RECORD OF DECISION

RIVERFRONT SITE
OPERABLE UNIT 5: OLD HAT FACTORY

December 2006

Prepared by
U.S. Environmental Protection Agency
Region 7
Kansas City, Kansas

RECORD OF DECISION
RIVEFRONT SITE
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Part I – DECLARATION

Part II – DECISION SUMMARY

LIST OF FIGURES

LIST OF TABLES

PART I THE DECLARATION

1.0 Site Name and Location

Riverfront Site
Operable Unit 5 (OU 5): Old Hat Factory
Maupin Avenue
New Haven, Missouri 63068

1.1 Statement of Basis and Purpose

This decision document presents the selected remedy for the Riverfront Superfund site, OU 5, the Old Hat Factory, located in New Haven, Missouri. The selected remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. §§ 9601-9675, as amended, and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300. This decision is based on the Administrative Record file for OU 5. The state of Missouri, acting through the Missouri Department of Natural Resources, concurs with the selected remedy.

1.2 Assessment of Site

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

1.3 Description of Selected Remedy

The remedial action for OU 5 addresses the tetrachloroethene (PCE) contamination at OU 5. Institutional controls and monitoring will be used to prevent exposure to groundwater contamination. There are no source materials or dense nonaqueous phase liquids in the groundwater constituting a principal threat at OU 5. Elevated concentrations of PCE were found in groundwater, and low levels of PCE were found in soils at this OU. The following key components of the remedy for OU 5 involve:

- Monitoring the groundwater through periodic sampling at all monitoring wells.

- Monitoring well sampling parameters will include volatile organic compounds and field geochemistry.

- Monitoring nearby wells on a recurring basis, particularly immediately prior to five-year reviews.

- Institutional controls to prohibit or limit certain land uses, provide notice of the contamination to future owners and users, and educate the public on the potential health hazards posed by contaminants present at OU 5.

Through the periodic sampling of groundwater monitoring wells, any changes in contaminant concentrations should be detected and documented over time. Monitoring the contaminated groundwater will provide a greater level of protection to local residents since substantial changes in groundwater contaminant concentrations would be discovered, and additional remedial action would be taken if necessary.

1.4 Statutory Determination

The selected remedy is protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to the remedial action, and is cost effective. While the selected remedy does not meet the statutory preference for treatment, as there is no source contamination constituting a principal threat at OU 5, treatment is not within the scope of this action.

Because the selected remedy will result in hazardous substances, pollutants, or contaminants remaining at OU 5 at levels that do not allow for unlimited use and unrestricted exposure, EPA will review the remedy no less often that every five years after initiation of the selected remedy to ensure that the remedy is or will be protective of human health and the environment.

1.5 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for the Riverfront Superfund site, OU 5.

- Chemicals of concern and their respective concentrations – Pages 10 & 11
- Baseline risk presented by the chemicals of concern – Page 20
- How source materials constituting principal threats are addressed – Page 32
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD – Page 13
- Potential land and groundwater use that will be available at OU 5 as a result of the selected remedy – Page 12

- Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected – Pages 35 & 36

- Key factor(s) that led to the selected remedy – Page 33

1.6 Authorizing Signature

Cecilia Tapia, Director
Superfund Division

12/7/06
Date

PART II THE DECISION SUMMARY

1.0 Site Name, Location, and Description

The Riverfront Superfund site, Operable Unit 5 (OU 5), also referred to as the Old Hat Factory, is located just south of downtown New Haven, Missouri, on the corner of Maupin Avenue and Wall Street. OU 5 is located atop a steep bluff overlooking the Missouri River. OU 5 is within 1,000 feet of OU 1 of the Riverfront Superfund site and contaminated New Haven city wells (W1 and W2). New Haven (population 1,867) is located along the southern bank of the Missouri River in Franklin County, Missouri, about 50 miles west of St. Louis, Missouri (Figure 1-1). The Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification Number for the Riverfront Superfund site, which includes OU 1 through OU 6, is MOD981720246. The lead agency for the Riverfront Superfund site is the Environmental Protection Agency (EPA). The Missouri Department of Natural Resources (MDNR) is the support agency. The expected source of cleanup monies for OU 5 is the Superfund.

OU 5 is located on a 1.9-acre parcel in a mostly residential area just south of downtown New Haven. The northwestern portion of the brick building that occupies this OU was originally built in the mid-to-late 1800s and housed a dry goods store. In the late 1800s, the original building was extended south and turned into an opera house and town hall. In 1928, the building was bought by the Langenberg Hat Company, which formed and shaped hats from stock material manufactured at other locations. In 2002, the facility closed due to bankruptcy and remained vacant until the building was purchased in 2002.

2.0 Site History and Enforcement Activities

2.1 Site History

In 1986, the volatile organic compound (VOC), tetrachloroethene (PCE), was detected in two public-supply groundwater wells owned by the city of New Haven (wells W1 and W2) in the northern part of the city. Following the discovery of the contamination, two new public-supply wells were installed in the southern part of the city, and several investigations to determine the source of the contamination were conducted by the MDNR and EPA. The site became known as the Riverfront site; and in December 2000, the PCE contamination prompted the listing of the Riverfront site on the National Priorities List (NPL). The NPL is a list compiled by EPA pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of uncontrolled hazardous substance releases in the United States that are priorities for long-term remedial evaluation and response.

The Riverfront site encompasses six OUs in and around the city of New Haven (Figure 1-2). The OUs have been designated by EPA based on the results of prior investigations and information received through interviews with local citizens regarding waste generation and disposal. These areas include facilities which are possible sources of the

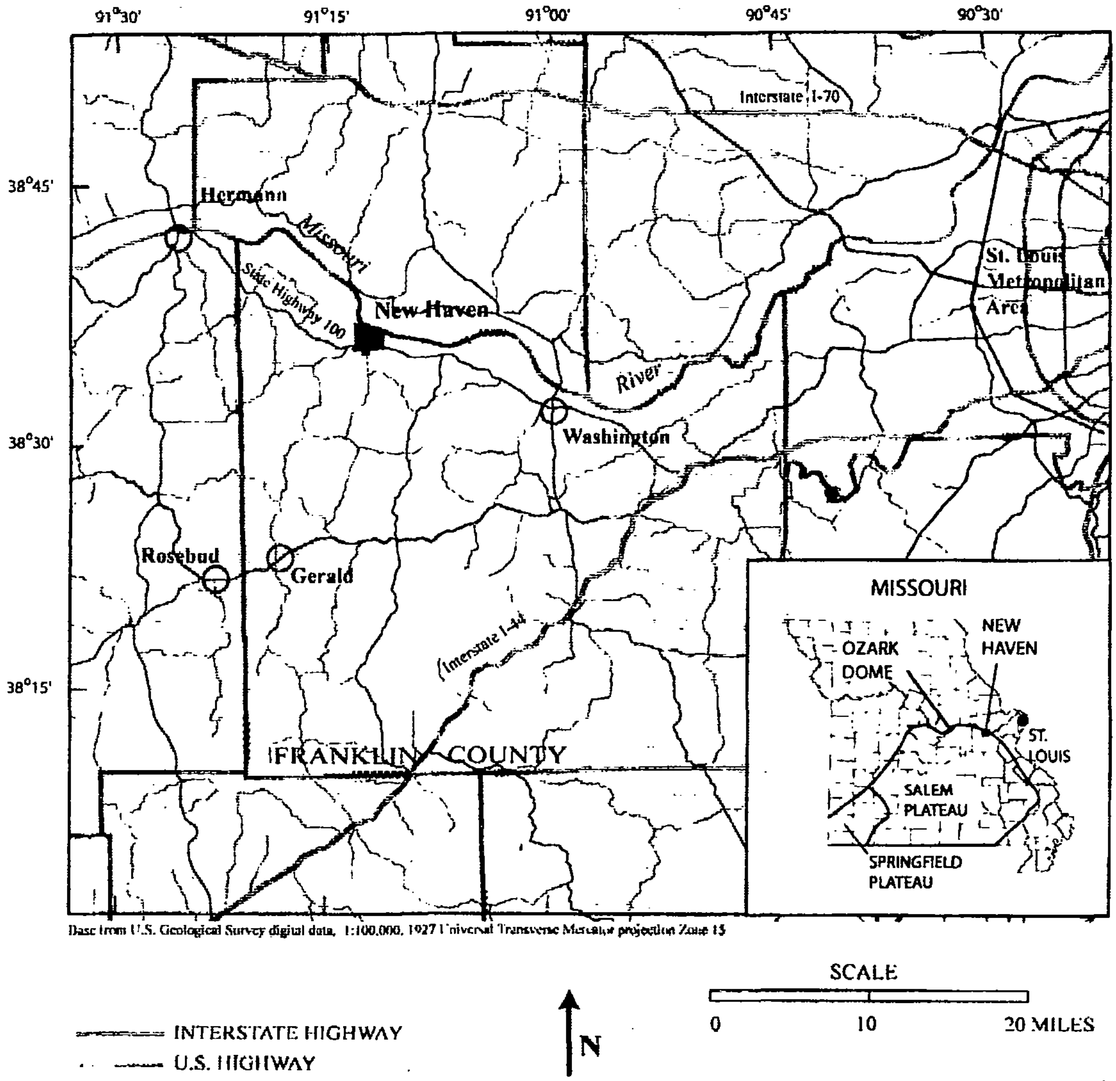
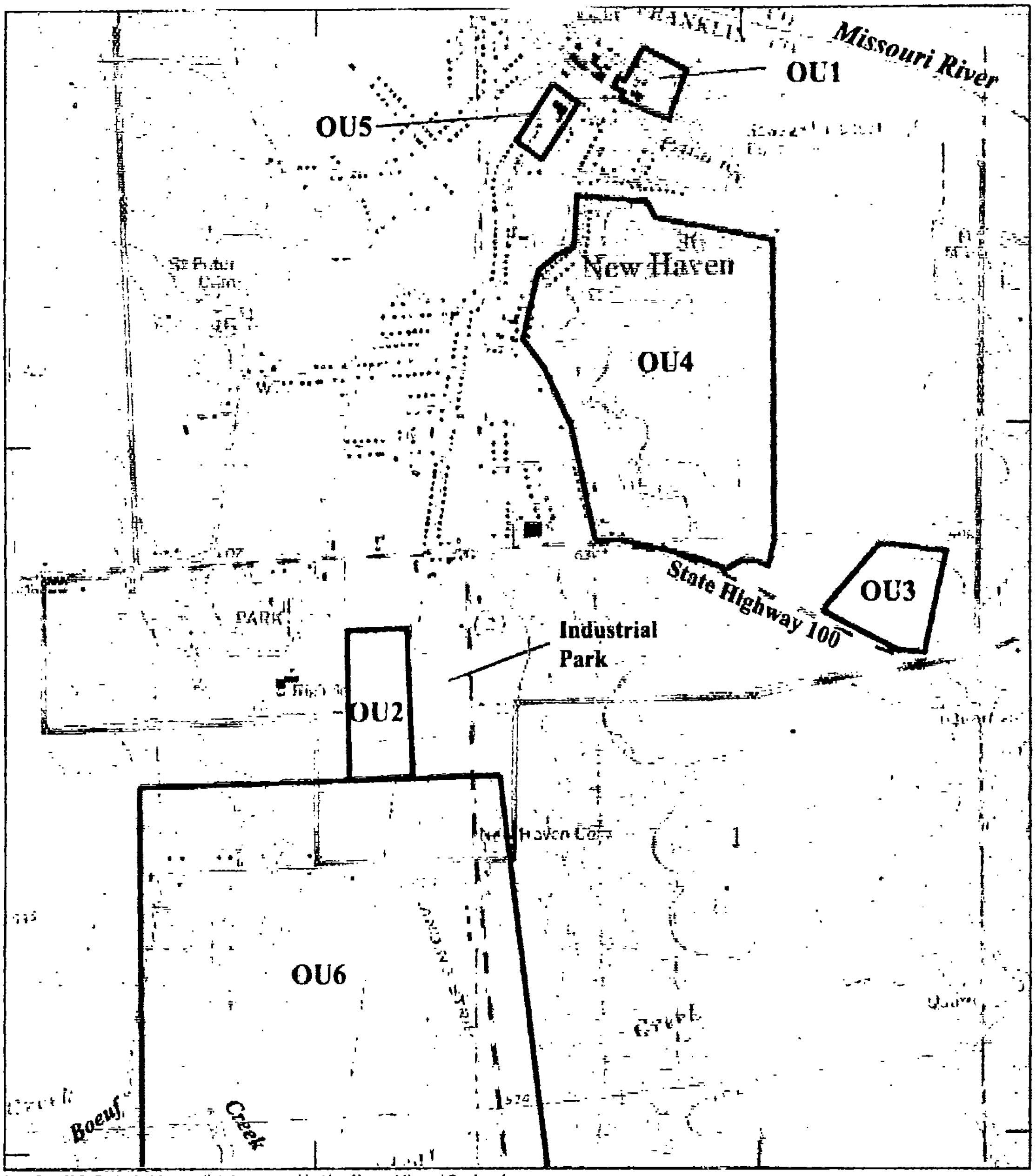


