ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

Public Health Assessment for

PB2004-100086

ALARK HARD CHROME
RIVERSIDE, RIVERSIDE COUNTY, CALIFORNIA
EPA FACILITY ID: CAD098229214
SEPTEMBER 17, 2003

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

ALARK HARD CHROME

RIVERSIDE, RIVERSIDE COUNTY, CALIFORNIA

EPA FACILITY ID: CAD098229214

Prepared by:

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

FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the *Superfund* law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements. The public health assessment program allows the scientists flexibility in the format or structure of their response to the public health issues at hazardous waste sites. For example, a public health assessment could be one document or it could be a compilation of several health consultations the structure may vary from site to site. Nevertheless, the public health assessment process is not considered complete until the public health issues at the site are addressed.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists evaluate whether or not these contacts may result in harmful effects. ATSDR recognizes that children, because of their play activities and their growing bodies, may be more vulnerable to these effects. As a policy, unless data are available to suggest otherwise, ATSDR considers children to be more sensitive and vulnerable to hazardous substances. Thus, the health impact to the children is considered first when evaluating the health threat to a community. The health impacts to other high risk groups within the community (such as the elderly, chronically ill, and people engaging in high risk practices) also receive special attention during the evaluation.

ATSDR uses existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries, to determine the health effects that may result from exposures. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further public health actions are needed.

Conclusions: The report presents conclusions about the public health threat, if any, posed by a site. When health threats have been determined for high risk groups (such as children, elderly, chronically ill, and people engaging in high risk practices), they will be summarized in the conclusion section of the report. Ways to stop or reduce exposure will then be recommended in the public health action plan.

ATSDR is primarily an advisory agency, so usually these reports identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, fullscale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E60), Atlanta, GA 30333.

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Summary

The California Department of Health Services (CDHS) has prepared this public health assessment (PHA) under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). A PHA is a document that provides the community with information on the public health implications of specific hazardous waste sites and identifies those populations for which further health actions or studies are needed. Existing environmental data, facility operation permits, and community concerns gathered by CDHS were reviewed and evaluated as part of the PHA process.

The Alark Hard Chrome (AHC) site is located at 2775 Main Street, Riverside, Riverside County, California. AHC was a metal plating facility that operated from 1971 to late 1985. A number of chemicals were handled at the facility, including metals, acids, cyanides, and volatile organic compounds (VOCs). Activities at the site resulted in contamination of the soil and groundwater. In 1985, AHC was closed down by the California Environmental Protection Agency (Cal EPA), Department of Toxic Substances and Control (DTSC), for failure to comply with violation notifications. The site is fenced, restricting access to the public.

AHC is located in a mixed, light industrial-commercial-residential neighborhood. There are residential neighborhoods within one to two blocks of the site. There are two elementary schools, about 0.75 miles from AHC. There is a recreational park, which includes Lake Evans, about 0.5 miles from AHC.

CDHS became involved with the site in December 2000, when the United States Environmental Protection Agency (USEPA) listed it on the National Priorities List (NPL) as a Superfund site. This listing automatically requires an assessment of the public health impact of the AHC site, which is the subject of this PHA.

Environmental sampling on site and off site has been conducted, under the supervision of DTSC, USEPA, and the Riverside Public Utility Department (PUD). Between 1982–2001, samples were collected from subsurface soil, surface soil, groundwater (from monitoring wells), sediments from a municipal storm drain and Lake Evans, and surface water from on site and Lake Evans. No air sampling was conducted while AHC was operating.

The contaminants found in *on-site subsurface soil* were hexavalent chromium, total chromium, cadmium, lead, nickel, cyanide, and sodium cyanide. *On-site and off-site groundwater* tests show elevated levels of hexavalent chromium and trichloroethylene (TCE). Low levels of hexavalent chromium were detected in *storm drain sediment* near the AHC site.

CDHS has not identified any completed exposure pathways to site-related contaminants. We have identified a past potential exposure pathway to residents living in the vicinity of AHC

between 1971–1985, to air releases of hexavalent chromium. Because there is no air sampling data, this exposure will be evaluated from estimations produced by air modeling. CDHS is working with ATSDR atmospheric scientists to complete the air modeling. The results will be presented in a separate document.

After a review of available data, CDHS concludes that there is no current or future health hazard from exposure to site-related contaminants in soil, surface water, or groundwater, provided remedial activities continue at the AHC site. If future investigations conducted at or near the AHC site reveal additional sources of contamination that the community could come into contact with, CDHS/ATSDR will evaluate the data.

Background and Statement of Issue

The Environmental Health Investigations Branch (EHIB) of the California Department of Health Services, under cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR), is conducting a PHA for the Alark Hard Chrome (AHC) facility in Riverside, California. ATSDR, located in Atlanta, Georgia, is a federal agency within the United States Department of Health and Human Services that is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 to conduct PHAs at hazardous waste sites. The PHA process includes an evaluation of existing environmental data to determine whether the release of contaminants (chemicals) from a hazardous waste site or an industrial facility impacts or has impacted the health of people in the surrounding communities. The PHA process also includes gathering and responding to concerns that community members have about their health as it relates to an industrial facility. Lastly, through the PHA process, recommendations are made to reduce or prevent possible adverse health effects.

In December 2000, ATSDR was contacted by USEPA, Region IX, because of an updated National Priorities List (NPL) that included the AHC site. AHC was listed on the NPL because of the contamination to the groundwater and because DTSC funds had been exhausted by site-related activities. The USEPA is currently investigating and overseeing the remedial activities at the AHC site. The USEPA requested that ATSDR and CDHS evaluate the potential health impact from exposure to site-related contaminants at AHC. Specifically, this health assessment addresses potential exposure from contamination of the soil, groundwater, surface water, and sediment. CDHS will evaluate exposure from air releases of hexavalent chromium in a separate health assessment.

Site Description and History

The AHC site is located at 2775 Main Street, between Main Street and Market Street in Riverside, California [Appendix A (Figure 1)]. In the northeast corner of the property is Dick's Barbershop, which shares walls on two sides with AHC. On the north and west boundary lines is Klure and Harris Metal Supply Company. On the east boundary line is Main Street. On the south boundary line is Precision Auto Body and Paint [Appendix A (Figure 2)]. This area of Riverside contains a mix of light industry, commercial businesses, and residential neighborhoods [Appendix A (Figure 2)]. There are residential neighborhoods one block to the east and 1.5 blocks to the west. There is a recreational park called Fairmount Park less than a mile to the northwest [Appendix A (Figure 3)]. This park contains Lake Evans and Fairmount Lake, which are popular fishing spots. Lake Evans (the larger of the two) and Fairmount Lake are connected.

AHC was a metal plating facility that operated from 1971 to late 1985, when the facility was closed by DTSC for failure to comply with violation notifications (1). A number of chemicals were handled at the facility, including metals, acids, cyanides, and volatile organic compounds (VOCs) [Appendix B (Table 1)] (2).

The building, which still remains, consists of three main portions: the front room, the middle room, and the back room [Appendix A (Figure 4)]. At the time of operations, the front room of the building was used for grinding metal parts. The middle room was used to conduct the metal plating. The back room contained a recirculation tank for rinse solutions. Behind the building is a small back yard, with a storm drain against the back wall [Appendix A (Figure 4)].

The floor of the building is concrete. However, it was not a solid concrete slab during AHC operations. There were cutouts in the concrete around each of the six plating tanks. These cutouts resulted in 3- to-5 inch gaps in the concrete around each plating tank (3).

In the middle and front rooms, there were six plating tanks, 10 rinse tanks, and two soap tanks [Appendix A (Figure 4)]. Four of the plating tanks contained hexavalent chromium. The chrome plating tanks held 300, 670, 1,400, and 2,100 gallon capacities (4). There was one 300 gallon cadmium plating tank and one 300 gallon nickel plating tank.

There were two holding sites for contaminated liquids. In the middle room, there was an unlined pit that was 40 feet deep and 4 feet in diameter [Appendix A (Figure 4)]. In the back room, there was a leaky 750-gallon recirculation tank that was never pumped for disposal during 10 years of use (7). Contaminants from these areas spread through the soil to the groundwater. Other releases occurred from spills in the plating areas that migrated through cracks in the concrete and from direct dumping on surface soil in the backyard.

During periods of moderate or high rain, a pond formed across the back yard of the site where the soil had been contaminated. Run-off from this pond would then flow into the storm drain system [Appendix A (Figure 4)]. Through the storm drain, potentially contaminated run-off would flow into Lake Evans and Lake Fairmount [Appendix A (Figure 3 and Figure 5)] (8). This area has been paved, reducing the likelihood for such contamination to occur in the future.

In 1986, McLaughlin Enterprises, working for the owners of AHC, moved soil from an area in the middle room that was 30 feet wide, 30 feet long, and 10 feet deep. This soil was placed in the front room. DTSC halted this work because it represented unsafe practices.

In 1994, Rust Remediation, working under contract for DTSC, remediated most of the soil in the middle room. Soil samples found contamination down to the bedrock, at 50 feet. The soil within 5 feet of the walls down to a depth of 40 feet was remediated. Also in 1994, a concrete cap was placed over the entire floor of the middle room.

Environmental sampling on site and off site has been conducted, under the supervision of DTSC, USEPA, and the Riverside Public Utility Department. Between 1982–2001, samples were collected from subsurface soil, surface soil, groundwater (from monitoring wells), sediments from a municipal storm drain and Lake Evans, and surface water from on site and Lake Evans. No air sampling was conducted while AHC was operating.

Site Visit

On March 16, 2001, CDHS staff visited the site and the surrounding residential and recreational areas. CDHS staff met with a hazardous substances scientist from the Site Mitigation Cleanup Operations Branch of the DTSC. The DTSC representative provided CDHS staff with a walking tour of the site. The site consists of the original, one-story building and the small backyard, which is fenced. The building was empty, except for several 55-gallon drums.

