190 - GOR - GRM - 00006

97-152

SL-1187

Department of Energy

Oak Ridge Operations Office
P.O. Box 2001
Oak Ridge, Tennessee 37831—

May 12, 1997

Lori Gordon, Planner
Missouri Department of Natural Resources
P.O. Box 176
Jefferson City, MO 65102

Dear Ms. Gordon:

As you requested, please find enclosed a copy of the following documents:

1. A copy of the memorandum is attached. Please note that this is a summary of the RODs.

2. A copy of the diskette provided to SAIC by the USEPA, is enclosed. No other information was used to summarize these documents.

3. A memo from Amanda Ralph dated May 6, 1997 is attached. As stated in this memo, Ms. Ralph spent 20.5 hours in January 1997 preparing the summary in question. Review and briefing by SAIC staff required less than one hour. However, an additional 6.5 hours have been spent by SIAC employees responding to Ms. Gordon's request. The total cost to the Department of Energy of the analysis and the response to Ms. Gordon's request was approximately $2,200. The hours and costs cited in this letter reflect on SAIC's efforts. Any analysis performed by persons outside of SIAC based on Ms. Ralph's summary are not included.

4. Preparation of this memorandum in question was verbally authorized by David Miller on November 20, 1996. The scope of work verbally given to Ms. Ralph included the following:
   - Summarize the diskette provided by the USEPA
   - Look for analogies between the DOE site and other sites that were further along in the CERCLA process. Particular attention was to be given to groundwater management strategies because of the

importance of determining a proper groundwater approach for the St. Louis site.

5. The memorandum in question is the only documentation related to this analysis, other than the ROD summary information provided by the USEPA.

6. SAIC distributed copies of the memo in question to Mr. David Adler and Mr. Albert Johnson, both of the Department of Energy, at their request.

If you need any further information, please feel free to contact me at my office (314) 524-4083.

Sincerely yours,

Ed Valdez
Deputy Site Manager

Enclosures

cc: John Young, MDNR
David Miller, SAIC

MEMORANDUM

Date: May 6, 1997
To: David Miller
From: Amanda Ralph
Subject: Missouri RODS Summary

This memorandum is to address the concerns of Lori Gordon from the Missouri Department of Natural Resources, as expressed in a letter to Mr. Ed Valdez, USDOE, on April 25, 1997.

I prepared a memorandum and summary table summarizing eight Missouri records of decision, with particular attention to how groundwater was managed at each facility. I did not conduct or prepare any analysis of the RODS or groundwater management techniques.

The memorandum drafted by me was comprised of information solely from the eight RODS contained on the diskette furnished to me. I used no additional or other documentation, nor did I make any phone calls or rely on any other verbal information.

The number of hours I spent drafting the memorandum and table is 20 5.

No extra documentation outside of the eight RODS contained on the diskette was used for the RODS summary.

I hope that this information supplies what is requested by Lori Gordon. If further information would be useful, or if you have additional questions, please feel free to contact me.

It has taken one and one half hours to respond to this information request.

Date: January 21, 1997
To: David Miller
From: Amanda Ralph
Subject: Allowable Level of Contamination for Groundwater

Issue:

What level of contaminants have been allowed to remain in groundwater at other sites in Missouri: that is, what cleanup levels have been established for groundwater at various sites in Missouri?

Brief Response:

Eight records of decision (RODS) were examined to ascertain the level of contaminants allowed to remain in groundwater in Missouri. None of the eight sites had radioactive substances as contaminants. In general, levels of contamination to be removed were determined based on Federal and State maximum contaminant levels (MCLs), Federal water quality criteria, and Missouri water quality standards.

Discussion:

Eight RODS that were examined for groundwater contaminant levels are:

1. Conservation Chemical Company (CCC), Kansas City, 1987: media = groundwater and soil;
2. Findett Corp., St. Charles, 1989: media = groundwater and soil;
3. Fulbright Landfill, Cape Girardeau, 1988: media = debris;
4. Kem-Pest Laboratories, OU2, Cape Girardeau, 1993: media = debris;
5. Missouri Electric Works (MEW), Cape Girardeau, 1990: media = soil, sediment and groundwater;
6. Syntex Facility, OU2, Verona, 1993; media = none;
7. Syntex Facility (Syntex 1), Verona, 1988: media = soil; and
8. Wheeling Disposal Service Company Inc., Amazonia, 1990: media = soil.

Some language from the RODs is repeated verbatim in this memorandum. Paragraphs enclosed in brackets ([ ]) are taken directly from a ROD. Also, some passages taken directly from a ROD are indicated by indenting the paragraphs after stating that they are from the ROD.

Actual contaminant levels in groundwater are included for one facility - Wheeling.

Both the Wheeling and the Syntex facilities were allowed to leave groundwater on-site that was contaminated at levels above MCLs and ambient water quality criteria. The Wheeling ROD includes the actual levels of contaminants left on-site, while the Syntex ROD references in the text the fact that some groundwater contaminants are present at levels that exceed MCLs. Each site has set up as part of its remedial action a long-term groundwater monitoring program. Also, the geology of each site is such that off-site migration of contaminants is restricted or unlikely to occur.

A brief discussion of what does not constitutes potable drinking water was contained in the Wheeling site ROD. Language in that ROD indicated that parts of an aquifer were not a suitable source of potable water due to high salinity and hardness of the groundwater. Other language in the Wheeling ROD indicates that a formation capable of producing 5 to 50 gallons per day of water is a usable aquifer.

CCC

The Conservation Chemical Company (CCC) site is situated on the floodplain of the Missouri River near the confluence of the Missouri and Blue Rivers. The area in which the site is located is industrially zoned. An agricultural chemical manufacturing plant is located southwest of the site. Northeast and east of the site is undeveloped, but a portion of it has been used for agricultural purposes. A power plant is located northwest of the site, with undeveloped land to the north and west of the site.

Generally, the site is underlain by an aquifer used as a source of drinking water by both private residents and public water supply companies.

Based on available site operating records, it has been estimated that the following materials were brought to the site: acid metal-finishing wastes; alkaline metal-finishing wastes; cyanides; solvents/organics; miscellaneous wastes;refinery wastes; and arsenic/phosphorus wastes. Most of the materials brought to the site reportedly were disposed of on-site, with or without treatment. According to the site operator, the principal exceptions are cyanides, some of which reportedly were converted to HCN and released or burned, and solvents, most of which reportedly were either incinerated or reclaimed. However, there is evidence from inventories that substantial quantities of organic solvents may have been disposed of on-site.

