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Environmental Protection
Agency

Office of
Emergency and
Remedial Response

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September 1991

EPA

Superfund Record of Decision:

Chem-Central, MI

50272-101

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SUPERFUND RECORD OF DECISION
Chem-Central, MI
First Remedial Action - Final

5. Report Date
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401 M Street, S.W.
Washington, D.C. 20460

13. Type of Report & Period Covered
800/000

14.

15. Supplementary Notes

16. Abstract (Limit: 200 words)

The 2-acre Chem-Central site is a bulk chemical storage facility in Wyoming, Kent County, Michigan. Land use in the area is a mixture of residential and commercial. An estimated 10,000 people live within 1 mile of the site and receive their water supply via the municipal distribution system. Two creeks, Cole Drain and Plaster Creek, lie in proximity to the site. Cole Drain, which has been included as part of the site, empties into Plaster Creek 2,500 feet north of the site. In addition, two hotels are located 800 feet from the site. Since 1957, Chem-Central has used the site to receive and hold bulk chemicals by truck and railroad tanker before redistribution to various industries. Facilities at the site include a building with two loading docks and a rail spur on the west side of the plant. Approximately 10 above-ground storage tanks are located along the plant's north side and are surrounded by a concrete containment wall and paved ground surface. Between 1957 and 1962, hazardous substances entered the ground as a result of faulty construction of a T-arm pipe used to transfer liquid products from bulk storage tanks to small delivery trucks. Additional hazardous substances may have entered the ground through accidental spills. In 1977, a routine State biological survey of Plaster

(See Attached Page)

17. Document Analysis a. Descriptors
Record of Decision - Chem-Central, MI
First Remedial Action - Final
Contaminated Media: soil, gw
Key Contaminants: VOCs (PCE, TCE, toluene), other organics (PAHs, PCBs)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

18. Availability Statement	19. Security Class (This Report) None	21. No. of Pages 69
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) See Instructions on Reverse OPTIONAL FORM 272 (4-77) (Formerly NTIS-35) Department of Commerce

Abstract (Continued)

Creek identified a contaminated ditch containing oils with organic compounds including PCBs and metals that was discharging into Cole Drain. In 1977, the State attempted to stop the oil flow by damming the ditch. In 1978, EPA excavated sludge from the ditch and removed the sludge using twelve 55-gallon drums for offsite disposal. Oils, ground water, and various contaminants continued to enter the ditch, and the State unsuccessfully attempted to filter oil out of the water. Between 1978 and 1986, the State and EPA focused their efforts on finding and eliminating the source of the ditch contamination through extensive investigations of area soil, ground water, and surface water. Results indicated that ground water and soil surrounding and north of the Chem-Central plant were contaminated with volatile and semi-volatile organic compounds. In 1980, the State required Chem-Central to clean up the contamination and to institute a ground water monitoring program. Consequently, between 1984 and 1985, three ground water extraction wells, an interceptor trench, and a treatment system using an air stripper were installed. Contaminated water, soil, and sludge were removed from the ditch and placed in hazardous waste landfills, and the ditch was backfilled with clean soil. This Record of Decision (ROD) addresses a remedy for contaminated onsite soil, contaminated offsite soil surrounding and north of the plant, and the addresses a remedy for contaminated onsite soil, contaminated offsite soil surrounding and north of the plant, and the ground water contamination plume emanating from the plant and spreading 1,800 feet northward. The primary contaminants of concern affecting the soil and ground water are VOCs including PCE, TCE, and toluene; and other organics including PAHs and PCBs.

The selected remedial action for this site includes installing an in-situ vapor extraction system for onsite soil and two offsite soil areas north of the property, using a network of horizontal piping, collecting contaminated vapors in the soil source area at the vacuum pump, and treating these vapors using a vapor phase carbon adsorption system before discharge to the atmosphere; continuing the operation and maintenance of the current ground water collection and treatment system; installing, operating, and maintaining an expansion of the current offsite ground water collection system either by extending the current interceptor trench further east or north, or by constructing two additional purge wells east of the current interceptor trench; installing and operating a purge well in the deep lens of contaminated ground water beneath the main aquifer, and connecting this well to the pump and treat system; treating contaminated ground water using an air stripper with offsite discharge to a publicly owned treatment works (POTW); collecting oil in the purge wells, and disposing of the oil at an offsite facility; monitoring ground water; and implementing institutional controls including deed restrictions. The estimated present worth cost for this remedial action is $2,099,000, which includes an annual O&M cost of $170,000; or $2,131,000, which includes an annual O&M cost of $172,900, depending on which offsite ground water collection option is used.

PERFORMANCE STANDARDS OR GOALS: Contaminant goals for soil are based on 10^{-6} cancer level or the Human Life Cycle Safe Concentration (HLSC). Clean-up levels in soil must be reduced to less than 20 times the ground water standard for each chemical, or soil leach tests (TCLP) must produce leachate with contaminant levels below the ground water clean-up levels. Chemical-specific ground water clean-up goals are based on health-based criteria including 10^{-6} risk level or Human Life-Cycle Safe (concentration) and State levels including TCE 3 ug/l (health-based), PCE 0.7 ug/l (health-based), and toluene 100 ug/l.

RECORD OF DECISION

SELECTED REMEDIAL ALTERNATIVE FOR THE

CHEM CENTRAL SITE WYOMING, MICHIGAN

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Chem Central Site, in Wyoming, Michigan, which was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

The State of Michigan concurs with 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

The selected remedy is for ground water and on-property and off-property soils, with the exceptions noted below. The selected remedy uses treatment to address the principal threats at the site. Soils beneath the Chem Central building and paved areas on the Chem Central property are not part of this remedy.

The major components of the selected remedy include:

- Continue operation of the current existing ground-water collection and treatment system.
- Install and operate an expansion of the current off-property ground-water collection system, by either extending the interceptor trench or installing additional purge wells.
- Install and operate a purge well at the deep lens of contaminated ground water location and hook this well into the current ground-water collection and treatment system.

- Collect oil accumulating in the purge wells and dispose of the oil at an off-site facility in accordance with applicable federal and state regulations.

- Install and operate a soil vapor extraction system for soils on-property as well as two off-property locations just north of the property.

- Impose institutional controls, such as deed restrictions to prohibit the installation of water wells in the site area and any future development that might disturb contaminated soils.

- Implement a ground-water monitoring program capable of demonstrating the effectiveness of the ground-water capture system and that ground-water treatment technology is achieving clean-up standards.

STATUTORY DETERMINATIONS

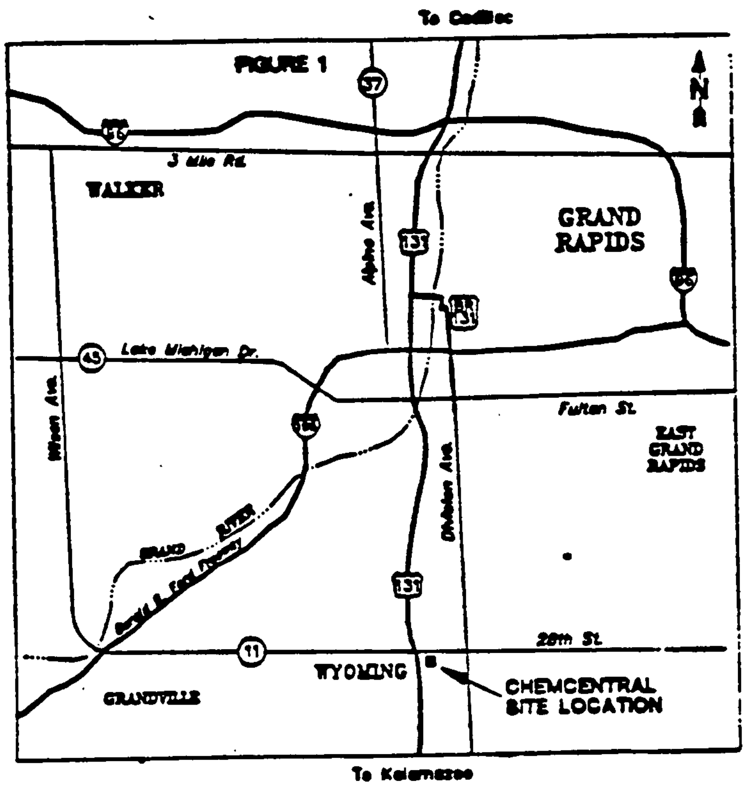
The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and is cost-effective. This remedy utilizes permanent solutions and alternative treatment or resource recovery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

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

For Valdas V. Adamkus
Regional Administrator

9/30/91
Date

DECISION SUMMARY FOR THE RECORD OF DECISION
CHEM CENTRAL SITE
WYOMING, MICHIGAN



SITE LOCATION AND DESCRIPTION

The Chem Central property is a 2-acre parcel of land located at 2940 Stafford Avenue in Wyoming, Michigan (Figures 1 & 2). The City of Wyoming is a southern suburb of Grand Rapids which is located in west-central Michigan, approximately 25 miles east of Lake Michigan in Kent County. There are approximately 10,000 people living within one mile of the site.

The site is situated in a mixed residential and commercial section of the City of Wyoming that includes small industrial facilities. The nearest residences to the site are located approximately 500 feet west of the property boundary. The residential areas primarily consist of single family residential homes. There are two hotels located within approximately 800 feet of the site. The "site" encompasses both a square shaped piece of property owned by the Chem Central Corporation which is the location of the currently operating plant and a rectangular piece of land owned by Consumers

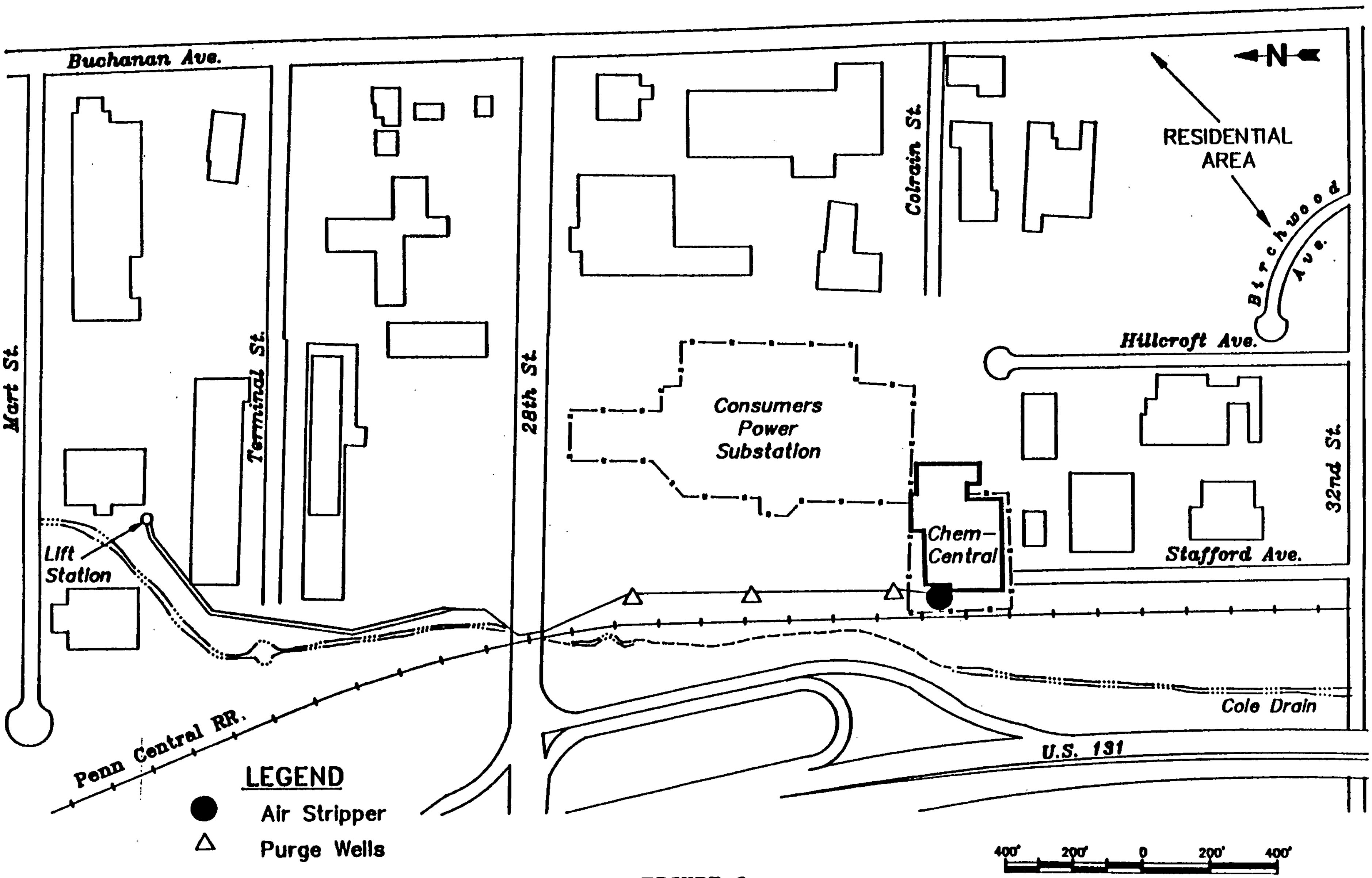


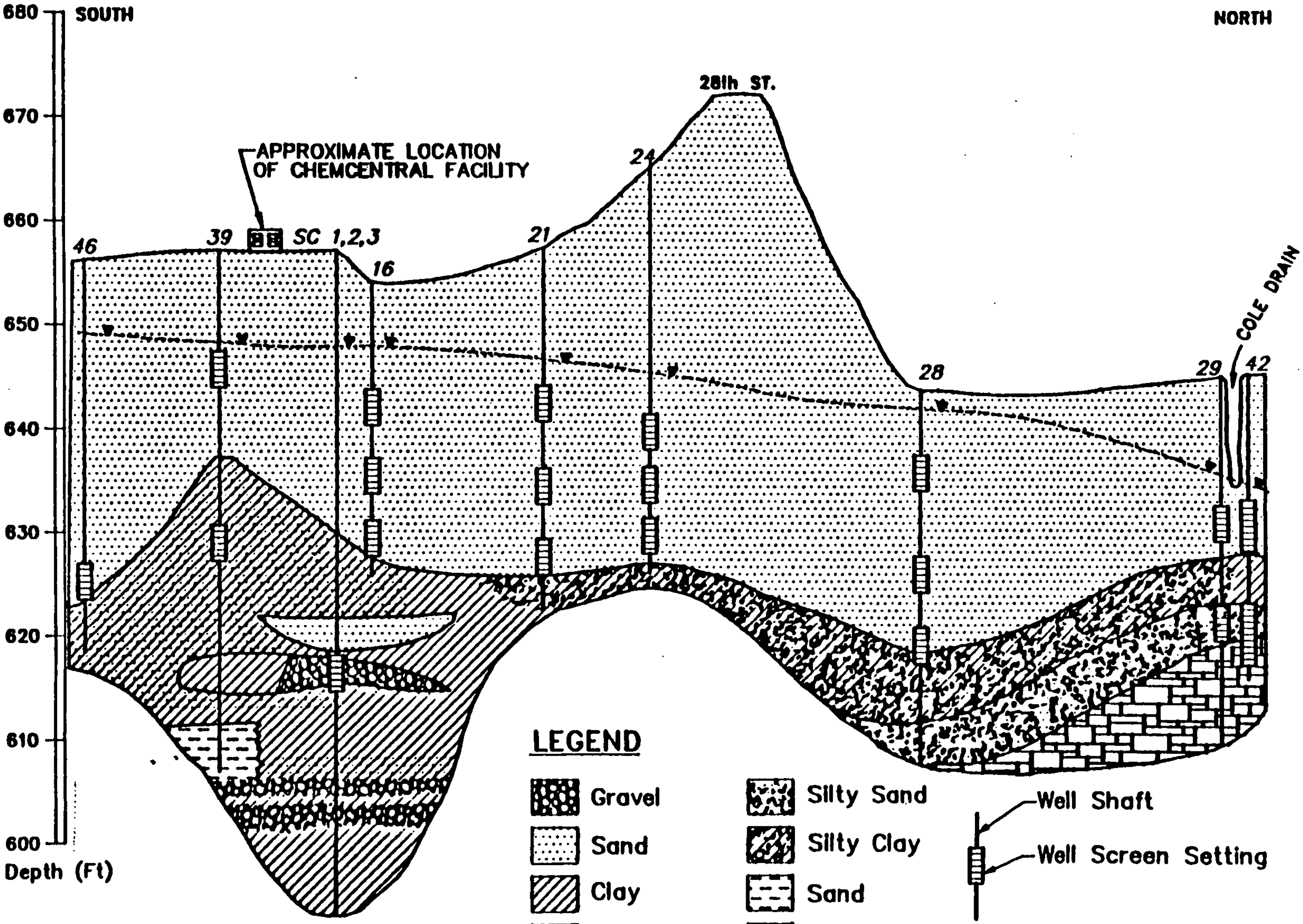
FIGURE 2

CHEMCENTRAL SITE MAP

Power extending north from the Chem Central property with the approximate dimensions of 1,800 feet in length and 300 feet wide. In addition, the site includes Cole Drain, and any place where hazardous substances on the property have come to be located. The Chem Central property is relatively flat however, the rectangular piece of property consists of a more undulating terrain. Cole Drain, a small urban creek flowing in a northerly direction, is located along the site's western boundary. This creek receives most of the surface runoff from the site. Cole Drain enters Plaster Creek at a confluence approximately 2,500 feet north of the site. Plaster Creek enters the Grand River approximately 2.5 miles northwest of the site. The Grand River flows to the west for approximately 30 miles and enters Lake Michigan at Grand Haven.