Afterward, CDHS staff conducted a driving tour of the residential neighborhoods near the site, Fairmount Park and Lake Evans. During the driving tour, CDHS met several community members and discussed their concerns. Please see the *Community Health Concerns* section for a summary of conversations with community members.

Demographics, Land Use, and Natural Resources Uses

Demographics

According to the 2000 US Census, the City of Riverside has a population of 255,166 (9). All or part of census tracts 301, 302, and 303 are within 1.6 miles of the AHC site. The total population of these three census tracts is 17,434 people, who live in 5,680 households. The female population is 48.8% (8,512), and the male population is 51.2% (8,922). The ethnic distribution is as follows: 57.4% (10,010) White; 8.5% (1,483) African American; 2.3% (397) Asian; 0.5% Pacific Islander (88); and 1.2% (209) American Indian and Alaska Native; 24% (4,237) other race; and 5.8% (1,010) two or more races. The total Hispanic or Latino population (of any race) is 42.8% (7,476). The population by age is as follows: 28.8% (5,026) 0–18 years old; 62.7% (10,927) 19–65 years old; and 8.5% (1,481) older than 65 (9).

Land Use

The area in which AHC is located contains light industry, commercial businesses, and residential neighborhoods. There are residential neighborhoods one block to the east and 1.5 blocks to the west. Several churches are located in the residential areas. Two elementary schools are located within 1 mile of AHC. These are Bryant Elementary, which is 3/4 of a mile southwest of AHC, and Fremont Elementary, which is three-quarters of a mile northeast of AHC [Appendix A (Figure 3)] (10).

Natural Resources Uses and Characteristics:

Surface Water

The Santa Ana River is about 1 mile west of AHC [Appendix A (Figure 3)]. The river probably acts as a hydraulic barrier that prevents contaminated alluvial groundwater from AHC from migrating across the river. Most of the flow in the Santa Ana River comes from treated water from the San Bernardino sewage treatment plant (8).

Storm drains flow west-northwest from AHC, through Springbrook Channel, and then lead directly to Lake Evans [Appendix A (Figure 5)] (8). Lake Evans has a surface area of about 38 acres. It is interconnected to Fairmount Lake, which has a surface area of 10 acres, and a small unnamed pond, with a surface area of about 2 acres. These are man-made lakes that are primarily filled by irrigation wells.

Lake Evans is a heavily used urban fishing lake in Riverside County. The California Department of Fish and Game (DFG) stocks the lake with channel catfish and trout. The lake also has a resident population of largemouth bass, bluegill, green sunfish, and African clawed frogs (8). Boating is allowed on the lake, but swimming is not.

Groundwater Hydrogeology

The geology beneath the AHC site consists of sandy river alluvial deposits, above granitic bedrock, which ranges between 28 to 60 feet deep. There are no known continuous clay layers between the alluvium and the bedrock (11).

The aquifer system consists of two groundwater flow regimes, one that flows through alluvial sediments and the other that flows through fractured bedrock. The aquifer is unconfined, because of the lack of clay, and begins on average at about 40 feet below the ground surface of AHC. The direction of flow in the fractured bedrock is complicated and undefined at this time, and inadequate information exists to suggest groundwater flow direction in the alluvial sediments or fractured bedrock beneath AHC. The regional groundwater generally flows to the southwest from upstream areas of the Santa Ana River basin (to the north) and the Box Springs Mountains (to the east) (2).

Community Concerns

In order to document community concerns, CDHS spoke with staff at federal, state, and local agencies, with residents, with fishers at Lake Evans, and with nearby business owners.

CDHS staff contacted USEPA staff to get a better understanding of community involvement in the past. USEPA provided CDHS with a DTSC Community Relations Plan from March 1990. On the basis of a total of five interviews with local business owners, agency staff, and a resident, DTSC reported that residents appeared to be concerned about potential health hazards. Business owners did not view the site as an immediate threat to their health but were interested in seeing progress made toward remediation. Local elected officials were concerned about potential health hazards to the surrounding community. The City of Riverside had received a few calls from someone interested in building on or around the site. The caller had not followed up with City staff after this initial inquiry.

During a site visit made on March 16, 2001, CDHS staff spoke with a resident near the AHC site. The resident had not attended any of the various agency meetings related to the site, nor did the resident have any health concerns; however, the resident wished to be kept informed about CDHS activities at the site. A nearby business owner did not have any health concerns related to the site and was not interested in receiving more information from CDHS. During a site visit to Fairmount Park, CDHS observed approximately 17 anglers fishing in Lake Evans. The people with whom CDHS staff spoke reported that they fished in Lake Evans between one and five days a week for both food and relaxation. Fishing appears to occur year-round. In November 2002, CDHS talked to a few local agency contacts. No other community health concerns were reported.

CDHS is not aware of any building restrictions in the area as a result of the AHC site.

On February 19, 2003, copies of this public health assessment (PHA), "Alark Hard Chrome Site, Riverside California", were distributed to community members living near the Alark Hard Chrome site for review and public comment. There were approximately 5 weeks (February 19, 2003 to March 31, 2003) allotted for the public to comment on this document. Copies of this health assessment were placed in the Riverside Public Library for all interested parties to review. Also, additional copies were sent to local, state and federal government agencies involved at the site for their review.

Public comments were received for this PHA and are presented in Appendix D along with CDHS's responses.

Environmental Contamination and Pathway Evaluation

Identification of Contaminants of Concern

Three steps are required in order to assess the potential adverse health effects of environmental contamination on a nearby population. First, contaminants that may be affecting a population are identified. Second, exposure pathways or the ways in which someone could come into contact

with the contaminated media are identified. Third, a determination is made whether the contaminants are present at concentrations that could possibly cause adverse health effects. Those contaminants are called contaminants of concern and are assessed as follows.

Use of Health Comparison Values

The concentration of the contaminant in a specific medium (soil, air, and water) is compared to ATSDR health comparison values for that contaminant in that medium. This health comparison value is the concentration of a specific chemical in a specific medium (soil, air, or water) at or below which a person could be exposed to that chemical without the expectation of adverse health effects occurring. These values are calculated by using health-protective assumptions regarding the body weight and ingestion rate of the exposed, receptor population. (For an explanation of the term "ingestion", see Appendix C.) If the concentration of the contaminant is at or below the health comparison value, one should feel confident that adverse health effects should not occur.

If the concentration of the contaminant exceeds the health comparison value, then it is called a contaminant of concern. Adverse health effects do not automatically occur if the concentration of a chemical exceeds its health comparison value. The chemical must be further evaluated on an individual basis to determine the likelihood of exposure and the possibility of adverse health effects.

ATSDR uses health comparison values for both cancer and non-cancer adverse health effects. These health comparison values are described below.

Health Comparison Values for Non-Cancer Adverse Health Effects

ATSDR uses several types of health comparison values to evaluate contaminants of concern for their potential to cause non-cancer adverse health effects. The health comparison value that ATSDR uses for non-cancer adverse health effects is called an Environmental Media Evaluation Guide (EMEG). An EMEG is the concentration of a chemical in soil, air, or water above which a person might experience adverse health effects if exposed to that chemical. EMEGs are based on an ATSDR Minimal Risk Level (MRL), the daily dose (milligrams per kilogram per day (mg/kg/day)) of a chemical to which a person could be exposed without experiencing adverse health effects. MRLs are derived from animal and human toxicological studies. MRLs may be calculated for different lengths of exposure (acute, up to 14 days; intermediate, 15 to 364 days; and chronic, 365 days and more) and for different routes of exposure (inhalation or ingestion).

If there is no MRL, then other values are used. Most frequently, ATSDR will use the USEPA Reference Dose (RfD) for that chemical. The RfD is analogous to ATSDR's chronic MRL. Other

comparison values can be used in the absence of an MRL include the USEPA's Preliminary Remediation Goals (PRGs) and state and federal drinking water standards (Maximum Contaminant Levels—MCLs).

Health Comparison Values for Cancer Health Effects

The health comparison value that ATSDR uses to identify carcinogenic contaminants of concern is called a Cancer Risk Evaluation Guide (CREG). CREG values represent media (air, soil, water) concentrations that are thought to be associated with an extra lifetime cancer risk of one-in-a-million if ingested or inhaled. CREGs are derived from the USEPA oral slope factor, or cancer potency factor, for that chemical. The oral slope factor is the upper 95% slope of the dose-response curve for that chemical, expressed in the inverse of milligrams per kilograms per day ($(mg/kg/day)^{-1}$). The increased lifetime cancer risk is calculated by multiplying the oral slope factor by the concentration of that chemical.

In an average population of 1,000,000 people, approximately 400,000 of those people will develop cancer during their lifetimes as a result of various factors (18). In other words, about 40% of Americans will develop cancer. When considering the increased lifetime cancer risk, one must understand that this value represents the expected increase in the number of cases of cancer, over and above the normal background rate of cancer. An increased lifetime cancer risk of 1×10^{-6} means that in that same population of 1,000,000 people, 400,001 will develop cancer at some point in their lives, with the extra one case being attributable to the specific chemical exposure being evaluated.

On-site Contamination

The main contaminants found at the site were hexavalent chromium, total chromium, cadmium, lead, nickel, cyanide, and TCE. Subsurface soil tests for VOCs showed non-detectable, or very low, levels. The following chemicals were also used on-site: ammonia, cyanide, sodium cyanide, cadmium cyanide, chromic acid, sulfuric acid, sodium hydroxide, nickel chloride, nickel sulfate and methyl ethyl ketone (MEK) [Appendix B (Table 1)].

On-site Subsurface Soil

Since 1982, the on-site subsurface soil has been sampled four times [Appendix B (Table 2)] (6, 12, 13). Between 1983 and 1994, subsurface soil was sampled at various depths, from the three rooms of the building on site and the back yard [Appendix B (Table 2)]. Consultants working for DTSC (IT Corporation, and Rust Remediation) and the owners of Alark Hard Chrome (Pioneer Consultants, McLaughlin Enterprises) collected these samples.

