5.0 Operable Unit 3, the Old City Dump

5.1 Background of Operable Unit 3

5.1.1 Location and Physical Setting of OU3

The old City Dump (OU3) is located in the southeastern part of New Haven along the north side of State Highway 100 (fig. 5-1). The dump is located at the upper end of a steep ravine on the north side of the topographic divide between the Missouri River to the north and Boeuf Creek to the south (fig. 1-2). Wastes were pushed into the ravine until the entire upper end of the ravine was filled. The surface of the dump covers about 1.4 acres with a maximum width of about 350 ft (east-west) and extends to about 200 ft north from the State Highway 100 right-of-way. At the entrance off State Highway 100 at the southeastern part of the site, the level surface of the dump is about 8 ft below the altitude of State Highway 100 and covered by demolition debris (concrete rubble, old asphalt, gravel, and dirt).

The north face of the dump is steep (about a 45 percent slope) and from 20 to 35 ft above the original land surface. The maximum height of the fill is along the northern part of the dump near seep M (fig. 5-2). The fill height gradually decreases away from the middle of the north face and along the west and east sides toward State Highway 100. The dump surface blends into the natural topography along the southwestern part of the site near tree-core sampling location OU3-JF59 (fig. 5-2). The east side of the dump remains about 5 to 10 ft above the natural land surface. Runoff from the south side of State Highway 100 flows through a culvert and into a ditch between the east side of the dump and a gravel parking lot for an industrial building. Debris exposed along both sides of this ditch indicates that the dump may also extend beneath part of the gravel parking lot (fig. 5-2).

5.1.2 Site History

Between the mid-1950's and about 1974, the old City Dump (OU3) was used for the disposal of household, industrial, and demolition wastes. Inspection of historic aerial photographs indicates that the OU3 area was a tree-covered ravine in 1945 (fig. 5-3). By 1958, about 30 percent of the current (2002) extent of the dump area had been filled. Access to the dump from 1945 through at least 1970 appeared to be from State Highway 100 and from a gravel road that was about parallel to State Highway 100 (probably an original route of State Highway 100) and entered the site from the west (fig. 5-4). The surface of the dump in the 1958, 1965, and 1970 aerial photographs was highly reflective, suggesting that it was actively disturbed by waste disposal activities. During

this period it appears that wastes were being dumped mostly on the north face and that the fill area slowly expanded outward from the original fill area (figs. 5-3, 5-4). During 1976 and 1979, some sort of solid wastes (possibly demolition or yard waste) appeared to be stockpiled in the northern part of the dump (fig. 5-5). These wastes may have been dumped in piles of similar size (as if from a dump truck) at regularly spaced intervals (fig. 5-5). Access to the dump from the gravel road to the west was closed by 1976. By 1979, the southern one-half of the dump appeared to be covered with grass and piles of solid waste in rows covered the northern part. During 1984, the south and east part of the dump appeared to be disturbed and the northwest part was covered with grass (fig. 5-6). During 1984 excavation had begun on the industrial building east of OU3, along what would become East Industrial Drive, and by 1986 the industrial building was occupied (fig. 5-6). The surface of the dump was mostly covered with grass and little activity appeared to be occurring in 1986.

The dump was originally under private ownership until 1974 when the city of New Haven purchased a 4-acre tract of land that included the dump. Several local citizens recall that the original landowner allowed industrial wastes from the Hawthorne Company and Kellwood Company to be dumped on his property. It is not known whether these accounts refer to early dumping at OU3 or another area. According to local citizens and former employees of area industries, during the period that the dump was open, hundreds of 55-gal drums of industrial wastes from the manufacturing of tents were placed in the dump. These wastes included unused dyes, flammable solvents, waterproofing compounds, and waste fabrics. Former employees of the fabric plant on Orchard Street recalled that about a dozen drums of waste from the plant were taken to the old city dump on a flat-bed truck several times each month (sometimes as often as weekly). Area residents also indicated that liquid contents of the drums were routinely burned in a pit at the dump and that the thick, black smoke from the fire could be seen for miles. Access to the dump throughout much of its operation was generally unrestricted. Former employees also recalled that drums from the fabric plant were sometimes hauled to the old city dump during the evening or night shifts.

After the dump was closed in 1974, it was used by the city of New Haven for the disposal of yard wastes and demolition debris from utility excavations and road maintenance. As much as 10 ft of demolition and yard wastes currently (2002) cover the top of the old dump. From 1999 to 2002, the surface of the dump was raised 1 to 2 ft in some areas and the northern face of the dump was extended as much as 10 ft.

5.1.3 Previous Environmental Sampling at OU3

Paint wastes and dozens of old drums were found at the dump during an inspection in September 1989 (Missouri Department of Natural Resources, 1989). A composite soil sample (0-7 ft deep) from immediately down slope of the dump had an organic solvent odor and contained PCE at 150 µg/kg (Missouri Department of Natural Resources, 1989). The location of the MDNR soil sample is unknown, but during a reconnaissance of the site in 1999, stained soils (faint blue and green) were noted in the vicinity of Seep H (fig. 5-2). Because the dump is more than 1 mi southeast of public-supply wells W1 and W2, the MDNR did not consider the dump a likely source of the PCE contamination in public-supply wells W1 and W2, and no further investigations was done by the MDNR at the site. The dump also was not considered a potential source of PCE in public-supply wells W1 and W2 in the ESI (Jacobs Engineering Group, 1994).

