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September 1987

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Superfund Record of Decision:

Seymour, IN (2nd O.U.)

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16. ABSTRACT

The Seymour Recycling Corporation (SRC) site, encompassing a fourteen-acre area, is approximately two miles southwest of Seymour, Indiana. SRC and its corporate predecessor, Seymour Manufacturing Company, processed, stored and incinerated chemical wastes at the site from about 1970 to early 1980. The facility was closed when SRC failed to comply with a 1978 agreement with the State of Indiana to cease receiving wastes and to institute better waste management practices. In 1980, several thousand drums were removed from the site by two potentially responsible parties (PRPs). In 1981, the U.S. EPA removed chemicals from tanks at the site and disposed of those wastes offsite. A 1982 Consent Decree with potential PRPs resulted in the removal, between December 1982 and January 1984, of approximately 50,000 drums, 100 storage tanks and the first foot of contaminated soil from about 75 percent of the site's surface. A Record of Decision, signed in September 1986, evaluated the stabilization of the ground water plume emanating from the site and selected the implementation of a plume stabilization system to extract, treat and discharge ground water to a waste water treatment plant. Currently, the shallow aquifer under and just beyond the site boundaries, which serves approximately 100 residences and businesses, is highly contaminated with more than 35 different hazardous chemicals, including 1,2-dichloroethane, benzene, vinyl chloride and 1,1,1-trichloroethane.

(See Attached Sheet)

17. KEY WORDS AND DOCUMENT ANALYSIS		
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Record of Decision Seymour, IN Second Remedial Action - Final Contaminated Media: gw, soil, sediments Key contaminants: TCE, DCE, VOCs, benzene, inorganics, organics		
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EPA/ROD/R05-87/050
Seymour, IN
Second Remedial Action - Final

16. ABSTRACT (continued)

The selected remedial action for this second operable unit includes: deed and access restrictions and other institutional controls; implementation of a full scale soil vapor extraction system; ground water extraction and treatment by air stripping, mixed-media cap; and excavation of 800 cubic yards of contaminated creek sediment and consolidation of the sediment beneath the cap. The estimated capital cost for this remedy is $10,536,000 with present worth O&M of $7,200,000.

RECORD OF DECISION
REMEDIAL ALTERNATIVE SELECTION

SEYMOUR RECYCLING CORPORATION SUPERFUND SITE
SEYMOUR, INDIANA

Statement of Basis and Purpose

This decision document, with the attached Summary of Record of Decision (incorporated herein as Attachment 1), represents the selected remedial action for this site which was developed and selected in accordance with CERCLA, as amended by SARA, and to the extent practicable, the National Contingency Plan.

This decision concerning the appropriate remedial alternative for the Seymour site is based primarily on the following documents:

1. Remedial Investigation, Volumes 1 and 2, Seymour Recycling Corporation, May 12, 1986, prepared by CH_2M Hill, including the Endangerment Assessment, which is Chapter 9 of Volume 1.

2. Public Comment Feasibility Study Report, Volumes 1 and 2, Seymour Recycling Corporation, August 29, 1986, prepared by CH_2M Hill.

3. Community Relations Responsiveness Summary, Seymour Recycling Corporation, September 1987, prepared by CH_2M Hill.

4. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986.

5. The National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, November 20, 1985.

6. Correspondence from Dr. C.W. Fetter, Jr., to David Favero, dated July 2, 1987.

7. Guidance on Remedial Investigations Under CERCLA, May 1985.

8. Guidance on Feasibility Studies Under CERCLA, April 1985.

9. Conceptual Level Design and Feasibility Study for In-situ Air Stripping of Volatile Organic Contaminants from the Unsaturated Zone at the Seymour Recycling Corporation Hazardous Waste Site, Seymour, Indiana, Hydro Geo Chem, April 28, 1987.

10. Draft Conceptual Plan for Groundwater Remediation in the Shallow Aquifer at the Seymour Recycling Site, Geraghty & Miller, April 28, 1987.

11. Superfund Public Health Evaluation Manual, OSWER Directive 9285.4-1, October 1986.

12. Memorandum from J. Winston Porter, Assistant Administrator, OSWER, to Director, Waste Management Division, Region V, and others, entitled Interim Guidance on Superfund Selection of Remedy, December 24, 1986.

13. Memorandum from J. Winston Porter, Assistant Administrator, OSWER, to Director, Waste Management Division, Region V, and others, entitled Additional Interim Guidance for FY '87 Records of Decision, July 24, 1987.

14. Memorandum from J. Winston Porter, Assistant Administrator, OSWER, to Regional Administrator, Region V and Director, Waste Management Division Region V, and others, entitled Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements, July 9, 1987.

15. Memorandum from J. Winston Porter, Assistant Administrator, OSWER to Regional Administrators, entitled Superfund Selection of Remedy, August 14, 1987.

16. Correspondence from Harry John Watson III, Indiana Attorney General's Office, to Lawrence Kyte, dated August 8, 1986.

A substantial number of additional documents, which are included in the administrative record, have also been considered in selecting the remedial action for this site. An index to the administrative record is incorporated as Attachment 2 to this document.

Description of the Selected Remedial Alternative

The selected remedial alternative represents the final remedy for the Seymour site.

The selected remedial alternative includes the following major components which are discussed in more detail in Attachment 1:

- Deed and access restrictions/other institutional controls to prevent future development of the site and adjacent property and to assure the integrity of the remedial action.
- Implemention of a full scale soil vapor extraction system.
- Extraction and treatment of contaminated groundwater at and beyond the site boundaries.
- Installation of a multi-media cap.
- Excavation of contaminated sediment and consolidation of the sediment beneath the cap.

- A regular monitoring program to determine the effectiveness of the proposed remedial action.

Declaration

Consistent 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 the National Oil and Hazardous Substances Pollution Contingency Plan, 40 C.F.R. Part 300, I have determined that at the Seymour Recycling Corporation Site, the selected remedial alternative provides adequate protection of human health and the environment; satisfies the preference for treatment that reduces mobility, toxicity or volume to the maximum extent practicable; and is cost-effective.

The State of Indiana has been involved with the development of the remedial investigation/feasibility study. The State has been consulted on the selection of the remedy and is expected to concur.

The Office of Waste Programs Enforcement has concurred with the remedy selected for this site (Attachment 3).

I have determined that the action taken is consistent with Section 121 of CERCLA, as amended by SARA, and is appropriate, balanced against the availability of Trust Fund monies for use at other sites.

Because hazardous substances will remain on-site, the 5-year review provision of Section 121(c) of CERCLA, as amended by SARA, will apply to the Seymour site.

Valdas V. Adamkus
Regional Administrator

September 30, 1987
Date

Attachments

ATTACHMENT 1

SUMMARY OF RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

SEYMOUR RECYCLING CORPORATION

SEYMOUR, INDIANA

September 25, 1987
U.S. EPA, REGION V
CHICAGO, ILLINOIS

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SUMMARY OF RECORD OF DECISION
SEYMOUR RECYCLING CORPORATION

SITE LOCATION AND DESCRIPTION

The Seymour Recycling Corporation site is located 2.3 miles southwest of the central business district of Seymour, Indiana, near the northwest corner of Freeman Municipal Airport and Industrial Park (Figure 1.2 from the FS). The site covers about 14 acres, approximately 1/2 mile south of the Snyde Acres subdivision. Most of the area immediately surrounding the site is used for agriculture. A drainage ditch extends from the northwest corner of the site, (Northwest Creek), and drains into East-West Creek about 1000 feet north of the site. The closest residence to the site is Mrs. Otte's farm, just north of the creek. East-West Creek flows into Von Fange Ditch, which runs through the Snyde Acres Subdivision.

SITE HISTORY

The Seymour Recycling Corporation (SRC) and its corporate predecessor, Seymour Manufacturing Company, processed, stored and incinerated chemical wastes at the site from about 1970 to early 1980. The facility was closed when SRC failed to comply with a 1978 agreement with the State of Indiana to cease receiving wastes and to institute better waste management practices. In 1980, a state court placed the site under receivership. Later that year, U.S. EPA fenced the site to restrict access and constructed dikes to control runoff from the site. Several thousand drums were removed from the site by two potentially responsible parties (PRPs) in 1980. In 1981, U.S. EPA removed chemicals from tanks at the site and disposed of those wastes at authorized disposal sites. In 1982, the U.S. Government entered into a consent decree in U.S. District Court with some companies believed to be PRPs. Under the agreement, the PRPs arranged for the removal of hazardous substances on the surface of the site.

The surface cleanup was conducted from December 1982 to January 1984 by a hazardous waste disposal firm. The cleanup was monitored by U.S. EPA and the State of Indiana. All wastes on the surface of the site, including roughly 50,000 drums and 100 storage tanks, were removed and taken to authorized disposal sites. In addition, the top foot of contaminated soil on the site was removed from about 75 percent of the site and also transported to authorized disposal sites. Clean fill was brought in to replace the contaminated soil that was removed.

In 1982 and 1983, the U.S. Government entered into additional agreements with other PRPs. As a result of these agreements, a fund was established to be used for future cleanup actions. For example, money from the PRP trust fund was used in 1985 to extend municipal water system pipelines to the Snyde Acres area and money from the trust fund will be used to pay for a plume stabilization project at the site.

In August 1983, U.S. EPA began the remedial investigation (RI) to determine the nature and extent of the potential long-term hazards that remain

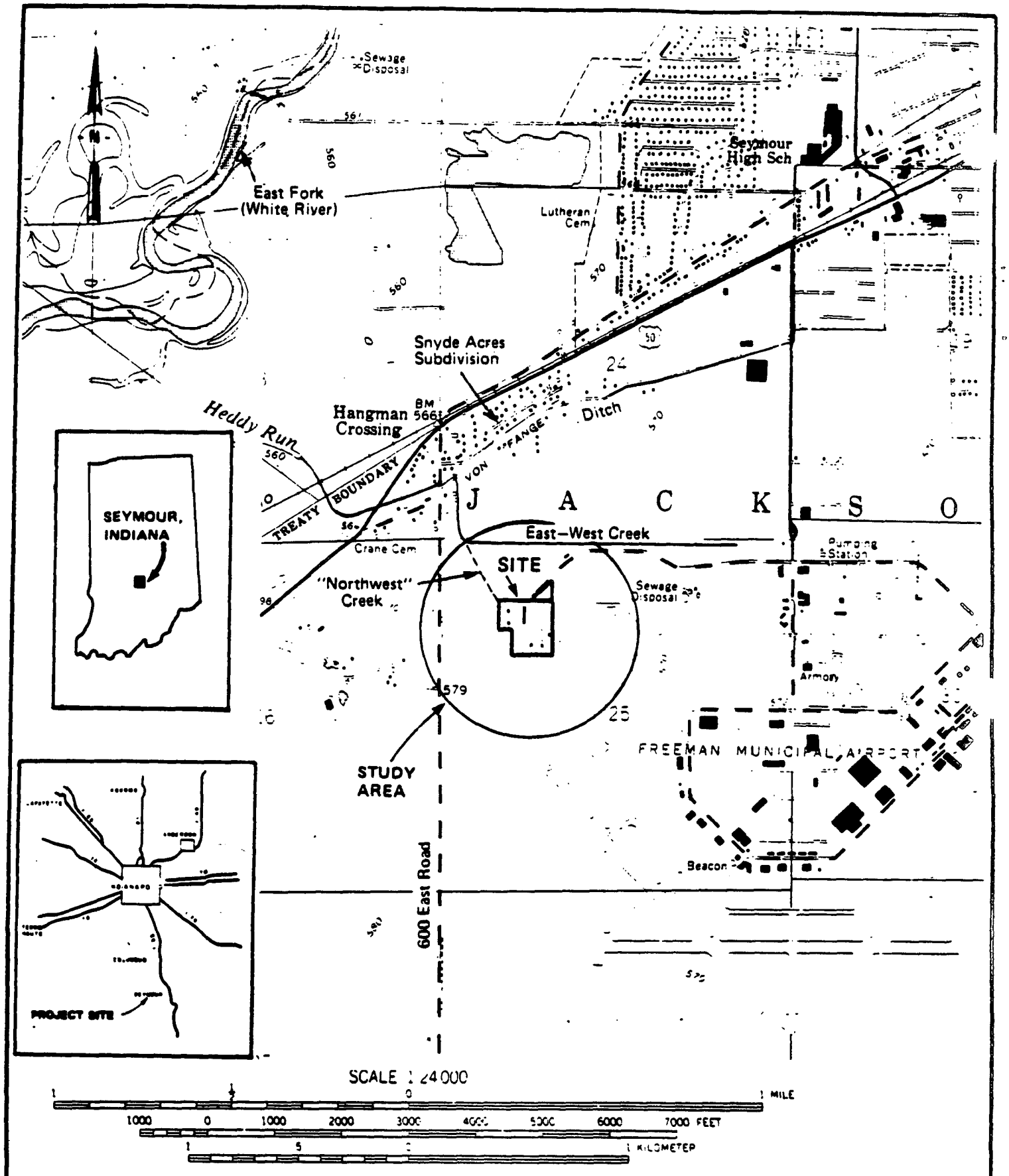

FIGURE 1.2
SITE LOCATION/STUDY AREA

SEYMOUR RECYCLING CORPORATION
FEASIBILITY STUDY
EPA WA 70-5L01.0

at and in the vicinity of the site. The RI also attempted to identify pathways in the environment by which chemicals from the site may come into contact with people or the environment. Part of the RI, the endangerment assessment, estimates the potential impacts of the remaining contaminants on human health and the environment if no further clean-up actions are taken at the site. The RI, which was completed in May 1986, serves as the primary source of data U.S. EPA used in the Feasibility Study to develop alternative measures for reducing the potential long-term threats posed by the site.

A phased feasibility study was completed in August 1986 that evaluated the stabilization of the groundwater contamination plume emanating from the Seymour site. A Record of Decision was signed on September 30, 1986 selecting the implementation of a plume stabilization project.