FIGURE 1-1
RIVERFRONT SITE LOCATION MAP
RIVERFRONT SUPERFUND SITE
OPERABLE UNIT 5 FS

SOURCE: USGS RI, 2005
C0008058 6/7/2006



Base from U.S. Geological Survey digital raster graphic, New Haven, Missouri Quadrangle, 1:24,000. 1927 Universal Transverse Mercator projection Zone 15

NEW HAVEN CITY LIMIT
OPERABLE UNIT (OU)

N

SCALE

0 2,000 4,000 FEET

FIGURE 1-2
RIVERFRONT OPERABLE UNITS 1 TO 5 LOCATION MAP
RIVERFUND SUPERFUND SITE
OPERABLE UNIT 5 FS

SOURCE: USGS RI, 2005
C0008059 6/27/2006

PCE contamination. These include: a former manufacturing facility in downtown New Haven (OU 1), a metal fabrication plant in south New Haven (OU 2), the Old City Dump (OU 3), an undeveloped area south of contaminated city well number 2 (OU 4), a former hat factory (OU 5), and an area containing contaminated domestic wells south of the city (OU 6).

2.2 Previous Investigations and Enforcement Activities

In 1986, PCE was detected in two public-supply wells (W1 and W2) in the northern part of the city of New Haven. Following the discovery of the contamination, two new public-supply wells (W3 and W4) were installed in the southern part of the city. Several investigations of potential sources of the contamination were conducted by the MDNR and the EPA during the late 1980s and the early 1990s.

The initial investigations of PCE contamination of the public-supply wells began with a Preliminary Assessment conducted by the MDNR in 1987 and concluded with an Expanded Site Investigation (ESI) conducted by the EPA in 1994. In 1998, the EPA requested that the U.S. Geological Survey (USGS) provide technical assistance in assessing the geohydrology in the New Haven area and establishing the groundwater flow direction and PCE migration from potential sources. The USGS technical assistance was performed as an ESI/Remedial Investigation (RI) that was completed in 2000.

As a result of the additional information collected during the ESI/RI, the EPA placed the Riverfront site on the NPL in December 2000. The EPA then requested the USGS to conduct a RI. The RI for OU 5 was completed in June 2006.

3.0 Community Participation

Public participation activities prior to the issuance of this Record of Decision (ROD) included several community meetings, distribution of fact sheets, publication of notices, assistance by EPA in the formation of a Community Advisory Group, development of a Riverfront website for public use, and attendance by EPA representatives at city council meetings. Copies of all documents are available in the Administrative Record file at the EPA, Region 7 office in Kansas City, Kansas, and the New Haven Scenic Regional Library in New Haven. The notice of availability of these documents was published on September 6, 2006, along with a description of the remedy components. A public meeting for the Proposed Plan was held on September 14, 2006. The public comment period for the Proposed Plan began on September 6, 2006, and concluded on October 5, 2006.

4.0 Scope and Role of Operable Unit or Response Action

This action is anticipated to be the final response action for OU 5. It is expected that other actions will be implemented to address the other OUs at the Riverfront site.

The Remedial Action Objectives (RAOs) for OU 5 are to minimize the contact with contaminated groundwater and to ensure that contaminant levels in the groundwater and/or volume of contaminated groundwater do not increase substantially. Institutional controls will help prevent contact with the contaminated groundwater. In addition, the periodic sampling of monitoring wells will provide EPA and MDNR the means to monitor contaminant migration from OU 5. The current sampling data indicate that contaminants in the shallow aquifer are continuing to migrate off-site. However, there is no use of groundwater in the vicinity of OU 5. Because of the proximity of OU 5 to the Missouri River valley, which serves as a drain for regional and shallow groundwater flow, the PCE detected in the shallow bedrock well at OU 5 is not a threat to public-supply wells, W3 and W4, located south and upgradient from OU 5 or domestic wells outside of the city limits. Therefore, no source control measures will be implemented in this action, and no source control actions are contemplated in the future.

5.0 Site Characteristics

5.1 Conceptual Site Model

The conceptual site model (CSM) developed for OU 5 is based on the following exposure pathways: ingestion, dermal contact, and inhalation of groundwater contaminants. The receptors include future residents and on-site indoor and outdoor workers. The assumptions applied to this pathway include contact with contaminated groundwater by a future resident who would use it as untreated water for household uses and on-site workers who may use contaminated groundwater as drinking water. There is minimal ecological exposure at OU 5. The exposure pathways identified in the CSM are discussed in section 7.1.2.

5.2 Overview of OU 5

OU 5 is located on a 1.9-acre parcel in a mostly residential area at the southeast corner of the intersection of Maupin Avenue (west) and Wall Street (north) just south of downtown New Haven. At the time of the initial field investigation (2002), OU 5 consisted of a three-story, 14,000-square-foot brick building at the northwest corner of the property with an attached 12,000-square-foot, one-story metal manufacturing building to the east and an attached 4,200--square-foot, one-story office building to the south (Figure 1-3). The south one-half of the parcel consisted of an asphalt parking lot. Most of the building was demolished during 2003-2004, and OU 5 was extensively regraded in 2005.

The Langenberg Hat Company opened in New Haven in 1928 and operated until the company entered bankruptcy in 2000. During peak production, the factory produced and shipped nearly 500,000 hats domestically and around the world each year. The company formed, dyed, and shaped hats from stock materials manufactured at other locations. No tanning operations were done at the facility. There is no documented use of PCE or other chlorinated solvents at the facility; however, an unknown aerosol *spot remover* was used in a finishing area to spot clean finished hats before packaging. Hazardous substances known to have been used at the facility included acetic acid, formic acid, sulfuric acid,

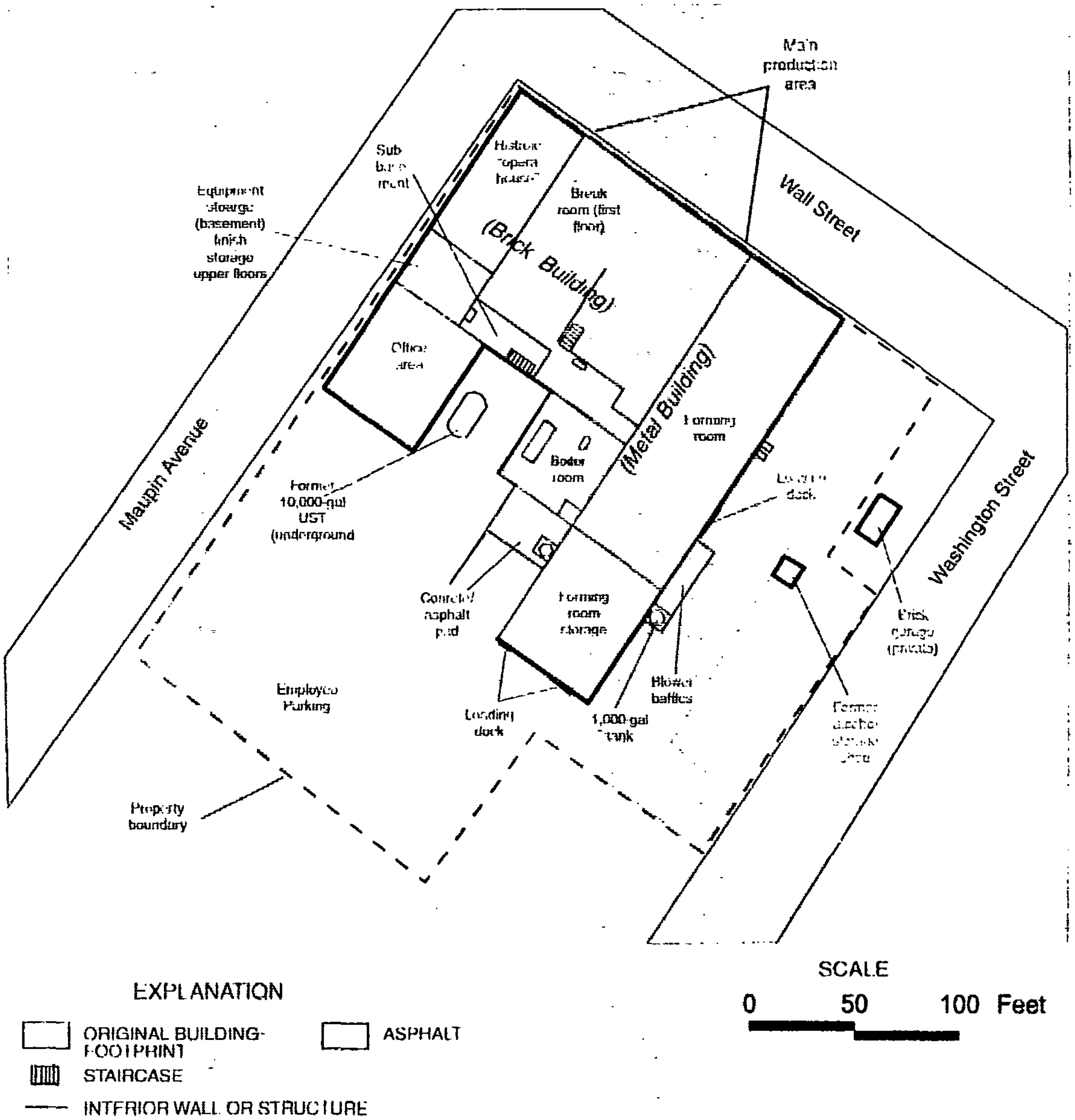


Figure **1-3** Major features of the old hat factory building and site.

boiler treatment chemicals, other materials such as petroleum jelly, and small quantities of oils, lubricants, and cleaners were also reportedly used.

5.3 Sampling Strategy

From November 2001 through 2005, the USGS conducted a variety of sampling activities as part of the RI for OU 5. During these various sampling efforts, the USGS collected groundwater, surface water, soil, and sanitary sewer samples.

Soil Sampling

The USGS conducted two soil sampling efforts at OU 5. The first was conducted during November and December 2003, which involved soil collection through 23 soil borings. The second effort was conducted in July 2004 when two additional soil borings were conducted to determine if other hazardous constituents such as semivolatile organic compounds (SVOCs), metals, pesticides, and polychlorinated biphenyls (PCBs) were present in the soils (Figure 1-4).

Groundwater Sampling

Two groundwater monitoring wells were installed by EPA at OU 5 (Figure 1-4), and a third well has been installed as a background well on a nearby property. A soil boring was conducted at a proposed location of monitoring well BW-09A which was on-site in November 2001. Soil samples from the boring contained low levels of PCE. When monitoring well BW-09A was installed in April 2002, PCE levels were higher than the Maximum Contaminant Level (MCL)[1] of five micrograms per liter (µg/L). The detection of PCE in the groundwater samples led to the Old Hat Factory being designated OU 5 in July 2002.