During June 2000, the USEPA was informed that several hundred drums of industrial wastes were located on a private farm about 0.75 mi south of the old City Dump. Local residents said that wastes from the fabric plant were hauled to local farms for disposal after the city closed the dump (OU3) in 1974. Several former employees identified samples of debris, stained soil, and residues from the farm as mineral spirits, dye wastes, and "heals" from waterproofing and dye tanks at the Hawthorne/Kellwood Fabrics Division plant on Orchard Street. The landowner initiated a cleanup of the wastes, and allowed the USEPA to collect samples of the waste to aid in characterizing the types of industrial wastes that were placed in OU3. Analysis of liquid wastes from drums at the farm indicated that the liquid was an organic solvent mixture containing large concentrations of naphthalene (54 mg/L), ethylbenzene (1,100 mg/L), toluene (32 mg/L), xylenes (4,700 mg/L), and Pb (272 mg/L; data on file at the U.S. Environmental Protection Agency, Region VII). Solid-waste samples from the farm contained large concentrations of Pb [49,500 mg/kg, (milligrams per kilogram)] and chromium (Cr, 14,500 mg/kg). Soil samples from the farm contained Pb (448 µg/kg), ethylbenzene (5.9 to 15,000 µg/kg), toluene (43 to 1,100 µg/kg), 2-butanone (66 µg/kg), and xylenes (50 to 95,000 µg/kg). No PCE or other chlorinated solvents were detected in the wastes at the farm. Based on the analytical data collected at the farm and recollections of former employees, hundreds of drums of similar waste were placed in the old City Dump.

During the ESI/RI, the USGS installed a bedrock monitoring well (OU3-BW-03) at OU3 and sampled domestic wells in the vicinity (fig. 5-1). Water samples from monitoring well OU3-BW-03 and seeps along the north side of the dump were screened for the presence of PCE and other

VOCs (fig. 5-1). Water samples from two of the seeps also were submitted for laboratory analysis. Results of the ESI/RI sampling indicated only trace amounts of PCE at OU3. A complete discussion of the ESI/RI sampling results is provided in section 5.4.

5.2 Remedial Investigation Activities at Operable Unit 3, the Old City Dump

The following discussion presents a summary of all data collected by the USGS at OU3 during the ESI/RI and the RI. During the RI at OU3, additional samples were collected from trees and seeps along the dump face and from streams and springs in the vicinity of the dump. Water samples were collected from a bedrock monitoring well (OU3-BW-03) that was installed in 2000 at OU3 during the ESI/RI (fig. 5-2). Additional domestic wells in the vicinity of OU3 were inventoried and sampled during the RI (fig. 5-1). A summary of additional domestic well data collected during the RI is listed in table B-2 (appendix B).

During the ESI/RI and RI, a total of 22 trees and 4 seeps were sampled on and along the slopes of OU3. The sampled seeps had small discharges [less than 50 mL/min (milliliters per minute)], so a small hole was dug at each seep orifice and allowed to fill with water for several minutes before sampling. Water samples from the seeps were collected by dipping the sample bottles directly into the water-filled hole. Field measurements of temperature, specific conductance, and pH were made after the collection of water samples. All four seeps were screened for the presence of PCE and other VOCs using the portable GC. Seep E and Seep M contained sufficient flow (about 50 mL/min) for the collection of laboratory samples and were sampled for VOCs and dissolved inorganic constituents. Samples for dissolved inorganic constituents were collected using a battery-powered peristaltic pump to pump water from the pool at the orifice through a disposable capsule filter. Samples were preserved and shipped according to protocols described in the project QAPP.

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5.3 Physical Characteristics of Operable Unit 3

5.3.1 Surface Features

The surface of the approximately 1.4-acre dump is flat and consists of gravel, dirt, and occasional pieces of weathered asphalt and concrete. The area immediately north and west of the dump is covered by dense woods composed of a mixture of deciduous trees. The land surface immediately

north of the dump is rugged, consisting of steep, tree-covered slopes 5 to 15 ft high separating small steep drainages.

5.3.2 Soils and Geology

Unconsolidated surficial deposits mapped by Starbuck (in press) in the vicinity of OU3 consist of Quaternary-age loess (Ql) and the Buffalo a Subunit (fig. 1-12). Because the dump is located within a ravine where bedrock is exposed along the stream course immediately north of the dump, it is likely that most, if not all, of the loess and Buffalo a Subunit deposits have been eroded beneath the dump.

Bedrock exposed beneath and in the vicinity of OU3 consists of the Cotter Dolomite. The geologic log from monitoring well OU3-BW-03 indicates that the upper 120 ft of bedrock is composed of mostly dolostone with minor chert and mudstone. The upper sand marker bed was encountered at 120 ft deep and the Swan Creek sandstone member of the Cotter Dolomite was encountered at 190 ft deep.

5.3.3 Ground-Water Flow

Shallow ground-water flow in the bedrock at OU3 is toward the northeast and east (fig. 5-1). The depth to ground water in monitoring well BW-03 is about 92 to 98 ft below the land surface (table b-3, appendix B)); however, perched water was encountered during the drilling of the borehole at less than 50 ft deep. The direction of flow of shallow perched water may be partially controlled by the attitude of the bedrock surface beneath the dump and the general dip of the bedrock in the area. The attitude of bedrock surface beneath the overburden in the vicinity of OU3 is unknown and may not reflect the current topography. Only isolated bedrock exposures are present in the ravine immediately north of the dump. According to geologic mapping by Starbuck (in press), bedrock in the OU3 area dips to the east and north.

5.4 Nature and Extent of Contamination at Operable Unit 3

5.4.1 Contaminant Sources

The potential source of PCE contamination at OU3 is from wastes, especially liquid wastes, placed within the dump. Although large quantities of industrial wastes from the fabric plant on Orchard Street were placed in the dump, analysis of similar wastes from a farm dump south of OU3 indicates that these wastes did not contain significant amounts of PCE. However, the presence of PCE in the MDNR soil boring collected from the north side of the dump indicates

that some wastes containing PCE were placed in the dump. The source of the wastes containing PCE is unknown.

