ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

AMCO CHEMICAL COMPANY
OAKLAND, ALAMEDA COUNTY, CALIFORNIA
EPA FACILITY ID: CA0001576081
SEPTEMBER 22, 2005

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations (42 C.F.R. Part 90). In preparing this document, ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30-day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the agency's opinion, indicates a need to revise or append the conclusions previously issued.

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PUBLIC HEALTH ASSESSMENT

AMCO CHEMICAL COMPANY

OAKLAND, ALAMEDA COUNTY, CALIFORNIA

EPA FACILITY ID: CA0001576081

Prepared by:

California Department of Health Services
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

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ASTs—Above Ground Storage Tanks
ATSDR—Agency for Toxic Substances and Disease Registry
BART—Bay Area Rapid Transit
bgs—below ground surface
CalEPA—California Environmental Protection Agency
Caltrans—California Department of Transportation
CERCLA—Comprehensive Environmental Response, Compensation, and Liability Act
CDHS—California Department of Health Services
COCs—contaminants of concern
CREG—Cancer Risk Evaluation Guide for one in a million excess cancer risk
CSBCA—Chester Street Block Club Association
DEH—Alameda County Department of Environmental Health
DHHS—U.S. Department of Health and Human Services
DTSC—California Department of Toxic Substances Control
EBMUD—East Bay Municipal Utility District
EHIB—Environmental Health Investigations Branch
EMEG—Environmental Media Evaluation Guide (ATSDR)
IARC—International Agency for Research on Cancer
kg—kilogram
LOAEL—Lowest Observable Adverse Effect Level
MCL—Maximum Contaminant Level for drinking water (state and federal)
mg—milligram
microgram (µg)—one-millionth of a gram, or 0.000001 grams
MRL—Minimal Risk Level (ATSDR)
NA—not analyzed or not applicable
NAPL—non-aqueous phase liquid
ND—not detected
NPL—National Priorities List (USEPA)
NTP—National Toxicology Program
OSHA—Occupational Safety and Health Administration
PCDDs/PCDFs—poly-chlorinated dibenzodioxins/poly-chlorinated dibenzofurans
PCE—tetrachloroethylene
PG&E—Pacific Gas & Electric
PHA—public health assessment
PI—Pacific Institute
PID—photo ionization detector
ppm—parts per million
ppb—parts per billion
ppbv—parts per billion volume
PPE- personal protective equipment
PRGs—preliminary remediation goals (USEPA)
PRP—potentially responsible party
RCRA—Resource, Conservation, and Recovery Act
RfC—Reference Concentration (USEPA)
RfD—Reference Dose (USEPA)
REL—Reference Exposure Level
RI—remedial investigation
RI/FS—remedial investigation/feasibility study
RMEG—Reference Dose Media Evaluation Guide (ATSDR)
ROD—Record of Decision (USEPA)
RWQCB—Regional Water Quality Control Board
SPNA—South Prescott Neighborhood Association
SVOC—semi-volatile organic compound
TAG—Technical Assistance Grant (USEPA)
TCE—trichloroethylene
TDS—Total Dissolved Solids
TRI—Toxic Release Inventory (USEPA)
UPR—Union Pacific Railroad
USEPA—U.S. Environmental Protection Agency
USTs—Underground Storage Tanks
VOC—volatile organic compound
WOA—West Oakland Alliance

A description of some of these terms can be found in the *Glossary* (Appendix C)

Summary

The California Department of Health Services (CDHS) has prepared this public health assessment (PHA) for the AMCO Chemical (AMCO) site under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). The AMCO site is located at 1414 Third Street in Oakland, Alameda County, California, and was used as a chemical transfer facility from the 1960s to 1989. The site occupies approximately 0.83 acres and is currently owned by DC Metals and Cypress Street Investments. Site operations involved the transfer of chemicals from large volume tanks and railroad cars into smaller volume drums and containers for resale. Chemicals handled on the site included chlorinated solvents and petroleum-related products. The site is located in an area zoned for mixed residential, commercial, and industrial land uses.

The AMCO site is situated in the West Oakland neighborhood of South Prescott. CDHS collected community health concerns as a part of the PHA process from a variety of sources including the South Prescott Street Neighborhood Association (SPNA), the Chester Street Block Club Association (CSBCA), and the West Oakland Alliance (WOA). The community expressed concerns ranging from breathing problems, miscarriages, and cancer, to property values. Community members are concerned about vinyl chloride from the AMCO site affecting their health and the cumulative health effects from all pollution sources in the area. There is also concern about the lack of inclusion of the community in the decision-making process.

Soils and groundwater (water flowing below the surface of the ground) have been impacted by volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals. Contamination is on the site and, in some cases, has migrated off site. The AMCO site was occupied by the DC Metals Company from 1989 to 1998. During this time, the site was used for storage and sale of scrap metals. Since 1998, the site has been leased to the Cable Moore Company by DC Metals to store cables.

The source area for contamination on the AMCO site is centered near the former railroad spur, where chemicals were offloaded. In December 1996, the U.S. Environmental Protection Agency (USEPA) initiated an emergency response action at the AMCO site. This included removing some contaminated soil and installing a groundwater and vapor treatment system (incinerator). The treatment system operated from January 1997 until July 1998. When it became apparent to the community that this system was incinerating the contaminants, some community members felt mislead about what the treatment system was doing. There were also concerns about dioxins being emitted by the treatment system.

Two areas of the AMCO site were previously unpaved and it is likely that on-site workers had some exposure to contaminants in the soil in these areas. Because the frequency of exposure was probably low, it is unlikely that on-site workers experienced any health effects. The AMCO site is currently paved; therefore, workers are not currently exposed to the soil contamination on the site. Without activity and use limitations, maintenance of the pavement, or remediation of the source area, people could be exposed to soil contamination in the future.

Air data collected during subsurface excavations in 1996 indicate that utility workers were exposed to VOCs. Exposure to levels of trichloroethene (TCE) in air could pose short-term health problems including dizziness, lung irritation, and headaches. Using the average concentrations of TCE in air at excavations on the AMCO site, workers spending 5 days per year for 9 years on the site without protective equipment are estimated to have a low increased cancer risk. Therefore, CDHS considers the past and future utility worker inhalation pathway to pose a public health hazard. Subsurface soil and soil gas contaminants and associated VOC vapors at the AMCO site pose an exposure risk to utility workers who may excavate on or near the AMCO site in the future, unless appropriate personal protective equipment (PPE) are used, contaminants are remediated, or activity and use limitations are imposed. The City of Oakland has placed a permit restriction on excavations at the AMCO site.

Vinyl chloride has been detected in the crawlspace of three residences that abut the site. Although the concentrations detected are not at levels that pose a health risk, their detection indicates that people in these residences may have breathed in some of these contaminants. Because the source area has not been adequately contained or remediated, future exposure to soil gas vapors in these residences is considered a potentially completed exposure pathway. CDHS recommends that the vapor intrusion pathway be further characterized for the adjacent residences, including collecting additional air data and sub-slab soil gas data and analyzing samples for a variety of VOCs to determine if VOCs from the site pose a risk to residents in abutting houses.

The proximity of the AMCO office to the source area (less than 30 feet) suggests VOCs could have been drawn into the office. Therefore, present and future on-site worker inhalation pathway in the building (office) is considered potentially completed until more data can be collected or the source area is contained or remediated. Due to limited data and uncertainties about future conditions on the site and the abutting residential properties, CDHS considers this pathway to be an indeterminate public health hazard. CDHS recommends that the vapor intrusion pathway at the AMCO office be further characterized.

Groundwater beneath the AMCO site is contaminated with VOCs at concentrations above health comparison values. In August 2002 residual liquid wastes (free floating product) were observed in two on-site monitoring wells at a maximum thickness of 5.3 feet. However, nobody is drinking this water and because the groundwater has high levels of total dissolved solids, future use as a potable water source is highly unlikely. Further compromising future use as a potable water source are the effects of tidal influence (potential salt water intrusion) and the salty soils and marine clays present in soils in the area (1), which may limit extraction rates. Therefore, the groundwater consumption exposure pathway is considered eliminated.

Using available data, CDHS has concluded that the AMCO site has four completed exposure pathways, two potentially completed exposure pathways, and four pathways that have been eliminated from consideration**.** The breathing of vapors from subsurface excavations by utility workers is considered a public health hazard. The potential present and future exposure to soil gas contamination at the site office and abutting residences are considered indeterminate public

health hazards (Table 1). The potential future exposure to subsurface soil contamination at the AMCO site is considered an indeterminate public health hazard. On the basis of CDHS review of the site data and understanding of the neighborhood, CDHS is concerned that people may have come into contact with chemicals at the site at levels that could result in health effects or could come into contact with them in the future. The concentrations of chemicals that remain at the AMCO site could pose health risks to utility workers, on-site workers, and neighboring residents in the future. Therefore, CDHS considers the AMCO site to be a public health hazard.

Background

This PHA was prepared by CDHS under a cooperative agreement with ATSDR. In this document, CDHS and ATSDR will determine whether health effects are likely to occur because of past, present, or future exposure to site contaminants, and will recommend actions to reduce or prevent possible exposures. ATSDR, located in Atlanta, Georgia, is a federal agency within the U.S. Department of Health and Human Services (DHHS) and is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 to conduct PHAs at hazardous waste sites. The conclusions of this PHA for the AMCO site are based on a review of available environmental data, community concerns, information obtained from site visits, and consultations with involved parties and the public.

USEPA added the AMCO site to the National Priorities List (NPL) in April 2003. The NPL is a list of hazardous waste sites eligible for federal funds to carry out extensive long-term cleanup. The NPL is part of the CERCLA Superfund Program. USEPA investigates NPL sites to determine if they pose risks to public health or the environment and to eliminate those risks, whenever possible.

Site Description and History

The AMCO site is located at 1414 Third Street in Oakland, Alameda County, California. The site was used as a chemical transfer facility from the 1960s to 1989 (Figure 1). Bulk chemicals were offloaded from a railroad spur that entered the site from Third Street. Chemicals were stored in aboveground storage tanks (ASTs) and underground storage tanks (USTs) prior to being transferred to smaller containers for resale (2). From 1989 to 1998, the site was occupied by the DC Metals Company, who used the site for a scrap metal business. In November 1998, all metal scrap and equipment were removed from the site by the operator (3). From 1998 to present, the site has been leased by the Cable Moore Company for cable storage purposes.

The site occupies approximately 0.83 acres and is currently owned by DC Metals and Cypress Street Investments. The site is located in an area zoned for mixed residential, commercial, and industrial land uses. The site is bounded to the east by Nelson Mandela Parkway, to the north by a vacant lot and the California Soda Company, to the west by residences and Center Street, and to the south by Third Street (Figure 2). The site is located approximately ½ mile north of the Oakland Inner Harbor and less than 300 feet north of State Highway 880. The AMCO site is generally level and sits approximately 10 feet above mean sea level. The immediate area is also level and is about 10 feet above mean sea level with a very slight gradual downward grade to the south toward the Oakland Inner Harbor. Groundwater elevations vary seasonally, with the

highest elevations in the spring and lowest in the late fall. The approximate direction of groundwater flow varies from 343 degrees (north-northwest) to 230 degrees (southwest), but the dominant flow is towards the west-southwest. Groundwater in the area is likely influenced by tides (4). B-63 (Figure 3) has the highest vinyl chloride concentrations encountered and for the purposes of this analysis, will be considered the center of the VOC contamination (4). Groundwater is encountered at a depth ranging 3 to 8 feet below ground surface (bgs) beneath the site (3). The nearest surface water (Oakland Inner Harbor) is more than ½ mile from the site with no intervening drainage pathways (3).