RESULTS OF THE REMEDIAL INVESTIGATION

GroundWater Contamination

Monitoring wells have been installed and used by various contractors to study the groundwater at and in the vicinity of the Seymour Recycling site. These studies indicate the presence of two aquifers: a shallow aquifer and a deep aquifer. The shallow aquifer, sometimes as shallow as six to eight feet below the surface, is separated from the deep aquifer by a silty clay aquitard that allows some water to flow from the shallow to the deep aquifer.

Groundwater in the shallow aquifer flows to the north/northwest. During wet periods, the high level of ground water in the shallow aquifer results in groundwater discharging into the East-West Creek. During drier periods the creek dries up and groundwater flows beneath the creek bed toward residences in the Snyde Acres subdivision. Downgradient of the East-West Creek, a portion of the groundwater in the shallow aquifer discharges to the Von Fange Ditch. The ditch occasionally dries up which indicates groundwater flows beneath the ditch toward additional residences in the Snyde Acres Subdivision.

The deep aquifer, located from about 55 to 70 feet below the land surface, flows primarily to the south. The area immediately to the south of the site contains no wells or streams which could provide an exposure pathway for site chemicals in the deep aquifer to contact humans or wildlife. However, there are wells located at Freeman Municipal Airport to the east of the site that currently draw from the deep aquifer.

The shallow aquifer is highly contaminated with more than 35 different hazardous organic chemicals, including 1,2-dichloroethane, benzene, vinyl chloride and 1,1,1-trichloroethane. Most of the contaminants are directly under or just beyond the site boundaries. As of June 1985, the major portion of the contaminant plume extended 400 feet beyond the site boundary. (Figure 7.21 from the RI) However, studies detected lower concentrations of organic chemicals as far as 1,100 feet downgradient of the site boundary. The contaminants in the groundwater are moving away from the site at different rates; some as fast as 150 feet or more per year and others as slow as one foot or less per year.

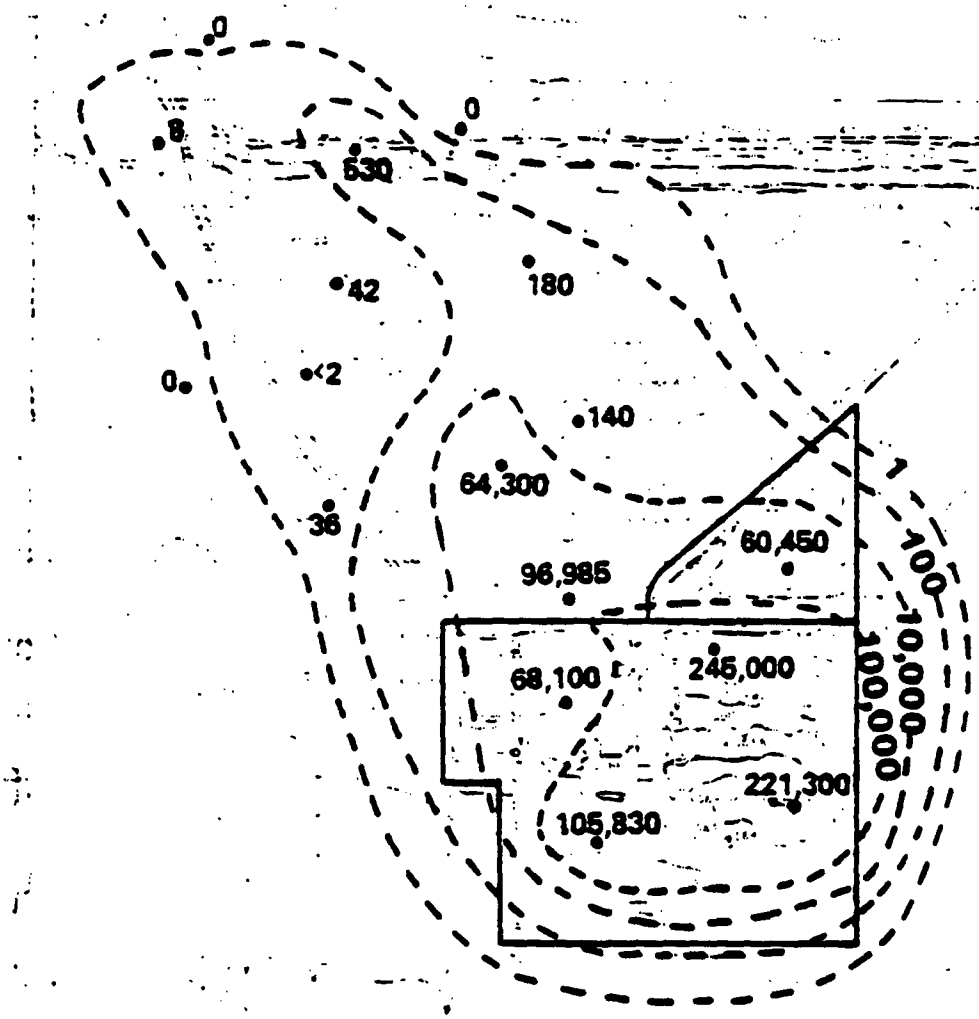

FIGURE 7.21

VOLATILE ORGANIC COMPOUNDS IN SHALLOW AQUIFER
JUNE 1985

SEYMOUR RECYCLING CORPORATION
REMEDIAL INVESTIGATION EPA WA 50.5 VO1.1

Hazardous organic chemicals have been detected in the deep aquifer. Concentrations range up to 1,344 ug/l of total organic contaminants. The rate and direction of contaminant movement in the deep aquifer is not well documented nor understood.

Soil Contamination

Soil samples were collected during 1984 and 1985 to determine the extent of contamination in the soil. Three types of locations were sampled:

1. Soil beneath the surface from the groundwater monitoring sites (46 samples in 37 locations);

2. Sediments in the northwest drainage ditch next to the site and in surface soils immediately surrounding the site (138 samples in 60 locations); and

3. Soil to a depth of six feet on the site (205 samples in 51 locations).

Samples from the groundwater monitoring well locations and the near surface soils were analyzed in an on-site laboratory, with select samples being sent to the contract laboratory program (CLP) for a complete analysis. Analyses of the soil samples indicate that soils at various depths within the boundaries of the site are contaminated with hazardous organic and inorganic chemicals. More than 54 organic chemicals were identified in the soils, including high concentrations of 1,1,2-trichloroethane, carbon tetrachloride, 1,1,2,2-tetrachloroethane and trichloroethene. (RI, Vol. 1 Chap. 6) (Record #_____) Inorganic chemicals were found in the soils in concentrations greater than background. (RI, Vol. 1, Chap. 6) (Record #_____)

Contamination of near surface soils and sediments outside the site boundaries is much more limited. Sediment samples from Northwest Creek show the presence of low level concentrations of hazardous organic chemicals. (RI, Vol. 1, Chap. 6) (Record #_____)

Surface Water and Wildlife Contamination

In 1983 and 1984, the U.S. Fish and Wildlife Service (FWS) captured animals and sampled soils and sediments in the area surrounding the Seymour Recycling Site. FWS collected additional sediment samples in 1985. Analyses of the animal tissues and the sediment samples indicate that some contamination from the site has migrated to surrounding land areas and waterways.

These studies indicate that contaminants like those at the site have reached East-West Creek.

No surface water samples were collected during the RI. However, the presence of contaminants in the sediment and animal tissue indicate that the surface waters, at least on occasion, contain low levels of contamination. (RI, Vol. 1, Chapter 8) (Record #_____)

ENDANGERMENT ASSESSMENT

The endangerment assessment (EA) performed as part of the RI includes both a public health and environmental evaluation. The public health evaluation portion of the EA was conducted in three major phases: 1) toxicological evaluation, 2) exposure assessment and 3) risk characterization. A brief discussion of each phase follows.

Toxicological Evaluation (RI, Vol 1, Chapter 9.2.1) (Record #_____)

Over 70 chemicals were detected at the site. Table 9.2 from the RI presents a summary of the general toxicological categories into which selected chemicals fall. Chemicals evaluated were selected based on their concentration, frequency of occurrence and potential toxic effects.

The toxicological properties are evaluated in quantitative terms in the EA. Three types of quantitative evaluations are performed: 1) comparison with available and appropriate standards, criteria or guidelines, 2) additive carcinogenic risk calculation and 3) comparison of estimated potential daily intakes of contaminants to acceptable intakes; The Health Index.

Exposure Assessment (RI, Vol. 1, Chapter 9.2.2) (Record #_____)

The populations identified as actually or potentially exposed to chemicals at or migrating from the Seymour site are:

- approximately 100 residences and businesses using groundwater from the shallow aquifer.
- users of wells supplying the Freeman Municipal Airport and other users of the deep aquifer.
- populations downwind of the site; approximately 100 residences within a 1 mile radius.
- people who may live on, work at or may otherwise use the site.
- people who would consume aquatic wildlife caught from Northwest Creek, East-West Creek, Von Fange Ditch, and Heddy Run.

Exposure pathways are shown in Table 9.7 from the RI.

The routes of exposure vary depending on the migration pathway and the human activity. The potential routes of exposure are ingestion, inhalation or dermal absorption.

Risk Characterization (RI, Vol. 1, Chapter 9.2.4) (Record #_____)

According to EPA policy, the target total individual carcinogenic risk resulting from exposures at a Superfund site may range anywhere from 1×10^{-4} to 1×10^{-7}. (Superfund Public Health Evaluation Manual, October 1986).

Table 9.2

OWPE HAZARD CRITERIA FOR SELECTED CHEMICALS AT THE SRC SITE*

	Carcinogencity[a]	Reproduction/ Teratogenicity[b]	Mutagenicity[c]	Acute Toxicity[d]	Chronic Toxicity[e]
Barium		X		X	
Benzene	X	X	X		X
Benzo(a)pyrene	X	X	X		
2-Butanone					
Cadmium	X	X			X
Chloroform	X				X
Chromium	X	X	X	X	X
1,1-Dichloroethane					
1,2-Dichloroethane	X		X		X
1,4-Dioxane	X		X		
Lead		X			X
Methylene chloride	X		X		
Methyl phenol					
Nickel	X	X			X
Phenol					
1,1,2,2-Tetrachloroethane	X	X	X		X
Tetrachloroethene	X	X	X		
1,1,1-Trichloroethane			X		
1,1,2-Trichloroethane	X				
Trichloroethene	X		X		
Vinyl chloride	X	X	X		X
Xylene		X			

*Adopted from "Chemical, Physical, and Biological Properties of Compounds Present at Hazard Waste Site" Office of Waste Programs Enforcement, (OWPE) U.S. EPA 1985. Criteria presented below is that of OWPE. An "X" indicates the chemical meets the criteria outlined by OWPE for the particular toxic effect classification. The lack of an "X" under a classification does not necessarily imply that the chemical can not have a toxic effect.

[a]A compound is classified as carcinogenic if it is a known or suspected human carcinogen, if it has been shown to be carcinogenic at a particular site in more than one species or set in an animal bioassay, or if it has been shown to increase the incidence of site-specific malignant tumors in a single species or sex, and there is a statistically significant dose-response relationship in more than one exposed group. (This classification is not necessarily the same as presented by IARC or CAG in Table 2-2).

[b]Chemicals are classified as teratogens and reproductive toxins if there is suggestive evidence of an effect in humans or if at least one study in whole animals is clearly positive. Unsupported in vitro evidence is considered sufficient to classify a chemical as a reproductive toxicity/teratogenicity hazard.

[c]A chemical is classified as mutagenic if it has given a positive result in at least one of the mammalian in vivo or bacterial or mammalian cell in vitro assays for mutagenicity.

[d]A compound will be considered to be acutely toxic if it has an oral $LD_{50} \leq 100$ mg/kg, an inhalation $LC_{50} \leq 400$ mg/m^3, or a dermal $LD_{50} \leq 400$ mg/kg.

[e]Chemicals will be considered to cause chronic toxicity if they cause serious irreversible effects other than cancer or reproductive effects after extended exposure to oral doses of less than 100 mg/kg/day, inhalation concentrations less than 400 mg/m^3, or dermal doses less than 100 mg/kg/day.

Table 9.7
POTENTIAL EXPOSURE PATHWAYS--SRC SITE

Release Source	Transport Medium	Exposure Point	Exposure Route	Exposure Potential
Fugitive dust	Air	Offsite and onsite	Inhalation Ingestion	Human population downwind--if site is disturbed--current cap may limit releases in the short term.
			Dust on crop ingested	Human or livestock consumers of crops if site is disturbed--current cap may limit releases in the short term.
Volatilization from soil	Air	Offsite and onsite	Inhalation	Human population downwind--no known current releases--current cap may limit releases in the short term--future releases potential if site developed.
Site runoff	Surface water (transferred to fish)	"east-west" creek Von Fange Ditch Heddy Run Creek	Ingestion of fish	Past releases probably stopped by berm and surface cleanup; fish may still carry contaminants.
	Surface water		Direct contact (dermal absorption)	Past releases probably stopped by berm and surface cleanup.
Soil	Direct contact	Onsite	Dermal absorption Ingestion	Requires development of site--does not currently occur.
Soil and already contaminated groundwater	Groundwater	Onsite	Ingestion Inhalation of volatiles Dermal absorption	Requires development of site and potable water well development for exposure to occur--exposure does not currently occur.
	Groundwater	Offsite (down-gradient)	Ingestion Inhalation of volatiles Dermal absorption	Requires migration offsite to well locations--exposure is not currently known to occur.
	Groundwater discharge to surface water	"east-west" creek Von Fange Ditch Heddy Run Creek	Ingestion of fish Direct contact (dermal absorption) Direct contact/ Ingestion	Requires offsite migration and shallow aquifer discharge to east-west ditch or Von Fange Ditch.

(Record #____) The 1 x 10^{-6} risk level is the point of departure for risk management. (FS Guidance April 1985) (Record #_____).

Further guidance in regard to risk management is provided in the references cited in the FS, the FS guidance document and the Superfund Public Health Evaluation Manual.

