Risk Assessment
Grand Auto Supply
4240 East 14th Street
Oakland, California

Prepared for
PACCAR Automotive, Inc.

October 8, 1996
J-6077

HARTCROWSER

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Earth and Environmental Technologies

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October 8, 1996

Ms. Madhula Logan
Hazardous Materials Division
Alameda County Health Care Services Agency
1131 Harbor Bay Parkway, Room 250
Alameda, California 94502

Re: Request for Closure/Site Soil
Grand Auto Supply
4240 East 14th Street
Oakland, California J-6077

Dear Ms. Logan:

On behalf of PACCAR Automotive, Inc. (PAI), Hart Crowser, Inc., requests closure for the soil portion of the site at 4240 East 14th Street in Oakland, California (the Site), which is currently occupied by a Grand Auto store.

Hart Crowser, in our "Facility Closure Report," dated February 16, 1996, previously requested closure for this Site. (A copy of the report is attached to the enclosed risk assessment.) This report was prepared to meet the closure requirements of the Alameda County Health Care Services Agency (ACHCSA) and the California Regional Water Quality Control Board - San Francisco Region (RWQCB). The facility closure request was based on the following:

- The known potential onsite sources of petroleum hydrocarbons (underground storage tanks (USTs), UST-associated piping, and car wash sump) have been removed, along with the bulk of the sump-related soil that contained petroleum hydrocarbons;

- Petroleum hydrocarbons have not been detected in site groundwater for five quarters of groundwater monitoring;

- The available chemical data suggest that the former car wash sump was not a likely source of halogenated volatile organic compounds (VOCs) to groundwater;

- No other potential sources of halogenated VOCs related to Grand Auto operations are known or suspected at the site. We therefore concluded that the halogenated VOCs present in site groundwater are due to a source unrelated to Grand Auto operations;

- Numerous potential offsite sources of halogenated VOCs exist in the immediate vicinity of the site. We have not identified any documents indicating that environmental investigations pertaining to halogenated VOCs have been conducted at these potential offsite sources.

In the meeting between Hart Crowser, PAI, and you, held at your office on June 22, 1996, you indicated that Alameda County would grant closure for the soil portion of the Site at this time, provided an ASTM-style risk assessment indicated that soil remaining at the Site posed no significant threat to human health. At the request of PAI, Hart Crowser completed a risk assessment for the soil portion of the Site, following ASTM RBCA (Tier I) guidelines (the Risk Assessment). A copy of the Risk Assessment, dated September 27, 1996, is enclosed. The Risk Assessment indicated that residual chemicals at the Site *do not* exceed Risk-Based Screening Levels (RBSLs). The RBSLs correspond to chemical concentrations in various environmental media at the Site, where the concentrations result in a non-carcinogenic hazard quotient of 1 and a carcinogenic risk level of 1×10^{-6}. The Risk Assessment concluded, therefore, that the presence of residual chemicals in Site soil does not pose unacceptable risks to human health under all current Site use or potential future Site use scenarios.

Hart Crowser believes that we have now satisfied the requirements for closure of the soil portion of the Site, as set forth in our meeting on June 22, 1996. We therefore request that you please consider closure of the soil portion of the Site at your earliest convenience.

Please call Jay Ach at (415) 391-1885 if you have any questions or require further information.

Sincerely

HART CROWSER, INC.

Jay A. Ach, R.G.
Senior Project Geologist

Taku Fuji
Project Toxicologist

REGISTERED PROFESSIONAL GEOLOGIST
JAY A. ACH
No. 4595
STATE OF CALIFORNIA

cc: Ms. Lisa Robbins, PACCAR, Inc.
Mr. Raymond Elliott, PACCAR Automotive, Inc.

enclosure:
Risk Assessment, dated September XX, 1996

RISK ASSESSMENT

Grand Auto Supply
4240 East 14th Street
Oakland, California

October 8, 1996

J-6077

Submitted to:

PACCAR Automotive, Inc.
1400 N. 4th Street
Renton, WA 98055

Submitted by:

Hart Crowser, Inc.
353 Sacramento Street, Suite 1140
San Francisco, California 94111

CONTENTS

CONTENTS (Continued)

ACRONYMS

ASTM	American Society of Testing Materials
BTEX	Benzene, Toluene, Ethylbenzene, and Xylenes
CPF	Cancer Potency Factor
EDI	Estimated Daily Intake
EPA	US Environmental Protection Agency
EPC	Exposure Point Concentration
HEAST	Health Effects Assessment Summary Table
HI	Hazard Index
HQ	Hazard Quotient
IRIS	Integrated Risk Information System
NOAEL	No Observable Adverse Effects Level
PCE	Perchloroethylene
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goal
RBC	Risk-Based Concentrations
RBCA	Risk-Based Corrective Action
RBSL	Risk-Based Screening Level
RfD	Reference Dose
RME	Reasonable Maximum Exposure
TPH	Total Petroleum Hydrocarbons
UCL	Upper Confidence Level
UST	Underground Storage Tank
VOC	Volatile Organic Compounds
µg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram

RISK ASSESSMENT
GRAND AUTO SUPPLY
4240 EAST 14TH STREET
OAKLAND, CALIFORNIA

EXECUTIVE SUMMARY

On behalf of PACCAR Automotive, Inc., Hart Crowser, Inc. has prepared this risk assessment for the Grand Auto Supply store located at 4240 East 14th Street in Oakland, California. This risk assessment has been prepared to meet the closure requirements of the Alameda County Health Care Services Agency and the California Regional Water Quality Control Board - San Francisco Region. This risk assessment was conducted in accordance with the framework developed by the American Society of Testing Materials (ASTM), designated the Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (RBCA) Tier 1 analysis.

The RBCA Tier 1 evaluation is a risk-based analysis to develop non-site-specific values for direct and indirect exposure pathways utilizing conservative exposure assumptions for potential pathways and various property use categories. In the Tier 1 analysis, a table of Risk-Based Screening Levels (RBSLs) are derived for standard exposure scenarios using current Reasonable Maximum Exposure (RME) and toxicological parameters as recommended by the EPA. Site conditions are then compared against the appropriate RBSLs to determine whether site conditions satisfy the criteria for regulatory closure or warrant a more site-specific evaluation (ASTM, 1995).

This risk assessment was conducted to evaluate the probability and magnitude of adverse impacts to human health associated with actual or potential exposures to site-related chemicals remaining in soils at the Grand Auto Supply site. Based on an evaluation of existing site data, the exposure pathways that were quantitatively assessed were the inhalation of vapors volatilizing from subsurface soils and the inhalation of vapors volatilizing from groundwater. The compounds considered in the subsurface soils exposure pathway were perchloroethylene (PCE) and benzene, toluene, ethylbenzene, and xylenes (BTEX). The compounds considered in the groundwater exposure pathway were chlorinated solvents. The exposure models utilized in this risk assessment assumed that the receptors were on site, at the location of the boring or well with the highest detected concentration for each compound of concern, in accordance with the Tier 1 evaluation guidance (ASTM, 1995). To

account for all possible future uses of the site, RBSLs were calculated for both residential and commercial/industrial uses.

The RBSLs for each exposure scenario and detected chemical from the site are presented in Table 5. These RBSLs correspond to a chemical concentration in the selected environmental media resulting in a non-carcinogenic hazard quotient (HQ) of 1 and a carcinogenic risk level of 1×10^{-6}. These RBSLs were compared with the maximum concentration of the chemical found in the corresponding media on site. The use of the maximum detected concentration of chemical is a conservative assumption and will overestimate the actual or potential risks associated with current site conditions.

No exceedences are noted of RBSLs in subsurface soil or from vapors in soil from groundwater under either the residential or industrial exposure scenario. Therefore, the residual presence of chemicals in subsurface soils does not pose an unacceptable risk to human health under current or potential future use scenarios, and the site satisfies the conditions for regulatory site closure from a human health risk perspective.

1.0 INTRODUCTION

This risk assessment was prepared by Hart Crowser, Inc. as part of the Facility Closure Report for Grand Auto Supply property in Oakland California. The risk assessment framework developed by the American Society of Testing Materials (ASTM), designated the Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (RBCA) was used. This risk assessment followed the guidelines set forth for a Tier I Level RBCA Evaluation.

The RBCA Tier 1 evaluation is a risk-based analysis to develop non-site-specific values for direct and indirect exposure pathways utilizing conservative exposure assumptions for potential pathways and various property use categories (for example, residential and industrial). In the Tier 1 analysis, a table of Risk Based Screening Levels (RBSLs) is derived for standard exposure scenarios using current Reasonable Maximum Exposure (RME) and toxicological parameters as recommended by the EPA. Site conditions are then compared against the appropriate RBSLs to determine whether site conditions satisfy the criteria for regulatory closure or warrant a more site-specific evaluation (ASTM, 1995).

This baseline risk assessment has been conducted to evaluate the probability and magnitude of adverse impacts on human health associated with actual or potential exposure to soil-related chemicals at the Grand

Auto Supply property in Oakland California. The section below summarize the history and current status of the site. Additional information about the site can be found in the "Facility Closure Report" prepared by Hart Crowser (1996) that is included in this document as Attachment 1.

1.1 Site Background and History

The Grand Auto Supply retail facility is located on an approximately 1.2-acre site. The site is used as an auto service and retail merchandise facility. Previously, the site also was used for retail gasoline sales and had fuel underground storage tanks (USTs) and a car wash with an associated drainage sump. The USTs were removed in 1986, and the car wash drainage sump and surrounding soil were removed in 1992. During October 1993, the remaining fuel conveyance piping associated with the former fuel USTs was excavated and removed from the site.

Historical Use

The earliest available recorded use of the property is as a dance hall in 1903. Site use between 1903 and 1946 is unknown (AllWest Environmental, 1995). Around 1946, an L-shaped building was constructed on the site. This building was used as office space and for auto repair, auto body repair, and auto painting shops. The date of demolition of this building is not known.

In 1960 or 1961, the present building was constructed for use as a Safeway grocery store. Grand Auto Supply leased the building from the property owners in 1971 and, in 1972, installed pump islands and three 10,000-gallon USTs for retail gasoline sales. The USTs were subsequently removed in 1986 and the remaining associated conveyance piping was removed in 1993. Grand Auto Supply also operated a car wash at the site from approximately 1972 to 1986. The drainage sump associated with the car wash was removed in August 1992.

Site Investigation and Remediation

The USTs at the site were removed in 1986. In July 1992, Hart Crowser performed a site investigation as outlined in "Sampling and Analysis Plan, Grand Auto/Super Tire Facilities," (Hart Crowser, 1992a). The investigation included drilling two borings in the assumed vicinity of the location of the former USTs. No petroleum hydrocarbons were detected in soil samples from borings located in the vicinity of the former UST excavation.

The car wash drainage sump and surrounding soil were removed on August 7, 1992. Hart Crowser collected a soil sample from beneath the sump at the bottom of the excavation, 8.5 feet below ground surface. Analyses of the sample indicated the presence of petroleum hydrocarbons and low concentrations of perchloroethylene (PCE) in the soil beneath the sump. A groundwater monitoring well was installed within 10 feet southwest of the sump. Despite some slightly wet conditions encountered at a depth of 8 feet groundwater was not encountered until an approximate depth of 36 feet. The shallow, wet zone may indicate a discontinuous perched water-bearing zone at the site. The results of this phase of the investigation were summarized in the "Preliminary Site Investigation Report" (Hart Crowser, 1992b).

During April 1993, Hart Crowser drilled five soil borings and converted three of them to groundwater monitoring wells. An off-site groundwater monitoring well (HC-1) was also installed at the adjacent Super Tire facility. Two of the soil borings (B-8 and B-9) were completed in the area of the former car wash sump. Soil samples from B-8 and B-9 indicated that the TPH and PCE detected immediately below the sump were neither laterally nor vertically widespread.

During October 1993, fuel conveyance piping associated with the former fuel USTs was excavated and removed from the site. Verification soil samples were collected from the base of the excavation and analyzed for total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene and xylenes (BTEX). TPH-G and BTEX were not detected in any of the samples analyzed.

1.2 Local and Regional Hydrology

The site is located on the alluvial plain on the east side of San Francisco Bay (the Bay). As is typical for the Bay margin, the area around the site is underlain by Quaternary alluvial deposits, consisting of unconsolidated clay, silt, sand, and gravel. Bedrock underlying the alluvium in the area consists primarily of the Mesozoic-age Franciscan Formation; depth to bedrock in the area of the site is unknown.

Several soil borings were completed to depths of up to 46 feet at the site and the adjacent Super Tire site. The borings indicate that the site is underlain by an irregularly layered sequence of silty to gravelly sand lenses separated by clayey silt. As much as 20 feet of imported fill material may exist in some areas of the site.

Unconfined groundwater was generally encountered at depths of approximately 35 feet. The available groundwater elevation data indicate

that the groundwater gradient is nearly flat at the site. It can be assumed from regional geology and hydrology that groundwater flow in the area is generally westerly, toward San Francisco Bay.

Potential Beneficial Uses of Groundwater

The site is located in an area where groundwater in deep, regional aquifers is considered to have beneficial uses. The Alameda County Department of Public Works indicated the presence of industrial and irrigation supply wells within one mile of the site. In general, these wells are completed to depths of several hundred feet.

Shallow groundwater in the area is separated from the deep, regional aquifers by significant thickness of silt and clay, which act as regional aquitards. There are no known or documented uses of shallow groundwater in the vicinity of the site (Alameda County, 1988).

1.3 Extent of Contamination in Soils

No petroleum hydrocarbons were detected in soil samples from borings located in the vicinity of the former UST excavation. No petroleum hydrocarbons were detected in soil samples from the piping excavation. Low concentrations of TPH-G and BTEX were detected in site soil during excavation and removal of the car wash sump. Overexcavation of the sump was completed to the extent practicable, and the overexcavation successfully removed the bulk of the visibly stained soil. The highest concentrations of TPH-G detected in soil in place is 310 μg/kg from beneath the car wash sump, at a depth of 8 feet. No further excavation was performed in this area because of the proximity to the existing building.

PCE was detected at a concentration of 104 μg/kg in the soil sample collected from beneath the car wash sump at a depth of 8 feet. Soil samples from the two subsequent soil borings completed in this area indicated a limited lateral and vertical extent of the PCE detected. Samples from depths of 10 to 11 feet indicated concentrations of PCE at or below detection limits (5 μg/kg). Samples from depths of 16 and 21 feet did not indicate the presence of detectable concentrations of PCE. A sample collected at a depth of 25 feet indicated 30 μg/kg of PCE. These data suggest that the volume of soil containing PCE is limited and that PCE concentrations within the soil are low. Additionally, given that (1) the sample at 25 feet is locate near the water table and (2) that approximately 15 feet of clean soil separates this depth from the base of the sump excavation, it is reasonable to assume that the low concentration of PCE

detected at 25 feet is the result of either direct contact with, or vapor migration from the PCE in groundwater immediately below.

PCE was detected in soil at lower concentrations than recorded in groundwater samples from the adjacent monitoring well. This suggests that the soil in the sump area did not act as a source of PCE to groundwater. PCE binds preferentially to soil organic matter rather than solubilize in water, as indicated by a positive log K_{oc} (K_{oc}=2.56). This tendency indicates that for soil to act as a source of PCE to groundwater, the soil must have a higher concentration of PCE than the groundwater it is in contact with. Because site data indicate that soil concentrations are lower than groundwater concentrations, it is unlikely that the site is a source of PCE to groundwater.

Several soil samples collected during various phases of the site investigations were analyzed for metals—cadmium (Cd), chromium (Cr), nickel (Ni), lead (Pb), and zinc (Zn). With the exception of cadmium, low concentrations of the metals were detected. However, these metals all occur naturally in soil in background concentrations and the concentrations detected at this site fall within or near typical background concentrations (Hart Crowser, 1996).

To determine whether the metal concentrations present in surface soils at the site required further evaluation in the RBCA Tier 1 risk assessment, the concentrations of metals were compared against EPA Region 9 Preliminary Remediation Goals (PRGs). The PRGs are risk-based screening level concentrations of chemicals published by EPA Region 9 for use in screening chemicals of concern for actual or potential human health risks. Generally, at sites where chemical concentrations fall below the corresponding PRG, no further action or study is warranted for the evaluation of human health risks. The concentration of metals detected in site soils were below their respective PRGs indicating that no unacceptable risks are present at the site because of metals in surface soils (Hart Crowser, 1996). Therefore, there was no further evaluation of these heavy metals in the risk assessment.

1.4 Extent of Contamination in Groundwater

Groundwater monitoring at the site began in 1992. Halogenated volatile organic compounds (VOCs) consistently have been detected in site groundwater samples. PCE has been detected in all five monitoring wells, with the highest concentrations typically found in MW-1. Trichloroethylene (TCE) and cis-1,2-dichloroethylene (cis-1,2-DCE) have been detected in all five monitoring wells. The highest concentration of

TCE and cis-1,2-DCE typically have been reported in the samples from MW-2, located at the assumed upgradient boundary of the site.

The distribution of halogenated VOCs within site groundwater indicates that halogenated VOCs in groundwater are not restricted to the site boundaries. Furthermore, with the exception of PCE, the maximum concentration of VOCs in site groundwater have been detected in well MW-2, at the upgradient site boundary. This would indicate the presence of an off-site, upgradient source.

2.0 EXPOSURE ASSESSMENT

As presented in Tables 1 and 5 of the site closure report (presented as Attachment 1, Hart Crowser, 1996), a few VOCs remain in the subsurface soil and groundwater at the Grand Auto Supply site. BTEX and PCE were detected at low concentrations in several borings. The highest concentrations were measured at an 8-foot depth under the location of the former car wash sump. Chlorinated solvents were also detected in groundwater, located 27 to 35 feet below ground surface. They include PCE, TCE, cis-1,2-DCE, chloroform, 1,1,1-trichloroethane (1,1,1-TCA), 1,2-dichloroethane (1,2-DCA), vinyl chloride (VC), and freon 12. The closure report indicated that the remaining halogenated solvents in site groundwater were likely the result of releases at one or more of the numerous off-site potential sources located in the immediate vicinity of the site. The compounds identified as compounds of concern in the Tier 1 evaluation are BTEX and the chlorinated solvents detected in monitoring events performed after 1993.

2.1 Potential Exposure Pathways

The potential exposure pathways present at the site were determined by evaluating the site physical features that may influence human exposures for both current and future use scenarios. An exposure pathway is the course a chemical takes from the source to the exposed receptor. Chemical intake is how a chemical enters a receptor after contact, e.g., by ingestion, inhalation, or dermal absorption. These two components are considered together in identifying potential exposure pathways. A complete exposure pathway consists of the following elements:

- A source and mechanism of chemical release;
- A migration pathway;

- An exposure route through which chemical uptake by the receptor occurs; and

- A receptor group who may come into contact with site chemicals.

When these four elements are present, the exposure pathway is considered complete. If one or more of the components is missing, the exposure pathway is incomplete and exposure cannot occur.

Based on an evaluation of site data, the potential exposure pathways to human receptors at the Grand Auto Supply site include the following:

1. Surficial soil ingestion and absorption;
2. Inhalation of dust generated by wind erosion of surficial soil;
3. Inhalation of vapors volatilizing from surface soils in ambient air or in indoor air;
4. Inhalation of vapors volatilizing from subsurface soils in ambient air or in indoor air; and
5. Inhalation of vapors volatilizing from groundwater through the soil to ambient air or indoor air.

As reported in the site closure report (Hart Crowser, 1996) impacted surficial soils were removed along with the car wash drainage sump and the fuel conveyance piping. Verification soil samples collected subsequent to soil excavation revealed no detectable concentrations of petroleum hydrocarbons in surface soils as all known potential sources of chemicals related to Grand Auto Supply operations at the site have been removed. Therefore, it is assumed that no impacted surficial soil remains on the site. Moreover, much of the site is currently paved further reducing the potential exposure of human receptors to surface soil. As a result, exposure pathway numbers 1, 2, and 3, involving surficial soil, are not considered complete exposure pathways applicable to the site.

The exposure pathways retained for evaluation in this risk assessment are numbers 4—the inhalation of vapors volatilizing from subsurface soils and 5—the inhalation of vapors volatilizing from groundwater through the soil. Based on site data, the compounds considered in exposure pathway number 4 are PCE and BTEX. The compounds considered in exposure pathway number 5 are chlorinated solvents. The exposure pathways to be utilized in this risk assessment assumed that the receptors were on site, at the location of the boring or well with the highest detected concentration for each compound of concern, in accordance with the Tier 1 evaluation guidance (ASTM, 1995). To account for all possible current and future uses of the site, RBSLs were calculated for both residential and commercial/industrial uses.

3.0 TOXICITY ASSESSMENT

Toxicity assessments for risk assessments are generally accomplished in two steps: hazard identification and dose-response assessment. The first step, hazard identification, is the process of determining whether exposure to a chemical can cause an increase in the incidence of a particular adverse health effect (e.g., cancer, birth defects) and whether the adverse health effect is likely to occur in humans. The second step, dose-response evaluation, is the process of quantitatively evaluating the toxicity information and characterizing the relationship between the dose of the chemical administered or received and the incidence of adverse health effects in the exposed population. From this quantitative dose-response relationship, toxicity values are derived that can be used to estimate the incidence or potential for adverse effects as a function of human exposure to the chemical.

The EPA has performed the toxicity assessment step for numerous chemicals and has made available the resulting toxicity information and toxicity values (see discussion below), which have undergone extensive peer review. The types of values available for calculating RBSLs and the sources and uses of such toxicity values are presented in the following sections. Toxicity profiles for selected chemicals of concern are presented in Appendix A.

3.1 Types of Toxicity Values for Quantifying Risks

Toxicity and risk assessments vary for different chemicals depending upon whether non-carcinogenic or carcinogenic responses (i.e., endpoints) are used to assess potential risks. These criteria, in turn, are based on the endpoints observed from laboratory or epidemiological studies with the chemicals. Some chemicals of potential concern may result in both non-carcinogenic and carcinogenic effects, although in many cases the EPA has published toxicity criteria for only the most sensitive type of toxic effect supporting the most restrictive toxicological criteria.

Reference Doses (RfDs). Reference doses are used to quantitatively evaluate non-carcinogenic toxicity of a specific chemical. Reference doses are established at levels associated with no adverse effect, the "no observed adverse effect level" (NOAEL). In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime.

The RfDs are developed from an analysis of the available toxicological literature from which a critical study is selected. The selection of a critical study is made by professional judgment, and also considers factors such as the quality of the study, the relevance of the study to human exposures, and other factors. Good quality human toxicological data are preferred to animal studies. If no human data are available, the study on the most sensitive species is selected as the critical study. Similarly, the toxic effect manifested at the lowest exposure level is (generally) selected as the critical effect.

Cancer Potency Factors (CPFs). The toxicity of potential human carcinogens are evaluated differently. It is assumed for carcinogens that no threshold concentrations exist below which adverse effects may not occur. Probabilistic methods based on chemical-specific dose-response curves are used to establish slope factors, which are then used to quantify potential risks from exposure to carcinogens.

Dose-response curves are generated in laboratory studies using high chemical concentrations. The dose-response curve is fitted to a linearized multi-stage model that extrapolates the slope of the curve from high experimental concentrations to low concentrations at which people are typically exposed. The final cancer potency slope factor (CPF) is based on the 95% upper confidence level (UCL) of the extrapolated slope of the dose-response curve. Because of the non-threshold assumption and the UCL statistical procedure, the use of published slope factors provides a conservative upper-bound estimate of potential risks associated with exposure.

3.2 Use of Toxicity Values in Calculating RBSLs

This section presents the general equations used to calculate RBSLs for carcinogenic and non-carcinogenic chemicals. In the case of compounds that have been classified as carcinogens, the RBSLs are based on the general equation:

Risk = average lifetime intake (mg/kg-day) x potency factor $(mg/kg\text{-}day)^{-1}$

where intake depends on exposure parameters (ingestion rate, exposure duration, and so forth), the source concentration, and transport rates between the source and receptor. The potency factor is selected after reviewing a number of sources, including the EPA Integrated Risk Information System (IRIS) database (EPA, 1996a), EPA Health Effects Assessment Summary Tables (HEAST) (EPA, 1995), and peer-reviewed sources. The RBSL values presented in Table 5 correspond to probabilities of adverse health effects at the 1×10^{-6} risk level for the specified exposure

scenario. Note that this risk value does not reflect the probability for the specific exposure to occur. Therefore, the actual risk to a population for these RBSLs is lower than 1 x 10^{-6} (ASTM, 1995).

In the case of compounds that have not been classified as carcinogens, the RBSLs are based on the following general equation:

Hazard Quotient = average intake (mg/kg-day)/reference dose (mg/kg-day)

where the intake depends on exposure parameters (ingestion rate, exposure duration, and so forth), the source concentration, and transport rates between the source and receptor. The reference dose is selected after reviewing a number of sources, including the EPA IRIS database (EPA, 1996a), EPA HEAST (EPA, 1995), and peer-reviewed sources. The RBSL values presented in Table 5 correspond to hazard quotients of unity resulting from the specified exposure. Note this hazard quotient value does not reflect the probability for the specified exposure scenario to occur. Therefore, the actual potential impact to a population for these RBSLs is lower than a hazard quotient of unity.

4.0 CALCULATION OF RBSLs

Tier 1 risk-based screening levels (RBSLs) were calculated for the chemicals of concern at the Grand Auto Supply site in Oakland, California, in accordance with the Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM, 1995). Table 1 provides a list of the equations used and Tables 2 and 3 provide the modeling parameters for the site. Table 4 presents chemical-specific data including the toxicity values used in the calculation of the RBSL. Table 5 shows the RBSLs for carcinogenic and non-carcinogenic effects as well as the maximum detected concentration of the chemical in subsurface soil or groundwater samples at the site.

Tier 1 RBSLs are derived for standard exposure scenarios using current RME and toxicological parameters as recommended by the EPA. The points of exposure and points of compliance are assumed to be located within close proximity to the source area or the area where the highest concentrations of the chemicals of concern have been identified. Additivity of risks is not explicitly considered in this evaluation.

The equations used are presented in Table 1. The assumptions behind these models are presented below. In the scenarios involving inhalation of outdoor vapors, no pavement is assumed in the modeling of vapor diffusion. Therefore results can be expected to overestimate the actual

risks present at the site as a substantial portion of the site is currently paved.

4.1 Groundwater—Inhalation of Outdoor Vapors

In this case, chemical intake is a result of inhalation of outdoor vapors which originate from dissolved chemicals in groundwater located some distance below ground surface.

The relationship between outdoor air and dissolved groundwater concentrations is represented by the "volatilization factor," VF_{wamb} [$(mg/m^3\text{-air})/(mg/L\text{-}H_2O)$]. It is based on the following assumptions:

- A constant dissolved chemical concentration in groundwater;
- Linear equilibrium partitioning between dissolved chemicals in groundwater and chemical vapors at the groundwater table;
- Steady-state vapor- and liquid-phase diffusion through the capillary fringe and vadose zones to ground surface;
- No loss of chemical as it diffuses toward ground surface (that is, no biodegradation); and
- Steady well-mixed atmospheric dispersion of the emanating vapors within the breathing zone as modeled by a "box model" for air dispersion.

4.2 Groundwater—Inhalation of Enclosed-Space (Indoor) Vapors

In this case, chemical intake results from the inhalation of vapors in enclosed spaces. The chemical vapors originate from dissolved chemicals in groundwater located some distance below ground surface.

For simplicity, the relationship between enclosed-space air and dissolved groundwater concentrations is represented by the "volatilization factor" VF_{wesp} [$(mg/m^3\text{-air})/(mg/L\text{-}H_2O)$]. It is based on the following assumptions:

- A constant dissolved chemical concentration in groundwater;
- Equilibrium partitioning between dissolved chemicals in groundwater and chemical vapors at the groundwater table;
- Steady-state vapor- and liquid-phase diffusion through the capillary fringe, vadose zone, and foundation cracks;
- No loss of chemical as it diffuses toward ground surface (that is, no biodegradation); and
- Steady, well-mixed atmospheric dispersion of the emanating vapors within the enclosed space, where the convective transport into the

building through foundation cracks or openings is negligible in comparison with diffusive transport.

4.3 Subsurface Soils—Inhalation of Outdoor Vapors

In this case, chemical intake is a result of inhalation of outdoor vapors which originate from chemicals contained in subsurface soils located some distance below ground surface.

For simplicity, the relationship between outdoor air and soil concentration is represented in the "volatilization factor," VF_{samb} [(mg/m^3-air)/kg-soil)]. It is based on the following assumptions:

- A constant chemical concentration in subsurface soils;
- Linear equilibrium partitioning within the soil matrix between sorbed, dissolved, and vapor phases, where the partitioning is a function of constant chemical- and soil-specific parameters;
- Steady-state vapor- and liquid-phase diffusion through the vadose zone to ground surface;
- No loss of chemical as it diffuses toward ground surface (that is, no biodegradation); and
- Steady well-mixed atmospheric dispersion of the emanating vapors within the breathing zone as modeled by a "box model" for air dispersion.

4.4 Subsurface Soils—Inhalation of Enclosed Space (Indoor) Vapors

In this case, chemical intake is a result of inhalation of enclosed-space vapors which originate from chemicals contained in subsurface soils located some distance below ground surface.

For simplicity, the relationship between indoor air and soil concentrations is represented by the "volatilization factor," VF_{sesp} [(mg/m^3-air)/kg-soil)]. It is based on the following assumptions:

- A constant chemical concentration in subsurface soils;
- Linear equilibrium partitioning within the soil matrix between sorbed, dissolved, and vapor phases, where the partitioning is a function of constant chemical- and soil-specific parameters;
- Steady-state vapor- and liquid-phase diffusion through the vadose zone and foundation cracks;
- No loss of chemical as it diffuses toward ground surface (that is, no biodegradation); and
- Well-mixed atmospheric dispersion of the emanating vapors within the enclosed space.

The exposure parameters are presented in Table 2 as obtained from the Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites (ASTM, 1995). Since additivity of risks is not considered, a conservative target excess cancer risk of 1 x 10^{-6} was selected. Soil, building, surface, and subsurface parameters are listed in Table 3. The depth to groundwater was assumed to be 27 feet (upper value in the range reported by Hart Crowser, 1996). The depth to subsurface soil sources was assumed to be 8 feet, which is the location of the highest detected soil concentrations of chemicals of concern. Porosity data were selected based on test data, soil descriptions, and engineering judgment. Other non-chemical-specific parameters retained their values as presented in ASTM (1995). Chemical-specific data are shown in Table 4.

