PLEASE SCAN AS ONE FILE (VOL I & II)

The electronic version of this file/report should have the file name:

Type of document.Spill Number.Year-Month.File *Year-Year* or Report name.pdf

letter._____._____-_____.File spillfile___.pdf

report.hw915046B.1994-08-01.Remedial Investigation Report (Vol I & II).pdf

Project Site numbers will be proceeded by the following:

Municipal Brownfields - b
Superfund - hw
Spills - sp
ERP - e
VCP - v
BCP - c

non-releasable - put .nf.pdf
Example: letter.sp9875693.1998-01.Filespillfile.nf.pdf

DAMES & MOORE

AUGUST 1994

REMEDIAL INVESTIGATION REPORT

RAMCO STEEL SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. 915046B

VOLUME I

DAMES & MOORE

3065 Southwestern Blvd., Suite 202
Orchard Park, New York

August 1994
25848-001

REMEDIAL INVESTIGATION REPORT

RAMCO STEEL SITE
Buffalo, New York
NYSDEC Site No. 915046B

TABLE OF CONTENTS

VOLUME I

TABLE OF CONTENTS (Continued)

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF PLATES

LIST OF APPENDICES

VOLUME II

REMEDIAL INVESTIGATION REPORT

RAMCO STEEL SITE
Buffalo, New York
NYSDEC Site No. 915046B

EXECUTIVE SUMMARY

This document presents the results of a Remedial Investigation (RI) conducted at the Ramco Steel (Ramco) site, City of Buffalo, Erie County, New York. The purpose of the investigation was to characterize site environmental conditions, evaluate the nature and extent of potential contaminants at the site, and to evaluate the risks posed to human health and the environment, if any, as a result of site contaminants. This investigation was conducted under the Order on Consent (Order) between Axia, Inc. and the New York State Department of Environmental Conservation (NYSDEC).

The Ramco site is located at 110 Hopkins Street in Buffalo, New York. The associated steel processing facility is currently operated by Niagara Cold Drawn Steel (NCDS). At present, the site is classified as a "Class 2" site in accordance with Title 6 of the New York State Code, Rules and Regulations Part 375 (6 NYCRR 375). The NYSDEC's Inactive Hazardous Waste Disposal Site registry states for the Ramco site (site number 915046B) that the pond in the rear of the plant was used to dispose of waste pickle liquor, rinse water, lime sludge, iron and chrome and is the primary area of concern for the site.

The entire Ramco site, as defined by the NYSDEC, is comprised of approximately 17 acres which is separated into two areas by an existing railroad spur which runs north-south through the property. The western portion of the property includes the on-site pond and associated surrounding land and covers an area of approximately 8.5 acres. The eastern portion of the property, under operation of NCDS, consists of a manufacturing building and associated parking and storage areas. For the purposes of the RI completed under the Order, the study area is limited to the western portion of the property which includes the pond area and surrounding land.

The Ramco site is and historically has been a steel processing facility. During the operational period of the plant the principal business activity was the processing of mill steel to produce various products by mechanical methods. The processing of steel prior to manufacturing operations has continued to be a part of the plant operation from 1929 to present day, although, the actual pickling process and facility equipment has evolved over the years. Beginning in 1929 and ending in 1986, the pickling process consisted of dipping steel in an acidic solution. In 1986, the pickling process was changed to a shot blasting process which does not include the use of acid materials to remove scale.

For the period of approximately 1929 to 1979, industrial wastewater allegedly was discharged directly to the on-site pond, although conflicting information exists regarding the discharge of spent pickle liquor into the pond during the period of 1929 to 1972. A NYSDEC information request response from Axia, Inc. states that acid rinse waters were disposed of into the pond during that period, however spent pickle liquor was sewered. Ramco Steel's response to a similar inquiry in 1976 indicates that spent pickle liquor was disposed of in the pond. For the period of 1975 to 1979, from other information gathered by the NYSDEC, it appears that wastewater was discharged to the pond under a New York State Pollution Elimination Discharge System (SPDES) permit.

In 1978, the pond water reportedly was neutralized with sodium hydroxide to a neutral pH. In 1979, the wastewater discharge point reportedly was eliminated and no further industrial wastewater was directed to the pond. The discharge lines from the plant operation to the pond apparently were closed under the supervision of the NYSDEC. For the period 1979 to 1986, industrial wastewater reportedly was directed to the Buffalo Sewer Authority for treatment. Spent pickle liquor wastes allegedly were shipped off-site for beneficial recovery in wastewater treatment operations.

Land use in the immediate vicinity of the Ramco site is used for industrial and light-industry purposes with residential/light industry areas to the east. A significant portion of the areas to the north, south and west of the Ramco site are used for industrial purposes or are swamp-marsh areas. Much of the marsh areas have been filled, although smaller unfilled areas still exist. Residential areas exist approximately one-third mile to the east and are interspersed with light industry.

Properties surrounding the Ramco site include: the Altift Landfill, which partially encroaches the Ramco site, a 25-acre automobile junkyard (Skyway Autoparts, Inc.), and Greif Bros. Containers (manufacturer of fiber drums) to the north; a railroad line and an abandoned auto parts supplier (Sloan Auto Parts) to the south; Hopkins Street to the east; and a railroad right-of-way to the west and the Republic Steel Landfill to the southwest. Residential areas closest to the site are in locations which are not likely to be impacted by potential contaminant migrations from the site. The Altift Landfill to the north and the Republic Steel Landfill to the southwest are listed as inactive hazardous waste disposal sites with the NYSDEC. The Altift Landfill is of significant importance to the Ramco site due to its proximity to Ramco and the fact that contaminants have been detected at the Altift site. The Altift Landfill site encroaches upon the northern portions of the pond.

To evaluate significant ecological concerns related to site contaminants, a habitat based assessment of the site and surrounding areas was completed in accordance with NYSDEC guidance documents. Based on this work, NYSDEC Significant Habitats and endangered species have not been identified at the site or within 1 mile of the site. NYSDEC designated wetland areas have been identified adjacent to the site and the site pond is listed on the national wetland inventory compiled by the U.S. Fish and Wildlife Service. A wetland delineation of the site was completed for the site in accordance with the *U.S. Army Corps of Engineers Wetlands Delineations Manual (January 1987)*. Based on this work, the on-site pond area and a smaller parcel of land on-site have been delineated as wetland areas based on the three parameter technique (vegetation, soil, and hydrology) outlined by the U.S. Army Corps of Engineers. With regard to potential ecological concerns related to the site, the important contaminant exposure route associated with the Ramco site is direct uptake of pond sediments, aquatic plants, and prey species that may consume or be in direct contact with pond sediments. Other potential exposure pathways also exist for the on-site pond. Two recreational areas are located in the proximity of the site: Tifft Farm Nature Preserve approximately 1 mile to the northwest, and South Park municipal park located approximately 3/4 mile to the south of the Ramco site.

The geology of the site is characterized primarily by four distinct units overlying bedrock; fill, silty sand unit, sandy clay unit, and till. The silty sand and sandy clay units were identified consistently across the site and have also been identified as continuous units at adjacent sites. Surficial materials in the fill area of the site are composed of various fill or debris type materials - slag, brick, cinders, steel, concrete, tire, and wood to depth ranging from 4 to 8 feet below grade. In addition, oily waste material was found in fill at three locations within the fill area (test pit locations #2, #4 and #7). The oily material was intermixed with water contained in the fill material, with no apparent

interconnection of the oily wastes between the three locations based on other test pits and monitoring wells installed in the area. Various other fill material, typically slag fill around railroad tracks, has been used across the site. The source of fill at the site and the dates of deposition of fill material across the site have not been determined. The southern extent of the Altift site which was used for disposal of industrial demolition debris encroaches upon the Ramco pond.

The silty sand and silty clay units are composed of native materials with a thin zone of till material encountered in some boring logs at the base of the silty clay. The silty sand and silty clay units were found continuous across the site with thicknesses of the sand unit varying between 0.5 to 3 feet and the clay unit ranging in thickness from 2 to 3 feet. Hydraulic conductivities for samples of the silty clay unit collected from borings and from beneath the pond were less than 1×10^{-7} cm/sec. The silty clay unit is believed to be a confining unit between the overlying water bearing materials and the underlying bedrock. Bedrock at the site has been identified over a majority of the site as limestone of the Skaneateles Formation. In areas toward the northwest, the limestone pinches out and the underlying shale of the Marcellus Formation is encountered. Based on data from the adjacent Republic Steel and Altift landfill sites, the Ramco site is positioned on a bedrock ridge which is orientated in the approximate east-west direction. The bedrock slopes away from the site in the north and south directions with overburden thicknesses increasing in these same directions.

The site area and surrounding areas to the north in the prominent direction of surficial water flow are characterized by lowlying marsh areas with many stagnant surface water features. This area is also dissected by many man-made features such as elevated railroad tracks and roads which have presumably altered the natural flow patterns of the area. Surface water flow from the pond to adjacent areas has been observed to be minimal with little or no flow observed from these areas. Due to the marsh conditions of the area, surface water in the area is believed to be interconnected with shallow groundwater above the silty clay confining unit overlying bedrock.

Based on evaluation of available groundwater elevation data, groundwater patterns in the area are characterized by radial flow from the Altift Landfill site. No apparent vertical groundwater flow patterns have been observed based on water level readings from on-site wells.

The remedial investigation was undertaken to further characterize and evaluate site specific physical properties of the site and the extent of potential contaminants on-site. Monitoring wells were installed on-site to evaluate geologic and contaminant concerns related to groundwater. Surface water and sediment sampling in the on-site pond and at adjacent areas was completed to address potential contamination of sediment and surface water within the pond and other areas. Soil contaminants were also evaluated through surface and subsurface soil sampling in the fill area located to the north of the Ramco pond and at monitoring well locations. Samples of sediment, soil, groundwater, and surface water were tested for the presence of chemical compounds. Sediment and soil samples were also tested for radiological contaminants.

The results of the environmental media sampling identified chemicals contaminants within sediment, soil, and groundwater. Contaminants were also identified within these media at off-site locations, however, it is unlikely that off-site contaminants are related to the release of contaminants from the Ramco site. Constituents representing contaminants of concern in sediments and soil on-site include semivolatile organic compounds (specifically PAH compounds), PCBs, and metals. Surface water within the pond was free of contamination, with exception to high levels of iron, manganese, and

magnesium above NYS water quality standards. Similarly, groundwater was free of contamination with exception to the previously noted inorganic parameters and limited volatile organics detected in a single well near the Altift Landfill site. No radiological contamination was identified in sediment or soil samples from the site. Potential pathways for off-site migration of contaminants from site media are limited and the release of identified contaminants to off-site areas is unlikely based on current site conditions.

Based on an evaluation of current/future human health risks associated with site condition, the level of human health risk associated with the pond sediment and the site in general is not considered significant. For ecological risk considerations, the important exposure route associated with the site is direct uptake of pond sediment as well as consumption of plants and prey species that may consume or be in direct contact with pond sediment. The levels of contaminants detected in the pond sediment were below the levels representing a risk from acute exposure. Due to the apparent lack of organisms within the pond and sediment mechanisms for mobilizing contaminants into the food chain are reduced. These conditions arise from a lack of significant ecologic pathways believed to be due, in part, to the levels of contaminants, specifically metals, within pond sediment.

Based on the results of the remedial investigation, the site does not currently present an imminent threat to human health or the environment. Groundwater concerns have been evaluated through completion of supplemental sampling and have been found to contain limited constituents above NYS standards. Constituents which have been detected above NYS standards within groundwater included iron, magnesium, manganese, and sodium. The levels of these constituents are believed to be associated with background water quality conditions rather than site related contaminants.

Concern has been raised regarding the risk to ecological concerns because of contaminants contained within the on-site pond sediment. Currently, the pond contains limited fish, benthic invertebrates and other aquatic organisms, due in part to contaminant levels within pond sediment and the historical use of the pond, which may potentially reduce the biological mechanisms for mobilizing contaminants. Other exposure pathways exist for ecological concerns and may include ingestion of sediment, consumption of aquatic organisms, ingestion of plant detritus and direct contact with sediment. Remedial options which may be used to mitigate exposure pathways of concern will be evaluated through the completion of a Feasibility Study to be completed for the site.

REMEDIAL INVESTIGATION REPORT

RAMCO STEEL SITE
Buffalo, New York
NYSDEC Site No. 915046B

1.0 INTRODUCTION

This report presents the results of a Remedial Investigation (RI) of the Ramco Steel site, City of Buffalo, Erie County, New York. The purpose of the investigation was to characterize site environmental conditions, evaluate the nature and extent of potential contaminants at the site, and to evaluate the risk posed to human health and the environment, if any, as a result of site contaminants.

The Ramco Steel (Ramco) site is located at 110 Hopkins Street in Buffalo, New York. The associated steel processing facility is currently operated by Niagara Cold Drawn Steel (NCDS). Figure 1-1 illustrates the relative location of the site to neighboring areas. The New York State Department of Environmental Conservation's (NYSDEC) Inactive Hazardous Waste Disposal Site registry states for the Ramco site, site number 915046B, that the pond in the rear of the plant was used to dispose of waste pickle liquor, rinse water, lime sludge, iron and chrome. This listing identifies the pond as the primary area of concern for the Ramco site. At present, the site is classified as a "Class 2" site in accordance with Title 6 of the New York State Code, Rules and Regulations Part 375 (6 NYCRR 375).

As an initial step in the RI process, a work plan was developed which described the scope of work for the RI. The RI Work Plan for the Ramco site, entitled *Remedial Investigation Work Plan, Ramco Steel Site, Buffalo, New York, NYSDEC Site No. 915046, June 1992* (Work Plan), was approved by the NYSDEC and is included as an appendix to an Order on Consent between Axia, Inc. and the NYSDEC for the completion of the RI activities. Field activities for the RI as presented in the RI Work Plan were completed in May 1993. Subsequent to the completion of field activities a draft Remedial Investigation Report was submitted to the NYSDEC in July 1993. Comments on this draft RI report were provided by the NYSDEC and scope of work for supplemental investigations was developed for completion of the remedial investigation for the site. This supplemental investigation scope of work was approved by the NYSDEC in March 1994. Field work for completion of the supplemental investigations was completed in June 1994. This RI report includes discussions regarding both the initial remedial activities completed in May 1993 and supplemental investigations completed in March 1994.

The initial Work Plan and subsequent supplemental investigation outlined the rationale for and scope of the remedial investigation for the Ramco site. The focus of the investigation was the pond area and area of fill material adjacent to the pond. Investigation of active portions of the site to the east of the pond and fill areas operated by NCDS was not addressed in the Work Plan and thus, discussions regarding the condition of the active NCDS plant area and any associated environmental concerns are not included in this RI report. Supplemental investigations were completed to clarify data gaps and additional evaluations which were required based on the results of the initial RI activities.

1.1 PURPOSE OF REPORT

This report presents and evaluates site investigation and laboratory analytical data collected during the remedial investigation and supplemental investigations. It has as its objectives:

- To provide an understanding of existing site conditions
- To characterize the nature, extent and distribution of site contamination
- To evaluate the risk, if any, posed to human health and the environment resulting from site related contamination
- To make available the data needed to select and evaluate cost effective and appropriate remedial alternatives, if required.

1.2 SITE BACKGROUND

Background information on the Ramco site is summarized below in terms of:

- Site Description
- Site History
- Previous Investigations

1.2.1 SITE DESCRIPTION

The Ramco site is and historically has been a steel processing facility. During the period the plant was operating as Ramco Steel Inc. and throughout the history of the site, the principal business activities were the processing of mill steel to produce various products by mechanical methods, such as shearing, milling, grinding, cutting or drawing. The entire Ramco site is comprised of approximately 17 acres, with the property separated into two areas by an existing railroad spur which runs north-south through the property. The eastern portion of the property consists of a manufacturing building and associated parking and storage areas. The western portion of the property includes the on-site pond and associated surrounding land. Figure 1-2 illustrates the location of the plant building and the pond relative to the site boundaries. The eastern portion of the property containing the manufacturing building covers an area of approximately 8.5 acres, and the western portion including the pond and associated area comprises a similar acreage.

The Ramco site has generally been defined as the entire 17 acre parcel encompassing both the pond area to the west and the manufacturing building area to the east of the railroad spur. For the purposes of the RI completed under the Order between Axia, Inc. and the NYSDEC, the Ramco site is considered that portion of the property to the west of the railroad spur which includes the pond area and surrounding land (refer to Figure 1-2).

Properties surrounding the Ramco site include the Altift Landfill which partially encroaches the Ramco site, a 25 acre automobile junkyard (Skyway Autoparts, Inc.), and Greif Bros. Containers (manufacturer of fiber drums) to the north; a railroad line and a partially abandoned auto parts building (Sloan Auto Parts) to the south; Hopkins Street to the east; and a railroad right-of-way and Republic Steel Landfill to the west (refer to Figure 1-2). Other businesses in the area of the Ramco site include: a cement block/concrete distributor to the north, a scrap metal processor, and additional light industrial and residential areas. The surrounding land use can be generally categorized as medium density industrial, with commercial and residential occupants located to the east of Hopkins Street.

The following provides a brief introduction to adjacent properties to the Ramco site. Of significance, information on the Altift Landfill, the Republic Steel Landfill and the property immediately to the south (Sloan Autoparts) is presented. Both the Altift and Republic Steel sites are listed as NYSDEC inactive hazardous waste disposal, "Class 2", sites.

Altift Landfill

The Altift Landfill is located immediately to the north of the Ramco site covering an area of approximately 25 acres with the southern areas of the landfill encroaching on the Ramco pond. The landfill was operated over the period of 1930's to 1984. According to the NYSDEC, the operational history of the landfill included the disposal of domestic and industrial waste materials. During the 1950's and 1960's the landfill reportedly was used as a chemical landfill by among others Allied Chemical Company, Buffalo Dye plant. Materials allegedly disposed in the landfill during this period include: metal sludges, naphthalene, monochlorobenzene, dye, oil sludges and phenolic compounds. For the period of 1975 to 1984, the Altift site reportedly was used for the disposal and filling of solid wastes including, shredder waste from automobile manufacturing, fly ash, sand wastes, and demolition debris.

Numerous investigations have been completed at the site by the NYSDEC and others over the past years and currently, Allied-Signal, Inc. is completing a Remedial Investigation/Feasibility Study for the site. The field investigation has been initiated with completion of the project scheduled for the Fall of 1994. Information available from the site, including boring logs, groundwater elevation data and analytical testing data from completed sampling at the site have been made available for use in evaluating conditions on the Ramco site. Where applicable, information from the Altift Landfill has been included by reference.

Previously conducted investigations at the Altift site have identified contamination of surface water bodies, groundwater, and sediments in and around the landfill area. Contaminants identified in groundwater at the site include: iron, chromium, mercury, arsenic, benzene, naphthalene, phenolics, toluene and xylene. Surface water contaminants detected on the Altift site include: aluminum, antimony, chromium, iron, lead, magnesium, manganese, zinc, copper, and phenolics. A number of pesticides compounds were also identified in the surface waters of the site including: 4,4'-DDE, 4,4'-DDT, and alpha-Endosulfan. Sediments in ponds adjacent to the south of the Altift site were found to contain: acenaphthene, benzene compounds, toluene, xylene, 3,3-dichlorobenzidine, in addition to the metals found in the surface waters on-site.

The characteristics of this site from both a geologic/hydrogeologic and contaminant make-up are important in identifying impacts to the Ramco site. Groundwater flow patterns at the Altift site have been identified in previously completed reports to be migrating in a radial pattern away from the interior portions of the site. This would indicate that there may be a potential for migration of contaminants from the Altift site to the Ramco site and/or into adjacent surface water bodies, i.e. the on-site Ramco pond. It is also important to note that fill material at the Altift site has been identified to be located very near the northern boundary of the Ramco pond. Plate 1 illustrates the relative location of the Altift site to the Ramco site.

Republic Steel Landfill

The Republic Steel Landfill, also know as the Marilla Street Landfill, is located immediately southwest of the Ramco site. This site covers an area of approximately 200+ acres and was used between the period of 1930 to 1981 for the disposal of wastes generated from the Republic Steel plant. LTV Steel also operated the former Republic Steel plant and is currently responsible for closure of the site. Materials disposed in the landfill reportedly include slag, precipitator dust, wastewater treatment clarifier sludge, railroad ties, checker bricks, scrap wood, tool scale, blast furnace dust, Basic Oxygen Furnace brick, and miscellaneous construction debris. Prior to 1981, materials placed in the landfill apparently were not segregated, however, following the November 1980 classification of BOF dust as EP-Toxic hazardous waste due to lead leachability, all materials reportedly were segregated according to waste type.

The site has been subject to a number of investigations by the NYSDEC and USEPA over the years. Currently, LTV Steel is in the process of closing the landfill by capping and is conducting a Phase II investigation program for the site. Based on previous investigation at the site, analytical results of groundwater samples collected on-site have indicated elevated levels of arsenic, cadmium, chromium, iron, lead, manganese, sulfate, phenolics, and tetrachloroethylene. Groundwater patterns of the shallow aquifer material have been shown to flow in a radial direction outward from the landfill where it may be intercepted by perimeter ditches on the east and west sides of the landfill which direct flow toward a pond at the north end of the site or may flow beyond the SAE boundaries to off-site locations. The extent of potential off-site groundwater migration is indeterminable at the time of this report. Original site conditions, prior to landfilling, are believed to be similar to other surrounding sites consisting mostly of swampy-marsh areas.

Currently, the site is inactive and areas of the site are undergoing closure under NYS Part 360 and USEPA RCRA regulations. To more fully understand geologic and hydrogeologic conditions in the area, geologic/hydrogeologic information from the Altift, Republic Steel and Ramco sites is being shared between the parties responsible for investigating the areas.

Sloan Autoparts

Limited information is available as to the current conditions of this area immediately to the south of the Ramco site and past owners and operators of the site. Currently, the site is characterized by an abandoned building and associated areas, two large surface impoundments are located to the west and south of the main building area. The material placed in these impoundments appears to be a lime precipitate or similar material.

Previous owners and/or operators of the site were identified from Buffalo area directories dating to back to the 1940's. Based on the review of the directories, Prest-O-Lite Company, Inc. operated at the site previous to 1940 and through approximately 1946 to 1953. Information as to the operations performed on-site or products manufactured during this period of time was not available. From the period of 1943/1953 to 1966, Linde Company, a Division of Union Carbide was the listed occupant for the site. The existence of large quantities of lime material may be waste material generated from acetylene gas production at the site during the operation period of Linde. During this operational period, acetylene gas was commonly generated using a carbonate process which resulted in the generation of lime waste material. From the period of 1966 to the 1980's the site was listed as occupied by Sloan Autoparts, Inc. It is presumed that the site was used for the storage and sale of used or new autoparts during this period of time. No known investigations of this property have been completed.

1.2.2 SITE HISTORY

The Ramco site is and has historically been a steel processing facility. For the period of 1929 to present, the site has been owned and operated by several companies. The following lists a chronology of site owners and operators:

1929 to Nov. 1972

The western (pond) portion of the site was owned largely by the City of Buffalo through 1952, when it was purchased by Bliss and Laughlin Steel. The eastern (plant) portion of the site was owned and operated by Bliss and Laughlin from 1929 to 1972.

Nov. 1972 to June 1986

The Bliss/Laughlin operation was purchased in 1972 by Ramco/Fitzsimmons Steel (Ramco Steel, Inc.) and operated until 1986.

June 1986 to present

In 1986 the site was subdivided into two parcels; the main building structure, and the western pond area behind the plant building. The manufacturing operation and plant building parcel were sold to Niagara Cold Drawn Steel, the current owner/operator of the steel processing facility. The western pond parcel was sold to Hopkins-Tifft Realty, a corporation believed to have been formed by NCDS in order to facilitate the purchase of the manufacturing operation from the bankruptcy trustee.

Plant process operation descriptions were obtained from a preliminary engineering report (Process Changes to Eliminate Waste Discharge from Steel Pickling Operations, Ramco Steel, Inc., David Krofchak Limited, Specialist Engineers, May 1976) prepared for Ramco Steel. This report is presented as an appendix to the Work Plan. Obviously Axia, Inc. is in no position to confirm this report and information gathered by Axia is inconsistent with any contention that spent pickle liquor was disposed of into the pond. According to this report, past operational history of the Ramco site included the use of cleaning and pickling processes in the manufacture of final steel product. Pickling processes at the plant included the dipping of the bar steel into tanks containing 10% sulfuric acid solution. The bar steel was left in the tanks for a period of time to ensure full contact of the acidic solution with all surfaces of the steel. Following dipping, the steel was removed from the tanks and placed on a rinsing rack where generous amounts of water were used to rinse the acid solution from

Pb pellicles contain metals

the bars. The rinsing of the steel following dipping in the pickling tanks generated the largest quantities of wastewater from the operation. Following rinsing, the bars were immersed in a hot 10% lime suspension, and placed on the rinse rack, with no water rinsing, until dry. The processing of coiled product was essentially the same, however, the coils were placed in a rinse tank to remove the pickling solution, rather than spraying them clean. The resulting rinse water, spent pickle liquor, lime tank liquids, and spillage from the rinse tanks was directed to a sump and gravity drained to the pond in the rear of the property.

The processing of steel prior to manufacturing operations (pickling) has continued to be a part of the plant operation from 1929 to present day, although, the actual pickling process and facility equipment has evolved over the years. Beginning in 1929 and ending in 1986, the pickling process consisted of dipping of the steel in an acidic solution to remove scale from the steel prior to manufacturing operations. In 1986, the pickling process was changed to a shot blasting process which does not include the use of acid materials to remove scale. For the period in which the pickling process included the use of acid solutions, acid rinse waters were presumably discharge to the on-site pond located to the west of the manufacturing building. The following provide a chronology of reported wastewater disposal practices associated with discharges to the on-site pond.

During the period of approximately 1929 to 1979, industrial wastewater was discharged directly to the on-site pond. It is noted that conflicting information exists regarding the discharge of spent pickle liquor into the pond during the period of 1929 to 1972 when the plant was operated by Bliss & Laughlin Steel. A NYSDEC information request response from Axia, Inc. states that, acid rinse waters were disposed of into the pond during that period, spent pickle liquor was sewered. Ramco Steel's response to a similar inquiry in 1976 indicates that spent pickle liquor was disposed of in the pond. For the period of 1975 to 1979, from other information gathered by the NYSDEC, it appears that, wastewaters were discharged to the pond under a New York State Pollution Elimination Discharge System (SPDES) permit. In 1979, the wastewater discharge point was eliminated and no further industrial wastewater was directed to the pond. The discharge lines from the plant operation to the pond was closed under the supervision of the NYSDEC. In 1978, the pond surface water was neutralized with sodium hydroxide to a neutral pH.

For the period 1979 to 1986, industrial wastewater was directed to the Buffalo Sewer Authority for treatment. Spent pickle liquor wastes were shipped off-site for beneficial recovery in a wastewater treatment operations.

In 1986, after the purchase of the operation by NCDS, the initial steel processing to remove scale was changed from a pickle liquor process to a shot blasting operation. NCDS shot blasts hot-rolled bars of steel to remove unwanted surface scale and defects prior to soaking in a lime solution for preparation for final rolling and shaping. Currently, no industrial or other discharges are directly discharged to the pond.

Additionally, in 1952, the manufacturing facility at the site was reportedly used for the machining and straightening of uranium rods. The following information, obtained from a report prepared for the U.S. Department of Energy (DOE) by Oak Ridge Institute for Science and Education, summarizes the activities completed at the site relative to the machining of uranium rods. The following is an extract from the report entitle *Radiological Survey of the Former Bliss Laughlin Steel Company Facility, Buffalo, New York, June 1992* presented in Appendix A.

In the Fall of 1952, the Bliss and Laughlin Steel Company, Buffalo, New York performed machining and straightening operations on uranium rods. The finished rods were shipped directly to the Fernald site in Ohio; turnings were returned by the Atomic Energy Commission (AEC) to the Lake Ontario Ordinance Works (LOOW) for packaging and ultimate disposal or recycle. Available records indicate uranium machining occurred at the site during September and October 1953, and that 53 drums of turnings were generated by the Bliss and Laughlin activities. It is unknown whether these records describe the full extent of the Bliss and Laughlin work; no records, indicating the total quantity of uranium handled at the site, have been located. There is also mention of possible earlier Atomic Energy Commission work at the site (the nature of which is unknown) in an October 1951 correspondence, which indicate that several drums of dry uranium oxide had accumulated. In 1972 the facility was sold to Ramco Steel, Inc.; the current owner is Niagara Cold Drawn Corporation.

The radiological survey completed for the facility and documented in the referenced report focused mainly on the interior of the manufacturing area. The report indicated that all uranium rod turnings were recovered for future disposal or recycling, no other mention of on-site disposal or discharge of radiologically contaminated material was provided in the report. Findings for the manufacturing area survey identified residual uranium activity, exceeding the DOE surface contamination guideline levels on the floor of the "special finishing" area. The contamination in these areas was reported as "fixed"; removable contamination in surveyed areas was within DOE guideline levels.

1.2.3 PREVIOUS INVESTIGATIONS

Over the period of July 1978 to June 1986, numerous environmental site assessments have been completed by various agencies at the adjacent Altift Landfill site and the Ramco site for the purposes of assessing environmental conditions of the two sites. Inclusive in these site assessments has been the sampling of environmental media for the purpose of characterizing potential site contaminants. Table 1-1 lists investigative actions which were completed at the Ramco site together with the responsible agency and the areas investigated.

Information and data generated during these investigative activities was used during the development of the RI Work Plan and in the preparation of this RI report. Where relevant, data from these investigations has been included in the report discussion by reference.

1.3 REPORT ORGANIZATION

This RI report is divided into seven sections. A summary of the contents of each of the sections is provided below:

Section 1.0 - Introduction

The purpose and objectives of this RI report are introduced in this section. It provides a brief summary of background information and describes the report purpose and organization.

Section 2.0 - Site Characterization Activities

Field activities performed during the remedial investigation are described in this section. It includes a brief discussion of the topographic survey, boring/well installation, media sampling, and field and laboratory testing.

Section 3.0 - Physical Characteristics of Study Area

This section summarizes the physical characteristics of the study area in terms of surface features, meteorology, surface water, geology, surface soils, groundwater, demographics and land use, and ecology.

Section 4.0 - Nature and Extent of Contamination

This section summarizes the nature and extent of contamination at the Ramco site. It describes the contaminant constituents detected in the soil, groundwater, surface water, sediment media at the site.

Section 5.0 - Contaminant Fate and Transport

This section discusses the movement and transformation characteristics of contaminant detected at the site.

Section 6.0 - Baseline Risk Assessment

In this section the conditions of the Ramco site and its potential impacts on public health and the environment are described. A baseline assessment is developed for use in evaluating current and future human health and environmental risks associated with the site.

Section 7.0 - Summary and Conclusions

Summaries of the nature and extent of contamination, fate and transport processes and risk assessment are provided in this section. In addition, recommendations for additional environmental media sampling for the purpose of verifying collected data are presented.

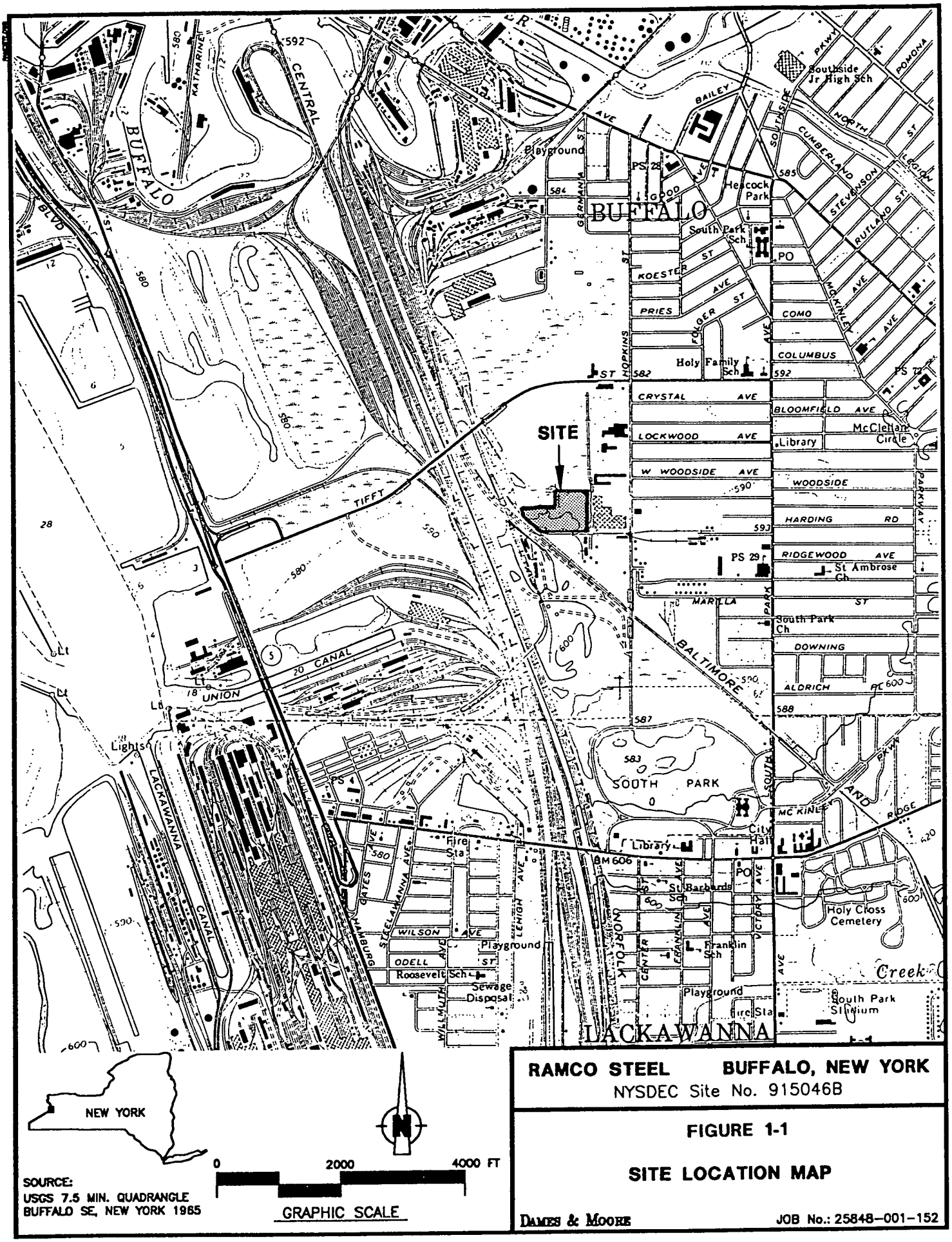
Tables, figures and references referred to in the text follow at the end of respective sections of the report.

Appendices containing field investigation task reports, laboratory data and other information are provided at the end of the report.

TABLE 1-1
Ramco Steel

PREVIOUS INVESTIGATIVE ACTIVITIES

Date	Responsible Agency	Reason	Sampling Area
7/5/78	Recra Research	Preliminary evaluation of Altifft Landfill	Pond water Discharge channel water
7/17/78	Recra Research	Preliminary evaluation of Altifft Landfill	Pond water Discharge channel water
7/81	Erie County Dept. of Environmental Protection	Preliminary evaluation of Ramco Steel	Pond water Pond sediment Discharge channel water
7/82	United States Geological Survey	Preliminary evaluation of Ramco Steel	Pond water Discharge channel water Soil around pond
7/84	NUS Corporation	EPA Site Investigation of Ramco Steel	Soil around site Pond water Pond sediment Discharge channel water Discharge storm sediment
4/85 (6/86)	Dames & Moore	Phase II Investigation of Altifft Landfill	Pond water Pond sediment
1/91	Conestoga-Rovers & Associates	Supplemental data collection program at the NCDS site	Pond Water Pond Sediment Discharge storm sediment



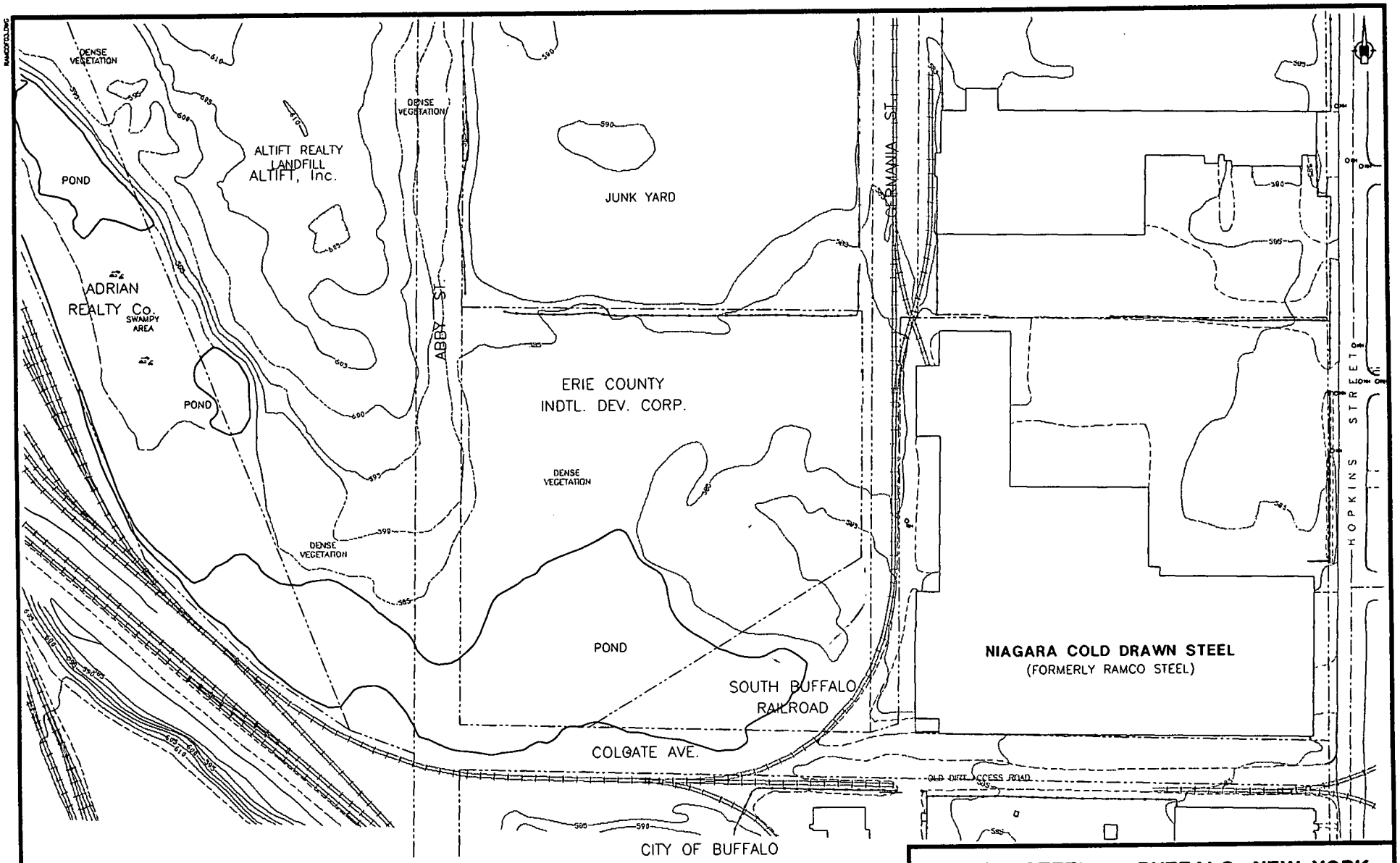
SOURCE:
USGS 7.5 MIN. QUADRANGLE
BUFFALO SE, NEW YORK 1965

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 1-1

SITE LOCATION MAP

DAMES & MOORE JOB No.: 25848-001-152



RAMCO STEEL BUFFALO, NEW YORK

NYSDEC Site No. 915046B

FIGURE 1-2

SITE LAYOUT PLAN

DAMES & MOORE JOB No.: 25848-001-152

2.0 SITE CHARACTERIZATION ACTIVITIES

The first step in the remedial investigation was the preparation of the Work Plan which described the tasks and methods to be used in evaluating the site. The *Remedial Investigation Work Plan, Ramco Steel Site, Buffalo, New York, Site Registry No. 915046, June 1992*, was approved by the NYSDEC in June 1992. Field work for the initial RI activities were completed in May 1993. Supplemental investigations were completed for the site in June 1994. The field investigations and laboratory activities performed as part of the investigations for the site are described in this section as follows:

- Topographic Survey
- Sediment Sampling
- Surface Water Sampling
- Groundwater Monitoring
- Surface/Subsurface Soil Sampling
- Analytical Testing

Field activities were conducted under a Health and Safety Plan which was prepared specifically for the RI program to provide procedures for protection of personnel and avoidance of accidents. The Health and Safety Plan and a Data Collection Quality Assurance Plan prepared for the RI activities provided environmental media sampling and decontamination procedures to ensure representative sample collection and protection of workers on-site. Representatives from the NYSDEC were present on-site during performance of field work.

2.1 TOPOGRAPHIC SURVEY

To provide a base map for use during the investigations and future work, if required, which illustrates the current conditions of the site, a topographic map of the site and areas surrounding the site was prepared by Erdmann Anthony, Consulting Engineers, Rochester, New York. The base map was produced utilizing aerial photographs taken on April 14, 1989 and computerized photogrammetric interpretation techniques. The April 14, 1989 aerial photographs have been used by others for the preparation of base maps and presentation of site data for the adjacent Altift Landfill and Republic Landfill sites. The base map which comprises all three sites is presented in Plate 1 with surficial contour intervals of 1 foot.

2.2 SEDIMENT SAMPLING

Sediment samples were collected to investigate and evaluate the characteristics of the sediment contained in the on-site pond. Sediment samples were collected over the entire area of the on-site pond as part of the initial remedial investigation in February 1993. Additional sediment samples were collected from the pond and outfall area in April 1994 as part of the supplemental investigations. Sediment sampling locations are illustrated in Figure 2-1. A summary of the initial remedial investigations and supplemental work are presented in the following subsections.

Remedial Investigation

A total of 15 sediment samples were collected from the pond for laboratory analysis during the period of February 4-5, 1993. Sediment sampling locations for this initial work were established on a grid system (Figure 2-1).

The sediment samples collected during February 4-5, 1993 for hexavalent chromium analysis were delivered to the laboratory beyond holding times. Holding time for hexavalent chromium analysis is a maximum of 24-hours. As a result, sediment was resampled on March 23, 1993 at the same locations as previously sampled and submitted for laboratory analysis of hexavalent chromium, chromium and percent organic carbon content.

Ice cover over the pond at the time of sediment sampling allowed easy access to the sampling locations. Sediment samples were collected using hand tools and standard split-spoon techniques. A hole was completed through the ice at each sampling location and sediment samples collected using a 2-inch diameter by 2-foot long steel split-spoon sampler. Sediment samples were collected over an approximate 2-foot sampling interval depth at each sampling location and composited on-site for laboratory analysis. Visual observations and field screening measurements made during the collection of sediment samples were recorded on field log sheets by an on-site hydrogeologist. Sediment data from the field log sheets have been compiled and are presented in Table 2-1.

In addition to the on-site sediment samples, two sediment samples were collected from off-site locations on February 15, 1993. The off-site sediment sampling areas are: 1) the ponded area immediately west of the Altift property, and 2) the drainage ditch trending north-south between the western edge of the railroad service road and the Republic Landfill immediately west of the Ramco site (refer to Figure 2-1). Off-site sediment samples were collected at the same locations as off-site surface water samples (Section 2.3).

At three locations within the pond, materials underlying the pond sediment were collected for geotechnical laboratory testing of vertical permeability. Undisturbed soil samples were collected at sediment sampling locations SED-2, SED-4, and SED-7. A discussion of the result of the permeability testing is presented in Section 3.7 - Site Hydrogeology.

Supplemental Investigations

A total of four sediment samples were collected on April 18, 1994; two from the on-site pond and two from the pond outfall area. Figure 2-1 illustrates the relative location of these sampling points.

Sediment samples were collected by wading into the areas and collection of the upper 1 to 2 feet of sediment with a hand shovel. Following collection, samples from each location were composited on-site for laboratory analysis.

All sampling equipment was cleaned in accordance with the Quality Assurance Project Plan (QAPP) prior to the collection of sediment samples at each location. Additional quality assurance/quality control samples were also collected during completion of the sediment sampling activities and submitted for laboratory analysis.

2.3 SURFACE WATER SAMPLING

As part of the initial RI activities, three surface water samples were collected from the on-site pond and two from off-site locations on February 15, 1993. The three pond surface water sampling locations are illustrated on Figure 2-1 which also shows the off-site sampling locations. The off-site sampling locations for surface water coincide with the location of off-site sediment sampling locations (Section 2.2 - Sediment Sampling).

All surface water samples were collected by directly filling precleaned sampling containers provided by the analytical laboratory. All sampling procedures were completed in accordance with the project QAPP.

2.4 GROUNDWATER MONITORING

Monitoring wells installed during the remedial investigation and pre-existing monitoring wells were used for the primary purposes of investigating further, the groundwater flow and potential groundwater contaminant conditions, geologic conditions beneath the site, and for identifying aquifer characteristics necessary for use in evaluating potential migration patterns and exposure pathways and for selection of future remedial design alternatives, if deemed appropriate for the site.

Existing wells at the site included wells MW-1S and MW-1D installed in November 1991 as part of the adjacent Altift site remedial investigation and well CW-1 installed in July 1986 by Dames & Moore as part of a Phase II investigation of the Altift site. Additional wells have also been installed at the Altift site as part of the remedial investigations completed for that site. For the purposes of the Ramco site RI, the three existing wells discussed above were included as part of the Ramco site investigation.

During the completion of the Ramco site RI, three new wells were installed on January 6, 1993. The drilling and installation of these wells was completed by Empire Soils Investigations of Hamburg, New York. The three new monitoring wells on-site, RMW-1, RMW-2, and RMW-3, increased the monitoring well network to a total of six wells on the Ramco site. Figure 2-2 illustrates the location of the six wells relative to site features.

At all locations, with the exception of well location MW-1D, monitoring wells were completed as shallow water table wells with the intended purpose of monitoring the water bearing zone within the unconsolidated materials. The screened interval of these wells intersected the water table surface in the unconsolidated material above bedrock. At location MW-1D, the screened interval of the well apparently is placed within the upper weathered zone of the underlying bedrock and extends into competent bedrock, thus, this well has been designated a bedrock well. In review of the boring logs and completion details for all of the wells, wells RMW-3 and CW-1 may be more appropriately designated as interface wells, as they appear to be completed with the screened interval intersecting the unconsolidated material and the underlying weathered bedrock zone. Table 2-2 presents details regarding the depth of each well, installed interval, and other construction details.

At each monitoring well location, the well boring was advanced to the top of bedrock using hollow-stem auger techniques with split-spoon samples collected at designated intervals. Standard installation practices, as described in the monitoring well installation section of the RI Work Plan, were used for well installation. Each well and associated boring was described on a boring log by an on-site hydrogeologist and a schematic well construction diagram was prepared showing details of the well installation. Boring logs and well construction diagrams are presented in Appendix B and includes boring logs and well construction diagrams for all wells installed at the Ramco site.

Subsurface soil samples were collected from each of the newly installed well borings, RMW-1, RMW-2, and RMW-3 for laboratory testing. One sample from each of the borings was collected for laboratory analysis based on field head space screening for volatile organics. Additionally, an undisturbed soil sample was collected at each of these well locations for the purposes of vertical permeability testing. Permeability testing results are discussed in Section 3.7 - Site Hydrogeology.

Following installation and development of the wells at the Ramco site, groundwater samples were collected on February 15, 1993 from the newly installed wells and from the three existing wells on-site. Additional groundwater sampling was completed as part of the supplemental investigations on April 15 and 18, 1994. Groundwater sampling was completed in accordance with the procedures presented in the project QAPP.

For reference purposes, all wells on-site were survey for coordinate position and elevation of the top of PVC casing. Well elevation measurements were referenced from existing Altift monitoring wells MW-1S, MW-1D, and MW-5S. Coordinates of site features were referenced to New York State Plane Coordinates as referenced on the site topographic map (Plate 1).

2.5 SURFACE/SUBSURFACE SOIL SAMPLES

A series of eight test pits were installed in the area north of the pond identified as the "fill area" of the site (Figure 2-3). The test pit excavations were completed over a 1-day period on December 12, 1992. Each test pit was excavated using a tire-mounted backhoe to the top of bedrock. At all locations bedrock was encountered at a depth of between 8 to 11 feet below grade.

At each test pit, subsurface soil samples were collected for laboratory analysis. The selection of the soil samples for analysis was based on visual observations and field instrument screening for volatile organics of the soil during test pit installation. An on-site NYSDEC representative was present during the completion of the test pits and provided oversight in the selection of soil samples from each location. A total of 12 soil samples were collected from the eight test pits and subject to laboratory testing. Visual observations and field screening measurements made during test pit installation was described on a test pit log sheet by an on-site hydrogeologist. Test pit log sheets for the eight test pits completed on-site are presented in Appendix B.

Two surface soil samples were also collected for the "fill area" for laboratory analysis. One surface sample (sample SS-1) was collected from piles of apparently solidified iron mill scale material located between test pit locations #5 and #6. The second sample was collected to the east of test pit location #2, near the railroad spur. Figure 2-3 illustrates the location of the test pit and surface sampling locations.

2.6 RADIOLOGICAL TESTING

Due to concerns raised and based on the radiological survey completed for the manufacturing areas of the site by others, sediment and soil samples from the site were subject to radiological testing to screen these materials for potentially related radiological contamination.

Sediment samples collected on March 23, 1993 and submitted for laboratory chemical analysis were retrieved from the analytical laboratory and submitted for radiological testing. Original soil samples collected from test pits completed in the fill area were disposed of by the chemical analytical laboratory prior to the arranging for radiological testing. As a result, additional soil samples were collected on April 23, 1993 from the same areas as the original eight test pits for the purpose of radiological testing. Composite soil samples were collected at each test pit location and consisted of fill and natural soil material encountered from surface grade to bedrock, approximately 8 to 11 feet below grade. Two surficial soil samples were collected for identifying background activities; one in the vicinity of monitoring well CW-1 and the other from the east side of Hopkins Street in front of the NCDS facility.

All sediment and soil samples were submitted to Radiation Safety Organization, Inc in Laurel, Maryland for gross gamma and specific isotope identification using a high purity germanium detector.

2.7 AIR MONITORING

During initial RI activities, background air monitoring data was collected upwind of the Ramco site and compared to downwind locations at the site to determine potential impacts of volatile contaminants and particulate matter emanating from the site. Instruments used in performing the air monitoring program included a portable photoionization organic vapor detector for the detection of total organic vapor content in air and a particulate monitor for the detection of particulate matter in the air during site activities. A discussion of air monitoring results are presented in Section 4.5 - Air.

2.8 ANALYTICAL TESTING

Laboratory analyses were performed on samples of soil, groundwater, surface water and sediment obtained during completion of the RI at the Ramco site. Table 2-3 lists collected samples and analytical tests performed for each of the samples. Analytical data summary sheets for each sample analysis completed as part of the initial RI activities have been provided under separate cover. Analytical data summary sheets for samples collected during the supplemental investigations are provided in Appendix G.

All sample chemical analysis were completed by Recra Environmental, Inc. (Recra) of Amherst, New York. Recra is approved through the New York State Department of Health, Environmental Laboratory Approval Program (ELAP) for laboratory analysis and has received approval as an accredited New York State Analytical Services Protocol (ASP) laboratory.

Analytical laboratory data collected from the initial RI activities was validated in accordance with procedures outlined in the RI Work Plan by Dames & Moore's Analytical Quality Assurance Services (AQuA) group based in Baltimore, Maryland. The results of the data validation report and tabulated data are presented in Appendix C.

TABLE 2-1
Ramco Steel
Summary of Sediment Sampling Points
On-site Pond

LOCATION #	COORDINATES NORTH	EAST	ICE ELEV.	WATER DEPTH (ft)	STRATIGRAPHY DESCRIPTION (distances in feet from sediment)	LAYER TOP ELEV.
SED-1	1035008	432236	581.8	2.2	0-1.8 mottled BROWNISH YELLOW DARK GRAY SANDY SILT (saturated)(soft)[SLUDGE](petro odor, trace of vegetation)	579.6
					1.8-2.2 GRADES TO OLIVE GRAY SILTY SAND (wet) (medium dense)	577.8
					2.2- DARK GRAY GRADING TO MOTTLED GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.4
SED-2	1035021	432158	581.6	1.5	0-1.0 mottled BROWNISH YELLOW DARK GRAY SANDY SILT (saturated)(soft)[SLUDGE](petro odor, trace of vegetation)	580.09
					1.0-4.0 GRADES TO OLIVE GRAY SILTY SAND (wet) (medium dense)	579.09
					4.0- GRAY TO DARK GRAY SILTY CLAY (moist)(medium stiff)	576.09
SED-3	1035052	432062	581.3	1.5	0-1.0 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	579.79
					1.0-3.0 OLIVE GRAY SILTY SAND (wet)(medium dense)	578.79
					3.0- GRAY TO DARK GRAY SILTY CLAY (moist)(medium stiff)	576.79
SED-4	1035068	431963	581.5	1.5	0-0.7 mottled BROWNISH YELLOW DARK GRAY SANDY SILT (saturated)(soft)[SLUDGE](petro odor, trace of vegetation)	579.95
					0.7-1.5 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.25
					1.5- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	578.45
SED-5	1035070	431862	581.6	1.5	0-0.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	580.1
					0.2-2.7 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.9
					2.7- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.4
SED-6	1035087	431763	581.5	1.5	0-0.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	580.04
					0.2-2.6 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.84
					2.6- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.44
SED-7	1035103	431665	581.5	2.5	0-0.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	579
					0.2-1.2 OLIVE GRAY SILTY SAND (wet)(medium dense)	578.8
					1.2- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.8
SED-8	1035144	431570	581.5	2	0-0.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	579.48
					0.2-2.4 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.28
					2.4- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.09
SED-9	1035155	431536	581.6	2	0-0.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	579.58
					0.2-3.0 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.38
					3.0- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	576.58

TABLE 2 - 1 (con't)
Ramco Steel
Summary of Sediment Sampling Points
On-site Pond

LOCATION #	COORDINATES NORTH	EAST	ICE ELEV.	WATER DEPTH (ft)	STRATIGRAPHY DESCRIPTION (distances in feet from sediment)	LAYER TOP ELEV.
SED-10	1035014	431949	580.9	1.5	0-1.0 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	579.41
					1.0-2.0 DARK GRAY SILTY SAND (wet)(medium dense)	578.41
					2.0- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.41
SED-11	1035020	431848	581	1.5	0-0.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	579.52
					0.2-3.0 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.32
					3.0- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	576.52
SED-12	1035046	431784	581.6	0.9	0-0.3 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	580.67
					0.3-3.0 OLIVE GRAY SILTY SAND (wet)(medium dense)	580.37
					3.0- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	577.67
SED-13	1035154	431975	581.6	1.1	0-1.2 DARK GRAY SANDY SILT(saturated)(soft) [SLUDGE](petro odor, trace of vegetation)	580.5
					1.2-1.9 OLIVE GRAY SILTY SAND (wet)(medium dense)	579.3
					1.9- mottled GREENISH GRAY AND BROWN SILTY CLAY (moist)(medium stiff)	578.6
SED-14	1035154	432081	581.7	1.5	0-0.5 mottled BROWNISH YELLOW DARK GRAY SANDY SILT (saturated)(soft)[SLUDGE](petro odor, trace of vegetation)	580.16
					0.5-1.25 DARK GRAY SILTY SAND (wet)(medium dense)	579.66
					1.25- GRAY TO DARK GRAY SILTY CLAY 9moist)(medium stiff)	578.91
SED-15	1035099	432176	581.6	1.7	0-1.0 mottled BROWNISH YELLOW DARK GRAY SANDY SILT (saturated)(soft)[SLUDGE](petro odor, trace of vegetation)	579.88
					1.0-2.8 DARK GRAY SILTY SAND (wet)(medium dense)	578.88
					2.8- GRAY TO DARK GRAY SILTY CLAY (moist)(medium stiff)	577.08

TABLE 2-2
Ramco Steel

Monitoring Well Details

Well Type	Well No.	Date Installed	Installed By*	Well Construction	Well Depth (ft)	Unit Screened**	Top of Riser Elevation (ft)***
Monitoring Well	RMW-1	1/6/93	D&M	2" PVC	7.5	Overburden	586.9
	RMW-2	1/6/93	D&M	2" PVC	10	Overburden	589.09
	RMW-3	1/6/93	D&M	2" PVC	10.5	Overburden	585.33
	MW-1S	11/5/91	M&E	2" PVC	12	Overburden	584.47
	MW-1D	11/4/91	M&E	2" PVC	6	Interface	583.37
	CW-1	7/16/85	D&M	2" PVC	22	Interface	586.93
On-site Pond	-	-	-	-	-	-	581.8

Note: * - Dames & Moore
- Metcalf & Eddy, Inc.
** - Interface between the overburden material and bedrock
*** - Elevations referenced from Altift wells MW-1S and MW-1D

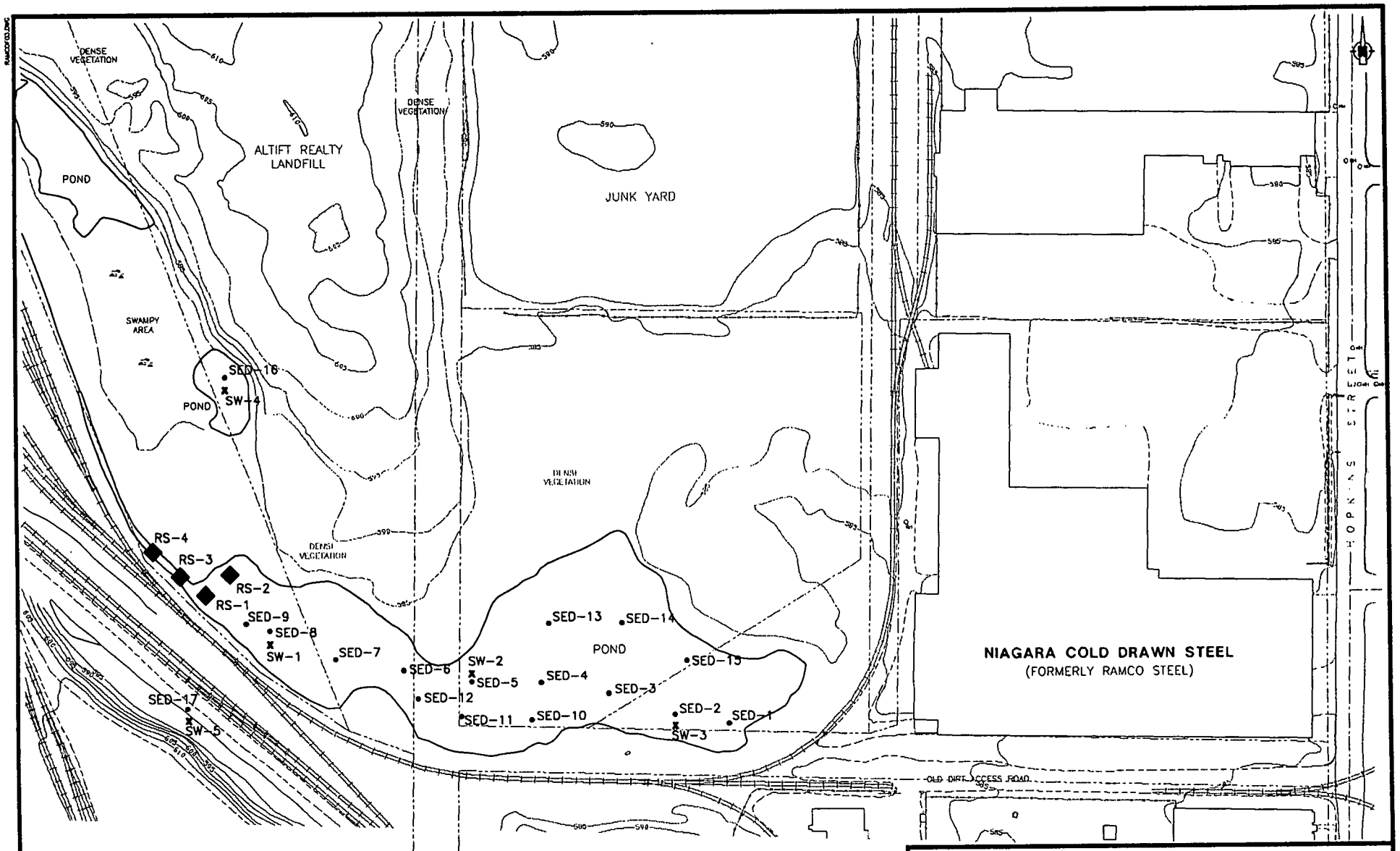
TABLE 2-3
Ramco Steel
Schedule of Sample Analysis

		VOA		BNA		Pest		PCB	METALS			OIL &
Media	Sample ID	T	TCLP	T	TCLP	T	TCLP	T	T	D	TCLP	GREASE
Groundwater												
	RMW-1	✓		✓		✓		✓	1			
	RMW-2	✓		✓		✓		✓	1			
	RMW-3	✓		✓		✓		✓	1			
(Duplicate RMW-3)	DUP-3	✓		✓		✓		✓	1			
	MW-1A	✓		✓		✓		✓	1			
	MW-1B	✓		✓		✓		✓	1			
	CW-1	✓		✓		✓		✓	1			
Supplemental	(All six											
Investigation	On-site wells)	✓		✓		✓			1	1		
Surface Water												
(Pond)	SW-1	✓		✓		✓		✓	1			
(Pond)	SW-2	✓		✓		✓		✓	1			
(Pond)	SW-3	✓		✓		✓		✓	1			
(Duplicate SW-3)	DUP-4	✓		✓		✓		✓	1			
(off-site, Atlift)	SW-4	✓		✓		✓		✓	1			
(off-site, Republic)	SW-5	✓		✓		✓		✓	1			
Sediment												
	SED-1	✓						✓	2			✓
	SED-2	✓	✓	✓	✓	✓	✓	✓	1		3	
	SED-3	✓						✓	2			✓
	SED-4	✓						✓	2			
	SED-5	✓	✓	✓	✓	✓	✓	✓	1		3	
	SED-6	✓						✓	2			✓
	SED-7	✓						✓	2			✓
	SED-8	✓	✓	✓	✓	✓	✓	✓	1		3	
	SED-9	✓						✓	2			✓
(Duplicate SED-9)	DUP-1	✓						✓	2			✓
	SED-10	✓						✓	2			✓
	SED-11	✓						✓	2			✓
	SED-12	✓	✓	✓	✓	✓	✓	✓	1		3	
(Duplicate SED-12)	DUP-2	✓	✓	✓	✓	✓	✓	✓	1		3	
	SED-13	✓						✓	2			✓
	SED-14	✓						✓	2			✓
	SED-15	✓	✓	✓	✓	✓	✓	✓	1		3	
(off-site, Atlift)	SED-16	✓		✓		✓		✓	1			
(off-site, Republic)	SED-17	✓		✓		✓		✓	1			
Pond	RS-1	✓		✓				✓	1			
Pond	RS-2	✓		✓				✓	1			
Outfall	RS-3	✓		✓				✓	1			
Outfall	RS-4	✓		✓				✓	1			
Soil												
	RMW-1 (4-6')	✓						✓	2			✓
	RMW-2 (0-2')	✓						✓	2			✓
	RMW-3 (2-4')	✓						✓	2			✓
(Waste Pile)	SS-1	✓		✓		✓		✓	1			
(Surface Soil)	SS-2	✓		✓		✓		✓	1			
Test Pits	TP-1-1	✓						✓	2			✓
	TP-1-2	✓						✓	2			✓
	TP-2-1	✓		✓		✓		✓	1			
	TP-3-1	✓						✓	2			✓
	TP-4-1	✓						✓	2			✓
	TP-4-2	✓		✓		✓		✓	1		3	
	TP-5-1	✓						✓	2			✓
	TP-6-1	✓						✓	2			✓
	TP-6-2	✓						✓	2			✓
	TP-7-1	✓		✓		✓		✓	1		3	
	TP-7-2	✓		✓		✓		✓	1			
	TP-8-1	✓						✓	2			✓

NOTES: 1 - Full TAL list 2 - RCRA Metals + zinc + Hex chrome

3 - RCRA Metals only

Ramco Steel RI:RSAMPTBL.XLS



KEY:

- APPROXIMATE PROPOERTY BUONDARIES
- SED-10 SEDIMENT SAMPLE LOCATIONS (FEB. 1993)
- SW-4 SURFACE WATER SAMPLE LOCATIONS (FEB. 1993)
- RS-1 SEDIMENT SAMPLE LOCATIONS (APRIL 1994)

0 50 100 200 FT
GRAPHIC SCALE

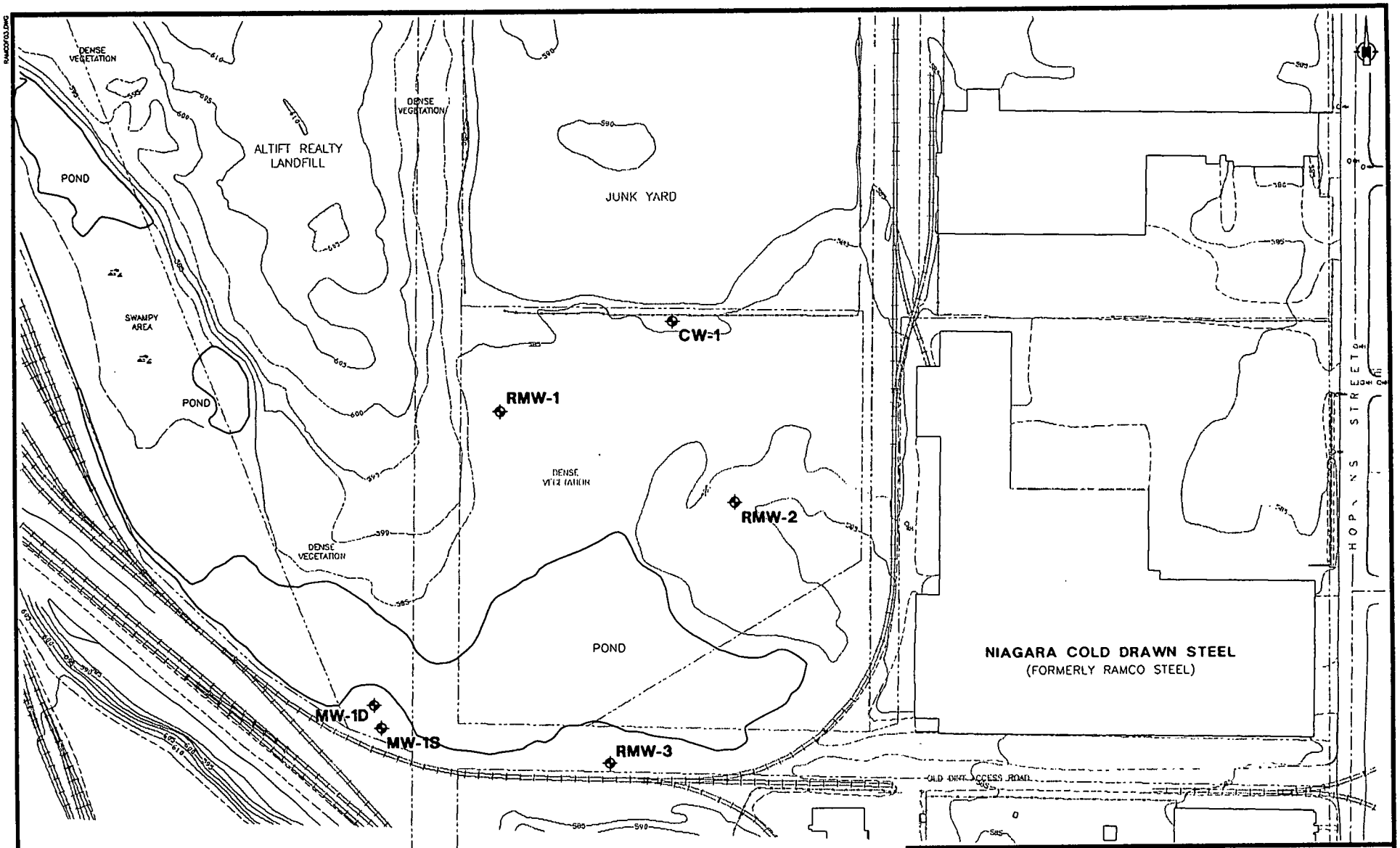
BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 2-1

SEDIMENT/SURFACE WATER SAMPLE LOCATIONS

DAMES & MOORE JOB No.: 25848-001-152



KEY:

APPROXIMATE PROPOERTY BUONDARIES

RMW-1 MONITORING WELL LOCATION

BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

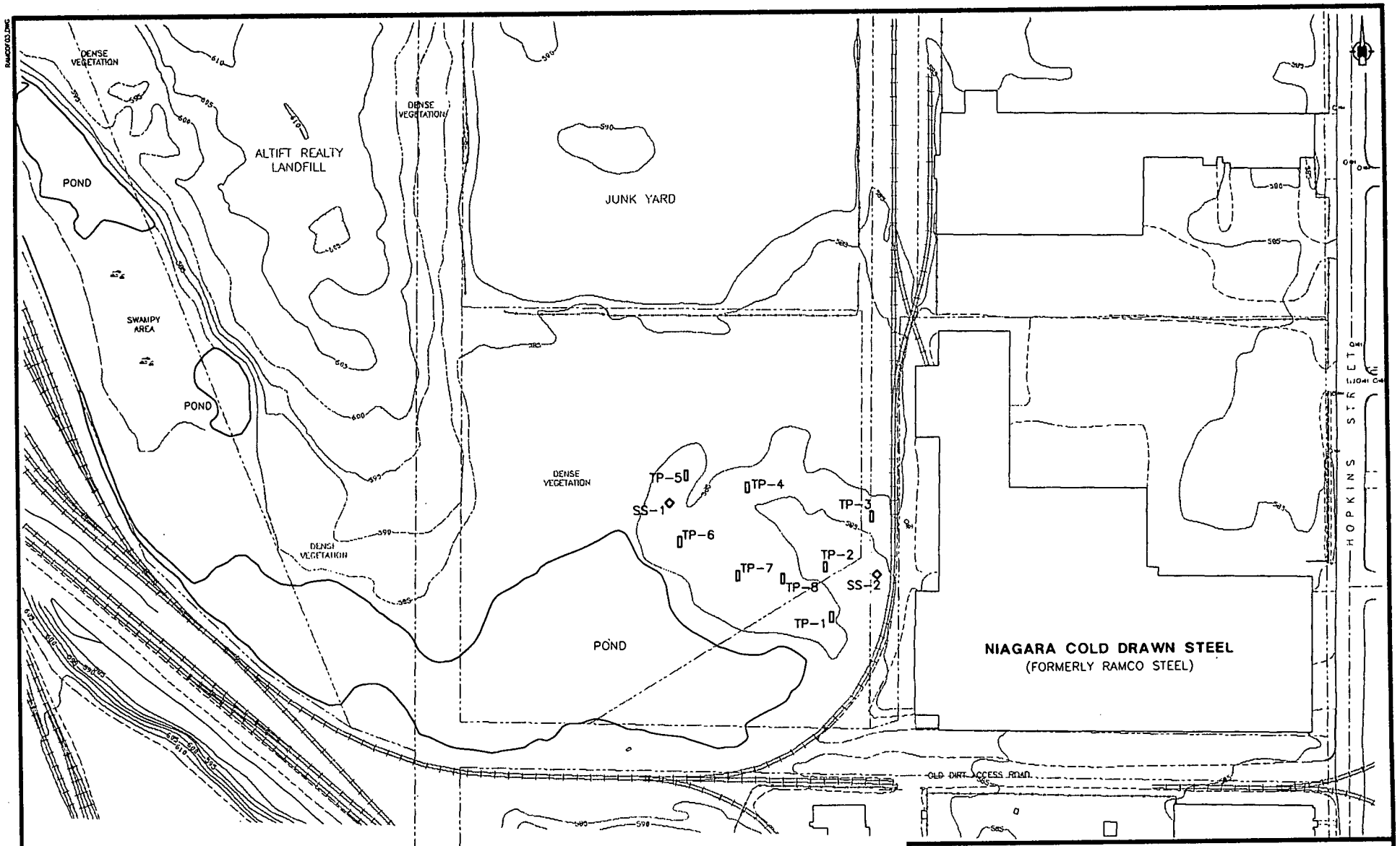
0 50 100 200 FT
GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 2-2

MONITORING WELL LOCATIONS

DAMES & MOORE JOB No.: 25848-001-152



KEY:

- APPROXIMATE PROPOERTY BUONDARIES
- TP-5 TEST PIT LOCATION
- SS-1 SOIL SAMPLE LOCATION

BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

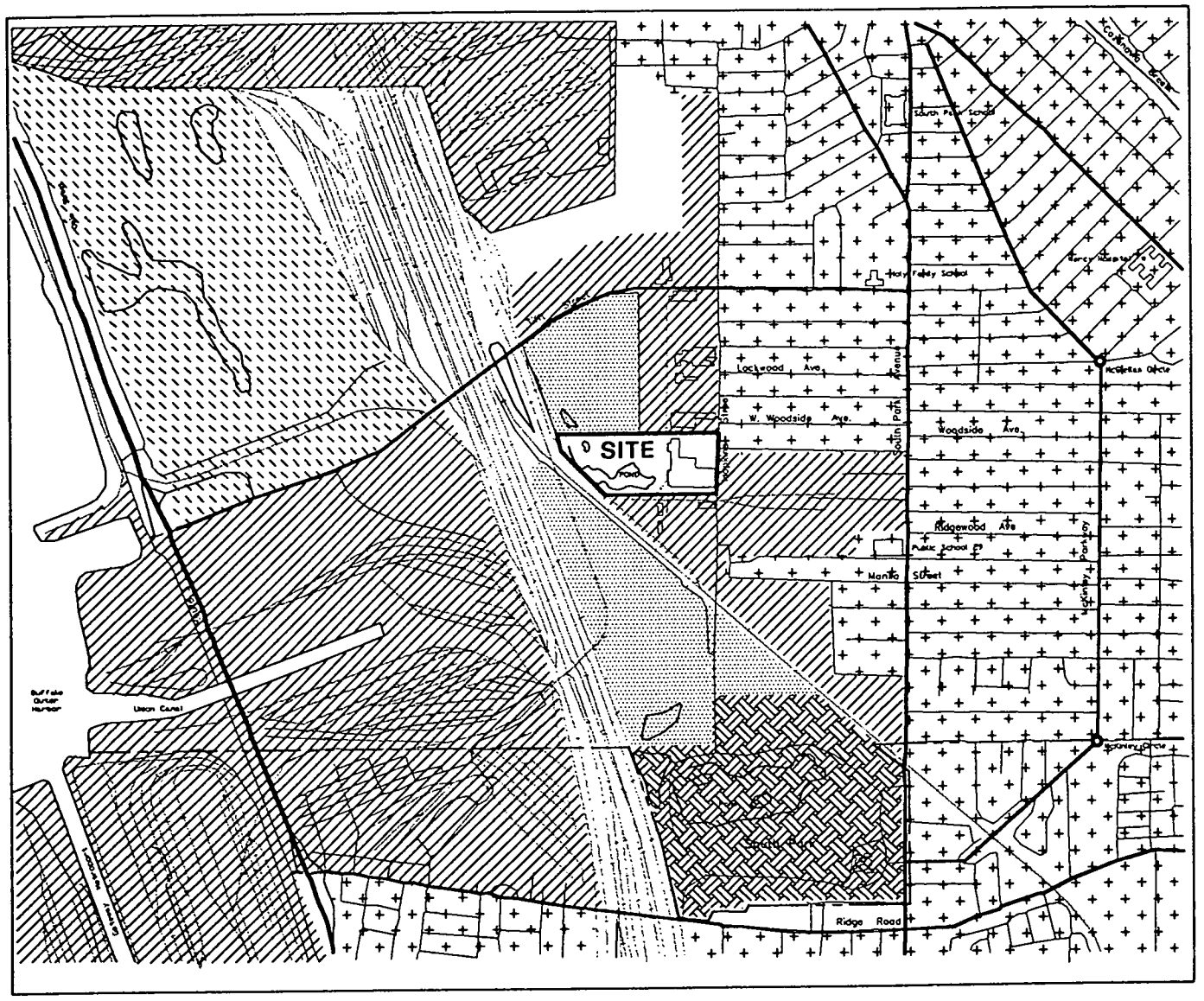
0 50 100 200 FT
GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 2-3

TEST PIT AND SURFACE SOIL SAMPLE LOCATIONS

DAMES & MOORE JOB No.: 25848-001-152



KEY:

- RESIDENTIAL
- LANDFILL
- INDUSTRIAL/SEMI-INDUSTRIAL
- TIFFT FARMS NATURE PRESERVE
- PARK
- CORPORATE LIMITS

NOTE:
Location of areas and facilities shown are approximate. Map is provided for illustrative purposes only and not intended to be represntative of all land uses.

SOURCE:
USGS 7.5 MIN. QUADRANGLE BUFFALO SE, NEW YORK 1965, NYSDEC WETLAND MAP 1977 UPDATED 1981, 1982, 1985 & 1986.

0 2000 4000 FT
GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-11

LAND USE MAP

DAMES & MOORE JOB No.: 25848-001-152

3.0 PHYSICAL CHARACTERISTICS OF STUDY AREA

This section summarizes the physical characteristics of the study area in terms of surface features, meteorology, surface water, geology, hydrogeology, and demographics and land use.

3.1 SURFACE FEATURES

The Ramco site is situated in an area characterized largely as medium density industrial with residential areas existing to the east of the main building area. Much of the land area surrounding the site originally comprised low-lying areas with extensive surface water and marsh areas. These original conditions are presumably similar to those presently observed in areas to the west of the site. Over time, areas surrounding the site have been altered, primarily by filling, to create usable land areas and for use as landfill areas. Two large landfill areas have been created adjacent to the site property: Altift Landfill which actually encroaches on the Ramco site to the north, and the Republic Landfill to the southwest. In addition, fill has been place in the area of the car junk yard immediately to the north of the site property to create usable land areas. On-site, the "fill area" of the site and areas around railroad right-of-ways have been altered by filling of low-lying areas. The original pond area on-site was observed to be present in aerial photographs taken in the 1930's and 1940's, however, it appears from photos that the pond size and configuration has been altered slightly over time increasing the overall pond area.

Based on observations made during the installation of the eight test pits in the fill area of the site the following conditions are noted. Surficial materials in the area consists largely of construction debris, i.e., soil, concrete, bricks, gravel, and slag and cinder material. The slag and cinder material is intermixed with other materials over the entire area, except areas near the north-south trending railroad spur located to the west of the plant building. The area around the railroad spur contains mostly slag fill in and around the railroad ties. Depths of fill material encountered in the fill area ranges from less than 1 foot thick at the east end near test pit locations #1 and #3 to depths approaching 4 feet toward the west. Material encountered at depth within the area included, slag, cinder material and red bricks at test pit location #2, construction debris, wood, metal objects, and oily wastes at locations #4 and #7, and concrete and tires at location #6. A moist, brown silty clay was observed to be present below the fill material at all test pit locations with limestone bedrock encountered below the brown clay at depths ranging from 8 to 11 feet below grade. Dredge materials from the on-site pond were not identified in any of the fill areas of the site. Perched water was encountered in the fill material at shallow depths. Water was encountered at most test pit locations, with exception of location #3 in which no water was encountered in the unconsolidated material above bedrock. At test pit locations #2, #4 and #7, an oily sheen was observed on water within fill materials encountered at these locations, however, no oily material was observed at location #8, located between pit #2 and #7. Thus, it is believed that the areas in which oily material was encountered are not interconnected and represent isolated pockets of this type of material surrounding each location.

The pond is characterized as a 3.5 acre shallow pond with the outfall flowing toward the north from the west end of the pond. Depth of water in the pond ranges from approximately 1 to 3 feet, with the shallowest areas being toward the east near the original plant discharge point to the pond. A soil berm surrounds the pond except at the outfall. At this location, water from the pond is not contained

and may flow toward the north to ponded areas adjacent to the Altift Landfill during periods of high water. During most of the year, the pond water level has been observed to be relatively static. During extended dry periods the pond was observed to be mostly dry with water covering only a small percentage of the western areas of the pond. The bottom of the pond was visible and is littered with debris such as tires, metals objects, wood, and miscellaneous car parts. The upper layers of sediments consist of settled precipitate from former plant wastewater discharges to the pond and are described as a sludge material during sediment sampling. During sediment sampling, the sludge material was noted as being thickest in the east areas of the pond near the former plant discharge point. This material is characterized as red to brown in color with a very loose consistency. In addition, oily sheens were observed on the surface water upon disturbing the pond sediment. Oily material which may be contained in the sludge material is most likely attributed to the previous discharge of lubricating and hydraulic oils contained within wastewater from the plant operation. A more detailed description of the pond sediments is provided in Section 3.6.1 - Surficial Materials.

3.2 METEOROLOGY

Buffalo, New York has a humid-continental climate. The summer is moderately warm with average daily maximum temperatures reaching 75°F. Winter months are cold, averaging daily maximum temperatures of approximately 43°F and have much cloudiness and periods of stormy weather. Annual precipitation is generally evenly distributed throughout the year with average precipitation totals of 36 inches. Winter precipitation generally occurs as snow with total snowfall amounts averaging approximately 91 inches. Snow cover generally extends through the latter weeks of December into mid-March.

Wind direction in the area is variable but most often is out of the south-southwest with an average speed of 8 to 14 miles per hour as recorded at the Buffalo International Airport, Buffalo, New York.

3.3 AREA SURFACE WATER/GROUNDWATER USE

As described previously, surface water flow from the on-site pond to off-site areas is minimal and is believed to occur only during high water periods. Flow conditions from the site and to the north in the direction of preferential flow are characterized by stagnant marshy areas indicative of very low flow rates. Additionally, man-made features such as elevated railroad track beds, roadways and filled areas intercept and direct surface water flow in the area. Based on the review of available topographic maps for the area, no direct surface water flow patterns were identified between the site pond and other significant surface water bodies, i.e., Lake Erie, Buffalo River, pond areas at the Tifft Farms Nature Preserve, etc., along the direction of preferential flow.

New York State Freshwater Wetland Maps and the U.S. Department of the Interior, Fish and Wildlife Wetland Maps were reviewed to identify any defined wetland areas near the Ramco site. Figure 3-1 and 3-2 illustrate these two reference maps. The closest New York State designated wetland area to the Ramco site is approximately 1,000 feet west, designated as BU-1. Two other areas are identified approximately 0.5 miles north and west of the site, designated wetlands BU-7 and BU-15 (refer to Figure 3-1). These areas are separated from the Ramco Pond and associated surface water areas by the manhole features (elevated railroad tracks and roadways).

The National Wetland Inventory compiled by the U.S. Department of the Interior, U.S. Fish and Wildlife Service have designated many of the surface water features in the area of the site, including the on-site pond, as a wetland area. Figure 3-2 presents the National Wetland Inventory Map. Additionally, during the supplemental investigations, Earth Dimensions, Inc., Elma, New York was retained to complete a wetland delineation of the site in accordance with the *U.S. Army Corps of Engineers Wetlands Delineations Manual (January 1987)*. Based on the work of Earth Dimensions, the on-site pond area and a smaller parcel of land on-site have been delineated as wetland areas based on the three parameter technique (vegetation, soil, and hydrology) outlined by the U.S. Army Corps of Engineers. A copy of the main body of the report which presents the results of the wetland delineation is presented in Appendix G.

Drinking water in the area of the site is supplied by a public water system. The local water supply for the City of Buffalo is obtained from Lake Erie. The closest water intake to the site is located approximately 5 miles north of the site in the Niagara River. There are no known users of groundwater or surface water for industrial and/or potable sources of water in the immediate area. It has been reported in the Altift Site Phase II Investigation Report (1986) that a deep bedrock well existed at the now closed Donna-Hanna Coke site 1-mile to the north. This well was reportedly used to supply water for industrial purposes at the facility. Recreational use of the surface water in Buffalo River and the Tifft Farm Nature Preserve areas are limited to fishing. There are no public beaches along the Buffalo River or at the Tifft Farm Nature Preserve.

3.4 REGIONAL GEOLOGY

The Ramco site lies within the Erie-Ontario Lowlands Province and Erie-Niagara Basin. (Geology of New York, 1976). The geology of the Erie-Niagara Basin, as described by La Sala (1968), is generally unconsolidated deposits, glacio-lacustrine in origin, overlying Silurian and Devonian age sedimentary bedded or layered bedrock. The bedrock formations in the region dip to the south and are masked with gentle folding. Rock units in Erie County strike east-west, dip southward at 40 to 60 feet per mile and are exposed locally in east-west trending bands. Relatively intense erosion near Lake Erie has exposed the rock at lower elevations in Western New York, compared to those farther east in the Appalachian Uplands.

The naturally occurring unconsolidated deposits in the area consist of the following three general types: 1) alluvial silt, sand and gravel deposited during comparatively recent geologic time; 2) Late Pleistocene lacustrine sediments composed primarily of silt, sand and clay; 3) Pleistocene glacial till, a heterogeneous mixture of particles (i.e. clay, silt, sand, gravel and cobble) deposited directly from glacial ice. Relief in the area is due to preglacial erosion of bedrock and subsequent topographic modification by glaciation. Granular deposits frequently act as shallow aquifers, whereas lacustrine clays, as well as tills, often inhibit groundwater movement. Water-lain sediments often contain horizontal lamination and sand seams which facilitate groundwater movement through otherwise low permeability material.

The recognized bedrock formations underlying the Ramco site are Devonian Age limestone and shales of the Skaneateles, Marcellus, and Onondaga Formations. Figure 3-3 illustrates the stratigraphic sequence of bedrock units in the Erie-Niagara Basin.

3.5 REGIONAL HYDROGEOLOGY

In the Erie-Niagara Basin the major sources of groundwater are glacial sand and gravel deposits, the Camillus Shale, Onondaga Limestone, Akron Dolomite, Bertie Limestone and the Lockport Dolomite (La Sala, 1968). The Marcellus Shale overlies the Onondaga Limestone and has a much lower permeability and water yield. In some areas, the overlying glacial deposits maybe hydraulically connected to the bedrock, particularly where the upper bedrock surface is fractured and the glacial deposits consists of sand and gravel. However, where the bedrock surface is competent and overlain by lacustrine silts, clays, or clayey tills, no or very little hydraulic connection exists. Groundwater flow within and along the bedrock units is controlled by the primary permeability of the unit and the secondary porosity which includes fractures, joints, and open bedding plane surfaces. The main sources of groundwater within the bedrock are fractures and solution cavities. Shales at depth, typically, have a much lower permeability than the shallow fractured zone at the top of the shale (La Sala, 1968).

Groundwater recharge to the unconsolidated deposits in the Erie-Niagara basin is variable. More permeable deposits such as sand and gravel accept infiltration at a much higher rate than low permeability materials such as till, clay, and silt. Regionally, groundwater recharge ranges from about 500,000 gallons per day per square mile (2.4×10^{-3} ft/day) for surficial sand and gravel deposits to about 50,000 gallons per day per square mile (2.4×10^{-4} ft/day) when the alluvial deposits are overlain by tills (La Sala, 1968).

3.6 SITE GEOLOGY

Previous studies of the Altift and Republic Landfills provided additional background and site specific information of the Ramco site geology and of adjacent sites. Site specific information was obtained through pond sediment sampling, test pits installed in the fill area of the site and monitoring wells drilled at the Ramco site.

Geologic units identified at the Ramco site and at adjacent site, in stratigraphic order, include:

- Surficial Materials - topsoil(organic silt), sludge, fill material
- Alluvial silt, sand, and gravel
- Lacustrine silty clay
- Till - possibly with cobbles, gravel, or sand
- Bedrock:
  Skaneateles Formation - olive gray, gray, and black fissile shale, limestone base
  Marcellus Formation - black shale
  Onondaga Limestone - gray and cherty limestone

The following sections present a discussion of each of the units as they apply to the Ramco site and adjacent sites. Geologic cross sections illustrating the stratigraphic sequences beneath the Ramco site have been developed based on data obtained from the installation of soil borings, test pits, sediment sampling, and included the interpretation of data obtained from off-site locations at the Altift and Republic landfill sites. These cross sections are presented in Figures 3-4 through 3-7.

3.6.1 SURFICIAL MATERIALS

The surficial materials at the Ramco site consists of a thin layer of peat and organic silt topsoil and fill. Test pits located in the fill area primarily revealed various fill or debris type materials - slag, brick, cinders, steel, concrete, tires, oily sludge, and wood within 2 to 8 feet of the ground surface. Peat and organic silt was identified at monitoring well locations RMW-1, CW-1, MW-1S, and MW-1D. At all locations the organic material exists from the ground surface to a depth of approximately 1 foot. Beneath the surficial and fill material, silty sand and silty clay units were consistently encountered overlying bedrock.

Pond Sediment

Based on observation made during sediment sampling within the pond, three layers of "sediment" or natural material were observed to underlie the pond; a loose silty "sludge" material, silty sand, and silty clay. The term "sediment" has been used to describe all material which was sampled from the bottom of the pond. The silty sludge material was defined as material which appears to be altered natural material or deposits resulting from wastewater discharges to the pond. The silty sand and silty clay materials beneath the pond are natural materials which is consistent with the geology. Although the silty sand and silty clay units were encountered at all sampling locations throughout the pond, the contact between units during field sampling activities was difficult to identify since the sediment and clay were similar. Table 2-1 presents detailed descriptions of material collected at each location, elevations of pond sediment and unit sequences.

The maximum thickness of the sludge layer, as identified from the sediment sampling, is approximately 1.8 feet at sampling location SED-1. Figure 3-8 illustrates the thickness of pond sludge which was identified based on sediment sampling data from the pond. Figure 3-5 presents a cross section through the center of the pond in an east-west direction illustrating the stratigraphic sequences below the pond. At sampling location SED-9, the sludge thickness was approximated at 0.2 feet. The thickness of the pond sludge tended to decrease in thickness proceeding in a westerly direction away from the plant wastewater discharge point on the east edge of the pond. The sludge also grades in color in a westerly direction, from a mottled brownish-yellow, dark gray to dark gray. The resulting thicker deposits of sludge in the east portions of the pond and changes in color are likely the result of material precipitating out of solution near the wastewater discharge point which was located in the far east area of the pond. During sampling, oily sheens were observed on the water surface after disturbing the upper layer of sediments in the pond at sampling locations SED-3, SED-4, SED-7, SED-9, SED-10, SED-11 and SED-14. A slight petroleum odor was also noted at these sampling locations.

3.6.2 SILTY SAND

Underlying the sludge in the pond is a olive gray to dark gray, medium grained silty sand unit (refer to Figure 3-5). The silty sand is dark gray in color at the north and south edges of the pond (SED-10, SED-11, SED-14, SED-15). The undulating top and bottom contacts of the silty sand layer causes the thickness of the layer to vary across the length of the pond, from less than 0.5 feet to a maximum thickness of 3 feet. Boring logs from monitoring well locations indicate that the silty sand extends across the site and the surrounding areas and is either brown or dark gray in color (refer to Figures 3-4 through 3-7).

3.6.3 SILTY CLAY

Boring logs at monitoring wells RMW-2, RMW-3 and MW-1D indicate that a silty clay unit exists at a thicknesses of approximately 2 to 3 feet. Typically, the silty clay is noted as gray in color altering to olive gray or greenish gray, possibly with gravel. Silty clay was also noted underlying the pond sediment and was generally mottled greenish gray and brown to gray and changes to gray to dark gray in the eastern locations (SED-2, SED-3, SED-14, SED-15). Sediment sampling points within the pond were terminated at the top of the clay, thus the thickness of the silty clay under the pond area is indeterminable, however, based on boring logs completed for the monitoring wells on-site, the silty clay units appears to be continuous over the site at thicknesses ranging from 2 to 3 feet (refer to Figures 3-4 through 3-7). This unit is believed to act as a confining layer between the upper water bearing fill and silty sand material and the underlying bedrock water bearing zones.

3.6.4 TILL

Till, characteristically is a dense, non-stratified deposit consisting of materials picked up by a glacier as the massive ice sheet moves over the land. Subsequently after deposition of this varied material, the material becomes well compacted by the succeeding cycles of glacier advance and retreat.

At the base of the silty clay unit a thin till layer with the presence of cobbles, gravel or sand was noted at the Ramco site. Approximately 0.5 to 1 foot of till was encountered at wells RMW-1, CW-1, and MW-1D. The brown or gray till appears to pinch-out towards the southeast as the unit was absent at well locations RMW-2 and RMW-3 (refer to Figures 3-4 through 3-7). Further north and west of the Ramco site, the thicknesses of the till units were observed to be up to 20 feet thick beneath the Altift Landfill site.

3.6.5 BEDROCK

Bedrock at the Ramco site is identified as Middle Devonian age Skaneateles and Marcellus Formations. These formations provide an alternating sequence of shale and dolomite limestone bedrock (refer to Figure 3-3). The Skaneateles Formation is predominantly composed of shale bedrock with limestone encountered at the base of the formation. The Marcellus Formation is composed of black shale and is found beneath the Skaneateles Formation.

The upper shale of the Skaneateles Formation was not encountered at the Ramco or Altift Landfill sites. Based on information from the Altift site, the Skaneateles limestone thins in a northerly direction and pinches out beneath the landfill. Further to the north at the Altift site, an escarpment exists sloping toward the north and cuts through the Marcellus shale downward into the Onondaga limestone.

The limestone base of the Skaneateles Formation was encountered at most of the wells at Ramco, with the exceptions of well RMW-1 located to the north near the Altift site. At RMW-1, silty clay overlies dark gray shale of the Marcellus Formation (refer to Figure 3-7). It is also noted on boring logs that the shale or limestone bedrock may be weathered or fragmented in areas. Depth to bedrock from ground surface is in the range of 7 to 13 feet, based on borings and test pits installed on-site.

Based on additional information obtained from the Republic Landfill to the southwest and from the Altift Landfill to the north, the Ramco site is situated on a bedrock ridge which is orientated in an east-west direction. South of the pond, at wells MW-1D, the top of the limestone bedrock is at an elevation of approximately 565 feet. Further to the east, at location RMW-3, bedrock is encountered at approximately 573 feet. In the fill area of the site, bedrock was encountered at elevations ranging from approximately 576 to 580 feet (refer to Figures 3-4 through 3-7).

3.7 SITE HYDROGEOLOGY

As described in the previous Section, the soil underlying the site is composed predominantly of fill, silty sand and silty clay. The fill and silty sand units above the silty clay comprise the primary unconfined water bearing zone for the site. Depths to water at the site are shallow at 2 to 3 feet below grade with a saturated thickness of approximately 2 to 3 feet.

Water level data has been collected from both on- and off-site monitoring wells and off-site piezometers to evaluate the flow conditions within the shallow water bearing zones for the immediate area of the Ramco site. Figures 3-9 and 3-10 illustrate groundwater elevation contours for the shallow water bearing zone during February and June 1994, respectively. Based on these water elevation data, groundwater flow patterns appear to flow radially from the Altift landfill area and at the Ramco site are influenced by the on-site pond. Table 3-1 presents the data used in preparing the groundwater contour maps for the area.

Based on water level measurements, no distinguishable vertical groundwater gradient was observed between the shallow and deep monitoring wells, MW-1S and MW-1D, completed to the south of the pond. Water level elevation differences between these two wells fluctuated by as much as 0.2 feet in both a positive and negative direction based on water level readings collected over the past two years.

Aquifer tests were conducted on monitoring wells completed on the Ramco site in March and April 1993. Rising head slug tests were performed at well locations RMW-1 and RMW-2 and falling head slug tests were performed at RMW-3 and CW-1. Slug tests are performed by monitoring the changes in the water level as it equilibrates in the well after the well had been 'slugged' by adding (or removing) a known volume of water.

All data analysis was conducted using the Bouwer and Rice Method (1976), which is applicable to both falling head and rising head aquifer tests. Aquifer testing data summary tables and test analysis are presented in Appendix D.

Two water bearing aquifers have been identified underlying the Ramco site; a shallow aquifer consisting of the material above the silty clay unit, i.e., fill and the silty sand unit and a lower bedrock aquifer. These two units are believed to be separated by the low hydraulic conductivity silty clay or till confining layers consistently identified across the site and adjacent areas. Well screens at the site were placed such that they screened the fill and upper silty sand unit and at one well, MW-1D, into the bedrock. Additionally, wells RMW-3 and CW-1 may also be partially screened within the weathered bedrock zone and the overlying silty sand, silty clay and till.

Analysis of rising head slug test data from well RMW-1 revealed the lowest hydraulic conductivity value of 3.44×10^{-5} cm/sec. The screened interval at well RMW-1 is positioned predominantly in the silty clay material. Well RMW-3 is also screened mostly in silty clay, however, the calculated hydraulic conductivity value of 1.51×10^{-3} cm/sec at this well indicates that flow may be principally through higher conductivity zones, such as the lower 1.5 feet of the screen which may be interconnected with the limestone bedrock. The result of testing at well RMW-2 show a hydraulic conductivity of 1.01×10^{-4} cm/sec, where the 5 foot screened interval is positioned approximately half into the upper silty sand layer and half in the lower silty clay layer. Finally, at well CW-1 the second highest hydraulic conductivity value of 1.25×10^{-3} cm/sec was obtained and may be due to the sand, gravel, and cobbles material identified at this location. Similarly, high permeabilities were report for well CW-1 in the Phase II Investigation report prepared for the Altift Landfill site in september 1986. Reported permeability of material at well CW-1 in this report were 1.54×10^{-2} cm/sec.

In addition to the aquifer tests, flexible wall permeability tests were performed on six undisturbed soil samples from the site. Shelby-tube soil samples were collected from the three newly installed well locations and at three locations within the pond. Materials sampled at these locations consisted of the silty clay. The range of permeabilities reported for this testing were 1.52×10^{-8} to 2.47×10^{-5} cm/sec. Most samples were less than 4×10^{-7} cm/sec and consisted of silty clay materials comprising the confining unit above bedrock. The highest permeability was reported for sample SED-2, a clay and silt and gray sand sample. This sample was noted as appearing altered by the laboratory technician performing the permeability tests and may not represent undisturbed permeabilities for this sample. Testing results for the laboratory permeability testing are presented in Appendix D.

3.8 DEMOGRAPHICS AND LAND USE

In 1990, the population in Erie County, New York was estimated to be 968,532. These residents are dispersed among 44 municipalities. The most populous municipality in Erie County is Buffalo with 328,123 residents.

Land use in the immediate vicinity of the Ramco site is used for industrial and light industry purposes. Figure 3-10 illustrates the land use patterns of the area surrounding the Ramco site. From Figure 3-10 it is evident that a significant portion of the areas to the north, south and west of the Ramco site are used for industrial purposes or are swamp-marsh areas. Much of the area has been filled, although smaller marshy areas exist in areas. Residential areas exist approximately one-third mile to the east and are interspersed with light industry areas. Two recreational areas are located within 1-mile of the site: Tifft Farm Nature Preserve approximately 1 mile to the northwest, and South Park municipal park located approximately 3/4 mile to the south of the Ramco site. These areas are not in the pathway of surface water drainage patterns from the site.

3.9 ECOLOGY

To evaluate ecological concerns related to the site, a Habitat Based Assessment (HBA) of the site and surrounding areas was performed. The HBA was performed in accordance with the NYSDEC guidance documents entitled *Fish and Wildlife Impact Analysis for Inactive Hazardous Wastes Sites, NYSDEC, Division of Fish and Wildlife, June 18, 1991.* The analysis was limited to evaluation of site

description (Step I) and contaminant-specific impact analysis (Step II) of the guidance documentation. The results of the HBA are presented in Appendix E. The following summarizes the information contained in the HBA report for the site.

The objective of this analysis was to characterize the potentially impacted habitat types in the vicinity of the site and to describe the potential environmental risks associated with the Ramco site. The focus of the risk analysis was the on-site pond.

The description of the existing environment (Appendix E, Section 2.0) includes a description of the existing habitat which may potentially be effected by constituents at the site. The discussion includes a description and illustration of the significant habitats, wetlands, and other special natural resources within a 2-mile radius of the site. As part of this description, a resource characterization is included which identifies fish and wildlife species that utilize the habitats at the site.

The habitat evaluation also includes an identification of the hazard threshold at the site (Appendix E, Section 3.0). The hazard threshold is defined as the available fish and wildlife related applicable or relevant and appropriate requirements (ARARs) and other to be considered values.

The contaminant-specific impact analysis (Appendix E, Section 4.0) used the information developed in the habitat evaluation to assess the potential risks that the constituents at the site pose to the identified fish and wildlife receptors. The analysis consists of: 1) a pathway analysis, 2) criteria-specific analysis, and 3) an analysis of toxicological effects. The assessment includes an evaluation of the potential for bioaccumulation and biomagnification, and the potential threat to upper-level food chain consumers.

Eight natural heritage cover types were identified within ½-mile of the Ramco site during this evaluation. The habitats identified all reflect the site's history as an industrialized urban site.

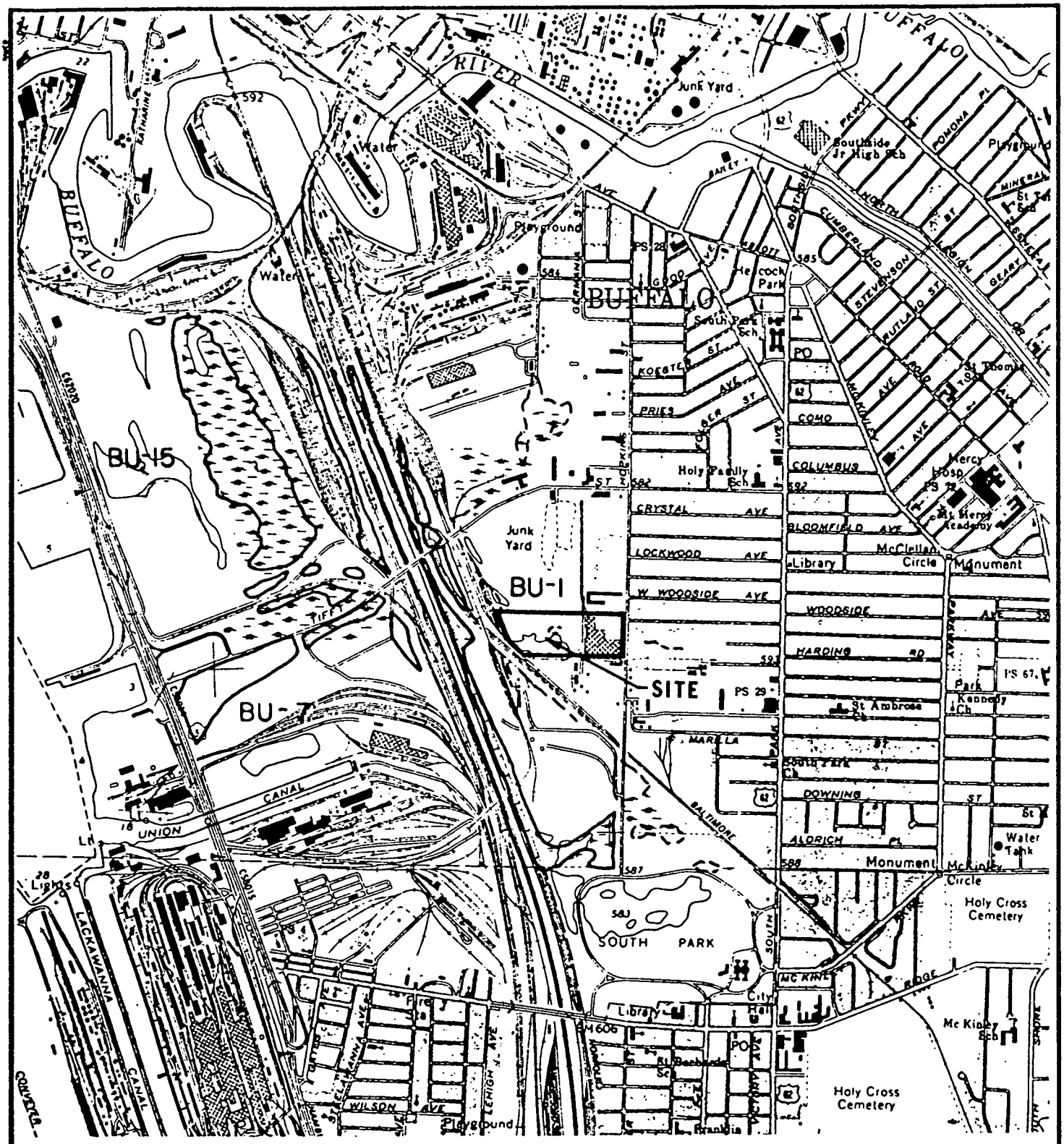
Important resources proximate to the site include State and Federally-regulated wetlands to the north and west and the Federal areas include the on-site pond, and four natural heritage program-designated significant habitats within 2-miles. The significant habitats are all greater than 1-mile from the site.

The focus of the contaminant-specific impact analysis was the on-site pond and pond sediments. The pathway analysis identified several target species including plants, invertebrates, herpetofauna, mallard, American bittern, and muskrat. Based on the habitat evaluation and contaminant-specific impact assessment, the following conclusions are offered in support of the RI.

The important contaminant exposure route associated with the Ramco site is direct uptake of pond sediments as well as consumption of plants and prey species that may consume or be in direct contact with pond sediments. No potential aquatic toxicity is expected. Estimated surface water concentrations of contaminants of concern are below levels of concern. The concentrations of contaminants of concern in the sediments are generally above the level of concern as presented in the *NYSDEC, Division of Fish and Wildlife, Sediment Criteria, December 1989*. Due to the absence of fish and benthic invertebrates in the pond and pond sediments, the biological mechanisms for mobilizing contaminants from the pond sediments are reduced, however, other exposure pathways exist and may include ingestion of sediment, consumption of calcareous algae, ingestion of plant detritus, and direct contact with the sediment.

TABLE 3-1
Ramco Steel
Summary of Water Level Data
(February and June 1994)

Well/Piez. Number	Site Location	Coordinates East	Coordinates North	Top of PVC Elevation (ft)	Water Levels - Elevation 2/9-2/21/94	Water Levels - Elevation 6/7-6/17/94
Pond	Ramco	N/A	N/A	581.80	-	579.35
CW-1	Ramco	432078.09	1035549.68	586.93	583.12	582.29
MW-1D	Ramco	431721.03	1035023.28	583.37	582.00	581.27
MW-1S	Ramco	431731.88	1034990.83	584.48	581.94	581.26
RMW-1	Ramco	431907.03	1035452.95	586.90	583.16	581.95
RMW-2	Ramco	432246.15	1035324.62	589.09	584.19	582.47
RMW-3	Ramco	432062.68	1034947.56	585.33	582.29	581.60
PZ-1	Altift	430688.55	1036605.84	583.26	581.36	580.78
PZ-2	Altift	430778.72	1036649.5	583.46	-	580.74
PZ-3	Altift	430855.05	1036675.96	584.36	-	581.03
PZ-4	Altift	430814.65	1036280.64	583.31	582.07	581.01
PZ-5	Altift	430966.94	1036320.78	585.07	-	580.98
PZ-6	Altift	431.032.35	1036384.95	584.69	-	-
PZ-7	Altift	431055.47	1035689.82	585.59	581.65	581.07
PZ-8	Altift	431181.6	1035741.43	584.60	581.66	581.06
PZ-9	Altift	431136.78	1035635.4	583.86	581.64	581.04
PZ-10	Altift	431096.87	1035579.57	584.68	581.74	581.11
PZ-11	Altift	431371.04	1035782.32	584.70	-	-
PZ-12	Altift	431483.36	1035578.19	584.11	-	-
PZ-13	Altift	431130.13	1035424.85	585.40	581.82	581.16
PZ-14	Altift	431251.4	1035421.44	584.96	-	582.09
PZ-15	Altift	431546.25	1035490.78	583.89	-	-
PZ-16	Altift	431332.79	1035227.52	585.43	581.73	581.13
PZ-17	Altift	431719.93	1034953.94	585.24	580.96	581.31
PZ-19	Altift	431352.44	1037129.55	583.56	580.84	581.74
PZ-20	Altift	432083.69	1037064.46	587.49	580.35	580.37
PZ-21	Altift	432354.08	1036998.54	586.39	581.62	581.69
PZ-22	Altift	431991.88	1036716.35	588.45	585.19	-
PZ-23	Altift	432300	1036711.28	584.98	582.72	581.88
PZ-24	Altift	431881.1	1036321.9	593.00	585.38	584.38
PZ-25	Altift	432169.72	1036305.76	586.67	582.41	581.53
PZ-26	Altift	432411.89	1036334.1	586.73	581.85	581.00
PZ-27	Altift	431978.93	1035911.18	591.80	583.42	582.87
PZ-28	Altift	432279.98	1035896.35	589.18	582.04	581.53
PZ-29	Altift	431884.41	1035625.31	589.99	584.11	582.77
PZ-30	Altift	432180	1035612.29	589.83	583.71	582.65
PZ-31	Altift	432420.79	1035603.16	585.03	582.57	581.74



LEGEND:

WETLAND BOUNDARY

0 2000 4000 FT

GRAPHIC SCALE

SOURCE:
NYSDEC WETLAND MAP DATED: 1977
UPDATED 1981,1982,1985,1986

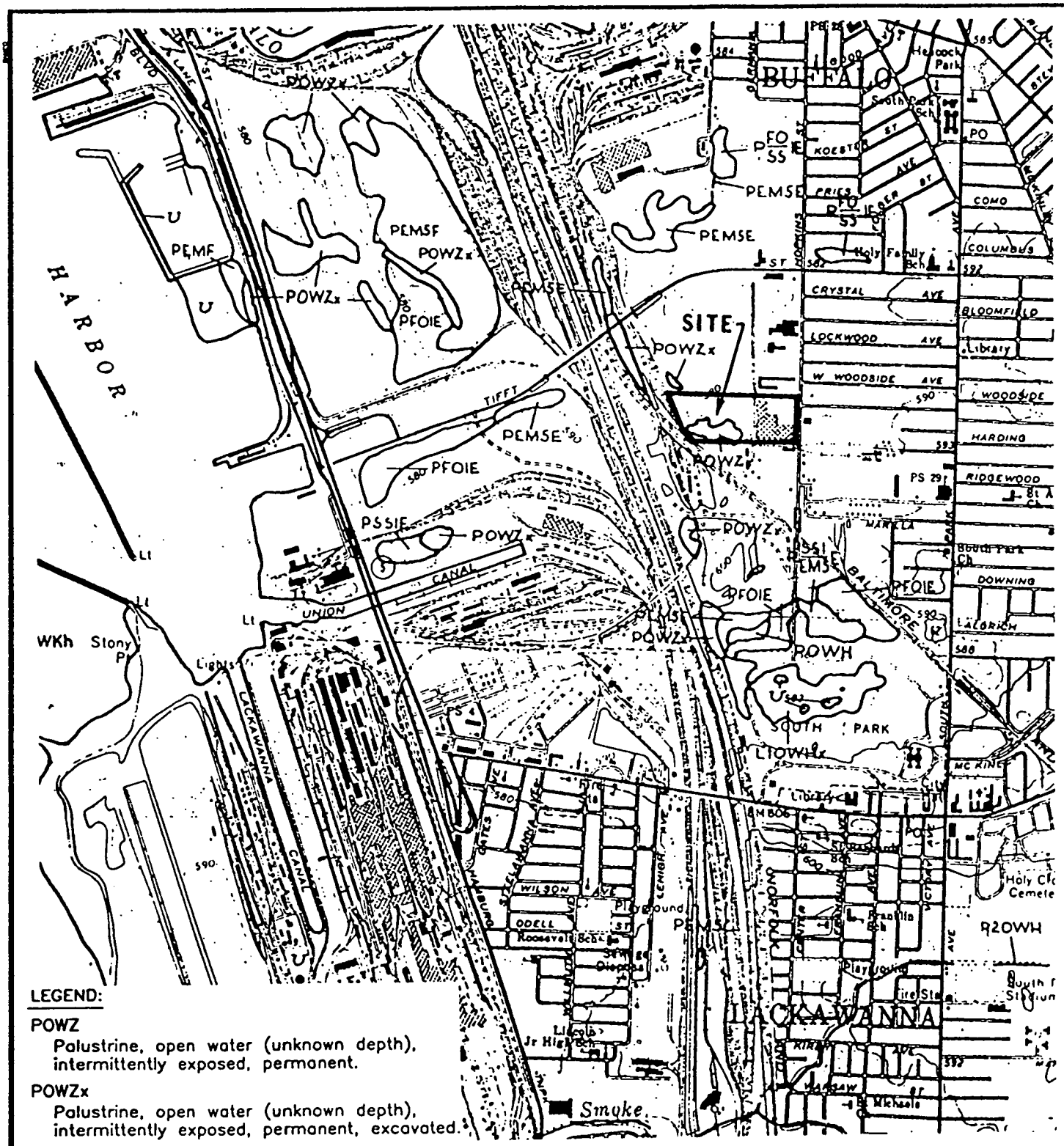
RAMCO STEEL BUFFALO, NEW YORK

NYSDEC Site No. 915046B

FIGURE 3-1

NYSDEC WETLAND AREAS

DAMES & MOORE JOB No.: 23101-001-152



LEGEND:

POWZ
Palustrine, open water (unknown depth), intermittently exposed, permanent.

POWZx
Palustrine, open water (unknown depth), intermittently exposed, permanent, excavated.

PEMSE
Palustrine, narrow-leaved persistent, intermittently, seasonal saturated.

0 2000 4000 FT

GRAPHIC SCALE

SOURCE:
NATIONAL WETLAND INVENTORY U.S. DEPT. OF THE INTERIOR
AERIAL PHOTOGRAGH DATED OCTOBER, 1978.

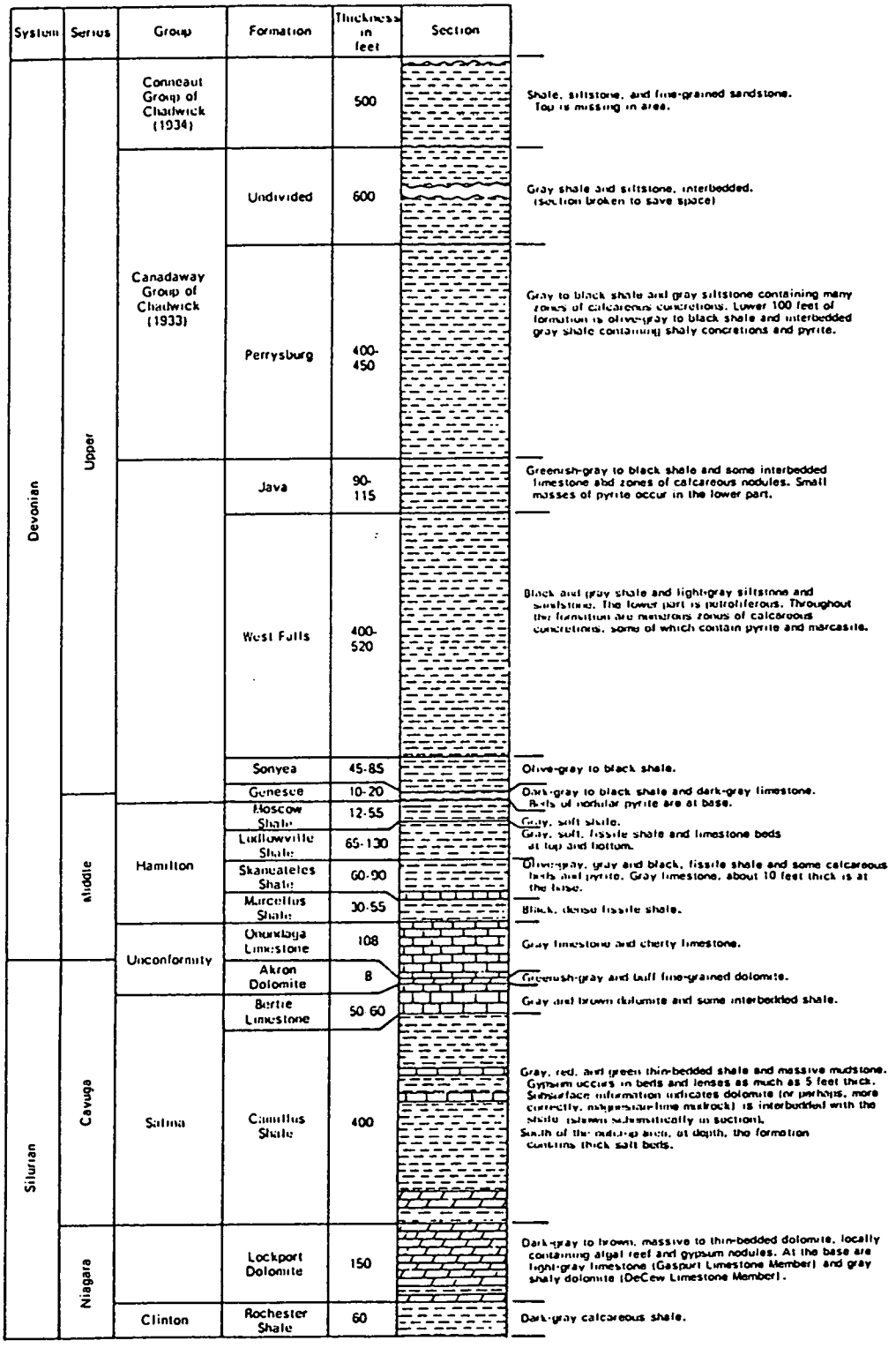
RAMCO STEEL BUFFALO, NEW YORK

NYSDEC Site No. 915046B

FIGURE 3-2

U.S. DEPARTMENT OF THE INTERIOR NATIONAL WETLAND INVENTORY

DAMES & MOORE JOB No.: 23101-001-152



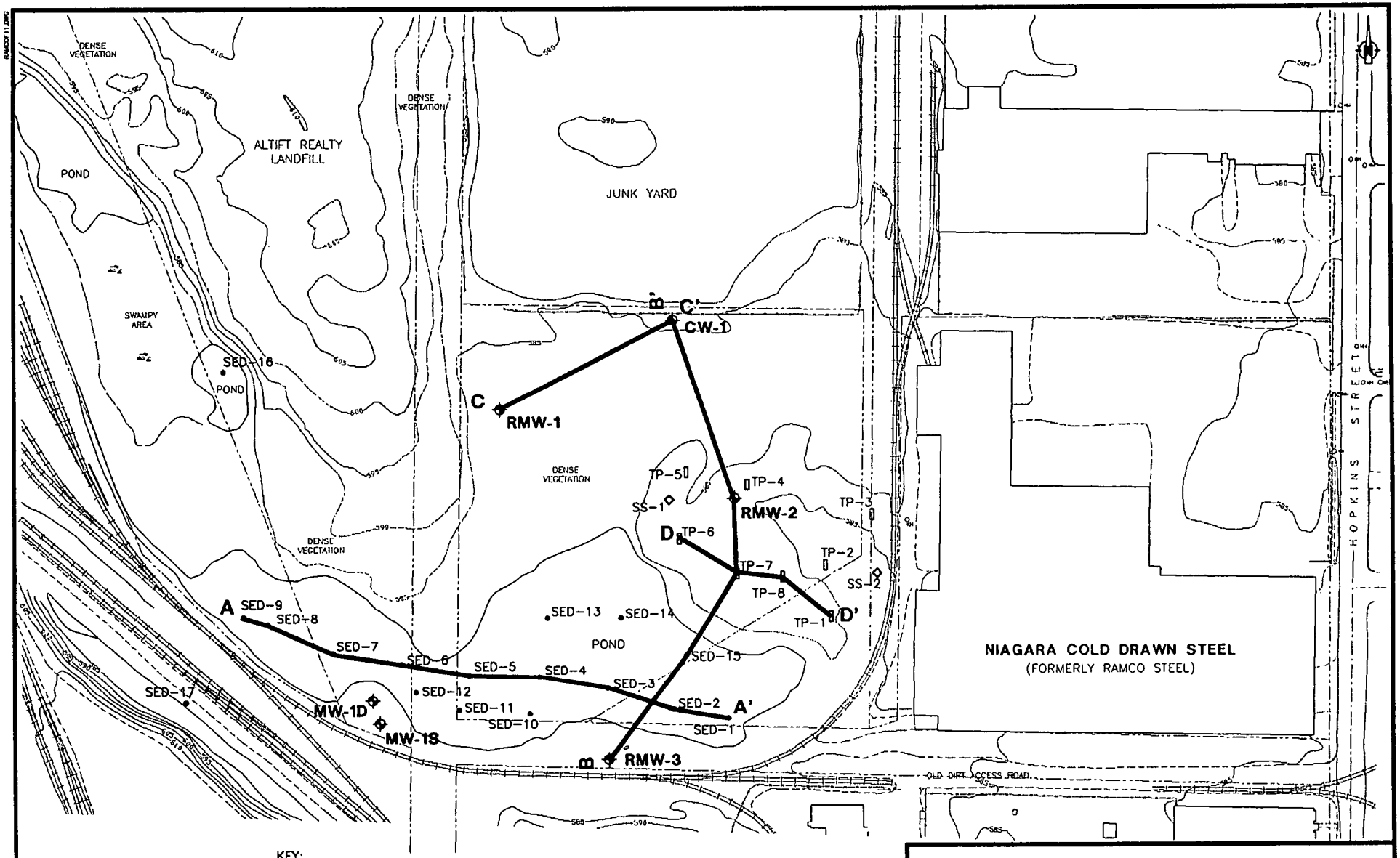
RAMCO STEEL BUFFALO, NEW YORK

NYSDEC Site No. 915046B

FIGURE 3-3

BEDROCK UNITS OF THE ERIE-NIAGARA BASIN

DAMES & MOORE JOB No.: 25848-001-152



KEY:

- RMW-1 MONITORING WELL LOCATION
- TP-5 TEST PIT LOCATION
- SS-1 SOIL SAMPLE LOCATION
- SED-10 SEDIMENT SAMPLE LOCATION
- APPROXIMATE PROPERTY BOUNDARIES

BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

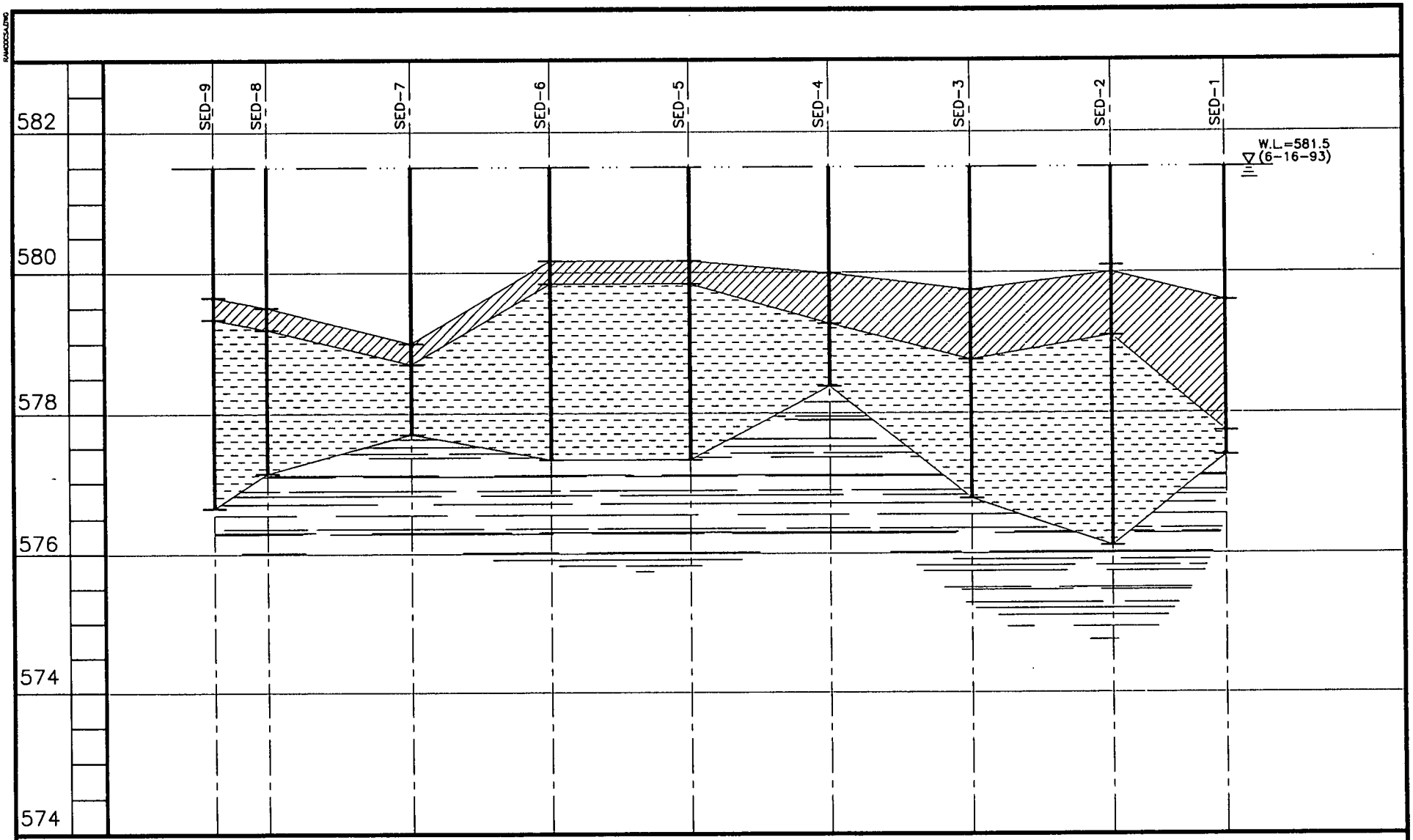
0 50 100 200 FT
GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-4

SITE CROSS SECTIONS

DAMES & MOORE JOB No.: 25848-001-152



KEY:

- BROWNISH YELLOW–DARK GRAY Silty Sand
- OLIVE GRAY Silty Sand
- GREENISH GRAY to BROWN–GRAY to DARK GRAY Silty Clay

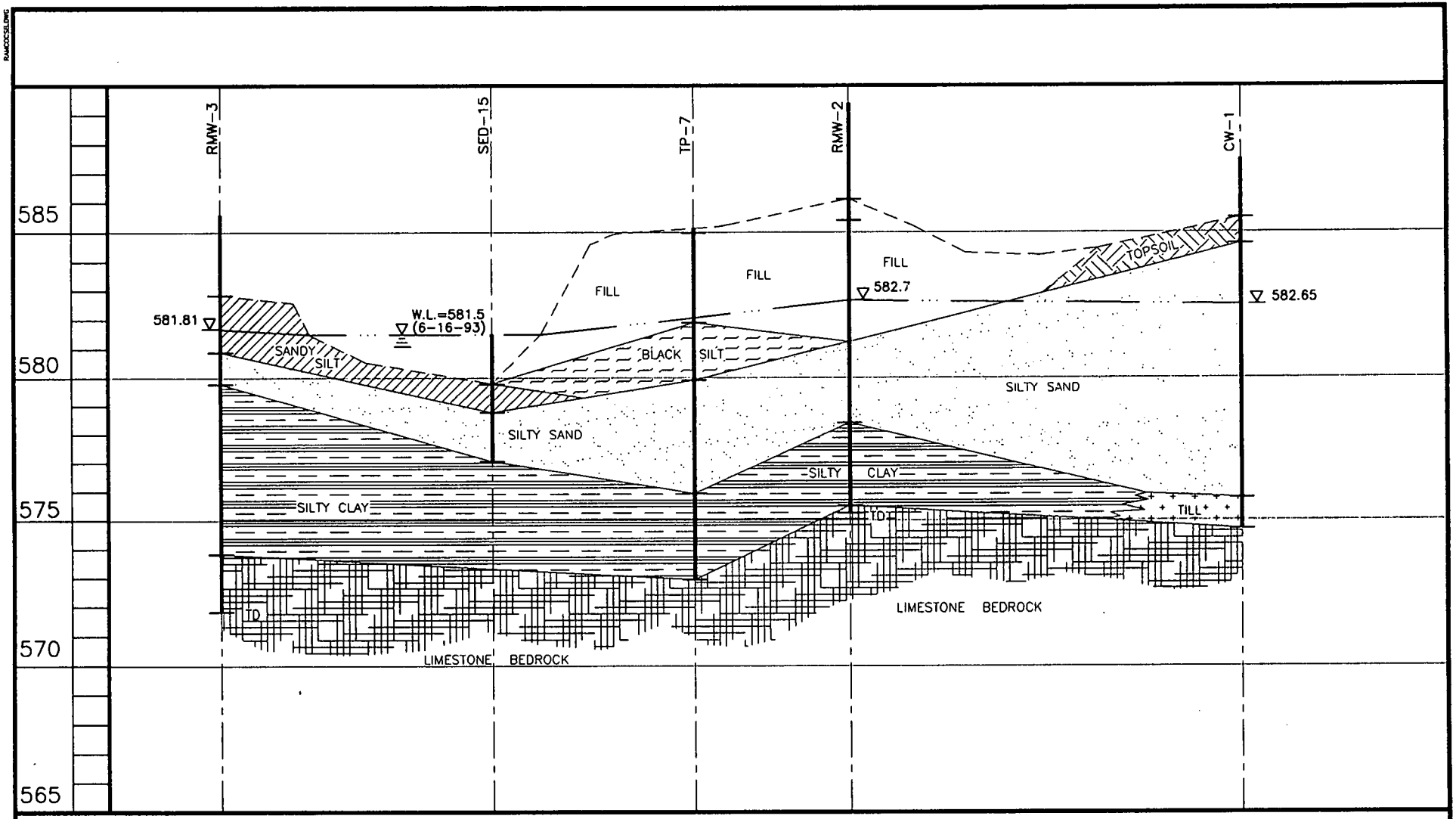
0 25 50 100 FT
HORIZONTAL SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-5

CROSS SECTION A-A'

DAMES & MOORE JOB No.: 25848-001-152



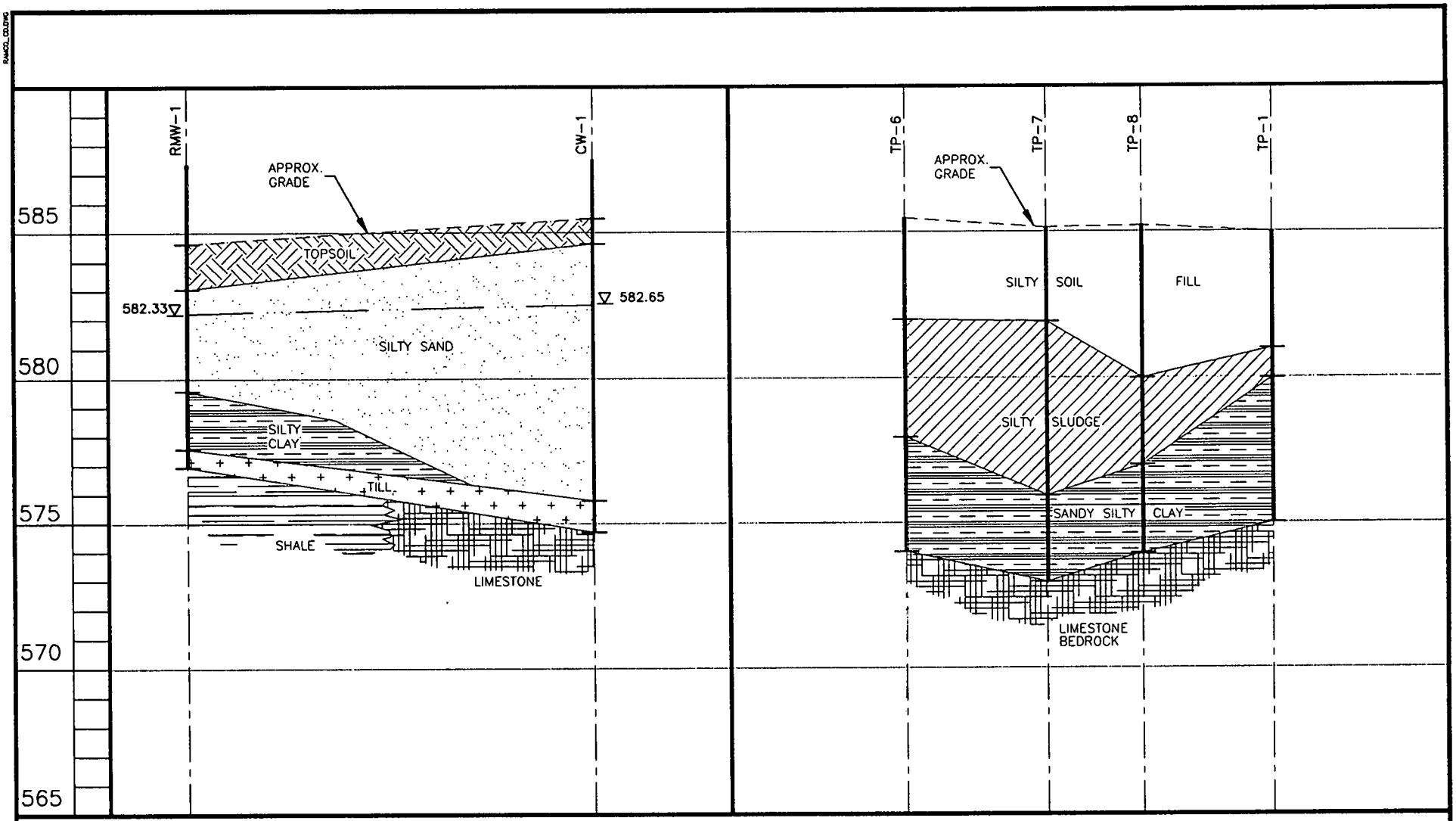
0 25 50 100 FT
HORIZONTAL SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-6

CROSS SECTION B-B'

DAMES & MOORE JOB No.: 25848-001-152



CROSS SECTION C-C'

CROSS SECTION D-D'

0 25 50 100 FT
HORIZONTAL SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-7

CROSS SECTION C-C' & D-D'

DAMES & MOORE JOB No.: 25848-001-152

KEY:

APPROXIMATE PROPOERTY BUONDARIES

BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

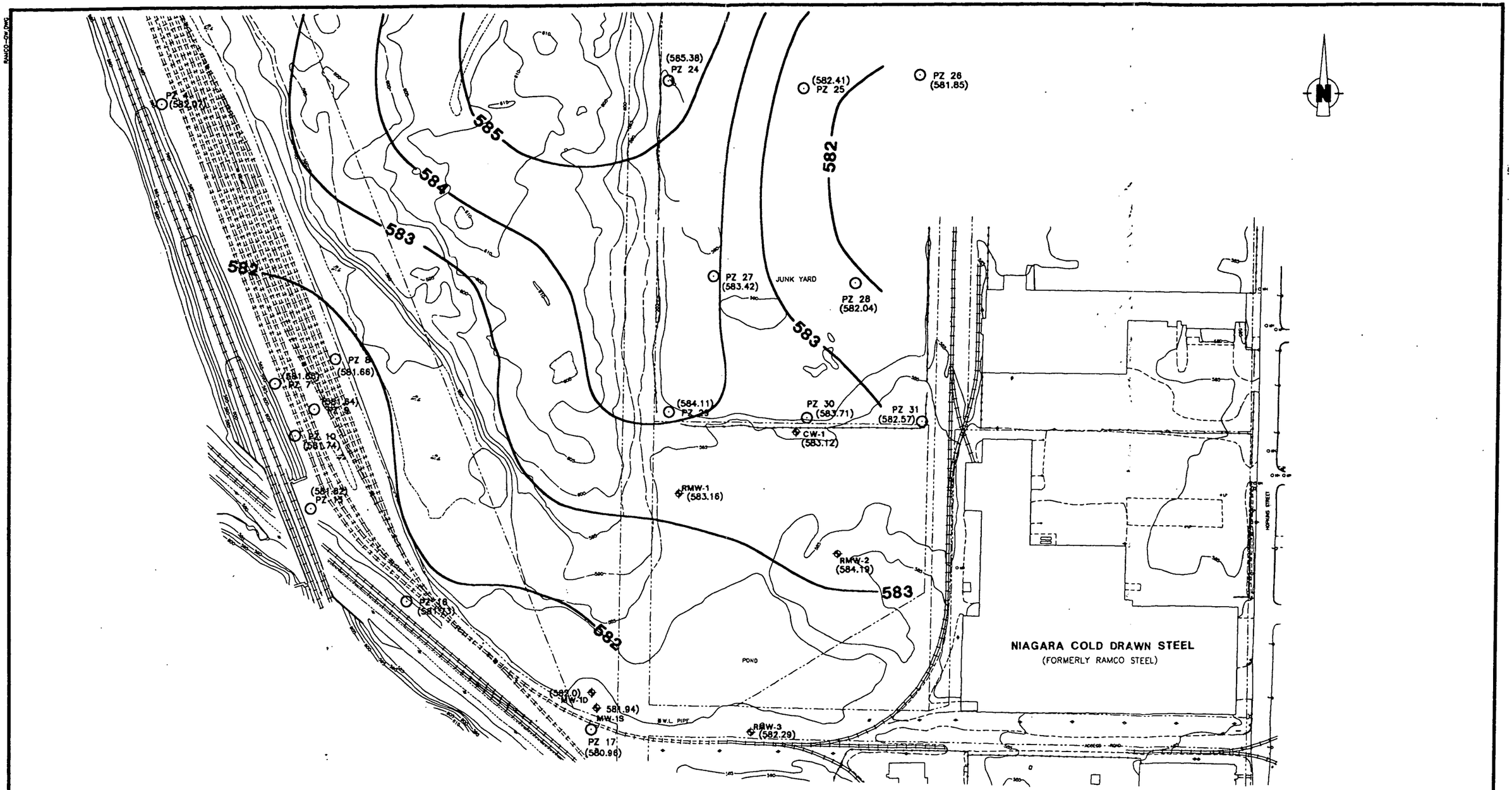
0 50 100 200 FT
GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-8

POND SLUDGE/SEDIMENT THICKNESS CONTOURS

DAMES & MOORE JOB No.: 25848-001-152



KEY:

- APPROXIMATE PROPOERTY BUONDARIES
- RMW-1 MONITORING WELL LOCATION
- PZ 31 PIEZOMETER BY OTHERS
- 582 GROUNDWATER CONTOUR AND ELEVATION

BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

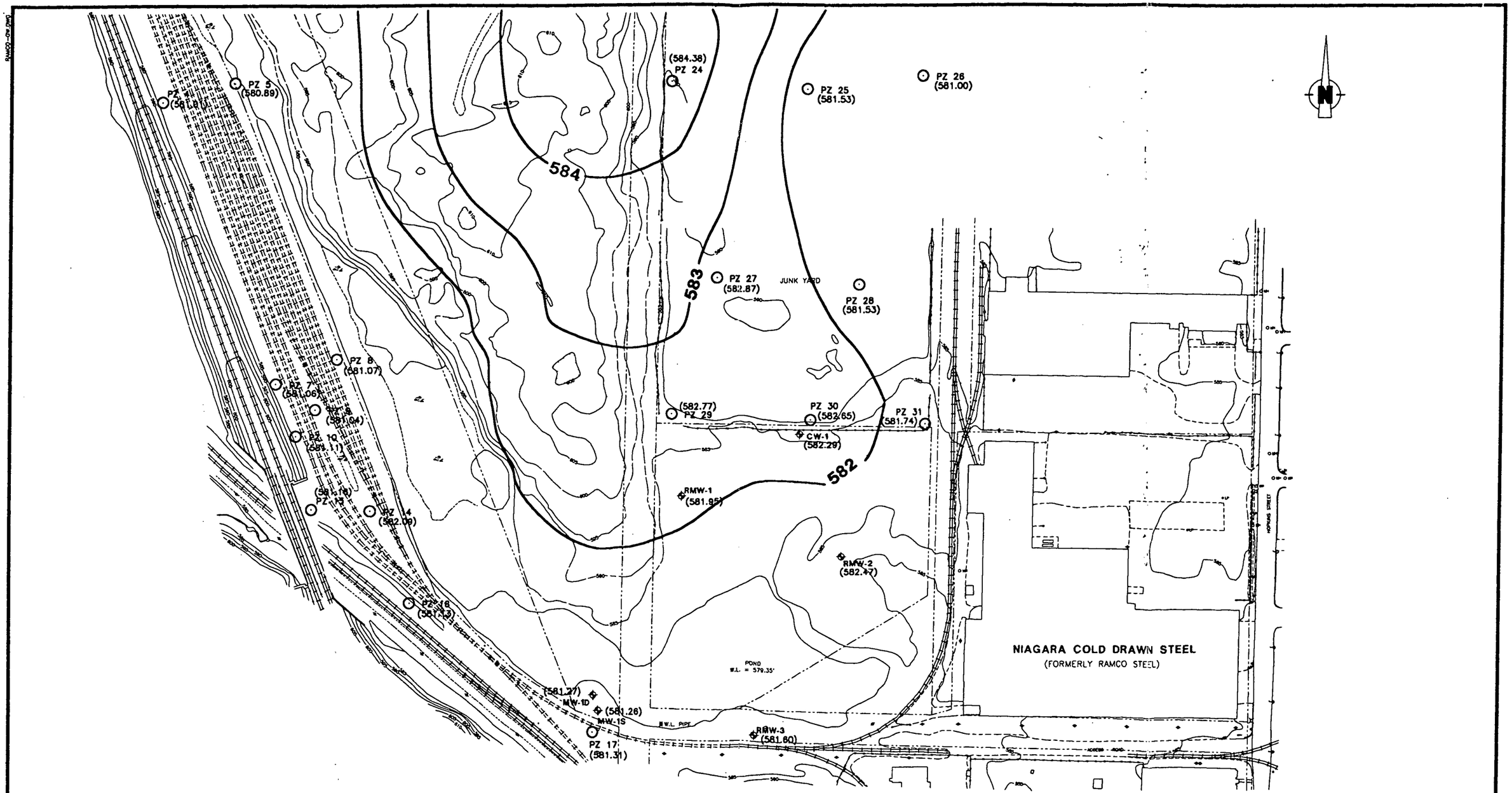
0 50 100 200 FT
GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-9

GROUNDWATER LEVELS
FEBRUARY 1994

DAMES & MOORE JOB No.: 25848-001-152



KEY:

- APPROXIMATE PROPOERTY BUONDARIES
- RMW-1 MONITORING WELL LOCATION
- PZ 31 PIEZOMETER BY OTHERS
- 582 GROUNDWATER CONTOUR AND ELEVATION

0 50 100 200 FT
GRAPHIC SCALE

BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046B

FIGURE 3-10

GROUNDWATER LEVELS JUNE 1994

DAMES & MOORE JOB No.: 25848-001-152

4.0 NATURE AND EXTENT OF CONTAMINATION

This section summarizes the nature and extent of contaminants detected at the Ramco site based on the results of the initial RI activities and the supplemental investigations complete for the site. Descriptions of site related contaminants in sediment, soil, groundwater and surface water are presented in the following subsections.