In 1988, the California Department of Toxic Substances Control (DTSC) conducted an inspection of the AMCO site. During this investigation, DTSC determined from the property owner that chlorinated and non-chlorinated organic solvents, water soluble and oil soluble cleaners, and other chemicals had been handled and stored on the site (3). The DTSC inspector observed spillage of chemicals to soil as well as leaking and deteriorating drums (5). Subsequent to the inspection by DTSC, a report of violation was drafted but, for unknown reasons, was not sent to AMCO (6).

On July 18, 1988, the Alameda County Department of Environmental Health (DEH) met with the site owner regarding the site cleanup (7). On July 26, 1988, DEH conducted an emergency response at the AMCO site subsequent to notification that the Oakland Fire Department had observed leaking drums at the site (3). During this response, DEH investigators noted over 100 5- and 55-gallon drums, many of which were corroded, bulging, or leaking. Among the drum labels noted in the investigation were acetone, 1,1,1-trichloroethane, methanol, methyl ethyl ketone, and dry cleaning solvent (7). Dry cleaning solvents often contain chlorinated solvents such as trichloroethene (TCE) and tetrachloroethene (PCE). DEH did not find that emergency action was necessary.

During the years AMCO was in operation, there were 12 ASTs, a large number of drums, and two 10,000-gallon USTs on the site (3). The USTs were installed prior to 1970, most likely in the 1960s (8). All ASTs and drums were removed from the site in 1989, when AMCO ceased operations (9).

The contamination source area on the AMCO site is centered near the former railroad spur where chemicals were offloaded. This area was previously unpaved (Figure 3). The USEPA Site Priority Characterization identified the source at the AMCO site as a 6,500 square foot area of contaminated soil (10). However, the boundaries of this source area were not specifically identified. A circle with a diameter of 91 feet (45 ½ foot radius) would approximate 6,500 square feet.

Vinyl chloride has been detected in soil, groundwater, and soil gas on the site. The vinyl chloride at the AMCO site is most likely the result of the breakdown of precursor compounds like PCE and TCE (11). The technical memorandum prepared by Ecology and Environment, Inc., identified boring 63 (B-63) as the center of the source area for vinyl chloride (4). This boring is located in the area of the former railroad spur and the existing inactive treatment trench (Figure 3).

On April 26, 1996, DTSC issued an Imminent and Substantial Endangerment Order to DC Metals and AMCO (Docket #181SE95196-005) (6). BSK & Associates submitted a draft Public Participation and Remedial Action Plan for the site on behalf of DC Metals. In September 1996, DTSC requested USEPA's assistance to assess vinyl chloride contamination at the site.

USEPA conducted a Removal Assessment at the AMCO site in October 1996 and initiated an Emergency Response action in December 1996. USEPA's Emergency Response action included removing some contaminated soil and installing a groundwater and soil vapor treatment system that operated from January 1997 until July 1998 (3). The treatment system consisted of a soil and groundwater vapor extraction system that essentially sucked VOC contaminants from the soil and the groundwater. These vapors were then mixed with natural gas and burned in an incinerator. The incineration exhaust then went through an air scrubber to remove any particulates or remaining materials.

As part of the construction of the treatment system, approximately 160 cubic yards of soil were excavated from the site and from beneath the sidewalk immediately south of the site (3). During excavation for the treatment system collection trench, a 1,800-gallon UST containing oily water and sludge was discovered (3). This UST, located under the sidewalk on Third Street, was removed and disposed of off site. A small volume of petroleum contaminated soil was also removed (3).

USEPA observed vapors emanating from the treatment trench excavation on December 5 and 14, 1996. These vapors were analyzed and were found to contain vinyl chloride at concentrations of up to 120 parts per billion volume (ppbv). Vinyl chloride precursor compounds, PCE and TCE, were also detected in grab samples at concentrations up to 420 and 9,600 ppbv (12).

In December 1997, CDHS released a health consultation on the West Oakland/Cypress Reconstruction Corridor (13). This report investigated environmentally contaminated properties and companies that use, store, or handle hazardous materials in West Oakland. The report focused on the area encompassed by Maritime Street to the west, 10th Street to the north, Market Street to the east, and Middle Harbor Road to the south. CDHS identified 29 contaminated sites within the neighborhood of concern, including the DC Metals site (now referred to as AMCO) and the former Bobo Junkyard (now referred to as the Union Pacific Railroad (UPR) site). CDHS also identified 49 RCRA hazardous material handlers within the area of concern.

In 1997 and 2000, groundwater samples were collected from seven locations on the AMCO site and three locations to the south along Third Street (Figure 4). These samples were collected from depths ranging from 5 to 45 feet bgs. This sampling identified over 30 different VOCs in the groundwater, including 16 VOCs at concentrations above health comparison values. Some of the VOCs detected included 1,1,1-trichloroethane, acetone, cis-1,2-dichloroethene, PCE, TCE, toluene, and vinyl chloride.

By February 1998, USEPA estimated the treatment system on the AMCO site treated 6,260 pounds of VOCs from the soil and groundwater, including 36 pounds of vinyl chloride from the soil and 553,000 gallons of contaminated groundwater, which contained 1,900 pounds of VOCs, including vinyl chloride (14). Although the treatment system appeared to be working properly, it

was shut down in July 1998 in response to community concern over potential exposure to dioxin contaminants from the system's incinerator exhaust stack (2).

USEPA and various contractors have collected additional environmental data since 1998. This data can be found in the Preliminary Assessment/Site Investigation Report released in August 2001 (3), and in the Data Evaluation Report released in August 2002 (15). Additional data was collected in the fall of 2004. Results from this round of data collection should be released in 2005.

Site Visit

CDHS staff visited the AMCO site and the immediate neighborhood on August 20, 2003. CDHS staff was accompanied by USEPA staff during the site visit to provide access and a verbal history of activities at the site and in the area.

The following observations were made during the August 20, 2003 site visit:

- The Nelson Mandela Parkway was only graded dirt during the site visit. The City of Oakland was in the process of completing the extension for this road, but no pavement had been laid. Subsequent to this visit, the road had been paved.
- The property immediately to the east of the AMCO site is owned by the Alliance for West Oakland Development and is currently being used as a parking lot. There is one building on this property that is reportedly being used for storage. An environmental assessment has been conducted on this site that analyzed soils for contamination (Bruni Davila, USEPA, personal communication, August 13, 2003). This report focused on concerns about soil contamination. The West Oakland Alliance is interested in developing this property into a multi-level parking facility and potentially some residential dwellings.
- Construction activities were evident on the Amtrak train property to the southeast of the site. This property is being developed as a train maintenance facility.
- Immediately to the north of the AMCO site is a vacant dirt lot that is owned by the Bay Area Rapid Transit (BART). There is a chain-link fence around the perimeter of this lot. The gate to this lot was open during the site visit. This lot appears to be used for storage of light construction materials.
- There is an office on the southeast corner of the AMCO site at the junction of Nelson Mandela Parkway and Third Street. There is a warehouse immediately north of the office. As CDHS staff walked onto the site, remnants of the former railroad line could be seen in the pavement. This "fingerprint" of the railroad line can be seen almost all the way to the northern edge of the warehouse and overlaps with the approximate source area for the site.
- The entire AMCO site appeared paved during the site visit.
- The AMCO site is currently occupied by the Cable Moore Company. Current activities at the site appear to be storage and handling of various types and gauges of wire. Some manipulation of the wire was occurring during the site visit, such as cutting and splicing wire. The majority of the site is occupied by large spools of industrial cables.
- There were some remnant materials from the former treatment system in the southern portion of the site. There was a shed, some utility connections, and a concrete pad in the vicinity of the treatment system.

- There are five residential properties within 150 feet to the west of the AMCO source area. Most of these homes appear to be greater than 30 years old. Some of them are duplexes with one tenant upstairs and another living at or near street level.
- There are three residential properties located approximately 200 feet to the northwest of the AMCO source area. There are several additional residences across Center Street located greater than 200 feet from the AMCO source area.
- CDHS walked around the neighborhood to assess potential residential exposure issues. There are three residential properties immediately to the west of the AMCO site.
- Immediately to the south of the AMCO site is the UPR site, located at 1401 Third Street. The UPR site had a Remedial Investigation Report and a Baseline Risk Assessment completed by Geomatrix Consultants for DTSC to assess contamination at the property (16).
- The property to the south of AMCO was remediated by UPR and the California Department of Transportation (Caltrans) in 1999. UPR and Caltrans remediated the area where the footings for Route 880 overpass on-ramp are currently located.
- South Prescott Park is located to the south-southwest of the AMCO site, across Third Street.
- Caltrans remediated the area that is now South Prescott Park. This area was remediated by removing contaminated soil, sampling remaining soil to ensure clean-up levels were achieved, and then regrading the whole area with 3 feet of clean fill. The entire park was then landscaped into its current form.
- To the west-northwest of the AMCO site is a vacant, paved lot. This area appears to have been used as a parking lot and storage area.
- The Cypress Freeway (Highway 880) is an eight-lane elevated freeway located less than 300 feet south of the site.
- Along Fifth Street to the north of the AMCO site is a parking lot and a warehouse used by the Cable Moore Company and the California Soda Company.
- CDHS made a brief visit to the AMCO site on May 16, 2005, to assess current activities. The AMCO site is still occupied by the Cable Moore Company. The majority of the site is occupied with large cable spools. No significant activities appeared to be taking place during this visit.

Demographics, Land Use, and Natural Resources

Demographics

According to the 2000 census, 399,484 people reside in the City of Oakland and 21,048 people reside in the 94607 zip code. According to the 2000 census, 759 people live in block group 1 of census tract 4019 in Alameda County. Block group 1 is bounded by Seventh Street to the north, Adeline Street to the east, and beyond Bay Street to the west (Figure 5). The southern boundary of Block group 1 of census tract 4019 goes all the way to Middle Harbor Road to the southwest. The main residential area in this census tract is referred to as the South Prescott neighborhood. The South Prescott Neighborhood is generally thought to be bounded by Seventh Street to the north, Third Street to the south, Mandela Parkway to the east, and Peralta Street to the west. Approximately 51% of the population in block group 1 of census tract 4019 is of Hispanic or Latino decent; approximately 23% is of African American origin; approximately 14% is white; and roughly 7% is of Asian decent.

According to the 2000 census, 51% of people living in census tract 4019, which includes the AMCO site, speak a language other than English at home; 46.8% of those people speak Spanish or Spanish Creole at home; the only other languages spoken at home in census tract 4019 are Chinese (2.0%), Arabic (1.6%), and French (including Patois, Cajun) (0.5%).

Slightly less than half (49%) of the population in block group 1 of census tract 4019 is female and slightly more than half (51%) is male. The dominant age group for males and females in block group 1 of census tract 4019 are 25-29 year olds. Roughly 11% of the total population of males and females is in this age group. The median age for the total population is 29.3 years old.

Of the 223 households reported in block group 1 of census tract 4019, approximately 60% are renter-occupied households and approximately 40% are owner-occupied units. The median value for properties in Oakland in 2000 was $235,500. The median value for homes in census tract 4019 was $141,200. The median monthly rent in Oakland in 2000 was $631. The median monthly rent in census tract 4019 was $603.

Eight single and multi-family residences abut the AMCO site on the same block, most with children living in them. The closest residential property is located on Third Street. This residence abuts up to the western edge of the AMCO site boundary and is located within 100 feet of the AMCO source area. There are additional residential properties located across Center Street.

The Prescott Elementary School, located at 920 Campbell Street, is approximately ½ mile northwest of the AMCO site. The Cole School (grades 4 through 8), located at 1011 Union Street, is approximately ½ mile northeast of the AMCO site.