5.0 RISK CHARACTERIZATION

In the risk characterization step of a risk assessment, the chemical intakes estimated in the exposure assessment are combined with the appropriate critical toxicity values identified in the toxicity assessment. The results are the estimated cancer risks and non-carcinogenic health hazards posed by the modeled exposures. In a RBCA Tier 1 analysis, this step is modified by incorporating the exposure parameters along with toxicity values and a predetermined level of acceptable risk in calculating RBSLs for specific media and chemicals of concern. For this risk assessment, RBSLs were calculated for subsurface soils and groundwater evaluating the exposure pathways presented in Section 2.1. RBSLs were calculated under both residential and industrial exposure scenarios with residential exposure considered the "worst-case future" exposure scenario for this site. The residential use scenario is considered a "worst-case" exposure scenario as it utilizes a higher level of exposure duration and frequency than the commercial/industrial use scenario (Table 2). It is assumed that if site chemical concentrations are below the appropriate residential RBSLs, that the current site conditions pose no unacceptable human health risks for all possible present and future uses of the property.

The RBSLs for each exposure scenario and constituents of concern are presented along with the maximum detected concentration of site chemicals in subsurface soil and groundwater samples in Table 5. As previously stated, these RBSLs correspond to a chemical concentration in the selected environmental media resulting in a non-carcinogenic hazard quotient of 1 and a carcinogenic risk level 1 x 10^{-6}. These RBSLs were compared with the maximum concentration of the chemical found in the corresponding media on site. The use of the maximum detected concentration of chemical is a conservative assumption and will overestimate the actual or potential risks associated with current site conditions.

No exceedences are noted of RBSLs in either subsurface soil or from vapors in the soil from groundwater under either the residential or industrial exposure scenario. In subsurface soil, both benzene and PCE have maximum detected concentrations within an order of magnitude of their respective RBSL but are still below the RBSL even under the most conservative or protective use scenarios. The remaining chemicals detected in subsurface soils are several orders of magnitude below their respective RBSLs. Therefore, the residual presence of chemicals in subsurface soils, including potential vapors, does not pose an unacceptable risk to human health under current or potential future site uses and the site satisfies the conditions for regulatory site closure from a human health risk perspective.

6.0 REFERENCES

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7.0 LIMITATIONS

Work for this project was performed, and this report prepared, in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. It is intended for the exclusive use of PACCAR Automotive, Inc. for specific application to the referenced property. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made.

Any questions regarding our work and this report, the presentation of the information, and the interpretation of the data are welcome and should be referred to the undersigned.

We trust that this report meets your needs.

Sincerely,

HART CROWSER, INC.

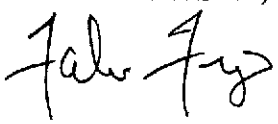

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Table 1 - Equations Used to Develop Tier 1 Risk-Based Screening Level (RBSLs)

Medium	Exposure Route	Risk-Based Screening Level (RBSL)
Carcinogenic Effects		
Air	inhalation	$RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right] = \frac{TR \times BW \times AT_c \times 365\frac{days}{years} \times 10^3\frac{\mu g}{mg}}{SF_i \times IR_{air} \times EF \times ED}$
Groundwater	enclosed-space (indoor) vapor inhalation[D]	$RBSL_w\left[\frac{mg}{L\text{-}H_2O}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{wesp}} \times 10^{-3}\ \frac{mg}{\mu g}$
Groundwater	ambient (outdoor) vapor inhalation[D]	$RBSL_w\left[\frac{mg}{L\text{-}H_2O}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{wamb}} \times 10^{-3}\ \frac{mg}{\mu g}$
Subsurface soil	ambient (outdoor) vapor inhalation[D]	$RBSL_s\left[\frac{mg}{kg\text{-}soil}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{samb}} \times 10^{-3}\ \frac{mg}{\mu g}$
Subsurface soil	enclosed space (indoor) vapor inhalation[D]	$RBSL_s\left[\frac{mg}{kg\text{-}soil}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{sesp}} \times 10^{-3}\ \frac{mg}{\mu g}$
Non-carcinogenic Effects		
Air	inhalation	$RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right] = \frac{THQ \times RID_i \times BW \times AT_n \times 365\frac{days}{years} \times 10^3\ \frac{\mu g}{mg}}{IR_{air} \times EF \times ED}$
Groundwater	enclosed-space (indoor) vapor inhalation[D]	$RBSL_w\left[\frac{mg}{L\text{-}H_2O}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{wesp}} \times 10^{-3}\ \frac{mg}{\mu g}$

Table 1 - Continued

Medium	Exposure Route	Risk-Based Screening Level (RBSL)
Groundwater[c]	ambient (outdoor) vapor inhalation[D]	$RBSL_w \left[\frac{mg}{L\text{-}H_2O}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{wamb}} \times 10^{-3} \frac{mg}{\mu g}$
Subsurface soil[c]	ambient (outdoor) vapor inhalation[D]	$RBSL_s \left[\frac{mg}{kg\text{-}soil}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{samb}} \times 10^{-3} \frac{mg}{\mu g}$
Subsurface soil[c]	enclosed space (indoor) vapor inhalation[D]	$RBSL_s \left[\frac{mg}{kg\text{-}soil}\right] = \frac{RBSL_{air}\left[\frac{\mu g}{m^3\text{-}air}\right]}{VF_{sesp}} \times 10^{-3} \frac{mg}{\mu g}$
Volatilization Factors (VF_i), and Effective Diffusion Coefficients (D^{eff}_i)		
VF_{wesp}	Groundwater - enclosed-space vapors	$VF_{wesp}\left[\frac{(mg/m^3\text{-}air)}{(mg/L\text{-}H_2O)}\right] = \frac{H\left[D^{eff}_{ws}/\frac{L_{GW}}{ER\ L_B}\right]}{1 + \left[\frac{D^{eff}_{ws}/L_{GW}}{ER\ L_B}\right] + \left[\frac{D^{eff}_{ws}/L_{GW}}{(D^{eff}_{crack}/L_{crack})}\eta\right]} \times 10^3 \frac{L}{m^3}$
VF_{wamb}	Groundwater - ambient (outdoor) vapors	$VF_{wamb}\left[\frac{(mg/m^3\text{-}air)}{(mg/L\text{-}H_2O)}\right] = \frac{H}{1 + \left[\frac{U_{air}\delta_{air}L_{GW}}{WD^{eff}_{ws}}\right]} \times 10^3 \frac{L}{m^3}$
VF_{samb}	Subsurface soils - ambient air	$VF_{samb}\left[\frac{(mg/m^3\text{-}air)}{(mg/kg\text{-}soil)}\right] = \frac{H\rho_s}{[\theta_{ws} + \kappa_s\rho_s + H\theta_{as}]\left(1 + \frac{U_{air}\delta_{air}L_s}{D^{eff}_s W}\right)} X\ 10^3 \frac{cm^3\text{-}kg}{m^3\text{-}g}$
VF_{sesp}	Subsurface soil - enclosed-space vapors	$VF_{sesp}\left[\frac{(mg/m^3\text{-}air)}{(mg/kg\text{-}soil)}\right] = \frac{\frac{H\rho_s}{(\theta_{ws} + k_s\rho_s + H\theta_{as})}\left[\frac{D^{eff}_s/L_s}{ER\ L_B}\right]}{1 + \left[\frac{D^{eff}_s/L_s}{ER\ L_B}\right] + \left[\frac{D^{eff}_s/L_s}{(D^{eff}_{crack}/L_{crack})\eta}\right]} \times 10^3 \frac{cm^3\text{-}kg}{m^3\text{-}g}$

Table 1 - Continued

Medium	Exposure Route	Risk-Based Screening Level (RBSL)
D_s^{eff}	Effective diffusion coefficient in soil based on vapor-phase concentration	$D_s^{eff}\left[\frac{cm^2}{\sec}\right] = D^{air}\frac{\theta_{as}^{3.33}}{\theta_T^2} + D^{wat}\frac{1}{H}\frac{\theta_{ws}^{3.33}}{\theta_T^2}$
D_{crack}^{eff}	Effective diffusion coefficient through foundation cracks	$D_{crack}^{eff}\left[\frac{cm^2}{\sec}\right] = D^{air}\frac{\theta_{acrack}^{3.33}}{\theta_T^2} + D^{wat}\frac{1}{H}\frac{\theta_{wcrack}^{3.33}}{\theta_T^2}$
D_{cap}^{eff}	Effective diffusion coefficient through capillary fringe	$D_{cap}^{eff}\left[\frac{cm^2}{\sec}\right] = D^{air}\frac{\theta_{acap}^{3.33}}{\theta_T^2} + D^{wat}\frac{1}{H}\frac{\theta_{wcap}^{3.33}}{\theta_T^2}$
D_{ws}^{eff}	Effective diffusion coefficient between groundwater and soil surface	$D_{ws}^{eff}\left[\frac{cm^2}{\sec}\right] = (h_{cap} + h_v)\left[\frac{h_{cap}}{D_{cap}^{eff}} + \frac{h_v}{D_s^{eff}}\right]-1$

Note: D: These equations simply define the "cross-media partitioning factors," VFij

Table 1 - Continued

Parameters	Definitions, Units
AT_c	averaging time for carcinogens, years
AT_n	averaging time for noncarcinogens, years
BW	adult body weight, kg
ED	exposure duration, years
EF	exposure frequency, days/years
IR_{air}-indoor	daily indoor inhalation rate, m^3/day
IR_{air}-outdoor	daily outdoor inhalation rate, m^3/day
$RBSL_i$	risk-based screening level for media i, mg/kg-soil, mg/L-H_2O, or $\mu g/m^3$-air
RfD_i	inhalation chronic reference dose, mg/kg-day
SF_i	inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$
THQ	target hazard quotient for individual constituents, unitless
TR	target excess individual lifetime cancer risk, unitless
VF_i	volatilization factor, $(mg/m^3\text{-}air)/(mg/kg\text{-}soil)$ or $(mg/m^3\text{-}air)/(mg/L\text{-}H_2O)$
d	lower depth of sufficient soil zone, cm
D^{air}	diffusion coefficient in air, cm^2/sec
D^{wat}	diffusion coefficient in water, cm^2/sec
ER	enclosed-space air exchange rate, S^{-1}
f_{oc}	fraction of organic carbon in soil, g-C/g-soil
H	henry's law constant, $(cm^3\text{-}H_2O)/(cm^3\text{-air})$
h_{cap}	thickness of capillary fringe, cm
h_v	thickness of vadose zone, cm
k_{oc}	carbon-water sorption coefficient, $cm^3\text{-}H_2O$/g-C
k_s	soil-water sorption coefficient, $cm^3\text{-}H_2O$/g-soil
L_B	enclosed-space volume/infiltration area ratio, cm
L_{crack}	enclosed-space foundation or wall thickness, cm
L_{GW}	depth to groundwater = $h_{cap} + h_{vs}$, cm
L_s	depth to subsurface soil sources, cm
S	pure component solubility in water, mg/L-H_2O
U_{air}	wind speed above ground surface in ambient mixing zone, cm/sec
W	width of source area parallel to wind, or groundwater flow direction, cm
δ_{air}	ambient air mixing zone height, cm
η	areal fraction of cracks in foundations/walls, cm^2-cracks/cm^2-total area
θ_{acap}	volumetric air content in capillary fringe soils, cm^3-air/cm^3-soil
θ_{acrack}	volumetric air content in foundation/wall cracks, cm^3-air/cm^3 total volume
θ_{as}	volumetric air content in vadose zone soils, cm^3-air/cm^3-soil
θ_T	total soil porosity, cm^3/cm^3-soil
θ_{wcap}	volumetric water content in capillary fringe soils, $cm^3\text{-}H_2O/cm^3$-soil
θ_{wcrack}	volumetric water content in foundation/wall cracks, $cm^3\text{-}H_2O/cm^3$ total volume
θ_{ws}	volumetric water content in vadose zone soils, $cm^3\text{-}H_2O/cm^3$-soil
ρ_s	soil bulk density, g-soil/cm^3-soil
τ	averaging time for vapor flux, sec

Table 2 - Exposure Parameters

Parameters	Definitions, Units	Residential	Commercial/Industrial
AT_c	averaging time for carcinogens, years	70 years	70 years
AT_n	averaging time for non-carcinogens, years	30 years	25 years
BW	adult body weight, kg	70 kg	70 kg
ED	exposure duration, years	30 years	25 years
EF	exposure frequency, days/years	350 days/year	250 days/year
IR_{air}-indoor	daily indoor inhalation rate, m^3/day	15 m^3/day	20 m^3/day
IR_{air}-outdoor	daily outdoor inhalation rate, m^3/day	20 m^3/day	20 m^3/day
$RBSL_i$	risk-based screening level for media i, mg/kg-soil, mg/L-H_2O, or $\mu g/m^3$-air	chemical-, media-, and exposure route-specific	chemical-, media-, and exposure route-specific
RfD_i	inhalation chronic reference dose, mg/kg-day	chemical-specific	chemical-specific
SF_i	inhalation cancer slope factor, $(mg/kg\text{-}day)^{-1}$	chemical-specific	chemical-specific
THQ	target hazard quotient for individual constituents, unitless	1.0	1.0
TR	target excess individual lifetime cancer risk, unitless	10^{-6}	10^{-6}
VF_i	volatilization factor, (mg/m^3-air)/(mg/kg-soil) or (mg/m^3-air)/(mg/L-H_2O)	chemical- and media-specific	chemical- and media-specific

Table 3 - Soil, Building, Surface, and Subsurface Parameters Used in Generating Tier 1 RBSLs

Parameters	Definitions, Units	Residential	Commercial/Industrial
d	lower depth of sufficient soil zone, cm	100 cm	100 cm
D^{air}	diffusion coefficient in air, cm^2/sec	chemical-specific	chemical-specific
D^{wet}	diffusion coefficient in water, cm^2/sec	chemical-specific	chemical-specific
ER	enclosed-space air exchange rate, S^{-1}	0.00014 s^{-1}	0.00023 s^{-1}
f_{oc}	fraction of organic carbon in soil, g-C/g-soil	0.01	0.01
H	henry's law constant, $(cm^3\text{-}H_2O)/(cm^3\text{-air})$	chemical-specific	chemical-specific
h_{cap}	thickness of capillary fringe, cm	100 cm	5 cm
h_v	thickness of vadose zone, cm	820.8 cm	820.8 cm
k_{oc}	carbon-water sorption coefficient, $cm^3\text{-}H_2O/g\text{-}C$	chemical-specific	chemical-specific
k_s	soil-water sorption coefficient, $cm^3\text{-}H_2O/g\text{-soil}$	$f_{oc} \times k_{oc}$	$f_{oc} \times k_{oc}$
L_B	enclosed-space volume/infiltration area ratio, cm	200 cm	300 cm
L_{crack}	enclosed-space foundation or wall thickness, cm	15 cm	15 cm
L_{GW}	depth to groundwater = $h_{cap} + h_{vs}$ cm	920.8 cm	920.8 cm
L_s	depth to subsurface soil sources, cm	243.2 cm	243.2 cm
S	pure component solubility in water, $mg/L\text{-}H_2O$	chemical-specific	chemical-specific
U_{air}	wind speed above ground surface in ambient mixing zone, cm/sec	225 cm/sec	225 cm/sec
W	width of source area parallel to wind, or groundwater flow direction, cm	1500 cm	1500 cm
δ_{air}	ambient air mixing zone height, cm	200 cm	200 cm
η	areal fraction of cracks in foundations/walls, $cm^2\text{-cracks}/cm^2\text{-total area}$	0.01 $cm^2\text{-cracks}/cm^2\text{-total area}$	0.01 $cm^2\text{-cracks}/cm^2\text{-total area}$
θ_{acap}	volumetric air content in capillary fringe soils, $cm^3\text{-air}/cm^3\text{-soil}$	0.03 $cm^3\text{-air}/cm^3\text{-soil}$	0.38 $cm^3\text{-air}/cm^3\text{-soil}$
θ_{acrack}	volumetric air content in foundation/wall cracks, $cm^3\text{-air}/cm^3$ total volume	0.22 $cm^3\text{-air}/cm^3$ total volume	0.26 $cm^3\text{-air}/cm^3$ total volume
θ_{as}	volumetric air content in vadose zone soils, $cm^3\text{-air}/cm^3\text{-soil}$	0.22 $cm^3\text{-air}/cm^3\text{-soil}$	0.26 $cm^3\text{-air}/cm^3\text{-soil}$
θ_T	total soil porosity, $cm^3/cm^3\text{-soil}$	~~0.41 cm^3/cm^3-soil~~	0.38 cm^3/cm^3-soil
θ_{wcap}	volumetric water content in capillary fringe soils, $cm^3\text{-}H_2O/cm^3\text{-soil}$	0.38 $cm^3\text{-}H_2O/cm^3\text{-soil}$	0.342 $cm^3\text{-}H_2O/cm^3\text{-soil}$
θ_{wcrack}	volumetric water content in foundation/wall cracks, $cm^3\text{-}H_2O/cm^3$ total volume	0.19 $cm^3\text{-}H_2O/cm^3$ total volume	0.12 $cm^3\text{-}H_2O/cm^3$ total volume
θ_{ws}	volumetric water content in vadose zone soils, $cm^3\text{-}H_2O/cm^3\text{-soil}$	0.19 $cm^3\text{-}H_2O/cm^3\text{-soil}$	0.12 $cm^3\text{-}H_2O/cm^3\text{-soil}$
ρ_s	soil bulk density, $g\text{-soil}/cm^3\text{-soil}$	1.6 g/cm^3	1.7 g/cm^3
τ	averaging time for vapor flux, sec	7.88 x 10^8 sec	7.88 x 10^8 sec

Table 4 - Chemical-Specific Parameters

Parameter	Unit	PCE	TCE	cis-1,2-DCE	Chloroform	1,1,1-TCA	1,2-DCA	Vinyl Chloride	Benzene	Toluene	Ethyl-benzene	Xylenes
RfDi	mg/kg-day			1.00E-02 (1)		3.00E+00 (3)				1.14E-02 (3)	2.86E-01 (3)	2.00E-01 (3)
SFi	(mg/kg-day)-1	2.03E-03 (1)	1.70E-02 (2)		8.10E-02 (3)		9.10E-02 (3)	3.00E-01 (3)	2.90E-02 (3)			
Dair	cm2/s	7.20E-02 (4)	7.90E-02 (4)	1.39E-01 (5)	1.04E-01 (4)	7.80E-04 (4)	1.04E-01 (4)	1.06E-01 (4)	9.30E-02 (6)	8.50E-02 (6)	7.60E-02 (6)	7.20E-02 (6)
Dwat	cm2/s	8.20E-06 (4)	9.10E-06 (4)	1.12E-05 (5)	1.00E-05 (4)	8.80E-06 (4)	9.90E-06 (4)	1.23E-05 (4)	1.10E-05 (6)	9.40E-06 (6)	8.50E-06 (6)	8.50E-06 (6)
H	atm-m3/mol	2.30E-02 (7)	9.10E-03 (7)	7.50E-03 (7)	3.80E-03 (7)	3.00E-02 (7)	1.10E-03 (7)	1.10E-02 (7)				
H	cm3-H2O/cm3-air	9.40E-01	3.72E-01	3.07E-01	1.55E-01	1.23E+00	4.50E-02	4.50E-01	2.20E-01 (6)	2.60E-01 (6)	3.20E-01 (6)	2.90E-01 (6)
log(koc)		2.56E+00 (7)	2.10E+00 (7)	2.17E+00 (7)	1.64E+00 (7)	1.76E+00 (7)	7.10E-01 (7)	9.10E-01 (7)	1.58E+00 (6)	2.13E+00 (6)	1.98E+00 (6)	2.38E+00 (6)
koc	cm3-H2O/g-C	3.63E+02 (7)	1.26E+02 (7)	1.48E+02 (7)	4.37E+01 (7)	5.75E+01 (7)	5.13E+00 (7)	8.13E+00 (7)	3.80E+01 (6)	1.35E+02 (6)	9.55E+01 (6)	2.40E+02 (6)
S	mg/L	1.50E+02 (7)	1.10E+03 (7)	8.00E+02 (7)	8.20E+03 (7)	4.40E+03 (7)	8.69E+03 (7)	2.76E+03 (7)	1.78E+03 (7)	1.52E+02 (7)	5.15E+02 (7)	1.75E+02 (7)

(1) Provisional values provided by EPA Superfund Health Risk Technical Support Center (EPA, 1996b).

(2) HEAST (EPA, 1991)

(3) HEAST (EPA, 1995)

(4) Data from: Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) - Air Emission Models, Documentation, EPA, Dec 1987 (PB88-198619)

(5) Data estimated with equations from Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDF) - Air Emission Models, Documentation, EPA, Dec 1987 (PB88-198619)

(6) Data from ASTM E 1739-95, Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites, 1995.

(7) Data from Facility Closure Report, Grand Auto Supply, Oakland, California, prepared by Hart Crowser Inc., February 16, 1996.

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Table 5 - RBSL Table

Consitutent of Concern	RBSL for Non-Carcinogenic Effects: Residential	RBSL for Non-Carcinogenic Effects: Commercial/ Industrial	RBSL for Carcinogenic Effects: Residential	RBSL for Carcinogenic Effects: Commercial/ Industrial	Maximum Detected Concentrations (1)	Units
Benzene						
Air indoor			0.392	0.493		µg/m3-air
Air outdoor			0.294	0.493		µg/m3-air
subsurface soil to ambiant air			0.020	0.034	0.011	mg/kg-soil
subsurface soil to indoor air			0.013	0.040	0.011	mg/kg-soil
Ethylbenzene						
Air indoor	1390	1460				µg/m3-air
Air outdoor	1043	1460				µg/m3-air
subsurface soil to ambiant air	128	180			0.064	mg/kg-soil
subsurface soil to indoor air	81	210			0.064	mg/kg-soil
Toluene						
Air indoor	56	58				µg/m3-air
Air outdoor	42	58				µg/m3-air
subsurface soil to ambiant air	8	11			0.065	mg/kg-soil
subsurface soil to indoor air	5	12			0.065	mg/kg-soil
Xylenes						
Air indoor	973	1022				µg/m3-air
Air outdoor	730	1022				µg/m3-air
subsurface soil to ambiant air	239	335			1.5	mg/kg-soil
subsurface soil to indoor air	151	392			1.5	mg/kg-soil
Perchloethylene (PCE)						
Air indoor	48.7	51.1	5.594	7.048		µg/m3-air
Air outdoor	37	51	4.195	7.048		µg/m3-air
Groundwater to indoor vapor	>S	>S	79.635	595.424	0.3	mg/L-H_2O
Groundwater to outdoor vapor	>S	>S	33.646	56.526	0.3	mg/L-H_2O
subsurface soil to ambiant air	6	8	0.643	1.081	0.104	mg/kg-soil
subsurface soil to indoor air	4	9	0.407	1.264	0.104	mg/kg-soil
Trichloroethylene (TCE)						
Air indoor			0.668	0.842		µg/m3-air
Air outdoor			0.501	0.842		µg/m3-air
Groundwater to indoor vapor			14.142	105.699	0.13	mg/L-H_2O
Groundwater to outdoor vapor			5.971	10.032	0.13	mg/L-H_2O
Cis-1,2-Dichloroethylene						
Air indoor	49	51				µg/m3-air
Air outdoor	37	51				µg/m3-air
Groundwater to indoor vapor	780.25	>S			0.036	mg/L-H_2O
Groundwater to outdoor vapor	329.50	461.31			0.036	mg/L-H_2O
Chloroform						
Air indoor			0.140	0.177		µg/m3-air
Air outdoor			0.105	0.177		µg/m3-air
Groundwater to indoor vapor			3.447	25.745	0.0019	mg/L-H_2O
Groundwater to outdoor vapor			1.454	2.442	0.0019	mg/L-H_2O
1,1,1-Trichloroethane						
Air indoor	14600	15330				µg/m3-air
Air outdoor	10950	15330				µg/m3-air
Groundwater to indoor vapor	>S	>S			0.0009	mg/L-H_2O
Groundwater to outdoor vapor	>S	>S			0.0009	mg/L-H_2O
1,2-Dichloroethane						
Air indoor			0.125	0.157		µg/m3-air
Air outdoor			0.094	0.157		µg/m3-air
Groundwater to indoor vapor			4.077	30.375	0.0018	mg/L-H_2O
Groundwater to outdoor vapor			1.712	2.876	0.0018	mg/L-H_2O
Vinyl Chloride						
Air indoor			0.038	0.048		µg/m3-air
Air outdoor			0.028	0.048		µg/m3-air
Groundwater to indoor vapor			0.547	4.087	0.0009	mg/L-H_2O
Groundwater to outdoor vapor			0.231	0.388	0.0009	mg/L-H_2O

>S = above maximum solubility of compound.

6077/PACCARRA.xls - results

(1) Data from Hart Crowser, 1996

APPENDIX A
TOXICITY PROFILES OF SELECTED CHEMICALS OF CONCERN

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TOXICITY PROFILES OF SELECTED CHEMICALS OF CONCERN

This appendix provides toxicity profiles for the seven chemicals detected at the highest concentrations in either subsurface soil or groundwater samples at the Grand Auto property.

BENZENE

Benzene is a colorless liquid with a pleasant odor. Benzene found in the environment is from both natural processes and human activities. Natural sources, which include volcanoes and forest fires, account for a small amount of benzene in the environment. Various industries use benzene to make other chemicals, such as styrene, cumene, and cyclohexane. Benzene is also used for manufacturing of some types of rubber, lubricants, dyes, detergents, drugs, and pesticides.

Physical-Chemical Properties

Benzene is considered to be highly volatile with a vapor pressure of 95 mm Hg at 25°C. It is also soluble in water with a solubility of 1,780 mg/L at 25°C. Because of its physical-chemical properties, benzene released to the environment partitions mainly to the atmosphere.

Mammalian Toxicology

Pharmacokinetics. Data from both human and animals consistently indicate that benzene is rapidly absorbed through the lungs. Although experimentally acquired data are not available on oral absorption of benzene in humans, case reports of accidental and incidental poisonings suggest that benzene is rapidly absorbed from the gastrointestinal tract. The efficient absorption of oral doses in animals is well-documented. Benzene can be absorbed through the skin, but the rate of absorption is much lower than that for inhalation. Following absorption into the body, benzene is widely distributed to tissues, with the relative uptake dependent on the perfusion of the tissue by blood (ATSDR, 1992).

Inhalation Toxicity. Acute inhalation exposure to high concentrations of benzene has caused death. Lethality in humans following inhalation exposure has been attributed to asphyxiation, respiratory arrest, central nervous system depression, or cardiac collapse (Winek and Collom, 1971). Based on case studies, it has been estimated that exposure to a benzene

concentration of 20,000 ppm for 5 to 10 minutes is likely to be fatal (Flury, 1928).

Both human and animal studies have shown that benzene exerts toxic effects on various parts of the hematological system. All major types of blood cells are affected (erythrocytes, leukocytes, and platelets). In the less severe cases of toxicity, specific deficiencies occur in individual types of blood elements. A more severe effect occurs when there is hypoplasia of the bone marrow that results in ineffective hematopoiesis so that all types of blood cells are found in reduced numbers (ATSDR, 1992).

Oral Toxicity. Lethality in humans following oral exposure has been attributed to respiratory arrest, central nervous system depression, or cardiac collapse. Oral lethal doses in humans have been estimated to be about 125 mg/kg (Thienes and Haley, 1972). Accidental ingestion and/or attempted suicide with lethal oral doses have produced the following signs and symptoms: staggering gate, vomiting, shallow rapid pulse, somnolence, and loss of consciousness, followed by delirium, pneumonitis, collapse, and then central nervous system depression, coma, and death (Thienes and Haley, 1972).

Carcinogenicity. It is established that exposure to commercial benzene or benzene-containing mixtures can cause damage to the hematopoietic system including pancytopenia with subsequent manifestation of leukemia (Aksoy et al., 1974). A series of studies (Infante et al., 1977; Rinsky et al., 1981 and 1987) analyzing the mortality of workers exposed to benzene at two rubber hydrochloride manufacturing locations demonstrated excess risk of leukemia.

Benzene is considered to be a human carcinogen by EPA, OSHA, the World Health Organization, and the International Agency for Research on Cancer (IARC). EPA (1986) has verified the weight-of-evidence classification of carcinogenicity of benzene as EPA Group A, based on a sufficient level of human evidence supported by a sufficient level of animal evidence. There are still questions regarding both the mechanisms of benzene carcinogenesis and the most appropriate models for developing human risk estimates.

The inhalation Cancer Potency Factor (CPF) of 0.0290 $(mg/kg\text{-}day)^{-1}$ used in this risk assessment was taken from HEAST (EPA, 1995).

1,2-DICHLOROETHENE, *CIS* AND *TRANS* ISOMERS

1,2-Dichloroethene (1,2-DCE), also known as acetylene dichloride, is a chlorinated aliphatic compound, which can be released to the atmosphere and groundwater via wastewater discharge during its production and use as a solvent. It also may be released during its use in the manufacture of perfumes, lacquers, and thermoplastics. 1,2-DCE, predominately the *cis*-isomer, is also a product formed during the degradation of higher chlorinated ethenes such as PCE and TCE by reductive dehalogenation. There are no known naturally occurring sources of 1,2-DCE.

Physical-Chemical Properties

1,2-DCE is a colorless liquid having a sweet, pleasant odor. It is very volatile, with a isomer-specific vapor pressure of 273 and 395 mm Hg at 30°C for *cis*- and *trans*- isomers, respectively. The aqueous solubility of *cis*- and *trans*- vary by almost a factor of 2; however, both isomers are very soluble in water. 1,2-DCE is soluble in acetone, ethanol, and ether, and is very soluble in benzene and chloroform.