In order to evaluate the nature and extent of contaminants at the site, numerous environmental media samples were collected for laboratory analysis as discussed in Section 2.5 - Analytical Testing. Table 2-2 summarizes environmental samples collected and the laboratory analysis which was completed for each sample.

Summary Tables 4-1 through 4-7 present the results of the analytical testing for each of the environmental media: sediment, soil, groundwater, and surface water, respectively for the initial RI activities. These tables present a complete listing of metals analysis and only data for those constituents which were detected in the associated media for volatile organic, semivolatile organic, pesticide, and polychlorinated biphenyls (PCBs). Constituents which were reported at below limits of detection for all associated media samples have not been included in summary Tables 4-1 through 4-7. The results of sample analysis which was completed as part of the supplemental investigations are summarized in Tables 4-8 and 4-9 for sediment and groundwater, respectively.

4.1 SEDIMENT

To evaluate contaminant conditions in sediments associated with the on-site pond and at other off-site locations, a total of 15 sediment samples were taken from the on-site pond and two sediment samples from two adjacent site locations during the initial RI activities. An additional four sediment samples were collected from the on-site pond and pond outfall area as part of the supplemental investigations. Sediment samples were tested for volatile organic compounds, semivolatile organic compounds, pesticides, PCBs, radiological testing, oil & grease and a select subset subject to Toxicity Characteristic Leaching Procedure (TCLP) extracting and testing to determine the hazardous characteristics of the sediment. Additionally, fraction organic carbon content of the sediment was determined for use in evaluating organic constituents contained in sediment using techniques outlined in the NYSDEC Sediment Criteria guidance document.

Tables 4-1 and 4-7 summarize those constituents which were detected in sediment samples from the on-site pond. Table 4-5 summarizes constituents detected in off-site sediment sample locations. Radiological sampling results for sediment and soil samples are presented in Table 4-6. Table 4-8 summarizes analytical testing results for pond and outfall sediment samples collected during the supplemental investigations. The analytical testing results for the sediment samples are discussed in the following sections.

4.1.1 VOLATILES

Volatile organic constituents (VOCs) detected in the pond sediment included acetone, carbon disulfide, chloroform, 2-butanone (methyl ethyl ketone), 1,1,1-trichloroethane, and xylene. All at relatively low concentrations.

Acetone and 2-butanone (methyl ethyl ketone) were detected in all of the initial RI sediment samples tested at concentrations ranging from 31 to 270 μg/kg and 7 to 61 μg/kg, respectively. Acetone is prevalent in most analytical laboratory settings and is used for the preparation and decontamination of analytical equipment. As a result, it is possible that these constituents may be the result of laboratory or other introduced contamination to the sediment samples, although these constituents were not detected in quality assurance/quality control samples for the sediment analysis. Acetone and 2-butanone have been detected in previous sediment sampling from the Ramco pond, notably during the Altift RI program. Acetone and 2-butanone have also been detected in sediment samples at other Altift pond locations and in groundwater from shallow monitoring wells at the Altift site. These contaminants were not detected in surface water samples from the on-site pond.

The remaining constituents detected in the initial RI sediment samples; carbon disulfide, chloroform, 1,1,1-trichloroethane, and xylene, were all detected below quantification limits with estimated concentrations ranging from 0.1 to 5 μg/kg. For the two pond sediment samples which were collected during the supplemental investigation, chloroform was the only volatile constituent detected at estimated concentrations of 13 and 6 μg/kg. These values represent minimal contamination of sediment as they are all well below health based levels as derived by the EPA.

Five volatile organic constituents were detected in sediment samples from off-site locations and included 1,2-dichloroethene, trichloroethane, benzene, toluene, and chlorobenzene. For sediment sample SED-16 collected from the ponded area to the north near the Altift Landfill, four of the five constituents were detected; 1,2-dichloroethene, trichloroethane, benzene, and chlorobenzene. All concentrations were reported below quantification limits with estimated concentrations ranging from 8 to 13 μg/kg. Only toluene was detected in sediment sample SED-17 collected from the drainage ditch near the Republic Landfill to the west of the Ramco site at an estimated concentration of 0.8 μg/kg. Volatile organic constituents within sediment samples from the on-site pond outfall area, sediment samples RS-3 and RS-4 collected during the supplemental investigations were all reported as less than quantification limits.

4.1.2 SEMIVOLATILES

Semivolatile constituents detected in pond sediment included a limits number of parameters: naphthalene, 2-methylnapthalene, acenaphthene, fluorene, phenanthrene, benzo(a)anthracene, chrysene, and bis(2-ethylhexyl) phthalate. These constituents were detected in various sediment samples tested, with all concentrations reported below quantification limits and estimated concentrations ranged from 18 μg/kg to 350 μg/kg, with the exception of bis(2-ethylhexyl) phthalate detected at 1,100 μg/kg at location SED-12. These compounds were typically found at other on-site locations within the Fill area were oily sheens or stained soil have been found. These constituents are likely attributable to oily material contained in the pond sediment which presumably originated from lubrication and/or hydraulic oils discharged with plant wastewater to the pond location, as described in Section 3.1 - Surface Features.

At off-site locations SED-16 (Altift area) and SED-17 Republic Landfill area), a significant number of semivolatile organic constituents were detected in the sediment samples. A total of 23 constituents were detected at location SED-16 (Altift area), consisting mostly of polyaromatic hydrocarbon compounds (PAHs) ranging in concentration from 37 to 14,000 μg/kg (refer to Table 4-7). Many of

these constituents have been detected at concentrations above 5,000 μg/kg. The potential origin of the detected constituents in the Altift pond areas are not known at this time, however, the constituents and detected concentrations are similar to previous sampling results which have been reported for sediment within these same pond areas. Also, similar constituents have reportedly been detected in site soils from the Altift landfill area.

The supplemental investigations included the sampling of sediment at two locations within the pond near the pond outfall and at two locations within the outfall from the pond (refer to Section 2.1). At the pond sediment locations (RS-1 and RS-2), the total number and concentration of semivolatile constituents detected were similar to those reported for the initial RI activities. At the outfall locations (RS-3 and RS-4), a greater number of constituents were detected at relatively higher concentrations than reported in the Ramco pond sediments (refer to Table 4-8).

In reviewing the constituents detected and the relative concentrations of semivolatiles at the Ramco and Altift sites, it is apparent that the total number of constituents detected within sediment and soil at the Altift site is much greater than those detected at the Ramco site. Further, after a preliminary review of the historic analytical data for sediment at the Altift and Ramco pond areas, it appears that the reported concentration of similar constituents detected within the Ramco pond sediment are significantly lower than those detected within sediment at the downstream Altift pond areas. Based on this information, historic Ramco activities are not believed to have contributed significantly to the downstream contamination of sediment within the Altift pond areas.

Numerous semivolatile organic constituents were also identified in sediment sample SED-17 (Republic Landfill); 17 in total, of which the maximum concentration was estimated at 340 μg/kg for benzo(a)fluoranthene. The potential origin of constituents detected at this location is unknown, however they are not believed to be the result of activities at the Ramco site due to surface features which separate the two sites and the lack of potential migration routes from Ramco to the Republic Landfill area.

4.1.3 PCBS

PCBs were identified in two on-site sediment samples; SED-15 and the duplicate sample at location SED-2. Concentrations of Aroclor 1248 in the duplicate sample at SED-2 were estimated at 44 μg/kg. Levels of Aroclor 1248 at location SED-15 were reported at 810 μg/kg.

PCBs were detected in pond sediment samples collected during the supplemental investigations. Total PCB concentrations were reported at 910 and 810 μg/kg at locations RS-1 and RS-2, respectively. PCBs were not detected in sediment samples from the outfall channel of the pond, locations RS-3 and RS-4.

PCBs have been detected in soil samples from the fill area of the site, however, PCBs detected in this area were Aroclor 1242 and 1254 make-up. PCBs in the pond sediment is most likely attributed to oily matter which has been observed in pond sediment as described to in Section 4.1.2 - Semivolatiles, above.

PCBs were detected at both off-site sediment sampling locations. Reported concentrations of Aroclor 1242 in sediment samples from locations SED-16 (Altift area) and SED-17 (Republic Landfill) were 390 and 65 μg/kg, respectively. Aroclor 1260 was additionally detected at concentrations of 620 and 33 μg/kg at locations SED-16 and SED-17, respectively.

4.1.4 METALS

Metals concentrations in pond sediment were evaluated against two background criteria: upper background limits based on limited site data, and reported upper limits of background concentrations in sediment presented in the NYSDEC, Sediment Criteria Guidance Document, December 1989.

The first criteria used upper background limits of soils data collected on-site. Site background data were established using data from soils samples collected from test pit locations #2 and #6. Soil samples TP-2-1 and TP-6-1 from these locations were used as the basis for establishing background metals concentrations in soils. Both of these samples are comprised of the silty clay material which underlies the pond and presumably represents the original unaltered pond bottom prior to the deposition of sediment material. For each constituent, data from these points were used to calculate the mean background concentration. Standard deviations were calculated and upper background limits for each contaminant were established by adding two times the standard deviation to the corresponding mean background concentration. This approach was selected for establishing upper background concentration limits based on a 95 percent probability that concentrations above these limits represent elevated concentrations rather than background concentrations.

The second criteria used for evaluation were those values reported for upper limits of background concentrations presented in the Sediment Criteria Guidance Document, December 1989, NYSDEC, Division of Fish and Wildlife. These values represent the upper 95 percent confidence limit of pre-industrial concentrations in Great Lakes sediment. Table 4-8 presents a summary of the background concentrations for metals used in the evaluation of pond sediment.

Based on an evaluation of concentrations of metals in the sediment using the two background criteria provided above, it is apparent that a majority of the metals identified in the sediment are above background levels. As the pond has historically been used for the discharge of process wastewater from steel processing operations, these conditions are not unexpected.

In review of the sediment data, the following is noted. Average arsenic concentrations in sediment of 24 μg/kg exceeded background concentrations by a factor of two. Average barium concentrations were also elevated above background concentrations. The average concentration for chromium, hexavalent chromium and lead in sediment exceeded the site background levels by as much as 10 times with chromium and lead levels also exceeding the reported Great Lakes upper background limit. Average metals concentrations for copper, iron, manganese were also slightly above the Great Lakes sediment concentrations. Nickel and zinc concentrations were both below the Great lakes upper background limits. Mercury results for a majority of pond sediment samples were reported at below detection limits with the exception of two samples, SED-13 and SED-14 which had reported levels of 3.9 μg/kg and 0.29 μg/kg, respectively. Mercury concentrations of 3.9 μg/kg exceed the Great Lakes background concentrations as well as those of site background.

mg/kg

In general, analytical data from sediment samples collected as part of the supplemental investigation activities were similar to those reported for the initial RI activities.

4.1.5 PESTICIDES

Pesticide contaminants have been detected in sediment, soil, and groundwater at the Ramco site. No pesticides were detected above quantification limits in surface water samples from the on-site pond or at other off-site surface water locations.

Pesticides which were detected in pond sediments included beta-BHC, dieldrin, 4,4-DDE, endrin, endosulfan II, 4,4-DDD, 4,4-DDT and endrin ketone. The sediment sample collected at location SED-15 contained the majority of detected constituents and generally, at the highest concentrations. Of the detected pesticide compounds, 4,4-DDD was the most prevalent compound detected at concentrations ranging from 6.3 μg/kg to 120 μg/kg.

The detection of pesticides is widespread among the various media on-site and also in other off-site areas. Based on the historic marshy conditions of this area and thus, the large areas which would promote the breading of insects, it is likely that the occurrence of these pesticides may be attributable to past insecticide spraying in the immediate area and other off-site surrounding areas.

4.1.6 TCLP RESULTS

A total of five sediment samples from the on-site pond were collected and submitted for analytical testing using the Toxicity Characteristic Leaching Procedure (TCLP) and subsequent analysis to evaluate the hazardous characteristics of the sediment. Table 4-7 presents the results of TCLP testing on sediment and soil samples from the site.

On average, the pH of the pond sediment was 5.7 standard units (su) (Table 4-1). Pond sediment pH below a neutral value of 7.0 is not unexpected due to the historical use of the pond for the discharge of acid wastewater from plant operations. Although surface water pH in the pond has been neutralized, the interstitial water contained in pond sediment remains in an acidic condition and is likely to remain slightly acidic until dilution and neutralization of interstitial water occurs.

TCLP data for metals analysis on pond sediment shows that although several constituents leached from the material, all concentrations are below regulatory limits which would defined the materials as hazardous by characteristic. All volatile organic, semivolatile and pesticide constituents were not detected above quantification limits, with the exception of chloroform and trichloroethene. Quantifiable levels of these two constituents were detected in sediment at location SED-12 at estimated concentrations of 24 μg/l and 9 μg/l, respectively. Based on this TCLP data, pond sediment does not exhibit characteristics of hazardous material and would not be classified as hazardous by characteristic.

4.1.7 RADIOLOGICAL

Sediment samples submitted for analytical laboratory testing were also submitted for radiological testing as presented in Section 2.6 - Radiological Testing. The results of the radiological testing indicate that all reported uranium 238 (U-238) activities are less than the minimal detectable activity

(MDA) for the counting system (Table 4-6). The highest MDA for the U-238 analysis was 2.52 picocuries/gram (pCi/g) in sediment sample SED-4. Results of thorium 232 (Th-232) analysis on sediment samples were reported at activities less than 0.52 $\pm$ 0.10 pCi/g, the highest activity of all sediment samples found at locations SED-3. All reported levels are below the action level of 35 pCi/g for depleted uranium and 10 pCi/g for natural thorium set by the Nuclear Regulatory Commission.

4.2 SOIL

Soil samples were primarily collected from the fill area of the site during the course of test pit installations and also included soil samples from soil borings completed for monitoring well installation. Soil samples were collected to evaluate contaminant conditions in the fill area and other areas of the site and included the collection of 14 soil samples from test pit locations and one soil sample from each of the three newly installed monitoring well locations. Soil samples were tested for volatile organic compounds, semivolatile organic compounds, pesticides, PCBs, and a select subset subject to Toxicity Characteristic Leaching Procedure (TCLP) extracting and testing to determine the hazardous characteristics of the material. Table 4-2 summarizes those constituents which were detected in soil samples from the Ramco site. Analytical testing results for the soil samples are discussed in the following sections.

4.2.1 VOLATILES

Volatile organic constituents detected in the soils included methylene chloride, acetone, 2-butanone (methyl ethyl ketone), tetrachloroethane, toluene, ethyl benzene, and xylene. All detected concentration of volatile organics were at similarly low concentrations, with many of the reported values estimated at below quantification limits.

Methylene chloride was detected in associated laboratory QA/QC samples for soil and is also a common laboratory contaminant. Acetone and 2-butanone (methyl ethyl ketone) were detected in a majority of soil samples tested at concentrations ranging from 28 μg/kg to 430 μg/kg and 5 μg/kg to 110 μg/kg, respectively. Acetone, as stated earlier is prevalent in most analytical laboratory settings and is typically used for the preparation and decontamination of analytical equipment. As a result, it is possible that these constituents may be the result of laboratory or other introduced contamination to the soil samples. These constituents are not thought to be of a major concern related to the site, due to the relatively low concentrations detected.

Tetrachloroethane was detected in only one sample, sample TP-4-1 from test pit location #4, at an estimated concentration of 2 μg/kg. For toluene, ethyl benzene, and xylene all reported values were reported below quantification limits with estimated concentrations ranging from 0.4 μg/kg to 6 μg/kg. The dispersed detection and relatively low reported concentration of these constituents within the soil samples does not provide for a clear understanding as to the origin of these contaminants and it is possible that the detection of some constituents may be attributable to introduced contamination to the soil samples following sample collection. In evaluation of this, analytical results of groundwater samples identified many of these same constituents in laboratory QA/QC samples during analysis (refer to Section 4.3).

4.2.2 SEMIVOLATILES

The detection of semivolatile organic constituents in soil samples from test pit locations is associated with the visual identification of oily sheens and stained soils at these same locations. Test pit locations #2, #4, and #7 all contained oily material with heavy sheens and oil stained soils in the fill material. The primary group of semivolatile organics detected at these same locations were PAHs. Identified constituents were most prevalent in soil sample TP-4-2 from test pit location #4, an area in which oily material was observed.

Semivolatile constituents detected in surface soil sample SS-2 collected from near the railroad tracks close to the building included naphthalene, 2-methylnaphthalene and phenanthrene with estimated concentrations of 55 μg/kg, 62 μg/kg, and 100 μg/kg, respectively. Sample SS-1 was collected from solidified mill scale piles located along the western boundary of the fill area. Phenol was the only constituent detected in this sample at a concentration of 470 μg/kg and is also the only soil sampling location in which phenols were detected.

4.2.3 PCBS

As with the detection of semivolatile constituents, PCBs were detected only at those locations in which visually identifiable oily sheens or stained soil was observed, i.e., test pit locations #2, #4, and #7. The highest concentrations of PCBs were detected in sample TP-7-2 from test pit location #7. Concentrations of aroclor 1242 and aroclor 1254 were reported at 700 μg/kg and 660 μg/kg, respectively. In associated sample TP-7-1, aroclor 1254 concentrations were reported at 140 μg/kg. Aroclor 1254 was detected in samples TP-4-2 from test pit location #4 at a concentration of 170 μg/kg. PCBs were not detected in any of the remaining soil samples above detection limits.

The PCBs detected in soil samples from these locations are believed to be concentrated in the oily wastes which were observed at these locations and most likely originated from lubricating oils and/or hydraulic oils used in past plant operations.

4.2.4 METALS

Slag fill and fill materials originating from steel making and/or steel processing operations are characteristic of fill material used throughout the area surrounding the Ramco site and also at the Ramco site. At various unknown times, slag fill and other construction debris have been disposed in the fill area for the purpose of leveling and filling the marshy, low lying area of the site. Slag fill has also been used extensively as railroad ballast for railroad tracks surrounding the site. As a result, the composition of the fill material at the site is heterogeneous and consists, to a large extent, of slag, cinder material and construction debris.

The results of metals analysis on soil samples collected in the fill area and other areas of the site provided a wide degree of fluctuation in specific metal concentrations. The following metals were not detected above quantification limits in any of the soil samples; beryllium, cadmium, mercury, selenium, and thallium. Cyanide was also not detected above quantification limits in any soil samples.

As with the comparison of analytical results for sediment samples to the results obtained from designated site background sample locations TP-2-1 and TP-6-2, the results of site soil analysis were evaluated using the upper limit of background concentrations calculated from the results at these two locations. The following metals were identified above site background levels for a majority of soil samples; arsenic, barium, chromium, lead and zinc. It should be noted that samples used to represent site background conditions are believed to be representative of native soils underlaying the site and would not necessary represent the metals content of slag materials deposited at the site. It is expected that elevated metals concentrations would be associated with slag/cinder materials at the site. As discussed in Section 4.2.6, concentrations of metals in leachable fractions from tested soils are minimal in comparison to the total metals concentrations.

4.2.5 PESTICIDES

Pesticides were detected primarily in sample SS-1 from the mill scale piles located in the fill area. This sample contained concentrations of the following pesticides; beta-BHC, dieldrin, 4,4-DDE, endrin, endosulfan II, and alpha-chlordane. The highest reported concentration was for endrin at a concentration of 10 μg/kg. For other soil samples, endosulfan II was detected in sample surface soil SS-2 at an estimated concentration of 1.2 μg/kg and beta-BHC was detect in soil sample TP-4-2 at an estimated concentration of 1.7 μg/kg.

It is unlikely that pesticides were associated with the original mill scale material disposed of in the fill area and most likely originated on-site as a result of insecticide spaying in the area. As discussed in the previous Section, pesticides have been widely detected in other media and the identified concentrations are most likely residual or background levels for the area resulting from past maintenance activities involving spraying of the various pesticide materials.

4.2.6 TCLP RESULTS

Two soil samples, TP-4-2 and TP-7-1, were submitted for TCLP extraction and subsequent analysis for metals to evaluate the leaching potential of metals from the associated fill material. From these two samples, barium and lead were the only metals detected in the leachable fraction of the material. Concentrations of barium in samples TP-4-2 and TP-7-1 were 901 μg/l and 1,190 μg/l, both well below hazardous characteristic levels for barium. Lead levels in the leachable extract for the samples were 4 μg/l for sample TP-4-2 and 64.2 μg/l for sample TP-7-1, also well below hazardous characteristic levels for lead. Based on these results, the fill material in these areas would not be classified as hazardous by characteristic for metals.

4.2.7 RADIOLOGICAL

Soil samples submitted for analytical laboratory testing were submitted for radiological testing as presented in Section 2.6 - Radiological Testing. The results of the radiological testing indicate that all reported uranium 238 (U-238) activities are less than the minimal detectable activity (MDA) for the counting system (Table 4-6). The highest MDA for the U-238 analysis was 1.87 pCi/g in the soil sample from test pit #6 (sample I.D. TP-6). Results of thorium 232 (Th-232) analysis on soil samples were reported at activities less than 0.54 $\pm$ 0.07 pCi/g, the highest activity of all soil samples found at test pit #7 (sample I.D TP-7). All reported levels are below the action level of 35 pCi/g for depleted uranium and 10 pCi/g for natural thorium set by the Nuclear Regulatory Commission.

4.3 GROUNDWATER

Groundwater quality at the Ramco site has been monitored through the sampling of six on-site monitoring wells during two separate sampling periods: the initial RI activities and the supplemental investigations. Five of the site monitoring wells are completed as shallow wells within the unconsolidated material above bedrock and the remaining well MW-1D is completed as a bedrock well. As discussed in Section 3.7 - Site Hydrology, wells RMW-3 and CW-1 may also intersect the weathered bedrock zone below the unconsolidated material. The results of analytical testing of groundwater samples from these wells during the initial RI activities and the supplemental investigations are presented in Table 4-3 and 4-9, respectively, and are discussed in the following subsections.

4.3.1 VOLATILES

Volatile organic constituents detected in groundwater samples collected during the initial RI sampling activities included; acetone, 1,1-dichloroethane, toluene, chlorobenzene, ethyl benzene, and xylene. Of these constituents, four were detected in laboratory QA/QC samples; toluene, chlorobenzene, ethyl benzene, and xylene. The levels of these four constituents detected in the groundwater samples are presumed to be representative of laboratory or other introduced contaminants. The concentration of these constituents ranged from 0.4 to 5 μg/l. 1,1-dichloroethane was detected in groundwater at only one well, RMW-1, at an estimated concentration of 1 μg/l.

Constituents detected in groundwater samples collected during the supplemental investigations included, carbon disulfide, chlorobenzene, 1,1-dichloroethane, and toluene. Of these, chlorobenzene and toluene were detected in laboratory QA/QC samples. 1,1-dichloroethane was again detected in well RMW-1 with an estimated concentration of 0.9 μg/l. Due to the proximity of this well to the Altift landfill site, the detected contaminant may be a result of the migration of contaminated groundwater from the adjacent site. All other constituents detected were at concentrations below NYS class "GA" standards for groundwater.

4.3.2 SEMIVOLATILES

During the results of the initial RI activities, phenol was report at a concentration of 25 μg/l in groundwater at well location RMW-3, above the NYS groundwater standard of 1 μg/l for class "GA" groundwater. Other compounds detected in groundwater samples from the initial RI sampling included benzoic acid, di-n-butyl phthalate, and butyl benzyl phthalate which were found in a majority of the samples at relative low concentrations, i.e., less than 2 μg/L. These compounds are frequently detected as laboratory contaminants and the detection of these compounds at the reported levels are not thought to be a major concern for the site.

Additional semivolatile compounds were identified from the initial RI sampling activities from locations RMW-1 and RMW-3 including: 4-methylphenol, naphthalene, 2-methylnaphthalene, diethyl phthalate, phenanthrene, benzo(a)anthracene, and benzo(a)fluoranthrene. With the exception of benzo(a)anthracene and benzo(a)fluoranthrene detected at well RMW-1, all estimated concentration of

the above mentioned semivolatile constituents were reported below NYS groundwater standards for class "GA" groundwater for the individual constituents. As a result of the initially detected semivolatile constituents, additional groundwater samples were collected during the supplemental investigations to confirm this data.

Semivolatile organic constituents were not detected in any of the groundwater samples collected from on-site wells during the supplemental investigations. As a result, semivolatile organics are not believed to be of concern for the site.

4.3.3 PCBS

PCBs were not detected in any of the groundwater samples collected from on-site monitoring wells.

4.3.4 METALS

The results of metals analysis on unfiltered groundwater samples collected from the on-site wells during the initial RI activities indicated a wide fluctuation in metals concentrations (Table 4-3). As these groundwater samples were not filtered prior to analysis, the wide variation was thought to be attributable to the varying content of suspended solids in the groundwater samples. Additionally, discrepancies were noted in analytical results obtained on unfiltered samples collected during the initial RI activities for the Ramco site and data from the recent Altift Landfill RI. For this reason, both unfiltered and filtered groundwater samples were collected for metals analysis during the supplemental investigations.

The results of both unfiltered (total) and filtered (dissolved) groundwater sample analyses are presented in Table 4-9. Based on the analysis of unfiltered samples, metals which exceeded NYS class "GA" groundwater standards included; iron, lead, magnesium, manganese, sodium and zinc. Lead was only above NYS standards at two wells: RMW-1 (43 μg/l) and MW-1S (150 μg/l). Zinc was above NYS standards at one well, RMW-1, at a concentration of 360 μg/l. Iron, magnesium, manganese, and sodium exceeded NYS standards at a majority of the wells, however, the reported concentrations may be representative of background groundwater quality conditions for the area.

The analysis of filtered groundwater samples indicated a general reduction in all metals concentrations in relation to unfiltered samples from the same well location, with exception of iron, magnesium, manganese and sodium concentrations at a number of well locations. Concentrations of dissolved iron, magnesium, manganese and sodium were also above NYS standards at several wells. Since the detected metals constituents may be representative of background water quality conditions, the occurrence of these metals within groundwater is not thought to be related to site activities.

4.3.5 PESTICIDES

Pesticide contaminants were detected in groundwater at only one well, RMW-1, during the initial RI activities and the supplemental investigation sampling. Heptachlor epoxide and dieldrin were detected initially and 4,4'-DDE was detected during the supplemental investigations. The relative levels of heptachlor epoxide and dieldrin were estimated at 0.038 and 0.024 μg/l, respectively. The estimated concentration of 4,4'-DDE was 0.025 μg/l. Due to the marshy site conditions in the area of well RMW-1 and the relative shallow groundwater table at this location, it is presumed that the detected

pesticides are the result of residual contamination from historic insecticide spraying in the area or may be the result of contaminant migration from the Altift landfill site. The detected concentrations are above the NYS groundwater standard of "non-detect" (less than 0.01 μg/l).

4.4 SURFACE WATER

As described in Section 2.3 - Surface Water Sampling, surface water samples were collected from three locations within the pond and at two off-site locations near the Altift and Republic Steel Landfill areas. The results of analytical testing of surface water samples from these areas are presented in Table 4-4 and discussed in the following subsections.

4.4.1 VOLATILES

The only reported volatile organic constituents detected in surface water collected from the on-site pond were toluene and chlorobenzene, constituents which were also detected in laboratory QA/QC blank samples. The resulting detected concentrations for these constituents are suspect and are most likely the result of laboratory or some other introduced contamination following sample collection. The reported concentrations for both the toluene and chlorobenzene were estimated at or below 1 μg/l for all three pond samples.

Toluene and chlorobenzene were also detected in surface water samples from the two off-site locations in addition to the detection of styrene and xylene in sample SW-4 from the Altift pond area. As mentioned above, detected constituents were identified in laboratory blank samples and presumably resulted from laboratory or some other introduced contamination following sample collection and are not necessarily representative of actual site contaminant conditions. Two other contaminants, trichloroethene and benzene were detected in surface water sample SW-4 from the Altift pond area. The concentrations were estimated at 1 μg/l and 2 μg/l, respectively, for trichloroethene and benzene. The estimated benzene concentration is above NYS surface water standards for class "A, A-S, AA, AA-S" surface water bodies.

4.4.2 SEMIVOLATILES

For surface water samples collected from the on-site pond, no semivolatile organic constituents were detected above quantification limits. Three compounds, benzoic acid, di-n-butyl phthalate, and butyl benzyl phthalate were detected as an estimated value, below quantification limits, in all surface water samples from the pond. The estimated concentrations ranged from 0.5 μg/l to 8 μg/l for all constituents. Di-n-butyl phthalate and butyl benzyl phthalate are commonly used plasticizing agents and are frequently identified as a laboratory contaminant. The detection of these constituents are likely the result of laboratory contamination or other contamination following sample collection and are not thought to be a major site concern.

Additional semivolatile constituents were detected in surface water samples from off-site locations. Phenol was detected at an estimated concentration of 3 μg/l in the surface water sample SW-5 collected from the drainage ditch near the Republic Landfill. At location SW-4 from the Altift pond area, 1,3-dichlorobenzene, 1,4-dichlorobenzene, nitrobenzene, naphthalene, 4-chloroaniline, 2-chloronaphthalene, 2-nitroaniline, and acenaphthelene were detected, many were reported at

concentration below quantification limits. Of significance, nitrobenzene was reported at a concentration of 22 μg/l, slightly below the NYS surface water quality standard of 30 μg/l for class "A, A-S, AA, AA-S" surface water bodies.

4.4.3 PCBS

PCBs were not reported above detection limits for any of the surface water samples collected from the on-site pond or at off-site locations.

4.4.4 METALS

Significant concentrations of metals in surface water from the on-site pond were not identified in any of the three samples from the pond, with a majority of the metals constituents reported at below quantification limits. Iron, magnesium, and manganese were reported at concentrations above NYS surface water standards (refer to Table 4-4). The reported levels are not unexpected due to the historic conditions of the pond and the similar levels of these metals identified in groundwater and are likely represent natural conditions.

Surface water quality at location SW-4 from the Altift pond area were similar to that reported for water quality of the on-site pond water, although surface water sample SW-5 from the Republic Landfill area contained much higher concentrations of aluminum, arsenic, barium, chromium, lead and zinc. The elevated concentrations of these constituents may be the result of discharges from the Republic Landfill area, however, this can not be concluded based on this limited information alone.

4.4.5 PESTICIDES

Pesticides were not reported above detection limits for any of the surface water samples collected from the on-site pond or at off-site locations.

4.5 AIR

To evaluate off-site impacts resulting from emission of site contaminants via air pathways, an air impact evaluation was completed. The air impact evaluation was undertaken on what is considered to be the pathway which would represent the greatest potential for emissions from the site, as a conservative evaluation. For the Ramco site, emission of contaminants from surface soil in the fill area of the site were evaluated in the air pathways analysis.

For the analysis, three criteria were used for comparison of calculated emission rates and acceptable emission levels. These criteria are; emission rate, ambient air concentrations and risk to human health. Emission rates from soil were calculated based on established volatilization models and on calculated diffusion coefficients and volatilization factors. The results of the calculations were prepared as part of the baseline risk assessment work for the site and are presented in Appendix F. Risk assessment calculations are further discussed in Section 6.0 - Baseline Risk Evaluation.

Emission rate criteria are established by 6 NYCRR Part 212 - General Process Emission Sources. If emission rates for an "A-rated" contaminant exceed one pound per hour, remediation is required to control the source. Based on the calculated emission rates at the Ramco site, rates of emission would be expected to be below one pound per hour.

If annual Ambient Guideline Concentrations (AGCs) present in the NYSDEC Air Guide-1 guidance document are exceeded by site values as applied to the boundary of the site, remediation would be required for air quality. Based on the emission rates calculated for the site, AGCs for site related contaminants would not be exceeded.

An assessment of the human health risk as applied to the specific nature of the site is presented in Section 6.0 - Baseline Risk Evaluation. As part of the baseline risk assessment to human health, the health risk associated with the air emission pathway from soil was considered. Based on this risk evaluation, the calculated hazard indices for noncarcinogen effects are below 1 and the carcinogen risk has been calculated to be less than the one-in-10^{-6} risk level.

To provide site specific data relating to the release of volatile organic and particulate contamination from the site, air quality measurements were completed during the course of on-site RI activities. Air quality monitoring was completed during completion of test pits and during the installation of RI monitoring wells. Air quality survey records for site monitoring are included in Appendix F.

Of the measurements made during the field activities, no field readings were reported above background conditions over the surveyed areas. Based on these results, migration of volatile organic detectable by the field equipment was not occurring at the site during field investigations via airborne pathways. The survey also indicated that no particulate matter was migrating from the site during field activities.

TABLE 4 - 1
Ramco Steel
Summary of Analytical Results
Pond Sediment

Sample ID	SED-1	SED-2	SED-3	SED-4	SED-5	SED-6	SED-7
Misc.							
Total Recoverable Oil & Grease (ug/g)	20100		1920			892	6450
pH	5.59	5.05	4.94	5.05	5.26	5.98	5.65
Total Organic Carbon (ug/g)*	42800	15900	30700	12900	60300	36700	75500
Metals (mg/kg)							
Aluminum - Total		4500			7590		
Antimony - Total		< 11			< 10.8		
Arsenic - Total	36.2	9.4	13.2	37.5	14	12.8	50.3
Barium - Total	195	28	91	117	65.4	66.3	180
Beryllium - Total		< 1.4			< 1.3		
Cadmium - Total*	< 1.7	< 1.4	< 1.4	< 1.6	< 1.3	< 1.5	< 2.2
Calcium - Total		1530			3770		
Chromium - Total	205	30.8	95	81.3	50.3	30.8	267
Cobalt - Total		< 5.5			< 5.4		
Copper - Total		29.7			23.9		
Iron - Total		12600			46800		
Lead - Total	115	36.7	34.3	161	57.1 R	44.7	142
Magnesium - Total		57.3			397		
Mangenese - Total		1070			2490		
Mercury - Total	< 0.16	< 0.12	< 0.12	< 0.14	< 0.12	< 0.14	< 0.19
Nickel - Total		20.8			16.3		
Potassium - Total		668			1030		
Selenium - Total	< 1.3	< 1.1	< 1.1	< 1.2	< 1.1	< 1.2	< 1.7
Silver - Total		0.19			0.08		
Sodium - Total		468			376		
Thallium - Total		< 1.4			< 1.4		
Vanadium - Total		14.7			18.3		
Zinc - Total	105	60.7	49.4	113	82.6	75.9	197
Cyanide - Total		7.6			< 1.6		
Hexavalent Chromium - Total*	38.9	0.94	18.2	13.4	3.4	5	17.7

Note: * - Based on analytical results of sediment samples collected on March 23, 1993

TABLE 4 - 1
Ramco Steel
Summary of Analytical Results
Pond Sediment

Sample ID		SED-8		SED-9		SED-10		SED-11		SED-12		SED-13		SED-14		SED-15
Misc.																
Total Recoverable Oil & Grease (ug/g)				967		561		3720				1910		7590		
pH		6.23		6.61		4.79		5.47		5.62		5.24		5.38		5.6
Total Organic Carbon (ug/g)*		59500		26600		24300		38400		46500		28400		50800		38500
Metals (mg/kg)																
Aluminum - Total		5800								8050						10900
Antimony - Total	<	12.4							<	11.2					<	12.9
Arsenic - Total		20		17		14.8		28.6		8.6		22.3		40.9		35.1
Barium - Total		95.2		63.7		60.6		70.3		60.4		33.4		241		128
Beryllium - Total	<	1.5							<	1.4					<	1.6
Cadmium - Total*	<	1.5	<	1.2	<	1.3	<	1.4	<	1.4	<	1.5	<	1.8	<	1.6
Calcium - Total		10500								4310						5900
Chromium - Total		39		70.7		135		63.1		35.6		42.9		103		213
Cobalt - Total	<	6.2							<	5.6					<	6.5
Copper - Total		66.4								24.2						221
Iron - Total		42100								45500						29000
Lead - Total		85.7		64.2		35.9		85.9		79		113		242		69.8
Magnesium - Total		271								171						137
Manganese - Total		1760								944						2330
Mercury - Total	<	0.14	<	0.12	<	0.12	<	0.14	<	0.14		3.9		0.29	<	0.15
Nickel - Total		21.3								18.9						46.3
Potassium - Total		757								716						992
Selenium - Total	<	1.2	<	1.1	<	1.1	<	1.1	<	1.2	<	1.3	<	1.4	<	1.4
Silver - Total		0.15								0.12						0.17
Sodium - Total		338								418						384
Thallium - Total	<	1.5							<	1.5					<	1.7
Vanadium - Total		17.8								21						29.4
Zinc - Total		171		90.1		95.9		211		166		46.6		31.5		103
Cyanide - Total		3.2							<	1.8					<	2.1
Hexavalent Chromium - Total*		2.8		7.5		19.6		7.5		3.5		3		26.2		7.7

Note: * - Based on analytical results of se

TABLE 4 - 1
Ramco Steel
Summary of Analytical Results
Pond Sediment

Sample ID	SED-1	SED-2	SED-3	SED-4	SED-5	SED-6	SED-7
VOC (ug/kg)							
Acetone	210	35	33	66	31	71	170
Carbon Disulfide	< 14	0.7 J	< 14	2 J	< 14	< 15	< 18
Chloroform	< 14	1 J	< 14	2 J	0.9 J	2 J	< 18
2-Butanone	37	7 J	11 J	22	10 J	21	43
1,1,1-Trichloroethane	< 14	< 14	< 14	< 16	< 14	< 15	< 18
Total Xylenes	< 14	< 14	< 14	< 16	< 14	< 15	< 18
SEMI-VOC (ug/kg)							
Naphthalene		< 440			< 440		
2-Methylnaphthalene		< 440			< 440		
SEMI-VOC (ug/kg) (con't)							
Acenaphthene		18 J			< 440		
Fluorene		44 J			< 440		
Phenanthrene		210 J			140 J		
Fluoranthene		280 J			350 J		
Benzo(a)anthracene		< 440			< 440		
Chrysene		< 440			200 J		
Bis(2-ethylhexyl) phthala		< 440			510		
PCBS (ug/kg)							
Aroclor 1248	< 110	< 44	< 44	< 48	< 43	< 52	< 70
PEST (ug/kg)							
beta-BHC		< 2.3			< 2.2		
Dieldrin		< 4.4			< 4.3		
4,4'-DDE		< 4.4			0.62 J		
Endrin		< 4.4			< 4.3		
Endosulfan II		0.42 J			0.55 J		
4,4'-DDD		6.5			6.3		
4,4'-DDT		2.2 J			< 4.3		
Endrin ketone		< 4.4			1.6 J		
alpha-Chlordane		< 2.3			< 2.2		

SC
-003

TABLE 4 - 1
Ramco Steel
Summary of Analytical Results
Pond Sediment

Sample ID	SED-8	SED-9	SED-10	SED-11	SED-12	SED-13	SED-14	SED-15
VOC (ug/kg)								
Acetone	76	45	41	59	46	37	190	270
Carbon Disulfide	< 14	< 13	< 16	< 14	< 14	< 13	4 J	3 J
Chloroform	1 J	0.5 J	1 J	< 14	0.8 J	2 J	1 J	< 16
2-Butanone	21	7 J	15 J	13 J	14 J	12 J	61	50
1,1,1-Trichloroethane	< 14	< 13	< 16	< 14	< 14	< 13	1 J	< 16
Total Xylenes	< 14	< 13	0.1 J	< 14	< 14	< 13	3 J	5 J
SEMI-VOC (ug/kg)								
Naphthalene	< 490				< 480			220 J
2-Methylnaphthalene	< 490				< 480			140 J
SEMI-VOC (ug/kg) (con't)								
Acenaphthene	20 J				< 480			< 550
Fluorene	30 J				< 480			< 550
Phenanthrene	89 J				91 J			< 550
Fluoranthene	350 J				180 J			< 550
Benzo(a)anthracene	< 490				74 J			< 550 R
Chrysene	190 J				110 J			< 550 R
Bis(2-ethylhexyl) phthala	< 490				1100			< 550 R
PCBS (ug/kg)								
Aroclor 1248	< 49	< 43	< 42	< 46	< 48	< 50	< 58	810
PEST (ug/kg)								
beta-BHC	< 2.5				< 2.5			13 J
Dieldrin	< 4.9				< 4.8			8.1 J
4,4'-DDE	0.82 J				0.59 J			10 J
Endrin	1.8 J				< 4.8			< 55
Endosulfan II	1.4 J				2.1 J			6.3 J
4,4'-DDD	17				19			120
4,4'-DDT	3.1 J				3.5 J			52 J
Endrin ketone	< 4.9				< 4.8			< 55
alpha-Chlordane	< 2.5				< 2.5			26 J

Sc 0.03 ppm

TABLE 4 - 2
Ramco Steel
Summary of Analytical Results
Soil

Sample ID	SS-1	SS-2	RMW-1	RMW-2	RMW-3	TP-1-1	TP-1-2	TP-2-1	TP-3-1
Sample Location/Depth	Waste Pile	Surface	(4-6')	(0-2')	(2-4')	(4')	(9')	(4-6')	(0-2')
Misc.									
Total Recoverable Oil & Grease (ug/g)			1210	2590	1760	9080	931		5250
pH	6.6	5.4						5.4	
Metals (mg/kg)									
Aluminum - Total	335	3080						5740	
Antimony - Total	< 1.2	< 1.4						< 1.3	
Arsenic - Total	< 0.96	11	3.9	8.8	36.5	1.8 R	4.5 R	1.3 R	52.3 R
Barium - Total	6.8	52.8	80.4	72.5	249	30.7	55.7	32.8	172
Beryllium - Total	< 1.2	< 1.4						< 1.3	
Cadmium - Total	< 117	< 1.4	< 1.3	< 10.9	< 13.8	< 1.5 R	< 1.2 R	< 1.3 R	< 1.1 R
Calcium - Total	2120	1530						1970	
Chromium - Total	643	10.4	18.5	101	32.2	6.3	9.8	6.5	18.5
Cobalt - Total	26.6	6.6						< 5.1	
Copper - Total	540	< 2.8						< 2.5	
Iron - Total	589000	24600						10400	
Lead - Total	9.1	41.3	12.1	219	135	59.5	7.3	10.1	74
Magnesium - Total	4940	58						164	
Manganese - Total	< 46.6	470						691	
Mercury - Total	< 0.11	< 0.14	< 0.12	< 0.11	< 0.13	< 0.15	< 0.12	< 0.11	< 0.11
Nickel - Total	488	9.4						5.2	
Potassium - Total	70.4	699						322	
Selenium - Total	< 0.96	< 1.1	< 0.97	< 0.88	< 1.1	< 1.2 R	< 0.94 R	< 1 R	< 0.89 R
Silver - Total	< 2.3	< 2.8						< 0.25	
Sodium - Total	169	262						323	
Thallium - Total	< 1.2	< 1.4						< 1.3	
Vanadium - Total	< 466	11.1						13.7	
Zinc - Total	< 233	37.1	64.7	116	49.6	65.2 R	49.9 R	28.5 R	228 R
Cyanide - Total	< 1.3	< 1.5						< 1.4	
Hexavalent Chromium - Total			0.2 R	< 0.09 R	< 0.11 R	0.29	< 0.1		< 0.09

TABLE 4 - 2
Ramco Steel
Summary of Analytical Results
Soil

Sample ID	TP-4-1	TP-4-2	TP-5-1	TP-6-1	TP-6-2	TP-7-1	TP-7-2	TP-8-1
Sample Location/Depth	(4')	(5-6')	(6')	(3-7')	(7-11')	(2')	(4-5')	(5-6')
Misc.								
Total Recoverable Oil & Greas	7880		4630	2980	796			1270
pH		6.6				7.5	7.1	
Metals (mg/kg)								
Aluminum - Total		13600				19800	16000	
Antimony - Total		2.9				2.7	1.9	
Arsenic - Total	12.9 R	52.6 R	< 1.1 R	6 R	1.2 R	27.4 R	49.5 R	18.1 R
Barium - Total	237	173	88	79.6	47.5	406	212	64
Beryllium - Total	<	2.4			<	1.7	< 1.9	
Cadmium - Total	< 16.9 R	< 2.4 R	< 12.7 R	< 12.6 R	< 12 R	< 1.7 R	< 18.6 R	< 14.7 R
Calcium - Total		19200				47700	37400	
Chromium - Total	113	72.1	51.6	29.6	11.8	115	89.9	11.8
Cobalt - Total	<	9.7				10.8	16	
Copper - Total		89.5				245	173	
Iron - Total		161000				72100	131000	
Lead - Total	559	407	734	52.5	5.3	453	382	105
Magnesium - Total		1490				1130	1110	
Mangenese - Total		5450				21800	13000	
Mercury - Total	0.17	< 0.23	< 0.13	< 0.12	< 0.12	< 0.16	< 0.17	< 0.13
Nickel - Total		63.8				112	75.7	
Potassium - Total		1020				2640	2440	
Selenium - Total	< 1.3 R	< 1.9 R	< 1.1 R	< 1.1 R	< 0.96 R	< 1.3 R	< 1.5 R	< 1.2 R
Silver - Total		0.62				4.3	2	
Sodium - Total		733				820	582	
Thallium - Total	<	2.4			<	1.7	< 1.9	
Vanadium - Total	<	9.7			<	6.8	< 7.5	
Zinc - Total	537 R	885 R	295 R	72.8 R	68.9 R	840 R	488 R	280 R
Cyanide - Total	<	2.5			<	2	< 2.2	
Hexavalent Chromium - Total	< 0.14		2.1	< 0.11	< 0.1			0.29

TABLE 4 - 2
Ramco Steel
Summary of Analytical Results
Soil

Sample ID	SS-1	SS-2	RMW-1	RMW-2	RMW-3	TP-1-1	TP-1-2	TP-2-1	TP-3-1
Sample Location/Depth	Waste Pile	Surface	(4-6')	(0-2')	(2-4')	(4')	(9')	(4-6')	(0-2')
VOC (ug/kg)									
Methylene chloride	< 12	< 14	< 13	< 11	< 14	8 BJ	2 BJ	2 J	8 BJ
Acetone	34	< 14	< 13	210	170	390 E	28	85	< 12
2-Butanone	9 J	< 14	< 13	13	12 J	86	5 J	24	< 12
Tetrachloroethene	< 12	< 14	< 13	< 11	< 14	< 14	< 12	< 13	< 12
Toluene	< 12	< 14	< 13	6 J	1 J	0.8 J	< 12	< 13	< 12
Ethyl benzene	< 12	< 14	< 13	3 J	< 14	0.4 J	< 12	< 13	< 12
Total Xylenes	< 12	< 14	< 13	4 J	< 14	2 J	< 12	0.6 J	2 J
SEMI-VOC (ug/kg)									
Phenol	470	< 480						< 420	
Benzoic Acid	< 1900	< 2300						< 2000	
Naphthalene	< 390	55 J						< 420	
2-Methylnaphthalene	< 390	62 J						< 420	
Acenaphthylene	< 390	< 480						< 420	
Acenaphthene	< 390	< 480						49 J	
Dibenzofuran	< 390	< 480						< 420	
Fluorene	< 390	< 480						< 420	
Phenanthrene	< 390 R	100 JR						35 J	
Anthracene	< 390 R	< 480 R						< 420	
Pyrene	< 390 R	< 480 R						< 420	
Benzo(a)anthracene	< 390 R	< 480 R						< 420	
Chrysene	< 390 R	< 480 R						< 420	
Bis(2-ethylhexyl) phthala	< 390 R	< 480 R						1400 B	
Benzo(b)fluoranthene	< 390 R	< 480 R						< 420	
Benzo(k)fluoranthene	< 390 R	< 480 R						< 420	
Benzo(a)pyrene	< 390 R	< 480 R						35 J	
Indeno(1,2,3-cd)pyrene	< 390 R	< 480 R						< 420	
Dibenzo(a,h)anthracene	< 390 R	< 480 R						< 420	
Benzo(ghi)perylene	< 390 R	< 480 R						< 420	
PCBS (ug/kg)									
Aroclor 1242	< 39	< 48	< 42	< 39	< 50	< 46	< 42	< 42	< 94
Aroclor 1254	< 39	< 48	< 42	< 39	< 50	< 46	< 42	< 42	< 94
PEST (ug/kg)									
beta-BHC	0.92 J	< 2.5						< 2.2	
Dieldrin	0.79 J	< 4.8						< 4.2	
4,4'-DDE	0.5 J	< 4.8						< 4.2	
Endrin	10	< 4.8						< 4.2	
Endosulfan II	6.2	1.2 J						< 4.2	
alpha-Chlordane	2.8	< 2.5						< 2.2	

TABLE 4 - 2
Ramco Steel
Summary of Analytical Results
Soil

Sample ID		TP-4-1		TP-4-2		TP-5-1		TP-6-1		TP-6-2		TP-7-1		TP-7-2		TP-8-1
Sample Location/Depth		(4')		(5-6')		(6')		(3-7')		(7-11')		(2')		(4-5')		(5-6')
VOC (ug/kg)																
Methylene chloride		2 J		3 JR		2 BJ	<	13		3 BJ		1 J	<	70		1 BJ
Acetone	<	17		430 R		170		74		67	<	17	<	70		50
2-Butanone		19		110 R		33		20		10 J	<	17	<	70		13 J
Tetrachloroethene		2 J	<	24 R	<	13	<	13	<	11	<	17	<	70	<	14
Toluene	<	17	<	24 R	<	13	<	13		0.2 J	<	17	<	70	<	14
Ethyl benzene	<	17	<	24 R	<	13	<	13	<	11	<	17	<	70	<	14
Total Xylenes	<	17	<	24 R		0.7 J	<	13		0.7 J	<	17	<	70	<	14
SEMI-VOC (ug/kg)																
Phenol			<	700 R							<	540	<	540 R		
Benzoic Acid				300 JR							<	2600		64 JR		
Naphthalene				120 JR							<	540		71 JR		
2-Methylnaphthalene				110 JR							<	540	<	540 R		
Acenaphthylene				36 JR							<	540	<	540 R		
Acenaphthene				51 JR								26 J	<	540 R		
Dibenzofuran				65 JR							<	540	<	540 R		
Fluorene				58 JR							<	540	<	540 R		
Phenanthrene				420 JR								290 J	<	540 R		
Anthracene				95 JR							<	540	<	540 R		
Pyrene				920 R							<	540	<	540 R		
Benzo(a)anthracene				380 JR								170 J	<	540 R		
Chrysene				540 JR								200 J	<	540 R		
Bis(2-ethylhexyl) phthala				2000 BR								2000 B		1300 BR		
Benzo(b)fluoranthene				890 R							<	540	<	540 R		
Benzo(k)fluoranthene				410 JR							<	540	<	540 R		
Benzo(a)pyrene				480 JR							<	540	<	540 R		
Indeno(1,2,3-cd)pyrene				280 JR							<	540	<	540 R		
Dibenzo(a,h)anthracene				77 JR							<	540	<	540 R		
Benzo(ghi)perylene				200 JR							<	540	<	540 R		
PCBS (ug/kg)																
Aroclor 1242	<	92	<	70	<	110	<	43	<	39	<	54		700	<	53
Aroclor 1254	<	92		170	<	110	<	43	<	39		140		660	<	53
PEST (ug/kg)																
beta-BHC				1.7 J							<	2.8	<	14		
Dieldrin			<	7							<	5.4	<	27		
4,4'-DDE			<	7							<	5.4	<	27		
Endrin			<	7							<	5.4	<	27		
Endosulfan II			<	7							<	5.4	<	27		
alpha-Chlordane			<	3.6							<	2.8	<	14		

TABLE 4 - 3
Ramco Steel
Summary of Analytical Results
Groundwater

Sample ID	NYS Class "GA" Standard		RMW-1		RMW-2		RMW-3 (Interface)		MW-1D (Bedrock)		MW-1S (Shallow)		CW-1 (Interface)
Metals (ug/l)													
Aluminum - Total	-		71000		16400		61500		146000		6610		24200
Antimony - Total	-		6	<	5	<	5	<	5	<	5	<	5
Arsenic - Total	25		17		6		7		16		4		10
Barium - Total	1,000		490		379		887		809		130		322
Beryllium - Total	-	<	5	<	5	<	5	<	5	<	5	<	5
Cadmium - Total	10	<	5	<	5	<	5	<	5	<	5	<	5
Calcium - Total	-		268000		290000		872000		977000		92900		527000
Chromium - Total	50		108		36.7		92		208	<	10		48.1
Cobalt - Total	-		46.8	<	20		33.5		96.4	<	20		142
Copper - Total	200		17.5		29.8		16.2		112		17.1		20
Iron - Total	300		102000		48500		76700		246000		53200		51700
Lead - Total	25		195		41		136		240		18		47
Magnesium - Total	-		94200		74100		153000		171000		8400		74700
Manganese - Total	300		11900		3330		2320		4790		1990		3340
Mercury - Total	2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2	<	0.2
Nickel - Total	-		235		68.5		96.2		266	<	20		84.1
Potassium - Total	-		47300		16200		16200		45200		11400		10100
Selenium - Total	10	<	4	<	4	<	20	<	4	<	4	<	4
Silver - Total	50	<	10	<	10	<	10	<	10	<	10	<	10
Sodium - Total	20,000		159000		62100		16400		77900		18800		54100
Thallium - Total	-	<	5	<	5	<	5	<	5	<	5	<	5
Vanadium - Total	-		123		34.4		116		258	<	20		44.8
Zinc - Total	300		500		226		455		598		73		176
Cyanide - Total	100	<	10	<	10	<	10	<	10		14.7	<	10

TABLE 4 - 3
Ramco Steel
Summary of Analytical Results
Groundwater

Sample ID	NYS Class "GA" Standard		RMW-1		RMW-2		RMW-3		Bedrock MW-1D		MW-1S		CW-1
VOC (ug/l)													
Acetone	50	<	10	<	10		14	<	10	<	10	<	10
1,1-Dichloroethane	5		1 J	<	10	<	10	<	10	<	10	<	10
Toluene	5		1 BJ		0.6 BJ		0.7 BJ		0.5 BJ	<	10		0.4 BJ
Chlorobenzene	5		5 BJ		0.2 BJ	<	10	<	10	<	10	<	10
Ethyl benzene	5		0.4 BJ	<	10	<	10	<	10	<	10	<	10
Total Xylenes	5		3 BJ	<	10	<	10		1 BJ	<	10	<	10
SEMI-VOC (ug/l)													
Phenol	1	<	10	<	10		25	<	10	<	10	<	10
4-Methylphenol	50	<	10	<	10		2 J	<	10	<	10	<	10
Benzoic Acid	50		2 J		2 J		8 J		0.8 J		2 J	<	50
Naphthalene	10		0.5 J	<	10	<	10	<	10	<	10	<	10
2-Methylnaphthalene	50		0.6 J	<	10	<	10	<	10	<	10	<	10
Diethyl phthalate	50		0.6 J		2 J		0.6 J	<	10		1 J		2 J
Phenanthrene	50		2 J	<	10		0.4 J	<	10	<	10	<	10
Di-n-butyl phthalate	50	<	10	<	10		0.8 J		0.9 J		1 J		1 J
Butyl benzyl phthalate	50		0.5 J	<	10		0.7 J		0.5 J		0.8 J		0.7 J
Benzo(a)anthracene	ND(<.002)		0.3 J	<	10	<	10	<	10	<	10	<	10
Benzo(b)fluoranthene	ND(<.002)		0.4 J	<	10	<	10	<	10	<	10	<	10
PCBS (ug/kg)													
PEST (ug/l)													
Heptachlor	ND(<.01)	<	0.052	<	0.05	<	0.05	<	0.059	<	0.057	<	0.05
Heptachlor epoxide	ND(<.01)		0.038 J	<	0.05	<	0.05	<	0.059	<	0.057	<	0.05
Dieldrin	ND(<.01)		0.024 J	<	0.1	<	0.1	<	0.12	<	0.11	<	0.1

TABLE 4 - 4
Ramco Steel
Summary of Analytical Results
Surface Water

Sample ID	NYS Water Quality Standard		SW-1		SW-2		SW-3
Metals (ug/l)							
Aluminum - Total	100	<	100	<	100	<	100
Antimony - Total	-	<	5	<	5	<	5
Arsenic - Total	50	<	4	<	4	<	4
Barium - Total	1,000		46.8		44		40.9
Beryllium - Total	1,000	<	5	<	5	<	5
Cadmium - Total	10	<	5	<	5	<	5
Calcium - Total	-		160000		170000		117000
Chromium - Total	50	<	10	<	10	<	10
Cobalt - Total	5	<	20	<	20	<	20
Copper - Total	200	<	10	<	10	<	10
Iron - Total	300		771		2120		6230
Lead - Total	50		5		7	<	3
Magnesium - Total	35,000		32400		37100		19800
Manganese - Total	300		833		1100		1050
Mercury - Total	2	<	0.2	<	0.2	<	0.2
Nickel - Total	320		23.8	<	20	<	20
Potassium - Total	-		10800		9730		9530
Selenium - Total	10	<	20	<	20	<	20
Silver - Total	50	<	10	<	10	<	10
Sodium - Total	-		29500		34100		15300
Thallium - Total	8	<	5	<	5	<	5
Vanadium - Total	-	<	20	<	20	<	20
Zinc - Total	300		36.9		27.8		28.5
Cyanide - Total	100	<	10	<	10	<	10
VOC (ug/l)							
Toluene	5		1 JB		0.7 JB		0.7 JB
Chlorobenzene	5		0.4 JB		0.3 JB		0.2 JB
SEMI-VOC (ug/l)							
Benzoic Acid	-		8 J		2 J		2 J
Di-n-butyl phthalate	-		0.8 J		0.7 J		0.5 J
Butyl benzyl phthalate	-		0.5 J		0.6 J		0.5 J
PCBS (ug/kg)							
PEST (ug/l)							

TABLE 4 - 5
Ramco Steel
Summary of Analytical Results
Off-Site Locations

Sample ID	SW-4	SW-5	SED-16	SED-17
Sample Type	Surface Water	Surface Water	Sediment	Sediment
Sample Location	Altift	Republic	Altift	Republic
Metals	(ug/l)	(ug/l)	(mg/kg)	(mg/kg)
Aluminum - Total	< 100	16600	8620	10700
Antimony - Total	160	< 5	31	< 9
Arsenic - Total	< 4	12	20.7	12.9
Barium - Total	108	124	229	108
Beryllium - Total	< 5	< 5	< 1.7	< 1.1
Cadmium - Total	< 5	< 5	3.1	1.2
Calcium - Total	185000	73200	19100	147000
Chromium - Total	< 10	27.7	791	864
Cobalt - Total	< 20	< 20	11.6	7.2
Copper - Total	< 10	16.8	204	< 2.2
Iron - Total	2340	26800	39900	75300
Lead - Total	4	71	610	104
Magnesium - Total	77300	8030	776	16200
Manganese - Total	3510	680	5470	19200
Mercury - Total	< 0.2	< 0.2	0.68	< 0.1
Nickel - Total	53.5	34.7	15.5	114
Potassium - Total	46100	31600	1460	1120
Selenium - Total	< 4	< 4	1.4	0.92
Silver - Total	< 10	< 10	< 3.5	< 2.2
Sodium - Total	145000	50800	884	669
Thallium - Total	< 5	< 5	< 1.7	< 1.2
Vanadium - Total	< 20	50	27.2	373
Zinc - Total	44.4	159	556	230
Cyanide - Total	< 10	22.5	2.8	< 1.4
VOC	(ug/l)	(ug/l)	(ug/kg)	(ug/kg)
1,2-Dichloroethene (Total)	< 10	< 10	13 J	< 14
Trichloroethene	1 J	< 10	11 J	< 14
Benzene	2 J	< 10	2 J	< 14
Toluene	0.8 BJ	0.4 BJ	< 16	0.8 J
Chlorobenzene	26 B	0.5 BJ	8 J	< 14
Styrene	0.1 BJ	< 10	< 16	< 14
Total Xylenes	1 BJ	< 10	< 16	< 14
SEMI-VOC	(ug/l)	(ug/l)	(ug/kg)	(ug/kg)
Phenol	< 10	3 J	< 560	< 360
1,3-Dichlorobenzene	0.2 J	< 10	< 560	< 360
1,4-Dichlorobenzene	2 J	< 10	< 560	< 360
2-Methylphenol	< 10	< 10	< 560	27 J
4-Methylphenol	< 10	< 10	< 560	73 J
Nitrobenzene	22	< 10	64 J	< 360
Benzoic Acid	< 50	4 J	< 2700	< 1800
1,2,4-Trichlorobenzene	< 10	< 10	43 J	< 360
Naphthalene	0.5 J	< 10	270 J	50 J
4-Chloroaniline	3 J	< 10	< 560	< 360
2-Methylnaphthalene	< 10	< 10	240 J	47 J

TABLE 4 - 5
Ramco Steel
Summary of Analytical Results
Off-Site Locations

Sample ID		SW-4		SW-5		SED-16		SED-17
Sample Type		Surface Water		Surface Water		Sediment		Sediment
Sample Location		Altift		Republic		Altift		Republic
SEMI-VOC (ug/l) (con't)		(ug/l)		(ug/l)		(ug/kg)		(ug/kg)
2-Chloronaphthalene		0.4 J	<	10		37 J	<	360
2-Nitroaniline		0.4 J	<	25	<	1400	<	880
Acenaphthylene	<	10	<	10		120 J		23 J
Acenaphthene		0.07 J	<	10		810		14 J
Dibenzofuran	<	10	<	10		380 J	<	360
Fluorene	<	10	<	10		350 J	<	360
N-nitrosodiphenylamine	<	10	<	10		47 J	<	360
Heachlorobenzene	<	10	<	10		950	<	360
Phenanthrene	<	10	<	10		5900		160 J
Anthracene	<	10	<	10		1300		31 J
Di-n-butyl phthalate	<	10	<	10		70 J		16 J
Fluoranthene	<	10	<	10		11000		250 J
Pyrene	<	10	<	10		9600		280 J
3,3'-Dichlorobenzidine	<	10	<	10	<	560	<	360
Benzo(a)anthracene	<	10	<	10		7700		160 J
Chrysene	<	10	<	10		7900		200 J
Di-n-octyl phthalate	<	10	<	10	<	560	<	360
Benzo(b)fluoranthene	<	10	<	10		14000		340 J
Benzo(k)fluoranthene	<	10	<	10		5800		140 J
Benzo(a)pyrene	<	10	<	10		9100		140 J
Indeno(1,2,3-cd)pyrene	<	10	<	10		2700		36 J
Dibenzo(a,h)anthracene	<	10	<	10		560	<	360
Bis(2-chloroisopropyl) ether	<	10	<	10	<	560	<	360
PCBS (ug/kg)		(ug/l)		(ug/l)		(ug/kg)		(ug/kg)
Aroclor 1242	<	1	<	1		390 J		65
Aroclor 1260	<	1	<	1		620		33 J
PEST (ug/l)		(ug/l)		(ug/l)		(ug/kg)		(ug/kg)
Dieldrin	<	0.1	<	0.1	<	56	<	3.7
Endrin	<	0.1	<	0.1	<	56	<	3.7
Endosulfan II	<	0.1	<	0.1	<	56		0.78 J
4,4'-DDD	<	0.1	<	0.1		57		1.3 J
Endosulfan Sulfate	<	0.1	<	0.1		9.7 J	<	3.7
Toxaphene	<	5	<	5	<	2900	<	190

TABLE 4 - 6
Ramco Steel
Summary of Radiological Analysis
Sediment/soil

Media	SAMPLE I.D.	U-238 (pCi/g)	Th-232 (pCi/g)
Soil			
Background (CW-1)	SS-3	<1.43	<0.37
Background (east of bldg.)	SS-4	<1.10	<0.23
Test Pits	TP-1	<1.84	<0.27
	TP-2	<1.35	<0.35
	TP-3	<1.63	<0.27
	TP-4	<1.72	<0.47
	TP-5	<1.27	<0.34
	TP-6	<1.87	0.45 +/-23.7%
	TP-7	<1.34	0.54 +/-12.1%
	TP-8	<1.62	<0.21
Sediment			
	SED-1	<2.02	<0.54
	SED-2	<1.39	<0.28
	SED-3	<1.65	0.52 +/-19.2%
	SED-4	<2.52	<0.55
	SED-5	<1.24	0.44 +/-18.5%
	SED-6	<1.73	<0.44
	SED-7	<2.36	<0.64
	SED-8	<1.50	0.51 +/-20.6%
Duplicate SED-9	SED-9	<1.19	<0.32
	Dup-1	<1.51	0.35 +/-25.6%
	SED-10	<1.81	<0.46
	SED-11	<1.62	<0.19
Duplicate SED-12	SED-12	<1.64	<0.20
	Dup-2	<2.04	<0.54
	SED-13	<1.52	<0.39
	SED-14	<2.24	<0.67
Off-site	SED-15	<1.79	<0.42
Off-site	SED-16	<2.19	<0.54
	SED-17	<1.41	<0.38

TABLE 4 - 7
Ramco Steel
Summary of Analytical Results
TCLP Data

Sample ID Sample Location/Depth	SED-2 Pond	SED-5 Pond	SED-8 Pond	SED-12 Pond	SED-15 Pond	TP-4-2 (5-6')	TP-7-1 (2')
Metals (ug/l)							
Arsenic	4 <	4 <	4 <	4 <	12.4	4 <	4 <
Barium	128	114	140	141	43.1	901	1190
Cadmium	12.4	5.9 <	5	11.5	17.4	5 <	5 <
Chromium	< 10	< 10	< 10	< 10	< 10	< 10	< 10 <
Lead	49.4	49.3	70.3	242	903	4	64.2
Mercury	< 0.2	< 0.2	< 0.2	0.25	0.2	< 0.2	< 0.2 <
Selenium	< 4	< 4	< 4	< 4	< 4	< 4	< 20 <
Silver	< 0.3	< 0.3	< 0.3	0.5	< 0.3	< 1	< 1 <
VOC (ug/l)							
Vinyl chloride	< 100	< 100	< 100	< 100	< 100	-	-
1,1-Dichloroethene	< 100	< 100	< 100	< 100	< 100	-	-
Chloroform	< 100	< 100	< 100	24 J	< 100	-	-
1,2-Dichloroethane	< 100	< 100	< 100	< 100	< 100	-	-
2-Butanone	< 100	< 100	< 100	< 100	< 100	-	-
Carbon Tetrachloride	< 100	< 100	< 100	< 100	< 100	-	-
Trichloroethene	< 100	< 100	< 100	9 J	< 100	-	-
Benzene	< 100	< 100	< 100	< 100	< 100	-	-
Tetrachloroethene	< 100	< 100	< 100	< 100	< 100	-	-
Chlorobenzene	< 100	< 100	< 100	< 100	< 100	-	-

TABLE 4 - 7
Ramco Steel
Summary of Analytical Results
TCLP Data

Sample ID Sample Location/Depth		SED-2 Pond		SED-5 Pond		SED-8 Pond		SED-12 Pond		SED-15 Pond	TP-4-2 (5-6')	TP-7-1 (2')
SEMI-VOC (ug/l)												
1,4-Dichlorobenzene	<	25	<	25	<	25	<	33	<	33	-	-
Hexachloroethane	<	25	<	25	<	25	<	33	<	33	-	-
Nitrobenzene	<	25	<	25	<	25	<	33	<	33	-	-
Hexachlorobutadiene	<	25	<	25	<	25	<	33	<	33	-	-
2,4-Dinitrotoluene	<	25	<	25	<	25	<	33	<	33	-	-
Hexachlorobenzene	<	25	<	25	<	25	<	33	<	33	-	-
2-Methylphenol	<	25	<	25	<	25	<	33	<	33	-	-
4-Methylphenol	<	25	<	25	<	25	<	33	<	33	-	-
2,4,6-Trichlorophenol	<	25	<	25	<	25	<	33	<	33	-	-
2,4,5-Trichlorophenol	<	62	<	62	<	62	<	83	<	83	-	-
Pentachlorophenol	<	62	<	62	<	62	<	83	<	83	-	-
Pyridine	<	25	<	25	<	25	<	33	<	33	-	-
3-Methylphenol	<	25	<	25	<	25	<	33	<	33	-	-
PEST/HERB (ug/l)												
2,4,5-TP (Silvex)(mg/l)	<	0.01	<	0.01	<	0.01	<	0.01	<	0.01	-	-
2,4-D(mg/l)	<	0.1	<	0.1	<	0.1	<	0.1	<	0.1	-	-
Chlordane	<	10	<	10	<	10	<	10	<	10	-	-
gamma-BHC (Lindane)	<	10	<	10	<	10	<	10	<	10	-	-
Heptachlor	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	-	-
Heptachlor epoxide	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	-	-
Endrin	<	0.5	<	0.5	<	0.5	<	0.5	<	0.5	-	-
Methoxychlor	<	100	<	100	<	100	<	100	<	100	-	-
Toxaphene	<	10	<	10	<	10	<	10	<	10	-	-

TABLE 4-8
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Sediment (April 18, 1994)

Sample ID	RS-1	RS-2	RS-3	RS-4
Location	Pond-West Result	Pond-East Result	Outfall-South Result	Outfall-North Result
Metals (mg/kg)				
Aluminum - Total	1020	1330	8760	3480
Antimony - Total	20.4	20.9	< 5.7	11.7
Arsenic - Total	27.8	162	42.4	60.3
Barium - Total	< 7.6	< 5.2	27.4	72
Beryllium - Total	< 1.1	< 0.77	0.57	< 0.69
Cadmium - Total	< 3.8	< 2.6	< 1.9	< 2.3
Calcium - Total	23000	2580	4640	2390
Chromium - Total	30.2	230	52.8	44
Cobalt - Total	< 3.8	7	12.2	5.5
Copper - Total	60.4	374	48.6	81.9
Hexavalent Chromium	0.76	1.0	1.1	0.89
Iron - Total	167000	410000	160000	166000
Lead - Total	456	1300	306	393
Magnesium - Total	940	514	1530	562
Mangenese - Total	844	749	1290	918
Mercury - Total	< 0.34	< 0.22	<0.18	< 0.19
Nickel - Total	< 11.3	< 7.7	< 5.7	< 6.9
Potassium - Total	281	244	897	368
Selenium - Total	1.9	1.8	< 0.58	< 0.70
Silver - Total	< 3.8	< 2.6	< 1.9	< 2.3
Sodium - Total	528	338	334	285
Thallium - Total	< 1.5	< 1.0	< 0.77	< 0.93
Vanadium - Total	17	< 2.6	38.6	34.1
Zinc - Total	277	426	877	479

TABLE 4-8
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Sediment (April 18, 1994)

Sample ID	RS-1	RS-2	RS-3	RS-4
Location	Pond-West Result	Pond-East Result	Outfall-South Result	Outfall-North Result
VOC (ug/kg)				
Acetone	< 37	< 26	< 20	< 23
Benzene	< 18	< 13	< 10	< 11
Bromodichloromethane	< 18	< 13	< 10	< 11
Bromoform	< 18	< 13	< 10	< 11
Bromomethane	< 37	< 26	< 20	< 23
2-Butanone	< 37	< 26	< 20	< 23
Carbon Disulfide	< 18	< 13	< 10	< 11
Carbon Tetrachloride	< 18	< 13	< 10	< 11
Chlorobenzene	< 18	< 13	< 10	< 11
Chloroethane	< 37	< 26	< 20	< 23
Chloroform	13J	6J	< 10	< 11
Chloromethane	< 37	< 26	< 20	< 23
Dibromochloromethane	< 18	< 13	< 10	< 11
1,1-Dichloroethane	< 18	< 13	< 10	< 11
1,2-Dichloroethane	< 18	< 13	< 10	< 11
1,1-Dichloroethene	< 18	< 13	< 10	< 11
1,2-Dichloroethene (Total)	< 18	< 13	< 10	< 11
1,2-Dichloropropane	< 18	< 13	< 10	< 11
cis-1,3-Dichloropropene	< 18	< 13	< 10	< 11
trans-1,3-Dichloropropene	< 18	< 13	< 10	< 11
Ethyl benzene	< 18	< 13	< 10	< 11
2-Hexanone	< 37	< 26	< 20	< 23
Methylene chloride	< 18	< 13	< 10	< 11
4-Methyl-2-pentanone	< 37	< 26	< 20	< 23
Styrene	< 18	< 13	< 10	< 11
1,1,2,2-Tetrachloroethane	< 18	< 13	< 10	< 11
Tetrachloroethene	< 18	< 13	< 10	< 11
Toluene	< 18	< 13	< 10	< 11
1,1,1-Trichloroethane	< 18	< 13	< 10	< 11
1,1,2-Trichloroethane	< 18	< 13	< 10	< 11
Trichloroethene	< 18	< 13	< 10	< 11
Vinyl acetate	< 37	< 26	< 20	< 23
Vinyl chloride	< 37	< 26	< 20	< 23
Total Xylenes	< 18	< 13	< 10	< 11

TABLE 4-8
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Sediment (April 18, 1994)

Sample ID	RS-1	RS-2	RS-3	RS-4
Location	Pond-West Result	Pond-East Result	Outfall-South Result	Outfall-North Result
SEMI-VOC (ug/kg)				
Acenaphthene	500 J	1100	80 J	1100
Acenaphthylene	< 1300	< 700	65 J	460 J
Anthracene	< 1300	< 700	94 J	4400
Benzo(a)anthracene	< 1300	< 700	360 J	8100
Benzo(b)fluoranthene	< 1300	< 700	480 J	4500
Benzo(k)fluoranthene	< 1300	< 700	< 640	1900
Benzo(ghi)perylene	< 1300	< 700	< 640	1300
Benzo(a)pyrene	< 1300	< 700	180 J	3300
Benzoic Acid	< 6400	< 3400	< 3100	< 3600
Benzyl Alcohol	< 1300	< 700	< 640	< 750
Bis(2-chloroethoxy) methane	< 1300	< 700	< 640	< 750
Bis(2-chloroethyl) ether	< 1300	< 700	< 640	< 750
Bis(2-chloroisopropyl) ether	< 1300	< 700	< 640	< 750
Bis(2-ethylhexyl) phthala	< 1300	< 700	< 640	9800
4-Bromophenyl phenyl ethe	< 1300	< 700	< 640	< 750
Butyl benzyl phthalate	< 1300	< 700	< 640	< 750
4-Chloroaniline	< 1300	< 700	< 640	< 750
4-Chloro-3-methylphenol	< 1300	< 700	< 640	< 750
2-Chloronaphthalene	< 1300	< 700	< 640	< 750
2-Chlorophenol	< 1300	< 700	< 640	< 750
4-Chlorodiphenylether	< 1300	< 700	< 640	< 750
Chrysene	< 1300	< 700	440 J	7500
Dibenzo(a,h)anthracene	< 1300	< 700	< 640	1300
Dibenzofuran	< 1300	< 700	76 J	1900
Di-n-butyl phthalate	< 1300	< 700	< 640	< 750
1,2-Dichlorobenzene	< 1300	69 J	< 640	< 750
1,3-Dichlorobenzene	< 1300	< 700	< 640	< 750
1,4-Dichlorobenzene	< 1300	110 J	< 640	< 750
3,3'-Dichlorobenzidine	< 2600	< 1400	< 1300	< 1500
2,4-Dichlorophenol	< 1300	< 700	< 640	< 750
Diethyl phthalate	< 1300	< 700	< 640	< 750
2,4-Dimethylphenol	< 1300	< 700	< 640	< 750
Dimethyl phthalate	< 1300	< 700	< 640	< 750
4,6-Dinitro-2-methylpheno	< 6400	< 3400	< 3100	< 3600
2,4-Dinitrophenol	< 6400	< 3400	< 3100	< 3600
2,4-Dinitrotoluene	< 1300	< 700	< 640	< 750
2,6-Dinitrotoluene	< 1300	< 700	< 640	< 750
Di-n-octyl phthalate	< 1300	< 700	< 640	< 750
Fluoranthene	< 1300	< 700	480 J	18000 E
Fluorene	< 1300	< 700	40 J	2700
Hexachlorobenzene	< 1300	< 700	< 640	< 750
Hexachlorobutadiene	< 1300	< 700	< 640	< 750
Hexachlorocyclopentadiene	< 1300	< 700	< 640	< 750
Hexachloroethane	< 1300	< 700	< 640	< 750
Indeno(1,2,3-cd)pyrene	< 1300	< 700	< 640	1400
Isophorone	< 1300	< 700	< 640	< 750
2-Methylnaphthalene	340 J	180 J	170 J	990
2-Methylphenol	< 1300	< 700	< 640	< 750
4-Methylphenol	180 J	190 J	94 J	160 J
Naphthalene	540 J	530 J	150 J	1000
2-Nitroaniline	< 6400	< 3400	< 3100	< 3600
3-Nitroaniline	< 6400	< 3400	< 3100	< 3600
4-Nitroaniline	< 6400	< 3400	< 3100	< 3600

TABLE 4-8
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Sediment (April 18, 1994)

Sample ID	RS-1	RS-2	RS-3	RS-4
Location	Pond-West Result	Pond-East Result	Outfall-South Result	Outfall-North Result
SEMI-VOC (ug/kg)				
Nitrobenzene	< 1300	< 700	< 640	< 750
2-Nitrophenol	< 1300	< 700	< 640	< 750
4-Nitrophenol	< 6400	< 3400	< 3100	< 3600
N-Nitrosodimethylamine	< 1300	< 700	< 640	< 750
N-Nitroso-Di-n-propylamine	< 1300	< 700	< 640	< 750
Pentachlorophenol	< 6400	< 3400	< 3100	< 3600
Phenanthrene	< 1300	< 700	280 J	20000 E
Phenol	< 1300	< 700	< 640	< 750
Pyrene	< 1300	< 700	460 J	14000 E
1,2,4-Trichlorobenzene	100 J	< 700	< 640	50 J
2,4,5-Trichlorophenol	< 6400	< 3400	< 3100	< 3600
2,4,6-Trichlorophenol	< 1300	< 700	< 640	< 750
PCBS (ug/kg)				
Aroclor 1016	< 140	< 160	< 83	< 77
Aroclor 1221	< 280	< 320	< 170	< 150
Aroclor 1232	< 140	< 160	< 83	< 77
Aroclor 1242	< 140	< 160	< 83	<77
Aroclor 1248	250	420	< 83	<77
Aroclor 1254	520	270	< 83	<77
Aroclor 1260	140	120 J	< 83	<77

TABLE 4-9
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Groundwater (April 15, 1994)

Sample ID	NYS "GA" Standards (ug/l)	RMW-1		RMW-2		RMW-3		CW-1		MW-1D		MW-1S	
		Unfiltered (Total)	Filtered (Dissolved)	Unfiltered (Total)	Filtered (Dissolved)	Unfiltered (Total)	Filtered (Dissolved)	Unfiltered (Total)	Filtered (Dissolved)	Unfiltered (Total)	Filtered (Dissolved)	Unfiltered (Total)	Filtered (Dissolved)
Metals (ug/l)													
Aluminum	-	11900	< 90	1800	< 90	680	< 90	1500	< 90	490	< 90	3900	< 90
Antimony	3*	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6	< 6
Arsenic	25	5	3	5	3	< 3	3	4	< 3	< 3	< 3	< 3	4
Barium	1000	130	71	360	370	150	150	110	89	83	72	120	97
Beryllium	3*	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Cadmium	10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Calcium	-	264000	255000	164000	150000	39600	26800	350000	211000	178000	175000	94800	94400
Chromium	50	17	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Cobalt	-	32	< 10	< 10	< 10	< 10	< 10	29	21	< 10	< 10	< 10	< 10
Copper	200	25	< 10	15	< 10	< 10	< 10	12	< 10	< 10	< 10	23	< 10
Iron	300	29600	5900	18200	19300	1300	< 40	8100	1400	18400	19000	39600	43200
Lead	25	43	< 2	14	< 2	< 2	< 2	12	< 2	< 2	< 2	150	< 2
Magnesium	35000	65500	69600	76900	71000	6300	4700	52700	42400	20100	18400	7200	6900
Manganese	300	10300	12200	1400	1500	66	5	1600	1200	853000	780	1900	1900
Mercury	2	< 0.4	< 0.2	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Nickel	-	93	91	< 30	< 30	< 30	< 30	36	< 30	< 30	< 30	< 30	< 30
Potassium	-	29100	31900	23700	22500	2800	3100	4200	3900	11300	11800	11400	11400
Selenium	10	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Silver	50	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Sodium	20000	125000	140000	68600	68200	12600	13400	48800	48200	38500	38700	18000	17200
Thallium	4*	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 3
Vanadium	-	32	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10	< 10
Zinc	300	360	40	76	< 10	39	< 10	71	15	35	< 10	94	12

Note: * - Guidance Value
"-" - No Value Given
All units in ug/l

TABLE 4-9
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Groundwater (April 15, 1994)

Sample ID	NYS "GA" Standards (ug/l)	RMW-1 Results (Unfiltered)	RMW-2 Results (Unfiltered)	RMW-3 Results (Unfiltered)	CW-1 Results (Unfiltered)	MW-1D Results (Unfiltered)	MW-1S Results (Unfiltered)
VOC (ug/l)							
Acetone	50*	< 0.4	9	< 0.4	< 0.4	< 0.4	< 0.4
Benzene	0.7	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bromodichloromethane	50*	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bromoform	50*	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Bromomethane	5	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
2-Butanone	50*	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Carbon Disulfide	-	8	< 0.2	2	25	18	40
Carbon Tetrachloride	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chlorobenzene	5	4B	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chloroethane	5	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Chloroform	7	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chloromethane	5	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Dibromochloromethane	50*	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1-Dichloroethane	5	0.9	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichloroethane	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1-Dichloroethene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichloroethene (Total)	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,2-Dichloropropane	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
cis-1,3-Dichloropropene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
trans-1,3-Dichloropropene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Ethyl benzene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
2-Hexanone	50*	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Methylene chloride	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
4-Methyl-2-pentanone	-	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Styrene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1,2,2-Tetrachloroethane	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Tetrachloroethene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Toluene	5	< 0.2	< 0.2	0.1BJ	< 0.2	< 0.2	< 0.2
1,1,1-Trichloroethane	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
1,1,2-Trichloroethane	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Trichloroethene	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Vinyl acetate	-	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Vinyl chloride	2	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4	< 0.4
Total Xylenes	5	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2

TABLE 4-9
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Groundwater (April 15, 1994)

Sample ID	NYS "GA" Standards (ug/l)	RMW-1 Results (Unfiltered)	RMW-2 Results (Unfiltered)	RMW-3 Results (Unfiltered)	CW-1 Results (Unfiltered)	MW-1D Results (Unfiltered)	MW-1S Results (Unfiltered)
SEMI-VOC (ug/l)							
Acenaphthene	20*	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Acenaphthylene	-	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4	< 4.4
Anthracene	50*	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Benzidine	5	< 55	< 55	< 55	< 55	< 55	< 55
Benzo(a)anthracene	0.002	< 9.8	< 9.8	< 9.8	< 9.8	< 9.8	< 9.8
Benzo(b)fluoranthene	0.002	< 6	< 6	< 6	< 6	< 6	< 6
Benzo(k)fluoranthene	0.002	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
Benzo(ghi)perylene	-	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1	< 5.1
Benzo(a)pyrene	ND	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
Bis(2-chloroethoxy) methane	5	< 6.6	< 6.6	< 6.6	< 6.6	< 6.6	< 6.6
Bis(2-chloroethyl) ether	1.0	< 7.1	< 7.1	< 7.1	< 7.1	< 7.1	< 7.1
Bis(2-chloroisopropyl) ether	5	< 7.1	< 7.1	< 7.1	< 7.1	< 7.1	< 7.1
Bis(2-ethylhexyl) phthalate	50	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
4-Bromophenyl phenyl ether	-	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Butyl benzyl phthalate	50*	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
4-Chloro-3-methylphenol	-	< 3.8	< 3.8	< 3.8	< 3.8	< 3.8	< 3.8
2-Chloronaphthalene	10*	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
2-Chlorophenol	-	< 4.1	< 4.1	< 4.1	< 4.1	< 4.1	< 4.1
4-Chlorodiphenylether	-	< 5.2	< 5.2	< 5.2	< 5.2	< 5.2	< 5.2
Chrysene	0.002	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
Dibenzo(a,h)anthracene	-	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
1,3-Dichlorobenzene	5	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
1,2-Dichlorobenzene	4.7	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
1,4-Dichlorobenzene	-	< 5.5	< 5.5	< 5.5	< 5.5	< 5.5	< 5.5
3,3'-Dichlorobenzidine	5	< 21	< 21	< 21	< 21	< 21	< 21
2,4-Dichlorophenol	1	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Diethyl phthalate	50*	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
2,4-Dimethylphenol	-	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Dimethyl phthalate	50*	< 2	< 2	< 2	< 2	< 2	< 2
4,6-Dinitro-2-methylphenol	-	< 30	< 30	< 30	< 30	< 30	< 30
1,2-Diphenylhydrazine	ND	< 12	< 12	< 12	< 12	< 12	< 12
2,4-Dinitrophenol	-	< 52	< 52	< 52	< 52	< 52	< 52
2,4-Dinitrotoluene	5	< 7.1	< 7.1	< 7.1	< 7.1	< 7.1	< 7.1
2,6-Dinitrotoluene	5	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Di-n-butyl phthalate	50	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
Di-n-octyl phthalate	50*	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1	< 3.1
Fluoranthene	50*	< 2.8	< 2.8	< 2.8	< 2.8	< 2.8	< 2.8
Fluorene	50*	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Hexachlorobenzene	0.35	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Hexachlorobutadiene	5	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1	< 1.1
Hexachlorocyclopentadiene	5	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Hexachloroethane	5	< 2	< 2	< 2	< 2	< 2	< 2
Indeno(1,2,3-cd)pyrene	0.002	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6	< 4.6
Isophorone	50*	< 2.8	< 2.8	< 2.8	< 2.8	< 2.8	< 2.8
Naphthalene	10*	< 2	< 2	< 2	< 2	< 2	< 2
Nitrobenzene	5	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
2-Nitrophenol	-	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5
4-Nitrophenol	-	< 3	< 3	< 3	< 3	< 3	< 3
N-Nitrosodimethylamine	50*	< 2.8	< 2.8	< 2.8	< 2.8	< 2.8	< 2.8
N-Nitroso-Di-n-propylamine	-	< 4.1	< 4.1	< 4.1	< 4.1	< 4.1	< 4.1
N-Nitrosodiphenylamine	-	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
Pentachlorophenol	1	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5	< 4.5

TABLE 4-9
Ramco Steel
Supplemental Investigation
Summary of Analytical Results
Groundwater (April 15, 1994)

Sample ID	NYS "GA" Standards (ug/l)	RMW-1 Results (Unfiltered)	RMW-2 Results (Unfiltered)	RMW-3 Results (Unfiltered)	CW-1 Results (Unfiltered)	MW-1D Results (Unfiltered)	MW-1S Results (Unfiltered)
SEMI-VOC (ug/l)							
Phenanthrene	50*	< 6.8	< 6.8	< 6.8	< 6.8	< 6.8	< 6.8
Phenol	1	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9	< 1.9
Pyrene	50*	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
1,2,4-Trichlorobenzene	5	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4	< 2.4
2,4,6-Trichlorophenol	-	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4	< 3.4
Pesticides (ug/l)							
Aldrin	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
alpha-BHC	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
beta-BHC	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
gamma-BHC (Lindane)	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
delta-BHC	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
Chlordane	0.1	< 0.62	< 0.62	< 0.62	< 0.62	< 0.50	< 0.50
4,4'-DDD	ND	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
4,4'-DDE	ND	0.025 J	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
4,4'-DDT	ND	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Dieldrin	ND	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Endosulfan I	-	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Endosulfan II	-	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Endosulfan Sulfate	-	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Endrin	ND	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Endrin ketone	-	< 0.12	< 0.12	< 0.12	< 0.12	< 0.10	< 0.10
Heptachlor	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
Heptachlor epoxide	ND	< 0.062	< 0.062	< 0.062	< 0.062	< 0.050	< 0.050
Methoxychlor	35	< 0.62	< 0.62	< 0.62	< 0.62	< 0.50	< 0.50
Toxaphene	ND	< 1.2	< 1.2	< 1.2	< 1.2	< 1.0	< 1.0

TABLE 4 - 10
Ramco Steel
Metals Concentrations Guidance Values

Constituent	Site Background Soil Data * (mg/kg)	NYSDEC Sediment Background Data** (mg/kg)	NYSDEC Sediment Criteria Data** (mg/kg)
Arsenic	7.5	12	5
Barium	63.2	-	-
Cadmium	ND(<21.9)	2.5	0.8
Chromium (Total)	13.6	75	26
Chromium (VI)	<0.1	-	-
Copper	-	65	19
Iron(%)	-	5.9	2.4
Lead	9.1	55	27
Manganese	-	1200	428
Mercury	ND(<0.12)	0.6	0.11
Nickel	-	75	22
Selenium	ND(<0.94)	-	-
Zinc	86.3	145	85

Note:
* - Based on the 95% Upper Confidence Level (UCL) for concentrations reported in soil samples TP2-1 and TP-6-1

** - From NYSDEC guidance document, Sediment Criteria - December 1989

5.0 CONTAMINANT FATE AND TRANSPORT EVALUATION

5.1 POTENTIAL ROUTES OF MIGRATION

Chemicals detected at the site could be released to the environment through a number of different routes or pathways. These pathways include:

- Resuspension to air along with surface dust; a concern for metals and possibly PAHs and PCBs
- Migration of chemicals in soil to groundwater under the site
- Migration of chemicals in groundwater under site to off-site groundwater
- Transport of chemicals off-site in surface water runoff

The potential for contaminants to migrate from the site depends upon the concentrations present in the environmental media, their location at the site, climate conditions, i.e. precipitation, wind, and physio-chemical properties of the contaminants.

5.2 CONTAMINANT MIGRATION POTENTIAL

This section identifies pathways by which chemicals could be released from the site, and evaluates the potential for releases based on site conditions and physio-chemical properties. Additional evaluation of pathways and the potential risks involved with the specific contaminants have been addressed in Section 6 - Baseline Risk Assessment.

5.2.1 RELEASES TO AIR

VOC emissions could occur largely from petroleum hydrocarbon source areas at the site or from chlorinated solvents identified at the site. The constituents in petroleum hydrocarbons with the greatest potential for emission to the air have low vapor pressures and high diffusion coefficients, i.e. those that diffuse readily through soil. The constituents include low-molecule weight aromatic hydrocarbons, such as benzene, toluene, ethylbenzene, and xylene, and low-molecular weight straight-chain hydrocarbons. Chlorinated VOCs that could be emitted to the air included acetone, tetrachloroethylene or other similar contaminants.

Results of the environmental media sampling at the Ramco site have revealed the presence of various VOCs which would be of potential concern for emission to the air. However, these contaminants have all been detected in relatively low concentrations, in the part per billion range in soil, sediment and groundwater. These results suggest that VOCs that could previously have been detected in higher concentrations have been emitted to the air over time, migrated along other pathways or have been decomposed in the environmental media. Remaining organics constituents with low vapor pressures and diffusion coefficients have limited potential for emission to the air as vapor, compared with VOCs. These are principally the higher molecular weight constituents of petroleum hydrocarbons, PAHs and PCBs.

Metals and semivolatile constituents in the surface soil can become resuspended along with dust to the air. The potential for dust to become resuspended depends upon particle size distribution, the extent of crust or aggregate formation in the surface soil and the extent of vegetation or non-erodible elements, such as rocks or concrete foundations in the soil. The fill area and a majority of other areas on-site are covered with vegetation. In addition, many of the areas are covered with slag aggregate fill material around railroad tracks and other areas of the site. The magnitude of chemical emission to the air depends upon the chemical concentrations and the surface area impacted. Metals have been detected within fill material on-site, although a majority of the metals detected have been related to slag material or other material at depth within the fill area of the site. PCBS and PAHs detected in soil at depth within the fill area have a low potential for emission to air because of their limited extent in subsurface soils on-site.

5.2.2 MIGRATION TO GROUNDWATER

The mobility of constituents through soil to groundwater is dependent upon the amount of water infiltrating through the soil or in contact with soil and physio-chemical properties. The migration of VOCs through soil can occur by diffusion through soil moisture, diffusion through soil vapor and mass flow along with water infiltrating through the soil column.

Several VOCs, semivolatile, pesticides and metals were initially detected during groundwater monitoring at relative low concentrations in select wells on-site. However, based on the results of subsequent resampling of groundwater from on-site wells, minimal contaminants have been identified in groundwater. Specifically, a limited number of VOC and pesticide constituents, at low concentrations have been identified in groundwater from well location RMW-1 near the Altift Landfill. The identified VOCs and pesticides in groundwater are not easily correlated to contaminants detected in soil media at the individual sampling locations and may be attributed to migration from other areas. Significant metals concentrations in groundwater which may be attributable to site related contaminants have not been identified. This is consistent with the TCLP testing result which indicated that the potential of leaching of metals from site soil and sediment media was minimal.

5.2.3 MIGRATION TO OFF-SITE GROUNDWATER

As discussed in Section 3.5 - Site Hydrogeology, complex groundwater flow patterns exist within shallow water table conditions and bedrock under the site and at adjacent sites. Migration of contaminants from the Ramco site would likely be within the shallow unconsolidated material which comprises the upper water bearing unit at the site. It would appear that any flow on-site would be directed toward the pond, though these flow patterns are complicated by the mounding effect of the adjacent Altift site, the affects of this site may contribute to the inward direction of groundwater flow at the Ramco site. As a result, it is not believed that migration of contaminants from the Ramco site via groundwater pathways is of a significant concern related to surrounding hydrogeologic conditions of neighboring sites.

5.2.4 MIGRATION OFF-SITE IN SURFACE WATER

The surficial relief of the site is relatively flat with a majority of surface water flow from the site being directed toward the on-site pond. The original outfall structure of the pond remains open which would direct the flow of surface water to ponded areas north of the site and adjacent to the Altift

Landfill site. With the exception of iron, magnesium, and manganese, surface waters within the pond were identified to contain no significant concentrations of any organic constituents, thus no impacts related to surface water contamination would be expected from the flow of water from the pond to downgradient areas. The transport and distribution of contaminants residing in sediment material within the pond is expected to be minimal due to the low volume and velocity of water exiting the pond via this route.

6.0 BASELINE RISK EVALUATION

This section presents the results of the baseline risk assessment conducted for the Ramco site based on data and information developed from the RI activities. The objective of the risk assessment is to evaluate the potential impacts to human health associated with the residual concentrations of chemicals detected in sediment, soil, groundwater, and surface water.

6.1 RISK ASSESSMENT APPROACH

A conservative approach was used in the risk assessment for this site. Outlined below is a summary of the underlying assumptions used in the risk assessment

- The risk assessment performed for the site has been limited to a human health evaluation. Risks associated with ecological concerns at the site have been addressed in Section 3.5 - Ecology.

- Potential human health risks associated with concentrations of individual chemicals of interest are estimated in accordance with the guidance contained in the following EPA documents for Superfund assessment:

  - U.S. EPA, 1989a. Risk Assessment Guidance for Superfund. Vol. I. Human Health Evaluation Manual (Part A). OSWER Directive No. 9285.7-01A.

  - U.S. EPA, 1989b. Exposure Factor Handbook. EPA 600/8-89/-043.

  - U.S. EPA 1991. Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors." OSWER Directive 9285:6-03.

- The potential human health risks are calculated based on direct contact with the contaminated environmental media. Factors pertinent to the environmental fate and transport of the contaminants, such as dilution, degradation and dispersion prior to the potential receptor, are not factored into the risk assessment.

The organization of the risk assessment is fashioned after the suggested outline for a baseline risk assessment, presented in Exhibit 9-1 in the U.S. EPA's interim final publication "Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Part A, Baseline Risk Assessment" (U.S. EPA, 1989a).

The organization of the risk assessment may be briefly summarized as follows:

Section 6.1: Risk Assessment Approach
Information reviewed in this section includes the scope of the risk assessment, the background of the site, and a brief discussion of the nature of contamination.

Section 6.2: Identification of Chemicals of Potential Concern
Analytical results obtained during the previous investigations and the relevance to the risk assessment are discussed in this section.

Section 6.3: Exposure Assessment
The potential pathways by which populations may be exposed to chemicals of concern are discussed. For each pathway that is selected for quantitative evaluation, the chemical concentrations at the point of exposure are estimated. The exposure to each pathway is quantified by estimating the magnitude, frequency, and duration of exposure for each relevant pathway.

Section 6.4: Toxicity Assessment
Chemical-specific toxicological criteria to be used in the quantitative risk assessment are presented in this section.

Section 6.5: Risk Characterization
In this section, results from the exposure and toxicity assessments are integrated into a quantitative expression of the risks potentially associated with the site.

6.2 CHEMICALS OF POTENTIAL CONCERN

Analytical data available from the site investigation were reviewed in order to identify a set of chemicals that were likely to be site-related and to organize sampling data that were of acceptable quality for use in the quantitative risk assessment. Presented in this section is information regarding the methods used to evaluate the quality of data and to select the chemicals of potential concern.

6.2.1 SITE-SPECIFIC DATA COLLECTION CONSIDERATIONS

The RI for the Ramco site included the collection and analysis of numerous environmental samples from sediment, soil, groundwater, and surface water. Samples were collected at various locations across the site and included laboratory analysis for volatiles, semivolatiles, PCBs, pesticides and metals. Section 2.0 - Site Characterization Activities summarized the RI activities undertaken for the collection of environmental samples and Section 4.0 - Nature and Extent of Contamination presented the result of the sampling and data interpretation for the Ramco site.

Based on the results of the RI activities, chemical constituents have been detected at varying concentrations in the four primary environmental media at the site; sediment, soil, groundwater and surface water. For each of these media, contaminant concentrations were identified and evaluated for their use in the quantitative risk assessment. The following summarizes the specific environmental media data which was considered for use in the risk assessment:

- To provide a conservative evaluation of risk associated with the site, all volatile organic, semivolatile, pesticide, and PCB constituents which were detected in the individual media were considered in the risk assessment.

- For metals constituents in surface water and groundwater, only those constituents which were above NYS water quality standards were considered.

- For metals in sediment and soil, those constituents which were identified with average concentrations exceeding site background data were considered in the assessment.

Tables 6-1 through 6-4 provide a summary of the exposure point concentrations for each of the environmental media and data included in the quantitative risk assessment.

6.2.2 SITE-SPECIFIC DATA EVALUATION CONSIDERATIONS

The methodology employed in the general data evaluation can be outlined as follows:

Reasonable Maximum Exposure (RME) Calculations

The reasonable maximum exposure (RME) is defined by U.S. EPA as the maximum exposure that is reasonably expected to occur at a site. The RME concentrations used in the human health risk assessment were calculated by estimating the 95th upper confidence limit on the arithmetic mean (Gilbert, 1987). If the estimated RME was greater than the maximum detected concentration, then the maximum detected concentration was used as the exposure point concentration in the risk assessment, in accordance with guidance provided in Section 6.4 of U.S. EPA 1989a.

6.3 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate the type and magnitude of exposures to the chemicals of potential concern that are present at or migrating from a site. The results of the exposure assessment will be integrated with chemical-specific toxicity information in order to characterize human health risks potentially associated with the site.

6.3.1 CHARACTERIZATION OF EXPOSURE SETTING

The first step in the exposure assessment is to characterize the site with respect to its physical characteristics as well as those of the human populations on or near the site.

6.3.1.1 Physical Setting

The Ramco site is and historically has been a steel processing facility. During the period the plant was operating as Ramco Steel Inc. and throughout the history of the site, the principal business activities were the processing of mill steel to produce various products by mechanical methods, such as shearing, milling, grinding, cutting or drawing. The entire Ramco site is comprised of approximately 17 acres, with the property separated into two areas by an existing railroad spur which runs north-south through the property. The eastern portion of the property consists of a manufacturing building and associated parking and storage areas. The western portion of the property includes the on-site pond and associated surrounding land. The eastern portion of the property containing the manufacturing building covers an area of approximately 8.5 acres and the western portion including the pond and associated area comprises a similar acreage and is the focus of this RI report.

Land use in the immediate vicinity of the Ramco site is used for industrial and light-industrial purposes. Areas to the north, south and west of the Ramco site are used for industrial purposes or are natural swamp-marsh areas. Much of the original marsh areas have been filled, although smaller marshy areas exist in areas. Two recreational areas are located in the proximity of the site: Tifft Farm Nature Preserve to the northwest, and South Park municipal park located to the south of the

Ramco site. Residential areas exist approximately one-third mile to the east and are interspersed with light industry areas. The residential and recreational areas are removed from the site area and away from likely migration pathways of contaminants.

6.3.1.2 Potentially Exposed Populations

Under the current land use, the potentially exposed population has been limited to trespassers. Although no specific information is available concerning the use of the premises by trespassers and none have been observed on-site, trespassers may migrate to the site or through the site from neighboring areas. Current and future industrial workers were considered in the assessment for the site to provide an evaluation of exposure risk to workers which may be exposed to the site. Similarly, information is unavailable regarding the use of the site by workers and there is no indication that such use occurs. Thus, both the trespasser and worker scenarios are considered conservative in the evaluation of associate human health risks.

Under the current land use condition, the potential exposed population includes trespassers. Population from age 7 to 30 are assumed most likely to trespass on the site. The frequency with which an individual will trespass on the site is expected to be influenced by climate conditions. For the purpose of this risk assessment trespassers are on the site for 3 days a week in the summer months (June, July, and August) and 1 day a week for late spring (May) and early fall (September). Therefore, a total of 44 days is calculated per year for on-site exposure.

Under the current industrial land use condition, workers are assumed to be exposed only for brief periods of time (intermittently) while performing routing maintenance for the facility. The frequency with which a worker is exposed to sediments and other media is assumed to be two days per month and twelve months per year. Therefore, a total of 24 days of exposure per year is calculated for this scenario.

6.3.2 IDENTIFICATION OF EXPOSURE PATHWAYS

Exposure pathways describe the movement of chemicals from sources (e.g., chemicals in soil) to exposure points (on-site locations) where receptors (potentially exposed populations) may come in contact with the chemicals.

6.3.2.1 Sources and Receiving Media

Sampling of the sediment, soil, groundwater, and surface water has revealed detectable concentrations of metals, volatile organics, semivolatile organics, pesticides and PCBs. Contamination of the air via routes of air borne dust and volatilization pathways is possible; however, the level of any contaminants which would be released in the air is expected to be negligible. Air modeling was used as an estimate of the concentration of any potential air related contaminants.

Although fish species were not identified in the pond based on the ecological evaluation of the site, the potential consumption of fish by trespasser has been included in the risk assessment for current land use as a conservative measure.

6.3.2.2 Exposure Points and Exposure Routes

The known or potential human receptors under both current/future land use conditions include:

Human Receptors	Current/Future Land Use
Site resident	None
Site worker	Potential
Site trespasser	Potential

The possibility of the human receptor to be exposed to the contaminated media through all relevant routes of exposure (i.e., ingestion, inhalation, and dermal contact) will be evaluated. Exposure routes considered not to be applicable to the site, based on site-specific information and professional judgment, were excluded from the quantitative risk assessment.

6.3.2.3 Compilation of Exposure Pathways

Exposure pathways describe the movement of chemicals from sources (e.g., contaminated soil) to exposure points (locations) where receptors (exposed populations) may come in contact with the chemicals. Pathways through which individuals could be exposed to chemicals at the site are listed below. Pertinent information, such as potential human receptors, routes of exposure, and land use conditions, is also provided for each of the pathways.

Scenario	Media	Route
Current trespasser	Soil	Inhalation Ingestion Dermal Contact
	Sediment	Dermal Contact
	Surface Water	Ingestion Dermal Contact Inhalation Fish Ingestion
Current/Future Site Worker	Soil	Inhalation Ingestion Dermal Contact

Exposures to contaminated groundwater via ingestion, inhalation, and dermal contact under current land use conditions are not included in the quantitative risk analysis. Based on the hydrology of the area, the groundwater quality, and the fact that no current or foreseeable users of groundwater for potable and/or industrial purposes exist, preclude including groundwater as a viable pathway for current or future use scenario exposure to groundwater.

6.3.3 QUANTIFICATION OF EXPOSURE

Estimates of exposure levels for the chemicals of concern are required for quantitative risk characterization. Tables 6-5 through 6-15 present calculations used to determine the exposure levels for the chemicals of concern for each of the pathways. The basic equation used to calculate the human intake of the chemicals (U.S. EPA, 1989a) is:

$$I = C \times \frac{CR \times EFD}{BW} \times \frac{1}{AT}$$

Where:
- I = daily intake (mg of chemical per kg of body weight per day)
- C = concentration of the chemical (e.g., mg/kg in soil or mg/L in water)
- CR = contact rate; the amount of contaminated medium contacted over the exposure period (e.g., mg/day for soil, L/day for groundwater and m3/day for air)
- EFD = exposure frequency and duration; describes how often and how long exposure occurs. Generally calculated using the terms EF (exposure frequency in days/year) and ED (exposure duration in years)
- BW = body weight; the average body weight over the exposure period (kg)
- AT = averaging time; period over which exposure is averaged (days)

The pathway-specific intake formulae, variables, and calculations are presented in Tables 6-5 through 6-15. Two tables are included for each of the pathways. The first table (Table A, variable table) presents the formula, assumed input values, associated references, and relevant comments. The "A" tables should be consulted for details and rationale regarding the parameter values used in calculation. The second table (Table B, calculation table) presents the actual calculations using the information contained in the variable table. For clarity, each variable of the intake equation is included in the calculation tables. Values in the tables may be presented in scientific notation indicated as xE-xx (the use of the E designation is required for the computer software utilized and is standard format used in risk assessments). For example, one million would be indicated as 1E+06 (i.e., $1 \times 10^{+6}$ or 1,000,000) and one thousandth would be 1E-03 (i.e., 1×10^{-3} or 0.001).

For reference, the tables associated with each pathway are as follows:

Pathways	Variable Table	Calculation Table
Current trespasser/inhalation of airborne chemicals in soil	6-5(A)	6-5(B)
Current trespasser/ingestion of chemicals in soil	6-6(A)	6-6(B)
Current trespasser/dermal contact with chemicals in soil	6-7(A)	6-7(B)
Current trespasser/dermal contact with chemicals in sediment	6-8(A)	6-8(B)

Current trespasser/inhalation of airborne chemicals in surface water	6-9(A)	6-9(B)
Current trespasser/ingestion of chemicals in surface water	6-10(A)	6-10(B)
Current trespasser/dermal contact with chemicals in surface water	6-11(A)	6-11(B)
Current trespasser/ingestion of fish	6-12(A)	6-12(B)
Current/future worker/inhalation of airborne chemicals in soil	6-13(A)	6-13(B)
Current/future worker/ingestion of chemicals in soil	6-14(A)	6-14(B)
Current/future worker/dermal contact with chemicals in soil	6-15(A)	6-15(B)

The contaminant concentrations (CS) used in the risk assessment are the RME concentrations (Tables 6-1 through 6-5). The air concentrations (CA) used in the inhalation pathways are estimated via modeling. The modeling calculation tables in Appendix F are identified as follows:

- Table A1 -- Soil to Air Concentration
  - -- Estimate of air concentration of volatiles and particulate from chemicals in soil
- Table A2 -- Calculation of volatilization factor
  - -- Estimation of volatilization factor
  - -- Calculated value used in Table A1
- Table A3 -- Diffusion Coefficient Model
  - -- Estimation of air diffusion coefficient
  - -- Calculated value used in Table A1
- Table A4 -- Calculation of fish concentrations
  - -- Estimation of the concentration of chemicals in fish
- Table A5 -- Surface Water Volatile Air Emission Modeling
  - -- Estimation of volatilization of chemical in water

6.4 IDENTIFICATION OF UNCERTAINTY

Uncertainties in the exposure assessment could arise from the following sources:

- Use of standard assumptions instead of site-specific data selected on the basis of "best professional judgment."

- Selection from a wide range of values reported in the published literature of a value thought to best represent the site under study.

- The degree of "protectiveness" or "conservatism" inherent in the current risk assessment guidance.

6.5 TOXICITY ASSESSMENT

The objectives of the toxicity assessment are to evaluate available information regarding the potential for particular contaminants to cause adverse effects in exposed individuals, and to provide the analytical framework for the characterization of human health impacts.

For the purpose of evaluating the casual relationship between the extent of exposure to a contaminant and the increased likelihood and/or severity of adverse effects, toxicological information used to support the risk assessment conclusions is generally divided into two categories: carcinogenic and systemic (or noncarcinogenic). To quantify the relationship between intake and noncarcinogenic effects, an oral reference dose (RfD) or inhalation reference concentration (RFC) is used. To express the cancer risk per unit dose, cancer slope factors are used. The sources for the toxicological information to be used in the toxicity assessment (as recommended by EPA, 1989a) are:

- Integrated Risk Information System (IRIS) (U.S. EPA, 1992a)
  IRIS is an EPA electronic data base containing up-to-date health risk and EPA regulatory information for numerous chemicals. IRIS contains only toxicity criteria that have been verified by the EPA Workgroups and consequently, is considered to be the preferred source of toxicity information. Information in IRIS always supersedes all other sources.

- Health Effects Assessment Summary Tables (HEAST) [U.S. EPA, 1992b]
  HEAST is a tabular presentation of toxicity information and values for specific chemicals. HEAST, which is updated on a quarterly basis, also directs readers to the most current sources of supporting toxicity information through an extensive reference system. Therefore, HEAST is a useful source when verified information is not on IRIS. The most current version of the HEAST was used in this risk assessment.

Currently, there are no toxicological criteria available for gauging potential human health concerns associated with the dermal route of exposure. For the purpose of a baseline risk assessment, it is recommended that the oral RfDs and slope factors be adopted as the default dermal RfDs (U.S. EPA 1989a), if:

- Health effects following exposure are not route-specific.

- Portal-of-entry effects (e.g., dermatitis associated with dermal exposure and respiratory effects associated with inhalation exposure) are not the principal effects of concern.

Exposures with the dermal route are generally calculated as absorbed doses, while oral RfDs are expressed as administered doses. Therefore, adjustments are necessary to match the dermal exposure estimates with the oral RfDs and slope factors. Current U.S. EPA Superfund guidance is to adjust

the oral RfD or slope factor with oral absorption factor (i.e., percent chemical that is absorbed) in order to extrapolate a default dermal RfD or slope factor, which is expressed in terms of absorbed dose. The equation for extrapolation of a default dermal RfD is as follows:

Oral RfD (administered dose in mg/kg-day) x oral absorption factor (%)
= dermal RfD (absorbed dose in mg/kg-day)

The equation for extrapolation of a default dermal slope factor is as follows:

Oral slope factor [(mg/kg-day)-1] x oral absorption factor (%)
= dermal slope factor [(mg/kg-day)-1]

The default dermal RfDs and the oral absorption factors used in calculation and the default dermal slope factors and the oral absorption factors used in calculation are presented in Tables 6-16 through 6-21.

6.5.1 UNCERTAINTIES RELATED TO TOXICITY INFORMATION

Uncertainties in the quantitative toxicity assessment have been well recognized, but the degrees of uncertainty can vary, depending on the major sources of uncertainty associated with the toxicity assessment of a particular site.

It should be noted that, the current method recommended by U.S. EPA for extrapolating default dermal toxicity criteria does not reflect the specific conditions under which the reference toxicology study was conducted (e.g., method of administration such as gavage, water, or diet, and vehicle of administration such as solvent, oil, or solution). Therefore, uncertainty is added to the assessment of dermal pathways.

6.6 RISK CHARACTERIZATION

In this step of the risk assessment, information obtained during the exposure and toxicity assessments (Sections 6.3 and 6.4) was integrated in order to characterize the potential risks posed by the chemicals at the site.

For clarity, the methodology used for risk characterization is briefly outlined as follows:

- **Organize outputs of exposure and toxicity assessments by the duration and route of exposure for each population.**

  The chronic daily intakes calculated in Section 6.3 (Tables 6-5 through 6-15) were combined with the toxicity criteria presented in Section 6.5 (Tables 6-16 through 6-21) in order to obtain some quantitative expression of the potential risks from the site.

  Potential risks for noncarcinogenic effects are estimated by calculating the hazard quotient (the ratio of the chronic daily intake to the reference dose) for each chemical.

Potential risks for carcinogenic effects are estimated by calculating excess lifetime cancer risks as a result of exposure to carcinogens. Calculation involves multiplying the chronic daily intake for each chemical by its upper-bound cancer slope factor. A cancer risk level of greater than 1 x 10^{-4} (or 1E-4) to 1 x 10^{-6} (or 1E-06) is generally considered to be of regulatory concern.

- **Quantify total carcinogenic and noncarcinogenic risks for each pathway by summing the risks estimated for each chemical of concern.**

  The sum of the hazard quotients of all chemicals under consideration is termed the hazard index. The hazard index is used as a reference point for gauging the potential noncarcinogenic effects of environmental exposures to complex exposures. A hazard index that is less than 1 is regarded as not likely to be associated with any health risks.

  The total upper-bound excess lifetime cancer risk for each pathway was obtained by summing the chemical-specific cancer risk estimates.

- **Estimate overall risks that affect each population over the same time period by combining risks across pathways.**

  In order to address the possibility of a population that is likely to be exposed to more than one pathway, risks across different pathways that were likely to affect the same population were combined.

- **Analyze and discuss uncertainties related to the risk characterization.**

  Uncertainties associated with the methodology of the risk characterization were analyzed in order to evaluate the potential impact of the uncertainties on the conclusions of the risk characterization.

Results of the risk characterization are presented by the exposure pathways and the land use conditions and are discussed in the following sections.

6.6.1 CURRENT/FUTURE LAND USE CONDITIONS

Under the current/future land use conditions, trespassers and industrial workers on the site were considered to be the human populations most likely to be impacted by the chemicals that were present at or migrating from the site. Potential risks associated with trespasser and worker exposure under current/future land use conditions are presented in Tables 6.22 and 6.23.

A summary of risks calculated for the current land use conditions, i.e., trespasser scenario and current and future industrial worker scenario is as follows:

Current/Future Land Use - Trespasser

Pathway	Noncarcinogenic Risks	Carcinogenic Risks
Inhalation of Chemicals from Surface Water	0	0E+00
Incidental Ingestion of Surface Water	0.0000004	0E+00
Dermal Contact with Surface Water	0.0000006	0E+00
Fish Ingestion	0.000002	0E+00
Dermal Contact with Sediment	0.003	1E-7
Inhalation of Soil	0.000002	3E-9
Ingestion of Soil	0.02	3E-6
Dermal Contact with Soil	0.002	2E-7
TOTAL	0.03	4E-6

Current/Future Land Use - Industrial Worker

Pathway	Noncarcinogenic Risks	Carcinogenic Risks
Inhalation of Soil	0.0000006	1E-9
Ingestion of Soil	0.006	9E-7
Dermal Contact with Soil	0.001	1E-7
TOTAL	0.007	1E-6

The hazard index for the trespasser exposure for all chemicals through all relevant pathways is 0.03 based on RME concentrations. The hazard index for current/future industrial worker exposure pathways is 0.007. Under current U.S. EPA guidance, a hazard index of less than 1 suggests that exposures under consideration are not expected to be associated with appreciable noncarcinogenic risks.

The total excess lifetime cancer risk based on RME concentrations is 4E-6. For the current/future industrial worker exposure the excess risk is 1E-6. The associated excess lifetime cancer risks calculated for these scenarios are at the lower limits of acceptable risks of between 1E-4 and 1E-6.

As indicated above, these risks are driven primarily by the ingestion of soil pathway of exposure. In more detail, the calculate risk associated with ingestion of soil is driven primarily by the concentration of arsenic detected in soils at the site.

6.6.2 UNCERTAINTIES RELATED TO THE RISK CHARACTERIZATION

The objective of uncertainty analysis in the risk characterization step was to specify the assumptions and uncertainties inherent in the risk assessment in order to place the risk estimates in proper perceptive. Presented in this section is key information bearing on the level of confidence in the quantitative risk assessment for the site.

6.6.2.1 Summary of Uncertainty Related to Exposure Assessment

There is a wide variety of models that can be used in the exposure assessment. The uncertainty concerning the approximation between mathematical expression of the model and site-specific environmental conditions has been well recognized. It is not always feasible, however, to identify and quantify the types and degrees of uncertainty related to modeling. Models were used to calculate air concentrations from soil and surface water.

6.6.2.2 Summary of Uncertainty Related to Toxicity Assessment

The types of uncertainties generally encountered in a quantitative toxicity assessment include the following:

Uncertainty Inherent in the Risk Assessment Process

- Use of animal data to predict the potential human health impact.
- Use of toxicity information obtained from animals experimentally exposed to high doses, to project the likely impacts in humans following exposure to low levels of contaminants in the environment.
- Use of a conservative approach in calculating toxicity criteria.

Uncertainty Common to Current EPA Guidance on Risk Assessment

- Lack of pertinent toxicity data for chemicals of concern.
- Lack of appropriate toxicity criteria for evaluation of effects following dermal route of exposure.

6.6.3 SUMMARY DISCUSSION OF THE RISK CHARACTERIZATION

The risk characterization for current/future land use conditions have been presented in Section 6.6.1 above. According to U.S. EPA, risk characterization must be performed to evaluate noncarcinogenic and carcinogenic risks associated with contaminants under site-specific exposure scenarios. For gauging the risk of noncarcinogenic effects, a hazard index is used. A hazard index of less than 1 is

regarded as not likely to be associated with any health risks. For gauging the risks of carcinogenic effects, an excess cancer risk is utilized. A cancer risk of greater than 1×10^{-4} to 1×10^{-6} is generally considered to be of regulatory concern.

The results of the risks characterization at the Ramco site are summarized according to scenario and media:

Scenario	Based on RME Concentrations
Current land use/trespasser	
Hazard index (total)	0.03
soil	0.02
sediment	0.003
surface water	0.000003
Excess cancer risk (total)	4E-6
soil	3E-6
sediment	1E-7
surface water	0E+00
Current/Future Industrial Worker	
Hazard index (total)	0.007
soil	0.007
Excess cancer risk (total)	1E-6
soil	1E-6

In summary, adverse impacts to human health are not necessarily associated with exposure to chemical constituents at the Ramco site according to the current/future trespasser and worker scenarios. As presented above, exposure to soil on-site has the result of elevating hazard indices and excess lifetime cancer risks. The associated lifetime cancer risks are at or only slightly above the extreme lower bounds of the 1×10^{-4} to 1×10^{-6} range defined as a regulatory concern.

Specifically, excess lifetime cancer risks and elevated hazard indices under the current/future land use scenarios for trespassers and worker exposure are largely attributable to the pathway of ingestion of arsenic in soil. Elevated levels of arsenic above background were detected in numerous soil samples from the fill area of the site. In correlating arsenic concentration to the types of materials sampled in this area, it is apparent that elevated levels of arsenic are characteristic of the slag fill material. The elevated total constituent concentrations of arsenic and other metals in slag is not unexpected of slag, and is characteristic of steel slag materials. It is noted that although the slag material contains high concentration of metals, the metals are not readily leachable from the material using TCLP or other leach testing. This is supported by on site TCLP testing results which indicated that no arsenic and minimal levels of lead and barium were detected in samples from the fill area. The inclusion of steel making slag as a Bevel Amendment waste materials which exempts steel making slag as a hazardous waste due to the low potential for leaching of metals from the material further supports this.

TABLE 6-1
SUMMARY OF SOIL RESULTS
RAMCO STEEL - BUFFALO, NEW YORK

Sample ID	Average Background Concentration	Range of Detected Values	Frequency of Detection	Average RA Value	Standard Deviation	t-Value	95th Upper Confidence Limit	Exposure Point Concentration
Metals (mg/kg)								
Arsenic - Total	2.85E+00	1.3 - 52.6	13 / 15 (87%)	1.89E+01	1.97E+01	1.761	2.78E+01	2.78E+01
Barium - Total	5.16E+01	6.8 - 406	14 / 15 (93%)	1.30E+02	1.09E+02	1.761	1.80E+02	1.80E+02
Chromium - Total	1.08E+01	6.3 - 643	14 / 15 (93%)	8.80E+01	1.59E+02	1.761	1.60E+02	1.60E+02
Lead - Total	6.30E+00	9.1 - 559	14 / 15 (93%)	2.17E+02	2.32E+02	1.761	3.22E+02	3.22E+02
Mercury - Total	6.00E-02	0.17 - 0.17	1 / 15 (7%)	7.53E-02	3.06E-02	1.761	8.93E-02	8.93E-02
Zinc - Total	5.94E+01	28.5 - 885	13 / 15 (87%)	2.74E+02	2.87E+02	1.761	4.04E+02	4.04E+02
VOC (ug/kg)								
Acetone		34 - 430	8 / 15 (53%)	1.12E+02	1.38E+02	1.761	1.75E+02	1.75E+02
2-Butanone		9 - 110	9 / 15 (60%)	2.68E+01	3.06E+01	1.761	4.07E+01	4.07E+01
Benzene		4 - 4	1 / 15 (7%)	8.93E+00	7.41E+00	1.761	1.23E+01	4.00E+00
Tetrachloroethene		2 - 2	1 / 15 (7%)	8.60E+00	7.57E+00	1.761	1.20E+01	2.00E+00
Toluene		0.8 - 6	3 / 15 (20%)	8.25E+00	7.88E+00	1.761	1.18E+01	6.00E+00
Chlorobenzene		2 - 2	1 / 15 (7%)	8.73E+00	7.55E+00	1.761	1.22E+01	2.00E+00
Ethyl benzene		0.4 - 3	2 / 15 (13%)	8.43E+00	7.77E+00	1.761	1.20E+01	3.00E+00
Total Xylenes		0.6 - 4	4 / 15 (27%)	7.55E+00	8.24E+00	1.761	1.13E+01	4.00E+00
SEMI-VOC (ug/kg)								
Phenol		470 - 470	1 / 6 (17%)	3.02E+02	9.47E+01	2.015	3.80E+02	3.80E+02
Benzoic Acid		64 - 300	2 / 6 (33%)	7.94E+02	4.95E+02	2.015	1.20E+03	3.00E+02
Naphthalene		55 - 120	3 / 6 (50%)	1.54E+02	8.50E+01	2.015	2.23E+02	1.20E+02
2-Methylnaphthalene		62 - 110	2 / 6 (33%)	1.86E+02	8.48E+01	2.015	2.56E+02	1.10E+02
Acenaphthylene		36 - 36	1 / 6 (17%)	2.04E+02	8.76E+01	2.015	2.76E+02	3.60E+01
Acenaphthene		26 - 51	3 / 6 (50%)	1.39E+02	1.09E+02	2.015	2.28E+02	5.10E+01
Dibenzofuran		65 - 65	1 / 6 (17%)	2.08E+02	7.66E+01	2.015	2.71E+02	6.50E+01
Fluorene		58 - 58	1 / 6 (17%)	2.07E+02	7.92E+01	2.015	2.72E+02	5.80E+01
Phenanthrene		35 - 420	4 / 6 (67%)	2.18E+02	1.39E+02	2.015	3.33E+02	3.33E+02
Anthracene		95 - 95	1 / 6 (17%)	2.13E+02	6.55E+01	2.015	2.67E+02	9.50E+01
Fluoranthene		630 - 630	1 / 6 (17%)	3.03E+02	1.63E+02	2.015	4.37E+02	4.37E+02
Pyrene		920 - 920	1 / 6 (17%)	3.51E+02	2.81E+02	2.015	5.82E+02	5.82E+02
Benzo(a)anthracene		170 - 380	2 / 6 (33%)	2.44E+02	7.51E+01	2.015	3.06E+02	3.06E+02
Chrysene		200 - 540	2 / 6 (33%)	2.76E+02	1.32E+02	2.015	3.85E+02	3.85E+02
Bis(2-ethylhexyl) phthalate		1300 - 2000	4 / 6 (67%)	1.19E+03	8.08E+02	2.015	1.85E+03	1.85E+03
Benzo(b)fluoranthene		890 - 890	1 / 6 (17%)	3.46E+02	2.68E+02	2.015	5.67E+02	5.67E+02
Benzo(k)fluoranthene		410 - 410	1 / 6 (17%)	2.66E+02	7.70E+01	2.015	3.29E+02	3.29E+02
Benzo(a)pyrene		35 - 480	2 / 6 (33%)	2.48E+02	1.44E+02	2.015	3.66E+02	3.66E+02
Indeno(1,2,3-cd)pyrene		280 - 280	1 / 6 (17%)	2.44E+02	3.53E+01	2.015	2.73E+02	2.73E+02
Dibenzo(a,h)anthracene		77 - 77	1 / 6 (17%)	2.10E+02	7.21E+01	2.015	2.70E+02	7.70E+01
Benzo(ghi)perylene		200 - 200	1 / 6 (17%)	2.31E+02	3.41E+01	2.015	2.59E+02	2.00E+02
PCBS (ug/kg)								
Aroclor 1242		700 - 700	1 / 15 (7%)	7.41E+01	1.74E+02	1.761	1.53E+02	1.53E+02
Aroclor 1254		140 - 660	3 / 15 (20%)	8.79E+01	1.65E+02	1.761	1.63E+02	1.63E+02
PEST (ug/kg)								
beta-BHC		0.92 - 1.7	2 / 6 (33%)	2.23E+00	2.35E+00	2.015	4.16E+00	1.70E+00
Dieldrin		0.79 - 0.79	1 / 6 (17%)	4.17E+00	4.66E+00	2.015	8.00E+00	7.90E-01
4,4'-DDE		0.5 - 0.5	1 / 6 (17%)	4.12E+00	4.70E+00	2.015	7.98E+00	5.00E-01
Endrin		10 - 10	1 / 6 (17%)	5.70E+00	4.84E+00	2.015	9.68E+00	9.68E+00
Endosulfan II		1.2 - 6.2	2 / 6 (33%)	4.87E+00	4.56E+00	2.015	8.62E+00	6.20E+00
alpha-Chlordane		2.8 - 2.8	1 / 6 (17%)	2.56E+00	2.26E+00	2.015	4.42E+00	2.80E+00

TABLE 6-2
SUMMARY OF SEDIMENT RESULTS
RAMCO STEEL - BUFFALO, NEW YORK

Sample Number	Range of Detected Values	Frequency of Detection	Average RA Value	Standard Deviation	t-Value	95th Upper Confidence Limit	Exposure Point Concentration
Metals (mg/kg)							
Arsenic - Total	8.6 - 50.3	17 / 17 (100%)	2.27E+01	1.29E+01	1.746	2.82E+01	2.82E+01
Chromium - Total	17.1 - 267	17 / 17 (100%)	8.86E+01	7.45E+01	1.746	1.20E+02	1.20E+02
Copper - Total	23.9 - 221	6 / 6 (100%)	6.63E+01	7.74E+01	2.015	1.30E+02	1.30E+02
Iron - Total	12600 - 54300	6 / 6 (100%)	3.84E+04	1.51E+04	2.015	5.08E+04	EN
Lead - Total	34.3 - 242	17 / 17 (100%)	8.78E+01	5.40E+01	1.746	1.11E+02	1.11E+02
Manganese - Total	936 - 2490	6 / 6 (100%)	1.59E+03	7.07E+02	2.015	2.17E+03	2.17E+03
Mercury - Total	0.29 - 3.9	2 / 17 (12%)	3.06E-01	9.28E-01	1.746	6.99E-01	6.99E-01
Nickel - Total	15.5 - 46.3	6 / 6 (100%)	2.32E+01	1.16E+01	2.015	3.27E+01	3.27E+01
Zinc - Total	31.5 - 211	17 / 17 (100%)	1.10E+02	5.48E+01	1.746	1.33E+02	1.33E+02
Hexavalent Chromium - Total	0.94 - 38.9	16 / 16 (100%)	1.11E+01	1.06E+01	1.753	1.57E+01	1.57E+01
VOC (ug/kg)							
Acetone	25 - 270	17 / 17 (100%)	8.91E+01	7.45E+01	1.746	1.21E+02	1.21E+02
Carbon Disulfide	0.7 - 4	4 / 17 (24%)	6.07E+00	2.25E+00	1.746	7.02E+00	4.00E+00
Chloroform	0.5 - 3	12 / 17 (71%)	3.17E+00	3.04E+00	1.746	4.46E+00	3.00E+00
2-Butanone	7 - 61	16 / 17 (94%)	2.19E+01	1.65E+01	1.746	2.89E+01	2.89E+01
1,1,1-Trichloroethane	1 - 1	1 / 17 (6%)	6.91E+00	1.65E+00	1.746	7.61E+00	1.00E+00
Trichloroethene	2 - 2	1 / 17 (6%)	7.03E+00	1.45E+00	1.746	7.64E+00	2.00E+00
Toluene	0.5 - 1	2 / 17 (12%)	6.53E+00	2.27E+00	1.746	7.49E+00	1.00E+00
Ethyl benzene	0.6 - 0.6	1 / 17 (6%)	6.89E+00	1.74E+00	1.746	7.63E+00	6.00E-01
Total Xylenes	3 - 5	2 / 16 (13%)	6.78E+00	1.29E+00	1.753	7.35E+00	5.00E+00
SEMI-VOC (ug/kg)							
Naphthalene	220 - 220	1 / 6 (17%)	2.31E+02	1.20E+01	2.015	2.41E+02	2.20E+02
2-Methylnaphthalene	140 - 140	1 / 6 (17%)	2.18E+02	3.95E+01	2.015	2.50E+02	1.40E+02
Acenaphthene	18 - 20	2 / 6 (33%)	1.69E+02	1.17E+02	2.015	2.65E+02	2.00E+01
Fluorene	30 - 44	2 / 6 (33%)	1.75E+02	1.08E+02	2.015	2.64E+02	4.40E+01
Phenanthrene	87 - 210	5 / 6 (83%)	1.49E+02	7.81E+01	2.015	2.13E+02	2.10E+02
Fluoranthene	180 - 350	5 / 6 (83%)	2.69E+02	7.63E+01	2.015	3.32E+02	3.32E+02
Benzo(a)anthracene	74 - 74	1 / 6 (17%)	2.12E+02	7.07E+01	2.015	2.71E+02	7.40E+01
Chrysene	110 - 200	4 / 6 (67%)	1.96E+02	5.39E+01	2.015	2.40E+02	2.00E+02
Bis(2-ethylhexyl) phthalate	510 - 1100	3 / 6 (50%)	5.17E+02	3.51E+02	2.015	8.05E+02	8.05E+02
Benzo(b)fluoranthene	120 - 120	1 / 6 (17%)	2.20E+02	5.30E+01	2.015	2.64E+02	1.20E+02
PCBS (ug/kg)							
Aroclor 1248	44 - 810	2 / 17 (12%)	7.35E+01	1.90E+02	1.746	1.54E+02	1.54E+02
PEST (ug/kg)							
4,4'-DDE	0.45 - 0.82	4 / 5 (80%)	9.36E-01	7.19E-01	2.132	1.62E+00	8.20E-01
Endrin	1.8 - 1.8	1 / 5 (20%)	2.18E+00	2.36E-01	2.132	2.41E+00	1.80E+00
Endosulfan II	0.42 - 2.1	4 / 5 (80%)	1.36E+00	8.76E-01	2.132	2.20E+00	2.10E+00
4,4'-DDD	6.3 - 19	5 / 5 (100%)	1.11E+01	6.36E+00	2.132	1.71E+01	1.71E+01
4,4'-DDT	1.8 - 3.5	4 / 5 (80%)	2.55E+00	7.16E-01	2.132	3.23E+00	3.23E+00
Endrin ketone	1.6 - 1.6	1 / 5 (20%)	2.20E+00	3.48E-01	2.132	2.53E+00	1.60E+00

EN : Essential Nutrient

TABLE 6-3
SUMMARY OF GROUND WATER RESULTS

RAMCO STEEL - BUFFALO, NEW YORK

Sample ID	Range of Detected Concentrations	Frequency of Detection	Average RA Value	Standard Deviation	t-Value	95th Upper Confidence Limit	Exposure Point Concentration
Metals (ug/l)							
Chromium - Total	36.7 - 208	5 / 6 (83%)	8.30E+01	7.18E+01	2.015	1.42E+02	1.42E+02
Iron - Total	48500 - 246000	6 / 6 (100%)	9.64E+04	7.61E+04	2.015	1.59E+05	EN
Lead - Total	18 - 240	6 / 6 (100%)	1.13E+02	9.16E+01	2.015	1.88E+02	1.88E+02
Magnesium - Total	8400 - 171000	6 / 6 (100%)	9.59E+04	5.91E+04	2.015	1.45E+05	EN
Sodium - Total	16400 - 159000	6 / 6 (100%)	6.47E+04	5.22E+04	2.015	1.08E+05	EN
Zinc - Total	73 - 598	6 / 6 (100%)	3.38E+02	2.08E+02	2.015	5.09E+02	5.09E+02
VOC (ug/l)							
Acetone	14 - 14	1 / 6 (17%)	6.50E+00	3.67E+00	2.015	9.52E+00	9.52E+00
1,1-Dichloroethane	1 - 1	1 / 6 (17%)	4.33E+00	1.63E+00	2.015	5.68E+00	1.00E+00
SEMI-VOC (ug/l)							
Phenol	25 - 25	1 / 6 (17%)	8.33E+00	8.16E+00	2.015	1.51E+01	1.51E+01
4-Methylphenol	2 - 2	1 / 6 (17%)	4.50E+00	1.22E+00	2.015	5.51E+00	2.00E+00
Benzoic Acid	0.8 - 8	5 / 6 (83%)	6.63E+00	9.36E+00	2.015	1.43E+01	8.00E+00
Naphthalene	0.5 - 0.5	1 / 6 (17%)	4.25E+00	1.84E+00	2.015	5.76E+00	5.00E-01
2-Methylnaphthalene	0.6 - 0.6	1 / 6 (17%)	4.27E+00	1.80E+00	2.015	5.74E+00	6.00E-01
Diethyl phthalate	0.6 - 2	5 / 6 (83%)	1.87E+00	1.66E+00	2.015	3.23E+00	2.00E+00
Phenanthrene	0.4 - 2	2 / 6 (33%)	3.73E+00	2.03E+00	2.015	5.40E+00	2.00E+00
Di-n-butyl phthalate	0.8 - 1	4 / 6 (67%)	2.28E+00	2.11E+00	2.015	4.02E+00	1.00E+00
Butyl benzyl phthalate	0.5 - 0.8	5 / 6 (83%)	1.37E+00	1.78E+00	2.015	2.83E+00	8.00E-01
Benzo(a)anthracene	0.3 - 0.3	1 / 6 (17%)	4.22E+00	1.92E+00	2.015	5.80E+00	3.00E-01
Benzo(b)fluoranthene	0.4 - 0.4	1 / 6 (17%)	4.23E+00	1.88E+00	2.015	5.78E+00	4.00E-01
PEST (ug/l)							
Heptachlor epoxide	0.038 - 0.038	1 / 6 (17%)	2.85E-02	5.06E-03	2.015	3.27E-02	3.27E-02
Dieldrin	0.024 - 0.024	1 / 6 (17%)	4.82E-02	1.25E-02	2.015	5.84E-02	2.40E-02

EN : Essential Nutrient

TABLE 6-4
SUMMARY OF SURFACE WATER RESULTS

RAMCO STEEL - BUFFALO, NEW YORK

Sample ID	Range of Detected Values	Frequency of Detection	Average RA Value	Standard Deviation	95th Upper onfidence Lim	Exposure Point Concentration
Metals (ug/l)						
Iron - Total	771 - 6230	3 / 3	3.04E+03	2.84E+03	7.83E+03	EN
Magnesium - Total	19800 - 37100	3 / 3	2.98E+04	8.95E+03	4.48E+04	EN
SEMI-VOC (ug/l)						
Benzoic Acid	2 - 8	3 / 3	4.00E+00	3.46E+00	9.84E+00	8
Di-n-butyl phthalate	0.5 - 0.8	3 / 3	6.67E-01	1.53E-01	9.24E-01	0.8
Butyl benzyl phthala	0.5 - 0.6	3 / 3	5.33E-01	5.77E-02	6.31E-01	0.6

EN = Essential Nutrient

TABLE 6-5(a)

EXPOSURE INTAKE FORMULA AND PARAMETERS
CURRENT LAND USE TRESPASSERS EXPOSURE:
INHALATION OF AIRBORNE CHEMICALS FROM SOIL
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, page 6-44):

$$DIinhal = F(CA \times IR \times ET \times EF \times ED, BW \times AT)$$

Parameters	Definition	Units	Value	Reference
DIinhal	Daily intake --Iinhalation route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CA	Chemical concentration in air	mg/m^3	Site-specific	Hwang and Falco, 1986[b]
IR	Inhalation rate	m^3/hr	0.83	U.S. EPA, 1989a, 1991[c]
ET	Exposure time	hrs/day	4	Conservative assumption
EF	Exposure frequency	days/year	44	U.S. EPA, 1991[d]
ED	Exposure duration	years	24	Conservative assumption[e]
BW	Body weight -- 7-30 age group	kg	70	U.S. EPA, 1989a, 1991[f]
AT	Averaging time			U.S. EPA, 1989a, 1991[g]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	8,760	

(a) Value calculated is expressed in terms of an administered dose.
(b) Modelled based on methods from Hwang and Falco, 1986. (See Appendix A1 for calculation of air concentrations.)
(c) Selected based on average ventilation rate for an adult (20 m^3/day or 0.83 m^3/hr).
(d) Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September (3 days/week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days)
(e) Assumes population from ages 7 to 30 are most likely to trespass on the site.
(f) Average adult body weight.
(g) Averaging time of exposure for carcinogenic effects is based on 70-year lifetime (70 years x 365 days/year = 25,550 days). Averaging time of exposure for noncarcinogenic effects is based on 24-year ED (24 years x 365 days/year = 8,760 days).