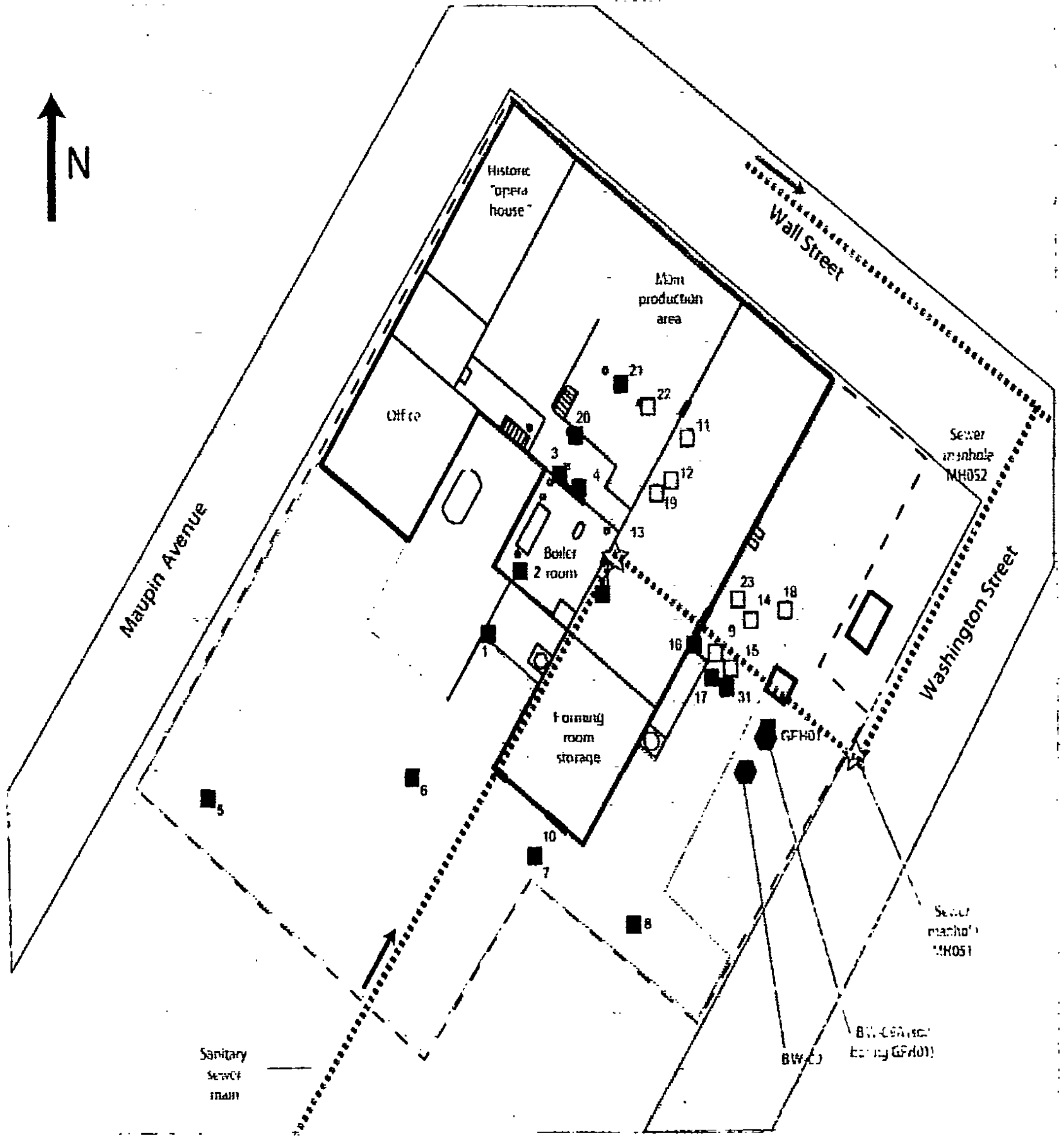
A third well (BW-09) was installed in July 2004. BW-09 monitors the groundwater below the interval sampled by BW-09A and above the groundwater contaminated by OU 4, which also migrates below OU 5.

Surface Water Sampling

Two small creeks flow past OU 5—the 300 tributary to the east and the 400 tributary to the west (Figure 1-5). The 300 tributary is fed by a small (> 0.3 gallons per minute [gpm]) perennial spring called Bates Spring.

Surface water samples were collected from these tributaries during four sampling efforts. The 300 tributary and the Bates Spring were sampled in November 2000 and April 2001 as part of the OU 1 RI since the 300 tributary also flows past that OU. Two more

[1] The MCL is the maximum permissible level of a contaminant in water which is delivered to the free flowing outlet of the ultimate user of a public water system. MCLs are promulgated by EPA pursuant to the Safe Drinking Water Act, 42 U.S.C. §§ 300f-300j-26, and are codified at 40 C.F.R. Part 141.



EXPLANATION

- ASPHALT
- STAIRCASE
- INTERIOR WALL OR STRUCTURE
- MONITORING WELL
- SANITARY SEWER MANHOLE

MAXIMUM PCE CONCENTRATION IN SOIL BORINGS (MICROGRAMS PER KILOGRAM)

- LESS THAN 1.0
- 1.0 TO 9.99
- 10 TO 99.9
- 100 TO 120

SCALE

0 50 100 Feet

FIGURE 1-4
MAXIMUM PCE CONCENTRATIONS IN LABORATORY SAMPLES FROM SOIL BORINGS AT OU 5
RIVERFRONT SUPERFUND SITE
OPERABLE UNIT 5 FS

SOURCE: USGS RI, 2005

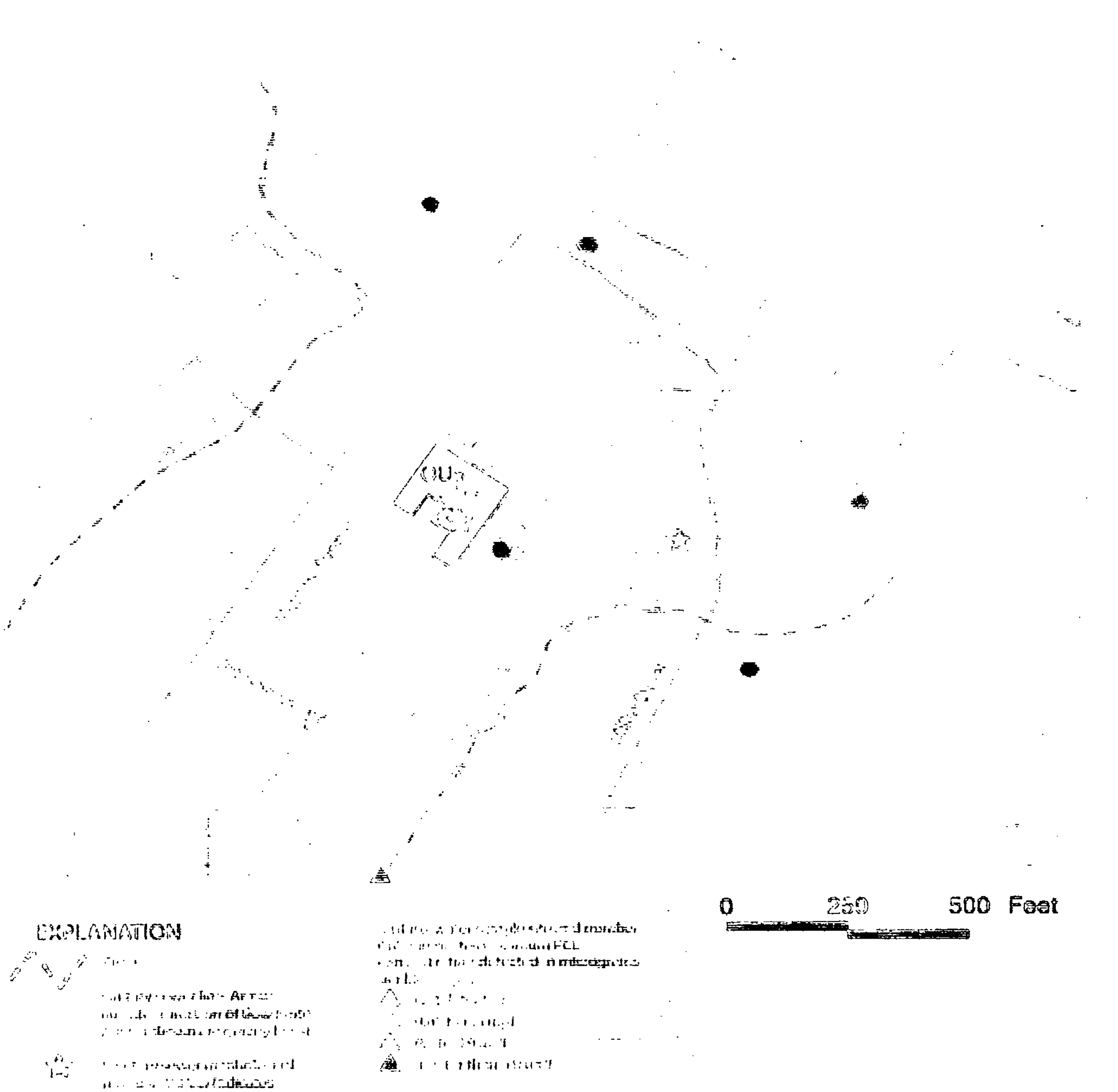


FIGURE 1-5

STREAM SAMPLE LOCATIONS

SOURCE: USGS RI, 2005

samples were collected from the 300 tributary in February 2005 to confirm the earlier results.

Sanitary Sewer Sampling

On February 20, 2004, grey water samples were collected from the sewers around OU 5 to see if PCE levels were different during the periods of high and low flow through the sewers.

5.4 Known and Suspected Sources of Contamination

There was no known use or disposal of PCE at OU 5. However, small undocumented use at the facility could explain its presence. Other hazardous substances and materials had been used at OU 5 including: formic acid; sulfuric acid; acetic acid; boiler treatment chemicals; petroleum jelly; pesticides containing diazinon, piperonyl butoxide, pyrethrins, propoxur, and dichlorvos; and a 30-gallon washing station filled with diesel fuel for degreasing. Also, the location of a former 10,000-gallon underground storage tank was identified during a site assessment. The tank was removed in 1991.

5.5 Types of Contamination and Affected Media

During the RI, groundwater samples were taken from the three monitoring wells, and soil samples were collected from an on-site soil boring. Additionally, samples were collected from sewers and streams in the vicinity of OU 5 as was previously discussed in section 5.3, Sampling Strategy.

5.6 Location of Contamination and Potential Routes of Migration

5.6.1 Soil Contamination

The USGS collected 141 soil samples from 26 borings during two phases of the OU 5 RI. The majority of the borings were conducted during the 2003 Phase I subsurface VOC characterization effort. The 2003 samples were screened for PCE in the field using a portable gas chromatograph, and selected split samples were analyzed in an off-site laboratory to confirm the field screening results. In 2004, soil samples from two borings were analyzed by the USGS contract laboratory for metals, SVOCs, pesticides, PCBs, and VOCs. Analytical results from the Phase I soil samples indicated that PCE was present at low levels in 17 of the 23 Phase I soil borings (78 of the 141 soil samples) at OU 5. The PCE contamination in the soil samples ranged from 0.13 micrograms per kilogram (µg/kg) to approximately 120 µg/kg when field screened. All of the off-site confirmation soil results were less than 55 µg/kg. These levels are four to eight times less than the EPA residential preliminary remediation goal (PRG) for PCE of 484 µg/kg. Only one sample out of 78 detections exceeded the EPA screening level of 60 µg/kg for migration to groundwater. This result was from a field screened sample and its corresponding laboratory verification was less than the EPA screening level.

Analytical results for the two borings installed in 2004 did not detect any PCBs or pesticides. Only one SVOC—bis(2-ethylhexyl) phthalate—was detected. This compound was only detected in one sample, at a level (390 μg/kg) far below its residential PRG of 35,000 μg/kg. While some metals were above background levels, the RI found that these results were not statistically different from the background data. Also, no metals as contaminants of potential concern (COPCs) were identified.