Mammalian Toxicology

Inhalation Toxicity. Comparatively little information is reported in the literature on the toxic and carcinogenic properties of either the *cis*- or *trans*- isomers of 1,2 DCE. One reference reported that the *trans*- isomer is twice as toxic to mammals as the *cis*- isomer. 1,2-DCE's toxicity has been studied by both the inhalation and oral pathways. Gradiski et al. (1978) reported an LC_{50} of 21,723 ppm for *trans*-dichloroethene in mice exposed for 6 hours. The primary target tissue identified for inhalation exposure were the lungs, the liver, and the central nervous system. Freundt et al. (1977) studied pathological changes in rats following repeated exposures to 200 ppm *trans*-dichloroethene. These authors observed increases of pulmonary capillary hyperemia, alveolar septal distation, and pulmonary edema. The livers of these animals displayed lipid accumulation and fatty degradation. These results have several shortcomings. There was no statistical analysis of these data, and only a small number of animals were included in this study. Neurological effects of dichloroethene were studied by Lehman and Schmidt-Kehl (1936). Humans exposed to 4.8 mg/L dichloroethene had a variety of symptoms including nausea, drowsiness, vertigo, and intracranial pressure.

Oral Toxicity. Oral exposure demonstrated the same target tissues as inhalation. Chronic exposure to low concentrations of 1,2-DCE in drinking water lead to no observable changes in mice (Barnes et al., 1985). However, Freundt et al. (1977) described increased pulmonary edema in

rats given lethal oral doses. Hepatic effects were also only seen at near lethal dosing. Central nervous system depression in mice was reported by Barnes et al. (1985) at near lethal dosages.

Carcinogenicity. No data were available to make any determination about the carcinogenic potential of these compounds. Possible genotoxicity by the *cis-* isomer of 1,2-DCE was described by Cerna and Kypenova (1977) using Salmonella. Negative results were found in experiments involving the *trans-* isomer. The metabolism of these compounds are metabolized by the mixed-function oxidase of the cytochrome P-450 enzyme system forming the chloroethene epoxide. Actual experimental data to support these theories are not presently available.

The inhalation Reference Dose (RfD) of 0.010 mg/kg-day used in this risk assessment was taken from HEAST (EPA, 1991).

ETHYLBENZENE

Ethylbenzene is a colorless liquid with an aromatic odor. It is used in the production of styrene and synthetic polymers, as a solvent and as a component of automotive and aviation fuels. Ethylbenzene is found in many man-made products, including paints, inks, and insecticides. Gasoline contains about 2% (by weight) ethylbenzene.

Physical-Chemical Properties

The physicochemical properties of ethylbenzene reveal a strong tendency for ethylbenzene to partition into the atmosphere. Depending upon site conditions, releases to surface soil can result in substantial losses to the atmosphere in addition to subsurface infiltration. Vapor phase transport will occur from subsurface releases and during migration through partitioning into air pockets within unsaturated soil pore spaces. Sorption and retardation by soil organic carbon will occur to a small extent, but sorption is not significant enough to prevent migration in most soils (ATSDR, 1990).

Mammalian Toxicology

Pharmacokinetics. Quantitative and qualitative evidence indicate that ethylbenzene is rapidly and efficiently absorbed by humans following inhalation and dermal exposures. Animal data support these findings and indicate that absorption rates are high following oral exposures as well.

Available data suggest that ethylbenzene is rapidly distributed throughout the body following inhalation and oral exposure. It is accumulated primarily in the intestine, liver, kidney, and fat, which provides some basis for ethylbenzene-induced toxicity observed in the liver and kidney (ATSDR, 1990).

Systemic Toxicity. In general, data on the toxic effects of ethylbenzene in humans and animals are limited. Moderate upper respiratory irritation accompanied by chest constriction has been reported in humans exposed by inhalation to ethylbenzene (Yant et al., 1930). Animal studies support these findings and show more severe effects with increased doses (De Ceaurriz et al., 1981; Nielsen and Alarie, 1982).

No hepatotoxic effects in humans have been reported in the literature. Inhalation studies in animals suggest that biochemical changes and histopathological alterations in the liver may be related to dose and duration of exposure to ethylbenzene (Cragg et al., 1989; Elovaara et al., 1985).

The principal effect in humans acutely exposed to high concentrations of ethylbenzene has been central nervous system toxicity (dizziness, vertigo). Complete recovery has been shown to occur if the exposure is not prolonged (ATSDR, 1990).

Carcinogenicity. No association between increased cancer incidence in humans and exposure to ethylbenzene has been reported in the literature. The only chronic bioassay available showed a significant increase in tumors in rats orally exposed to ethylbenzene (Maltoni et al., 1985). These results are inconclusive, given the weaknesses of the study (e.g., only one dose was tested and no survival data were provided). Therefore, the relevance of ethylbenzene-induced carcinogenicity to public health cannot be ascertained (ATSDR, 1990).

The EPA has classified ethylbenzene as a Group D agent (EPA, 1996). This classification applies to those chemical agents for which there is inadequate evidence of carcinogenicity in animals.

The inhalation RfD of 0.2857 mg/kg-day used in this risk assessment was taken from HEAST (EPA, 1995).

PERCHLOROETHYLENE

Perchloroethylene (PCE), also known as tetrachloroethene, is a chlorinated aliphatic compound commonly used as a solvent. Sources of vapor-phase

PCE to the environment include fugitive air emissions from dry cleaning and metal degreasing industries. Wastewater discharges from metal finishing, laundries, and aluminum forming industries, organic chemical and plastics manufacturing, and municipal treatment plants may also contain PCE.

Physical-Chemical Properties

PCE is a colorless liquid having a sweet, chloroform-like odor. PCE is quite volatile having a vapor density of 5.7 which is greater than the vapor density of atmospheric air. The saturation concentration of PCE in air is 126 gm/m^3 at 20°C and 210 gm/m^3 at 30°C. PCE is soluble in water and is miscible with other solvents including alcohol, ether, chloroform, benzene, and hexane.

Mammalian Toxicology

Pharmacokinetics. PCE is readily absorbed through the lung and to a lesser degree through skin, mucous membranes, or following ingestion. PCE has been reported to reach steady-state concentrations in the blood of humans within 2 hours of continuous exposure. Once in the bloodstream, PCE tends to distribute to body fat. PCE ratios in fat:liver of greater than 6:1 and a brain:blood ratio of 8:1 have been reported. Metabolism is relatively slow, with only a few percent of the dose excreted as metabolites, the major one being trichloroacetic acid. Other known metabolites in humans include trichloroethanol, inorganic chloride, and trans-1,2-dichloroethylene. PCE uptake via inhalation or skin absorption is eliminated primarily by respiration; the half-life for elimination of PCE from fat stores via expired air has been reported to be 65 to 71.5 hours (HDSB, 1995).

Inhalation Toxicity. PCE has been extensively studied as a hepatotoxin from both oral and inhalation exposures. Inhalation of PCE has produced lung irritations in humans but no respiratory lesions have been reported in animal studies (Coler and Rossmiller, 1953). Rats exposed to 1,600 ppm PCE over a three-month period exhibited an increase in mortality (NTP, 1986). A two-year carcinogenicity study of rats exposed to 200 and 400 ppm PCE also demonstrated increased mortality resulting from lesions other than neoplasms (NTP, 1986). The primary target tissues of PCE by inhalation exposure are the liver and the central nervous system. Macroscopic liver changes such as increased liver weight and cirrhosis have been described (Rowe et al., 1952), as well as microscopic changes in hepatocyte vacuolization and enlargement (Kjellstrand et al., 1984).

Oral Toxicity. Oral exposure to PCE has been demonstrated to be toxic with single dose LD_{50} of 3,500 mg/kg in rats (Chaudhuri and Mukerji, 1947). Chronic oral administration of 475 mg/kg PCE has lead to increased mortality among rats over an 18-month period (NCI, 1977). Primary target organs from oral exposure the liver, kidney, spleen, and some central nervous system effects. Hepatic lesions consist of hepatocyte hypertrophy, centrilobular necrosis, and hepatocyte vacuolization (Buben and O'Flaherty, 1985). This study reported a NOAEL of 20 mg/kg-day which has been used by the EPA to establish an oral RfD of 0.01 mg/kg-day (EPA, 1996a).

Carcinogenicity. The data concerning genotoxicity and carcinogenicity of PCE are very inconsistent. Direct evidence of DNA interaction with PCE or any metabolites has not been demonstrated, and epidemiological studies have been difficult to interpret. In most epidemiological studies, subjects exposed to PCE were simultaneously exposed to other organic solvents. A study from Woburn, Massachusetts, reported an increase in childhood leukemia from drinking water contaminated with 21 μg/kg PCE and 267 μg/kg TCE (Lagakos et al., 1986). This study was complicated by methodological problems and lack of exposure data.

The carcinogenicity of PCE has been documented in animal studies (NCI, 1977; NTP, 1986). Hepatocellular neoplasms have been identified by both oral and inhalation pathways. The validity of these studies have been questioned because of a very high rate of spontaneous neoplasms in the control Fisher 344 rats (ATSDR, 1991). In rat studies, a glutathione conjugate has been identified as extremely mutagenic (Goldsworthy and Popp, 1987). Green et al. (1990) demonstrated that humans may not form this conjugate. Buben and O'Flaherty (1985) suggested the formation of a reactive epoxide as the genotoxic species. The formation of this genotoxic species is cytochrome P-450 mediated.

The evidence of animal tumorigenicity and similar metabolism to vinyl chloride has lead IARC to classify PCE as a Group 2B "possible" human carcinogen. The EPA has previously classified PCE as a Group B2 probable human carcinogen (EPA, 1996a); however, this classification is being currently reviewed. Questions about the carcinogenicity data and the applicability to humans are to be addressed in the revised classification.

The inhalation CPF of 0.00203 $(mg/kg\text{-}day)^{-1}$ used in this risk assessment is a provisional value developed by the EPA Superfund Health Risk Technical Support Center, part of the Chemical Mixtures Branch of ECAO-Cincinnati (EPA, 1996b).

TOLUENE

Toluene, also known as methyl benzene, is an organic solvent used in the manufacture of paints, lacquers, adhesives, rubber, paint thinners, and in printing. Toluene naturally occurs in crude oil and is isolated in the process of making gasoline and other fuels from crude oil, in making coke from coal, and as a by-product in the manufacture of styrene.

Toluene emissions to the environment primarily consist of direct release to the atmosphere, an estimated 680 x 10^3 metric tons per year from automobile exhaust and 370 x 10^3 metric tons from sources other than exhausts such as paints and solvents (EPA, 1981). Toluene releases also occur to soil and water by industrial releases, spills, and leaking underground storage tanks.

Physical-Chemical Properties

Toluene is quite volatile having a vapor pressure of 28.4 at 25°C. It will not significantly hydrolyze in soil or water under normal environmental conditions. If toluene is released into water, its concentration will decrease as a result of evaporation and biodegradation (Howard, 1990).

Mammalian Toxicology

Inhalation Toxicity. The effects of toluene intoxication have been studied primarily by the inhalation exposure pathway. In Great Britain, around 80 deaths a year are associated with solvent abuse that include exposure to toluene (Anderson et al., 1985). Deaths were attributed to cardiac arrhythmias, central nervous system depression, asphyxia, hepatic failure, and renal failure (Anderson et al., 1985). The primary target of toluene appears to be the central nervous system. Human exposures of 100 mg/kg toluene have demonstrated minor central nervous system depression (Baelem et al., 1985). Moderate exposures of 200 to 800 mg/kg result in initial excitatory effects followed by narcosis (EPA, 1985). High levels of exposure are associated with more serious neurological effects such as ataxia, tremors, atrophy, and impaired speech, vision, and hearing (King et al., 1981; Suzuki et al., 1983).

Animal studies have shown that toluene intoxication produces significant changes in neurotransmitters (Ikeda et al., 1986). In addition, Kyrklund et al., (1987) demonstrated morphological changes to the brain from toluene exposure. These authors describe decreased brain weight and loss of gray matter in rats continuously exposed to 320 ppm for 30 days. Cardiac arrhythmias are not the result of direct cardiac toxicity but an indirect neurological effect. In rats chronically exposed to 300 ppm, no

histopathological lesions could be found (CIIT, 1980). Although studies have shown increased liver weight caused by solvent exposure, the liver does not appear to be a primary target of toluene toxicity (ATSDR, 1993). Studies of solvent abusers have shown some renal toxicities; however, these studies are confounded by the presence of solvents other than toluene. Animal inhalation studies of toluene have failed to demonstrate renal abnormalities; therefore, the kidney is not considered a primary target organ.

Oral Toxicity. No human data were available regarding the health effects of ingested toluene. Oral toxicity studies in animals have focused primarily on lethal effects. LD_{50} values range from 5,500 to 7,300 mg/kg in rats. No systemic toxicities were associated with oral exposure in any test animal. An NTP (1989) carcinogenesis study reported significantly increased liver and kidney weights in rats exposed to doses of 625 mg/kg or more.

Carcinogenicity. Studies of toluene reveal no carcinogenic potential for this compound; however, human data are lacking. Retrospective mortality studies of oil refinery workers exposed to toluene indicated no increase in cancer-related deaths (Wen et al., 1985). Toluene did not produce increases of tumor incidence in chronically treated rats (CIIT, 1980) and was negative for mutation assays (Bos et al., 1981). These studies have lead the EPA to classify toluene as a Group D, non-carcinogenic compound.

The inhalation RfD of 0.011429 mg/kg-day used in this risk assessment was taken from HEAST (EPA, 1995).

TRICHLOROETHENE

Trichloroethene (TCE) is a chlorinated aliphatic compound commonly used as a solvent. The primary sources of vapor-phase TCE to the environment are metal degreasing and dry cleaning industries.

Physical-Chemical Properties

TCE is a clear, colorless liquid with a chloroform-like odor. TCE is quite volatile with a vapor density of 4.53 which is greater than the vapor density of atmospheric air. The saturation concentration of TCE in air is 5.38 mg/m^3 at 25°C and 760 mm Hg. TCE is moderately soluble in water and is soluble in organic solvents including alcohol, ether, chloroform, and acetone.

Mammalian Toxicology

Pharmacokinetics. TCE concentrations in blood during inhalation rapidly equilibrates with alveolar gas concentrations in the lung. The blood:air partition coefficient for TCE in humans ranges from 9 to 15. An average of 11 percent of the absorbed dose of TCE is eliminated unchanged by the lung (half-life of 5 hours); 2 percent of the dose is eliminated as trichloroethanol by the lung (half-life 10 to 12 hours); 58 percent is eliminated as urinary metabolites (half-life approximately 41 hours); and the remainder is metabolized by unknown pathways (HSDB, 1995). Other known metabolites of TCE in humans include trichloroacetic acid, urochloralic acid, monochloroacetic acid, and chloroform.

Inhalation Toxicity. TCE has been extensively studied both in laboratory animals and human epidemiology. The primary target of TCE is the central nervous system. Central nervous system effects by inhalation exposure have been demonstrated but a threshold has not been well-defined. Nomiyama and Nomiyama (1977) reported severe drowsiness in human subjects after 1 to 4 hour exposures to $\leq$ 27 mg/kg TCE. Acute inhalation exposure to TCE causes irritation in the mucous membranes with associated conjunctivitis and rhinitis. Acute inhalation exposures may also cause headache, dizziness, and sleepiness, or rapid coma with eventual death from hepatic or renal failure. Chronic effects of inhalation exposure can include liver and kidney lesions, nerve degeneration, and psychic disturbances (HDSB, 1995).

Oral Toxicity. Unlike similar compounds, TCE does not appear to be overly hepatotoxic. Animal inhalation studies have been reported reversible liver enlargements following acute and subchronic exposures. Human studies on patients anesthetized with TCE demonstrated similar findings (Defalque, 1961). Ingestion produces a burning sensation in the mouth, along with nausea, vomiting, and abdominal pain (HDSB, 1995).

Oral administration of 1,000 mg/kg TCE to rats over a 10-day period failed to show any cytotoxic effects to the liver (Goldsworthy and Popp, 1987). Buben and O'Flaherty (1985) illustrated that intermediate periods of exposure to TCE had a dose-related enlargement of livers in animals exposed to 100 mg/kg or higher.

Carcinogenicity. The carcinogenic classification of TCE has been subject to great debate. The IARC has determined that the data for TCE is inadequate for classification as a Group 3 human carcinogen. The EPA had rated TCE as a Group B2 possible human carcinogen. This ranking was based upon an EPA study and possible childhood leukemia linked with

groundwater contamination in Woburn, Massachusetts. This classification is currently under review by the EPA (1996a).

The inhalation CPF of 0.0170 $(mg/kg\text{-}day)^{-1}$ used in this risk assessment was taken from HEAST (EPA, 1991).

XYLENES

Xylenes are a class of similar chemicals which form a clear liquid with a strong, sweet odor. They are used as solvents, in making drugs, dyes, insecticides, lacquers and enamels, and in gasoline for airplanes. Xylenes also occur naturally in petroleum and coal tar and is formed during forest fires.

Physical-Chemical Properties

Xylenes are a very volatile class of compounds and would be expected to partition to the atmosphere from surface soil and surface water. When spilled on land, xylenes volatilizes or leaches into the ground (ATSDR, 1994).

Mammalian Toxicology

Pharmacokinetics. Studies in humans and animals have shown that xylenes are well absorbed by the inhalation and oral routes. Approximately 60% of inspired xylene is retained and approximately 90% of ingested xylene is absorbed. Absorption of xylene also occurs by the dermal route, but to a much lesser extent than by the inhalation or oral routes. Following absorption, xylene is rapidly distributed throughout the body by way of the systemic circulation. In the blood, xylene is primarily bound to serum proteins and accumulates primarily in adipose tissue (ATSDR, 1994).

Systemic Toxicity. Short-term exposure of humans to high levels of xylene can cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; impaired function of the lungs; delayed response to a visual stimulus; impaired memory; and possible changes in the liver and kidney. Both short- and long-term exposure to high concentrations of xylene can also cause a number of effects on the nervous system, such as headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Humans exposed to very high levels of xylene for a short period of time have died. Most of the information on long-term exposure to xylene is from studies of workers employed in industries that make or use xylene. Those workers were exposed to levels of xylene in

air far greater than the levels normally encountered by the general population (ATSDR, 1994).

Results of studies with animals indicate that large amounts of xylene can cause changes in the liver and harmful effects on the kidneys, lungs, heart, and nervous system. Short-term exposure to very high concentrations of xylene causes death in some animals, as well as muscular spasms, incoordination, hearing loss, changes in behavior, changes in organ weights, and changes in enzyme activity. Long-term exposure to low concentrations of xylene has not been well-studied in animals (ATSDR, 1994).

Carcinogenicity. Information from animal studies is not adequate to determine whether xylene causes cancer in humans. Neither IARC nor EPA have found adequate information to determine that xylene is carcinogenic. Currently, EPA classifies xylene as a Group D agent (EPA, 1996a). This classification applies to those chemical agents for which there is inadequate evidence of carcinogenicity in animals.

The inhalation RfD of 0.2000 mg/kg-day used in this risk assessment was taken from HEAST (EPA, 1995).

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ATTACHMENT 1
FACILITY CLOSURE REPORT
GRAND AUTO SUPPLY
4240 EAST 14TH STREET
OAKLAND, CALIFORNIA
HART CROWSER, INC.
FEBRUARY 16, 1996

FACILITY CLOSURE REPORT

Grand Auto Supply
4240 East 14th Street
Oakland, California

J-6077

February 16, 1996

HARTCROWSER

FACILITY CLOSURE REPORT

Grand Auto Supply
4240 East 14th Street
Oakland, California

February 16, 1996

J-6077

Submitted to:

PACCAR Automotive, Inc.
1400 N. 4th Street
Renton, WA 98055

Submitted by:

Hart Crowser, Inc.
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San Francisco, California 94111

Jay A. Ach, R.G.
Senior Project Hydrogeologist

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

On behalf of PACCAR Automotive, Inc. (PACCAR), Hart Crowser, Inc., has prepared this facility closure report for the Grand Auto store at 4240 East 14th Street in Oakland, California (the site). This report has been prepared to meet the closure requirements of the Alameda County Health Care Services Agency (ACHCSA) and the California Regional Water Quality Control Board - San Francisco Region (RWQCB). This facility closure request is based on the following:

- The known potential onsite sources of petroleum hydrocarbons (underground storage tanks (USTs), UST-associated piping, and car wash sump) have been removed, along with the bulk of the sump-related soil that contained petroleum hydrocarbons;

- Petroleum hydrocarbons have not been detected in site groundwater for five quarters of groundwater monitoring;

- The available chemical data suggest that the former car wash sump was not a likely source of halogenated volatile organic compounds (VOCs) to groundwater;

- No other potential sources of halogenated VOCs related to Grand Auto operations are known or suspected at the site. We therefore conclude that the halogenated VOCs present in site groundwater are due to a source unrelated to Grand Auto operations;

- Numerous potential offsite sources of halogenated VOCs exist in the immediate vicinity of the site. We have not identified any documents indicating that environmental investigations pertaining to halogenated VOCs have been conducted at these potential offsite sources.

This report includes sections that discuss the history of the site, the local hydrogeology, the soil and groundwater investigations completed to date, the removal actions completed onsite, and the nature and extent of chemicals present in soil and groundwater. The

potential for offsite sources of the chemicals remaining in site groundwater is discussed. Additionally, this report provides our rationale for requesting facility closure at this time.

2.0 SITE DESCRIPTION

The Grand Auto retail facility is located on an approximately 1.2 acre site (Figure 1). The site currently is used as an auto service and retail merchandise facility. Previously, the site also was used for retail gasoline sales, and had underground fuel storage tanks and a car wash with an associated drainage sump. The underground fuel tanks were removed in 1986. The car wash drainage sump was removed in August 1992. During October 1993, the remaining fuel conveyance piping associated with the former underground fuel storage tanks was excavated and removed from the site.

When environmental activities were initiated at the site, the former Super Tire store at 4256 East 14th Street was included as part of the Grand Auto site. Subsequently, the former Super Tire store was considered by both PACCAR and ACHCSA as a separate site. In it's letter to PACCAR dated December 27, 1993, ACHCSA indicated that no further action was required for soil-related issues at the former Super Tire store.

3.0 HISTORICAL SITE USE

The earliest available recorded use of the property is as a dance hall in 1903. Site use between 1903 and 1946 is unknown. Around 1946, an L-shaped building was constructed on the site. This building was used as office space and for auto repair, auto body repair, and auto painting shops. The date of demolition of this building is not known.

In 1960 or 1961, the present building was constructed for use as a Safeway grocery store. Grand Auto leased the building from the property owner in 1971 and, in 1972, installed pump islands and three 10,000-gallon underground storage tanks for retail gasoline sales. The tanks were subsequently removed in 1986 and the remaining

associated conveyance piping was removed in 1993. Grand Auto also operated a car wash at the site from approximately 1972 to 1986. The drainage sump associated with the car wash was removed in August 1992.

4.0 HISTORICAL USE OF THE SURROUNDING AREA

In addition to residential housing, numerous commercial operations have existed in the areas immediately adjacent to the site. Various adjacent or nearby parcels have been used as retail gasoline stations, auto repair shops, auto paint shops, auto transmission repair shops, auto dealerships, and retail dry cleaners. In many cases, these parcels have been used for these purposes since the late 1940's or early 1950's (Figure 2).

A detailed description of historical uses of adjacent properties was compiled by AllWest Environmental (August 10, 1995). The historical use sections of AllWest's document is included herein as Appendix A.

5.0 SITE INVESTIGATION AND REMEDIATION

5.1 *Work Chronology*

The underground fuel tanks at the site were removed in 1986. In July 1992, Hart Crowser performed a site investigation as outlined in "Sampling and Analysis Plan, Grand Auto/Super Tire Facilities," July 6, 1992. The investigation included drilling two borings (B-4 and B-5) in the assumed vicinity of the former location of the underground fuel storage tanks (Figure 3). Analyses of soil samples from these borings did not indicate significant petroleum hydrocarbon concentrations (Table 1).

The car wash drainage sump and surrounding soil were removed on August 7, 1992 (Figure 3). Hart Crowser collected a soil sample (S2C) from beneath the sump at the bottom of the excavation, 8.5 feet below ground surface (ft BGS). Analyses of the sample indicated the presence of petroleum hydrocarbons and low concentrations of

tetrachloroethylene (PCE) in the soil beneath the sump (Table 1). A groundwater monitoring well (MW-1) was installed within ten feet southwest of the sump, approximately the downgradient direction. Despite some slightly wet conditions encountered at 8 ft BGS, free groundwater was not encountered until approximately 36 ft BGS. The shallow, wet zone may indicate a discontinuous perched zone of groundwater at the site at approximately 8 ft BGS. The results of this phase of the investigation were summarized in the "Preliminary Site Investigation Report" (Hart Crowser, November 20, 1992).

During April 1993, Hart Crowser drilled five soil borings (B-8 to B-12) and converted three of them to groundwater monitoring wells (MW-2, MW-3, MW-4; see Figure 3 and Table 2). We also installed an off-site groundwater monitoring well (HC-1) at the adjacent Super Tire facility. Two of the soil borings, B-8 and B-9, were completed in the area of the former car wash sump. Soil samples from B-8 and B-9 indicated that the TPH and PCE detected immediately below the sump in sample S2C were neither laterally nor vertically widespread.

The wells were developed and sampled in April 1993. The results of this phase of the assessment were summarized in a report, "Supplemental Site Investigation," June 18, 1993.

During October 1993, fuel conveyance piping associated with the former underground fuel storage tanks was excavated and removed from the site. Verification soil samples were taken from the base of the excavation at the four locations shown on Figure 3. Each sample was analyzed for total petroleum hydrocarbons as gasoline (TPH-G) and benzene, toluene, ethylbenzene, and xylenes (BTEX). TPH-G and BTEX were not detected in any of the samples analyzed (Table 1). This work was described in our "Quarterly Status Report," dated January 14, 1994.

5.2 *Local and Regional Hydrogeology*

The site is located on the alluvial plain on the east side of San Francisco Bay (the Bay). As is typical for the Bay margin, the area around the site is underlain by Quaternary alluvial deposits, consisting of unconsolidated clay, silt, sand, and gravel. Bedrock

underlying the alluvium in the area consists primarily of the Mesozoic-age Franciscan Formation; depth to bedrock in the area of the site is unknown.

Several soil borings were completed to depths of up to 46 ft BGS at the site and the adjacent former Super Tire site. The borings indicate that the site is underlain by an irregularly layered sequence of silty to gravelly sand lenses separated by clayey silt. As much as 20 feet of imported fill material may exist in some areas of the site.

Unconfined groundwater was generally encountered at depths of approximately 35 ft BGS. However, in well MW-1, wet soil at 8 ft BGS indicated a possible discontinuous zone of perched groundwater. The extent of such a perched zone cannot be assessed with the available data; however no potential perched zones of groundwater were noted in other borings at the site. The available groundwater elevation data indicates that the groundwater gradient is nearly flat at the site (Table 2; Figure 4). It can be assumed from regional geology and hydrogeology that groundwater flow in the area is generally westerly, toward San Francisco Bay. Groundwater elevations in well MW-2, on the east side of the site, have consistently been slightly higher than other wells, which also indicates a general westerly groundwater flow.

5.3 *Potential Beneficial Uses of Groundwater*

The site is located in an area where groundwater in deep, regional aquifers is considered to have beneficial uses (SF Basin Plan). The Alameda County Department of Public Works indicated the presence of industrial and irrigation supply wells within one mile of the site. In general, these wells are completed to depths of several hundred feet.

Shallow groundwater in the area is separated from the deep, regional aquifers by significant thicknesses of silt and clay, which act as regional aquitards (Alameda County, 1988). There are no known or documented uses of shallow groundwater in the vicinity of the site.

5.4 *Nature and Extent of Chemicals of Concern*

5.4.1 Types of Chemicals

Physical and chemical properties of gasoline, and of its component chemicals of primary toxicological concern (benzene, toluene, ethylbenzene, and xylenes) are presented in Table 3. Gasoline components are less dense than water and would be expected to form a floating layer on the water surface if present in high enough concentrations. BTEX compounds are highly volatile, relatively insoluble in water, and can migrate readily from water into soil air spaces and thence into the atmosphere. These compounds have low to moderate adsorption to soil. Of the fuel-related compounds, benzene is the primary health concern because it is a known human carcinogen.

Physical and chemical properties of the halogenated VOCs detected in site groundwater are presented in Table 4. The only halogenated VOC detected in site soil samples was tetrachloroethylene (PCE).

5.4.2 Extent of Chemicals in Soil

No petroleum hydrocarbons were detected in soil samples from borings B4 or B5, located in the vicinity of the former UST excavation (Figure 3). No petroleum hydrocarbons were detected in soil samples from the piping excavation. Low concentrations of TPH-G and BTEX were detected in site soil during the excavation and removal of the car wash sump. Overexcavation of the sump was completed to the extent practicable, and the overexcavation successfully removed the bulk of the visibly stained soil. The highest concentration of TPH-G detected in soil in place is 310 micrograms per kilogram (μg/kg) from beneath the car wash sump, at a depth of 8 ft BGS (sample S2C; Table 1). No further excavation was performed in this area due to the proximity to the existing building.

PCE was detected in the soil sample collected from beneath the car wash sump at 8 ft BGS (104 μg/kg PCE in sample S2C-8; Table 1). Soil samples from the two subsequent soil borings completed in the area (B8 and B9) indicated a limited lateral and vertical extent of the PCE detected in S2C-8. Samples from 10 to 11 ft BGS indicated

concentrations of PCE at or below detection limits (5 μg/kg). Samples from 16 and 21 ft BGS did not indicated the presence of detectable concentrations of PCE. Sample B8-25 indicated 30 μg/kg of PCE. These data suggest that the volume of soil containing PCE is small and that PCE concentrations within the soil are low. Additionally, given that (1) sample B8-25 is from near the water table and (2) that approximately 15 ft of clean soil separates this depth from the base of the sump excavation, it is reasonable to assume that the low concentration of PCE detected at 25 ft BGS is due to either direct contact with, or vapor migration from the PCE in groundwater immediately below.

PCE was also detected in low concentrations in soil samples from near the water table in wells MW-3 and MW-4 (9 and 12 μg/kg, respectively). These low concentrations also are likely to reflect the PCE present in site groundwater. No other halogenated VOCs have been detected in site soil.

Note that the PCE concentrations in soil are lower than the PCE concentrations recorded for groundwater samples from the adjacent well MW-1 (as much as 340 micrograms per liter (μg/L); Table 5). This suggests that the soil in the sump area did not act as a source of PCE to the groundwater (see Section 6.1 below). PCE tends to bind preferentially to organic material in soil, rather than to dissolve in groundwater, as indicated by a positive log K_{oc} (Table 4 and detailed discussion in Appendix B). This tendency indicates that for soil to act as a source of PCE to groundwater, the soil must have a higher concentration of PCE than the groundwater it is in contact with. Because site data indicate that soil concentrations are lower than groundwater concentrations, it is unlikely that the site soil is a source of PCE to groundwater.