5.4.2 Soils and Vegetation

The only soil sample collected by the MDNR at OU3 was from the north side of the dump (Missouri Department of Natural Resources, 1989). This sample (sample 89-4355) was a composite sample collected from a hand-augered borehole 7 ft deep. The surface soil at the sample location was described as having a chemical odor and was discolored with a blue tint. Possible paint waste and pieces of dozens of old drums were present near the sample location. The exact location of the MDNR soil sample is unknown, but the location was described as along a natural drainage on the north side of the site. Since the collection of the MDNR sample in 1989, the original sample location likely has been covered by demolition and yard wastes.

The MDNR soil sample was analyzed for VOCs, RCRA metals, and flashpoint (table OU3-1). The sample contained concentrations of Hg (4 µg/kg), 2-butanone (170 µg/kg), and PCE (150 µg/kg). The compound 2-butanone, also known as methylethyl ketone (MEK), was used in large quantities for a time at the fabric plant and was detected in small concentrations (66 µg/kg) in soil samples from the farm dump south of OU3. Because PCE was detected at only small concentrations in the MDNR soil sample and in the soil and waste samples from the farm dump south of OU3, and former employees recalled no PCE used at the fabric plant, no further soil sampling was conducted at OU3.

Tree-core samples were collected from 22 trees along the flanks of the dump and analyzed for PCE and other VOCs using the portable GC (table OU3-2). Most of the sampled trees were growing at the toe of the slopes or through the fill along the slopes of the dump. Trace concentrations of PCE (0.23 to 1.01 µg/kg) were detected in three trees (OU3-TC-8, OU3-JF54, and OU3-JF-55) on the north and northeast sides of the site (fig. 5-2). The infrequent detections and small concentrations of PCE in the tree-core samples from OU3 suggest minimal PCE contamination at OU3.

5.4.3 PCE and other VOCs in Ground Water

None of the ground-water samples collected from seeps, springs, or bedrock monitoring well OU3-BW-03 contained PCE concentrations above the MCL of 5 µg/L. Overall PCE concentrations were considerably smaller in samples from OU3 than in samples from OU1.

Because wastes at OU3 were placed in a natural ravine that sloped steeply to the north, the most likely locations to detect PCE and other dissolved contaminants emanating from the dump would be in seeps along the contact between the fill and the original land surface on the north side of the dump (fig. 5-2). Screening results using the portable GC indicated that trace concentrations of PCE (less than 0.2 µg/L) were detected in samples from two of the four seeps on the north side of the dump (fig. 5-2). PCE was detected (estimated at 0.02 to 0.07 µg/L) in all three screening samples from seep H (SEEP H) and in four of the seven screening samples (estimated at 0.02 to 0.18 µg/L) from seep M (SEEP M; table OU3-3). Except for Seep M, all seeps were dry during the summer.

PCE was detected at 0.10 J µg/L and 0.11 µg/L in two of the four laboratory samples that were collected from seep M (table OU3-4). No PCE was detected in the laboratory samples from seep E. The detection of PCE in laboratory samples from seep M and the absence of PCE in the laboratory samples from seep E confirm the screening results using the portable GC. Flow at seep H was insufficient for the collection of laboratory samples so the trace detection in the portable GC samples could not be confirmed. The detection of PCE in the seeps did not correspond to tree-core locations where PCE was detected (fig. 5-2), perhaps because PCE was lost by diffusion as water moved up the tree truck (Davis and others, 1999). On the basis of these findings, widespread PCE contamination does not exist at OU3.

Monitoring well OU3-BW-03 was installed about 300 ft northwest of the dump (fig. 5-2). The well was installed at this location to determine if PCE contamination existed in the bedrock between OU3 and the contaminated public-supply wells. Monitoring well OU3-BW-03 is open to two permeable sandstone beds within the Cotter Dolomite (upper sandstone marker bed and the Swan Creek Member). Water samples were collected from various intervals in the borehole before and after the well casing was set. During the early stages of drilling, an odor similar to that of “latex paint ” was detected, and a large quantity of white foam was produced from the borehole at about 16 to 20 ft deep. Drilling was halted at 20 ft and a laboratory sample was collected on March 13, 2000, from the 6-to 20-ft depth interval and analyzed for VOCs (table OU3-4). Results of the laboratory sample indicated no detectable concentrations of PCE or other chlorinated solvents, but the sample did contain large estimated concentrations of ethanol (120,000 µg/L) and ethyl acetate (3,600 µg/L). Ethyl acetate has a considerable variety of uses including as a flavoring and perfume agent, as a solvent for varnishes and lacquers, and for the cleaning of fabrics and textiles. According to Feng (2002), ethyl acetate and ethanol are known microbial

decomposition products of 2-butanone or MEK. Based on interviews with former employees that indicated large quantities of MEK were used as a solvent at the fabric plant on Orchard Street, the source of the ethanol and ethyl acetate detected probably is the microbial degradation of MEK in the dump.

Concentrations of PCE (0.22 and 0.80 µg/L) were detected in two of the seven samples from monitoring well OU3-BW-03 (table OU3-4). Both of these samples were collected from packer tests in the borehole before the PVC well casing was set. The packer tests consisted of suspending a 1-ft thick bentonite packer on a steel pipe in the borehole at 168 ft deep and pumping a water sample through the inside of the pipe from beneath the packer. The packer was pulled up to 118 ft and the process was repeated again. The PCE concentration (0.80 µg/L) in the 118-to 230-ft deep packer interval was larger than the PCE concentration of 0.22 µg/L in the 168- to 230-ft deep packer interval (table OU3-4). No PCE was detected in any water samples collected after the well casing had been set and grouted to 101.5 ft deep. During both packer tests, the water level in the borehole above the packer was observed to drop, indicating that the packer was leaking. The leakage, combined with the absence of PCE in water samples collected after the PVC well casing was set and grouted, indicates that the PCE detected in the packer tests was entering the borehole between the bottom of the steel surface casing (34.5 ft deep) and the bottom of the PVC well casing (101.5 ft deep). Estimated PCE concentrations detected in 15 of the 47 drill cuttings samples collected during the drilling of monitoring well OU3-BW-03 were all less than 5.1 µg/L (table OU3-5). No trend appeared in the PCE concentrations in the drill cuttings samples with depth as was observed in samples from OU1 bedrock monitoring wells (fig. 4-32).