The Chem Central plant, constructed in 1957, receives bulk chemicals by truck or railroad tanker and stores these chemicals in on-site tanks before redistribution to various industries. The plant consists of one structure with two loading docks and a rail spur on the west side of the plant. Approximately 10 above ground storage tanks are located along the plant's north side and are surrounded by a concrete containment wall and paved ground surface. The Chem Central property is fenced along the western and northern property lines and the actual walls of the building serve as barriers to entrance to the property on the south and east sides of the property. The rectangular portion of the property extending north from the Chem Central property is currently unused and unfenced. The undulating terrain and sandy soils have however made this area (south of 28th Street) an attractive area to dirt bike riders, as evidenced by the numerous trails criss-crossing the terrain. The property to the east of this unused portion of the property, is currently used as a transformer yard by the Consumers Power Company. Consumers Power owns the unused portion of the site. The land adjacent to the site on the west is the right of way for the Conrail Railroad Company's single line track. Adjacent to the rail line is U.S. Route 131, a four-lane limited-access highway. The adjacent property north and south of the site is privately owned, and is occupied by commercial and light industrial facilities.

The subsurface geology of the site area consists of a glacial sand deposit averaging approximately 30 feet in depth (see Figure 3). Underlying this sand unit is a low permeable clay layer which acts as an aquiclude to the migration of ground water from the upper sand unit down into the underlying bedrock which is comprised of gypsum and shales. The clay layer does contain small lenses of sand and gravel but these lenses are not hydraulically connected to the upper sand aquifer. There are no drinking water wells in the immediate site area. The City of Wyoming has a municipal water supply which uses Lake Michigan as its source. An intake on the Grand River (upstream of the site) is also used as a backup supply during the summer. The nearest public well to the site is located approximately 1.5 miles south of the property. An industrial well



GEOLOGY BENEATH CHEMCENTRAL SITE AREA

FIGURE

is located at the C.D. Osborn Company which is situated approximately 500 feet south of the site.

Cole Drain is the only surface water body in the immediate site area. This creek is narrow and shallow and poorly suited for swimming. However, there are areas of the creek where pooling occurs and children could potentially swim. Fish inhabit this creek, and it is possible that some occasional fishing occurs.

SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Chem Central property was undeveloped prior to construction of the present plant. In 1957, the chemical distribution plant was constructed. Between 1957 and 1962 hazardous substances entered the ground at the plant through a construction error in a T-arm pipe used to transfer liquid products from bulk storage tanks to small delivery trucks. The T-arm pipe was located on the west side of the building near the southwest corner. After losses in chemical inventories were noted, the construction flaw was discovered and then repaired. It is also possible that additional hazardous substances entered the ground through accidental spills.

The Chem Central site first came to the attention of federal and state officials in July 1977, when a routine biological survey of Plaster Creek conducted by Michigan Department of Natural Resources (MDNR), identified a contaminated ditch draining into Cole Drain (tributary to Plaster Creek). The ditch was located north of 28th Street and east of Cole Drain. Sample analysis of the ditch indicated oils contaminated with organic compounds, including Polychlorinated Biphenyls (PCBs), as well as heavy metals to be present. In 1977 the MDNR attempted to control the movement of oil and other contaminants from the ditch into Cole Drain by damming the ditch. In 1978, the United States Environmental Protection Agency (U.S.EPA) excavated sludges from the ditch, resulting in the removal of twelve 55-gallon drums for off-site disposal. Consumers Power Company, which owned the ditch at that time, placed warning signs and a fence around the ditch. Despite these efforts, ground water, oils, and various contaminants continued to enter the ditch. MDNR then attempted to filter water from the ditch and subsequently pump it into Cole Drain. This attempt at preventing the oils and contaminants from entering the drain was unsuccessful. Oil absorbent booms were then used to collect oil from the surface of the water of the ditch. In October 1978, MDNR and U.S.EPA then focused all efforts on finding and eliminating the source of the contamination. Between 1978 and 1986, an extensive investigation was made of soils, ground water, and surface water around the Chem Central plant and the area between Chem Central and the ditch north of 28th Street. The investigation was conducted by MDNR, U.S.EPA and an environmental contractor to the Chem Central Corporation. Results of the investigation indicated that ground water and soils surrounding and downgradient of the Chem Central plant were contaminated with volatile and semi- volatile organic compounds.

In an effort to get the Chem Central Corporation to clean up the contamination and institute a ground-water monitoring program, the MDNR filed a suit in the Kent County Circuit Court in 1980. In 1984 the court ordered Chem Central to undertake clean-up activities which included (1) defining the extent of contamination, (2) designing, constructing, and operating a ground-water collection and treatment system until court-ordered clean-up standards were met, and (3) cleaning up contaminated soils in the ditch. In the fall of 1984, as a result of the court order, three ground-water extraction wells, an interceptor trench, and a water treatment system (air stripper) were installed (see **Figure 2** for locations). In 1985, also as a result of the court order, contaminated water, sludges and soils from the contaminated ditch were excavated and transported to hazardous waste landfills in Michigan and New York. The ditch was backfilled with clean soil.

In December 1982, the Chem Central site was proposed for inclusion on the NPL. In 1986, U.S.EPA issued a Special Notice Letter to the Chem Central Corporation. In June of 1987, U.S.EPA and Chem Central signed an Administrative Order By Consent (AOC) to conduct a Remedial Investigation (RI) and Feasibility Study (FS) for the Chem Central site. In July of 1987 the site was finalized on the NPL. Chem Central conducted the RI from 1988 through 1989. The FS was conducted from 1989 through 1991.

COMMUNITY RELATIONS HISTORY

Community relations activities for the Chem Central site began in July 1987 when a press release was issued seeking comments from the public on the AOC. In July 1988, the Community Relations Plan was issued by MDNR. A progress report was first issued for the site in July 1988 and another in March 1989. A public meeting was held at the Wyoming City Hall on July 26, 1988 to discuss the upcoming RI/FS for the site. A fact sheet for the RI/FS Meeting was written and distributed to the public.

U.S.EPA took the lead for community relations for the Chem Central site in 1990. A fact sheet and press release were issued prior to a March 1991 public meeting to discuss the results of the RI at Chem Central. The U.S.EPA's Community Relations Coordinator for the Chem Central site met with local city officials to discuss issues related to the site prior to the public meeting. In accordance with CERCLA Section 117(a), the Proposed Plan for the Chem Central site was released for public comment on July 10, 1991. The public comment period began on July 10, 1991 and closed September 9, 1991. A public meeting to discuss the Chem Central Proposed Plan was held July 18, 1991. At the Proposed Plan public meeting, U.S.EPA and MDNR discussed the remedial alternatives considered, as well as the preferred alternatives. Notice of the Proposed Plan, the public comment period, the public meeting, and the availability of the RI/FS and other site-related documents were published in the Advance (the local Wyoming, Michigan newspaper) and the Grand Rapids Press.

The RI for the Chem Central site was released to the public in March 1991, and the FS was released in July 1991. Both documents were made available at the information repository maintained at the Wyoming Public Library. The Administrative Record was also made available at this location.

All comments which were received by U.S.EPA during the public comment period are addressed in the Responsiveness Summary, which is part of this Record of Decision.

SCOPE AND ROLE OF THE RESPONSE ACTION

The selected remedy addresses several principal threats at the site which include the contaminated soils surrounding the Chem Central plant as well as areas of soil contamination north of the plant. The remedy also addresses the ground-water contamination plume which emanates from the plant and spreads northward for approximately 1,800 feet.

Unacceptable risks to human health and the environment have been identified for soils on and off the Chem Central property. Surface soils on the Chem Central property present a risk to human health through direct contact and incidental ingestion. Contaminated soils on and off the Chem Central property present a risk to the environment due to potential for further migration of contaminants into the ground water. The potential use of ground water as a drinking water source also presents an unacceptable risk.

The role of this response action is to protect public health and the environment from the unacceptable risks associated with the Chem Central site. These risks included the potential ingestion of and direct contact with contaminated soils; the possible ingestion of contaminated ground water; the movement of contaminants from the soils into ground water; and the discharge of contaminated ground water into Cole Drain.

These objectives will be achieved by expanding the current collection/treatment system for ground water by adding additional purge wells or extending the interceptor trench to capture that portion of the ground-water contamination plume not currently addressed by the system. An additional purge well will be installed on-site to collect and treat contaminated ground water from a deep sand/gravel lens beneath the main sand aquifer. Oils contaminated with organic compounds, including PCBs, which are accumulating in the active purge wells will be collected and disposed of off-site in accordance with applicable federal and state regulations. Soil vapor extraction will be implemented to address contamination in the on-property and off-property soils.

Institutional controls and a ground-water monitoring program will also be implemented.

Soils beneath the Chem Central building and paved areas on the Chem Central property are not included in this response action. These soils have not been ruled out as potential source areas for further ground-water contamination for the following reasons:

1. Soils beneath the building and paved areas have never been investigated subsequent to the discovery of the flawed T-arm pipe.

2. The source of some contaminants (i.e., PCBs) in the oil accumulating in the active purge wells has not yet been identified. Because the levels of PCBs found in the oil are several times greater than that found in the surrounding soils which have been investigated, it is possible that soils beneath the building and paved areas are contaminated with PCBs and other organic compounds.

3. Current soil analysis around the edges of the Chem Central building indicates that some of the highest levels of various compounds are located in these areas (i.e., volatile and semi-volatile organic compounds), possibly indicating that levels in adjoining soils beneath the building may also be contaminated.

4. As evidenced by 35 years of aerial photos, the present Chem Central building is the result of several additions to the original structure. The possibility exists that soil impacted by releases in the past is now covered by buildings.

Based on the above facts, the soils beneath the building and paved areas will need to be investigated further at a later date.

SUMMARY OF SITE CHARACTERISTICS

As part of the RI, samples of soil, ground-water, sediment, and surface water from the site and adjacent areas were collected. Samples from all media were analyzed for organic and inorganic compounds.

HYDROGEOLOGY

A sand unit comprises the shallow aquifer in the site area. This shallow aquifer is unconfined. The depth to the water table in this aquifer varies from less than 5 feet near Cole Drain to 30 feet in the south eastern portion of the site area. The shallow aquifer is fairly thin, with a saturated thickness of less than 10 feet to 25 feet. This sand unit thickens toward an area to the east of the Consumers Power Substation. The base of the aquifer (top of clay) dips to the east in the site area.

The soils identified in cluster wells and borings have shown the aquifer materials to consist of fine to medium grained sands with variable concentrations of stones or gravel in apparently interrupted layers. The shallow aquifer is underlain by a clay layer. The underlying clay, which has been penetrated to a thickness of 38 feet, has a fairly uniform topography. It is a clean to sandy gray clay. Sand and gravel lenses are also located in this unit. The top of the clay dips to the east in the area. The Chem Central plant overlies an apparent clay elevation closed topographic high. The northeast area of the site exhibits the greatest degree of dip at the top of the clay .

Gypsum and shales of the Michigan Formation are encountered beneath the sand and clay units in the northeastern portion of the site area. A 5 foot thick sand layer is encountered between the base of the clay and bedrock in the northern portion of the site area.

Ground water flow in the shallow sand unit is to the north. The ground water in the area appears to flow roughly parallel to the north trending segment of Cole Drain before beginning to enter the underdrain approximately 700 feet north of 28th Street. The hydraulic gradient in the area changes from approximately 0.4 percent south of 28th Street to 2.4 percent north of 28th Street. This trend may be consistent with a generally northwest thinning of the aquifer.

In-situ permeability testing and analysis reveals that the permeability varies from values of a little less than 100 gallons per day per square foot to 600 gallons per day per square foot. An average permeability of 260 gallons per day per square foot appears to be the typical permeability value.

Contaminant Analyses

The analytical results of the sampling are presented in **Table 1**. Analysis of the samples indicates that soils contain approximately twenty-two different organic compounds (volatile and semi-volatile), at concentrations above background soil levels, including low levels of PCBs. An estimate of the volume of contaminated soil on the Chem Central property is approximately 6,200 cubic yards.

Analysis of ground-water samples indicates that it contains approximately thirty-five different organic compounds (volatile and semi-volatile) at concentrations above background (upgradient) ground-water levels. The majority of these contaminants are above the Maximum Contaminant Levels (MCLs) in the Federal Safe Drinking Water Act and the Michigan Act 307 Type B criteria.

TABLE 1

SUMMARY OF THE OCCURRENCE OF CHEMICALS

COMPOUND*	CAS No.	SURFACE SOIL BORING CONCENTRATIONS[1] (mg/kg) ON-SITE SOILS Ave	Min	Max	Count**	OFF-SITE SOILS Ave	Min	Max	Count**	SEDIMENT CONCENTRATIONS (mg/kg) UPSTREAM Ave	Min	Max	Count**	DOWNSTREAM Ave	Min	Max	Count**
PHENOL, TOTAL	108952	ND			0 / 18	NA				ND			0 / 2	ND			0 / 7
GREASE & OIL		320	150	1050	18 / 18	276.5	98	990	15 / 15	109.5	60	159	2 / 2	231.4	60	398	7 / 7
ANTIMONY	7440360	ND			0 / 18	NA				ND			0 / 2	ND			0 / 7
ARSENIC	7440382	3.211	2	4.3	18 / 18	NA				1.85	1.1	2.6	2 / 2	2.057	1.5	3.1	7 / 7
CADMIUM	7740439	4.845	0.29	9.4	2 / 18	NA				ND			0 / 2	ND			0 / 7
CHROMIUM	7440473	9.544	6.2	15	18 / 18	NA				11.45	8.9	14	2 / 2	8.543	6.1	11	7 / 7
COPPER	7440508	8.094	5.6	16	18 / 18	NA				9.55	8.1	11	2 / 2	8.1	6.2	12	7 / 7
LEAD	7439921	5.953	1.3	16	17 / 18	NA				103	26	180	2 / 2	35.57	13	110	7 / 7
MERCURY		ND			0 / 18	NA				0.1	0.1	0.1	1 / 2	ND			0 / 7
NICKEL	7440020	5.667	4.3	7.1	18 / 18	NA				3.5	2.5	4.5	2 / 2	3.171	2.2	4.6	7 / 7
SELENIUM	7782492	0.055	0.04	0.07	4 / 18	NA				ND			0 / 2	0.044	0.044	0.044	1 / 7
ZINC	7440666	23.67	12	66	18 / 18	NA				30.5	24	37	2 / 2	31	25	48	7 / 7
BARIUM	7440393	73.38	5.5	220	4 / 18	NA				ND			0 / 2	6.7	4.2	10	5 / 7
IRON	15438310	10117	4100	64000	18 / 18	NA				4400	2600	6200	2 / 2	3700	2500	5000	7 / 7
ACETONE	67641	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
BENZENE	71432	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
CHLOROBENZENE	108907	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
CHLOROETHANE	75003	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
CHLOROFORM	67663	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
1,1-DICHLOROETHANE	75343	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
1,2-DICHLOROETHANE	107062	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
1,1-DICHLOROETHYLENE	75354	0.016	0.01	0.022	3 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
TRANS-1,2-DICHLOROETHYLENE	156605	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
ETHYLBENZENE	100414	1.7	0.23	4.6	3 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
METHYLENE CHLORIDE	75092	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
1,1,2,2-TETRACHLOROETHANE	79345	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
TETRACHLOROETHYLENE	127184	8.029	0.011	81	14 / 19	0.141	0.012	0.38	4 / 15	ND			0 / 3	ND			0 / 7
TOLUENE	108883	3.063	0.007	15	5 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
1,1,1-TRICHLOROETHANE	71556	0.824	0.031	5.7	11 / 19	0.059	0.059	0.059	1 / 15	ND			0 / 3	ND			0 / 7
TRICHLOROETHYLENE	79016	0.091	0.016	0.22	7 / 19	0.015	0.015	0.015	1 / 15	ND			0 / 3	ND			0 / 7
VINYL CHLORIDE	75014	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
XYLENE	1330207	ND			0 / 19	ND			0 / 15	ND			0 / 3	ND			0 / 7
ACENAPTHENE	83329	0.44	0.44	0.44	1 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
ANTHRACENE	120127	ND			0 / 19	ND			0 / 15	0.26	0.26	0.26	1 / 2	ND			0 / 8
BENZO (A) ANTHRACENE		ND			0 / 19	ND			0 / 15	0.74	0.74	0.74	1 / 2	1.7	1.7	1.7	1 / 8
BENZO (B) FLUORANTHENE		ND			0 / 19	ND			0 / 15	1.5	1.5	1.5	1 / 2	0.877	0.51	1.5	3 / 8