The remedial alternative selected for this site is an active pumping containment system. The principal element of the selected alternative is treating hazardous substances to reduce their volume, toxicity and mobility by treating the extracted groundwater. The treatment system will include, at a minimum, such treatment processes as metals precipitation using both hydroxide and sulfide precipitation, filtration, biological treatment, and carbon absorption. The metals precipitation units will be designed and operated so as to attain the following levels:

Metal	Design Values, ug/l
AL	100

AS	50
CD	2
CR	20
FE	20
PB	5
NI	150
ZN	30

About 12 off-site groundwater monitoring wells will be installed and sampled quarterly for three years, for priority pollutants and other selected water quality parameters; then as per the schedule specified in the ROD.

At CCC, 21 substances have been detected at concentrations substantially in excess of applicable criteria or standards for water quality. These include six metals, cyanide, four phenolic compounds, and ten volatile organic compounds (VOCs). In addition, aluminum and total phenolics have been detected at levels sufficiently high to cause concern for aquatic life. These 23 substances are listed in Table 1 {not included in ROD on disc}, along with the highest concentrations for each compound reported in groundwater at or near the site. Trans-1,2-dichloroethylene has been detected at high concentrations (up to 47,100 ug/liter). These high concentrations may be of concern because of the chemical similarity between this substance and trichloroethylene, 1,1-dichloroethylene, and vinyl chloride.

[A number of other inorganic and organic compounds have been detected in soil and groundwater at or near the CCC site. The 23 contaminants listed in Table 1 {Table 1 is not available}, together with trans-1,2-dichloroethylene and the 2,3,7,8-TCDD in soil, are the primary contaminants of concern at this site.]

The applicable or relevant and appropriate requirements for groundwater contamination are discussed below. The discussion contained in the ROD was so thorough that it is reprinted here in its entirety.

> The goal of this remedial action is to restore groundwater to drinking water quality for possible use as a drinking water supply. The agency has considered seven sets of standards for groundwater quality: maximum contaminant level goals (MCLGs), maximum contaminant levels (MCLs), water quality criteria, health advisories, the concentration limits calculated from potency factors and verified reference doses (RfD), and RCRA groundwater protection standards.
>
> Recommended cleanup levels were selected from those seven categories according to four basic criteria:
>
> 1. Where a chemical causes both carcinogenic and noncarcinogenic

effects, the cleanup levels must be set within the 10^{-4} to 10^{-7} risk range.

2. Where two standards or criteria describe the same effect for the same chemical, the more recently derived standard (based on more recent scientific information) was chosen.

3. MCLs and non-zero MCLGs were taken as the point of departure for evaluating cleanup levels.

4. Total risk from all carcinogens should be between 10^{-4} to 10^{-7}.

Section 121 of SARA outlines the cleanup standards for remedial actions at Superfund sites. The primary standard is that remedial actions must assure protection of human health and the environment.

SARA further requires that a remedial action meet applicable or relevant and appropriate standards, criteria, or limitations. SARA specifies that: "such remedial action shall require a level or standard of control which at least attains maximum contaminant level goals and water quality criteria where such goals or criteria are relevant and appropriate under the circumstances of the release or threatened release" (SARA 121(d) (2)).

As noted above, seven groups of federal standards, criteria and other health-based levels might be used for cleanup standards for groundwater at the CCC site. Potential cleanup standards include the following:

Maximum contaminant level goals (MCLG), 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 to exposed populations, and which allow a margin of safety.

Maximum contaminant levels (MCL), established under the Safe Drinking Water Act. These are the maximum contaminant concentrations allowed in regulated public water supplies. MCLs represent a balance between the MCLGs and technical limitations: they are based on a chemical's toxicity, treatability, cost effectiveness and the analytical limits of detection. All MCLs are set for non-carcinogens at no adverse effects levels, and for carcinogens within the 10^{-4} to 10^{-7} risk range.

Health advisories (HA), 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.

Water quality criteria (WQC), for human health established under the Clean Water Act. The original WQC assumed that people drank contaminated surface water and ate contaminated fish that grew in that water.

The criteria for freshwater aquatic life are relevant to this site since groundwater discharges to surface water.

Verified reference doses (RfD), developed by an intra-agency EPA workgroup. 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.

Potency factors (PF), 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.

Groundwater protection standards - established under the resource conservation and recovery act (RCRA). These standards directly apply to the groundwater at regulated facilities that treat, store, or dispose of hazardous waste in surface impoundments, waste piles, land treatment units, or landfills after November 19, 1980. If contaminant concentrations exceed the standard, the facility owner/operator must begin corrective action.

MCLs were the first set of standards considered for cleanup levels. MCLs have been proposed for a number of the contaminants of concern at the CCC site. MCLs represent safe contaminant concentrations in public water supplies. Most public water supplies should be fairly clean, even before treatment. In contrast, groundwater at the CCC site contains many toxicants.

Ambient water quality criteria (AWQC), were the next set of standards considered, as specified in SARA. These levels were calculated from the criteria for exposure to both contaminated water and fish listed in the 1980 water quality criteria documents. EPA updated the water quality criteria in 1986. The 1986 water quality criteria states that for the maximum protection of human health from potential carcinogenic effects, the ambient water concentration of carcinogens should be zero. However, the document acknowledges that the zero level may not be achievable and presents a range of concentrations associated with an incremental increase in cancer risk between 10^{-4} and 10^{-7} for each carcinogen. For contaminated groundwater at the Superfund sites, the 10^{-6} level is the starting point for evaluating risks. Table 9 {reprinted below} lists the water quality criteria for human health for the 1×10^{-6} risk level.

For noncarcinogens, water quality criteria, health advisories, and contaminant concentrations calculated from verified reference doses (RfD) may be appropriate cleanup levels. For carcinogens, health advisories suggest concentration limits that guard against noncarcinogenic health effects. For example, vinyl chloride is a known human carcinogen with a long term health advisory of 46 ug/l. Vinyl chloride may cause liver damage and other noncancerous disorders after long term exposure. The health advisory of 46 ug/l should prevent these effects, but will not preclude an increase in cancer incidence in a population exposed for a lifetime to vinyl chloride at that level. The MCL for vinyl chloride is 2 ug/l.