U.S. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual. Part A. Interim Final. December, 1989 EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors," Interim Final. OSWER Directive 9285. 6-03, March 25, 1991.

TABLE 6-5 (B)

EXPOSURE INTAKE CALCULATIONS

CURRENT LAND USE TRESPASSER EXPOSURE: INHALATION OF CHEMICALS IN SOIL

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIinhal	= [	CA	x	IR	x	ET	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years				kg		days	
UNIT/CHEMICAL(S)																		
Adult-Noncarcinogenic Effects																		
Metals																		
Arsenic - Total	3.44E-11	= [	6.013E-09	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Barium - Total	2.22E-10	= [	3.890E-08	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Chromium - Total	1.98E-10	= [	3.458E-08	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Lead - Total	3.98E-10	= [	6.962E-08	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Mercury - Total	1.10E-13	= [	1.928E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Zinc - Total	4.99E-10	= [	8.730E-08	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
VOC																		
Acetone	2.16E-13	= [	3.783E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
2-Butanone	5.03E-14	= [	8.796E-12	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzene	4.94E-15	= [	8.639E-13	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Tetrachloroethene	2.47E-15	= [	4.320E-13	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Toluene	7.41E-15	= [	1.296E-12	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Chlorobenzene	2.47E-15	= [	4.320E-13	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Ethyl benzene	3.70E-15	= [	6.479E-13	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Total Xylenes	4.94E-15	= [	8.639E-13	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
SEMI-VOC																		
Phenol	4.69E-13	= [	8.198E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzoic Acid	3.70E-13	= [	6.472E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Naphthalene	1.48E-13	= [	2.592E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
2-Methylnaphthalene	NA	= [	NA	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Acenaphthylene	4.45E-14	= [	7.775E-12	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Acenaphthene	6.30E-14	= [	1.101E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Dibenzofuran	NA	= [	NA	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Fluorene	7.16E-14	= [	1.253E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Phenanthrene	4.11E-13	= [	7.184E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Anthracene	1.17E-13	= [	2.052E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Fluoranthene	5.39E-13	= [	9.427E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Pyrene	7.17E-13	= [	1.254E-10	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzo(a)anthracene	3.71E-13	= [	6.493E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Chrysene	4.73E-13	= [	8.275E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Bis(2-ethylhexyl) phthalate	2.27E-12	= [	3.974E-10	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzo(b)fluoranthene	6.99E-13	= [	1.223E-10	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzo(k)fluoranthene	4.06E-13	= [	7.109E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzo(a)pyrene	4.40E-13	= [	7.701E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Indeno(1,2,3-cd)pyrene	3.35E-13	= [	5.861E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Dibenzo(a,h)anthracene	8.90E-14	= [	1.557E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Benzo(ghi)perylene	2.42E-13	= [	4.229E-11	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]

TABLE 6-5(B) (Continued)

EQUATION	DIinhal	= [	CA	x	IR	x	ET	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years		kg		days	
PCBS																
Aroclor 1242	1.89E-13	= [	3.302E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
Aroclor 1254	2.01E-13	= [	3.515E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
PEST																
beta-BHC	2.10E-15	= [	3.666E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
Dieldrin	9.75E-16	= [	1.706E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
4,4'-DDE	6.17E-16	= [	1.079E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
Endrin	1.19E-14	= [	2.084E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
Endosulfan II	7.65E-15	= [	1.339E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
alpha-Chlordane	3.46E-15	= [	6.045E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	8760	]
Adult-Carcinogenic Effects																
Metals																
Arsenic - Total	1.18E-11	= [	6.013E-09	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Barium - Total	7.63E-11	= [	3.890E-08	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Chromium - Total	6.78E-11	= [	3.458E-08	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Lead - Total	1.36E-10	= [	6.962E-08	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Mercury - Total	3.78E-14	= [	1.928E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Zinc - Total	1.71E-10	= [	8.730E-08	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
VOC																
Acetone	7.42E-14	= [	3.783E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
2-Butanone	1.72E-14	= [	8.796E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzene	1.69E-15	= [	8.639E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Tetrachloroethene	8.47E-16	= [	4.320E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Toluene	2.54E-15	= [	1.296E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Chlorobenzene	8.47E-16	= [	4.320E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Ethyl benzene	1.27E-15	= [	6.479E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Total Xylenes	1.69E-15	= [	8.639E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]

TABLE 6-5(B) (Continued)

EQUATION	DIinhal	= [	CA	x	IR	x	ET	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years		kg		days	
SEMI-VOC																
Phenol	1.61E-13	= [	8.198E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzoic Acid *	1.27E-13	= [	6.472E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Naphthalene	5.08E-14	= [	2.592E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
2-Methylnaphthalene	NA	= [	NA	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Acenaphthylene	1.52E-14	= [	7.775E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Acenaphthene	2.16E-14	= [	1.101E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Dibenzofuran	NA	= [	NA	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Fluorene	2.46E-14	= [	1.253E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Phenanthrene	1.41E-13	= [	7.184E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Anthracene	4.02E-14	= [	2.052E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Fluoranthene	1.85E-13	= [	9.427E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Pyrene	2.46E-13	= [	1.254E-10	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzo(a)anthracene	1.27E-13	= [	6.493E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Chrysene	1.62E-13	= [	8.275E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Bis(2-ethylhexyl) phthalate	7.79E-13	= [	3.974E-10	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzo(b)fluoranthene	2.40E-13	= [	1.223E-10	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzo(k)fluoranthene	1.39E-13	= [	7.109E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzo(a)pyrene	1.51E-13	= [	7.701E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Indeno(1,2,3-cd)pyrene	1.15E-13	= [	5.861E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Dibenzo(a,h)anthracene	3.05E-14	= [	1.557E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Benzo(ghi)perylene	8.29E-14	= [	4.229E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
PCBS																
Aroclor 1242	6.47E-14	= [	3.302E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Aroclor 1254	6.89E-14	= [	3.515E-11	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
PEST																
beta-BHC	7.19E-16	= [	3.666E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Dieldrin	3.34E-16	= [	1.706E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
4,4'-DDE	2.12E-16	= [	1.079E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Endrin	4.09E-15	= [	2.084E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
Endosulfan II	2.62E-15	= [	1.339E-12	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]
alpha-Chlordane	1.18E-15	= [	6.045E-13	x	0.83	x	4	x	44	x	24	] / [	70	x	25550	]

* Indicates that the concentrations for metals were reported in mg/kg, thus the conversion factor of 1E-6 kg/mg was used.

DIinhal = Daily intake via inhalation route (mg/kg-day)

CA = Chemical concentration in air (mg/m3) (See Appendix Table A1)

IR = Inhalation rate (m3/hr)

ET = Exposure time (hrs/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

TABLE 6-6(a)

EXPOSURE INTAKE FORMULA AND PARAMETERS
CURRENT LAND USE TRESPASSERS EXPOSURE:
INGESTION OF CHEMICALS IN SOIL
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, Exhibit 6-14, page 6-40):

$$DIoral = F(CS \times IR \times CF \times FI \times EF \times ED, BW \times AT)$$

Parameters	Definition	Units	Value	Reference
DIoral	Daily intake --Oral route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CS	Concentration in soil	μg/kg	Site-specific	
IR	Ingestion rate --7 to 30 age group	mg soil/day	100	U.S. EPA, 1989a, 1991
CF	Conversion factor	kg/μg	10^{-9}	SI system
FI	Fraction ingested from contaminated source	unitless	1	Conservative assumption[b]
EF	Exposure frequency	days/year	44	U.S. EPA, 1991[c]
ED	Exposure duration --7-30 age group	years	24	Conservative assumption[d]
BW	Body weight	kg	70	U.S. EPA, 1989a[e]
AT	Averaging time			U.S. EPA, 1989a, 1991[f]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	8,760	U.S. EPA, 1989a

[a] Daily intake is expressed as an administered dose

[b] A conservative assumption, assuming all soil ingested is from contaminated source.

[c] Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September (3 days/week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days)

[d] Assumes age groups 7 to 30 are most likely to trespass on the site.

[e] Average adult body weight.

[f] For carcinogenic effects, based on 70-year lifetime, a value by convention (70 yr x 365 days/yr = 25,550 days). For noncarcinogenic effects in adults, based on 24-year ED (24 yrs x 365 days/yr = 8,760 days).

U.S. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual. Part A. Interim Final. December, 1989 EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors," Interim Final. OSWER Directive 9285. 6-03, March 25, 1991.

TABLE 6-6(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT LAND USE TRESPASSER EXPOSURE: INGESTION OF CHEMICALS IN SOIL

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	Dioral	= [	CS	x	IR	x	CF	x	FI	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		mg/day		kg/µg*		unitless		days/year		years				kg		days	
UNIT/CHEMICAL(S)																				
Adult-Noncarcinogenic Effects																				
Metals																				
Arsenic - Total	4.794E-06	= [	27.84	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	8760	]
Barium - Total	3.102E-05	= [	180.10	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	8760	]
Chromium - Total	2.757E-05	= [	160.10	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	8760	]
Lead - Total	5.551E-05	= [	322.34	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	8760	]
Mercury - Total	1.537E-08	= [	0.09	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	8760	]
Zinc - Total	6.961E-05	= [	404.20	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	8760	]
VOC																				
Acetone	3.016E-08	= [	175.16	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
2-Butanone	7.014E-09	= [	40.73	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzene	6.888E-10	= [	4.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Tetrachloroethene	3.444E-10	= [	2.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Toluene	1.033E-09	= [	6.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Chlorobenzene	3.444E-10	= [	2.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Ethyl benzene	5.166E-10	= [	3.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Total Xylenes	6.888E-10	= [	4.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
SEMI-VOC																				
Phenol	6.537E-08	= [	379.61	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzoic Acid	5.166E-08	= [	300.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Naphthalene	2.067E-08	= [	120.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
2-Methylnaphthalene	1.894E-08	= [	110.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Acenaphthylene	6.200E-09	= [	36.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Acenaphthene	8.783E-09	= [	51.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Dibenzofuran	1.119E-08	= [	65.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Fluorene	9.988E-09	= [	58.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Phenanthrene	5.729E-08	= [	332.69	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Anthracene	1.636E-08	= [	95.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Fluoranthene	7.523E-08	= [	436.86	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Pyrene	1.002E-07	= [	581.58	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzo(a)anthracene	5.269E-08	= [	305.97	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Chrysene	6.627E-08	= [	384.79	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Bis(2-ethylhexyl) phthalate	3.192E-07	= [	1853.50	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzo(b)fluoranthene	9.757E-08	= [	566.57	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzo(k)fluoranthene	5.668E-08	= [	329.15	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzo(a)pyrene	6.310E-08	= [	366.42	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Indeno(1,2,3-cd)pyrene	4.705E-08	= [	273.18	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Dibenzo(a,h)anthracene	1.326E-08	= [	77.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Benzo(ghi)perylene	3.444E-08	= [	200.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]

TABLE 6-6(B) (Continued)

EQUATION	DIoral	=	[	CS	x	IR	x	CF	x	FI	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day			µg/kg*		mg/day		kg/µg*		unitless		days/year		years				kg		days	
PCBS																					
Aroclor 1242	2.634E-08	=	[	152.97	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Aroclor 1254	2.804E-08	=	[	162.84	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
PEST																					
beta-BHC	2.928E-10	=	[	1.70	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Dieldrin	1.360E-10	=	[	0.79	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
4,4'-DDE	8.611E-11	=	[	0.50	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Endrin	1.667E-09	=	[	9.68	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Endosulfan II	1.068E-09	=	[	6.20	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
alpha-Chlordane	4.822E-10	=	[	2.80	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	8760	]
Adult-Carcinogenic Effects																					
Metals																					
Arsenic - Total	1.644E-06	=	[	27.84	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	25550	]
Barium - Total	1.063E-05	=	[	180.10	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	25550	]
Chromium - Total	9.453E-06	=	[	160.10	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	25550	]
Lead - Total	1.903E-05	=	[	322.34	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	25550	]
Mercury - Total	5.270E-09	=	[	0.09	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	25550	]
Zinc - Total	2.387E-05	=	[	404.20	x	100	x	1E-06	x	1	x	44	x	24	]	/	[	70	x	25550	]
VOC																					
Acetone	1.034E-08	=	[	175.16	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
2-Butanone	2.405E-09	=	[	40.73	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzene	2.362E-10	=	[	4.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Tetrachloroethene	1.181E-10	=	[	2.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Toluene	3.543E-10	=	[	6.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Chlorobenzene	1.181E-10	=	[	2.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Ethyl benzene	1.771E-10	=	[	3.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Total Xylenes	2.362E-10	=	[	4.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]

TABLE 6-6(B) (Continued)

EQUATION	Dderal	=	[	CS	x	IR	x	CF	x	FI	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day			µg/kg*		mg/day		kg/µg*		unitless		days/year		years				kg		days	
SEMI-VOC																					
Phenol	2.241E-08	=	[	379.61	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzoic Acid	1.771E-08	=	[	300.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Naphthalene	7.085E-09	=	[	120.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
2-Methylnaphthalene	6.495E-09	=	[	110.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Acenaphthylene	2.126E-09	=	[	36.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Acenaphthene	3.011E-09	=	[	51.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Dibenzofuran	3.838E-09	=	[	65.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Fluorene	3.425E-09	=	[	58.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Phenanthrene	1.964E-08	=	[	332.69	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Anthracene	5.609E-09	=	[	95.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Fluoranthene	2.579E-08	=	[	436.86	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Pyrene	3.434E-08	=	[	581.58	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzo(a)anthracene	1.807E-08	=	[	305.97	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Chrysene	2.272E-08	=	[	384.79	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Bis(2-ethylhexyl) phthalate	1.094E-07	=	[	1853.50	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzo(b)fluoranthene	3.345E-08	=	[	566.57	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzo(k)fluoranthene	1.943E-08	=	[	329.15	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzo(a)pyrene	2.163E-08	=	[	366.42	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Indeno(1,2,3-cd)pyrene	1.613E-08	=	[	273.18	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Dibenzo(a,h)anthracene	4.546E-09	=	[	77.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Benzo(ghi)perylene	1.181E-08	=	[	200.00	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
PCBS																					
Aroclor 1242	9.032E-09	=	[	152.97	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Aroclor 1254	9.615E-09	=	[	162.84	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
PEST																					
beta-BHC	1.004E-10	=	[	1.70	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Dieldrin	4.664E-11	=	[	0.79	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
4,4'-DDE	2.952E-11	=	[	0.50	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Endrin	5.715E-10	=	[	9.68	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
Endosulfan II	3.661E-10	=	[	6.20	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]
alpha-Chlordane	1.653E-10	=	[	2.80	x	100	x	1E-09	x	1	x	44	x	24	]	/	[	70	x	25550	]

* Indicates that the concentrations for metals were reported in mg/kg, thus the conversion factor of 1E-6 kg/mg was used.

Dderal = Daily intake via dermal intake (mg/kg-day)

CS = Chemicals concentration in soil (µg/kg)

CF = Conversion factor (kg/µg)

SA = Skin surface area available for contact (cm2/event)

AF = Soil to skin adherence factor (mg/cm2)

ABS = Absorption factor (unitless)

EF = Exposure frequency (events/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

TABLE 6-7(a)

EXPOSURE INTAKE FORMULA AND VARIABLES CURRENT LAND USE TRESPASSERS EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN SOIL RAMCO STEEL

Intake equation (Absorbed dose, from U.S. EPA, 1989a, Exhibit 6-15, page 6-41):

$$DIdermal = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Parameters	Definition	Units	Value	Reference
DIdermal	Daily intake --Dermal route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CS	Chemical concentration in soil	μg/kg	Site-specific	
CF	Conversion factor	kg/μg	10^{-9}	SI system
SA	Skin surface area available for contact	cm^2/event	5,000	U.S. EPA, 1989b[b]
AF	Soil to skin adherence factor	mg/cm^2	0.6	U.S. EPA, 1992b[c]
ABS	Absorption factor	unitless	Chemical-specific	U.S. EPA, 1992b[d]
EF	Exposure frequency	events/year	44	U.S. EPA, 1991[e]
ED	Exposure duration -- 7-30 age group	years	24	U.S. EPA, 1989a, 1991[f]
BW	Body weight	kg	70	U.S. EPA, 1989a, 1991[g]
AT	Averaging time			
	--Carcinogenic effects	days	25,550	U.S. EPA, 1989a, 1991[h]
	--Noncarinogenic effects	days	8,760	

[a] Daily intake calculated is expressed as an absorbed dose.

[b] The value of 5,000 cm^2/event represents the reasonable worst case.

[c] The soil to skin adherence factors given in EPA's Risk Assessment Guidance for Superfund (U.S. EPA, 1989a) are 1.45 mg/cm^2 and 2.77 mg/cm^2 for commercial potting soil and clay, respectively. Because of new data in this area, a range of 0.2 to 1.0 mg/cm^2 has been recommended by the U.S. EPA Region IV (see Appendix B).

[d] In determining the risks associated with dermal exposure to contaminated soils, absorption factors of 1% (for organics) and 0.1% (for inorganics) have been recommended by the U.S. EPA Region IV (see Appendix B).

[e] Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September (3 days/a week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days)

[f] Assumes population from ages 7 to 30 are most likely to trespass on the site.

[g] Calculated from Exposure Factor Handbook (U.S. EPA, 1989b).

[h] For carcinogenic effects, based on 70-year lifetime, a value by convention (70 yr x 365 days/yr = 25,550 days). For noncarcinogenic effects in 7-30 age group, based on 24 year ED (24 yrs x 365 days/yr = 8,760 days).

TABLE 6-7(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT LAND USE TRESPASSER EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN SOIL

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIdermal	= [	CS	x	CF	x	SA	x	AF	x	ABS	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		kg/µg*		cm2/event		mg/cm2		unitless		events/year		years		kg		days	
UNIT/CHEMICAL(S)																				
Adult-Noncarcinogenic Effects																				
Metals																				
Arsenic - Total	1.438E-07	= [	27.84	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Barium - Total	9.305E-07	= [	180.10	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Chromium - Total	8.272E-07	= [	160.10	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Lead - Total	1.665E-06	= [	322.34	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Mercury - Total	4.611E-10	= [	0.09	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Zinc - Total	2.088E-06	= [	404.20	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
VOC																				
Acetone	9.049E-09	= [	175.16	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
2-Butanone	2.104E-09	= [	40.73	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzene	2.067E-10	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Tetrachloroethene	1.033E-10	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Toluene	3.100E-10	= [	6.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Chlorobenzene	1.033E-10	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Ethyl benzene	1.550E-10	= [	3.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Total Xylenes	2.067E-10	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
SEMI-VOC																				
Phenol	1.961E-08	= [	379.61	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzoic Acid	1.550E-08	= [	300.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Naphthalene	6.200E-09	= [	120.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
2-Methylnaphthalene	5.683E-09	= [	110.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Acenaphthylene	1.860E-09	= [	36.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Acenaphthene	2.635E-09	= [	51.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Dibenzofuran	3.358E-09	= [	65.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Fluorene	2.996E-09	= [	58.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Phenanthrene	1.719E-08	= [	332.69	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Anthracene	4.908E-09	= [	95.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Fluoranthene	2.257E-08	= [	436.86	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Pyrene	3.005E-08	= [	581.58	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(a)anthracene	1.581E-08	= [	305.97	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Chrysene	1.988E-08	= [	384.79	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Bis(2-ethylhexyl) phthalate	9.576E-08	= [	1853.50	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(b)fluoranthene	2.927E-08	= [	566.57	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(k)fluoranthene	1.700E-08	= [	329.15	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(a)pyrene	1.893E-08	= [	366.42	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Indeno(1,2,3-cd)pyrene	1.411E-08	= [	273.18	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Dibenzo(a,h)anthracene	3.978E-09	= [	77.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(ghi)perylene	1.033E-08	= [	200.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]

TABLE 6-7(B) (Continued)

EQUATION	Dldermal	= [	CS	x	CF	x	SA	x	AF	x	ABS	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		kg/µg*		cm2/event		mg/cm2		unitless		events/year		years		kg		days	
PCBS																				
Aroclor 1242	7.903E-09	= [	152.97	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Aroclor 1254	8.413E-09	= [	162.84	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
PEST																				
beta-BHC	8.783E-11	= [	1.70	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Dieldrin	4.081E-11	= [	0.79	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
4,4'-DDE	2.583E-11	= [	0.50	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Endrin	5.001E-10	= [	9.68	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Endosulfan II	3.203E-10	= [	6.20	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
alpha-Chlordane	1.447E-10	= [	2.80	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Adult-Carcinogenic Effects																				
Metals																				
Arsenic - Total	4.931E-08	= [	27.84	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Barium - Total	3.190E-07	= [	180.10	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Chromium - Total	2.836E-07	= [	160.10	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Lead - Total	5.710E-07	= [	322.34	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Mercury - Total	1.581E-10	= [	0.09	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Zinc - Total	7.160E-07	= [	404.20	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
VOC																				
Acetone	3.103E-09	= [	175.16	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
2-Butanone	7.214E-10	= [	40.73	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzene	7.085E-11	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Tetrachloroethene	3.543E-11	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Toluene	1.063E-10	= [	6.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Chlorobenzene	3.543E-11	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Ethyl benzene	5.314E-11	= [	3.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Total Xylenes	7.085E-11	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]

TABLE 6-7(B) (Continued)

EQUATION	DIdermal	= [	CS	x	CF	x	SA	x	AF	x	ABS	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		kg/µg*		cm2/event		mg/cm2		unitless		events/year		years		kg		days	
SEMI-VOC																				
Phenol	6.724E-09	= [	379.61	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzoic Acid	5.314E-09	= [	300.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Naphthalene	2.126E-09	= [	120.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
2-Methylnaphthalene	1.948E-09	= [	110.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Acenaphthylene	6.377E-10	= [	36.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Acenaphthene	9.034E-10	= [	51.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Dibenzofuran	1.151E-09	= [	65.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Fluorene	1.027E-09	= [	58.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Phenanthrene	5.893E-09	= [	332.69	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Anthracene	1.683E-09	= [	95.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Fluoranthene	7.738E-09	= [	436.86	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Pyrene	1.030E-08	= [	581.58	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzo(a)anthracene	5.420E-09	= [	305.97	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Chrysene	6.816E-09	= [	384.79	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Bis(2-ethylhexyl) phthalate	3.283E-08	= [	1853.50	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzo(b)fluoranthene	1.004E-08	= [	566.57	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzo(k)fluoranthene	5.830E-09	= [	329.15	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzo(a)pyrene	6.490E-09	= [	366.42	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Indeno(1,2,3-cd)pyrene	4.839E-09	= [	273.18	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Dibenzo(a,h)anthracene	1.364E-09	= [	77.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzo(ghi)perylene	3.543E-09	= [	200.00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
PCBS																				
Aroclor 1242	2.710E-09	= [	152.97	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Aroclor 1254	2.884E-09	= [	162.84	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
PEST																				
beta-BHC	3.011E-11	= [	1.70	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Dieldrin	1.399E-11	= [	0.79	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
4,4'-DDE	8.857E-12	= [	0.50	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Endrin	1.715E-10	= [	9.68	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Endosulfan II	1.098E-10	= [	6.20	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
alpha-Chlordane	4.960E-11	= [	2.80	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]

* Indicates that the concentrations for metals were reported in mg/kg, thus the conversion factor of 1E-6 kg/mg was used.

DIdermal = Daily intake via dermal intake (mg/kg-day)

CS = Chemicals concentration in soil (µg/kg)

CF = Conversion factor (kg/µg)

SA = Skin surface area available for contact (cm2/event)

AF = Soil to skin adherence factor (mg/cm2)

ABS = Absorption factor (unitless)

EF = Exposure frequency (events/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

TABLE 6-8(a)

EXPOSURE INTAKE FORMULA AND VARIABLES
CURRENT LAND USE TRESPASSER EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN SEDIMENT
RAMCO STEEL

Intake equation (Absorbed dose, from U.S. EPA, 1989a, Exhibit 6-15, page 6-41):

$$DIdermal = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Parameters	Definition	Units	Value	Reference
DIdermal	Daily intake --Dermal route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CS	Chemical concentration in sediment	µg/kg	Site-specific	
CF	Conversion factor	kg/µg	10^{-9}	SI system
SA	Skin surface area available for contact	cm^2/event		U.S. EPA, 1989b[b]
	--Adult		5,000	
AF	Sediment to skin adherence factor	mg/cm^2	0.6	U.S. EPA, 1992b[c]
ABS	Absorption factor	unitless	Chemical-specific	U.S. EPA, 1992b[d]
EF	Exposure frequency	events/year	44	Conservative assumption[e]
ED	Exposure duration			U.S. EPA, 1989a[f]
	--7 to 30 age group	years	24	
BW	Body weight	kg	70	U.S. EPA, 1989a
AT	Averaging time			
	--Carcinogenic effects	days	25,550	U.S. EPA, 1989a[g]
	--Noncarcinogenic effects	days	8,760	

[a] Daily intake calculated is expressed as an absorbed dose.

[b] Based on the average of 25% total body surface area.

[c] The soil to skin adherence factors given in EPA's Risk Assessment Guidance for Superfund (U.S. EPA, 1989a) are 1.45 mg/cm^2 and 2.77 mg/cm^2 for commercial potting soil and clay, respectively. Because of new data in this area, a range of 0.2 to 1.0 mg/cm^2 has been recommended by the U.S. EPA.

[d] In determining the risks associated with dermal exposure to contaminated soils, absorption factors of 1% (for organics) and 0.1% (for inorganics) have been recommended by the U.S. EPA.

[e] Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September, (3 days/a week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days).

[f] Based on 90th percentile time spent at one residence.

[g] For carcinogenic effects, based on 70-year lifetime, a value by convention (70 yr x 365 days/yr = 25,550 days). For noncarcinogenic effects in 7 to 30 age group based on 24 year ED (24 years x 365 days/yr = 2,190 days).

TABLE 6-8(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT LAND USE TRESPASSERS EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN SEDIMENT

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIdermal	= [	CS	x	CF	x	SA	x	AF	x	ABS	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		kg/µg*		cm2/event		mg/cm2		unitless		events/year		years		kg		days	
UNIT/CHEMICAL(S)																				
Noncarcinogenic Effects																				
Metals																				
Arsenic - Total	1.455E-07	= [	2.82E+01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Chromium - Total	6.206E-07	= [	1.20E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Copper - Total	6.716E-07	= [	1.30E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Lead - Total	5.718E-07	= [	1.11E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Manganese - Total	1.121E-05	= [	2.17E+03	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Mercury - Total	3.613E-09	= [	6.99E-01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Nickel - Total	1.689E-07	= [	3.27E+01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Zinc - Total	6.863E-07	= [	1.33E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
Hexavalent Chromium - Total	8.118E-08	= [	1.57E+01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	8760	]
VOC																				
Acetone	6.234E-09	= [	1.21E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Carbon Disulfide	2.067E-10	= [	4.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Chloroform	1.550E-10	= [	3.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
2-Butanone	1.494E-09	= [	2.89E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
1,1,1-Trichloroethane	5.166E-11	= [	1.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Trichloroethene	1.033E-10	= [	2.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Toluene	5.166E-11	= [	1.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Ethyl benzene	3.100E-11	= [	6.00E-01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Total Xylenes	2.583E-10	= [	5.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
SEMI-VOC																				
Naphthalene	1.137E-08	= [	2.20E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
2-Methylnaphthalene	7.233E-09	= [	1.40E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Acenaphthene	1.033E-09	= [	2.00E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Fluorene	2.273E-09	= [	4.40E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Phenanthrene	1.085E-08	= [	2.10E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Fluoranthene	1.715E-08	= [	3.32E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(a)anthracene	3.823E-09	= [	7.40E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Chrysene	1.033E-08	= [	2.00E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Bis(2-ethylhexyl) phthalate	4.160E-08	= [	8.05E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Benzo(b)fluoranthene	6.200E-09	= [	1.20E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
PCBS																				
Aroclor 1248	7.954E-09	= [	1.54E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
PEST																				
4,4'-DDE	4.236E-11	= [	8.20E-01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Endrin	9.299E-11	= [	1.80E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Endosulfan II	1.085E-10	= [	2.10E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
4,4'-DDD	8.856E-10	= [	1.71E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
4,4'-DDT	1.670E-10	= [	3.23E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]
Endrin ketone	8.266E-11	= [	1.60E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	8760	]

TABLE 6-8(B) (continued)

EQUATION	Didermal	= [	CS	x	CF	x	SA	x	AF	x	ABS	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		kg/µg*		cm2/event		mg/cm2		unitless		events/year		years		kg		days	
Carcinogenic Effects																				
Metals																				
Arsenic - Total	4.987E-08	= [	2.82E+01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Chromium - Total	2.128E-07	= [	1.20E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Copper - Total	2.302E-07	= [	1.30E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Lead - Total	1.961E-07	= [	1.11E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Manganese - Total	3.844E-06	= [	2.17E+03	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Mercury - Total	1.239E-09	= [	6.99E-01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Nickel - Total	5.791E-08	= [	3.27E+01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Zinc - Total	2.353E-07	= [	1.33E+02	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
Hexavalent Chromium - Total	2.783E-08	= [	1.57E+01	x	1E-06	x	5000	x	0.6	x	0.001	x	44	x	24	] / [	70	x	25550	]
VOC																				
Acetone	2.137E-09	= [	1.21E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Carbon Disulfide	7.085E-11	= [	4.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Chloroform	5.314E-11	= [	3.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
2-Butanone	5.124E-10	= [	2.89E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
1,1,1-Trichloroethane	1.771E-11	= [	1.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Trichloroethene	3.543E-11	= [	2.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Toluene	1.771E-11	= [	1.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Ethyl benzene	1.063E-11	= [	6.00E-01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Total Xylenes	8.857E-11	= [	5.00E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	
SEMI-VOC																				]
Naphthalene	3.897E-09	= [	2.20E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
2-Methylnaphthalene	2.480E-09	= [	1.40E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Acenaphthene	3.543E-10	= [	2.00E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Fluorene	7.794E-10	= [	4.40E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Phenanthrene	3.720E-09	= [	2.10E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Fluoranthene	5.880E-09	= [	3.32E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Benzo(a)anthracene	1.311E-09	= [	7.40E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Chrysene	3.543E-09	= [	2.00E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Bis(2-ethylhexyl) phthalate	1.426E-08	= [	8.05E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	
Benzo(b)fluoranthene	2.126E-09	= [	1.20E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
PCBS																				]
Aroclor 1248	2.727E-09	= [	1.54E+02	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
PEST																				
4,4'-DDE	1.452E-11	= [	8.20E-01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Endrin	3.188E-11	= [	1.80E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
Endosulfan II	3.720E-11	= [	2.10E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
4,4'-DDD	3.036E-10	= [	1.71E+01	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]
4,4'-DDT	5.726E-11	= [	3.23E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	
Endrin ketone	2.834E-11	= [	1.60E+00	x	1E-09	x	5000	x	0.6	x	0.01	x	44	x	24	] / [	70	x	25550	]

*Indicates the concentration of metals were reported in mg/kg, so the conversion factor of kg/mg is 1E-6.

Didermal = Daily intake for dermal route (mg/kg-day)

CS = Chemical concentration in sediment (µg/kg)

CF = Conversion factor (kg/µg)

AF = Sediment of skin adherence factor (mg/cm2)

ABS = Absorption factor (unitless)

EF = Exposure frequency (events/year)

ED = Exposure duration (years)

AT = Averaging time (days)

TABLE 6-9(a)

EXPOSURE INTAKE FORMULA AND PARAMETERS
CURRENT LAND USE TRESPASSERS EXPOSURE:
INHALATION OF AIRBORNE CHEMICALS FROM SURFACE WATER
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, page 6-44):

$$DIinhal = \frac{CA \times IR \times ET \times EF \times ED}{BW \times AT}$$

Parameters	Definition	Units	Value	Reference
DIinhal	Daily intake --Inhalation route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CA	Chemical concentration in air	mg/m^3	Site-specific	U.S. EPA, 1985[b]
IR	Inhalation rate	m^3/hr	0.83	U.S. EPA, 1989a, 1991[c]
ET	Exposure time	hrs/day	4	Conservative assumption
EF	Exposure frequency	days/year	44	U.S. EPA, 1991[d]
ED	Exposure duration	years	24	Conservative assumption[e]
BW	Body weight -- 7-30 age group	kg	70	U.S. EPA, 1989a, 1991[f]
AT	Averaging time			U.S. EPA, 1989a, 1991[g]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	8,760	

(a) Value calculated is expressed in terms of an administered dose.

(b) Modelled based on methods from EPA/600/6-85/002a. (See Appendix for calculation of air concentrations.)

(c) Selected based on average ventilation rate for an adult (20 m^3/day or 0.83 m^3/hr).

(d) Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September (3 days/week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days)

(e) Assumes population from ages 7 to 30 are most likely to trespass on the site.

(f) Average adult body weight.

(g) Averaging time of exposure for carcinogenic effects is based on 70-year lifetime (70 years x 365 days/year = 25,550 days). Averaging time of exposure for noncarcinogenic effects is based on 24-year ED (24 years x 365 days/year = 8,760 days).

U.S. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual. Part A. Interim Final. December, 1989 EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors," Interim Final. OSWER Directive 9285. 6-03, March 25, 1991.

TABLE 6-9(B)

EXPOSURE INTAKE CALCULATIONS
CURRENT LAND USE TRESPASSERS EXPOSURE:
INHALATION OF AIRBORNE CHEMICALS FROM SURFACE WATER

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIinhal	[	CA	x	IR	x	ET	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years				kg		days	
UNIT/CHEMICAL(S)																		
Noncarcinogenic Effects																		
SEMI-VOC																		
Benzoic Acid	1.78E-07	[	3.11E-05	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Di-n-butyl phthalate	1.18E-08	[	2.06E-06	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Butyl benzyl phthalate	8.33E-09	[	1.46E-06	x	0.83	x	4	x	44	x	24	]	/	[	70	x	8760	]
Carcinogenic Effects																		
SEMI-VOC																		
Benzoic Acid	6.09E-08	[	3.11E-05	x	0.83	x	4	x	44	x	24	]	/	[	70	x	25550	]
Di-n-butyl phthalate	4.04E-09	[	2.06E-06	x	0.83	x	4	x	44	x	24	]	/	[	70	x	25550	]
Butyl benzyl phthalate	2.86E-09	[	1.46E-06	x	0.83	x	4	x	44	x	24	]	/	[	70	x	25550	]

DIoral = Daily intake for ingestion of water (mg/kg-day)
CW = Water concentration (μg/L)
CR = Contact rate (L/hr)
CF = Conversion factor (mg/μg)
ET = Exposure time (hours/event)

ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days)

TABLE 6-10(a)

EXPOSURE INTAKE FORMULA AND PARAMETERS
CURRENT LAND USE TRESPASSER EXPOSURE:
INCIDENTAL INGESTION OF CHEMICALS IN SURFACE WATER DURING WADING
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, Exhibit 6-12, page 6-36):

$$DIoral = \frac{CW \times CR \times CF \times ET \times EF \times ED}{BW \times AT}$$

Parameters	Definition	Units	Value	Reference
DIoral	Daily intake --Oral route	mg/kg-day	Calculated	U..S EPA, 1989a[a]
CW	Chemical concentration	µg/L	Site-specific	
CR	Contact rate	L/hr	0.005	U.S. EPA 1989a, 1991[b]
CF	Conversion factor	mg/µg	10^{-3}	SI system
ET	Exposure time	hours/event	4	Conservative assumption
EF	Exposure frequency	events/year	44	Conservative assumption[c]
ED	Exposure duration --7 to 30 age group	years	24	Conservative assumption[d]
BW	Body weight	kg	70	U.S. EPA, 1989a
AT	Averaging time			U.S. EPA, 1989a[e]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	8,760	

(a) Value calculated is expressed as an administered dose.

(b) Based on 10% of the value for incidental ingestion of water during swimming (50 mL/event).

(c) Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September (3 days/week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days).

(d) Assumes people in the age group 7 to 30 are most likely to trespass on the site.

(e) Averaging time of exposure for carcinogenic effects is based on 70-year lifetime (70 years x 365 days/year = 25,550 days). Averaging time for noncarcinogenic effects in child is based on 6 years (6 years x 365 days/year = 2,190 days). Averaging time of exposure for noncarcinogenic effects in adult is based on 24-year ED (24 years x 365 days/year = 8,760 days).

U.S. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual. Part A. Interim Final. December 1989 EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors," Interim Final. OSWER Directive 9285. 6-03, March 25, 1991.

TABLE 6-10(B)

EXPOSURE INTAKE CALCULATIONS
CURRENT LAND USE TRESPASSERS EXPOSURE:
INCIDENTAL INGESTION OF CHEMICALS IN SURFACE WATER DURING WADING

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIoral	[	CW	x	CR	x	CF	x	ET	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/L		L/hr		mg/µg		hours/day		days		years		kg		days	
UNIT/CHEMICAL(S)																		
Noncarcinogenic Effects																		
SEMI-VOC																		
Benzoic Acid	2.755E-07	[	8	x	0.005	x	1E-03	x	4	x	44	x	24	] / [	70	x	8760	]
Di-n-butyl phthalate	2.755E-08	[	0.8	x	0.005	x	1E-03	x	4	x	44	x	24	] / [	70	x	8760	]
Butyl benzyl phthalate	2.067E-08	[	0.6	x	0.005	x	1E-03	x	4	x	44	x	24	] / [	70	x	8760	]
Carcinogenic Effects																		
SEMI-VOC																		
Benzoic Acid	9.447E-08	[	8	x	0.005	x	1E-03	x	4	x	44	x	24	] / [	70	x	25550	]
Di-n-butyl phthalate	9.447E-09	[	0.8	x	0.005	x	1E-03	x	4	x	44	x	24	] / [	70	x	25550	]
Butyl benzyl phthalate	7.085E-09	[	0.6	x	0.005	x	1E-03	x	4	x	44	x	24	] / [	70	x	25550	]

DIoral = Daily intake for ingestion of water (mg/kg-day)
CW = Water concentration (µg/L)
CR = Contact rate (L/hr)
CF = Conversion factor (mg/µg)
ET = Exposure time (hours/event)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days)

TABLE 6-11(a)

EXPOSURE INTAKE FORMULA AND VARIABLES
CURRENT LAND USE TRESPASSER EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN SURFACE WATER DURING WADING
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, page 6-37):

$$DIdermal = \frac{CW \times SA \times PC \times ET \times EF \times ED \times CF}{BW \times AT}$$

Parameters	Definition	Units	Value	Reference
DIdermal	Daily intake --Dermal route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CW	Chemical concentration in water	µg/L	Site-specific	
SA	Skin surface area available for contact			U.S. EPA, 1989a[b]
	--Adult	cm^2	5,000	
PC	Dermal permeability constants	cm/hr		Chemical specific[c]
ET	Exposure time	hrs/day	4	Conservative assumption
EF	Exposure frequency	days/year	44	U.S. EPA, 1991[d]
ED	Exposure duration			Conservative assumption[e]
	--7 to 30 age group	years	24	
CF	Conversion factor	$\frac{mg \times L}{\mu g\ cm^3}$	10^{-6}	SI sytem
BW	Body weight	kg	70	U.S. EPA, 1989a
AT	Averaging time			U.S. EPA, 1989a[f]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	8,760	

(a) Value calculated is expressed in terms of an absorbed dose.

(b) Based on the average of 25% total body surface area.

(c) Dermal permeability constants were based on a draft U.S. EPA document, *Interim Guidance for Dermal Exposure Assessment*, OHEA-E-367, March, 1991.

(d) Assumes the frequency with which an individual will trespass on the site is influenced by climate conditions. In this case, assumes 3 days/week for June, July, and August and 1 day/week for May and September (3 days/week x 4 weeks/month x 3 months + 1 day/week x 4 weeks/month x 2 months = 44 days).

(e) Based on 90th percentile time spent at one residence.

(f) Averaging time of exposure for carcinogenic effects is based on 70-year lifetime (70 years x 365 days/year = 25,550 days). Averaging time of exposure for noncarcinogenic effects in 7 to 30 age group is based on 24-year ED (24 years x 365 days/year = 8,760 days).

TABLE 6-11(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT USE TRESPASSERS EXPOSURE:

DERMAL CONTACT WITH CHEMICALS IN SURFACE WATER DURING WADING

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	Didermal	= [	CW	x	SA	x	PC	x	ET	x	EF	x	ED	x	CF	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/L		cm2		cm/hr		hrs/day		days/year		years		L*mg/µg*cm3		kg		days	
UNIT/CHEMICAL(S)																				
Noncarcinogenic Effects																				
SEMI-VOC																				
Benzoic Acid	8.38E-08	= [	8	x	5000	x	7.3E-03	x	4	x	44	x	24	x	1E-06	] / [	70	x	8760	]
Di-n-butyl phthalate	3.79E-08	= [	0.8	x	5000	x	3.3E-02	x	4	x	44	x	24	x	1E-06	] / [	70	x	8760	]
Butyl benzyl phthalate	2.84E-08	= [	0.6	x	5000	x	3.3E-02	x	4	x	44	x	24	x	1E-06	] / [	70	x	8760	]
Carcinogenic Effects																				
SEMI-VOC																				
Benzoic Acid	2.87E-08	= [	8	x	5000	x	7.3E-03	x	4	x	44	x	24	x	1E-06	] / [	70	x	25550	]
Di-n-butyl phthalate	1.30E-08	= [	0.8	x	5000	x	3.3E-02	x	4	x	44	x	24	x	1E-06	] / [	70	x	25550	]
Butyl benzyl phthalate	9.74E-09	= [	0.6	x	5000	x	3.3E-02	x	4	x	44	x	24	x	1E-06	] / [	70	x	25550	]

Didermal = daily intake for dermal route (mg/kg-day)
CW = Chemical concentration in water (µg/L)
SA = Skin surface area available for contact (cm2)
PC = Dermal permeability constants (cm/hr)
ET = Exposure time (hrs/day)
EF = Exposure frequency (days/year)
ED = Exposure duration (years)
CF = Conversion factor (mg*L/cm3*µg)
BW = Body weight
AT = Averaging time (days)

TABLE 6-12(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT LAND USE TRESPASSERS EXPOSURE: INGESTION OF FISH

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION UNITS	DIoral mg/kg-day	= [	CF mg/kg	x	IR kg/day	x	FI unitless	x	EF days/yr	x	ED years	] / [	BW kg	x	AT days	]
UNIT/CHEMICAL(S)																
Noncarcinogenic Effects																
SEMI-VOC																
Benzoic Acid	NA	= [	NA	x	0.054	x	0.5	x	44	x	30	] / [	70	x	8760	]
Di-n-butyl phthalate	NA	= [	NA	x	0.054	x	0.5	x	44	x	30	] / [	70	x	8760	]
Butyl benzyl phthalate	NA	= [	NA	x	0.054	x	0.5	x	44	x	30	] / [	70	x	8760	]
Carcinogenic Effects																
SEMI-VOC																
Benzoic Acid	NA	= [	NA	x	0.054	x	0.5	x	44	x	30	] / [	70	x	25550	]
Di-n-butyl phthalate	NA	= [	NA	x	0.054	x	0.5	x	44	x	30	] / [	70	x	25550	]
Butyl benzyl phthalate	NA	= [	NA	x	0.054	x	0.5	x	44	x	30	] / [	70	x	25550	]

NA = Not Available due to lack of fish bioconcentration factor

DIoral = Daily intake by oral route (mg/kg-day)

CF = Contaminant concentration in fish (mg/kg)

IR = Ingestion rate (kg/day)

FI = Fraction of fish ingested from contaminated source (unitless)

EF = Exposure frequency (days/yr)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

TABLE 6-13(a)

EXPOSURE INTAKE FORMULA AND PARAMETERS
CURRENT AND FUTURE LAND USE INDUSTRIAL EXPOSURE:
INHALATION OF AIRBORNE CHEMICALS FROM SOIL
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, page 6-44):

$$DIinhal = F(CA \times IR \times ET \times EF \times ED, BW \times AT)$$

Parameters	Definition	Units	Value	Reference
DIinhal	Daily intake --Iinhalation route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CA	Chemical concentration in air	mg/m^3	Site-specific	Hwang and Falco, 1986[b]
IR	Inhalation rate	m^3/hr	0.83	U.S. EPA, 1989a, 1991[c]
ET	Exposure time	hrs/day	2	Conservative assumption
EF	Exposure frequency	days/year	24	U.S. EPA, 1991[d]
ED	Exposure duration	years	25	Conservative assumption[e]
BW	Body weight	kg	70	U.S. EPA, 1989a, 1991[f]
AT	Averaging time			U.S. EPA, 1989a, 1991[g]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	8,760	

[a] Value calculated is expressed in terms of an administered dose.
[b] Modelled based on methods from Hwang and Falco, 1986. (See Appendix A1 for calculation of air concentrations.)
[c] Selected based on average ventilation rate for an adult (20 m^3/day or 0.83 m^3/hr).
[d] Assumes the frequency with which an individual will work on the site. In this case, assumes 2 days/month for 12 month/year = 24 days)
[e] Assumes working lifetime of 25 years.
[f] Average adult body weight.
[g] Averaging time of exposure for carcinogenic effects is based on 70-year lifetime (70 years x 365 days/year = 25,550 days). Averaging time of exposure for noncarcinogenic effects is based on 25-year ED (25 years x 365 days/year = 9,125 days).

U.S. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual. Part A. Interim Final. December, 1989 EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors," Interim Final. OSWER Directive 9285. 6-03, March 25, 1991.

TABLE 6-13(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT AND FUTURE LAND USE INDUSTRIAL EXPOSURE: INHALATION OF CHEMICALS IN SOIL

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIinhal	= [	CA	x	IR	x	ET	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years		kg		days	
UNIT/CHEMICAL(S)																
Adult-Noncarcinogenic Effects																
Metals																
Arsenic - Total	9.38E-12	= [	6.013E-09	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Barium - Total	6.07E-11	= [	3.890E-08	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Chromium - Total	5.39E-11	= [	3.458E-08	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Lead - Total	1.09E-10	= [	6.962E-08	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Mercury - Total	3.01E-14	= [	1.928E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Zinc - Total	1.36E-10	= [	8.730E-08	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
VOC																
Acetone	5.90E-14	= [	3.783E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
2-Butanone	1.37E-14	= [	8.796E-12	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzene	1.35E-15	= [	8.639E-13	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Tetrachloroethene	6.74E-16	= [	4.320E-13	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Toluene	2.02E-15	= [	1.296E-12	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Chlorobenzene	6.74E-16	= [	4.320E-13	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Ethyl benzene	1.01E-15	= [	6.479E-13	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Total Xylenes	1.35E-15	= [	8.639E-13	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
SEMI-VOC																
Phenol	1.28E-13	= [	8.198E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzoic Acid	1.01E-13	= [	6.472E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Naphthalene	4.04E-14	= [	2.592E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
2-Methylnaphthalene	NA	= [	NA	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Acenaphthylene	1.21E-14	= [	7.775E-12	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Acenaphthene	1.72E-14	= [	1.101E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Dibenzofuran	NA	= [	NA	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Fluorene	1.95E-14	= [	1.253E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Phenanthrene	1.12E-13	= [	7.184E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Anthracene	3.20E-14	= [	2.052E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Fluoranthene	1.47E-13	= [	9.427E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Pyrene	1.96E-13	= [	1.254E-10	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzo(a)anthracene	1.01E-13	= [	6.493E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Chrysene	1.29E-13	= [	8.275E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Bis(2-ethylhexyl) phthalate	6.20E-13	= [	3.974E-10	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzo(b)fluoranthene	1.91E-13	= [	1.223E-10	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzo(k)fluoranthene	1.11E-13	= [	7.109E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzo(a)pyrene	1.20E-13	= [	7.701E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Indeno(1,2,3-cd)pyrene	9.14E-14	= [	5.861E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Dibenzo(a,h)anthracene	2.43E-14	= [	1.557E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]
Benzo(ghi)perylene	6.59E-14	= [	4.229E-11	x	0.83	x	2	x	24	x	25	] / [	70	x	9125	]

TABLE 6-13(B) (Continued)

EQUATION	DIinhal	= [	CA	x	IR	x	ET	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years				kg		days	
PCBS																		
Aroclor 1242	5.15E-14	= [	3.302E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
Aroclor 1254	5.48E-14	= [	3.515E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
PEST																		
beta-BHC	5.72E-16	= [	3.666E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
Dieldrin	2.66E-16	= [	1.706E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
4,4'-DDE	1.68E-16	= [	1.079E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
Endrin	3.25E-15	= [	2.084E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
Endosulfan II	2.09E-15	= [	1.339E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
alpha-Chlordane	9.43E-16	= [	6.045E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	9125	]
Adult-Carcinogenic Effects																		
Metals																		
Arsenic - Total	3.35E-12	= [	6.013E-09	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Barium - Total	2.17E-11	= [	3.890E-08	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Chromium - Total	1.93E-11	= [	3.458E-08	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Lead - Total	3.88E-11	= [	6.962E-08	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Mercury - Total	1.07E-14	= [	1.928E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Zinc - Total	4.86E-11	= [	8.730E-08	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
VOC																		
Acetone	2.11E-14	= [	3.783E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
2-Butanone	4.90E-15	= [	8.796E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzene	4.81E-16	= [	8.639E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Tetrachloroethene	2.41E-16	= [	4.320E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Toluene	7.22E-16	= [	1.296E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Chlorobenzene	2.41E-16	= [	4.320E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Ethyl benzene	3.61E-16	= [	6.479E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Total Xylenes	4.81E-16	= [	8.639E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]

TABLE 6-13(B) (Continued)

EQUATION	DIinhal	= [	CA	x	IR	x	ET	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		mg/m3		m3/hr		hrs/day		days/year		years				kg		days	
SEMI-VOC																		
Phenol	4.57E-14	= [	8.198E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzoic Acid	3.60E-14	= [	6.472E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Naphthalene	1.44E-14	= [	2.592E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
2-Methylnaphthalene	NA	= [	NA	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Acenaphthylene	4.33E-15	= [	7.775E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Acenaphthene	6.13E-15	= [	1.101E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Dibenzofuran	NA	= [	NA	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Fluorene	6.98E-15	= [	1.253E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Phenanthrene	4.00E-14	= [	7.184E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Anthracene	1.14E-14	= [	2.052E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Fluoranthene	5.25E-14	= [	9.427E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Pyrene	6.99E-14	= [	1.254E-10	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzo(a)anthracene	3.62E-14	= [	6.493E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Chrysene	4.61E-14	= [	8.275E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Bis(2-ethylhexyl) phthalate	2.21E-13	= [	3.974E-10	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzo(b)fluoranthene	6.81E-14	= [	1.223E-10	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzo(k)fluoranthene	3.96E-14	= [	7.109E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzo(a)pyrene	4.29E-14	= [	7.701E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Indeno(1,2,3-cd)pyrene	3.26E-14	= [	5.861E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Dibenzo(a,h)anthracene	8.67E-15	= [	1.557E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Benzo(ghi)perylene	2.36E-14	= [	4.229E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
PCBS																		
Aroclor 1242	1.84E-14	= [	3.302E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Aroclor 1254	1.96E-14	= [	3.515E-11	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
PEST																		
beta-BHC	2.04E-16	= [	3.666E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Dieldrin	9.50E-17	= [	1.706E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
4,4'-DDE	6.01E-17	= [	1.079E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Endrin	1.16E-15	= [	2.084E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
Endosulfan II	7.46E-16	= [	1.339E-12	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]
alpha-Chlordane	3.37E-16	= [	6.045E-13	x	0.83	x	2	x	24	x	25	]	/	[	70	x	25550	]

* Indicates that the concentrations for metals were reported in mg/kg, thus the conversion factor of 1E-6 kg/mg was used.

DIinhal = Daily intake via inhalation route (mg/kg-day)

CA = Chemical concentration in air (mg/m3) (See Appendix Table A1)

IR = Inhalation rate (m3/hr)

ET = Exposure time (hrs/day)

EF = Exposure frequency (days/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

TABLE 6-14(a)

EXPOSURE INTAKE FORMULA AND PARAMETERS
CURRENT AND FUTURE LAND USE INDUSTRIAL EXPOSURE:
INGESTION OF CHEMICALS IN SOIL
RAMCO STEEL

Intake equation (from U.S. EPA, 1989a, Exhibit 6-14, page 6-40):

$$DIoral = F(CS \times IR \times CF \times FI \times EF \times ED, BW \times AT)$$

Parameters	Definition	Units	Value	Reference
DIoral	Daily intake --Oral route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CS	Concentration in soil	µg/kg	Site-specific	
IR	Ingestion rate --7 to 30 age group	mg soil/day	50	U.S. EPA, 1989a, 1991
CF	Conversion factor	kg/µg	10^{-9}	SI system
FI	Fraction ingested from contaminated source	unitless	1	Conservative assumption[b]
EF	Exposure frequency	days/year	24	U.S. EPA, 1991[c]
ED	Exposure duration	years	25	Conservative assumption[d]
BW	Body weight	kg	70	U.S. EPA, 1989a[e]
AT	Averaging time			U.S. EPA, 1989a, 1991[f]
	--Carcinogenic effects	days	25,550	
	--Noncarcinogenic effects	days	9,125	U.S. EPA, 1989a

(a) Daily intake is expressed as an administered dose

(b) A conservative assumption, assuming all soil ingested is from contaminated source.

(c) Assumes the frequency with which an individual will work on the site. In this case, assumes 2 days/month for 12 month/year = 24 days)

(d) Assumes working lifetime of 25 years.

(e) Average adult body weight.

(f) For carcinogenic effects, based on 70-year lifetime, a value by convention (70 yr x 365 days/yr = 25,550 days). For noncarcinogenic effects in adults, based on 25-year ED (25 yrs x 365 days/yr = 9,125 days).

U.S. EPA, 1989a. Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual. Part A. Interim Final. December, 1989 EPA/540/1-89/002.

U.S. EPA, 1991. Human Health Evaluation Manual Supplemental Guidance. "Standard Default Exposure Factors," Interim Final. OSWER Directive 9285. 6-03, March 25, 1991.

TABLE 6-14(B)

EXPOSURE INTAKE CALCULATIONS
CURRENT AND FUTURE LAND USE INDUSTRIAL EXPOSURE: INGESTION OF CHEMICALS IN SOIL
RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	Dioral	= [	CS	x	IR	x	CF	x	FI	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		mg/day		kg/µg*		unitless		days/year		years				kg		days	
UNIT/CHEMICAL(S)																				
Adult-Noncarcinogenic Effects																				
Metals																				
Arsenic - Total	1.307E-06	= [	27.84	x	50	x	1E-06	x	1	x	24	x	25	]	/	[	70	x	9125	]
Barium - Total	8.459E-06	= [	180.10	x	50	x	1E-06	x	1	x	24	x	25	]	/	[	70	x	9125	]
Chromium - Total	7.520E-06	= [	160.10	x	50	x	1E-06	x	1	x	24	x	25	]	/	[	70	x	9125	]
Lead - Total	1.514E-05	= [	322.34	x	50	x	1E-06	x	1	x	24	x	25	]	/	[	70	x	9125	]
Mercury - Total	4.192E-09	= [	0.09	x	50	x	1E-06	x	1	x	24	x	25	]	/	[	70	x	9125	]
Zinc - Total	1.898E-05	= [	404.20	x	50	x	1E-06	x	1	x	24	x	25	]	/	[	70	x	9125	]
VOC																				
Acetone	8.227E-09	= [	175.16	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
2-Butanone	1.913E-09	= [	40.73	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzene	1.879E-10	= [	4.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Tetrachloroethene	9.393E-11	= [	2.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Toluene	2.818E-10	= [	6.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Chlorobenzene	9.393E-11	= [	2.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Ethyl benzene	1.409E-10	= [	3.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Total Xylenes	1.879E-10	= [	4.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
SEMI-VOC																				
Phenol	1.783E-08	= [	379.61	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzoic Acid	1.409E-08	= [	300.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Naphthalene	5.636E-09	= [	120.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
2-Methylnaphthalene	5.166E-09	= [	110.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Acenaphthylene	1.691E-09	= [	36.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Acenaphthene	2.395E-09	= [	51.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Dibenzofuran	3.053E-09	= [	65.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Fluorene	2.724E-09	= [	58.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Phenanthrene	1.563E-08	= [	332.69	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Anthracene	4.462E-09	= [	95.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Fluoranthene	2.052E-08	= [	436.86	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Pyrene	2.732E-08	= [	581.58	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzo(a)anthracene	1.437E-08	= [	305.97	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Chrysene	1.807E-08	= [	384.79	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Bis(2-ethylhexyl) phthalate	8.705E-08	= [	1853.50	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzo(b)fluoranthene	2.661E-08	= [	566.57	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzo(k)fluoranthene	1.546E-08	= [	329.15	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzo(a)pyrene	1.721E-08	= [	366.42	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Indeno(1,2,3-cd)pyrene	1.283E-08	= [	273.18	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Dibenzo(a,h)anthracene	3.616E-09	= [	77.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]
Benzo(ghi)perylene	9.393E-09	= [	200.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	9125	]

TABLE 6-14(B) (Continued)

EQUATION	DIoral	= [	CS	x	IR	x	CF	x	FI	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		mg/day		kg/µg*		unitless		days/year		years		kg		days	
PCBS																		
Aroclor 1242	7.184E-09	= [	152.97	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
Aroclor 1254	7.648E-09	= [	162.84	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
PEST																		
beta-BHC	7.984E-11	= [	1.70	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
Dieldrin	3.710E-11	= [	0.79	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
4,4'-DDE	2.348E-11	= [	0.50	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
Endrin	4.546E-10	= [	9.68	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
Endosulfan II	2.912E-10	= [	6.20	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
alpha-Chlordane	1.315E-10	= [	2.80	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	9125	]
Adult-Carcinogenic Effects																		
Metals																		
Arsenic - Total	4.670E-07	= [	27.84	x	50	x	1E-06	x	1	x	24	x	25	] / [	70	x	25550	]
Barium - Total	3.021E-06	= [	180.10	x	50	x	1E-06	x	1	x	24	x	25	] / [	70	x	25550	]
Chromium - Total	2.686E-06	= [	160.10	x	50	x	1E-06	x	1	x	24	x	25	] / [	70	x	25550	]
Lead - Total	5.407E-06	= [	322.34	x	50	x	1E-06	x	1	x	24	x	25	] / [	70	x	25550	]
Mercury - Total	1.497E-09	= [	0.09	x	50	x	1E-06	x	1	x	24	x	25	] / [	70	x	25550	]
Zinc - Total	6.780E-06	= [	404.20	x	50	x	1E-06	x	1	x	24	x	25	] / [	70	x	25550	]
VOC																		
Acetone	2.938E-09	= [	175.16	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
2-Butanone	6.832E-10	= [	40.73	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
Benzene	6.710E-11	= [	4.00	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
Tetrachloroethene	3.355E-11	= [	2.00	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
Toluene	1.006E-10	= [	6.00	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
Chlorobenzene	3.355E-11	= [	2.00	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
Ethyl benzene	5.032E-11	= [	3.00	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]
Total Xylenes	6.710E-11	= [	4.00	x	50	x	1E-09	x	1	x	24	x	25	] / [	70	x	25550	]

8

TABLE 6-14(B) (Continued)

EQUATION	Dlderal	= [	CS	x	IR	x	CF	x	FI	x	EF	x	ED	]	/	[	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		mg/day		kg/µg*		unitless		days/year		years				kg		days	
SEMI-VOC																				
Phenol	6.367E-09	= [	379.61	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Benzoic Acid	5.032E-09	= [	300.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Naphthalene	2.013E-09	= [	120.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
2-Methylnaphthalene	1.845E-09	= [	110.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Acenaphthylene	6.039E-10	= [	36.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Acenaphthene	8.555E-10	= [	51.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Dibenzofuran	1.090E-09	= [	65.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Fluorene	9.729E-10	= [	58.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Phenanthrene	5.581E-09	= [	332.69	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Anthracene	1.594E-09	= [	95.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Fluoranthene	7.328E-09	= [	436.86	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Pyrene	9.755E-09	= [	581.58	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Benzo(a)anthracene	5.132E-09	= [	305.97	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Chrysene	6.454E-09	= [	384.79	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Bis(2-ethylhexyl) phthalate	3.109E-08	= [	1853.50	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Benzo(b)fluoranthene	9.504E-09	= [	566.57	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Benzo(k)fluoranthene	5.521E-09	= [	329.15	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Benzo(a)pyrene	6.146E-09	= [	366.42	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Indeno(1,2,3-cd)pyrene	4.582E-09	= [	273.18	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Dibenzo(a,h)anthracene	1.292E-09	= [	77.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Benzo(ghi)perylene	3.355E-09	= [	200.00	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
PCBS																				
Aroclor 1242	2.566E-09	= [	152.97	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Aroclor 1254	2.732E-09	= [	162.84	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
PEST																				
beta-BHC	2.852E-11	= [	1.70	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Dieldrin	1.325E-11	= [	0.79	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
4,4'-DDE	8.387E-12	= [	0.50	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Endrin	1.624E-10	= [	9.68	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
Endosulfan II	1.040E-10	= [	6.20	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]
alpha-Chlordane	4.697E-11	= [	2.80	x	50	x	1E-09	x	1	x	24	x	25	]	/	[	70	x	25550	]

* Indicates that the concentrations for metals were reported in mg/kg, thus the conversion factor of 1E-6 kg/mg was used.

Dldermal = Daily intake via dermal intake (mg/kg-day)

CS = Chemicals concentration in soil (µg/kg)

CF = Conversion factor (kg/µg)

SA = Skin surface area available for contact (cm2/event)

AF = Soil to skin adherence factor (mg/cm2)

ABS = Absorption factor (unitless)

EF = Exposure frequency (events/year)

ED = Exposure duration (years)

BW = Body weight (kg)

AT = Averaging time (days)

TABLE 6-15(a)

EXPOSURE INTAKE FORMULA AND VARIABLES
CURRENT AND FUTURE LAND USE INDUSTIRAL EXPOSURE:
DERMAL CONTACT WITH CHEMICALS IN SOIL
RAMCO STEEL

Intake equation (Absorbed dose, from U.S. EPA, 1989a, Exhibit 6-15, page 6-41):

$$DIdermal = \frac{CS \times CF \times SA \times AF \times ABS \times EF \times ED}{BW \times AT}$$

Parameters	Definition	Units	Value	Reference
DIdermal	Daily intake --Dermal route	mg/kg-day	Calculated	U.S. EPA, 1989a[a]
CS	Chemical concentration in soil	µg/kg	Site-specific	
CF	Conversion factor	kg/µg	10^{-9}	SI system
SA	Skin surface area available for contact	cm^2/event	5,000	U.S. EPA, 1989b[b]
AF	Soil to skin adherence factor	mg/cm^2	0.6	U.S. EPA, 1992b[c]
ABS	Absorption factor	unitless	Chemical-specific	U.S. EPA, 1992b[d]
EF	Exposure frequency	events/year	24	U.S. EPA, 1991[e]
ED	Exposure duration	years	25	U.S. EPA, 1989a, 1991[f]
BW	Body weight	kg	70	U.S. EPA, 1989a, 1991[g]
AT	Averaging time --Carcinogenic effects --Noncarinogenic effects	 days days	 25,550 9,125	U.S. EPA, 1989a, 1991[h]

[a] Daily intake calculated is expressed as an absorbed dose.
[b] The value of 5,000 cm^2/event represents the reasonable worst case.
[c] The soil to skin adherence factors given in EPA's Risk Assessment Guidance for Superfund (U.S. EPA, 1989a) are 1.45 mg/cm^2 and 2.77 mg/cm^2 for commercial potting soil and clay, respectively. Because of new data in this area, a range of 0.2 to 1.0 mg/cm^2 has been recommended by the U.S. EPA Region IV (see Appendix B).
[d] In determining the risks associated with dermal exposure to contaminated soils, absorption factors of 1% (for organics) and 0.1% (for inorganics) have been recommended by the U.S. EPA Region IV (see Appendix B).
[e] Assumes the frequency with which an individual will work on the site. In this case, assumes 2 days/month for 12 month/year = 24 days)
[f] Assumes working lifetime of 25 years.
[g] Calculated from Exposure Factor Handbook (U.S. EPA, 1989b).
[h] For carcinogenic effects, based on 70-year lifetime, a value by convention (70 yr x 365 days/yr = 25,550 days). For noncarcinogenic effects in 7-30 age group, based on 25 year ED (25 yrs x 365 days/yr = 9,125 days).

TABLE 6-15(B)

EXPOSURE INTAKE CALCULATIONS

CURRENT AND FUTURE LAND USE INDUSTRIAL EXPOSURE: DERMAL CONTACT WITH CHEMICALS IN SOIL

RAMCO STEEL - BUFFALO, NEW YORK

EQUATION	DIdermal	= [	CS	x	CF	x	SA	x	AF	x	ABS	x	EF	x	ED	] / [	BW	x	AT	]
UNITS	mg/kg-day		µg/kg*		kg/µg*		cm2/event		mg/cm2		unitless		events/year		years		kg		days	
UNIT/CHEMICAL(S)																				
Adult-Noncarcinogenic Effects																				
Metals																				
Arsenic - Total	7.845E-08	= [	27.84	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	9125	]
Barium - Total	5.075E-07	= [	180.10	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	9125	]
Chromium - Total	4.512E-07	= [	160.10	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	9125	]
Lead - Total	9.084E-07	= [	322.34	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	9125	]
Mercury - Total	2.515E-10	= [	0.09	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	9125	]
Zinc - Total	1.139E-06	= [	404.20	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	9125	]
VOC																				
Acetone	4.936E-09	= [	175.16	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
2-Butanone	1.148E-09	= [	40.73	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzene	1.127E-10	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Tetrachloroethene	5.636E-11	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Toluene	1.691E-10	= [	6.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Chlorobenzene	5.636E-11	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Ethyl benzene	8.454E-11	= [	3.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Total Xylenes	1.127E-10	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
SEMI-VOC																				
Phenol	1.070E-08	= [	379.61	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzoic Acid	8.454E-09	= [	300.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Naphthalene	3.382E-09	= [	120.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
2-Methylnaphthalene	3.100E-09	= [	110.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Acenaphthylene	1.014E-09	= [	36.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Acenaphthene	1.437E-09	= [	51.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Dibenzofuran	1.832E-09	= [	65.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Fluorene	1.634E-09	= [	58.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Phenanthrene	9.375E-09	= [	332.69	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Anthracene	2.677E-09	= [	95.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Fluoranthene	1.231E-08	= [	436.86	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Pyrene	1.639E-08	= [	581.58	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzo(a)anthracene	8.622E-09	= [	305.97	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Chrysene	1.084E-08	= [	384.79	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Bis(2-ethylhexyl) phthalate	5.223E-08	= [	1853.50	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzo(b)fluoranthene	1.597E-08	= [	566.57	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzo(k)fluoranthene	9.275E-09	= [	329.15	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzo(a)pyrene	1.033E-08	= [	366.42	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Indeno(1,2,3-cd)pyrene	7.698E-09	= [	273.18	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Dibenzo(a,h)anthracene	2.170E-09	= [	77.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Benzo(ghi)perylene	5.636E-09	= [	200.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]

TABLE 6-15 (B) (Continued)

EQUATION UNITS	DIdermal mg/kg-day	= [	CS µg/kg*	x	CF kg/µg*	x	SA cm2/event	x	AF mg/cm2	x	ABS unitless	x	EF events/year	x	ED years	] / [	BW kg	x	AT days	]
PCBS																				
Aroclor 1242	4.311E-09	= [	152.97	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Aroclor 1254	4.589E-09	= [	162.84	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
PEST																				
beta-BHC	4.791E-11	= [	1.70	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Dieldrin	2.226E-11	= [	0.79	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
4,4'-DDE	1.409E-11	= [	0.50	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Endrin	2.728E-10	= [	9.68	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Endosulfan II	1.747E-10	= [	6.20	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
alpha-Chlordane	7.890E-11	= [	2.80	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	9125	]
Adult-Carcinogenic Effects																				
Metals																				
Arsenic - Total	2.802E-08	= [	27.84	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	25550	]
Barium - Total	1.813E-07	= [	180.10	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	25550	]
Chromium - Total	1.611E-07	= [	160.10	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	25550	]
Lead - Total	3.244E-07	= [	322.34	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	25550	]
Mercury - Total	8.983E-11	= [	0.09	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	25550	]
Zinc - Total	4.068E-07	= [	404.20	x	1E-06	x	5000	x	0.6	x	0.001	x	24	x	25	] / [	70	x	25550	]
VOC																				
Acetone	1.763E-09	= [	175.16	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
2-Butanone	4.099E-10	= [	40.73	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzene	4.026E-11	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Tetrachloroethene	2.013E-11	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Toluene	6.039E-11	= [	6.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Chlorobenzene	2.013E-11	= [	2.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Ethyl benzene	3.019E-11	= [	3.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Total Xylenes	4.026E-11	= [	4.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]

TABLE 6-15 (B) (Continued)

EQUATION UNITS	DIdermal mg/kg-day	= [	CS µg/kg*	x	CF kg/µg*	x	SA cm2/event	x	AF mg/cm2	x	ABS unitless	x	EF events/year	x	ED years	] / [	BW kg	x	AT days	]
SEMI-VOC																				
Phenol	3.820E-09	= [	379.61	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzoic Acid	3.019E-09	= [	300.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Naphthalene	1.208E-09	= [	120.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
2-Methylnaphthalene	1.107E-09	= [	110.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Acenaphthylene	3.623E-10	= [	36.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Acenaphthene	5.133E-10	= [	51.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Dibenzofuran	6.542E-10	= [	65.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Fluorene	5.837E-10	= [	58.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Phenanthrene	3.348E-09	= [	332.69	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Anthracene	9.561E-10	= [	95.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Fluoranthene	4.397E-09	= [	436.86	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Pyrene	5.853E-09	= [	581.58	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzo(a)anthracene	3.079E-09	= [	305.97	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Chrysene	3.873E-09	= [	384.79	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Bis(2-ethylhexyl) phthalate	1.865E-08	= [	1853.50	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzo(b)fluoranthene	5.702E-09	= [	566.57	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzo(k)fluoranthene	3.313E-09	= [	329.15	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzo(a)pyrene	3.688E-09	= [	366.42	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Indeno(1,2,3-cd)pyrene	2.749E-09	= [	273.18	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Dibenzo(a,h)anthracene	7.750E-10	= [	77.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Benzo(ghi)perylene	2.013E-09	= [	200.00	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
PCBS																				
Aroclor 1242	1.540E-09	= [	152.97	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Aroclor 1254	1.639E-09	= [	162.84	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
PEST																				
beta-BHC	1.711E-11	= [	1.70	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Dieldrin	7.951E-12	= [	0.79	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
4,4'-DDE	5.032E-12	= [	0.50	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Endrin	9.742E-11	= [	9.68	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
Endosulfan II	6.240E-11	= [	6.20	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]
alpha-Chlordane	2.818E-11	= [	2.80	x	1E-09	x	5000	x	0.6	x	0.01	x	24	x	25	] / [	70	x	25550	]

* Indicates that the concentrations for metals were reported in mg/kg, thus the conversion factor of 1E-6 kg/mg was used.

DIdermal = Daily intake via dermal intake (mg/kg-day)
CS = Chemicals concentration in soil (µg/kg)
CF = Conversion factor (kg/µg)
SA = Skin surface area available for contact (cm2/event)
AF = Soil to skin adherence factor (mg/cm2)
ABS = Absorption factor (unitless)
EF = Exposure frequency (events/year)
ED = Exposure duration (years)
BW = Body weight (kg)
AT = Averaging time (days)

TABLE 6-16
DEFAULT DERMAL RfD's
WATER

RAMCO STEEL -BUFFALO,NEW YORK

	Chronic				Subchronic			
Chemical	RfC mg/kg-day	Oral RfD mg/kg-day	Oral Abs. %	Dermal RfD mg/kg-day	RfC mg/kg-day	Oral RfD mg/kg-day	Oral Abs. %	Dermal RfD mg/kg-day
Inorganics								
Chromium (VI)	ND	5E-3	10	5.00E-04	ND	2E-2	10	2.00E-03
Lead	ND	ND	15	ND	ND	ND	15	ND
Zinc	ND	3E-1	30	9.00E-02	ND	2E-1	30	6.00E-02
VOC's								
Acetone	ND	1E-1	100	1.00E-01	ND	1E+0	100	1.00E+00
1,1-Dichlorethane	ND	ND	100	ND	1E+0	1E+0	100	1.00E+00
SVOCs								
Phenol	ND	6E-1	90	5.40E-01	ND	6E-1	90	5.40E-01
4-Methylphenol	ND	5E-2	84	4.20E-02	ND	5E-1	84	4.20E-01
Benzoic acid	ND	4E+0	100	4.00E+00	ND	4E+0	100	4.00E+00
Naphthalene	ND	4E-2	40	1.60E-02	ND	4E-2	40	1.60E-02
2-Methylnaphthelene	ND	ND	100	ND	ND	ND	100	ND
Diethylphthalate	ND	8E-1	100	8.00E-01	ND	8E+0	100	8.00E+00
Phenanthrene	ND	ND	100	ND	ND	ND	100	ND
Di-n-butyl phthalate	ND	1E-1	100	1.00E-01	ND	1E+0	100	1.00E+00
Butyl benzyl phthalate	ND	2E-1	60	1.20E-01	ND	2E+0	60	1.20E+00
Benzo(a)anthracene	ND	ND	100	ND	ND	ND	100	ND
Benzo(b)fluorathene	ND	ND	100	ND	ND	ND	100	ND
Pesticides								
Heptachlor epoxide	ND	1.3E-5	100	1.30E-05	ND	1.3E-5	100	1.30E-05
Dieldrin	ND	5E-5	100	5.00E-05	ND	5E-5	100	5.00E-05

Source:

HAD: Health Assessment Document for Tetrachloroethane

HEAST: Health Effects Assessment Summary Tables. Annual 1993 and Supplemental Documents (July, 1992 and November, 1992).

IRIS: Integrated Risk Information System. On-line.

TEF: Toxicity equivalency factor based on carcinogenicity relative to benzo(a)pyrene.

TABLE 6-17
DEFAULT DERMAL SLOPE FACTORS
WATER

RAMCO STEEL- BUFFALO, NEW YORK

Chemical	Inhalation (mg/kg-day)-1	Oral (mg/kg-day)-1	Dermal Absorption %	Dermal (mg/kg-day)-1
Inorganics				
Chromium (VI)	4.1E+1	ND	10	ND
Lead	ND	ND	15	ND
Zinc	ND	ND	30	ND
VOCs				
Acetone	ND	ND	100	ND
1,1-Dichloroethane*	ND	ND	100	ND
SVOCs				
Phenol	ND	ND	90	ND
4-Methylphenol	ND	ND	84	ND
Benzoic acid	ND	ND	100	ND
Naphthalene	ND	ND	40	ND
2-Methylnaphthelene*	ND	ND	100	ND
Diethylphthalate*	ND	ND	100	ND
Phenanthrene*	ND	ND	100	ND
Di-n-butyl phthalate	ND	ND	100	ND
Butyl benzyl phthalate	ND	ND	60	ND
Benzo(a)anthracene*	6.1E-1	7.3E-1	100	7.3E-01
Benzo(b)fluoranthene	6.1E-1	7.3E-1	100	7.3E-01
Pesticides				
Heptachlor epoxide*	9.1	9.1	100	9.1E+00
Dieldrin*	1.6E+1	1.6E+1	100	1.6E+01

Source:

HAD: Health Assessment Document for Tetrachloroethane
HEAST: Health Effects Assessment Summary Tables. Annual 1993 and Supplemental Documents (July, 1992 and November, 1992).
IRIS: Integrated Risk Information System. On-line.
TEF: Toxicity equivalency factor based on carcinogenicity relative to benzo(a)pyrene.

TABLE 6-18
DEFAULT DERMAL RfDs
SEDIMENT

RAMCO STEEL - BUFFALO, NEW YORK

	Chronic			Subchronic		
	Oral RfD	Oral Abs.	Dermal RfD	Oral RfD	Oral Abs.	Dermal RfD
Chemical	mg/kg-day	%	mg/kg-day	mg/kg-day	%	mg/kg-day
Inorganics						
Arsenic	3E-4	100	3.00E-04	3E-4	100	3.00E-04
Barium	7E-2	5	3.50E-03	7E-2	5	3.50E-03
Chromium III	1E+0	10	1.00E-01	1E+1	10	1.00E+00
Chromium (VI)	5E-3	10	5.00E-04	2E-2	10	2.00E-03
Copper	1.3 mg/L	60	ND	1.3 mg/L	60	ND
Lead	ND	15	ND	ND	15	ND
Manganese	5E-3(w); 1.4E-1(f)	5	7E-3	5E-3(w);1.4E-1(f)	5	7.00E-03
Mercury	3E-4	15	4.50E-05	3E-4	15	4.50E-05
Nickel	2E-2	10	2.00E-03	2E-02	10	2.00E-03
Zinc	3E-1	30	9.00E-02	2E-1	30	6.00E-02
VOC's						
Acetone	1E-1	100	1.00E-01	1E+0	100	1.00E+00
Benzene	NA	100	ND	ND	100	ND
2-Butanone	5E-2	100	5.00E-02	5E-1	100	5.00E-01
Carbon Disulfide	1E-1	63	6.30E-02	1E-1	63	6.30E-02
Chlorobenzene	2E-2	13	2.60E-03	2E-1	13	2.60E-02
Chloroform	1E-2	100	1.00E-02	1E-2	100	1.00E-02
1,1-Dichlorethane	ND	100	ND	1E+0	100	1.00E+00
Ethylbenzene	1E-1	90	9.00E-02	1E+0	90	9.00E-01
1,1,2,2-Tetrachloroethane	ND	70	ND	ND	70	ND
Tetrachloroethene	1E-2	100	1.00E-02	1E-1	100	1.00E-01
Toluene	2E-1	100	2.00E-01	2E+0	100	2.00E+00
1,1,1-Trichloroethane	9E-2	100	9.00E-02	9E-1	100	9.00E-01
Trichloroethene	7E-3	100	7.00E-03	NA	100	ND
Xylenes	2E+0	100	2.00E+00	4E+0	100	4.00E+00
SVOCs						
Acenaphthene	6E-2	100	6.00E-02	6E-1	100	6.00E-01
Acenaphthylene	ND	100	ND	ND	100	ND
Anthracene	3E-1	100	3.00E-01	3E+0	100	3.00E+00
Benzo(a)anthracene	ND	100	ND	ND	100	ND
Benzo(b)fluorathene	ND	100	ND	ND	100	ND
Benzo(k)fluoranthene	ND	100	ND	ND	100	ND
Benzo(g,h,i)perylene	ND	100	ND	ND	100	ND
Benzo(a)pyrene	ND	60	ND	ND	60	ND
Benzoic acid	4E+0	100	4.00E+00	4E+0	100	4.00E+00
Bis(2-ethylhexyl)phthalate	2E-2	100	2.00E-02	2E-2	100	2.00E-02
Butyl benzyl phthalate	2E-1	60	1.20E-01	2E+0	60	1.20E+00
Chrysene	ND	50	ND	ND	50	ND
Di-n-butyl phthalate	1E-1	100	1.00E-01	1E+0	100	1.00E+00
Dibenzo(a,h)anthracene	ND	100	ND	ND	100	ND
Dibenzofuran	ND	100	ND	ND	100	ND
Diethylphthalate	8E-1	100	8.00E-01	8E+0	100	8.00E+00
Fluoranthene	4E-2	100	4.00E-02	4E-1	100	4.00E-01
Fluorene	4E-2	100	4.00E-02	4E-1	100	4.00E-01
Indeno(1,2,3-c,d)pyrene	ND	100	ND	ND	100	ND
2-Methylnaphthalene	ND	100	ND	ND	100	ND
4-Methylphenol	5E-2	84	4.20E-02	5E-1	84	4.20E-01
Naphthalene	4E-2	40	1.60E-02	4E-2	40	1.60E-02
Phenanthrene	ND	100	ND	ND	100	ND
Phenol	6E-1	90	5.40E-01	6E-1	90	5.40E-01
Pyrene	3E-2	100	3.00E-02	3E-1	100	3.00E-01
PCBs						
Arochlor 1242	NA	100	ND	ND	100	ND
Arochlor 1248	ND	100	ND	ND	100	ND
Arochlor 1254	NA	100	ND	ND	100	ND
Pesticides						
beta-BHC	ND	91	ND	ND	91	ND
alpha-chlordane	6E-5	80	4.80E-05	6E-5	80	4.80E-05
4,4'-DDD	ND	90	ND	ND	90	ND
4,4'-DDE	ND	90	ND	ND	90	ND
4,4'-DDT	5E-4	90	4.50E-04	5E-4	90	4.50E-04

Source:

HAD: Health Assessment Document for Tetrachloroethane

HEAST: Health Effects Assessment Summary Tables. Annual 1993 and Supplemental Documents (July, 1992 and November, 1992).

IRIS: Integrated Risk Information System. On-line.

TEF: Toxicity equivalency factor based on carcinogenicity relative to benzo(a)pyrene.

TABLE 6-19
DEFAULT DERMAL SLOPE FACTORS
SEDIMENT

RAMCO STEEL - BUFFALO, NEW YORK

Chemical	Oral Slope Factor (mg/kg-day)-1	Dermal Absorption %	Dermal Slope Factor (mg/kg-day)-1
Inorganics			
Arsenic	1.75	100	1.8E+00
Barium	NA	5	ND
Chromium III	NA	10	ND
Chromium (VI)	ND	10	ND
Copper	ND	60	ND
Lead	ND	15	ND
Manganese	ND	5	ND
Mercury	ND	15	ND
Nickel	ND	10	ND
Zinc	ND	30	ND
VOCs			
Acetone	ND	100	ND
Benzene	2.9E-2	100	2.9E-02
2-Butanone	ND	100	ND
Carbon Disulfide	ND	63	ND
Chlorobenzene	ND	13	ND
Chloroform	6.1E-3	100	6.1E-03
1,1-Dichloroethane*	ND	100	ND
Ethylbenzene	ND	90	ND
1,1,2,2-Tetrachloroethane	2E-1	70	2.9E-01
Tetrachloroethene	5.2E-2	100	5.2E-02
Toluene	ND	100	ND
1,1,1-Trichloroethane	ND	100	ND
Trichloroethene	1.1E-2	100	1.1E-02
Xylenes	ND	100	ND
SVOCs			
Acenaphthene	ND	100	ND
Acenaphthylene*	ND	100	ND
Anthracene*	ND	100	ND
Benzo(a)anthracene*	7.3E-1	100	7.3E-01
Benzo(b)fluoranthene	7.3E-1	100	7.3E-01
Benzo(k)fluoranthene	7.3E-1	100	7.3E-01
Benzo(g,h,i)perylene*	ND	100	ND
Benzo(a)pyrene	7.3	60	1.2E+01
Benzoic acid	ND	100	ND
Bis(2-ethylhexyl)phthalate*	1.4E-2	100	1.4E-02
Butyl benzyl phthalate	ND	60	ND
Chrysene	7.3E-2	50	1.5E-01
Di-n-butyl phthalate	ND	100	ND
Dibenzo(a,h)anthracene*	7.3E-1	100	7.3E-01
Dibenzofuran*	ND	100	ND
Diethylphthalate*	ND	100	ND
Fluoranthene*	ND	100	ND
Fluorene*	ND	100	ND
Indeno(1,2,3-c,d)pyrene*	7.3E-1	100	7.3E-01
2-Methylnaphthalene*	ND	100	ND
4-Methylphenol	ND	84	ND
Naphthalene	ND	40	ND
Phenanthrene*	ND	100	ND
Phenol	ND	90	ND
Pyrene*	ND	100	ND
PCBs			
Aroclor 1242	7.7	100	7.7E+00
Aroclor 1248	7.7	100	7.7E+00
Aroclor 1254	7.7	100	7.7E+00
Pesticides			
beta-BHC	1.8E+0	91	2.0E+00
alpha-chlordane	1.3E+0	80	1.6E+00
4,4'-DDD	2.4E-1	90	2.7E-01
4,4'-DDE	3.4E-1	90	3.8E-01
4,4'-DDT	3.4E-1	90	3.8E-01
Dieldrin*	1.6E+1	100	1.6E+01
Endrin*	ND	100	ND
Endrin ketone*	ND	100	ND
Endosulfan II	ND	80	ND
Heptachlor epoxide*	9.1	100	9.1E+00

TABLE 6-20

DEFAULT DERMAL RfD's

SOIL

RAMCO STEEL- BUFFALO, NEW YORK

	Chronic				Subchronic			
Chemical	RfC mg/kg-da	Oral RfD mg/kg-day	Oral Abs. %	Dermal RfD mg/kg-day	RfC mg/kg-da	Oral RfD mg/kg-day	Oral Abs. %	Dermal RfD mg/kg-day
Inorganics								
Arsenic	ND	3E-4	100	3.00E-04	ND	3E-4	100	3.00E-04
Barium	1E-4	7E-2	5	3.50E-03	fetus	7E-2	5	3.50E-03
Chromium (VI)	ND	5E-3	10	5.00E-04	ND	2E-2	10	2.00E-03
Lead	ND	ND	15	ND	ND	ND	15	ND
Mercury	30	3E-4	15	4.50E-05	1E-4	3E-4	15	4.50E-05
Zinc	ND	3E-1	30	9.00E-02	ND	2E-1	30	6.00E-02
VOC's								
Acetone	ND	1E-1	100	1.00E-01	ND	1E+0	100	1.00E+00
2-Butanone	3E-1	5E-2	100	5.00E-02	3E-1	5E-1	100	5.00E-01
Benzene	ND	NA	100	ND	ND	ND	100	ND
Tetrachloroethene	ND	1E-2	100	1.00E-02	ND	1E-1	100	1.00E-01
Toluene	1E-1	2E-1	100	2.00E-01	1E-1	2E+0	100	2.00E+00
Chlorobenzene	6E-3	2E-2	13	2.60E-03			13	0.00E+00
Ethylbenzene	3E-1	1E-1	90	9.00E-02	3E-1	1E+0	90	9.00E-01
Xylenes	ND	2E+0	100	2.00E+00	ND	4E+0	100	4.00E+00
SVOCs								
Phenol	ND	6E-1	90	5.40E-01	ND	6E-1	90	5.40E-01
Benzoic acid	ND	4E+0	100	4.00E+00	ND	4E+0	100	4.00E+00
Naphthalene	ND	4E-2	40	1.60E-02	ND	4E-2	40	1.60E-02
2-Methylnaphthelene	ND	ND	100	ND	ND	ND	100	ND
Acenaphthylene	ND	ND	100	ND	ND	ND	100	ND
Acenaphthene	ND	6E-2	100	6.00E-02	ND	6E-1	100	6.00E-01
Dibenzofuran	ND	ND	100	ND	ND	ND	100	ND
Fluorene	ND	4E-2	100	4.00E-02	ND	4E-1	100	4.00E-01
Phenanthrene	ND	ND	100	ND	ND	ND	100	ND
Anthracene	ND	3E-1	100	3.00E-01	ND	3E+0	100	3.00E+00
Fluoranthene	ND	4E-2	100	4.00E-02	ND	4E-1	100	4.00E-01
Pyrene	ND	3E-2	100	3.00E-02	ND	3E-1	100	3.00E-01
Benzo(a)anthracene	ND	ND	100	ND	ND	ND	100	ND
Chrysene	ND	ND	50	ND	ND	ND	50	ND
Bis(2-ethylhexyl)phthalate	ND	2E-2	100	2.00E-02	ND	2E-2	100	2.00E-02
Benzo(b)fluorathene	ND	ND	100	ND	ND	ND	100	ND
Benzo(k)fluoranthene	ND	ND	100	ND	ND	ND	100	ND
Benzo(a)pyrene	ND	ND	60	ND	ND	ND	60	ND
Indeno(1,2,3-c,d)pyrene	ND	ND	100	ND	ND	ND	100	ND
Dibenzo(a,h)anthracene	ND	ND	100	ND	ND	ND	100	ND
Benzo(g,h,i)perylene	ND	ND	100	ND	ND	ND	100	ND
PCBs								
Arochlor 1242	ND	NA	100	ND	ND	ND	100	ND
Arochlor 1254	ND	NA	100	ND	ND	ND	100	ND
Pesticides								
beta-BHC	ND	ND	91	ND	ND	ND	91	ND
Dieldrin	ND	5E-5	100	5.00E-05	ND	5E-5	100	5.00E-05
4,4'-DDE	ND	ND	90	ND	ND	ND	90	ND
Endrin	ND	3E-4	100	3.00E-04	ND	3E-4	100	3.00E-04
Endosulfan II	ND	5E-5	80	4.00E-05			80	0.00E+00
alpha-chlordane	ND	6E-5	80	4.80E-05	ND	6E-5	80	4.80E-05

Sou

HAD: Health Assessment Document for Tetrachloroethane

HEAST: Health Effects Assessment Summary Tables. Annual 1993 and Supplemental Documents (July, 1992 and November, 1992).

IRIS: Integrated Risk Information System. On-line.

TEF: Toxicity equivalency factor based on carcinogenicity relative to benzo(a)pyrene.

TABLE 6-21
DEFAULT DERMAL SLOPE FACTORS
SOIL

RAMCO STEEL- BUFFALO, NEW YORK

Chemical	Slope Inhalation (mg/kg-day)-1	Oral (mg/kg-day)-1	Dermal Absorption %	Dermal (mg/kg-day)-1
Inorganics				
Arsenic	5.0E+1	1.75	100	1.75E+00
Barium	ND	NA	5	ND
Chromium (VI)	4.1E+1	ND	10	ND
Lead	ND	ND	15	ND
Mercury	ND	ND	15	ND
Zinc	ND	ND	30	ND
VOCs				
Acetone	ND	ND	100	ND
2-Butanone	ND	ND	100	ND
Benzene	2.9E-2	2.9E-2	100	2.90E-02
Tetrachloroethene	2E-3	5.2E-2	100	5.20E-02
Toluene	ND	ND	100	ND
Chlorobenzene	ND	ND	13	ND
Ethylbenzene	ND	ND	90	ND
Xylenes	ND	ND	100	ND
SVOCs				
Phenol	ND	ND	90	ND
Benzoic acid	ND	ND	100	ND
Naphthalene	ND	ND	40	ND
2-Methylnaphthelene*	ND	ND	100	ND
Acenaphthylene*	ND	ND	100	ND
Acenaphthene	ND	ND	100	ND
Dibenzofuran*	ND	ND	100	ND
Fluorene*	ND	ND	100	ND
Phenanthrene*	ND	ND	100	ND
Anthracene*	ND	ND	100	ND
Fluoranthene*	ND	ND	100	ND
Pyrene*	ND	ND	100	ND
Benzo(a)anthracene*	6.1E-1	7.3E-1	100	7.30E-01
Chrysene	6.1E-2	7.3E-2	50	1.46E-01
Bis(2-ethylhexyl)phthalate*	ND	1.4E-2	100	1.40E-02
Benzo(b)fluoranthene	6.1E-1	7.3E-1	100	7.30E-01
Benzo(k)fluoranthene	6.1E-1	7.3E-1	100	7.30E-01
Benzo(a)pyrene	6.1	7.3	60	1.22E+01
Indeno(1,2,3-c,d)pyrene*	6.1E-1	7.3E-1	100	7.30E-01
Dibenzo(a,h)anthracene*	6.1E-1	7.3E-1	100	7.30E-01
Benzo(g,h,i)perylene*	ND	ND	100	ND
PCBs				
Aroclor 1242	ND	7.7	100	7.70E+00
Aroclor 1254	ND	7.7	100	7.70E+00
Pesticides				
beta-BHC	1.8E+0	1.8E+0	91	1.98E+00
Dieldrin*	1.6E+1	1.6E+1	100	1.60E+01
4,4'-DDE	ND	3.4E-1	90	3.78E-01
Endrin*	ND	ND	100	ND
Endosulfan II	ND	ND	80	ND
alpha-chlordane	1.3E+0	1.3E+0	80	1.63E+00

Source:

HAD: Health Assessment Document for Tetrachloroethane

HEAST: Health Effects Assessment Summary Tables. Annual 1993 and Supplemental Documents (July, 1992 and November, 1992).

IRIS: Integrated Risk Information System. On-line.

TEF: Toxicity equivalency factor based on carcinogenicity relative to benzo(a)pyrene.

TABLE 6-22

RISK CHARACTERIZATION

HYPOTHETICAL CURRENT LAND USE TRESPASSER EXPOSURE

RAMCO STEEL - BUFFALO, NEW YORK

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
Chemical										
INHALATION DURING WADING										
Benzoic Acid	1.78E-07	/	ND	=	Not Applicable	6.09E-08	x	ND	=	Not Applicable
Di-n-butyl phthalate	1.18E-08	/	ND	=	Not Applicable	4.04E-09	x	ND	=	Not Applicable
Butyl benzyl phthalate	8.33E-09	/	ND	=	Not Applicable	2.86E-09	x	ND	=	Not Applicable
			Pathway total	=	0E+00			Pathway total	=	0E+00
INCIDENTAL INGESTION OF SURFACE WATER										
Benzoic Acid	2.76E-07	/	4.0E+00	=	7E-08	9.45E-08	x	ND	=	Not Applicable
Di-n-butyl phthalate	2.76E-08	/	1.0E-01	=	3E-07	9.45E-09	x	ND	=	Not Applicable
Butyl benzyl phthalate	2.07E-08	/	2.0E-01	=	1E-07	7.09E-09	x	ND	=	Not Applicable
			Pathway total	=	4E-07			Pathway total	=	0E+00
DERMAL CONTACT WITH SURFACE WATER										
Benzoic Acid	8.38E-08	/	4.0E+00	=	2E-08	2.87E-08	x	ND	=	Not Applicable
Di-n-butyl phthalate	3.79E-08	/	1.0E-01	=	4E-07	1.30E-08	x	ND	=	Not Applicable
Butyl benzyl phthalate	2.84E-08	/	1.2E-01	=	2E-07	9.74E-09	x	ND	=	Not Applicable
			Pathway total	=	6E-07			Pathway total	=	0E+00
FISH INGESTION										
Benzoic Acid	NA	/	4.0E+00	=	Not Applicable	NA	x	ND	=	Not Applicable
Di-n-butyl phthalate	NA	/	1.0E-01	=	Not Applicable	NA	x	ND	=	Not Applicable
Butyl benzyl phthalate	4.08E-07	/	2.0E-01	=	2E-06	1.40E-07	x	ND	=	Not Applicable
			Pathway total	=	2E-06			Pathway total	=	0E+00
DERMAL CONTACT WITH SEDIMENT										
Inorganics										
Arsenic	1.45E-07	/	3.0E-04	=	5E-04	4.99E-08	x	1.8E+00	=	9E-08
Chromium	6.21E-07	/	5.0E-04	=	1E-03	2.13E-07	x	ND	=	Not Applicable
Copper	6.72E-07	/	ND	=	Not Applicable	2.30E-07	x	ND	=	Not Applicable
Lead	5.72E-07	/	ND	=	Not Applicable	1.96E-07	x	ND	=	Not Applicable
Manganese	1.12E-05	/	7.0E-03	=	2E-03	3.84E-06	x	ND	=	Not Applicable
Mercury	3.61E-09	/	4.5E-05	=	8E-05	1.24E-09	x	ND	=	Not Applicable
Nickel	1.69E-07	/	2.0E-02	=	8E-06	5.79E-08	x	ND	=	Not Applicable
Zinc	6.86E-07	/	9.0E-02	=	8E-06	2.35E-07	x	ND	=	Not Applicable
Chromium VI	8.12E-08	/	5.0E-04	=	2E-04	2.78E-08	x	ND	=	Not Applicable

TABLE 6-22 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
VOCs										
Acetone	6.23E-09	/	1.0E-01	=	6E-08	2.14E-09	x	ND	=	Not Applicable
Carbon disulfide	2.07E-10	/	6.3E-02	=	3E-09	7.09E-11	x	ND	=	Not Applicable
Chloroform	1.55E-10	/	1.0E-02	=	2E-08	5.31E-11	x	6.1E-03	=	3E-13
2-Butanone	1.49E-09	/	5.0E-02	=	3E-08	5.12E-10	x	ND	=	Not Applicable
1,1,1-Trichloroethane	5.17E-11	/	9.0E-02	=	6E-10	1.77E-11	x	ND	=	Not Applicable
Trichloroethene	1.03E-10	/	7.0E-03	=	1E-08	3.54E-11	x	1.0E-02	=	4E-13
Toluene	5.17E-11	/	2.0E-01	=	3E-10	1.77E-11	x	ND	=	Not Applicable
Ethylbenzene	3.10E-11	/	9.0E-02	=	3E-10	1.06E-11	x	ND	=	Not Applicable
Xylene	2.58E-10	/	2.0E+00	=	1E-10	8.86E-11	x	ND	=	Not Applicable
SVOCs										
Naphthalene	1.14E-08	/	1.6E-02	=	7E-07	3.90E-09	x	ND	=	Not Applicable
2-Methylnaphthene	7.23E-09	/	4.2E-02	=	2E-07	2.48E-09	x	ND	=	Not Applicable
Acenaphthene	1.03E-09	/	6.0E-02	=	2E-08	3.54E-10	x	ND	=	Not Applicable
Fluorene	2.27E-09	/	4.0E-02	=	6E-08	7.79E-10	x	ND	=	Not Applicable
Phenanthrene	1.08E-08	/	ND	=	Not Applicable	3.72E-09	x	ND	=	Not Applicable
Fluoranthene	1.71E-08	/	4.0E-02	=	4E-07	5.88E-09	x	ND	=	Not Applicable
Benzo(a)anthracene	3.82E-09	/	ND	=	Not Applicable	1.31E-09	x	7.3E-01	=	1E-09
Chrysene	1.03E-08	/	ND	=	Not Applicable	3.54E-09	x	1.5E-01	=	5E-10
Bis(2-ethylhexyl)phthalate	4.16E-08	/	2.0E-02	=	2E-06	1.43E-08	x	1.4E-02	=	2E-10
Benzo(b)fluoranthene	6.20E-09	/	ND	=	Not Applicable	2.13E-09	x	7.3E-01	=	2E-09
PCBs										
Arochlor 1248	7.95E-09	/	ND	=	Not Applicable	2.73E-09	x	7.7E+00	=	2E-08
Pesticides										
4,4-DDE	4.24E-11	/	ND	=	Not Applicable	1.45E-11	x	3.8E-01	=	6E-12
Endrin	9.30E-11	/	3.0E-04	=	3E-07	3.19E-11	x	ND	=	Not Applicable
Endosulfan II	1.08E-10	/	4.0E-05	=	3E-06	3.72E-11	x	ND	=	Not Applicable
4,4-DDD	8.86E-10	/	ND	=	Not Applicable	3.04E-10	x	2.7E-01	=	8E-11
4,4-DDT	1.67E-10	/	4.5E-04	=	4E-07	5.73E-11	x	3.8E-01	=	2E-11
Endrin ketone	8.27E-11	/	ND	=	Not Applicable	2.83E-11	x	ND	=	Not Applicable
			Pathway total	=	3E-03			Pathway total	=	1E-07
INHALATION OF SOIL										
METALS										
Arsenic - Total	3.44E-11	/	ND	=	Not Applicable	1.18E-11	x	5.0E+01	=	6E-10
Barium - Total	2.22E-10	/	1.0E-04	=	2E-06	7.63E-11	x	ND	=	Not Applicable
Chromium - Total	1.98E-10	/	ND	=	Not Applicable	6.78E-11	x	4.1E+01	=	3E-09
Lead - Total	3.98E-10	/	ND	=	Not Applicable	1.36E-10	x	ND	=	Not Applicable
Mercury - Total	1.10E-13	/	1.0E-04	=	1E-09	3.78E-14	x	ND	=	Not Applicable
Zinc - Total	4.99E-10	/	ND	=	Not Applicable	1.71E-10	x	ND	=	Not Applicable

TABLE 6-22 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
VOC										
Acetone	2.16E-13	/	ND	=	Not Applicable	7.42E-14	x	ND	=	Not Applicable
2-Butanone	5.03E-14	/	3.0E-01	=	2E-13	1.72E-14	x	ND	=	Not Applicable
Benzene	4.94E-15	/	ND	=	Not Applicable	1.69E-15	x	2.9E-02	=	5E-17
Tetrachloroethene	2.47E-15	/	ND	=	Not Applicable	8.47E-16	x	2.0E-03	=	2E-18
Toluene	7.41E-15	/	1.0E-01	=	7E-14	2.54E-15	x	ND	=	Not Applicable
Chlorobenzene	2.47E-15	/	6.0E-03	=	4E-13	8.47E-16	x	ND	=	Not Applicable
Ethyl benzene	3.70E-15	/	3.0E-01	=	1E-14	1.27E-15	x	ND	=	Not Applicable
Total Xylenes	4.94E-15	/	ND	=	Not Applicable	1.69E-15	x	ND	=	Not Applicable
SEMI-VOC										
Phenol	4.69E-13	/	ND	=	Not Applicable	1.61E-13	x	ND	=	Not Applicable
Benzoic Acid	3.70E-13	/	ND	=	Not Applicable	1.27E-13	x	ND	=	Not Applicable
Naphthalene	1.48E-13	/	ND	=	Not Applicable	5.08E-14	x	ND	=	Not Applicable
2-Methylnaphthalene	NA	/	ND	=	Not Applicable	NA	x	ND	=	Not Applicable
Acenaphthylene	4.45E-14	/	ND	=	Not Applicable	1.52E-14	x	ND	=	Not Applicable
Acenaphthene	6.30E-14	/	ND	=	Not Applicable	2.16E-14	x	ND	=	Not Applicable
Dibenzofuran	NA	/	ND	=	Not Applicable	NA	x	ND	=	Not Applicable
Fluorene	7.16E-14	/	ND	=	Not Applicable	2.46E-14	x	ND	=	Not Applicable
Phenanthrene	4.11E-13	/	ND	=	Not Applicable	1.41E-13	x	ND	=	Not Applicable
Anthracene	1.17E-13	/	ND	=	Not Applicable	4.02E-14	x	ND	=	Not Applicable
Fluoranthene	5.39E-13	/	ND	=	Not Applicable	1.85E-13	x	ND	=	Not Applicable
Pyrene	7.17E-13	/	ND	=	Not Applicable	2.46E-13	x	ND	=	Not Applicable
Benzo(a)anthracene	3.71E-13	/	ND	=	Not Applicable	1.27E-13	x	6.1E-01	=	8E-14
Chrysene	4.73E-13	/	ND	=	Not Applicable	1.62E-13	x	6.1E-02	=	1E-14
Bis(2-ethylhexyl) phthalate	2.27E-12	/	ND	=	Not Applicable	7.79E-13	x	ND	=	Not Applicable
Benzo(b)fluoranthene	6.99E-13	/	ND	=	Not Applicable	2.40E-13	x	6.1E-01	=	1E-13
Benzo(k)fluoranthene	4.06E-13	/	ND	=	Not Applicable	1.39E-13	x	6.1E-01	=	9E-14
Benzo(a)pyrene	4.40E-13	/	ND	=	Not Applicable	1.51E-13	x	6.1E+00	=	9E-13
Indeno(1,2,3-cd)pyrene	3.35E-13	/	ND	=	Not Applicable	1.15E-13	x	6.1E-01	=	7E-14
Dibenzo(a,h)anthracene	8.90E-14	/	ND	=	Not Applicable	3.05E-14	x	6.1E-01	=	2E-14
Benzo(ghi)perylene	2.42E-13	/	ND	=	Not Applicable	8.29E-14	x	ND	=	Not Applicable
PCBS										
Aroclor 1242	1.89E-13	/	ND	=	Not Applicable	6.47E-14	x	ND	=	Not Applicable
Aroclor 1254	2.01E-13	/	ND	=	Not Applicable	6.89E-14	x	ND	=	Not Applicable
PEST										
beta-BHC	2.10E-15	/	ND	=	Not Applicable	7.19E-16	x	1.8E+00	=	1E-15
Dieldrin	9.75E-16	/	ND	=	Not Applicable	3.34E-16	x	1.6E+01	=	5E-15
4,4'-DDE	6.17E-16	/	ND	=	Not Applicable	2.12E-16	x	ND	=	Not Applicable
Endrin	1.19E-14	/	ND	=	Not Applicable	4.09E-15	x	ND	=	Not Applicable
Endosulfan II	7.65E-15	/	ND	=	Not Applicable	2.62E-15	x	ND	=	Not Applicable
alpha-Chlordane	3.46E-15	/	ND	=	Not Applicable	1.18E-15	x	1.3E+00	=	2E-15
			Pathway total	=	2E-06			Pathway total	=	3E-09

TABLE 6-22 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
INGESTION OF SOIL										
METALS										
Arsenic - Total	4.79E-06	/	3.0E-04	=	2E-02	1.64E-06	x	1.8E+00	=	3E-06
Barium - Total	3.10E-05	/	7.0E-02	=	4E-04	1.06E-05	x	NA	=	Not Applicable
Chromium - Total	2.76E-05	/	5.0E-03	=	6E-03	9.45E-06	x	ND	=	Not Applicable
Lead - Total	5.55E-05	/	ND	=	Not Applicable	1.90E-05	x	ND	=	Not Applicable
Mercury - Total	1.54E-08	/	3.0E-04	=	5E-05	5.27E-09	x	ND	=	Not Applicable
Zinc - Total	6.96E-05	/	3.0E-01	=	2E-04	2.39E-05	x	ND	=	Not Applicable
VOC										
Acetone	3.02E-08	/	1.0E-01	=	3E-07	1.03E-08	x	ND	=	Not Applicable
2-Butanone	7.01E-09	/	5.0E-02	=	1E-07	2.40E-09	x	ND	=	Not Applicable
Benzene	6.89E-10	/	NA	=	Not Applicable	2.36E-10	x	2.9E-02	=	7E-12
Tetrachloroethene	3.44E-10	/	1.0E-02	=	3E-08	1.18E-10	x	5.2E-02	=	6E-12
Toluene	1.03E-09	/	2.0E-01	=	5E-09	3.54E-10	x	ND	=	Not Applicable
Chlorobenzene	3.44E-10	/	2.0E-02	=	2E-08	1.18E-10	x	ND	=	Not Applicable
Ethyl benzene	5.17E-10	/	1.0E-01	=	5E-09	1.77E-10	x	ND	=	Not Applicable
Total Xylenes	6.89E-10	/	2.0E+00	=	3E-10	2.36E-10	x	ND	=	Not Applicable
SEMI-VOC										
Phenol	6.54E-08	/	6.0E-01	=	1E-07	2.24E-08	x	ND	=	Not Applicable
Benzoic Acid	5.17E-08	/	4.0E+00	=	1E-08	1.77E-08	x	ND	=	Not Applicable
Naphthalene	2.07E-08	/	4.0E-02	=	5E-07	7.09E-09	x	ND	=	Not Applicable
2-Methylnaphthalene	1.89E-08	/	ND	=	Not Applicable	6.49E-09	x	ND	=	Not Applicable
Acenaphthylene	6.20E-09	/	ND	=	Not Applicable	2.13E-09	x	ND	=	Not Applicable
Acenaphthene	8.78E-09	/	6.0E-02	=	1E-07	3.01E-09	x	ND	=	Not Applicable
Dibenzofuran	1.12E-08	/	ND	=	Not Applicable	3.84E-09	x	ND	=	Not Applicable
Fluorene	9.99E-09	/	4.0E-02	=	2E-07	3.42E-09	x	ND	=	Not Applicable
Phenanthrene	5.73E-08	/	ND	=	Not Applicable	1.96E-08	x	ND	=	Not Applicable
Anthracene	1.64E-08	/	3.0E-01	=	5E-08	5.61E-09	x	ND	=	Not Applicable
Fluoranthene	7.52E-08	/	4.0E-02	=	2E-06	2.58E-08	x	ND	=	Not Applicable
Pyrene	1.00E-07	/	3.0E-02	=	3E-06	3.43E-08	x	ND	=	Not Applicable
Benzo(a)anthracene	5.27E-08	/	ND	=	Not Applicable	1.81E-08	x	7.3E-01	=	1E-08
Chrysene	6.63E-08	/	ND	=	Not Applicable	2.27E-08	x	7.3E-02	=	2E-09
Bis(2-ethylhexyl) phthalate	3.19E-07	/	2.0E-02	=	2E-05	1.09E-07	x	1.4E-02	=	2E-09
Benzo(b)fluoranthene	9.76E-08	/	ND	=	Not Applicable	3.35E-08	x	7.3E-01	=	2E-08
Benzo(k)fluoranthene	5.67E-08	/	ND	=	Not Applicable	1.94E-08	x	7.3E-01	=	1E-08
Benzo(a)pyrene	6.31E-08	/	ND	=	Not Applicable	2.16E-08	x	7.3E+00	=	2E-07
Indeno(1,2,3-cd)pyrene	4.70E-08	/	ND	=	Not Applicable	1.61E-08	x	7.3E-01	=	1E-08
Dibenzo(a,h)anthracene	1.33E-08	/	ND	=	Not Applicable	4.55E-09	x	7.3E-01	=	3E-09
Benzo(ghi)perylene	3.44E-08	/	ND	=	Not Applicable	1.18E-08	x	ND	=	Not Applicable
PCBS										
Aroclor 1242	2.63E-08	/	NA	=	Not Applicable	9.03E-09	x	7.7E+00	=	7E-08
Aroclor 1254	2.80E-08	/	NA	=	Not Applicable	9.61E-09	x	7.7E+00	=	7E-08

TABLE 6-22 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
PEST										
beta-BHC	2.93E-10	/	ND	=	Not Applicable	1.00E-10	x	1.8E+00	=	2E-10
Dieldrin	1.36E-10	/	5.0E-05	=	3E-06	4.66E-11	x	1.6E+01	=	7E-10
4,4'-DDE	8.61E-11	/	ND	=	Not Applicable	2.95E-11	x	3.4E-01	=	1E-11
Endrin	1.67E-09	/	3.0E-04	=	6E-06	5.72E-10	x	ND	=	Not Applicable
Endosulfan II	1.07E-09	/	5.0E-05	=	2E-05	3.66E-10	x	ND	=	Not Applicable
alpha-Chlordane	4.82E-10	/	6.0E-05	=	8E-06	1.65E-10	x	1.3E+00	=	2E-10
			Pathway total	=	2E-02			Pathway total	=	3E-06
DERMAL CONTACT WITH SOIL										
METALS										
Arsenic - Total	1.44E-07	/	3.0E-04	=	5E-04	4.93E-08	x	1.8E+00	=	9E-08
Barium - Total	9.30E-07	/	3.5E-03	=	3E-04	3.19E-07	x	ND	=	Not Applicable
Chromium - Total	8.27E-07	/	5.0E-04	=	2E-03	2.84E-07	x	ND	=	Not Applicable
Lead - Total	1.67E-06	/	ND	=	Not Applicable	5.71E-07	x	ND	=	Not Applicable
Mercury - Total	4.61E-10	/	4.5E-05	=	1E-05	1.58E-10	x	ND	=	Not Applicable
Zinc - Total	2.09E-06	/	9.0E-02	=	2E-05	7.16E-07	x	ND	=	Not Applicable
VOC										
Acetone	9.05E-09	/	1.0E-01	=	9E-08	3.10E-09	x	ND	=	Not Applicable
2-Butanone	2.10E-09	/	5.0E-02	=	4E-08	7.21E-10	x	ND	=	Not Applicable
Benzene	2.07E-10	/	ND	=	Not Applicable	7.09E-11	x	2.9E-02	=	2E-12
Tetrachloroethene	1.03E-10	/	1.0E-02	=	1E-08	3.54E-11	x	5.2E-02	=	2E-12
Toluene	3.10E-10	/	2.0E-01	=	2E-09	1.06E-10	x	ND	=	Not Applicable
Chlorobenzene	1.03E-10	/	2.6E-03	=	4E-08	3.54E-11	x	ND	=	Not Applicable
Ethyl benzene	1.55E-10	/	9.0E-02	=	2E-09	5.31E-11	x	ND	=	Not Applicable
Total Xylenes	2.07E-10	/	2.0E+00	=	1E-10	7.09E-11	x	ND	=	Not Applicable
SEMI-VOC										
Phenol	1.96E-08	/	5.4E-01	=	4E-08	6.72E-09	x	ND	=	Not Applicable
Benzoic Acid	1.55E-08	/	4.0E+00	=	4E-09	5.31E-09	x	ND	=	Not Applicable
Naphthalene	6.20E-09	/	1.6E-02	=	4E-07	2.13E-09	x	ND	=	Not Applicable
2-Methylnaphthalene	5.68E-09	/	ND	=	Not Applicable	1.95E-09	x	ND	=	Not Applicable
Acenaphthylene	1.86E-09	/	ND	=	Not Applicable	6.38E-10	x	ND	=	Not Applicable
Acenaphthene	2.63E-09	/	6.0E-02	=	4E-08	9.03E-10	x	ND	=	Not Applicable
Dibenzofuran	3.36E-09	/	ND	=	Not Applicable	1.15E-09	x	ND	=	Not Applicable
Fluorene	3.00E-09	/	4.0E-02	=	7E-08	1.03E-09	x	ND	=	Not Applicable
Phenanthrene	1.72E-08	/	ND	=	Not Applicable	5.89E-09	x	ND	=	Not Applicable
Anthracene	4.91E-09	/	3.0E-01	=	2E-08	1.68E-09	x	ND	=	Not Applicable
Fluoranthene	2.26E-08	/	4.0E-02	=	6E-07	7.74E-09	x	ND	=	Not Applicable
Pyrene	3.00E-08	/	3.0E-02	=	1E-06	1.03E-08	x	ND	=	Not Applicable
Benzo(a)anthracene	1.58E-08	/	ND	=	Not Applicable	5.42E-09	x	7.3E-01	=	4E-09
Chrysene	1.99E-08	/	ND	=	Not Applicable	6.82E-09	x	1.5E-01	=	1E-09
Bis(2-ethylhexyl) phthalate	9.58E-08	/	2.0E-02	=	5E-06	3.28E-08	x	1.4E-02	=	5E-10

TABLE 6-22 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
Benzo(k)fluoranthene	1.70E-08	/	ND	=	Not Applicable	5.8E-09	x	7.3E-01	=	4E-09
Benzo(a)pyrene	1.89E-08	/	ND	=	Not Applicable	6.49E-09	x	1.2E+01	=	8E-08
Indeno(1,2,3-cd)pyrene	1.41E-08	/	ND	=	Not Applicable	4.84E-09	x	7.3E-01	=	4E-09
Dibenzo(a,h)anthracene	3.98E-09	/	ND	=	Not Applicable	1.4E-09	x	7.3E-01	=	1E-09
Benzo(ghi)perylene	1.03E-08	/	ND	=	Not Applicable	3.5E-09	x	ND	=	Not Applicable
PCBS										
Aroclor 1242	7.90E-09	/	ND	=	Not Applicable	2.71E-09	x	7.7E+00	=	2E-08
Aroclor 1254	8.41E-09	/	ND	=	Not Applicable	2.88E-09	x	7.7E+00	=	2E-08
PEST										
beta-BHC	8.78E-11	/	ND	=	Not Applicable	3.01E-11	x	2.0E+00	=	6E-11
Dieldrin	4.08E-11	/	5.0E-05	=	8E-07	1.40E-11	x	1.6E+01	=	2E-10
4,4'-DDE	2.58E-11	/	ND	=	Not Applicable	8.86E-12	x	3.8E-01	=	3E-12
Endrin	5.00E-10	/	3.0E-04	=	2E-06	1.71E-10	x	ND	=	Not Applicable
Endosulfan II	3.20E-10	/	4.0E-05	=	8E-06	1.10E-10	x	ND	=	Not Applicable
alpha-Chlordane	1.45E-10	/	4.8E-05	=	3E-06	4.96E-11	x	1.6E+00	=	8E-11
			Pathway total	=	2E-03			Pathway total	=	2E-07

	Noncarcinogenic Effects			Carcinogenic Effects		
Inorganics						
Arsenic	Total of all pathways	=	2E-02	Total of all pathways	=	3E-06
Barium	Total of all pathways	=	7E-04	Total of all pathways	=	0E+00
Chromium	Total of all pathways	=	8E-03	Total of all pathways	=	3E-09
Copper	Total of all pathways	=	0E+00	Total of all pathways	=	0E+00
Lead	Total of all pathways	=	0E+00	Total of all pathways	=	0E+00
Manganese	Total of all pathways	=	2E-03	Total of all pathways	=	0E+00
Mercury	Total of all pathways	=	1E-04	Total of all pathways	=	0E+00
Nickel	Total of all pathways	=	8E-06	Total of all pathways	=	0E+00
Zinc	Total of all pathways	=	3E-04	Total of all pathways	=	0E+00
VOC's						
Acetone	Total of all pathways	=	5E-07	Total of all pathways	=	0E+00
Benzene	Total of all pathways	=	0E+00	Total of all pathways	=	9E-12
2-Butanone	Total of all pathways	=	2E-07	Total of all pathways	=	0E+00
Carbon Disulfide	Total of all pathways	=	3E-09	Total of all pathways	=	0E+00
Chlorobenzene	Total of all pathways	=	6E-08	Total of all pathways	=	0E+00
Chloroform	Total of all pathways	=	2E-08	Total of all pathways	=	3E-13
1,1-Dichloroethane	Total of all pathways	=	0E+00	Total of all pathways	=	0E+00
Ethylbenzene	Total of all pathways	=	7E-09	Total of all pathways	=	0E+00
1,1,2,2-Tetrachloroethane	Total of all pathways	=	0E+00	Total of all pathways	=	0E+00
Tetrachloroethene	Total of all pathways	=	4E-08	Total of all pathways	=	8E-12
Toluene	Total of all pathways	=	7E-09	Total of all pathways	=	0E+00
1,1,1-Trichloroethane	Total of all pathways	=	6E-10	Total of all pathways	=	0E+00
Trichloroethene	Total of all pathways	=	1E-08	Total of all pathways	=	4E-13
Xylenes	Total of all pathways	=	6E-10	Total of all pathways	=	0E+00

TABLE 6-22 (Continued)

	Noncarcinogenic Effects		Carcinogenic Effects	
SVOCs				
Acenaphthene	Total of all pathways =	2E-07	Total of all pathways =	0E+00
Acenaphthylene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Anthracene	Total of all pathways =	7E-08	Total of all pathways =	0E+00
Benzo(a)anthracene	Total of all pathways =	0E+00	Total of all pathways =	2E-08
Benzo(b)fluoranthene	Total of all pathways =	0E+00	Total of all pathways =	3E-08
Benzo(k)fluoranthene	Total of all pathways =	0E+00	Total of all pathways =	2E-08
Benzo(g,h,i)perylene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Benzo(a)pyrene	Total of all pathways =	0E+00	Total of all pathways =	2E-07
Benzoic acid	Total of all pathways =	1E-07	Total of all pathways =	0E+00
Bis(2-ethylhexyl)phthalate	Total of all pathways =	2E-05	Total of all pathways =	2E-09
Butyl benzyl phthalate	Total of all pathways =	2E-06	Total of all pathways =	0E+00
Chrysene	Total of all pathways =	0E+00	Total of all pathways =	3E-09
Di-n-butyl phthalate	Total of all pathways =	7E-07	Total of all pathways =	0E+00
Dibenzo(a,h)anthracene	Total of all pathways =	0E+00	Total of all pathways =	4E-09
Dibenzofuran	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Diethylphthalate	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Fluoranthene	Total of all pathways =	3E-06	Total of all pathways =	0E+00
Fluorene	Total of all pathways =	4E-07	Total of all pathways =	0E+00
Indeno(1,2,3-c,d)pyrene	Total of all pathways =	0E+00	Total of all pathways =	2E-08
2-Methylnaphthalene	Total of all pathways =	2E-07	Total of all pathways =	0E+00
4-Methylphenol	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Naphthalene	Total of all pathways =	2E-06	Total of all pathways =	0E+00
Phenanthrene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Phenol	Total of all pathways =	1E-07	Total of all pathways =	0E+00
Pyrene	Total of all pathways =	4E-06	Total of all pathways =	0E+00
PCBs				
Arochlor 1242	Total of all pathways =	0E+00	Total of all pathways =	9E-08
Arochlor 1248	Total of all pathways =	0E+00	Total of all pathways =	2E-08
Arochlor 1254	Total of all pathways =	0E+00	Total of all pathways =	1E-07
Pesticides				
beta-BHC	Total of all pathways =	0E+00	Total of all pathways =	2E-10
alpha-chlordane	Total of all pathways =	1E-05	Total of all pathways =	3E-10
4,4'-DDD	Total of all pathways =	0E+00	Total of all pathways =	8E-11
4,4'-DDE	Total of all pathways =	0E+00	Total of all pathways =	2E-11
4,4'-DDT	Total of all pathways =	4E-07	Total of all pathways =	2E-11
Dieldrin	Total of all pathways =	4E-06	Total of all pathways =	1E-09
Endrin	Total of all pathways =	8E-06	Total of all pathways =	0E+00
Endrin ketone	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Endosulfan II	Total of all pathways =	3E-05	Total of all pathways =	0E+00
Heptachlor epoxide	Total of all pathways =	0E+00	Total of all pathways =	0E+00
	Total of all chemicals and pathways =	3E-02	Total of all chemicals and pathways =	4E-06

(a) See Tables 5(B) through 12(B) for derivation of intake values.

(b) See Tables 26 through 29 for toxicity values.

(c) Hazard Quotient is the ratio of calculated intake (DI) over acceptable intake (RfD).

(d) Cancer risk is the unitless probability of an individul developing cancer as a result of exposure to chemicals associated with the site.

ND = Not Determined

"Not Applicable" indicates that an HQ or CR cannot be calculated because the chemical was not detected in that medium and/or toxicity values are not available.