TABLE 1

SUMMARY OF THE OCCURRENCE OF CHEMICALS

COMPOUND*	CAS No.	SURFACE SOIL BORING CONCENTRATIONS[1] (mg/kg)								SEDIMENT CONCENTRATIONS (mg/kg)							
		ON-SITE SOILS				OFF-SITE SOILS				UPSTREAM				DOWNSTREAM			
		Ave	Min	Max	Count**	Ave	Min	Max	Count**	Ave	Min	Max	Count**	Ave	Min	Max	Count**
ENZO (K) FLUORANTHENE		ND			0 / 19	ND			0 / 15	0.71	0.71	0.71	1 / 2	1.1	1.1	1.1	1 / 8
ENZO (A) PYRENE		ND			0 / 19	ND			0 / 15	0.89	0.89	0.89	1 / 2	1.3	1.3	1.3	1 / 8
BIS-(2-ETHYLHEXYL)PHTHALATE	**117817**	14.73	0.28	57	9 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
UTYLE BENZYL PHTHALATE		1.357	0.46	3.3	7 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
HRYSENE	85687	ND			0 / 19	ND			0 / 15	1	1	1	1 / 2	2.2	2.2	2.2	1 / 8
I-N-BUTYL PHTHALATE	84742	0.31	0.12	0.66	4 / 19	ND			0 / 15	ND			0 / 2	0.638	0.39	1.1	6 / 8
IETHYLPHALATE	84662	ND			0 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
,4-DIMETHYLPHENOL	105679	ND			0 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
I-N-OCTYLPHTHALATE	117840	0.414	0.2	0.71	5 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
LUOROANTHENE	206440	0.155	0.15	0.16	2 / 19	0.18	0.15	0.21	2 / 15	1.8	1.8	1.8	1 / 2	1.653	0.76	3.1	3 / 8
SOPHORONE	78591	2.2	2.2	2.2	1 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
-METHYLNAPHTHALENE	91576	0.34	0.34	0.34	1 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
-METHYLPHENOL	95487	ND			0 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
-METHYLPHENOL	106445	ND			0 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
NAPHTHALENE	**91203**	0.295	0.11	0.65	4 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
ENTACHLOROPHENOL	87865	ND			0 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
HENANTHRENE	85018	0.34	0.11	0.54	3 / 19	ND			0 / 15	1.2	1.2	1.2	1 / 2	0.98	0.97	0.99	2 / 8
HENOL	108952	ND			0 / 19	ND			0 / 15	ND			0 / 2	ND			0 / 8
PYRENE	**129000**	0.125	0.12	0.13	2 / 19	0.185	0.18	0.19	2 / 15	1.5	1.5	1.5	1 / 2	1.567	0.81	3	3 / 8
BENZENES, SUBSTITUTED		13.28	2.6	39	5 / 5	NA				NA				NA			
-PROPYLPHENOL		NA				NA				NA				NA			
ETHYLPHENOL	90006	NA				NA				NA				NA			
DIHYDRO-INDENE-ONE		NA				NA				NA				NA			
HYDROCARBONS, TOTAL		109.4	1.2	220	8 / 8	NA				NA				NA			
HEPTACHLOR	76448	ND			0 / 18	NA				ND			0 / 2	ND			0 / 7
PCB-1248	**1336363**	0.208	0.13	0.32	4 / 18	NA				ND			0 / 2	ND			0 / 7

* Chemicals in BOLD print are indicator chemicals

** Count includes all duplicate and companion samples

NA= Not Analyzed for in this area/medium

ND = Not Detected

[1] Surface Soil samples include all samples taken within the 0 to 2 foot range, either completely or partially

TABLE 1

SUMMARY OF THE OCCURRENCE OF CHEMICALS

COMPOUND*	CAS No.	GROUNDWATER CONCENTRATIONS (mg/l)** UPGRADIENT Ave	Min	Max	Count**	DOWNGRADIENT Ave	Min	Max	Count**	DEEP WELLS Ave	Min	Max	Count**
PHENOL, TOTAL	108952	ND			0 / 10	0.424	0.07	0.75	8 / 37	ND			0 / 7
GREASE & OIL		1.817	1.1	2.6	6 / 14	6.071	1.2	30	17 / 39	1.9	1.1	2.6	3 / 7
ANTIMONY	7440360	NA				0.003	0.003	0.003	1 / 38	ND			0 / 7
ARSENIC	7440382	NA				0.01	0.003	0.024	11 / 38	0.003	0.002	0.004	2 / 7
CADMIUM	7740439	NA				ND			0 / 38	ND			0 / 7
CHROMIUM	7440473	NA				ND			0 / 38	ND			0 / 7
COPPER	7440508	NA				ND			0 / 38	ND			0 / 7
LEAD	7439921	NA				ND			0 / 38	ND			0 / 7
MERCURY		NA				ND			0 / 38	ND			0 / 7
NICKEL	7440020	NA				ND			0 / 38	ND			0 / 7
SELENIUM	7782492	NA				0.002	0.002	0.002	4 / 38	ND			0 / 7
ZINC	7440666	NA				1.697	0.05	6.2	35 / 38	2.243	0.9	4.1	7 / 7
BARIUM	7440393	NA				0.362	0.1	0.7	9 / 38	ND			0 / 7
IRON	15438310	NA				5.578	0.06	16	17 / 38	ND			0 / 7
ACETONE	67641	ND			0 / 15	0.068	0.068	0.068	1 / 41	ND			0 / 7
BENZENE	71432	ND			0 / 15	0.009	0.002	0.021	3 / 41	ND			0 / 7
CHLOROBENZENE	108907	ND			0 / 15	0.002	0.001	0.002	4 / 41	ND			0 / 7
CHLOROETHANE	75003	ND			0 / 15	1.143	0.16	2.8	6 / 41	ND			0 / 7
CHLOROFORM	67663	0.002	0.001	0.002	3 / 15	ND			0 / 41	ND			0 / 7
1,1-DICHLOROETHANE	75343	0.002	0.002	0.002	1 / 15	2.273	0.003	9.5	16 / 41	ND			0 / 7
1,2-DICHLOROETHANE	107062	ND			0 / 15	0.003	0.003	0.003	2 / 41	ND			0 / 7
1,1-DICHLOROETHYLENE	75354	ND			0 / 15	0.344	0.002	0.89	7 / 41	0.745	0.72	0.77	2 / 7
TRANS-1,2-DICHLOROETHYLENE	156605	ND			0 / 15	8.775	0.002	53	21 / 41	3.55	3.5	3.6	2 / 7
ETHYLBENZENE	100414	ND			0 / 15	2.669	0.003	8	15 / 41	0.185	0.18	0.19	2 / 7
METHYLENE CHLORIDE	75092	ND			0 / 15	0.35	0.34	0.36	2 / 41	ND			0 / 7
1,1,2,2-TETRACHLOROETHANE	79345	ND			0 / 15	0.002	0.002	0.002	1 / 41	ND			0 / 7
TETRACHLOROETHYLENE	127184	0.029	0.002	0.11	10 / 15	0.242	0.006	1.4	16 / 41	ND			0 / 7
TOLUENE	108883	ND			0 / 15	18.63	0.001	70	15 / 41	0.039	0.039	0.039	2 / 7
1,1,1-TRICHLOROETHANE	71556	0.024	0.002	0.042	3 / 15	7.966	0.003	150	30 / 41	0.049	0.043	0.054	2 / 7
TRICHLOROETHYLENE	79016	0.005	0.004	0.006	3 / 15	0.785	0.002	12	17 / 41	1.3	1	1.6	2 / 7
VINYL CHLORIDE	75014	ND			0 / 15	1.287	0.022	2.8	7 / 41	1.15	1.1	1.2	2 / 7
XYLENE	1330207	ND			0 / 15	6.351	0.01	13	10 / 41	ND			0 / 7
ACENAPTHENE	83329	ND			0 / 15	ND			0 / 40	ND			0 / 8
ANTHRACENE	120127	ND			0 / 15	ND			0 / 40	ND			0 / 8
BENZO (A) ANTHRACENE		ND			0 / 15	ND			0 / 40	ND			0 / 8
BENZO (B) FLUORANTHENE		ND			0 / 15	ND			0 / 40	ND			0 / 8

(continued)

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TABLE 1

SUMMARY OF THE OCCURRENCE OF CHEMICALS

		GROUNDWATER CONCENTRATIONS (mg/l)**											
		UPGRADIENT				DOWNGRADIENT				DEEP WELLS			
COMPOUND*	CAS No.	Ave	Min	Max	Count**	Ave	Min	Max	Count**	Ave	Min	Max	Count**
BENZO (K) FLUORANTHENE		ND			0 / 15	ND			0 / 40	ND			0 / 8
BENZO (A) PYRENE		ND			0 / 15	ND			0 / 40	ND			0 / 8
BIS-(2-ETHYLHEXYL)PHTHALATE	**117817**	0.019	0.003	0.043	4 / 15	0.067	0.002	0.43	22 / 40	0.017	0.008	0.026	2 / 8
BUTYLE BENZYL PHTHALATE		0.003	0.003	0.003	2 / 15	0.048	0.004	0.092	2 / 40	ND			0 / 8
CHRYSENE	85687	ND			0 / 15	ND			0 / 40	ND			0 / 8
DI-N-BUTYL PHTHALATE	84742	0.001	0.001	0.001	3 / 15	0.016	0.001	0.043	9 / 40	0.014	0.014	0.014	1 / 8
DIETHYLPHALATE	84662	ND			0 / 15	0.005	0.005	0.005	1 / 40	ND			0 / 8
2,4-DIMETHYLPHENOL	105679	ND			0 / 15	0.033	0.033	0.033	1 / 40	ND			0 / 8
DI-N-OCTYLPHTHALATE	117840	ND			0 / 15	0.02	0.002	0.037	4 / 40	ND			0 / 8
FLUOROANTHENE	206440	ND			0 / 15	ND			0 / 40	ND			0 / 8
ISOPHORONE	78591	ND			0 / 15	ND			0 / 40	ND			0 / 8
2-METHYLNAPHTHALENE	91576	ND			0 / 15	0.037	0.03	0.043	3 / 40	ND			0 / 8
2-METHYLPHENOL	95487	ND			0 / 15	0.176	0.008	0.42	7 / 40	ND			0 / 8
4-METHYLPHENOL	106445	ND			0 / 15	0.093	0.008	0.2	7 / 40	ND			0 / 8
NAPHTHALENE	**91203**	ND			0 / 15	0.122	0.003	0.35	13 / 40	ND			0 / 8
PENTACHLOROPHENOL	87865	ND			0 / 15	0.047	0.012	0.082	2 / 40	ND			0 / 8
PHENANTHRENE	85018	ND			0 / 15	ND			0 / 40	ND			0 / 8
PHENOL	108952	ND			0 / 15	0.052	0.004	0.1	7 / 40	ND			0 / 8
PYRENE	**129000**	ND			0 / 15	ND			0 / 40	ND			0 / 8
BENZENES, SUBSTITUTED		NA				1.513	0.058	4	13 / 13	NA			
4-PROPYLPHENOL		NA				0.008	0.002	0.015	2 / 2	NA			
2-ETHYLPHENOL	90006	NA				0.008	0.007	0.008	2 / 2	NA			
DIHYDRO-INDENE-ONE		NA				0.186	0.011	0.88	5 / 5	NA			
HYDROCARBONS, TOTAL		0.132	0.015	0.51	7 / 7	0.063	0.04	0.11	3 / 3	NA			
HEPTACHLOR	76448	NA				4E-04	4E-04	4E-04	1 / 34	ND			0 / 7
PCB-1248	**1336363**	NA				ND			0 / 34	ND			0 / 7

* Chemicals in BOLD print are indicator chemicals

** Count includes all duplicate and companion samples

NA= Not Analyzed for in this area/medium

ND = Not Detected

** The upgradient and downgradient groundwater samples are from a shallow aquifer. No upgradient deep wells were sampled.

TABLE 1

SUMMARY OF THE OCCURRENCE OF CHEMICALS

COMPOUND*	CAS No.	SURFACE WATER CONCENTRATIONS (mg/l) UPSTREAM Ave	Min	Max	Count**	DOWNSTREAM Ave	Min	Max	Count**
PHENOL, TOTAL	108952	ND			0 / 2	ND			0 / 7
GREASE & OIL		4	4	4	1 / 2	5.629	1.7	11	7 / 7
ANTIMONY	7440360	ND			0 / 2	ND			0 / 7
ARSENIC	7440382	ND			0 / 2	ND			0 / 7
CADMIUM	7740439	ND			0 / 2	ND			0 / 7
CHROMIUM	7440473	ND			0 / 2	0.243	0.05	0.34	3 / 7
COPPER	7440508	0.045	0.04	0.05	2 / 2	0.063	0.03	0.1	7 / 7
LEAD	7439921	ND			0 / 2	ND			0 / 7
MERCURY		ND			0 / 2	ND			0 / 7
NICKEL	7440020	ND			0 / 2	0.075	0.03	0.12	2 / 7
SELENIUM	7782492	ND			0 / 2	ND			0 / 7
ZINC	7440666	0.06	0.06	0.06	1 / 2	ND			0 / 7
BARIUM	7440393	ND			0 / 2	ND			0 / 7
IRON	15438310	ND			0 / 2	0.86	0.86	0.86	1 / 7
ACETONE	67641	ND			0 / 2	ND			0 / 7
BENZENE	71432	ND			0 / 2	ND			0 / 7
CHLOROBENZENE	108907	ND			0 / 2	ND			0 / 7
CHLOROETHANE	75003	ND			0 / 2	ND			0 / 7
CHLOROFORM	67663	ND			0 / 2	ND			0 / 7
1,1-DICHLOROETHANE	75343	ND			0 / 2	ND			0 / 7
1,2-DICHLOROETHANE	107062	ND			0 / 2	ND			0 / 7
1,1-DICHLOROETHYLENE	75354	ND			0 / 2	ND			0 / 7
TRANS-1,2-DICHLOROETHYLENE	156605	0.004	0.004	0.004	1 / 2	ND			0 / 7
ETHYLBENZENE	100414	ND			0 / 2	ND			0 / 7
METHYLENE CHLORIDE	75092	ND			0 / 2	ND			0 / 7
1,1,2,2-TETRACHLOROETHANE	79345	ND			0 / 2	ND			0 / 7
TETRACHLOROETHYLENE	127184	ND			0 / 2	ND			0 / 7
TOLUENE	108883	ND			0 / 2	ND			0 / 7
1,1,1-TRICHLOROETHANE	71556	ND			0 / 2	ND			0 / 7
TRICHLOROETHYLENE	79016	ND			0 / 2	ND			0 / 7
VINYL CHLORIDE	75014	ND			0 / 2	ND			0 / 7
XYLENE	1330207	ND			0 / 2	ND			0 / 7
ACENAPTHENE	83329	ND			0 / 2	ND			0 / 7
ANTHRACENE	120127	ND			0 / 2	ND			0 / 7
BENZO (A) ANTHRACENE		ND			0 / 2	ND			0 / 7
BENZO (B) FLUORANTHENE		ND			0 / 2	ND			0 / 7

(continued)

TABLE 1

SUMMARY OF THE OCCURRENCE OF CHEMICALS

COMPOUND*	CAS No.	SURFACE WATER CONCENTRATIONS (mg/l) — UPSTREAM Ave	Min	Max	Count**	DOWNSTREAM Ave	Min	Max	Count**
BENZO (K) FLUORANTHENE		ND			0 / 2	ND			0 / 7
BENZO (A) PYRENE		ND			0 / 2	ND			0 / 7
BIS-(2-ETHYLHEXYL)PHTHALATE	**117817**	ND			0 / 2	ND			0 / 7
BUTYLE BENZYL PHTHALATE		ND			0 / 2	ND			0 / 7
CHRYSENE	85687	ND			0 / 2	ND			0 / 7
DI-N-BUTYL PHTHALATE	84742	ND			0 / 2	ND			0 / 7
DIETHYLPHALATE	84662	ND			0 / 2	ND			0 / 7
2,4-DIMETHYLPHENOL	105679	ND			0 / 2	ND			0 / 7
DI-N-OCTYLPHTHALATE	117840	ND			0 / 2	ND			0 / 7
FLUOROANTHENE	206440	ND			0 / 2	ND			0 / 7
ISOPHORONE	78591	ND			0 / 2	ND			0 / 7
2-METHYLNAPHTHALENE	91576	ND			0 / 2	ND			0 / 7
2-METHYLPHENOL	95487	ND			0 / 2	ND			0 / 7
4-METHYLPHENOL	106445	ND			0 / 2	ND			0 / 7
NAPHTHALENE	**91203**	ND			0 / 2	ND			0 / 7
PENTACHLOROPHENOL	87865	ND			0 / 2	ND			0 / 7
PHENANTHRENE	85018	ND			0 / 2	ND			0 / 7
PHENOL	108952	ND			0 / 2	ND			0 / 7
PYRENE	**129000**	ND			0 / 2	ND			0 / 7
BENZENES, SUBSTITUTED		NA				NA			
4-PROPYLPHENOL		NA				NA			
2-ETHYLPHENOL	90006	NA				NA			
DIHYDRO-INDENE-ONE		NA				NA			
HYDROCARBONS, TOTAL		NA				NA			
HEPTACHLOR	76448	ND			0 / 2	ND			0 / 7
PCB-1248	**1336363**	ND			0 / 2	ND			0 / 7

* Chemicals in BOLD print are indicator chemicals

** Count includes all duplicate and companion samples

NA= Not Analyzed for in this area/medium

ND = Not Detected

Analysis of sediment samples from Cole Drain indicates that Cole Drain contains low levels of a few organic compounds. However, most of these compounds were also detected in upstream samples indicating that these compounds probably originated from a source other than the contaminated soils on the Chem Central property. Analysis of surface water samples from Cole Drain did not detect any contaminants. Oils accumulating in two of the active purge wells at the site were analyzed. The oil contains approximately fourteen different organic compounds, including PCBs, at high levels.

Potential Migration Pathways

The potential migration pathways identified for the Chem Central site include the following:

AIR: The public may be exposed to contaminants in air emitted from the air stripping tower or that volatilize from contaminated soils. The potential exposure points are the property itself, nearby homes, nearby businesses, a nearby hotel, and nearby schools.