5.4.4 Inorganic Constituents and Metals in Ground Water

Water samples collected from seeps E and M and the domestic well west of OU3 (OUX-JS-26) were analyzed for dissolved inorganic chemical constituents and metals (table OU3-6). The water sample from domestic well OUX-JS-26 generally contained concentrations of major ions and trace elements typical of water from the Ozark aquifer (Feder, 1979; Imes and Davis, 1991). Compared to the domestic well, water samples from the seeps had large specific conductance values (1,327 and 1,988 µS/cm) and large concentrations of most inorganic constituents. The large concentrations of Na (74 and 107 mg/L), Cl (155 and 183 mg/L), and SO_4 (31.3 and 256 mg/L) in the seep samples are typical in ground water affected by leachate from sanitary wastes. Concentrations of NO_3 (9.99 mg/L) were essentially at the MCL of 10 mg/L. The large concentrations of NO_3 compared to reduced forms of nitrogen such as ammonia (NH_3) and the

small concentrations of dissolved Fe (less than 10 µg/L) and Mn (less than 150 µg/L) indicate that strongly anaerobic conditions are not present within the areas of the dump drained by the seeps. The sample from seep B contained an unusually large boron concentration (2,710 µg/L). Elevated B concentrations are not unusual in sanitary landfill leachate (Cameron, 1978). A particular concern is the antimony (Sb) concentration of 82 µg/L in the sample from seep M, which is considerably larger than the MCL of 6 µg/L. Antimony has a wide variety of industrial applications such as a hardening alloy in metals and lead-acid batteries, in paint pigments, and an agent in organic synthesis. Antimony also is commonly used as a flame-proofing agent and as a pigment fixer in canvas and textiles (Sax and Lewis, 1987; Merck, 1989). The application of dyes, waterproofing, and flame retardants were major processes at the Kellwood Fabrics Division plant on Orchard Street, and the detection of Sb in samples from both seeps could be related to the disposal of large volumes of wastes from this plant in OU3.

5.4.5 Surface Water

Surface-water samples collected from streams in the vicinity of OU3 were screened for the presence of PCE and other VOCs using the portable GC. A trace concentration of PCE (estimated at 0.02 µg/L) was detected in only 1 of the 12 surface-water samples (table OU3-7). The sample containing the PCE detection (OU3-122TB-G) was collected from a small pool at the base of a bedrock exposure in the stream channel north of the dump (fig. 5-1). Because of the absence of substantial detections of PCE in seep samples from OU3, no laboratory samples were collected from streams in the vicinity of OU3. Based on the screening results, substantial PCE contamination is not present in surface water in the vicinity of OU3.

5.5 Contaminant Fate and Transport at Operable Unit 3

5.5.1 Soils

Because of the minimal thickness of soil that probably exists beneath OU3, this medium is not expected to be of importance in the transport of PCE at the site. Processes occurring in soils beneath OU3 probably are similar to those occurring in aerobic or mildly anaerobic soils at OU1.

The presence of elevated Sb concentrations in seep samples at OU3 indicates that Sb may be migrating from wastes in the dump and coming into contact with soils beneath the dump or adjacent to the seeps. Some of the geochemical traits of Sb are similar to those of arsenic (As), and under near neutral pH and aerobic conditions, As is transported in water as aqueous hydroxide complexes. Adsorption by hydrous iron oxide, coprecipitation, and combination with

sulfide in anaerobic soils or sediments are major factors controlling the migration of As (Hem, 1992), and probably are important in controlling the migration of Sb.

5.5.2 Ground Water and Surface Water

Ground water in the bedrock aquifer in the vicinity of OU3 is aerobic, and the reductive dechlorination of PCE is not expected to be a process affecting the fate and transport of PCE. Ground-water samples collected from the site and vicinity indicate that OU3 is not a large source of PCE. The detection of trace PCE concentrations (less than 1.0 µg/L; table OU3-4) in packer-test samples from monitoring well OU3-BW-03 indicate that migration of some PCE into the shallow bedrock (less than 100 ft deep) from OU3 has occurred. The most likely direction of migration of PCE from OU3 in the saturated bedrock would be downgradient to the northeast. Although migration of PCE from OU3 cannot be confirmed because of the few available wells, it is likely that if significant migration of PCE was occurring, PCE concentrations detected in water samples from monitoring well OU3-BW-03 and seeps along the north side of the dump would be much larger than the trace (less than 1.0 ug/L) concentrations detected. The migration of Sb that may be emanating from OU3 through ground water probably would be controlled by sorption onto hydrous iron oxides within the bedrock. Concentrations of Sb also would be further reduced by dilution with ambient ground water.

Results of stream sampling indicate that migration of PCE or other VOCs from OU3 through surface water is not occurring. The trace (less than 1 ug/L) PCE concentrations detected in seep samples at OU3 volatilize or are diluted before reaching any of the surface-water sampling sites along the tributaries north of the site. Because the combined quantity of flow from the seeps at OU3 is small (few hundreds of milliliters per minute during wet periods), substantial dilution of Sb concentrations in these seeps will occur if the flow enters tributaries north of the site.

5.6 Baseline Risk Assessment for Operable Unit 3

5.6.1 Human-Health Risk Assessment for Operable Unit 3

The MDHSS performed a Human-Health Risk Assessment for OU3 at the Riverfront Site for USEPA in Summer 2002. An assessment of human-health risks associated with OU3 can be found in Baseline Risk Assessment for Operable Unit 3 (OU3)–Old City Dump, The Riverfront

Site, New Haven, Franklin County, Missouri (Missouri Department of Health and Senior Services, 2003b).

