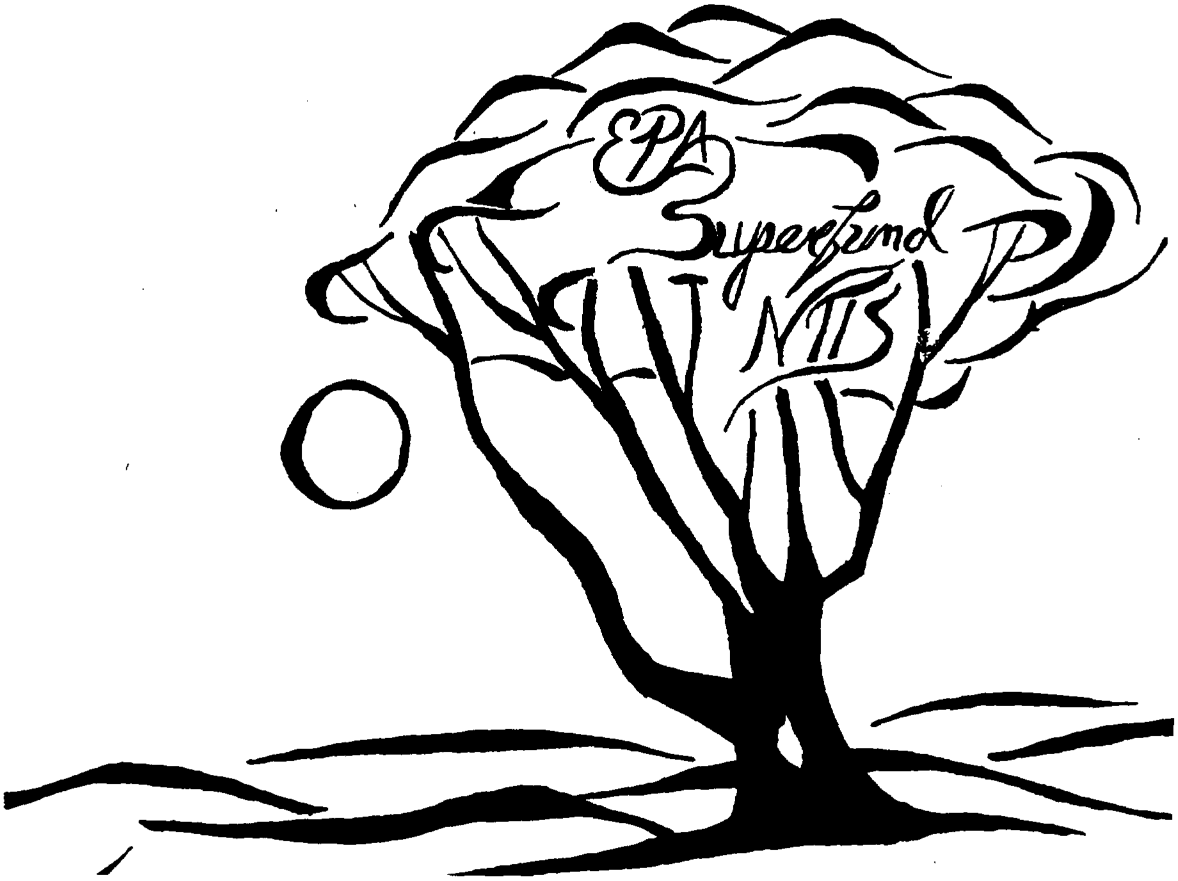
PB94- 964072
EPA/ROD/R04-94/205
February 1995

EPA Superfund Record of Decision:

Airco Plating Company (O.U. 1), Miami, FL

10/1/1993



RECORD OF DECISION
DECLARATION

SITE NAME AND LOCATION

Airco Plating Company, Inc.
Miami, Dade County, Florida

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Site noted above. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the administrative record for this Site.

The State of Florida, as represented by the Florida Department of Environmental Protection, has been the support agency during the Remedial Investigation (RI) and Feasibility Study (FS) process for the Airco Plating Company, Inc. Site. In accordance with 40 CFR 300.430, FDEP, as the support agency, has provided input during this process. Based upon discussions with FDEP, it is anticipated that the State of Florida will concur with the groundwater treatment to reduce organic and inorganic contaminant levels, soil vapor extraction to reduce organic contamination, deed restrictions, and soil capping to reduce the threat posed by direct contact with soil. However, FDEP has stated a preference for additional soil treatment prior to capping the Site. A formal letter of concurrence has not been received to date.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

This remedy addresses the contaminated soil and groundwater at the Site. This remedy addresses the most mobile threat at the Site by extraction and treatment of groundwater contaminated with organic compounds.

In addition, soil contaminated with tetrachloroethylene, which is the source of organic contaminants in Site groundwater, will be treated with soil vapor extraction. Metals contaminated soil will be capped to reduce exposure to the soil contaminants and to reduce the potential for leachate generation.

The major components of the remedy include:

- Soil vapor extraction of organic compounds, such as PCE concentrations in excess of 90 ppm, that are present in Site soils to a depth of 5-6 feet below land surface, or just above the water table, whichever is lower.

- Placement of a RCRA-type cap over soil with cadmium concentrations in excess of 73 ppm and PCE concentrations in excess of .060 ppm.

- Institutional controls, including deed restrictions, to preserve integrity of the cap and to prohibit activities that are not compatible with the remedy.

- Extraction of contaminated groundwater with subsequent treatment by air stripping at the Site; and

- Discharge of treated water to the POTW or to the surficial aquifer via a recharge gallery in accordance with all applicable regulations and other Performance Standards.

- Evaluation of the need for treatment of inorganics in groundwater will be conducted during the Remedial Design.

- Modeling of air emissions and analysis of actual air emissions from the air stripping tower and the soil vapor extraction system will be conducted during the Remedial Design in order to determine the need for air emission control equipment.

STATUTORY DETERMINATIONS

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment for the reduction of toxicity, mobility, or volume as a principal element and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

Because the remedy will result in hazardous substances remaining on-site, a review will be conducted within five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

Patrick M Tobin　　　　10-1-93

Patrick M. Tobin,　　　　Date
Acting Regional Administrator

TABLE OF CONTENTS

SECTION TITLE PAGE

TABLE OF CONTENTS (cont.)

TABLES

FIGURES

THE DECISION SUMMARY

1.0 SITE LOCATION AND DESCRIPTION

The Airco Plating Company, Inc. Site ("Site") is principally located at 3650 N.W. 46th Street, Miami, Florida. The Site is close to the intersection of N.W. 46th Street and N.W. 36th Avenue which is a just over one mile northeast of the Miami International Airport (see Figures 1 and 2).

The Site occupies approximately two acres in a predominantly industrial/commercial area and is surrounded by other active businesses. There is a mobile home park located about 300 feet south of the Site.

The topography is relatively flat in the vicinity of the Site with a land surface elevation of about 8 feet above mean sea level.

The Miami Canal is located approximately 2/3 of a mile southwest of the Site and is the only major surface water body in the vicinity of the Site.

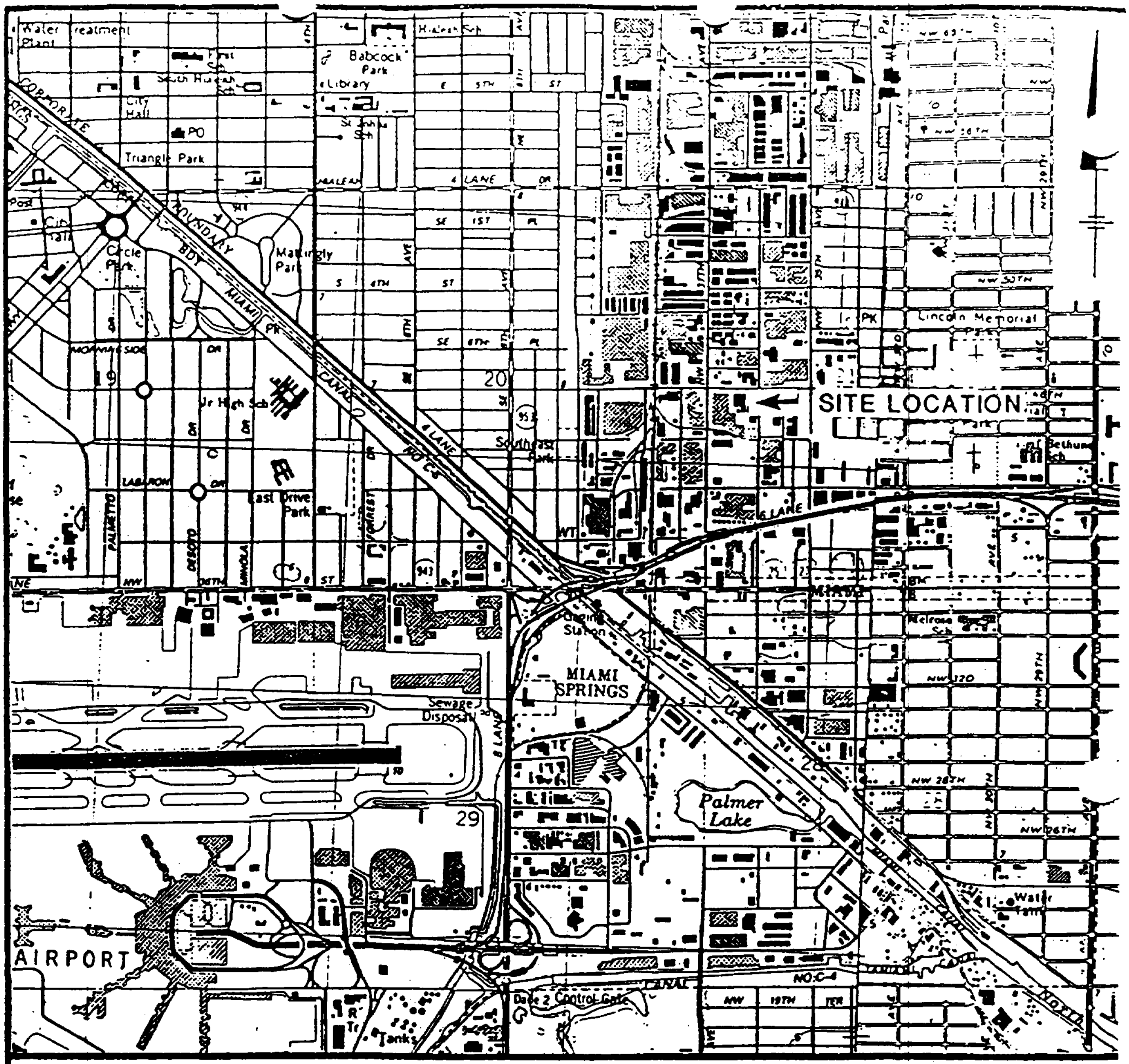
The Site is immediately underlain by the Biscayne Aquifer which is approximately 100 feet thick in the vicinity of the Site. The Biscayne Aquifer supplies all municipal water supply systems from South Palm Beach County southward.

The Site is an operational electroplating facility owned and operated by Airco Plating Company, Inc. Primarily steel, copper, and brass items are plated with zinc, but the facility also plates various items with brass, cadmium, chromium, copper, nickel, and tin. Cyanide, caustic compounds and acids are additional chemicals used in the plating process. Tetrachloroethene, a common industrial solvent, has been used to clean parts prior to plating.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

Airco Plating began its operations at the Site in the mid-1950's. From approximately 1957 to 1972, Airco, by permit from the Florida State Board of Health, utilized three ponds to discharge wastewater, after some treatment, following electroplating operations. The treatment process included cyanide destruction, chromium reduction and pH neutralization.

According to Airco Plating, the center pond was used by Airco from about 1957 until 1972 or 1973. In 1962, Airco leased a parcel of property immediately south of the southwest corner of Airco's current property boundary. This leased parcel was utilized as a pond for about 10 years. The northwest pond was used from the late 1960's until about 1972 or 1973.



AIRCO PLATING CO., INC.
3650 N.W. 46th STREET
MIAMI, FLORIDA

Figure 1:

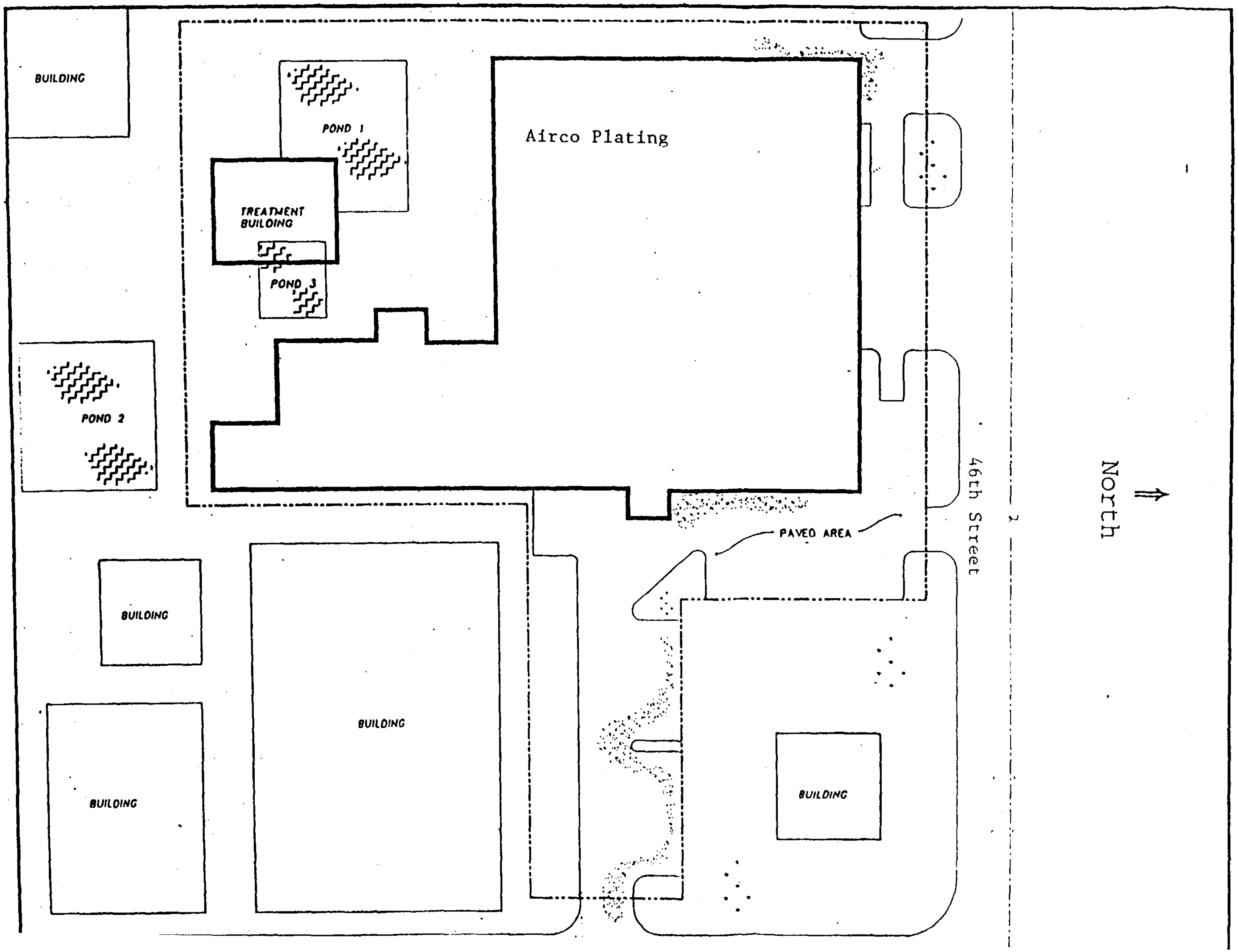
QUADRANGLE LOCATION MAP

SCALE
2000 0 2000 FT.

SOURCE: U.S.G.S - 7.5 MINUTE SERIES TOPOGRAPHIC MAPS
HIALEAH, FLA., 1999
MIAMI, FLA, PHOTOREVISED 1969

12/92 LLG DIV# 23
C:\WIP\1920201C\19202801

FIGURE 2: SITE LAYOUT - AIRCO PLATING NPL SITE



An EPA inspection during 1971 noted the use of the seepage ponds and reported that some wastewater was discharged to the ponds without treatment. Between June 1972 and January 1973, Airco Plating received at least three notices regarding wastewater discharges that exceeded Dade County standards. In February 1973, Airco was ordered to pump out the ponds and make necessary changes to the treatment system so that it would comply with regulations.

Sometime after June 1973, Airco ceased use of the ponds and began to discharge the treated wastewater to the Miami municipal sewer.

In 1981, the treatment facility at Airco was upgraded to separate sludge from the treated effluent before it was discharged to the sewer. The sludge was collected on-site and periodically shipped offsite for disposal.

U.S. Environmental Protection Agency investigations at the Site were conducted in July 1985, December 1986, and January 1987. In February 1990 the Site was listed on the National Priorities List as defined in Section 105 of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA).

During July 1990, Airco Plating and other Potentially Responsible Parties (PRPs) received Special Notice Letters for the Remedial Investigation and Feasibility Study (RI/FS). On November 8, 1990, Airco Plating Company, Inc. signed an Administrative Order by Consent for the RI/FS.

The RI report was finalized during February 1993 along with the Baseline Risk Assessment prepared by EPA. The RI report documented the presence of primarily metals, cyanide, and tetrachloroethylene (also known as perchloroethylene or PCE) in the areas of the former seepage ponds, and an area of excessive PCE and metals levels adjacent to the main building. In addition, PCE was found in excessive levels in shallow groundwater from a well near the location of the excessive PCE soil concentrations. PCE and related by-products were found in deeper portions of the aquifer at the edge of the Site and also downgradient of the Site. Cadmium exceeded groundwater standards in the shallow groundwater and, to a lesser extent, in intermediate depths of the aquifer.

3.0 HISTORY OF COMMUNITY RELATIONS

Public announcements for the Proposed Plan comment period and public meeting appeared in the Diaros Las Americas on July 18 and the Miami Herald Neighbors on July 20. The 30-day comment period was held from July 19 to August 18 and the public meeting was held on August 2 at the Caleb Business Center in Miami. Over 100 Proposed Plan fact sheets were mailed to local businesses, citizens, environmental groups, and local and state agencies.

An availability session was held at the Caleb Center prior to the start of the RI/FS in July 1990. Brief fact sheets were mailed periodically during the course of the RI/FS.

4.0 SCOPE AND ROLE OF ACTION

The planned actions for this Site address both soil and groundwater contamination. The planned soil cleanup for metals, including cadmium and nickel, and organic compounds, such as PCE, is necessary to prevent further migration of contaminants to groundwater. The planned groundwater cleanup for metals and organics is necessary to protect the Biscayne Aquifer, the sole source of drinking water in Dade County. The ROD further describes this combined action and is the only ROD anticipated for this Site.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 Site Geology

The surface sediments are made up of organic rich top soil in areas of no asphalt or concrete cover and limerock base fill where asphalt cover occurs. Below the surficial soils, the Site is underlain by a 40 to 45 feet thick layer of fine to coarse-grained, moderately sorted, unconsolidated quartz sand which contains randomly distributed limestone rubble increasing with depth. The sand ranges in color from a white to a light brown. The sand unconformably overlies a coral limestone which ranges in depth from 45 to 55 feet below land surface (bls). Sand has filled some of the voids and open spaces within the limestone. Crystalline calcite also occurs at this depth.

From 52 to 65 feet beneath the Site is a fairly dense, fine grained limestone containing abundant solution channels and voids which may be filled with sand. At approximately 65 to 70 feet bls, this limestone grades into a less dense coarse grained shelly limestone which continues to at least 75 feet bls. Both are buff tan to white in color. These sands and limestones are interpreted to be constituents of the Pamlico, Key Largo and Fort Thompson Formations, respectively.

On-site soil samples, collected at a depth of about three feet, indicated that permeability ranged between 0.00719 to 0.0166 cm/sec, pH ranged between 7.8 to 8.7, oil and grease ranged between 10 to less than 1800 mg/kg, sulfate ranged between 140 mg/kg to 370 mg/kg, calcium (as $CaCO3$) ranged between 1.2% to 6.3%, and porosity ranged between 31.51% to 56.12%.

5.2 Site Hydrology

The Site is immediately underlain by the Biscayne Aquifer. The unconfined aquifer is approximately 100 feet thick in the vicinity of the Site. It is composed of sand, limestone and sandstone. Groundwater in the Biscayne Aquifer flows through pore spaces between grains of sand, solution channels and joint systems in the limestone, and secondary openings and pore spaces in the sandstone.

The Biscayne Aquifer supplies all municipal water supply systems from South Palm Beach County southward. It has been stated that the Biscayne Aquifer "is the most productive aquifer of the shallow nonartesian aquifers in the area and is one of the most permeable in the world" (Klein and Hull, 1978).

The water table is found at the Site at depths of about 4.5 to 6 feet bls. Groundwater flow direction varies from the southeast to the southwest. The flow direction in the shallow or intermediate depths of the aquifer may be affected by pumpage of two industrial wells at the Site, which, according to Airco, pump approximately 15,000 gallons per day, five days a week.

Hydraulic conductivity of the aquifer was measured by two different methods, slug tests and pump tests. Hydraulic conductivity values ranged from 119.73 to 398.02 gpd/ft^2 (gallons per day per square foot). Transmissivity, which is equal to hydraulic conductivity times the aquifer thickness, was estimated to have a minimum value of 8,381 gpd/ft.

The maximum range of horizontal groundwater velocities in the shallow aquifer, based on the pump test and slug test data, is .0384 ft/day to .362 ft/day.

5.3 Soil Contamination

Various metals, cyanide, PCE and occasionally, trichloroethene, were detected in soil ranging in depths from one-half foot bls to 16 feet bls (see Figure 3 - Soil Boring Locations). The metals detected most often at the highest concentrations were cadmium, chromium, copper, lead, nickel, and zinc. Generally, the higher concentrations are found in areas used formerly as percolation ponds for industrial wastewaters (see Figure 2). However, there is also a limited area outside the boundaries of the former ponds, that contains the highest levels of PCE in soil. Soil contaminants are summarized in Table 1.