Some of the major risks associated with the site include:

° Offsite Migration -- The offsite migration of highly mobile organic contaminants could result in concentrations of contaminants at the nearest offsite receptor locations (near Mrs. Otte's well, approximately one-quarter mile northwest of the site) at concentrations associated with a 1 x 10^{-6} excess lifetime cancer risk in less than five years from 1984 (See Figure A.17 from the FS). One chemical, 1,4-dioxane, could exceed the 10-day health advisory level at the nearest receptor in less than 5 years from 1984. Contaminants may migrate and discharge to the Von Fange Ditch, resulting in exposures at that location, or may also migrate below the ditch to additional residences in the Snyde Acres Subdivision.

° Use of Shallow Groundwater Onsite -- Potable use of the shallow groundwater in a residential, commercial, or recreational setting could result in adverse health effects. The contaminant concentrations onsite exceed current and proposed drinking water standards, criteria, and guidelines. The major chemicals of concern are the volatile organic compounds (VOCs). Exposure to VOCs could result in carcinogenic health effects. For example, in a residential setting, estimates of daily contaminant intake exceed acceptable levels, and estimates of excess lifetime cancer risk range from 1 x 10^{-1} to 2 x 10^{-1}. This risk is based on maximum reported concentrations of all known potential carcinogenic VOCs.

° Exposure to Onsite Soils from Site Use-- Site development could result in exposure to contaminants in the soil. Ingestion of soil could result in adverse health effects as measured by estimates of excess lifetime cancer risk (ranging from 3 x 10^{-3} to 1 x 10^{-6}, depending on the site use) and comparison of estimated daily contaminant intake to acceptable intake (acceptable intakes for children could be exceeded). The major chemicals of concern in the soil are VOCs.

° Environmental Concerns-- Prior to the surface cleanup, releases of contaminants from the site resulted in fish kills. Sampling by the U.S. Fish and Wildlife Service in 1983 and 1984 detected contaminants in aquatic and terrestrial organisms. Environmental exposures are currently possible. Terrestrial organisms could come onto the site and be exposed to contaminants in the soil. Releases of contaminants to the "East-West" creek are occurring, and

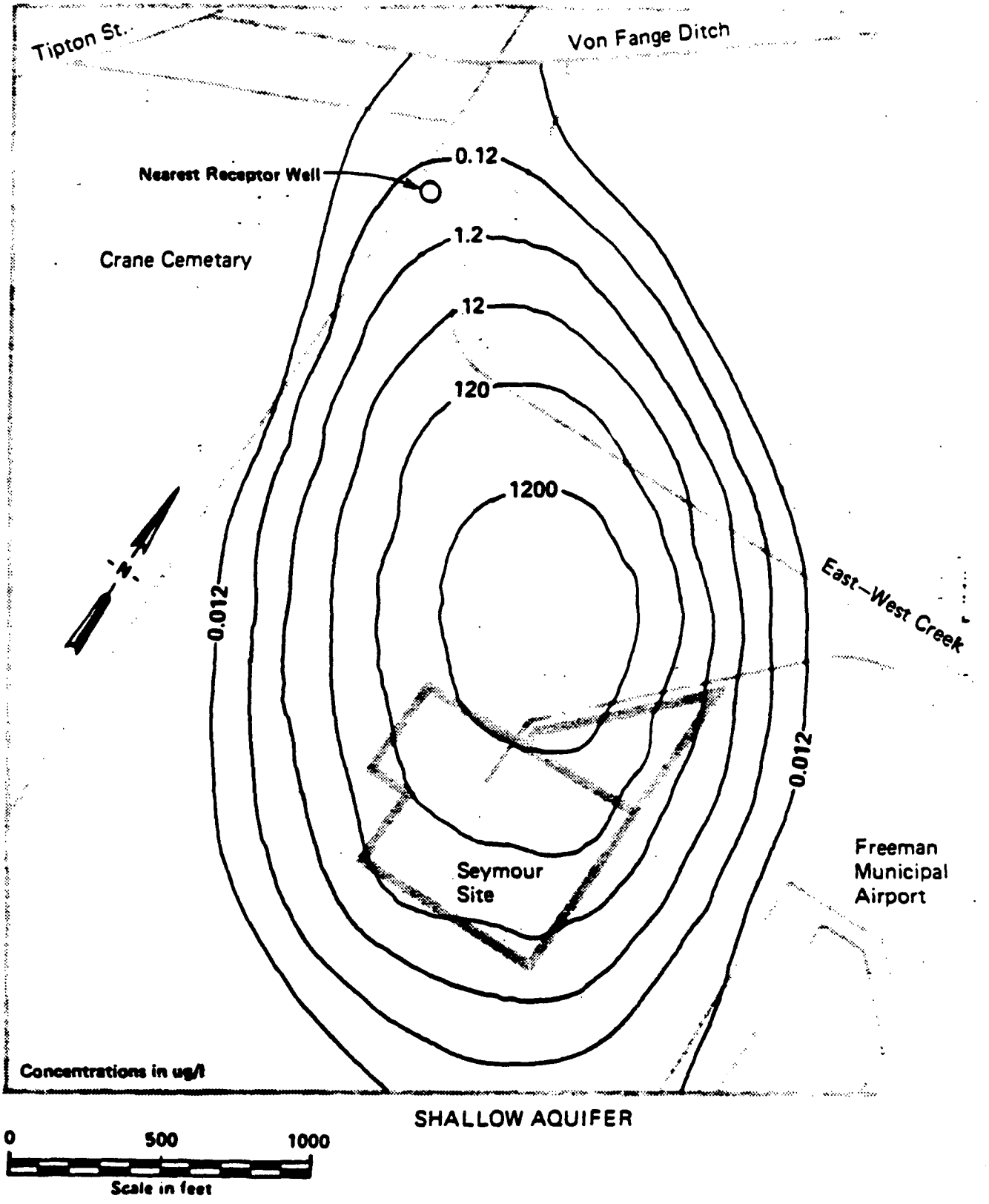

FIGURE A.17
1989 DISTRIBUTION OF VINYL CHLORIDE WITHOUT PLUME STABILIZATION ASSUMING LOWEST REPORTED RETARDATION

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continued migration of contaminants (without remedial action) will eventually result in their release to the Von Fange Ditch. This could expose aquatic organisms to contaminants from the site.

TECHNOLOGY ANALYSIS SUMMARY

The remedial action objectives established for the Seymour Site are discussed in the FS, Vol. 1, Chapter 2. (Record #_____)
A large array of technologies were identified and initially screened for their ability to meet these objectives. Generally these technologies addressed the two environmental media contaminated at the site: soil and groundwater.

Groundwater Remediation Technologies

A. Shallow Aquifer

Technologies passing through the initial technology screening in the FS were combined into schemes to address the groundwater contamination at and beyond the site boundary. These technologies include extraction and injection wells, and slurry walls. Components for extracting groundwater, and then treating and discharging contaminated groundwater as recommended in the FS, are part of the overall groundwater remedial action.

1. Groundwater Extraction Schemes (FS, Vol. 1, Chapter 4.1) (Record #_____)

   There were three basic schemes that met the response objectives and were evaluated in the FS. These schemes should be reviewed as approaches to groundwater extraction based on the currently available information. They do not establish exact location, number and pumping rates of a final extraction scheme.

   The schemes are:

   1. extraction wells only,

   2. extraction wells in combination with an injection well(s), and

   3. extraction wells in combination with partial containment in a slurry wall around the site.

   The approach in scheme 1 is to extract groundwater at the downgradient site boundary and at the downgradient extent of the off-site contaminant plume.

   Scheme 2 takes the approach of placing extraction wells on site, clustered around the most highly contaminated area of the plume. These wells would maximize inward radial flow from off-site; i.e. the wells would draw groundwater from all directions toward the site. An injection well would be necessary to eliminate an area

of low hydraulic gradient created by competition among the extraction wells. A downgradient migration control well is also required in this scheme.

The approach of Scheme 3 is to use a slurry wall to contain contaminants within the site boundaries but restore the aquifer outside the boundaries to the cleanup levels. A slurry wall would be installed down to the confining layer around the site to prevent continued off-site migration of contaminants. An extraction well would be necessary within the slurry wall in order to maintain the interior water table at an elevation below that of the exterior water table. Extraction wells would be necessary near the corners of the site to remove the contaminant plume outside of the slurry wall. A downgradient migration control well is also required in this scheme.

A plume stabilization project is currently in progress. Schemes 1 through 3 were evaluated with a downgradient migration control extraction well. The purpose of this well is similar to that of the plume stabilization well: to prevent further downgradient migration of the contaminant plume. The assumption used in evaluating the schemes in the FS was that the downgradient migration control well would not be installed until 1989. One option was evaluated which assumed the plume stabilization well was to be installed in the Spring of 1987. The results indicate the plume stablization well would decrease the time of aquifer restoration by 1 to 3 years. (RI, Vol. 2, Appendix A) (Record #_____) This same impact can reasonably be assumed to also occur with the other pumping schemes. Also, if the plume stabilization well is substituted for the downgradient extraction well it would not be necessary to install the downgradient migration control well as far downgradient. (FS, Vol. 1, Chapter 4.1)

Computer modeling was used to compare the different schemes. The flow component of the model was calibrated with historical data; however, the contaminant transport model was not calibrated. Calibration of the contaminant transport model was not possible because there is not an adequate history of contaminant concentration levels in the groundwater. Verification of the models was not possible because data was not available with which the modeling predictions could be compared. Because of lack of calibration and verification, the model results should only be used and considered accurate for relative comparisons between schemes. In addition, in order to provide a basis for comparison, all schemes were assumed to begin extraction in Fall 1989. Results should not be taken as absolute values.

Indicator compounds were selected on which to base the computer modeling. The selection criteria included concentration, contaminant mobility, toxicity and treatability. (FS, Vol. 2, Appendices A and B) (Record #____) The most mobile compounds determined the area that an extraction scheme would need to contain and the less mobile compounds determined the time period a scheme must operate. Tetrachloroethene was selected as the indicator compound on which to base performance comparisons. Table 4.4 from the FS provides a summary of the groundwater extraction scheme performance and cost analysis.

Table 4.4

SUMMARY OF GROUNDWATER EXTRACTION SCHEME PERFORMANCE AND COST ANALYSIS

Extraction Scheme	Soil Option Assumed	Aquifer Restoration Time (Yrs) To Reach Cancer Risk Of:** 1×10^{-4}	1×10^{-5}	1×10^{-6}	Cost*
1. Extraction Wells Only	Source Eliminated	11-17	19-29	25-39	$1,417,000
	No Action	50-80	>100	>100	
2. Extraction-Injection	Source Eliminated	9-15	16-26	21-33	$1,643,000
	No Action	50-80	>100	>100	
3. Extraction-Containment	N/A	14-22	20-30	27-41	$3,085,000

* Total Present Worth Cost Over 30 years. Costs are for extraction only and do not include treatment costs.

** Tetrochloroethene used as indicator compound to determine pumping times. All pumping was assumed to start in Fall 1989.

2. Groundwater Treatment and Discharge

The following discharge alternatives for treated groundwater from the site were considered in the FS: 1) direct discharge to the Northwest Creek, 2) aquifer reinjection, and 3) discharge to the Seymour Publicly Owned Treatment Works (POTW).

The POTW provides an added level of protection to the environment because of the additional treatment of the treated groundwater prior to its discharge to the East Fork of the White River. Discharge to the Seymour POTW was carried forward in the FS for detailed evaluation of remedial alternatives.

Discharge criteria for the Northwest Creek are not known because they have not been identified by the Indiana Department of Environmental Management (IDEM) which is responsible for implementing the National Pollution Discharge Elimination System (NPDES). The criteria are expected to be more stringent than discharge criteria to the POTW. State Water Quality Standards adopted pursuant to 40 CFR Part 131 would be applicable to this discharge. Treatment costs would increase as the discharge criteria become more stringent. The creek receiving treated groundwater discharged from the site flows through the influence of the proposed extraction scheme and would provide recharge to the shallow aquifer. This recharge could increase the volume of contaminated water that must be extracted and treated. Further, the creek flows through a residential area where, if the on-site treatment system were to fail, a threat to human health could result. Therefore this discharge alternative was not carried forward for further evaluation.

Treatment with reinjection was not carried forward because the aquifer could not accept the anticipated flow in any of the proposed extraction schemes. Therefore, an off site discharge would also be required using reinjection. Operational problems such as clogging of the well screen, plugging of the formation or possibly having to excavate part of the multimedia cap for maintenance of the injection well are expected with reinjection. Those problems could reduce the effectiveness of any extraction scheme. To be compatible with the cleanup levels for the groundwater, reinjected water has to be at least as clean as the ultimate groundwater cleanup levels. This could cause increased treatment cost relative to discharge to the POTW.

The treatment process developed for the extracted groundwater to be discharged to the POTW was designed to be able to achieve pretreatment standards that were preliminarily identified by the City of Seymour and the IDEM. The City of Seymour, under an authorized pretreatment program pursuant to 40 CFR 403.5, has the authority to establish pretreatment regulations and criteria. The City consults with IDEM when implementing the pretreatment program. These preliminary pretreatment standards are subject to revision. The treatment process would most likely remain the same under the other two discharge alternatives. Refinements would be likely, however, due to more stringent discharge criteria.

The treatment process consists of an air stripper followed by mixed media filtration, followed by carbon adsorption.

The purpose of the air stripper is to remove strippable organic compounds which are present in the groundwater in high concentrations. Vapor phase carbon treatment may be needed and is included in the cost analysis in this document. Air emission levels must be monitored and a determination of the public health risk associated with the emissions made. Evaluation of estimated emission levels indicates a maximum of a 3.6×10^{-6} excess cancer risk level at 167 meters from the site. This risk level means there could be 3.6 additional cases of cancer in a population of 1,000,000 if that population was located 167 meters from the site for a 70 year period. This risk was based on the summation of 9 individual risks. (See memorandum from Steven Rothblatt to Richard Bartelt, September 18, 1986) (Record #_____). Based on actual population in the Seymour area, the estimated emission levels would result in 2.7×10^{-3} (.0027) additional cases of cancer within a 50 km radius of the site in a 70 year period.

