5 9 001

Site: JADCO-Hughes
Break: 5.9
Other: V.1

Record of Decision
Jadco-Hughes Site
North Belmont, North Carolina

U.S. Environmental Protection Agency
Region IV
Atlanta, Georgia

September 1990

5 9 002

SUMMARY OF REMEDIAL ALTERNATIVE SELECTION

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

JADCO-HUGHES SITE
NORTH BELMONT, NORTH CAROLINA

PREPARED BY:
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IV
ATLANTA, GEORGIA

5 9 003

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DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Jadco-Hughes Site
North Belmont, Gaston County, North Carolina

Statement of Basis and Purpose

This decision document represents the selected remedial action for the Jadco-Hughes Site, located in North Belmont, North Carolina, developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) 42 U.S.C. Section 9601 et. seq., and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300.

This decision is based upon the contents of the Administrative Record for the Jadco-Hughes site.

The State of of North Carolina concurs on the selected remedy.

Assessment of the Site

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

Description of the Selected Remedy

This remedy is the final action for the site. It addresses the groundwater contamination, which constitutes the principal health threat remaining at the site, as well as the remaining soil contamination, which continues to be a source for groundwater contamination. Groundwater remediation will be accomplished by pumping and treating contaminated groundwater. Treated groundwater will be discharged to a publicly-owned treatment works (POTW). The discharge of contamination into surface water will be addressed by the diversion of the flow of surface water and replacement of an onsite culvert. Soil treatment will be conducted in situ with a soil vacuum extraction system followed by soil flushing.

The major components of the selected remedy include:

- Institutional Controls and/or Other Land Use Restrictions;
- Groundwater Monitoring
- Groundwater Recovery via Extraction Wells and tile drain(s);
- Groundwater Treatment via Aeration and Carbon Filtration to Pre-Treatment Standards;
- Discharge of Treated Effluent to the Belmont POTW;
- Treatability Studies to Ensure Compliance with POTW Pre-treatment Standards;

- Backup Discharge Plan;
- Soil Vapor Extraction followed by carbon adsorption of removed vapor;
- Soil Flushing by introduction uncontaminated water;
- Replacement of Onsite culvert;
- Redirection of spring water flow;
- Qurterly monitoring of the site, to include groundwater, surface water, sediments, and soils; and
- Review of Groundwater Use Every Five Years.

EPA has also selected a contingency alternative, in the event that the POTW does not agree to accept the discharge.

The major components of the contingency remedy include:

- Institutional Controls and/or Other Land Use Restrictions;
- Groundwater Monitoring
- Groundwater Recovery via Extraction Wells and tile drain(s);
- Groundwater Treatment involving Pre-treatment for metals followed by Ultraviolet Oxidization to Pre-Treatment Standards;
- Surface Water Discharge of Treated Effluent;
- Treatability Studies to Ensure Compliance with Surface Water Discharge Criteria;
- Soil Vapor Extraction followed by carbon adsorption of removed vapor;
- Soil Flushing by introduction uncontaminated water; and
- Replacement of Onsite culvert;
- Redirection of spring water flow;
- Qurterly monitoring of the site, to include groundwater, surface water, sediments, and soils; and
- Review of Groundwater Use Every Five Years.

Statutory Determinations

The selected and contingency remedies are protective of human health and the environment, comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost-effective. These remedies utilize permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable and satisfy the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element. Because these remedies will not result in hazardous substances remaining on the site above health-based levels, the five-year review will not apply to this action.

Greer C. Tidwell, Regional Administrator

9/27/90

Date

DECISION SUMMARY

Site Location and Description

The Jadco-Hughes Site is located on Cason St. in an unincorporated area of North Belmont, Gaston County, North Carolina (Figure 1). Belmont is located about 15 miles west of Charlotte, North Carolina.

The Jadco-Hughes site is approximately six acres in size. Disposal and storage practices were conducted throughout the six acres. Figure 2 shows historical features of the site. Residential housing is located immediately north of the site.

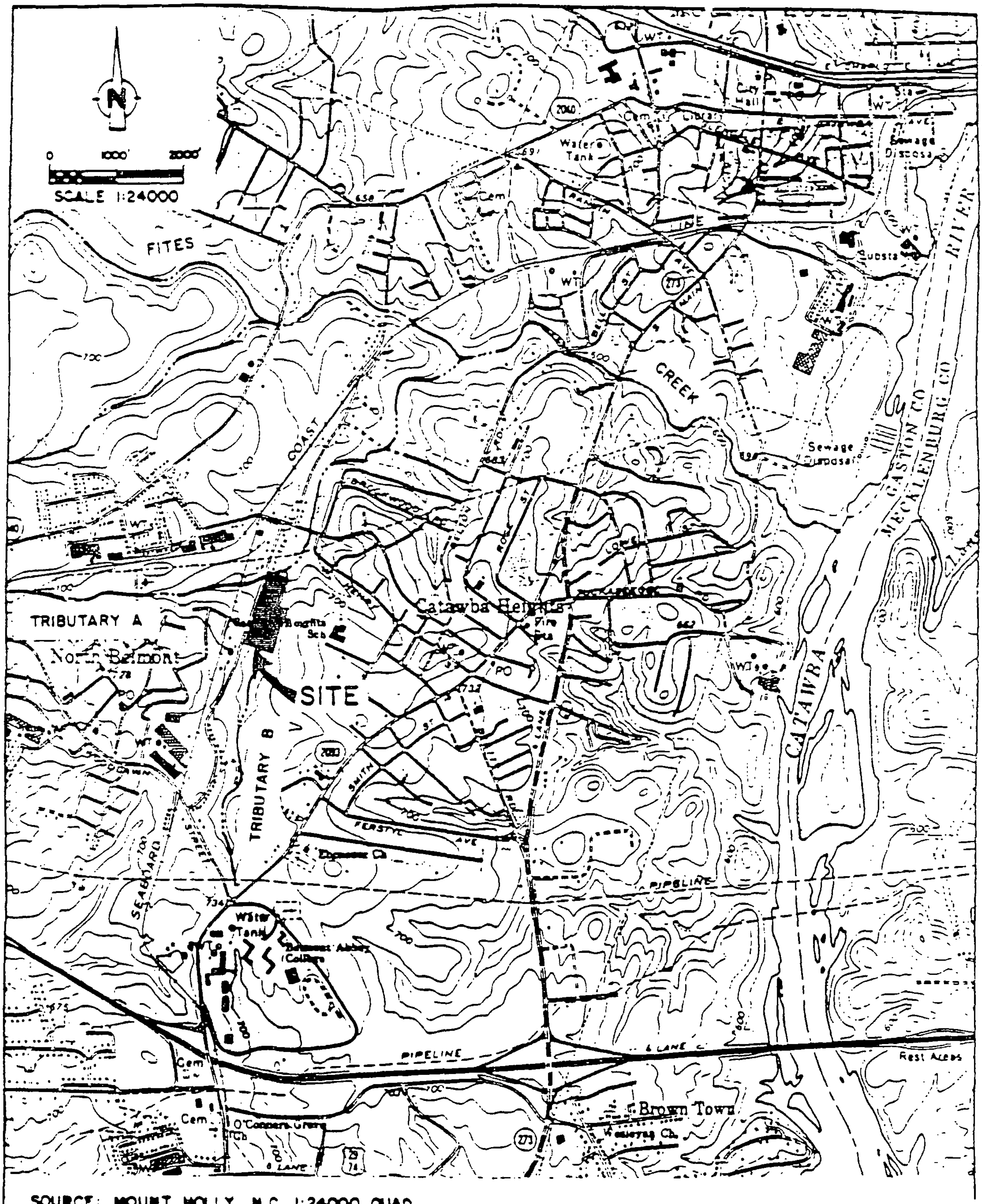
Land use of the immediately surrounding areas is a mixture of residential and industrial developments. Much of the area surrounding the site remains forested, though the area is experiencing growth and development along with the entire "Metrolina Area". According to the 1980 census, Gaston County had a population of 162,568 which represented a growth rate of 9.5% since 1970. The number of housing units increased by 28.2% over the same period. The 1980 population for Belmont was 4,607; neither Catawba Heights nor North Belmont were listed separately. Approximately 30 families live within the immediate vicinity north of the site.

Groundwater and surface water are both used for potable water. Public drinking water supplies are drawn predominantly from the Catawba River. Groundwater is not used as a drinking water supply onsite but is a water supply resource offsite for residents having operational wells installed prior to the provision of municipal water connections.

Two unnamed tributaries flow through and/or adjacent to the site. Tributary A flows in an easterly direction along the north site boundary. Tributary B flows through a buried culvert in a northward direction. The confluence of the two tributaries continue flowing in a northerly direction merging with Fites Creek and ultimately flowing into the Catawba River. Figure 3 shows the surface tributaries as well as current site condictions.

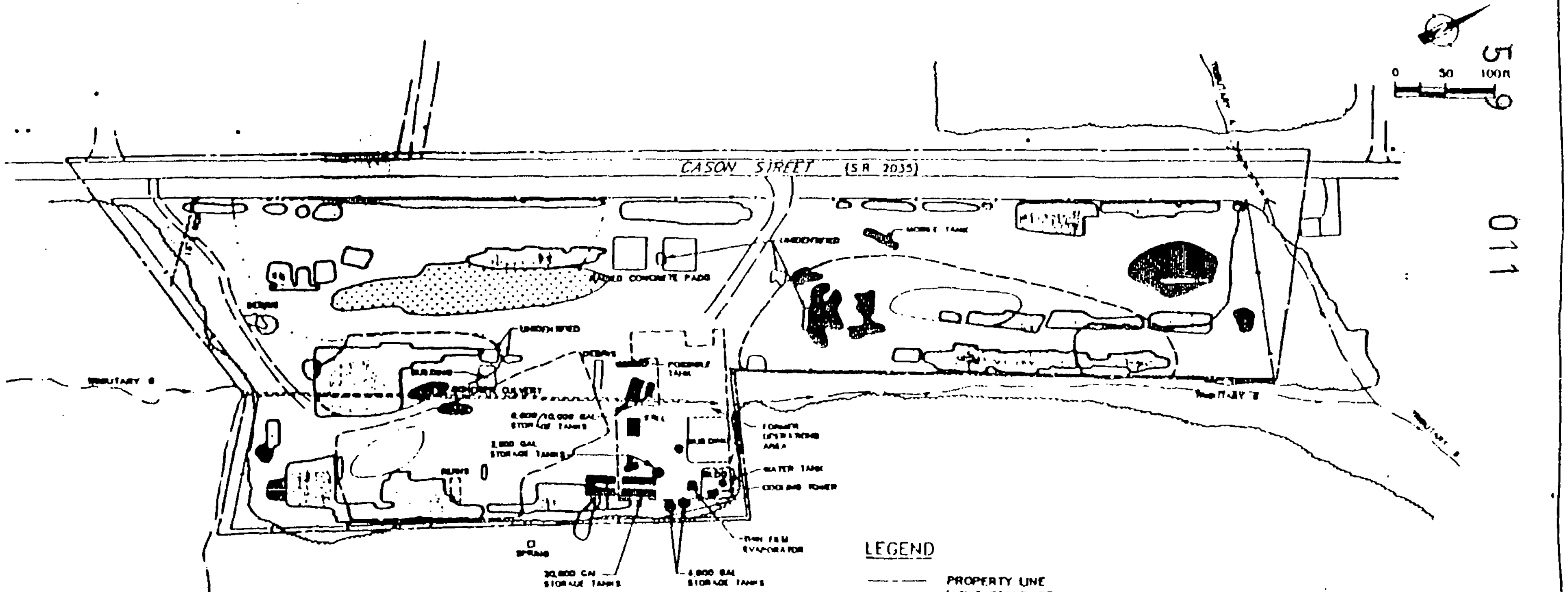
A flowing spring is located just east of the site proper. This spring historically flowed north and west and merged into tributary B downstream of the mouth of the buried culvert. Drainage from this spring currently flows across the former operations area, and discharges into Tributary B.

There are no designated North Carolina State Significant Habitats, nor historic landmark sites directly or potentially affected by the site. There are no endangered species or critical habitats within close proximity of the site. There are no identified coastal or fresh-water wetlands within an area of influence of the site.
The geologic setting of the portion of Gaston County near the site is dominated at shallow depths by the Crystalline Rock Aquifer which is the principle aquifer in the Piedmont physiographic province. Two distinct water-bearing zones exist beneath the site, the bedrock



SOURCE: MOUNT HOLLY, N.C. 1:24000 QUAD

FIGURE 1
SITE LOCATION MAP
JADCO—HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA



LEGEND

— - —	PROPERTY LINE
•	LIGHT STANDARD

COMPOSITE AREAS

▨	POSSIBLE GROUNDSTAINS AND/OR STANDING LIQUIDS
☐	DRUM AND/OR OPEN STORAGE AREAS
░	DEBRIS STORAGE AND/OR FILL AREAS
— — —	DRUM AND/OR OPEN STORAGE AREAS NOVEMBER 18, 1975
– – –	APPROXIMATE LIMITS OF LANDFILL
———	APPROXIMATE LIMITS OF FORMER SOUTH DECANT PIT
··· · —	APPROXIMATE LIMITS OF FORMER NORTH DECANT PIT

NOTES:

1. COMPOSITE AREAS SHOWN ARE BASED ON AERIAL PHOTOGRAPHS DATED FEBRUARY 12, 1980, MARCH 17, 1980, AND NOVEMBER 18, 1975 FROM THE USEPA DOCUMENT "SITE ANALYSIS – JADCO-HUGHES, NORTH BELMONT, NORTH CAROLINA", DATED DECEMBER 1985.
2. THE LOCATIONS AND LIMITS OF ALL FEATURES SHOWN ARE APPROXIMATE.
3. LOCATION OF TANKS AND EQUIPMENT BASED ON SITE MAP FROM GASTON COUNTY DSH FILES (UNDATED).

GEOPHYSICAL DATA ANOMOLIES FOUND NEAR 'UNIDENTIFIED' AREAS AND MOBILE TANK LOCATION

FIGURE 2
HISTORICAL SITE FEATURES
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

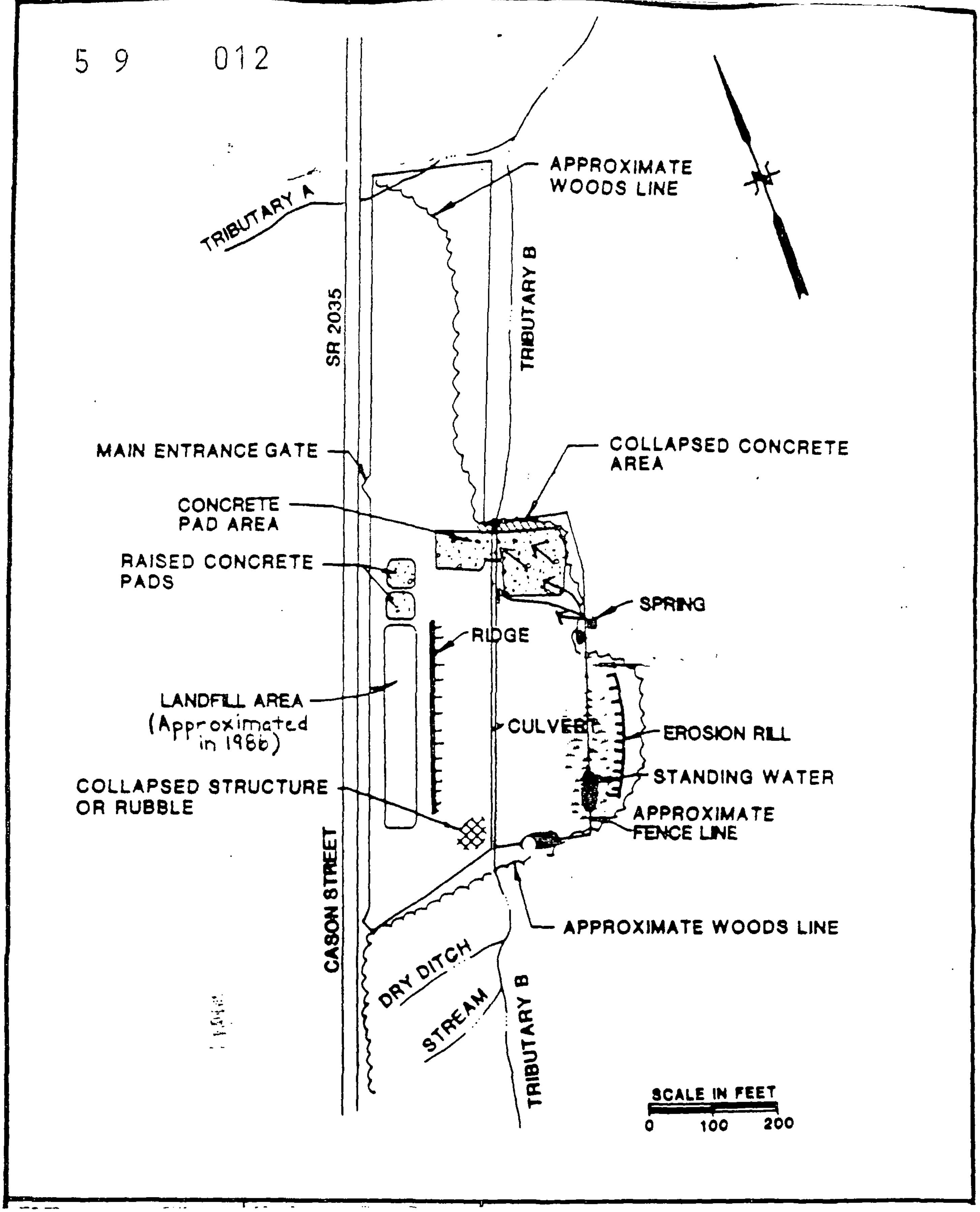


FIGURE 3
APPROXIMATE CURRENT SITE FEATURES
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

aquifer and the upper saprolite aquifer. Data generated during the Remedial Investigation (RI) confirmed that there is no confining zone between the two aquifers and therefore, these two zones are considered hydraulically connected. Results of the RI also indicated that the predominant direction of groundwater flow is to the north.

Site History and Enforcement Analysis

The Jadco-Hughes site is located in North Belmont, North Carolina. The six-acre site is a former solvent reclamation and waste storage facility operated by C.A. Hughes, Inc. from 1971 to 1975 and later leased to Jadco, Inc. until operations were suspended and consequently terminated in 1975. Aerial photography indicates that the facility was active as early as 1969. During its operation, the site reclaimed used waste paint and ink-type solvents. It also stored drummed material consisting of many waste substances including waste chemicals and chemical waste sludges from area industries.

The State of North Carolina ordered the site to be closed in 1975 after numerous complaints by neighboring residents and the documentation of frequent spills during the years of operation. In addition, the State ordered the facility to be cleaned up and pursued proper management of the cleanup under existing State and Federal laws. Reportedly, the cleanup included the excavation of two in-ground pits into which solvents were placed. Also, onsite contaminated surface soil was consolidated and covered in an onsite landfill located in the southwest quadrant of the site. All remaining large storage tanks, a mobile tanker, and numerous residual drums were removed in 1983.

In 1983, the EPA initiated a Superfund site investigation. This investigation analyzed surface water, sediment, soil, and groundwater samples. The data collected were evaluated using the Hazard Ranking System (HRS). The resulting HRS score was 42.00 and reflected the potential for groundwater and surface water contamination. As a result, the EPA finalized the site's placement on the National Priorities List (NPL) in 1986.

Subsequently, EPA negotiated with a number of the companies, or potentially responsible parties (PRPs) that had conducted business with Jadco, Inc. and C.A. Hughes, Inc. to perform the Remedial Investigation and Feasibility Study (FS), or RI/FS. In September 1986, an Administrative Order on Consent was agreed upon by EPA and the PRP Steering Committee. The Administrative Order outlined the terms under which EPA would allow the PRP Steering Committee to conduct the RI/FS.

The first draft RI Report was submitted to the Agency in December of 1989. A final RI Report was approved by EPA in August of 1990.

Community Relations Activities

The majority of public interest and participation occurred during the years of active operation and subsequent cleanup. Citizens were the source of pressure that resulted in the State ordered cleanup completed in 1978. Once the main problems associated with the operations on the site, such as the termination of incineration operations, removal of thousands of drums as well as numerous large storage tanks, and the elimination of spills and fish kills that were observed by the residents, public involvement decreased. Essentially, their primary objectives had been met.

During the investigations of 1983 and 1985, selected residents were informally interviewed when field personnel were sampling in the area. Some of the citizens allowed their wells to be tested to determine whether groundwater contamination had migrated from the site.

Formal community relations were initiated by EPA after the RI/FS process began with the development of a Community Relations Plan. Several site specific fact sheets were distributed to the area in an effort to keep citizens informed.

Two public meetings have been held near the site; the first meeting was held to present the results of the RI in November of 1989. The second public meeting was held in July of 1990 to present the Proposed Plan and to initiate the formal comment period. The Administrative Record was made available at the Information Repository. This Information Repository has been maintained for over a year at the Belmont Branch of the Gaston County Library System. Public Notice was published prior to the meeting and also announced the specific time frame of the Public Comment Period, which was July 26, 1990 to August 24, 1990.

The Responsiveness Summary, which compiles all comments received during this period, in included as Appendix A. During the course of investigative and remedial activities at the site, federal response to community needs and concerns has been perceived as sufficient. Criticism has predominantly pertained to the length of the Superfund process.

Scope and Role of Response Action

This ROD addresses the final response action for the Jadco-Hughes Site, which consists of extraction and treatment of contaminated groundwater, treatment of contaminated soils onsite, elimination of surface water contamination by surface water diversion and culvert replacement. Additional institutional controls and access restriction will be taken to complete the remediation at the site. Periodic monitoring will be conducted until all requirements as presented by this ROD are met. The response actions are consistent with the National Contingency Plan (40 CFR 300.68).

Site Characteristics

Information available from State and Gaston County files as well as aerial photography were used to help characterize the site. Surface drainage in the area of the site flows to the north. Tributary B transects the site and intersects tributary A at the north end of the site. Figure 3 shows current site features. The stream continues north to Fites Creek, approximately 0.8 miles (1.3 km) away. Fites

Creek joins the Catawba River approximately 1.5 miles (2.5 km) away.

The site is underlain by approximately 100 feet of silty sands, sandy silts, clays and silts containing variable amounts of unconsolidated granite, diorite schist and gniess. The main geologic unit at the site is the Residuum/Saprolite Unit. These units were formed by the in situ chemical weathering of the granite/diorite bedrock. The overlying Residuum displayed a higher degree of weathering and total lack of any vestigal bedrock structure. The Saprolite contains remnant granitic/dioritic structure such as relic quartz and feldspar veins. The Residuum/Saprolite unit was described as red-brown to white-black unconsolidated fine to medium grained sand and silt size particles. Fluvial deposits were encountered predominantly at the northern end of the site and consisted of clays and silts, with lesser amounts of fine to medium grain sand.
The regional hydrogeology is characterized as the Piedmont physiographic province. The Crystalline Rock Aquifer is the principal aquifer in the Piedmont physiographic province. The surficial aquifer is characterized as the Saprolite Unit and is known to be hydraulically connected with the bedrock unit.

The RI focused on the identified site features, such as the landfill, operations area and numerous storage areas, as well as determining the site impact on groundwater as well as surface water. The site characteristics have been organized by media within this decision document.

Soils

The soils at the Jadco-Hughes site were characterized by the collection of samples from boreholes, test pits and grab samples, as well as additional screening of soils with an HNu, which is used to detect the presence of organic vapors in air by photoionization.

Four areas of concern to the Agency were identified for investigation of soils. These areas were:

- o the landfill area located in the southwestern quadrant of the site;
- o the former operations area located in the southeastern quadrant of the site;
- o the former decant pits, designated the north and south pits;
- o the southeastern "swale" area;

Figure 4 estimates the locations of these areas. Soil samples were collected from other areas of the site to ensure that additional areas of soil contamination were not present.

Soil characterization will be presented by focusing on each area of concern. Due to the number of individual contaminants found at the site, the RI focused on all constituents detected at or greater than 1 mg/kg, (or 1 part per million, ppm). This format will be incorporated into the ROD to help delineate the site contamination.

Landfill Area

The landfill area originated during the 1978 cleanup and reportedly contains the consolidation of contaminated surface soils, excavated soils from the decant pits, and well as other debris. Figure 4 shows the approximate boundaries of the landfill. The landfill was characterized by the collection of samples from nine locations. The contamination found in the landfill area was predominantly organic compounds though some elevated metal concentrations have been observed. Table 1 presents a summary of the landfill contaminants. Figure 5 presents locations of soil sampling points.

The RI determined that phthalates, phenolic compounds and trichlorobenzene were most frequently detected and although a greater number of extractable organic compounds were detected, the overall concentration of volatile organic contamination was greater than that of the total extractable organic compounds in concentration. In addition PCB 1248 was detected in the landfill and antimony, lead and beryllium were detected at concentrations above estimated background levels.

Former Operations Area

The former operations area was used for distallation and processing of waste chemicals. Numerous spills were reported to have occurred in this area and consequently into the tributary system.

The collection of eight soil samples were used in the former operations area to characterize the soil contamination. Several main contaminants of concern were identified for the former operations area. These include 1,2-dichloroethane, trichloroethene, acetone, and PCB 1248. Since data was not presented for all parameters of concern on all eight samples collected in the former operations area, this Record of Decision assumes that the contamination in this area may not be not limited to those four constituents identified above. Table 2 provides the analytical data for soils in the former operations area.

Former Decant Pit Areas

The decant pits were constructed and reportedly used in 1977 as a place to pour contents of drums to allow the liquids and sludges to separate. This allowed the liquid phase of the wastes to be pumped into larger capacity storage vessels and ultimately removed. The use of plastic as lining material was reported in the RI, but according to interviews with state officials and local residents, the pits were essentially unlined. Several incidents are recorded in the State's files of the decant pits being left full of liquids for extended periods of time. Seepage of contamination most probably did occur.

The size of the south decanting pit was reported to be approximately 20 feet by 8 feet with an unknown depth. The size of the north decant pit was approximately 6 feet by 12 feet also with an unknown depth. According to the RI, personal interviews conducted with area

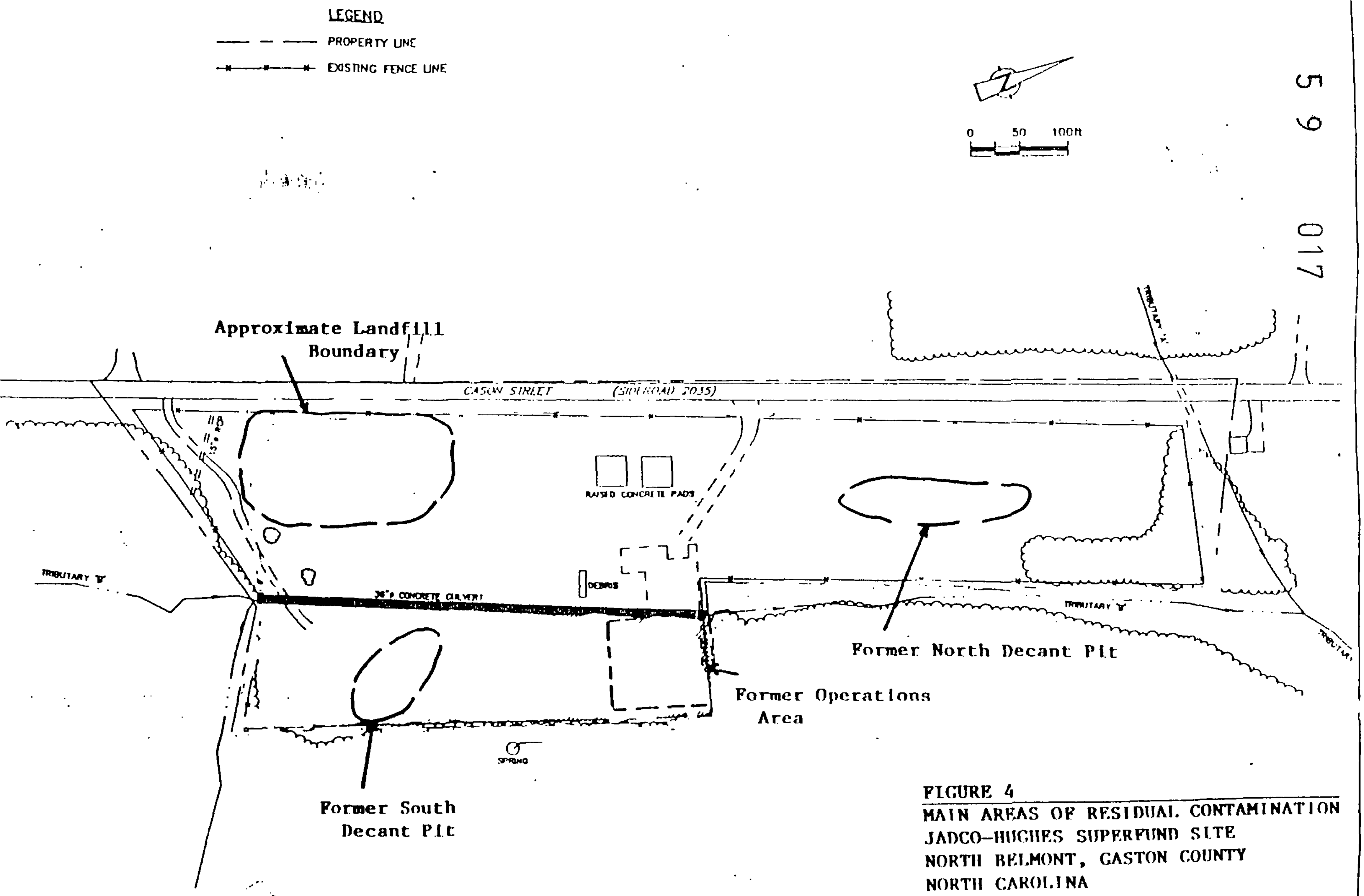


FIGURE 4
MAIN AREAS OF RESIDUAL CONTAMINATION
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

5 9 018

TABLE 1

SOIL CONTAMINANTS IN LANDFILL

Compound	F.O.D.(1)	Concentration	
		Minimum	Maximum
VOCs(mg/kg)			
acetone	9/19	ND	72
2-butanone	3/19	ND	170
1,1-dichloroethane	1/19	ND	0.0027
1,2-dichloroethane	4/19	ND	9.3
ethylbenzene	6/19	ND	65
methylene chloride	7/19	ND	11.0
4-methyl1-2-pentanone	3/19	ND	19.000
1,1,2,2-tetrachloroethane	1/19	ND	0.0095
tetrachloroethene	8/19	ND	12
toluene	7/19	ND	620
1,1,1-trichloroethane	1/19	ND	0.014
1,1,2-trichloroethane	1/19	ND	0.0028
trichloroethene	2/19	ND	3.5
total xylenes	8/19	ND	320
BNAs(mg/kg)			
acenaphthene	2/13	ND	0.98
anthracene	1/13	ND	1
benzo(o)anthrene	1/13	ND	3.1
benzo(a)pyrene	1/13	ND	3.6
benzo(b)fluoranthene	1/13	ND	2.7
benzo(g,h,i)perylene	1/13	ND	1.4
benzo(k)flouranthene	1/13	ND	2.2
benzoic acid	5/13	ND	35
bis(2-chlorethyl)ether	2/13	ND	1.7
bis(2-ethylhexyl)phthalate	11/13	ND	260
butylbenzylphthalate	5/13	ND	8.2
2-chlorophenol	5/13	ND	90
chrysene	2/13	ND	3,400
1,2-dichlorobenzene	4/13	ND	2.1
di-n-butylphthalate	9/13	ND	8.4
di-n-octylphthalate	2/13	ND	6.1
fluoranthene	2/13	ND	5.4
fluorene	2/13	ND	0.69
indeno(1,2,3-cd)pyrene	1/13	ND	2.0
2-methylnaphthalene	5/12	ND	2.9
2-methylphenol	5/13	ND	9.1
4-methylphenol	5/13	ND	2.5
naphthal[illegible]	5/13	ND	6.3
phenanth[illegible]e	1/13	ND	3.4
phenol	5/13	ND	24
pyrene	2/13	ND	5.6
1,2,4-trichlorobenzene	7/13	ND	86

TABLE 1 (cont.)

SUMMARY OF DETECTED COMPOUNDS IN SOIL-LANDFILL AREA
JADCO-HUGHES RI/FS

		Concentrations	
Compound	F.O.D.(1)	Minimum	Maximum
Pesticides/PCDs(mg/kg)			
Aroclor1248		ND	36.0
Metals and Total Cyanide (mg/kg)			
aluminum	9/9	1.6	27.6
antimony	3/9	ND	0.0475
arsenic	2/2	0.031	0.047
barium	9/9	0.027	0.268
beryllium	4/9	ND	0.002
cadmium	6/9	ND	0.004
calcium	9/9	1.2	16.4
chromium	9/9	0.006	0.19
aluminum	9/9	1.6	27.6
antimony	3/9	ND	0.0475
arsenic	2/2	0.031	0.047
barium	9/9	0.027	0.268
beryllium	4/9	ND	0.002
cadmium	6/9	ND	0.004
calcium	9/9	1.2	16.4
chromium	9/9	0.006	0.19
cabalt	9/9	0.01	0.03
copper	9/9	0.035	1.01
iron	9/9	17.0	63.7
lead	2/2	0.005	0.596
magnesium	9/9	1.4	8.9
manganese	9/9	0.11	0.99
mercury	6/9	ND	0.0002
nickel	9/9	0.0056	0.06
potassium	6/9	ND	0.885
silver	2/9	ND	0.0009
sodium	4/9	ND	0.757
thallium	2/9	ND	0.00011
vanadium	9/9	0.037	0.29
zinc	9/9	0.0234	0.175
Total Cyanide	3/7	ND	0.0089

Notes:

(1) FOD - Frequency of Detection.
- The above data assessment was based on samples collected from the following locations: BH (MW-3), BH-7, BH-8,BH9,BH-10, BH-11,TP-2,TP-3.

- VOCs = volatile orgnaic compounds.

- BNAs = base/neutral and acid extractable compounds

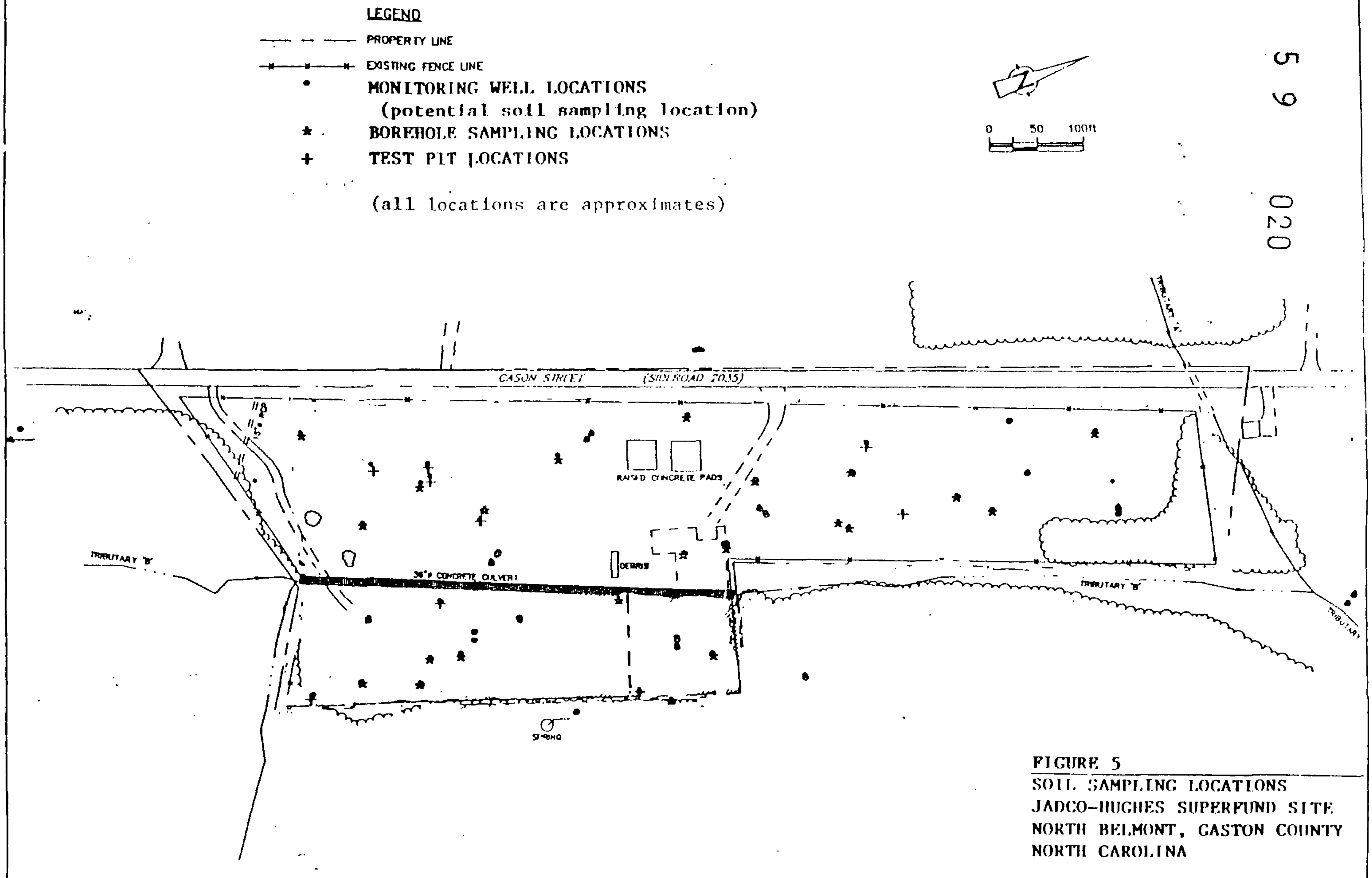


FIGURE 5
SOIL SAMPLING LOCATIONS
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

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TABLE 2

SUMMARY OF DETECTED COMPOUNDS
IN SOIL-FORMER OPRATIONS AREA
JADCO-HUGHES RI/FS

Compound	Consentrations in Soil(mg/kg) F.O.D	Minimin	Maximum
VOCs			
acetone	5/15	ND	1.8
2-butanone	2/15	ND	0.68
1,2-dichloroethane	5/15	ND	30
1,2-dichloroethene	4/15	ND	0.16
methylene chloride	4/15	ND	0.44
4-methyl-2-pentanone	4/15	ND	0.18
toluene	4/15	ND	0.2
trichloroethene	4/15	ND	19
vinyl chloride	1/15	ND	0.0055
BNAs			
bis(2-chloroethyl)ether	1/9	ND	0.23
bis(2-ethylhexyl)phthalate	5/9	ND	0.21
di-n-butylphthalate	3/9	ND	0.29
PCBs			
aroclor-1248	1/4	ND	1.2

Notes:

F.O.D - Frequency of Detection.
ND - Not Detected.

The above data assessment was based on samples collected from the following locations:
BH(MW-6), BH-17, BH-18, BH-19, BH-20, BH-21, TP-7.

Analytical results for full list of TCL compounds and detected limits are provided in Appendix M.

residents suggested that the north pit may have been much larger and deeper than reported. Also, local residents indicated that both the north and south decant pits were at least 15 feet deep since a bulldozer was observed to be completely hidden while inside the pits. The use of the pits was discontinued following a state inspection in 1977. The RI also reports that the pits were pumped out, limed and backfilled.

Samples were collected from seven locations in each decant pit area to characterize the soils. Table 3 and Figure 6 provide the locations and tabulated data of the pit areas. Based on the findings of the RI, the decant pits no longer constitute a source of groundwater contamination. Soils from the decant pits will not be further remediated.

Southeastern "Swale" Area

The results of Phase I of the RI, indicated the southeastern area of the site, also known as the "swale" area, required further investigation to delineate the extent of PCB contamination of surface soils. This focused portion of the RI is presented in the Surface Sediment Assessment of the RI. This ROD considers this area of concern under the soils characterization of the site.

Concentrations of PCB were observed up to 1500 mg/kg, (or ppm). As a result, the PRPs suggested an interim removal soil program and entered into an Administrative Order on Consent with the EPA to conduct the removal. The final Interim Soil Removal Program is attached as Appendix B. The Soil Removal Program establishes the cleanup goal for PCBs at 10 mg/kg. This cleanup goal was derived from the USEPA PCB Cleanup Spill Policy and will be conducted in accordance to TSCA.

Surface Water and Sediments

As described earlier, the site has a tributary system that flows adjacent to and/or through the site. There is also a flowing spring from the property just east of the site boundary. The confluence of these three water systems flows northward until it merges with Fites Creek and ultimately discharges into the Catwba River.

Historical records provide information concerning unauthorized discharges of waste materials occurring at regular intervals during facility operations. At least two fish kills were considered to be caused by surface water violations from the site during active operations.
Surface water and sediment samples were collected in an effort to establish background conditions as well as to characterize the nature and extent of contamination from the site. Surface water sampling resulted in the identification of surface water contamination, predominantly of organic compounds. Table 4 lists these contaminants. Figure 6 shows the locations of all surface water and sediment sampling locations. The nature of the contamination indicates that the impact to surface water may be from groundwater discharge via the damaged culvert or from surface water runoff

Table 3

SUMMARY OF DETECTED COMPOUNDS
IN SOIL-DECANT PIT AREAS
JADCO-HUGHES RI/FS

Compound	Consentrations in Soil (mg/kg)		
	F.O.D	Minimum	Maximum
VOCs			
acetone	16/28	ND	1.8
2-butanone	4/28	ND	6.6
chlorobenzen	1/14	ND	0.0015
chloroform	3/14	ND	0.053
1,2-dichloroethane	3/14	ND	0.83
ethylbenzen	3/14	ND	1.3
2-hexanone	1/28	ND	0.036
methylene chloride	5/28	ND	0.093
4-methyl-2-pentanone	4/28	ND	35
1,1,2,2-tetrachloroethane	5/14	ND	0.38
tetrachloroethene	5/14	ND	5.3
toluene	3/14	ND	2.9
1,1,2-trichloroethane	3/14	ND	0.023
trichloroethene	4/14	ND	0.46
total xylenes	3/14	ND	9.1
BNAs			
bix(2-ethylhexyly)phthanlate	7/14	ND	1.1
butylbenzylphthalate	1/7	ND	0.11
2-chlorophenol	2/15	ND	0.77
di-n-butylphthalate	8/15	ND	0.74

Notes:

F.O.D. - Frequency of Detection.
ND - The above data assessment was based on samples collected from the following locations: BH-22, BH-23, BH-24, BH-25, BH-26, TP-9, TP-11.

Analytical results for full list of TCL compounds and detected limits are provided in in Appendix M.

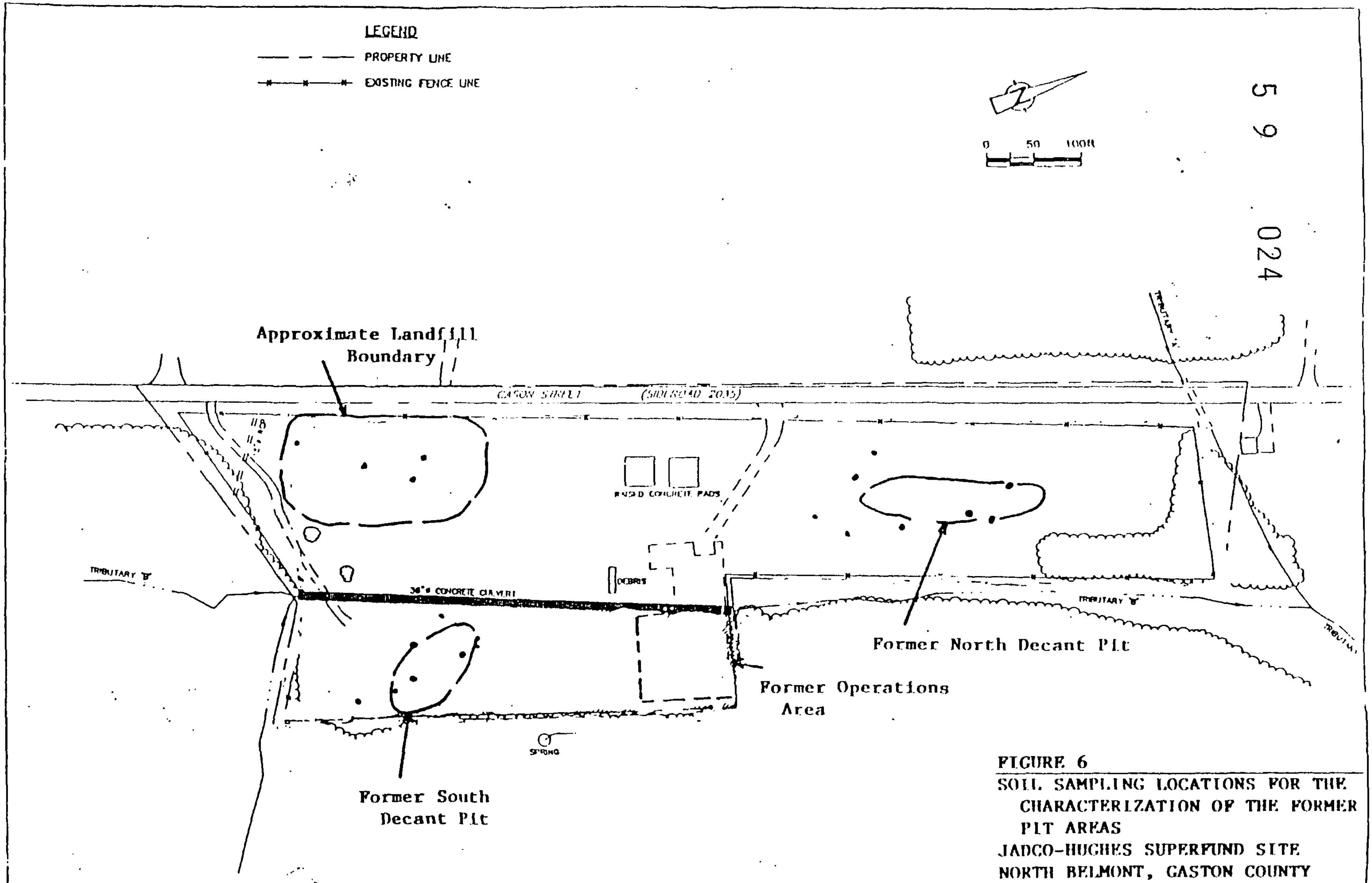

FIGURE 6
SOIL SAMPLING LOCATIONS FOR THE CHARACTERIZATION OF THE FORMER PIT AREAS
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

CRA
2427-15/11/89-7-0 (P-12)

TABLE 4

SURFACE WATER SAMPLE RESULTS
DETECTED COMPOUNDS
JADCO-HUGHES RI/FS

	Upstream of site		Adjecent to Site		Downstream of Confluence	
Compound	FOD	Range of Consentrations (ug/L)	FOD	Range of Consentrations (ug/L)	FOD	Range of Consentrations (ug/L)
VOCs						
acetone	4/4	2.4-8.7	6/6	2.2-12	1/1	3.3
carbon tetrachloride	0/4	ND	2/6	3.4-13	1/1	0.60
chlorobenzene	0/4	ND	2/6	1.4J-2.7J	0/1	ND
chloroform	0/4	ND	3/6	15-23	1/1	3.1
1,1-dichloroethane	0/4	ND	1/6	0.29J	0/1	ND
1,2-dichloroethane	0/4	ND	3/6	7.0-140	1/1	1.5
1,2-dichloroethene (total)	0/4	ND	3/6	2.0-14	1/1	0.43
4-methyl1-2-pentanone	0/4	ND	2/6	0.98J-1.9J	0/1	ND
tetrachloroethene	1/4	0.35J	2/6	0.21J-2.3	1/1	0.69JL
toluene	1/4	1.1J	3/6	1.21J-6.12	1/1	1.4
trichlorethene	0/4	ND	3/6	1.7-10	1/1	0.49
1,1,1-trichloroethane	0/4	ND	1/6	0.38J	0/1	ND

Notes:

ROD - Frequency of Detection
J - an estimated qualntity
ND - nOT DETECTED
Analytical results for full list of TCL compounds and detection limits are provided in Appendix M.
Average concentrations are ased on detected values only.

TABLE 4 (Cont.)

SURFACE WATER SAMPLE RESULTS
DETECTED COMPOUNDS
JADCO-HUGHES RI/FS

Compound	FOD	Upstream of Site Range (ug/l)	Averae (ug/L)	FOD	Adjacent to Site Range (ug/L)	Average (ug/L)	FOD	Downstream of Confluence Range (ug/L)	Average (ug/L)
BNAs									
bis(2-chloroethyl)ether	0/4	ND	ND	2/6	1.7J2.1J	1.9J	0/1	ND	ND
bis(2-ethylbhxyl)phthalate	4/4	4.4-100	30	6/6	3.1-60	20	1/1	94	94
butybenzyphthalate	1/4	ND-1.0J	1.0J	0/6	ND	ND	0/1	ND	ND
1,3-dichlorobenzene	0/4	ND	ND	1/6	ND-1.5J	1.5J	0/1	ND	ND
1,4-dichlorobenzene	0/4	ND	ND	2/6	2.J-2.7J	2.4J	00/1	ND	ND
Diethylphthalate	0/4	ND	ND	1/6	ND-1.5J	1.5J	0/1	ND	ND
di-n-butylphthalate	4/4	3.5-8.7	6.4	4.1-6.1	5.0	1/1	7.1	7.1	
4-methylphenol	1/4	ND-1.6J	1.6J	0/6	ND	ND	0/1	ND	ND
1,2,4-trichlorobenzene	0/4	ND	ND						

Notes:

FOD -Frequency of Detection
J - an estimated quantity
ND-Not detected
Analytical results for full list of TCL compounds detection limits are provided in Appendix M.

TABLE 4 (Cont.)

SURFACE WATER SAMPLE RESULTS
DETECTED COMPOUNDS
JADCO-HUGHES RI/FS

		Upstream of Site			Adjacent to Site			Downstream of Confluence	
Compound	FOD	Range (ug/l)	Averae (ug/L)	FOD	Range (ug/L)	Average (ug/L)	FOD	Range (ug/L)	**Average (ug/L)**
Pesticdes/PCPs									
beta-BHC	1/4	ND-0.46C	0.46C	0/6	ND	ND	0/3	ND	ND
delth-BHC	0/4	ND	ND	1/6	ND-0.015C	0.051C	0/3	ND	ND
gamma-BHC(lindane)	1.4	ND-0.41C	0.41C	0/6	ND	ND	0/3	ND	ND
dieldrin	0.4	ND	ND	1/6	ND-0.059C	0.059C	0/3	ND	ND

Notes:

FOD -Frequency of Detection
J - an estimated quantity
ND-Not detected
Analytical results for full list of TCL compounds detection limits are provided in Appendix M.

currently flowing across the former operations area. The contamination detected in the surface water is similar to the contamination found in the groundwater, but at much lower concentrations. An additional source could be the surface flow from the spring accross the former operations area.

The concentrations of the site contaminants that were detected in the sedimentation of the tributary system were very low. Elimination of the potential sources of the contamination entering into the surface water system is included in the site remedy. Therefore, sediment in the tributary systems are not being considered for further remediation. Monitoring of the surface water as well as the sediments will ensure that no additional sources exist and that the current problems are eradicated.

Groundwater

The site groundwater was characterized by sampling and analysis of 21 monitoring wells which were installed during the RI. Figure 7 provides the monitoring well locations. Five residential wells were also sampled.

Volatile organic compounds, VOCs, in groundwater are of principle concern at the Jadco-Hughes site. Table 5 identifies the twenty five VOCs identified in the groundwater. Twelve of these compounds exceed drinking water criteria. These are (in decreasing order of maximum concentration) as follows:

- acetone
- chloroform
- vinyl chloride
- 2-butanone (also known as methylethylketone)
- carbon tetrachloride
- 1,2-dichloroethene
- methylene chloride
- 4-methyl-2-pentanone (also known as methyl-isobutyl ketone)
- 1,2-dichloroethane
- benzene
- 1,1-dichloroethene
- trichloroethene

VOC contamination is most prominent in the former operations area at well MW6S and the former south decant pit area at wells MW2D and PW1. Groundwater contamination by VOCs is also evident at the following monitoring wells: MW3S, MW7S, MW8S, and MW5D. VOCs present at these wells are generally an order of magnitude lower than contamination found in former source areas. These areas of contamination may be attributed to unrecorded, isolated releases over the site.

The results analysis for extractable organic compounds, also known as base-neutral-acid compounds (BNAs), identified fourteen BNA compounds. Table 6 identifies these compounds. Three of these contaminants exceeded drinking water standards:

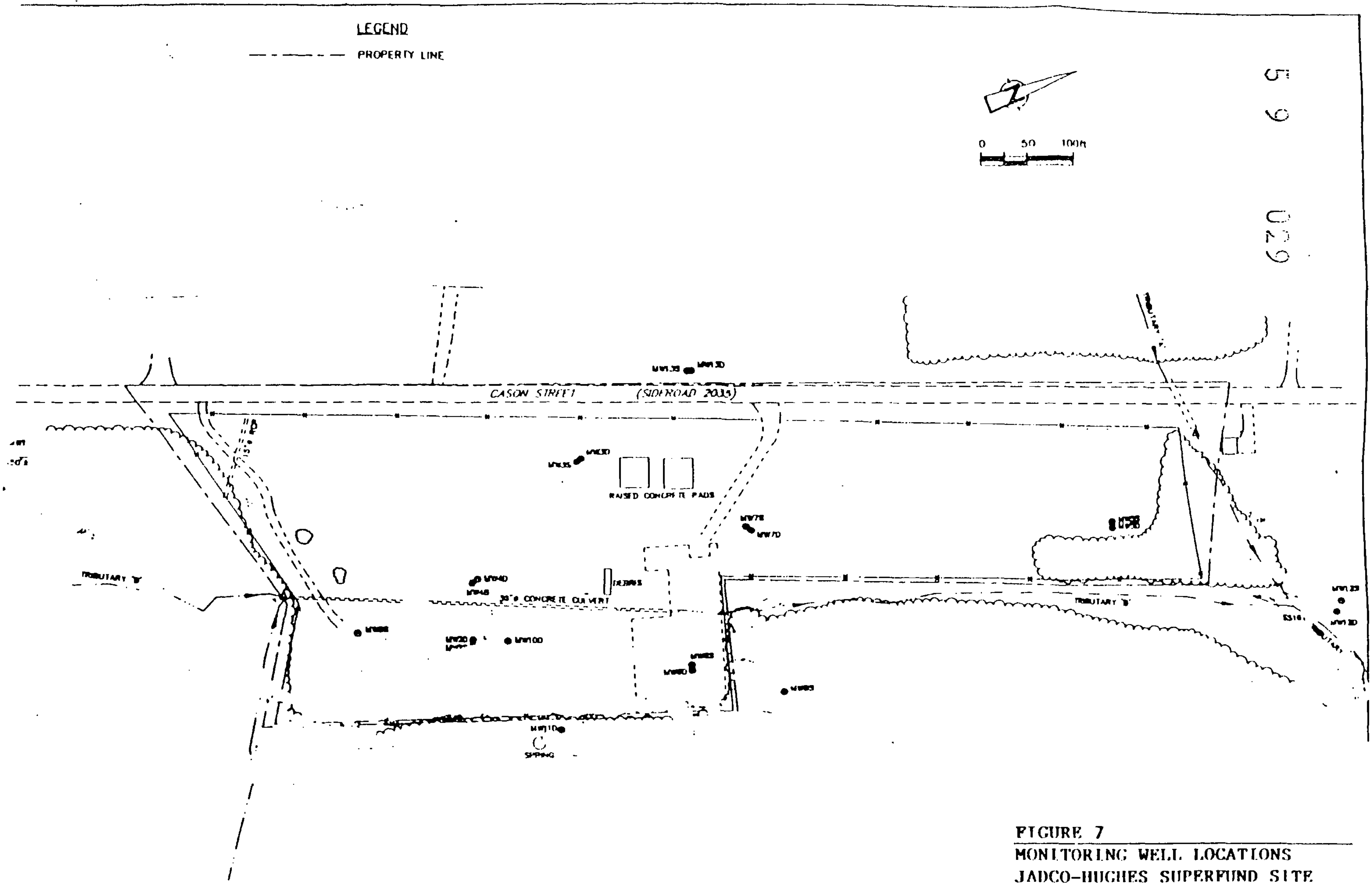

FIGURE 7

MONITORING WELL LOCATIONS
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

Table 5

GROUNDWATER - VOC SAMPLE RESULTS
JADCO-HUGHES RI/FS

VOCs	F.O.D.	Range (ug.L)
acetone	8/17	ND-140,563
benzene	11/17	ND-1,285
2-butanone	2/17	ND-64,000
carbon disulfide	6/30	ND-1.25
charbon tetrachloride	6/17	ND-26,118
chlorobenzene	6/17	ND-340
chloroethane	2/17	ND-15
chloroform	14/17	ND-103,589
1.1-dichloroethane	8/17	ND-110
1,2-dichloroethane	13/17	ND-5,531
1,1-dichloroethene	6/17	ND-839
1,2-dichloroethene	12/17	ND-15,000
1,2-dichloropropane	2/17	ND-0.34
ethylbenzene	3/17	ND-1,268
2-hexanone	2/17	ND-1,800
methylene chlorode	12/17	ND-10,981
4-methyl-2-pentanone	2/17	ND-10,277
1,1,2,2-tetrachloroethane	1/17	ND-0.26
tetrachloroethene	6/17	ND-13
toluene	10/17	ND-98,808
1,1,1-trichloroethane	4/17	ND-672
1,1,2-trichloroethane	3/17	ND-2.8
trichloroethene	9/17	ND-580
vinyl chloride	9/17	ND-68,000
total xylenes	8/17	ND-5,402

(1) F.O.D. - Frequency of Detection
(2) ND - Not Detected
(3) Drinking Water Criteria and references are provided in Table 1.1.

Analtyical resluts for full list of TCL compounds and detected limits are provided in Appendix M.

Table 6

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GROUNDWATER - BNA DATA SCREEN
JADCO-HUGHES RI/FS

BNA	F.O.D.	Range (ug.L)
benzoic acid	2/17	ND-4,800
bis(2-chlorethyl)ether	10/17	ND-29,000
bis(2-chloroisopropyl)ether	1/17	ND-11
bis(2-ethylhexyl)phthalate	9/17	ND-270
1,2-dichloroebenzene	7/17	ND-89
1,3-dichlorobenzene	7/17	ND-89
1,4-dichlorobenzene	9/17	ND-590
di-n-butyphthalate	6/17	ND-680
di-n-octylphthalate	4/35	ND-3.1
2-methylphenol	1/17	ND-26
4-methylphenol	1/17	ND-74
naphthalene	1/17	ND-8.1
phenol	3/17	ND-1700
1,2,4-trichlorbenzene	8/17	ND-3000

Notes:

(1) F.O.D. - Frequency of Detection
(2) ND - Not Detected
(3) Table 1.1. (including groundwater)
Analtyical resluts for full list of TCL compounds and detected limits are provided in Appendix M.

- bis(2-chloroethyl)ether
- 1,2,4-trichlorobenzene
- 1,4-dichlorobenzene

It must be noted that drinking water criteria are not established for many of the BNAs.

The presence of BNA compounds follows the pattern of prominent VOCs. The BNA compounds of greatest concentration are found at monitoring wells located in the former operations area and the former south decant pit.

The presence of inorganic, or metal concentrations are often detected in groundwater samples since metals are naturally occurring elements within the structure of an aquifer. Twenty-one metals were detected in groundwater samples and are shown in Table 7. Comparison to background concentrations, as well as frequency of detection were utilized in the selection of contaminants of concern. The concentrations of eleven metals exceeded drinking water criteria:

- aluminum
- antimony
- arsenic
- beryllium
- cadmium
- chromium
- iron
- lead
- manganese
- nickel
- vanadium

Groundwater within the shallow saprolite is believed to discharge to the tributaries of Fites Creek while the deeper groundwater is believed to migrate in a northerly direction. Groundwater migration is estimated to move at a rate of approximately 8 to 14 per year.

Summary of Site Risks

The following discussion provides an overview of the baseline public health and environmental risk evaluation for the Jac -Hughes site. It is based on the "Superfund Risk Assessment for the Jadco-Hughes Site, North Belmont, North Carolina". The baseline evaluation helps determine if a remedial action is necessary at the site. It is designed to represent an evaluation of the "no-action alternative", in that it identifies the risk present if no remedial action is taken. The baseline assessment also provides the framework for developing the preliminary remediation goals for the Jadco-Hughes site. Field observations and analytical data as presented in the RI report represent exposure point concentrations for the risk evaluation. Risk from the future ingestion of the groundwater is the most significant risk posed by the site. Potential impact of contaminated groundwater on surface water is also of concern at the Jadco-Hughes site.

Table 7

GROUNDWATER - BNA DATA SCREEN
JADCO-HUGHES RI/FS

BNA	F.O.D.	Range (ug.L)
<u>On-Site Groundwater</u>		
aluminum	16/16	ND-130
antimony	7/16	ND-0.39
arsenic	8/25	ND-0.09
barium	16/16	ND-0.56
beryllium	2/16	ND-0.001
cadmium	3/16	ND-0.008
calcium	16/16	35-470
chromium VI	22/25	ND-0.76
cobalt	13/16	ND-0.1
copper	13/16	ND-0.4
iron	16/16	4.2-200
lead	18/45	ND-0.76
magnesium	16/16	16-170
manganese	16/16	0.24-56
nickel	14/16	ND-0.58
potassium	4/16	ND-11
silver	3/24	ND-0.011
sodium	16/16	9.6-36
thallium	1/16	ND-0.001
vanadium	13/16	ND-0.38
zinc	24/24	0.004-7.8

Notes:

(1) F.O.D. - Frequency of Detection
(2) ND - Not Detected
(3) Criteria and references provided on Table 1.1.
(including background)

Analtyical resluts for full list of TCL compounds and detected limits are provided in Appendix M.

TABLE 8
SUBSURFACE SOIL EXPOSURE POINT CONCENTRATIONS
JADCO-HUGHES SUPERFUND SITE

Former Compound[a] (mg/kg)	N. Decant Pit	S. Decant Pit	Operations Area	Landfill Area
VOCs				
acetone	1.64	0.57	0.39	9.9
2-butanone	5.25	2.12	0.39	72
chlorobenzene		0.002		
chloroform		0.02		
1,1-dichloroethane				0.0027
1,2-dichloroethane		0.47	6.06	5.7
1,2-dichloroethene			0.08	
ethylbenzene		0.67		36.4
2-hexanone	0.04			
methylene chloride	0.01	0.03	0.11	3.1
4-methyl-2-pentanone	0.32	29	0.06	4.5
1,1,2,2-tetrachloroethane		0.10		0.0095
tetrachloroethene		1.55		4.7
toluene		1.74	0.06	303.6
1,1,1-trichloroethane				0.014
1,1,2-trichloroethane	0.01			0.0028
trichloroethene		0.25	4.76	1.8
total xylenes		4.47		134.6
vinyl chloride			0.01	
BNAs				
acenaphthene				0.575
anthracene				1.0
benzo(a)pyrene				3.6
benzo(b)fluoranthene				2.7
benzo(g,h,i)perylene				1.4
benzo(k)fluoranthene				2.2
benzoic acid				19.4
bis(2-chloroethyl)ether			0.23	1.5
bis(2-ethylhexyl)phthalate	0.13	0.53	0.15	53.8
butylbenzylphthalate		0.11		5.0
2-chlorophenol	0.77	0.34		42.4
chrysene				1.8
1,2-dichlorobenzene				1.7
1,4-dichlorobenzene				0.775
di-n-butylphthalate	0.36	0.44	0.19	3.4
fluoranthene				2.9
fluorene				0.44
indeno(1,2,3-cd)pyrene				2.0
2-methylnaphthalene				1.1
2-methylphenol				5.1

The risk assessment for this decision document is divided into the following components:

- Contaminant identification
- Exposure assessment
- Toxicity assessment
- Risk Characterization

Contaminant Identification

The objective of contaminant identification is to screen the information that is available on hazardous substances or wastes present at the site and to identify contaminants of concern on which to focus the risk assessment process. Contaminants of concern are selected based on magnitude and frequency of occurrence, their toxicological properties, and/or because they are presently in or potentially may move into critical exposure pathways (e.g., drinking water supply).

The media of concern at the site are surficial soils and sediments adjacent to the south decant pit and former operations area; subsurface soils in the north and south decant pits, former operations area and onsite landfill, groundwater and surface water in Tributaries in A and B which flow into Fites Creek. Contaminants of concern in the subsurface soils and groundwater are volatile organic compounds (VOCs), extractable organic compounds and metals. PCBs are the contaminants of concern in the surface soils and sediments. The surface water contaminants of concern are the groundwater chemicals which could discharge into the surface water.

The exposure point concentrations for subsurface soils are based on the arithmetic mean of the detected values. These mean concentrations are contained in Table 8.

The exposure point concentrations for groundwater for the risk assessment were based on the three following mean concentrations:

- mean of all detects above SQLs plus nondetects assumed to be present at one-half the concentration of the SQL (Level 1);
- 95th percentile mean of the Level 1 mean concentration (Level 2);
- mean of all detects above sample quantitations limits (SQLs) (Level 3);

The exposure point concentrations for groundwater are contained in Table 9.

TABLE 8 (cont.)
SUBSURFACE SOIL EXPOSURE POINT CONCENTRATIONS
JADCO-HUGHES SUPERFUND SITE

Former Compound (mg/kg)	N. Decant Pit	S. Decant Pit	Operations Area	Landfill Area
BNAs (cont.)				
4-methylphenol				1.9
naphthalene				3.6
phenanthrene				3.4
phenol				1.6
pyrene				3.0
1,2,4-trichlorobenzene				24.2
Pesticides/PCBs				
Aroclor			1.2	20.3
Metals and Cyanide				
aluminum				13.9
antimony				0.031
arsenic				0.038
barium				0.102
beryllium				0.001
cadmium				0.002
calcium				4.0
chromium				0.066
cobalt				0.02
copper				0.218
iron				36.4
lead				0.3
magnesium				4.1
manganese				0.487
mercury				0.0001
nickel				0.021
potass				0.358
sodium				0.53
thallium				0.000095
vanadium				0.1215
zinc				0.071
cyanide (total)				0.00684

a A blank space for an organic compound denotes that the compound was not detected. A blank space for an inorganic compound indicates the compound was not detected above the background conentration for that chemical.

TABLE 9
GROUNDWATER EXPOSURE POINT CONCENTRATIONS
JADCO-HUGHES SUPERFUND SITE

Chemical (mg/l)	Level 1	Level 2	Level 3
Organics			
acetone	8.12	14.04	30.52
benzene	0.16	0.31	0.01
2-butanone	4.25	4.70	57.12
carbon tetrachloride	1.48	1.54	7.15
chlorobenzene	0.21	0.41	0.09
chloroethane	0.18	0.37	0.02
chloroform	7.04	7.06	10.03
1,1-dichloroethane	0.11	0.21	0.02
1,2-dichloroethane	0.44	0.48	0.69
1,1-dichloroethene	0.17	0.34	0.01
1,2-dichloroethene (total)	1.04	1.07	2.05
1,2-dichloropropane	0.21	0.42	ND
ethylbenzene	0.25	0.50	ND
2-hexanone	1.22	2.44	ND
methylene chloride	0.67	0.68	0.73
4-methyl-2-pentanone	1.56	3.11	ND
tetrachloroethylene	0.15	0.30	0.01
toluene	5.85	5.94	28.81
1,1,1-trichloroethane	0.14	0.27	ND
1,1,2-trichloroethane	0.18	0.35	0.01
trichlorethylene	0.07	0.14	0.01
vinyl chloride	3.56	3.69	10.31
xylene	0.35	0.46	2.40
benzoic acid	0.55	1.10	ND
bis(2-chloroethyl)ether	1.55	3.37	7.56
bis(2-ethylhexyl)phthalate	0.02	0.04	0.01
1,2-dichlorobenzene	0.03	0.04	0.05
1,3-dichlorobenzene	0.03	0.04	0.03
1,4-dichlorobenzene	0.07	0.12	0.15
di-n-butylphthalate	0.05	0.09	0.09
phenol	0.12	0.25	0.67
1,2,4-trichlorobenzene	0.17	0.36	0.69

ND - No samples were detected above the quantitation limit.