TABLE 6-23

RISK CHARACTERIZATION

CURRENT AND FUTURE LAND USE INDUSTRIAL EXPOSURE

RAMCO STEEL - BUFFALO, NEW YORK

	Noncarcinogenic Effects				Carcinogenic Effects			
	Daily Intake		Reference Dose	Hazard Quotient	Daily Intake		Slope Factor	Cancer Risk
Equation	DI	/	RfD	= HQ	DI	x	SF	= CR
Units	mg/kg-day		mg/kg-day	unitless	mg/kg-day		(mg/kg-day)-1	unitless
Reference	(a)		(b)	(c)	(a)		(b)	(d)
Chemical								
INHALATION OF SOIL								
METALS								
Arsenic - Total	9.38E-12	/	ND	= Not Applicable	3.35E-12	x	5.0E+01	= 2E-10
Barium - Total	6.07E-11	/	1.0E-04	= 6E-07	2.17E-11	x	ND	= Not Applicable
Chromium - Total	5.39E-11	/	ND	= Not Applicable	1.93E-11	x	4.1E+01	= 8E-10
Lead - Total	1.09E-10	/	ND	= Not Applicable	3.88E-11	x	ND	= Not Applicable
Mercury - Total	3.01E-14	/	1.0E-04	= 3E-10	1.07E-14	x	ND	= Not Applicable
Zinc - Total	1.36E-10	/	ND	= Not Applicable	4.86E-11	x	ND	= Not Applicable
VOC								
Acetone	5.90E-14	/	ND	= Not Applicable	2.11E-14	x	ND	= Not Applicable
2-Butanone	1.37E-14	/	3.0E-01	= 5E-14	4.90E-15	x	ND	= Not Applicable
Benzene	1.35E-15	/	ND	= Not Applicable	4.81E-16	x	2.9E-02	= 1E-17
Tetrachloroethene	6.74E-16	/	ND	= Not Applicable	2.41E-16	x	2.0E-03	= 5E-19
Toluene	2.02E-15	/	1.0E-01	= 2E-14	7.22E-16	x	ND	= Not Applicable
Chlorobenzene	6.74E-16	/	6.0E-03	= 1E-13	2.41E-16	x	ND	= Not Applicable
Ethyl benzene	1.01E-15	/	3.0E-01	= 3E-15	3.61E-16	x	ND	= Not Applicable
Total Xylenes	1.35E-15	/	ND	= Not Applicable	4.81E-16	x	ND	= Not Applicable
SEMI-VOC								
Phenol	1.28E-13	/	ND	= Not Applicable	4.57E-14	x	ND	= Not Applicable
Benzoic Acid	1.01E-13	/	ND	= Not Applicable	3.60E-14	x	ND	= Not Applicable
Naphthalene	4.04E-14	/	ND	= Not Applicable	1.44E-14	x	ND	= Not Applicable
2-Methylnaphthalene	NA	/	ND	= Not Applicable	NA	x	ND	= Not Applicable
Acenaphthylene	1.21E-14	/	ND	= Not Applicable	4.33E-15	x	ND	= Not Applicable
Acenaphthene	1.72E-14	/	ND	= Not Applicable	6.13E-15	x	ND	= Not Applicable
Dibenzofuran	NA	/	ND	= Not Applicable	NA	x	ND	= Not Applicable
Fluorene	1.95E-14	/	ND	= Not Applicable	6.98E-15	x	ND	= Not Applicable
Phenanthrene	1.12E-13	/	ND	= Not Applicable	4.00E-14	x	ND	= Not Applicable
Anthracene	3.20E-14	/	ND	= Not Applicable	1.14E-14	x	ND	= Not Applicable
Fluoranthene	1.47E-13	/	ND	= Not Applicable	5.25E-14	x	ND	= Not Applicable
Pyrene	1.96E-13	/	ND	= Not Applicable	6.99E-14	x	ND	= Not Applicable
Benzo(a)anthracene	1.01E-13	/	ND	= Not Applicable	3.62E-14	x	6.1E-01	= 2E-14
Chrysene	1.29E-13	/	ND	= Not Applicable	4.61E-14	x	6.1E-02	= 3E-15
Bis(2-ethylhexyl) phthalate	6.20E-13	/	ND	= Not Applicable	2.21E-13	x	ND	= Not Applicable
Benzo(b)fluoranthene	1.91E-13	/	ND	= Not Applicable	6.81E-14	x	6.1E-01	= 4E-14
Benzo(k)fluoranthene	1.11E-13	/	ND	= Not Applicable	3.96E-14	x	6.1E-01	= 2E-14
Benzo(a)pyrene	1.20E-13	/	ND	= Not Applicable	4.29E-14	x	6.1E+00	= 3E-13
Indeno(1,2,3-cd)pyrene	9.14E-14	/	ND	= Not Applicable	3.26E-14	x	6.1E-01	= 2E-14
Dibenzo(a,h)anthracene	2.43E-14	/	ND	= Not Applicable	8.67E-15	x	6.1E-01	= 5E-15
Benzo(ghi)perylene	6.59E-14	/	ND	= Not Applicable	2.36E-14	x	ND	= Not Applicable
PCBS								

TABLE 6-23 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
Aroclor 1242	5.15E-14	/	ND	=	Not Applicable	1.84E-14	x	ND	=	Not Applicable
Aroclor 1254	5.48E-14	/	ND	=	Not Applicable	1.96E-14	x	ND	=	Not Applicable
PEST										
beta-BHC	5.72E-16	/	ND	=	Not Applicable	2.04E-16	x	1.8E+00	=	4E-16
Dieldrin	2.66E-16	/	ND	=	Not Applicable	9.50E-17	x	1.6E+01	=	2E-15
4,4'-DDE	1.68E-16	/	ND	=	Not Applicable	6.01E-17	x	ND	=	Not Applicable
Endrin	3.25E-15	/	ND	=	Not Applicable	1.16E-15	x	ND	=	Not Applicable
Endosulfan II	2.09E-15	/	ND	=	Not Applicable	7.46E-16	x	ND	=	Not Applicable
alpha-Chlordane	9.43E-16	/	ND	=	Not Applicable	3.37E-16	x	1.3E+00	=	4E-16
			Pathway total	=	6E-07			Pathway total	=	1E-09
INGESTION OF SOIL										
METALS										
Arsenic - Total	1.31E-06	/	3.0E-04	=	4E-03	4.67E-07	x	1.8E+00	=	8E-07
Barium - Total	8.46E-06	/	7.0E-02	=	1E-04	3.02E-06	x	NA	=	Not Applicable
Chromium - Total	7.52E-06	/	5.0E-03	=	2E-03	2.69E-06	x	ND	=	Not Applicable
Lead - Total	1.51E-05	/	ND	=	Not Applicable	5.41E-06	x	ND	=	Not Applicable
Mercury - Total	4.19E-09	/	3.0E-04	=	1E-05	1.50E-09	x	ND	=	Not Applicable
Zinc - Total	1.90E-05	/	3.0E-01	=	6E-05	6.78E-06	x	ND	=	Not Applicable
VOC										
Acetone	8.23E-09	/	1.0E-01	=	8E-08	2.94E-09	x	ND	=	Not Applicable
2-Butanone	1.91E-09	/	5.0E-02	=	4E-08	6.83E-10	x	ND	=	Not Applicable
Benzene	1.88E-10	/	NA	=	Not Applicable	6.71E-11	x	2.9E-02	=	2E-12
Tetrachloroethene	9.39E-11	/	1.0E-02	=	9E-09	3.35E-11	x	5.2E-02	=	2E-12
Toluene	2.82E-10	/	2.0E-01	=	1E-09	1.01E-10	x	ND	=	Not Applicable
Chlorobenzene	9.39E-11	/	2.0E-02	=	5E-09	3.35E-11	x	ND	=	Not Applicable
Ethyl benzene	1.41E-10	/	1.0E-01	=	1E-09	5.03E-11	x	ND	=	Not Applicable
Total Xylenes	1.88E-10	/	2.0E+00	=	9E-11	6.71E-11	x	ND	=	Not Applicable
SEMI-VOC										
Phenol	1.78E-08	/	6.0E-01	=	3E-08	6.37E-09	x	ND	=	Not Applicable
Benzoic Acid	1.41E-08	/	4.0E+00	=	4E-09	5.03E-09	x	ND	=	Not Applicable
Naphthalene	5.64E-09	/	4.0E-02	=	1E-07	2.01E-09	x	ND	=	Not Applicable
2-Methylnaphthalene	5.17E-09	/	ND	=	Not Applicable	1.85E-09	x	ND	=	Not Applicable
Acenaphthylene	1.69E-09	/	ND	=	Not Applicable	6.04E-10	x	ND	=	Not Applicable
Acenaphthene	2.40E-09	/	6.0E-02	=	4E-08	8.55E-10	x	ND	=	Not Applicable
Dibenzofuran	3.05E-09	/	ND	=	Not Applicable	1.09E-09	x	ND	=	Not Applicable
Fluorene	2.72E-09	/	4.0E-02	=	7E-08	9.73E-10	x	ND	=	Not Applicable
Phenanthrene	1.56E-08	/	ND	=	Not Applicable	5.58E-09	x	ND	=	Not Applicable
Anthracene	4.46E-09	/	3.0E-01	=	1E-08	1.59E-09	x	ND	=	Not Applicable
Fluoranthene	2.05E-08	/	4.0E-02	=	5E-07	7.33E-09	x	ND	=	Not Applicable
Pyrene	2.73E-08	/	3.0E-02	=	9E-07	9.76E-09	x	ND	=	Not Applicable
Benzo(a)anthracene	1.44E-08	/	ND	=	Not Applicable	5.13E-09	x	7.3E-01	=	4E-09
Chrysene	1.81E-08	/	ND	=	Not Applicable	6.45E-09	x	7.3E-02	=	5E-10
Bis(2-ethylhexyl) phthalate	8.71E-08	/	2.0E-02	=	4E-06	3.11E-08	x	1.4E-02	=	4E-10
Benzo(b)fluoranthene	2.66E-08	/	ND	=	Not Applicable	9.50E-09	x	7.3E-01	=	7E-09
Benzo(k)fluoranthene	1.55E-08	/	ND	=	Not Applicable	5.52E-09	x	7.3E-01	=	4E-09

TABLE 6-23 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
Benzo(a)pyrene	1.72E-08	/	ND	=	Not Applicable	6.15E-09	x	7.3E+00	=	4E-08
Indeno(1,2,3-cd)pyrene	1.28E-08	/	ND	=	Not Applicable	4.58E-09	x	7.3E-01	=	3E-09
Dibenzo(a,h)anthracene	3.62E-09	/	ND	=	Not Applicable	1.29E-09	x	7.3E-01	=	9E-10
Benzo(ghi)perylene	9.39E-09	/	ND	=	Not Applicable	3.35E-09	x	ND	=	Not Applicable
PCBS										
Aroclor 1242	7.18E-09	/	NA	=	Not Applicable	2.57E-09	x	7.7E+00	=	2E-08
Aroclor 1254	7.65E-09	/	NA	=	Not Applicable	2.73E-09	x	7.7E+00	=	2E-08
PEST										
beta-BHC	7.98E-11	/	ND	=	Not Applicable	2.85E-11	x	1.8E+00	=	5E-11
Dieldrin	3.71E-11	/	5.0E-05	=	7E-07	1.33E-11	x	1.6E+01	=	2E-10
4,4'-DDE	2.35E-11	/	ND	=	Not Applicable	8.39E-12	x	3.4E-01	=	3E-12
Endrin	4.55E-10	/	3.0E-04	=	2E-06	1.62E-10	x	ND	=	Not Applicable
Endosulfan II	2.91E-10	/	5.0E-05	=	6E-06	1.04E-10	x	ND	=	Not Applicable
alpha-Chlordane	1.32E-10	/	6.0E-05	=	2E-06	4.70E-11	x	1.3E+00	=	6E-11
			Pathway total	=	6E-03			Pathway total	=	9E-07
DERMAL CONTACT WITH SOIL										
METALS										
Arsenic - Total	7.84E-08	/	3.0E-04	=	3E-04	2.80E-08	x	1.8E+00	=	5E-08
Barium - Total	5.08E-07	/	3.5E-03	=	1E-04	1.81E-07	x	ND	=	Not Applicable
Chromium - Total	4.51E-07	/	5.0E-04	=	9E-04	1.61E-07	x	ND	=	Not Applicable
Lead - Total	9.08E-07	/	ND	=	Not Applicable	3.24E-07	x	ND	=	Not Applicable
Mercury - Total	2.52E-10	/	4.5E-05	=	6E-06	8.98E-11	x	ND	=	Not Applicable
Zinc - Total	1.14E-06	/	9.0E-02	=	1E-05	4.07E-07	x	ND	=	Not Applicable
VOC										
Acetone	4.94E-09	/	1.0E-01	=	5E-08	1.76E-09	x	ND	=	Not Applicable
2-Butanone	1.15E-09	/	5.0E-02	=	2E-08	4.10E-10	x	ND	=	Not Applicable
Benzene	1.13E-10	/	ND	=	Not Applicable	4.03E-11	x	2.9E-02	=	1E-12
Tetrachloroethene	5.64E-11	/	1.0E-02	=	6E-09	2.01E-11	x	5.2E-02	=	1E-12
Toluene	1.69E-10	/	2.0E-01	=	8E-10	6.04E-11	x	ND	=	Not Applicable
Chlorobenzene	5.64E-11	/	2.6E-03	=	2E-08	2.01E-11	x	ND	=	Not Applicable
Ethyl benzene	8.45E-11	/	9.0E-02	=	9E-10	3.02E-11	x	ND	=	Not Applicable
Total Xylenes	1.13E-10	/	2.0E+00	=	6E-11	4.03E-11	x	ND	=	Not Applicable
SEMI-VOC										
Phenol	1.07E-08	/	5.4E-01	=	2E-08	3.82E-09	x	ND	=	Not Applicable
Benzoic Acid	8.45E-09	/	4.0E+00	=	2E-09	3.02E-09	x	ND	=	Not Applicable
Naphthalene	3.38E-09	/	1.6E-02	=	2E-07	1.21E-09	x	ND	=	Not Applicable
2-Methylnaphthalene	3.10E-09	/	ND	=	Not Applicable	1.11E-09	x	ND	=	Not Applicable
Acenaphthylene	1.01E-09	/	ND	=	Not Applicable	3.62E-10	x	ND	=	Not Applicable
Acenaphthene	1.44E-09	/	6.0E-02	=	2E-08	5.13E-10	x	ND	=	Not Applicable
Dibenzofuran	1.83E-09	/	ND	=	Not Applicable	6.54E-10	x	ND	=	Not Applicable
Fluorene	1.63E-09	/	4.0E-02	=	4E-08	5.84E-10	x	ND	=	Not Applicable
Phenanthrene	9.38E-09	/	ND	=	Not Applicable	3.35E-09	x	ND	=	Not Applicable
Anthracene	2.68E-09	/	3.0E-01	=	9E-09	9.56E-10	x	ND	=	Not Applicable
Fluoranthene	1.23E-08	/	4.0E-02	=	3E-07	4.40E-09	x	ND	=	Not Applicable
Pyrene	1.64E-08	/	3.0E-02	=	5E-07	5.85E-09	x	ND	=	Not Applicable

TABLE 6-23 (Continued)

	Noncarcinogenic Effects					Carcinogenic Effects				
	Daily Intake		Reference Dose		Hazard Quotient	Daily Intake		Slope Factor		Cancer Risk
Equation	DI	/	RfD	=	HQ	DI	x	SF	=	CR
Units	mg/kg-day		mg/kg-day		unitless	mg/kg-day		(mg/kg-day)-1		unitless
Reference	(a)		(b)		(c)	(a)		(b)		(d)
Benzo(a)anthracene	8.62E-09	/	ND	=	Not Applicable	3.08E-09	x	7.3E-01	=	2E-09
Chrysene	1.08E-08	/	ND	=	Not Applicable	3.87E-09	x	1.5E-01	=	6E-10
Bis(2-ethylhexyl) phthalate	5.22E-08	/	2.0E-02	=	3E-06	1.87E-08	x	1.4E-02	=	3E-10
Benzo(b)fluoranthene	1.60E-08	/	ND	=	Not Applicable	5.7E-09	x	7.3E-01	=	4E-09
Benzo(k)fluoranthene	9.28E-09	/	ND	=	Not Applicable	3.3E-09	x	7.3E-01	=	2E-09
Benzo(a)pyrene	1.03E-08	/	ND	=	Not Applicable	3.69E-09	x	1.2E+01	=	4E-08
Indeno(1,2,3-cd)pyrene	7.70E-09	/	ND	=	Not Applicable	2.75E-09	x	7.3E-01	=	2E-09
Dibenzo(a,h)anthracene	2.17E-09	/	ND	=	Not Applicable	7.7E-10	x	7.3E-01	=	6E-10
Benzo(ghi)perylene	5.64E-09	/	ND	=	Not Applicable	2.0E-09	x	ND	=	Not Applicable
PCBS										
Aroclor 1242	4.31E-09	/	ND	=	Not Applicable	1.54E-09	x	7.7E+00	=	1E-08
Aroclor 1254	4.59E-09	/	ND	=	Not Applicable	1.64E-09	x	7.7E+00	=	1E-08
PEST										
beta-BHC	4.79E-11	/	ND	=	Not Applicable	1.71E-11	x	2.0E+00	=	3E-11
Dieldrin	2.23E-11	/	5.0E-05	=	4E-07	7.95E-12	x	1.6E+01	=	1E-10
4,4'-DDE	1.41E-11	/	ND	=	Not Applicable	5.03E-12	x	3.8E-01	=	2E-12
Endrin	2.73E-10	/	3.0E-04	=	9E-07	9.74E-11	x	ND	=	Not Applicable
Endosulfan II	1.75E-10	/	4.0E-05	=	4E-06	6.24E-11	x	ND	=	Not Applicable
alpha-Chlordane	7.89E-11	/	4.8E-05	=	2E-06	2.82E-11	x	1.6E+00	=	5E-11
			Pathway total	=	1E-03			Pathway total	=	1E-07
	Noncarcinogenic Effects					Carcinogenic Effects				
Inorganics										
Arsenic			Total of all pathways	=	5E-03			Total of all pathways	=	9E-07
Barium			Total of all pathways	=	3E-04			Total of all pathways	=	0E+00
Chromium			Total of all pathways	=	2E-03			Total of all pathways	=	8E-10
Copper			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Lead			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Manganese			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Mercury			Total of all pathways	=	2E-05			Total of all pathways	=	0E+00
Nickel			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Zinc			Total of all pathways	=	8E-05			Total of all pathways	=	0E+00
VOC's										
Acetone			Total of all pathways	=	7E-03			Total of all pathways	=	0E+00
Benzene			Total of all pathways	=	0E+00			Total of all pathways	=	3E-12
2-Butanone			Total of all pathways	=	6E-08			Total of all pathways	=	0E+00
Carbon Disulfide			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Chlorobenzene			Total of all pathways	=	3E-08			Total of all pathways	=	0E+00
Chloroform			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
1,1-Dichloroethane			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Ethylbenzene			Total of all pathways	=	2E-09			Total of all pathways	=	0E+00
1,1,2,2-Tetrachloroethane			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Tetrachloroethene			Total of all pathways	=	2E-08			Total of all pathways	=	3E-12
Toluene			Total of all pathways	=	2E-09			Total of all pathways	=	0E+00
1,1,1-Trichloroethane			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00
Trichloroethene			Total of all pathways	=	0E+00			Total of all pathways	=	0E+00

TABLE 6-23 (Continued)

	Noncarcinogenic Effects		Carcinogenic Effects	
Xylenes	Total of all pathways =	2E-10	Total of all pathways =	0E+00
SVOCs				
Acenaphthene	Total of all pathways =	6E-08	Total of all pathways =	0E+00
Acenaphthylene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Anthracene	Total of all pathways =	2E-08	Total of all pathways =	0E+00
Benzo(a)anthracene	Total of all pathways =	0E+00	Total of all pathways =	6E-09
Benzo(b)fluoranthene	Total of all pathways =	0E+00	Total of all pathways =	1E-08
Benzo(k)fluoranthene	Total of all pathways =	0E+00	Total of all pathways =	6E-09
Benzo(g,h,i)perylene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Benzo(a)pyrene	Total of all pathways =	0E+00	Total of all pathways =	9E-08
Benzoic acid	Total of all pathways =	6E-09	Total of all pathways =	0E+00
Bis(2-ethylhexyl)phthalate	Total of all pathways =	7E-06	Total of all pathways =	7E-10
Butyl benzyl phthalate	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Chrysene	Total of all pathways =	0E+00	Total of all pathways =	1E-09
Di-n-butyl phthalate	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Dibenzo(a,h)anthracene	Total of all pathways =	0E+00	Total of all pathways =	2E-09
Dibenzofuran	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Diethylphthalate	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Fluoranthene	Total of all pathways =	8E-07	Total of all pathways =	0E+00
Fluorene	Total of all pathways =	1E-07	Total of all pathways =	0E+00
Indeno(1,2,3-c,d)pyrene	Total of all pathways =	0E+00	Total of all pathways =	5E-09
2-Methylnaphthalene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
4-Methylphenol	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Naphthalene	Total of all pathways =	2E-07	Total of all pathways =	0E+00
Phenanthrene	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Phenol	Total of all pathways =	5E-08	Total of all pathways =	0E+00
Pyrene	Total of all pathways =	1E-06	Total of all pathways =	0E+00
PCBs				
Arochlor 1242	Total of all pathways =	0E+00	Total of all pathways =	3E-08
Arochlor 1248	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Arochlor 1254	Total of all pathways =	0E+00	Total of all pathways =	3E-08
Pesticides				
beta-BHC	Total of all pathways =	0E+00	Total of all pathways =	9E-11
alpha-chlordane	Total of all pathways =	4E-06	Total of all pathways =	1E-10
4,4'-DDD	Total of all pathways =	0E+00	Total of all pathways =	0E+00
4,4'-DDE	Total of all pathways =	2E-06	Total of all pathways =	5E-11
4,4'-DDT	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Dieldrin	Total of all pathways =	1E-06	Total of all pathways =	3E-10
Endrin	Total of all pathways =	2E-06	Total of all pathways =	0E+00
Endrin ketone	Total of all pathways =	0E+00	Total of all pathways =	0E+00
Endosulfan II	Total of all pathways =	1E-05	Total of all pathways =	0E+00
Heptachlor epoxide	Total of all pathways =	0E+00	Total of all pathways =	0E+00
	Total of all pathways and chemicals =	7E-03	Total of all pathways and chemicals =	1E-06

(a) See Tables 13(B) through 15(B) for derivation of intake values.

(b) See Tables 26 through 30 for toxicity values.

(c) Hazard Quotient is the ratio of calculated intake (DI) over acceptable intake (RfD).

(d) Cancer risk is the unitless probability of an individul developing cancer as a result of exposure to chemicals associated with the site.

ND = Not Determined

"Not Applicable" indicates that an HQ or CR cannot be calculated because the chemical was not detected in that medium and/or toxicity values are not available.

7.0 SUMMARY AND CONCLUSIONS

This section of the report provides a summary of the conclusions and recommendations of the remedial investigation.

7.1 SUMMARY

The findings of the remedial investigation are summarized below in terms of site characteristics, the nature and extent of contamination, fate and transport of contaminants, and the baseline risk assessment for the site.

7.1.1 SITE CHARACTERISTICS

The geology and hydrogeology of the Ramco site were characterized from the interpretation of geologic boring logs from test pits, groundwater monitoring wells installed at on- and off-site locations, from sediment sampling data, and from the measurement of aquifer and soil properties. The understanding of the site geology is important in evaluating hydrogeologic conditions of the site and potential contaminant transport mechanisms and pathways.

The geology of the site is characterized primarily by four distinct units overlying bedrock; surficial materials, silty sand unit, sandy clay unit and till. The silty sand and sandy clay units were identified consistently across the site and have also been identified as continuous units at adjacent sites. Surficial materials in the fill area of the site are composed of various fill or debris type materials - slag, brick, cinders. steel, concrete, tire, and wood to depth ranging from 4 to 8 feet below grade. In addition, oily waste material was found in fill at three locations within the fill area (test pit locations #2, #4 and #7). The oily material was intermixed with water contained in the fill material, with no apparent interconnection of the oily wastes between the three locations identified from test pit or monitoring well instructions. Various other fill material, typically slag fill around railroad tracks, has been used across the site and the southern extent of the Altift Landfill encroaches upon the northern boundary of the Ramco pond.

The silty sand and silty clay units are composed of native materials with a thin zone of till material encountered in some boring logs at the base of the silty clay. These two units were found continuous across the site with thicknesses of the sand unit varying between 0.5 to 3 feet and the clay unit ranging in thickness from 2 to 3 feet. Hydraulic conductivities of the silty clay is less than 1×10^{-7} cm/sec. The silty clay unit is believed to be a confining unit between the overlying water bearing materials and the underlying bedrock. Bedrock at the site has been identified over a majority of the site as limestone of the Skaneateles Formation. In areas toward the northwest, the limestone pinches out and the underlying shale of the Marcellus Formation is encountered. Based on data from the adjacent Altift and Republic landfill sites, the Ramco site is located above a bedrock ridge which is orientated in the approximate east-west direction. The bedrock slopes away from the site in the north and south directions with overburden material thicknesses, specifically the sand and clay units, increasing in these same directions.

The site area and surrounding areas to the north, in the prominent direction of surficial water flow are characterized by lowlying marsh areas with many stagnant surface water features. This area is also dissected by many man-made structures such as elevated railroad tracks and roads which have presumably altered the natural flow patterns of the area. Surface water flow from the pond and at adjacent areas has been observed to be minimal. Due to the marsh conditions of the area, surface water in the area are believed to be interconnected with shallow groundwater above the silty clay confining unit overlying bedrock.

Groundwater elevation data has been collected from both on- and off-site monitoring wells to evaluate the flow conditions within the shallow water bearing zones for the immediate area of the Ramco site and at the Altift site. Based on this water elevation data, groundwater flow patterns appear to flow radially from the Altift landfill area and at the Ramco site flow are influenced by the on-site pond.

7.1.2 NATURE AND EXTENT OF CONTAMINATION

The RI was undertaken to further characterize and evaluate site specific physical properties of the site and the extent of potential contaminants on-site. Monitoring wells were installed on-site to evaluate geologic and contaminant concerns related to groundwater. Surface water and sediment sampling in the on-site pond and at adjacent areas was completed to address potential contamination of sediment and surface water within and near the pond area. Soil contaminants were also evaluated through surface and subsurface soil sampling in the fill area and at monitoring well locations. Sediment, soil, groundwater, and surface water samples were tested for the presence of chemical compounds. Sediment and soil samples were also tested for radiological contaminants. The results of the environmental media sampling are summarized below.

7.1.2.1 Sediment

Organic constituents were detected within pond sediments at most locations. Volatile organic constituents, found predominantly at low concentrations, included acetone, carbon disulfide, chloroform, 2-butanone, 1,1,1-trichloroethane, and xylene. These constituents were all detected at relatively low concentrations and are not believed to be of concern for the site. Additionally, semivolatile organic compounds, principally a limited number of polyaromatic hydrocarbons (PAHs) were detected at low concentrations in the sediment. The PAH constituents most likely originated in the pond sediment from lubricating and hydraulic oils discharged with process wastewater to the pond. Likewise, PCBs were detected at two locations within sediment at concentrations below 1 ppm, and presumably originated from process wastewater containing lubricating or hydraulic oils.

Pesticides were detected in pond sediment, as well as in soil and water both on- and off-site. It is concluded that the presence of pesticides in the sediment, and in other media in the area of the site, is most likely a result of previous insecticide spraying common to the marshy-swamp conditions and not the result of disposal activities at the site.

The concentration of metals in pond sediment were compared to site background data and to data presented in NYSDEC guidance documentation. Based on this comparison, a majority of metals detected were above site background levels with the exception of nickel, zinc and average mercury levels. Elevated levels of mercury were detected in two sediment samples from the on-site pond.

TCLP leachability data for pond sediment indicates that the material would not be classified as hazardous by characteristic properties and the sediments have a minimal potential to leach volatile organic, semivolatile organic, pesticides, or metals constituents.

Radiological contamination was not found in any of the sediment samples collected from the on-site pond or at off-site sediment sampling locations.

7.1.2.2 Soils

Soil samples were collected from test pit locations in the fill area of the site and at borings completed for monitoring well installations. Additionally, surficial samples were collected of soil and piles of solidified mill scale disposed of in the fill area.

Volatile organic constituents were detected in subsurface soil samples from the fill area at relatively low concentrations. The constituents detected, acetone, methylene chloride, 2-butanone, tetrachlorethane, toluene, ethyl benzene and xylene, were all detected at similarly low concentrations with reported concentrations below the instrument quantification limits. As with volatile organics in sediment, these levels are not believed to be of concern for the site.

Semivolatile organic constituents were detected in connection with three locations in the fill area in which oily waste material was identified; test pit locations #2, #4, and #7. The semivolatile constituents consisted primarily of PAH compounds with total concentrations of semivolatiles exceeding 5 ppm at only one location, test pit location #4. PCBs were also detected in soil samples from the three test pit locations, #2, #4, and #7. PCB concentrations were highest at test pit location #7, with total PCB concentrations of 1.3 ppm. As described above, the detection of PAHs and PCBs constituents in soil samples correlates with the occurrence of oily waste material and is presumed to originate from lubricating or hydraulic oils used at the plant.

Pesticides were detected predominantly in surface samples from the fill area. In particular, the highest levels were found within the piles of mill scale found in the fill area of the site. A sample of this material was collected from the surface of the pile and most likely represents residual pesticide material sprayed in the area.

For evaluation purposes, metals concentrations in fill are soil samples were compared to site background data. Based on this comparison, arsenic, barium, chromium, lead, and zinc were identified above background concentrations. As a significant volume of slag and cinder material is found throughout the fill area and these types of material were identified in collected soil samples from the fill area, it is not unexpected to find elevated metals concentrations. Based on TCLP leachability testing, barium and lead were the only metals detected in the leachable fraction from the fill material. The leachable levels detected were well below hazardous characteristic levels for these metals and thus, the material would not be classified as hazardous by characteristic based on this testing.

Radiological contamination was not found in any of the soil samples collected from the fill area of the site or in soil samples from other areas of the site.

7.1.2.3 Groundwater

Groundwater quality at the Ramco site was evaluated through the collection and testing of groundwater samples from six on-site monitoring wells. Five of the wells are screened to intersect the upper water bearing material and a single well, MW-1D, is completed as a bedrock monitoring well.

A limited number of volatile organic constituents including acetone, toluene, carbon disulfide, chlorobenzene, 1,1-dichloroethane, and xylene have been detected in groundwater samples from site monitoring wells. Of these, 1,1-dichloroethane has been consistently detected in a single well, RMW-1, located near the Altift landfill site. Concentrations of all constituents detected were below NYS groundwater quality standards and are not believed to be a major concern for the site. However, the detection of these compounds at well RMW-1 may indicate the migration of contaminants from the Altift site.

Semivolatile constituents were initially detected at low concentrations in groundwater samples from two wells, RMW-1 and RMW-3. With the exception of benzo(a)anthracene and benzo(b)fluoranthrene detected only at the RMW-1 location near the Altift site, all constituents from the initial sampling were at levels below groundwater quality standards. Based on the results of additional groundwater sampling for the site, no semivolatile organics were detected above quantification limits for the site and, thus, semivolatile organics in groundwater are not believed to be of concern for the site.

Pesticides have also been detected in groundwater from only one well, RMW-1. The concentration of pesticides detected in groundwater at this location were very low, however, they were above the groundwater quality standard of "non-detect" (less than 0.01 μg/l). PCBs were not detected in groundwater samples from the site.

The results of metals analysis on unfiltered groundwater samples collected from the on-site wells during the initial RI activities indicated a wide fluctuation in metals concentrations from location to another. As these groundwater samples were not filtered prior to analysis, the wide variation in detected metals concentrations was initially thought to be attributable to the varying content of suspended solids in the groundwater samples. Additionally, discrepancies were noted in analytical results obtained on unfiltered samples from collected during the initial RI activities for the Ramco site and data from the recent Altift Landfill RI and previous studies with regard to metals concentrations at wells MW-1D and CW-1. As a result, both unfiltered and filtered groundwater samples from all wells were collected during the supplemental investigations for metals analysis.

Based on the results of metals analysis on the unfiltered (total) samples in subsequent sampling, the only constituents which exceeded NYS class "GA" groundwater standards were; iron, lead, magnesium, manganese, sodium and zinc. Iron, magnesium, manganese, and sodium exceeded NYS standards at a majority of the wells and the reported concentrations may be representative of background groundwater quality conditions for the area.

The analysis of filtered groundwater samples indicated a general reduction in all metals concentrations in relation to unfiltered samples from the same well location, with exception of iron, magnesium, manganese and sodium concentrations at a number of well locations. The concentration of iron,

magnesium, manganese and sodium in the filtered samples were also above NYS standards for a number of wells. Since no groundwater users are located in the area of the site and detected metals constituents may be representative of background water quality conditions, the occurrence of these metals within groundwater is not thought to be a concern related to the site.

7.1.2.4 Surface Water

Surface water samples were collected from three separate areas of the on-site pond for analysis. No volatile organic compounds, semivolatile constituents, pesticide, or PCBs were identified in surface water samples collected from the pond. Metals detected above NYS surface water quality standards included iron, magnesium, and manganese. All other metals were below water quality standards.

7.1.3 FATE AND TRANSPORT

The results of the RI environmental media sampling and subsequent evaluation identified metals, semivolatile organics, and PCBs associated with sediment within the pond and in the fill area of the site. Based on this and other information generated in the RI program, four potential routes or pathways of contaminant releases to the environment have been identified; resuspension of dust and releases to air, migration of groundwater, migration of off-site groundwater, migration off-site in surface water. As discussed in Section 5.2 - Contaminant Migration Potential, air releases from the site are not expected to be significant due to the nature of the contaminants detected, the media in which they are detected, and site conditions. Likewise the migration of contaminants to groundwater or within groundwater to off-site areas is not expected to be a significant pathway for contaminant movement. Movement of contaminants within groundwater from off-site areas such as the Altift site may provide a pathway for contaminants to the Ramco site. This may include migration to surface water and sediment within the on-site pond. Due to the lack of contaminants within pond surface water, limited flow which could occur from the on-site pond, and the nature of the pond sediment, the migration of contaminants via a surface water pathway is not considered significant.

7.1.4 RISK ASSESSMENT

A baseline and future assessment of risk associated with contaminants at the Ramco site was performed to determine noncarcinogen and carcinogen risk of human health exposure to site contaminants. For the Ramco site, various volatile organic, semivolatile, pesticide, PCBs and metals contaminants were included in the risk assessment. The risk assessment also considered contaminant fate and transport mechanisms, exposure routes, exposure point concentrations, exposed populations, and toxicological properties of the contaminants.

For evaluating the risk of noncarcinogen effects of exposure to contaminants, a hazard index is calculated. A hazard index of less than 1 is regarded as not likely to be associated with any health risks. For evaluation of carcinogen effects of exposure to contaminants, an excess cancer risk is calculated. A cancer risk of greater than 1×10^{-4} to 1×10^{-6} is considered to be a regulatory concern.

Using the exposure scenarios developed in Section 6.0 - Baseline Risk Assessment, the current risk associated with the site have been calculated as follows:

	Hazard Index	Excess Cancer Risk
Current Land Use/Trespasser		
soil	0.02	3E-6
sediment	0.003	1E-7
surface water	0.000003	0E+00
Total	0.03	4E-6
Current/Future Industrial Worker		
soil	0.007	1E-6

As presented above, the hazard index for the noncarcinogen effect is less than 1 indicating no adverse impacts to human health associated with the current/future use scenarios. The excess cancer risk for the current land use scenario is not greater than the 1×10^{-4} risk level. These calculated risk levels indicate that adverse impacts to human health would not likely be associated with exposure to contaminants in sediment, soil, and surface water at the Ramco site according to the current use scenario used to evaluate the risks. Groundwater has not been included in the use scenarios because a complete pathway for exposure to groundwater has not been established do in part to the site hydrogeologic conditions and that groundwater is neither used or usable as a source of drinking water or for other uses.

For current land use considerations, exposure to on-site soils poses the most significant level of human health risk. Exposure to pond sediments would be limited under any of the exposure scenarios evaluated and thus, the level of human health risk associated with the pond sediment is not considered significant.

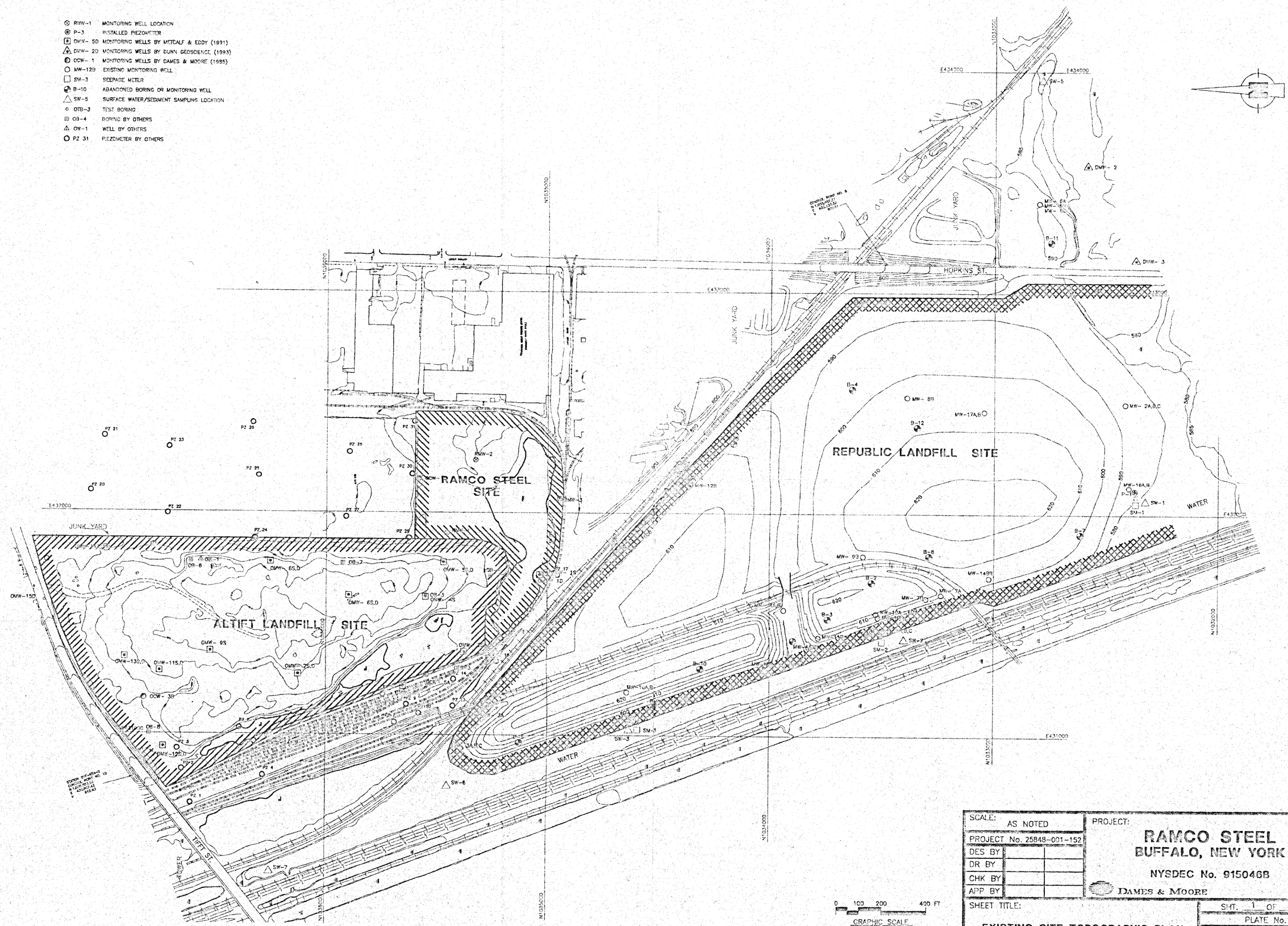
For ecological risk considerations, the important exposure route associated with the site is direct uptake of pond sediment as well as consumption of plants and prey species that may consume or be in direct contact with pond sediment. The levels of contaminants detected in the pond sediment were below the levels representing a risk from acute exposure. The biochemical mechanisms that affect risk associated with chronic exposure to contaminants (biomagnification and bioaccumulation) require the primary producers (phytoplankton) and consumers (benthic invertebrates) to mobilize the contaminants at the lowest trophic levels. Due to the apparent lack of these organisms within the pond and sediment, this mechanism for mobilizing contamination is significant reduced. As such, the risk to upper levels of the food-chain is further minimized by the absence of the typical mechanism for biomagnification or bioaccumulation. These conditions arise from a lack of significant ecologic pathways believed to be due, in part, to the levels of contaminants, specifically metals, within pond sediment.

7.2 CONCLUSIONS

Based on the results of the remedial investigation, the site does not currently present an imminent threat to human health or the environment. Groundwater concerns have been evaluated thorough completion of supplemental sampling and have been found to contain limited constituents above NYS standards. Constituents which have been detected above NYS standards within groundwater included inorganic constituents such as iron, magnesium, manganese, and sodium. The levels of these constituents are believed to be associated with background water quality conditions rather than site related contaminants.

Concern has been raised regarding the risk to ecological concerns because of contaminants contained within the on-site pond sediment. Currently, the pond contains limited fish, benthic invertebrates and other aquatic organism, due in part to contaminant levels within pond sediment and the historical use of the pond, which may potentially reduce the biological mechanisms for mobilizing contaminants. Other exposure pathways exist for ecological concerns and may include ingestion of sediment, consumption of aquatic organisms, ingestion of plant detritus and direct contact with sediment. Remedial options which may be used to mitigate exposure pathways of concern will be evaluated through the completion of a Feasibility Study to be completed for the site.

- ⊗ RMW-1 MONITORING WELL LOCATION
- ◉ P-3 INSTALLED PIEZOMETER
- ▣ OMW- 5D MONITORING WELLS BY METCALF & EDDY (1991)
- ⧋ DMW- 2D MONITORING WELLS BY DUNN GEOSCIENCE (1993)
- ◐ OGW- 1 MONITORING WELLS BY DAMES & MOORE (1985)
- ○ MW-12B EXISTING MONITORING WELL
- □ SM-3 SEEPAGE METER
- ◔ B-10 ABANDONED BORING OR MONITORING WELL
- △ SW-5 SURFACE WATER/SEDIMENT SAMPLING LOCATION
- ⊕ OTB-3 TEST BORING
- ⊞ OB-4 BORING BY OTHERS
- ⚠ OW-1 WELL BY OTHERS
- ○ PZ 31 PIEZOMETER BY OTHERS



0 100 200 400 FT
GRAPHIC SCALE

SCALE:	AS NOTED
PROJECT No.	25848-001-152
DES BY	
DR BY	
CHK BY	
APP BY	

PROJECT:
RAMCO STEEL
BUFFALO, NEW YORK
NYSDEC No. 915046B
DAMES & MOORE

SHEET TITLE:
EXISTING SITE TOPOGRAPHIC PLAN

SHT. 1 OF 1
PLATE No.
PLATE 1

8/01/94

CAD DRAWING-DO NOT REVISE THIS ORIGINAL

DAMES & MOORE

AUGUST 1994

REMEDIAL INVESTIGATION REPORT

RAMCO STEEL SITE
BUFFALO, NEW YORK
NYSDEC SITE NO. 915046B

VOLUME II -- APPENDICES

DAMES & MOORE

3065 Southwestern Blvd., Suite 202
Orchard Park, New York

August 1994
25848-001

APPENDIX A

APPENDIX A

APPENDIX A

RADIOLOGIC DATA

RSO,Inc.

Radiation Service Organization

14 May 1993

Pete Smith
Dames & Moore
3065 Southwestern Blvd., Suite 202
Orchard Park, NY 14127

Dear Mr. Smith,

Attached is the report of analysis for the soil samples you sent us on April 28, 1993.

These samples were analyzed using a High Purity Germanium (HPGe) gamma spectrometer. The samples were prepared by drying them to remove moisture, then each sample was pulverized to a consistent particle size. The samples were then placed into a 500mL Marinelli beaker and counted for 30 minutes. The resulting energy spectra were analyzed using Canberra Sampo 90 software.

Also included in this report is the daily quality control data for each day the samples were counted. The standard used to verify our performance is traceable to the National Institutes of Standards and Technology (NIST).

The U-238 was determined by measuring the activity of Th-234 and the Th-232 was determined by measuring the activity of Ac-228 contained in each sample. The activities listed on the report of analysis is in units of pCi/gram of sample and the error, where appropriate, is at the two sigma level.

If I can be of further assistance, please contact me at 301-953-2482. Thank you for allowing RSO, Inc. to perform this work for your organization.

Respectfully,

Myke Beard
Manager, Laboratory Services

ENCLOSURES

P.O. Box 1526, Laurel, Maryland 20725-1526
Washington (301) 953-2482 Fax (301) 498-3017 Baltimore (410) 792-7444

REPORT OF ANALYSIS

Customer: Dames and Moore
Date: 14 May 1993
Sample Matrix: Soil
RSO Procedure: 2108.4

SAMPLE I.D.	U-238	Th-232
DUP-1	<1.51	0.35 +/-25.6%
DUP-2	<2.04	<0.54
SS-3	< 1.43	< 0.37
SS-4	< 1.10	< 0.23
TP-1	< 1.84	< 0.27
TP-2	< 1.35	< 0.35
TP-3	< 1.63	< 0.27
TP-4	< 1.72	< 0.47
TP-5	< 1.27	< 0.34
TP-6	< 1.87	0.45 +/-23.7%
TP-7	< 1.34	0.54 +/-12.1%
TP-8	< 1.62	< 0.21
SED-1	< 2.02	< 0.54
SED-2	< 1.39	< 0.28
SED-3	< 1.65	0.52 +/-19.2%
SED-4	< 2.52	< 0.55
SED-5	< 1.24	0.44 +/-18.5%
SED-6	< 1.73	< 0.44
SED-7	< 2.36	< 0.64
SED-8	< 1.50	0.51 +/-20.6%
SED-9	< 1.19	< 0.32
SED-10	< 1.81	< 0.46
SED-11	< 1.62	< 0.19
SED-12	< 1.64	< 0.20
SED-13	< 1.52	< 0.39
SED-14	< 2.24	< 0.67
SED-15	< 1.79	< 0.42
SED-16	< 2.19	< 0.54
SED-17	< 1.41	< 0.38

Reviewed By: _____
Manager, Laboratory Services

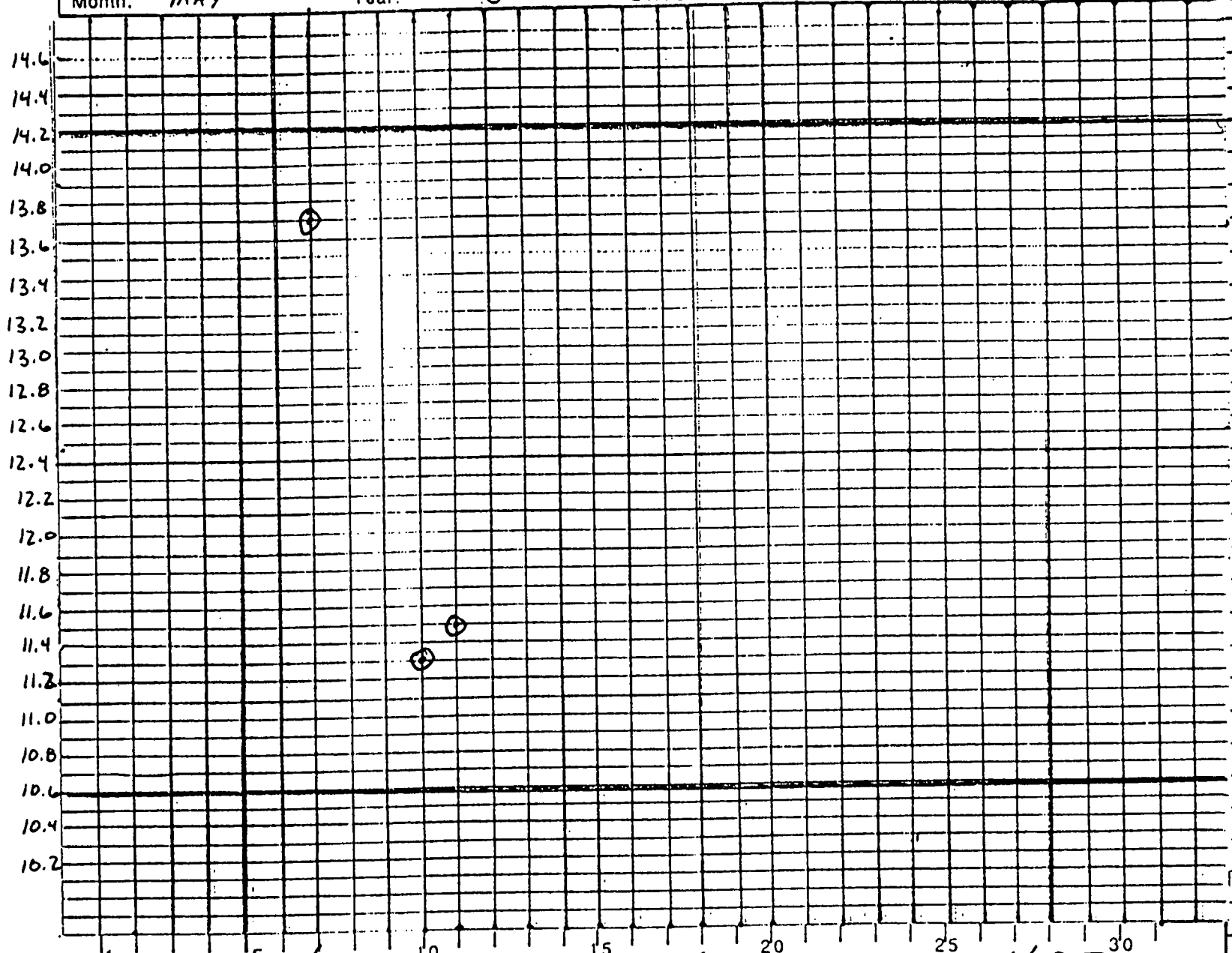
RSO, Inc.

HPGe

DAMES + MOORE SOIL QC

Month: MAY Year: 93

DAILY CONTROL CHART



Date	Time: Gross ~~Counts~~ ACT
1	
2	
3	
4	
5	
6	
7	13.71
8	
9	
10	11.30
11	11.57
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
24	
25	
26	
27	
28	
29	
30	
31	

Channel TH234 Lower Limit 10.68 Upper Limit 14.25

Standard Isotope 361 Standard Serial Number RSO 361

THE FOLLOWING PAGES WERE NON-LEGIBLE AT THE TIME OF SCANNING

13.4 .7477750 .7024910
13.3 .8500004 .7225000
13.2 .75 .5625
13.1 .8500000 .4225008
13 .7500002 .5625002
12.9 .4499998 .2024998
12.8 .5500004 .3025008
12.7 .65 .4225
12.6 .7500006 2.250041E-02
12.5 5.000019E-02 2.500019E-03
12.4 -5.000019E-02 2.500019E-03
12.3 -.1499996 2.249939E-02
12.2 .25 .0625
12.1 -.3499994 .1224998
12 -.4499998 .2024998
11.9 -.5500002 .3025002
11.8 .8499996 .7224995
11.7 -.75 .5625
11.6 -.8499994 .7224995
11.5 -.9499998 .9024996
249 6.65 12.45 .5341360
.5916608 1.183216 1.774824
13.04101 11.85859 15.03522 11.26078 14.22482 10.67518

$\bar{X}$

$\pm 2\sigma$ $\pm 3\sigma$

RSO 361

The Following Image(s) are the Best Copy Available

BIEL'S

5/7/93

**** RADIONUCLIDE ANALYSIS REPORT ****

[illegible] I.D.: I[illegible]

[illegible] activity (pCi/GRAM) [illegible]

		measured			decay corrected	saturation
:	I[illegible]-64	.973%	1.371E+01	+- 7.56%	1.371E+01	0.000E+00
			1.371E+01		1.371E+01	0.000E+00

[illegible]: 0 = check nuclide is a part of an underdetermined solution

These peaks were not identified:

number	channel	energy	peak intensity (cps)
1	20.6	10.97	1.570E+07 +- 7.97%
2	257.8	63.05	7.225E+00 +- 18.54%

5/10/93

***** RADIONUCLIDE ANALYSIS REPORT *****

SUMMARY [illegible]

nuclide identification ---- activity (pCi/gram)

			measured	decay corrected	saturation
[illegible]	[illegible]	.[illegible]	1.130E+01 +- 8.70%	1.130E+01	0.000E+00
			1.130E+01	1.130E+01	0.000E+00

Flagged "C" - check: nuclide is a part of an underdetermined solution

These peaks were not identified:

number	channel	energy	peak intensity (cps)
1	20.8	11.02	1.377E+02 +- 3.40%
[illegible]	237.1	[illegible]5.75	7.570E+00 +- 17.56%
4	2199.7	310.31	4.[illegible]23E+00 +- 12.28%

5/11/93

**** [illegible] NUCLIDE ANALYSIS REPORT ****

[illegible]:

Nuclide	Conf.	Activity (nCi/GRAM) measured	decay corrected	Emission
1 Tl 204	100%	1.157E+01 +- 8.29%	1.157E+01	9.70E+00
		1.157E+01	1.157E+01	9.70E+00

Flags: C = check: nuclide is a part of an undetermined solution.

These peaks were not identified:

Number	Channel	Energy	Peak Intensity (cps)
1	20.9	11.05	1.422E+02 +- 8.25%
2	738.3	63.17	4.275E+00 +- 15.55%

END OF

NON-LEGIBLE

PAGES

RSO, Inc.

Radiation Service Organization

FAX TRANSMITTAL COVER PAGE

DATE 5/27/93

#OF PAGES IN THE FAX 5
INCLUDING COVER PAGE

TO: BOB MONSALVE-JONES
CO: JAMES & MOORE
DEPT:
FAX# 716-675-7137

FROM: MYLES BEARD
CO: RSO
DEPT: LAB
FAX: 301-497-6363

COMMENTS:

DUP-1 REPORT FOLLOWS

UNIDENTIFIED PEAKS: 11.04 KeV ⇒ BKG
77.1 " "
238.48 " Pb^{212} FM ^{232}Th
583.47 " ^{208}Tl FM ^{232}Th
1461.34 " ^{40}K ⇒ NATURAL

MB

P.O. Box 1526, Laurel, Maryland 20725-1526
Washington (301) 953-2482 Fax (301) 498-3017 Baltimore (410) 792-7444

12-May-1993 10: 9:30

GMO 90. 1990 PA.HN.JR.

G A M M A S P E C T R U M A N A L Y S I S R E P O R T

RADIATION SERVICE ORGANIZATION LABORATORY INFORMATION MANAGEMENT SYSTEM

Sample description: DAMES & MOORE DUP-1
Spectrum file name: DUP1
Sample identifier : DUP1
Sample size : 5.3205E+02 GRAM
Measured by : J.D.

Start of irradiation	:	12-May-1993 at 8: 0: 0
End of irradiation	:	12-May-1993 at 8: 0: 0
Collect started on	:	12-May-1993 at 9:32:35
Collect ended on	:	12-May-1993 at 10: 2:38
		0 years 0 days 0 hours 0 minutes
Irradiation time	:	0 years 0 days 1 hours 32 minutes
Decay time	:	
Live time: 1.800E+03 s	real time:	1.800E+03 s dead time: .00 %

Shape calibration requested	:	RS0360	
Shape calibration used	:	RS0360	
Created	:	7-May-1991	10:20: 8
Modified	:	7-May-1991	10:20: 8
Energy calibration requested	:	RS0360	
Energy calibration used	:	RS0360	
Created	:	7-May-1991	9:24:28
Modified	:	7-May-1991	10:10:34
Efficiency calibration requested	:	RS0360	
Efficiency calibration used	:	RS0360	
Created	:	7-May-1991	10:23:57
Modified	:	7-May-1991	10:23:57

Last search discrimination level:	4.00	
Last search FROM channel	14 TO channel	8178
Last fitting discrimination level:	4.00	
Last fit FROM channel	1 TO channel	16384
Identification energy tolerance	: 1.00	
Minimum intensity conv. factor	: 1.00	
Gamma reference library	: ..\LIBRARY\U-238.ILF	
with 6 isotopes and	9 gamma lines.	

MDA library name:	..\LIBRARY\U-238.ILF
MDA energy tolerance:	1.00 keV
MDA decision limit 1-alpha:	95.00 %
MDA detection limit 1-beta:	95.00 %

Peaked background file: NONE
Energy tolerance for peaked background subtraction: 1.00 keV
Threshold factor for peak areas: 1.00

********** P E A K F I T R E P O R T **********

SAMPLE I.D.: DUP1

Peak no	centroid channel	energy keV	area counts	error %	background counts	intensity cps	error %	qfit
1	20.87	11.04	6.1738E+02	4.4	4.6694E+01	2.6064E+02	6.8	15.5
2	296.42	77.10	7.9550E+01	15.5	3.5690E+01	2.5726E+00	16.4	1.7
3	770.74	239.48	1.7627E+02	9.9	3.9273E+01	4.0491E+00	10.3	1.3
4	1206.98	294.95	9.2630E+01	12.4	1.8874E+01	2.2909E+00	13.3	.6
5	1445.00	351.86	1.5441E+02	9.1	1.1766E+01	4.2786E+00	10.2	.7
6	2413.67	583.47	4.0215E+01	19.6	7.1450E+00	1.7956E+00	20.0	.9
7	2523.01	609.60	1.2822E+02	10.1	7.9536E+00	5.8318E+00	10.9	.7
8	3783.55	911.30	2.9090E+01	25.3	7.2370E+00	1.9790E+00	25.6	.7
9	6086.74	1461.34	2.2120E+02	7.1	2.5571E+00	2.2537E+01	8.3	.8

(last m = a peak in a multiplet. M = last peak in a multiplet. ? = bad fit
b = background peak - will be subtracted from the peak above.

********** R A D I O N U C L I D E A N A L Y S I S R E P O R T **********

SAMPLE I.D.: DUP1

number	nuclide	conf.value	Activity (pCi/GRAM) measured	decay corrected	saturation
1	PB-214	.8579	6.081E-01 +- 3.10%	6.081E-01	0.000E+00
2	BI-214	.9875	6.304E-01 +- 10.86%	6.304E-01	0.000E+00
3	AC-228	.9910	3.467E-01 +- 25.59%	3.467E-01	0.000E+00
			1.583E+00	1.583E+00	0.000E+00

Flags: C = check; nuclide is a part of an underdetermined solution

These peaks were not identified:

number	channel	energy	peak intensity (cps)
1	20.9	11.04	2.607E+02 +- 6.81%
2	296.4	77.10	2.573E+00 +- 16.39%
3	970.7	238.48	4.049E+00 +- 10.27%
6	2413.7	583.47	1.796E+00 +- 20.02%
9	6086.7	1461.34	2.254E+01 +- 8.34%

MDA REPORT

SAMPLE I.D.: DUP1

peak #	spectrum #	library energy keV	spectrum energy keV	energy diff. keV	full photopeak activity pCi/GRAM	detection limit pCi/GRAM
PB-214						
1	4	295.22	294.95	.27	6.165E-01	1.525E-01
2	5	352.00	351.86	.14	6.040E-01	7.299E-02
						7.299E-02
BI-214						
1	7	609.30	609.60	-.30	6.302E-01	7.777E-02
						7.777E-02
RA-226						
1	3	186.00	230.48	-52.48	0.000E+00	1.614E+00
						1.614E+00
AC-228						
1	5	338.40	351.86	-13.46	0.000E+00	4.403E-01
2	8	911.07	911.30	-.23	3.466E-01	1.813E-01
						1.813E-01
TH-234						
1	2	92.80	77.10	15.70	0.000E+00	1.514E+00
						1.514E+00
PA-234m						
1	8	765.00	911.30	-146.30	0.000E+00	1.499E+01
2	8	1001.00	911.30	89.70	0.000E+00	1.154E+01
						1.154E+01

ORISE 92/G-6

RADIOLOGICAL SURVEY OF THE FORMER BLISS AND LAUGHLIN STEEL COMPANY FACILITY BUFFALO, NEW YORK

Prepared by

J. D. Berger

Environmental Survey and Site Assessment Program
Energy/Environmental Systems Division
Oak Ridge Institute for Science and Education
Oak Ridge, Tennessee 37831-0117

Project Staff

D. A. Gibson R. B. Slaten

Prepared for

Department of Energy
Office of Environmental Restoration

JUNE 1992

This report is based on work performed under contract number DE-AC05-76OR00033 with the U.S. Department of Energy.

RADIOLOGICAL SURVEY OF THE FORMER BLISS AND LAUGHLIN STEEL COMPANY FACILITY BUFFALO, NEW YORK

Prepared by: _____ Date: 6/19/92
J. D. Berger, Program Director
Environmental Survey and Site Assessment Program

Reviewed by: Shawn M. Shaunnigan Date: 6/30/92
C. F. Weaver, Laboratory Manager For
Environmental Survey and Site Assessment Program

Reviewed by: _____ Date: 6/26/92
M. R. Landis, Project Manager
Environmental Survey and Site Assessment Program

Reviewed by: _____ for Date: 6/30/92
W. L. Beck, Assistant Program Director
Environmental Survey and Site Assessment Program

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

RADIOLOGICAL SURVEY OF THE FORMER BLISS AND LAUGHLIN STEEL COMPANY FACILITY BUFFALO, NEW YORK

INTRODUCTION AND SITE HISTORY

In the fall of 1952, the Bliss and Laughlin Steel Company, Buffalo, New York, performed machining and straightening operations on uranium rods. The finished rods were shipped directly to the Fernald site in Ohio; turnings were returned by the Atomic Energy Commission (AEC) to the Lake Ontario Ordnance Works (LOOW) for packaging and ultimate disposal or recycle. Available records indicate uranium machining occurred at the site during September and October of 1952, and that 53 drums of turnings were generated by the Bliss and Laughlin activities[1]. It is unknown whether these records described the full extent of the Bliss and Laughlin work; no records, indicating the total quantity of uranium handled at this site, have been located. There is also mention of possible earlier Atomic Energy Commission work at the site (the nature of which is unknown[1]) in an October 1951 correspondence, which indicated that several drums of dry uranium oxide had been accumulated. In 1972 the facility was sold to Ramco Steel, Inc.; the current owner is Niagara Cold Drawn Corporation.

Based on the operations performed at this site, the potential radiological contaminant would be processed natural uranium, i.e. uranium chemically separated from its long-lived daughter products and in its naturally occurring isotopic abundances. Surveys of the facility, conducted by National Lead of Ohio at the time of the rod turning operations, identified contamination on the turning machines. The machinery used for this work has been replaced; disposition of the old equipment is not known. No records, indicating the radiological conditions of the site following the uranium machining, have been located. The U.S. Department of Energy's Office of Environmental Restoration and Waste Management recommended that the current radiological conditions be determined; the Environmental Survey and Site Assessment Program (ESSAP) of Oak Ridge Associated Universities/Oak Ridge Institute for Science and Education

(ORAU/ORISE) was requested to perform a survey of the site. This report describes the procedures and results of that survey.

PROJECT ORGANIZATION AND RESPONSIBILITY

DOE Headquarters provides overview and coordination for all FUSRAP activities. DOE Oak Ridge (DOE-OR) is responsible for implementation of FUSRAP and The Former Sites Restoration Division of DOE-OR, manages the daily activities.

Under the FUSRAP protocol, an initial investigation/survey of a potential site is performed by ORISE or Oak Ridge National Laboratory (ORNL), under contract to DOE Headquarters. If appropriate, DOE Headquarters designates the site into FUSRAP based upon the results provided by the initial investigation/survey. DOE's Project Management Contractor (PMC) for FUSRAP is Bechtel National, Inc. (BNI). BNI is responsible for planning and implementation of FUSRAP activities and managing any required remedial actions. The final phase for a FUSRAP site is independent verification, which is provided by ORISE or ORNL, after remedial action is complete. This verification activity provides independent (third party) data to assist DOE in evaluating the accuracy of the post-remedial action status of the site, as presented by the PMC, and in assuring that the documentation accurately and adequately describes the condition of the site. DOE Headquarters uses the information developed by the remediation and verification activities to certify that a site can be released for use, without restrictions.

FACILITY DESCRIPTION

The former Bliss and Laughlin facility at 110 Hopkins Street consists of a single large building, with a floor area of about 12,000 m^2 (Figures 1 and 2). There have been only minor changes to the main structure, since the uranium operations in the 1950's. Equipment inside the building has been rearranged or replaced to varying degrees. The current facility occupants indicate that machining operations, such as were performed on the uranium rods, would have

been located in the "special finishing" area, but machining is no longer performed in this section of the facility. The "special finishing" area occupies about 300 m^2 of floor space (Figure 3). The floor is concrete and contains several shallow utility (water, electricity, lubricant, and pneumatic) trenches; there are no drains in this area. Floor surfaces are generally rough and "pitted" and are covered with a thin layer of oil absorbent material and dried oil and grease. Machining equipment and material storage racks prevent access to some floor surface areas. Ceilings are approximately 12 m high and supported by a framework of trusses. The machining area of the building is open (without inside walls or partitions).

PROCEDURES

On March 14, 1992, representatives of the ORISE Environmental Survey and Site Assessment Program (ESSAP), assisted by W. A. Williams of the DOE Office of Environmental Restoration, conducted a radiological survey at the former Bliss and Laughlin Steel Company facility. The survey was initially conducted in accordance with a plan prepared by the ESSAP and approved by DOE/EM. Positive findings of residual contamination exceeding guidelines established the possible eligibility under FUSRAP; initial plans were then modified and the number of surface activity and exposure rate measurements was reduced. Additional information, concerning major instrumentation and survey and analysis procedures, is provided in Appendices A and B.

OBJECTIVE

The objective of the survey was to determine the radiological status of the site, relative to the FUSRAP guidelines and DOE Order 5400.5, Chapter IV[2]. The results will be used by DOE/EM to determine whether there is a need for further actions under FUSRAP.

SURVEY PROCEDURES

Reference Grid

The floor of the "special finishing" area was gridded at 2 m intervals for referencing measurement and sampling locations. Survey locations in other portions of the facility were referenced to prominent building features.

Surface Scans

The floor of the "special finishing" area was scanned for alpha, beta, and gamma activity, using gas proportional and gamma scintillation detectors. Scans for alpha, beta, and gamma activity were also performed in other areas of the building. Scans for gamma activity were performed outside the building at entrances/exits and within 5 to 10 m of the building exterior walls. All detectors were coupled to instruments with audible indicators. Locations of elevated direct radiation, suggesting the presence of surface contamination, were marked and identified for further investigation.

Measurements of Surface Activity Levels

Direct measurements for total surface activity were performed at 8 locations of elevated direct radiation, identified by surface scans; at 10 additional locations on the floor of the "special finishing" area; and at 10 locations throughout the remainder of the building. Although processed natural uranium emits alpha and beta radiations in approximately equal proportions, initial measurements indicated that the total alpha activity levels were significantly lower than the beta levels at the same location; this suggested that the physical condition of the floor surface was resulting in absorption of a large fraction of the alpha radiation. Therefore, measurements of alpha surface activity were discontinued, and the beta measurements were used to determine the residual uranium activity level. Measurement locations are identified on Figures 4 and 5. Smears for removable activity were obtained at direct measurement locations.

Exposure Rate Measurement

A background exposure rate of 9 uR/h for the general building area was measured at 1 meter (3.3 ft) above the surface in the truck loading area (Figure 5). This location is similar in construction to the rest of the building, and is not believed to have a history of radioactive material use. A pressurized ionization chamber was used to perform this measurement.

Miscellaneous Samples

Scrapings and chips were obtained from locations of elevated direct radiation on the floor. Two dust and residue samples were collected from overhead beams in the "special finishing" area, and two samples of oil and sludge were obtained from trenches in the "special finishing" area. Two samples of slag-like fill material were obtained from beneath the concrete flooring at locations of elevated gamma scan findings; these samples were from excavations on the south side of the building, where new storage racks were being installed. Sampling locations are identified on Figures 4 and 5.

Sample Analysis and Data Interpretation

All samples and data were returned to the ESSAP laboratory for analysis and interpretation. Smears were analyzed for gross alpha and gross beta activity. Miscellaneous samples were analyzed by gamma spectrometry and the radionuclide content reported in units of pCi or pCi/g. The radionuclides of primary interest were those associated with processed natural uranium; however, spectra were reviewed for the presence of additional photopeaks. Total surface activity levels were converted to units of disintegrations per minute per 100 cm^2 (dpm/100 cm^2). Findings were compared to the DOE guidelines.

FINDINGS AND RESULTS

SURFACE SCANS

Gamma scans of the building interior and exterior perimeter identified levels of 2 to 3 times background in subfloor excavations along the south side of the building. The elevated radiation levels appeared to be associated with slag and cinder-like material, which had been used as fill between the subfloor soil and the concrete flooring. No additional indoor or outdoor locations, indicating possible residual radioactive material, were identified by the gamma scans.

Alpha-beta scans identified several areas of elevated direct radiation in the "special finishing" area. These locations, shown on Figure 4, were noted for additional measurements.

Scans of other building floor surfaces did not identify additional locations of possible residual activity.

SURFACE ACTIVITY LEVELS

Results of surface activity measurements in the "special finishing" area are presented in Table 1. At locations identified by surface scans the total beta activity levels ranged from 4,700 to 700,000 dpm/100 cm^2; removable alpha and beta activities at these locations ranged from <12 to 430 dpm/100 cm^2 and <15 to 540 dpm/100 cm^2, respectively. Activity levels at other locations in the "special finishing" area were less than detection limits of the procedure, i.e. <880 dpm/100 cm^2, total beta; <12 dpm/100 cm^2, removable alpha; and <15 dpm/100 cm^2, removable beta.

Surface activity levels, measured at all other building locations, were less than the detection limits of the procedures.

RADIONUCLIDE LEVELS IN MISCELLANEOUS SAMPLES

Metal chips and floor scrapings, collected from locations of elevated direct radiation in the "special finishing" area were combined for analysis. The composite sample contained 200,000 pCi of U-238 and 9700 pCi of U-235; this ratio of U-238 and U-235 activities is typical of natural uranium. The total uranium content in this composite was approximately 0.6 gm. No additional uranium series radionuclides were identified in this sample, indicating that the material is processed uranium, i.e. separated from its longer-lived daughter products.

Table 3 presents the concentrations of radionuclides in other samples from the facility. Samples of slag and cinder-like material from the floor excavations contained positive levels of U-238 (up to 5.2 pCi/g) and Th-232 (up to 3.7 pCi/g). The gamma spectra revealed that longer-lived daughters of these two radionuclide series were present in approximately equal amounts, indicating that the material is of natural origin, rather than being associated with the uranium machining activities for AEC/MED. The material containing the low levels of natural uranium and thorium is similar in appearance and radionuclide content to that which has been encountered at various other sites in the Buffalo area[3-4].

Slightly elevated U-238 concentrations (up to 2.2 pCi/g) were present in the oil and sludge samples from the floor trenches and in the dust removed from overhead surfaces (up to 5.7 pCi/g). As with the samples of chips and floor scrapings, these samples did not contain the longer-lived daughters of the uranium decay series (e.g., Ra-226), and it is therefore likely that activity in these samples is associated with the uranium machining operations.

COMPARISON OF RESULTS WITH GUIDELINES

The DOE surface contamination guideline levels applicable for processed natural uranium are as follows:

Total Activity

5,000 dpm α/100 cm^2, averaged over a 1 m^2 area

15,000 dpm α/100 cm^2, maximum in a 100 cm^2 area

Removable Activity

1,000 dpm α/100 cm^2

Survey results indicate that measurements for beta activity levels, rather than alpha activity, provide a more accurate representation of uranium activity levels on dusty, porous, or rough surfaces, because of selective attenuation of alpha radiations; therefore, beta activity levels were used for comparison with the guideline values. Seven locations in the "special finishing" area had total beta activity levels exceeding the 15,000 dpm/100 cm^2 (maximum) limit. Measurements at eleven other locations in the "special finishing" area and locations throughout the remainder of the facility were within the guideline levels for total surface activity. There were no measurement locations where removable activity exceeded the guideline.

A guideline value for U-238 in soil and other volumetric sources has not been established for this site; however, for comparison purposes, guidelines at other FUSRAP sites have typically ranged from 30 to 50 pCi/g. Samples collected from this facility contain less than those typical levels. The slag/cinder samples contain naturally occurring activity, not associated with former AEC activities at the Bliss and Laughlin site.

SUMMARY

In March 1992, ESSAP performed a radiological survey of the former Bliss and Laughlin Steel Company facility, located at 110 Hopkins Street, Buffalo, New York. Survey activities included scans for direct alpha, beta, and gamma radiation, measurements of total and removable surface activity, and collection and analysis of samples.

Residual uranium activity, exceeding the DOE surface contamination guideline levels, was identified on the floor of the "special finishing" area. The contamination appears to be fixed; removable contamination is within DOE guideline levels. Some floor surfaces in this area were inaccessible, due to equipment and material storage; it is possible that additional areas of residual contamination are present.

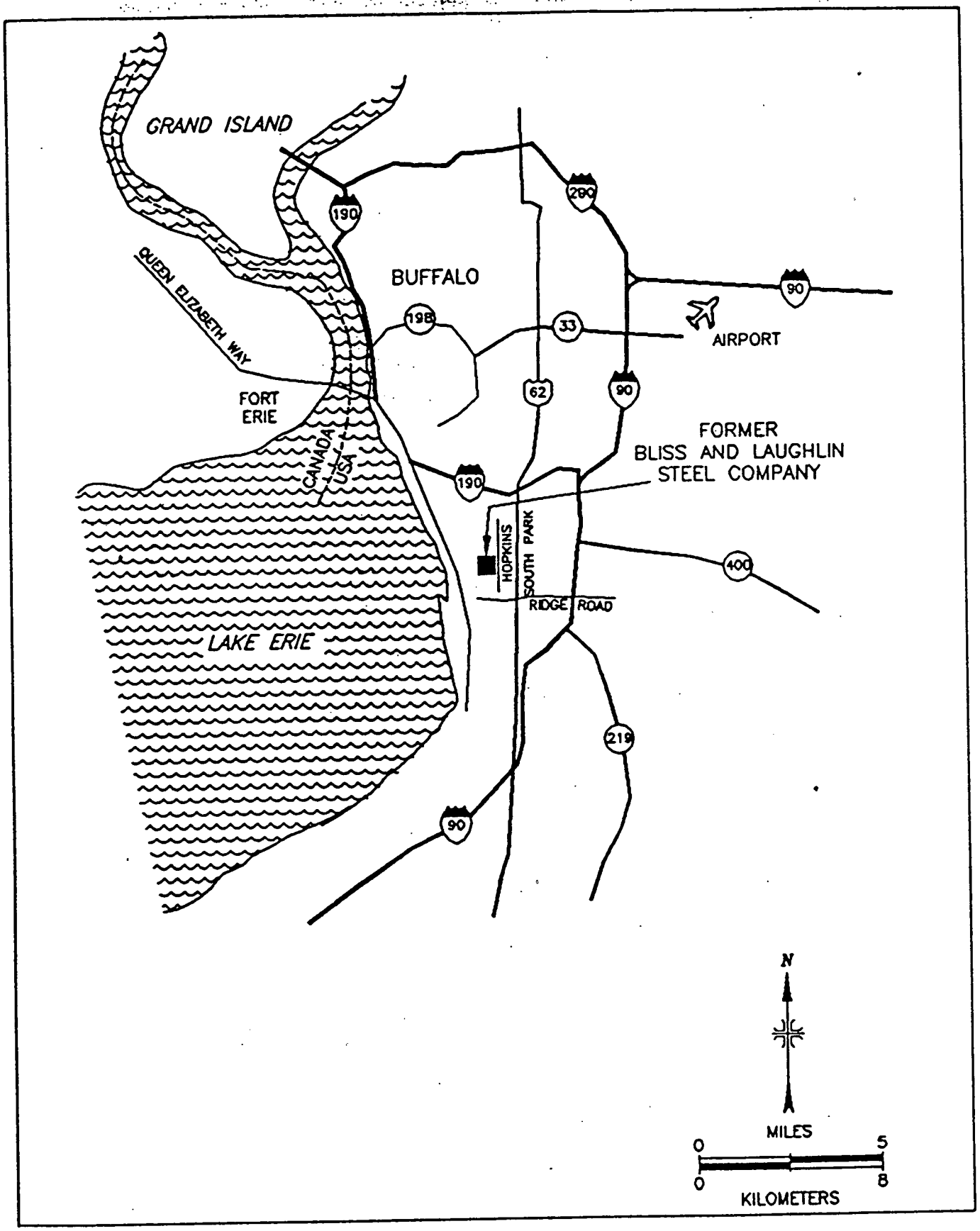


FIGURE 1: Buffalo, New York Area – Location of Former Bliss and Laughlin Steel Company Site

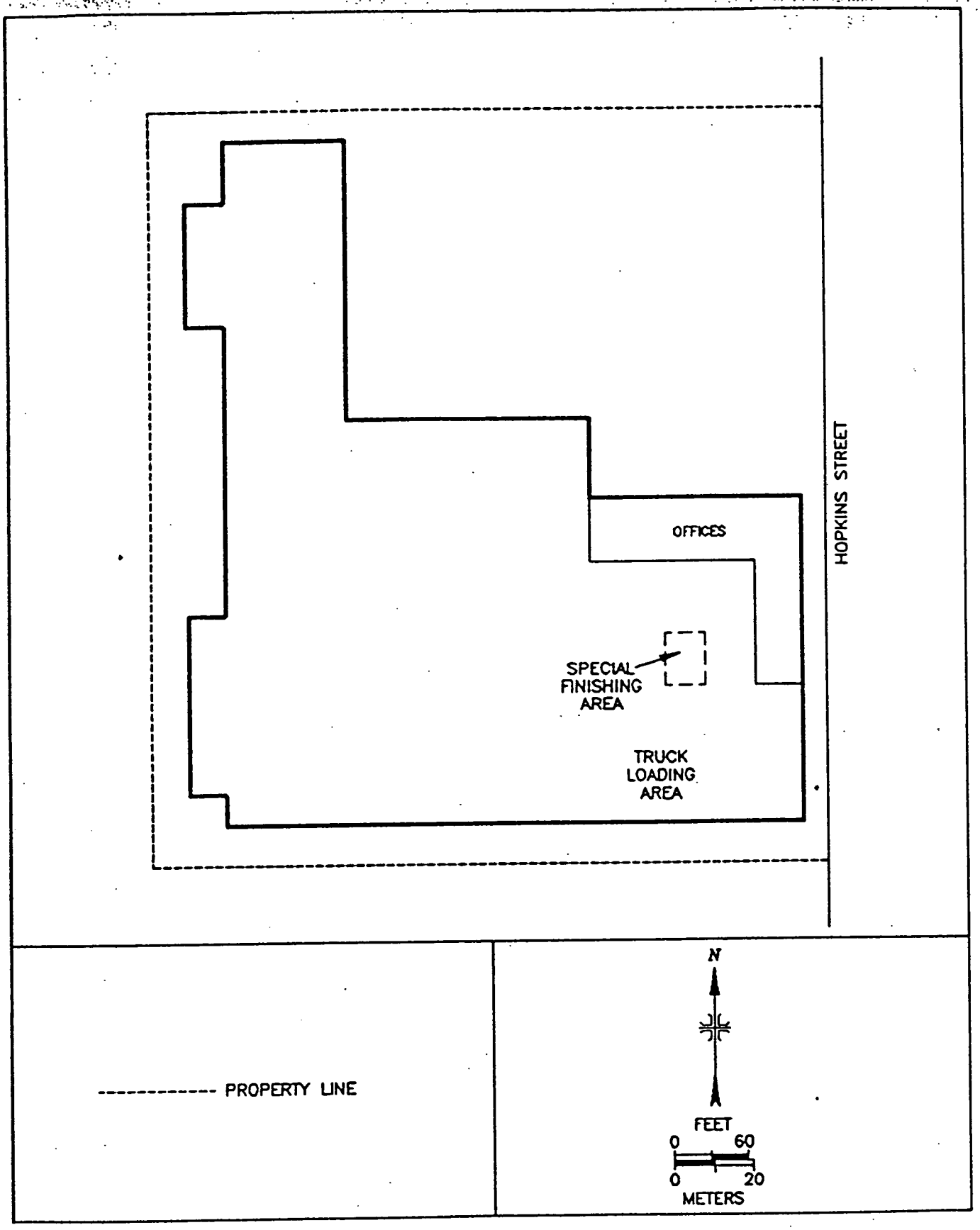


FIGURE 2: Plot Plan of Former Bliss and Laughlin Steel Company Facility

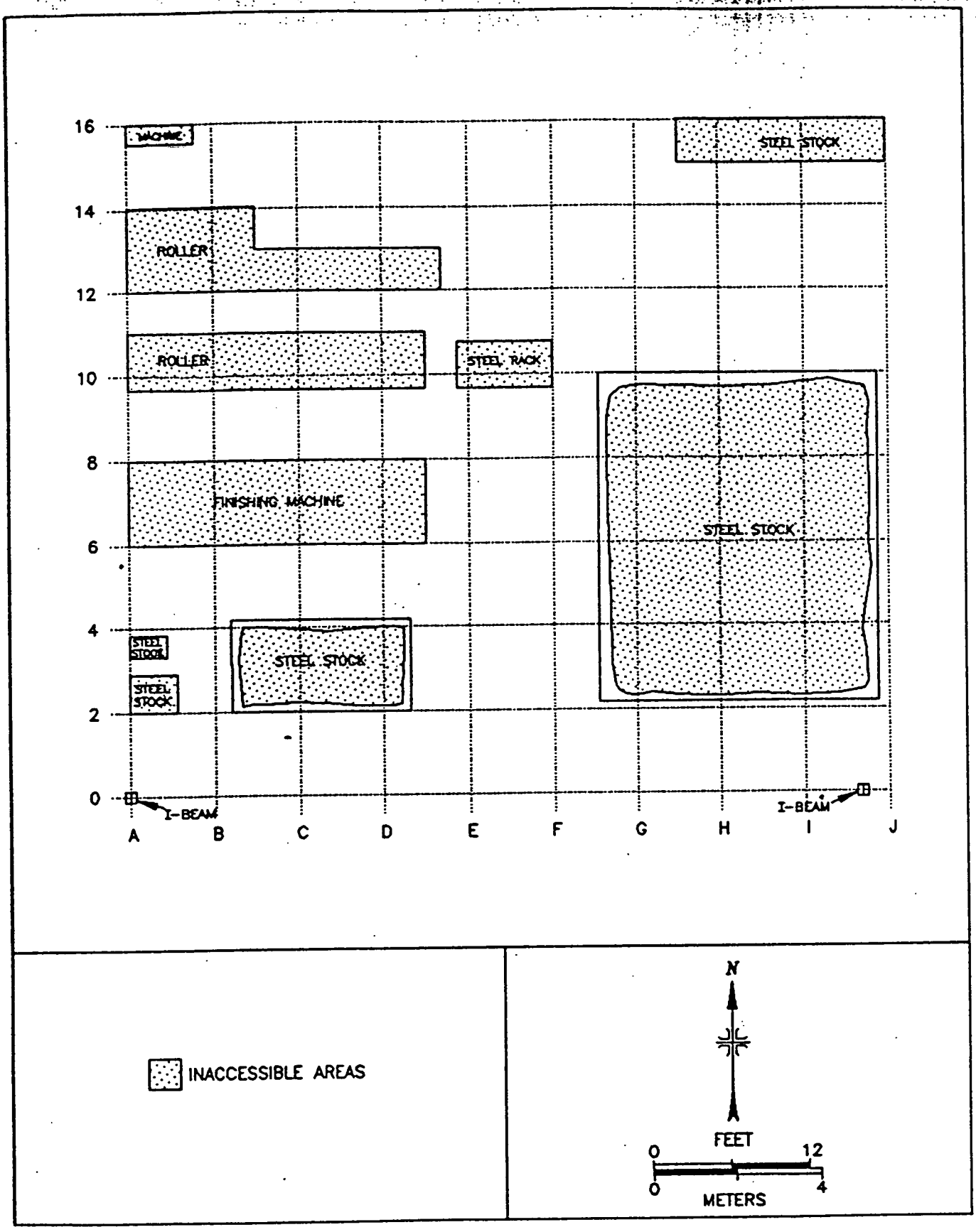


FIGURE 3: "Special Finishing" Area – Floor Plan and Reference Grid

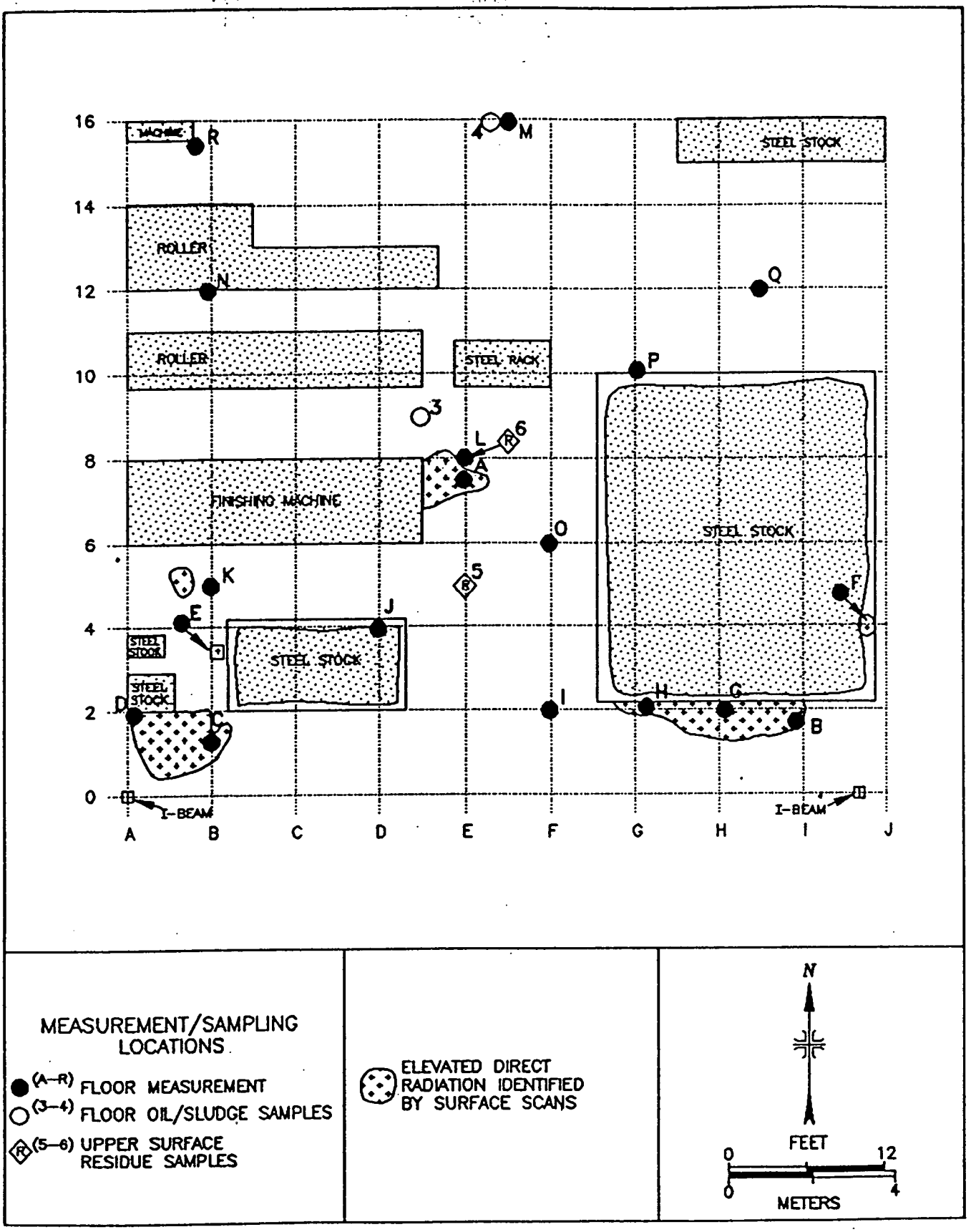


FIGURE 4: "Special Finishing" Area – Findings of Surface Scans and Measurement and Sampling Locations

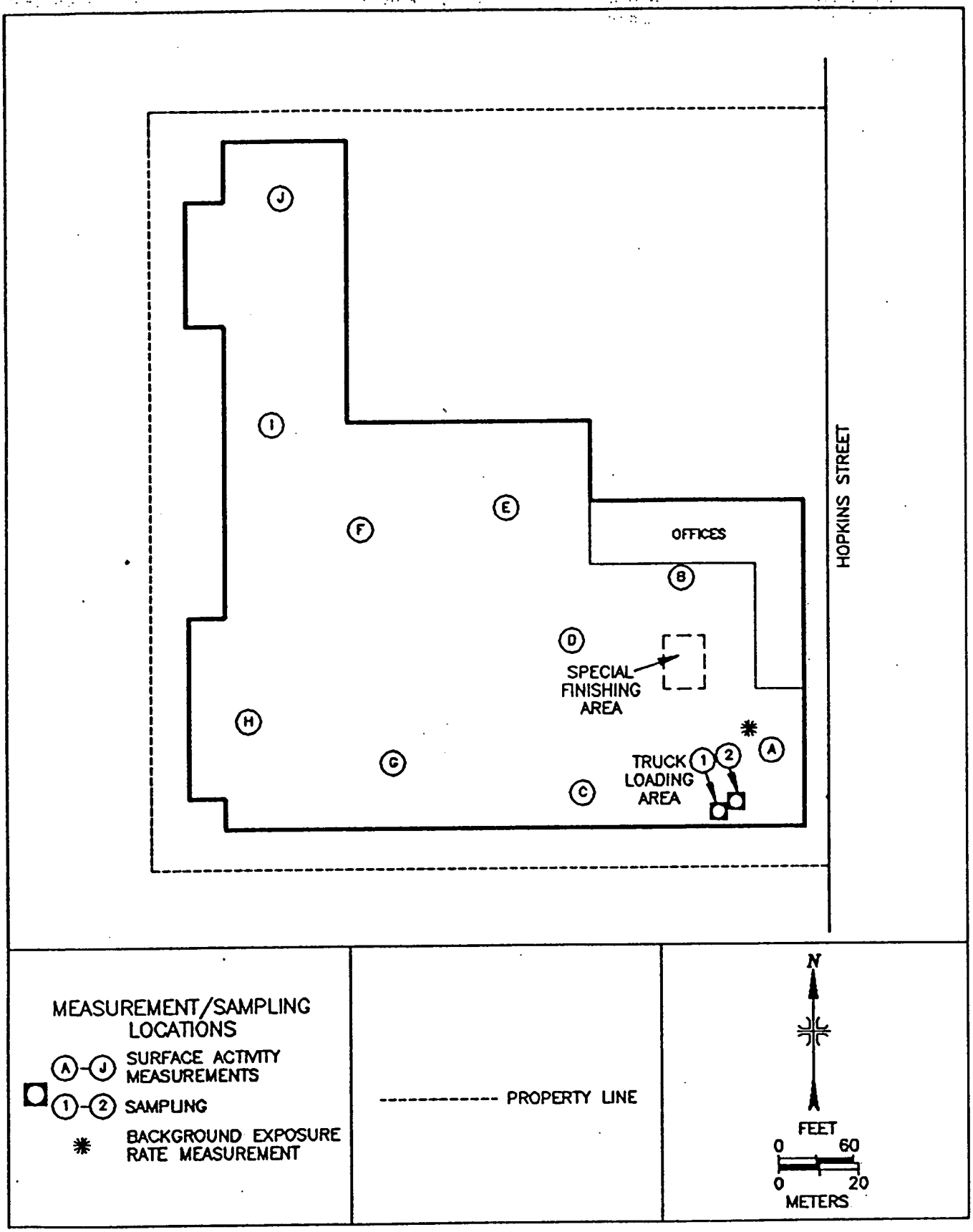


FIGURE 5: General Building Area – Measurement and Sampling Locations

TABLE 1

RESULTS OF SURFACE ACTIVITY MEASUREMENTS
"SPECIAL FINISHING" AREA
FORMER BLISS AND LAUGHLIN FACILITY
BUFFALO, NEW YORK

LOCATION*	SURFACE ACTIVITY LEVELS (dpm/100 cm²)		
	TOTAL BETA ACTIVITY	REMOVABLE ACTIVITY	
		ALPHA	BETA
A	700,000	430	540
B	60,000	<12	<15
C	240,000	<12	17
D	41,000	120	340
E	27,000	<12	19
F	21,000	17	39
G	4,700	<12	<15
H	28,000	19	26
I	<880	<12	<15
J	<880	<12	<15
K	<880	<12	<15
L	<880	<12	<15
M	<880	<12	<15

TABLE 1 (Continued)

RESULTS OF SURFACE ACTIVITY MEASUREMENTS
"SPECIAL FINISHING" AREA
FORMER BLISS AND LAUGHLIN FACILITY
BUFFALO, NEW YORK

LOCATION[a]	SURFACE ACTIVITY LEVELS (dpm/100 cm^2)		
	TOTAL BETA ACTIVITY	REMOVABLE ACTIVITY	
		ALPHA	BETA
N	<880	<12	<15
O	<880	<12	<15
P	<880	<12	<15
Q	<880	<12	<15
R	<880	<12	<15

[a]Refer to Figure 4.

TABLE 2

RESULTS OF SURFACE ACTIVITY MEASUREMENTS
GENERAL BUILDING AREA
FORMER BLISS AND LAUGHLIN FACILITY
BUFFALO, NEW YORK

LOCATION[a]	SURFACE ACTIVITY LEVELS (dpm/100 cm^2)		
	TOTAL BETA ACTIVITY	REMOVABLE ACTIVITY	
		ALPHA	BETA
A	<930	<12	<15
B	<930	<12	<15
C	<930	<12	<15
D	<930	<12	<15
E	<930	<12	<15
F	<930	<12	<15
G	<930	<12	<15
H	<930	<12	<15
I	<930	<12	<15
J	<930	<12	<15

[a]Refer to Figure 5.

TABLE 3

RADIONUCLIDE CONCENTRATIONS IN MISCELLANEOUS SAMPLES
FORMER BLISS AND LAUGHLIN FACILITY
BUFFALO, NEW YORK

SAMPLE TYPE	SAMPLING[a] LOCATION	RADIONUCLIDE CONCENTRATIONS (pCi/g)			
		U-235	U-238	Th-232	Ra-226
Soil/Slag	1 Subfloor Excavation	0.4 ± 0.1[b]	5.2 ± 1.6	3.7 ± 0.7	3.5 ± 0.5
Soil/Slag	2 Subfloor Excavation	<0.1	1.7 ± 1.1	1.4 ± 0.3	1.2 ± 0.2
Oil and Sludge	3 Floor Trench	0.2 ± 0.4	2.2 ± 0.4	0.4 ± 0.1	0.5 ± 0.1
Oil and Sludge	4 Floor Trench	0.1 ± 0.2	2.1 ± 0.4	0.2 ± 0.1	0.2 ± 0.1
Dust	5 Upper Beams	0.4 ± 0.1	4.3 ± 1.0	<0.1	<0.3
Dust	6 Upper Beams	0.4 ± 0.1	5.7 ± 1.2	0.1 ± 0.1	<0.4

[a]Refer to Figure 5.
[b]Uncertainties represent the 95% confidence level, based only on counting statistics.

REFERENCES

1. Attachment to letter from W.A. Williams (DOE/EM) to F. Archer (Niagara Cold Drawn Steel Co.), regarding history of MED/AEC activities at Bliss and Laughlin Steel Company, February 21, 1991.

2. "DOE Order 5400.5, Radiation Protection of the Public and the Environment", February 1990.

3. "Verification of 1983 and 1984 Remedial Actions, Niagara Falls Storage Site, Vicinity Properties, Lewiston, New York," S.A. Wical, et al., Oak Ridge Associated Universities, December 1989.

4. "Verification of 1985 and 1986 Remedial Actions, Niagara Falls Storage Site, Vicinity Properties, Lewiston, New York," J.D. Berger, et al., Oak Ridge Associated Universities, July 1990.

APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

APPENDIX A

MAJOR SAMPLING AND ANALYTICAL EQUIPMENT

The display or description of a specific product is not to be construed as an endorsement of that product or its manufacturer by the authors or their employer.

DIRECT RADIATION MEASUREMENT

Instruments

Eberline Pulse Ratemeter
Model PRM-6
(Eberline, Santa Fe, NM)

Ludlum Ratemeter-Scaler
Model 2221
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Ludlum Floor Monitor
Model 239-1
(Ludlum Measurements, Inc.,
Sweetwater, TX)

Reuter-Stokes Pressurized Ion Chamber
Model RSS-111
(Reuter-Stokes, Cleveland, OH)

Detectors

Eberline GM Detector
Model Hp-260
Effective Area, 15 cm^2
(Eberline, Santa Fe, NM)

Eberline ZnS Scintillation Detector
Model AC-3-7
Effective Area, 59 cm^2
(Eberline, Santa Fe, NM)

Victoreen NaI(Tl) Scintillation Detector
Model 489-55
3.2 cm x 3.8 cm crystal
(Victoreen, Cleveland, OH)

Ludlum Gas Proportional Detector
Model 43-37
Effective Area, 550 cm^2
(Ludlum Measurements, Inc.,
Sweetwater, TX)

LABORATORY ANALYTICAL EQUIPMENT

Low Background Gas Proportional Counter
Model LB-5110
(Tennelec, Oak Ridge, TN)

High Purity Extended Range Intrinsic Detectors
Model No: ERVDS30-25195
(Tennelec, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-11
(Nuclear Lead, Oak Ridge, TN) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

High-Purity Germanium Detector
Model GMX-23195-S, 23% Eff.
(EG&G ORTEC, Oak Ridge, TN)
Used in conjunction with:
Lad Shield Model G-16
(Gamma Products, Palos Hills, IL) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

High-Purity Germanium Coaxial Well Detector
Model GWL-110210-PWS-S, 23% Eff.
(EG&G ORTEC, Oak Ridge, TN)
Used in conjunction with:
Lead Shield Model G-16
(Applied Physical Technology, Atlanta, GA) and
Multichannel Analyzer
3100 Vax Workstation
(Canberra, Meriden, CT)

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

APPENDIX B

SURVEY AND ANALYTICAL PROCEDURES

SURVEY PROCEDURES

Surface Scans

Surface scans were performed by passing the probes slowly over the surface; the distance between the probe and the surface was maintained at a minimum - nominally about 1 cm. Identification of elevated levels was based on increases in the audible signal from the recording or indicating instrument. Scans of large surface areas on the floor of the facility were performed with a gas proportional floor monitor. The detector was moved slowly over 100% of the accessible floor surface in the "special finishing" area; other building floors were scanned in a random pattern to provide coverage of 10 to 20% of the surface. Equipment and overhead surfaces were scanned using smaller, hand-held detectors. Combinations of detectors and instruments used for the scans were:

Alpha	-	ZnS Scintillation detector with ratemeter-scaler.
Alpha-Beta	-	Gas Proportional detector with ratemeter-scaler.
Beta	-	GM detector with ratemeter-scaler.
Gamma	-	NaI Scintillation detector with ratemeter.

Surface Activity Measurements

Measurements of total beta surface activity were performed using portable ratemeter-scalers with thin-window "pancake" GM detectors. Count rates (cpm) were converted to disintegration rates (dpm/100 cm^2) by dividing the net rate by the 4 π efficiency and correcting for the active area of the detector. The effective window area was 15 cm^2 for the GM detectors; the average background count rate for the GM detectors was 55 cpm and the average efficiency was 27%.

Removable Activity Measurements

Smears for determination of removable activity were performed using numbered filter paper disks, 47 mm in diameter; smears were sealed in labeled envelopes with the locations and other pertinent information recorded. The smears were returned to laboratories in Oak Ridge and counted on a low-background gas-proportional counter for alpha and gross beta activity.

Exposure Rate Measurements

Measurement of gamma exposure rate at the background location was performed using a Reuter-Stokes pressurized ionization chamber; the detector was placed 1 m above the floor and a series of consecutive readings obtained and averaged to determine the exposure rate.

ANALYTICAL PROCEDURES

Gamma Spectrometry

Samples were placed in appropriate containers, chosen to reproduce calibrated counting geometries. The net weights were determined and the samples counted using germanium detectors coupled to a Canberra pulse height analyzer system. Background and Compton striping, peak search, peak identification, and concentration calculations were performed using

the computer capabilities inherent in the analyzer 3100 Vax workstation system. Energy peaks, used for determination of radionuclides of concern, were:

U-235	0.185 MeV
U-238	0.093 MeV from Th-234*
Th-232	0.911 MeV from Ac-228*
Ra-226	0.609 MeV from Bi-214*

*Secular equilibrium assumed.

Spectra were reviewed for other identifiable photopeaks.

UNCERTAINTIES AND DETECTION LIMITS

The uncertainties associated with the analytical data presented in the tables of this report represent the 95% confidence level for that data. These uncertainties were calculated based on both the gross sample count levels and the associated background count levels. When the net sample count was less than the 95% statistical deviation of the background count, the sample concentration was reported as less than the detection limit of the measurement procedure. Because of variations in background levels, measurement efficiencies, and contributors from other radionuclides in samples, the detection limits differ from sample to sample and instrument to instrument. Additional uncertainties of $\pm$ 6 to 10%, associated with laboratory procedures, have not been propagated into the data presented in this report.

QUALITY ASSURANCE

Analytical and field survey activities were conducted in accordance with procedures from the following documents:

- Survey Procedures Manual, Revision 6, February 1991
- Quality Assurance Manual, Revision 4, April 1991
- Laboratory Procedures Manual, Revision 6, April 1991

The procedures contained in these manuals were developed to meet the requirements of DOE Order 5700.6B and ANSI/ASME-NQA1.

Calibration of all field laboratory instrumentation is based on NIST-traceable standards, when such standards are available. In cases where they are not available, standards of an industry recognized organization are used. Calibration of pressurized ionization chambers is performed by the manufacturer.

Quality Control procedures include:

- Daily instrument background and check-source measurements to confirm that the equipment operation is within acceptable statistical fluctuations
- Participation in EPA and EML Quality Assurance Programs
- Training and certification of individuals performing procedures
- Periodic internal and external audits

APPENDIX B

APPENDIX B

APPENDIX B

GEOLOGIC LOGS/WELL CONSTRUCTION DIAGRAMS

LOG OF BORING

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
RAMCO STEEL	25848-001-152	1 of 1	RMW-1

SITE	COORDINATES	LOGGED BY	CHECKED BY
Buffalo, NY	1035452.946 / 431907.029	K. Ignaszak	P. Smith

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
1-5-93	1-6-93	Empire Soils/K. Fuller	CME 45-C Track Mount, HS Augers	8"	7.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
/		5	3	584.59 MSL	▽ 2.28 / 582.3 ▼ 2.28 / 582.3	7.5 / 577.1

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
Split Spoon		HNu background reading = 0.0ppm

SAMPLE NUMBER	LENGTH/RECOV. (inches)	BLOWS PER FOOT	HNu (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
1	24/12	2	0.3	583.1 1.5	BROWN TO DARK BROWN SANDY SILT and trace silty clay, some organic material (saturated) (soft)	
2	24/18	2	1.4		BROWN TO LIGHT BROWN SILTY SAND (saturated) (soft)	Soil Sample from four to six feet at RMW-1.
3	24/24	5	0.8	579.6 5.0	GRADES TO BROWN TO GRAY SILTY CLAY with gray fine graded gravel (saturated) (soft)	Obstruction hit at six feet. Augers walk around it. Driller feels material is too hard for Shelby tube, take splitspoon instead. Moved hole forty feet to the North and redrill. Pushed Shelby Tube from five to seven feet.
4	12/4	53	1.8	577.6 577.9	BROWN TO GRAY SILTY CLAY with gray fine graded gravel (wet) (dense)	
5	1/4	80/1"	3.2	7.8	GRADES TO DARK GRAY SHALE FRAGMENTS with trace of dark gray fine grained silty sand (wet) (dense) (slight petro odor)	
					DARK GRAY SHALE FRAGMENTS with trace of dark gray fine grained silty sand (wet) (dense) (slight petro odor, some cuttings in sample) Boring completed at 7.5 feet @10:40 on 1/6/93 (Monitoring well constructed in borehole- 2" Dia. PVC with 4' of 0.020 screen set at 7.5')	

DEPTH: 5, 10, 15, 20, 25, 30, 35

GRAPHIC LOG / SAMPLE

Dames & Moore

WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
RAMCO STEEL	25848-001-152	RMW-1

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Buffalo, NY	1035452.946 / 431907.029	584.59 MSL ☒Surveyed ☐Estimated	3

Soil Boring Cross-Reference RMW-1
Town and City Buffalo
County and State Erie, NY

Installation Date (s) 1/8/93

Drilling Method CME 45-C Track Mount, HS Augers
Drilling Contractor Empire Soils/K. Fuller
Drilling Fluid None

Development Technique (s) / Dates
SS Bailer
2/8/93

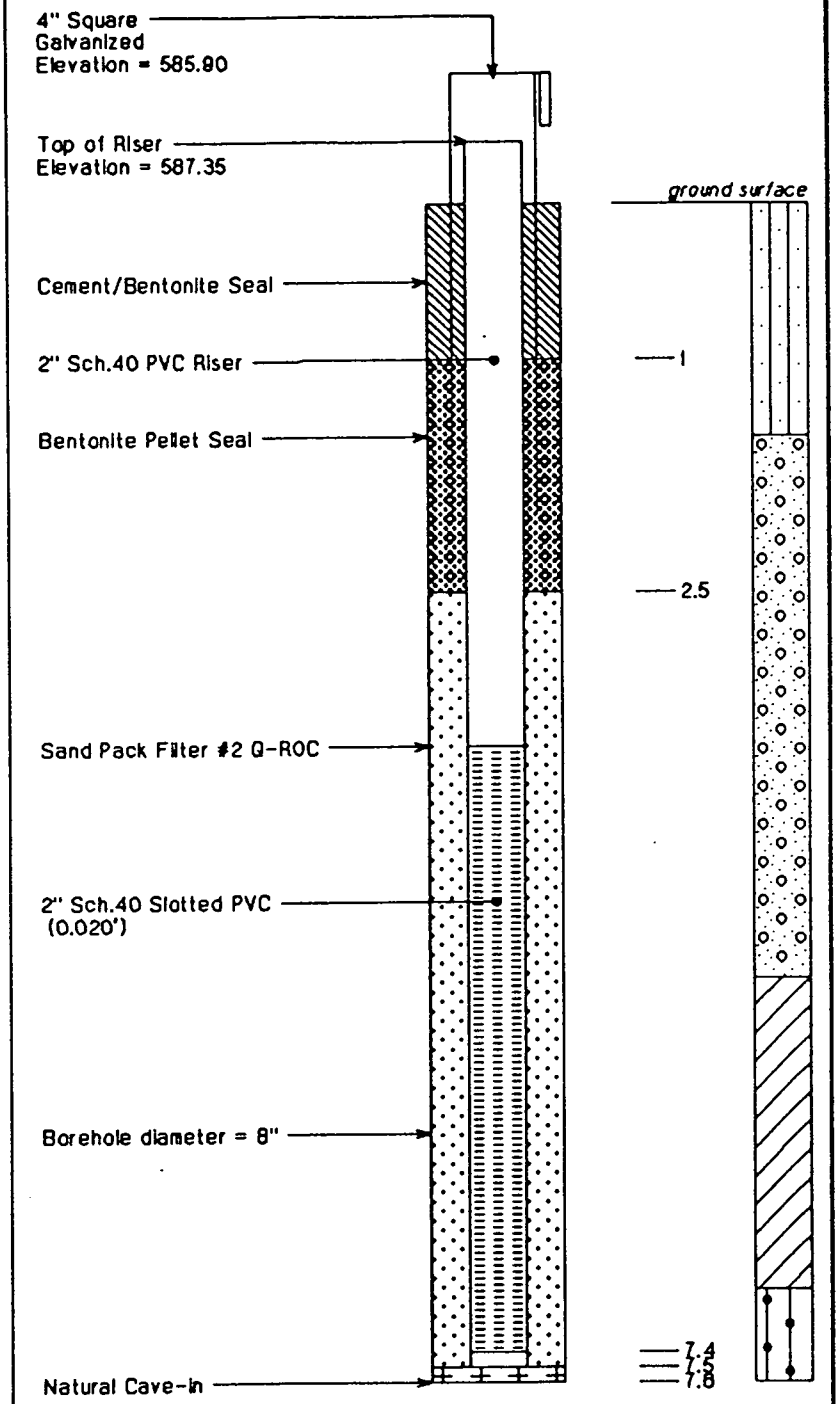
Fluid Loss During Drilling (gals)
Water Removed During Development (gals)
4.5 gallons - 2/8/93

Static Depth to Water Date 6/16/93
Static Depth to Water (feet) 5.02 TOR

Well Purpose Groundwater sampling

Remarks Not to Scale

Prepared By K. Ignaszak
Date Prepared 3/8/93



Dames & Moore

LOG OF BORING

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
RAMCO STEEL	25848-001-152	1 of 1	RMW-2

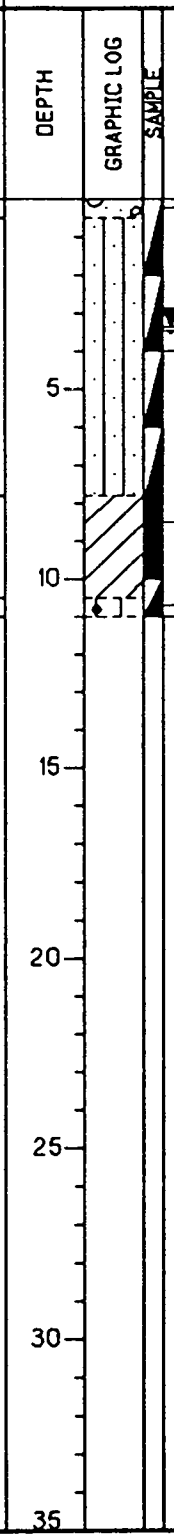
SITE	COORDINATES	LOGGED BY	CHECKED BY
Buffalo, NY	1035324.620 / 432246.150	K. Ignaszak	P. Smith

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
1-6-93	1-6-93	Empire Soils/K. Fuller	CME 45-C Track Mount, HS Augers	8"	11

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
/		6	3	586.07 MSL	▽ 3.37 / *582.7* ▼ 3.37 / *582.7*	10.5 / *575.6*

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
Split Spoon		HNu background reading = 0.0ppm

SAMPLE NUMBER	LENGTH/RECOV. (inches)	BLOWS PER FOOT	HNu (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
1	24/12	18	20	*585.6* .5	MOTTLED REDDISH BROWN BRICK FRAGMENTS with brown sandy silt trace of silty clay (moist) (medium stiff)(FILL)	Soil sample taken from 0-2 feet.
2	24/8	7	4			
3	24/0	5	BKG		DARK GRAY COARSE GRAINED SILTY SAND with some sandy silt and silty clay (moist) (soft to slightly stiff)	No recovery from four to six feet
4	24/18	2	0.4	*578.3* 7.8		
5	24/24	push	BKG		GRAY TO OLIVE GRAY SILTY CLAY with fine silty sand (moist) (soft)	Shelby tube pushed from 8-10 feet
6	12/12	97	3	*575.6* *575.1* 11.0	DARK GRAY LIMESTONE FRAGMENTS with trace of dark gray silty sand (wet) (dense) (slight petro odor)	
					Boring completed at 11 feet @14:15 on 1/6/93 (Monitoring well constructed in borehole - 2" Dia. PVC with 5' of 0.020 screen set at 10.0')	



Dames & Moore

WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
RAMCO STEEL	25848-001-152	RMW-2

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Buffalo, NY	1035324.620 / 432246.150	586.07 MSL ☒Surveyed ☐Estimated	3

Soil Boring Cross-Reference: RMW-2
Town and City: Buffalo
County and State: Erie, NY

Installation Date (s): 1/8/93

Drilling Method: CME 45-C Track Mount, HS Augers
Drilling Contractor: Empire Soils/K. Fuller
Drilling Fluid: None

Development Technique (s) / Dates
SS Bailer
2/9/93

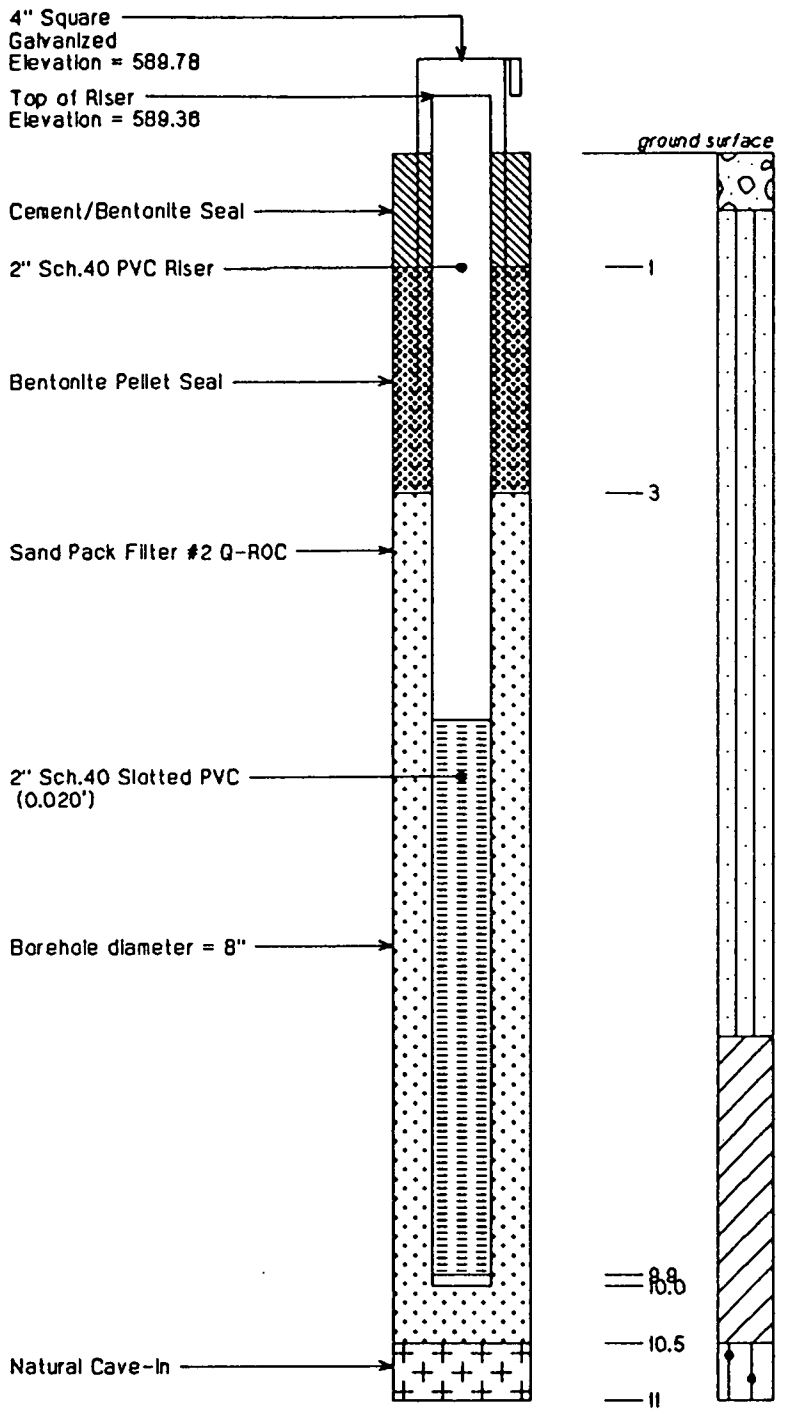
Fluid Loss During Drilling (gals):
Water Removed During Development (gals)
12 gallons - 2/9/93

Static Depth to Water Date: 6/16/93
Static Depth to Water (feet): 8.66 TOR

Well Purpose: Groundwater sampling

Remarks: Not to Scale

Prepared By: K. Ignaszak
Date Prepared: 3/8/93



Dames & Moore

LOG OF BORING

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
RAMCO STEEL	25848-001-152	1 of 1	RMW-3

SITE	COORDINATES	LOGGED BY	CHECKED BY
Buffalo, NY	1034947.564 / 432062.677	K. Ignaszak	P. Smith

BEGUN	COMPLETED	DRILLER	DRILLING EQUIPMENT	BORING DIA.	TOTAL DEPTH
1-6-93	1-6-93	Empire Soils/K. Fuller	CME 45-C Track Mount, HS Augers	8"	11

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
/		8	3	582.69 MSL	▽ 0.88 / *581.8* ▼ 0.88 / *581.8*	9.0 / *573.7*

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
Split Spoon		HNu background reading = 0.0ppm

SAMPLE NUMBER	LENGTH/RECOV. (Inches)	BLOWS PER FOOT	HNu (ppm)	LAYER *Elev.* Depth	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
1	8/0	140	BKG		DARK BROWN SANDY SILT AND GRAY FINE TO MEDIUM GRADED GRAVEL (moist) (dense)[FILL] (RR track bed)	RR track bed. Driller augers to 2' and takes splitspoon
				580.7 2.0		
2	24/12	13	2.5	*579.7* 3.0	DARK BROWN COARSE SILTY SAND with silty clay (moist) (soft)	Soil sample taken from 2-4 feet.
3	24/12	28	0.4		DARK GRAY CLAYEY SILT with silty fine sand trace of fine gravels (moist) (soft)	
				576.7 *576.5* 6.2	GRAY FINE GRADED GRAVEL from 6-6.2 feet	Attempt to push Shelby tube from 6' unsuccessful
4	24/24	28	2.5		MOTTLED BROWN AND REDDISH BROWN SILTY CLAY (moist) (medium stiff)	
5	24/24	push	BKG			Push Shelby tube from 8-8 feet
6	6/2	120	2.8	*573.7* 9.0		
				571.7 11.0	DARK GRAY LIMESTONE with trace of dark gray silty sand (wet) (dense) (slight petro odor)	
					Boring completed at 11 feet @17:15 on 1/6/93 (Monitoring well constructed in borehole- 2" Dia. PVC with 5' of 0.020 screen set at 10.5')	

5 10 15 20 25 30 35

Dames & Moore

WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
RAMCO STEEL	25848-001-152	RMW-3

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Buffalo, NY	1034947.564 / 432062.677	582.69 MSL ☒Surveyed ☐Estimated	3

Soil Boring Cross-Reference *RMW-3*
Town and City *Buffalo*
County and State *Erie, NY*

Installation Date (s) *1/8/93*

Drilling Method *CME 45-C Track Mount, HS Augers*
Drilling Contractor *Empire Soils/K. Fuller*
Drilling Fluid *None*

Development Technique (s) / Dates
SS Bailer
2/9/93

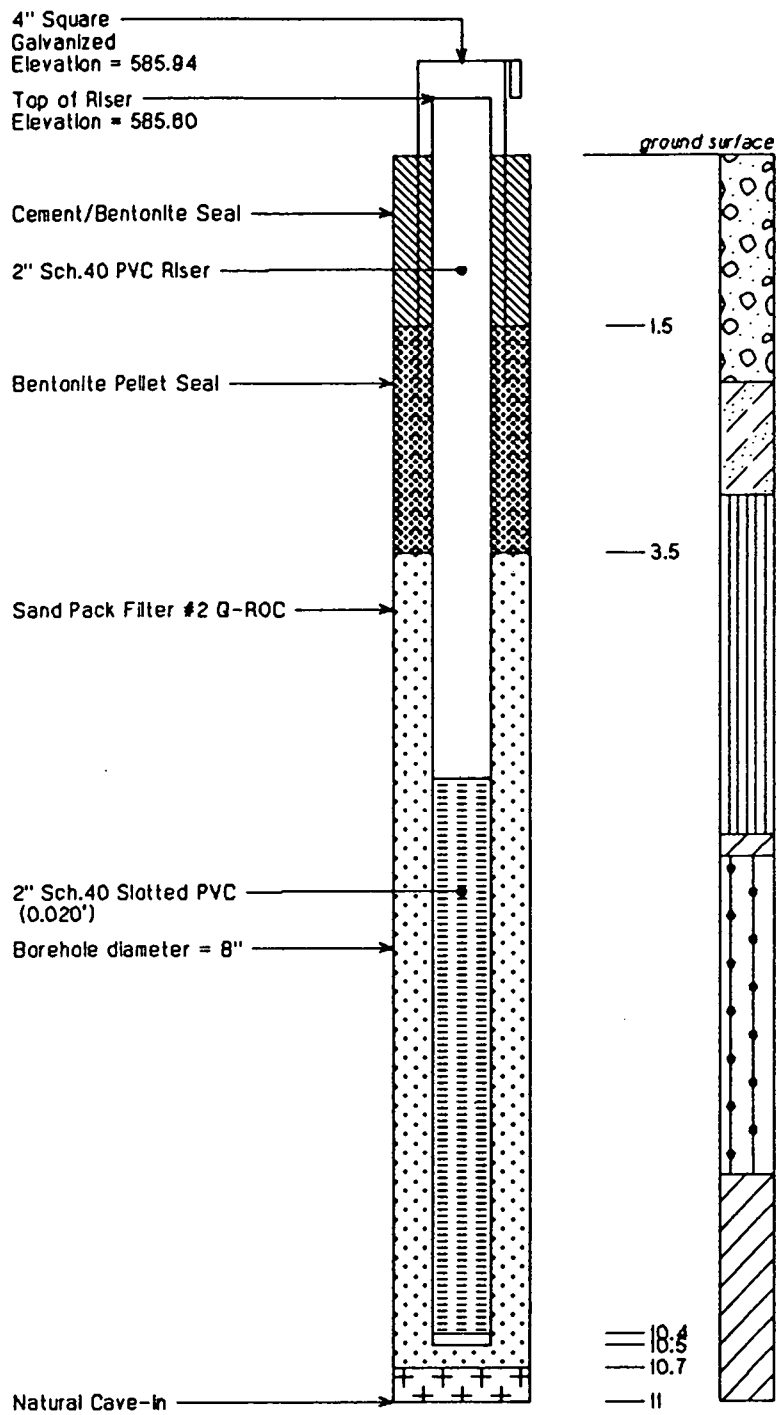
Fluid Loss During Drilling (gals)
Water Removed During Development (gals)
35 gallons - 2/9/93

Static Depth to Water Date *6/16/93*
Static Depth to Water (feet) *3.79 TOR*

Well Purpose *Groundwater sampling*

Remarks ***Not to Scale***

Prepared By *K. Ignaszak*
Date Prepared *3/8/93*



Dames & Moore

DAMES & MOORE
BORING LOG

BORING NO.: CW-1
SURFACE ELEV: 585.47'

CLIENT: NYSDEC
LOCATION: ALLTIFT REALTY

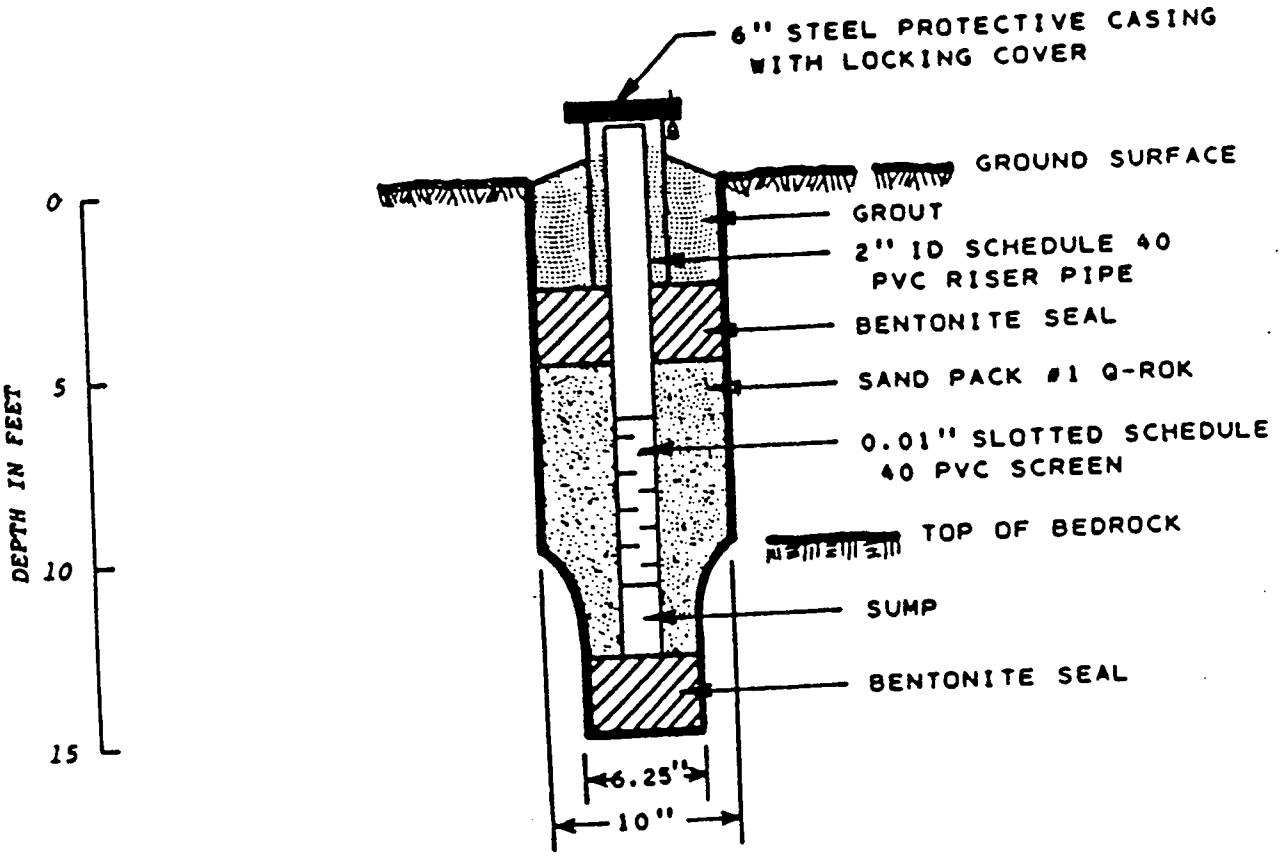
DRILLING METHOD: Hollow stem auger

SAMPLING METHOD: Split spoon

DATE STARTED: 7/16/85
DATE FINISHED: 7/16/85

SAMPLE NO.	BLOWS/FT	SAMPLE TYPE	DEPTH IN FT.	SOIL GRAPH	MATERIAL DESCRIPTION
			0		Black organic silty topsoil
1	4	SS	1		Tan fine sand with some black organic silt Hnu=0
			2		
			3		grading moist
			4		grading some clay and gravel
			5	SM	
2	11	SS	6		
			7		
			8		grading with cobbles
			9		
			10	GM	Brown gravel with brown wet sand and some clay (Till) Hnu=1ppm
3	50/2.5"	SS	11		Black stained limestone (Onondaga Limestone)
			12		
			13		
			14		
			15		Boring terminated at a depth of 15.0 feet on 7/16/85.

REFERENCE 3



ENGINEERING-SCIENCE
IN ASSOCIATION WITH
DAMES & MOORE

NEW YORK STATE DEPARTMENT
OF ENVIRONMENTAL CONSERVATION
PHASE II REPORT

WELL SCHEMATIC
BORING CW-1
ALLTIFT REALTY

APPENDIX B

R15

REFERENCE 5

SITE LOCATION: Allfift Landfill, Buffalo New York. DATE DRILLED: November 5, 1991
BORING LOCATION: GEOLOGIST: Jeff Stevenson
DRILLER: Moody Drilling DRILLING METHOD: 6 1/4" I.D. HSA

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL	BLOW COUNTS*	REC* (in)	HNu (ppm)	Lithologic Description
0			Pushed			Peat and Organic SILT (OM). (0-1')
1						
2						Grey, green silty sandy clay, wet to saturated (1'-6')
3						
4						
5						
6			Pushed			~~Silty~~ CLAY (CH), ~~gray~~ brown, with ~~some gravel~~. plastic, wet. End of Boring. (6'-6.6')
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						

BORING MW-1S

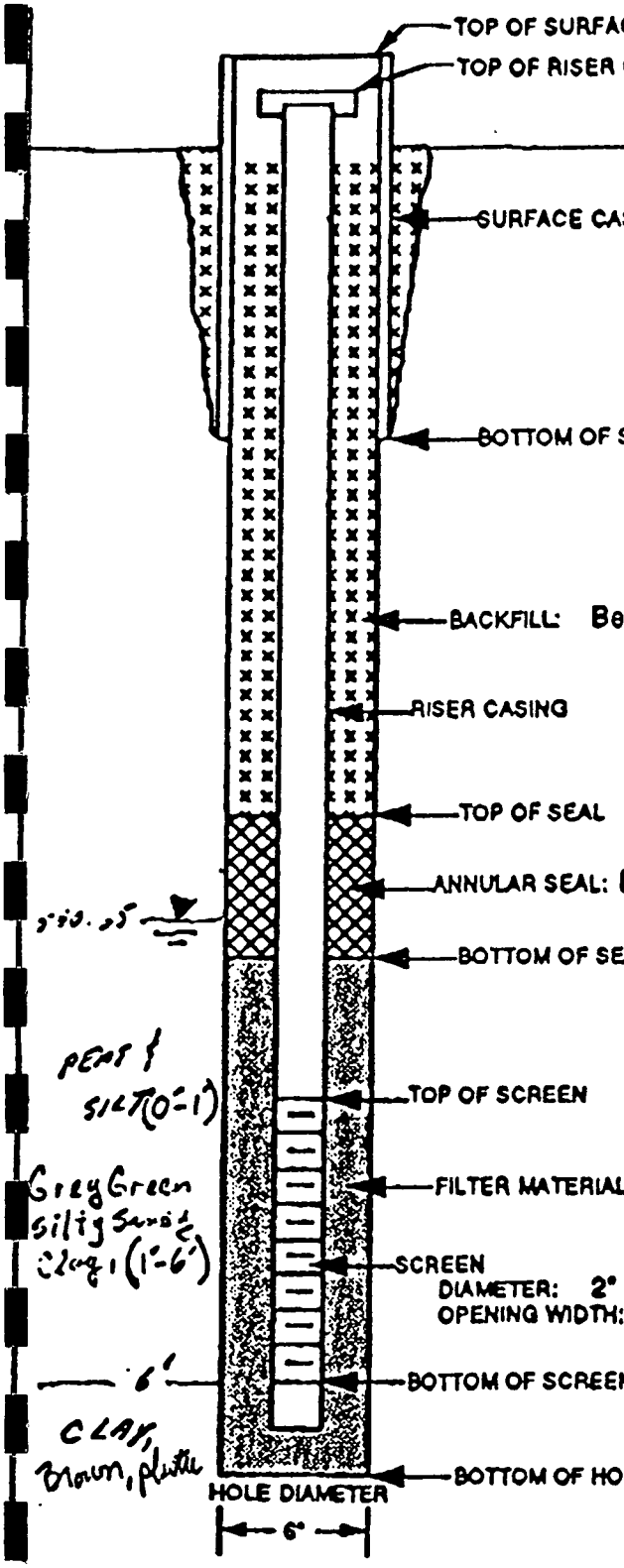
PROJECT No.: 007309 PAGE: 1 of 1

METCALF & EDDY, INC., Columbus, Ohio M&E

MONITORING WELL CONSTRUCTION

PROJECT: Alliit	JOB NO. 007309-0002	WELL NO MW-1S	
DRILLING CONTRACTOR: Moody's	COORDINATES:		
BEGUN: 11/5/91	SUPERVISOR: Jeff Stevenson	WELL SITE:	WATER LEVEL: 3.33'
FINISHED: 11/5/91	DRILLER: Dave Lynn/Jeff Swafford		DEPTH/ELEV. 581.42

REFERENCE POINT & ELEVATION:



	DEPTH	ELEVATION
TOP OF SURFACE CASING: 2' 6" / TOP OF RISER CASING: 2' 0" / GROUND SURFACE	0	582.71
BOTTOM OF SURFACE CASING	2' 0"	580.71
TOP OF SEAL	Surface	582.71
BOTTOM OF SEAL	2' 6"	580.21
TOP OF SCREEN	3' 0"	579.71
BOTTOM OF SCREEN	6' 0"	576.71
BOTTOM OF HOLE	6' 3"	576.46

METHOD DRILLED: Hollow Stem Auger

METHOD DEVELOPED: Surged and Bailed

COMMENTS: Due to shallow water table, Benonite Pellets were placed to the surface.

Metcalf & Eddy

SITE LOCATION: Alliift Landfill #7309, Buffalo New York
BORING LOCATION:
DRILLER: Moody Drilling

DATE DRILLED: November 4, 1991
GEOLOGIST: Jeff Stevenson
DRILLING METHOD: CABLE TOOL

DEPTH (ft)	SAMPLE NUMBER	SAMPLE INTERVAL	BLOW COUNTS*	REC (in)	HNu (ppm)	Lithologic Description
0		0-2'	Pushed		bkgd	Organic SILT (OM), black., and Root
1						
2						
3						
4						
5						
6		6-8'	Pushed	24	bkgd	Silty CLAY (CH), gray brown, with gravel.
7						
8					bkgd	Clayey GRAVEL (GC).
9						TILL (gravel+Clay) & some sand
10						9'-11' limestone gravel & some coarse sand and trace of Clay
11						
12						11.5-13.5 - weathered rock grading to solid rock
13			Pushed		bkgd	Clayey GRAVEL (GC), mostly ~~black~~ limestone. limestone gravel & some shale pieces (13')
14						13'-17' limestone gravel & some shale pieces
15						
16						
17			Cuttings		bkgd	Shaley LIMESTONE becomes SHALE, black.
18						17'-22' limestone + shale, appears to be interbedded
19						

BORING MW-1D

PROJECT No.: 007309

METCALF & EDDY, INC., Columbus, Ohio

M&E

DEPTH (Ft)	SAMPLE NUMBER	SAMPLE INTERVAL	BLOW COUNTS*	REC (in)	HNu (ppm)	Lithologic Description
20						
21						
22			Cuttings			SHALE, black.
23						22-25' - mostly shale fragments & little limestone
24						
25						SHALE, black.
26						23-28' mostly shale fragments & trace of limestone
27						
28						
29						
30						End of Boring. 30' - dry
31						
32						
33						
34						
35						
36						
37						
38						
39						
40						

BORING MW-1D (cont.)

MONITORING WELL CONSTRUCTION

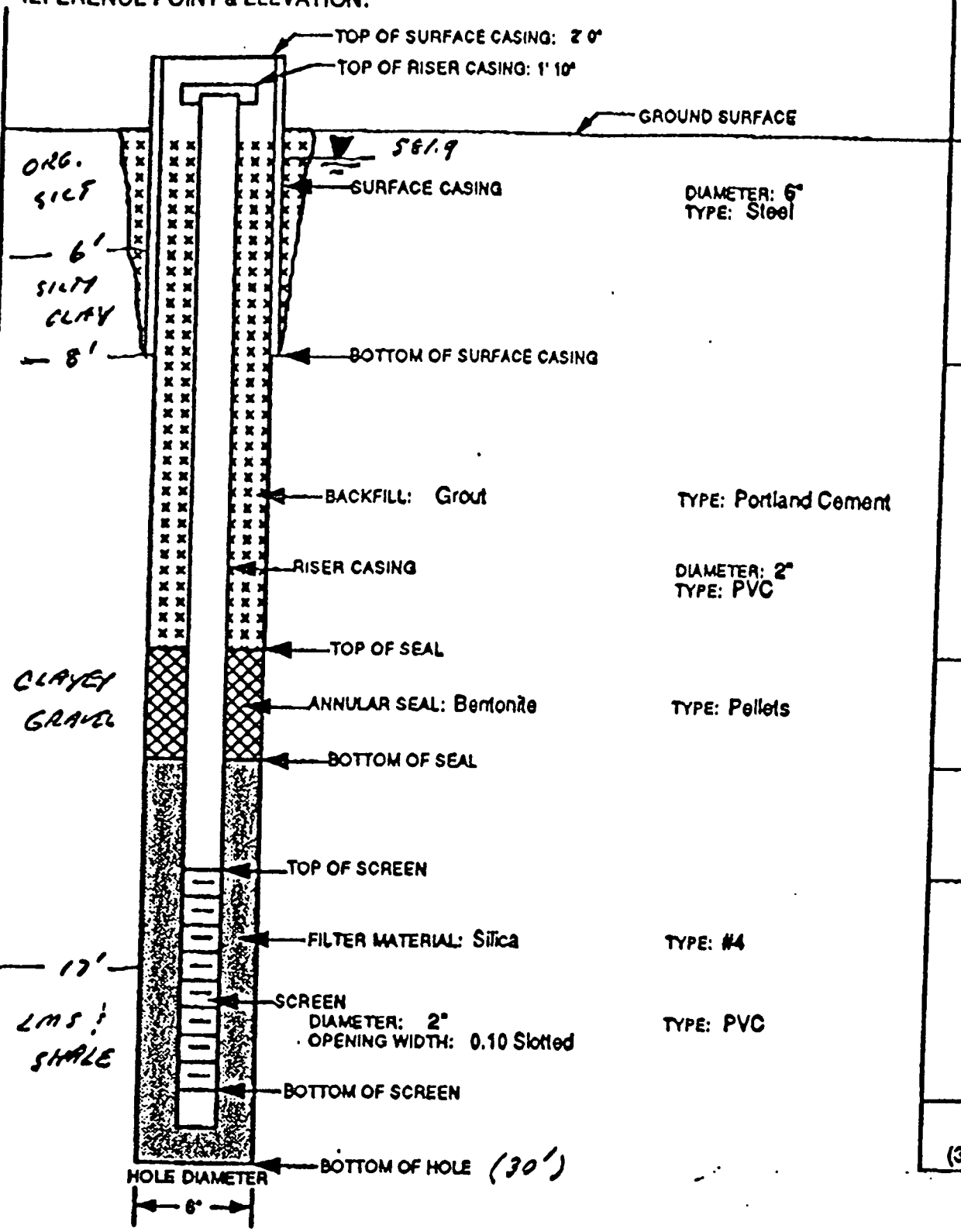
PROJECT: Alkift | JOB NO. 007309-0002 | WELL NO MW-1D

DRILLING CONTRACTOR: Moody's | COORDINATES:

BEGUN: 11/2/91 | SUPERVISOR: Todd Struttmann/Todd Fisher | WELL SITE: | WATER LEVEL: 2.28' | DEPTH/ELEV 581.46

FINISHED: 11/4/91 | DRILLER: Bill Knight

REFERENCE POINT & ELEVATION:



	DEPTH	ELEVATION
GROUND SURFACE	0	582.21
BOTTOM OF SURFACE CASING	8' 0"	574.21
TOP OF SEAL	10' 0"	572.21
BOTTOM OF SEAL	12' 0"	570.21
TOP OF SCREEN	12' 0"	570.21
BOTTOM OF SCREEN	22' 0"	560.21
BOTTOM OF HOLE	22' 3" (31' 0")	559.96

METHOD DRILLED: Cable Tool

METHOD DEVELOPED: Pumped

COMMENTS: Bottom of hole backfilled to 22' 3". WITH WHAT?