This risk is considered acceptable at this time for initiation of the plume stabilization project without vapor phase carbon treatment because: 1) the risk is within EPA's acceptable range of excess carcinogenic risk, 2) the plume stabilization project is not expected to pump the flow volume used in the risk assessment, 3) the quality of the water being extracted by the plume stabilization well is expected to contain lower concentrations of carcinogenic compounds than was used in the risk assessment, 4) the short period of operation prior to implementation of the final extraction and treatment system, and 5) no exposure to humans because of institutional controls. Therefore, the plume stabilization project will be initiated but actual monitoring results from the plume stabilization project treatability studies should be evaluated when these results become available. Any combined cancer risk greater than 1×10^{-6} caused by air emissions must result in treatment of the emissions. (See Memorandum from Steven Rothblatt to Richard Bartelt, September 18, 1986) (Record #_____)

The mixed media filter will remove suspended solids and precipitates that form from oxidation of iron from the groundwater in the air stripper.

The carbon adsorbers are necessary to remove less volatile organic compounds. The low discharge criteria for phenol makes carbon adsorption a required part of the treatment system.

Estimated present worth for a 150 gpm treatment system is $6,115,000.

The treatment process may be altered when discharge criteria are established pursuant to the authorization procedure to discharge to the POTW.

B. Deep Aquifer

Contamination in the deep aquifer has only consistently been detected in monitoring well 222. The contamination levels detected within the site boundary are above the cleanup standards, but contamination above cleanup standards has not been detected at or beyond the site boundary. Therefore, remedial technologies specifically in relation to the deep aquifer were not evaluated in the FS. Required actions are described in the section discussing the selected alternative.

Soil Remediation Technologies

The soil remediation technologies passing initial screening in the FS include:

1. capping,
2. soil removal/on site disposal,
3. soil removal/off site disposal,
4. onsite incineration,
5. in-situ soil washing, and
6. in-situ vapor extraction.

These technologies were evaluated separately from the groundwater technologies, but there is an important linkage between the time of restoring the shallow aquifer and the soil contamination. The soil serves as the source of contamination to the shallow aquifer which in turn is the source of contamination to the deep aquifer. The source of contamination to the shallow aquifer must be eliminated to allow the shallow aquifer to be restored and to prevent additional contamination of the deep aquifer.

1. Capping

Based upon the initial screening of technologies, the capping option merited further evaluation as a remedial action or a component of a more comprehensive remedial action. The preliminary design of the cap used in cost analysis had a 3% slope, and successive layers of a two foot vegetative cover, a geotextile layer, a synthetic drainage layer, an 80 mil synthetic liner, and 2 feet of compacted clay. (See FS, Vol. 1, Chapter 4.3.1) (Record #_____) The design is consistent with RCRA closure requirements set forth at 40 CFR Part 264, Subpart G. The cap is estimated to take 2 construction seasons to install.

Estimated present worth is $5,794,000.

2. Soil Removal/Offsite Disposal

The soil removal option analysis was based on a cleanup level that represents a 1×10^{-6} excess lifetime cancer risk for residential use. This risk is within the acceptable range under current EPA guidance. These levels also should provide adequate protection to the groundwater. The volume of soil is estimated at 95,800 cubic yards or 7,900 truck-loads. Disposal is assumed to take place within a 250 mile radius of the site over a period of .5 to three years.

Estimated present worth is $40,805,000.

3. Soil Removal/Onsite Disposal

Removal of soil and disposal in an onsite RCRA compliant landfill was evaluated in the FS. As in the above option, 95,800 cubic yards of soil would be removed. The size of the RCRA compliant landfill would be approximately 4.5 acres in area and 40 feet high at its center.

Replacement costs for cap components are included for cost analysis purposes. Construction of the landfill would take at least two but possibly three construction seasons to complete.

Estimated present worth is $9,229,000.

4. On-site Incineration

Rotary kiln was proposed in the FS as the most effective and appropriate incineration technology and was used for cost estimation purposes. Six and a half years were estimated to be needed to thermally treat the estimated volume of contaminated soils and other waste.

This option is considerably more complex to implement and operate than other soil technologies. There is limited experience with the process needed to demonstrate compliance with the technical requirements for onsite, temporary incinerators and making this demonstration could take a considerable amount of time. Operation of an incinerator is also very labor intensive and requires skilled operators. The FS assumed it would take at least 6.5 years to complete incineration. The solid residuals from the incineration process would need to be demonstrated to not pose a threat to public health, welfare and the environment. For the purposes of the FS it was assumed the solid residuals would be hazardous and must be disposed of in an onsite RCRA compliant landfill.

Estimated present worth is $28,833,000.

5. In-situ Soil Washing

The FS stated that this technology is attractive because it removes the more soluble contaminants from the soil by accelerating their leaching into the groundwater and then collecting the contaminated groundwater. To implement this technology at the Seymour site, surface soil that was placed over the site after the 1982 surface cleanup would have to be removed. The relatively lower permeability of this surface cover material would inhibit infiltration of water applied to the soil.

A pilot study would possibly have to be performed on a portion of the site to develop operational and effectiveness information. It is estimated it will take 3-6 years to maximize the effectiveness of the soil washing process. All contaminants would not leach from the soil, so some contaminants would remain in the soil and a cap would be needed.

Estimated present worth is $8,675,000.

6. In-situ Vapor Extraction

In-situ soil vapor extraction takes advantage of the volatile nature of some of the contaminants to remove them from the unsaturated zone. Vertical extraction wells were used in cost estimates. However, in areas where the water table is high, horizontal extraction pipes may be more

effective. (See FS, Vol. 1, page 4-97 and Hydro Geo Chem Report, April 28, 1987) (Record #_____ and Record #_____)

A cap must be installed on-site in conjunction with any soil vapor extraction system to prevent leaching of contaminants to the groundwater, to prevent direct contact with contaminated soil and to prevent run-off of contaminated water or sediment.

Estimated present worth is $9,554,000.

REMEDIAL ALTERNATIVES DEVELOPMENT

The technologies that passed through the initial screening in the FS were then developed and evaluated, according to the criteria in the NCP, in Chapter 4 of the FS. (Record #_____) The technologies were then combined in the FS into a number of remedial alternatives to address all the public health and environmental risks posed by the Seymour site. The NCP requires that alternatives be developed and evaluated for the following categories:

- No action.
- An alternative for treatment or disposal at an off-site facility approved by U.S. EPA.
- An alternative which does not attain applicable or relevant public health and environmental standards but will reduce the likelihood of present or future threat from hazardous substances and provides significant protection to public health, welfare and the environment.
- An alternative which attains all applicable and relevant federal public health and environmental requirements.
- An alternative which exceeds applicable and relevant federal public health and environmental requirements as currently known.

The alternatives developed in the FS were also developed with the intent of meeting applicable or relevant and appropriate State requirements. These requirements are identified in a correspondence from Harry John Watson III, to Lawrence Kyte, August 8, 1986. (Record #_____)

In addition, alternatives were included in the FS that addressed the cleanup standards required by Section 121 of SARA. The NCP required that EPA develop these types of alternatives before the passage of SARA, and it was EPA's policy to do so. (See 40 CFR Section 300.68)(n))

Alternatives developed included treatment alternatives that minimized the public health and environmental risks associated with long term manage-

ment of residuals and alternatives involving treatment as a principal element that permanently and significantly reduces the toxicity, mobility, or volume of hazardous substances at the site. Containment options were also evaluated in the FS.

Common Features

All alternatives analyzed in the FS, except the no action alternative, included a number of common features that are necessary to supplement the major soil and groundwater components. These common features are:

- The existing onsite buildings would be demolished and disposed of in accordance with the alternative selected. The volume of building rubble is estimated at 2,200 cubic yards. The buildings must be razed in order to allow for the installation of the cap, soil removal or the implementation of vapor extraction or soil washing.

- Deed and access restrictions and/or other institutional controls would be placed on the SRC site property and the area surrounding the site. Deed restrictions would prohibit excavation of soil, building construction on site and ground water extraction. Off site groundwater withdrawal restrictions would be necessary to prevent any adverse impacts to the proposed extraction well system. These would deal primarily with prohibition of the installation of large volume wells on neighboring lands that could negatively impact the recovery patterns of the extraction well system. Use of the adjacent land owned by the City of Seymour would have to be limited in order to prevent a public health threat during operation of the vapor extraction system. Access to the site would be controlled by fencing, and the fence would be posted with warning signs. The timing of the restrictions may vary depending on the alternative and when cleanup standards are achieved. The precise location, magnitude, and timing of the restrictions would be determined during the design phase of the remedial action.

- Contaminant migration would be assessed through a regular groundwater and surface water monitoring program. Monitoring is necessary to determine the effectiveness of any remedial action.

- One foot of sediment would be removed from the Northwest Creek and from the ditch just north of the site as shown on Figure 5.4. The approximate volume of sediment to be removed would be 800 cubic yards. The sediments would be addressed with the same technologies as the soils for the various alternatives. The sediments pose a potential threat to aquatic life in the ditch and creek.

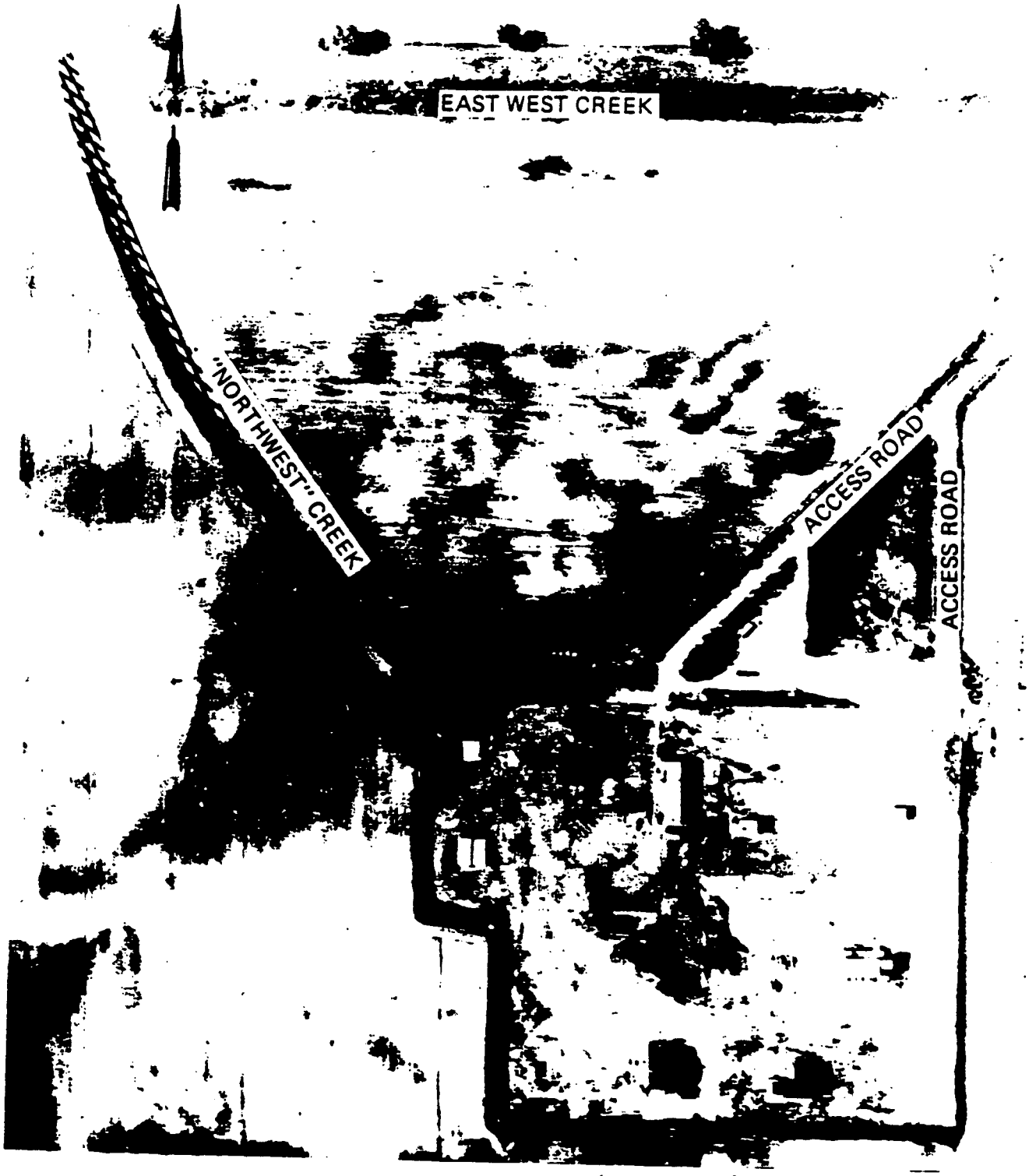

FIGURE 5.4
SEDIMENT REMOVAL AREAS

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- Temporary runon and runoff controls would be constructed at the site as needed. These controls would prevent any off-site migration of contaminants by surface water during construction activities on the site.

EPA, in Chapter 6 of the FS, added the following feature to be included in all remedial alternatives.

- Residential wells in the Snyde Acres subdivision would be properly abandoned if consent is obtained from their owners.

This feature is desirable to eliminate potential conduits for contamination to enter the shallow aquifer from residential wells which are no longer being used. Under a previous response action, the residences have been hooked up to the City of Seymour's water supply distribution system.

The Assembled Alternatives

The assembled alternatives, except the no-action alternative, include the common features described above and specific soil and groundwater components.

The assembled alternatives are:

1. No action.
2. Offsite soil disposal/Groundwater extraction and treatment.
3. Onsite soil disposal/Groundwater extraction and treatment.
4. Onsite soil incineration/Groundwater extraction and treatment.
5. Multi-media cap/Groundwater extraction and treatment.
6. In-situ soil washing, multi-media cap/Groundwater extraction and treatment.
7. Vapor extraction, multi-media cap/Groundwater extraction and treatment.

An alternative was considered for each category required by the NCP. (See FS, Vol. 1, Figure 5.2) (Record # _____) The determinations in the FS as to attainment, exceedance or non-attainment of applicable and relevant public health and environmental standards was made prior to SARA being enacted.