Land Use

The AMCO site is located within the City of Oakland's S-15 district. The S-15 district allows for mixed-use development, including retail, residential, commercial, and other uses in an environment conducive to pedestrian and multi-modal transit activities (17). The City of Oakland has placed a permit restriction on excavations at the AMCO site (Odili Ojukwu, City of Oakland Environmental Division, personal communication, July 28, 2004). However, the specifics of this permit restriction were not available to CDHS as of the date of this report. CDHS has made efforts to meet with the City of Oakland to determine the limitations of this permit process, but have not been able to get specifics pertaining to the permit process for the area.

Immediately to the south, across Third Street, is the UPR site. The UPR property was owned by Occidental Chemical Company from 1973 to 1976 (18). Best Fertilizer, a subsidiary of Occidental Chemical Company, was the owner of record from 1966 to 1973. Southern Pacific Transportation Company purchased the property from Occidental in 1976 and leased it to the owner of Bobo's Junkyard for use as an automobile dismantling operation until 1988 (18). The remedial investigation for this site identified various hydrocarbons, VOCs, and pesticides as contaminants in the soil (16). The UPR site is being overseen by the DTSC. The UPR site is currently occupied by the footings for Cypress Highway Route 880 overpass and an associated on-ramp.

The South Prescott Park playground is located approximately 150 feet southwest of the AMCO site. The South Prescott neighborhood is located to the west of the AMCO site and is comprised predominantly of single family dwellings. There is a BART station located 500 feet north of the site. Approximately 4,700 people exit this station daily. An additional 154,000 people ride trains that stop at this station every day (10).

Community Health Concerns/ Health Concerns Evaluation

Introduction and Purpose

The collection, documentation, and responses to community health concerns are a vital part of the PHA process. The purpose of this section is 1) to characterize the main exposure/health concerns compiled to date by CDHS of the community living near the AMCO site; 2) to provide educational information about the exposure/health concerns; and 3) to use the PHA to inform the community about what is happening at the site and immediate area.

Background Information

There are several well organized community groups based in the vicinity of the AMCO site. The three most active groups appear to be the South Prescott Street Neighborhood Association (SPNA), the Chester Street Block Club Association (CSBCA), and the West Oakland Alliance (WOA). Both SPNA and CSBCA are neighborhood-based associations that are open to the residents who want to join. The mission of the WOA is to initiate, promote, and facilitate the development of blighted residential and commercial districts in West Oakland, California, improving opportunities for long-time residents, and preserving the cultural roots of the area (19). The SPNA is based in the neighborhood that AMCO is located in. The South Prescott Neighborhood is bounded by Seventh Street to the north, Third Street to the south, Mandela Parkway to the east, and Peralta Street to the west.

USEPA provides the opportunity for community groups to apply for a Technical Assistance Grant (TAG). The TAG is designed to provide an independent technical advisor for the community. USEPA received TAG applications from all three of these community groups. The TAG grant was awarded to the WOA. The WOA formed an alliance with the SPNA to implement the grant.

In January 1996, the CSBCA filed a Title VI complaint with USEPA headquarters' Office of Civil Rights concerning the AMCO site (3). Title VI of the Civil Rights Act of 1964 prohibits the use of federal funds for projects that have a discriminatory or disparate impact on a low-income community or a community of color. In 1996, Clearwater Revival Company began working with the CSBCA to address the neighborhood pollution problems. Clearwater Revival Company is an environmental engineering firm that provides technical assistance to community groups on various environmental issues.

CDHS has heard from a number of community members and groups that they felt mislead by the communication process to inform them about the treatment system installed at the AMCO site in 1996/1997. At first they were told that that the treatment system is called a "thermal oxidizer."

But upon learning that the system was actually 'incinerating' the AMCO contaminants, some community members expressed their concerns and wanted the system stopped because they thought that the thermal oxidizer/incinerator could release dioxins into the air.

In June 1998, Green Action and the California Communities Against Toxics voiced criticism of the AMCO site thermal oxidation/incineration treatment system for potentially releasing dioxins and furans into the neighborhood and requested the treatment system be shut down (3). Green Action is an organization that mobilizes communities to change corporate and government policy to protect health and promote environmental justice. California Communities Against Toxics are an organization committed to environmental justice, pollution prevention and world peace. It is true that polychlorinated dibenzodioxins and dibenzofurans (PCDDs/PCDFs), or dioxins, are potentially formed from oxidation of gas-phase halogenated VOCs (20). This usually occurs when incineration does not fully combust the contaminants.

To address community concerns, USEPA collected air samples from the incinerator on June 16 and 17, 1998, and analyzed them for VOCs and dioxins (21). Dioxins were detected in 3-hour time-weighted samples at 0.0083 nanograms per cubic meter (ng/m^3), 0.0103 ng/m^3, and 0.0289 ng/m^3 (21). There are few health-based comparison values available for dioxins. The State of Arizona has developed an annual acceptable ambient air concentration (0.03 ng/m^3) (22). All three dioxin samples collected from the incinerator were below the 0.03 ng/m^3 Arizona standard.

The community had additional concerns about the dioxin data collected from the incinerator because the sample with the maximum detection (run one at 0.0289 ng/m^3) was of questionable value since it was collected when the system was not operating properly. This test run was not representative of standard operation because a well cap had been removed (21). No further information is available about why or how the missing well cap affected incinerator operation.

The three main community groups (SPNA, WOA, and CSBCA) had differing opinions about whether USEPA's former treatment system should have been allowed to continue operating. The SPNA and WOA wanted the system to continue operating, but the CSBCA opposed continued operation (Bruni Davila, USEPA, personal communication, August 13, 2003).

After USEPA ceased operation of the treatment system in July 1998, its staff conducted weekly conference calls with community members to identify acceptable alternative technologies to thermal oxidation or incineration (3). Formal records of these meetings were not available; however, according to one resident, this effort was unsuccessful at identifying a method to treat the waste that was acceptable to the community. Additionally, the resident commented that USEPA was interested in one technology or system to treat the entire problem while the community's position was that there should be as many systems as needed to completely clean up the contamination.

CDHS received a number of comments on the public comment draft of this PHA. One of the more frequent comments was the concern that people would be exposed to groundwater contamination. While CDHS has concluded that the groundwater on the AMCO site and vicinity

are contaminated, currently CDHS does not believe that people are likely to be exposed to these contaminants. Please refer to Appendix E for more details on these comments and CDHS' responses.

Process for Gathering Community Health Concerns

CDHS first began work on the AMCO site when USEPA nominated the site to the NPL in April 2003. Early in the process there were several discussions with USEPA from August 2003 to February 2004 about the exposure/health concerns that had been reported to them from the community near AMCO. The findings of the USEPA community interviews were made available in their Community Involvement Plan (CIP) in May 2004 (23).

The CIP that USEPA provided to the community in May 2004 listed several community health concerns, such as:

- the effects of the AMCO site on the health of the community;
- the kind of contamination at the site, the amount, the location, the movement, and the hazardous nature of the contamination;
- how vinyl chloride can affect people's health;
- the drinking water being contaminated;
- what proactive and preventive actions could be taken to protect families from potential exposure to vinyl chloride;
- pancreatic cancer;
- cancer more generally and the overall health of the residents near the AMCO site;
- control of the contamination while work occurs at the AMCO site;
- the cumulative risks from all the sources of contamination in the community besides the AMCO site;
- contaminated dust coming from the site;
- digging in the backyard and planting fruits and vegetables; and
- the effect of contamination on the South Prescott Park.

In addition to the regulatory agency contact, CDHS contacted the local health department with a letter on March 30, 2004; the Alameda County Health Department provided feedback on concerns they had received from the community about the AMCO site. People have expressed to the county concerns about inhalation and exposure to vapors from the AMCO site due to soil and groundwater contamination. There were concerns about contaminants of any groundwater treatment system being released to the neighborhood. There were also concerns about the lack of inclusion of the community in early decision-making opportunities. The county requested to be kept informed of the activities that CDHS conducts at the AMCO site.

In addition to the local health and regulatory agencies, CDHS had contact with the Pacific Institute (PI) on February 26, 2004, to discuss activities in the area. The PI is a non-profit organization that strives to improve policy through science-based research and dialogue with action-oriented groups. The PI has released two documents relative to the AMCO site vicinity in the past few years: in January 2002, "Neighborhood Knowledge for Change: West Oakland Indicators Project," and in November 2003, "Clearing the Air: Reducing Diesel Pollution in

West Oakland." The representative of the PI indicated that in general the residents around the AMCO site are very well organized and want to be involved in the process of studies and cleanup at the site. A PI representative expressed the importance of creating public participation opportunities and providing information and activities that would be useful to the community. The PI representative also emphasized earlier involvement/inclusion of the community into the PHA process.

CDHS met with a representative of the CSBCA on May 5, 2004, at the representative's house on Chester Street and walked around the neighborhood and the AMCO site for about an hour. While walking around the neighborhood, the CSBCA representative expressed some concerns about the AMCO site. There were concerns that the AMCO site is causing health problems like cancer, asthma, and other health conditions. The representative had some questions about what the community could expect from the CDHS PHA. CDHS provided an overview of the PHA process.

CDHS provided an outreach letter for distribution at a neighborhood event sponsored by the SCBCA on June 5, 2004. The letter provided an overview of the PHA process and a general timeline for the completion of the work. This was provided at the Annual Block Party of the Chester Street Block Club Association. The focus of the party was primarily to have fun and to provide health and environmental information to the attendees.

CDHS also provided an outreach letter to the West Oakland Project Area Committee within the City of Oakland. This committee is a 17-member group representing the West Oakland area. This group works with the City of Oakland to create a redevelopment plan. In a conversation with CDHS, the co-chair of the committee expressed an interest in being kept informed. He also mentioned that the Environmental Impact Sub-committee may provide comments to the public comment version of the PHA, depending on their ongoing priorities.

In July 2004 CDHS held conversations with the representatives of the SPNA. There were suggestions to keep the input of the community localized and relevant to only those living near the site. Concerns were expressed about the need for clear and concise information relating to the AMCO site. One of the main concerns was the need to explain how the characterization of risk is done for vinyl chloride. It was also suggested that a neutral venue be provided for any information that would be presented. A suggestion was made to make contact with all the residents directly.

Community Health Concerns and Health Effects Evaluation
The following questions were several concerns expressed by the community living near the AMCO site.

Is there the possibility of inhaling or getting exposed to vapors from groundwater that could lead to health problems? VOCs are chemicals that evaporate easily. VOC contamination in soils and groundwater can move through tiny spaces between soil particles. This "soil gas" can enter buildings through openings in basements such as foundation cracks, sumps, or utility ports that may bring wires or pipes into the foundation.

CDHS has evaluated crawlspace air data collected at residential properties and has concluded that levels are not high enough to pose an immediate danger such that immediate action would be needed. VOC levels in the crawlspaces of homes are much lower than levels that have been associated with immediate health symptoms such as headaches and dizziness. Because there are gaps in the testing that was done, CDHS cannot rule out the possibility that at times people living in houses abutting the site have been exposed to very low levels of VOCs from the AMCO site. Even if this information was available, it is difficult to establish whether a particular individual's illness/symptoms were caused by a specific environmental contaminant because there can be more than one factor that causes the illness.

Is there the possibility of getting exposed to soil contamination?

There were two areas at the site that were not paved in the past. Workers at the site may have had some contact with the contaminants in the soil in these areas. Because the frequency of exposure was likely low, it is unlikely that the workers experienced health effects from the exposures based on the levels of the contaminants. The AMCO site is presently paved, therefore workers and community residents are not currently exposed to soil contamination at the site. If future activity takes place in the subsurface soils or if the pavement is removed, workers and trespassers could be exposed to soil contamination. The City of Oakland has placed excavation permit restrictions in this area to prevent exposure to contaminants.

