RECORD OF DECISION

WEST LAKE LANDFILL SITE
BRIDGETON, MISSOURI

OPERABLE UNIT 2

July 2008

Prepared by
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Region 7
Kansas City, Kansas

30012559

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ABBREVIATIONS

The following is a list of the acronyms and abbreviations used in this document:

GENERAL

AOC	Administrative Order on Consent
AR	Administrative Record
ARAR	Applicable or Relevant and Appropriate Requirement
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CSR	Code of State Regulations
EPA	U.S. Environmental Protection Agency
FS	Feasibility Study
IC	Institutional Control
LUST	Leaking Underground Storage Tank
MCL	Maximum Contaminant Level
MCLG	Maximum Contaminant Level Goal
MDNR	Missouri Department of Natural Resources
MECA	Missouri Environmental Covenants Act
MSL	Mean Sea Level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	Operation and Maintenance
OU	Operable Unit
PRP	Potentially Responsible Party
RA	Remedial Action
RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
ROD	Record of Decision
TOC	Total Organic Carbon
TPH	Total Petroleum Hydrocarbons

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CHEMICALS

PCBs	Polychlorinated Biphenyls
Ra-226	Radium-226
Rn-222	Radon-222
SVOC	Semivolatile Organic Compound
Th-232	Thorium-232
Th-230	Thorium-230
U-238	Uranium-238
U-235	Uranium-235
U-234	Uranium-234
VOC	Volatile Organic Compound

UNITS OF MEASURE

cm	Centimeter
ft\amsl	Feet Above Mean Sea Level
m^2	Square Meter
pCi/g	Picocuries per gram
pCi/l	Picocuries per Liter
ppm	Parts per Million
mg/kg	Milligrams per Kilogram
mg/l	Milligrams per Liter
sec	Second
ug/l	Microgram per Liter
yd^3	Cubic Yards

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Record of Decision Data Certification Checklist

The following information is included in this Record of Decision. Additional information is in the Administrative Record file for this Site.

Site Data	Chapter
Contaminants of Concern	5.0 & 7.0
Baseline risk represented by the contaminants	7.0
Remedial Action Objectives	8.0
Principal Threats	11.0
Current and reasonably anticipated future land and groundwater use assumptions	6.0
Potential land and groundwater use that will be available after implementation of the remedy	6.0 & 12.0
Estimated capital, annual Operation and Maintenance, and total present worth costs	12.0
Key factor(s) that led to selecting the remedy	8.0 & 10.0

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PART I. DECLARATION

Site Name and Location

West Lake Landfill Site
Operable Unit 2
Bridgeton, Missouri
CERCLIS ID Number: MOD079900932

Statement of Basis and Purpose

This Record of Decision (ROD) presents the Selected Remedy for Operable Unit 2 (OU 2) of the West Lake Landfill Site (Site) in Bridgeton, Missouri. This remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This decision is based on information contained in the Administrative Record file for the Site.

The Missouri Department of Natural Resources (MDNR), acting on behalf of the state of Missouri, accepts the Selected Remedy. See Section 10.8 of the Decision Summary for MDNR's statement.

Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of the Selected Remedy

The Site consists of the Bridgeton Sanitary Landfill (Former Active Sanitary Landfill) and several inactive areas with sanitary and demolition fill that were closed prior to state regulation. The Site is divided into two OUs. OU 1 addresses two of the inactive landfill areas that became radiologically contaminated when soils mixed with uranium ore processing residues were used as daily cover in the landfill operations. The Selected Remedy for OU 1 is provided in a separate ROD. OU 2 addresses the other landfill areas that are not impacted by radionuclide contaminants. Missouri is a federally approved regulator for solid waste landfills. For areas operated under state permit, i.e., the Former Active Sanitary Landfill and the Closed Demolition Landfill, the terms of their respective permits dictate the appropriate closure and post-closure care requirements. Successful completion of these requirements would eliminate the need for further CERCLA action at these units. Consistent with EPA's policy on coordination between the Resource Conservation and Recovery Act and CERCLA actions, these regulated units are deferred to the state regulatory program. For the Inactive Sanitary Landfill, which was closed

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prior to state regulation, the Selected Remedy is containment with relevant and appropriate closure and post-closure care requirements identified through the CERCLA remedy selection process. OU 2 does not contain principal threat wastes.

The major components of the Selected Remedy for Inactive Sanitary Landfill are as follows:

- Install landfill cover meeting the Missouri closure and post-closure care requirements for sanitary landfills
- Apply groundwater monitoring and protection standards consistent with requirements for sanitary landfills
- Surface water runoff control
- Gas monitoring and control consistent with sanitary landfill requirements as necessary
- Institutional controls to prevent land uses that are inconsistent with a closed sanitary landfill site
- Long-term surveillance and maintenance of the remedy

Statutory Determinations

The Selected Remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate, is cost effective, and utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable.

The remedy for OU 2 does not satisfy the statutory preference for treatment as a principal element of the remedy. The contaminants are dispersed within large volumes of heterogeneous municipal refuse and demolition debris; there are no practicable treatment alternatives and no principal threat wastes have been identified.

This remedy will result in hazardous substances, pollutants, or contaminants remaining on the Site above levels that allow for unlimited use and unrestricted exposure; therefore, a statutory review will be conducted within five years after initiation of the remedial action to ensure that the remedy is or will be protective of human health and the environment.

Cecilia Tapia

Cecilia Tapia, Director
Superfund Division

7/25/08
Date

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PART II. DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

The West Lake Landfill Site (Site) is located in Bridgeton, Missouri. The U.S. Environmental Protection Agency (EPA) is the lead agency and the Missouri Department of Natural Resources (MDNR) is the supporting state agency. The EPA ID Number is MOD079900932.

The Site is on a parcel of approximately 200 acres located in the northwestern portion of the St. Louis metropolitan area (Figure 1-1). It is situated approximately one mile north of the intersection of Interstate 70 and Interstate 270 within the limits of the city of Bridgeton in northwestern St. Louis County. The Missouri River lies about two miles to the north and west of the Site. The Site is bounded on the north by St. Charles Rock Road and on the east by Taussig Road. Old St. Charles Rock Road borders the southern and western portions of the Site. The Earth City Industrial Park is adjacent to the Site on the west. The Spanish Village residential subdivision is located less than a mile to the south.

The Site consists of the Bridgeton Sanitary Landfill (Former Active Sanitary Landfill) and several inactive areas with sanitary and demolition fill that have been closed. The address of the Bridgeton Landfill is 13570 St. Charles Rock Road. The Site is divided into two operable units (OUs). OU 1 addresses two of the inactive landfill areas that became radiologically contaminated when soils mixed with uranium ore processing residues were used as daily and intermediate cover in the landfill operations. The Selected Remedy for OU 1 is provided in a separate Record of Decision (ROD). OU 2 addresses the other landfill areas that are not impacted by radionuclide contaminants. This ROD provides the Selected Remedy for OU 2.

Missouri is a federally approved regulator for solid waste landfills. For areas operated under state permit, i.e., the Former Active Sanitary Landfill and the Closed Demolition Landfill, the terms of their respective permits dictate the appropriate closure and post-closure care requirements. Successful completion of these requirements would eliminate the need for further Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) action at these units. Consistent with EPA's policy on coordination between the Resource Conservation and Recovery Act (RCRA) and CERCLA actions, these regulated units are deferred to the state regulatory program. For the Inactive Sanitary Landfill which was closed prior to state regulation, the Selected Remedy is containment with relevant and appropriate closure and post-closure care requirements identified through the CERCLA remedy selection process.

Other facilities which are not subject to this response action are located on the 200-acre parcel, including concrete and asphalt batch plants, a solid waste transfer station, and an automobile repair shop.

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2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

The Site was used agriculturally until a limestone quarrying and crushing operation began in 1939. The quarrying operation continued until 1988 and resulted in two quarry pits. Beginning in the early 1950s, portions of the quarried areas and adjacent areas were used for landfilling municipal refuse, industrial solid wastes, and construction/demolition debris. These operations were not subject to state permitting because they occurred prior to the formation of MDNR in 1974. Two landfill areas addressed under OU 1 were radiologically contaminated in 1973 when they received soil mixed with leached barium sulfate residues from uranium ore processing.

The quarry pits were used for permitted solid waste landfill operations beginning in 1979. In August 2005, the Bridgeton Sanitary Landfill (Former Active Sanitary Landfill) stopped receiving waste pursuant to an agreement with the city of St. Louis to reduce the potential for birds to interfere with airport operations.

EPA placed the Site on the Superfund National Priorities List (NPL) in 1990. The NPL is a list of priority sites promulgated pursuant to CERCLA section 105, as amended by the Superfund Amendments and Reauthorization Act. The NPL is found in Appendix B of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP).

In December 1994, EPA entered into an Administrative Order on Consent (AOC) with the potentially responsible party (PRP) for performance of the Remedial Investigation/ Feasibility Study (RI/FS) for OU 2. Pursuant to the requirements of that order, the PRP submitted for EPA review and approval an RI which detailed the findings of extensive sampling and analysis on the area of OU 2 and the surrounding area. Following the RI, the PRP submitted for EPA review and approval an FS which evaluated the various remedial alternatives for OU 2 consistent with the requirements of the AOC and taking into account the requirements of CERCLA and the NCP. In addition, the state of Missouri was provided an opportunity for review and comment on these documents.

3.0 COMMUNITY PARTICIPATION

Public participation activities for the remedy selection process were carried out consistent with NCP section 300.430(f)(3). The Proposed Plan and the Administrative Record (AR) file, which contains the RI/FS and other supporting documents, were made available to the public in June 2006. The AR file was placed at the Bridgeton Trails Branch of the public library, which is a location near the Site. Public notice on the Proposed Plan and public meeting was published in *Bridgeton/Hazelwood Journal* of the *St. Louis Post Dispatch.* Fact sheet notices were sent to area residents, elected officials, and the media outlets.

The comment period was opened on June 14, 2006. The first public meeting was held on June 22, 2006, at the Bridgeton Community Center. At the meeting, EPA provided an overview of the Site, described the preferred alternatives for both OU 1 and OU 2, and explained the remedy selection process. Following the presentation, oral comments from the public were received.

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In response to a request from the city of Bridgeton, the comment period was extended to August 14, 2006, and later extended again to October 14, 2006. Following public notice, a second public meeting was held at City Hall on September 14, 2006. All of the community concerns expressed at the first meeting were related to the proposed remedy for OU 1. Therefore, the presentation at the second meeting was more narrowly focused to address concerns with the proposed remedy for OU 1 that were identified at the first meeting. Following the presentation, oral comments from the public were received.

In response to additional requests, EPA further extended the comment period to December 29, 2006. In total, the first public comment period was held open for more than six months.

Responding to ongoing community interest, EPA reopened the public comment period and held a third public meeting on March 27, 2008. This third public comment period was closed on April 9, 2008.

Written transcripts were made of all public meetings, and these are contained in the AR file. Responses to comments received at the meeting and to written comments received during the comment period are provided in the Responsiveness Summary, which is Part III of the OU 1 ROD. No significant comments were received in reference to the Proposed Plan for OU 2, and there is no Responsiveness Summary included with this ROD.

4.0 SCOPE AND ROLE OF THE RESPONSE ACTION

The Site is divided into the following areas (see Figure 4-1):

- Radiological Area 1 (OU 1)
- Radiological Area 2 (OU 1)
- Closed Demolition Landfill (OU 2)
- Former Active Sanitary Landfill (OU 2)
- Inactive Sanitary Landfill (OU 2)

The Site is divided into two OUs. OU 1 addresses Radiological Area 1 and Radiological Area 2. The Selected Remedy for OU 1 is provided in a separate ROD. OU 2 consists of the other landfill areas that are not impacted by radionuclides, i.e., the Closed Demolition Landfill, the Inactive Sanitary Landfill, and the Former Active Sanitary Landfill. This ROD provides the Selected Remedy for OU 2. The Former Active Sanitary Landfill and the Closed Demolition Landfill are deferred to the state regulatory program consistent with EPA's policy on coordination between RCRA and CERCLA. The CERCLA decision process has been applied to the Inactive Sanitary Landfill which did not operate under state permit. OU 1 and OU 2 RODs complete the CERCLA decision-making for the Site.

This ROD identifies the performance standards and environmental requirements for the Selected Remedy. This ROD will be followed by a Remedial Design/Remedial Action (RD/RA) process to develop specific standards for construction, monitoring, and maintenance.

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5.0 SITE CHARACTERISTICS

This section presents a summary of the Site's conditions for OU 2 based on the results of the RI evaluations. The potential pathways for exposure to the Site's contaminants are also identified.

5.1 Site Description

The Site is a 200-acre facility located within the city of Bridgeton, St. Louis County, Missouri (Figure 1-1). The address is 13570 St. Charles Rock Road. The property includes a formerly active Bridgeton Sanitary Landfill, several other inactive landfill areas, concrete and asphalt plants, and an automobile repair shop (Figure 4-1). The Site was used agriculturally until 1939 when a limestone quarry and crushing operation was initiated.

The Site is bounded on the north by St. Charles Rock Road and on the east by Taussig Road and agricultural land. Old St. Charles Rock Road borders the southern and western portions of the Site. Property north of the Site (across St. Charles Rock Road) is moderately developed with commercial retail and industrial operations. The property northeast of the Site is also developed for commercial uses. The property south of the Site is currently experiencing significant commercial development. The Earth City Industrial Park is adjacent to the Site on the west. The Site is now almost completely surrounded by commercial/industrial properties.

The Site is located in the eastern edge of the Missouri River flood plain. The Missouri River is located less than two miles west of the Site. The area is transitional between the alluvial flood plain immediately to the west and the loessial bluffs 0.5 mile to the east. The edge of the alluvial valley is oriented north to south through the center of the Site. Topography in the area is gently rolling. However, the Site's topography has been significantly altered by quarry activities in the eastern portion and placement of mine spoils (unused quarry rock) and landfilled materials in the western portion.

The limestone quarry was operated between 1939 and 1988 and was closed when economically recoverable reserves were exhausted. The quarry consisted of two pits which were excavated to a maximum depth of about 240 feet below ground surface (bottom elevation of about 240 feet above mean sea level [MSL]). A sanitary landfill was operated within the limestone quarry pits. Permitted landfilling operations were initiated within the north pit of the quarry in 1979 and later moved into the south pit. Landfilling in the north pit terminated at a maximum elevation of about 500 feet above MSL. Activities at the south pit terminated with solid waste at an elevation of about 580 feet above MSL. The Former Active Sanitary Landfill ceased accepting wastes in 2005, and closure activities were completed in 2006.

The Former Active Sanitary Landfill was constructed with a gas collection system and separate leachate collection system. The gas collection system is designed to alleviate potential odor problems and recover gas for potential beneficial use. The leachate

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collection system currently includes seven leachate collection sumps. The leachate collection system collects an average of about 32.5 million gallons of leachate per year from the Former Active Sanitary Landfill area. The collected leachate is pumped into the St. Louis Metropolitan Sewer District.

The Earth City Levee District, which lies to the north and east of the Site, is fully developed with business and industrial parks. The 1,891-acre Levee District is protected on three sides with the main levee running 2.6 miles along the eastern bank of the Missouri River. The levee system is designed to exceed the 500-year flood level and ranges from 462.03 feet above MSL (ft/msl) at the south end to 459.34 ft/msl at the north end. The 500-year flood elevation at these locations is 459.03 ft/msl and 452.15 ft/msl, respectively. Assuming a 500-year flood, the Missouri River would be 3 to 7 feet below the top of the Earth City Levee.

