3.5 AOC 2 Landfill cap and subsurface information

Perimeter and interior borings were drilled to obtain information on the landfill cap materials and thickness, and extent of waste.

Perimeter borings were used to delineate the horizontal extent of waste. To the east of the closed landfill, the surface soils consist of a half foot to four feet of silty clay underlain by sand or silty sand. Landfilled waste was not encountered on the eastern perimeter. To the south of the closed landfill, slag and gravel are found at the surface at AOCSB1, and surface soil at AOC2SB2 consists of clayey silt. Slag mixed with silty sand was also noted in the northern perimeter borings at AOC2SB6 and AOC2SB7 at a depth of less than 1 foot bgs. Surface soil at AOC2SB6 was gravel, and at AOC2SB7 was silty clay. To the west of the closed landfill the surface soil is sand at AOC2SB3 and AOC2SB5, and is silty clay at AOC2SB4. AOC2SB5, on the western site perimeter was the only perimeter boring to contain landfill materials, such as slag and coke, below six feet of sand at the surface.

Within the closed landfill, the surface soil is a one foot layer of silty clay at AOC2SB13 and AOC2SB14. Below the silty clay is a silty sand or slag and gravel, that lies above other waste materials (black tarry material, concrete, wood). Waste at AOC2SB14 (black tarry material) was noted to a depth of at least 22 feet bgs. At AOC2SB15, taconite was found mixed in with sandy clay at the surface in the 1 foot layer overlying slag, black tarry material, and taconite.

Beneath the closed landfill, a silty clay layer was encountered in ten of thirteen borings. Two borings encountered gravel and sand beneath the emplaced waste and one boring was terminated in the fill material.

3.6 Regional hydrogeology

Groundwater resources in Butler County, Ohio are primarily from the surficial sand and gravel glacial deposits. Along the Great Miami River, groundwater is derived from sand and gravel deposits located in the river's ancestral drainage channels (Schmidt, 1993). Typical well yields are 500 to 1,000 gallons per minute from large diameter wells installed between 35 and 220 feet below ground surface (bgs). The more permeable coarser deposits are found at deeper depths, at locations where the current and historical courses of the Great Miami River coincide (Lloyd and Lyke, 1995). The aquifer along the Great Miami River is commonly referred to as the Great Miami River Buried Valley Aquifer System (Sheets and Bossenbroeck, 2005). Recharge to the lower portion of this aquifer system is primarily through precipitation or infiltration of the Great Miami River and its tributaries (Sheets and Bossenbroeck, 2005). However, infiltration from the River can be inhibited by the clay lenses found throughout this surficial aquifer system. Borings conducted as part of a study of the Hamilton North Well Field were conducted on both sides of the Great Miami River. A thick clay layer was observed approximately 30 feet bgs in both areas, indicating that it may extend under the Great Miami River (Sheets and Bossenbroeck, 2005). Clay encountered in Site borings correlates well with this clay layer. Figure 3.4.2-2 provides a geologic cross-section which illustrates the clay layer. The cross section is based upon Site data and the 2005 study of the Hamilton North Well Field. The underlying bedrock is generally assumed to have a permeability at least two orders of magnitude lower than that of the overlying sand and gravel aquifer. Therefore, the bedrock is rarely used as water supply source.

Groundwater flow direction within 500 feet of the Great Miami River in the water table (shallow) aquifer is generally towards the river, while deeper wells indicated a flow direction away from the river (Sheets and Bossenbroeck, 2005). At distances greater than 500 feet from the river,

groundwater flow direction in the shallow aquifer was generally away from the Great Miami River (Sheets and Bossenbroeck, 2005). The results of the study at the Hamilton North Well Field indicated the major influence to the aquifer is the water level of the Great Miami River. The study also conducted in-situ tests for hydraulic conductivity of the upper unconfined unit and lower semi-confined unit (separated by the discontinuous clay layer described above). The resulting values were 0.2 feet per day (ft/d) for the semi-confined unit and 200 ft/d for the unconfined unit (Sheets and Bossenbroeck, 2005). Streamflow gauging data collected between 1968 and 1997 by the USGS in Hamilton indicated periods of high discharge occur during the months of March and April (approximately 6,000 cubic feet per second [mean monthly discharge]) and the lowest discharge periods were observed in September and October (Debrewer et.al., 2000).

3.7 Site hydrogeology

Borings and monitoring wells installed were used to determine the site hydrogeology. Site hydrogeology was determined to be similar to regional hydrogeology, influenced primarily by the Great Miami River and site stratigraphy.

3.7.1 Stratigraphy

The site hydrogeology is controlled by the site stratigraphy. As discussed in section 3.4.2, the site geology consists primarily of sand and gravel, with silty clay lenses. Lenses of silt and clay are generally found between 595 feet MSL and 540 ft MSL, and based upon the definition of lateral extent at the site, one consistent lens is anticipated to be locally confining. These lenses may extend horizontally greater than the length of the site as seen in A-A' in Figure 3.4.2-2 and are generally between 10 and 50 ft in thickness. Cross sections B-B', C-C', and D-D', in Figure 3.4.2-3, show the horizontal continuity of these lenses across the southern portion of the site from southeast to northwest. Cross sections E-E' (Figure 3.4.2-4), and G-G' (Figure 3.4.2-5) show a clay-silty clay lens at similar depths in the northern section of the site. There is some variability in the thickness of these lenses, and sand and gravel lenses exist within this silty clay lens. Where sand and gravel lenses occur within the larger clay lens, a resultant slight increase in permeability is anticipated to occur.

3.7.2 Groundwater

Groundwater flow both regionally and on site is influenced by the Great Miami River which runs along the southeast perimeter of the site.

Water level measurements from the installed monitoring wells and stream gauges were used to determine the groundwater flow on site and relationship to stratigraphy and hydrology. Groundwater elevation data is provided in Table 3.7.1. Groundwater elevations in both the shallow and intermediate groundwater monitoring wells are above the surface elevation of the water in the Great Miami River at the stream gauges indicating groundwater flows to the river.

Groundwater contour maps based on the latest groundwater elevation measurement event completed during the Supplemental RI (August 2008) are shown in Figures 3.7.2-1 and 3.7.2-2. For the single water level measurement event completed since the 2008 wells were installed, both shallow and intermediate depth groundwater appears to flow in a generally southward direction. Both figures depict groundwater flow on a site-wide scale. In the shallow well map, some localized small-scale mounding effects can be seen in some areas which are probably due to fill material influences/cultural effects. River-edge effects may also be seen at the south end of the site where

contouring becomes more parallel with the river. In the intermediate well map, based on a smaller set of wells, a more consistent southerly trend in flow direction is observed across the site.

3.7.2.1 Hydraulic gradient

Vertical gradients were calculated for clustered shallow/intermediate wells to determine the influence of vertical flow within the aquifer, based upon the 2005-2006 well data. Vertical gradient calculations are based on Darcy's Law, and were calculated for variation of flow between low, mid, and high points on the well screens. Table 3.7.2 presents the vertical gradient calculations. Vertical gradients vary between upward and downward flow and are generally small. Vertical groundwater flow in monitoring well clusters (MW-6S/M, MW-10S/M, and MW-14S/M) located along the upgradient side of the property and away from the Great Miami River was consistently up (from intermediate to shallow).

Vertical groundwater flow in monitoring well clusters located along the river was either consistently down (from shallow to intermediate) in MW-21S/M, MW-20S/M, MW-9S/M, and MW-8S/M or mixed (up and down) in MW-4S/M and MW-7S/M.

Horizontal gradients measured in the shallow wells in the general direction of groundwater flow varied from 0.0001 ft/ft to 0.0038 ft/ft. Horizontal gradients measured in the intermediate wells in the general direction of groundwater varied from 0.0008 ft/ft to 0.003 ft/ft.

No additional hydraulic gradient determinations were included in the scope of the supplemental RI.

3.7.2.2 Hydraulic conductivity

Slug tests were conducted in April 2006 to determine the hydraulic conductivities of fourteen shallow, seven intermediate, and two deep monitoring wells. A summary of the hydraulic conductivities for these wells, including a description of the soil types within the screened intervals of the wells, is presented as Table 3.7.3. The results of the AQTESOLVE® analysis are included as Appendix F.

The distribution of the hydraulic conductivities within the shallow monitoring wells is presented as Figure 3.7.2-5. Hydraulic conductivities of the shallow monitoring wells generally ranged from 27 ft/day at MW-16S to 309 ft/day at MW-21S. These data are within the range of typical hydraulic conductivities for sand and gravel materials, which can vary from 10 to 1,000 ft/day (Coduto, 1999). The hydraulic conductivity measured at MW-9S was relatively low at 4.1 ft/day considering that the material within the screened interval was described as coarse gravel-sized slag and medium to coarse sand with a clay lens.

The distribution of the hydraulic conductivities within the intermediate and deep monitoring wells is presented as Figure 3.7.2-6. The hydraulic conductivities within the intermediate and deep wells were lower than those measured within the shallow wells but were also within the range of typical values for sand and gravel. Hydraulic conductivities generally ranged from approximately 17 to 252 ft/day. The lowest hydraulic conductivity of 0.33 ft/day was measured at the northern most portion of the site at MW-14M, which was screened in limestone, and the hydraulic conductivity at MW-4M was also relatively low (1.1 ft/day).

No additional hydraulic conductivity testing was included in the scope of the 2008 supplemental RI field work.

3.8 Demography and land use

Figures 3.8.1 and 3.8.2, provided by the Butler County Department of Development Planning Division, show the land use of St Claire and Fairfield, respectively, as of 1998. The site is located in St. Claire Township with Fairfield Township adjacent to it on the south side. City of Hamilton is located to the far southwest and some parts of the property and areas to the north of it are incorporated into the city. The Great Miami River flowing immediately south of the property defines the southern and the western boundary while CSX railroad line defines the property boundary on the north side.

Land on the immediate south, south west, far north and far east has been put to agricultural use. Gravel extraction operations are located to the north of the site. Residential areas are scattered all around the site, primarily to the north, northwest and far south of the property. General businesses are generally interspersed with the residential areas with clusters on the north side adjacent to the residences. The land on the east side of the property has been put to miscellaneous use including residential, industrial, agricultural and general business. Public and private recreational areas are located along the Great Miami River.

About two-thirds of the land around the off-site Former COG pipeline has been put to agricultural use. The area adjacent to the pipeline, near the Great Miami River, is being used for recreation by hikers and boaters. The rest of the land is under industrial and residential use with some intermittent commercial use.

AK Steel Corporation owns the site and does not have plans to sell or transfer the property, nor to institute any zoning changes from the current industrial status of the parcel. AK Steel Corporation anticipates that land use restrictions and/or institutional controls will be applied to the property deed that will limit the future use of the property and prohibiting use of groundwater for potable purposes. The southern parcel is expected to remain fenced, with access restricted to authorized personnel, and the northern parcel's access restrictions currently in place are also expected to remain.

4.0 Nature and Extent of Detected Constituents

Section 4.0 presents the results of the site remedial investigation and summarizes constituent detections for both the initial and supplemental RI phases. Each Area of Concern (AOC) or Block is addressed separately, as are groundwater and the Great Miami River surface water and sediments.

For each AOC or Block area, a description is provided of the sampling program, the geophysical survey (if any), the process for selection of preliminary COPCs, and the analytical sampling results. In each AOC or Block area, the soil data discussion is divided into two sections consistent with the Human Health Risk Assessment, to surface soils (0 to 2 ft bgs), and subsurface soils (2 to 10 ft bgs and greater than 10 ft bgs). Soil impacts in each location are discussed by analytical group respective to the available screening criteria that are considered applicable to this investigation: VOCs, SVOCs, Metals, PCBs, Dioxins, and Cyanide. Laboratory analytical data have been screened against USEPA Region 9 residential and industrial Preliminary Remediation Goals (USEPA, 2004), the USEPA Soil Screening Level Guidance Dilution Attenuation Factor 10 screening values (USEPA, 2002), and ecological screening levels (ESLs) from USEPA, Region 5's Resource Conservation and Recovery Act (RCRA) website, at: http://www.epa.gov/region5/rcraca/edql.htm.