As can be seen from the data presented in Table 1, various chemicals associated with electroplating operations are present at elevated concentrations in Site soils. PCE, cadmium, chromium, cyanide, copper, lead, nickel, and zinc are present at concentrations much above background levels detected just north of the Site. The highest concentrations are generally found in the first five feet of soil, but were detected at reduced concentrations as deep as 16 feet. The soil sampling focused on the former percolation ponds and most of the contaminants were

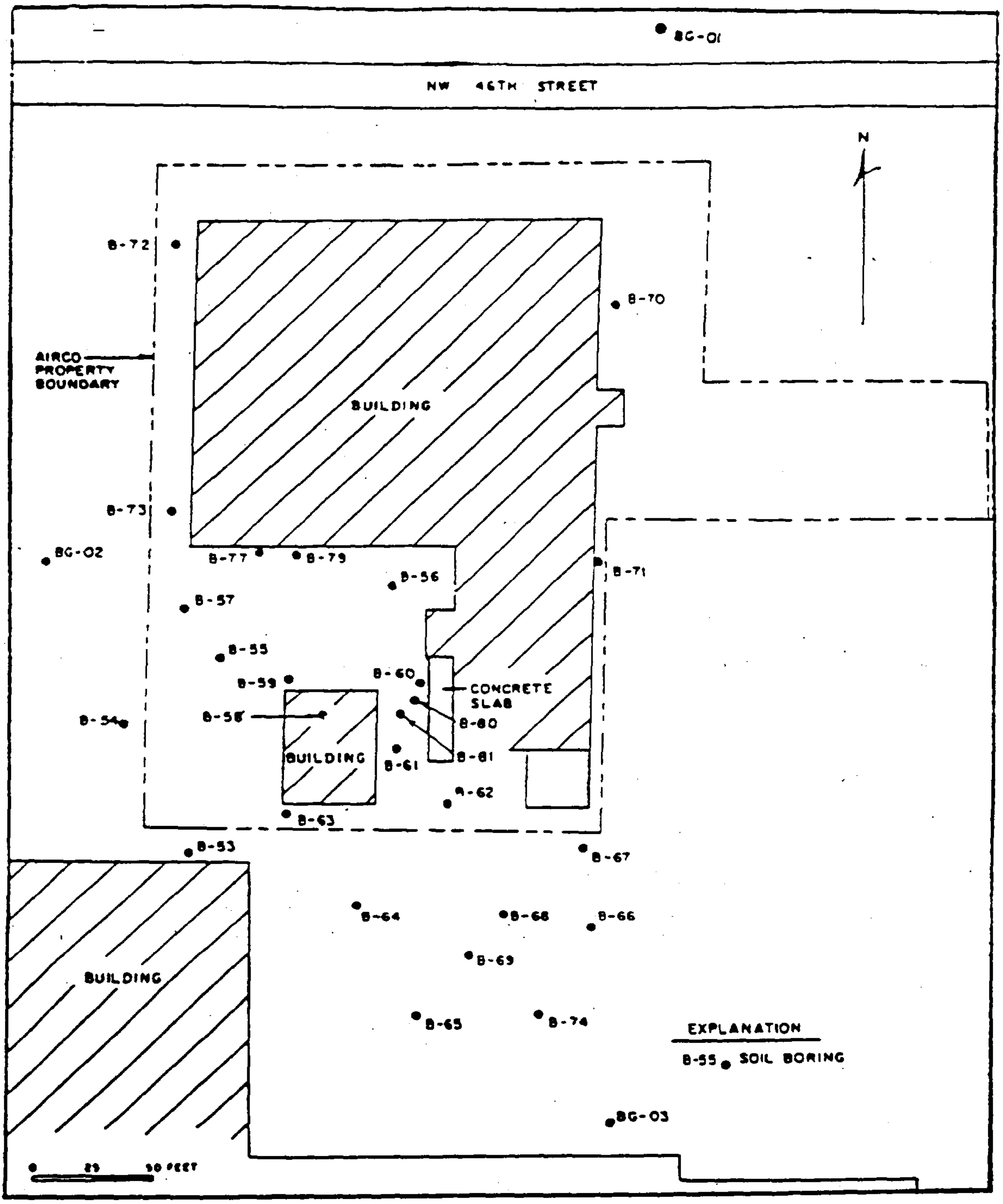


FIGURE 3: Locations of All Soil Sample Borings, Airco Plating Company, Inc., Miami, Florida.

detected in all of the surface soil samples. However, there was sufficient decrease in the concentrations to approximate the extent of the contaminated areas.

Other contaminants, including acetone, chloroform, trichloroethene, bis (2-ethylhexyl)phthalate, 4,4′-DDT, and 4,4′-DDE, and antimony were detected in single soil samples. However, given the low frequency of detection and the low detected levels, those contaminants are not considered significant.

TABLE 1: CONTAMINANTS IN SURFACE SOIL

Contaminant	Range of Detected Concentrations (ppm)	Average Concentration	Background Level	Detection Frequency
Acetone	.088	.088	Not detected (ND)	1/1
Chloroform	.016	.016	ND	1/18
Tetrachloroethylene (PCE)	.009 - 230	19.6	ND	12/18
Trichloroethylene	.010	.010	ND	1/18
Bis (2-ethylhexyl) phthalate	.310	.310	ND	1/1
4,4'-DDT	.058	.058	ND	1/1
4,4'-DDE	.029	.029	ND	1/1
Cyanide	1.8 - 3,100	858	ND	15/18
Arsenic	4	4	ND	1/1
Cadmium	1 - 1,400	452	ND	18/18
Chromium	9.6 - 5,300	1,911	ND	18/18
Copper	2 - 1,200	258	23	18/18
Lead	1.3 - 3,700	281	26	18/18
Nickel	18 - 760	244	ND	15/18
Zinc	15 - 13,700	4,589	ND	18/18
Antimony	39.6	39.6	ND	1/1

5.4 Groundwater Contamination

Shallow groundwater quality at the Site was characterized by data from monitoring wells with depths ranging from 14 to 20 feet. Shallow groundwater, within the boundaries of the Airco Plating property, is primarily contaminated with cadmium and volatile organic compounds (VOCs) such as PCE. Three wells (APS 5, 6, and 10) contained cadmium at levels ranging from 50 to 67 ppb, which is greater than the federal standard for cadmium. Well APS-10 contained highly elevated levels of PCE, at least 4000 ppb, which is much greater than the state standard for PCE.

Intermediate groundwater quality was characterized by data from monitoring wells with depths of approximately 45 feet. Cadmium and PCE exceeded their respective MCLs in an intermediate well located adjacent to the former Pond 2. Pond 2 was located on a parcel of land immediately south of Airco Plating's fence line. PCE exceeded its MCL in wells located approximately 120 feet south of the Airco Plating property (see Figure 4 - Monitor Well Locations).

Deep groundwater quality was characterized by data from monitoring wells with depths of approximately 75 feet. PCE exceeded its MCL in the four wells located on the southern edge of the Airco Plating property and about 120 feet south of the property boundary.

The sampling results are consistent with the presence of a PCE plume which has its origins on the Site and which has migrated at least 120 feet south of the Site. PCE and related VOCs were detected at elevated levels at various depths in groundwater at the Site. The highest concentrations are found in shallow groundwater while the most extensive migration has been in the deeper portions of the aquifer as evidenced by reduced concentrations detected in several intermediate and deep wells. Also, PCE concentrations decrease with increased distance south of the Site. Groundwater contaminants are listed in Table 2.

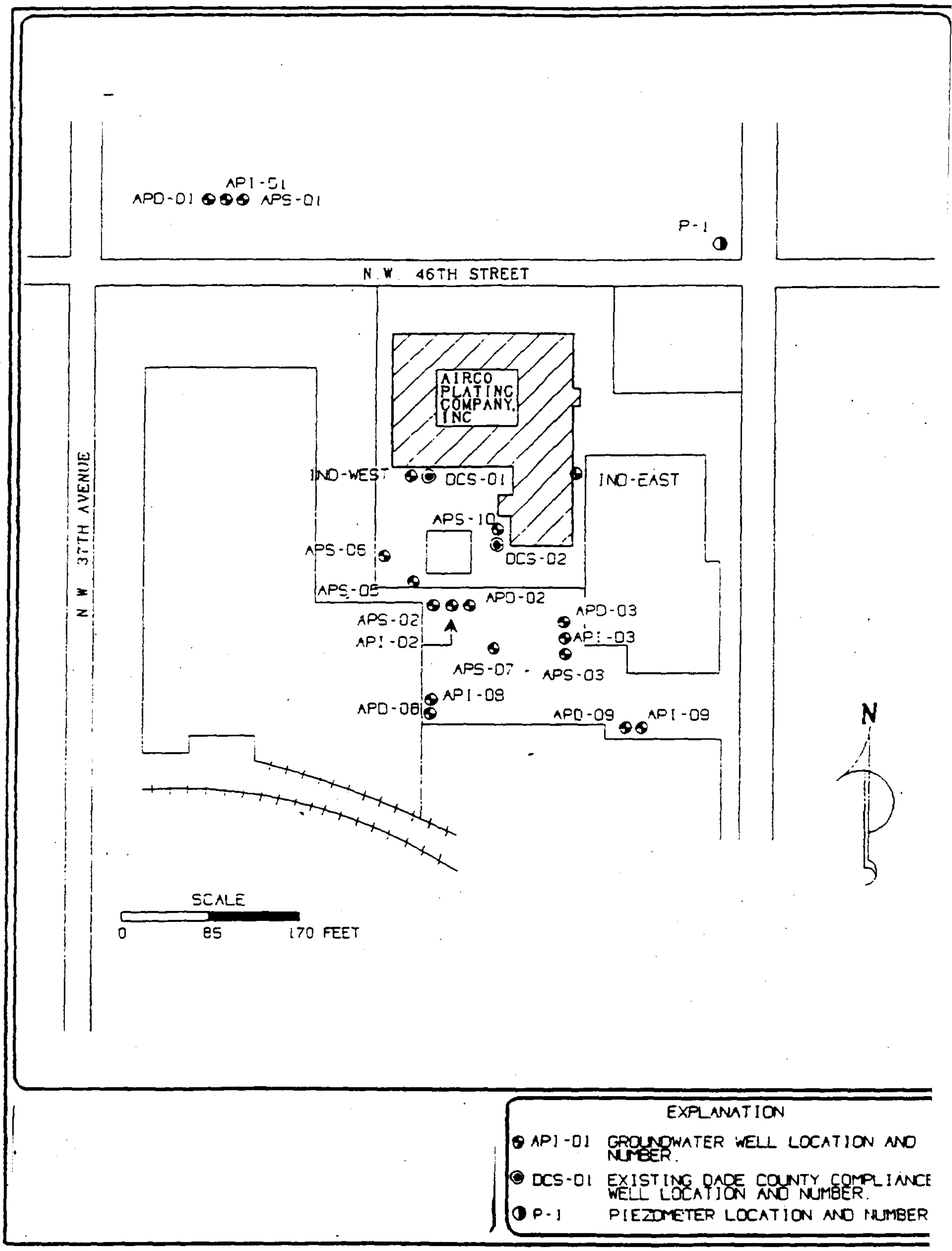


FIGURE 4: **Monitor Well and Piezometer Locations, Airco Plating Company Inc., Miami, Florida.**

TABLE 2: CONTAMINANTS IN GROUNDWATER

Contaminant	Range of Detected Concentrations (ppm)	Average of Detected Concentrations (ppm)	Background Concentration	Detection Frequency	Groundwater Standard
Acetone	.007	.007	ND	1/3	NA
Chloroform	.001 - .21	.008	ND	5/21	.100
1,1 Dichloroethylene	.011	.011	ND	1/21	.007
Cis/trans 1,2 Dichloroethylene	.004 - .27	.042	.004	11/21	.07/.100
Tetrachloroethylene (PCE)	.0046 - 4.0	2.5	ND	10/21	.003
Trichloroethylene	.017 - .042	.016	ND	6/21	.003
Vinyl Chloride	.005 - .1	.024	.005		.001
Bis (2-ethylhexyl) phthalate	.004 - .005	.0045	ND	2/3	NA
Cyanide	.011 - .024	.015	.010	3/21	.200
Cadmium	.009 - .067	.045	<.005	5/21	.005
Chromium	.010 - .26	.047	<.005	13/21	.100
Copper	.0026 - .049	.026	<.02	9/21	1.3
Lead	.005 - .13	.025	.13	6/21	.015
Nickel	.005 - .15	.064	.053	9/21	.100
Zinc	.02 - .68	.2	.07	13/21	5.0

ppm=parts per million ND=not detected NA=not applicable or appropriate

6.0 SUMMARY OF SITE RISKS

CERCLA directs EPA to conduct a baseline risk assessment to determine whether a Superfund Site poses a current or potential threat to human health and the environment in the absence of any remedial action. The baseline risk assessment provides the basis for taking action and indicates the exposure pathways that need to be addressed by the remedial action. It serves as the baseline indicating what risks could exist if no action were taken at the Site. This section of the ROD reports the results of the baseline risk assessment conducted for this Site.

6.1 Contaminants of Concern

The chemicals measured in the various environmental media during the RI were included in this discussion of the site risks if the results of the risk assessment indicated that a contaminant might pose a significant current or future risk or contribute to a cumulative risk which is significant. The criteria for a significant risk was a carcinogenic risk level above the acceptable risk range, i.e., $1x10^{-4}$ to $1x10^{-6}$, or a hazard quotient (HQ) greater than 1.0 (unity).

The exposure point concentrations for each of the chemicals of concern and the exposure assumptions for each pathway were used to estimate the chronic daily intakes for the potentially complete pathways. The exposure point concentrations are based on either the calculated 95% Upper Confidence Limit of the arithmetic mean or the maximum concentration detected during sampling. If the calculated UCL exceeded the maximum level measured at the Site, then the maximum concentration detected was used to represent the reasonable maximum concentration. The chronic daily intakes were then used in conjunction with cancer slope factors and noncarcinogenic reference doses to evaluate risk.

The baseline risk assessment considered current commercial land use and future residential land use. There is a mobile home park about 250 feet south of the Site, but commercial operations are between the Site and the mobile home park. Future residential use of the Site is evaluated in the risk assessment. However, given the current Comprehensive Development Master Plan for Dade County, revised October 1992, and Site visits by EPA, it is not anticipated that this use will occur in the immediate future.

Groundwater at the Site is currently used for industrial purposes. Groundwater at the mobile home park is currently used for irrigation of lawns. Groundwater in the vicinity of the Site could be used in the future for drinking water since the aquifer is the only source of drinking water in Dade County.

6.2 Exposure Assessment

Whether a chemical is actually a concern to human health and the environment depends upon the likelihood of exposure, i.e. whether the exposure pathway is currently complete or could be complete in the future. A complete exposure pathway (a sequence of events leading to contact with a chemical) is defined by the following four elements:

- A source and mechanism of release from the source,
- A transport medium (e.g., surface water, air) and mechanisms of migration through the medium,
- The presence or potential presence of a receptor at the exposure point, and
- A route of exposure (ingestion, inhalation, dermal absorption).

If all four elements are present, the pathway is considered complete.

The three major constituent release and transport mechanisms potentially associated with the Site are as follows:

- The infiltration of precipitation through the affected soils and the percolation of the resulting leachate into subsurface soils and groundwater, followed by groundwater transport.
- Release of contaminated surface soil through wind erosion. Surface soils could be suspended in air and transported from their source by the wind.
- Release of volatile compounds from soils and waste to the atmosphere. These constituents could be transported and dispersed by the wind.

Because the vegetation and ground cover present at the Site will impede volatilization and wind erosion, exposure to constituents in air, either as vapor or adsorbed to dust, is not considered significant at the Site under current land use conditions. The presence of vegetation also reduces direct contact with surface soils by Site visitors.

An evaluation was undertaken of all potential exposure pathways which could connect chemical sources at the Site with potential receptors. All possible pathways were first hypothesized and evaluated for completeness using the above criteria. Three current potentially complete exposure pathways and five future exposure pathways remained after screening. The current pathways represent exposure pathways which could exist under current Site conditions while the future pathways represent exposure pathways which could exist, in the future, if the current exposure conditions change. Exposure by each of these pathways was mathematically modeled using generally conservative assumptions. The major assumptions used in the risk calculations are presented in Appendix C.

The potential current or future pathways for industrial use are:

- ingestion of surface soil by a trespasser or an onsite worker;
- absorption through the skin from surface soil by a trespasser or an onsite worker;
- inhalation of fugitive dust and VOCs by a trespasser or an onsite worker

The potential future pathways for residential use are:

- ingestion of surface soil by an onsite resident;
- absorption through the skin from surface soil by an onsite resident;
- ingestion of groundwater by an onsite resident;
- inhalation of VOCs in groundwater by an onsite resident during showering;
- inhalation of airborne dust by an onsite residents;

The baseline risk assessment is based on the reasonable maximum exposure (RME) that may be encountered during the various Site use scenarios. The intent of the RME is to estimate a conservative exposure case (i.e., well above the average case) that is still within the range of possible exposures.

6.3 Toxicity Assessment

Toxicity values are used in conjunction with the results of the exposure assessment to characterize Site risk. EPA has developed critical toxicity values for carcinogens and noncarcinogens. Cancer slope factors (CSFs) have been developed for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenic chemicals. CSFs, which are expressed in units of $(mg/kg/day)^{-1}$, are multiplied by the estimated intake of a potential carcinogen, in mg/kg/day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper bound" reflects the conservative estimate of the risks calculated from the CSF.

Use of this conservative approach makes underestimation of the actual cancer risk highly unlikely. CSFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg/day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur.

6.4 Risk Characterization

Human health risks are characterized for potential carcinogenic and noncarcinogenic effects by combining exposure and toxicity information. Excessive lifetime cancer risks are determined by multiplying the estimated daily intake level with the CSF. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper boundary, an individual has a one in one million additional (above their normal risk) chance of developing cancer as a result of Site-related exposure to a carcinogen over a 70-year lifetime under the assumed specific exposure conditions at a Site.

EPA considers individual excess cancer risks in the range of $1x10^{-4}$ to $1x10^{-6}$ as protective; however the $1x10^{-6}$ risk level is generally used as the point of departure for setting cleanup levels at Superfund sites. The point of departure risk level of $1x10^{-6}$ expresses EPA's preference for remedial actions that result in risks at the more protective end of the risk range. The health-based risk levels for the Site are shown in Table 3.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminants's reference dose). A HQ which exceeds unity (1) indicates that the daily intake from a scenario exceeds the chemical's reference dose. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media. An HI which exceeds unity indicates that there may be a concern for potential health effects resulting from the cumulative exposure to multiple contaminants within a single medium or across media. The HIs for the Site are shown in Table 3. Chemical specific risk calculations and exposure point concentrations are summarized in Appendix C.

TABLE 3: Summary of Cumulative Potential Cancer Risks and Non-Carcinogenic Hazard Indices

Land Use/Receptor	Pathway	Noncarcinogenic Risk (Hazard Index)	Carcinogenic Risk
Current Commercial Onsite Worker	Fugitive Dust Inhalation	3×10^{-4}	4.4×10^{-8}
	Ingestion of Soil	1.1×10^{0}	5.1×10^{-9}
	Dermal Contact with Soil	2.1×10^{-1}	1.0×10^{-8}
	TOTAL:	1.31×10^{0}	
Current Commercial Trespasser	Fugitive Dust Inhalation	6×10^{-5}	3.8×10^{-9}
	Ingestion of Soil	8.6×10^{-1}	4.3×10^{-9}
	Dermal Contact with Soil	2.2×10^{-1}	1.1×10^{-8}
	TOTAL:	1.08×10^{0}	2.0×10^{-8}
Future Residential (Adult)	Fugitive Dust Inhalation	1.8×10^{-3}	2.3×10^{-5}
	Ingestion of Soil	5.8×10^{0}	1.1×10^{-5}
	Dermal Contact with Soil	1.6×10^{0}	1.9×10^{-5}
	Ingestion of groundwater	9.4×10^{0}	2.8×10^{-3}
	Inhalation of groundwater	NA	1.2×10^{-4}
	TOTAL:	1.68×10^{1}	3×10^{-3}
Future Residential (Child)	Fugitive Dust Inhalation	8.5×10^{-3}	2.1×10^{-5}
	Ingestion of Soil	5.4×10^{1}	2.1×10^{-5}
	Dermal Contact with Soil	5.8×10^{0}	1.4×10^{-5}
	Ingestion of groundwater	4.6×10^{1}	2.6×10^{-3}
	Inhalation of groundwater	NA	1.2×10^{-4}
	TOTAL:	1.06×10^{2}	3×10^{-3}

The risk assessment indicates that the noncancer Site risks are slightly above the EPA benchmark of 1.0 for the commercial use scenario. The HI for all exposure pathways for the on-site worker is 1.3.

The noncarcinogenic and carcinogenic risks for the future residential use of the Site exceed EPA guidelines. The HI for an adult resident for all exposure pathways is 16.8. The HI for a child resident for all exposure pathways is 105.8. The carcinogenic risk for all exposure pathways is 3×10^{-3} for the adult resident and for the child resident.

Groundwater standards, for certain contaminants, particularly PCE, have been exceeded at the Site and downgradient of the Site. Cadmium also exceeded its MCL in some shallow groundwater at the Site. MCLs are chemical specific standards that define acceptable risk levels. Violation of such standards generally warrant remedial action. Furthermore, since contaminated soil provides a source for the groundwater contamination, some remedial action for soil is also warranted.

Other contaminants that exceeded groundwater standards are included in Table 2. PCE is the primary organic compound found in Site soil. Other organic compounds, such as cis/trans 1,2-dichloroethene, are common breakdown products of PCE. Cadmium is the most common inorganic groundwater contaminant. Other metals, such as nickel or chromium, were not detected above standards as often as cadmium. Lead was detected above standards in a single upgradient well.

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

6.5 Environmental Risk

A qualitative risk assessment was conducted to determine if contaminants present in site soils and groundwater have impacted or can potentially impact flora and fauna in the area. Given the industrial nature of the Site and the surrounding area, impacts to local flora and fauna are not expected and, as a result, it was not necessary to perform a quantitative risk assessment for environmental risk. Furthermore, no endangered or threatened species have been identified in the immediate vicinity of the Site.

The risk assessment also considered the potential for contaminated groundwater to reach the Miami Canal, which is about one-half mile downgradient of the Site. It concluded that there was a potential for impacts to aquatic species in the canal if contaminated groundwater reached the Canal. However, this is unlikely given that even without remedial action, dilution, dispersion, adsorption, and biodegradation of the contaminants may occur before the groundwater reached the Canal.

6.6 Uncertainties

At all stages of the risk assessment, conservative estimates and assumptions were made so as not to underestimate potential risk. Nevertheless, uncertainties and limitations are inherent in the risk assessment process.

The estimates of exposure point concentrations of the chemicals of concern probably overstate actual concentrations to which individuals would hypothetically be exposed and therefore, the health risk estimates are very conservative. In addition, no attenuation of the chemicals was considered; however, this may reduce concentrations of organic chemicals over time.

The assumed exposure pathways evaluated in the risk assessment are conservative in nature and may overstate the actual risk posed by this Site. As an example, the risk assessment assumes that an on-site worker will spend a significant amount of time outdoors and be exposed to uncovered soil; actually, most of the workers are indoors for a majority of their work day.

Summing risks or hazard indices for multiple contaminants ignores the possibility of synergistic or antagonistic activities in the metabolism of the contaminants.

7.0 **DESCRIPTION OF ALTERNATIVES FOR SOIL AND GROUNDWATER**

The following Site specific alternatives represent a range of distinct actions addressing human health and environmental concerns. The analysis presented below reflects the fundamental components of the various alternatives considered feasible for this Site.

Six alternatives have been identified for evaluation and are listed below:

C-1: Ground-water recovery and treatment; soil vapor extraction (SVE); RCRA-type cap
C-2: Ground-water recovery and treatment; source removal and off-site landfill disposal; RCRA-type cap
C-3: Ground-water recovery and treatment; source removal and off-site landfill disposal; SVE; RCRA-type cap
C-4: Ground-water recovery and treatment; source in-situ S/S; cap
C-5: Ground-water recovery and treatment; RCRA-type cap
C-6: No Action

7.1 Ground-Water Recovery and Treatment; SVE; RCRA-type Cap (C-1)

This alternative provides:

- Ground-water remediation for organics;
- Soil vapor extraction of organics from soil above the water table with PCE concentrations in excess of 90 ppm.
- Capping of soil above the water table with cadmium concentrations in excess of 73 ppm and PCE concentrations in excess of .060 ppm but less than 90 ppm;

The ground water would be removed from the subsurface by pumping from a recovery well and would then be treated. Organic contaminants would be removed by air stripping. The treated water would then either be 1) directed to Airco for industrial purposes and discharged to the POTW subsequent to treatment for inorganics, or 2) treated to remove inorganics and then reintroduced to the surficial aquifer through a recharge gallery. The discharge of treated groundwater would comply with the pertinent ARARs.