Landfilling has significantly raised the elevation of the Site above the level of the former flood plain. The top elevation of the most northeastern portion of the Site—the Area 2 berm—is approximately 20 feet above the projected flood elevations of about 453 feet within the levee system along the river. Flooding of areas adjacent to the landfill, i.e., areas outside of the levee system, would only occur as a result of a failure or overtopping of the levee system. Spreading of floodwaters into areas outside of the levee system would result in lower flood elevations than those projected to occur within the levee system. Therefore, the actual elevations of any floodwaters that may extend into areas adjacent to the landfill would be less than 453 feet. The result would be no more than a foot or two of water at the northwestern toe of the landfill. Four major flood events have occurred since the levee was completed in 1972 including the record-level flood of August 1993 when the Missouri River crested at 14.6 feet above flood stage and remained above flood level for about 110 days. The flood control system functioned successfully in each case.

According to information provided on the Earth City Levee District Web site, the Levee District has:

> ...developed a comprehensive and ongoing maintenance program whereby the entire levee system, relief wells, pump station and other mechanical and electrical systems are inspected at least annually by qualified independent contractors. The U.S. Army Corps of Engineers inspects the levee and pump station normally on an annual basis. The District's levee and the pump station have qualified for participation in the Corps' rehabilitation assistance program for flood control projects (e.g., Public Law 84-99). As a result of such participation, the Corps will pay 80% of the construction costs incurred in connection with rehabilitation of the levee or pump station resulting from flooding. Costs such as dirt are not covered by the Corps' assistance program.

The three landfill areas that were studied in the RI for OU 2 are briefly discussed below. These areas are identified on Figure 4-1.

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5.1.1 Closed Demolition Landfill

The Closed Demolition Landfill is located in the northern portion of the Site between Area 2 and the landfill entrance road. The Closed Demolition Landfill accepted demolition wastes pursuant to the Missouri Operating Permit numbers 218912 and 21903 and is subject to an October 1987 Closure Plan and Missouri state closure and post-closure regulations. Figure 5-1 identifies MDNR's permitted areas. As such, the remedial requirements for the Closed Demolition Landfill portion of the OU 2 Site are established by those permit terms, laws, and regulations. There is no evidence that the Closed Demolition Landfill (which ceased accepting waste in June 1995) received or disposed of waste outside the scope of its permit. It is therefore appropriate for the Closed Demolition Landfill to remain under the state of Missouri regulatory program.

5.1.2 Former Active Sanitary Landfill

Permitted landfilling activities began in 1974 at the Former Active Sanitary Landfill (Bridgeton Sanitary Landfill) and were conducted subject to Missouri state sanitary landfill and waste water permits—most recently, MDNR Operating Permit numbers 118912 (solid waste) and MO-0112771 (waste water). Figure 5-1 identifies MDNR's permitted areas. The Former Active Sanitary Landfill ceased receiving municipal solid waste in February 2005 pursuant to an agreement with the city of St. Louis to reduce the potential harm to airport operations from birds that may be attracted to a sanitary landfill. This agreement was recorded as a negative easement on the entire Site in April 2005. A transfer station now exists within this area of OU 2. The Former Active Sanitary Landfill is undergoing closure and post-closure pursuant to its state of Missouri permits and state of Missouri solid waste regulations. As such, the requirements for the Former Active Sanitary Landfill portion of the OU 2 Site are established by those permit terms, plans, and regulations.

5.1.3 Inactive Sanitary Landfill

The Inactive Sanitary Landfill is located in the western portion of the Site, southwest of the Closed Demolition Landfill. Wastes disposed of in this area are believed to consist of municipal sanitary wastes. The Inactive Sanitary Landfill ceased accepting wastes in 1975 but was not officially *closed* under Missouri state landfill statutes or regulations. Therefore, remedial requirements for the Inactive Sanitary Landfill portion of the OU 2 Site are not established by permit. Data collected during the RI indicated that RA is warranted for the Inactive Sanitary Landfill (see Section 7.1). Accordingly, the FS was designed to evaluate appropriate RA for the Inactive Sanitary Landfill under CERCLA.

5.2 Subsurface Conditions

The geology of the landfill area consists of Paleozoic age sedimentary rocks overlying Pre-Cambrian age igneous and metamorphic rocks. The Paleozoic bedrock is overlain by unconsolidated alluvial and loess deposits of recent (Holocene) age.

The uppermost bedrock units near the landfill consist of Mississippian age limestone and dolomite with interbedded shale and siltstone layers of the Kinderhookian, Osagean, and Meramecian Series. The Kinderhookian Series is an undifferentiated limestone, dolomitic

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limestone, shale, and siltstone unit ranging in thickness from 0 to 122 feet in the St. Louis area. The Osagean Series consists of the Fern Glen Formation—a red limestone and shale—and the Burlington-Keokuk Formation—a cherty limestone. The Fern Glen Formation ranges in thickness from 0 to 105 feet, and the Burlington-Keokuk Formation ranges from 0 to 240 feet thick in the St. Louis area.

The Meramecian Series overlies the Osagean Series rocks. The Meramecian Series consists of several formations including the Warsaw Formation, the Salem Formation, the St. Louis Formation, and the St. Genevieve Formation. The St. Genevieve Formation is reportedly not present near the landfill.

Pennsylvanian age Missourian, Desmoisian, and Atokan Formations are present in some areas above the Mississippian age rocks. The Pennsylvanian age rocks consist primarily of shale, siltstone, and sandstone with silt and clay. These formations range in combined thickness from 0 to 375 feet in this area. The Atokan-Series Cheltenham Formation was identified as being present in the former landfill soil borrow area located to the southeast of the landfill.

Alluvial deposits of varying thickness are present beneath most of the Site. The underlying alluvium extends north and west from the former quarry pits, generally increasing in thickness from east to west toward the river. The thickness ranges from less than 5 feet to a fairly uniform thickness of approximately 100 feet beneath Area 2 (OU 1).

The regional direction of groundwater flow is in a generally northerly direction within the Missouri River alluvial valley, parallel or subparallel to the river alignment. The RI data indicate very flat gradients in the water table of the alluvial aquifer near the Site. However, in the immediate vicinity of the leachate collection system for the Former Active Sanitary Landfill, groundwater flow is inward toward the leachate sumps. The leachate collection system is of hydrogeologic importance because it is designed to remove the leachate and groundwater which flow into the Former Active Sanitary Landfill. The leachate collection system, therefore, acts as a groundwater sink to the shallow groundwater surrounding the Former Active Sanitary Landfill. Figure 5-2 shows the conceptual hydraulic model for the Former Active Sanitary Landfill. The area of influence extends laterally to the alluvium but does not extend vertically to the deeper bedrock units.

5.3 Nature and Extent of Contamination

The OU 2 RI was conducted to characterize affected media associated with OU 2 areas and to identify the pathways for contaminant migration associated with the Inactive Sanitary Landfill. The RI included studies of the physical and biological characteristics, hydrogeologic characteristics, sources of contamination, surface and sediment quality, and air quality. Source characterization activities were conducted for the Inactive Sanitary Landfill including landfill gas and leachate characterization. The findings are briefly summarized below.

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Landfill gas characterization of the Inactive Sanitary Landfill was accomplished using various measurement techniques. Air monitoring of the breathing zone conducted during 49 borings did not show appreciable impacts from landfill gas. Active gas venting was not observed. Direct measurements of landfill gas were made along the crest of the landfill. Measurements along the western perimeter were also taken. Sporadic impacts from combustible gas emissions and volatile organic compounds (VOCs) were observed.

Leachate sampling and analysis were conducted at the Inactive Sanitary Landfill to look for impacts from potential sources of hazardous substances. Existing leachate risers at the Former Active Sanitary Landfill were also sampled. Leachate samples were analyzed for the full suite of hazardous substances. In general, the leachate from the Inactive Sanitary Landfill had fewer detected parameters and at lower concentrations than leachate from the Former Active Sanitary Landfill. This is probably due to the greater age of the Inactive Sanitary Landfill which ceased accepting waste materials in 1975. Table 5-2 compares the organic compounds above the laboratory reporting limit for the leachate from the Former Active Sanitary Landfill against the leachate from the Inactive Sanitary Landfill.

Surface and subsurface soil samplings were conducted to characterize the distribution and extent of organic constituents within and near the landfill mass at the Inactive Sanitary Landfill. Samples were analyzed for total organic carbon (TOC) or total petroleum hydrocarbon (TPH) and VOCs where elevated organic concentrations were suspected. TOC values near the ground surface west of the Inactive Sanitary Landfill range from about 2,300 milligrams per kilogram (mg/kg) (0.23 percent) to 10,000 mg/kg (1 percent). Soil samples from the southwest corner of the Inactive Sanitary Landfill near MW-F2 were analyzed for TPH and VOCs to confirm and characterize suspected petroleum-related impacts. Table 5-3 lists the results. Detectable VOCs were limited to toluene, ethylbenzene, and total xylenes which are common petroleum constituents. These impacts may be due to the leaking underground storage tank (LUST) site located at the asphalt plant to the west. Vapor intrusion to off-site locations is not a concern under current conditions because the area is bordered by the Earth City Industrial Park storm water retention system and undeveloped land to the west and southwest.

Groundwater was the medium most extensively sampled as part of the OU 2 RI. Constituents detected in the alluvial groundwater at levels exceeding Safe Drinking Water Act Maximum Contaminant Levels (MCLs) include arsenic, benzene, vinyl chloride, iron, manganese, chloride, total dissolved solids, and fluoride. Some of the metals and conventional water quality parameters appear to reflect background groundwater conditions. See Table 5-1 for a summary of parameters detected as part of the OU 2 RI that exceeded MCLs in groundwater.

The OU 2 RI identified an area of shallow groundwater impact near the extreme southwest corner of the Inactive Sanitary Landfill. The groundwater in this area is impacted by petroleum hydrocarbons and volatile organic hydrocarbons. As detailed in the RI, the potential source of the impacts may be the LUST site that lies between the Inactive Sanitary Landfill and the Former Active Sanitary Landfill. Surface water and sediment results indicate that the localized area of impacted groundwater is not measurably affecting downgradient surface waters and sediments.

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Figures 5-3 through 5-7B are maps illustrating all groundwater and surface water data collected as part of both the OU 1 and OU 2 RI/FS projects combined. Groundwater and surface water results for chlorobenzene, benzene, dissolved and total lead, dissolved and total arsenic, and dissolved and total radium are illustrated on these figures. These are the only constituents detected at the Site in excess of MCLs. The results generally show sporadic and isolated detections of a small number of contaminants at relatively low concentration levels. These results are not indicative of on-site contaminant plumes, radial migration, or other forms of contiguous groundwater contamination that might be attributable to the landfill units being investigated. Based on the frequency of detection and concentration level relative to its MCL, arsenic is one of the more noteworthy contaminants found in the groundwater that is potentially related to the landfill units. However, even in the case of arsenic, no evidence of radial migration was found, i.e., the detections were not supported by nearby locations.

The locations of the two known sources of groundwater contamination unrelated to the Site are identified on the figures. PM Resources, located to the east of Area 1 across St. Charles Rock Road, produces a wide variety of animal health care products and chemicals. The LUST site is located at the center of the Site property. As shown by the arrows on these figures, some groundwater flows from these sources toward the landfill units. Some of the contaminants detected as part of the OU 1 and OU 2 investigations may be attributable to these sources. Summaries regarding the nature of these facilities and the potential groundwater releases associated with these can be found in the OU 2 RI/FS documents.

The figures also include the approximate extent of the inward hydraulic gradient that has been established by the pumping of about 300 million gallons per year of groundwater/leachate at the Former Active Sanitary Landfill. The sanitary landfill has been pumping about 300 million gallons per year of leachate/groundwater for approximately 15 years and is required by state permit to maintain a significant inward hydraulic gradient throughout post-closure, which will extend for at least another 28 years.

In summary, as part of the OU 2 RI and related site characterization efforts, a variety of environmental media were sampled for landfill contaminants. The data did not indicate disposal of large quantities of hazardous waste at any of the landfill areas. However, low levels of hazardous substances were identified in leachate, landfill gas, and groundwater. The findings are generally consistent with municipal waste disposal which often includes small quantities of hazardous wastes. While groundwater at the Site has been impacted, significant off-site contaminant migration is not currently indicated; however, this remains an ongoing and potential pathway that needs to be addressed. Based on these findings and general experience with landfill sites, the potential pathways by which contaminants could migrate from the landfill are listed below and the remedy for OU 2 will need to address these pathways:

- Airborne transport of gas and fugitive dust
- Rainwater runoff transport of dissolved or suspended contaminants

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- Erosion and transport of contaminated soils or waste materials
- Leaching of contaminants to the underlying alluvial groundwater

6.0 CURRENT AND FUTURE LAND AND RESOURCE USES

This section describes the current and reasonably anticipated land uses and current and potential groundwater uses at the Site.

6.1 Land Use

The Site is a 200-acre facility on which are located several solid waste disposal areas including the Bridgeton Sanitary Landfill (Former Active Sanitary Landfill). There is also a solid waste transfer station, concrete and asphalt plants, and an automobile repair shop located on the facility.

Land use in the area surrounding the landfill is generally commercial and industrial. The property to the north of the landfill across St. Charles Rock Road is moderately developed with commercial, retail, and manufacturing operations. The Earth City Industrial Park is located adjacent to the landfill on the west and southwest across Old St. Charles Rock Road. Spanish Village—a residential development—is located to the south of the landfill near the intersection of St. Charles Rock Road and Interstate 270 approximately .75 mile from the Site. Adjacent to the Spanish Village development is a large industrial park. Mixed commercial, retail, manufacturing, and single family residential uses are present to the southeast of the landfill.

The Site itself is expected to remain a landfill site and any on-site commercial uses will need to be compatible with this end use. There are existing land use controls in the form of restrictive covenants executed by the property owner. Development within the Earth City Levee District, which includes all the property to the north, west, and southwest of the Site, is commercial and industrial by design; the entire 1,891 acres are 97 percent developed. Surrounding land use to the south and east is also expected to remain largely commercial/industrial. Zoning in that area is consistent with this observation. Because the surrounding area is already mostly developed, no significant changes in land use are anticipated.

6.2 Groundwater Use

The Site is located at the edge of the alluvial valley. Groundwater is present in both the unconsolidated materials (alluvium) and in the bedrock underlying and adjacent to the Site.

The major alluvial aquifers in the area are differentiated to include the Quaternary age alluvium and the basal parts of the alluvium underlying the Missouri River flood plain. The major bedrock aquifers favorable for groundwater development lie at great depths. The St. Peter Sandstone aquifer lies at a depth of approximately 1,450 feet below ground surface. While of regional importance, the major bedrock aquifers are not significant to the study of the Site due to their great depths and intervening shale units. The bedrock

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units immediately underlying and adjacent to the Site (including the Warsaw, Salem, and St. Louis Formations) are not very favorable for groundwater development, i.e., yield less than 50 gallons per minute to wells.

Investigation during the RI confirmed there is no current groundwater use in the vicinity of the Site. The nearest registered well is a deep bedrock well located about one mile northeast of the Site. The closest registered alluvial well is two and one-half miles south of the Site. A public water supply intake is located approximately eight miles downstream of the Site. Given the setting and the ready access to municipal drinking water supplies, use of the shallow groundwater at or near the Site is not considered to be a viable pathway for the foreseeable future. Nevertheless, based on potential yields, groundwater in the vicinity of the Site is considered potentially usable. In particular, alluvial groundwater wells completed in the Missouri River flood plain are capable of very high yields.

7.0 SUMMARY OF SITE RISKS

A streamlined or qualitative risk evaluation was conducted as part of the RI/FS process for OU 2. As a matter of policy, a quantitative risk assessment is not necessary to establish a basis for action at CERCLA municipal landfill sites if groundwater data are available to demonstrate that contaminants exceed standards or if other conditions exist that provide a clear justification for action, which is the case for OU 2. Figure 7-1 depicts the Site Conceptual Model for OU 2.

7.1 Human Health Risks

The OU 2 Baseline Risk Assessment (BRA) was prepared in accordance with the presumptive remedy approach for municipal landfills. EPA recognizes that certain categories of sites, i.e., municipal landfill sites, have similar characteristics such as types of contaminants, types of disposal practices, or how environmental media are affected. Based on information acquired from evaluating and cleaning up these sites, EPA has initiated the use of presumptive remedies to accelerate cleanups at these types of sites.