To be protective of the community's health, CDHS recommends that the deed on the AMCO property be amended to impose activity and use limitations on the site to minimize or prevent future exposures to surface and subsurface soil contamination. CDHS is also recommending that the existing pavement be maintained and that the City of Oakland continue to prohibit subsurface excavation permits in the vicinity of the AMCO site.

Is there risk to the community from the vinyl chloride found in houses near AMCO?

Vinyl chloride has been detected at the AMCO site and in the crawlspaces of three residences abutting the site. The concentrations are not at levels that pose a health risk. However, people may have breathed in some of the chemical in the past. Because the source of the contamination has not been adequately contained or remediated, future exposure to soil gas vapors in these residences is possible. CDHS has recommended that additional air data be collected from the residences abutting the AMCO site to confirm that vinyl chloride and other VOCs pose no risk to residents in houses that abut the site.

How does government decide if there is or is not a risk from the vinyl chloride that was found in the community?

CDHS uses mathematical models (equations) to estimate what risk may be coming from a chemical. The four major components that are used in the model are; 1) the concentration or amount of the chemical in the air, 2) the rate at which people breathe in the air, 3) the length of time and frequency of exposure, and 3) the weight of a person. These factors are combined in an

equation that provides an estimate of a person's risk. Additionally, information from the model is used to determine if the contamination is below a level where CDHS would not expect health problems.

The approach that CDHS used to interpret the risk from the vinyl chloride contamination in abutting residences made some conservative assumptions to be protective of public health. The assumptions were as follows:

1. An assumption is made that residents spend every hour of every day in their homes (24 hours a day, 365 days/year); it is unlikely that people spend all of their time in their homes.
2. The concentrations used to estimate risk were the maximum values found in residential crawl spaces; concentrations in the air in living spaces are likely lower.

These conservative assumptions are part of a model that CDHS used to calculate the exposure dose and to estimate cancer risk (Table 2).

Is there monitoring of the community's health?

Ideally, to review and understand the health of the community who may have been affected by AMCO contaminants, CDHS would need to have complete and thorough records of the symptoms and diseases of each person who lived near the AMCO site during the time he/she could have been exposed. A comprehensive community health surveillance system is not available because some people go to private doctors, some go to Health Maintenance Organizations (HMOs), some to county services, some to non-traditional healers, and others have only limited or no access to health care.

In California, the only thorough health surveillance system is for cancer cases. The surveillance that occurs for birth defects is very limited. There is data available on birth rates, weight at birth, and mortality rates, which are also limited. Unfortunately, the lack of a health surveillance system for most illnesses limits CDHS' ability to objectively understand how much illness the residents near the AMCO site may be experiencing.

What is the percent of cancer/disease in the community as a result of the site?

This question cannot be answered presently with the tools and science available to CDHS. In some communities where there is an increased risk of exposure, the data from the California Cancer Registry is used to inform CDHS' overall understanding of the potential impact of the site on the health of the residents. Since CDHS concludes that the levels of exposure from the AMCO site are not likely to increase cancer rates by any detectable amount, this information was not requested from the California Cancer Registry.

Another limitation of the cancer surveillance information is that there are a number of reasons why it is difficult to tell whether specific exposures caused cancer in the community. Many types of cancer take a long time to develop (many years), so people may have had exposure to cancer-

causing agents (e.g., cigarette smoke, hazardous chemicals, etc.) for a long time before cancer develops. If the people moved away from the area and developed cancer later, their cancer would not be included in the number tally for cancers in the area.

Environmental Contamination/Pathways Analyses/Toxicological Implications

This section examines the pathways for exposure to contamination from the AMCO site. CDHS will examine each of the media (soil, soil gas, air, and groundwater) to determine what media are contaminated and if people in the community are exposed to (or in contact with) the contamination (24). If people are exposed to contamination in any of the media, CDHS will evaluate whether there is enough contamination to pose a hazard to people in the community. A time frame given for each pathway indicates whether the exposure occurred in the past, is occurring now, or is likely to occur in the future (24). For example, a completed pathway with only a past time frame indicates that exposure did occur in the past but is not occurring now and is not likely to occur in the future. Table 1, located in Appendix B, presents a summary of the exposure situations identified at this site.

Exposure occurs when a chemical comes into contact with people and enters the body. For a chemical to pose a human health risk, a completed exposure pathway must exist. A completed exposure pathway consists of five elements: 1) a source and mechanism of chemical release to the environment; 2) a contaminated environmental medium (air, soil, or water); 3) a point where someone contacts the contaminated medium (known as the exposure point); 4) an exposure route, such as breathing, dermal absorption, or ingestion; and 5) the person or people exposed. Exposure pathways are classified as either completed, potential, or eliminated. In completed exposure pathways, all five elements exist. Potential exposure pathways are either 1) not currently complete but could become complete in the future or 2) indeterminate due to lack of information. Pathways are eliminated from further assessment if one or more elements are missing and are never likely to exist.

CDHS reviewed all relevant, available environmental data to evaluate pathways of exposure. Samples were collected using prescribed protocols, with agencies occasionally taking samples concurrently. Laboratories that conduct the analyses do so using prescribed protocols and are licensed by the state and the federal government. The licensed laboratories, unaware where the samples come from and which ones are sample blanks, analyze real samples and duplicates of real samples. The majority of data that CDHS reviewed was produced by the USEPA and its contractors. A number of environmental studies have taken place in the vicinity of the site by Pacific Gas & Electric (PG&E), UPR, and Caltrans, relating to the highway 880 overpass and the UPR property to the south of the AMCO site.

To screen the contaminants for evaluation, CDHS compared contaminant concentrations to health comparison values. Health comparison values are media-specific contaminant concentrations used to screen contaminants for further evaluation (see the *Glossary* in Appendix C). Noncancer health comparison values for soil and water are called Environmental Media Evaluation Guides (EMEGs) or Reference Dose Media Evaluation Guides (RMEGs) and are respectively based on ATSDR's Minimal Risk Levels (MRLs) or USEPA's Reference Doses (RfDs) and Reference Concentration Doses (RfCs) (24). Cancer Risk Evaluation Guides

(CREGs) are based on USEPA's chemical specific cancer slope factors (24) and estimated excess lifetime cancer risk of one in a million persons exposed for a lifetime. CDHS also used the USEPA Preliminary Remediation Guidelines (PRGs) as an environmental media guide in some cases.

These comparison values allow an investigator to quickly sort contaminants into two groups: 1) those not likely to cause health effects and 2) those that should be evaluated further. Contaminants that receive further evaluation exist at concentrations that exceed the comparison values; they are called contaminants of concern (COCs) (see Appendix D for toxicological information on COCs). Exceeding a health comparison value does not indicate that a contaminant represents a public health threat, but suggests that the contaminant warrants further consideration.

When COCs are identified in a media, CDHS will evaluate the pathway by which people are being exposed to the contaminants. To determine whether adverse health effects are possible as a result of exposure to a contaminant, an exposure dose must be estimated for each pathway (Tables 3-5). This exposure dose can then be compared with appropriate toxicity values in order to evaluate the likelihood of adverse health effects. Toxicity values used to evaluate noncancer adverse health effects include ATSDR's MRLs, and USEPA's RfDs for ingestion and RfCs for breathing (24). The MRL and RfD values are estimates of daily human exposure to a contaminant below which noncancer adverse health effects are unlikely to occur. (See Appendix C for additional information about health comparison values.)

The National Toxicology Program, the International Agency for Research on Cancer (IARC), and USEPA have reviewed available information from human or animal studies to determine whether certain chemicals are likely to cause cancer (24). The potential for cancer to occur in an individual or a population is evaluated by estimating the probability of an individual developing cancer over a lifetime as the result of exposure. USEPA has developed cancer slope factor values for many carcinogens. A cancer slope factor is an estimate of a chemical's potential for causing cancer. A cancer slope factor is derived from a study where the exposure is averaged over a lifetime. Cancer risks can not be appropriately calculated for short-term exposures (less than 7 or 9 years) using the USEPA or the California Environmental Protection Agency (CalEPA) cancer slope factors. Science does not support estimating theoretical increased cancer risks for short-term exposures as these estimates may misrepresent the actual risk (25).

CDHS evaluated 10 pathways related to the AMCO site, including four completed pathways, two potentially completed pathway, and four pathways that are eliminated. Data in this section is presented in tables located in Appendix B. Sample locations of the data collected can be seen in the figures in Appendix A. In the following pages, CDHS presents an evaluation of these pathways. A description of some terms used in this document can be found in the *Glossary* in Appendix C. A brief summary of the toxicological characteristics of the COCs identified by CDHS is presented in Appendix D. The toxicological evaluation of the completed pathways involves the use of exposure assumptions. CDHS used "high end" estimates and assumptions to ensure that any potential health hazards from the chemicals are recognized.

Completed Exposure Pathways

Past Exposure to Contaminated Surface Soils—On-site Workers

Summary: Two areas of the AMCO site previously had unpaved soils. On-site workers likely had some exposure to contaminants in the soil in these areas. Because the frequency of exposure was likely low, it is unlikely that on-site workers experienced any health effects. However, this conclusion is limited due to the small amount of soil data and that VOCs in surface soils may have evaporated or been washed away from the surface by rain, making it difficult to assess what surface soil exposures to VOCs may have occurred in the past. Therefore, CDHS concludes this pathway was complete in the past, but posed no apparent public health hazard.

Some exposure to contaminated soils likely occurred in the past in the area near the former railroad spur. This area, along with an area to the northwest, had bare soils as recently as 1986 (Figure 6) and perhaps prior to and after 1986. Workers may have contacted these contaminated soils if a worker dropped a tool or cloth on the ground in the soil areas and then picked it up. Soil from the tool or cloth could then be incidentally ingested. Workers may have eaten their lunch or taken coffee breaks in or near the contaminated soil areas where soil could have gotten on or into their food or beverage.

The only available surface soil data was collected on March 17, 1986, by Engineering-Science, Inc., a contractor for AMCO. Engineering-Science, Inc. collected six surface soil samples from the site (Figures 3 and 6) and analyzed samples for metals, oil and grease, and VOCs (26). All six surface soil samples (A, B, C, D, and E) had detections of oil and grease. There are no comparison values for oil and grease.

Sample D located near the former railroad spur had 25.5 parts per million (ppm) of 1,1,1,-trichloroethane (1,1,1,-TCA) and 2.1 ppm 1,1-dichloroethane (1,1-DCA) (26). The concentrations of VOCs are below their respective health comparison values. Vinyl chloride, a known site contaminant, was not detected in any of these samples. Because VOCs are generally water soluble, some of the VOCs on the surface were likely washed away into the groundwater from rain. An equal or greater portion of the VOCs on the surface probably evaporated into the air. This, in conjunction with limited surface soil data, makes quantifying surface soil VOC exposure difficult. However, soils were exposed in the past and therefore on-site workers were exposed to some portion of the contaminants in site soils.

Lead concentrations in samples A, B, C, and D are generally below the USEPA Region IX industrial PRG. However, one soil sample (location E) had a lead concentration of 1,300 ppm. This is above the USEPA Region IX industrial PRG for lead of 750 ppm. The average concentration of lead in soil on the site (447 ppm) is below the PRG. Therefore, lead soil exposure to workers in the past likely did not present a health risk.