Using ground-water sample results from the RI, this Baseline Risk Assessment evaluated human-health risks from hypothetical exposures to contaminated environmental media if no final remedial action were taken at OU3. The Baseline Risk Assessment was not able to provide a full range of risk scenarios due to limited sampling data. However, the Baseline Risk Assessment does provide a general idea of the risk associated with PCE contamination at OU3. Based on the results of this Baseline Risk Assessment, OU3 poses some risk from the ground-water pathway.

5.6.1.1 Risks from Ground Water Underlying OU3:

Ground water in wells and seeps in and around OU3 do not pose an excessive cancer risk from VOCs in the ground water. Two inorganic contaminants, antimony and boron, however, pose excessive non-carcinogenic health risks.

5.6.1.2 Risks from Surface Soils at OU3:

Two surface soil samples were considered for the Baseline Risk Assessment, but both samples were located over 1,000 feet northeast of the OU3 boundary and were consequently not used in assessing risk for OU3 because they were not believed to be representative samples. Thus, the risk associated with surface soils at OU3 is unknown.

5.6.1.3 Other Pathways at OU1:

No other pathways were evaluated as part of the Baseline Risk Assessment.

5.6.2 Ecological Risk Assessment for Operable Unit 3

An ERA was conducted to evaluate the analytical data generated during the RI as they relate to ecological risks at the Riverfront Site. A complete assessment of the ecological risks for the Riverfront Site can be found in *Ecological Risk Assessment Riverfront Superfund Site, City of New Haven, Franklin County, Missouri,* (Black & Veatch Special Projects Corp., 2002). The methodology used in the ERA was based on and complied with the latest guidance described in

the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (USEPA, 1997).

Based on site conditions and the physical properties of the contaminants at OU3, the ERA considered the direct exposure risks associated with stream sediment and surface water in the drainage tributary to the north of OU3. In addition, the ERA also evaluated a food chain ingestion model for herbivores. Ecological screening values (ESVs) are contaminant-specific, media-specific concentrations that are used to determine the risk that any particular contaminant might pose to ecological receptors. Concentrations of chlorinated ethenes (PCE, TCE, cis-DCE, trans-DCE, VC) and the volatile hydrocarbons benzene, and toluene were compared to ESVs to determine the risk that contaminants in each media might pose to ecological receptors.

Analytical results for stream sediment at OU3 were compared to the selected ESVs for stream sediment (Table 5-1). No chlorinated ethenes or other contaminants of concern were detected in stream sediment at OU3. Based on this comparison, there are no significant ecological risks presented by sediment sampled near OU3. It is important to note that the reporting limit for VC was higher than the ESV, so there could be concentrations of this compound between the reporting limit and the ESV.

Analytical results for surface water were compared to the selected ESVs for surface water at OU3. No chlorinated ethenes or other contaminants of concern were detected in the surface water sample associated with OU3 (table 5-1). PCE concentrations well above the ESVs were detected on the Riverfront Site, but the high detections were detected in surface water associated with OU2, not OU3.

Estimated concentrations of compounds detected by the portable GC in tree-core samples from OU1 were converted to exposure doses. PCE, cis-DCE, benzene, and toluene were detected in tree-core samples at OU3. TCE, VC, and trans-DCE were not detected in tree-core samples at OU3. The estimated average daily dose for the representative mammal and bird species were compared to the wildlife ESVs. Based on this comparison, none of the target compounds were present at levels that indicate a significant risk to herbivores. The overall conclusion of the ERA was that ecological risks are minimal at OU3 of the Riverfront Site.

Table 5-1. Summary of laboratory results for the Ecological Risk Assessment at Operable Unit OU3.

[ug/kg, micrograms per kilogram; ug/L, micrograms per liter; PCE, tetrachloroethene; TCE, trichloroethene; cis-DCE, cis-1,2-dichloroethene; trans-DCE, trans-1,2-dichloroethene; VC, vinyl chloride; nd, not detected

Target Compound	Number of samples	Number of detections	Minimum detected	Maximum detected	Ecological Screening Value (ESV)[1]
Stream-bed Sediment, 100 tributary north of the site, location OUX-EC-11 (fig. 5-1)					
PCE	1	0	nd	nd	195.83 ug/kg
TCE	1	0	nd	nd	179.56 ug/kg
cis-DCE	1	0	nd	nd	208.94 ug/kg
trans-DCE	1	0	nd	nd	208.94 ug/kg
VC	1	0	nd	nd	2 ug/kg
Benzene	1	0	nd	nd	57 ug/kg
Toluene	1	2	nd	nd	670 ug/kg
Surface-water, 100 tributary north of the site, location OUX-EC-11 (fig. 5-1)					
PCE	1	0	nd	nd	8.9 ug/L
TCE	1	0	nd	nd	75 ug/L
cis-DCE	1	0	nd	nd	310 ug/L
trans-DCE	1	0	nd	nd	310 ug/L
VC	1	0	nd	nd	9.2 ug/L
Benzene	1	0	nd	nd	46 ug/L
Toluene	1	0	nd	nd	130 ug/L

[1] All results listed above are from *Ecological Risk Assessment Riverfront Superfund Site, City of New Haven, Franklin County, Missouri,*(BVSPC, 2002).