The streamlined approach to evaluating risks at CERCLA municipal landfill sites differs from the typical BRA in that quantitative calculations of intakes and risks are not conducted. Instead, pathways that present an obvious threat to human health and the environment are identified by comparing site-specific contaminant concentrations to established standards or risk-based chemical concentrations (EPA, 1991b).

Consistent with the streamlined approach, the OU 2 BRA compared groundwater contaminant concentrations with chemical-specific standards. In this case, MCLs as provided in the drinking water regulations pursuant to the Safe Drinking Water Act (40 CFR 141) and the Missouri regulations (10 CSR 60-4.010, et seq) were used.

Carcinogenic contaminants exceeding MCLs which were identified in the alluvial groundwater sampling for the Site are arsenic, benzene, and vinyl chloride.

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Noncarcinogenic contaminants that exceeded MCLs in the Site's groundwater are iron, manganese, chloride, total dissolved solids, and fluoride. TPHs also exceeded the MDNR Tier 1 Cleanup Levels apparently as a result of releases from a LUST discussed in more detail in the RI Report.

In this case, the ongoing potential for contaminants to leach to groundwater is sufficient to justify CERCLA response action. Moreover, consistent with this streamlined approach, the final remedy must address all pathways and contaminants of concern not just those that trigger the RA.

7.2 Ecological Risks

A qualitative ecological evaluation was conducted for OU 2. Although local populations of some common species may be present in the area, OU 2 is not a highly sensitive or ecologically unique environment. The streamlined risk assessment for OU 2 as discussed in the human health evaluation identified groundwater as the primary media of concern. Groundwater is not readily accessible to ecological receptors, and the Site's characterization suggests that groundwater will not adversely impact ecologically sensitive areas.

8.0 REMEDIAL ACTION OBJECTIVES

The general objective for the Selected Remedy is to protect public health and the environment by preventing actual or potential human exposure to the Site's contaminants and by preventing or mitigating contaminant migration. Potential pathways for contaminant migration are identified in Section 5.3.

Generally, the principal response action for CERCLA municipal landfill sites is engineered containment in place consistent with EPA's presumptive remedy approach described below. This approach takes advantage of EPA's experience with landfill sites to streamline the site evaluation and remedy selection processes. This approach was used in the case of OU 2. The presumptive approach is described in Section 8.1.

8.1 Presumptive Remedy Approach for CERCLA Municipal Landfills

NCP provides the implementing regulations for CERCLA. Section 300.430(a)(iii)(B) of the NCP contains the expectation that engineering controls such as capping or other form of containment will be used for waste that poses a relatively low, long-term threat or where treatment is impracticable. The preamble to the NCP identifies municipal landfills as a type of site where treatment of the waste may be impracticable because of the size and heterogeneity of the contents (55 FR 8704). Waste in CERCLA landfills usually is present in large volumes and is a heterogeneous mixture of municipal waste frequently codisposed with industrial and/or hazardous waste. Because treatment is usually impracticable, EPA generally considers containment to be the appropriate response action or the *presumptive remedy* for the source areas of municipal landfill sites.

Presumptive remedies are preferred technologies for common categories of sites based on historical patterns of remedy selection and EPA's scientific and engineering evaluation of

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performance data on technology implementation. EPA has issued guidance that establishes containment as the presumptive remedy for CERCLA municipal landfills including EPA 540-F-93-035, *Presumptive Remedy for CERCLA Municipal Landfill Sites*; EPA/540/P-92-001, *Conducting Remedial Investigations/Feasibility Studies for CERCLA Municipal Landfill Sites*; EPA/540F-95/009, *Presumptive Remedies: CERCLA Landfill Caps RI/FS Data Collection Guide*; EPA/540/F-96/020, *Application of the CERCLA Municipal Landfill Presumptive Remedy to Military Landfills*, including those that contain radioactive wastes; EPA 540/R-94/081, *Feasibility Study Analysis for CERCLA Municipal Landfill Sites;* and EPA 540-F-99-015, *Reuse of CERCLA Landfill and Containment Sites*. These documents are included in the AR file and some can be found in Appendix A to the OU 1 FS.

The landfill units at the Site OU 2 were used for solid waste disposal consistent with the situation envisioned in the presumptive remedy guidance. The presumptive remedy is suitable for OU 2, and the streamlined approach to site evaluation was taken where appropriate. The presumptive remedy is engineered containment composed of technology options that are appropriate to the circumstance.

The Remedial Action Objectives (RAOs) for the municipal landfill presumptive remedy are the following:

- Prevent direct contact with landfill contents
- Minimize infiltration and resulting contaminant leaching to groundwater
- Control surface water runoff and erosion
- Collect and treat contaminated groundwater and leachate to contain any contaminant plume and prevent further migration from the source area
- Control and treat landfill gas

These RAOs identified by EPA in the presumptive remedy guidance (EPA, 1993) address the potential migration pathways identified in the RI. The first objective of preventing direct contact with landfill contents addresses direct exposure to contaminated soil or waste materials. The second and third objectives identified in the presumptive remedy guidance are also appropriate for OU 2. The fourth objective is not applicable because a plume of contaminated groundwater beneath or downgradient of the disposal areas has not been identified. In addition, meeting the second objective ensures that the potential for ongoing infiltration or leaching is minimized. The fifth objective of controlling and treating landfill gas applies. The following summarizes these objectives:

8.2 Remedial Actions Objectives for Operable Unit 2:

- Prevent direct contact with landfill contents
- Minimize infiltration and any resulting contaminant leaching to groundwater

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- Control surface water runoff and erosion

- Control and treat landfill gas emissions

Hot spots are defined in EPA's Presumptive Remedy for CERCLA Municipal Landfills (EPA 540-F-93-035) as discrete, accessible, and more toxic or mobile waste forms within the landfill that might compromise the integrity of the containment remedy. Typical hot spots include drums or trenches containing liquids or concentrated industrial waste. If hot spots are identified, the process provides that they be evaluated for removal and/or treatment. To be considered for excavation and treatment, hot spots should be large enough or toxic enough that remediation would significantly reduce the risk posed by the site, but small enough and accessible enough that it is reasonable to consider removal. The RI for OU 2 found no evidence of any hot spots at any of the landfill units.

9.0 DESCRIPTION OF REMEDIAL ALTERNATIVES

The following components address the RAOs identified above:

- Landfill cap

- Landfill gas collection and treatment as necessary

- Institutional controls (ICs) to limit land and resource use

- Long-term groundwater monitoring and maintenance

Construction of a proper landfill cap will prevent direct contact with landfill contents. The cap will be designed to minimize infiltration, control surface water runoff and erosion, and control landfill gas emissions. Based on the results of gas monitoring, collection and/or treatment will be undertaken as necessary. Long-term groundwater monitoring plans and operation and maintenance (O&M) plans will be developed and implemented. The specific requirements that these components must meet are established based on an analysis of applicable or relevant and appropriate requirements (ARARs).

Under this approach, the Site will remain a landfill and hazardous substances will remain on-site at levels that do not allow for unlimited use and unrestricted exposure. Therefore, a periodic review of the remedy will need to be conducted at least every five years (Five-Year Review).

9.1 Closed Demolition Landfill and the Former Active Sanitary Landfill

Missouri is a federally approved regulator for solid waste landfills and has promulgated laws and requirements for the design and operation of sanitary landfills (10 CSR 80-3.010) and demolition landfills (10 CSR 80-4.010). The Missouri Solid Waste Management Rules also provide requirements for closure and post-closure care (10 CSR 80-2.030). The Closed Demolition Landfill operated under Missouri permit and was

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closed in 1995. The Former Active Sanitary Landfill (Bridgeton Landfill) operated under Missouri permit and disposal operations ceased in 2005. The Missouri Solid Waste Rules are applicable to these landfills, and closure and post-closure care will be carried out in accordance with state and local permits. Application of these rules is consistent with the RAOs identified in Section 8.0 above. Consistent with EPA's policy on coordination between RCRA and CERCLA actions, these regulated units are deferred to the state regulatory program. The terms of these permits will dictate the closure and post-closure requirements, and no FS evaluation of remedial alternatives or identification of relevant and appropriate requirements was necessary for these areas.

9.2 Inactive Sanitary Landfill

This landfill was part of the unregulated landfill operations conducted prior to 1974. It contains sanitary wastes and a variety of other solid wastes and demolition debris. This landfill is similar to a sanitary landfill, and many of the substantive Missouri requirements for closure and post-closure care are relevant and appropriate. This landfill is also well suited for streamlined evaluation as envisioned under EPA's presumptive approach to municipal solid waste landfills. There is no unusual site condition that might justify evaluation of nonpresumptive remedial options. For the Inactive Sanitary Landfill, the RAOs identified in Section 8.0 will be met through application of the CERCLA process. The FS provides the development and evaluation of remedial alternatives and identifies ARARs for this landfill unit.

9.2.1 Alternative 1 – No Action

Alternative 1 (No Action) is included as required by the NCP to serve as a baseline for comparison of the other alternatives. Under this alternative, no engineering measures will be implemented at the Inactive Sanitary Landfill to reduce potential exposures or control potential migration. Similarly, no additional ICs and no additional fencing will be implemented to control land use, access, or potential future exposures. No monitoring will be conducted to identify or evaluate any potential changes that may occur. The only costs that would be associated with the No Action Alternative are those associated with performing Five-Year Reviews. The 30-year present worth cost is estimated at $47,000.

9.2.2 Alternative 2 – Landfill Cover with Long-Term Monitoring and Institutional Controls

Estimated capital cost: $6,670,000
Estimated annual O&M cost: $45,000
Estimated 30-year present worth cost: $7,215,000

Under Alternative 2, a landfill cap would be installed at the Inactive Sanitary Landfill consistent with relevant and appropriate Missouri requirements for sanitary landfill cap construction, including two feet of engineered materials meeting the permeability requirement and vegetated cover (Figure 9-1). Missouri requirements for landfill gas monitoring/management, groundwater monitoring, and inspection and maintenance would also be met. ICs must be implemented to limit future uses and to ensure future uses do not impact the effectiveness or integrity of the remedy.

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10.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

In accordance with the NCP, remedial alternatives must be evaluated against the nine evaluation criteria provided in the NCP. The nine evaluation criteria fall into three categories: threshold criteria, primary balancing criteria, and modifying criteria. The first two criteria described below are the threshold criteria. To be eligible for selection, an alternative must meet the threshold criteria, i.e., be protective of human health and the environment and comply with ARARs. The next five criteria are the primary balancing criteria. These criteria are used to assess the relative advantages and disadvantages of each alternative. The last two are the modifying criteria. These allow for consideration of state and community issues and concerns.

The Site OU 2 is comprised of the Closed Demolition Landfill, the Former Active Sanitary Landfill, and the Inactive Sanitary Landfill. As explained in the prior section, an FS evaluation was not performed for the Closed Demolition Landfill and the Former Active Sanitary Landfill because these units are appropriately regulated through existing state and local permits.

The OU 2 FS provides a detailed description of Alternative 2 for the Inactive Sanitary Landfill – Landfill Cover with Long-Term Monitoring and ICs. However, a true comparative analysis of alternatives for the Inactive Sanitary Landfill is not presented because consistent with EPA guidance the remedy is presumed to be containment consisting of a landfill cover with long-term monitoring and ICs as described in Alternative 2. FS analysis supporting the presumptive approach is provided in EPA 540/R-94/081 – *Feasibility Study Analysis for CERCLA Municipal Landfill Sites*. Although not a comparative analysis, the following subsections describe how the evaluation criteria are met by the containment remedy.

10.1 Overall Protection of Human Health and the Environment

This criterion addresses whether the alternative provides adequate protection of human health and the environment and how well the risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or ICs.

Through inclusion of an upgraded landfill cap sufficient to meet the state of Missouri solid waste landfill closure requirements, Alternative 2 would be protective of human health and the environment. The upgraded landfill cover would prevent contact with landfill contents, minimize infiltration and resulting contaminant leaching to groundwater, and would control the generation of landfill gas. In addition, through engineering design to ensure proper slopes are maintained, the upgraded cover would control surface water runoff and erosion.

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10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and NCP § 300.430(f)(1)(ii)(B) require that RAs at CERCLA sites attain legally applicable or relevant and appropriate federal and state requirements, standards, criteria, and limitations which are collectively referred to as ARARs unless such ARARs are waived under CERCLA section 121(d)(4).

ARARs for the closure and post-closure care of the Inactive Sanitary Landfill are identified by the Missouri solid waste landfill rules. Alternative 2 will meet these requirements. See Section 13.2 for a full description.

10.3 Long-Term Effectiveness and Permanence

This refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time.

Alternative 2 provides engineered containment in conjunction with long-term monitoring, maintenance, and land use control designed to be effective over the long term. Long-term site management plans and ICs will be made as robust and durable as possible. Even without ICs, the landfill cover will passively prevent human exposures for an indefinite period.

10.4 Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 2 will not result in a reduction of toxicity, mobility, or volume through treatment. The hazardous substances in the Inactive Sanitary Landfill are dispersed within the overall, heterogeneous matrix of municipal refuse and construction and demolition debris. Consequently, treatment techniques are considered impracticable.

10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during implementation of the remedy.

Alternative 2 involves routine landfill closure activities. The short-term impacts to workers and the community would be comparable to those resulting from the recent closure of the Former Active Sanitary Landfill. The local roads would experience increased truck traffic as a result of hauling low permeability soil and topsoil and heavy equipment; however, the current capacity of these roads is sufficient to accommodate the traffic with minimal disturbance to the community.

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10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Placement of low permeability soil and topsoil is a routine closure activity associated with solid waste landfills. There are no unknown or nonroutine technical difficulties associated with Alternative 2. Administratively, construction of a state of Missouri solid waste landfill prescribed cover would involve coordination with other offices and agencies that are routinely utilized when placing final cover on solid waste landfills. The necessary construction equipment and materials are readily available.

10.7 Cost

This addresses the capital and O&M costs of the alternative. These study estimated costs are intended to allow gross comparisons but are not expected to have a high degree of accuracy.

Estimated capital, annual O&M, and 30-year present worth costs for Alternative 2 are as follows:

- Estimated capital cost: $6,670,000
- Estimated annual O&M cost: $45,000
- Estimated 30-year present worth cost: $7,215,000

10.8 State Acceptance

MDNR assists EPA in its oversight role and provides review and comment on the Site's documents. MDNR provided the following statements describing state acceptance:

> The Missouri Department of Natural Resources has reviewed the Record of Decision for Operable Unit 1 and Operable Unit 2 (OU-1 and OU-2) of the West Lake Landfill. Generally speaking, everyone would want all sites remediated to levels that provide unencumbered use. The department's goal of remediation to unencumbered use aligns with the National Contingency Plan's objective. For West Lake Landfill, however, the department accepts remediation that provides containment and isolation of contaminants from human receptors and the environment as the most reasonable option given the circumstances, as defined in the selected remedies for OU-1 and OU-2. The department recognizes the hazards associated with excavation into a former solid waste landfill, and has determined that the risks associated with this option to on-site workers and nearby citizens, outweigh the risks of containment in place.

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The department also recognizes the need for long-term care and monitoring for containment in place and insists that a robust and durable stewardship plan be implemented to address this aspect. In order to achieve this, the state has applicable standards, which are relevant and appropriate for:

- closure and long-term care of all portions of the site,
- monitoring and control of gas generated in the waste deposits,
- monitoring of groundwater, and
- continued removal of leachate from the Former Active Sanitary Landfill.

The department must remain a partner in the development of the remedial design, stewardship plan, and implementation of these aspects for this site to ensure that the selected remedy remains protective of human health and the environment into the future. To reiterate, the department would support actions that move the site closer to unencumbered use (recognizing the site is a landfill), should future events occur that would change the current administrative process.