Metcalf & Eddy

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : Ramco Steel RI — PROJECT No. : 25048-001
WEATHER CONDITIONS : Low 40's, cloudy, slight breeze — DATE : 12-29-92
CLIENT : Axia, Inc. — CONTRACTOR : SJB Services, Inc.
INSPECTOR : P. Smith — EQUIPMENT : Foro 655A

TEST PIT No. : Test Pit #1 - (TP-1) — ELEVATION :
START TIME : 8:50 AM — STOP TIME : 9:50 AM — GROUNDWATER DEPTH : ~ 2.5' below grade

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
5		0-2' Lt. Brown SANDY SOIL with SILT SOME GRAVEL 2-4' Reddish brown Sandy ½-1" size, Some brick frags., Cinders 4'-5' Grey-Green SILT, SATURATED, Sticky 5'-10' Lt brown/TAN SILTY SAND, fine w/silt, LOOSE reddish brown sand strings some grey clay w/ reddish strings	water encountered at ~ 2.5' below grade SAMPLE TP-1-1 (4') - Grey Green Silt TIME: 9:10 AM ANALYSIS: LIMITED SUITE
10		10' DENSE grey CLAY stratified red, brown, layering SOME SAND strings, moist	SAMPLE TP-1-2 (9') - TAN SILTY SAND TIME: 9:30 AM ANALYSIS: LIMITED SUITE
15		END TEST PIT AT ~ 10' below grade Bedrock encountered. - limestone pieces observed.	Backfilled hole 9:50 - 10:00 AM
20			
25			

COMMENTS :

ZONES OF SEEPAGE : G.W. encountered at ~ 2.5' b.g. - filled hole w/ static level at ~ 2.5' bg

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : Ranco Steel RI
PROJECT No. : 25848-001
WEATHER CONDITIONS : Low 40's, overcast, light breeze
DATE : 12-29-92
CLIENT : AXIA, Inc.
CONTRACTOR : SJB Services, Inc.
INSPECTOR : P. Smith
EQUIPMENT : Ford 655A

TEST PIT No. : TEST PIT #2 - (TP-2)
ELEVATION :
START TIME : 10:00 AM
STOP TIME : 10:50 AM
GROUNDWATER DEPTH : @ 3' below grade

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
		0-3' Grey Brown to black silty sand and slag, with black cinders	
		3-4' Red - red/Brown slag w/water	water filling hole from red slag zone (3-4')
		4-5' Black with grey silt, loose to st. ff confining material for water above	- Heavy oily sheen noted in water
5		5-6' Brown sand with silt, st. ff, moist	Sample TP-2-1 (4-6')
		6-8' Brown clay with silt, dense, st. ff, moist	- Black/grey silt
		8.5' - bedrock, limestone frag. w cuttings.	Time: 10:20 AM
10		End test pit at 8.5' below grade	Analysis: Full TCL/TAL
			- HNU - 1 ppm
			OVA 0 % LEL
			Back filling hole at 10:30-11:00
15			
20			
25			

COMMENTS :

ZONES OF SEEPAGE : G.W. encountered at ~ 3' w/in red/brown slag material
Static level ~ 3' below grade

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : Ramco Steel RI
PROJECT No. : 25848-001
WEATHER CONDITIONS : Low 40's, overcast, light breeze
DATE : 12-29-92
CLIENT : AKIA, INC
CONTRACTOR : SJB Services, Inc.
INSPECTOR : P. Smith
EQUIPMENT : Fxo 655A

TEST PIT No. : Test Pit #3 - (TP-3)
ELEVATION :
START TIME : 11:05
STOP TIME : 11:45
GROUNDWATER DEPTH : None encountered

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
5		0-2' Black Cinders/Soil, loose moist 2-8' Grey/brown mottled clay, st.ft, dense, damp w. the same roots. 8' - Bedrock - Limestone - water percolating in from clay/bedrock interface END TEST PITS AT 8' below grade	SAMPLE TP-3-1 (0-2') - Black Cinders TIME: 11:30 AM ANALYSIS: LIMITED SUITE NO significant amount of water encountered in hole Backfilled hole 11:30-11:45
10			
15			
20			
25			

COMMENTS :

ZONES OF SEEPAGE : Water percolating from interface of clay w/ bedrock

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : Ramco Steel RI — PROJECT No. : 25848-001
WEATHER CONDITIONS : Low 40's, overcast, slight drizzle — DATE : 12-29-92
CLIENT : Axia Inc. — CONTRACTOR : SSB Services, Inc.
INSPECTOR : P. Smith — EQUIPMENT : Ford 655A

TEST PIT No. : Test Pit #4 - (TP-4) — ELEVATION :
START TIME : 11:45 — STOP TIME : 12:35 — GROUNDWATER DEPTH : ~3' below grade

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
		0-3' Grey to brown silty SOIL w/ Construction debris - Concrete, Asphalt, some metal pieces	
		3-4' black cinders. Strong organic/sewer odor, saturated, oily Appearance (sheen)	WATER encountered ~3' bg
5		4-6' Construction debris, wood, concrete, bricks, w/peat like mat'l, saturated black oily appearance.	SAMPLE TP-4-1(3-4') - black cinder MAT'L TIME 12:00 ANALYSIS: LIMITED SUITE
		6-8' Brown - grey clay - silty sand dense, moist - wet	SAMPLE TP4-2(5-6') - black peat MATERIAL oily APPEARANCE TIME: 12:25 ANALYSIS: FULL TCL/TAL FULL TCLP
10		~9' Bedrock -	
		END TEST PIT AT 9' below grade	Backfilled hole 12:35-12:50
15			
20			
25			

COMMENTS :

ZONES OF SEEPAGE : G.W. encountered at ~3' below grade, had oily sheen and strong organic/sewer odor STATIC level ~3' bg

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : Ranco Steel RI — PROJECT No. : 25848-001
WEATHER CONDITIONS : Low 40's, overcast, light drizzle — DATE : 12-29-92
CLIENT : Axia, Inc. — CONTRACTOR : SJB Services, Inc.
INSPECTOR : P. Smith — EQUIPMENT : Ford 655A

TEST PIT No. : TEST PIT #5 (TP-5) — ELEVATION :
START TIME : 13:35 — STOP TIME : 14:10 — GROUNDWATER DEPTH : ~ 3-4' below grade

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
		0-2' Red - brown to black Slag and cinders	
		2-3' Grey silty soil and construction debris - concrete	
5		3-5' Tires with construction debris - SATURATED ZONE	WATER encountered ~ 3-4' below grade
		5-6' BLACK - organic silt, peat like, w/ ~~clay~~ red layers, sticks.	SAMPLE TP-5-1 (6') - black orange/red silt
		6-9' brown silty SAND AND silty clay - turning Gray, MOIST	TIME: 1400
10		9' bedrock encountered	ANALYSIS: LIMITED SUITE
		END TEST PIT AT 9' below grade	BACKFILLED hole 1400-1420
15			
20			
25			

COMMENTS :

ZONES OF SEEPAGE : GW encountered at ~ 3' below grade within fine zone. STATIC LEVEL MAINTAINED AT ~ 3-4'

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : RANCO STEEL RI — PROJECT No. : 25248-001
WEATHER CONDITIONS : LOW 40'S, OVERCAST, DRIZZLE — DATE : 12-29-92
CLIENT : AGIA, INC. — CONTRACTOR : SJB SERVICES, INC.
INSPECTOR : P. SMITH — EQUIPMENT : FORD 655A

TEST PIT No. : TEST PIT #6 (TP-6) — ELEVATION :
START TIME : 1425 — STOP TIME : 1455 — GROUNDWATER DEPTH : SEE BELOW

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
		0-3' Grey silty soil with construction debris, damp, stiff, NO WATER	
5		3-7' BLACK organic silt, moist, sticky	SAMPLE TP6-1 (3-7') - BLACK SILT MAT'L TIME: 1440 ANALYSIS: LIMITED SUITE
		7-11' Brown to grey sandy clay to silt, w/ fine sand, med. stiff damp	SAMPLE TP-6-2 (7-11') - brown/grey sandy silt clay TIME: 1450 ANALYSIS: LIMITED SUITE
10		11' - bedrock LIMESTONE frags in cuttings	
		END TEST P.I. AT 11' below grade	BACKFILLED HOLE 1455-1500
15			
20			
25			

COMMENTS :

ZONES OF SEEPAGE : NO SIGNIFICANT G.W. ENCOUNTERED IN TEST P.I. - FILL ZONE MOIST TO WET, NATIVE STRATUM MOIST

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : Ramco Steel RI
PROJECT No. : 25648-001
WEATHER CONDITIONS : Low 40's, overcast, rain
DATE : 12-29-82
CLIENT : AKIA, INC.
CONTRACTOR : SJB Services, Inc.
INSPECTOR : P. Smith
EQUIPMENT : Ford 655A

TEST PIT No. : Test Pit #7 (TP-7)
ELEVATION :
START TIME : 1505
STOP TIME : 1545
GROUNDWATER DEPTH : ~2.5' below grade

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
5		0-3' Red-brown to black Cinders Slag with metal debris, wire strapping wet 3-5' Black silt with slag/cinders saturated, oily, loose, heavy oil sheen 5-9' As above 9-12' Brown sandy silt and clay 12' Bedrock	2.5' water encountered Sample TP-7-1 (2') - Red brown Cinders Time: 1515 Analysis: Full TCL/TAL Full TCLP Sample TP-7-2 (4-5') - black oily silt, sat. Time: 1530 Analysis: Full TCL/TAL Backfilled hole 1545-1555
10			
15			
20			
25			

COMMENTS :

ZONES OF SEEPAGE : G.W. encountered at ~2.5' below grade, ~~heavy~~ heavy oil sheen and static at ~2.5' below grade.

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

DAMES & MOORE

TEST PIT LOG SHEET

PROJECT : RAMCO Steel RI
PROJECT No. : 25848-001
WEATHER CONDITIONS : Low 40's, overcast, light breeze
DATE : 12-29-92
CLIENT : AKIA, INC.
CONTRACTOR : SJB Services, Inc.
INSPECTOR : P. SMITH
EQUIPMENT : Ford 655A

TEST PIT No. : TEST PIT #8 - (TP-8)
ELEVATION :
START TIME : 1555
STOP TIME : 1620
GROUNDWATER DEPTH : ~3' below grade

DEPTH (FT.)	SAMPLE No. DEPTH	CLASSIFICATION	NOTES
		0-2' Grey silty soil w/ cinders debris	
		2-4' Red-brown cindery silty 3/4" dia., wet-saturated	water at 3' within slag
5		5-8' Black to grey silt w/ wood frags, loose, wet, sticky	SAMPLE TP-8-1 (5-6') - BLACK SILT TIME: 1605 ANALYSIS: LIMITED SUITE
		8-14' Grey-brown mottled sandy clay, moist to wet, med firm, plastic	
10		14' Bedrock	
		END TEST PIT AT 14' below grade	
15			BACKFILLED hole 1620-1630
20			
25			

COMMENTS :

ZONES OF SEEPAGE : GW! ENCOUNTERED AT 3' below grade with STATIC AT SAME LEVEL - NO OILY APPEARANCE.

INCLUDE A SKETCH (DIMENSIONS, GRADE, ETC...)

SHEET 1 OF 1

APPENDIX C

APPENDIX C

APPENDIX C

DATA VALIDATION REPORT

DATA VALIDATION REPORT

RAMCO STEEL SITE
Buffalo, New York
NYSDEC Site No. 915046

1.0 INTRODUCTION

In the period from December 12, 1992 through March 23, 1993, Dames & Moore collected a series of environmental samples from the referenced site. The samples were forwarded under chain of custody to Recra Environmental, Inc. in Amherst, New York for applicable laboratory analysis. The data generated from the laboratory analysis have been validated using a modified application of the USEPA Region II CLP "Organics Data Review", SOP No. HW-6, Revision 6, and "Evaluation of Metals Data for the Contract Laboratory Program", SOP No. HW-2, Revision 9. The modifications employed were intended to take into account differences between the requirements of the SOP as written and the NYSDEC ASP-91 protocols employed by the laboratory. Detailing the specific modifications would be tantamount to generating a new SOP. In general terms, the validations covered all of the areas of review specified in the Region II protocols using acceptance criteria established in ASP-91. Professional judgement has been employed in areas where specific guidance is absent. Copies of the Region II checklists are on file in Dames & Moore's Quality Assurance Services (AQuA) office in Baltimore, Maryland. They are available upon request and made a part hereof by reference. This report will provide an executive summary regarding the major correctable and non-correctable deficiencies observed in the data. Data tables are also attached with validation flags applied.

2.0 METALS

2.1 CORRECTABLE DEFICIENCIES

Matrix spike and laboratory duplicate data have not been provided in the data packages for the water samples or the TCLP extract analyses. As a result, all of the positive aqueous data have been flagged as estimated. Non-detects are not effected.

2.2 NON-CORRECTABLE DEFICIENCIES

Principle areas of concern include matrix spike failures, laboratory duplicate precision and linearity near the contract required detection limit (CRDL). Matrix spike failures resulted in "R" (unreliable) flags being applied to 22.6% of the soil data. Five other individual data points were flagged "R" due to linearity failure for Method of Standard Additions (MSA) analysis. Lack of duplicate precision and CRDL Standard failures account for the balance of the "J" (estimated) flags with the exception of those applied to TP-4-2 because of an extraordinarily high water content in the sample (>50%).

3.0 PESTICIDE/HERBICIDE

3.1 CORRECTABLE DEFICIENCIES

There were no serious correctable deficiencies observed.

3.2 NON-CORRECTABLE DEFICIENCIES

Low surrogate recoveries resulted in the application of "J" and "UJ" (estimated detection limit) flags to all of the aqueous pesticide/PCB data and some few soil/sediment samples. Very low surrogate recopies required the application of "R" flags to one TCLP herbicide sample. Large differences were noted between primary and secondary column quantitative results. Those data points were also flagged as "J" if the %D between the two columns exceeded 100%.

4.0 VOLATILES

4.1 CORRECTABLE DEFICIENCIES

There were no correctable deficiencies observed.

4.2 NON-CORRECTABLE DEFICIENCIES

One volatile sample, TP-4-2, has been flagged "R" for all parameters due to moisture content in excess of 50%. Various low level results for methylene chloride, toluene and other aromatic volatiles, were flagged "U" (not detected) due to method, field or trip blank contamination. Routine calibration failures for individual compounds were observed but in general these were neither large nor extensive in their effects. In general the volatile analyses display good precision and accuracy.

5.0 SEMIVOLATILES

5.1 CORRECTABLE DEFICIENCIES

A number of pages were missing from the data packages as received. The critical pages were supplied by the laboratory upon request.

5.2 NON-CORRECTABLE DEFICIENCIES

Principal areas of concern include internal standard area and retention time failures and high levels of hydrocarbon interference. Other, less extensive or less significant areas of concern include a single sample, TP-4-2, flagged "R" for high percent moisture, a single sample, TP-7-2RE, flagged "R" due to being analyzed outside the required 12 hour tune criteria, surrogate and matrix spike failures, routine calibration failures for individual analytes and low level blank contamination.

The failure to meet internal standard area or retention time criteria resulted in the application "R" and "J" flags to analytes in the late eluting positions for a number of soil samples (see data tables attached). "J" flags wee also applied to most positive detections in the same late stages (after 15-16 minutes) due to significant hydrocarbon interferences. It should be noted that this is not indicative of any error on the part of the laboratory, but is a matrix effect over which the laboratory would have limited, if any, control. Many of the minor surrogate and matrix spike failures may likewise be attributable to these matrix effects.

6.0 CONCLUSIONS

It will be difficult to use the metals data without reservation until data have been made available regarding spike and duplicates for water and TCLP samples. Even so, the metals data has been qualified extensively and should be used with a thorough understanding of the limitations of the data. Organics data are generally acceptable with some specific exceptions that have been flagged "R" on the data tables.

RAMSED.XLS

Sample Number	DUP-1/SED-9			DUP-2/SED-12			DUP-2T/SED-12			RMW-1(4-6)			RMW-2(0-2)			RMW-2RE			RMW-3			SED-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.																								
Total Recoverable Oil & Grease (ug/g)	974									1210			2590						1760			20100		
pH																								
Metals (mg/kg)																								
Aluminum - Total				8700																				
Antimony - Total				11.9 UN		UJ																		
Arsenic - Total	15.8 SN		J	9.6 SN		J				3.9			8.8 B						36.5			36.2 SN		J
Barium - Total	68.3			57.9 B						80.4			72.5						249			195		
Beryllium - Total				1.5 U																				
Cadmium - Total	1.3 UN		UJ	1.5 UN		UJ				1.3 UN		UJ	10.9 UN		UJ				13.8 UN		UJ	1.7 UN		UJ
Calcium - Total				2260 *																				
Chromium - Total	26.1 N		J	17.1 N		J				18.5			101						32.2			132 N		J
Cobalt - Total				6 B																				
Copper - Total				32.5 N*		J																		
Iron - Total				54300 *																				
Lead - Total	65.9			61						12.1			219						135			115		
Magnesium - Total				167 N		J																		
Manganese - Total				936 B																				
Mercury - Total	0.11 UN		UJ	0.13 UN		UJ				0.12 UN		UJ	0.11 UN		UJ				0.13 UN		UJ	0.16 UN		UJ
Nickel - Total				15.5																				
Potassium - Total				731 B																				
Selenium - Total	1.1 UN		UJ	1.2 UWN		UJ				0.97 UW			0.88 UW						1.1 UW			1.3 UWN		UJ
Silver - Total				0.09 B		J																		
Sodium - Total				416 B																				
Thallium - Total				1.5 UN		UJ																		
Vanadium - Total				22.6																				
Zinc - Total	89.8			175						64.7			116						49.6 B			105		
Cyanide - Total				1.8 UN*		UJ																		
Hexavalent Chromium - Total	1.6 *									0.2 N*		R	0.09 UN*		R				0.11 UN*		R	1.5 *		
VOC (ug/kg)																								
Chloromethane	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
Bromomethane	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
Vinyl chloride	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
Chloroethane	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
Methylene chloride	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
Acetone	25			110						13 U			220			210		J	170		J	210		
Carbon Disulfide	14 U			14 U						13 U			7 J			11 U			14 U			14 U		
1,1-Dichloroethene	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
1,1-Dichloroethane	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
1,2-Dichloroethene (Total)	14 U			14 U						13 U			11 U			11 U			14 U			14 U		
Chloroform	0.7 J			3 J						13 U			11 U			11 U			14 U			14 U		

Sample Number	SED-10			SED-11			SED-12			SED-12T			SED-13			SED-14			SED-15		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.																					
Total Recoverable Oil & Grease (ug/g)	561			3720									1910			7590					
pH																					
Metals (mg/kg)																					
Aluminum - Total							8050 *												10900		
Antimony - Total							11.2 UN		UJ										12.9 UN		UJ
Arsenic - Total	14.8 SN		J	28.6 SN		J	8.6 SN		J				22.3 SN		J	40.9 SN		J	35.1 SN		J
Barium - Total	60.6			70.3			60.4						33.4 B			241			128		
Beryllium - Total							1.4 U												1.6 U		
Cadmium - Total	1.3 UN		UJ	1.4 UN		UJ	1.4 UN		UJ				1.5 UN		UJ	1.8 UN		UJ	1.6 UN		UJ
Calcium - Total							4310 *												5900		
Chromium - Total	61.5 N		J	58.8 N		J	15.4 N		J				19.5 N		J	59.8 N		J	52.9 N		J
Cobalt - Total							5.6 U												6.5 U		
Copper - Total							24.2 N*		J										221 N*		J
Iron - Total							45500 *												29000 *		
Lead - Total	35.9			85.9			79 S						113			242			69.8		
Magnesium - Total							171 N		J										137 N		J
Mangenese - Total							944 B												2330		
Mercury - Total	0.12 UN		UJ	0.14 UN		UJ	0.14 UN		UJ				3.9 N		J	0.29 N		J	0.15 UN		UJ
Nickel - Total							18.9												46.3		
Potassium - Total							716 B												992 B		
Selenium - Total	1.1 UWN		UJ	1.1 UWN		UJ	1.2 UWN		UJ				1.3 UWN		UJ	1.4 UWN		UJ	1.4 UN		UJ
Silver - Total							0.12 BW		J										0.17 B		J
Sodium - Total							418 B												384 B		
Thallium - Total							1.5 UN		UJ										1.7 UN		UJ
Vanadium - Total							21												29.4		
Zinc - Total	95.9			211			166						46.6			31.5			103		
Cyanide - Total							1.8 UN*		UJ										2.1 UN*		UJ
Hexavalent Chromium - Total	37.9 *			1.5 *									3.8 *			8.8 *					
VOC (ug/kg)																					
Chloromethane	16 U			14 U			14 U						13 U			16 U			16 U		
Bromomethane	16 U			14 U			14 U						13 U			16 U			16 U		
Vinyl chloride	16 U			14 U			14 U						13 U			16 U			16 U		
Chloroethane	16 U			14 U			14 U						13 U			16 U			16 U		
Methylene chloride	16 U			14 U			14 U						13 U			16 U			16 U		
Acetone	41			59			46						37			190			270		
Carbon Disulfide	16 U			14 U			14 U						13 U			4 J			3 J		
1,1-Dichloroethene	16 U			14 U			14 U						13 U			16 U			16 U		
1,1-Dichloroethane	16 U			14 U			14 U						13 U			16 U			16 U		
1,2-Dichloroethene (Total)	16 U			14 U			14 U						13 U			16 U			16 U		
Chloroform	1 J			14 U			0.8 J						2 J			1 J			16 U		

RAMSED.XLS

Sample Number	SED-15RE			SED-15T			SED-2			SED-2T			SED-3			SED-4			SED-5			SED-5T		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.																								
Total Recoverable Oil & Grease (ug/g)													1920											
pH																								
Metals (mg/kg)																								
Aluminum - Total							4500												7590					
Antimony - Total							11	UN	UJ										10.8	UN	UJ			
Arsenic - Total							9.4	SN	J				13.2	SN	J	37.5	SN	J	14	SN	J			
Barium - Total							28	B					91			117			65.4					
Beryllium - Total							1.4	U											1.3	U				
Cadmium - Total							1.4	UN	UJ				1.4	UN	UJ	1.6	UN	UJ	1.3	UN	UJ			
Calcium - Total							1530												3770					
Chromium - Total							130	N	J				35.7	N	J	72.2	N	J	23.7	N	J			
Cobalt - Total							5.5	U											5.4	U				
Copper - Total							29.7	N*	J										23.9	N*	J			
Iron - Total							12600	*											46800	*				
Lead - Total							36.7						34.3			161			57.1	+	R			
Magnesium - Total							57.3	N	J										397	N	J			
Manganese - Total							1070	B											2490					
Mercury - Total							0.12	UN	UJ				0.12	UN	UJ	0.14	UN	UJ	0.12	UN	UJ			
Nickel - Total							20.8												16.3					
Potassium - Total							668	B											1030	B				
Selenium - Total							1.1	UWN	UJ				1.1	UWN	UJ	1.2	UWN	UJ	1.1	UWN	UJ			
Silver - Total							0.19	B	J										0.08	BW				
Sodium - Total							468	B											376	B				
Thallium - Total							1.4	UN	UJ										1.4	UN	UJ			
Vanadium - Total							14.7												18.3					
Zinc - Total							60.7						49.4			113			82.6					
Cyanide - Total							7.6	N*	J										1.6	UN*	UJ			
Hexavalent Chromium - Total													12.5	*		2.6	*							
VOC (ug/kg)																								
Chloromethane							14	U					14	U		16	U		14	U				
Bromomethane							14	U					14	U		16	U		14	U				
Vinyl chloride							14	U					14	U		16	U		14	U				
Chloroethane							14	U					14	U		16	U		14	U				
Methylene chloride							14	U					14	U		16	U		14	U				
Acetone							35						33			66			31					
Carbon Disulfide							0.7	J					14	U		2	J		14	U				
1,1-Dichloroethene							14	U					14	U		16	U		14	U				
1,1-Dichloroethane							14	U					14	U		16	U		14	U				
1,2-Dichloroethene (Total)							14	U					14	U		16	U		14	U				
Chloroform							1	J					14	U		2	J		0.9	J				

RAMSED.XLS

Sample Number	SED-6			SED-7			SED-8			SED-8T			SED-9		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.															
Total Recoverable Oil & Grease (ug/g)	892			6450									967		
pH															
Metals (mg/kg)															
Aluminum - Total							5800								
Antimony - Total							12.4 UN		UJ						
Arsenic - Total	12.8 N		J	50.3 SN		J	20 SN		J				17 SN		J
Barium - Total	66.3			180		J	95.2						63.7		
Beryllium - Total							1.5 U								
Cadmium - Total	1.5 UN		UJ	2.2 UN		UJ	1.5 UN		UJ				1.2 UN		UJ
Calcium - Total							10500 B								
Chromium - Total	42.9 N		J	145 N		J	32.1 N		J				24.3 N		J
Cobalt - Total							6.2 U								
Copper - Total							66.4 N*		J						
Iron - Total							42100 *								
Lead - Total	44.7			142		J	85.7						64.2		
Magnesium - Total							271 N		J						
Manganese - Total							1760								
Mercury - Total	0.14 UN		UJ	0.19 UN		UJ	0.14 UN		UJ				0.12 UN		UJ
Nickel - Total							21.3								
Potassium - Total							757 B								
Selenium - Total	1.2 UN		UJ	1.7 UWN		UJ	1.2 UWN		UJ				1.1 UN		UJ
Silver - Total							0.15 BW		J						
Sodium - Total							338 B								
Thallium - Total							1.5 UN		UJ						
Vanadium - Total							17.8								
Zinc - Total	75.9			197		J	171						90.1		
Cyanide - Total							3.2 N*		J						
Hexavalent Chromium - Total	0.72 *			8.5 *		J							0.9 *		
VOC (ug/kg)															
Chloromethane	15 U			18 U			14 U						13 U		
Bromomethane	15 U			18 U			14 U						13 U		
Vinyl chloride	15 U			18 U			14 U						13 U		
Chloroethane	15 U			18 U			14 U						13 U		
Methylene chloride	15 U			18 U			14 U						13 U		
Acetone	71			170			76						45		
Carbon Disulfide	15 U			18 U			14 U						13 U		
1,1-Dichloroethene	15 U			18 U			14 U						13 U		
1,1-Dichloroethane	15 U			18 U			14 U						13 U		
1,2-Dichloroethene (Total)	15 U			18 U			14 U						13 U		
Chloroform	2 J			18 U			1 J						0.5 J		

Sample Number	DUP-1/SED-9			DUP-2/SED-12			DUP-2T/SED-12			RMW-1(4-6)			RMW-2(0-2)			RMW-2RE			RMW-3			SED-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
2-Butanone	9	J		31						13	U		36			13			12	J		37		
1,1,1-Trichloroethane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Carbon Tetrachloride	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Bromodichloromethane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
1,2-Dichloropropane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
cis-1,3-Dichloropropene	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Trichloroethene	14	U		2	J					13	U		11	U		11	U		14	U		14	U	
Dibromochloromethane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
1,1,2-Trichloroethane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Benzene	14	U		14	U					13	U		5	J		4	J		14	U		14	U	
trans-1,3-Dichloroprope	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Bromoform	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
4-Methyl-2-pentanone	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
2-Hexanone	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Tetrachloroethene	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Toluene	14	U		0.5	J					13	U		8	BJ		6	J		1	J		14	U	
1,1,2,2-Tetrachloroethane	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Chlorobenzene	14	U		14	U					2	J		11	U		11	U		14	U		14	U	
Ethyl benzene	14	U		14	U					13	U		5	J		3	J		14	U		14	U	
Styrene	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
Total Xylenes	14	U		14	U					13	U		6	J		4	J		14	U		14	U	
Vinyl acetate	14	U		14	U					13	U		11	U		11	U		14	U		14	U	
SEMI-VOC (ug/kg)																								
Phenol				480	U																			
Bis(2-chloroethyl) ether				480	U																			
2-Chlorophenol				480	U																			
1,3-Dichlorobenzene				480	U																			
1,4-Dichlorobenzene				480	U																			
Benzyl Alcohol				480	U																			
1,2-Dichlorobenzene				480	U																			
2-Methylphenol				480	U																			
4-Methylphenol				480	U																			
N-Nitroso-Di-n-propylamine				480	U																			
Hexachloroethane				480	U																			
Nitrobenzene				480	U																			
Isophorone				480	U																			
2-Nitrophenol				480	U																			
2,4-Dimethylphenol				480	U																			
Benzoic Acid				2300	U																			
Bis(2-chloroethoxy) methane				480	U																			
2,4-Dichlorophenol				480	U																			

RAMSED.XLS

Sample Number	SED-10			SED-11			SED-12			SED-12T			SED-13			SED-14			SED-15		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane	16 U			14 U			14 U						13 U			16 U			16 U		
2-Butanone	15 J			13 J			14 J						12 J			61			50		
1,1,1-Trichloroethane	16 U			14 U			14 U						13 U			1 J			16 U		
Carbon Tetrachloride	16 U			14 U			14 U						13 U			16 U			16 U		
Bromodichloromethane	16 U			14 U			14 U						13 U			16 U			16 U		
1,2-Dichloropropane	16 U			14 U			14 U						13 U			16 U			16 U		
cis-1,3-Dichloropropene	16 U			14 U			14 U						13 U			16 U			16 U		
Trichloroethene	16 U			14 U			14 U						13 U			16 U			16 U		
Dibromochloromethane	16 U			14 U			14 U						13 U			16 U			16 U		
1,1,2-Trichloroethane	16 U			14 U			14 U						13 U			16 U			16 U		
Benzene	16 U			14 U			14 U						13 U			16 U			16 U		
trans-1,3-Dichloroprope	16 U			14 U			14 U						13 U			16 U			16 U		
Bromoform	16 U			14 U			14 U						13 U			16 U			16 U		
4-Methyl-2-pentanone	16 U			14 U			14 U						13 U			16 U			16 U		
2-Hexanone	16 U			14 U			14 U						13 U			16 U			16 U		
Tetrachloroethene	16 U			14 U			14 U						13 U			16 U			16 U		
Toluene	16 U			14 U			14 U						13 U			1 J			16 U		
1,1,2,2-Tetrachloroethane	16 U			14 U			14 U						13 U			16 U			16 U		
Chlorobenzene	16 U			14 U			14 U						13 U			16 U			16 U		
Ethyl benzene	16 U			14 U			14 U						13 U			0.6 J			16 U		
Styrene	16 U			14 U			14 U						13 U			16 U			16 U		
Total Xylenes	0.1 J			14 U			14 U						13 U			3 J			5 J		
Vinyl acetate	16 U			14 U			14 U						13 U			16 U			16 U		
SEMI-VOC (ug/kg)																					
Phenol							480 U												550 U		R
Bis(2-chloroethyl) ether							480 U												550 U		
2-Chlorophenol							480 U												550 U		
1,3-Dichlorobenzene							480 U												550 U		
1,4-Dichlorobenzene							480 U												550 U		
Benzyl Alcohol							480 U												550 U		
1,2-Dichlorobenzene							480 U												550 U		
2-Methylphenol							480 U												550 U		
4-Methylphenol							480 U												550 U		
N-Nitroso-Di-n-propylamine							480 U												550 U		
Hexachloroethane							480 U												550 U		
Nitrobenzene							480 U												550 U		
Isophorone							480 U												550 U		
2-Nitrophenol							480 U												550 U		
2,4-Dimethylphenol							480 U												550 U		
Benzoic Acid							2300 U												2600 U		
Bis(2-chloroethoxy) methane							480 U												550 U		
2,4-Dichlorophenol							480 U												550 U		R

Sample Number	SED-15RE			SED-15T			SED-2			SED-2T			SED-3			SED-4			SED-5			SED-5T		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane							14	U					14	U		16	U		14	U				
2-Butanone							7	J					11	J		22			10	J				
1,1,1-Trichloroethane							14	U					14	U		16	U		14	U				
Carbon Tetrachloride							14	U					14	U		16	U		14	U				
Bromodichloromethane							14	U					14	U		16	U		14	U				
1,2-Dichloropropane							14	U					14	U		16	U		14	U				
cis-1,3-Dichloropropene							14	U					14	U		16	U		14	U				
Trichloroethene							14	U					14	U		16	U		14	U				
Dibromochloromethane							14	U					14	U		16	U		14	U				
1,1,2-Trichloroethane							14	U					14	U		16	U		14	U				
Benzene							14	U					14	U		16	U		14	U				
trans-1,3-Dichloropropene							14	U					14	U		16	U		14	U				
Bromoform							14	U					14	U		16	U		14	U				
4-Methyl-2-pentanone							14	U					14	U		16	U		14	U				
2-Hexanone							14	U					14	U		16	U		14	U				
Tetrachloroethene							14	U					14	U		16	U		14	U				
Toluene							14	U					14	U		16	U		14	U				
1,1,2,2-Tetrachloroethane							14	U					14	U		16	U		14	U				
Chlorobenzene							14	U					14	U		16	U		14	U				
Ethyl benzene							14	U					14	U		16	U		14	U				
Styrene							14	U					14	U		16	U		14	U				
Total Xylenes							14	U					14	U		16	U		14	U				
Vinyl acetate							14	U					14	U		16	U		14	U				
SEMI-VOC (ug/kg)																								
Phenol	550	U					440	U											440	U				
Bis(2-chloroethyl) ether	550	U					440	U											440	U				
2-Chlorophenol	550	U					440	U											440	U				
1,3-Dichlorobenzene	550	U					440	U											440	U				
1,4-Dichlorobenzene	550	U					440	U											440	U				
Benzyl Alcohol	550	U					440	U											440	U				
1,2-Dichlorobenzene	550	U					440	U											440	U				
2-Methylphenol	550	U					440	U											440	U				
4-Methylphenol	550	U					440	U											440	U				
N-Nitroso-Di-n-propylamine	550	U					440	U											440	U				
Hexachloroethane	550	U					440	U											440	U				
Nitrobenzene	550	U					440	U											440	U				
Isophorone	550	U					440	U											440	U				
2-Nitrophenol	550	U					440	U											440	U				
2,4-Dimethylphenol	550	U					440	U											440	U				
Benzoic Acid	2600	U					2100	U											2100	U				
Bis(2-chloroethoxy) methane	550	U					440	U											440	U				
2,4-Dichlorophenol	550	U					440	U											440	U				

Sample Number	SED-6			SED-7			SED-8			SED-8T			SED-9		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane	15	U		18	U		14	U					13	U	
2-Butanone	21			43			21						7	J	
1,1,1-Trichloroethane	15	U		18	U		14	U					13	U	
Carbon Tetrachloride	15	U		18	U		14	U					13	U	
Bromodichloromethane	15	U		18	U		14	U					13	U	
1,2-Dichloropropane	15	U		18	U		14	U					13	U	
cis-1,3-Dichloropropene	15	U		18	U		14	U					13	U	
Trichloroethene	15	U		18	U		14	U					13	U	
Dibromochloromethane	15	U		18	U		14	U					13	U	
1,1,2-Trichloroethane	15	U		18	U		14	U					13	U	
Benzene	15	U		18	U		14	U					13	U	
trans-1,3-Dichloroprope	15	U		18	U		14	U					13	U	
Bromoform	15	U		18	U		14	U					13	U	
4-Methyl-2-pentanone	15	U		18	U		14	U					13	U	
2-Hexanone	15	U		18	U		14	U					13	U	
Tetrachloroethene	15	U		18	U		14	U					13	U	
Toluene	15	U		18	U		14	U					13	U	
1,1,2,2-Tetrachloroethane	15	U		18	U		14	U					13	U	
Chlorobenzene	15	U		18	U		14	U					13	U	
Ethyl benzene	15	U		18	U		14	U					13	U	
Styrene	15	U		18	U		14	U					13	U	
Total Xylenes	15	U		18	U		14	U					13	U	
Vinyl acetate	15	U		18	U		14	U					13	U	
SEMI-VOC (ug/kg)															
Phenol							490	U							
Bis(2-chloroethyl) ether							490	U							
2-Chlorophenol							490	U							
1,3-Dichlorobenzene							490	U							
1,4-Dichlorobenzene							490	U							
Benzyl Alcohol							490	U							
1,2-Dichlorobenzene							490	U							
2-Methylphenol							490	U							
4-Methylphenol							490	U							
N-Nitroso-Di-n-propylamine							490	U							
Hexachloroethane							490	U							
Nitrobenzene							490	U							
Isophorone							490	U							
2-Nitrophenol							490	U							
2,4-Dimethylphenol							490	U							
Benzoic Acid							2400	U							
Bis(2-chloroethoxy) methane							490	U							
2,4-Dichlorophenol							490	U							

Sample Number	DUP-1/SED-9			DUP-2/SED-12			DUP-2T/SED-12			RMW-1(4-6)			RMW-2(0-2)			RMW-2RE			RMW-3			SED-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2,4-Trichlorobenzene				480	U																			
Naphthalene				480	U																			
4-Chloroaniline				480	U																			
Hexachlorobutadiene				480	U																			
4-Chloro-3-methylphenol				480	U																			
2-Methylnaphthalene				480	U																			
Hexachlorocyclopentadiene				480	U																			
2,4,6-Trichlorophenol				480	U																			
2,4,5-Trichlorophenol				1200	U																			
2-Chloronaphthalene				480	U																			
2-Nitroaniline				1200	U																			
Dimethyl phthalate				480	U																			
Acenaphthylene				480	U																			
2,6-Dinitrotoluene				480	U																			
3-Nitroaniline				1200	U																			
Acenaphthene				480	U																			
2,4-Dinitrophenol				1200	U																			
4-Nitrophenol				1200	U																			
Dibenzofuran				480	U																			
2,4-Dinitrotoluene				480	U																			
Diethyl phthalate				480	U																			
4-Chlorodiphenylether				480	U																			
Fluorene				480	U																			
4-Nitroaniline				1200	U																			
4,6-Dinitro-2-methylpheno				1200	U																			
N-nitrosodiphenylamine				480	U																			
4-Bromophenyl phenyl ethe				480	U																			
Hexachlorobenzene				480	U																			
Pentachlorophenol				1200	U																			
Phenanthrene				87	J	CJ																		
Anthracene				480	U																			
Di-n-butyl phthalate				480	U																			
Fluoranthene				180	J																			
Pyrene				480	U																			
Butyl benzyl phthalate				480	U																			
3,3'-Dichlorobenzidine				480	U																			
Benzo(a)anthracene				480	U																			
Chrysene				180	J	CJ																		
Bis(2-ethylhexyl) phthala				750		CJ																		
Di-n-octyl phthalate				480	U																			
Benzo(b)fluoranthene				120	J	CJ																		
Benzo(k)fluoranthene				480	U																			
Benzo(a)pyrene				480	U																			
Indeno(1,2,3-cd)pyrene				480	U																			

Sample Number	SED-10			SED-11			SED-12			SED-12T			SED-13			SED-14			SED-15		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2,4-Trichlorobenzene							480	U											550	U	R
Naphthalene							480	U											250	J	
4-Chloroaniline							480	U											550	U	
Hexachlorobutadiene							480	U											550	U	
4-Chloro-3-methylphenol							480	U											550	U	
2-Methylnaphthalene							480	U											110	J	
Hexachlorocyclopentadiene							480	U											550	U	
2,4,6-Trichlorophenol							480	U											550	U	
2,4,5-Trichlorophenol							1200	U											1300	U	
2-Chloronaphthalene							480	U											550	U	
2-Nitroaniline							1200	U											1300	U	
Dimethyl phthalate							480	U											550	U	
Acenaphthylene							480	U											550	U	
2,6-Dinitrotoluene							480	U											550	U	
3-Nitroaniline							1200	U											1300	U	
Acenaphthene							480	U											550	U	
2,4-Dinitrophenol							1200	U											1300	U	
4-Nitrophenol							1200	U											1300	U	
Dibenzofuran							480	U											550	U	
2,4-Dinitrotoluene							480	U											550	U	
Diethyl phthalate							480	U											550	U	
4-Chlorodiphenylether							480	U											550	U	
Fluorene							480	U											550	U	
4-Nitroaniline							1200	U											1300	U	
4,6-Dinitro-2-methylpheno							1200	U											1300	U	
N-nitrosodiphenylamine							480	U											550	U	
4-Bromophenyl phenyl ethe							480	U											550	U	
Hexachlorobenzene							480	U											550	U	
Pentachlorophenol							1200	U											1300	U	
Phenanthrene							91	J	J										550	U	
Anthracene							480	U											550	U	
Di-n-butyl phthalate							480	U											550	U	
Fluoranthene							180	J	J										550	U	
Pyrene							480	U											550	U	
Butyl benzyl phthalate							480	U											550	U	
3,3'-Dichlorobenzidine							480	U											550	U	
Benzo(a)anthracene							74	J	J										550	U	
Chrysene							110	J	J										550	U	
Bis(2-ethylhexyl) phthala							1100		J										550	U	
Di-n-octyl phthalate							480	U											550	U	
Benzo(b)fluoranthene							480	U											550	U	
Benzo(k)fluoranthene							480	U											550	U	
Benzo(a)pyrene							480	U											550	U	
Indeno(1,2,3-cd)pyrene							480	U											550	U	R

Sample Number	SED-15RE			SED-15T			SED-2			SED-2T			SED-3			SED-4			SED-5			SED-5T		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2,4-Trichlorobenzene	550	U					440	U											440	U				
Naphthalene	220	J					440	U											440	U				
4-Chloroaniline	550	U					440	U											440	U				
Hexachlorobutadiene	550	U					440	U											440	U				
4-Chloro-3-methylphenol	550	U					440	U											440	U				
2-Methylnaphthalene	140	J					440	U											440	U				
Hexachlorocyclopentadiene	550	U					440	U											440	U				
2,4,6-Trichlorophenol	550	U					440	U											440	U				
2,4,5-Trichlorophenol	1300	U					1100	U											1100	U				
2-Chloronaphthalene	550	U					440	U											440	U				
2-Nitroaniline	1300	U					1100	U											1100	U				
Dimethyl phthalate	550	U					440	U											440	U				
Acenaphthylene	550	U					440	U											440	U				
2,6-Dinitrotoluene	550	U					440	U											440	U				
3-Nitroaniline	1300	U					1100	U											1100	U				
Acenaphthene	550	U					18	J	J										440	U				
2,4-Dinitrophenol	1300	U					1100	U											1100	U				
4-Nitrophenol	1300	U					1100	U											1100	U				
Dibenzofuran	550	U					440	U											440	U				
2,4-Dinitrotoluene	550	U					440	U											440	U				
Diethyl phthalate	550	U					440	U											440	U				
4-Chlorodiphenylether	550	U					440	U											440	U				
Fluorene	550	U					44	J	J										440	U				
4-Nitroaniline	1300	U					1100	U											1100	U				
4,6-Dinitro-2-methylpheno	1300	U	J				1100	U											1100	U				
N-nitrosodiphenylamine	550	U					440	U											440	U				
4-Bromophenyl phenyl ethe	550	U					440	U											440	U				
Hexachlorobenzene	550	U					440	U											440	U				
Pentachlorophenol	1300	U					1100	U											1100	U				
Phenanthrene	550	U					210	J	J										140	J	J			
Anthracene	550	U					440	U											440	U				
Di-n-butyl phthalate	550	U					440	U											440	U				
Fluoranthene	550	U	J				280	J	J										350	J	J			
Pyrene	550	U	R				440	U											440	U				
Butyl benzyl phthalate	550	U					440	U											440	U				
3,3'-Dichlorobenzidine	550	U					440	U											440	U				
Benzo(a)anthracene	550	U					440	U											440	U				
Chrysene	550	U					440	U											200	J	J			
Bis(2-ethylhexyl) phthala	550	U					440	U											510		J			
Di-n-octyl phthalate	550	U					440	U	R										440	U				
Benzo(b)fluoranthene	550	U					440	U											440	U				
Benzo(k)fluoranthene	550	U					440	U											440	U				
Benzo(a)pyrene	550	U					440	U											440	U				
Indeno(1,2,3-cd)pyrene	550	U	R				440	U	R										440	U				

Sample Number	SED-6			SED-7			SED-8			SED-8T			SED-9		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2,4-Trichlorobenzene							490	U							
Naphthalene							490	U							
4-Chloroaniline							490	U							
Hexachlorobutadiene							490	U							
4-Chloro-3-methylphenol							490	U							
2-Methylnaphthalene							490	U							
Hexachlorocyclopentadiene							490	U							
2,4,6-Trichlorophenol							490	U							
2,4,5-Trichlorophenol							1200	U							
2-Chloronaphthalene							490	U							
2-Nitroaniline							1200	U							
Dimethyl phthalate							490	U							
Acenaphthylene							490	U							
2,6-Dinitrotoluene							490	U							
3-Nitroaniline							1200	U							
Acenaphthene							20	J	J						
2,4-Dinitrophenol							1200	U							
4-Nitrophenol							1200	U							
Dibenzofuran							490	U							
2,4-Dinitrotoluene							490	U							
Diethyl phthalate							490	U							
4-Chlorodiphenylether							490	U							
Fluorene							30	J	J						
4-Nitroaniline							1200	U							
4,6-Dinitro-2-methylpheno							1200	U							
N-nitrosodiphenylamine							490	U							
4-Bromophenyl phenyl ethe							490	U							
Hexachlorobenzene							490	U							
Pentachlorophenol							1200	U							
Phenanthrene							89	J	J						
Anthracene							490	U							
Di-n-butyl phthalate							490	U							
Fluoranthene							350	J							
Pyrene							490	U							
Butyl benzyl phthalate							490	U							
3,3'-Dichlorobenzidine							490	U							
Benzo(a)anthracene							490	U							
Chrysene							190	J	J						
Bis(2-ethylhexyl) phthala							490	U							
Di-n-octyl phthalate							490	U							
Benzo(b)fluoranthene							490	U							
Benzo(k)fluoranthene							490	U							
Benzo(a)pyrene							490	U							
Indeno(1,2,3-cd)pyrene							490	U							

Sample Number	DUP-1/SED-9			DUP-2/SED-12			DUP-2T/SED-12			RMW-1(4-6)			RMW-2(0-2)			RMW-2RE			RMW-3			SED-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Dibenzo(a,h)anthracene				480 U																				
Benzo(ghi)perylene				480 U																				
Bis(2-chloroisopropyl) ether				480 U																				
PCBS (ug/kg)																								
Aroclor 1016	44 U			47 U						42 U			39 U						50 U			110 U		
Aroclor 1221	89 U			96 U						85 U			78 U						100 U			220 U		
Aroclor 1232	44 U			47 U						42 U			39 U						50 U			110 U		
Aroclor 1242	44 U			47 U						42 U			39 U						50 U			110 U		
Aroclor 1248	44 U			44 JP		J				42 U			39 U						50 U			110 U		
Aroclor 1254	44 U			47 U						42 U			39 U						50 U			110 U		
Aroclor 1260	44 U			47 U						42 U			39 U						50 U			110 U		
PEST (ug/kg)																								
alpha-BHC				2.4 U																				
beta-BHC				2.4 U																				
delta-BHC				2.4 U																				
gamma-BHC (Lindane)				2.4 U																				
Heptachlor				2.4 U																				
Aldrin				2.4 U																				
Heptachlor epoxide				2.4 U																				
Endosulfan I				2.4 U																				
Dieldrin				4.7 U																				
4,4'-DDE				0.45 JP		J																		
Endrin				4.7 U																				
Endosulfan II				4.7 U																				
4,4'-DDD				6.6		J																		
Endosulfan Sulfate				4.7 U																				
4,4'-DDT				1.8 JP		J																		
Methoxychlor				24 U																				
Endrin ketone				4.7 U																				
alpha-Chlordane				2.4 U																				
gamma-Chlordane				2.4 U																				
Toxaphene				240 U																				
TCLP (ug/l)																								
Arsenic - Total							4 UN																	
Barium - Total							153 B		J															
Cadmium - Total							5.2 N		J															
Chromium - Total							10 UN																	
Lead - Total							47.5 S		J															
Mercury - Total							0.2 UN																	

Sample Number	SED-10			SED-11			SED-12			SED-12T			SED-13			SED-14			SED-15		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Dibenzo(a,h)anthracene							480 U												550 U		R
Benzo(ghi)perylene							480 U												550 U		R
Bis(2-chloroisopropyl) ether							480 U												550 U		R
PCBS (ug/kg)																					
Aroclor 1016	42 U			46 U			48 U						50 U			58 U			550 U		
Aroclor 1221	86 U			92 U			98 U						100 U			120 U			1100 U		
Aroclor 1232	42 U			46 U			48 U						50 U			58 U			550 U		
Aroclor 1242	42 U			46 U			48 U						50 U			58 U			550 U		
Aroclor 1248	42 U			46 U			48 U						50 U			58 U			810		J
Aroclor 1254	42 U			46 U			48 U						50 U			58 U			550 U		
Aroclor 1260	42 U			46 U			48 U						50 U			58 U			550 U		
PEST (ug/kg)																					
alpha-BHC							2.5 U														
beta-BHC							2.5 U														
delta-BHC							2.5 U														
gamma-BHC (Lindane)							2.5 U														
Heptachlor							2.5 U														
Aldrin							2.5 U														
Heptachlor epoxide							2.5 U														
Endosulfan I							2.5 U														
Dieldrin							4.8 U														
4,4'-DDE							0.59 JP		J												
Endrin							4.8 U														
Endosulfan II							2.1 JP		J												
4,4'-DDD							19		J												
Endosulfan Sulfate							4.8 U														
4,4'-DDT							3.5 JP		J												
Methoxychlor							25 U														
Endrin ketone							4.8 U														
alpha-Chlordane							2.5 U														
gamma-Chlordane							2.5 U														
Toxaphene							250 U														
TCLP (ug/l)																					
Arsenic - Total										4 UN		UJ									
Barium - Total										141 B											
Cadmium - Total										11.5 N		UJ									
Chromium - Total										10 UN											
Lead - Total										242 S		UJ									
Mercury - Total										0.25 N		UJ									

Sample Number	SED-15RE			SED-15T			SED-2			SED-2T			SED-3			SED-4			SED-5			SED-5T		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Dibenzo(a,h)anthracene	550 U		R				440 U		R										440 U					
Benzo(ghi)perylene	550 U		R				440 U		R										440 U					
Bis(2-chloroisopropyl) ether	550 U		R				440 U		R										440 U					
PCBS (ug/kg)																								
Aroclor 1016							44 U						44 U			48 U		UJ	43 U					
Aroclor 1221							89 U						90 U			98 U			87 U					
Aroclor 1232							44 U						44 U			48 U			43 U					
Aroclor 1242							44 U						44 U			48 U			43 U					
Aroclor 1248							44 U						44 U			48 U			43 U					
Aroclor 1254							44 U						44 U			48 U			43 U					
Aroclor 1260							44 U						44 U			48 U			43 U					
PEST (ug/kg)																								
alpha-BHC							2.3 U												2.2 U					
beta-BHC							2.3 U												2.2 U					
delta-BHC							2.3 U												2.2 U					
gamma-BHC (Lindane)							2.3 U												2.2 U					
Heptachlor							2.3 U												2.2 U					
Aldrin							2.3 U												2.2 U					
Heptachlor epoxide							2.3 U												2.2 U					
Endosulfan I							2.3 U												2.2 U					
Dieldrin							4.4 U												4.3 U					
4,4'-DDE							4.4 U												0.62 J		J			
Endrin							4.4 U												4.3 U					
Endosulfan II							0.42 J		J										0.55 JP		J			
4,4'-DDD							6.5		J										6.3 P					
Endosulfan Sulfate							4.4 U												4.3 U					
4,4'-DDT							2.2 JP		J										4.3 U					
Methoxychlor							23 U												22 U					
Endrin ketone							4.4 U												1.6 JP		J			
alpha-Chlordane							2.3 U												2.2 U					
gamma-Chlordane							2.3 U												2.2 U					
Toxaphene							230 U												220 U					
TCLP (ug/l)																								
Arsenic - Total		12.4	SN	J						4	BWN	J								4	UN			
Barium - Total		43.1	B	J						128	B	J								114	B	J		
Cadmium - Total		17.4	N	J						12.4	N	J								5.9	N	J		
Chromium - Total		10	UN							10	UN									10	UN			
Lead - Total		903	+	J	R					49.4	+	R								49.3	S	J		
Mercury - Total		0.2	N	J						0.2	UN									0.2	UN			

Sample Number	SED-6			SED-7			SED-8			SED-8T			SED-9		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Dibenzo(a,h)anthracene							490 U								
Benzo(ghi)perylene							490 U								
Bis(2-chloroisopropyl) ether							490 U								
PCBS (ug/kg)															
Aroclor 1016	52 U			70 U			49 U						43 U		
Aroclor 1221	100 U			140 U			99 U						87 U		
Aroclor 1232	52 U			70 U			49 U						43 U		
Aroclor 1242	52 U			70 U			49 U						43 U		
Aroclor 1248	52 U			70 U			49 U						43 U		
Aroclor 1254	52 U			70 U			49 U						43 U		
Aroclor 1260	52 U			70 U			49 U						43 U		
PEST (ug/kg)															
alpha-BHC							2.5 U								
beta-BHC							2.5 U								
delta-BHC							2.5 U								
gamma-BHC (Lindane)							2.5 U								
Heptachlor							2.5 U								
Aldrin							2.5 U								
Heptachlor epoxide							2.5 U								
Endosulfan I							2.5 U								
Dieldrin							4.9 U								
4,4'-DDE							0.82 J		J						
Endrin							1.8 J		J						
Endosulfan II							1.4 J		J						
4,4'-DDD							17 P		J						
Endosulfan Sulfate							4.9 U								
4,4'-DDT							3.1 JP		J						
Methoxychlor							25 U								
Endrin ketone							4.9 U								
alpha-Chlordane							2.5 U								
gamma-Chlordane							2.5 U								
Toxephene							250 U								
TCLP (ug/l)															
Arsenic - Total										4 UN					
Barium - Total										140 B		J			
Cadmium - Total										5 UN					
Chromium - Total										10 UN					
Lead - Total										70.3 S		J			
Mercury - Total										0.2 UN					

RAMSED.XLS

Sample Number	DUP-1/SED-9			DUP-2/SED-12			DUP-2T/SED-12			RMW-1(4-6)			RMW-2(0-2)			RMW-2RE			RMW-3			SED-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Selenium - Total							4	UN																
Silver - Total							0.3	U																
Vinyl chloride							100	U																
1,1-Dichloroethene							100	U																
Chloroform							100	U																
1,2-Dichloroethane							100	U																
2-Butanone							100	U																
Chlordane							10	U	UJ															
Carbon Tetrachloride							100	U																
Trichloroethene							100	U																
Benzene							100	U																
Tetrachloroethene							100	U																
Chlorobenzene							100	U																
1,4-Dichlorobenzene							33	U																
2-Methylphenol							33	U																
2,4,5-TP (Silvex)(mg/l)							0.01	U																
4-Methylphenol							33	U																
Hexachloroethane							33	U																
Nitrobenzene							33	U																
Hexachlorobutadiene							33	U																
2,4-D(mg/l)							0.1	U																
2,4,6-Trichlorophenol							33	U																
2,4,5-Trichlorophenol							83	U																
2,4-Dinitrotoluene							33	U																
Hexachlorobenzene							33	U																
Pentachlorophenol							83	U																
Pyridine							33	U																
3-Methylphenol							33	U																
gamma-BHC (Lindane)							10	U	UJ															
Heptachlor							0.5	U																
Heptachlor epoxide							0.5	U																
Endrin							0.5	U																
Methoxychlor							100	U																
Toxaphene							10	U																

RAMSED.XLS

Sample Number	SED-10			SED-11			SED-12			SED-12T			SED-13			SED-14			SED-15		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Selenium - Total										4	UN										
Silver - Total										0.5	B	J									
Vinyl chloride										100	U										
1,1-Dichloroethene										100	U										
Chloroform										24	J										
1,2-Dichloroethane										100	U										
2-Butanone										100	U										
Chlordane										10	U	UJ									
Carbon Tetrachloride										100	U										
Trichloroethene										9	J										
Benzene										100	U										
Tetrachloroethene										100	U										
Chlorobenzene										100	U										
1,4-Dichlorobenzene										33	U										
2-Methylphenol										33	U										
2,4,5-TP (Silvex)(mg/l)										0.01	U	R									
4-Methylphenol										33	U										
Hexachloroethane										33	U										
Nitrobenzene										33	U										
Hexachlorobutadiene										33	U										
2,4-D(mg/l)										0.1	U	R									
2,4,6-Trichlorophenol										33	U										
2,4,5-Trichlorophenol										83	U										
2,4-Dinitrotoluene										33	U										
Hexachlorobenzene										33	U										
Pentachlorophenol										83	U										
Pyridine										33	U										
3-Methylphenol										33	U										
gamma-BHC (Lindane)										10	U	UJ									
Heptachlor										0.5	U										
Heptachlor epoxide										0.5	U										
Endrin										0.5	U										
Methoxychlor										100	U										
Toxaphene										10	U										

RAMSED.XLS

Sample Number	SED-15RE			SED-15T			SED-2			SED-2T			SED-3			SED-4			SED-5			SED-5T		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Selenium - Total				4	UN					4	UN											4	UN	
Silver - Total				0.3	U					0.3	U											0.3	U	
Vinyl chloride				100	U					100	U											100	U	
1,1-Dichloroethene				100	U					100	U											100	U	
Chloroform				100	U					100	U											100	U	
1,2-Dichloroethane				100	U					100	U											100	U	
2-Butanone				100	U					100	U											100	U	
Chlordane				10	U	UJ				10	U	UJ										10	U	UJ
Carbon Tetrachloride				100	U					100	U											100	U	
Trichloroethene				100	U					100	U											100	U	
Benzene				100	U					100	U											100	U	
Tetrachloroethene				100	U					100	U											100	U	
Chlorobenzene				100	U					100	U											100	U	
1,4-Dichlorobenzene				33	U					25	U											25	U	
2-Methylphenol				33	U					25	U											25	U	
2,4,5-TP (Silvex)(mg/l)				0.01	U					0.01	U											0.01	U	
4-Methylphenol				33	U					25	U											25	U	
Hexachloroethane				33	U					25	U											25	U	
Nitrobenzene				33	U					25	U											25	U	
Hexachlorobutadiene				33	U					25	U											25	U	
2,4-D(mg/l)				0.1	U					0.1	U											0.1	U	
2,4,6-Trichlorophenol				33	U					25	U											25	U	
2,4,5-Trichlorophenol				83	U					62	U											62	U	
2,4-Dinitrotoluene				33	U					25	U											25	U	
Hexachlorobenzene				33	U					25	U											25	U	
Pentachlorophenol				83	U					62	U											62	U	
Pyridine				33	U					25	U											25	U	
3-Methylphenol				33	U					25	U											25	U	
gamma-BHC (Lindane)				10	U	UJ				10	U	UJ										10	U	UJ
Heptachlor				0.5	U					0.5	U											0.5	U	
Heptachlor epoxide				0.5	U					0.5	U											0.5	U	
Endrin				0.5	U					0.5	U											0.5	U	
Methoxychlor				100	U					100	U											100	U	
Toxaphene				10	U					10	U											10	U	

RAMSED.XLS

Sample Number	SED-6			SED-7			SED-8			SED-8T			SED-9		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Selenium - Total										4	UN				
Silver - Total										0.3	U				
Vinyl chloride										100	U				
1,1-Dichloroethene										100	U				
Chloroform										100	U				
1,2-Dichloroethane										100	U				
2-Butanone										100	U				
Chlordane										10	U	UJ			
Carbon Tetrachloride										100	U				
Trichloroethene										100	U				
Benzene										100	U				
Tetrachloroethene										100	U				
Chlorobenzene										100	U				
1,4-Dichlorobenzene										25	U				
2-Methylphenol										25	U				
2,4,5-TP (Silvex)(mg/l)										0.01	U				
4-Methylphenol										25	U				
Hexachloroethane										25	U				
Nitrobenzene										25	U				
Hexachlorobutadiene										25	U				
2,4-D(mg/l)										0.1	U				
2,4,6-Trichlorophenol										25	U				
2,4,5-Trichlorophenol										62	U				
2,4-Dinitrotoluene										25	U				
Hexachlorobenzene										25	U				
Pentachlorophenol										62	U				
Pyridine										25	U				
3-Methylphenol										25	U				
gamma-BHC (Lindane)										10	U	UJ			
Heptachlor										0.5	U				
Heptachlor epoxide										0.5	U				
Endrin										0.5	U				
Methoxychlor										100	U				
Toxaphene										10	U				

Sample Number	SS-1			SS-1RE			SS-2			TP-1-1			TP-1-1DL			TP-1-2			TP-2-1			TP-3-1			TP-4-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.																											
Total Recoverable Oil & Grease (ug/g)										9080						931						5250			7880		
pH																											
Metals (mg/kg)																											
Aluminum - Total	335						3080												5740 •	J							
Antimony - Total	1.2 U						1.4 U												1.3 UN	UJ							
Arsenic - Total	0.96 U						11			1.8 BN	R					4.5 N	R		1.3 BN	R		52.3 N	R		12.9 +N	R	
Barium - Total	6.8 B						52.8 B			30.7 B						55.7			32.8 B			172			237		
Beryllium - Total	1.2 U						1.4 U												1.3 U								
Cadmium - Total	117 UN	UJ					1.4 UN	UJ		1.5 UN	R					1.2 UN	R		1.3 UN	R		1.1 UN	R		16.9 UN	R	
Calcium - Total	2120						1530												1970								
Chromium - Total	643						10.4			6.3 •	J					9.8 •	J		6.5 •	J		18.5 •	J		113 •	J	
Cobalt - Total	26.6						6.6 B												5.1 U								
Copper - Total	540						2.8 U												2.5 U•	UJ							
Iron - Total	589000						24600												10400 •	J							
Lead - Total	9.1						41.3 S			59.5						7.3			10.1			74 N•	R		559 N•	R	
Magnesium - Total	4940						58												164								
Manganese - Total	46.6 U						470 B												691 B								
Mercury - Total	0.11 UN	UJ					0.14 UN	UJ		0.15 U						0.12 U			0.11 U			0.11 U			0.17		
Nickel - Total	488						9.4 B												5.2 B•	J							
Potassium - Total	70.4 B						699 B												322 B								
Selenium - Total	0.96 U						1.1 UW			1.2 UWN	R					0.94 UWN	R		.1 UWN	R		0.89 UWN	R		1.3 UWN	R	
Silver - Total	2.3 UN	UJ					2.8 UN	UJ											0.25 U								
Sodium - Total	169 B						262 B												323 B								
Thallium - Total	1.2 U						1.4 U												1.3 UW								
Vanadium - Total	466 U						11.1 B												13.7 •	J							
Zinc - Total	233 U						37.1			65.2 N•	R					49.9 N•	R		28.6 N•	R		228 N•	R		537 N•	R	
Cyanide - Total	1.3 U						1.5 U												1.4 U								
Hexavalent Chromium - Total										0.29 N	J					0.1 UN	UJ					0.09 UN	UJ		0.14 UN	UJ	
VOC (ug/kg)																											
Chloromethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Bromomethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Vinyl chloride	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Chloroethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Methylene chloride	12 U						14 U			14 B BJ	U		56 B BDJ	U		12 B BJ	U		2 J			12 B BJ	U		2 J		
Acetone	34						14 U			390 E			420 D			28			85			12 U			17 U		

Sample Number	TP-4-2			TP-4-2T			TP-5-1			TP-6-1			TP-6-2			TP-7-1			TP-7-1T			TP-7-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.																								
Total Recoverable Oil & Grease							4630			2980			796											
pH																								
Metals (mg/kg)																								
Aluminum - Total	13600	•	J													19800	•	J				16000	•	J
Antimony - Total	2.9	BN	J													2.7	BN	J				1.9	BN	J
Arsenic - Total	52.6	N	R				1.1	UN	R	6	N	R	1.2	BN	R	27.4	SN	R				49.5	+N	R
Barium - Total	173		J				88			79.6			47.5	B		406						212		
Beryllium - Total	2.4	U	UJ													1.7	U					1.9	U	R
Cadmium - Total	2.4	UN	R				12.7	UN	R	12.6	UN	R	12	UN	R	1.7	UN	R				18.6	UN	
Calcium - Total	19200		J													47700						37400		J
Chromium - Total	72.1	•	J				51.6	•	J	29.6	•	J	11.8	•	J	115	•	J				89.9	•	J
Cobalt - Total	9.7	U	UJ													10.8	B					16	B	
Copper - Total	89.5	•	J													245	•	J				173	•	J
Iron - Total	161000	•	J													72100	•	J				131000	•	J
Lead - Total	407		J				734	N•	R	52.5	S		5.3			453	N•	R				382	N•	R
Magnesium - Total	~~1490~~ 5450		J													1130						1110		
Manganese - Total	~~5450~~ 1490		J													21800						13000		
Mercury - Total	0.23	U	UJ				0.13	U		0.12	U		0.12	U		0.16	U					0.17	U	
Nickel - Total	63.8	•	J													112	•	J				75.7	•	J
Potassium - Total	1020	B	J													2640						2440		
Selenium - Total	1.9	UN	R				1.1	UN	R	1.1	UWN	R	0.96	UN	R	1.3	UWN	R				1.5	UWN	R
Silver - Total	0.62	B	J													4.3	B					2	BS	
Sodium - Total	733	B	J													820	B					582	B	
Thallium - Total	2.4	UW	UJ													1.7	U					1.9	U	
Vanadium - Total	9.7	U•	J													6.8	U•	UJ				7.5	U•	UJ
Zinc - Total	885	N•	R				295	N•	R	72.8	N•	R	68.9	N•	R	840	N•	R				488	N•	R
Cyanide - Total	2.5	U														2	U					2.2	U	
Hexavalent Chromium - Total							2.1	N	J	0.11	UN	UJ	0.1	UN	UJ									
VOC (ug/kg)																								
Chloromethane	24	U	R				13	U		13	U		11	U		17	U					70	U	
Bromomethane	24	U					13	U		13	U		11	U		17	U					70	U	
Vinyl chloride	24	U					13	U		13	U		11	U		17	U					70	U	
Chloroethane	24	U					13	U		13	U		11	U		17	U					70	U	
Methylene chloride	3	J					13 ~~2~~ BJ		U	13	U		11 ~~3~~ BJ		U	1	J					70	U	
Acetone	430						170			74			67			17	U					70	U	

Sample Number	TP-7-2RE			TP-8-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Misc.						
Total Recoverable Oil & Grees				1270		
pH						
Metals (mg/kg)						
Aluminum - Total						
Antimony - Total						
Arsenic - Total				18.1	N	R
Barium - Total				64		
Beryllium - Total						
Cadmium - Total				14.7	UN	R
Calcium - Total						
Chromium - Total				11.8	*	J
Cobalt - Total						
Copper - Total						
Iron - Total						
Lead - Total				105		
Magnesium - Total						
Manganese - Total						
Mercury - Total				0.13	U	
Nickel - Total						
Potassium - Total						
Selenium - Total				1.2	UN	R
Silver - Total						
Sodium - Total						
Thallium - Total						
Vanadium - Total						
Zinc - Total				280	N*	R
Cyanide - Total						
Hexavalent Chromium - Total				0.29	N	J
VOC (ug/kg)						
Chloromethane				14	U	
Bromomethane				14	U	
Vinyl chloride				14	U	
Chloroethane				14	U	
Methylene chloride				~~14~~ 8	BJ	U
Acetone				50		

Sample Number	SS-1			SS-1RE			SS-2			TP-1-1			TP-1-1DL			TP-1-2			TP-2-1			TP-3-1			TP-4-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Carbon Disulfide	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
1,1-Dichloroethene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
1,1-Dichloroethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
1,2-Dichloroethene (Total)	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Chloroform	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
1,2-Dichloroethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
2-Butanone	9 J						14 U			86			89 D			5 J			24			12 U			19		
1,1,1-Trichloroethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Carbon Tetrachloride	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Bromodichloromethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
1,2-Dichloropropane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
cis-1,3-Dichloropropene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Trichloroethene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Dibromochloromethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
1,1,2-Trichloroethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Benzene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
trans-1,3-Dichloroprope	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Bromoform	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
4-Methyl-2-pentanone	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
2-Hexanone	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Tetrachloroethene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			2 J		
Toluene	12 U						14 U			0.8 J			56 U			12 U			13 U			12 U			17 U		
1,1,2,2-Tetrachloroethane	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Chlorobenzene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Ethyl benzene	12 U						14 U			0.4 J			56 U			12 U			13 U			12 U			17 U		
Styrene	12 U						14 U			14 U			56 U			12 U			13 U			12 U			17 U		
Total Xylenes	12 U						14 U			2 J			56 U			12 U			0.6 J			2 J			17 U		
Vinyl acetate	12 U						14 U			14 U			58 U			12 U			13 U			12 U			17 U		
SEMI-VOC (ug/kg)																											
Phenol	590			470			480 U		W										420 U								
Bis(2-chloroethyl) ether	390 U			390 U			480 U												420 U								
2-Chlorophenol	390 U			390 U			480 U												420 U								
1,3-Dichlorobenzene	390 U			390 U			480 U												420 U								
1,4-Dichlorobenzene	390 U			390 U			480 U												420 U								
Benzyl Alcohol	390 U			390 U			480 U												420 U								
1,2-Dichlorobenzene	390 U			390 U			480 U												420 U								
2-Methylphenol	390 U			390 U			480 U												420 U								
4-Methylphenol	390 U			390 U			480 U		V										420 U								

Sample Number	TP-4-2			TP-4-2T			TP-5-1			TP-6-1			TP-6-2			TP-7-1			TP-7-1T			TP-7-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Carbon Disulfide	24	U					13	U		13	U		11	U		17	U					70	U	
1,1-Dichloroethene	24	U					13	U		13	U		11	U		17	U					70	U	
1,1-Dichloroethane	24	U					13	U		13	U		11	U		17	U					70	U	
1,2-Dichloroethene (Total)	24	U					13	U		13	U		11	U		17	U					70	U	
Chloroform	24	U					13	U		13	U		11	U		17	U					70	U	
1,2-Dichloroethane	24	U					13	U		13	U		11	U		17	U					70	U	
2-Butanone	110						33			20			10	J		17	U					70	U	
1,1,1-Trichloroethane	24	U					13	U		13	U		11	U		17	U					70	U	
Carbon Tetrachloride	24	U					13	U		13	U		11	U		17	U					70	U	
Bromodichloromethane	24	U					13	U		13	U		11	U		17	U					70	U	
1,2-Dichloropropane	24	U					13	U		13	U		11	U		17	U					70	U	
cis-1,3-Dichloropropene	24	U					13	U		13	U		11	U		17	U					70	U	
Trichloroethene	24	U					13	U		13	U		11	U		17	U					70	U	
Dibromochloromethane	24	U					13	U		13	U		11	U		17	U					70	U	
1,1,2-Trichloroethane	24	U					13	U		13	U		11	U		17	U					70	U	
Benzene	24	U					13	U		13	U		11	U		17	U					70	U	
trans-1,3-Dichloroprope	24	U					13	U		13	U		11	U		17	U					70	U	
Bromoform	24	U					13	U		13	U		11	U		17	U					70	U	
4-Methyl-2-pentanone	24	U					13	U		13	U		11	U		17	U					70	U	
2-Hexanone	24	U					13	U		13	U		11	U		17	U					70	U	
Tetrachloroethene	24	U					13	U		13	U		11	U		17	U					70	U	
Toluene	24	U					13	U		13	U		0.2	J		17	U					70	U	
1,1,2,2-Tetrachloroethane	24	U					13	U		13	U		11	U		17	U					70	U	
Chlorobenzene	24	U					13	U		13	U		11	U		17	U					70	U	
Ethyl benzene	24	U					13	U		13	U		11	U		17	U					70	U	
Styrene	24	U					13	U		13	U		11	U		17	U					70	U	
Total Xylenes	24	U					0.7	J		13	U		0.7	J		17	U					70	U	
Vinyl acetate	24	U					13	U		13	U		11	U		17	U					70	U	
SEMI-VOC (ug/kg)																								
Phenol	700	U														540	U					540	U	
Bis(2-chloroethyl) ether	700	U														540	U					540	U	
2-Chlorophenol	700	U														540	U					540	U	
1,3-Dichlorobenzene	700	U														540	U					540	U	
1,4-Dichlorobenzene	700	U														540	U					540	U	
Benzyl Alcohol	700	U														540	U					540	U	
1,2-Dichlorobenzene	700	U														540	U					540	U	
2-Methylphenol	700	U														540	U					540	U	
4-Methylphenol	700	U														540	U					540	U	

Sample Number	TP-7-2RE			TP-8-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Carbon Disulfide				14	U	
1,1-Dichloroethene				14	U	
1,1-Dichloroethane				14	U	
1,2-Dichloroethene (Total)				14	U	
Chloroform				14	U	
1,2-Dichloroethane				14	U	
2-Butanone				13	J	
1,1,1-Trichloroethane				14	U	
Carbon Tetrachloride				14	U	
Bromodichloromethane				14	U	
1,2-Dichloropropane				14	U	
cis-1,3-Dichloropropene				14	U	
Trichloroethene				14	U	
Dibromochloromethane				14	U	
1,1,2-Trichloroethane				14	U	
Benzene				14	U	
trans-1,3-Dichloroprope				14	U	
Bromoform				14	U	
4-Methyl-2-pentanone				14	U	
2-Hexanone				14	U	
Tetrachloroethene				14	U	
Toluene				14	U	
1,1,2,2-Tetrachloroethane				14	U	
Chlorobenzene				14	U	
Ethyl benzene				14	U	
Styrene				14	U	
Total Xylenes				14	U	
Vinyl acetate				14	U	

SEMI-VOC (ug/kg)			
Phenol	540	U	R
Bis(2-chloroethyl) ether	540	U	
2-Chlorophenol	540	U	
1,3-Dichlorobenzene	540	U	
1,4-Dichlorobenzene	540	U	
Benzyl Alcohol	540	U	
1,2-Dichlorobenzene	540	U	
2-Methylphenol	540	U	
4-Methylphenol	540	U	

Sample Number	SS-1			SS-1RE			SS-2			TP-1-1			TP-1-1DL			TP-1-2			TP-2-1			TP-3-1			TP-4-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
N-Nitroso-Di-n-propylamine	390 U			390 U			480 U		UJ										420 U								
Hexachloroethane	390 U			390 U			480 U												420 U								
Nitrobenzene	390 U			390 U			480 U												420 U								
Isophorone	390 U			390 U			480 U												420 U								
2-Nitrophenol	390 U			390 U			480 U												420 U								
2,4-Dimethylphenol	390 U			390 U			480 U												420 U								
Benzoic Acid	1900 U		UJ	1900 U			2300 U		UJ										2000 U								
Bis(2-chloroethoxy) methane	390 U			390 U			480 U												420 U								
2,4-Dichlorophenol	390 U			390 U			480 U												420 U								
1,2,4-Trichlorobenzene	390 U			390 U			480 U												420 U								
Naphthalene	390 U			390 U			55 J												420 U								
4-Chloroaniline	390 U			390 U			480 U												420 U								
Hexachlorobutadiene	390 U			390 U			480 U												420 U								
4-Chloro-3-methylphenol	390 U			390 U			480 U												420 U								
2-Methylnaphthalene	390 U			390 U			62 J												420 U								
Hexachlorocyclopentadiene	390 U		UJ	390 U			480 U		UJ										420 U		UJ						
2,4,6-Trichlorophenol	390 U			390 U			480 U												420 U								
2,4,5-Trichlorophenol	940 U			940 U			1200 U												1000 U								
2-Chloronaphthalene	390 U			390 U			480 U												420 U								
2-Nitroaniline	940 U			940 U			1200 U												1000 U								
Dimethyl phthalate	390 U			390 U			480 U												420 U								
Acenaphthylene	390 U			390 U			480 U												420 U								
2,6-Dinitrotoluene	390 U			390 U			480 U												420 U								
3-Nitroaniline	940 U			940 U			1200 U												1000 U								
Acenaphthene	390 U			390 U			480 U												49 J								
2,4-Dinitrophenol	940 U			940 U			1200 U												1000 U								
4-Nitrophenol	940 U			940 U			1200 U												1000 U								
Dibenzofuran	390 U			390 U			480 U												420 U								
2,4-Dinitrotoluene	390 U			390 U			480 U												420 U								
Diethyl phthalate	390 U			390 U			480 U												420 U								
4-Chlorodiphenylether	390 U			390 U			480 U												420 U								
Fluorene	390 U			390 U			480 U												420 U								
4-Nitroaniline	940 U			940 U			1200 U												1000 U								
4,6-Dinitro-2-methylpheno	940 U		R	940 U		R	1200 U		R										1000 U								
N-nitrosodiphenylamine	390 U			390 U			480 U												420 U								
4-Bromophenyl phenyl ethe	390 U			390 U			480 U												420 U								
Hexachlorobenzene	390 U			390 U			480 U												420 U								
Pentachlorophenol	940 U			940 U			1200 U												1000 U								
Phenanthrene	390 U		R	390 U		R	100 J		R										35 J								

Sample Number	TP-4-2			TP-4-2T			TP-5-1			TP-6-1			TP-6-2			TP-7-1			TP-7-1T			TP-7-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
N-Nitroso-Di-n-propylamine	700	U														540	U					540	U	
Hexachloroethane	700	U														540	U					540	U	
Nitrobenzene	700	U														540	U					540	U	
Isophorone	700	U														540	U					540	U	
2-Nitrophenol	700	U														540	U					540	U	
2,4-Dimethylphenol	700	U														540	U					540	U	
Benzoic Acid	300	J														2600	U					64	J	
Bis(2-chloroethoxy) methane	700	U														540	U					540	U	
2,4-Dichlorophenol	700	U														540	U					540	U	
1,2,4-Trichlorobenzene	700	U														540	U					540	U	
Naphthalene	120	J														540	U					71	J	
4-Chloroaniline	700	U														540	U					540	U	
Hexachlorobutadiene	700	U														540	U					540	U	
4-Chloro-3-methylphenol	700	U														540	U					540	U	
2-Methylnaphthalene	110	J														540	U					540	U	
Hexachlorocyclopentadiene	700	U														540	U	UJ				540	U	
2,4,6-Trichlorophenol	700	U														540	U					540	U	
2,4,5-Trichlorophenol	1700	U														1300	U					1300	U	
2-Chloronaphthalene	700	U														540	U					540	U	
2-Nitroaniline	1700	U														1300	U					1300	U	
Dimethyl phthalate	700	U														540	U					540	U	
Acenaphthylene	36	J														540	U					540	U	
2,6-Dinitrotoluene	700	U														540	U					540	U	
3-Nitroaniline	1700	U														1300	U					1300	U	
Acenaphthene	51	J														28	J					540	U	
2,4-Dinitrophenol	1700	U														1300	U					1300	U	
4-Nitrophenol	1700	U														1300	U					1300	U	
Dibenzofuran	65	J														540	U					540	U	
2,4-Dinitrotoluene	700	U														540	U					540	U	
Diethyl phthalate	700	U														540	U					540	U	
4-Chlorodiphenylether	700	U														540	U					540	U	
Fluorene	58	J														540	U					540	U	
4-Nitroaniline	1700	U														1300	U					1300	U	
4,6-Dinitro-2-methylpheno	1700	U														1300	U					1300	U	
N-nitrosodiphenylamine	700	U														540	U					540	U	
4-Bromophenyl phenyl ethe	700	U														540	U					540	U	
Hexachlorobenzene	700	U														540	U					540	U	
Pentachlorophenol	1700	U														1300	U					1300	U	
Phenanthrene	420	J														290	J	J				540	U	

Sample Number	TP-7-2RE			TP-8-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
N-Nitroso-Di-n-propylamine	540	U	K			
Hexachloroethane	540	U				
Nitrobenzene	540	U				
Isophorone	540	U				
2-Nitrophenol	540	U				
2,4-Dimethylphenol	540	U				
Benzoic Acid	69	J				
Bis(2-chloroethoxy) methane	540	U				
2,4-Dichlorophenol	540	U				
1,2,4-Trichlorobenzene	540	U				
Naphthalene	66	J				
4-Chloroaniline	540	U				
Hexachlorobutadiene	540	U				
4-Chloro-3-methylphenol	540	U				
2-Methylnaphthalene	540	U				
Hexachlorocyclopentadiene	540	U				
2,4,6-Trichlorophenol	540	U				
2,4,5-Trichlorophenol	1300	U				
2-Chloronaphthalene	540	U				
2-Nitroaniline	1300	U				
Dimethyl phthalate	540	U				
Acenaphthylene	540	U				
2,6-Dinitrotoluene	540	U				
3-Nitroaniline	1300	U				
Acenaphthene	540	U				
2,4-Dinitrophenol	1300	U				
4-Nitrophenol	1300	U				
Dibenzofuran	540	U				
2,4-Dinitrotoluene	540	U				
Diethyl phthalate	540	U				
4-Chlorodiphenylether	540	U				
Fluorene	540	U				
4-Nitroaniline	1300	U				
4,6-Dinitro-2-methylpheno	1300	U				
N-nitrosodiphenylamine	540	U				
4-Bromophenyl phenyl ethe	540	U				
Hexachlorobenzene	540	U				
Pentachlorophenol	1300	U				
Phenanthrene	540	U	J			

Sample Number	SS-1			SS-1RE			SS-2			TP-1-1			TP-1-1DL			TP-1-2			TP-2-1			TP-3-1			TP-4-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Anthracene	390 U		R	390 U		R	480 U		R										420 U								
Di-n-butyl phthalate	390 U			390 U			480 U												420 U								
Fluoranthene	390 U			390 U			480 U												420 U								
Pyrene	390 U			390 U			480 U												420 U								
Butyl benzyl phthalate	390 U			390 U			480 U												420 U								
3,3'-Dichlorobenzidine	390 U			390 U			480 U												420 U								
Benzo(a)anthracene	390 U			390 U			480 U												420 U								
Chrysene	390 U			390 U			480 U												420 U								
Bis(2-ethylhexyl) phthala	390 U			390 U			480 U												1400 B								
Di-n-octyl phthalate	390 U			390 U			480 U												420 U		UJ						
Benzo(b)fluoranthene	390 U			390 U			480 U												420 U								
Benzo(k)fluoranthene	390 U			390 U			480 U												420 U								
Benzo(a)pyrene	390 U			390 U			480 U												35 J								
Indeno(1,2,3-cd)pyrene	390 U			390 U			480 U												420 U								
Dibenzo(a,h)anthracene	390 U			390 U			480 U												420 U								
Benzo(ghi)perylene	390 U			390 U			480 U												420 U								
Bis(2-chloroisopropyl) ether	390 U		R	390 U		R	480 U		R										420 U								
PCBS (ug/kg)																											
Aroclor 1016	39 U						48 U			46 U						42 U			42 U			94 U			92 U		
Aroclor 1221	79 U						97 U			93 U						86 U			86 U			190 U			190 U		
Aroclor 1232	39 U						48 U			46 U						42 U			42 U			94 U			92 U		
Aroclor 1242	39 U						48 U			46 U						42 U			42 U			94 U			92 U		
Aroclor 1248	39 U						48 U			46 U						42 U			42 U			94 U			92 U		
Aroclor 1254	39 U						48 U			46 U						42 U			42 U			94 U			92 U		
Aroclor 1260	39 U						48 U			46 U						42 U			42 U			94 U			92 U		
PEST (ug/kg)																											
alpha-BHC	2 U		UJ				2.5 U												2.2 U								
beta-BHC	0.92 JP		UJ				2.5 U												2.2 U								
delta-BHC	2 U		UJ				2.5 U												2.2 U								
gamma-BHC (Lindane)	2 U						2.5 U												2.2 U								
Heptachlor	2 U						2.5 U												2.2 U								
Aldrin	2 U						2.5 U												2.2 U								
Heptachlor epoxide	2 U						2.5 U												2.2 U								
Endosulfan I	2 U		UJ				2.5 U												2.2 U								
Dieldrin	0.79 JP		UJ				4.8 U												4.2 U								
4,4'-DDE	0.5 JP		UJ				4.8 U												4.2 U								

Sample Number	TP-4-2			TP-4-2T			TP-5-1			TP-6-1			TP-6-2			TP-7-1			TP-7-1T			TP-7-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Anthracene	95	J														540	U					540	U	
Di-n-butyl phthalate	700	U														540	U					540	U	
Fluoranthene	630	J														540	U					540	U	
Pyrene	920															540	U					540	U	
Butyl benzyl phthalate	700	U														540	U					540	U	
3,3'-Dichlorobenzidine	700	U														540	U					540	U	
Benzo(a)anthracene	380	J														170	J					540	U	
Chrysene	540	J														200	J					540	U	
Bis(2-ethylhexyl) phthala	2000	B														2000	B					1300	B	
Di-n-octyl phthalate	700	U														540	U					540	U	
Benzo(b)fluoranthene	890															540	U					540	U	
Benzo(k)fluoranthene	410	J														540	U					540	U	
Benzo(a)pyrene	480	J														540	U					540	U	
Indeno(1,2,3-cd)pyrene	280	J														540	U					540	U	
Dibenzo(a,h)anthracene	77	J														540	U					540	U	
Benzo(ghi)perylene	200	J														540	U					540	U	
Bis(2-chloroisopropyl) ether	700	U														540	U					540	U	
PCBS (ug/kg)																								
Aroclor 1016	70	U					110	U		43	U		39	U		54	U					270	U	
Aroclor 1221	140	U					230	U		88	U		80	U		110	U					550	U	
Aroclor 1232	70	U					110	U		43	U		39	U		54	U					270	U	
Aroclor 1242	70	U					110	U		43	U		39	U		54	U					700		
Aroclor 1248	70	U					110	U		43	U		39	U		54	U					270	U	
Aroclor 1254	170						110	U		43	U		39	U		140						660	P	
Aroclor 1260	70	U					110	U		43	U		39	U		54	U					270	U	
PEST (ug/kg)																								
alpha-BHC	3.6	U														2.8	U					14	U	
beta-BHC	1.7	JP														2.8	U					14	U	
delta-BHC	3.6	U														2.8	U					14	U	
gamma-BHC (Lindane)	3.6	U														2.8	U					14	U	
Heptachlor	3.6	U														2.8	U					14	U	
Aldrin	3.6	U														2.8	U					14	U	
Heptachlor epoxide	3.6	U														2.8	U					14	U	
Endosulfan I	3.6	U														2.8	U					14	U	
Dieldrin	7	U														2.8	U					14	U	
4,4'-DDE	7	U														5.4	U					27	U	
																5.4	U					27	U	

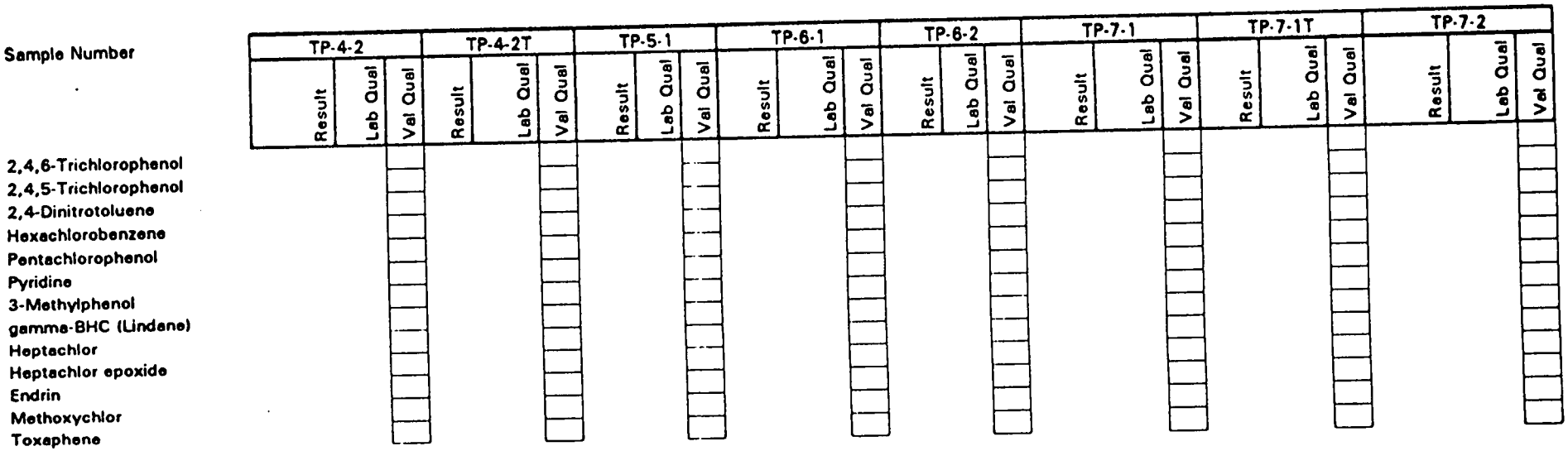
Sample Number	TP-7-2RE			TP-8-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Anthracene	540	U				
Di-n-butyl phthalate	540	U				
Fluoranthene	540	U				
Pyrene	540	U				
Butyl benzyl phthalate	540	U				
3,3'-Dichlorobenzidine	540	U				
Benzo(a)anthracene	540	U				
Chrysene	540	U				
Bis(2-ethylhexyl) phthale	1100	B				
Di-n-octyl phthalate	540	U				
Benzo(b)fluoranthene	540	U				
Benzo(k)fluoranthene	540	U				
Benzo(a)pyrene	540	U				
Indeno(1,2,3-cd)pyrene	540	U				
Dibenzo(a,h)anthracene	540	U				
Benzo(ghi)perylene	540	U				
Bis(2-chloroisopropyl) ether	540	U				
PCBS (ug/kg)						
Aroclor 1016				53	U	
Aroclor 1221				110	U	
Aroclor 1232				53	U	
Aroclor 1242				53	U	
Aroclor 1248				53	U	
Aroclor 1254				53	U	
Aroclor 1260				53	U	
PEST (ug/kg)						
alpha-BHC						
beta-BHC						
delta-BHC						
gamma-BHC (Lindane)						
Heptachlor						
Aldrin						
Heptachlor epoxide						
Endosulfan I						
Dieldrin						
4,4'-DDE						

Sample Number	SS-1			SS-1RE			SS-2			TP-1-1			TP-1-1DL			TP-1-2			TP-2-1			TP-3-1			TP-4-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Endrin	10		UJ				4.8	U											4.2	U							
Endosulfan II	6.2		UJ				1.2	JP											4.2	U							
4,4'-DDD	3.9	U	UJ				4.8	U											4.2	U							
Endosulfan Sulfate	3.9	U					4.8	U											4.2	U							
4,4'-DDT	3.9	U					4.8	U											4.2	U							
Methoxychlor	20	U					25	U											22	U							
Endrin ketone	3.9	U					4.8	U											4.2	U							
alpha-Chlordane	2.8		UJ				2.5	U											2.2	U							
gamma-Chlordane	2	U	UJ				2.5	U											2.2	U							
Toxaphene	200	U	UJ				250	U											220	U							
TCLP (ug/l)																											
Arsenic - Total																											
Barium - Total																											
Cadmium - Total																											
Chromium - Total																											
Lead - Total																											
Mercury - Total																											
Selenium - Total																											
Silver - Total																											
Vinyl chloride																											
1,1-Dichloroethene																											
Chloroform																											
1,2-Dichloroethane																											
2-Butanone																											
Chlordane																											
Carbon Tetrachloride																											
Trichloroethene																											
Benzene																											
Tetrachloroethene																											
Chlorobenzene																											
1,4-Dichlorobenzene																											
2-Methylphenol																											
2,4,5-TP (Silvex)(mg/l)																											
4-Methylphenol																											
Hexachloroethane																											
Nitrobenzene																											
Hexachlorobutadiene																											
2,4-D(mg/l)																											

Sample Number	TP-4-2			TP-4-2T			TP-5-1			TP-6-1			TP-6-2			TP-7-1			TP-7-1T			TP-7-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Endrin	7	U														5.4	U					27	U	
Endosulfan II	7	U														5.4	U					27	U	
4,4'-DDD	7	U														5.4	U					27	U	
Endosulfan Sulfate	7	U														5.4	U					27	U	
4,4'-DDT	7	U														5.4	U					27	U	
Methoxychlor	36	U														28	U					140	U	
Endrin ketone	7	U														5.4	U					27	U	
alpha-Chlordane	3.6	U														2.8	U					14	U	
gamma-Chlordane	3.6	U														2.8	U					14	U	
Toxephene	360	U														280	U					1400	U	
TCLP (ug/l)																								
Arsenic - Total				4	UN														4	UN				
Barium - Total				901		J													1190		J			
Cadmium - Total				5	UN														5	UN				
Chromium - Total				10	U*														10	U*				
Lead - Total				4		J													64.2	S	J			
Mercury - Total				0.2	U														0.2	U				
Selenium - Total				4	UWN														20	UWN				
Silver - Total				1	UW														1	UW				
Vinyl chloride																								
1,1-Dichloroethene																								
Chloroform																								
1,2-Dichloroethane																								
2-Butanone																								
Chlordane																								
Carbon Tetrachloride																								
Trichloroethene																								
Benzene																								
Tetrachloroethene																								
Chlorobenzene																								
1,4-Dichlorobenzene																								
2-Methylphenol																								
2,4,5-TP (Silvex)(mg/l)																								
4-Methylphenol																								
Hexachloroethane																								
Nitrobenzene																								
Hexachlorobutadiene																								
2,4-D(mg/l)																								

Sample Number	TP-7-2RE			TP-8-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Endrin						
Endosulfan II						
4,4'-DDD						
Endosulfan Sulfate						
4,4'-DDT						
Methoxychlor						
Endrin ketone						
alpha-Chlordane						
gamma-Chlordane						
Toxaphene						
TCLP (ug/l)						
Arsenic - Total						
Barium - Total						
Cadmium - Total						
Chromium - Total						
Lead - Total						
Mercury - Total						
Selenium - Total						
Silver - Total						
Vinyl chloride						
1,1-Dichloroethene						
Chloroform						
1,2-Dichloroethane						
2-Butanone						
Chlordane						
Carbon Tetrachloride						
Trichloroethene						
Benzene						
Tetrachloroethene						
Chlorobenzene						
1,4-Dichlorobenzene						
2-Methylphenol						
2,4,5-TP (Silvex)(mg/l)						
4-Methylphenol						
Hexachloroethane						
Nitrobenzene						
Hexachlorobutadiene						
2,4-D(mg/l)						

Sample Number	SS-1			SS-1RE			SS-2			TP-1-1			TP-1-1DL			TP-1-2			TP-2-1			TP-3-1			TP-4-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
2,4,6-Trichlorophenol																											
2,4,5-Trichlorophenol																											
2,4-Dinitrotoluene																											
Hexachlorobenzene																											
Pentachlorophenol																											
Pyridine																											
3-Methylphenol																											
gamma-BHC (Lindane)																											
Heptachlor																											
Heptachlor epoxide																											
Endrin																											
Methoxychlor																											
Toxaphene																											



Sample Number	TP-4-2			TP-4-2T			TP-5-1			TP-6-1			TP-6-2			TP-7-1			TP-7-1T			TP-7-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
2,4,6-Trichlorophenol																								
2,4,5-Trichlorophenol																								
2,4-Dinitrotoluene																								
Hexachlorobenzene																								
Pentachlorophenol																								
Pyridine																								
3-Methylphenol																								
gamma-BHC (Lindane)																								
Heptachlor																								
Heptachlor epoxide																								
Endrin																								
Methoxychlor																								
Toxaphene																								

Sample Number	TP-7-2RE			TP-8-1		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
2,4,6-Trichlorophenol						
2,4,5-Trichlorophenol						
2,4-Dinitrotoluene						
Hexachlorobenzene						
Pentachlorophenol						
Pyridine						
3-Methylphenol						
gamma-BHC (Lindane)						
Heptachlor						
Heptachlor epoxide						
Endrin						
Methoxychlor						
Toxaphene						

Sample Number	CW-1			DUP-3/RMW-3			DUP-4/SW-3			MW-1A			MW-1B			Rinsate-2			RMW-1			RMW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Metals (ug/l)																								
Aluminum - Total	24200	*	J	69900	*	J	100	U*		146000	*	J	6610	*	J	100	U*		71000	*	J	16400	*	J
Antimony - Total	5	U		5	U		5	U		5	U		5	U		5	U		6	BW	J	5	U	
Arsenic - Total	10	N	J	7	BN	J	4	UWN		16	N	J	4	BN	J	4	UWN	J	17	N	J	6	BN	J
Barium - Total	322			899			42.3	B		809			130	B		20	U		490			379		
Beryllium - Total	5	UN		5	UN		5	UN		5	UN		5	UN		5	UN		5	UN		5	UN	
Cadmium - Total	5	U	UJ	5	U	UJ	5	U	UJ	5	U	UJ	5	U	UJ	5	U	UJ	5	U	UJ	5	U	UJ
Calcium - Total	527000		J	799000		J	118000		J	977000		J	92900		J	562	B		268000		J	290000		J
Chromium - Total	48.1	*	J	96.2	*	J	10	U*		208	*	J	10	U*		10	U*		108	*	J	36.7	*	J
Cobalt - Total	142			33.6	B		20	U		96.4		J	20	U		20	U		46.8	B		20	U	
Copper - Total	20	BN	J	10	UN		10	UN		112	N	J	17.1	BN	J	10	UN		17.5	BN	J	29.8	N	J
Iron - Total	51700	*	J	75900	*	J	6260	*	J	246000	*	J	53200	*	J	74.6	B*	J	102000	*	J	48500	*	J
Lead - Total	47		J	62		J	3	UW		240		J	18	S	J	3	UW		195	+	R	41		J
Magnesium - Total	74700		J	142000		J	20400		J	171000		J	8400		J	200	U		94200		J	74100		J
Manganese - Total	3340		J	2200		J	1060		J	4790		J	1990		J	5	U		11900		J	3330		J
Mercury - Total	0.2	U		0.2	U		0.2	U		0.2	U		0.2	U		0.2	U		0.2	U		0.2	U	
Nickel - Total	84.1	N	J	99.5	N	J	20	UN		266	N	J	20	UN	J	20	UN		235	N	J	68.5	N	J
Potassium - Total	10100		J	20900		J	9790		J	45200		J	11400		J	200	U		47300		J	16200		J
Selenium - Total	4	UN		4	UWN		4	UN		4	UWN		4	UWN		4	UWN		4	UN		4	UN	
Silver - Total	10	UN*		10	UN*		10	UN*		10	UN*		10	UN*		10	UN*		10	UN*		10	UN*	
Sodium - Total	54100		J	17000		J	15700		J	77900		J	18800		J	990	B		159000		J	62100		J
Thallium - Total	5	UW		5	UW		5	UW		5	U		5	UW		5	U		5	UW		5	UW	
Vanadium - Total	44.8	BN*	J	129	N*	J	20	UN*		258	N*	J	20	UN*	J	20	UN*		123	N*	J	34.4	BN*	J
Zinc - Total	176	N	J	432	N	J	35.7	N	J	598	N	J	73	N	J	10	UN		500	N	J	226	N	J
Cyanide - Total	10	U		10	U		17.1		J	10	U		14.7		J				10	U		10	U	
Hexavalent Chromium - Total																								
VOC (ug/l)																								
Chloromethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Bromomethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Vinyl chloride	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Chloroethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Methylene chloride	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Acetone	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Carbon Disulfide	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
1,1-Dichloroethene	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
1,1-Dichloroethane	10	U		10	U		10	U		10	U		10	U		10	U		1	J	J	10	U	
1,2-Dichloroethene (Total)	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Chloroform	10	U		10	U		10	U		10	U		10	U		9	J		10	U		10	U	

RAMW.XLS

Sample Number	RMW-3			SED-16			SED-16DL			SED-16DLRE			SED-16RE			SED-17			SW-1			SW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Metals (ug/l)																								
Aluminum - Total	61500	*	J	8620	*	J										10700	*	J	100	U*		100	U*	
Antimony - Total	5	U		31	N	J										9	UN	R	5	U		5	U	
Arsenic - Total	7	BN	J	20.7	N	J										12.9	N	J	4	UN		4	UN	
Barium - Total	887		J	228												108			46.8	B		44	B	
Beryllium - Total	5	UN		1.7	UN	UJ										1.1	UN	UJ	5	UN		5	UN	
Cadmium - Total	5	U	UJ	3.1	N	R										1.2	N	R	5	U		5	U	
Calcium - Total	872000		J	19100												147000			160000			170000		
Chromium - Total	92	*	J	791	*	J										864	*	J	10	U*		10	U*	
Cobalt - Total	33.5	B		11.6	B											7.2	B		20	U		20	U	
Copper - Total	16.2	BN	J	204	N	J										2.2	UN	UJ	10	UN		10	UN	
Iron - Total	76700	*	J	38900	*	J										75300	*	J	771	*	J	2120	*	J
Lead - Total	136	+	J	610	N	R										104	N	R	5		J	7		J
Magnesium - Total	153000		J	776												16200			32400			37100		
Manganese - Total	2320		J	5470												19200			833		J	1100		
Mercury - Total	0.2	U		0.68												0.1	U		0.2	U		0.2	U	
Nickel - Total	96.2	N	J	15.5	N	J										114	N	J	23.8	BN	J	20	UN	
Potassium - Total	16200		J	1460	B											1120			10800			9730		
Selenium - Total	20	UN		1.4	BWN	J										0.92	BWN	J	20	UN		20	UWN	
Silver - Total	10	UN*		3.5	UN*	UJ										2.2	UN*	UJ	10	UN*		10	UN*	
Sodium - Total	16400		J	884	B											669	B		29500			34100		
Thallium - Total	5	UW		1.7	UW											1.2	U		5	UW		5	UW	
Vanadium - Total	116	N*	J	27.2	N*	R										373	N*	R	20	UN*	J	20	UN*	
Zinc - Total	455	N	J	556	N	R										230	N	R	36.9	N	J	27.8	N	J
Cyanide - Total	10	U		2.8												1.4	U		10	U		10	U	
Hexavalent Chromium - Tot																								
VOC (ug/l)																								
Chloromethane	10	U		16	U											14	U		10	U		10	U	
Bromomethane	10	U		16	U											14	U		10	U		10	U	
Vinyl chloride	10	U		16	U											14	U		10	U		10	U	
Chloroethane	10	U		16	U											14	U		10	U		10	U	
Methylene chloride	10	U		16	U											14	U		10	U		10	U	
Acetone	14			16	U											14	U		10	U		10	U	
Carbon Disulfide	10	U		16	U											14	U		10	U		10	U	
1,1-Dichloroethene	10	U		16	U											14	U		10	U		10	U	
1,1-Dichloroethane	10	U		16	U											14	U		10	U		10	U	
1,2-Dichloroethene (Total)	10	U		13	J											14	U		10	U		10	U	
Chloroform	10	U		16	U											14	U		10	U		10	U	

Sample Number	SW-3			SW-4			SW-5		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Metals (ug/l)									
Aluminum - Total	100	U*		100	U*		16600	*	J
Antimony - Total	5	U		160	B		5	U	
Arsenic - Total	4	UN		4	UN		12	N	J
Barium - Total	40.9	B		108	B		124	B	
Beryllium - Total	5	UN		5	UN		5	UN	
Cadmium - Total	5	U	UJ	5	U	UJ	5	U	UJ
Calcium - Total	117000		J	185000		J	73200		J
Chromium - Total	10	U*		10	U*		27.7	*	J
Cobalt - Total	20	U		20	U		20	U	
Copper - Total	10	UN		10	UN		16.8	BN	J
Iron - Total	6230	*	J	2340	*	J	26800	*	J
Lead - Total	3	UW		4		J	71		J
Magnesium - Total	19800		J	77300		J	8030		J
Manganese - Total	1050		J	3510		J	680		J
Mercury - Total	0.2	U		0.2	U		0.2	U	
Nickel - Total	20	UN		53.5	N	J	34.7	BN	J
Potassium - Total	9530		J	46100		J	31600		J
Selenium - Total	20	UWN		4	UN		4	UN	
Silver - Total	10	UN*		10	UN*		10	UN*	
Sodium - Total	15300		J	145000		J	50800		J
Thallium - Total	5	UW		5	U		5	U	
Vanadium - Total	20	UN*		20	UN*		50	BN*	J
Zinc - Total	28.5	N	J	44.4	N	J	159	N	J
Cyanide - Total	10	U		10	U		22.5		J
Hexavalent Chromium - Tot									
VOC (ug/l)									
Chloromethane	10	U		10	U		10	U	
Bromomethane	10	U		10	U		10	U	
Vinyl chloride	10	U		10	U		10	U	
Chloroethane	10	U		10	U		10	U	
Methylene chloride	10	U		10	U		10	U	
Acetone	10	U		10	U		10	U	
Carbon Disulfide	10	U		10	U		10	U	
1,1-Dichloroethene	10	U		10	U		10	U	
1,1-Dichloroethane	10	U		10	U		10	U	
1,2-Dichloroethene (Total)	10	U		10	U		10	U	
Chloroform	10	U		10	U		10	U	

Sample Number	CW-1			DUP-3/RMW-3			DUP-4/SW-3			MW-1A			MW-1B			Rinsate-2			RMW-1			RMW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
2-Butanone	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
1,1,1-Trichloroethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Carbon Tetrachloride	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Bromodichloromethane	10	U		10	U		10	U		10	U		10	U		3	J		10	U		10	U	
1,2-Dichloropropane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
cis-1,3-Dichloropropene	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Trichloroethene	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Dibromochloromethane	10	U		10	U		10	U		10	U		10	U		1	J		10	U		10	U	
1,1,2-Trichloroethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Benzene	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
trans-1,3-Dichloropropene	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Bromoform	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
4-Methyl-2-pentanone	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
2-Hexanone	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Tetrachloroethene	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Toluene	0.4	BJ	J	0.7	BJ	J	0.5	BJ	J	0.5	BJ	J	10	U		1	BJ	J	1	BJ	J	0.6	BJ	J
1,1,2,2-Tetrachloroethane	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
Chlorobenzene	10	U		10	U		10	U		10	U		10	U		0.4	BJ	J	5	BJ	J	0.2	BJ	J
Ethyl benzene	10	U		10	U		10	U		10	U		10	U		10	U		0.4	BJ	J	10	U	
Styrene	10	U		10	U		10	U		10	U		10	U		0.2	BJ	J	10	U		10	U	
Total Xylenes	10	U		10	U		10	U		1	BJ	J	10	U		0.7	BJ	J	3	BJ	J	10	U	
Vinyl acetate	10	U		10	U		10	U		10	U		10	U		10	U		10	U		10	U	
SEMI-VOC (ug/l)																								
Phenol	10	U		31			10	U		10	U		10	U					10	U		10	U	
Bis(2-chloroethyl) ether	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2-Chlorophenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
1,3-Dichlorobenzene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
1,4-Dichlorobenzene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Benzyl Alcohol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
1,2-Dichlorobenzene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2-Methylphenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
4-Methylphenol	10	U		2	J		10	U		10	U		10	U					10	U		10	U	
N-Nitroso-Di-n-propylamine	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Hexachloroethane	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Nitrobenzene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Isophorone	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2-Nitrophenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	

Sample Number	RMW-3			SED-16			SED-16DL			SED-16DLRE			SED-16RE			SED-17			SW-1			SW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane	10	U		16	U											14	U		10	U		10	U	
2-Butanone	10	U		16	U											14	U		10	U		10	U	
1,1,1-Trichloroethane	10	U		16	U											14	U		10	U		10	U	
Carbon Tetrachloride	10	U		16	U											14	U		10	U		10	U	
Bromodichloromethane	10	U		16	U											14	U		10	U		10	U	
1,2-Dichloropropane	10	U		16	U											14	U		10	U		10	U	
cis-1,3-Dichloropropene	10	U		16	U											14	U		10	U		10	U	
Trichloroethene	10	U		11	J											14	U		10	U		10	U	
Dibromochloromethane	10	U		16	U											14	U		10	U		10	U	
1,1,2-Trichloroethane	10	U		16	U											14	U		10	U		10	U	
Benzene	10	U		2	J											14	U		10	U		10	U	
trans-1,3-Dichloroprope	10	U		16	U											14	U		10	U		10	U	
Bromoform	10	U		16	U											14	U		10	U		10	U	
4-Methyl-2-pentanone	10	U		16	U											14	U		10	U		10	U	
2-Hexanone	10	U		16	U											14	U		10	U		10	U	
Tetrachloroethene	10	U		16	U											14	U		10	U		10	U	
Toluene	0.7	BJ	U	16	U											14	U		10	U		10	U	
1,1,2,2-Tetrachloroethane	10	U		16	U											0.8	J	U	1	BJ	U	0.7	BJ	U
Chlorobenzene	10	U		8	J											14	U		10	U		10	U	
Ethyl benzene	10	U		16	U											14	U		0.4	BJ	U	0.3	BJ	U
Styrene	10	U		16	U											14	U		10	U		10	U	
Total Xylenes	10	U		16	U											14	U		10	U		10	U	
Vinyl acetate	10	U		16	U											14	U		10	U		10	U	
SEMI-VOC (ug/l)																								
Phenol	25			560	U		2800	U	UJ	2800	U	UJ	560	U		360	U		10	U		10	U	
Bis(2-chloroethyl) ether	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
2-Chlorophenol	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
1,3-Dichlorobenzene	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
1,4-Dichlorobenzene	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
Benzyl Alcohol	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
1,2-Dichlorobenzene	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
2-Methylphenol	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
4-Methylphenol	2	J		560	U		2800	U		2800	U		560	U		27	J		10	U		10	U	
N-Nitroso-Di-n-propylamine	10	U		560	U		2800	U		2800	U		560	U		73	J		10	U		10	U	
Hexachloroethane	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
Nitrobenzene	10	U		64	J		2800	U		2800	U		560	U		360	U		10	U		10	U	
Isophorone	10	U		560	U		2800	U		2800	U		65	J		360	U		10	U		10	U	
2-Nitrophenol	10	U		560	U		2800	U	UJ	2800	U	UJ	560	U		360	U		10	U		10	U	

Sample Number	SW-3			SW-4			SW-5		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
1,2-Dichloroethane	10	U		10	U		10	U	
2-Butanone	10	U		10	U		10	U	
1,1,1-Trichloroethane	10	U		10	U		10	U	
Carbon Tetrachloride	10	U		10	U		10	U	
Bromodichloromethane	10	U		10	U		10	U	
1,2-Dichloropropane	10	U		10	U		10	U	
cis-1,3-Dichloropropene	10	U		10	U		10	U	
Trichloroethene	10	U		1	J		10	U	
Dibromochloromethane	10	U		10	U		10	U	
1,1,2-Trichloroethane	10	U		10	U		10	U	
Benzene	10	U		2	J		10	U	
trans-1,3-Dichloroprope	10	U		10	U		10	U	
Bromoform	10	U		10	U		10	U	
4-Methyl-2-pentanone	10	U		10	U		10	U	
2-Hexanone	10	U		10	U		10	U	
Tetrachloroethene	10	U		10	U		10	U	
Toluene	0.7	BJ	U	0.8	BJ	U	0.4	BJ	U
1,1,2,2-Tetrachloroethane	10	U		10	U		10	U	
Chlorobenzene	0.2	BJ	U	26	B		0.5	BJ	U
Ethyl benzene	10	U		10	U		10	U	
Styrene	10	U		0.1	BJ	U	10	U	
Total Xylenes	10	U		1	BJ	U	10	U	
Vinyl acetate	10	U		10	U		10	U	
SEMI-VOC (ug/l)									
Phenol	10	U		10	U		3	J	
Bis(2-chloroethyl) ether	10	U		10	U		10	U	
2-Chlorophenol	10	U		10	U		10	U	
1,3-Dichlorobenzene	10	U		0.2	J		10	U	
1,4-Dichlorobenzene	10	U		2	J		10	U	
Benzyl Alcohol	10	U		10	U		10	U	
1,2-Dichlorobenzene	10	U		10	U		10	U	
2-Methylphenol	10	U		10	U		10	U	
4-Methylphenol	10	U		10	U		10	U	
N-Nitroso-Di-n-propylamine	10	U		10	U		10	U	
Hexachloroethane	10	U		10	U		10	U	
Nitrobenzene	10	U		22			10	U	
Isophorone	10	U		10	U		10	U	
2-Nitrophenol	10	U		10	U		10	U	

Sample Number	CW-1			DUP-3/RMW-3			DUP-4/SW-3			MW-1A			MW-1B			Rinsate-2			RMW-1			RMW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
2,4-Dimethylphenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Benzoic Acid	50	U		19	J		2	J		0.8	J		2	J					2	J		2	J	
Bis(2-chloroethoxy) methan	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2,4-Dichlorophenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
1,2,4-Trichlorobenzene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Naphthalene	10	U		0.5	J		10	U		10	U		10	U					0.5	J		10	U	
4-Chloroaniline	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Hexachlorobutadiene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
4-Chloro-3-methylphenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2-Methylnaphthalene	10	U		10	U		10	U		10	U		10	U					0.6	J		10	U	
Hexachlorocyclopentadiene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2,4,6-Trichlorophenol	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2,4,5-Trichlorophenol	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
2-Chloronaphthalene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2-Nitroaniline	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
Dimethyl phthalate	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Acenaphthylene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2,6-Dinitrotoluene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
3-Nitroaniline	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
Acenaphthene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2,4-Dinitrophenol	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
4-Nitrophenol	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
Dibenzofuran	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
2,4-Dinitrotoluene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Diethyl phthalate	2	J		10	U		10	U		10	U		1	J					0.6	J		2	J	
4-Chlorodiphenylether	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Fluorene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
4-Nitroaniline	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
4,6-Dinitro-2-methylphene	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
N-nitrosodiphenylamine	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
4-Bromophenyl phenyl ethe	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Hexachlorobenzene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Pentachlorophenol	25	U		25	U		25	U		25	U		25	U					25	U		25	U	
Phenanthrene	10	U		0.5	J		10	U		10	U		10	U					2	J		10	U	
Anthracene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Di-n-butyl phthalate	1	J		1	J		1	J		0.9	J		1	J					10	U		10	U	
Fluoranthene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Pyrene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Butyl benzyl phthalate	0.7	J		0.6	J	J	0.6	J	J	0.5	J	J	0.8	J	J				0.5	J	J	10	U	

Sample Number	RMW-3			SED-16			SED-16DL			SED-16DLRE			SED-16RE			SED-17			SW-1			SW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
2,4-Dimethylphenol	10 U			560 U			2800 U	UJ		2800 U	UJ		560 U			360 U			10 U			10 U		
Benzoic Acid	8 J			2700 U			14000 U			13000 U			2700 U			1800 U			8 J		J	2 J		J
Bis(2-chloroethoxy) methan	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
2,4-Dichlorophenol	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
1,2,4-Trichlorobenzene	10 U			43 J			2800 U	UJ		2800 U	UJ		44 J			360 U			10 U			10 U		
Naphthalene	10 U			270 J			270 DJ	J		270 DJ	J		270 J			50 J			10 U			10 U		
4-Chloroaniline	10 U			560 U			2800 U	UJ		2800 U	UJ		560 U			360 U			10 U			10 U		
Hexachlorobutadiene	10 U			560 U			2800 U	UJ		2800 U	UJ		560 U			360 U			10 U			10 U		
4-Chloro-3-methylphenol	10 U			560 U			2800 U	UJ		2800 U	UJ		560 U			360 U			10 U			10 U		
2-Methylnaphthalene	10 U			240 J			240 DJ	J		230 DJ	J		240 J			47 J			10 U			10 U		
Hexachlorocyclopentadiene	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
2,4,6-Trichlorophenol	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
2,4,5-Trichlorophenol	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
2-Chloronaphthalene	10 U			37 J			2800 U			2800 U			37 J			360 U			10 U			10 U		
2-Nitroaniline	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
Dimethyl phthalate	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
Acenaphthylene	10 U			120 J			130 DJ			130 DJ			120 J			23 J			10 U			10 U		
2,6-Dinitrotoluene	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
3-Nitroaniline	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
Acenaphthene	10 U			810			880 DJ			880 DJ			810			14 J			10 U			10 U		
2,4-Dinitrophenol	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
4-Nitrophenol	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
Dibenzofuran	10 U			380 J			400 DJ			390 DJ			380 J			360 U			10 U			10 U		
2,4-Dinitrotoluene	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
Diethyl phthalate	0.6 J			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
4-Chlorodiphenylether	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
Fluorene	10 U			350 J			2800 U			2800 U			560 U			360 U			10 U			10 U		
4-Nitroaniline	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
4,6-Dinitro-2-methylpheno	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
N-nitrosodiphenylamine	10 U			47 J			2800 U			2800 U			53 J			360 U			10 U			10 U		
4-Bromophenyl phenyl ethe	10 U			560 U			2800 U			2800 U			560 U			360 U			10 U			10 U		
Hexachlorobenzene	10 U			950			1000 DJ			1000 DJ			940			360 U			10 U			10 U		
Pentachlorophenol	25 U			1400 U			6800 U			6700 U			1400 U			880 U			25 U			25 U		
Phenanthrene	0.4 J			4900 E			5900 D			5900 D			4900 E			160 J			10 U			10 U		
Anthracene	10 U			1300			1500 DJ			1500 DJ			1200			31 J			10 U			10 U		
Di-n-butyl phthalate	0.8 J			70 J			2800 U			2800 U			69 J			16 J			0.8 J			0.7 J		
Fluoranthene	10 U			6700 E			11000 D			12000 D			6500 E			250 J			10 U			10 U		
Pyrene	10 U			18000 E			9000 D			9500 D			19000 E	J		280 J			10 U			10 U		
Butyl benzyl phthalate	0.7 J	J		120 J	J		67 DJ	J		72 DJ	J		120 J	J		360 U	J		0.5 J			0.8 J		

Sample Number	SW-3			SW-4			SW-5		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
2,4-Dimethylphenol	10	U		10	U		10	U	
Benzoic Acid	2	J	J	50	U		4	J	J
Bis(2-chloroethoxy) methan	10	U		10	U		10	U	
2,4-Dichlorophenol	10	U		10	U		10	U	
1,2,4-Trichlorobenzene	10	U		10	U		10	U	
Naphthalene	10	U		0.5	J		10	U	
4-Chloroaniline	10	U		3	J		10	U	
Hexachlorobutadiene	10	U		10	U		10	U	
4-Chloro-3-methylphenol	10	U		10	U		10	U	
2-Methylnaphthalene	10	U		10	U		10	U	
Hexachlorocyclopentadiene	10	U		10	U		10	U	
2,4,6-Trichlorophenol	10	U		10	U		10	U	
2,4,5-Trichlorophenol	25	U		25	U		25	U	
2-Chloronaphthalene	10	U		0.4	J		10	U	
2-Nitroaniline	25	U		0.4	J		25	U	
Dimethyl phthalate	10	U		10	U		10	U	
Acenaphthylene	10	U		10	U		10	U	
2,6-Dinitrotoluene	10	U		10	U		10	U	
3-Nitroaniline	25	U		25	U		25	U	
Acenaphthene	10	U		0.07	J		10	U	
2,4-Dinitrophenol	25	U		25	U		25	U	
4-Nitrophenol	25	U		25	U		25	U	
Dibenzofuran	10	U		10	U		10	U	
2,4-Dinitrotoluene	10	U		10	U		10	U	
Diethyl phthalate	10	U		10	U		10	U	
4-Chlorodiphenylether	10	U		10	U		10	U	
Fluorene	10	U		10	U		10	U	
4-Nitroaniline	25	U		25	U		25	U	
4,6-Dinitro-2-methylpheno	25	U		25	U		25	U	
N-nitrosodiphenylamine	10	U		10	U		10	U	
4-Bromophenyl phenyl ethe	10	U		10	U		10	U	
Hexachlorobenzene	10	U		10	U		10	U	
Pentachlorophenol	25	U		25	U		25	U	
Phenanthrene	10	U		10	U		10	U	
Anthracene	10	U		10	U		10	U	
Di-n-butyl phthalate	0.5	J		10	U		10	U	
Fluoranthene	10	U		10	U		10	U	
Pyrene	10	U		10	U		10	U	
Butyl benzyl phthalate	0.5	J		0.2	J	J	0.6	J	

Sample Number	CW-1			DUP-3/RMW-3			DUP-4/SW-3			MW-1A			MW-1B			Rinsate-2			RMW-1			RMW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
3,3'-Dichlorobenzidine	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Benzo(a)anthracene	10	U		10	U		10	U		10	U		10	U					0.3	J		10	U	
Chrysene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Bis(2-ethylhexyl) phthala	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Di-n-octyl phthalate	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Benzo(b)fluoranthene	10	U		10	U		10	U		10	U		10	U					0.4	J		10	U	
Benzo(k)fluoranthene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Benzo(a)pyrene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Indeno(1,2,3-cd)pyrene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Dibenzo(a,h)anthracene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Benzo(ghi)perylene	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
Bis(2-chloroisopropyl) ether	10	U		10	U		10	U		10	U		10	U					10	U		10	U	
PCBS (ug/kg)																								
Aroclor 1016	1	U	UJ	1.1	U	UJ	1	U	UJ	1.2	U	UJ	1.1	U	UJ	1	U	UJ	1	U	UJ	1	U	UJ
Aroclor 1221	2	U		2.2	U		2	U		2.4	U		2.3	U		2	U		2.1	U		2	U	
Aroclor 1232	1	U		1.1	U		1	U		1.2	U		1.1	U		1	U		1	U		1	U	
Aroclor 1242	1	U		1.1	U		1	U		1.2	U		1.1	U		1	U		1	U		1	U	
Aroclor 1248	1	U		1.1	U		1	U		1.2	U		1.1	U		1	U		1	U		1	U	
Aroclor 1254	1	U		1.1	U		1	U		1.2	U		1.1	U		1	U		1	U		1	U	
Aroclor 1260	1	U		1.1	U		1	U		1.2	U		1.1	U		1	U		1	U		1	U	
PEST (ug/l)																								
alpha-BHC	0.05	U	UJ	0.056	U	UJ	0.05	U	UJ	0.059	U	UJ	0.057	U	UJ	0.05	U	UJ	0.052	U	UJ	0.05	U	UJ
beta-BHC	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.052	U		0.05	U	
delta-BHC	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.052	U		0.05	U	
gamma-BHC (Lindane)	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.052	U		0.05	U	
Heptachlor	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.052	U		0.05	U	
Aldrin	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.052	U		0.05	U	
Heptachlor epoxide	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.052	U		0.05	U	
Endosulfan I	0.05	U		0.056	U		0.05	U		0.059	U		0.057	U		0.05	U		0.038	JP	J	0.05	U	
Dieldrin	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.052	U	UJ	0.1	U	
4,4'-DDE	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.024	JP	J	0.1	U	
Endrin	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.1	U	UJ	0.1	U	
Endosulfan II	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.1	U		0.1	U	
4,4'-DDD	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.1	U		0.1	U	
Endosulfan Sulfate	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.1	U		0.1	U	
4,4'-DDT	0.1	U		0.11	U		0.1	U		0.12	U		0.11	U		0.1	U		0.1	U		0.1	U	

Sample Number	RMW-3			SED-16			SED-16DL			SED-16DLRE			SED-16RE			SED-17			SW-1			SW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
3,3'-Dichlorobenzidine	10	U		560	U	UJ	2800	U		2800	U		560	U	UJ	360	U		10	U		10	U	
Benzo(a)anthracene	10	U		7300	E		7700	D		7900	D		6900	E		160	J		10	U		10	U	
Chrysene	10	U		7000	E		7900	D		7900	D		7400	E		200	J		10	U		10	U	
Bis(2-ethylhexyl) phthala	10	U		1000			620	DJ		510	DJ		1100			43	J	J	10	U		10	U	
Di-n-octyl phthalate	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
Benzo(b)fluoranthene	10	U		16000	E		14000	D		14000	D		16000	E		340	J		10	U		10	U	
Benzo(k)fluoranthene	10	U		5400	E		5800	D		6800	D		6200	E		140	J		10	U		10	U	
Benzo(a)pyrene	10	U		8500	E		9100	D		9600	D		5400	E		140	J		10	U		10	U	
Indeno(1,2,3-cd)pyrene	10	U		2700			3300	D		3300	D		2800			36	J		10	U		10	U	
Dibenzo(a,h)anthracene	10	U		470	J		120	DJ		110	DJ		560			360	U		10	U		10	U	
Benzo(ghi)perylene	10	U		740			1200	DJ	J	1100	DJ		840		J	360	U		10	U		10	U	
Bis(2-chloroisopropyl) ether	10	U		560	U		2800	U		2800	U		560	U		360	U		10	U		10	U	
PCBS (ug/kg)																								
Aroclor 1016	1	U	UJ	560	U	UJ										37	U		1	U	UJ	1	U	UJ
Aroclor 1221	2	U		1100	U											75	U		2	U		2	U	
Aroclor 1232	1	U		560	U											37	U		1	U		1	U	
Aroclor 1242	1	U		390	JX											65	PX	J	1	U		1	U	
Aroclor 1248	1	U		560	U											37	U		1	U		1	U	
Aroclor 1254	1	U		560	U											37	U		1	U		1	U	
Aroclor 1260	1	U		620												33	JP		1	U		1	U	
PEST (ug/l)																								
alpha-BHC	0.05	U	UJ	29	U	UJ										1.9	U		0.05	U	UJ	0.05	U	UJ
beta-BHC	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
delta-BHC	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
gamma-BHC (Lindane)	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
Heptachlor	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
Aldrin	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
Heptachlor epoxide	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
Endosulfan I	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
Dieldrin	0.1	U		56	U											3.7	U		0.1	U		0.1	U	
4,4'-DDE	0.1	U		11	JP	J										1.3	J		0.1	U		0.1	U	
Endrin	0.1	U		56	U	UJ										3.7	U		0.1	U		0.1	U	
Endosulfan II	0.1	U		56	U	UJ										0.78	JP	J	0.1	U		0.1	U	
4,4'-DDD	0.1	U		57	P	J										1.3	JP	J	0.1	U		0.1	U	
Endosulfan Sulfate	0.1	U		9.7	JP	J										3.7	U		0.1	U		0.1	U	
4,4'-DDT	0.1	U		48	JP	J										3.7	U		0.1	U		0.1	U	

Sample Number	SW-3			SW-4			SW-5		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
3,3'-Dichlorobenzidine	10	U		10	U		10	U	
Benzo(a)anthracene	10	U		10	U		10	U	
Chrysene	10	U		10	U		10	U	
Bis(2-ethylhexyl) phthala	10	U		0.1	J	J	10	U	
Di-n-octyl phthalate	10	U		10	U		10	U	
Benzo(b)fluoranthene	10	U		10	U		10	U	
Benzo(k)fluoranthene	10	U		10	U		10	U	
Benzo(a)pyrene	10	U		10	U		10	U	
Indeno(1,2,3-cd)pyrene	10	U		10	U		10	U	
Dibenzo(a,h)anthracene	10	U		10	U		10	U	
Benzo(ghi)perylene	10	U		10	U		10	U	
Bis(2-chloroisopropyl) ether	10	U		10	U		10	U	
PCBS (ug/kg)									
Aroclor 1016	1	U	UJ	1	U	UJ	1	U	UJ
Aroclor 1221	2	U		2	U		2	U	
Aroclor 1232	1	U		1	U		1	U	
Aroclor 1242	1	U		1	U		1	U	
Aroclor 1248	1	U		1	U		1	U	
Aroclor 1254	1	U		1	U		1	U	
Aroclor 1260	1	U		1	U		1	U	
PEST (ug/l)									
alpha-BHC	0.05	U	UJ	0.05	U	UJ	0.05	U	UJ
beta-BHC	0.05	U		0.05	U		0.05	U	
delta-BHC	0.05	U		0.05	U		0.05	U	
gamma-BHC (Lindane)	0.05	U		0.05	U		0.05	U	
Heptachlor	0.05	U		0.05	U		0.05	U	
Aldrin	0.05	U		0.05	U		0.05	U	
Heptachlor epoxide	0.05	U		0.05	U		0.05	U	
Endosulfan I	0.05	U		0.05	U		0.05	U	
Dieldrin	0.1	U		0.1	U		0.1	U	
4,4'-DDE	0.1	U		0.1	U		0.1	U	
Endrin	0.1	U		0.1	U		0.1	U	
Endosulfan II	0.1	U		0.1	U		0.1	U	
4,4'-DDD	0.1	U		0.1	U		0.1	U	
Endosulfan Sulfate	0.1	U		0.1	U		0.1	U	
4,4'-DDT	0.1	U		0.1	U		0.1	U	

Sample Number	RMW-3			SED-16			SED-16DL			SED-16DLRE			SED-16RE			SED-17			SW-1			SW-2		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Methoxychlor	0.5	U	UJ	290	U	UJ										19	U		0.5	U	UJ	0.5	U	UJ
Endrin ketone	0.1	U		56	U											3.7	U		0.1	U		0.1	U	
alpha-Chlordane	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
gamma-Chlordane	0.05	U		29	U											1.9	U		0.05	U		0.05	U	
Toxaphene	5	U		2900	U											190	U		5	U		5	U	

Sample Number	SW-3			SW-4			SW-5		
	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual	Result	Lab Qual	Val Qual
Methoxychlor	0.5	U	UJ	0.5	U	UJ	0.5	U	UJ
Endrin ketone	0.1	U		0.1	U		0.1	U	
alpha-Chlordane	0.05	U		0.05	U		0.05	U	
gamma-Chlordane	0.05	U		0.05	U		0.05	U	
Toxaphene	5	U		5	U		5	U	

APPENDIX D

APPENDIX D

APPENDIX D

HYDROGEOLOGIC DATA

TABLE 1
Ramco Steel
Summary of Aquifer Testing Results

Well ID	Method	Hydrualic Conductivity cm/sec
RMW-1	Rising head slug test Bouwer and Rice, 1976	3.44E-05
RMW-2	Rising head slug test Bouwer and Rice, 1976	1.01E-04
RMW-3	Falling head slug test Bouwer and Rice, 1976	1.51E-03
CW-1	Falling head slug test Bouwer and Rice, 1976	1.25E-03

TABLE 2
Ramco Steel
Summary of Permeability Testing Results
Flexible Wall Permeability Tests

Sample	Range of Hydraulic Conductivity cm/sec	
RMW-1	3.59E-07 3.18E-07	to
RMW-2	2.37E-08 2.36E-08	to
RMW-3	6.92E-08 6.69E-08	to
SED-2	2.89E-05 2.47E-05	to
SED-4	1.52E-08 1.88E-08	to
SED-7	7.03E-08 5.76E-08	to

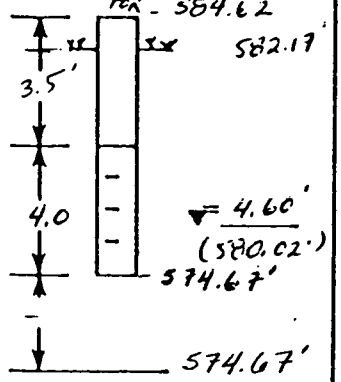
AQUIFER TEST DATA SUMMARY SHEET
SLUG TEST ANALYSIS

PROJECT: RAMCO STEEL JOB NO: 25848-001-152

WELL ID: RMW-1 TEST DATE: 3/2/93 13:55

BY: E. FUJITA & D. RAFFLE METHOD: RISING HEAD SLUG TEST

WELL DETAILS



INITIAL CONDITIONS

STATIC WATER LEVEL	4.60	(ft)
RADIUS OF WELL (r_w)	.333	(ft)
RADIUS OF CASING (r_c)	.083	(ft)
LENGTH OF SCREEN (L)	4.0	(ft)
HT. OF WATER COLUMN (H)	5.35	(ft)
SATURATED THICKNESS (b)	5.36	(ft)
MAXIMUM DRAWDOWN (s_o)	5.3'	(ft)

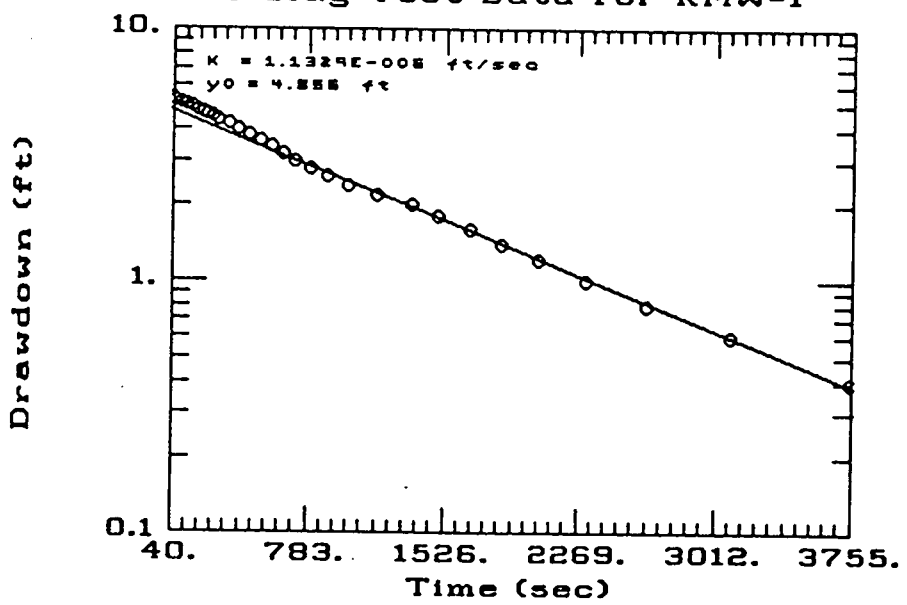
RESULTS

METHOD: BOUWER & RICE

RESULT: K= 1.13×10^{-6} (ft/sec) = 3.44×10^{-5} (cm/sec)

T= .52 (ft2/day)

Plot of Slug Test Data for RMW-1

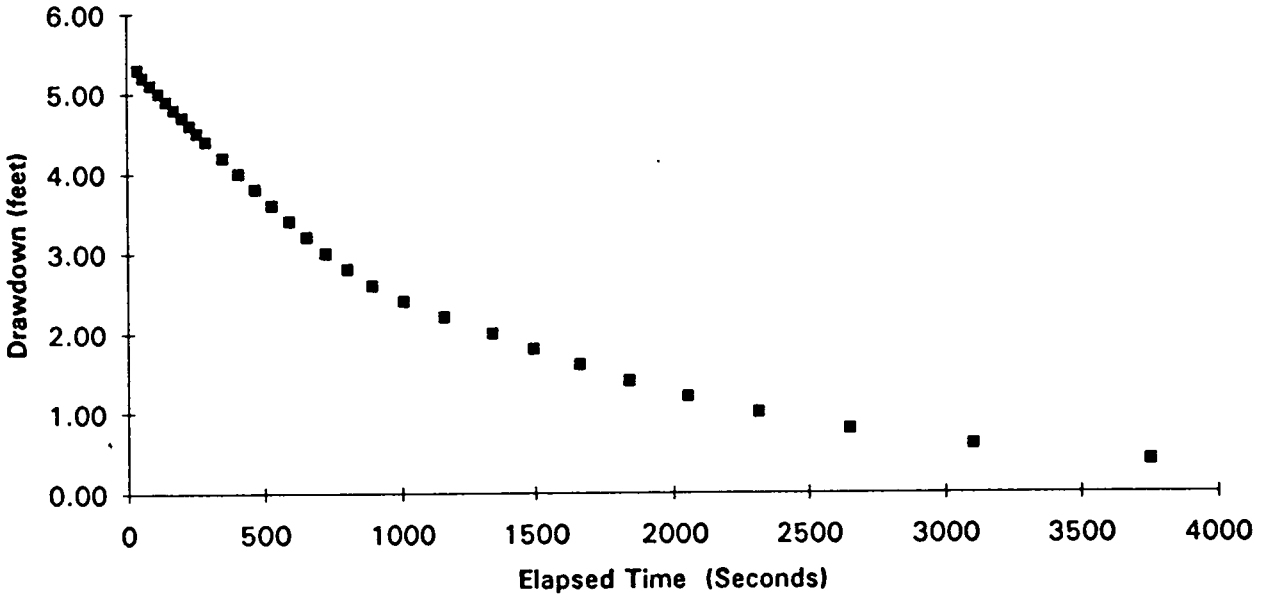


BY: [illegible] DATE 3-12-93

CHECKED BY: [illegible] DATE 4-16-93

Project:	Ramco Steel		Project No.:25848-001-152				
Well ID:		RMW-1		Static Water Level (ft):			4.60
Date of test:		3/2/93					
Start Time:		13:58:55					
Total Sec:		50335					
	hr	min	sec	ET	Depth to water (ft)		ds
	13	58	55	0		10.00	5.40
	13	59	35	40		9.90	5.30
	13	59	55	60		9.80	5.20
	14	0	24	89		9.70	5.10
	14	0	55	120		9.60	5.00
	14	1	22	147		9.50	4.90
	14	1	51	176		9.40	4.80
	14	2	22	207		9.30	4.70
	14	2	50	235		9.20	4.60
	14	3	16	261		9.10	4.50
	14	3	46	291		9.00	4.40
	14	4	48	353		8.80	4.20
	14	5	45	410		8.60	4.00
	14	6	46	471		8.40	3.80
	14	7	45	530		8.20	3.60
	14	8	46	591		8.00	3.40
	14	9	50	655		7.80	3.20
	14	10	55	720		7.60	3.00
	14	12	15	800		7.40	2.80
	14	13	46	891		7.20	2.60
	14	15	42	1007		7.00	2.40
	14	18	14	1159		6.80	2.20
	14	21	16	1341		6.60	2.00
	14	23	50	1495		6.40	1.80
	14	26	39	1664		6.20	1.60
	14	29	35	1840		6.00	1.40
	14	33	6	2051		5.80	1.20
	14	37	30	2315		5.60	1.00
	14	43	5	2650		5.40	0.80
	14	50	37	3102		5.20	0.60
	15	1	25	3750		5.00	0.40

RMW-1 Rising Head Slug Test



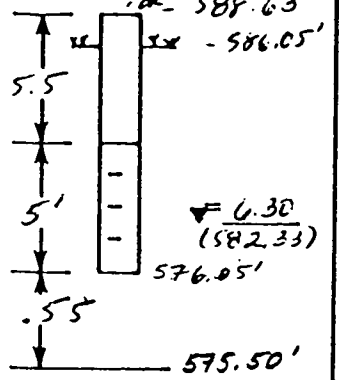
AQUIFER TEST DATA SUMMARY SHEET
SLUG TEST ANALYSIS

PROJECT: RAMCO STEEL JOB NO: 25848-001-152

WELL ID: RMW-2 TEST DATE: 3/2/93 12:30

BY: E.HUSTA + D.RAFFLE METHOD: RISING HEAD SLUG TEST

WELL DETAILS



INITIAL CONDITIONS

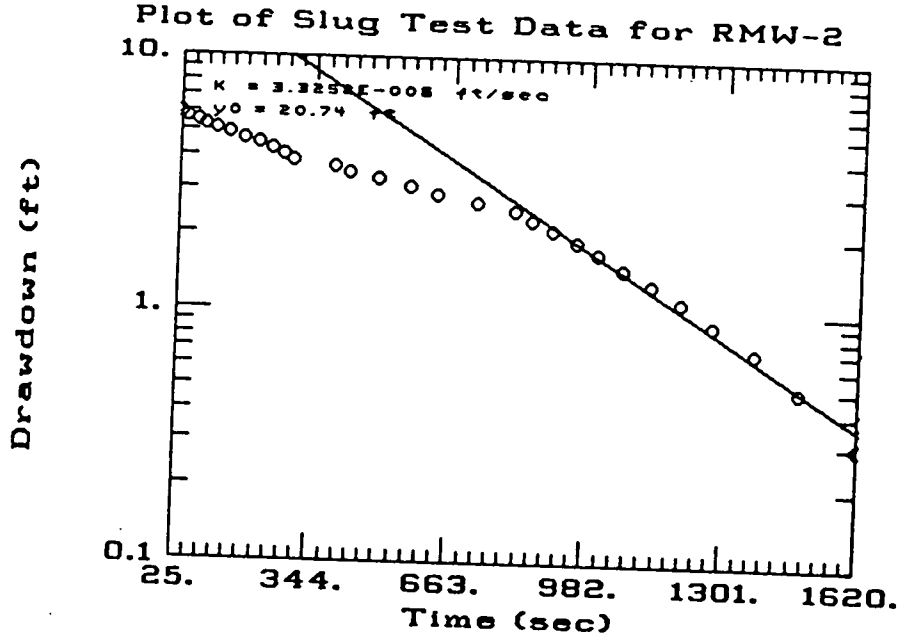
STATIC WATER LEVEL	6.30	(ft)
RADIUS OF WELL (r_w)	.333	(ft)
RADIUS OF CASING (r_c)	.083	(ft)
LENGTH OF SCREEN (L)	5.0	(ft)
HT. OF WATER COLUMN (H)	6.28	(ft)
SATURATED THICKNESS (b)	6.83	(ft)
MAXIMUM DRAWDOWN (s_o)	5.90	(ft)

RESULTS

METHOD: BOUWER & RICE

RESULT: K= 3.33×10^{-6} (ft/sec) = 1.02×10^{-4} (cm/sec)

T= 1.97 (ft2/day)