The total capital cost, total operation and maintenance cost and total present worth are presented below for each alternative.

Alternative	Total Capital Cost	Total O&M Cost	Total Present Worth*
1	0	0	0
2	$44,976,000	$4,659,000	$49,635,000
3	12,275,900	5,235,000	17,510,000
4	28,281,000	8,700,000	36,981,000
5	9,034,000	4,929,000	13,963,000
6	11,845,000	5,614,000	17,459,000
7	10,536,000	7,200,000	17,736,000

*Present worth is based on a 10 percent interest rate and a 30 year O&M period.

In accordance with the NCP, a detailed analysis of the assembled alternatives was performed. The factors evaluated were technical considerations, public health, welfare and environmental impacts, institutional concerns and cost.

A summary of the detailed evaluation of alternatives is presented in Table 5.14 from the FS.

SELECTED ALTERNATIVE

The alternative recommended by EPA in the FS was a modification of number 7: Soil vapor extraction and multimedia cap/Groundwater extraction and treatment. This alternative, with minor modifications discussed below, is the selected remedy for the site.

The criteria for selecting this remedy are contained in the NCP at 40 CFR Part 300.68(j) and Section 121 of the Superfund Amendments and Reauthorization Act of 1986, Public Law 99-499, 100 Stat. 1613 (1986) or "SARA". In addition, a December 24, 1986 memorandum titled "Interim Guidance on Superfund Selection of Remedy" from J. Winston Porter, Assistant Administrator to Regional Administrators and other regional management was taken into consideration in selecting an alternative.

The vapor extraction system selected for implementation at the Seymour site would remove a substantial amount of the estimated 200,000 pounds of volatile organic compounds (VOCs) that are present in the soil in high concentrations. The VOCs are generally the most mobile and toxic compounds present at the site. The endangerment assessment identified this group of compounds as posing the greatest threat to human health via groundwater ingestion since the majority of these compounds are carcinogens and are present in high concentrations. (RI, Vol. I, Page 9-73) (Record #____) The non-volatile organic compounds would remain in the soil. However, these compounds are relatively immobile and may biodegrade over time. The application of soil nutrients in order to stimulate biodegradation is included in the selected alternative. This alternative utilizes treatment technologies and reduces the mobility, toxicity and volume of hazardous substances at the Seymour site to the maximum extent practicable.

A detailed pilot study was envisioned in EPA's recommended alternative in the FS. However, based on reports submitted by the defendants in this case (see Hydro Geo Chem Report and Geraghty and Miller Report, both dated April 28, 1987) (Record #_____and #_____), it is reasonable to gather additional site data needed to design a soil vapor extraction system, apply nutrients to stimulate biodegradation, install the soil vapor extraction system, and then construct the multi-media cap. This phasing of implementation of the system minimizes the additional time the contaminated soils are exposed to the environment and is therefore preferable to the pilot study proposed in the FS.

Table 5.14
DETAILED EVALUATION SUMMARY MATRIX

	Alternative 1 No Action	Alternative 2 Offsite Soil Disposal/Groundwater Extraction and Treatment	Alternative 3 Onsite Soil Disposal/Groundwater Extraction and Treatment	Alternative 4 Onsite Soil Incineration/Groundwater Extraction and Treatment
Technical Criteria	Allows continued release of hazardous substances causing unacceptable public health risk.	Reduces risk of direct contact with soil or leaching of contaminants to groundwater. Soil excavation and transport is effective and reliable. Due to the large volume of soil excavated completion could take up to 2.5 years. Disposal at a RCRA landfill does not result in contaminant destruction. Performance of ultimate disposal at a RCRA landfill is considered reliable. Shallow aquifer pumping time will require 40 to 60 years to reach the $1x10^{-6}$ groundwater cancer risk level.	Reduces risk of direct contact with soil or leaching of contaminants to groundwater. Onsite disposal in a RCRA type landfill is reliable. Onsite landfill will require regular maintenance to assure its long term effectiveness. Due to the phased construction of the landfill installation will be fairly difficult. Completion could take up to two years. Disposal onsite does not result in contaminant destruction. Shallow aquifer pumping time will require 40 to 60 years to reach the $1x10^{-6}$ groundwater cancer risk level.	Reduces risk of direct contact with soil or leaching of contaminants to groundwater. Incineration has been proven effective in destroying organic contaminants to 99.99 percent. Operation is complex and requires full-time trained operating personnel. Implementation requires performance testing and air monitoring. Completion could take up to 6.5 years. Ash disposal will be in a onsite RCRA-type landfill. Shallow aquifer pumping time would require 40 to 60 years to reach the $1x10^{-6}$ groundwater cancer risk level.
Public Health And Welfare Criteria	Public health risks exist for direct contact with excavated soil. Cancer risk level in soil ranges between $3x10^{-3}$ to $6x10^{-5}$. Public health risks also exist for ingestion and absorption of groundwater. Cancer risk level in shallow groundwater ranges between $1x10^{0}$ to $1x10^{-2}$. Exposure limited to local population. Duration of potential exposure is indefinite for soils and greater than 100 years for shallow groundwater.	Cancer health risk from soil reduced to $<1x10^{-6}$ onsite. Shallow aquifer concentrations would be less than the $1x10^{-6}$ cancer risk level after 40 to 60 years of pumping.	Cancer health risk from direct contact with soil reduced to $<1x10^{-6}$ onsite. Landfill will require long-term maintenance to assure its effectiveness. Shallow aquifer concentrations would be less than the $1x10^{-6}$ cancer risk level after 40 to 60 years of pumping.	Cancer health risk from soil reduced to $<1x10^{-6}$ onsite. Potential for impacts from air emissions if incenerator is run improperly. Shallow aquifer concentrations would be less than the $1x10^{-6}$ cancer risk level after 40 to 60 years of pumping.
Environmental Criteria	Local vegetation and burrowing animals may be affected through uptake or direct contact with onsite soil. Food chain bioconcentration may affect other local terrestrial or aquatic animals.	Soil exposure risk reduced for terrestrial animals and aquatic organisms.	Soil exposure risk reduced for terrestrial animals and aquatic organisms.	Soil exposure risk reduced for terrestrial animals and aquatic organisms.
Institutional Criteria	Uncontrolled hazardous waste site does not meet the goals of CERCLA and RCRA. Shallow aquifer is violation of $1x10^{-6}$ cancer risk level.	All applicable and relevant standards will be met. CERCLA goals will be met. Since wastes are to be disposed of offsite, RCRA generator and transporter requirements will require compliance. Wastes must be disposed of at an EPA approved facility.	All applicable and relevant standards will be met. CERCLA goals will be met. Since wastes will be disposed of onsite technical compliance with RCRA regulations must be met. Local zoning and building codes must also be complied with.	All applicable and relevant standards will be met. CERCLA goals will be met. Residue may be delisted which will then require less stringent final disposal. No permits required however must follow technical requirements. Local zoning and building codes must also be complied with.
Total Present Worth	0	$49,635,000	$17,510,000	$36,981,000

Table 5.14
(continued)
DETAILED EVALUATION SUMMARY MATRIX

	Alternative 5 Multimedia Cap/Groundwater Extraction and Treatment	Alternative 6 In-situ Soil Washing, Multimedia Cap/Groundwater Extraction and Treatment	Alternative 7 Vapor Extraction, Multi-Media Cap/ Groundwater Extraction and Treatme
Technical Criteria	Reduces risk of direct contact with soil or leaching of contaminants to groundwater. Onsite capping is reliable. The cap will require regular maintenance to assure its long-term effectiveness. Completion of the cap could take up to two years. Capping does not result in contamination destruction. Shallow aquifer pumping time will require 25 to 39 years to reach the $1x10^{-6}$ groundwater cancer risk level.	Reduces risk of direct contact with soil and long-term leaching of contaminants to groundwater. In-situ soil washing will need to be piloted to determine its effectiveness with the SBC site conditions. The in-situ soil washing system will be operated for about 3 to 6 years. See Alternative 5 for capping discussion. Shallow aquifer pumping time will require 30 to 45 years to reach the $1x10^{-6}$ groundwater cancer risk level.	Reduces risk of direct contact with soil and long-term leaching of contaminants to groundwater. Soil vap extraction will need to be piloted to determine its effectiveness with the SBC site conditions. The soil vapor extraction system will be operated for about 1 to 3 years. See Alternative 5 for capping discussion. Shallow aquifer pumping time will require 28 to 42 years to reach the $1x10^{-6}$ groundwater cancer risk level.
Public Health and Welfare Criteria	Cancer health risk from direct contact with soil reduced to $<1x10^{-6}$ onsite. Cap will require long-term maintenance to assure its effectiveness. Shallow aquifer concentrations should be less than the $1x10^{-6}$ cancer risk level after 25 to 39 years of pumping.	Cancer health risk from direct contact with soil reduced to $<1x10^{-6}$ onsite after cap has been constructed. Cap will require long-term maintenance to assure its effectiveness. For the initial 3 to 6 years soil washing will accelerate leaching of contaminants into the shallow groundwater. This impact will be mitigated through a properly operated groundwater extraction system. Shallow aquifer concentrations should be less than the $1x10^{-6}$ cancer risk level after 30 to 45 years of pumping.	Cancer health risk from direct contact with soil reduced to $<1x10^{-6}$ onsite after the cap has been constructed. Cap will require long-term maintenance to assure its effectiveness. For the initial 1 to 3 years potential for air release of volatile organic compounds exist. This potential impact will be mitigated through proper operation and maintenance of the GAC air treatment sytsem. Shallow aquifer concentrations should be less than the $1x10^{-6}$ cancer risk level after 28 to 42 years of pumping.
Environmental Criteria	Soil exposure risk reduced for terrestrial animals.	Soil exposure risk reduced for terrestrial animals after cap is constructed.	Soil exposure risk reduced for terrestrial animals after cap is constructed.
Institutional Criteria	All applicable and relevant standards will be met. CERCLA goals will be met. Since construction will take place onsite local zoning and building codes must be complied with.	All applicable and relevant standards will be met. CERCLA goals will be met. Since construction will take place onsite local zoning and building codes must be complied with.	All applicable and relevant standards will be met. CERCLA goals will be met. Since construction will take place onsite, local zoning and building codes must be complied with.
Total Present Worth	$13,963,000	$17,459,000	$17,736,000

The multi-media cap would provide protection from direct contact with the remaining contaminants and substantially reduce the threat of long-term migration of remaining non-strippable contaminants into the environment.

The groundwater extraction component of the selected remedial action is scheme 1. Scheme 1 includes downgradient extraction wells at the site boundary in combination with the plume stabilization well. The goal is to meet the cleanup levels listed in a later section of this document and to prevent uncontaminated portions of the shallow aquifer from being contaminated above these cleanup levels.

This scheme is nearly as effective in restoring the aquifer to cleanup levels as scheme 2, which was recommended in the FS. According to modeling projections, scheme 2 is advantageous because it will restore the aquifer quickly and maintain a hydraulic gradient from the deep aquifer toward the shallow aquifer. However, scheme 2 adds an additional level of operational and maintenance difficulty because of the injection well. If the integrity of the cap is compromised for maintenance of the injection well included in scheme 2, additional leaching of contaminants from the soil to the groundwater could take place. Additional leaching would prolong groundwater quality restoration. Scheme 1 also costs less than scheme 2. The simplicity in operation and maintenance of scheme 1 makes it the selected groundwater extraction component. (See Fetter correspondence, July 2, 1987 and Geraghty & Miller Report, April 28, 1987) (Record #_____and Record #_____)

Scheme 3 costs considerably more than the other two schemes and is much less reliable because of the difficulty of installing the slurry wall and the potential failure of the slurry wall.

For the deep aquifer, additional evaluation, and extraction and treatment if necessary, are required as part of the selected remedy. The wells should be of adequate design, number and location to allow for rapid detection of contaminants migrating off-site and to enable extraction of contaminated groundwater if necessary. Part of this evaluation should include a time-series analysis of water quality from monitoring well 222. This will aid in determining the consistency of the contamination and possibly the extent of contamination near this monitoring well. Extraction of contaminated groundwater for treatment and discharge should occur if contaminant concentrations above the cleanup levels are detected at or beyond the site boundary. Treatment and discharge can be performed in the same manner as groundwater extracted from the shallow aquifer. The treatment system for the shallow aquifer must be sized or provisions made for upgrading the system for the potential flow from the deep aquifer. In addition to immediate pumping of the deep aquifer, if concentrations exceeding the cleanup standards are detected, a plan for further investigation or additional remedial action must be prepared.

The groundwater treatment and discharge components of the selected remedy are air stripping, mixed-media filtration and carbon adsorption with the treated water being discharged to the sewer system leading to the Seymour

POTW. The treatment components can be modified to most efficiently meet discharge criteria ultimately to be set by the POTW. (See discussion on pages 37-40) The discharge criteria will be established to prevent upset of the POTW, pass through of contaminants to the East Fork of the White River and interference or accumulation in the POTW's sludge.

In addition to the soil and groundwater operable units, the selected remedy also includes the features common to all alternatives, except no action. These features are discussed on page 19 above.

Alternative 1, no action, is not acceptable for the Seymour site because of the existing and potential threats to human health and the environment. These risks were summarized earlier in this document.

Alternative 4, which includes incineration, has the distinct advantage that if operated properly, it would destroy the organic hazardous substances present in the soil. For certain waste types, this technology may be appropriate, but at the Seymour site, the volatile organics pose the main threat to human health and the environment, and vapor extraction is a less costly and mechanically simpler system for removing VOCs. In addition, there are safety and environmental risks associated with incineration technology. Other disadvantages associated with incineration are the potential long time needed to obtain approval to operate, the disposal of ash and the total system cost. The ash must be handled as a hazardous waste unless it can be demonstrated it is not a threat to human health and the environment. The cost for the incineration alternative is more than twice the cost for the selected vapor extraction alternative. The estimated cost of incinerating soil has a high degree of uncertainty based on the limited amount of experience with incineration of soils. On balance, it is EPA's judgment that for this site, the benefits that can be realized from the vapor extraction alternative are superior to the incineration alternative due to the complexity of implementation, the safety and environmental risks, and the high cost of incineration in relation to other effective alternatives.