The screening values were used for initial data evaluation only. Exceedance of one or more screening values is not indicative of a need for a CERCLA action in any particular area. The data screening process was used for determining whether additional data collection was appropriate for the 2008 supplemental RI work, and for relative data comparisons throughout the site. The entire site was evaluated in detail and in conformance with USEPA regulations, policy and guidance, via a site-specific human health risk assessment and a site-specific ecological risk assessment. The risk assessments utilized the entire RI data set. The calculated potential risks are presented in the Baseline Human Health Risk Assessment (ENSR, 2008) and the Baseline Ecological Risk Assessment (KEMRON, 2008), and are summarized in Sections 6.0 and 7.0 of this RI Report.

With very limited exceptions, the data generated from the RI was found to be reliable and acceptable for use. The laboratory completeness objective established for the project (calculated as the percent of valid data), as stated in the QAPP, was 95%. The actual laboratory completeness for the project as a whole was greater than 99%. Completeness on an analysis-specific basis was as follows: VOCs (>99%), SVOCs (>99%), PCBs (100%), metals (>99%), dioxins/furans (100%), cyanide (>99%), and TOC (100%). In summary, the majority of the laboratory data was determined to be valid. Less than 1% of the data was rejected. Data rejected was due to low recoveries of matrix spikes, surrogates or internal standards, indicating a possible matrix affect. These results were flagged as "R" in the tables of analytical results. Laboratory analysis of the 2008 samples had initial rejection of selenium results for soils, based on findings of the data validation. However, the samples were reanalyzed, with all results being found acceptable. No 2008 final analytical data were rejected, since the selenium results that were R qualified were superseded by the reanalyses. Additional data qualifiers were applied to analytical results based on the protocol of the US EPA approved project QAPP (as included in the FSP, ENSR, 2005; KEMRON Addendum 2008). These qualifiers do not result in exclusion of data from the Site analytical data set, and

remain fully usable for its intended purpose. Other than the limited 2006 RI data qualified "R", all Site data are usable and reliable for decision-making purposes.

Laboratory analytical data for all detected analytes are presented in tabular form for each AOC or Block area by analytical method/analyte group. The tabulated data illustrates exceedances of any and all of the four initial data screening values for each analyte. Figures 4.0.1-1 through 4.0.1-15 illustrate the southern portion of the Site, and Figures 4.0.2-1 through 4.0.2-15 illustrate the northern portion of the Site, showing sample locations with analytical detections that exceed one or more screening value provided in tabulated form on the figure.

Each AOC/Block-specific section contains a summary of the findings based upon the comparison of analytical results to the four screening values that were applied. Additional AOC and Block specific findings and conclusions are provided in Section 8 of this RI Report. The Section 8 findings and conclusions consider not only the initial screening of the site data, but also the results of the Baseline HHRA and BERA.

4.1 AOC 1 - Former air scrubber sludge storage and rail yard area

4.1.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 1, the former air scrubber sludge storage and rail yard area, located in the northern parcel of the site. A total of 60 soil borings were completed during the initial RI within 13 composite areas, identified as AOC1CA1 through AOC1CA13. In addition, four shallow monitoring wells were installed and identified as MW-11S, MW-12S, MW-16S and MW-17S. Surface and subsurface samples for analysis of VOCs were collected from one or more individual soil borings within each composite area, and from monitoring well borings MW-11S, MW-12S, MW-16S and MW-17S. Surface and subsurface samples for all other analyses were collected as composite samples of all soil borings within each composite area, and from monitoring well borings MW-11S, MW-12S, MW-16S and MW-17S. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values.

One additional soil boring (AOC1CA6SB5) was completed during the supplemental RI. One additional surface and two additional subsurface soil samples were obtained and analyzed for VOCs, SVOCs, metals, and PCBs.

One intermediate depth monitoring well (MW-17M) was also installed within AOC 1 adjacent to well MW-17S during the supplemental RI for the purpose of monitoring intermediate depth groundwater south of the AOC-2 closed landfill. One additional soil sample was collected during installation of boring/well MW-17M. Information relative to this boring is summarized within the AOC 2 discussion.

Soil sample results for the initial and supplemental RI programs are summarized on Tables 4.1-1 through 4.1-5. The distribution of analytical results for detectable constituents are indicated on Figure 4.0.2-1 through Figure 4.0.2-15. Results are discussed in the following sections.

4.1.1.1 Surface soil

VOCs

All soil VOC analytical results for AOC 1 are presented as **Table 4.1-1**. One or more VOCs were detected in surface soil samples collected for the AOC 1 investigation. VOCs detected within surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The distribution of VOC detections is indicated on **Figure 4.0.2-1**. Relatively few VOC constituents were detected in surface soils. Several of the VOCs detected included acetone, benzene, toluene, xylenes, and other constituents, in low concentrations. In all but one surface soil sample, detected concentrations of VOCs did not exceed the screening criteria. In one sample, AOC1CA2SB5, benzene was detected (21 ug/kg) at a concentration which slightly exceeded the Daf 10 SSL. No VOC detections were noted in the supplemental RI surface soil sample collected from AOC1CA6SB5.

SVOCs

All soil SVOC analytical results for AOC 1 are presented as **Table 4.1-2**. SVOCs were detected in surface soil samples collected for the AOC 1 investigation, except AOC1CA9. Detected concentrations of SVOCs were compared to the available screening criteria that are considered applicable to this investigation. The distribution of the SVOC detections is indicated on **Figure 4.0.2-4**. The concentrations of several SVOCs exceeded the PRG and/or the DAF 10 SSL; including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene. Benzo(a)pyrene and other PAH COC concentrations exceeded the PRG and/or other screening criteria in several surface soil samples. No significant SVOC were detected in soil borings AOC1CA9, MW-11S and MW-17S. The range of SVOCs detected is within the range of SVOCs detected in the background samples. No additional significant SVOC detections were noted in the supplemental RI soil sample collected from AOC1CA6SB5.

Metals

All soil metals and cyanide analytical results for AOC 1 are presented as **Table 4.1-3**. Various metals were detected in surface soil samples collected for the AOC 1 investigation. Detected concentrations of metals were compared to the available screening criteria that are considered applicable to this investigation. The distribution of the metals detections is provided as **Figure 4.0.2-7**. Arsenic, cadmium, chromium, copper, iron, lead, manganese, selenium, silver, vanadium and zinc were found to exceed screening criteria in more than one sample. Arsenic concentrations exceeded the PRG at each surface sample location, except at AOC1CA2, AOC1CA8 and MW-11S. Arsenic concentrations exceeded the DAF 10 SSL at more than one sample location (AOC1CA5, AOC1CA6, AOC1CA10, AOC1CA11, AOC1CA12 and MW-16S). Chromium (total), iron, lead, and manganese concentrations also exceeded the PRG at one or more soil sample locations. Selenium, chromium (total), and cadmium concentrations exceeded the DAF10 SSL at one or more soil sample location. No additional significant metals detections were noted in the supplemental RI soil sample collected from AOC1CA6SB5.

PCBs

All soil PCB analytical results for AOC 1 are presented as **Table 4.1-4**. Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for

surface soil samples. Both PCB and total PCB concentrations were compared to the available screening criteria that are considered applicable to this investigation. Aroclor 1248, aroclor 1254, and aroclor 1260 were detected in some of the surface soil samples. The distribution of total PCBs is provided as **Figure 4.0.2-10**. Aroclor 1254 was detected in AOC1CA9 (110 mg/kg), exceeding the PRG and ESL. Aroclor 1254 was also detected in AOC1CA10 (1.0 mg/kg), exceeding the PRG. Total PCB concentrations exceeded the PRG at composite areas AOC1CA2, AOC1CA5, AOC1CA9, AOC1CA10, and AOC1CA11. No additional significant PCB detections were noted in the supplemental RI soil sample collected from AOC1CA6SB5.

Dioxins

All soil dioxins analytical results for AOC 1 are presented as **Table 4.1-5**. Dioxins were detected in surface soil samples AOC1CA1, AOC1CA3, AOC1CA4, AOC1CA6, and AOC1CA10. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG. The distribution of dioxin TEQ-HH is provided as **Figure 4.0.2-13**. The dioxin TEQ-HH concentration for AOC1CA3 exceeded the PRG. Dioxin TEQ-HH concentrations for AOC1CA1, AOC1CA4 and AOC1CA10 exceeded the ESL.

Cyanide

Low concentrations of cyanide were detected in most surface soil samples collected for the AOC 1 investigation. Detected concentrations of cyanide were compared to the Region 9 PRG, and the results are presented as **Table 4.1-3**. All surface soil detections of cyanide were below the PRG. Several of the detections were, however, above the ESL.

4.1.1.2 Subsurface soil

VOCs

VOCs were detected in several subsurface soil samples collected for the AOC 1 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. The majority of VOC detections were low in concentration, except for a few samples, which a discussed further below. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The analytical results are presented on **Table 4.1-1.** The distribution of VOC detections is provided as **Figure 4.0.2-2** and **Figure 4.0.2-3**.

Subsurface soil concentrations of benzene exceeded the PRG and DAF 10 SSL at AOC1CA5SB3, AOC1CA6SB1, and AOC1CA11SB2 from 2 to 10 ft bgs. The benzene detection in the AOC1CA11SB2 sample (4-6 ft bgs) also exceeded the ESL Toluene also exceeded the DAF 10 SSL and ESL in this sample. Xylenes were also detected in sample AOC1CA11SB2 and AOC1CA12SB4 (4-5.4 ft bgs) above the ESL. Carbon disulfide was detected in sample AOC1CA11SB2 above the ESL. Benzene was the only VOC detected in soils greater than 10 ft bgs at AOC1CA3SB4. In this sample, the benzene detection exceeded the DAF 10 SSL.

The highest concentrations of VOCs were observed within subsurface fill materials located in the 2 to 10 ft bgs interval in the central portion of the AOC, specifically within the AOC1CA11 and AOC1CA12 composite areas. No additional significant VOC detections were noted in the supplemental RI soil samples collected from AOC1CA6SB5.

SVOCs

SVOCs were detected in subsurface soil samples collected from each soil boring except MW-11S, MW-12S, and MW-17S. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation.. The results are presented as **Table 4.1-2**. The distribution of SVOC detections is provided as **Figure 4.0.2-5** and **Figure 4.0.2-6**.

Subsurface soil concentrations of SVOCs exceeded one or more of the screening criteria at AOC1CA1, AOC1CA6, AOC1CA7 AOC1CA10, AOC1CA11, AOC1CA12, and AOC1CA13 from 2 to 10ft bgs. The highest concentrations of SVOCs were observed in the AOC1CA12 sample (2 to 10ft bgs), where sample detections for several PAH, including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, naphthalene, phenanthrene and pyrene also exceeded the DAF 10 SSL and ESL, in addition to the PRG. Subsurface soil detects of SVOCs from greater than 10 ft bgs were below the screening criteria, except for a low concentration detection of benzo(a)pyrene above the PRG in AOC1CA3 (78 ug/kg), and low concentration detection of naphthalene above the ESL in AOC1CA3 (440 ug/kg) and in AOC1CA12 (250 ug/kg). The highest concentrations of SVOCs were observed within subsurface materials located in composite area AOC1CA12. No additional significant SVOC detections were noted in the supplemental RI soil samples collected from AOC1CA6SB5.