5.7 Summary and Conclusions for Operable Unit 3

OU3 is an old dump that was used for the disposal of household and industrial wastes from the mid-1950's through 1974. After the dump was closed in 1974, it has been used intermittently for the disposal of demolition and yard waste. Although OU3 was used for the disposal of industrial and municipal sanitary wastes, quantities of PCE were not detected in tree-core samples or in ground- and surface-water samples collected at or near the site. Concentrations of PCE detected in soil and ground-water samples from the site do not exceed residential PRG or the drinking water MCL. Based on the small quantities of PCE detected in the various media sampled at or near the site, OU3 does not appear to be a source of the PCE contamination detected in public-supply well W1 and W2 and does not appear to be a significant source of PCE to the environment. However, a water sample collected from a seep on the north side of the site contained the trace element Sb at a concentration of 82 µg/L , which is above the USEPA

drinking water MCL of 6 µg/L. In addition, a shallow (less than 20 ft deep) water sample collected during the drilling of monitoring well OU3-BW-03 (about 200 ft northwest of the site) contained large concentrations of ethanol (120,000 µg/L) and ethyl acetate (3,600 µg/L) that probably originated from wastes placed in the dump. Samples from seeps at the dump contained larger than background concentrations of Na, Cl, SO_4, and NO_3, which are commonly detected in leachate from sanitary landfills.

Environmental sampling at OU3 during the RI consisted of the collection of tree-core, surface-water, and ground-water samples. Tree-core samples from 3 of the 22 trees sampled at OU3 contained trace quantities (estimated concentrations of 0.23 to 1.01 µg/L; table OU3-2) of PCE indicating that some wastes containing PCE were disposed at the site. The largest PCE concentration (0.80 µg/L; table OU3-4) detected in ground water at OU3 was in a packer sample collected from the 118-to 230-ft deep interval in monitoring well OU3-BW-03. The packer samples were collected before the well casing had been set and grouted in place. Subsequent samples collected from monitoring well OU3-BW-03 after the well casing was set and grouted (open interval from 100 to 230 ft below the land surface) did not contain concentrations of PCE or other VOCs. None of the surface-water samples collected downstream of OU3 contained detectable concentrations of PCE or other VOCs. Water samples collected from three of four seeps located along the north face of OU3 and analyzed by the portable GC contained trace contractions of PCE estimated at between 0.02 to 0.18 µg/L. Only two of the seeps (seeps E and M) had sufficient flow for the collection of laboratory samples, which confirmed the presence of trace PCE concentrations in samples from seep M (0.10 J and 0.11 µg/L). A single soil sample collected by the MDNR from an area of stained soils along the north side of the site contained 150 µg/kg of PCE. Shallow ground water beneath OU3 flows to the northeast. No PCE or its degradation products were detected in ground-water samples collected from several domestic wells and a spring northeast of OU3.

Baseline Risk Assessment scenarios for OU3 found that there are human-health risks associated with the contamination at OU3, but human-health risks were not related to PCE contamination. Antimony and boron were detected in a ground-water seep from the landfill, and if ground water from this seep were ingested, it would pose an excessive non-carcinogenic health risk. However, it is unlikely that the ground-water seep would be used as a drinking water source in the future. Surface soil sample results were not analyzed because it was felt that they were not representative samples. The human-health risks associated with surface soils at OU3 are unknown.

In addition to the human health risk assessment, an Ecological Risk Assessment was also conducted at OU3. No chlorinated ethenes or other contaminants of concern were detected in the surface water or in the stream sediment from the creek directly north of OU3. Four VOCs were detected in the vegetation at OU3, but contaminant concentrations were not great enough to pose an unacceptable risk to herbivores. Therefore, the overall conclusion of the Ecological Risk Assessment was that contamination at OU3 is of minimal risk to environmental receptors.