The highest levels of PCE tended to be found in the shallow soil and in the soils below where the forming room and the asphalt drive were previously located at OU 5. The USGS estimated that the total mass of PCE in the upper 20 feet of soil at OU 5 was approximately 167 grams.

5.6.2 Groundwater Contamination

A total of 12 groundwater samples was collected from three monitoring well locations at and in the vicinity of OU 5 from varying depths. The laboratory analyzed for VOCs using EPA Method 8260.

When monitoring well BW-09A was installed in March and April 2002, PCE was detected in the groundwater. PCE was detected in both the borehole before the well was completed and in the well after completion. The most contaminated section of this well was from 0-50 feet below ground surface (bgs) where contamination in water ranged from 27 μg/L to 140 μg/L. The MCL for PCE is 5 μg/L. Detectable levels of PCE have also been found in an adjacent well (BW-09) up to a depth of 160 feet bgs. However, the levels in the completed well have not exceeded the MCL.

The detection of PCE in well BW-09A prompted the EPA to install a second shallow well near OU 5 as a background well. Monitoring well BW-12A was installed in November 2003 approximately 250 feet sidegradient of OU 5. PCE, cis-1,2-DCE, and toluene were detected in the off-site laboratory samples from the borehole of BW-12A, but none of the detections exceeded 0.5 μg/L. The detection limit for PCE was 0.5 μg/L. PCE, benzene, and toluene were detected in the groundwater samples screened in the field from borehole BW-12A and the well itself. The PCE level was trace—0.09 μg/L. The benzene levels ranged from 1.07 to 3.04 μg/L. Toluene was detected once at 1.01μg/L.

The EPA installed a deeper well—monitoring well BW-09—adjacent to BW-09A in July 2004. BW-09 was installed to monitor the groundwater below the interval sampled by BW-09A, but above the deeper PCE plume migrating north from OU 4. The OU 4 plume passes below OU 5. PCE and carbon tetrachloride (CT) have been detected in the off-site laboratory samples from BW-09. None of the three PCE detections have exceeded 0.5 μg/L. The single CT detection from the borehole before the well was installed was 4.5 μg/L. Neither of the two off-site samples from the completed well contained detectable levels of CT. PCE, trichloroethylene (TCE), cis-1,2-DCE, benzene, and toluene were detected in the groundwater samples screened on-site from the borehole for well BW-09. The PCE levels ranged from nondetect (the detection level was 0.5 μg/L to 34 μg/L).

However, the levels in the completed well (sampled at a depth of 185 feet) have not exceeded 0.5 µg/L as noted above. In the 15 screened samples, TCE, cis-1,2-DCE, benzene, and toluene were detected five, two, three, and four times, respectively. None of the detections of these four compounds exceeded their EPA-established drinking water standard.

5.6.3 Surface Water and Sewer Sampling

Surface water samples collected from the vicinity of OU 5 (Figure 1-5) were mostly nondetect for PCE and all other COPCs. The only exceptions were samples from Bates Spring and from a tributary that runs east of OU 5. Both of these locations are more than 800 feet upstream from OU 5. The OU 5 RI concluded that the PCE contamination found in Bates Spring and the stream samples were from OU 4 to the south. All the stream samples collected downstream of Bates Spring that could have been contaminated from OU 5 were found to be nondetect for all compounds. Therefore, the OU 5 RI concluded that the PCE contamination from OU 5 is not affecting the surface waters near OU 5 and do not pose a threat to human health or the environment.

Several samples were collected from sewers upstream and downstream of OU 5. While PCE was detected in these samples, the levels were approximately the same in the upstream and the downstream samples. The RI concluded the OU 5 is not a source of the PCE in the sewers.

6.0 Current and Potential Land Use and Water Uses

6.1 Land Uses

The Old Hat Factory (OU 5) closed permanently in 2000, and some of the assets were sold. In 2002, the property was purchased, restoration of the historic *opera house* section commenced, and the remainder of the building was demolished. The metal office building on the south side of the facility was leased to a carpentry shop in 2002. In 2003, salvage operations began with interior wood beams and wood flooring being removed and the machinery and remaining interior equipment auctioned. Demolition of the forming room and the main production area was completed in mid-2005. After the demolition of the buildings, OU 5 was regraded. During the regrading process, the underlying soil was disturbed, an unknown amount was removed and used as fill to the east of OU 1, and the remaining original soil was regraded. Subsequently, new topsoil was spread over the entire regraded area and reseeded. Future use of the property is anticipated to remain commercial.

6.2 Groundwater and Surface Water Uses

Currently, there is no groundwater or surface water use at OU 5. OU 5 is within *Special Area 3* as designated by the state of Missouri.[2] State well drilling restrictions are in place which will prohibit any new domestic wells in the immediate vicinity of OU 5 or which

[2] 10 C.S.R. 23-3.100(7)

will require extended casing depths on new wells. It is extremely unlikely that wells would be installed at OU 5 to supply water to residents as the area is provided drinking water from city wells.

7.0 Summary of Site Risks

The Missouri Department of Health and Senior Services (MDHSS) completed a *Baseline Human Health Risk Assessment for Operable Unit 5 (OU 5) - The Old Hat Factory* in January 2006. The Human Health Risk Assessment (HHRA) estimates the human health risks that OU 5 could pose if no action was taken. It is one of the factors EPA considers in deciding whether to take action at a site. The risk assessment also identified the contaminants and exposure pathways that need to be addressed by the remedial action.

This assessment used sampling results obtained during investigations and sampling events conducted by the USGS. This assessment examined risks that may result from human exposure to soils and groundwater contaminated with PCE and other VOCs. The potential health risks of exposure to contaminants were evaluated under current and possible future land use scenarios as presented in Table 7-1.

Current receptors that may be exposed to OU 5 contaminants include indoor workers. Future human receptors that may be exposed to OU 5 contaminants include both indoor and outdoor workers, construction/excavation workers, and residents. Currently, there is no human exposure to hazardous substances at OU 5. This section of the ROD summarizes the current and future risks at OU 5.

7.1 Summary of Human Health Risk Assessment

This summary of health risks identifies the COPCs, the exposure assessment, the toxicity assessment, and the risk characterization.

7.1.1 Identification of Contaminants of Potential Concern

The primary COPCs for all investigation activities at the Riverfront site are VOCs, specifically PCE and its daughter products trichloroethene, cis-dichloroethene, and vinyl chloride. This narrow list of VOCs is the focus of the main objective of EPA activities at the Riverfront site, which is to identify and remediate the source of the PCE contamination that resulted in the closure of city wells W1 and W2. However, to fully characterize the potential risk to human health at OU 5, additional COPCs such as metals, pesticides, PCBs, and SVOCs were considered and added to the target list of primary COPCs. The list of additional COPCs is specific to each OU and developed based upon information regarding past and current industrial or disposal practices at each OU. The list of COPCs for the various media characterized during the RI at OU 5 is given in Table 7-2.

The MDHSS conducted a screening process of the COPCs to limit the number of contaminants included in the quantitative risk assessment to those that might drive the

Table 7-1 Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Soil	Surface Soil	Surface Soil	Occupational (Indoor Worker)	Adult	Incidental Ingestion	Quantitative	The indoor worker is assumed to work indoors all day and has the potential for minimal soil exposure through the incidental exposure through the incidental ingestion of indoor dust.
Current/Future	Soil	Air (Vapor Intrusion)	Indoor Soil Vapors	Occupational (Indoor Worker)	Adult	Inhalation	Quantitative	The indoor worker could potentially be exposed to volatile chemicals in indoor air from intrusion of vapors through a building foundation of contaminants in subsurface soil beneath current and future buildings. This pathway is only evaluated qualitatively because soil gas data are not available.
Current/Future	Groundwater (Vapor Intrusion)	Air (Vapor Intrusion)	Groundwater Vapors	Occupational (Indoor Worker)	Adult	Inhalation	Quantitative	The indoor worker could potentially be exposed to volatile chemicals in indoor air from intrusion of vapors through a building foundation of contaminants in groundwater beneath current and future buildings.

Table 7-1 Selection of Exposure Pathways

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion Pathway
Future	Soil	Surface Soil Air	Surface Soil Outdoor Soil Vapors	Occupational (Outdoor Worker)	Adult	Incidental Ingestion Inhalation	Quantitative	The outdoor worker is assumed to work outdoors all day and has the potential for substantial soil exposure through the incidental ingestion of outdoor soils and inhalation of soil of soil vapors.
	Soil	Surface/ Subsurface Soils Air	Surface/ Subsurface Soils	Occupational Construction/ Excavation Workers	Adult	Incidental Ingestion Inhalation	Quantitative	The construction/excavation worker is assumed to be exposed during construction/excavation activities and has the potential for high soil exposure through incidental ingestion of outdoor soil and inhalation of soil vapors.
	Soil	Surface Soil Air	Surface Soil Outdoor Soil Vapors	Residents	Child/ Adult	Incidental Ingestion Inhalation	Quantitative	The resident is assumed to have the potential for substantial soil exposure through the incidental ingestion of indoor dust and outdoor soils and inhalation of soil vapors.
	Soil	Air (Vapor Intrusion)	Indoor Soil Vapors	Residents	Child/ Adult	Inhalation	Qualitative	The resident could potentially be exposed to volatile chemicals in indoor air from intrusion of vapors through a building foundation of contaminants in subsurface soil beneath current and potential future buildings.
	Groundwater (Vapor Intrusion)	Air (Vapor Intrusion)	Groundwater Vapors	Residents	Child/ Adult	Inhalation	Quantitative	The resident could potentially be exposed to volatile chemicals in indoor air from intrusion of vapors through a building foundation of contaminants in groundwater beneath current and future buildings.
	Groundwater (Tap Water)	Groundwater	Tap Water	Occupational (Indoor/Outdoor Workers)	Adult	Ingestion	Quantitative	In the future, a potable water well could be installed and onsite workers may use this as a source of drinking water.

remediation considerations. Because VOCs are the primary contaminants of interest and are the focus of the RI, all VOCs detected in each media were retained for the quantitative assessment. The results of the screening process identified four groundwater contaminants that were carried forward in the risk assessment: acetone, carbon tetrachloride, chloroform, and PCE.

Table 7-2 Contaminants of Potential Concern at OU 5

Description	Soil	Groundwater	Surface Water	EPA Method
VOCs	YES	YES	YES	8260
Selected Inorganics and Metals	YES	YES	YES	6010B
Organo-chlorine and PCBs	YES	YES	YES	8081A and 8082
Mercury	YES	YES	YES	7471A
SVOCs	YES	YES	YES	8270C

7.1.2 Exposure Assessment

Exposure to contaminants is defined as the contact of a receptor with a contaminant. For exposure to occur, there must be a source of the contaminant (contaminated water, soil, or air), a receptor (a person), and a mechanism or pathway for contaminants to reach the receptor (ingestion of, dermal contact with, or inhalation of particulates or vapors from contaminated media).

Contaminants may be transported from a site to a secondary media (surface and subsurface soils, ambient and indoor air, groundwater, surface water, and sediments) through several processes, including leaching of contaminants to groundwater from soil or surface water, recharge of surface water from contaminated groundwater, and migration or erosion of contaminated soil particles to air or surface water. Several potential exposure pathways may exist for each contaminated media.