Metals

Various metals were detected in subsurface soil samples collected for the AOC 1 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.1-3.** The distribution of metals detections is provided as **Figure 4.0.2-8** and **Figure 4.0.2-9**. Subsurface soil concentrations of arsenic from 2 to 10 ft bgs exceeded the PRG in every sample, and the DAF 10 SSL eight samples. Other metals detected above the PRG from 2 to 10 ft bgs include cadmium, chromium (total), iron, lead, and manganese. In addition, metals detected above the DAF 10 SSL from 2 to 10 ft bgs include cadmium, chromium (total), selenium, and zinc. Soil samples collected from greater than 10 ft bgs were below the DAF 10 SSL. The highest concentrations of metals were observed within subsurface materials located in composite areas AOC1CA9 and AOC1CA10, and monitoring well boring MW-17S. No additional significant metals detections were noted in the supplemental RI soil samples collected from AOC1CA6SB5.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for subsurface soil samples. Detected concentrations of PCBs and total PCBs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.1-4**. The distribution of PCB detections is provided as **Figure 4.0.2-11** and **Figure 4.0.2-12**. Concentrations of one or more PCBs, including aroclor 1248 aroclor 1254, and/or arochlor 1260 were detected in subsurface soil samples AOC1CA3, AOC1CA6, and AOC1CA9, AOC1CA10, AOC1CA11 and AOC1CA13 . The detections for arochlor 1254 in samples AOC1CA3 (1,000 ug/kg), AOC1CA9 (19,000 ug/kg), and AOC1CA10 (1,100 ug/kg) exceed the PRG. Total PCB concentrations in subsurface soil exceeded the PRG at composite areas AOC1CA3, AOC1CA6, AOC1CA9, AOC1CA10, AOC1CA11 and AOC1CA13 as well. No

additional significant PCB detections were noted in the supplemental RI soil samples collected from AOC1CA6SB5.

Dioxins

Dioxins were detected in subsurface soil samples AOC1CA2, AOC1CA5, AOC1CA7, AOC1CA8, AOC1CA9, AOC1CA12, AOC1CA11, MW-11S, MW-12S, and MW-16S. Dioxin concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.1-5**. The distribution of dioxin is provided as **Figure 4.0.2-14** and **Figure 4.0.2-15**. One or more individual constituents were found to exceed their respective individual ESL values within five of ten samples.

Cyanide

Cyanide was detected in subsurface soil samples collected for the AOC 1 investigation. Detected concentrations of cyanide were compared to the Region 9 PRG, and the results are presented as **Table 4.1-3**. Subsurface soil detections of cyanide were all below the PRG. Subsurface soil detections of cyanide in samples from AOC1CA3, AOC1CA9, AOC1CA10, AOC1CA11, AOC1CA12, and MW-17S were above the ESL.

4.1.2 Summary

Surface soil sampling results for AOC 1 indicated that concentrations of metals, SVOCs, PCBs and dioxins that exceed the screening criteria are present in surface soils. No VOCs were detected above the screening criteria from 0 -2 ft. The distribution of detected PCBs appears to be greatest in the northern portion of AOC1 at composite areas AOC1CA9 and AOC1CA10. Soil boring logs for theses areas indicate the presence of soft to firm black clay.

Soil sampling results also indicate that concentrations of metals, SVOCs, PCBs and dioxins that exceed the screening criteria are present in subsurface soils. The highest concentrations of SVOCs were located in AOC1CA12 from 2 to 10 ft bgs and correspond to silty clay soils with some slag. The distribution of metal and PCBs appears to be concentrated in the northern portion of AOC1 at composite areas AOC1CA9 and AOC1CA10, and monitoring well boring MW-17S. Metallic flecks were noted in MW-17S from 2 to 4 ft bgs and native soft silt was observed beneath this layer of fill. Soil boring logs for composite samples AOC1CA9 and AOC1CA10 also indicate the presence of soft black clay. The only VOC exceedance in soil samples from greater than 10 ft bgs was for benzene in AOC1CA3SB4 (exceeding the DAF 10 SSL only).

The highest concentrations of detected chemicals in AOC 1 occurs in shallow fill materials (0 to 10 feet) and in general decreases with depth, indicating that detected chemicals within the fill materials do not appear to have migrated into the native soils greater than 10 feet or into the groundwater. There are no exceedances of the groundwater screening criteria (MCLs or Region 9 Tap Water) in monitoring wells located in or downgradient of AOC 1 (i.e., MW-10, MW-11, MW-12, MW-16 and MW-16).

No additional significant analyte detections were noted in the supplemental RI surface or subsurface soil samples collected from AOC1CA6SB5.

4.1.3 Recommendations

No further investigation of AOC1 is recommended.

4.2 AOC 2 – Closed landfill

4.2.1 Soil sampling and analysis

Soil sampling activities were conducted to confirm the lateral extent of the landfill boundaries and to characterize waste placed within the closed landfill. A total of 10 soil borings were completed around the perimeter of the landfill (i.e., outside the landfill fence) and were identified as AOC2SB1 through AOC2SB10. Borings AOC2SB1 and SB2 were moved south of the landfill because the active railroad tracks located adjacent to the southern boundary of the landfill precluded drilling in this area. Borings AOC2SB13, AOCSB14 and AOC2SB15 were advanced within the landfill for waste characterization purposes. The locations of borings SB13, SB14 and SB15 were based on subsurface anomalies identified during the geophysical program (see Section 4.2.2 below).

One intermediate depth monitoring well (MW-17M) was also installed adjacent to well MW-17S during the supplemental RI for the purpose of monitoring intermediate depth groundwater south of the AOC-2 closed landfill. One additional soil sample was collected during installation of boring/well MW-17M.

Soil sample results for the initial and supplemental RI programs are summarized on Tables 4.2-1 through 4.2-5. The distribution of analytical results for detectable constituents are indicated on Figure 4.0.2-1 through Figure 4.0.2-15. Results are discussed in the following sections.

4.2.1.1 Surface soil

<u>VOCs</u>
VOCs were detected in surface soil samples collected for the AOC 2 investigation. VOCs detected within surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The results are presented as **Table 4.2-1.** The distribution of VOC detections is indicated on **Figure 4.0.2-1**. Detected concentrations of VOCs within surface soils were below the screening criteria.

<u>SVOCs</u>
SVOCs were detected in surface soil samples collected for the AOC 2 investigation except the samples from AOC2SB5 and AOC2SB9. Detected concentrations of SVOCs were compared to the available action level criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-2**. The distribution of SVOC detections are provided as **Figure 4.0.2-4**. SVOCs which were detected above screening criteria in more than sample included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, carbazole, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, and naphthalene. Benzo(a)pyrene concentrations exceeded the PRG in soil borings AOC2SB1 though AOC2SB8. Benzo(a)pyrene also exceeded the DAF 10 SSL in AOC2SB1. In addition, benzo(a)anthracene and benzo(b)fluoranthene concentrations exceeded both the PRG and DAF10 SSL in soil borings

AOC2SB1 and AOC2SB4. Naphthalene exceeded the ESL in soil borings AOC2SB2 though AOC2SB4.

Metals

Multiple metals were detected in surface soil samples collected for the AOC 2 investigation. Detected concentrations of metals were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-3**. The distributions of metals detections are shown on **Figure 4.0.2-7**. Arsenic, cadmium, iron, lead, manganese, selenium, vanadium and zinc were found to exceed screening criteria in more than one sample. Arsenic concentrations exceeded the PRG at all surface sample locations. Chromium (total), iron, and manganese concentrations also exceeded the PRG at one or more soil sample locations. Selenium concentrations exceeded the DAF10 SSL only in soil boring AOC2SB3. Lead, vanadium and zinc exceeded the ESL in several samples. The surface sample from AOC2SB2 contained multiple metal constituent detections at concentrations above one or more screening criteria.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both PCB and total PCB concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.2-4**. The distribution of PCB detections are shown on **Figure 4.0.2-10.** Aroclor 1260 was detected in surface soil samples at AOC2SB1, AOC2SB3, AOC2SB6 and AOC2SB8. Arochlor 1248 was detected in AOC2SB2 at a concentration above the PRG. For most samples, individual PCB and total PCB concentrations were below the PRG. In sample AOC2SB2, the total PCB concentration (2829 ug/kg) exceeded the PRG.

Dioxins

Dioxins were detected in surface soil samples at AOC2SB2, AOC2SB3, and AOC2SB8. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.2-5**. The distribution of dioxin TEQ-HH is provided as **Figure 4.0.2-13**. The dioxin TEQ-HH concentration for AOC2SB2, exceeded the dioxin PRG and ESL. The dioxin TEQ-HH concentration for AOC2SB3, and AOC2SB8 exceeded the ESL.

Cyanide

Low concentrations of cyanide were detected in each surface soil sample collected for the AOC 2 investigation, except AOC2SB8. Detected concentrations of cyanide were compared to the Region 9 PRG, and the results are presented as **Table 4.2-3**. Surface soil detects of cyanide were below the PRG. Cyanide detections in samples AOC2SB1, AOC2SB2 and AOC2SB6 were above the ESL.

4.2.1.2 Subsurface soil

VOCs

VOCs were detected in subsurface soil samples collected for the AOC 2 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater

than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-1.** Adjacent to the landfill, subsurface soil detects of VOCs from 2 to 10 ft bgs and greater than 10 ft bgs were below the screening criteria except for AOC2SB4 (33.7-34 ft bgs) where benzene was detected above the PRG, DAF 10 SSL, and ESL. Within the landfill borings AOC2SB13, AOC2SB14 and AOC2SB15, one or more of the following VOC - benzene ,styrene, toluene and xylenes - were detected at depths greater than 10 feet and at concentrations that exceeded the PRG and/or the DAF 10 SSL, or ESL. The highest concentrations of benzene, styrene, toluene and xylenes were observed in slag fill materials located within the landfill in soil borings AOC2SB14 and AOC2SB15. Lower concentrations of benzene were detected in mixed concrete, wood and slag fill materials located within the landfill in AOC2SB13 and in soils located at a depth of 33-34 feet in boring AOC2SB4 located adjacent to the landfill's western boundary. The distribution of VOCs is provided as **Figure 4.0.2-2 and Figure 4.0.2-3**.

SVOCs

SVOCs were detected in subsurface soil samples collected from perimeter borings AOC2SB1, AOC2SB5, and AOC2SB7 and from landfill characterization borings AOC2SB13, AOC2SB14, and AOC2SB15. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-2**. The distributions of SVOC detections are provided as **Figure 4.0.2-5** and **Figure 4.0.2-6.** Subsurface soil detections of SVOCs in the perimeter borings from 2 to 10 ft bgs were below the screening criteria except for the sample from AOC2SB1 (4-5.2 ft bgs) where benzo(a)pyrene was detected above PRG. Subsurface soil detections of SVOCs from the landfill characterization boring samples greater than 10 ft bgs exceeded ton or more of the screening criteria in samples analyzed from borings AOC2SB13, AOC2SB14 and AOC2SB15. The highest concentrations of benzo(a)pyrene, carbazole and other SVOCs were observed within slag fill materials located in landfill soil borings AOC2SB14 and AOC2SB15. Lower concentrations of benzo(a)pyrene, carbazole and other SVOCs were detected in mixed concrete, wood and slag fill materials in landfill boring AOC2SB13.

Metals

Metals were detected in subsurface soil samples collected for the AOC 2 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-3.** The distribution of metals detections is provided as **Figure 4.0.2-8** and **Figure 4.0.2-9**. Arsenic exceeded the PRG in the majority of subsurface samples. Vanadium exceeded the ESL in the majority of subsurface samples. Multiple metals constituents were observed in soil samples from 2 to 10 ft bgs in AOC2SB4 and AOC2SB5 with detections of arsenic, iron, manganese, selenium and vanadium above one or more of the screening criteria. Multiple metals constituents were observed in soil samples from greater than 10 ft bgs in AOC2SB13 and AOC2SB15 with detections of arsenic, cadmium, chromium, iron, manganese, mercury, selenium, vanadium and zinc above one or more of the screening criteria in one or both samples.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for subsurface soil samples. Detected concentrations of PCBs and total

PCBs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-4**. The distributions of PCB are provided as **Figure 4.0.2-11** and **Figure 4.0.2-12**, respectively. Aroclor 1260 was detected in subsurface soil samples at AOC2SB5 and AOC2SB13. Total PCB concentrations in the two subsurface soil samples from AOC2SB13 exceeded the PRG.