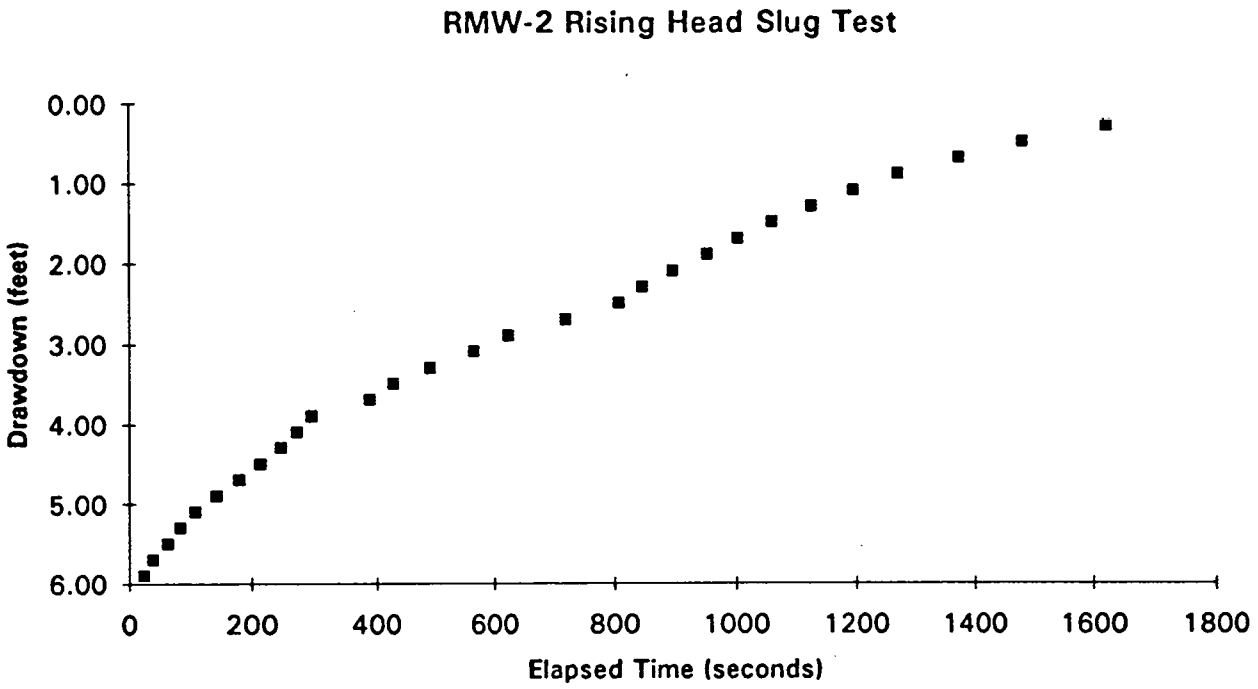


BY E.H DATE 3-2-93

CHECKED BY PS DATE 4-14-93

SLUGTEST.FRM

Project:	Ramco Steel		Project No.:25848-001-152				
Well ID:		RMW-2					
Date of test:		3/2/93		Static Water Level (ft):			6.30
Start time:		12:44:15					
Total Sec:		45855					
	hr	min	sec	ET	Depth to water (ft)		ds
	12	44	15	0		12.40	
	12	44	40	25		12.20	5.90
	12	44	55	40		12.00	5.70
	12	45	20	65		11.80	5.50
	12	45	40	85		11.60	5.30
	12	46	5	110		11.40	5.10
	12	46	39	144		11.20	4.90
	12	47	15	180		11.00	4.70
	12	47	49	214		10.80	4.50
	12	48	21	246		10.60	4.30
	12	48	47	272		10.40	4.10
	12	49	10	295		10.20	3.90
	12	50	44	389		10.00	3.70
	12	51	23	428		9.80	3.50
	12	52	26	491		9.60	3.30
	12	53	40	565		9.40	3.10
	12	54	39	624		9.20	2.90
	12	56	15	720		9.00	2.70
	12	57	42	807		8.80	2.50
	12	58	20	845		8.60	2.30
	12	59	10	895		8.40	2.10
	13	0	7	952		8.20	1.90
	13	0	58	1003		8.00	1.70
	13	1	55	1060		7.80	1.50
	13	3	0	1125		7.60	1.30
	13	4	10	1195		7.40	1.10
	13	5	25	1270		7.20	0.90
	13	7	7	1372		7.00	0.70
	13	8	55	1480		6.80	0.50
	13	11	15	1620		6.60	0.30


RMW-2 Rising Head Slug Test
Drawdown (feet)
0.00
1.00
2.00
3.00
4.00
5.00
6.00
0
200
400
600
800
1000
1200
1400
1600
1800
Elapsed Time (seconds)

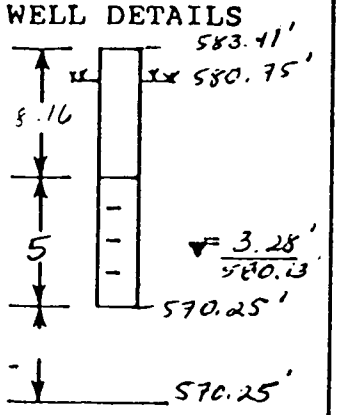
AQUIFER TEST DATA SUMMARY SHEET
SLUG TEST ANALYSIS

PROJECT: RAMCO STEEL JOB NO: 2584F-001-152

WELL ID: RMW-3 TEST DATE: 4/6/93 10:45

BY: E. FUJITA + K. IGNASZAK METHOD: FALLING HEAD SLUG TEST
½ GALLON H_2O INTRODUCED

WELL DETAILS



INITIAL CONDITIONS

STATIC WATER LEVEL	: 3.28'	(ft)
RADIUS OF WELL (r_w)	: .333	(ft)
RADIUS OF CASING (r_c)	: .053	(ft)
LENGTH OF SCREEN (L)	: 5.0'	(ft)
HT. OF WATER COLUMN (H)	: 9.85	(ft)
SATURATED THICKNESS (b)	: 9.88'	(ft)
MAXIMUM DRAWDOWN (s_o)	: 2.94	(ft)

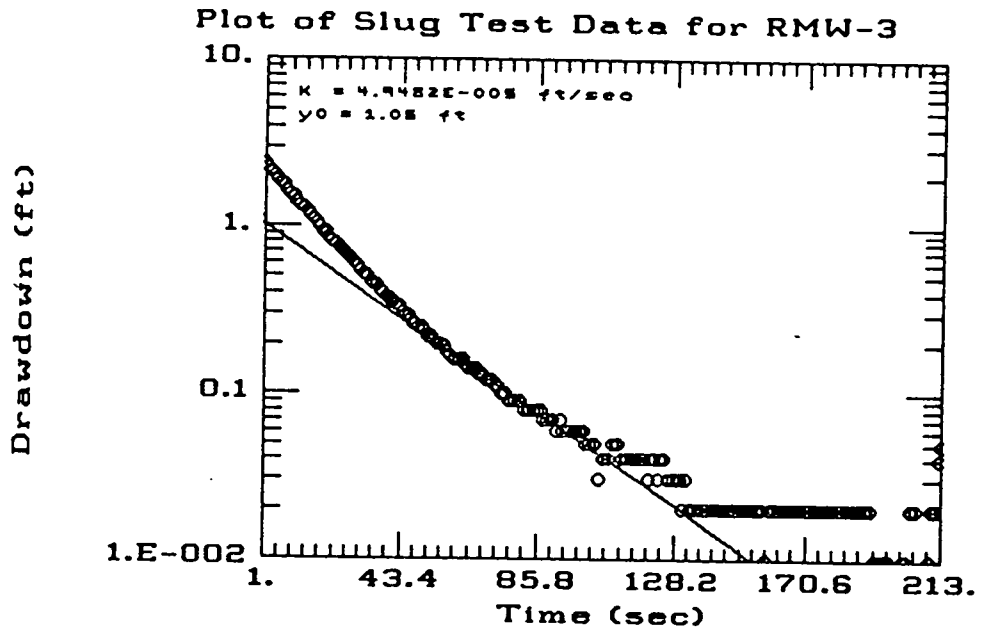
BY E.F. 5/7/93 DATE 5-7-93
CHECKED BY KS DATE 4-16-93

RESULTS

METHOD: BOUWER + RICE

RESULT: K= 4.95×10^{-5} (ft/sec) = 1.51×10^{-3} (cm/sec)

T= 42 (ft2/day)



Project:	Ramco Steel		Project No.: 25848-001-152					
Well ID:	RMW-3							
Date of test:		4/6/93		Static Water Level (ft):		3.28		
Start Time:		9:51:43						
Total Sec:		35503		Water Introduced:		1/2 Gallon		
					final avg:	2.73		
	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	51	43	0	5.67	2.94		
	9	51	44	1	5.07	2.34		
	9	51	45	2	4.96	2.23		
	9	51	46	3	4.85	2.12		
	9	51	47	4	4.75	2.02		
	9	51	48	5	4.66	1.93		
	9	51	49	6	4.56	1.83		
	9	51	50	7	4.47	1.74		
	9	51	51	8	4.38	1.65		
	9	51	52	9	4.29	1.56		
	9	51	53	10	4.22	1.49		
	9	51	54	11	4.14	1.41		
	9	51	55	12	4.07	1.34		
	9	51	56	13	4.01	1.28		
	9	51	57	14	3.94	1.21		
	9	51	58	15	3.89	1.16		
	9	51	59	16	3.83	1.10		
	9	52	0	17	3.78	1.05		
	9	52	1	18	3.73	1.00		
	9	52	2	19	3.66	0.93		
	9	52	3	20	3.66	0.93		
	9	52	4	21	3.59	0.86		
	9	52	5	22	3.54	0.81		
	9	52	6	23	3.51	0.78		
	9	52	7	24	3.48	0.75		
	9	52	8	25	3.45	0.72		
	9	52	9	26	3.42	0.69		
	9	52	10	27	3.38	0.65		
	9	52	11	28	3.36	0.63		
	9	52	12	29	3.33	0.60		
	9	52	13	30	3.30	0.57		
	9	52	14	31	3.28	0.55		
	9	52	15	32	3.25	0.52		
	9	52	16	33	3.23	0.50		
	9	52	17	34	3.20	0.47		
	9	52	18	35	3.18	0.45		
	9	52	19	36	3.17	0.44		
	9	52	20	37	3.14	0.41		
	9	52	21	38	3.13	0.40		
	9	52	22	39	3.11	0.38		
	9	52	23	40	3.10	0.37		

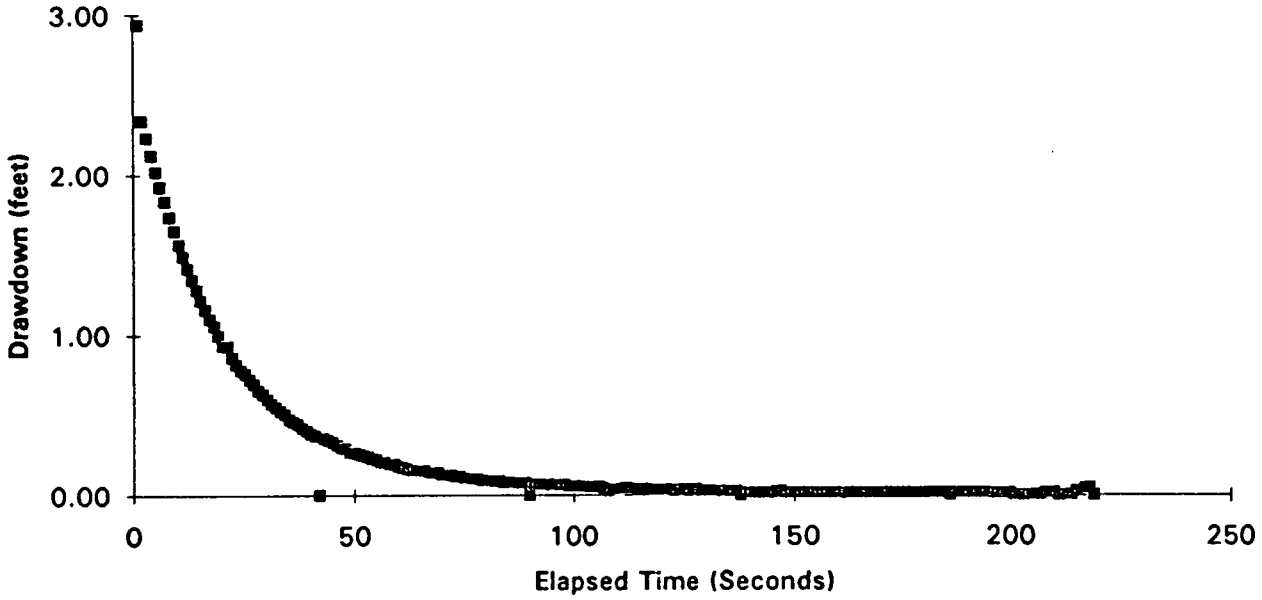
	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	52	24	41	3.08	0.35		
	9	52	25	42	3.07	0.34		
	9	52	26	43	3.06	0.33		
	9	52	27	44	3.04	0.31		
	9	52	28	45	3.02	0.29		
	9	52	29	46	3.02	0.29		
	9	52	30	47	2.99	0.26		
	9	52	31	48	2.99	0.26		
	9	52	32	49	2.98	0.25		
	9	52	33	50	2.98	0.25		
	9	52	34	51	2.97	0.24		
	9	52	35	52	2.95	0.22		
	9	52	36	53	2.95	0.22		
	9	52	37	54	2.94	0.21		
	9	52	38	55	2.93	0.20		
	9	52	39	56	2.93	0.20		
	9	52	40	57	2.92	0.19		
	9	52	41	58	2.91	0.18		
	9	52	42	59	2.90	0.17		
	9	52	43	60	2.89	0.16		
	9	52	44	61	2.89	0.16		
	9	52	45	62	2.89	0.16		
	9	52	46	63	2.89	0.16		
	9	52	47	64	2.88	0.15		
	9	52	48	65	2.87	0.14		
	9	52	49	66	2.87	0.14		
	9	52	50	67	2.87	0.14		
	9	52	51	68	2.86	0.13		
	9	52	52	69	2.86	0.13		
	9	52	53	70	2.85	0.12		
	9	52	54	71	2.85	0.12		
	9	52	55	72	2.85	0.12		
	9	52	56	73	2.84	0.11		
	9	52	57	74	2.84	0.11		
	9	52	58	75	2.83	0.10		
	9	52	59	76	2.83	0.10		
	9	53	0	77	2.82	0.09		
	9	53	1	78	2.82	0.09		
	9	53	2	79	2.82	0.09		
	9	53	3	80	2.82	0.09		
	9	53	4	81	2.82	0.09		
	9	53	5	82	2.81	0.08		
	9	53	6	83	2.81	0.08		
	9	53	7	84	2.81	0.08		
	9	53	8	85	2.81	0.08		
	9	53	9	86	2.81	0.08		
	9	53	10	87	2.81	0.08		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	53	11	88	2.80	0.07		
	9	53	12	89	2.80	0.07		
	9	53	13	90	2.80	0.07		
	9	53	14	91	2.80	0.07		
	9	53	15	92	2.79	0.06		
	9	53	16	93	2.80	0.07		
	9	53	17	94	2.79	0.06		
	9	53	18	95	2.79	0.06		
	9	53	19	96	2.79	0.06		
	9	53	20	97	2.79	0.06		
	9	53	21	98	2.79	0.06		
	9	53	22	99	2.79	0.06		
	9	53	23	100	2.79	0.06		
	9	53	24	101	2.78	0.05		
	9	53	25	102	2.78	0.05		
	9	53	26	103	2.78	0.05		
	9	53	27	104	2.78	0.05		
	9	53	28	105	2.76	0.03		
	9	53	29	106	2.77	0.04		
	9	53	30	107	2.77	0.04		
	9	53	31	108	2.77	0.04		
	9	53	32	109	2.78	0.05		
	9	53	33	110	2.78	0.05		
	9	53	34	111	2.78	0.05		
	9	53	35	112	2.77	0.04		
	9	53	36	113	2.77	0.04		
	9	53	37	114	2.77	0.04		
	9	53	38	115	2.77	0.04		
	9	53	39	116	2.77	0.04		
	9	53	40	117	2.77	0.04		
	9	53	41	118	2.77	0.04		
	9	53	42	119	2.77	0.04		
	9	53	43	120	2.76	0.03		
	9	53	44	121	2.77	0.04		
	9	53	45	122	2.77	0.04		
	9	53	46	123	2.76	0.03		
	9	53	47	124	2.77	0.04		
	9	53	48	125	2.77	0.04		
	9	53	49	126	2.76	0.03		
	9	53	50	127	2.76	0.03		
	9	53	51	128	2.76	0.03		
	9	53	52	129	2.76	0.03		
	9	53	53	130	2.76	0.03		
	9	53	54	131	2.75	0.02		
	9	53	55	132	2.76	0.03		
	9	53	56	133	2.75	0.02		
	9	53	57	134	2.75	0.02		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	53	58	135	2.75	0.02		
	9	53	59	136	2.75	0.02		
	9	54	0	137	2.75	0.02		
	9	54	1	138	2.75	0.02		
	9	54	2	139	2.75	0.02		
	9	54	3	140	2.75	0.02		
	9	54	4	141	2.75	0.02		
	9	54	5	142	2.75	0.02		
	9	54	6	143	2.75	0.02		
	9	54	7	144	2.75	0.02		
	9	54	8	145	2.75	0.02		
	9	54	9	146	2.75	0.02		
	9	54	10	147	2.75	0.02		
	9	54	11	148	2.75	0.02		
	9	54	12	149	2.75	0.02		
	9	54	13	150	2.75	0.02		
	9	54	14	151	2.75	0.02		
	9	54	15	152	2.75	0.02		
	9	54	16	153	2.75	0.02		
	9	54	17	154	2.75	0.02		
	9	54	18	155	2.75	0.02		
	9	54	19	156	2.75	0.02		
	9	54	20	157	2.75	0.02		
	9	54	21	158	2.74	0.01		
	9	54	22	159	2.75	0.02		
	9	54	23	160	2.75	0.02		
	9	54	24	161	2.75	0.02		
	9	54	25	162	2.75	0.02		
	9	54	26	163	2.75	0.02		
	9	54	27	164	2.75	0.02		
	9	54	28	165	2.75	0.02		
	9	54	29	166	2.75	0.02		
	9	54	30	167	2.75	0.02		
	9	54	31	168	2.75	0.02		
	9	54	32	169	2.75	0.02		
	9	54	33	170	2.75	0.02		
	9	54	34	171	2.75	0.02		
	9	54	35	172	2.75	0.02		
	9	54	36	173	2.75	0.02		
	9	54	37	174	2.75	0.02		
	9	54	38	175	2.75	0.02		
	9	54	39	176	2.75	0.02		
	9	54	40	177	2.75	0.02		
	9	54	41	178	2.75	0.02		
	9	54	42	179	2.75	0.02		
	9	54	43	180	2.75	0.02		
	9	54	44	181	2.75	0.02		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	54	45	182	2.75	0.02		
	9	54	46	183	2.75	0.02		
	9	54	47	184	2.75	0.02		
	9	54	48	185	2.75	0.02		
	9	54	49	186	2.75	0.02		
	9	54	50	187	2.75	0.02		
	9	54	51	188	2.75	0.02		
	9	54	52	189	2.75	0.02		
	9	54	53	190	2.75	0.02		
	9	54	54	191	2.75	0.02		
	9	54	55	192	2.74	0.01		
	9	54	56	193	2.74	0.01		
	9	54	57	194	2.74	0.01		
	9	54	58	195	2.74	0.01		
	9	54	59	196	2.74	0.01		
	9	55	0	197	2.74	0.01		
	9	55	1	198	2.73	0.00		
	9	55	2	199	2.73	0.00		
	9	55	3	200	2.73	0.00		
	9	55	4	201	2.74	0.01		
	9	55	5	202	2.74	0.01		
	9	55	6	203	2.75	0.02		
	9	55	7	204	2.75	0.02		
	9	55	8	205	2.75	0.02		
	9	55	9	206	2.73	0.00		
	9	55	10	207	2.73	0.00		
	9	55	11	208	2.73	0.00		
	9	55	12	209	2.74	0.01		
	9	55	13	210	2.75	0.02		
	9	55	14	211	2.75	0.02		
	9	55	15	212	2.77	0.04		
	9	55	16	213	2.78	0.05		
	9	55	17	214	2.73	0.00		

RMW-3 Falling Head Slug Test



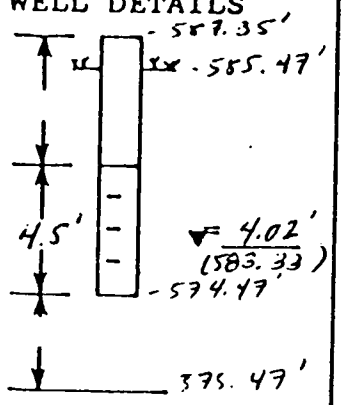
AQUIFER TEST DATA SUMMARY SHEET
SLUG TEST ANALYSIS

PROJECT: RAMCO STEEL JOB NO: 25848-001-152

WELL ID: CW-1 TEST DATE: 4/6/93 10:00

BY: E.FUJITA & K.IGNASZAK METHOD: FALLING HEAD SLUG TEST
½ GALLON WATER INTRODUCED

WELL DETAILS



INITIAL CONDITIONS

STATIC WATER LEVEL	4.02	(ft)
RADIUS OF WELL (r_w)	.417	(ft)
RADIUS OF CASING (r_c)	.083	(ft)
LENGTH OF SCREEN (L)	4.5	(ft)
HT. OF WATER COLUMN (H)	8.56	(ft)
SATURATED THICKNESS (b)	8.56	(ft)
MAXIMUM DRAWDOWN (s_o)	2.47	(ft)

BY: E.FUJITA DATE 4-1-93

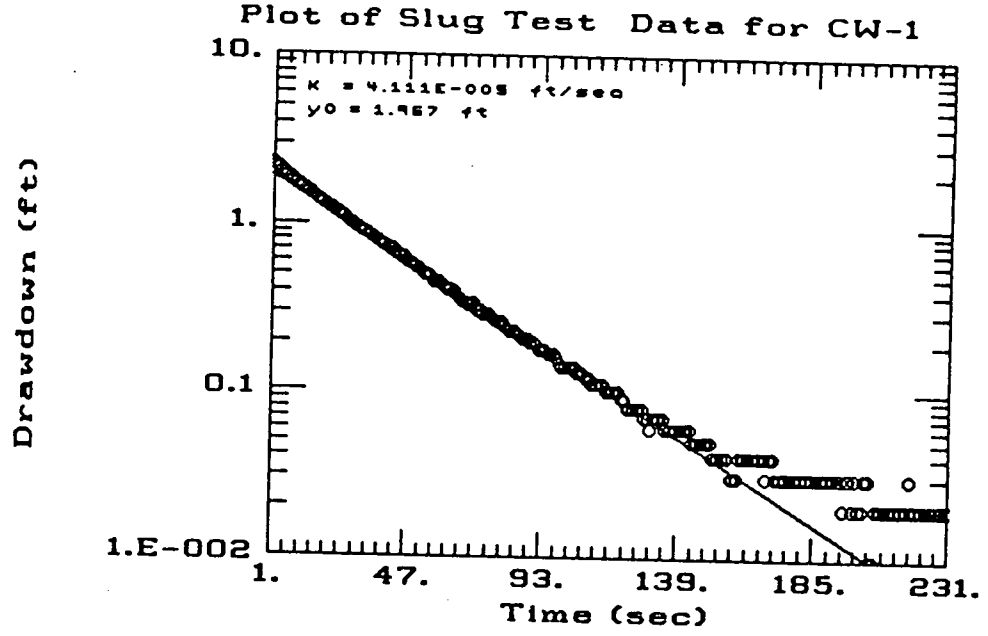
CHECKED BY: JS DATE 4-16-93

RESULTS

METHOD: BOUWER + RICE

RESULT: K= 4.11×10^{-5} (ft/sec) = 1.25×10^{-3} (cm/sec)

T= 31.5 (ft2/day)



Project:	Ramco Steel		Project No.: 25848-001-152					
Well ID:	CW-1							
Date of Test:		4/6/93		Static Water Level (ft):		4.02		
Start Time:		9:21:27						
Total Sec:		33687		Water Introduced:		1/2 Gallon		
					final s(t):	4.02		
	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	21	27	0	6.49	2.47		
	9	21	28	1	6.27	2.25		
	9	21	29	2	6.19	2.17		
	9	21	30	3	6.12	2.10		
	9	21	31	4	6.05	2.03		
	9	21	32	5	5.98	1.96		
	9	21	33	6	5.92	1.90		
	9	21	34	7	5.86	1.84		
	9	21	35	8	5.81	1.79		
	9	21	36	9	5.75	1.73		
	9	21	37	10	5.70	1.68		
	9	21	38	11	5.65	1.63		
	9	21	39	12	5.60	1.58		
	9	21	40	13	5.55	1.53		
	9	21	41	14	5.51	1.49		
	9	21	42	15	5.47	1.45		
	9	21	43	16	5.43	1.41		
	9	21	44	17	5.39	1.37		
	9	21	45	18	5.35	1.33		
	9	21	46	19	5.31	1.29		
	9	21	47	20	5.28	1.26		
	9	21	48	21	5.24	1.22		
	9	21	49	22	5.21	1.19		
	9	21	50	23	5.17	1.15		
	9	21	51	24	5.14	1.12		
	9	21	52	25	5.11	1.09		
	9	21	53	26	5.08	1.06		
	9	21	54	27	5.05	1.03		
	9	21	55	28	5.02	1.00		
	9	21	56	29	5.00	0.98		
	9	21	57	30	4.97	0.95		
	9	21	58	31	4.94	0.92		
	9	21	59	32	4.92	0.90		
	9	22	0	33	4.90	0.88		
	9	22	1	34	4.87	0.85		
	9	22	2	35	4.85	0.83		
	9	22	3	36	4.83	0.81		
	9	22	4	37	4.81	0.79		
	9	22	5	38	4.78	0.76		
	9	22	6	39	4.77	0.75		
	9	22	7	40	4.74	0.72		

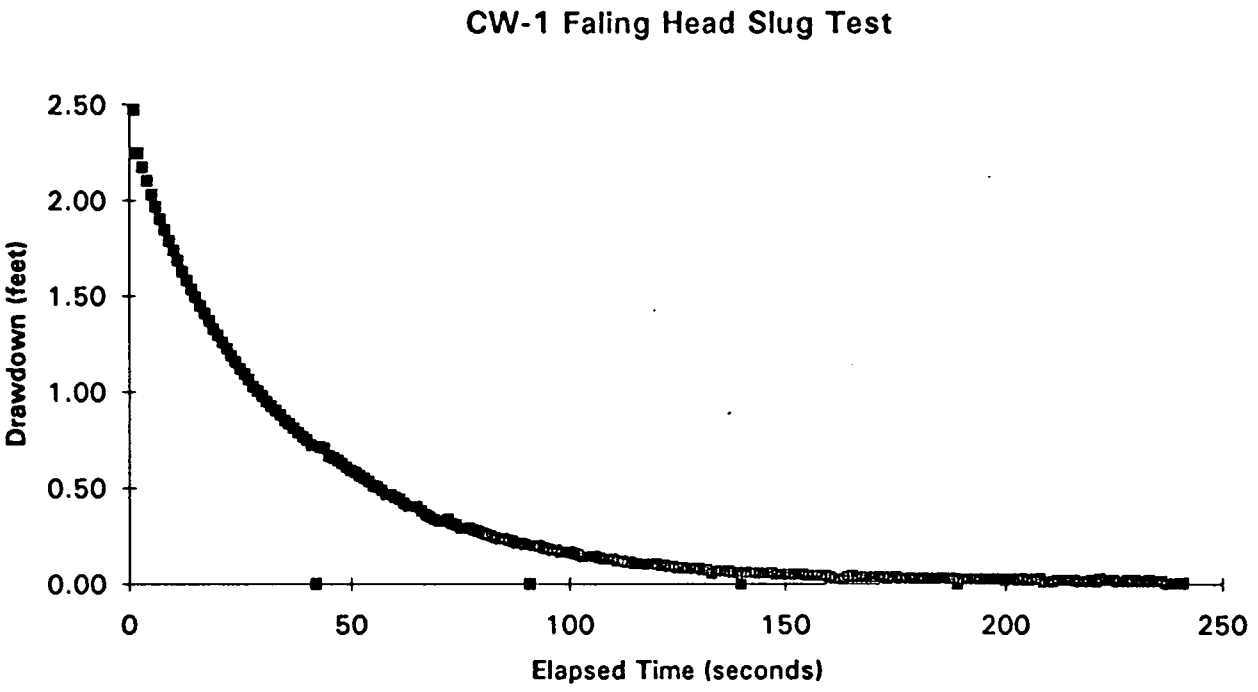
	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	22	8	41	4.73	0.71		
	9	22	9	42	4.73	0.71		
	9	22	10	43	4.69	0.67		
	9	22	11	44	4.67	0.65		
	9	22	12	45	4.66	0.64		
	9	22	13	46	4.65	0.63		
	9	22	14	47	4.63	0.61		
	9	22	15	48	4.61	0.59		
	9	22	16	49	4.60	0.58		
	9	22	17	50	4.58	0.56		
	9	22	18	51	4.57	0.55		
	9	22	19	52	4.55	0.53		
	9	22	20	53	4.53	0.51		
	9	22	21	54	4.52	0.50		
	9	22	22	55	4.51	0.49		
	9	22	23	56	4.48	0.46		
	9	22	24	57	4.48	0.46		
	9	22	25	58	4.47	0.45		
	9	22	26	59	4.46	0.44		
	9	22	27	60	4.44	0.42		
	9	22	28	61	4.43	0.41		
	9	22	29	62	4.43	0.41		
	9	22	30	63	4.42	0.40		
	9	22	31	64	4.40	0.38		
	9	22	32	65	4.38	0.36		
	9	22	33	66	4.37	0.35		
	9	22	34	67	4.36	0.34		
	9	22	35	68	4.35	0.33		
	9	22	36	69	4.35	0.33		
	9	22	37	70	4.36	0.34		
	9	22	38	71	4.33	0.31		
	9	22	39	72	4.33	0.31		
	9	22	40	73	4.31	0.29		
	9	22	41	74	4.31	0.29		
	9	22	42	75	4.31	0.29		
	9	22	43	76	4.30	0.28		
	9	22	44	77	4.29	0.27		
	9	22	45	78	4.28	0.26		
	9	22	46	79	4.28	0.26		
	9	22	47	80	4.27	0.25		
	9	22	48	81	4.26	0.24		
	9	22	49	82	4.25	0.23		
	9	22	50	83	4.25	0.23		
	9	22	51	84	4.25	0.23		
	9	22	52	85	4.24	0.22		
	9	22	53	86	4.23	0.21		
	9	22	54	87	4.23	0.21		
	9	22	55	88	4.23	0.21		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	22	56	89	4.22	0.20		
	9	22	57	90	4.22	0.20		
	9	22	58	91	4.21	0.19		
	9	22	59	92	4.20	0.18		
	9	23	0	93	4.20	0.18		
	9	23	1	94	4.20	0.18		
	9	23	2	95	4.19	0.17		
	9	23	3	96	4.19	0.17		
	9	23	4	97	4.19	0.17		
	9	23	5	98	4.18	0.16		
	9	23	6	99	4.17	0.15		
	9	23	7	100	4.16	0.14		
	9	23	8	101	4.16	0.14		
	9	23	9	102	4.16	0.14		
	9	23	10	103	4.16	0.14		
	9	23	11	104	4.16	0.14		
	9	23	12	105	4.15	0.13		
	9	23	13	106	4.15	0.13		
	9	23	14	107	4.15	0.13		
	9	23	15	108	4.14	0.12		
	9	23	16	109	4.14	0.12		
	9	23	17	110	4.13	0.11		
	9	23	18	111	4.13	0.11		
	9	23	19	112	4.13	0.11		
	9	23	20	113	4.13	0.11		
	9	23	21	114	4.13	0.11		
	9	23	22	115	4.12	0.10		
	9	23	23	116	4.12	0.10		
	9	23	24	117	4.12	0.10		
	9	23	25	118	4.12	0.10		
	9	23	26	119	4.12	0.10		
	9	23	27	120	4.11	0.09		
	9	23	28	121	4.11	0.09		
	9	23	29	122	4.10	0.08		
	9	23	30	123	4.10	0.08		
	9	23	31	124	4.10	0.08		
	9	23	32	125	4.10	0.08		
	9	23	33	126	4.10	0.08		
	9	23	34	127	4.10	0.08		
	9	23	35	128	4.09	0.07		
	9	23	36	129	4.09	0.07		
	9	23	37	130	4.08	0.06		
	9	23	38	131	4.09	0.07		
	9	23	39	132	4.09	0.07		
	9	23	40	133	4.09	0.07		
	9	23	41	134	4.09	0.07		
	9	23	42	135	4.08	0.06		
	9	23	43	136	4.08	0.06		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	23	44	137	4.08	0.06		
	9	23	45	138	4.08	0.06		
	9	23	46	139	4.08	0.06		
	9	23	47	140	4.08	0.06		
	9	23	48	141	4.08	0.06		
	9	23	49	142	4.08	0.06		
	9	23	50	143	4.08	0.06		
	9	23	51	144	4.07	0.05		
	9	23	52	145	4.07	0.05		
	9	23	53	146	4.07	0.05		
	9	23	54	147	4.07	0.05		
	9	23	55	148	4.07	0.05		
	9	23	56	149	4.07	0.05		
	9	23	57	150	4.07	0.05		
	9	23	58	151	4.06	0.04		
	9	23	59	152	4.06	0.04		
	9	24	0	153	4.06	0.04		
	9	24	1	154	4.06	0.04		
	9	24	2	155	4.06	0.04		
	9	24	3	156	4.06	0.04		
	9	24	4	157	4.05	0.03		
	9	24	5	158	4.05	0.03		
	9	24	6	159	4.05	0.03		
	9	24	7	160	4.06	0.04		
	9	24	8	161	4.06	0.04		
	9	24	9	162	4.06	0.04		
	9	24	10	163	4.06	0.04		
	9	24	11	164	4.06	0.04		
	9	24	12	165	4.06	0.04		
	9	24	13	166	4.06	0.04		
	9	24	14	167	4.06	0.04		
	9	24	15	168	4.06	0.04		
	9	24	16	169	4.05	0.03		
	9	24	17	170	4.06	0.04		
	9	24	18	171	4.06	0.04		
	9	24	19	172	4.05	0.03		
	9	24	20	173	4.05	0.03		
	9	24	21	174	4.05	0.03		
	9	24	22	175	4.05	0.03		
	9	24	23	176	4.05	0.03		
	9	24	24	177	4.05	0.03		
	9	24	25	178	4.05	0.03		
	9	24	26	179	4.05	0.03		
	9	24	27	180	4.05	0.03		
	9	24	28	181	4.05	0.03		
	9	24	29	182	4.05	0.03		
	9	24	30	183	4.05	0.03		
	9	24	31	184	4.05	0.03		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	24	32	185	4.05	0.03		
	9	24	33	186	4.05	0.03		
	9	24	34	187	4.05	0.03		
	9	24	35	188	4.05	0.03		
	9	24	36	189	4.05	0.03		
	9	24	37	190	4.05	0.03		
	9	24	38	191	4.05	0.03		
	9	24	39	192	4.05	0.03		
	9	24	40	193	4.05	0.03		
	9	24	41	194	4.05	0.03		
	9	24	42	195	4.04	0.02		
	9	24	43	196	4.05	0.03		
	9	24	44	197	4.05	0.03		
	9	24	45	198	4.04	0.02		
	9	24	46	199	4.05	0.03		
	9	24	47	200	4.04	0.02		
	9	24	48	201	4.04	0.02		
	9	24	49	202	4.05	0.03		
	9	24	50	203	4.05	0.03		
	9	24	51	204	4.03	0.01		
	9	24	52	205	4.03	0.01		
	9	24	53	206	4.04	0.02		
	9	24	54	207	4.04	0.02		
	9	24	55	208	4.04	0.02		
	9	24	56	209	4.04	0.02		
	9	24	57	210	4.04	0.02		
	9	24	58	211	4.04	0.02		
	9	24	59	212	4.04	0.02		
	9	25	0	213	4.04	0.02		
	9	25	1	214	4.04	0.02		
	9	25	2	215	4.04	0.02		
	9	25	3	216	4.04	0.02		
	9	25	4	217	4.05	0.03		
	9	25	5	218	4.04	0.02		
	9	25	6	219	4.04	0.02		
	9	25	7	220	4.04	0.02		
	9	25	8	221	4.04	0.02		
	9	25	9	222	4.04	0.02		
	9	25	10	223	4.04	0.02		
	9	25	11	224	4.04	0.02		
	9	25	12	225	4.04	0.02		
	9	25	13	226	4.04	0.02		
	9	25	14	227	4.04	0.02		
	9	25	15	228	4.04	0.02		
	9	25	16	229	4.04	0.02		
	9	25	17	230	4.04	0.02		
	9	25	18	231	4.04	0.02		
	9	25	19	232	4.02	0.00		

	hr	min	sec	ET	avg	s(t) = avg - final avg		
	9	25	20	233	4.02	0.00		
	9	25	21	234	4.02	0.00		
	9	25	22	235	4.02	0.00		


CW-1 Faling Head Slug Test
2.50
2.00
1.50
1.00
0.50
0.00
Drawdown (feet)
0
50
100
150
200
250
Elapsed Time (seconds)

GEOTECHNICAL TESTING REPORT
RAMCO STEEL PROJECT
BUFFALO, NEW YORK

Huntingdon
Consulting Engineers Environmental Scientists

Empire Soils Investigations, Inc., Division

GEOTECHNICAL TESTING REPORT
RAMCO STEEL PROJECT
BUFFALO, NEW YORK

FOR:
DAMES & MOORE
ORCHARD PARK, NEW YORK

JOB NO. G025.004
MARCH, 1993

Huntingdon
Consulting Engineers Environmental Scientists

Empire Soils Investigations, Inc.
Corporate Offices
140 Telegraph Road
Box 297
Middleport, New York 14105
(716)735-3502
Fax: (716)735-9027

March 30, 1993

Mr. Peter J. Smith, PE
DAMES & MOORE
3065 Southwestern Boulevard, Suite 202
Orchard Park, New York 14127-1240

SUBJECT: GEOTECHNICAL TESTING
RAMCO STEEL PROJECT
BUFFALO, NEW YORK

Dear Mr. Smith:

Transmitted herewith are the results of geotechnical laboratory testing performed on six (6) tube samples from the subject project delivered to our laboratory in Middleport, New York on March 5, 1993.

As requested in your letter to David Steiner of our office in Hamburg, New York we have performed flexible wall permeability test (ASTM D5084) on all six (6) samples. Individual Permeability Test Reports are attached.

It should be noted that the three (3) 2-inch diameter tube samples identified as SED-2, SED-4 and SED-7 (Lab Nos. 1547.004, 1547.005 and 1547.006) probably were afflicted with considerable sample disturbance. This is particularly the case for SED-2, where a near vertical material boundary was noted in the specimen.

It has been a pleasure working with your firm again. Should you have any questions, or in case we may be of further service, do not hesitate to contact the undersigned at 716-735-3400.

Respectfully submitted,

EMPIRE SOILS INVESTIGATIONS, INC.

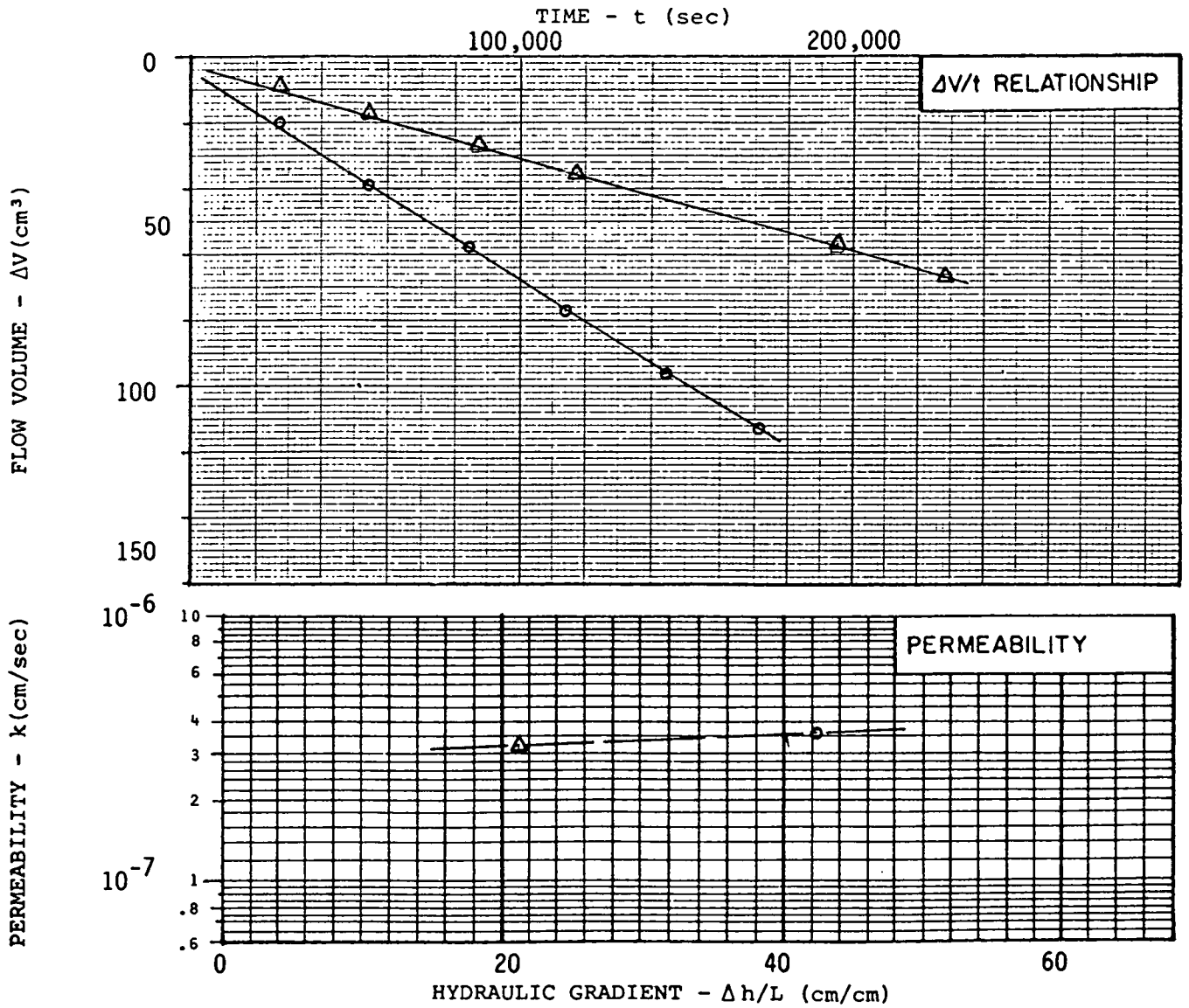
Jorgen F. Christiansen

Jorgen F. Christiansen, PE
Director, Geotechnical Testing

JFC/rfp

Enc.

TEST DATA:			SAMPLE DATA:	
Specimen Height (cm):	8.18		Sample Identification:	LAB NO. 1547.001
Specimen Diameter (cm):	7.29			SAMPLE BMW-1; 5.0' - 7.0'
Dry Unit Weight (pcf):	115.1		Visual Description:	Brown SILT & SAND,
Moisture Content Before Test (%):	17.9			little gravel
Moisture Content After Test (%):	16.5		Remarks:	
Cell Confining Pressure (psi):	95.0			
Test Pressure (psi):	84.8	82.2	Maximum Dry Density	
Back Pressure (psi):	80.0	80.0	(ASTM D ____) (pcf):	
Differential Head (psi):	4.8	2.2	Optimum Moisture Content (%):	
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 6.32×10^{-4}	Δ 2.80×10^{-4}	Percent Compaction:	
Permeability (cm/sec):	O 3.59×10^{-7}	Δ 3.18×10^{-7}	Permeameter Type:	FLEXIBLE WALL



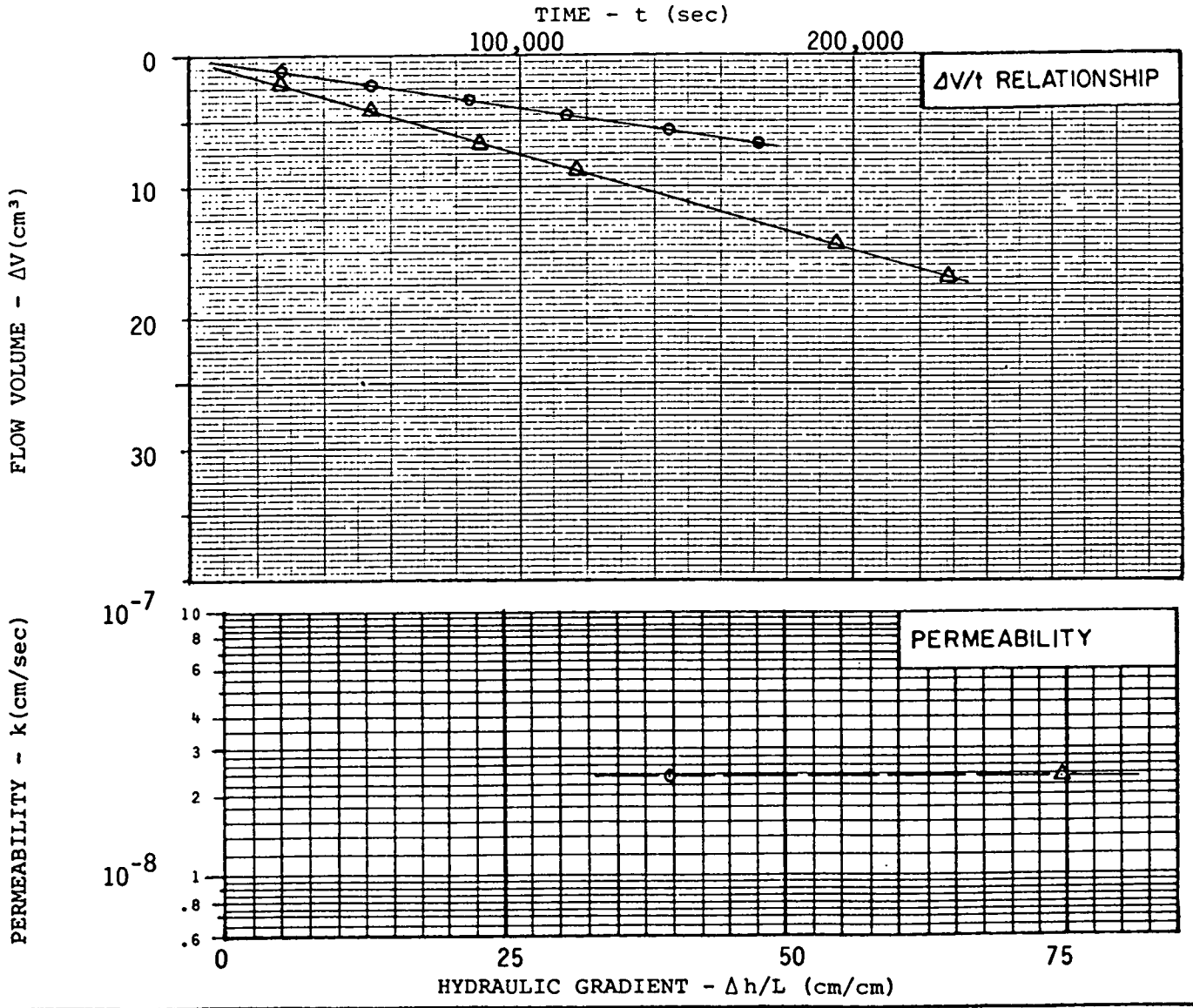
EMPIRE SOILS INVESTIGATIONS INC.

PERMEABILITY TEST REPORT

RAMCO STEEL PROJECT
BUFFALO, NEW YORK

DR BY: JFC	CK'D. JFC	DATE: MARCH, 1993	PROJ.NO. G025.004

TEST DATA:			SAMPLE DATA:	
Specimen Height (cm):	9.51		Sample Identification:	LAB NO. 1547.002
Specimen Diameter (cm):	7.25			SAMPLE BMW-2, 8.0' - 10.0'
Dry Unit Weight (pcf):	101.6		Visual Description:	Brown CLAY & SILT,
Moisture Content Before Test (%):	25.3			Some Sand, trace gravel
Moisture Content After Test (%):	22.7		Remarks:	
Cell Confining Pressure (psi):	95.0			
Test Pressure (psi):	85.1	89.8	Maximum Dry Density	
Back Pressure (psi):	80.0	79.9	(ASTM D ____) (pcf):	
Differential Head (psi):	5.1	9.9	Optimum Moisture Content (%):	
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 3.87×10^{-5}	Δ 7.26×10^{-5}	Percent Compaction:	
Permeability (cm/sec):	O 2.37×10^{-8}	Δ 2.36×10^{-8}	Permeameter Type:	FLEXIBLE WALL



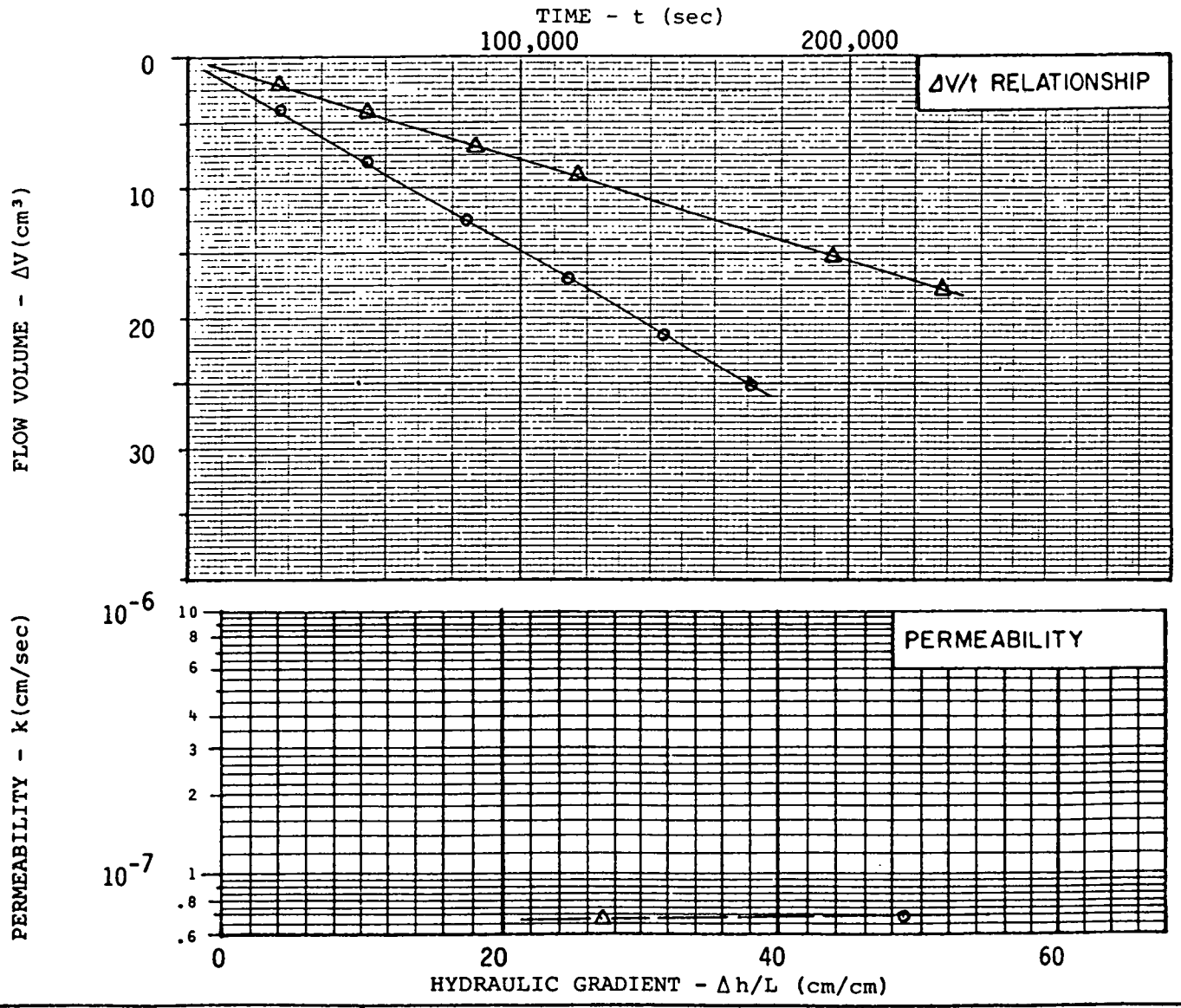
EMPIRE SOILS INVESTIGATIONS INC.

PERMEABILITY TEST REPORT

RAMCO STEEL PROJECT
BUFFALO, NEW YORK

DR BY: JFC	CK'D. JFC	DATE: MARCH, 1993	PROJ.NO. G025.004

TEST DATA:			SAMPLE DATA:	
Specimen Height (cm):		7.47	Sample Identification:	LAB NO. 1547.003
Specimen Diameter (cm):		7.42		SAMPLE BMW-3
Dry Unit Weight (pcf):		133.8	Visual Description:	Grey SILT & SAND,
Moisture Content Before Test (%):		10.9		trace gravel
Moisture Content After Test (%):		9.1	Remarks:	
Cell Confining Pressure (psi):		95.0		
Test Pressure (psi):	85.0	82.4	Maximum Dry Density	
Back Pressure (psi):	80.1	79.9	(ASTM D ____) (pcf):	
Differential Head (psi):	4.9	2.5	Optimum Moisture Content (%):	
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 1.46×10^{-4}	Δ 7.80×10^{-5}	Percent Compaction:	
Permeability (cm/sec):	O 6.92×10^{-8}	Δ 6.69×10^{-8}	Permeameter Type:	FLEXIBLE WALL



EMPIRE SOILS INVESTIGATIONS INC.

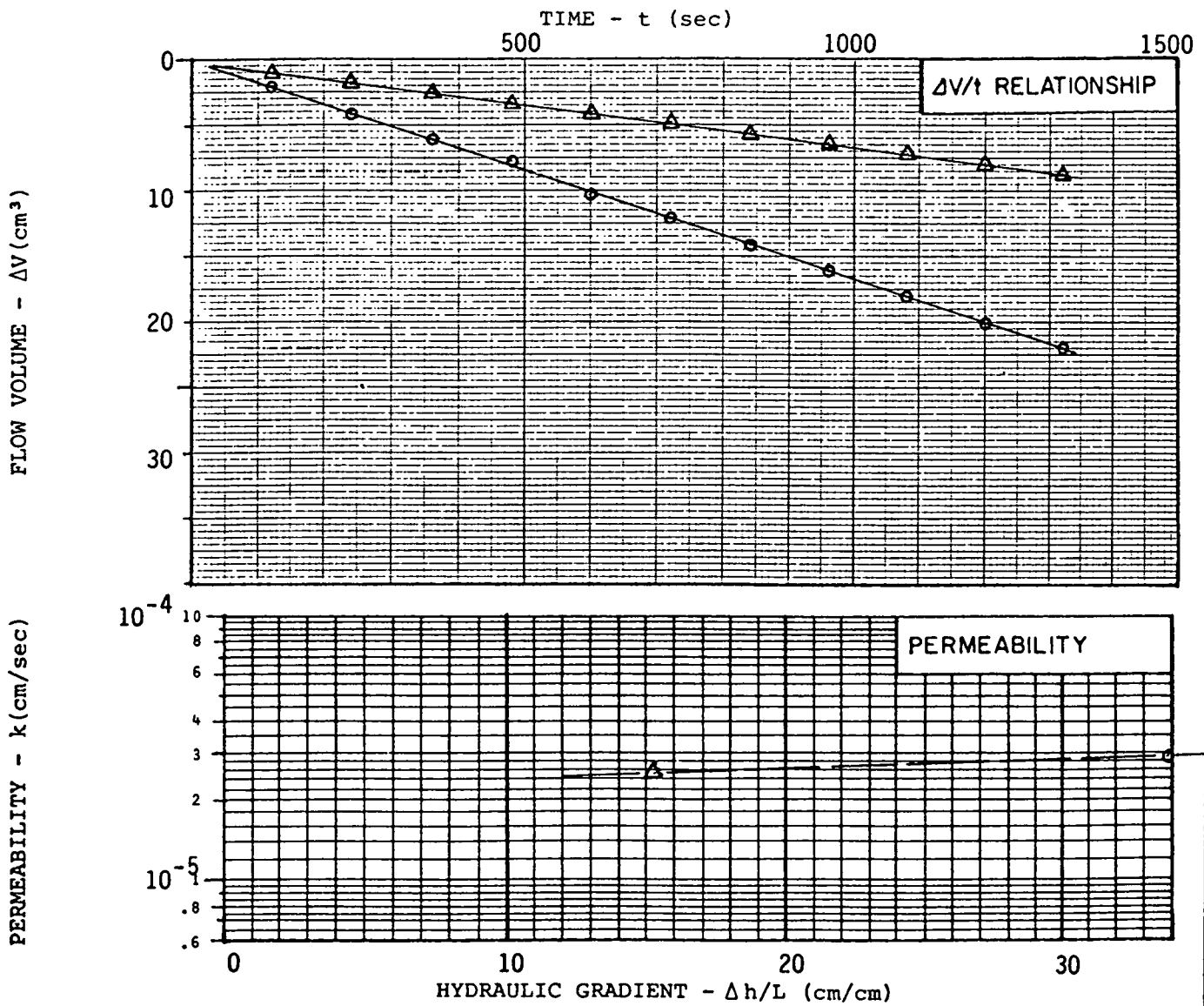
PERMEABILITY TEST REPORT

RAMCO STEEL PROJECT
BUFFALO, NEW YORK

DR BY: JFC	CK'D. JFC	DATE: MARCH, 1993	PROJ.NO. G025.004

-42-

TEST DATA:			SAMPLE DATA:
Specimen Height (cm):		6.73	Sample Identification: LAB NO. 1547.004
Specimen Diameter (cm):		4.65	SAMPLE SED-2
Dry Unit Weight (pcf):		97.5	Visual Description: Red Brown CLAY & SILT,
Moisture Content Before Test (%):		28.3	and Grey SAND, little silt
Moisture Content After Test (%):		25.4	Remarks: PROBABLE SAMPLE DISTURBANCE.
Cell Confining Pressure (psi):		95.0	MATERIAL BOUNDARY NEAR VERTICAL.
Test Pressure (psi):	82.8	81.0	Maximum Dry Density
Back Pressure (psi):	79.9	79.9	(ASTM D ____) (pcf):
Differential Head (psi):	2.9	1.1	Optimum Moisture Content (%):
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 1.66×10^{-2}	Δ 6.44×10^{-3}	Percent Compaction:
Permeability (cm/sec):	O 2.89×10^{-5}	Δ 2.47×10^{-5}	Permeameter Type: FLEXIBLE WALL



EMPIRE SOILS INVESTIGATIONS INC.

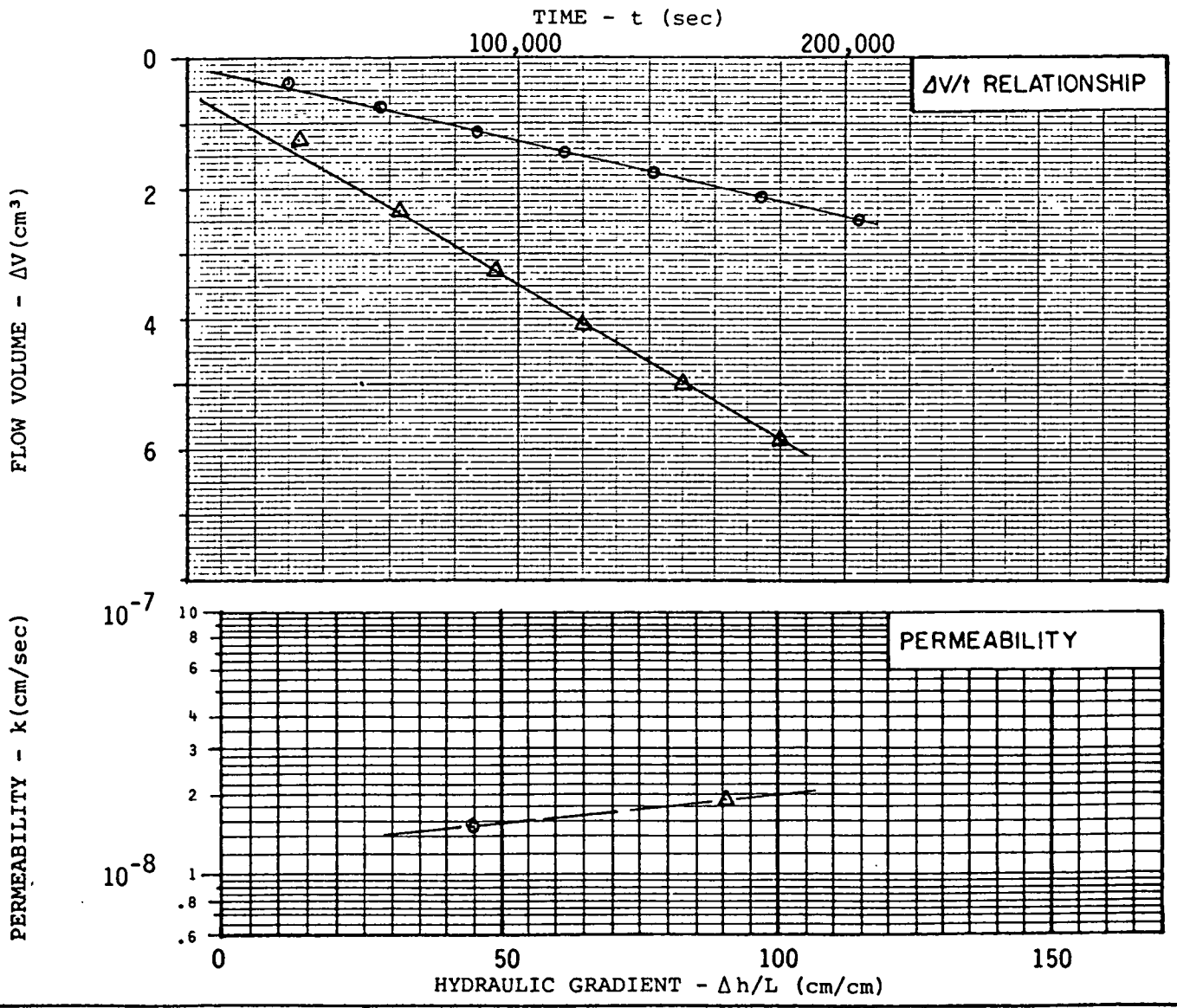
PERMEABILITY TEST REPORT

RAMCO STEEL PROJECT
BUFFALO, NEW YORK

DR BY: JFC	CK'D. JFC	DATE: MARCH, 1993	PROJ.NO. G025.004

54.5

TEST DATA:			SAMPLE DATA:	
Specimen Height (cm):	7.93		Sample Identification:	LAB NO. 1547.005
Specimen Diameter (cm):	4.70			SAMPLE SED-4
Dry Unit Weight (pcf):	97.3		Visual Description:	Brown SILT & CLAY,
Moisture Content Before Test (%):	28.2			trace organics
Moisture Content After Test (%):	24.9		Remarks:	
Cell Confining Pressure (psi):	95.0			
Test Pressure (psi):	84.6	89.9	Maximum Dry Density	
Back Pressure (psi):	79.9	79.9	(ASTM D ____) (pcf):	
Differential Head (psi):	4.7	10.0	Optimum Moisture Content (%):	
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 1.17×10^{-5}	Δ 2.96×10^{-5}	Percent Compaction:	
Permeability (cm/sec):	O 1.51×10^{-8}	Δ 1.88×10^{-8}	Permeameter Type:	FLEXIBLE WALL



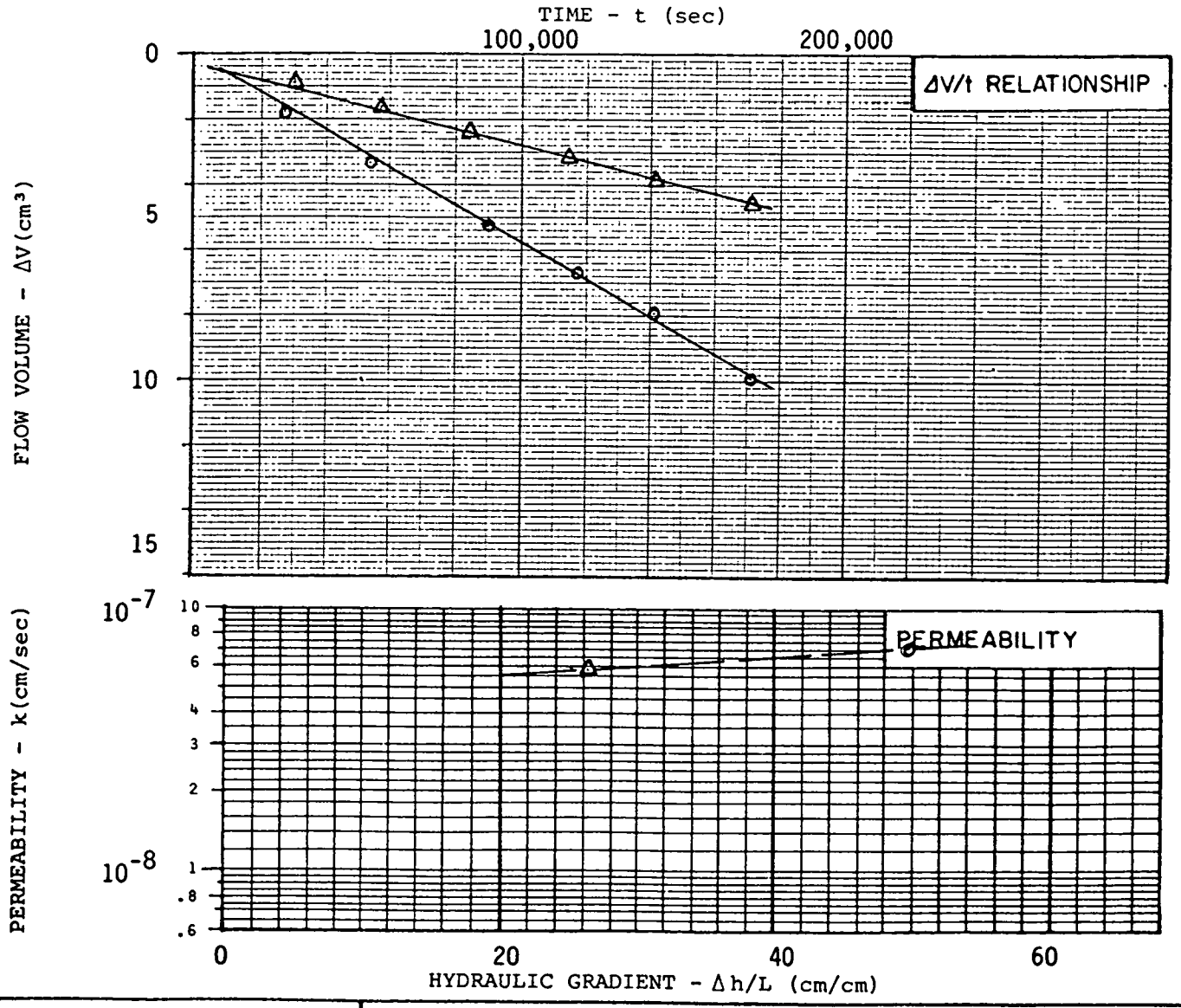
EMPIRE SOILS INVESTIGATIONS INC.

PERMEABILITY TEST REPORT

RAMCO STEEL PROJECT
BUFFALO, NEW YORK

DR BY: JFC	CK'D. JFC	DATE: MARCH, 1993	PROJ.NO. G025.004

TEST DATA:			SAMPLE DATA:	
Specimen Height (cm):	7.80		Sample Identification:	LAB NO. 1547.006
Specimen Diameter (cm):	4.57			SAMPLE SED-7
Dry Unit Weight (pcf):	83.6		Visual Description:	Mottled Black & Grey
Moisture Content Before Test (%):	39.0			SAND & SILT, Some Clay
Moisture Content After Test (%):	33.0		Remarks:	
Cell Confining Pressure (psi):	95.0			
Test Pressure (psi):	85.2	82.6	Maximum Dry Density	
Back Pressure (psi):	79.9	80.0	(ASTM D ____) (pcf):	
Differential Head (psi):	5.3	2.6	Optimum Moisture Content (%):	
Flow Rate ($\Delta V/t$) (cm^3/sec)	O 5.73×10^{-5}	Δ 2.47×10^{-5}	Percent Compaction:	
Permeability (cm/sec):	O 7.03×10^{-8}	Δ 5.76×10^{-8}	Permeameter Type:	FLEXIBLE WALL



EMPIRE SOILS INVESTIGATIONS INC

PERMEABILITY TEST REPORT

RAMCO STEEL PROJECT
BUFFALO, NEW YORK

DR BY:	CK'D.	DATE:	PROJ. NO.
JFC	JFC	MARCH, 1993	G025.004

APPENDIX E

APPENDIX E

APPENDIX E

HABITAT EVALUATION AND ECOLOGICAL RISK ANALYSIS

JULY 1993

HABITAT EVALUATION AND ECOLOGICAL RISK ANALYSIS

RAMCO STEEL SITE
BUFFALO, NEW YORK

NYSDEC SITE NO. 915046

DAMES & MOORE

3065 Southwestern Blvd., Suite 202
Orchard Park, New York

July 1993
25848-001

HABITAT EVALUATION
AND ECOLOGICAL RISK ANALYSIS
RAMCO STEEL
BUFFALO, NEW YORK
NYSDEC Site No. 915046

EXECUTIVE SUMMARY

In accordance with the NYSDEC approved RI Work Plan, Dames & Moore, Inc. has conducted an analysis of fish and wildlife impact's. The RI Work Plan specifically limits the analysis to Step I (Site Description) and Step II (Contaminant-Specific Impact Analysis) as presented in the NYSDEC guidance document, Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites, June 18, 1991. The analysis was conducted during the period of May-June 1993 with the actual field work being performed in May.

The purpose of this Executive Summary is to provide a brief overview of the scope of the analysis performed and the results.

Scope of Habitat Evaluation and Ecological Risk Analysis

The objective of this analysis was to characterize the potentially impacted habitat types in the vicinity of the site and to describe the potential environmental risks associated with the Ramco Steel site. The focus of the risk analysis was the on-site pond.

The description of the existing environment (Section 2.0) includes a description of the existing habitat which may potentially be effected by constituents at the site. The discussion includes a description and illustration of the significant habitats, wetlands, and other special natural resources within a 2-mile radius of the site. As part of this description, a resource characterization is included which identifies fish and wildlife species that utilize the habitats at the site.

The habitat evaluation also includes an identification of the hazard threshold at the site (Section 3.0). The hazard threshold is defined as the available fish and wildlife related applicable or relevant and appropriate requirements (ARARs) and other to be considered (TBC) values.

The contaminant-specific impact analysis (Section 4.0) used the information developed in the habitat evaluation to assess the potential risks that the constituents at the site pose to the identified fish and wildlife receptors. The analysis consists of: 1) a pathway analysis, 2) criteria-specific analysis, and 3) an analysis of toxicological effects. The assessment includes an evaluation of the potential for bioaccumulation and biomagnification, and the potential threat to upper-level food chain consumers.

Conclusions - Habitat Evaluation

Eight natural heritage cover types were identified within ½-mile of the Ramco site during this evaluation. The habitats identified all reflect the site's history as an industrialized urban site.

Important resources proximate to the site include State and Federally-regulated wetlands to the north and west and the Federal areas inlcude the on-site pond, and four natural heritage program-designated significant habitats within 2-miles. The significant habitats are all greater than 1-mile from the site.

Conclusions - Contaminant-Specific Impact Analysis

The focus of the contaminant-specific impact analysis was the on-site pond and pond sediments. The pathway analysis identified several target species including plants, invertebrates, herpetofauna, mallard, American bittern, and muskrat. Based on the habitat evaluation and contaminant-specific impact assessment, the following conclusions are offered in support of the RI.

The important contaminant exposure route associated with the Ramco site is direct uptake of pond sediments as well as consumption of plants and prey species that may consume or be in direct contact with pond sediments. No potential aquatic toxicity is expected. Surface water concentrations of the contaminants of concern are below levels of concern. The concentrations of contaminants of concern in the sediments is generally near or slightly above the level of concern as presented in the NYSDEC, Division of Fish and Wildlife, Sediment Criteria, December 1989. Due to the absence of fish and benthic invertebrates in the pond and pond sediments, the biological mechanisms for mobilizing contaminants from the pond sediments are absent. Therefore, potential threats to upper-level food chain consumers are minimized.

HABITAT EVALUATION
AND ECOLOGICAL RISK ANALYSIS
RAMCO STEEL
BUFFALO, NEW YORK
NYSDEC Site No. 915046

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

LIST OF TABLES

LIST OF FIGURES

HABITAT EVALUATION
AND ECOLOGICAL RISK ANALYSIS
RAMCO STEEL SITE
BUFFALO, NEW YORK
NYSDEC Site No. 915046

1.0 INTRODUCTION

In accordance with the NYSDEC-approved RI Work Plan, Dames & Moore Inc. has conducted a Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites (Analysis). This Analysis has been performed in accordance with NYSDEC's guidance document titled "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites" (NYSDEC, 1991). The work plan specifically limits the Analysis to Step I (Site Description) and Step II (Contaminant-Specific Impact Analysis).

1.1 SITE BACKGROUND

1.1.1 SITE LOCATION/DESCRIPTION

The Ramco Steel Site is located at 110 Hopkins Street in Buffalo, New York (see Figure 1-1). The steel processing facility on the site is currently operated by Niagara Cold Drawn Steel (NCDS). The site is comprised of 17 acres, with the property separated into two areas by an existing railroad spur (see Figure 1-2). The eastern portion of the property consists of a manufacturing building and associated parking and storage areas. The western portion of the property includes the on-site pond of about 3.5 acres and associated surrounding land. For the purposes of the Analysis, the Ramco site is limited to the property to the west of the railroad spur which includes the pond area and surrounding land (see Figure 1-2).

1.1.2 SITE HISTORY[1]

The processing of steel (pickling) prior to manufacturing operations has continued to be a part of the operation from 1929 to present day, although, the actual pickling process operation and facility equipment has changed over the years for a variety of reasons. Beginning in 1929 and ending in 1986, the pickling process consisted of dipping of the steel in an acidic solution to remove scale from the steel prior to manufacturing operations. In 1986, the pickling process was changed to a shot blasting process which does not include the use of acid materials to remove scale. For the period in which the pickling process included the use of acid solutions, acid rinse waters were discharge to the on-site pond located to the west of the manufacturing building. The following provide a chronology of reported wastewater disposal practices associated with discharges to the on-site pond.

For the period of approximately 1929 to 1979, industrial wastewaters were discharged directly to the on-site pond. It is noted that conflicting information exists regarding the discharge of spent pickle liquor into the pond during the period of 1929 to 1972 when the plant was operated by Bliss & Laughlin Steel. A NYSDEC information request response from Axia, Inc. indicates that, whereas

---

[1] Information concerning the site history has been derived from various sources, some of which are conflicting and inconsistent and much of the information relied upon is not capable of verification.

acid rinse waters were disposed of into the pond during that period, spent pickle liquor was sewered. A Ramco Steel response to a similar inquiry in 1976 indicates that spent pickle liquor was disposed of in the pond. For the period of 1975 to 1979, from other information gathered by the NYSDEC, it appears that, wastewaters were discharged to the pond under a New York State Pollution Elimination Discharge System (SPDES) permit. In 1979, the wastewater discharge point was eliminated and no further industrial wastewaters were directed to the pond. The discharge lines from the plant operation to the pond was closed under the supervision of the NYSDEC. In 1978, the pond was neutralized with sodium hydroxide.

For the period 1979 to 1986, industrial wastewater was directed to the Buffalo Sewer Authority for treatment. Spent pickle liquor wastes were shipped off-site for beneficial recovery in a wastewater treatment operations.

In 1986, after the purchase of the operation by NCDS, the initial steel processing to remove scale was changed from a pickle liquor process to a shot blasting operation. NCDS shot blasts hot-rolled bars of steel to remove unwanted surface scale and defects prior to soaking in a lime solution for preparation for final rolling and shaping.

1.2 SCOPE AND ORGANIZATION OF HABITAT EVALUATION AND ECOLOGICAL RISK ANALYSIS

The ultimate objectives of this report are to characterize the potentially impacted habitat types in the vicinity of the site and to describe the potential environmental risks associated with the Ramco Steel site. The focus of the ecological risk analysis will be the on-site habitat and, in particular, the on-site pond and adjacent land areas.

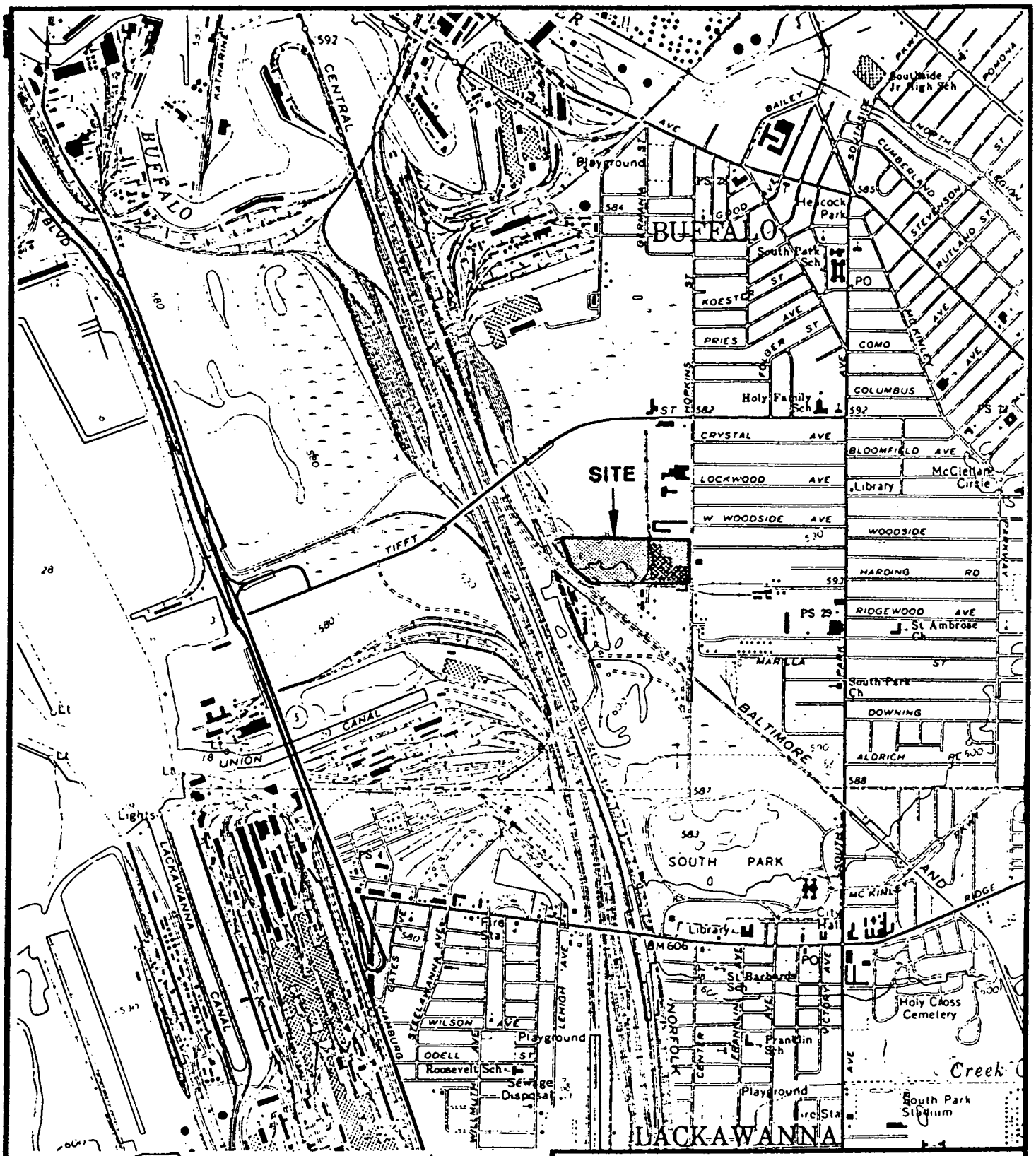
The habitat evaluation (Step I of Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites) includes a description of the existing ecology which may be affected by constituents at the site. This description includes a discussion and illustration of the significant habitats, wetlands and other natural resources within a 2-mile radius of the site. As part of this description, a resource characterization is included which identifies fish and wildlife species that would utilize the habitats at the site and evaluates the general quality of the habitat in meeting the needs of the resident species populations.

The habitat evaluation also includes identification of the hazard threshold at the site. The hazard threshold is defined as the available fish and wildlife related applicable or relevant and appropriate requirements (ARARs) and other to be considered (TBC) values.

The contaminant-specific impact analysis (step II) uses the information developed in the habitat evaluation to evaluate the potential risk that the constituents at the site pose to the identified fish and wildlife receptors. The ecological risk assessment includes three major components:

- Pathway Analysis
- Criteria Specific Analysis, and
- Analysis of Toxicological Effects.

Information in the impact analysis is dependent on the habitat evaluation (step I) and the results of the characterization of contaminants and their distribution developed in the RI. The contaminant-specific impact analysis follows a step-wise process. Step II presents three steps of increasing complexity (Pathway Analysis, Criteria-Specific Analysis and Analysis of Toxicological Effects) that assess the effects to fish and wildlife from site-related contaminants. If initial analyses (i.e., pathway analysis) do not demonstrate a minimal impact on fish and wildlife resources, more information - intensive steps should not be conducted.



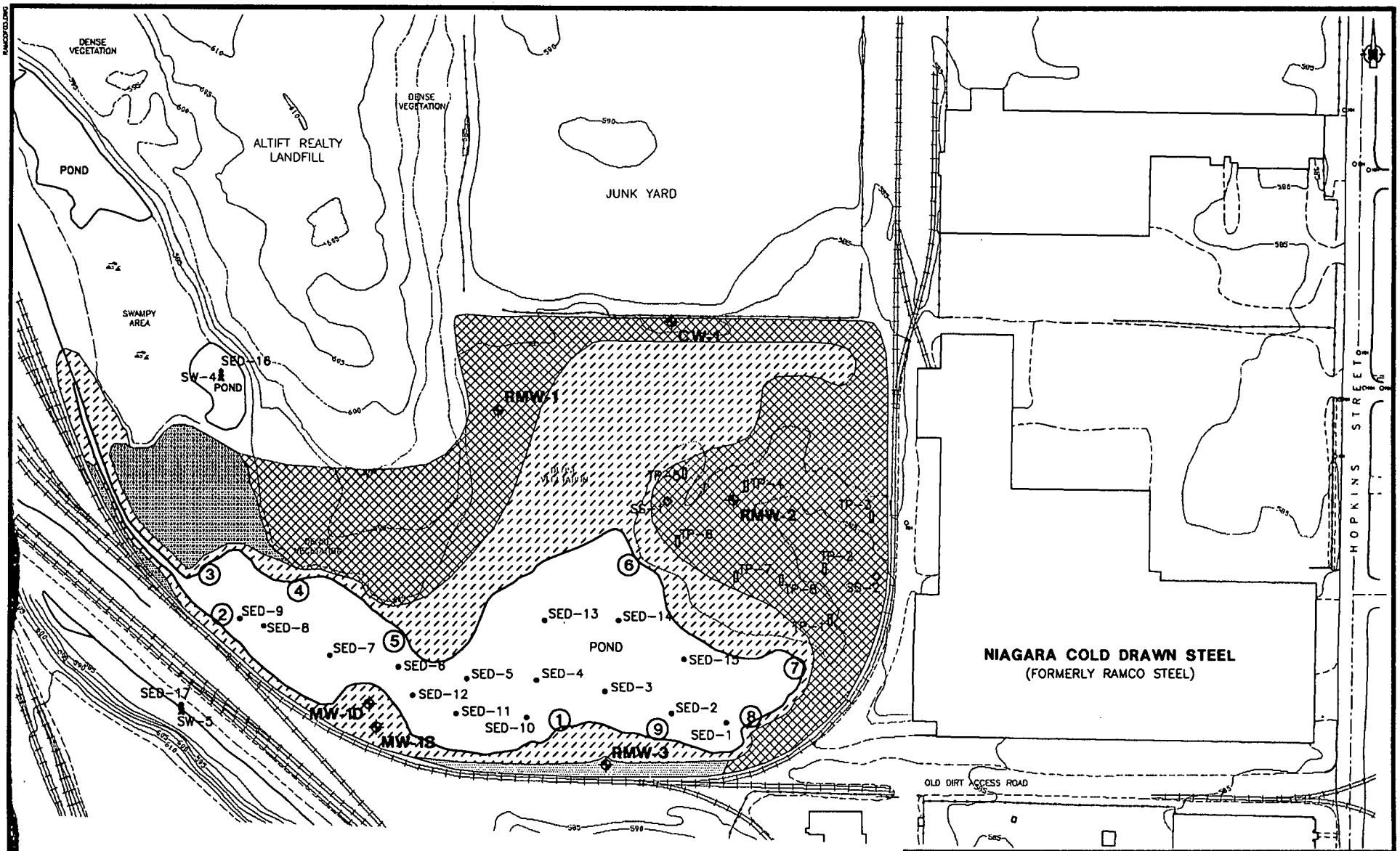
SOURCE:
USGS 7.5 MIN. QUADRANGLE
BUFFALO SE, NEW YORK 1965

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046

FIGURE 1-1

SITE LOCATION MAP

DAMES & MOORE JOB No.: 25848-001-152



BASE MAP SOURCE:
CONTOUR INTERVAL: 5 FOOT
MAPPING COMPILED BY PHOTOGRAMMETRIC METHODS
FROM 1"=500' PHOTOGRAPHY TAKEN 04/14/89.
COMPLETED BY: ERDMAN ANTHONY, CONSULTING ENGINEERS.

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046

FIGURE 1-2

SITE HABITAT MAP

DAMES & MOORE JOB No.: 25848-001-152

2.0 DESCRIPTION OF THE EXISTING ENVIRONMENT

An ecological surveillance was conducted at the Ramco Steel site and the surrounding area on May 4, 1993. A listing of agencies and organizations contacted prior to, and following field reconnaissance, who supplied supplementary materials on the area, are listed in Section 6.0.

The purpose of the ecological surveillance was to:

a) Characterize terrestrial and aquatic habitats and cover types within a ½-mile radius of the Ramco site, and

b) to qualitatively characterize the floral and faunal species associated with these existing habitats.

Quantitative species characterizations (i.e., population census, seasonal surveys) of the Ramco site were not included in the ecological study.

A walkover of the Ramco site was conducted by three Dames & Moore biologists. Aquatic habitat characterizations were a result of direct observations of both physical (i.e., submergent and emergent vegetation), and chemical (i.e., temperature and pH) characteristics of the site's 3.5 acre pond. Terrestrial habitat characterizations were primarily based upon identification of predominant vegetative communities within the project area surrounding the site pond. Plant and animal identifications were essentially accomplished in the field, however, selected floral specimens were harvested to assure accuracy of field observations via taxonomic scrutinization.

2.1 SITE ECOLOGY

The Ramco site is located in an industrial area of Erie County, New York. The topography of the area is relatively flat. Given the site's proximity to Lake Erie, the site is firmly entrenched within the Great Lakes Plain ecozone. The site is bordered by a variety of wetland communities to the west and north formed by the numerous man-made projects in the immediate area. The Altlift Landfill coupled with a railroad line, has created a lengthy stretch of wetland habitat west of the project site.

New York State Freshwater Wetland Maps and the U.S. Department of the Interior, Fish and Wildlife Wetland Maps were reviewed to identify any defined wetland areas near the Ramco site. Figure 2-1 and 2-2 illustrate these two reference maps. The closest New York designated wetland area to the Ramco site is approximately 1,000 feet west, designated as BU-1. Two other areas are identified approximately 0.5 miles north and west of the site, designated wetlands BU-7 and BU-15 (refer to Figure 2-1).

The National Wetland Inventory compiled by the U.S. Fish and Wildlife Service have designated many of the surface water features in the area of the site, including the on-site pond, as designated wetland areas. Figure 2-2 presents site related information from the National Wetland Inventory Map.

The aquatic community of the project area is exclusively represented by the site pond and its spillway. The pond has a rather low diversity due primarily to its historical use for the discharge of wastewater from the steel manufacturing processes.

2.1.1 COVER TYPES

A number of cover types were identified within ½-mile radius of the Ramco Steel facility. All cover types have been defined using the NYS Natural Heritage Program's "Ecological Communities of New York State" (1990). Habitats identified are those that most closely represent (both physically and biologically) those defined by the Natural Heritage Program.

Palustrine (wetland) communities identified include reedgrass/purple loosestrife marsh and floodplain forest. Terrestrial communities represented were successional old field and successional shrubland.

Aquatic habitats within the project area include the 3.5 acre pond and its edges.

Table 2-1 presents a listing of the cover types with ½-mile of the site and Figure 2-3 illustrates the areas covered by these covertypes within ½-mile of the site.

Cover types within the project area are a direct result of the land use practices in the area. The on-site pond comprises 3.5 acres of the 8.5 acres (approximately 41%) not used for building space on the Ramco site. The remaining 59% of the area is divided rather equally among the early successional cover types (shrubland and old field), the floodplain forest, and the reedgrass/purple loosestrife marsh. Figure 1-2 illustrates these areas relative to site features. All of these cover types show successional indications representative of disturbed areas.

2.1.2 IDENTIFICATION OF SPECIAL RESOURCES

An investigation was conducted to identify "special" resources within a two-mile radius of the Ramco Steel site. Special resources are those natural resources identified by the Natural Heritage Program (NHP) as communities and/or species considered to be rare, protected or otherwise significant. Significance is largely determined by New York State Rank ("S1-S5") and the Element Occupance and ("A-F", "X" and "H").

The state ranking system reflects resource rarity within the state ("S1" being the most rare), while element occurrence ranking of a resource is based upon: quality, condition, viability and defensibility ("A" defined as excellent). According to NHP, significant resources are those species or communities with state ranks of S1 and S2, regardless of Element of Occurrence Rank (EO) and those species or communities with an EO rank of A, regardless of S rank (NYSDEC, 1990).

The investigation identified four areas identified by the NHP within the two mile radius of the Ramco Steel Site: significant plant habitat for the small skullcap, the Tifft Farm Nature Reserve (osprey feeding area), the entire Lake Erie Waterfront from the Buffalo Bridge to Cattaraugus Creek (Waterfowl Wintering Area), and the Small Boat Harbor (significant coastal fish and wildlife habitat). Table 2-2 presents a listing of the significant habitats and associated risk. Figure 2-4 illustrates the location of these areas relative to the site.

2.1.3 HABITAT DESCRIPTION/SPECIES ASSOCIATION

Successional Communities

As a result the abandonment of past industrial land use activities (i.e., automobile junkyard, railroad) successional communities are found in early serial stages including old field and shrubland.

Old Field and Shrubland

These early successional cover types (refer to Figure 2-3) are found in the area between the Ramco site pond, the junkyard, the Altlift Realty Landfill and the Niagara Cold Drawn Steel building.

This floral community provides habitat to a variety of fauna. Those cover types provide good nesting, feeding and foraging cover for numerous bird species and small mammals.

Bird species commonly found in successional old field and shrubland include the American robin, the ringneck pheasant and the red-tailed hawk. A more complete list of bird species that may be found in these habitats are provided in Table 2-3.

Mammals potentially occurring in these early successional cover types include white tailed deer, eastern cottontail rabbits and deer mice. A more complete listing of mammals and amphibians and reptiles potentially found in these habitats are found in Table 2-4 and 2-5, respectively.

Predominant floral species identified in successional old fields' shrubland during reconnaissance include creeping buttercup (*Ranunculus repens*), white clover (*Trifolium repens*), common dandelion (*Taraxacum officinal*), goldenrod (*Solidago spp.*), common greenbrier (*Smilax rotundifolia*), staghorn sumac (*Rhus typhina*) wild strawberry (*Fragaria virginian*) and honeysuckle (*Lonicera sp.*).

WETLAND COMMUNITIES

Two wetland community cover types were identified during observations within the project boundaries. These communities were classified as reedgrass/purple loosestrife marsh and floodplain forest (refer to Figure 2-3). Both of these communities are located in close proximity to the site pond and represent the transitional area between the strictly aquatic habitat of the pond and the strictly terrestrial successional old field and shrubland.

REEDGRASS/PURPLE LOOSESTRIFE MARSH

A reedgrass/purple loosestrife marsh is often found in disturbed areas such as along highways and railroads or in areas with a history of filling, draining, road salts, etc. This marsh type, as the name indicates, has become dominated by reedgrass *(Phragmites australis)* and/or purple loosestrife *(Lythrum salicaria)*. Given the springtime date of the reconnaissance, only the reedgrass appeared to be the dominant vegetative species in the marsh area, which surrounded the site pond. Upon closer investigation, however, there was a sufficient number of dead and dormant purple loosestrife plants present to warrant their inclusion in the survey. The common cattail *(Typha latifolia)* was also found throughout the marsh, although not in dominating numbers.

FLOODPLAIN FOREST

An area of floodplain forest was identified within the project boundary north of the site pond and reaching to the automobile junkyard property line. With an area only about 300 feet long and 100 feet wide, this wetland community showed a rather diverse collection of wetland indicator plants. The primary canopy species identified included cottonwood (*Populous deltoideus*) black willow (*Salix nigra*). Characteristic ground layer vegetation noted during the surveillance included swamp buttercup (*Ranunculus septentrionalis*), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilia*), may apple (*Podophyllum peltatum*), some sedges (*Carex spp.*) and soft rush (*Juncus effusus*).

The composition of the vegetation varies greatly within this area in relation to the flood frequency and soil types within each subsection. Areas which drain poorly and may have standing water for long periods of time will develop vegetative communities which are more obligative to moisture (i.e., *Carex sp.* and *Juncus sp.*) than areas which flood occasionally and drain better (i.e., *Onoclea sensibilia*).

AQUATIC HABITATS

The Ramco Steel Site pond was surveyed for temperature and pH at 9 sites along the shore on May 4, 1993 (refer to Figure 1-2 for survey location around the pond). Table 2-6 presents the results of this survey and included habitat characterization information. Additionally, Table 2-7 presents aquatic flora and fauna observed at the survey locations. The day was cloudy with the temperature in the mid 70's. Any organisms in the water were noted, as well as the presence of submerged vegetation during the survey. Sediment conditions were noted, and where possible, sediments were screened for benthic invertebrates. Organisms on submerged objects were noted.

The shallow 3.5-acre pond was completely surrounded with dense stands of *Phragmites*. The bottom of the pond was littered with debris such as tires, metal objects, wood, and car parts. The northern shore of the pond abutted the Altifft Landfill. The eastern end of the pond, closest to the plant, was turbid and rust-colored, however, the water became clearer toward the western end of the pond. The substrate of the pond was firm, with a floc-like thin film of precipitate covering the submerged debris. The color of the deposits differed from site to site, ranging from red to brown to white.

No organisms were noted in the sediments at any sample site. No evidence of fish was observed. The presence of calcareous algae (*Chara*) was consistent with the high calcium content noted in the water sample results. Three muskrat hutches were present in the water close to the northern shore of the pond.

2.2 RESOURCE CHARACTERIZATION

2.2.1 GENERAL HABITAT QUALITY

The general quality of the habitats observed within the project boundaries was variably related to land use practices of past and present. Although providing habitat useable by various organisms, the habitat types represented are common.

As explained earlier in Section 2.1.1, approximately 41% of the 8.5-acre project site was covered by a 3.5 acre pond. Bodies of water this size and of this relatively shallow depth tend to be rather productive in terms of resource availability. Many of the aquatic vegetation types which grow in these waters serve as food sources for a variety of wildlife and fish species. The Ramco site pond, however, appeared to be of very low productivity. Consequently, the site pond, although supportive of limited species, (flora and fauna) should be considered poor quality because it does not support fish or typical benthic invertebrates (i.e., *chironimids*).

Wetland communities account for approximately 50% of the remaining 5+ acres not covered by the site pond. These communities arose in areas with permanent to "semi-permanent" wet conditions. Wetland areas offer valuable habitat for wildlife and have critical duties in the areas of sediment and erosion control, water quality improvement and flood water storage. The common reed/purple loosestrife wetland areas are generally poorer quality wetlands indicative of cultural influence. Although providing nesting habitat for a number of passerine birds (red-winged blackbird, swamp sparrow) and foraging areas for wading birds (American bittern) these areas are not considered high quality wetlands. Muskrats effectively utilize the common reed for both food and den construction materials.

The successional habitats found within the project boundaries were represented by old field and shrubland and accounted for the remaining approximately 1.5 acres of available habitat. As discussed in Section 2.1.3, these areas are characterized by a wide variety of vegetation types, which include shrubs, grasses and trees. Based on the relatively short time of direct field observations, a quantitative wildlife evaluation could not be undertaken. Given the number of species (animals, tracks and scat) identified during the reconnaissance, these areas may be expected to support a moderate diversity of wildlife indigenous to the area. However, the sites small size and location within an industrialized and residential area of the City of Buffalo limit its quality as wildlife habitat.

2.2.2 EXISTING ENVIRONMENTAL STRESS

No significant evidence of recent environmental stress was observed during the site reconnaissance. The entire areas flora and associated fauna reflect the cultural influence of being utilized in an industrial capacity. Any areas within the project boundaries which appeared barren or show signs of very early successional growth were deemed that way as a result of cultural activities there (i.e., the railroad access road between the Ramco site pond and the Altlift Landfill).

Any mortality to vegetation observed was most likely related to natural sources (i.e., natural life cycle, disease).

The absence of any benthic invertebrates within the pond sediments, and the absence of fish and common benthic invertebrates (i.e., *chironimids*) in the pond are an indication that water and sediment conditions are not life supporting. These conditions may be attributable to both natural physical (i.e., water temperature, D.O. content) and/or chemical (i.e., contaminants) factors of the pond.

TABLE 2-1

NEW YORK NATURAL HERITAGE COVER TYPES IN THE VICINITY OF THE RAMCO STEEL SITE

Code	Classification
1.	Cultural - Junkyard
2.	Cultural - Landfill/Dump
3.	Cultural - Urban Structure Exterior
4.	Cultural - Residential - Homes, Lawns, Driveways
5.	Cultural - Railroad/Unpaved Roads
6.	Successional Oldfield/Shrubland
7.	Reedgrass/Purple Loosestrife Marsh
8.	Successional Oldfield/Shrubland

TABLE 2-2

NATURAL HERITAGE PROGRAM
SIGNIFICANT HABITATS WITHIN 2-MILE RADIUS

Name of Area	Resource	Heritage Global/State Rank
1. Significant Plant Habitat	Small Skullcap *(Scutellaria parvula var Leonardii)*	G4 / S1
2. Tifft Farm Nature Preserve	Osprey Feeding Area	-----
3. Buffalo Bridge to Cattaraugus Creek	Waterfowl Wintering Area	-----
4. Small Boat Harbor	Significant coastal fish and wildlife habitat	-----

----- None given.

TABLE 2-3

BIRD SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE RAMCO STEEL SITE

Common Name	Scientific Name
American bittern**	*Botaurus lentiginosus*
American black duck*	*Anas rubripes*
American coot**	*Fulica americana*
American crow**	*Corvus brachyrhynchos*
American goldfinch**	*Carduelis tristis*
American kestrel*	*Falco sparverius*
American redstart*	*Setophaga ruticilla*
American robin**	*Turdus migratorius*
American tree sparrow*	*Spizella arborea*
American wigeon*	*Anas americana*
American woodcock**	*Philohela minor*
Bald eagle	*Haliaeetus leucocephalus*
Bank swallow*	*Riparia riparia*
Barn swallow*	*Hirundo rustica*
Bay-breasted warbler*	*Dendroica castanea*
Belted kingfisher*	*Ceryle alcyon*
Black tern*	*Chlidonias niger*
Black-and-white warbler*	*Mniotilta varia*
Black-capped chickadee**	*Parus atricapillus*
Black-crowned night-heron*	*Nycticorax nycticorax*
Black-throated blue warbler*	*Dendroica caerulescens*
Black-throated green warbler*	*Dendroica virens*
Blackburnian warbler*	*Dendroica fusca*
Blackpoll warbler*	*Dendroica striata*
Blue jay**	*Cyanocitta cristata*
Blue-gray gnatcatcher*	*Polioptila caerulea*
Blue-winged teal*	*Anas discors*
Blue-winged warbler*	*Vermivora pinus*
Bonaparte's gull*	*Larus philadelphia*
Broad-winged hawk*	*Buteo platypterus*
Brown creeper*	*Certhia americana*
Brown thrasher*	*Toxostoma rufum*
Brown-headed cowbird**	*Molothrus ater*
Bufflehead*	*Bucephala albeola*
Canada goose**	*Branta canadensis*
Canada warbler*	*Wilsonia canadensis*
Canvasback*	*Aythya valisineria*

*Indicates recorded at the Tifft Preserve in 1992.
**Indicates recorded during field recognizance.

TABLE 2-3

BIRD SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE RAMCO STEEL SITE

Common Name	Scientific Name
Cape May warbler*	*Dendroica tigrina*
Carolina wren*	*Thryothorus ludovicianus*
Caspian tern*	*Sterna caspia*
Cedar waxwing*	*Bombycilla cedrorum*
Cerulean warbler	*Dendroica cerulea*
Chestnut-sided warbler*	*Dendroica pensylvanica*
Chimney swift*	*Chaetura pelagica*
Chipping sparrow**	*Spizella passerina*
Cliff swallow	*Hirundo pyrrhonota*
Common goldeneye	*Buscephala clangula*
Common grackle**	*Quiscalus quiscula*
Common loon*	*Gavia immer*
Common merganser*	*Mergus merganser*
Common moorhen*	*Gallinula chloropus*
Common nighthawk*	*Chordeiles minor*
Common redpoll*	*Carduelis flammea*
Common snipe	*Gallinago gallinago*
Common tern*	*Sterna hirundo*
Common yellowthroat*	*Geothlyris trichas*
Cooper's hawk*	*Accipiter cooperii*
Dark-eyed junco*	*Junco hyemalis*
Double-crested cormorant*	*Phalacrocorax auritus*
Downy woodpecker*	*Picoides pubescens*
Eastern bluebird	*Sialia sialis*
Eastern kingbird*	*Tyrannus tyrannus*
Eastern meadowlark	*Sturnella magna*
Eastern phoebe*	*Sayornis nigricans*
Eastern screech-owl*	*Otus asio*
Eastern wood-pewee*	*Contopus virens*
European starling**	*Sturnus vulgaris*
Field sparrow*	*Spizella pusilla*
Fox sparrow*	*Passerella iliaca*
Gadwall*	*Anas strepera*
Glaucus gull	*Larus hyperboreus*
Golden-crowned kinglet*	*Regulus satrapa*
Golden-winged warbler*	*Vermivora chrysoptera*
Gray catbird**	*Dumetella carolinensis*

*Indicates recorded at the Tifft Preserve in 1992.
**Indicates recorded during field recognizance.

TABLE 2-3

BIRD SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE RAMCO STEEL SITE

Common Name	Scientific Name
Gray-cheeked thrush*	*Catharus minimus*
Great black-backed gull*	*Larus marinus*
Great blue heron*	*Ardea herodias*
Great crested flycatcher*	*Myiarchus crinitus*
Great egret*	*Casmerodius albus*
Great horned owl*	*Bubo virginianus*
Greater scaup*	*Aythya marila*
Green-backed heron*	*Butorides striatus*
Green-winged teal*	*Anas crecca*
Hairy woodpecker*	*Picoides villosus*
Henslow's sparrow	*Ammodramus henslowii*
Hermit thrush*	*Catharus guttatus*
Herring gull*	*Larus argentatus*
Hooded merganser*	*Lophodytes cucullatus*
Hooded warbler*	*Wilsonia citrina*
Horned lark	*Eremophila alpestris*
Horned grebe*	*Podiceps auritus*
House sparrow	*Passer domesticus*
House wren*	*Troglodytes aedon*
House finch**	*Carpodacus mexicanus*
Indigo bunting	*Passerina cyanea*
Killdeer**	*Charadrius vociferus*
King rail	*Rallus elegans*
Lapland longspur	*Calcarius lapponicus*
Least flycatcher*	*Empidonax minimus*
Least bittern*	*Ixobrychus exilis*
Lesser yellowlegs*	*Tringa flavipes*
Lesser black-backed gull	*Larus fuscus*
Lesser scaup*	*Aythya affinis*
Lincoln's sparrow*	*Melospiza lincolnii*
Little gull	*Larus minutus*
Little blue heron	*Egretta caerulea*
Loggerhead shrike	*Lanius ludovicianus*
Magnolia warbler*	*Dendroica magnolia*
Mallard**	*Anas platyrhynchos*
Marsh wren*	*Cistothorus palustris*
Mourning warbler	*Oporornis philadelphia*

*Indicates recorded at the Tifft Preserve in 1992.
**Indicates recorded during field recognizance.

TABLE 2-3

BIRD SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE RAMCO STEEL SITE

Common Name	Scientific Name
Mourning dove**	*Zenaidura macroura*
Mute swan*	*Cygnus olor*
Nashville warbler*	*Vermivora ruficapilla*
Northern cardinal*	*Cardinalis cardinalis*
Northern flicker**	*Colaptes auratus*
Northern harrier*	*Circus cyaneus*
Northern mockingbird	*Mimus polyglottos*
Northern oriole*	*Icterus galbula*
Northern parula*	*Parula americana*
Northern pintail*	*Anas acuta*
Northern rough-winged swallow*	*Stelgidopteryx serripennis*
Northern shoveler*	*Anas clypeata*
Northern shrike*	*Lanius excubitor*
Northern waterthrush*	*Seiurus noveboracensis*
Oldsquaw*	*Clangula hyemalis*
Orange crowned warbler	*Vermivora celata*
Osprey*	*Pandion haliaetus*
Ovenbird*	*Seiurus aurocapillus*
Palm warbler**	*Dendroica palmarum*
Peregrine falcon	*Falco peregrinus*
Philadelphia vireo*	*Vireo philadelphicus*
Pied-billed grebe*	*Podilymbus podiceps*
Pileated woodpecker	*Dryocopus pileatus*
Pine grosbeak	*Pinicola enucleator*
Pine siskin	*Carduelis pinus*
Pine warbler*	*Dendroica pinus*
Prairie warbler	*Dendroica discolor*
Purple finch*	*Carpodacus purpureus*
Purple martin	*Progne subis*
Red crossbill	*Loxia curvirostra*
Red-breasted merganser*	*Mergus serrator*
Red-breasted nuthatch	*Sittus canadensis*
Red-eyed vireo*	*Vireo olivaceus*
Red-headed woodpecker*	*Melanerpes erythrocephalus*
Red-necked grebe	*Podiceps grisegena*
Red-shouldered hawk	*Buteo lineatus*
Red-tailed hawk**	*Buteo jamaicensis*

*Indicates recorded at the Tifft Preserve in 1992.
**Indicates recorded during field recognizance.

TABLE 2-3

BIRD SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE RAMCO STEEL SITE

Common Name	Scientific Name
Red-throated loon	*Gavia stellata*
Red-winged blackbird**	*Agelaius phoeniceus*
Redhead	*Aythya americana*
Ring-billed gull**	*Larus delawarensis*
Ring-necked duck*	*Aythya collaris*
Ring-necked pheasant**	*Phasianus colchicus*
Rock dove**	*Columba livia*
Rose-breasted grosbeak*	*Pheucticus ludovicianus*
Rough-legged hawk*	*Buteo lagopus*
Rough-winged swallow**	*Stelgidopteryx serripennis*
Ruby-crowned kinglet*	*Regulus calendula*
Ruby-throated hummingbird*	*Archilochus colubris*
Ruddy duck*	*Oxyura jamaicensis*
Ruffed grouse*	*Bonasa umbellus*
Rufous-sided towhee*	*Pipilo erythropthalmus*
Rusty blackbird*	*Euphagus carolinus*
Savannah sparrow*	*Passerculus sandwichensis*
Scarlet tanager*	*Piranga olivacea*
Sedge wren	*Cistothorus platensis*
Sharp-shinned hawk*	*Accipiter striatus*
Short-eared owl	*Asio flammeus*
Snow bunting	*Plectrophenax nivalis*
Snow goose	*Chen caerulescens*
Snowy owl*	*Nyctea scandiaca*
Solitary sandpiper*	*Tringa solitaria*
Solitary vireo*	*Vireo solitarius*
Song sparrow**	*Melospiza melodia*
Sora*	*Porzana carolina*
Spotted sandpiper**	*Actitis macularia*
Swainson's warbler	*Limnothlypis swainsonii*
Swainson's thrush*	*Catharus ustulatus*
Swamp sparrow**	*Melospiza georgiana*
Tennessee warbler*	*Vermivora peregrina*
Tree swallow**	*Tachycineta bicolor*
Tufted titmouse*	*Parus bicolor*
Tundra swan*	*Cygnus columbianus*
Turkey vulture*	*Cathartes aura*

*Indicates recorded at the Tifft Preserve in 1992.
**Indicates recorded during field recognizance.

TABLE 2-3

BIRD SPECIES POTENTIALLY OCCURRING IN THE VICINITY OF THE RAMCO STEEL SITE

Common Name	Scientific Name
Veery*	*Cathraus fuscescens*
Vesper sparrow	*Pooecetes gramineus*
Virginia rail*	*Rallus limicola*
Warbling vireo*	*Vireo gilvus*
Whippoorwill	*Caprimulgus voceriferus*
White-breasted nuthatch*	*Sitta carolinensis*
White-crowned sparrow**	*Zonotrichia leucophrys*
White-eyed vireo	*Vireo griseus*
White-throated sparrow*	*Zonotrichia albicollis*
White-winged crossbill	*Loxia leucoptera*
Wild turkey**	*Meleagris gallopavo*
Willow flycatcher*	*Empidonax traillii*
Wilson's warbler*	*Wilsonia pusilla*
Winter wren*	*Troglodytes troglodytes*
Wood duck*	*Aix sponsa*
Wood thrush*	*Hylocichla mustelina*
Yellow warbler**	*Dendroica petechia*
Yellow-bellied flycatcher*	*Empidonax flaviventris*
Yellow-bellied sapsucker*	*Sphyrapicus varius*
Yellow-breasted chat	*Icteria virens*
Yellow-rumped warbler*	*Dendroica coronata*
Yellow-throated vireo*	*Vireo flavifrons*

*Indicates recorded at the Tifft Preserve in 1992.
**Indicates recorded during field recognizance.

TABLE 2-4

MAMMAL SPECIES POTENTIALLY OCCURRING WITHIN THE RAMCO STEEL SITE

Common Name	Scientific Name
Beaver	*Castor canadensis*
Big brown bat	*Eptesicus fuscus*
Coyote	*Canis latrans*
Deer mouse*	*Peromyscus maniculatus*
Dog (feral)*	*Canis familaris*
Eastern chipmunk	*Tamias striatus*
Eastern cottontail*	*Sylvilagus floridanus*
Eastern pipistrel	*Pipistrellus subflavus*
Eastern mole	*Scalopus aquaticos*
Ermine	*Mustela erminea*
Gray fox	*Urocyon cinereoargenteus*
Gray squirrel	*Sciurus carolinensis*
Hoary bat	*Lasiurus cinereus*
House mouse	*Mus musculus*
Least shrew	*Cryptotis parva*
Little brown bat	*Myotis lucifugus*
Little brown myotis	*Myotis lucifugus*
Longtail shrew	*Sorex dispar*
Longtail weasel	*Mustela frenata*
Masked shrew	*Sorex cinereus* (cinerus?)
Meadow jumping mouse	*Zapus hudsonius*
Meadow vole	*Microtus pennsylvanicus*
Mink	*Mustela vison*
Muskrat*	*Ondatra zibethica*
Norway rat	*Rattus norvegicus*
Opossum	*Didelphis virgianus* (marsupialis?)
Pine vole	*Pitymys pinetorum*
Racoon*	*Procyon lotor*
Red bat	*Lasiurus borealis*
Red fox	*Vulpes fulva*
Red squirrel	*Tamiasciurus hudsonicus*
Shorttail shrew	*Blarina brevicauda*
Silver-haired bat	*Lasionycteris noctivagans*
Smokey shrew	*Sorex fumeus*
Starnose mole	*Condylura cristata*
Striped skunk	*Mephitis mephitis*
White-footed mouse	*Peromyscus leucopus*
Whitetail deer*	*Odocoileus virginianus*
Woodchuck*	*Marmota monax*
Woodland jumping mouse	*Napaeozapus insignis*

*Observed during site recognizance.

TABLE 2-5

AMPHIBIANS AND REPTILES POTENTIALLY OCCURRING WITHIN THE RAMCO STEEL SITE

Common Name	Scientific Name
Amphibians	
American toad*	*Bufo americanus*
Blue-spotted salamander	*Ambystoma laterale*
Bullfrog	*Rana catesbeiana*
Dusky salamander	*Desmognathus fuscus*
Green frog	*Rana clamitans*
Grey tree frog	*Hyla versicolor*
Mountain dusky salamander	*Desmognathus ochrophaeus*
Mudpuppy	*Necturus maculosus*
Northern leopard frog*	*Rana pipiens*
Northern spring peeper	*Hyla crucifer*
Northern spring salamander	*Gyrinophilus porphyriticus*
Pickerel frog	*Rana palustris*
Red-backed salamander	*Plethodon cinereus*
Red-spotted newt	*Notophthalmus viridescens*
Slimy salamander	*Plethodon glutinosus*
Two-lined salamander	*Eurycea bislineata*
Western chorus frog	*Pseudacris triseriata*
Wood frog	*Rana sylvatica*
Reptiles	
Black rat snake	*Elaphe obsoleta*
Eastern garter snake	*Thamnophis sirtalis*
Eastern milk snake	*Lampropeltis triangulum*
Eastern smooth green snake	*Opheodrys vernalis*
Eastern spiny softshell	*Trionyx spiniferus*
Map turtle	*Graptemys geographica*
Northern black racer	*Coluber constrictor*
Northern brown snake	*Storeria dekayi*
Northern ribbon snake	*Thamnophis sauritus*
Northern ringneck snake	*Diadophis punctatus*
Northern water snake	*Nerpdoa sipedon*
Painted turtle*	*Chrysemys picta*
Queen snake	*Regina septemvittata*
Red-bellied snake	*Storeria occipitomaculata*
Snapping turtle*	*Chelydra serpentina*
Spotted turtle	*Clemmys guttata*
Stinkpot	*Sternotherus odoratus*
Wood turtle	*Clemmys insculpta*

*Observed during site recognizance.

TABLE 2-6

WATER QUALITY AND SUBSTRATE CHARACTERISTICS AT RAMCO STEEL SITE AQUATIC SAMPLING LOCATIONS

(TEMPERATURE AND PH MEASUREMENTS WERE TAKEN WITHIN 3 FEET OF SHORE AND WHERE WATER WAS 3 - 12" DEEP)

Station No.	pH	Temperature (°1F)	Habitat Characteristics
1	8.46	78.8	Southern shore. Water clear. Submerged tires, plywood. White precipitate on bottom.
2	7.89	76.2	Southern shore, near western end of pond. Water clear. Brown precipitate on submerged objects and bottom. Decaying vegetation.
3	7.51	71.9	Western end of pond. Water clear. Brown precipitate on submerged objects and bottom. Decaying vegetation on bottom. Metallic film along edge of pond.
4	8.02	72.7	Northern shore on western end of pond. Altifft dump along this shore; much debris, glass, metal, wood, on pond bottom. Metallic film along pond edge.
5	8.08	74.5	Northern shore, central portion of pond. Altifft dump along this shore; steep access to pond. Much debris, glass, metal, ceramic dishes on shore and on pond bottom.
6	7.92	80.2	Northernmost shore of pond. Steep access and small clearing in reeds with overlook of pond expanse. Tires, car seats, rocks in water. Red precipitate on bottom.
7	7.53	75.6	Easternmost shore of pond, closest to plant. Water turbid and red. Reed stems covered with red precipitate 2-3 inches above water surface. Metallic film along water edge.
8	7.55	75.4	Southeastern shore of pond, closest to conjunction of railroad tracks running along southern and eastern shores. Dense stands of reeds along shore; dead reeds on bottom. Water clear.
9	8.13	74.8	South central shore. Dense stands of reeds along shore; dead reeds on bottom. Water clear.

TABLE 2-7

AQUATIC FLORA AND FAUNA OBSERVED AT THE RAMCO STEEL SITE

Taxa	Survey Location
Flora	
Reed (*Phragmites sp.*)	All sites
Cattail (*Typha sp.*)	6
Calcareous algae (*Chara sp.*)	1,2
Green algal mat - floating (*Cladophora sp.*)	1,2,5
Blue-green algal mat on sediments (*Cyanophyceae*)	4
Fauna	
Snail (*Gastropoda*)	1,3,6
Amphipoda (*Gammarus sp.*)	3,6
Isopoda (*Asellus sp.*)	3
Leech (*Hirudinea*)	6
Diving beetle (*Coleoptera*)	1
Dragonfly (*Anisoptera*)	1
Water strider (*Gerridae*)	1,2

Note: No organisms were found in the sediments

LEGEND:

WETLAND BOUNDARY

0 2000 4000 FT

GRAPHIC SCALE

SOURCE:
NYSDEC WETLAND MAP DATED: 1977
UPDATED 1981,1982,1985,1986

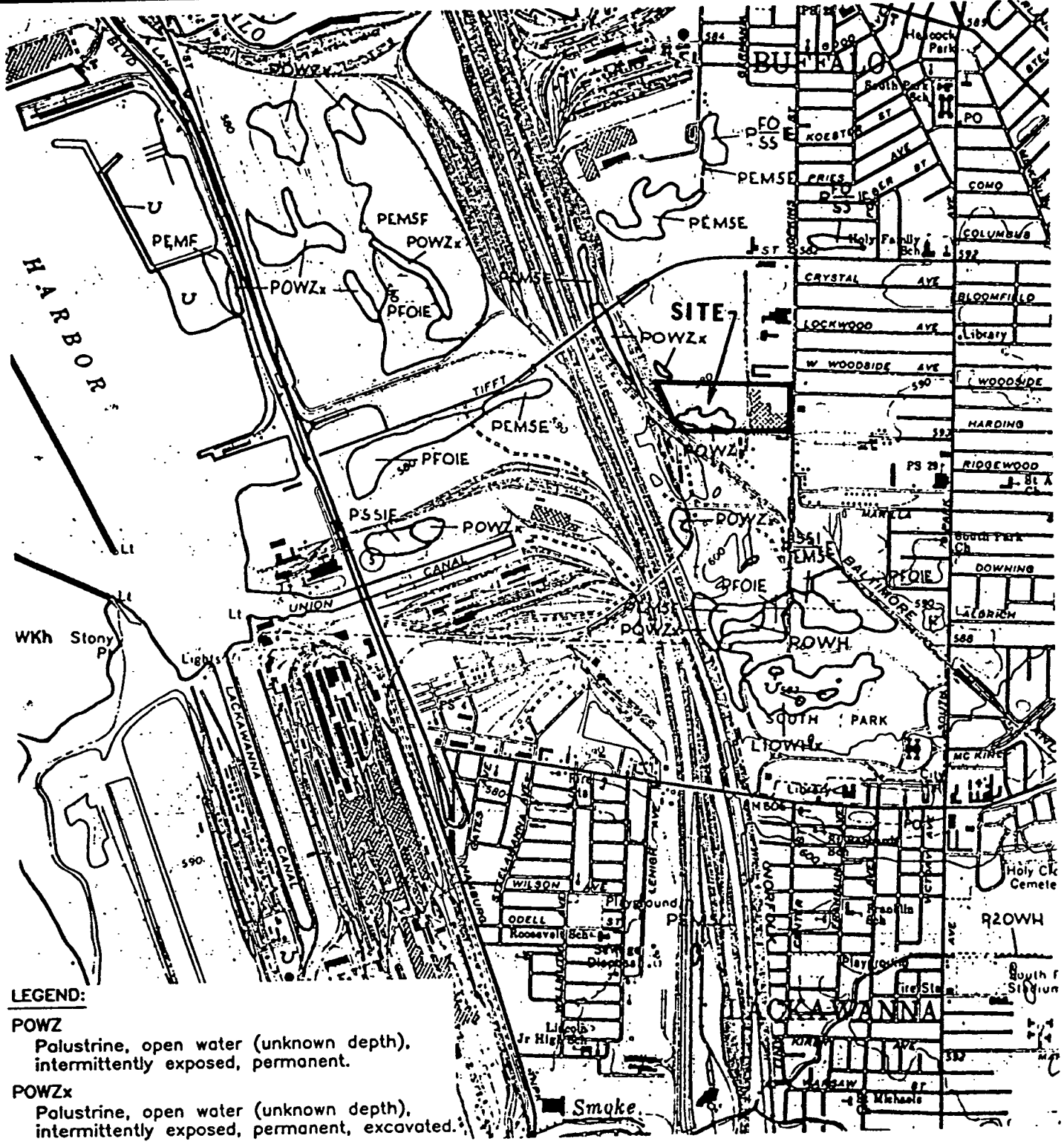
RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046

FIGURE 2-1

NYSDEC WETLAND AREAS

DAMES & MOORE

JOB No.: 23101-001-152



LEGEND:

POWZ
Palustrine, open water (unknown depth), intermittently exposed, permanent.

POWZx
Palustrine, open water (unknown depth), intermittently exposed, permanent, excavated.

PEMSE
Palustrine, narrow-leaved persistent, intermittently, seasonal saturated.

0 2000 4000 FT

GRAPHIC SCALE

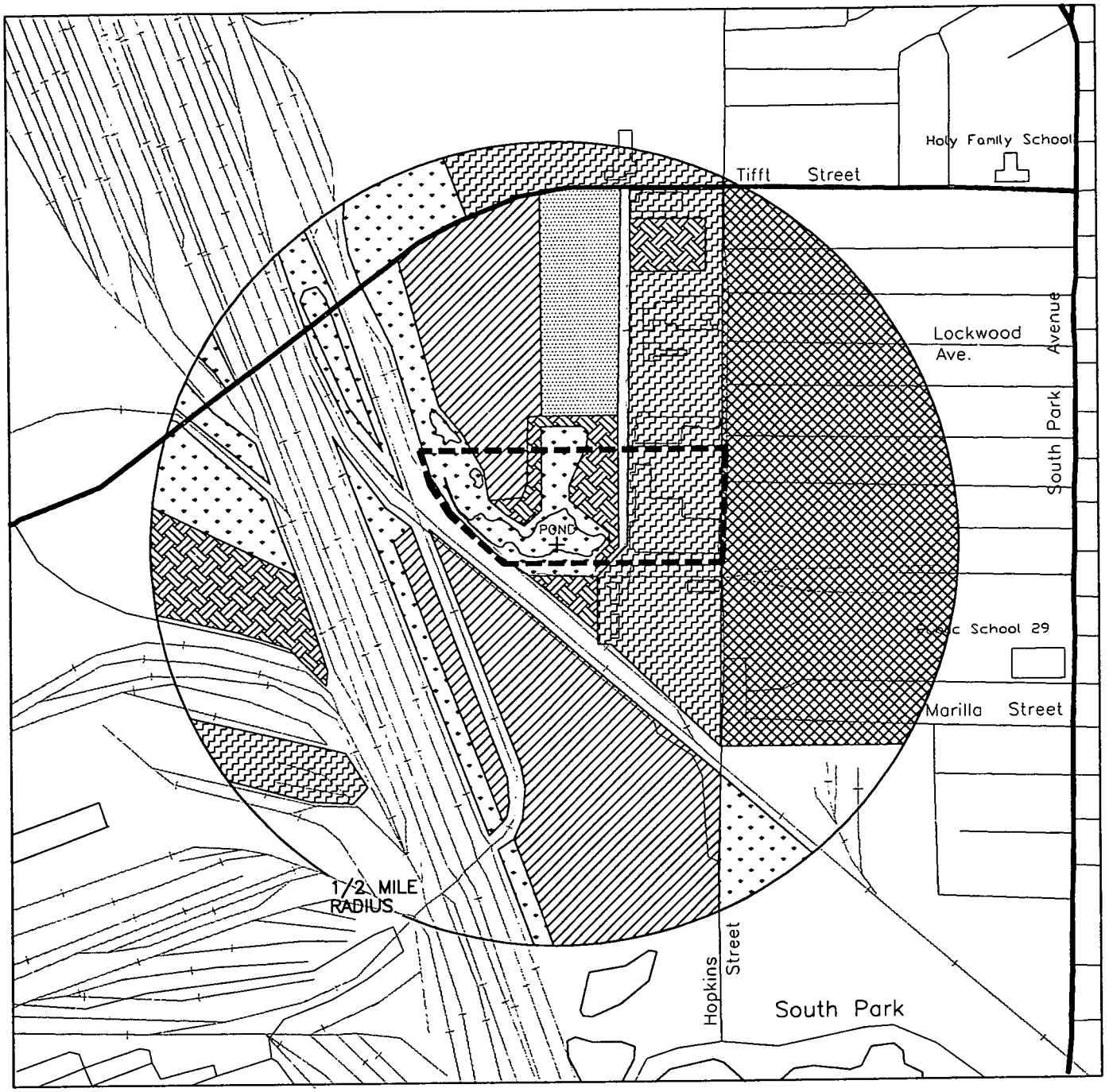
SOURCE:
NATIONAL WETLAND INVENTORY U.S. DEPT. OF THE INTERIOR
AERIAL PHOTOGRAGH DATED OCTOBER, 1978.

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046

FIGURE 2-2

U.S. DEPARTMENT OF THE INTERIOR NATIONAL WETLAND INVENTORY

DAMES & MOORE JOB No.: 23101-001-152



KEY:

- JUNKYARDS
- LANDFILL/DUMP
- URBAN STRUCTURE EXTERIOR
- RESIDENTIAL AREA
- REEDGRASS/PURPLE LOOSTRIFE MARSH
- SECCESSIONAL OLD FIELD/SHRUBLAND

N

0 1000 2000 FT

GRAPHIC SCALE

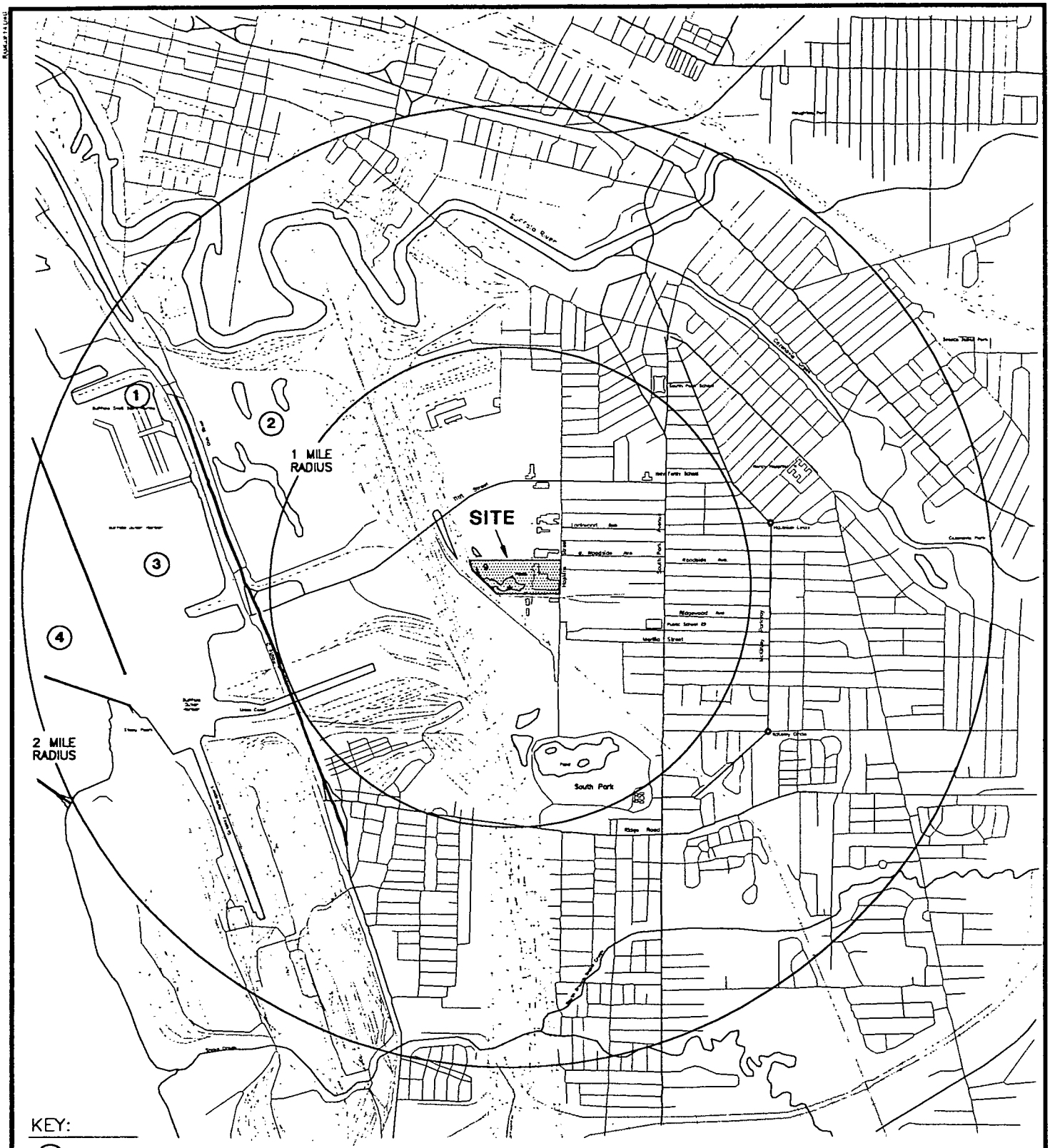
SOURCE:
USGS 7.5 MIN. QUADRANGLE
BUFFALO SE, NEW YORK 1965,
NYSDEC WETLAND MAP 1977
UPDATED 1981, 1982, 1985 & 1986.

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046

FIGURE 2-3

NEW YORK NATURAL HERITAGE COVER TYPE CLASSIFICATION

DAMES & MOORE JOB No.: 25848-001-152



KEY:

1. SMALL SKULLCAP
2. OSPREY FEEDING AREA
3. WATERFOWL WINTERING AREA
4. COASTAL FISH & WILDLIFE HABITAT

N

SOURCE:
USGS 7.5 MIN. QUADRANGLE
BUFFALO SE, NEW YORK 1965,
NYSDEC WETLAND MAP 1977
UPDATED 1981, 1982, 1985 & 1986.

0 3000 6000 FT

GRAPHIC SCALE

RAMCO STEEL BUFFALO, NEW YORK
NYSDEC Site No. 915046

FIGURE 2-4

SIGNIFICANT HABITAT

DAMES & MOORE JOB No.: 25848-001-152

3.0 HAZARD THRESHOLD IDENTIFICATION

3.1 FISH AND WILDLIFE RELATED APPLICABLE AND RELEVANT OR APPROPRIATE REQUIREMENTS (ARARS)

The National Contingency Plan (NCP), amended pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), established the process for determining appropriate remedial actions at those sites listed on the National Priorities List (NPL) (Superfund sites). Recent amendments to CERCLA by the Superfund Amendments and Reauthorization Act of 1986 (SARA) further define the process for determining appropriate remedial actions at Superfund sites and the degree of remediation to be achieved by these remedial actions.

Potential ARARs are to be used as a guide in evaluating the appropriate extent of site remediation, to aid in scoping and formulating remedial action alternatives, and to govern the implementability and reliability of the selected remedial action. The purpose of these requirements is to make CERCLA response actions consistent with other pertinent federal or state public health and environmental requirements.

To identify potential fish and wildlife related ARARs specified to the Ramco Steel site, input for the Ecological Risk Assessment (ERA) is necessary. The ERA describes those pathways that may result in exposure, identifies potential receptors, characterizes the risk from exposure to chemicals at the site, characterizes the uncertainty associated with that risk, proves the appropriate context for assessing the magnitude of that risk, and defines those exposure pathways that may pose an endangerment to the environment. Using this information as a basis, potential ARARs are determined only for those exposure routes resulting in potential endangerments exceeding the criteria specified in the NCP. The site-specified risk management decision, (i.e., the decision concerning water level of risk is acceptable at this site) is made when a remedy is selected.

As the definition implies, potential ARARs identified for a site are those selected from federal and state environmental laws and standards that are applicable or relevant and appropriate to the site-specific remedial actions under consideration. In order to determine whether a regulatory requirement is a potential ARAR, one must divide the question into whether the requirement is "applicable" or "relevant and appropriate." Applicable requirements are defined in the NCP as those "promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site" (40 CFR 300.5). A requirement is applicable if there is a "one-to-one correspondence between the requirement and the circumstances at the site..." (53 FR 51437). SARA has broadened the definition of applicable to include state requirements. However, any state standard that precludes in-state land disposal is not applicable unless all of several conditions apply [SARA Sec. 121(d)(2)(C)]. Thus, a federal or state standard is applicable if it applies to the remedial action under consideration if the action were undertaken outside of the context of a CERCLA cleanup. For example, maximum contaminant levels (MCLs) are applicable to the quality of water supplied by a water supplier, but not to groundwater that is not developed as a water supply. Usually, there is little discretion involved in such determinations (53 FR 51437).

If the requirement is not applicable, best professional judgement must be used to determine whether the requirement is "relevant and appropriate." The NCP defines relevant and appropriate as those "that, while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site, address problems sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site" (40 CFR 300.5). Additionally, a requirement is relevant and appropriate if it addresses problems or situations that are generally pertinent to the conditions at the site (i.e., the requirement is relevant) and the requirement is well-suited to the particular site (i.e., the requirement is appropriate) (53 FR 51436, 51437). Relevant requirements are not potential ARARs unless their use is appropriate given the conditions at the site (50 FR 47912, 47918). Whether a requirement is appropriate depends upon the nature of the substances at the site, the site characteristics, the circumstance surrounding the release, and the ability of the action to address the release. The most important criteria used to assess either a requirement is appropriate are whether the purpose for which the requirement was created is similar to the specific objectives of the CERCLA action and whether the actions or activities regulated by the requirement are similar to the remedial action contemplated at the CERCLA site (50 FR 51346).

Potential ARARs are classified as chemical-specific, location-specific, and action-specific. Another category of remediation goals is the "to be considered" (TBC) advisories and guidance. TBCs are non-promulgated advisories, guidance, or other criteria issued by federal and state governments that are not legally binding and do not have the status of potential ARARs. However, they may be useful in determining remediation goals for the further protection of human health and the environment.

A potential chemical-specific ARAR is a chemical-specific concentration limit set by either federal or state environmental laws for a given environmental medium. Examples for groundwater include MCLs and maximum contaminant level goals (MCLGs) established pursuant to the SDWA. Examples for surface water are ambient water quality criteria (AWQC) established pursuant to the CWA.

AWQCs established pursuant to Section 304 (a) of the CWA set numerical concentration limits for constituents in surface water. These criteria provide guidance on concentration of constituents acceptable to the U.S. Environmental Protection Agency (EPA) for the protection of aquatic life and are thus relevant and appropriate to surface water. AWQCs are not applicable to groundwater, but they may be determined to be relevant and appropriate as they are specifically identified in Section 121 of SARA.

AWQCs are promulgated to provide guidance on detrimental effects of pollutants "in any body of water, including groundwater" (33 U.S.C. Sec. 1314).

There are three types of AWQCs based on human exposure: (1) consumption of aquatic organisms, (2) consumption of aquatic organisms and drinking water, and (3) adjusted criteria based solely on exposure through consumption of drinking water. These later adjusted criteria are not promulgated but are more pertinent to groundwater than the other two since aquatic organisms do not exist in groundwater. However, to be relevant and appropriate, the AWQCs must reflect current scientific information (53 FR 51442). Thus AWQCs may be relevant but not appropriate if its scientific basis is not current. Additionally, AWQCs are not appropriate if an MCL or non-zero MCLG exist for the constituent of concern (55 FR 8755).

The shallow pond at the Ramco Steel site is not utilized as a source of drinking water, nor are there any residences/businesses that utilize the groundwater in the near vicinity. There may be some limited through flow of groundwater in a northern direction from the pond. Therefore, AWQCs for the protection of aquatic life may also be relevant and appropriate. The potential hydraulic connection between the shallow groundwater and NYS-designated jurisdictional wetlands to the north and northwest of the site results in the need to address the protection of aquatic life in identifying ARARs for the site.