As previously indicated, investigations have established that PCE and other VOCs have migrated through soils and groundwater in the vicinity of OU 5, creating multiple human exposure points. The following exposure pathways were addressed in the exposure assessment:

Exposure Media	Receptors	Pathways
Soil	Current and Future Indoor Workers	Incidental Ingestion of Soil
	Future Outdoor Workers	Incidental Ingestion of Soil and Inhalation of Outdoor Soil Vapors
	Future Construction/Excavation Workers	
	Future Residents	
Groundwater (Vapor Intrusion)	Current and Future Indoor Workers	Inhalation of Groundwater Vapors
	Future Residents	
Groundwater (Tap Water)	Future Indoor and Outdoor Workers	Drinking Water Ingestion
	Future Residents	Drinking Water Ingestion, Dermal Contact While Showering/Bathing, and Inhalation of Tap Water Vapors

7.1.3 Toxicity Assessment

Tables 7-3 and 7-4 show the COPCs that are the major risk contributors for OU 5. Based on the data from the EPA Integrated Risk Information System (IRIS) and other published data, two of the COPCs (carbon tetrachloride and chloroform) are classified as probable human carcinogens (EPA weight of evidence B2). The other two (acetone and PCE) were either not classified as human carcinogens or have not been assessed. The carcinogenic oral/dermal and inhalation slope factors for the COPCs are presented in Table 7-3. For complete information on the toxicity of the COPCs, see the OU 5 HHRA.

7.1.4 Risk Characterization

This section presents the results of the evaluation of the potential risks to human health associated with exposure to contaminated groundwater at OU 5.

For carcinogens, risks are generally expressed as the probability of an individual developing cancer over a lifetime as a result of exposure to site-related contaminants. This is described as *excess lifetime cancer risk* because it is in addition to the risk of cancer from other causes. Risk is expressed in scientific notation; that is, 1E-06 means the individual has a 1 in 1,000,000 chance of developing cancer from site-related exposure. The chance of an individual developing cancer from all other causes has been estimated to be as high as 1 in 3. The EPA's generally acceptable risk range for site-related exposures is 1E-04 to 1E-06—in effect, 1 in 10,000 to 1 in 1,000,000. An excess lifetime cancer risk greater than 1 in 10,000 (1E-04) is the point at which action is generally required at a site.

The potential for noncarcinogenic effects is evaluated by comparing an exposure level over a specified time period, e.g., lifetime, with a reference dose (RfD) based on an average daily exposure or dose. This comparison represents a ratio of the dose to the RfD and is called the hazard quotient (HQ). If the HQ is less than one, this means the receptor (individual) is exposed to a dose *less than* the RfD and is not expected to

Table 7-3 Cancer Toxicity Data - Oral/Dermal

Chemical of Potential Concern	Oral Slope Factor		Oral Absorption Efficiency for Dermal (1)	Absorbed Cancer Slope Factor for Dermal		Weight of Evidence/Cancer Guideline Description	Oral CSF	
	Value	Units		Value	Units		Source(s)	Date(s) MM/DD/YYY
Acetone	NA	NA	NA	NA	NA	Data Inadequate	I	08/29/2005
Carbon Tetrachloride	1.3E-01	$(mg/kg\text{-}d)^{-1}$	1	1.3E-01	$(mg/kg\text{-}d)^{-1}$	B2	I	08/29/2005
Chloroform	See Comment #1 Below		NA	NA	NA	B2	I	08/29/2005
PCE	5.4E-01	$(mg/kg\text{-}d)^{-1}$		5.4E-01	$(mg/kg\text{-}d)^{-1}$	Not Assessed by IRIS; the IARC classifies PCE as probably carcinogenic to humans (Group 2A)	C	08/29/2005

(1) EPA RAGS Part E: Supplemental Guidance for Dermal Risk Assessment

Weight of Evidence Classifications
B2 – Probable Human Carcinogen, based on sufficient evidence of animal studies, but inadequate epidemiological studies

Source References
I – EPA's Integrated Risk Information System (IRIS)
C – California Environmental Protection Agency (CalEPA)

Definitions
NA= Not Available/Not Applicable

Comments
#1 – The EPA has chosen not to rely on a mathematical model to estimate a point of departure for cancer risk estimate, because the mode of action indicates that cytotoxicity is the critical effect and the reference dose value is considered protective for this effect. A dose of 0.01 mg/kg/day (equal to the RfD) can be considered protective against cancer risk (see IRIS).

Table 7-4 Cancer Toxicity Data – Inhalation

Contaminant of Potential Concern	Unit Risk		Inhalation Cancer Slope Factor		Weight of Evidence/Cancer Guideline Description	Unit Risk: Inhalation CSF	
	Value	Units	Value	Units		Source(s)	Dates (MM/DD/YYY)
Acetone	NA	NA	NA	NA	Data Inadequate	I	08/29/2005
Carbon Tetrachloride	1.5E-05	$(\mu g/m^3)^{-1}$	5.3E-02	$(mg/kg\text{-}d)^{-1}$	B2	I	08/29/2005
Chloroform	2.3E-05	$(\mu g/m^3)^{-1}$	8.1E-02	$(mg/kg\text{-}d)^{-1}$	B2	I	08/29/2005
PCE	5.9E-06	$(\mu g/m^3)^{-1}$	2.1E-02	$(mg/kg\text{-}d)^{-1}$	Not Assessed by IRIS; the IARC classifies PCE as probably carcinogenic to humans (Group 2A)	C	08/29/2005

Weight of Evidence Classifications
B2 – Probable Human Carcinogen, based on sufficient evidence of animal studies, but inadequate epidemiological data

Source References
I – EPA's Integrated Risk Information System (IRIS)
C- California Environmental Protection Agency (CalEPA)

Definitions
NA – Not Available/Not Applicable

experience any harmful effects. The Hazard Index (HI) is the sum of all HQs. An HI *less than* one means that, based on the sum of HQs from different contaminants and exposure routes, toxic effects are unlikely.

Conclusion

The risk characterization summaries for carcinogenic and noncarcinogenic effects are shown in Table 7-5. The risk estimates presented are based on reasonable maximum exposure scenarios and considered various conservative assumptions about the frequency and duration of exposure to groundwater as well as the toxicity of the COPCs.

Table 7-5 Cancer and Noncarcinogenic Risk Summaries

Carcinogenic Risks			
Population	**Exposure Pathway**	***Total Excess Lifetime* Cancer Risk**	***Contaminant(s)* Driving Risk**
Future Resident	Groundwater (used as water supply	1.3E-3	PCE, Carbon Tetrachloride, Chloroform
Future Occupational Worker	Groundwater (used as water supply)	1.6E-4	PCE, Carbon Tetrachloride, Chloroform

Note 1: Human health risks may exist when the total lifetime excess cancer risk exceeds 1.0E-6. The EPA considers risks greater than 1.0E-4 to be unacceptable.

Noncarcinogenic Risks			
Population Scenario	**Exposure Pathway**	**Total Hazard Index**	**Contaminant(s) Driving Risks**
Future Resident	Groundwater (used as supply water)	2.1	PCE

Note 1: Human health risks may exist when the total HI for noncarcinogenic effects exceeds a value of 1.0.

All calculated excess cancer risks for soil exposure were less than 1 in 1,000,000 (1.0E-6) and all noncarcinogenic risks from soils had total HIs less than one. Therefore, soils at OU 5 pose an insignificant threat.

The HHRA identified cancer risks from vapor intrusion due to groundwater contamination in the 1.2E-6 to 2.0E-6 range. These estimates fall within EPA's target risk range (1.0E-4). Noncarcinogenic health effects from vapor are not expected. With regard to vapor intrusion due to soil contamination, the HHRA concluded in its *Uncertainties Section* that based on site conditions, "...it is unlikely that contaminants in soils would contribute significantly to human health risks via the vapor intrusion pathway." Further analysis of the vapor intrusion pathway by the EPA and MDHSS risk assessors provided in Appendix C of the HHRA confirmed this conclusion. Given that even when assuming reasonable maximum scenarios, the health risks from vapor intrusion exposure fall right at the lower boundary of EPA's target risk range, the vapor intrusion pathway is considered insignificant.

The HHRA identified risks to future workers at OU 5 and future residents if the groundwater below OU 5 was used as a water supply. The excess cancer risk for workers was 1.6E-4 while the cancer risk for residents was 1.0E-3. In addition, the noncarcinogenic risk to residents from the groundwater (2.1) exceeded the threshold value of 1. Therefore, the groundwater contamination risk is unacceptable and will need to be addressed.

7.1.5 Uncertainty Analysis

The estimation of risk posed by a site is a complex problem and involves making a series of assumptions to determine chemical intake and toxicity. Daily chemical intake is estimated using a variety of variables. Many of the values used for intake variables are upper confidence limits of the mean values. This is done to ensure the protection of human health, but it may overestimate the true risk posed by a site.

The recovery of contaminants during sample extraction can be less than 100 percent. This inability to extract all contaminants present at a site may result in an underestimation of the risks posed by a site.

The degree to which transport or release models are representative of physical reality may overestimate or underestimate risk.

The assumptions of 100 percent bioavailability of chemicals in environmental media may result in an overestimation of risk.

Risk estimates are assumed to be additive in the absence of information regarding synergism and antagonism. This may result in an overestimation or underestimation of risks posed by a site.

Most of the toxicity values used to calculate risk are derived from toxicity testing carried out on animals. Interspecies as well as intraspecies variation adds uncertainty to the toxicity values; thus, the true risk posed by a site may be higher or lower than presented in the assessment.

Toxicity values were not available for all COPCs in the risk assessment. Therefore, risk could not be quantitatively characterized for all chemicals and an underestimation of risk may result.

In the modeling of contaminant uptake, chemical concentrations in soil and groundwater were assumed to remain constant over time. This is a conservative estimate and is likely to overestimate the true risk posed by a site. The chemical concentrations may vary and will likely decrease over time leading to a potential overestimation of future risk.

Vapor intrusion modeling can over predict or under predict levels of contaminants that may impact indoor air which adds additional uncertainty to the risk assessment. The Johnson & Ettinger Model was used in this assessment to evaluate potential risks from groundwater vapors that may intrude into indoor air from groundwater. This model was developed for use as a screening level model and consequently is based on a number of simplifying assumptions regarding contaminant distribution and occurrence, subsurface characteristics, transport mechanisms, and building construction. The simplified assumptions employed in this model may result in an overestimation or underestimation of the risks presented for vapor intrusion from groundwater sources. A more thorough discussion on uncertainties can be found in the HHRA.

7.2 Summary of Ecological Risk Assessment

A screening-level ecological risk assessment (ERA) was conducted to assess the potential for the existence of ecological receptors and pathways between those receptors and COPCs associated with the Riverfront site as a whole. There was not a separate ERA done for OU 5 specifically. The ERA was conducted using the methodology described in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (USEPA 1997)*. The screening-level ERA was designed to assess the need for a follow-up Baseline ERA. The results of the screening-level ERA are discussed in detail in the *Ecological Risk Assessment, Revision 0,* prepared for EPA by Black & Veatch Special Projects Corp. The ERA concluded that OU 5 poses minimal risk to ecological receptors.

7.3 Risk Assessment Conclusion

There are COPCs at OU 5 and of these PCE, carbon tetrachloride, and chloroform pose the greatest health risk in the groundwater pathway. Therefore, 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 from OU 5.

8.0 Remedial Action Objectives

Section 121(b) of CERCLA requires selection of remedial actions that: attain a degree of cleanup that ensures protection of human health and the environment, are cost effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the extent practicable.

The RAOs provide a general description of what the response action is expected to accomplish. The RAOs developed for groundwater at OU 5 were: (1) minimize contact with the contaminated groundwater exceeding PRGs, and (2) ensure that the contaminant levels in the groundwater and/or the volume of contaminated groundwater do not increase.

Institutional controls will be used as well as periodic sampling of monitoring wells on and in the vicinity of OU 5 to limit any potential future exposure to COPCs. PCE, carbon tetrachloride, and chloroform present a potential risk to a resident and/or occupational worker.

This response action will provide EPA and MDNR with the means to evaluate this remedy, monitor any contaminant migration, and prevent any potential future risks from OU 5.

9.0 Description of Remedial Alternatives

The options for addressing groundwater that were retained from the initial screening of remedial alternatives were evaluated in greater detail for effectiveness, implementability, and cost. The evaluation focused on three main points:

- The potential effectiveness of the process option in handling the estimated volume of contaminated groundwater and meeting the goals identified in the general response.
- The effectiveness of the process option in protecting human health and the environment during the construction and implementation phases.
- The reliability and certainty of process options with respect to the contaminants and conditions at OU 5.