The exposure point concentrations of PCBs in the surface soils and sediments for Levels 1,2, and 3 are 90.6 mg/kg, 189.7 mg/kg and 107.0 mg/kg respectively.

Future surface water concentrations were calculated based on complete discharge of groundwater to the tributaries and subsequent dilution based on the tributary flow rate. Surface water exposure point concentrations are contained in Table 10.

Exposure Assessment

The objectives of an exposure assessment are to identify actual or potential exposure pathways, to characterize the potentially exposed populations, and to determine the extent of the exposure. Identifying potential exposure pathways helps to conceptualize how contaminants may migrate from a source to an existing or potential point of contact. An exposure pathway may be viewed as consisting of four elements: (1) A source and mechanism of chemical release to the environment; (2) An environmental transport medium (e.g., air, groundwater) for the released chemical; (3) A point of potential contact with the contaminated medium (referred to as the exposure point); and (4) An exposure route (e.g., inhalation, ingestion) at the exposure point.

The exposure assessment for the Jadco-Hughes site evaluated the potential exposure pathways of air, surface water, soil sediments, and groundwater.

Potentially complete exposure pathways include:

- direct contact with contaminated surface soil and sediments;
- future ingestion of contaminated groundwater as a drinking water source and exposure to groundwater via showering or bathing;
- future recreational use of contaminated surface water; and
- future contact with contaminated subsurface soil due to construction activities onsite.

Potential exposure is characterized by the local setting. The site is vacant and partially secured by a fence. Although human access to the site is infrequent and unauthorized, the potential exists for a trespasser to be exposed to contaminated surface soil and sediments. Tributaries A and B are small streams which flow adjacent to and converge downstream of the site. Surface water is not used as a drinking water supply or for fishing in the vicinity of the site. However, contact with surface water could occur through recreational activities. Groundwater is not used as a drinking water supply onsite but is a water supply resource offsite for residents having operational wells installed prior to the provision of municipal water connections. The future potential exists for offsite wells to become contaminated with chemicals in the onsite plume and for residents to be exposed to the contaminated groundwater.

TABLE 10
SURFACE WATER EXPOSURE POINT CONCENTRATIONS
JADCO-HUGHES SUPERFUND SITE

Chemical (ug/l)	NON-CARCINOGENIC CONCENTRATIONS [a]			CARCINOGENIC CONCENTRATIONS [a]		
	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
acetone	39.67	68.50	148.90	147.86	255.31	549.98
benzene	0.77	1.74	0.06	2.86	6.48	0.22
2-butanone	20.75	35.78	278.65	77.34	133.34	1038.62
carbon disulfide	0.32	0.51	0.01	1.19	1.89	0.03
carbon tetrachloride	7.25	12.89	34.90	27.01	48.00	130.07
chlorobenzene	1.01	7.49	0.46	3.77	5.51	1.70
chloroform	34.35	59.84	48.94	128.04	223.04	182.42
1,1-dichloroethane	0.52	0.78	0.08	1.96	2.91	0.32
1,2-dichloroethane	2.13	3.41	3.37	7.94	12.71	12.55
1,1-dichloroethene	0.82	1.24	0.01	3.06	4.64	0.02
1,2-dichloroethene	5.09	8.93	10.00	18.97	33.27	37.26
methylene chloride	3.27	5.45	3.57	12.17	20.33	13.31
tetrachloroethene	0.73	1.09	0.03	2.71	4.06	0.11
toluene	28.54	49.67	140.52	106.36	185.14	523.74
trichloroethene	0.36	0.56	0.02	1.33	2.07	0.08
vinyl chloride	17.37	31.80	50.28	64.76	118.54	187.42
xylenes	1.70	2.80	11.71	6.34	10.44	43.66
bis(2-chloroethyl)ether	7.58	16.45	36.89	28.24	61.31	137.46
bis(2-ethylhexyl)phthalate	0.120	.21	0.03	0.43	0.78	0.10
1,2-dichlorobenzene	0.13	0.20	0.25	0.47	0.76	0.92
1,3-dichlorobenzene	0.15	0.18	0.14	0.55	6.66	0.53
1,4-dichlorobenzene	0.35	0.58	0.74	1.30	2.18	2.77
di-N-butyl phthalate	0.23	0.45	0.42	0.84	1.67	1.57
phenol	0.56	1.20	3.25	2.10	4.49	12.13
1,2,4-trichlorobenzene	0.81	1.73	3.39	3.02	6.45	12.59

[a] The surface water concentrations are based on complete discharge of groundwater into the tributaries and subsequent dilution based on the tributary flow rate. Noncarcinogenic concentrations are based on the 7Q10 flow rate (lowest 7 day average flow rate over a 10 year period). Carcinogenic concentrations are based on an average long term flow rate.

The future residential groundwater exposure concentrations assume that there is no discharge to intermediate surface water bodies, and that no attenuation or dilution of chemicals occurs before reaching the exposure point. The ingestion rate of groundwater was assumed to be 1.4 liters for level 1 and 2.0 liters for levels 2 and 3. The exposure duration for carcinogens was 10, 30 and 70 years for levels 1,2 and 3 respectively. The exposure duration for noncarcinogens was assumed to be one year.

The potential future surface water concentrations were based on the complete discharge of groundwater to the tributaries. The exposure concentration for noncarcinogens was based on dilution in the tributaries at the 7Q10 flowrate (the lowest 7 day average flowrate occurring over a 10 year period). The carcinogen exposure concentration was based on dilution in the tributary at a long-term average flowrate. The main assumptions for surface water contact were for an ingestion rate of 50 ml/hour, a body surface area of 18,200 cm^2, a permeability constant of 0.002 cm/hr and an exposure time of 2.6 hours. The exposure duration for carcinogens was 20 years for level 1 and 30 years for levels 2 and 3. The exposure duration was assumed to be 1 year for noncarcinogens. The exposure frequency was 7, 21 and 52 days/year for levels 1,2 and 3 respectively.

Surface soil and sediment exposure concentrations are based on current concentrations in those media. Subsurface soil exposure concentrations are based on current concentrations in the subsurface and the assumption that these soils will be brought to the surface during future construction activities.

The exposure assumptions for direct contact with surface soil and sediments by a trespasser and direct contact with subsurface soils by a construction worker are for a 100 mg/day soil ingestion rate, a body surface area of 1980 cm^2, an absorption factor of 0.15 and a soil to skin adherence factor of 1.45 mg/cm^2. The exposure frequency for the trespasser scenario is for 3,6 and 9 days/year for levels 1, 2 and 3 respectively and and exposure duration of 20, 30 and 50 years for these same levels. The exposure frequency for the construction worker scenario is for 30, 90 and 180 days/year for the three exposure levels and the exposure duration is for 1 year.

Toxicity Assessment

Toxicity assessment, as part of the Superfund baseline risk assessment process, considers (1) the types of adverse health or environmental effects associated with individual and multiple chemical exposures; (2) the relationship between magnitude of exposures and adverse effects; and (3) related uncertainties such as the weight of evidence for a chemical's potential carcinogenicity in humans.

Cancer potency factors (CPFs) have been developed by EPA's Carcinogenic Assessment Group for estimating excess lifetime cancer risks associated with exposure to potentially carcinogenci chemicals. CPFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multipled by the estimated intake of a potential carcinogen in mg/kg-day, to provide an upper-bound estimate of the excess lifetime cancer risk associated with exposure at that intake level. The term "upper-bound" reflects the conservative estimate of the risks calculated from the CPF. Use of this approach makes underestimation of the actual cancer risk highly unlikely. CPFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation and uncertainty factors have been applied. CPFs for the site contaminants of concern are contained in Table 11.

Reference doses (RfDs) have been developed by EPA for indicating the potential for adverse health effects from exposure to chemicals exhibiting noncarcinogenic effects. RfDs, which are expressed in units of mg/kg-day, are estimates of lifetime daily exposure levels for humans, including sensitive individuals. Estimated intakes of chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated drinking water) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors have been applied (e.g., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncarcinogenic effects to occur. RfDs for the site contaminants of concern are contained in Table 11.

Risk Characterization

In the final component of the risk assessment process, a characterization of the potential risks of adverse health or environmental effects for each of the exposure scenarios derived in the exposure assessment, is developed and summarized. Estimates of risks are obtained by integrating information developed during the exposure and toxicity assessments to characterize the potential or actual risk, including carcinogenic risks, noncarcinogenic risks, and environmental risks. The final analysis includes a summary of the risks associated with a site including each projected exposure route for contaminants of concern and the distribution of risks across various sectors of the population.

For noncarcinogenic chemicals, the predicted exposure level is compared with an EPA reference level or reference dose (RfD). The RfD is based on an evaluation of current toxicity data and is the lifetime dose which is likely to be without significant risk to human populations. An exposure level which exceeds the RfD is an indication that there may be a concern for a potential noncarcinogenic health risk. The ratio of the estimated contaminant intake to the contaminants RfD is termed the HQ. By adding the HQs for all contaminants within a medium or across all media to which a given population may reasonably be exposed, the Hazard Index (HI) can be generated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

TABLE 11
TOXICITY VALUES FOR SITE-RELATED CHEMICALS
JADCO-HUGHES SITE

Chemical	RfD (mg/kg/d)	CPF 1/(mg/kg/d)
acetone	0.10	
antimony	0.0004	
arsenic	0.001	1.8
barium	0.05	
benzene		0.029
benzoic acid	4.0	
beryllium	0.005	
bis(2-chloroethyl)ether		1.1
bis(2-ethylhexyl)phthalate	0.02	
2-butanone	0.05	
carbon disulfide	0.10	
carbon tetrachloride	0.007	0.13
chloroform	0.01	.0061
chromium VI	0.005	.0
copper	0.02	
1,2-dichloroethane		0.091
1,1-dichloroethylene	0.009	
1,2-dichloroethylene	0.02	
di-n-butyl phthalate	0.1	
ethylbenzene	0.10	
methylene chloride	0.06	0.007
2-methylphenol	0.05	
4-methylphenol	0.05	
4-methyl-2-pentanone	0.05	
phenol	0.6	
silver	0.003	
1,1,2,2-tetrachloroethane		0.20
tetrachloroethylene	0.01	
toluene	0.30	
1,2,4-trichlorobenzene	0.02	
1,1,1-trichloroethane	0.001	
1,1,2-trichloroethane	0.004	
vinyl chloride		2.3
xylenes	2.0	
zinc	0.21	

The carcinogenic risk levels are probabilities that are expressed in scientific notation (e.g. 1×10^{-6}). An excess lifetime cancer risk of 1×10^{-6} indicates that an individual has a one in a million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at the site. The excess cancer risk levels are upperbound estimates which means that the risk levels are probably an overestimation of the actual cancer risk posed by the site-related pathways. The EPA acceptable risk range is 1×10^{-4} to 1×10^{-6} or one in ten thousand to one in a million. Although a risk range is designated, EPA uses 1×10^{-6} as the point of departure indicating that the preference is for setting cleanup goals at the more protective end of the range. The cleanup goal of 1×10^{-6} may be revised to a different risk level within the acceptable range based on the consideration of appropriate site-related factors.

The current risk posed by onsite surficial soils contaminated by PCBs was evaluated. This risk is associated with potential contact with soil by people who have gained unauthorized site access and resulted in a calculated risk level ranging from 1×10^{-5} (Level 1) to 8×10^{-5} (Level 3).

Current use of residential wells located immediately downgradient of the site was evaluated. The assessment identified that compounds detected in potential residential water supplies were below drinking water criteria or standards. As such, these detected compounds do not pose a current unacceptable risk to local residents.

The future potential risk associated with offsite groundwater use as a domestic water supply was evaluated. Under this scenario a contaminant plume is assumed to migrate, unremediated, offsite and result in increased contaminant levels in residential wells. The associated potential cumulative additional lifetime cancer risk ranged from 6×10^{-2} for a level 1 exposure to 2×10^{0} for a level 3 exposure and the cumulative noncarcinogenic HQs exceeded unity, ranging from 10 for level 1 to 100 for level 3 . Table 12 contains the risk levels for individual groundwater contaminants of concern.

The potential future risk due to exposure to contaminated subsurface soil onsite was evaluated for a construction worker involved in a hypothetical excavation activity. The potential additional lifetime cancer risk ranged from 5×10^{-10} to 2×10^{-7}. These levels are below the acceptable risk range. The noncarcinogenic exposure levels were also below the EPA reference level.

The future potential risk associated with an offsite exposure to contaminated surface water was evaluated. Under this scenario a contaminant groundwater plume would discharge, unremediated, to surface water resulting in increased contaminant levels in surface water and subsequently creating a potential recreational exposure. The associated potential additional lifetime cancer risk ranged from 9×10^{-7} to 3×10^{-5}. The noncarcinogenic exposure levels did not exceed the reference levels.

TABLE 12
RISK LEVELS FOR EXPOSURE TO GROUNDWATER CONTAMINANTS OF CONCERN[a]
JADCO-HUGHES SUPERFUND SITE

Carcinogens	Risk Level	
	Ingestion	Showering
benzene	2E-05	9E-06
carbon tetrachloride	3E-02	1E-02
chloroform	2E-02	1E-02
1,2--dichloroethane	2E-03	9E-04
1,1-dichloroethane	2E-05	9E-06
methylene chloride	2E-04	8E-05
tetrachloroethane	9E-06	4E-06
1,1,2-trichloroethane	2E-06	1E-06
trichloroethene	1E-06	7E-07
vinyl chloride	7E-01	3E-01
bis(2-chloroethyl)ether	2E-01	1E-01

Noncarcinogens	Hazard Quotient	
	Ingestion	Showering
acetone	8.7	10.0
2-butanone	32.6	37.3
chlorobenzene	1.0	1.1
toluene	2.7	3.1
xylenes	6.9	7.8
phenol	1.0	1.1

[a] The risk levels reflect a level 3 exposure scenario. This table only contains chemicals which exceed the 1E-06 risk level for carcinogens or have a HQ which exceeds 1 for noncarcinogens.

The baseline risk assessment indicates that the greatest potential risk from the Jadco-Hughes site is via exposure to contaminated groundwater. Although, exposure to unsafe levels of contaminated groundwater is not presently occuring, further movement of the groundwater plume could cause offsite wells to be contaminated with unacceptable levels of site contaminants. An alternate water supply has been made available to potentially affected residents. In addition, potential risks from exposure to contaminated groundwater and other media are being addressed in this decision document.

Environmental Risks

Terrestrial and/or aquatic species may be exposed to the site contaminants through direct contact with surface soil, surface water and sediments, consumption of surface water and lower level trophic species, and contact with contaminated subsurface soil should future construction take place. Although the risk to receptor populations has not been quantified, the site contaminants of concern may potentially impact ecological communities in the site area.

The United States Fish and Wildlife Service has verified that there are no endangered of threatened animal species currently in the vicinity of the Jadco-Hughes site.

Descriptions of Alternatives

The RI resulted in the following definition of the nature and extent of contamination at the Jadco-Hughes site.

- contamination of no less that 6000 yd^3 of subsurface soil principally contaminated with volatile organic compounds (VOCs) and extractable organic compounds (BNAs);
- contamination of groundwater beneath the site with VOCs, BNAs and metals,
- contamination of Tributary B, predominantly by VOCs;
- contamination of no less than 435 yd^3 of surface soil with PCB concentrations exceeding 10 mg/kg (ppm).

A total of 11 alternatives were evaluated in detail for remediating the site. Nine remedial alternatives address the contaminated subsurface soils that contribute to groundwater contamination. Eight alternatives address the contamination in the groundwater beneath the site. Each alternative presented essentially builds upon the scope of the previous alternative.

Alternative 1 - No Action with Monitoring

The Superfund program requires that the "No-Action" alternative be considered at every site. Under this alternative, EPA would take no further action to control the source of contamination. However, long-term monitoring of the site would be necessary to monitor contaminant migration.

The FS interpreted the "No-Action" alternative literally and assumed no action whatsoever would be necessary. As previously stated, monitoring would be required due to the resulting contaminants remaining onsite. In such cases, CERCLA requires that the site be reviewed every five years. The "No-Action" alternative presented within this decision document was developed from specific costing information identified in the FS, based on monitoring of site contamination on a quarterly basis every year. Monitoring can be implemented by using previously installed monitoring wells and residential wells.

If justified by the review, remedial actions would be implemented at that time to remove or treat the wastes.

The present worth cost of this alternative for a 20-year period is approximately $890,000. The time to implement this alternative is two months.

Alternative 2 - Deed, Access Restrictions and Monitoring

Deed restriction involves placing institutional controls on the use of the property and the use of groundwater beneath the Site. Access restriction involves a security fence to minimize unauthorized access. The fence is to be constructed as an interim remedy and consists of an 8-foot high chain link fence and locking gates to replace the present fence. The fence will be permanent and is to be situated at the site perimeter. Monitoring involves a periodic measurement of groundwater and surface water quality to assess any changes and trends of contamination.

Deed and access restrictions would not prevent further migration of groundwater contamination. Alternative 2 is designed to eliminate exposure to contamination which exists on site.

The present worth cost of this alternative is $947,900. This alternative does not achieve ARARs, offers no protectiveness. (Remedial actions performed under CERCLA must comply with all applicable or relevant and appropriate requirements or ARARs. A more complete discussion on ARARs is provided in the Statutory Deteminations Section of this decision document.)

Alternative 3 - Cap, Deed and Access Restrictions, Monitoring

This alternative addresses the soils within the existing on-site landfill with the provisions of a RCRA cap designed to minimize infiltration into contaminated soils. Figure 8 provides a schematic of the RCRA cap.Leaching of natural precipitation would be inhibited, thereby reducing the source role to groundwater. Limited excavation work would be necessary for the installation of a cap.

Alternative 3 builds upon the scope of Alternative 2. The contaminated soils within the landfill is estimated to be no less than 5,500 yds^3. Approximately 500 additional cubic yards of contaminated soils would be excavated from the former operations area

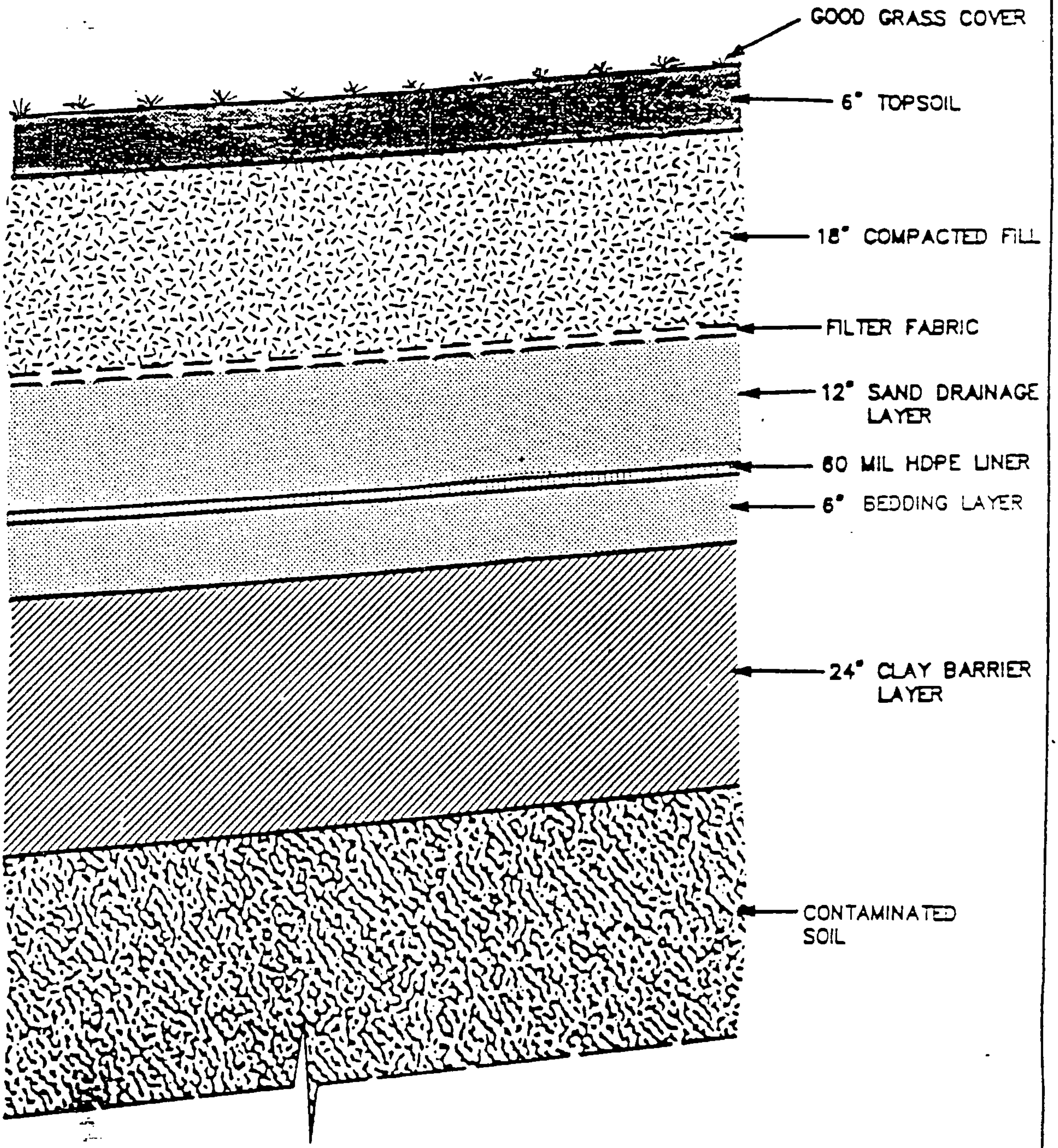


FIGURE 8
RCRA LANDFILL CAP CROSS SECTION
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

and consolidated within the soils of that landfill prior to the installation of the RCRA cap.

This alternative does not prevent further migration of contaminated groundwater. This alternative would eliminate potential onsite contaminant exposure; monitoring would be conducted to track contaminant migration; no provision would be made for contaminant reduction. Alternative 3 would not achieve ARARs.

The present worth cost of this alternative is approximately $1,505,900. This alternative is readily implementable.

Alternative 4 - Cap, Groundwater Extraction, Treatment, Discharge to Fites Creek, Deed/Access Restrictions, Culvert Replacement and Monitoring

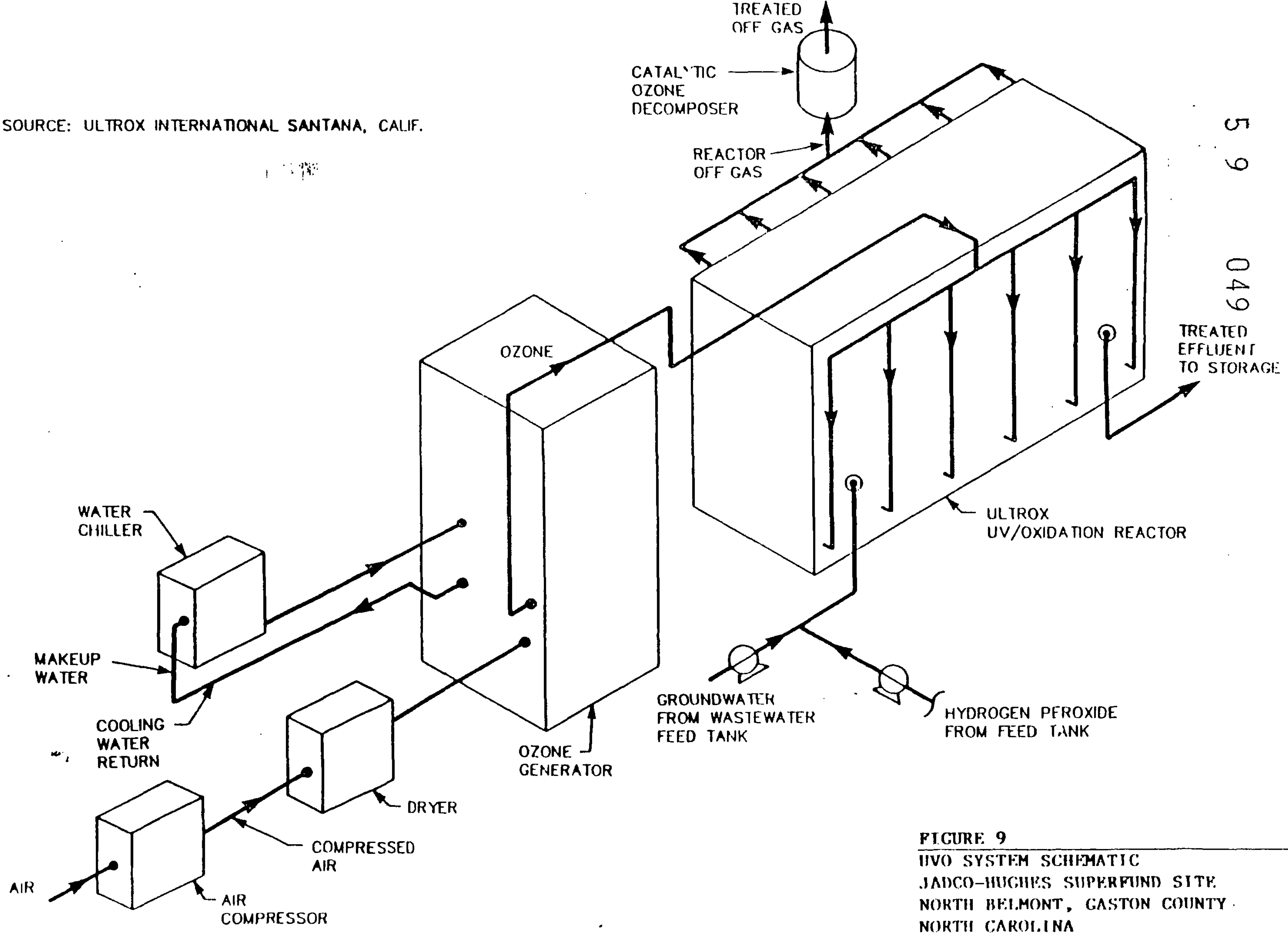
Alternative 4 builds upon Alternative 3 by the addition of a groundwater remedy and a surface water remedy. Groundwater extraction would be accomplished by the use of a subsurface tile drain system to collect groundwater and would prevent future offsite migration of contaminated groundwater. The extracted groundwater would be treated followed by discharge to surface water. Soils contamination would be addressed by a cap with no reduction of contamination. Monitoring of the contamination would be required.

Extraction wells would be located in the areas of highest contamination concentration and would be utilized for "hot spot" pumping. The effectiveness of the groundwater remedy and the progress of remediation would be evaluated by monitoring.

Groundwater treatment and discharge would be accomplished via a pre-treatment for metals removal followed by ultraviolet oxidation and discharge to Tributary B. Monitoring of this tributary would be conducted to ensure effectiveness. The UVO treatment technology was selected due to its ability to treat the compounds of concern. Figure 9 is an illustration of the UVO treatment system coupled with the ozone pretreatment system for metals. Pre-treatment for metals removal would require disposal of inorganic sludges.

Ultraviolet oxidation is a relatively new technology which was evaluated by a treatability study and offers the most promising technology for achieving the low levels of discharge required for surface water discharge. The treatability study results are attaached as Appendix C. However, problems associated with natural inorganic chemistry of the groundwater present potential operational problems when high efficiency treatment is required. Specifically, iron may preferentially consume the oxidant resulting in a reduced efficiency in organic treatment. Accordingly, an ozone pretreatment system comprised of a tank, ozone diffusers and a clarifier would be required to condition the water prior to processing in the UVO system.

Surface water remediation would be accomplished, in part, by groundwater extraction which would intercept contaminated groundwater prior to discharge to Tributaries A and B. The replacement of the



SOURCE: ULTROX INTERNATIONAL SANTANA, CALIF.

FIGURE 9
UVO SYSTEM SCHEMATIC
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

onsite culvert and the construction of a spillway would represent the remaining action necessary to prevent contaminated groundwater discharge to Tributary B. The culvert replacement involves sliplining the culvert with HDPE pipe and plugging the annular space between the old and new pipe and the pipe bedding. The HDPE pipe would allow streamflow through the site. Contaminated groundwater would not leak into the HDPE pipe and would be prevented from migration along the old culvert and bedding material by the installation of plugs. The existing culvert could be used to augment groundwater collection through the use of the annular space as a collection trench.

The present worth cost of this alternative is $5,344,900. This alternative would not achieve ARARs. This alternative could be implemented within a 12 month period.

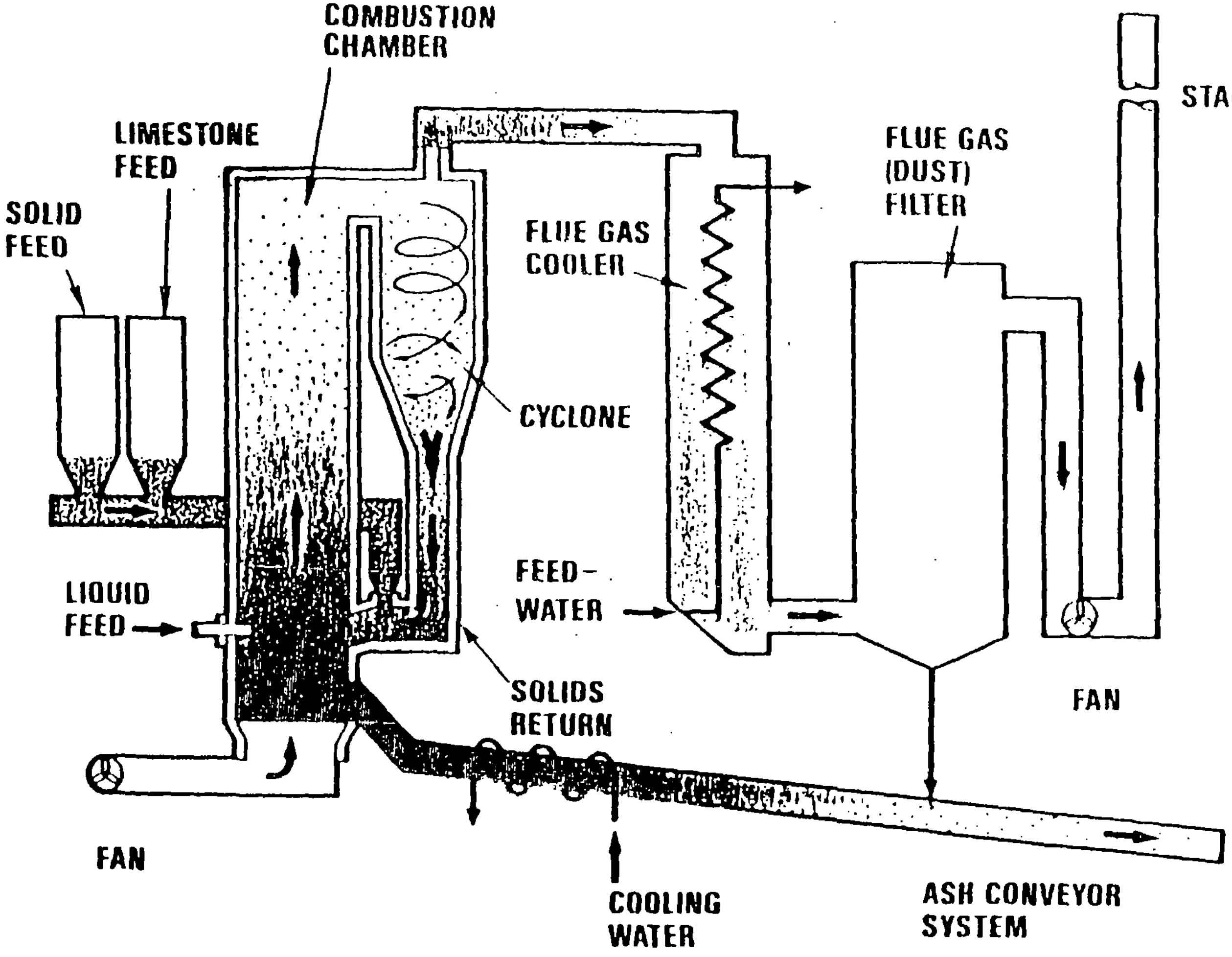
Alternative 5 - Soil Vapor Extraction, Soil Flushing, Groundwater Extraction, Treatment and Discharge to Fites Creek, Deed Restrictions, Culvert Replacement and Monitoring

This alternative is essentially the same as Alternative 4 except that the cap is replaced by soil treatment. Alternative 5 utilized soil venting and soil flushing to remove contaminants from soil and treatment of the off gas by carbon adsorption.

Soil venting involves the placement of perforated vents vertically into the contaminated soil above the water table., The extraction vents are connected by solid pipe to a common above-ground header. A blower draws a vacuum through the pipe network allowing soil gas to be extracted. Contaminants partition from the soil to the air and the contaminated air stream is treated by carbon adsorption. Figure 10 illustrates the soil vapor extraction (SVE) system layout.

Soil flushing would be conducted following the termination of soil venting and is designed to remove soluble contaminants which are non-volatile. The soil flushing system would involve controlled infiltration of water into contaminated soil. Uncontaminated water from Tributary B would be used as a water supply. This water would be pumped into the recharge system via a common header. The recharge system would be designed such that the rate of flow to each recharge well could be controlled.Recharge water would contact contaminated soil as it infiltrates downward. The effectiveness of the system would be enhanced by introducing recharge water in pulses and rotating recharge locations. This procedure would create a saturated wetting front within the contaminated soil, thereby increasing the partitioning of contaminants from soil to water. Contaminated recharge water would be captured by a groundwater drain situated in a downgradient, onsite location and would be pumped into the site's groundwater treatment system.

The remaining components of Alternative 5 are the groundwater extraction system, ozone pretreatment for metals, UVO treatment and discharge to Tributary B surface water, culvert replacement, and monitoring, with deed and access restrictions.



SOURCE: OGDEN ENVIROMENTAL SERVICES INC.

FIGURE 10
TYPICAL ONSITE INCINERATOR
SCHEMATIC OF CIRCULATION BED COMBUSTION
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

Alternative 5 eliminates potential onsite contamination exposure. It provides remedies for soil and groundwater with contaminant reduction. Monitoring would be conducted to track effectiveness of the remedy.

The present worth cost of this alternative is $6,164,900. This alternative would achieve ARARs. It is estimated that the RD and installation of extraction wells could be completed within one year. Soil venting would be completed in one to three years, soil flushing and groundwater would be completed within 30 years.

Alternative 6 - Off-site Land Disposal, Groundwater Extraction, Treatment and Discharge to Fites Creek, Deed Access Restriction, Culvert Replacement and Monitoring

Alternative 6 involves the removal of approximately 6,000 yds^3 of contaminated soil and replacement with clean soil. Contaminated soil would be excavated and loaded onto trucks for transport to a RCRA permitted landfill.

Any major excavation program would require air monitoring to ensure that offsite air quality is not significantly impacted. Groundwater remediation, deed and access restrictions, culvert replacement and monitoring are identical to the program identified in Alternative 4.

This selection eliminates the potential onsite contaminant exposure. It contains a provision of groundwater and surface water remedy with contaminant reduction. Soil remedy selection does not provide contaminant reduction. Monitoring is required of effectiveness of the remedy.

The present worth of this remedy is $7,632,900. This remedy is readily implementable. This alternative would meet remediation goals, however, this alternative has implementation concerns with respect to the regulatory deadlines for RCRA land disposal.

Alternative 7 - On-site Soil Incineration, Groundwater extraction, Treatment and Discharge to Fites Creek, Deed Access Restriction, Culvert Replacement and Monitoring

Alternative 7 involves excavation and treatment by onsite incineration of approximately 6,000 yd^3 of contaminated soils from the landfill and former operations area. The treatment of the contaminated soils is conducted instead of the installation of a cap.

Onsite incineration is a treatment method for organic compounds which uses high temperature oxidation under controlled conditions to degrade a substance into carbon dioxide, water vapor, sulfur dioxide, nitrogen oxides, hydrogen chloride gases and ash. The hazardous products of incineration, such as particulates, sulfur dioxide, nitrogen oxides and hydrogen chloride require air emission control equipment.

Alternative 7 proposes onsite incineration with the use of a Circulating Bed Combustor (CBC), which is presented on Figure 11. The CBC incinerator uses temperatures in excess of 1500° F. Onsite incineration typically achieves greater than 99.99 percent removal of organic contaminants. The contaminated soils would be excavated, fed into the incinerator, treated and backfilled.
The remaining elements of groundwater remediation, deed/access restrictions, culvert replacement and monitoring will utilize the same methodologies as identified in Alternatives 4, 5 and 6. This alternative eliminates potential on-site contaminant exposure. The alternative provides a remedy which addresses groundwater surface water and soil contamination with reduction of contamination. Monitoring is required to track the effectiveness of the remedy.

The present worth of this remedy is $3,895,900. This remedy is readily implementable, but would not achieve ARARs.

Alternative 8 - Cap, Groundwater Extraction, Treatment with Discharge to POTW, Deed and Access Restrictions, Culvert Replacement and Monitoring

Alternative 8 is similar to Alternative 4 but offers a different method of groundwater treatment and discharge. The groundwater extraction system remains the same and consists of downgradient control and hot spot pumping. However, Alternative 8 involves discharging treated water to the Belmont POTW through the sewer system. Aeration was determined to be the most cost-effective method of treatment required to meet discharge requirements to a POTW.

Aeration onsite involves the construction of an in-ground aeration basin having a volume of 9,000 gallons. Air is sparged into the tank by diffusers to reduce VOC concentrations. The air would be vented through a carbon adsorption system to restrict VOC releases to the atmospheres.
Water discharged to the Belmont POTW would be further treated there by biological degradation and aeration. The FS concluded that the Belmont sewage treatment plant can effectively treat water discharged from the Jadco-Hughes site.

Alternative 8 also includes soil remediation by the installation of a RCRA cap. The low permeability cap includes a synthetic liner to mitigate future releases of VOCs from contaminated soil, thereby eliminating the source of groundwater contamination. An in situ treatment of soils is provided by Alternative 8. Deed restriction and access restriction components do not change from the previous alternatives.

This alternative eliminates potential on-site contaminant exposure. This alternative provides a remedy for groundwater and surface water with reduction of contamination. The remedy selection for soil does not provide contaminant reduction. Monitoring is required to track the effectiveness of the remedy.

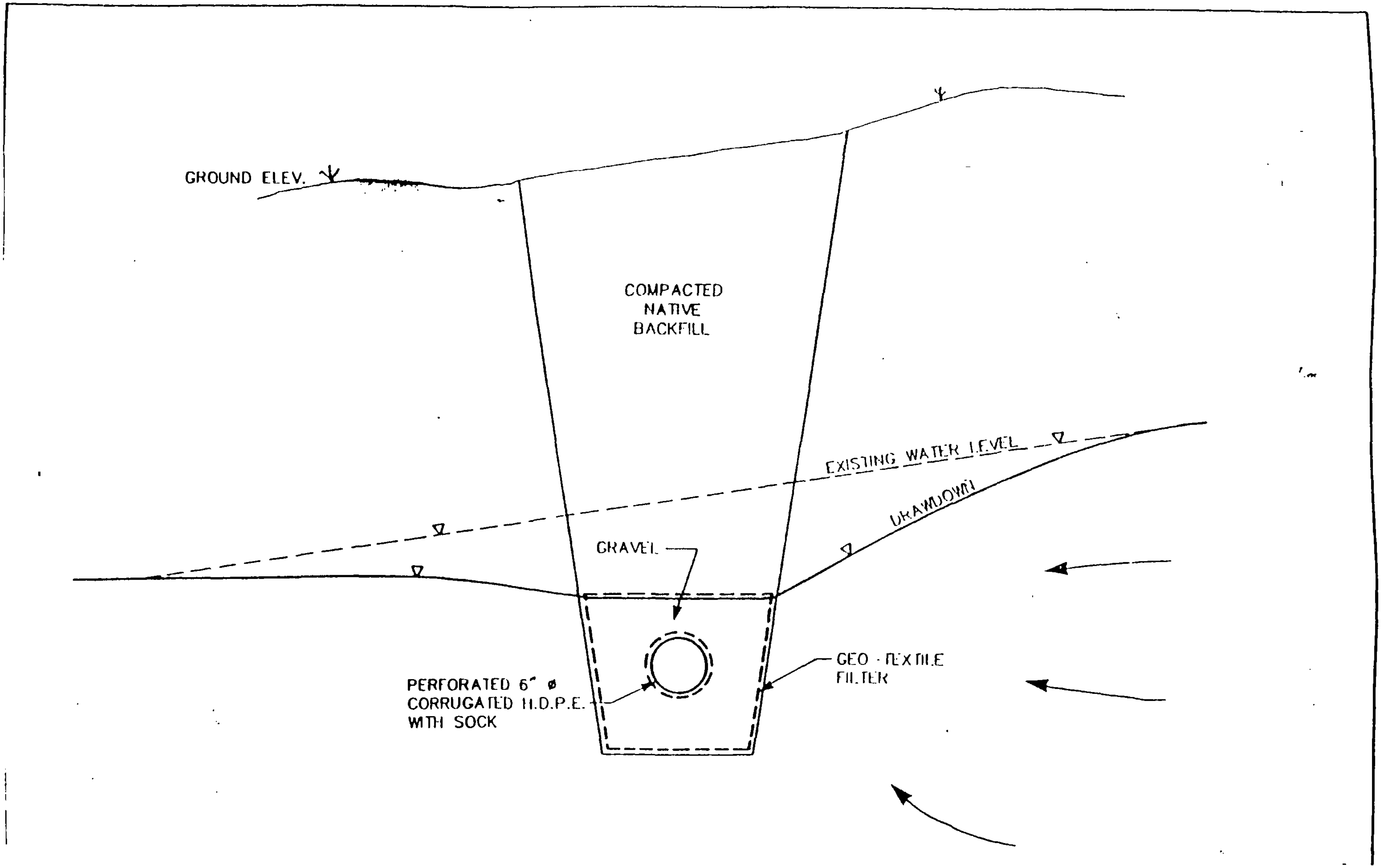


FIGURE 11
TYPICAL TILE TRENCH DRAIN SYSTEM
JADCO-HUGHES SUPERFUND SITE
NORTH BELMONT, GASTON COUNTY
NORTH CAROLINA

The present worth of this remedy is $3,895,900. This alternative is readily implementable, but does not achieve ARARs.

Alternative 9 - Soil Vapor Extraction, Soil Flushing, Groundwater Extration, Treatment and Discharge to POTW, Deed and Access Restrictions, Culvert Replacement, and Monitoring

Alternative 9 provides soil remediation by soil venting using a series of vertical vents installed into the the contaminated soil above the water table. Under a vacuum, VOCs and some BNAs are drawn into the air stream and are subsequently removed by carbon adsorption. This process would be complete in three years of operation.

Soil flushing is achieved through the introduction of uncontaminated water into the contaminated soil areas following completion of the soil venting treatment. The recharged water would be collected and treated in the groundwater treatment system.

Groundwater remediation is accomplished by downgradient extraction and hot spot pumping using the extraction system as described in Alternative 8. Groundwater treatment involves aeration to reduce VOC concentrations for acceptable discharge to Belmont's POTW. The air vented from the aeration basin would be treated by carbon adsorption. Additional treatment by biological degradation and aeration is provided at the sewage treatment plant.

Remaining elements of Alternative 9 involve deed and access restriction, culvert replacement and monitoring as described in previous alternatives.

This alternative eliminates potential on-site contaminant exposure. The remedy provides reduction of contamination in soils, groundwater and surface water. Monitoring is required to track the effectiveness of the remedy.

The present worth of this remedy is $4,715,900. The remedy is readily implementable and would achieve ARARs.

Alternative 10 - Off-site Land Disposal, Groundwater Extraction, Treatment and Discharge to POTW, Deed and Access Restrictions, Culvert Replacement and Monitoring

Alternative 10 involves the removal of approximately 6,000 yd^3 of contaminated soil. Contaminated soil would be excavated and loaded onto trucks for transport to a RCRA permitted landfill. During the excavation process VOCs would be released to the atmosphere due to volatilization. Air monitoring would be required to ensure that the off site air quality is not significantly impacted.

Groundwater remediation would be accomplished by downgradient extraction and hot spot pumping using the extraction system as presented in in Alternatives 8 and 9. Groundwater treatment would involve aeration to reduce VOC concentrations followed by carbon adsorption for acceptable discharge to the local POTW

This alternative eliminates potential on-site contaminant exposure. The remedy provides reduction of contamination in surface water and groundwater. No reduction of contamination is conducted in the remedy selection for soils. Monitoring is required to track the effectiveness of the remedy.

The present worth of this remedy is $6,183,900. The remedy is readily implementable.

Alternative 11 - On-site Soil Incineration, Groundwater Extracti0on, Treatment and Discharge to POTW, Deed and Access Restrictions, Culvert Replacement and Monitoring

Alternative 11 involve excavation and treatment by on-site incinerator of an estimated 6,000 yd^3 of contaminated soils from the landfill and former operations area. On-site incineration involves oxidation of organic compounds at temperatures greater than 1500 ° F. On-site incineration typically achieves greater than 99.99 percent removal of organic contaminants.

Remaining remedial components of groundwater extraction, treatment via aeration and carbon desorption, discharge to POTW, deed and access restriction, culvert replacement and monitoring are identical to Alternatives 8, 9 and 10.

On-site incineration requires permitting of the incinerator and could present a significant obstacle to the implementation of this Alternative. Lack of community support could also present a significant problem.

The present worth of this remedy is $8,305,900. The remedy is readily implementable and would achieve ARARs. Moderate concern exists with respect to potential volatile organic emissions released during excavation.

Summary of Comparative Analysis

The major objective of the Feasibility Study (FS) was to develop, screen, and evaluate alternatives for remediating the Jadco-Hughes site. This decision document deals with the groundwater, the soils, and surface water for which several alternatives were identified. The technologies reviewed were screened based on their feasibility given the contaminants present and the site characteristics. Those which remained after the initial screening were evaluated in detail based on the nine selection criteria required by SARA and listed in the NCP, which are listed below:

> **Overall Protection of Human Health and the Environment** addresses whether or not an alternative provides adequate protection and describes how risks are eliminated, reduced or controlled through treatment and engineering or institutional controls.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether or not an alternative will meet all of the applicable or relevant and appropriate requirements or provide grounds for invoking a waiver.

Long-term Effectiveness and Permanence refers to the ability of an alternative to maintain reliable protection of human health and the environment, over time, once cleanup objectives have been met.

Reduction of Toxicity, Mobility or Volume is the anticipated performance of the treatment technologies an alternative may employ.

Short-term Effectiveness involves the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until cleanup objectives are achieved.

Implementability is the technical and administrative feasibility of an alternative, including the availability of goods and services needed to implement the solution.

Cost includes capital costs, as well as operation and maintenance costs.

Agency Acceptance indicates whether, based on its review of the technical documents for all aspects of the Site investigation, and the Proposed Plan, the U.S. EPA and the Tennessee Department of Health and Environment (TDHE) agree on the preferred alternative.

Community Acceptance indicates the public support of a given alternative. This criteria is discussed in the Responsiveness Summary.

It should be noted that cost is used to compare alternatives only when they provided similar degrees of protection and treatment. Three alternatives remained after the detailed evaluation; however, all eleven alternatives presented in the FS are evaluated below. A summary of the relative performance of the alternatives with respect to each of the nine criteria is provided in this section.

Protectiveness of Human Health and the Environment

Alternatives 4 through 11 presented in this document would be protective of human health and the environment. Alternatives 1, 2 and 3 are not protective of human health or the environment. These three alternatives allow further migration of the contaminants, leading to possible ingestion of contaminated water if drinking-water wells were to be used for potable purposes.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Several of the alternatives identified in the FS would not comply with applicable or relevant and appropriate requirements (ARARs). The no action alternative would not address the groundwater contamination and would allow the contaminants to remain in the groundwater at concentrations above drinking water standards, thus violating the Safe Drinking Water Act (SDWA), which is a federal ARAR for this site.

Reduction of Toxicity, Mobility, or Volume

Remedies that use treatment to reduce the mobility, toxicity or volume (MTV) of the contaminants at a site are preferred over those remedies that do not. The eleven alternatives presented in the FS were evaluated under this criterion. Alternatives 1, 2, and 3 make no attempt to reduce the MTV of site contamination. Alternatives 4, 6, 8, and 10 offer MTV reduction of groundwater contamination only. Contaminated soils are addressed in varying methods, including no action, containment or off-site disposal. Alternatives 5, 7, 9 and 11 offer the reduction of MTV for groundwater contamination and soil contamination.

Long-Term Effectiveness and Permanence

The majority of the alternatives presented in the FS would have long-term effectiveness and permanence once clean-up goals are met. Alternatives 4 through 11 address the contaminant plume in the groundwater with similar designs of the extraction system but with differing treatment technologies dependent upon final discharge point. Alternatives 1, 2, and 3 do not offer permanent remedies for any of the contaminated media present at the site.

Short-Term Effectiveness

The eleven alternatives were evaluated with respect to short-term effectiveness. Alternatives 1, 2, and 3 provide no protectiveness to human health and the environment; and subsequently the first three alternatives offer no short-term effectiveness. Short-term effectiveness is believed to be administered by the implementation of Alternatives 4, 5, 8, and 9 with minimal problems. Alternatives 6 and 10 provide short-term effectiveness, but also introduce considerations concerning the hazards associated with the excavation of soils. Alternatives 7 and 11 also include excavation concerns as well as emissions control, and residual waste concerns. The implementation of a site specific health and safety plan would mitigate the hazards from excavation work. Engineering within the Remedial Design plans would address emissions from incineration.

The short-term effectiveness of an alternative also includes consideration of the time required for each alternative to achieve protection. The following information is provided for those alternatives that do provide short-term effectiveness:

Alternative 4 - 1 year cap installation, addresses soils
Alternative 5 - 3 years for initial soils treatment
Alternative 6 - 1.5 years for initial soils treatment
Alternative 7 - 2 years for initial soils treatment
Alternative 8 - 2 years for initial soils treatment
Alternative 9 - 3 years for initial soils treatment

Alternative 10 - 1.5 years for initial soils treatment
Alternative 11 - 2 years for initial soils treatment

Alternatives 4 through 11 estimate that the groundwater water remedy will achieve groundwater cleanup goals within 30 years.

Implementability

The implementability of an alternative is based on technical feasibility, administrative feasibility and the availability of services and materials. Services and materials are available for all alternatives. Due to soil vapor extraction being an innovative technology, there is limited demonstration data available. Factors at the Jadco-Hughes site, such as depth of soil contamination and size of soil contamination areas where considered in the development of the various technologies. Additional concerns included Land Disposal Restrictions in those alternatives were Off-site disposal was considered. Concerns such as emissions were considered under the short-term effectiveness criterion.

Cost

A present worth cost for the eleven alternatives presented for the Jadco-Hughes site are presented below.

Alternative 1 -	$ 890,000	(No Action)
Alternative 2 -	$ 947,900	
Alternative 3 -	$1,505,900	
Alternative 4 -	$5,344,900	
Alternative 5 -	$6,279,900	
Alternative 6 -	$7,632,900	
Alternative 7 -	$9,754,900	
Alternative 8 -	$3,895,900	
Alternative 9 -	$4,830,900	
Alternative 10 -	$6,183,900	
Alternative 11 -	$8,305,900	

More detailed information on the costing for each alternative is presented in Appendix D.

State Acceptance

The State of North Carolina, as represented by the North Carolina Department of Environmental Health and Natural Resources, NC-DEHNR is in favor of the soil vapor extraction, soil flushing, groundwater extraction and treatment via aeration, culvert replacement, surface water diversion and monitoring. The State has expressed in its letter of concurrence that the remedial design should also include provisions for in-situ bioremediation in conjunction with soil flushing. EPA concurs that a bioremediation treatability study should be conducted during the remedial design phase and if substantial additional benefits for little or no additional cost can be shown, then bioremediation will be incorporated as an integral part of the soil flushing/soil venting process. However, incorporation of bioremediation into the soil remediation remedy selection will only be accomplished based upon joint concurrence between EPA, the Sate of North Carolina and the PRPs. The State will concur with the discharge of the treated water to the City of Belmont POTW or other local POTW for further treatment if the POTW is willing to accept the waste.

In the event the city does not accept the treated groundwater effluent, NC-DEHNR concurs with EPA's contingency alternative of groundwater extraction and treatment by aeration, precipitation, filtration, and carbon adsorption followed by surface water discharge.

Community Acceptance

Based on comments made by citizens at the public meeting held on July 26, 1990, and those received during the public comment period, the community agrees that an extraction and treatment system for the groundwater, as well as the soil vapor extraction/soil flushing technologies selected for soils are necessary for effectively protecting human health and the environment. Citizens did make concerted statements regarding their desire for EPA to not allow incineration.

The Selected Remedy

Based on available data and analysis to date, the US EPA has proposed Alternative 9 for the remedy selection for the Jadco-Hughes site. The comparison of remedial alternatives conducted in the FS provided the basis of this selection and are presented in this decision document.

Alternative 9 involves deed and access restrictions, soil venting with carbon adsorption of the off gas, soil flushing, culvert replacement, surface water diversion, monitoring, groundwater extraction and treatment by aeration and vapor phase carbon adsorption on site, discharge to the city of Belmont POTW or other local POTW. However, in the event that a POTW has not agreed to accept the discharge from the Jadco-Hughes site within a reasonable period of time after the date of signature of the Record of Decision, EPA has selected Alternative 5 as a contingency alternative.

Alternative 5, consists of groundwater extraction and treatment by ozone pre-treatment for metals followed by ultraviolet oxidation (UVO) for removal of VOCs. Effluent discharge would be to Tributary B. Both the selected and contingency alternatives include institutional controls or other land use restrictions necessary to prevent adverse effects to the remedy.

Alternative 9 was developed for treatment of constituents recovered in groundwater to levels suitable for discharge to a POTW. The proposed groundwater recovery system will include installation of recovery wells in areas of known high contaminant levels. The anticipated flow rate is estimated to be 1 gpm per well. Further delineation of the plume will be necessary to determine the exact location of extraction wells. The installation of bedrock wells may also be necessary.

A subsurface drainage tile trench will be used to collect contaminated groundwater. Groundwater flows into the drain system and is collected in a sump where it is pumped into the groundwater treatment system. Figure 11 illustates a typical tile trench. This technology is best suited to capture contamination in shallow groundwater.

Recovered groundwater will be piped to an on-site treatment system. The actual treatment system will be based on the final discharge option. For Alternative 9, the system would consist of an aeration basin with an equalization tank. Air diffusion would be conducted to provide a high rate air-to-water ratio. The air vented from the aeration basin would be treated by carbon adsorption. The effluent would be tested to verify that pre-treatment standards are met. The effluent from the treatment system would be pumped to the nearest City of Belmont sewer system manhole. The discharge would then be transported, via the sanitary sewer, to the POTW where it would undergo biological treatment.

Implementation of the treatment and discharge scenario proposed for Alternative 9 would require the responsible parties to secure the approval of administrative personnel from the city government of Belmont. The treated effluent would have to meet pretreatment criteria established by these administrative officials as well as comply with EPA guidelines for discharging of a CERCLA wastewater to a POTW.

Easements and rights-of-way would be required for installation of the recovery wells and piping and the discharge piping to the sewer interconnection. These easements and rights-of-way are essential to the implementation of any remedial action.

The O&M will include monitoring of system controls which will be incorporated to ensure the effluent quality meets established pretreatment criteria prior to discharge to the POTW. The routine O&M procedure will require monitoring performance of the recovery, aeration, and discharge system components as well as periodic cleaning or replacement of the packing media as well as the overall system maintenance. Periodic monitoring of the groundwater will be performed to assure that the remedy is working. The O&M plan will also identify all residuals management necessary for the remedy as well as minimum replacement times for carbon filters and other expendable items. Detailed cost analysis for Alternative 9 is contained in Appendix D, Part 2.

Alternative 5, the contingency alternative, is proposed in the event that the POTW is unable to accept the effluent from the Jadco-Hughes site. The primary differences between the preferred Remedial

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Table 13

Groundwater Remediation Goals for the Jadco-Hughes Site

Chemical	Cleanup Goal	Risk Level[a]	Basis[b]
Organics (ug/l)			
Acetone	700		RfD
Benzene	1	1E-06	NC
2-Butanone	170		NC
Carbon Tetrachloride	0.3	1E-06	NC
Chlorobenzene	300		NC[c]
clorethane	10		CRQL
Chloroform	0.19	3E-05	NC
1,1-Dichloroethane	0.3	1E-06	NC[d]
1,2-Dichloroethane	0.3	1E-06	NC
1,1-Dichloroethylene	7	1E-04	NC
1,2-*Dichloroethylene* (Total)	70		PMCL[e]
1,2-Dichloropropane	0.56	1E-06	NC
Ethylbenzene	29		NC
2-Hexanone	10		CRQL
Methylene Chloride	5		NC
4-Methy-2-Pentanone	350		RfD
Tetrachloroethylene	0.7		NC
Toluene	1000		NC
1,1,1-Trichloroethane	200		NC
1,1,2-Trichloroethane	3	5E-06	PMCLG
Trichlorethylene	2.8	1E-06	NC
Vinyl Chloride	0.015	1E-06	NC
Xylene	400		NC
Benzoic Acid	28,000		RfD
Bis(2-chloroethyl)Ether	0.03	1E-06	CSF
Bis(2-ethylhexyl)Phthalate	4	2E-06	PMCL
1,2-Dichlorobenzene	620		NC
1,3-Dichlorobenzene	620		NC
1,4-Dichlorobenzene	1.8	1E-06	NC
Di-n-Butyl Phthalate	700		RfD
Phenol	4200		RfD
1,2,4-Trichlorobenzene	9		PMCLG

Table 13 (cont.)

Chemical Inorganics (ug/l)	Cleanup Goal	Risk Level[a]	Basis[b]
Aluminum	50		PSMCL
Antimony	3	2E-03	PMCLG
Arsenic	50		NC
Barium	1000		NC
Beryllium	1	1E-04	PMCL
Cadmium	5		NC
Chromium	50		NC
Iron	300		NC
Lead	15		RCG
Manganese	50		NC
Nickel	150		NC
Vanadium	20		RfD
Zinc	5000		NC

RfD = Reference Dose. This is the systemic threshold concentration calculated as Reference Dose (mg/kg-day)* Body Weight (70kg)* Relative Source Contribution (.10 for inorganics; .20 for organics)/Daily Water Consumption (2 liters).

NC = North Carolina Water Quality Standard August 4, 1989

CRQL = Contract Required Quantification Limit. This is the quantification limit specified by the Contract Laboratory Program.

PMCL = Proposed Maximum Contaminat Level

CSF Carcinogenic Slope Factor. This is the concentration which corresponds to an incremental lifetime cancer risk of 1×10^{-6}.

PSMCL Proposed Secondary Maximum Contaminant Level

PMCLG = Proposed Maximum Contaminant Level Goal

RCG = Recommended Cleanup Goal for lead at Superfund sites (correspondence from the Directors of the Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, June 21, 1990)

Alternative 9 and this contingency Remedial Alternative 5 are twofold. Fist, Alternative 9 involves discharge to the POTW whereas Alternative 5 discharges to surface water. Second, additional or different treatment is necessary to meet surface water discharge criteria. Treatment by ultraviolet oxidation involves the construction of an onsite UVO treatment plant. UVO is a form of chemical oxidation. Hydrogen peroxide and ozone (O_3) are the common oxidants used for groundwater treatment. The oxidant is bubbled through the wastewater while it is exposed to ultraviolet light. The high energy ultraviolet radiation causes these oxidants to form hydroxyl radicals which oxidize the chemical contaminants in the wastewater UVO end products are water, carbon dioxide, hydrochloric acid (in small amounts) and metal oxides. Inorganic compounds will be pretreated prior to treatment of the organic constituents by UVO. An inorganic sludge requireing disposal would result from this pretreatment.

Treatability studies will be conducted during the development of the Remedial Design to ensure the successful operation as well as the reliability of the treatment system. Treatability studies will be conducted for the selected remedy or as well as the contingency remedy, if the contingency remedy becomes necessary.

The effluent from the treatment system will be transported via a gravity pipeline to the selected discharge point in Tributary B. A NPDES discharge permit will be required which will include the monitoring program to ensure compliance with surface water discharge criteria. All NPDES substantive requirements will be met.

As in Alternative 9, O&M requirement for Alternative 5 would include inspection of the performance of recovery, treatment, and discharge system components and periodic cleaning or replacement of any necessary equipment. Additional O&M required for Alternative 5 would include the collected and stabilization of sludges generated during metals pre-treatment. The carbon adsorption system would require periodic replacement. A detailed cost breakdown for Alternative 5 is contained in Appendix d, Part 2. Upon deveopment of the Remedial Design, further review of any ARARs applicable in the management of residual wastes will be identified and complied with, i.e. sludge, carbon filters, etc.

Upon initial and tentative completion of the groundwater remediation, the O&M requirement after shut down of extraction wells will require monitoring of the groundwater on a semi-annual basis. After final remediation of groundwater at the Jadco-Hughes site, a re-evaluation of monitoring requirements will be conducted.

Under both the selected and contingency alternatives, groundwater monitoring of the groundwater would be performed to assess the efficiency of organic constituent recovery utilizing the system proposed. Analytical results would be used to track the progress in achievement of the remediation goals.

Soil treatment is the same for both the selected alternative and the contingency alternative. Soil treatment is via a vacuum extraction process followed soil flushing. The vacuum extraction process is a technique for the removal and venting of VOCs and some semi-volatiles from the unsaturated zone. This technology would involve the installation of extraction vents above the water table within the waste soil similar to the conventional method of landfill gas extraction. A vacuum system induces air flow through the soil, stripping and volatilizing the VOCs from the soil matrix into the air stream. Water in the air stream condenses, is separated from the air stream and is transferred to the groundwater treatment system. The contaminated air stream would then flow through two activated carbon units arranged in a series. Clean water is then introduced into the contaminated soil zone moving with the natural groundwater flow to be collected within the groundwater collection system for treatment, thereby enhancing the soil cleanup by a flushing mechanism. The soil contamination at the Jadco-Hughes site has been found to be largely organic in nature, and the major portion of the contamination was determined to be volatile.

A security fence is being installed under the Interim Action Soil Removal Program and is being placed along the perimeter of the property boundary. This will restrict unauthorized access to the site as well as to the treatment area ultimately minimizing the potential for direct human contact with any residual contaminated media at the site.

The current flow of water from the spring, located to the east of the site, accross the former operations area will be redirected as part of the final remedy of the site. This in necessary because of the potential for contamination to be introduced to the tributary system since the former operations area will continue to be a source area until remediation is complete. The spring water is uncontaminated prior to entering the site.

The goal of this remedial action is to restore groundwater to its beneficial use, which is, at this site, a potential drinking water source. Therefore, groundwater remediation will be performed until all contaminated water meets cleanup goals throughout the plume area(s). The groundwater cleanup goals are presented in Table 13; soil cleanup goals are identified in Table 14. Both the groundwater and soil cleanup goals are developed for the cleanup and overall protection of the groundwater. Groundwater cleanup goals were derived from one of the following references:

contamination and would allow the contaminants to remain in the groundwater at concentrations above drinking water standards, thus violating the Safe Drinking Water Act (SDWA), which is a federal ARAR for this site.

Reduction of Toxicity, Mobility, or Volume

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Recovered groundwater will be piped to an on-site treatment system. The actual treatment system will be based on the final discharge option. For Alternative 9, the system would consist of an aeration basin with an equalization tank. Air diffusion would be conducted to provide a high rate air-to-water ratio. The air vented from the aeration basin would be treated by carbon adsorption. The effluent would be tested to verify that pre-treatment standards are met. The effluent from the treatment system would be pumped to the nearest City of Belmont sewer system manhole. The discharge would then be transported, via the sanitary sewer, to the POTW where it would undergo biological treatment.

Implementation of the treatment and discharge scenario proposed for Alternative 9 would require the responsible parties to secure the approval of administrative personnel from the city government of Belmont. The treated effluent would have to meet pretreatment criteria established by these administrative officials as well as comply with EPA guidelines for discharging of a CERCLA wastewater to a POTW.

Easements and rights-of-way would be required for installation of the recovery wells and piping and the discharge piping to the sewer interconnection. These easements and rights-of-way are essential to the implementation of any remedial action.

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Chlorobenzene	300		NC[c]
clorethane	10		CRQL
Chloroform	0.19	3E-05	NC
1,1-Dichloroethane	0.3	1E-06	NC[d]
1,2-Dichloroethane	0.3	1E-06	NC
1,1-Dichloroethylene	7	1E-04	NC
1,2-Dichloroethylene (Total)	70		PMCL[e]
1,2-Dichloropropane	0.56	1E-06	NC
Ethylbenzene	29		NC
2-Hexanone	10		CRQL
Methylene Chloride	5		NC
4-Methy-2-Pentanone	350		RfD
Tetrachloroethylene	0.7		NC
Toluene	1000		NC
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Under both the selected and contingency alternatives, groundwater monitoring of the groundwater would be performed to assess the efficiency of organic constituent recovery utilizing the system proposed. Analytical results would be used to track the progress in achievement of the remediation goals.

Soil treatment is the same for both the selected alternative and the contingency alternative. Soil treatment is via a vacuum extraction process followed soil flushing. The vacuum extraction process is a technique for the removal and venting of VOCs and some semi-volatiles from the unsaturated zone. This technology would involve the installation of extraction vents above the water table within the waste soil similar to the conventional method of landfill gas extraction. A vacuum system induces air flow through the soil, stripping and volatilizing the VOCs from the soil matrix into the air stream. Water in the air stream condenses, is separated from the air stream and is transferred to the groundwater treatment system. The contaminated air stream would then flow through two activated carbon units arranged in a series. Clean water is then introduced into the contaminated soil zone moving with the natural groundwater flow to be collected within the groundwater collection system for treatment, thereby enhancing the soil cleanup by a flushing mechanism. The soil contamination at the Jadco-Hughes site has been found to be largely organic in nature, and the major portion of the contamination was determined to be volatile.

A security fence is being installed under the Interim Action Soil Removal Program and is being placed along the perimeter of the property boundary. This will restrict unauthorized access to the site as well as to the treatment area ultimately minimizing the potential for direct human contact with any residual contaminated media at the site.

The current flow of water from the spring, located to the east of the site, accross the former operations area will be redirected as part of the final remedy of the site. This in necessary because of the potential for contamination to be introduced to the tributary system since the former operations area will continue to be a source area until remediation is complete. The spring water is uncontaminated prior to entering the site.