Contaminant levels calculated from verified reference doses also refer to noncarcinogenic health effects after chronic exposure. For example, methylene chloride is a probable human carcinogen. The concentration limit calculated from the RfD is 2100 ug/l. This limit represents an acceptable daily intake from drinking water which should prevent (noncarcinogenic) damage to the central nervous system and the heart associated with exposure to methylene chloride. However, lifetime exposure to 2100 ug/l methylene chloride in drinking water may cause an increase of 17 cases of cancer in an exposed population of 20,000 (8.4×10^{-7} risk level).

Verified reference doses represent a recent consensus among EPA scientists on acceptable daily intakes of toxic chemicals. Therefore, more weight was given to reference doses than to the older water quality criteria for human health and health advisories when evaluating possible cleanup levels. Of the few noncarcinogens which have nonorganoleptic criteria (i.e., the lack of physical and chemical characteristics that stimulate the eye, ear, skin, nose, and mouth, whose receptors initiate impulses that travel to the brain, where perception occurs), the 1986 water quality criteria specifies that RfDs should replace the older water quality criteria for human health.

Groundwater protection standards set under RCRA were the last set of standards considered for the site. These standards, which apply to hazardous waste treatment, storage or disposal facilities, do not legally apply to the site but may be considered relevant and appropriate.

Portions of 40 C.F.R. Part 264, Subpart F, are relevant and appropriate because they address situations similar to the site, notably, situations where hazardous wastes are present in both the soils and the groundwater. Subpart F provides that groundwater must be cleaned up to background, to MCLs, or to risk-based alternate concentration limits (ACLs). The agency thinks it appropriate to restore the groundwater on-site, as well as the groundwater off-site, to drinking water quality. As noted above, this is an aquifer that is used as a drinking water source now, and the use of which can be expanded by cleaning up this site to ensure that all potentially usable groundwater is of drinking water quality.

The agency's Groundwater Protection Strategy (GWPS) promulgated by the Office of Groundwater Protection in August 1984, provides guidance concerning how different groundwaters throughout the country should be classified and to what extent cleaning up a particular groundwater is appropriate, given where it fits in the classification scheme.

The GWPS provides that EPA's policy on groundwater protection should consider the highest beneficial use to which particular groundwater can presently or potentially be put. It defines protection policies (i.e., policies concerning levels of protection and cleanup) for three classes of groundwater, based on their respective value and their vulnerability to contamination. Class I groundwater is special groundwater that is irreplaceable (i.e., no reasonable alternative source of drinking water is available to substantial populations) or ecologically vital (i.e., the aquifer provides the base flow for a particularly sensitive ecological system that, if polluted, would destroy a unique habitat). Class II groundwaters include groundwaters that are current or potential sources of drinking water and waters having other beneficial uses. Class III groundwater is not considered to be a potential source of drinking water and to be of limited beneficial use (i.e., goundwater that is heavily saline or is otherwise contaminated beyond levels that could be cleaned up). To fit into Class III, groundwater also cannot migrate to Class I or II groundwater or have a discharge to surface water that could cause degradation.

The groundwater that underlies the CCC site is Class II groundwater. This groundwater is considered to be a current drinking water source since groundwater is used for drinking water within a two mile radius of the site. The natural condition of the groundwater makes it possible to develop the area, including installation of drinking water wells in the future. This groundwater also migrates to and is part of a Class II groundwater aquifer that is being used as a drinking water source now.

Based upon the above considerations, until such time as alternate concentration limits for those contaminants of concerns are established, EPA has determined that the appropriate levels for groundwater cleanup are those levels noted in column 2 of Table 9.

Table 9

Applicable or Relevant and Appropriate Requirements (ARARs) for Contamination of Concern at the CCC Site

contaminants of concern	concentration	source of ARARs
arsenic	50 ug/l	MC
cadmium	10 ug/l	MCL
chromium (total)	50 ug/l	MCL
nickel	13.4 ug/l	AWQC for human health
zinc	5000 ug/l	AWQC for human health
iron	300 ug/l	MCL (secondary)
aluminum	none	none
cyanide (total)	220 ug/l (long term, child)	health advisory
lead	50 ug/l	MCL

chloroform	0.19 ug/l	AWQC for human health (10-6)
trichloroethylene	2.7 ug/l	AWQC for human health (10-6)
trichloroethylene	5.0 ug/l	MCL
benzene	5.0 ug/l	MCL
vinyl chloride	2.0 ug/l	AWQC (10-6)
vinyl chloride	2.0 ug/l	MCL
1,2-dichloroethane	5.0 ug/l	MCL
1,1,2-trichloroethane	0.6 ug/l	AWQC (10-6)
1,1-dichloroethylene	0.033 ug/l	AWQC (10-6)
1,1-dichloroethylene	7.0 ug/l	MCL
trans-1,2-dichloro-ethylene	70.0 ug/l	MCLG
2,4 dichlorophenol	0.3 ug/l	AWQC
2,4 dimethylphenol	400 ug/l	AWQC
phenol	300 ug/l	AWQC (organoleptic)
2,4,6-trichlorophenol	1.2 ug/l	AWQC (10-6)
carbon tetrachloride	5.0 ug/l	MCL
carbon tetrachloride	0.4 ug/l	AWQC (10-6)
toluene	14.3 mg/l	AWQC
methylene chloride	0.19 ug/l	AWQC (10-6)
2,3,7,8-tetrachloro-dibenzodioxin (TCDD).	1.3 x 10-8	AWQC (10-6)

Findett Corporation

Findett Corporation is located on the floodplain of the Mississippi River, surrounded by land that is used primarily for agriculture, but also for some light industry. The facility is built over an aquifer which has a shallow and a deep portion. A well field that is the primary drinking water source for St. Charles is located 1800 feet northeast of the facility. Private wells from residences are located about 1000 feet northeast of the facility and about 1500 feet south. Groundwater contamination at the facility has been demonstrated at much higher levels in the uppermost shallow aquifer. This is the aquifer from which private wells draw their water. The well field draws from the deeper aquifer. Contaminants of concern are organics, PCBs, and VOCs, although PCB contamination has not been detected in groundwater. VOCs have been discovered in groundwater at levels well above those considered safe for human consumption. Contaminants have not yet migrated off-site, indicated by samples from private wells and from the well field which did not show evidence of contamination. The goal of remedial action at the facility is to contain the shallow groundwater and contamination on-site. This will be accomplished by on-site groundwater pumping and treatment using air stripping, with discharge to the publicly owned treatment works (POTW). Contaminant levels in groundwater and subsurface soils from the analyses of these samples are summarized in Figures 7 and 8. {Figures 7 and 8 were not included in the ROD on the disc.} No ARARs or performance goals or cleanup levels were mentioned in the ROD. The ROD contained the information that an RI, RS and Proposed Plan for remedial action had been prepared, and that USEPA will enter into a consent order with Findett Corporation for remediation.