Elevated levels of total chromium, hexavalent chromium, cadmium, lead, and nickel were detected in subsurface soil in the middle room at depths to about 50 feet below ground surface (bgs) [Appendix B (Table 2)]. Sodium cyanide was detected in one sample collected from the middle room.

In 1994, contaminated soil from the middle room was removed to a depth of 40 feet and replaced with clean soil.

Total chromium, cadmium, lead, nickel, and cyanide have been detected in subsurface soil from the backroom and the back yard [Appendix B (Table 2)]. Hexavalent chromium was not detected in soil from the backroom.

On-site Surface soil

In August 2000, one surface soil sample (less than 3 inches from the top) was collected on site from the backyard (parking lot area, exact location not provided) and tested for hexavalent chromium by the City of Riverside Public Utility Department (PUD). The results showed hexavalent chromium at 38 parts per billion (ppb), which is below health comparison values.

On-site Surface Water

The only on-site surface water was a large puddle in the backyard (parking lot area) that occurred during heavy rains [Appendix A (Figure 4)]). On behalf of DTSC, Ecology and Environment, Inc. tested the on-site surface water for metals. Total chromium and cadmium were the only metals detected in the on-site surface water. The total chromium concentration exceeded 10,000 ppb, which exceeds the California Maximum Contaminant Level (MCL) for drinking water of 50 ppb. Cadmium was detected at 134 ppb, which exceeds the MCL for drinking water of 5 ppb. Since the backyard area was fenced, it was unlikely that adult or child residents would have come in contact with this water. The backyard area has been covered with asphalt and/or concrete.

On-site Groundwater (monitoring wells)

Monitoring Well (MW)–2 is the only on-site groundwater monitoring well; it was installed in the bedrock in 1991 [Appendix A (Figure 2), Appendix B (Table 3)]. The well was sampled and tested in 1991, 1995, and 2001. The contaminants that exceed health comparison values/drinking water standards (MCLs) in on-site groundwater are listed in Table 3, Appendix B (11).

High levels of total and hexavalent chromium have been detected in MW–2. The concentrations in samples collected in 1991, 1998, and 2001 range from 1,700 to 10,200 ppb (14). Total chromium ranged from 5,300 to 40,000 ppb. These levels exceed drinking water standards for total chromium in drinking water. TCE concentrations ranged from 7.2 ppb to 41 ppb, which

exceed drinking water standards (MCL). While these contaminants may exceed drinking water standards, the monitoring wells are not used for drinking water purposes. Therefore, no exposures are anticipated from drinking or coming into contact with the contaminated groundwater.

Off-Site Contamination

Off-site Subsurface Soil

In 1983, a consultant for the owners of AHC, and in 1990, a consultant for DTSC sampled and tested off-site subsurface soil [Appendix A (Figure 2)] [Appendix B (Table 4)] (6, 13). On the western boundary, adjacent to K & H parking lot, the levels of total chromium, cadmium, lead, nickel, and cyanide did not exceed health comparison values [Appendix B (Table 4)]. Given the low levels of these contaminants and the unlikelihood of higher concentrations in the future, there are no contaminants of concern in off-site subsurface soil.

Off-site Surface Soil

In August 2000, the City of Riverside PUD collected five off-site surface soil samples near the site and at Lake Evans. Samples were collected at less than 3 inches of depth and analyzed for hexavalent chromium. None of the samples showed detectable levels of hexavalent chromium (15).

Off-site Sediment in Storm Drain

In 1993, Bechtel Environmental Inc., for USEPA, collected and analyzed four sediment samples from the storm drains near the site. The samples were analyzed for metals [Appendix A (Figure 5), Appendix B (Table 5)] (8). One sample was collected from the storm drain outlet, which drains the backyard surface water from AHC. Total chromium was the only AHC-related metal detected. Total chromium was measured at 14.9 parts per million (ppm). Upon retesting, the level was 20.1 ppm. Two more samples were collected downstream, one near the diversion dam where the storm drain outlet joins with Springbrook Channel and one from Fairmount Lake. The total chromium concentrations in these samples were 24.4 ppm and 28.7 ppm, respectively. None of these levels exceed the health comparison values for soil. Therefore, total chromium is not a contaminant of concern for off-site storm drain sediment or Fairmount Lake sediment.

Off-site Surface Water

In July 2000, the City of Riverside PUD collected off-site surface water samples from the east and west ends of Lake Evans. These two samples were tested for hexavalent chromium. The

results showed 0.2 and 0.3 ppb of hexavalent chromium (15). These concentrations are 100 to 300 times below the health comparison values for hexavalent chromium in drinking water. Therefore, they are not considered contaminants of concern for off-site surface water.

Off-site Groundwater

Nine monitoring wells have been drilled in either the alluvium or the fractured bedrock [Appendix A (Figure 2)]. There are no groundwater monitoring wells (MW) in the alluvium to the southeast of AHC [Appendix A (Figure 2)] (11). MW–1 and MW–3 were sampled in 1991, 1995, 2001, and analyzed for metals and VOCs [Appendix B (Table 3)]. The remainder of the wells were sampled in 1995 and 2001 (11, 14).

Total chromium has been detected at levels up to 40,000 ppb in MW–2. Hexavalent chromium has been detected at levels up to 17,300 ppb in MW–7 [Appendix B (Table 3)]. TCE was detected at levels up to 110 ppb in MW–7 [Appendix B (Table 3)]. Vanadium (not site-related) exceeded drinking water standards in one sample collected from MW–10 in 1995. Elevated levels of hexavalent chromium and TCE have also been detected in a number of the other monitoring wells [Appendix B (Table 3)]. These results indicate that total chromium, hexavalent chromium, vanadium, and TCE are contaminants of concern in off-site groundwater. However, because these are monitoring wells not used for drinking water purposes, nobody is coming into contact with the contaminated water, and thus no exposures are anticipated.

Municipal Drinking Water Wells

Before water is distributed to the public, the water must meet the standards mandated in the California Health and Safety Code, Title 22. The USEPA and the CDHS—Division of Drinking Water have issued drinking water standards or Maximum Contaminant Levels (MCLs) for more than 80 contaminants in drinking water. The MCL is the maximum permissible concentration of a contaminant allowable in drinking water. MCLs are set as close as possible to the level at which no adverse health effects are expected to occur, accounting for sensitive subgroups such as children, pregnant women, the elderly; and the ability, effectiveness, and treatment costs of various technologies to remove the contaminant.

The City of Riverside PUD, the City of Rubidoux, and Riverside Highland Water Company operate 18 drinking water supply wells located within 4 miles of AHC. The closest municipal water supply wells are approximately 1.8 miles from AHC and are operated by the City of Riverside [Appendix B (Table 6)].

Hexavalent chromium has been detected at low levels ranging from 0.6 to 2.4 ppb [Appendix B (Table 6)]. These levels are below drinking water standards (MCLs) for total chromium and therefore not considered a contaminant of concern.

Irrigation Wells

The City of Riverside PUD owns 10 irrigation wells within 4 miles of AHC. The nearest irrigation well (Mori well) is about 1/3 of a mile away. The Mori well supplies water to Lake Evans (16). In 1991, hexavalent chromium was detected at 0.175 ppb, which is below California's drinking water standard for total chromium (50 ppb).

Private Wells

There are no known private wells in the area surrounding AHC.

Quality Assurance/Quality Control Procedures

In preparing this PHA, CDHS/ATSDR relied on information provided by USEPA, DTSC, the City of Riverside PUD, the San Bernardino Water District, California DFG, and contractors. CDHS/ATSDR assumes that adequate quality control measures were followed with regard to chain of custody, laboratory procedures, and data reporting. The validity of the analysis and conclusions reported in this PHA depends on the completeness and reliability of the referenced information.

Pathway Analyses

For a receptor population to be exposed to environmental contamination, there must be a mechanism by which that contamination comes into direct contact with the target population. An exposure pathway is the description of this mechanism. An exposure pathway consists of five parts: a source of contamination, an environmental medium and transport mechanism, a point of exposure, a route of exposure, and a receptor population.

Exposure pathways are classified as completed, potential, or eliminated. A completed exposure pathway is one in which all five elements of the pathway are present. A potential pathway is a pathway in which one or more elements of the pathway are missing but might be present later. An eliminated pathway is one in which one or more of the elements is missing and will not be complete in the future. For a population to be exposed to an environmental contaminant, a completed exposure pathway, consisting of all five elements, must be present.

Completed Exposure Pathway

CDHS has concluded there are no completed exposure pathways for site-related contaminants at the AHC.

Potential Exposure Pathway

CDHS has identified one potential exposure pathway to past air releases of hexavalent chromium at the site. This pathway will be evaluated in a separate health assessment using air modeling data. It is possible for off-site soils to have been impacted by hexavalent chromium as a result of aerial deposition. Under certain environmental conditions, hexavalent chromium converts to trivalent chromium (non-toxic form) in soil (17). Hexavalent chromium has not been detected in the few off-site surface soil samples analyzed.

Eliminated Exposure Pathways

On the basis of a review of the data, CDHS has eliminated several exposure pathways [Appendix B (Table 7)]. The following list describes the reasons these exposure pathways were eliminated.