Dioxins

Dioxins were detected in subsurface soil samples from AOC2SB1, AOC2SB4, ACO2SB5, AOC2SB6, AOC2SB7, AOC2SB9, AOC2SB13 and AOC2SB14. Dioxin concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-5**. The distribution of dioxin is provided as **Figure 4.0.2-14** and **Figure 4.0.2-15,** respectively. One or more individual dioxin/furan compounds were found to exceed their respective individual ESL values within each of the subsurface soil samples.

Cyanide

Low concentrations of cyanide were detected in subsurface soil samples collected for the AOC 2 investigation. Cyanide concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria that are considered applicable to this investigation. The results are presented as **Table 4.2-3**. Subsurface soil detects of cyanide were below the PRG. Cyanide detections in samples AOC2SB6, AOC2SB7 and AOC2SB15 were above the ESL.

4.2.1.3 Soil saturation assessment

Concentrations of VOCs and SVOCs were compared to Region 9 Csat values during the initial RI. All VOC concentrations were below their respective C_{SAT} values. SVOCs were detected above C_{SAT} values in soil borings AOC2SB13, AOC2SB14 and AOC2SB15, which are located in the landfill and are representative of disposed waste. No indications of separate phase product or waste materials (except for slag) were observed in the landfill perimeter borings. The only perimeter boring that exceeded a Csat value is AOC2SB1 at 0-2 feet for chrysene and there were no field observations of separate phase material in this sample. Separate phase product was not observed and there were no exceedances of MCLs or Tap Water PRGs in the landfill monitoring wells (MW-15S, -16S, -17S, -17M, and -18S), with the exception of a single exceedance in MW-17M. Bis(2-ethylhexyl)phthalate was detected at 9.65 ug/L in this well, above the MCL of 6 ug/L. This was the first sampling event from the well, which was installed in July 2008.

4.2.2 Geophysical results

AOC 2 consists of a landfill located within the northern parcel of the "Site" approximately 550 ft north of Augspurger Road. This area neighbors existing railroad tracks to the south. At the time of the geophysical survey, the AOC 2 perimeter was defined by a steel chain-link fence and the area of investigation (Figure 4.2.2.1), within the fencelines, consisted entirely of mowed grass. AOC 2 has appreciable topographic relief (approximately 12 ft) with higher ground along the western one-third of the area and generally lower relief along the eastern and southern fencelines. Both the chain-link perimeter fencing and two steel bollards, one situated near southwestern and one located at the southeastern corner of the survey area, were metallic targets that acted as potential above-ground interference sources for EM-31 and magnetic instrumentation.

Magnetic Gradient Response

A total of 11,860 magnetic data points were collected at AOC 2 on August 27, 2005. Data points were collected along north-south oriented profiles spaced approximately 5-ft apart (see Figure 4.2.2-1A). Magnetic gradient values, measured in nanoteslas per meter (nT/m), were calculated at each data point location by taking the difference in total magnetic field of the top and bottom sensors and dividing by the separation distance between sensors which was maintained at 1 m (3.28 ft) for the survey. Magnetic gradient values ranged from approximately -500 to 460 nT/m.

The Kriged magnetic gradient response data were contoured and splined output is shown in Figure 4.2.2-1B. Color enhancement was applied to the output to highlight negative (light to dark blue shading; <50 nT/m) and positive (orange to red shading; >50 nT/m) magnetic gradient response as a means of visualizing magnetic anomalies. Elevated magnetic gradients with respect to background response (green shading) are more concentrated within the western one-half of the survey area, near the southern perimeter, and along the eastern-central perimeter. It appears as though the clustering of magnetic gradient anomalies situated within the western one-half of AOC 2 equates to areas of higher topography, whereas lower-lying areas along the eastern perimeter are dominated by background response. In addition, there appears to be at least three linear-trending magnetic gradient anomalies that intersect the area. These features are located at: (1) parallel to and approximately 50 ft north of southern fenceline; (2) parallel to and approximately 20-to-30 ft west of eastern fenceline from the northeast corner to east-central portion of AOC 2 perimeter; and, (3) oblique to east-central fenceline extending approximately 300 ft to the southwest.

The steel chain-link fence that surrounds AOC 2 was predicted to be a potential source of magnetic interference, however, interference (observed elevated negative magnetic gradient) occurred only over portions of the area perimeter, namely the western and portions of the southwestern, northern, and east-central perimeter.

EM-31 Response

A total of 12,680 EM-31 data points were collected at AOC 2 on August 23, 2005. Similar to magnetic data collection, EM-31 data points were collected along north-south oriented profiles spaced approximately 5-ft apart (see Figure 4.2.2-1A). EM-31 readings collected at each location included both ground conductivity (mS/m) and magnetic susceptibility (ppt) data. The Kriged ground conductivity and magnetic susceptibility data were contoured and output is presented in panels C and D. As with the magnetic gradient data, color enhancement was applied to the output to enhance EM-31 anomalous response.

Ground Conductivity
Relative ground conductivity values ranged from -40 to 200 mS/m. Lower relative ground conductivity (<5 mS/m; light-to-dark blue shading) values were the dominant response at AOC 2, and areas of peak low response were clustered towards the southwest, along an east-west trending anomaly parallel to south fenceline and consistent with magnetic gradient response, and at a number of "bulls-eye" locations generally within the northern one-half of AOC 2. Higher relative ground conductivity response (>30 mS/m; light orange-to-red shading) was generally restricted to the west-central portion of AOC 2 and appears to be associated with areas of higher

topography within AOC 2. Also, the metallic fenceline produced an elevated ground conductivity response as evidenced by orange-to-red shading along perimeter (Figure 4.2.2-1C).

Magnetic Susceptibility
Magnetic susceptibility values ranged from approximately -15 to 25 ppt. Negative magnetic susceptibility (light-to-dark blue shading) values were the dominant response over AOC 2 with a number of peak point-source responses mapped generally within the northern one-half of the survey area. Area background response was at or near 0 ppt. A positive magnetic susceptibility (orange-to-red shading) response was dominant over a rectangular-shaped, approximate 80 x 400 ft area along the western portion of AOC 2 (Figure 4.2.2-1D). The southern one-quarter of this magnetic susceptibility anomaly area correlates to an area of anomalous, negative ground conductivity response and elevated magnetic gradients. The EM-31 anomaly area is dominated by elevated positive magnetic susceptibility response, but in comparison, relative ground conductivity appears to be more transitional in character with both negative and positive response within this area. Consistent with the ground conductivity response, the metallic fenceline produced an elevated magnetic susceptibility response visualized by orange-to-red shading along perimeter (Figure 4.2.2-1D).

4.2.3 Summary

Landfill perimeter borings SB1 to SB10 confirm that the lateral extent of the wastes placed in the landfill are within the boundaries of the perimeter fencing. Also, except for two borings around the perimeter of the landfill, silty clay with a low hydraulic conductivity [10(-6) to 10(-7) cm/sec] was encountered at the bottom of each of the perimeter borings, and also in two landfill characterization borings. One landfill characterization boring (AOC2SB14) was terminated before natural sediments were encountered. Surface soil sampling results for AOC 2 indicate that no VOCs, PCBs and cyanide were detected above the screening values and only low concentrations of metals, SVOCs and dioxins that exceed the screening criteria are present in surface soils. Subsurface soil sampling results indicate that relatively low concentrations of metals and dioxins that exceed the screening criteria are present.

The highest concentrations of VOCs and SVOCs correspond to field observations of tar-like material and product staining in landfill borings AOC2SB14 and AOC2SB15. These observations correspond to areas of elevated magnetic gradient, higher ground conductivity response, and elevated magnetic susceptibility identified by the geophysical survey. The vertical extent of fill materials within the landfill was 16.4 ft bgs at AOC2SB13 and 14.4 ft bgs at AOC2SB15. The vertical extent of fill material was not defined in soil boring AOC2SB14 as fill materials were observed until the termination of the boring at 21.6 ft bgs. Separate phase product was not observed and no exceedances of MCLs or Tap Water PRGs have been detected in the landfill monitoring wells (MW-15S, -16S, -17S, -17M, and -18S) with the exclusion of the one MCL exceedance of bis(2-ethylhexyl)phthalate at 9.65 ug/L in this well, compared to the MCL of 6 ug/L.

Other than this single detection, the July 2008 installation and sampling of intermediate monitoring well MW-17M indicated no significant water quality impacts beneath the clay unit downgradient of the AOC2 landfill.

4.2.4 Recommendations

No further investigation of AOC 2 is required to assess the horizontal and vertical extent of constituents of concern. Additional groundwater monitoring is anticipated to be conducted for AOC 2 in association with the conduct of a Site FS.

4.3 AOC 3, AOC 4, AOC 5 and AOC 6 – Former storm water outfalls

A discussion of surface water and sediment sampling downstream of these AOCs is addressed in Section 4.26. The locations of these AOCs are depicted in Figure 1.2.2-1.

4.4 AOC 7 – Drainage ditch

4.4.1 Sediment sampling and analysis

Sediment sampling activities, completed during the initial RI, were conducted to assess the nature and extent of constituents at AOC 7 (the drainage ditch/intermittent stream which is only occasionally flooded), located adjacent to the landfill in the northern parcel of the site. A total of 4 sediment samples were collected and were identified as AOC7SD10 through AOC7SD13. The samples were collected from 0 to 0.5 ft bgs. Sediment samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, and cyanide. The analytical results for the sediment samples are summarized on Tables 4.4-1 through 4.4-4. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.2-1** through **Figure 4.0.2-15**, and **Figure 4.4.1-1** and Figure 4.4.1-2. Results are discussed in the following sections.

VOCs

VOCs were detected in surface sediment samples collected for the AOC 7 investigation. VOCs detected within sediment included petroleum and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the Region 5 Sediment ESL, and the results are presented as **Table 4.4-1**. The distribution of VOCs is provided as **Figure 4.0.2-1**. All detected concentrations of VOCs in sediments met the ESL with the exception of acetone which exceeded the ESL at locations AOC7SD12 and AOC7SD13. Because the intermittent stream is mostly dry, a comparison of detected VOCs to Region 9 soil PRGs was also conducted, and resulted in no exceedances.

SVOCs

SVOCs were detected in all surface soil samples collected for the AOC 7 investigation. Detected concentrations of SVOCs were compared to the Region 5 ESL, and the results are presented as **Table 4.4-2**. The distribution of SVOC is provided as **Figure 4.4.1-1**. The concentrations of 11 SVOCs exceeded the ESL in one sediment sample (AOC7SD13). Phenanthrene exceeded the sediment ESL at three of four locations (AOC7SD10, AOC7SD11 and AOC7SD13). Pyrene exceeded the sediment ESL at all four locations. A comparison of the detected SVOCs to Region 9 soil PRGs shows exceedances for 4 PAHs [benzo(a)anthracene, benzo(a)pyrene, chrysene and indeno(1,2,3-cd)pyrene]. Of note for sample locations AOC7SD12 and AOC7SD13 is the presence of the railroad and an observed associated deposit of rail ties upgradient of these sample locations. Sample locations AOC7SD10 and AOC7SD11 are located adjacent to AOC 2 (Closed Landfill). The higher concentration of PAHs within sample AOC7SD13 may be affected by the railroad and deposit of rail ties by the railroad in an upgradient location compared to the sample location.

Metals
Metals were detected in sediment samples collected for the AOC 7 investigation. Detected concentrations of metals were compared to the Region 5 ESL, and the results are presented as **Table 4.4-3**. The distribution of metals is provided as **Figure 4.4.1-2**.The results indicate that the sediment ESL was exceeded for aluminum and iron in each of the four samples, and also for manganese in one sample (AOC7SD10).