Soil vapor extraction would be used to remove organic contaminants from the soil above the water table or "vadose zone." This would involve the application of a vacuum to subsurface soils at extraction points and the introduction of air under pressure at injection points. The subsequent movement of air through the pore spaces of the contaminated soils would carry volatilized VOCs with it. The captured VOCs would then be treated, if required, or discharged directly to the atmosphere. Soil vapor extraction would remediate the unsaturated soil contaminated with organic constituents, including PCE in excess of 90 ppm.

Closure of the former pond areas would be accomplished by installation of a RCRA-type cap over soil with contaminant concentrations above the cleanup levels, except for contaminated soil that is adequately covered by buildings, concrete, or asphalt. The existing concrete and asphalt will be evaluated to determine if it must be replaced by the RCRA-type cap. The cap would substantially reduce or eliminate the leaching of Site contaminants, particularly metals, from soil to groundwater.

Institutional controls would be implemented in order to maintain and ensure the effectiveness of the cap. Institutional controls include:

- Additional fencing to further restrict access to the area of concern;
- Posting of appropriate warning signs;
- A monitoring and maintenance program to insure that institutional controls remain in place; and

- Recording of deed restrictions to control future uses incompatible with the remedy.

Zoning restrictions for future land use already exist and deed restrictions controlling soil excavation and the construction of buildings would be recorded. Current fencing would be maintained or expanded to restrict access by animals and the general public.

7.2 Ground-Water Recovery and Treatment; Source Removal and Off Site Landfill Disposal; RCRA-type Cap (C-2)

This alternative provides:

- Ground-water remediation for organics and inorganics;
- Excavation of sources above the water table with PCE concentrations in excess of 90 ppm, with off-site disposal;
- Capping of all soil with PCE concentrations in excess of .060 ppm but less than 90 ppm and cadmium concentrations in excess of 73 ppm.

The ground water would be removed from the subsurface by pumping from a recovery well and would then be treated. Organic contaminants would be removed by air stripping. The treated water would then either be 1) directed to Airco for industrial purposes and discharged to the POTW subsequent to treatment for inorganics, or 2) treated to remove inorganics and then reintroduced to the surficial aquifer through a recharge gallery. The discharge of treated groundwater would comply with the pertinent ARARs.

Soil containing PCE concentrations above 90 ppm would be excavated and transported off-site to an approved disposal facility. Given the elevated concentrations of contaminants that would be present in the excavated material, the soil may require treatment prior to disposal. Additional analysis of the excavated material may be appropriate to confirm the need for treatment before disposal. The excavated areas would be subsequently backfilled with clean fill material and covered with a RCRA-type cap.

The purpose of this excavation would be to remove the soil contaminated with elevated levels of PCE which is acting as a source of underlying groundwater contamination. A small amount of metals contaminated soil would be removed as a result of this excavation. Existing sampling data indicate that the contaminated soil would require disposal in a hazardous waste landfill. If it becomes necessary to conduct further characterization of the contaminated soil prior to disposal, the excavated soil could possibly be stockpiled temporarily at the Site.

Site structures and a shallow water table may render excavation below the water table impracticable; therefore, excavation would be limited to soils above the water table and which are not covered with substantial buildings.

Closure of the former pond areas would be accomplished by installation of a RCRA-type cap over soil with contaminant concentrations above the cleanup levels, except for contaminated soil that is adequately covered by buildings, concrete, or asphalt. The existing concrete and asphalt will be evaluated to determine if it must be replaced by the RCRA-type cap. The cap would substantially reduce or eliminate the leaching of Site contaminants, particularly metals, from soil to groundwater.

Institutional controls would be implemented in order to maintain and ensure the effectiveness of the cap. Institutional controls include:

- Additional fencing to further restrict access to the area of concern;
- Posting of appropriate warning signs;
- A monitoring and maintenance program to insure that institutional controls remain in place; and
- Recording of deed restrictions to control future uses incompatible with the remedy.

Zoning restrictions for future land use already exist and deed restrictions controlling soil excavation and the construction of buildings would be recorded. Current fencing would be maintained or expanded to restrict access by animals and the general public.

7.3 Ground-Water Recovery and Treatment; Source Removal and Off Site Landfill Disposal; SVE; RCRA-type Cap (C-3)

Alternative C-3 provides:

- Ground-water remediation for organics and inorganics;
- Excavation of sources above the water table with cadmium concentrations in excess of 500 ppm, with off-site disposal;
- Soil vapor extraction removal of organics from soil above the water table with PCE concentrations in excess of 90 ppm;
- Capping of all soil with PCE concentrations in excess of .060 ppm but less than 90 ppm and cadmium concentrations in excess of 73 mg/kg.

The ground water would be removed from the subsurface by pumping from a recovery well and would then be treated. Organic contaminants would be removed by air stripping. The treated water would then either be 1) directed to Airco for industrial purposes and discharged to the POTW subsequent to treatment for inorganics, or 2) treated to remove inorganics and then reintroduced to the surficial aquifer through a recharge gallery. The discharge of treated groundwater would comply with the pertinent ARARs.

Soil containing cadmium greater than the cleanup levels would be excavated and transported off-site to an approved disposal facility. Given the elevated concentrations of contaminants that would be present in the excavated material, the soil may require treatment prior to disposal. If it becomes necessary to conduct further characterization of the contaminated soil prior to disposal, the excavated soil could possibly be stockpiled temporarily at the Site. The excavated areas would be subsequently backfilled with clean fill material and covered with a RCRA-type cap.

The purpose of this excavation would be to remove the accessible soil contaminated with elevated levels of metals, particularly cadmium. This excavation would reduce the volume of metals contaminated soil at the Site. Site structures and a shallow water table may render excavation below the water table impracticable; therefore, excavation would be limited to soils above the water table. Approximately 850 cubic yards of contaminated soil would be removed. This would remove approximately 20 percent of the unsaturated soil contaminated with cadmium in excess of 73 ppm, and approximately 31 percent of the unsaturated soil contaminated with PCE in excess of .060 ppm.

Soil vapor extraction would be used to remove the organic contaminants, above cleanup levels, remaining in the vadose zone following excavation. This would involve the application of a vacuum to subsurface soils at extraction points and the introduction of air under pressure at injection points. The subsequent movement of air through the pore spaces of the impacted soils carries volatilized VOCs with it. The captured VOCs would then be treated, if required, or discharged directly to the atmosphere. Soil vapor extraction would remediate approximately 100 percent of the unsaturated soil contaminated with organic constituents in excess of .060 ppm at the Site, with the exception of soil beneath buildings that cannot be completely exposed to subsurface SVE.

Closure of the former pond areas would be accomplished by installation of a RCRA-type cap over soil with contaminant concentrations above the cleanup levels, except for contaminated soil that is adequately covered by buildings, concrete, or asphalt. The existing concrete and asphalt will be evaluated to determine if it must be replaced by the RCRA-type cap. The cap would substantially reduce or eliminate the leaching of Site contaminants, particularly metals, from soil to groundwater.

Institutional controls would be implemented in order to maintain and ensure the effectiveness of the cap. Institutional controls include:

- Additional fencing to further restrict access to the area of concern;
- Posting of appropriate warning signs;
- A monitoring and maintenance program to insure that

institutional controls remain in place; and
- Recording of deed restrictions to control future uses incompatible with the remedy.

Zoning restrictions for future land use already exist and deed restrictions controlling soil excavation and the construction of buildings would be recorded. Current fencing would be maintained or expanded to restrict access by animals and the general public.

7.4 Ground-Water Recovery and Treatment; Source In-Situ S/S (C-4)

This alternative provides:

- Ground-water remediation for organics and inorganics;
- Stabilization/solidification of all accessible soil (soil not covered by buildings) with concentrations of cadmium in soil below the water table that exceed 50 ppm, and concentrations of cadmium in soil above the water table that exceed 73 ppm;
- Stabilization/solidification, as described above, will provide an impermeable barrier for soil with PCE concentrations in excess of .060 ppm;
- Placement of a protective cover over the S/S mass.

The ground water would be removed from the subsurface by pumping from a recovery well and would then be treated. Organic contaminants would be removed by air stripping. The treated water would then either be 1) directed to Airco for industrial purposes and discharged to the POTW subsequent to treatment for inorganics, or 2) treated to remove inorganics and then reintroduced to the surficial aquifer through a recharge gallery. The discharge of treated groundwater would comply with the pertinent ARARs.

In-situ S/S would be used to treat contaminated soil that is not presently covered by Site buildings. The process utilizes mechanical mixing and injection as a means of stabilizing the soil in place. An estimated 6,700 cubic yards of contaminated soil would be stabilized, which includes stabilization to a depth of approximately 8.5 feet. This would stabilize and solidify approximately 100 percent of the unsaturated soil contaminated with cadmium in excess of 73 ppm and 90 percent of the saturated soil contaminated with cadmium in excess of 50 ppm at the Site. Approximately 97 percent of the unsaturated soil contaminated with PCE in excess of .060 ppm would have a reduced permeability, as a result of S/S.

In-situ S/S could treat a larger volume of metals contaminated soil than excavation because of the difficulties associated with excavation below the water table and the proximity to Site structures. However, in-situ S/S may also have some restrictions on its area of application because of the presence of buildings at or adjacent to the Site.

The basic components of the in-situ S/S system include a crane with an associated mixing system. The mixing system is comprised of an auger(s) with mixing blades and a batch mixing plant, which supplies the necessary treatment chemicals, binding agents, and additives. The mixing auger (typically 3 to 12 feet in diameter) penetrates and loosens the soil, lifting it to the mixing paddles (attached to the upper portion of the auger), effectively mixing the additives and soil. The mixing blades move through the total depth of the soil column in a vertical motion. Treatment chemicals are transferred pneumatically for dry chemicals (or pumped in cases where liquid chemicals are used) and mixed with the untreated soil. If vapor emissions are of concern, auguring can be performed beneath a hood which is connected to a vapor treatment unit. Once mixing is completed to the desired depth, the auger is retracted and begins mixing the adjacent soil, overlapping the previously mixed zone. This process is repeated until all of the soil is treated. After allowing the S/S mass to cure, the concrete cap would be placed over the S/S mass to reduce the potential of compromising its integrity.

A protective concrete cover would be installed over the S/S mass. The surface would be graded, compacted, and sloped to direct precipitation runoff to a desirable location. Upon completion of grading, a reinforced concrete pad would be constructed over the S/S mass.

Institutional controls would also be implemented in order to ensure the effectiveness of the cap. Institutional controls include:

- Additional fencing to further restrict access to the area of concern;
- Posting of appropriate warning signs;
- A monitoring and maintenance program to insure that institutional controls remain in place; and
- Recording of deed restrictions to control future uses incompatible with the remedy.

Zoning restrictions for future land use already exist and deed restrictions controlling soil excavation and the construction of buildings would be recorded. Current fencing would be maintained or expanded to restrict access by animals and the general public.

7.5 Ground-Water Recovery and Treatment; RCRA-type Cap; (C-5)

This alternative provides:

- Ground-water remediation for organics and inorganics;
- Capping of all soil with PCE concentrations in excess of .060 ppm but less than 90 ppm and cadmium concentrations in excess of 73 ppm.

The ground water would be removed from the subsurface by pumping from a recovery well and would then be treated. Organic contaminants would be removed by air stripping. The treated water would then either be 1) directed to Airco for industrial purposes and discharged to the POTW subsequent to treatment for inorganics, or 2) treated to remove inorganics and then reintroduced to the surficial aquifer through a recharge gallery. The discharge of treated groundwater would comply with the pertinent ARARs.

Closure of the former pond areas would be accomplished by installation of a RCRA-type cap over soil with contaminant concentrations above the cleanup levels, except for contaminated soil that is adequately covered by buildings, concrete, or asphalt. The existing concrete and asphalt will be evaluated to determine if it must be replaced by the RCRA-type cap. The cap would substantially reduce or eliminate the leaching of Site contaminants, particularly metals, from soil to groundwater.

Institutional controls would be implemented in order to maintain the effectiveness of the cap. Institutional controls include:

- Additional fencing to further restrict access to the area of concern;
- Posting of appropriate warning signs;
- A monitoring and maintenance program to insure that institutional controls remain in place; and
- Recording of deed restrictions to control future uses incompatible with the remedy.

Zoning restrictions for future land use already exist and deed restrictions controlling soil excavation and the construction of buildings would be recorded. Current fencing would be maintained or expanded to restrict access by animals and the general public.

7.6 No Action (C-6)

No remedial action would occur under this alternative.

7.7 Volume of contaminated media:

The amounts of contaminated soil, based on EPA-derived soil cleanup levels, are estimated as follows:

- Volume of soil above the water table contaminated with inorganics: approximately 4,225 cubic yards (soil with cadmium concentrations in excess of 73 ppm)
- Volume of soil below the water table contaminated with inorganics: approximately 2,500 cubic yards (soil with cadmium concentrations in excess of 50 ppm)

- Volume of soil above the water table contaminated with organics: approximately 140 cubic yards (soil with PCE concentrations in excess of 90 ppm); approximately 1,960 cubic yards (soil with PCE concentrations in excess of .060 ppm)

- Volume of contaminated groundwater: approximately 3,411,000 gallons.

8.0 **COMPARATIVE ANALYSIS OF ALTERNATIVES**

The alternatives are evaluated against one another by using the following nine criteria:

- Overall protection of human health and the environment.
- Compliance with Applicable or Relevant and Appropriate Requirements (ARARs).
- Long term effectiveness and permanence.
- Reduction of toxicity, mobility, or volume through treatment.
- Short term effectiveness.
- Implementability.
- Costs.
- State Acceptance.
- Community Acceptance.

The NCP categorized the nine criteria into three groups:

(1) Threshold criteria: the first two criteria, overall protection of human health and the environment and compliance with ARARs (or invoking a waiver), are the minimum criteria that must be met in order for an alternative to be eligible for selection

(2) Primary balancing criteria: the next five criteria are considered primary balancing criteria and are used to weigh major trade-offs among alternative cleanup methods

(3) Modifying criteria: state and community acceptance are modifying criteria that are formally taken into account after public comment is received on the proposed plan. State and community acceptance is addressed in the responsiveness summary of the ROD.

The comparative analysis of the six alternatives proposed for this Site are presented in the following section.

8.1 Comparative Analysis of Combined Remedial Alternatives

1. Overall Protection of Human Health and the Environment

Except for the no action alternative, all the alternatives would provide protection for human health and the environment. These alternatives all treat the contaminated ground water and provide protection from contact with contaminated soil as well as reduced leachate potential through either excavation and/or treatment as well as Site capping.

2. Compliance with ARARs

The no action alternative would not comply with ARARs because contaminants would remain in excess of soil and groundwater action levels.

All of the combined alternatives include ground water treatment, and this component of the remedy would comply with ARARs (see Tables 4 and 5). Alternatives C-1, C-2, and C-3 will reduce the ongoing source of PCE contamination in groundwater and thus reduce the time necessary to achieve ARARs for organic contaminants. Alternative C-5 will likely take longer to achieve ARARs for organic compounds in groundwater because a cap alone will not reduce the leaching of PCE from soil for PCE concentrations greater than 90 ppm.

Groundwater remediation time frames may be extended if metals leach to the ground water. Alternative C-4 may be more effective at reducing remediation time frames for metals in groundwater. Alternative C-3 provides a lesser amount of saturated soil metals removal.

3. Long-Term Effectiveness and Permanence

All the alternatives, except no action, would reduce potential risks and environmental impacts. Alternative C-3 would provide the highest degree of long term effectiveness and permanence because it includes excavation and offsite disposal and SVE for certain sources of contaminated soil in addition to treatment of the ground water. Exposure to contaminants would be essentially eliminated.

Alternative C-1 would provide a high degree of long term effectiveness and permanence because the RCRA-type cap would reduce infiltration and, in combination with deed restrictions and institutional controls, would restrict access to contaminated soil. Organic contaminants in the vadose zone would be removed. Ground water recovery and treatment would provide remediation of Site ground water and would reduce risks associated with human or environmental exposure to ground water. Alternative C-2 would provide an approximately equal level of long-term effectiveness and permanence.

TABLE 4

POTENTIAL LOCATION SPECIFIC ARARs

	Citation	Location/Description
A	•Florida Administrative Code 17-524 and Florida Statute 373.309	Areas of known contamination. Regulatory clearance required to use potable water wells in area of known contamination.
A	•Florida Administrative Code 17-736	Hazardous waste sites. Requires use of warning signs to inform public of potentially harmful conditions at sites.
A	•Endangered Species Act of 1973 (50 CFR Part 200 and Part 402) •Fish and Wildlife Coordination Act (33 CFR Parts 320-330)	Critical habitat upon which endangered or threatened species depends
R&A	•General RCRA Facility Location Standard (40 CFR 264.18(b)) •TSCA requirements (40 CFR 761.75) •Protection of floodplain (40 CFR 6, Appendix A) •Fish and Wildlife Coordination Act (40 CFR 6.302) •TSCA (40 CFR 761.75)	Within 100-year floodplain
R&A	•Florida Administrative Code 17-55.312	Location of public drinking water wells. Buffer zone of no less than 500 feet between future potable well and existing land applications of reclaimed water areas

A = APPLICABLE REQUIREMENTS WHICH WERE PROMULGATED UNDER FEDERAL LAW TO SPECIFICALLY ADDRESS A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION LOCATION OR OTHER CIRCUMSTANCE AT THE SITE.

R & A = RELEVANT AND APPROPRIATE REQUIREMENTS WHICH WHILE THEY ARE NOT "APPLICABLE" TO A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION, LOCATION, OR OTHER CIRCUMSTANCE AT THE SITE, ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT THE SITE THAT THEIR USE IS WELL SUITED TO THE SITE.

TABLE 5
POTENTIAL CHEMICAL-SPECIFIC AND ACTION-SPECIFIC ARARs

CLEAN WATER ACT - 33 U. S. C. 1251-1376		
R & A	40 CFR Part 122-125: National Pollutant Discharge Elimination System 40 CFR 131 40 CFR 136.1	Requires permits for the discharge of pollutants for any point source into waters of the United States.
R & A	40 CFR Part 131 - Ambient Water Quality Criteria requirements	Suggested ambient standards for the protection of human health and aquatic life.
R & A	40 CFR Part 146	Technical criteria and standards for the UIC program. Class IV and V well criteria and standards
A	CWA 402 (a)(1)	Effluent limitations are required to achieve all appropriate state water quality standards
A	40 CFR Part 403 - National Pretreatment Standards	Sets standards to control pollutants which pass through or interfere with treatment processes in public treatment works or which may contaminate sewage sludge.
RESOURCE CONSERVATION AND RECOVERY ACT - 42 U.S.C. 6901-6987		
A_1 R&A_2	40 CFR Part 241 - Guidelines for the Land Disposal of Solid Wastes	Establishes minimum levels of performance required of any solid waste land disposal Site operation and includes operation and maintenance.
R & A	40 CFR Part 261 - Identification and Listing of Hazardous Wastes	Defines those solid wastes which are subject to regulation as hazardous wastes under 40 CFR Parts 263-265 and Parts 124, 270, and 271.
R & A	40 CFR Part 262 - Standards Applicable to Generators of Hazardous Waste	Establishes standards for generators of hazardous wastes.
A	40 CFR Part 263 - Standards Applicable to Transportation of Hazardous Waste	Establishes standards which apply to transporters of hazardous waste within the U.S. if the transportation requires a manifest under 40 CFR Part 262.
R & A	40 CFR Part 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal (TSD) Facilities	Establishes minimum national standards which define the acceptable management of hazardous wastes for owners and operators of facilities which treat, store or dispose of hazardous wastes.
$A_{1,2}$	40 CFR Part 268 - Land Disposal 51 FR 40641 52 FR 25760 RCRA sections 3004(d)(3), & (e)(3)	Identifies hazardous wastes that are restricted from land disposal and describes those circumstances under which an otherwise prohibited waste may be land disposed.
SAFE DRINKING WATER ACT - 40 USC Section 300		
A	40 CFR Part 141 - National Primary Drinking Water Standards	Establishes maximum contaminant levels (MCLs) which are health-based standards for public water systems.
R & A	PL No. 99-339 100 Stat.462 (1986) - Maximum Contaminant Level Goals (MCLGs)	Establishes drinking water quality goals set at levels of no known or anticipated adverse health effects with an adequate margin of safety.
CLEAN AIR ACT		
A	40 CFR Part 52	Part 50 specifies the maximum primary and secondary 24-hour concentrations for listed pollutants. Subchapter C, Part 52, provides federal approval of Florida's air quality implementation plan, with standards, criteria, and procedures.
A	40 CFR Part 61 - National Emission Standards for Hazardous Air Pollutants	Addresses hazardous air pollutants at their point of emission from specific sources
HAZARDOUS MATERIALS TRANSPORTATION ACT - 49 U.S. C 1801-1813		
A	40 CFR Parts 107, 171-179: Hazardous Materials Transportation Regulations	Regulates transportation of hazardous materials.
STATE ARARS		
A	FAC 17-730	Florida hazardous waste management regulations
R & A	FAC 17-302.300	Antidegradation policy for surface water quality. Prohibits discharge of wastes into Florida waters without treatment to protect beneficial uses.

TABLE 5 (cont.)

R & A	FAC 17-710	Used oil management regulations.
A	FAC 17-28	Regulations to control discharges to groundwater. Authorizes zone of discharge for facilities discharging to ground water as July 1, 1982.
R & A	FAC 17-2.3	Specifies ambient air quality standards not to be exceeded for listed pollutants
A	FAC 17-2.1	Regulations to eliminate, prevent, and control air pollution
A	FAC 17-4	Establishes procedures and requirements to obtain a permit from FDEP
R & A	FAC 17-660	Effluent discharge requirements for industrial wastewater treatment facilities.

A = APPLICABLE REQUIREMENTS WHICH WERE PROMULGATED UNDER FEDERAL LAW TO SPECIFICALLY ADDRESS A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION LOCATION OR OTHER CIRCUMSTANCE AT THE SITE.

R & A = RELEVANT AND APPROPRIATE REQUIREMENTS WHICH WHILE THEY ARE NOT "APPLICABLE" TO A HAZARDOUS SUBSTANCE, POLLUTANT, CONTAMINANT, REMEDIAL ACTION, LOCATION, OR OTHER CIRCUMSTANCE AT THE SITE, ADDRESS PROBLEMS OR SITUATIONS SUFFICIENTLY SIMILAR TO THOSE ENCOUNTERED AT THE SITE THAT THEIR USE IS WELL SUITED TO THE SITE.

1 = CHEMICAL-SPECIFIC REQUIREMENT

2 = ACTION-SPECIFIC REQUIREMENT

Alternative C-4 provides approximately the same level of long-term effectiveness and permanence as C-1. The treatment process would immobilize metals, and the permeability of the mass relative to organics would be reduced, but the toxicity and volume of contaminants would not be reduced. Access restrictions would be required to continue effectiveness, and this is provided by the capping alternatives. The only benefit provided by alternative C-4 over the other alternatives is that the ground water remediation time frame for metals may be reduced.