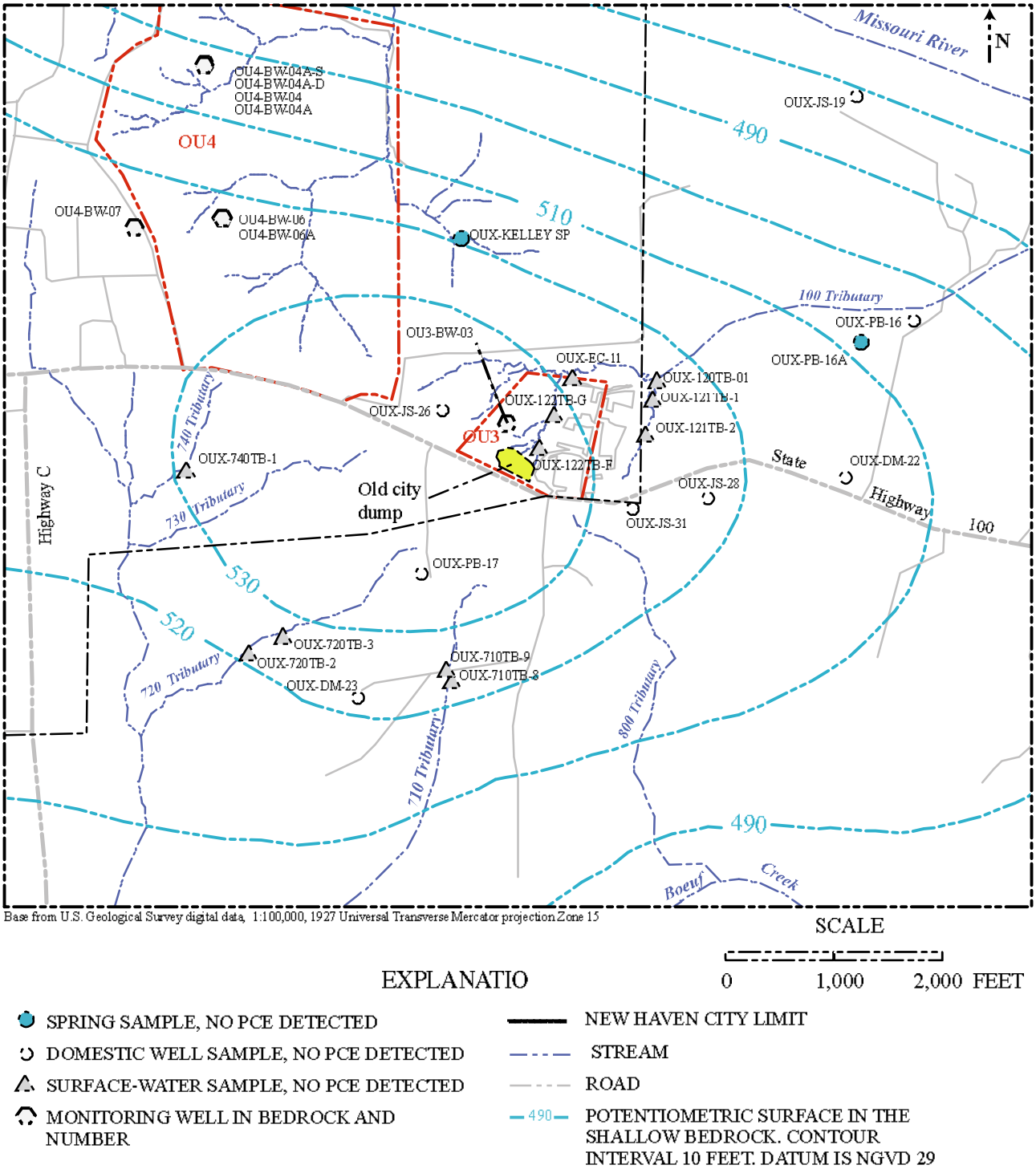


Figure 5-1. Potentiometric surface in the shallow bedrock aquifer and location of selected springs, domestic wells, and surface-water sites sampled in the vicinity of Operable Unit 3 (OU3).

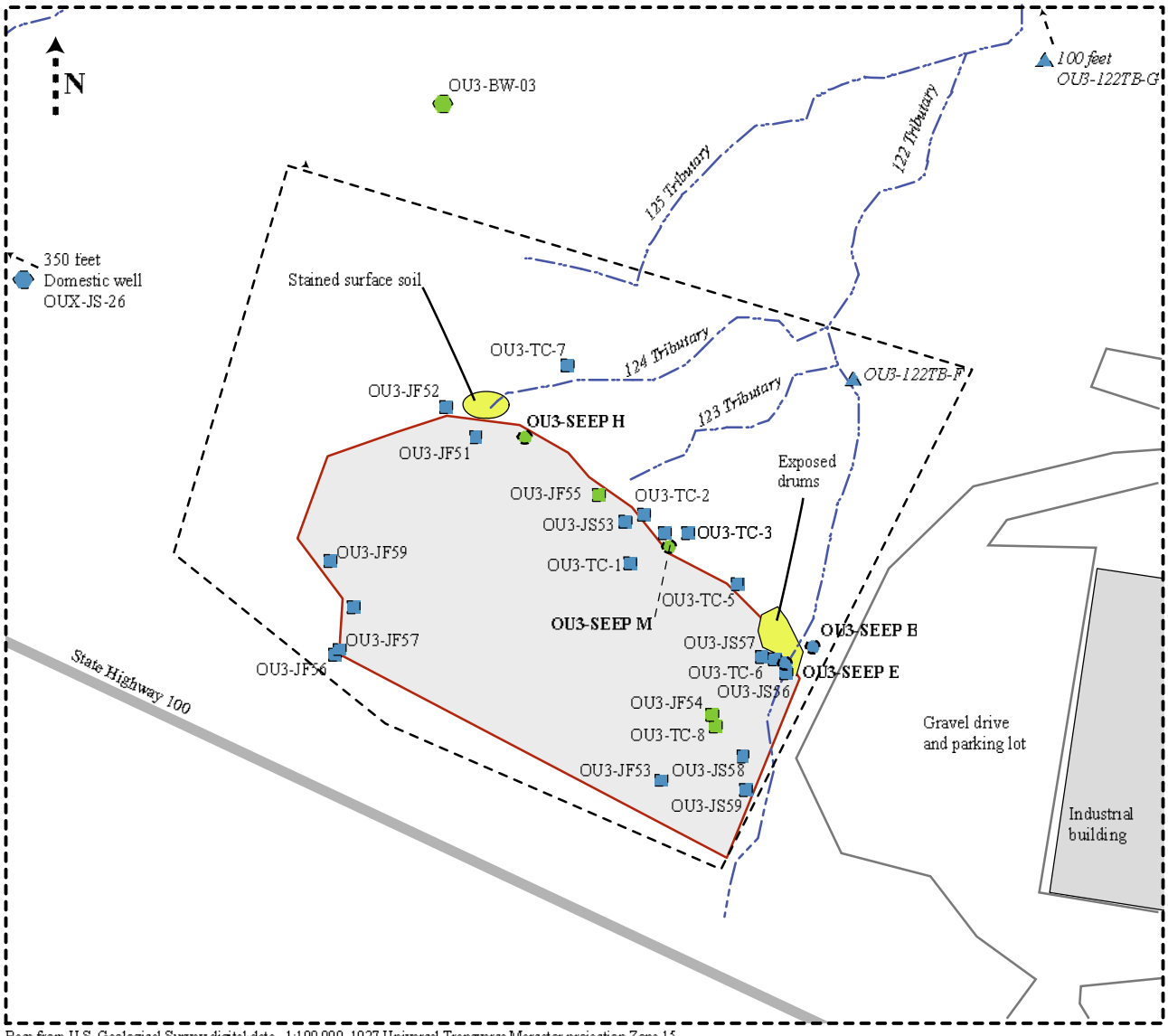
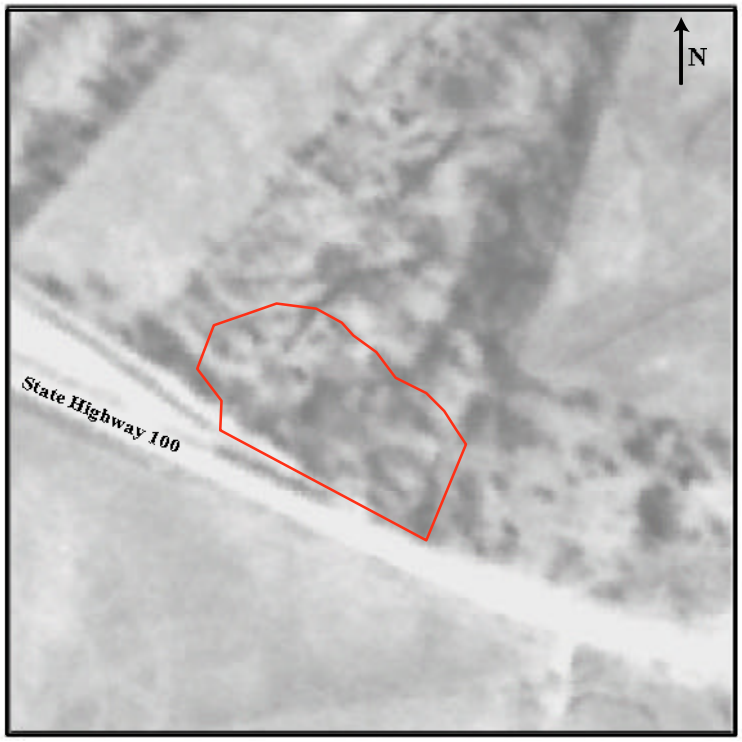