SURFACE WATER: A portion of the ground-water contamination plume (as much as 10% of the total plume) is bypassing the current ground-water collection/treatment system. This ground water is most likely discharging into Cole Drain and therefore may be impacting the surface water and sediments quality. If the ground-water collection/treatment system were to fail, or be shut down, there would be a potential increase in the contaminant load to Cole Drain.

SOIL: Persons working on the Chem Central property may be exposed to contaminants in the soil by direct contact with the soil or by incidental ingestion of the soil. The majority of the contaminated soil is currently covered with pavement or loose gravel. If the pavement or gravel areas were disturbed, the potential for exposure would increase. Under a future residential scenario, persons in the vacant area extending north of the Chem Central property (and south of 28th Street) may be exposed to contaminants found in these soils. This area is also subject to wind erosion and fugitive dust may be generated. Persons could be exposed to contaminants in these soils by inhalation of fugitive dust or direct contact. Volatilization of chemicals from the soil could also occur.

Contaminated soils on and off the Chem Central property act as a major source for ground-water contamination. As precipitation moves through these contaminated soils it carries contaminants into the aquifer.

GROUND WATER: Ground water beneath the site area is contaminated with organic compounds. The ground-water contamination plume originating from the Chem Central site presently does not affect any drinking water wells. If the current collection/treatment system were to fail, or be shut down, the ground water would discharge into Cole Drain and not affect any existing wells. The exposure pathway is based on the potential that a drinking water supply well could be placed in the affected area of ground water in the future.

SUMMARY OF SITE RISKS

A baseline risk assessment was conducted for the Chem Central site as part of the RI. The baseline risk assessment was conducted in accordance with the Superfund Public Health Evaluation Manual (U.S.EPA, 1986) and, to the extent practicable, the Risk Assessment Guidance for Superfund (U.S.EPA, 1989).

Unacceptable risks to human health have been identified for direct contact with or ingestion of the surface soils on the Chem Central property; and for the ingestion of ground water from the plume area beneath the site.

Unacceptable risks to the environment have also been identified for the soils on and off the Chem Central property and for the surface water in Cole Drain. The risks from soils are primarily due to the potential migration of contaminants from the soils into ground water. The potential risk to surface water in Cole Drain is due to that portion of the contaminated ground-water plume bypassing the current collection system. Some of the contaminants present in ground water could potentially pose a risk through bioaccumulation.

The risk assessment, which includes the identification of site-specific indicator chemicals, an exposure assessment, a toxicity assessment, and a risk characterization, is described in greater detail in the following sections.

Indicator Chemicals

Indicator chemicals were selected from the fifty-one organic chemicals that were detected at the Chem Central site. The indicator chemicals for the Chem Central site where selected to represent the most toxic, mobile, and persistent chemicals at the site, those chemicals present at the highest concentrations and the chemicals most prevalent at the site. The indicator chemicals at the Chem Central site include VOCs, SVOCs, PCBs, and heavy metals. Table 2 lists the specific indicator chemicals for the Chem Central site.

Exposure Assessment

The potential risks to human health and the environment were calculated based on the assumption that no future remedial actions would be taken at the site. The media for which risks were calculated included air, surface water (Cole Drain), soil on the Chem Central property, soil on the vacant property north of the

TABLE 2

Indicator Chemicals

1. 1,1-Dichloroethylene
2. Vinyl Chloride
3. Trichloroethylene
4. Tetrachloroethylene
5. 1,2-Dichloroethane
6. Bis(2-ethylhexyl)phthalate
7. PCB
8. Naphthalene
9. Pyrene
10. trans-1,2-Dichloroethylene
11. Toluene
12. Arsenic
13. Zinc

Chem Central property, and ground water. The risk assessment scenarios for each media included: (1) existing site conditions with the collection/treatment system on; (2) existing site conditions with the system off; (3) future site conditions with the system on; (4) future site conditions with the system off; and (5) future residential development with the system off.

The human populations potentially exposed to the contamination at the site include persons working at the Chem Central plant, children who may play in Cole Drain or in areas where contaminants have been detected in soils, employees of nearby businesses, hotel residents, and residents of nearby areas. In addition, it was assumed that drinking water supply wells would be installed in the area of ground-water contamination. The users of these wells may also be exposed.

Several ecosystems and animal populations, in addition to natural resources, may be potentially exposed to contamination at the Chem Central site. The potentially exposed ecosystems and animal populations include small to medium sized trees (siberian elm, box elder, and cottonwood), shrubs and other weedy species. Cole Drain also supports some filamentous algae and watercress. Animal populations include fish, amphibians and reptiles, mammals and birds. Common species are listed in **Table 3**. Threatened or endangered species that may be found in the Grand Rapids area include the peregrine falcon, cooper's hawk, red shouldered hawk, marsh hawk, osprey, black rat snake, eastern box turtle, and least shrew. The primary natural resources at the Chem Central site are the ground-water aquifer and Cole Drain.

The following potential routes of exposure were quantitatively evaluated for the human and animal populations at or near the Chem Central site. All exposure routes were evaluated for short-term and long-term exposure to adults and short-term exposure to children.

Human Population

- o Inhalation of air emissions from the stripping tower;
- o Dermal contact (swimming) with water in Cole Drain;
- o Consumption of fish from Cole Drain;
- o Dermal contact with soil and sediments;
- o Ingestion of soils, sediments, and ground water.

Animal Population

- o Drink, swim, or feed from Cole Drain.

TABLE 3
COMMON SPECIES FOUND IN URBAN AREAS OF SOUTHERN MICHIGAN

Birds:

English sparrows
Rock doves
Starlings
Grackles
Red-winged black birds
Pheasants
Mourning doves
Song sparrows
White-throated sparrows
Chickadees
Downy woodpeckers
Nuthatches
Mallards
Yellow warblers

Mammals:

Norway rats
Muskrats
Raccoons
Opossum
Skunks
Fox squirrels
Flying squirrels
White-footed field mice
Bats
Moles
Shrews
Woodchucks
Cottontail rabbits

Reptiles & Amphibians:

Garter snakes
Ribbon snakes
Eastern box turtle
Green frogs
Leopard frogs
American toads

Fish:

Sticklebacks
Minnows
Bluegills
Carp
Steelhead (in Plaster Creek near Cole Drain confluence)

Intake of the indicator chemicals was evaluated for the human populations in these scenarios under worst case conditions. The exposure points were assumed to be in the area with the highest concentrations of indicator chemicals. The major assumptions (e.g., body weight, frequency, and duration) used to evaluate both carcinogenic and non-carcinogenic risks for the identified exposure routes are presented in **Table 4.**

In addition, a qualitative evaluation of relationship between the on and off property soils at the Chem Central site and the ground water beneath them was performed.

Toxicity Assessment

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

Reference doses (RfDs) have been developed by U.S.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 (hazard index). 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.

The cancer potency factors (slope factors) and the reference doses used to evaluate the potential risks at the Chem Central site are presented in **Table 5.** 1,1-Dichloroethylene, vinyl chloride, trichloroethylene, tetrachloroethylene, 1,2-Dichloroethane, bis (2-ethylhexyl) phthalate, PCB, and arsenic are potential human carcinogens. These chemicals, and other indicator chemicals (Trans-1,2-Dichloroethylene, naphthalene, pyrene, toluene, and

TABLE 4

SUMMARY OF CONSTANTS USED TO ESTIMATE CHEMICAL INTAKES

	10-Year Old Child	Adult	Reference
AIR			
Body weight (kg)	36	70	U.S. EPA, 1988
Inhalation rate (m^3/hr)	1.3(1)	1.1(1)	U.S. EPA, 1988
Exposure period (days)	3650	25600	U.S. EPA, 1988
Frequency of exposure (events)	3650	25600	U.S. EPA, 1988
On-site duration of exposure (hours)	0	8	
Off-site duration of exposure (hours)	24	16	
SURFACE WATER			
Duration (hours/event)	2.6	NA	U.S. EPA, 1988
Skin surface area (cm^2)	11800	NA	U.S. EPA, 1985
Body weight (kg)	36	NA	U.S. EPA, 1988
Frequency (events)	70	NA	U.S. EPA, 1988
Permeability (cm/hour)	(see Table 1-2)		U.S. EPA, 1988
Exposure period (days)	3650	25600	U.S. EPA, 1988
Fish consumption (kg/day)	0.0016	0.0016	U.S. EPA, 1988
Water ingestion (l/hr)	0.050	NA	U.S. EPA, 1988
SOIL			
Soil ingestion rate (g/day)	0.2	0.1	U.S. EPA, 1989
Skin surface area (cm^2)	7,764	4,515	U.S. EPA, 1985
Dust adherence (kg/cm^2)	2.77×10^{-6}	2.77×10^{-6}	U.S. EPA, 1988
Body weight (kg)	36	70	U.S. EPA, 1985
Exposure period (days, off-site)	3650	25600	U.S. EPA, 1988
Exposure period (days, on-site)	2740	19180	
Frequency (days)	640	13650	
GROUND WATER			
Ingestion Rate (liters/day)	2	2	U.S. EPA, 1988
Exposure Frequency (days/year)	365	365	
Exposure Duration (years)	10	70	U.S. EPA, 1988
Body Weight (kg)	36	70	
Averaging Time (days)	3650	25600	

NA: Not Applicable
(1) Weighted average. See text for explanation

TABLE 5

REFERENCE DOSES (CHRONIC AND SUBCHRONIC) AND CARCINOGENIC SLOPE FACTORS FOR INDICATOR CHEMICALS.

Indicator Chemical	Oral Reference Dose (mg/kg/day) Chronic	Oral Reference Dose (mg/kg/day) Subchronic	Oral Slope Factor (mg/kg/day)^-1	Oral C/NC	Inhalation Reference Dose (mg/kg/day) Chronic	Inhalation Reference Dose (mg/kg/day) Subchronic	Inhalation Slope Factor (mg/kg/day)^-1	Inhalation C/NC
1,1-DICHLOROETHYLENE	0.009(1)	0.009(2)	0.6(1)	C	N/A	N/A	1.2(1)	C
VINYL CHLORIDE	N/A	N/A	2.3(2)	C	N/A	N/A	0.295(2)	C
TRICHLOROETHYLENE	N/A	N/A	0.011(2)	C	N/A	N/A	0.017(2)	C
TETRACHLOROETHYLENE	0.01(1)	0.1(2)	0.051(2)	C	N/A	N/A	0.00033(2)	C
1,2-DICHLOROETHANE	N/A	N/A	0.091(1)	C	N/A	N/A	0.091(1)	C
BIS-(2-ETHYL HEXYL) PHTHALATE	0.02(1)	0.02(2)	0.014(1)	C	N/A	N/A	0.015(3)	C
PCB-1248	N/A	N/A	7.7(1)	C	N/A	N/A	3.5(3)(4)	C
NAPHTHALENE	0.004(2)	0.004(2)	N/A	NC	N/A	N/A	N/A	NC
PYRENE	0.03(5)	N/A	N/A	NC	N/A	N/A	N/A	NC
TRANS-1,2-DICHLOROETHYLENE	0.02(1)	0.2(3)	N/A	NC	N/A	N/A	N/A	NC
TOLUENE	0.3(1)	0.4(2)	N/A	NC	2.0(2)	2.0(2)	N/A	NC
ARSENIC	0.001(2)	0.001(2)	1.75(1)	C	N/A	N/A	50(1)	C
ZINC	0.2(2)	0.2(2)	N/A	NC	N/A	N/A	N/A	NC

(1) IRIS Documents
(2) Health Effects Assessments Summary Table, 3/90
(3) Derived in text
(4) Standard based on Aroclor 1260
(5) Flaga, 1990

N/A = Not Available
C = Carcinogen
NC = Non-Carcinogen

zinc), also have the potential for causing acute and chronic noncarcinogenic health effects in humans.

Risk Characterization

Human Health Risks

Excess lifetime cancer risks are determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., 1 X 10^{-6} or 1E-6). An excess lifetime cancer risk of 1 X 10^{-6} indicates that, as a plausible upper bound, an individual has a one in one 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 identified.

Potential concern for noncarcinogenic effects of a single contaminant in a single medium is expressed as the hazard quotient (HQ) (or the ratio of the estimated intake derived from the contaminant concentration in a given medium to the contaminants's reference dose). 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. Noncarcinogenic risks are considered to be unacceptable if the hazard index is greater than 1.0, that is, if the intake of a chemical exceeds the established reference dose for that chemical.

At the Chem Central site, unacceptable human health risks have been calculated for exposure to the on-property soils and ground water (**Table 6**). An unacceptable carcinogenic and noncarcinogenic risk for children and adults under worst case conditions exists for ingestion and dermal contact with soils on the Chem Central property. The estimated carcinogenic risks due to long-term dermal exposure and ingestion of on-property soils by adults is 1.0 X 10^{-3}. The estimated risk due to long-term exposure of adults to on-property soils is 2.5 X 10^{-4}, when arsenic is removed from consideration. The noncarcinogenic Hazard Index calculated for dermal contact and ingestion of on-property soils by children (short term) under worst case conditions is 1.2, while the Hazard Index for adults (short term) is 1.1. It was assumed that the exposure to soils was the same whether the ground-water collection system was in operation or not. Therefore the risks posed by the soil would not change over time. The soil exposure route is currently not complete as the on-property soils are covered with pavement or loose gravel. This exposure route would be completed however, if the pavement or gravel is disturbed.

TABLE 6

SUMMARY OF HAZARD INDICES

	Exisiting Conditions System On	Exisiting Conditions System Off	Future Conditions System On	Future Conditions System Off	Residential System Off
<u>Child Short-Term</u>					
Air	3.6 E-4	0	3.6 E-4	0	0
Water (Cole Drain)	0	2.3 E-6	0	1.2 E-4	1.2 E-4
Off-site Soil	4.2 E-4	4.2 E-4	4.2 E-4	4.2 E-4	4.2 E-4
On-Site Soil	0	0	0	0	1.2 E+0
Ground Water	4.0 E+1	4.0 E+1	4.0 E+1	4.0 E+1	4.0 E+1
Total with Ground Water:	**4.0 E+1**	**4.0 E+1**	**4.0 E+1**	**4.0 E+1**	**4.1 E+1**
Total without Ground Water:	**7.8 E-4**	**4.2 E-4**	**7.8 E-4**	**5.4 E-4**	**1.2 E+0**
<u>Adult Short-Term</u>					
Air	1.6 E-4	0	1.6 E-4	0	0
Water (Cole Drain)	0	1.2 E-6	0	6.4 E-5	6.4 E-5
Off-site Soil	3.7 E-4	3.7 E-4	3.7 E-4	3.7 E-4	3.7 E-4
On-Site Soil	0	0	0	0	1.1 E+0
Ground Water	2.0 E+1	2.0 E+1	2.0 E+1	2.0 E+1	2.0 E+1
Total with Ground Water:	**2.0 E+1**	**2.0 E+1**	**2.0 E+1**	**2.0 E+1**	**2.2 E+1**
Total without Ground Water:	**5.2 E-4**	**3.7 E-4**	**5.2 E-4**	**4.3 E-4**	**1.1 E+0**
<u>Adult Long-Term</u>					
Air	1.9 E-6	0	1.9 E-6	0	0
Water (Cole Drain)	0	1.2 E-6	0	6.5 E-5	6.5 E-5
Off-site Soil	2.0 E-3	2.0 E-3	2.0 E-3	2.0 E-3	2.0 E-3
On-Site Soil	0	0	0	0	6.4 E-1
Ground Water	1.8 E+1	1.8 E+1	1.8 E+1	1.8 E+1	1.8 E+1
Total with Ground Water:	**1.8 E+1**	**1.8 E+1**	**1.8 E+1**	**1.8 E+1**	**1.8 E+1**
Total without Ground Water:	**2.0 E-3**	**2.0 E-3**	**2.0 E-3**	**2.0 E-3**	**6.4 E-1**

Note: The totals shown are the sums of the hazard indices for various exposure routes

SUMMARY OF TOTAL RISKS

	Exisiting Conditions System On	Exisiting Conditions System Off	Future Conditions System On	Future Conditions System Off	Residential System Off
<u>Adult Long-Term</u>					
Air	2.5 E-7	0	2.5 E-7	0	0
Water (Cole Drain)	0	2.4 E-10	0	1.7 E-8	0
Off-site Soil	7.1 E-7	7.1 E-7	7.1 E-7	7.1 E-7	7.1 E-7
On-Site Soil	0	0	0	0	1.0 E-3
Ground Water	9.1 E-2	9.1 E-2	9.1 E-2	9.1 E-2	9.1 E-2
Total with Ground Water:	**9.1 E-2**	**9.1 E-2**	**9.1 E-2**	**9.1 E-2**	**9.2 E-2**
Total without Ground Water:	**9.7 E-7**	**7.1 E-7**	**9.7 E-7**	**7.3 E-7**	**1.0 E-3**

The ingestion of ground water from the site area poses unacceptable carcinogenic and noncarcinogenic risks to children and adults under worst case conditions. The estimated carcinogenic risks to adults from exposure to ground water is 9.1×10^{-2}. Vinyl chloride is the major chemical contributing to the carcinogenic risks. The noncarcinogenic risk for children (short term) ingesting ground water is calculated at 40. The noncarcinogenic risks for adults ingesting ground water is 20 for short-term and 18 for long-term. These risks do not take into account the currently operating ground-water collection/treatment system. This exposure route is presently not complete, as no drinking water wells currently exist in the area of ground-water contamination. The exposure route is based on the potential that a drinking water well would be installed in the area of ground-water contamination.