New York Water Quality Standards are identified in Title 6, Parts 609 and 700-704 of the New York Codes, Rules and Regulations. Specific numeric water quality criteria have been established by the state to be protective of both aquatic life and human health and are applicable to the waters of the state. Surface waters in the vicinity of the site are designed class fresh surface water. Because these state standards are applicable, they are considered as potential ARARs for the Ramco Steel site.

The chemical specific ARARs for sediment and surface water are presented in Table 3-1.

Other fish and wildlife-related ARARs include:

6 NYCRR Part 193.3: Establishes as a violation the damage or destruction of listed plant species by the application of herbicides or defoliants without the consent of the owner.

Title 7, Article 24: (Freshwater Wetlands Act) of the Environmental Conservation Law, (Regulated under 6 NYCRR Part 663): regulates any form of pollution in to freshwater wetlands. Permit required.

TABLE 3-1

FISH AND WILDLIFE RELATED ARARS FOR CONSTITUENTS OF CONCERN AT THE RAMCO STEEL SITE

	Surface Water Action Level (µg/L)	Criteria for Aquatic Sediments (µg/L)	
		Aquatic *b	Wildlife Residue *b
Arsenic	10_{α}	5_b	
Chromium	50_c	26_b	
Iron	300_c	$2.4\%_b$	
Lead	25_c	27_b	
Mercury	2_c	0.11_b	
Aroclor-1248 (PCBs)	0.001_c	10,900	770
4,4'-DDD	0.001_c	1,975	32.7
Naphthalene	10_c	---	---
Acenapthalene	20_c	28,835	---
Fluorene	---	---	---
Flouranthene	---	---	---
Phenanthrene	---	5,490	---
Benzo(a)Anthracene	---	---	---
Chrysene	---	---	---
Bis(2-Ethylhexyl)Phthalate	0.6_c	4,728	---

∝ Health Based Value from EPA Health Effects Summary Table - EPA HEAST - Jan. 31, 1991.

b NYSDEC, Division of Fish and Wildlife, Sediment Criteria, DEC, 1989.

c NYSDEC Draft Clean-up Policy and Guidelines. Volume II, Appendix B: Water Clean-Up Criteria, 6 NYCRR 703.5

* Corrected for organic carbon content of sediment at average measured concentration of 3.9%.

--- Not given.

4.0 IMPACT ANALYSIS (ECOLOGICAL RISK ASSESSMENT)

The evaluation of potential impacts on environmental receptors associated with the constituents of concern detected at the Ramco Steel site includes an evaluation of site-specific constituents data, information on animal and plant species present, exposure data, and toxicological information about the potential effects of the constituents of concern on the indigenous biota.

The primary objective of this ecological risk assessment is to describe the potential environmental risks associated with the Ramco Steel site. It is a specific objective of this assessment to evaluate the risk associated with exposure of individual species to the constituents of concern at the site. Adverse impacts on the environmental receptors will be characterized for each environmental media of concern. Based on the requirements of the NYSDEC guidelines for the preparation of a habitat evaluation and impact analysis, this assessment will be semi-quantitative. When data are sufficient, environmental risks will be quantified. However, when information is inadequate to numerically characterize the anticipated impacts, a qualitative discussion will be provided.

An evaluation of the site constituent data has been represented previously in the RI. Constituents detected in on-site sediments include organic and inorganic chemicals. Of these constituents, arsenic, chromium, iron, lead, mercury, PCBs, 4-4'DDD, and a number of polyaromatic hydrocarbons were identified potential constituents of concern because some concentrations were found at elevated concentrations. Constituents detected in surface water also include organic and inorganic chemicals, however, these media were not selected as media of concern because the levels of contamination did not exceed regulatory limits.

The ecological setting of the Ramco Steel site is described in detail in Section 2.0 of this report. The habitat types present at the site include both terrestrial and aquatic resources. Terrestrial habitats include successional old field, successional shrubland, reedgrass/purple loosestrife marsh and floodplain forest. The aquatic habitat is the on-site pond. A variety of plant and animal species are found in each habitat type. A detailed description of each habitat type and the associated plant and animal species known or suspected of occurring is provided in Section 2.1.

4.1 SELECTION OF TARGET SPECIES AND PATHWAYS OF EXPOSURE

The following presents the target species and pathway selection for the site. It eliminates those pathways and exposure routes that are not of concern, based on the analysis of site characteristics, and provides a focus for those pathways and species critical to the ecological risk assessment.

Principal criteria for the selection of target species (USEPA, 1991) include:

- Species that are threatened, endangered, or of special concern;
- Species that are valuable for recreation purposes;
- Species that are important to the well being of either or both of the above groups;

- Species that are critical to the structure and function of the particular ecosystem in which they inhibit; and
- Species that serve as indicators of an important change in the ecosystem.

Other criteria for the selection of target species include:

- Species present in habitats on-site or immediately adjacent to the site; and
- Species that are resents and or transients in the identified impacted habitats.

Factors that have been considered in the exposure pathway selection process include:

- Location of the site;
- Local topography;
- Local land use;
- Surrounding terrestrial habitats;
- Surrounding aquatic habitats;
- Qualitative prediction of constituent migration; and
- Persistence and mobility of migrating constituents.

The following subsections provide a qualitative screening of the species and exposure pathways of concern at the Ramco Steel site.

4.1.1 AQUATIC SPECIES AND PATHWAYS

The aquatic environmental receptors at the Ramco Steel site include both plant and animal species that may come into contact with site constituents. Because the constituents of concern have been limited to the pond sediments, all pathway discussions will be limited to those associated with the sediments and aquatic habitat.

There are no known local populations of federally endangered or threatened species in the area. However, the Tifft Farm Nature preserve is an osprey (NYS-listed threatened species) feeding area. A number of typical local species are known or suspected to be present. Among the terrestrial wildlife species listed in Section 2.1 that are expected to reside within the Ramco Steel site's habitat are:

Herpetofauna - painted turtle
bull frog
snapping turtle
northern leopard frog
American toad

Birds -	mallard duck
	American crow
	Canada goose
	American bittern
	house sparrow
	red-winged blackbird
Mammals -	muskrat
	whitetail deer

In addition to those resident species, many additional species may seasonally migrate through the site.

As delineated in Figure 2-3, the site's habitat is representative of much of the terrestrial habitats in the area. The site is within the City of Buffalo and the surrounding areas reflect the post-industrial, disturbed communities characteristic of cultural influence.

The aquatic environmental receptors at the site include both plant and animal species that may come into contact with site constituents of concern in the sediments. Results presented in the RI indicate that no sediment transport is expected from the pond.

The dominant plant species associated with the pond edge are common reed and purple loosestrife. Common cattail were also found along the pond edge, but were not particularly abundant. Aquatic plants also noted were calcareous algae (*Chara sp.*), green algae (*Cladophora sp.*), and blue-green algae (*Cyaropyceal sp.*).

The common reed provides nesting habitat for birds, especially red-winged blackbirds, as well as forage from their seed heads.

The pond also provides suitable feeding and nesting areas for various waterfowl (mallard, Canada goose). The small size of the pond limits the species of waterfowl that would normally utilize the site to the marsh ducks (*Anatinids*) and would generally preclude the diving ducks (*Aythyinids*).

Limited sediment sampling identified no organisms in the pond's sediments. Chironimids were noticeably absent from all sediment samples. A number of invertebrates were identified on the detritus: snails, amphipods, isopods, leeches, and a number of insects (diving beetle, water strider). Site recognizance identified that no fish present in the pond.

The processes governing constituent fate in aquatic systems: hydrolysis, volatilization, oxidation/reduction, chemical transformation/biodegradation, bioaccumulation, and biomagnification are dependent in varying degrees on water chemistry. The water chemistry parameters of importance include pH, alkalinity, disposed oxygen, temperature, and calcium carbonate concentration. These parameters determine the chemical specification of constituent compounds, constituent reactions and their rates of reaction, and where the constituents are ultimately stored. A major determinant of contaminant fate and transport within aquatic systems in the physical nature of the system. The Ramco site pond is a (standing water) system. Contaminant fate and transport is also predicated on morphological configuration, physical and chemical characteristics of the sediments, and whether seasonal turnover occurs.

4.1.2 AVIAN SPECIES AND PATHWAYS

A list of the birds observed or expected to occur at the site is presented in Section 2.1 and in the previous discussion of species of concern. New York State or Federally-listed threatened or endangered species within the immediate vicinity of the site. Among the more important avian species are waterfowl (mallard, Canada goose), wading birds (American bittern, great blue heron) predator species (red-tailed hawk), numerous song birds (red-winged blackbirds, song sparrow), and other game species (ring-necked pheasant, wild turkey).

Because the potential exists for the bioaccumulation of constituents within a food-chain, a bird species is chosen to evaluate the exposure and risk associated with the consumption of food. A predatory wading species (i.e., American bittern) was selected as the species of concern for this route of exposure, because its diet is almost exclusively based on a variety of small amphibians, crustaceans, and reptiles which may potentially accumulate constituents of concern from the site sediments.

In addition to the American bittern, the mallard was chosen as an indicator avian species to examine the potential impact to waterfowl using the Ramco Steel site. The mallard is known to consume both plant and animal foods including the seeds, nuts and stems of marsh plans, and a few crustaceans and mollusks. Additionally, mallards consume sediments due to their feeding technique (dabbling). Consequently, the critical route through which the mallard may be exposed includes consumption of aquatic life from surface waters potentially containing constituents of concern and consumption of the sediments themselves.

4.2 EXPOSURE ASSESSMENT

The analysis of exposure to wildlife is a complex process involving the use of numerous exposure assumptions for which the determination is often quite difficult. Potential exposure routes for the aquatic and avian species at the site may inlcude:

- Adsorption/absorption of constituents by sediment microfauna (e.g., nematodes, earthworms);
- Ingestion of constituents in sediments by non-soil dwelling organisms (e.g., mallard ingesting soil as grit).
- Ingestion of constituents in surface water from pond and wetland areas;
- Herbivore exposure resulting from ingestion of constituents in plant material (e.g., muskrat);
- Predator exposure resulting from ingestion of affected prey species (e.g., insect, American bittern, raccoon);
- Exposure (e.g., adsorption/absorption, ingestion) to constituents in early life stages of amphibians using aquatic and wetland locations for breeding;
- Absorption of constituents in solution through gills (e.g., fish, tadpole, crayfish);

- Dermal exposure as a result of contact with constituents in the sediment or in the aqueous phase (e.g., burrowing organisms, aquatic insects);

- Ingestion of constituents of concern in sediments and microfauna as a result of feeding activity (e.g., oligochaetes); and

- Ingestion of prey organisms containing constituents of concern.

4.3 TOXICITY ASSESSMENT

This section summarizes the background information, general fate and transport process, and the toxicity characteristics for each of the contaminants of concern. For each contaminant discussed, there are important environmental fate and transport properties associated with it. These properties can be any of the following:

- Photolysis;
- Oxidation-Reduction;
- Hydrolysis;
- Volatilization;
- Sorption (absorption and adsorption);
- Biotransformation;
- Biodegradation; and
- Bioaccumulation.

The summaries presented here are not meant to be complete representations of all possible environmental interactions. Ideally, modes of action most pertinent to the Ramco site would be discussed, however, for many contaminants of concern, extensive terrestrial fact/transport and toxicological data is lacking or suspect. For some contaminants (such as metals) it is not always possible to distinguish between its transport and environmental fate. This is due to the various compounds and complexes it may transform into during the degradation process. Toxicity data was collected for each contaminant through examination of available and reliable results from various laboratory experiments. In some discussions there is little data on bioaccumulation related to mammals, i.e., in thee cases it was necessary to use primarily aquatic data. Therefore, in many cases a generic overview of contaminant interactions in soils, sediments, and terrestrial and aquatic ecosystems is presented.

4.3.1 ARSENIC

Background

Arsenic (As) is a highly poisonous metallic element that exists in three crystalline forms--yellow black, or gray--of which the bristle gray is the most common (Morris, 1985). Pure elemental arsenic is relatively rare (Kourimsky, 1977). Arsenic is classified as a semi-metal and belongs to the Arsenic Group, which is comprised of the native elements arsenic, antimony, and bismuth (Mason and Bery, 1968), and Group 5a in the periodic table of elements (Considine, 1976). Arsenic and its compounds, especially white arsenic (As_2O_3), are used in insecticides, weed killers, solid-state doping agents, and various alloys (Morris, 1985). It is also used in making medicines and paints, and in the manufacture of glass.

General Fate and Transport Properties

Arsenic may be relatively mobile in oxidizing environmental, controlled by coprecipitation with iron oxides, and in iron-poor or partially reducing environments, as suggested by moderately high average content in water relative to rock (Rose *et. al.*, 1979). No information was found specifically on the rate of oxidation/reduction of arsenic in aquatic environments. Arsenic is stable in four oxidation states (+5, +3, 0, -3) under Eh conditions occurring in aquatic systems. Arsenic metal occurs only rarely and the -3 oxidation state is stable only at extremely low Eh values. Cycling of arsenic in the aquatic environment is dominated by adsorption and desorption with sediments. In non-aquatic environments, metallic arsenic is stable in dry air, but when exposed to moistened or humid air, the surface oxidizes, giving a superficial golden bronze tarnish that turns black on further exposure (Kirk-Othmer, 1970). Arsenic does adsorb to soils and sometimes accumulates, but redistribution processes usually preclude hazardous accumulations (Woolson, 1977). Arsenic may be sorbed onto clays, aluminum hydroxide, iron oxides, and organic material (Ferguson and Gavis, 1972; Jackson *et. al.*, 1978).

No evidence was found to indicate that photolysis is an important mechanism in determining the fate of arsenic compounds. Volatilization of arsenic may be a significant process in extremely reducing environments where AsH_3 is formed. Under normal circumstances, however, it is not an important mechanism in determining the fact of arsenic after its introduction to the environment.

A number of studies have shown that arsenic is bioaccumulated, but reported concentration factors for arsenic in aquatic organisms are generally quite low. However, some fish and invertebrates contained high levels of toxicologically relatively inert arsenic compounds (USEPA, 1984). It appears that arsenic compounds do not tend to increase in concentration as trophic levels increase (Isensee *et. al.*, 1973). In general, fat accumulates more arsenic than muscle tissue (Callahan *et. al.*, 1979). Shellfish concentrate arsenic to a greater extent than fish, and marine organisms contain more arsenic than freshwater species (Callahan *et. al.*, 1979). Plants may accumulate arsenic via root uptake from soil solution, and certain species may accumulate substantial levels (USEPA, 1984). Current data shows arsenical are readily absorbed after ingestion by animals; however, most arsenical are rapidly excreted in urine within days, or at most a week (Eisler, 1988a).

General Toxicity Characteristics

Soluble arsenic forms are absorbed well across the gastrointestinal tract of mice (USPHS, 1991b). Insoluble forms, such as lead arsenate and arsenic trisulfide, are not absorbed as well. Animal studies have indicated distribution to most tissues, including the placenta and fetus (USPHS, 1991b). The two primary metabolic reactions are interconversion of the arsenite (3+) and arsenate (5+) forms, and methylation of the arsenite form, which is apparently a detoxification step. Because of these metabolic interconversions, any toxicity differences between inorganic forms or arsenic are considered inconsequential (USPHS, 1991b). Arsenic is bioconcentrated, but not biomagnified through the food chain (Eisler, 1988a).

Sublethal oral acute toxicity is characterized by peripheral nervous system disturbances, melanosis, anemia, leukopenia, cardiac abnormalities, and liver effects (Pershagen and Vahter, 1979). Although the primary health hazard in humans is dermatological, a similar generalization cannot be made for

other animals, which usually have different skin types than humans. Chronic toxicity in mammals is often difficult to characterize because of arsenic's rapid detoxification and excretion (Woolson, 1977) in all species, except rats (NAS, 1977a; USEPA, 1980a). In a three-generation study, mice exposed to 5 ppm of dietary arsenite (approximately 0.65 mg/As/kg/day) showed reduced litter sizes but no clinical signs of toxicity (Pershagen and Vahter, 1979). No significant reproductive effects occurred in mice exposed for three generations to .1 mg As/kg/day for 2 years died with no histopathological evidence of toxicity (Byron *et. al.*, 1967). Orally poisoned cattle show trembling, unsteady gait, convulsions, shallow breathing, and submucosal gastrointestinal hemorrhage (Samad and Chowdhury, 1984). Clinical signs of arsenosis in birds, including muscular incoordination, debility, jerkiness, immobility, and seizures, are not unique to arsenic intoxication (Hudson *et. al.*, 1984; Eisler, 1988a).

4.3.2 CHROMIUM

Background

Chromium (Cr) is a lustrous, hard, steel-gray, metallic element that is resistant to tarnish and corrosion and is found primarily in chromite (Morris, 1985). Chromium is not affected by air or water at ordinary temperatures (Considine, 1976). It belongs to Group 6b in the periodic table of elements. Its primary use in industry is as a catalyst to harden steel alloys and produce stainless steels. Larger amounts of chromium are being emitted into the environment through mining of chromium-containing ores than from natural processes such as volcanic eruptions and soil erosion (USPHS, 1987b). Chromium is moderately abundant in the earth's crust, with concentrations averaging 100 ppm (Green, 1959; Taylor, 1964; Wedepohl, 1969-1978). River waters of the United States have chromium concentrations ranging from 1 to 30 g/L (USEPA, 1984b), depending on the extent of anthropogenic pollution. Chromium concentrations in soils range from 5 to 1,500 mg/kg (Carey, 1982). A 1987 study of Maryland, Pennsylvania, and Virginia soils reported a range of 4.9 to 71 mg/kg (Beyer and Cromartie, 1987).

General Fate and Transport Characteristics

Chromium is immobile in normal surface weathering (pH 5.0 to 8.0) and in organic-rich environments because of its incomplete inner electron shells, which cause the element to be strongly adsorbed (Rose *et. al.*, 1979). Chromium primarily exists in the oxidation states Cr (III) and Cr (VI) in aqueous systems. Schroeder and Lee (1975) found that Cr (III) and Cr (VI) are readily interconvertible under natural conditions. They found that Cr (VI) can be reduced by iron (Fe (II)), dissolved sulfides, and certain organic compounds with sulfhydryl groups, while Cr (III) can be oxidized by an excess of manganese dioxide (MnO_2) and, at a slower rate, by O_2 under natural water conditions. Cr (VI) is a strong oxidizing agent and reacts with reducing materials to form trivalent chromium.

It appears that Cr (III) and Cr (VI) are only weakly adsorbed into inorganic solids, although Cr (III) is adsorbed more strongly than Cr (VI). Chromium in soil is present mainly as insoluble oxide $Cr_2I_3{}^{\bullet}nH_2O$ (USEPA, 1984b). Therefore it is not very mobile in soils. The fate of chromium in soils is primarily dependent on the redox potential and pH of the soil. Organic forms can exist and are more easily oxidized than insoluble inorganic oxides.

Bioaccumulation of chromium does occur in both aquatic and soil environments. Chromium is an essential nutrient and is present in aquatic and marine biota at levels much higher than in ambient water (NAS, 1974). Bioconcentration factors for chromium have been calculated to range from the thousands for plankton, aquatic plants, and aquatic invertebrates, to the tanks and hundreds for fish (NAS, 1974; Chapman *et. al.*, 1968). Carey (1982) found that chromium concentrates primarily in the roots of plants and has low mobility for transfer to above ground pats of plants. Although bioaccumulation does occur, biomagnificant is not expected to occur along either the aquatic or terrestrial food chains (USPHS, 1987b; Carey, 1982).

General Toxicity Characteristics

Donaldson and Barreras (1966) reported that most chromium VI (Cr(VI)) is metabolically reduced to chromium III (Cr(III)) in the acidic environment of the stomach. Studies in rates indicate that the extent of absorption of either form is less than 1.5 percent of the administered dose (Sayato *et. al.*, 1980; Henderson *et. al.*, 1979). Cr (III) apparently penetrates the placental barrier only as glucose tolerance factor, a biologically active macromolecular complex. Trivalent chromium is the form most commonly measured and assumed to be biologically active at hazardous waste sites.

In general, hexavalent chromium is more toxic than the trivalent form. The rat LD50s for the trivalent and hexavalent forms are 600 to 2,600 mg/kg (Smyth *et. al.*, 1969) and 19.8 mg/kg (NIOSH, 1990). Lifetime exposure to approximately 1,500 mg Cr(III)/kg/day in rats had no adverse effects on a number of organ systems (Ivankovic and Preussman, 1975). A dietary concentration corresponding to a dose of 32 mg Cr(VI)/kg/day, administered for a 24- to 90-day period, produced diarrhea, rough coats, and reproductive sterility in rats (Gross and Heller, 1946; USEPA, 1984b). Similarly, while exposure to high equivalent doses of Cr(III) produced no adverse reproductive effects in rats (Ivanokovic and Preussmann, 1975), gestational exposure of mice to 57 mg Cr(VI)/kg/day resulted in embryolethality and gross malformations (Trivedi *et. al.*, 1989). Subchronic treatment with 100 ppm (approximately 2.5 mg/kg/day) Cr(VI) in drinking water was fatal to dogs, while 11.2 ppm only resulted in increased tissue accumulation (Steven *et. al.*, 1976). Haseltine *et. al.*, (1985) found that juvenile black ducks were much more susceptible to anionic Cr(III) than adults were.

4.3.3 IRON

Background

Iron (Fe) is a silvery-white, lustrous, malleable, ductile, magnetic or magnetizable, metallic element occurring abundantly in combined forms, notably in hematite, limonite, magnetite, and taconite (Morris, 1985). It belongs to Group 8 in the periodic table of elements (Considine, 1976). Iron is an extremely versatile construction and engineering material and serves both in relatively pure forms, such as malleable and wrought iron, and in many hundreds of iron-based alloys of major importance, including various types of steel. Iron is the second most abundant metal in the earth's crust (HSDB, 1991b), where it concentrates at approximately 46,500 ppm (Green, 1959; Taylor, 1964; Wedepohl, 1969-1978), constituting 5 percent of the crust.

General Fate and Transport Characteristics

Important environmental fate and transport mechanisms include chemical transformation/degradation through oxidation/reduction reactions and hydrolysis. The mobility of iron is dependent on the element's valence state. Fe^{2+} is moderately mobile, whereas Fe^{3+} has a very low tendency to mobilize because it is precipitated as hydrous iron oxides with pH >2.0 (Hem, 1960).

Solubility properties of iron indicate that exposing an equilibrated system to relatively small shifts in Eh or pH can cause great changes in iron solubility. Thus, when pyrite is exposed to oxygenated water or ferric hydroxide is in contact with reducing substances, iron will tend to go into solution. Chemical speciation, which is affected by pH, Eh, and oxygen content in aquatic systems, further affects the concentration and availability in the environment.

Organic compounds containing iron are particularly important in life processes, such as photosynthesis, and in the functions of hemoglobin in the blood of animals. As an essential nutrient, iron is accumulated by plants and animals; although no literature was available, it seems reasonable to assume that the majority of accumulation results from uptake rather than dermal adsorption.

General Toxicity Characteristics

In animals, specifically humans, essential elements such as iron characteristically tend to concentrate in body tissues in a fairly consistent fashion, with absorption within the body and removal from the body being precisely regulated by the body's homeostatic mechanisms. Although iron accumulation is generally well regulated by the body, excessive amounts of iron can overload the homeostatic mechanism and prove toxic (Pike and Brown, 1975).

Iron absorption occurs in a two-stage process: uptake by gastrointestinal mucosal cells and transfer from the mucosal cells to the plasma (USEPA, 1984). Regulation of iron absorption is controlled by a complex homeostatic feedback mechanism that depends on the level of endogenous stores and the erythropoiesis rate. Consequently, determination of an accurate absorption factor is not possible. Although iron is the nutrient essential for the oxygenation of cells and tissues, levels required in most animals populations are unknown.

Most health effects studies about iron have been concerned with iron deficiency rather than toxicosis. Recently, Aisen *et. al.*, (1990) described free radical toxicity, characterized by gastrointestinal hemorrhage, hepatic effects, fatty deposition, and metabolic acidosis (Ellenhorn and Barceloux, 1988), resulting from iron overload. Clinical signs of iron overload, including hemosiderosis and hemochromatosis, are not expected after exposure to environmentally relevant levels. Tadokoru *et. al.*, (1979) reported embryolethality in gravid mice and rats administered 1200 mg/kg/day for 6 unspecified days. Administration of 120 to 380 mg/kg/day had no adverse effect.

The results of limited animal feeding studies do not indicate a consistent systemic toxicity after iron overload (Bothwell *et. al.*, 1979). A more extensive toxicological data based, consisting primarily of case studies, is available for humans. Excessive accumulation in humans results in hemochromatosis, a general tissue fibrosis (U.S. EPA, 1984). Bantu men who consumed large iron concentrations in food and home-brewed beer had liver hemosiderin deposits and a high incidence of cirrhosis (Elinder, 1990). Elinder (1990) also reported abdominal pain, vomiting, metabolic damage, and hepatitis in children accidentally ingesting greater than 500 mg (approximately 50 mg/kg).

Iron flocs can cover stream bottoms, resulting in toxicity to bottom-dwelling invertebrates, plants, or incubating fish eggs (U.S. EPA, 1976). The formation of solid bottom iron deposits is especially detrimental to trout and salmon spawning activities. Furthermore, these flocs can accumulate in gills, resulting in asphyxiation.

Lethal aqueous iron concentrations include 0.32 mg/L in mayflies, stoneflies, and caddisflies (Warnick and Bell, 9169) and 1 to 2 mg/L in pike and trout (Doudoroff and Katz, 1953). Ellis (1937) noted that healthy fish populations predominated in water bodies in which the iron concentration was less than 10 mg/L. Based primarily on field observations, the U.S. EPA (1976) determined a freshwater criterion of 1 mg/L. Smith and Sykora (1976) concluded that 0.97 to 1.27 mg/L iron was the maximum concentration for successful hatching, survival, and growth of coho salmon avelines. Andersson and Nyberg (1984) primarily attributed brown trout deaths to iron-related asphyxiation at neutral pH. The iron concentrations did not exceed 1.2 mg/L. In other freshwater experiments at lower pH, however, trout survived fluctuating iron concentrations as high as 52 mg/L, possibly because the iron was bound in non-toxic organic complexes (Andersson and Nyberg, 1984). More recently, investigators (Grobler *et. al.*, 1989; Grobler-van Heerden *et. al.*, 1991) have observed that iron concentrations as high as 52 mg/L, possibly because the iron was bound in non-toxic organic complexes (Andersson and Nyberg, 1984). More recently, investigators (Grobler *et. al.*, 1989; Grobler-van Heerden *et. al.*, 1991) have observed that iron concentrations of as high as 88 mg/L, which increase oxygen consumption in the freshwater fish *Tilapia sparrmanii*, are nevertheless rapidly cleared from the blood after four weeks of exposure.

4.3.4 LEAD

Background

Lead (Pb) is a soft, malleable, ductile, bluish-white, dense metallic element, extracted chiefly from galena (Morris, 1985). Lead and its compounds can be detected in all parts of the environment, including as plants, animals, air, drinking water, rivers, oceans, dust, and soil (USPHS, 1988). It belongs to Group 4a in the periodic table of elements (Considine, 1976). Lead has a wide range of uses, primarily in the manufacture of storage batteries. Other uses include its use in the production of ammunition, meal products, and various chemicals, including gasoline additives. Lead is not very abundant in the earth's crust, where its concentration is around 10 ppm (Green, 1959; Taylor, 1964; Wedepohl, 1969-1978). In urban areas and in sties near smelters, as much as 130,000 g/g has been measured in the upper 2 to 5 centimeters of soil. Samples of surface water, tap water, and groundwater have reported lead concentrations between 5 and 30 g/L, 7 and 11 g/L, and 1 and 100 g/L, respectively (USEPA, 1986a).

General Fate and Transport Properties

Lead is slightly mobile in normal surface weathering conditions (pH 5.0 to 8.0) and immobile in organic-rich reducing environments (Perel'man, 1967). the relatively low mobility of lead is attributed to the element's tendency to adsorb to manganese-iron oxides and insoluble organic matter. Lead exists in three oxidation states: 0, +2, and +4. the divalent form of lead, Pb^{+2}, is the stable ionic species of lead under natural environments. metallic lead in the presence of dry air is

unchanged (Kirk-Othmer, 1967). In the presence of moisture, an oxide film forms on lead, which, with carbon dioxide, forms a white carbonate. The oxidized solid, PbO_2, is stable only under highly oxidizing conditions. Under reducing conditions in the presence of sulfur, lead combines to form lead sulfate.

Sorption processes appear to exert a dominant effect on the distribution of lead in the environment. Several investigators have reported that in aquatic and estuarine systems, lead is removed to the bed sediments in close proximity to its source, apparently because of sorption onto the sediments (Helz *et. al.*, 1975; Valiela *et. al.*, 1974). Different sorption mechanisms have been invoked by a various investigators, and the relative importance of these mechanisms varies widely with such parameters as geologic setting, pH, Eh, available of ligands, dissolved and particulate iron concentration, salinity, composition of suspended and bed sediments, and initial lead concentration. Pita and Hyne (1975) studied the depositional environment of lead in reservoir sediments and found that almost all of the lead in the sediments was in the fraction containing clay with specific gravity between 2.0 and 2.9. The adsorption of lead to soils and oxides was studied by Huang *et. al.*, (1977). The date indicate that adsorption is highly pH-dependent, but above pH 7.0; essentially all of the lead is in the solid phase. It should be noted that at low pH, lead is negatively sorbed (repelled from the adsorbent surface).

Bioaccumulation of lead has been demonstrated for a variety of organisms, including plants (Patrick and Loutit, 1976). However, the amount of lead accumulated by aquatic organisms has been demonstrated to be related to the species of lead available for uptake, which in turn is related to environmental conditions such as water pH (USEPA, 1985; Merlini and Pozzi, 1977a; b). Lead accumulation varies in different organisms; for example, oysters and mussels are capable of accumulating high levels of lead, whereas lead does not appear to bioaccumulate significantly in the edible tissues of most fish (HSDB, 1987a; Callahan *et. al.*, 1979). Microcosm studies indicate that lead is not biomagnified through food chains (Lu *et. al.*, 1975; Patrick and Loutit, 1976). Bioavailability of lead in soils to plants is limited, but is increased by reduced soil pH, reduced content of organic matter, reduced iron oxide and phosphorus content, and increased amount of lead in soils (NRCC, 1973; Boggers, 1977).

General Toxicity Characteristics

The oral absorption of lead in experimental animals is apparently saturable (Aungst *et. al.*, 1981) and age-dependent, with younger rodents capable of absorbing more than adults (Forbes and Reina, 1972; Kostial *et. al.*, 1978). Aungst *et. al.*, (1981) found that the extent of absorption was approximately 42 percent and 2 percent, respectively, after the adminsitration of 1 and 100 mg Pb/kg, as lead acetate. Tissue distribution is initially in the liver, lungs, and kidneys (Aungst *et. al.*, 1981; Kozlowski and Wojcik, 1987), followed by relocation and deposition in the bone. Lead affects virtually every system in the body by its ability to bind to subcellular structures, particularly the mitochondria, and to alter normal physiological functions through a variety of mechanisms (USEPA, 1986a). these mechanisms include uncoupled energy metabolism, inhibition of intercellular calcium turnover, interference with the active transport of essential ions, and the inhibition of enzyme activity. The hematopoietic system, reproductive endpoints, and developing nervous system are particularly susceptible to the adverse consequences of these actions.

Lead inhibits the activities of delta-aminoleuvinilic acid (ALAD), ferro-chelatase, and coproporphyrinogen oxidase, enzymes involved in the formation of heme and, ultimately, red blood cells (USPHS, 1988). The net result of this enzyme inactivation is inadequate oxygenation of the cells and, possibly, anemia. The lowest exposure level in a long-term experimental study that has no associated health effects on the exposed receptor associated with hematological aberrations varies with species, form of lead administered, and endpoint. For example, Krasovskii *et. al.*, (1979) reported impaired heme synthesis in rats administered 0.005 mg Pb/kg/day, as lead acetate in drinking water, but Walsh and Ryden (1984) found that the lowest exposure level associated with an effect that has adverse health implications for decreases in hematocrit was 318 mg Pb/kg/day when lead was administered in the diet. Dogs administered 17 mg dietary Pb/kg/day for 46 weeks showed no impairments on hematopoiesis after severe hemorrhagic shock (Maxfield *et. al.*, 1972). Dietary dosing of hawks with 4.3 mg Pb/kg/day for 75 weeks resulted in impairments on several hematological parameters, including decreased hematocrit and hemoglobin levels and increased porphyrin (the precursor of the heme protein) (Redig *et. al.*, 1991) concentrations.

Reproductive impairments include multiple effects on both male and female reproductive systems. Leydig cell dystophy and irregular estrus have been reported at 0.005 and 0.014 mg Pb/kg/day, respectively (Krasovskii *et. al.*, 1979; Hilderbrand *et. al.*, 1973). The relevance of these values, which wee converted from drinking water concentrations, to the uptake of lead from solid matrices is difficult to assess. Al-Hakkak *et. al.*, (1988) determined reproductive impairments, but not complete sterility, in male mice exposed to 3.2 mg dietary Pb/kg/day. Prenatal lead also has severe effects on the neurological development of offspring, resulting in learning impairment,s distractibility, hyperactivity, peripheral neuropathies, and abnormal social behavior (USEPA, 1986a; Eisler, 1988b). Although the basis of the current "non-threshold" human risk assessment is neurological toxicity in exposed children, the significant differences between the human and subprimate nervous systems makes extrapolation of this concept untenable. pre-weanling rodents have shown numerous neurobehavioral deficits near or below lead concentrations of 1 mg/kg/day (USEPA, 1986a; USPHS, 1988). the relevance of many of these findings is questionable because (a) most of the studies involved lead that was dissolved in drinking water, and (b) study investigators did not usually address the possibility of reversal of behavioral deficit. In contrast, lambs exposed prenatally to 2.3 mg dietary Pb/kg/day showed no learning deficits when tested repeatedly on several behavioral tasks (Carson, 1976; Carson *et. al.*, 1974). A dose equivalent of 4.5 mg Pb/kg/day was the lowest level associated with an observable effect on learning new tasks.

4.3.5 MERCURY

Background

Mercury (Hg) is a silvery-white, poisonous metallic element that is a liquid at room temperature (Morris, 1985). Mercury that is released into the environment will remain there indefinitely. It belongs to Group 2b in the periodic table of elements (Considine, 1976). It is used in pure form in thermometers, barometers, vapor lamps, and batteries, and in the preparation of chemical pesticides.

Mercury is almost undetectable in the earth's crust, where its concentration is about 0.02 ppm. Concentrations of mercury in surface soils range from 20 to 625 g/g (Andersson, 1979), with the highest concentrations generally found in the surface layers and in urban areas. Unpolluted marine waters, rainwater, fresh snow, and estuarine waters have concentrations of about 0.005 to 0.006 g/liter (Matsunaga *et. al.*, 1979), <0.2 g/L, $\approx$ 0.2 g/L (USEPA, 1980c; 1984d), and 0.002 to 0.45 g/L (Fitzgerald, 1979), respectively.

General Fate and Transport Properties

Mercury is moderately mobile in normal surface watering conditions (pH 5.0 to 8.0) and near an oxidizing sulfide orebody (pH $<$ 4.0). It is immobile in organic-rich, reducing environments (Perel'man, 1967).

In the aquatic environment, mercury exists in three oxidation states: as the native element itself, in the +1 (mercurous) state, and in the +2 (mercuric) state. The nature of species present in solution depends on the oxidation/reduction (redox) potential and pH of the environment. In a moderately oxidizing environment above pH 5.0, the predominant mercury species will be elemental mercury. Under reducing conditions, which occur in many sediments, mercury is precipitated as sulfide and cinnabar, which have low aqueous solubility (Callahan *et. al.*, 1979).

Mercury shows a tenacious affinity for surfaces of many types. In natural samples, a major portion of total mercury has been associated with particulates (Hinkle and Learned, 1969). Studies of the addition of mercury to a variety of natural samples have led to the same conclusion. In a laboratory study, Ramamoorty and Rust (1976) studied mercury sorption onto the bed sediments of the Ottawa River. By varying Hg^{2+} concentrations and pH at a constant temperature, they found that sorption rates were highest in organic-rich sands, and that apparently, sediment binding capacity was most closely related to organic content. They found that mercury sorption was affected very little by pH, and desorption rates were low (e.g., <1 percent mercury was leached from the sediment after 70 hours agitation in distilled water).

Photolysis seems to be important in the chemical speciation of mercury in the atmosphere and perhaps in the aquatic environment. A photolytic breakdown of dimethyl mercury to methyl mercury in the atmosphere has been suggested (Williston, 1968; Holm and Cox, 1974; Johnson and Bramen, 1974), as well as photodecomposition of phenyl mercury compounds in both the atmosphere and natural waters (Zepp *et. al.*, 1973). However, due to the limited data on this subject, it is not clear what impact this process might have on the overall fate of mercury in the aquatic environment.

With its uniquely high vapor pressure relative to other metals, metallic mercury can be released from the aquatic environment to the atmosphere as several different gaseous compounds. This factor also makes volatilization important for the aquatic fate of mercury.

Biotransformation is one of the most important processes in the environmental fate of mercury. Given favorable conditions, involving inorganic mercury concentration and microbial population size, virtually any mercury compound entering an aqueous system can be converted to methylmercury, which is soluble and mobile (USPHS, 1989a). If methylmercury levels become excessive, demethylation to volatile elemental mercury can occur through other microbially mediated processes (Fagerstrom and Jernelov, 1972; USEPA, 1984d; NAS, 1977b). Mobilization of sorbed mercury from particulates also can occur through biological reduction to elemental mercury and bioconversion

to volatile organic forms (Andersson, 1979; USEPA, 1984). The behavior and fate of mercury compounds in soils may be similar to those described for aquatic environments. Depending on the pH, slat content, and composition of the soil, mercuric mercury usually forms various complexes with chloride and hydroxide ions in the soil (USPHS, 1989a).

In addition to the above processes, bioaccumulation is also an important process in the environmental fate of mercury. Mercury is acquired by organisms through direct contact in air and/or water and trough the food chain (Phillips and Russo, 1978). Methylated mercury apparently is the form of mercury most readily accumulated (Kramer and Neidhart, 1975). Biomagnification of methylmercury has been documented for both aquatic and terrestrial food chains (Eisler, 1987). Concentrations of methylmercury in carnivorous fish at the tops of freshwater and salt water food chains have been reported to be biomagnified on the order of 10,000 to 100,000 times those concentrations found in ambient waters (Callahan *et. al.*, 1979; USEPA, 1980c; 1984d). No specific data was located in the above referenced documents for the bioaccumulation of mercury from soils to plants and higher order animals.

General Toxicity Characteristics

The extent of oral absorption of inorganic mercury ranged from 38 percent in suckling mice to 1 percent in adult mice (Clarkson, 1971). Elemental mercury is highly lipophilic and distributes to most body tissues, especially the kidney (Hursh *et. al.*, 1976). Fetal accumulation is also common (Dencker *et. al.*, 1983), and the developing organism of all species tested is the most susceptible to mercury toxicity (Eisler, 1987). Organomercury compounds are generally more toxic than inorganics.

Acute signs in mule deer exposed to a high single does of methylmercury includes bloody diarrhea, piloerection, and loss of appetite (Hudson *et. al.*, 1984). The oral LD50 was 17.9 mg/kg. Acutely dosed birds showed muscular incoordination, slowness, hypoactivity, and eyelid drooping (Eisler, 1987). Neurological signs are less common after exposure to inorganic mercury salts or metallic mercury, which are ore prevalent in non-agricultural contaminated soils and surface waters (Eisler, 1987; USPHS, 1989a). The toxicological data base for inorganic mercury is incomplete and somewhat contradictory.

4.3.6 POLYCHLORINATED BIPHENYLS (PCBs)

Background

The information provided in this section was obtained from the following sources: IRIS (1992), Kimbrough (1987), and Shields *et. al.*, (1992). PCBs are a family of compounds which vary widely in physical, chemical, and biological properties according to the degree and position of chlorination.

General Toxicity Characteristics

PCBs can be absorbed through the skin, lungs, and gastrointestinal tract. They are transported by the blood stream to the liver and muscle, then subsequently redistributed to adipose tissue. PCBs are metabolized in the liver and the rate of formation of metabolic products varies depending on the PCB isomer and animal species. Dogs and rodents metabolize PCBs relatively quickly in comparison to primate species. PCBs produce relatively little acute toxicity. In nonprimate animals, subacute and

chronic exposures lead to a variety of effects that are recognized as a syndrome. These symptoms include progressive weight loss, chloracne, hair loss, swelling of the skin and around the eyes, involution of immune tissues, increased liver size, bone marrow depression, and reproductive dysfunction. However, in humans and other primates, dermatologic effects (particularly chloracne) are the only consistent findings of clinical relevance. Other effects that have been noted in sporadic clinical cases include alterations in blood levels of liver-associated enzymes, increased liver size, and elevated serum cholesterol, but none of these symptoms were linked to a functional deficit. Neurologic disturbances (headache, fatigue, and nervousness) and pulmonary function abnormalities have also be reported in individuals exposed to PCBs; however, these observations have not been corroborated in numerous subsequent studies.

Many studies have been published regarding the carcinogenic potential of PCBs. There is much interspecies variation in the tumorigenic response to PCBs, but in general, the target organ for PCB tumorigenicity in experimental animals is the liver. It should be noted, however, that in spite of the malignant morphologic appearance of the induced tumors, these lesions do not otherwise demonstrate malignant behavior. For example, animals with these tumors live longer than controls, and metastases do not seem to occur. Animal studies have also demonstrated that PCBs can act as modifying agents following exposure to known carcinogens, either promoting or inhibiting tumor growth and metastases. Epidemiologic studies of humans with long-term continuous exposure to high levels of PCBs fail to demonstrate a significant correlation between PCBs and cancer incidence. Similarly, studies of persons in Japan and Taiwan exposed to large amounts of PCBs, polychlorinated dibenzofurans (PCDFs), and other chlorinated organics via accidental contamination of rice oil, concluded that the resulting adverse health effects (which included neoplasms of the liver) were caused by exposure to the PCDFs, and not the PCBs in the oil (IRIS 1992). Moreover, most mutagenicity and genotoxicity studies of PCBs using human cells have been negative. On the basis of these studies, the U.S. EPA has classified PCBs as B2 carcinogens (i.e., probable human carcinogens).

4.3.7 DDD

Background

DDD (dichlorodiphenyldichloroethane) was used as an agricultural pesticide. A purified, refined form of the o,p'-DDD isomer has medical applications; its generic name is mitotane.

General Fate and Transport Properties

Bioaccumulation and sorption to sediments and biota are the major fate processes for DDD in the environment; however, volatilization is also an important process in aquatic systems.

In aquatic environments, DDD is estimated to have a direct photolysis half-life greater than 150 years (Callahan *et. al.*, 1979). No sources of information consulted provided information regarding rates of indirect photolysis or direct atmospheric photolysis of DDD. Volatilization of DDD from aquatic systems occurs with an estimated volatilization half-life ranging from 1 day to less than 1 month (Callahan *et. al.*, 1979). DDD has a Henry's Law Constant of 3.1E-05 (atm-m3/mole at 20°C), indicating a medium tendency to volatilize from water.

Sorption to soil in terrestrial environments and to sediment in aquatic environments is an important process for DDD. Relatively insoluble and hydrophobic compounds, such as DDD, tend to have high soil adsorption coefficients and exhibit affinities for material is soil and sediment (USPHS, 1988a; Callahan *et. al.*, 1979). The organic carbon partition coefficient (K_{oc}) for DDD is 2.4E-05 indicating a high affinity to bind to sediment and soil. Experiments indicate that DDD is less stable than DDT (dichloro-diphenyl-trichloroethane) and DDE (dichlorodiphenyldichloroethylene) (Metcalf *et. al.*, 1971). Biodegradation of DDD results in the eventual end produce bis-(p-chlorophenyl)-acetate acid (DDA), which is excreted by higher animals (NRC, 1977). Microbial systems further degrade DDA into DDCO. DDD is known to be degraded in sewage sludge under anaerobic conditions (Macalady *et. al.*, 1986). Bioaccumulation of DDD is an important fate process. DDD has a high octanol-water partition coefficient of 3.63E-05 and is hydrophobic. Compounds exhibiting these characteristics tend to show significant bioaccumulation in fatty tissue. Bioconcentration factors for DDD range between 10^3 and 10^5. DDD concentrations exceeding 2,000 parts per million have been found in fatty tissue in aquatic birds and fish, resulting from applications of DDD at maximum concentrations of 20 parts per billion (Hunt and Bischoff, 1960). Biomagnification of DDD up the food chain is also of potential concern.

General Toxicity Characteristics

DDD is one of the two products of DDT reductive dechlorination (USPHS, 1989d) that has been actively studied because of its carcinogenic and mutagenic potential. Few investigators have studied the mammalian systemic toxicity of this metabolite. Researchers at the National Cancer Institute have found no evidence of non-carcinogenic effects at oral doses of 107 mg/kg/day (rats) or 165 mg/kg/day (mice). By contrast, Gellert and Hendrichs (1975) observed delayed vaginal opening, changes in adrenal weights, and loss of corpora lutea in the offspring of rats treated with 28 mg/kg/day DDD from gestation days 15 through 19. Because the administration route in the latter study was oral gavage, the significant of the results is questionable. Subchronic exposure to 200 mg/kg/day DDD produced alkaline phosphatase elevations, but no other health effects in sheep (Thun *et. al.*, 1982).

DDT and its metabolites have been extensively studied for their adverse effects on avian reproduction. In mallards, Health *et. al.*, (1969) found that a dose equivalent of 0.5 mg/kg/day DDD was associated with a decreased incidence of normal hatchlings and hatchling survival. Egg shell thickness was not effected by treatment.

4.3.8 PAHs

Eight of the contaminants of concern may be grouped collectively as poly-aromatic hydrocarbons (PAH). Because of the similarities among their chemical properties they are discussed together. Few aquatic or terrestrial data related to bioaccumulation of specific PAH compounds are available. In general, PAH bioaccumulation is a rapid, short-term process. Bioconcentration is greater for the higher molecular weight PAHs, some of which are probable human carcinogens (USEPA, 1986), than for the lower molecular weight compounds. Roubal *et. al.*, (1977) indicated that organics accumulate in the order anthracene > naphthalene > benzene, which correlates with the number of phenyl rings and the octanol-water partition coefficient.

Fish rapidly metabolize PAHs (Eisler, 1987b), so that endogenous stores are typically low. In addition, the carcinogenic higher molecular weight PAHs do not seem to accumulate in pelagic fish (West *et. al.*, 1984). Sediment-bound PAHs do bioaccumulate in benthics, and a growing body of mostly circumstantial evidence indicates that cancer in bottom dwelling fish may be linked to sediments that are heavily contaminated with PAHs (Eisler, 1987).

4.4 RISK CHARACTERIZATIONS

Observation of the physical characteristics and chemical contaminants of the Ramco Steel site indicate that potentially the largest risk may be from iron and possibly other metals in the sediments and surface water. The noteworthy absence of fish and common benthic invertebrates suggests that the iron floc and aqueous iron concentrations may potentially be rendering the sediments uninhabitable to any strictly aquatic organisms.

Table 3-1 is a summary of water and sediment ARARs for the Ramco site. The environmental concentrations of several metals and organics were at or slightly above the referenced levels. There were no acute or chronic exceedances for surface water standards.

Sediment criteria, as presented in the NYSDEC guidance documentation, were slightly exceeded or at the limit for arsenic, chromium, lead, mercury, PCBs, DDD, and PAHs. The absence of strictly aquatic organisms (i.e., fish, benthic invertebrates) within the pond significantly affects the potential for contaminant transport and functionally limits the risk. The contaminant levels detected within the pond were, in each case, below the levels representing a risk from acute exposure. The biochemical mechanisms that affect risk associated with chronic exposure to contaminants (i.e., biomagnification, bioaccumulation) require the primary producers (i.e., phytoplankton) and consumers (i.e., benthic invertebrates) to mobilize the contaminants at the lowest trophic levels. Due to the apparent lack of these organisms within the pond and sediments, a significant mechanism for mobilizing contamination is not present. As such, the risk associated with the contaminants is further minimized by the absence of the typical mechanism for biomagnification or bioaccumulation.

The operational history of the facility accounts for the levels of metals including the exceptionally high iron concentrations within the sediments.

Because research on the health effects of iron has concentrated on the impact of iron deficiency rather than the adverse consequences of iron overload, health-based toxicity values are not available. The terrestrial animal species that depend on surface water from the Ramco site may significantly increase their body burden of iron. Nevertheless, because of inconsistent findings of iron toxicity even at pharmacological concentrations, the intake of excessive levels of surface water iron should not result in adverse ecological impacts in these species.

TABLE 4-1

ECOLOGICAL EXPOSURE SCENARIOS FOR THE RAMCO STEEL SITE

Habitat	Location	Target Species	Routes of Exposure
Aquatic	Pond	Plants	Uptake from sediments
		Invertebrates	Uptake from sediments
		Herpetofauna	Uptake from sediments, ingestion of invertebrates
		Mallard	Consumption of aquatic plants, ingestion of invertebrates, ingestion of sediments
		Muskrat	Ingestion of aquatic plants uptake from sediment
		American bittern	Ingestion of prey species

5.0 SUMMARY

5.1 HABITAT EVALUATION

The habitat evaluation of the Ramco Steel site included an identification and characterization of significant habitats, wetlands, and other special antral resources within a 2 mile radius of the site. The evaluation was conducted by contacting numerous agencies and organizations, reviewing available mapping, aerial photography and literature, and by performing field sampling and verification.

Eight Natural Heritage cover types were identified during this evaluation. All of these consisted of habitats illustrating the cultural influence in an industrial urban setting.

Important resources in the project vicinity include the presence of NYS-regulated wetlands, and four areas designated as "Significant Habitat" by NYSDEC. Each of the habitats designated as significant is greater than ½ mi. from the Ramco site.

5.2 SUMMARY OF ECOLOGICAL RISK ASSESSMENT

The focus of the ecological risk analysis was the on-site pond. The ecological risk analysis identified several target species including plants, invertebrates, herpetofauna, mallard, muskrat, and American bittern. Based on the results of the habitat evaluation and ecological risk assessment, the following conclusions are forwarded in support of the overall RI.

The important contaminant exposure route associated with the Ramco site is direct uptake of pond sediments as well as consumption of plants and prey species that may consume or be in direct contact with pond sediments. Due to the absence of fish and benthic invertebrates in the pond and pond sediments, the biological mechanisms for mobilizing contaminants from the pond sediments are absent. No potential aquatic toxicity is expected. Estimated surface water concentrations of the contaminants of concern are below levels of concern. The concentrations of contaminants of concern in the sediments is generally near or slightly above the level of concern.

6.0 AGENCY AND ORGANIZATION CONTACTS

A number of agencies and organizations were contacted as part of the ecological site characterization. A listing of these agencies contacted are presented in Table 6-1.

TABLE 6-1

LIST OF AGENCIES/ORGANIZATIONS CONTACTED

AGENCY/ORGANIZATION	REPRESENTATIVE
NY Department of Environmental Conservation	
Significant Habitat Unit	Burrell Buffington
Division of Regulatory Affairs	Region 9
Fish and Wildlife	Region 9
U.S. Fish and Wildlife Service	Tom McCartney

+ Other references as presented in Section 7.0.

7.0 REFERENCES

Aisen, P. *et al.* 1990. *Iron Toxicosis*, in G.W. Richleu *et al*, eds. *International Review of Experimental Pathology*, Vol. 31, Transition Metal Toxicity, San Diego, California, Academic Press, Incorporated.

Al-Hakkak, Z.S. *et al.* 1988. *Effects of Ingestion of Lead Monoxide Alloy on Male Mouse Reproduction*, Archives of Toxicology, 62, pp. 97-100.

Andersson, A. 1979. *Mercury in soils*, in J.O. Niriagu, ed., The Biogeochemistry of Mercury in the Environment, pp. 79-112, Elsevier/North Holland Biomedical Press, New York. (As cited in USPHS, 1989a.)

Aungst, B.J., J.A. Dolce, and H.L. Fung. 1981. *The Effect of Dose on the Disposition of Lead in Rats After Intravenous and Oral Administration*, Toxicol. Appl. Pharmacol., Vol. 61, pp. 48-57.

Beyer, W.N. and E.J. Cromartie. 1987. *A Survey of Pb, Cu, Zn, Cd, Cr, As, and Se in Earthworms and Soil from Diverse Sites*, Environ. Monit. Assess., Vol. 8, pp. 27-36. (as cited in USPHS, 1991f.)

Boggers, W.R. (ed). 1977. *Lead in the Environment*, National Science Foundation Report No. NSF/RA-770214.272 pp. Available from U.S. Government Printing Office, Washington, DC 20402. (As cited in Eisler, 1988b.)

Burt, W.H. and Grossenheider, R.P., 1976. *A Field Guide to the Mammals*. The Peterson Field Guide Series, Houghton Mifflin Co., Boston.

Byron, W.R., G.W. Bierbower, J.B. Brouwer, et al. 1967. *Pathological Changes in Rats and Dogs From Two-Year Feeding of Sodium Arsenite or Sodium Arsenate*, Toxicol Appl. Pharmacol. 10, pp. 132-147.

Callahan, M.A. et al. 1979. *Water-Related Environmental Fate of 129 Priority Pollutants*, Vols. I and II, EPA-440/4-79-029a and -029b, United States Environmental Protection Agency, Office of Water Planning and Standards, Washington, D.C.

Carey, E.E. 1982. *Chromium in Air, Soil and Natural Waters*, in S. Langer, ed., Topics in Environmental Health 5 (Biol. Environ. Aspects Chromium), pp. 49-64, Elsevier, New York.

Carson, T.L. 1976. *Auditory and Visual Discrimination Learning in Sheep Prenatally and Postnatally Exposed to Lead*, Ph.D. thesis, Iowa State University, Ames.

Carson, T.L., G. Van Gelder, G. Karas, and W.B. Buck. 1974. *Slowed Learning in Lambs Prenatally Exposed to Lead*, Arch. Environ. Health, 29, 154, 1974.

Chang, L. and H.A. Hartmann. 1972. *Blood Brain Barrier Dysfunction in Experimental Mercury Intoxication*, Acta Neuropathol (Berl) 21, pp. 179-184.

Chapman, W.H. *et al.* 1968. *Concentration Factors of Chemical Elements in Edible Aquatic Organisms*, OCRL-50564, p. 46, Lawrence Radiation Laboratory, Livermore, California. (As cited in Callahan *et al.*, 1979.)

Clarkson, T.W. 1971. *Epidemiological and Experimental Aspects of Lead and Mercury Contamination*, Food Cosmet. Toxicol., Vol. 9, pp. 229-243.

Conant, R. 1975. *A Field Guide to Reptiles and Amphibians of Eastern and Central North America.* The Peterson Field Guide Series, Houghton Mifflin Co., Boston.

Considine, D.M. ed. 1976. *Van Nostrand's Scientific Encyclopedia*, 5th Ed., Van Nostrand/Reinhold Company, New York.

Dencker, L. and R.B. Danielsson, et al. 1983. *Deposition of Metals in the Embryo and Fetus*, in: T.W. Clarkson, G.G. Nordberg, and P.R. Sager, ed. *Reproductive and Developmental Toxicity of Metals*, New York, NY, Plenum Press, pp. 607-631.

Donaldson, R.M. and R.F. Barreras. 1966. *Intestinal Absorption of Trace Quantities of Chromium*, J. Lab. Clin. Mejd., Vol. 68, pp. 484-493.

Eisler, R. 1988a. *Arsenic Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*, Report No. 12, Biological Report 85(1.12), United State Fish and Wildlife Service, Laurel, Maryland.

Eisler R. 1988b. *Mercury Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*, Report No. 14, Biological Report 85(1.14), United State Fish and Wildlife Service, Laurel, Maryland.

Eisler, R. 1987. *Mercury Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*, Report No. 10, Biological Report 85(1.10), United State Fish and Wildlife Service, Laurel, Maryland.

Ellenhorn, M.J. and D.G. Barceloux. 1988. *Medical Toxicology: Diagnosis and Treatment of Human Poisoning*, New York. Elsevier, p. 1025.

Fagerstrom, T. and A. Jernelov. 1972. *Some Aspects of the Quantitative Ecology of Mercury*, Water Res., Vol. 6, pp. 1193-1202. (As cited in Callahan *et al.*, 1979.)

Ferguson, J.F. and J. Gavis. 1972. *A Review of the Arsenic Cycle in Natural Waters*, Water Resources Vol. 6, pp. 1259-1274. (As cited in Callahan *et al.* 1979.)

Fitzgerald, W.F. 1979. *Distribution of Mercury in Natural Waters*, in J.O. Niriagu, ed., The Biogeochemistry of Mercury in the Environment, pp. 161-174, Elsevier/North Holland Biomedical Press, New York. (As cited in USPHS, 1989a.)

Forbes, G.B. and J.C. Reina. 1972. *Effect of Age on Gastrointestinal Absorption (Fe, Sr, Pb) in the Rat*, J. Nutr., Vol. 102, pp. 657-652.

Gellert, R. and W. Hendrichs. 1975. *Effects of DDT Homologs Administered to Female Rats During the Perinatal Period*, Biol. Neonate, Vol. 26, pp. 283-290.

Green, J. 1959. *Geochemical Table of the Elements for 1959*, Geol. Soc. Am. Bull., Vol. 70, pp. 1127-1184. (As cited in Rose *et al*, 1979.)

Gross, W.G. and V.G. Heller. 1946. *Chromates in Animal Nutrition*, J. Ind. Hyg. Toxicol., Vol. 28, pp. 52-56.

Haseltine, S.D., L. Sileo, D.J. Hoffman, and B.M. Mulhern. 1985. *Effects of Chromium on Reproduction and Growth of Black Ducks*, (Manuscript in preparation). (As cited in Eisler, 1985.)

Hazardous Substances Databank (HSDB). 1991b. *Computerized Record for Iron*, National Library of Medicine, National Toxicology Information Program, Bethesda, Maryland.

Hazardous Substances Databank (HSDB). 1987a. Online, National Library of Medicine, Report No. 231. (As cited in USPHS, 1988.)

Heath, R.G. *et al*. 1969. *Marked DDE Impairment of Mallard Reproduction in Controlled Studies*, Nature, Vol. 2242(10), pp. 47-48.

Helz, G.R. et al., 1975. *Behavior of Mn, Fe, Cu, Zn, Cd, and Pb Discharged from a Wastewater Treatment Plant into an Estuarine Environment*, Water Research, Vol. 9, pp. 631-636. (As cited in Callahan *et al*., 1979.)

Hem, J.D. 1960. *Restraints on Dissolved Ferrous Iron Imposed by Bicarbonate Redox Potential and pH*, United States Geological Survey Water Supply Paper 1459-B. (As cited in Hem, 1989.)

Henderson, R.F., A.H. Rebar, and J.A. Pickrell *et al*. 1979. *Early Damage Indicators in the Lung, III, Biochemical and Cytological Response of the Lung to Inhaled Metal Salts*, Toxicol. Appl. Pharmacol., Vol. 50, pp. 123-136.

Hilderbrand D.C. *et al*, 1973. *Effect of lead Acetate on Reproduction*, American Journal of Obstetrics and Gynecology, 115, pp. 1058-1065.

Hinkle, M.E. and R.E. Learned. 1969. *Determination of Mercury in Natural Waters by Collection on Silver Screens*, pp. 251-255, United States Geological Survey Professional Paper 650D, Washington, D.C. (As cited in Callahan *et al*., 1979.)

Holm, H.W. and M.F. Cox. 1974. *Mercury in Aquatic Systems: Methylation, Oxidation-Reduction, and Bioaccumulation*, EPA-600/3-74-021, p. 38, United States Environmental Protection Agency, Washington, D.C. (As cited in Callahan *et al*., 1979.)

Huang, C.P. et al. 1977. *Interfacial Reactions and the Fate of Heavy Metals in Soil-Water Systems*, Jour. Water Poll. Control Fed., Vol. 49(5), pp. 745-756.(As cited in Callahan et al., 1979.)

Hudson, R.H., R.K. Tucker, and M.A. Haegle. 1984. *Handbook of Toxicity and Pesticides to Wildlife*. United States Fish and Wildlife Service Resource, Publ. 153.90 pp.

Hunt, E.G. and A.I. Bischoff. 1960. *Inimical Effects on Wildlife of Periodic DDD Applications to Clear Lake*, California Fish and Game, Vol. 46 pp. 91-106. (As cited in Callahan *et al.*, 1979.)

Hursh, J.B., T.W. Clarkson, and M.G. Cherian *et al.* 1976. *Clearance of Mercury (Hg-197,Hg-203) Vapor Inhaled by Human Subjects*, Arch. Environ. Health, Vol. 31, pp. 302-309.

Integrated Risk Information System. October 1992. U.S. Environmental Protection Agency database.

Isensee, A.R. *et al.* 1973. *Distribution of Alkyl Arsenicals in Model Ecosystems*, Environ. Sci. Technol., Vol. 7(9), pp. 841-845. (As cited in Callahan et al., 1979.)

Ivankovic, S. and R. Preussman. 1975. *Absence of Toxic and Carcinogenic Effects After Administrations of High Doses of Chromic Oxide Pigment in Subacute and Long-Term Feeding Experiments in Rats*, Food Cosmet. Toxicol. 13 pp. 347-351.

Jackson, K.S. *et al.* 1978. T*he Nature of Metals-Sediment-Water Interactions in Freshwater Bodies, With Emphasis on the Role of Organic Matter*, Earth Science Reviews, Vol. 14, pp. 97-146. (As cited in Callahan, *et al.*, 1979.)

Johnson, D.L. and R.S. Bramen. 1974. *Distribution of Atmospheric Mercury Near Ground*, Environ. Sci. Technol., Vol. 8(12), pp. 1003-1009. (As cited in Callahan *et al.*, 1979.)

Kirk-Othmer. 1970. *Arsenic*, Encyclopedia of Chemical Technology, Vol. II, 2nd Ed., John Wiley & Sons, New York.

Kirk-Othmer. 1967. *Lead and Lead Compounds*, Encyclopedia of Chemical Technology, Vol. 12, John Wiley & Sons, New York.

Kostial, K., D. Kello, and S. Jugo. 1978. *Influence of Age on Metal Metabolism and Toxicity*, Environ. Health Perspect., Vol. 25, pp. 81-86.

Kourimsky, D.J. 1977. *The Illustrated Encyclopedia of Minerals and Rocks*, translated by B. Gissing, Octopus B.

Kozlowski, J. and A. Wojcik. 1987. *Accumulation and Elimination of Orally Administered Lead in Laboratory Mice: Experimental Studies and a Simple Mathematical Model*, Ekol. Pol., Vol. 35, pp. 355-371.

Kramer, H.J. and B. Neidhart. 1975. *The Behavior of Mercury in the System Water-Fish*, Bull. Environ. Contam. Toxicol., Vol. 14(6), pp. 699-704. (As cited in Callahan *et al.*, 1979.)

Krasovskii, G.N., L.Y. Vasukovich, and O.G. Chariev. 1979. *Experimental Study of Biological Effects of Lead and Aluminum Following Oral Administration*, Environ. Health Perspect., Vol. 30, pp. 47-51.

Lu, P.Y. et al. 1975. *Model Ecosystem Studies of Lead and Cadmium and of Urban Sewage Sludge Containing These Elements*, J. Environ. Qual., Vol. 4(4), pp. 505-509. (As cited in Callahan et al., 1979.)

Macalady, D.L. *et al.* 1986. *Abiotic Reduction Reactions of Anthropogenic Organic Chemicals in Anaerobic Systems: A Critical Review*, J. Contam. Hydrol., Vol. 1, pp. 1-28. (As cited in Arthur D. Little, Incorporated, 1987.)

Mason, B. and L.G. Berry, 1968. *Elements of Mineralogy*, W.H. Freeman and Company, San Francisco, California.

Matsunga *et al.* 1979. *Possible Errors Caused Prior to Measurement of Mercury in Natural Waters with Special Reference to Seawater*, Environ. Sci. Technol., Vol. 13, pp. 63-65. (As cited in USPHS, 1989.)

Maxfield, M.E. *et al.* 1972. *Effect of Lead on Blood Reguvination Following Acute Hemorrhage in Dogs*, American Industrial Hygiene Association Journal, Vol. 33, pp. 326-327.

Merlini, M. and A. Pozzi, 1977a. *Lead and Freshwater Fishes: Part 1 - Ionic Lead Accumulation*, Environ. Pollut., Vol. 12, pp. 168-172. (As cited in Callahan et al., 1979.)

Merlini, M. and A Pozzi, 1977b. *Lead and Freshwater Fishes: Part 2 - Ionic Lead Accumulation*, Environ. Pollut., Vol. 13, pp. 119-126. (As cited in Callahan *et al.*, 1979.)

Metcalf, R.L. *et al.* 1971. *Model Ecosystem for the Evaluation of Pesticide Biodegradability and Ecological Magnification*, Environ. Sci. Technol., Vol. 5, pp. 709-713. (As cited in Arthur D. Little, Incorporated, 1987).

Morris, W., ed., 1985. *The American Heritage Dictionary*, p. 57, 74, 115, 294, 691, 743, and 886, Houghton Mifflin Company, Boston.

National Academy of Sciences (NAS). 1977a. *Arsenic*, NAS, Washington D.C. pp. 332.

National Academy of Sciences (NAS). 1977b. *An assessment of Mercury in the Environment (Scientific and Technical Assessments of Environmental Pollutants)*, National Research Council, PB83-111625, Washington, D.C. (As cited in Callahan *et al.*, 1979.)

National Academy of Sciences (NAS). 1974. *Chromium*, pp. 86-89, United States Government Printing Office, Washington, D.C. (As cited in Callahan *et al.*, 1979.)

National Institute for Occupational Safety and Health (NIOSH). 1990. *Pocket Guide to Chemical Hazards*, U.S. Department of Health and Human Services. Publication No. 90-117.

National Resource Council (NRC). 1977. *Drinking Water and Health*, Vol. 3, National Academy Press, Washington, D.C. (As cited in Arthur D. Little, Incorporated, 1987.)

New York State Department of Enviornmenal Conservation, 1991. *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites*. Division of Fish and Wildlife.

New York State Department of Enviornmenal Conservation, 1991. *Draft Cleanup Policy and Guidelines, Volumes I and II*. Cleanup Standards Taskforce, October 1991.

New York State Department of Environmental Conservation. 1990. *Ecological Communities of New York State*. New York Natural Heritage Program, NYSDEC.

Patrick, F.M. and M. Loutit. 1976. *Passage of Metals in Effluents, Through Bacteria to Higher Organisms*, Water Res., Vol. 10, pp. 333-335. (As cited in Callahan *et al.*, 1979.)

Perel'man, A.I. 1967. *Geochemistry of Epigenesis*, Plenum Press, New York. (As cited in Rose *et al.*, 1979.)

Pershagen, G. and M. Vahter. 1979. *Arsenic: A Toxicological and Epidemiological Appraisal*, Naturvardsverket Rapp. SNV PM 1128, Liber Tryck, Stockholm. 265 pp.

Peterson, R.T., 1980. *A Field Guide to the Birds*. The Peterson Field Guide Series, Houghton Miffli, Co., Boston.

Phillips, G.R. and R.C. Russo. 1978. *Metal Bioaccumulation in Fishes and Aquatic Invertebrates: A Literature Review*, EPA-600/3-78-103, United States Environmental Protection Agency, Duluth, Minnesota. (as cited in Callahan *et al.*, 1979.)

Pike, R.L. and M.L. Brown, 1975. *Nutrition: An Integrated Approach*, 2nd Ed., John Wiley & Sons, New York.

Pita, F.W. and N.J. Hyne. 1975. *The Depositional Environment of Zinc, Lead, and Cadmium in Reservoir Sediments*, Water Res., Vol. 9, pp. 701-706. (As cited in Callahan *et al.*, 1979.)

Ramamoorthy, S. and B.R. Rust. 1976. *Mercury Sorption and Desorption Characteristics of Some Ottawa River Sediments*, Can. J. Earth Sci., Vol. 13, pp. 530-536. (As cited in Callahan *et al.*, 1979.)

Redig, P.T. *et al.* 1991. *Effects of Chronic Exposure to Sublethal Concentrations of Lead Acetate on Hemosynthesis and Immune Function in Red-Tailed Hawks*, Archives of Environmental Contamination and Toxicology, Vol 21, pp. 72-77.

Rose, A.W. *et al.* 1979. *Geochemistry in Mineral Exploration*, Academic Press, London, England.

Samad, M.A. and A. Chowdhury. 1984. *Clinical Cases of Arsenic Poisoning in Cattle*, Indian Journal of Veterinary Medicine, Vol. 4, pp. 107-108 (As cited in Eisler, 1988a.)

Sayato, Y., K. Nakamuro, and S. Matsui et al. 1980. *Metabolic Fate of Chromium Compounds I. Comparative Behavior of Chromium in Rat Administered with* $NA_2{}^{51}CrO_4$ *and* $^{51}CrCl_3$, J. Pharm. Dyn., Vol. 3 pp. 17-23.

Schroeder, D.C. and G.F. Lee. 1975. *Potential Transformations of Chromium in Natural Waters*, Water Air Soil Pollut., Vol. 4, pp. 355-365. (As cited in Callahan *et al.*, 1979.)

Shields, P.G., J.A. Whysner and K.H. Chase. 1992, *Polychlorinated Biphenyls and Other Polyhalogenated Aromatic Hydrocarbons*, Hazardous Materials Toxicology, Clinical Principles of Environmental Health, (J.B. Sullivan and G.R. Krieger, Eds.) Baltimore: Williams and Wilkins, pp. 748-755.

Smyth, H.F., C.P. Carpenter, and C.S. Weil *et al.* 1969. *Range Finding Toxicity Data: List VII*, Am. Ind. Hyg. Assoc., Vol. 30, pp. 470-476.

Steven, J.D., L.J. Davies, E.K. Stanley *et al.* 1976. National Research Council of Canada Associate Committee on Scientific Criteria for Environmental Quality: Effects of Chromium in the Canadian Environment, Publ. No. 15017.

Tadokoru, T. *et al.* 1979. *Teratogenicity Studies of Slow-Iron in Mice and Rats*, Oyo Yakuri, Vol. 17, pg. 483. CA 91: 134052f. (Cited in USEPA,1981.)

Taylor, S.R. 1964. *Abundance of Chemical Elements in the Continental Crust: A New Table*, Geochim. Cosmochim. Acta, Vol. 28, pp. 1273-1286. (As cited in Rose *et al.*,1979.)

Thun, R. *et al.*1982. *The Effects of o,p'-DDD on the Adrenal Cortex in Sheep*, Experiential, Vol. 38(12), pp. 1494-1496.

Trivedi, B.D.K. Saxena, and R.C. Murthy *et al.* 1989. *Embryotoxicity and Fetotoxicity of Orally Administered Hexavalent Chromium in Mice*, Reproductive Toxicology, Vol 3, pp. 275-278.

United States Environmental Protection Agency (USEPA). 1991. *Criteria for Choosing Indicator Species for Ecological Risk Assessments at Superfund Sites*. EPA 101/F-90/051.

United States Environmental Protection Agency (USEPA). 1986a. *Air Quality Criteria for Lead*, June 1986, and Addendum, September 1986, EPA-600/8-83-018F, Office of Research and Development, Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Research Triangle Park, North Carolina. (As cited in USPHS, 1988.)

United States Environmental Protection Agency (USEPA). 1985. *Drinking Water Criteria Document on Cadmium*, Office of Drinking Water, Washington D.C.

United States Environmental Protection Agency (USEPA). 1984. *Health Assessment Document for Inorganic Arsenic, Final Report*, EPA-600/8-83-021F, Research Triangle Park, North Carolina. (As cited in USPHS, 1987a.)

United States Environmental Protection Agency (USEPA). 1984b. *Health Assessment Document for Chromium,* Environmental Assessment and Criteria Office, RPA-600/8-83-014F, Research Triangle Park, North Carolina.

United States Environmental Protection Agency (USEPA). 1984d. *Mercury Health Effects Update; Health Issue Assessment; Final Report*, EPA-600/8-84-019F, Office of Health and Environmental Assessment, Washington D.C. (As cited in USPHS, 1989.)

United States Environmental Protection Agency (USEPA). 1980a. *Health Assessment Document for Arsenic*, External Review Draft.

United States Environmental Protection Agency (USEPA). 1980c. *Ambient Water Quality Criteria for Mercury*, EPA-440/5-80-058, Office of Water Regulations and Standards, Washington, D.C. (As cited in USPHS, 1989.)

United States Public Health Service (USPHS). 1989a. *Draft Toxicological Profile for Mercury*, Agency for Toxic Substances and Disease Registry.

United States Public Health Service (USPHS). 1989d. *Draft Toxicological Profile for DDT, DDE, and DDD*, Agency for Toxic Substances and Disease Registry, December 1988.

United States Public Health Service (USPHS). 1988. *Toxicological Profile for Lead*, Agency for Toxic Substances and Disease Registry, February 1988.

United States Public Health Service (USPHS). 1988a. *Draft Toxicological Profile for DDT, DDE, and DDD*, Agency for Toxic Substances and Disease Registry, December 1988.

United States Public Health Service (USPHS). 1987b. *Draft Toxicological Profile for Nickel*, Agency for Toxic Substances and Disease Registry.

Valiela, I. *et al.* 1974. *Response of Salt Marsh Bivalves to Enrichment with Metal Containing Sewage Sludge and Retention of Pb, Zn, and Cd by Marsh Sediments*, Environ. Pollut., Vol. 7(2), pp. 149-157.

Walsh, C.T. and E.B. Ryden. 1984. *The Effect of Chronic Ingestion of Lead on Gastrointestinal Transit in Rats*, Toxicol. Appl. Pharmacol., Vol. 75, pp. 485-495.

Wedepohl, K.H., ed. 1969-1978. *Handbook of Geochemistry*, Vols. 2-4, Springer-Verlag, Berlin. (As cited in Rose et al., 1979.)

Williston, S.H. 1968. *Mercury in the Atmosphere*, J. Geophysical Res., Vol. 73(22), pp. 7051-7055. (As cited in Callahan *et al.*, 1979.)

Woolson, E.A. 1977. *Fate of Arsenicals in Different Environmental Substrates*, Environ. Health Perspect., Vol. 19,pp. 73-81. (As cited in Callahan *et al.*, 1979.)

Zepp, R.G. *et al.* 1973. *Photodecomposition of Phenylmercury Compounds in Sunlight*, Chemosphere, Vol. 3, pp. 93-99. (As cited in Callahan *et al.*, 1979.)

APPENDIX F

APPENDIX F

APPENDIX F

AIR DATA/CALCULATIONS

AIR MONITORING

GENERAL INFORMATION

Name(s): KEVIN IGNASZAK
Date: 1.5.93
Time: 1245
Project: RAMCO
Job No.: 23101-001-152 (23948)
Personnel Present: KEVIN IGNASZAK, DAVE MADDEX

Background Level: 0.3
Weather Conditions: OVERCAST, WINDY, 40°↓

Estimated Wind Direction: WEST
Estimated Wind Speed (i.e., calm, moderate, strong, etc.): MODERATE
Location Where Background Level Was Obtained: ACCESS ROAD

EQUIPMENT SETTINGS

	HNU	MSA EXPLOSIMETER	MINIRAM AEROSOL MONITOR
Range:	0-2000		
Span Pot:	5		
Calibration Gas:	ISOBUTYLENE	AMBIENT AIR	AMBIENT AIR

FIELD ACTIVITIES

Field Activities Conducted:
DRILLING AND INSTALLATION OF MONITORING WELLS

~~ppm-constituent~~-time				ppm-constituent-time		ppm-constituent-time	
H-NU	EXP	MAM					
0.3	0%	1.05	1500				
0.3	0%	.04	1515				
0.3	0%	.06	1535				
0.3	0%	.02	1546				
0.3	0%	.02	1615				

AIR MONITORING

GENERAL INFORMATION

Name(s): KEVIN IGNASZAK
Background Level: 0.4 ppm
Date: 1.6.92
Weather Conditions: OVERCAST
Time: 0805
MODERATE WIND
Project: RAMCO
32°
Job No.: 23101-001-152
Personnel Present: KEVIN IGNASZAK

Estimated Wind Direction: WEST
Estimated Wind Speed (i.e., calm, moderate, strong, etc.): MODERATE
Location Where Background Level Was Obtained: ACCESS ROAD

EQUIPMENT SETTINGS

	HNU	MSA EXPLOSIMETER	MINIRAM AEROSOL MONITOR
Range:	0-2000		
Span Pot:	5		
Calibration Gas:	ISOBUTYLENE	Calibration Gas: AMBIANT AIR	AMBIENT AIR

FIELD ACTIVITIES

Field Activities Conducted:
DRILLING & INSTALLATION OF MONITORING WELLS

RMW-1

~~ppm-constituent-time~~

H·NU	EXP	MAM	
0.4	10%	.04	0845
0.4	10%	.03	0857
0.4	10%	.07	0918
0.4	10%	.09	0945
0.4	10%	.06	1014

RMW-2

~~ppm-constituent-time~~

H·NU	EXP	MAM	
0.4	10%	.05	1150
0.4	10%	.07	1216
0.4	10%	.02	1331
0.4	10%	.04	1402

RMW-3

~~ppm-constituent-time~~

H·NU	EXP	MAM	
0.4	10%	.06	1458
0.4	10%	.03	1520
0.4	10%	.07	1539
0.4	10%	.06	1604
0.4	10%	.08	1634

AIR MONITORING

GENERAL INFORMATION

Name(s): P. Smith
Date: 12-29-93
Time: 10:00
Project: Rparco
Job No.: 25018-001-152
Personnel Present: P. Smith, W. Potapchuk

Background Level: 0.5, 0.05, 0%
Weather Conditions: Overcast, low 40's
Light breeze

Estimated Wind Direction: North east
Estimated Wind Speed (i.e., calm, moderate, strong, etc.): Calm
Location Where Background Level Was Obtained: upgradient South of Pond
Downgradient Northwest corner bldg.

EQUIPMENT SETTINGS

HNU

Range: 0-2000
Span Pot: 5
Calibration Gas: Isobutylene

MIE-PDM Aerosol monitor
Calibration Gas: Ambient Air

Neutron Explosimeter
Ambient Air

FIELD ACTIVITIES

Field Activities Conducted:

TEST PIT INSTALLATIONS

Time	Upgradient ppm-constituent-time HNU	Upgradient ppm-constituent-time OVA	Upgradient ppm-constituent-time MIE	Downgradient ppm-constituent-time HNU	Downgradient ppm-constituent-time OVA	Downgradient ppm-constituent-time MIE	ppm-constituent-time	
~~Time~~								
10:00	0.5	0	0.07	1	0	0.5		
11:30	0.4	0	0.05	0.3	0	0.5		
13:30	0.4	0	0.08	0	0	0.10		
15:30	0.4	0	0.13	0	0	0.15		

DAILY INSTRUMENT CALIBRATION CHECK SHEET

INSTRUMENT MINIRAM AEROSOL MONITOR

SERIAL # 5266

Date	Pure Air Y/N	Calibration Gas (ppm)	Battery Check (Good/bad)	Calibrated By	Remarks
1.5.93	-	AMBIENT AIR	GOOD	KDI	-
1.6.93	-	"	GOOD	KDI	-

DAILY INSTRUMENT CALIBRATION CHECK SHEET

INSTRUMENT MSA EXPLOSIMETER

SERIAL # 89ZZO

Date	Pure Air Y/N	Calibration Gas (ppm)	Battery Check (Good/bad)	Calibrated By	Remarks
1.5.93	—	AMBIENT AIR	GOOD	KDI	—
1.6.93	—	"	"	KDI	—

DAILY INSTRUMENT CALIBRATION CHECK SHEET

INSTRUMENT H·NU

SERIAL # 04694

Date	Pure Air Y/N	Calibration Gas (ppm)	Battery Check (Good/bad)	Calibrated By	Remarks
1.5.93	—	100	GOOD	KDI	—
1.6.93	—	100	GOOD	KDI	—

DAILY INSTRUMENT CALIBRATION CHECK SHEET

INSTRUMENT HNU — MINI-RAM Aerosol Monitor — Neutronics Tri-Gas

SERIAL # 04694 — 52066 — 126522

	Date	Pure Air Y/N	Calibration Gas (ppm)	Battery Check (Good/bad)	Calibrated By	Remarks
HNU	12-29-92	—	100	Good	P. Smith	—
MINIRAM	12-29-92	—	Ambient Air	Good	P Smith	—
Neutronics	12-29-92	—	Ambient Air	Good	P. Smith	—

APPENDIX TABLE A1
SOIL TO AIR CONCENTRATION
RAMCO STEEL - BUFFALO, NEW YORK

	Air Concentration		Soil Concentration				Volatilization Factor		Emissions Factor	
Variable > >		=		x	CF	/ (	VF	+	PEF	)
Abbreviation > >	CA		CS							
Units > >	mg/m3		µg/kg*		mg/µg		m3/kg		m3/kg	
Reference > >	(a)		(b)				(c)		(d)	
Chemicals										
Metals										
Arsenic - Total	6.013E-09	=	27.84	x	1E+00	/ (	0.00E+00	+	4.63E+09	)
Barium - Total	3.890E-08	=	180.10	x	1E+00	/ (	0.00E+00	+	4.63E+09	)
Chromium - Total	3.458E-08	=	160.10	x	1E+00	/ (	0.00E+00	+	4.63E+09	)
Lead - Total	6.962E-08	=	322.34	x	1E+00	/ (	0.00E+00	+	4.63E+09	)
Mercury - Total	1.928E-11	=	0.09	x	1E+00	/ (	0.00E+00	+	4.63E+09	)
Zinc - Total	8.730E-08	=	404.20	x	1E+00	/ (	0.00E+00	+	4.63E+09	)
VOC										
Acetone	3.783E-11	=	175.16	x	1E-03	/ (	7.64E+03	+	4.63E+09	)
2-Butanone	8.796E-12	=	40.73	x	1E-03	/ (	1.22E+04	+	4.63E+09	)
Benzene	8.639E-13	=	4.00	x	1E-03	/ (	3.74E+03	+	4.63E+09	)
Tetrachloroethene	4.320E-13	=	2.00	x	1E-03	/ (	5.06E+03	+	4.63E+09	)
Toluene	1.296E-12	=	6.00	x	1E-03	/ (	5.37E+03	+	4.63E+09	)
Chlorobenzene	4.320E-13	=	2.00	x	1E-03	/ (	1.03E+04	+	4.63E+09	)
Ethyl benzene	6.479E-13	=	3.00	x	1E-03	/ (	8.12E+03	+	4.63E+09	)
Total Xylenes	8.639E-13	=	4.00	x	1E-03	/ (	8.24E+03	+	4.63E+09	)
SEMI-VOC										
Phenol	8.198E-11	=	379.61	x	1E-03	/ (	2.01E+05	+	4.63E+09	)
Benzoic Acid	6.472E-11	=	300.00	x	1E-03	/ (	5.10E+06	+	4.63E+09	)
Naphthalene	2.592E-11	=	120.00	x	1E-03	/ (	0.00E+00	+	4.63E+09	)
2-Methylnaphthalene	NA	=	110.00	x	1E-03	/ (	NA	+	4.63E+09	)
Acenaphthylene	7.775E-12	=	36.00	x	1E-03	/ (	3.57E+05	+	4.63E+09	)
Acenaphthene	1.101E-11	=	51.00	x	1E-03	/ (	6.50E+04	+	4.63E+09	)
Dibenzofuran	NA	=	65.00	x	1E-03	/ (	NA	+	4.63E+09	)
Fluorene	1.253E-11	=	58.00	x	1E-03	/ (	8.11E+04	+	4.63E+09	)
Phenanthrene	7.184E-11	=	332.69	x	1E-03	/ (	1.16E+06	+	4.63E+09	)
Anthracene	2.052E-11	=	95.00	x	1E-03	/ (	7.20E+05	+	4.63E+09	)
Fluoranthene	9.427E-11	=	436.86	x	1E-03	/ (	4.38E+06	+	4.63E+09	)
Pyrene	1.254E-10	=	581.58	x	1E-03	/ (	6.09E+06	+	4.63E+09	)
Benzo(a)anthracene	6.493E-11	=	305.97	x	1E-03	/ (	8.20E+07	+	4.63E+09	)
Chrysene	8.275E-11	=	384.79	x	1E-03	/ (	2.02E+07	+	4.63E+09	)
Bis(2-ethylhexyl) phthalate	3.974E-10	=	1853.50	x	1E-03	/ (	3.44E+07	+	4.63E+09	)
Benzo(b)fluoranthene	1.223E-10	=	566.57	x	1E-03	/ (	4.53E+06	+	4.63E+09	)
Benzo(k)fluoranthene	7.109E-11	=	329.15	x	1E-03	/ (	1.83E+05	+	4.63E+09	)
Benzo(a)pyrene	7.701E-11	=	366.42	x	1E-03	/ (	1.28E+08	+	4.63E+09	)
Indeno(1,2,3-cd)pyrene	5.861E-11	=	273.18	x	1E-03	/ (	3.12E+07	+	4.63E+09	)
Dibenzo(a,h)anthracene	1.557E-11	=	77.00	x	1E-03	/ (	3.15E+08	+	4.63E+09	)
Benzo(ghi)perylene	4.229E-11	=	200.00	x	1E-03	/ (	9.91E+07	+	4.63E+09	)
PCBS										
Aroclor 1242	3.302E-11	=	152.97	x	1E-03	/ (	2.16E+06	+	4.63E+09	)
Aroclor 1254	3.515E-11	=	162.84	x	1E-03	/ (	2.46E+06	+	4.63E+09	)
PEST										
beta-BHC	3.666E-13	=	1.70	x	1E-03	/ (	7.16E+06	+	4.63E+09	)
Dieldrin	1.706E-13	=	0.79	x	1E-03	/ (	6.95E+05	+	4.63E+09	)
4,4'-DDE	1.079E-13	=	0.50	x	1E-03	/ (	2.80E+06	+	4.63E+09	)
Endrin	2.084E-12	=	9.68	x	1E-03	/ (	1.49E+07	+	4.63E+09	)
Endosulfan II	1.339E-12	=	6.20	x	1E-03	/ (	1.17E+06	+	4.63E+09	)
alpha-Chlordane	6.045E-13	=	2.80	x	1E-03	/ (	2.05E+06	+	4.63E+09	)

(a) Modelled based on methods from Hwang and Falco, 1986.

(b) Based on arithmetic mean and 95% upper confidence limit of the arithmetic mean.

(c) Value calculated on Appendix Table A2.

(d) Hwang and Falco, 1986.

*The soil concentrations of metals were reported as mg/kg, so a conversion factor of 1 was used for the metals.

APPENDIX TABLE A2

VOLATILIZATION FACTOR CALCULATION

RAMCO STEEL - BUFFALO, NEW YORK

Variable > >	Volatilization Factor	Molecular Diffusivity	Henry's Law Constant	Organic Carbon Partition Coefficient	Soil Organic Carbon Content
Abbreviation > >	VF	Di	H	Koc	OC
Units > >	m3/kg	cm2/s	atm-m3/mol	cm3/g	unitless
Reference > >	(a)	(b)	(c)	(d)	(e)
Chemical					
Metals					
Arsenic - Total	0.00E+00	0.61595	NA	1.00E+07	0.02
Barium - Total	0.00E+00	0.57578	NA	2.80E+05	0.02
Chromium - Total	0.00E+00	0.65256	NA	3.10E+04	0.02
Lead - Total	0.00E+00	0.55870	NA	6.00E+04	0.02
Mercury - Total	0.00E+00	0.55982	NA	5.80E+04	0.02
Zinc - Total	0.00E+00	0.62831	NA	9.40E+04	0.02
VOC					
Acetone	7.64E+03	0.10304	4.28E-04	1.80E+01	0.02
2-Butanone	1.22E+04	0.08942	5.59E-05	5.20E+00	0.02
Benzene	3.74E+03	0.08706	5.55E-03	4.90E+01	0.02
Tetrachloroethene	5.06E+03	0.07404	2.69E-02	3.63E+02	0.02
Toluene	5.37E+03	0.07826	5.92E-03	9.50E+01	0.02
Chlorobenzene	1.03E+04	0.07195	3.93E-03	2.09E+02	0.02
Ethyl benzene	8.12E+03	0.06728	8.04E-03	2.50E+02	0.02
Total Xylenes	8.24E+03	0.07162	7.04E-03	2.40E+02	0.02
SEMI-VOC					
Phenol	2.01E+05	0.08299	1.30E-06	3.02E+01	0.02
Benzoic Acid	5.10E+06	0.07032	7.00E-08	5.57E+01	0.02
Naphthalene	0.00E+00	0.06108	4.84E-03	8.87E+02	0.02
2-Methylnaphthalene	NA	0.05818	4.99E-04	NA	0.02
Acenaphthylene	3.57E+05	0.05577	1.14E-04	5.62E+03	0.02
Acenaphthene	6.50E+04	0.05525	2.41E-03	3.89E+03	0.02
Dibenzofuran	NA	0.05471	NA	8.13E-03	0.02
Fluorene	8.11E+04	0.05311	1.17E-03	2.83E+03	0.02
Phenanthrene	1.16E+06	0.05121	3.93E-05	1.88E+04	0.02
Anthracene	7.20E+05	0.05121	8.60E-05	1.58E+04	0.02
Fluoranthene	4.38E+06	0.04792	6.50E-06	4.14E+04	0.02
Pyrene	6.09E+06	0.04792	5.10E-06	6.27E+04	0.02
Benzo(a)anthracene	8.20E+07	0.04490	6.60E-07	1.38E+06	0.02
Chrysene	2.02E+07	0.04490	1.05E-06	1.33E+05	0.02
Bis(2-ethylhexyl) phthalate	3.44E+07	0.03556	3.00E-07	8.74E+04	0.02
Benzo(b)fluoranthene	4.53E+06	0.09149	1.20E-05	1.56E+05	0.02
Benzo(k)fluoranthene	1.83E+05	0.09149	1.04E-03	2.20E+04	0.02
Benzo(a)pyrene	1.28E+08	0.09149	4.90E-07	5.07E+06	0.02
Indeno(1,2,3-cd)pyrene	3.12E+07	0.04063	6.95E-08	1.90E+04	0.02
Dibenzo(a,h)anthracene	3.15E+08	0.04041	7.30E-08	2.03E+06	0.02
Benzo(ghi)perylene	9.91E+07	0.04063	1.47E-07	4.06E+05	0.02
PCBS					
Aroclor 1242	2.16E+06	0.04829	3.40E-04	5.30E+05	0.02
Aroclor 1254	2.46E+06	0.04517	2.80E-04	5.30E+05	0.02
PEST					
beta-BHC	7.16E+06	0.05207	2.30E-07	4.25E+03	0.02
Dieldrin	6.95E+05	0.04289	5.84E-05	8.37E+03	0.02
4,4'-DDE	2.80E+06	0.04391	2.10E-05	5.01E+04	0.02
Endrin	1.49E+07	0.04289	4.00E-07	2.65E+04	0.02
Endosulfan II	1.17E+06	0.03640	1.91E-05	6.55E+03	0.02
alpha-Chlordane#	2.05E+06	0.04300	4.80E-05	5.98E+04	0.02

N/A = Not applicable

(a) From U.S.EPA, 1991 (RAGS, HHEM Part B) equation 8' using default values.

(b) See Appendix Table A3 for calculation.

(c) From CHEMFATE.

(d) From CHEMFATE.

(e) Assumed value of 2 percent organic carbon

Based on Chlorodane

* From The Installation Restoration Program Toxicology Guide, Volume 3

APPENDIX TABLE A3
CALCULATION OF DIFFUSION COEFFICIENT

	Diffusion Coefficient in air				Absolute Temperature T: Ambient Temperature		Kelvin Conversion		Expon. Power		Molecular Weight (chemical)		Molecular Weight (air)		Expon. Power		Pressure		Atomic Diffusion Volume (chemical)		Atomic Diffusion Volume (air)	Expon. Power	Expon. Power
Equation > >	D	=	[(	0.001	x (	°C	+	273.15	)	^1.75	x (1 /	M1	+ 1 /	M2	)	^1/2	] / [	P	x (	V1	^1/3 +	V2	^ 1/3	))^2]
Units > >	cm2/sec					K						g/mol		g/mol				atm		cm3/mol		cm3/mol		
Reference > >	(a)					(b)						(c)		(d)				(e)		(f)		(d)		
Chemical																							
Metals																							
Arsenic - Total	0.61595	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	74.92	+ 1 /	28.8	)	^1/2	] / [	1	x (	0	^ 1/3 +	20.1	^ 1/3	)^2]
Barium - Total	0.57578	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	137.33	+ 1 /	28.8	)	^1/2	] / [	1	x (	0	^ 1/3 +	20.1	^ 1/3	)^2]
Chromium - Total	0.65256	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	52.00	+ 1 /	28.8	)	^1/2	] / [	1	x (	0	^ 1/3 +	20.1	^ 1/3	)^2]
Lead - Total	0.55870	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	207.20	+ 1 /	28.8	)	^1/2	] / [	1	x (	0	^ 1/3 +	20.1	^ 1/3	)^2]
Mercury - Total	0.55982	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	200.59	+ 1 /	28.8	)	^1/2	] / [	1	x (	0	^ 1/3 +	20.1	^ 1/3	)^2]
Zinc - Total	0.62831	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	65.38	+ 1 /	28.8	)	^1/2	] / [	1	x (	0	^ 1/3 +	20.1	^ 1/3	)^2]
VOC																							
Acetone	0.10304	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	58.08	+ 1 /	28.8	)	^1/2	] / [	1	x (	66.86	^ 1/3 +	20.1	^ 1/3	)^2]
2-Butanone	0.08942	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	72.11	+ 1 /	28.8	)	^1/2	] / [	1	x (	87.32	^ 1/3 +	20.1	^ 1/3	)^2]
Benzene	0.08706	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	78.11	+ 1 /	28.8	)	^1/2	] / [	1	x (	90.68	^ 1/3 +	20.1	^ 1/3	)^2]
Tetrachloroethene	0.07404	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	165.83	+ 1 /	28.8	)	^1/2	] / [	1	x (	111	^ 1/3 +	20.1	^ 1/3	)^2]
Toluene	0.07826	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	92.14	+ 1 /	28.8	)	^1/2	] / [	1	x (	111.14	^ 1/3 +	20.1	^ 1/3	)^2]
Chlorobenzene	0.07195	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	112.56	+ 1 /	28.8	)	^1/2	] / [	1	x (	128.4	^ 1/3 +	20.1	^ 1/3	)^2]
Ethyl benzene	0.06728	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	106.70	+ 1 /	28.8	)	^1/2	] / [	1	x (	151.6	^ 1/3 +	20.1	^ 1/3	)^2]
Total Xylenes	0.07162	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	106.17	+ 1 /	28.8	)	^1/2	] / [	1	x (	131.6	^ 1/3 +	20.1	^ 1/3	)^2]
SEMI-VOC																							
Phenol	0.08299	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	94.11	+ 1 /	28.8	)	^1/2	] / [	1	x (	96.16	^ 1/3 +	20.1	^ 1/3	)^2]
Benzoic Acid	0.07032	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	122.12	+ 1 /	28.8	)	^1/2	] / [	1	x (	132.86	^ 1/3 +	20.1	^ 1/3	)^2]
Naphthalene	0.06108	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	128.17	+ 1 /	28.8	)	^1/2	] / [	1	x (	180.84	^ 1/3 +	20.1	^ 1/3	)^2]
2-Methylnaphthalene	0.05818	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	142.20	+ 1 /	28.8	)	^1/2	] / [	1	x (	197.34	^ 1/3 +	20.1	^ 1/3	)^2]
Acenaphthylene	0.05577	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	152.20	+ 1 /	28.8	)	^1/2	] / [	1	x (	213.84	^ 1/3 +	20.1	^ 1/3	)^2]
Acenaphthene	0.05525	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	154.21	+ 1 /	28.8	)	^1/2	] / [	1	x (	217.8	^ 1/3 +	20.1	^ 1/3	)^2]

APPENDIX TABLE A3 (Continued)

	Diffusion Coefficient in air				Absolute Temperature T: Ambient Temperature		Kelvin Conversion		Expon. Power		Molecular Weight (chemical)		Molecular Weight (air)		Expon. Power		Pressure		Atomic Diffusion Volume (chemical)		Atomic Diffusion Volume (air)	Expon. Power	Expon. Power
Equation >>	D	=	[(	0.001	x (	°C	+	273.15	)	^1.75	x (1 /	M1	+ 1 /	M2	)	^1/2	] / [	P	x (	V1	^1/3 +	V2	^ 1/3	))^2]
Units >>	cm2/sec						K					g/mol		g/mol				atm		cm3/mol		cm3/mol		
Reference >>	(a)						(b)					(c)		(d)				(e)		(f)		(d)		
SEMI-VOC (cont)																							
Dibenzofuran	0.05471	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	168.19	+ 1 /	28.8	)	^1/2	] / [	1	x (	219.32	^ 1/3 +	20.1	^ 1/3	)^2]
Fluorene	0.05311	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	166.22	+ 1 /	28.8	)	^1/2	] / [	1	x (	234.3	^ 1/3 +	20.1	^ 1/3	)^2]
Phenanthrene	0.05121	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	178.23	+ 1 /	28.8	)	^1/2	] / [	1	x (	250.8	^ 1/3 +	20.1	^ 1/3	)^2]
Anthracene	0.05121	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	178.23	+ 1 /	28.8	)	^1/2	] / [	1	x (	250.8	^ 1/3 +	20.1	^ 1/3	)^2]
Fluoranthene	0.04792	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	202.26	+ 1 /	28.8	)	^1/2	] / [	1	x (	283.8	^ 1/3 +	20.1	^ 1/3	)^2]
Pyrene	0.04792	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	202.26	+ 1 /	28.8	)	^1/2	] / [	1	x (	283.8	^ 1/3 +	20.1	^ 1/3	)^2]
Benzo(a)anthracene	0.04490	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	228.29	+ 1 /	28.8	)	^1/2	] / [	1	x (	320.76	^ 1/3 +	20.1	^ 1/3	)^2]
Chrysene	0.04490	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	228.29	+ 1 /	28.8	)	^1/2	] / [	1	x (	320.76	^ 1/3 +	20.1	^ 1/3	)^2]
Bis(2-ethylhexyl) phthala	0.03556	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	390.54	+ 1 /	28.8	)	^1/2	] / [	1	x (	493.16	^ 1/3 +	20.1	^ 1/3	)^2]
Benzo(b)fluoranthene	0.09149	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	252.32	+ 1 /	28.8	)	^1/2	] / [	1	x (	62.24	^ 1/3 +	20.1	^ 1/3	)^2]
Benzo(k)fluoranthene	0.09149	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	252.32	+ 1 /	28.8	)	^1/2	] / [	1	x (	62.24	^ 1/3 +	20.1	^ 1/3	)^2]
Benzo(e)pyrene	0.09149	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	252.32	+ 1 /	28.8	)	^1/2	] / [	1	x (	62.24	^ 1/3 +	20.1	^ 1/3	)^2]
Indeno(1,2,3-cd)pyrene	0.04063	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	276.34	+ 1 /	28.8	)	^1/2	] / [	1	x (	386.76	^ 1/3 +	20.1	^ 1/3	)^2]
Dibenzo(a,h)anthracene	0.04041	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	278.35	+ 1 /	28.8	)	^1/2	] / [	1	x (	390.72	^ 1/3 +	20.1	^ 1/3	)^2]
Benzo(ghi)perylene	0.04063	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	276.34	+ 1 /	28.8	)	^1/2	] / [	1	x (	386.76	^ 1/3 +	20.1	^ 1/3	)^2]
PCBS																							
Aroclor 1242	0.04829	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	266.00	+ 1 /	28.8	)	^1/2	] / [	1	x (	270.36	^ 1/3 +	20.1	^ 1/3	)^2]
Aroclor 1254	0.04517	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	328.00	+ 1 /	28.8	)	^1/2	] / [	1	x (	305.4	^ 1/3 +	20.1	^ 1/3	)^2]
PEST																							
beta-BHC	0.05207	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	290.83	+ 1 /	28.8	)	^1/2	] / [	1	x (	227.88	^ 1/3 +	20.1	^ 1/3	)^2]
Dieldrin	0.04289	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	380.91	+ 1 /	28.8	)	^1/2	] / [	1	x (	336.32	^ 1/3 +	20.1	^ 1/3	)^2]
4,4'-DDE	0.04391	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	319.13	+ 1 /	28.8	)	^1/2	] / [	1	x (	324.84	^ 1/3 +	20.1	^ 1/3	)^2]
Endrin	0.04289	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	380.92	+ 1 /	28.8	)	^1/2	] / [	1	x (	336.32	^ 1/3 +	20.1	^ 1/3	)^2]
Endosulfan II	0.03640	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	406.95	+ 1 /	28.8	)	^1/2	] / [	1	x (	469.18	^ 1/3 +	20.1	^ 1/3	)^2]
alpha-Chlordane	0.04300	=	[(	0.001	x (	20	+	273.15	)	^1.75	x (1 /	409.80	+ 1 /	28.8	)	^1/2	] / [	1	x (	332.88	^ 1/3 +	20.1	^ 1/3	)^2]

(a) Diffusion coefficient in air calculated using equation referenced in Shen, TT "Estimating Hazardous Air Emissions from Disposal Sites," Pollution Engineering. August 1981.

(b) Ambient air temperature used in the emission calculations (includes conversion from Celsius to absolute temperature).

(c) Molecular weight of the chemical for which the diffusion coefficient is being calculated.

(d) Molecular weight and diffusion volume for air; from Shen, 1981 (see above for full citation).

(e) Assumed atmospheric pressure.

(f) Molecular diffusion volume of the chemical for which the diffusion coefficient is being calculated. Values listed are from Shen, 1981 using the following equation:

Chemical	Diffusion Volume	=	No. of Carbon atoms	x	Atomic Diff. Volume for Carbon	+	No. of Hydrogen atoms	x	Atomic Diff. Volume for Hydrogen	+	No. of Chlorine atoms	x	Atomic Diff. Volume for Chlorine	+	No. of Bromine atoms	x	Atomic Diff. Volume for Bromine	+	No. of Nitrogen atoms	x	Atomic Diff. Volume for Nitrogen
e.g., Trichloroethene	93.48	=	2	x	16.5	+	1	x	1.98	+	3.00	x	19.5	+	0	x	35.0	+	0	x	5.69

APPENDIX TABLE A4

FISH CONCENTRATIONS

RAMCO STEEL - BUFFALO, NEW YORK

Variables> >	CF	=	CW	x	BCF	x	CF
Units> >	mg/kg		µg/L		unitless		mg*L/kg*µg
CHEMICALS							
SEMI-VOC							
Benzoic Acid	NA	=	8	x	NA	x	1.00E-03
Di-n-butyl phthalate	NA	=	0.8	x	NA	x	1.00E-03
Butyl benzyl phthalate	0.00702	=	0.6	x	11.7	x	1.00E-03
Carcinogenic Effects							
SEMI-VOC							
Benzoic Acid	NA	=	8	x	NA	x	1.00E-03
Di-n-butyl phthalate	NA	=	0.8	x	NA	x	1.00E-03
Butyl benzyl phthalate	0.00702	=	0.6	x	11.7	x	1.00E-03

APPENDIX TABLE A5
SURFACE WATER VOLATILE AIR EMISSION MODELING

RAMCO STEEL - BUFFALO, NEW YORK

Emission rate is calculated using the following equation:*

ER = 18E-06 x 4.45E-03 x (MW)^ -0.5 x (1.024)^ T-20 x (V)^ 0.67 x (d) ^ -0.85 x A x C

with the variables presented below:

Chemical	Emission Rate ER (g/sec)	Chemical Molecular Weight MW (g/mol)	Water Surface Temperature T (C)	Surface Velocity V (cm/s)	Average Liquid Depth d (m)	Area A (cm2)	Chemical Concentration in Water C (µg/L)	CF (mg/µg)
SEMI-VOC								
Benzoic Acid	**3.11E-05**	122.12	20	49	0.9144	3.66E+04	8	1.00E-03
Di-n-butyl phthalate	**2.06E-06**	278.00	20	49	0.9144	3.66E+04	0.8	1.00E-03
Butyl benzyl phthalate	**1.46E-06**	312.40	20	49	0.9144	3.66E+04	0.6	1.00E-03

The pond is assumed to be 3 feet deep in wading area. Human exposure will occur at the pond in 10 foot increments.

*Source: U.S. EPA, 1989. Air/Superfund National Technical Guidance Study Series. Volume II - Estimation of Baseline Air Emissions at Superfund Sites. Office of Air Quality, Planning and Standards. EPA - 450/1-89-002.

APPENDIX G

APPENDIX G

APPENDIX G

SUPPLEMENTAL INVESTIGATION DATA

THE WETLAND DELINEATION OF

THE

RAMCO STEEL SITE

City of Lackawanna
Erie County, New York

Prepared by

Erath Dimensions, Inc.
1091 Jamison Road
Elma, New York 14059

For

Dames & Moore
3065 Southwestern Blvd.
Orchard Park, New York 14217

EARTH DIMENSIONS, INC.

Soil and Hydrogeologic Investigations • Wetland Delineations

Date: May 25, 1994

Project Code: W2D94

REPORT SUMMARIZING
THE RESULTS OF
A WETLAND DELINEATION SURVEY OF

Ramco Steel Site

Prepared for Submission to

U.S. ARMY CORPS OF ENGINEERS
1776 NIAGARA STREET
BUFFALO, NEW YORK 14207

Prepared by

EARTH DIMENSIONS INC.
1091 JAMISON ROAD
ELMA, NEW YORK 14059

for

DAMES & MOORE
3065 SOUTHWESTERN BLVD.
ORCHARD PARK, NEW YORK 14127

DATE PREPARED
May 25, 1994

PROJECT CODE:W2D94

EXECUTIVE SUMMARY

Dames & Moore has Retained Earth Dimensions, Inc. (EDI) to complete a wetland investigation within a 8.0± acre land parcel located in an urban industrial area in the City of Lackawanna, County of Erie, State of New York. Dames & Moore has retained Earth Dimensions Inc. (EDI) to complete a wetland delineation report that would allow the U.S. Army Corps of Engineers (Corps) and New York State Department of Environmental Conservation (NYSDEC) to determine the extent of their jurisdiction over the project, pursuant to Section 404 of the Clean Water Act and Article 24 (Freshwater Wetlands) of the New York State Environmental Conservation Law.

A preliminary review of available information pertaining to vegetation, soils and hydrology in the project area was implemented prior to conducting a field investigation within the site. Sources of information included the United States Geological Survey (USGS), Soil Conservation Service (SCS), National Wetland Inventory (NWI), and NYSDEC Freshwater Wetland maps. The Ramco Steel Site does not lie within a wetland under New York State jurisdiction. However, SCS, NWI and USGS maps indicate the possible presence of wetlands under federal jurisdiction within the proposed development site.

EDI applied methods specified by the *Corps of Engineers Wetlands Delineation Manual* (January 1987) to perform a field investigation at the Ramco Steel Site for

purposes of verification of the preliminary data review. The routine-level wetland determination method was chosen for the field study. The routine-level investigative method was chosen based on the site conditions and the determination that the detail and frequency of wetland data points ("X" points) placed throughout the investigation would thoroughly sample the existing conditions within this site. Wetland determinations at sampling points were based on the three criteria of vegetation, soils and hydrology. EDI identified two (2) wetland areas within the Ramco Steel Site and partially identified one wetland area off-site to the north/northwest. EDI noted significant disturbance throughout the entire site associated with past on-site and off-site land use. The wetland areas on-site may be described as follows: 1) a 4.50± acre open water pond located within the central/southwestern area of the site, and 2) a 0.43± acre isolated wetland located within the northwestern section of the site. As a result of the field investigation, EDI has determined that the Ramco Steel Site contains a total of 4.93± acres of wetland area which may be under Corps jurisdiction.

Dames & Moore has indicated plans for remediation within this land parcel. EDI recommends that any future plans within this site emphasize the minimization of all unnecessary wetland impacts. It is the further recommendation of EDI that Dames & Moore submit this report to the Corps for their jurisdictional review and approvals.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ATTACHMENTS

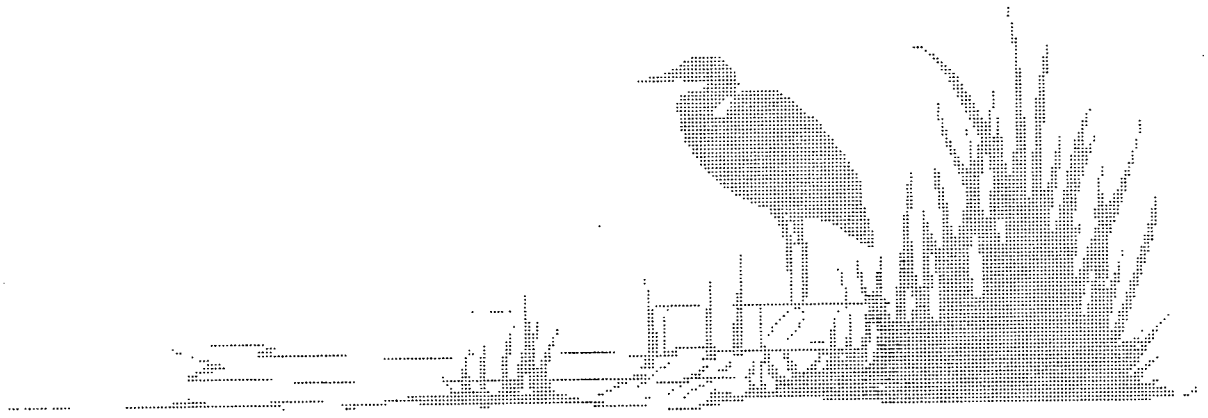
SECTION I

INTRODUCTION

Dames & Moore has retained EDI to complete a wetland investigation within a 8.0± acre site located in an urban industrial area within the City of Lackawanna, County of Erie, State of New York. The Ramco Steel Site is somewhat irregularly shaped with straight boundaries forming a square shaped section of the site immediately west of Niagara Cold Drawn Steel. The remainder of the site curves northwest along some existing abandoned railroad tracks. The site is bordered on the east by the existing Niagara Cold Drawn Steel facilities and on the north by an existing junk yard. The western and southern boundaries border abandoned and in-use railroad tracks and abandoned buildings located off-site to the south and west. The project has been given the name Ramco Steel Site and is located on the U.S.G.S. 7.5 minute quadrangle map indexed as Buffalo, Southeast (1965) (Figure 1).

The wetland investigation was designed to facilitate a determination of the extent of U.S. Army Corps of Engineers (Corps) and New York State Department of Environmental Conservation (NYSDEC) jurisdiction over the project area pursuant to Section 404 of the Clean Water Act and Article 24 (Freshwater Wetlands) of the New York State Environmental Conservation Law.

EDI has performed a wetland delineation study at the proposed project site under guidelines specified by the *Corps of Engineers Wetland Delineation Manual*, dated January 1987 (referred to hereafter as the Corps Manual). The purpose of this report is to present EDI's methods, results, conclusions and recommendations with respect to the Ramco Steel Site.



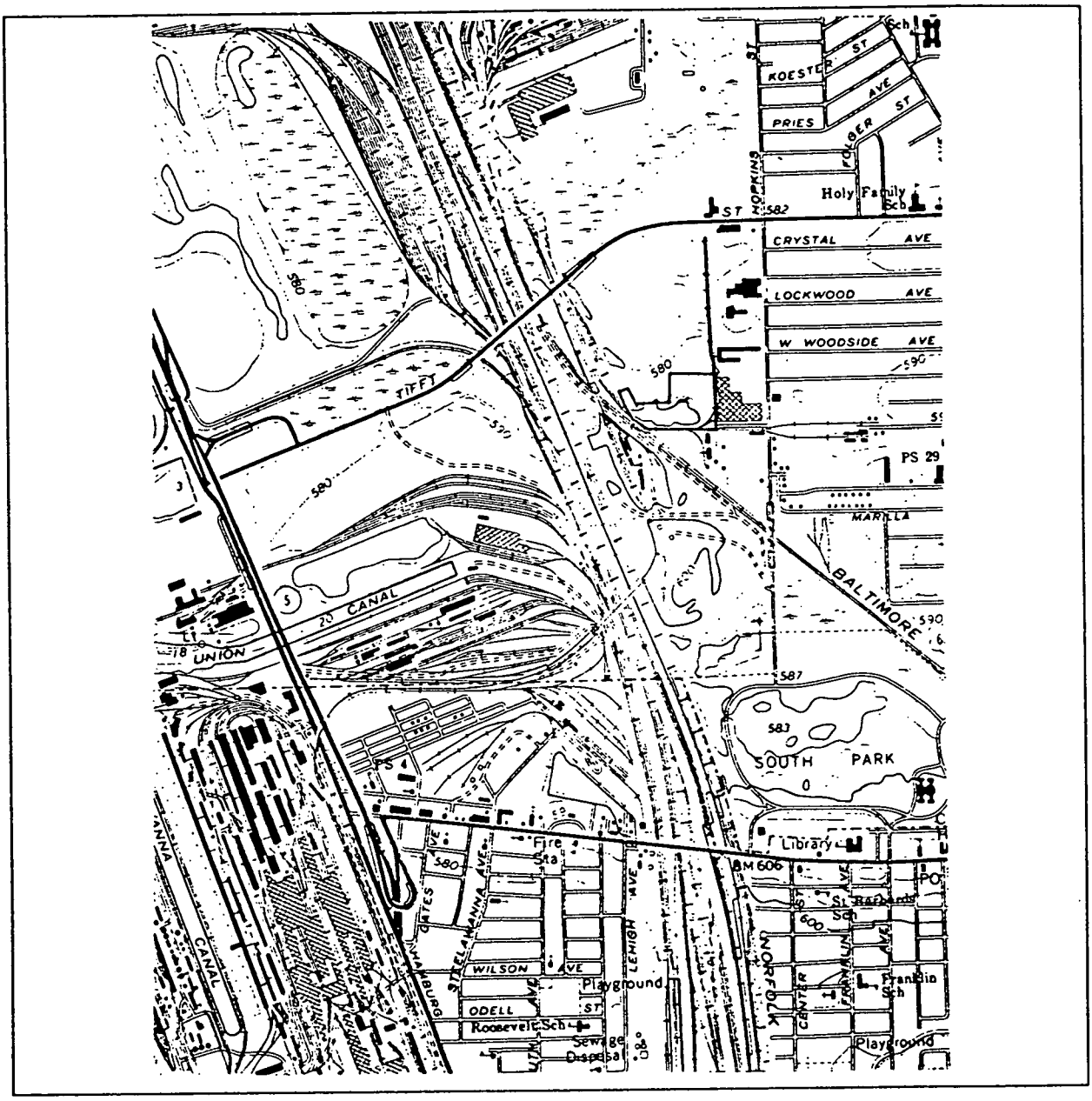


Figure 1:	U.S. G. S. Topographic Map Buffalo, SE (1965) Erie County, New York	Ramco Steel Site City of Lackawanna Erie County, New York

Earth Dimensions, Inc.

SECTION II

SITE DESCRIPTION

The Ramco Steel Site is an irregularly shaped site located west of Hopkins Street behind the existing Niagara Cold Drawn Steel facilities, south of an existing junk yard, and southeast of the Altift Realty Landfill in the City of Lackawanna, Erie County, New York. The exact dimensions of the site are depicted on the site map included as Attachment F. The approximate site location is outlined on Figure 1.

The topography of the Ramco Steel Site is irregular due to previous extensive filling and excavating activities. The most notable feature is the large pond located in this area partially on-site. The remaining area of the site possesses a variety of topographic features.

This site supports two (2) basic vegetative communities as follows: 1) open herbaceous wetland communities consisting primarily of common reed, cattail and purple loosestrife, and 2) mostly open, disturbed upland vegetational communities supporting the growth of herbaceous species such as common reed, common mugwort, Canada bluegrass, goldenrods, asters, and field horsetail, and shrub and tree species including staghorn sumac, grey-stem dogwood, red osier dogwood, willow, European buckthorn, eastern cottonwood, and swamp cottonwood.

SECTION III

PRELIMINARY DATA REVIEW

A. SUMMARY OF FINDINGS

Several sources of information may be reviewed to facilitate the completion of a wetland delineation study. In some cases it is even possible to make a preliminary office wetland determination based upon available vegetation, soils, and hydrologic information for a project site.

EDI completed a preliminary review of several data sources at the onset of this study. The results of the review are summarized as follows:

1. U.S.G.S. Quadrangle Map

   Figure 1 depicts the proposed the Ramco Steel Site on the Buffalo, SE (1965) U.S.G.S. 7.5 minute quadrangle map. The map depicts a large pond within the southern section of the site. No other streams, creeks, lakes or drains are depicted within the site.

2. National Wetlands Inventory Map

   The National Wetlands Inventory Map (NWI), indexed as Buffalo, SE (10/1978) depicts one wetland area labeled as "POWZx" which indicates a Palustrine Open Water Intermittently exposed/permanent Excavated wetland located within the Ramco Steel Site bounds.

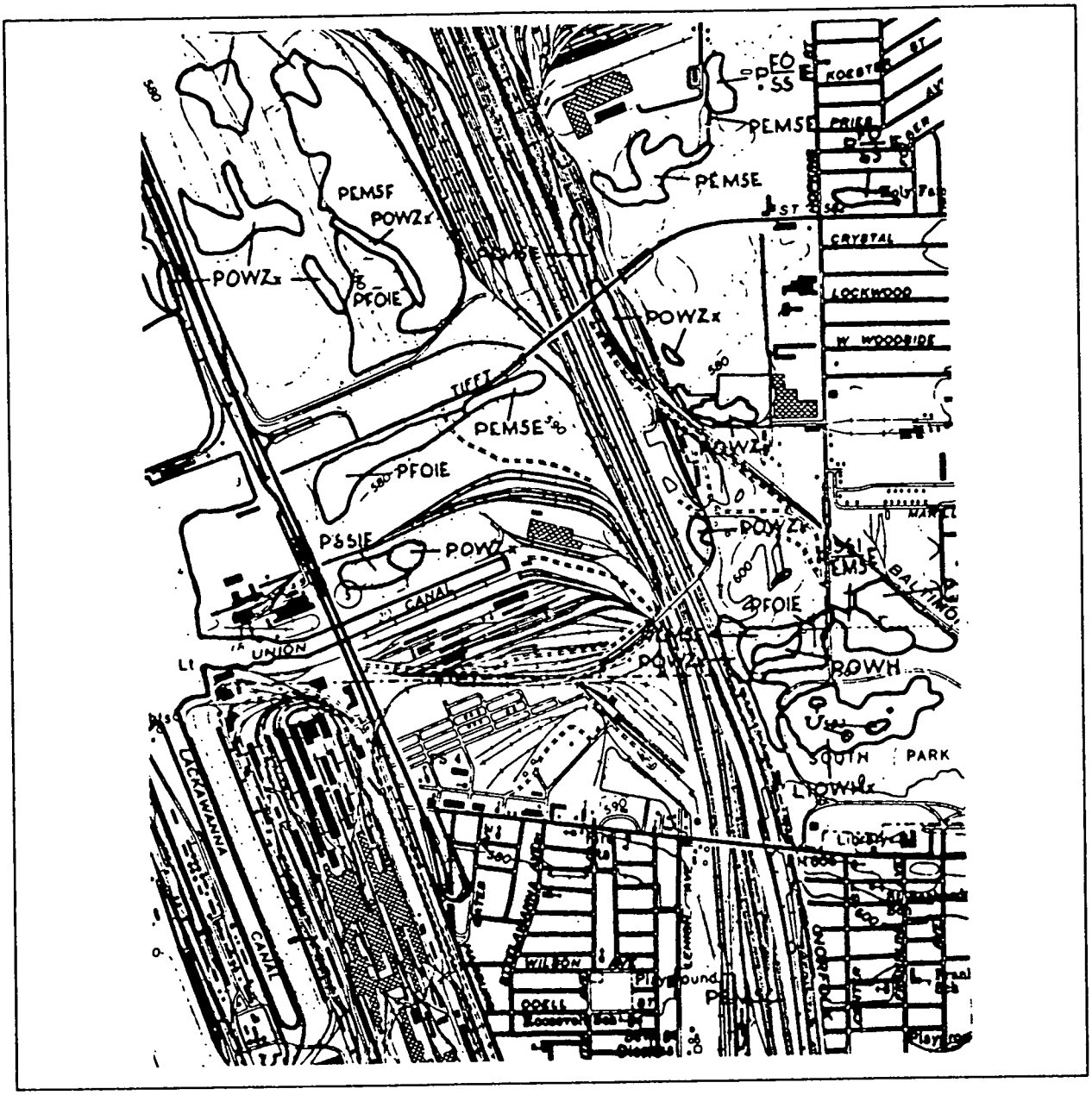


Figure 2:	U.S.F.W.S NWI Map Buffalo, SE 10/78 Erie County, New York	Ramco Steel Site City of Lackawanna Erie County, New York

Earth Dimensions, Inc.

Symbol	Description
P	Palustrine
OW	Open Water (unknown bottom)
Z	Intermittently exposed/permanent
x	Excavated

Palustrine open water intermittently exposed/permanent excavated wetlands refers to man-created nontidal wetlands dominated by trees, shrubs, persistent emergents, emergent mosses or lichens which possess open water, and are intermittently exposed and/or permanently flooded. Such systems include small shallow, permanent or intermittently flooded water bodies often called ponds.

3. Soil Conservation Service Soils Map

Figure 3 presents the project area outlined on a copy of the SCS Erie County soils map (Sheet Number 49). As shown on that figure, the Ramco Steel Site has the following soil types:

Soil Conservation Service

Designation	Description	Hydric Soil/ Inclusions?
Hn	Haplaquolls, ponded	Hydric soil
NfA	Niagara silt loam 0-3% slopes	Inclusions possible
Ud	Urban land	Inclusions unlikely
W	Open water	Ponded area

Haplaquolls, ponded- Freshwater marshes made up of very poorly drained soils ponded with shallow water most of the year. They often border lakes, ponds, and other open bodies of water.

Niagara silt loam (0-3% slopes)- Deep, nearly level, somewhat poorly drained silty soil on broad, moderately low flats in the northern part of the county and a few flat areas elsewhere.

Urban land- This map unit indicates a miscellaneous area in which 80 percent or more of the soil surface is covered by asphalt, concrete, buildings, or other impervious structures.

Water- Open water

Ponded Haplaquolls are the *hydric* soils mapped within this land parcel. Hydric soils are typically the result of saturated, flooded or ponding hydrologic conditions over time. Such anaerobic conditions can support the growth and survival of hydrophytic vegetation. Wetland hydrologic conditions, hydric soils, and hydrophytic vegetation are all characteristics of a wetland area.

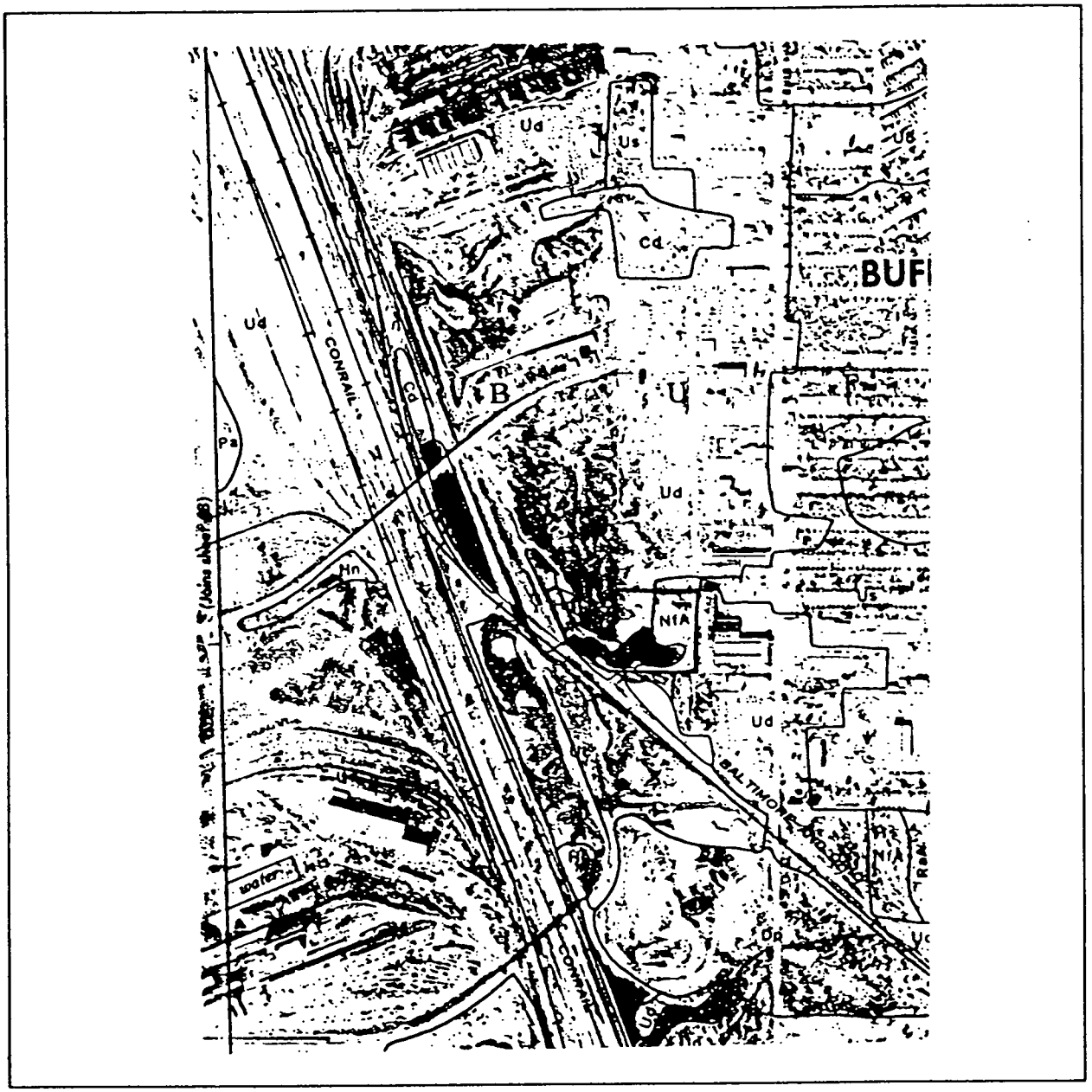
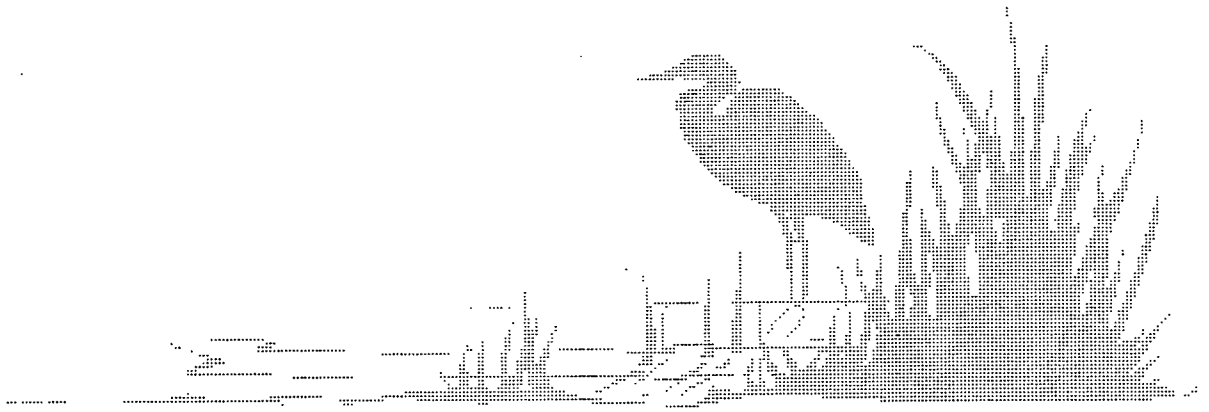


Figure 3:	U.S.D.A. Soil Survey Erie County, Sheet #49 Erie County, New York	Ramco Steel Site City of Lackawanna Erie County, New York

4. NYSDEC Freshwater Wetlands Map

Figure 4 is a copy of the NYSDEC Freshwater Wetlands map indexed as Buffalo, Southeast (1975). The Ramco Steel Site is outlined on the map. No designated wetland areas or marshy areas are outlined or labeled within or immediately adjacent to the Ramco Steel Site.



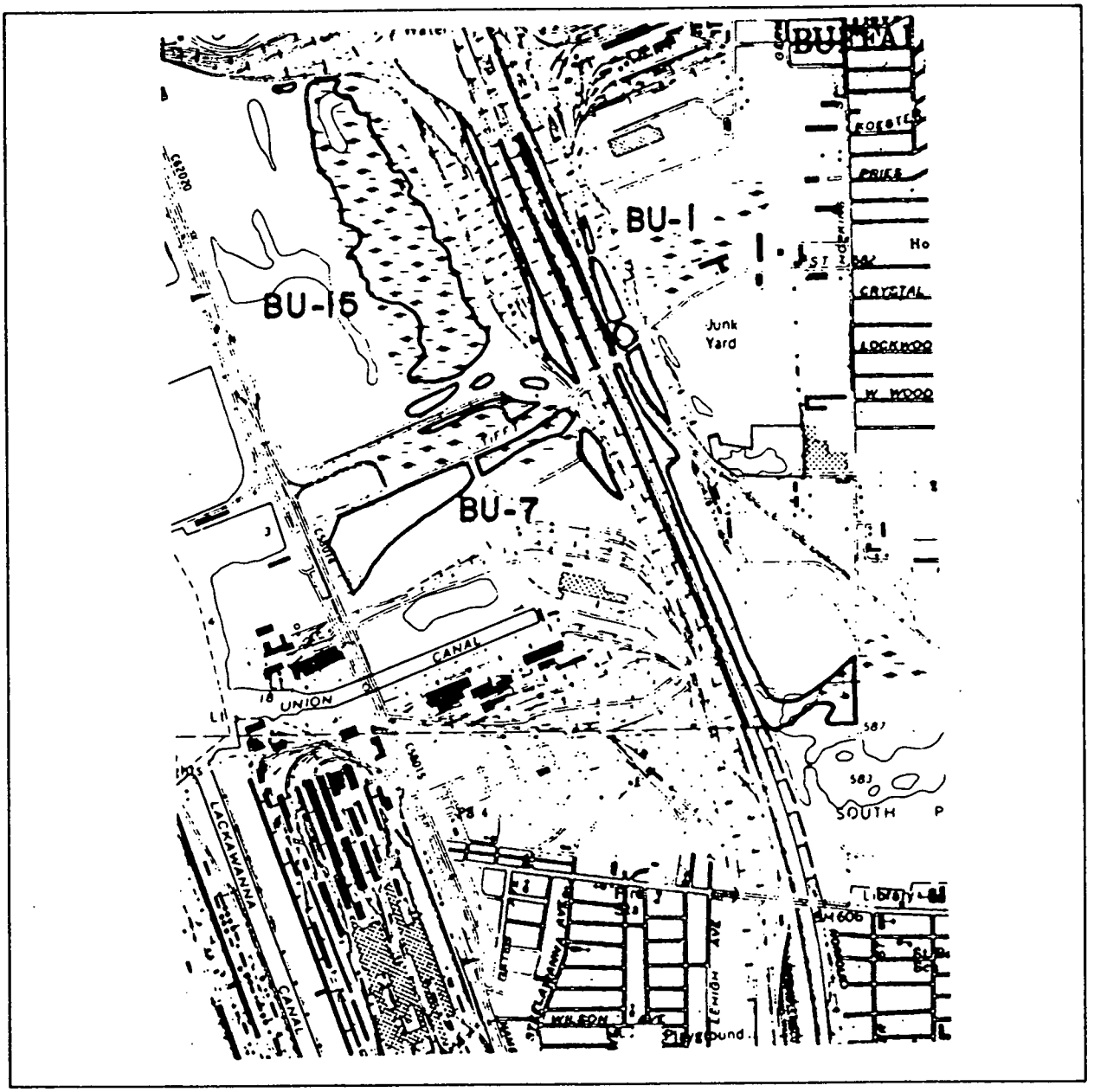
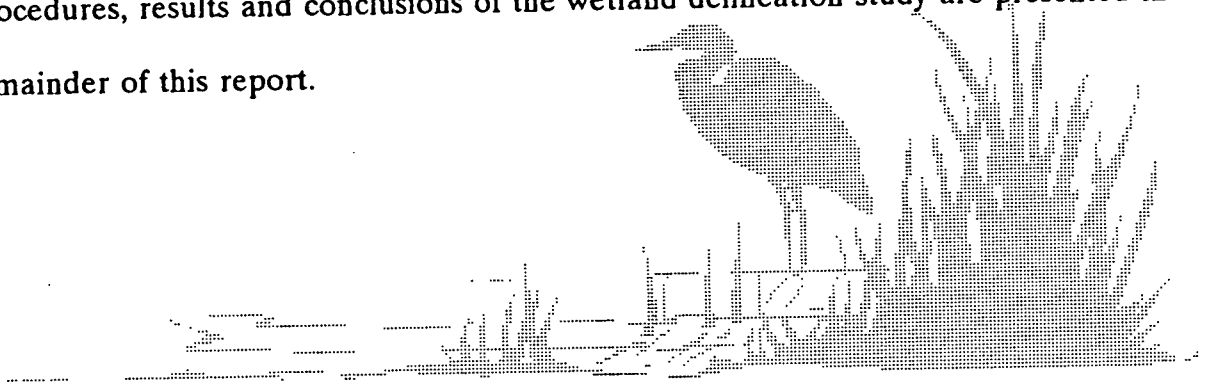


Figure 4:	NYSDEC Freshwater Wetlands Map Buffalo, SE (1975) Erie County, New York	Ramco Steel Site City of Lackawanna Erie County, New York

B. RESULTS OF AGENCY INFORMATION REVIEW

The preliminary data review found no wetlands subject to NYSDEC jurisdiction at the Ramco Steel Site. Therefore, the NYSDEC has no regulatory authority over wetlands within this site. The depiction of hydric soil and an area of open water on the SCS, U.S.G.S., and NWI maps warranted a field investigation at the Ramco Steel Site in order to confirm the presence of any federally regulated wetlands which might be located within the land parcel. The methods specified in the *Corps of Engineers Wetlands Delineation Manual* (January 1987) were employed during the field investigation. Procedures, results and conclusions of the wetland delineation study are presented in the remainder of this report.



SECTION IV
FIELD INVESTIGATION PROCEDURES

Step 1

The size of the site, as well as the location and extent of the wetland areas, dictated the choice of the routine-level wetland determination method for the field investigation. Routine-level wetland determinations are considered sufficient for areas under 5 acres in size or areas of low plant species diversity. Comprehensive-level determinations are appropriate for significantly disturbed sites, or when extensive statistical information is desired from surveys.

Step 2

The random sampling procedure was adopted for the field investigation at this site because of the limited size of the site and the location and extent of the wetland areas. The detail and quantity of data gathered as a result of delineating the wetland boundaries, as well as four (4) random sample points, was determined to be sufficient to adequately categorize the site conditions.

Step 3

Four (4) additional random sample data points, 1A through 1D, were placed in addition to the thirty-four (34) wetland boundary "X" points.

Step 4

During the field investigation it was determined that four (4) random sample data points in addition to the wetland boundary "X" points were necessary in order to adequately characterize the existing site conditions. The wetland boundary sample points placed in the field along each wetland boundary are labelled X1-X34.

Step 5

A determination of whether normal conditions were present within the site was implemented by considering the following questions:

1. *Is the area presently lacking hydrophytic vegetation or hydrologic indicators due to annual, seasonal or long-term fluctuations in precipitation, surface water, or ground-water levels?*

2. *Are hydrophytic vegetation indicators lacking due to seasonal fluctuations in temperature (e.g. seasonality of plant growth)?*

The field work was performed during the beginning of the growing season (April 21, 1994). There was no snow cover and weather conditions were favorable with sunny skies, cool temperatures and zero precipitation prevailing. The vegetative indicators were sufficient to perform a wetland investigation. All other environmental conditions were also considered to be suitable for the investigation.