The goal of this remedial action is to restore groundwater to its beneficial use, which is, at this site, a potential drinking water source. Therefore, groundwater remediation will be performed until all contaminated water meets cleanup goals throughout the plume area(s). The groundwater cleanup goals are presented in Table 13; soil cleanup goals are identified in Table 14. Both the groundwater and soil cleanup goals are developed for the cleanup and overall protection of the groundwater. Groundwater cleanup goals were derived from one of the following references:

Table 13 (cont.)

a = The risk level represents the risk level for the carcinogenic compounds that corresponds to a lifetime exposure to the groundwater cleanup goal. The risk level calculation assumes a 2 liter daily consumption rate by a 70 kg person.

b = The North Carolina Water Quality Standard was used as the remediation goal for all chemicals which have a promulgated standard. If a North Carolina Standard was not available, the following hierarchy was used to establish cleanup goals.

(1) PMCL or PMCLG (for nonzero PMCLGs)

(2) PSMCL

(3) Health based values using RfD for noncarcinogens and CSF for carcinogens

(4) Contract required quantitation limit

c = The proposed MCL for chlorobenzene is 100 ug/l.

d = Due to structural similarities, the North Carolina Standard for 1,2-dichloroethane was used for 1,1-dichloroethane

e = The goal represents the PMCL for cis-1,2-dichloroethene

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TABLE 14
SOIL CLEANUP GOALS [b]
JADCO-HUGHES SUPERFUND SITE

Chemical	Cleanup Goal	Units
arsenic [a]	48.0	mg/kg
barium	360.0	mg/kg
cadmium	6.0	mg/kg
carbon tetrachloride	3,689	ug/kg
chloroform	15,865	ug/kg
chromium [a]	140 .0	mg/kg
1,2-dichlorobenzene [a]	1.5	mg/kg
lead 1.3	mg/kg	
mercury [a]	0.15	mg/kg
PCBs 10.0	mg/kg	
selenium [a]	4.6	mg/kg
silver [a]	0.6	mg/kg
vinyl chloride	14	ug/kg

The above identified soil cleanup goals are developed for the protection of the groundwater and are designed to ultimately eliminate any leachability from soil contamination that would exceed the established groundwater cleanup goals (Table 13).

[a] Based on the established background soil concentration as established by the RI.

[b] The above established cleanup goals for soil were published in the Administrative Record established in lieu of sufficient site

- Reference Dose (RfD) is the systemic threshold concentrations calculated for the protection of human health. (See further explanation on Table 11);

- North Carolina Groundwater Regulations;

- For those groundwater standards promulgated by the State of North Carolina that are below analytical detection limits, the cleanup goals were established at the Contract Required Quantification Limit (CRQL) specified by the Contract Laboratory Program (CLP) utilized by the USEPA.

- Proposed Maximum Contaminant Levels (PMCL), Proposed Secondary Maximum Contaminant Levels (PSMCL), and the Proposed Maximum Contaminant Level Goals (PMCLG) are used when the PCML is more conservative and therefore more protective of human health and the environment;

- The Carcinogenic Slope Factor (CSF) is used to determine the "one-in-a-million" incremental lifetime cancer risk and to establish a health based number for the protection of human health

- The cleanup goal established for lead in groundwater was obtained from correspondence from the Directors of the Office of Emergency and Remedial Response and Office of Waste Programs Enforcement, USEPA, June 21, 1990 as the Recommended Cleanup Goal for lead at Superfund sites.

Table 14 identifies specific cleanup goals for thirteen soil contaminants. The final cleanup goals for the remaining soil contaminants at the Jadco-Hughes site will be developed during pre-design work and will be based on site specifc data. Partition coefficients must be derived from site specific soil column tests. Soil cleanup numbers will be designed to ensure that the remaining leachability of the soil contamination will not exceed the groundwater cleanup goals upon final remediation.

As previously stated, the goal of this remedial action is to restore groundwater to its beneficial use, which is to a potential drinking water source. Based on information obtained during the RI and on a careful analysis of all remedial alternatives, EPA and the State of North Carolina believe that the selected remedy or the contingency remedy will achieve this goal. It may become apparent, during implementation or operation of the groundwater extraction system and its modifications, that contaminant levels have ceased to decline and are remaining constant at levels higher than the remediation goal over some portion of the contaminated plume. In such a case, the system performance standards and/or the remedy may be reevaluated.

The selected or contingency remedy will include groundwater extraction for an estimated period of 30 years, during which the system's performance will be carefully monitored on a regular basis and adjusted as warranted by the performance data collected during operation. Modifications may include:

a) alternating pumping at wells to eliminate stagnation points;

b) pulse pumping to allow aquifer equilibration and to allow adsorbed contaminants to partition into groundwater;

c) installation of additional extraction wells to facilitate or accelerate cleanup of the contaminant plume; and

d) at individual wells where cleanup goals have been attained, and after analytical confirmation, pumping may be discontinued.

To ensure that cleanup goals continue to be maintained, the aquifer will be monitored at those wells where pumping has ceased on an occurrence of every year following discontinuation of groundwater extraction. This monitoring will be incorporated into the overall site monitoring program which will include the

If, in EPA's judgment, implementation of the selected remedy clearly demonstrates, in corroboration with strong hydrogeological and chemical evidence, that it will be technically impracticable to achieve and maintain remediation goals throughout the area of attainment, a groundwater remedy contingency will be developed and implemented. For example, a contingency may be invoked when it has been demonstrated that contaminant levels have ceased to decline over time, and are remaining constant at some statistically significant level above remediation goals, in a discrete portion of the area of attainment, as verified by multiple monitoring wells.

Where such a contingency situation arises, groundwater extraction and treatment would typically continue as necessary to achieve mass reduction and remediation goals throughout the rest of the area of attainment.

If it is determined, on the basis of the preceding criteria and the system performance data, that certain portions of the aquifer cannot be restored to their beneficial use, all of the following measures involving long-term management may occur, for an indefinite period of time, as a modification of the existing system:

a) engineering controls such as physical barriers, or long-term gradient control provided by low level pumping, as containment measures;

b) chemical-specific ARARs will be waived for the cleanup of those portions of the aquifer based on the technical impracticability of achieving further contaminant reduction;

c) institutional controls will be provided/maintained to restrict access to those portions of the aquifer which remain above health-based goals, since this aquifer is classified a potential drinking water source;

d) continued monitoring of specified wells; and

e) periodic reevaluation of remedial technologies for groundwater restoration.

The decision to invoke any or all of these measures may be made during a periodic review of the remedial action, which will occur at intervals at least every five years.

Statutory Determinations

The US EPA has determined that both the selected and contingency remedies will satisfy the following statutory requirements of Section 121 of CERCLA: protection of human health and the environment, attaining ARARs, cost-effectiveness, and utilization of permanent solutions and alternative treatment technologies to the maximum extent practicable

Remedial actions performed under CERCLA must comply with all applicable or relevant and appropriate requirements (ARARs). All alternatives considered for the Jadco-Hughes site were evaluated on the basis of the degree to which the remedy would comply with these requirements. The selected remedy was found to meet or exceed the following ARARs, as presented below:

Clean Water Act/Safe Drinking Water Act:
EPA's detemination of appropriate groundwater cleanup criteria involved an evaluation of contaminant concentrations relative to available health-based standards. Such limits, including Maximum Concentrations Limits (MCLs) and Maximum Concentration Limit Goals (MCLGs), and Federal Ambient Water Quality Criteria (AWQC), Section 304 of the Clean Water Act (CWA) used as prescribed in Section 121(d) (2) (b) (i) of CERCLA, as defined by the Safe Drinking Water Act (SDWA) (40 CFR Part 141 and 142) and the Clean Water Act, respectively, will be achieved by the selected remedy presented in this decision document.

Toxic Substances Control Act (TSCA):

The majority of the PCB contamination detected at the Jadco-Hughes site will be addressed under the interim removal action. This removal action will be conducted in accordance to those requirements define by TSCA in the disposal of PCBs.

Federal Occupational Safety and Health Administration Act (OSHA):
The lead party conducted and implementing the Remedial Action will develop and implement a health and safety program for all site workers. All onsite workers will meet the minimum training and medical monitoring requirements outlined in 40 CFR 1910.

Resouce Conservation and Recovery Act (RCRA):
The implementation of the selected remedy will not constitute "placement" under the RCRA Land Disposal Restrictions (LDRs) but the generation of spent activated carbon from the water and vapor treatment systems and the accumulation of heavy metal sludges in the contingency alternative could trigger applicability of RCRA LDRs if the waste streams demonstrate RCRA characteristics and if the carbon is not being shipped off to be regenerated (this would exempt it as a solid waste). Should RCRA LDRs be triggered, or if wastes are unexpectedly uncovered during the the remedy implementation that require additional containment, treatment , or removal, LDRs will be complied with or appropriate variances will be obtained.

Effluent Guidelines and Standards, 40 CFR 400 Subchapter N, FWPCA:
Any discharge to publicly owned treatment works must comply with these requiremnts, the selected remedy is designed to discharge to Belmont POTW;

National Pollution Discharge Ellimination System;
The substantive requirements of NPDES must be met in the event that the contingency remedy must be utilized. The contingency would be to discharge to surface waters either on site or adjacent to the Jadco-Hughes site.

North Carolina Superfund Act:
The State of North Carolina has been involved with the review and oversight of the Remedial Investigation and Feasibility Study conducted at the Jadco-Hughes site for the development of this final remedy decision.

North Carolina Groundwater Regulations/North Carolina Water Quality Standard August 4, 1989;
Many of the final cleanup goals established for the Jadco-Hughes site were directly from those promulgated groundwater standards of North Carolina.

Protection of Human Health and the Environment

The selected and contingency remedies adequately protect human health by reducing the risk of consumption of contaminated groundwater. This will be accomplished through the capture of the groundwater contaminant plume. Environmental risk will be reduced by eliminating the impact of groundwater into the tributary by the replacement of the culvert as well as the redirection of the spring water. Treatment of soils will reduce the source of contamination to the groundwater. No unacceptable short-term risks will result from the implementation of these remedies.

Attainment of Applicable or Relevant and Appropriate Requirements

As established, all CERCLA remedial actions must comply with all established ARARs. These remedies assure that the groundwater at the Jadco-Hughes site will meet available MCLs under the Safe Drinking Water Act (SDWA) as well as the North Carolina Administrative Code, Title 15, Subchapter 2L; Classification and Water Quality Standards Applicable to the Groundwaters of North Carolina. For those chemicals which do no have assigned MCLs or other specified cleanup goal, to-be-considered health-based values will be attained. Discharge from the groundwater treatment system will meet either the POTW's pretreatment standards or NPDES permit discharge limits under the Clean Water Act (CWA). The CWA is an applicable requirement, while the SDWA (MCLs) is relevant and appropriate.

Cost-Effectiveness

Alternative 9, the selected alternative, is the most cost-effective remedy that will achieve clean-up goals. The total present worth cost is $4,830,900. Alternative 5, the contingency alternative, would provide a comparable level of protection has a present worth cost of $6,279,900.

The US EPA has determined that the costs of the selected and contingency alternatives are proportionate to the overall effectiveness and both are a reasonable value for the money.

Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable (MEP)

Both the selected and contingency alternatives utilize permanent solutions and treatment technologies to the maximum extent practicable. Both provide short-term and long-term effectiveness and would reduce the toxicity, mobility, and volume through extraction and treatment of the groundwater. Both would require an estimated 30 years to achieve groundwater clean-up goals. Both would require an estimated 3 years to achieve soil clean-up goals. The selected remedy, Alternative 9, is the most cost-effective remedy but not may not be implementable if the City of Belmont POTW or other local POTW is unable to accept discharge from the Jadco-Hughes site within a reasonable period of time after the signature of this ROD. Alternative 5 costs just under $1.5 million more and would become the selected remedy for the site if the above contingency is not met.

Preference for Treatment as a Principal Element

The statutory preference for treatment will be met because the principal threat from the Jadco-Hughes site is ingestion of contaminated groundwater. Both the selected and contingency remedies will reduce this risk to public health through the capture of the groundwater plume as well as the reduction of the source of groundwater contamination via soil treatment.

Documentation of Significant Changes

Two significant change from the proposed plan is incorporated in this decision document. The proposed plan recommended that the groundwater treatment in Alternative 9 would be utilized with three discharge options: to POTW, to surface water with NPDES permit, or natural infiltration onsite. However, the Feasibility Study identified a separate treatment for groundwater that would be more effective and more effecient for meeting surface water discharge requirements of an NPDES permit. Additional public comment is not necessary because incorporation of this technology in Alternative 5 is considered a logical outgrowth of the information on which the public already had the opportunity to comment.

The second significant change is the culvert replacement option. The proposed plan recommended the possibility of removing the buried culvert to eliminate groundwater discharge with surface water diversion. However, the replacement technology as identified in the FS has been incorporated into the selected remedy. This is predominantly due to storm water and flood control problems that are not cost-effective to implement. Confirmation of the elimination of groundwater discharge will be determined by results of the comprehensive site monitoring program which will occur on a quarterly basis.

RISK ASSESSMENT CERTIFICATION

The Region IV risk assessment staff has reviewed the PRP-generated risk assessment for the Jadco-Hughes NPL Site, Belmont, NC for compliance with current Agency health risk guidance and policy. Comments were conveyed to the Potential Responsible Parties (PRP) through the Remedial Project Manager and appropriate changes/corrections have been incorporated into a revised risk assessment document. In accordance with the requirement of OSWER Directive No. 9835.15 (8/28/90), it has been determined that the final risk assessment as summarized in this Record of Decision conservatively conveys the upperbound cancer and the systemic toxicity risks posed through all reasonably likely current and future exposure scenarios by contaminants identified at this site. Therefore, it is acceptable to the Agency.

ELMER W. AKIN
HEALTH ASSESSMENT OFFICER

9/25/90
DATE

APPENDIX A

RESPONSIVENESS SUMMARY

APPENDIX A

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RESPONSIVENESS SUMMARY

This community responsiveness summary is divided into the following sections:

SECTION I.	Overview. This section discusses EPA's preferred remedial action alternative and public reaction to this alternative.
SECTION II.	Background on Community Involvement and Concerns. This section provides a brief history of community interest and concerns raised during remedial planning activities at the Jadco-Hughes Site.
SECTION III.	Summary of Major Comments Received During the Public Meeting and the Public Comment Period and EPA's Responses to These Comments. Information provided in brackets [ ] supplements and/or clarifies the Agency responses given during the public meeting.
SECTION IV.	Remaining Concerns. This section describes the remaining community concerns that EPA should be aware of in conducting the remedial design and remedial action at the Jadco-Hughes Site.
SECTION V.	Transcript of the Public Meeting. This section provides a transcript of the Proposed Plan Public Meeting held at the Catawba Heights Elementary school. The meeting was held on July 26, 1990.

SECTION I. OVERVIEW

The formal comment period for the Jadco-Hughes Superfund Site was held from July 26, 1990 through August 24, 1990. The comment period was extended to September 18, 1990. The Selected Alternative for Remedial Action at the site addressed the soils contamination, the surface water contamination and the groundwater contamination. A copy of the Proposed Plan Fact Sheet, as well as a copy of the Jadco-Hughes Risk Assessment Fact Sheet are attached to this Responsiveness Summary as Attachment A.

During the public meeting, the results of both the Remedial Investigation and the Feasibility Study were described to the attendees. The different technologies that were identified and analyzed for potential use at the Jadco-Hughes Site were also presented. The discharge location had not been finalized at the time of the public meeting; the Proposed Plan listed three discharge options which included discharge to the publicly owned treatment works (POTW), discharge to surface water or onsite infiltration.

The overall Community response indicates that residents favor the remedial action selected for the site.

SECTION II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

The Jadco-Hughes Site is an abandoned solvent recovery and storage facility located in North Belmont, North Carolina in Gaston County. The six acre site is situated in a community characterized by residential areas and light industrial use. Homes are located immediately adjacent north of the site.

The operations at the site were conducted between approximately 1968 and 1975 when the State of North Carolina ordered the operations to cease. The State also ordered the site to be cleaned up; cleanup continued on the site through 1978. Based on results of environmental samples collected by the EPA in 1983, the site was proposed to the National Priorities List and finalized in 1986.

The majority of the public interest and participation occurred during the years of active operation and subsequent cleanup. Pressure from the local citizens ultimately resulted in the State ordered cleanup. Active public involvement decreased substantially with the resolution of the main problems associated with the operations on the site, i.e., fish kills, drum spills, site fires, odors from the storage and incinerator, etc. Essentially, the primary objective of closing the site had been met.

During the sampling activities that occurred between 1983 and 1990, many of the residents have allowed their wells to be sampled and analyzed for site related contaminants. In addition to the EPA sampling efforts, the State of North Carolina also had some of the private wells sampled.

Formal community relations were conducted in the vicinity of the site as a result of the NPL status of the site. A Community Relations Plan was developed and updated as the Remedial Investigation progressed. Several site-specific fact sheets have been distributed. Two public meetings have been held to discuss the progress and the results of the Remedial Investigation and to formally submit the Proposed Plan to the community. The Administrative Record was available at the Belmont Branch of the Gaston County Library where Information Repository has been established for more than two years. Prior to the meeting, EPA published a public notice to announce the meeting and the specific time frame of the Public Comment Period (July 26, 1990 to August 24, 1990, and then subsequently extended to September 18, 1990).

SECTION III. SUMMARY OF PUBLIC COMMENTS RECEIVED DURING THE PUBLIC MEETING AND THE PUBLIC COMMENT PERIOD AND AGENCY RESPONSES

Concerns that the community has identified include a desire to eliminate incineration as a treatment option for this site. Monitoring of residential wells has been identified as a priority concern by residents, State officials and EPA. Public water lines are available in the area. A comprehensive study will be conducted to determine all currently used residential wells in the immediate area downgradient. This data will supplement the well inventory report conducted by the Jadco-Hughes Steering Committee of Potentially Responsible Parties. Additional monitoring of these wells is required by the Record of Decision. Property values and land value in the vicinity of the site is another concern identified by the community.

Specific community comments presented at the public meeting are outlined as follows:

- A citizen requested that incineration be "ruled out" completely.
  Agency Response: Incineration is not being proposed for remediation at the Jadco-Hughes Site.

- A definition for PCBs and VOCs was requested.
  Agency Response: PCBs are defined as polychlorinate biphenyls. These were used in transformers in the past and are organic in nature and are not volatile by nature, or do not readily evaporate. [A PCB compound is one of several aromatic compounds containing two benzene nuclei with two or more substituent chlorine atoms. They are colorless liquids. Because of their persistence, toxicity, and ecological damage via water pollution, their manufacture was discontinued in the United States in 1976.] VOCs are defined as volatile organic compounds which are characterized by their readiness to evaporate. [Organic chemicals which possess the tendency of a solid or liquid material to pass into the vapor stage at a particular temperature; for example, at ambient or even elevated weather temperatures such as a warm summer day.

- Clarification was requested on how much contamination remains in the soil at the site.
  Agency Response: The majority of the waste materials were removed during the removal action that took place between 1975 through 1978. However residual contamination has been confirmed in some areas. The PCB removal action was discussed in some detail outlining the cleanup levels for the removal. The cleanup goal has been defined at 10 parts per million (ppm). The area will be cleaned up until no PCB remains in the soil greater than 10 ppm. (The soil removal work plan is included in the Record of Decision as an Appendix.)

- A citizen asked how far the contamination [in the groundwater] has gone and whether it would stop before it [the contaminant plume] gets to his well.
  Agency Response: There have been low levels of contamination from the site that have been detected in private well samples, though all those levels have been well below drinking water standards. The groundwater extraction system was discussed as to the effects it would have on the plume, such as stopping the migration of the plume so that it would not impact the private wells.

- A citizen asked if the site will be cleaned up well enough to live on the site or to develop the land.
  Agency Response: The Selected Remedy, when implemented will clean the site up for whatever purpose. The groundwater treatment will restrict any drinking water wells from being placed on the site until the cleanup goals are met.

- Several questions focused on the groundwater plume, the extraction system, the final disposal option.
  Agency Response: The three options of discharge were discussed identifying the criteria that would have to met for the respective discharge option. The extraction system was also briefly discussed as well as the monitoring requirements to ensure that the pump and treat system will work as designed. [Some discussion centered around problems that the Belmont POTW had been experiencing.]

- A member of the Potentially Responsible Party (PRP) Steering Committee asked if the Proposed Plan included the removal of the culvert and the diversion of the stream.
  Agency Response: Yes, that is the Agency's proposal. The storm drainage of the area was also discussed.

- A citizen asked if property value around the site was going to decrease or be affected.
  Agency Response: The Agency does not have the answer to that question. The real estate market is not addressed by the Agency. However, the area is known for being a growing area, called the "Metrolina Area". [EPA is a regulatory Agency and must enforce CERCLA, but cannot attempt to predict changes in property values.]

- A citizen asked what he could do to get his well checked.
  Agency Response: The PRPs have offered that service. Please see the representative. [During the formal comment period, a letter was received by the Agency of another citizen located in the vicinity of the site that requested his well to be sampled. This request will be forwarded to the PRPs. The Agency agreed to sample this well if the PRP Steering Committee should refuse.]

Remaining questions centered around the comment period, the availability of the Administrative Record and the availability of the Meeting Transcript.

SECTION IV. REMAINING CONCERNS

In addition to the concerns identified above, additional monitoring (sampling/analysis) of residential wells for site related contaminants and well use may be necessary and has been specifically requested by the State of North Carolina.

SECTION V. TRANSCRIPT OF THE PUBLIC MEETING

See Attachment A.

ATTACHMENT A

MEETING TRANSCRIPT

STATE OF NORTH CAROLINA
COUNTY OF GASTON

PUBLIC MEETING OF JADCO-HUGHES SUPERFUND SITE	THURSDAY, JULY 26, 1990

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SPONSORED BY:	U. S. ENVIRONMENTAL PROTECTION AGENCY (EPA) (MS. BARBARA BENOY, PRESIDING)
HELD AT:	CATAWBA HEIGHTS ELEMENTARY SCHOOL 101 School Drive Belmont, North Carolina 28012
APPEARANCES:	GIEZELLE BENNETT, U. S. ENVIRONMENTAL PROTECTION AGENCY, SUPERFUND BRANCH SUPERVISOR
	BARBARA BENOY, REMEDIAL PROJECT MANAGER (PRESIDING)
	MICHAEL HENDERSON, U. S. ENVIRONMENTAL PROTECTION AGENCY COMMUNITY RELATIONS CO-ORDINATOR, JADCO-HUGHES SITE MEETING
	SHARON ABBOTT, CONSULTANT, BOOZ-ALLEN & HAMILTON, INC.

PANEL MEMBERS:

ELMER AKIN, U. S. ENVIRONMENTAL PROTECTION AGENCY

LEE THOMAS, U. S. ENVIRONMENTAL PROTECTION AGENCY'S GROUND WATER TECHNOLOGY UNIT

BARBARA BENOY, REMEDIAL PROJECT MANAGER

MICHAEL HENDERSON, U. S. ENVIRONMENTAL PROTECTION AGENCY COMMUNITY RELATIONS CO-ORDINATOR, JADCO-HUGHES SITE MEETING

JOE CLAYPOOL, CPMFPC

ALSO PRESENT:

LIBBY B. SIMS,
COURT REPORTER

THIS, a Public Hearing of Jadco-Hughes Superfund Site, held on Thursday, July 26, 1990, beginning at, approximately, 7:37 P. M. in the Catawba Heights Elementary School, 101 School Drive, Belmont, North Carolina, before Libby B. Sims, Court Reporter, 402 Sunset Circle, Dallas, North Carolina, with BARBARA BENOY, Remedial Project Manager, presiding, the following proceedings were had, to wit:

....

-- THURSDAY, JULY 26, 1990 - 7:30 P.M. --

MS. BARBARA BENOY:- Good evening and welcome. Thanks for waiting a few minutes. I guess we've got about everybody here. Most of you already know who I am, but I'll cover it again. I'm also going to be trying to does these overviews myself; so bear with me.

My name is Barbara Benoy and I represent the Environmental Protection Agency as the Remedial Project Manager assigned to the Jadco-Hughes site.

We appreciate your coming out tonight. I know that eveybody's schedule is busy but this is an important meeting and thank you all.

The last meeting that we held here was in November of 1989 during which we presented to you the preliminary results of the Remedial Investigation.

Tonight's meeting we'll also present the results of the Remedial Investigation as well as the results of the Feasibility Study but, more specifically, EPA is presenting a proposed plan. It's a proposed plan for the remedy of the site for the clean-up of Jadco-Hughes site and I know that you are all very glad to hear that we've gotten to this point.

This meeting will initiate the formal thirty-day public comment period. Today is the first day. As I said before in past meetings with you that your involvement, your concerns, your questions, your comments are very, very important to us. They are vital as part of the decision-making process. And, again, I appreciate you coming out.

Because EPA wants to accurately address each and every concern, we do have a Court Reporter. She will be generating a transcript. That transcript will, also, be available at the information repository. Most of you are familiar with the information repository already. It's been established and now has the -- the administrative record which has all of that documentation that EPA uses to make a decision for the remedial site. I did check the administrative record, it is at the library and it is available for you now.

Hopefully, you all got a set of the handout sheets. They should be all of the same fliers, but they're not all going to be in the same order. There were some last minute changes that I've made.

Turning your attention to the agenda. I'm going to try to keep the presentation part of this meeting very, very brief. It's going to cover the Superfund Process and how it applies to the Jadco-Hughes site, where we are in that process. We'll talk about the site history. Again, we'll talk about the results of the Remedial Investigation and the

Feasibility Study. The next item will be the EPA's proposal for clean-up. Michael Henderson will then address Community Relations; and at that point in time, the real purpose of our meeting is to hear any questions, comments from you. I would like to keep a majority of that meeting for that purpose. And if you don't mind, we will hold the question/answer period at the end. If you'll just hold your questions or if you think of a question, write it down so that you don't forget it.

We have several people here tonight, I also want to introduce. They will be available later for the questions and answers; and if you guys don't mind, just stand up when I call your name.

Michael Henderson. Michael is with the EPA. He is Community Relations Coordinator assigned for this meeting, Jadco-Hughes site. He was with us last meeting.

Elmer Akin. Elmer Akin is with the Environmental Protection Agency's Health Assessment Office. He is also with Region Four in Atlanta.

Lee Thomas. Lee is from the EPA Ground-Water Technology Unit, again, Region Four's Office in Atlanta.

Giezelle Bennett. Giezelle is in the Superfund Branch. She is my current Supervisor.

Joe Claypool. Joe is with CPMFPC. Joe has worked directly with the site on a monitoring capacity watching all the activities with the Remedial Investigation and Feasibility Study. EPA is required to have a third-party oversite available watching all PRP activities, all RI/FS activities and I'll explain a little bit more of that and if I don't clarify it, ask me. The oversite is to insure that EPA's protocols, standards or procedures are all adhered to.

With us, also, tonight are Lee Crosby and Jack Butler from the North Carolina Department of Environmental -- sorry, should have called one name at a time -- Department of Environmental Health and Natural Resources. We thank you for coming, also.

Okay. Move on to Superfund Process. After we did this line, it's not quite in order but, hopefully, I'll be able to clarify. Can you see this?

In 1980, the Comprehensive Environmental Response and Liability Act -- there's something missing -- I'm sorry -- CERCLA was passed to deal with some of the nation's hazardous waste sites. The law is, also, known as Superfund. I'm sure you're more familiar with that -- with that name. It requires the EPA to determine the nature and extent of contamination on a Superfund site.

When Superfund was reauthorized in 1986, even more stringent clean-up criteria were identified. To follow this process, a site can be discovered in a lot of different ways. What usually happens is the State contacts the EPA if it's a concern. A preliminary assessment or a site inspection is done. Data is gathered and we subject the site to what is known as an HRS ranking and that's just a model takes to __________ the ground water, the surface water, how the water is used, whether it's drinking water, whether it's a recreational use. It also takes into -- it takes the environment, any environmental concerns into account. And it comes up with numerical scores. And the magic number is 28.5, and they decide if it ranks above 28.5 it's proposed for inclusion in the National Priorities List, which we call NPL. If you haven't figured out yet, we use a lot of acronyms from the alphabet, so, I'll try not to give you much of that.

When I'm talking about the fact that it's out of order, the PRP search is actually or usually done between the HRS Ranking and the RI/FS negotiations.

PRP stands for Potentially Responsible Parties. The agency conducts the search to determine if there are parties that might have been --- come on in -- generator, site-owners, disposers, anyone who might have been potentially responsible for the site contamination. And if those parties, when they're identified, are willing and able to conduct the activities, EPA negotiates with those parties and allows them to do the work. That saves money for the funds for sites where we don't have the potentially responsible party -- potentially responsible party identified. So, those two bubbles are really reversed.

If you cannot come to agreement with the PRPs, then again, Superfund monies can be spent and the PRPs may be liable for the cost that is spent.

At that point in time, when negotiations occur -- let me back up a second -- if there is agreement, then a Consent Order which is a -- it's a legal document -- EPA has their attorneys, PRPs have their attorneys -- and we do come to some sort of agreement to conduct the work.

The RI/FS is then conducted. The Remedial Investigation, the RI, is a study, it's an in-depth study that determines the nature and extent of the contamination. It determines the media that's been contaminated. It determines where it is, how deep it is, how far it's gone. The Feasibility Study is then conducted which looks at the available technology of how we can cleanup particular medias. How do you cleanup ground water out of grass roots? Down in the ground water. How do you cleanup sub-surface soils? And we're still learning. We will continue to learn for a long time.

At that point, we take the alternatives with the different technologies that we looked at that can be used for particular sites and we develop them on a site specific basis. Some things just aren't practical or they're too

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expensive; and in further development process, there's a proposed plan that comes out. One, in particular, looks the best so to speak. Once the proposed plan or the selected alternative is developed, it is presented to the State, presented to the public or to the community. We would like your acceptance. We need to know your response to it. That's why we're here. All the comments, all the analytical data, any -- all the applicable environmental laws that also apply; the water act, any State statutes.

They're also taken into account when we make the decision which brings us to ROD. That stands for Record of Decision. Once all this information is compiled, your comments, the State's response, all the data, we develop a Record of Decision submitted to my Regional Administrator and hopefully he approves it.

After approval, we may enter into negotiations with the PRPs to conduct the Remedial Design and Remedial Action. The Remedial Design is just what it says. It's the actual design of the cleanup. It's the engineering specs; it's well locations, fence locations, monitoring programs. It has everything in the plan -- we have to again to approve and review to make sure the State approves; and in RA, Remedial Action, is the point we all like to get to, actual cleanup, the implementation of the cleanup of the site.

The only -- at that point, what you have left is the removal of the NPL. The only time that that can occur is when the site has actually been cleaned up and that's all in the process, also. There are certain types of ground contamination that could take years, decades.

I'd like to go to sites specific now and bring it to the Jadco-Hughes site.

When I made my introductions earlier, I failed to -- to acknowledge some of our PRPs are here tonight; and we have the Steering Committee spokesperson and their consultants, consultants; and attorney -- Ben, would you like to introduce any of your people.

MR. BEN LEACH:- I guess we're just here to listen. But I don't think we have anything to talk about.

MS. BENOY:- As most of you know, the Jadco-Hughes site is located in Belmont, Longhaven Street, and I believe it's right over this hill, or this hill, this one?

It consists of, approximately, six acres and it was originally used as a solvent reformation facility or it was supposed to be used for that. That process -- that facility, design, ultimately failed and it resulted in more of a storage facility of quite a bit of accumulation of waste. There was industrial waste, solvent waste, a lot of things just needed to be discarded and the site seemed to be a convenient place to put things. Historical ______ indicates that operations did begin as early as 1959 --

excuse me, 1969. No official records of the facility -- don't show the operations beginning until 1971. The accumulation of waste materials include large tanks on the site as well as about eighteen thousand drums. There was stained soil. Over the lifetime of the site, there were spills into the creek. Those of you that live here are quite a bit more aware of what went on at the site than I am. But complaints from the community were frequent and they were serious, and the site was finally closed down by the State in 1975.

During that year, I believe the cleanup was initiated and it continued through 1978. In 1983, the final removal of some of the bulk storage tanks was also conducted. In that same year, EPA conducted samplings. Private wells were sampled, soil on the site was sampled, sediment and surface water from the streams were sampled and the resulting data was subjected to the HRS system we talked about; and due to the potential contamination for ground water and surface water this -- the resulting score was 42.

The site was proposed for the NPL in 1984 and was finalized in 1986. EPA then negotiated with various firms that had conducted business with Jadco-Hughes facility. And they came to an agreement of the Administrative Order On Consent 1986, in September; and, again, as I said earlier the Consent Order outlined the terms in which EPA will allow the PRP to conduct the RI/FS.

During the RI, this is an old map which comes from a much previous report but it was a very good one from an overview site. Contamination was detected in surface water and soil, particularly in the landfilled area, which you see where the concrete pad is -- that's the operation's area and that's what we usually refer to as the ____________ Report. The area where the word, culvert, is in this box, bottom area was also determined to be contaminated with significant levels of PCBs.

The landfill in the operations area and the pit areas that were used were found to be contaminated predominantly with volatile organic compounds. PCBs at lower levels in this well area revital lower corner, were found in landfills as were metals and extracted organic compounds. But again, the predominant contamination of the soils seems to be volatile organic compounds.

The ground water has also been found to be contaminated and volatile organic compounds seem to be the most common. Because we had different classifications of chemicals, I kept them in the classifications to talk about presenting to you different classifications. More specific data is available in the reports. We did not include them in our proposed plan because it would have been a lot of information.

The Feasibility Study and Remedial Investigation are in the information repository and I'll try to answer your questions about that. The ground water contamination, we have seen the most significant levels on site. There has been resampling of the offsite private wells -- I have to adjust my voice -- and some low levels have been detected in some of the private wells. But they are low -- at levels that are below drinking water standards and if -- I'm not aware of anyone using private wells solely for the drinking water. If anybody knows of one, please let me know.

The private wells that we sampled are to the north of the site and that is the direction that the ground water is migrating.

The surface water contamination was also with volatiles. And this map, I don't really consider it quite accurate in showing surface water. But the surface water contamination is believed to be due to either the discharge of the ground water, contaminated ground water, through this culvert. You can see the dash line that goes through the site. It's damaged. We know that it's damaged in -- very likely in place but, also, another source of contaminated surface water could be surface water run off from the site itself.

The Feasibility Study, as I said, is the next step in the process of where we take the different technologies that are available -- and I'm going to speak mostly from the slides -- that are available and that can work for a particular site. For example, the soils -- some of the things that are considered capping, where a cap is put on top of the soil so that they cannot be -- they're not an exposed pathway. However, it leaves the contaminated soil on site. Removal, that's always an option -- pick it up. One of the questions with removal is what do you do with it when you pick it up. You've got to do something with it.

Treatment -- such as incineration -- that's one of the options which you can use. Soil washing -- where the soil is actually washed. Soil vapor extraction which you'll learn a little bit more about ---

MR. TONY HAYES:- --- ma'am, may I interrupt you just for a second?

MS. BENOY:- Yes, sir.

MR. HAYES:- I certainly wish you would rule out incineration at all. They had a minimum incinerator down there that was just absolutely terrible. If you'll notice, it's in a pocket like this and you have more or less an inversion there that holds all this in _____________; and it's just absolutely __________. I would hope that ya'll would just wipe that off of it and any other program _______ but not an incineration, not on site. Okay.

MS. BENOY:- And we're not proposing that.

MR. HAYES:- Okay.

MS. BENOY:- We're not.

MR. HAYES:- I just wanted to be sure.

MS. BENOY:- I understand -- I -- that was one thing that I expected to hear from you. The -- I had mentioned that in the history. For any of you that do not know, the site had an onsite incinerator that was never in compliance and I really have not found the exact amount of time that it ran but it wasn't very long -- was it?

MR. HAYES:- It was a long time. It just didn't work for a long time. I mean it was down there ______________________.

MR. HAYES:- But it worked for, you know ---

MR. WARREN RHINEHART:- --- it just didn't do the job that it was designed to do.

MR. HAYES:- I don't know whether it or not. When it came out of there, there was just absolutely unlimited _______________. It just lay in the little valley there and didn't ____________, not in any sense of the word. And it was so bad -- and I won't say anymore -- that when I was over there that you had to hold your mouth like this to get in the house.

MS. BENOY:- There are some depositions, citizens complaints, that are in the files that I have read and I appreciate you sharing that.

The other media which is really more than -- and ground letter -- some of the options that we look at are physical containment, where we physically containment it. The hydraulic containment is technology that you put a barrier within the soil that prevents the surface water ________________, the ground water from moving and migrating from the site. Treatment such as air stripping, activated carbon adsorption, in-situ bioremediation -- these are treatments designed to reduce and ultimately eliminate contamination to a certain -- bring it down to levels, cleanup levels.

For the Jadco-Hughes site, the Feasibility Study presented -- let me back up. Thirteen technologies were identified in the Feasibility Study. And for the Jadco-Hughes site, eleven were further developed. And I'll just briefly go through these.

No further action. No further action is required to be considered for every site; for more than one reason. But basically, to give EPA and the public an idea of baseline comparison. This is how the site is, the risk that it poses, this is the problem that it is, as it is, if nothing else were to be done to it. Are you following me? I hope I said that clear.

Deed/Access, Restriction and Monitoring. Deed restriction doesn't do much. It identifies in the future property purchasers if there's a problem with the site. Access restrictions -- again, it keeps people out, but it does nothing to eliminate the problems. Monitoring -- monitoring is -- you can watch to see if the contamination migrates it's a problem, has left the site, you can watch to see if the problem -- what the contamination does. But it doesn't do anything -- Number 2, doesn't reduce -- well doesn't change -- it's not really any different from the no further action as far as the cleanup technology.

The next three are just official steps added on. The third one would be -- is Number 2 plus a cap. Again, it does not -- it does not treat the soil, it just covers the soil. Caption also inhibit ground water pump and treat system.

Number 4 was that -- those options, plus ground water extraction, ultra-violet treatment, discharge to Fites Creek; and 5, you can read, also, soil venting and flushing/culvert replacement.

Off-site land disposal is Number 6 with Ground water extraction treatment and discharge to Fites Creek/Deed/Access Restriction/Culvert Replacement/ Monitoring.

The seventh one Incineration -- the rest is pretty much the same.

Number 8 was Cap or Ground Water Extraction,

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Aeration Treatment, another treatment system technology/ Discharge to POTW.

Number 9, Soil Vapor Extraction/Soil Flushing/ Ground Water Extraction, Treatment and Discharge.

Number 10 was Off-site Disposal.

Number 11 was On-site Incineration with the remaining part of it pretty much equivalent.

Congress identified or through the -- I shouldn't say Congress but EPA must utilize the nine point criteria is after we developed alternatives that are viable for the site. We must deal with these following nine criteria, it's called nine point nine criteria.

Protective of human health and the environment as it should be is the primary criteria. The technology or the cleanup most protective human health and environment. It complies with ARARs. These ARARs -- let's see if I can say it now that I'm up here. The applicable relevant and appropriate requirements and that's just a fancy acronym for saying that any cleanup standard that's been identified: for example, clean water act, state, the ground water we have promulgated maximum contaminate levels, all these are considered ARARs. It's just our little catch phrase. It's very important -- ARARs were identified -- the concept of ARARs was identified ______________ that reorganization of Superfund, 1986. The third criteria is that it provides long-term effectiveness. That it works over a long period of time. That it provides short-term effectiveness. That the reduction of toxicity, the mobility or volume of contaminants be addressed. Implement ability that it can be done. That is important to us. I'm sure it's important to you. That it receives State acceptance. That it receives community acceptance and, yes, we must consider the cost effect of alternatives.

The Feasibility Study presented three final alternatives and you can read them -- Number 1, Number 9 and Number 11. And I want to emphasize at this point that your comments are -- we're asking for your -- we are asking for your comments on the proposed plan but we are asking for your comments on any of the alternatives that are identified. We're asking for your suggestions, we're asking you -- you know, please, it's not limited to just what we have put on the board or on the table here.

Number 9 -- Soil Treatment, Ground Water Pump and Treatment. Number 9 does say surface water diversion, the restrictions and monitoring.

Number 11 was soil incineration, ground water pump and treat, surface water conversion, deed restrictions and monitoring. These are not exactly as they were presented in the Feasibility Studies and EPA has modified the recommended alternative or alternative that the ERP's have presented to out.

The proposed plan, we selected Number 9 or we -- it was the proposal that was presented. We looked at the nine-point criteria and we looked at a few other things. The proposed plan for soils -- soil vapor extraction. The system vents are put into the soil, contaminated areas. Clean area is forced into the system. The contaminated air is pulled out. You've got the volatile organics, the emission of volatilization of fumes being pulled out, being vacuumed out. The air is then flushed through an activated carbon absorption system. There are -- one of the problems in the -- there is a mistake in the proposed plan. It says it is a proven technology. It is a technology that is being [illegible] and we are seeing some success at that the [illegible] site, because the soil contamination seems to be the upper part of the soil and it's not very deep -- that it [illegible] it could be very promising. And soil -- the soil vapor extraction seems to work well with the ground water extraction system in that the ground water is lower; so, therefore, more fumes or greater surface area is exposed.

After the emission of the soil vapors is completed, clean water is flushed, also, through the soil and this is a technology in itself. So, you've got the second technology introduced to the soil. You flush uncontaminated, clean water through the soils and it washes or flushes the contaminants out. The contaminated water is collected at some sort of ditch systems or it's collected through this ground water pump and treat system. The contaminated water would then be treated with the ground water contaminated -- the contaminated ground water in that system.

Extraction wells are installed through the site in areas of concern where the highest contamination is found or even in areas intercept from, stopping the contaminants from going off-site, and Lee will be able to elaborate probably more than I can. It's not my area of expertise. But the [illegible] Mills and former operation areas are two significant areas that we are concerned about with the ground water contamination. Again, the treated ground water will be -- the extracted ground water would be treated on site and EPA requested that the discharge options be expanded to include three options -- the local POTW was the discharge option that's identified in the Feasibility Study. The adjacent stream which would require an NPDES Permit or at least standards identified by NPDES that have to be met. And on-site infiltration which would require that the ground water be cleaned up to MCLs or the maximum contaminant level which would probably -- well -- and higher standards that are identified by the State of North Carolina. The cleanup for on-site infiltration has the most stringent cleanup requirements for the water because it's going back into the ground.

EPA, again, after using the nine-point criteria, we have some further evaluation of criteria, and the remedy that we're proposing -- we believe that -- I need to back up a little bit. On Number 9, EPA is recommending that -- the Feasibility Study suggested culvert replacement and EPA would -- is proposing that the culvert be removed and that surface water not flow through the site whether through a culvert or a ditch, but that it be diverted around the site, and that that would eliminate any contaminants into the culvert and ground water, as well as the surface water flowing from the site, ground -- surface water conversion is what EPA is -- that's the way we've modified.

Backing up to the Selection Criteria, we believe that the alternatives that we're proposing is consistent with the National Contingency Plan as well as Section 121 of CERCLA. Those are the requirements that we must identify and adhere to. This is an innovative technology that we believe that will be effective at Jadco-Hughes and at any point in this process that we determine that it's not effective; obviously, we change direction. We'd find something more appropriate to the site. We believe that it can achieve ARARs with the cleanup levels that are going to be identified. Most of those have been identified, such as the maximum contaminant levels. There are some that will be ultimately -- it's not in the proposed plan. I don't know if it's -- that I could list them all out for you. I'm sorry. I just -- I can't do that at this time, but they're available. And it is a cost-effective alternative.

And, again, this is your -- this is where EPA identifies it to you and we refer to that comment here --

I'm going to let Michael talk. Now, that's a lot of information and I hope that I haven't overwhelmed you. After Michael tells you a little bit about Community Relations, what we'll do is we'll take a short break and then we'll be available for your questions and answers

MR. HENDERSON:- As Barbara said, my name is Michael Henderson. And I'm doing the community relations for this particular meeting here.

When EPA talks about community relations, we're talking about a two-fold process. It's a two-way street. It's not only EPA presenting information to you or trying to let you know what's going, but it's, also, you providing us information; and one of the reasons is because we can't do it without you. We find out about sites, about situations, history, et cetera, from talking to the people in the community. We don't know.

One of the ideas or one of the purposes of the whole type of community relations strategy is to find ways and mechanisms of making sure that throughout the entire process and that site discovery all the way through the end until the site is cleaned up of how are we going to keep you informed.

The first thing we try to do is develop what we call a Community Relations Plan. By this, we have our contractors or either people from our staff come out and talk to the residents that are close, say, within a mile or two miles of the site, and find out what are their concerns; whether they are economic concerns; whether they are health concerns or whatever. We take this basic information and then we try to compile a little plan to say this is the basic background of this community. These are the things involving this site which are -- concerns them. And we put the plan together and from this, we say the first thing we need to do is develop what we call an Information Repository, which is here at the Belmont Library. And this repository, the administrative record -- we put all the information we have during the history of this site, copies of Remedial Investigation, the Feasibility Studies, your Community Relations Plan, your Fact Sheets -- all this information is placed there where the community doesn't necessarily always have to write EPA or call somebody. Something here in your local community that you can get the same information here. If there is some more details you want, yes, we say, encourage you, write us or call. But we should have something here in your location that you don't have to run all over creation to find it.

We, also, try to use press releases. If something comes up and we think you need to know right away, we try to put it in the newspaper. We use public notices to let people -- to notify the community of public meetings that we have. We do think like the public meeting here tonight - which, for example, in this case, the law requires at the end of Feasibility Study that you do the public meeting. That we have the thirty days public comments period and that we have, for example, the Court Reporter.

Speaking of the Court Reporter, in this particular instance, since this is going to be part of what we call a response and summary for the record of decision, when you do make a comment or question, please state your name clearly and who you represent. This information will be compiled in a transcript of this meeting and it will be placed in the Information Repository so that any citizen and interested party can go by and see it.

We are at this point, as I said before, the public comment period. During this public comment period, we are accepting oral comments as well as written comments. One of the things we have out on the desk besides the Fact Sheet -- there is a self-addressed, stamped envelope; postage being paid, that if you have a comment, we can just take one of those envelopes and put it in the mail and drop it to us. We do need your comments, we do need your concerns about what's going to happen because you live in this community and you have a right to make or express your desires one way or the other. We do work for the Federal Government and your taxes pay us. If you have any questions or any problems about that, I would encourage you to write us, call us or whatever. If you call me, I will probably tell you. I will find you an answer. You may not like my answers, but if you ask me, I'll find you one, one way or the other. If I can't get it the exact time you call me, I will let you know why I can't get it. But I will get you an answer.

One of the interesting programs that has been also [illegible] the recent years since the Superfund Reorganization Act, SARA is the program called Technical Assistance Grants. What this program does is it allows a community group to apply for a grant up to Fifty Thousand Dollars to hire their own technical advisor to interpret what EPA is doing. What it requires, generally, is a twenty-percent in-kind matching fund. It can be, for example, if a lawyer says he's going to work with a community group and he says, Well, my normal rate will be a Hundred Dollars an hour, but I will donate it to you. You can say, Well, hey, he worked twenty hours or whatever and this is Two Thousand Dollars or this is Fifteen Hundred

Dollars or whatever and apply that toward the matching fund. Governmental entities cannot apply for it. Educational institutions cannot apply for it. National Environmental groups cannot apply for it. It is, basically, geared for the community itself. If anyone is interested and you can apply for it any time during the Superfund process in terms of a remedial process. If anyone is interested, the lady they should talk to is a lady named Denise, D-E-N-I-S-E, Blanc, B-L-A-N-C. She is a Technical Assistance Grant specialist for EPA. And she would be at the same address, 345 Courtland Street, NE, Atlanta, Georgia 30365.

This is basically ---

MR. RHINEHART:- --- do you have an 800 number?

MS. GIZELLE BENNETT:- It should be in your Fact Sheet.

MR. MICHAEL HENDERSON:- It should be in the Fact Sheet.

MS. BENNETT:- --- it's a 404-347-2234.

MR. HENDERSON:- No, he was asking about the 800 number.

MS. BENNETT:- Oh.

MR. HENDERSON:- We have an 800 number.

________________:- Is it in this?

MR. HENDERSON:- In fact, it's a general 800 number. So, that would be -- he may get it, he may not.

Because one of the problems we've had is that Region Four -- -- we cover eight states. We cover North Carolina, South Carolina, Georgia, Alabama, Tennessee, Mississippi, Florida and the State of Kentucky, and this is the other reason we need the community. There are only about one thousand, maybe eleven hundred people in our Region Headquarters. We do not have district offices. So, a lot of the things we find out in terms of site history and the things that are going on in the community. Or what's going on at the site, we get it from the community or what's on at the site, we get it from the community itself, because we don't have the staff to go all the way around. This is another reason we use contractors. So, it has to be a give and take for this [illegible] to work [illegible] all parts. And, again, as Barbara said, I encourage you to make comments and write -- oral comments or written comments -- send your comments in. There have been instances -- I don't know too many in this region, but I know that it's happened in other regions where citizens have changed the record of decision by their comments. In fact, there's one -- one region, what happened was that the remedy that the citizens came up with was cheaper and more effective. So, it's not a closed thing. We make those recommendations based on an evaluation of everything. Your comments here, comments from the State, comments from all interested parties and submit it to the Regional administrator, but your comments are important to us. And we do need to -- do need to hear from you.

MR. RHINEHART:- You said even during the cleanup period it is -- we can ---

MR. HENDERSON:- --- you can -- huh ---

MR. RHINEHART:- --- even during the cleanup period ---

MR. HENDERSON:- --- sure. Sure.

MR. RHINEHART:- If there's a comment or a complaint or whatever?

MR. HENDERSON:- Sure. Sure. Yeah. It's not -- this is not, for example, say a locked thing that we say, well, you [illegible] make your comments during appeal. Now, we want your comments in terms of getting everything together in terms of making a final decision, the record of decision. But still if there are some problems or comments, yes, yes. Because this is an ongoing -- community relations is ongoing. It doesn't stop for, say, this meeting or when we come up for a fact sheet. This is an ongoing process and any time you have a concern call us, write us. That's what we're there for.

Yes, I encourage you to do that any time, any time. This is the basic of how Community Relation work without getting too far into blowing it up but, yeah, we do the public comment period, we do the public meeting, we

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sometimes have, what we call, availability sessions in which we will go into a community and we'll say, okay, we're here at the library from 4:00 to 8:00 and you can come in and talk to us one on one. We have done that before. It depends. We have, also, in certain instances have gone door to door talking to people in the community or at special invitations of community groups to come and talk to them about various problems or things that have been going on.

Yours, your taxes, use us. One of the interesting things I would like to tell you about Superfund which is [illegible] for a lot of people. Superfund is a little different than any other governmental program in EPA. We are primarily funded by taxes on chemical manufacturers as opposed to as coming out of the general tax budget. Eighty-seven percent of the Superfund comes out of tax on chemicals [illegible]. Thirteen percent comes out of the budget. The idea behind using the potential responsible parties is -- it's a replenishing fund. As they pay, then we can use the money to work on other abandoned sites. And so, it's a self-replenishing fund.

That's basically it in a nutshell. I hope I didn't forget anything and I will be around to answer any questions that anybody has. Thank you very much.

<u>MS. BENOY:-</u> Give us a chance to set up here. I'd like to suggest a quick break. And we'll turn on the air

conditioner again so that it will cool down again.

-- 8:30 P.M. --

-- BREAK. --

-- 8:40 P.M. --

MS. BENOY:- Okay. If we could go ahead and get started. There is a microphone in the back. We're going to have to keep this air conditioner off. She's not being able to get a good record. I thought maybe we could open the window but they're sealed shut. So, for the one air conditioner placed in the school. There is a microphone back there. Without the air conditioner going, it's not too bad, but you may want to use it just to make sure.

Mrs. Corrie Hayes:- Why can't we have the air conditioner?

MS. BENOY:- We have to record it and she ---

MR. RHINEHART:- --- well, can we open the door maybe and get a breeze from there? Is that ---

MR. BENOY:- --- that's fine. It's pretty warm out there, too. That's why ---

MR. WARREN RHINEHART:- Okay.

MRS. CORRIE HAYES:- I thought if you were just doing it for my husband, we'd send him outside.

-- Laughter. --

MR. BENOY:- But I open the floor up to you.

MR. WARREN RHINEHART:- If someone would, please, I'd like for them to explain to me exactly what PCBs and VOCs [illegible] I read that here. Is that iron, is it silver -- I mean just, basically, what is it?

MR. BENOY:- What we call VOCs -- that stands for volatile organic compounds. Those are the compounds -- the [illegible] -- Elmer, you might want to elaborate. [illegible]

MR. WARREN RHINEHART:- Such as? That's what I'm wondering.

MR. BENOY:- Such as Benzene, Toluene, Acetone: those compounds that readily evaporate. That's one of the ways you can look at them, that volatilize, that -- again, anybody that wants to jump in and help out here.

PCBs, polychlorinated biphenyls are not volatiles. They -- I can get you better information -- better chemical information -- I really don't have a good explanation off the top of my head. The extractable organic compounds are also organic in nature, which means that they're carbon based. But they don't volatilize. You don't have the fumes, the emissions. They stay -- they don't evaporate into the air. They stay in their form.

<u>MR. HENDERSON:-</u> PCBs were used a lot in transformers.

<u>MR. WARREN RHINEHART:-</u> I mean is that magnesium or -- I mean what is that?

<u>MR. BENDY:-</u> It's an organic compound. Again [illegible] to classification ---

<u>MR. LEE THOMAS:-</u> Carbon and Hydrogen -- these are -- they're not metals at all. It's Carbon and Hydrogen and things like that.

<u>MR. TONY HAYES:-</u> May I ask something about the site? Can I ask a general question?

<u>MR. BENDY:-</u> Yes, sir.

<u>MR. TONY HAYES:-</u> It's my understanding at the last meeting that someone said that ninety percent of the chemicals of -- I asked a question about leaching off the site and I may be wrong, my impression -- someone said that most of the chemicals have not been _________ site, that they were there because of the soil content which has been held in a basin underneath that. Did I dream that or did someone tell me that?

MR. BENOY:- No, sir. Most of the contamination outside the very top layer of the sediment is still on the site. Again, a lot of contamination of waste was removed in the 70's, but we have found residual contamination. In some areas, we found significant levels. I need to tell -- I need to talk about this. I forgot all about saying this. The PCB area is being addressed in an interim measure. The agency looked at the levels. Agency for Toxic Substances and Disease Control looked at the levels. A proposal was made by the PRPs to do an interim removal on that particular area and that's been agreed to. I'm sorry, I didn't mean to leave that out. It's a significant part of the action that we're doing at the site.

The PRPs met with EPA. We are doing this similar as removal under our emergency program. It's a removal, so I'm not the lead person for that particular action at the site. I'm still the Remedial Project Manager for the site. Warren Dixon is going to be the On-scene Coordinator, who is working with the PRPs on this. Another Administrative Order on Consent has been signed. It's, again, similar to the order that we had for the RI/FS. But I'm sorry that I left that out. I certainly had no intentions. That is a very important part of the site. That's how the PCB soils are going to be addressed. That particular area they're going to remove -- if I remember

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correctly, the top ten inches and anything above ten parts per million or above will be removed from the site area.

MR. TONY HAYES:- How deep will they probe for that?

MS. BENOY:- The monitoring program I don't think has been finalized, but they will -- there is some minimal requirement -- the top ten inches, if I -- and please correct me, Pat or Steve, the top ten inches is what they're going to start off with and then they're going to base it on a grid program and they're going to collect samples over this whole area to insure that, in fact, the removal is complete.

MRS. CHRIS HAYES:- What will they do with that soil. Where are they going to take it?

MS. BENOY:- They're going to take it off the site. I would, -- to a permitted facility is what I understand -- I'm, -- the plan at this point in time, because it is removed from me ---

MR. STEVE QUIGLEY:- --- if you want -- do you want me to say something about this, Barbara?

MS. BENOY:- If you'd like to answer that question, that would be appreciated, yes.

MR. STEVE QUIGLEY:- My name is Steve Quigley. I work for a company called Conestoga-Rovers & Associates. We're the consulting engineering firm that has done the work during the Remedial Investigation and Feasibility Study of the site. The question was just asked about PCB contamination and how it's going to be taken off and where it's going to be taken. That's one of the things that we're working on right now and we're working on it today, as a matter of fact. We will be hiring on behalf of the PRPs a contractor who will come in and excavate the material and take it off off-site to a secured landfill. There are a number of places that are designed in the United States to take this material and store in a secured fashion unlike a situation where it is now where it's at the ground surface.

The question was asked earlier of how we would -- how deep would we go and how would we confirm what -- what's there. The work plan that's been submitted and reviewed by the EPA, specifically Warren Dixon includes some more sampling. What we're going to do is go in and bore some more shallow holes down about three feet and take samples to profile the depth, to see how deep the PCBs have migrated before we go in and dig; and once we get that information, we'll go in, dig out what's contaminated, sample it to make sure that we have cleaned up what was there and then -- we have that confirmatory information, we put clean backfill which we've sampled from somewhere else to make sure we're not putting dirty stuff back on the sites but we put clean backfill in and the top soil on, seed it and it's back to its original condition.

MR. TONY HAYES:- My question is: Suppose you go down ten inches or you go down a foot, two feet, if you have contaminated, damp contaminated soil down there, what's to keep it from leaching back up if you put fresh soil on it?

MR. STEVE QUIGLEY:- Well, the objective is to go and pick up whatever is contaminated.

MR. TONY HAYES:- Just whatever depth?

MR. STEVE QUIGLEY:- That's right. If we go down, we're removing the soil until it's cleaned. Now, PCEs don't generally migrate at that -- they kind of stay where they are.

MR. TONY HAYES:- At this point, did you say that PCEs and not other incarcinogenics (sic)?

MR. STEVE QUIGLEY:- Yes, this is specifically related to PCEs ____________________.

MR. TONY HAYES:- Okay. Thank you.

MR. EDDIE BARKER:- I'm Eddie Barker and I live on Clearwater Lake Road which is downstream and I still use my well for drinking water. How far has the contamination got down and when will it stop before it gets there?

MS. BENOY:- We have -- Joe, is it clear water? The one that is perpendicular. We have seen low levels of some of the contaminants migrate as far as Clearwater Road, I believe. Do you know if your well was one of the ones that was sampled?

MR. EDDIE BARKER:- I have been there six years -- I don't know.

MS. BENOY:- This would have been this past year.

MR. EDDIE BARKER:- There's three houses there -- there's mine and the two up toward this site, but we all use our wells.

MS. BENOY:- Do you know where Cason Street intersects with Clearwater? Where are you in proximity to that intersection?

MR. EDDIE BARKER:- You run down straight to Cason, you'd run straight into my well. It's parallel with it.

MS. BENOY:- Could you give me your name again?

MR. EDDIE BARKER:- Eddie Barker.

MS. BENOY:- I don't know -- the name does not ring a bell. It did not sound familiar like -- as if it were one of the sites that we -- one of the wells that we've sampled. And if you're not aware of it, permission must be obtained before we sample wells, whether it's us or PRPs or any of our contractors. We don't -- we don't sample without permission. We wouldn't come onto your site, onto your property without your permission. Also, where detection of contaminants has occurred, we have submitted letters to all the owners, to well users.

MR. WARREN RHINEHART:- Did you say it had migrated

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to Clearwater Lake?

MR. BENOY:- There are certain levels, very low levels, they're below drinking water standards, yes, sir, that we have sampled.

MR. WARREN RHINEHART:- That came off of this site?

MR. LEE THOMAS:- Well, let me speak to that for just a second. I'm the person who's been responsible for the ground water part of the EPA overview site and I've looked very carefully at the date from the monitoring well on the site, also, at the date from the water wells that has been sampled and most of the contamination is still on the site. There's no question about that. The highest levels of contamination are contained in monitoring wells that are on the site. There are some low levels of some of the metals that have been detected in some of the-water wells that are [illegible] on the site. We don't know for sure that that's connected with the site. It may be something that's naturally occurring in the soil. So, but by far, there's no question that most of the contaminants are still contained on the site at this time. Okay?

MR. WARREN RHINEHART:- Well, I think his home would probably be about half a mile from the site.

MR. EDDIE BARKER:- Yeah.

MR. BEN LEACH:- What's your address on Clearwater Lake Road?

MR. EDDIE BARKER:- 308.

MR. STEVE QUIGLEY:- The well that was sampled was 329 Clearwater Lake Road.

MR. EDDIE BARKER:- What's the name of the -- got the name?

MR. STEVE QUIGLEY:- I believe it was Mr. Voist. Is that right?

MR. ELMER AKIN:- I think on the record it's Mr. Sipe.

MR. STEVE QUIGLEY:- Mr. Sipe. That's right.

MR. EDDIE BARKER:- That's ---

MR. ELMER AKIN:- --- where is that in relationship to your home?

MR. EDDIE BARKER:- It's 308.

MR. ELMER AKIN:- Is that further out or closer in?

MR. EDDIE BARKER:- 318 ---

MR. ELMER AKIN:- --- so, 329 would be closer in or would it be ---

MR. EDDIE BARKER:- --- I don't know that man. I know just about everybody else.

MR. WARREN RHINEHART:- I think if 329 is the last site tested, I don't think they got to his house. That's above his house back towards ---

MR. ELMER AKIN:- --- towards the site ---

MR. WARREN RHINEHART:- --- Sykes is the man's here.

MR. BEN LEACH:- I'm Ben Leach from the Technical Committee of the PRPs. We -- he shouldn't have to worry about this, Barbara, if we didn't test his well. I think -- what Mr. Thomas said is correct. If we look at the profiles that have been drawn from the samples that we did take, it may answer the question. If it doesn't answer the question, then, you know, we'd be very glad to sample his well and get it analyzed and see what it is, because we don't need to have anybody worry about whether his well is good or not.

MR. EDDIE EARLER:- Yeah, but how do you if it ain't going to in the next five years, make it down?

MR. BEN LEACH:- I guess Ms. Benoy should answer that. I think the objective of the work that we are doing here is to prevent that from happening.

MS. BENOY: That is -- what Mr. Leach said was ---

MR. LEE THOMAS:- The alternative is that EPA's proposal for this site is in part that we -- as far as the ground work part is concerned, is going to involve capturing the ground water that is contaminated with extracted wells, wells that would pull the contaminated ground water out of the soil and remediate the ground water. So, EPA has a plan to keep the highly contaminated ground water that's on the site from moving off-site to endanger the wells that are downgrading it from the site.

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MR. WARREN RHINEHART:- There's at least two and maybe three homes right, you know, within fifty yards, or thirty yards, of the site. Have those wells been tested?

MS. BENOY:- No.

MR. LEE THOMAS:- I believe all the wells have been tested.

MR. WARREN RHINEHART:- And those are the ones that you are referring to now that have low level contaminants?

MS. BENOY:- I -- I hesitate to say, yes. It's this one and this one, because really I don't have it in front of me. Lee [illegible] may be more familiar with which individual ones. Steve, also, may be more aware. The specific information is in both the Remedial Investigation and can be made, you know, available in a more useable form if you'd like. The wells have been tested a number of times over -- since 19[illegible]. EPA has, also, done a recent investigation of some of those wells. I'm not sure if I'm answering your question, but I don't have the specific well ---

MR. WARREN RHINEHART:- --- I think you do. I'm curious as to why you arrived at the Solution Nine as opposed to Solution Eleven and what's the future for that -- can that property be cleaned up and in the future developed or is it going to be sort of like the Love Canal never be of any commercial value to anyone?

MS. BENOY:- Deed restrictions will be placed on the site and if I remember, it will continue on deeds for as long as any contamination remains. I really -- I can't project what type of development might, you know, be identified for the site. I don't think that you can look towards a residential ---

<u>MR. WARREN RHINEHART:-</u> --- so will it possibly be cleaned up well enough to live on it or develop or something of that sort, is that feasible?

<u>MS. GIEZELLE BENNETT:-</u> Hi, I'm Giezelle Bennett from EPA. The reason why we're proposing the alternative that we are, the vacuum extraction and then the soil washing is to remove all contamination above our action level. Once we finish with that, the soil will be clean and you will be able to use the site for whatever purposes. However, the ground water will not be clean and that's where the restrictions will apply. You'd have restrictions on putting -- put a monitoring well or -- I mean put a drinking water well in and drink the ground water, but the soil itself should be fine once we finish with this cleanup.

<u>MR. EDDIE BARKER:-</u> If you can't clean the ground water up there, what's going to keep it from coming on down my way? I mean the water's got to start somewhere and it's got to go somewhere.

<u>MS. GIEZELLE BENNETT:-</u> Well, that's what we're going to do. The system that we're going to put in is not

only going to clean it up, but it's going to contain the ground water so it won't continue to move towards your direction.

MR. EDDIE BARKER:- That means my well's going to dry up. Right?

MS. GIEZELLE BENNETT:- Well, that's all going to be part of the design ---

MR. LEE THOMAS:- We're not going to design the system so that it will cause people's water wells to go dry. [illegible] -- we do have ground water cleanup goals that will be specified as part of the -- part of the right and those ground water cleanup goals will be goals that will be protective with human health. In case of meeting the drinking water, there'll be the MCLs or help those numbers where MCLs don't exist. So, basically, there will be a period of time when the ground water at the site, as now, will be contaminated but, hopefully, by the time that, you know, we'll implement the cleanup goals and at some point in the future the ground water will be safe. Of course, you've got to realize, also, that there's some natural continuation that will be occurring at the site as well. So, there is -- as long as there is some threat as long as the cleanup goals haven't been breached, then we will still be pursuing cleanup goals at the site.

MR. BEN LEACH:- Lee, why don't you give them a that simple explanation of how ground water moves, that it doesn't move at a hundred feet a minute and all that stuff.

MR. LEE THOMAS:- Okay. Ground water is like other things on earth. It's effected by gravity. So, it moves downhill, but ground water moves in the spaces in the rock and there's a lot of resistance in those spaces. So, ground water moves at a very slow rate of speed. That's why the contamination from the site has not, for the most part, at least, moved off the site, as yet. Most of the contamination is still moved on the site. It's because of the fact that the ground water moves at a very slow rate of speed. So, there's no imminent danger of the ground water suddenly moving off the site and causing people's wells to actually be contaminated. It's just that -- what we're concerned about is in the long term if no ground water remediation occurs, there is the possibility that people's water wells are offsite that could become contaminated if the plume moves off site or if the site should change hands and people drill wells where there is contamination presently, then those wells could be contaminated. Okay?

MR. ELMER AKIN:- Perhaps what would relieve your mind as much as anything is continuing monitoring program of that water to be sure that all this works. I think that will give you probably, you know, the information that you really would want to know.

MR. BEN LEACH:- I think that Mr. Akins is right. I mean we guys who spend our life worrying about things like this are confident of the technical solution that we are proposing here. But as Mr. Akins just said, only by continued testing of what's really happening will be proved whether our confidence was right or not. I mean, the monitoring is not going to end when the ROD is signed or even when the RD is signed. We're still going to have to look at things to see that our remedy is effective.

MRS. CORRIE HAYES:- Because I saw those drums [illegible] and I saw those holes that they dug and they poured all that stuff in there, are you telling me that stuff is really still there? Is that ---

MR. ELVIN AKINS:- --- we're talking about thousands of drums, not hundreds. We're talking about thousands, not hundreds of drums ---

____________________:- --- crushed them ---

MRS. CORRIE HAYES:- --- is that the ground water?

MR. LEE THOMAS:- You're asking if it's still in the ground water? Yes. I've looked at all the data very carefully from all the ground water monitoring wells. We've got -- we've had monitoring wells sampled of successive occasions and I have checked all the data very carefully and, yes, the -- you can clearly tell areas where there are pile-ups of contamination and because of the fact that the

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ground water moves at a very slow rate of speed, there is no doubt that the bulk of the ground water contamination is still contained on the site. That is correct.

MR. CORRIE HAYES:- Well, who -- my question is are you going to pump out that mess? And what are you going to do with it when you get it or whatever, containers or something?