Alternative C-5 would provide effectiveness and permanence, but not to the extent of the other alternatives in consideration since contaminants in Site soils would not be removed or immobilized. Alternative C-6 would provide little or no long-term effectiveness or permanence.

4. <u>Reduction of Toxicity, Mobility, or Volume</u>

All combined alternatives include ground water remediation, so the only relative differences between the alternatives are restricted to the components of the alternatives that address soil contamination. The ground water remediation system would remove ground water contaminants, and thus would reduce toxicity, mobility, and volume.

Alternative C-3 would provide the greatest reduction of toxicity, mobility, and volume of all the alternatives through removal and treatment of limited sources of contaminants in the soil. Soil vapor extraction would effectively reduce the toxicity, mobility, and volume of any VOCs remaining following excavation. Most of the organic contaminants in unsaturated soil would be removed, and about 20 percent of the inorganics in unsaturated soil would be removed, and about 25 percent of the saturated soil inorganics would be removed. The cap would essentially eliminate infiltration through remaining contaminated soil.

Alternatives C-1 and C-2 would provide a relatively moderate degree of reduction in toxicity, mobility, and volume. Both alternatives would remove unsaturated soil organic contaminants to the 90 ppm level. Alternative C-2 would remove a small percentage of unsaturated soil inorganics, while neither alternative would remove saturated soil inorganics.

Alternative C-4 would provide a lesser degree of reduction of toxicity, mobility, and volume, since soil contaminants would not be removed; they would be bound in place thereby reducing their mobility.

Alternative C-5 would provide an even lower degree of reduction in toxicity, mobility, and volume, because since it does not provide for treatment of soil contaminants. Alternative C-6, no action, would rank lowest for this criteria.

5. Short-Term Effectiveness

All the alternatives present some potential risks to remediation workers, local workers, and the environment during implementation. Alternatives C-1 and C-5 could be implemented more quickly than the other alternatives, and require the least amount of soil disturbance and intrusion. Any volatile emissions or fugitive dust generated could be controlled through the application of water (wetting) or foam vapor suppressants.

Alternatives C-2, C-3, and C-4 present additional risks to remediation workers and local workers during implementation due to heavy equipment operation within Site constraints. These risks would be controlled by the implementation of appropriate health and safety procedures during construction.

6. Implementability

All the alternatives, except for no-action, may require that a treatability study or pilot test be performed. Alternatives C-1 and C-5 would not require any specialized equipment to implement.

Alternatives C-2 and C-3 would be more difficult to implement because of Site access and space limitations. Both of these alternatives include excavation, which can be conducted at the Site but may require consent by adjacent property owners and will require more planning than at typical Sites.

Site structures limit access to the majority of the contaminated soil. To completely remove contaminated soil, he treatment building and a portion of the main building may eventually have to be demolished. Excavation to recover all contaminated soil to 16 feet is not possible with the buildings on Site, and with adjacent buildings. Excavation to a depth of 16 feet would include "wet" excavation because the water table occurs at about 6 feet. The sandy soil would sluff under the wet conditions and, even with shoring, building stability would be in jeopardy. Because of implementability problems, contaminated soil source removal to a depth of 8 feet is the only excavation considered implementable.

Alternative C-4 would require specialized technical expertise as well as specialized equipment, and requires a large amount of space for the equipment. S/S equipment is large and would be difficult to maneuver in the limited space at the Site. The in-situ S/S mixing equipment may not be able to reach soil beneath Site or adjacent buildings, and would require a minimum setback of one to two feet from the buildings. The space limitations would require staging because equipment would have to be setup over stabilized material to access unstabilized material. On-site and some off-site business activities may have to be suspended during S/S implementation. This remedy may also interfere with adjacent businesses because equipment would have to mobilize over and setup some operations on adjacent property. This alternative would be the most difficult to implement.

7. Cost

The cost estimates for the various alternatives are summarized in order of least to highest present worth below.

Alternative	Capital	Annual O&M	Present Worth
C-6 - No Action	$0	$0	$0
C-5 - GW Recovery & Treatment; RCRA-type cap	$399,750	$71,900	$1,505,000
C-2 - GW Recovery & Treatment; limited source removal; RCRA-type cap	$442,200	$71,900	$1,547,400
C-1 - GW Recovery & Treatment; RCRA-type cap; SVE	$445,500	$92,600	$1,868,900
C-3 - GW Recovery & Treatment; limited source removal; SVE; RCRA-type cap	$800,813	$92,600	$2,224,200
C-4 - GW Recovery & Treatment; limited source in-situ S/S; concrete cap	$1,801,500	$75,000	$2,954,400

8. Community Acceptance

The local community did not have any significant comment on the various remedial alternatives. One commentor did not disapprove of the selected remedy, but did raise various questions regarding the risk assessment process and the general Superfund process. Responses to their questions are provided in Appendix B - Responsiveness Summary.

An equipment vendor submitted a limited proposal for groundwater treatment which was similar to one of the treatment methods described in the FS. Based on the available information, EPA concluded that the vendor's proposed method would not be cost effective.

9. State Acceptance

The State of Florida accepted portions of the selected remedy including the groundwater treatment and deed restrictions, but recommended excavation or solidification of the contaminated soil in order to control the leaching of metals to groundwater. EPA does not agree with the State regarding excavation or solidification of soil since those methods would likely be the most difficult to implement because of the space constraints at the Site. In addition, excavation of all metals contaminated soil would require the demolition of some Site buildings, including the existing industrial wastewater pretreatment plant.

The metals contamination in groundwater is generally limited to the shallow groundwater and has not migrated beyond Airco Plating's property. Furthermore, the selected groundwater action is expected to capture the groundwater contaminated with metals and will include treatment for metals in extracted groundwater if necessary to satisfy discharge requirements.

Groundwater monitoring is a component of the selected remedy. If long term monitoring indicates that the cap is not effective in reducing metals concentrations in groundwater, then it may be necessary to conduct more active soil remediation measures.

8.2 Synopsis of Comparative Analysis of Alternatives

All the alternatives, except for No-Action, would provide some degree of overall protection of human health and the environment and would comply with ARARs. Each of the remaining five alternatives included groundwater extraction and treatment to address VOCs in groundwater. Therefore, to select from among the remaining five alternatives, more significance was given to reducing the volume of PCE in soil through treatment because PCE is the most mobile contaminant at the Site when compared to the metal contaminants. Therefore, active measures such as soil vapor extraction were favored. Excavation and off-site disposal of the PCE contaminated soil would be effective but there is a regulatory preference for treatment and a regulatory bias against the off-site disposal of untreated wastes. The soil vapor extraction will result in a permanent reduction of organic contaminant concentrations in the Site soil.

Capping the metals contaminated soil was considered sufficient to reduce the leaching of metals from soil to groundwater. More active measures such as excavation to the water table and in-situ S/S would also be effective but would have been more difficult to implement because of space constraints at the Site and the presence of functional buildings at and adjacent to the Site. In addition, alternative C-4, which included in-situ S/S, had costs which were double the costs of alternative C-5, which included a cap.

9.0 **SELECTED REMEDY**

Based upon consideration of the requirements of CERCLA, the NCP, the detailed analysis of alternatives and public and state comments, EPA has selected a combined source control and groundwater remedy for this site. At the completion of this remedy, the risk associated with this Site has been determined to be in the range from 1×10^{-5} to 1×10^{-6} which is considered to be protective of human health and the environment.

The total present worth cost of the selected remedy, Alternative C-1, is estimated at $ 1,868,900. This includes capital costs of $445,500 and annual O&M costs of $92,600.

A. Source Control

Source control remediation will address the contaminated soils at the Site. The primary contaminants are metals, including cadmium, and VOCs including PCE. Source control will include soil vapor extraction of VOCs from soil above the water table, capping metals and VOC contaminated soils, and institutional controls (including deed restrictions), that will preserve the integrity of the cap and prohibit activities that are not compatible with the selected remedy.

A.1 Major components of source control include:

a. Soil vapor extraction of VOCs, including PCE concentrations greater than 90 ppm, for Site soil to a depth of 5-6 feet below land surface, or just above the water table, whichever is lower.

b. A RCRA-type cap over soil above the water table with cadmium concentrations in excess of 73 ppm and PCE concentrations in excess of .060 ppm but less than 90 ppm;

c. Institutional controls, including deed restrictions that are not inconsistent with the NCP, that shall: 1) preserve integrity of the cap and restrict activities that are not compatible with the remedy. The restrictions would prohibit residential use of the Site as long as the contaminated soil remains in place and would prohibit removal of the cap unless any necessary remedial action, such as soil treatment, was conducted; 2) ensure that the remedy remains protective of human health and the environment if on-site buildings that are currently located over contaminated soil undergo any significant physical modification or alteration. Those areas under such buildings would then be evaluated to determine if remedial action is necessary, such as extending a RCRA-type cap over those areas.

d. A pilot-scale treatability study of the soil vapor extraction system will be necessary during the remedial design in order to maximize the performance of the system. In addition, modeling of projected air emissions and analysis of actual air emissions from the pilot plant will be conducted in order to determine the need for air emission control equipment for the system.

e. Review of the periodic groundwater monitoring results to determine the effectiveness of the cap at reducing the concentrations of inorganics in groundwater at the Site. If metals concentrations in Site groundwater increase or do not decrease within five years after installation of the cap, then the need for active soil treatment measures such as excavation, solidification, etc., shall be evaluated.

f. Compliance with ARARs listed in Tables 4 and 5 and in this Section 9.

A.2 Treatment of in-situ material

Soil action levels are intended to reduce the leaching of contaminants from soil to groundwater so that groundwater standards are no longer exceeded, or to reduce the risk associated with exposure to contaminated soil. The levels for PCE and cadmium were calculated by using the Summers model, which is more fully explained in Appendix C of the FS.

Soil action levels were set for PCE because it is the primary organic contaminant detected at elevated concentrations in Site soils. PCE found in Site soil is the likely source of PCE and related organic compounds found in Site groundwater. Soil action levels were set for cadmium because it is found at elevated levels in soil and is acting as a source of cadmium in underlying groundwater.

Site soil containing elevated levels of cadmium generally contain elevated levels of other metals and cyanide. Therefore, action for cadmium contaminated soil will also address other metals and cyanide found in the soil. Nevertheless, action levels for the other site contaminants have also been developed. They are generally based on calculated allowable levels for exposure to soil.

Site soils above the water table that are contaminated with PCE concentrations greater than .060 ppm and less than 90 ppm will be capped as well as soil contaminated with cadmium concentrations greater than 73 ppm.

However, since PCE is a highly mobile contaminant, the cap is not expected to reduce the potential for leaching of PCE in soil for PCE concentrations greater 90 ppm. Therefore, Site soils above the water table that are contaminated with PCE at concentrations greater than 90 ppm will be treated by soil vapor extraction. This method involves the application of a vacuum to subsurface soils at extraction points (typically wells) and the introduction of air under pressure at injection points. The resulting movement of air through the pore spaces of the contaminated soils carries volatilized VOCs with it.

The captured VOCs will then be treated, if necessary, or discharged directly to the atmosphere. At a minimum, additional air emission testing coupled with a risk assessment methodology will be conducted to evaluate the need for air emission control equipment for the soil vapor extraction system alone and in combination with the air stripping tower used for groundwater treatment.

A.3 Performance Standards

Because certain performance standards may not be determined until the Remedial Design Phase, and because certain minor performance standards may not be listed, the list of Performance Standards in this section is not exclusive. The performance standards for this component of the selected remedy include, but are not limited to, the following standards:

a. Treatment standards

PCE concentrations in Site soils to a depth of 5-6 feet below land surface, or just above the water table, whichever is lower, shall be reduced to less than or equal to 90 ppm by SVE.

b. Capping standards

Site soils above the water table that are contaminated above the action levels listed below will be capped.

CONTAMINANT	SOIL ACTION LEVEL (ppm)
Tetrachloroethylene (PCE)	>.060 and <90[1]
Cadmium	73[1]
Chromium	1,350[2-3]
Copper	9,990[2-3]
Cyanide	5,940[2-3]
Lead	500[2-3]

Nickel	5,400[3]
Zinc	8,100[3]

[1] Summers model calculation - protection of groundwater
[2] Florida Background Level
[3] BRA - protection of human health from contact with soil

In general, the cap shall comply with the pertinent portions of 40 CFR 264 Subparts, F, G, and K. In particular, the cap will substantially eliminate infiltration and thus reduce leachate generation of metals and organic compounds in general, and cadmium and PCE in particular. The soil cleanup levels are based upon a cap permeability value of 10^{-7} cm/sec. At a minimum, the cap will be designed so that it meets the requirements in the EPA guidance document "Construction Quality Management for Remedial Action and Remedial Design - Waste Containment Systems" (EPA/540/R-92/073) and other relevant guidance. The cap will be a "hardened" cap as required for the closure of hazardous waste storage facilities where it is advantageous to continue using the Site.

As part of the construction of the cap, the surface would be graded, compacted, and sloped to direct precipitation runoff to a desirable location. Upon completion of grading, a geosynthetic layer would be placed on the soil surface. Next, a geomembrane would be put in place which would then be topped by a granular drainage layer. Finally, a reinforced concrete pad would be constructed to protect the underlying layers and to provide a durable working surface for ongoing industrial activity.

In addition, the cap will satisfy the pertinent requirements in 40 CFR 264.90 -.120, and 264.228 which include:

-provide long term minimization of liquids through the closed surface impoundment.

-function with minimum maintenance

-promote drainage and minimize erosion or abrasion of the final cover

-accommodate settling and subsidence so that the cover's integrity is maintained

-maintain the integrity and effectiveness of the final cover, including making repairs to the cap as necessary

-have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present

Use of the capped area for commercial purposes will follow the substantive requirements found in 40 CFR 264.117 -.120 regarding post closure care and use of property including, but not limited to, maintenance, groundwater monitoring, post closure plans and notices, etc.

The estimated size of the cap is approximately 12,500 square feet. The size of the cap may increase if existing concrete or asphalt at the Site does not provide an equivalent level of protection or effectiveness. A final decision regarding the effectiveness of the existing covers will be made during the RD.

c. Discharge standards

Air emission modeling and monitoring coupled with a risk assessment methodology will be conducted to evaluate the need for air emission control equipment for the soil vapor extraction system alone and in combination with the air stripping tower.

Air emissions from the SVE system shall comply with EPA Office of Solid Waste and Emergency Response Directive 9355.0-28 titled Control of Air Emissions from Superfund Air Strippers from Superfund Groundwater Sites. This guidance indicates that air emission sources need controls if their actual emission rates for total VOCs exceed:

3 pounds/hour or
15 pounds/day or
10 tons/year

Air emissions shall also comply with levels included and/or referred to in the guidance document entitled "Estimation of Air Impacts for Air Stripping of Contaminated Water" (EPA-450/1-91-002, dated 5/91), where appropriate.

Air emissions must also comply with State regulations identified as ARARs for this Site. Florida regulations in Chapter 17-2 provides requirements for sources which emit pollutants. If any contaminant regulated by these standards will be released by the planned remedial action, the regulations shall be followed.

Air emissions that exceed the standards referred to above shall be collected and treated by carbon absorption, vapor membrane separation, or other suitable methods as approved by EPA.

B. Groundwater Remediation

Contaminated groundwater will be removed by pumping from recovery wells designed to provide effective capture of dissolved contaminants. The extracted ground water will then be treated by air stripping. The treated water will then either be directed to Airco (for industrial purposes and discharged to the POTW after meeting POTW permit requirements for inorganics), or, as necessary, treated to remove inorganics and then reintroduced to the surficial aquifer through a recharge gallery on-Site.

B.1. The major components of groundwater remediation to be implemented include:

Extraction of contaminated groundwater and treatment by air stripping at the Site; and

a. Discharge of treated water to the POTW or to the surficial aquifer via a recharge gallery on-Site in accordance with all applicable regulations and other Performance Standards.

b. Evaluation of the need for treatment of inorganics in groundwater will be conducted during the RD.

c. Air emissions will be sampled during the initial operation of the air stripping tower. The purpose of the sampling will be to validate the air emissions modeling included in the FS. Air emission control equipment will be added to the design of the air stripping system if EPA determines that such equipment is necessary.

d. Compliance with ARARs listed in Tables 4 and 5 and this Section 9.

B.2. Extraction, Treatment, and Discharge of Contaminated Ground Water

Groundwater beneath and downgradient from the Site contains VOCs at various depths in the Biscayne Aquifer. Some metals, including cadmium, have also been detected primarily in shallow groundwater at the Site.

The contaminated groundwater will extracted by extraction wells. The groundwater extraction well design and installation requirements will be finalized during the design phase. However, according to the FS, one extraction well pumping at a rate of approximately 75 gpm would be sufficient to contain the entire contaminant plume within 180 days.

The VOC contaminated groundwater will be treated by air stripping to remove the VOCs. Air stripping equipment is generally classified as either packed towers or low profile.

The specific type of air stripping system will be determined during the RD and will depend upon flow rates, influent concentrations, efficiency rates, etc. In either type of system, air is forced through the groundwater in order to volatilize the VOCs. According to the FS, a single packed tower, about 30 feet high would be required to achieve cleanup levels for groundwater.

The need for treatment of inorganics in groundwater will be determined during the RD/RA. This will be accomplished during a pilot scale operation of the airstripping tower. Treated effluent from the tower will be analyzed for inorganics. If contaminants are detected above discharge standards, then appropriate treatment methods shall be designed. If inorganic contaminants are detected consistently during periodic effluent sampling from the full scale operation of the groundwater treatment system, then an EPA approved design for inorganics treatment shall be implemented.

Treated groundwater will be discharged to either the POTW, an on-site recharge gallery, or a combination of both. Currently, Airco Plating only discharges a portion of the total daily volume allowed under its permit with DERM (Dade County) for discharge to the POTW. This excess discharge capacity may be utilized for disposal of a portion of the treated groundwater, if authorized by DERM and the POTW. The remainder of the treated groundwater could then be discharged to an on-site recharge gallery that would discharge the treated water to the surficial aquifer. However, a recharge gallery shall be designed in such a manner so as to allow for the discharge of all treated water if conditions prohibit a discharge to the POTW. It shall also be designed so that "recharged" water does not adversely alter the migration pattern.

Air emissions from a packed column air stripping tower have been estimated. Based on the estimates developed in the FS, air emissions should not exceed allowable levels. However, since the soil vapor extraction system for soil will also have air emissions that were not estimated, additional air emission testing coupled with a risk assessment methodology will be conducted to evaluate the need for air emission control equipment for the air stripping tower, the soil vapor extraction system, or both.

All sampling conducted during the RD/RA is subject to verification by EPA.

B.3. Performance Standards

Because certain performance standards may not be determined until the Remedial Design Phase, and because certain minor performance standards may not be listed, the list of Performance Standards in this section is not exclusive.

a. Extraction Standards

Groundwater at the Site which exceeds federal and/or state groundwater standards, particularly those listed in the following table, will be extracted. A pumping rate of 75 gallons per minute was used in the FS as estimates of the pumping rate necessary to contain the entire plume; these values will be further evaluated during the RD.

b. Treatment Standards

Groundwater shall be treated until federal and/or state groundwater standards are attained at the wells designated by EPA as compliance points. These compliance points are currently considered to be located at the immediate boundaries of the capped area, the furthest extent of the contaminant plume, and the extraction wells.

The groundwater treatment standards include the levels listed in the following table - "Groundwater Extraction and Treatment Standards".

Some of the groundwater treatment standards include promulgated State groundwater standards that are more stringent than Federal standards. These State standards are ARARs that shall be complied with and include:

Trichloroethylene.........	3 ppb
Tetrachloroethylene.......	3 ppb
Vinyl Chloride............	1 ppb

Acetone and bis(2-ethylhexyl)phthalate, listed as contaminants of concern in the Risk Assessment, might not be Site related. It is possible that these compounds are laboratory compounds that contaminated a groundwater sample during the RI but are not actually present in Site groundwater. Additional sampling and analysis of groundwater will be conducted during the RD to confirm the presence or absence of these compounds.

CONTAMINANT	GROUNDWATER EXTRACTION AND TREATMENT STANDARDS (ppm)
Acetone	NA
Chloroform	.100[1]
Cis/trans 1,2 dichloroethylene	.07/.100[1]
1,1-Dichloroethylene	.007[1]

Tetrachloroethylene (PCE)	.003[2]
Trichloroethene	.003[2]
Vinyl Chloride	.001[2]
Bis(2-ethylhexyl)phthalate	NA
Cyanide	.200[1]
Cadmium	.005[1]
Chromium	.100[1]
Copper	1.3[3]
Lead	.015[4]
Nickel	.100[1]
Zinc	5.0[5]
[1] Federal MCL [2]Florida Groundwater standard [3] Federal MCLG	
[4] Federal action level [5] Federal SMCL	

c. Discharge Standards

Discharges from the ground water treatment system shall comply with all ARARs, including, but not limited to, federal and state groundwater standards and all effluent limits established by EPA.

Treated water discharged to the recharge gallery shall meet performance standards including those noted in 9.B.3.b.

Treated water discharged to the POTW shall meet the standards required by the POTW and/or DERM. DERM has issued an annual waste pretreatment operating permit to Airco Plating. The current standards for pretreatment of wastewater prior to discharge to the POTW include:

Parameter	Daily Maximum Limit
Flow, total	80,000 gallons/day
pH	9.5 (5.5 is monthly average limit)
Cadmium	.5 mg/l
Chromium	1.0 mg/l
Chromium, hex	.5 mg/l
Copper	.5 mg/l

Cyanide	.1 mg/l
Lead	.3 mg/l
Nickel	1.5 mg/l
Silver	.4 mg/l
Zinc	1.0 mg/l
Total Toxic Organics (TTO)	2.0 mg/l
Total Metals (Cu, Cr, Ni, Zn)	2.0 mg/l

Airco Plating is currently discharging approximately 45,000 gallons/day of treated wastewater, thus there is currently unused capacity in the total permitted daily discharge at the Site. Use of this discharge option is dependent upon the approval of DERM and the POTW.

Air emissions from the groundwater treatment system shall comply with EPA Office of Solid Waste and Emergency Response Directive 9355.0-28 titled Control of Air Emissions from Superfund Air Strippers from Superfund Groundwater Sites. This guidance indicates that air emission sources need controls if their actual emission rates for total VOCs exceed:

3 pounds/hour or
15 pounds/day or
10 tons/year

Air emissions shall also comply with levels included and/or referred to in the guidance document entitled "Estimation of Air Impacts for Air Stripping of Contaminated Water" (EPA-450/1-91-002, dated 5/91).

Air emissions must also comply with State regulations identified as ARARs for this Site. Florida regulations in Chapter 17-2 provides requirements for sources which emit pollutants. If any contaminant regulated by these standards will be released by the planned remedial action, the regulations shall be followed.

d. Design Standards

The design, construction and operation of the groundwater treatment system shall be conducted in accordance with all ARARs, including the pertinent requirements set forth in 40 C.F.R. Part 264 (Subpart F).

C. Compliance Testing

Sampling of treated and untreated soils, groundwater, treated effluent, and air emissions shall be conducted at this Site. Appropriate samples from soil or the extracted air/PCE mixture shall be collected to ensure that PCE levels in soil are less than or equal to 90 ppm. This sampling will be conducted in order to determine the effectiveness of the SVE system. Verification samples will be collected to demonstrate that all soil that exceeds action levels has been capped.