Several soil samples collected during various phases of the site investigations were analyzed for the metals cadmium (Cd), chromium (Cr), nickel (Ni), lead (Pb), and zinc (Zn). With the exception of cadmium, low concentrations of the metals were detected (Table 1). However, these metals all occur naturally in soil in background concentrations. The concentrations detected fall within or near typical background concentrations (Table 6). Preliminary Remediation Goals

(PRGs) are screening-level, risk-based concentrations of chemicals published by the US EPA to be used in evaluation of human health risks at a given site (Table 7). The concentrations of PCE and metals detected in site soil samples are below their respective PRGs.

5.4.3 Extent in Groundwater

Groundwater monitoring at the site began in 1992. The groundwater monitoring program at the site included analyzing groundwater samples for TPH-G, BTEX, metals, and halogenated VOCs (Table 5). TPH-G and BTEX were not analyzed for in groundwater during any 1995 sampling event because five previous quarters of sampling indicated that petroleum hydrocarbons were not present in groundwater at the site. The five metals (Cd, Cr, Ni, Pb, Zn) were also dropped from the list of analytes in 1995, because five previous rounds of sampling indicated that the metals were not present in the groundwater.

Halogenated VOCs consistently have been detected in site groundwater samples (Table 5). For halogenated VOCs having recorded onsite concentrations that exceed their respective MCLs, historical concentration ranges are as follows:

Chemical	Range of Concentrations (μg/L)
PCE	3 to 340
TCE	13 to 130
cis-1,2-DCE	ND (<0.5) to 36
VC	ND (<0.5) to 0.9

(ND = below detection limit listed)

PCE has been detected in all five monitoring wells, with the highest concentrations typically found in MW-1. Trichloroethylene (TCE) and cis-1,2-dichloroethylene (cis-1,2-DCE) have been detected in all five monitoring wells. The highest concentrations of TCE and cis-1,2-DCE typically have been reported in the samples from MW-2. MW-2 is located at the assumed upgradient boundary of the site. Vinyl chloride (VC) was detected at the site for the first time during the September 1995 sampling round. Duplicate analyses of groundwater samples from MW-2 indicated VC concentrations of 0.8 μg/L and 0.9 μg/L, values close to the detection limit of 0.5 μg/L.

The distribution of halogenated VOCs within site groundwater indicates that halogenated VOCs in groundwater are not restricted to the site boundaries (Figure 5). Furthermore, with the exception of PCE, the maximum concentrations of VOCs in site groundwater have been detected in well MW-2, at the upgradient site boundary. An offsite, upgradient source is likely for these chemicals.

5.5 *Effectiveness of Removal Actions*

The USTs at the site were removed in 1986 and the remaining associated conveyance piping was removed in 1993. Soil samples collected at the conclusion of the piping removal action and from borings in the assumed vicinity of the former UST indicated that significant concentrations of TPH-G and BTEX did not remain in soil in the areas sampled.

The car wash sump was removed in 1992 and surrounding apparently stained soil was excavated to the maximum extent practicable without endangering the structural integrity of the building (Preliminary Site Investigation Report, Hart Crowser, November 20, 1992). A soil sample collected from the bottom of the excavation indicated low concentrations of PCE and petroleum hydrocarbons. The excavation was then backfilled and repaved.

6. 0 POTENTIAL SOURCES OF CHEMICALS PRESENT IN SOIL AND/OR GROUNDWATER

6.1 *Potential Onsite Sources of Chemicals*

All known potential sources of chemicals related to Grand Auto operations at the site (USTs and related piping; car wash sump) have been removed. The USTs and conveyance piping were potential sources of TPH-G and BTEX only. The available data indicates that the bulk of the chemicals in soil that may have been associated with these potential sources have been removed.

There is no evidence that the car wash drainage sump was used for disposal of fuels or solvents. Some discoloration of soil around the sump was noted when the sump was removed and, to the extent practicable, the discolored soil was removed. Analyses of soil from the bottom of the sump excavation indicated low concentrations of TPH-G and PCE. However, soil samples from borings B-8 and B-9, drilled directly adjacent to the sump, indicated that the TPH and PCE detected immediately below the sump were neither laterally nor vertically widespread.

While analyses of soil from beneath the sump indicated the presence of PCE, the maximum concentration in soil (104 μg/kg in sample S2C) was much less that the concentration of PCE in groundwater in adjacent well MW-1 (340 μg/L maximum). In a soil/water system, PCE is preferentially adsorbed to organic material in the soil (see discussion in Appendix B). The lower concentrations in soil than that in groundwater thereby indicates that the PCE in soil was unlikely to have served as a source of the PCE in groundwater. Therefore, it is unlikely that the car wash sump was a source to groundwater of PCE.

Other halogenated VOCs detected in site groundwater were not detected in any site soil sample or in the sample of material from the sump (Table 8). Conversely, chemicals detected in the sump sample or from the soil sample immediately beneath the sump were not detected in site groundwater. The overall difference in the "sump suite" of chemicals from the "groundwater suite" further suggests that the sump did not act as a source of chemicals to groundwater.

6.2 *Potential Offsite Sources of Chemicals*

As indicated in Section 5.4.3 above, the distribution of halogenated VOCs within site groundwater indicates that halogenated VOCs in groundwater are not restricted to the site boundaries and suggests that the occurrence of halogenated VOCs is due to an offsite source.

Potential offsite sources of halogenated VOCs include:

- Various current and past auto repair operations at various properties surrounding the site;

- The former gas station at 1455 High Street and its likely waste oil tank and auto repair operations; and

- The several generations of dry cleaners at 1460 High St. and the sewer lines servicing the dry cleaners.

Locations of these potential offsite sources are indicated on Figure 2. The potential sources are described in detail in Appendix A. A record search did not locate any environmental records pertaining to these potential offsite sources.

Environmental work has been completed at 4256 East 14th St. (Former Super Tire site), and no further action for soil at the site is required by ACHCSA. The former Super Tire site is therefore not considered a potential offsite source.

6.3 *Conclusions Regarding Potential Sources*

The above discussions of potential onsite and offsite sources of chemicals to the groundwater indicates that:

- Potential onsite sources related to Grand Auto operations (USTs, pump islands, associated piping, and car wash sump) have been investigated and/or successfully remediated, thus are no longer considered to be sources;

- Investigations of these potential onsite sources did not indicate evidence of a source of halogenated VOCs to the groundwater; and

- Several potential offsite sources of halogenated VOCs exist. We have not discovered any documents that would indicate that environmental investigations have been conducted by the owners of any of the potential offsite sources.

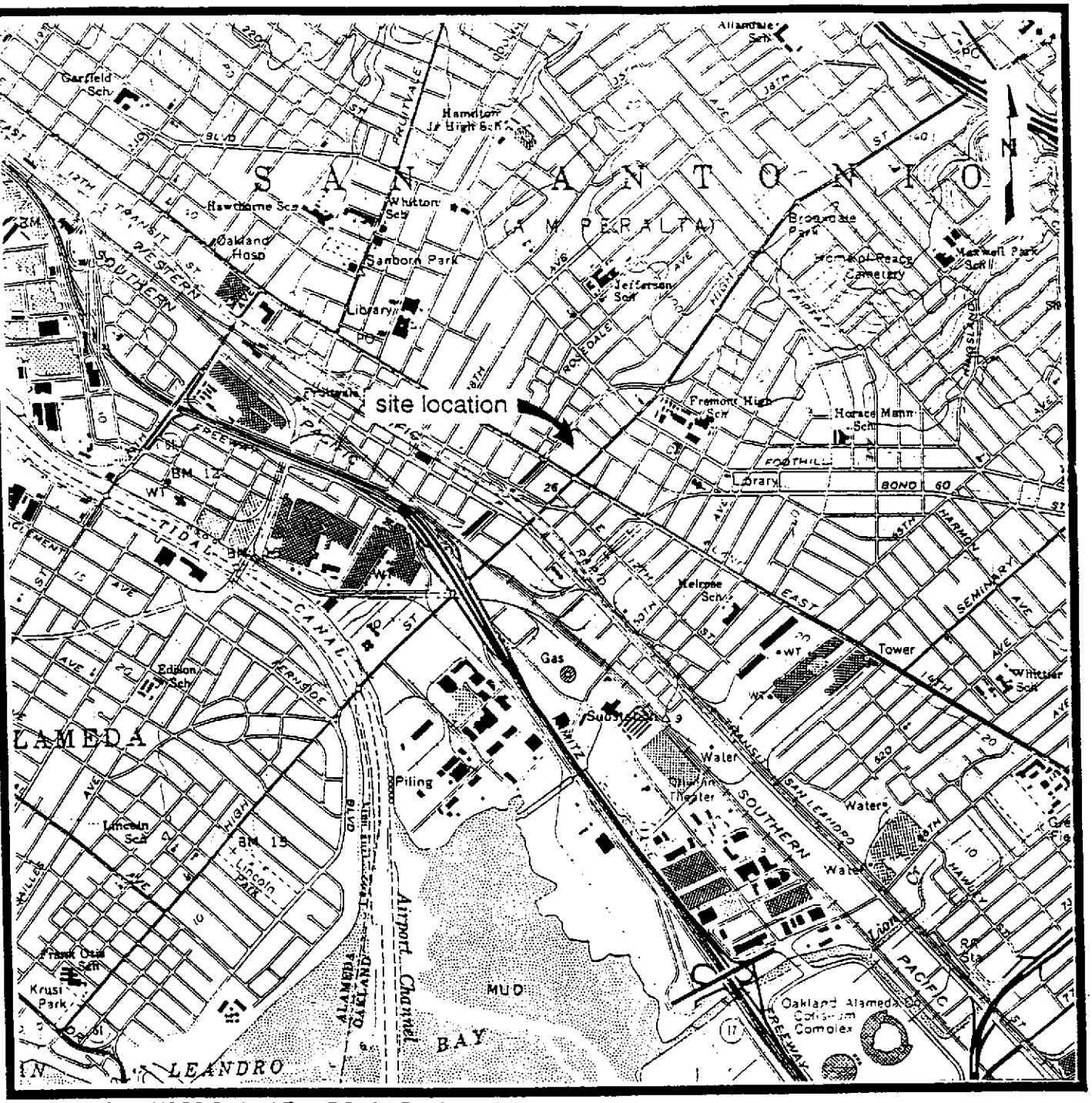
7.0 SUMMARY AND RECOMMENDATIONS

We recommend case closure for the site since the environmental issues associated with potential onsite sources of chemicals have been addressed. Halogenated VOCs remain in site groundwater, but these are 1) unrelated to the onsite sources that have been addressed; and 2) likely to be the result of releases at one or more of the numerous offsite potential sources located in the immediate vicinity of the site. We recommend abandonment of the remaining groundwater monitoring wells after the closure certification is approved by ACHCSA and RWQCB.

8.0 LIMITATIONS

Services performed by Hart Crowser have been provided in accordance with generally accepted professional practices for the nature and conditions of the work completed in the same or similar localities, at the time the work was performed. This report is not meant to represent a legal opinion. No other warranty, express or implied, is made. This report was prepared for the sole use of PACCAR Automotive, Inc.

FIGURES



Base Map From USGS Oakland East 7.5 min. Quad

LOCATION MAP
Grand Auto/Former Super Tire Site
Oakland, California

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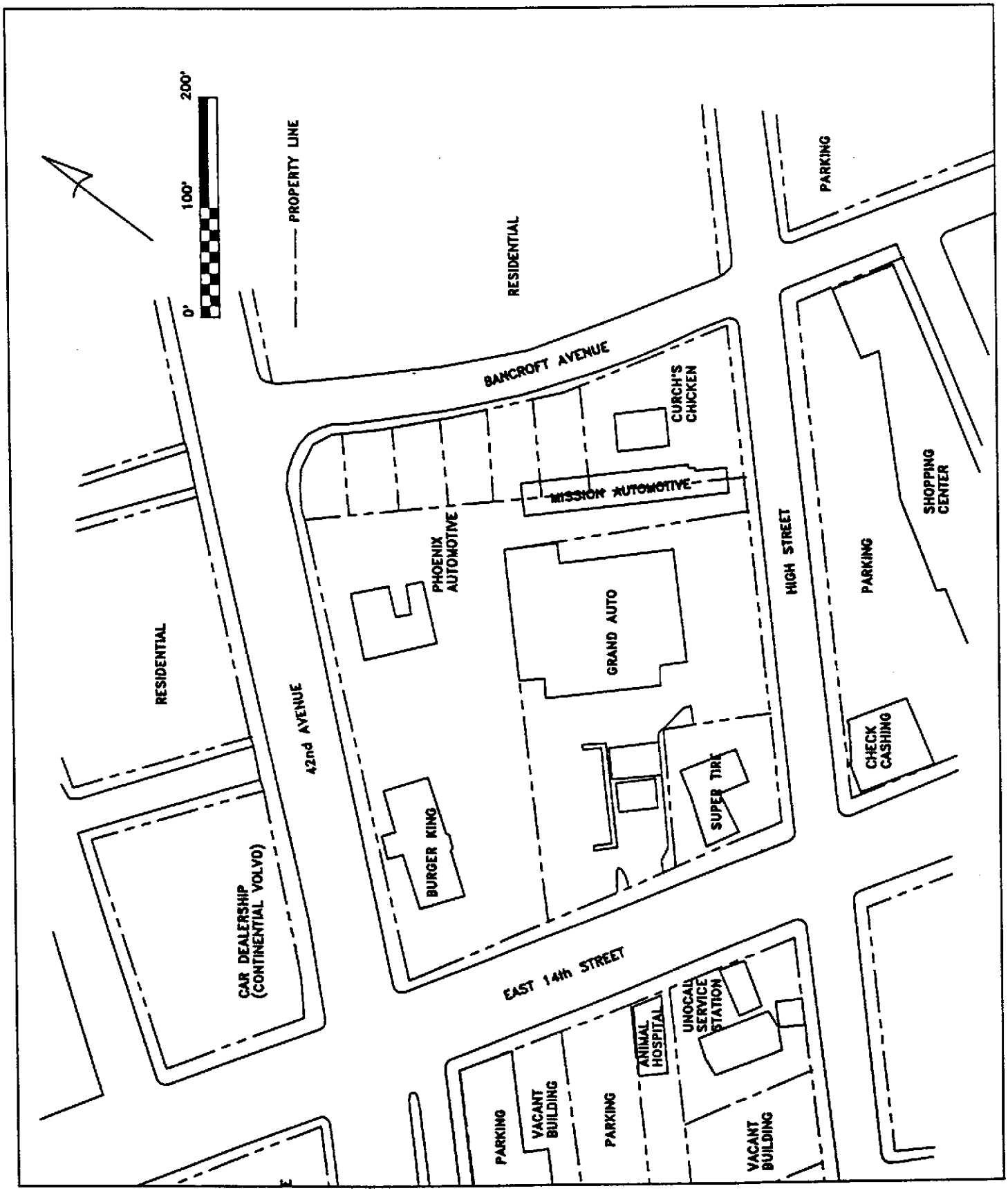
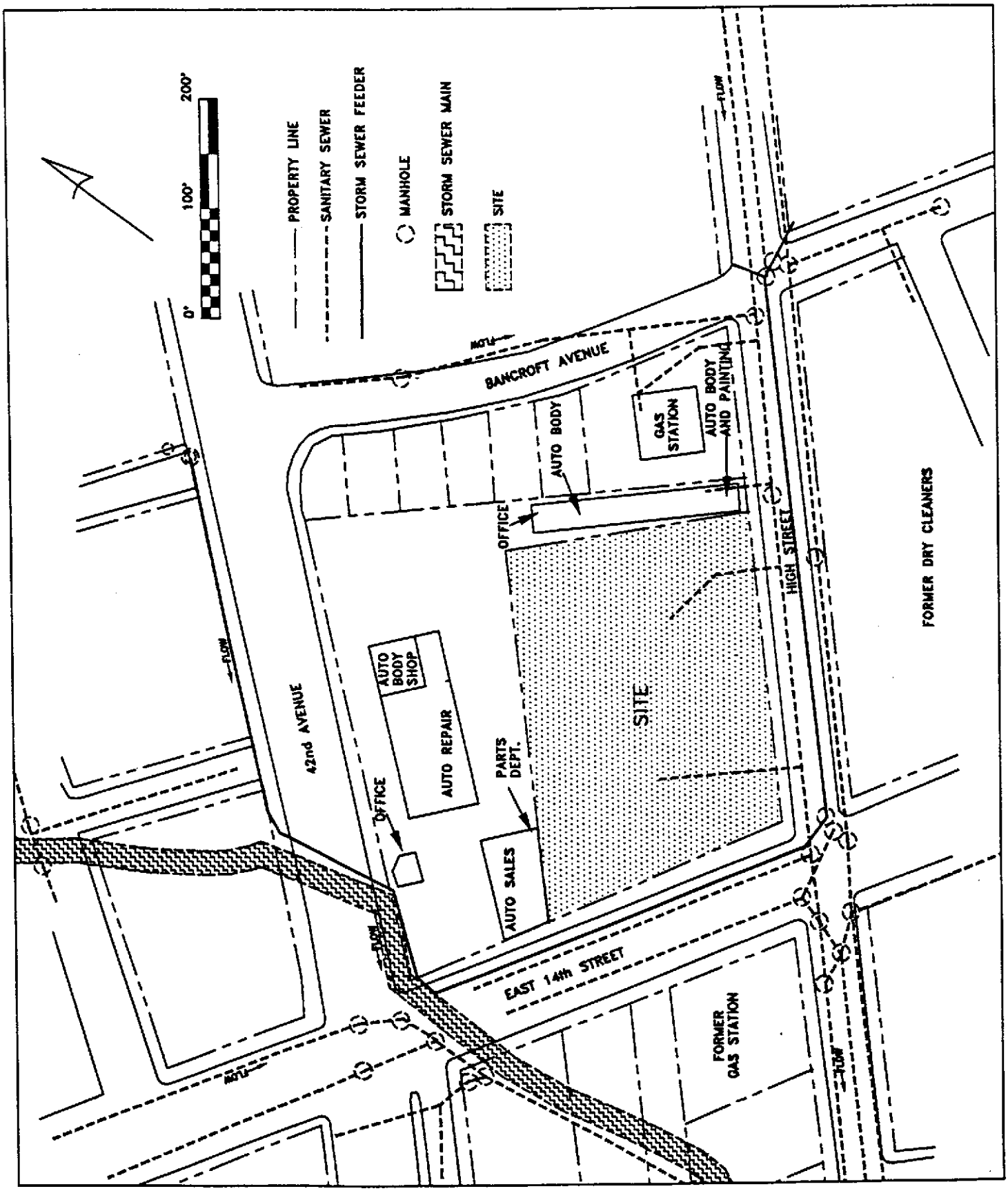
J-6077

Figure 1



Current Use of Adjacent Properties
Grand Auto Supply
4240 East 14th Street
Oakland, California

HARTCROWSER
J-6067 2/96
Figure 2a



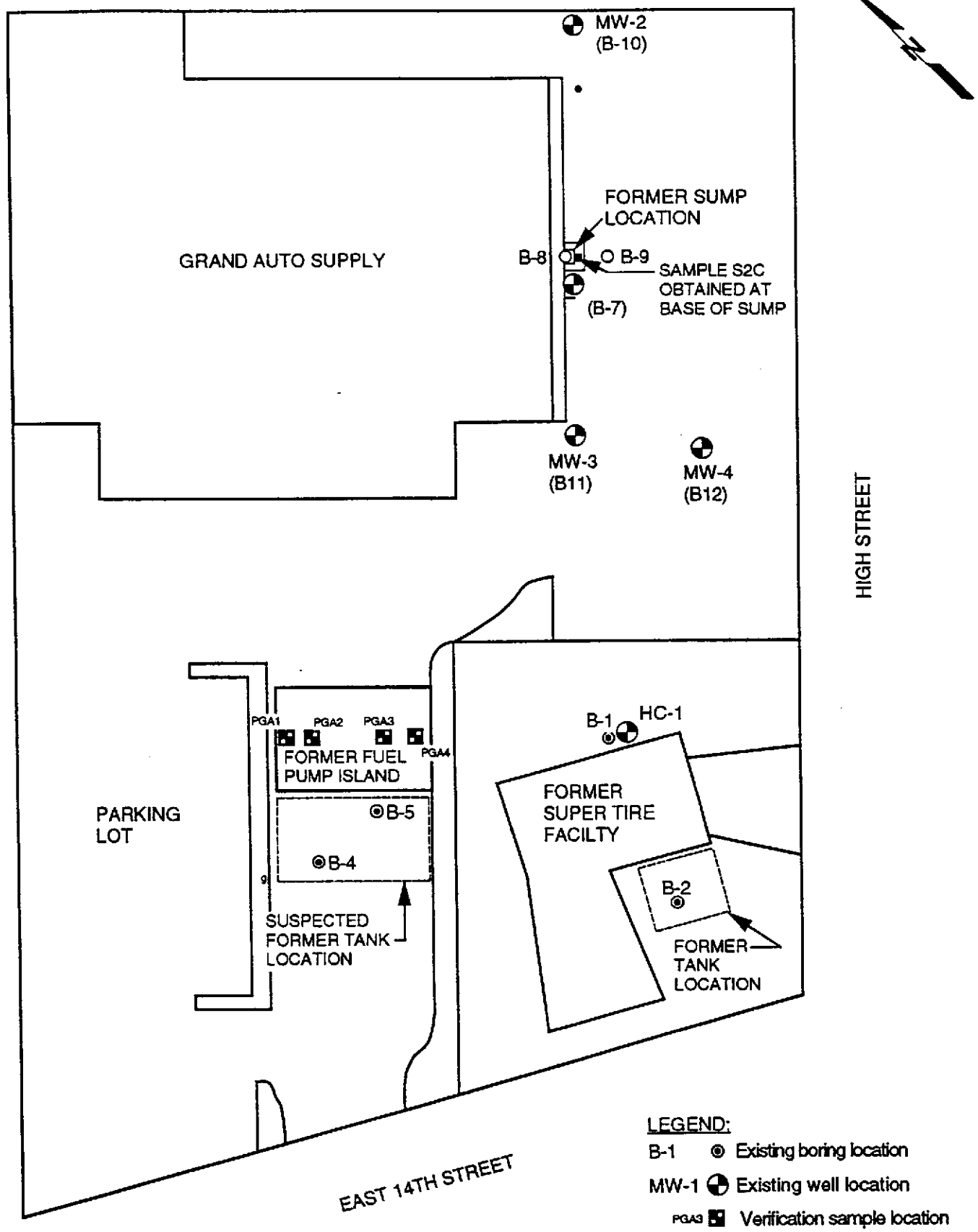
Current and Former Sewer Lines and Past Use of Adjacent Properties

Grand Auto Supply
4240 East 14th Street
Oakland, California

HARTCROWSER

J-6067 2/96
Figure 2b

MISSION AUTOMOTIVE



LEGEND:

B-1 ◉ Existing boring location

MW-1 ◔ Existing well location

PGA3 ■ Verification sample location

20 40 80

Scale, in Feet

SITE PLAN

Grand Auto Store
East 14th & High Streets
Oakland, California

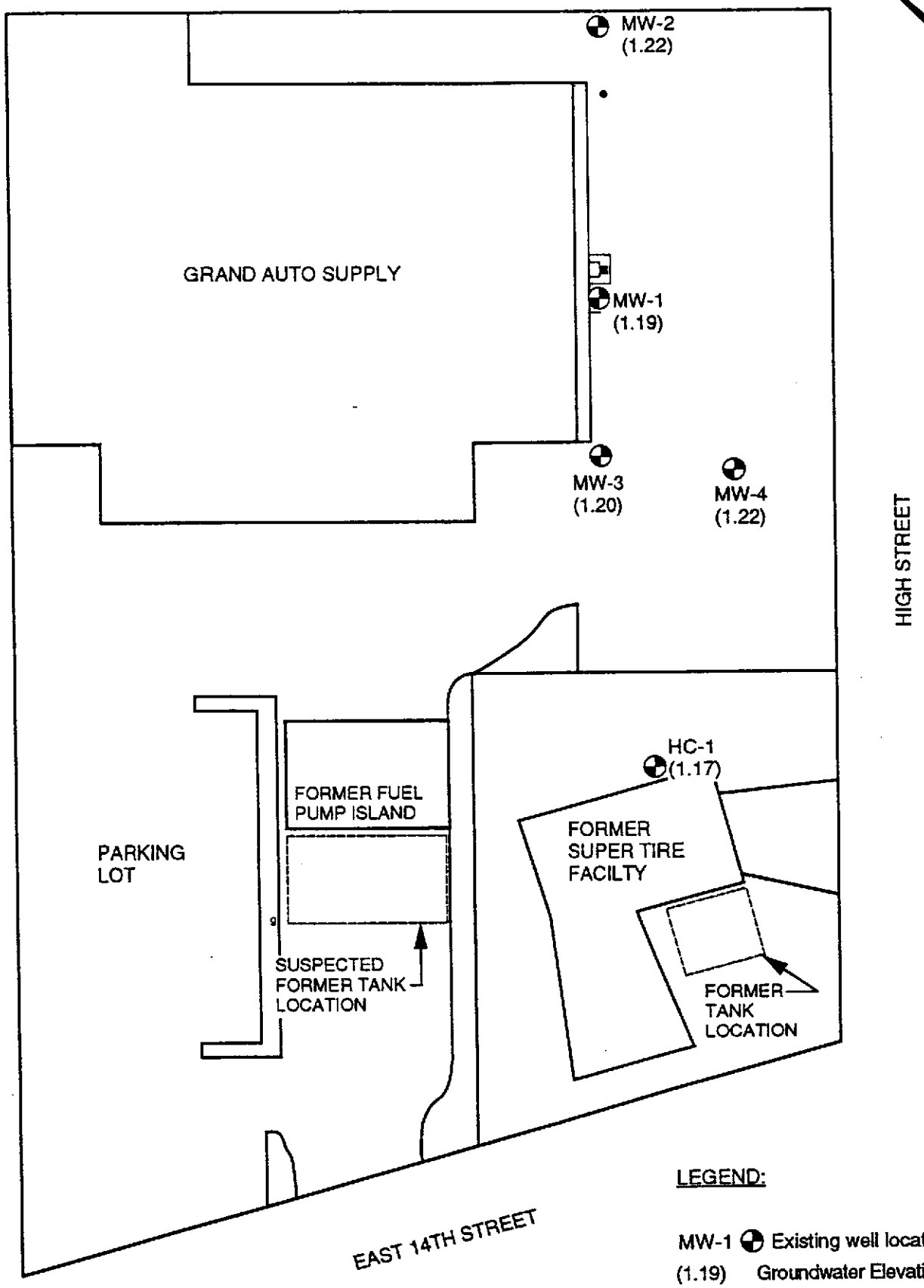
HARTCROWSER

J-6077 2/96

Figure 3

d/pacaz oakland site v.1

MISSION AUTOMOTIVE



LEGEND:

MW-1 Existing well location

(1.19) Groundwater Elevation, ft msl

20 40 80

Scale, in Feet

GROUNDWATER ELEVATIONS
September 15, 1995

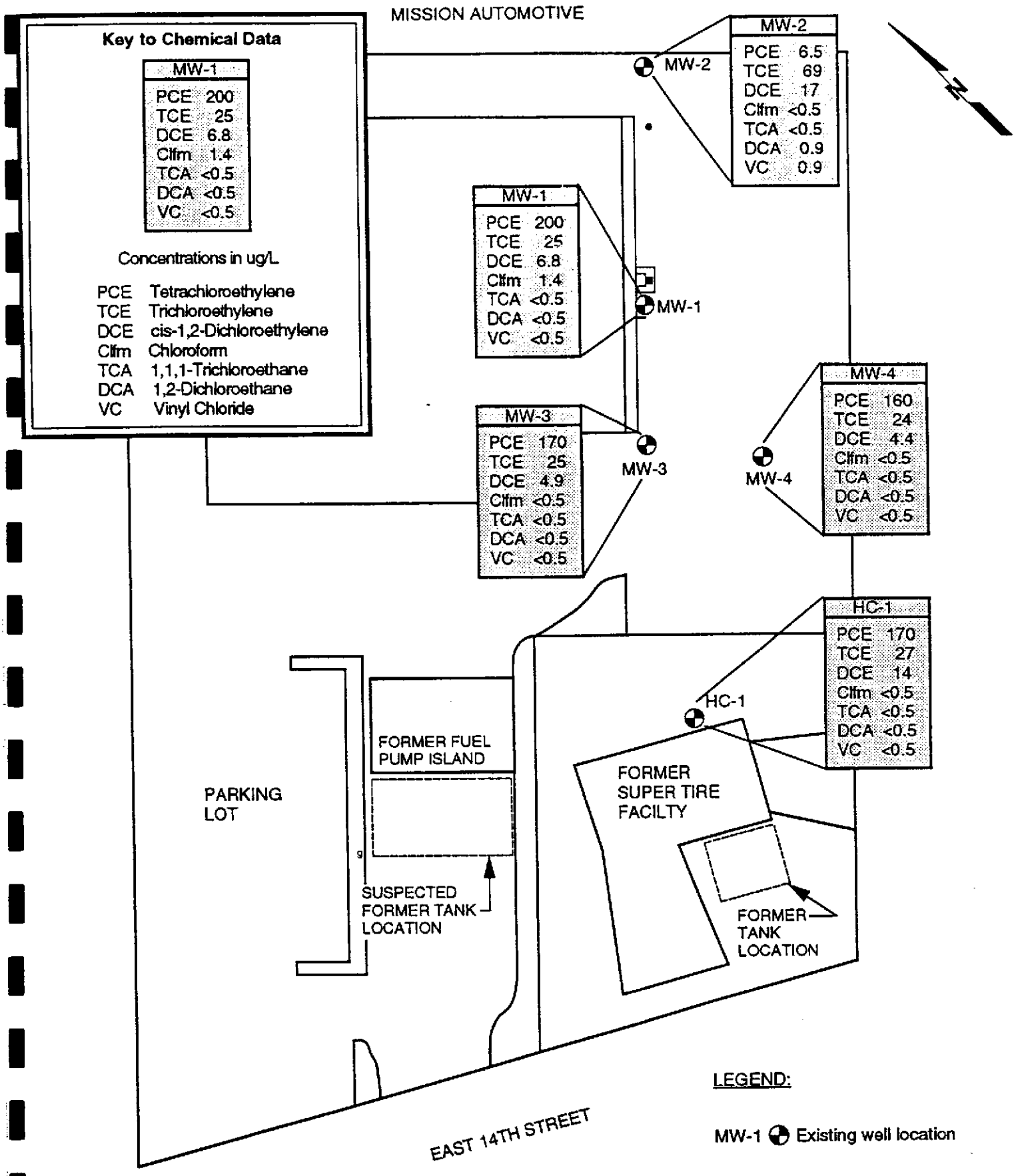
Grand Auto Store
East 14th & High Streets
Oakland, California

HARTCROWSER

J-6077 2/96

Figure 4

d/paccar oakland site v.1



VOCs IN GROUNDWATER
September 15, 1995

Grand Auto Store
East 14th & High Streets
Oakland, California

HARTCROWSER
J-6077 2/96
Figure 5

ed/pacor oakland site v.1

TABLES

TABLE 1
SUMMARY OF SOIL ANALYSES
GRAND AUTO STORE , OAKLAND, CALIFORNIA

BORING/WELL DATE	B4-21 7/16/92	B5-19 7/16/92	B5-26 7/16/92	S2C-8 8/7/92	MW2-10.5 4/14,15,16/93	MW2-35 4/14,15,16/93	MW3-35.5 4/14,15,16/93	MW4-36 4/14,15,16/93	B8-11 4/14,15,16/93
Oil & Grease	NT	NT	NT	ND<50	NT	NT	NT	NT	NT
TPH-Diesel	ND<10	ND<10	ND<10	120	ND<10	ND<10	ND<10	ND<10	ND<10
TPH-Gasoline	ND<1	ND<1	ND<1	310	ND<1	ND<1	ND<1	ND<1	ND<1
Organic Lead	ND<2	NT	ND<2	ND<2	NT	NT	NT	NT	NT
Benzene	ND<0.003	0.011	ND<0.003	ND<0.075	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003
Ethyl Benzene	ND<0.003	ND<0.003	ND<0.003	0.064	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003
Toluene	ND<0.003	ND<0.003	ND<0.003	0.065	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003
Xylenes	ND<0.003	0.003	ND<0.003	1.5	ND<0.009	ND<0.009	ND<0.009	ND<0.009	ND<0.009
PCE	NT	NT	NT	0.104	ND<0.005	ND<0.005	0.009	0.012	0.005
Other Chlorinated VOCs	NT	NT	NT	ND	ND	ND	ND	ND	ND
Cadmium	NT	NT	NT	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1
Chromium	NT	NT	NT	73	28	31	29	35	58
Lead	NT	NT	NT	9	5	ND	ND	ND	9
Nickel	NT	NT	NT	110	61	47	42	59	150
Zinc	NT	NT	NT	30	39	49	47	34	61

Notes:
ND denotes chemical not dected in sample at a concentration of x.
NT denotes analysis not performed on sample.
Concentrations listed are in milligrams per kilogram (mg/kg).