- *Drinking Water Supply Wells:* Levels of chromium present in drinking water supply wells managed by Riverside PUD are below health comparison values and drinking water standards (MCLs). Continued monitoring (as required by Title 22) by Riverside PUD will help to ensure that any future contamination (from any source) that may exceed drinking water standards will be detected before it is served to customers. In addition, continued remedial work at the site will help to ensure that there are no future impacts to water supply wells from AHC contaminants.
- *Groundwater:* There is no way for residents to come into contact or be exposed to contaminated groundwater below the site.
- *On-site/Off-site Soil:* There is no exposed soil where contamination has been detected at levels that exceed health comparison values. The site and surrounding areas are covered by asphalt and/or concrete, further reducing the likelihood for someone to come into contact with contaminated soil.
- *On-*Site *Surface Water:* The backyard area where surface water would accumulate on contaminated soil in the past was fenced, restricting access to the public. Since the site is no longer operating and is covered by asphalt and/or concrete, it is unlikely for surface water to become contaminated in the future.
- *Off-site Surface Water:* No contaminants have been detected at levels of health concern in off-site surface water. Since the site is no longer operating and is covered with asphalt and/or concrete, it is unlikely for surface water to become contaminated in the future.
- *Off-site storm drain and Fairmount Lake sediment:* No contaminants have been detected at levels of health concern in off-site sediment.

CDHS did not consider past exposure to workers at AHC. Exposure to toxic chemicals in the workplace is governed by the state and federal Occupational Safety and Health Administration (Cal-OSHA, OSHA) and by the National Institute of Occupational Safety and Health (NIOSH) and are outside the jurisdiction of CDHS and ATSDR.

Children's Health Considerations

ATSDR recognizes that infants and children may be more sensitive to contaminants, depending on the substance and the exposure situation, than adults. This sensitivity is a result of several factors. First, 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. Second, children play outdoors close to the ground, increasing their exposure to toxicants in dust, soil, surface water, and ambient air. Third, children have a tendency to stick their hands in their mouths while playing, and as a result, they may eat contaminated soil particles at higher rates than adults. Some children exhibit a behavior trait known as "pica", a tendency to ingest non-food items such as soil. Fourth, children are shorter than adults and therefore breathe dust, soil, and any vapors close to the ground. Fifth, children's bodies are rapidly growing and developing, and they can sustain permanent damage if toxic exposures occur during critical growth stages. Sixth, children and teenagers may disregard no-trespassing signs and wander into restricted locations. Because children depend completely on adults for risk identification and management decisions, CDHS is committed to evaluating their special interests at sites, such as the AHC site.

CDHS has attempted to identify residential and other populations of children in the vicinity of AHC. According to the site visit, the nearest schools/playgrounds, Bryant Elementary and Fremont Elementary, are located approximately 3/4 of a mile southwest and northeast of the site, respectively. The children attending these schools would not be exposed to contaminants in the soil, surface water, or groundwater at AHC.

Conclusions

CDHS concludes that there is no past or current, or future health hazard from exposure to contaminated soil, surface water, or groundwater, provided remedial activities continue at the AHC site. If future investigations conducted at or near the AHC site reveal additional sources of contamination that the community could come into contact with, CDHS/ATSDR will evaluate the data.

On the basis of a review of available data pertaining to AHC, CDHS has not identified any completed exposure pathways to site-related contaminants.

CDHS has identified one potential exposure pathway to past air releases of hexavalent chromium at the site. This pathway will be evaluated in a separate health assessment using air model-derived data.

CDHS eliminated several pathways relating to drinking water supply wells, contaminated soil, surface water, sediment, and groundwater, because contamination in these media is not accessible to the public or else the contaminant concentrations are below levels of health concern.

Recommendations

CDHS recommends that USEPA confirm the direction of groundwater flow and define the boundary of the contaminated groundwater plume. This is important so that remedial activities can be implemented to ensure protection of water quality in the area.

Public Health Action Plan

The Public Health Action Plan (PHAP) for this site contains a description of actions taken, to be taken, or under consideration by ATSDR and CDHS or others at and near the site. The purpose of the PHAP is to ensure that this 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. The first section of the PHAP contains a description of actions completed. In the second section there is a list of additional public health actions that are currently in underway.

Actions Completed

1. CDHS reviewed all on-site and off-site groundwater, surface water, soil, and storm drain sediment data to evaluate potential exposures.
2. CDHS met with regulatory agencies and city and county officials to assess future site-related activities.
3. CDHS reviewed the available hexavalent chromium data for Riverside Municipal Supply Wells near AHC.

Current Actions

1 ATSDR atmospheric specialists are creating a model of air contamination from past AHC activities. CDHS will evaluate these data and prepare a separate health assessment.
2. USEPA is investigating the boundary of the hexavalent chromium plume in the bedrock groundwater in the west-northwest direction.
3. As a precautionary measure, the City of Riverside PUD is testing municipal supply wells for hexavalent chromium.

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Certification

This Public Health Assessment for the Alark Hard Chrome site in Riverside, California, 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 begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health assessment and concurs with the findings.

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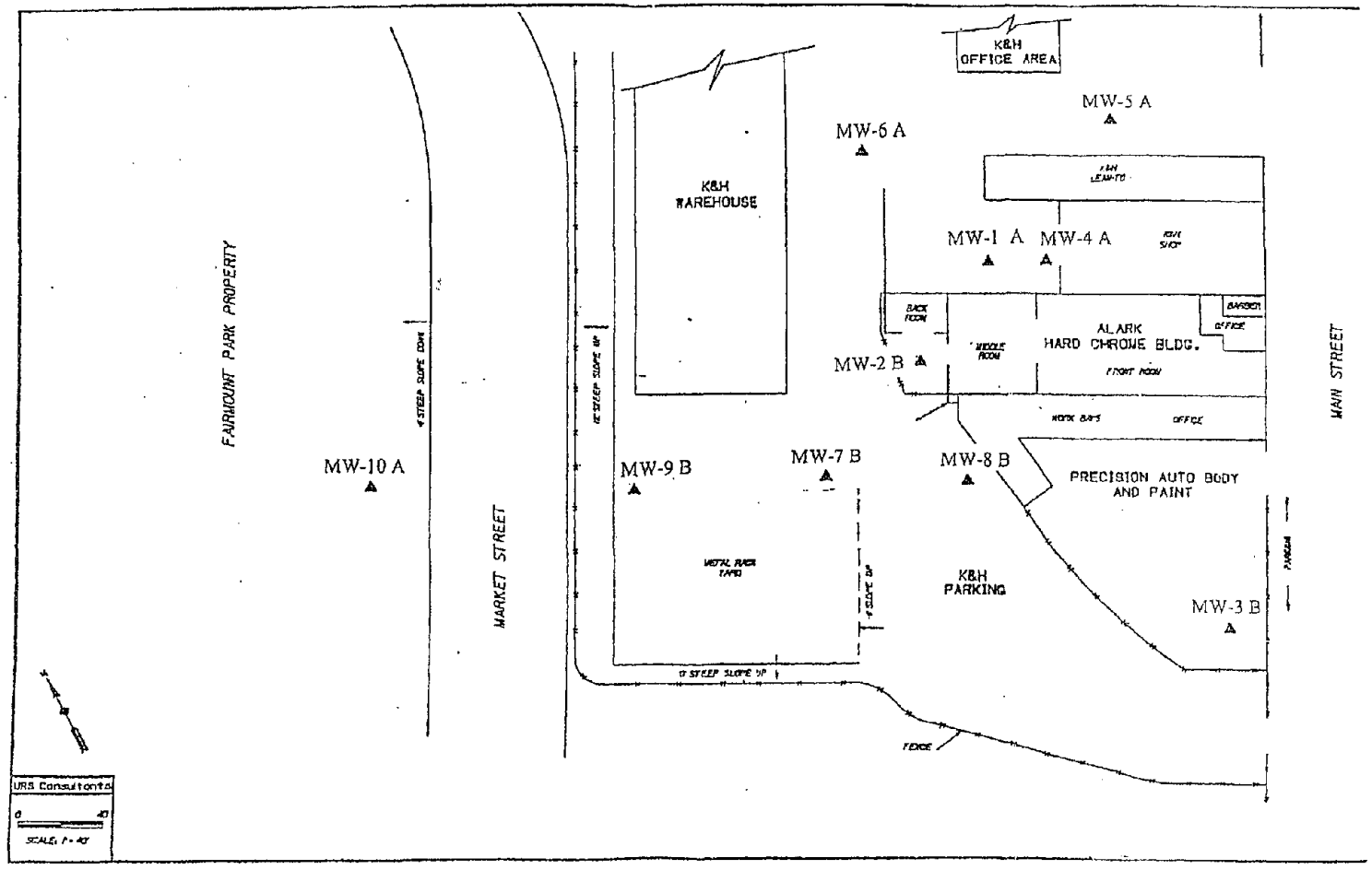
Chief, State Program Section, DHAC, ATSDR

Appendix A
Figures

Figure 1. Location of Alark Hard Chrome Site (AHC) in Riverside, California

Figure 2. Location of Alark Hard Chrome (AHC) building, surrounding properties, and monitoring wells (MWs)



A - Alluvial groundwater MW

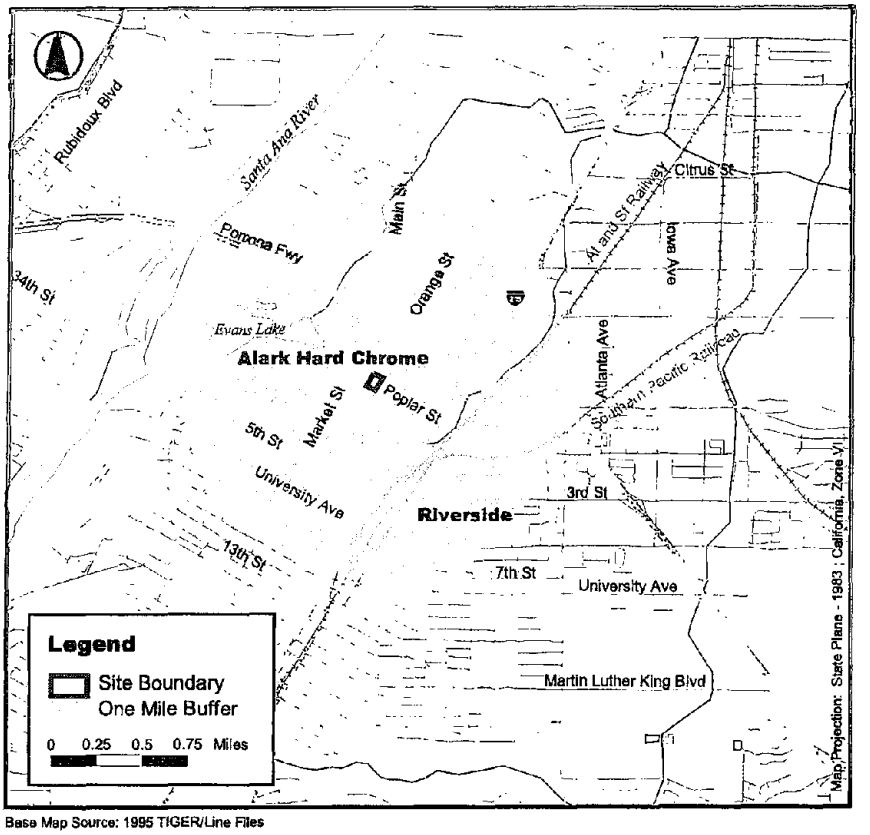
B - Bedrock groundwater MW

From URS Consultants, Inc. Groundwater Remedial Investigation Report for the Alark Hard Chrome Site. 1996.