The implementability of a process option encompasses both the technical and institutional feasibility of implementing a process. Because technical feasibility of the process options was considered during the initial screening, the primary emphasis during this more detailed evaluation was institutional feasibility. Institutional feasibility included: consideration of the ability to obtain the necessary permits for offsite actions; the availability of treatment, storage, or disposal facilities; and the availability of the necessary equipment and workers.

The cost evaluation included an estimation of the capital and operation and maintenance (O&M) costs associated with the process options. Because more detailed cost estimates will be included in the screening and detailed evaluation of alternatives, costs are not greatly emphasized at this point. The greatest costs during site remediation are usually associated with the degree to which the different technology types are used, not the specific process options.

From the screening of technologies provided in the Feasibility Study (FS) completed in June 2006, EPA evaluated and assembled a range of alternatives including:

- Alternative 1 – No Action
- Alternative 2 – Institutional Controls
- Alternative 3 – Institutional Controls with Groundwater Monitoring

9.1 Description of Groundwater Alternatives/Remedy Components

This section presents a discussion of the remedial alternatives for the contaminated groundwater at OU 5. Table 9-1 summarizes the alternatives developed for OU 5 for consideration in each alternative. For all alternatives, the five-year reviews would be performed by EPA, as required by CERCLA and the NCP.

Table 9-1 Process Options Retained for Groundwater RAOs

General Response Action	Process Options
No Action	None
Institutional Controls	Restrictive Covenant Well Construction Requirements Public Education

9.1.1 Groundwater Alternative 1 – No Action

The NCP requires that the EPA consider a no action alternative. The no action alternative serves as a baseline against which the other remedial alternatives can be compared. Under the no action alternative, no further actions would be taken to monitor, control, or remediate the groundwater contamination below OU 5; thus, no funds would be expended implementing a remedial action at OU 5. The statutorily required five-year review would be a site-wide review, with OU 5 being one of the OUs reviewed. As a result, there would be some funds expended to support the OU 5 portion of the site-wide five-year review. The five-year reviews for OU 5 would be conducted on the same schedule as OU 1. As the long-term remediation action for OU 1 was the first achieved, it established the site-wide five-year review schedule. In addition, minimum capital costs are included to properly abandon the three existing monitoring wells. The capital costs, periodic costs, and present worth of Alternative 1 are shown in Appendix A of the June 2006 FS.

9.1.2 Groundwater Alternative 2 – Institutional Controls

Treatment/Containment Components

No treatment or containment components are included.

Institutional Controls

Alternative 2 would involve the use of existing state of Missouri well construction requirements and public education to prevent human use of the groundwater at OU 5. As discussed above in section 6.2, the state of Missouri has enacted well construction requirements for *Special Area 3*, which includes the area where OU 5 is located. These well construction requirements are embodied in regulations found at 10 C.S.R. 23-3.100(7). These requirements provide that MDNR is to be consulted before any new well is constructed or any existing well is deepened within *Special Area 3*. These regulations further provide that MDNR "...will provide specific guidance on well drilling protocol and construction specifications on a case-by-case basis. The division must provide written approval for all new wells prior to construction." Similar language is present in the regulations for well deepening.

OU 5 and the surrounding area are all within an area served by municipal water. Accordingly, it is very unlikely that new wells would be installed in the vicinity of OU 5 due to the ready availability in that area of municipal water. The state regulations will ensure that if any new well construction or well deepening is planned, state officials will be informed and can prescribe methods for ensuring that no exposures to hazardous substances occur. These regulations should also be effective in preventing the construction of substandard wells which could spread contamination at or near OU 5. The regulations are considered to be durable as revocation would require the affirmative action of the state with notification to interested parties.

Some of the groundwater contamination found at OU 5 appears to originate from an upgradient source (OU 4). Rather than apply additional institutional controls on a parcel-by-parcel basis, EPA intends as part of the remedy selection process for OU 4 to explore opportunities to impose a more area-wide institutional control to provide a layer of controls in addition to those institutional controls already in place.

It is expected that the EPA will also provide public education to inform the city officials and landowners residing near OU 5 of the restrictions on well drilling in the area. Public education may be conducted through informational meetings and flyers. As in Alternative 1, five-year reviews would be required. In addition, minimal capital costs are included to properly abandon the three existing monitoring wells. The capital costs, periodic costs, and present worth of Alternative 2 are shown in Appendix A of the June 2006 FS.

Monitoring Component

No groundwater monitoring would occur in this alternative.

Operation & Maintenance (O&M) Components

The O&M activities may consist of public education activities including: (1) preparation of a newsletter on OU 5, (2) publication in the local newspaper, (3) direct mailing to local officials and concerned citizens, and (4) holding public information meetings on OU 5 in New Haven every five years. In addition, five-year reviews of OU 5 are required under CERCLA so there will be a five-year review prepared periodically.

Expected Outcomes

The contaminated groundwater under OU 5 is shallow. Implementation of Alternative 2 would prevent exposure to the contaminated groundwater. However, without monitoring it would be difficult to determine if the contaminants were migrating farther from OU 5 or deeper into the aquifer.

9.1.3 Alternative 3 – Institutional Controls and Groundwater Monitoring

Treatment/Containment Components

No treatment or containment components are included.

Institutional Controls

The institutional controls would be the same as in Alternative 2.

Monitoring Activities

In addition to the institutional controls, Alternative 3 would set up a system of regular groundwater monitoring to track the contaminant levels in and the location of the plume. Since the demolition and regrading activities at OU 5 may have removed most of the PCE contamination in the soils, PCE levels in the groundwater may begin to attenuate. By sampling groundwater monitoring wells, any changes in contaminant concentrations would be documented over time. Monitoring the contaminated groundwater would provide a greater level of protection to local residents since substantial changes in groundwater contaminant concentrations would be discovered, and additional remedial actions could be taken if necessary.

Alternative 3 would require the drilling and installation of two new monitoring wells near OU 5 (Figure 9-1). The new wells would be shallow, sampling the same depth as BW-09A and BW-12A—approximately 55 feet bgs. One well would be installed upgradient of OU 5, preferably to the south along Maupin Avenue, providing background information. The second well would be installed downgradient of OU 5 providing site information.

Operation and Maintenance (O&M) Activities

The O&M activities for the monitoring activities would include well maintenance (periodic cleaning/redevelopment). In addition, five-year reviews of OU 5 are required under CERCLA so there will be a five-year review prepared periodically.

Expected Outcomes

The contaminated groundwater under OU 5 is shallow. Implementation of Alternative 3 would prevent exposure to the contaminated groundwater. In addition, monitoring of the groundwater will allow the EPA to determine if the contaminants were migrating farther from OU 5 or deeper into the aquifer and to implement additional remedial actions if necessary.

FIGURE 9-1
ALTERNATIVE 3 PROPOSED MONITORING WELL LOCATIONS
RIVERFRONT SUPERFUND SITE
OPERABLE UNIT 5 FS

SOURCE: USGS RI, 2005
C0008077_1 6/7/2006

9.2 Common Elements and Distinguishing Features of Each Alternative

Common elements of Alternatives 2 and 3 include:

- Prevent the exposure to the contaminated groundwater at OU 5
- Institutional controls

The distinguishing features include:

- Alternative 3 would monitor the groundwater contamination, whereas Alternative 2 would not.
- Alternative 3 would require the installation of additional monitoring wells.
- Alternative 3 would require the disposal of drill cuttings and other well installation wastes.
- Alternative 3 would attain Applicable or Relevant and Appropriate Requirements (ARARs), whereas Alternative 2 would not.

10.0 Comparative Analysis of Alternatives

As required, EPA evaluated the alternatives using the nine criteria listed in the NCP [40 C.F.R. § 300.430(e)(9)(iii)]. Two of the nine criteria (overall protection of human health and the environment and compliance with ARARs) are threshold criteria. If an alternative does not meet these criteria, it cannot be considered as a remedy.

Five of the criteria are balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume of contaminants through treatment; short-term effectiveness; implementability; and cost. The EPA can make tradeoffs between the alternatives with respect to the balancing criteria.

Two of the criteria are modifying criteria: state/support agency acceptance and community acceptance.

This section of the ROD compares each alternative against the nine criteria, noting how it compares to the other alternatives. A detailed evaluation of these alternatives against the nine criteria can be found in the FS.

10.1 Overall Protection of Human Health and the Environment

This criterion determines whether an alternative eliminates, reduces, or controls threats to human health and the environment through institutional controls, engineering controls, or treatment. This is a threshold criterion.

All of the alternatives except the No Action Alternative would adequately protect human health and the environment from contaminants in the groundwater. Because Alternative 1 - No Action is not protective of human health and the environment, it was eliminated from consideration under the remaining eight criteria.

The restrictions on well construction and public education effort in Alternative 2 should be effective in preventing human exposure to contaminated groundwater. However, because no monitoring is required under this alternative, it would not be possible to determine if contaminants are continuing to migrate from OU 5 or are posing additional threats to human health and the environment.

Alternative 3 provides the greatest amount of protection of human health and the environment. In addition to providing restrictions on groundwater usage and public education, Alternative 3 would also include groundwater monitoring. Sampling of wells in and around OU 5 would allow for the monitoring of the contamination in the groundwater. Monitoring also provides greater protection of the environment because changes in contaminant concentrations in the groundwater would be monitored by regulatory agencies. Any changes in groundwater contamination would be detected through the monitoring, and additional remedial actions could be implemented if needed.

10.2 Compliance with ARARs

This criterion evaluates whether the alternative meets applicable and relevant and appropriate federal and state environmental statutes, regulations, and other requirements. These requirements are known as ARARs. ARARs are generally placed into one of three categories: chemical specific, location specific, or action specific. Chemical-specific ARARs regulate the levels of chemicals at a site. They are generally a level that must be met for a site to be considered remediated and are specific to a media such as groundwater. Location-specific ARARs regulate contaminant levels or activities in specific locations such as flood plains. Action-specific ARARs regulate remedial activities, not a specific contaminant. If necessary, this evaluation may also provide an explanation of why a waiver of an ARAR is justified. This is a threshold criterion.

Alternatives 1 and 2 do not comply with chemical-specific ARARs because contaminants have been detected in monitoring wells above regulatory limits (MCLs). It is uncertain if the groundwater contamination will migrate, so it is unknown if compliance with chemical-specific ARARs would be attained in the future. However, Alternative 3 includes monitoring of the groundwater, allowing changes in contaminant levels to be detected. Location-specific ARARs were not identified for Alternative 2. Alternative 3 would comply with action- and location-specific ARARs.

10.3 Long-Term Effectiveness and Permanence

This criterion considers the ability of an alternative to maintain protection of human health and the environment over time, including the adequacy and the reliability of the alternatives' controls. This is a balancing criterion.

Alternative 2 would have some long-term effectiveness and permanence. Implementation would reduce long-term risk to health from human use of contaminated groundwater. However, the aquifer would not be actively restored. A long-term risk would exist for the environment as the contaminated groundwater would remain in the aquifer. Because no monitoring would be conducted, changes in risks to human health or the environment could not be evaluated.

Alternative 3 would reduce the long-term risk to health from human usage of contaminated groundwater, and monitoring would provide additional information on the contamination levels and plume location. However, the aquifer would not be actively restored. A long-term risk would exist for the environment as the contaminated groundwater would remain in the aquifer. However, changes in groundwater contamination levels would be detected through monitoring, and additional remedial actions could be taken as needed.

10.4 Reduction of Toxicity, Mobility, or Volume Through Treatment

This criterion evaluates an alternative's use of treatment to reduce the harmful effects of contaminants, their ability to move in the environment, and the amount of contaminants present. This is a balancing criterion.

None of the alternatives would reduce the toxicity, mobility, or volume of the contaminants through treatment. Alternative 3 would use monitoring to determine if contaminant toxicity, mobility, or volumes were increasing and migrating off-site.

10.5 Short-Term Effectiveness

This criterion considers the length of time needed to implement an alternative. It also evaluates the risks the alternative poses to workers, residents, and the environment during implementation. This is a balancing criterion.