10.9 Community Acceptance

The public comment periods for OU 1 and OU 2 were held simultaneously. Based on comments received during the public comment period, the community has a substantial interest in the remedy for OU 1 but not OU 2. No significant public comments were received on the proposed remedy for OU 2.

11.0 PRINCIPAL THREAT WASTES

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. For example, drums or trenches with hazardous or liquid wastes would generally be considered principal threat wastes. The NCP establishes the expectation that treatment will be used to address the principal threats posed by the site wherever practicable [section 300.430(a)(1)(iii)(A)]. The hazardous substances at the Site OU 2 are dispersed in a heterogeneous mix of municipal solid waste. No principal threat wastes have been identified.

12.0 SELECTED REMEDY

The Selected Remedy for the Inactive Sanitary Landfill is to install a cover system consistent with Alternative 2. Long-term monitoring, maintenance, ICs, and periodic reviews will also be required.

As explained in Section 9.0, the Closed Demolition Landfill and the Former Active Sanitary Landfill are appropriately deferred to state and local regulation.

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12.1 Rationale for the Selected Remedy

The information indicates that the waste materials in the Inactive Sanitary Landfill can be safely managed in place using conventional landfill methods consistent with Alternative 2. There are no exposure pathways outside the source area (landfill) and no long-term groundwater response action is necessary. The circumstances fit well with those envisioned by EPA's presumptive remedy guidance for CERCLA municipal landfill sites.

12.2 Description of the Selected Remedy

The major components of the Selected Remedy for the Inactive Sanitary Landfill are as follows:

- Installation of landfill cover meeting the Missouri closure and post-closure care requirements for sanitary landfills
- Use and application of groundwater monitoring and protection standards consistent with requirements for sanitary landfills
- Surface water runoff control
- Gas monitoring and control consistent with sanitary landfill requirements as necessary
- ICs to prevent land uses that are inconsistent with a closed solid waste landfill site
- Long-term surveillance and maintenance of the remedy

Prior to construction of the landfill cover, the area will be brought up to grade using placement of inert fill and regrading of existing material as determined in the RD. Final grades will achieve a minimum slope of two percent.

The landfill cover, gas control, runoff control, long-term groundwater monitoring, and post-closure inspection and maintenance will at a minimum meet the relevant and appropriate requirements found in the Missouri solid waste rules for sanitary landfills.

Surface drainage diversions, controls, and structures will be designed and constructed to expeditiously route storm water runoff to the water drainage systems which are subject to state National Pollution Discharge Elimination System permits.

Landfill gas characterization of the Inactive Sanitary Landfill indicated the sporadic presence of decomposition gases and organic vapors. Typically, gas generation in municipal solid waste increases for the first five or six years after placement in the landfill and then declines thereafter. Because the landfill has been inactive for 30 years, decomposition gas generation is relatively low and expected to decline. However, even at low generation rates, placement of the landfill cover creates the potential for gases to be trapped and accumulate under the cover. To prevent pressure build up under the landfill cover and/or lateral migration, gas control systems may be required. Gas control measures may involve passive venting or active collection. The need for and nature of gas control measures will be evaluated and defined as part of the RD.

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The landfill cover system will be routinely inspected and maintained to ensure the integrity of the remedy over time. In addition to surveillance of the physical remedy, the periodic site inspections will include administrative functions such as monitoring of ICs and coordination with key stakeholders including the Earth City Levee District regarding management of the flood control system. See Section 5.1 for a description of the levee maintenance program.

The O&M plan will be developed and submitted for approval as part of the RD/RA process. The O&M plan will cover all the long-term remedy management functions including groundwater monitoring plans, site inspection, maintenance and repair, IC monitoring and enforcement, five-year reviews, notification and coordination, community relations, health and safety, emergency planning, activity schedules, reporting, etc. In practice, the O&M plan may be developed as a compilation of more focused plans.

12.2.1 Groundwater Monitoring Objectives

One of the primary objectives of the Selected Remedy is to protect groundwater from any ongoing or future impacts from the Inactive Sanitary Landfill. The landfill cover over the Inactive Sanitary Landfill will be designed and constructed to shed water and minimize the potential for precipitation to infiltrate the waste materials. Therefore, the cover is expected to further reduce the potential for migration of contaminants from the Inactive Sanitary Landfill to the shallow groundwater underlying the Site. A long-term groundwater monitoring program will be established to demonstrate that the Selected Remedy performs as required over the post-closure period. The plan will have a groundwater monitoring component and a detection monitoring component. Statistical evaluation of groundwater data will be used to assess groundwater quality and identify long-term trends. Statistically significant deterioration in groundwater quality with time as a result of contaminant migration from the Inactive Sanitary Landfill shall be cause to reevaluate the remedy.

Monitoring plans requiring specific monitoring locations, sampling frequencies, parameters, sampling and analysis procedures, and evaluation approach will be developed and submitted as part of the O&M plan in the RD/RA process. The program may be optimized with time, depending on results. Monitoring plans and groundwater protection standards will be consistent with the requirements found in the Missouri Solid Waste Rules for Sanitary Landfills [10 CSR 80-3.010 (11)].

12.2.2 Institutional Controls

The Site will need to be used in ways consistent with it being a landfill site. Land use restrictions must be implemented for the Inactive Sanitary Landfill to limit future uses and to ensure future uses do not impact the effectiveness or integrity of the remedy. The restrictions must be maintained until the remaining hazardous substances are at levels allowing for unlimited use and unrestricted exposure. These restrictions do not apply to activities related to the implementation, maintenance, or repair of the remedy.

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The following use restrictions apply within the boundary of the cover system(s) for the Inactive Sanitary Landfill:

- Prevent development and use for residential housing, schools, childcare facilities or playgrounds.
- Prevent development and use for industrial or commercial purposes such as manufacturing, offices, or other facilities that are incompatible with the function or maintenance of the landfill cover.
- Prevent construction activities involving drilling, boring, digging, or other use of heavy equipment that could disturb vegetation, disrupt grading or drainage patterns, cause erosion, or otherwise compromise the integrity of the landfill cover or manage these activities such that any damage to the cover is avoided or repaired.
- Prevent the use of all groundwater underlying the area.
- Provide for access necessary for continued maintenance, monitoring, inspections, and repair.

For nondisposal areas of the Site, any new or existing structures for human occupancy shall be assessed for landfill gas accumulation; mitigative engineering measures such as foundation venting should be employed as necessary.

Property use restrictions at the Site will be implemented through the placement of ICs. The specific IC design and implementation strategy will be a component of the RD planning process following release of this ROD. Where appropriate, multiple mechanisms or a *layered* approach will be used to enhance the effectiveness of the IC strategy. Access controls such as fences and gates may also be used to support the use restrictions.

At the Site, the affected properties are privately owned and the use restrictions must be maintained for an indefinite period of time. Therefore, proprietary controls will be used because they generally run with the land and are enforceable. The Missouri Environmental Covenants Act (MECA), which is based on the Uniform Environmental Covenants Act, was recently enacted. MECA specifically authorizes environmental covenants and authorizes the state to acquire property interests. Specifically designed to support use restrictions at contaminated sites, an environmental covenant pursuant to MECA is the preferred instrument to be used at the Site.

The Site has been listed by MDNR on the state's Registry of Confirmed, Abandoned, or Uncontrolled Hazardous Waste Disposal Sites in Missouri (Uncontrolled Sites Registry). The Registry is maintained by MDNR pursuant to the Missouri Hazardous Waste Management Law, Mo.Rev.Stat. Section 260.440. Sites listed on the Registry appear on a publicly available list. A notice is filed with the County Recorder of Deeds and notice must be provided by the seller to any potential buyers of the property.

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The O&M plan will contain procedures for surveillance, monitoring, and maintenance of the ICs. The O&M plan will provide for notice to EPA and/or the state of any IC violations, planned or actual land use changes, and any planned or actual transfers, sales, or leases of property subject to the use restrictions.

12.2.3 Estimated Remedy Costs

Estimated capital, annual O&M, and 30-year present worth costs for the Selected Remedy are as follows:

- Estimated capital cost: $6,670,000
- Estimated annual O&M cost: $45,000
- Estimated 30-year present worth cost: $7,215,000

A breakdown of the capital cost estimate is provided in Table 12-1. The total present worth cost uses a discount rate of 7 percent for the duration of the 30-year evaluation period. The 30-year evaluation period is used to allow for cost comparisons only and has nothing to do with the expected duration of the remedy.

The cost estimates are based on the best available information regarding the anticipated scope of the remedy and unit rates. Changes in the cost elements will occur as new information is collected during the design and construction phase.

12.3 Expected Outcomes of the Selected Remedy

As a result of the Selected Remedy, the Site will remain dedicated to solid waste disposal. This use is consistent with current and reasonably anticipated future use for the Site. As such, the Site may be used in ways that are consistent with it being a closed landfill site, i.e., uses that do not interfere with the function or maintenance of the landfill cover system. See Section 12.2.2 for a description of the use restrictions.

13.0 STATUTORY DETERMINATIONS

Under CERCLA section 121(b) and NCP, the lead agency must select remedies that are protective of human health and the environment, comply with ARARs, are cost effective, and utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. In addition, CERCLA includes a preference for treatment that reduces volume, toxicity, or mobility as a principal element. The following sections discuss how the Selected Remedy meets these statutory requirements.

13.1 Protection of Human Health and the Environment

The Selected Remedy will protect human health and the environment through the use of engineered containment, long-term surveillance and maintenance, and ICs on land and resource use. The landfill cover will eliminate potential risks of exposure from inhalation or ingestion of contaminated soils or other wastes, dermal contact with contaminated soils or other wastes, gas emissions, and wind dispersal of fugitive dust.

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The cover will also limit infiltration of surface water that might cause leaching of contaminants to the groundwater. Long-term maintenance and monitoring will ensure that the Selected Remedy functions as intended. ICs will ensure that land and resource uses are consistent with permanent waste disposal.

13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The Selected Remedy will comply with all ARARs as identified below.

Missouri Solid Waste Rules for Sanitary Landfills

Under RCRA Subtitle D, a state may promulgate more stringent regulations for landfills in that state provided that EPA approves of the state's regulations. Missouri is an approved state for providing regulations for landfills. Missouri promulgated its regulations in 1997 (22 Mo Reg 1008, June 2, 1997) and they became effective July 1, 1997. The Missouri Solid Waste Management Rules establish requirements for design and operation of sanitary landfills (10 CSR 80-3.010) and demolition landfills (10 CSR 80-4.010). The rules also provide closure and post-closure requirements (10 CSR 80-2.030) for existing landfills closed after October 9, 1991. The Closed Demolition Landfill operated under Missouri permit and was closed in 1995. The Former Active Sanitary Landfill (Bridgeton Landfill) operated under Missouri permit, and disposal operations ceased in 2005. The Missouri Solid Waste Management Rules are applicable to these landfills and closure and post-closure care will be carried out in accordance with state and local permits. These rules are not applicable to the Inactive Sanitary Landfill which closed prior to the effective date. However, the requirements are considered relevant and appropriate as described below.

MDNR regulations require cover to be applied to minimize fire hazards, infiltration of precipitation, odors, and blowing litter; control gas venting and vectors; discourage scavenging; and provide a pleasing appearance [10 CSR 80-3.010(17)(A)]. This final cover shall consist of at least two feet of compacted clay with a coefficient of permeability of 1×10^{-5} cm/sec or less overlaid by at least one foot of soil capable of sustaining vegetative growth [10 CSR 80-3.010(17)(C)(4)]. Placement of soil cover addresses the requirements for minimization of fire hazards, odors, blowing litter, control of gas venting, and scavenging. Placement of clay meeting the permeability requirement addresses the requirement for minimization of infiltration of precipitation. Placement of soil and establishment of a vegetative cover meet the requirement of providing for a pleasing appearance.

MDNR landfill regulations also contain minimum and maximum slope requirements. Specifically, these regulations require the final slope of the top of the sanitary landfill shall have a minimum slope of five percent [10 CSR 80-3.010(17)(B)(7)]. MDNR regulations also require that the maximum slopes be less than 25 percent unless it has been demonstrated in a detailed slope stability analysis that the slopes can be constructed and maintained throughout the entire operational life and post-closure period of the landfill. Even with such a demonstration, no active, intermediate, or final slope shall exceed $33^1/_3$ percent. The objective of these requirements is to promote maximum runoff without excessive erosion and to account for potential differential settlement. Because

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landfilling of the Inactive Sanitary Landfill was completed approximately 30 years ago, most compaction of the refuse has taken place and differential settlement is no longer a significant concern. The five percent minimum sloping requirement is greater than necessary and may not be optimal in this case. Therefore, the five percent minimum sloping requirement is not considered appropriate. Sloping specifications would be designed to promote drainage and reduce infiltration of precipitation while minimizing the potential for erosion. It is anticipated that a two percent slope would be sufficient to meet drainage requirements while resulting in a lower potential for erosion or slope failure. This approach should increase the life of the cover and overall longevity of the remedy compared to a steeper slope which would be subject to increase erosion potential. The maximum sloping requirements would be met.

The requirements for decomposition gas monitoring and control in 10 CSR 80-3.010(14) are considered relevant and appropriate and will be met. The number and locations of gas monitoring points and the frequency of measurement will be established in RD submittals to be approved by EPA and the state. In the event landfill gas is detected at the landfill boundaries above the regulatory thresholds, appropriate gas controls will be implemented.

The requirements for groundwater monitoring and protection in 10 CSR 80-3.010(11) are considered relevant and appropriate. The monitoring program must be capable of monitoring any ongoing or potential impact of the landfill on underlying groundwater. The monitoring program will enable the regulatory agencies to evaluate the need for any additional requirements.

The substantive MDNR landfill requirements for post-closure care and corrective action found in 10 CSR 80-2.030 are also considered relevant and appropriate. These provisions provide a useful framework for O&M and corrective action plans. These substantive provisions require post-closure plans describing the necessary maintenance, monitoring activities, and schedules.

Clean Water Act

The Clean Water Act sets standards for ambient water quality and incorporates chemical-specific standards including federal water quality criteria and state water quality standards. The substantive requirements for storm water runoff are relevant and appropriate.

Safe Drinking Water Act

40 CFR Part 141 establishes primary drinking water regulations pursuant to section 1412 of the Public Health Service Act, as amended by the Safe Drinking Water Act (Pub. L. 93-523), and related regulations applicable to public water systems. These MCLs apply to public drinking water systems. Missouri regulations (10 CSR 60-4.010, et seq) also establish MCLs for public drinking water systems. Consistent with the NCP, MCLs are considered relevant and appropriate to all potentially usable groundwater.

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The following are construction-related regulatory requirements:

Missouri Well Construction Code

MDNR has promulgated regulations pertaining to the location and construction of water wells. The Well Construction Code (10 C.S.R. 23-3.010) prohibits the placement of a well within 300 feet of a landfill. These rules should provide protection against the placement of wells on or near the Site.

The regulations on monitoring well construction (10 C.S.R. 23-4) will apply to the construction of new or replacement monitoring wells.

Missouri Storm Water Regulations

The Missouri regulations governing storm water management at construction sites are set out in 10 C.S.R. 20-6.200. A disturbance of greater than one acre and the creation of a storm water point source during construction of the remedy would trigger these requirements. Temporary measures such as diversion dikes and sediment traps would be used to control runoff.

13.3 Cost Effectiveness

A cost-effective remedy is one whose "costs are proportional to its overall effectiveness" [NCP § 300.430(f)(1)(ii)(D)]. The Selected Remedy is considered cost effective because it provides a high degree of effectiveness and permanence at reasonable cost.