Environmental Risks

A survey of wildlife in the site area has not been conducted. However, it is probable that species commonly found in urban areas in southern Michigan occur at the property (**see Table 3**). Threatened or endangered species that may be found in the Grand Rapids area include the peregrine falcon, cooper's hawk, red shouldered hawk, marsh hawk, osprey, black rat snake, eastern box turtle, and least shrew. Wildlife in the area could potentially be impacted by chemicals at the site if the currently operating ground-water collection/treatment system were to fail or be shut off. This is based on predicted contaminant load of indicator chemicals entering the drain under low flow conditions. Potential risks to animal populations from chemicals entering the drain include bioaccumulation.

Ground water is a natural resource that has been impacted by contaminants at the site. Soils on and off the Chem Central property present a risk to the environment due to the potential for migration of contaminants into the ground water. Contaminated soils act as a continuing source to ground-water contamination as precipitation moving through the soils carries the chemicals into the aquifer.

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 human health, welfare, or the environment.

DESCRIPTION OF ALTERNATIVES

Based on the results of the RI and Baseline Risk Assessment, a FS was conducted to identify and evaluate different alternatives for protecting human health and the environment from unacceptable risks posed by the Chem Central site. The remedial action objectives for the site are to prevent current or future exposure to both contaminated soil on and off the Chem Central property; prevent exposure to contaminated ground water in the site area; prevent further migration of contaminants in soil down into ground water; and prevent discharge of contaminated ground water into Cole Drain.

The FS identified seven remedial alternatives for soil and seven remedial alternatives for ground water. A No Action alternative was included as part of the array of ground water alternatives. The No Action alternative addresses both ground water and soil. The alternatives considered involve a variety of containment, removal, and treatment technologies, and are described in greater detail in the following sections and within the FS.

GROUND WATER

ALTERNATIVE GW-A - NO ACTION: DISCONTINUE CURRENT REMEDIAL ACTIONS

The National Contingency Plan (NCP) requires that the no action alternative be considered at every Superfund site. Under this alternative, with the exception of institutional controls, such as deed restrictions, and ground water monitoring, no remedial activities would be implemented. The current ground-water extraction and treatment system would be discontinued.

Capital Cost	$ 5,000
O & M (annual)	$ 25,000
Present Worth	$ 410,000

ALTERNATIVE GW-B: CONTINUE CURRENT REMEDIAL ACTIONS

This alternative would continue the current remedial activities required under the existing state court order. These remedial activities would consist of: (1) collecting ground water via purge wells and an interceptor trench, (2) transporting the collected, untreated water through a force main to a treatment system, (3) skimming off the floating oil layer in an oil-water separator, (4) treating the collected ground water on-property via an air stripping mechanism, (5) transporting the treated ground water through a force main to the discharge point, (6) discharging the treated ground water to the City of Wyoming's Waste Water Treatment Plant, and (7) treating air emissions from the air stripping device using a vapor phase carbon adsorption system. Treatment residuals generated from the air stripper would have to be treated as a hazardous waste if they fail the Toxicity Characteristic Leaching Procedure (TCLP). This alternative also includes quarterly monitoring of ground water.

Capital Cost	$ 0
O & M (annual)	$ 108,000
Present Worth	$ 1,400,000

Estimated Time Until Clean-Up Objective Is Met: 10 years

ALTERNATIVE GW-C: EXPAND CURRENT GROUND-WATER COLLECTION SYSTEM OFF-PROPERTY

This alternative involves the expansion of the current ground-water collection system (as described in Alternative GW-B) north of 28th Street to capture ground water currently not being captured east of the trench. There are two options for expanding the current system:

Option 1: The current interceptor trench would be extended further east or north to capture ground water currently bypassing the system. The interceptor trench would consist of a 4-inch polyethylene corrugated perforated pipe imbedded in pea stone gravel. This passive system would be placed approximately 10 feet below the water table. The pipe would slope so that infiltrating ground water would flow by gravity to the lift station which then pumps the collected ground water back to the air stripper.

Option 2: Two purge wells would be constructed east of the current interceptor trench to a depth of approximately 10 feet. The ground water would be pumped from the wells to the lift station and then to the air stripper for treatment.

For either option the ground water collection rate is estimated at 5 gallons per minute (gpm). This estimate is based on the current interceptor trench's collection rate and the geologic characteristics of the aquifer north of 28th Street. Ground water collected by either of these options would be treated as outlined in alternative GW-B, the current ground-water treatment system. Treatment residuals generated from the air stripper would have to be treated as a hazardous waste if they fail the Toxicity Characteristic Leaching Procedure (TCLP).

Option 1:	
Capital Cost	$ 34,000
O & M (annual)	$ 0
Present Worth	$ 34,000

Option 2:	
Capital Cost	$ 28,000
O & M (annual)	$ 2,900
Present Worth	$ 66,000

Estimated Time Until Clean-Up Objective Is Met: 10 years

ALTERNATIVE GW-D: EXPAND CURRENT GROUND-WATER COLLECTION SYSTEM ON-PROPERTY

As described in the RI Report, a sand and gravel lens is located in the clay layer beneath the site. Ground-water samples from this lens showed organic chemicals to be present. This indicates that contamination is present at greater depths in this area than in other areas at the site. This sand and gravel lens is located near the northwest corner of the Chem Central property. This alternative includes adding a purge well to the current ground-water collection system to address this deep area of contamination. A 4-inch well would be placed to a depth of approximately 45 feet to collect ground water in the sand and gravel lens. Ground water would then be pumped directly to the air stripper for treatment. The collection rate of ground water is estimated at 1 gpm. The collected ground water would be treated as outlined in Alternative GW-B. Treatment residuals generated from the air stripper would have to be treated as a hazardous waste if they fail the Toxicity Characteristic Leaching Procedure (TCLP).

Capital Cost	$ 18,000
O & M (annual)	$ 1,500
Present Worth	$ 38,000

Estimated Time Until Clean-Up Objective Is Met: 10 years

ALTERNATIVE GW-E: COLLECTION AND OFF-PROPERTY DISPOSAL OF FLOATABLE OILS

As described in the RI Report, there is a thin film of floating oil accumulating in two of the active purge wells at the site. This alternative includes the removal of this oil by manual bailing. The collected oil would be disposed off-site in accordance with applicable regulations. If PCBs are present in the oil, incineration of the oils may be necessary. It is believed 90% of the floatable oils can be recovered from the aquifer and will be destroyed. This alternative assumes that the purge wells will be operating (Alternative GW-B), since the ground-water flow created by the purge wells causes the oils to accumulate. A conservative estimate of the amount of oil to be collected is two gallons annually.

Capital Cost	$ 0
O & M (annual)	$ 3,200
Present Worth	$ 42,000

Estimated Time Until Clean-Up Objective Is Met: 10 years

ALTERNATIVE GW-F: TREAT COLLECTED GROUND-WATER BY ULTRA-VIOLET-OXIDATION

This alternative includes treating collected ground water by ultra-violet oxidation instead of the currently used air stripping method. UV-oxidation is a chemical oxidation process which uses oxidizing agents such as ozone and/or hydrogen peroxide enhanced by ultraviolet light (UV) to oxidize organic compounds. In this process, many organic contaminants absorb UV light and undergo a change in their chemical structure or become more reactive with the oxidation agents. Commercial treatment systems have been developed in which the oxidation agent is injected into the ground water. The ground water would then pass through a UV light cell. Both hydrogen peroxide and ozone were also considered as oxidants. This system could be constructed and operated on the site to treat the ground water collected by the current ground-water collection system.

Capital Cost	$ 670,000
O & M (annual)	$ 232,000
Present Worth	$ 3,700,000

Estimated Time Until Clean-Up Objective Is Met: 10 years

ALTERNATIVE GW-G: TREAT COLLECTED GROUND WATER BY BIOLOGICAL DEGRADATION

This alternative includes treating collected ground water by biological degradation instead of the currently used air stripping method. Biological degradation is a treatment method used to remove a variety of biodegradable organic compounds from water. One version of biological treatment used for ground water containing relatively low concentrations of degradable organic chemicals utilizes a submerged fixed film reactor consisting of a tank containing plastic media on which the microorganisms attach and grow. The contaminated ground water is passed through the reactor, and the acclimated microorganisms transform the contaminants to carbon dioxide and water. Oxygen and nutrients are supplied to the reactor to promote the growth of microorganisms. Commercial fertilizers could be used to supply nitrogen and phosphorous to meet biological nutrient requirements. This system could be constructed and operated on-site to treat the ground water collected by the current ground-water collection system. Treatment residuals generated from this system would have to be treated as a hazardous waste if they fail the Toxicity Characteristic Leaching Procedure (TCLP).

Capital Cost	$ 700,000
O & M (annual)	$ 123,000
Present Worth	$ 2,200,000

Estimated Time Until Clean-Up Objective Is Met: 10 years

SOIL

ALTERNATIVE S-A: IN-SITU TREATMENT OF SOILS VIA SOIL VAPOR EXTRACTION

In this alternative, a grid of vapor extraction wells would be placed in the contaminated soil areas. Each well is screened in the unsaturated soil. The wells are interconnected by a shallow network of horizontal piping that enables connection to a vacuum pump. Contaminated vapors in the soil source areas are collected at the vacuum pump, treated in a vapor phase carbon adsorption system and then discharged to the atmosphere. An asphalt cover encompassing approximately 2,000 square yards would be placed over the areas of vapor extraction to prevent short-circuiting of the extraction system.

Capital Cost	$ 73,000
O & M (annual)	$ 38,100
Present Worth	$ 182,400

Estimated Time Until Clean-Up Objective Is Met: 3 years

ALTERNATIVE S-B: IN-SITU TREATMENT OF SOILS VIA SOIL VAPOR EXTRACTION AND SOIL FLUSHING

In this alternative volatile organic compounds in the soil would first be removed by soil vapor extraction. After completion of the soil vapor extraction any organic compounds and semi-volatile compounds remaining in the soil would be remediated by soil flushing. The system would be similar to Alternative S-A with two exceptions: two of the venting wells would be constructed so they could also be used as purge wells, and an infiltration bed would be constructed over the soil areas of concern. The infiltration bed would consist of corrugated perforated polyethylene (PE) pipe imbedded in approximately 10 inches of sand. The sand is then topped with a synthetic cover and approximately 10 inches of compacted fill. An asphalt covering would cover the compacted fill. A flushing fluid would be injected into the piping and allowed to infiltrate into the contaminated soil. The fluid would consist of 4% biodegradable surfactant solution with the rest of the solution being City water. The fluid would be recovered by the purge wells pumping at approximately 10 gallons per minute to ensure that all the flushing fluid is recovered. The recovered flushing fluid would be pretreated on-site prior to discharge to Wyoming's Waste Water Treatment Plant.

Capital Cost	$ 240,000	
O & M (annual)	$ 33,900	(years 1-3)
	$ 40,500	(years 4-7)
Present Worth	$450,000	

Estimated Time Until Clean-Up Objective Is Met: 7 years

ALTERNATIVE S-C: IN-SITU TREATMENT OF SOILS VIA SOIL VAPOR EXTRACTION AND BIORECLAMATION

This alternative is similar to S-B with respect to the well systems and the infiltration bed. In addition, a nutrient tank would be required for preparation and storage of nutrient solution. The system described in Alternative S-A would be operated until the levels of volatile organic compounds in the soils diminish to concentrations which are no longer feasible to warrant continued vapor extraction. The soil vapor extraction system would then be restructured to inject and capture a nutrient solution which stimulates the growth of native microorganisms. The microorganisms would quickly acclimate to the constituents present, and with the addition of the essential nutrients, will degrade many organic compounds. Commercial grade fertilizer would be used to supply the nitrogen and phosphorous required. Hydrogen peroxide could be used as an oxygen source.

Capital Cost	$ 250,000	
O & M (annual)	$ 33,900	(years 1-3)
	$ 75,500	(years 4-8)
Present Worth	$ 620,000	

Estimated Time Until Clean-Up Objective Is Met: 8 years

ALTERNATIVE S-D: SOIL CAPPING

A soil cap would be placed over the off-property areas where soils are acting as sources for ground-water contamination. The cap would consist of 18 inches of low-permeability compacted soil along with 6 inches of top soil capable of supporting plant life. A cap would be designed to minimize the amount of precipitation that might further wash contaminants from the soil into the ground water. The cap would cover approximately 800 square feet of off-property soil. Periodic monitoring and maintenance would be required for the soil cap.

Capital Cost	$ 3,800
O & M (annual)	$ 3,100
Present Worth	$ 54,000

Estimated Time To Construct A Cap: 3 months

ALTERNATIVE S-E: FENCING

A fence would be placed around the off-property areas where soils act as a source for ground-water contamination. This fence would consist of a 6-foot-high, galvanized steel, chain-link fence topped with barbed wire and an 8-foot-wide gate to facilitate access of service vehicles.

Capital Cost	$ 5,500
O & M (annual)	$ 1,600
Present Worth	$ 31,000

Estimated Time To Construct A Fence: 3 months

ALTERNATIVE S-F: SOIL CAPPING AND FENCING

This alternative combines both Alternative S-D and S-E. Fencing around the capped area would help maintain the integrity of the cap.

Capital Cost	$ 9,300
O & M (annual)	$ 4,700
Present Worth	$ 85,000

Estimated Time To Construct a Cap and Fence: 3 months

ALTERNATIVE S-G: EXCAVATION OF ON-PROPERTY SOILS AND DISPOSAL OFF-SITE

Two areas on-property would be excavated and soils disposed of at a licensed off-site disposal facility. The area on the west side of the Chem Central building would be excavated. This area encompasses a 60-foot by 275-foot area. The area north of the Chem Central building would also be excavated. This area encompasses a 60 foot by 75 foot area. The excavation would extend vertically to the water table (approximately 8 feet). The total volume of soil to be removed is estimated at 6,200 cubic yards. The railroad spur on the west side of the Chem Central building would have to be removed and replaced, as would the fence along the western property boundary. Metal sheeting would be required along the main line of the railroad tracks and the building to protect them from damage during the excavation activities. The costs listed below are presented for the two types of disposal facilities which could be used for the excavated soils. If analysis of the soil indicates it is a hazardous waste (fails TCLP), then the soil must be treated and disposed of in accordance with applicable Federal and State regulations at an U.S.EPA approved facility. If the soil is not a hazardous waste (passes TCLP), then it may be disposed of in a Michigan Type II landfill.

Capital Cost	$ 560,000	(Type II Landfill)
	$ 13,000,000	(Hazardous Waste Facility)
O & M	$ 0	(Type II Landfill)
	$ 0	(Hazardous Waste Facility)
Present Worth	$ 560,000	(Type II Landfill)
	$ 13,000,000	(Hazardous Waste Landfill)

Estimated Time Until Clean-Up Objective Is Met: 1 year

SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

The remedial alternatives developed in the FS were evaluated using the following nine criteria. The advantages and disadvantages of each alternative were then compared to identify the alternative providing the best balance among these nine criteria.

- **Overall Protection of Human Health and the Environment** -- Addresses whether a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

- **Compliance with ARARs** -- Addresses whether a remedy will meet all of the applicable, relevant, or appropriate requirements (ARARs) of other Federal and State environmental laws and/or justifies use of a waiver.

- **Long-Term Effectiveness and Permanence** -- Addresses the expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up goals have been met.

- **Reduction of Contaminant Toxicity, Mobility, or Volume Through Treatment** -- Addresses the anticipated performance of the treatment technologies the remedy may employ.

- **Short-Term Effectiveness** -- Addresses 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.

- **Implementability** -- Addresses the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.

- **Cost** -- Addresses the estimated capital and O&M costs, as well as present-worth.

- **State Acceptance** -- Addresses the support agency's comments and concerns.

- **Community Acceptance** -- Addresses the public's comments on and concerns about the Proposed Plan and RI/FS Report.

The first two criteria, Overall Protection of Human Health and the Environment, and Compliance with ARARs, are threshold requirements that must be met for an alternative to be selected. The next five criteria are balancing criteria used to evaluate the advantages and disadvantages of each alternative. The final two criteria, state and community acceptance, are modifying criteria which are used in a final evaluation of each alternative. The comparative analysis of the alternatives for both ground water and soil is presented below.

GROUND WATER

Overall Protection of Human Health and the Environment

In analyzing the various possible ground-water remedial alternatives discussed above, U.S.EPA looked at two components in order to determine whether a particular remedial alternative is fully protective of human health and the environment: (1) whether the alternative would capture the proportion of the plume of contamination deemed necessary to fully protect human health and the environment, and (2) whether the particular treatment technology employed by the remedy would clean up the ground water to levels deemed fully protective by EPA. Some of the remedial alternatives, such as GW-C and GW-D, would use the current treatment technology, but would be expansions of the current ground-water collection system. Others, such as GW-F and GW-G, rely on alternate ground-water treatment technologies, but would utilize the current collection system. In order to be considered fully protective of human health and the environment, a remedial alternative both had to ensure the capture of all ground water contaminated above clean-up levels, and be capable of remediating the ground water to U.S.EPA's clean-up standards.

In the Superfund process, clean-up remedies are selected that reduce the threat from carcinogenic contaminants at sites such that the excess risk from any medium (i.e., soil or ground water) to an individual exposed over a lifetime generally falls within a risk range from 10^{-4} to 10^{-6}. U.S.EPA's preference is to select remedies that are at the more protective end of the risk range. Therefore, when developing its remediation goals (clean-up levels), U.S.EPA determined that a risk of 10^{-6} is necessary to fully protect human health and the environment.