Alternative 6, in-situ soil washing, has many of the same advantages as vapor extraction, such as enhancing natural processes to reduce the contaminant concentration, and minimizing excavation. From the human health and environmental perspective, however, in-situ soil washing creates the potential for relatively less mobile contaminants to be flushed into the aquifer that, under natural conditions, would take many years to migrate to the groundwater or would never reach the aquifer if the site was capped. Once the contaminants reach the shallow aquifer, the groundwater extraction system may not capture these relatively immobile compounds because of their slow migration rates; thus, the potential remains for long-term public health and environmental risks from groundwater contamination. This risk is unnecessary since the vapor extraction system would remove the VOCs, which are of primary concern, by extracting them from the surface and a cap would be installed to prevent additional leaching of contaminants to the shallow aquifer. In addition, in order for soil washing to be implemented at the Seymour site, the upper one foot of soil would need to be removed, or otherwise altered to increase its permeability. This soil cover was placed on the site's surface after the surface clean-

up was performed in 1983. It has a low enough permeability to limit infiltration into the highly contaminated soils, thereby reducing the effectiveness of the washing process. As proposed in the FS study, this soil would be placed in a RCRA-type landfill in the triangular area in the northeast part of the site. The need for soil excavation also causes soil washing to be less suitable and desirable for implementation at the Seymour site compared to vapor extraction. The cost of this alternative is comparable to that of vapor extraction.

Alternative 2, which includes offsite soil disposal at an EPA-approved facility, is not selected for several reasons. Primarily, SARA makes off site disposal the least preferred remedial technology. (SARA, Section 121(b)(1)) Off site disposal may not be able to be completed prior to the effective date of the RCRA land disposal restrictions for CERCLA wastes; therefore treatment of the soil would be required, adding to the cost of this alternative. (RCRA, Section 3004(d) and (e)) Excavation of the soil would create uncontrolled releases of volatile organics into the air as well as the potential for promoting the flushing of contaminants into the groundwater during rainfall. Excavation also poses a risk to the construction workers on site by increasing the potential for them to come in contact with the contaminants. The selected vapor extraction alternative requires minimal disturbance of the soil since it is an in-situ technology. Transportation of the contaminated soil increases the risk to human health, welfare, and the environment from accidents and spills along public roadways. In view of the fact that landfills are subject to leakage, long-term negative human health and environmental impacts could occur at the facility where the wastes are disposed of. Moreover, the present worth for this alternative is more than three times the cost for the selected in-situ soil vapor extraction alternative.

Alternative 3, which includes on site landfilling of the contaminated soil, has many of the same potential negative aspects as offsite landfilling mentioned in the previous paragraph. Although the risks associated with transportation would not apply, all the wastes would remain onsite. The waste volume, toxicity, and mobility would be the same. Since the wastes are not treated, they could create a long-term problem should the onsite landfill leak. The estimated cost for Alternative 3 is about the same as for the selected alternative, but EPA believes it would represent greater risks to human health/welfare and the environment and does not satisfy the statutory preference in SARA for permanent solutions and treatment to the maximum extent practical. (SARA, Section 121(b)(1) Therefore alternative 3 is not cost effective; nor does it protect public human and the environment to the same degree as the selected alternative. As in alternative 2 above, RCRA landfill restrictions may be in effect prior to completion of this remedial action. Therefore, treatment such as incineration would be necessary prior to disposal, increasing the cost of this alternative. This would make this alternative equivalent to alternative 4, which has already been discussed.

Alternative 5, which includes a multi-media cap and groundwater extraction and treatment, is not selected since EPA believes if the cap fails, there

is a significant of additional leaching of contaminants into the shallow aquifer because the soils are not treated. The statutory preference for treatment which permanently and significantly reduces the volume, toxicity or mobility of hazardous substances is not satisfied. This causes alternative 5 to be not as protective of human health and the environment as the selected alternative. (See FS, Vol. 1, pp.5-10 and 11) (Record #_____) The selected alternative includes installation of a multimedia cap, but only in combination with in-situ soil vapor extraction. It is believed that the vapor extraction component should greatly reduce the concentration of VOCs, the most mobile and toxic chemicals at the site, in the unsaturated soils.

The cost of the selected alternative is higher than the cost of alternative 5; however, EPA believes that the greater treatment and subsequent human health and environmental protection offered by the selected alternative outweighs the additional costs.

COMPLIANCE WITH OTHER ENVIRONMENTAL REQUIREMENTS AND CLEANUP STANDARDS

This section identifies the requirements of the environmental laws, regulations and policies that are applicable or relevant and appropriate standards (ARARs) for the selected alternative for the Seymour site.

Cleanup standards must insure that the remedy is protective of human health and the environment. (See SARA Section 121(d)(1))

Applicable requirements are cleanup standards, standards of control, and other substantive environmental protection requirements, criteria or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site. A requirement is "applicable" if the remedial action or circumstances at the site satisfy all of the jurisdictional prerequisites of the requirement.

Relevant and appropriate requirements are cleanup standards, standards of control, and other environmental protection requirements, criteria or limitations promulgated under Federal or State law that, while not legally "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a site, address problems or situations sufficiently similar to those encountered at the site that their use is well suited to that site.

"A requirement that is judged to be relevant and appropriate must be complied with to the same degree as if it were applicable. However, there is more discretion in this determination: it is possible for only part of a requirement to be considered relevant and appropriate, the rest being dismissed if judged not to be relevant and appropriate in a given case." (Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements, p. 3, from J. Winston Porter, dated July 9, 1987) (Record #_____)

While non-promulgated advisories or guidance documents issued by Federal or State governments do not have the status of potential ARARs, they may be considered in determining the necessary level of cleanup for protection of human health and the environment. (See Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements, from J. Winston Porter, dated July 9, 1987).

GROUNDWATER

Four groups of federal standards and criteria and other health-based levels were considered in determining the ARARs for the groundwater cleanup standards for the remedial action at the Seymour Site.

MCLG - Maximum Contaminant Level Goals established under the Safe Drinking Water Act. MCLGs are nonenforceable health goals, set at levels where no known or anticipated adverse health effects will occur in exposed people, and which allow for a margin of safety.

MCL - Maximum Contaminant Levels established under the Safe Drinking Water Act. These are the maximum contaminant concentrations allowed in regulated public water supplies. Levels are based on a chemical's toxicity, treatability (including cost consideration), and analytical limits of detection.

RCRA Groundwater Protection Standards - RCRA Groundwater Protection Standards established under 40 CFR Section 264.94 include Background Concentrations, Maximum Concentration Limits, and Alternate Concentration Limits (ACLs). These standards are specified in permits issued to hazardous waste management facilities pursuant to RCRA.

WQC - Ambient Water Quality Criteria for Human Health established under the Clean Water Act. The original WQC assumed that people drank contaminated surface water and ate contaminated fish that lived in that water. The Superfund program has adapted these criteria to groundwater by calculating the corresponding contaminant concentration for exposure to contaminated drinking water alone. (Superfund Public Health Evaluation Manual, October 1986) (Record #_____)

Potential ARARS

A. Safe Drinking Water Act--MCLGs and MCLs apply at the tap to "public water systems," which are water systems having at least 15 service connections or regularly serving at least 25 individuals. (42 U.S.C. section 300(f)(4)) A public water system has not been contaminated by the Seymour site; therefore, SDWA standards are not "applicable" to the site. Whether these standards are "relevant and appropriate" to the site is discussed below.

   1. MCLGs--
      Section 121(d)(2) of SARA mandates that remedial actions require a level or standard of control that attains MCLGs if they are relevant and appropriate under the circumstances at a site. As cleanup goals, MCLGs may be rele-

vant to remedial actions at Superfund sites where the groundwater at the site is or may be used for drinking water. Although most area residences are connected to the Seymour municipal water system, the aquifers at the Seymour site are used for drinking water. (See RI, Vol. 1, pp. 9-21) (Record #_____) MCLGs may therefore be "relevant" to the remedial action at the site; however, they are not "appropriate." EPA's "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements" states on page 9 that MCLs are generally the relevant and appropriate cleanup standard for groundwater that may be used for drinking. (Record #_____) (MCLs are discussed below). Unlike MCLs, MCLGs are based entirely on health considerations and do not take cost or feasibility into account. As health goals, MCLGs are set at levels where no known or anticipated health effects may occur, including an adequate margin of safety. MCLs are required to be set as close as feasible to their respective MCLGs and are set at the same levels as MCLGs for noncarcinogens. MCLs are the standards for public water supplies. EPA has therefore determined that MCLs, rather that MCLGs, are relevant and appropriate as cleanup standards for groundwater that may be used for drinking water, such as the aquifers at the Seymour site. (See also correspondence dated May 21, 1987 from Lee M. Thomas to the Honorable James J. Florio) (Record #_____)

2. MCLs - MCLs are "relevant" to the remedial action at the Seymour site because the aquifers are or may be used for drinking water. MCLs are "appropriate" because they set enforceable drinking water standards for public water supplies. (See July 9, 1987 "Interim Guidance on Compliance With Applicable or Relevant and Appropriate Requirements" and the May 21, 1987 Lee M. Thomas letter to the Honorable James J. Florio) (Record #_____and #_____) As MCLs apply to water at its point of distribution ("at the tap"), these levels are appropriate for groundwater at this site because residential wells that would use the aquifers generally have minimal or no treatment. Thus, these standards will have to be applied in the groundwater itself to ensure safe levels at the tap.

8. Resource Conservation and Recovery Act (RCRA) - The RCRA regulations applicable to facilities treating, storing or disposing of hazardous waste became effective November 19, 1980. (See 40 CFR sections 264.1 and 265.1). The Seymour facility ceased operating and accepting wastes prior to that date. These regulations are therefore not legally "applicable" to the Seymour facility for the groundwater cleanup. Whether RCRA regulations are "relevant and appropriate" to this site is discussed below.

1. Listed Maximum Concentration Limits - The groundwater protection standards at 40 CFR Section 264.94(a)(2) list maximum concentration limits for fourteen compounds. There are listed levels for three contaminants of concern at the Seymour site. The levels listed at 40 CFR 264.94(a)(2) are 50 ug/l for lead, 10 ug/l for cadmium, and 1,000 ug/l for barium. These levels are based on the Safe Drinking Water Act MCL, which is set at a level protective of human health and the environment. These levels are therefore "relevant and appropriate" for the groundwater cleanup at the site.

2. Alternate Concentration Limits (ACLs) - EPA may establish ACLs in lieu of background levels or listed maximum contaminant levels if the ACL "will not pose a substantial present or potential hazard to human health or the environment as long as the [ACL] is not exceeded." 40 CFR § 264.94(b). Section 121(d)(2)(B)(ii) of CERCLA restricts the use of ACLS as cleanup standards for on-site cleanups that assume a point of human exposure beyond the facility's boundaries. The selected remedy for the Seymour site does not assume a point of human exposure to contaminants exceeding ACLs beyond the facility boundary: the cleanup standards are required to be met at the boundary. Therefore, the CERCLA Section 121(d)(2)(B)(ii) restriction on the use of ACLs as cleanup standards does not apply at this site. ACLs are "relevant and appropriate" requirements for the groundwater cleanup at the Seymour site, except for those contaminants with a maximum concentration limit listed at 40 CFR Section 264.94(a)(2) (discussed above) that are sufficiently protective of human health and the environment. When the overall health based cleanup standards of 1×10^{-5} at the site boundary, 1×10^{-6} at the nearest receptor, and the HI of 1 are met, by definition the concentrations of the the individual contaminants in the groundwater will not present a threat to human health and environment. Those residual concentrations are the ACLs.

3. Background Levels - RCRA groundwater protection regulations require that the concentration of a hazardous constituent must not exceed background or the listed maximum concentration limit or the ACL. The listed maximum concentration limits for barium, lead and cadmium, must be met at the site. ACLs for other contaminants will be based on the remaining concentration of a particular contaminant in the groundwater at the time the overall level of protection for human health and the environment is met. Background levels are therefore not relevant and appropriate cleanup standards for the Seymour site.

C. Water Quality Criteria (WQC) Established Under the Clean Water Act

The Clean Water Act is not legally "applicable" to the groundwater cleanup at the site, with the exception of pretreatment requirements (discussed below) for discharge of treated groundwater to the Seymour POTW. With this exception, there is no current or planned point

source discharge from the facility to surface waters. Section 121(d)(2) of SARA requires remedial actions to attain WQC where the criteria are "relevant and appropriate under the circumstances of the release or threatened release." This determination is based on the designated or potential use of the water, the media affected, the purposes of the criteria, and the latest information available.

The aquifers beneath the site are current and potential sources of drinking water, and the shallow aquifer at times discharges to Northwest Creek and the Von Fange Ditch. Therefore, WQC that have been adapted for drinking water only (in the Superfund Public Health Evaluation Manual, Record #_____) and WQC for protection of freshwater aquatic organisms are "relevant and appropriate" for the groundwater cleanup for the site.

Other Standards Necessary to Protect Human Health and the Environment

In addition to these potential ARARs, the following non-promulgated advisory standards were considered in determining groundwater cleanup levels that are necessary for chemicals for which there are no ARARs or where an ARAR is not sufficiently protective of human health or the environment.

HA - Health Advisories developed under the Safe Drinking Water Act for contaminants not having a MCL. Health Advisories may apply to short term exposure, long term exposure or chronic exposure.