PCBs
PCB aroclor 1260 was detected in a sediment sample collected for the AOC 7 investigation and the concentration is compared to the Region 5 ESL in **Table 4.4-4**. The detected concentration (30 J ug/kg) was below the ESL. This detection did not exceed the Region 9 soil PRG.

Cyanide
Cyanide was detected in one AOC 7 sample during the investigation. The detected concentration (1.2 mg/kg) exceeded the ESL, but not the Region 9 soil PRG.

4.4.2 Surface water sampling and analysis

Surface water sampling activities were conducted to assess the nature and extent of constituents at AOC 7, the drainage ditch, located adjacent to the landfill in the northern parcel of the site. A total of 4 surface water samples were collected and were identified as AOC7SW6 through AOC7SW9. Surface water samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, and cyanide. The analytical results for the surface water samples are summarized on **Table 4.4-5** through **Table 4.4-8.** Results are discussed in the following sections.

VOCs
VOC was detected in a surface water sample collected for the AOC 7 investigation. A low concentration of acetone (a common laboratory artifact) was detected in sample AOC7SW8 (2.4 J ug/l). The detection was compared to the screening criteria, and the result is presented as **Table 4.4-5**. The acetone concentration in surface water sample AOC7SW8 was below the screening criteria.

SVOCs
SVOCs were detected in surface water samples collected for the AOC 7 investigation. The detected concentrations of SVOCs for surface water were compared to the Surface Water Ecological Screening Level, and the results are presented as **Table 4.4-6**. Fluoranthene was detected at AOC7SW8 (0.056 J ug/l), and naphthalene was detected at AOC7SW9 (0.75 J ug/l). The SVOCs concentrations were below the screening criteria.

Metals
Metals were detected in surface water samples collected for the AOC 7 investigation. Detected concentrations of metals for surface water were compared to the Surface Water Ecological Screening Levels and the results are presented as **Table 4.4-7.** The results indicate that the surface water ESL was exceeded for aluminum in each of the four samples. Concentrations of aluminum, iron and lead exceeded their respective ESL in samples taken from locations AOC7SW7 and AOC7SW8.

PCBs
PCBs were not detected in surface water during the AOC 7 investigation. Surface water PCB data are presented as **Table 4.4-8.**

Cyanide
Cyanide was detected in one sample collected for the AOC 7 investigation. The cyanide concentration for surface water was compared to the Surface Water Ecological Screening Level, and the results are presented as **Table 4.4.2-4**. The distribution of cyanide is provided as **Figure 4.4.2-2**.The cyanide concentration detected in surface water sample taken at AOC7SW7 exceeded the ESL.

4.4.3 Summary

A number of constituents detected in sediment sampling results for AOC 7 were present at concentrations above screening values (or as discussed in the SLERA did not have ecological screening values) including inorganic compounds, PAHs, VOCs (acetone, cyclohexane and methycyclohexane) and PCBs. Higher concentrations of SVOCs were detected in sediment samples collected from AOC7SD10 through AOC7SD13 (all sampled locations in AOC 7) with the highest concentration documented at AOC7SD13, which is located at the southernmost (downstream) portion of the ditch, downgradient of the railroad and a railroad deposit of rail ties. Since the bed of AOC 7 is frequently dry, the sediment samples have been displayed on the Northern Parcel figures in conjunction with soil sampling points.

Although inorganic constituents were detected in surface water, no additional evaluation of surface water is warranted as the concentrations were generally low, the samples represent total recoverable (rather than dissolved) and the same inorganic constituents were detected in upstream GMR samples. Surface water flow in the ditch also occurs on an intermittent basis.

4.4.4 Recommendations

No further investigation of AOC 7 sediments or surface water is recommended.

4.5 AOC 8 – Former railcar thaw area

4.5.1 Soil sampling and analysis

Geophysical survey and soil sampling activities were conducted to assess the nature and extent of constituents at AOC 8, the former railcar thaw area, located in the southern parcel of the Site. A total of 13 soil borings were completed and were identified as AOC8SB1 through AOC8SB13. Based on the results of the geophysical survey, boring locations were adjusted to maximize the investigation of subsurface anomalies. The elevated differential responses, ground conductivity and magnetic susceptibility identified by the geophysical survey corresponded to concrete slabs and slag present at a depth of about 2 feet below the surface at AOC 8. The subsurface anomalies observed in the GPR profiles also correspond to the concrete slabs, slag and iron mottle observed in the field.

Surface samples were collected at AOC8SB1 through AOC8SB5 from 0 to 2 ft bgs. Subsurface soil samples were collected at AOC8SB1, AOC8SB3 and AOC8SB5 through AOC8SB13 from 2 to 10 ft bgs. One or more subsurface soil samples were collected at soil borings AOC8SB1

through AOC8SB5 from greater than 10 ft bgs. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values.

The analytical results for each constituent were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The summary of analytical detections for surface soils, subsurface soils from 2 to 10 ft bgs, and subsurface soils greater than 10 ft bgs are provided as **Table 4.5-1** through **Table 4.5-5**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections. Local background concentrations are also shown in analytical data summary tables for reference purposes.

4.5.1.1 Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 8 investigation. VOCs detected within surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria, and the results are presented as **Table 4.5-1**. The distribution of VOCs is indicated in **Figure 4.0.1-1**. Benzene, cyclohexane, methylcyclohexane, methylene chloride and toluene were detected within all surface soil samples collected. However, all detected concentrations of VOCs , except for methylene chloride, did not exceed any of the screening criteria. Methylene chloride was found to exceed the DAF 10 criteria in one soil sample (AOC8SB4, 18 ug/kg).

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 8 investigation. Detected concentrations of SVOCs were compared to the available screening criteria, and the results are presented as **Table 4.5-2.** The distribution of SVOC detections is indicated in **Figure 4.0.1-4**. Benzo(a)pyrene, and several related PAH compounds were detected in surface soils samples with concentrations above one or more screening criteria. Benzo(a)pyrene was found to exceed criteria in a greater number of samples than other PAH compounds. Benzo(a)pyrene exceeded one or more screening criteria in each of the soil borings completed in this AOC. The concentrations of five SVOCs (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene) exceeded the PRG in one sample (AOC8SB2). Naphthalene was also detected above the ESL in this sample. None of the SVOC detections exceeded the DAF 10 SSL.

Metals

Metals were detected in surface soil samples collected for the AOC 8 investigation. Detected concentrations of metals were compared to the available screening criteria, and the results are presented as **Table 4.5-3**. The distribution of metals is provided as **Figure 4.0.1-7**. Several metals constituents were found to exceed one or more of the available screening criteria in surface soil, including: arsenic, cadmium, cobalt, chromium, iron, lead manganese, selenium, vanadium, and zinc. Arsenic concentrations exceeded the PRG at all surface sample locations, and the DAF 10 SSL at more than one location. Iron and manganese concentrations also exceeded the PRG at one or more soil sample locations. Additional metals constituents, including cadmium, lead, vanadium and zinc, were detected in multiple surface samples above the ESL.

PCBs
Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both individual and total PCB concentrations were compared to the available screening criteria, and the results are presented as **Table 4.5-4**. The distribution of PCB is provided as **Figure 4.0.1-10**. Only Arochlor 1260 was detected in surface soil samples at AOC8SB1 and AOC8SB2. PCB and total PCB concentrations were, however, all below the available screening criteria.

Dioxins
Dioxins were detected in surface soil samples at AOC8SB1 and AOC8SB5. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG and the ESL, and the results are presented as **Table 4.5-5**. The distribution of dioxin TEQ-HH is provided as **Figure 4.0.1-13**. The dioxin TEQ-HH concentration for AOC8SB1 exceeded the PRG and ESL screening criteria. No exceedence is indicated for AOC8SB5.

Cyanide
Cyanide was detected in surface soil sample AOC8SB2. The detected concentration of cyanide was compared to the Region 9 PRG and the ESL, and the result is presented as **Table 4.5-3**. The distribution of cyanide is provided as **Figure 4.0.1-7**. The surface soil detection of cyanide was below the PRG, but above the ESL in one sample (AOC8SB2).

4.5.1.2 Subsurface soil

VOCs
VOCs were detected in subsurface soil samples collected for the AOC 8 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.5-1**. The distribution of VOCs is provided as **Figure 4.0.1-2** and **Figure 4.0.1-3.** Benzene and trichloroethene were found to exceed the DAF 10 criteria in one soil sample from 2 to 10 ft bgs (AOC8SB7, 6-7.6 ft). Other VOC were detected in several other subsurface soil samples, including, acetone, cyclohexane, ethylbenzene, isopropylbenzene, methylcyclohexane, toluene and xylenes. The remaining VOC detections were, however, below the available screening criteria.

SVOCs
SVOCs were detected in subsurface soil samples collected from 2 to 10 ft bgs for AOC 8 investigation, with the exception of AOC8SB7. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.5-2** The distribution of SVOCs is provided as **Figure 4.0.1-5** and **Figure 4.0.1-6.** Benzo(a)pyrene, and several related PAH compounds were detected in subsurface soils samples with concentrations above one or more screening criteria. Other SVOC detected included acenaphthene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, fluorine, phenanthrene and pyrene. Subsurface soil detections of benzo(a)pyrene, benzo(k)fluoranthene and dibenzo(a,h)anthracene from samples between 2 and 10 ft bgs exceeded the PRG in AOC8SB5. Soil samples exceeding the PRG for benzo(a)pyrene were also

collected from soil boring locations AOC8SB3 and AOC8SB13. Naphthalene was also detected in four of five samples above the ESL. Subsurface soil detections of SVOCs at sample depths greater than 10 ft bgs were all below the screening criteria.

Metals
Metals were detected in subsurface soil samples collected for the AOC 8 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.5-3**. The distribution of metals detections is provided as **Figure 4.0.1-8** and **Figure 4.0.1-9.** Several metals constituents were found to exceed one or more of the screening criteria in subsurface soil, including: arsenic, cadmium, chromium, iron, lead manganese, selenium, vanadium, and zinc. Arsenic concentrations exceeded the PRG at all 2 to 10 ft and greater than 10 ft sample locations, and the DAF 10 SSL at two locations. Iron concentrations exceeded the PRG at four 2 to 10 ft sample locations (AOC8SB3, AOC8SB5, AOC8SB12 and AOC8SB13). Chromium concentrations exceeded the DAF 10 SSL at two locations (AOC8SB3, AOC8SB5). Additional metals constituents, including lead, manganese, vanadium and zinc, were detected in more than one 2 to 10 ft and greater than 10 ft sample locations above the ESL.

PCBs
PCBs were not detected in subsurface soils sampled during the investigation of AOC 8 investigation.

Dioxins
Dioxins were detected in subsurface soil samples from borings AOC8SB2, AOC8SB3, AOC8SB7, AOC8SB10 and ACO3SB13. Dioxin (2,3,7,8-TCDD) concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the Region 9 PRG and the ESL, and the results are presented as **Table 4.5-5**. The distribution of dioxin detections is provided as **Figure 4.0.1-14** and **Figure 4.0.1-15.** Several individual constituent detections were above the ESL.

Cyanide
Cyanide was not detected in subsurface soils during AOC 8 investigation.

4.5.2 Geophysical results

AOC 8 consists of a combined former railcar thaw and former fuel oil UST areas located within the south parcel of the "Site" approximately 350 ft south of Augspurger Road. The survey area was approximately 0.60 acres in size and consisted of grass covered terrain with minimal (<5 ft) relief. Several small slag piles were located in the northeast corner of the survey area and bordered by dense vegetation. There were no visible signs of above-ground metallic interference.

EM-61 Differential Response
A total of 2,364 EM-61 data points were collected on August 25, 2005. Data points were collected along profiles oriented along the length of the AOC in a northeast-southwest direction spaced approximately 5-ft apart. Differential response values, measured in (mV), were calculated by taking the difference between the time-decay response values of the top and bottom coils of the instrument. Differential response values ranged from approximately -600 to 1,400 mV.