The "No-Action" alternative does not provide overall protection of human health and the environment because it allows continued migration of the ground-water contaminant plume of contamination in the ground water and would allow contaminated ground water to discharge to Cole Drain. Alternative GW-G will most likely not provide overall protection of human health and the environment because biological degradation does not work effectively on chlorinated organics, which are the principal ground-water contaminants at Chem Central. Thus, Alternative GW-G would not be able to meet remediation goals. Alternative GW-G is also not fully protective because it relies on the current ground-water collection system, whose deficiencies are elaborated in this section's discussion of Alternative GW-B. GW-B will only partially protect human health and the environment because some ground water currently bypasses the current ground-water collection system. As such, the potential for contaminated ground water to discharge to Cole Drain exists. A discharge to Cole Drain may create a threat to humans and several animal populations that come into direct contact with the contaminated water. Alternatives GW-C and GW-D require that Alternative GW-B be implemented. Individually, Alternatives GW-C, GW-D and GW-E are not fully protective because they are not comprehensive remedies. It is necessary to combine Alternatives GW-D and GW-E with Alternative GW-C because Alternative GW-C alone will not remedy the contamination found in the deeper sand lens. Alternative GW-C alone, also, will not treat the floating oils found in the purge wells, which are highly contaminated with PCBs and organic compounds, which is addressed by Alternative GW-E. The collection of approximately 90% of the floatable oils in the purge wells using alternative GW-E is sufficient to address this aspect of ground-water contamination. However, implemented together, Alternatives GW-C, GW-D and GW-E would be protective because together they address all sources of ground-water contamination. Alternative GW-F intercepts, collects, and treats a portion of the contaminated ground water before it can discharge to Cole Drain. Alternative GW-F would be able to meet the clean-up standards that U.S.EPA has identified; however, since it relies on the current ground-water collection system, it is only partially protective, based upon the same reasoning as that contained in the above discussion for Alternative GW-B.

Since the No-Action Alternative and GW-G (Biological Degradation) do not provide adequate protection of human health and the environment, they are not available for selection and will not be discussed through the remainder of this analysis.

Compliance With ARARs

The major potential ground-water ARARs include the requirements of the Federal Safe Drinking Water Act; Federal Clean Water Act; Michigan 1929 Public Act 245 Parts 4 and 9, as amended; 1976 Public Act 399, as amended; and 1982 Public Act 307, as amended. The MDNR has issued rules to implement Act 307. These rules establish criteria for three acceptable clean-up types. Under the rules, a Type A cleanup generally achieves cleanup to background or non-detectable levels, a Type B generally achieves risk-based clean-up levels (10^{-6}),and a Type C cleanup is based on a site-specific risk assessment that considers specific criteria.

U.S.EPA has used the framework outlined in the NCP that will reduce the concentration of hazardous substances to levels presenting a site risk of not greater than $10^{-6}$for carcinogens and hazard index of 1 for noncarcinogens. Therefore, a risk level of 10^{-6}has been used as a point of departure by U.S.EPA in selecting the appropriate ARAR, or clean-up standard, for the site. In examining potential state ARARs, U.S.EPA has determined that the clean-up standards defined by a Michigan Act 307 Type B cleanup are those which are most compatible with U.S.EPA's preferred risk level, and which also allow for overall protection of human health and the environment.

The major ARAR for Alternatives GW-B, GW-C, GW-D and GW-F is Michigan Act 307 Type B. Alternatives GW-C and GW-D will comply with this ARAR. As Alternative GW-B and GW-F do not capture approximately 10% of the ground-water contamination plume, they will not meet the Michigan Act 307 Type B.

Alternative GW-E must comply with the Toxic Substances Control Act (TSCA). Compliance with these requirements would be required if the oil contains ≥ 50 ppm of PCBs. Alternative GW-E is capable of complying with this ARAR.

The major air ARARs include the requirements of Michigan's 1965 Public Act 348, as amended, and the Federal Clean Air Act. All Alternatives will comply with both of these ARARs.

Long-Term Effectiveness and Permanence

Alternatives GW-C, GW-D and GW-E provide a high degree of long-term effectiveness and permanence at the site by collecting and treating the contaminated ground-water and assuring that the contaminated ground-water does not impact Cole Drain. Alternatives GW-B and GW-F would only be capable of capturing approximately 90% of the plume as opposed to the vast majority of the plume. Alternative GW-B leaves the risk of contaminated ground-water discharging to Cole Drain. These risks could result from a potential direct contact threat to humans and several animal populations. All alternatives include institutional controls such as deed restrictions, to prevent the use of ground water in the site area. Ground-water monitoring would also be implemented in each alternative.

Short-Term Effectiveness

There is an increased risk of exposure to workers during construction of alternatives GW-C, GW-D, and GW-F but these risks can be minimized by following proper safety guidelines. Alternative GW-E presents a risk of dermal contact with the recovered oil and inhalation of volatile organics from the oil by workers collecting the oil. This risk can also be minimized by following proper safety guidelines and wearing protective clothing. Risks from increased air emissions of organic compounds from alternative GW-C are similar to those of alternative GW-B but are not expected to exceed federal or state air emission guidelines. Thus these increased air emissions would not present unacceptable risk levels.

Reduction of Contaminant Toxicity, Mobility, or Volume through Treatment

Alternative GW-C, GW-D, GW-E, and GW-F are all able to sufficiently reduce ground-water contamination through treatment. The floatable oils are removed and destroyed in Alternative GW-E. Alternatives

GW-B and GW-F do not capture the entire plume. As such, these alternatives are not fully successful in reducing the toxicity, mobility and volume of contaminants in the ground water.

Technical and Administrative Difficulty

Alternatives GW-B, GW-C, GW-D, and GW-E are all relatively simple to construct and operate. These alternatives are reliant on the currently operating collection/treatment system. This system is operating to design specifications, and all air and water discharge permits have already been obtained. The treatment system currently meets or exceeds the performance specifications required by the City of Wyoming's Waste Water Treatment Plant for discharge of the treated ground water from the air stripper. Alternative GW-F would be the most difficult to implement. A pilot study of the UV-Oxidation system using the contaminated ground water present on the site would be required. This study would determine whether this type of system could be used on a large-scale and long-term basis. Alternative GW-F also requires a four month delivery time for the necessary equipment. In addition, before Alternative GW-F could be implemented, the current ground-water treatment system would have to be decommissioned. Alternative GW-F may be inconsistent with the obligations of the state court judgement. For all these reasons, Alternative GW-F is considered to be technically and administratively difficult.

Cost

A comparison of capital, operation and maintenance (O & M), and present worth costs for implementing the various ground-water alternatives at the site are presented below.

ALTERNATIVE		CAPITAL	O & M	PRESENT WORTH
No-Action: (Institutional Controls and Monitoring)		$ 5,000	$ 25,000	$ 410,000
GW-B		$ 0	$ 108,000	$ 1,400,000
GW-C	Option 1	$ 34,000	$ 0	$ 34,000
	Option 2	$ 28,000	$ 2,900	$ 66,000
GW-D		$ 18,000	$ 1,500	$ 38,000
GW-E		$ 0	$ 3,200	$ 42,000
GW-F		$ 670,00	$ 232,000	$ 3,700,000
GW-G		$ 700,000	$ 123,000	$ 2,200,000

NOTES: Present Worth Costs assume a 5% interest rate.
Listed O & M Costs are annual costs.

The costs presented are compiled for each individual alternative only and do not include costs for any other alternative which must also be used in conjunction. For instance Alternative GW-E requires that the purge well system be operating, such as GW-B; however, the costs shown are only for implementing GW-E, they do not include purge well operation.

State Acceptance

The response of MDNR has been discussed in the section describing the selected remedy.

Community Acceptance

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides: 1) a thorough review of the public comments received on the RI/FS and Proposed Plan; and 2) U.S.EPA's responses to the comments received.

SOIL

Overall Protection of Human Health and the Environment

In analyzing the various alternatives for their ability to meet the overall protectiveness criterion, U.S.EPA looked to two areas of concern: 1) the degree to which they would minimize or eliminate a direct contact threat to contaminated soils, and 2) the degree to which they would protect ground water from the leaching of soil contaminants.

The No-Action Alternative for soil remediation would not control exposure to the contaminated soil and would allow for continued migration of contaminants from the soil into ground water. The No Action Alternative would therefore not be protective of human health and the environment. Alternative S-E reduces the chances of direct human contact but does not affect migration of contaminants to the ground water. Therefore, it is not protective of human health and the environment by itself. Since the No Action Alternative and Alternative S-E do not provide adequate protection to human health and the environment, they are not available for selection and will not be discussed throughout the remainder of this analysis.

Alternatives S-A, S-B, and S-C are protective of human health and the environment because they reduce the migration of contaminants from the soil to ground water. These alternatives also include a soil cap in the areas where soil vapor extraction takes place. The soil cap will reduce the risk of direct human contact. Alternative S-D is also potentially protective of human health and the environment. Alternative S-D would reduce direct human contact risks and would reduce, but not prevent, the potential for the migration of contaminants from soils into ground water. Alternative S-F is a combination of Alternatives S-D and S-E. Alternative S-F will provide adequate protection of human health and the environment by reducing direct contact threats and by reducing, but not preventing, the migration of contaminants into the ground water. Alternative S-G is protective of human health and the environment because it requires the removal of contaminated soil which would eliminate the risk of contaminant migration to ground water. The risk of human exposure would also be eliminated.

Compliance With ARARs

The major soil ARAR for the Chem Central site is Michigan Act 307. MDNR has issued rules to implement Act 307. These rules establish criteria for three acceptable cleanup types. Under the rules, a Type A cleanup generally achieves background or nondetectable levels. The Type B cleanup achieves levels required: to protect ground water from the migration of contaminants from the soil into the ground water; to protect against unacceptable human health risks due to direct contact; and, to protect surface water quality. A Type C soil cleanup is based upon a site-specific risk assessment, that considers specific criteria. The clean-up standards for soils at the Chem Central site are consistent with Michigan Act 307 requirements.

Alternatives S-A, S-B, S-C and S-G are capable of complying with a Type B Michigan Act 307 cleanup. Alternatives S-D and S-F may not comply with a Type C Michigan Act 307 cleanup, which is the least stringent type of cleanup contemplated under this statute. The State of Michigan has indicated that Alternatives S-D and S-F as presented in the FS would not comply with Act 307, based upon the specific criteria used for evaluating a Type C cleanup.

The major air ARARs include Michigan's 1965 Public Act 348, as amended, and the Federal Clean Air Act. All soil alternatives will comply with these ARARs.

Long-Term Effectiveness and Permanence

Alternatives S-A, S-B, S-C and S-G will all result in a low long-term risk once the treatment or soil removal is completed. Each may leave some residual soil contamination but at levels which would still be protective of human health and the environment. Alternative S-D will reduce the chance of direct human contact as long as the cap is maintained. Since the cap only covers, and not removes, the contamination, it leaves a moderate long-term risk to human health and the environment. Alternative S-F poses a moderate long-term risk since fencing the capped soil areas will reduce access and therefore requires less maintenance of the cap. The effectiveness of Alternatives S-D and S-F over the long-term can be diminished from frost heave and desiccation.

Short-Term Effectiveness

Alternatives S-A and S-C may result in increased short-term risks to the community from air emissions. However, a carbon adsorption system can be used to minimize these emissions. Exposure through dermal contact and inhalation by workers in and around the construction area may occur during the installation of the vapor extraction system. Proper protective clothing will minimize the risk to workers in these areas involved with these hazards. Alternative S-B may result in the same short term risks as Alternative S-A. In addition, flushing fluid could be discharged to ground water if pump failure occurs, or if an inadequate gradient is produced in the purge wells. Alternatives S-D and S-F may pose a risk to residents and workers because during the construction of a cap volatiles or particulates can be released from the soil. Alternative S-G could result in a risk to workers in the area of soil removal as well as the community from vapors released from the soils during excavation, loading, transportation, and disposal.

Reduction of Toxicity, Mobility, or Volume Through Treatment

Alternatives S-A, S-B and S-C treat the contaminated soils thereby resulting in a reduction of the toxicity, mobility and volume of contaminants. Any residual contamination would be below acceptable risk-based levels for these alternatives. Alternatives S-D and S-F do not involve a treatment component and therefore do not reduce the toxicity, mobility, or volume of the contaminated soil through treatment. Alternative S-G removes the contaminated soil from the site but does not reduce toxicity, mobility, or volume of the contaminants if treatment is not required prior to disposal at the off-site facility.

Technical and Administrative Difficulty

Alternatives S-A, S-B, and S-C would all require pilot studies to maximize the efficiency of each system. Alternatives S-B and S-C would also require the removal of a railroad line running onto Chem Central's property. Removal of this railroad line would interrupt the company's business for a short period of time. Alternatives S-D and S-F are straightforward and require little technical expertise. However, implementation of these alternatives may require zoning variances. Alternative S-G would require the removal of the railroad line on Chem Central's property and would also require sheet piling along the building and the main rail line. Administrative difficulties may be encountered in identifying a landfill willing to accept the contaminated soil for disposal under Alternative S-G.

Cost

A comparison of the capital, operation and maintenance (O & M), and present worth costs for implementing the various soil alternatives at the site is presented below.

ALTERNATIVE		CAPITAL	O & M	PRESENT WORTH
S-A		$ 73,000	$ 38,100	$ 182,000
S-B		$ 240,000	(yr.1-3) $33,900 (yr.4-7) $40,500	$ 450,000
S-C		$ 250,000	(yr.1-3) $33,900 (yr.4-7) $75,500	$ 620,000
S-D		$ 3,800	$ 3,100	$ 54,000
S-E		$ 5,500	$ 1,600	$ 31,000
S-F		$ 9,300	$ 4,700	$ 85,000
S-G	(Type II Ldfl) (Haz Waste)	$ 560,000 $ 13,000,000	$ 0 $ 0	$ 560,000 $ 13,000,000

Notes: Present Worth Costs assume a 5% interest rate.
Listed O & M Costs are annual amounts.

State Acceptance

The response of MDNR has been discussed in the section describing the selected remedy.

Community Acceptance

Community acceptance is assessed in the attached Responsiveness Summary. The Responsiveness Summary provides: 1) a thorough review of the public comments received on the RI/FS and Proposed Plan; and 2) U.S.EPA's and MDNR's responses to the comments received.

THE SELECTED REMEDY

The selected remedy for ground water is a combination of alternatives evaluated for the Chem Central site. These include: Alternatives GW-B, Continue Current Remedial Actions; GW-C, expansion of the current ground-water collection system off-property; GW-D, expansion of the current system on-property; and GW-E, collection of floatable oils from the purge wells. The selected remedy for soil on and off the Chem Central property is Alternative S-A, soil vapor extraction.

The major components of the selected remedy are illustrated in <u>**Figure 4**</u> and include:

- o Continue operation and maintenance of the current ground-water collection and treatment system.

- o Install, operate and maintain an expansion of the current off-property ground-water collection system, either by extending the interceptor trench or installing additional purge wells.

- o Install, operate and maintain a purge well at the deep location of contaminated ground water identified in the RI.

- o Collect oil in the purge wells and dispose of the oil at an off-site facility in accordance with applicable federal and state regulations

- o Install, operate and maintain a soil vapor extraction system for soils on-property as well as two off-property locations just north of the Chem Central property.

- o Institutional controls such as deed restrictions to prohibit the installation of water wells in the site area and any future development that might disturb contaminated soils, will be sought.

- o Implement a ground-water monitoring program capable of demonstrating the effectiveness of the ground-water capture system.