TABLE 1
SUMMARY OF SOIL ANALYSES
GRAND AUTO STORE , OAKLAND, CALIFORNIA

BORING/WELL DATE	B8-16 4/14,15,16/93	B8-21 4/14,15,16/93	B8-25 4/14,15,16/93	B9-10 4/14,15,16/93	P1-2.5 10/20/93	P2-2.5 10/20/93	P3-2.5 10/20/93	P4-2.5 10/20/93
Oil & Grease	NT	NT	NT	NT	NT	NT	NT	NT
TPH-Diesel	ND<10	ND<10	ND<10	ND<10	NT	NT	NT	NT
TPH-Gasoline	ND<1	ND<1	ND<1	ND<1	ND<1.0	ND<1.0	ND<1.0	ND<1.0
Organic Lead	NT	NT	NT	NT	NT	NT	NT	NT
Benzene	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003
Ethyl Benzene	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003
Toluene	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003	ND<0.003
Xylenes	ND<0.009	ND<0.009	ND<0.009	ND<0.009	ND<0.009	ND<0.009	ND<0.009	ND<0.009
PCE	ND<0.005	ND<0.005	0.030	ND<0.005	NT	NT	NT	NT
Other Chlorinated VOCs	ND	ND	ND<0.005	ND<0.005	NT	NT	NT	NT
Cadmium	ND<1	ND<1	ND<1	ND<1	NT	NT	NT	NT
Chromium	29	29	28	27	NT	NT	NT	NT
Lead	ND	ND	6	6	NT	NT	NT	NT
Nickel	53	43	41	72	NT	NT	NT	NT
Zinc	45	37	48	40	NT	NT	NT	NT

Notes:
ND denotes chemical not dected in sample at a concentration of x.
NT denotes analysis not performed on sample.
Concentrations listed are in milligrams per kilogram (mg/kg).

TABLE 2
MONITORING WELL DATA
September 15, 1995
Grand Auto Supply
Oakland, California

WELL	TOTAL DEPTH (feet BGS)	SCREENED INTERVAL (feet BGS)	SURFACE ELEVATION (feet above msl)	TOP OF CASING ELEVATION (feet above msl)	DEPTH TO GROUNDWATER (feet BGS)	GROUNDWATER ELEVATION (feet above msl)
MW-1	43	33-43	30.8	30.53	29.34	1.19
MW-2	45	31-45	30.7	30.41	29.19	1.22
MW-3	45	30-45	30.7	30.31	29.11	1.2
MW-4	45	30-45	29.5	29.08	27.86	1.22
HC-1	42	30-42	28.7	28.33	27.16	1.17

Notes:
1. See Figure 1 for well locations.
2. BGS = below ground surface.
3. MSL = mean seal level

TABLE 3
PHYSICAL/CHEMICAL CHARACTERISTICS OF GASOLINE AND RELATED COMPOUNDS
GRAND AUTO STORE
4240 EAST 14TH STREET
OAKLAND, CALIFORNIA

Chemical	Molecular Weight	Boiling Point (°C @ 760 mm Hg)	Vapor Pressure (psia)	Henry's Law Constant (m^3atm/mol @ 25°C)	Solubility (mg/L @ 20°C)	Log of Octanol-Water Coefficient (log Kow)
Benzene	78.11	80.1	1.84 (25°C)	0.00555	1,780	2.13
Ethylbenzene	106.17	136	0.19 (25°C)	0.00644	152	3.15
Toluene	92.14	111	0.54 (25°C)	0.00592	515	2.69
Xylene [1]	106.16	140	0.097 (20°C)	0.00527	175	2.77
Gasoline	NA	60 to 199	7.4(21°C)	NA	100 to 200	NA

(1)Characteristics shown are for the ortho isomer.
NA - Information not located or not pertinent to chemical mixture.

TABLE 4
CHEMICAL PROPERTIES OF VOLATILE ORGANIC COMPOUNDS
GRAND AUTO STORE
4240 EAST 14TH STREET, OAKLAND, CALIFORNIA

Chemicals Detected at the Study Area	Specific Gravity (20* C)	Water Solubility (mg/l @ 20*C)	Vapor Pressure (mmHg @ 20*C)	Henry's Constant (atm-m3/mol)	Kow (Log 10)	Koc (Log 10)
CHLORINATED CHEMICALS						
Trichloroethene (TCE)	1.464	1100 [5]	58 [5]	0.0091 [1]	2.38 [7]	2.10
Tetrachloroethane (PCE)	1.623	150 [5]	14 [5]	0.023 [11]	2.52 [7]	2.56
1,1,1-Trichloroethane (1,1,1 -TCA)	1.339	4400 [3]	96 [5]	0.03 [1]	2.47 [7]	1.76
1,2-Dichlorethane (1,2-DCA)	1.235	8690 [11]	64 [11]	0.0011 [11]	1.48 [6]	0.71
cis-1,2-Dichloroethene (1,2-DCE)	1.260	800 [3]	200 [4]	0.0075 [1]	2.09 [9]	2.17
Vinyl Chloride (VC)	0.911	2763 [6]	2660 [6]	0.011 [6]	1.38 [6]	0.91
Chloroform	1.483	8,200	160	0.0038	1.95	1.64
Dichlorodifluoromethane (Freon 12)	1.183 [57]	280	4,250	0.1000	2.16	1.76

Notes:
Kow = Octanol/Water partition coefficient
Koc = Organic carbon/water partition coefficient

TABLE 5

HISTORICAL GROUNDWATER QUALITY DATA - HALOGENATED HYDROCARBONS
GRAND AUTO SUPPLY, OAKLAND

WELL	DATE	Freon 12 (µg/L)	cis-1,2-DCE (µg/L)	Chloroform (µg/L)	1,1,1-TCA (µg/L)	1,2-DCA (µg/L)	Vinyl Chloride	TCE (µg/L)	PCE (µg/L)
MW-1	9/10/92	NR	11	1.1	ND 0.5	ND 0.5	- -	26	310
GC/MS	1/19/93	NR	14	ND 3	ND 3	ND 1	- -	28	220
	4/26/93	37	8.7	1	ND 0.5	ND 0.5	ND 1	22	300
(d)	4/26/93	110	8.7	1.1	0.6	ND 0.5	ND 1	22	300
	8/4/93	NR	10	ND 5	ND 5	ND 5	ND 10	23	290
	11/17/93	NR	15	1.8	ND 0.5	ND 0.5	ND 1	28	230
	2/18/94	NR	12	1	ND 0.5	ND 0.5	ND 0.5	25	200
	6/7/94	NR	25	1.6	ND 0.5	ND 0.5	ND 0.5	28	200
(d)	6/7/94	NR	22	1.5	ND 0.5	ND 0.5	ND 0.5	35	340
	9/20/94	NR	19	ND 5	ND 5	ND 5	ND 5	37	270
(d)	9/20/94	NR	18	ND 5	ND 5	ND 5	ND 5	36	270
	1/31/95	NR	9.7	ND 1	ND 1	ND 1	ND 2	13	54
(d)	1/31/95	NR	9.3	ND 1	ND 1	ND 1	ND 2	13	54
	9/15/95	NR	6.8	1.4	ND 0.5	ND 0.5	ND 0.5	25	200
MW-2	4/26/93	31	8.5	0.9	0.6	0.6	ND 1	32	7.5
	8/4/93	NR	22	ND 1.2	ND 1.2	ND 1.2	ND 2.4	110	7.2
	11/17/93	NR	8.7	ND 0.5	ND 0.5	ND 0.5	ND 1	32	6.1
	2/18/94	NR	25	ND 0.5	ND 0.5	1.5	ND 0.5	75	4.8
	6/7/94	NR	31	ND 0.5	ND 0.5	1.8	ND 0.5	120	6.9
	9/20/94	NR	36	ND 5	ND 5	ND 5	ND 5	130	6
	1/31/95	NR	17	ND 1	ND 1	ND 1	ND 2	60	3
	9/15/95	NR	17	ND 0.5	ND 0.5	1.1	0.8	52	6.3
(d)	9/15/95	NR	17	ND 0.5	ND 0.5	0.9	0.9	69	6.5
MW-3	4/26/93	35	9.7	ND 0.5	0.8	ND 0.5	ND 1	21	79
	8/4/93	NR	ND 5	ND 5	ND 5	ND 5	ND 10	28	170
	11/17/93	NR	12	1.3	0.8	ND 0.5	ND 1	29	170
	2/18/94	NR	5	0.7	ND 0.5	ND 0.5	ND 0.5	19	85
	6/7/94	NR	8.3	0.6	0.6	ND 0.5	ND 0.5	34	160
	9/20/94	NR	11	ND 5	ND 5	ND 5	ND 5	37	240
	1/31/95	NR	6.2	ND 1	ND 1	ND 1	ND 5	34	160
	9/15/95	NR	4.9	ND 0.5	ND 0.5	ND 0.5	ND 0.5	25	170

TABLE 5 (cont.)

HISTORICAL GROUNDWATER QUALITY DATA - HALOGENATED HYDROCARBONS
GRAND AUTO SUPPLY, OAKLAND

WELL	DATE	Freon 12 (µg/L)	cis-1,2-DCE (µg/L)	Chloroform (µg/L)	1,1,1-TCA (µg/L)	1,2-DCA (µg/L)	Vinyl Chloride	TCE (µg/L)	PCE (µg/L)
MW-4	4/26/93	28	3.9	0.6	ND 0.5	ND 0.5	ND 1	17	78
	8/4/93	NR	ND 5	ND 5	ND 5	ND 5	ND 10	16	110
	11/17/93	NR	6.6	1	ND 0.5	ND 0.5	ND 1	20	87
	2/18/94	NR	6	1.9	0.7	ND 0.5	ND 0.5	31	120
	6/7/94	NR	7.1	0.9	0.9	ND 0.5	ND 0.5	28	140
	9/20/94	NR	5	ND 5	ND 5	ND 5	ND 5	32	220
	1/31/95	NR	4.7	ND 1	ND 1	ND 1	ND 5	20	140
	9/15/95	NR	4.4	ND 0.5	ND 0.5	ND 0.5	ND 0.5	24	160
HC-1	4/26/93	47	13	ND 0.5	ND 0.5	ND 0.5	ND 1	22	46
	8/4/93	NR	15	ND 0.5	ND 0.5	ND 0.5	ND 1	27	83
	11/17/93	NR	16	1.1	0.7	ND 0.5	ND 1	27	130
	2/18/94	NR	13	0.7	ND 0.5	ND 0.5	ND 0.5	30	140
(d)	2/18/94	NR	11	0.6	ND 0.5	ND 0.5	ND 0.5	22	150
	6/7/94	NR	22	1	ND 0.5	ND 0.5	ND 0.5	42	180
	9/20/94	NR	15	ND 5	ND 5	ND 5	ND 5	37	190
	1/31/95	NR	11	ND 1	ND 1	ND 1	ND 5	27	120
	9/15/95	NR	14	ND 0.5	ND 0.5	ND 0.5	ND 0.5	27	170

Notes: ND - Not detected at specified detection limit.
NR - Not reported.
GC/MS - Denotes that EPA Method 8240 was used, all other results for EPA Method 8010.
(d) - Denotes results are for a duplicate sample.

TABLE 6 RANGE OF TYPICAL BACKGROUND METAL CONCENTRATIONS				
METAL	**U.S. RANGE [1]**	**WESTERN U.S. MEAN [1]**	**SANTA CLARA COUNTY RANGE[2]**	**RANGE DETECTED ON-SITE**
Cadmium	<1-10	1.0	<DL-14	all <1
Chromium	3-1500	38	<DL-170	28-73
Lead	<7-700	18	<DL-54	5-9
Nickel	<3-700	16	6-145	40-150
Zinc	10-2000	51	7.8-120	30-61

Note: units in mg/kg

References:

1) Final Statement of Reasons (for the development of Title 22 of the California Administrative Code), Table X, "Concentrations of Toxic Elements In Soils-Natural Levels and Concentrations Levels".

2) Background Metal Concentrations in Soils in Northern Santa Clara County, California, CM Scott, December 1991.

Table 7
Preliminary Remediation Goals (PRGs) for Soil[1]

Halogenated VOCs	Site Maximum	Residential Soil	Industrial Soil
PCE	104 ug/kg	7,000 ug/kg	25,000 ug/kg
Metals			
Cadmium	<1 mg/kg	38 mg/kg	850 mg/kg
Total Chromium	73 mg/kg	210 mg/kg	450 mg/kg
Chromium VI	NA	30 mg/kg	64 mg/kg
Nickel	150 mg/kg	1,500 mg/kg	34,000 mg/kg
Lead	9 mg/kg	130 mg/kg [(2)]	1,000 mg/kg
Zinc	61 mg/kg	23,000 mg/kg	100,000 mg/kg

NOTES

[1] from Smucker, S.J., 9/1/95, US EPA Region IX Prelinimary Remediation Goals
[2] Cal-modified PRG
NA - Not Analyzed For

TABLE 8
COMPARISON OF CHEMICAL CONCENTRATIONS
GRAND AUTO STORE
4240 EAST 14TH STREET
OAKLAND, CALIFORNIA

Chemical/Element	Concentrations		
	Sump Sample (mg/kg)	Soil Sample S2C-8 (mg/kg)	Maximum Historical Concentrations in Site Groundwater (mg/L)
Sump Suite [a]:			
Acetone	2.1	ND	ND
Ethylbenzene	0.33	0.064	ND
Dichlorobenzene	0.8	ND	ND
Lead	2800	9	ND
Arsenic	5	ND	ND
Barium	240	ND	ND
Cadmium	12	ND	ND
Copper	210	ND	ND
Mercury	0.41	ND	ND
Antimony	7	ND	ND
Vanadium	26	ND	ND
Groundwater Suite [b]:			
Benzene	ND	ND	0.0008
Freon	ND	ND	0.047
cis 1,2-DCE	ND	ND	0.036
chloroform	ND	ND	0.0019
1,1,1-TCA	ND	ND	0.0009
1,2-DCA	ND	ND	0.0018
Vinyl Chloride	ND	ND	0.0009
TCE	ND	ND	0.130
Others:			
Oil & Grease (TPH)	10,000	310	0.17
Xylene	2.5	1.5	0.001
PCE	ND	0.104	0.34
Toluene	4.6	0.065	0.0011
Chromium	68	73	0.17
Zinc	1300	61	0.21
Nickel	110	150	0.2

Notes:
[a] = In sump or soil but not in groundwater
[b] = In groundwater but not in sump or soil

APPENDIX A
AllWest Phase I Report

AllWest

AllWest Environmental, Inc.

Specialists in Environmental Due Diligence and Remedial Services

One Sutter Street, Suite 600
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Tel 415.391.2510
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ENVIRONMENTAL SITE ASSESSMENT

Grand Auto Store No. 43
4240 East 14th Street
Oakland, California 94601

PREPARED FOR:

Mr. Raymond Elliott, CHMM
PACCAR Automotive
1400 North Fourth Street
Renton, Washington 98055

ALLWEST PROJECT NO. 95181.21
August 10, 1995

REGISTERED ENVIRONMENTAL ASSESSOR
MARVIN H. SNAPP
No. 05525
Expires: 6/30/96
STATE OF CALIFORNIA

PREPARED BY:

Marvin H. Snapp, REA
Certified Asbestos Consultant, 92-0663
Project Manager

REVIEWED BY:

Long Ching, P.E.
Senior Project Manager

AllWest

TABLE OF CONTENTS

AllWest

I. EXECUTIVE SUMMARY

AllWest has completed an environmental site assessment of *Grand Auto Store No. 43*, 4240 East 14th Street, City of Oakland, County of Alameda, California. This was an investigation defined by the scope and limitations of ASTM Practice E 11527-93. Any exceptions to, or deletions from, this practice are described in Section III of this report. This assessment has revealed evidence of a *recognized environmental condition* at the property. The site's groundwater is contaminated with halogenated volatile organic solvents. This condition is described below and more fully in the body of the report. AllWest conducted a site visit of the subject property on July 21, 1995.

The subject property is a rectangular shaped parcel of land that comprises approximately 1.2 acres. There is one building located on the property, the *Grand Auto Store,* a concrete tilt-up structure, built on a concrete slab-on-grade foundation. The *Grand Auto* building is 16,900 square feet (sf) in size, with approximately 8,800 sf for the retails sales floor, 5,000 sf for the shop area and 3,000 sf for the backroom/storage area. This building was constructed circa 1961 and is currently utilized as an automotive parts store and repair shop.

The subject property is located in a commercial-retail area. Northwest to northeast of the subject site are commercial businesses and residential homes. Located on the subject site (at the corner of E. 14th and High Streets) is a furniture store, *American Mattress & Furniture.* East of the subject site, across High Street, is a small strip center which includes retail and commercial businesses. A *Union 76* gas station is located southeast of the subject site at the southeast corner of E. 14th and High Streets. Across E. 14th Street, southwest of the *Grand Auto* property are several small retail businesses including *California Dog and Cat Hospital* and office space. Commercial use is predominant along E. 14th and High Streets. Residential homes are located further northwest and northeast.

Industrial equipment noted on the premises include two air compressors, a grinding machine, a battery charger, and machines related to tire repair (a dynamometer and tire mounting). There are six hydraulic hoists in the shop area. The hoist cylinders and hydraulic oil reservoirs are located underground. There were no visible signs of leaks around the hoist cylinders.

Inflammable materials and petrochemicals are stored at the site. These include automotive chemicals for both on-site and retail sales purposes, cleaning solvents, and oils and batteries containing acids for shop use and retail sales. These materials are stored in a neat and orderly fashion. New motor oil and automotive coolant are stored in 250 gallons, double-lined steel aboveground tanks. Used batteries are stored on wooden pallets.

Hazardous wastes observed at the site include the generation and storage of wastes oils, coolants and used batteries. These are generated from repair activities in the automotive shop. Waste oils are stored in 55-gallon metal drums that are properly labeled and located inside of secondary containments.

There are several pole-mounted transformers located along the northeast property boundary that belong to Pacific Gas and Electric (PG&E). According to PG&E, it is unknown if the transformers contain polychlorinated biphenyls (PCBs). The transformers were observed to be in good condition with no leaks evident.

Two types of asbestos-containing resilient floor tiles were located within the building. A 12" x 12" white floor tile/mastic (sales floor) and a 9" x 9" grey floor tile (backroom and restroom). These materials were observed to be in good condition at the time of the site visit and if left undisturbed should not present a health threat to building occupants. There is approximately 11,000 square feet of the white floor tiles/mastic and 300 square feet of the grey floor tile (no asbestos was detected in the mastic).

The earliest identified use of the subject site was obtained from a Sanborn Fire Map dated 1903. It listed the site in use as a dance hall. The next identified use of the site was of a reinforced concrete, L-shaped building, that was used as automotive repair shops, auto body repair and paint shops and office space. This building was constructed in 1946 and demolished in 1960-61. The next use of the property was by *Safeway Inc.* as a grocery store from 1960-61 to 1970. The site has been occupied by *Grand Auto* since 1971.

The subject property is a recorded fuel leak on the RWQCB fuel leaks list and the Cortese List. The site was previously utilized for gasoline sales (1972 through the mid-1980s) with underground storage tanks (three 10,000 gallon USTs), and a car wash with an associated sump. The underground storage tanks were removed in 1986. Analytical results of soil samples collected from the UST pit did not reveal significant hydrocarbon contamination. Removal of the car wash drainage sump occurred in August 1992. Soil sample results indicated the presence of hydrocarbons, halogenated hydrocarbons and some metals in the soil beneath the sump. Groundwater monitoring wells installed in 1992 and 1993 have revealed the presence of total petroleum hydrocarbons (<170 ppbs) and the HVOCs- DCE, chloroform, TCE and PCE in the groundwater. The levels of HVOCs have remained consistent with a slight increase in wells MW-3, MW-4 and HC-1 during the quarterly monitoring events between September 1992 and September 1994 (PCE at a high of 310 ppb, TCE with a high of 130 ppb and DCE at a high of 36 ppb). Petroleum hydrocarbons have not been detected in the site's groundwater since early 1994 and are no longer a concern. The site is presently undergoing quarterly monitoring for the HVOCs.

The historical use of surrounding properties included businesses which routinely stored and utilized hazardous materials. The adjacent property to the northwest was occupied by several automotive dealerships between 1947 and 1978, where *Burger King* (constructed 1978) is currently located. The present building northeast of the subject site, *1421 High Street,* is

currently occupied by *Mission Auto Body and Repair and Tulleners Automotive. Mission Auto Body and Repair* has been located at this address since at least 1963. Also present at this address at various times during the 1960s through 1980s were various transmission repair shops (1967 - 1980). This property was vacant between 1962 and 1966. Prior to 1959, from at least 1947, residential houses were located along the south side of Bancroft Street between E. 42nd Avenue and High Street.

Church's Fried Chicken (1455 High Street) has been located at the southwest corner of High and Bancroft Streets (beyond *Mission Auto Body)* from circa 1980 up to the present. Prior to 1980, an *Econo Gasoline* station occupied this site dating back at least to 1973. Between 1963 and 1973 this gas station was operated by the *Douglas Oil Company*. Between 1947 and 1959 there were residential homes located at this address.

East of the subject site, which is presently the location of a small retail strip center, has been the location of several restaurants and dry cleaners since the late 1950s. *Golden City Restaurant* was located at the corner of High and E. 14th Streets between 1980 and 1990. Before that it was operated by *Chucks ChuckBurgers* from 1960 to 1980.

Also located in the center at 1460 High Street (presently a coin-operated laundry), was *Della's 1-Hour Cleaners* between 1980 and 1989. The 1975 Haines Cross Street directory listed the occupant of this address as *Country Fresh Cleaners*. Building Department records list a proposed *Postal Instant Press* occupancy on July 29, 1975 (permit No.C84842). A building department inspection form dated December 18, 1975 lists a plumbing and mechanical inspection for a print shop. The 1969 and 1973 Haines directories gives *Daisies Cleaners* as the occupant. *Rogers Dry Cleaning* was listed at this address from 1963 through 1969. This center is within 400 feet of the subject property.

Directly south, and adjacent to the subject property is the *American Furniture & Mattress (formerly Super Tire)* site. This site was occupied by an older service station building prior to 1961. This building was demolished at that time and the present building constructed for use as a service station to be operated by *Tidewater Oil Company*. *Phillips 66* operated a gasoline service station on the site from 1966 to circa 1972-73. *Super Tire* operated on the site between 1976 to the early 1990s.

South of the subject site is the *Union 76* gasoline station. This station has been operating as a gasoline station since the late 1950s.

AllWest reviewed the U.S. Environmental Protection Agency's (EPA) National Priorities List (NPL) sites list, the EPA Resource Conservation and Recovery Act (RCRA) database, the EPA Comprehensive Environmental Response Compensation Liability Information System (CERCLIS) sites list, California Environmental Protection Agency's Cal-Sites toxic sites list, the California Central Valley Regional Water Quality Control Board (RWQCB) fuel leak sites list, Solid Waste Active and Inactive Landfills site list, and the Hazardous Waste and Substance Sites List Cortese.

There are 46 recorded sites with some degree of soil and/or groundwater issues within a one mile radius of the *Grand Auto Store*. Because of hydraulic gradient considerations and distance from the subject property only two of these sites are considered to have any potential to impact the subject property's soil and groundwater. These are the *Unocal Station* at the southern corner of E. 14th and High Street and a former *Southern Pacific* facility at 1421 High Street.

The *Unocal Station,* at 4251 E. 14th Street is approximately 300 to 400 feet south-southwest of the subject property. *Unocal* had a waste oil underground storage tank removed in January 1990 and a gasoline UST removed in April 1992. Contamination as total petroleum hydrocarbons as gasoline (TPH-G) and the gasoline constituent benzene were detected in the soils samples and groundwater. Four groundwater monitoring wells were installed between September and November 1992. TPH-G did not exceed 480 parts per million (ppm), nor did benzene exceed 12 parts per billion (ppb) in the groundwater samples. The measured depth to groundwater averages 33 to 35 feet bgs. The groundwater flow direction has been measured to fluctuate between the southwest, and east-northeast and northeast, upgradient of the subject site. *No halogenated volatile organic compounds (HVOCs) have been detected in the groundwater on this site.*

The *Southern Pacific* facility at 1421 High Street is listed on the Cortese database as a recorded fuel leak site. This site is not found on any of the other databases reviewed by AllWest in preparation of this report. This site is not listed on the Regional Water Quality Control Board's (RWQCB) Leaking Underground Storage Tank list, nor, is it listed with the Alameda County Health Care Services Agency-Hazardous Materials Division as a recorded fuel leak site. No information at the above-referenced agencies was available regarding this site. In addition, a review of historic building permit records at the City of Oakland Building Department did not reveal any reference to *Southern Pacific* having ever occupied this site.

II. SCOPE OF WORK AND LIMITATIONS

AllWest has completed a Phase I Environmental Site Assessment (ESA) of the facility located at 4240 E. 14. Street, City of Oakland, County of Alameda, California. *AllWest* performed the ESA at the request of *PACCAR Automotive* in Renton, Washington.

The scope of work presented in this environmental site assessment is in accordance with the American Society for Testing and Materials Standard E-1527-93. It addresses potentially hazardous or toxic materials manufactured, stored, released or disposed on the site. It also addresses historical land use, natural hazards, and reviews documentation concerning air, hazardous medical waste, soil, groundwater, and solid waste contamination potentially affecting the subject site and neighboring properties. The ERNS list was not reviewed because it was not reasonably ascertainable. The state list of registered underground storage tanks was also not reviewed because all registered tanks in California are required by law to be monitored for leakage. Any site with leaking tanks or where an overspill has occurred will be included in the RWQCB Leaking Underground Storage Tank List. Only leaking tanks would result in a recognized environmental condition. The objective of the ESA was to evaluate the potential for contamination of the site's soils and/or groundwater resulting from past or present land uses, and/or from off-site contamination sources. The intent of this investigation was to address real and potential environmental impairments or risks of impairments that may represent existing or potential financial and legal liabilities to *PACCAR*, or the present property owner and their agents.

The scope of work included reviewing available reports documenting historical land use and natural hazards. *AllWest* also reviewed available documentation concerning hazardous waste, liquid and solid waste and medical or infectious waste, as well as contamination of the air, soil and groundwater that could potentially affect the subject site.

AllWest's reconnaissance was limited to inspection of the subject lot and building's interiors, including areas of potential hazardous material storage. The scope of work did not include an in-depth audit of the site or their procedures for hazardous material use, waste storage or handling prior to disposal, or for personnel safety and health training and monitoring procedures.

As part of the environmental assessment, AllWest performed a preliminary inspection of the building premises for suspect asbestos-containing materials (ACM) such as floor coverings, ceiling materials, bulk insulation, and fireproofing. The purpose of the asbestos survey was to identify **major** applications of asbestos based on a limited visual and physical inspection. This survey was preliminary in nature and does not constitute a comprehensive survey with complete material and attendant air sampling.

Destructive test methods were beyond the scope of *AllWest's* assessment. *AllWest* has made a reasonable effort to identify, describe, locate, and quantify inaccessible hazardous

materials. In the event of further renovation or demolition of the subject property, suspected materials should be analyzed.

Chemical or microscopic analyses of soil, groundwater, radon, formaldehyde, lead paint and other hazardous materials are not considered to be part of the scope of work unless specified as such. For materials analyzed, *AllWest* cannot be held accountable for analyte quantities falling below recognized standard detection limits for the laboratory method utilized.