The Kriged differential response data were contoured and output is shown in Figure 4.5.2-1. Colored definition was applied to the output to highlight negative (light to dark blue shading; <-200 mV) and positive (light orange to red shading; >50 mV) differential response as a means of visualizing metallic anomalies. Elevated differential responses with respect to background response (green shading) are concentrated in the southern one-half of the survey area. There are approximately six anomalies (approximately 15 x 30 ft) with defined edges that correspond to approximate locations of former railcar thaw pits in southern one-third of survey area. A 150-ft linear anomaly is located along the western boundary of the survey area and appears to be at least three anomalies; 1 to north; 1 to west; and 1 to east.

EM-31 Response

A total of 2,207 EM-31 data points were collected on August 25, 2005. Similar to EM-61, data points were collected along profiles oriented along the length of the AOC in a northeast-southwest direction spaced approximately 5-ft apart. EM-31 readings collected at each location included both ground conductivity (mS/m) and magnetic susceptibility (ppt) data. The Kriged ground conductivity and magnetic susceptibility data were contoured and output is presented in Figures 4.5.2-1C and 4.5.2-1D. As with the EM-61 data, color enhancement was applied to the output to enhance EM-31 anomalous response.

Ground Conductivity

Relative ground conductivity values ranged from -100 to 800 mS/m. Lower relative ground conductivity (<90 mS/m; light orange-to-red shading) values were the dominant response at AOC 8, and areas of peak low response are located throughout the survey area. These peak low response values appear to lie on a rectangular grid pattern oriented in a NE-SW fashion. Larger "rectangular-shaped" anomalies are located to the southwest, northeast, and east-central limits of AOC 8. Higher relative ground conductivity response (>230 mS/m; light-to-dark blue shading) was generally restricted to along the east-central survey boundary southeast of former "fuel oil tanks" location.

Magnetic Susceptibility

Magnetic susceptibility values ranged from -40 to 25 ppt. Area background response (light green shading) was at or near 0 ppt. Lower relative magnetic susceptibility (orange-to-red shading) responses were dominant over the southern one-half of the survey area with at least four approximately 15 x 30 ft rectangular-shaped anomalies that are coincident with EM-61 differential response contours (Figure 4.5.2-1). A linear, negative-valued anomaly in the north trends from NW-SE to NE-SW and is bordered by areas of higher relative magnetic susceptibility response (light-to-dark blue shading).

Ground Penetrating Radar

GPR profiles were collected over geophysical anomalies in the southern one-third of the survey area in a NW-SE direction, transverse to long axis of anomalies. Total linear footage collected was approximately 1800 ft. Radar signal penetration was limited to approximately 20 ns two-way travel time. Using 6 ns/ft for time-depth conversion, this equates to approximately 3 ft bgs. Signal attenuation is believed to be due to differences in soil characteristics such as moisture and clay content. Figure 4.5.2-2 shows two intersecting GPR profiles collected within the survey area and trackline map indicating location of these radar profiles. There are labeled subsurface anomalies on Lines 14 and 10 (indicated by arrows) that exhibit high amplitude responses in relation to the

surrounding material within the zone of effective depth of penetration. These higher amplitude, point-source reflections correlate to EM-31 anomalies (Figure 4.5.2-1C for example).

4.5.3 Summary

Surface and subsurface soil sampling results for AOC 8 indicate the presence of VOC, SVOC, metals, PCB, dioxin and cyanide in one or more samples analyzed from this AOC. When compared to the available screening criteria, relatively few exceedances above screening criteria were noted for VOC, SVOC, dioxins and cyanide. Relatively low concentrations of metals exceeding the screening criteria were also indicated. No PCB exceedence was indicated.

At depths greater than 10 feet, no analytical detections exceeded VOC or SVOC screening criteria. Only arsenic was detected above the screening criteria at a depth greater than 10 feet. Elevated VOC concentrations were not detected in the samples collected beneath 10 feet and no petroleum or tarry materials were observed in soil borings.

Geophysical survey findings, consisting of elevated differential responses, ground conductivity and magnetic susceptibility identified by the geophysical survey seem to correspond to the concrete slabs and slag present at a depth of about 2 feet below the surface at AOC 8. The subsurface anomalies observed in the GPR profiles also correspond to the concrete slabs, slag and iron mottle observed in the field.

4.5.4 Recommendations

No further investigation of AOC 8 is recommended.

4.6 AOC 9 – Former fuel oil USTs

4.6.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 9, former fuel oil USTs, located in the southern parcel of the Site. A total of 4 soil borings were completed during the initial RI and were identified as AOC9SB1 through AOC9SB4. The locations of the four soil borings were adjusted based on the results of the geophysical findings, which are discussed in Section 4.6.2. The geophysical survey did not identify any subsurface anomalies in this area that suggested the presence of any former buried USTs. Therefore, as described in the SSP, soil borings instead of test pits were used to investigate this area. In addition to the soil borings completed during the initial RI, two additional soil borings were completed as monitoring wells (MW-23S and MW-24S) during the Supplemental RI. Surface samples (0 to 2 ft bgs) and subsurface samples (2 to 10 ft bgs and greater than 10 ft bgs) were collected at each boring. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide (supplemental RI soil samples were not submitted for cyanide or dioxins analysis). Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values.

The analytical results for each constituent were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for surface soils, subsurface soils from 2 to 10 ft bgs, and subsurface soils greater than 10 ft bgs are provided as **Table 4.6-1** through **Table 4.6-5**. The distribution of

analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through Figure **4.0.1-15**. Analytical results and field observations are discussed in the following sections.

4.6.1.1 Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 9 investigation. Detected concentrations of VOCs were compared to the available screening criteria, and the results are presented as **Table 4.6-1**. The distribution of VOCs is provided as **Figure 4.0.1-1**. Minor concentration detections of acetone, 2-butanone and carbon disulfide were noted in one soil sample (AOC9SB2), with several other estimated-value (J-flagged) detections in one or more soil samples. None of the sample results exceeded the available screening criteria.

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 9 investigation. Detected concentrations of SVOCs were compared to the available screening criteria, and the results are presented as **Table 4.6-2**. The distribution of SVOCs is provided in **Figure 4.0.1-4**. Several SVOC exceeded one or more screening criteria in surface soil, including: benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, carbazole, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene. The majority of SVOC detections are noted within the surface soil samples from borings AOC9SB1, AOC9SB2 and AOC9SB3. Sample results for the surface sample from boring AOC9SB4 required elevated detection limits which may have masked constituent detections. Benzo(a)pyrene concentrations exceeded the PRG in soil borings AOC9SB1 through AOC9SB3, and the DAF 10 SSL and ESL in two samples (AOC9SB1 and AOC9SB3). Benzo(a)anthracene and benzo(b)fluoranthene concentrations exceeded both the PRG and DAF10 SSL in soil borings AOC9SB1 and AOC9SB3. Carbazole and dibenz(a,h)anthracene concentrations exceeded the DAF 10 SSL in AOC9SB2.

Metals

Metals were detected in surface soil samples collected for the AOC 9 investigation. Detected concentrations of metals were compared to the available screening criteria, and the results are presented as **Table 4.6-3.** The distribution of metals detections are provided as **Figure 4.0.1-7**. Several metals exceeded one or more screening criteria in surface soil, including: antimony, arsenic, cadmium, chromium, copper, iron, manganese, selenium, vanadium and zinc. Iron and manganese concentrations exceeded the residential PRG at each of the four surface sample locations. Arsenic and chromium (total) concentrations also exceeded the PRG at one or more soil sample locations. Antimony, arsenic, cadmium, chromium and selenium exceeded the DAF 10 SSL in one or more samples.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both PCB and total PCB concentrations were compared to the available screening criteria and the results are presented as **Table 4.6-4**. The distribution of PCB detections are provided as **Figure 4.0.1-10**. Aroclor 1260 was detected in three of four surface soil samples (AOC9SB1, AOC9SB3 and AOC9SB4) at concentrations below the PRG and the ESL screening level. Aroclor 1248 was detected in the surface soil sample taken at AOC9SB2, also below the ESL. Upon calculation of the total PCB concentration (including

addition of half of the analytical detection level for undetected isomers) in each sample, total PCB concentrations were calculated to be above the residential PRG in each of the three samples.

Dioxins
Dioxins were detected in surface soil samples AOC9SB1 and AOC9SB4. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.6-5**. The distribution of the dioxin TEQ-HH is provided as **Figure 4.0.1-13**. The dioxin TEQ-HH concentration for AOC9SB4 exceeded the PRG and the ESL.

Cyanide
Cyanide was detected in four of four surface soil samples collected for the AOC 9 investigation. Detected concentrations of cyanide were compared to the available screening criteria, and the results are presented as **Table 4.6-3**. The distribution of the cyanide is provided as **Figure 4.0.1-7**.The surface soil detects of cyanide were below the PRG screening levels; however, three of the four samples (AOC9SB2, AOC9SB3, AOC9SB4) were above the ESL.

4.6.1.2 Subsurface soil

VOCs
VOCs were detected in subsurface soil samples collected for the AOC 9 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.6-1**. The distribution of VOCs is provided in **Figure 4.0.1-2** and **Figure 4.0.1-3.** Subsurface soil detects of VOCs were below the available screening criteria, except for benzene in one sample (AOC9SB2, 18-20ft) which exceeded all four screening criteria. Additional petroleum-related COCs were also detected in this sample below screening criteria.

SVOCs
SVOCs were detected in subsurface soil samples collected for the AOC 9 investigation. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.6-2**. The distribution of SVOCs is provided as **Figure 4.0.1-5** and **Figure 4.0.1-6,** respectively. The concentration of benzo(a)pyrene exceeded the PRG at each soil boring location (with the exception of no exceedence noted in the MW-23S and MW-24S well borings). Benzo(a)anthracene was detected above the PRG in soil samples taken between 2 and 10 ft bgs from borings AOC9SB1 and AOC9SB4. Benzo(a)fluoranthene, benzo(k)fluoranthene and dibenz(a,h)anthracene was detected at concentrations above the PRG between 2 and 10 ft bgs at AOC9SB1. Naphthalene was detected above the DAF 10 SSL in the soil sample taken from AOC9SB2 from greater than 10 ft bgs; 2-Methylnapthalene was also detected in the same sample at concentrations above the ESL. Within the MW-23S and MW-24S well borings, only naphthalene was detected above the ESL in a soil sample collected from 3 to 5 feet.

Metals
Metals were detected in subsurface soil samples collected for the AOC 9 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs

were compared to the available screening criteria, and the results are presented as **Table 4.6-3** The distributions of metals are provided as **Figure 4.0.1-8** and **Figure 4.0.1-9**, respectively. Arsenic concentrations exceeded the PRG at each location. At one or more soil boring locations, chromium (total), iron, and manganese concentrations exceeded the PRG, antimony concentrations exceeded the DAF 10 SSL and/or the ESL, and cadmium, selenium and vanadium concentrations exceeded the ESL from 2 to 10 ft bgs.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for subsurface soil samples. Detected concentrations of PCBs and total PCBs for subsurface soil from 2 to 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.6.-4**. The distributions of PCB are provided as **Figure 4.0.1-11** and **Figure 4.0.1-12,** respectively. Aroclor 1260 was detected in subsurface soil samples at AOC9SB1 and AOC9SB2, however, the individual concentration did not exceed the PRG or the ESL. The concentration of total PCB at AOC9SB1 exceeded the PRG in soils from 2 to 10 ft bgs in a single sample (4 to 5.3ft bgs).

Dioxins

Dioxins were detected in subsurface soil samples AOC9SB2 and AOC9SB3. Dioxin concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the Region 9 PRG, and the results are presented as **Table 4.6-5**. The distribution of the dioxin is provided as **Figure 4.0.1-14** and **Figure 4.0.1-15,** respectively. Several individual constituent concentrations at AOC9SB3, for soil samples from 2 to 10 ft bgs, exceeded the ESL with moderate concentrations of several furan constituents indicated. Correspondingly low constituent detections were noted in sample AOC9SB2.