A long term monitoring system shall be implemented to monitor the progress of groundwater remediation and the effectiveness of continued operation of the groundwater treatment system. After demonstration of compliance with groundwater Performance Standards, the groundwater shall be monitored for at least five years. If monitoring indicates that the Performance Standards set forth in Paragraph B.3 are being exceeded at any time after pumping has been discontinued, extraction and treatment of the ground water will recommence until the Performance Standards are once again achieved. Furthermore, if monitoring indicates Performance Standards set forth in Paragraphs A.3 or B.3 have been exceeded, the effectiveness of the source control component will be re-evaluated.

Treated groundwater will also be monitored on a regular basis to ensure that the treated water meets the necessary discharge standards. Discharge standards include federal and state groundwater standards for discharges to the aquifer. An appropriate sampling and analysis plan for the remedial action will be prepared during the RD. In addition to analyses of organic contaminants, inorganic contaminants will be analyzed periodically during the first two years of operation. After two years, the frequency of metals analyses may be reduced. If, at any time, metals are present above federal or state standards, then treatment for metals may be deemed by EPA to be necessary, dependent upon the discharge point and associated discharge standards.

Air emissions monitoring will be performed periodically during the remedial action to evaluate the air emissions from the groundwater treatment system and the SVE system to determine if air emission controls are necessary.

Use of the capped area will follow the substantive requirements found in 40 CFR 264.117 -.120 regarding post closure care and use of property including, but not limited to, maintenance, groundwater monitoring, post closure plans and notices, etc.

10. STATUTORY DETERMINATIONS

EPA has determined that the selected remedy will satisfy the statutory determinations of Section 121 of CERCLA. The remedy will be protective of human health and the environment, will comply with ARARs (unless a statutory waiver is justified), will be cost effective, and will use permanent solutions and alternative treatment technologies to the maximum extent practicable.

Furthermore, the regulatory preference for treatment as a principal element and the bias against off-site land disposal of untreated wastes are satisfied to the extent practicable.

10.1 Protection of Human Health and The Environment

The selected remedy protects human health and the environment through treatment of the principal threat in soil. PCE is considered a principal threat in soil because it is the most mobile primary contaminant at the Site. SVE will reduce the most elevated levels of PCE in soil that act as a source of groundwater contamination at the Site. The subsequent cap over the soil containing any remaining PCE and the various metals will further reduce the generation of leachate which contaminates the underlying groundwater. The cap will also greatly reduce the risk of direct exposure associated with the contaminated soil. Installation of a cap will reduce the cancer risks associated with soil contact to less than 1×10^{-6}; the non-carcinogenic hazard index will be reduced below 1.

The groundwater treatment component of the selected remedy will protect human health and the environment by reducing or preventing further migration of the contaminated groundwater and by reducing the contaminant concentrations in groundwater until the concentrations are less than or equal to MCLs. Compliance with MCLs will reduce the longterm cancer risk associated with possible ingestion of the groundwater to the range between $1x10^{-5}$ and $1x10^{-6}$. Periodic groundwater monitoring will be conducted to evaluate the performance of the groundwater treatment system.

10.2 Compliance with ARARs

Implementation of this remedy will comply with all Federal and State ARARs and will not require a waiver. The groundwater extraction and treatment system will meet the groundwater performance standards noted in Section 9.B.3, which are based on Federal and State MCLs or EPA action levels. Federal and State MCLs are considered relevant and appropriate in the cleanup of contaminated groundwater. MCLs will be met with respect to the discharge of treated groundwater and long-term groundwater monitoring to assess progress and effectiveness of cleanup.

The cap will comply with the substantive RCRA requirements regarding the capping and closure of hazardous waste units. These requirements include the relevant portions of 40 CFR 264 Subparts F, G, and K and are also discussed in Section 9.A.3.

Air emissions from the soil and groundwater treatment systems shall comply with EPA Directive 9355.0-28 which provides guidelines for the control of air emissions from air stripping towers at Superfund groundwater sites. In addition, State standards for air emissions are found in FAC 17-2.300. These standards would apply if regulated pollutants were emitted during the remedial action.

10.3 Cost-Effectiveness

The selected remedy, alternative C-1, is a cost effective remedy. The total estimated present worth cost of this alternative is approximately $1,868,900 which includes capital costs and annual operation and maintenance costs. EPA has determined that the cost of implementing the remedy is proportionate to the overall effectiveness of the remedy and is a reasonable value.

10.4 Use of Permanent Solutions and Treatment Technologies

The selected remedy uses permanent solutions and treatment technologies to the maximum extent practicable. Groundwater extraction and treatment will involve active measures to reduce the toxicity, mobility, and volume of contaminants in groundwater. Soil treatment, through soil vapor extraction, involves active treatment to address the PCE in soil which acts as a source of contamination in the groundwater. PCE is the most mobile Site contaminant.

10.5 Preference for Treatment as a Principal Element

The statutory preference for treatment will be met because the selected remedy includes active treatment for groundwater and active treatment for the most mobile soil contaminants. Groundwater remediation will be accomplished through extraction and air stripping of the contaminated groundwater. Air stripping will remove the VOCs from groundwater and discharge them to the air at levels that will not pose an unacceptable level of risk to human health or the environment.

Treatment for the PCE contaminated soil, soil vapor extraction, will reduce the amount of PCE that leaches from soil to groundwater and thus increase the effectiveness of the groundwater treatment system.

11. DOCUMENTATION OF SIGNIFICANT CHANGES

The remedy described in this Record of Decision is the preferred alternative described in the Proposed Plan for this Site. There have been no significant changes in the selected remedy.

APPENDIX A: ADMINISTRATIVE RECORD INDEX

ADMINISTRATIVE RECORD INDEX

for the

AIRCO PLATING CO INC NPL Site

1.0 PRE-REMEDIAL

1.8 Preliminary Assessment Documents

1. Preliminary Assessment, Airco Plating Company Site, Eric Nuzie, State of Florida Department of Environmental Regulation. (September 20, 1984).

2. Preliminary Assessment, Airco Plating Company Site, Camilla Warren, EPA Region IV. (May 20, 1985).

1.9 Site Inspection Documents

1. Site Inspection, Airco Plating Company Site, Kenneth Richardson, EPA Region IV. (April 24, 1985).

2. Site Inspection, Airco Plating Company Site, Kenneth Barry, EPA Region IV. (January 29, 1986).

3. Site Inspection, Airco Plating Company Site, Kenneth Richardson, EPA Region IV (May 19, 1986).

1.10 Expanded Site Inspection Documents

1. "Report, Airco Plating Company, Miami, Florida," EPA Region IV. (September 16, 1986).

2. "Final Expanded Site Investigation, Airco Plating Company Site, Miami, Florida, Volume II; Appendices," NUS Corporation. [Note: Thesetwo volumes appear in reverse order in the Index because of their approval dates. However, they appear in correct volume order in the Administrative Record itself.] (July 1987).

3. "Final Expanded Site Investigation, Airco Plating Company Site, Miami, Florida, Volume I," NUS Corporation. [Note: Thesetwo volumes appear in reverse order in the Index because of their approval dates. However, they appear in correct volume order in the Administrative Record itself.] (July 1988).

3.0 REMEDIAL INVESTIGATION (RI)

3.4 Work Plans and Progress Reports (cont'd.)

1. Letter from David Ferrell, United States Department of the Interior, to Randy Bryant, EPA Region IV. (February 12, 1991). Concerning the United States Department of the Interior's choice not to comment on the Airco Plating RI/FS.

2. Letter from Alex Cordero, Florida Department of Natural Resources, to Randy Bryant, EPA Region IV. (May 8, 1991). Concerning comments on the Revised Work Plan for the RI/FS.

3. "Remedial Investigation and Feasibility Study Work Plan, Airco Plating Company, Inc.," Prepared for Airco Plating Company, by M.P. Brown & Associates, Inc. (June 1991).

3.8 Interim Deliverables

1. "Site Safety and Health Plan, Airco Plating Company, Inc., Miami, Florida," Prepared for Airco Plating Company, by M.P. Brown & Associates, Inc. (June 1991).

2. "Quality Assurance Project Plan for Airco Plating Company, Inc., Miami, Florida," Prepared for Airco Plating Company, by M.P. Brown & Associates, Inc. (June 1991).

3. "Field Sampling and Analysis Plan, Airco Plating Company, Inc., Miami, Florida," Prepared for Airco Plating Company, by M.P. Brown & Associates, Inc. (June 1991).

3.10 Remedial Investigation (RI) Reports

1. Memorandum from Dan Thoman, EPA Region IV Environmental Services Division, Athens, Georgia, to Randy Bryant, EPA Region IV. (May 15, 1992). Concerning comments on the Airco Plating Remedial Investigation Report.

2. Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (May 19, 1992). Concerning Comments on the Airco Plating Draft Remedial Investigation Report.

3.10 Remedial Investigation (RI) Reports (cont'd.)

3. Letter from Kelsey Helton, State of Florida Department of Environmental Regulation, to Randy Bryant, EPA Region IV. (July 9, 1992). Concerning transmittal of the enclosed comments on the draft Site Source Characterization (Remedial Investigation Report) for the Airco Plating Co. NPL Site.

4. Letter from Randy Bryant, EPA Region IV, to Mike King, Airco Plating Company, Inc. (July 14, 1992). Concerning transmittal of EPA's enclosed comments on the draft Remedial Investigation Report for Airco Plating Company NPL Site.

5. Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (November 5, 1992). Concerning transmittal of the enclosed comments on the Airco Plating Revised Draft Remedial Investigation Report.

6. Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (November 20, 1992). Concerning transmittal of the enclosed comments on the Revised Remedial Investigation Report as well as scheduling of the Remedial Investigation Report and Feasibility Study Report Documents for the Airco Plating Company Site.

7. Letter from Kelsey Helton, State of Florida Department of Environmental Regulation, to Randy Bryant, EPA Region IV. (December 7, 1992). Concerning transmittal of the enclosed comments on the Site Source Characterization (Remedial Investigation Report) for the Airco Plating Co. NPL Site.

8. Letter from Randy Bryant, EPA Region IV, to Kelsey Helton, State of Florida Department of Environmental Regulation. (December 23, 1992). Concerning request for review of the Final Remedial Investigation Report and the Draft Technical Memorandum for Remedial Alternatives (Provided) for the Airco Plating Co. NPL Site.

9. Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (January 8, 1993). Concerning transmittal of the enclosed comments on the Revised Remedial Investigation Report and Technical Memorandum for the FS for the Airco Plating Company Site.

3.10 Remedial Investigation (RI) Reports (cont'd.)

10. Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (January 22, 1993). Concerning Comments on the Airco Plating Revised Draft Remedial Investigation Report and Technical Memorandum on Remedial Technologies and Alternatives.

11. Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (January 28, 1993). Concerning transmittal of the enclosed comments on the Revised Remedial Investigation Report and Technical Memorandum for the FS for the Airco Plating Company Site.

12. "Remedial Investigation, Airco Plating NPL Site, Miami, Florida, Volume I," M.P. Brown &l Associates, Inc., Prepared for Airco Plating Company, Inc. (February 1993).

13. "Remedial Investigation, Airco Plating NPL Site, Miami, Florida, Volume II," M.P. Brown &l Associates, Inc., Prepared for Airco Plating Company, Inc. (February 1993).

14. Letter from Kelsey Helton, State of Florida Department of Environmental Regulation, to Randy Bryant, EPA Region IV. (February 12, 1993). Concerning the State of Florida Department of Environmental Regulation's comments on the Remedial Investigation Report and the Technical Memorandum on Remedial Technologies and Alternatives.

3.11 Health Assessments

1. "Interim Preliminary Health Assessment, Airco Plating Company, Inc., Miami, Dade County, Florida," Agency for Toxic Substances and Disease Registry (ATSDR) . (February 26, 1992).

3.12 Endangerment Assessments

1. Memorandum from Elmer Akin, EPA Region IV, to Randy Bryant, EPA Region IV. (May 6, 1992). Concerning the attached review comments by Krista Jones, onsite ESAT contractor, on the Baseline Risk Assessment for the Airco Plating Co. NPL Site.

2. Letter from Randy Bryant, EPA Region IV, to Cody Jackson, Dynamac Corporation. (July 1, 1992). Concerning the attached comments on the Baseline Risk Assessment for the Airco Plating Co. NPL Site.

3.12 Endangerment Assessments (cont'd.)

3. Letter from Randy Bryant, EPA Region IV, to Cody Jackson, Dynamac Corporation. (November 5, 1992). Concerning the attached comments on the Revised Baseline Risk Assessment for the Airco Plating Co. NPL Site.

4. Memorandum from Elmer Akin, EPA Region IV, to Randy Bryant, EPA Region IV. (January 29, 1993). Concerning the attached review comments by Krista Jones, onsite ESAT contractor, on the Revised Baseline Risk Assessment for the Airco Plating Co. NPL Site.

5. Letter from Randy Bryant, EPA Region IV, to Cody Jackson, Dynamac Corporation. (February 24, 1993). Concerning the attached comments on the Revised Baseline Risk Assessment for the Airco Plating Co. NPL Site.

6. "Revised Final Baseline Risk Assessment, Airco Plating Company Site, Miami, Dade County, Florida," Dynamac Corporation. (March 19, 1993).

7. Memorandum from Elmer Akin, EPA Region IV, to Randy Bryant, EPA Region IV. (April 8, 1993). Concerning the attached review comments by Krista Jones, onsite ESAT contractor, concurring on the Revised Baseline Risk Assessment for the Airco Plating Co. NPL Site.

4.0 FEASIBILITY STUDY (FS)

4.8 Interim Deliverables

1. "Technical Memorandum on Remedial Technologies and Alternatives for Airco Plating NPL Site, Miami, FL," Blasland, Bouck & Lee, and Haztech, for Airco Plating Company, Inc. (December 1992).

2. Cross-Reference: Letter from Randy Bryant, EPA Region IV, to Kelsey Helton, State of Florida Department of Environmental Regulation. (December 23, 1992). Concerning request for review of the Final Remedial Investigation Report and the Draft Technical Memorandum for Remedial Alternatives (Provided) for the Airco Plating Co. NPL Site. [Filed and cited as entry number 8 in 3.10 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]

4.0 FEASIBILITY STUDY (FS)

4.8 Interim Deliverables (cont'd.)

3. Cross-Reference: Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (January 8, 1993). Concerning transmittal of the enclosed comments on the Revised Remedial Investigation Report and Technical Memorandum for the FS for the Airco Plating Company Site. [Filed and cited as entry number 9 in 3.10 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]

4. Cross-Reference: Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (January 22, 1993). Concerning Comments on the Airco Plating Revised Draft Remedial Investigation Report and Technical Memorandum on Remedial Technologies and Alternatives. [Filed and cited as entry number 10 in 3.10 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]

5. Cross-Reference: Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (January 28, 1993). Concerning transmittal of the enclosed comments on the Revised Remedial Investigation Report and Technical Memorandum for the FS for the Airco Plating Company Site. [Filed and cited as entry number 11 in 3.10 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]

6. Cross-Reference: Letter from Kelsey Helton, State of Florida Department of Environmental Regulation, to Randy Bryant, EPA Region IV. (February 12, 1993). Concerning the State of Florida Department of Environmental Regulation's comments on the Remedial Investigation Report and the Technical Memorandum on Remedial Technologies and Alternatives. [Filed and cited as entry number 14 in 3.10 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]

4.9 Feasibility Study (FS) Reports

1. Cross-Reference: Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (November 20, 1992). Concerning transmittal of the enclosed comments on the Revised Remedial Investigation Report as well as scheduling of the Remedial Investigation Report and Feasibility Study Report Documents for the Airco Plating Company Site. [Filed and cited as entry number 6 in 3.10 REMEDIAL INVESTIGATION (RI) - Remedial Investigation (RI) Reports]

4.9 Feasibility Study (FS) Reports (cont'd.)

2. Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (March 8, 1993). Concerning comments on the draft Feasibility Study Report for the Airco Plating Co. NPL Site.
3. Letter from Krista Jones, ManTech Environmental Technology, to Elmer Akin, EPA Region IV. (March 9, 1993). Concerning comments on the draft Feasibility Study Report for the Airco Plating Co. NPL Site.
4. Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (March 25, 1993). Concerning EPA Region IV review and comments on the draft Feasibility Study Report for the Airco Plating Co. NPL Site.
5. Memorandum from Rick Ruscito, State of Florida Department of Environmental Regulation, to Kelsey Helton, State of Florida Department of Environmental Regulation. (April 16, 1993). Concerning comments on the draft Feasibility Study Report for the Airco Plating Co. NPL Site.
6. Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (April 30, 1993). Concerning soil remediation goals, Airco Plating Co. NPL Site.
7. Letter from Charles MacPhearson, Haztech, to Randy Bryant, EPA Region IV. (May 11, 1993). Concerning a request for additional time to produce the final Feasibility Study Report for the Airco Plating Co. NPL Site.
8. Letter from Charles MacPhearson, Haztech, to Randy Bryant, EPA Region IV. (May 26, 1993). Concerning Haztech's position regarding some of EPA Region IV's comments on the draft Feasibility Study Report for the Airco Plating Co. NPL Site.
9. "Feasibility Study Report, Airco Plating NPL Site, Miami, Florida," Haztech, Blasland & Bouck Engineers, P.C., Blasland, Bouck & Lee, Engineers and Scientists, for Airco Plating Co., Inc. (May 26, 1993).
10. Letter from Kiber Environmental Services, Inc., to Randy Bryant, EPA Region IV. (June 15, 1993). Concerning recent information relative to hydrogen peroxide/ultra violet light treatment for organics.

4.9 Feasibility Study (FS) Reports (cont'd.)

11. Memorandum from William O'Steen, EPA Region IV, to Randy Bryant, EPA Region IV. (June 16, 1993). Concerning comments on the revised Feasibility Study Report.

12. Letter from Randy Bryant, EPA Region IV, to Charles MacPhearson, Haztech. (July 14, 1993). Concerning transmittal of the enclosed review comments on the Revised Feasibility Study Report for the Airco Plating NPL Site.

13. Letter from Frederick Blickle, Blasland, Bouck & Lee, to Randy Bryant, EPA Region IV. Response to EPA's comments on the Feasibility Study (July 26, 1993).

4.10 Proposed Plans for Selected Remedial Action

1. Letter from Randy Bryant, EPA Region IV, to Kelsey Helton, State of Florida Department of Environmental Regulation. (June 28, 1993). Concerning request for review of and comments on the draft Proposed Plan for the Airco Plating Co. NPL Site.

2. Letter from Alex Cordero, State of Florida Department of Environmental Protection, to Randy Bryant, EPA Region IV. (July 8, 1993). Concerning review comments on the Proposed Plan for the Airco Plating NPL Site.

3. "Superfund Proposed Plan, Region IV, Airco Plating Superfund Site, Miami, Florida," EPA Region IV. (July 14, 1993).

4. Letter from George King, Airco Plating Co. Inc., to Randy Bryant, EPA Region IV. Comments on the proposed remedy for the Airco Plating Superfund Site (August 17, 1993).

5. Letter from Damon Marunyak, Ecozone, Inc., to Randy Bryant, EPA Region IV, with attached letter to Chuck MacPhearson, Kibel Environmental, from Damon Marunyak, Ecozone. Summary of technology and test results using an Advanced Oxidation Process (AOP) (August 27, 1993).

6. Cross-Reference: Letter from Kelsey Helton, Florida Department of Environmental Protection, to Randy Bryant, EPA Region IV. Review of the draft Record of Decision (ROD) (September 3, 1993). [Filed and cited as entry number 1 in 5.9 RECORD OF DECISION (ROD) - Record of Decision (ROD)]

5.0 RECORD OF DECISION (ROD)

5.9 Record of Decision (ROD) (cont'd.)

1. Letter from Kelsey Helton, Florida Department of Environmental Protection, to Randy Bryant, EPA Region IV. Review of the draft Record of Decision (ROD) (September 3, 1993).
2. "Record of Decision, Airco Plating, Co. Inc. Dade County" (October 1, 1993).

10.0 ENFORCEMENT

10.11 EPA Administrative Orders

1. Administrative Order by Consent for Remedial Investigation/Feasibility Study, "In the Matter of Airco Plating Company, Inc., Respondent," EPA Region IV, (Includes Scope of Work). (November 14, 1990).

13.0 COMMUNITY RELATIONS

13.6 Community Relations Plans

1. "Final Community Relations Plan, Airco Plating Company Site, Miami, Dade County, Florida," Dynamac Corporation. (March 22, 1991).

13.7 News Clippings and Press Releases

1. Public Meeting Announcement (in Spanish), EPA Region IV, Newspaper Advertisement, Diario Las Americas. (April 21, 1991).
2. "Airco Plating Company, National Priorities List, Superfund Site, Public Availability Session," EPA Region IV. (April 30, 1991).
3. "The United States Environmental Protection Agency Announces a Comment Period and Public Meeting for the Airco Plating Superfund Site, Newspaper Advertisement, appeared in the Miami Herald (July 18, 1993).
4. Environmental Protection Agency announces a public comment period and meeting (in Spanish), Newspaper Advertisement, appeared in Diario Las Americas (July 20, 1993).

13.7 News Clippings and Press Releases (cont'd.)

5. Newspaper article outlining the Proposed Plan for Airco Plating Superfund Site, (in Spanish), EPA Region IV, appeared in Diario Las Americas (August 5, 1993).

13.8 Public Meetings

1. Transcript, "The Airco Plating Superfund Site, Public Information Meeting", held at the Joseph Caleb Center (August 2, 1993).

13.9 Fact Sheets

1. "Superfund Proposed Activities Fact Sheet, Airco Plating Site," EPA Region IV. (May 1991).
2. Hoja De Hechos Sobre Actividades Propuestas Del Programa "Superfund," Predio Superfund De La Airco Plating Company (Superfund Proposed Activities Fact Sheet, in Spanish), EPA Region IV. (May 1991).

16.0 NATURAL RESOURCE TRUSTEE

16.1 Correspondence

1. Cross-Reference: Letter from David Ferrell, United States Department of the Interior, to Randy Bryant, EPA Region IV. (February 12, 1991). Concerning the United States Department of the Interior's choice not to comment on the Airco Plating RI/FS. [Filed and cited as entry number 1 in 3.4 REMEDIAL INVESTIGATION (RI) - Work Plans and Progress Reports]
2. Letter from Susan Goggin, State of Florida Department of Environmental Regulation, to Randy Bryant, EPA Region IV. (January 26, 1993). Concerning the fact that the Florida Department of Environmental Regulation is a natural resource trustee, and should therefore should continue to have the opportunity to review and comment on documents associated with the Airco Plating NPL Site.

16.0 NATURAL RESOURCE TRUSTEE

16.1 Correspondence (cont'd.)

3. Letter from Alex Cordero, Florida Department of Natural Resources, to Randy Bryant, EPA Region IV. (February 5, 1993). Concerning a request to review Airco Plating Remedial Investigation/Feasibility Study Report documents in light of the natural resource trustee status of the Florida Department of Natural Resources.