Fulbright

The Fulbright Landfill and Sac River Landfill are located in a semirural area in the floodplain of the Little Sac River. The Landfills are surrounded by a police shooting range, an animal shelter, and an inactive wastewater treatment plant. Contaminants of concern are not listed in the ROD but acid and cyanide wastes are referenced in the ROD as present at the Landfills. Wastes were disposed at the Landfills in drums or in bulk in trenches. Based on data from the RI, environmental contaminant concentrations in soil, groundwater, leachate, surface water, and sediments do not exceed applicable or relevant and appropriate requirement standards. The site, however, could endanger human health or the environment in the future through exposure of the industrial wastes through erosion of the landfill cover, installation of drinking water wells at or near the landfills, or from direct contact with leachate at the seeps.

Remedial action at the site includes removal of the drum and drum remnants found in the sinkhole and associated trench east of the Fulbright Landfill; sampling the removed contents to determine hazardous characteristics; proper off-site treatment or disposal of removed contents; observation of the leachate seeps during maintenance (no action), ground and surface water monitoring for a 30-year maintenance period; and imposition of deed restrictions and groundwater use prohibitions. Contaminant concentrations in the environmental samples collected are summarized in detail in the RI report.

Kem-Pest

The Kem-Pest Laboratories (Amendment) site is a former pesticide production facility located near the Mississippi River, with an unconfined, underground aquifer system beneath the property. Land use in the area is predominantly rural, with residences, an industrial storage tank facility, and agricultural fields, located near the site.

Groundwater contamination has resulted from the migration of contaminants from the soil within the lagoon; and groundwater also may have acted as a flushing mechanism for contaminants in the subsurface soil.

A 1989 ROD addressed the contaminated surface soil in the lagoon, surface soil in the lagoon area and near the formulation building, and sediment in drainage channels on-site and off-site, as OU1. A 1990 ROD addressed pesticide contamination in the formulation building and groundwater, as OU2. This ROD amends the 1990 selected remedy for decontamination and off-site incineration of the formulation building debris, but does not affect the original selected remedy for groundwater and institutional controls.

The selected remedy for groundwater is the no remedial action alternative, with monitoring conducted to verify that no unacceptable exposures to risks posed by conditions at the site occur in the future.

In order to obtain levels of contaminants allowed to remain in groundwater at the site, the 1990 ROD would have to be examined, along with other relevant documents as referenced in that ROD.

MEW

The Missouri Electric Works (MEW), an electric equipment recycler and supplier, recycled electrical equipment and fluid from electric transformers. MEW is located in a commercial/industrial area within 0.7 miles of LaCroix Creek, which runs into the Mississippi River 1.6 miles southeast of the facility. A wetlands area is located 700 feet south of the facility.

Contaminants of concern discovered in groundwater at the facility are: trans 1,2-dichloroethene; chlorobenzene; 1,1 dichloroethane; trichloroethene; tetrachloroethene; and benzene. Groundwater contaminants derive mainly from cleaning solvents.

The highest concentration of total VOCs detected was 320 ppb. Analytical data from additional sampling showed that VOC-contaminated groundwater has migrated beyond the MEW property boundaries in one of the two off-site wells.

[There is no barrier or confining layer present to prevent the downward migration of contamination in the bedrock aquifer once the contamination reaches groundwater. Some of the VOC contaminants are known to be "sinkers", i.e., they are heavier than water and tend to sink through water to a confining layer.]

[No users of the upper portions of the bedrock aquifer were identified. This does not mean that users do not exist. Users of lower portions of the bedrock aquifer have been identified.]

Groundwater remedial action at the sites involves installing six to ten extraction wells; extracting groundwater and storing it in a tank on-site; processing the stored water through an air-stripping tower; processing the vapor-phase after air-stripping through an activated carbon adsorption unit, discharging the treated water to the surface or to the publicly owned treatment works (POTW); and monitoring quarterly the effectiveness of the groundwater treatment system.

Performance standards or goals for the remedial action are cleanup levels for groundwater that represent an excess upper bound life-time cancer risk on the order of 1×10^{-5} and cleanup levels that will meet the state water quality standards and federal MCLs for VOCs. Chemical-specific goals for groundwater are 20 ppb for chlorobenzene, which has been detected at levels up to 240 ppb, and 5 ppb for trichloroethene (TCE), which has been detected at levels up to 19 ppb, as adequate to protect human health and the environment. Groundwater cleanup levels were selected based on technical limits of remediation. Case studies for groundwater remediations have indicated that effective removal of contaminants from groundwater lessens as contaminant concentrations decrease.

Syntex

The Syntex Facility is an active chemical manufacturing facility located mostly within the 100-year floodplain of the Spring River. The industrial facility is surrounded on three sides by property used for agricultural purposes. A predominantly residential setting is located to the east of the site in the city of Verona. Scattered residences are located within the Spring River floodplain down-gradient from the site. The Spring River is used for recreational and industrial purposes within southwestern Missouri.

This ROD addresses groundwater contamination at the site, as OU2. A previous ROD required cleanup of soil contamination of VOCs and dioxin. [The 1988 remedial action greatly removed dioxin and associated volatile organic compound (VOC) soil contamination at this site. Reported concentrations of contaminants are currently present at low levels and represent little risk to human health and the environment. Based upon trends observed from historical data, the low levels of contaminants present should continue to attenuate over time.]

[Groundwater investigations conducted prior to the1988 ROD indicated the presence of elevated organic and metals contamination in the uppermost aquifer underlying the site. Subsequent sampling of groundwater and fish from Spring River, conducted from 1988 through 1992, indicated a significant decrease in the contaminant levels in groundwater and fish at the site. In addition, EPA assessed the potential threat to human health posed by groundwater at the site and determined that groundwater at the Syntex facility does not present any current or potential threat to human health or the environment. Based on this new information, EPA has determined that the remedial action for OU1 has significantly reduced the threat due to groundwater at this site; therefore, there are no contaminants of concern affecting this site.]