MR. LEE THOMAS:- Well, what we'll do is the ground water will be pumped out and it depends on the type of constituents that are present in the ground water as to what kind of treatment will occur. At this site, most of the constituents of concern is the greatest volume, I guess, the constituents of concern is the volatile organics. And so, [illegible] a lot of times we use a process of air stripping. You can actually put the -- put the effluent from the extraction wells in the air and the volatile will move out into the air and because there's so much air relative to the amount of volatiles, it is essentially a harmless procedure would be a very small amount released into the atmosphere, but it will allow all to be cleaned up in the ground water.

MRS. CORRIE HAYES:- And that'll go into Fites Creek?

MR. LEE THOMAS:- No. No, the water -- after the water comes out of the treatment system, the water will have to -- have to meet ground water cleanup standards.

MR. WARREN RHINEHART:- And where will it go?

MS. BENOY:- There are three options ---

MR. WARREN RHINEHART:- --- I mean will it be trucked off the site?

MS. BENOY:- Will the water?

MR. WARREN RHINEHART:- Yes.

MS. BENOY:- No, sir. Well, there are three options of discharge that are being considered and I did not elaborate and I shouldn't elaborate. The first option that has been -- that was presented in the Feasibility Study would be discharge to the local POTW and that's publicly owned treatment works.

MR. LEE THOMAS:- Sewage Treatment Plant.

MS. BENOY:- Thank you. Yes.

MRS. CORRIE HAYES:- Belmont's in trouble the way it is.

MS. BENOY:- Well, and there is some concern. EPA has not -- the discharge to POTWs has not been that successful for whatever reasons. The POTWs have their own requirements and standards that they must address and must adhere to. They can be fined when they're not in compliance, when they're not meeting those. Yes, I understand there is some problem right now with Belmont's POTW and that even the director has recently resigned and the City Manager is going to have to become certified. So, they're dealing with some problems of their own. This would be a new situation for them to deal with. I talked to -- to the City Manager. I know that the PRPs have contacted them

The second option would be ---

MR. ELMER AKIN:- --- before you leave that option ---

MS. BENOY:- --- yes ---

MR. ELMER AKIN:- --- the point is, that would all be explored though before that option is chosen to see if that plant can handle it and see if they can completel ______________. That process is to further degrade all these things too, and if it won't do that, ______________________ or volume of water won't -- can't be handled in that option ____________________________.

MR. LEE THOMAS:- And this plant -- wherever this plant is charged, they have a permitted license that tells how much they can discharge and they have to operate their plant in the manner that whereby they stated in the discharge limits of their permit that's carefully monitored. So, you know, throughout the whole process, there will be checks to make sure that the contaminants remain within acceptable levels and aren't released in the environment to cause harm.

MRS. CORRIE HAYES:- But the former fellow falsified his records.

MS. LILLIE HOLDSCLAW:- Are you saying that you're going to -- that ya' monitored the plant, that plant you're talking about or are that they're monitoring it?

MS. BENOY:- We would not be involved with their monitoring. That's part of their program. It is ---

MR. LEE THOMAS:- --- but they are going -- it's an EPA Program.

MS. BENOY:- That's right.

MR. ELMER AKIN:- It's a different EPA program.

MS. BENOY:- It's a state delegated program for the National Pollution Discharge Elimination System.

MR. TOMMY HAYES:- Are they monitoring themselves or some other agency's monitoring them?

MS. BENOY:- Yes, sir, they have a Monitoring Program in place. But this is not water straight out from the wells, from the ground going straight to the plant either. This would be treated on site and the vast amount of the contamination would be eliminated, extremely reduced. Again, it's got to be acceptable to the plant, it's got to be acceptable to -- it's got to meet the permits of the plant. The plant has to be able to integrate this water into their own system and that's a big concern.

MR. WARREN RHINEHART:- Would ya' have to build a facility down there to do whatever you're talking about or

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you just move a temporary facility in to -- how do you go about this and what's our time frame we're talking about?

MS. BENOY:- The usual time frame for the design, for putting it on paper, for developing it, for EPA review, is less than a year to get to a point where we can approve the design and say, Yes, this is acceptable and we begin the remedial action. Everything that I've seen proposed would be a treatment facility on site. Yes, sir. The extraction system, the wells would be installed at the site. The ground water would be pumped out and would go through the system facility and then it would be discharged and, again, there are three options.

The second option is discharge into the adjacent stream, which would have to meet its own NPDES that pollution standards, that program -- it's an EPA Federal program, but it is -- it's a state delegated program. The State of North Carolina does the actual administration of that program. Those requirements are very, very stringent for release into a stream. They're higher than a lot of -- a lot of other options. They're very stringent. You're talking about discharging into a body of water. So, therefore, they've got to be very, very stringent. It would have to go through permitting. It would have to be acceptable to the State, and there are a lot of problems with that, also.

The discharge option of the water from the system is a very big consideration and it's not -- we can't take it lightly.

The third option that EPA asks that -- to be looked at would be onsite natural filtration and that would allow through a draining system to infiltrate back into the ground water. Those cleanup levels would, also, be extremely stringent because you're allowing it to just go right back into the ground water and you certainly want it to be cleaner -- well, it would be cleaner. There's a definition that North Carolina puts on their augraphers and all augraphers should be able to be drinking water augraphers from the way I understand it. And right now, we don't have that situation at the Jadco-Hughes site. And my -- did I clarify that for everybody?

<u>MR. BEN LEACH:-</u> Let me add a little bit something to that, Barbara. In the presentation, you saw that once the ROD is issued, the remedial design is the next step. These issues of selecting the options that Barbara is talking about will be addressed during this remedial design step. So, sometime during that phase, we'll be deciding where this treated water is going to go. Is that correct?

<u>MS. BENOY:-</u> That may or may not be correct. If we can make that decision before the ROD is signed, then ---

<u>MR. BEN LEACH:-</u> I didn't say that -- the design

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step is what I said, because if I'm incorrect in saying you won't select the option of where the water is going in the design step, then I need to be straightened out on some things.

MR. BENOY:- Well, it may be that through process of elimination. I don't know it may be -- it may very well be part of the decision. It may be defined in the record of decision prior to the design stage.

MR. BEN LEACH:- That means earlier. Before the construction on the site starts, we will have to solve these issues as to what the treatment is going to be and where the water is going to go to after it is treated. So, if -- it's [illegible] we're trying to decide that here tonight. It will be a [illegible] we're going to go through to reach that decision. Then you're exactly right on the question, sir. There will be a considerable facility put on site to treat this water and unfortunately it's going to take many years to take care of the contaminated ground water that's there. Probably in the -- in the round of a couple decades. So, that equipment is going to be running for a long time and so the decision on where the water is going to go probably is a long-term decision.

MR. HENDERSON:- The other thing when it comes to that remedial design stage, the law does require us to do a remedial design fact sheet when that final design is done and that will be sent out to the community and placed in a depository to explain to you exactly what that design is and what the decision in terms how that action's going to be.

MR. TONY HAYES:- You know, the judge that heard this in Gastonia, in his wisdom, made the fella (sic) that's responsible for all this -- an expert witness and exempted him from any fines or anything. That was beautiful, wasn't it. And made him an expert witness. Yes.

MR. EDDIE BARKER:- How far offsite can you suck that ground water out?

MR. LEE THOMAS:- Well, what we'll be doing, we will be installing extracted wells onsite. The purpose of the ground water remediation is not to move the ground water offsite. The purpose of the ground water remediation is to capture the ground water onsite, pull it out onsite and then take it through whichever one of three remedial options we come up with. So, in -- by no means will we, will the ground water remediation result in any contaminated ground water moving offsite. It's just ---

MR. EDDIE BARKER:- --- how far downstream will you -- can you suck the ground water? Or are you going to have to move down two blocks.

MR. LEE THOMAS:- Well it depends on a lot of factors that -- and I can't give you a real specific answer but the augrapher that you're pulling the ground water out it is going to have certain properties that are going to determine how far the influence of an extraction well would extend, the diameter of the well, the amount that you pump the well in question; and basically, those types of things are the things that will be considered in the design of the remediation of the site and what we'll do is we will come up with the design that will result in the plume being captured by the capture under the wells. So, I can't give you a specific answer for the augrapher in question, but I can assure you that that is something that we will look at very carefully because in order for the remediation to be successful, we must capture all the contaminated ground water in the capture zone of the extracted wells.

MR. BENOY:- What we're trying to do and what we -- what the design will do is to -- is to stop the contamination. What's clean, stay clean in the augrapher and for what is contaminated to be taken out, but it won't -- we can stop it. We can effectively stop the contamination from continuing on the site and that's very -- it's very -- it's very -- the ground water, hydrologists, all these scientists -- and hopefully, we're not getting too technical. I know that's it very hard sometimes to speak ---

MR. EDDIE BARKER:- But you can't stop what's in the offsite from going on down. Right?

MR. LEE THOMAS:- No, that can be done too. There's still a question, I think, realistically -- I'm not sure that there's firm evidence that's there any significant ground water contamination that's offsite. If we do determine that there's ground water contamination that's offsite, then we can certainly make modifications in the extraction system so that it could reach offsite to take care of any of those kinds of problems. I don't see any problem whatsoever.

MR. ED LEACH:- Let me go just a little bit beyond what Mr. Thomas has said there. He said before that water flows by gravity, like downhill. The movement of ground water is just like a gravity flow downhill. And you know very well from your experience it's hard to make things go uphill and particularly you can't pull water uphill. So, the end, we, if there is a contaminated plume offsite, and we don't believe there is, the only way you can capture that is to put a well down there where the contamination is and capture it wherever it is. We can't pull it back. Your question about can you pull it back. The answer to that is, no. What we're going to do is prevent it from going any further. And if, in fact, we are satisfied in the future of this offsite, we got to go down there and get whatever it is.

MR. EDDIE BARKER:- Okay.

MR. BEN LEACH:- Isn't that correct? Because I hear his -- his sense is that that thing is going to come to my well someday and he's saying how the heck are you guys going to tell me that it's not going to come to my well?

MR. LEE THOMAS:- Because we're going to get it before it gets offsite.

MR. TONY HAYES:- As long as you're sure of that. It seems to me that the water system that's available between Belmont and Mount Holly and all like this is that those water systems should be made available with the help of this program to where people could tap on and not have to worry like the gentleman does down here or that his child will be damaged by this type of thing.

MR. LEE THOMAS:- Well, the objective of the Superfund process though is to result in the ground water from the site being safe for consumption by humans. So, we don't want to leave the plume on the site. We're -- we're going to take that plume, we're going to remediate that plume so that a person could put a well in the site and the water would be safe to drink.

MS. BENOY:- You were -- you were asking -- are you asking about the municipal water supply?

MR. TONY HAYES:- Yes.

MS. BENOY:- I'm under the impression that there is an available water line in that whole area. Is that not ---

MR. AYERS WEBSTER:- Either the City of Mount Holly or the City of Belmont -- most of them, both have water lines in that area.

MR. EDDIE BARKER:- Yeah, there's a water line there.

MS. BENOY:- Now, some people may not have been attached, but I believe there's a water line available.

MR. BEN LEACH:- If there's not -- no citizen's questions? I've got one for you?

If I understood you correctly on this presentation, you said you're going to remove the culvert and divert the stream. Is that what I heard you say?

MS. BENOY:- Yes, sir. That is EPA's proposal.

MR. BEN LEACH:- Okay. Well, maybe I don't remember as well as I think I do what the lay of that land is there, but I think that little stream that goes to the culvert is in the bottom of a little valley and I don't -- I'm just trying to picture and with talking with Steve about where the heck could it be diverted to when it's lying in the lowest part of a little valley. I think that's where that -- why that culvert is there in the first place.

MS. BENOY:- Let's put the map on.

MR. BEN LEACH:- Okay.

MS. BENOY:- To see if we can't figure out where you're talking about. Can everybody see? I said earlier

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that this map is not real accurate and I believe that -- we have tributaries A and B -- I'm not sure right this second which one is which, but one comes from across Cason Street merges with this other Tributary and they both flow downstream and ultimately go into Fites Creek and then into the Catawba River. I don't believe this exists. I've walked the site. there is some -- yes. you're right, there is some water in here. I'm not real sure where you're talking about. But this -- there's a drop off and we've been telling me about the fact that water doesn't flow uphill and from what I remember in walking the site -- I haven't worked on this site in a long time and, granted, things can change. I haven't been up here in a while and I'd be more than happy to go up there. This is a low lying area also. This [illegible] is damaged. SARA did a remote control test on [illegible] only got -- I don't know. Steve, you can show about approximately where you hit blockage.

MR. STEVE QUIGLEY:- May I give you a map with contours on it and you can see?

MS. BENOY:- Certainly.

MR. BEN LEACH:- Want to orient it the same way then as the way hers was oriented?

MS. BENOY:- Yeah, these lines are contours and they show the lay of the land.

________________:- Rotate it 90 degrees, Steve.

MR. BEN LEACH:- Yeah. it'd be the same as the other drawing then.

MS. BENOY:- Now, this water is not a flowing continual body of water. And again, I'll be more than happy to get out my boots and go trekking up there again, and you know, if there's water flowing here. Again, it doesn't preclude diverting the water somewhere else. There's also a spring here. The spring now has been redirected, it's going across the site and that is something that has been a result of remedial investigation activities onsite and it did not [illegible] site and it should not do that. It really should go away from the site. That flow of water used to go this way, around, and it did not flow across the site. The last time I was on the site, last month, there was flowing -- there was flow from the spring and it shouldn't do that. I believe -- and, again, I'm always welcome to be proven wrong, but I do believe from what I've seen and my history of the site that most of the flow in this -- in this tributary is from this spring. I also further believe -- it has not been proven that this spring is not ground water discharge from the site. The reason I believe that it is -- the reason I believe it's coming from somewhere else, probably this elevated area here is because the spring has always been clean. We haven't seen contamination from the site. And I just go -- I believe it's coming from maybe this area.

But this is the source for us, this flow. If this flow here again, please show it to me -- but even still I don't believe that we need to have flow coming from offsite going through the site and this being in a position to be a potential point of discharge for contaminated ground water. You have contaminated ground water. The surface water, if this flow here can be diverted around the site, again so can this spring, the spring is not contaminated; so there's no reason to introduce it to the contamination, to that potential.

MR. BEN LEACH:- Well, I'm -- I hear -- your words are very eloquent there, Barbara, but it's my sense that we have a V-shaped valley here with the culvert at the lowest spot and I don't see where the diversion possibility is.

MS. BENOY:- I don't -- I'm not aware of your V as far as the site. This is a buried underground culvert.

MR. BEN LEACH:- Well, but the -- we're probably going further than we need to here. The reason the culvert is there is either Mr. Hughes or the Jadco folks filled in the thing to make the property more level for the work that they wanted to do in order to handle the storm water run off that went down this little creek here, they put in a culvert to handle it. Now, one part of the site history, that I'm sure you know as well as I do, is that one time that culvert got blocked and it washed some doggone drums off the site.

During storm periods, a lot of water goes through there. Now, you and I can go out there any moment and find no flow but that doesn't mean the next time they have a thunderstorm, there's not flow.

<u>MS. BENOY:-</u> I agree with that.

<u>MR. BEN LEACH:-</u> Okay. And the proposal in Alternative 9 is that we replace the culvert to handle the anticipated intermittent water flow and I don't understand why culvert removal is suddenly the alternative preferred by EPA rather than replacing the culvert so it does it's natural job in managing the surface water. But I'm sure we can address those issues later. I was just quite surprised to hear this this evening.

<u>MS. BENOY:-</u> The proposed plan that was submitted to you were __________ ---

<u>MR. BEN LEACH:-</u> --- I thought it was a typo because at one place it said removal, and another it said replacement and I said, Oh, it's a typo where it says removal.

<u>MS. BENOY:-</u> No, sir.

<u>MR. BEN LEACH:-</u> All right. I've learned that tonight much to my dismay.

________________:- Barbara.

<u>MS. BENOY:-</u> Yes, ma'am.

________________:- There's something I'd like to project here ______________. Across the street from our house is a, what we call a, creek. But it's a very low creek. You couldn't get this much water at normal periods. But during a very strong thunderstorm, it will overflow and we're talking five foot and above across the road.

MS. BENOY:- Oh, I have the same situation in my own yard. I do appreciate that.

MS. CIEZELLE BENNETT:- Well, it sounds like all these are issues that we need to explore. If you'll go ahead and send us comments in to that ---

MR. BEN LEACH:- --- we'll be very glad to do that, Ciezelle.

MS. CIEZELLE BENNETT:- And as well you, because there may be something that we need to look at before we determine our ultimate cleanup goal.

MR. EDDIE BARKER:- What about the property value around the site? Is it going to decrease or is it going ---

MS. BENOY:- --- that -- the question as far as from a real estate standpoint is an ever -- a more frequent question that we had ______________. I don't have an answer to -- for you. I cannot respond to the property values. I don't know. My job is to deal with contamination. The property values, you know, this is a growing area -- Metrolina area -- but that issue EPA really has not been able to address the real estate -- the value. We're concerned with contamination and cleaning that up. I wish I could answer you.

MRS. CORRIE HAYES:- But if anyone lives kind of up on a hill from that place, they don't have to worry about ground water contamination, right?

MR. LEE THOMAS:- Ground water doesn't flow uphill. Now, normally, the ground water flow is sort of parallel to the ground surface, although that's not always true. But certainly if you're a substantial elevation above the site, it would be pretty unlikely that you'd have any problems and, of course, if you're on City water, then you're certainly not going to have any problems with the site whatsoever.

MR. [illegible]:- Are there any more questions?

MR. [illegible] BARKER:- Yeah, one more. Where can I -- what do I have to do about getting my well checked?

MR. [illegible]:- Mr. Leach has offered that service. My suggestion would be to talk to Mr. Leach. You -- if you'd like, we can give you some further information. See me afterwards and maybe I can help you.

MR. BEN LEACH:- Well, we'll be glad to get some samples of your well and get it analyzed and get the results back to you and include the results of that testing in the reports which we have. Because it just furtherance expands our knowledge and, hopefully, will make you feel a little better once we get these results.

MR. BENOY:- I appreciate everybody's -- yes, sir.

MR. JIMMY KIRKLAND:- I have two questions. I'm Jimmy Kirkland with King and Spaulding. I have -- first question is: In reference that EPA had done a recent investigation of the residential wells, are the results of that made a part of your administrative record?

MR. BENOY:- I believe they are. They should be if they're not and will be included, but I do believe that they're in there. But because I don't have the index in front of me, I can't say absolutely.

MR. JIMMY KIRKLAND:- The second question is when will the transcript of this meeting be available?

MR. BENOY:- I'll defer that to Sharon. Sharon, do you know when?

MS. SHARON ABBOTT:- We can get an initial -- we can get an initial draft by August 10th. What we do then is to go over it and if there are any obvious cases of a typo, sometimes for example, a technical word is not familiar to a Court Reporter, we give it some review and go back at it and so that would take -- let's see August 10th, it would probably take another week or so turn around. I would say certainly by the end of August.

MR. JIMMY KIRKLAND:- Will that be in time for the public comment period to run?

MS. SHARON ABBOTT:- I'm just thinking in terms of -- is there a reason you would want to see the comments rather than ---

MS. GIEZELLE BENNETT:- Well, it doesn't matter one way or the other. You can give Barbara a call and she'll let you know as soon as this -- it is available. You know we do have to review it and finalize it first before we put it out for any repository.

MR. JIMMY KIRKLAND:- But will it be available before the end of comment period.

MS. GIEZELLE BENNETT:- It should be.

MR. HENDERSON:- It will be close because the public comment period ends August the 24th.

MS. LILLIE HOLDSCLAW:- Let me ask one question. I'm not sure what you -- you said there's a thirty-day comment period. And then you said that we could make comments any time. What's going to happen at the end of the thirty days? I'm not sure.

MS. BENOY:- The thirty-day comment period is specifically on this proposed plan. EPA is suggesting a way to deal with the contamination of the site. Michael Henderson was talking about the comments. Any comments -- the record of decision that we will write and, hopefully, have approved will have to include comments given for this particular thing during this comment period. Comments can be made at any time, but for this, ________, we have to view a thirty-day comment period so that we can go to a decision. Does that clarify it for you?

MS. LILLIE HOLDSCLAW:- I think so.

MS. GIEZELLE BENNETT:- Let me just say something else. This comment period is only on what we're proposing to do for this site, Alternative 9, and the way Barbara explained it to you. Now, the comments that Michael were saying were if you have any other comments, say about the water filling up, what you said previously, or if you see something else happening at the site, you can always contact Barbara about those kind of things.

MR. ELMER AKIN:- If you don't like option 9, we want to hear from you before the 24th and your suggestions, perhaps, what alternative.

MR. BENDY:- Are there any more questions? Any comments? Thank you all very much for coming out. And we'll close the meeting now.

MS. GIEZELLE BENNETT:- We'll be around afterwards if anybody wants to come up and .....

-- 9:30 P.M. - Meeting Adjourned. --

==========.

STATE OF NORTH CAROLINA

CERTIFICATE

COUNTY OF GASTON

I, LIBBY B. SIMS, do hereby certify that I was the Court Reporter for the July 26, 1990, Jadco-Hughes Superfund Site Public Meeting held at the Catawba Heights Elementary School Library, 101 School Drive, Belmont, North Carolina, said meeting commencing at, approximately, 7:30 P.M. and adjourning at, approximately, 9:30 P.M.

That I am not related by blood or marriage to any of the parties, and that I am not interested in the outcome of the enclosed transcript of said proceedings;

This, the 17th day of August, 1990.

Libby B. Sims
LIBBY B. SIMS, Court Reporter
and Notary Public

(N.P. SEAL AFFIXED)

MY COMMISSION EXPIRES:

My Commission Expires February 18, 1991

Commission Expiration Date.

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APPENDIX B

SOIL REMOVAL PROGRAM

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CRA
Consulting Engineers

CONESTOGA-ROVERS & ASSOCIATES LIMITED
651 Colby Drive,
Waterloo, Ontario, Canada N2V 1C2
(519) 884-0510

July 26, 1990

Reference No. 3480

Mr. Warren Dixon
On-Scene Coordinator
United States Environmental Protection Agency
Region IV
North Superfund Remedial Branch
Waste Management Division
345 Courtland Street
Atlanta, Georgia
U.S.A. 30365

Dear Mr. Dixon:

Re: Responses to Comments on Interim Soil Removal Work Plan
<u>Jadco-Hughes Superfund Site - Gaston County, N.C.</u>

Enclosed are three (3) copies of the revised Interim Soil Removal Work Plan for the Jadco-Hughes Site which is being submitted on behalf of the steering committee. The Work Plan has been revised as per the comments provided by the United States Environmental Protection Agency. These comments were made on the version of the Work Plan that was submitted to the USEPA prior to the signing of the Administrative Order (AO) that addresses the scope of removal.

The AO requires the Work Plan to contain the RI/FS Quality Assurance Project Plan (QAPP). This QAPP has been supplied to and approved by the USEPA for the RI/FS and was provided to the USEPA for the purpose of finalizing the AO. Hence, it is incorporated into this work plan by reference.

All USEPA comments have been incorporated into the text, except as indicated on Table 1. References to further geophysical studies of the Site have been removed from the Work Plan as agreed to by the USEPA since the previously contemplated study was unrelated to the soil removal action.

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TABLE 1

SUMMARY OF RESPONSES TO COMMENTS
JADCO-HUGHES WORK PLAN

Comment No. 1

The Work Plan must address the site access for Mr. Matthew Plecnik's property. Access problems with Mr. Plecnik should be avoided. The Plan discusses mobilization of soil excavation equipment but makes no mention of the use of equipment on Mr. Plecnik's property. If heavy equipment or any equipment will be used on Mr. Plecnik's property, a written request is needed before any mobilization of equipment onto Mr. Plecnik's property.

Response No. 1

Comment acknowledged. The access agreement for Matthew Plecnik's property is presented in the work plan as Attachment C.

Comment No. 2

A staging area must be designated for all soil excavation equipment that will be used to remove soil on site. An office trailer (Command Post) should be located outside on the "exclusion zone". The exclusion zone for the Jadco-Hughes site needs to be defined in the Work Plan.

Response No. 2

Section 2.1.1 (Mobilization) identifies the use of an office trailer (command post). The exclusion zone is defined in Attachment A, Section 1.8 (Work Areas/Site Control). Figure 2.2 illustrates the soil staging area, the exclusion zone and the location of the command post.

Comment No. 3

The Work Plan must also address the sampling of the PCB contaminated soil across the site based on a grid pattern of no greater than 50 feet by 50 feet. This action should be taken before any excavation of soil on site. Surficial soils and sediment samples should be collected for verification of cleanup pursuant to USEPA guidelines (USEPA, 1985). As mentioned in the Work Plan, the guidelines provide for composite soil samples to be collected in the contaminated area to assess the cleanup of the PCB contaminated soil. Results of the composite samples should be below the cleanup criteria of 10 mg/kg that was established as the cleanup goal for the site.

Response No. 3

Section 2.1.2 (Site Preparation) details the sampling of PCB contaminated soil. Figure 2.3 illustrates the grid pattern.

Comment No. 4

The Plan only mentioned a geophysical survey along the northwest site fenceline, but the objective of the geophysical investigation needs to be defined. The geophysical investigation should not be limited to only the northwest site fenceline as mentioned in the Work Plan. It would also be very helpful in knowing which or what types of magnetometer would be used to perform the geophysical investigation.

Response No. 4

All geophysical/magnetometer information removed from the work plan.

Comment No. 5

The Work Plan must address the site preparation which included the clearing of the vegetative brush and trees, if any. The trees should be cut at the surface, with the roots being dug up and stockpiled with any and all contaminated soil in the contaminated area. The soil on the tree root may contain PCB contaminated soil.

Response No. 5

Section 2.0 (Scope of Work), the component titled "tree clearing" acknowledges this comment.

Comment No. 6

Dust control measures should be used during the removal of the vegetative area and the stockpiling of contaminated soil in the staging area.

Response No. 6

Section 2.0 (Scope of Work), the component titled "soil removal" acknowledges this comment.

Comment No. 7

In the event of rain during the stockpiling of contaminated soil; the stockpile should be covered and protected from rain to prevent any run-off of water from contaminated soil.

Response No. 7

See Response No. 6.

Comment No. 8

The Work Plan mentions the "paint filter test" that the stabilizing agents mixed with contaminated soil must pass. Please define in the Work Plan the "paint filter test".

Response No. 8

The paint filter test is presented as Attachment B.

Comment No. 9

A more detailed and definite schedule should include all work task to be performed on-site and off-site with realistic time periods. Reporting requirements should be monthly reports that include all work performed on-site, plus 50%, 70% and 90% completion reports.

Response No. 9

Section 3.0 (Submittals) acknowledges this comment.

COMMENTS/RESPONSES TO THE HEALTH AND SAFETY PLAN

Comment No. 1

Provide a site characterization. Provide information on the worst case concentrations of each contaminants. Provide chemical data sheets (MSDS) on the contaminants.

Response No. 1

Section 1.3 (Site Characterization and Potentially Hazardous Compounds) acknowledges this comment. Table A1.1 details worst case contaminant concentrations. Material Safety Data Sheets (MSDS) are presented in Attachment D.

Comment No. 2

Maps are lacking, specifically; a road map showing the location of the site, a site map showing the various work zones and points of contamination, and a route map to the emergency medical facility/hospital in the event of a serious accident.

Response No. 2

Figures A1.1, A1.2 and A1.3 acknowledge this comment.

Comment No. 3

Each work task should be addressed separately with risk analysis and level of applicable PPE.

Response No. 3

Section 1.14 (Task Analysis) and Table A1.3 acknowledge this comment.

Comment No. 4

Section 1.3 makes note of the contaminant as PCB but fails to provide information on either the expected or worst case levels of contamination. These levels should be addressed.

Response No. 4

See Response No. 1.

Comment No. 5

Section 1.4 describes some of the responsibilities of the site Safety Officer and a CIH. It should provide the names of key site and safety personnel including the site safety manager, site supervisor, project manager, engineer, names of subcontractors etc., to be provided.

Response No. 5

Section 1.4 (Health & Safety Personnel), Paragraph 1 acknowledges this comment.

Comment No. 6

Within Section 1.5 (top of page A-5), the report mentions that medical surveillance is to be required of employees who wear a respirator for any part of 30 days or more a year. While this is true, 29CFR 1910.120 medical surveillance requirements are not only applicable to user of respirators. Normally it would be expected that all PCB sit personnel be participating in a medical surveillance program.

Response No. 6

Comment noted.

Comment No. 7

Section 1.8 Work Area/Site Control, should provide a diagram of the site with an outline of specific work zones.

Response No. 7

Figure A1.2 outlines specific work zones.

Comment No. 8

Section 1.10, Emergency/First Aid supplies are provided in the exclusion zone. While this is somewhat unusual, it is permitted. However, it cannot be used in lieu of Emergency/First Aid, hopefully the safety officer, who is normally stationed at the support zone. The support zone should include at minimum, a first aid kit, ABC fire extinguishers, eye wash station and water in addition to the siren and SCBA rescue supplies.

Response No. 8

Additional supplies for the support zone are detailed in Section 1.10 (Emergency and First Aid Equipment and Supply).

Comment No. 9

Section 1.11, the Emergency/Contingency Plan must provide emergency and support phone numbers plus an evacuation route to a suitable hospital. A map to the hospital should be included. This information should be posted in the support zone.

Response No. 9

Table A1.2 and Figure A1.3 acknowledge this comment.

Comment No. 10

Section 1.12 (page A-15) should specify respirator cartridges to be used (example, GMC-H or equivalent, dual purpose for dust and organic vapors). Also cartridges should be changed more often than weekly as specified in the Plan, recommend daily changes.

Response No. 10

Changes made to Section 1.12 (Personal Safety and Related Equipment).

Comment No. 11

Section 1.15, heat stress monitoring must provide a protocol for their procedures. Will they utilize core body temperature, body weight loss, pulse rate, blood pressure, etc.? Will they use ambient or WBGT temperature readings. Who will be responsible for conducting the monitoring and enforcing a work/rest schedule? Provide an example for the heat stress monitoring work sheet in the Appendix.

Response No. 11

Section 1.16 (Heat Stress Monitoring) defines the protocol. Figure A1.4 is a heat stress monitoring work sheet example.

Comment No. 12

Under Section 1.16 Air Monitoring, please provide information on the routine monitoring frequency for each test/instrument. Is it to be conducted weekly, daily, hourly, or continuously?

How many dust monitors will be employed? Are any to be provided on the employees?

Response No. 12

Section 1.18 (Air Monitoring) acknowledges this comment.

Comment No. 13

Sections 1.12 and 1.17 provided limited information on decontamination procedures. A separate section should be provided to address decontamination. Decontamination must be conducted upon each egress from the exclusion zone. A decon procedure should be developed to provide a step-by-step progression of decontamination which must be strictly adhered. Also to be provided is a list of decon supplies and equipment. Decontamination of personnel and heavy equipment should be addressed separately.

An unusual mention of decontamination found on page A-24 states that the Engineer will certify each piece of equipment decontaminated prior to sire removal. Will decontamination actually be certified? Perhaps this is a reference to inspection/supervision. If they are actually going to certify the decon, then please provide an example certificate.

Response No. 13

Section 1.20 (Contaminant Migration Control) expanded to detail decontamination procedures. The Engineer will supervise, not certify the decontamination of each piece of equipment prior to site removal.

Comment No. 14

Section 1.20 mentions that safety meeting will be conducted weekly and additional meetings will be held as required. It is required that safety meeting be held before any work conducted, and before beginning any task. Normally safety meetings are expected to be conducted daily to brief staff on the tasks and safety expectations.

Response No. 14

Section 1.23 (Safety Meetings) acknowledges this comment.

Comment No. 15

Provide a description of the site with site characterization noting any intrinsic physical hazards.

Response No. 15

See Response No. 1.

Comment No. 16

Provide an MSDS or chemical data sheet for each known contaminant present on site.

Response No. 16

See Response No. 1.

Comment No. 17

Provide information on the user of a "buddy system".

Response No. 17

Section 1.17 (Buddy System) acknowledges this comment.

Comment No. 18

The plan should contain specific information on emergency site communications.

Response No. 18

Section 1.18 (Emergency Communications) acknowledges this comment.

Comment No. 19

The plan should identify individuals functioning in a supervisory capacity who have received the requisite supervisory training.

Response No. 19

See Response No. 5.

Comment No. 20

As a final note the wording in Section 1.13 probably states all on-site personnel will use, at least, full-face respirators. However the third paragraph on page A-16 states this is to be followed in "the absence of additional air monitoring information". What does it refer? Does it mean that with additional information they could eliminate the use of respirators?

Response No. 20

Section 1.13 (Respiratory Protection) acknowledges this comment.

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1.0 INTRODUCTION

The Jadco-Hughes Site is a six-acre former solvent reclamation and waste storage facility located in North Belmont, North Carolina. The Site is the subject of a Remedial Investigation/Feasibility Study (RI/FS) under an Administrative Order on Consent (AO) between the United States Environmental Protection Agency (USEPA) and a group of companies who conducted business with the former operations. Some of these companies, called Potentially Responsible Parties (PRPs), have formed the Jadco-Hughes steering committee.

The steering committee submitted the Remedial Investigation Report for the Site (CRA, December 1989) on December 13, 1989 to the USEPA. Comments were received and a revised RI report was submitted on February 20, 1990 (CRA, February 1990).

The steering committee also submitted the Feasibility Study report (CRA, February 1990) and the Superfund Risk Assessment (SRA) report for the Site (CRA, February 1990) on February 21, 1990.

The SRA report identified an unacceptable risk from dermal contact with Site soils situated in and adjacent to a swale along the southeast side of the Site. Accordingly, the steering committee proposed in the FS report (Section 1.2) to undertake an interim remedial measures (IRM) plan to restrict access to the Site and remove PCB-contaminated soils above 10 mg/kg.

The physical removal and off-Site landfilling of soil contaminated with PCBs is permitted under the national variance to the land disposal regulations (40 CFR 268) for halogenated organic compound (HOC) contaminated soils from CERCLA sites. This variance terminates on November 8, 1990.

The purpose of this report is to describe the steps associated with the implementation of a program to remove the PCB-contaminated soil from the area surrounding the southeast swale area. The removal of the contaminated soil shall be done in accordance with a health, safety and site control plan which is presented as Attachment A. The objective of the program will be to remove sediments from the swale bed and surficial soils from the immediate swale area which has been characterized during the RI to contain PCBs above 10 mg/kg. The soil will be disposed of off Site and the cleanup will be verified on Site. The excavated soils will be replaced with clean imported backfill. Off-Site disposal is preferred over other alternatives due to the small volume of soils being considered for removal.

The report will also describe the steps associated with the construction of a full perimeter fence and the completion of a geophysical survey along the northwest Site fenceline.

1.1 BACKGROUND

The Site is located on Cason Street (State Road 2040) in an unincorporated jurisdiction between the Cities of Belmont and Mount Holly in Gaston County, North Carolina. The Site location is shown on Figure 1.1.

C.A. Hughes Inc. operated a solvent recovery and reprocessing operation on the Site from 1968 to 1974. Jadco, Inc. took over operations on the Site from 1974 to 1975.

Over the course of the operations on the Site, an inventory of up to 18,000 drums held in open outdoor storage and an inventory in aboveground storage tanks was accumulated. The presence of the drums on Site, discharge incidents and complaints by local residents led to a State-ordered closure of the Site operations in 1975. A state ordered cleanup was conducted in two phases: 1975 to 1987 and 1981 to 1983. This cleanup reportedly resulted in the removal of the drum inventory, decanting of some drums in partially lined decant pits, and the consolidation of surficial soils from the Site into an on-Site landfill, approximately one acre in size.

Further information on the operations on the Site and the 1975-1983 cleanup is contained in the RI report (CRA, February 1990).

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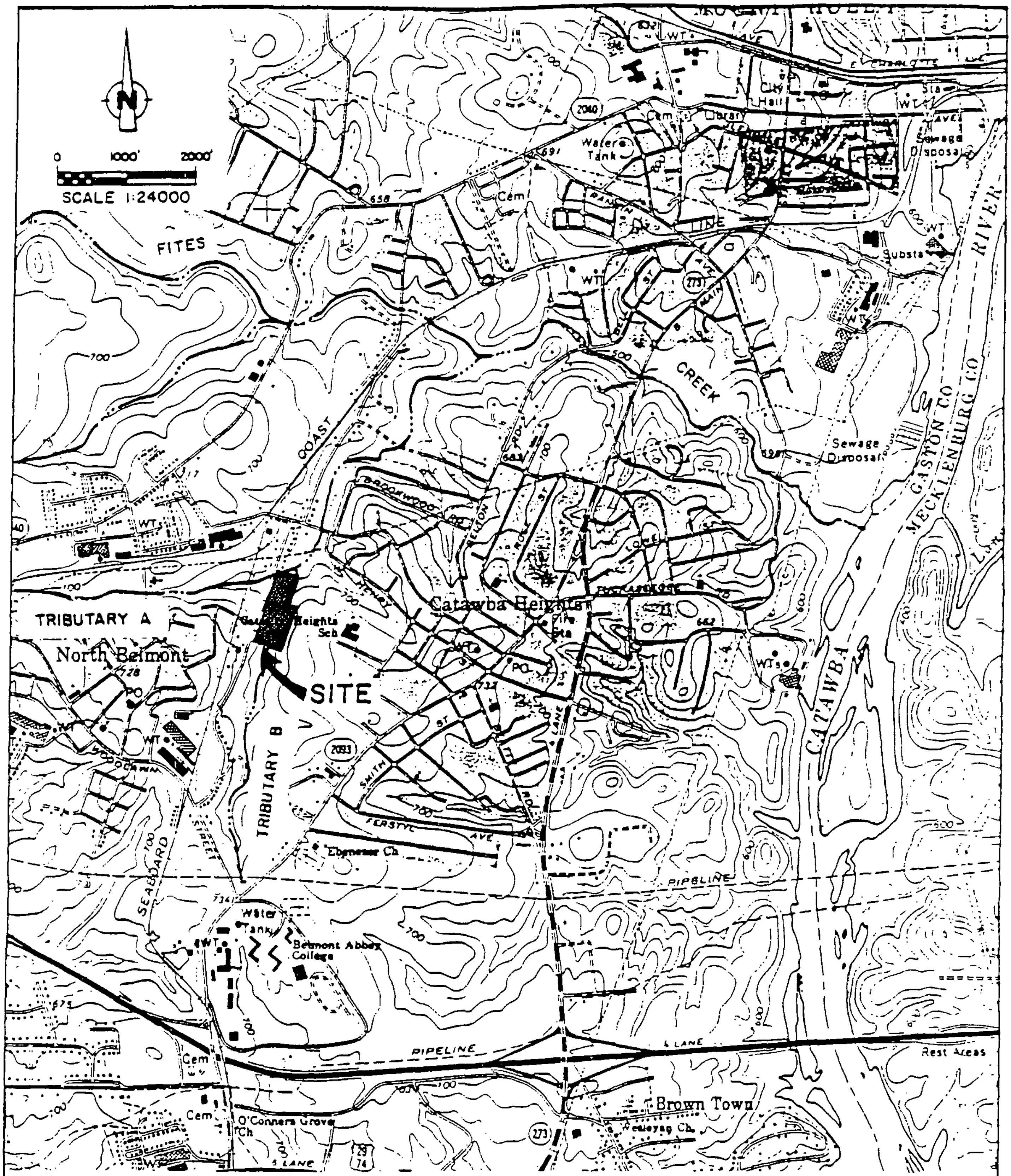

SOURCE: MOUNT HOLLY, N.C. 1:24000 QUAD.

figure 1.1

SITE LOCATION
JADCO–HUGHES SITE
Gaston County, NC

CRA

3480–06/07/90–1–0

1.2 NATURE AND EXTENT OF PCB CONTAMINATION

The RI report identified an area of PCB contamination along the southeast perimeter of the Site. The location of the southeast swale area is shown on Figure 1.2.

The delineation of PCB contamination was conducted with a supplemental surficial soils and sediment sampling program approved by the USEPA in October 1989. The supplemental sampling program involved the collection of 26 sediment and surficial soil samples for PCB analyses. Sediment sampling for PCBs during both Phases I and II of the RI produced a total of 45 sediment sampling points for PCBs. Table 1.1 presents the analytical data for PCBs in sediment and surficial soil. Figure 1.2 presents the distribution of PCB concentrations in the southeast swale area.

The areal extent of PCB contamination over 10 mg/kg is estimated to be 440 square yards. CRA's experience has shown that PCB contamination is generally confined to the top 10 inches of soil. Samples of PCB contaminated soils in the southeast swale area were not collected at depth. Thus, based on the surficial data, it is estimated that a total of 1,000 square yards of soil will have to be excavated for disposal because of the inability of the excavation equipment to segregate the isolated zones of contaminated soils. The affected areas are shown on Figure 1.3.

Following backfilling of the excavated areas, excavation equipment will be decontaminated in an on-Site decontamination area prior

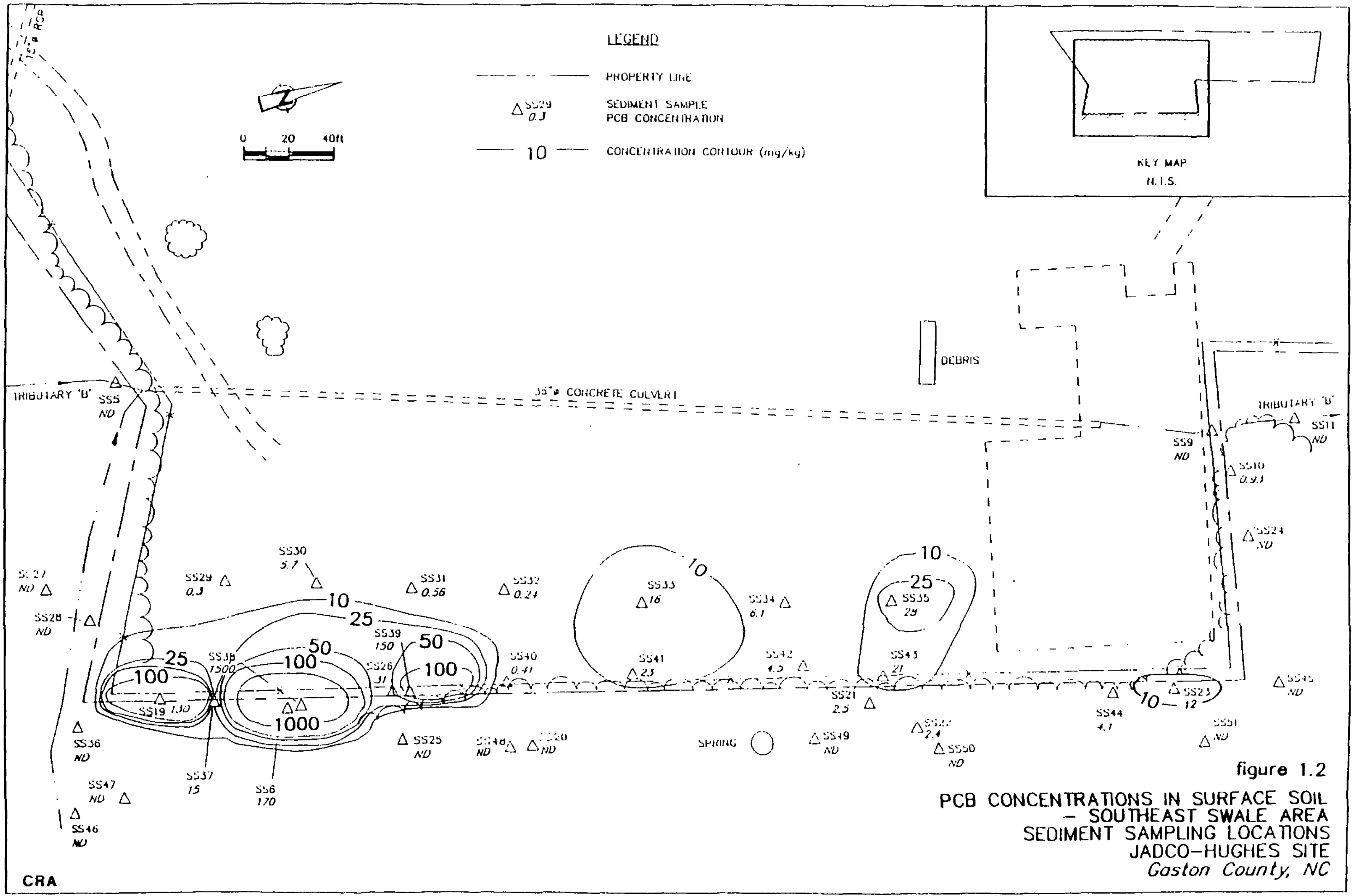

figure 1.2

PCB CONCENTRATIONS IN SURFACE SOIL
– SOUTHEAST SWALE AREA
SEDIMENT SAMPLING LOCATIONS
JADCO–HUGHES SITE
Gaston County, NC

3480-06/07/90-1-0

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TABLE 1.1

DETECTED PCBs IN SITE SEDIMENTS
JADCO-HUGHES SITE

Sampling Location	*Aroclor 1248 (mg/kg)*	*Aroclor 1252 (mg/kg)*
SS1	ND	ND
SS5	ND	ND
SS6	72 - 170 (A)	ND
SS9	ND	ND
SS10	ND	0.93
SS11	ND	ND
SS12	ND	ND
SS14	ND	ND
SS15	ND	ND
SS16	ND	ND
SS17	ND	ND
SS18	ND	ND
SS19	110	20
SS20	ND	ND
SS21	2.5	ND
SS22	2.4	ND
SS23	12	ND
SS24	ND	ND
SS25	ND	ND
SS26	23	8.2
SS27	ND	ND
SS28	ND	ND
SS29	0.3	ND
SS30	5.7	ND
SS31	0.56	ND
SS32	0.24	ND
SS33	16	ND
SS34	6.1	ND
SS35	28	ND
SS36	ND	ND
SS37	15 (3.2)	ND (1.0)
SS38	1500	ND
SS39	150	ND
SS40	0.41	ND

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TABLE 1.1

DETECTED PCBs IN SITE SEDIMENTS
JADCO-HUGHES SITE

Sampling Location	*Aroclor 1248 (mg/kg)*	*Aroclor 1252 (mg/kg)*
SS41	23	ND
SS42	4.5	ND
SS43	21	ND
SS44	4.1	ND
SS45	ND	ND
SS46	ND	ND
SS47	ND	ND
SS48	ND	ND
SS49	ND	ND
SS50	ND	ND
SS51	ND	ND

Notes:

(A) - Four duplicate samples analyzed.
Duplicate analyses in brackets.

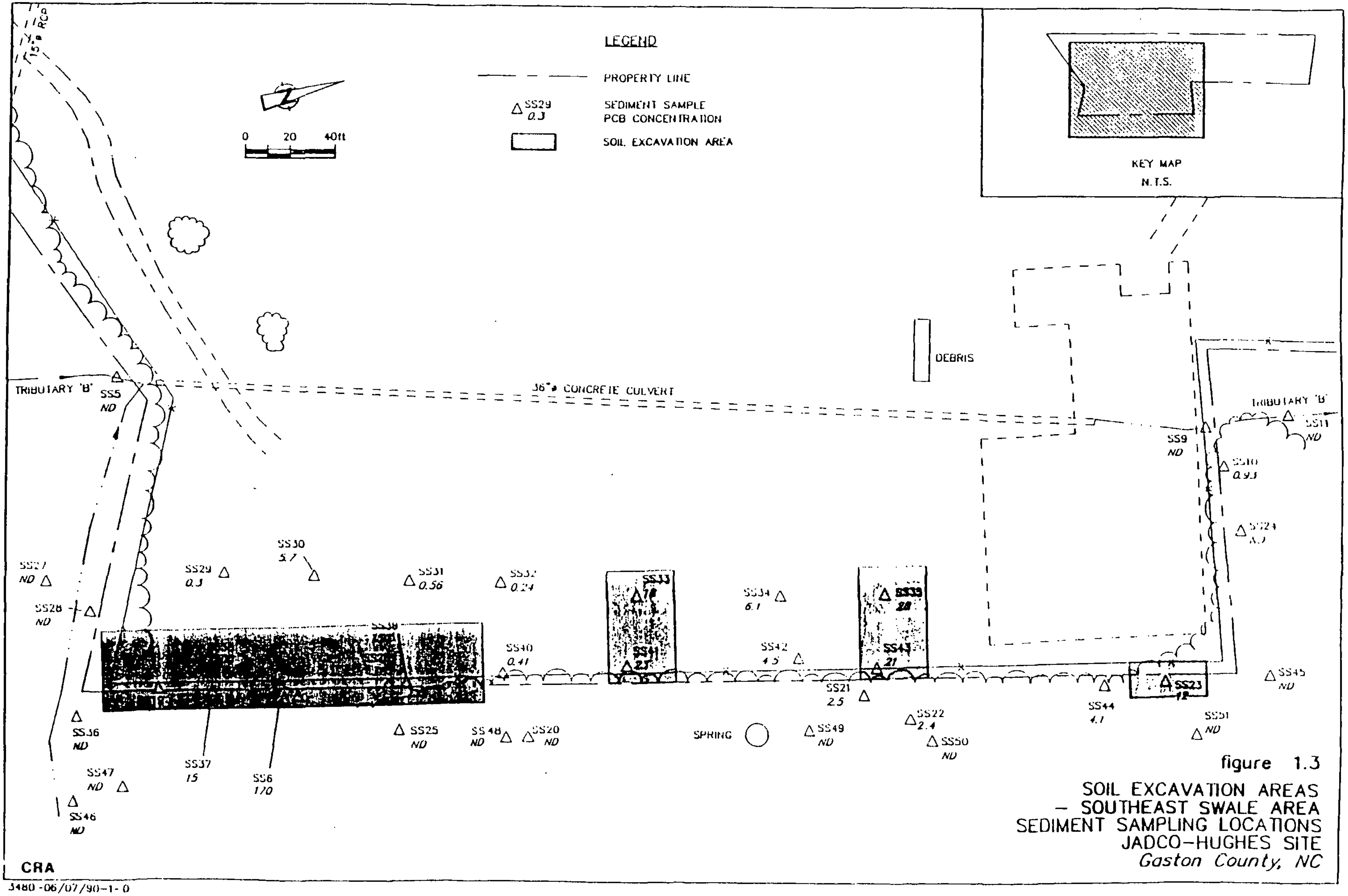

figure 1.3

SOIL EXCAVATION AREAS
– SOUTHEAST SWALE AREA
SEDIMENT SAMPLING LOCATIONS
JADCO-HUGHES SITE
Gaston County, NC

CRA

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to removal from the Site. This Scope of Work is discussed in the following sections.

2.0 SCOPE OF WORK

The interim soil removal program consists of the following components:

- **Mobilization/Site Preparation**

Construction equipment and personnel will be brought to the Site and preparations will be made for the soil removal and handling operation. The Site preparation will include tree clearing (as required), delineation of a soil staging area, erection of temporary fences, and pre-excavation soil sampling for PCB analyses.

- **Fence Construction**

An eight-foot high perimeter chain link fence will be constructed concurrently with soil removal activities. The location of the fence is shown on Figure 2.1.

- **Tree Clearing**

All trees will be cut off at the soil surface and disposed of. All root systems will be removed and will be disposed with the contaminated soil.

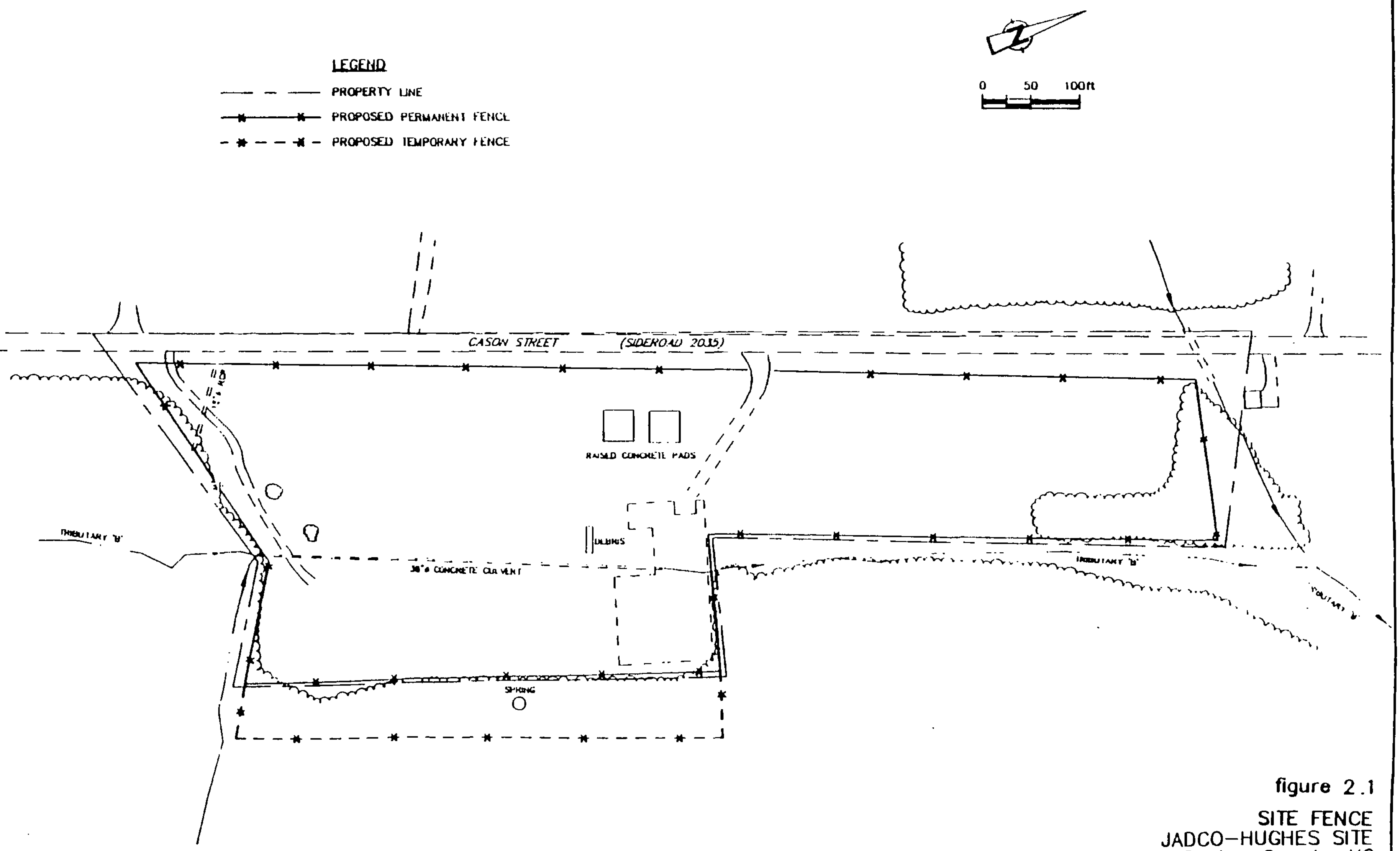

figure 2.1

SITE FENCE
JADCO–HUGHES SITE
Gaston County, NC

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- **Soil Removal**

Affected soils will be excavated with a backhoe and stockpiled in the soil staging area in preparation for loading on to transport trucks or loaded directly into transport trucks for off-Site disposal.

A polyethylene cover will be placed over the soil at the staging areas during intermittent periods when no work is being performed or when it is raining. Soils which are saturated with water (if any) will be stabilized prior to loading.

The southeast swale area is characteristically moist. In areas where the soils are not moist in their native condition, a water mist will be utilized to control fugitive dust emissions.

Surface water runoff will be prevented from entering excavations using dikes, sandbags, ditching or other available means. All surface runoff which has been diverted around excavations will be permitted to follow the existing drainage paths. Surface water which has been pumped out of excavated areas will be contained and stored in wastewater storage tanks for retention, sampling and disposal off Site in accordance with State and Federal Regulations.

- **Verification**

Surficial soil samples will be collected for verification of cleanup pursuant to USEPA guidance (USEPA, 1985).

- Backfilling and Post-Excavation Work

Clean imported backfill which has been prequalified by grab sampling for VOCs, BNAs and PCBs will be brought on Site to replace the excavated soils. The land surface will be re-graded to its original contour.

2.1 MOBILIZATION AND SITE PREPARATION

Mobilization and Site preparation activities include all activities conducted prior to the initiation of soil removal.

2.1.1 Mobilization

Mobilization will include the preparation of operating plans for the removal activities, obtaining necessary agency approvals and mobilizing equipment to the Site. The operating plans will include:

- a Site-specific Health and Safety Plan,
- design drawings for the soil removal areas, and
- an operating plan detailing the sequencing of construction, removal, verification and backfilling activities. The plan will also identify recordkeeping requirements and project management responsibilities.

The removal activities will be completed under an agreement between the steering committee and the USEPA. An access agreement from the adjoining property owner, Mr. Matthew Plecnik, will be necessary to complete the work. This agreement is presented as Attachment C.

Following execution of the agreements, equipment mobilization will begin. Equipment which will be mobilized within one week of project startup will include:

- an office trailer (command post),
- sanitary facilities,
- soil excavation equipment,
- a decontamination facility,
- small tools and communication equipment, and
- health and safety supplies.

2.1.2 Site Preparation

Site preparation activities involve the construction of the soil staging area and the delineation of exclusion zones. Utility requirements will be met by a portable generator.

The soil staging area will be constructed on one of the concrete pads remaining from the former operations area. Cracks in the concrete surface will be patched and the staging area will be covered with a 30 mil high density polyethylene liner which will be bermed on two sides.

The staging area for soil, the exclusion zone (based on sampling data from the RI) and the location of the command post (office trailer) are shown on Figure 2.2.

Soil samples will be collected from the southeast swale area on a 50 foot grid pattern at the locations shown on Figure 2.3. The sampling techniques will be consistent with the procedures identified in the "Engineering" Support Branch Standard Operating Procedures and Quality Assurance Manual Region IV (USEPA, 1986), Section 4-9. 4.3:

- a sample of the surface soil will be collected;
- a shovel will be used to remove soils to a depth of 30 inches;
- loose soil from the sides of the hole or trench will be removed with a stainless steel spoon; and
- soil samples will be collected at the 10 inch, 20 inch and 30 inch depths from the sides of the hole or trench with a clean stainless steel spoon.

Samples from the surface and 10 inch horizon will be analyzed for PCBs on a rapid turn around basis. If the analytical results for any one sample indicates concentrations of PCBs at the 10 inch horizon above 10 mg/kg, the corresponding 20 inch horizon sample(s) will be analyzed for PCBs. If the analytical results for any one sample from the 20 inch horizon indicate the presence of PCBs above 10 mg/kg, then the corresponding 30 inch horizon sample(s) will be analyzed for PCBs.

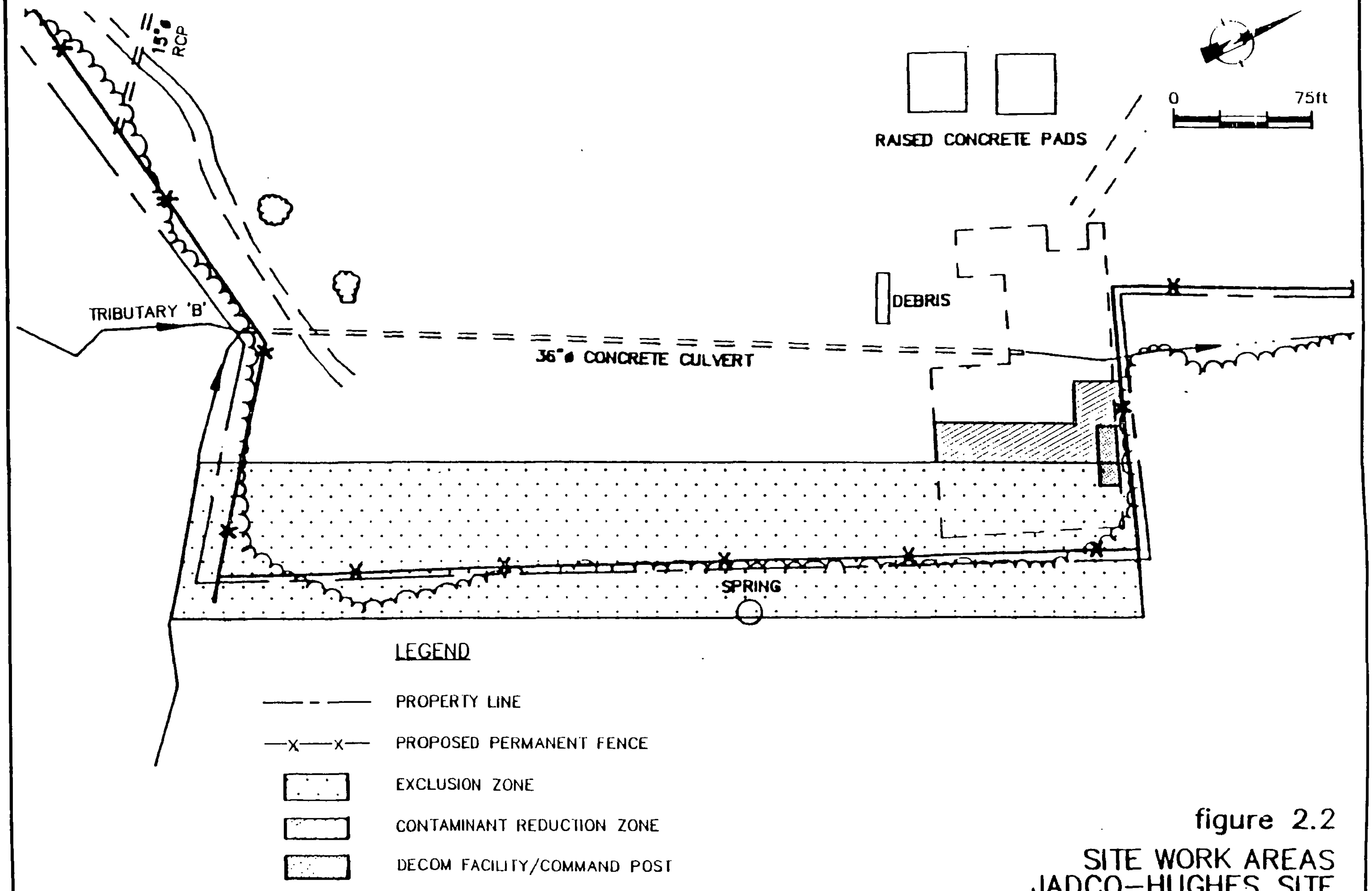

figure 2.2

SITE WORK AREAS
JADCO–HUGHES SITE
Gaston County, NC

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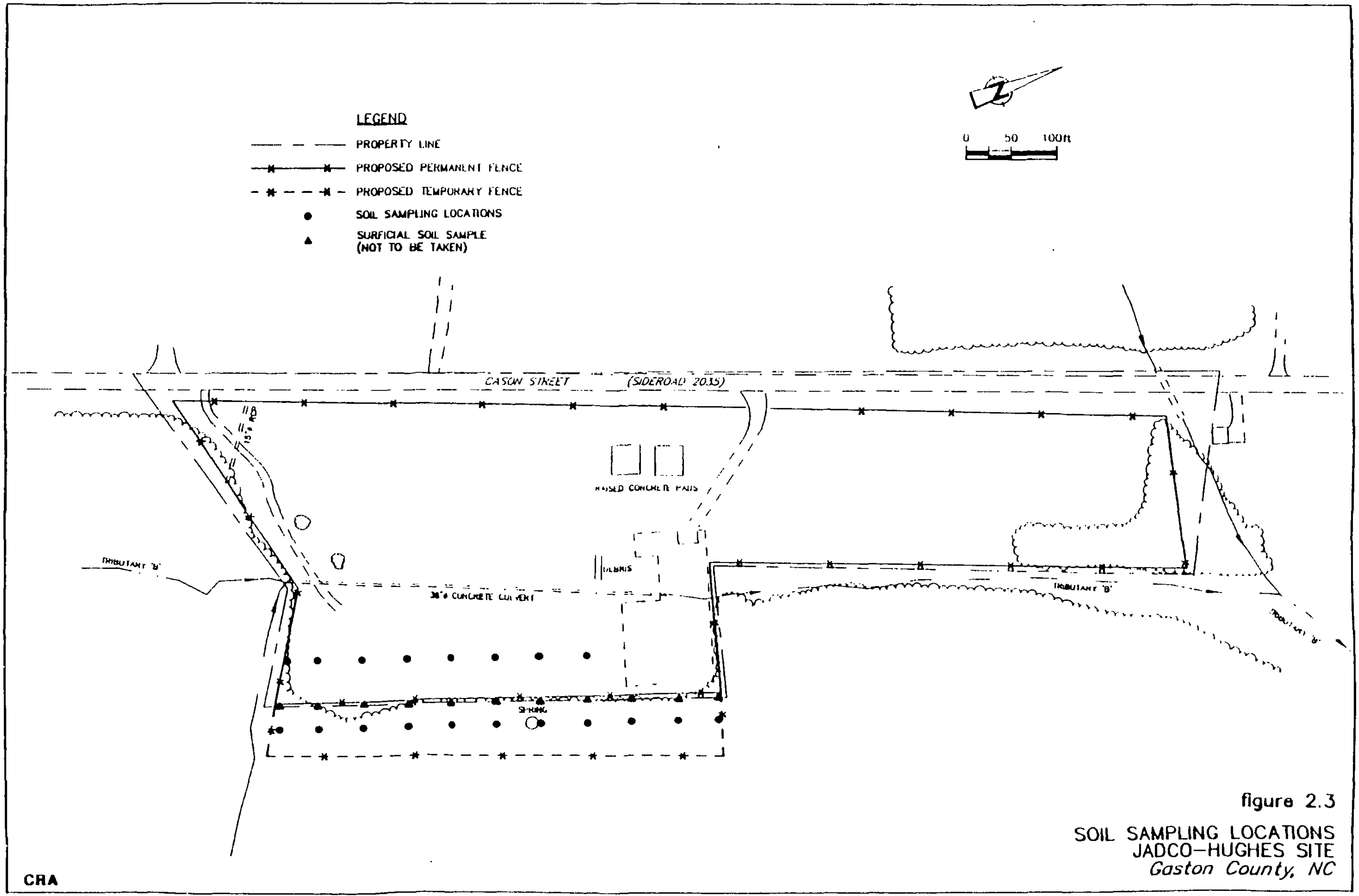

figure 2.3

SOIL SAMPLING LOCATIONS
JADCO–HUGHES SITE
Gaston County, NC

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Site preparation activities are estimated to take one week to complete.

2.2 SOIL REMOVAL

The objective of the removal program is to excavate soils with PCB concentrations of more than 10 mg/kg for off-Site disposal. The areas to be removed are indicated on Figure 1.3, and are estimated to contain 440 square yards of contaminated soils above 10 mg/kg. Approximately 1,000 square yards of soil will be removed to accommodate the removal of the contaminated soil.

The soils will be excavated to a depth of ten inches pursuant to USEPA guidelines and stockpiled in the staging area. Soils or sediment which are saturated with water will be stabilized prior to loading onto transportation equipment.

2.2.1 Soil Stabilization

Soils and sediments will be stabilized in the staging area using kiln dust, hydrated lime or an equivalent. The stabilizing agents will be mixed with the contaminated soil so that the material will pass the paint filter test. The paint filter test is described in Attachment B. The stabilized soil will be loaded onto trailers for transportation to an off-Site USEPA permitted secure landfill.