Alark Hard Chrome

Riverside, California

EPA Facility ID CAD093229214



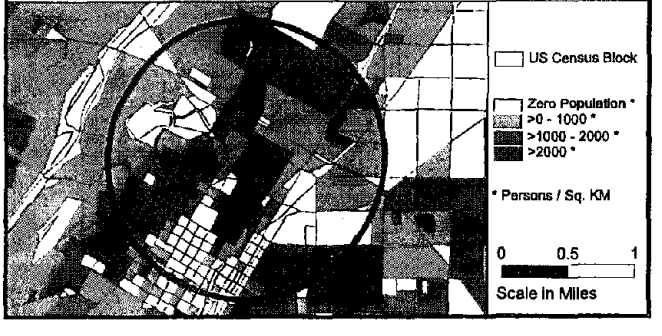
Base Map Source: 1995 TIGER/Line Files

Riverside County, California

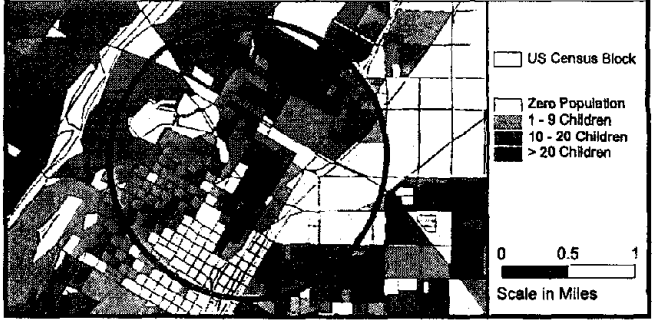
Demographic Statistics Within One Mile of Site*	
Total Population	15418
White	8821
Black	1547
American Indian, Eskimo, Aleut	153
Asian or Pacific Islander	476
Other Race	4422
Hispanic Origin	6502
Children Aged 6 and Younger	2183
Adults Aged 65 and Older	1230
Females Aged 15 - 44	3676
Total Housing Units	5261

Demographics Statistics Source: 1990 US Census
*Calculated using an area-proportion spatial analysis technique