[The National Contingency Plan (NCP) established by EPA to implement the requirements of CERCLA and SARA defines acceptable exposure levels to be those that represent an upper-bound lifetime cancer risk to an individual of between 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000) using information on the relationship between dose and response. The level of risk reported for this site falls within this 10^{-4} to 10^{-6} range, which allows EPA flexibility in determining whether to take action. EPA has determined the risks defined for groundwater under existing site conditions are acceptable and that no further action is necessary at this time.]

The selected remedial action for this site is no further action,with groundwater and surface water monitoring for two years.

Syntex was required to analyze groundwater samples for the following minimum list of parameters:

pH	Lead
Conductivity	Manganese
Total Organic Carbon	Selenium
Calcium	Sodium
Magnesium	Acetone
Chloride	Dichloromethane
Sulfate	Toluene
Nitrate	Chlorobenzene
Phenol	Ethylbenzene
Arsenic	1,4 Dichlorobenzene
Barium	Tetrachloroethane
Chromium	Tetrachloroethene
Xylenes	Iron

Additional compounds to be analyzed for the selected alternative are:

1. Dioxin (2,3,7,8 Tetrachlorodibenzo-p)
2. Heptachlor
3. Heptachlor Epoxide
4. 1,4 Dichlorobenzene
5. Bis (2-Ethylhexyl) phthlate
6. Antimony
7. Tetrachlorobenzene (1,2,4,5)
8. Triclorobenzene (1,2,4)
9. 1,3-Dichlorobenzene
10. Naphthalene
11. Hexachlorophene
12. 1,4 Dioxane

[Groundwater sampling results indicate the presence of several volatile organic compounds which exceed Maximum Contaminant Levels (MCLs). Table 3 {Table 3 is not included in the ROD} shows the volatile organic compounds detected above MCLs in the wells which were sampled between January 1991 and April 1992. MCLs for dichloromethane, 1,1 dichloroethane, and toluene were exceeded. MCLs are standards utilized by municipal water supplies for safe drinking water and are noted here for comparison purposes. In addition, the compounds acetone and chlorobenzene, for which no MCLs are available, have been detected in shallow groundwater samples (Table 4, {not included in the ROD}).]

[Nine inorganic constituents were detected in concentrations above MCLs established for drinking water supplies. They include arsenic, barium, cadmium, chromium, lead, selenium, antimony, nitrate, and fluoride. Three additional inorganic analytes, iron, chlorides and manganese, were present above secondary MCLs.]

[Upon review of the groundwater analytical data, it appears that an inexactly defined area of metals and organic groundwater contaminants is present at various times at a location downgradient of the former OU 1 contaminated soils areas. The affected area is located north of the wastewater treatment plant and former Lagoon Area, and is approximately bounded to the east and west by the former Slough Area and Spring River, respectively. Acetone, dichloromethane, and chlorobenzene were among the organic contaminants most commonly detected in monitoring wells in this area. In 1989, dioxin was reported at 5.3 part per trillion (ppt) from well 16. However, since dioxin has not been consistently found in the groundwater and was not evaluated in the risk assessment, further monitoring will be conducted to better define its presence. Acetone and chlorinated solvents, such as dichloromethane and chlorobenzene, are volatile compounds. As such they readily volatilize during transport. These compounds also readily biodegrade in waste water treatment processes and may biodegrade in groundwater. The lack of persistence exhibited by these compounds in the groundwater beneath the site indicates that they may not be attributable to historic soils contamination at the facility.]

[The confining layer at the base of the shallow aquifer appears to restrict movement of contaminants into the deep bedrock aquifer. The shallow groundwater beneath the floodplain at the site discharges to the Spring River along and downstream of the Syntex facility, thus the River defines the westernmost aerial extent of groundwater contaminants in the shallow aquifer below the floodplain. Due to the general groundwater flow direction, the River would also be expected to intercept any contaminated groundwater leaving the site within a short distance of the northern property boundary. Further, due primarily to biodegradation and volatilization, some of the historically detected organic contaminants may be permanently removed from the groundwater system before the groundwater discharges to the Spring River.]

Actual groundwater monitoring results are contained in the Groundwater Assessment Monitoring Report.

Syntex 1

This ROD addresses the same facility as the Syntex ROD, but involves soil contamination and OU1. It describes the 1988 remedial action referred to in the Syntex ROD.

Wheeling

The Wheeling Disposal Service Company Landfill site (site) is located in a rural setting situated in bluffs approximately 1/4 to 1/2 mile east of the Missouri River floodplain. Surrounding land use is mixed residential and agricultural. Runoff from the site flows into Mace Creek, which eventually flows into the Missouri River two miles south of the site.

Several private residences are located within a one-mile radius of the site. Most of these residences have private wells. The Cities of Amazonia, Savannah, and St. Joseph obtain their drinking water from waters hydraulically connected to the site.

Community interest in the site extends back as far as 1970 on account of odors from the processes at the site. Extensive groundwater monitoring has been conducted.

Monitoring by MDNR at the site between 1976 and 1980 did not identify significant groundwater contamination; however, the analyses were limited primarily to metals.

In December 1980, a preliminary assessment and site inspection were performed. The report concluded that there was no significant evidence of leaching or off-site migration of contaminants, but noted the potential for lateral seepage beneath the site. The site was given a medium to high priority for further monitoring, based on the active status of the landfill and the types of wastes which had been disposed at the site.

The EPA sampled on-site groundwater monitoring wells and springs in November 1982. Analyses of these samples revealed barium, manganese and arsenic existing at concentrations above safe drinking water standards, and trace amounts of at least five organic compounds. The report concluded that there was no evidence of off-site migration of contaminants but recommended further monitoring and inspections.

The EPA conducted a follow-up inspection of the site and sampled on-site monitoring wells and springs and three off-site private wells in November 1983. Concentrations of metals above safe drinking water standards and twelve organic priority pollutants were detected in on-site wells and springs. Priority pollutants included 1,2-dichloroethane, trichloroethylene (TCE), 2-butanone, benzoic acid, chloroform, bis(2-ethylhexyl) phthalate, bromodichloromethane, and chlorodibromomethane. Trace amounts of organic compounds and concentrations of iron and manganese above the safe drinking water standards were detected in the samples from off-site private wells and springs. However, there was no conclusive evidence of off-site migration. The report recommended further periodic monitoring and inspections.