Cyanide

Cyanide was detected in one subsurface soil sample (AOC9SB1, 4-5.3ft bgs) collected for the AOC 9 investigation. The cyanide concentration for subsurface soil from 2 to 10 ft bgs was compared to the Region 9 PRG, and the result is presented as **Table 4.6-3**. The subsurface soil detect of cyanide was below the PRG, but above the ESL.

4.6.1.3 Soil saturation assessment

Concentrations of VOCs and SVOCs from the original RI phase were compared to Region 9 C_{SAT} values. VOC concentrations were detected below their respective CSat values. Chrysene was detected above C_{SAT} values in soil borings AOC9SB1 and AOC9SB3 in the 0-2 foot sample interval. In addition, anthracene and naphthalene were detected above the C_{SAT} values in soil boring AOC9SB2 at a depth of 18-20 feet bgs. Field observation of phased product and staining were observed in boring AOC9SB1 at a depth of 26-30 feet and in AOC9SB4 at a depth of 24-27 feet. Additional product staining, identified as a petroleum hydrocarbon, was observed at a depth of 23.5 feet within an initial boring attempt for MW-23S (boring log ID MW-23S-A) during the 2008 Supplemental RI. This interval is likely the same encountered in AOC9SB1 and AOC9SB4.

4.6.2 Geophysical results

AOC 9 consists of a former fuel oil UST area located within the south parcel of the Site approximately 4,600 ft south of Augspurger Road. The survey area was approximately 0.2 acres in size and consisted of grass and slag covered terrain with minimal (<5 ft) relief. There was no

evidence of above-ground metallic interference within the survey area at the time of data collection.

EM-61 Response

A total of 780 EM-61 data points were collected on August 25, 2005. Data points were collected along profiles spaced approximately 5-ft apart and oriented along the length of the survey area in a northeast-southwest direction (Figure 4.6.2-1A). Differential response values, measured in millivolts (mV), are calculated by taking the difference between the time-decay response values of the top and bottom coils of the instrument. Differential response values ranged from -400 to 1400 mV.

The Kriged differential response data were contoured and output is shown in Figure 4.6.2-1B. Colored contouring was applied to the output to highlight negative (light blue shading) and positive (red shading; >200 mV) differential response as a means of visualizing buried metallic anomalies. Anomalies with elevated differential responses with respect to background response (green shading) are concentrated along edges of survey area in the southwest, west, and north. These anomalies (Figure 4.6.2-1B) have defined edges that exhibit a metallic response between 200 and 800 mV. There is a dominant negative differential response, not indicative of a buried UST, in the center of AOC 9 in the area believed to the location of the former USTs.

EM-31 Response

A total of 562 EM-31 data points were collected on August 25, 2005. Similar to EM-61, data points were collected along profiles oriented along the length of AOC 9 in a northeast-southwest direction spaced approximately 5-ft apart. EM-31 readings collected at each location included both ground conductivity (mS/m) and magnetic susceptibility (ppt) data. The Kriged ground conductivity and magnetic susceptibility data were contoured and output is presented in Figures 4.6.2-1C and 4.6.2-1D. As with the EM-61 data, color enhancement was applied to the output to enhance EM-31 anomalous response.

Ground Conductivity

Relative ground conductivity values ranged from -200 to 570 mS/m. Lower relative ground conductivity (<40 mS/m; light orange-to-red shading) values were the dominant response at AOC 8, and are located throughout the survey area (Figure 4.6.2-1C). These anomalies are linear in shape and orientation, but irregular in geometry, and extend across AOC 9 from west-to-east and north-to-south. There are three areas of higher relative ground conductivity response (>120 mS/m; light-to-dark blue shading) that neighbor these linear, negative-response anomalies.

Magnetic Susceptibility

Magnetic susceptibility values ranged from -40 to 15 ppt. Negative magnetic susceptibility (light orange-to-red shading) values were the dominant response over AOC 9 with a peak linear response mapped within the southern one-half of the survey area (Figure 4.6.2-1D). Two point-source anomalies located at the northern portion of AOC 9 correlate to EM-61 response. Area background response was at or near 0 ppt with the linear anomaly having a response between -6 and -40 ppt. This linear anomaly trends west-to-east and coincides with relative ground conductivity response. Lower amplitude anomalies in the east-central portion of central portions of AOC 9 exhibit a higher relative response when compared to the aforementioned linear or point-source anomalies.

4.6.3 Summary

Based on the geophysical results, no evidence of any buried USTs was documented in AOC 9. Surface soil sampling results for AOC 9 indicate that low concentrations of metals, SVOCs and dioxins, that exceed the screening criteria, are present in surface soils. No VOCs, PCBs or cyanide were detected in surface soils or the 2-10 feet sample interval above the screening criteria.

Subsurface soil sampling results indicate that relatively low concentrations of VOCs (benzene was detected in one sample above the screening criteria at a depth greater than 10 feet), SVOCs (primarily in the 2-10 feet sample interval, below 10 feet only naphthalene was detected above the SSL), metals (only in the 2-10 foot sample interval) and dioxins (one exceedance in the 2-10 foot sample interval) are present in subsurface soils. The concentration of naphthalene in AOC9SB2 at a depth greater than 10 feet exceeds the DAF 10 SSL. However, no phased product, staining or odor was observed in this boring. Field observations of phased product and staining in AOC9SB1 and AOC9SB4 near the water table correspond to areas of elevated magnetic gradient identified by the geophysical survey. However, low concentrations of VOCs and SVOCs were observed in the samples taken from these soil borings.
Additional product staining, identified as a petroleum hydrocarbon, was observed at a depth of 23.5 feet within an initial boring attempt for MW-23S. The initial boring attempt completed for installation of MW-23S was drilled near AOC9SB1, and likely encountered the same subsurface material as in that boring. The final well boring for MW-23S was relocated slightly northeast out of observed product area. No product has been observed in monitoring well groundwater samples adjacent and downgradient of AOC 9 (e.g., MW-1S, MW-4S, MW-23S, MW-24S). The December 2005 sample results for MW-1S indicate detections of certain SVOCs, with naphthalene detected at 120ug/L. However, naphthalene was not detected above the 2.5 ug/L analytical method detection limit in the June 2008 sampling event for this well.

4.6.4 Recommendations

No further investigation of AOC 9 is recommended for purposes of delineation of the nature and extent of contaminants. Additional groundwater monitoring is anticipated to occur as the project proceeds to a CERCLA FS.

4.7 AOC 10 – Former fuel oil AST area

4.7.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 10, the former fuel oil AST area located in the southern portion of the southern parcel of the Site. A total of 4 soil borings were completed during the initial RI and were identified as AOC10SB1 through AOC10SB4. Soil samples were also collected during the installation of monitoring wells MW-4S and MW-4M, which were included as part of the AOC 10 investigation. Surface samples from 0 to 2 ft bgs were collected from AOC10SB1 through AOC10SB4 and from MW-4S. One subsurface soil sample from 2 to 10 ft bgs was collected at AOC10SB4. One or more subsurface soil samples from greater than 10 ft bgs were collected from the six soil borings. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values.

Three additional soil borings were completed during the 2008 supplemental RI in the AOC 10 area but were primarily identified as being part of the supplemental remedial investigation field work for AOC 20. The findings from analysis of soil samples from borings AOC20CA4SB3A, AOC20CA4SB3B, and AOC20CA4SB4 are evaluated within the AOC 20 discussion section as related to detected constituents and field observations of a tarry material in certain soil borings.

The analytical results for each constituent were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for surface soils, subsurface soils from 2 to 10 ft bgs, and subsurface soils greater than 10 ft bgs are provided as **Table 4.7-1** through **Table 4.7-5**. The distribution of analytical results for detectable constituents are indicated on Figure 4.0.1-1 through Figure 4.0.1-15.The preliminary ranking of chemicals detected indicate that benzene, benzo(a)pyrene, benzo(a)anthracene, arsenic, and chromium were the indicator compounds for AOC 10. Final COPCs will be selected based upon the results of the human health and ecological risk assessments. Local background concentrations are also shown in each table for reference purposes.

4.7.1.1 Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 10 investigation. VOCs detected within AOC 10 surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs within surface soil were compared to the available screening criteria and the results are presented as **Table 4.7-1**. The distribution of VOCs is provided as **Figure 4.0.1-1**. The concentrations of VOCs detected within surface soils were below the PRG and DAF 10 SSL.

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 10 investigation. SVOCs detected within AOC 10 surface soils included various PAHs and other SVOCs. The PAHs were generally detected in each surface soil sampling location. Detected concentrations of SVOCs within surface soil were compared to the available screening criteria, and the results are presented as **Table 4.7-2**. The concentrations of seven SVOCs exceeded the PRG, and four SVOCs exceeded the DAF 10 SSL in boring AOC10SB1. The distributions of SVOCs are provided as **Figure 4.0.1-4**. Benzo(a)pyrene concentrations exceeded the PRG in all five soil borings, and benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and dibenz(a,h)anthracene concentrations exceeded both the PRG and DAF 10 SSL in soil boring AOC10SB1. Fewer and lower concentration detections of SVOC were observed in the remaining three soil borings.

Metals

Metals were detected in surface soil samples collected for the AOC 10 investigation. Detected concentrations of metals within surface soil were compared to the available screening criteria, and the results are presented as **Table 4.7-3**. The concentrations of three metals (arsenic, iron, and manganese) exceeded the PRG, one metal (selenium) exceeded the DAF 10 SSL, and six metals (cadmium, lead, manganese, selenium, vanadium, and zinc) exceeded the ESL. The distribution of metals detections are provided as **Figure 4.0.1-7**. Arsenic concentrations exceeded the PRG at each surface sample location, with the highest concentration observed at AOC10SB2. Iron and

manganese concentrations exceeded the PRG and selenium concentrations exceeded the DAF10 SSL and ESL in soil boring AOC10SB1.

PCBs
Surface soil samples collected for the AOC 10 investigation were laboratory analyzed for PCBs, but no PCBs were detected in the five surface soil samples. The distributions of PCB detections are provided as **Figure 4.0.1-10**.

Dioxins
Dioxins were detected in the surface soil samples collected from AOC10SB4 and MW-4S. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,7-TCDD) and dioxin TEQ-HH values within the surface soil were compared to the Region 9 PRG, and the results are presented as **Table 4.7-5**. The distribution of dioxin detections are provided as **Figure 4.0.1-13**. No dioxins were detected at concentrations exceeding the PRG. However, several dioxin compounds were detected at concentrations exceeding the ESL in both samples. The calculated TEQ-HH and ESL value was exceeded in samples AOC10SB4 (0-1 ft) and MW-4S..

Cyanide
Surface soil samples collected for the AOC 10 investigation were laboratory analyzed for cyanide. Detected concentrations of cyanide were compared to the available screening criteria, and the results are presented as **Table 4.7-3**. Cyanide was detected in the surface soil sample collected from AOC10SB1. The surface soil detection of cyanide at AOC10SB1 did not exceed PRG. The detection did, however, exceed the ESL.

4.7.1.2 Subsurface soil

VOCs
VOCs were detected in subsurface soil samples collected for the AOC 10 investigation. VOCs detected within AOC 10 subsurface soils included primarily petroleum VOCs as well as chlorinated and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.7-1**. The distribution of VOCs is provided as **Figure 4.0.1-2** and **Figure 4.0.1-3**, respectively. Subsurface soil detects of VOCs from 2 to 10 ft bgs were below both the PRG and DAF 10 SSL. However, subsurface soil detects of benzene, ethylbenzene, styrene, toluene and total xylenes from greater than 10 ft bgs exceeded the DAF 10 SSL. Soil samples exceeding the DAF 10 SSL were collected from soil boring locations AOC10SB1 and AOC10SB2. The highest concentrations of benzene were observed in the western portion of AOC 10 within the silty clay materials located in soil boring AOC10SB1 and within the silty clay with poorly sorted sand and gravel materials located in soil boring AOC10SB2.