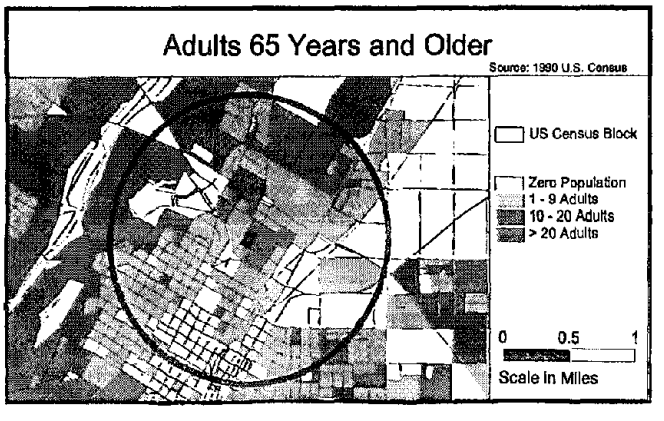
Population Density



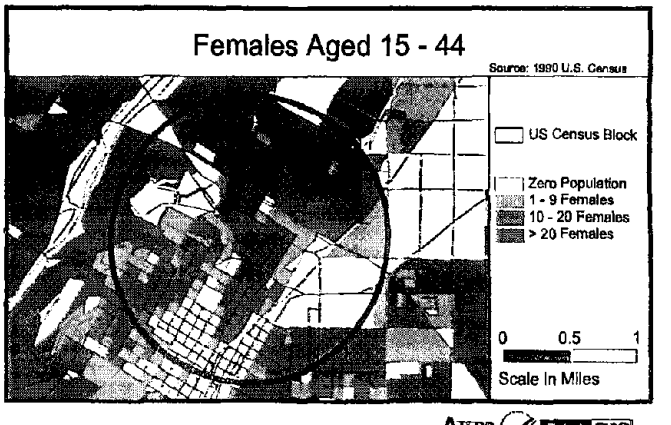
Children 6 Years and Younger



Adults 65 Years and Older



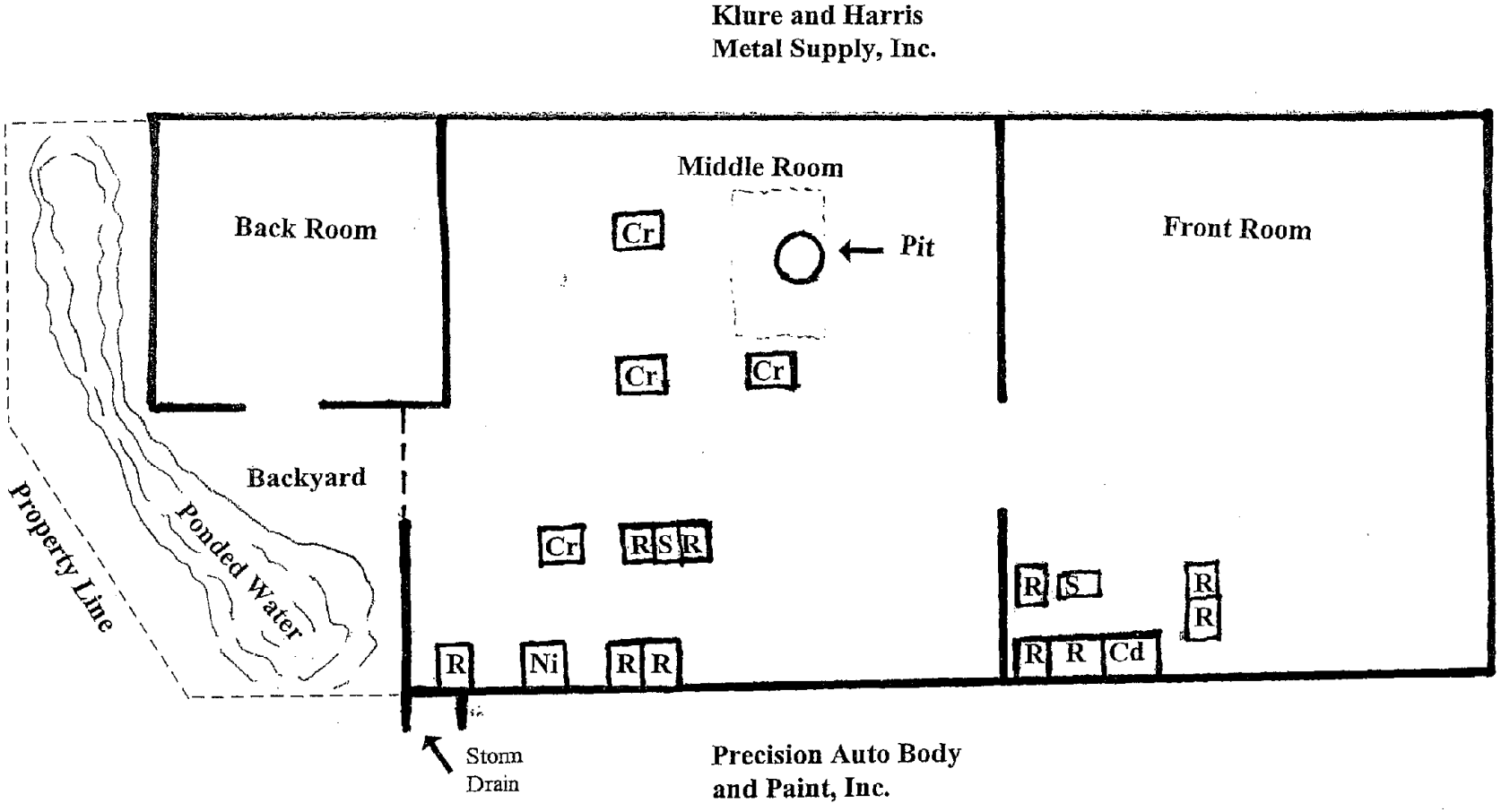
Females Aged 15 - 44



ATSDR SAAGIS

JVA051101

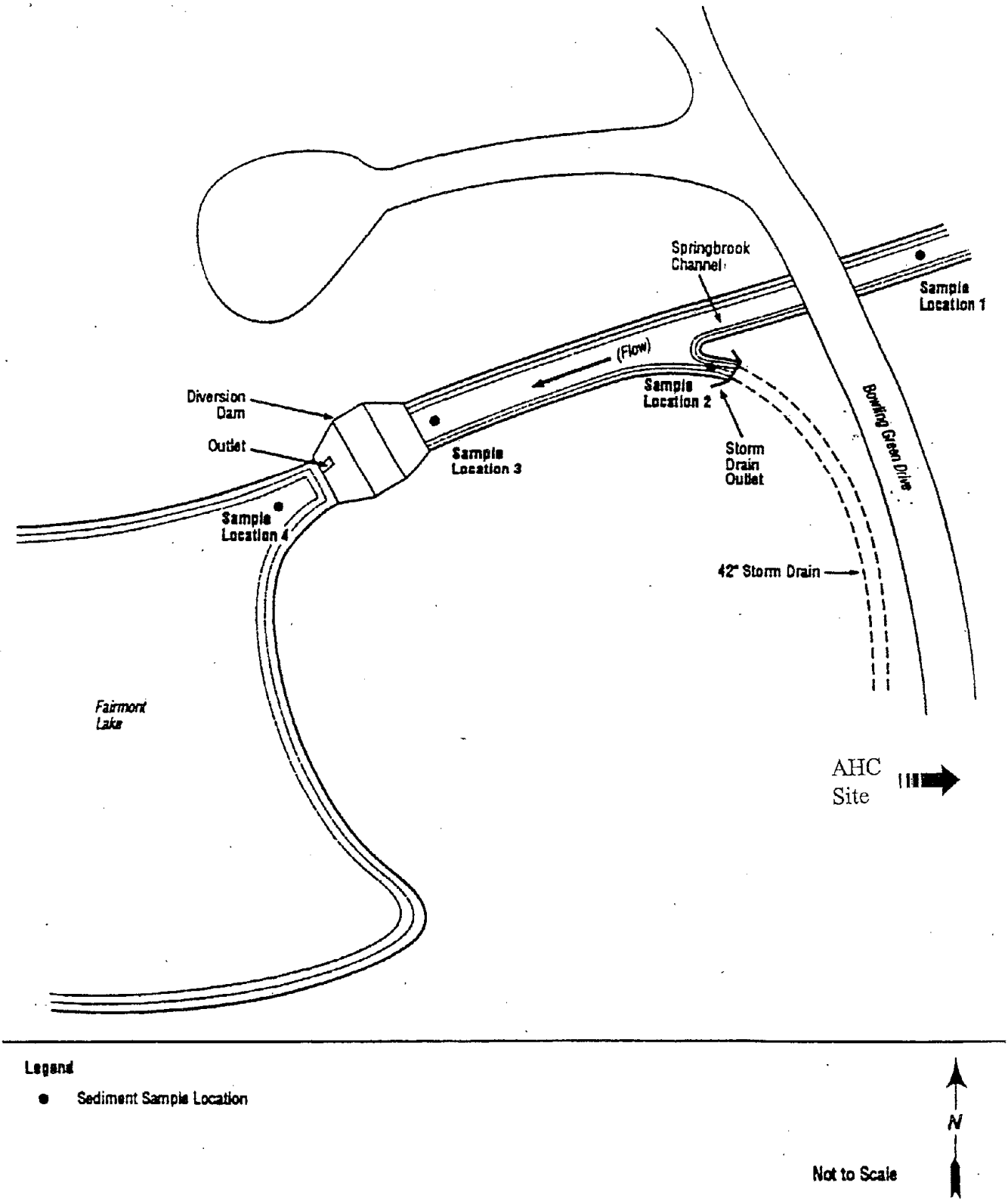
Figure 4. Layout of plating tanks, rinse tanks, soap tanks, unlined disposal pit, storm drain, and pond



Cr- Chrome Plating Tank **Ni**-Nickel Plating Tank **Cd**-Cadmium Plating Tank

R - Rinse Tank **S** - Soap Tank

Figure 5. Location of storm drain sediment samples, between Alark Hard Chrome (AHC) Site and Lake Evans



From Bechtel Environmental, Inc. Site Inspection Prioritization, March 29, 1993.

Appendix B
Tables

Table 1: Metals and Chemicals Present During Alark Hard Chrome Plating Operations; Alark Hard Chrome (1971-1985) Site, Riverside, California.

Ammonia
Cadmium
Cadmium Cyanide
Chromic Acid (Chromium Trioxide)
Chromium, Hexavalent
Chromium, Total
Cyanide
Lead
MEK (Methyl Ethyl Ketone)
Nickel
Nickel Chloride
Nickel Sulfate
Sodium Cyanide
Sodium Hydroxide
Sulfuric Acid
TCE (Trichloroethylene)

Table 2: Range of Contaminant Levels Detected in On-site Subsurface Soil Prior to Remedial Activities

Soil Samples Collected 1982-84 and 1992 from the Alark Hard Chrome Site, Riverside, California

Location and Depth	Hexavalent Chromium (ppm)	Total Chromium (ppm)	Cadmium (ppm)	Lead (ppm)	Nickel (ppm)	Cyanide (ppm)	Sodium Cyanide (ppm)
Health Comparison Value	200 (child) 2000 (adult)	210 (PRG)	10 (child) 100 (adult)	400 (PRG)	1000 (child) 10000 (adult)	1000 (child) 10000 (adult)	2000 (child) 30000 (adult)
Front Room < 10 ft.	ND	9.2	ND	10	7	NT	NT
Front Room 20 to 40 ft.	ND	7.6 - 11	ND	ND - 12	5 - 12	ND	NT
Middle Room < 10 ft.	21 - 3120	0 - 3460	1 - 120	160 - 800	ND - 72	NT	0 - 24
Middle Room 20 to 50 ft.	11 - 2450	0 - 7000	0.3 - 16	ND - 16	4 - 63	ND - 2	NT
Backyard <10 ft.	ND	37 - 2500	0 - 2.7	11 - 48	11 - 47	NT	NT
Backyard 20 to 40 ft.	NT	20	0 - 1	ND	5 - 10	38 - 48	NT
Backroom < 10 ft.	NT	43 - 800	ND - 100	12 - 190	10 - 15	26	NT
Backroom 20 to 40 ft.	NT	25 - 520	ND - .8	ND - 13	9 - 19	ND	NT

ppm-parts per million; PRG-USEPA preliminary remedial goal [see Glossary (Appendix C) for definition], ND - Not Detected; NT - Not Tested. In 1994, soil from the middle room was removed to a depth of ~40 feet and replaced with clean soil.

Table 3: Range of Contaminant Levels Detected in On-site and Off-site Groundwater Monitoring Wells (MWs) 1991, 1995, 2001
Alark Hard Chrome Site, Riverside, California

Monitoring Well	Years Tested	Hexavalent chromium (ppb*)	Total chromium (ppb)	Vanadium (ppb)	Trichloroethylene (TCE) (ppb)
Health Comparison Value (ppb)** ⬇		50 (MCL for total chromium)	50	50 (action level)	5
MW-1 Alluvial Off-site	1991, 1995, 2001	210 - 800	200 - 400	<50 - <100	3.0 - 8.9
MW-2 Bedrock On-site	1991, 1995, 2001	1700 - 10,200	5300 - 40,000	<50 - <100	7.2 - 41
MW-3 Bedrock Off-site	1991, 1995, 2001	<20 - <100	<15 - <1000	<50 - <100	ND
MW-4 Alluvial Off-site	1995, 2001	100 - 130	80 - 100	<50 - <100	3.8 - 6.0
MW-5 Alluvial Off-site	1995, 2001	<20 - <50	20 - <100	<50 - <100	1 - 1.2
MW-6 Alluvial Off-site	1995, 2001	<20 - <50	<15 - <100	<50 - <100	0.8
MW-7 Bedrock Off-site	1995, 2001	9000 - 17,300	9400 - 10,500	<50 - <100	50 - 110
MW-8 Bedrock Off-site	1995, 2001	<20 - <50	19 - <100	<50 - <100	<1 - 1.4
MW-9 Bedrock Off-site	1995, 2001	<1 - 5900	3800	<50 - <100	30
MW-10 Alluvial Off-site	1995, 2001	<20	20	150	<5

Note: cadmium, nickel and lead have not been detected in groundwater monitoring wells on-site or off-site.
*ppb = parts per billion; ** State drinking water standard/ MCL (maximum contaminant level); action level- health based advisory levels established by CDHS for drinking water contaminants without MCLs.

Table 4: Range of Off-Site Subsurface Soil Contaminants and Health Comparison Values (4,20)

Soil Samples Collected in 1983 and 1990 at the Alark Hard Chrome Site, Riverside, California

	Hexavalent Chromium (ppm)	Total Chromium (ppm)	Cadmium (ppm)	Lead (ppm)	Nickel (ppm)	Cyanide (ppm)
Child Comparison Value (ppm)	200 (RMEG)	not available	10 (cEMEG)		1,000 (RMEG)	1,000 (RMEG)
Adult Comparison Value (ppm)	2,000 (RMEG)	210 (PRG)	100 (cEMEG)	400 (PRG)	10,000 (RMEG)	10,000 (RMEG)
Location and Depth						
Northern Boundary < 10 feet (ft) Deep	NT	8.1 - 10	ND	ND - 10	7 - 8	NT
Northern Boundary 20 to 40 ft. Deep	NT	2.1 - 12	ND - 0.4	ND - 13	ND - 9	NT
Western Boundary <10 ft. Deep	NT	96 - 130	1.7 - 12	39 - 88	14 - 24	NT
Western Boundary 20 to 40 ft. Deep	NT	2.9 - 120	ND - 1.0	ND	ND - 9	NT

ppm-parts per million
RMEG - Reference Dose Media Evaluation Guide
cEMEG - Chronic EMEG. Environmental Media Evaluation Guide (ATSDR) [see Glossary (Appendix C) for definition]
PRG - PRG-USEPA preliminary remedial goal [see Glossary (Appendix C) for definition]
NT - Not Tested
ND - Not Detected

Table 5: Off-site Storm Drain Sediment Testing Results for Total Chromium (9); Sample Collected 1993 at the Alark Hard Chrome (AHC) Site, Riverside, California