A 1985 report concluded that while organic contamination existed in on-site wells and springs, there was no evidence of off-site migration. As in the earlier studies, continued monitoring was recommended because of the potential for off-site transport of groundwater contaminants.

The Missouri Department of Health (MDOH) performed sampling of off-site private wells and creeks in the site vicinity in January 1986. Results of the sampling indicated the presence of aluminum, barium, iron, and manganese in the stream samples and the presence of aluminum in samples from two of the private wells. Levels of contaminants were not considered to pose a significant health threat.

In response to several citizen's concerns with groundwater quality around the site, the Missouri

Department of Health (MDOH) conducted a groundwater and surface water study in the vicinity of the site during 1987. Results confirmed earlier sampling events indicating that on-site groundwater is contaminated but is not migrating off-site. The MDOH study concluded that groundwater and surface water in the area exceed aesthetic drinking water criteria for several metals, but did not determine that the site was the source of the contamination. In agreement with the MDOH study, the remedial investigation found that groundwater in the area would exceed drinking water standards for several naturally occurring metals if the wells are not effectively filtered.

Several types of contamination - volatile organic compounds (VOCs), organic compounds (including pesticides), and metals - were found during the RI in varying concentrations and in various media including groundwater, surface water, sediment, surface soils and subsurface soils. The elevated concentrations of VOCs in the groundwater and surface water indicate a release of chemicals from the original disposal areas. The elevated concentrations of metals and pesticides in the surface soils indicate either degradation of the cover or improper construction of the cover.

In 1990, the MDNR Division of Geology and Land Survey classified the geologic system beneath the Wheeling Disposal Service Site to be a usable aquifer. Groundwater yields from this water-bearing unit can be expected to range from 5 to 50 gallons per minute. There are records of six private water supply wells screened in the glacial drift within one mile of the site. Only one well is currently known to be used as a potable water source. However, the site hydrogeology consists in part of a loess/drift interface that acts to control the migration of leachate from the disposal areas. Thus, the migration of hazardous substances is limited and can be effectively monitored to protect human health and the environment.

The area surrounding the site has been characterized as suitable for development as both a potable and irrigation water supply source. The aquifer has been used as a potable water source in the past and is currently being used as a potable water source.

Performance standards or goals have not yet been developed for the site. Performance criteria for groundwater and surface water will be developed, and may be based on federal MCLs or ambient water quality criteria, or state water quality standards. If contaminant levels exceed these criteria, groundwater treatment and/or leachate collection and treatment may be required. Chemical-specific ARARs for the site are:

* Federal Maximum Contaminant Levels for inorganic and organics in drinking water supplies (40 CFR part 141) as defined in the Safe Drinking Water Act (SWDA) of 1974, as amended in 1986, 42 USC SS 300f et. seq.;

* Federal ambient water quality standards as defined by the Clean Water Act (CWA) of 1977, as amended by the Water Quality Act (WQA) of 1987, 33 USC SS 1251 et. seq.;

* State of Missouri water quality standards for inorganics and organics in groundwater and surface water (10 CSR 20-7.031).

Tables 3 and 4 present the contaminants which were identified in on-site groundwater at levels above background levels. VOCs and pesticides do not occur naturally in nature and, as such, any detectable level of these contaminants is considered above background. Table 4 also presents the corresponding background concentrations and the supporting references.

VOC contamination has extended to shallow groundwater found underneath the site, primarily on the north side of the site. The results indicate that the VOC contamination has not migrated off-site or into the deep groundwater underneath the site. Carbon tetrachloride and chloroform were detected in one deep well in one sampling event. However, several subsequent sampling events were conducted for that well and no contamination was detected. Well 3, located just south of the industrial disposal units, is the only VOC contaminated well on the south side of the site.

Pesticides detected in on-site groundwater appear to be associated with on-site farming activities.

The first phase of samples analyzed for metals indicated high concentrations in most on-site wells but also indicated very high levels of suspended solids in the samples. High suspended solids is typically associated with either poor well development during construction or with failing to effectively screen out fine soil particles such as clays. A second phase of sampling was conducted in an effort to minimize suspended solids in the samples. The results from the second phase are presented in Table 4. The important point learned for this site is that future monitoring should use wells which are properly designed and constructed for the site's geology; specifically, drinking water quality wells will be required for future monitoring.

The data presented in Table 4 for monitoring wells 14, 29s and 30s indicate contamination with several metals. These results are suspect however because sampling events have experienced difficulties in minimizing suspended solids in these wells. The metal contaminants detected in wells 27d, 28s and 28d are aesthetic water quality concerns and appear to be related to the natural geology.

Table 3
Summary of Organic Constituents Detected in Groundwater

constituent	maximum concentration (ug/l)	locations of detected levels
(volatile organic compounds)		
carbon disulfide	76	30d
carbon tetrachloride	3100	3*, 25s, 31d
chloroform	128	3*, 25s, 31d
1,2-dichloroethane	106	3
1,2-dichloroethene	26	3*, 17
methylene chloride	1000	17*, 20, 24s, 24d, 25d, 26d, 28d, 29d
toluene	1600	marks*, 17, 20
trichloroethene	1200	3, 17, 20*, 24s, 24d
(pesticides)		
atrazine	1.2	20, 23d*, 28s
nabam	250	23d, 29s, 30s*,30d
sevin	63	Gramer, 14*, 30d

(*) designates location of maximum concentration

Table 4
Summary of Metal Constituents Detected in Groundwater

constituent	background(1) concentration (ug/l)	maximum concentration (ug/l)	locations of levels above background
aluminum	lt 1000	6550	14*, 30s
barium	lt 500	1440	14*, 29s
cadmium	lt 1	5.0	28d, 29d
calcium	lt 141,200	391,000	14*, 27d, 28s, 29s
chromium	lt 5	119	29s, 30s*

cobalt	lt 10	14	29s
copper	lt 30	33.9	30s
iron	lt 3800	16,300	14, 30s*
magnesium	lt 30,500	118,000	14*, 30s
manganese	lt 400	3550	14*, 27d, 30s
nickel	lt 50	207	14
vanadium	lt 10	26	30s

(*) designates the location of maximum concentration

(1) developed from a combination of the following references:
Table 3.2 from "The Soil Chemistry of Hazardous Materials," James Dragun, 1988, page 79; in relatively humid regions; total metals.
"Water Possibilities from the Glacial Drift of Andrew County," Dale L. Fuller, J.R. Mcmillen, Harry Pick, W.B. Russell, and Jack S. Wells; Missouri Geological Survey and Water Resources, 1957, pages 7-8.