Sample F had 540 ppm arsenic, which is above the adult RMEG of 200 ppm (25). CDHS estimated the worker risk from exposure to arsenic via soil and determined the concentrations on the AMCO site would not likely pose a health risk to workers. This analysis considered a worker who incidentally consumed 100 mg of soil with the average and maximum concentrations of

arsenic. This estimate also considered exposure to the worker for 5 days per week and 50 weeks per year over 30 years. Using CDHS estimates, the exposure dose for arsenic, 0.00004 milligrams/kilogram/day (mg/kg/day) was below the RfD for arsenic in soil (0.0003 mg/kg/day) and therefore not considered a health risk to workers.

The limited surface soil data collected by Engineering-Science, Inc. in 1986 indicated that both lead and arsenic are considered COCs in soil at the AMCO site. However, the concentrations detected would not be expected to pose any health risk to workers that may have been exposed to surface soils in the past. Therefore, CDHS considers the on-site worker surface soil exposure pathway to pose no apparent public health hazard even though it was a completed exposure pathway in the past.

Past Exposure to Soil Gas Contaminants—Residents Living Near the AMCO site

Summary: A variety of VOCs have been detected in the soil and soil gas on the AMCO site. Vinyl chloride has been detected in the crawlspace of three residences that abut the AMCO site. Although the concentrations detected would not likely pose a health risk, their detection indicates people in these residences may have breathed in some contaminants. Therefore, CDHS considers this to be a completed pathway in the past. Because the concentrations of vinyl chloride detected in the crawlspaces were only slightly above the comparison value in one sample, CDHS concludes that this past exposure poses no apparent public health hazard.

Past exposure to soil gas contaminants at the residences near the AMCO site are considered completed exposure pathways because vinyl chloride has been detected in the crawlspace of three abutting properties and one of these detections was slightly above a health comparison value. A sample of air collected from the crawlspace at a residence on Third Street in 1999 had a detection of 0.117 micrograms per cubic meter ($\mu g/m^3$) or 0.045 ppbv of vinyl chloride (Table 6). This is slightly above the CREG for vinyl chloride in air (0.10 $\mu g/m^3$ or 0.039 ppbv) and the USEPA Region IX residential PRG (0.11 $\mu g/m^3$ or 0.043 ppbv). Therefore, vinyl chloride is considered a COC in indoor air at a residence on Third Street. In 1999, there were two detections of vinyl chloride at a residence on Third Street and one detection of vinyl chloride at a residence on Center Street, but these detections were below comparison values. CDHS concludes that vinyl chloride has impacted abutting residences in the past and that some exposure to these contaminants may have occurred.

Because one crawlspace sample exceeded the CREG, CDHS developed a vinyl chloride air exposure model to assess the potential health risk. CDHS assumed that residents would breathe the maximum detected concentration of vinyl chloride (0.117 $\mu g/m^3$ or 0.045 ppbv) for 24 hours per day and 365 days per year. This estimate results in a breathing dose of 0.0000254 milligrams per kilogram per day (mg/kg/day) for adults and 0.0000472 mg/kg/day for children (Table 2). These doses are below the breathing noncancer health comparison value (RfD = 0.0286 mg/kg/day). Therefore, even if residents were constantly exposed to the maximum concentration detected in the crawlspace, they would not be expected to have experienced noncancer health effects from vinyl chloride exposure.

CDHS also considered cancerous effects from exposure to vinyl chloride in the air. CDHS estimated that a resident spending 24 hours per day and 365 days per year over a 70-year lifetime

would have an insignificant increase in cancer risk (3.37 E-07) based on exposure to the maximum vinyl chloride concentration detected in the crawlspace (Table 2). This estimated risk translates into an increase of three and four additional cancers in a population of 10 million residents exposed at this concentration.

CDHS is concerned that VOCs other than vinyl chloride, such as TCE and PCE, may be making their way into abutting properties. USEPA has been analyzing air samples for just vinyl chloride because vinyl chloride is the most volatile of the VOCs detected on the AMCO site and therefore the most likely to make its way into buildings. However, this does not preclude other VOCs from making their way into buildings as well. Therefore, CDHS has recommended that future air samples collected in abutting residences and in the buildings on the site include a full range of VOCs to address this issue.

Vinyl chloride has been detected in the crawlspace of three residences abutting the AMCO site. However, the levels detected are not expected to pose any health risks. Therefore, CDHS considers the exposure of residents to soil gas contaminants to be completed in the past, but concludes that it poses no apparent public health hazard.

Past and Future Exposure to Contaminated Subsurface Soils—Utility Workers Excavating In or Near AMCO contaminants

Summary: Vinyl chloride, TCE, 1,3,5-trimethylbenzene, and 1,2,4-trimethylbenzene are considered COCs in the subsurface soil on the AMCO site. Because utility work occasionally requires subsurface excavation work, utility workers may have been exposed to these contaminants in the past and could be exposed to them in the future. However, due to the nature of utility work being short term, the concentrations detected in soil do not appear to pose a health risk to utility workers in the past and are not likely to pose a health risk in the future. Therefore, CDHS considers this pathway to pose no apparent public health hazard even though the pathway is considered completed.

Occasionally, utility providers such as electric, water, and phone companies need to access subsurface wires, pipes, and conduits to do maintenance, repair, and upgrading. In 1995, PG&E was doing work in a subsurface excavation near the AMCO site. Utility workers in the area were concerned that contaminants from the AMCO site may be getting into these excavations. Exposure to VOC contaminated soils in excavations could occur if, for example, workers wiped their brows while working and their hands or gloves had contaminated soil on them.

In the absence of comparison values developed specifically for utility workers, CDHS used CREGs, EMEGs, and Industrial PRGs to identify the COCs. CREGs and EMEGs are developed for screening media in long-term daily exposure scenarios (i.e., a residential scenario). The Region IX Industrial PRGs are more representative of utility worker exposure than CREGs and EMEGs. However, Region IX Industrial PRGs were developed for use in industrial settings based on the assumption that an outdoor worker spends 225 days per year for 25 years in a work area. Utility workers do not usually work that long at any one location.

On August 7, 1996, CET, a contractor for PG&E, collected four geoprobe soil samples along the southern edge of the AMCO site along Third Street (Figure 2) to investigate environmental conditions near a PG&E utility trench. One of these samples (GP-4) was collected at 4 feet bgs and had several VOC detections, including a detection of TCE at 0.26 ppm. This is above the USEPA Region IX Industrial PRG for soil of 0.11 ppm. Therefore, TCE is considered a COC in soil to the south of the AMCO site (9).

USEPA collected 49 subsurface soil samples in 1999 from 16 borings on or near the AMCO site (Figure 7) (3). Samples were collected from 2, 5, and 10 feet bgs, although soil samples were not collected from all three depth intervals at each boring. These samples were analyzed for VOCs. Over 25 different VOCs were detected in the soils, including vinyl chloride, TCE, and PCE. Vinyl chloride was documented in eight soil samples from locations S-63, S-66, S-72, and S-78 at concentrations ranging from 0.008 to 5.1 ppm, indicating that vinyl chloride is distributed throughout the site at various concentrations and various depths (Figure 7). Vinyl chloride, 1,3,5-trimethylbenzene, 1,2,4-trimethylbenzene, and TCE were detected at concentrations above their respective comparison values. The maximum concentration of vinyl chloride (5.1 ppm) exceeds the CREG of 0.5 ppm. The maximum concentrations of TCE (350 ppm), 1,2,4-trimethylbenzene (320 ppm), and 1,3,5-trimethylbenzene (110 ppm) exceed their respective USEPA Region IX Industrial PRGs of 110 ppm, 170 ppm, and 70 ppm, respectively. Therefore, vinyl chloride, TCE, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene are all considered COCs in subsurface soil on the AMCO site.

In April 2000, Ecology and Environment, Inc., contractor for USEPA, collected 50 subsurface soil samples from five borings (S-110 to S-114) on the AMCO site from depths ranging from 5 to 45 feet bgs at 5 foot intervals (Figure 4). This round of sampling (Table 7) confirmed vinyl chloride, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene as COCs. However, TCE was not detected in any of the five borings. The maximum concentration of vinyl chloride was collected at S-112 at 34 ppm. This is above the CREG for vinyl chloride (0.5 ppm), the chronic EMEG (10 ppm), and the USEPA Region IX Industrial PRG for soil of 0.11 ppm, hence vinyl chloride is considered a COC. Soil collected from 5 feet bgs at S-113 had 270 ppm of 1,2,4-trimethylbenzene, which is above the USEPA Region IX PRG (170 ppm). This sample also had 94 ppm of 1,3,5-trimethylbenzene, which is above the USEPA Region IX PRG (70 ppm). Therefore, both 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene are considered COCs.

To further screen the contaminants in the soil, CDHS evaluated the soil utility worker pathway by estimating daily dose exposures and comparing them to noncancer comparison values, MRLs and RfDs. As a conservative measure, CDHS used maximum concentrations of COCs to estimate daily doses assuming that a worker spent 5 days per year working in subsurface soils in the area over a 9-year period (Table 3). Daily doses of COCs were all less than their respective health based comparison values (MRLs and RfDs). Because doses are below the MRLs and RfDs, presently none of the COCs are expected to pose noncancer health problems for subsurface utility workers.

If no remediation or intervention occurs on the AMCO site, future excavations on or near the site could expose VOC contaminated soils, contaminated liquids, or vapors to utility workers. However, the City of Oakland currently has an excavation restriction policy on the AMCO site

(Odili Ojukwu, City of Oakland Environmental Division, personal communication, July 28, 2004). Any permits awarded for work in the area are required to comply with the city's no excavation policy. Although exposure to subsurface soils is not expected in the future, even if it does occur, the concentration of contaminants detected are unlikely to pose any health risks to utility workers. However, specifics about this permit flagging effort were not available to CDHS as of the date of this report. Therefore, CDHS is planning to meet with the City of Oakland to discuss the capabilities and limitations of this permit process. For example, it is not clear if the process would prevent excavation based on address number, relative location to AMCO or street name.

Excavations on or near the AMCO site have uncovered soils contaminated with vinyl chloride, TCE, and other VOCs. VOC concentrations in subsurface soils are not expected to pose health risks to utility workers. Because utility workers have worked in excavations with VOC detections in the soil, CDHS considers utility worker exposure to subsurface soils complete in the past and in the future. Although future exposure is unlikely, CDHS cannot rule out this possibility of future exposure until activity and use limitations are imposed on the site or the Oakland permit process has been reviewed. Due to the short-term nature of subsurface utility work and the concentrations of VOCs in the soil, CDHS considers this pathway to pose no apparent public health hazard.

Past and Future Exposure to Contaminated Air—Utility Workers Excavating In or Near AMCO Contaminants

Summary: Air data indicates utility workers may have been exposed to VOCs off gassing from soil or non-aqueous phase liquids (NAPLs) in excavations on or near the AMCO site. An air grab sample collected at an excavation in 1996 had levels of TCE that exceeded the acute EMEG. This level of TCE could have caused noncancer health effects to utility workers if they were not using PPE. Using the time-weighted average concentrations of TCE in air at excavations on the AMCO site, workers spending 5 days per year for 9 years without protective equipment in these excavations are estimated to have a low increased cancer risk. Therefore, CDHS considers this pathway to be complete and to pose a public health hazard.

Utility providers occasionally need to access subsurface wires, pipes, and conduits to do maintenance, repair, and upgrading. In addition to exposure to subsurface soil contaminants from the AMCO site, utility workers may have also come into contact with vapor or air contaminants related to the AMCO site. Utility workers that work in excavations on or near the AMCO site that are not using PPE could breathe VOC contaminants. Utility workers should be trained in the use of PPE and screening equipment to assess if an excavation is potentially dangerous. However, this is not always the case, and workers could become complacent or be unaware of the potential risks subsurface vapors present.