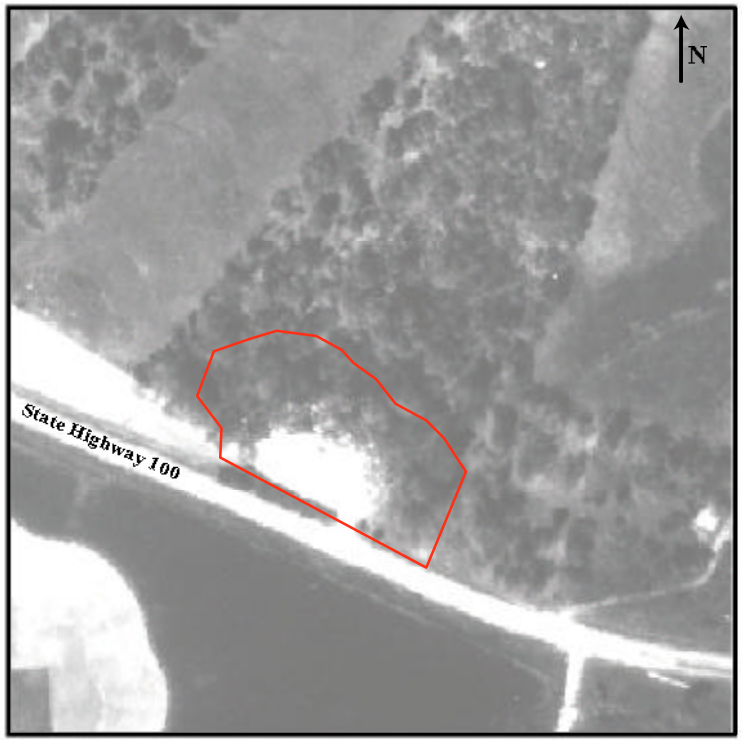
Figure 5-2. Location and tetrachloroethene (PCE) concentrations in environmental samples collected from the old city dump (OU3) and vicinity.

1945



U.S. Army Corps of Engineers, Kansas City District

1958



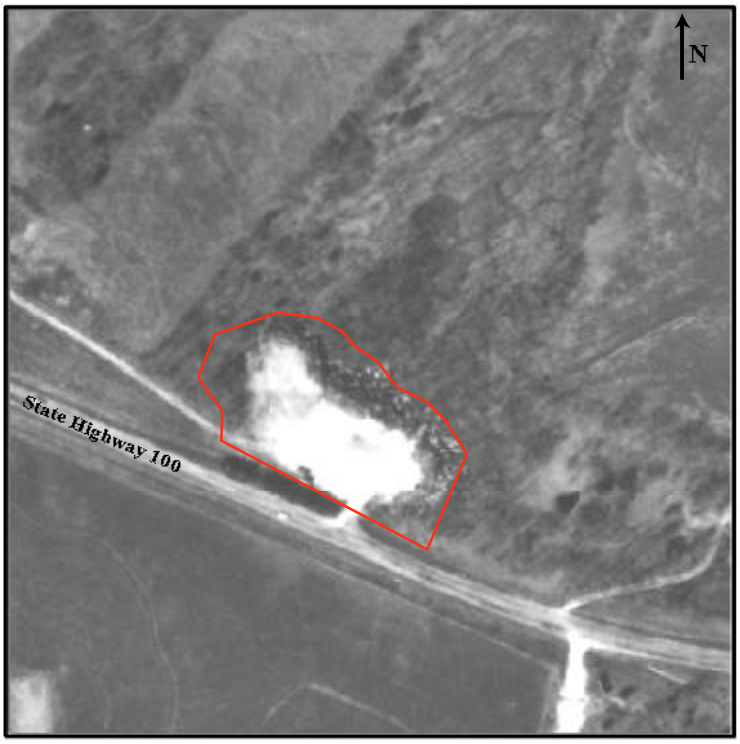
U.S. Army Corps of Engineers, Kansas City District

Figure 5-3. Aerial photographs of Operable Unit 3 (OU3) during 1945 and 1958.

1965

U.S. Army Corps of Engineers, Kansas City District

1970



U.S. Army Corps of Engineers, Kansas City District

Figure 5-4. Aerial photographs of Operable Unit 3 (OU3) during 1965 and 1970.

1976

U.S. Army Corps of Engineers, Kansas City District

1979

U.S. Geological Survey, 1979

Figure 5-5. Aerial photographs of Operable Unit 3 (OU3) during 1976 and 1979.

1984

U.S. Army Corps of Engineers, Kansas City District

1986

U.S. Army Corps of Engineers, Kansas City District

Figure 5-6. Aerial photographs of Operable Unit 3 (OU3) during 1984 and 1986.