17.0 SITE MANAGEMENT RECORDS

17.8 State and Local Technical Records

1. Facsimile from Omar Prieto, Dade County, to Randy Bryant EPA Region IV, of a letter from John Renfrow, Dade County, Florida, to George King, Airco Plating Co. (June 23, 1993). Concerning transmittal of the enclosed Multiple Source Operating Permit for the Airco Plating Co.

APPENDIX B: RESPONSIVENESS SUMMARY

APPENDIX B
RESPONSIVENESS SUMMARY
AIRCO PLATING NPL SITE
RECORD OF DECISION

PART I: Summary of Commentor's Major Issues and Concerns

A public meeting was held on August 2, 1993 at the Caleb Business Center in Miami, Florida. The purpose of the meeting was to discuss EPA's proposed plan for Superfund action at the Airco Plating Site. The proposed plan included groundwater extraction and treatment via airstripping, soil vapor extraction, and a cap over contaminated soil.

About nine people attended the meeting, including representatives of Airco Plating, a newspaper reporter, and two private citizens. No significant concerns about the proposed cleanup were expressed during the meeting.

A 30-day public comment period on the proposed plan began on July 19 and concluded on August 18. Comments were received from Airco Plating, Dade County Environmental Resources Management (DERM), Florida Department of Environmental Protection (FDEP) and a vendor of groundwater treatment technologies. Airco Plating expressed support for the proposed action, but expressed concerns about the accuracy of the Risk Assessment conducted by EPA, the fairness of the Superfund laws, and the need for Site investigations. DERM verbally expressed some hesitation to allow treated groundwater to be discharged to the POTW because of possible capacity limitations. FDEP's main concern was that more extensive soil cleanup actions were necessary. The vendor proposed a variation of an ultraviolet light groundwater treatment system.

PART II: Comments and Responses

1. One commenter wanted to emphasize EPA comments regarding the limitations of pump and treat systems.

   RESPONSE: EPA indicated the possible difficulty associated with achieving MCLs for organic compounds in groundwater when using a pump and treat system and that such a system should be monitored on a regular basis to evaluate its continued effectiveness towards meeting MCLs.

2. One commenter suggested that groundwater contamination at the Site is due to groundwater contamination at the Miami Airport.

   RESPONSE: As part of EPA's Biscayne Aquifer Study, conducted in the 1980's, groundwater samples were collected within an 80 square mile area that included the Miami Airport. The highest concentration of PCE found in the study area was approximately

5.9 ppb. The highest concentration of PCE recently found in groundwater underneath the Airco Plating property however, was at least 4,000 ppb, which is at least 650 times higher than the highest value noted in the Biscayne Aquifer Study. Furthermore, during the Site-specific investigations, PCE was not detected in upgradient monitoring wells which are located about 150 feet northwest of the Site.

3. One commentor supported EPA's statement that the need for treatment of metals in groundwater can best be determined during the Remedial Design because groundwater results to date indicate that such treatment is not necessary.

   RESPONSE: Currently, cadmium is present in concentrations above its MCLs in shallow groundwater underneath the Airco Plating property. However, once the pump and treat system is operational and begins to draw in enough groundwater to capture the PCE plume, the cadmium levels in the extracted groundwater may be low enough that treatment for metals, such as cadmium, may not be necessary before discharge. However, if metals in the treated groundwater are present above discharge standards, additional treatment may be necessary.

4. A commentor claimed that the most significant flaw in the Baseline Risk Assessment (BRA) is the calculation of the Hazard Index for the onsite worker.

   RESPONSE: The Hazard Index of 1.3, was calculated correctly. A review of the risk assessment reveals that the primary component of the HI for the onsite worker is the ingestion of soil containing cadmium and chromium. The soil concentrations used in the calculations for soil ingestion were taken from soil boring B-62. B-62 is located on the Airco Plating property and is accessible to workers. Boring locations B-52 and B-70 may be covered by asphalt or concrete and contained some of lowest levels of site contaminants; use of data from these points would underestimate potential risk.

   Use of sampling data from boring B-62 is appropriate because the calculated 95 % upper confidence level (UCL) of average soil concentrations for the onsite worker scenario was much higher than the maximum value of the four sampling points referenced, including B-62. EPA risk assessment guidance indicates that when the UCL is higher than the maximum detected value, then the maximum detected value should be used, and that such an approach is reasonable. The BRA is intended to provide conservative calculations of risk in order to ensure protection of human health and the environment.

   The HI of 1.3 for the onsite worker is a summation of the hazard quotients (HQ) for exposure to surface soil. A limitation of this approach is that it is based on the assumption that dose additivity is most properly applied to compounds that induce the same effect. The application of the

HI approach to a number of compounds that are not expected to induce the same type of effects or do not act by the same mechanism could overestimate the potential for effects. It is appropriate to sum these chemicals as a screening approach but if the HI is greater than unity as a consequence of summing several HQs, it is appropriate to segregate the compounds by effect and by mechanism of action. The two major contributors to the HI of 1.3 are cadmium and chromium. These two chemicals do not have the same toxic effect and neither chemical has an individual HQ greater than 1.

5. A commentor noted that the depicted location of soil boring B-70 changed during revision of the BRA and that such a change may have an impact on the onsite worker scenario.

   RESPONSE: The depicted location of soil boring B-70 is identical to the location noted in the RI report. The sampling data from boring B-70 was not used in the calculated value of 1.3 for the Hazard Index for the onsite worker.

6. A commentor noted that, in the BRA, it is not possible to arrive at the reported mean concentration of PCE when using the reported concentrations of PCE in the upper one foot of soil from locations B-57, 62, 67, and 70.

   RESPONSE: It appears that the detected concentrations were used in the calculation of the mean concentration of PCE at those locations. Nevertheless, the calculated mean concentration was not used in the risk calculation and thus does not affect the risk assessment conclusions.

7. One commentor noted that, in the BRA, the oral and dermal risk calculations for the onsite worker are based on a revised Fraction of Area Not Covered (FI) value of 1, but previously the value was considered .2. Thus, the area of exposure is reportedly uncovered. It is not clear how a worker would actually be in proximity to these areas, especially since three of the four sampling points are covered.

   RESPONSE: The FI term was changed from .2 to 1.0 at EPA's request. The FI term should represent the fraction of ingested soil that comes from the contaminated source. The FI term should not represent the fraction of the area not covered. Since all of the exposed soil is contaminated, the FI term should be 1.0. In other words, 100% of the soil ingested may come from the contaminated source. References to this concept inadvertently appear as footnotes in some tables in the BRA, but the concept was not used in the actual calculation of risk.

8. A commentor suggested that, in the BRA, the calculated value of F(x) for x=3.1 should be .00326 instead of .006468. As a result, it is not possible to further evaluate the air particulate concentrations and the associated risk

calculations.

RESPONSE: It appears that the value should be revised to .00326. However, the calculated risks from inhalation of particulate contaminants were initially within an acceptable risk range. If the F(x) value were revised, the net result of this change is that the risk levels associated with inhalation of air particulate would be even lower.

9. A commentor asked why the BRA states that the noncarcinogenic risk associated with dermal contact and inhalation of contaminated soil is insignificant compared with the total noncarcinogenic risks associated with soil exposure when those two exposure routes account for 20% of the total noncarcinogenic risk?

RESPONSE: Ingestion of contaminated soil contributes approximately 80% of the calculated noncarcinogenic risk for the onsite worker scenario; therefore, ingestion of contaminated soil, with a Hazard Index of 1.1, is the most significant exposure pathway. The other individual hazard indices were much lower: dermal contact - .2; inhalation - .0003.

10. A commentor suggested that the Rfds listed in table 8-4 of the BRA do not match the Rfds listed in other tables.

RESPONSE: There are discrepancies in some reference doses for DDT, trichloroethene, 1,2-dichloroethene, antimony, and cadmium. As an example, the correct Rfd for cadmium was used in the risk calculations, but a different Rfd was used for the calculation of soil remediation goals for cadmium. The net result of the change is that the soil remediation goal for cadmium would be reduced to about 135 ppm. However, this revision would have no impact on the planned site cleanup because the final cleanup level for cadmium in soil was actually based on the protection of groundwater which is lower than the revised soil remediation goal based on the risk associated with direct contact.

The net impact upon the site cleanup of revising Rfds for the other compounds is neglible. Rfds are listed correctly for the remaining contaminants.

11. A commentor noted that, in the BRA, the particulate concentrations were not calculated for VOCs in Table 5-1. Also, the ambient concentration of particulate reported in Table 5-1 for bis(2-ethylhexyl)phthalate is not used in the risk calculations for the onsite worker scenario as presented in Appendix B.

RESPONSE: The particulate concentrations were not calculated for VOCs because of their volatility. There is no currently acceptable reference dose or cancer slope factor for inhalation of bis(2-ethylhexyl)phthalate. EPA generally recommends the use of an oral toxicity value in place of an inhalation toxicity value unless the chemical is known to cause a local effect on the respiratory system. Using this approach for for bis(2-ethylhexyl)phthalate at this Site would yield a risk level even lower than the acceptable range.

12. One commentor noted that the number of soil borings used in the environmental risk assessment (70) differ from the number used in other sections of the report (71). You need to precisely define the data set before any calculations are performed.

    RESPONSE: As noted in the BRA, environmental risk associated with exposure to contaminated soil was evaluated qualitatively, not quantitatively, Therefore, it is not appropriate to specify criteria for the calculation of environmental risk due to soil exposure, since no calculations of this nature were performed.

13. A commentor inquired how the value of 2,000 ug/l for the median lethal concentration of TCE was derived.

    RESPONSE: For trichloroethylene (TCE), the median lethal concentrations (LC_{50}) for acute toxicity testing of the water flea, Daphnia magna, ranged from 41,000 ug/l to 100,000 ug/l (USEPA, "Ambient Water Quality Criteria for Trichloroethylene, EPA-440/5-80-077, 1980). To be conservative, the lowest of these concentrations was divided by a safety factor of 20 (page 169 of the Ecological Assessment), to address possible effects on more sensitive species. The resulting concentration is approximately 2,000 ug/l.

    For vinyl chloride, the LC_{50} of 406,000 ug/l was not shown in the USEPA document "Ambient Water Quality Criteria for Vinyl Chloride", EPA-440/5-80-078, 1980. This number may have been obtained from the AQUIRE database. However, the maximum ground water concentration of vinyl chloride (100 ug/l) was far below the calculated benchmark (20,300 ug/l) for this compound, indicating no risk to aquatic receptors in the canal.

14. One commentor asked why p. 170 of the BRA refers to benchmark value for TCE of 2,000 ug/l when a different value in used in Table 10-8.

    RESPONSE: The text on page 170 of the BRA should have used the Florida surface water quality standard of 80.7 ug/l for TCE, rather than a calculated concentration. Table 10-8 of the EA does, in fact, use the Florida standard as the benchmark for TCE.

15. One commentor suggested that the assumption in the BRA regarding the persistence of hexavalent chromium in natural

water is not defensible

RESPONSE: Table 10-8 of the EA compares the maximum total chromium concentration in the ground water to the surface water benchmark for chromium VI, as a worst-case scenario, since no hexavalent chromium data were available.

16. One commentor noted that the State of Florida surface water criterion for tetrachloroethene should have been used as a benchmark in the BRA.

RESPONSE: The Florida standard for tetrachloroethylene (8.85 ug/l) should have been used as the surface water benchmark in Table 10-8 of the EA. (The benchmark of 84 ug/l was actually a calculated chronic toxicity screening number, based upon toxicity test data for fewer than eight species.) Comparison of the maximum ground water concentration for tetrachloroethylene (11,000 ug/l) to the Florida standard for this compound (8.85 ug/l) changes the Toxicity Unit from 131 to 1243, implying an increased risk to aquatic receptors.

17. One commentor noted that the EPA ambient water quality criterion for acute toxicity for chloroform should be 289,000 ug/l and that the EPA ambient water quality criterion for chronic toxicity for chloroform in freshwater is 1,240 ug/l instead of 1,240 mg/l.

RESPONSE: The lowest acute toxicity concentration for chloroform is given as 28,900 ug/l (not 289,000 ug/l) in the USEPA document "Ambient Water Quality Criteria for Chloroform", EPA- 440/5-80-033, 1980. The benchmark given in Table 10-8 of the EA was apparently based upon the EPA Region IV Waste Division surface water screening numbers. Since acute toxicity data for fewer than eight species were presented in the AWQC document for chloroform, the lowest acute toxicity concentration was decreased by a factor of 10, to account for possible effects on more sensitive species. Apparently another factor of 10 was then applied to account for chronic effects, yielding a chronic screening number of 289 ug/l for chloroform.

The chronic toxicity concentration (1240 ug/l) shown in the AWQC document was also based upon toxicity data for fewer than eight species. The chloroform concentration units on page 170 of the EA should be ug/l. If a factor of 10 is applied to account for possible effects on more sensitive species, the chronic screening number would become 124 ug/l, and the Toxicity Unit would increase from 0.73 to 1.69.

18. One commentor noted that the reported maximum detected concentrations of contaminants in Site groundwater did not agree in many instances in Tables 10-4,-5,-6, and-8 of the BRA.

RESPONSE: A review of the tables in question reveals that data reported in Tables 10-4,-5,-6 do agree. The maximum detected concentrations listed in 10-8 do not always agree with the previous data and should be revised as follows:

Contaminant	Groundwater concentration (ug/l)	Benchmark (ug/l)	Toxicity Unit (ug/l)
Acetone	7	NA	NA
Chloroform	22	289	.076
1,2-dichloroethene	270	11,000	.025
Tetrachloro-ethene	4,000	84	47.6
Trichloroethene	42	80.7	.52
Vinyl Chloride	100	20,300	.005
Cadmium	67	1.13	59.2
Chromium	260	11	23.7
Copper	49	11.8	4.15
Lead	ND[1]	3.2	NA
Nickel	150	157.7	9.5
Zinc	680	106	6.4
Cyanide	24	5.2	4.6
Bis(2-ethylhexyl) phthlate	5.5	<.3	18.3
Butylbenzyl phthalate	.7	22	.03

[1] Lead was not detected in groundwater underneath the Site, but was detected in an upgradient well.

19. A commentor noted that data from the first sampling of well APS-10 was used in Table 10-8 of the BRA while data from the second sampling of well APS-10 was used in Tables 10-4,-5, and -6.

RESPONSE: Table 10-8 should have used the unfiltered data from the second sampling of APS-10. If table 10-8 were revised accordingly, then the calculated toxicity units would decrease for the site related organic compounds, but would increase for the inorganic compounds (because of conversion of the inorganic results to ug/l). However, this measure of potential environmental risk was not ultimately used for the remedy selection at this Site because the likelihood of exposure for organisms to Site groundwater is minimal.

20. A commentor noted that the reported concentration of acetone differs in certain sections of the BRA. In Table 3-4, the value is reported as .0075 mg/l. In Table 10-5, the value is reported as .007J mg/l. Such inconsistencies cast doubt on the reporting of data throughout the document.

RESPONSE: The two values are virtually the same; both represent values of approximately 7 parts per billion of acetone in groundwater. To suggest that there is any significant difference between the two values and that such a difference renders other data questionable, is unsupportable.

21. One commentor suggested that the BRA is inconsistent with regards to evaluation of the potential environmental impacts of contaminated groundwater. The conclusions which are drawn regarding the site-specific potential for ecological impacts to offsite receptors is thereby weakened.

<u>RESPONSE</u>: The statement concerning the potential for Site ground water contaminants to cause ecological impacts in the Miami Canal (Summary section on page 173 of the risk assessment) reflects a conservative evaluation, based upon available data and information. This statement is later qualified (on the same page) by mentioning that it does not take into account factors such as dilution, dispersion, adsorption, and biodegradation which could result in attenuation of the ground water contaminants prior to, or during, discharge to the canal. For clarity, this qualifier should have directly followed the statement on potential ecological efects. Also, the qualifier could have been reworded to state more directly that some degree of attenuation would be expected, but the degree of such attenuation has not been determined.

The ROD states that there is little likelihood for any negative impacts to the Miami Canal due to contaminated groundwater migrating from the Site. Continued monitoring of the contaminated groundwater will be used to confirm this statement.

22. Airco Plating resubmitted its comments on the draft BRA dated April 1992.

<u>RESPONSE</u>: EPA had earlier received and reviewed these comments, and incorporated these comments where appropriate in subsequent revisions to the BRA. The draft BRA was not used as a basis for the final remedy selection.

23. A commentor asked why a cleanup is necessary since Airco Plating had a permit to operate the percolation ponds.

<u>RESPONSE</u>: The presence of metals, cyanide, and PCE in soil and groundwater at this Site constitutes a release of hazardous substances as defined in CERCLA and SARA (the Superfund laws). EPA is required to investigate and remediate such releases when necessary to protect human health and the environment.

24. A commentor questioned the conclusions of an earlier Expanded Site Investigation (ESI) and also why it was necessary to perform both an ESI and a Remedial Investigation (RI) at the Site.

RESPONSE: The ESI was conducted during 1987-1988. The data from the ESI were used to determine if the Site should be placed on the NPL and to facilitate planning for subsequent investigations.

Results of the ESI indicated the presence of various metals, cyanide, and PCE in soil and metals and PCE in groundwater. The ESI concluded that the environmental impact associated with this site was estimated to be negligible because of its location in urban area.

However, the ESI went on to state that "...the most significant public welfare impact is the potential loss of a portion of the Biscayne Aquifer as a drinking water source." The Biscayne Aquifer, which underlies this site, is the only source of drinking water for people in South Florida, particularly in Dade County.

EPA did not agree with the conclusions of the ESI that the Site could be moved directly to the Feasibility Study stage, but felt that additional RI sampling was necessary. The RI provided further information not developed in the previous sampling investigations. The RI further delineated the extent of contamination, especially to the north, south, and west of the covered percolation ponds previously used by Airco at the Site. In addition, the RI identified, for the first time, significant localized PCE contamination of soil and shallow groundwater at the Site. The RI also identified the presence of PCE contamination in deeper groundwater, that had moved further downgradient from the Site than was previously known. Although Site related, this PCE contamination appears to be unrelated to Airco's permitted use of the percolation ponds.

25. One commentor claimed that EPA wanted to remove relevant information regarding land use at the Site from RI/FS reports.

RESPONSE: A description of land use at and around the Site, including relevant zoning information, is fully described in the RI Report, Section 2.4

26. A commentor claimed that information in the Risk Assessment should be repeated in the FS so that the FS can serve as a stand alone document describing Site risk.

RESPONSE: Given the complexities and difficult issues associated with Superfund sites, it is not appropriate for the FS to serve as a stand alone document. The Record of Decision summarizes all relevant information regarding remedy selection. In addition, the administrative record for this Site contains documents relied upon in the remedy selection process. The documents for this Site including sampling information, zoning information, risk assessment calculations, remedial alternatives, etc. are available at the John F. Kennedy Library in Hialeah, Florida and EPA Region IV in

Atlanta, Georgia.

27. One commentor stated that the development of future work plans for Site actions could be accelerated if EPA were not so "picky."

<u>RESPONSE</u>: EPA will approve future work plans at such time as they are determined to comply with appropriate regulations and guidance and satisfy Site specific considerations.

28. A commentor submitted a proposal for an ultraviolet light/proprietary catalyst system to treat contaminated groundwater at the Site.

<u>RESPONSE</u>: A similar system was evaluated in the FS for this Site. Such systems can be effective in destroying most VOCs in groundwater. However, according to the FS, this type of system is not cost effective when compared with air stripping and thus was not chosen as the Site remedy. The commentor's estimate appears to be approximately equal to the cost estimate in the FS.

The commentor reported that its system could also treat metals, along with the VOCs, in groundwater. Air stripping does not treat metals in groundwater. The need for treatment of metals in groundwater will be determined during the RD phase of the project. If metals treatment is combined with the air stripping system, then it may be worthwhile to reevaluate the total costs of the combined treatment process to the total costs of other systems, including the commentor's proposed system.

29. DERM expressed some concern about the potential discharge of a portion of the treated groundwater through Airco Plating's existing sewer discharge permit, primarily due to system-wide capacity limitations. Currently, if such a discharge was undertaken, both County and Federal approval of the discharge would be necessary due to a Federal suit regarding the Miami-Dade Sewer system.

<u>RESPONSE</u>: The ROD suggests two possible discharge options for treated groundwater: 1) the POTW and/or 2) an on-site recharge gallery. The recharge gallery is feasible and would be easier to implement at this time. However, a discharge to the POTW via the facility's existing discharge permit should not be ruled out because limitations on this option may be lifted in the future.

30. FDEP recommended that the ROD adopt soil cleanup levels for Site contaminants (in addition to those already established for PCE and cadmium) including cyanide, chromium, lead and zinc because these soil contaminants are acting as a source of groundwater contamination. These cleanup levels, as developed by the State, should be protective of human health under a

future industrial scenario which assumes unlimited exposure to Site contaminants.

RESPONSE: These additional contaminants are not present at significant levels in Site groundwater and thus soil cleanup levels to protect groundwater are not necessary. Chromium has been detected in only one well at levels above its MCL. Lead was detected in one upgradient well and was not present in Site groundwater. Cyanide was detected above MCLs in one turbid sample from a well that was later resampled; cyanide was below MCLs in those latter samples. Zinc was not detected above its SMCL in any groundwater sample.

Action levels for these contaminants were developed on the basis of direct exposure to soil. The risk assessment calculated such values in Table 8-4. Action levels for these and other inorganic contaminants will be presented in the ROD and used during verification sampling to confirm that the soil that requires action is addressed.

A cleanup level for cadmium in soil that would be protective of groundwater was calculated and was below the direct contact cleanup level noted in the BRA. The more protective value was established as the cleanup level. For the purposes of the RI/FS, it is less cumbersome to refer to this single cleanup level for inorganics because the other inorganic Site contaminants tend to be elevated when cadmium is elevated. Thus, action that addresses the cadmium contaminated soil will also address soil contaminated with other inorganics.

31. A commentor stated that groundwater recovery should continue until all groundwater at the Site contaminant plume is remediated, not just the portions monitored by compliance wells.

RESPONSE: The EPA document "Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites", EPA/540/G-88/003, indicates that it may not be appropriate to require compliance with groundwater standards in those specific areas where wastes are managed in place. At this Site, such guidance may apply to the former pond areas that will be capped. Therefore, groundwater standards for metals should not have to be met directly in the areas of the former ponds, but at the immediate boundaries of those ponds. Monitoring of the groundwater will be designed to detect the migration of metals beyond the boundaries of the former ponds. EPA feels that this guidance would not apply to the organic contamination because the organic compounds in soil are being actively remediated; thus groundwater standards for the organic contaminants shall be met throughout the extent of the plume.

32. A commentor noted that Air emissions from the air stripper or the SVE system must meet Florida's Air Quality Standards.

RESPONSE: The ROD refers generally to these standards as ARARs. However, during the RD, the State should specify the numerical values associated with these standards.

33. A commentor noted that the recharge gallery should be located in such a way so that a recharge to the aquifer does not result in splitting the plume or otherwise adversely changing the migration pattern.

RESPONSE: These design considerations will be incorporated to the extent possible.

34. One commentor stated that deed restrictions limiting future use of the Site to industrial use must be enacted if the Site is remediated to levels that are not protective of future residential use.

RESPONSE: The deed restrictions will restrict residential use of the Site because such use would not be consistent with the cap to be installed over the contaminated soil.

35. One commentor noted that the nature of the intended cap and its long term effectiveness is questionable.

RESPONSE: The cap is more fully described in Section 9.A.3.b of the ROD: Performance Standards - Capping. With periodic maintenance, the cap is expected to last approximately 30 years.