	Total Chromium (ppm)
Locations (See Figure 5)	
Storm Drain Upstream of AHC (Location 1)	6.5
AHC Sample (Location 2)	14.9
AHC Sample Duplicate Lab Test (Location 2)	20.1
Springbrook Channel Upstream of Diversion Dam (Location 3)	24.4
East End of Fairmount Lake (Location 4)	28.7

ppm - parts per million

Table 6: Municipal Drinking Water Wells Within 2 Miles of the Alark Hard Chrome (AHC) Site Riverside, California and Hexavalent Chromium Test Results and Drinking Water Standard (15, 16)

Name of Well	Distance from AHC Site	Use of Well	Owner	Hexavalent Chromium (ppb)	Drinking Water Standard (MCL) (ppb)
Garner C	1-2 miles	Domestic	Riverside Public Utilities	1.5	50
Garner D	1-2 miles	Domestic	Riverside Public Utilities	1.1	50
Russell C	1-2 miles	Domestic	Riverside Public Utilities	0.6	50
7th and Chicago	1-2 miles	Domestic	Riverside Public Utilities	2.4 - 2.6	50
Iowa Booster	1-2 miles	Domestic	Riverside Public Utilities	2.8	50
North Orange/ Columbia	2 miles	Domestic	Riverside Public Utilities	1.1 - 1.5	50

ppb - parts per billion
MCL- California's maximum contaminant level

Table 7: Elements of Eliminated Exposure Pathways from Alark Hard Chrome Site

Pathway Name	Source	Medium	Exposure Point	Exposure Route	Receptor Population	Time of Exposure	Chemicals of concern
Exposure to on-site soil	Alark Hard Chrome	Soil	None	Ingestion, dermal contact	Adults and children	Past, present, future	Cadmium, hexavalent chromium, cyanide, lead
Exposure to off-site subsurface soil	Alark Hard Chrome and other possible sources	Soil	None	Ingestion, dermal contact	Adults and children	Past, present, future	Cadmium
Exposure to contaminated groundwater	Alark Hard Chrome and other possible sources	Water	None	Ingestion, dermal contact	Adults and children	Past, present, future	Hexavalent chromium
Exposure to contaminated drinking water	Alark Hard Chrome and other possible sources	Water	Household tap	Ingestion, dermal contact	Adults and children	Past, present, future	None
Exposure to on-site surface water	Alark Hard Chrome and other possible sources	Water	None	Ingestion, dermal contact	Adults and children	Past, present, future	Cadmium, total chromium
Exposure to off-site surface water	Alark Hard Chrome and other possible sources	Water	Storm drain/lakes	Ingestion, dermal contact	Adults and children	Past, present, future	None

Appendix C
Glossary

Glossary

Absorption: How a chemical enters a person's blood after the chemical has been swallowed, has come into contact with the skin, or has been breathed in.

Adverse Health Effect: A change in body function or the structures of cells that can lead to disease or health problems.

ATSDR: The **A**gency for **T**oxic **S**ubstances and **D**isease **R**egistry. ATSDR is an agency of the U.S. Department of Health and Human Services located in Atlanta, Georgia.

Background Level: An average or expected amount of a chemical in a specific environment; or, amounts of chemicals that occur naturally in a specific environment.

Cancer Risk: The potential for a contaminant exposure to cause cancer in an individual or population is evaluated by estimating the probability of an individual's developing cancer over a lifetime, assuming there are no "safe" toxicity values for carcinogens. USEPA's cancer slope factors, available for many carcinogens, are an estimate of a chemical's carcinogenic potency, or potential, for causing cancer.
Cancer risk is the likelihood, or chance, of getting cancer. We say "excess cancer risk" because we have a "background risk" of about one-in-four chances of getting cancer. In other words, in a million people, it is expected that 250,000 individuals would get cancer from a variety of causes. If we say that there is a "one-in-a-million" excess cancer risk from a given exposure to a contaminant, we mean that if one million people are exposed to a carcinogen at a certain level over their lifetimes, then one cancer above the background chance, or the 250,001st cancer, may appear in those million persons from that particular exposure. In order to take into account the uncertainties in the science, the risk numbers used are plausible upper limits of the actual risk based on conservative assumptions. In actuality, the risk is probably somewhat lower than calculated, and in fact, may be zero.

Cancer Risk Evaluation Guide (CREG): Carcinogenic chemicals are selected for follow-up by comparing the levels to the CREG. CREGs are derived from USEPA's cancer slope factors. Cancer slope factors give an indication of the relative carcinogenic potency of a particular chemical. CREG values represent media concentrations which are thought to be associated with an extra lifetime cancer risk of one-in-a-million.

CERCLA: See **C**omprehensive **E**nvironmental **R**esponse, **C**ompensation, and **L**iability **A**ct.

Chronic Exposure: A contact with a substance or chemical that happens over a long period of time. ATSDR considers exposures of more than one year to be chronic.

Completed Exposure Pathway: See Exposure Pathway.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): CERCLA was put into place in 1980. It is also known as Superfund. This act concerns releases of hazardous substances into the environment, and the cleanup of these substances and hazardous waste sites. ATSDR was created by this act and is responsible for assessing health issues related to hazardous waste sites.

Concern: A belief or worry that chemicals in the environment might cause harm to people.

Concentration: The amount of a substance present in a certain amount of soil, water, air, or food.

Contaminant: See Environmental Contaminant.

Dermal Contact: A chemical getting onto your skin (see Route of Exposure).

Dose: The amount of a substance to which a person may be exposed, usually on a daily basis. Dose is often explained as "amount of substance(s) per body weight per day".

Duration: The amount of time (days, months, years) that a person is exposed to a chemical.

Environmental Contaminant: A substance (chemical) that gets into a system (person, animal, or the environment) in amounts higher than that found in Background Level, or what would be expected.

Environmental Media: Usually refers to the air, water, and soil in which chemicals of interest are found. Sometimes refers to the plants and animals that are eaten by humans. Environmental media is the second part of an Exposure Pathway.

Environmental Media Evaluation Guide (EMEG): EMEGs are media-specific values developed by ATSDR to serve as an aid in selecting environmental contaminants that need to be further evaluated for potential health impacts. EMEGs are based on noncarcinogenic health results and do not consider carcinogenic effects. EMEGs are based on the MRLs (see non-cancer evaluation).

Exposure: Coming into contact with a chemical substance. (For the three ways people can come in contact with substances, see Route of Exposure.)

Exposure Assessment: The process of finding ways people come into contact with chemicals, how often and how long they come in contact with chemicals, and the amounts of chemicals with which they come in contact.

Exposure Pathway: A description of the way that a chemical moves from its source (where it began) to where and how people can come into contact with (or get exposed to) the chemical.
ATSDR defines an exposure pathway as having five parts:

- Source of Contamination,
- Environmental Media and Transport Mechanism,
- Point of Exposure,
- Route of Exposure, and
- Receptor Population.

When all five parts of an exposure pathway are present, it is called a Completed Exposure Pathway.

Frequency: How often a person is exposed to a chemical over time—for example, every day, once a week, twice a month.

Hazardous Waste: Substances that have been released or thrown away into the environment and, under certain conditions, could be harmful to people who come into contact with them.

Health Effect: ATSDR deals only with Adverse Health Effects (see definition in this Glossary).

Indeterminate Public Health Hazard: This category is used in ATSDR's public health assessment (PHA) documents for sites that have certain physical features or evidence of short-term (less than 1 year), site-related chemical exposure that could result in adverse health effects and require quick intervention to stop people from being exposed.

Ingestion: Swallowing something, as in eating or drinking. It is a way a chemical can enter your body (See Route of Exposure).

Inhalation: Breathing. It is a way a chemical can enter your body (See Route of Exposure).

LOAEL: **L**owest **O**bserved **A**dverse **E**ffect **L**evel. The lowest dose of a chemical in a study, or group of studies, that has caused harmful health effects in people or animals.

Maximum Contaminant Level (MCL): The US Environmental Protection Agency (USEPA) and the CDHS has issued drinking water standards, or MCLs, for contaminants in drinking water. The MCLs are set according to known or anticipated adverse human health effects (which also account for sensitive subgroups, such as children, pregnant women, the elderly, etc.), the ability of various technologies to remove the contaminant, their effectiveness, and cost of treatment. The MCLs can change as new technologies are developed and as new scientific knowledge are attained. For cancer risk, the MCLs are set at levels that will limit an individual risk of cancer from a contaminant to between 1 in 10,000 (low increased excess risk) to 1 in 1,000,000 (no apparent increased excess risk) over a lifetime. As for non-cancer effects, the MCLs are set at levels below which no adverse health effects are expected to occur. For total chromium, the USEPA has adopted an MCL of 100 parts per billion (ppb) in 1991 for chromium as a total of two species: trivalent chromium and hexavalent chromium. The CDHS adopted the MCL of 50 ppb, based on OEHHA's risk assessment of 1994. The MCL was intended to protect primarily from the hexavalent chromium species.

Non-Cancer Evaluation = ATSDR's Minimal Risk Level (MRL) and USEPA's Reference Dose (RfD) and Reference Concentration (RfC): The MRL, RfD and RfC are estimates of daily exposure to the human population (including sensitive subgroups), below which non-cancer adverse health effects are not likely to occur. The MRL, RfD, and RfC consider only non-cancer effects. Because they are based only on information currently available, some uncertainty is always associated with the MRL, RfD and RfC. "Safety" factors are used to account for the uncertainty in our knowledge about their danger. The greater the uncertainty, the greater the "safety" factor and the lower the MRL, RfD, or RfC.