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

The Selected Remedy represents the maximum extent to which permanent solutions and treatment are practicable. Treatment to reduce toxicity, mobility, or volume is not practicable because most contaminants in the Inactive Sanitary Landfill are dispersed throughout the overall, heterogeneous matrix of municipal refuse and construction and demolition debris. Consequently, excavation of the hazardous substances for possible ex-situ treatment techniques is considered impracticable. Similarly, the heterogeneous nature of the solid waste materials and the dispersed nature of the contaminants within the overall solid waste matrix make in situ treatment techniques impracticable.

The waste materials can be effectively managed in place over the long term using conventional landfill methods.

13.5 Preference for Treatment as a Principal Element

The Selected Remedy does not satisfy the preference for treatment as a principal element. For the reasons described in the previous section, no effective or practicable treatment options are available.

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13.6 Five-Year Review Requirements

CERCLA § 121(c) and NCP § 300.430(f)(5)(iii)(C) require a periodic review, commonly called a Five-Year Review, if the RA results in hazardous substances, pollutants, or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure. Therefore, a statutory Five-Year Review is required under the Selected Remedy for OU 2. The review evaluates whether the remedy remains protective of human health and the environment.

13.7 Significant Changes from the Proposed Plan

The Selected Remedy for OU 2 is not significantly changed from the preferred alternative in the Proposed Plan. No significant comments were received on the Proposed Plan for OU 2 during the public comment period.

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TABLES

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Table 5-1
Summary of Constituents Detected in Groundwater that Exceed MCLs or MCLGs

Parameter	Range of Detection (mg/l)	MCL (mg/l)
Alluvium		
Metals		
Arsenic (Dissolved)	<0.002 to 0.094	0.05 [a]
Arsenic (Total)	<0.002 to 0.087	0.05 [a]
Iron (Dissolved)	<0.04 to 92.0	0.3 [b]
Iron (Total)	<0.063 to 90.1	0.3 [b]
Manganese (Dissolved)	<0.017 to 6.54	0.05 [b]
Manganese (Total)	<0.077 to 6.39	0.05 [b]
Conventionals		
Chloride	17 to 299	250 [b]
Total Dissolved Solids	86 to 1396	500 [b]
Volatiles/Organics		
Benzene	<0.002 to 0.078	0.005 [a]
Vinyl Chloride	<0.001 to 0.026	0.002 [a]
Total Petroleum Hydrocarbons	13.12 to 21.3	10 [c]
St. Louis/Upper Salem		
Metals		
Iron (Dissolved)	<0.04 to 4.24	0.3 [b]
Iron (Total)	<0.04 to 5.87	0.3 [b]
Manganese (Dissolved)	<0.01 to 0.375	0.05 [b]
Manganese (Total)	0.017 to 0.528	0.05 [b]
Conventionals		
Fluoride	0.49 to 2.7	2 [b]
Total Dissolved Solids	364 to 1418	500 [b]
Deep Salem		
Metals		
Iron (Dissolved)	<0.04 to 0.945	0.3 [b]
Iron (Total)	0.119 to 2.09	0.3 [b]
Manganese (Dissolved)	0.016 to 0.238	0.05 [b]
Manganese (Total)	0.017 to 0.332	0.05 [b]
Conventionals		
Total Dissolved Solids	340 to 665	500 [b]

[a] Primary MCL 40 CFR 141.11 and 141.62
[b] Secondary MCL 40 CFR 143.3
[c] Missouri Department of Natural Resources, Tier 1 Clean-up Level

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Table 5.2 Organic Compounds Detected in Leachate

Compound	Active Sanitary Landfill Leachate				Inactive Landfill Leachate			
	LCS-1	LCS-2	LCS-3	LCS-4	LR-100	LR-103	LR-104	LR-105
Acetone	***1.2***	***0.65***	***0.038***	***0.61***	<0.010	<0.010	<0.010	***0.04***
Benzene	<0.5	***0.009***	<0.005	<0.005	<0.005	<0.005	<0.005	***0.007***
Chlorobenzene	<0.5	***0.035***	***0.029***	***0.011***	***0.044***	<0.005	<0.005	***0.74***
1,4-Dichlorobenzene	<0.5	***0.081***	***0.009***	***0.056***	***0.01***	<0.005	<0.005	***0.068***
Ethylbenzene	<0.5	***0.049***	***0.023***	***0.07***	***0.012***	<0.005	<0.005	***0.089***
2-Hexanone	<1	***0.1***	<0.010	***0.18***	<0.010	<0.010	<0.010	<0.010
Methyl Ethyl Ketone	***3***	***1.3***	***0.11***	***2.6***	<0.010	<0.010	<0.010	<0.010
Methyl iso-butyl Ketone	<1	***0.08***	<0.010	***0.076***	<0.010	<0.010	<0.010	<0.010
Styrene	<0.5	***0.005***	<0.005	***0.006***	<0.005	<0.005	<0.005	<0.005
Toluene	<0.5	***0.097***	***0.15***	***0.12***	<0.005	<0.005	<0.005	***0.007***
Total Xylenes	<0.5	***0.14***	***0.035***	***0.17***	***0.057***	<0.005	<0.005	***0.43***
M+P Cresol	***1.9***	***0.95***	***0.077***	***0.26***	<0.010	<0.010	<0.010	R
2,4-Dimethylphenol	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	***0.082***
Bis(2-ethylhexyl)phthalate	***0.019***	***0.022***	***0.017***	<0.010	***0.12***	<0.010	<0.010	***0.036***
Diethyl phthalate	***0.033***	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Dimethyl phthalate	***0.012***	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
Phenol	***0.29***	***0.16***	<0.010	***0.017***	<0.010	<0.010	<0.010	R
Naphthalene	<0.010	<0.010	<0.010	<0.010	***0.011***	<0.010	<0.010	<0.010
Volatile Petroleum Hydrocarbons	***0.41***	***0.4***	***0.12***	***0.48***	***0.17***	<0.05	<0.05	***0.95***
Petroleum Hydrocarbons (Diesel)	***79***	***6.9***	***2.2***	***0.22***	***2.2***	***0.63***	***0.08***	***4.4***

Notes:
All results in mg/L
R: Data point rejected during data evaluation
Results above reporting limit are shown in ***boldface/italic*** type
Inactive landfill leachate riser LR-101 was not installed due to the absence of leachate at this location
Inactive landfill leachate riser LR-102 was not sampled due to minimal (<6 inches) liquid thickness

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Table 5.3 Alluvial Soil Total Petroleum Hydrocarbon and VOC Results from locations near MW-F2

Sampling Location	TPH Purgeable Range (mg/kg)	TPH Extractable Range (mg/kg)	VOCs (mg/kg)
PZ-303-AS (17 ft)	2,000	12,000	Toluene (5.3) Ethylbenzene (10) Total Xylenes (54)
PZ-303-AS (25-25.5 ft)	160	160,	Total Xylenes (0.82)
SB-01 (16-18 ft)	6,700	15,000	Toluene (310) Ethylbenzene (24) Total Xylenes (120)
SB-02 (4-6 ft)	<0.1	32	ND
SB-02 (14-16 ft)	<0.1	24	ND
SB-03 (6-8 ft)	<0.1	23	ND
SB-03 (10-12 ft)	<0.1	<10	ND
SB-04 (8-10 ft)	<0.1	<10	ND

Notes:
ND: Not Detected

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Table 12-1

Capital Cost Estimate
Alternative 2 - Missouri-prescribed Cover with Long-Term Monitoring and Institutional Controls
(Cover Installation)

Description	Quantity	Units	Unit Rate	Estimated Cost
Estimated Capital Costs:				
Work Plan	1	each	$50,000	$50,000
Surveying (site layout)	15	day	$1,023	$15,345
Secure access / easements	1	lump sum	$10,000	$10,000
Inactive Landfill Perimeter Silt Fence	6,600	feet	$2.05	$13,530
Geotechnical testing of borrow materials	1	each	$20,459	$20,459
Perimeter drainage				
Drainage channels	6,600	linear feet	$4.51	$29,766
Place cover over Inactive Landfill area				
Clearing / grubbing / preparation	47.5	acre	$5,933	$281,818
Deliver, place, and compact 10^{-5} permeability soil over Region 3-1	14,520	cubic yard	$18.55	$269,346
Deliver, place, and compact 10^{-5} permeability soil over Region 3-2	5,091	cubic yard	$18.55	$94,438
Deliver, place, and compact 10^{-5} permeability soil over Region 3-3	6,370	cubic yard	$18.55	$118,164
Deliver, place, and compact 10^{-5} permeability soil over Region 3-4	464	cubic yard	$18.55	$8,973
Deliver and place 1 foot vegetative growth layer over Inactive Landfill area (approx 47.5 acres)	101,922	cubic yard	$25.03	$2,551,108
Fertilize / seeding / mulching	47.5	acre	$1,534	$72,865
Survey control	130	day	$1,023	$132,990
Materials testing equipment during construction	8	month	$2,046	$16,368
Monitoring during construction				
Continuous monitoring / recording of air flow	1	lump sum	$20,459	$20,459
Meterological	8	month	$2,046	$16,368
Health and safety monitoring	8	month	$7,368	$59,104
Miscellaneous site work	1	lump sum	$50,000	$50,000
Surveying ("record drawings")	11	day	$1,023	$11,253
Construction completion report	1	lump sum	$50,000	$50,000
Health and safety surcharge for CERCLA site contractor	10	%	$1,025,627	$102,563
Estimated Construction Costs - Subtotal				**$3,994,921**
Contractor Markup, Mob/demob, Insurance	10	%		$399,492
Engineering, Permitting, and Construction Management	20	%		$798,984
Regulatory Oversight	2.5	%		$99,873
Estimated Project Capital Costs - Subtotal				**$5,293,270**
Contingency	25	%		$1,323,317.46
Estimated Project Capital Costs - Total				**$6,616,587**

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Table 12-1 (Cont.)

Capital Cost Estimate
Alternative 2 - Missouri-prescribed Cover with Long-Term Monitoring and Institutional Controls
(Monitoring System Construction & Additional Institutional Controls)

Description	Quantity	Units	Unit Rate	Estimated Cost
Estimated Capital Costs:				
Planning Documents	1	lump sum	$10,000	$10,000
Secure easements	1	lump sum	$1,000	$1,000
Install 13 new perimeter landfill gas monitoring wells	13	each	$1,200	$15,600
Labor to establish Institutional Controls	1	lump sum	$16,000	$16,000
Estimated Capital Costs - Subtotal				**$42,600**
Contingency	25	%		$10,650
Estimated Project Capital Costs - Total				**$53,250**

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FIGURES

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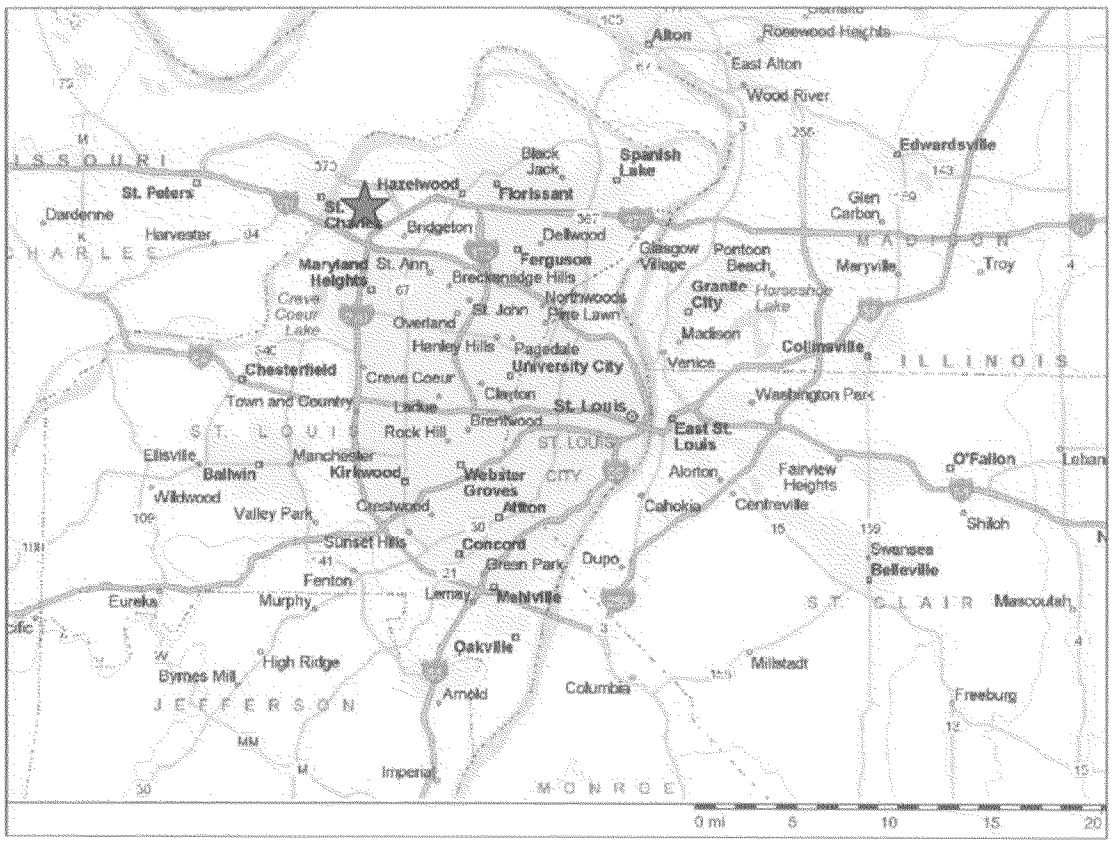
FIGURE 1-1 SITE LOCATION



★ Site Location

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FIGURE 1-2 VICINITY MAP

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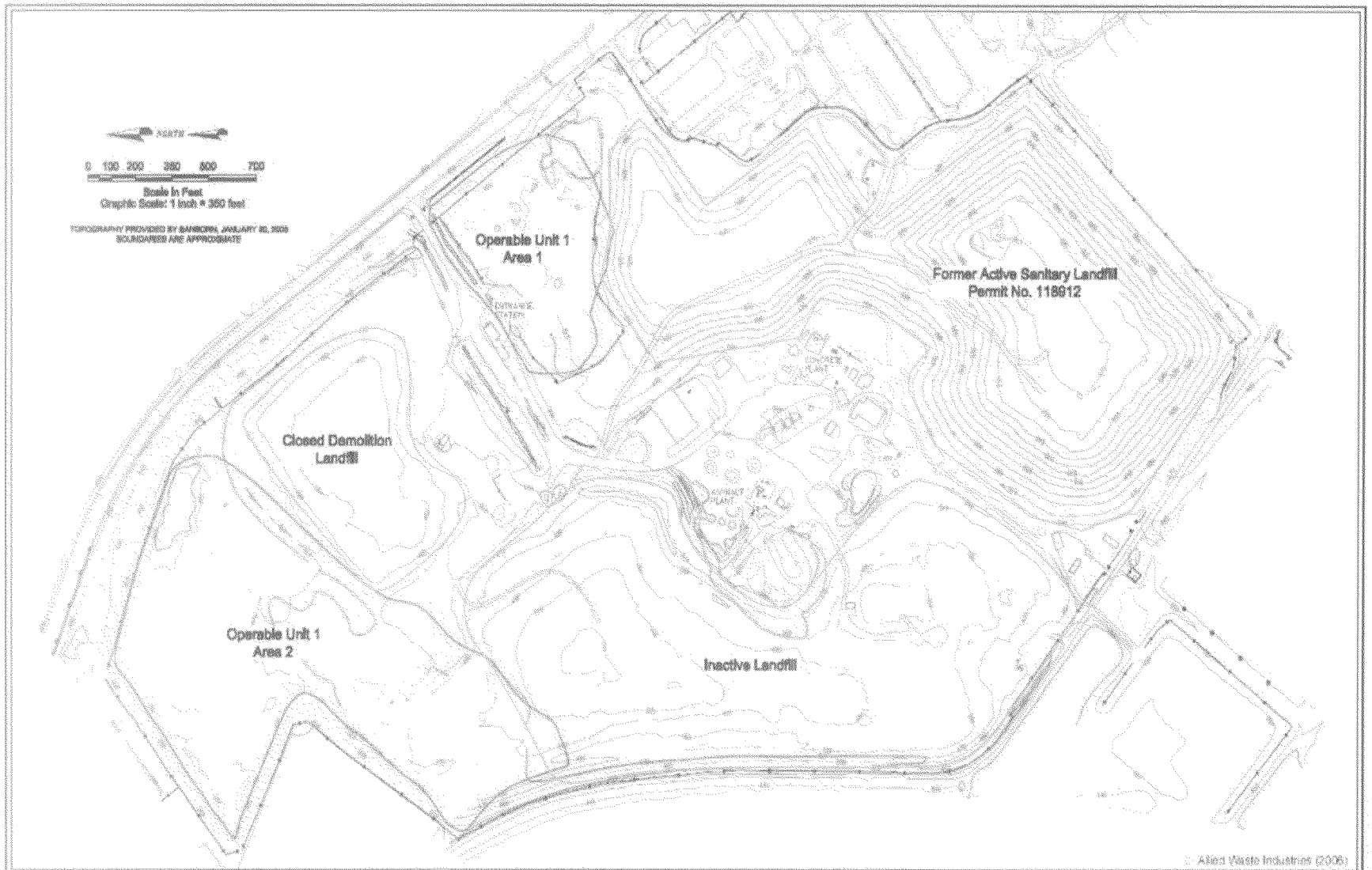