APPENDIX A

Summary of Carcinogenic and Non-Carcinogenic Toxicity Values

	cancer		non-cancer
chemical	group	oral cpf	rfd
carbon tetrachloride	b2	1.3 x (10-1)	7 x (10-3) (subchronic) 7 x (10-4) (chronic)
1,2-dichloroethane	b2	9.1 x (10-2)	na
trichloroethene	b2	1.1 x (10-2)	na
aldrin	b2	1.7 x (10+1)	3 x (10-5) (subchronic and chronic)
chlordane	b2	1.3 x (10+0)	6 x (10-5) (chronic)
dieldrin	b2	1.6 x (10+1)	5 x (10-5) (subchronic and chronic)
arsenic	a	na	1 x (10-3) (subchronic and chronic)
barium	-	--	5 x (10-2)

			(subchronic) and chronic)
chromium (iii)	-	--	1 x (10+0) (chronic)
lead	-	--	--
nickel	-	--	2 x (10-2) (subchronic and chronic)

b2 - probable human carcinogen
a - known human carcinogen
cpf - cancer potency factor (mg/kg/day)
rfd - reference dose (mg/kg/day)

APPENDIX C

Federal Health Advisories[1]

chemical	one-day (ug/l)	ten-day (ug/l)	long-term (ug/l)	lifetime (ug/l)
aldrin	0.3	0.3	0.3	–
arsenic	–	–	–	–
barium	5,000	5,000	5,000	5,000
carbon tetrachloride	4,000 (c)	200 (c)	70 (c) 300 (a)	–
chlordane	60 (c)	60 (c)	0.5 (c) 0.5 (a)	–
chromium (total)	1,000	1,000	200 (c) 800 (a)	100
dieldrin	0.5	0.5	0.5 (c) 2 (a)	–
1,2-dichloroethane	700	700	700 (c) 2,600 (a)	–
lead	–	–	–	–
nickel	1,000	1,000	100 (c) 600 (a)	100
trichloroethene	–	–	–	–

(c) denotes value developed for child
(a) denotes value developed for adult
[1] Drinking Water Health Advisories; Office of Drinking Water, US Environmental Protection Agency; April 1990

Summary of Federal Drinking Water ARARs[1]

Chemical	MCL (ug/l)	proposed MCL (ug/l)	MCLG (ug/l)
Aldrin	--	--	--
Arsenic	50	--	0
Barium	--	5,000	5,000
Carbon tetrachloride	5	--	0
Chlordane	--	--	0
Chromium (total)	50	100	120
Dieldrin	--	--	--
1,2-dichloroethane	5	--	0
Lead	50	5	0
Nickel	--	100	100
Trichloroethene	5	--	0

[1] Drinking Water Regulations; Office of Drinking Water; US Environmental Protection Agency; April 1990

Federal Surface Water Quality Criteria[1]

	Human health		Aquatic life freshwater	
	Water/fish	fish	acute	chronic
Chemical	(ug/l)	(ug/l)	(ug/l)	(ug/l)
Aldrin	0.00013	0.00014	3	--
Arsenic	0.018	0.14	360	190
Barium	--	--	--	--
Carbon Tetrachloride	0.25	4.5	--	--
Chlordane	--	--	2.4	0.0043
Chromium (total)	170	3,400	1,700	210
Dieldrin	0.00014	0.00014	2.5	0.0019
1,2-Dichloroethane	0.38	99	--	--
Lead	50	--	82	32

Nickel	510	3,800	1,400	160
Trichloroethene	2.7	81	--	--

(1) Federal Water Quality Criteria; Clean Water Act; US Environmental Protection Agency

Missouri Water Quality Standards(1)

Chemical	Aquatic life (ug/l)	drinking (ug/l)	groundwater (ug/l)
Aldrin	0.000079	0.000074	0.000074
Arsenic	20	50	50
Barium	--	1,000	1,000
Carbon Tetrachloride	--	5	5
Chlordane	0.00048	0.00046	0.00046
Chromium (total)	190 (chronic) 280 (acute)	50	50
Dieldrin	0.000076	0.000071	0.000071
1,2-Dichloroethane	--	5	5
Lead	29 (chronic) 190 (acute)	50	50
Nickel	700 (chronic) 6,900 (acute)	--	200
Trichloroethene	--	5	5

(1) Missouri Water Quality Standards; 10 CSR 20-7.031

Summary Table of RODs

Facility	Selected Remedy	ARARs, Action Levels/Cleanup Levels, Performance Goals	Level of Contaminants at Facility	Comments
CCC	Pump and treat	[1]Metal design values; [2]chemical ARARs - including MCLs, AWQC, and health advisory levels	Contained in Table 1, which was not included on the disc	
Findett	Pump and treat		Figures 6, 7 and 8 contain these levels - must obtain	
Fulbright	Groundwater monitoring for 30 years		RI document contains these values - must obtain	Levels of contaminants shown in the RI are allowed to be left at the facility: Aquifer information is not contained in the ROD.
Kem-Pest	Groundwater monitoring			We need to obtain the 1990 ROD and work from there in order to get actual levels.
MEW	Pump and treat	[3]Performance goals		ROD does not reference any figures or tables for values.
Syntex	Groundwater monitoring for 2 years		Contained in Tables 3 and 4 - must obtain; also, more recent results would be in a Groundwater Monitoring Assessment Report	Groundwater has restricted movement beneath facility; Values in Tables 3 and 4 are allowed to be left at facility.
Wheeling	Groundwater monitoring	[4]ARARs, [5]Toxicity limits in Appendix A and [6]Health Advisory Limits in Appendix C	[7]Tables 3 and 4 in ROD	Groundwater has restricted movement beneath facility.

[1]Metal and Design Value in ug/l: AL -100; AS - 50; CD - 2; CR -20; FE - 20; PB - 5; NI -150; and ZN -30.