Alternative 2 would require the least time to implement as the institutional controls are generally already in place. Alternative 3 would require a short time—three to six months to implement—since it requires that some additional monitoring wells be installed.

In general, alternatives with the fewest construction or intrusive activities pose the lowest risk to site workers and the community during the remedial action. Alternative 3 requires a small amount of intrusive work during the drilling and the installation of the additional monitoring wells. Short-term risks to workers, the community, and the environment could be controlled by the proper use of personal protective equipment, equipment decontamination, monitoring during site activities, and following the Occupational Safety and Health Act (OSHA) safety guidelines. The risk to the community would be reduced further by limiting access to areas where well installations were being conducted. Since no one is currently exposed to contaminated groundwater, only workers involved in well drilling operations and sample collection from monitoring wells (Alternative 3) could be exposed to contaminants. This exposure could be minimized by proper use of personal protective equipment, adherence to a site-specific health and safety plan, and following proper well installation and sampling procedures. Alternative 3 would provide a means of evaluating the short-term effectiveness of natural processes that may attenuate the contaminants at OU 5.

10.6 Implementability

This criterion considers the technical and administrative feasibility of implementing the alternative. It evaluates such concerns as the relative availability of the goods and services needed to construct or operate the remedy. This is a balancing criterion.

Implementation of Alternative 2 is essentially complete as the required institutional controls are generally already in place (discussed above in section 9.1.2). Public education could be easily implemented through public notices in the newspaper, through direct mailings, and public meetings. As with Alternative 1, closure of the existing monitoring wells and five-year reviews would be required. The services, material, and personnel needed to close the wells and complete the reviews are readily available.

Implementation of Alternative 3 would also be easy to accomplish, but slightly more difficult than Alternative 2. The installation of monitoring wells is a common practice, and technical assistance for health and safety concerns is readily available. As with Alternative 2, the required institutional controls are generally already in place. Public education could be easily implemented through public notices in the newspaper, through direct mailings, and through public meetings. As with Alternative 2, well closure (in years 2 and 20) and five-year reviews would be required. The services, material, and personnel needed to close the wells and complete the reviews are readily available.

10.7 Cost

This criterion evaluates the estimated capital and O&M costs as well as present worth costs. Present worth costs are the total costs of an alternative over time in terms of today's dollars, i.e., present worth costs corrected for expected inflation. The cost estimates are order-of-magnitude estimates which are expected to be accurate within a range of +50 to -30 percent. This is a balancing criterion.

The total present worth of Alternative 1 would be the lowest at a cost of $39,000. Alternative 2 also has a relatively low total present worth cost of $45,000. Alternative 3 has the highest total present worth cost at $122,000.

10.8 State/Agency Acceptance

This criterion considers whether the state agrees with EPA's analyses and recommendations as contained in the RI/FS and the Proposed Plan. This is a modifying criterion.

As indicated by MDNR, the state of Missouri supports the preferred alternative (Alternative 3) selected by the EPA.

10.9 Community Acceptance

This criterion considers whether the local community agrees with the EPA's analyses and preferred alternative. Comments received on the Proposed Plan are important indicators of community acceptance. This is a balancing criterion.

During the Proposed Plan public comment period, no written comments were received that opposed EPA's choice of Alternative 3. There was one comment raised during the public meeting that focused on another alternative. That comment is addressed in the Responsiveness Summary, Part III, section 1.0 of this ROD.

11.0 Principal Threat Wastes

The NCP establishes an expectation that the EPA will use treatment on principal threat wastes wherever practicable. Principal threat wastes are source materials that are considered highly toxic or highly mobile, that cannot be reliably contained, or present a significant risk to human health or the environment. Generally, contaminated groundwater is not considered to be a source material.

There are no known source materials or dense nonaqueous phase liquids (DNAPLs) in the groundwater constituting a principal threat at OU 5. Elevated concentrations of PCE were found in groundwater, and low levels of PCE were found in soils at this OU. Groundwater monitoring will ensure that the levels will continue to be evaluated, and institutional controls will prevent exposure to the contaminated groundwater.

12.0 Selected Remedy

Alternative 3 (the preferred alternative for OU 5) will address contaminated groundwater. This alternative uses several institutional controls to prevent access to the contaminated groundwater. It also uses monitoring to evaluate any fluctuations in contaminant levels.

Alternative 3 meets both of the threshold criteria: protection of human health and the environment and compliance with ARARs. It also provides the best balance among the four applicable balancing criteria.

12.1 Summary of the Rationale for the Selected Remedy

The main factors in selecting Alternative 3 as the OU 5 remedy are: (1) institutional controls are expected to be effective in minimizing the possibility of a receptor being exposed to contaminated groundwater; (2) current monitoring data have not found any indication that there is source material of DNAPLs in the groundwater, so there is no evidence of principal threat wastes at OU 5; and (3) monitoring of OU 5 is warranted because of the detections of PCE and COPCs in the groundwater at the OU. Sampling would be done bi-annually (twice per year) for the first and second years and then annually for the next three years to provide data during the first five-year review for OU 5. After the first five-year review, monitoring efforts would then be scaled back to one sampling round every five years to provide a current data set for the next five-year review.

12.2 Description of the Selected Remedy

As described above, the selected remedy includes a system of regular groundwater monitoring to track contaminant levels in, and the location of, the plume. The selected remedy also utilizes institutional controls which involve the use of existing state of Missouri well construction requirements and public education to prevent human use of the groundwater at OU 5. The state of Missouri has enacted well construction requirements for *Special Area 3*, which includes the area where OU 5 is located. These well construction requirements are embodied in regulations found at 10 C.S.R. 23-3.100(7). They provide that MDNR is to be consulted before any new well is constructed or any existing well is deepened within *Special Area 3*.

It unlikely that new wells would be installed in the vicinity of OU 5 since municipal water is available in that area, and there are currently no known wells in use in the vicinity of OU 5. The state regulations will ensure that if any new well construction or well deepening is planned, state officials will be informed and can prescribe methods for ensuring that no exposures to hazardous substances occur. These regulations should also be effective in preventing the construction of substandard wells which could spread contamination at or near OU 5. The regulations are considered to be durable as revocation would require the affirmative action of the state with notification to interested parties.

Increases in groundwater contaminant levels, migration of groundwater off-site, and/or identification of new sources of OU 5 groundwater contamination may result in the implementation of additional remedial actions.

Some of the groundwater contamination found at OU 5 appears to originate from an upgradient source—OU 4. Rather than apply additional institutional controls on a parcel-by-parcel basis, EPA intends, as part of the remedy selection process for OU 4, to explore opportunities to impose a more area-wide institutional control to provide a layer of controls in addition to those institutional controls already in place.

It is expected that the EPA will also provide public education through the preparation and distribution of fact sheets and/or a newsletter on OU 5 and by providing informational meetings which may be held every five years. The public education campaign would be intended to inform citizens of the potential health hazards associated with exposure to contaminated groundwater and would remind the city officials and residents of the restrictions on OU 5.

12.3 Summary of the Estimated Costs

Table 12-1 presents the following costs for the selected remedy:

- The capital subtotal
- Annual costs for the various O&M work activities to be done and the years that the costs would be incurred
- The total (undiscounted) costs for the O&M activities
- The total present worth of the annual O&M costs
- The total present worth for the selected remedy

The following assumptions were made to generate the cost estimate:

- After the first five-year review, the monitoring/sampling of wells would occur every five years, not annually
- Undiscounted costs are in 2006 dollars
- The operational life of the remedy would be 30 years
- A seven percent discount rate was used to calculate present worth

The values in this cost estimate summary table are based on the best available information regarding the expected scope of the remedy. Changes in the costs and changes in the various work items that were costed are likely to occur as a result of new information and data collected during the design and implementation of the remedy. Any major changes will be in the form of a memorandum in the Administrative Record file, an Explanation of Significant Differences, or an amendment to this ROD. This estimate is an order-of-magnitude engineering cost estimate. It is expected to be within +50 to -30 percent of the actual costs of the remedy.

Table 12-1
Operable Unit 5 FS
Present Worth Cost Estimate
Alternative 3 - Institutional Controls and Monitoring

Cost Estimate Component	Quantity	Units	Unit Cost	Capital Cost	Annual Cost
CAPITAL COSTS					
Place Deed Restrictions (1 property)	1	EA	$1,500	$1,500	
Installation of two 2" monitoring wells to depths of 55 ft in bedrock.	110	VLF	$48	$5,280	
DIRECT CAPITAL COST SUBTOTAL				$6,780	
Bid Contingency (15% of well installation)				$800	
Scope Contingency (15%)				$1,000	
TOTAL DIRECT CAPITAL COST				$8,580	
Permitting and Legal (5%)				$400	
Construction Services (10%)				$900	
CONSTRUCTION COSTS TOTAL				$9,880	
Engineering Design (8%)				$800	
TOTAL CAPITAL COST				$11,000	
ANNUAL OR PERIODIC O&M COSTS					
GROUNDWATER MONITORING (Analysis Only) *					
Years 1 and 2 Bi-Annual sampling of 5 monitoring wells for VOCs (standard turnaround + QA/QC)	16	EA	$115		$1,800
Years 3, 4, and 5 Annual sampling of 4 monitoring wells for VOCs (standard turnaround + QA/QC)	8	EA	$115		$920
Years 10, 15, 20, 25, and 30 Sampling of 4 monitoring wells for VOCs (standard turnaround + QA/QC)	8	EA	$115		$920
GROUNDWATER MONITORING (Labor only)					
Years 1 and 2 1 Jr. Level person for 1 x 14 hour day to hang PDB samplers, 1 Jr. & 1 Mid Level persons for 2 x 10-hour days per sampling event and 2 x 8-hour days per data evaluation report	172	HR	$90		$15,500
Expenses (including per diem)	10	DAY	$150		$1,500
Years 3, 4, and 5 1 Jr. Level person for 1 x 14 hour day to hang PDB samplers, 1 Jr. & 1 Mid Level persons for 2 x 10-hour days per sampling event and 2 x 8-hour days per data evaluation report	86	HR	$90		$7,700
Expenses (including per diem)	5	DAY	$150		$750
Years 10, 15, 20, 25, and 30 1 Jr. Level person for 1 x 14 hour day to hang PDB samplers, 1 Jr. & 1 Mid Level persons for 2 x 10-hour days per sampling event and 2 x 8-hour days per data evaluation report	86	HR	$90		$7,700
Expenses (including per diem)	5	DAY	$150		$750
PLAN PREPARATION / INSTITUTIONAL CONTROLS					
Preparation of Health and Safety Plan (Year 1 only)	40	HR	$75		$3,000
Preparation of QA/Sampling Plan (Year 1 only)	60	HR	$75		$4,500
Prepare Newsletter @ 5, 10, 15, 20, 25, and 30 yrs	16	HR	$75		$1,200
Newsletter Publication in Local Newspaper and Direct Mailing @ 5, 10, 15, 20, 25, and 30 yrs	1	LS	$200		$200
OU 5 Portion of the Public Informational Meeting @ 5, 10, 15, 20, 25, and 30 yrs	1	LS	$1,000		$1,000
Assist MDNR with Enforcement of Well Construction Restrictions @ 5, 10, 15, 20, 25, and 30 yrs	1	LS	$500		$500
OU5 Portion of the Site-Wide Five-Year Review (@ 5, 10, 15, 20, 25, and 30 yrs)	1	LS	$10,000		$10,000
Monitoring Well Closures (Year 2, only) (including Contingency, Permitting, Construction Services, and Engineering Design Costs).	1	Well	$5,000		$5,000
Monitoring Well Closures (Year 30, only) (including Contingency, Permitting, Construction Services, and Engineering Design Costs).	4	Well	$5,000		$20,000
TOTAL PRESENT WORTH O&M COST				$111,000	
TOTAL PRESENT WORTH				$122,000	

7 percent discount rate used to calculate present worth.

* For each sampling event, include 1 duplicate, 1 matrix spike/matrix spike duplicate, and 1 trip blank for the groundwater samples.