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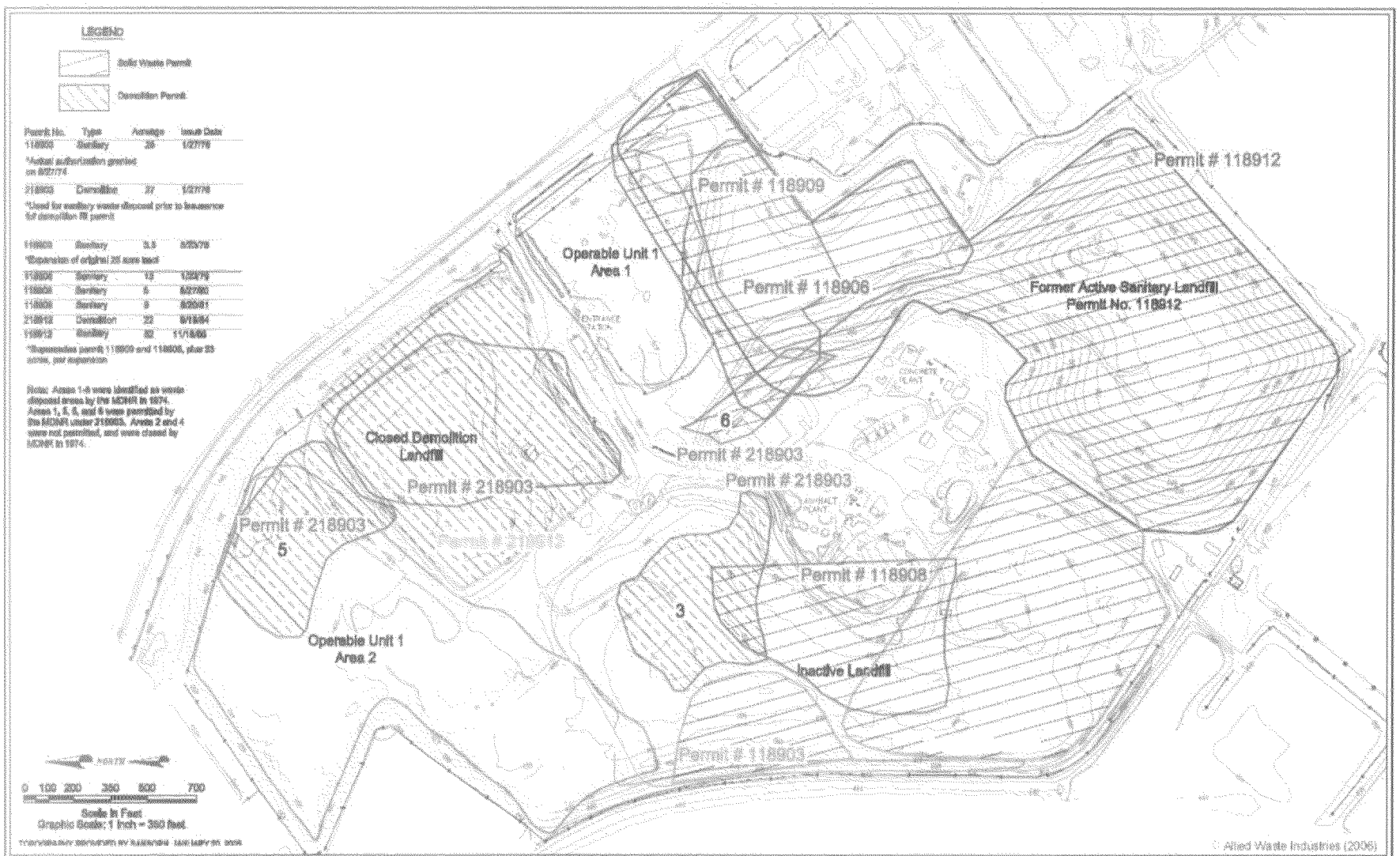
West Lake Landfill OU-2
Bridgeton, Missouri

Figure 4-1
Site-Wide Landfill
Area Boundaries



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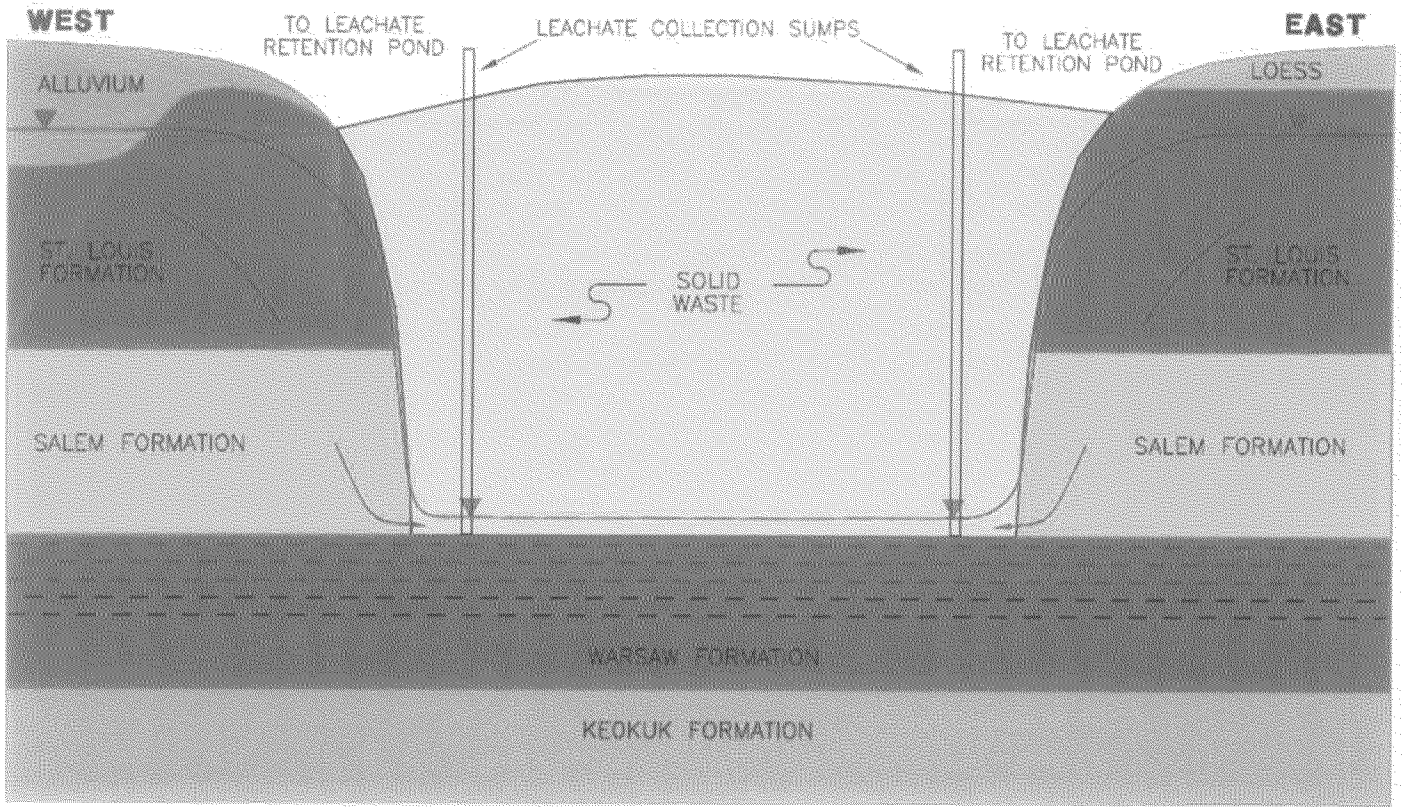
West Lake Landfill OU-2
Bridgeton, Missouri

Figure 5-1
Missouri Department of Natural Resources Permitted Areas



LEGEND

- GROUNDWATER LEVEL
- LEACHATE LEVEL
- GENERALIZED DIRECTION OF GROUNDWATER FLOW

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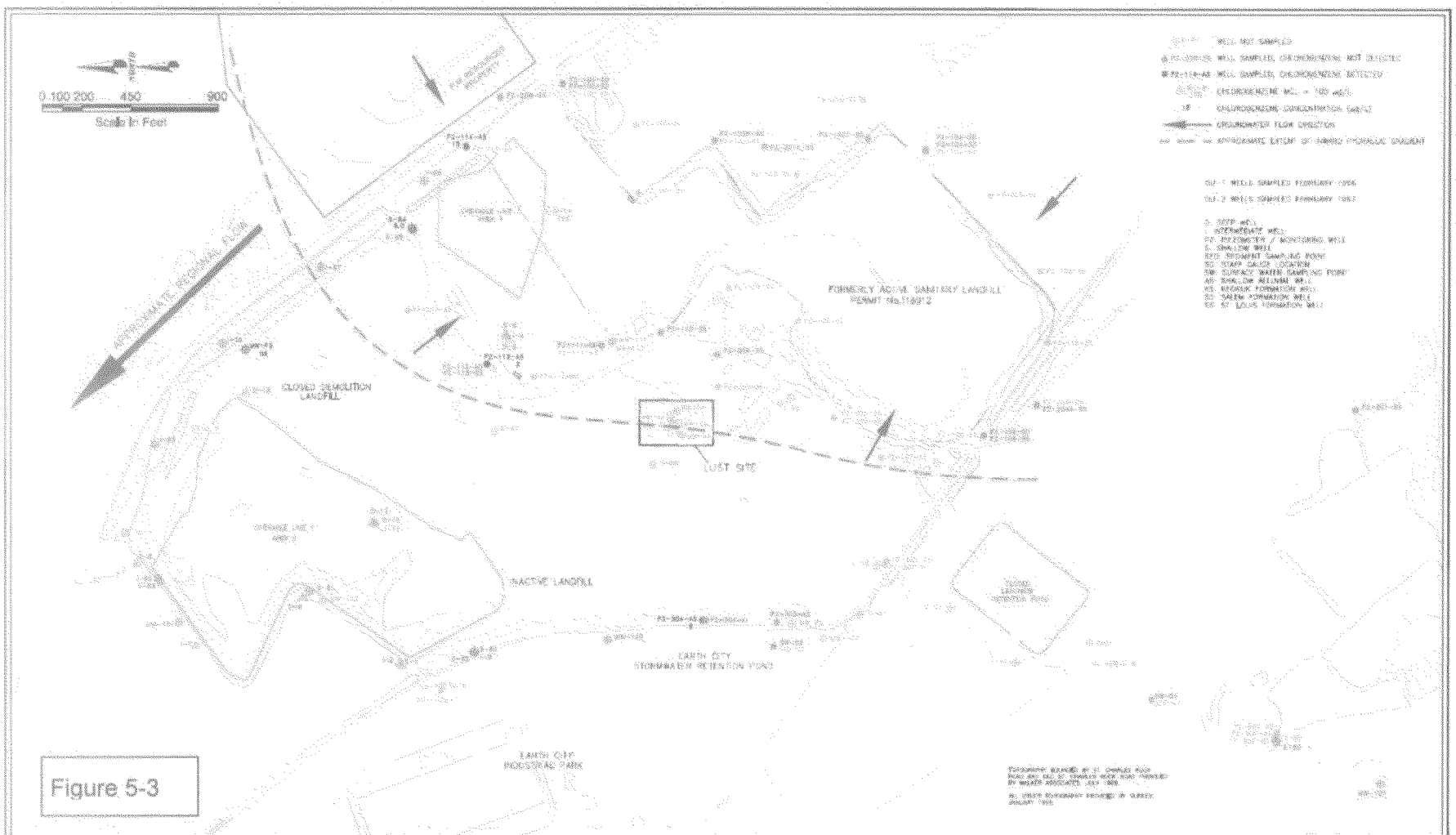
West Lake Landfill OU-2
Bridgeton, Missouri

Figure 5-2
Conceptual Hydrogeologic Model
Former Active Sanitary Landfill



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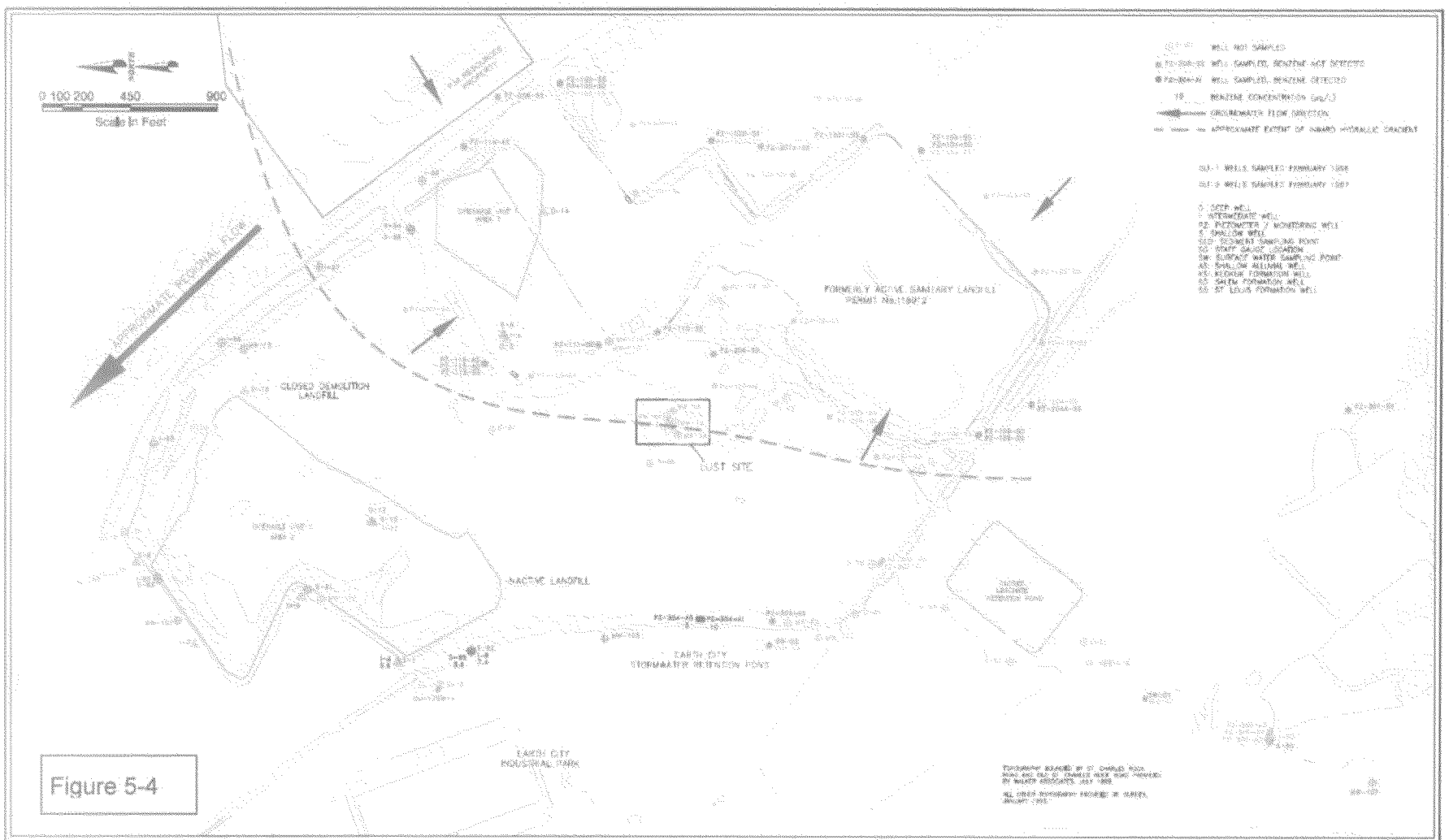
West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Chlorobenzene Results