36. A commentor questioned the effectiveness of the existing asphalt covers in reducing infiltration.

RESPONSE: EPA agrees. That is why the existing covers will be further evaluated during the RD to determine if they deliver an acceptable level of performance. If the existing covers do not meet the levels of effectiveness achieved by the new cap, then the existing covers will be replaced by expanding the new cap.

37. The State recommends that soil above the water table which exceeds the metals cleanup levels be remediated by 1) excavation and off-site disposal, or 2) excavated, solidified, disposed of at the Site, and capped in order to control the leaching of metals in groundwater.

RESPONSE: Similar alternatives were evaluated in the FS. They would likely be very difficult to implement because of the space constraints at the Site. In addition, excavation of all metals contaminated soil would require the demolition of some Site buildings, including the existing industrial wastewater pretreatment plant and the replacement of the pipes and sumps which feed the pretreatment plant.

The metals contamination in groundwater is generally limited to the shallow groundwater and has not migrated beyond Airco Plating's property. Furthermore, the selected groundwater action is expected to capture the groundwater contaminated with metals and will include treatment for metals in extracted groundwater if necessary to satisfy discharge requirements.

Groundwater monitoring is a component of the selected remedy. If long term monitoring indicates that the cap is not effective in reducing metals concentrations in groundwater, then it may be necessary to conduct more active soil remediation measures.

APPENDIX C: SUMMARY OF RISK ASSUMPTIONS/CALCULATIONS

The major assumptions about exposure frequency and duration that were included in the exposure assessment were:

- The most likely trespasser is a male, age 9-18.
- The trespasser will visit the Site on a routine basis for 10 years (age 9-18).
- The trespasser will visit the Site 39 days per year (one day per week for nine months)
- The average body weight of the trespasser is 50.5 kg.
- The soil ingestion rate for the trespasser is 100 mg/day.
- The resident will spend 24 hours per day, 350 days per year onsite.
- Residents will drink 2 liters of water per day.
- The resident child lives on the Site for the six-year period from ages 1 to 6. The resident adult lives on the Site for 30 years.
- The average weight of the child is 15 kg over the nine-year period. The average weight of the adult is 70 kg.
- The soil ingestion rate of the resident child is 200 mg/day. The soil ingestion rate for the resident adult is 100 mg/day.
- The average body weight of the on-site worker is 70 kg.
- The on-site worker will spend 250 days per year onsite.
- The on-site worker will work at the Site for 25 years.
- The soil ingestion rate for the on-site worker is 50 mg/day.

TABLE EXPOSURE POINT CONCENTRATIONS FOR SOIL (in ppm)			
Chemical	Exposure Scenarios		
	On-site worker	Off-site trespasser	Future Resident
Antimony	ND	ND	39.6
Arsenic	ND	ND	4
Cadmium	770	1400	1400
Chromium	3100	5150	5300
Copper	290	1400	1200
Cyanide	1000	2950	3100
Lead	220	180	1381
Nickel	140	760	760
Zinc	5600	13000	13700
PCE	.570	2.8	230

TABLE EXPOSURE POINT CONCENTRATIONS IN GROUNDWATER (in ppm)	
Chemical	Exposure Scenario
	Future Resident
Cadmium	.023
Chromium	.055
Copper	.049
Nickel	.056
Zinc	.284
Bis (2-ethyhexyl) phthalate	.006
Chloroform	.022
1,1-dichloroethene	.011
1,2-dichloroethene	.144
PCE	2.6
TCE (trichloroethene)	.01
vinyl chloride	.05

TES VIII WORK ASSIGNMENT NO. C04084
AIRCO PLATING COMPANY SITE - BASELINE RISK ASSESSMENT
CALCULATION OF AVERAGE DAILY INTAKE FOR ONSITE WORKER

NONCARCINOGENS SURFACE SOIL CONTAMINANT	SOIL CONCENT (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED REF. DOSE	ORAL REF. DOSE	DERMAL REF. DOSE	RISK FROM INHALATION	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	ND	ND	0.19	4.8E-07	1.9E-07	0.0E+00	NA	NA	NA	1.0E-01	2.0E-02	NA	NA	NA
CHLOROFORM	ND	ND	0.19	4.8E-07	1.9E-07	0.0E+00	NA	NA	NA	1.0E-02	2.0E-03	NA	NA	NA
TETRACHLOROETHYLE	0.57	3.3E-04	0.19	4.8E-07	1.9E-07	6.3E-05	2.7E-07	1.1E-07	NA	1.0E-02	2.0E-03	NA	2.7E-05	5.4E-05
TRICHLOROETHYLENE	ND	ND	0.19	4.8E-07	1.9E-07	0.0E+00	NA	NA	NA	6.0E-03	1.2E-03	NA	? NA	NA
CADMIUM	770	2.5E-10	0.19	4.8E-07	1.9E-08	4.8E-11	3.7E-04	1.5E-05	NA	5.0E-04	1.0E-04	NA	? 7.4E-01	1.5E-01
CHROMIUM	3100	9.1E-10	0.19	4.8E-07	1.9E-08	1.7E-10	1.5E-03	5.9E-05	5.7E-07	5.0E-03	1.0E-03	3.0E-04	3.0E-01	5.9E-02
COPPER	290	2.2E-10	0.19	4.8E-07	1.9E-08	4.2E-11	1.4E-04	5.5E-06	NA	3.7E-02	7.4E-03	NA	3.8E-03	7.4E-04
LEAD	220	4.0E-11	0.19	4.8E-07	1.9E-08	7.6E-12	1.1E-04	4.2E-06	NA	NA	NA	NA	NA	NA
NICKEL	140	1.4E-10	0.19	4.8E-07	1.9E-08	2.7E-11	6.7E-05	2.7E-06	NA	2.0E-02	4.0E-03	NA	3.4E-03	6.7E-04
ZINC	5600	2.4E-09	0.19	4.8E-07	1.9E-08	4.6E-10	2.7E-03	1.1E-04	NA	3.0E-01	6.0E-02	NA	9.0E-03	1.8E-03
CYANIDE	1000	5.3E-10	0.19	4.8E-07	1.9E-08	1.0E-10	4.8E-04	1.9E-05	NA	2.2E-02	4.4E-03	NA	2.2E-02	4.3E-03
ANTIMONY	ND	ND	0.19	4.8E-07	1.9E-08	0.0E+00	0.0E+00	0.0E+00	NA	4.0E-04	8.0E-05	NA	NA	NA
ARSENIC	ND	ND	0.19	4.8E-07	1.9E-08	0.0E+00	0.0E+00	0.0E+00	NA	3.0E-04	8.0E-05	NA	NA	NA
BIS(2-ETHYLHEXYL)PHT	ND	ND	0.19	4.8E-07	1.9E-07	0.0E+00	NA	NA	NA	2.0E-02	4.0E-03	NA	NA	NA
4,4' DDT	ND	ND	0.19	4.8E-07	1.9E-07	0.0E+00	NA	NA	NA	NA	NA	NA	NA	NA
4,4 DDE	ND	ND	0.19	4.8E-07	1.9E-07	0.0E+00	NA	NA	NA	NA	NA	NA	NA	NA
											TOTAL	3.0E-04	1.1E+00	2.1E-01

CARCINOGENS SURFACE SOIL CONTAMINANT	SOIL CONCENT (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED SLOPE FACTOR	ORAL SLOPE FACTOR	DERMAL SLOPE FACTOR	RISK FROM INHALATIO	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	ND	ND	0.07	1.75E-07	7.0E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	ND	ND	0.07	1.75E-07	7.0E-08	NA	NA	NA	8.1E-02	6.1E-03	3.1E-02	NA	NA	NA
TETRACHLOROETHYLE	0.57	3.3E-04	0.07	1.75E-07	7.0E-08	2.3E-05	1.0E-07	4.0E-08	1.8E-03	5.1E-02	2.5E-01	4.2E-08	5.1E-09	1.0E-08
TRICHLOROETHYLENE	ND	ND	0.07	1.75E-07	7.0E-08	NA	0.0E+00	0.0E+00	1.7E-02	1.1E-02	5.5E-02	NA	NA	NA
CADMIUM	770	2.5E-10	0.07	1.75E-07	7.0E-09	1.8E-11	1.3E-04	5.4E-06	6.1E+00	NA	NA	1.1E-10	NA	NA
CHROMIUM	3100	9.1E-10	0.07	1.75E-07	7.0E-09	6.4E-11	5.4E-04	2.2E-05	4.1E+01	NA	NA	2.6E-09	NA	NA
COPPER	290	2.2E-10	0.07	1.75E-07	7.0E-09	1.5E-11	5.1E-05	2.0E-06	NA	NA	NA	NA	NA	NA
LEAD	220	4.0E-11	0.07	1.75E-07	7.0E-09	2.8E-12	3.9E-05	1.5E-06	NA	NA	NA	NA	NA	NA
NICKEL	140	1.4E-10	0.07	1.75E-07	7.0E-09	9.8E-12	2.5E-05	9.8E-07	1.7E+00	NA	NA	1.7E-11	NA	NA
ZINC	5600	2.4E-09	0.07	1.75E-07	7.0E-09	1.7E-10	9.8E-04	3.9E-05	NA	NA	NA	NA	NA	NA
CYANIDE	1000	5.3E-10	0.07	1.75E-07	7.0E-09	3.7E-11	1.8E-04	7.0E-06	NA	NA	NA	NA	NA	NA
ANTIMONY	ND	ND	0.07	1.75E-07	7.0E-09	NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	ND	ND	0.07	1.75E-07	7.0E-09	NA	NA	NA	1.5E+01	1.8E+00	8.8E+00	NA	NA	NA
BIS(2-ETHYLHEXYL)PHT	ND	ND	0.07	1.75E-07	7.0E-08	NA	NA	NA	NA	1.4E-02	7.0E-02	NA	NA	NA
4,4' DDT	ND	ND	0.07	1.75E-07	7.0E-08	NA	NA	NA	3.4E-01	3.4E-01	1.7E+00	NA	NA	NA
4,4 DDE	ND	ND	0.07	1.75E-07	7.0E-08	NA	NA	NA	3.4E-01	3.4E-01	1.7E+00	NA	NA	NA
											TOTAL	4.4E-08	5.1E-09	1.0E-08

UNITS FOR PATH-SPECIFIC INTAKE FACTORS ARE m^3/kg/day FOR INHALATION AND kg/kg/day FOR INGESTION AND DERMAL CONTACT

TES VIII WORK ASSIGNMENT NO. C04064
AIRCO PLATING COMPANY SITE - BASELINE RISK ASSESSMENT
CALCULATION OF AVERAGE DAILY INTAKE FOR SITE VISITOR

NONCARCINOGENS SURFACE SOIL CONTAMINANT	SOIL CONCENT (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED REF. DOSE	ORAL REF. DOSE	DERMAL REF. DOSE	RISK FROM INHALATIO	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	~~ND~~	~~ND~~	~~4.0E-02~~	~~2.1E-07~~	~~1.1E-07~~	NA	NA	NA	NA	1.0E-01	2.0E-02	NA	NA	NA
CHLOROFORM	ND	ND	4.0E-02	2.1E-07	1.1E-07	NA	NA	NA	NA	1.0E-02	2.0E-03	NA	NA	NA
TETRACHLOROETHYLE	2.8	3.3E-04	4.0E-02	2.1E-07	1.1E-07	1.3E-05	5.9E-07	3.1E-07	NA	1.0E-02	2.0E-03	NA	5.9E-05	1.5E-04
TRICHLOROETHYLENE	ND	ND	4.0E-02	2.1E-07	1.1E-07	NA	NA	NA	NA	6.0E-03	1.2E-03	NA	NA	NA
CADMIUM	1400	2.5E-10	4.0E-02	2.1E-07	1.1E-08	1.0E-11	2.9E-04	1.5E-05	NA	5.0E-04	1.0E-04	NA	5.9E-01	1.5E-01
CHROMIUM	5150	9.1E-10	4.0E-02	2.1E-07	1.1E-08	3.6E-11	1.1E-03	5.7E-05	5.7E-07	5.0E-03	1.0E-03	6.4E-05	2.2E-01	5.7E-02
COPPER	1400	2.2E-10	4.0E-02	2.1E-07	1.1E-08	8.8E-12	2.9E-04	1.5E-05	NA	3.7E-02	7.4E-03	NA	7.9E-03	2.1E-03
LEAD	180	4.0E-11	4.0E-02	2.1E-07	1.1E-08	1.6E-12	3.8E-05	2.0E-06	NA	NA	NA	NA	NA	NA
NICKEL	760	1.4E-10	4.0E-02	2.1E-07	1.1E-08	5.6E-12	1.6E-04	8.4E-06	NA	2.0E-02	4.0E-03	NA	8.0E-03	2.1E-03
ZINC	13000	2.4E-09	4.0E-02	2.1E-07	1.1E-08	9.6E-11	2.7E-03	1.4E-04	NA	3.0E-01	6.0E-02	NA	9.1E-03	2.4E-03
CYANIDE	2950	5.3E-10	4.0E-02	2.1E-07	1.1E-08	2.1E-11	6.2E-04	3.2E-05	NA	2.2E-02	4.4E-03	NA	2.8E-02	7.4E-03
ANTIMONY	ND	ND	4.0E-02	2.1E-07	1.1E-08	NA	NA	NA	NA	4.0E-04	8.0E-05	NA	NA	NA
ARSENIC	ND	ND	4.0E-02	2.1E-07	1.1E-08	NA	NA	NA	NA	3.0E-04	6.0E-05	NA	NA	NA
BIS(2-ETHYLHEXYL)PHT	ND	ND	4.0E-02	2.1E-07	1.1E-07	NA	NA	NA	NA	2.0E-02	4.0E-03	NA	NA	NA
4,4' DDT	ND	ND	4.0E-02	2.1E-07	1.1E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,4 DDE	ND	ND	4.0E-02	2.1E-07	1.1E-07	NA	NA	NA	NA	NA	NA	NA	NA	NA
											TOTAL	6.4E-05	8.6E-01	2.2E-01

CARCINOGENS SURFACE SOIL CONTAMINANT	SOIL CONCENT (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED SLOPE FACTOR	ORAL SLOPE FACTOR	DERMAL SLOPE FACTOR	RISK FROM INHALATIO	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	ND	ND	6.0E-03	3.0E-08	1.6E-08	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLOROFORM	ND	ND	6.0E-03	3.0E-08	1.6E-08	NA	NA	NA	8.1E-02	6.1E-03	3.1E-02	NA	NA	NA
TETRACHLOROETHYLE	2.8	3.3E-04	6.0E-03	3.0E-08	1.6E-08	2.0E-06	8.4E-08	4.6E-08	1.8E-03	5.1E-02	2.5E-01	3.6E-09	4.3E-09	1.1E-08
TRICHLOROETHYLENE	ND	ND	6.0E-03	3.0E-08	1.6E-09	NA	NA	NA	1.7E-02	1.1E-02	5.5E-02	NA	NA	NA
CADMIUM	1400	2.5E-10	6.0E-03	3.0E-08	1.6E-09	1.5E-12	4.2E-05	2.2E-06	6.1E+00	NA	NA	9.2E-12	NA	NA
CHROMIUM	5150	9.1E-10	6.0E-03	3.0E-08	1.6E-09	5.5E-12	1.5E-04	8.2E-06	4.1E+01	NA	NA	2.2E-10	NA	NA
COPPER	1400	2.2E-10	6.0E-03	3.0E-08	1.6E-09	1.3E-12	4.2E-05	2.2E-06	NA	NA	NA	0.0E+00	NA	NA
LEAD	180	4.0E-11	6.0E-03	3.0E-08	1.6E-09	2.4E-13	5.4E-06	2.9E-07	NA	NA	NA	0.0E+00	NA	NA
NICKEL	760	1.4E-10	6.0E-03	3.0E-08	1.6E-09	8.4E-13	2.3E-05	1.2E-06	1.7E+00	NA	NA	1.4E-12	NA	NA
ZINC	13000	2.4E-09	6.0E-03	3.0E-08	1.6E-09	1.4E-11	3.9E-04	2.1E-05	NA	NA	NA	NA	NA	NA
CYANIDE	2950	5.3E-10	6.0E-03	3.0E-08	1.6E-09	3.2E-12	8.9E-05	4.7E-06	NA	NA	NA	NA	NA	NA
ANTIMONY	ND	ND	6.0E-03	3.0E-08	1.6E-09	NA	NA	NA	NA	NA	NA	NA	NA	NA
ARSENIC	ND	ND	6.0E-03	3.0E-08	1.6E-09	NA	NA	NA	1.5E+01	1.8E+00	8.8E+00	NA	0.0E+00	0.0E+00
BIS(2-ETHYLHEXYL)PHT	ND	ND	6.0E-03	3.0E-08	1.6E-08	NA	NA	NA	NA	1.4E-02	7.0E-02	NA	NA	NA
4,4' DDT	ND	ND	6.0E-03	3.0E-08	1.6E-08	NA	NA	NA	3.4E-01	3.4E-01	1.7E+00	NA	NA	NA
4,4 DDE	ND	ND	6.0E-03	3.0E-08	1.6E-08	NA	NA	NA	3.4E-01	3.4E-01	1.7E+00	NA	NA	NA
											TOTAL	3.8E-09	4.3E-09	1.1E-08

UNITS FOR PATH-SPECIFIC INTAKE FACTORS ARE m^3/kg/day FOR INHALATION AND kg/kg/day FOR INGEST ION AND DERMAL CONTACT

TES VIII WORK ASSIGNMENT NO. C04084
AIRCO PLATING COMPANY SITE - BASELINE RISK ASSESSMENT
CALCULATION OF AVERAGE DAILY INTAKE FOR FUTURE ADULT RESIDENT

NONCARCINOGENS SURFACE SOIL CONTAMINANT	SOIL CONCENT (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE SOIL INGESTION	AVG. DAILY INTAKE DERMAL	INHALED REF. DOSE	ORAL REF. DOSE	DERMAL REF. DOSE	RISK FROM INHALATIO	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	0.088	9.2E-05	0.27	1.4E-06	7.3E-07	2.5E-05	1.2E-07	6.4E-08	NA	1.0E-01	2.0E-02	NA	1.2E-06	3.2E-06
CLOROFORM	0.016	2.2E-05	0.27	1.4E-06	7.3E-07	5.9E-06	2.2E-08	1.2E-08	NA	1.0E-02	2.0E-03	NA	2.2E-06	5.8E-06
TETRACHLOROETHYLE	230	1.1E-01	0.27	1.4E-06	7.3E-07	2.9E-02	3.2E-04	1.7E-04	NA	1.0E-02	2.0E-03	NA	3.2E-02	8.4E-02
TRICHLOROETHYLENE	0.01	2.4E-05	0.27	1.4E-06	7.3E-07	6.5E-06	1.4E-08	7.3E-09	NA	6.0E-03	1.2E-03	NA	2.3E-06	6.1E-06
CADMIUM	1400	1.0E-09	0.27	1.4E-06	7.3E-08	2.7E-10	1.9E-03	1.0E-04	NA	5.0E-04	1.0E-04	NA	3.8E+00	1.0E+00
CHROMIUM	5300	3.8E-09	0.27	1.4E-06	7.3E-08	1.0E-09	7.3E-03	3.9E-04	5.7E-07	5.0E-03	1.0E-03	1.8E-03	1.5E+00	3.9E-01
COPPER	1200	6.0E-10	0.27	1.4E-06	7.3E-08	1.6E-10	1.6E-03	8.8E-05	NA	3.7E-02	7.4E-03	NA	4.4E-02	1.2E-02
LEAD	1381	2.8E-09	0.27	1.4E-06	7.3E-08	7.6E-10	1.9E-03	1.0E-04	NA	NA	NA	NA	NA	NA
NICKEL	760	5.6E-10	0.27	1.4E-06	7.3E-08	1.5E-10	1.0E-03	5.5E-05	NA	2.0E-02	4.0E-03	NA	5.2E-02	1.4E-02
ZINC	13700	1.0E-08	0.27	1.4E-06	7.3E-08	2.7E-09	1.9E-02	1.0E-03	NA	3.0E-01	6.0E-02	NA	6.3E-02	1.7E-02
ANIDE	3100	2.2E-09	0.27	1.4E-06	7.3E-08	5.9E-10	4.2E-03	2.3E-04	NA	2.2E-02	4.4E-03	NA	1.9E-01	5.1E-02
TIMONY	39.6	3.6E-11	0.27	1.4E-06	7.3E-08	9.7E-12	5.4E-05	2.9E-06	NA	4.0E-04	8.0E-06	NA	1.4E-01	3.6E-02
ARSENIC	4	3.0E-12	0.27	1.4E-06	7.3E-08	8.1E-13	5.5E-06	2.9E-07	NA	3.0E-04	6.0E-05	NA	1.8E-02	4.9E-03
BIS(2-ETHYLHEXYL)PHT	0.31	2.2E-12	0.27	1.4E-06	7.3E-07	5.9E-13	4.2E-07	2.3E-07	NA	2.0E-02	4.0E-03	NA	2.1E-05	5.7E-05
4,4' DDT	0.058	4.4E-14	0.27	1.4E-06	7.3E-07	1.2E-14	7.9E-08	4.2E-08	NA	NA	NA	NA	NA	NA
4,4 DDE	0.029	2.2E-14	0.27	1.4E-06	7.3E-07	5.9E-15	4.0E-08	2.1E-08	NA	NA	NA	NA	NA	NA
											TOTAL	1.8E-03	5.8E+00	1.6E+00