EXPANSION OF CURRENT GROUND-WATER COLLECTION SYSTEM OFF-PROPERTY

This remedy involves the expansion of the current ground water collection system north of 28th Street to capture ground water currently bypassing the collection system. The current ground-water collection system includes the following:

- collecting ground water via purge wells and an interceptor trench,

- transporting the collected, untreated ground water through a force main to a treatment system,

- skimming off any floating layer in an oil-water separator,

- treating the collected ground water on-site via air stripping,

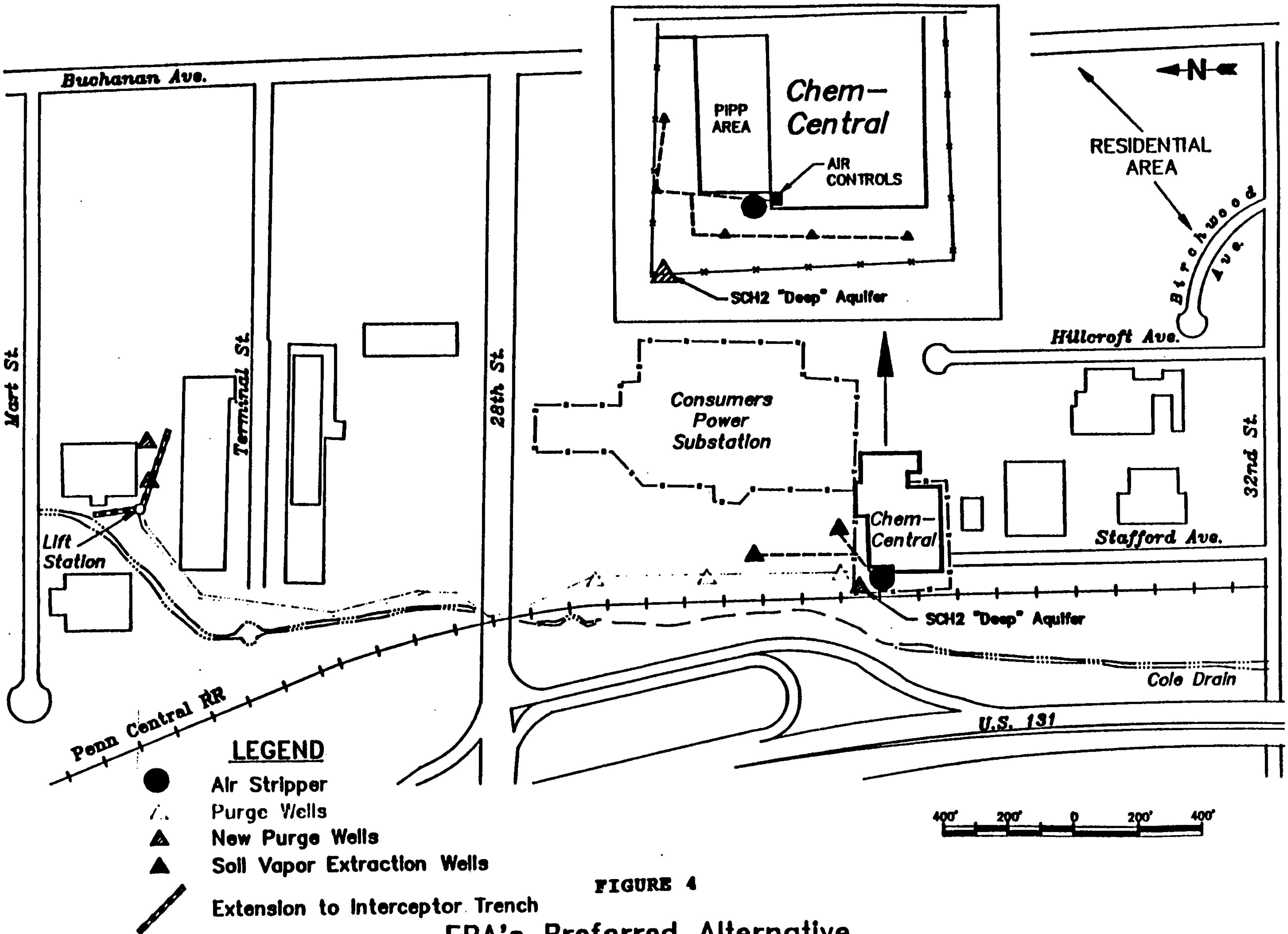

FIGURE 4

EPA's Preferred Alternative

- transporting the treated ground water through a force main to the discharge point,

- discharging the treated ground water to the City of Wyoming POTW, and

- treating air emissions from the air stripper using a vapor phase carbon adsorption system.

To collect the portion of the ground-water plume currently bypassing the interceptor trench north of 28th Street, one of the following options will need to be implemented.

OPTION 1

An interceptor trench would be constructed east or north of the lift station as shown in **Figure 4**. The interceptor trench would consist of a perforated pipe imbedded in gravel. This passive system would be placed below the water table (approximately 10 feet) so that ground water will infiltrate into it. The pipe would slope so that the infiltrating ground water would flow by gravity to the lift station. Any dewatering required during construction would be discharged to the lift station.

OPTION 2

Two purge wells would be constructed to an approximate depth of ten feet. Approximate locations are shown in **Figure 4**. The ground water would be pumped from the wells and transmission piping would convey the water to the lift station.

For either option the ground-water collection rate is estimated at 5 gpm. This estimate is based on the current underdrain system's collection rate and aquifer characteristics. The collected ground water will be transferred from the lift station to a treatment system through the transmission piping. The ground water will be treated as outlined above in the description of the current collection/treatment system.

A final decision on the option to be implemented will be made during the remedial design phase based on a comparison of the effectiveness of the two options.

EXPANSION OF GROUND-WATER COLLECTION SYSTEM ON-PROPERTY

The ground-water collection system will be expanded on the Chem Central property by adding a purge well to capture on-property ground water in the sand/gravel lens at SCH-2 near the northwest corner of the property (see **Figure 4**). A well will be placed to an approximate depth of 45 feet. Transmission piping will be installed to convey the ground water to a treatment system.

The collection rate of ground water is estimated at 1 gpm. This estimate is based on the hydrogeological characteristics of the aquifer. The ground water will be treated as outlined in the description of the current collection/treatment system under "Expansion of Current Ground-Water Collection Off-Property".

COLLECTION AND OFF-SITE DISPOSAL OF FLOATABLE OILS

The thin film of floatable oils present in the purge wells will be removed by manual bailing. The collected oil will be disposed of off-site in accordance with applicable federal and state regulations. A conservative estimate of the amount of oil collected is 1 gallon per recovery event, with two events per year. Along with the oil, approximately 9 gallons of water will also be collected.

IN-SITU TREATMENT OF SOILS VIA SOIL VAPOR EXTRACTION

A soil vapor extraction system will be installed, operated and maintained for on-property and off-property soils impacted by organic chemicals. Venting wells will be spaced approximately 75 feet apart. The actual number of wells and the exact spacing needed to effectively cover the area of concern will be determined during the remedial design. Based on soil characteristics, a conservative estimate for the yield at each well is approximately 20 cubic feet of air per minute (CFM). This flow rate will determine the size of the blower required to create a vacuum of approximately 5 psi. The estimated emission of VOCs in the air stream generated during this operation is 0.4 lb/hr. Air controls consisting of a vapor phase carbon adsorption system will be required for treatment of air emissions. The extracted soil vapor will be conveyed to the air treatment system through buried ducting. A cover of suitable material will be placed over the currently exposed areas to be vapor extracted.

The soil vapor extraction system is expected to reduce the contaminant levels in soil to below the soil cleanup standards for the site. However, some semi-volatile compounds may be more difficult to vapor extract. It is estimated that 80% of semi-volatile compounds will be removed using soil vapor extraction. If, following a treatability study or through additional soil testing during the operation of the soil vapor extraction system, it is determined that the system is unable to reduce the semi-volatile compounds to below the soil cleanup standards, additional treatment methods in order to reduce the compounds to below the soil cleanup standards will be evaluated and implemented to supplement the vapor extraction system. This may include soil flushing or bioreclamation as described under Alternatives S-B and S-C.

TABLE 7A

MICHIGAN ACT 307 TYPE B CLEAN-UP STANDARDS FOR GROUND WATER AT THE CHEMCENTRAL SITE

CHEMICAL	CLEAN-UP LEVEL (ppb)	BASIS FOR LEVEL	METHOD DETECTION LIMIT (ppb)
Benzene	1	HB	1
Bis(2-Ethylhexyl)phthalate	2	HB	5
Chloroethane	9	HB	1
1,1-Dichloroethane	700	HB	1
1,2-Dichloroethane	0.4	HB	1
1,2-Dichloroethene	70	HB	1
1,1-Dichloroethylene	7	HB	1
Trans-1,2-Dichloroethylene	100	HB	1
Ethylbenzene	30	SW/R.57	1
Methylene Chloride	5	HB	1
2-Methylnaphthalene	10	HB	10
2-Methylphenol	40	SW/R.57	10
Naphthalene	29	SW/R.57	5
Pentachlorophenol	0.3	HB	20
Tetrachloroethylene	0.7	HB	5
Toluene	100	SW/R.57	1
1,1,1-Trichloroethane	117	SW/R.57	1
1,1,2,2-Tetrachloroethane	0.2	HB	1
Trichloroethylene	3	HB	1
Vinyl Chloride	0.02	HB	1
Xylene	59	SW/R.57	1

NOTES: -ppb: "parts per billion" or ug/L
-HB: Health Based
-SW/Rule 57: Surface water protection based on Michigan Water Resources Commission Act, Public Act 245, Rule 57.

When the ground water or soil clean-up level is lower than the method detection limit, the method detection limit is then used as the clean-up standard.

Cleanup Standards

In the Superfund process, clean-up remedies are selected that reduce the threat from carcinogenic contaminants at sites such that the excess risk from any medium (i.e., soil or ground water) to an individual exposed over a lifetime generally falls within a risk range from 10^{-4} to 10^{-6}. U.S.EPA's preference is to select remedies that are at the more protective end of the risk range. Therefore, when developing its remediation goals (clean-up standards), U.S.EPA determined that a risk of 10^{-6} was necessary in order to be fully protective of human health and the environment.

The Clean-up Standards for the Chem Central site are listed in **Table 7A & 7B**. The clean-up standards for ground water have been established at the 10^{-6} level for each carcinogenic contaminant and at the Human Life Cycle Safe Concentration (HLSC) for each noncarcinogenic contaminant. The clean-up standards for soil have been established based on direct contact at the 10^{-6} level for each carcinogenic contaminant and at the HLSC for each noncarcinogenic contaminant. In addition, a soil clean-up objective has been established to protect ground water from the leaching of soil contaminants into the ground water. In order to demonstrate compliance with this objective, the contaminant levels in the on and off-property soils must be reduced to less than twenty (20) times the ground-water clean-up standard for each chemical (see **Table 7A & 7B**), or leach tests (TCLP) performed on the soils must produce leachate with contaminant levels below the ground-water clean-up levels, or the results of other test methods (other than TCLP) that accurately simulate conditions at the site must be employed to demonstrate that contaminants are not leaching into the ground water above the ground-water clean-up standards.

Points of Compliance

Compliance points to be measured during the course of ground-water remediation, to determine the progress towards the attainment of ground-water clean-up standards, include the treatment system effluent and monitoring well analyses. The area of attainment for ground-water contamination extends throughout the plume in the aquifer underlying the Chem Central site.

The compliance points for soil remediation include all soils on the Chem Central property and the soils immediately north of the Chem Central property. The area of attainment for soil contamination extends throughout the soil column.

IMPLEMENTATION TIME AND COSTS

The selected ground-water remedy will take approximately 10 years before clean-up objectives are met. The soil remedy will take an estimated 3 years before clean-up objectives are met.

The current cost estimate for the selected remedy is approximately $2,099,000 or $2,131,000 (reflects present worth costs) depending on whether an extension to the interceptor trench is constructed or two new purge wells are added to the current collection and treatment system for ground water. A break down of the costs associated with the selected remedy is as follows:

CONTINUED OPERATION OF CURRENT GROUND-WATER COLLECTION SYSTEM

Capital Cost	$0
O & M (annual)	$108,000
Present Worth	$1,400,000

EXPANSION OF CURRENT GROUND-WATER COLLECTION SYSTEM OFF-PROPERTY

Option 1 (interceptor trench)

Capital Cost	$34,000
O & M (annual)	$0
Present Worth	$34,000

Option 2 (purge wells)

Capital Cost	$28,000
O & M (annual)	$2,900
Present Worth	$66,000

EXPANSION OF CURRENT GROUND-WATER COLLECTION SYSTEM ON-PROPERTY

Capital Cost	$18,000
O & M (annual)	$1,500
Present Worth	$38,000

SOIL VAPOR EXTRACTION

Capital Cost	$72,000
O & M (annual)	$35,500
Present Worth	$175,000

MONITORING AND INSTITUTIONAL CONTROLS (30 years)

Capital Cost	$5,000
O & M (annual)	$25,000
Present Worth	$410,000

STATUTORY DETERMINATIONS

Under its legal authorities, U.S.EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a statutory waiver is justified. The selected remedy must also be cost-effective and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Finally, the statute includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment through treatment of ground water and soils impacted by organic chemicals at the Chem Central plant. Institutional controls will also be implemented to protect human health and the environment.

Overall protection of human health and the environment will be achieved by continuing operation of the current ground-water collection and treatment system; expanding the current collection/treatment system to intercept and recover all of the ground-water contaminant plume, including the contaminants present in a deeper sand and gravel lens for treatment; and implementing a soil vapor extraction system for soils on and off the Chem Central property.

Implementation of the ground-water component of the selected remedy will reduce the risks identified for that media. All ground water contaminated above clean-up levels within the contaminant plume will be captured, preventing the uncontrolled discharge of contaminants to Cole Drain. In addition, the contaminants present in ground water will be treated by an air stripper. Air emissions off the air stripper will also be controlled.

Soil vapor extraction will treat soil contamination, thereby significantly reducing the migration potential for contaminants to move from soil to ground water and by reducing the direct contact risks at the site. Although contaminants are transferred from soil to air through soil vapor extraction, air emissions from the soil vapor will be controlled via carbon adsorption.

The selected remedy does not pose any short-term threats that cannot be readily controlled, and no adverse cross-media impacts are expected from its implementation.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The selected remedy will comply with all applicable or relevant and appropriate chemical, action, and location-specific requirements

(ARARs). The ARARs for the selected remedy at the Chem Central site are presented below.

Action-Specific ARARs:

Action-specific ARARs are requirements that define acceptable treatment and disposal procedures for hazardous substances.

Federal ARARs

- Resource Conservation and Recovery Act, Subtitle C (RCRA) addresses the proper handling treatment, storage and disposal of hazardous wastes. These requirements may be ARARs for the Chem Central site due to the fact that the oil removed from the purge wells and the treatment residuals generated from the air stripper and soil vapor extraction system may be RCRA characteristic wastes.

  40 CFR 262: Regulations for Hazardous Waste Generators. This is an ARAR if site materials (i.e., treatment residuals, oils) are shipped off-site to for treatment, storage or disposal.

  40 CFR 263: Department of Transportation (DOT) Hazardous Materials Transportation Act,42 USC 1801. This is an ARAR for any shipment of hazardous materials.

  40 CFR 264, Subpart D: Contingency Plan and Emergency Procedures. Technical requirements are ARARs for the on-site treatment of soils to minimize hazards to human health and environment

  40 CFR 264, Subpart E: Manifest System, Recordkeeping and Reporting. This regulation requires written records of waste management operations. This is an ARAR if hazardous wastes are shipped to a RCRA facility.

  40 CFR 268, Land Ban Restrictions. Disposal of treatment residuals and contaminated oil must be in accordance with the RCRA Land Disposal Regulations.

- Occupational Safety and Health Act (OSHA) regulations under 40 CFR 300 (300.38). This is an applicable regulation which establishes safety and health standards for protecting employees from unsafe work conditions.

- Toxic Substance Control Act (TSCA), 15 USC 2601. This regulation requires testing and use restrictions for PCBs.

  40 CFR 761 (761.60): PCB Storage and Disposal. Is an ARAR if PCB concentrations are over 50 ppm in any media.

- U.S.EPA Pretreatment Standards; 40 CFR 403.5; POTW's NPDES Permit. This ARAR prohibits discharge to a POTW of pollutants that "pass-through" (exit the POTW in quantities or concentrations that violate the POTW's NPDES permit) or cause "interference" (inhibits or disrupts the POTW, its treatment processes or operations, or its sludge processes, use or disposal, thereby causing a violation of the permit). Under these regulations, certain POTWs, specified in Section 403.8, are also required to develop pretreatment standards for specified users where pollutants discharged to the public system could cause interference or pass-through. The regulations also prohibit introduction into a POTW of: (1) pollutants which create a fire or explosion hazard, (2) pollutants which will cause corrosive structural damage, (3) solid or viscous pollutants that will obstruct flow, (4) pollutants discharged at a flow rate and/or concentration that will cause interference, and (5) heat that will inhibit biological activity.

- Federal Clean Air Act, 42 USC 1857; 40 USC 52, R52.21: U.S.EPA Regulations on Approval and Promulgation of Implementation Plans (Prevention of Significant Deterioration of Air Quality). These provisions impose various requirements (e.g., use of best available control technology) on any new major source of a federally regulated air pollutant in an area which has been designated attainment or unclassifiable for that pollutant. A "major stationary source" is a source listed in 40 CFR 52.21 which emits, or has the potential to emit, 100 tons per year of a federally regulated air pollutant or any non-listed source that emits, or has the potential to emit, 250 tons per year of a federally regulated air pollutant. This requirement is relevant and appropriate if any treatment system used during remediation would constitute a major stationary source of any federally regulated air pollutant.

<u>State ARARs</u>

- Michigan Environmental Response Act 307. MDNR has issued rules to implement Act 307. These rules establish criteria for three acceptable clean-up types. Under the rules, a Type A cleanup generally achieves cleanup to background or non-detectable levels, a Type B generally achieves risk-based clean-up levels (10^{-6}),and a Type C cleanup is based on a site-specific risk assessment that considers specific criteria. Act 307 may be an applicable requirement; however, even if it is not, U.S.EPA has determined that it is a relevant and appropriate requirement. The clean-up standards selected for soil and ground water at the Chem Central site are consistent with a Type B cleanup.

- Michigan Water Resources Commission Act Public Act 245, Part 4. This is a relevant and appropriate requirement that provides general prohibition of concentrations in surface water for substances which impart unpalatable flavor to food, fish, or otherwise interfere with the reasonable use of the surface water in the state.

  Part 4, Rule 57; Acute Toxicity: provides that surface water must not be acutely toxic to aquatic life (except in small zones to initial dilution at discharge points).

  Part 4, Rule 57; Chronic Toxicity: provides that surface water with designated aquatic life uses shall not be chronically toxic to aquatic life (except in mixing zones and below critical low-flow conditions).

  Part 4, Rule 57; General Toxicity: provides that surface waters must not be toxic or injurious to man or to terrestrial or aquatic life.

  Part 4, Rule 57; Human Toxicity: provides that surface water must be maintained to preclude adverse toxic effects on human health resulting from contact recreation, consumption of aquatic organisms, or consumption of drinking water after reasonable treatment.

  Part 4, Rule 57; Toxicity Criteria: provides that concentrations of toxic materials for which no numerical criteria have been specified must not exceed values which are chronically toxic to representative, sensitive aquatic organisms, as determined from appropriate chronic toxicity data or calculated as 0.1 of the median lethal concentrations (LC50) for non-persistent toxics.

  Part 4, Rule 57; Numerical Criteria for Toxics: provides for numerical criteria for certain toxic materials including some site indicator chemicals.