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West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Benzene Results

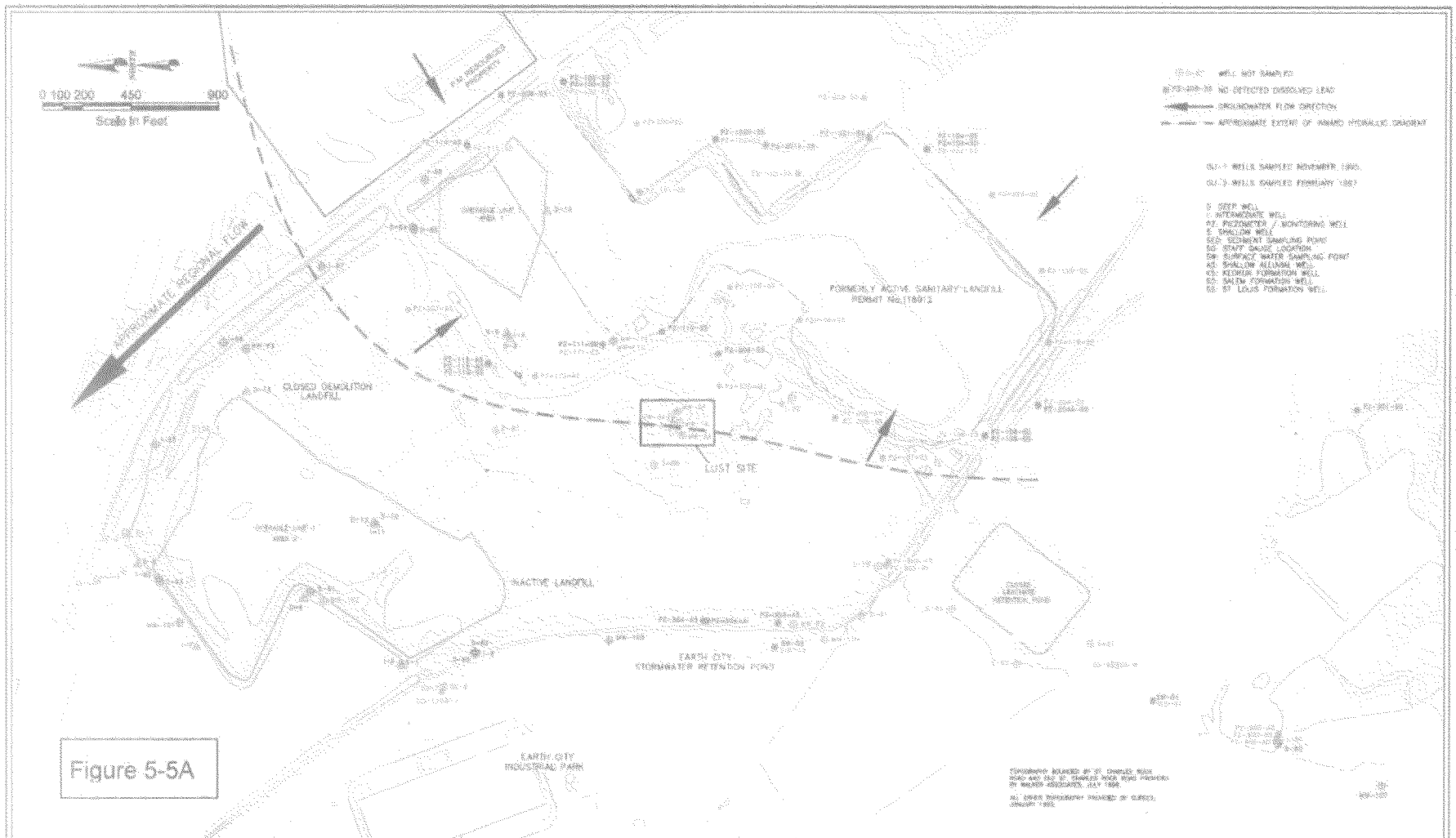

Figure 5-5A

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West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Dissolved Lead Results

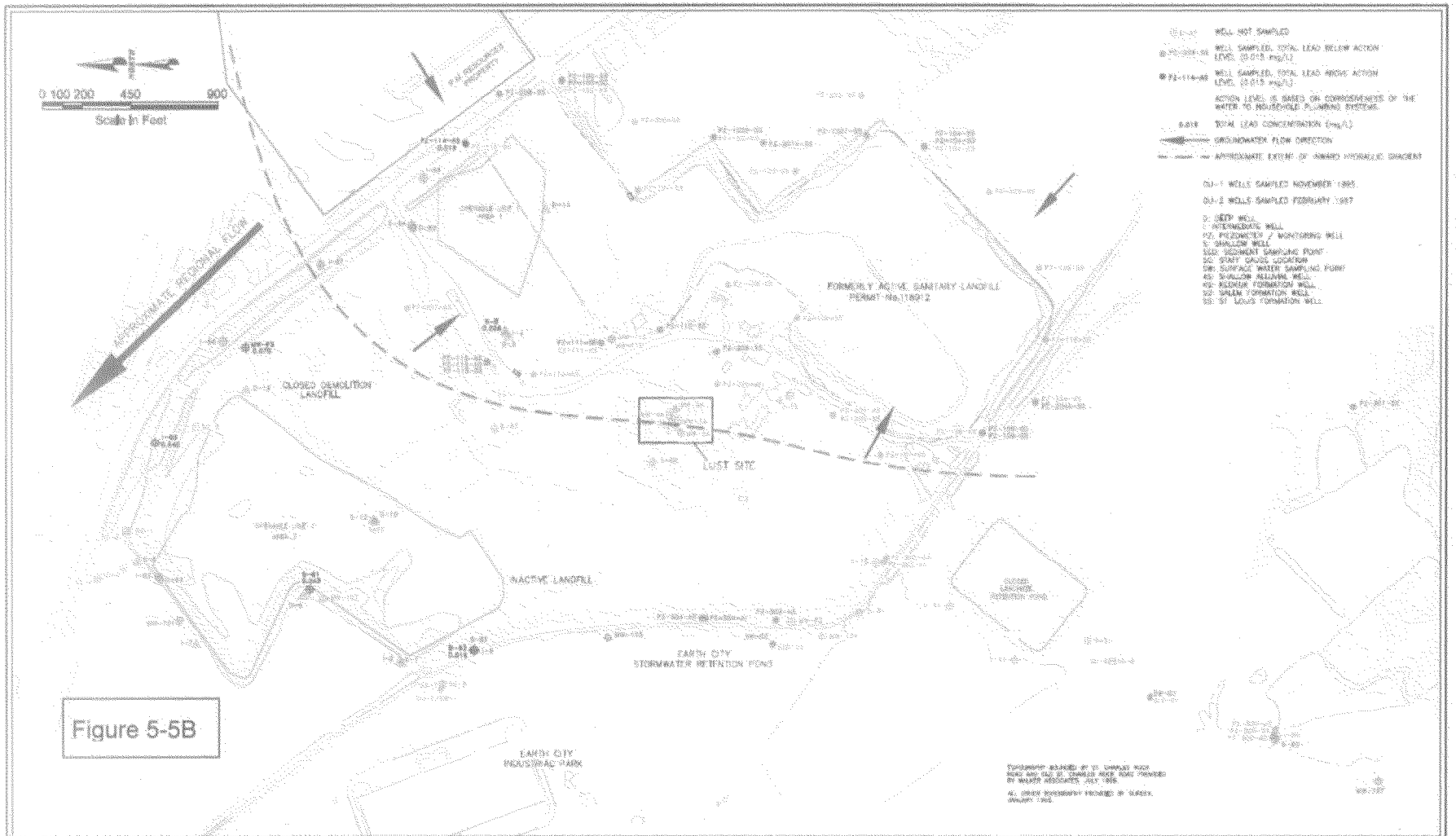

Figure 5-5B

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West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Total Lead Results

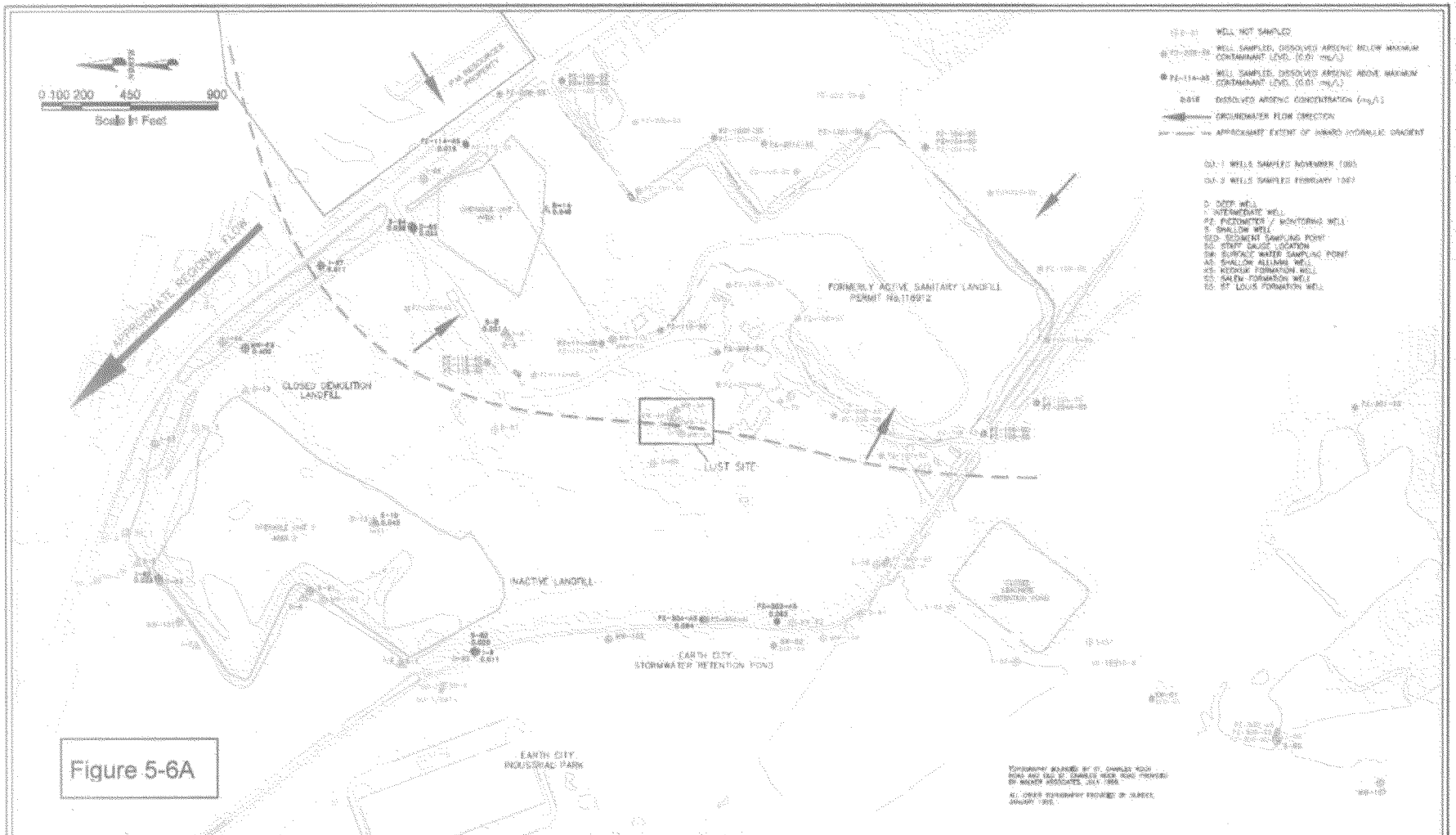

Figure 5-6A

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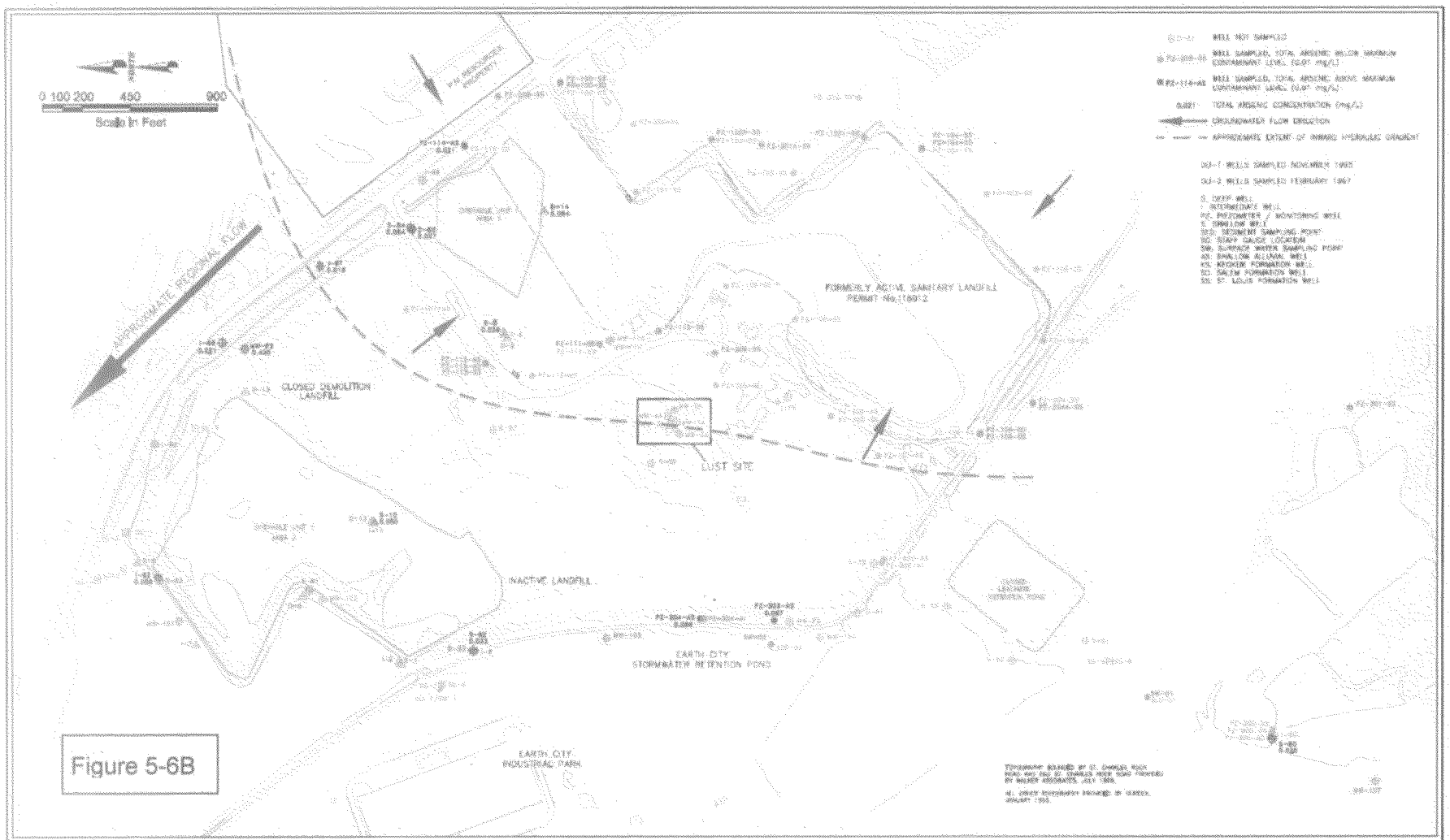
West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Dissolved Arsenic Results



HERST & ASSOCIATES, INC.