Documentation and other information from personal interviews in this investigation has been provided by public and private agencies. Findings based on these data are limited to historical documentation, availability of records and recollections of persons interviewed. No warranty is implied or expressed with use of such information.

AllWest has prepared this report for *PACCAR Automotive's* exclusive use for this particular project and in accordance with generally accepted practices at the time of the investigation. No other warranties, either expressed or implied are made as to the professional advice offered. This report is not a specification for further work and should not be used to bid out any of the recommendations found within.

The user should be cognizant that strict interpretations of Federal and State of California laws by regulatory agencies that may hold a landholder of property liable for all costs of cleaning or remediating toxic contamination.

III. ENVIRONMENTAL ISSUES MATRIX

Grand Auto Store No. 43, 4240 E. 14th St., Oakland, Ca — *AllWest Project No. 95181.21*

ON-SITE ISSUES	LOCATED	REGULATORY COMPLIANCE	MSDS	HAZMAT PERMITS	O&M PROGRAM	REPAIR	WITHIN 1/2 MILE	WITHIN 1 MILE	RECOMMENDED ACTION	REFER TO PAGE
55-Gallon Drums	Yes	Yes	Yes	Yes					None	18
Above Ground Tanks	Yes	Yes	Yes	Yes					None	19
Underground Tanks	Were removed	Under investig.							Work with regulatory agency	18
Hydraulic Hoists Systems	Yes	Yes							None	17
Transformers (PCBs)	No									
Hazardous Materials	Yes	Yes	Yes	Yes					None	18
Hazardous Wastes	Yes	Yes	Not required						None	18
Asbestos Fireproofing	No									
Asbestos Bulk Insulation	No									
Asbestos Walls	No									
Asbestos Floors	Yes	Yes			No				None	16
Air Quality Issues	No									
Radon	No									
Alquist/Earthquake Zone	No									
Flood District	No									
Historical Contamination	Yes	Unknown							Work with regulatory agency	18 & 22
OFF-SITE ISSUES										
CERCLIS/NPL Sites	Yes						Yes	Yes	None	20
RCRA TSD Facilities	Yes	Unknown					No	Yes	None (downgradient)	20
DTSC Cal/Sites/SLIC/ Toxic Pits	Yes	Unknown					Yes	Yes	None (downgradient)	20
Cortese List	Yes	Unknown					Yes	Yes	Review regulatory files periodically	20
LUST	Yes	Unknown					Yes	Yes	Review regulatory files periodically	20
Sensitive Ecological Areas	No									

NOTES:

IV. SURVEY FINDINGS

A. GENERAL INFORMATION

1. PROPERTY NAME AND ADDRESS: *Grand Auto Store No. 43, 4240 E. 14th Street, Oakland, California*

2. ZONING: The subject site and vicinity is zoned C-40, Commercial Zone-Community Thoroughfare.

3. FACILITY/SITE DESCRIPTION: Improvements to the subject property include one single-story, concrete tilt-up structure that comprises 16,900 square feet. The subject property is rectangular in shape and consists of approximately 1.2 acres. The site is bounded by Bancroft Street to the northeast, High Street on the southeast, E. 14th Street to the southwest, and a *Burger King* restaurant and automotive parts and service store (*Phoenix Auto Parts & Service)* to the northwest. The building was constructed circa 1961-63. The parcel is covered with asphalt-paved parking.

4. CURRENT USE OF PROPERTY BY TENANT(S): The subject property is currently in use as an automotive shop and automotive parts store by *Grand Auto*.

5. HISTORICAL USE OF PROPERTY: *AllWest* reviewed the historical use of the property by reviewing aerial photographs at *Pacific Aerial Surveys* in Oakland, California. Photographs from the following years were examined; 1994, 1992, 1990, 1988, 1985, 1983, 1981, 1979, 1977, 1975, 1973, 1971, 1969, 1968, 1966, 1963, 1959, 1957, 1953, 1950 and 1947. One Sanborn Fire Insurance Map for 1903 was also reviewed at U.C. Berkeley's Bancroft Library. Haines Cross Street directories for the years 1994, 1990, 1985, 1975, and 1973 were researched. R.J. Polk's City Directories available for this area of Oakland were dated 1969, 1967 and 1963. These were the earliest directories available. Also reviewed was a USGS topographic map (Oakland East Quadrangle, *U.S.G.S.*, 1959, Photorevised 1980), and building permit records at the City of Oakland Building Department.

Aerial Photographs

The subject building was visible in all of the photographs between 1963 and 1994. The only significant difference in land use at the subject site in these photographs was a structure visible in the 1973 through 1985 photos located on the south side of the *Grand Auto* building. This

structure was a canopy (constructed in 1972) for the former gasoline pumps operated at the subject property.

In the 1947 to 1959 photographs, an L-shaped building was located along the northwest and northeast sides of the property. This building included a variety of automotive repair, and auto body repair and paint shops (1953 Aerial Photograph dated 1953, *HartCrowser*, 1994, Scale 1" = 40').

Historical Directories

Grand Auto was listed as the tenant on the subject property at 4240 E. 14th Street between 1973 and the present. Between 1963 and 1969, *Safeway Inc.* is listed as having a store located on the property.

Building Permit Records

4240 E. 14th Street

- The first available building permit (No. B11750) for *4240 E. 14th Street* was dated July 3, 1946 to a Vad Jelton for construction of an office building.

- The next permit was dated June 13, 1952, also to Vad Jelton, for alterations to the present building. He proposed to remodel the existing building for use as a used car office. The size of the building was listed as 261 feet x 20 feet.

- Permit No. B86276 was applied for on February 18, 1960 for new construction. The existing use of the building to be demolished was listed as two automotive repair shops. Permit No. B86375 was issued February 24, 1960 for demolition of the existing reinforced concrete building.

- A inspection form by the Oakland Building Department dated August 22, 1960, listed a *Safeway's* store under construction.

- Permit C62406 was dated October 1971 and was for *Grand Auto* to perform interior demolition for remodelling.

- Permit C64838 is dated March 7, 1972 and is for *Grand Auto* to install three 10,000-gallon gasoline USTs and a pump island.

Sanborn Fire Insurance Map

A 1903 Sanborn Map lists the subject property as being occupied by a dance hall.

Summary

In summary, the site has been occupied by the *Grand Auto* store since 1971. From approximately 1960-61 until roughly 1970-71 the building was used by *Safeway Inc.* as a grocery store. Prior to 1960-61 the site was occupied by a reinforced concrete, L-shaped building, that was used as automotive repair, auto body repair and paint shops and office space. This building was constructed circa 1946.

6. CURRENT USE OF THE SURROUNDING PROPERTY: The present use of the surrounding properties is a *Burger King* restaurant and *Phoenix Auto Parts and Service* to the west and northwest, *Mission Auto Repair, Mission Body and Fender and Churches Fried Chicken* to the northeast. East and southeast of the subject site, across High Street, is a small retail strip center which includes a check cashing store, *Lee's Donut Shop,* a New Orleans style restaurant, a coin-operated laundry, *High Street Billiards,* a *Subway Sandwich* shop, and *Western Union.* Located adjacent to and south of the subject site, at the corner of E. 14th and High Streets is a used furniture store *(American Furniture & Mattress).*

A *Union 76* gas station is located southwest of the subject site on the west corner of E. 14th and High Streets. Across E. 14th Street, to the southwest of the *Grand Auto* property are several small retail businesses including the *Dog and Cat Hospital* and offices spaces. Commercial use is predominant along E. 14th and High Streets. Residential homes are located further northwest and northeast.

7. HISTORICAL USE OF THE SURROUNDING PROPERTY: The historical documents referenced above were also reviewed to evaluate the historical use of the surrounding properties.

Northwest

The present *Burger King* restaurant (west) and the *Phoenix Auto Parts & Service* building were constructed circa 1978. Between approximately 1963 and 1978, the *Bob Phillipi Auto Dealership* was located on these parcels. An automotive dealership was located on

these parcels in all of the aerial photographs viewed from 1947 to 1978.

Beyond the adjacent parcel to the northwest, across 42nd Avenue, is *Continental Volvo's* parking lot. *Continental Volvo* has occupied this parcel since 1970. Prior to that, this site was occupied by several buildings dating back to at least 1947.

Northeast

The present building northeast of the subject site, *1421 High Street,* is currently occupied by *Mission Auto Body and Repair and Tulleners Automotive. Mission Auto Body and Repair* has been located at this address since at least 1963. Also present at this address at various times during the 1960s, 1970s and 1980s were *Beasly Transmission* (1969-1990), *Herman Transmission* (1967 - 1980). This property was undeveloped between 1962 and 1966. Prior to 1959, from at least 1947, residential houses were located along the south side of Bancroft Street between E. 42nd Avenue and High Street.

Church's Fried Chicken (1455 High Street) has been located at the southwest corner of High and Bancroft Streets (beyond *Mission Auto Body)* from circa 1980 up to the present. Prior to 1980, an *Econo Gasoline* station was located at this site dating back at least to 1973. Between 1963 and 1973 this gas station was operated by the *Douglas Oil Company.* Between 1947 and 1959 there were residential homes located at this address.

Southeast

East of the subject site, which is presently the location of a small retail strip center, has been the location of several restaurants and dry cleaners since the late 1950s. *Golden City Restaurant* was located at the corner of High and E. 14th Streets between 1980 and 1990. Before that it was operated by *Chucks ChuckBurgers* from 1960 to 1980.

Also located in the center at 1460 High Street was *Della's 1-Hour Cleaners* between 1980 and 1989. The 1975 Haines Cross Street directory listed the occupant of this address as *Country Fresh Cleaners.* Building Department records list a proposed *Postal Instant Press* occupancy on July 29, 1975 (permit No.C84842). A building department inspection form dated December 18, 1975 lists a plumbing and mechanical inspection for a print shop. The 1969 and 1973 Haines directories gives *Daisies Cleaners* as the occupant. *Rogers Dry*

Cleaning is listed at this address from 1963 through 1969. This center is within 400 feet of the subject property.

South and Southwest

Directly south and adjacent to the subject property was the former *Super Tire* store at 4256 E. 14th Street (currently *American Furniture & Mattress). Super Tire* was in operation at the site between 1980 and the early 1990s. Between 1963 and 1972-73 a *Phillips 66* gas station is listed as occupying this site. The gas station building was visible in all photographs dating between 1963 and 1994. A gas station building with a different configuration was visible in the 1947 through 1959 photographs.

Building permit records for **4256 E. 14th Street** revealed the following information

- A permit was issued November 4, 1960 to *Tidewater Oil Company* for new construction. The existing building was listed as a 20 foot x 30 foot structure and in use as a gasoline service station. The new construction was to be a 49 foot x 26 foot building also to be used as a gasoline service station.

- A permit was issued to *Tidewater Oil Company* on September 22, 1960 for the approval to reconstruct and operate a service station at 4256 E. 14th Street.

- The next permit was dated July 5, 1966 and was for *Phillips 66* to operate a service station on the site.

- The final available permit, dated May 24, 1976, was for *Grand Auto/Super Tire* to vacate the service station and to operate a retail tire sales store.

Southwest of the subject site, at the west corner of E. 14th and High Streets, is the *Union 76* gasoline station. This station has been operating as a gasoline station since the late 1950s. Northwesterly is the *California Dog & Cat Hospital* and then *Quality Tune-up & Service.*

B. PHYSICAL CHARACTERISTICS

1. TOPOGRAPHY: The site is situated on flat-lying terrain at an approximate elevation of 25-30 feet of above mean sea level.

2. VEGETATION: There is no on-site vegetation. The site's surface is paved.

3. SOILS: The soils are composed of unconsolidated fine-grained sands, silts and clays. Shallow soils are silty clays to roughly 8-10 feet below ground surface (bgs), clayey sands with gravel from 10-12 feet bgs, which are underlain by Holocene aged coarse-grained alluvium.

4. GEOLOGY: Surficial alluvial deposits are underlain by the Holocene aged alluvial deposits that consist mostly of unconsolidated sands and silts

5. HYDROLOGY: The depth to first groundwater varies between 8 to 15 feet bgs (this may be perched groundwater). The first free groundwater on the site is encountered at approximately 30 to 35 feet bgs. Surface runoff for the vicinity drains into the City of Oakland storm drain system. The regional groundwater flow for the Oakland area is towards the west-southwest. Groundwater flow, unless obstructed, follows topographic patterns towards a direction of decreasing elevation. Upgradient areas from the subject site are toward the northeast. Historical groundwater elevations recorded since 1992 have not revealed a distinct groundwater flow direction. *Grand Auto's* consultant, *HartCrowser*, reports that the groundwater gradient has remained relatively flat since measurements have been collected.

C. NATURAL HAZARDS

1. SEISMICITY: The site lies approximately one and one-half miles southwest of the Hayward-Calaveras Fault Zone. The buildings did not suffer any structural damage from the Lone-Prieta earthquake of October 1989. This site does not lie within an Alquist-Priolo Special Studies Earthquake zone. There are no recorded active fault traces that traverse the area. The main seismic hazard of the site is strong ground shaking by earthquakes generated along active faults in the region.

2. RADON: Outgassing of radon has not been identified as a problem in the City of Oakland. According to radon survey results published by the California Environmental Protection Agency's Toxic Substances Control Program (formerly Department of Health Services), the average result of measurements in Region 6, which includes Alameda County and Oakland, is 1.1 pico curies per liter of air (pCi/l). This average is well below 4 pCi/l, the level for which the U.S. Environmental Protection Agency recommends that action be taken to reduce radon.

Radon, specifically, radon isotope-22, is a colorless, odorless, tasteless radioactive gas that is produced as a natural decay product of uranium. Because uranium and radon occur in varying amounts in rocks and soils, radon is present in all the air that we breath. Furthermore, due to its radioactivity, numerous studies have shown that at elevated levels there is a link between radon and lung cancer. Anyone living in a building with elevated radon concentrations may have an increased risk of contracting lung cancer over a period of years. Concentrations of radon gas are expressed as pico curies per liter of air (pCi/l). A curie, is the amount of radiation given off by a gram of radium. Pico means one-trillionth. A picoCurie is the radiation given off by a trillionth of a gram of radium. The U.S. Environmental Protection Agency recommends that action be taken to reduce radon levels at 4.0 pCi/l of air.

3. SENSITIVE ECOLOGICAL AREAS: The site is not dependent on sole source aquifers. Coastal dunes or beaches are not found on the site, nor is the site home to critical or unique habitats. Wild and scenic rivers do not traverse the property, nor are there any special archeological resources onsite. There are no recreational areas or areas managed for conservation purposes on the property. The site is not a State of California or Federal Historical Landmark.

4. FLOODING: There has been no record of recent flooding near the site.

5. MASS WASTING: The site lot has been graded essentially flat. Mass wasting or subsidence is not considered a hazard at the site.

D. SITE CHARACTERISTICS

1. PARKING: The site's parking lot is asphalt paved. Parking is available on the easterly and southerly sides of the building. The property can be accessed from either E. 14th or High Streets.

2. ROADWAYS: The site is bounded by E. 42 Avenue on the northwest, Bancroft Street on the northeast, High Street on the southeast and E. 14th Street to the southwest.

3. FENCES: The only fencing observed on the property was along the Burger King and Grand Auto property line. This is a 6-foot high chainlink fence.

4. OUTSIDE STORAGE: There were no exterior storage facilities observed.

5. EASEMENTS: Other than public utilities, there are no recorded easements on the subject property.

6. WELLS: There are no recorded potable water wells on site. There are four groundwater monitoring wells located on the site.

7. SUMPS: There are no sumps on the site.

8. CATCH BASINS: Catch basins as storm drains are located in the parking lots to direct surface water runoff. These are connected to the Oakland municipal storm drain system.

9. PONDS: There were no surface water impoundments noted on the property.

10. SEWAGE SYSTEM: Sewage is directed into the local municipal sanitary sewage system (East Bay Municipal Utilities District-EBMUD).

11. POTABLE WATER SYSTEM: Potable water is supplied by the local municipal water system (EBMUD).

12. WASTE WATER SYSTEMS: The site does not produce waste water, with the exception of sewage.

13. POWER DISTRIBUTION SYSTEMS: Electrical power to the site is directed through a pole mounted transformers located at the northeast property line. These transformers are owned by *PG&E*. According to PG&E, it is unknown if these transformers contain polychlorinated biphenyls (PCBs). PG&E regularly inspects these transformers and in the event leakage occurs, PG&E will perform the required cleanup and take any necessary measures to prevent exposure to the public.

    Information provided to AllWest by PG&E, stated that all new transformers in the service area use dielectric fluids for cooling that do not contain PCBs. Over 99% of PG&E's former PCB-containing transformers have been removed or had their PCB-containing fluids replaced since PCBs were banned in 1977 by the United States Environmental Protection Agency (EPA).

E. ASBESTOS AND HAZARDOUS MATERIALS IN FACILITY AND OPERATIONAL SYSTEMS

1. BUILDING STRUCTURE: The subject building is a single-story, concrete tilt-up structure, built on a concrete slab-on-grade foundation. The exterior is painted concrete. The roof covering is built-up tar and gravel. There were no suspect asbestos-containing materials noted on structural framing members.

2. BUILDING MATERIALS: Typical building finish materials noted were sheetrock and sheetrock tape compound, 2'x 4' suspended ceiling tiles, two types of floor tiles and mastic, and concrete.

As part of this environmental assessment, AllWest inspected the building premises for potential asbestos-containing materials (ACM) such as floor coverings, ceiling materials, bulk insulation, and fireproofing. Thermal insulation noted on pipes located in the building was fiberglass. Two types of resilient floor tiles (RFT) were noted in the building. These were a white 12" x 12" RFT in the sales area and a grey 9" x 9" RFT.

A total of 6 suspect asbestos-containing material samples were collected and transported under Chain-of-Custody protocol to *Asbestos TEM Laboratories* in Berkeley, California. The materials sampled, sample number, sample location, and type and percentage of asbestos are presented in the table below.

Table I
Materials Sampled for Asbestos

Sample Number/Location	Material Description	Type and Percentage of Asbestos
P-1A Sales Floor	2'x 4' Ceiling Tile	No Asbestos Detected (ND)
P-1B Sales Floor	2'x 4' Ceiling Tile	ND
P-2A Sales Floor	12"x 12" White RFT/Mastic	5-10% chrysotile (in tile) 1-5% chrysotile (in mastic)
P-2B Sales Floor	12"x 12" White RFT/Mastic	Sample not analyzed due to prior positive
P-3A Back Room	9"x 9" Grey RFT/mastic	10-20% chrysotile in tile No asbestos detected in mastic
P-3B Restroom	9"x 9" Grey RFT/mastic	Sample not analyzed due to prior positive

The floor tiles are presently in good condition, and as such, they should not pose a health threat to building occupants.

Should the materials containing asbestos become damaged or disturbed through normal or abnormal use, or should any remodeling, renovation or demolition work take place that might disturb the asbestos-containing materials and potentially release asbestos fibers into the air, then the work should be performed by a licensed asbestos contractor. If removal is chosen as an option, the removal of asbestos should be conducted by a licensed asbestos contractor and under the guidelines of a strict technical specification.

AllWest recommends that the building tenants, contractors, and maintenance personnel be notified of the presence of asbestos in the buildings to avoid damaging the ACM.

It is also recommended that an asbestos-containing building materials Operations & Maintenance Program (O&M) be implemented. An O&M program details procedures designed to ensure that the asbestos containing building materials, whenever possible, remain undisturbed to minimize the likelihood of exposing building tenants and workers to airborne asbestos fibers.

Chain of custody records, and PLM laboratory results are included in Appendix C.

3. ELECTRICAL SYSTEMS: The main electrical panels of the building are located in the back area. No suspect PCB-containing electrical equipment was noted at the site.

4. MECHANICAL AND HVAC SYSTEMS: Fire suppression lines and a water heater were noted in the building. There was no suspect ACM noted on mechanical systems.

   Heating is provided by electric radiant heating units mounted on the ceiling.

5. BUILDING EQUIPMENT: There was no building equipment, such as elevators, escalators, or trash compactors, noted on the premises.

6. INDUSTRIAL EQUIPMENT: Industrial equipment noted on the premises include hydraulic hoists, air compressors, a grinding machine, a battery charger, and machines related to tire repair (a dynamometer and tire mounting). There are six hydraulic hoists in the shop area.

The hoist cylinders and hydraulic oil reservoirs are located underground.

F. TOXIC AND FLAMMABLE MATERIALS, COMPRESSED GASES, AND PETROCHEMICALS

1. MANUFACTURE: No known toxic materials are manufactured at the site. There was no indication of past manufacturing activities associated with toxic, flammable materials, or petrochemicals found in the historical review.

2. STORAGE: Inflammable materials and petrochemicals are stored at the site. These include automotive chemicals for both on-site and retail sales purposes, cleaning solvents, and oils and batteries containing acids for shop use and retail sales. These materials are stored in a neat and orderly fashion. Waste drums of motor oil and automotive coolant are stored in secondary containers. Used batteries are stored on wooden pallets. A Hazardous Materials Business Plan (HMBP) was reviewed during the site visit. The HMBP was current and is also on file with the Oakland Fire Department.

3. DISPOSAL: Waste oil and coolant are disposed of with *Evergreen Environmental Services* of Newark, California. Used batteries are transported off-site by the *Exide Corporation* of Sumner, Washington. The cleaning solvent tank is maintained by an outside service company, *Safety-Kleen, Inc.*

   There is no known disposal of toxic or hazardous materials on the subject property. There was no sign of intentional disposal, such as stained floor drains or wash basins. There were indications of accidental oil spills on the shop floor.

4. UNDERGROUND STORAGE TANKS: The site was previously utilized for gasoline sales with underground storage tanks (3-10,000 gallon USTs), and a car wash with an associated sump. The USTs were located in the middle of the parking lot at the front side (E. 14th) of the store. The underground storage tanks were removed in 1986. Analytical results of soil samples collected from the UST pit did not reveal significant hydrocarbon contamination.

   Removal of the car wash drainage sump occurred in August 1992. Soil sample results indicated the presence of hydrocarbons, halogenated hydrocarbons and some metals in the soil beneath the sump. Groundwater monitoring wells installed in 1992 and 1993 have revealed

the presence of total petroleum hydrocarbons (< 170 ppbs) and the HVOCs- DCE, chloroform, TCE and PCE in the groundwater. Petroleum hydrocarbons have not been detected in the site's groundwater since early 1994 and are no longer an issue. The site is presently undergoing quarterly monitoring for the HVOCs.

5. ABOVEGROUND STORAGE TANKS: The only aboveground storage tanks noted were two 250-gallon new oil containers, two 55-gallon drums for waste oil and coolant and a 55-gallon drum for cleaning solvent. These were all placed inside of secondary containers. There is a 55-gallon drum that is for used oil filters. This drum is stored on a wooden pallet.

One of the hydraulic hoists at the site has an associated aboveground storage tank for the hoist's fluid reservoir. This is the hoist used for wheel alignment.

G. POLLUTION SOURCES, CONTROLS AND TREATMENT

1. AIR: The site has not been recorded as a source of air pollution by regulatory agencies.

2. SOIL & GROUNDWATER: The subject site is a recorded site of soil and groundwater pollution; namely the halogenated volatile organic compounds (HVOCs) DCE, chloroform, TCE, and PCE. This site is presently under the authority of the Alameda County Health Care Services Agency. Refer to Section F, paragraph 4 for discussion.

3. SOLID WASTE: Solid waste is transported by Waste Management Disposal Company.

4. HAZARDOUS WASTE: Hazardous wastes observed at the site include the generation and storage of wastes oils, coolants and used batteries. These are generated from repair activities in the automotive shop. Waste oils are stored in 55-gallon metal drums that are properly labeled and located inside of secondary containments. The used batteries are stored on wooden pallets and transported to an off-site recycling facility.

   Hazardous waste generation and storage on the property do not appear to have negatively impacted the subject property.

5. MEDICAL WASTE: No medical wastes are produced at the site.

H. OFF-SITE ENVIRONMENTAL CONCERNS

AllWest reviewed the following regulatory lists to locate sites under investigation or cleanup within a one-mile radius of the subject property: the U.S. Environmental Protection Agency's *National Priorities List (NPL), Comprehensive Environmental Response, Compensation and Liability Act (CERCLIS) List* and *Resource Conservation and Recovery Act (RCRA) Database*; the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC) *Annual Work Plan* (formerly *Expenditure Plan for the Hazardous Clean-up Bond Act* of 1984 and 1990) and the *Cal-Sites/Toxic Pits List* (formerly *Abandoned Sites Program Information List*).

AllWest also reviewed the following regulatory lists to locate sites under investigation or clean up within one-half mile of the subject property: the California Office of Planning and Research *Hazardous Waste and Substances Site (Cortese) List*; the California Integrated Waste Management Board's *Active and Inactive/Closed Landfills List*; California Regional Water Quality Control Board, San Francisco Bay Region: *Leaking Underground Fuel Tanks (LUFT) Cases.*

Regulatory List	*Search Radius*	*Number of Sites*
NPL	*1 mile*	*None*
CERCLIS	*1 mile*	*2*
RCRA TSD Facilities	*1 mile*	*1*
Cal-Sites/Toxic Pits	*1 mile*	*13*
CIWMB Landfills	*½ mile*	*None*
*Cortese **	*½ mile*	*10*
LUST	*½ mile*	*31*

**** Denotes sites that are also on the LUST list.***

Summary: There are 46 recorded sites on the above lists within the specified radii. These sites are listed below.

CERCLIS SITES

1.	Clorox Co., Oakland Plant	*850 42nd Avenue*	*1,320 feet sw*
2.	National Lead Co.	*47th Ave. & E. 10th St.*	*1,000 feet south*

RCRA TSD SITES

3.	American National Can Inc.	*3801 E. 8th Street*	*2,900 feet west*

CAL-SITES

3.	American National Can Inc.	*3801 E. 8th Street*	*2,900 feet west*
4.	Armor Equipment.	*1137 57th Ave.*	*4,300 feet se*
5.	Clorox Co.	High & Wattling St.	1,600 feet sw
6.	General Electric Co.	5441 E. 14th St.	3,300 feet se
7.	Arrow Sign Co.	1046 45th Ave.	1,400 feet south
8.	Owens-Illinois, Inc.	3600 Alameda Ave.	3,300 feet sw
9.	L&M Plating	920 54th Ave.	3,600 feet south
10.	Ferro Enameling Co.	1100 57th St.	4,300 feet se
11.	Quaker Oats Co.	5625 E. 14th St.	4,500 feet se
12.	Veiss-Zaken Scrap Metal & Iron	1249 49th Ave.	1,900 feet south
13.	The Learner Co.	768 46th Ave.	2,500 feet sw
14.	August Manufacturing Co.	1466 36th Ave.	2,600 feet nw
15.	Volvo GM Heavy Truck Corp.	750 60th Ave.	2,800 feet south

LEAKING UNDERGROUND STORAGE TANK AND CORTESE SITES

16.*	PT Hutchins	4901 E. 12th	*1,900 feet south*
17.	*Tony's Auto Express Service*	*3609 E. 14th St.*	*2,300 feet nw*
18.	*Shell Station*	*3750 E. 14th St.*	*2,100 feet nw*
*19.**	*Continental Volvo*	*4030 E. 14th St.*	*900 feet nw*
20.	*Grand Auto/Super Tire*	*4240/4256 E. 14th St.*	*Subject Site*
21.	*Unocal*	*4251 E. 14th St.*	*300 feet sw*
22.	*Motor Partners*	*1234 40th Ave.*	*1,000 feet west*
*23.**	*Motor Partners I*	*1236 & 1238 41st Ave.*	*800 feet west*
24.	*Everett Stern Property*	*1033 44th Ave.*	*800 feet south*
*25.**	*Pacific Galvanizing*	*715 46th Ave.*	*2,600 feet south*
*26.**	*Learner*	*768 46th Ave.*	*2,500 feet sw*
27.	*Peterson Property*	*1066 47th Ave.*	*1,700 feet south*
28.	*Cohn Warehouse*	*1212 47th Ave.*	*1,400 feet se*
29.	*Norcal*	*1234 47th Ave.*	*1,400 feet se*
30.	*F&K Investment*	*1259 48th Ave.*	*1,900 feet east*
31.	*Bayview Federal Bank*	*1437 48th Ave.*	*2,300 feet east*
32.	*Mepaco*	*1226 49th Ave.*	*1,800 feet se*
33.	*Stop "n Go*	*4100 Foothill Blvd.*	*1,400 feet ne*
*34.**	*BP Oil*	*4250 Foothill Blvd.*	*1,100 feet ne*
35.	*Chevron*	*4265 Foothill Blvd.*	*1,000 feet ne*
36.	*BP Oil*	*4280 Foothill Blvd.*	*1,050 feet ne*
37.	*Shell*	*4411 Foothill Blvd.*	*1,400 feet ne*
38.	*Shell*	*630 High St.*	*2,600 feet ne*
39.	*Exxon*	*720 High St.*	*2,300 feet sw*
40.	*Southern Pacific Trans Co.*	*744 High St.*	*2,100 feet sw*
*41.**	*Ed's Auto Wreckers*	*752 High St.*	*1,800 feet sw*
42.	*Oakland Unified School District*	*900 High St.*	*1,500 feet sw*
43.	*Chevron*	*3616 San Leandro St.*	*2,500 feet nw*
*44.**	*Chevron Asphalt Terminal*	*4525 San Leandro St.*	*1,200 feet south*
45.#	*Childrens Hospital*	*4509 Foothill Blvd.*	*1,600 feet ne*
46.#	Southern Pacific	1421 High St.	50 feet ne (adjacent to subject site on the northeast

* Denotes sites that are referenced on both lists.
# Denotes sites that are on the Cortese List only.

All of the above sites, with the exception of *Sites 20, 21, 46*, because of hydraulic gradient considerations and the distance from the subject property, are considered to have a negligible potential to impact the subject site. Please refer to Figure 3 in Appendix A for a graphical representation of the site locations.

Site 20 is the subject site and is discussed in detail in Section G, Part 2.

Site 21, the Unocal Station, at 4251 E. 14th Street is approximately 300 to 400 feet south-southwest of the subject property. *Unocal* had a waste oil underground storage tank removed in January 1990 and a gasoline UST removed in April 1992. Contamination as total petroleum hydrocarbons as gasoline (TPH-G) and the gasoline constituent benzene were detected in the soils samples and groundwater. Four groundwater monitoring wells well installed between September and November 1992. TPH-G did not exceed 480 parts per million (ppm), nor did benzene surpass 12 parts per billion (ppb) in the groundwater samples.