During trenching activities by PG&E on Third Street in June 1995, Smith-Reidel reported discovery of a NAPL in the trench. NAPLs are fluids that do not mix with water (e.g., oil). Based on the location of the excavation, groundwater flow direction, and the location of the AMCO source area, it is possible that at least a portion of the NAPL and vapors were from the AMCO site.

CET monitored worker exposures to VOCs encountered during PG&E utility excavations on Third Street in June 1995. CET monitored air in the excavations using a photo ionization detector (PID), which detects VOCs as a group in ppm. PID readings ranged from non-detect to 2,000 ppm (9). Workers were advised to wear respirators when PID readings exceeded 25 ppm. Because the PID readings provide the concentration of a wide range of VOCs as a group and not for specific chemicals, it is not possible to estimate health risks to workers around these excavations using PID data. However, this information is sufficient to qualitatively say that some exposure likely occurred in the excavation area; and therefore, utility worker exposure to contaminated air is considered completed in the past and, without any intervention, are likely to occur in the future.

In the absence of comparison values developed specifically for utility workers, CDHS used CREGs, EMEGs, and RfCs to identify the COCs. CREGs and EMEGs are developed for screening media in long-term daily exposure scenarios (i.e., a residential scenario). Utility workers are not exposed to these vapors on a daily basis.

Air sampling conducted at the USEPA excavation perimeter during two observed release events (December 5 and 14, 1996), documented the presence of vinyl chloride at concentrations of up to 120 ppbv (312 $\mu g/m^3$) in instantaneous "grab" samples, and up to 19 ppbv (49.4 $\mu g/m^3$) in 6-hour time-weighted samples. The concentration of the grab sample was above the CREG for vinyl chloride in air (0.1$\mu g/m^3$) and the RfC of 100 $\mu g/m^3$. Vinyl chloride precursor compound PCE was detected up to 420 ppbv (1,092 $\mu g/m^3$) in grab samples and up to 48 ppbv (124.8 $\mu g/m^3$) in time-weighted samples. Vinyl chloride precursor compound TCE was detected up to 9,600 ppbv (24,960 $\mu g/m^3$) in grab samples and up to 1,600 ppbv (4,160 $\mu g/m^3$) in time-weighted samples (12). Grab samples are collected over a short time period (usually minutes) and time-weighted samples are collected over a long period of time (usually hours), then averaged. The 9,600 ppbv grab sample detection of TCE is above the acute EMEG of 2,000 ppb. The 420 ppbv grab sample detection of PCE is above the acute EMEG of 200 ppb. Therefore, vinyl chloride, TCE, and PCE are all considered COCs in air in and around excavations near the AMCO site. Health effects from inhaling TCE include headaches, fatigue, lung irritation, and poor coordination (27). Health effects from inhaling PCE include headaches, dizziness, nausea, and difficulty speaking and walking (28). Health effects from inhaling vinyl chloride include dizziness and headaches (29).

Compared to health comparison values, the Occupational Safety and Health Association (OSHA) limits the amount of PCE that can be present in workroom air to 100 ppm (678,936 ppbv) for an 8-hour workday over a 40-hour workweek. OSHA limits the amount of TCE that can be present in workroom air to 100 ppm (537,832 ppbv) for an 8-hour workday over a 40-hour workweek. The 15-minute average exposure in air that should not be exceeded at any time during a workday is 300 ppm TCE. The maximum allowable amount of vinyl chloride in workroom air during an 8-hour workday in a 40-hour workweek is 1 ppm (2,556 ppbv). The maximum amount allowed in a 15-minute period is 5 ppm vinyl chloride. The concentrations of VOCs detected in the air on or near the AMCO site are well below these OSHA standards.

CDHS used air sampling data to estimate potential utility worker exposure to VOCs (Table 4). None of the air samples contained vinyl chloride or PCE concentrations exceeding their acute

MRLs. However, one TCE grab sample concentration (24,960 µg/m^3) exceeded the acute breathing MRL (10,747 µg/m^3). This suggests that short-term health effects could occur from TCE air exposure for utility workers that do not use PPE in these areas. This is not likely though, because the grab samples represent high-end exposure concentrations and the Lowest Observed Adverse Effects Level (LOAEL) used to derive the acute breathing MRL for TCE in air is 200 ppm (1,074,700 µg/m^3). The acute MRL is based on a study of neurological effects of TCE on six volunteers. After breathing 200 ppm TCE for 7 hours, the volunteers complained of fatigue and drowsiness. Because the levels of TCE in the grab samples from the utility excavations did not approach the concentrations upon which an effect has been seen (LOAEL), it is unlikely that utility workers would have experienced noncancer health effects.

CDHS estimated potential cancer risk to utility workers from VOCs in air near excavations based on the time-weighted air data (Table 6). CDHS estimated that a worker spending 5 days in excavations near the AMCO site for 9 years and wearing no PPE would have a low increase in cancer risk (5.02 in 10,000) based on exposure to the time-weighted TCE concentration (4,160 µg/m^3). The low increase in cancer risk translates into an increase of approximately five additional cancers in a population of 10,000 utility workers. Using these estimates, CDHS believes TCE vapors from utility excavations could pose a long-term cancer risk to utility workers at or near the AMCO site that do not use PPE. As this risk estimate demonstrates, chemicals other than vinyl chloride pose a risk to the utility worker. This has implications for other people that could breathe VOC contaminants, such as nearby residents. Although there is limited air VOC data from these excavations, exposure to VOC vapors from subsurface excavations remains a possible scenario until the VOC contaminant source on the AMCO site is remediated.

Because the AMCO source area contains a considerable amount of VOC contamination, VOCs could pose a problem to workers breathing in the vicinity of excavations without PPE on or near the AMCO site. Past and future excavations on or near the AMCO site are considered completed exposure pathways until the contaminants at AMCO are remediated or activity and use limitations are imposed on the site. Using the concentration of VOCs detected in the air near subsurface excavations and the likelihood of exposure, CDHS considers utility worker exposure to contaminated air to be a public health hazard in the past and in the future.

Potentially Completed Exposure Pathways

Potential Current and Future Exposure to Contaminated Indoor Air—On-site Workers and Residents Living Near the AMCO site

Summary: A variety of VOCs, including vinyl chloride, TCE, and PCE have been detected in soil and soil gas on the AMCO site. Vinyl chloride has been detected in the crawlspace of three abutting residences and may have impacted other areas on or near the site. The proximity of the AMCO office to the source area (less than 30 feet) and detections of vinyl chloride in the crawlspaces of some residences suggests the vapor intrusion pathway should be evaluated further. Therefore, this pathway is considered potentially completed until more data can be

collected or the source area is contained or remediated. Due to limited data and uncertainties about future conditions on the site and abutting properties, CDHS considers this pathway to be an indeterminate public health hazard.

The source area at the AMCO site consists predominantly of VOCs. Volatile compounds can travel through the subsurface by soil gas pathways into buildings that are near the contaminants. The degree to which soil gas VOCs can get into buildings is dependent on a number of variables. Two of the more important factors in determining if soil gas contaminants can get into buildings are 1) the distance from the source to the buildings and 2) the depth of contamination. Under normal circumstances, buildings within 100 feet of a VOC source are considered potential areas of vapor intrusion. If VOCs make their way via the soil gas pathway into buildings, people could then be exposed to the contaminants by breathing the vapors. This concern is investigated further in this section for the residences that abut the AMCO site and for the office on the AMCO property. Soil gas contamination is mostly a concern for people spending time in enclosed buildings.

On several occasions the USEPA has collected air data from crawlspaces in residences abutting the AMCO site and analyzed these samples for vinyl chloride. USEPA detected vinyl chloride in 1999 in the crawlspace of three residential properties abutting the AMCO site, indicating that residents in these buildings may have been exposed to VOCs from the AMCO site in the past. However, air data collected from the crawlspaces of the same three residences in 2000 and 2002 were non-detect for vinyl chloride. The fact that vinyl chloride has been found in the past in the crawlspaces beneath these buildings indicates that these vapors could have entered into the buildings and that people living there may have breathed some of these vapors. Although recent data suggests VOCs are not currently getting into these properties, the vapor intrusion pathway should be further assessed in these residences including crawlspace air sampling for a variety of VOCs and sub-slab soil gas sampling.

The AMCO office is located within 30 feet of the AMCO source area. Because the office is close to the AMCO source area, CDHS believes that soil gas contaminants could be getting into the AMCO office. On August 28, 2002, CH2MHILL, as a part of their preparation of the data evaluation report, collected one indoor air sample from the office on the AMCO site (15). This sample was analyzed for vinyl chloride and found to be non-detect (less than 0.0016 ppbv). Because the sample did not include initial and final canister pressures, the vinyl chloride air concentration had to be estimated. Therefore, CDHS believes that the vapor intrusion pathway should be further assessed in the AMCO office. Indoor air sampling and sub-slab soil gas sampling may be useful in making this determination. Future indoor air samples should be analyzed for a range of VOCs that have been detected on the AMCO site.

To better understand if VOCs are likely to impact the office on the AMCO site and nearby buildings, CDHS reviewed soil gas data collected at the AMCO site. In 1997, soil gas samples were collected from 25 locations on the AMCO site and along Third Street, and were analyzed for vinyl chloride. Twelve of the 25 locations had detections of vinyl chloride with the maximum concentration of 17,000 ppbv detected at location #2, which is close to the office on the AMCO site. There was also a detection of 6,400 ppbv of vinyl chloride (location #26) close to a residence on Third Street (Figure 8).

In September 1998, USEPA collected soil gas samples from 12 locations on the AMCO site and one location on Third Street. These samples were analyzed for VOCs and found to contain a variety of VOCs, including vinyl chloride. Vinyl chloride was detected in all but two samples. One of the non-detects was near the BART lot to the north, the other was to the south on Third Street. Soil gas collected from SG-14, the sample closest to the source area, had 15 different VOCs detected, including 280,000 ppbv of vinyl chloride. The highest concentration of vinyl chloride detected in this round of sampling was collected at SG-27 with a concentration of 1,100,000 ppbv. SG-27 is located approximately 10 feet north of SG-22 (Figure 8). This data indicates vinyl chloride and potentially other VOCs associated with the AMCO site are distributed throughout the site and along the boundaries with the abutting residential properties and could be drawn into on-site and off-site buildings.

To assess the impacts of exposure to vapors from the AMCO site, CDHS recommends additional air data be collected from the abutting residences and the AMCO office and analyzed for a wide range of VOCs. CDHS also recommends sub-slab soil gas data be collected at residences and the AMCO office, if possible. Until the AMCO source area is contained or remediated, or a review of indoor air data determines that VOCs are not getting into buildings, the possibility of current and future indoor air exposure to contaminants from AMCO cannot be eliminated. Worker and resident exposure to contaminated indoor air are considered potentially completed present and future exposure pathways. CDHS considers this potentially completed exposure pathway to pose an indeterminate public health hazard.

Potential Future Exposure to Contaminated Subsurface Soils—Workers on the AMCO site

Summary: The majority of the AMCO site is currently paved. There are no current activities in the subsurface soil at the site. However, without activity and use limitations on the site or remediation of the source area, future excavations are possible, which could expose people to subsurface contamination. Therefore, future exposure to subsurface soils is considered a potentially completed future exposure pathway. Based on the available data, subsurface VOCs are not likely to pose a public health hazard. However, there is no subsurface soil data for metals and some metals (lead and arsenic) have been detected in surface soils at 6 inches bgs at levels above comparison values for surface soils (less than 6 inches bgs). Therefore, CDHS considers the future exposure to contaminated subsurface soils by workers on the AMCO site to be an indeterminate public health hazard until subsurface soil metal data can be collected, activity and use limitations are imposed on the site, or the site is remediated.

