheet
Version: 1.0.1