The measured depth to groundwater averages 33 to 35 feet bgs. The groundwater flow direction has been measured to fluctuate between the southwest, and east-northeast and northeast, upgradient of the subject site. *No halogenated volatile organic compounds (HVOCs) have been detected in the groundwater on this site.*

Site 46, the *Southern Pacific* facility at 1421 High Street is listed on the Cortese database as a recorded fuel leak site. This site is not found on any of the other databases reviewed by AllWest in preparation of this report. This site is not listed on the Regional Water Quality Control Board's (RWQCB) Leaking Underground Storage Tank list, nor, is it listed with the Alameda County Health Care Services Agency-Hazardous Materials Division as a recorded fuel leak site. No information at the above-referenced agencies was available regarding this site. In addition, a review of historic building permit records at the City of Oakland Building Department did not reveal any reference to *Southern Pacific* having ever occupied this site. The Alameda County Health Care Services Agency is further reviewing their historic records and will forward any information they uncover regarding this site at a future date.

V. INFORMATION SOURCES

A. AERIAL PHOTOGRAPHS

Pacific Aerial Surveys, 8407 Edgewater Drive, Oakland, California

AV-4625-12-31, 11/94
AV-4230-112-33, 4/92
AV-3845-11-35, 6/90
AV-3268-7-30, 3/88
AV-2717-7-4, 10/85
AV-2300-7-26, 6/83
AV-2040-7-27, 6/81
AV-1750-7-28, 9/79
AV-1377-6-28, 7/77
AV-1193-7-22, 5/75
AV-1100-7-31, 4/73
AV-995-5-25, 5/71
AV-902-7-25, 5/69
AV-858-3-31, 7/68
AV-710-9-27, 4/66
AV-550-8-22, 7/63
AV-337-7-34, 7/59
AV-253-11-33, 5/57
AV-119-13-25, 8/53
AV-28-18-16, 4/50
AV-11-5-19, 3/47

B. REGULATORY AGENCY LISTS

- U.S. Environmental Protection Agency: *National Priorities List (NPL)* - April 1995
- U.S. Environmental Protection Agency: *Comprehensive Environmental Response, Compensation and Liability Act (CERCLIS) List* - June 1995
- U.S. Environmental Protection Agency: *Resource Conservation and Recovery Act (RCRA) Database* - July 1995
- California Environmental Protection Agency, Department of Toxic Substances Control (DTSC): *Annual Work Plan* (formerly *Expenditure Plan for the Hazardous Clean-up Bond Act (BEP) of 1984 and 1990*) - June 1994
- California Environmental Protection Agency, Department of Toxic Substances Control (DTSC): *CALSITES* (formerly *Abandoned Sites Program Information List*) - March 1995
- California Integrated Management Board: *Active and Inactive/Closed Landfills List* - December 1994
- California Office of Planning and Research: *Hazardous Waste and Substances Site (Cortese) List* - September 1994

- California Regional Water Quality Control Board, San Francisco Bay Region, *Leaking Underground Fuel Tanks (LUFT) Cases* - July 1995

C. ENVIRONMENTAL STUDIES

- California Division of Mines and Geology, 1972, Geologic Atlas of California (Olaf P. Jenkins Edition), Oakland Sheet. Prepared by the California Division of Mines and Geology; Oakland Sheet; Geology compiled by Thomas H. Rogers, 1965

- U.S. Geological Survey, Oakland East Quadrangle, 7-1/2-Minute Quadrangle Topographic Map, 1959 base map, photo-revised in 1980 (1:24,000)

- State of California Hydrologic Unit Map, 198, United States Geological Survey, 1983

- Studies for the Zonation of the San Francisco Bay Region, Paper 941-A, R.D., 1975, United States Geological Survey

C. ASSESSOR'S INFORMATION

- Alameda County Assessor's Office, 1221 Oak Street, Oakland, California (510) 272-3787

D. PLANNING AND ZONING

- Oakland Planning Department, Building Records Division, 1330 Broadway Street, 2nd Floor, Oakland, California

- Oakland Planning Department, Zoning Information, 1330 Broadway Street, 2nd Floor, Oakland, California

E. PUBLIC WORKS

- Oakland Public Works Department, Oakland, California

F. WATER QUALITY

- California Regional Water Quality Control Board-Bay Area Division, Webster Street, Oakland, California

G. PUBLIC HEALTH

- Alameda County Health Care Services Agency - Hazardous Materials Division, 1131 Harbor Bay Parkway, Room 250, Oakland, California (510) 567-6700

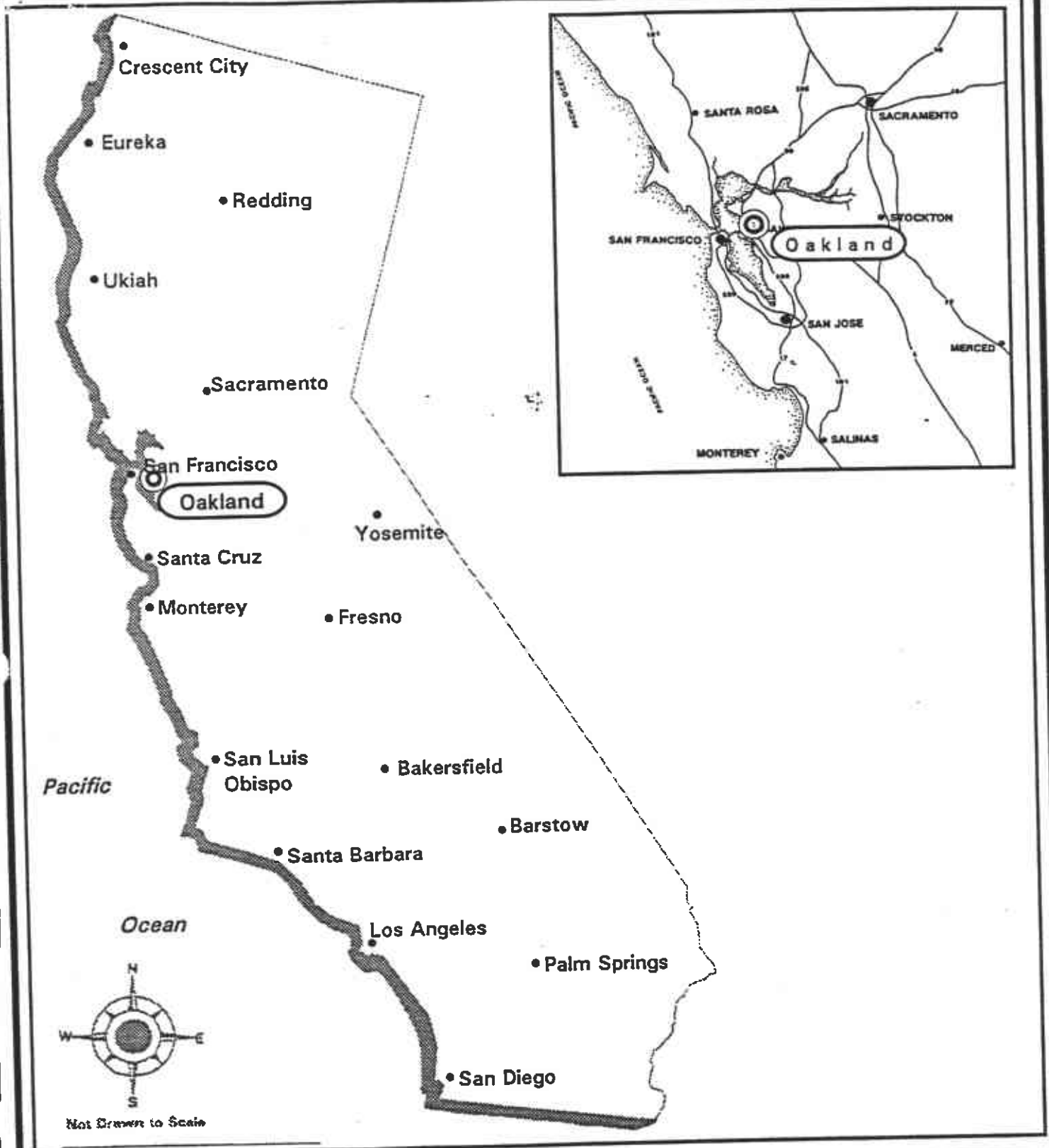
H. AIR QUALITY

- San Francisco Bay Area Air Quality Management District,939 Ellis Street, San Francisco, California

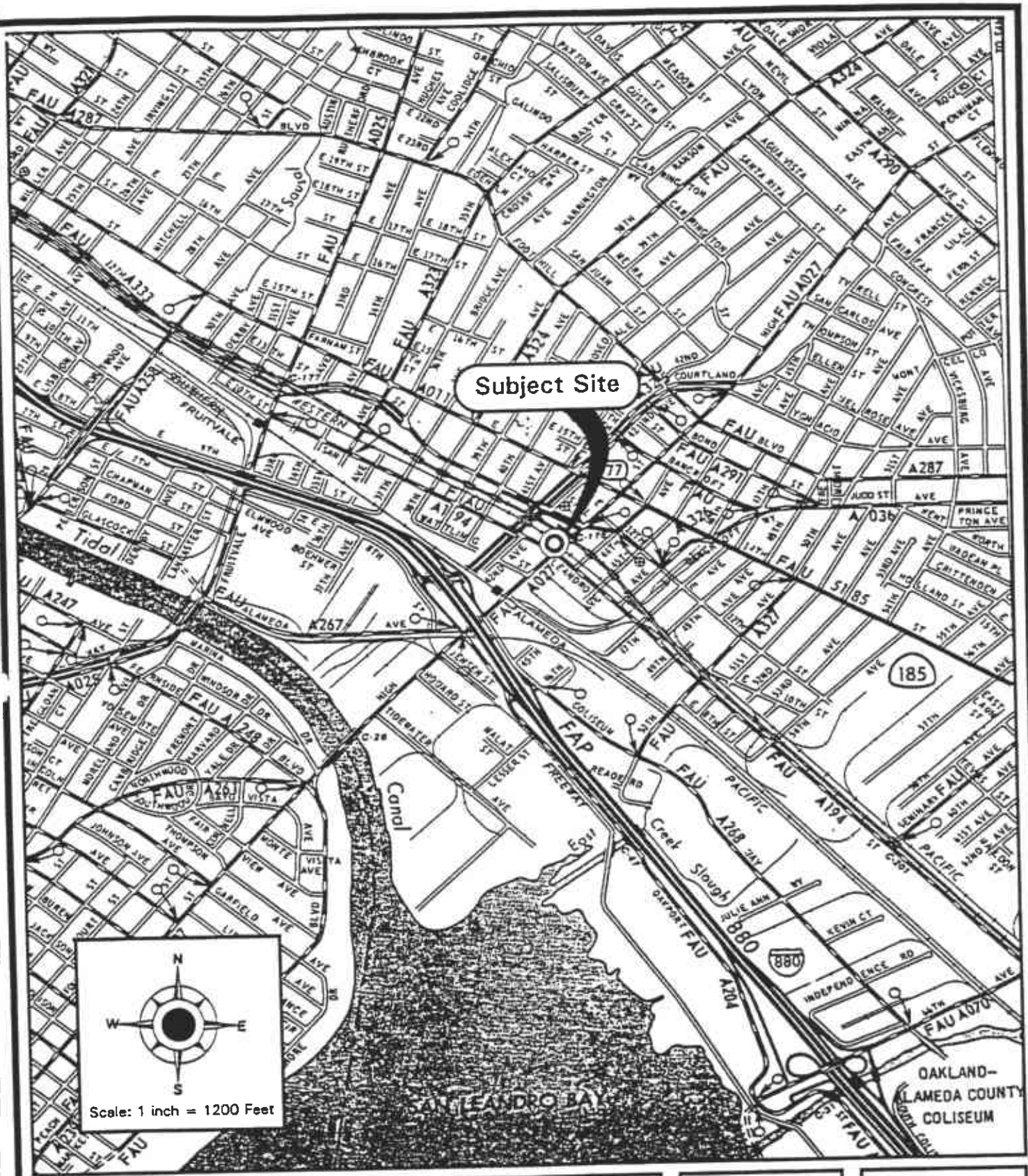
I. OTHER SOURCES

- Sanborn Fire Insurance Maps, 1903, U.C. Berkeley Bancroft Library, Berkeley, California
- Haines Cross Street Directories, 1994, 1990, 1985, 1975, and 1973. Oakland Public Library, 125 14th Street, Oakland, California
- R.J. Polk's City Directories, 1969, 1967 and 1963. Oakland Public Library, 125 14th Street, Oakland, California

APPENDIX A

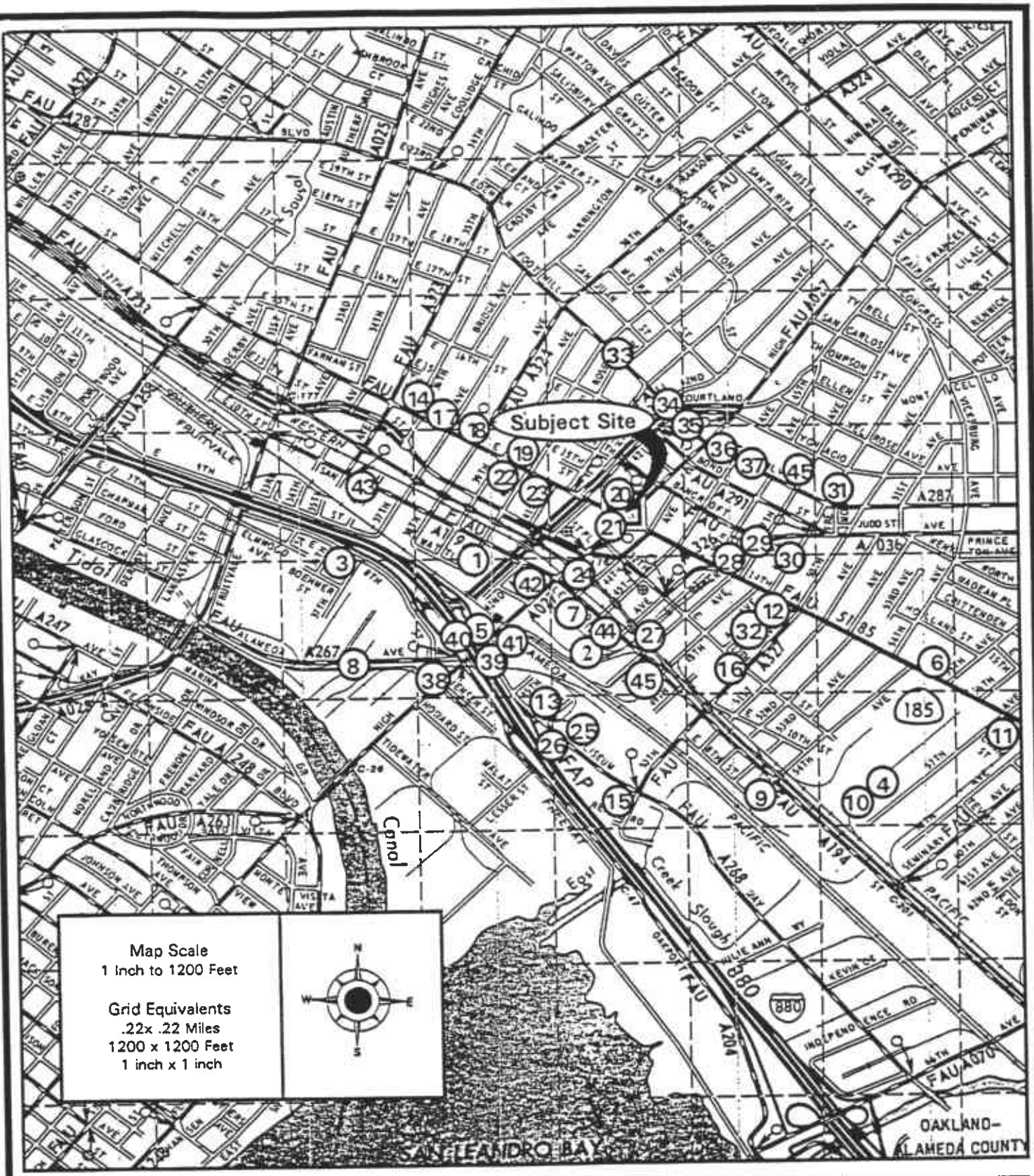


AllWest Environmental, Inc.	July 1995	Site Regional Map	Project 95181.21	Figure 1
	4240 E. 14th Street, Oakland, California			Source *AllWest*



AllWest
AllWest Environmental, Inc.

July 1995	Site Vicinity Map	Project 95181.21	Figure 2
4240 E. 14th Street Oakland California			Source *Thomas Bros.*



AllWest
AllWest Environmental, Inc.

July 1995	Off - Site Concerns	Project 95181.21	Figure 3	
4240 East 14th Street Oakland, California			Source *CA DOT*	

CERCLIS Sites

1. Clorox Co., Oakland Plant 850 42nd Avenue
2. National Lead Co. 47th Ave. & E. 10th St.

RCRA TSD Facility

3. American National Can Inc.
   3801 E. 8th Street

Cal Sites

3. American National Can Inc., 3801 E. 14th Street
4. Armor Equipment, 1137 57th Avenue
5. Clorox Co., High & Wattling Street
6. General Electric Co. 5441 E. 14th Street
7. Arrow Sign Co., 1046 45th Avenue
8. Owens-Illinois, Inc. 1100 57th Street
9. L&M Plating, 920 54th Avenue
10. Ferro Enameling Co., 1100 57th Street
11. Quaker Oats Co., 5625 E.14th Street
12. Veiss-Zaken Scrap Metal & Iron, 1249 49th Avenue
13. The Learner Co., 768 46th Avenue
14. August Manufacturing Co., 1466 36th Avenue
15. Volvo GM Heavy Truck Corp., 750 50th Avenue

LUST & CORTESE SITES

16. PT Hutchins, 4901 E. 12th St.
17. Tony's Auto Express, 3609 E. 14th St.
18. Shell Station, 3750 E. 14th St.
19. Continental Volvo, 4030 E. 14th St.
20. Grand Auto/Super Tire, 4240/4256 E. 14th St.
21. Unocal 4251 E. 14th St.
22. Motor Partners 1234 40th Ave.
23. Motor Partners 1, 1236 & 1238 41st Ave.
24. Everett Stern, 1033 44th Ave.
25. Pacific Galvanizing, 715 46th Ave.
26. Learner Co., 768 46th Ave.
27. Pererson Prop., 1066th 47th Ave.
28. Cohn Warehouse, 1212 47th Ave.
29. Norcal, 1234 47th Ave.
30. F&K Investment, 1259 48th Ave.
31. Bayview Bank, 1437 48th Ave.
32. Mepaco, 1226 49th Ave.
33. Stop n' Go, 4100 Foothill Blvd.
34. BP Oil, 4250 Foothill Blvd.
35. Chevron, 4265 Foothill Blvd.
36. BP Oil, 4280 Foothill Blvd.
37. Shell, 4411 Foothill Blvd.
38. Shell, 630 High St.
39. Exxon, 720 High St.
40. Southern Pacific Trans. Co., 744 High St.
41. Ed's Auto Wreckers, 752 High St.
42. Oakland Unified School District, 900 High St.
43. Chevron, 3616 San Leandro St.
44. Chevron Asphalt Terminal, 4525 San Leandro St.
45. Childrens Hospital, 4509 Foothill Blvd.

AllWest
AllWest Environmental, Inc.

July 1995

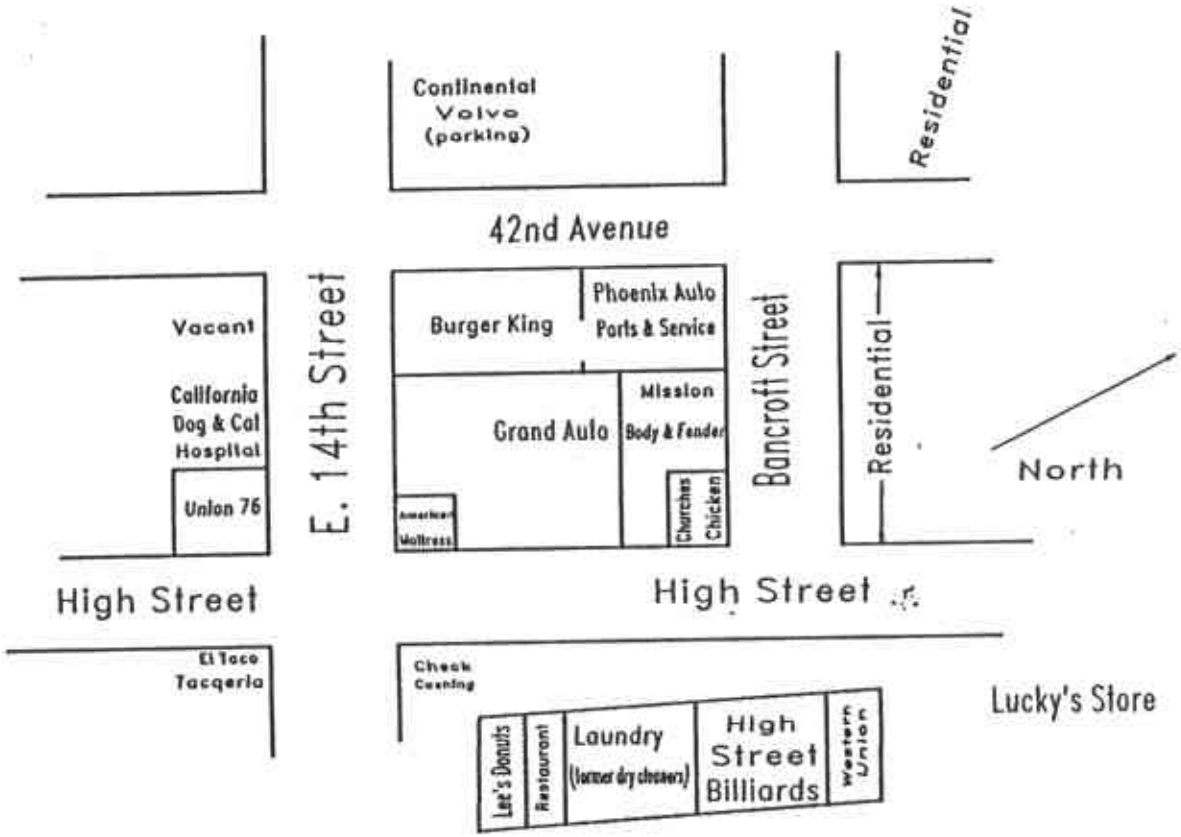
Off - Site Concerns

Project 95181.21

Figure 3(continued)

4240 East 14th Street
Oakland, California

Source *CA DOT*



AllWest Environmental, Inc.	August 1995	Adjacent and Local Site Plan	Project No. 95181.21	Figure 4
	4240 East 14th Street Oakland, California			Source *AllWest*