RfD - Verified Reference Doses developed by an intra-agency EPA work-group. These values represent an acceptable daily intake of noncarcinogenic chemicals (or, for a carcinogen, an acceptable daily intake of that chemical considering its noncarcinogenic toxicity). The corresponding acceptable concentration of a contaminant in drinking water is calculated by assuming that a typical 70 kg person drinks 2 liters of water per day.

$$\text{Concentration (mg/l)} = \text{RfD(mg/kg/d)} \times [70\ \text{kg}]/[2\ \text{l/d}]$$

PF - Potency Factors developed by EPA to characterize the potency of a given carcinogen. These factors are used to estimate the incremental increase in cancer in a large group of people due to chronic exposure to a carcinogen at a given concentration. The calculations assume that a typical person weighs 70 kg and drinks 2 liters of contaminated water per day. Assuming a linear dose response curve (appropriate for risk below 0.01):

$$\text{Risk} = \text{PF}((\text{mg/kg/d})^{-1}) \times \text{concentration (mg/l)} \times [2\ \text{l/d}] / [70\ \text{kg}]$$

Determination of Cleanup Standards

The MCLs, which are ARARs for groundwater at the Seymour site, are used as cleanup levels where available and where they provide sufficient

protection of human health and the environment, taking into account cumulative health effects.

U.S. EPA's policy on cleanup standards for Superfund sites considers an excess lifetime cancer risk of 1×10^{-4} to 1×10^{-7} to be an acceptable cleanup level. (See July 9, 1987 "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements," page 9) (Record #_____) The exact excess cancer risk acceptable is based on site specific circumstances. The 1×10^{-6} risk level has generally been applied at Superfund sites in the past.

A. Carcinogenic Effects

As discussed above, MCLs are ARARs for the groundwater cleanup at the Seymour site. At the Seymour site, chloroform cleanup standards are being compared to the MCL for total trihalomethanes because there is no specific standard for chloroform and it is a trihalomethane.

When determining whether MCLs and other standards are protective of human health and the environment, the possible effects of simultaneous exposure to many contaminants were considered. For the carcinogenic compounds with proposed MCLs, the carcinogenic risk associated with the proposed MCL was calculated using the potency factor. The cumulative risk from exposure to these compounds is assumed to be additive, rather than synergistic or antagonistic. (See Superfund Public Health Evaluation Manual, October 1986) (Record #_____) The additive risk of the six organic carcinogens at their proposed MCLs is 4×10^{-4}. The total excess cancer risk in the groundwater at the Seymour Site for all carcinogenic contaminants (including those with no MCLs) would increase the 4×10^{-4} risk because any concentration of a carcinogenic contaminant has an associated risk. This total risk is not acceptable because it is not within EPA's acceptable risk range of 1×10^{-4} to 1×10^{-7}. (See FS Guidance and Superfund Public Health Evaluation Manual) (Record#_____and #_____) This cumulative risk level and a number of other factors create a need for cleanup standards that are more stringent than MCLs. These factors include: a large number of contaminants (both carcinogenic and noncarcinogenic) are present in the groundwater and there is a limited understanding of these contaminants' cumulative effect on human health and the environment; low levels of contaminants (below the MCLs) will continue to migrate when the extraction system is terminated; and the aquifer is a potential source of drinking water. A cumulative excess cancer risk that is more stringent than the MCLs is therefore necessary to ensure sufficient protection of human health and the environment.

EPA has determined that a cumulative excess cancer risk of 1×10^{-5} for groundwater cleanup at the Seymour site must be attained at and beyond the site boundary. This risk level is within the acceptable risk range (1×10^{-4} to 1×10^{-7}) and is appropriate for the circumstances at the site. A number of the circumstances justify this risk level.

This is a conservative risk level that will provide protection of human health. A more conservative risk level is not required to be met at the site boundary because there must be provisions during the cleanup for institutional controls on the area of the groundwater contamination plume; the current land use of the area is agricultural; and the area is zoned industrial for any future development. Also, the groundwater is currently highly contaminated which makes it more difficult to restore the aquifer.

Consistent with the FS Guidance, a 1×10^{-6} excess cancer risk must be maintained at the site's nearest receptor. (Record #_____) (See Figure A.17 on page 9 for the location of the nearest current receptor in the shallow aquifer) This more stringent cleanup standard is necessary because no contamination has been detected at this receptor to date and the well is being used for watering livestock and possibly human consumption.

The procedure that must be used for calculating the excess cancer risk level is detailed in the Superfund Public Health Evaluation Manual. (Record #_____)

The cleanup level for groundwater was not determined considering the potential carcinogenic effects from ingestion of the groundwater in combination with the risks from inhalation of air or ingestion of soil. Simultaneous exposure to contaminated air and groundwater is not expected because of the prohibition on the use of groundwater until cleanup is achieved. The air emissions from the vapor extraction system are expected to have ceased by the time the groundwater is usable. If the vapor extraction system is still in operation, the cumulative excess lifetime cancer risk from air and groundwater at the nearest receptor must not exceed 1×10^{-6}. The soil is being capped, so any direct exposure to contaminated soil is eliminated.

In addition to meeting the total cumulative excess cancer risk level of 1×10^{-5} at the site boundary, the individual MCLs for the carcinogenic compounds must also be met. The compounds to be considered in the calculation of the cumulative excess cancer risk and their MCL are:

- benzene (MCL-5 ug/l)
- chloroform (MCL-100 ug/l)
- 1,2 dichloroethane (MCL-5 ug/l)
- 1,1 dichloroethene (MCL-7 ug/l)
- 1,4 dioxane
- methylene chloride
- tetrachloroethene
- 1,1,2 trichloroethane
- trichloroethene (MCL-5 ug/l)
- vinyl chloride (MCL-2 ug/l)

This list includes all the carcinogens by the oral route of exposure that have been identified in the groundwater. This list of compounds must be revised if other compounds are identified as possible, probable or known human carcinogens.

The cumulative risk calculation shall be performed in accordance with the methods being employed by EPA in the Superfund Public Health Evaluation Manual and subsequent revisions in effect at the time the calculations are performed. The toxicity data used shall be the most current data contained in the Superfund Public Health Evaluation Manual

or available from EPA's Cancer Assessment Group.

B. Non Carcinogenic Effects

For noncarcinogenic chemicals there is also a need to establish an overall cleanup level for the ground water. Again this need arises because of the large number of contaminants in the groundwater. The method recommended to address effects of multiple noncarcinogenic chemicals is the chronic health index (HI). The method is defined in more detail in the Superfund Public Health Evaluation Manual (SPHEM), October 1986. (Record #_____)

The qualifications to the HI process identified in the Superfund Public Health Evaluation Manual are recognized. However, the HI process is a reasonable procedure to attempt to take into consideration cumulative noncarcinogenic health effects and will provide a conservative measure of the potential threat to human health from contaminants in the ground water. The justification for using this approach is based on the same site specific circumstances described in paragraph A above regarding the 1×10^{-5} excess lifetime cancer risk level.

The total HI for the following compounds shall not exceed 1.

- barium (MCL-50 ug/l)
- benzene (MCL-5 ug/l)
- copper
- 2-butanone
- cadmium (MCL-10 ug/l)
- chloroform
- ethyl benzene
- lead (MCL-50 ug/l)
- manganese
- methylene chloride
- nickel
- phenol
- tetrachloroethene
- toluene
- 1,1,1 trichloroethane
- xylenes
- vinyl chloride (MCL-2 ug/l)

In addition, for those contaminants that have MCLs, the MCL must not be exceeded.

This list was developed from compounds identified and used in the endangerment assessment performed as part of the RI. The list should be updated as additional reference doses or other information becomes available and as MCLs are established for additional compounds.

The calculation of the HI shall be performed in accordance with the Superfund Public Health Evaluation Manual and subsequent revisions. Reference doses used in this calculation shall be taken from the Superfund Public Health Evaluation Manual. (Record #_____)

The carcinogenic risk level is expected to be the ultimate factor for establishing compliance with cleanup standards because of the low concentrations associated with excess lifetime cancer risk levels.

In summary, the ARARs for groundwater cleanup standards for both the shallow and deep aquifer are the MCLs from the Safe Drinking Water Act, the listed maximum concentration limits and ACLs as discussed at

40 CFR Section 264.94, and the water quality criteria established pursuant to the Clean Water Act.

In accordance with EPA policy (See "Interim Guidance on Compliance with Applicable or Relevant and Appropriate Requirements," dated July 9, 1987) (Record #_____) the MCLs are first considered as cleanup standards for the groundwater. However, because of cumulative health risks, the MCLs were not sufficiently protective of human health. Therefore health based standards of 1×10^{-5} cumulative excess lifetime cancer risk and a chronic health index not to exceed 1, are set for the groundwater cleanup standard at the site boundary. A 1×10^{-6} excess lifetime cancer risk must be met at the nearest current receptor. In addition, the MCLs must, at a minimum, be met for a particular compound at both compliance points. Although specific concentration levels required for cleanup are not established at this time, the cumulative risk calculation and the chronic HI calculation are dependent upon the concentrations present in the ground water. The health based standard allows for evaluating different contaminants at different concentrations that may be present in the groundwater at the time when the groundwater extraction system may be terminated. Different compounds will be removed from the groundwater preferentially. The mobility and original concentration of a contaminant will be among the factors that determine the time required for removal from the groundwater. Arriving at specific concentration levels for individual contaminants based on the cumulative health risk is consistent with the requirement for an ACL under RCRA because they are protective of human health and the environment and because of the direct relationship between the health based standard and an associated concentration level. The factors in 40 CFR Part 264.94(b) were considered when the cleanup standard was determined.

The cleanup standards are consistent with and more stringent than the water quality criteria for protection of human health for consumption of water only and for the protection of fresh water aquatic organisms. The water quality criteria consider an excess cancer risk of 1×10^{-5} to 1×10^{-7} for individual compounds to be an acceptable risk range. The cleanup standard requires a cumulative excess cancer risk of 1×10^{-5} at the site boundary, so excess cancer risks for individual compounds must necessarily be within the 1×10^{-5} to 1×10^{-7} range identified in the water quality criteria document.

C. Compliance Point

The point of compliance for the ARARs, the 1×10^{-5} cumulative excess lifetime cancer risk level and the chronic HI of 1 is at and beyond the site boundary; or from a practical standpoint, the edge of the cap. The remedial action includes a multi-media cap over the site. Future use of the site is not envisioned, and deed restrictions prohibiting use of the site are a part of the remedial action. Therefore, the aquifers do not become actual or potential sources of drinking water until they reach the site boundary. The site boundary is therefore an appropriate point of compliance for groundwater cleanup standards and is consistent with 40 CFR Section 264.95. A second compliance point for the MCLs, the 1 x 10-6 cumulative excess lifetime cancer risk and the chronic HI of 1 in the groundwater is the

nearest current receptor. The compliance points apply to both the shallow and deep aquifers.

D. Technical Impracticability

The possibility exists of not being able to technically meet the cleanup levels. Therefore provisions for making such a claim must be carefully developed. Section 121(b)(2) of SARA allows for a waiver. Generally the approach to a waiver of the cleanup levels based on technical impracticability should be based on information developed during the operation of the selected groundwater extraction and treatment system. A monitoring program must be carefully designed to develop needed information. This information must then be evaluated from both an overall qualitative perspective and a quantitative perspective. The qualitative evaluation should include, among other things, water quality at extraction and monitoring wells, possible modifications to the extraction system that could help achieve cleanup levels, and an endangerment assessment of the impact of discontinuing operation of the extraction system. The quantitative evaluation should consider, among other things, a statistical analysis of contaminant concentrations over time and the cumulative mass of contaminants being removed by the extraction system compared to the mass of contaminants remaining in the aquifer. The groundwater model developed as a part of the RI must be calibrated and verified for contaminant mass transport to aid in predicting aquifer behavior and determining if cleanup levels are met at the determined compliance points.

State ARARs

Based on information supplied by the State of Indiana in an August 8, 1986 letter from Harry John Watson III to Lawrence Kyte (Record #___), State ARARS for groundwater at the Seymour site include:

1. Narrative water quality standards and non-degradation standards requiring waters to be free of substances which are acutely toxic or cause serious adverse physiological response, or are believed to be chronically toxic, carcinogenic, mutagenic or teratogenic, and

2. Numerical drinking water standards for public water supplies.

The State of Indiana has not identified these standards as more stringent than the Federal standards previously identified. Consistent with the State's narrative standards, the recommended cleanup levels have accounted for chronic health threats.

Discharge

For discharge and subsequent treatment of extracted groundwater, the ARARs are dependent on the point of discharge. The Department of Public Works of the City of Seymour and IDEM have preliminarily identified the pretreatment standards for the metal finishing and electro-plating industry to be appropriate for discharge to the Seymour sewer system of treated groundwater from the Seymour site.

These pretreatment standards are:

SUBSTANCE	MAXIMUM CONCENTRATION (mg/l)
Arsenic	1.0
Cadmium	1.0
Copper	5.0
Cyanide	1.0
Lead	1.0
Mercury	0.5
Nickel	5.0
Total Chromium	10.0
Zinc	10.0
Phenols	0.5
Oil and Grease	100.0
Total Toxic Organics	2.13
Total Suspended Solids*	13.4

*Average daily discharge for four consecutive monitoring days.

A more thorough evaluation of water quality and the POTW's ability to handle the water must be performed as a part of the plume stabilization project and as a part of the final groundwater extraction system.

This evaluation must be consistent with 40 CFR 403.5 and local POTW regulations. The major criteria considered in 40 CFR 403.5 are pass through the POTW without treatment, interference with POTW operation, and contamination of POTW sludge.

In order to discharge from a Superfund site to a POTW, certain issues identified in an April 15, 1986 memorandum entitled "Discharge of Wastewater from CERCLA Sites Into POTWs" from Henry L. Longest, Director, Office of Emergency and Remedial Response, Rebecca Hanner, Director, Office of Water Enforcement and Permits, and Gene Lucero, Director, Office of Waste Programs Enforcement, to Waste Management Division Directors, Region I-X and Water Management Division Directors Region I-X, must be evaluated.

The first issue that must be evaluated concerns the compatibility of the discharge with the POTW. An evaluation of the anticipated water quality that would reach the POTW is provided in the Work Plan for the Plume Stabilization Project. Because of the pretreatment being provided at the site prior to discharge, and the treatment and dilution of the discharge at the POTW, no "pass through" or interference with the POTW's operations or accumulation in the sludge is expected. However, this will have to be verified by continued monitoring. No hazards are expected to employees at the POTW because of the pretreatment of the discharged water. The air stripper included in the treatment scheme will greatly reduce the concentration of VOCs which could cause a hazard to employees of the POTW.