The study area was examined for evidence of extensive natural or human induced alteration of vegetation, soils or hydrology. The site is located in an urban industrial area and previous land use has resulted in extensive disturbance throughout the majority of the site as well as along all of its boundaries. The site revealed evidence of excavation, filling, and dumping which has resulted in debris piles and a landscape possessing variable topography based on previous activities. In disturbed areas, historical information was consulted in order to determine the presence of wetland in the currently disturbed areas at an earlier time.

Step 6

The plant community inhabiting each observation point was characterized by an EDI Wetland Ecologist in accordance with methods specified in the Corps Manual. Dominant plant species were identified within five vegetative strata (i.e. herb, shrub, woody vine, sapling and tree) at each sampling point. The Corps Manual defines the vegetative strata in the following manner:

Herb- herbaceous plants including graminoids, forbs, ferns, fern allies, herbaceous vines and tree seedlings;

Shrub-multi-stemmed, bushy shrubs and small trees and saplings between three and twenty feet tall;

Woody Vine - woody, climbing and twining plants;

Sapling- young trees of 0.4 to less than 5.0 inches in diameter-at-breast height that reach 20 feet or more in height; and

Tree - tree of 5.0 or more inches in diameter-at-breast height that reach 20 feet or more in height.

The quadrat sizes chosen for the vegetative strata were (i) a five-foot radius for bryophytes and herbs and (ii) a thirty-foot radius for trees, saplings, shrubs and woody vines. Dominant plant species were estimated using areal coverage methods, and the total dominance measure (sum total of the dominance measure values for all species within each stratum) was recorded. Dominant species are defined in the Corps Manual as the most abundant plant species that when ranked in descending order of abundance and cumulatively totalled immediately exceed 50 percent of the total dominance measure for the stratum, plus any additional species comprising 20 percent or more of the total dominance measure.

The wetland indicator status (OBL, FACW, FAC, FACU, or UPL) listed for each identified species by the U.S. Fish and Wildlife Service in the *National List of Plant Species that Occur in Wetlands: Northeast (Region 1)* was recorded. The U.S. Fish and Wildlife wetland indicator status listings are defined as follows:

OBL - obligate wetland plants that almost always occur in wetlands (estimated probability of >99%);

FACW - facultative wetland plants that usually occur in wetlands (estimated probability of 67 to 99%);

FAC - facultative plants that are equally likely to occur in wetlands or non-wetlands (estimated probability of 34 to 66%);

FACU - facultative upland plants that usually occur in non-wetlands (estimated probability of 67 to 99%); and

UPL - obligate upland plants that almost always occur in non-wetlands (estimated probability of >99%).

The plant community data were summarized on the Vegetation Data forms provided in the Corps Manual and are included in this report as Attachment A.

Step 7

Plant data from each observation point were tested against the hydrophytic vegetation criterion specified in the Corps Manual. If more than 50 percent of the dominant species present at the sample plot had an indicator status of OBL, FACW, and/or FAC, the hydrophytic vegetation criterion was considered to be met. All observation points that met the hydrophytic vegetation criterion were considered potential wetlands and soils were also characterized.

Step 8

The Corps Manual specifies that soils need not be characterized (and are assumed hydric soils) at sampling points meeting the hydrophytic vegetation criterion if: (i) all dominant plant species have an indicator status of OBL, or (ii) all dominant species have an indicator status of OBL and/or FACW, and the wetland boundary is abrupt (at least one dominant OBL species must be present). All observation points sampled during this field investigation were examined directly for soil and hydrologic characteristics.

Step 9

Soil borings were performed by an EDI Senior Soil Scientist using methods specified in the Corps Manual at each observation point. Soil borings were dug using a stainless steel hand auger. The borings were examined to a minimum depth of 10 inches, or to the soil layer immediately below the A horizon, whichever was shallower. All soil samples were checked for hydric soil indicators and a determination was made as to whether the hydric soils criterion was met. Areas with disturbed soils were examined as discussed in Step 5. Results were recorded on Soils and Hydrology data forms taken from the Corps Manual and are included in this report as Attachment B.

Step 10

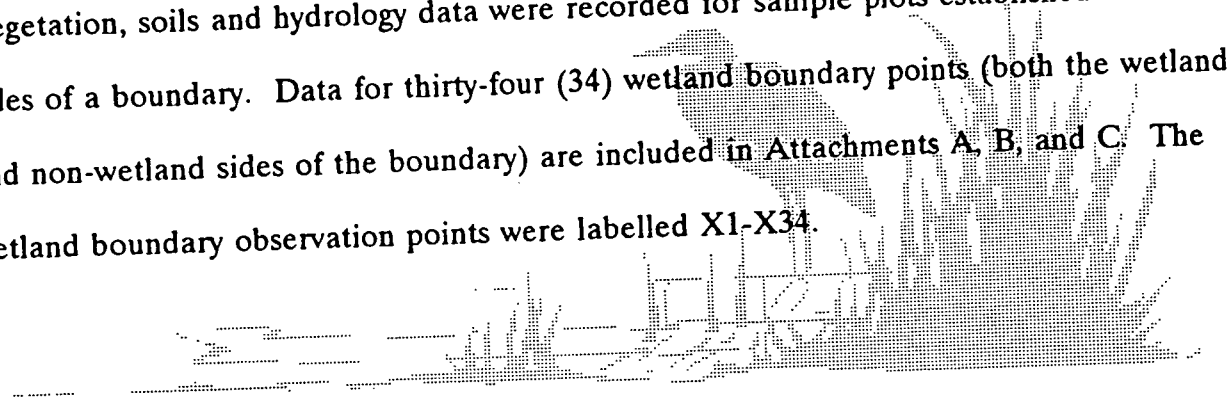
The EDI Senior Soil Scientist examined hydrologic indicators using methods specified by the Corps Manual at each observation point. The wetland hydrology criterion was met if: (i) one or more field indicators was materially present, (ii) available hydrologic records provided necessary evidence, or (iii) the plant community was dominated by OBL, FACW and/or FAC species, and the area's hydrology was not significantly disturbed. Results were recorded on Soils and Hydrology data forms taken from the Corps Manual and are included in this report as Attachment B.

Step 11

A wetland determination was made for every observation point. If a sample plot met the hydrophytic vegetation, hydric soil and wetland hydrology criteria, the area was considered to be wetland. Summary data sheets taken from the Corps Manual were completed for each observation point and are included in this report as Attachment C.

Step 12

The wetland/non-wetland boundary line was delineated for every wetland area identified within the project site using methods specified by the Corps Manual. Vegetation, soils and hydrology data were recorded for sample plots established on both sides of a boundary. Data for thirty-four (34) wetland boundary points (both the wetland and non-wetland sides of the boundary) are included in Attachments A, B, and C. The wetland boundary observation points were labelled X1-X34.



SECTION V

RESULTS AND CONCLUSIONS

Earth Dimensions Inc. (EDI) has completed a wetland delineation study at the Ramco Steel Site located in the City of Lackawanna, County of Erie, State of New York. Information gathered from the SCS, U.S.G.S and NWI maps indicated that wetlands might exist at the site that would be subject to jurisdiction by the U.S. Army Corps of Engineers.

A field investigation was conducted using one Senior Soil Scientist and one Wetland Ecologist from EDI. The wetland delineation study found 4.93± acres of wetland present within the limits of the site. All wetland acreages were calculated by the coordinate geometry method by the surveyor for this project, Nussbaumer & Clarke, Inc.

Simple site maps are presented in Figures 5 and 6 which show the soil types and major plant communities found on the property.

Field examination of the soil within the site showed general agreement to the published SCS soil map (Figure 3). Udorthents (soil/non-soil fill), Minoa, and Lamson were the soils delineated during the investigation. Lamson was the hydric soil identified within one of the wetland areas and within a portion of the wetland area associated with

the pond. Udorthents consisting of flyash, cinders, industrial sediments etc., were also identified within the delineated wetlands. Udorthents and Minoa were the soils associated with the upland side of the wetland boundaries.

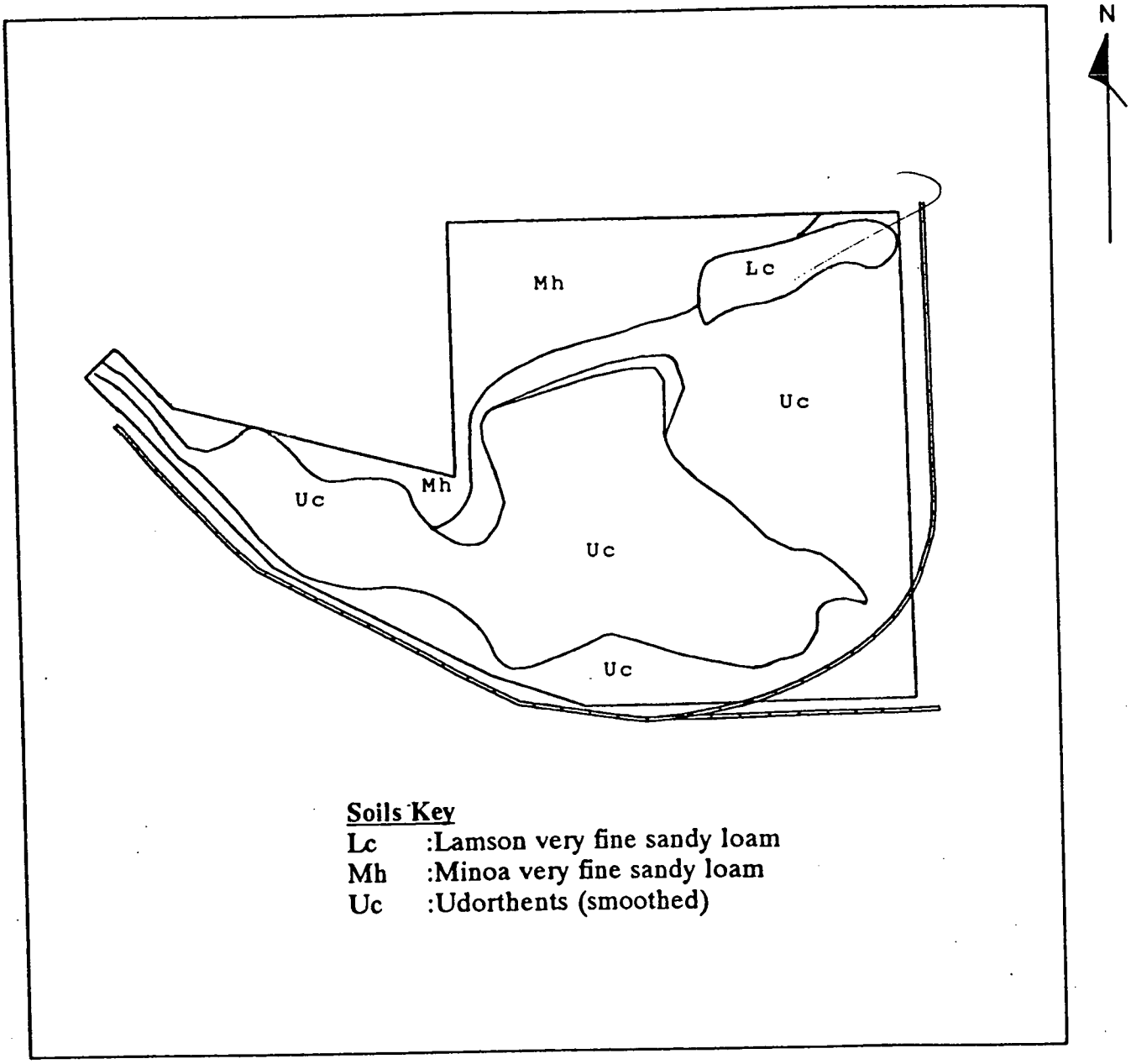
The vegetational communities within his site reflected that the site has a long history of disturbance. The site possesses two (2) vegetational communities described as follows: 1) open herbaceous wetland communities supporting predominantly the dense growth of common reed (*Phragmites australis*) around the perimeter of the pond and the limited growth of narrow-leaf cattail (*Typha angustifolia*), and purple loosestrife (*Lythrum salicaria*), and 2) an upland disturbed vegetational community consisting of dense areas of common reed, common mugwort (*Artemisia vulgaris*) as well as the growth of herbaceous field species such as asters (*Aster spp.*), goldenrods (*Solidago spp.*), Canada bluegrass (*Poa compressa*), field horsetail (*Equisetum arvense*), common dandelion (*Taraxacum officinale*), chicory (*Cichorium intybus*), and Queen Anne's lace (*Daucus carota*). Tree and shrub species occurring throughout the site include eastern cottonwood (*Populus deltoides*), willow (*Salix sp.*), swamp cottonwood (*Populus heterophylla*), grey-stem dogwood (*Cornus foemina*), silky dogwood (*Cornus amomum*), red osier dogwood (*Cornus stolonifera*), and staghorn sumac (*Rhus typhina*).

Vegetation was useful in determining the boundaries of the wetland areas in most situations. In particular, cattail was very useful, being identified within the wetland areas and forming an abrupt wetland boundary in contrast to the surrounding upland area.

Hydrology is generally highly variable during a field investigation and accurate examinations of the landscape must be conducted to assure an accurate delineation. Generally, hydrology was observed to be average for the existing conditions within the site.

Table 1 presents vegetation, soils and hydrology results for all observation points examined within the site. Attachment D notes the references used during the preparation of this report and during the field investigation. Attachment E provides the names, addresses and phone numbers of the survey personnel involved in the wetland delineation study.

Maps are enclosed in Attachment F that show the plan view of the proposed development, the location of the baseline, and all observation points established during the field survey.



Soils Key
Lc :Lamson very fine sandy loam
Mh :Minoa very fine sandy loam
Uc :Udorthents (smoothed)

Figure 5: Simple Site Map *Soil*	Ramco Steel Site City of Lackawanna Erie County, New York

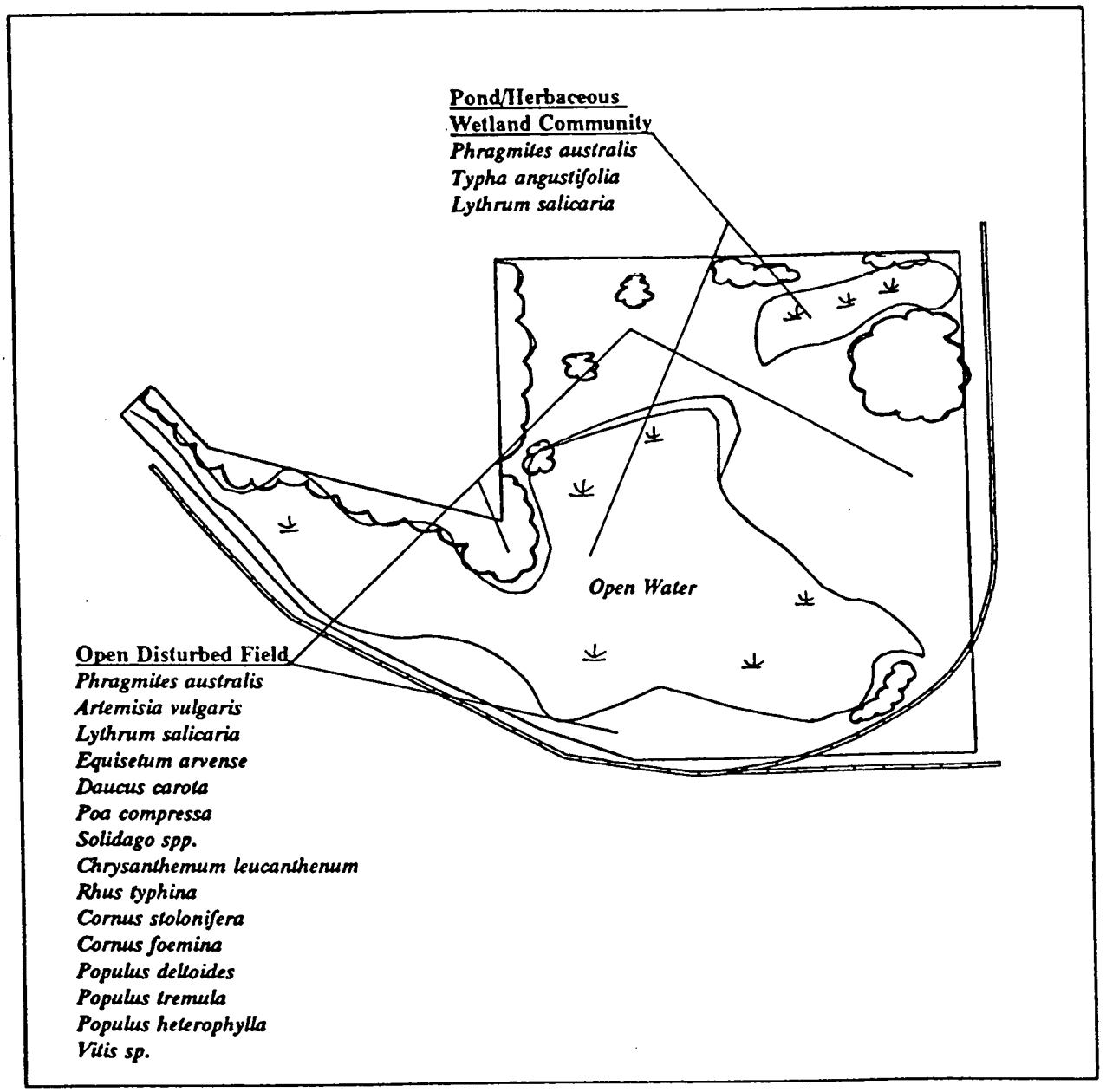
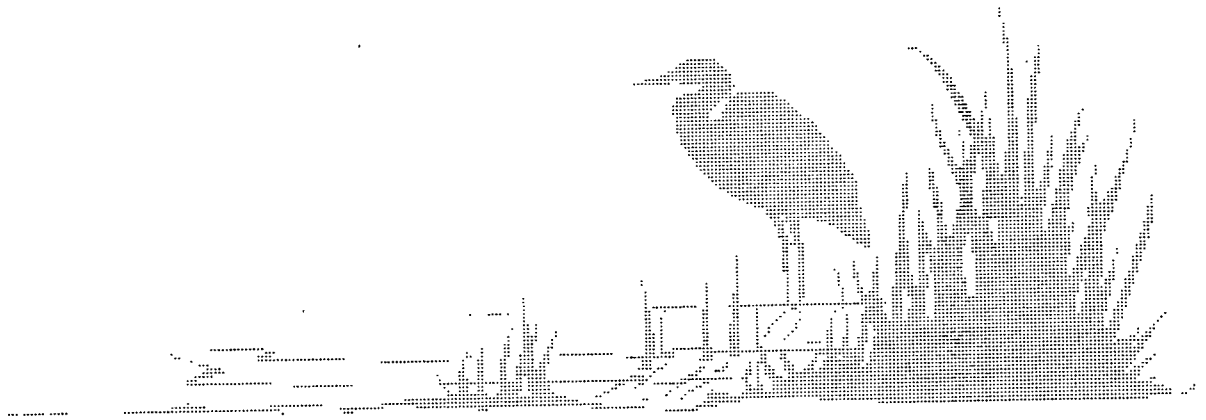


Figure 6: Simple Site Map *Vegetation*	Ramco Steel Site City of Lackawanna Erie County, New York

OBSERVATION POINT	CRITERION MET (YES/NO)			WETLAND DETERMINATION
	VEGETATION	SOILS	HYDROLOGY	
X10 NONWET	YES	UD	NO	NONWETLAND
X11 WET	YES	UD	YES	WETLAND
X11 NONWET	YES	UD	NO	NONWETLAND
X12 WET	YES	UD	YES	WETLAND
X12 NONWET	YES	UD	NO	NONWETLAND
X13 WET	YES	UD	YES	WETLAND
X13 NONWET	YES	UD	NO	NONWETLAND
X14 WET	YES	UD	YES	WETLAND
X14 NONWET	NO	UD	NO	NONWETLAND
X15 WET	YES	UD	YES	WETLAND
X15 NONWET	NO	UD	NO	NONWETLAND
X16 WET	YES	UD	YES	WETLAND
X16 NONWET	YES	UD	NO	NONWETLAND
X17 WET	YES	UD	YES	WETLAND
X17 NONWET	YES	UD	NO	NONWETLAND
X18 WET	YES	UD	YES	WETLAND
X18 NONWET	YES	UD	NO	NONWETLAND
X19 WET	YES	UD	YES	WETLAND
X19 NONWET	YES	UD	NO	NONWETLAND
X20 WET	YES	YES	YES	WETLAND
X20 NONWET	YES	UD	NO	NONWETLAND
X21 WET	YES	YES	YES	WETLAND

OBSERVATION POINT	CRITERION MET (YES/NO)			WETLAND DETERMINATION
	VEGETATION	SOILS	HYDROLOGY	
X32 NONWET	YES	UD	NO	NONWETLAND
X33 WET	YES	YES	YES	WETLAND
X33 NONWET	YES	UD	NO	NONWETLAND
X34 WET	YES	YES	YES	WETLAND
X34 NONWET	YES	UD	NO	NONWETLAND

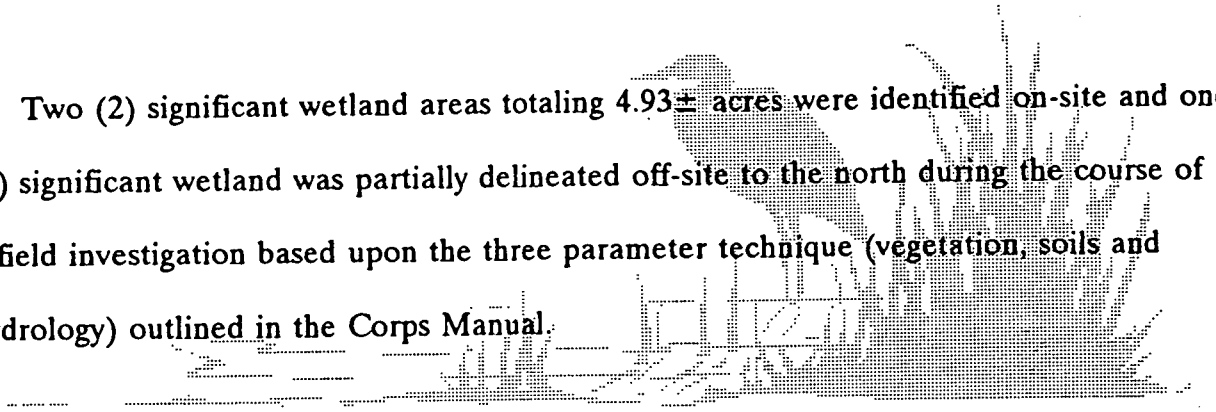
UD: Non-soil materials such as cinders, flyash, slag, industrial sediments etc..



SECTION VI

RECOMMENDATIONS

EDI has completed this wetland delineation study in accordance with the *Corps of Engineers Wetland Delineation Manual* (January 1987). The U.S. Army Corps of Engineers has jurisdiction over wetlands under Section 404 of the Clean Water Act and recommends this manual for the performance of wetland delineations. EDI believes that the results of this study are logically organized, easily defensible, and should be considered the basis of a wetland determination.



Two (2) significant wetland areas totaling 4.93± acres were identified on-site and one (1) significant wetland was partially delineated off-site to the north during the course of a field investigation based upon the three parameter technique (vegetation, soils and hydrology) outlined in the Corps Manual.

The Corps and New York State Department of Environmental Conservation approach their regulatory analyses by first considering avoidance of wetlands and minimization of wetland losses. It is our recommendation that plans for future remedial activities avoid and minimize negative wetland impacts. Dames & Moore has indicated plans for remedial activities within this site. It is the recommendation of EDI that prior to the initiation of any planned activities, which propose impacts to wetlands, Dames & Moore submit this report to the Corps for regulatory review and approvals.

RECRA
ENVIRONMENTAL
INC.

Chemical and Environmental Analysis Services

May 23, 1994

Mr. Peter Smith
Dames & Moore, Inc.
3065 Southwestern Blvd.
Orchard Park, NY 14127

RE: Analytical Results

Dear Mr. Smith:

Please find enclosed results concerning the analyses of the samples recently submitted by your firm. The pertinent information regarding these analyses is listed below:

Quote #:	NY94-415
Project Name:	Ramco Steel
Project #:	25848-001
Matrix:	Aqueous
Samples Received:	04/15/94
Sample Date:	04/15/94

If you have any questions concerning these data, please contact Mr. Robert E. Steiner, Program Manager at (716) 691-2600 and refer to the I.D. number listed below. It has been our pleasure to provide Dames & Moore, Inc. with environmental testing services. We look forward to serving you in the future.

Sincerely,

RECRA ENVIRONMENTAL, INC.

Candace L. Steady for RKW

Robert K. Wyeth
Laboratory Director

Robert E. Steiner

Robert E. Steiner
Program Manager

RES/RKW/rs
Enclosure

I.D. # 94-1495
#NY4A5027

ANALYTICAL RESULTS

Prepared For

Dames & Moore, Inc.
3065 Southwestern Blvd.
Orchard Park, NY 14127

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive
Amherst, New York 14228-2298

METHODOLOGIES

The specific methodology employed in obtaining the enclosed analytical results is indicated on the specific data table. The method number presented refers to one of the following U.S. Environmental Protection Agency references.

* "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846), Third Edition, August 1993, "U.S. Environmental Protection Agency Office of Solid Waste.

* 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants", U.S. Environmental Protection Agency.

COMMENTS

Comments pertain to data on one or all pages of this report.

The enclosed data has been reported utilizing data qualifiers (Q) as defined on the Organic and Inorganic Data Comment Pages.

Quality control analysis was performed on a batch basis. All results were within acceptable limits.

ORGANIC DATA COMMENT PAGE

Laboratory Name: Recra Environmental, Inc.

USEPA Defined Organic Data Qualifiers:

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample.

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

G - The TCLP Matrix Spike recovery was greater than the upper limit of the analytical method.

L - The TCLP Matrix Spike recovery was lower than the lower limit of the analytical method.

T - This flag is used when the analyte is found in the associated TCLP extraction as well as in the sample.

N - Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search. It is applied to all TIC results.

P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on the Form I and flagged with a "P".

A - This flag indicates that a TIC is a suspected aldol-condensation product.

DAMES & MOORE

0003

METHOD 8260 - TCL VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149501
lient ID: MW-1D

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		18	
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.2	U
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	U
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149502
Client ID: MW-1S

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		40	
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.2	U
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	U
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149503
Client ID: RMW-2

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		9	
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		0.2	U
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.2	U
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	U
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149504
Client ID: MW-3

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		2	
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.2	U
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.1	BJ
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149505
Client ID: CW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		25	
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.2	U
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	U
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

aboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
ab Job No:	A94-1495	Dilution Factor:	1
Lab Samp ID:	A4149506	Sample Date:	04/14/94
lient ID:	TRIP BLANK	Analysis Date:	04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		0.2	U
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.2	U
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	U
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: AM005531
Client ID: VBLK25

Matrix: Aqueous
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		0.2	U
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.3	
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149501
Client ID: MW-1D

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		2.4	U
Acenaphthylene		4.4	U
Anthracene		2.4	U
Benzidine		55	U
Benzo(a)anthracene		9.8	U
Benzo(b)fluoranthene		6.0	U
Benzo(k)fluoranthene		3.1	U
Benzo(ghi)perylene		5.1	U
Benzo(a)pyrene		3.1	U
Bis(2-chloroethoxy) methane		6.6	U
Bis(2-chloroethyl) ether		7.1	U
Bis(2-chloroisopropyl) ether		7.1	U
Bis(2-ethylhexyl) phthalate		3.1	U
4-Bromophenyl phenyl ether		2.4	U
Butyl benzyl phthalate		3.1	U
4-Chloro-3-methylphenol		3.8	U
2-Chloronaphthalene		2.4	U
2-Chlorophenol		4.1	U
4-Chlorodiphenylether		5.2	U
Chrysene		3.1	U
Dibenzo(a,h)anthracene		3.1	U
1,3-Dichlorobenzene		2.4	U
1,2-Dichlorobenzene		2.4	U
1,4-Dichlorobenzene		5.5	U
3,3'-Dichlorobenzidine		21	U
2,4-Dichlorophenol		3.4	U
Diethyl phthalate		2.4	U
2,4-Dimethylphenol		3.4	U
Dimethyl phthalate		2.0	U
4,6-Dinitro-2-methylphenol		30	U
1,2-Diphenylhydrazine		12	U
2,4-Dinitrophenol		52	U
2,4-Dinitrotoluene		7.1	U
2,6-Dinitrotoluene		2.4	U

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149501
lient ID: MW-1D

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		3.1	U
Di-n-octyl phthalate		3.1	U
Fluoranthene		2.8	U
Fluorene		2.4	U
Hexachlorobenzene		2.4	U
Hexachlorobutadiene		1.1	U
Hexachlorocyclopentadiene		1.2	U
Hexachloroethane		2.0	U
Indeno(1,2,3-cd)pyrene		4.6	U
Isophorone		2.8	U
Naphthalene		2.0	U
Nitrobenzene		2.4	U
2-Nitrophenol		4.5	U
4-Nitrophenol		3.0	U
N-Nitrosodimethylamine		2.8	U
N-Nitroso-Di-n-propylamine		4.1	U
N-nitrosodiphenylamine		2.4	U
Pentachlorophenol		4.5	U
Phenanthrene		6.8	U
Phenol		1.9	U
Pyrene		2.4	U
1,2,4-Trichlorobenzene		2.4	U
2,4,6-Trichlorophenol		3.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149502
lient ID: MW-1S

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		2.4	U
Acenaphthylene		4.4	U
Anthracene		2.4	U
Benzidine		55	U
Benzo(a)anthracene		9.8	U
Benzo(b)fluoranthene		6.0	U
Benzo(k)fluoranthene		3.1	U
Benzo(ghi)perylene		5.1	U
Benzo(a)pyrene		3.1	U
Bis(2-chloroethoxy) methane		6.6	U
Bis(2-chloroethyl) ether		7.1	U
Bis(2-chloroisopropyl) ether		7.1	U
Bis(2-ethylhexyl) phthalate		3.1	U
4-Bromophenyl phenyl ether		2.4	U
Butyl benzyl phthalate		3.1	U
4-Chloro-3-methylphenol		3.8	U
2-Chloronaphthalene		2.4	U
2-Chlorophenol		4.1	U
4-Chlorodiphenylether		5.2	U
Chrysene		3.1	U
Dibenzo(a,h)anthracene		3.1	U
1,3-Dichlorobenzene		2.4	U
1,2-Dichlorobenzene		2.4	U
1,4-Dichlorobenzene		5.5	U
3,3'-Dichlorobenzidine		21	U
2,4-Dichlorophenol		3.4	U
Diethyl phthalate		2.4	U
2,4-Dimethylphenol		3.4	U
Dimethyl phthalate		2.0	U
4,6-Dinitro-2-methylphenol		30	U
1,2-Diphenylhydrazine		12	U
2,4-Dinitrophenol		52	U
2,4-Dinitrotoluene		7.1	U
2,6-Dinitrotoluene		2.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149502
lient ID: MW-1S

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		3.1	U
Di-n-octyl phthalate		3.1	U
Fluoranthene		2.8	U
Fluorene		2.4	U
Hexachlorobenzene		2.4	U
Hexachlorobutadiene		1.1	U
Hexachlorocyclopentadiene		1.2	U
Hexachloroethane		2.0	U
Indeno(1,2,3-cd)pyrene		4.6	U
Isophorone		2.8	U
Naphthalene		2.0	U
Nitrobenzene		2.4	U
2-Nitrophenol		4.5	U
4-Nitrophenol		3.0	U
N-Nitrosodimethylamine		2.8	U
N-Nitroso-Di-n-propylamine		4.1	U
N-nitrosodiphenylamine		2.4	U
Pentachlorophenol		4.5	U
Phenanthrene		6.8	U
Phenol		1.9	U
Pyrene		2.4	U
1,2,4-Trichlorobenzene		2.4	U
2,4,6-Trichlorophenol		3.4	U

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149503
Client ID: RMW-2

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		2.4	U
Acenaphthylene		4.4	U
Anthracene		2.4	U
Benzidine		55	U
Benzo(a)anthracene		9.8	U
Benzo(b)fluoranthene		6.0	U
Benzo(k)fluoranthene		3.1	U
Benzo(ghi)perylene		5.1	U
Benzo(a)pyrene		3.1	U
Bis(2-chloroethoxy) methane		6.6	U
Bis(2-chloroethyl) ether		7.1	U
Bis(2-chloroisopropyl) ether		7.1	U
Bis(2-ethylhexyl) phthalate		3.1	U
4-Bromophenyl phenyl ether		2.4	U
Butyl benzyl phthalate		3.1	U
4-Chloro-3-methylphenol		3.8	U
2-Chloronaphthalene		2.4	U
2-Chlorophenol		4.1	U
4-Chlorodiphenylether		5.2	U
Chrysene		3.1	U
Dibenzo(a,h)anthracene		3.1	U
1,3-Dichlorobenzene		2.4	U
1,2-Dichlorobenzene		2.4	U
1,4-Dichlorobenzene		5.5	U
3,3'-Dichlorobenzidine		21	U
2,4-Dichlorophenol		3.4	U
Diethyl phthalate		2.4	U
2,4-Dimethylphenol		3.4	U
Dimethyl phthalate		2.0	U
4,6-Dinitro-2-methylphenol		30	U
1,2-Diphenylhydrazine		12	U
2,4-Dinitrophenol		52	U
2,4-Dinitrotoluene		7.1	U
2,6-Dinitrotoluene		2.4	U

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149503
Client ID: RMW-2

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		3.1	U
Di-n-octyl phthalate		3.1	U
Fluoranthene		2.8	U
Fluorene		2.4	U
Hexachlorobenzene		2.4	U
Hexachlorobutadiene		1.1	U
Hexachlorocyclopentadiene		1.2	U
Hexachloroethane		2.0	U
Indeno(1,2,3-cd)pyrene		4.6	U
Isophorone		2.8	U
Naphthalene		2.0	U
Nitrobenzene		2.4	U
2-Nitrophenol		4.5	U
4-Nitrophenol		3.0	U
N-Nitrosodimethylamine		2.8	U
N-Nitroso-Di-n-propylamine		4.1	U
N-nitrosodiphenylamine		2.4	U
Pentachlorophenol		4.5	U
Phenanthrene		6.8	U
Phenol		1.9	U
Pyrene		2.4	U
1,2,4-Trichlorobenzene		2.4	U
2,4,6-Trichlorophenol		3.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149504
Client ID: MW-3

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		2.4	U
Acenaphthylene		4.4	U
Anthracene		2.4	U
Benzidine		55	U
Benzo(a)anthracene		9.8	U
Benzo(b)fluoranthene		6.0	U
Benzo(k)fluoranthene		3.1	U
Benzo(ghi)perylene		5.1	U
Benzo(a)pyrene		3.1	U
Bis(2-chloroethoxy) methane		6.6	U
Bis(2-chloroethyl) ether		7.1	U
Bis(2-chloroisopropyl) ether		7.1	U
Bis(2-ethylhexyl) phthalate		3.1	U
4-Bromophenyl phenyl ether		2.4	U
Butyl benzyl phthalate		3.1	U
4-Chloro-3-methylphenol		3.8	U
2-Chloronaphthalene		2.4	U
2-Chlorophenol		4.1	U
4-Chlorodiphenylether		5.2	U
Chrysene		3.1	U
Dibenzo(a,h)anthracene		3.1	U
1,3-Dichlorobenzene		2.4	U
1,2-Dichlorobenzene		2.4	U
1,4-Dichlorobenzene		5.5	U
3,3'-Dichlorobenzidine		21	U
2,4-Dichlorophenol		3.4	U
Diethyl phthalate		2.4	U
2,4-Dimethylphenol		3.4	U
Dimethyl phthalate		2.0	U
4,6-Dinitro-2-methylphenol		30	U
1,2-Diphenylhydrazine		12	U
2,4-Dinitrophenol		52	U
2,4-Dinitrotoluene		7.1	U
2,6-Dinitrotoluene		2.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149504
lient ID: MW-3

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		3.1	U
Di-n-octyl phthalate		3.1	U
Fluoranthene		2.8	U
Fluorene		2.4	U
Hexachlorobenzene		2.4	U
Hexachlorobutadiene		1.1	U
Hexachlorocyclopentadiene		1.2	U
Hexachloroethane		2.0	U
Indeno(1,2,3-cd)pyrene		4.6	U
Isophorone		2.8	U
Naphthalene		2.0	U
Nitrobenzene		2.4	U
2-Nitrophenol		4.5	U
4-Nitrophenol		3.0	U
N-Nitrosodimethylamine		2.8	U
N-Nitroso-Di-n-propylamine		4.1	U
N-nitrosodiphenylamine		2.4	U
Pentachlorophenol		4.5	U
Phenanthrene		6.8	U
Phenol		1.9	U
Pyrene		2.4	U
1,2,4-Trichlorobenzene		2.4	U
2,4,6-Trichlorophenol		3.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149505
Client ID: CW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		2.4	U
Acenaphthylene		4.4	U
Anthracene		2.4	U
Benzidine		55	U
Benzo(a)anthracene		9.8	U
Benzo(b)fluoranthene		6.0	U
Benzo(k)fluoranthene		3.1	U
Benzo(ghi)perylene		5.1	U
Benzo(a)pyrene		3.1	U
Bis(2-chloroethoxy) methane		6.6	U
Bis(2-chloroethyl) ether		7.1	U
Bis(2-chloroisopropyl) ether		7.1	U
Bis(2-ethylhexyl) phthalate		3.1	U
4-Bromophenyl phenyl ether		2.4	U
Butyl benzyl phthalate		3.1	U
4-Chloro-3-methylphenol		3.8	U
2-Chloronaphthalene		2.4	U
2-Chlorophenol		4.1	U
4-Chlorodiphenylether		5.2	U
Chrysene		3.1	U
Dibenzo(a,h)anthracene		3.1	U
1,3-Dichlorobenzene		2.4	U
1,2-Dichlorobenzene		2.4	U
1,4-Dichlorobenzene		5.5	U
3,3'-Dichlorobenzidine		21	U
2,4-Dichlorophenol		3.4	U
Diethyl phthalate		2.4	U
2,4-Dimethylphenol		3.4	U
Dimethyl phthalate		2.0	U
4,6-Dinitro-2-methylphenol		30	U
1,2-Diphenylhydrazine		12	U
2,4-Dinitrophenol		52	U
2,4-Dinitrotoluene		7.1	U
2,6-Dinitrotoluene		2.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149505
Client ID: CW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		3.1	U
Di-n-octyl phthalate		3.1	U
Fluoranthene		2.8	U
Fluorene		2.4	U
Hexachlorobenzene		2.4	U
Hexachlorobutadiene		1.1	U
Hexachlorocyclopentadiene		1.2	U
Hexachloroethane		2.0	U
Indeno(1,2,3-cd)pyrene		4.6	U
Isophorone		2.8	U
Naphthalene		2.0	U
Nitrobenzene		2.4	U
2-Nitrophenol		4.5	U
4-Nitrophenol		3.0	U
N-Nitrosodimethylamine		2.8	U
N-Nitroso-Di-n-propylamine		4.1	U
N-nitrosodiphenylamine		2.4	U
Pentachlorophenol		4.5	U
Phenanthrene		6.8	U
Phenol		1.9	U
Pyrene		2.4	U
1,2,4-Trichlorobenzene		2.4	U
2,4,6-Trichlorophenol		3.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
Lab Job No:	A94-1495	Dilution Factor:	1
Lab Samp ID:	AM004710	Sample Date:	-
Client ID:	SBLK38	Analysis Date:	04/24/94
		Extraction Date:	04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		1.9	U
Acenaphthylene		3.5	U
Anthracene		1.9	U
Benzidine		44	U
Benzo(a)anthracene		7.8	U
Benzo(b)fluoranthene		4.8	U
Benzo(k)fluoranthene		2.5	U
Benzo(ghi)perylene		4.1	U
Benzo(a)pyrene		2.5	U
Bis(2-chloroethoxy) methane		5.3	U
Bis(2-chloroethyl) ether		5.7	U
Bis(2-chloroisopropyl) ether		5.7	U
Bis(2-ethylhexyl) phthalate		2.5	U
4-Bromophenyl phenyl ether		1.9	U
Butyl benzyl phthalate		2.5	U
4-Chloro-3-methylphenol		3.0	U
2-Chloronaphthalene		1.9	U
2-Chlorophenol		3.3	U
4-Chlorodiphenylether		4.2	U
Chrysene		2.5	U
Dibenzo(a,h)anthracene		2.5	U
1,3-Dichlorobenzene		1.9	U
1,2-Dichlorobenzene		1.9	U
1,4-Dichlorobenzene		4.4	U
3,3'-Dichlorobenzidine		16	U
2,4-Dichlorophenol		2.7	U
Diethyl phthalate		1.9	U
2,4-Dimethylphenol		2.7	U
Dimethyl phthalate		1.6	U
4,6-Dinitro-2-methylphenol		24	U
1,2-Diphenylhydrazine		10	U
2,4-Dinitrophenol		42	U
2,4-Dinitrotoluene		5.7	U
2,6-Dinitrotoluene		1.9	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: AM004710
Client ID: SBLK38

Matrix: Aqueous
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/24/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		2.5	U
Di-n-octyl phthalate		2.5	U
Fluoranthene		2.2	U
Fluorene		1.9	U
Hexachlorobenzene		1.9	U
Hexachlorobutadiene		0.90	U
Hexachlorocyclopentadiene		1.0	U
Hexachloroethane		1.6	U
Indeno(1,2,3-cd)pyrene		3.7	U
Isophorone		2.2	U
Naphthalene		1.6	U
Nitrobenzene		1.9	U
2-Nitrophenol		3.6	U
4-Nitrophenol		2.4	U
N-Nitrosodimethylamine		2.2	U
N-Nitroso-Di-n-propylamine		3.3	U
N-nitrosodiphenylamine		1.9	U
Pentachlorophenol		3.6	U
Phenanthrene		5.4	U
Phenol		1.5	U
Pyrene		1.9	U
1,2,4-Trichlorobenzene		1.9	U
2,4,6-Trichlorophenol		2.7	U

DAMES & MOORE

00022

METHOD 8080 - TCL PESTICIDES

aboratory:	Recra Environmental, Inc. - RECNY	Matrix:	Aqueous
ab Job No:	A94-1495	Dilution Factor:	1
Lab Samp ID:	A4149501	Sample Date:	04/15/94
lient ID:	MW-1D	Analysis Date:	05/06/94
		Extraction Date:	04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.050	U
alpha-BHC		0.050	U
beta-BHC		0.050	U
gamma-BHC (Lindane)		0.050	U
delta-BHC		0.050	U
Chlordane		0.50	U
4,4'-DDD		0.10	U
4,4'-DDE		0.10	U
4,4'-DDT		0.10	U
Dieldrin		0.10	U
Endosulfan I		0.10	U
Endosulfan II		0.10	U
Endosulfan Sulfate		0.10	U
Endrin		0.10	U
Endrin ketone		0.10	U
Heptachlor		0.050	U
Heptachlor epoxide		0.050	U
Methoxychlor		0.50	U
Toxaphene		1.0	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149502
Client ID: MW-1S

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.050	U
alpha-BHC		0.050	U
beta-BHC		0.050	U
gamma-BHC (Lindane)		0.050	U
delta-BHC		0.050	U
Chlordane		0.50	U
4,4'-DDD		0.10	U
4,4'-DDE		0.10	U
4,4'-DDT		0.10	U
Dieldrin		0.10	U
Endosulfan I		0.10	U
Endosulfan II		0.10	U
Endosulfan Sulfate		0.10	U
Endrin		0.10	U
Endrin ketone		0.10	U
Heptachlor		0.050	U
Heptachlor epoxide		0.050	U
Methoxychlor		0.50	U
Toxaphene		1.0	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149503
Client ID: RMW-2

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.062	U
alpha-BHC		0.062	U
beta-BHC		0.062	U
gamma-BHC (Lindane)		0.062	U
delta-BHC		0.062	U
Chlordane		0.62	U
4,4'-DDD		0.12	U
4,4'-DDE		0.12	U
4,4'-DDT		0.12	U
Dieldrin		0.12	U
Endosulfan I		0.12	U
Endosulfan II		0.12	U
Endosulfan Sulfate		0.12	U
Endrin		0.12	U
Endrin ketone		0.12	U
Heptachlor		0.062	U
Heptachlor epoxide		0.062	U
Methoxychlor		0.62	U
Toxaphene		1.2	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: A4149504
Client ID: MW-3

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.062	U
alpha-BHC		0.062	U
beta-BHC		0.062	U
gamma-BHC (Lindane)		0.062	U
delta-BHC		0.062	U
Chlordane		0.62	U
4,4'-DDD		0.12	U
4,4'-DDE		0.12	U
4,4'-DDT		0.12	U
Dieldrin		0.12	U
Endosulfan I		0.12	U
Endosulfan II		0.12	U
Endosulfan Sulfate		0.12	U
Endrin		0.12	U
Endrin ketone		0.12	U
Heptachlor		0.062	U
Heptachlor epoxide		0.062	U
Methoxychlor		0.62	U
Toxaphene		1.2	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1495
Lab Samp ID: A4149505
Client ID: CW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/15/94
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter Units = UG/L	Result	Q
Aldrin	0.062	U
alpha-BHC	0.062	U
beta-BHC	0.062	U
gamma-BHC (Lindane)	0.062	U
delta-BHC	0.062	U
Chlordane	0.62	U
4,4'-DDD	0.12	U
4,4'-DDE	0.12	U
4,4'-DDT	0.12	U
Dieldrin	0.12	U
Endosulfan I	0.12	U
Endosulfan II	0.12	U
Endosulfan Sulfate	0.12	U
Endrin	0.12	U
Endrin ketone	0.12	U
Heptachlor	0.062	U
Heptachlor epoxide	0.062	U
Methoxychlor	0.62	U
Toxaphene	1.2	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Samp ID: AG002443
Client ID: METHOD BLANK

Matrix: Aqueous
Dilution Factor: 1
Sample Date: -
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.050	U
alpha-BHC		0.050	U
beta-BHC		0.050	U
gamma-BHC (Lindane)		0.050	U
delta-BHC		0.050	U
Chlordane		0.50	U
4,4'-DDD		0.10	U
4,4'-DDE		0.10	U
4,4'-DDT		0.10	U
Dieldrin		0.10	U
Endosulfan I		0.10	U
Endosulfan II		0.10	U
Endosulfan Sulfate		0.10	U
Endrin		0.10	U
Endrin ketone		0.10	U
Heptachlor		0.050	U
Heptachlor epoxide		0.050	U
Methoxychlor		0.50	U
Toxaphene		1.0	U

DAMES & MOORE
METHOD 8260 - TCL VOLATILE ORGANICS
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495

Client Sample ID	Lab Sample ID	S1 TOL #	S2 BFB #	S3 DCE #
CW-1	A4149505	91	112	88
MW-1D	A4149501	93	112	89
MW-1S	A4149502	95	114	86
MW-3	A4149504	94	114	90
RMW-2	A4149503	95	110	91
TRIP BLANK	A4149506	96	109	92
VBLK25	AM005531	96	105	94

S1 TOL = Toluene-D8
S2 BFB = p-Bromofluorobenzene
S3 DCE = 1,2-Dichloroethane-D4

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495

Client Sample ID	Lab Sample ID	S1 NBZ	#	S2 FBP	#	S3 TPH	#	S4 PHL	#	S5 2FP	#	S6 TBF	#
CW-1	A4149505	58		48		81		31		39		48	
MW-1D	A4149501	69		57		106		30		42		79	
MW-1S	A4149502	63		45		86		42		51		79	
MW-3	A4149504	66		54		83		43		54		101	
RMW-2	A4149503	68		52		90		48		56		112	
SBLK38	AM004710	52		47		116		34		48		94	

S1 NBZ = Nitrobenzene-D5
S2 FBP = 2-Fluorobiphenyl
S3 TPH = Terphenyl-D14
S4 PHL = Phenol-D5
S5 2FP = 2-Fluorophenol
S6 TBF = 2,4,6-Tribromophenol

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8080 - TCL PESTICIDES
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495

Client Sample ID	Lab Sample ID	S1 DCBP #	S2 TCMX #
CW-1	A4149505	65	75
METHOD BLANK	AG002443	70	50
MW-1D	A4149501	45	75
MW-1S	A4149502	50	80
MW-3	A4149504	50	75
RMW-2	A4149503	55	75

S1 DCBP = Decachlorobiphenyl
S2 TCMX = Tetrachloro-m-xylene

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8260 - TCL VOLATILE ORGANICS
WATER INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495

Client Sample ID	Lab Sample ID	IS1 BCM	#	IS2 DFB	#	IS3 CBZ	#
CW-1	A4149505	86		70		76	
MW-1D	A4149501	78		71		74	
MW-1S	A4149502	72		66		68	
MW-3	A4149504	86		74		76	
RMW-2	A4149503	89		78		80	
TRIP BLANK	A4149506	82		79		77	
VBLK25	AM005531	88		84		82	

IS1 BCM = Bromochloromethane
IS2 DFB = 1,4-Difluorobenzene
IS3 CBZ = Chlorobenzene-D5

Column to be used to flag recovery values
* Values outside of contract required QC limits

DAMES & MOORE
METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES
WATER INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495

Client Sample ID	Lab Sample ID	IS1 DCB	#	IS2 NPT	#	IS3 ANT	#	IS4 PHN	#	IS5 CRY	#	IS6 PRY	#
CW-1	A4149505	90		94		96		95		78		90	
MW-1D	A4149501	92		95		98		101		78		81	
MW-1S	A4149502	104		105		113		112		90		91	
MW-3	A4149504	81		88		93		96		89		105	
RMW-2	A4149503	96		96		105		102		101		108	
SBLK38	AM004710	110		110		110		110		73		85	

IS1 DCB = 1,4-Dichlorobenzene-D4
IS2 NPT = Naphthalene-D8
IS3 ANT = Acenaphthene-D10
IS4 PHN = Phenanthrene-D10
IS5 CRY = Chrysene-D12
IS6 PRY = Perylene-D12

Column to be used to flag recovery values
* Values outside of contract required QC limits

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149501
Client Sample ID: MW-1D

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	0.49	
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0030	U
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.083	
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	178	
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Iron - Total	MG/L	6010	04/29/94	05/02/94	18.4	
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.0020	U
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	20.1	
Manganese - Total	MG/L	6010	04/29/94	05/02/94	853	
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00040	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.030	U
Potassium - Total	MG/L	6010	04/29/94	05/02/94	11.3	
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	38.5	
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.035	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149502
Client Sample ID: MW-1S

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	3.9	
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0030	U
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.12	
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	94.8	
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.023	
Iron - Total	MG/L	6010	04/29/94	05/02/94	39.6	
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.15	
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	7.2	
Manganese - Total	MG/L	6010	04/29/94	05/02/94	1.9	
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00040	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.030	U
Potassium - Total	MG/L	6010	04/29/94	05/02/94	11.4	
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	18.0	
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.094	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149503
Client Sample ID: RMW-2

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	1.8	
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0050	
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.36	
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	164	
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.015	
Iron - Total	MG/L	6010	04/29/94	05/02/94	18.2	
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.014	
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	76.9	
Manganese - Total	MG/L	6010	04/29/94	05/02/94	1.4	
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00040	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.030	U
Potassium - Total	MG/L	6010	04/29/94	05/02/94	23.7	
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	68.6	
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.076	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149504
Client Sample ID: MW-3

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	0.68	
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0030	U
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.15	
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	39.6	
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Iron - Total	MG/L	6010	04/29/94	05/02/94	1.3	
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.0020	U
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	6.3	
Manganese - Total	MG/L	6010	04/29/94	05/02/94	0.066	
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00040	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.030	U
Potassium - Total	MG/L	6010	04/29/94	05/02/94	2.8	
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	12.6	
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.039	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149505
Client Sample ID: CW-1

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	1.5	
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0040	
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.11	
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	350	
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.029	
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.012	
Iron - Total	MG/L	6010	04/29/94	05/02/94	8.1	
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.012	
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	52.7	
Manganese - Total	MG/L	6010	04/29/94	05/02/94	1.6	
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00040	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.036	
Potassium - Total	MG/L	6010	04/29/94	05/02/94	4.2	
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	48.8	
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.071	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1495
Lab Sample ID: AW001328
Client Sample ID: METHOD BLANK

Matrix: Aqueous
Sample Date: -

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	0.090	U
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0030	U
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.020	U
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	1.0	U
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Iron - Total	MG/L	6010	04/29/94	05/02/94	0.040	U
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.0020	U
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	0.10	U
Manganese - Total	MG/L	6010	04/29/94	05/02/94	0.0050	U
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00020	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.030	U
Potassium - Total	MG/L	6010	04/29/94	05/02/94	0.20	U
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	1.0	U
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.010	U

DAMES & MOORE

Soluble Metals Analysis

Laboratory: Recra Environmental, Inc.- RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149501
Client Sample ID: MW-1D

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Analysis Date	Result	Q
Aluminum - Soluble	MG/L	6010	05/02/94	0.090	U
Antimony - Soluble	MG/L	7041	05/03/94	0.0060	U
Arsenic - Soluble	MG/L	7060	05/03/94	0.0030	U
Barium - Soluble	MG/L	6010	05/02/94	0.072	
Beryllium - Soluble	MG/L	6010	05/02/94	0.0030	U
Cadmium - Soluble	MG/L	6010	05/02/94	0.010	U
Calcium - Soluble	MG/L	6010	05/02/94	175	
Chromium - Soluble	MG/L	6010	05/02/94	0.010	U
Cobalt - Soluble	MG/L	6010	05/02/94	0.010	U
Copper - Soluble	MG/L	6010	05/02/94	0.010	U
Iron - Soluble	MG/L	6010	05/02/94	19.0	
Lead - Soluble	MG/L	7421	05/03/94	0.0020	U
Magnesium - Soluble	MG/L	6010	05/02/94	18.4	
Manganese - Soluble	MG/L	6010	05/02/94	0.78	
Mercury - Soluble	MG/L	7470	04/26/94	0.00040	U
Nickel - Soluble	MG/L	6010	05/02/94	0.030	U
Potassium - Soluble	MG/L	6010	05/02/94	11.8	
Selenium - Soluble	MG/L	7740	05/03/94	0.0030	U
Silver - Soluble	MG/L	6010	05/02/94	0.010	U
Sodium - Soluble	MG/L	6010	05/02/94	38.7	
Thallium - Soluble	MG/L	7841	05/03/94	0.0030	U
Vanadium - Soluble	MG/L	6010	05/02/94	0.010	U
Zinc - Soluble	MG/L	6010	05/02/94	0.010	U

DAMES & MOORE

Soluble Metals Analysis

Laboratory: Recra Environmental, Inc.- RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149502
Client Sample ID: MW-1S

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Analysis Date	Result	Q
Aluminum - Soluble	MG/L	6010	05/02/94	0.090	U
Antimony - Soluble	MG/L	7041	05/03/94	0.0060	U
Arsenic - Soluble	MG/L	7060	05/03/94	0.0040	
Barium - Soluble	MG/L	6010	05/02/94	0.097	
Beryllium - Soluble	MG/L	6010	05/02/94	0.0030	U
Cadmium - Soluble	MG/L	6010	05/02/94	0.010	U
Calcium - Soluble	MG/L	6010	05/02/94	94.4	
Chromium - Soluble	MG/L	6010	05/02/94	0.010	U
Cobalt - Soluble	MG/L	6010	05/02/94	0.010	U
Copper - Soluble	MG/L	6010	05/02/94	0.010	U
Iron - Soluble	MG/L	6010	05/02/94	43.2	
Lead - Soluble	MG/L	7421	05/03/94	0.0020	U
Magnesium - Soluble	MG/L	6010	05/02/94	6.9	
Manganese - Soluble	MG/L	6010	05/02/94	1.9	
Mercury - Soluble	MG/L	7470	04/26/94	0.00040	U
Nickel - Soluble	MG/L	6010	05/02/94	0.030	U
Potassium - Soluble	MG/L	6010	05/02/94	11.4	
Selenium - Soluble	MG/L	7740	05/03/94	0.0030	U
Silver - Soluble	MG/L	6010	05/02/94	0.010	U
Sodium - Soluble	MG/L	6010	05/02/94	17.2	
Thallium - Soluble	MG/L	7841	05/03/94	0.0030	U
Vanadium - Soluble	MG/L	6010	05/02/94	0.010	U
Zinc - Soluble	MG/L	6010	05/02/94	0.012	

DAMES & MOORE

Soluble Metals Analysis

Laboratory: Recra Environmental, Inc.- RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149503
Client Sample ID: RMW-2

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Analysis Date	Result	Q
Aluminum - Soluble	MG/L	6010	05/02/94	0.090	U
Antimony - Soluble	MG/L	7041	05/03/94	0.0060	U
Arsenic - Soluble	MG/L	7060	05/03/94	0.0030	
Barium - Soluble	MG/L	6010	05/02/94	0.37	
Beryllium - Soluble	MG/L	6010	05/02/94	0.0030	U
Cadmium - Soluble	MG/L	6010	05/02/94	0.010	U
Calcium - Soluble	MG/L	6010	05/02/94	150	
Chromium - Soluble	MG/L	6010	05/02/94	0.010	U
Cobalt - Soluble	MG/L	6010	05/02/94	0.010	U
Copper - Soluble	MG/L	6010	05/02/94	0.010	U
Iron - Soluble	MG/L	6010	05/02/94	19.3	
Lead - Soluble	MG/L	7421	05/03/94	0.0020	U
Magnesium - Soluble	MG/L	6010	05/02/94	71.0	
Manganese - Soluble	MG/L	6010	05/02/94	1.5	
Mercury - Soluble	MG/L	7470	04/26/94	0.00040	U
Nickel - Soluble	MG/L	6010	05/02/94	0.030	U
Potassium - Soluble	MG/L	6010	05/02/94	22.5	
Selenium - Soluble	MG/L	7740	05/03/94	0.0030	U
Silver - Soluble	MG/L	6010	05/02/94	0.010	U
Sodium - Soluble	MG/L	6010	05/02/94	68.2	
Thallium - Soluble	MG/L	7841	05/03/94	0.0030	U
Vanadium - Soluble	MG/L	6010	05/02/94	0.010	U
Zinc - Soluble	MG/L	6010	05/02/94	0.010	U

DAMES & MOORE

Soluble Metals Analysis

Laboratory: Recra Environmental, Inc.- RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149504
Client Sample ID: MW-3

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Analysis Date	Result	Q
Aluminum - Soluble	MG/L	6010	05/02/94	0.090	U
Antimony - Soluble	MG/L	7041	05/03/94	0.0060	U
Arsenic - Soluble	MG/L	7060	05/03/94	0.0030	
Barium - Soluble	MG/L	6010	05/02/94	0.15	
Beryllium - Soluble	MG/L	6010	05/02/94	0.0030	U
Cadmium - Soluble	MG/L	6010	05/02/94	0.010	U
Calcium - Soluble	MG/L	6010	05/02/94	26.8	
Chromium - Soluble	MG/L	6010	05/02/94	0.010	U
Cobalt - Soluble	MG/L	6010	05/02/94	0.010	U
Copper - Soluble	MG/L	6010	05/02/94	0.010	U
Iron - Soluble	MG/L	6010	05/02/94	0.040	U
Lead - Soluble	MG/L	7421	05/03/94	0.0020	U
Magnesium - Soluble	MG/L	6010	05/02/94	4.7	
Manganese - Soluble	MG/L	6010	05/02/94	0.0050	
Mercury - Soluble	MG/L	7470	04/26/94	0.00040	U
Nickel - Soluble	MG/L	6010	05/02/94	0.030	U
Potassium - Soluble	MG/L	6010	05/02/94	3.1	
Selenium - Soluble	MG/L	7740	05/03/94	0.0030	U
Silver - Soluble	MG/L	6010	05/02/94	0.010	U
Sodium - Soluble	MG/L	6010	05/02/94	13.4	
Thallium - Soluble	MG/L	7841	05/03/94	0.0030	U
Vanadium - Soluble	MG/L	6010	05/02/94	0.010	U
Zinc - Soluble	MG/L	6010	05/02/94	0.010	U

DAMES & MOORE

Soluble Metals Analysis

Laboratory: Recra Environmental, Inc.- RECNY
Lab Job No: A94-1495
Lab Sample ID: A4149505
Client Sample ID: CW-1

Matrix: Aqueous
Sample Date: 04/15/94

Dilution Factor: 1

Parameter	Units	Method	Analysis Date	Result	Q
Aluminum - Soluble	MG/L	6010	05/02/94	0.090	U
Antimony - Soluble	MG/L	7041	05/03/94	0.0060	U
Arsenic - Soluble	MG/L	7060	05/03/94	0.0030	U
Barium - Soluble	MG/L	6010	05/02/94	0.089	
Beryllium - Soluble	MG/L	6010	05/02/94	0.0030	U
Cadmium - Soluble	MG/L	6010	05/02/94	0.010	U
Calcium - Soluble	MG/L	6010	05/02/94	211	
Chromium - Soluble	MG/L	6010	05/02/94	0.010	U
Cobalt - Soluble	MG/L	6010	05/02/94	0.021	
Copper - Soluble	MG/L	6010	05/02/94	0.010	U
Iron - Soluble	MG/L	6010	05/02/94	1.4	
Lead - Soluble	MG/L	7421	05/03/94	0.0020	U
Magnesium - Soluble	MG/L	6010	05/02/94	42.4	
Manganese - Soluble	MG/L	6010	05/02/94	1.2	
Mercury - Soluble	MG/L	7470	04/26/94	0.00040	U
Nickel - Soluble	MG/L	6010	05/02/94	0.030	U
Potassium - Soluble	MG/L	6010	05/02/94	3.9	
Selenium - Soluble	MG/L	7740	05/03/94	0.0030	U
Silver - Soluble	MG/L	6010	05/02/94	0.010	U
Sodium - Soluble	MG/L	6010	05/02/94	48.2	
Thallium - Soluble	MG/L	7841	05/03/94	0.0030	U
Vanadium - Soluble	MG/L	6010	05/02/94	0.010	U
Zinc - Soluble	MG/L	6010	05/02/94	0.015	

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 25848-001

SITE NAME: Ramco Steel

SAMPLERS (SIGNATURE): P. Smith / K. Ignastak

STATION NO	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO OF CONTAINERS	VOC	SVOA	Pest	Metals - total	Metals - filtered	REMARKS
MW-1D	4/15	1155		X	With MW-1D	6	2	1	1	1	1	Ground water
MW-1S	4/15	1125		X	With MW-1S	6	2	1	1	1	1	
RMW-2	4/15	1415		X	Middle well	6	2	1	1	1	1	
MW-3	4/15	1330		X	South east well	6	2	1	1	1	1	
CW-1	4/15	1600		X	North east well	6	2	1	1	1	1	

PSA

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
P. Smith	4-15-94 1640				
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
	4-15-94 17:18				
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE/TIME	REMARKS	
				Rec'd 2 x 40 ml trip Blanks that were not on the COC	

Distribution: Original accompanies shipment copy to coordinator field files

DJB 4/15/94

RECRA
ENVIRONMENTAL
INC.

Chemical and Environmental Analysis Services

May 27, 1994

Mr. Peter Smith
Dames & Moore, Inc.
3065 Southwestern Blvd.
Orchard Park, NY 14127

RE: Analytical Results

Dear Mr. Smith:

Please find enclosed results concerning the analyses of the samples recently submitted by your firm. The pertinent information regarding these analyses is listed below:

Quote #:	NY94-415
Project Name:	Ramco Steel
Project #:	25848-001
Matrix:	Aqueous, Soil
Samples Received:	04/18/94
Sample Date:	04/18/94

If you have any questions concerning these data, please contact Mr. Robert E. Steiner, Program Manager at (716) 691-2600 and refer to the I.D. number listed below. It has been our pleasure to provide Dames & Moore, Inc. with environmental testing services. We look forward to serving you in the future.

Sincerely,

RECRA ENVIRONMENTAL, INC.

For Robert K. Wyeth
Laboratory Director

Robert E. Steiner
Program Manager

RES/RKW/rs
Enclosure

I.D. #94-1516
#NY4A5027

ANALYTICAL RESULTS

Prepared For

Dames & Moore, Inc.
3065 Southwestern Blvd.
Orchard Park, NY 14127

Prepared By

Recra Environmental, Inc.
10 Hazelwood Drive
Amherst, New York 14228-2298

METHODOLOGIES

The specific methodology employed in obtaining the enclosed analytical results is indicated on the specific data table. The method number presented refers to one of the following U.S. Environmental Protection Agency references.

* "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" (SW-846), Third Edition, August 1993, "U.S. Environmental Protection Agency Office of Solid Waste.

* 40 CFR Part 136 "Guidelines Establishing Test Procedures for the Analysis of Pollutants", U.S. Environmental Protection Agency.

COMMENTS

Comments pertain to data on one or all pages of this report.

The enclosed data has been reported utilizing data qualifiers (Q) as defined on the Organic and Inorganic Data Comment Pages.

Quality control analysis was performed on a batch basis. All results were within acceptable limits with the exceptions listed below.

The results of soil samples have been corrected for moisture content and are reported on a dry weight basis.

VOLATILE DATA

No deviations from protocol were encountered during analysis.

SEMIVOLATILE DATA

Sample RS-1 exhibited three (3) internal standard compounds as outside of quality control limits. This sample was re-analyzed with similar results. Both sets of data are included.

Sample RS-2 exhibited two (2) surrogate and all six (6) internal standard compounds as outside of quality control limits. This sample was re-analyzed with similar results. Both sets of data are included.

Sample RS-3 exhibited two (2) surrogate and all six (6) internal standard compounds as outside of quality control limits. This sample was re-analyzed with one (1) internal standard compound remaining outside of quality control limits. Both sets of data are included.

Sample RS-4 exhibited four (4) internal standard compounds as outside of quality control limits. This sample was re-analyzed with two (2) internal standards remaining outside of quality control limits.

PESTICIDE/PCB DATA

Due to the presence of Aroclor 1260 in samples RS-1 and RS-2, the recoveries of surrogate compound Hexabromobenzene could not be calculated in these samples.

METALS DATA

No deviations from protocol were encountered during analysis.

ORGANIC DATA COMMENT PAGE

Laboratory Name: Recra Environmental, Inc.

USEPA Defined Organic Data Qualifiers:

U - Indicates compound was analyzed for but not detected.

J - Indicates an estimated value. This flag is used either when estimating a concentration for tentatively identified compounds where a 1:1 response is assumed, or when the mass spectral data indicates the presence of a compound that meets the identification criteria but the result is less than the sample quantitation limit but greater than zero.

C - This flag applies to pesticide results where the identification has been confirmed by GC/MS.

B - This flag is used when the analyte is found in the associated blank as well as in the sample.

E - This flag identifies compounds whose concentrations exceed the calibration range of the GC/MS instrument for that specific analysis.

D - This flag identifies all compounds identified in an analysis at a secondary dilution factor.

G - The TCLP Matrix Spike recovery was greater than the upper limit of the analytical method.

L - The TCLP Matrix Spike recovery was lower than the lower limit of the analytical method.

T - This flag is used when the analyte is found in the associated TCLP extraction as well as in the sample.

N - Indicates presumptive evidence of a compound. This flag is only used for tentatively identified compounds, where the identification is based on a mass spectral library search. It is applied to all TIC results.

P - This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on the Form I and flagged with a "P".

A - This flag indicates that a TIC is a suspected aldol-condensation product.

INORGANIC DATA COMMENT PAGE

Laboratory Name: Recra Environmental, Inc.

USEPA Defined Inorganic Data Qualifiers:

B	-	Indicates a value greater than or equal to the instrument detection limit, but less than the contract required detection limit.
U	-	Indicates element was analyzed for but not detected. Report with the detection limit value (e.g., 100).
E	-	Indicates a value estimated or not reported due to the presence of interference.
S	-	Indicates value determined by Method of Standard Addition.
N	-	Indicates spike sample recovery is not within control limits.
*	-	Indicates duplicate analysis is not within control limits.
+	-	Indicates the correlation coefficient for Method of Standard Addition is less than 0.995.
M	-	Indicates duplicate injection results exceeded control limits.
W	-	Post digestion spike for Furnace AA analysis is out of control limits (85-115%), while sample absorbance is less than 50% of spike absorbance.

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1516
Lab Samp ID: A4151601
lient ID: RMW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		8	
Carbon Tetrachloride		0.2	U
Chlorobenzene		4	B
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.9	
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	U
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8260 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AM005523
Client ID: METHOD BLANK

Matrix: Aqueous
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/19/94

Parameter	Units = UG/L	Result	Q
Acetone		0.4	U
Benzene		0.2	U
Bromodichloromethane		0.2	U
Bromoform		0.2	U
Bromomethane		0.4	U
2-Butanone		0.4	U
Carbon Disulfide		0.2	U
Carbon Tetrachloride		0.2	U
Chlorobenzene		0.3	
Chloroethane		0.4	U
Chloroform		0.2	U
Chloromethane		0.4	U
Dibromochloromethane		0.2	U
1,1-Dichloroethane		0.2	U
1,2-Dichloroethane		0.2	U
1,1-Dichloroethene		0.2	U
1,2-Dichloroethene (Total)		0.2	U
1,2-Dichloropropane		0.2	U
cis-1,3-Dichloropropene		0.2	U
trans-1,3-Dichloropropene		0.2	U
Ethyl benzene		0.2	U
2-Hexanone		0.4	U
Methylene chloride		0.2	U
4-Methyl-2-pentanone		0.4	U
Styrene		0.2	U
1,1,2,2-Tetrachloroethane		0.2	U
Tetrachloroethene		0.2	U
Toluene		0.2	
1,1,1-Trichloroethane		0.2	U
1,1,2-Trichloroethane		0.2	U
Trichloroethene		0.2	U
Vinyl acetate		0.4	U
Vinyl chloride		0.4	U
Total Xylenes		0.2	U

DAMES & MOORE

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151602
Client ID: RS-1

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/19/94
% Dry Weight: 26.00

Parameter	Units = UG/KG	Result	Q
Acetone		37	U
Benzene		18	U
Bromodichloromethane		18	U
Bromoform		18	U
Bromomethane		37	U
2-Butanone		37	U
Carbon Disulfide		18	U
Carbon Tetrachloride		18	U
Chlorobenzene		18	U
Chloroethane		37	U
Chloroform		13	J
Chloromethane		37	U
Dibromochloromethane		18	U
1,1-Dichloroethane		18	U
1,2-Dichloroethane		18	U
1,1-Dichloroethene		18	U
1,2-Dichloroethene (Total)		18	U
1,2-Dichloropropane		18	U
cis-1,3-Dichloropropene		18	U
trans-1,3-Dichloropropene		18	U
Ethyl benzene		18	U
2-Hexanone		37	U
Methylene chloride		18	U
4-Methyl-2-pentanone		37	U
Styrene		18	U
1,1,2,2-Tetrachloroethane		18	U
Tetrachloroethene		18	U
Toluene		18	U
1,1,1-Trichloroethane		18	U
1,1,2-Trichloroethane		18	U
Trichloroethene		18	U
Vinyl acetate		37	U
Vinyl chloride		37	U
Total Xylenes		18	U

DAMES & MOORE

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151603
Client ID: RS-2

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/19/94
% Dry Weight: 38.00

Parameter	Units = UG/KG	Result	Q
Acetone		26	U
Benzene		13	U
Bromodichloromethane		13	U
Bromoform		13	U
Bromomethane		26	U
2-Butanone		26	U
Carbon Disulfide		13	U
Carbon Tetrachloride		13	U
Chlorobenzene		13	U
Chloroethane		26	U
Chloroform		6	J
Chloromethane		26	U
Dibromochloromethane		13	U
1,1-Dichloroethane		13	U
1,2-Dichloroethane		13	U
1,1-Dichloroethene		13	U
1,2-Dichloroethene (Total)		13	U
1,2-Dichloropropane		13	U
cis-1,3-Dichloropropene		13	U
trans-1,3-Dichloropropene		13	U
Ethyl benzene		13	U
2-Hexanone		26	U
Methylene chloride		13	U
4-Methyl-2-pentanone		26	U
Styrene		13	U
1,1,2,2-Tetrachloroethane		13	U
Tetrachloroethene		13	U
Toluene		13	U
1,1,1-Trichloroethane		13	U
1,1,2-Trichloroethane		13	U
Trichloroethene		13	U
Vinyl acetate		26	U
Vinyl chloride		26	U
Total Xylenes		13	U

DAMES & MOORE

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151604
Client ID: RS-3

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/19/94
% Dry Weight: 51.00

Parameter	Units = UG/KG	Result	Q
Acetone		20	U
Benzene		10	U
Bromodichloromethane		10	U
Bromoform		10	U
Bromomethane		20	U
2-Butanone		20	U
Carbon Disulfide		10	U
Carbon Tetrachloride		10	U
Chlorobenzene		10	U
Chloroethane		20	U
Chloroform		10	U
Chloromethane		20	U
Dibromochloromethane		10	U
1,1-Dichloroethane		10	U
1,2-Dichloroethane		10	U
1,1-Dichloroethene		10	U
1,2-Dichloroethene (Total)		10	U
1,2-Dichloropropane		10	U
cis-1,3-Dichloropropene		10	U
trans-1,3-Dichloropropene		10	U
Ethyl benzene		10	U
2-Hexanone		20	U
Methylene chloride		10	U
4-Methyl-2-pentanone		20	U
Styrene		10	U
1,1,2,2-Tetrachloroethane		10	U
Tetrachloroethene		10	U
Toluene		10	U
1,1,1-Trichloroethane		10	U
1,1,2-Trichloroethane		10	U
Trichloroethene		10	U
Vinyl acetate		20	U
Vinyl chloride		20	U
Total Xylenes		10	U

DAMES & MOORE

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151605
Client ID: RS-4

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/19/94
% Dry Weight: 43.00

Parameter	Units = UG/KG	Result	Q
Acetone		23	U
Benzene		11	U
Bromodichloromethane		11	U
Bromoform		11	U
Bromomethane		23	U
2-Butanone		23	U
Carbon Disulfide		11	U
Carbon Tetrachloride		11	U
Chlorobenzene		11	U
Chloroethane		23	U
Chloroform		11	U
Chloromethane		23	U
Dibromochloromethane		11	U
1,1-Dichloroethane		11	U
1,2-Dichloroethane		11	U
1,1-Dichloroethene		11	U
1,2-Dichloroethene (Total)		11	U
1,2-Dichloropropane		11	U
cis-1,3-Dichloropropene		11	U
trans-1,3-Dichloropropene		11	U
Ethyl benzene		11	U
2-Hexanone		23	U
Methylene chloride		11	U
4-Methyl-2-pentanone		23	U
Styrene		11	U
1,1,2,2-Tetrachloroethane		11	U
Tetrachloroethene		11	U
Toluene		11	U
1,1,1-Trichloroethane		11	U
1,1,2-Trichloroethane		11	U
Trichloroethene		11	U
Vinyl acetate		23	U
Vinyl chloride		23	U
Total Xylenes		11	U

DAMES & MOORE

METHOD 8240 - TCL VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AM005508
Client ID: METHOD BLANK

Matrix: Soil
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/19/94
% Dry Weight: 100.00

Low

Parameter	Units = UG/KG	Result	Q
Acetone		10	U
Benzene		5	U
Bromodichloromethane		5	U
Bromoform		5	U
Bromomethane		10	U
2-Butanone		10	U
Carbon Disulfide		5	U
Carbon Tetrachloride		5	U
Chlorobenzene		5	U
Chloroethane		10	U
Chloroform		5	U
Chloromethane		10	U
Dibromochloromethane		5	U
1,1-Dichloroethane		5	U
1,2-Dichloroethane		5	U
1,1-Dichloroethene		5	U
1,2-Dichloroethene (Total)		5	U
1,2-Dichloropropane		5	U
cis-1,3-Dichloropropene		5	U
trans-1,3-Dichloropropene		5	U
Ethyl benzene		5	U
2-Hexanone		10	U
Methylene chloride		5	U
4-Methyl-2-pentanone		10	U
Styrene		5	U
1,1,2,2-Tetrachloroethane		5	U
Tetrachloroethene		5	U
Toluene		5	U
1,1,1-Trichloroethane		5	U
1,1,2-Trichloroethane		5	U
Trichloroethene		5	U
Vinyl acetate		10	U
Vinyl chloride		10	U
Total Xylenes		5	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151601
Client ID: RMW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Acenaphthene		2.4	U
Acenaphthylene		4.4	U
Anthracene		2.4	U
Benzidine		55	U
Benzo(a)anthracene		9.8	U
Benzo(b)fluoranthene		6.0	U
Benzo(k)fluoranthene		3.1	U
Benzo(ghi)perylene		5.1	U
Benzo(a)pyrene		3.1	U
Bis(2-chloroethoxy) methane		6.6	U
Bis(2-chloroethyl) ether		7.1	U
Bis(2-chloroisopropyl) ether		7.1	U
Bis(2-ethylhexyl) phthalate		3.1	U
4-Bromophenyl phenyl ether		2.4	U
Butyl benzyl phthalate		3.1	U
4-Chloro-3-methylphenol		3.8	U
2-Chloronaphthalene		2.4	U
2-Chlorophenol		4.1	U
4-Chlorodiphenylether		5.2	U
Chrysene		3.1	U
Dibenzo(a,h)anthracene		3.1	U
1,3-Dichlorobenzene		2.4	U
1,2-Dichlorobenzene		2.4	U
1,4-Dichlorobenzene		5.5	U
3,3'-Dichlorobenzidine		21	U
2,4-Dichlorophenol		3.4	U
Diethyl phthalate		2.4	U
2,4-Dimethylphenol		3.4	U
Dimethyl phthalate		2.0	U
4,6-Dinitro-2-methylphenol		30	U
1,2-Diphenylhydrazine		12	U
2,4-Dinitrophenol		52	U
2,4-Dinitrotoluene		7.1	U
2,6-Dinitrotoluene		2.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151601
Client ID: RMW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/25/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		3.1	U
Di-n-octyl phthalate		3.1	U
Fluoranthene		2.8	U
Fluorene		2.4	U
Hexachlorobenzene		2.4	U
Hexachlorobutadiene		1.1	U
Hexachlorocyclopentadiene		1.2	U
Hexachloroethane		2.0	U
Indeno(1,2,3-cd)pyrene		4.6	U
Isophorone		2.8	U
Naphthalene		2.0	U
Nitrobenzene		2.4	U
2-Nitrophenol		4.5	U
4-Nitrophenol		3.0	U
N-Nitrosodimethylamine		2.8	U
N-Nitroso-Di-n-propylamine		4.1	U
N-nitrosodiphenylamine		2.4	U
Pentachlorophenol		4.5	U
Phenanthrene		6.8	U
Phenol		1.9	U
Pyrene		2.4	U
1,2,4-Trichlorobenzene		2.4	U
2,4,6-Trichlorophenol		3.4	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AM004734
Client ID: METHOD BLANK

Matrix: Aqueous
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/24/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Result	Q
Di-n-butyl phthalate		2.5	U
Di-n-octyl phthalate		2.5	U
Fluoranthene		2.2	U
Fluorene		1.9	U
Hexachlorobenzene		1.9	U
Hexachlorobutadiene		0.90	U
Hexachlorocyclopentadiene		1.0	U
Hexachloroethane		1.6	U
Indeno(1,2,3-cd)pyrene		3.7	U
Isophorone		2.2	U
Naphthalene		1.6	U
Nitrobenzene		1.9	U
2-Nitrophenol		3.6	U
4-Nitrophenol		2.4	U
N-Nitrosodimethylamine		2.2	U
N-Nitroso-Di-n-propylamine		3.3	U
N-nitrosodiphenylamine		1.9	U
Pentachlorophenol		3.6	U
Phenanthrene		5.4	U
Phenol		1.5	U
Pyrene		1.9	U
1,2,4-Trichlorobenzene		1.9	U
2,4,6-Trichlorophenol		2.7	U

DAMES & MOORE

METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AM004734
Client ID: METHOD BLANK

Matrix: Aqueous
Dilution Factor 1
Sample Date: -
Analysis Date: 04/24/94
Extraction Date: 04/22/94

Parameter	Units = UG/L	Resul	Q
Acenaphthene		1.9	U
Acenaphthylene		3.5	U
Anthracene		1.9	U
Benzidine		44	U
Benzo(a)anthracene		7.8	U
Benzo(b)fluoranthene		4.8	U
Benzo(k)fluoranthene		2.5	U
Benzo(ghi)perylene		4.1	U
Benzo(a)pyrene		2.5	U
Bis(2-chloroethoxy) methane		5.3	U
Bis(2-chloroethyl) ether		5.7	U
Bis(2-chloroisopropyl) ether		5.7	U
Bis(2-ethylhexyl) phthalate		2.5	U
4-Bromophenyl phenyl ether		1.9	U
Butyl benzyl phthalate		2.5	U
4-Chloro-3-methylphenol		3.0	U
2-Chloronaphthalene		1.9	U
2-Chlorophenol		3.3	U
4-Chlorodiphenylether		4.2	U
Chrysene		2.5	U
Dibenzo(a,h)anthracene		2.5	U
1,3-Dichlorobenzene		1.9	U
1,2-Dichlorobenzene		1.9	U
1,4-Dichlorobenzene		4.4	U
3,3'-Dichlorobenzidine		16	U
2,4-Dichlorophenol		2.7	U
Diethyl phthalate		1.9	U
2,4-Dimethylphenol		2.7	U
Dimethyl phthalate		1.6	U
4,6-Dinitro-2-methylphenol		24	U
1,2-Diphenylhydrazine		10	U
2,4-Dinitrophenol		42	U
2,4-Dinitrotoluene		5.7	U
2,6-Dinitrotoluene		1.9	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151602
Client ID: RS-1

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 24.50

Parameter	Units = UG/KG	Result	Q
Acenaphthene		500	J
Acenaphthylene		1300	U
Anthracene		1300	U
Benzo(a)anthracene		1300	U
Benzo(b)fluoranthene		1300	U
Benzo(k)fluoranthene		1300	U
Benzo(ghi)perylene		1300	U
Benzo(a)pyrene		1300	U
Benzoic acid		6400	U
Benzyl alcohol		1300	U
Bis(2-chloroethoxy) methane		1300	U
Bis(2-chloroethyl) ether		1300	U
Bis(2-chloroisopropyl) ether		1300	U
Bis(2-ethylhexyl) phthalate		1300	U
4-Bromophenyl phenyl ether		1300	U
Butyl benzyl phthalate		1300	U
4-Chloroaniline		1300	U
4-Chloro-3-methylphenol		1300	U
2-Chloronaphthalene		1300	U
2-Chlorophenol		1300	U
4-Chlorodiphenylether		1300	U
Chrysene		1300	U
Dibenzo(a,h)anthracene		1300	U
Dibenzofuran		1300	U
Di-n-butyl phthalate		1300	U
1,2-Dichlorobenzene		1300	U
1,3-Dichlorobenzene		1300	U
1,4-Dichlorobenzene		1300	U
3,3'-Dichlorobenzidine		2600	U
2,4-Dichlorophenol		1300	U
Diethyl phthalate		1300	U
2,4-Dimethylphenol		1300	U
Dimethyl phthalate		1300	U
4,6-Dinitro-2-methylphenol		6400	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1516
Lab Samp ID: A4151602
Client ID: RS-1

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 24.50

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		6400	U
2,4-Dinitrotoluene		1300	U
2,6-Dinitrotoluene		1300	U
Di-n-octyl phthalate		1300	U
Fluoranthene		1300	U
Fluorene		1300	U
Hexachlorobenzene		1300	U
Hexachlorobutadiene		1300	U
Hexachlorocyclopentadiene		1300	U
Hexachloroethane		1300	U
Indeno(1,2,3-cd)pyrene		1300	U
Isophorone		1300	U
2-Methylnaphthalene		340	J
2-Methylphenol		1300	U
4-Methylphenol		180	J
Naphthalene		540	J
2-Nitroaniline		6400	U
3-Nitroaniline		6400	U
4-Nitroaniline		6400	U
Nitrobenzene		1300	U
2-Nitrophenol		1300	U
4-Nitrophenol		6400	U
N-nitrosodiphenylamine		1300	U
N-Nitroso-Di-n-propylamine		1300	U
Pentachlorophenol		6400	U
Phenanthrene		1300	U
Phenol		1300	U
Pyrene		1300	U
1,2,4-Trichlorobenzene		100	J
2,4,5-Trichlorophenol		6400	U
2,4,6-Trichlorophenol		1300	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151602RI
Client ID: RS-1RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 24.50

Parameter	Units = UG/KG	Result	Q
Acenaphthene		1000	J
Acenaphthylene		1300	U
Anthracene		1300	U
Benzo(a)anthracene		1300	U
Benzo(b)fluoranthene		1300	U
Benzo(k)fluoranthene		1300	U
Benzo(ghi)perylene		1300	U
Benzo(a)pyrene		1300	U
Benzoic acid		6400	U
Benzyl alcohol		1300	U
Bis(2-chloroethoxy) methane		1300	U
Bis(2-chloroethyl) ether		1300	U
Bis(2-chloroisopropyl) ether		1300	U
Bis(2-ethylhexyl) phthalate		1300	U
4-Bromophenyl phenyl ether		1300	U
Butyl benzyl phthalate		1300	U
4-Chloroaniline		1300	U
4-Chloro-3-methylphenol		1300	U
2-Chloronaphthalene		1300	U
2-Chlorophenol		1300	U
4-Chlorodiphenylether		1300	U
Chrysene		1300	U
Dibenzo(a,h)anthracene		1300	U
Dibenzofuran		1300	U
Di-n-butyl phthalate		1300	U
1,2-Dichlorobenzene		1300	U
1,3-Dichlorobenzene		1300	U
1,4-Dichlorobenzene		1300	U
3,3'-Dichlorobenzidine		2600	U
2,4-Dichlorophenol		1300	U
Diethyl phthalate		1300	U
2,4-Dimethylphenol		1300	U
Dimethyl phthalate		1300	U
4,6-Dinitro-2-methylphenol		6400	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151602RI
Client ID: RS-1RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 24.50

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		6400	U
2,4-Dinitrotoluene		1300	U
2,6-Dinitrotoluene		1300	U
Di-n-octyl phthalate		1300	U
Fluoranthene		1300	U
Fluorene		1300	U
Hexachlorobenzene		1300	U
Hexachlorobutadiene		1300	U
Hexachlorocyclopentadiene		1300	U
Hexachloroethane		1300	U
Indeno(1,2,3-cd)pyrene		1300	U
Isophorone		1300	U
2-Methylnaphthalene		330	J
2-Methylphenol		1300	U
4-Methylphenol		200	J
Naphthalene		540	J
2-Nitroaniline		6400	U
3-Nitroaniline		6400	U
4-Nitroaniline		6400	U
Nitrobenzene		1300	U
2-Nitrophenol		1300	U
4-Nitrophenol		6400	U
N-nitrosodiphenylamine		1300	U
N-Nitroso-Di-n-propylamine		1300	U
Pentachlorophenol		6400	U
Phenanthrene		1300	U
Phenol		1300	U
Pyrene		1300	U
1,2,4-Trichlorobenzene		130	J
2,4,5-Trichlorophenol		6400	U
2,4,6-Trichlorophenol		1300	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151603
Client ID: RS-2

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 46.00

Parameter	Units = UG/KG	Result	Q
Acenaphthene		1100	
Acenaphthylene		700	U
Anthracene		700	U
Benzo(a)anthracene		700	U
Benzo(b)fluoranthene		700	U
Benzo(k)fluoranthene		700	U
Benzo(ghi)perylene		700	U
Benzo(a)pyrene		700	U
Benzoic acid		3400	U
Benzyl alcohol		700	U
Bis(2-chloroethoxy) methane		700	U
Bis(2-chloroethyl) ether		700	U
Bis(2-chloroisopropyl) ether		700	U
Bis(2-ethylhexyl) phthalate		700	U
4-Bromophenyl phenyl ether		700	U
Butyl benzyl phthalate		700	U
4-Chloroaniline		700	U
4-Chloro-3-methylphenol		700	U
2-Chloronaphthalene		700	U
2-Chlorophenol		700	U
4-Chlorodiphenylether		700	U
Chrysene		700	U
Dibenzo(a,h)anthracene		700	U
Dibenzofuran		700	U
Di-n-butyl phthalate		700	U
1,2-Dichlorobenzene		700	U
1,3-Dichlorobenzene		700	U
1,4-Dichlorobenzene		700	U
3,3'-Dichlorobenzidine		1400	U
2,4-Dichlorophenol		700	U
Diethyl phthalate		700	U
2,4-Dimethylphenol		700	U
Dimethyl phthalate		700	U
4,6-Dinitro-2-methylphenol		3400	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151603
Client ID: RS-2

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 46.00

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		3400	U
2,4-Dinitrotoluene		700	U
2,6-Dinitrotoluene		700	U
Di-n-octyl phthalate		700	U
Fluoranthene		700	U
Fluorene		700	U
Hexachlorobenzene		700	U
Hexachlorobutadiene		700	U
Hexachlorocyclopentadiene		700	U
Hexachloroethane		700	U
Indeno(1,2,3-cd)pyrene		700	U
Isophorone		700	U
2-Methylnaphthalene		230	J
2-Methylphenol		700	U
4-Methylphenol		700	U
Naphthalene		480	J
2-Nitroaniline		3400	U
3-Nitroaniline		3400	U
4-Nitroaniline		3400	U
Nitrobenzene		700	U
2-Nitrophenol		700	U
4-Nitrophenol		3400	U
N-nitrosodiphenylamine		700	U
N-Nitroso-Di-n-propylamine		700	U
Pentachlorophenol		3400	U
Phenanthrene		700	U
Phenol		700	U
Pyrene		700	U
1,2,4-Trichlorobenzene		700	U
2,4,5-Trichlorophenol		3400	U
2,4,6-Trichlorophenol		700	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151603RI
Client ID: RS-2RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 46.00

Parameter	Units = UG/KG	Result	Q
Acenaphthene		380	J
Acenaphthylene		700	U
Anthracene		700	U
Benzo(a)anthracene		700	U
Benzo(b)fluoranthene		700	U
Benzo(k)fluoranthene		700	U
Benzo(ghi)perylene		700	U
Benzo(a)pyrene		700	U
Benzoic acid		3400	U
Benzyl alcohol		700	U
Bis(2-chloroethoxy) methane		700	U
Bis(2-chloroethyl) ether		700	U
Bis(2-chloroisopropyl) ether		700	U
Bis(2-ethylhexyl) phthalate		700	U
4-Bromophenyl phenyl ether		700	U
Butyl benzyl phthalate		700	U
4-Chloroaniline		700	U
4-Chloro-3-methylphenol		700	U
2-Chloronaphthalene		700	U
2-Chlorophenol		700	U
4-Chlorodiphenylether		700	U
Chrysene		700	U
Dibenzo(a,h)anthracene		700	U
Dibenzofuran		700	U
Di-n-butyl phthalate		700	U
1,2-Dichlorobenzene		69	J
1,3-Dichlorobenzene		700	U
1,4-Dichlorobenzene		110	J
3,3'-Dichlorobenzidine		1400	U
2,4-Dichlorophenol		700	U
Diethyl phthalate		700	U
2,4-Dimethylphenol		700	U
Dimethyl phthalate		700	U
4,6-Dinitro-2-methylphenol		3400	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151603RI
Client ID: RS-2RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 46.00

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		3400	U
2,4-Dinitrotoluene		700	U
2,6-Dinitrotoluene		700	U
Di-n-octyl phthalate		700	U
Fluoranthene		700	U
Fluorene		700	U
Hexachlorobenzene		700	U
Hexachlorobutadiene		700	U
Hexachlorocyclopentadiene		700	U
Hexachloroethane		700	U
Indeno(1,2,3-cd)pyrene		700	U
Isophorone		700	U
2-Methylnaphthalene		180	J
2-Methylphenol		700	U
4-Methylphenol		190	J
Naphthalene		530	J
2-Nitroaniline		3400	U
3-Nitroaniline		3400	U
4-Nitroaniline		3400	U
Nitrobenzene		700	U
2-Nitrophenol		700	U
4-Nitrophenol		3400	U
N-nitrosodiphenylamine		700	U
N-Nitroso-Di-n-propylamine		700	U
Pentachlorophenol		3400	U
Phenanthrene		700	U
Phenol		700	U
Pyrene		700	U
1,2,4-Trichlorobenzene		700	U
2,4,5-Trichlorophenol		3400	U
2,4,6-Trichlorophenol		700	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151604
Client ID: RS-3

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 50.40

Parameter	Units = UG/KG	Result	Q
Acenaphthene		69	J
Acenaphthylene		80	J
Anthracene		100	J
Benzo(a)anthracene		320	J
Benzo(b)fluoranthene		850	
Benzo(k)fluoranthene		640	U
Benzo(ghi)perylene		640	U
Benzo(a)pyrene		300	J
Benzoic acid		3100	U
Benzyl alcohol		640	U
Bis(2-chloroethoxy) methane		640	U
Bis(2-chloroethyl) ether		640	U
Bis(2-chloroisopropyl) ether		640	U
Bis(2-ethylhexyl) phthalate		640	U
4-Bromophenyl phenyl ether		640	U
Butyl benzyl phthalate		640	U
4-Chloroaniline		640	U
4-Chloro-3-methylphenol		640	U
2-Chloronaphthalene		640	U
2-Chlorophenol		640	U
4-Chlorodiphenylether		640	U
Chrysene		410	J
Dibenzo(a,h)anthracene		640	U
Dibenzofuran		76	J
Di-n-butyl phthalate		640	U
1,2-Dichlorobenzene		640	U
1,3-Dichlorobenzene		640	U
1,4-Dichlorobenzene		640	U
3,3'-Dichlorobenzidine		1300	U
2,4-Dichlorophenol		640	U
Diethyl phthalate		640	U
2,4-Dimethylphenol		640	U
Dimethyl phthalate		640	U
4,6-Dinitro-2-methylphenol		3100	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151604
Client ID: RS-3

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 50.40

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		3100	U
2,4-Dinitrotoluene		640	U
2,6-Dinitrotoluene		640	U
Di-n-octyl phthalate		640	U
Fluoranthene		460	J
Fluorene		640	U
Hexachlorobenzene		640	U
Hexachlorobutadiene		640	U
Hexachlorocyclopentadiene		640	U
Hexachloroethane		640	U
Indeno(1,2,3-cd)pyrene		640	U
Isophorone		640	U
2-Methylnaphthalene		190	J
2-Methylphenol		640	U
4-Methylphenol		640	U
Naphthalene		130	J
2-Nitroaniline		3100	U
3-Nitroaniline		3100	U
4-Nitroaniline		3100	U
Nitrobenzene		640	U
2-Nitrophenol		640	U
4-Nitrophenol		3100	U
N-nitrosodiphenylamine		640	U
N-Nitroso-Di-n-propylamine		640	U
Pentachlorophenol		3100	U
Phenanthrene		240	J
Phenol		640	U
Pyrene		380	J
1,2,4-Trichlorobenzene		640	U
2,4,5-Trichlorophenol		3100	U
2,4,6-Trichlorophenol		640	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151604RI
Client ID: RS-3RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 50.40

Parameter	Units = UG/KG	Result	Q
Acenaphthene		80	J
Acenaphthylene		65	J
Anthracene		94	J
Benzo(a)anthracene		360	J
Benzo(b)fluoranthene		480	J
Benzo(k)fluoranthene		640	U
Benzo(ghi)perylene		640	U
Benzo(a)pyrene		180	J
Benzoic acid		3100	U
Benzyl alcohol		640	U
Bis(2-chloroethoxy) methane		640	U
Bis(2-chloroethyl) ether		640	U
Bis(2-chloroisopropyl) ether		640	U
Bis(2-ethylhexyl) phthalate		640	U
4-Bromophenyl phenyl ether		640	U
Butyl benzyl phthalate		640	U
4-Chloroaniline		640	U
4-Chloro-3-methylphenol		640	U
2-Chloronaphthalene		640	U
2-Chlorophenol		640	U
4-Chlorodiphenylether		640	U
Chrysene		440	J
Dibenzo(a,h)anthracene		640	U
Dibenzofuran		76	J
Di-n-butyl phthalate		640	U
1,2-Dichlorobenzene		640	U
1,3-Dichlorobenzene		640	U
1,4-Dichlorobenzene		640	U
3,3'-Dichlorobenzidine		1300	U
2,4-Dichlorophenol		640	U
Diethyl phthalate		640	U
2,4-Dimethylphenol		640	U
Dimethyl phthalate		640	U
4,6-Dinitro-2-methylphenol		3100	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151604RI
Client ID: RS-3RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 50.40

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		3100	U
2,4-Dinitrotoluene		640	U
2,6-Dinitrotoluene		640	U
Di-n-octyl phthalate		640	U
Fluoranthene		480	J
Fluorene		40	J
Hexachlorobenzene		640	U
Hexachlorobutadiene		640	U
Hexachlorocyclopentadiene		640	U
Hexachloroethane		640	U
Indeno(1,2,3-cd)pyrene		640	U
Isophorone		640	U
2-Methylnaphthalene		170	J
2-Methylphenol		640	U
4-Methylphenol		94	J
Naphthalene		150	J
2-Nitroaniline		3100	U
3-Nitroaniline		3100	U
4-Nitroaniline		3100	U
Nitrobenzene		640	U
2-Nitrophenol		640	U
4-Nitrophenol		3100	U
N-nitrosodiphenylamine		640	U
N-Nitroso-Di-n-propylamine		640	U
Pentachlorophenol		3100	U
Phenanthrene		280	J
Phenol		640	U
Pyrene		460	J
1,2,4-Trichlorobenzene		640	U
2,4,5-Trichlorophenol		3100	U
2,4,6-Trichlorophenol		640	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1516
Lab Samp ID: A4151605
lient ID: RS-4

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 43.10

Parameter	Units = UG/KG	Result	Q
Acenaphthene		1100	
Acenaphthylene		520	J
Anthracene		4700	
Benzo(a)anthracene		8400	
Benzo(b)fluoranthene		11000	
Benzo(k)fluoranthene		4300	
Benzo(ghi)perylene		1000	
Benzo(a)pyrene		6100	
Benzoic acid		3600	U
Benzyl alcohol		750	U
Bis(2-chloroethoxy) methane		750	U
Bis(2-chloroethyl) ether		750	U
Bis(2-chloroisopropyl) ether		750	U
Bis(2-ethylhexyl) phthalate		12000	E
4-Bromophenyl phenyl ether		750	U
Butyl benzyl phthalate		750	U
4-Chloroaniline		750	U
4-Chloro-3-methylphenol		750	U
2-Chloronaphthalene		750	U
2-Chlorophenol		750	U
4-Chlorodiphenylether		750	U
Chrysene		7100	
Dibenzo(a,h)anthracene		450	J
Dibenzofuran		1900	
Di-n-butyl phthalate		750	U
1,2-Dichlorobenzene		750	U
1,3-Dichlorobenzene		750	U
1,4-Dichlorobenzene		750	U
3,3'-Dichlorobenzidine		1500	U
2,4-Dichlorophenol		750	U
Diethyl phthalate		750	U
2,4-Dimethylphenol		750	U
Dimethyl phthalate		750	U
4,6-Dinitro-2-methylphenol		3600	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1516
Lab Samp ID: A4151605
lient ID: RS-4

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 43.10

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		3600	U
2,4-Dinitrotoluene		750	U
2,6-Dinitrotoluene		750	U
Di-n-octyl phthalate		750	U
Fluoranthene		19000	E
Fluorene		2500	
Hexachlorobenzene		750	U
Hexachlorobutadiene		750	U
Hexachlorocyclopentadiene		750	U
Hexachloroethane		750	U
Indeno(1,2,3-cd)pyrene		1600	
Isophorone		750	U
2-Methylnaphthalene		1100	
2-Methylphenol		750	U
4-Methylphenol		210	J
Naphthalene		930	
2-Nitroaniline		3600	U
3-Nitroaniline		3600	U
4-Nitroaniline		3600	U
Nitrobenzene		750	U
2-Nitrophenol		750	U
4-Nitrophenol		3600	U
N-nitrosodiphenylamine		750	U
N-Nitroso-Di-n-propylamine		750	U
Pentachlorophenol		3600	U
Phenanthrene		19000	E
Phenol		750	U
Pyrene		12000	E
1,2,4-Trichlorobenzene		750	U
2,4,5-Trichlorophenol		3600	U
2,4,6-Trichlorophenol		750	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151605DL
Client ID: RS-4 DL

Matrix: Soil Low
Dilution Factor: 2
Sample Date: 04/18/94
Analysis Date: 04/27/94
Extraction Date: 04/25/94
% Dry Weight: 43.10

Parameter	Units = UG/KG	Result	Q
Acenaphthene		1200	DJ
Acenaphthylene		480	DJ
Anthracene		4700	D
Benzo(a)anthracene		9300	D
Benzo(b)fluoranthene		8200	D
Benzo(k)fluoranthene		3300	D
Benzo(ghi)perylene		2400	D
Benzo(a)pyrene		5900	D
Benzoic acid		7300	U
Benzyl alcohol		1500	U
Bis(2-chloroethoxy) methane		1500	U
Bis(2-chloroethyl) ether		1500	U
Bis(2-chloroisopropyl) ether		1500	U
Bis(2-ethylhexyl) phthalate		9500	D
4-Bromophenyl phenyl ether		1500	U
Butyl benzyl phthalate		1500	U
4-Chloroaniline		1500	U
4-Chloro-3-methylphenol		1500	U
2-Chloronaphthalene		1500	U
2-Chlorophenol		1500	U
4-Chlorodiphenylether		1500	U
Chrysene		7500	D
Dibenzo(a,h)anthracene		770	DJ
Dibenzofuran		1900	D
Di-n-butyl phthalate		1500	U
1,2-Dichlorobenzene		1500	U
1,3-Dichlorobenzene		1500	U
1,4-Dichlorobenzene		1500	U
3,3'-Dichlorobenzidine		3000	U
2,4-Dichlorophenol		1500	U
Diethyl phthalate		1500	U
2,4-Dimethylphenol		1500	U
Dimethyl phthalate		1500	U
4,6-Dinitro-2-methylphenol		7300	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

aboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
ab Samp ID: A4151605DL
lient ID: RS-4 DL

Matrix: Soil Low
Dilution Factor: 2
Sample Date: 04/18/94
Analysis Date: 04/27/94
Extraction Date: 04/25/94
% Dry Weight: 43.10

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		7300	U
2,4-Dinitrotoluene		1500	U
2,6-Dinitrotoluene		1500	U
Di-n-octyl phthalate		1500	U
Fluoranthene		20000	D
Fluorene		2600	D
Hexachlorobenzene		1500	U
Hexachlorobutadiene		1500	U
Hexachlorocyclopentadiene		1500	U
Hexachloroethane		1500	U
Indeno(1,2,3-cd)pyrene		3100	D
Isophorone		1500	U
2-Methylnaphthalene		1100	DJ
2-Methylphenol		1500	U
4-Methylphenol		1500	U
Naphthalene		1100	DJ
2-Nitroaniline		7300	U
3-Nitroaniline		7300	U
4-Nitroaniline		7300	U
Nitrobenzene		1500	U
2-Nitrophenol		1500	U
4-Nitrophenol		7300	U
N-nitrosodiphenylamine		1500	U
N-Nitroso-Di-n-propylamine		1500	U
Pentachlorophenol		7300	U
Phenanthrene		20000	D
Phenol		1500	U
Pyrene		14000	D
1,2,4-Trichlorobenzene		1500	U
2,4,5-Trichlorophenol		7300	U
2,4,6-Trichlorophenol		1500	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151605RI
Client ID: RS-4RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 43.10

Parameter	Units = UG/KG	Result	Q
Acenaphthene		1100	
Acenaphthylene		460	J
Anthracene		4400	
Benzo(a)anthracene		8100	
Benzo(b)fluoranthene		4500	
Benzo(k)fluoranthene		1900	
Benzo(ghi)perylene		1300	
Benzo(a)pyrene		3300	
Benzoic acid		3600	U
Benzyl alcohol		750	U
Bis(2-chloroethoxy) methane		750	U
Bis(2-chloroethyl) ether		750	U
Bis(2-chloroisopropyl) ether		750	U
Bis(2-ethylhexyl) phthalate		9800	
4-Bromophenyl phenyl ether		750	U
Butyl benzyl phthalate		750	U
4-Chloroaniline		750	U
4-Chloro-3-methylphenol		750	U
2-Chloronaphthalene		750	U
2-Chlorophenol		750	U
4-Chlorodiphenylether		750	U
Chrysene		7500	
Dibenzo(a,h)anthracene		1300	
Dibenzofuran		1900	
Di-n-butyl phthalate		750	U
1,2-Dichlorobenzene		750	U
1,3-Dichlorobenzene		750	U
1,4-Dichlorobenzene		750	U
3,3'-Dichlorobenzidine		1500	U
2,4-Dichlorophenol		750	U
Diethyl phthalate		750	U
2,4-Dimethylphenol		750	U
Dimethyl phthalate		750	U
4,6-Dinitro-2-methylphenol		3600	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151605RI
Client ID: RS-4RE

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/03/94
Extraction Date: 04/25/94
% Dry Weight: 43.10

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		3600	U
2,4-Dinitrotoluene		750	U
2,6-Dinitrotoluene		750	U
Di-n-octyl phthalate		750	U
Fluoranthene		18000	E
Fluorene		2700	
Hexachlorobenzene		750	U
Hexachlorobutadiene		750	U
Hexachlorocyclopentadiene		750	U
Hexachloroethane		750	U
Indeno(1,2,3-cd)pyrene		1400	
Isophorone		750	U
2-Methylnaphthalene		990	
2-Methylphenol		750	U
4-Methylphenol		160	J
Naphthalene		1000	
2-Nitroaniline		3600	U
3-Nitroaniline		3600	U
4-Nitroaniline		3600	U
Nitrobenzene		750	U
2-Nitrophenol		750	U
4-Nitrophenol		3600	U
N-nitrosodiphenylamine		750	U
N-Nitroso-Di-n-propylamine		750	U
Pentachlorophenol		3600	U
Phenanthrene		20000	E
Phenol		750	U
Pyrene		14000	E
1,2,4-Trichlorobenzene		50	J
2,4,5-Trichlorophenol		3600	U
2,4,6-Trichlorophenol		750	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AM004735
Client ID: METHOD BLANK

Matrix: Soil Low
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 100.00

Parameter	Units = UG/KG	Result	Q
Acenaphthene		330	U
Acenaphthylene		330	U
Anthracene		330	U
Benzo(a)anthracene		330	U
Benzo(b)fluoranthene		330	U
Benzo(k)fluoranthene		330	U
Benzo(ghi)perylene		330	U
Benzo(a)pyrene		330	U
Benzoic acid		1600	U
Benzyl alcohol		330	U
Bis(2-chloroethoxy) methane		330	U
Bis(2-chloroethyl) ether		330	U
Bis(2-chloroisopropyl) ether		330	U
Bis(2-ethylhexyl) phthalate		330	U
4-Bromophenyl phenyl ether		330	U
Butyl benzyl phthalate		330	U
4-Chloroaniline		330	U
4-Chloro-3-methylphenol		330	U
2-Chloronaphthalene		330	U
2-Chlorophenol		330	U
4-Chlorodiphenylether		330	U
Chrysene		330	U
Dibenzo(a,h)anthracene		330	U
Dibenzofuran		330	U
Di-n-butyl phthalate		330	U
1,2-Dichlorobenzene		330	U
1,3-Dichlorobenzene		330	U
1,4-Dichlorobenzene		330	U
3,3'-Dichlorobenzidine		660	U
2,4-Dichlorophenol		330	U
Diethyl phthalate		330	U
2,4-Dimethylphenol		330	U
Dimethyl phthalate		330	U
4,6-Dinitro-2-methylphenol		1600	U

DAMES & MOORE

METHOD 8270 - TCL SEMI-VOLATILE ORGANICS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AM004735
Client ID: METHOD BLANK

Matrix: Soil Low
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/26/94
Extraction Date: 04/25/94
% Dry Weight: 100.00

Parameter	Units = UG/KG	Result	Q
2,4-Dinitrophenol		1600	U
2,4-Dinitrotoluene		330	U
2,6-Dinitrotoluene		330	U
Di-n-octyl phthalate		330	U
Fluoranthene		330	U
Fluorene		330	U
Hexachlorobenzene		330	U
Hexachlorobutadiene		330	U
Hexachlorocyclopentadiene		330	U
Hexachloroethane		330	U
Indeno(1,2,3-cd)pyrene		330	U
Isophorone		330	U
2-Methylnaphthalene		330	U
2-Methylphenol		330	U
4-Methylphenol		330	U
Naphthalene		330	U
2-Nitroaniline		1600	U
3-Nitroaniline		1600	U
4-Nitroaniline		1600	U
Nitrobenzene		330	U
2-Nitrophenol		330	U
4-Nitrophenol		1600	U
N-nitrosodiphenylamine		330	U
N-Nitroso-Di-n-propylamine		330	U
Pentachlorophenol		1600	U
Phenanthrene		330	U
Phenol		330	U
Pyrene		330	U
1,2,4-Trichlorobenzene		330	U
2,4,5-Trichlorophenol		1600	U
2,4,6-Trichlorophenol		330	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151601
Client ID: RMW-1

Matrix: Aqueous
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.062	U
alpha-BHC		0.062	U
beta-BHC		0.062	U
gamma-BHC (Lindane)		0.062	U
delta-BHC		0.062	U
Chlordane		0.62	U
4,4'-DDD		0.12	U
4,4'-DDE		0.025	J
4,4'-DDT		0.12	U
Dieldrin		0.12	U
Endosulfan I		0.12	U
Endosulfan II		0.12	U
Endosulfan Sulfate		0.12	U
Endrin		0.12	U
Endrin ketone		0.12	U
Heptachlor		0.062	U
Heptachlor epoxide		0.062	U
Methoxychlor		0.62	U
Toxaphene		1.2	U

DAMES & MOORE

METHOD 8080 - TCL PESTICIDES

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AG002443
Client ID: METHOD BLANK

Matrix: Aqueous
Dilution Factor: 1
Sample Date: -
Analysis Date: 05/06/94
Extraction Date: 04/21/94

Parameter	Units = UG/L	Result	Q
Aldrin		0.050	U
alpha-BHC		0.050	U
beta-BHC		0.050	U
gamma-BHC (Lindane)		0.050	U
delta-BHC		0.050	U
Chlordane		0.50	U
4,4'-DDD		0.10	U
4,4'-DDE		0.10	U
4,4'-DDT		0.10	U
Dieldrin		0.10	U
Endosulfan I		0.10	U
Endosulfan II		0.10	U
Endosulfan Sulfate		0.10	U
Endrin		0.10	U
Endrin ketone		0.10	U
Heptachlor		0.050	U
Heptachlor epoxide		0.050	U
Methoxychlor		0.50	U
Toxaphene		1.0	U

DAMES & MOORE

METHOD 8080 - POLYCHLORINATED BIPHENYLS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151602
Client ID: RS-1

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/25/94
Extraction Date: 04/21/94
% Dry Weight: 28.00

Parameter	Units = UG/KG	Result	Q
Aroclor 1016		140	U
Aroclor 1221		280	U
Aroclor 1232		140	U
Aroclor 1242		140	U
Aroclor 1248		250	
Aroclor 1254		520	
Aroclor 1260		140	

DAMES & MOORE

METHOD 8080 - POLYCHLORINATED BIPHENYLS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151603
Client ID: RS-2

Matrix: Soil Low
Dilution Factor: 2
Sample Date: 04/18/94
Analysis Date: 04/25/94
Extraction Date: 04/21/94
% Dry Weight: 50.00

Parameter	Units = UG/KG	Result	Q
Aroclor 1016		160	U
Aroclor 1221		320	U
Aroclor 1232		160	U
Aroclor 1242		160	U
Aroclor 1248		420	
Aroclor 1254		270	
Aroclor 1260		120	J

DAMES & MOORE

METHOD 8080 - POLYCHLORINATED BIPHENYLS

aboratory: Recra Environmental, Inc. - RECNY
ab Job No: A94-1516
Lab Samp ID: A4151604
Client ID: RS-3

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/25/94
Extraction Date: 04/21/94
% Dry Weight: 48.00

Parameter	Units = UG/KG	Result	Q
Aroclor 1016		83	U
Aroclor 1221		170	U
Aroclor 1232		83	U
Aroclor 1242		83	U
Aroclor 1248		83	U
Aroclor 1254		83	U
Aroclor 1260		83	U

DAMES & MOORE

METHOD 8080 - POLYCHLORINATED BIPHENYLS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: A4151605
Client ID: RS-4

Matrix: Soil Low
Dilution Factor: 1
Sample Date: 04/18/94
Analysis Date: 04/25/94
Extraction Date: 04/21/94
% Dry Weight: 51.00

Parameter	Units = UG/KG	Result	Q
Aroclor 1016		77	U
Aroclor 1221		150	U
Aroclor 1232		77	U
Aroclor 1242		77	U
Aroclor 1248		77	U
Aroclor 1254		77	U
Aroclor 1260		77	U

DAMES & MOORE

METHOD 8080 - POLYCHLORINATED BIPHENYLS

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Samp ID: AG002265
Client ID: METHOD BLANK

Matrix: Soil Low
Dilution Factor: 1
Sample Date: -
Analysis Date: 04/22/94
Extraction Date: 04/21/94
% Dry Weight: 100.00

Parameter	Units = UG/KG	Result	Q
Aroclor 1016		40	U
Aroclor 1221		80	U
Aroclor 1232		40	U
Aroclor 1242		40	U
Aroclor 1248		40	U
Aroclor 1254		40	U
Aroclor 1260		40	U

DAMES & MOORE
METHOD 8260 - TCL VOLATILE ORGANICS
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	S1 TOL	#	S2 BFB	#	S3 DCE	#
METHOD BLANK	AM005523	96		105		94	
RMW-1	A4151601	90		112		91	

				QC Limits
S1	TOL	=	Toluene-D8	(88 - 110)
S2	BFB	=	p-Bromofluorobenzene	(86 - 115)
S3	DCE	=	1,2-Dichloroethane-D4	(76 - 114)

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8240 - TCL VOLATILE ORGANICS
SOIL SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	S1 TOL #	S2 BFB #	S3 DCE #
METHOD BLANK	AM005508	100	96	90
RS-1	A4151602	115	77	88
RS-2	A4151603	111	79	99
RS-3	A4151604	113	87	94
RS-4	A4151605	116	82	91

			QC Limits
S1	TOL	= Toluene-D8	(81 - 117)
S2	BFB	= p-Bromofluorobenzene	(74 - 121)
S3	DCE	= 1,2-Dichloroethane-D4	(70 - 121)

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	S1 NBZ #	S2 FBP #	S3 TPH #	S4 PHL #	S5 2FP #	S6 TBF #
METHOD BLANK	AM004734	52	47	116	34	48	94
RMW-1	A4151601	71	54	66	42	57	107

			QC Limits				QC Limits
S1	NBZ	= Nitrobenzene-D5	(35 - 114)	S5	2FP	= 2-Fluorophenol	(21 - 100)
S2	FBP	= 2-Fluorobiphenyl	(43 - 116)	S6	TBF	= 2,4,6-Tribromophenol	(10 - 123)
S3	TPH	= Terphenyl-D14	(33 - 141)				
S4	PHL	= Phenol-D5	(10 - 94)				

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8270 - TCL SEMI-VOLATILE ORGANICS
SOIL SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	S1 NBZ	#	S2 FBP	#	S3 TPH	#	S4 PHL	#	S5 2FP	#	S6 TBP	#
METHOD BLANK	AM004735	73		83		110		68		72		106	
RS-1	A4151602	90		92		135		83		77		116	
RS-1RE	A4151602RI	86		225	*	181	*	87		90		48	
RS-2	A4151603	66		182	*	69		96		120		279	*
RS-2RE	A4151603RI	133	*	146	*	150	*	69		51		144	*
RS-3	A4151604	135	*	58		108		109		171	*	114	
RS-3RE	A4151604RI	80		80		102		87		85		117	
RS-4	A4151605	84		88		90		100		94		105	
RS-4 DL	A4151605DL	101		97		101		93		94		112	
RS-4RE	A4151605RI	98		94		98		96		90		106	

			QC Limits				QC Limits
S1	NBZ	= Nitrobenzene-D5	(23 - 120)	S5	2FP	= 2-Fluorophenol	(25 - 121)
S2	FBP	= 2-Fluorobiphenyl	(30 - 115)	S6	TBP	= 2,4,6-Tribromophenol	(19 - 122)
S3	TPH	= Terphenyl-D14	(18 - 137)				
S4	PHL	= Phenol-D5	(24 - 113)				

\# Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8080 - TCL PESTICIDES
WATER SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	S1 TCMX #	S2 DCBP #
METHOD BLANK	AG002443	50	70
RMW-1	A4151601	80	90

QC Limits

S1 TCMX = Tetrachloro-m-xylene (23 - 95)
S2 DCBP = Decachlorobiphenyl (24 - 114)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8080 - POLYCHLORINATED BIPHENYLS
SOIL SURROGATE RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	S1 HBB	#
METHOD BLANK	AG002265	59	
RS-1	A4151602	0	*
RS-2	A4151603	0	*
RS-3	A4151604	66	
RS-4	A4151605	58	

QC Limits

S1 HBB = Hexabromobenzene (58 - 126)

Column to be used to flag recovery values
* Values outside of contract required QC limits
D Surrogates diluted out

DAMES & MOORE
METHOD 8260 - TCL VOLATILE ORGANICS
WATER INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	IS1 BCM	#	IS2 DFB	#	IS3 CBZ	#
METHOD BLANK	AM005523	88		84		82	
RMW-1	A4151601	81		68		76	

QC Limits

IS1	BCM	=	Bromochloromethane	(50 - 200)
IS2	DFB	=	1,4-Difluorobenzene	(50 - 200)
IS3	CBZ	=	Chlorobenzene-D5	(50 - 200)

Column to be used to flag recovery values
* Values outside of contract required QC limits

DAMES & MOORE
METHOD 8240 - TCL VOLATILE ORGANICS
SOIL INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	IS1 BCM #	IS2 DFB #	IS3 CBZ #
METHOD BLANK	AM005508	91	86	83
RS-1	A4151602	78	76	52
RS-2	A4151603	75	77	55
RS-3	A4151604	86	82	70
RS-4	A4151605	75	70	55

			QC Limits
IS1	BCM	= Bromochloromethane	(50 - 200)
IS2	DFB	= 1,4-Difluorobenzene	(50 - 200)
IS3	CBZ	= Chlorobenzene-D5	(50 - 200)

Column to be used to flag recovery values
* Values outside of contract required QC limits

0050

DAMES & MOORE
METHOD 625 - P.P. BASE NEUTRAL/ACID EXTRACTABLES
WATER INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	IS1 DCB	#	IS2 NPT	#	IS3 ANT	#	IS4 PHN	#	IS5 CRY	#	IS6 PRY	#
METHOD BLANK	AM004734	110		110		110		110		73		85	
RMW-1	A4151601	84		86		89		91		82		90	

			QC Limits				QC Limits
IS1	DCB	= 1,4-Dichlorobenzene-D4	(50 - 200)	IS5	CRY	= Chrysene-D12	(50 - 200)
IS2	NPT	= Naphthalene-D8	(50 - 200)	IS6	PRY	= Perylene-D12	(50 - 200)
IS3	ANT	= Acenaphthene-D10	(50 - 200)				
IS4	PHN	= Phenanthrene-D10	(50 - 200)				

\# Column to be used to flag recovery values
* Values outside of contract required QC limits

DAMES & MOORE
METHOD 8270 - TCL SEMI-VOLATILE ORGANICS
SOIL INTERNAL STANDARDS RECOVERY

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516

Client Sample ID	Lab Sample ID	IS1 DCB	#	IS2 NPT	#	IS3 ANT	#	IS4 PHN	#	IS5 CRY	#	IS6 PRY	#
METHOD BLANK	AM004735	101		96		92		91		76		72	
RS-1	A4151602	105		102		82		38	*	34	*	27	*
RS-1RE	A4151602RI	113		114		49	*	58		28	*	15	*
RS-2	A4151603	8	*	10	*	4	*	34	*	27	*	11	*
RS-2RE	A4151603RI	34	*	16	*	5	*	10	*	15	*	6	*
RS-3	A4151604	28	*	15	*	24	*	36	*	36	*	31	*
RS-3RE	A4151604RI	115		117		134		152		133		239	*
RS-4	A4151605	19	*	35	*	44	*	57		69		49	*
RS-4 DL	A4151605DL	88		87		91		107		111		124	
RS-4RE	A4151605RI	50		47	*	49	*	54		55		105	

			QC Limits				QC Limits
IS1	DCB	= 1,4-Dichlorobenzene-D4	(50 - 200)	IS5	CRY	= Chrysene-D12	(50 - 200)
IS2	NPT	= Naphthalene-D8	(50 - 200)	IS6	PRY	= Perylene-D12	(50 - 200)
IS3	ANT	= Acenaphthene-D10	(50 - 200)				
IS4	PHN	= Phenanthrene-D10	(50 - 200)				

\# Column to be used to flag recovery values
* Values outside of contract required QC limits

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: A4151601
Client Sample ID: RMW-1

Matrix: Aqueous
Sample Date: 04/18/94

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	11.9	
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0050	
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.13	
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	264	
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.017	
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.032	
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.025	
Iron - Total	MG/L	6010	04/29/94	05/02/94	29.6	
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.043	
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	65.5	
Manganese - Total	MG/L	6010	04/29/94	05/02/94	10.3	
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00040	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.093	
Potassium - Total	MG/L	6010	04/29/94	05/02/94	29.1	
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	125	
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.032	
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.36	

DAMES & MOORE

Soluble Metals Analysis

Laboratory: Recra Environmental, Inc.- RECNY
Lab Job No: A94-1516
Lab Sample ID: A4151601
Client Sample ID: RMW-1

Matrix: Aqueous
Sample Date: 04/18/94

Dilution Factor: 1

Parameter	Units	Method	Analysis Date	Result	Q
Aluminum - Soluble	MG/L	6010	05/02/94	0.090	U
Antimony - Soluble	MG/L	7041	05/03/94	0.0060	U
Arsenic - Soluble	MG/L	7060	05/03/94	0.0030	
Barium - Soluble	MG/L	6010	05/02/94	0.071	
Beryllium - Soluble	MG/L	6010	05/02/94	0.0030	U
Cadmium - Soluble	MG/L	6010	05/02/94	0.010	U
Calcium - Soluble	MG/L	6010	05/02/94	255	
Chromium - Soluble	MG/L	6010	05/02/94	0.010	U
Cobalt - Soluble	MG/L	6010	05/02/94	0.010	U
Copper - Soluble	MG/L	6010	05/02/94	0.010	U
Iron - Soluble	MG/L	6010	05/02/94	5.9	
Lead - Soluble	MG/L	7421	05/03/94	0.0020	U
Magnesium - Soluble	MG/L	6010	05/02/94	69.6	
Manganese - Soluble	MG/L	6010	05/02/94	12.2	
Mercury - Soluble	MG/L	7470	04/26/94	0.00020	U
Nickel - Soluble	MG/L	6010	05/02/94	0.091	
Potassium - Soluble	MG/L	6010	05/02/94	31.9	
Selenium - Soluble	MG/L	7740	05/03/94	0.0030	U
Silver - Soluble	MG/L	6010	05/02/94	0.010	U
Sodium - Soluble	MG/L	6010	05/02/94	140	
Thallium - Soluble	MG/L	7841	05/03/94	0.0030	U
Vanadium - Soluble	MG/L	6010	05/02/94	0.010	U
Zinc - Soluble	MG/L	6010	05/02/94	0.040	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: A4151602
Client Sample ID: RS-1

Matrix: Soil
Sample Date: 04/18/94
% Dry Weight: 26.00
Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/KG	6010	04/25/94	04/26/94	1020	
Antimony - Total	MG/KG	6010	04/25/94	04/26/94	20.4	
Arsenic - Total	MG/KG	7060	04/25/94	04/26/94	27.8	
Barium - Total	MG/KG	6010	04/25/94	04/26/94	7.6	U
Beryllium - Total	MG/KG	6010	04/25/94	04/26/94	1.1	U
Cadmium - Total	MG/KG	6010	04/25/94	04/26/94	3.8	U
Calcium - Total	MG/KG	6010	04/25/94	04/26/94	23000	
Chromium - Total	MG/KG	6010	04/25/94	04/26/94	30.2	
Cobalt - Total	MG/KG	6010	04/25/94	04/26/94	3.8	U
Copper - Total	MG/KG	6010	04/25/94	04/26/94	60.4	
Hexavalent Chromium - Total	MG/KG	7195	04/18/94	04/18/94	0.76	
Iron - Total	MG/KG	6010	04/25/94	04/26/94	167000	
Lead - Total	MG/KG	6010	04/25/94	04/26/94	456	
Magnesium - Total	MG/KG	6010	04/25/94	04/26/94	940	
Manganese - Total	MG/KG	6010	04/25/94	04/26/94	844	
Mercury - Total	MG/KG	7471	04/21/94	04/21/94	0.34	U
Nickel - Total	MG/KG	6010	04/25/94	04/26/94	11.3	U
Potassium - Total	MG/KG	6010	04/25/94	04/26/94	281	
Selenium - Total	MG/KG	7740	04/25/94	04/26/94	1.9	
Silver - Total	MG/KG	6010	04/25/94	04/26/94	3.8	U
Sodium - Total	MG/KG	6010	04/25/94	04/26/94	528	
Thallium - Total	MG/KG	7841	04/25/94	04/26/94	1.5	U
Vanadium - Total	MG/KG	6010	04/25/94	04/26/94	17.0	
Zinc - Total	MG/KG	6010	04/25/94	04/26/94	277	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: A4151603
Client Sample ID: RS-2

Matrix: Soil
Sample Date: 04/18/94
% Dry Weight: 38.00
Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/KG	6010	04/25/94	04/26/94	1330	
Antimony - Total	MG/KG	6010	04/25/94	04/26/94	20.9	
Arsenic - Total	MG/KG	7060	04/25/94	04/26/94	162	
Barium - Total	MG/KG	6010	04/25/94	04/26/94	5.2	U
Beryllium - Total	MG/KG	6010	04/25/94	04/26/94	0.77	U
Cadmium - Total	MG/KG	6010	04/25/94	04/26/94	2.6	U
Calcium - Total	MG/KG	6010	04/25/94	04/26/94	2580	
Chromium - Total	MG/KG	6010	04/25/94	04/26/94	230	
Cobalt - Total	MG/KG	6010	04/25/94	04/26/94	7.0	
Copper - Total	MG/KG	6010	04/25/94	04/26/94	374	
Hexavalent Chromium - Total	MG/KG	7195	04/18/94	04/18/94	1.0	
Iron - Total	MG/KG	6010	04/25/94	04/26/94	410000	
Lead - Total	MG/KG	6010	04/25/94	04/26/94	1330	
Magnesium - Total	MG/KG	6010	04/25/94	04/26/94	514	
Manganese - Total	MG/KG	6010	04/25/94	04/26/94	749	
Mercury - Total	MG/KG	7471	04/21/94	04/21/94	0.22	U
Nickel - Total	MG/KG	6010	04/25/94	04/26/94	7.7	U
Potassium - Total	MG/KG	6010	04/25/94	04/26/94	244	
Selenium - Total	MG/KG	7740	04/25/94	04/26/94	1.8	
Silver - Total	MG/KG	6010	04/25/94	04/26/94	2.6	U
Sodium - Total	MG/KG	6010	04/25/94	04/26/94	338	
Thallium - Total	MG/KG	7841	04/25/94	04/26/94	1.0	U
Vanadium - Total	MG/KG	6010	04/25/94	04/26/94	2.6	U
Zinc - Total	MG/KG	6010	04/25/94	04/26/94	426	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: A4151604
Client Sample ID: RS-3

Matrix: Soil
Sample Date: 04/18/94
% Dry Weight: 51.00
Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/KG	6010	04/25/94	04/26/94	8760	
Antimony - Total	MG/KG	6010	04/25/94	04/26/94	5.7	U
Arsenic - Total	MG/KG	7060	04/25/94	04/26/94	42.4	
Barium - Total	MG/KG	6010	04/25/94	04/26/94	27.4	
Beryllium - Total	MG/KG	6010	04/25/94	04/26/94	0.57	
Cadmium - Total	MG/KG	6010	04/25/94	04/26/94	1.9	U
Calcium - Total	MG/KG	6010	04/25/94	04/26/94	4640	
Chromium - Total	MG/KG	6010	04/25/94	04/26/94	52.8	
Cobalt - Total	MG/KG	6010	04/25/94	04/26/94	12.2	
Copper - Total	MG/KG	6010	04/25/94	04/26/94	48.6	
Hexavalent Chromium - Total	MG/KG	7195	04/18/94	04/18/94	1.1	
Iron - Total	MG/KG	6010	04/25/94	04/26/94	160000	
Lead - Total	MG/KG	6010	04/25/94	04/26/94	306	
Magnesium - Total	MG/KG	6010	04/25/94	04/26/94	1530	
Manganese - Total	MG/KG	6010	04/25/94	04/26/94	1290	
Mercury - Total	MG/KG	7471	04/21/94	04/21/94	0.18	U
Nickel - Total	MG/KG	6010	04/25/94	04/26/94	5.7	U
Potassium - Total	MG/KG	6010	04/25/94	04/26/94	897	
Selenium - Total	MG/KG	7740	04/25/94	04/26/94	0.58	U
Silver - Total	MG/KG	6010	04/25/94	04/26/94	1.9	U
Sodium - Total	MG/KG	6010	04/25/94	04/26/94	334	
Thallium - Total	MG/KG	7841	04/25/94	04/26/94	0.77	U
Vanadium - Total	MG/KG	6010	04/25/94	04/26/94	38.6	
Zinc - Total	MG/KG	6010	04/25/94	04/26/94	877	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: A4151605
Client Sample ID: RS-4

Matrix: Soil
Sample Date: 04/18/94
% Dry Weight: 43.00
Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/KG	6010	04/25/94	04/26/94	3480	
Antimony - Total	MG/KG	6010	04/25/94	04/26/94	11.7	
Arsenic - Total	MG/KG	7060	04/25/94	04/26/94	60.3	
Barium - Total	MG/KG	6010	04/25/94	04/26/94	72.0	
Beryllium - Total	MG/KG	6010	04/25/94	04/26/94	0.69	U
Cadmium - Total	MG/KG	6010	04/25/94	04/26/94	2.3	U
Calcium - Total	MG/KG	6010	04/25/94	04/26/94	2390	
Chromium - Total	MG/KG	6010	04/25/94	04/26/94	44.0	
Cobalt - Total	MG/KG	6010	04/25/94	04/26/94	5.5	
Copper - Total	MG/KG	6010	04/25/94	04/26/94	81.9	
Hexavalent Chromium - Total	MG/KG	7195	04/18/94	04/18/94	0.89	
Iron - Total	MG/KG	6010	04/25/94	04/26/94	166000	
Lead - Total	MG/KG	6010	04/25/94	04/26/94	393	
Magnesium - Total	MG/KG	6010	04/25/94	04/26/94	562	
Manganese - Total	MG/KG	6010	04/25/94	04/26/94	918	
Mercury - Total	MG/KG	7471	04/21/94	04/21/94	0.19	U
Nickel - Total	MG/KG	6010	04/25/94	04/26/94	6.9	U
Potassium - Total	MG/KG	6010	04/25/94	04/26/94	368	
Selenium - Total	MG/KG	7740	04/25/94	04/26/94	0.70	U
Silver - Total	MG/KG	6010	04/25/94	04/26/94	2.3	U
Sodium - Total	MG/KG	6010	04/25/94	04/26/94	285	
Thallium - Total	MG/KG	7841	04/25/94	04/26/94	0.93	U
Vanadium - Total	MG/KG	6010	04/25/94	04/26/94	34.1	
Zinc - Total	MG/KG	6010	04/25/94	04/26/94	479	

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: AW001329
Client Sample ID: METHOD BLANK

Matrix: Aqueous
Sample Date: -

Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/L	6010	04/29/94	05/02/94	0.090	U
Antimony - Total	MG/L	7041	04/29/94	05/03/94	0.0060	U
Arsenic - Total	MG/L	7060	04/29/94	05/03/94	0.0030	U
Barium - Total	MG/L	6010	04/29/94	05/02/94	0.020	U
Beryllium - Total	MG/L	6010	04/29/94	05/02/94	0.0030	U
Cadmium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Calcium - Total	MG/L	6010	04/29/94	05/02/94	1.0	U
Chromium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Cobalt - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Copper - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Iron - Total	MG/L	6010	04/29/94	05/02/94	0.040	U
Lead - Total	MG/L	7421	04/29/94	05/03/94	0.0020	U
Magnesium - Total	MG/L	6010	04/29/94	05/02/94	0.10	U
Manganese - Total	MG/L	6010	04/29/94	05/02/94	0.0050	U
Mercury - Total	MG/L	7470	04/26/94	04/26/94	0.00020	U
Nickel - Total	MG/L	6010	04/29/94	05/02/94	0.030	U
Potassium - Total	MG/L	6010	04/29/94	05/02/94	0.20	U
Selenium - Total	MG/L	7740	04/29/94	05/03/94	0.0030	U
Silver - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Sodium - Total	MG/L	6010	04/29/94	05/02/94	1.0	U
Thallium - Total	MG/L	7841	04/29/94	05/03/94	0.0030	U
Vanadium - Total	MG/L	6010	04/29/94	05/02/94	0.010	U
Zinc - Total	MG/L	6010	04/29/94	05/02/94	0.010	U

DAMES & MOORE

Total Metals Analysis

Laboratory: Recra Environmental, Inc. - RECNY
Lab Job No: A94-1516
Lab Sample ID: AW001330
Client Sample ID: METHOD BLANK

Matrix: Soil
Sample Date: -
% Dry Weight: 100.00
Dilution Factor: 1

Parameter	Units	Method	Digestion Date	Analysis Date	Result	Q
Aluminum - Total	MG/KG	6010	04/25/94	04/26/94	9.0	U
Antimony - Total	MG/KG	6010	04/25/94	04/26/94	3.0	U
Arsenic - Total	MG/KG	7060	04/25/94	04/26/94	0.30	U
Barium - Total	MG/KG	6010	04/25/94	04/26/94	2.0	U
Beryllium - Total	MG/KG	6010	04/25/94	04/26/94	0.30	U
Cadmium - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U
Calcium - Total	MG/KG	6010	04/25/94	04/26/94	100	U
Chromium - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U
Cobalt - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U
Copper - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U
Hexavalent Chromium - Total	MG/KG	7195	04/18/94	04/18/94	0.10	U
Iron - Total	MG/KG	6010	04/25/94	04/26/94	4.0	U
Lead - Total	MG/KG	6010	04/25/94	04/26/94	3.0	U
Magnesium - Total	MG/KG	6010	04/25/94	04/26/94	10	U
Manganese - Total	MG/KG	6010	04/25/94	04/26/94	0.50	U
Mercury - Total	MG/KG	7471	04/21/94	04/21/94	0.020	U
Nickel - Total	MG/KG	6010	04/25/94	04/26/94	3.0	U
Potassium - Total	MG/KG	6010	04/25/94	04/26/94	20.0	U
Selenium - Total	MG/KG	7740	04/25/94	04/26/94	0.30	U
Silver - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U
Sodium - Total	MG/KG	6010	04/25/94	04/26/94	100	U
Thallium - Total	MG/KG	7841	04/25/94	04/26/94	0.40	U
Vanadium - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U
Zinc - Total	MG/KG	6010	04/25/94	04/26/94	1.0	U

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 25848-001
SITE NAME: Ramco Stora
SAMPLERS (SIGNATURE): P. Smith / J. Iynnszak

STATION NO	DATE	TIME	COMP.	GRAB	STATION LOCATION	NO. OF CONTAINERS	VOC	Semi-VOC (GC/MS)	Metals-TOTAL	Metals-Filtered	PCB	Pest	REMARKS
Rmw-1	4/18	1205		—	Well the RMW-1	6	2	1	1	1	—	1	Groundwater
RS-1	4/18	1110		—	Sediment Pond northwest	2	X	X	X		X		Sediment Samples
RS-2	4/18	1120		—	Sediment Pond northwest	2	X	X	X		X		↓
RS-3	4/18	1135		—	Sediment outfall north(1)	2	X	X	X		X		
RS-4	4/18	1145		—	Sediment outfall north(2)	2	X	X	X		X		

RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
	4/18/94 1806				
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED BY (SIGNATURE)
RELINQUISHED BY (SIGNATURE)	DATE/TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE/TIME	REMARKS	
			4/18/94 1806		

Distribution: Original accompanies shipment copy to coordinator field files

T5005