APPENDIX B

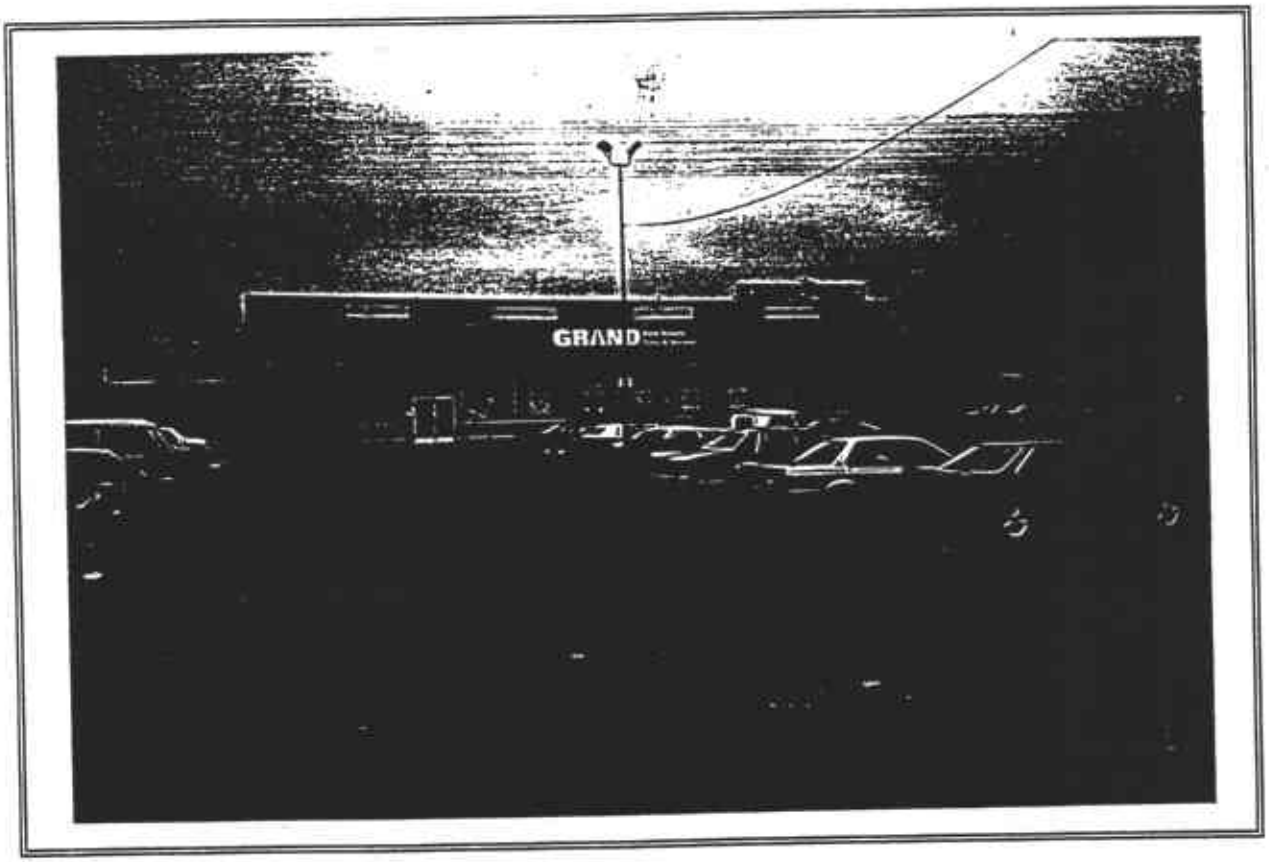


PHOTO 1: GRAND AUTO STORE NO. 43

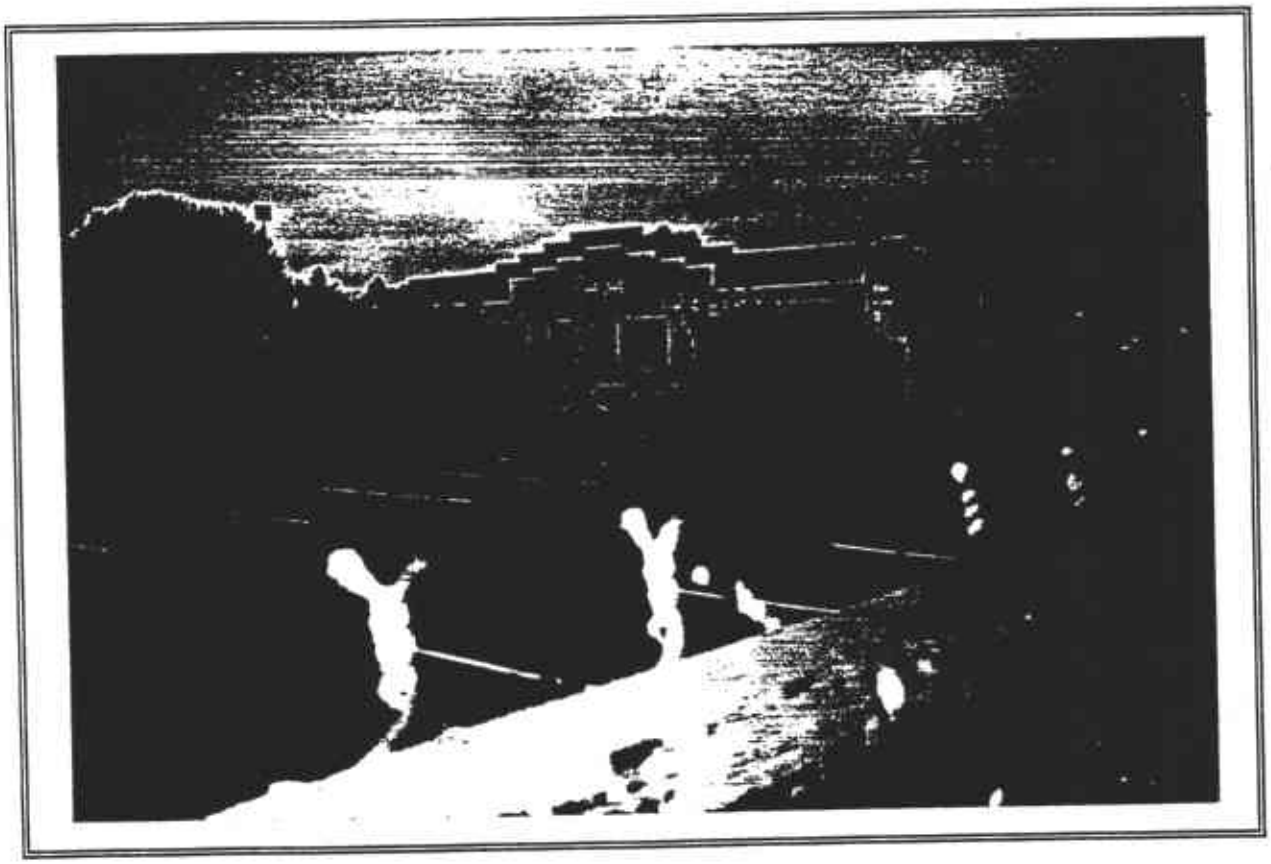


PHOTO 2: PHOENIX AUTO PARTS & SERVICE

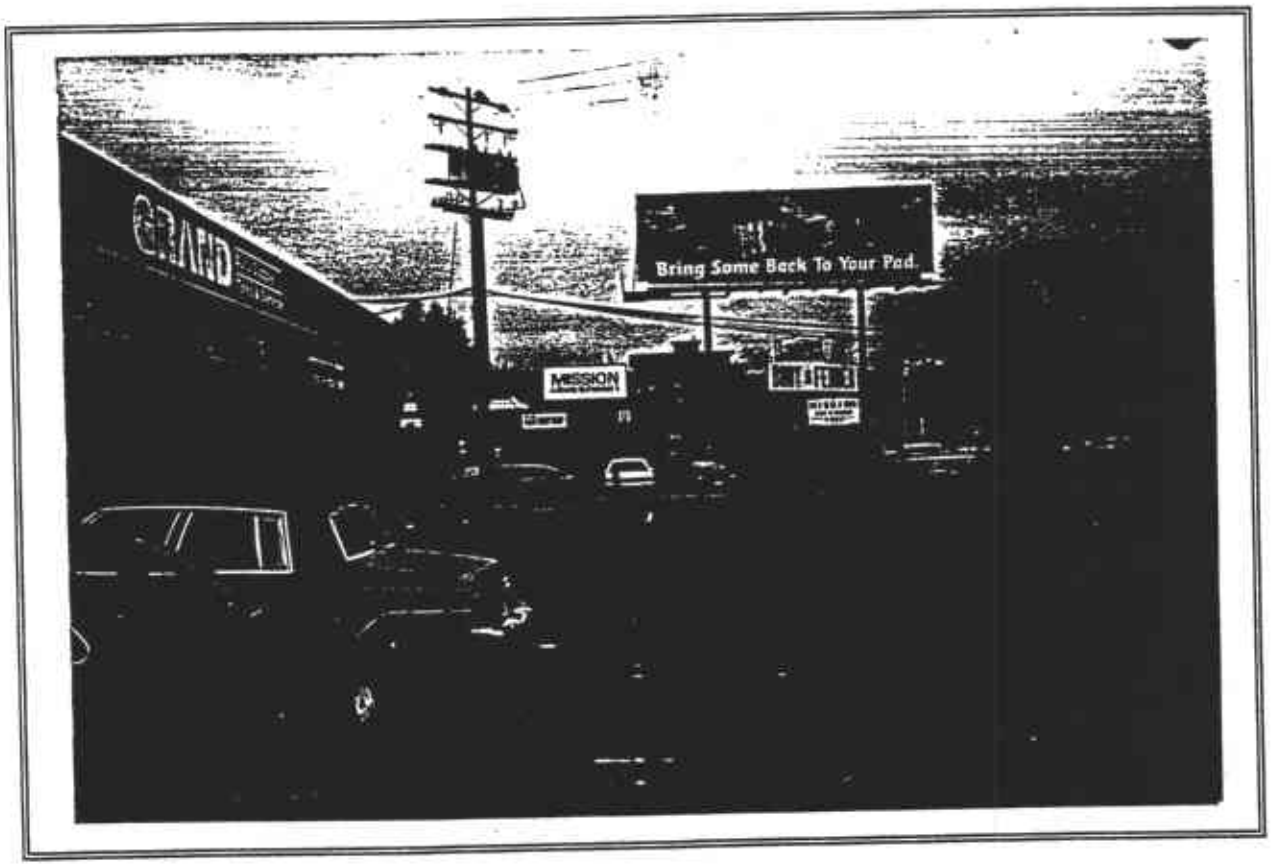


PHOTO 3: MISSION AUTO BODY & FENDER

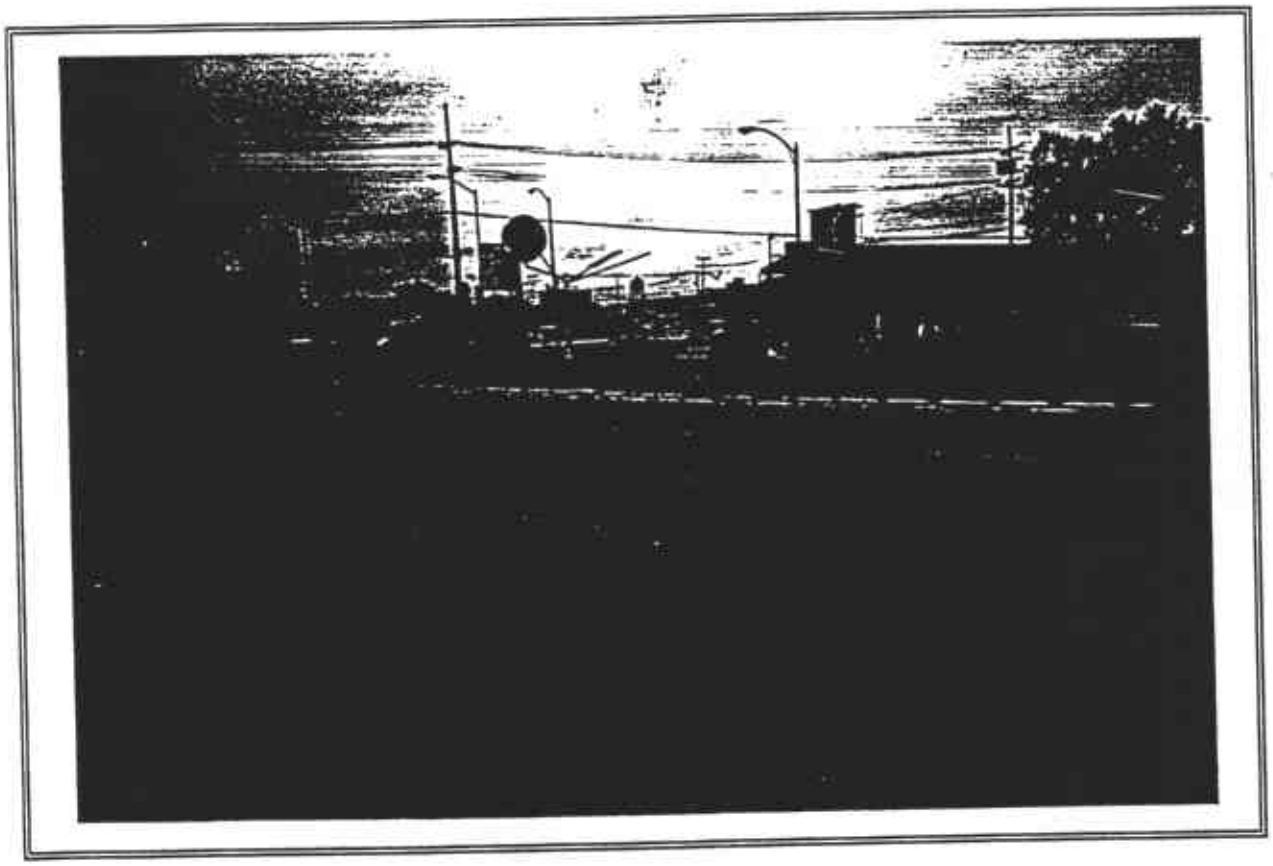


PHOTO 4: UNOCAL 76 AT 4251 E. 14TH

PHOTO 5: STRIP CENTER NORTHEAST OF GRAND AUTO

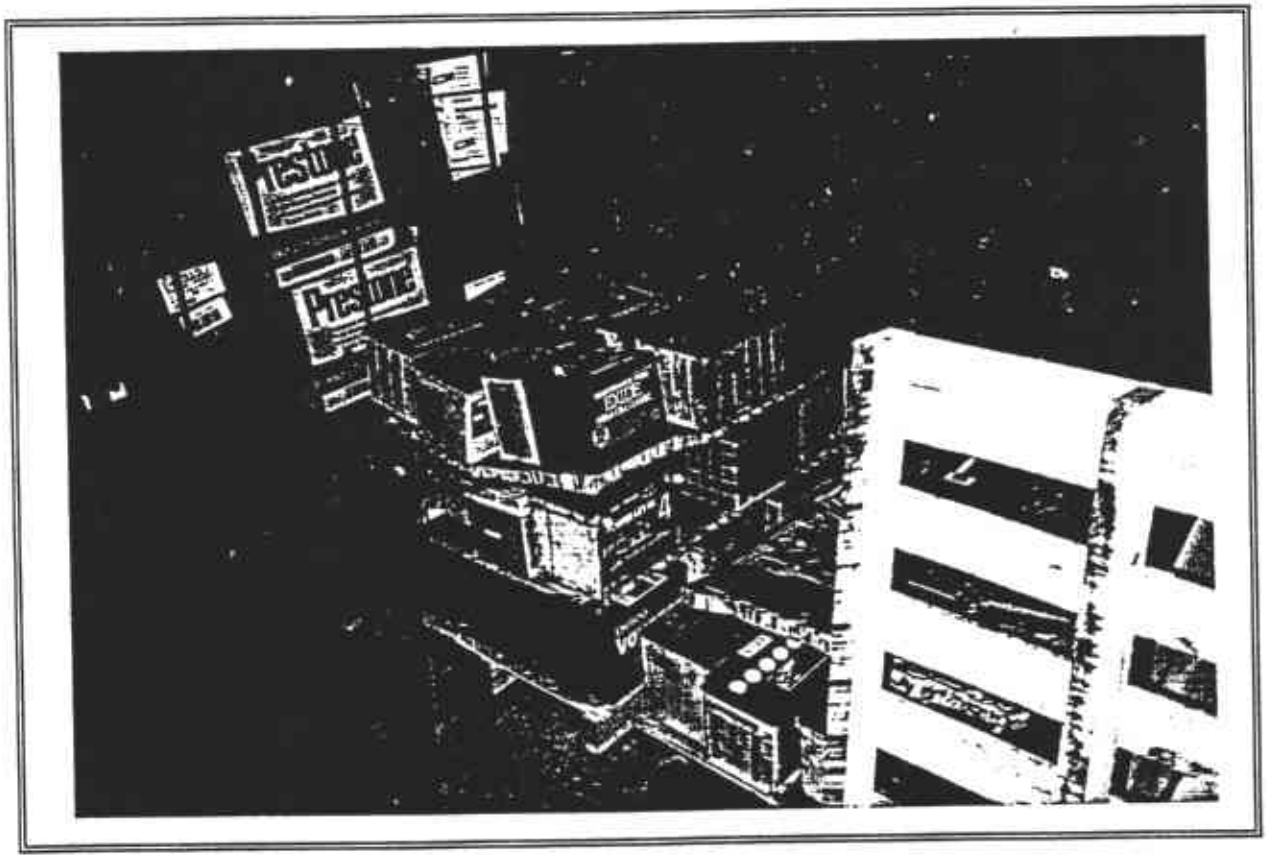


PHOTO 6: USED BATTERY STORAGE

PHOTO 7: NEW OIL, USED OIL AND WASTE COOLANT STORAGE

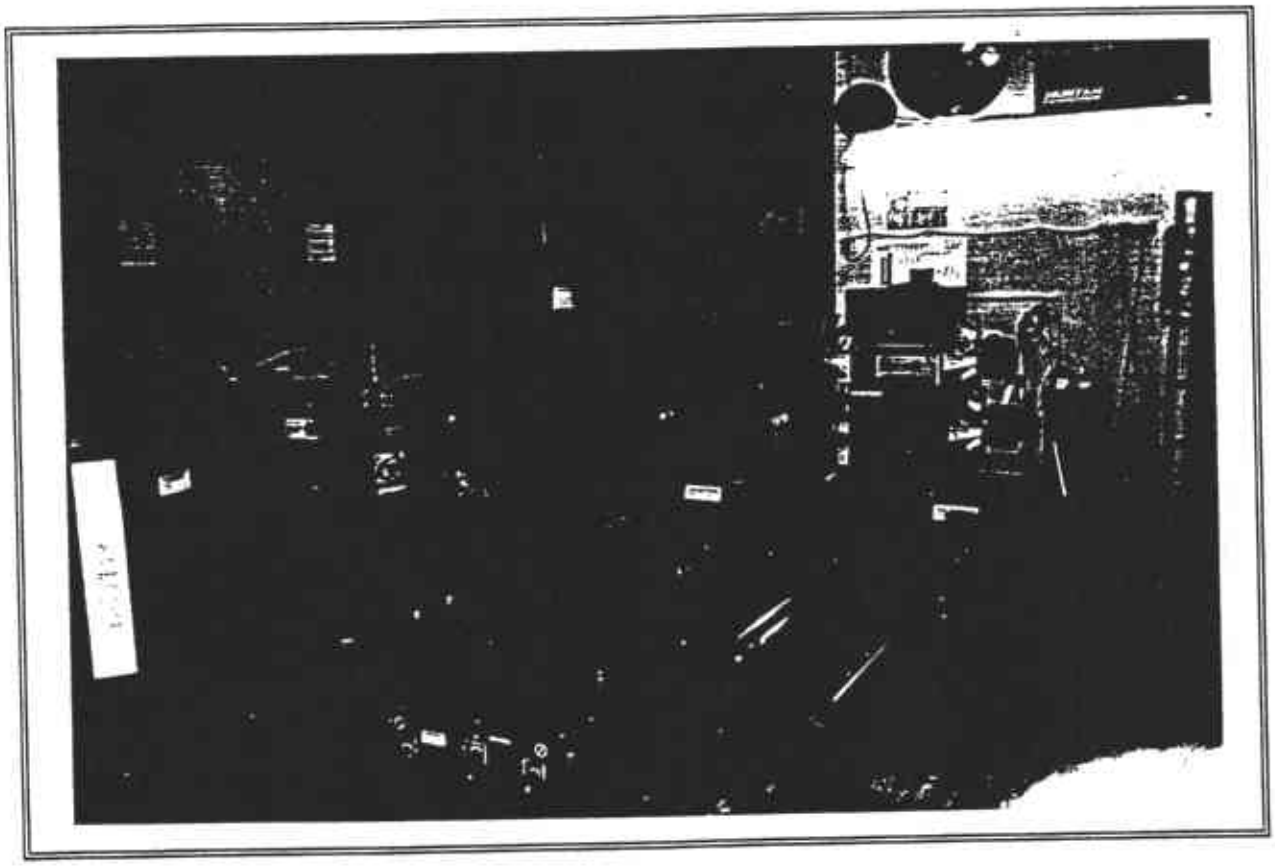


PHOTO 8: AIR COMPRESSORS AND ABOVEGROUND STORAGE TANK FOR HYDRAULIC LIFT

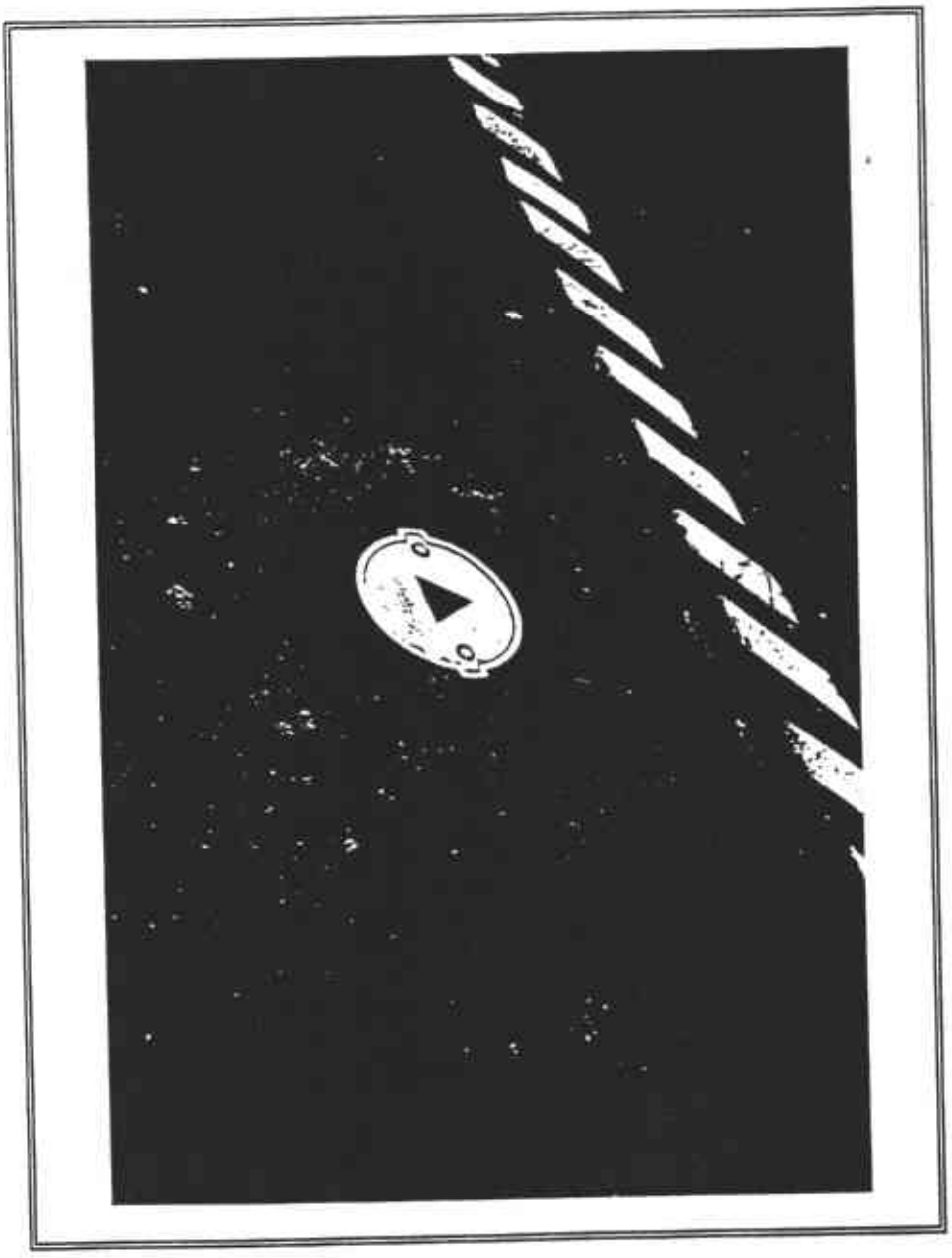


PHOTO 9: ONE OF 4 GROUNDWATER MONITORING WELLS

APPENDIX C

JUL 28 1995

ASBESTOS TEM LABORATORIES, INC.

EPA Interim Method
Polarized Light Microscopy
Analytical Report

Laboratory Job # 273-075

1409 Fifth Street
Berkeley, CA 94710
(510) 528-0108
FAX (510) 528-0109

ASBESTOS TEM LABORATORIES, INC

Accredited by
U.S. Dept. of Commerce
NVLAP
CA DOHS ELAP

July 26, 1995

Mr. Marvin Snapp
AllWest Environmental, Inc.
One Sutter Street, Ste-600
San Francisco, CA 94104

RE: LABORATORY JOB # 273-075
Polarized light microscopy analytical results for 4 bulk sample(s) with +2 sample split(s)
Job Site: PACCAR-H16H/E 14th
Job No.: 95181.21

Enclosed please find the bulk material analytical results for one or more samples submitted for asbestos analysis. The analyses were performed in accordance with EPA Method 600/R-93/116 for the determination of asbestos in bulk building materials by polarized light microscopy (PLM). Please note that while PLM analysis is commonly performed on non-friable and fine grained materials such as floor tiles and dust, the EPA method recognizes that PLM is subject to limitations. In these situations, accurate results may only be obtainable through the use of more sophisticated and accurate techniques such as transmission electron microscopy (TEM) or X-ray diffraction (XRD).

Prior to analysis, samples are logged-in and all data pertinent to the sample recorded. The samples are checked for damage or disruption of any chain-of-custody seals. A unique laboratory ID number is assigned to each sample. A hard copy log-in sheet containing all pertinent information concerning the sample is generated. This and all other relevant paper work are kept with the sample throughout the analytical procedures to assure proper analysis.

Each sample is opened in a class 100 HEPA negative air hood. A representative sampling of the material is selected and placed onto a glass microscope slide containing a drop of refractive index oil. The glass slide is placed under a polarizing light microscope where standard mineralogical techniques are used to analyze and quantify the various materials present, including asbestos. The data is then compiled into standard report format and subjected to a thorough quality assurance check before the information is released to the client.

Sincerely Yours,

Lab Manager
ASBESTOS TEM LABORATORIES, INC.

POLARIZED LIGHT MICROSCOPY
ANALYTICAL REPORT

Contact: Mr. Marvin Snapp
Address: AllWest Environmental, Inc.
One Sutter Street, Ste-600
San Francisco, CA 94104

Samples Submitted: 6
Samples Analyzed: 6
Job Site / No. PACCAR-H16H/E 14th 95181.21

Date Submitted: Jul-26-95
Date Reported: Jul-26-95

SAMPLE ID	ASBESTOS %	ASBESTOS TYPE	NON-ASBESTOS	LOCATION / DESCRIPTION
P1A Lab ID # 273-075-001		None Detected	Fibers: 90-95% Cellulose Matrix: 5-10% Glue, Paint	Sales Floor. 2x4 Ceiling Tile. Ceiling Tile-Brown
P1B Lab ID # 273-075-002		None Detected	Fibers: 90-95% Cellulose Matrix: 5-10% Glue, Paint	Garage Ceiling. Ceiling Tile. Ceiling Tile-Brown
P2A Lab ID # 273-075-003A	5-10%	Chrysotile	Fibers: None Detected Matrix: 90-95% Calc, Bndr	Sales Floor. 12x12 Wht. F.T./Mastic. Floor Tile-Grey
P2A Lab ID # 273-075-003B	1-5%	Chrysotile	Fibers: 1-5% Cellulose Matrix: 90-98% Tar, Opq, Qtz, Calc	Sales Floor. 12x12 Wht. F.T./Mastic. Mastic-Black
P2B Lab ID # 273-075-004		Not Analyzed	Fibers: Matrix:	Parts Floor. 12x12 Wht. F.T./Mastic.
P3A Lab ID # 273-075-005A	10-20%	Chrysotile	Fibers: None Detected Matrix: 80-90% Bndr, Calc	Bathroom. 9x9 Grey F.T./Mastic Floor Tile-Grey
P3A Lab ID # 273-075-005B		None Detected	Fibers: 10-20% Cellulose Matrix: 80-90% Tar, Opq, Glue, Qtz, Calc	Bathroom. 9x9 Grey F.T./Mastic Mastic-Black
P3B Lab ID # 273-075-006		Not Analyzed	Fibers: Matrix:	Back Hallway. 9x9 Grey F.T./Mastic
Lab ID #			Fibers: Matrix:	
Lab ID #			Fibers: Matrix:	

Lab Manager [signature] Analyst [signature]

ASBESTOS TEM LABORATORIES, INC.

1409 Fifth Street, Suite C Berkeley, CA 94710 Ph: (510) 528-0108 Fax: (510) 528-0109

*** PLM BULK SAMPLE SUBMISSION FORM / CHAIN-OF-CUSTODY REPORT ***

Company: AllWest

Address: 1 Sutter St, Suite [illegible]

City-State-Zip: S.F., CA 94111

Contact: Marvin Snapp

Analysis Requested/Turnaround: PLM / [illegible]

Job Site: PACCAR - HIGH/E [illegible]

Job No: 75181.21 P.O. #:

Phone: 415 391-2510 FAX: 415.391.[illegible]

SAMPLE NUMBER	LOCATION	DESCRIPTION
P1A	~~Fibrous~~ Sales Floor	2x4 Ceiling Tile
P1B	Garage Ceiling	" " "
P2A	Sales Floor	12x12 white Floor Tile/Mastic
P2B	Parts Floor	" " " "
P3A	Bathroom	9x9 Grey Floor Tile/Mastic
P3B	Back Hallway	" " " "

Special Instructions: Stop analysis after 1st Positive (>1%)

Relinquished By:	Date / Time	Received By:	Date / Time
Name/Company M. Snapp / AllWest	~~7-18-95~~ 7-27-95 12:10	Name/Company Asbestos TEM Lab	7-26-95 4:00 pm
Signature Marvin Snapp		Signature [illegible]	
Name/Company		Name/Company	
Signature		Signature	

Send Original to Lab - Keep Yellow Copy

ASBESTOS TEM LABORATORIES, INC.

1409 Fifth Street, Suite C Berkeley, CA 94710 Ph: (510) 528-0108 Fax: (510) 528-0109

*** PLM BULK SAMPLE SUBMISSION FORM / CHAIN-OF-CUSTODY REPORT ***

Company: AllWest

Address: 1 Sutter St, Suite 600

City-State-Zip: S.F., CA 94941

Contact: Marvin Snapp

Analysis Requested/Turnaround: PLM/ASAP

Job Site: PACCAR - HIGH/E 14th

Job No: 95181.21 P.O. #:

Phone: 415 391-2510 FAX: 415.391.2008

SAMPLE NUMBER	LOCATION	DESCRIPTION
P1A	~~Floor~~ Sales Floor	2x4 Ceiling Tile
P1B	Garage Ceiling	" " "
P2A	Sales Floor	12x12 White Floor Tile/Mastic
P2B	Parts Floor	" " "
P3A	Bathroom	9x9 Grey Floor Tile/Mastic
P3B	Back Hallway	" " "

Special Instructions: Stop analysis after 1st Positive (>1%)

Relinquished By:	Date / Time	Received By:	Date / Time
Name/Company M. Snapp / AllWest	~~7-18-95~~ 7-20-95 12:10	Name/Company	
Signature Marvin Snapp		Signature	
Name/Company		Name/Company	
Signature		Signature	

Send Original to Lab - Keep Yellow Copy

APPENDIX B

Estimating Equilibrium Concentration of Chlorinated VOCs in Soil and Groundwater Using Distribution Coefficients

APPENDIX B

Estimating Equilibrium Concentrations of Chlorinated VOCs in Soil and Groundwater Using Distribution Coefficients

In the saturated part of an aquifer, chemical interactions of chlorinated VOCs can be modeled by assuming a simplified, three-phase chemical system that consists of soil, water, and the chlorinated VOC of interest.

The overall ratio of the concentration of a VOC in the soil relative to the concentration of the VOC in the water is indicated by the equation

$$K_d = C_s/C_w \quad (1)$$

where: K_d is the overall ratio (or distribution coefficient), in L/kg,
C_s is the concentration of VOC in the soil (µg/kg), and
C_w is the concentration of VOC in the water (µg/L).

The components of soil are highly variable, and differ in their individual affinities for organic compounds such as chlorinated VOCs. Therefore K_d's for soil vary widely. However, for chlorinated VOCs, the soil components having the greatest affinities for VOCs are organic materials contained in the soil. Due to this effect, the amount of organic material in the soil, quantified as total organic carbon (TOC), is generally the most important indicator of potential affinity of the soil for VOCs. The distribution coefficient that describes the TOC/water concentration ratio is indicated by the equation

$$K_{oc} = C_{oc}/C_w \quad (2)$$

where: K_{oc} is the organic carbon/water ratio (or distribution coefficient), in L/kg,
C_{oc} is the concentration of VOC in the organic carbon (µg/kg), and
C_w is the concentration of VOC in the water (µg/L).

The K_{oc} for many VOCs and other organic compounds have been experimentally determined and are generally available (Table 4). Equation (2) above indicates that if $K_{oc} > 1$ (or $\log K_{oc} > 0$), then the VOC will be preferentially adsorbed onto the organic carbon. Conversely, if $K_{oc} < 1$ (or $\log K_{oc} < 0$), the VOC will preferentially be released to the water.

By assuming that the total concentration of a VOC in soil is due solely to the adsorption by organic material, the overall distribution coefficient can be expressed as

$$K_d = (\%TOC) \times K_{oc}. \quad (3)$$

Thus, by using an analyzed or estimated value for %TOC and a published value for K_{oc}, K_d can be estimated. Once K_d has been estimated, the corresponding equilibrium concentration in groundwater for a given soil concentration (or vice versa) can be estimated, as indicated by the following rearrangement of equation (1):

$$C_w = C_s/K_d . \quad (4)$$

As an example, for PCE in soil sample S2C-8, the concentration of PCE was determined to be 104 µg/mg. TOC in Bay mud typically ranges from 1.0% to 0.1%. Using a log K_{oc} of 2.56 for PCE (Table 4), the K_d for this sample is estimated (Equation 3) to range from

$$K_{d(max)} = (\%TOC) \times K_{oc} = 1.0\% \times \log 2.56 = 3.63$$

to

$$K_{d(min)} = (\%TOC) \times K_{oc} = 0.1\% \times \log 2.56 = 0.363.$$

The corresponding range of equilibrium water concentrations for the soil concentration of 104 µg/mg is therefore estimated (Equation 4) to be

$$C_{w(min)} = 104/3.63 = 28.6 \text{ µg/L} \quad (5)$$

to

$$C_{w(max)} = 104/0.363 = 286 \text{ µg/L}. \quad (6)$$

The estimated range equilibrium concentration for PCE in water (28.6 to 286 µg/L) is less than the maximum concentration of 340 µg/L of PCE measured in groundwater from nearby well MW-1. A similar calculation suggests that a soil TOC of 0.14% will produce an equilibrium water concentration of 200 µg/L PCE, the historical minimum measured in MW-1 (with the exception of the apparently anomalous 1/31/95 data).

Note that sample S2C-8 was collected from well above the water table (8 ft bgs). It is used as an example because this PCE concentration was the highest detected in site soil. The above calculations thus represent a conservative analysis. The second highest concentration of PCE detected in soil (30 µg/kg) was detected in boring B-8, drilled in the sump area. This sample was collected near the water table at 25 ft bgs; three samples collected from B-8 at shallower depths did not contain detectable PCE,

strongly suggesting that the PCE detected did not migrate from above. Calculations using equations 5 and 6 above and a PCE concentration of 30 µg/kg indicate an equilibrium concentration of 8 to 82 µg/L in water, well below historical concentrations.

Thus, soil containing greater than a minimum percentage of TOC and containing PCE at the detected concentrations, if in direct contact with water, is unlikely to produce PCE concentrations in groundwater as high as those historically observed in MW-1.

It should be noted that these calculations do not take into account adsorption of PCE by clay minerals in the Site soil (silty clay, i.e. "Bay Mud"). When the percentage of clay in soil greatly exceeds the percentage of TOC, as is the case at the Site, adsorption of VOCs by clay may greatly exceed adsorption by organic carbon (e.g. Mackay et al., 1985). The aqueous PCE concentrations calculated above therefore represent a maximum range, exclusive of additional adsorption of PCE by clay. The extent of adsorption by clays of VOCs has not been adequately quantified, however, so that it is not possible to estimate the magnitude of clay adsorption effects.

REFERENCE

Mackay, D.M., Roberts, P.V., and Cherry, J.A., 1985, Transport of organic contaminants in groundwater; Envir. Science & Technology, v. 19, no. 5, 384-392.