  Part 4, Rule 98; Antidegradation: requires maintenance and protection of existing waters when water quality is better than water quality standards, especially when discharging wastewater. In addition, this rule would address ground water discharges to surface water bodies.

Part 9, Rule 234; Wastewater Reporting. This is an applicable regulation which provides reporting requirements for discharges of wastewater to the waters of the state or for discharges to a sewer system. An ARAR because treated ground water is discharged to a POTW.

- Michigan Air Pollution Control (MAPC) Act; Michigan Public Act 348. Part 3, R336.1301 and 336.1331: Particulates. This is an applicable regulation for the air stripper and soil treatment unit.

Part 3, R336.1371 to 1373: Fugitive Dust. This is an ARAR for loading and unloading of bulk materials that act as a source of fugitive dust. Trucks with less than a 2-ton capacity that are used for transporting of bulk materials are exempt. Trucks larger than 2-ton capacity must abide by Rule 372 provisions when transporting.

Part 7, R336.1702: New Sources of VOC Emissions. Any person responsible for any new source of VOC emissions shall not cause or allow the emission of VOC emissions from the new source to exceed the lowest maximum allowable emission rate of the following: (1) the maximum allowable emission rate listed by the commission on its own initiative or based upon the application of the best available control technology. (2) The maximum allowable emission rate specified by a new source performance standards promulgated by the U.S.EPA under authority enacted by Title 1, Part A, Section III of the Clean Air Act, as amended, 42 USC 7413. (3) The maximum allowable emission rate specified by a permit to install or a permit to operate. The requirements may be an ARAR if remediation operations cause emissions of VOCs that exceed 50 tons/year, 1000 pound/day and 100 pounds per hour.

Part 9, R336.1901: Emissions Limitations and Prohibitions. This ARAR regulates the discharge of air contaminants from any source in such concentration and duration as may be injurious to or adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property.

Part 10, R336.2001: Intermittent Testing and Sampling. This is an ARAR for sources of emissions on-site. This regulation may require the owner or operator of any source of air contaminant to conduct acceptable performance tests, in accordance with Rule 1003.

- Michigan Hazardous Waste Management Act, PA 64. This regulation is substantially similar to U.S.EPA's RCRA Subtitle C requirements, and may apply to the proper handling, treatment, storage and/or disposal if the oil removed from the purge wells and any treatment residuals generated at the Chem Central site are characteristic wastes under the Michigan regulations implementing the RCRA program in that State.

  Michigan Hazardous Waste Management Rules, Part 3: Generators of Hazardous Wastes. These requirements are substantially similar to Federal ARAR 40 CFR 262.

  Michigan Hazardous Waste Rules, Part 4: Transporters of Hazardous Waste. These requirements are substantially similar to Federal ARAR 40 CFR 263 (DOT).

  Michigan Hazardous Waste Rules, Part 6: Contingency Plan and Emergency Procedures. These requirements are substantially similar to Federal ARAR 40 CFR 264, Subpart D.

  Michigan Hazardous Waste Rules, Part 6: Recordkeeping and Reporting. These requirements are substantially similar to Federal ARAR 40 CFR Subpart E.

- Michigan Occupational Health and Safety Laws, Michigan Act 154: Workers Protection. These requirements are substantially similar to Federal ARAR 40 CFR 300

Chemical-Specific ARARs

Chemical-specific ARARs regulate the release to the environment of specific substances.

Federal ARARs

- o Safe Drinking Water Act; 42 USC. 300. Part 141 U.S.EPA National Primary Drinking Water Standards Maximum Contaminant Levels (MCLs). This is a relevant and appropriate requirement when an aquifer is potentially usable as a drinking water source.

  40 CFR 141.50; U.S.EPA National Primary Drinking Water Standards; Maximum Contaminant Level Goals (MCLGs). The National Contingency Plan states that ground water that is or could be used for drinking water will be restored to MCLGs that are above zero. When MCLGs are set at zero the corresponding MCLs will be used as the cleanup level. MCLs, where MCLGs are set at 0, are considered by U.S.EPA to be fully protective of human health and the environment as these standards fall within the acceptable risk range of 10^{-4} to 10^{-6} for carcinogens.

- o Toxic Substances Control Act (TSCA); 40 CFR 761.60; PCB Disposal. This is an applicable requirement when PCBs are detected in oils removed through the operation of the groundwater pump and treat system.

- o Federal Clean Air Act, 42 USC 1857, 40 CFR Part 50; U.S.EPA Regulations on National Primary and Secondary Ambient Air Quality Standards (NAAQS). This may be an ARAR for the air stripper and soil treatment units. The NAAQS specify the maximum concentrations of federally regulated air pollutants (i.e., sulfur dioxide, particulate matter, nitrogen dioxide, carbon monoxide, ozone, and lead) in an area resulting from all sources of that pollutant. No new construction or modification of facility, structure or installation may emit an amount of any criteria pollutant that will interfere with the attainment or maintenance of a NAAQS.

State ARARs

- o Michigan Environmental Response Act 307. (see section on State ARARs for Action-Specific ARARs.

- o Michigan Environmental Protection Act MCL Section 691; Protection of the Air, Water and Other Natural Resources and the Public. This is a relevant and appropriate requirement that provides judicial basis and coordinated management action for protection of the state's air, water, and other natural resources as well as the health, safety and general welfare of the public from hazardous substances.

- Michigan Water Resources Commission Act Public Act 245, Part 4. This is a relevant and appropriate requirement that provides general prohibition of concentrations in surface water for substances which impart unpalatable flavor to food, fish, or otherwise interfere with the reasonable use of the surface water in the state.

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Part 9, Rule 234; Wastewater Reporting. This is an applicable regulation which provides reporting requirements for discharges of wastewater to the waters of the state or for discharges to a sewer system. An ARAR because treated ground water is discharged to a POTW.

- Michigan Safe Drinking Water Act; Michigan Public Act 399. Act 399 is a relevant and appropriate requirement because although a "public drinking water supply system" as defined under the Act does not or may not currently exist at or near the site, ground water could potentially be used as a drinking water source in the future.

- Michigan Air Pollution Control (MAPC) Act; Michigan Public Act 348. Part 3, R336.1301 and 336.1331: Particulates. This is an applicable regulation for the air stripper and soil treatment unit.

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50 tons/year, 1000 pound/day and 100 pounds per hour.

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Part 10, R336.2001: Intermittent Testing and Sampling. This is an ARAR for sources of emissions on-site. This regulation may require the owner or operator of any source of air contaminant to conduct acceptable performance tests, in accordance with Rule 1003.

Location-Specific ARARs

Location-Specific ARARs are requirements placed upon the concentration of hazardous substances or the conduct of activities solely because they are in specific locations.

- o Endangered Species Act; 16 USC. 1531 et seq.; 50 CFR part 200; Game Law of 1929, Public Act 286. Statute requires that proposed actions minimize effects on endangered species. It is an applicable requirement if plant or animal endangered species or "critical habitat" is adversely impacted by the site.

OTHER CRITERIA, ADVISORIES OR GUIDANCE TO BE CONSIDERED (TBCs) FOR THIS REMEDIAL ACTION (This list is not all inclusive):

- o RCRA Air Emission Standards - 3 lbs/hour total organic emissions from all units.

- o Health Effects Assessments (HEAs) and Proposed HEAs, (Health Effects Assessment for (Specific Chemicals).

- o Reference Doses (RFDs), ("Verified Reference Doses of U.S.EPA, "ECAO-CIM-475, January 1986). See also Drinking Water Equivalent Levels (DWELs), a set of medium-specific drinking water levels derived from RFDs.

- o Carcinogenic Potency Factor (CPFs) (e.g., Q1 Stars, Carcinogen Assessment Document for Tetrachloroethylene (Perchloroethylene).

- Public health criteria on which the decision to list pollutants as hazardous under Section 112 of the Clean Air Act was based.
- Guidelines for Ground Water Classification under the U.S.EPA Ground Water Protection Strategy.
- U.S.EPA Ground Water Protection Strategy (August 1984).
- U.S.EPA Guidelines for Ground Water Classification (December 1986).
- Elements of aquifer identification (October 1979).
- OSHA health and safety standards that may be used to protect public health (non-workplace).
- Health Advisories, U.S.EPA Office of Water.
- U.S.EPA Water Quality Advisories, U.S.EPA Office of Water, Criteria and Standards Division.
- U.S.EPA, Superfund Public Health Evaluation Manual (October 1986), Provide Acceptable Intake Concentration (AIC) Reference Dose (RFD) and Minimum Effective Dose (MED).
- Health Advisories (U.S.EPA Office of Drinking Water).
- Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final, December 1989
- Risk Assessment Guidance for Superfund, Volume II, Environmental Evaluation Manual, Interim Final, March 1989.
- U.S.EPA Integrated Risk Information System.
- U.S.EPA Proposed Maximum Contaminant Level Goals (MCLGs).
- U.S.EPA Carcinogen Assessment Group (CAG) potency factors.
- Federal Sole Source Aquifer requirements
- Court-Ordered Ground Water Remediation Criteria. The court decided that Chem Central/Grand Rapids Corporation may discontinue purging ground water when the following conditions are met:

a. The concentration of a compound in ground water is equal to or less than the 10^{-5} risk level of NOAEL as appropriate for the particular compound; or

b. When the concentration of the compound has been reduced to the point of diminishing return as calculated according to a specified method.

- o Soil Properties, Classification, and Hydraulic Conductivity testing.
- o A Method For Determining the Compatibility of Hazardous Wastes.
- o Guidance Manual on Hazardous Waste Compatibility.
- o Federal Clean Water Act, Section 304 (g) Guidance Document, Revised Pretreatment Guidelines (3 volumes).
- o Guidance for POTW Pretreatment Program Manual.
- o Developing Requirements for Direct and Indirect Discharges of CERCLA Wastewater, Draft (1987).
- o Guidance for Implementing RCRA Permit by Rule Requirements at POTWs.
- o Draft Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Program.
- o Water Related Environmental Fate of 129 Priority Pollutants.
- o Water Quality Standards Handbook.
- o Technical Support Document for Water Quality-based Toxics Control.
- o Lab Protocols Developed Pursuant to the Clean Water Act.

The source of the oil contaminated with PCBs and other organic compounds collecting in the active purge wells is presently unknown and may in fact be a continuing source of ground-water contamination. Due to this possible source, ground-water ARARs may not be met utilizing the proposed remedial alternative. Before any findings are made regarding the technical impracticability of achieving ground-water ARARs, a full investigation of the nature and extent of soil and ground-water contamination under the Chem Central building and paved areas must be conducted.

COST-EFFECTIVENESS

The selected remedy is cost-effective since it provides overall effectiveness proportional to its costs. The net present worth value is approximately $2,100,000. The selected remedy for ground water is the least costly alternative which provides full protection of human health and the environment. Soil vapor extraction is the least costly soil alternative providing both treatment of the contamination (as opposed to containment) and overall protection of human health and the environment.

UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT TECHNOLOGIES (OR RESOURCE RECOVERY TECHNOLOGIES) TO THE MAXIMUM EXTENT PRACTICABLE

U.S.EPA has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a cost-effective manner at the Chem Central site. Of those alternatives which protect human health and the environment and comply with ARARs, U.S.EPA has determined that the selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence, reduction in toxicity, mobility, or volume achieved through treatment, short-term effectiveness, implementability, cost, the statutory preference for treatment as a principal element, and State and community acceptance.

The selected remedy for both ground water and soil does result in air emissions which may increase short-term risks to the community and the environment during implementation; however, vapor phase carbon adsorption will be used to minimize these emissions to within acceptable risk levels. The remedy for both ground water and soil is a treatment technology and therefore satisfies U.S.EPA's preference for treatment as a principal element. The remedy is easy to construct and operate and presents little or no administrative difficulty. The ground water remedy for the most part is in place and operating to design specifications, air and water discharge permits have also been obtained. A pilot study will be required for the soil remedy prior to full-scale application. The remedy is the least costly of the alternatives or combination of alternatives which provide full protection of human health and the environment and use treatment to address the contamination. Institutional controls and operation and maintenance will ensure that the remedy is effective in the long-term. In addition, the State of Michigan has concurred with the selected remedy.

PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

As mentioned above, the remedy for both ground water and soil at the Chem Central site satisfies U.S.EPA's preference for treatment as a principal element. Ground water is (and will be) treated using air stripping, and soils will be treated using soil vapor extraction.

DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Chem Central site was released for public comment July 10, 1991. The Proposed Plan identified Alternatives GW-C, GW-D, GW-E, and S-A as the preferred alternatives. U.S.EPA reviewed all written comments (no verbal comments were made) submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the remedy, as it was originally identified in the Proposed Plan, were necessary.

STATE OF MICHIGAN

JOHN ENGLER, Governor

DEPARTMENT OF NATURAL RESOURCES
STEVENS T. MASON BUILDING
P.O. BOX 30028
LANSING, MI 48909

XXXXXXXXXXXX
Roland Harmes, Director

O: WMD
cc RA/RF
Westlake

September 24, 1991

Mr. Valdas Adamkus, Regional Administrator
U.S. Environmental Protection Agency
Region 5, 5RA-14
230 South Dearborn Street
Chicago, Illinois 60604

Dear Mr. Adamkus:

The Michigan Department of Natural Resources (MDNR), on behalf of the State of Michigan, has reviewed the draft Record of Decision (ROD) which we received on September 9, 1991, for the CHEMCENTRAL/Grand Rapids (CCGR) Superfund site in Kent County, Michigan. We are pleased to inform you that we concur with the selected remedy outlined in the draft ROD.

The major activities required by the selected remedy include:

- continuing operation of the existing groundwater collection and treatment system;
- imposing institutional controls such as deed restrictions to prohibit installation of water wells in the site area and any future development that might disturb contaminated soils. The institutional controls will continue until the groundwater and soil remedies have been completed;
- installing and operating an expansion of the current off-property groundwater collection system, either by extending the interceptor trench or installing additional purge wells;
- installing and operating an in-situ soil vapor extraction (SVE) system for soils on-property as well as two off-property locations just north of the property. If, following a treatability study or through additional soil testing during operation of the SVE system, it is determined that the system is unable to reduce the semi-volatile compounds to below the soil cleanup standards, additional treatment methods will be evaluated and implemented to attain the desired cleanup standards. The cleanup levels for soils will be dictated by the Type B cleanup levels for soils as described in the Michigan

Environmental Response Act (MERA) (1982 P.A. 307, as amended), MCL 299.601 et seq., and its rules. Since groundwater discharge to Cole Drain is or may be occurring, consistent with the MERA Rule 713 (2), soil cleanup numbers will be set based on 20 times the allowable level specified pursuant to Rule 57(2) of the Part 4 Rules of the Michigan Water Resources Commission Act (WRCA) (1929 P.A. 245, as amended) where these are more stringent than those resulting from the MERA Rules 711(2) or 711(5). However, if a leach test is performed consistent with Rule 711(2), the cleanup numbers maybe revised to reflect the results of the leach test. These numbers are listed in Table 7 of the draft ROD;

- installing and operating a purge well at the deep lens referred to as SCH-2 to extract contaminated groundwater. This well will be piped into the existing treatment system;

- collecting oil accumulating in the purge wells and disposing of the oils at an off-site facility in accordance with applicable state and federal regulations;

- implementing a groundwater monitoring program capable of demonstrating the effectiveness of the groundwater capture system.

The groundwater cleanup numbers for all groundwater will be dictated by the Type B numbers generated pursuant to the MERA Rule 709 or, as required by the MERA Rule 713(2), the Rule 57(2) numbers, whichever is more stringent. These cleanup criteria are listed in Table 7 of the draft ROD.

The MDNR also concurs with the Statutory Determination Summary with the following exception. The MDNR has previously identified the WRCA MCL 323.6(a) and the associated Part 22 Administrative Rules, MAC R.323.2201 et seq. as ARARs for this site. It remains our position that the WRCA and the associated Part 22 Rules are ARARs for the remedial action for this site because hazardous substances in the aquifer beneath the site are migrating to degrade previously uncontaminated groundwater.

It is the MDNR's judgement, however, that the selected remedial action for this site will provide for attainment of all ARARs, including the WRCA and the Part 22 Rules, by preventing further discharges of injurious substances into the groundwater outside of the containment area, and by remedying the existing groundwater contamination.

We still have the same concerns outlined in our letter of September 20, 1991, containing comments on the proposed plan for this site. These concerns are that the selected remedy may not be able to meet the cleanup objectives in a timely manner due to the presence of a floating product layer on the groundwater; soil vapor extraction may not be able to treat semi-volatile contaminants; and soils in the water table fluctuation zone would be treated faster by active remediation than by natural flushing with contaminated groundwater. We reiterate our position that the ROD should explicitly set a timeline for conducting the additional work activities for the soils under the buildings and paved areas on the CCGR property.

We are encouraged, however, that the U.S. Environmental Protection Agency will set the cleanup standards at those specified as Type B rules of our MERA. We understand that these numbers will become the performance standard that will have to be achieved, regardless of the technology employed to meet the standards.

If you have questions regarding this site, please contact Mr. Mitchell Adelman at 517-373-8436, or you may contact me directly.

Sincerely,

ACTING Delbert Rector
Deputy Director
517-373-7917

cc: Mr. Jonas Dikinis, EPA
Ms. Wendy Carney, EPA
Mr. Michael McAteer, EPA
Mr. Jeremy Firestone, DAG
Mr. Alan Howard, MDNR
Mr. William Bradford, MDNR
Mr. Peter Ollila/CCGR File
Mr. Mitchell Adelman, MDNR