2.3 VERIFICATION

Surficial soils and sediment samples will be collected for verification of cleanup pursuant to USEPA guidelines (USEPA, 1985). Surface samples will be scooped with stainless steel spoons into stainless steel mixing bowls. These sampling devices will be cleaned with the required Alconox detergent and water rinse, followed by an isopropanol/hexane/isopropanol rinse and a final deionized water rinse. These guidelines provide for composite soil samples to be collected to assess the success of cleanup in spill areas. Results of analyses on composite samples below the cleanup criteria of 10 mg/kg are indicative of a successful removal. Results above 10 mg/kg dictate that the individual samples which were composited must be analyzed to determine the location of the concentrations above the cleanup standard.

Samples will be collected from each of the excavated areas (Figure 1.3) and cleanup will be verified according to the following procedure:

- each excavated area will be divided up into four quadrants;

- a composite sample comprised of soil from the bottom of each quadrant of the excavation from six locations selected at random will be submitted to the analytical laboratory for analysis on a quick turnaround basis;

- if the analytical results for a composite sample exceed the cleanup criterion of 10 mg/kg, then the quadrant from which the sample was collected will be excavated a further ten inches and cleanup will be verified for that quadrant; and

- if the analytical results for a composite sample are less than 10 mg/kg, then the quadrant can be backfilled with imported fill.

2.4 BACKFILLING AND POST-EXCAVATION WORK

Upon verification of the cleanup of the southeast swale area, contaminated soil will be scraped from the staging area and hauled off Site. All equipment used on Site will be decontaminated using a portable steam cleaner. The resultant wash water will be collected, stored on Site and tested prior to transportation off Site for treatment and disposal.

Following decontamination of the Site equipment, the excavated areas will be backfilled with clean imported fill. The fill will be grab sampled prior to its use. The collected samples will be analyzed for VOCs, BNAs and PCBs. Sampling will be conducted in a manner consistent with the RI/FS QAPP. The area will be regraded to its original contours.

2.5 DECONTAMINATION

To prevent the off-Site migration of potentially contaminated material and equipment, the following decontamination protocols shall be used.

All vehicles and equipment used in the Exclusion Zone shall be decontaminated in the Contaminant Reduction Zone prior to leaving the Site and for any work outside of fenced areas. The Engineer will certify that each piece of equipment has been decontaminated prior to removal from the Site.

Decontamination shall involve the thorough cleaning of equipment with a high pressure steam cleaning unit, and shall be performed at the decontamination pad. Decontamination wash waters shall be collected and contained in an on-Site storage tank. Wash waters will be sampled prior to disposal in accordance with State and Federal regulations.

Personnel engaged in vehicle decontamination shall wear protective equipment including disposable clothing and respiratory protection.

3.0 SUBMITTALS

The following reports will be provided to the USEPA by the Steering Committee:

1) Notification of commencement of field work;

2) Monthly reports addressing all progress during the previous month under the AO and any activities planned for the upcoming month;

3) A 50% completion report which contains the analytical data from the pre-excavation sampling, the remediation contractor's health and safety plan, the areas to be excavated, Site preparation prior to excavation, and the names of disposal facilities to be used for Site materials;

4) A 75% completion report which contains a description of the areas excavated and the location of verification samples;

5) A 90% completion report which provides the results of analyses of verification samples and quadrants from excavation areas to be excavated a further 10 inches; and

6) Final Report documenting the completed action.

Additional reports will be made through the regular monthly progress reports provided for in the AO.

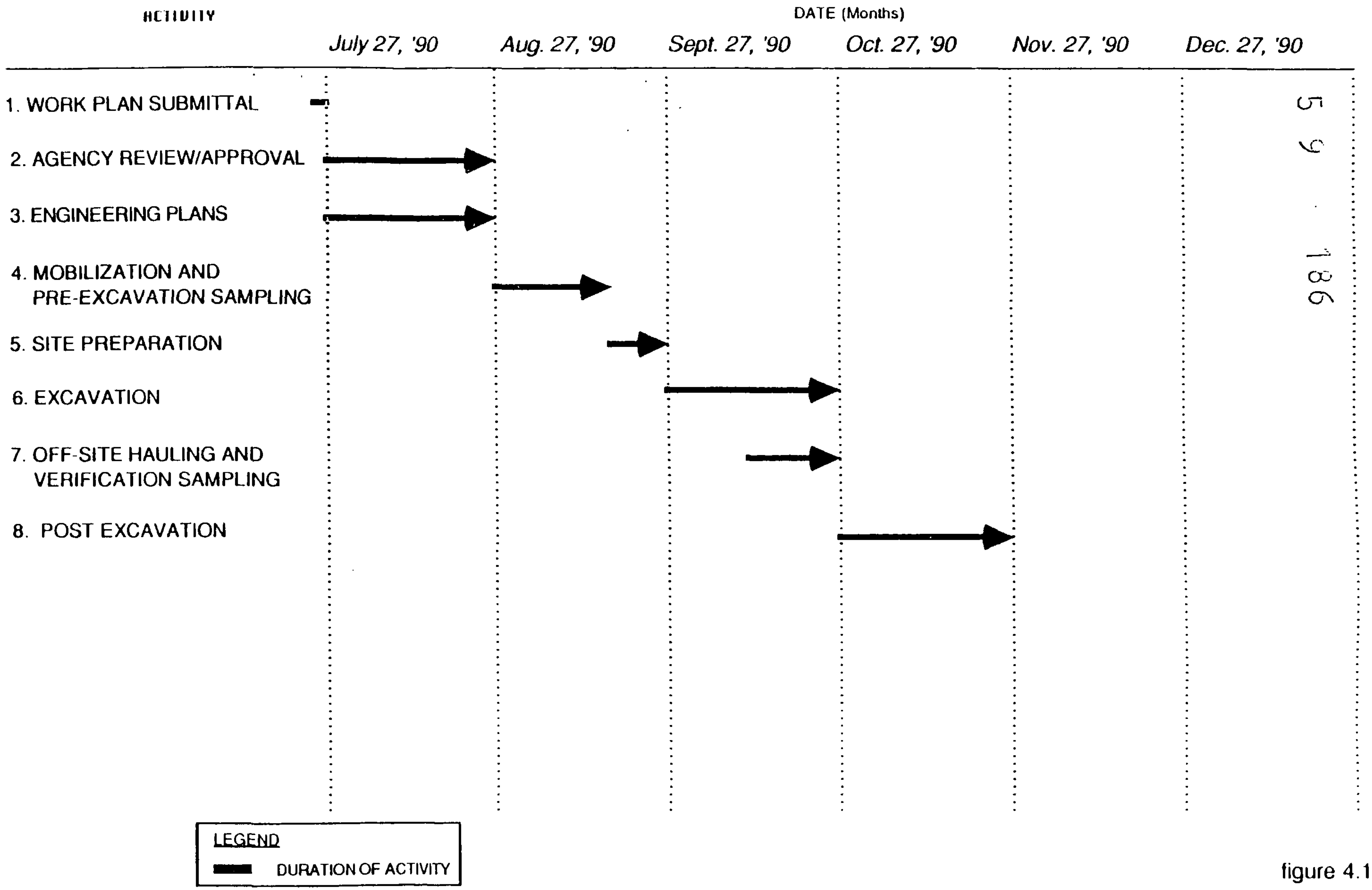

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figure 4.1

IRM Project Schedule
Jadco-Hughes Site
Gaston County, N.C.

4.0 SCHEDULE

Field implementation of this work plan is to commence in June 1990. Soil removal activities will be completed prior to November 8, 1990. Other activities may extend beyond that date. A proposed project schedule is presented on Figure 4.1.

REFERENCES

"Remedial Investigation Report, Jadco-Hughes Site, Gaston County, North Carolina", CRA, February 1990.

"Feasibility Study Report, Jadco-Hughes Site, Gaston County, North Carolina", CRA, February 1990.

"Superfund Risk Assessment Report, Jadco-Hughes Site, Gaston County, North Carolina", CRA, February 1990.

"SARA Regional Capacity Assurance Agreement, North Carolina", Secretary of State, December 1989.

"Verification of PCB Spill Cleanup by Sampling and Analysis", United States Environmental Protection Agency, August 1985.

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All of Which is Respectfully Submitted,

CONESTOGA-ROVERS & ASSOCIATES

HAYCOCK

Donald H. Haycock, P. Eng.

R. FREHNER

Ron Frehner, P. Eng.

Stephen M. Quigley, P. Eng.

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1.0 HEALTH, SAFETY AND SITE CONTROL PLAN

1.1 GENERAL

The work to be conducted during the Interim Soil Removal program includes the handling of contaminated and potentially contaminated materials. During the program, personnel may come in contact with PCB and/or VOC contaminated soils and articles.

The health and safety plan presented herein is a guide to be followed during the development of site specific health and safety plans by the Remedial Contractor. These plans will be submitted to the USEPA with the 50% completion report. This Contractor's plan will provide a Site organizational client, a list of the responsibilities of each position and a list of each person's qualifications.

All on-Site personnel will be required to comply with the health and safety requirements presented herein. This Health, Safety and Site Control Plan provides for a safe and minimal risk working environment for on-Site personnel. It also provides for emergency response procedures to minimize the potential for adverse impact of construction activities on the general public and Site control measures to mitigate the potential for migration of contaminants.

The program presented herein is consistent with approved health and safety protocols implemented during the Remedial Investigation conducted at the Site.

The Site location is shown on Figure A.1.1.

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1.2 BASIS

The Occupational Safety and Health Administration (OSHA) Standards and Regulations contained in Title 29, Code of Federal Regulations, Parts 1910 and 1926 (29 CFR 1910 and 1926) provide the basis for the safety and health program. Additional specifications within this Section are in addition to OSHA regulations and reflect for positions of both the USEPA and the National Institute for Occupational Safety and Health (NIOSH) regarding procedures required to insure safe operations at hazardous wasted sites.

The safety and health of the public and on-Site personnel and the protection of the environment will take precedence over cost and schedule considerations for all project work. Conestoga-Rovers & Associates (the Engineer) and the on-Site Safety Officer shall be responsible for decisions regarding when work will be stopped or started for health and safety considerations.

1.3 SITE CHARACTERIZATION AND POTENTIALLY HAZARDOUS COMPOUNDS

The RI identified the presence of VOCs, BNAs and PCBs in soil. The maximum concentrations of these compounds detected in the

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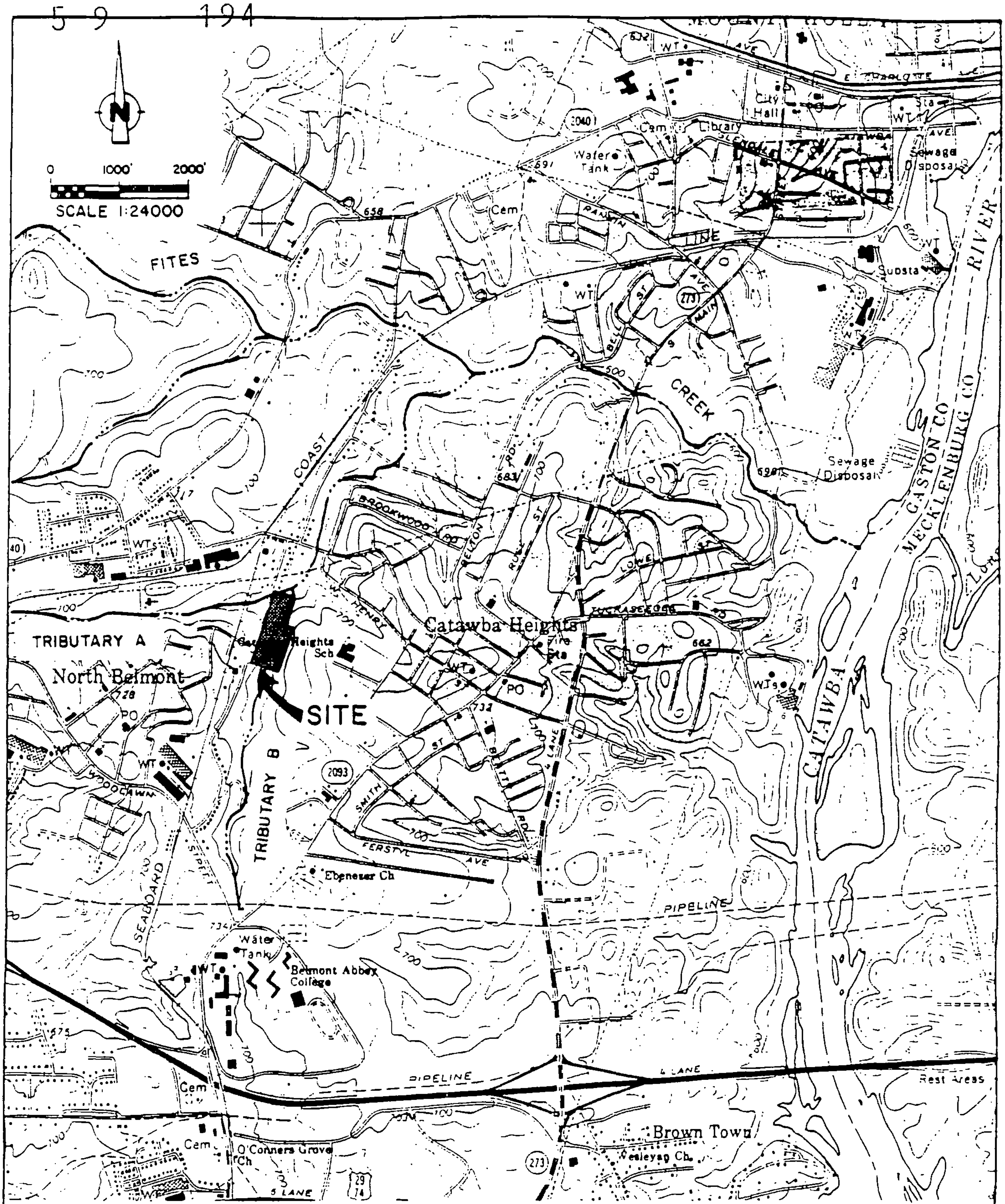

<u>SOURCE</u>: MOUNT HOLLY, N.C. 1:24000 QUAD.

figure A1.1

SITE LOCATION
JADCO-HUGHES SITE
Gaston County, NC

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3480-06/07/90-1-0

area to be excavated are shown on Table A1.1. The material safety data sheets for these chemicals are provided in Attachment D to the Work Plan.

The RI database for the Site confirms that the significant chemical contaminants found in the soils in the southeast swale area are PCBs.

PCBs are suspected carcinogens and acceptable exposure levels in the air have been established by the American Conference of Governmental Industrial Hygienists (ACGIH). The eight-hour time weighted average (TWA) threshold limit value (TLV) established for PCBs is 0.5 milligrams per cubic meter. The Immediately Dangerous to Life and Health (IDLH) concentration for PCBs is 5 mg/m3.

1.4 HEALTH AND SAFETY PERSONNEL

This section provides a description of the roles of Site health and safety personnel. The people who will fulfill these roles and the role of the Site safety manager/supervisor, project manager, and subcontractor will be listed in the Remedial Contractor's Site-specific Safety Plan which will be prepared prior to the initiation of excavation activity.

A Site Safety Officer who will, as a minimum, be an Industrial Hygiene Technician with qualifications in occupational health, shall be on-Site during all major construction activities involving excavation or securement of contaminated material. The Site Safety Officer will report

TABLE A1.1

JADCO-HUGHES SITE
INTERIM REMOVAL ACTION

Compound	*Landfill*		*Former Operations Area*		*Former South Decant Pit*		*Former North Decant Pit*		*Remainder of Site*	
	F.O.D. (1)	*Max. Conc. (mg/kg)*	*F.O.D.*	*Max. Conc. (mg/kg)*	*F.O.D.*	*Max. Conc. (mg/kg)*	*F.O.D.*	*Max. Conc. (mg/kg)*	*F.O.D.*	*Max. Conc. (mg/kg)*
VOCs										
acetone	9/19	72	5/15	1.8	10/14	1.9	6/14	5.8		
2-butanone	3/19	170			2/14	3.6	2/14	6.6		
1,2-dichloroethane	4/19	9.3	5/15	30						
ethylbenzene	6/19	65			3/14	1.3				
methylene chloride*	7/19	11								
4-methyl-2-pentanone	3/19	19			2/14	35				
tetrachloroethene	8/19	12			5/14	5.3				
toluene	7/19	620			3/14	2.9				
trichloroethene	2/19	3.5	4/15	19						
total xylenes	8/19	320			3/14	9.1				
BNAs										
anthracene	1/13	1.0								
benzo(a)anthracene	2/13	3.1								
benzo(a)pyrene	1/13	3.6								
benzo(b)fluoranthene	1/13	2.7								
benzo(g,h,i)perylene	1/13	1.4								
benzo (k) fluoranthene	1/13	2.2								
benzoic acid	5/13	35								
bis(2-chloroethyl) ether	2/13	1.7								
bis (2-ethylhexyl) phthalate	11/13	260			3/7	1.1			25/28	3.3
butylbenzylphthalate	5/13	8.2								
2-chlorophenol	5/13	90								
chrysene	2/13	3.4								
1,2-dichlorobenzene	4/13	2.1								
di-n-butylphthalate	9/13	8.4								

TABLE A1.1

JADCO-HUGHES SITE
INTERIM REMOVAL ACTION

	Landfill		*Former Operations Area*		*Former South Decant Pit*		*Former North Decant Pit*		*Remainder of Site*	
Compound	***F.O.D. (1)***	***Max. Conc. (mg/kg)***	***F.O.D.***	***Max. Conc. (mg/kg)***	***F.O.D.***	***Max. Conc. (mg/kg)***	***F.O.D.***	***Max. Conc. (mg/kg)***	***F.O.D.***	***Max. Conc. (mg/kg)***
BNAs (cont'd)										
di-n-octylphthalate	2/13	6.1								
fluoranthene	2/13	5.4								
indeno(1,2,3-cd)pyrene	1/13	2.0								
2-methylnaphthalene	5/12	2.9								
2-methylphenol	5/13	9.1								
4-methylphenol	5/13	2.5								
naphthalene	5/13	6.3								
phenanthrene	1/13	3.4								
phenol	5/13	24								
pyrene	2/13	5.6								
1,2,4-trichlorobenzene	7/13	86								
Pesticides/PCBs										
Aroclor - 1248	3/7	36	1/4	1.2						
Metals										
Antimony	3/9	47.5							3/28	35.7
Beryllium	4/9	1.7							12/28	3.4
Lead	9/9	596							27/28	290

Notes:

- Methylene chloride is a common laboratory contaminant.

(1) F.O.D. - Frequency of Detection.
Reported maximum concentrations reported as based on the data for all measurements in each area, regardless of depth of sample.
Max. Conc. - Maximum Concentration.
Analytical results for a full list of TCL compounds and detection limits are provided in Appendix M.
This data screen includes all sampling data from each Site area at all depths. Hence, the maximum value recorded may be at any depth sampled.
In general, all Site areas were sampled for soil contamination from 1 foot below ground surface to the surface of the water table (approximately 10 feet below) ground surface.

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directly to a Certified Industrial Hygienist who shall be responsible for implementing and overviewing the Health and Safety Plan on a part-time basis.

The Certified Industrial Hygienist shall:

a) Be responsible for implementation of the Health and Safety Plan at the start-up of potentially hazardous work;

b) Be responsible for a pre-construction indoctrination of all on-Site personnel with regard to the safety plan and other safety requirements to be observed during construction, including:

    i) potential hazards;
    ii) personal hygiene principles;
    iii) personnel protective equipment;
    iv) respiratory protection equipment usage and fit testing;
    v) emergency procedures dealing with fire and medical situations; and
    vi) heat stress principles.

c) Oversee the Site Safety Officer's activities on a part-time basis and be available on an as-needed basis for emergency situations.

The Safety Officer will:

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a) Be responsible for daily enforcement and monitoring of the Health and Safety Plan;

b) Be responsible for assisting the Certified Industrial Hygienist in the pre-construction indoctrination of all on-Site personnel;

c) Be responsible for notifying the Engineer prior to initiation of any hazardous work;

d) Be responsible for the maintenance of separation of "Exclusion" (potentially contaminated) and "Clean" (uncontaminated) areas as described hereafter; and

e) Be responsible for maintenance of the emergency contingency plan.

1.5 MEDICAL SURVEILLANCE

Medical surveillance shall be subject to an employee's expected interval of time spent on-Site.

In accordance with 29 CFR 1910.120, if an employee wears a respirator on a routine basis or as part of routine activities for any part of 30 days during a year, then medical surveillance shall be conducted at a frequency and extent as specified by the examining physician.

If personnel will not be involved in Site activities as outlined above, medical surveillance shall include testing required for approval for use of a respirator in accordance with 29 CFR 1910.134 as a minimum.

The Contractor shall retain the services of a licensed physician or physician's group to provide the medical examinations and surveillance required. All pertinent Site characterization data, a copy of 29 CFR 1910.120, and a description of the intended personnel protective equipment shall be provided to the physician prior to completing medical surveillance. The name of the physician and evidence of examination of all on-Site personnel shall be provided to the Engineer prior to assigning personnel on-Site work activities involving contact with potentially contaminated materials. Contractor personnel medical approvals shall be maintained by the Contractor at the Contractor's Site office for the duration of the project.

Medical surveillance protocols shall be the physician's responsibility but shall, as a minimum, meet the requirements of OSHA Standard 29 CFR 1910.120 and 20 CFR 1910.134 for all personnel. This exam may include:

i) medical/occupation questionnaire with work history;
ii) full physical examination;
iii) screening audiometric test with otoscopic exam for wax;
iv) visual acuity measurement, including color perception;
v) pulmonary function test (Spirometry-FVC and FEV-1.0 second);

vi) resting EKG;

vii) chest X-ray (PA) read by Board Certified Radiologist (only when clinically indicated by other testing procedures);

viii) blood chemistry profile* ;

ix) complete blood count with differential and platelet evaluation, including WBC, RBC, HGB, Hematocrit; and

x) urinalysis with microscopic examination.

All on-Site personnel requiring full medical surveillance shall be provided with medical surveillance within a reasonable time period prior to entering the Site, and at any time there is suspected to be exposure above permeable limits to toxic chemicals or physical agents.

The Contractor shall maintain all medical surveillance records for a minimum period of thirty (30) years and shall make those records available to personnel or governmental agencies as specified in 29 CFR 1910.20 and 29 CFR 1913.10.

1.6 TRAINING

All Site personnel will be required to complete site training and refresher sessions conducted by the safety officer. Site training and refresher sessions are designed to ensure that all personnel are capable of

---

* Minimum Blood Chemistry Profile: Calcium, Phosphorous, Glucose, Blood Urea Nitrogen (BUN), Uric Acid, Cholesterol, Total Protein, Total Bilirubin, Direct Bilirubin, Alkaline Phosphatase, SGOT, SGPT, Sodium, Potassium, Chloride, Cretinine, Triglycerides, Albumin, Globulin, A/G Raio, Lactic Acid Dehydrogenase (LDH) Serum Iron.

and familiar with the use of safety, health, respiratory and protective equipment and with the safety and security procedures required for this Site. The Site training session shall be conducted prior to beginning work by the Safety Officer or other qualified professional in the presence of the Certified Industrial Hygienist.

In accordance with 29 CFR 1910.120, all employees exposed to hazardous substances, health hazards or safety hazards shall receive training including a minimum of 40 hours instruction off-Site and three days of actual field experience under direct supervision. The Contractor shall provide documentation stating that all on-Site personnel have complied with this regulation. Each individual's name shall be included on this confirmatory letter. The training program shall include at a minimum the following items:

i) names and personnel responsible for Site health and safety;
ii) Site specific potential hazards;
iii) use of personal protective equipment (PPE), including proper donning and doffing procedures;
iv) work practices by which the employee can minimize risks from these potential hazards;
v) safe use of engineering controls and on-Site equipment;
vi) discussion and completion of medical surveillance requirements and recognition of symptoms associated with exposure to hazards;
vii) Site control methods (described in Section 1.20);
viii) on and off-Site contingency plans;
ix) decontamination procedures;

x) Site specific standards operating procedures;

xi) delineation between work zones;

xii) use of the buddy system (described in Section 1.17);

xiii) scope of the intended works for the project; and

xiv) review on -Site communications and appropriate hand signals between personnel working in the Exclusion and/or Contaminant Reduction Zone.

The Safety Officer shall be responsible for ensuring that personnel not successfully completing the required training prior to beginning work by the Safety Officer are not permitted to enter the Site to perform work.

The Contractor shall implement a hazard communication ("Right-to-Know") program in accordance with 29 CFR 1910.1200.

1.7 RESPIRATOR PROGRAM

All on-Site personnel shall receive training prior to beginning site work by the Safety Officer in the usage of, and be fit tested for, both half and full face respirators. This may include canister/cartridge and supplied air types, as appropriate.

Personnel working on-Site shall be required to wear respiratory protection as determined by air monitoring and as instructed by the Safety Officer.

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1.8 WORK AREAS/SITE CONTROL

Specific work areas shall be delineated by fence or a flagged line as outlined below and shown on Figure A1.2:

a) Exclusion Zone (EZ) - This zone shall include all areas where potentially contaminated soils or materials are to be excavated, handled, spoiled or covered, and all areas where contaminated equipment or personnel travel.

The EZ shall be clearly delineated in the field prior to commencing Site work, by temporary fencing with warning signs spaced around the perimeter of the Zone warning of a hazardous work area. Temporary Exclusion Zones outside of the Site fence will be delineated by temporary fencing when working in these areas.

b) Contaminant Reduction Zone (CRZ) - This zone will occur at the interface of the EZ and Clean Support Zone and shall provide access for the transfer of construction materials and Site dedicated equipment to the EZ, the decontamination of transport vehicles handling contaminated soil prior to leaving the EZ, the decontamination of personnel and clothing prior to entering the Clean Zone and for the physical segregation of the Clean Zone and EZ.

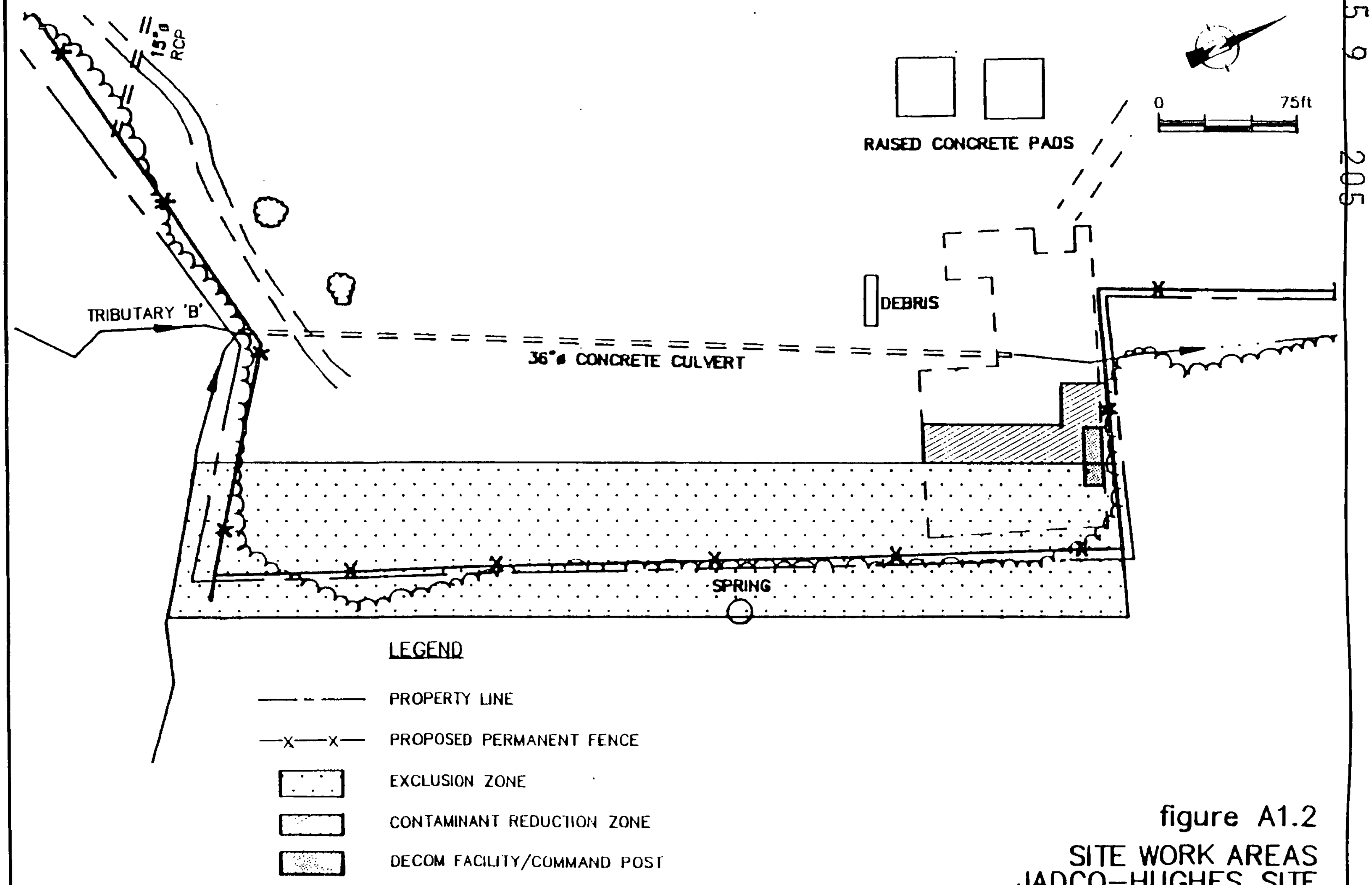

figure A1.2

SITE WORK AREAS
JADCO-HUGHES SITE
Gaston County, NC

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c) Clean Zone (CZ) - This area is the portion of the Site defined as being the area outside the zone of significant air and soil contamination. The Clean Zone shall be clearly delineated and procedures implemented to prevent active or passive migration of contamination from the work Site. The function of the Clean Zone includes:

- i) An entry area for personnel, material and equipment to the Exclusion Zone;
- ii) An exit area for decontaminated personnel, materials and equipment from the Exclusion Zone;
- iii) The housing of site special services; and
- iv) A storage area for clean safety and work equipment.

1.9 COMMUNICATIONS

Telephone service shall be provided to the Site during construction activities. Emergency numbers including police, fire, ambulance, hospital, and appropriate Regulatory agencies shall be prominently posted near each phone and attached to the final Site Safety Plan.

1.10 EMERGENCY AND FIRST AID EQUIPMENT AND SUPPLY

The safety equipment listed below shall be located and maintained within the Exclusion Zone in appropriate locations as directed by the Safety Officer.

a) portable emergency eye wash and shower
b) two twenty pound ABC type dry chemical fire extinguishers
c) two self contained air full face respirators

One hand-held emergency siren, a first aid kit, two twenty-pound ABC Fire extinguishers, an eye wash and shower station and two complete sets of Level B protective equipment shall be located and maintained in the Clean Zone.

1.11 EMERGENCY CONTINGENCY AND RESPONSE PLAN

1.11.1 Off-Site Contingency Plan

Prior to commencing work involving the excavation, handling and disposal of potentially contaminated material, the Engineer, will coordinate the development of an off-Site emergency contingency plan. This plan is intended to provide immediate response to a serious site occurrence such as explosion, fire or migration of significant quantities of toxic or hazardous material from the Site into adjacent public areas.

Coordination meetings shall be held with appropriate authorities which may include State, the Engineer, Fire Department, Hospital, State and City Police, State Department of Transportation, Gaston County Health Department and Civil Defense officials. The meetings shall identify the Emergency response coordinator through whom all information and coordination will occur in the event of an incident. Plans shall be developed, or existing plans incorporated into the master plan, for

i) evacuation of adjacent areas,
ii) fire fighting procedures,
iii) transport of injured personnel to medical facilities,
iv) priority transportation routes, and
v) coordination and/or modification of highway operations.

Techniques and recommended procedures for immediate first aid emergency response will be developed with local medical facilities.

1.11.2 <u>On-Site Contingency Plan</u>

a) In the event of injury to on-Site personnel or contact with hazardous materials, the following protocol shall be followed:

  i) in the event of injury, notify the Safety Officer, and the Engineer,

ii) contact the closest medical center and describe the injury (the closest medical center is the Gaston Memorial Hospital, as shown on Figure A1.3),

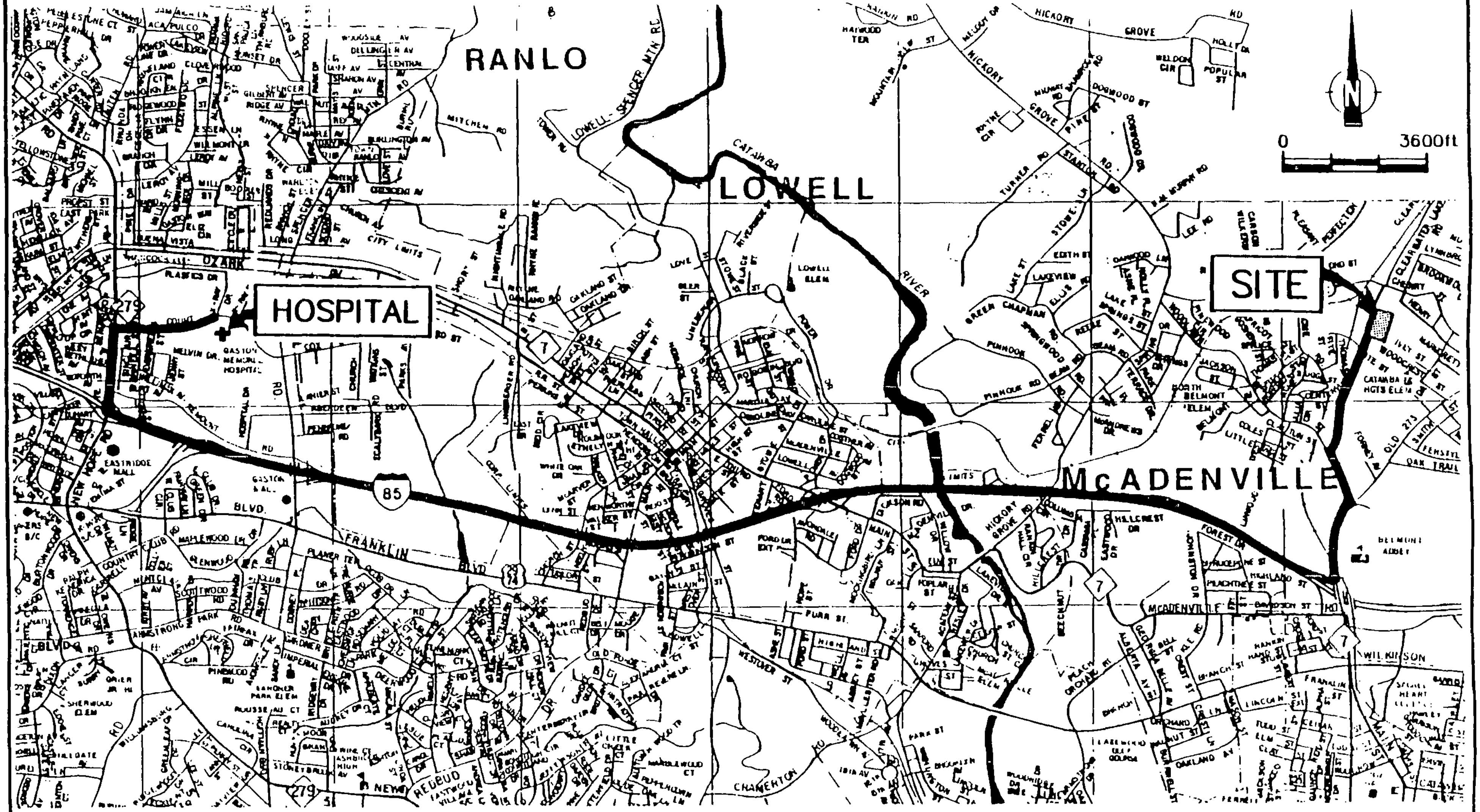
iii) decontaminate personnel and administer appropriate emergency first aid, and

iv) transport personnel to the defined medical facility along a predefined route.

b) Fire extinguishers shall be maintained in strategic locations within the Site to combat localized fires. Personnel shall be trained in fire fighting procedures and shall be equipped with self contained air when involved in such operations.

c) In the event of significant release of potentially toxic or hazardous vapors from any container or excavation equipment operators shall immediately don self contained air respirators during such operations and the source of such vapors shall be immediately backfilled or covered with fill. Alternate plans of contaminant removal will be developed and submitted to the Engineer prior to recommencing work in the area.

Injured personnel will be transported to the Gaston Memorial Hospital, located on Court Drive as shown on Figure A1.3.



LEGEND

▬ EMERGENCY ROAD

figure A1.3

EMERGENCY FACILITY LOCATIONS
JADCO–HUGHES SITE
Gaston County, NC

CRA

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Emergency telephone numbers for the area surrounding the Site are listed on Table A1.2.

Figure A1.3 and Table A1.2 will be posted in a prominent place in the CZ.

1.12 PERSONAL SAFETY AND RELATED EQUIPMENT

All on-Site personnel shall be equipped with personal safety equipment and protective clothing appropriate for the hazardous material being handled and the nature of work being completed. All safety equipment and protective clothing shall be kept clean and well-maintained.

Safety equipment and apparel as required for general work and excavation work within the Exclusion Zone shall consist of:

a) Liquid resistant, splash resistant, full coverage, disposable outerwear including tyvek type coveralls and nitrile/butyl gloves;
b) Hardhats;
c) Safety shoes or boots;
d) Rubber overshoes or overboots;
e) Full face-piece respirators with dual vapor and particulate filters (such as GMC-H or equivalent), self-contained breathing apparatus or other supplied air system as necessary to conduct remedial action in a safe manner.

TABLE A1.2

EMERGENCY TELEPHONE NUMBERS
JADCO-HUGHES SITE
INTERIM REMOVAL ACTION

Gaston Memorial Hospital	866-2000
Belmont Fire Department	911
Ambulance	911
Police	911
Conestoga-Rovers & Associates	(519) 884-0510
(after 6 p.m.) Stephen Quigley	(519) 746-7338

Additional protective equipment usage guidelines to be implemented include:

a) All prescription eyeglasses in use on the Site will be safety glasses. Contact lenses shall not be permitted.

b) All disposable or reusable gloves worn on the Site shall be nitrile/butyl gloves with latex surgical gloves worn underneath.

c) During periods of respirator usage in contaminated areas, respirator filters shall be changed daily or upon breakthrough, whichever occurs first.

d) Footwear used on site will be work shoes or boots, and will be covered by rubber overshoes when entering or working in the Exclusion Zone or Contaminant Reduction Zone.

e) On-Site personnel unable to pass a respirator fit test shall not enter or work in the Exclusion Zone or Contaminant Reduction Zone.

f) All on-Site personnel shall wear an approved hardhat when present in the Exclusion Zone.

g) All personal protective equipment worn on Site shall be decontaminated at the end of each work day. The Safety Officer shall be responsible for ensuring individuals decontaminate personal protective equipment before reuse.

h) Duct tape shall be used to ensure that disposable coveralls and gloves are tightly secured when personnel are working within contaminated zones.

1.13 RESPIRATORY PROTECTION

Appropriate respiratory protection, shall be mandatory during all on-Site construction activities. As a minimum, all on-Site personnel shall be required to wear full face-piece air purifying respiratory protection when working in the Exclusion Zone.

Levels of respiratory protection have been chosen consistent with potential airborne hazards. The selection of appropriate protection is based upon the potential presence of compounds with the lowest recommended threshold limit value.

In the absence of additional air monitoring information, such as measurements of PCB concentrations in air or total dust concentrations the following levels of respiratory protection shall be required when working in the Exclusion Zone:

Total Organic Vapor Concentration (ppm)	*Level of Respiratory Protection Required*
0 - 25	Full face air purifying protection
greatler than 25	Supplied air system or suspended activities

All major equipment, handling potentially contaminated soils, shall be equipped with a source of compressed grade D breathing air for air supplied respirators, should they be required.

If other air monitoring data exists and occupational health standards are not being exceeded, then respiratory protection requirements may be relaxed with the approval of the Engineer and the USEPA.

The Safety Officer shall be responsible for implementing, maintaining and enforcing the respirator program.

On-Site personnel unable to pass a respirator fit test will not be permitted to enter or work in the Exclusion Zone or Contaminant Reduction Zone.

1.14 TASK ANALYSIS

Table A1.3 provides a description of expected work tasks to be encountered during the Site activities related to the excavation of the PCB contaminated soils. Also listed are the potential exposures and appropriate

TABLE A1.3

TASK ANALYSIS
JADCO-HUGHES SITE
INTERIM REMOVAL ACTION

	Work Task	*Potential Chemical Exposures*	*Appropriate PPE*
1.	General site activities outside of exclusion zone	no significant chemical exposure anticipated	work clothes, safety boots
2.	Soil sampling prior to and after excavation activity	PCB contaminated soil	work clothes, rubber overshoes, plastic coated tyveks, latex inner gloves, nitrile/butyl outer gloves and a hardhat
3.	Surveying prior to excavation	may walk on PCB contaminated soil	work clothes, rubber overshoes in exclusion zone, hardhat
4.	Excavation equipment operator	PCB contaminated soils, dusts	work clothes, plastic coated tyveks, latex inner gloves, nitrile/butyl gloves, hardhat, safety shoes, rubber overshoes, full face respirator
5.	Excavation laborer	PCB contaminated soils, dusts	work clothes, plastic coated tyveks, latex inner gloves, nitrile/butyl gloves, hardhat, safety shoes, rubber overshoes, full face respirator
6.	Truck driver	no significant chemical exposure anticipated	work clothes, safety boots, full face respirator while truck is being loaded
7.	Equipment decontamination	PCB contaminated soils, dusts, mists, detergents	work clothes, plastic coated tyveks, latex inner gloves, nitrile/butyl gloves, hardhat, safety shoes, rubber overshoes, full face respirator
8.	Supervision in exclusion zone	PCB contaminated soils, dusts	work clothes, plastic coated tyveks, latex inner gloves, nitrile/butyl gloves, hardhat, safety shoes, rubber overshoes, full face respirator
9.	Fence construction	no significant chemical exposure anticipated. May walk on PCB contaminated soils when erecting temporary fencing	work clothes, work boots/shoes and rubber overshoes

levels of personal protective equipment. This analysis will be revised as appropriate by the Remedial Contractor to include any appropriate additional tasks.

1.15 PERSONAL HYGIENE

The Safety Officer shall be responsible for, and ensure that all personnel performing or supervising remedial work within a hazardous work area, or exposed or subject to exposure to hazardous chemical vapors, liquids, or contaminated solids, observe and adhere to the personal hygiene-related provisions of this section.

On-Site personnel found to be disregarding the personal hygiene-related provisions of this plan will be barred from the Site.

The following equipment/facilities shall be provided for the personal hygiene of all on-Site personnel:

a) Suitable disposable outerwear, gloves, and footwear on a daily or as-needed basis for the use of on-Site personnel,

b) Contained storage and disposal for used disposable outerwear,

c) Personnel hygiene facilities complete with change area, showers, toilets and washbasins with contained storage for all wash waters, missing A-20

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g) All personnel involved in excavation and/or handling of potentially contaminated soils in the Exclusion Zone or Contaminant Reduction Zone shall shower and change to street clothes prior to leaving the Site.

1.16 HEAT STRESS MONITORING

All employees will be trained prior to beginning work by the Safety Officer in the following:

a) individual factors which influence an individual's susceptibility to heat;

b) environmental characteristics such as temperature, humidity, wind speed, and cloud cover;

c) body response to heat;

d) effect of personal protective equipment and workload;

e) the various types of heat disorders and their associated symptoms; and

f) heat stress program - acclimatization, monitoring, work/rest regiment, and fluid intake (balanced electrolytic fluids).

This training will be conducted at the time of the initial training.

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Monitoring for heat stress will commence when the ambient air temperature is above 70°F. If ambient temperatures remain above 70°F, then monitoring will continue for every day that the ambient temperature exceeds 70°F. Heat stress monitoring will consist of a daily log of body weight loss. Total body weights will be recorded four times daily, at a minimum when the heat stress monitoring is in effect. This log will be maintained for each Site employee for the duration of the project. A sample log form is shown on Figure A1.4. In addition, the Safety Officer will also monitor Site personnel health.

After each worker has become familiar with his own limitations, and as long as the daily activities are not noticeably altered, it will remain the responsibility of the worker to remain cognizant of his own physical condition. Each individual will be made aware of the effects of acclimatization and that the loss of some acclimatization after a few days of rest will occur.

1.17 BUDDY SYSTEM

All site excavation work shall be conducted under a buddy system. This system is designed to ensure that no one employee enters the EZ without the support and assistance of a co-worker.

The daily safety briefings will be the forum where buddy assignments will be made for the Site. In the event that an odd number of

HEAT STRESS MONITORING LOG.

JOB SITE: JADCO-HUGHES SUPERFUND SITE
GASTON COUNTY N.C.

JOB TITLE: PCB CONTAMINATED SOIL REMOVAL

EMPLOYEE NAME ________________ POSITION ________________

DATE	TIME	ORAL TEMPERATURE	TOTAL BODY WEIGHT

figure A1.4

SAMPLE HEAT STRESS MONITORING LOG.
JADCO-HUGHES SITE
Gaston County, NC

CRA

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employees are present on the Site, then one team of three "buddies" will be established.

The key responsibilities of a buddy are as follows:

- monitor your buddy's work practices and physical condition;
- if your buddy appears to be in distress or has had an accident, assist him in a manner consistent with this health and safety plan; and
- do not permit your buddy to enter the EZ alone.

1.18 EMERGENCY COMMUNICATIONS

A system of emergency communications is required to ensure that communications are maintained and emergency procedures are followed in the event of a release or accident.

The emergency communication procedures to be followed during all Site activity are:

- emergency communications are to be made by hand held sirens, by vehicle horns, or a hand/arm signals;

- one long blast of a siren or one arm continuously waving over a worker's head means to stop work and return to the CRZ;

- repeated short blasts of a siren or both arms continuously waving over a worker's head will mean that an emergency condition exists on-Site and all employees are to leave the Site immediately and congregate at the Site gate.

1.19 AIR MONITORING

1.19.1 Protocols

During the progress of active remedial work, air quality shall be monitored in and around each active work location. Sampling shall be conducted on a regular periodic basis, and additionally as required by special or work-related conditions. Air leaving the active work locations during excavation shall be monitored by continuous daily downwind air sampling. Air sampling shall be conducted for particulates (Total Suspended Particulates; Total PCB) and total VOC vapors. Any departures from general background shall be reported to the Engineer who will, in conjunction with the Safety Officer, determine when operations should be shut down and restarted.

Instruments required for air monitoring shall include a real time organic vapor photoionizer or organic vapor analyzer, explosimeter, personal dust monitors, and a continuous total organic vapor monitor alarm.

Contractor air monitoring equipment shall be operated by personnel trained in the use of the specific equipment provided and shall be under the control of the Safety Officer. All monitoring equipment used within the Exclusion zone shall be intrinsically safe.

Should the organic vapor level in the breathing zone of any active working location exceed 100 ppm for any single reading, or 50 ppm for any two successive readings, or should the explosimeter indicate in excess of 20 percent of the lower explosive limit on any single reading, then that work location shall be shut down and evacuated upwind. The agency representative will be advised of these situations. Work shall not resume at such a work location until authorized by the Engineer and Safety Officer. Organic vapors will be monitored continuously using an organic vapor photoionizer.

Personal dust monitors shall be located upwind and downwind of activities involving the handling of contaminated material. Personal dust monitors shall also be provided for the highest risk person at both the interim storage and the contaminated soil excavation areas. It is expected that one personal dust monitor will be used to assess exposure in the exclusion zone during excavation. Samples will be collected daily and shall be analyzed for total suspended particulates (TSP). Results of the TSP analysis shall be verbally given to the Engineer within 24 hours of sample collection. Samples which show an excursion over 150 µg/m3 shall be analyzed for total PCB.

The Contractor shall be responsible for providing appropriate respiratory protection which meets the requirements of this Health and Safety Plan during all work activities. As a minimum, the

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Contractor shall ensure that all personnel working within or adjacent to the EZ/CRZ active work location are supplied with and use full face-piece respiratory protection as required.

A wind direction indicator shall be installed and maintained by the Contractor at each active work location.

1.19.2 Reporting

The results of air monitoring programs shall be reported on specific forms and shall include the following information:

i) Site Location/Date
ii) Work Process/Operation Name
iii) NIOSH Method Used
iv) Air Flow Calibration Record
v) Temperature, Pressure, Humidity at Sample Location
vi) Area Sampling Location Diagram
vii) Personal Samples
  - Name of Worker
  - Location of Workers
viii) Area Sample Description/Location
ix) Sample Data
  - Pump I.D.
  - Flow Rate
  - Sample Filter/Tube Number

- Pump On/Off (time)
- Volume Air Collected (liters)
- Lab Sample Number

x) Analysis Results (mg/m3,ppm)

xi) Field Notes

- Description of Operations and Complaints/Symptoms
- Chemicals/Materials/Equipment in Use
- Engineering/Administration Controls in Effect
- Personal Protective Equipment in Use
- Sampling Observations/Comments

xii) Sample Submission

- Name, Location
- Chemist/Industrial Hygienist Name
- Principal Air Monitor
- Reviewed by

In addition, all daily air monitoring activities shall be recorded in a hard cover log book which will be maintained on Site at all times by the Safety Officer. Copies of the daily air monitoring reports will be provided to the on-Site agency representative on a weekly basis.

1.20 CONTAMINANT MIGRATION CONTROL

To prevent the migration of potentially contaminated material both on Site and off Site, vehicle travel shall be restricted as shown on Figure A.1.5.

All vehicles and equipment used in the Exclusion Zone shall be decontaminated in the Contaminant Reduction Zone prior to leaving the Site and for any work outside of fenced areas. The Engineer will supervise the decontamination of each piece of equipment prior to its removal from the Site.

Personnel engaged in vehicle decontamination shall wear protective equipment including disposable clothing and respiratory protection.

Decontamination procedures shall be strictly adhered to for all personnel and equipment used in the exclusion zone. The procedures for personnel are as follows:

1) all personnel shall remove rubber overshoes at a designated boot station adjacent to the decontamination facility prior to leaving the EZ;

2) all personnel shall then enter the CRZ to remove respirators and disposable outer clothing, if it is being worn;

3) disposable clothing will be placed in designated containers;

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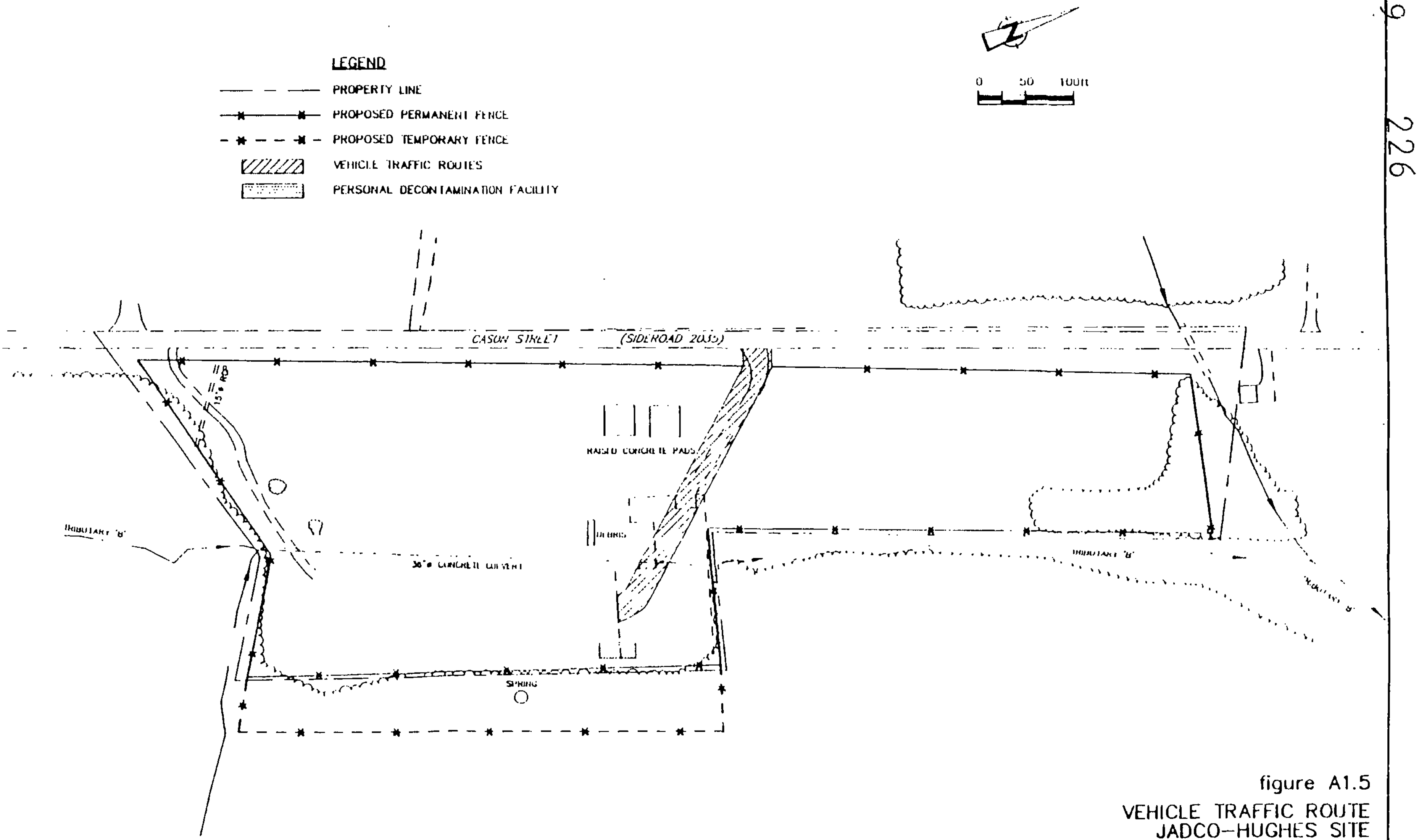

figure A1.5

VEHICLE TRAFFIC ROUTE
JADCO–HUGHES SITE
Gaston County, NC

CRA

4) personnel shall wash hands and faces before eating, drinking or smoking; and

5) all personnel will change out of work clothes in the decontamination facility and shower prior to leaving the Site at the end of the day.

At the completion of the project, rubber boots and potentially contaminated clothing will be disposed along with the contaminated soil.

Decontamination procedures for equipment as as follows:

1) all equipment used in excavation will be moved from the EZ onto the the decontamination pad after excavation is completed or the equipment is to be moved off of the Site;

2) the equipment will be cleaned using a high pressure steam cleaner, wire brushes, and an Alconox (or equivalent) detergent wash water;

3) decontamination will be certified in writing by the Engineer (certification will be in the form of written declaration); and

4) following certification, the equipment can be removed into the CZ and off-Site.

Decontamination equipment includes:

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- high pressure steam cleaner;
- Alconox detergent;
- wire brushes; and
- a shower facility.

1.21 PARTICULATE EMISSION CONTROL

During construction, a dust control program shall be implemented and strictly enforced to minimize the generation and potential off-Site migration of fugitive particulate emissions. Excavations and excavated material shall be kept moist while uncovered due to Site activities. Treated decontamination wash waters from the wastewater treatment facilities may be used to keep excavated material moist.

All roadways, designated work areas and other possible sources of dust generation shall be controlled by application of water as required.

1.22 POSTED REGULATIONS

"No Smoking" signs shall be posted at the Site entrance and on the perimeter of the Exclusion Zone in addition to signs which state "Warning, Hazardous Work Area, Do Not Enter Unless Authorized". In addition, a notice directing visitors to the office will be posted at the Site entrance.

Safety regulations and safety reminders will be posted at conspicuous locations throughout the Site.

1.23 SAFETY MEETINGS

The Safety Officer will conduct an indoctrination safety meeting with all employees prior to the initiation of Site excavation activities, followed by weekly safety meetings which will be mandatory for all Site personnel. Daily safety meetings will be held to brief Site employees on upcoming tasks and associated safety concerns/expectations. The meetings will provide refresher courses for existing equipment and protocols, and will examine new Site conditions as they are encountered.

Additional safety meetings will be held on an as required basis.

Should any unforeseen or Site peculiar safety related factor, hazard, or condition become evident during the performance of work at this Site, it will be brought to the attention of the Engineer in writing by the Safety Officer as quickly as possible, for resolution. In the interim, prudent action shall be taken to establish and maintain safe working conditions and to safeguard employees, the public and the environment.

1.24 SITE SECURITY

The Site shall be secured on a 24-hour basis when portions of the Site security fence have been dismantled for construction and, additionally, on an as-required basis when vehicles must frequently pass through the access gates. Security may include an unarmed guard as deemed necessary by the Engineer.

As part of the Site security, the Engineer or Safety Officer shall:

a) Limit vehicular access to the Site to authorized vehicles and personnel only,

b) Maintain a visitors and Site personnel sign-in/sign-out log, and a log of all security incidents, and

c) Provide initial screening of Site visitors.

2.0 ENVIRONMENTAL CONTROL

2.1 SITE LIGHTING

Adequate Site lighting will be provided to facilitate performance of the work and to maintain a safe working condition. As a minimum, area lighting will be provided in the office area and the decontamination area.

2.2 SURFACE WATER CONTROL

All excavation, backfilling and staging activities will be dry operations.

Surface water runoff will be prevented from entering excavations using dikes, sandbags, ditching or other available means. The methods used will be subject to the approval of the Engineer. Surface water runoff which may potentially contain waste constituents will not be discharged to water courses. All surface runoff will be contained and stored in wastewater storage tanks.

All the necessary equipment appropriately sized to keep excavations and the staging pad free from water will be available on-Site. Collected excavation waters will be transferred to the wastewater storage tank. There will be at all times sufficient pumping equipment, machinery and storage tanks in good working condition (and will be maintained in good working condition) for all emergencies, such as power outage, and there will predesignated workers available at all times while work is being conducted at the site for the operation of the pumping equipment.

Precipitation will be prevented from infiltrating or from directly running off stockpiled excavated waste materials. Excavated materials will be covered with an impermeable liner during periods of work stoppage including at the end of each working day. Any liquids generated from stockpiled waste materials will be contained and transferred to the wastewater storage tanks.

2.3 SEDIMENT CONTROL

Sediment migration from any stockpiled/non-contaminated soil will be controlled as necessary using silt fencing or hay bales. Sediment controls will be placed in downslope positions from soil stockpiles.

2.4 GENERAL HOUSEKEEPING

Daily accumulations of solid waste material such as discarded safety equipment, debris and rubbish will be collected in garbage bags and properly disposed of periodically.

Uncontaminated solid waste material will be disposed in a designated area segregated from the solid waste removed from the contaminated area. Trash removal services will be provided on a weekly basis for uncontaminated solid waste.

The Site will not be allowed to become littered with trash and/or waste materials from the Exclusion Zone; but will be maintained in a neat and orderly condition throughout the construction period. On or before the completion of the work, rubbish of all kinds will be removed from any of the grounds which have been occupied.

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3.0 SPILL CONTROL AND RESPONSE

3.1 SCOPE

During all active work at the Site involving the transport and handling of contaminated materials, the Contractor will be required to implement and maintain an on-Site and off-Site Spill Control and Response Plan. This plan, which will incorporate the guidelines presented herein will provide contingency measures for potential releases of bulked solids and liquids and other miscellaneous waste potentially handled on Site.

3.2 MATERIAL HANDLING

3.2.1 Bulked Solids and Liquids

All vehicles provided for the handling of bulked solids and liquids will be required to be in a good state of repair and will be operated in a safe manner to prevent spills during handling. Haulage units used for bulked solids (ie. soil, concrete rubble, etc.) will be inspected to ensure that their tailgates are secured and the loads are tarped to avoid spillage or tracking of excavated material.

3.2.2 Equipment

The following equipment will be available on Site and used for any unexpected spills:

i) sand, clean fill or other non-combustible absorbent;
ii) front end loader or other machine;
iii) drums (55 gallons); and
iv) shovels.

Hand tools which are used will generally be discarded with the waste material unless it is determined appropriate to decontaminate the tools. If tools are decontaminated, they will receive a detergent wash in addition to steam cleaning or hot water washing.

3.3 ON-SITE CONTINGENCY PLAN

In the event that a release occurs on site, the following protocols will be implemented:

i) Notification of Release: If the release is reportable, and/or human health or the environment are threatened, then the National Response Center and the North Carolina Department of Human Resources will be notified as soon as possible.

ii) Decontamination Procedures: Decontamination procedures may be required after cleanup to eliminate traces of the substance spilled or to reduce it to an acceptable level. Complete cleanup may require removal of affected soils. Personnel decontamination will include showers and cleansing or disposing of clothing and equipment as appropriate. All contaminated materials including solvents, clothes, soil, and wood that cannot be decontaminated must be properly containerized and labeled, if appropriate and properly disposed of as soon as possible.

iii) A release report will be submitted which will include final disposal location of all spilled material.

If a release of a reportable quantity of material stored in a tank or container occurs on Site, the following actions, if applicable, will immediately be taken:

i) Notify the Engineer and Site Safety Officer;
ii) Take immediate measures to control and contain the release within the Site boundaries;
iii) Keep unnecessary personnel away, isolate the area of release, and deny entry;
iv) Do not allow anyone to touch released material;
v) Stay upwind; keep out of low areas; and
vi) Keep combustibles away from the released material.

Upon implementing these procedures, the Site Safety Officer will scan the immediate areas of the release, including downwind, with the HNu to identify the level of protection required for personnel safety equipment to clean up the released material. As a minimum, personnel will wear all specified protective clothing including full-face respirators. Air monitoring completed by the Site Safety Officer will determine the need to increase the level of respiratory protection. The air monitoring action levels as presented in Section 1.16 of the Health and Safety Program will be followed during any clean up of a release.

Solid releases from drums will be placed into approved containers and covered. Each container will be labelled as to contents and will be disposed of as soon as possible. Solid spills from haulage units will be placed back into haulage units and disposed of as bulked material.

Liquid spills will be first covered with an approved absorbent to absorb any free liquids to minimize the amount that may infiltrate into the ground. The absorbent material and soils contacted by the spill will be excavated and placed in approved containers. Containers which are generated will be labelled as to contents and disposed of as soon as possible.

All native soil in which a release occurs outside the Exclusion Zone will be sampled following cleanup of the spill to determine the quality of the cleanup. Samples will be collected only over the immediate area of the spill. Collected samples will be analyzed only for PCBs. Sampling and analytical protocols will be in accordance with those used for the confirmatory soil sampling and analysis program (Section 2.3 of the Work Plan).

3.4 OFF-SITE CONTINGENCY PLAN

If a release of material from a transport vehicle occurs while in transit, the following actions will be taken to reduce potential migration of the waste material.

i) Immediately notify the Contractor, who will in turn notify the Engineer;

ii) Take immediate measures to control the release, if necessary;

iii) Contain and eliminate the release, if possible;

iv) The driver must remain with the vehicle, and will keep unnecessary people away, isolate the area of the release and deny entry to unauthorized personnel;

v) Stay upwind, keeping out of low areas, and do not allow contact with the released material;

vi) Contact the local authorities and local hazardous materials response unit; and,

vii) Other actions, as advised.

Upon implementing these procedures, the same action to clean up the release will be implemented as described in Section 3.3.

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ATTACHMENT B

PAINT FILTER TEST

METHOD 9095

PAINT FILTER LIQUIDS TEST

1.0 SCOPE AND APPLICATION

1.1 This method is used to determine the presence of free liquids in a representative sample of waste.

1.2 The method is used to determine compliance with 40 CFR 264.314 and 265.314.

2.0 SUMMARY OF METHOD

2.1 A predetermined amount of material is placed in a paint filter. If any portion of the material passes through and drops from the filter within the 5-min test period, the material is deemed to contain free liquids.

3.0 INTERFERENCES

3.1 Filter media were observed to separate from the filter cone on exposure to alkaline materials. This development causes no problem if the sample is not disturbed.

4.0 APPARATUS AND MATERIALS

4.1 Conical paint filter: Mesh number 60 (fine meshed size). Available at local paint stores such as Sherwin-Williams and Glidden for an approximate cost of $0.07 each.

4.2 Glass funnel: If the paint filter, with the waste, cannot sustain its weight on the ring stand, then a fluted glass funnel or glass funnel with a mouth large enough to allow at least 1 in. of the filter mesh to protrude should be used to support the filter. The funnel is to be fluted or have a large open mouth in order to support the paint filter yet not interfere with the movement, to the graduated cylinder, of the liquid that passes through the filter mesh.

4.3 Ring stand and ring, or tripod.

4.4 Graduated cylinder or beaker: 100-mL.

5.0 REAGENTS

5.1 None.

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6.0 SAMPLE COLLECTION, PRESERVATION, AND HANDLING

6.1 All samples must be collected according to the directions in Chapter Nine of this manual.

6.2 A 100-mL or 100-g representative sample is required for the test. If it is not possible to obtain a sample of 100 mL or 100 g that is sufficiently representative of the waste, the analyst may use larger size samples in multiples of 100 mL or 100 g, i.e., 200, 300, 400 mL or g. However, when larger samples are used, analysts shall divide the sample into 100-mL or 100-g portions and test each portion separately. If any portion contains free liquids, the entire sample is considered to have free liquids.

7.0 PROCEDURE

7.1 Assemble test apparatus as shown in Figure 1.

7.2 Place sample in the filter. A funnel may be used to provide support for the paint filter.

7.3 Allow sample to drain for 5 min into the graduated cylinder.

7.4 If any portion of the test material collects in the graduated cylinder in the 5-min period, then the material is deemed to contain free liquids for purposes of 40 CFR 264.314 and 265.314.