When there is adequate information from animal or human studies, MRLs and RfDs are developed for the ingestion exposure pathway, whereas RfCs are developed for the inhalation exposure pathway. An MRL, RfD, or RfC is an estimate of daily human exposure to a substance that is likely to be without an appreciable risk of adverse (noncarcinogenic) health effects over a specified duration of exposure. No toxicity values exist for exposure by skin contact. Separate non-cancer toxicity values are also developed for different durations of exposure. ATSDR develops MRLs for acute exposures (less than 14 days), intermediate exposures (from 15 to 364 days), and for chronic exposures (greater than one year). USEPA develops RfDs and RfCs for acute

exposures (less than 14 days), subchronic exposures (from two weeks to seven years), and chronic exposures (greater than seven years). Both the MRL and RfD for ingestion are expressed in units of milligrams of contaminant per kilograms body weight per day (mg/kg/day). The RfC for inhalation is expressed in units of milligrams per cubic meter (mg/m^3).

NPL: The **N**ational **P**riorities **L**ist. (Part of Superfund.) A list kept by the USEPA of the most serious, uncontrolled or abandoned hazardous waste sites in the country. An NPL site needs to be cleaned up or is being looked at to see if people can be exposed to chemicals from the site.

NOAEL: **N**o **O**bserved **A**dverse **E**ffect **L**evel. The highest dose of a chemical in a study, or group of studies, that did not cause harmful health effects in people or animals.

No Apparent Public Health Hazard: The category is used in ATSDR's PHA documents for sites where exposure to site-related chemicals may have occurred in the past or is still occurring, but the exposures are not at levels expected to cause adverse health effects.

No Public Health Hazard: The category is used in ATSDR's PHA documents for sites where there is evidence of an absence of exposure to site-related chemicals.

PHA: **P**ublic **H**ealth **A**ssessment. A report or document that looks at chemicals at a hazardous waste site and tells if people could be harmed from coming into contact with those chemicals. The PHA also tells if possible further public health actions are needed.

Point of Exposure: The place where someone can come into contact with a contaminated environmental medium (air, water, food or soil). Examples: the area of a playground that has contaminated dirt, a contaminated spring used for drinking water, the location where fruits or vegetables are grown in contaminated soil, or the backyard area where someone might breathe contaminated air.

Population: A group of people living in a certain area; or the number of people in a certain area.

PRG: Preliminary Remediation Goal: PRGs are developed by the USEPA to estimate contaminant concentrations in the environmental media (soil, air, and water), both in residential and industrial settings, that are protective of humans, including sensitive groups, over a lifetime. PRGs were developed for both industrial and residential settings because of the different exposure parameters, such as, different exposure time frames (e.g., industrial setting: workers are exposed for 8 hours/day and 5 days/week vs. residential setting: families are exposed 24 hours/day and 7 days/week; and different "human" exposure points (e.g., industrial setting: healthy adult males vs. residential setting: males, females, young children, and infants). Media concentrations less than the PRGs are unlikely to pose a health threat; whereas, concentrations exceeding a PRG do not automatically determine that a health threat exists, but suggest that further evaluation is necessary.

Public Health Assessment(s): See PHA.

Public Health Hazard: The category is used in PHAs for sites that have certain physical features or evidence of chronic site-related chemical exposure that could result in adverse health effects.

Receptor Population: People who live or work in the path of one or more chemicals and could come into contact with them (See Exposure Pathway).

Reference Dose based Media Evaluation Guide (RMEG): RMEGs are equivalent to EMEGs, but are derived from USEPA RfDs instead of ATSDR's MRLs.

Route of Exposure: The way a chemical can get into a person's body. There are three exposure routes: breathing (also called inhalation), eating or drinking (also called ingestion), and getting something on the skin (also called dermal contact).

Safety Factor: Also called Uncertainty Factor. When scientists don't have enough information to decide if an exposure will cause harm to people, they use "safety factors" and formulas in place of the information that is not known. These factors and formulas can help determine the amount of a chemical that is not likely to cause harm to people.

Source (of Contamination): The place where a chemical comes from, such as a landfill, a pond, a creek, an incinerator, a tank, or a drum. Contaminant source is the first part of an Exposure Pathway.

Special Populations: People who may be more sensitive to chemical exposures because of certain factors such as age, a disease they already have, occupation, sex, or certain behaviors (like cigarette smoking). Children, pregnant women, and older people are often considered special populations.

Superfund Site: See **NPL**.

Toxic: Harmful. Any substance or chemical can be toxic at a certain dose (amount). The dose is what determines the potential harm of a chemical and whether it would cause someone to get sick.

Toxicology: The study of the harmful effects of chemicals on humans or animals.

Uncertainty Factor: See Safety Factor.

Appendix D
Public Comments

On February 19, 2003, copies of this public health assessment (PHA), "Alark Hard Chrome Site, Riverside California", were distributed to community members living near the Alark Hard Chrome site for review and public comment. There were approximately 5 weeks (February 19, 2003 to March 31, 2003) allotted for the public to comment on this document. Copies of this health assessment were placed in the Riverside Public Library for all interested parties to review. Also, additional copies were sent to local, state and federal government agencies involved at the site for their review.

CDHS received the following comments on the PHA. The CDHS responses to the comments are presented in italics.

Comments from Southern California Cleanup Operations, Cypress Branch - DTSC

The Department of Toxic Substances Control (DTSC) received a draft, dated February 21, 2003, of the PHA for the Alark Hard Chrome site, and was asked to review and provide comments on it by March 31, 2003.

In the last paragraph of page 5 of the PHA, the statement is made that "The California Department of Health Services concludes that there is no current or future health hazard from exposure to site-related contaminants in soil, surface water, or groundwater at Alark Hard Chrome". DTSC believes that this statement, while perhaps accurate under current conditions, may not accurately assess the risk from the site under future conditions. If a future construction project were to expose site soils, or if contaminated groundwater were to migrate to a drinking water well, there would clearly be a risk to public health.

Also, the United States Environmental Protection Agency, Region 9, is in the process of performing a remedial investigation of this site, to be followed by a feasibility study. Until they complete this work, it is too early to state whether or not this site poses a risk to the public or the environment.

CDHS Response: Changes to the text have been made to reflect the comment. The text now reads, "Based on a review of available data, CDHS concludes that there is no current or future health hazard from exposure to site-related contaminants in soil, surface water, or groundwater, provided remedial activities continue at the AHC site. If future investigations conducted at or near the AHC site reveal additional sources of contamination that the community could come into contact with, potential exposures should be evaluated."

Comments from Riverside Public Utilities

Thank you for providing us with a copy of the *Public Comment Draft* of the PHA for the Alark Hard Chrome (AHC) Site dated February 19, 2003. The California Department of Health Services (DHS) prepared the PHA under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). The primary purpose of the PHA is to determine if people are exposed to harmful substances and, if so, whether that exposure is harmful and should be stopped or reduced. Staff of Riverside Public Utilities Department (Riverside, CA) appreciates this opportunity to comment of the draft PHA.

AHC operated a metal plating facility at the Site from 1971 to late 1985. Chemicals handled at the AHC facility included metals, acids, cyanides, and volatile organic compounds (VOCs). Both USEPA and the Cal

Department of Toxic Substances Control (DTSC) supervised environmental sampling at on-site and off-site locations. Contamination from the former AHC facility has or had impacted air, soils, groundwater, and storm drains within the city of Riverside.

DHS relied on data from various sources including Riverside PUD to prepare the PHA. DHS noted, "the validity of the analysis and conclusions depends on the completeness and reliability of the referenced information" (page 15 of referenced report).

In 2002, we provided comments on the Initial Release of the PHA. We are pleased to provide additional comments to further safeguard public health. DHS found "no past, current, or future health hazard from exposure to contaminated soil, surface water or groundwater at the AHC site" (page 18). DHS did not find a completed exposure pathway to drinking water supply wells, surface and groundwater. The identified elevated on-site/off-site groundwater contaminants in monitoring wells included hexavalent and total chromium, vanadium, and TCE. DHS (page 13) does not expect anybody to ingest contaminated water because "monitoring wells are not used for drinking water purposes".

Groundwater contaminants reported in monitoring wells can potentially migrate off-site especially as groundwater production from the basin increases. **To assure public health, Riverside requests that AHC capture and remediate contaminated groundwater as soon as practicable**. Experience suggests that it is much cheaper and faster to remediate "hot spots" before widespread contamination.

CDHS Response: CDHS agrees with the comment. It is our understanding that the USEPA is in the process of developing a feasibility study so that an appropriate remedial option can be selected. As a stakeholder, the City of Riverside may find it useful to share these comments and any other concerns with the USEPA, as stakeholder participation is a key component of the Superfund process.

DHS staff observed several 55-gallon drums within the AHC building (page 8) during a site visit in March of 2001. **Riverside requests that DHS identify the contents of those drums and if necessary, properly dispose them.**

CDHS Response: Activities related to identification and disposal of hazardous material is out of the jurisdiction of CDHS. These type of activities are coordinated by the regulatory agency(ies) investigating the site. We contacted the USEPA project manager about your concern and were informed that these drums probably contained excess groundwater collected during sampling activities. The contents of the drums are characterized and disposed of properly (D. Stensby, personal communication, USEPA, May 13, 2003).

DHS expects Riverside's continued monitoring will help to detect future contamination "that may exceed drinking water standards" before it is served to the public (page 16). Riverside policy regarding contaminants is "Non-detect" at the tap. It is also possible that drinking water standards for some contaminants may become more stringent. For example, the Office of Environmental Health Hazard Assessment (OEHHA) is schedule to adopt a public health goal (PHG) for Cr VI by spring 2003, and DHS will adopt MCL for Cr VI by January 1, 2004. In addition, Riverside is planning to increase groundwater production from wells in the vicinity of AHC to meet planned growth. Riverside is also evaluating the feasibility of recharging the basin.

Riverside requests that AHC fund site cleanup and development of a Contingency Plan with mitigation measures to ensure compliance with Riverside policy and water quality standards. Riverside requests that DHS include PHGs among the health comparison values.

CDHS Response: A PHG for Cr VI has not yet been proposed and thus it does not appear that a PHG for Cr VI will be adopted by spring 2003, as indicated by the comment. No changes have been made to the text.