CARCINOGENS SURFACE SOIL CONTAMINANT	SOIL CONCENT (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED SLOPE FACTOR	ORAL SLOPE FACTOR	DERMAL SLOPE FACTOR	RISK FROM INHALAT'O	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	0.088	9.2E-05	0.12	5.9E-07	3.1E-07	1.1E-05	5.2E-08	2.7E-08	NA	NA	NA	NA	NA	NA
CLOROFORM	0.016	2.2E-05	0.12	5.9E-07	3.1E-07	2.6E-06	9.4E-09	5.0E-09	8.1E-02	6.1E-03	3.1E-02	2.1E-07	5.7E-11	1.5E-10
TETRACHLOROETHYLE	230	1.1E-01	0.12	5.9E-07	3.1E-07	1.3E-02	1.4E-04	7.1E-05	1.8E-03	5.1E-02	2.5E-01	2.3E-05	6.9E-06	1.8E-05
TRICHLOROETHYLENE	0.01	2.4E-05	0.12	5.9E-07	3.1E-07	2.9E-06	5.9E-09	3.1E-09	1.7E-02	1.1E-02	5.5E-02	4.9E-08	6.5E-11	1.7E-10
CADMIUM	1400	1.0E-09	0.12	5.9E-07	3.1E-08	1.2E-10	8.2E-04	4.3E-05	6.1E+00	NA	NA	7.3E-10	NA	NA
CHROMIUM	5300	3.8E-09	0.12	5.9E-07	3.1E-08	4.6E-10	3.1E-03	1.6E-04	4.1E+01	NA	NA	1.9E-08	NA	NA
COPPER	1200	6.0E-10	0.12	5.9E-07	3.1E-08	7.2E-11	7.0E-04	3.7E-05	NA	NA	NA	NA	NA	NA
LEAD	1381	2.8E-09	0.12	5.9E-07	3.1E-08	3.4E-10	8.1E-04	4.3E-05	NA	NA	NA	NA	NA	NA
ICKEL	760	5.6E-10	0.12	5.9E-07	3.1E-08	6.7E-11	4.5E-04	2.4E-05	1.7E+00	NA	NA	1.1E-10	NA	NA
NC	13700	1.0E-08	0.12	5.9E-07	3.1E-08	1.2E-09	8.0E-03	4.2E-04	NA	NA	NA	NA	NA	NA
CYANIDE	3100	2.2E-09	0.12	5.9E-07	3.1E-08	2.6E-10	1.8E-03	9.6E-05	NA	NA	NA	NA	NA	NA
ANTIMONY	39.6	3.6E-11	0.12	5.9E-07	3.1E-08	4.3E-12	2.3E-05	1.2E-06	NA	NA	NA	NA	NA	NA
ARSENIC	4	3.0E-12	0.12	5.9E-07	3.1E-08	3.6E-13	2.3E-06	1.2E-07	1.5E+01	1.8E+00	8.8E+00	5.4E-12	4.1E-06	1.1E-06
BIS(2-ETHYLHEXYL)PHT	0.31	2.2E-12	0.12	5.9E-07	3.1E-07	2.6E-13	1.8E-07	9.6E-08	NA	1.4E-02	7.0E-02	NA	2.5E-09	6.7E-09
4,4' DDT	0.058	4.4E-14	0.12	5.9E-07	3.1E-07	5.3E-15	3.4E-08	1.8E-08	3.4E-01	3.4E-01	1.7E+00	1.8E-15	1.2E-08	3.1E-08
4,4 DDE	0.029	2.2E-14	0.12	5.9E-07	3.1E-07	2.6E-15	1.7E-08	9.0E-09	3.4E-01	3.4E-01	1.7E+00	9.0E-16	5.8E-09	1.5E-08
											TOTAL	2.3E-05	1.1E-05	1.9E-05

UNITS FOR PATH-SPECIFIC INTAKE FACTORS ARE m^3/kg/day FOR INHALATION AND kg/kg/day FOR INGESTION AND DERMAL CONTACT

TES VIII WORK ASSIGNMENT NO. C04084
AIRCO PLATING COMPANY SITE - BASELINE RISK ASSESSMENT
CALCULATION OF AVERAGE DAILY INTAKE FOR FUTURE CHILD RESIDENT (CONT'D)

NONCARCINOGENS GROUNDWATER CONTAMINANT	GROUNDWATE CONCENTR. (mg/L)	CONCENTR. IN AIR (mg/m^3)	PATH-SPECIFIC INTAKE FACTO INHALATION	PATH-SPECIFIC INTAKE FACTOR INGESTION	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	INHALED REFERENCE DOSE	ORAL REFERENCE DOSE	RISK FROM INHALATION	RISK FROM INGESTION
CHLOROFORM	0.022	0.088	1.2E-03	1.3E-01	1.1E-04	2.8E-03	NA	1.0E-02	NA	2.8E-01
1,2-DICHLOROETHYLENE	0.1437	0.57	1.2E-03	1.3E-01	6.8E-04	1.8E-02	NA	9.0E-03	NA	2.0E+00
TETRACHLOROETHYLENE	2.6	10.4	1.2E-03	1.3E-01	1.2E-02	3.3E-01	NA	1.0E-02	NA	3.3E+01
TRICHLOROETHYLENE	0.0098	0.039	1.2E-03	1.3E-01	4.7E-05	1.3E-03	NA	6.0E-03	NA	2.1E-01
VINYL CHLORIDE	0.0522	0.21	1.2E-03	1.3E-01	2.5E-04	6.7E-03	NA	NA	NA	NA
CADMIUM	0.023	NA	1.2E-03	1.3E-01	0.0E+00	2.9E-03	NA	5.0E-04	NA	5.9E+00
CHROMIUM	0.0551	NA	1.2E-03	1.3E-01	0.0E+00	7.1E-03	5.7E-07	5.0E-03	NA	1.4E+00
COPPER	0.049	NA	1.2E-03	1.3E-01	0.0E+00	6.3E-03	NA	3.7E-02	NA	1.7E-01
LEAD	0.0085	NA	1.2E-03	1.3E-01	0.0E+00	1.1E-03	NA	NA	NA	NA
NICKEL	0.0562	NA	1.2E-03	1.3E-01	0.0E+00	7.2E-03	NA	2.0E-02	NA	3.6E-01
ZINC	0.284	NA	1.2E-03	1.3E-01	0.0E+00	3.6E-02	NA	3.0E-01	NA	1.2E-01
CYANIDE	0.0075	NA	1.2E-03	1.3E-01	0.0E+00	9.6E-04	NA	2.2E-02	NA	4.4E-02
ACETONE	0.0075	0.03	1.2E-03	1.3E-01	3.6E-05	9.6E-04	NA	1.0E-01	NA	9.6E-03
BIS(2-ETHYLHEXYL)PHT	0.0055	NA	1.2E-03	1.3E-01	0.0E+00	7.0E-04	NA	3.0E-04	NA	2.3E+00
1,1-DICHLOROETHENE	0.011	0.044	1.2E-03	1.3E-01	5.3E-05	1.4E-03	NA	9.0E-03	NA	1.6E-01
VANADIUM	0.0047	NA	1.2E-03	1.3E-01	0.0E+00	6.0E-04	NA	7.0E-03	NA	8.6E-02
								TOTAL	0.0E+00	4.6E+01

CARCINOGENS GROUNDWATER CONTAMINANT	GROUNDWATE CONCENTR. (mg/L)	CONCENTR. IN AIR (mg/m^3)	PATH-SPECIFIC INTAKE FACTO INHALATION	PATH-SPECIFIC INTAKE FACTOR INGESTION	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	INHALED SLOPE FACTOR	ORAL SLOPE FACTOR	RISK FROM INHALATION	RISK FROM INGESTION
CHLOROFORM	0.022	0.088	1.2E-03	1.1E-02	1.1E-04	2.4E-04	8.1E-02	6.1E-03	8.6E-06	1.5E-06
1,2-DICHLOROETHYLENE	0.1437	0.57	1.2E-03	1.1E-02	6.8E-04	1.6E-03	NA	NA	NA	NA
TETRACHLOROETHYLENE	2.6	10.4	1.2E-03	1.1E-02	1.2E-02	2.9E-02	1.8E-03	5.1E-02	2.2E-05	1.5E-03
TRICHLOROETHYLENE	0.0098	0.039	1.2E-03	1.1E-02	4.7E-05	1.1E-04	1.7E-03	1.1E-02	8.0E-08	1.2E-06
VINYL CHLORIDE	0.0522	0.21	1.2E-03	1.1E-02	2.5E-04	5.7E-04	3.0E-01	1.9E+00	7.6E-05	1.1E-03
CADMIUM	0.023	NA	1.2E-03	1.1E-02	0.0E+00	2.5E-04	6.1E+00	NA	NA	NA
CHROMIUM	0.0551	NA	1.2E-03	1.1E-02	0.0E+00	6.1E-04	4.1E+01	NA	NA	NA
COPPER	0.049	NA	1.2E-03	1.1E-02	0.0E+00	5.4E-04	NA	NA	NA	NA
LEAD	0.0085	NA	1.2E-03	1.1E-02	0.0E+00	9.4E-05	NA	NA	NA	NA
NICKEL	0.0562	NA	1.2E-03	1.1E-02	0.0E+00	6.2E-04	1.7E+00	NA	NA	NA
ZINC	0.284	NA	1.2E-03	1.1E-02	0.0E+00	3.1E-03	NA	NA	NA	NA
CYANIDE	0.0075	NA	1.2E-03	1.1E-02	0.0E+00	8.3E-05	NA	NA	NA	NA
ACETONE	0.0075	0.03	1.2E-03	1.1E-02	3.6E-05	8.3E-05	NA	NA	NA	NA
BIS(2-ETHYLHEXYL)PHT	0.0055	NA	1.2E-03	1.1E-02	0.0E+00	6.1E-05	NA	1.4E-02	NA	8.5E-07
1,1-DICHLOROETHENE	0.011	0.044	1.2E-03	1.1E-02	5.3E-05	1.2E-04	1.8E-01	6.0E-01	9.2E-06	7.3E-05
VANADIUM	0.0047	NA	1.2E-03	1.1E-02	0.0E+00	5.2E-05	NA	NA	NA	NA
								TOTAL	1.2E-04	2.6E-03

UNITS FOR PATH-SPECIFIC INTAKE FACTORS ARE m^3/kg/day FOR INHALATION AND kg/kg/day FOR INGEST ION AND DERMAL CONTACT

TES VIII WORK ASSIGNMENT NO. C04064

AIRCO PLATING COMPANY SITE - BASELINE RISK ASSESSMENT

CALCULATION OF AVERAGE DAILY INTAKE FOR FUTURE ADULT RESIDENT (CONT'D)

NONCARCINOGENS GROUNDWATER CONTAMINANT	GROUNDWATE CONCENTR. (mg/L)	CONCENTR. IN AIR (mg/m^3)	PATH-SPECIFIC INTAKE FACTO INHALATION	PATH-SPECIFIC INTAKE FACTOR INGESTION	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	INHALED REF. DOSE	ORAL REF. DOSE	RISK FROM INHALATION	RISK FROM INGESTION
CHLOROFORM	0.022	0.088	2.9E-03	2.7E-02	2.6E-04	6.0E-04	NA	1.0E-02	NA	6.0E-02
1,2-DICHLOROETHYLENE	0.1437	0.57	2.9E-03	2.7E-02	1.7E-03	3.9E-03	NA	9.0E-03	NA	4.4E-01
TETRACHLOROETHYLENE	2.6	10.4	2.9E-03	2.7E-02	3.0E-02	7.1E-02	NA	1.0E-02	NA	7.1E+00
TRICHLOROETHYLENE	0.0098	0.039	2.9E-03	2.7E-02	1.1E-04	2.7E-04	NA	6.0E-03	NA	4.5E-02
VINYL CHLORIDE	0.0522	0.21	2.9E-03	2.7E-02	6.1E-04	1.4E-03	NA	NA	NA	NA
CADMIUM	0.023	NA	2.9E-03	2.7E-02	0.0E+00	6.3E-04	NA	5.0E-04	NA	1.3E+00
CHROMIUM	0.0551	NA	2.9E-03	2.7E-02	0.0E+00	1.5E-03	5.7E-07	5.0E-03	NA	3.0E-01
COPPER	0.049	NA	2.9E-03	2.7E-02	0.0E+00	1.3E-03	NA	3.7E-02	NA	3.6E-02
LEAD	0.0085	NA	2.9E-03	2.7E-02	0.0E+00	2.3E-04	NA	NA	NA	NA
NICKEL	0.0562	NA	2.9E-03	2.7E-02	0.0E+00	1.5E-03	NA	2.0E-02	NA	7.7E-02
ZINC	0.284	NA	2.9E-03	2.7E-02	0.0E+00	7.7E-03	NA	3.0E-01	NA	2.6E-02
CYANIDE	0.0075	NA	2.9E-03	2.7E-02	0.0E+00	2.1E-04	NA	2.2E-02	NA	9.3E-03
ACETONE	0.0075	0.03	2.9E-03	2.7E-02	8.7E-05	2.1E-04	NA	1.0E-01	NA	2.1E-03
BIS(2-ETHYLHEXYL)PHT	0.0055	NA	2.9E-03	2.7E-02	0.0E+00	1.5E-04	NA	2.0E-02	NA	7.5E-03
1,1-DICHLOROETHENE	0.011	0.044	2.9E-03	2.7E-02	1.3E-04	3.0E-04	NA	9.0E-03	NA	3.3E-02
VANADIUM	0.0047	NA	2.9E-03	2.7E-02	0.0E+00	1.3E-04	NA	7.0E-03	NA	1.9E-02
								TOTAL	0.0E+00	9.4E+00

CARCINOGENS GROUNDWATER CONTAMINANT	GROUNDWATE CONCENTR. (mg/L)	CONCENTR. IN AIR (mg/m^3)	PATH-SPECIFIC INTAKE FACTO INHALATION	PATH-SPECIFIC INTAKE FACTOR INGESTION	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	INHALED SLOPE FACTOR	ORAL SLOPE FACTOR	RISK FROM INHALATION	RISK FROM INGESTION
CHLOROFORM	0.022	0.088	1.2E-03	1.2E-02	1.1E-04	2.6E-04	8.1E-02	6.1E-03	8.6E-06	1.6E-06
1,2-DICHLOROETHYLENE	0.1437	0.57	1.2E-03	1.2E-02	6.8E-04	1.7E-03	NA	NA	NA	NA
TETRACHLOROETHYLENE	2.6	10.4	1.2E-03	1.2E-02	1.2E-02	3.0E-02	1.8E-03	5.1E-02	2.2E-05	1.6E-03
TRICHLOROETHYLENE	0.0098	0.039	1.2E-03	1.2E-02	4.7E-05	1.1E-04	1.7E-03	1.1E-02	8.0E-08	1.3E-06
VINYL CHLORIDE	0.0522	0.21	1.2E-03	1.2E-02	2.5E-04	6.1E-04	3.0E-01	1.9E+00	7.6E-05	1.2E-03
CADMIUM	0.023	NA	1.2E-03	1.2E-02	0.0E+00	2.7E-04	6.1E+00	NA	NA	NA
CHROMIUM	0.0551	NA	1.2E-03	1.2E-02	0.0E+00	6.4E-04	4.1E+01	NA	NA	NA
COPPER	0.049	NA	1.2E-03	1.2E-02	0.0E+00	5.7E-04	NA	NA	NA	NA
LEAD	0.0085	NA	1.2E-03	1.2E-02	0.0E+00	9.9E-05	NA	NA	NA	NA
NICKEL	0.0562	NA	1.2E-03	1.2E-02	0.0E+00	6.6E-04	1.7E+00	NA	NA	NA
ZINC	0.284	NA	1.2E-03	1.2E-02	0.0E+00	3.3E-03	NA	NA	NA	NA
CYANIDE	0.0075	NA	1.2E-03	1.2E-02	0.0E+00	8.8E-05	NA	NA	NA	NA
ACETONE	0.0075	0.03	1.2E-03	1.2E-02	3.6E-05	8.8E-05	NA	NA	NA	NA
BIS(2-ETHYLHEXYL)PHT	0.0055	NA	1.2E-03	1.2E-02	0.0E+00	6.4E-05	NA	1.4E-02	NA	9.0E-07
1,1-DICHLOROETHENE	0.011	0.044	1.2E-03	1.2E-02	5.3E-05	1.3E-04	1.8E-01	6.0E-01	9.2E-06	7.7E-05
VANADIUM	0.0047	NA	1.2E-03	1.2E-02	0.0E+00	5.6E-05	NA	NA	NA	NA
								TOTAL	1.2E-04	2.8E-03

UNITS FOR PATH-SPECIFIC INTAKE FACTORS ARE m^3/kg/day FOR INHALATION AND kg/kg/day FOR INGEST ION AND DERMAL CONTACT

TES VIII WORK ASSIGNMENT NO. C04084
AIRCO PLATING COMPANY SITE - BASELINE RISK ASSESSMENT
CALCULATION OF AVERAGE DAILY INTAKE FOR FUTURE CHILD RESIDENT

NONCARCINOGENS SURFACE SOIL CONTAMINANT	95% UCL (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED REF. DOSE	ORAL REF. DOSE	DERMAL REF. DOSE	RISK FROM INHALATIO	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	0.088	2.9E-04	1.27	1.3E-05	2.6E-06	3.7E-04	1.1E-06	2.3E-07	NA	1.0E-01	2.0E-02	NA	1.1E-05	1.1E-05
CHLOROFORM	0.014	2.2E-05	1.27	1.3E-05	2.6E-06	2.8E-05	1.8E-07	3.6E-08	NA	1.0E-02	2.0E-03	NA	1.8E-05	1.8E-05
TETRACHLOROETHYLE	230	1.1E-01	1.27	1.3E-05	2.6E-06	1.4E-01	2.9E-03	6.0E-04	NA	1.0E-02	2.0E-03	NA	2.9E-01	3.0E-01
TRICHLOROETHYLENE	0.01	2.5E-05	1.27	1.3E-05	2.6E-06	3.2E-05	1.3E-07	2.8E-08	NA	6.0E-03	1.2E-03	NA	2.1E-05	2.2E-05
CADMIUM	1400	1.0E-09	1.27	1.3E-05	2.6E-07	1.3E-09	1.8E-02	3.6E-04	NA	5.0E-04	1.0E-04	NA	3.6E+01	3.6E+00
CHROMIUM	5300	3.8E-09	1.27	1.3E-05	2.6E-07	4.8E-09	6.8E-02	1.4E-03	5.7E-07	5.0E-03	1.0E-03	8.5E-03	1.4E+01	1.4E+00
COPPER	1200	6.0E-10	1.27	1.3E-05	2.6E-07	7.6E-10	1.5E-02	3.1E-04	NA	3.7E-02	7.4E-03	NA	4.2E-01	4.2E-02
LEAD	1381	2.8E-09	1.27	1.3E-05	2.6E-07	3.6E-09	1.8E-02	3.6E-04	NA	NA	NA	NA	NA	NA
NICKEL	760	5.6E-10	1.27	1.3E-05	2.6E-07	7.1E-10	9.7E-03	2.0E-04	NA	2.0E-02	4.0E-03	NA	4.9E-01	4.9E-02
ZINC	13700	1.0E-08	1.27	1.3E-05	2.6E-07	1.3E-08	1.8E-01	3.6E-03	NA	3.0E-01	6.0E-02	NA	5.8E-01	5.9E-02
YANIDE	3100	2.2E-09	1.27	1.3E-05	2.6E-07	2.8E-09	4.0E-02	8.1E-04	NA	2.2E-02	4.4E-03	NA	1.8E+00	1.8E-01
NTIMONY	39.6	3.6E-11	1.27	1.3E-05	2.6E-07	4.6E-11	5.1E-04	1.0E-05	NA	4.0E-04	8.0E-05	NA	1.3E+00	1.3E-01
ARSENIC	4	3.0E-12	1.27	1.3E-05	2.6E-07	3.8E-12	5.1E-05	1.0E-06	NA	3.0E-04	6.0E-05	NA	1.7E-01	1.7E-02
BIS(2-ETHYLHEXYL)PHT	0.31	2.2E-12	1.27	1.3E-05	2.6E-06	2.8E-12	4.0E-06	8.1E-07	NA	2.0E-02	4.0E-03	NA	2.0E-04	2.0E-04
4,4' DDT	0.058	4.4E-14	1.27	1.3E-05	2.6E-06	5.6E-14	7.4E-07	1.5E-07	NA	NA	NA	NA	NA	NA
4,4 DDE	0.029	2.2E-14	1.27	1.3E-05	2.6E-06	2.8E-14	3.7E-07	7.5E-08	NA	NA	NA	NA	NA	NA
											TOTAL	8.5E-03	5.4E+01	5.8E+00

CARCINOGENS SURFACE SOIL CONTAMINANT	95% UCL (mg/kg)	AMBIENT AIR CONCENTR. (mg/m^3)	PATH-SPECIFIC INTAKE FACTOR INHALATION	PATH-SPECIFIC INTAKE FACTO INGESTION	PATH-SPECIFIC INTAKE FACTOR DERMAL CONTACT	AVG. DAILY INTAKE INHALATION	AVG. DAILY INTAKE INGESTION	AVG. DAILY INTAKE DERMAL	INHALED SLOPE FACTOR	ORAL SLOPE FACTOR	DERMAL SLOPE FACTOR	RISK FROM INHALATIO	RISK FROM INGESTION	RISK FRO DERMAL CONTACT
ACETONE	0.088	2.9E-04	0.11	1.1E-06	2.2E-07	3.2E-05	9.7E-08	1.9E-08	NA	NA	NA	NA	NA	NA
CHLOROFORM	0.014	2.2E-05	0.11	1.1E-06	2.2E-07	2.4E-06	1.5E-08	3.1E-09	8.1E-02	6.1E-03	3.1E-02	2.0E-07	9.4E-11	9.4E-11
TETRACHLOROETHYLE	230	1.1E-01	0.11	1.1E-06	2.2E-07	1.2E-02	2.5E-04	5.1E-05	1.8E-03	5.1E-02	2.5E-01	2.1E-05	1.3E-05	1.3E-05
TRICHLOROETHYLENE	0.01	2.5E-05	0.11	1.1E-06	2.2E-07	2.8E-06	1.1E-08	2.2E-09	1.7E-02	1.1E-02	5.5E-02	4.7E-08	1.2E-10	1.2E-10
CADMIUM	1400	1.0E-09	0.11	1.1E-06	2.2E-08	1.1E-10	1.5E-03	3.1E-05	6.1E+00	NA	NA	6.7E-10	NA	NA
CHROMIUM	5300	3.8E-09	0.11	1.1E-06	2.2E-08	4.2E-10	5.8E-03	1.2E-04	4.1E+01	NA	NA	1.7E-08	NA	NA
COPPER	1200	6.0E-10	0.11	1.1E-06	2.2E-08	6.6E-11	1.3E-03	2.6E-05	NA	NA	NA	NA	NA	NA
LEAD	1381	2.8E-09	0.11	1.1E-06	2.2E-08	3.1E-10	1.5E-03	3.0E-05	NA	NA	NA	NA	NA	NA
ICKEL	760	5.6E-10	0.11	1.1E-06	2.2E-08	6.2E-11	8.4E-04	1.7E-05	1.7E+00	NA	NA	1.0E-10	NA	NA
NC	13700	1.0E-08	0.11	1.1E-06	2.2E-08	1.1E-09	1.5E-02	3.0E-04	NA	NA	NA	NA	NA	NA
CYANIDE	3100	2.2E-09	0.11	1.1E-06	2.2E-08	2.4E-10	3.4E-03	6.8E-05	NA	NA	NA	NA	NA	NA
ANTIMONY	39.6	3.6E-11	0.11	1.1E-06	2.2E-08	4.0E-12	4.4E-05	8.7E-07	NA	NA	NA	NA	NA	NA
ARSENIC	4	3.0E-12	0.11	1.1E-06	2.2E-08	3.3E-13	4.4E-06	8.8E-08	1.5E+01	1.8E+00	8.8E+00	5.0E-12	7.7E-06	7.7E-07
BIS(2-ETHYLHEXYL)PHT	0.31	2.2E-12	0.11	1.1E-06	2.2E-07	2.4E-13	3.4E-07	6.8E-08	NA	1.4E-02	7.0E-02	NA	4.8E-09	4.8E-09
4,4' DDT	0.058	4.4E-14	0.11	1.1E-06	2.2E-07	4.8E-15	6.4E-08	1.3E-08	3.4E-01	3.4E-01	1.7E+00	1.6E-15	2.2E-08	2.2E-08
4,4 DDE	0.029	2.2E-14	0.11	1.1E-06	2.2E-07	2.4E-15	3.2E-08	6.4E-09	3.4E-01	3.4E-01	1.7E+00	8.2E-16	1.1E-08	1.1E-08
											TOTAL	2.1E-05	2.1E-05	1.4E-05

]UNITS FOR PATH-SPECIFIC INTAKE FACTORS ARE m^3/kg/day FOR INHALATION AND kg/kg/day FOR INGESTION AND DERMAL CONTACT