[2] This ROD contained a thorough discussion of ARARs. ARARs discussed are: MCLGs; MCLs; Health Advisories; Federal water quality criteria; verified reference doses; potency factors for carcinogens; and groundwater protection standards under RCRA. In addition, values for chemical ARARs are listed in Table 9, included in the ROD. These

values are:

contaminants of concern	concentration	source of ARARs
arsenic	50 ug/l	MCL
cadmium	10 ug/l	MCL
chromium (total)	50 ug/l	MCL
nickel	13.4 ug/l	AWQC for human health
zinc	5000 ug/l	AWQC for human health
iron	300 ug/l	MCL (secondary)
aluminum	none	none
cyanide (total)	220 ug/l (long term, child)	health advisory
lead	50 ug/l	MCL
chloroform	0.19 ug/l	AWQC for human health (10-6)
trichloroethylene	2.7 ug/l	AWQC for human health (10-6)
trichloroethylene	5.0 ug/l	MCL
benzene	5.0 ug/l	MCL
vinyl chloride	2.0 ug/l	AWQC (10-6)
vinyl chloride	2.0 ug/l	MCL
1,2-dichloroethane	5.0 ug/l	MCL
1,1,2-trichloroethane	0.6 ug/l	AWQC (10-6)
1,1-dichloroethylene	0.033 ug/l	AWQC (10-6)
1,1-dichloroethylene	7.0 ug/l	MCL
trans-1,2-dichloro-ethylene	70.0 ug/l	MCLG
2,4 dichlorophenol	0.3 ug/l	AWQC
2,4 dimethylphenol	400 ug/l	AWQC
phenol	300 ug/l	AWQC (organoleptic)
2,4,6-trichlorophenol	1.2 ug/l	AWQC (10-6)
carbon tetrachloride	5.0 ug/l	MCL
carbon tetrachloride	0.4 ug/l	AWQC (10-6)
toluene	14.3 mg/l	AWQC
methylene chloride	0.19 ug/l	AWQC (10-6)
2,3,7,8-tetrachloro-dibenzodioxin (TCDD).	1.3 x 10-8	AWQC (10-6)

3 Performance standards or goals for the remedial action are cleanup levels for ground water that represent an excess upper bound life-time cancer risk on the order of 1 X 10^{-6} and cleanup levels that will meet the state water quality standards and federal MCLs for VOCs. Chemical-specific goals for groundwater are 20 ppb for chlorobenzene, which has been detected at levels up to 240 ppb, and 5 ppb for trichloroethene (TCE), which has been detected at levels up to 19 ppb, as adequate to protect human health and the environment.

4 Federal maximum contaminant levels for inorganic and organics in drinking water supplies (40 CFR part 141) as defined in the Safe Drinking Water Act (SWDA) of 1974, as amended in 1986, 42 USC SS 300f et. seq.;

Federal ambient water quality standards as defined by the Clean Water Act (CWA) of 1977, as amended by the Water Quality Act (WQA) of 1987, 33 USC SS 1251 et. seq.;

State of Missouri water quality standards for inorganics and organics in groundwater and surface water (10 CSR 20-7.031).

[5] Summary of Carcinogenic and Non-Carcinogenic Toxicity Values

chemical	cancer group	oral cpf	non-cancer rfd
carbon tetrachloride	b2	1.3 x (10-1)	7 x (10-3 (subchronic) 7 x (10-4) (chronic)
1,2-dichloroethane	b2	9.1 x (10-2)	na
trichloroethene	b2	1.1 x (10-2)	na
aldrin	b2	1.7 x (10+1)	3 x (10-5) (subchronic and chronic)
chlordane	b2	1.3 x (10+0)	6 x (10-5) (chronic)
dieldrin	b2	1.6 x (10+1)	5 x (10-5) (subchronic and chronic)
arsenic	a	na	1 x (10-3) (subchronic and chronic)
barium	-	--	5 x (10-2) (subchronic and chronic)
chromium (iii)	-	--	1 x (10+0) (chronic)
lead	-	--	--
nickel	-	--	2 x (10-2) (subchronic and chronic)

b2 - probable human carcinogen
a - known human carcinogen
cpf - cancer potency factor (mg/kg/day)
rfd - reference dose (mg/kg/day)

[6]

APPENDIX C

Federal Health Advisories

chemical	one-day (ug/l)	ten-day (ug/l)	long-term (ug/l)	lifetime (ug/l)
aldrin	0.3	0.3	0.3	--

arsenic	–	–	–	–
barium	5,000	5,000	5,000	5,000
carbon tetrachloride	4,000 (c)	200 (c)	70 (c)	–
			300 (a)	
chlordane	60 (c)	60 (c)	0.5 (c)	–
			0.5 (a)	
chromium (total)	1,000	1,000	200 (c)	100
			800 (a)	
dieldrin	0.5	0.5	0.5 (c)	–
			2 (a)	
1,2-dichloroethane	700	700	700 (c)	–
			2,600 (a)	
lead	–	–	–	–
nickel	1,000	1,000	100 (c)	100
			600 (a)	
trichloroethene	–	–	–	–

7

Table 3
Summary of Organic Constituents Detected in Groundwater

constituent	maximum concentration (ug/l)
(volatile organic compounds)	
carbon disulfide	76
carbon tetrachloride	*3100*
chloroform	128
1,2-dichloroethane	*106*
1,2-dichloroethene	26
methylene chloride	*1000*
toluene	*1600*
trichloroethene	1200
(pesticides)	
atrazine	1.2
nabam	250
sevin	63

Table 4
Summary of Metal Constituents Detected in Groundwater

constituent	background(1) concentration (ug/l)	maximum concentration (ug/l)
aluminum	lt 1000	6550
barium	lt 500	1440
cadmium	*lt 1*	*5.0*
calcium	lt 141,200	391,000
chromium	lt 5	119

cobalt	lt 10	14
copper	lt 30	33.9
iron	*lt 3800*	*16,300*
magnesium	lt 30,500	118,000
manganese	lt 400	3550
nickel	*lt 50*	*207*
vanadium	lt 10	26

chemicals in italics are those that exceed MCLs or AWQC listed in Footnote 2.

External (FUSRAP to Outside Recipient)

SL-1187

00-2293

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the St. Louis Site, Missouri

U.S. Department of Energy

4.14-1070.2