West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Total Arsenic Results

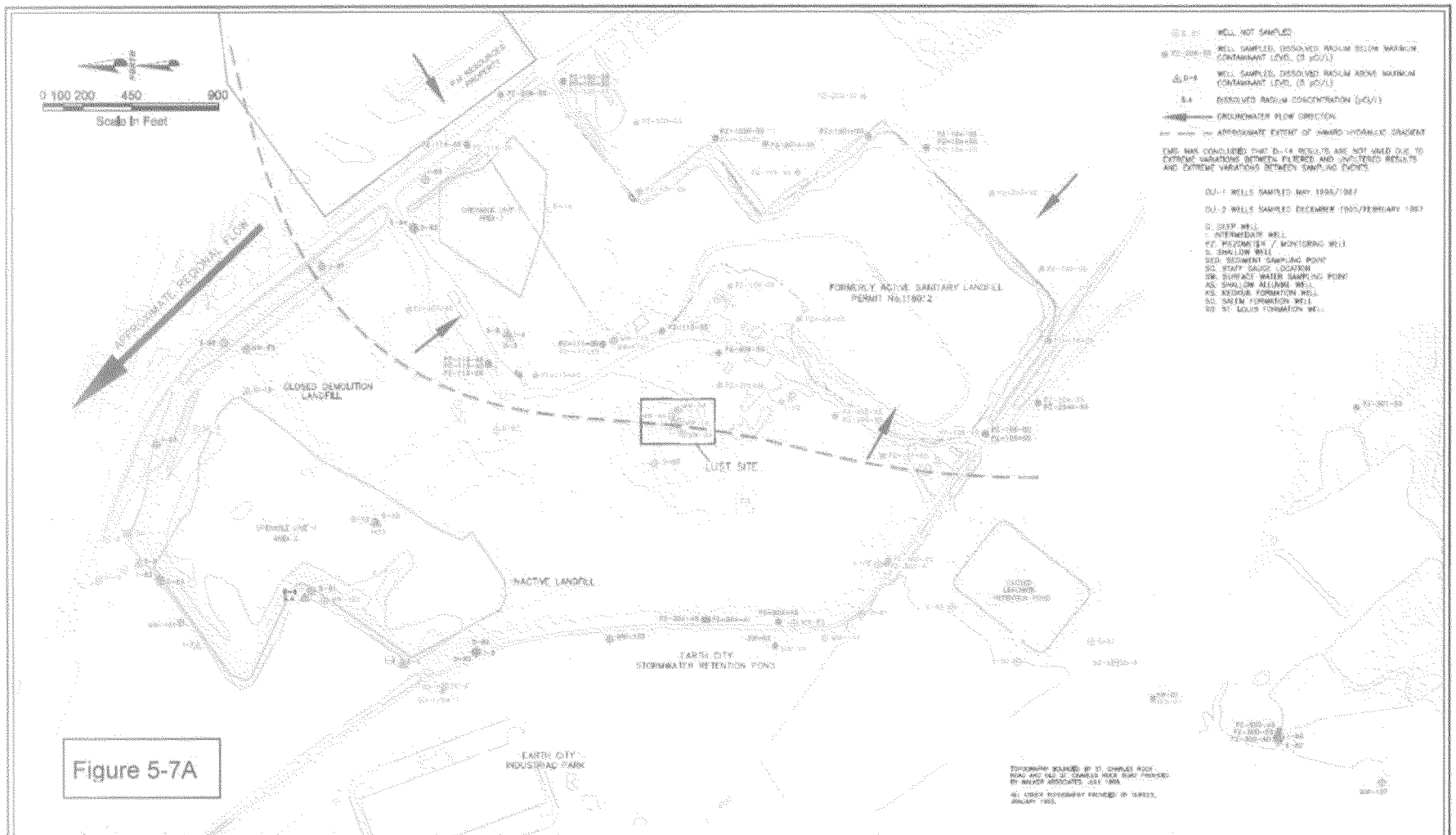


Figure 5-7A

HERST & ASSOCIATES, INC.

West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Dissolved Radium Results

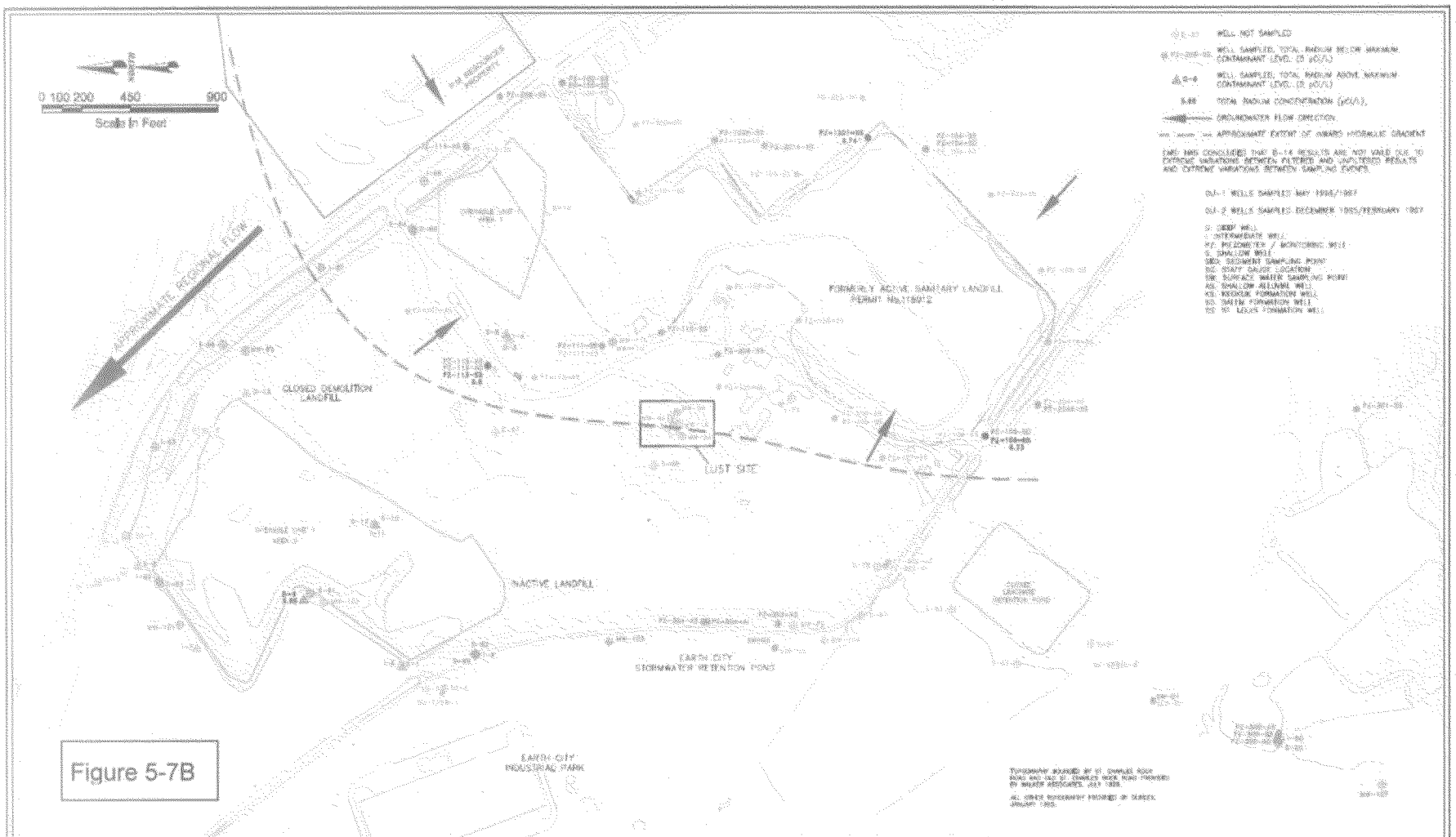


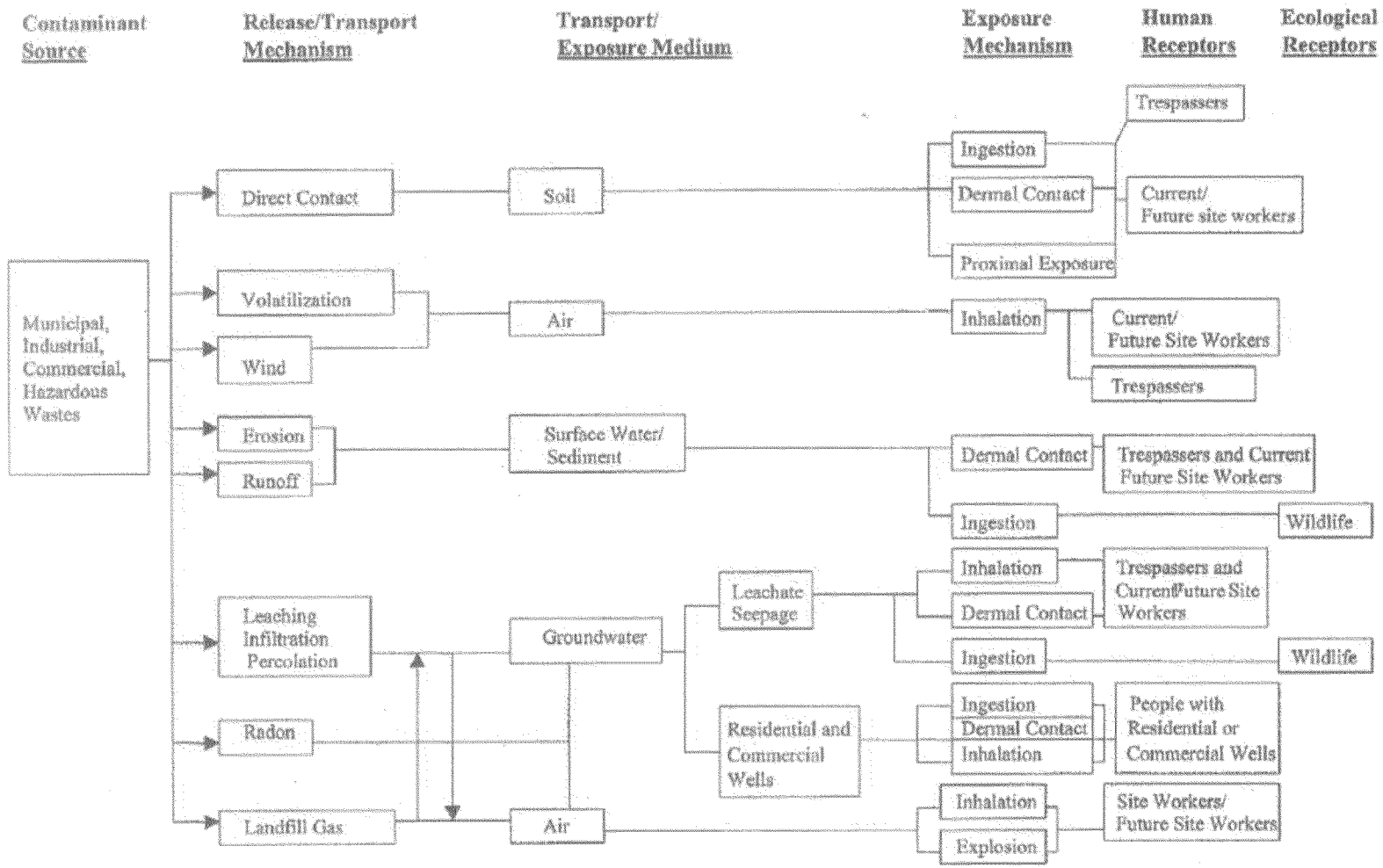
Figure 5-7B

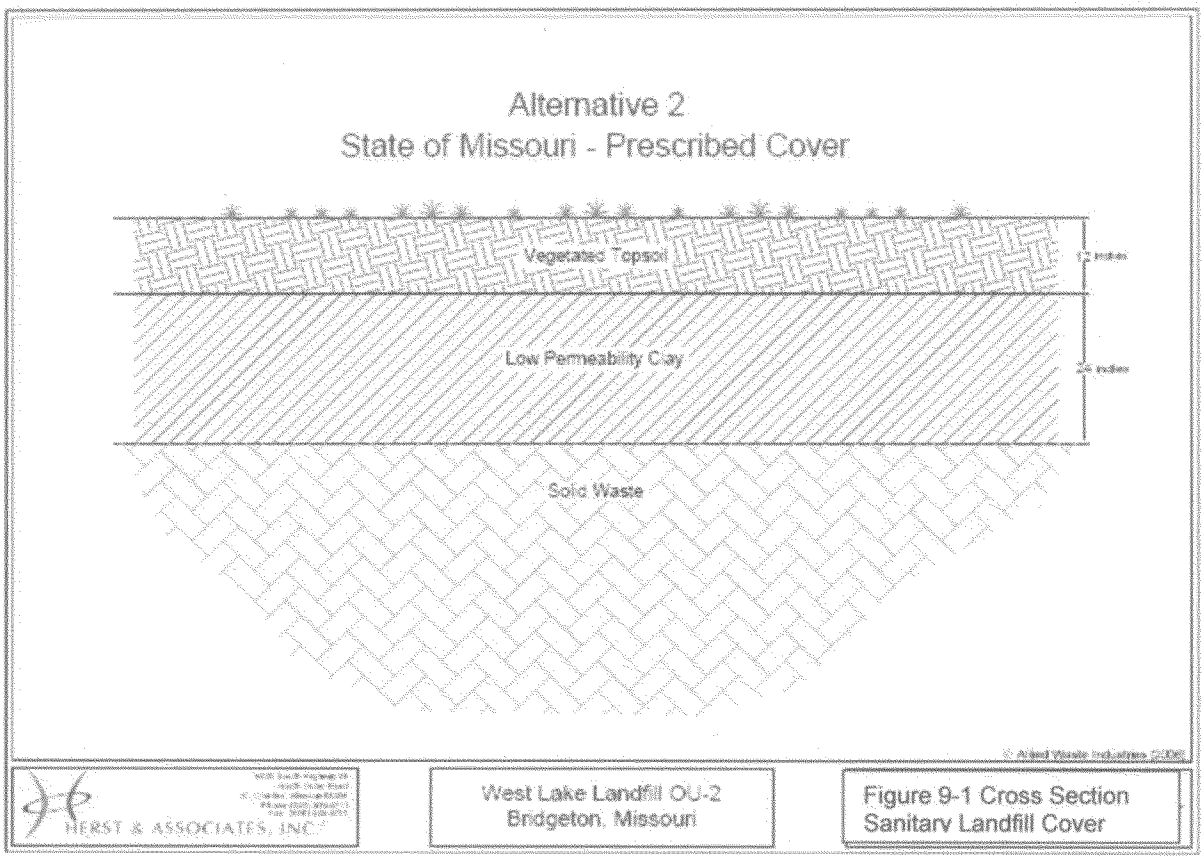
HERST & ASSOCIATES, INC.

West Lake Landfill
Bridgeton, Missouri

Groundwater and Surface Water
Total Radium Results

Figure 7-1 **Site Conceptual Model For West Lake Landfill Operable Unit 2**





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