The site is currently paved and no operations are taking place in the subsurface soils. If excavations were to take place on the AMCO site in the future, workers could come into contact with soil contaminants. Workers could breathe or ingest soil contaminants by accident while working in and around subsurface excavations. Vinyl chloride, TCE, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene are all considered COCs in subsurface soil on the AMCO site because the concentrations in the soil exceed their respective comparison values. The concentrations of the COCs in subsurface soils are not expected to pose any short-term health effects (Table 5). However, there is no subsurface soil metal data for the site. Thus, CDHS considers worker

exposure to contaminated subsurface soils to be potentially completed in the future and to pose an indeterminate public health hazard due to absence of subsurface (greater than 6 inches bgs) soil metal data.

Eliminated Exposure Pathways

Current Exposure to Contaminated Subsurface Soils—Workers on the AMCO site

Summary: The AMCO site is paved. There are no current activities in the subsurface at the site. Therefore, current exposure to subsurface soils is eliminated as a pathway of concern. CDHS considers this pathway to pose no apparent public health hazard.

Soil data has identified vinyl chloride, TCE, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene as COCs in subsurface soil on the AMCO site. However, the site is currently paved and no operations are taking place in the subsurface soils. Therefore, this pathway is eliminated because people are not currently exposed to soils on the AMCO site. CDHS considers this pathway to pose no apparent public health hazard.

Current Exposure to Contaminated Subsurface Soils—Utility Workers On or Near the AMCO site

Summary: The AMCO site is paved. There are no utility excavations currently taking place on or near the AMCO site. Therefore, current exposure to subsurface soils is eliminated as a pathway of concern. CDHS considers this pathway to pose no apparent public health hazard.

Four chemicals (vinyl chloride, TCE, 1,2,4-trimethylbenzene, and 1,3,5-trimethylbenzene) have been identified as COCs in the subsurface soils on the AMCO site. However, these COCs are only a health concern if people contact the contaminated soils. Currently, there are no utility excavations taking place on or near the AMCO site. Therefore, CDHS consider this pathway to be eliminated. CDHS considers this pathway to pose no apparent public health hazard.

Current Exposure to Contaminated Air—Utility Workers Excavating In or Near AMCO Contaminants

Summary: Air data collected in 1996 indicates that VOCs were off gassing from soil in excavations on or near the AMCO site. However, the AMCO site is currently paved and there are no utility excavations currently taking place on or near the AMCO site. Therefore, current exposure to VOC air contaminants is eliminated as a pathway of concern. CDHS considers this pathway to pose no apparent public health hazard.

Air data collected from excavations on the AMCO site indicate some VOCs may be entering the ambient air near subsurface excavations. However, there are no current utility excavations on or near the AMCO site and the site is paved. Therefore, current utility worker exposure to VOC air contaminants from subsurface excavations is considered an eliminated exposure pathway. CDHS considers this pathway to pose no apparent public health hazard.

Past, Present, and Future Exposure to Contaminated Groundwater—West Oakland Municipal Water Consumers

Summary: Groundwater at the AMCO site and the immediate vicinity is contaminated with VOCs and SVOCs and should be remediated. However, it is not currently being used for drinking water and there are no indications it has been used recently. Future use of groundwater from this area as a drinking water source is very unlikely due to the contamination and high levels of dissolved solids. Therefore, the past, present, and future exposure to contaminated groundwater at the AMCO site is eliminated. The groundwater pathway for the AMCO site poses no apparent public health hazard.

According to the available information, there are no private drinking wells near the AMCO site and people are not drinking groundwater contaminated by the AMCO site. While there is no information suggesting wells exist in the area, a well survey should be conducted to confirm that people are not using contaminated groundwater. There are no drinking water wells within 4 miles of the AMCO site (3). Drinking water is provided to the area by the East Bay Municipal Utility District (EBMUD). EBMUD water comes from a 577 square-mile protected watershed of the Mokelumne River. The watershed consists mainly of undeveloped land, on the west slope of the Sierra Nevada, where snowmelt flows into the protected and remote Pardee Reservoir. The water is then piped 90 miles to the East Bay by the Mokelumne Aqueducts. Pardee Reservoir water is piped to three East Bay water treatment plants: Lafayette, Walnut Creek, and Orinda. Oakland's water comes primarily from the Orinda Treatment Plant. The Orinda Plant filters the water and treats it to kill bacteria, and then distributes it to local water storage tanks in Oakland. Water is piped from these local storage tanks via steel water main pipes into residential and commercial properties (30).

A variety of VOCs and SVOCs have been detected in the groundwater on the AMCO site and in the immediate area. Vinyl chloride, 1,1-DCA, 1,2-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene (cis-1,2-DCE), trans-1,2-DCE, PCE, 1,1,1-TCA, TCE, other chlorinated solvents, and other organic compounds such as benzene, ethyl benzene, toluene and xylene have been documented in groundwater both on the site and immediately south of the site in the Preliminary Assessment/Site Investigation (PA/SI) dated August 2001 (3). In addition, floating free product (NAPL) was observed in two on-site monitoring wells in August 2002 at a maximum thickness of 5.3 feet (18).

In April 2000, Ecology and Environment, Inc., contractor for USEPA, collected 30 groundwater samples from seven locations (GW-110 to GW-116) on the AMCO site from depths ranging from 5 to 45 feet bgs (Figure 4) (3). A summary of the shallow groundwater collected on this date can be seen in Table 8. The full data set can be seen in Table 6-13 of the PA/SI (3). This round of sampling identified 1,2-dichlorobenzene, cis-1,2-DCE, ethyl benzene, 4-methyl-2-pentanone, toluene, TCE, 1,2,4-trimethylbenzene, vinyl chloride and o-xylene as COCs in the groundwater.

Figure 9 shows a set of groundwater wells that have data collected from 1997 to 2000. The concentration of these contaminants was greatest in the wells near the AMCO source area (Well 13 & 14). TCE was detected at 150,000 ppb in Well-14 in 2000. This is well above the MCL for

TCE (5 ppb). In 2000, the concentration of 1,1,1-TCA in Well-14 (5,600 ppb) was above the MCL of 200 ppb. Vinyl chloride (22,000 ppb), acetone (28,000 ppb), and 2-butanone (96,000 ppb) were detected above their respective RMEG values (30, 3,000, and 6,000 ppb, respectively) in Well-13 in 2000. Toluene (44,000 ppb) and cis-1,2-DCE (130,000 ppb) were detected above their respective EMEG values (700 and 10,000 ppb) in Well-14. Methylene chloride (48.000 ppb) was detected in Well-14 above the EMEG (2,000 ppb). Although people do not appear to be exposed to these contaminants, the groundwater should be remediated to ensure future exposures to contaminated groundwater do not occur.

1,4-Dioxane has been found in the groundwater of several Superfund sites and has become a chemical of concern for drinking water supplies in California because of it's widespread use as a stabilizer for chlorinated solvents (31). Groundwater samples collected in relation to the AMCO site have not been analyzed for 1,4-dioxane in the past. CDHS recommends that future sampling efforts include analysis for 1,4-dioxane. Sampling for 1, 4-dioxane is recommended because it can affect the breakdown of chlorinated solvents and it has its own toxicology. (If 1, 4-dioxane is present in groundwater, then USEPA should be sampling for it in air samples as well.) The presence of 1, 4-dioxane in groundwater will also effect remedial actions to be taken on the site, because it can inhibit some in-situ clean up methods that might otherwise be used to remediate groundwater contaminated with chlorinated solvents.

Groundwater levels in CET's 1996 report encountered groundwater from 4 to 6 feet bgs (9). Groundwater in the area is likely influenced by tides (4). However, the extent to which tidal forces influence groundwater at the AMCO site is unclear. Between February and May 1996, the local average hydraulic gradient in the vicinity of the AMCO site ranged from 0.001 to 0.004 feet (18). Thus, for every foot the water traveled horizontally, the water level would drop between 0.001 and 0.004 feet. Flow direction for March and April 1996 ranged from the west to west-southwest, toward San Francisco Bay.

While some of the groundwater on the AMCO site is fairly close to the surface (4 to 6 feet bgs), CDHS does not believe that people are likely to be exposed to contaminated groundwater by surface water exposures. Much of the area of concern is paved (AMCO site and Third Street). Residents would need to dig holes in their back yard or at the South Prescott Park of greater than 3 feet or more in order to reach groundwater. While CDHS cannot prevent this or ensure that it never happens, we believe this is very unlikely.

Groundwater samples collected on August 2, 1995, as part of the Remedial Investigation for Bobo's Junkyard (16), were analyzed for total dissolved solids (TDS). TDS levels in groundwater in the area ranged from 2,100 to 5,600 milligrams per liter (mg/L) or ppm. The levels of TDS are above the CDHS recommended long-term MCL of 500 mg/L. VOC contamination from the AMCO site and elevated concentrations of TDS make the groundwater unsuitable as a potable drinking water supply. Further compromising future use are the effects of tidal influence (potential salt water intrusion), and the salty soils and marine clays present in soils in the area (1), which may limit groundwater extraction rates.

Groundwater in the vicinity of the AMCO site is contaminated with VOCs and SVOCs. While groundwater levels do occasionally come close to the surface in the area, excavations to these

depths bgs (greater than 3 feet) are not likely to occur. Because the groundwater quality in the area is poor and the fact that there are no municipal wells within 4 miles of the site, future consumption of contaminated groundwater is considered highly unlikely and eliminated as a pathway of concern. A private well survey in the vicinity of the AMCO site should be conducted to ensure people are not using contaminated groundwater. CDHS concludes this pathway is not complete and poses no apparent public health hazard. However, contaminated groundwater should be cleaned up at the AMCO site to ensure future exposures do not occur.

Child Health Considerations

ATSDR recognizes that infants and children may be more sensitive than adults to environmental exposures. This sensitivity is a result of several factors: 1) children may have greater exposures to environmental toxicants than adults because, pound for pound of body weight, children drink more water, eat more food, and breathe more air than adults; 2) children play outdoors close to the ground, increasing their exposure to toxicants in dust, soil, surface water, and ambient air; 3) children have a tendency to put their hands in their mouths while playing, thereby exposing them to potentially contaminated soil particles at higher rates than adults (also, some children ingest non-food items, such as soil, a behavior known as “pica”); 4) children are shorter than adults, meaning that they can breathe dust, soil, and any vapors close to the ground; 5) children grow and develop rapidly; they can sustain permanent damage if toxic exposures occur during critical growth stages; and 6) children and teenagers may disregard “No Trespassing” signs and wander onto restricted locations. Because children depend on adults for risk identification and management decisions, CDHS and ATSDR are committed to evaluating their special interests at hazardous waste sites.

CDHS has attempted to identify places (e.g., parks, schools, recreational facilities, etc.) in the vicinity of the AMCO site where children live, play, or go to school. The closest location where children may spend time is at houses abutting the AMCO site. The pathway of greatest concern relative to children near the AMCO site is the air/soil gas pathway for VOCs that may make their way into residences abutting the AMCO site. CDHS estimated cancer and noncancer risks to children and adults that might live in these residences and could potentially breathe VOCs that entered the buildings. CDHS has requested that additional air sampling and sub-slab soil gas sampling be conducted in these residences to further characterize the vapor intrusion pathway and to ensure residents (especially children) are not inhaling VOCs at levels of health concern from the AMCO site.