8.0 QUALITY CONTROL

8.1 Duplicate samples should be analyzed on a routine basis.

9.0 METHOD PERFORMANCE

9.1 No data provided.

10.0 REFERENCES

10.1 None required.

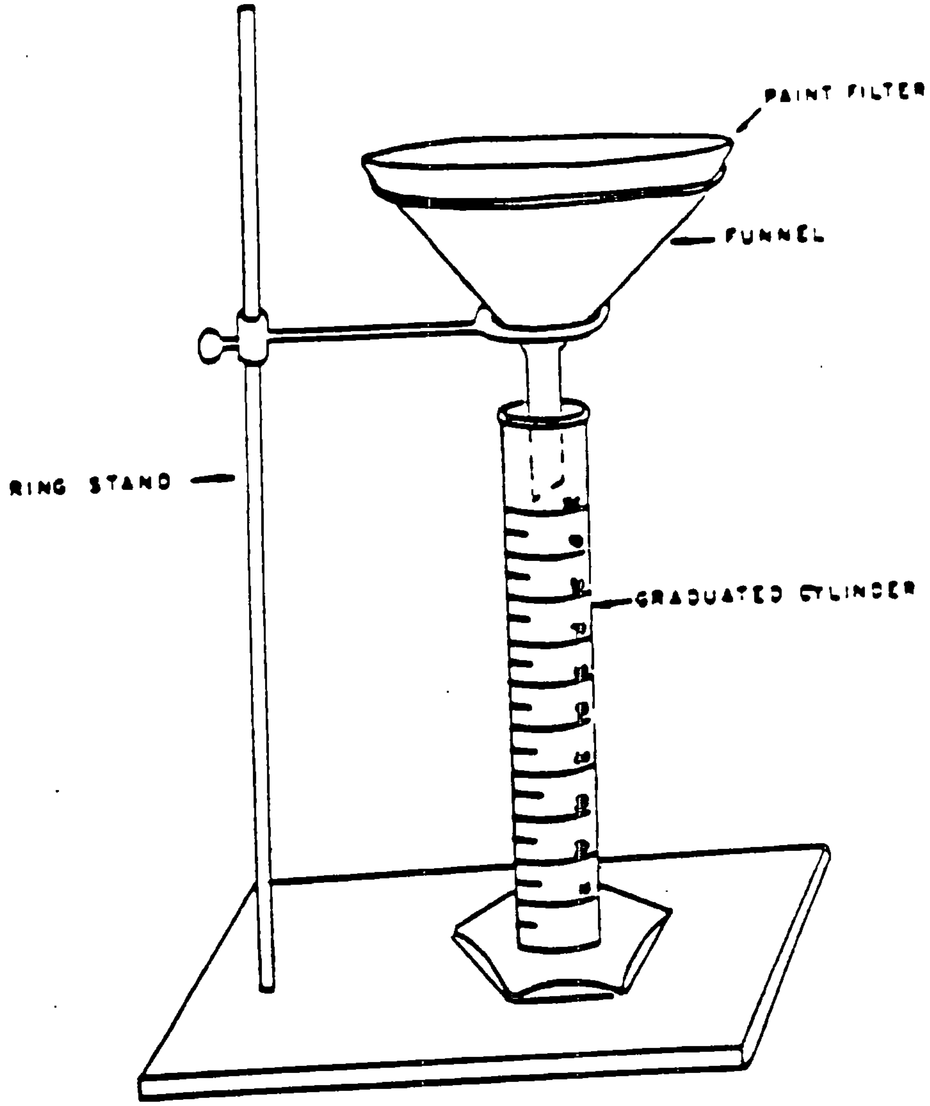
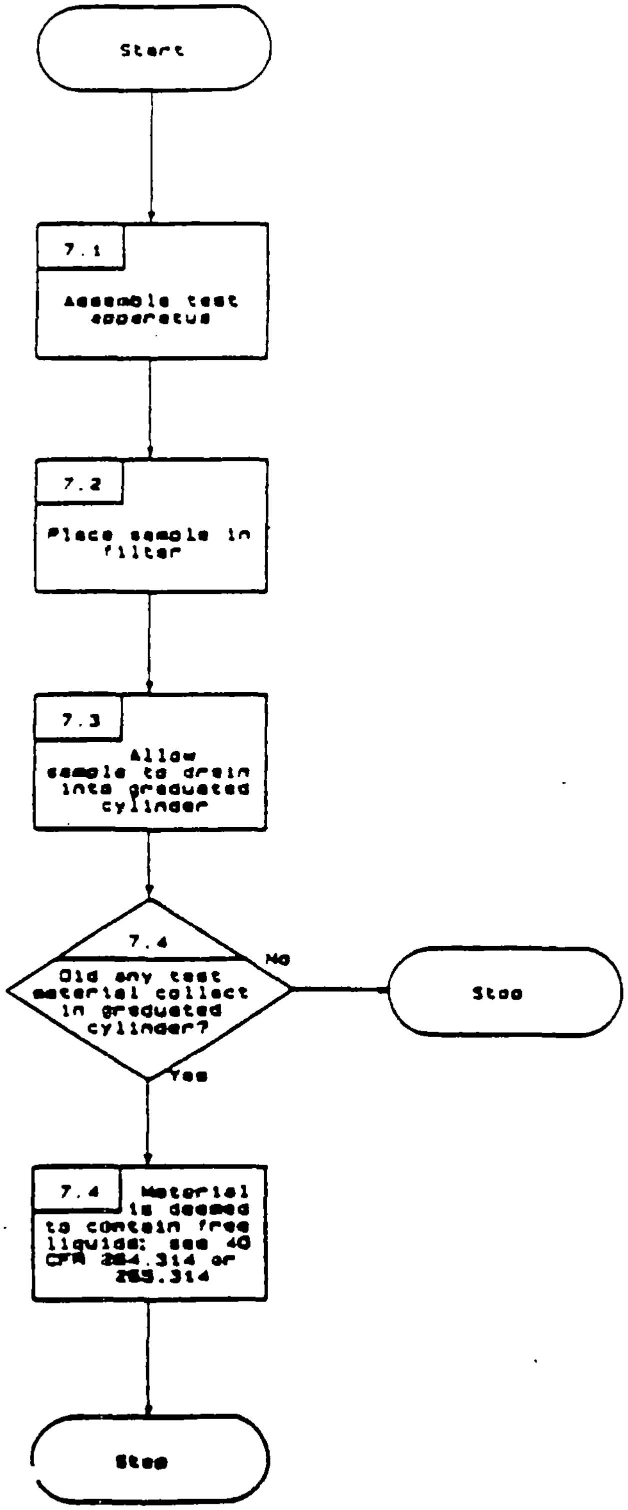


Figure 1. Paint filter test apparatus.

METHOD 9095
PAINT FILTER LIQUIDS TEST



ATTACHMENT C

ACCESS AGREEMENT MATTHEW PLECNIK PROPERTY

At the date of Report Release, the Access Agreement had not been executed by Matthew Plecnik.

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CRA
Consulting Engineers

CONESTOGA-ROVERS & ASSOCIATES LIMITED
651 Colby Drive.
Waterloo. Ontario. Canada N2V 1C2
(519) 884-0510

June 29, 1990

Reference No. 3480

Mr. Matthew Plecnik
6901 St. Clair
Cleveland, Ohio
U.S.A. 44103

FILE COPY

Dear Mr. Plecnik:

Re: Permission For Site Entry
Jadco-Hughes Remedial Investigation
Gaston County, NC

On behalf of the Jadco-Hughes Steering Committee, we request your permission to enter your property in Belmont, NC to conduct an interim remedial measure (IRM) involving the removal of PCB contaminated soil required under the terms of an Administrative Order by Consent (AO) between the Steering Committee and the United States Environmental Protection Agency (USEPA).

The property immediately to the west of your property in Belmont, NC (which is presently owned by the Fite family and hereafter referred to as "Site") is currently the subject of a Remedial Investigation/Feasibility Study (RI/FS) ordered by the USEPA pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The objective of the RI/FS is to assess the environmental impacts and health risks which the Site may pose in its present condition and the need for remedial actions, if any.

The RI/FS is being conducted by the Jadco-Hughes Steering Committee (Committee) which is comprised of a group of respondents to a separate USEPA AO. The Committee has retained Conestoga-Rovers & Associates (CRA) to implement the RI/FS and the IRMs on their behalf.

The RI Report, FS Report and Risk Assessment Report have been completed and submitted to the USEPA. The RI report identified an area of contaminated soils located along the southeast swale area which adjoins your property. The contaminated soils have been shown to extend onto portions of your property. USEPA and the Committee have determined that the most appropriate remedial action for the soil contamination which extends onto your property is to excavate the soil and properly dispose of it off site. The Committee would conduct this work under an administrative order being issued by EPA. Once the excavation was

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complete, your property would be backfilled and graded to its original contour with clean imported soil.

The removal action would involve the installation of temporary fences, the clearing of trees and vegetation for the known contaminated areas, excavation of the contaminated soils, verification of cleanup by sampling and analysis and backfilling and regrading of the excavated area. A permanent fence would then be installed along the existing property line. The known areas of contamination are shown on the attached Figure 1.

The Committee is seeking your permission to enter upon your property and conduct the work described above. Since this work will involve the removal of contaminated soil, it will provide significant benefit to you. Accordingly, the Committee believes that it is in your best interest to voluntarily permit the Committee to enter onto your property. If you are willing to permit access to the Committee and its contractor to enter on your property and conduct the work, please sign and date the copy of this letter and return it to us. An envelope and a Federal Express overnight courier weighbill have been provided for your convenience. To return the signed copy, please call Federal Express for pickup at your home.

Should you have any questions regarding this letter, please feel free to call us collect at (519) 884-0510. We look forward to receiving your signed agreement.

On behalf of the Jadco-Hughes Steering Committee,

Yours very truly,

CONESTOGA-ROVERS & ASSOCIATES

Stephen M. Quigley, P. Eng.
SMQ/cdd
Encl.
c.c. Mr. John Plecnik, 11 Spruce Pine, Belmont, N.C. 28012
Mr. Benton Leach, Uniroyal
Mr. Charles Tisdale, King & Spalding
Mr. Richard Shepherd, CRA
Mr. Ron Frehner, CRA

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June 29, 1990 Reference No. 3480

ACCESS AGREEMENT

I grant permission to the Jadco-Hughes Steering Committee, including its Contractors and representatives, and the USEPA and its representatives to enter my property in Belmont, NC to perform soil removal actions and associated excavating, sampling, fence construction and grading as required for the Interim Remedial Measure Administrative Order for the Jadco-Hughes Superfund Site.

Name: ______________________________

Date: ______________________________

cc: Mr. John Plecnik, 11 Spruce Pine, Belmont, NC. 28012
Mr. Warren Dixon, USEPA, Region IV
Mr. Reuben Bussey, USEPA, Region IV
Mr. Benton Leach, Uniroyal
Charles H. Tisdale, Esq., King & Spalding
Mr. Richard Shepherd, CRA
Mr. Mike Mateyk, CRA
Mr. Ron Frehner, CRA
Mr. Steve Quigley, CRA

ATTACHMENT D

MATERIAL SAFETY DATA SHEETS

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HAZARDOUS SUBSTANCE INFORMATION FORM

COMMON NAME: PCBs CHEMICAL NAME: Polychlorinated Biphenyls

I. PHYSICAL/CHEMICAL PROPERTIES

			REFERENCE
Natural physical state: Gas ______ Liquid X Solid ______ (at ambient temps of 20°C-25°C)			
Molecular weight		g/g-mole	
Density	1.44	g/ml	5.
Specific gravity	11.44 @ 30	°C	5.
Solubility: water	@	°F/°C	
Solubility: ______	@	°F/°C	
Boiling Point	340 - 375	°F	5.
Melting Point	NA	°F/°C	5.
Vapor Pressure	mmHG@	°F/°C	
Vapor Density	@	°F/°C	
Flash Point	348 - 356	°F/°C	1.
(open cup ______; closed cup ______)			
Other: ______			

II. HAZARDOUS CHARACTERISTICS

A.

TOXICOLOGICAL HAZARD		HAZARD?	CONCENTRATIONS (PEL, TLV, Other)	REFERENCE
Inhalation		Yes No	TLV = 0.5 mg/m3	3.
OSHA				
ACGIH	X			
NIOSH				
IDLH	5 mg/m3 (Arochlor 1254)			
TWAEV				
Ingestion		Yes		4.
Skin/eye absorption		Yes		4.
Skin/eye contact		Yes		4.
Carcinogenic		Yes No	Suspected	5.
Aquatic		Yes No		
Other: ______		Yes No		

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B.	TOXICOLOGICAL HAZARD	HAZARD?	CONCENTRATIONS	REFERENCE
	Combustibility	No		4
	Toxic by-product(s):	Yes		

Polychlorinated Dibenzo-p-Dioxins and Dibenzofurans upon Combustion

		HAZARD?	CONCENTRATIONS	REFERENCE
	Flammability	No		
	LFL			
	UFL			
	Explosivity	No		
	LEL			
	UEL			

C.	REACTIVITY HAZARD	HAZARD?	CONCENTRATIONS	REFERENCE
		No		
	Reactivities:			

D.	CORROSIVITY HAZARD	HAZARD?	CONCENTRATIONS	REFERENCE
		No		
	pH			
	Neutralizing agent:			

E.	RADIOACTIVE HAZARD	HAZARD?	CONCENTRATIONS	REFERENCE
	Background	No		
	Alpha particles	No		
	Beta particles	No		
	Gamma radiation	No		

III. TARGET ORGANS: skin, eyes, liver (2)

IV. INCOMPATIBILITIES: None expected at Site

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NOTES:

1. "The Merck Index. An encyclopedia of Chemicals and Drugs, Ninth Edition" Martha Windholz (ed.) Merck & Co. Inc. Rahway, N.J. (1976).

2. Sittig, M: "Handbook of Toxic and Hazardous Chemicals and Carcinogens, 2nd Edition". Noyes Publications, Park Ridge, N.J. (1985).

American Conference of Governmental Industrial Hygienists. "Threshold Limit Values and Biological Exposure Indices for 1986 - 1987".

4. U.S. Department of Health and Human Services "NIOSH Pocket Guide to Chemical Hazards", September 1985.

5. SAX, N.I.: "Dangerous Properties of Industrial Materials" Van Nostrand Reichold Company, New York (1984).

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CALEDON
LABORATORIES LTD
40 ARMSTRONG AVENUE, GEORGETOWN, ONTARIO, CANADA L7G 4R9
416-877-0101
FAX: 416-877-6666

MATERIAL SAFETY DATA SHEET ACETONE

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: *Acetone*

Chemical Family: *Ketone*

Chemical Formula: CH_3COCH_3

Product Use: *Laboratory Solvent*

Manufacturer's Name: *Caledon Laboratories Ltd.*

Street Address: *40 Armstrong Avenue*

City: *Georgetown*

Province: *Ontario*

Postal Code: *L7G 4R9*

Telephone No: *(416) 877-0101*

Emergency Telephone No.: *CANUTEC (613) 996-6666*

HAZARDOUS INGREDIENTS OF MATERIALS

Ingredients	*%*	*TLV Units*	*CAS No.*
Acetone	*99*	*50 ppm*	*67-64-1*

PHYSICAL DATA

Physical State: *Liquid*

Odour and Appearance: *Colourless, mobile liquid with a mild odour*

Odour Threshold (ppm): *40 ppm*

Vapour Pressure (mm Hg): *181 at 20°C*

Vapour Density (Air = 1): *2*

Evaporation Rate: *5.6 (n-Butyl Acetate = 1)*

Boiling Point (°C): *57°C*

Freezing Point (°C): *-94.3°C*

pH: *Not Available*

Specific Gravity: *0.791*

Coefficient of Water/Oil distribution: *Not Applicable*

SHIPPING DESCRIPTION

PIN: *1090*

T.D.G. Class: *3.1*

Pkg. Group: *II*

REACTIVITY DATA

Chemical Stability: *Stable*

Incompatibility with other substances: *Strong oxidizers*

Reactivity: *High temperatures, sparks, open flames, and other ignition sources*

Hazardous Decomposition Products: *CO, CO2*

FIRE AND EXPLOSION DATA

Flammability: *Flammable*

Extinguishing Media: *Alcohol-type foam for large fires. Carbon dioxide or dry chemicals for small fires*

Flash Point (Method Used): *-18.0°C (TOC)*

Autoignition Temperature: *537°C*

Upper Flammable Limit (% by volume): *12.8*

Lower Flammable Limit (% by volume): *2.6*

Hazardous Combustion Products: *CO, CO_2*

Sensitivity to Impact: *Not Available*

Sensitivity to Static discharge: *Not Available*

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:

LD_{50}: *(oral, rat) 5,800 - 10,700 mg/kg*

LC_{50}: *(inhalation, rat) 16,000 - 42,000 ppm*

Effects of Acute Exposure to Product:

Inhaled: *Irritation of eyes, nose and throat. May cause respiratory tract irritation and CNS depression.*

In contact with skin: *Direct contact with vapour, mist or liquid may cause defatting, drying and cracking of the skin.*

In contact with eyes: *Liquid is a severe irritant; may cause corneal damage and conjunctivitis. Vapour is an irritant; may cause corneal damage and photophobia.*

Ingested: *Burning sensation in mouth and throat. May cause irritation of upper respiratory tract.*

Effects of Chronic Exposure to Product:

Carcinogenicity: *Not listed as a carcinogen*

Teratogenicity: *No information available*

Reproductive Effects: *No information available*

Mutagenicity: *No information available*

Synergistic Products: *None known*

PREVENTIVE MEASURES

Engineering Controls: *Local exhaust ventilation*

Respiratory Protection: *An air-purifying respirator equipped with organic vapour cartridges for concentrations up to 1000 ppm. Air-supplied respirator for higher or unknown concentrations.*

Eye Protection: *Chemical goggles.*

Skin Protection: *Butyl Rubber Gloves*

Other Personal Protective Equipment: *Impermeable apron, boots, and overalls*

Leak and Spill Procedure: *For small spills, contain with absorbent. For large spills, evacuate area; provide maximum ventilation and protect from ignition.*

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ANTIMONY
ANTIMONY
ANTIMONY

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
112 COLONNADE ROAD
NEPEAN, ONTARIO
K2E 7L6
(613)226-3874

EMERGENCY CONTACT:
REGULATORY AFFAIRS OFFICER
(613)226-8874

DATE 07/20/89

ACCT: 17371-00

CAT NO: A845500

PURCHASE ORDER NUMBER

N/A. SPECIAL CUSTOMER REQUEST.

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7440-36-0

SUBSTANCE: **ANTIMONY**

TRADE NAMES/SYNONYMS:
ANTIMONY BLACK; ANTIMONY REGULUS; STIBIUM; ANTIMONY POWDER;
ANTIMONY ELEMENT; C.I. 77050; UN 2871; A-845; A-846; ACC01610

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: SB

MOLECULAR WEIGHT: 121.75

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=2 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=2 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: **ANTIMONY** PERCENT: 100

OTHER **CONTAMINANTS: NONE**

EXPOSURE **LIMITS:**
ANTIMONY:
0.5 MG/M3 OSHA TWA
0.5 MG/M3 ACGIH TWA
0.5 MG/M3 NIOSH RECOMMENDED 10 HOUR TWA

5000 POUNDS CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING

PHYSICAL DATA

DESCRIPTION: SILVERY-WHITE LUSTROUS METAL. BOILING POINT: 3182 F (1750 C)

MELTING POINT: 1202 F (630 C) SPECIFIC GRAVITY: 6.684

VAPOR PRESSURE: 1 MMHG @ 1627 F SOLUBILITY IN WATER: INSOLUBLE

SOLVENT SOLUBILITY: SOLUBLE IN AMMONIUM SULFIDE, HOT SULFURIC ACID

HARDNESS: 3-3.5 MOHS
AUTOIGNITION TEMPERATURE: 788 F (420 C) (CLOUD); 626 F (330 C) (DUST LAYER)

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
MODERATE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

LOWER EXPLOSIVE LIMIT: 0.42 OZ/FT3

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR ALCOHOL FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR ALCOHOL FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. COOL FIRE-EXPOSED CONTAINERS WITH WATER FROM SIDE UNTIL WELL AFTER FIRE IS OUT. STAY AWAY FROM STORAGE TANK ENDS. FOR MASSIVE FIRE IN STORAGE AREA, USE UNMANNED HOSE HOLDER OR MONITOR NOZZLES, ELSE WITHDRAW FROM AREA AND LET FIRE BURN. WITHDRAW IMMEDIATELY IN CASE OF RISING SOUND FROM VENTING SAFETY DEVICE OR ANY DISCOLORATION OF STORAGE TANK DUE TO FIRE (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 26).

EXTINGUISH USING AGENT SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING VAPORS AND DUSTS. KEEP UPWIND.

TOXICITY

ANTIMONY:
7 GM/KG ORAL-RAT LD50; 100 MG/KG INTRAPERITONEAL-RAT LD50; 90 MG/KG INTRAPERITONEAL-MOUSE LD50; 150 MG/KG INTRAPERITONEAL-GUINEA PIG LD50; TUMORIGENIC DATA (RTECS).
CARCINOGEN STATUS: NONE.

ANTIMONY IS AN EYE, SKIN, AND MUCOUS MEMBRANE IRRITANT. POISONING MAY AFFEC THE RESPIRATORY AND CARDIOVASCULAR SYSTEMS, LIVER, AND KIDNEYS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
ANTIMONY:
IRRITANT.

80 MG/M3 IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- INHALATION OF ANTIMONY OR ITS COMPOUNDS MAY CAUSE IRRITATION OF THE RESPIRATORY AND GASTROINTESTINAL TRACTS, SORE THROAT, SHALLOW RESPIRATION, DIZZINESS, WEIGHT LOSS, GINGIVITIS, ANEMIA, EOSINOPHELIA, AND INHIBITION OF SOME ENZYME SYSTEMS, SUCH AS PROTEIN OR CARBOHYDRATE METABOLISM. PULMONARY CONGESTION AND EDEMA AND DEATH DUE TO RESPIRATORY OR CURCULATORY FAILURE MAY OCCUR. PATHOLOGIC FINDINGS INCLUDE ACUTE CONGESTION OF THE HEART, LIVER, AND KIDNEYS. METAL FUME FEVER, AN INFLUENZA-LIKE ILLNESS, MAY OCCUR DUE TO THE INHALATION OF FRESHLY FORMED METAL OXIDE PARTICLES SIZED BELOW 1.5 MICRONS AND USUALLY BETWEEN 0.02-0.05 MICRONS. SYMPTOMS MAY BE DELAYED 4-12 HOURS AND BEGIN WITH A SUDDEN ONSET OF THIRST AND A SWEET, METALLIC OR FOUL TASTE IN THE MOUTH. OTHER SYMPTOMS MAY INCLUDE UPPER RESPIRATORY TRACT IRRITATION ACCOMPANIED BY COUGHING AND A DRYNESS OF THE MUCOUS MEMBRANES, LASSITUDE, AND A GENERALIZED FEELING OF MALAISE. FEVER, CHILLS, MUSCULAR PAIN, MILD TO SEVERE HEADACHE, NAUSEA, OCCASIONAL VOMITING, EXAGGERATED MENTAL ACTIVITY, PROFUSE SWEATING, EXCESSIVE URINATION, DIARRHEA, AND PROSTRATION MAY ALSO OCCUR. TOLERANCE TO FUMES DEVELOPS RAPIDLY, BUT IS QUICKLY LOST. ALL SYMPTOMS USUALLY SUBSIDE WITHIN 24-36 HOURS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED INHALATION OF ANTIMONY OR ITS COMPOUNDS MAY CAUSE STOMATITIS, DRY THROAT, METALLIC TASTE, GINGIVITIS, SEPTAL AND LARYNGEAL PERFORATION, LARYNGITIS, HEADACHE, DYSPNEA, INDIGESTION, NAUSEA, VOMITING, DIARRHEA, ANOREXIA, ANEMIA, WEIGHT LOSS, PAIN OR TIGHTNESS IN THE CHEST, SLEEPLESSNESS, MUSCULAR PAIN AND WEAKNESS, DIZZINESS, PHARYNGITIS, BRONCHITIS, AND PNEUMONITIS. DEGENERATIVE CHANGES OF THE LIVER AND KIDNEYS MAY OCCUR LATER. BENIGN PNEUMOCONIOSIS AND OBSTRUCTIVE LUNG DISEASES HAS BEEN REPORTED IN WORKERS. WOMEN MAY BE MORE SUSCEPTIBLE TO THE SYSTEMIC EFFECTS OF EXPOSURE. ANTIMONY CROSSES THE PLACENTA, IS PRESENT IN AMNIIONIC FLUID, AND IS EXCRETED IN HUMAN MILD. A STUDY REPORTED AN INCREASED INCIDENCE OF SPONTANEOUS LATE ABORTIONS, PREMATURE BIRTHS, AND GYNECOLOGICAL PROBLEMS AMONG FEMALE ANTIMONY SMELTER WORKERS. AN EXCESS OF DEATHS FROM LUNG CANCER HAS BEEN REPORTED IN SMELTER WORKERS WITH MORE THAN 7 YEARS EXPOSURE TO RELATIVELY HIGH LEVELS OF ANTIMONY DUST AND FUMES. ANIMAL STUDIES INDICATE THAT ANTIMONY DUST CAUSES PATHOLOGICAL CHANGES IN CARDIAC MUSCLE AND MAY INDUCE INTERSTITIAL PNEUMONITIS AND ENDOGENOUS LIPOID PNEUMONIA. AS EVALUATED BY RTECS, ADMINISTRATION TO RATS BY INHALATION RESULTED IN A STATISTICALLY SIGNIFICANT INCREASSE IN THE INCIDENCE OF CARCINOGENIC TUMORS OF THE LUNGS AND THORAX.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
ANTIMONY:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT WITH DUSTS FROM ANTIMONY OR ITS COMPOUNDS MAY CAUSE IRRITATION WITH ITCHING.

CHRONIC EXPOSURE- REPEATED OR PROLONGED CONTACT WITH ANTIMONY OR ITS COMPOUNDS MAY CAUSE ITCHING SKIN, PAPULES AND PUSTULES AROUND SWEAT AND SEBACEOUS GLANDS, BUT RARELY AROUND THE FACE, AND DERMATITIS. PROLONGED EXPOSURE BY ANTIMONY SMELTER WORKERS RESULTED IN SKIN RASHES ON FOREARMS AND THIGHS RESEMBLING CHICKEN POX PUSTULES.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO

EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
ANTIMONY:
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT WITH DUST OR FUMES MAY CAUSE IRRITATION AND INFLAMMATION OF THE CORNEA.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
ANTIMONY:

ACUTE EXPOSURE- INGESTION OF ANTIMONY OR ITS COMPOUNDS MAY CAUSE VIOLENT IRRITATION OF THE NOSE, THROAT, STOMACH, AND INTESTINES, NAUSEA, VOMITING, SEVERE DIARRHEA WITH MUCOUS AND LATER WITH BLOOD, SLOW AND SHALLOW RESPIRATION, AND LOW BLOOD PRESSURE. HEMORRHAGIC NEPHRITIS AND HEPATITIS MAY OCCUR CONCOMITANTLY OR FOLLOW LATER. PULMONARY CONGESTION AND EDEMA, COMA, AND DEATH FROM CIRCULATORY OR RESPIRATORY FAILURE MAY OCCUR.

CHRONIC EXPOSURE- REPEATED OR PROLONGED INGESTION OF ANTIMONY OR ITS COMPOUNDS MAY CAUSE SORES IN THE MOUTH AND THROAT, DRY THROAT, GINGIVITIS, LARYNGITIS, HEADACHE, INDIGESTION, NAUSEA, VOMITING, DIARRHEA, ANOREXIA, ANEMIA, WEIGHT LOSS, SLEEPLESSNESS, AND DIZZINESS. DEGENERATIVE LIVER AND KIDNEY CHANGES MAY OCCUR LATER. WOMEN MAY BE MORE SUSCEPTIBLE TO THE SYSTEMIC EFFECTS FROM ANTIMONY EXPOSURE. ANTIMONY CROSSES THE PLACENTA, IS PRESENT IN AMNIONIC FLUID, AND IS EXCRETED IN HUMAN MILK.

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.) ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AND ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

ANTIMONY POISONING:
ADMINISTER DIMERCAPROL, 3 MG/KG (OR 0.3 ML/10 KG) EVERY 4 HOURS FOR THE FIRST 2 DAYS AND THEN 2 MG/KG EVERY 12 HOURS FOR A TOTAL OF 10 DAYS. DIMERCAPROL IS AVAILABLE AS A 10% SOLUTION IN OIL FOR INTRAMUSCULAR ADMINISTRATION (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
ANTIMONY:

ACIDS: MODERATE TO VIOLENT REACTION.

ALKALINE NITRATES: EXPLOSIVE REACTION POSSIBLE.
ALUMINUM (POWDERED): VIOLENT REACTION ON HEATING.
AMMONIUM NITRATE: EXPLOSIVE REACTION WITH POWDERED ANTIMONY.
AQUA REGIA: READILY ATTACKS ANTIMONY.
BROMINE: SPONTANEOUS IGNITION.
BROMINE PENTAFLUORIDE: CONTACT AT AMBIENT OR SLIGHTLY ELEVATED TEMPERATURES MAY RESULT IN VIOLENT IGNITION.
BROMINE TRIFLUORIDE: VIOLENT REACTION WITH INCANDESCENCE.
BROMOAZIDE: EXPLOSION ON CONTACT.
CHLORIC ACID: FORMS EXPLOSIVE COMPOUND.
CHLORINE (GAS): SPONTANEOUS IGNITION.
CHLORINE (LIQUID): SPONTANEOUS IGNITION AT 33 C.
CHLORINE MONOXIDE (GAS): VIOLENT EXPLOSION ON CONTACT.
CHLORINE TRIFLUORIDE: CONTACT AT AMBIENT OR SLIGHTLY ELEVATED TEMPERATURES MAY RESULT IN VIOLENT IGNITION.
DICHLORINE OXIDE: EXPLOSION ON CONTACT.
DISULFUR DIBROMIDE: VIOLENT REACTION WITH FINELY DIVIDED ANTIMONY.
FLUORINE: SPONTANEOUS IGNITION.
HALOGENATED ACIDS: INCOMPATIBLE.
IODINE: IGNITION REACTION; LARGE AMOUNTS MAY RESULT IN EXPLOSION.
IODINE PENTAFLUORIDE: INCANDESCENT REACTION.
NITRATE SALTS: VIGOROUS OR VIOLENT REACTION.
NITRIC ACID: VIOLENT REACTION WITH FINELY DIVIDED ANTIMONY.
NITROSYL FLUORIDE: INCANDESCENT REACTION.
OXIDIZERS: MODERATE TO VIOLENT REACTION.
PERCHLORIC ACID: HAZARDOUS REACTION WITH TRIVALENT ANTIMONY.
PEROXIDES (MIXTURES): MAY REACT EXPLOSIVELY.
POTASSIUM DIOXIDE: OXIDATION REACTION WITH INCANDESCENCE.
POTASSIUM NITRATE: EXPLOSIVE REACTION WITH POWDERED ANTIMONY.
POTASSIUM PERMANGANATE: IGNITES ON GRINDING IN MORTAR.
POTASSIUM PEROXIDE: FORMATION OF EXPLOSIVE MIXTURE.
SELENINYL CHLORIDE: IGNITION ON CONTACT WITH POWDERED ANTIMONY.
SODIUM NITRATE: EXPLOSIVE REACTION WITH POWDERED ANTIMONY.
SODIUM PEROXIDE: FORMATION OF EXPLOSIVE MIXTURE ON HEATING.
SULFURIC ACID: READILY ATTACKED.

DECOMPOSITION:
ANTIMONY:
MAY RELEASE TOXIC STIBINE GAS UNDER THERMAL DECOMPOSITION. STIRRED ANTIMONY HALIDE YIELDS EXPLOSIVE ANTIMONY.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

12.5 MG/M3- ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.

25 MG/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND A HIGH-EFFICIENCY PARTICULATE FILTER.
5 9 260 ANY SUPPLIED-AIR RESPIRATOR WITH A TIGHT-FITTING FACEPIECE OPERATED IN A CONTINUOUS FLOW MODE.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.

80 MG/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A HALF-MASK AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.
ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

AUTHORIZED - FISHER SCIENTIFIC
CREATION DATE: 09/11/84 REVISION DATE: 03/15/89

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DISPOSAL

DISPOSAL MUST BE IN ACCORDANCE WITH STANDARDS APPLICABLE TO GENERATORS OF HAZARDOUS WASTE, 40 CFR 262. EPA HAZARDOUS WASTE NUMBER D001.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

REPORTABLE QUANTITY (RQ): 5000 POUNDS
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE OF THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN THE METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS; OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION.

ANTIMONY AND COMPOUNDS (AS SB):

FOR DUST OR MIST:
5 MG/M3- ANY DUST AND MIST RESPIRATOR, EXCEPT SINGLE USE AND QUARTER-MASK RESPIRATORS.

12.5 MG/M3- ANY POWERED AIR-PURIFYING RESPIRATOR WITH A DUST AND MIST FILTER.

FOR DUST, MIST OR FUME:
5 MG/M3- ANY SUPPLIED-AIR RESPIRATOR.
ANY SELF-CONTAINED BREATHING APPARATUS.

5 9 262

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN STREET
SCHENECTADY, NY 12303-1836 USA
(518) 377-8855

NO. 59

BERYLLIUM
METAL/POWDER

Date April 1980

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: BERYLLIUM METAL/POWDER
OTHER DESIGNATIONS: Glucinium, Glucinum, Be, CAS #007 440 417
MANUFACTURER: Material is available from several suppliers, including:

CERAC, Inc.
P.O. Box 1178
Milwaukee, WI 53201
Phone: (414) 289-9800

Brush Wellman
Metal & Oxide Div.
Elmore, OH 43416
Phone: (419) 862-2745

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Beryllium Beryllium Oxide	> 97 < 3	8-hr TWA 2 μg/m³*(as Be) Ceiling Level 5 μg/m³ Peak 25 μg/m³/30 min
*Current (1979) OSHA and ACGIH TLV. In 1975 OSHA proposed an 8-hr TWA of 1 μg/m³ with a ceiling of 5 μg/m³ (15 min. sample); OSHA believes that beryllium and its compounds should be treated as a carcinogenic threat to man. (The proposed OSHA standard is still under review, but is expected to issue in 1980.)		Human, inhalation TCLo 300 mg/m³, pulmonary effects Rabbit, intravenous TDLo 20 mg/kg, neoplastic effects

SECTION III. PHYSICAL DATA

Boiling point at 1 atm, deg C —— 2970
Vapor pressure at 1910 C, mm Hg —— 7.6
Water solubility, hot water —— Slight
cold water —— Insol.
Specific gravity at 20 C ———— 1.848
Melting point, deg C ———— 1278±5
Atomic weight ———— 9.01

Appearance & Odor: A grayish-white metal (hexagonal crystal structure) also as powdered metal; no odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
N/A	Powder ca. 1200 F	Dust explosion hazard		

Extinguishing Media: Do not use water or CO_2. Smother fire with approved dry powder extinguisher.* Beryllium can be a moderate fire hazard if exposed to flame. The hazard increases as particle size decreases. A cloud of Be dust in air can be explosive (areas where dusting may occur require Class II, Group E electrical services, 29 CFR 1910.309). Combustion products of this material are highly toxic.
Firefighters should use full protective clothing, eye protection, and self-contained breathing apparatus. After exposure to a beryllium fire, they should clean equipment and clothing thoroughly and bathe carefully. *Sand, graphite, powder, and sodium chloride have also been recommended.

SECTION V. REACTIVITY DATA

Beryllium is stable at room temperature and resists oxidation at ordinary temperatures.* When heated in air or in mixed CO_2 and nitrogen, it can be ignited.
It is acid and alkali soluble; it reacts with strong bases to evolve hydrogen.
Mixtures of the powdered metal with CCl_4 or trichloroethylene will flash on heavy impact.
Warm beryllium will react incandescently with phosphorus, fluorine or chlorine.
Molten lithium metal (180 C) severely attacks beryllium metal.

*Will form oxide on solid surfaces when moist.

NO. 59

SECTION VI. HEALTH HAZARD INFORMATION

TLV 2 ug/m^3 (See Sect. II)

Be is highly toxic by inhalation of fume or dust. Prolonged or repeated skin contact can cause skin irritation or dermatitis. Eye contact can produce conjunctivitis.

Implantation under the skin (via a chip or sliver or by particles entering a wound) can produce hard lesions with central non-healing areas which must be surgically removed.

Acute inhalation can produce pneumonitis with non-productive cough, chest pain, shortness of breath, weakness, and pulmonary edema. Chronic exposures can produce berylliosis (progressive lung damage) and systemic beryllium disease, including pneumonitis (as above), joint pain, skin lesions, chills & fever, & damage to liver, spleen & heart.

Present studies have indicated that Be is so poorly absorbed through the gut that ingestion is not an important hazard. (Hamilton, Industrial Toxicology, 3rd Edition). Animal studies have shown beryllium to produce lung and bone tumors; it is a suspected carcinogen for man.

FIRST AID:

Eye Contact: Flush eyes thoroughly with running water for 15 minutes, including under the eyelids. Get medical attention.

Skin Contact: Wash affected area thoroughly with soap and water after removing contaminated clothing. If skin is broken, get medical attention.

Inhalation: Remove to fresh air. Restore breathing and support with oxygen as needed. Keep warm and at rest. Get medical attention.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

If powdered metal is spilled, notify safety personnel. Exclude all from area except clean-up personnel with protective equipment against contact or inhalation hazards. Provide ventilation and remove sources of heat or ignition. Pick up powder spills by methods such as vacuuming or wet mopping; prevent dusting conditions. Collect particulate scrap in sealed container for recovery or disposal.

DISPOSAL: Scrap or waste material disposal is best accomplished by arranging to return to the supplier in a mutually acceptable form. Beryllium waste unsuitable for recycle must be handled in accordance with Federal, State, and Local regulations. Burying in an approved landfill, or burning in an approved incinerator with a scrubber, followed by burying the residues in an approved landfill, have been used in the past.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Isolate workplaces where beryllium dust and fume are generated. Provide adequate general and local exhaust ventilation (with filtration to purify recycled air and to protect the external environment) to meet TLV requirements. Provide approved respirators for emergency and nonroutine use above the TLV: High efficiency filter masks are suitable as high as 50 μg/m^3; use air-supplied or self-contained respirators above 50 μg/m^3. A full-facepiece respirator is needed above 10 μg/m^3.

Workers may require body-covering protective clothing, gloves and safety goggles. When exposed above the TLV, a change of clean protective clothing and a shower at the end of the day is required. (Wash protective clothing with suitable protection for the launderer.) Avoid carrying beryllium particulate outside the workplace on hair or clothing.

Eyewash stations and safety showers should be available.

Monitor the workplace to properly determine and control exposure to beryllium.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Use only with adequate ventilation where Be can become airborne. When Be or its alloys is heated (as in welding or sintering processes) hazardous levels of fume can be generated. Store in clean, dry place away from incompatible materials (see Sect V) in low fire-hazard area. Protect containers from physical damage. Label clearly.

Use good housekeeping practices to prevent accumulation of Be-containing deposits. Give preplacement and annual medical exams to those who may be exposed above the TLV. Preclude from exposure those with pulmonary disease, chronic skin, liver, heart, or kidney conditions, abnormal chest X-ray or blood count, or vital capacity depression greater than 10% Provide worker training.

DOT Classification of powder - POISON B.

DATA SOURCE(S) CODE: 1-12, 18-20, 24-26

APPROVALS: MIS, CRD

Industrial Hygiene and Safety 4.21.80

MEDICAL REVIEW: 5/5/80

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CALEDON
LABORATORIES LTD
416-877-0101
40 ARMSTRONG AVENUE, GEORGETOWN, ONTARIO, CANADA L7G 4R9
FAX:416-877-6666

MATERIAL SAFETY DATA SHEET DICHLOROMETHANE

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: *Dichloromethane; Methylene Chloride*

Chemical Family: *Chlorinated Hydrocarbon*

Chemical Formula: CH_2Cl_2

Product Use: *Laboratory Solvent*

Manufacturer's Name: *Caledon Laboratories Ltd.*

Street Address: *40 Armstrong Avenue*

City: *Georgetown*

Province: *Ontario*

Postal Code: *L7G 4R9*

Telephone No: *(416) 877-0101*

Emergency Telephone No.: *CANUTEC (613) 996-6666*

HAZARDOUS INGREDIENTS OF MATERIALS

Ingredients	*%*	*TLV Units*	*CAS No.*
Methylene Chloride	*99*	*100 ppm*	*75-09-2*

PHYSICAL DATA

Physical State: *Liquid*

Odour and Appearance: *Clear, colourless liquid. Penetrating ether-like odour*

Odour Threshold (ppm): *25 - 50 ppm*

Vapour Pressure (mm Hg): *355 mm Hg. at 20°C*

Vapour Density (Air = 1): *2.93*

Evaporation Rate: *0.62 (n-Butyl Acetate = 1)*

Boiling Point (°C): *39.8°C*

Freezing Point (°C): *-96.7°C*

pH: *Not Applicable*

Specific Gravity: *1.32*

Coefficient of Water/Oil distribution: *No Data*

SHIPPING DESCRIPTION

PIN: *1593*

T.D.G. Class: *9.2*

Pkg. Group: *III*

REACTIVITY DATA

Chemical Stability: *Stable*

Incompatibility with other substances: *Avoid amines and aluminum.*

Reactivity: *Hydrolysis producing small amounts of hydrochloric acid possible with gross water contamination. Avoid open flames, sparks or other high temperature sources.*

Hazardous Decomposition Products: *At high temperatures, decomposition occurs to give off HCl vapour and small quantities of other toxic vapours.*

FIRE AND EXPLOSION DATA

Flammability: *Non-flammable*

Extinguishing Media: *Water Fog*

Flash Point (Method Used): *None (TOC, TCC, COC)*

Autoignition Temperature: *1139°C*

Upper Flammable Limit (% by volume): *23%*

Lower Flammable Limit (% by volume): *13%*

Hazardous Combustion Products: *Emits phosgene gas and other toxic vapours*

Sensitivity to Impact: *No Data*

Sensitivity to Static discharge: *No Data*

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:

LD_{50}: *(oral, rat) 2136 mg/kg*

LC_{50}: *(inhalation, guinea pig) 5000 ppm for 2 hours*

Effects of Acute Exposure to Product:

Inhaled: *Minimal anesthetic or narcotic effects may be seen in the range of 500-1000 ppm methylene chloride. Progressively higher levels over 1000 ppm can cause dizziness, drunkenness.*

In contact with skin: *Prolonged exposure may cause skin irritation. Prolonged exposure may cause drying or flaking of skin. Extensive skin contact (such as immersion) may cause a burning sensation followed by a cold,numb feeling which subsides after contact.*

In contact with eyes: *May cause pain, moderate eye irritation and slight corneal injury. Vapours may irritate eyes.*

Ingested: *Single dose oral toxicity is low. The oral LD_{50} for rats is 1500 - 2500 mg/kg.*

Effects of Chronic Exposure to Product:

Carcinogenicity: *Increases the rate of malignant tumour formation in mice.*

Teratogenicity: *Effects were seen in fetus formation only at doses which caused toxic effects to mother.*

Reproductive Effects: *Does not interfere with reproduction in animals.*

Mutagenicity: *Negative results have been obtained in mutagenicity tests using mammalian cells.*

Synergistic Products: *None known*

PREVENTIVE MEASURES

Engineering Controls: *Use local exhaust ventilation, if necessary.*

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LEAD
LEAD
LEAD

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC
112 COLONNADE ROAD
NEPEAN, ONTARIO
K2E 7L6
(613)226-8874

EMERGENCY CONTACT:
REGULATORY AFFAIRS OFFICER
(613)226-8874

DATE 08/12/87

ACCT: 17371-00

CAT NO: L24500

PURCHASE ORDER NUMBER

N/A. SPECIAL CUSTOMER REQUEST.

SUBSTANCE IDENTIFICATION

CAS-NUMBER 7439-92-1

SUBSTANCE: **LEAD**

TRADE NAMES/SYNONYMS:
C.I. PIGMENT METAL 4; C.I. 77575; LEAD FLAKE; KS-4; LEAD S 2; SI; SO; PLUMBUM; SO; PB-S 100; LEAD ELEMENT; L-18; L-24; L-29; L-27; T-134; PB; ACC12510

CHEMICAL FAMILY:
METAL

MOLECULAR FORMULA: PB

MOLECULAR WEIGHT: 207.19

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=3
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: LEAD PERCENT: 99.3

OTHER CONTAMINANTS: BISMUTH, COPPER, ARSENIC, ANTIMONY, TIN, IRON, SILVER, ZINC

EXPOSURE LIMITS:
LEAD, INORGANIC FUMES AND DUST (AS PB):
50 UG(PB)/M3 OSHA 8 HOUR TWA
30 UG(PB)/M3 OSHA 8 HOUR TWA ACTION LEVEL
IF AN EMPLOYEE IS EXPOSED TO LEAD FOR MORE THAN 8 HOURS PER DAY THE FOLLOWING FORMULA IS USED:
MAXIMUM PERMISSIBLE LIMIT (IN UG/M3)= 400 DIVIDED BY HOURS WORKED IN THE D
0.15 MG(PB)/M3 ACGIH TWA
<0.10 MG(PB)/M3 NIOSH RECOMMENDED 10 HOUR TWA

1 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY
WARNING AND RELEASE REQUIRMENTS- (FEBRUARY 27, 1987)

PHYSICAL DATA

DESCRIPTION: BLUISH-WHITE, SILVERY GRAY, HEAVY, MALLEABLE METAL

BOILING POINT: 3164 F (1740 C)   MELTING POINT: 622 F (328 C)

SPECIFIC GRAVITY: 11.3   VAPOR PRESSURE: 1.3 MMHG @ 970 C

SOLUBILITY IN WATER: INSOLUBLE

SOLVENT SOLUBILITY: SOLUBLE IN NITRIC ACID, HOT CONCENTRATED SULFURIC ACID

HARDNESS: 1.5 MOHS

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLIGIBLE FIRE HAZARD IN METALLIC FORM; HOWEVER, POSSIBLE FIRE AND EXPLOSION HAZARD IN DUST FORM WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
NO ACUTE HAZARD. MOVE CONTAINER FROM FIRE AREA IF POSSIBLE. AVOID BREATHING VAPORS OR DUSTS; KEEP UPWIND.

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TOXICITY

LEAD:
450 MG/KG/6 YEAR ORAL-WOMAN TDLO; 10 UG/M3 INHALATION-HUMAN TCLO; 1000 MG/KG INTRAPERITONEAL-RAT LDLO; 160 MG/KG ORAL-PIGEON LDLO; MUTAGENIC DATA (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS).
CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B FOR INORGANIC LEAD COMPOUNDS). RENAL TUMORS WERE PRODUCED IN ANIMALS BY LEAD ACETATE, SUBACETATE AND PHOSPHATE GIVEN ORALLY, SUBCUTANEOUSL OR INTRAPERITONEALLY. NO EVALUATION COULD BE MADE OF THE CARCINOGENICITY OF POWDERED LEAD.
LEAD IS A NEUROTOXIN, NEPHROTOXIN, TERATOGEN, AND A CUMULATIVE POISON WHICH MAY ALSO AFFECT THE BLOOD, HEART, ENDOCRINE, AND IMMUNE SYSTEMS. PERSONS

WITH NERVOUS SYSTEM OR GASTROINTESTINAL DISORDERS, ANEMIA, OR CHRONIC BRONCHITIS MAY BE AT AN INCREASED RISK FROM EXPOSURE.

HEALTH EFFECTS AND FIRST AID

INHALATION:

LEAD:

NEUROTOXIN/NEPHROTOXIN/TERATOGEN.

ACUTE EXPOSURE- INHALATION OF LARGE AMOUNTS OF LEAD MAY CAUSE A METALLIC TASTE, THIRST, A BURNING SENSATION IN THE MOUTH AND THROAT, SALIVATION, ABDOMINAL PAIN WITH SEVERE COLIC, VOMITING, BLOODY DIARRHEA, CONSTIPATI FATIGUE, SLEEP DISTURBANCES, DULLNESS, RESTLESSNESS, IRRITABILITY, MEMOR LOSS, LOSS OF CONCENTRATION, DELIRIUM, OLIGURIA OFTEN WITH HEMATURIA AN ALBUMINURIA, ENCEPHALOPATHY WITH VISUAL FAILURE, PARESTHESIAS, MUSCLE PAIN AND WEAKNESS, CONVULSIONS, AND PARALYSIS. DEATH MAY RESULT FROM CARDIORESPIRATORY ARREST OR SHOCK. SURVIVORS OF ACUTE EXPOSURE MAY EXPERIENCE THE ONSET OF CHRONIC INTOXICATION. LIVER EFFECTS MAY INCLUDE ENLARGEMENT AND TENDERNESS AND JAUNDICE. THE FATAL DOSE OF ABSORBED LEA IS APPROXIMATELY 0.5 GRAMS. PATHOLOGICAL FINDINGS INCLUDE GASTROINTESTIN INFLAMMATION AND RENAL TUBULAR DEGENERATION. METAL FUME FEVER, AN INFLUENZA-LIKE ILLNESS, MAY OCCUR DUE TO THE INHALATION OF FRESHLY FORME METAL OXIDE PARTICLES SIZED BELOW 1.5 MICRONS AND USUALLY BETWEEN 0.02-0.05 MICRONS. SYMPTOMS MAY BE DELAYED 4-12 HOURS AND BEGIN WITH A SUDDEN ONSET OF THIRST AND A SWEET, METALLIC OR FOUL TASTE IN THE MOUTH. OTHER SYMPTOMS MAY INCLUDE UPPER RESPIRATORY TRACT IRRITATION ACCOMPANIE BY COUGHING AND A DRYNESS OF THE MUCOUS MEMBRANES, LASSITUDE AND A GENERALIZED FEELING OF MALAISE. FEVER, CHILLS, MUSCULAR PAIN, MILD TO SEVERE HEADACHE, NAUSEA, OCCASIONAL VOMITING, EXAGGERATED MENTAL ACTIVIT PROFUSE SWEATING, EXCESSIVE URINATION, DIARRHEA, AND PROSTRATION MAY ALS OCCUR. TOLERANCE TO FUMES DEVELOPS RAPIDLY, BUT IS QUICKLY LOST. ALL SYMPTOMS USUALLY SUBSIDE WITHIN 24-36 HOURS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO LOW LEVELS OF LEAD MAY RESULT IN AN ACCUMULATION IN BODY TISSUES AND EXERT ADVERSE EFFECTS ON T BLOOD, NERVOUS SYSTEMS, HEART, ENDOCRINE AND IMMUNE SYSTEMS, KIDNEYS, AN REPRODUCTION. EARLY STAGES OF LEAD POISONING, "PLUMBISM", MAY BE EVIDENC BY PALLOR, ANOREXIA, WEIGHT LOSS, CONSTIPATION, APATHY OR IRRITABILITY, OCCASIONAL VOMITING, FATIGUE, HEADACHE, WEAKNESS, METALLIC TASTE IN THE MOUTH, GINGIVAL LEAD LINE IN PERSONS WITH POOR DENTAL HYGIENE, AND ANEMI LOSS OF RECENTLY DEVELOPED MOTOR SKILLS IS GENERALLY OBSERVED ONLY IN CHILDREN. MORE ADVANCED STAGES OF POISONING MAY BE CHARACTERIZED BY INTERMITTENT VOMITING, IRRITABILITY AND NERVOUSNESS, MYALGIA OF THE ARMS LEGS, JOINTS, AND ABDOMEN, PARALYSIS OF THE EXTENSOR MUSCLES OF THE ARMS AND LEGS WITH WRIST AND/OR FOOT DROP, AND INTESTINAL SPASMS WHICH CAUSE SEVERE ABDOMINAL PAIN. SEVERE "PLUMBISM" MAY RESULT IN PERSISTENT VOMITING, ATAXIA, PERIODS OF STUPOR OR LETHARGY, ENCEPHALOPATHY WITH VISUAL DISTURBANCES WHICH MAY PROGRESS TO OPTIC NEURITIS AND ATROPHY, HYPERTENSION, PAPILLEDEMA, CRANIAL NERVE PARALYSIS DELIRIUM, CONVULSIONS, AND COMA. NEUROLOGIC SEQUELAE MAY INCLUDE MENTAL RETARDATION, SEIZURES, CEREBRAL PALSY, AND DYSTONIA MUSCULORAM DEFORMANS IRREVERSIBLE KIDNEY DAMAGE HAS BEEN ASSOCIATED WITH INDUSTRIAL EXPOSURE. REPRODUCTIVE EFFECTS HAVE BEEN EXHIBITED IN BOTH MALES AND FEMALES. PATERNAL EFFECTS MAY INCLUDE DECREASED SEX DRIVE, IMPOTENCE, STERILITY, AND ADVERSE EFFECTS ON THE SPERM WHICH MAY INCREASE THE RISK OF BIRTH DEFECTS. MATERNAL EFFECTS MAY INCLUDE MISCARRIAGE AND STILLBIRTHS IN EXPOSED WOMEN OR WOMEN WHOSE HUSBANDS WERE EXPOSED, ABORTION, STERILITY OR DECREASED FERTILITY, AND ABNORMAL MENSTRUAL CYCLES. LEAD CROSSES THE PLACENTA AND MAY AFFECT THE FETUS CAUSING BIRTH DEFECTS, MENTAL

RETARDATION, BEHAVIORAL DISORDERS, AND DEATH DURING THE FIRST YEAR OF CHILDHOOD. ANIMAL STUDIES INDICATE THAT REPRODUCTIVE EFFECTS MAY BE ADDITIVE IF BOTH PARENTS ARE EXPOSED TO LEAD.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
LEAD:

ACUTE EXPOSURE- DIRECT CONTACT WITH LEAD POWDERS OR DUST MAY CAUSE IRRITATION. LEAD IS NOT ABSORBED THROUGH THE SKIN, BUT MAY BE TRANSFERRED TO THE MOUTH INADVERTENTLY BY CIGARETTES, CHEWING TOBACCO, FOOD, OR MAKE-UP.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO THE POWDER OR DUST MAY RESULT IN DERMATITIS. SYSTEMIC TOXICITY MAY DEVELOP IF LEAD IS TRANSFERRE TO THE MOUTH BY CIGARETTES, CHEWING TOBACCO, FOOD, OR MAKE-UP.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
LEAD:

ACUTE EXPOSURE- LEAD DUST OR POWDERS MAY CAUSE IRRITATION. METALLIC LEAD PARTICLES MAY CAUSE AN INFLAMMATORY FOREIGN BODY REACTION; INJURY IS GENERALLY THOUGHT TO BE MECHANICAL AND NOT TOXIC.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALIN OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
LEAD:
NEUROTOXIN/NEPHROTOXIN/TERATOGEN.

ACUTE EXPOSURE- ABSORPTION OF LARGE AMOUNTS OF LEAD FROM THE INTESTINAL TRACT MAY CAUSE SYSTEMIC EFFECTS AS DETAILED IN ACUTE INHALATION. THE FATAL DOSE OF ABSORBED LEAD IS APPROXIMATELY 0.5 GRAMS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE TO LOW LEVELS OF LEAD MAY RESULT IN AN ACCUMULATION IN BODY TISSUES AND ADVERSE EFFECTS ON THE KIDNEYS, HEART, AND BLOOD, AND ON THE NERVOUS, REPRODUCTIVE, ENDOCRINE, AND IMMUNE SYSTEMS AS DETAILED IN CHRONIC INHALATION.

FIRST AID- DO NOT INDUCE VOMITING. QUALIFIED MEDICAL PERSONNEL SHOULD REMOVE CHEMICAL BY GASTRIC LAVAGE OR CATHARSIS. ACTIVATED CHARCOAL IS USEFUL. GET MEDICAL ATTENTION IMMEDIATELY.

ANTIDOTE:
THE FOLLOWING ANTIDOTE HAS BEEN RECOMMENDED. HOWEVER, THE DECISION AS TO WHETHER THE SEVERITY OF POISONING REQUIRES ADMINISTRATION OF ANY ANTIDOTE AN ACTUAL DOSE REQUIRED SHOULD BE MADE BY QUALIFIED MEDICAL PERSONNEL.

FOR LEAD POISONING:
INITIATE URINE FLOW FIRST. GIVE 10% DEXTROSE IN WATER INTRAVENOUSLY, 10-20 /KG BODY WEIGHT, OVER A PERIOD OF 1-2 HOURS. IF URINE FLOW DOES NOT START,

GIVE MANNITOL, 20% SOLUTION, 5-10 ML/KG BODY WEIGHT INTRAVENOUSLY OVER 20 MINUTES. FLUID MUST BE LIMITED TO REQUIREMENTS AND CATHERTIZATION MAY BE NECESSARY IN COMA. DAILY URINE OUTPUT SHOULD BE 350-500 ML/M2/24 HOURS. EXCESSIVE FLUIDS FURTHER INCREASE CEREBRAL EDEMA.
FOR ADULTS WITH ACUTE ENCEPHALOPATHY, GIVE DIMERCAPROL, 4 MG/KG, INTRAMUSCULARLY EVERY 4 HOURS FOR 30 DOSES. BEGINNING 4 HOURS LATER, GIVE CALCIUM DISODIUM EDETATE AT A SEPERATE INJECTION SITE, 12.5 MG/KG INTRAMUSCULARLY EVERY 4 HOURS AS A 20% SOLUTION, WITH 0.5% PROCAINE ADDED, FOR A TOTAL OF 30 DOSES. IF SIGNIFICANT IMPROVEMENT HAS NOT OCCURRED BY THE FOURTH DAY, INCREASE THE NUMBER OF INJECTIONS BY 10 FOR EACH DRUG.
FOR SYMPTOMATIC ADULTS, THE COURSE OF DIMERCAPROL AND CALCIUM DISODIUM EDETATE CAN BE SHORTENED OR CALCIUM DISODIUM EDETATE ONLY CAN BE GIVEN IN A DOSAGE OF 50 MG/KG INTRAVENOUSLY AS 0.5% SOLUTION IN 5% DEXTROSE IN WATER OR NORMAL SALINE BY INFUSION OVER NOT LESS THAN 8 HOURS FOR NOT MORE THAN 5 DAYS. FOLLOW WITH PENICILLAMINE, 500-750 MG/DAY, ORALLY FOR 1-2 MONTHS OR UNTIL URINE LEAD LEVELS DROPS BELOW 0.3 MG/24 HOURS (DREISBACH, HANDBOOK OF POISONING, 11TH ED.). ANTIDOTE SHOULD BE ADMINISTERED BY QUALIFIED MEDICAL PERSONNEL.

REACTIVITY

REACTIVITY:
STABLE UNDER NORMAL TEMPERATURES AND PRESSURES.

INCOMPATIBILITIES:
LEAD:
- AMMONIUM NITRATE: VIOLENT OR EXPLOSIVE REACTION.
- CHLORINE TRIFLUORIDE: VIOLENT REACTION.
- DISODIUM ACETYLIDE: TRITURATION IN MORTAR MAY BE VIOLENT AND LIBERATE CARBON.
- HYDROGEN PEROXIDE (52% OR GREATER): VIOLENT DECOMPOSITION.
- HYDROGEN PEROXIDE (60% SOLUTION) AND TRIOXANE: SPONTANEOUSLY DETONABLE.
- METALS (ACTIVE): INCOMPATIBLE.
- NITRIC ACID: LEAD-CONTAINING RUBBER MAY IGNITE.
- OXIDIZERS (STRONG): INCOMPATIBLE.
- SODIUM AZIDE: FORMS LEAD AZIDE AND COPPER AZIDE IN COPPER PIPE.
- SODIUM CARBIDE: VIGOROUS REACTION.
- SULFURIC ACID (HOT): REACTS.
- ZIRCONIUM-LEAD ALLOYS: IGNITION ON IMPACT.

DECOMPOSITION:
THERMAL DECOMPOSITION PRODUCTS ARE TOXIC OXIDES OF LEAD.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

OBSERVE ALL FEDERAL, STATE AND LOCAL REGULATIONS WHEN STORING OR DISPOSING OF THIS SUBSTANCE. FOR ASSISTANCE, CONTACT THE DISTRICT DIRECTOR OF THE ENVIRONMENTAL PROTECTION AGENCY.

STORAGE

STORE AWAY FROM INCOMPATIBLE SUBSTANCES.

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY.

SPILL AND LEAK PROCEDURES

OCCUPATIONAL SPILL:
DO NOT TOUCH SPILLED MATERIAL. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL SPILLS, TAKE UP WITH SAND OR OTHER ABSORBENT MATERIAL AND PLACE INTO CONTAINERS FOR LATER DISPOSAL. FOR SMALL DRY SPILLS, WITH A CLEAN SHOVEL PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER. MOVE CONTAINERS FROM SPILL AREA. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. KEEP UNNECESSARY PEOPLE AWAY. ISOLATE HAZARD AREA AND DENY ENTRY.

RESIDUE SHOULD BE CLEANED UP USING A HIGH-EFFICIENCY PARTICULATE FILTER VACUUM.

REPORTABLE QUANTITY (RQ): 1 POUND
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN T METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):
VENTILATION SHOULD MEET THE REQUIREMENTS IN 29CFR1910.1025(E).

RESPIRATOR:
THE FOLLOWING RESPIRATORS ARE THE MINIMUM LEGAL REQUIREMENTS AS SET FORTH BY THE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION FOUND IN 29 CFR1910, SUBPART Z.

RESPIRATORY PROTECTION FOR LEAD AEROSOLS

AIRBORNE CONCENTRATION OF LEAD OR CONDITION OF USE	REQUIRED RESPIRATOR
NOT IN EXCESS OF 0.5 MG/M3 (10X PEL)	HALF-MASK, AIR PURIFYING RESPIRATOR EQUIPPED WITH HIGH-EFFICIENCY FILTERS.
NOT IN EXCESS OF 2.5 MG/M3 (50X PEL)	FULL FACEPIECE, AIR-PURIFYING RESPIRATOR WITH HIGH EFFICIENCY FILTERS.

NOT IN EXCESS OF 50 MG/M3 (1000X PEL)	ANY POWERED AIR-PURIFYING RESPIRATOR WITH HIGH EFFICIENCY FILTERS; OR HALF-MASK SUPPLIED-AIR RESPIRAT OPERATED IN POSITIVE-PRESSURE MODE.
NOT IN EXCESS OF 100 MG/M3	SUPPLIED-AIR RESPIRATORS WITH FULL FACEPIECE, HOOD OR HELMET SUIT, OPERATED IN POSITIVE PRESSURE MODE.
GREATER THAN 100 MG/M3, UNKNOWN CONCENTRATIONS OR FIREFIGHTING	FULL FACEPIECE, SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE-PRESSURE MODE.

(RESPIRATORS SPECIFIED FOR HIGHER CONCENTRATIONS CAN BE USED AT LOWER CONCENTRATIONS OF LEAD).
(FULL FACEPIECE IS REQUIRED IF THE LEAD AEROSOLS CAUSE EYE OR SKIN IRRITATI
AT THE USE CONCENTRATIONS.)
(A HIGH EFFICIENCY PARTICULATE FILTER MEANS 99.97% EFFICIENT AGAINST 0.3 MICRON PARTICLES.)

THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATIO

LEAD, INORGANIC FUMES AND DUSTS (AS PB):

0.50 MG(PB)/M3- ANY SUPPLIED-AIR RESPIRATOR.
ANY AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SELF-CONTAINED BREATHING APPARATUS.

1.25 MG(PB)/M3- ANY POWERED AIR-PURIFYING RESPIRATOR WITH A HIGH-EFFICIENC PARTICULATE FILTER.
ANY SUPPLIED-AIR RESPIRATOR OPERATED IN A CONTINUOUS FLOW MODE.

2.50 MG(PB)/M3- ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY POWERED AIR-PURIFYING RESPIRATOR WITH A TIGHT-FITTING FACEPIECE AND A HIGH-EFFICIENCY PARTICULATE FILTER.
ANY SELF-CONTAINED BREATHING APPARATUS WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE.
ANY SUPPLIED-AIR RESPIRATOR WITH A TIGHT-FITTING FACEPIEC OPERATED IN A CONTINUOUS FLOW MODE.

50.0 MG(PB)/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A HALF-MASK AND OPERATED A PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

100.0 MG(PB)/M3- ANY SUPPLIED-AIR RESPIRATOR WITH A FULL FACEPIECE AND OPERATED IN A PRESSURE-DEMAND OR OTHER POSITIVE PRESSUR

MODE.

5 9 ESCAPE: ANY AIR-PURIFYING FULL FACEPIECE RESPIRATOR WITH A
HIGH-EFFICIENCY PARTICULATE FILTER.
ANY APPROPRIATE ESCAPE-TYPE SELF-CONTAINED BREATHING
APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITIONS

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):
PROTECTIVE CLOTHING SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING AND EQUIPMENT IN 29CFR1910.1025(G).

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

LEAD (ELEMENTAL, INORGANIC & SOAPS):
PROTECTIVE GLOVES SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING AND EQUIPMENT IN 29CFR1910.1025(G).

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

LEAD (ELEMENTAL, INORGANIC, AND SOAPS):
PROTECTIVE EYE EQUIPMENT SHOULD MEET THE REQUIREMENTS FOR PROTECTIVE WORK CLOTHING AND EQUIPMENT IN 29CFR1910.1025(G).

AUTHORIZED - FISHER SCIENTIFIC
CREATION DATE: 12/10/84 REVISION DATE: 03/15/89

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CALEDON LABORATORIES LTD

416-877-0101

40 ARMSTRONG AVENUE, GEORGETOWN, ONTARIO, CANADA L7G 4R9

FAX: 416-877-6666

MATERIAL SAFETY DATA SHEET

METHYL ETHYL KETONE

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: *Methyl Ethyl Ketone; 2-Butanone; Ethyl Methyl Ketone*

Chemical Family: *Ketones*

Chemical Formula: $CH_3COCH_2CH_3$

Product Use: *Laboratory Solvent*

Manufacturer's Name: *Caledon Laboratories Ltd.*

Street Address: *40 Armstrong Avenue*

City: *Georgetown*

Province: *Ontario*

Postal Code: *L7G 4R9*

Telephone No: *(416) 877-0101*

Emergency Telephone No.: *CANUTEC (613) 996-6666*

HAZARDOUS INGREGIENTS OF MATERIALS

Ingredients	*%*	*TLV Units*	*CAS No.*
Methyl Ethyl Ketone	*100*	*200 ppm*	*78-93-3*

PHYSICAL DATA

Physical State: *Liquid*

Odour and Appearance: *Colourless liquid with an acetone-like odour*

Odour Threshold (ppm): *Not Available*

Vapour Pressure (mm Hg): *71.2*

Vapour Density (Air = 1): *2.5*

Evaporation Rate: *2.8 (n-Butyl Acetate = 1)*

Boiling Point (°C): *80°C*

Freezing Point (°C): *-86.4°C*

pH: *Not Applicable*

Specific Gravity: *0.8064*

Coefficient of Water/Oil distribution: *No Data*

SHIPPING DESCRIPTION

PIN: *1193*

T.D.G. Class: *3.2*

Pkg. Group: *II*

REACTIVITY DATA

Chemical Stability: *Stable*

Incompatibility with other substances: *Strong oxidizers, amines, ammonia, caustics, inorganic acids and isocyanates*

Reactivity: *Avoid sparks, open flames and all ignition sources.*

Hazardous Decomposition Products: CO_2 *and CO*

FIRE AND EXPLOSION DATA

Flammability: *Flammable*

Extinguishing Media: *Water fog, carbon dioxide, or dry chemicals, aqueous film-forming foam for large fires.*

Flash Point (Method Used): *-7.0°C (TCC)*

Autoignition Temperature: *514°C*

Upper Flammable Limit (% by volume): *11.5*

Lower Flammable Limit (% by volume): *1.8*

Hazardous Combustion Products: *CO and* CO_2

Sensitivity to Impact: *Not Available*

Sensitivity to Static discharge: *Not Available*

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:

LD_{50}: *(rat, oral) 3.3 g/kg*

LC_{50}: *(inhalation, rat) 2,000 ppm for 4 hours*

Effects of Acute Exposure to Product:

Inhaled: *May cause irritation of eyes, nose, throat and respiratory tract, and CNS depression*

In contact with skin: *May cause defatting, drying and cracking of the skin. Prolonged or repeated contact may lead to dermatitis.*

In contact with eyes: *May cause severe irritation, corneal burns and conjunctivitis, possible corneal damage.*

Ingested: *May cause irritation and burning of the mouth and throat, abdominal pain and CNS depression.*

Effects of Chronic Exposure to Product:

Carcinogenicity: *Not listed as carcinogen by NTP (National Toxicology Program)*

Teratogenicity: *No information available*

Reproductive Effects: *No information is available and no adverse reproductive effects are anticipated*

Mutagenicity: *No information available*

Synergistic Products: *None known*

PREVENTIVE MEASURES

Engineering Controls: *Local exhaust ventilation required.*

Respiratory Protection: *An air-purifying respirator equipped with organic vapour cartridges for concentrations up to 1000 ppm. Air-supplied respirator, if concentrations are higher or unknown.*

Eye Protection: *Chemical goggles*

Skin Protection: *Butyl Gloves*

Other Personal Protective Equipment: *Impervious apron and boots. Safety shower and eye bath located close to chemical exposure area.*

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Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 624
NAPHTHALENE
Issued: November 1987

SECTION 1. MATERIAL IDENTIFICATION

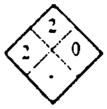
24

Material Name: NAPHTHALENE

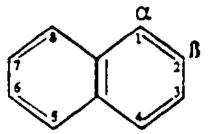
Description (Origin/Uses): Used as a moth repellant and in many industrial processes.

Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$;
NIOSH *RTECS* No. QJ0525000; CAS No. 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyer's Guide* (Genium ref. 73) for a list of suppliers.



HMIS			
H	2		
F	2	R	1
R	0	I	4
PPG*		S	1
*See sect. 8		K	2

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Naphthalene, CAS No. 0091-20-3  *Immediately dangerous to life and health **See NIOSH *RTECS* for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.	ca 100	IDLH* Level: 500 ppm **ACGIH TLVs, 1987-88** TLV-TWA: 10 ppm, 50 mg/m³ **OSHA PEL** 8-Hr TWA: 10 ppm, 50 mg/m³ **Toxicity Data**** Child, Oral, LD_{Lo}: 100 mg/kg Man, Unknown, LD_{Lo}: 74 mg/kg Rat, Oral, LD_{50}: 1250 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)
Vapor Density (Air = 1): 4.4
Vapor Pressure: 0.087 Torr at 77°F (25°C)
Water Solubility: Insoluble

Specific Gravity (H_2O = 1): 1.162 at 68°F (20°C)
Melting Point: 176°F (80°C)
Molecular Weight: 128 Grams/Mole
% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
174°F (79°C) OC; 190°F (88°C) CC	979°F (526°C)	% by Volume	0.9	5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. **Caution:** Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Naphthalene is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Renal shutdown (kidney failure), hemolytic effects (breakdown of red blood cells), hematuria (blood in the urine), oliguria (low volume of urine), jaundice, eye damage, and depression of the central nervous system (CNS) are the primary health concerns associated with exposure to naphthalene. The ACGIH TLVs in section 2 are set to prevent eye damage. These recommended exposure limits may not be low enough to prevent blood changes in genetically hypersensitive individuals.
Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver, and kidneys. Administer medical exams emphasizing these organs. **Target Organs:** Eyes, skin, kidneys, liver, blood (red blood cell effects), and CNS.
Primary Entry: Inhalation, skin contact. **Acute Effects:** Inhalation of naphthalene vapor causes excitement, confusion, headache, nausea, and loss of appetite. **Chronic Effects:** Increased incidence of cataracts.
FIRST AID
Eye Contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes to remove particles.
Skin Contact: Immediately wash the affected area with soap and water.
Inhalation: Remove victim to fresh air; restore and/or support his breathing as needed.
Ingestion: Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Administer a gastric lavage followed by saline catharsis. Monitor blood and electrolytic balance. Other sources recommend giving the victim several glasses of water to drink.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all ignition sources immediately. Cleanup personnel need protection against contact and inhalation of vapor (see sect. 8). Contain large spills and collect waste. Use nonsparking tools to place naphthalene into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z)
EPA Designations (40 CFR 302.4)
RCRA Hazardous Waste, No. U165
CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines of 29 CFR 1910.133. **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Respirator usage must be in accordance with the OSHA regulations of 29 CFR 1910.134. IDLH or unknown concentrations require an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.
Other Equipment: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specific work environment to prevent skin contact. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems of sufficient power to maintain airborne levels of naphthalene below the OSHA PEL standard cited in section 2. **Safety Stations:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from shoes and equipment.
Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep this material off of your clothing and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Do *not* smoke, eat, or drink in any immediate work area. Avoid inhalation of vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store naphthalene in a cool, dry, well-ventilated area away from chemical incompatibles (see sect. 5).
Special Handling/Storage: Protect containers from physical damage. All bulk storage facilities must be built with an explosion-proof design. All containers used in shipping/transferring operations must be electrically grounded to prevent static sparks. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.
Comments: All operations with naphthalene must be done carefully to prevent accidental ignition of its flammable/explosive vapor. If the weather is warm, more naphthalene vapor forms and the potential for explosion increases. Do *not* smoke in any use or storage area!
Transportation Data (49 CFR 172.101-2)
DOT Shipping Name: Naphthalene
DOT Hazard Class: ORM-A
IMO Class: 4.1
DOT ID No. UN1334
IMO Label: Flammable Solid
DOT Label: None

References: 1, 2, 12, 73, 84-94, 103. PJI

Approvals
Indust. Hygiene/Safety
Medical Review

59275

MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION
1145 CATALYN ST., SCHENECTADY, NY 12303 USA (518) 377-8854

From Genium's MSDS Collection, to be used as a reference.

MSDS # 355
PHENOL (Revision 3)

Issued: September, 1980
Revised: September, 1985

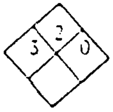
SECTION 1. MATERIAL IDENTIFICATION

17

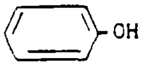
MATERIAL NAME: PHENOL

OTHER DESIGNATIONS: Carbolic Acid, Hydrobenzene, Oxybenzene, Phenic acid, Phenyl Hydrate, Phenyl hydroxide, Phenylic acid, Phenyl alcohol, CAS #000 108 952, C_6H_5OH

MANUFACTURER/SUPPLIER: Available from many suppliers, including;
Dow Chemical USA
2020 Dow Center
Midland MI 48640 (517) 636-1000



SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
PHENOL 	ca 100	8 hr TWA: 5 ppm, 19 mg/m^3 (Skin) STEL: 10 ppm, 38 mg/m^3*
		Human, Oral LDLo: 140 mg/kg
		Rat, oral LDLo: 414 mg/kg
		Rat, skin LD50: 669 mg/kg

* Current OSHA PEL and ACGIH TLV/STEL (1984-85) (Skin) notation indicates a potential contribution to overall exposure via absorption through the skin.

NIOSH recommends a 10 hr. TWA of 20 mg/m^3 with a ceiling of 60 mg/m^3 for any 15 minute period.

SECTION 3. PHYSICAL DATA

Boiling Point @ 1 atm .... 359.4°F (181.9°C)
Vapor pressure @ 25°C 0.35
Vapor density (Air=1) 3.24
Solubility in water (% by wt.) ... 8.4 @ 20°C
(Sol. in all proportion @ temp. >66°C)

Specific Gravity ($H_2O=1$):
Solid: 1.017 @ 25/4°C
Liquid: 1.0576 @ 41/4°C
Melting point .... 109.4°F (43°C)
Volatiles, % by vol @ 20°C .. ca 100
Evaporation rate (BuAc=1) ... <0.03
Viscosity, CPS, @ 80°C 1.51
Molecular weight 94.12

APPEARANCE & ODOR: White crystalline solid with a characteristic sharp medicinal sweet, tangy odor which is detectable above 0.05 ppm. Phenol turns pink or red if it contains impurities or if it is exposed to heat or light.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	Lower	Upper
175°F (79°C) C.C.	1319°F (715°C)	% by volume	1.5	8.6

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, or alcohol type foam. Do not use a solid stream of water since the stream will scatter and spread the fire. Use water spray to cool fire-exposed tanks/containers. Phenol presents a moderate fire hazard when exposed to heat, flame, or oxidizers. When heated, it remits toxic fumes and vapors which will form explosive mixtures with air. Solid phenol burns with difficulty, giving off a heavy smoke.

Firefighters should wear self-contained breathing apparatus and full protective clothing when fighting fires involving phenol. NOTE: Water containing phenol can cause severe chemical burns.

SECTION 5. REACTIVITY DATA

This material is stable at room temperature under normal handling and storage conditions. It does not undergo hazardous polymerization. Phenol is incompatible with strong oxidizing agents and halogens. Reaction with calcium hypochlorite is exothermic and produces toxic fumes which may ignite. Hot phenol is corrosive to many metals, including aluminum, lead, magnesium, and zinc. Reaction with these materials causes phenol to become discolored. Do not heat phenol above 122°F (90°C).

Thermal decomposition or burning produces oxides of carbon and water.

5 9 276

Revised 9/85

MSDS # 355 Issued 9/80 PHENOL (Rev. B)

SECTION 6. HEALTH HAZARD INFORMATION

TLV [illegible]

Phenol is a general protoplasmic poison which is corrosive to body tissue. Poisoning can occur via skin absorption, vapor inhalation, or ingestion. Vapors of phenol are irritating to the eyes, nose, and throat. The liquid is rapidly absorbed through the skin. Contact with the skin causes a white wrinkled discoloration followed by a severe burn or systemic poisoning if not properly removed. Intense burning and pain from skin contact may be delayed. Absorption of phenol through skin may cause sudden collapse, or death. Symptoms develop rapidly. When ingested, phenol causes burning of the gastrointestinal tract, and blotches on the lips and in the mouth. Headache, nausea, dizziness, dyspnea, shock, convulsions, and death may follow exposures by any route. Chronic exposure to low concentrations of phenol may cause digestive disturbances, nervous disorders, skin eruptions, and death due to liver and kidney damage. The TLV is set to prevent systemic poisoning.

FIRST AID: EYE CONTACT: Immediately flush eyes, including under eyelids, with copious amounts of running water for at least 30 minutes. Get medical attention! (Inplant, community, paramedic). SKIN CONTACT: Immediately flush skin for at least 30 minutes while removing contaminated clothing and shoes. Get medical attention! INHALATION: Remove victim to fresh air. Restore and/or support breathing as necessary. Keep person warm and quiet. Transport to a medical facility. INGESTION: Give victim large quantities of milk or water as quickly as possible. *Induce vomiting by touching back of throat with finger.* Do not give fluids or induce vomiting if victim is unconscious or is having convulsions. Contact a physician or Poison Control Center and transport to a medical facility.

SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES

Notify safety personnel of spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Evacuate all personnel from area, except for those involved in clean-up. Close the leak immediately, if possible. Absorb small spills on paper, vermiculite or other absorbent and place in a closed metal container for disposal. Dike large spills and allow material to cool and solidify. Shovel solid into steel containers for disposal. Flush spill area thoroughly with water and collect flushings and wash water for disposal. Do not allow phenol to enter sewer, watersheds, or waterways! Notify proper authorities including the National Response Center (800-424-8802). Clean-up personnel must wear a self-contained breathing apparatus and full personal protective clothing and equipment. DISPOSAL: Burn contaminated waste in an approved incinerator. Phenol may be recovered by charcoal absorption, solvent extraction or steam stripping. A concentration of 1% by weight is required for economical recovery. Phenol is water soluble and is amenable to biological or chemical oxidation. Solutions can be chemically oxidized by chlorine, chlorine dioxide, or other oxidants. Phenol content of water supply not to exceed 0.001 mg/L. (DO NOT flush phenol down drains.) RCRA Hazardous Waste # U188 Reportable Spill Quantity ... 1000 lbs.

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation (explosion-proof) to meet TLV requirements. When phenol is heated, vapor inhalation can be a serious hazard without proper precaution. For emergency or nonroutine exposures where the TLV may be exceeded, use an appropriate NIOSH-approved full face respirator. Fume hoods should maintain a minimum face velociry of 100 lfm. All electrical service in use or storage areas should have an explosion-proof design.

DANGER! Avoid any contact with this material. Full protective equipment, including splash goggles, faceshield impervious gloves, apron, boots, impervious shirt and trousers, hard hat with brim, acid suit and respirator *should be available and worn as appropriate. Remove contaminated clothing* immediately and do not reuse until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from heated surfaces, open flame and ignition sources. Outside or detached storage is preferred. Protect containers from physical damage.

Phenol is a very dangerous compound. Do not breathe vapor or allow liquid to come in contact with the skin. Wear appropriate protective equipment and remove contaminated clothing immediately. Use extreme caution when transporting phenol to prevent leaks. Vent containers before heating and do not heat above 140°F (60°C). Do not eat or smoke in areas where this material is being used or handled. Do not allow employees who have diseases of the central nervous system, liver, kidney, or lungs to work in area of phenol exposure. Provide preplacement and periodic medical exams to employees working with phenol. Do not allow untrained workers to handle this material (see also ASTM D2286-Sampling and Handling Phenol).

ICC & DOT - Class B Poison. LABEL: POISON

DATA SOURCE(S) CODE (See Glossary) 2-12, 15, 19, 23-24, 31, 34, 37, 38, 59, 79, R.

APPROVALS 11/85

INDUST. HYGIENE/SAFETY 11-85

MEDICAL REVIEW: Dec 85

GENIUM PUBLISHING

5 9 277

TETRACHLOROETHYLENE
TETRACHLOROETHYLENE
TETRACHLOROETHYLENE

MATERIAL SAFETY DATA SHEET

FISHER SCIENTIFIC	EMERGENCY CONTACT:	DATE 03/13/89
112 COLONNADE ROAD	REGULATORY AFFAIRS OFFICER	
NEPEAN, ONTARIO	(613)226-8374	ACCT: 17871-00
K2E 7L6		
(613)226-8374		CAT NO: O1584

PURCHASE ORDER NUMBER

N/A. SPECIAL CUSTOMER REQUEST.

SUBSTANCE IDENTIFICATION

CAS-NUMBER 127-18-4

SUBSTANCE: **TETRACHLOROETHYLENE**

TRADE NAMES/SYNONYMS:
PERCHLOROETHYLENE; 1,1,2,2-TETRACHLOROETHYLENE; NEMA; ETHYLENE TETRACHLORIDE; CARBON DICHLORIDE; CARBON BICHLORIDE; PERCLENE; PERC; ANKILOSTIN; TETRACHLORETHYLENE; PERCHLORETHYLENE; TETRALEX; TETRACHLOROETHENE; DIDAKENE; U210; NCI-C04580; ENT 1,860; UN 1897; D-4596; C-132; ACC22900

CHEMICAL FAMILY:
HALOGEN COMPOUND, ALIPHATIC

MOLECULAR FORMULA: C2-CL4 MOL WT: 165.82

CERCLA RATINGS (SCALE 0-3): HEALTH=3 FIRE=0 REACTIVITY=0 PERSISTENCE=2
NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

COMPONENTS AND CONTAMINANTS

COMPONENT: TETRACHLOROETHYLENE PERCENT: 100

OTHER CONTAMINANTS: AMINE AND/OR PHENOLIC STABILIZERS

EXPOSURE LIMITS:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
25 PPM (170 MG/M3) OSHA TWA
50 PPM (335 MG/M3) ACGIH TWA; 200 PPM (1340 MG/M3) ACGIH STEL
LOWEST FEASIBLE LIMIT NIOSH RECOMMENDED EXPOSURE CRITERIA

1 POUND CERCLA SECTION 103 REPORTABLE QUANTITY
SUBJECT TO SARA SECTION 313 ANNUAL TOXIC CHEMICAL RELEASE REPORTING
SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS- (APRIL 1, 1988)

THIS SUBSTANCE IS SUBJECT TO CALIFORNIA PROPOSITION 65 CANCER AND/OR REPRODUCTIVE TOXICITY WARNING AND RELEASE REQUIREMENTS.

PHYSICAL DATA

DESCRIPTION: COLORLESS LIQUID WITH A MILD CHLOROFORM-LIKE ODOR.

BOILING POINT: 250 F (121 C)   MELTING POINT: -9 F (-23 C)

SPECIFIC GRAVITY: 1.6   VAPOR PRESSURE: 15.0 MMHG @ 20 C

EVAPORATION RATE: (CCL4=1) 0.27   SOLUBILITY IN WATER: 0.04%

ODOR THRESHOLD: 50 PPM   VAPOR DENSITY: 5.8

SOLVENT SOLUBILITY: ALCOHOL, ETHER, AND BENZENE

FIRE AND EXPLOSION DATA

FIRE AND EXPLOSION HAZARD:
NEGLIGIBLE FIRE HAZARD WHEN EXPOSED TO HEAT OR FLAME.

FIREFIGHTING MEDIA:
DRY CHEMICAL, CARBON DIOXIDE, HALON, WATER SPRAY OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FOR LARGER FIRES, USE WATER SPRAY, FOG OR STANDARD FOAM (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4).

FIREFIGHTING:
STAY AWAY FROM STORAGE TANK ENDS. COOL CONTAINERS EXPOSED TO FLAMES WITH WAT FROM SIDE UNTIL WELL AFTER FIRE IS OUT (1987 EMERGENCY RESPONSE GUIDEBOOK, DOT P 5800.4, GUIDE PAGE 74).

USE AGENTS SUITABLE FOR TYPE OF SURROUNDING FIRE. AVOID BREATHING HAZARDOUS VAPORS, KEEP UPWIND.

TRANSPORTATION DATA

DEPARTMENT OF TRANSPORTATION HAZARD CLASSIFICATION 49CFR172.101:
ORM-A

DEPARTMENT OF TRANSPORTATION LABELING REQUIREMENTS 49CFR172.101 AND 172.402:
NONE

DEPARTMENT OF TRANSPORTATION PACKAGING REQUIREMENTS: 49CFR173.605
EXCEPTIONS: 49CFR173.505

TOXICITY

TETRACHLOROETHYLENE (PERCHLOROETHYLENE):

5 9 279

510 MG/24 HOURS SKIN-RABBIT SEVERE IRRITATION; 162 MG EYE-RABBIT MILD IRRITATION; 96 PPM/7 HOURS INHALATION-HUMAN TCLO; 280 PPM/2 HOURS INHALATION-MAN TCLO; 600 PPM/10 MINUTES INHALATION-MAN TCLO; 3005 MG/KG ORAL-RAT LD50; 4000 PPM/4 HOURS INHALATION-RAT LCLO; 2100 MG/KG INTRAPERITONEAL-DOG LD50; 2200 MG/KG SUBCUTANEOUS-RABBIT LDLO; 8100 MG/KG ORAL-MOUSE LD50; 85 MG/KG INTRAVENOUS-DOG LDLO; 2857 MG/KG INHALATION-MAN LDLO; 5200 PPM/4 HOURS INHALATION-MOUSE LC50; 4000 MG/KG ORAL-CAT LDLO; 4000 MG/KG ORAL-DOG LDLO; 5000 MG/KG ORAL-RABBIT LDLO; 65 GM/KG SUBCUTANEOUS-MOUSE LD50; 4643 MG/KG INTRAPERITONEAL-MOUSE LD50; MUTAGENIC DAT (RTECS); REPRODUCTIVE EFFECTS DATA (RTECS); TUMORIGENIC DATA (RTECS). CARCINOGEN STATUS: HUMAN INADEQUATE EVIDENCE, ANIMAL SUFFICIENT EVIDENCE (IARC CLASS-2B). ORAL ADMINISTRATION TO MICE PRODUCED HEPATOCELLULAR TUMORS. A STUDY REPORTED LEUKEMIA AND KIDNEYNEOPLASMS IN RATS AND LIVER CARCINOMAS IN MICE BY INHALATION (NTP TR 311).

TETRACHLOROETHYLENE IS AN EYE, MUCOUS MEMBRANE, AND SKIN IRRITANT, CENTRAL NERVOUS SYSTEM DEPRESSANT, AND HEPATOTOXIN. POISONING MAY PRODUCE PERIPHERAL NEUROPATHY. ALCOHOLIC BEVERAGES MAY ENHANCE THE SYSTEMIC EFFECTS. EPINEPHRINE OR OTHER STIMULANTS MAY CAUSE VENTRICULAR ARRHYTHMIAS.

HEALTH EFFECTS AND FIRST AID

INHALATION:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
IRRITANT/NARCOTIC/HEPATOTOXIN.
500 PPM IMMEDIATELY DANGEROUS TO LIFE OR HEALTH.

ACUTE EXPOSURE- VAPORS MAY CAUSE IRRITATION. 2000 PPM CAUSED MILD CENTRAL NERVOUS SYSTEM DEPRESSION WITHIN 5 MINUTES OF EXPOSURE. 500 PPM CAUSED NUMBNESS AROUND THE MOUTH, DIZZINESS, AND SOME INCOORDINATION AFTER 10 MINUTES. 500 PPM PRODUCED SALIVATION AND A METALLIC TASTE IN THE MOUTH. OTHER SYMPTOMS OF EXPOSURE MAY BE NAUSEA, GASTROINTESTINAL UPSET, VERTIG SINUS INFLAMMATION, HEADACHE, ANOREXIA, GIDDINESS, INEBRIATION, IRRESPONSIBLE BEHAVIOR, LOSS OF INHIBITIONS, PREMATURE VENTRICULAR BEATS AND UNCONSCIOUSNESS. HEPATIC NECROSIS AND OLIGURIC UREMIA HAVE BEEN REPORTED. MASSIVE EXPOSURES MAY RESULT IN DEATH FROM RESPIRATORY ARREST. HUMANS EXPOSED EXHIBITED BOTH LOCAL AND GENERAL ANESTHESIA AND HALLUCINATIONS. HUMAN EXPOSURE TO 2857 MG/KG HAS BEEN REPORTED TO CAUSE CHANGES IN THE LUNGS, COMA AND DEATH. TETRACHLOROETHYLENE MAY BE EXCRETE IN HUMAN MILK AND CAUSE OBSTRUCTIVE JAUNDICE IN INFANTS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE IMPAIRED MEMORY PARALYSIS, AND PERIPHERAL NERVE DAMAGE EVIDENCED BY TINGLING, NUMBNESS, MUSCLE WEAKNESS, AND IMPAIRED VISION. LIVER AND KIDNEY DAMAGE ARE POSSIBLE. EXPOSURE OF PREGNANT RATS RESULTED IN MUSCULOSKELETAL ABNORMALITIES, FETOTOXICITY, AND VARIOUS EFFECTS ON THE NEWBORN. MALE RA EXPOSED BEFORE MATING DEVELOPED EFFECTS ON THE REPRODUCTIVE ORGANS. NTP INHALATION STUDIES INDICATE AN INCREASED INCIDENCE OF LEUKEMIA AND KIDNEY NEOPLASMS IN RATS AND LIVER CARCINOMAS IN MICE FOLLOWING REPEATED EXPOSURES.

FIRST AID- REMOVE FROM EXPOSURE AREA TO FRESH AIR IMMEDIATELY. IF BREATHING HAS STOPPED, GIVE ARTIFICIAL RESPIRATION. MAINTAIN AIRWAY AND BLOOD PRESSURE AND ADMINISTER OXYGEN IF AVAILABLE. KEEP AFFECTED PERSON WARM AND AT REST. TREAT SYMPTOMATICALLY AND SUPPORTIVELY. ADMINISTRATION OF OXYGEN SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN CONTACT:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
IRRITANT/NARCOTIC.

ACUTE EXPOSURE- VAPORS MAY BE IRRITATING. BRIEF IMMERSION OF THE HANDS IN THE LIQUID USUALLY CAUSES ONLY MILD SKIN IRRITATION. HOWEVER, THE LIQUID ON THE SKIN FOR 40 MINUTES RESULTED IN A PROGRESSIVELY SEVERE BURNING SENSATION, BEGINNING WITHIN 5-10 MINUTES, AND MARKED ERYTHEMA, WHICH SUBSIDED AFTER 1-2 HOURS. ABSORPTION MAY OCCUR BUT ONLY TO A MINIMAL EXTENT POSSIBLY CAUSING CENTRAL NERVOUS SYSTEM DEPRESSION WITH LIGHTHEADEDNESS, CONFUSION AND NARCOSIS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED SKIN CONTACT MAY PRODUCE DERMATITIS BY THE DEFATTING OF THE SKIN.

FIRST AID- REMOVE CONTAMINATED CLOTHING AND SHOES IMMEDIATELY. WASH AFFECTED AREA WITH SOAP OR MILD DETERGENT AND LARGE AMOUNTS OF WATER UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

EYE CONTACT:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
IRRITANT.

ACUTE EXPOSURE- DIRECT CONTACT MAY CAUSE PAIN, LACRIMATION, AND BURNING. VAPORS ABOVE 200 PPM MAY CAUSE MILD IRRITATION, CONJUNCTIVITIS, AND LACRIMATION, BUT SERIOUS INJURY IS NOT LIKELY. APPLICATION TO RABBIT EYES FROM A PRESSURIZED FIRE EXTINGUISHER CAUSED IMMEDIATE PAIN AND BLEPHAROSPASM. THE CORNEAL EPITHELIUM BECAME GRANULAR AND OPTICALLY IRREGULAR AND PATCHES OF THE EPITHELIUM WERE LOST, BUT THE EYES RECOVERED COMPLETELY WITHIN 2 DAYS.

CHRONIC EXPOSURE- REPEATED OR PROLONGED EXPOSURE MAY CAUSE CONJUNCTIVITIS AND LACRIMAL DUCT DISEASE.

FIRST AID- WASH EYES IMMEDIATELY WITH LARGE AMOUNTS OF WATER OR NORMAL SALINE, OCCASIONALLY LIFTING UPPER AND LOWER LIDS, UNTIL NO EVIDENCE OF CHEMICAL REMAINS (APPROXIMATELY 15-20 MINUTES). GET MEDICAL ATTENTION IMMEDIATELY.

INGESTION:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
NARCOTIC/CARCINOGEN.

ACUTE EXPOSURE- ALTHOUGH POORLY ABSORBED BY THE GASTROINTESTINAL SYSTEM, NARCOSIS IS POSSIBLE, WITH HEADACHE, DIZZINESS, DELIRIUM, NAUSEA, VOMITING, DIARRHEA WITH BLOODY STOOLS, IRRESPONSIBLE BEHAVIOR AND LOSS OF INHIBITIONS. PERIPHERAL NERVE DAMAGE MAY OCCUR AND IS INDICATED BY TINGLING, NUMBNESS, AND MUSCLE WEAKNESS. TETRACHLOROETHYLENE MAY BE EXCRETED IN HUMAN MILK TO CAUSE OBSTRUCTIVE JAUNDICE IN NEWBORN INFANTS. THERAPEUTICALLY, IT IS USED IN HUMANS AND ANIMALS AS AN ANTHELMINTIC.

CHRONIC EXPOSURE- CHRONIC INGESTION HAS NOT BEEN REPORTED IN HUMANS. TETRACHLOROETHYLENE HAS PRODUCED HEPATOCELLULAR CARCINOMAS IN LABORATORY MICE.

FIRST AID- REMOVE BY GASTRIC LAVAGE OR EMESIS. MAINTAIN BLOOD PRESSURE AND AIRWAY. GIVE OXYGEN IF RESPIRATION IS DEPRESSED. DO NOT PERFORM GASTRIC LAVAGE OR EMESIS IF VICTIM IS UNCONSCIOUS. GET MEDICAL ATTENTION IMMEDIATELY. (DREISBACH, HANDBOOK OF POISONING, 11TH ED.) ADMINISTRATION OF GASTRIC LAVAGE OR OXYGEN SHOULD BE PERFORMED BY QUALIFIED MEDICAL PERSONNEL.

ANTIDOTE:
NO SPECIFIC ANTIDOTE. TREAT SYMPTOMATICALLY AND SUPPORTIVELY.

REACTIVITY

REACTIVITY:
PROLONGED EXPOSURE TO SUNLIGHT (UV) CAN DEGRADE UNSTABILIZED MATERIAL.

INCOMPATIBILITIES:
TETRACHLOROETYLENE (PERCHLOROETHYLENE):

- LITHIUM SHAVINGS: FORMS EXPLOSIVE MIXTURE.
- BARIUM SHAVINGS: FORMS EXPLOSIVE MIXTURE.
- ALUMINUM POWDER: EXPLOSIVE REACTION ON HEATING.
- DINITROGEN TETROXIDE: FORMS EXPLOSIVE COMPOUND.
- METALS (FINELY DISPERSED): EXPLOSIVE REACTION.
- SODIUM HYDROXIDE: POSSIBLE EXPLOSIVE REACTION.
- BERYLLIUM POWDER: FLASH OR SPARK ON HEAVY IMPACT.
- EXCESS HYDROGEN: IN THE PRESENCE OF REDUCED NICKEL CATALYST PRODUCES TOTAL DECOMPOSITION TO HYDROGEN CHLORIDE AND CARBON.
- NITRIC ACID (CONCENTRATED): VIOLENT REACTION.

DECOMPOSITION:
PROLONGED EXPOSURE TO SUNLIGHT (UV) CAN DEGRADE UNSTABLIZED MATERIAL. VAPOR EXPOSURE TO HIGH TEMPERATURE OR ELECTRIC ARCS MAY CAUSE DECOMPOSITION TO CORROSIVE HYDROGEN CHLORIDE, PHOSGENE, AND TOXIC CARBON MONOXIDE.

POLYMERIZATION:
HAZARDOUS POLYMERIZATION HAS NOT BEEN REPORTED TO OCCUR UNDER NORMAL TEMPERATURES AND PRESSURES.

STORAGE AND DISPOSAL

STORAGE: STORE IN A COOL, DRY, WELL-VENTILATED LOCATION, AWAY FROM ANY AREA WHERE THE FIRE HAZARD MAY BE ACUTE (NFPA 49, HAZARDOUS CHEMICALS DATA, 1975).

****

CONDITIONS TO AVOID

MAY BURN BUT DOES NOT IGNITE READILY. CONTAINER MAY EXPLODE IN HEAT OF FIRE.

****

SPILL AND LEAK PROCEDURES

SOIL SPILL:
DIG A HOLDING AREA SUCH AS PIT, POND OR LAGOON TO CONTAIN SPILLED MATERIAL. USE PROTECTIVE COVER SUCH AS A PLASTIC SHEET TO PREVENT DISSOLVING IN FIREFIGHTING WATER OR RAIN.

WATER SPILL:
TRAP SPILLED MATERIAL AT BOTTOM IN DEEP WATER POCKETS, EXCAVATED HOLDING ARE OR WITHIN SAND BAG BARRIERS.

USE ACTIVATED CARBON TO ABSORB SPILLED SUBSTANCE THAT IS DISSOLVED.

USE SUCTION HOSES TO REMOVE TRAPPED SPILL MATERIAL.

USE MECHANICAL DREDGES OR LIFTS TO EXTRACT IMMOBILIZED MASSES OF POLLUTION AN
PRECIPITATES.

THE CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (PROPOSITION 65) PROHIBITS CONTAMINATING ANY KNOWN SOURCE OF DRINKING WATER WITH SUBSTANCES KNOWN TO CAUSE CANCER AND/OR REPRODUCTIVE TOXICITY.

OCCUPATIONAL SPILL:
SHUT OFF IGNITION SOURCES. STOP LEAK IF YOU CAN DO IT WITHOUT RISK. FOR SMALL LIQUID SPILLS, TAKE UP WITH SAND, EARTH OR OTHER ABSORBENT MATERIAL. FOR LARGER SPILLS, DIKE FAR AHEAD OF SPILL FOR LATER DISPOSAL. NO SMOKING, FLAME
OR FLARES IN HAZARD AREA! KEEP UNNECESSARY PEOPLE AWAY.

REPORTABLE QUANTITY (RQ): 1 POUND
THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) SECTION 304 REQUIRES THAT A RELEASE EQUAL TO OR GREATER THAN THE REPORTABLE QUANTITY FOR THIS SUBSTANCE BE IMMEDIATELY REPORTED TO THE LOCAL EMERGENCY PLANNING COMMITTEE AND THE STATE EMERGENCY RESPONSE COMMISSION (40 CFR 355.40). IF THE RELEASE
THIS SUBSTANCE IS REPORTABLE UNDER CERCLA SECTION 103, THE NATIONAL RESPONSE CENTER MUST BE NOTIFIED IMMEDIATELY AT (800) 424-8802 OR (202) 426-2675 IN T
METROPOLITAN WASHINGTON, D.C. AREA (40 CFR 302.6).

PROTECTIVE EQUIPMENT

VENTILATION:
PROVIDE LOCAL EXHAUST OR PROCESS ENCLOSURE VENTILATION TO MEET PUBLISHED EXPOSURE LIMITS.

RESPIRATOR:
THE FOLLOWING RESPIRATORS AND MAXIMUM USE CONCENTRATIONS ARE RECOMMENDATIONS BY THE U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES, NIOSH POCKET GUIDE TO CHEMICAL HAZARDS OR NIOSH CRITERIA DOCUMENTS; OR DEPARTMENT OF LABOR, 29CFR1910 SUBPART Z.
THE SPECIFIC RESPIRATOR SELECTED MUST BE BASED ON CONTAMINATION LEVELS FOUND IN THE WORK PLACE AND BE JOINTLY APPROVED BY THE NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH AND THE MINE SAFETY AND HEALTH ADMINISTRATION

AT ANY DETECTABLE CONCENTRATION:

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.
SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

ESCAPE- AIR-PURIFYING FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE OR FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
ESCAPE-TYPE SELF-CONTAINED BREATHING APPARATUS.

FOR FIREFIGHTING AND OTHER IMMEDIATELY DANGEROUS TO LIFE OR HEALTH CONDITION

SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN PRESSUR
DEMAND OR OTHER POSITIVE PRESSURE MODE.

SUPPLIED-AIR RESPIRATOR WITH FULL FACEPIECE AND OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE IN COMBINATION WITH AN AUXILIARY SELF-CONTAINED BREATHING APPARATUS OPERATED IN PRESSURE-DEMAND OR OTHER POSITIVE PRESSURE MODE.

CLOTHING:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE (IMPERVIOUS) CLOTHING AND EQUIPMENT TO PREVENT REPEATED OR PROLONGED SKIN CONTACT WITH THIS SUBSTANCE.

GLOVES:
EMPLOYEE MUST WEAR APPROPRIATE PROTECTIVE GLOVES TO PREVENT CONTACT WITH THIS SUBSTANCE.

EYE PROTECTION:
EMPLOYEE MUST WEAR SPLASH-PROOF OR DUST-RESISTANT SAFETY GOGGLES TO PREVENT EYE CONTACT WITH THIS SUBSTANCE. CONTACT LENSES SHOULD NOT BE WORN.

AUTHORIZED - FISHER SCIENTIFIC
CREATION DATE: 10/25/84 REVISION DATE: 03/10/89

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 317
TOLUENE
(Revision D)

Issued: August 1979
Revised: April 1986

SECTION 1. MATERIAL IDENTIFICATION

20

MATERIAL NAME: TOLUENE

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C_7H_8, CAS #0108-88-3

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219, Columbus, OH; Telephone: (614) 889-3844

HMIS
H: 2
F: 3
R: 0
PPE*
*See sect. 8

3
2 0
-

R 1
I 3
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Toluene 	ca 100	8-hr TLV: 100 ppm, or 375 mg/m³* (Skin)** Man, Inhalation, TCLo: 100 ppm: Psychotropic*** Rat, Oral, LD_{50}: 5000 mg/kg Rat, Inhalation, LCLo: 4000 ppm/4 hrs. Rabbit, Skin, LD_{50}: 14 gm/kg Human, Eye: 300 ppm

* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.

** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.

*** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)
Vapor Pressure @ 20°C, mm Hg ... 22
Water Solubility @ 20°C, wt. % ... 0.05
Vapor Density (Air = 1) ... 3.14

Evaporation Rate (BuAc = 1) ... 2.24
Specific Gravity (H_2O = 1) ... 0.866
Melting Point ... -139°F (-95°C)
Percent Volatile by Volume ... ca 100
Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
40°F (4°C) CC	896°F (480°C)	% by Volume	1.27	7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetraoxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION

TLV

Toluene is not considered a carcinogen by the NTP, IARC, or OSHA. SUMMARY OF RISKS: Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing) and paresthesia (a sensation of prickling, tingling, or creeping on the skin that has no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract and may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury. FIRST AID: EYE CONTACT: Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists.* SKIN CONTACT: Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed.* INHALATION: Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help.* INGESTION: Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. * GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8).
WASTE DISPOSAL: Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway.
COMMENTS: Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLm 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 lfm (linear feet per minute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm.
Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use metal safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. SPECIAL HANDLING/STORAGE: Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. ENGINEERING CONTROLS: Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.
COMMENTS: Emptied containers contain product residues. Handle accordingly!
Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294.
Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26, 34, 81, 82. CR

Approvals J.O. Accuacco, 11/86.
Indust. Hygiene/Safety DJW 10-86
Medical Review Oct 86

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CALEDON LABORATORIES LTD

416-877-0101

40 ARMSTRONG AVENUE, GEORGETOWN, ONTARIO, CANADA L7G 4R9

FAX:416-877-6666

MATERIAL SAFETY DATA SHEET TRICHLOROETHYLENE

PRODUCT IDENTIFICATION

Chemical Name and Synonyms: *Trichloroethylene; Trichlor; Trichlorothene*

Chemical Family: *Halogenated Hydrocarbons*

Chemical Formula: $CHClCCl_2$

Product Use: *Laboratory solvent*

Manufacturer's Name: *Caledon Laboratories Ltd.*

Street Address: *40 Armstrong Avenue*

City: *Georgetown*

Province: *Ontario*

Postal Code: *L7G 4R9*

Telephone No: *(416) 877-0101*

Emergency Telephone No.: *CANUTEC (613) 996-6666*

HAZARDOUS INGREDIENTS OF MATERIALS

Ingredients	*%*	*TLV Units*	*CAS No.*
Trichloroethylene	*>99*	*50 ppm*	*79-01-6*

PHYSICAL DATA

Physical State: *Liquid*

Odour and Appearance: *Clear, colourless liquid with mild, ethereal odour*

Odour Threshold (ppm): *No Data*

Vapour Pressure (mm Hg): *100 mm Hg*

Vapour Density (Air = 1): *4.54*

Evaporation Rate: *0.28 (Ethyl Ether = 1)*

Boiling Point (°C): *87.1°C*

Freezing Point (°C): *-73°C*

pH: *6.7 to 7.5*

Specific Gravity: *1.465*

Coefficient of Water/Oil distribution: *No Data*

SHIPPING DESCRIPTION

PIN: *1710*

T.D.G. Class: *9.2*

Pkg. Group: *III*

REACTIVITY DATA

Chemical Stability: *Stable*

Incompatibility with other substances: *Avoid caustic soda, caustic potash or oxidizing materials.*

Reactivity: *Avoid open flames, hot glowing surfaces or electric arcs.*

Hazardous Decomposition Products: *Hydrogen chloride; phosgene*

FIRE AND EXPLOSION DATA

Flammability: *Flammable; may decompose*

Extinguishing Media: *Water-fog; dry chemicals; foam; carbon dioxide*

Flash Point (Method Used): *None*

Autoignition Temperature: *410°C*

Upper Flammable Limit (% by volume): *12.5*

Lower Flammable Limit (% by volume): *9.0*

Hazardous Combustion Products: *Hydrogen chloride; phosgene*

Sensitivity to Impact: *No Data*

Sensitivity to Static discharge: *No Data*

TOXICOLOGICAL PROPERTIES AND HEALTH DATA

Toxicological Data:

LD_{50}: *(oral, rat) 3670-4920 mg/kg*

LC_{50}: *(inhalation, rat) 12,000 mg/kg*

Effects of Acute Exposure to Product:

Inhaled: *Vapours are irritating to the eyes, nose, throat and respiratory tract. May cause convulsions, CNS depression, cardiac arrhythmia, visual disturbances and systemic poisoning.*

In contact with skin: *May cause defatting, drying and cracking of the skin. Burns can occur if not promptly removed. Prolonged and repeated exposure may lead to dermatitis.*

In contact with eyes: *May cause severe irritation, corneal burns and conjunctivitis; possible corneal damage.*

Ingested: *May cause irritation and burning of the mouth, throat, respiratory tract and esophagus. Can cause convulsions, CNS depression, cardiac arrhythmia and systemic poisoning.*

Effects of Chronic Exposure to Product:

Carcinogenicity: *Not listed as a carcinogen by NTP, OSHA or IARC*

Teratogenicity: *No information available*

Reproductive Effects: *No information available*

Mutagenicity: *No information available*

Synergistic Products: *None known*

PREVENTIVE MEASURES

Engineering Controls: *Local exhaust ventilation required.*

Respiratory Protection: *A NIOSH/MSHA approved air-purifying respirator equipped with organic vapour cartridges for concentrations up to 500 ppm. Air-supplied respirator for higher or unknown concentrations.*

Eye Protection: *Chemical safety goggles*

Skin Protection: *Protective clothing and gloves made from viton and impervious under conditions of use. Impervious apron and boots.*

Other Personal Protective Equipment: *Safety shower and eyewash fountain in work area.*

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Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 318
XYLENE (Mixed Isomers)
(Revision D)
Issued: November 1980
Revised: August 1988

SECTION 1. MATERIAL IDENTIFICATION

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Material Name: XYLENE (Mixed Isomers)

Description (Origin/Uses): Used as a raw material for the production of benzoic acid, phthalic anhydride, isophthalic and terephthalic acids and their dimethyl esters in the manufacture of polyester fibers; in sterilizing catgut; with Canadian balsam as oil-immersion in microscopy; and as a cleaning agent in microscopic techniques.

Other Designations: Dimethylbenzene; Xylol; C_8H_{10}; CAS No. 1330-20-7

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

Comments: Although there are three different isomers of xylene (*ortho*, *meta*, and *para*), the health and physical hazards of all three isomers are very similar. This MSDS is written for a xylene mixture of all three isomers, which is usually commercial xylene.

3
2 0

NFPA

HMIS			
H	2		
F	3	R	1
R	0	I	3
PPG*		S	2
*See sect. 8		K	3

SECTION 2. INGREDIENTS AND HAZARDS	%	EXPOSURE LIMITS
Xylene (Mixed Isomers), CAS No. 1330-20-7* *o-Xylene, CAS No. 0095-47-6 *m*-Xylene, CAS No. 0108-38-3 *p*-Xylene, CAS No. 0106-42-3 **Check with your supplier to determine if there are additions, contaminants, or impurities (such as benzene) that are present in reportable quantities per 29 CFR 1910. ***Immediately dangerous to life and health. **** See NIOSH, *RTECS* (No. ZE2100000), for additional data with references to reproductive, irritative, and mutagenic effects.	**	IDLH*** Level: 1000 ppm **OSHA PEL** 8-Hr TWA: 100 ppm, 435 mg/m^3 **ACGIH TLVs, 1987-88** TLV-TWA: 100 ppm, 435 mg/m^3 TLV-STEL: 150 ppm, 655 mg/m^3 **Toxicity Data****** Human, Inhalation, TC_{Lo}: 200 ppm Man, Inhalation, LC_{Lo}: 10000 ppm/6 Hrs Rat, Oral, LD_{50}: 4300 mg/kg

SECTION 3. PHYSICAL DATA

Boiling Point: 275°F to 293°F (135°C to 145°C)*
Melting Point: -13°F (-25°C)
Evaporation Rate: 0.6 Relative to BuAc = 1
Specific Gravity (H_2O = 1): 0.86

Water Solubility (%): Insoluble
Molecular Weight: 106 Grams/Mole
% Volatile by Volume: Ca 100
Vapor Pressure: 7 to 9 Torrs at 68°F (20°C)
Vapor Density (Air = 1): 3.7

Appearance and Odor: A clear liquid; aromatic hydrocarbon odor.

*Materials with wider and narrower boiling ranges are commercially available.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
81°F to 90°F (27°C to 32°C)	867°F (464°C)	% by Volume	1%	7%

Extinguishing Media: Use foam, dry chemical, or carbon dioxide. Use water sprays to reduce the rate of burning and to cool containers.

Unusual Fire or Explosion Hazards: Xylene vapor is heavier than air and may travel a considerable distance to a low-lying source of ignition and flash back.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Xylene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: This material may react dangerously with strong oxidizers.

Conditions to Avoid: Avoid any exposure to sources of ignition and to strong oxidizers.

Hazardous Products of Decomposition: Carbon monoxide (CO) may be evolved during xylene fires.

APPENDIX C

TREATABILITY STUDY RESULTS

APPENDIX C

TREATABILITY STUDY RESULTS

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TREATABILITY STUDY RESULTS
ULTRAVIOLET OXIDATION

The enclosed reports from Ultrox comprise the results of a treatability study for Ultraviolet Oxidation. In addition, CRA's Quality Assurance/Quality Control Assessment of confirmatory analyses conducted by Radian Corporation are attached. The results are summarized below.

The test objectives of the treatability study were defined in the Treatability Study Work Plan (CRA, 1990) as follows:

1) Identify the effluent concentrations that are economically achievable by Ultraviolet Oxidation (UVO).

2) Identify appropriate dosages of proxide or ozone and UVR exposure to effect treatment.

3) Provide data to develop capital and operating and maintenance costs for a UVO treatment alternative under FS.

4) Define pretreatment requirements (eg. pH, adjustment, iron sequestering, etc.) for Jadco-Hughes groundwater if a UVO system is used.

The UVO trials concluded that the Site compounds could be successfully treated and the test objectives were achieved.

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TREATABILITY STUDY RESULTS ULTRAVIOLET OXIDATION

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The UVO trials concluded that the Site compounds could be successfully treated and the test objectives were achieved.

Test Objectives 1 & 2:	The laboratory test runs demonstrated that the surface water and POTW discharge limits could be satisfied at Jadco-Hughes for alphatic ketones, halocarbons and aromatics. The combination of $UV/O_3/H_2O_2$ provided optimum contaminant destruction. Also, a pH adjustment and control will be required in a full scale system to obtain the desired level of contaminant destruction. The data tables appended to the Ultrox report, target compounds to the Ultrox lab: detection limits for most compounds in $UV/O_3/H_2O_2$ runs.
Test Objectives 3:	Budget capital, operating and maintenance costs were identified by Ultrox.

A) Capital Cost

1) includes one Ultrox F-1950 UV/oxidation reactor with 170 lb/day ozone generator with air preparation system consisting of air compressor, dryers, and filters, with H_2O_2 metering system, ballast enclosures and semi-automatic control system

Total Estimated Cost	$	319,500.00

2) pH Control system

Total Estimated Cost	$	15,000.00

B) Operating Costs

1) $H_2O_2 = 168 \frac{\text{lbs}}{\text{day}} \times \frac{\$0.70}{16}$

(Flow Rate assumed to be 25.0 GPM) $ 119.00/day

2) O_3: Electricity $1700 \frac{\text{KW - Hr}}{\text{day}} \times \frac{\$0.07}{\text{KW - Hr}}$

$ 23.58/day

3) UV Lamps:

$216 \text{ lamps} \times 65 \frac{\text{walls}}{\text{lamp}} \times 24 \frac{\text{hr.}}{\text{day}} \times \frac{\$0.07}{1000 \text{ Watts}}$

$ 260.18/day

$/1000 Gal = $260.18 x 1400 gal. x 1 min. $ 7.23/1000 gal

C) Maintenance

Lamp replacement amortized on a Daily Basis $ 29.89/day or

$ 0.82/1000 gal

The data analysis presented in the Ultrox reports complies with the provisions in the Work Plan. In addition, Ultrox collected samples and submitted them for confirmatory testing of the initial influent to the lab scale treatment system and treated effluent from the optimized runs. The analytical results for detected compounds are shown on Table C.17.

The results demonstrated that the UVO treatment system can be configured to test Site groundwater for discharge to the POTW or to surface water.

TABLE C.17

CONFIRMATORY SAMPLING
UVO TREATABILITY STUDY
JADCO-HUGHES RI/FS

	Influent (µg/L)	*Effluent (µg/L)*
Detected VOCs		
acetone	6700J	4200
benzene	220J	ND(110)
2-butanone	6400J	ND(250)
carbon tetrachloride	69J	ND(70)
chlorobenzene	560J	ND(130)
chloroform	2700J	110
1,1-dichloroethene	110J	ND(120)
1,2-dichloroethane	450J	ND(70)
ethylbenzene	150J	ND(130)
4-methyl-2-pentanone	1500J	50
methylene chloride	2700J	300U
toluene	3700J	ND(130)
total xylenes	460J	ND(130)
trichloroethene	53J	ND(63)
Detected BNAs		
benzonic acid	190J	ND(50)UJ
bis (2--chloroethyl) ether	6200J	7.8J
1,4-dichlorobenzene	280J	ND(4.4)UJ
phenol	140J	ND(2.6)UJ
1,2,4-trichlorobenzene	640J	ND(1.9)UJ

Notes:

ND - Not Detected (the detection limit is in brackets)
J - An estimated quantity
U - The associated value is the sample quantitation limit.
UJ - The analyte was checked for but not detected. The associated value is an estimate.

ULTROX INTERNATIONAL

UV/OXIDATION LABORATORY TREATABILITY STUDY OF GROUNDWATER AT JADCO HUGHES SITE

CONSULTANT: CONESTOGA ROVERS & ASSOCIATES
WATERLOO, ONTARIO, CANADA

Submitted by: Jerome T. Barich

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

Samples of ground water from the Jadco Hughes site were subjected to three UV/oxidation processes, including UV/O_3, UV/H_2O_2 and UV/O_3/H_2O_2. The primary contaminants targeted for destruction were ketones, halocarbons and aromatic compound (BTEX). Base neutral compounds also were of concern but were not analyzed for by the ULTROX laboratory.

Ground water treated with the UV/O_3/H_2O_2 in test runs 8, 8A, 8B and 8C all satisfied both surface discharge and P.O.T.W. discharge requirements in terms of ketones, halocarbons and BTEX. It was determined that depression of the pH to approximately 4.0 was critical to obtain the desired result. Additionally, it was determined that the O_3:H_2O_2 ratio also was very important. A ratio of 1:1 produced satisfactory results while a ratio of 3:1 (Run 10B) produced unsatisfactory results.

The UV/O_3 method did not produce acceptable results. The UV/H_2O_2 test runs were marginally successful with slower destruction rates than with UV/O_3/H_2O_2. pH depression was not attempted during the UV/O_3/H_2O_2 test runs as it normally has an adverse effect on reaction rates.

II. TECHNOLOGY DESCRIPTION

Ultraviolet oxidation is an enhanced or advanced oxidation process (AOP) utilizing ultraviolet with ozone and/or hydrogen peroxide. Ultraviolet light, when combined with O_3 and/or H_2O_2, produces a highly oxidative environment significantly more destructive than that created with O_3 or H_2O_2 by themselves or in combination.

UV light significantly enhances ozone or H_2O_2 reactivity by:

i) Transformation of O_3 or H_2O_2 to highly reactive $(OH)^-$ radicals;
ii) Excitation of the target organic solute to a higher energy level; and
iii) Initial attack of the target organic by UV light.

Table I illustrates the relative oxidant strength of hydroxyl radical $(OH)^-$, O_3, H_2O_2 and Cl_2. Table II illustrates a theoretical reaction pathway for the destruction of chlorobenzene that was developed by ULTROX under a research grant from the National Science Foundation.

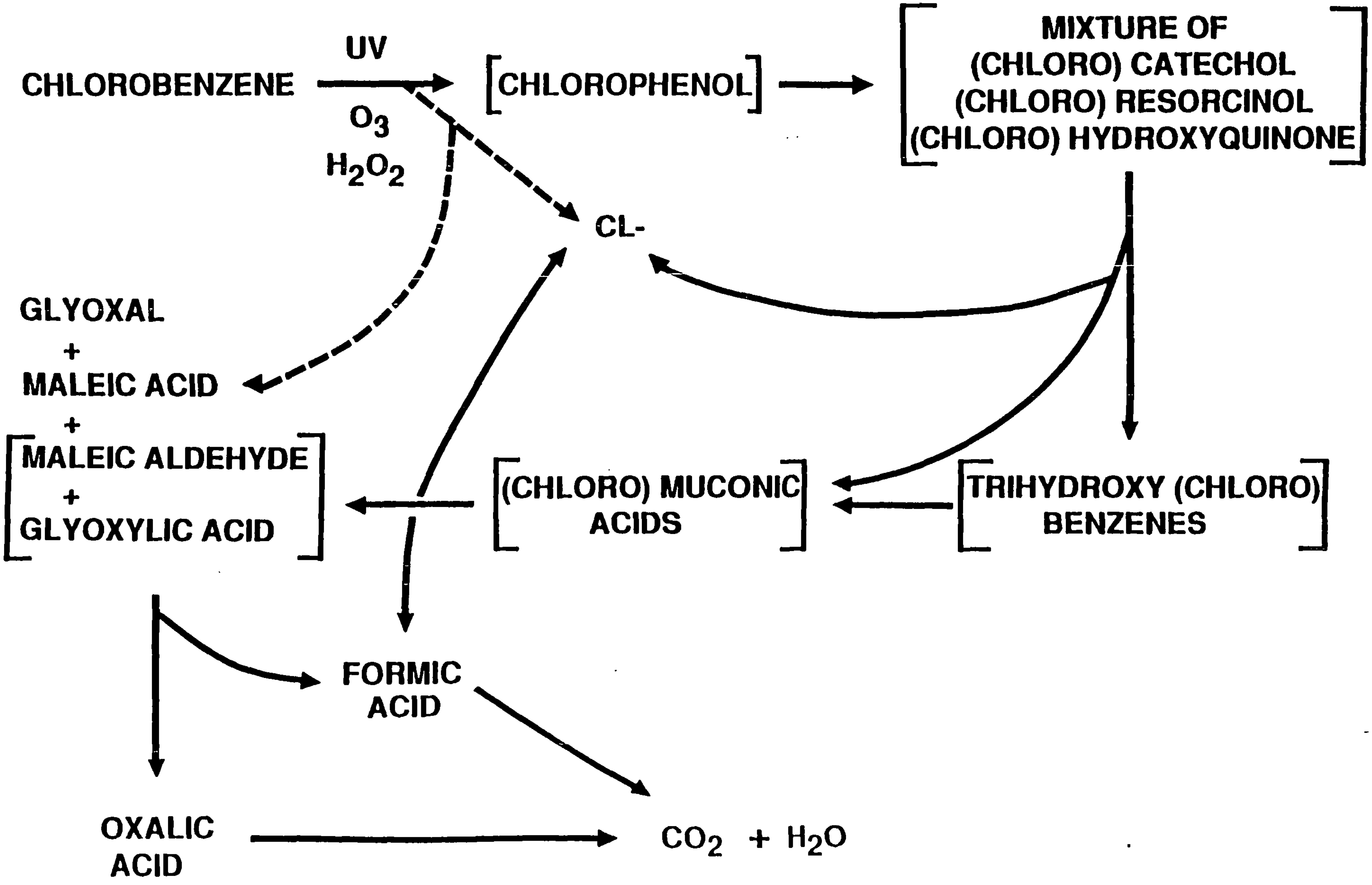
TABLE I

OXIDATION POTENTIAL

Relative Oxidation Potential (C12 = 1.0)	Species	Oxidation Potential (Volts)
2.23	fluorine	3.03
2.06	hydroxyl radical	2.80
1.78	atomic oxygen (single)	2.42
1.52	ozone	2.07
1.31	hydrogen peroxide	1.78
1.25	perhydroxyl radical	1.70
1.24	permanganate	1.68
1.15	chlorine dioxide	1.57
1.07	hypoiodous acid	1.45
1.00	chlorine	1.36
0.80	bromine	1.09
0.39	iodine	0.54

TABLE II : REACTION PATHWAY

OXIDATION OF CHLOROBENZENE



III. TEST OBJECTIVES

The objectives of the treatability study were as follows:

i) To identify the oxidant combination with UV that would destroy the targeted contaminants below surface discharge or P.O.T.W. discharge limits;

ii) To identify appropriate dosages of peroxide and/or ozone with UV light to achieve the desired treatment limits; and

iii) To obtain the data required to develop capital, operating and maintenance costs.

IV. EQUIPMENT AND MATERIALS

The bench scale test included the following equipment and materials:

- a batch reactor
- an ultraviolet radiation lamp
- hydrogen peroxide
- ozone and an ozone generator

The reactor used is a cylindrical 500 mm x 80 mm 2.4L glass vessel. It is sealed to minimize incidental releases of excess ozone and VOCs. The UV radiation is provided by one 40 watt low pressure mercury arc lamp inside a quartz sheath placed in the center of the vessel. The 2L of water charged into the reactor is stirred by a magnetic stirrer. Hydrogen peroxide is added during the ultraviolet radiation exposure using a source which is 30% hydrogen peroxide and 70% water.

Ozone is generated by a 2 lb/day model 8341 Matheson Gas Products generator from a commercial oxygen source and is introduced as a ratio of oxygen and ozone using a coarse frit gas dispersion tub (sparger) at the bottom of the reactor.

V. EXPERIMENTAL PROCEDURES

The treatability test was broken into 3 tasks:

1) The sample collection and shipping
2) Sample analyses
3) UVO bench tests

A. SAMPLE COLLECTION AND SHIPPING

The ground water samples were collected by Conestoga-Rovers personnel at the Jadco Hughes sites. The samples were collected in ten-one gallon amber bottles. Five packages, each containing two one-gallon containers, were received by the ULTROX laboratory. The samples were stored in a refrigerator at 5°C immediately after receiving them.

B. SAMPLE ANALYSES

Prior to the start of the test, ULTROX analyzed the groundwater sample for ketones, halocarbons and BTEX.

Each treated water batch also was analyzed at 20, 40 and 60 min. intervals utilizing the analytical procedures described above in Section VI to determine the degree of contaminant destruction in the treated water sample from each of the various batch tests.

Halocarbons were determined using EPA Protocol 601 and the BTEX compounds were determined with EPA Method 602. Ketones were analyzed using a Perkin Elmer Gas Chromotograph utilizing purge and trap. Please refer to Section VI and Table III for method and detection limit.

C. UV/OXIDATION TESTING PROCEDURE

At the beginning of each working period determine the ozone output of the ozone generator. Pass 1 liter/min of O_2-O_3 from the O_3 generator at the predetermined power level to produce an O_3 of 2% through 300 ml of 2% KI solution in a 500 ml graduated cylinder for 30-60 seconds. Titrate an acidified (H_2SO_4) 50 ml aliquot of the KI solution with 0.02 M sodium thiosulfate solution to starch endpoint. From the volume of the thiosulfate solution consumed calculate the O_3 output.

Charge the 2.4 liter glass reactor with two liters of the groundwater, place a quartz sheath containing one 25 watt low pressure UV lamp in the middle of the reactor, insert a sparger (gas dispersion tube with coarse frit) at the bottom of the reactor, turn on the coarse frit) at the bottom of the reactor, turn on the magnetic stirrer and the UV light and introduce O_2-O_3 from the sparger at the predetermined O_2-O_3 flow rate. During the runs in which H_2O_2 is used, the calculated volume of 30% H_2O_2 is added and mixed for five minutes before turning on the UV light and O_3.

Samples were taken at 20, 40 and 60 minutes of UV exposure and oxidant addition and analyzed for ketones, halocarbons and BTEX.

VI. ANALYTICAL PROCEDURES

A. HALOGENATED HYDROCARBON ANALYSIS: EPA METHOD 601

The halocarbon concentration in water samples was measured by gas liquid chromatography using EPA Method 601. Perkin-Elmer 8500 Gas Chromatograph was utilized equipped with Tekmar LSC-2 Liquid Sample Concentrator (purge and trap) and Model 1000 Hall Detector (electrolytic conductivity detector).

GLC Column: 25' x 1/8" SS column packed with 20% OV-101 + 0.1% 1500 ON
100/120 MESH CHROM WHP
Syringe: 5 ml gas tight
Volumetric Flasks: 10, 50, 100, 500 and 1000 ml with ground glass stoppers
Microsyringe: µl and 100 µl (Hamilton 701-N)
Standards: Reagent grade chemicals
Bottle: Glass with teflon lined screw-caps

B. AROMATICS (BTEX) ANALYSIS - EPA METHOD 602

An SRI-8610 Gas Chromatograph was utilized, equipped with purge and trap and PID (photo ionization detector).

G/C Column: Megabore Column AH95 SRI Part #8610-9093 (SRI Redondo Beach, Ca 90277, Tel. 213/214-5092) equivalent to DB-1.

Syringe: 10 ml. gas tight

C. ALIPHATIC KETONE ANALYSIS

The analysis of acetone, methyl ethyl ketone and methyl isobutyl ketone was as follows:

Feedstock samples were analyzed for acetone, methyl-ethyl ketone and methyl isobutyl ketone levels using the Perkin Elmer Model 8500 Gas Chromatograph, employing the purge and trap method, and a flame ionization detector. The separation column contains OV-101 (20% by weight) and C1500 (0.1% by weight) in the liquid phase, on a chromosorb W support. The column length is 25 feet, with an inside diameter of 0.085 inches. Helium was used at the carrier gas, as well as the purging gas. The volume of sample (or standard) purged during each analysis, was 5 milliliters.

Detailed calibration curves were constructed for each of the three compounds listed above. In each case, peak heights were plotted against compound concentration in units of parts per million by weight following chromatograph runs, employing standard solutions containing known levels of each compound. After each sample run, peak heights (for peaks identified by retention time) were used to determine compound concentrations. In nearly every case, samples had to be diluted with distilled water prior to analysis by purge and trap, in order to:

1) Insure that the peak heights did not exceed the upper range for the calibration curve corresponding to each compound being analyzed;

2) Insure that the purge and trap column or separation column was not overburdened by volatile organic materials from the sample.

In cases where no peak was detected for a given compound after a sample run, the limit of detectability listed for that compound is a product of the lower limit established for the calibration curve (example 0.01 ppm for methyl ethyl ketone), and the degree of sample dilution prior to analysis. (For a 10:1 dilution of sample with distilled wter, the actual limit of detectability would be 10 (0.01 ppm) = 0.10 ppm for the compound methyl ethyl ketone.)

TABLE III

ULTROX ANALYTICAL METHODS AND DETECTION LIMITS

JADCO-HUGES TRETABILITY STUDY*

Compounds	EPA Method	Detection Limit µg/l
acetone	*	1.5 to 10.0
2-butanone	*	1.5 to 10.0
4-methyl-2-pentanone	*	1.5 to 10.0
benzene	602	3.0
carbon tetrachloride	601	3.0
chloroform	601	3.0
1,2-dichloroethane	601	3.0
1,2-dichloroethene	601	3.0
ethylbenzene	602	3.0
methylene chlorides	601	3.0
toluene	602	3.0
1,1,1-trichloroethane	601	3.0
total xylenes	602	3.0

* See Section VI-C

VII. CONCLUSIONS

The laboratory test runs conclusively demonstrated that the surface and P.O.T.W. discharge limits could be satisfied at Jadco-Hughes in regards to the aliphatic ketones, halocarbons and aromatics, i.e. BTEX. The combination of $UV/O_3/H_2O_2$ provided the optimum results in terms of contaminant destruction.

pH adjustment will be required to obtain the desired level of contaminant destruction. Metals fouling was not a factor of concern in the laboratory bench work. However, iron removal equipment may be required in full scale operation based on the limited metals analyses that ULTROX has seen.

VIII. RECOMMENDATION

An on-site pilot plant demonstration is recommended to confirm the results obtained in the laboratory data. The demonstration also will give some indication as to whether or not the metals levels in the continuously pumped ground water will cause significant sheath fouling and, therefore, require pretreatment.

During the pilot work, sufficient data will be collected for full scale equipment design. A three week long on-site demonstration is recommended. A sketch of an ULTROX® P-75 pilot plant system can be found in the Appendix.

IX. BUDGET CAPITAL, OPERATING & MAINTENANCE COSTS

A. Capital Cost, FOB Santa Ana, California

1. Includes one ULTROX® F-1950 UV/oxidation reactor with 170 lb/day ozone generator with air preparation system consisting of air compressor, dryers and filters, with H_2O_2 metering system, ballast enclosures and semi-automatic control system. $319,500.00
2. pH Control System $15,000.00

B. Operating Costs

Flow Rate = 25.0 GPM $117.60

1. H_2O_2: 168 $\frac{\text{lbs}}{\text{day}} \times \frac{\$.70}{\text{lb}} =$ $119.00
2. O_3: Electricity 1700 $\frac{\text{KW-Hr}}{\text{day}} \times \frac{\$.07}{\text{KW-Hr}}$ $\underline{\$\ 23.58}$
3. UV Lamps:

   216 lamps $\times$ 65 $\frac{\text{watts}}{\text{lamp}} \times$ 24 $\frac{\text{hr.}}{\text{day}} \times \frac{\$.07}{1000 \text{ watts}}$ $260.18

$/1000 Gal. = $260.18 x 1440 gal. x 1 min. = $7.23/1000 gal.

C. Maintenance

Lamp Replacement Amortized on a Daily Basis = $29.89/day or
$.82/1000gal.