Table 12-1(Continued)
Operable Unit 5 FS
Present Worth Cost Estimate
Alternative 3 - Institutional Controls and Monitoring

Year	Yearly O&M Cost*	Intermittent O&M Costs	Total Annual O&M Costs	Intermittent O&M Costs Include:
1	$0	$26,300	$26,300	Year 1 (plans, monitoring).
2	$0	$23,800	$23,800	Year 2 sampling, closure of BW-12A
3	$0	$9,370	$9,400	Years 3, 4, and 5 sampling.
4	$0	$9,370	$9,400	Years 3, 4, and 5 sampling.
5	$0	$22,270	$22,270	Years 3, 4, and 5 monitoring, 5-yr review, informational meeting, and well installation support.
6	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
7	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
8	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
9	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
10	$0	$22,270	$22,300	Years 10, 15, 20, 25 and 30 sampling, 5-yr review, informational meeting, and well installation support.
11	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
12	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
13	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
14	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
15	$0	$22,270	$22,300	Years 10, 15, 20, 25 and 30 sampling, 5-yr review, informational meeting, and well installation support.
16	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
17	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
18	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
19	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
20	$0	$22,270	$22,300	Years 10, 15, 20, 25 and 30 sampling, 5-yr review, informational meeting, and well installation support.
21	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
22	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
23	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
24	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
25	$0	$22,270	$22,300	Years 10, 15, 20, 25 and 30 sampling, 5-yr review, informational meeting, and well installation support.
26	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
27	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
28	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
29	$0	$0	$0	Years 6-9, 11-14, 16-19, 21-24, & 26-29
30	$0	$42,270	$42,300	Years 10, 15, 20, 25 and 30 sampling, 5-yr review, monitoring well closures, informational meeting, and well installation support.
Total Costs of Annual O&M			$223,000	
Present Worth of Annual O&M			$111,000	

* There are no yearly O&M costs for this alternative.

12.4 Expected Outcomes of the Selected Remedy

OU 5 is located on a 1.9-acre parcel on a mostly residential area at the southeast corner of the intersection of Maupin Avenue and Wall Street. The site of OU 5 is currently undergoing renovation and restoration to the original opera house. These uses will be able to continue after the remedy has been implemented. It is anticipated that the future land use of OU 5 will be the same as the current land use.

The selected remedy is expected to prevent/minimize exposure to contaminated groundwater from OU 5. Currently, there is no known human exposure to the contaminated groundwater from OU 5. The time to reach cleanup levels for the COPCs on-site is unknown, but is anticipated to be greater than 30 years. If cleanup levels are not met within 30 years and there are no other effects from the groundwater, the current remedy could continue to be implemented beyond 30 years or additional remedial actions could be considered as needed.

The residual risk is minimal. The purpose of this response action is to control the potential risks from ingestion and dermal contact with contaminated groundwater. The HHRA indicates that there are noncarcinogenic risks to future residents (HI = 2.1) who ingest or have dermal contact with the groundwater.

13.0 Statutory Determinations

13.1 Protection of Human Health and the Environment

The selected remedy will prevent future exposure to contaminated groundwater through the use of institutional controls. Currently, there is no known exposure to the contaminated groundwater. The selected remedy includes monitoring of the groundwater around OU 5 to ensure that exposure to contaminant levels that could cause increased risk will be detected in time to take remedial action. The selected remedy does require additional site work so there may be some short-term risks for on-site workers.

13.2 Compliance with Applicable or Relevant and Appropriate Requirements

The selected remedy must meet applicable and relevant and appropriate federal and state environmental statutes, regulations, and other requirements that regulate the site and the actions in the alternative. These regulations are known as ARARs. ARARs are generally placed into three categories: chemical specific, location specific, and action specific. Chemical-specific ARARs regulate the levels of chemicals at the site. They are generally a level that must be met for the site to be considered remediated and are specific to a media such as groundwater. Location-specific ARARs regulate contaminant levels or activities in specific locations such as flood plains. Action-specific ARARs regulate remedial activities, not a specific contaminant. In addition, if there is no ARAR for a chemical or action, the EPA may evaluate on-promulgated advisories issued by federal or state governments as *to-be-considered* (TBC) materials. If used, a standard based on a TBC is a legally enforceable performance standard.

A full discussion of ARARs and TBCs for the selected remedy can be seen in the June 2006 FS for OU 5. In addition, the sampling activities will need to comply with OSHA requirements.

This remedial action can comply with all ARARs and does not require that any waivers be invoked.

13.3 Cost Effectiveness

The selected remedy (Alternative 3) is cost effective. This selection provides a summary of how cost effectiveness is defined and provides an analysis of the selected remedy and the other two remedial alternatives.

The NCP defines a cost-effective remedy as one whose "costs are proportional to its overall effectiveness." Overall effectiveness is determined by evaluating three of the balancing criteria: long-term effectiveness; reduction in toxicity, mobility, and volume through treatment; and short-term effectiveness. More than one of the remedial alternatives can be cost effective, and the EPA does not have to select the most cost-effective alternative.

None of the alternatives use treatment to reduce toxicity, mobility, or volume of the contaminants so this criterion is not applicable. The Alternative 3 monitoring schedule will be protective, giving it a high rank in the long-term effectiveness category. The sampling schedule and the installation of additional monitoring wells will provide the information necessary to implement any remedial actions to address contaminant fluctuations. Because of the need to install monitoring wells, there is a slight increase in the short-term risk; but if proper measures are taken during well drilling, the risk to the community and workers would be low. Alternative 3's overall effectiveness is high.

Because Alternative 2 does not include monitoring, it would not be able to evaluate changes in the contaminant levels in the groundwater, giving it a low ranking in long-term effectiveness. It would not require any intrusive work at OU 5 so in the short term, it is effective. However, it has moderate overall effectiveness.

Alternative 3 had moderate costs ($122,000), present worth, and high overall effectiveness. It is a cost-effective remedy. Alternative 2 had lower costs ($45,000), present worth, and moderate overall effectiveness. It is not a cost-effective remedy.

13.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

The selected remedy does not use treatment. The rationale for not using treatment is: (1) current monitoring data and the HHRA have not found any current exposure at OU 5 to contamination; (2) current monitoring data have not found any indication that there is source material or nonaqueous phase liquids in the groundwater, so there is no evidence of principal threat wastes at OU 5; (3) institutional controls will eliminate or minimize the chance of a receptor being exposed to the contaminated groundwater in the future; and (4) monitoring of the groundwater from OU 5 will provide a warning if contaminants begin migrating from OU 5.

Long-term Effectiveness and Permanence: Implementation would reduce the long-term risk to health from human usage of the contaminated groundwater, and monitoring would provide additional information on the contamination levels and plume location. However, the aquifer would not be actively restored. A long-term risk would continue to exist for the environment as the contaminated groundwater would remain in the aquifer.

Reduction of Toxicity, Mobility, and Volume: This criterion is not applicable. See the text at the beginning of the section for the rationale as to why no treatment was selected.

Short-term Effectiveness: The only short-term risk from the selected remedy to the community and on-site workers would be during the installation of additional monitoring wells and groundwater sampling. However, these risks would be minimal if proper protective measures are taken and proper procedures are followed.

Implementability: The selected remedy and the other remedial alternative would be easy to implement as described earlier.

Costs: The selected remedy is cost effective. The additional costs for O&M for the selected remedy (compared to Alternative 2) are warranted. The additional costs would be used to collect groundwater samples to confirm that the remedy is still protective, thus increasing the long-term effectiveness of the remedy. The monitoring will provide the EPA and MDNR current data before the five-year review. Monitoring will also indicate the need to consider additional remedial actions.

State Acceptance: The MDNR supports the remedy (Alternative 3) selected by the EPA.

Community Acceptance: The EPA has not received any written comments to indicate that the community does not support the selected remedy. One oral comment to the selected remedy was received during the EPA public meeting on the Proposed Plan. That comment is addressed in the Responsiveness Summary to this ROD (Part III below).

13.5 Preference for Treatment of Principal Threat Wastes

There are no principal threat wastes at OU 5; therefore, the EPA's statutory preference for treatment of principal threat wastes does not apply.

13.6 Five-Year Review Requirements

After the selected remedy is implemented, the RAO will be met, but hazardous substances may remain in the groundwater at OU 5 above levels that allow for unlimited use and unrestricted exposure. Therefore, a statutory review will be required every five years to ensure that the selected remedy is still protective of human health and the environment.

14.0 Documentation of Significant Changes from Preferred Alternative of Proposed Plan

The Proposed Plan was released for public comment on September 5, 2006. The Proposed Plan identified Alternative 3 - Institutional Controls and Monitoring as the preferred alternative. The EPA has considered the one oral comment submitted during the public comment period. The EPA has determined that no significant changes to the remedy as originally identified in the Proposed Plan were necessary or appropriate.

PART III RESPONSIVENESS SUMMARY

1.0 Stakeholder Issues and EPA Responses

This Responsiveness Summary has been prepared in accordance with CERCLA and the NCP and provides the EPA's response to all significant comments received on the Proposed Plan for OU 5 of the Riverfront Superfund site received from the public during the 30-day public comment period.

On September 6, 2006, the EPA released the Proposed Plan for OU 5. The Proposed Plan discussed the EPA's proposed actions to address contaminated groundwater at OU 5. The public comment period began September 6, 2006, and ended on October 5, 2006. The EPA held a public meeting in New Haven, Missouri, on September 14, 2006. The purposes of this meeting were to: (1) provide a detailed presentation to the public on the results of investigations conducted at OU 5, (2) present the alternatives considered by EPA for responding to the release or threat of release into the environment of hazardous substances at OU 5, (3) present EPA's preferred alternative for responding to the release or threat of release into the environment of hazardous substances at OU 5, and (4) provide the public with an opportunity to comment

Only one comment was received during the public meeting, and no written comments were received during the public comment period. A copy of the transcript from the public meeting is included in the Administrative Record file.

The following oral comment was received during the September 14, 2006, public meeting.

A community member stated that there were other sites in the town that need attention more than OU 5. The commenter stated that he believed that EPA's resources should be directed to the other OUs at the site. The commenter also expressed a preference for Alternative 1 - No Action for OU 5.

The EPA RI of the Riverfront site includes six OUs in the city of New Haven (Figure 1-2). The OUs were designated by the EPA on the basis of results of previous investigations conducted by MDNR, EPA, and USGS. Investigations at each OU were or are being conducted independently on the basis of the degree of prior information on waste generation or disposal practices and the magnitude of PCE concentrations from existing environmental data. Currently, the USGS is conducting investigations at OU 4. At the request of the EPA, a Potentially Responsible Party is conducting the RI/FS at OU 2 and OU 6. In 2003, a RI/FS was completed for OU 1 and OU 3.

Alternative 1 - No Action would not involve any remedial actions, and OU 5 would remain in its present condition. This alternative, required by CERCLA and the NCP, is a baseline alternative against which the effectiveness of the other alternatives can be compared. Under the no action alternative, the site is left *as is*, there would be no monitoring, control, or cleanup of the contaminated groundwater below OU 5. Alternative 1 does not address the current and future risks associated with exposure to contaminated groundwater and is therefore unacceptable as an alternative as it fails to meet the threshold criterion set forth in the NCP as it is not protective of human health and the environment and does not comply with ARARs.

The NCP Preamble (55 FR 8710) states:

> ...the exposure assessment involves developing reasonable maximum estimates of exposure for both current land use conditions and potential future land use conditions at the site. The analysis for potential exposures under future land use conditions is used to provide decision-makers with an understanding of exposures that may potentially occur in the future.

The NCP Preamble also indicates that:

> ...It is EPA policy to consider the beneficial use of the water and to protect against current and future exposures. Groundwater is a valuable resource and should be protected and restored if necessary and practicable. Groundwater that is not currently used may be a drinking water supply in the future.

2.0 Technical and Legal Issues

2.1 Technical Issues

There are no outstanding technical issues on OU 5.

2.2 Legal Issues

There are no legal issues identified.