Limitations with the Investigations Described in this Public Health Assessment

Limitations in the scope of an investigation or lack of sufficient data can be a source of uncertainty associated with any scientific investigation. CDHS believes that the limitations and data gaps do not compromise the conclusions of this PHA. However, a variety of uncertainties must be taken into account when considering the strength of the conclusions and the recommendations. Some uncertainties related to the AMCO site include an incomplete understanding of what chemicals were handled on the site, how much of the contamination originally on-site has migrated off site or has vaporized, where on-site specific activities took

place, and how much of the contamination has been broken down by natural processes. The recommendations presented in this document are aimed at addressing the limitations described below.

While soil gas can be an important source of in building air contaminants, there are a number of potential sources for air contaminants found inside buildings. Additional indoor air contaminant sources may include the chemicals contained in the ambient (background) air and the chemicals released into the building from the building components and contents. Furthermore, if there are chemicals (e.g., solvents, paints, cleaning solutions, etc.) in use in a building, those chemicals can contribute to the concentrations of contaminants in the in-building air.

Health Outcome Data

ATSDR and CDHS aim to understand the potential health impacts on communities near sites containing hazardous chemicals. This involves understanding which health problems might be caused by certain chemicals (as discussed in the *Environmental Contamination/Pathways Analyses/Toxicological Implications* section), understanding whether people had contact with contaminants, and understanding what health problems people in the community are experiencing. In addition to asking community members directly about their health concerns (as reported in the *Community Health Concerns* section), CDHS also tries to get information about the health status of a community from other sources. Additional review of health outcome data may be conducted if site information indicates there is a completed exposure pathway of health concern.

However, evaluating whether past releases from hazardous waste sites affect the health of people living near waste sites poses some challenges. Ideally, to review the health of community members who may have been affected by AMCO contaminants, it would be helpful to have thorough records about the symptoms and diseases of people who lived near the AMCO site. Information about the diseases and symptoms they had could then be compared to persons who did not live in the area during that time. However, this type of community health “surveillance” system is not available in the United States, since some people go to private physicians, some to health maintenance organizations, some to county services, etc. In California, there is a thorough health surveillance system, but only for cancer cases. Surveillance for birth defects was initiated for a time in the past, but is now very limited. The only other significant source of health outcome data that are available for the state are birth rates, weight at birth, and mortality rates. These data are not very useful in making determinations about the potential impacts that hazardous waste sites in general, and the AMCO site more specifically, would pose to people who live near them.

Conclusions

Using available data, CDHS concludes that the AMCO site has four completed exposure pathways, two potentially completed exposure pathways, and four pathways that have been eliminated from consideration. The breathing of vapors from subsurface excavations by utility

workers is considered a public health hazard. Two other pathways at the site are considered indeterminate public health hazards (Table 1). Therefore, CDHS considers the AMCO site to pose a public health hazard.

The community near the AMCO site is concerned about a variety of issues ranging from asthma to cancer to property values and the effects of the former thermal oxidizer/incinerator treatment system on their health. Community members are concerned about how vinyl chloride from the AMCO site can affect people's health and the cumulative health effects from all sources in the area. There is also concern about the lack of inclusion of the community in the decision-making process, especially as it relates to remedial efforts.

Air data collected at an excavation in 1996 on the site boundary indicate utility workers may have had some adverse health effects from exposure to VOC contaminants if they were not using PPE. Subsurface soil and soil gas contaminants and associated VOC vapors at the AMCO site pose an exposure risk to utility workers that may excavate on or near the AMCO site in the future, unless appropriate PPE are used, contaminants are remediated or activity and use limitations are imposed.

Vinyl chloride has been detected in the crawlspace of three abutting residences. Although the concentrations detected are not at levels that pose a health risk, their detection indicates people in these residences may have breathed in some contaminants. Because the source area has not been adequately contained or remediated, future exposure to VOC vapors in these residences is considered a potentially completed exposure pathway. CDHS recommends that the vapor intrusion pathway be further characterized for the facility and adjacent residences by collecting additional air data and analyzing it for a range of VOCs and collecting sub-slab soil gas data to determine if soil gas contaminants are present beneath these buildings. Until additional information is available, CDHS considers this pathway to pose an indeterminate public health hazard.

The proximity of the AMCO office to the source area (less than 30 feet) suggests VOCs could have been drawn into the office. Although one indoor air sample was non-detect for vinyl chloride, CDHS recommends collection of additional air VOC data as well as sub-slab soil gas data to determine if VOCs are getting into the office. This pathway is considered potentially completed until more data can be collected or the source area is contained or remediated.

Two areas of the AMCO site were previously unpaved. On-site workers likely had some exposure to contaminants in the soil in these areas. Because the frequency of exposure was likely low, it is unlikely that on-site workers experienced any health effects. The AMCO site is currently paved. Therefore, workers are not currently exposed to the soil contamination on the site. However, if future activity takes place in the subsurface soil or if the pavement is removed, workers could be exposed to soil contamination. CDHS considers future exposure to subsurface soils on the AMCO site to be a potentially completed exposure pathway that poses an indeterminate pubic health hazard.

VOCs have been detected in groundwater on the AMCO site at concentrations above health comparison values. Floating free product has been observed in two on-site monitoring wells in

August 2002 at a maximum thickness of 5.3 feet. However, nobody is drinking this water and because the groundwater has high levels of total dissolved solids, future use as a potable water source is highly unlikely. Therefore, the groundwater consumption pathway is considered eliminated. While groundwater in the area is not being used as a water supply, contaminated groundwater should be remediated when the groundwater plume is adequately characterized. A private well survey should be conducted in the area near the AMCO site to ensure nobody is using the contaminated groundwater for drinking or other purposes.

While some of the groundwater on the AMCO site is fairly close to the surface (4 to 6 feet bgs), CDHS does not believe that people are likely to be exposed to contaminated groundwater by surface water exposures. Much of the area of concern is paved (AMCO site and Third Street). Residents would need to dig holes in their back yard or at the South Prescott Park of greater than 3 feet or more in order to reach groundwater. While CDHS cannot prevent this or ensure that it never happens, we believe this is very unlikely.

Based on CDHS review of the site data and understanding of the neighborhood, CDHS is concerned that people may have come into contact with chemicals at levels of health concern from the AMCO site and could be exposed to chemicals from the site in the future if the site is not remediated or activity and use limitations are not imposed. Therefore, CDHS considers the AMCO site to be a public health hazard based on the past and possible future exposure to contamination (soil, soil gas and air) on the site and the possible impact of VOC vapors, via the soil gas pathway, on abutting residences and the on-site office building.

Recommendations for Further Actions

1. CDHS recommends that the USEPA remediate the source area.

2. CDHS recommends that the USEPA or their representatives continue to sample air in the basement or crawlspace of residences abutting the AMCO site at least annually to determine if VOCs from the AMCO site are impacting the residences. These samples should be analyzed for full range of VOCs to determine if VOCs from the source area are entering the residences. If vapor intrusion persists, an abatement and remediation plan should be implemented.

3. CDHS recommends that the USEPA collect additional air data from inside the AMCO office. These samples should be analyzed for full range of VOCs to determine if VOCs from the source area are entering the office. If vapor intrusion is persists, an abatement and remediation plan should be implemented.

4. CDHS recommends that the USEPA amend the deed on the AMCO property to impose activity and use limitations on the site to minimize or prevent future exposures to surface and subsurface contamination.

5. CDHS recommends that the USEPA collect sub-slab soil gas data at residences abutting the site and the AMCO office to determine if soil gas contaminants may be impacting these buildings.

6. CDHS recommends the City of Oakland maintain their excavation permit flagging plan and upgrade the plan if needed to limit or eliminate future excavations on or near the AMCO site.

7. CDHS recommends that the USEPA maintain the pavement at the site to prevent exposure to subsurface contaminants.

8. CDHS recommends that the USEPA remediate the groundwater contamination at the AMCO site and potential downgradient areas to prevent future exposure to these contaminants.

9. CDHS recommends that future groundwater monitoring efforts by the USEPA include analysis for the contaminant 1,4-dioxane. This contaminant has been associated with other chlorinated solvent plumes in California.

10. CDHS recommends that the USEPA conduct a private well survey in the vicinity of the AMCO site to ensure that people are not drinking or otherwise using contaminated groundwater.

Public Health Action Plan

The Public Health Action Plan (PHAP) for this site contains a description of actions under consideration by ATSDR and CDHS at and near the site. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards, but also provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. CDHS and ATSDR will follow up on this plan to ensure that actions are carried out. USEPA is collecting additional data to develop an appropriate remedial option at the site.

Actions Conducted by CDHS at the AMCO site

1. December 2, 1997: CDHS released the Health Consultation "West Oakland/Cypress Reconstruction Corridor, Oakland, Alameda County, California." This health consultation assessed the general area in the vicinity of the AMCO site, formerly referred to as DC Metals.

2. April 30, 2003: USEPA proposed to list the AMCO site on the NPL in the Federal Register. CDHS and ATSDR draft the initial PHA.

3. May 2003: CDHS begins the data acquisition process from USEPA Region IX Records Center.

4. June 2003: CDHS sends a letter to the USEPA Region IX Project Manager indicating that CDHS has a cooperative agreement with ATSDR and would like some assistance getting data and documents related to the site.

5. August 13, 2003: CDHS staff meets with ATSDR Regional Representative and USEPA staff to discuss the status of the AMCO site and the potential areas of public health concern.

6. August 20, 2003: CDHS visits the site with the USEPA Region IX Project Manager and tours the immediate neighborhood.

7. October 30, 2003: CDHS staff meets with USEPA staff to get an update on the Community Involvement Plan (CIP) and discuss data gaps at the site and additional data/documents that may be useful for the PHA.

8. February 4, 2004: CDHS meets with USEPA community involvement specialist to discuss community health concerns and the best ways to reach out to the community.

9. April 29, 2004: CDHS releases the initial technical draft of the AMCO PHA for agency review. The purpose of the technical review is to determine if any additional data relative to the subject site (AMCO) exists.

10. May 5, 2004: CDHS meets with representative of the Chester Street Association to discuss issues in the area and the AMCO site concerns in particular.

11. June 14, 2004: CDHS meets with ATSDR and USEPA representatives to discuss comments received on the technical draft of the AMCO PHA.

12. August 25, 2004: CDHS attends USEPA public meeting at the Prescott Elementary School covering USEPA field sampling plans and answering community questions.

13. September 13, 2004: CDHS attends West Oakland Neighborhood Crime meeting and presents an overview of the public comment draft of the PHA. CDHS also seeks comments from the group and individuals.

14. September 14, 2004: CDHS released and distributed the public comment draft of the PHA and appealed for feedback and comments from the community.

15. November 9, 2004: CDHS releases the Spanish version of the public comment draft of the PHA with translational services provided by the USEPA.

16. December 9, 2004: CDHS closed the public comment period for the public comment draft of the PHA.

Planned Actions

1. CDHS will provide a summary of the PHA in English and Spanish.

2. CDHS will post English and Spanish versions of the final PHA on their website.

3. CDHS will meet with any interested community members to discuss the content of the PHA and the implications for public health.

4. To the extent resources permit, CDHS will review appropriate environmental data when it becomes available to assess the potential health risks to residents that abut the AMCO site and to on-site workers.

5. CDHS will hold a public community meeting or attend various existing meetings to discuss the findings of the PHA and to listen to the concerns the community has about the site.

6. CDHS will make efforts to ensure translation of all public documents into Spanish.

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Certification

This **AMCO Chemical site, Oakland, California** public health assessment was prepared by the California Department of Health Services under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the public health assessment was initiated. Editorial review was completed by the Cooperative Agreement partner.

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The Division of Health Assessment and Consultation (DHAC), ATDR, has reviewed this public health assessment and concurs with the findings.

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