LABORATORY DATA

OXIDATION OF CONESTOGA-ROVERS - III JADCO HUGHES

RUN #	OXIDATION CONDITIONS	TIME (MIN)	Ph	O_3 DOSE MG/L	H_2O_2 DOSE MG/L	ACET-ONE (ppm)	METHYL ETHYL KETONE (ppm)	METHYL ISOBUTYL KETONE (ppm)	DATE OF RUN	BENZENE (ppm)	TOLUENE (ppm)	ETHYL-BENZENE (ppm)	XLENES (ppm)	CHLOR-FORM (ppm)	METHYL-ENE CHLORIDE (ppm)	CARBON TETRA-CHLORIDE (ppm)	1,2 DCA (ppm)	1,1 DCA (ppm)	COMMENTS
1A	UV/O_3	0	6.5	0		14.8	11.50	2.05	1/23/90										Dark precipitate forms
		20	-	300		23.6	9.50	0.60		<0.005	<0.005	<0.005	<0.005	0.220	<0.025	<0.025	0.040	<0.025	almost immediately at
		40	-	600		21.6	5.62	<0.25		<0.005	<0.005	<0.005	<0.005						start of test
		60	7.7	900		20.9	3.20	<0.25		<0.005	<0.005	<0.005	<0.005	0.026	<0.005	<0.005	<0.005	0.027	
4	UV/H_2O_2	0	6.5		0	14.8	11.50	2.05	1/23/90										Less dark precipitate
		20	-		300	18.7	8.00	0.42						2.250	<0.062	<0.062	<0.062	0.162	formed compared to
		40	-		600	18.5	1.87	<0.25		<0.005	<0.005	<0.005	<0.005	1.000	0.058	<0.025	<0.025	0.110	Run # 1A
		60	6.2		900	16.4	0.46	<0.25						0.360	0.100	<0.005	<0.005	0.125	
1B	UV/O_3	0	7.4	0		20.2	11.12	1.91	1/25/90										Pre-treated feedstock used
		20	-	300						<0.005	<0.005	<0.005	<0.005	0.210	<0.025	<0.025	<0.025	<0.025	(ozone at 15 mg/liter/min
		40	-	600						<0.005	<0.005	<0.005	<0.005	0.050	<0.025	<0.025	<0.025	<0.025	for 2 min followed by
		60	7.6	900		8.85	0.75	<0.25						<0.025	<0.025	<0.025	<0.025	0.080	filtration)
7*	UV/O_3/H_2O_2	0	7.4	0	0	20.2	11.12	1.91	1/25/90										Pre-treated feedstock used.
		20	-	300	300														No precipitate formed
		40	-	600	600														during run.
		60	7.9	900	900	7.55	<0.25	<0.25											
10A	UV/O_3/H_2O_2	0	7.4	0	0	9.47	10.12	1.62	1/26/90	0.350	2.750	0.500	0.400						Pre-treated feedstock used.
		20	-	225	75					<0.005	<0.005		<0.005	0.288	<0.005	<0.005	<0.005	<0.005	
		40	-	450	150					<0.005	<0.005		<0.005	0.085	0.040	<0.005	0.024	<0.005	
		60	7.9	675	225	8.32	2.55	<0.25		<0.005	<0.005		<0.005	0.020	0.012	<0.005	0.017	0.190	
10B	UV/O_3/H_2O_2	0	4.0	0	0	9.47	10.12	1.62	1/26/90	0.350	2.750	0.500	0.400						Pre-treated feedstock used.
		20	-	225	75					<0.005	<0.005		<0.005	0.288	<0.062	<0.062	<0.062	<0.062	Adjusted to pH = 4.0 using
		40	-	450	150					<0.005	<0.005		<0.005	0.048	0.040	<0.005	<0.005	<0.005	3 ml of 50% H_2SO_4 sol.prior
		60	3.6	675	225	5.17	<0.25	<0.25		<0.005	<0.005		<0.005	0.010	0.005	<0.005	<0.005	<0.005	start of run. No recip. for

Several drops of anti-foam agent added to solutions at beginning of run 1-5 (not needed for run #6)

OXIDATION OF CONASTOGA ROVERS - III JADCO HUGHES

RUN #	OXIDATION CONDITIONS	TIME (MIN)	Ph	O3 DOSE MG/L	H2O2 DOSE MG/L	ACET-ONE (ppm)	METHYL ETHYL KETONE (ppm)	METHYL ISOBUTYL KETONE (ppm)	DATE OF RUN	BENZENE (ppm)	TOLUENE (ppm)	ETHYL-BENZENE (ppm)	XLENES (ppm)	CHLOR-FORM (ppm)	METHYL-ENE CHLORIDE (ppm)	CARBON TETRA-CHLORIDE (ppm)	1,2 DCA (ppm)	1,1 DCA (ppm)	COMMENTS
6	UV/H2O2	0	7.1		0	3.42	9.40	1.76	1/31/90	0.079	0.560	0.014	0.018						Very small bubbles produced during oxidation, untill 45 min. after start of test larger bubbles appeared.
		20	-		375	4.00	3.15	<0.10		<0.005	<0.005		<0.005	0.625	<0.062	<0.062	<0.062	<0.062	
		40	-		750	2.25	0.20	<0.10		<0.005	<0.005		<0.005	0.450	<0.062	<0.062	<0.062	<0.062	
		60	6.5		1125	0.86	<0.10	<0.10		<0.005	<0.006		<0.005	0.440	0.040	<0.005		0.020	
3	UV/O3	0	4.0	0		2.40	8.60	1.68	2/01/90	0.100	1.500	0.086	0.031	2.150	0.056	<0.025	<0.025	0.020	Large amount of precipitate formed during oxidation
		20	-	375		3.42	7.20	0.86		0.028	0.025		<0.005	0.400	<0.025	<0.025	0.035	<0.025	
		40	-	750		3.65	5.45	0.30		<0.005	<0.005		<0.005	0.105					
		60	3.2	1125		3.60	3.58	<0.10		<0.005	<0.005		<0.005	0.025	0.130	<0.025	<0.025	<0.025	
8	UV/O3/H2O2	0	4.0	0	0	3.20	9.40	1.76	2/01/90	0.090	1.000		0.025						No precipitate formed during oxidation
		20	-	187.5	187.5	3.59	1.83	<0.10		<0.005	<0.005		<0.005	0.500	<0.040	<0.040	<0.040	<0.040	
		40	-	375	375	1.27	<0.10	<0.10		<0.005	<0.005		<0.005	0.224	<0.040	<0.040	<0.040	<0.040	
		60	3.8	562.5	562.5	<0.10	<0.10	<0.10		<0.005	<0.005		<0.005	0.040	0.007	<0.005	<0.005	<0.054	
6A	UV/H2O2	0	7.2		0	5.90	8.55	1.68	2/07/90	0.100	1.100		0.032	1.350	3.500	<0.125	<0.125	<0.125	12 ppm acetone spike prior to oxidation tests
		20	-		375	5.40	1.73	<0.10		<0.005	<0.005		<0.005						
		40	-		750	1.88	<0.10	<0.10		<0.005	<0.005		<0.005	0.650	0.969	<0.062	<0.062	<0.062	
		60	6.5		1125	0.66	<0.10	<0.10						0.650	0.830	<0.050	<0.050	<0.050	
8A	UV/O3/H2O2	0	4.0	0	0	5.90	8.55	1.71	2/07/90	0.100	1.100		0.032						12 ppm acetone spike prior to oxidation tests
		20	-	187.5	187.5	3.30	0.43	<0.10		<0.005	<0.005		<0.005	0.125	0.068	<0.010	<0.010	<0.010	
		40	-	375	375	0.57	<0.10	<0.10						0.044	0.046	<0.006	<0.005	<0.005	
		60	4.3	562.5	562.5	0.16	<0.10	<0.10						0.0065	<0.005	<0.005	<0.005	<0.005	
6B	UV/H2O2	0	7.2		0	5.80	8.45	1.62	2/08/90	0.100	0.900		0.032	1.350		<0.025			Double intense UV light source used 12 ppm acetone spike prior to oxidation test
		20	-		375	6.00	2.06	<0.10		0.005	<0.005		<0.005	0.250	<0.005		<0.005	<0.005	
		40	-		750	3.18	0.12	<0.10		<0.005	<0.005		<0.005	0.750	0.575	<0.062	<0.062	<0.062	
		60	6.6		1125	1.95	<0.10	<0.10						0.500	0.850	<0.050	<0.050	<0.050	

OXIDATION OF CONASTOGA ROVERS - III JADCO HUGHES

RUN #	OXIDATION CONDITIONS	TIME (MIN)	Ph	O3 DOSE MG/L	H2O2 DOSE MG/L	ACET-ONE (ppm)	METHYL ETHYL KETONE (ppm)	METHYL ISOBUTYL KETONE (ppm)	DATE OF RUN	BENZENE (ppm)	TOLUENE (ppm)	ETHYL-BENZENE (ppm)	XYLENES (ppm)	CHLOR-FORM (ppm)	METHYL-ENE CHLORIDE (ppm)	CARBON TETRA-CHLORIDE (ppm)	1,2 DCA (ppm)	1,1 DCA (ppm)	COMMENTS
8B	UV/O3/H2O2	0	4.0	0	0	5.80	8.45	1.62	2/08/90					0.334					Double intense UV light
		20	-	187.5	187.5	5.65	1.08	<0.10		<0.005	<0.005		<0.006	0.120	<0.025	<0.025	<0.025	<0.025	source used.
		40	-	375	375	2.72	<0.10	<0.10		<0.005	<0.006		<0.006	0.700	0.100	<0.005	<0.006	<0.005	12 ppm acetone spike prior
		60	3.9	562.5	562.5	0.07	<0.10	<0.10		<0.005	<0.005		<0.005	0.033	0.050	<0.005	<0.006	<0.005	to oxidation test. Single
																			prior to oxidation test
8C	UV/O3/H2O2	0	4.0	0	0	7.45	8.50	1.45	2/15/90	0.070	1.133	0.078	<0.050	1.150	1.450	<0.050	<0.050	<0.060	12 ppm acetone spike prior
		20	-	187.5	187.5	5.72	0.21	<0.10						0.570	0.840	<0.015	<0.015	<0.015	to oxidation test. Single
		40	-	375	375	1.72	<0.10	<0.10						0.300	0.960	<0.010	<0.010	<0.010	power
		60	3.6	562.5	562.5	0.70	<0.10	<0.10						0.110	0.105	<0.006	<0.005	<0.005	

PROCESS FLOW DIAGRAM

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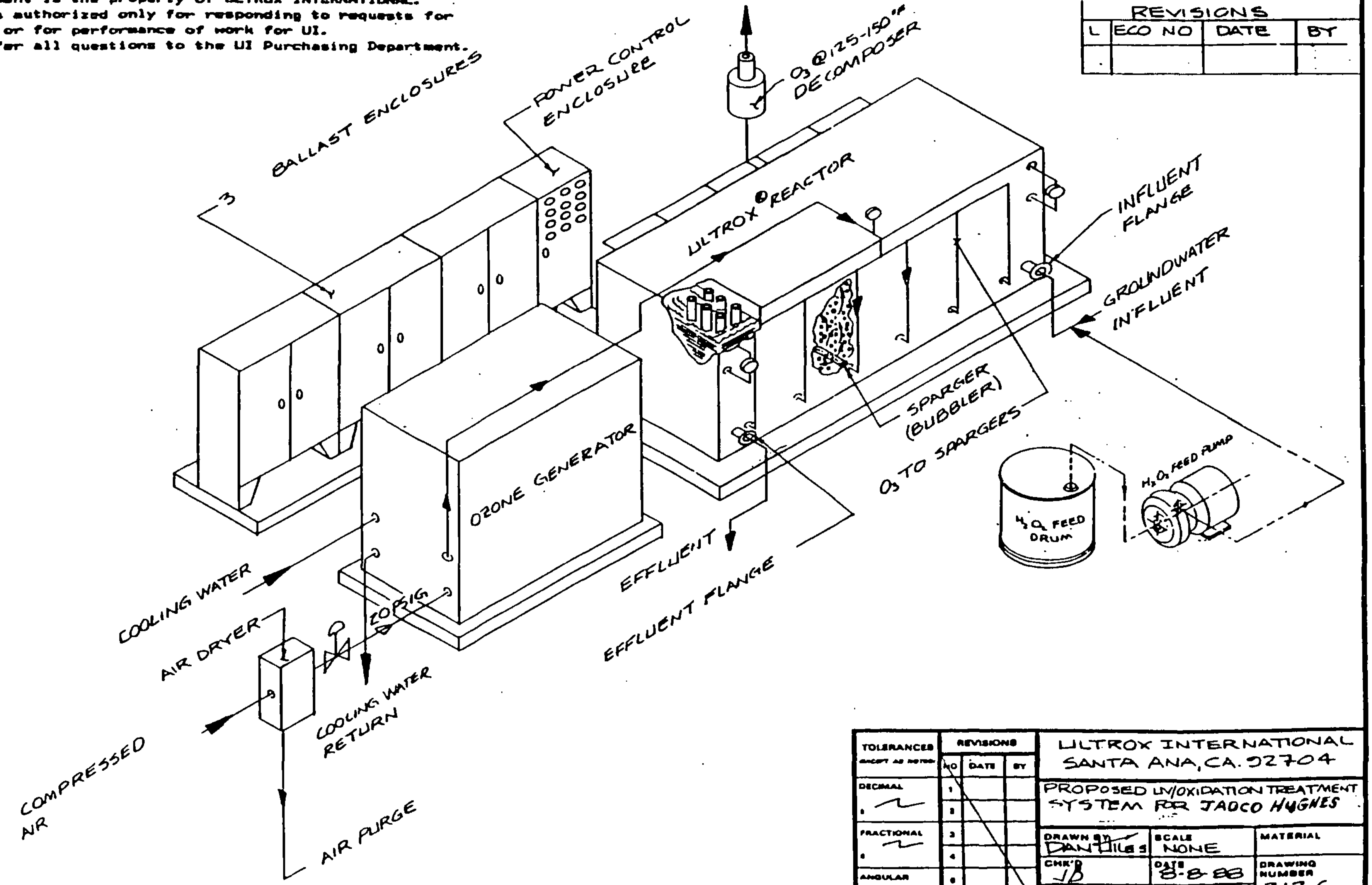
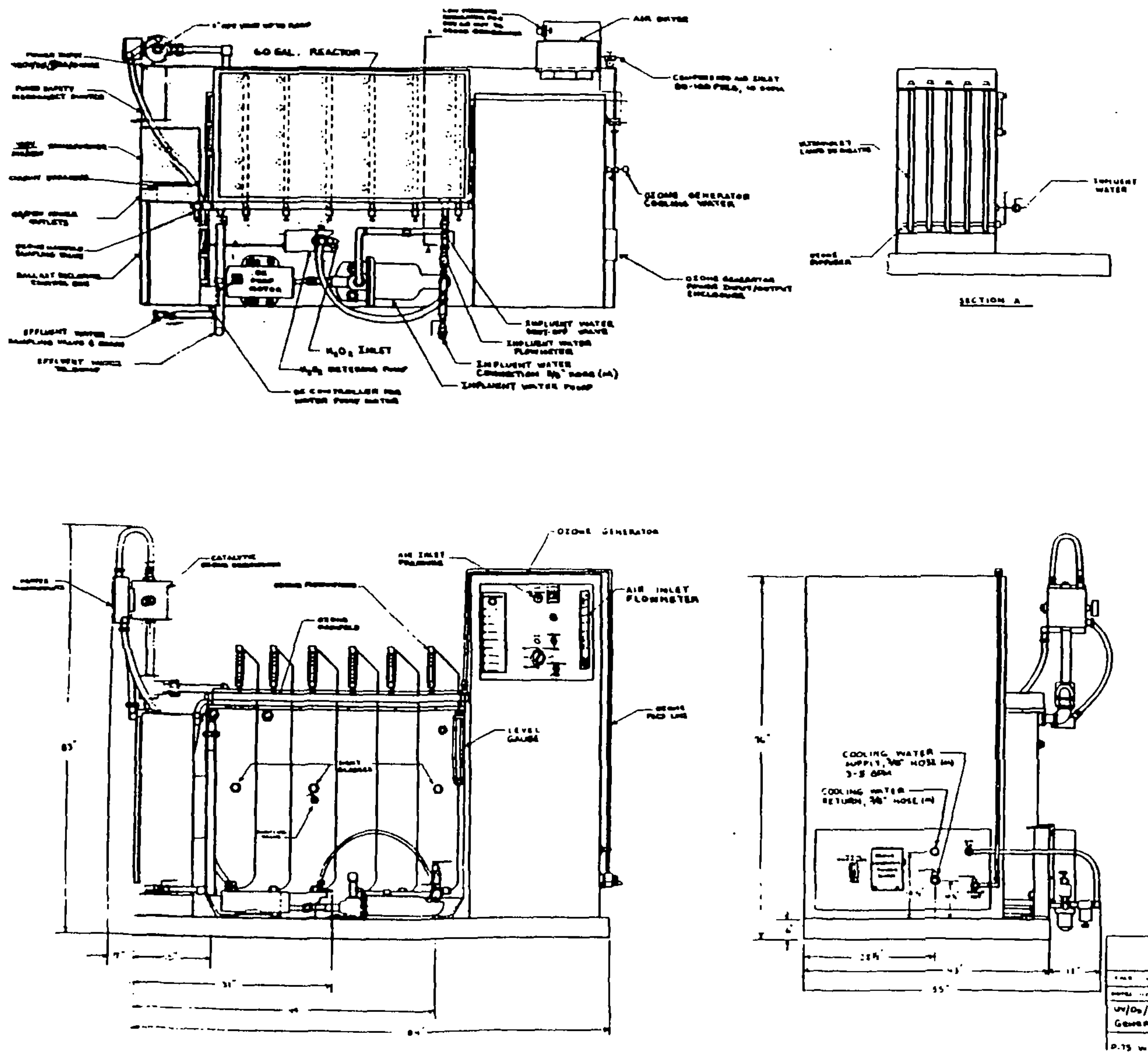


REVISIONS			
L	ECO NO	DATE	BY

TOLERANCES EXCEPT AS NOTED	REVISIONS			ULTROX INTERNATIONAL SANTA ANA, CA. 92704		
	NO	DATE	BY	PROPOSED UV/OXIDATION TREATMENT SYSTEM FOR JADCO HUGHES		
DECIMAL . ~	1					
	2					
FRACTIONAL . ~	3			DRAWN BY DAN Hiles	SCALE NONE	MATERIAL
	4					
ANGULAR . ~	5			CHK'D JB	DATE 8-8-88	DRAWING NUMBER 3126
	6			TRACED	APP'D	



ULTROX INTERNATIONAL
[illegible] S. ANNE STREET
SANTA ANA, CA 92704

SCALE NONE
DATE [illegible]

DRAWN BY:
APPROVED:

UV/O3/H2O2 SYSTEM WITH [illegible] FOR DRY OZONE GENERATOR

P-75 WATER TREATMENT SYSTEM

DRAWING NUMBER
2017

ULTROX
INTERNATIONAL

2435 South Anne Street
Santa Ana, California 92704
TEL: (714) 545-5557
FAX: (714) 557-5396

ULTROX INTERNATIONAL

EQUIPMENT SPECIFICATIONS FOR

ULTROX® MODEL F-1950 UV/OXIDATION SYSTEM

FOR

JADCO HUGHES SITE

SECTION I: ULTROX SCOPE OF SUPPLY

The equipment and services supplied by Ultrox shall be described in this document. The equipment shall be an ULTROX® Model F-1950 UV/oxidation system for the treatment of contaminated groundwater.

1.0 UV/Oxidation Reactor

1.1 Reactor volume: 1950 gallons

1.2 Reactor dimensions: 6'0" x 10'0" x 5'6" (d x l x h)

1.3 Reactor welded materials of construction: Type 304L SS

1.4 Stainless finish: 2B bright mill finish

1.5 Reactor to be divided by baffles into reaction stages directing water flow in a serpentine sinusoidal type pattern. Reactor will be fitted with observation ports in each stage. Stages will be designed to prevent back mixing.

1.6 Reactor will be equipped with 2" 150# ASA 304L SS flange inlet and 4" 150# ASA 304L SS flange outlet. Two 1" NPT drain lines with 316 SS ball valves will also be provided.

1.7 Reactor will be equipped with 216-5'2" long, 65 watt, low pressure, metallic vapor lamps capable of promoting effective oxidation.

1.8 Lamps will convert a minimum of 35% of input power into ultraviolet light.

1.9 Lamps will have a minimum service life of 7,000 hours.

1.10 Lamps will be vertically mounted within 1" o.d. quartz sheaths to prevent contact with water with provision for removal and inspection without having to drain down reactor.

1.11 UV lamps must not generate heat in excess of 222 BTUs/hour per lamp.

1.12 All UV sensitive components will be shielded from direct or indirect contact with UV light; otherwise, all components must be resistant to UV light.

2.0 Reactor Controls and Ballast Enclosures

2.1 All enclosures to be NEMA type 12 housing.

2.2 An elapsed time meter will be provided to indicate hours of lamp operation.

2.3 Ballasts will be of the high power factor type.

2.4 Controls will be provided to allow "on-off" operation of individual UV light banks.

2.5 The control system will include sensors and controls that:

- 2.5.1 Sense excessive temperature in ballast enclosures and also shut down system;
- 2.5.2 Shut down ULTROX® system if electrical enclosures are opened while system is in service;
- 2.5.3 Takes signal from water supply and shuts down system in the event of a water supply pump failure.

2.6 H_2O_2 feed pump controls will be mounted in reactor control enclosure.

3.0 Ozone Generator

Contractor to provide 170.0 lb/day ozone generator utilizing ozone cell with fixed voltage, variable figuring invertor. Generator to produce 2.0% by weight ozone using compressed air as feed gas.

4.0 Air Preparation System

Contractor to provide air preparation system consisting of air compressor, filters and dryers to produce -60°F (dew point) air as feed to generator. Compressor to have minimum 3.5 scfm output at 100 psig.

5.0 Hydrogen Peroxide Feed Pump

5.1 Pump(s) shall be 0 to 5.0 GPH Prominent diaphragm (or equal) pumps with manual adjustment. H_2O_2 pump to have GFR Noryl housing and diaphragm with steel core, EPDM carrier, nylon fabric and PTFE coating. H_2O_2

pump must be capable of pumping 10% to 50% H_2O_2 solution.

5.2 H_2O_2 to be injected ahead of reactor to allow adequate mixing and intimate contact with influent water.

6.0 Installation Requirements

The ULTROX® system will consist of:

6.1 UV Reactor Systems

6.2 Control and Ballast Enclosures

6.3 H_2O_2 Feed System

6.4 Ozone Generator

6.5 Air preparation system including air compressor, dryers and filters

The equipment should be placed on a levelled concrete slab provided by the client. The client will be responsible for bringing the electrical power feed supply to the UV reactor systems. The client also will bring the contaminated water supply to the Ultrox reactor and be responsible for piping the treated water to the receiving stream, sewer or POTW.

7.0 Technical Services

7.1 Start Up Services - Ultrox shall supply field engineer and technician for two weeks to interconnect equipment and modules at customer site, start-up equipment and train customer personnel at cost in addition to basic equipment capital cost.

7.2 Engineering - Engineering information and services required shall consist of the following:

- 7.2.1 Complete flow sheet
- 7.2.2 Complete piping/electrical connection drawings
- 7.2.3 Complete electrical single line/control diagrams
- 7.2.4 Three (3) copies of the operation and maintenance procedures for the ozone generation system and associated controls
- 7.2.5 Equipment layout drawings

8.0 Special tools or parts for maintenance shall be provided with equipment.

9.0 Spare Parts

The following spare parts shall be provided:

9.1 Ten lamps

9.2 Four ballasts

9.3 Ten quartz sheaths

9.4 Twenty viton sheath seals

10.0 Materials

10.1 Valves will have Type 316 SS bodies with teflon seats and seals.

10.2 Gaskets to be EPDM material.

10.3 The reactor inlet and outlet pipes to be Type 304 SS.

11.0 Codes

11.1 Welding standard to be AWS D1.1 with all reactor welds passivated.

11.2 Electrical systems to be in accordance with National Electric Code and all electrical enclosures to be NEMA 4.

12.0 Paint Specification

Carbon steel surfaces to be given: (1) One coat Pervo #2400 Industrial Rustless H.D. primer; and (2) two coats finish enamel Industrial Rustless Enamel Pervo #2424 Safety Blue.

13.0 Experience

Ultrox International has a minimum of nine years' experience in the design, manufacture and installation of UV/oxidation systems.

14.0 Shipping

Reactor module will be shipped in air ride van.

15.0 Testing

15.1 All electrical systems will be factory tested to ensure proper operation.

15.2 Reactor welds will be visually inspected and hydrostatically tested for leaks during dye solutions.

15.3 All pumps and piping will be hydrostatically tested to ensure leak-proof integrity.

16.0 Warranty

Manufacturer's products are warranted to be free from defects in material and workmanship under proper use, installation, application and maintenance in accordance with manufacturer's written recommendations and specifications for one year from completion of manufacturer's start up services, not to exceed eighteen months from date of equipment shipment. Manufacturer's obligation under this warranty is limited to, and to sole remedy for such defect shall be, the repair or replacement (at manufacturer's option) of unaltered products proven to have such defect, provided such defect is promptly reported to manufacturer within said one year warranty period. In no event will manufacturer be liable for business interruptions, loss of profits, personal injury, costs of delay, or for any other special indirect, incidental or consequential losses, costs or damages.

17.0 Equipment and Services Not Supplied By Ultrox

Contractor shall not supply the following materials or equipment: Pipe and pipe supports and associated detail engineering, tubing, valves, wire and conduit, conduit supports, structural and miscellaneous iron, pipe paint, anchor bolts or any other piping electrical materials and equipment not specifically indicated as described in above specification.

CONESTOGA-ROVERS & ASSOCIATES
MEMORANDUM

TO: [redacted]
FROM: Steve Day S. Day
DATE: April 9, 1990
REF. NO.: 2427
RE: Data Validation and Evaluation for the Samples Collected for a Bench Scale Treatability Study at the Jadco-Hughes Site in Belmont, North Carolina

The following details a data quality assessment and validation for one groundwater sample collected January 11, 1990 at the Jadco-Hughes project site (the Site) in Belmont, North Carolina. The sample was obtained for the purpose of conducting a bench scale treatability study at Ultrox International (Ultrox) and establishing baseline concentrations of organic contaminants in the untreated groundwater from the Site. The sample was analyzed for volatile organic compounds (VOC) and base-neutral/acid extractable organic compounds (BN/A) by the Radian Corporation (Radian). The methods used for analysis were from "Test Methods for Evaluating Solid Waste Physical/Chemical Methods", EPA SW-846, 3rd edition, November 1986 (SW-846), Method 8240, "Gas Chromatograph/Mass Spectrometry for Volatile Organics" and Method 8270, "Gas Chromatography/Mass Spectrometry for Semi-Volatile Organics: Capillary Column Technique" for VOC and BN/A analysis, respectively. The quality assurance and data evaluation were conducted in accordance with guidelines established in SW-846.[1]

Holding Time Periods and Sample Integrity

Holding time periods were defined within the methods and are summarized below:

VOC	-14 days from sample collection to completion of analysis
BN/A	-7 days from sample collection to extraction -40 days from extraction to completion of analysis

Investigation of sampling and extraction dates revealed that the holding time for BN/A extraction was exceeded due to a delay in sample shipment from Ultrox to

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[1] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

Radian. The BN/A results for the sample therefore were qualified as estimated (J or UJ).

While the VOC holding time was not violated, it was noted in the analytical report that the sample received consisted of a one-gallon amber container, the volatile fraction of which was split from the bulk sample. This is inconsistent with SW-846 sampling procedures and consequently the results were qualified as estimated (J or UJ).

Reagent Blank Samples

Contamination of the sample due to laboratory conditions or procedures was monitored by the analysis of a reagent blank sample. Only the VOC blank sample had a target analyte, 2-hexanone, present, the concentration of which was below the stated detection limit and was not present in the sample. Consequently, no action was taken on the data.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC and BN/A analyses was monitored by means of surrogate recoveries. The acceptance criteria for the surrogate compounds was specified in the method. Table 1 lists the BN/A surrogate recoveries that violated the acceptance criteria. The remaining BN/A surrogate and all VOC surrogate recoveries fell within the control limits specified by the method. No qualification of the base-neutral fraction data was required per USEPA guidelines. The acid extractable fraction data for sample W-011190-PS-01 was qualified as estimated (J) for positive results and unusable (R) for negative results due to surrogate recovery for 2,4,6-tribromophenol being less than 10 percent.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recovery

To assess the long term precision and accuracy of the analytical methods on various matrices, MS/MSD percent recoveries were determined. While insufficient volume did not allow for a project sample to undergo MS/MSD analyses, a sample of similar matrix was selected and analyzed. The percent recoveries reported for VOC and BN/A analyses were within the method acceptance criteria, except as presented in Table 2, indicating that the methods did exhibit acceptable accuracy and precision.

It should be noted that the relative percent difference (RPD) of duplicate matrix spike analysis for 4-chloro-3-methyl phenol was found to be 49 percent. While SW-846 provides no acceptance criteria for method precision, this would violate precision criteria ($RPD \leq 42$) set forth in "Contract Laboratory Program - Statement of Work for Organics Analysis", February 1988. The lack of guidance for evaluating method precision coupled with the fact that the sample used for MS/MSD recovery determination was from a non-project source resulted in no action on the data.

Overall Assessment

Violation of holding time period criteria resulted in qualification of all BN/A data. Sample collection techniques inconsistent with those specified in SW-846 resulted in qualification of all VOC data. Furthermore, violation of surrogate recovery criteria resulted in the qualification of all acid extractable parameters for sample W-011190-PS-01. Consequently, these data may only be used for qualitative assessment of analyte concentration in the groundwater. All qualification of the data has been discussed and summarized in the provided text and tables.

SD/amr/1

Attachments

cc: Bruce Clegg
David Dempsey

TABLE 1

OUTLYING SURROGATE RECOVERIES FOR SAMPLES COLLECTED FOR THE BENCH SCALE TREATABILITY STUDY

Sample ID	*Analysis*	*Compound*	*%R*[1]	*Limits*[2]	*Qualifier*[3]
W-011190-PS-01	BN/A	2-Fluorophenol	264	21 - 100	J/R
		Nitrobenzene-d5	128	35 - 114	
		2,4,6-Tribromophenol	8.0	10 - 123	
Reagent Blank	BN/A	2-Fluorophenol	104	21 - 100	NR

---

[1] %R = Percent Recovery

[2] Percent Recovery Limits were established by the method.

[3] The associated ACID extractable parameters should be qualified as follows:

J - The associated value is an estimated quantity (for positive results)
R - The data are unusable (for negative results)
NR - No additional qualifiers were necessary.

TABLE 2

OUTLYING MS/MSD PERCENT RECOVERIES FOR SAMPLES COLLECTED FOR THE BENCH SCALE TREATABILITY STUDY

Sample ID[1]	*Analysis*	*Parameter*	*MS*	*MSD*	*Limits*[2]	*Qualifier*[3]
MW-75-01	BN/A	Acenapthene	45	48	47 - 145	NR

---

[1] Sample spiked was not from Jadco-Hughes project site.

[2] Limits were specified in SW-846 Method 8270.

[3] Parameter results qualified as:
NR - No additional qualifiers required.

CONESTOGA-ROVERS & ASSOCIATES
MEMORANDUM

TO: [redacted]
FROM: Steve Day
DATE: April 10, 1990
REF. NO.: 2427
RE: Data Validation and Evaluation for the Samples Collected From the Bench-Scale Treatability Study of Groundwater at the Jadco-Hughes Project Site in Belmont, North Carolina

The following details a data quality assessment and validation for two post-treatment samples collected February 16, 1990 at Ultrox International (Ultrox). The samples were obtained for the purpose of evaluating the effectiveness of bench-scale treatability processes conducted at Ultrox in reducing baseline organic contaminants in groundwater collected from the Jadco-Hughes Site January 11, 1990. The samples were analyzed for volatile organic compounds (VOC) and base-neutral/acid extractable organic compounds (BN/A) by the Radian Corporation (Radian). The methods used for analysis were from "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods" EPA SW-846, 3rd edition, November 1986 (SW-846), Method 8240; "Gas Chromatography/Mass Spectrometry for Volatile Organics"; and Method 8270, "Gas Chromatography/Mass Spectrometry for Semi Volatile Organics: Capillary Column Technique" for VOC and BN/A analysis, respectively. The quality assurance and data evaluation were conducted in accordance with guidelines established in SW-846.[1]

Holding Time Periods

Holding time periods were defined within the methods and are summarized below:

VOC - 14 days from collection to completion of analysis

BN/A - 7 days from sample collection to extraction
- 40 days from extraction to completion of analysis

Examination of sampling, extraction and analysis dates revealed that no violations of holding time periods occurred. Therefore, the data were found to be acceptable based on the above criteria.

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[1] Application of quality assurance criteria was consistent with "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses", February 1, 1988.

Reagent Blank Samples

Contamination of the samples due to laboratory conditions or procedures was monitored by analysis of reagent blank samples. Only the VOC blank samples had target analytes present. Table 1 outlines analytes detected in reagent blank samples. Parameter results for samples associated with the reagent blanks were qualified as non-detect (U). Since the analytes detected within the reagent blanks were generally at or below the referenced detection limits, no significant laboratory contamination was observed.

Surrogate Compound Percent Recoveries (Surrogate Recoveries)

Individual sample performance for VOC and BN/A analyses was monitored by means of surrogate recoveries. The acceptance criteria for the surrogate compounds was specified in the methods. Table 2 summarizes the BN/A surrogate recoveries that violated the acceptance criteria. The remaining BN/A surrogates and all VOC surrogate recoveries fell within the control limits specified by the methods. BN/A data from samples were qualified as estimated (J/UJ) for base-neutral extractable parameter results, estimated (J) for positive acid extractable parameter results and unusable (R) for negative acid extractable parameter results as specified by USEPA guidelines. It should be noted that while insufficient sample volume precluded re-extraction and analysis, the associated reagent and method blanks exhibited acceptable surrogate recoveries for the BN/A analysis.

Matrix Spike/Matrix Spike Duplicate (MS/MSD) Percent Recovery

To assess the long term precision and accuracy of the analytical methods on various matrices, MS/MSD percent recoveries were determined. While insufficient volumes prevented a project sample from MS/MSD analysis, a sample of similar matrix was selected and analyzed for VOC analyses performed on February 23, 1990. No violations of MS/MSD acceptance criteria was noted and, consequently, an acceptable level of accuracy was achieved. While no guidance for precision acceptability was provided in the method, the relative percent difference between the matrix spike and matrix spike duplicate was found to be low (less than 10%) indicating an adequate level of precision was achieved.

No MS/MSD analyses were performed with the VOC samples analyzed on February 21, 1990. The samples consisted of the trip and reagent blanks and, consequently, would not be a representative matrix for MS/MSD analysis. A method spike was analyzed, the results of which are presented in Table 3. No violations of recovery criteria were noted, indicating an acceptable level of accuracy was achieved on a reagent water matrix. No evaluation of method precision may be performed on the VOC data generated February 21, 1990.

No MS/MSD analyses were performed for the BN/A analysis. Consequently, no evaluation of method accuracy or precision was performed on the BN/A samples and the parameter results were qualified as estimated (J or UJ) for the samples.

Trip Blank Samples

Potential cross-contamination by diffusion of volatile organic compounds through the septum seal into the samples during shipment and storage was monitored by means of trip blank sample TB-2. Methylene chloride and acetone were detected in the trip blank at concentrations of 6.9 µg/*l* and 5.3 µg/*l*, respectively. Methylene chloride was qualified as non-detect (U) based upon the associated reagent blank sample. Acetone was detected in the trip blank at a level below the detection limit and was not detected in the associated reagent blank. Sample 25-43.2, however, was determined to contain a relatively high concentration of acetone (4,200 µg/*l*) which may have been the source of the acetone in the trip blank. No action upon the data was required due to these facts.

Overall Assessment

Violation of surrogate recoveries and lack of MS/MSD analyses resulted in the qualification of all BN/A data. Consequently, these data may only be used for qualitative assessment of analyte concentration in the post-treatment sample. VOC data exhibited acceptable levels of precision and accuracy and, therefore, may be used for quantitative assessment of analyte concentration in the samples. All qualification of the data has been discussed and summarized in the provided text and tables.

SD/amr/2

Attachments

cc: Bruce Clegg
David Dempsey

TABLE 1

ANALYTES DETECTED IN REAGENT BLANK SAMPLES COLLECTED FROM THE BENCH-SCALE TREATABILITY STUDY OF GROUNDWATER AT THE JADCO-HUGHES PROJECT SITE

Blank ID	*Analysis*	*Parameter*	*Concentration (μg/l)*	*Associated Sample*[1]
Reagent Blank 6A	VOC	Methylene Chloride	6.7	25 - 43.2
Reagent Blank 6B	VOC	Methylene Chloride	4.2 J[2]	25 - 43.2
		Butanone	6.8 J	25 - 43.2

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[1] Associated sample had parameter results qualified as non-detect (U).

[2] The associated value is an estimate.

TABLE 2

OUTLYING SURROGATE RECOVERIES FOR SAMPLES COLLECTED FROM THE BENCH-SCALE TREATABILITY STUDY OF GROUNDWATER AT THE JADCO-HUGHES PROJECT SITE

Sample ID	*Analysis*	*Compound*	*%R*[1]	*Limits*[2]	*Qualifier*
25 - 43.1	BN/A	2-Fluorobiphenyl	36	43 - 116	J/UJ[3]
		2-Fluorophenol	0.9	21 - 100	J/R[4]
		Phenol-d5	3.6	10 - 94	
		Terphenyl-d14	22	33 - 141	
		2,4,6-Tribromophenol	0	10 - 123	

---

[1] %R = Percent Recovery

[2] Percent Recovery Limits were established by the method

[3] The associated BASE-NEUTRAL extractable parameter results should be qualified as follows:
J - The associated value is an estimated quantity for detected analytes.
UJ - The analyte was checked for but not detected. The associated value is an estimate.

[4] The associated ACID extractable parameter results should be qualified as follows:
J -The associated value is an estimated quantity (for positive results).
R - The data are unusable (for negative results).

TABLE 3
RESULTS AND ACCEPTANCE CRITERIA[1] FOR VOC METHOD SPIKE SAMPLES COLLECTED FROM THE BENCH-SCALE TREATABILITY STUDY OF GROUNDWATER AT THE JADCO-HUGHES PROJECT SITE

Compound	*%R*[2]	*Range - %R*
Benzene	89	37 - 151
Bromodichloromethane	98	35 - 155
Bromoform	87	45 - 169
Bromomethane	46	D[3] - 242
Carbon tetrachloride	93	70 - 140
Chlorobenzene	91	37 - 160
Chloroethane	57	N/A[4]
2-Chloroethylvinylether	71	D - 305
Chloroform	92	51 - 138
Chloromethane	94	D - 273
Dibromochloromethane	97	53 - 149
1,1-Dichloroethane	87	59 - 155
1,2-Dichloroethane	86	49 - 155
1,1-Dichloroethene	104	D - 234
1,2-Dichloropropane	85	D - 210
cis-1,3-Dichloropropane	105	D - 227
trans-1,3-Dichloropropane	109	17 - 183
Ethylbenzene	98	37 - 162
Methylene chloride	96	D - 221
1,1,2,2-Tetrachloroethane	94	46 - 157
Tetrachloroethane	93	64 - 148
Toluene	92	47 - 150
1,1,1-Trichloroethane	85	52 - 162
1,1,2-Trichloroethane	96	52 - 150
Trichloroethene	103	71 - 157
Vinyl Chloride	123	D - 251
1,4-Bromofluorobenzene - S[5]	93	86 - 115
1,2-Dichloroethane-d_4 - S	85	76 - 114
Toluene-d_8 - S	95	88 - 110

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[1] Acceptance criteria from SW-846

[2] %r = Percent Recovery

[3] D = Detected; result must be greater than zero

[4] N/A = No acceptance criteria in method

[5] S = Surrogate Compound

APPENDIX D

DETAILED COST ESTIMATES

Note: Abbreviations used in this Appendix:

C.Y. - Cubic Yards

S.Y. - Square Yards

L.S. - Lump Sum

Ea. - Each

Lb. - Pounds

L.F. - Linear Foot

COST ESTIMATE
ALTERNATIVE 2 - DEED/ACCESS RESTRICTIONS AND MONITORING
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.6	Monitoring	47,000	$ 57,500	884,000	931,000
	SUBTOTALS	$ 54,300	$ 58,125	$ 893,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 2				$ 947,900

ALTERNATIVE 3 - RCRA CAP
JADCO-HUGHES RI/FS

		Estimated Cost			
Remedial Component	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.2	RCRA cap	$ 365,000	$ 12,500	$ 193,000	$ 558,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
			$		
	SUBTOTALS	$ 419,300	$ 70,625	$ 1,086,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 3				$ 1,505,900

ALTERNATIVE 4 - CAP, GROUNDWATER EXTRACTION, UVO TREATMENT AND DISCHARGE TO FITES CREEK, DEED/ACCESS RESTRICTON, CULVERT REPLACEMENT AND MONITORING
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.2	RCRA cap	$ 365,000	$ 12,500	$ 193,000	$ 558,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.8	Groundwater extraction, treatment by UVO and discharge to Tributary B	$ 1,003,000	$ 163,000	$ 2,504,000	$ 3,507,000
	SUBTOTALS	$ 1,754,300	$ 233,625	$ 3,590,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 4				$ 5,344,900

ALTERNATIVE 5 - SOIL TREATMENT BY SVE WITH SOIL FLUSHING AND GROUNDWATER TREATMENT BY UVO
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.3	Soil Vapor Extraction	$ 1,107,000	$ 0	$ 0	$ 1,107,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.8	Groundwater extraction, treatment by UVO and discharge to Tributary B	$ 1,003,000	$ 163,000	$ 250,400	$ 3,507,000
G.10	Soil Flushing	$ 213,000	$ 11,300	$ 173,000	$ 386,000
	SUBTOTALS	$ 2,709,300	$ 232,425	$ 3,570,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 5				$ 6,279,900

ALTERNATIVE 6 - SOIL DISPOSAL WITH GROUNDWATER TREATMENT BY UVO
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.4	Soil disposal to RCRA landfill	$ 2,846,000	$ 0	$ 0	$ 2,846,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.8	Groundwater extraction, treatment by UVO and discharge to Tributary B	$ 1,003,000	$ 163,000	$ 2,504,000	$ 3,507,000
	SUBTOTALS	$ 4,235,300	$ 221,125	$ 3,397,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 6				$ 7,632,900

ALTERNATIVE 7 - ON-SITE SOIL INCINERATION WITH GROUNDWATER TREATMENT BY UVO
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.5	On-Site soil incineration	$ 4,968,000	$ 0	$ 0	$ 4,968,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.8	Groundwater extraction, treatment by UVO and discharge to Tributary B	$ 1,003,000	$ 163,000	$ 2,504,000	$ 3,507,000
	SUBTOTALS	$ 6,357,300	$ 221,125	$ 3,397,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 7				$ 9,754,900

ALTERNATIVE 8 - RCRA CAP WITH GROUNDWATER PRETREATMENT AND DISCHARGE TO POTW
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.2	RCRA cap	$ 365,000	$ 12,500	$ 193,000	$ 558,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.9	Groundwater extraction, pretreatment and discharge to POTW	$ 459,000	$ 104,000	$ 1,599,000	$ 2,058,000
	SUBTOTALS	$ 1,210,300	$ 174,625	$ 2,685,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 8				$ 3,895,900

ALTERNATIVE 9 - SOIL TREATMENT BY SVE
WITH SOIL FLUSHING AND GROUNDWATER TRATMENT AND DISCHARGE TO POTW
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.3	Soil Vapor Extraction	$ 1,107,000	$ 0	$ 0	$ 1,107,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.9	Groundwater extraction, pretreatment and discharge to POTW	$ 459,000	$ 104,000	$ 1,599,000	$ 2,058,000
C.10	Soil Flushing	$ 213,000	$ 11,300	$ 173,000	$ 386,000
	SUBTOTALS	$ 2,165,300	$ 173,425	$ 2,665,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 9				$ 4.830.900

ALTERNATIVE 10 - SOIL DISPOSAL
WITH GROUNDWATER TREATMENT AND DISCHARGE TO POTW
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.4	Soil disposal to RCRA landfill	$ 2,846,000	$ 0	$ 0	$ 2,846,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.9	Groundwater extraction, pretreatment and discharge to POTW	$ 459,000	$ 104,000	$ 1,599,000	$ 2,058,000
	SUBTOTALS	$ 3,691,300	$ 162,125	$ 2,492,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 10				$ 6,183,900

ALTERNATIVE 11 - ON-SITE SOIL INCINERATION
WITH GROUNDWATER PRETREATMENT AND DISCHARGE TO POTW
JADCO-HUGHES RI/FS

		Estimated Cost			
Item	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
G.1	Deed and access restrictions	$ 7,300	$ 625	$ 9,600	$ 16,900
G.5	On-Site soil incineration	$ 4,968,000	$ 0	$ 0	$ 4,968,000
G.6	Monitoring	$ 47,000	$ 57,500	$ 884,000	$ 931,000
G.7	Culvert replacement	$ 332,000	$ 0	$ 0	$ 332,000
G.9	Groundwater extraction, pretreatment and discharge to POTW	$ 459,000	$ 104,000	$ 1,599,000	$ 2,058,000
	SUBTOTALS	$ 5,813,300	$ 162,125	$ 2,492,600	
	TOTAL IMPLEMENTATION COST FOR ALTERNATIVE 11				$ 8,305,900

SUMMARY OF REMEDIAL COMPONENT COST ESTIMATES JADCO-HUGHES RI/FS

Remedial Component	*Description*	*Capital Cost*	*Annual Cost*	*Present Worth of Annual Cost*	*Total Present Worth*
1	Deed/Access Restrictions	$ 7,300	$ 625/yr	$ 9,600	$ 16,900
2	RCRA Cap	$ 365,000	$ 12,500/yr	$ 193,000	$ 558,000
3	Soil Vapor Extraction	$1,055,000	nil	0	$1,055,000
4	Excavation and Off-Site Disposal	$2,846,000	nil	0	$2,846,000
5	On-Site Incineration	$4,968,000	nil	0	$4,968,000
6	Aquifer/Surface Water Monitoring	$ 47,000	$ 57,500/yr	$ 884,000	$ 931,000
7	Culvert Replacement	$ 332,000	nil	0	$ 332,000
8	Groundwater Extraction, Treatment by UVO and Discharge to Tributary B	$1,003,000	$163,000/yr	$2,504,000	$3,507,000
9	Groundwater Extraction, Treatment by aeration, and discharge to POTW	$ 459,000	$104,000/yr	$1,599,000	$2,058,000
10	Soil Flushing	$ 150,000	$ 11,300/yr	$ 173,000	$ 323,000

REMEDIAL COMPONENT COST ESTIMATE
DEED AND ACCESS RESTRICTION
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	DEED AND ACCESS RESTRICTION				
A.1	Deed Restriction	--	L.S.	$4,500	$ 4,500
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 4,500
II	INDIRECT CAPITAL COSTS				
	Administration and Legal (5% of Direct Capital Cost)				$ 225
	Engineering (10% of Direct Capital Costs)				450
	Construction Supervision (15% of Direct Capital Costs)				675
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 1,350
	SUBTOTAL - CAPITAL COSTS				$ 5,850
	CONTINGENCY (25%)				$ 1,460
	TOTAL ESTIMATED CAPITAL COSTS				$ 7,310 ($7,300 rounded)
III	OPERATION AND MAINTENANCE (5% Discount Rate)				
	Maintain perimeter fence $500/yr for 30 years present worth				$ 7,700
	CONTIGENCY (25%)				$ 1,930
	TOTAL ESTIMATED OPERATING AND MAINTENANCE COSTS				$ 9,630 ($9,600 rounded)
	TOTAL ESTIMATED COMPONENT COST				$ 16,900

REMEDIAL COMPONENT COST ESTIMATE
RCRA CAP
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	RCRA CAP				
A.1	Project Start-up and mobilization	1	L.S.	$ 15,000.00	$ 15,000
A.2	Construction facilities	1	L.S.	5,000.00	5,000
A.3	Temporary Access Roads	1	L.S.	4,000.00	4,000
A.4	Clearing and Grubbing	1	Acre	1,000.00	1,000
A.5	Consolidation Contaminated Soils				
	a) Excavate and consolidate contaminated soils from former operation area	500	C.Y.	8.00	4,000
	b) Import, place, compact fill soils	500	C.Y.	12.00	6,000
A.6	RCRA Landfill Cap				
	a) Pregrade	1,000	C.Y.	6.00	6,000
	b) Supply, place, compact 24 inches of clay	3,300	C.Y.	12.00	39,600
	c) Supply, place, compact 18 inches of sand	2,500	C.Y.	15.00	37,500
	d) Supply and install 60-mil HDPE liner	5,000	S.Y.	6.00	30,000
	e) Supply and install filter fabric	5,000	S.Y.	1.30	6,500
	f) Supply, place, compact 18 inches imported fill	2,500	C.Y.	12.00	30,000
	g) Supply and place 6 inches of topsoil	850	C.Y.	15.00	12,750
	h) Hydroseed and fertilizer cover	5,000	S.Y.	0.40	2,000
A.7	Implement Health and Safety Plan including provision of PPE	1	L.S.	21,000.00	21,000
A.8	Project closeout and demobilization	1	L.S.	4,000.00	4,000
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 224,350

REMEDIAL COMPONENT COST ESTIMATE
RCRA CAP
JADCO-HUGHES RI/FS

Item	Description	Estimated Quantity	Unit	Unit Cost	Total Cost
II	**INDIRECT CAPITAL COSTS**				
	Administration and Legal (5% of Direct Capital Cost)				$ 11,220
	Engineering (10% of Direct Capital Costs)				22,440
	Construction Supervision (15% of Direct Capital Costs)				33,660
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 67,320
	SUBTOTAL - CAPITAL COSTS				$ 291,670
	CONTINGENCY (25%)				$ 72,920
	TOTAL ESTIMATED CAPITAL COSTS				$ 364,590 ($365,000 rounded)
III	**OPERATION AND MAINTENANCE** (5% Discount Rate)				
	Cap inspections $3,000/yr. for 30 years present worth				$ 46,120
	Cut grass and fertilize, repair erosion damage $7,000/yr for 30 years present worth				$ 107,600
	SUBTOTAL OPERATION AND MAINTENANCE				$ 153,720
	CONTINGENCY (25%)				$ 38,430
	TOTAL ESTIMATED OPERATION AND MAINTENANCE COSTS				$ 192,150 ($193,000 rounded)
	TOTAL ESTIMATED COMPONENT COST				$ 558,000

REMEDIAL COMPONENT COST ESTIMATE
SOIL VAPOR EXTRACTION
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	SOIL VAPOR EXTRACTION				
A.1	i) Excavate contaminated soil from former operations area and consolidated with landfill	500	C.Y.	8.00	$ 4,000
	ii) Import place and compact backfill	500	C.Y.	12.00	6,000
A.2	Permitting and mobilization	1	L.S.	20,000.00	20,000
A.3	Install dual vacuum extraction wells including manifold installation and on-Site gas chromatography (including H&S)	10	Ea.	3,500.00	35,000
A.4	Trial Start-up	1	L.S.	16,000.00	16,000
A.5	Operation (3 years) (including H&S and monthly emissions monitoring)	1	L.S.	200,000.00	200,000
A.6	Air Treatment by GAC	121,000	Lb.	3.00	363,000
A.7	Regrading of Landfill				
	i) topsoil	295	C.Y.	15.00	4,425
	ii) hydroseed and fertilizer cover	1,760	S.Y.	0.40	704
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 649,130

REMEDIAL COMPONENT COST ESTIMATE
SOIL VAPOR EXTRACTION
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
II	**INDIRECT CAPITAL COSTS**				
	Administration and Legal (5% of Direct Capital Cost)				$ 32,460
	Engineering (10% of Direct Capital Costs)				64,920
	Construction Supervision (15% of Direct Capital Costs)				97,380
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 194,760
	SUBTOTAL - CAPITAL COSTS				$ 843,890
	CONTINGENCY (25%)				$ 210,970
	TOTAL ESTIMATED CAPITAL COSTS				$1,054,860 ($1,055,000 rounded)
III	**OPERATION AND MAINTENANCE** (5% Discount Rate)				
	Nil				$ 0
	TOTAL ESTIMATED COMPONENT COST				$1,055,000

REMEDIAL COMPONENT COST ESTIMATE
EXCAVATION AND DISPOSAL AT RCRA LANDFILL
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	EXCAVATION AND DISPOSAL AT RCRA LANDFILL				
A.1	Mobilization/demobilization	1	L.S.	$ 10,000.00	$ 10,000
A.2					
	i) Excavation of contaminated soil from former operations area	500	C.Y.	8.00	4,000
	ii) Import, place and compact backfill in former operations area	500	C.Y.	12.00	6,000
A.3	Excavation of contaminated soil from landfill	5,500	C.Y.	8.00	44,000
A.4	Transportation and disposal at Pinewood, S.C. (including H&S)	9,000	Tons	205.00	1,845,000
A.5	Regrading of Landfill				
	i) import, place and compact backfill	5,500	C.Y.	12.00	66,000
	ii) topsoil	295	C.Y.	15.00	4,425
	iii) hydroseed and fertilizer cover	1,760	S.Y.	0.40	704
	SUBTOTAL - DIRECT CAPITAL COSTS				$1,980,130

REMEDIAL COMPONENT COST ESTIMATE
EXCAVATION AND DISPOSAL AT RCRA LANDFILL
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
II	**INDIRECT CAPITAL COSTS**				
	Administration and Legal (5% of Direct Capital Cost)				$ 99,010
	Engineering (5% of Direct Capital Costs)				99,010
	Construction Supervision (5% of Direct Capital Costs)				99,010
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 297,030
	SUBTOTAL - CAPITAL COSTS				$2,277,160
	CONTINGENCY (25%)				$ 569,290
	TOTAL ESTIMATED CAPITAL COSTS				$2,846,450 ($2,846,000 rounded)
III	**OPERATION AND MAINTENANCE** (5% Discount Rate)				
	Nil				$ 0
	TOTAL ESTIMATED COMPONENT COST				$2,846,000

REMEDIAL COMPONENT COST ESTIMATE
ON-SITE INCINERATION
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	ON-SITE INCINERATION				
A.1	Circulating bed combustor mobilization, demobilization, permitting	1	L.S.	$ 1,200,000.00	$ 1,200,000
A.2	Trial burn	1	L.S.	$ 250,000.00	250,000
A.3	Excavation of contaminated soil from former operations area	500	C.Y.	8.00	4,000
A.4	Excavation of contaminated soils from landfill	5,500	C.Y.	8.00	44,000
A.5	Incineration of soils (including H&S)	9,000	Tons	205.00	1,845,000
A.6	Backfilling of incinerated soil on site	6,000	C.Y.	18.00	108,000
A.7	Regrading of landfill				
	i) topsoil	295	C.Y.	15.00	4,425
	ii) hydroseed and fertilizer cover	1,760	S.Y.	0.40	704
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 3,456,130

REMEDIAL COMPONENT COST ESTIMATE
ON-SITE INCINERATION
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
II	**INDIRECT CAPITAL COSTS**				
	Administration and Legal (5% of Direct Capital Cost)				$ 172,810
	Engineering (5% of Direct Capital Costs)				172,810
	Construction Supervision (5% of Direct Capital Costs)				172,810
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 518,430
	SUBTOTAL - CAPITAL COSTS				$ 3,974,560
	CONTINGENCY (25%)				$ 993,640
	TOTAL ESTIMATED CAPITAL COSTS				$ 4,968,200 ($4,968,000 rounded)
III	**OPERATION AND MAINTENANCE** (5% Discount Rate)				
	Nil				$ 0
	TOTAL ESTIMATED COMPONENT COST				$ 4,968,000

REMEDIAL COMPONENT COST ESTIMATE
MONITORING
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A.1	Shallow saprolite monitoring well installation	2	Ea.	$ 3,000	$ 6,000
A.2	Deep saprolite monitoring well installation	3	Ea.	$ 8,000	$ 24,000
A.3	Install piezometer	6	Ea.	$ 1,000	$ 6,000
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 36,000
II	INDIRECT CAPITAL COSTS				
	Administration and Legal (5% of Subtotal)				$ 1,800
	Engineering (10% of Subtotal)				3,600
	Construction Supervision (15% of Subtotal)				5,400
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 10,800
	SUBTOTAL - CAPITAL COSTS				$ 46,800 ($47,000 rounded)

REMEDIAL COMPONENT COST ESTIMATE
MONITORING
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
III	ANNUAL MONITORING (5% Discount Rate)				
	A. Years 1-2 Sample Collection and Analysis				
	• 50 samples @ $125/sample		$ 6,250/yr		
	• 50 VOC analyses @ $290/sample		$ 14,500/yr		
	• 20 BNA analyses @ $620/sample		$ 12,400/yr		
	• 20 Metals analyses @ $190/sample		$ 3,800/yr		
	• QA/QC (30% of sample analyses)		$ 9,200/yr		
	• Data management and reporting		$ 10,000/yr		
	Subtotal		$ 56,150/yr		
	Present Worth for Years 1 and 2				$ 104,000
	B. Years 3-30 Sample Collection and Analysis				
	• 27 samples @ $125/sample		$ 3,375/yr		
	• 27 VOC analyses @ $290/sample		$ 7,830/yr		
	• 20 BNA analyses @ $620/sample		$ 12,400/yr		
	• 20 Metals analyses @ $190/sample		$ 3,800/yr		
	• QA/QC (30% of sample analyses)		$ 7,200/yr		
	• Data management and reporting		$ 10,000/yr		
	Subtotal		$ 44,600/yr		
	Present Worth for Years 3 to 30				$ 603,000
	SUBTOTAL ANNUAL COST				$ 707,000
	CONTINGENCY (25%)				$ 177,000
	TOTAL ESTIMATED ANNUAL COSTS				$ 884,000
	TOTAL ESTIMATED REMEDIAL COMPONENT COST				$ 931,000

REMEDIAL COMPONENT COST ESTIMATE
CULVERT REPLACEMENT
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	CULVERT REPLACEMENT				
A.1	Project start-up and mobilization	--	L.S.	$ 8,000.00	$ 8,000
A.2	Construction facilities	--	L.S.	5,000.00	5,000
A.3	Repair blocked section				
	i) Flow diversion	--	L.S.	4,700.00	4,700
	ii) Excavate supply and place new pipe and backfill	--	L.S.	12,100.00	12,100
	iii) Soils consolidation on Site	150	C.Y.	6.00	900
A.4	Televise culvert	--	L.S.	7,500.00	7,500
A.5	Clean culvert (optional)				
	i) Flow diversion	--	L.S.	4,700.00	4,700
	ii) Clean culvert	--	L.S.	12,500.00	12,500
	iii) Soils consolidation on Site	10	C.Y.	6.00	60
A.6	Slipline culvert with 30-inch HDPE pipe	420	L.F.	125.00	52,500
A.7	Manholes (12 feet deep)	2	Ea.	3,000.00	6,000
A.8	Plugs	2	Ea.	6,000.00	12,000
A.9	Implement Health and Safety Plan including provision of PPE	--	L.S.	16,000.00	16,000
A.10	Construction of Silte Spillway				
	i) Clearing and grubbing	2.5	Acres	1,000.00	2,500
	ii) Excavation of spillway and Berm Construction	1,900	C.Y.	8.00	15,200
	iii) Spoils Consolidation	600	C.Y.	6.00	3,600
	iv) 6 inches topsoil	2,000	C.Y.	15.00	30,000
	iv) Hydroseed and fertilizer cover	12,100	S.Y.	0.40	4,840

REMEDIAL COMPONENT COST ESTIMATE
CULVERT REPLACEMENT
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
A.11	Project closeout and demobilization	--	L.S.	6,000.00	6,000
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 204,100
II	**INDIRECT CAPITAL COSTS**				
	Administration and Legal (5% of Direct Capital Cost)				$ 10,210
	Engineering (10% of Direct Capital Costs)				20,420
	Construction Supervision (15% of Direct Capital Costs)				30,630
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 61,260
	SUBTOTAL - CAPITAL COSTS				$ 265,360
	CONTINGENCY (25%)				$ 66,340
	TOTAL ESTIMATED CAPITAL COSTS				$ 331,700 ($332,000 rounded)
III	**OPERATION AND MAINTENANCE** (5% Discount Rate)				
	Nil				$ 0
	TOTAL ESTIMATED COMPONENT COST				$ 332,000

REMEDIAL COMPONENT COST ESTIMATE GROUNDWATER EXTRACTION, TREATMENT BY ULTRAVIOLET OXIDATION AND DISCHARGE TO TRIBUTARY B JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	EXTRACTION WELLS				
A.1	Mobilization	1	L.S.	$ 10,000.00	$ 10,000
A.2	Install extraction wells (6-inch diameter steel casing, 40 feet deep)	1	Ea.	6,000.00	6,000
A.3	Install extraction well 6-inch diameter steel casing 20 feet deep)	2	Ea.	3,000.00	6,000
A.4	Perform pumping test	3	Ea.	2,000.00	6,000
A.5	Install 6-inch diameter perforated drain (average depth 15 feet)	850	L.F.	75.00	63,750
A.6	Install submersible pumps	6	Ea.	1,400.00	8,400
A.7	Install manholes (18 feet deep)	5	Ea.	4,000.00	20,000
A.8	Construct forcemain from wells and tile system to treatment system	1,200	L.F.	10.00	12,000
A.9	Supply electrical servicing, controls and flow measurement	1	L.S.	15,000.00	15,000
A.10	Health and Safety	1	L.S.	10,000.00	10,000
B	ULTRAVIOLET OXIDATION				
B.1	Treatment plant building	1	L.S.	50,000.00	50,000
B.2	UVO treatment system	1	L.S.	400,000.00	400,000
C	DISCHARGE TO FITES CREEK				
C.1	Discharge line to Tributary "B"	1	L.S.	10,000.00	10,000
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 617,150

REMEDIAL COMPONENT COST ESTIMATE
GROUNDWATER EXTRACTION, TREATMENT BY ULTRAVIOLET OXIDATION AND DISCHARGE TO TRIBUTARY B
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
II	INDIRECT CAPITAL COSTS				
	Administration and Legal (5% of Direct Capital Cost)				$ 30,860
	Engineering (10% of Direct Capital Costs)				61,720
	Construction Supervision (15% of Direct Capital Costs)				92,570
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 182,150
	SUBTOTAL - CAPITAL COSTS				$ 802,300
	CONTINGENCY (25%)				$ 200,600
	TOTAL ESTIMATED CAPITAL COSTS				$ 1,002,900 ($1,003,000 rounded)
III	OPERATION AND MAINTENANCE (5% Discount Rate)				
	UVO treatment operation and maintenance $95,300/yr for 30 years present worth				$ 1,465,000
	Extraction system operation and maintenance $5,000/yr for 30 years present worth				$ 77,000
	NPDES monitoring and reporting $30,000/yr for 30 years present worth				$ 461,000
	SUBTOTAL OPERATION AND MAINTENANCE COST				$ 2,003,000
	CONTINGENCY (25%)				$ 501,000
	TOTAL ESTIMATED OPERATION AND MAINTENANCE COST				$ 2,504,000
	TOTAL ESTIMATED COMPONENT COST				$ 3,507,000

REMEDIAL COMPONENT COST ESTIMATE
GROUNDWATER EXTRACTION, PRETREATMENT BY AERATION AND DISCHARGE TO POTW
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	EXTRACTION WELLS				
A.1	Mobilization	1	L.S.	$ 10,000.00	$ 10,000
A.2	Install extraction well (6-inch diameter steel casing, 40 feet deep)	1	Ea.	6,000.00	6,000
A.3	Install extraction wells 6-inch diameter steel casing 20 feet deep)	2	Ea.	3,000.00	6,000
A.4	Perform pumping test	3	Ea.	2,000.00	6,000
A.5	Install 6-inch diameter perforated drain (average depth 15 feet)	850	L.F.	75.00	63,750
A.6	Install submersible pumps (including one spare pump)	6	Ea.	1,400.00	8,400
A.7	Install manholes (18 feet deep)	5	Ea.	4,000.00	20,000
A.8	Construct forcemain from wells and tile system to treatment system	1,200	L.F.	10.00	12,000
A.9	Supply electrical servicing, controls and flow measurement	1	L.S.	15,000.00	15,000
A.10	Health and Safety	1	L.S.	10,000.00	10,000
B	PRETREATMENT BY AERATION				
B.1	Aeration tank and pretreatment system	1	L.S.	50,000.00	50,000
B.2	Carbon contactors and associated piping	1	L.S.	50,000.00	50,000
C	HOOKUP TO POTW	1	L.S.	25,000.00	25,000
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 282,150

REMEDIAL COMPONENT COST ESTIMATE
GROUNDWATER EXTRACTION, PRETREATMENT BY AERATION AND DISCHARGE TO POTW
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
II	INDIRECT CAPITAL COSTS				
	Administration and Legal (5% of Direct Capital Cost)				$ 14,110
	Engineering (10% of Direct Capital Costs)				28,220
	Construction Supervision (15% of Direct Capital Costs)				42,330
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 84,660
	SUBTOTAL - CAPITAL COSTS				$ 366,810
	CONTINGENCY (25%)				$ 91,700
	TOTAL ESTIMATED CAPITAL COSTS				$ 458,510 ($459,000 rounded)
III	OPERATION AND MAINTENANCE (5% Discount Rate)				
	Discharge to POTW (25 gpm @ $1.50/1000 gallons) $20,000/yr for 30 years present worth				$ 307,000
	Activated carbon replacement $33,000/yr for 30 years present worth				$ 510,000
	Discharge Monitoring $10,000/yr. for 30 years present worth				$ 155,000
	Extraction and treatment system operation and maintenance $20,000/yr for 30 years present worth				$ 307,000
	SUBTOTAL OPERATION AND MAINTENANCE				$ 1,279,000
	CONTINGENCY (25%)				$ 319,750
	TOTAL ESTIMATED OPERATION AND MAINTENANCE COSTS				$ 1,598,750 ($1,599,000 rounded)
	TOTAL ESTIMATED COMPONENT COST				$ 2,058,000

REMEDIAL COMPONENT COST ESTIMATE
SOIL FLUSHING
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
I	DIRECT CAPITAL COSTS				
A	RECHARGE SYSTEM				
A.1	Mobilization	1	L.S.	$ 7,000.00	$ 7,000
A.2	Install recharge forcemain and distribution header to recharge wells	1	L.S.	10,000.00	10,000
A.3	Install manholes (15 ft. deep each)	3	Ea.	3,500.00	10,500
A.4	Install 6 inch diameter perforated drain (average depth 15 ft)	300	L.F.	75.00	22,500
A.5	Install submersible sump pump	1	Ea.	1,400.00	1,400
A.6	Install hydraulic monitoring system (piezometers)	10	Ea.	1,000.00	10,000
A.7	Contruct forcemain from collection system to treatment plant	600	L.F.	10.00	6,000
A.8	Supply and install electrical servicing controls and flow measurement	1	L.S.	15,000.00	15,000
A.9	Health and Safety	1	L.S.	10,000.00	10,000
	SUBTOTAL - DIRECT CAPITAL COSTS				$ 92,400

REMEDIAL COMPONENT COST ESTIMATE
SOIL FLUSHING
JADCO-HUGHES RI/FS

Item	*Description*	*Estimated Quantity*	*Unit*	*Unit Cost*	*Total Cost*
II	INDIRECT CAPITAL COSTS				
	Administration and Legal (5% of Direct Capital Cost)				$ 4,620
	Engineering (10% of Direct Capital Costs)				9,240
	Construction Supervision (15% of Direct Capital Costs)				13,860
	SUBTOTAL - INDIRECT CAPITAL COSTS				$ 27,720
	SUBTOTAL - CAPITAL COSTS				$ 120,120
	CONTINGENCY (25%)				$ 30,030
	TOTAL ESTIMATED CAPITAL COSTS				$ 150,150 ($150,000 rounded)
III	OPERATION AND MAINTENANCE (5% Discount Rate)				
	Recharge System operation, maintenance and monitoring (Supplemental to Groundwater Extraction and Treatment System) $5,000/yr for 30 years present worth				$ 76,900
	Additional sewerage charge (5 gpm @ $1.50/1000 gallons $4,000/yr for 30 years present worth				$ 61,500
	SUBTOTAL OPERATION AND MAINTENANCE				$ 138,400
	CONTINGENCY (25%)				$ 34,600
	TOTAL ESTIMATED OPERATION AND MAINTENANCE COSTS				$ 173,000
	TOTAL ESTIMATED COMPONENT COST				$ 323,000

APPENDIX E

LETTER FROM SUPPORT AGENCY

State of North Carolina
Department of Environment, Health, and Natural Resources
Division of Solid Waste Management
P.O. Box 27687 · Raleigh, North Carolina 27611-7687

James G. Martin, Governor
William W. Cobey, Jr., Secretary

William L. Meyer
Director

24 September 1990

Mr. Greer C. Tidwell
Regional Administrator
US EPA Region IV
345 Courtland Street
Atlanta, Georgia 30365

RE: Conditional Concurrence with the Record of Decision
Jadco-Hughes NPL Site
Belmont, Gaston County, NC

Dear Mr. Tidwell:

North Carolina appreciates the opportunity to comment on the Record of Decision (ROD) for the subject site and looks forward to working with EPA on the final resolution of the problems at this site. The State concurs with the attached draft ROD and Remedial Alternative Selection for the Jadco-Hughes Site, Gaston County, Belmont, North Carolina, subject to the following comments, conditions, or exceptions:

1. Because off-site private wells have been found to contain site contaminants below the MCL, it is imperative that off-site private wells be included in the groundwater monitoring requirements, regardless of whether these wells are currently being used for drinking water or not.

2. Because soil flushing is proposed as a soil treatment, the remedial design should also include provisions for initiating in-situ bioremediation in conjunction with soil flushing. This approach may produce additional benefits for little additional cost.

3. The draft ROD states that the UV-ozone treatment is the selected contingency alternative to be used if the Belmont POTW will not accept the pretreated groundwater. We are concerned that this technology is not proven to be reliable. If the Belmont POTW does not accept the groundwater, we

advise that a thorough review of treatment technologies be conducted to establish whether UV-Ozone treatment is the best suited for the task (as opposed to steam stripping or air stripping, for example). If UV-Ozone treatment is ultimately selected, we request that there be no less frequent than weekly monitoring of the effluent discharge in the first 3 months of operation to establish the technology's reliability and ensure compliance with the NPDES permit.

4. State concurrence in the Record of Decision and Remedial Alternative Selection is based solely upon the information contained in the attached Record of Decision and Remedial Alternative Selection. Should the State receive new or additional information which significantly affects the conclusions or remedy selection contained in the Record of Decision and Remedial Alternative Selection, it may modify or withdraw this concurrence, effective immediately, upon written notice to EPA Region IV. Such notice shall contain a statement of the reason or reasons for the modification or withdrawal of State concurrence.

5. State concurrence in this Record of Decision and Remedial Action Alternative Selection in no way binds the State to concur in future decisions or commits the State to participate in future activities regarding this site including but not limited, to remedial design selection or State participation, financial or otherwise, in the clean up of the site. The State reserves the right to review, comment and make independent assessments of all future work relating to this site.

Again, the State appreciates the opportunity to comment on the ROD, and we look forward to working with you on the remedial design.

Respectfully yours,

William L Meyer

William L. Meyer

WLM/acr

cc: George Everett

Enclosures