The quantity of water initially expected to be discharged during the plume stabilization project is less than 150 gpm, which is approximately

20% of the excess capacity of the Seymour POTW and approximately 15% of the average daily wastewater flow. The design capacity of the plant is 4.3 million gallons per day (mgd) and current average wastewater flow is 3.2 mgd. However, it has been noted from the Indiana Department of Environmental Management that hydraulic overloading of the plant occurs during and after periods of precipitation. (See correspondence from Jacqueline W. Strecker to David Favero, dated August 22, 1986) (Record #_____) This factor must be taken into consideration when determining the operational parameters for the extraction/treatment system.

The second point of consideration is the POTW's ability to ensure compliance with applicable pretreatment standards and requirements. The Seymour POTW has an approved pretreatment program. Monitoring reports will be provided to the Seymour POTW. The monitoring will either be performed through funding of the Superfund program, the State during the O & M period, or responsible parties conducting the remedial action with EPA oversight.

Volatilization from the wastewater is the next point to consider. As stated above, an air stripper is a part of the selected treatment system. If determined to be necessary, air emission control equipment will be installed on the air stripper. The potential is low for significant volatilization at the POTW because most VOCs will have been volatalized during air stripping. Should the air stripper not be included in the pretreatment system because it is determined not to be necessary to meet pretreatment requirements, this point must be reevaluated.

The potential for groundwater contamination from transport of the treated groundwater or an impoundment at the POTW is the next concern. The potential exists for groundwater contamination along the sewer system transporting the treated water. Again the pretreatment at the site minimizes any expected impact of leakage from the sewer to the groundwater. The area of greatest potential impact is from the site to the sewer's hookup with other lines from the industrial park. At that point mixing would further minimize any potential impact of leakage to groundwater. A portion of the sewer line was integrity tested during the plume stabilization project. The results are being evaluated.

The potential of groundwater contamination from an impoundment at the POTW is diminished because of the pretreatment at the site and the additional treatment and mix at the plant. Groundwater monitoring at the POTW is therefore not recommended specifically as a result of receiving pretreated groundwater.

The next point of concern is the effect of water discharged from the Seymour site on maintaining water quality standards in the South Fork of the White River, the POTW's receiving stream. The results of the evaluation contained in the Plume Stabilization Work Plan indicate that there will be no detectable levels of toxics in the discharge of the POTW. (See Plume Stabilization Work Plan)(Record # _____) Further evaluation of this concern will be performed. When flow is increased for the final remedial action, treatment must also be

appropriate to assure water quality standards are maintained in the East Fork of the White River.

The next point of concern is applicability of other environmental laws at the POTW because it has received a discharge from a Superfund site. All water discharged to the POTW will mix with domestic waste along the transportation route to the POTW. Therefore RCRA requirements would not apply to the POTW. (See 40 CFR Section 261.4) Disposal of sludge is not anticipated to be a problem but will be evaluated more thoroughly during the process of receiving authorization to discharge. Monitoring of the sludge will continue after discharge is started. No other environmental requirements have been identified that would apply to the POTW because it is receiving wastewater from a Superfund site.

The last point of concern is the cost of managing water from a Superfund site. Increased costs will be related to monitoring requirements. Parameters that are not currently monitored will be required. There are potential costs associated with sludge disposal should the contaminants accumulate in the POTW's sludge due to improper operation of the pretreatment system or should the current land application sites refuse to accept the sludge.

Based on the evaluations performed on the discharge of treated groundwater to the Seymour POTW, it was determined in the FS that this is a viable means of managing the wastewater. An authorization to discharge must be obtained from the City of Seymour prior to any discharge to the POTW occurring. The considerations in the policy on CERCLA discharges to POTWs will continue to be reevaluated as additional data becomes available.

The public has been informed of the U.S. EPA's intention to discharge treated groundwater from the Seymour site to the Seymour POTW. No negative comments were received. In addition preliminary contacts have been made on this matter with the Director of the Seymour Sanitary District, the City of Seymour Department of Public Works, the IDEM Water Division and U.S. EPA's Region V Water Division to ensure that the treated groundwater is discharged in compliance with applicable federal, state and local laws. Additional coordination and document submittal will occur prior to actual discharge to the POTW. A consultant has been retained to represent the City of Seymour's interest in this matter.

If the discharge of treated groundwater were to occur to the Northwest Creek, the NPDES regulations would apply and a NPDES permit would be necessary.

If reinjection of treated groundwater or injection of water from another source were to be incorporated into the remedial action, the substantive requirements of the UIC program would apply. A permit would not be necessary, however, because the injection would be an on-site action. This would qualify it for the permit exemption in SARA.

SOIL

RCRA contains the ARARs for contaminated soil at the Seymour site. Closure and post-closure requirements of RCRA are not "applicable" to the remedial action because the facility ceased disposal of hazardous wastes prior to November 19, 1980. (See 40 CFR 264.1) RCRA's closure and post closure requirements are, however, generally "relevant and appropriate." The RCRA closure performance standards set forth at 40 CFR Section 264.111 are narrative and state:

> The owner or operator must close the facility in a manner that:
>
> (a) Minimizes the need for further maintenance; and
>
> (b) Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous constituents, leachate, contaminated run-off, or hazardous waste decomposition products to the ground or surface waters or to the atmosphere; and
>
> (c) Complies with the closure requirements of this subpart including but not limited to the requirements of [specific closure provisions for various types of facilities].

Closure standards for containers, tanks, surface impoundments, and landfills are generally "relevant" and "appropriate" to the Seymour site.

The closure requirements for containers are generally relevant and appropriate because drums of waste material generated during the RI containing drill cuttings, groundwater and protective clothing meet the RCRA definition of "container." (See 40 CFR Sections 264.170 and 260.10).

The closure requirements for tanks are generally relevant and appropriate to the treatment units used to treat collected surface water runoff. (See 40 CFR sections 264.220 and 260.10).

The surface impoundment created to collect the surface water runoff causes the closure and post-closure requirements for surface impoundments to generally be relevant and appropriate. (See 40 CFR sections 264.220 and 260.10).

Because the disposal of hazardous wastes occurred at the site, the landfill closure and post-closure requirements are generally relevant and appropriate for the Seymour site. One of the landfill closure requirements that is specifically relevant and appropriate calls for placing a cap on the disposal facility. (40 CFR Section 264.310 (a)) A cap is part of the selected remedial action.

As the State is authorized to implement the RCRA program, State requirements are equivalent to Federal requirements. See 320 IAC 4.1-46-1 et. seq. U.S. EPA has not been notified of any more stringent or broader in scope State requirements.

The land disposal restrictions of RCRA also apply to any off-site disposal of hazardous waste. (RCRA § 3004(d) and (e))

Contaminated sediment will be consolidated on the existing disposal area, which is the entire fenced area of the site. The sediments must be dewatered, if necessary, prior to consolidation in order to comply with the land disposal restrictions of RCRA. (See 51 Fed. Reg. 40572)

Other relevant and appropriate RCRA requirements include a notice in the deed to the property (40 CFR §264.119), access restrictions (40 CFR 264.14 and 264.117), inspection requirements (40 CFR §§ 264.15 and 264.117), and disposal or decontamination of equipment (40 CFR § 264.114). The remedial action selected for the Seymour site meets all applicable or relevant and appropriate RCRA requirements.

AIR

The air emission requirements of the Indiana State Implementation Plan (SIP) Rule 325 IAC Article 8 Section 6 apply to sources that emit greater than 25 tons per year of volatile organic compounds (VOCs). The selected remedy for the Seymour site is not expected to emit greater than 25 tons per year of VOCs to the air. Therefore, these requirements are not applicable. If emissions from the site were to exceed 25 tons per year of VOCs, the technical, substantive requirements of the SIP would apply. The requirement of Rule 325, Article 2 for registration of VOC emission sources does apply and will be met.

Although there are no applicable emission standards, an evaluation of the air emissions must be made to determine if they present an unacceptable threat to human health and the environment. Two components of the selected remedy emit to the air: 1. the air stripper in the ground water treatment system and 2. the vapor extraction system. These two sources must be considered in combination and the potential human impacts from the total air emissions from the site evaluated. As with the groundwater cleanup standard, air emissions must not exceed a 1×10^{-6} excess lifetime cancer risk level or a chronic health index (HI) of 1 at the nearest receptor.

Also, consistent with the FS guidance and as explained on page 34, the cumulative excess lifetime cancer risk from exposure to contaminated air and groundwater should not exceed 1×10^{-6}.

RADIATION

At another Superfund Site in Region V radon was discovered accumulated on carbon adsorbers used in treatment of groundwater. The radon was present at levels that pose a potential threat to human health and the environment. The radon was naturally occurring.

Because of this finding, radon will have to be considered in implementing the selected remedy. For example, soil gas sampling during the pre-design investigation phase must be performed and monitoring of air emissions and carbon used in any treatment process must be performed.

Radon must be factored into the calculations to determine if the cleanup standards for air, described above, are met.

ENFORCEMENT STATUS

Negotiations with the PRPs are on-going. As stated in the site history, a lawsuit was filed in the Federal District Court for the Southern District of Indiana in 1980. In 1984 a case management order was issued that provides the framework for negotiations between the defendants and the United States. There are approximately sixty defendants currently named by the United States in the ongoing suit. These defendants have in turn added approximately sixty third party defendants. Summaries of information linking defendants to the site and relative contribution of waste volume have been provided to the defendants.

Negotiations are expected to continue into the fall of 1987.

COMMUNITY RELATIONS

The community of Seymour has been concerned about the Seymour Recycling Corporation Site since 1976. Air and surface water discharges, which people in the area felt were responsible for detrimental public health and environmental impacts, were migrating from the site.

Evacuation of 100 homes was necessary in March, 1980 due to a chemical reaction that released toxic fumes. As a result, U.S. EPA became involved with the site.

The community was relieved when the surface cleanup began in December, 1982. A concern about drinking contaminated groundwater still existed. In order to alleviate this concern, money from the court-held trust fund, established as part of a 1983 settlement between U.S. EPA and certain potentially responsible parties, was used to extend the city's municipal water system to the Snyde Acres subdivision.

U.S. EPA has provided regular updates to the interested parties. In addition, important documents and information have been placed in three repositories in Seymour.

On October 9, 1986, U.S. EPA held a public meeting in Seymour to discuss the results of the RI and FS and to answer any questions and receive comments from the public. The prevailing concern of the public in regard to the remedial action seemed to be getting the action implemented as soon as possible.

For more information on community relations, see the Responsiveness Summary, Appendix 2.

FUTURE ACTIONS AND SCHEDULE

Future actions and a preliminary schedule for their implementation are shown in Appendix 1. The schedule will no doubt go through many modifications as negotiations progress and the project becomes more thoroughly defined in the design and implementation.

ATSDR COMMENTS

The Agency for Toxic Substances and Disease Registry (ATSDR) performed a health assessment for the Seymour Recycling Corporation as required by Section of 104(i)(6)(a) SARA. The health assessment memorandum is dated April 2, 1987. (Record #_____) The report concludes that no population is at present known to be exposed to hazardous substances from the site. The primary potential risk associated with the on- and off-site contaminants is the possibility for chronic toxicity and/or increased risk of cancer via low-level, repeated exposure should the no-action alternative be chosen. ATSDR also stated that all the alternatives considered by EPA, except no action, and EPA's recommended alternative are considered adequate to protect human health based upon the data presented.

Specific recommendations included in the memo, pending the implementation of a suitable remedial action alternative, are:

1. Periodically monitor airport well #5 and the nearest operational downgradient water supply well for volatile organic contaminants. If or when volatiles are detected, reassess the potability of the supply and the likelihood of endangerment to any remaining area wells. This may necessitate the extension of water lines to affected or potentially affected residences/establishments.

2. Post signs in the contaminated area of northwest creek identified for sediment removal to restrict recreational activities.

At such time as the suitable remedial action alternative is implemented, dust control should be instituted for those surface areas disturbed by removal/construction activity to minimize the production of beryllium contaminated airborne particulates.

APPENDIX 1

PROJECTED SCHEDULE FOR FUTURE ACTIONS
AT THE SEYMOUR RECYCLING SUPERFUND SITE

PHASE - Plume Stabilization Project

Activity	Projected Date
Conclude Negotiations for the Plume Stabilization Project	November, 1986 (Actual)
Install Plume Stabilization Well	September, 1987 (Actual)
Initiate Construction of a Temporary Groundwater Treatment System	Fall, 1987
Complete Aquifer Tests	Fall, 1987
Operate and Maintain the Plume Stabilization System	On-going

PHASE - Negotiations for Remedial Design (RD) and Remedial Action (RA)

Activity	Projected date
Receive Proposal for Site Cleanup	December, 1986 (Actual)
Complete the Government's Response to the PRP Cleanup Proposal	January, 1987 (Actual)
Conclude Negotiations	Fall, 1987

PHASE - Implementation of RD/RA

Activity	Projected Date
Complete Design of Groundwater Cleanup Component	Winter, 1988
Implement Groundwater Cleanup Component	Spring, 1989
Complete Design for Soil Cleanup Component	Spring, 1989
Implement Soil Cleanup Component	Fall, 1989

ATTACHMENT 2

INDEX OF THE ADMINISTRATIVE RECORD

SEPTEMBER 28, 1987
U.S. EPA, REGION V
CHICAGO, ILLINOIS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

SEP 28

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORNADUM

SUBJECT: OWPE Concurrence on the Record of Decision for the Seymour Recycling Corporation Site, Seymour, Indiana

FROM: Gene Lucero, Director Gene Lucero
Office of Waste Programs Enforcement

TO: Valdus V. Adamkus, Administrator
Region V

Based on the August 31 ROD briefing, and the communications and followup analysis conducted by our staffs, I concur on the record of decision for the Seymour Recycling Corporation site as stipulated in the "Twelth Remedy Delegation Report - Part Two" (May 19, 1987).

cc: J. Winston Porter
Jack McGraw
Russ Wyer
Bill Constantelos