SVOCs
SVOCs were detected in subsurface soil samples collected for the AOC 10 investigation with the exception of MW-4M. SVOCs detected within AOC 10 subsurface soils included various PAHs and other SVOCs. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.7-2**. The distribution of SVOCs is provided as **Figure 4.0.1-5** and **Figure 4.0.1-6**, respectively. The concentrations of three PAHs exceeded the PRG within subsurface

soils from 2 to 10 ft bgs within the soil boring AOC10SB4. Subsurface soil detects of ten SVOCs from samples greater than 10 ft bgs exceeded the DAF 10 SSL. Soil samples exceeding the DAF 10 SSL were collected from soil boring locations AOC10SB1, AOC10SB2, and MW-4S. The highest concentrations of benzo(a)pyrene and benzo(a)anthracene were observed within the silty clay with poorly sorted sand and gravel materials located in soil borings AOC10SB1 and AOC10SB2 and within medium grained sand and silt materials located within MW-4S.

Metals

Metals were detected in subsurface soil samples collected for the AOC 10 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.7-3** The distribution of metal detections is provided as **Figure 4.7.1-8** and **Figure 4.7.1-9**, respectively. Chromium and manganese concentrations exceeded the PRG and selenium concentrations exceeded the DAF 10 SSL from 2 to 10 ft bgs at soil boring AOC10SB4. The only DAF 10 SSL exceedances for soils greater than 10 ft bgs were for chromium in soil boring AOC10SB3 and for selenium in soil boring AOC10SB2.

PCBs

Subsurface soil samples collected for the AOC 10 investigation were laboratory analyzed for PCBs, but no PCBs were detected in any of the samples. The distribution of PCB detections for AOC 10 and surrounding areas are provided as **Figure 4.0.1-11** and **Figure 4.0.1-12**.

Dioxins

Dioxins were detected in subsurface soil samples AOC10SB1, AOC10SB2, and MW-4M. Dioxin results for subsurface soil greater than 10 ft bgs are presented as **Table 4.7-5**. The distribution of dioxin detections are provided as **Figure 4.0.1-14** and **Figure 4.0.1-15.** No dioxins were detected at concentrations exceeding the ESL screening criteria in subsurface soil samples.

Cyanide

Subsurface soil samples collected for the AOC 10 investigation were laboratory analyzed for cyanide. Detected concentrations of cyanide for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.7-3**. Cyanide was detected in the subsurface soil from 2 to 10 ft bgs sample collected from AOC10SB4 but did not exceed the PRG. Cyanide was detected in the subsurface soil greater than 10 ft bgs sample collected from MW-4S but did not exceed the PRG. Both results did, however, exceed the ESL.

4.7.2 Summary

Surface soil sampling results for AOC 10 indicate that relatively low concentrations of PAHs and metals that exceed the screening criteria are present in surface soils, with higher concentrations observed within soil borings AOC10SB1 and AOC10SB2. Field observations indicate that surface soils mainly consist of poorly sorted sand and gravel or possibly fill materials.

Subsurface soil sampling results indicate that relatively low concentrations of metals and dioxins that exceed the screening criteria are present in subsurface soils. Higher concentrations of petroleum VOCs and PAH compounds were detected above the DAF 10 SSL within subsurface soil greater than 10 ft bgs in soil borings AOC10SB1 and AOC10SB2. The highest concentrations

of VOCs and SVOCs correspond to field observations of silty clay materials with intermittent lenses of poorly sorted sand and gravel materials, underlain by sand and gravel.

Boring logs from the initial RI indicate the presence of a "shiny" or black material present within three of the four soil borings (AOC10SB1, -SB2, and –SB3) at discrete intervals/depths ranging from 8 to 18 feet bgs. A tar material was also observed at a shallow depth (4-6 ft bgs) in well boring MW-4S. Additional investigations completed during the supplemental RI indicated the presence of a tar-like material in subsurface soils from three borings (AOC20CA4SB3A, AOC20CA4SB3B, and AOC20CA4SB4) completed at the south end of the Southern Parcel as part of the AOC 20 investigation. Two of the soil borings (AOC20CA4SB3B and AOC20CA4SB4) were completed proximal to AOC 10. Within the three borings, tar-like material was observed at depths ranging from 14.5 to 21 feet bgs, in discrete intervals. A focused figure of the above boring locations, in which a tar-like or other material was observed, is presented as Figure 4.30.2-1 in conjunction with the discussion of AOC 22. This figure shows an area at the southern tip of the Site where a NAPL material is encountered in a concentrated area. Additional information relative to the presence of NAPL is further evaluated within the AOC 20 and AOC 22 discussion sections.

VOCs and SVOCs have not been detected above the applicable MCL within groundwater monitoring wells MW-4S and MW-4M. Several SVOCs were detected at low levels in MW-4S in December 2005, with all of these low level detections being J flagged. No SVOC detections above the laboratory method detection limit were reported for the June 2008 sampling event analytical results. (See Table 4.29-2.)

4.7.3 Recommendations

No further investigation of AOC 10 is recommended. Additional groundwater monitoring is anticipated to occur as the CERCLA process proceeds to the Site FS.

4.8 AOC 11 – Former gasoline UST

4.8.1 Soil sampling and analysis

A test pit (TP1) was excavated to assess the nature and extent of constituents at AOC 11, the former gasoline UST, located in the southern parcel of the Site. Six discrete subsurface test pit soil samples were collected from the bottom and sidewalls of TP1 (in the 2 to 10 ft bgs sample interval) and identified as AOC11TP1BN, AOC11TP1BS, AOC11TP1EWN, AOC11TP1NW, AOC11TP1SW and AOC11TP1WW. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values. A geophysical survey of AOC 11 identified a subsurface anomaly in this area that suggested the presence of a buried UST. Therefore, as described in the SSP, a test pit instead of soil borings was used to investigate this area. The test pit excavation, however, exposed a large buried concrete structure with large diameter rebar. No UST was discovered in the test pit.

The analytical results for each constituent were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.8-1** through **Table 4.8-5**, respectively. The distribution of analytical results for detectable constituents

are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections.

4.8.1.1 Soil results

VOCs

One or more VOCs were detected in the test pit soil samples collected for the AOC 11 investigation. VOCs detected within test pit soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria, and the results are presented as **Table 4.8-1**. The distribution of VOCs is provided as **Figure 4.0.1-1**. Low concentration detections of several organic COCs were noted in the six soil samples analyzed from the single test pit. All of the detections were "J"-flagged. The detected concentrations of VOCs were all below both the available screening criteria.

SVOCs

SVOCs were detected in five of the six the test pit soil samples collected for the AOC 11 investigation (no detections in sample AOC11TP1EWN). Detected concentrations of SVOCs were compared to the available screening criteria, and the results are presented as **Table 4.8-2**. The distribution of SVOCs is provided as **Figure 4.0.1-4**. The concentrations of six SVOCs exceeded the PRG, and two SVOCs exceeded the DAF 10 SSL. Benzo(a)pyrene concentrations exceeded the PRG in test pit samples AOC11TP1BN, AOC11TP1BS, AOC11TP1NW, AOC11TP1SW and AOC11TP1WW. In addition, benzo(a)anthracene concentrations exceeded both the PRG and DAF10 SSL in test pit samples AOC11TP1BN, AOC11TP1SW and AOC11TP1WW, and benzo(b)fluoranthene concentrations exceeded both the PRG and DAF10 in sample AOC11TP1SW.

Metals

Metals were detected in each test pit soil samples collected for the AOC 11 investigation. Detected concentrations of metals were compared to the available screening criteria, and the results are presented as **Table 4.8-3**. The distribution of metals is provided as **Figure 4.0.1-7.** The concentrations of four metals exceeded the PRG and two metals exceeded the DAF 10 SSL. Manganese concentrations exceeded the PRG at each test pit sample location. Arsenic and iron concentrations also exceeded the PRG at one or more test pit sample locations. Selenium concentrations exceeded the DAF10 SSL in each test pit sample. Chromium (total) concentrations exceeded both the PRG and DAF10 SSL in four of six test pit samples.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for the test pit samples. Both PCB and total PCB concentrations were compared to the available screening criteria, and the results are presented as **Table 4.8-4**. The distribution of metals is provided as **Figure 4.0.1-11.** Aroclor 1260 was detected in five of six test pit samples (all but AOC11TP1EWN), with detections below the ESL (the only available screening criteria for this COC). Total PCB concentrations at four test pit sample locations (AOC11TP1BN, AOC11TP1BS, AOC11TP1WW, and AOC11TP1SW exceeded the residential PRG.

Dioxins

Dioxins were detected in test pit soil samples AOC11TP1WW and AOC11TP1BN. Dioxin concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.8-**

5. The distribution of dioxins is provided as **Figure 4.0.1-14.** Several dioxin compounds were detected above the ESL within each sample.

Cyanide
Cyanide was detected in five of six test pit soil samples (not in AOC11TP1BN). Detected concentrations of cyanide were compared to the available screening criteria, and the results are presented as **Table 4.8-3**. The detected concentrations of cyanide were below the PRG. Each of the detections were above the ESL.

4.8.2 Geophysical results

AOC 11 was the former location of gasoline UST located within the southern parcel of the Site approximately 1800 ft south of Augspurger Road. The survey area was approximately 0.1 acres in size and consisted of grass covered terrain with minimal (<2 ft) relief. Since AOC 11 was embedded within AOC 13, the AOC 11 geophysical data collection was made part of the AOC 13 data collection. For purposes of differentiating AOC 11 from AOC 13, the limits of AOC 11 survey area have been superimposed on data coverage and geophysical contour maps (Figure 4.8.2-1A). There was no evidence of above-ground metallic interference within the survey area at the time of data collection.

EM-61 Differential Response
A total of 148 EM-61 data points were collected on August 25, 2005. Data points were collected along profiles in accordance with other AOCs, oriented along the length of AOC 11 in a northeast-southwest direction spaced approximately 5-ft apart. Differential response values, measured in mV, are calculated by taking the difference between the time-decay response values of the top and bottom coils of the instrument. Differential response values ranged from -250 to 200 mV.

The Kriged differential response data were contoured and output is shown in Figure 4.8.2-1B. Colored contouring was applied to the output to highlight negative (blue shading; <0 mV) and positive (red shading; >200 mV) differential response as a means of visualizing metallic anomalies. Anomalies with elevated differential responses with respect to background response (green shading) are concentrated in the center of the AOC. This anomaly (Figure 4.8.2-1B) has defined edges that exhibit a metallic response between 200 and 800 mV located in the area believed to be the location of the former gasoline UST.

EM-31 Response
A total of 167 EM-31 data points were collected on August 25, 2005. Similar to EM-61, data points were collected along profiles oriented along the length of AOC 11 in a northeast-southwest direction spaced approximately 5-ft apart. EM-31 readings collected at each location included both ground conductivity (mS/m) and magnetic susceptibility (ppt) data. The Kriged ground conductivity and magnetic susceptibility data were contoured and output presented in Figures 4.8.2-1C and 4.8.2-1D. As with the magnetic gradient data, color enhancement was applied to the output to enhance EM-31 anomalous response.

Ground Conductivity
Relative ground conductivity values ranged from -5 to 50 mS/m. There are no interpretable ground conductivity variations within AOC 11 that correspond to the EM-61 differential response

illustrated in Figure 4.8.2-1B. Several isolated anomalies are present in AOC 13, but outside the AOC 11 survey area.

Magnetic Susceptibility
Magnetic susceptibility values ranged from -40 to 35 ppt. Centered within AOC 11 are three point-source anomalies, two of these anomalies display negative magnetic susceptibility and bracket to the northeast and southwest a positive-valued in-phase anomaly (Figure 4.8.2-1D). AOC 11 background magnetic susceptibility response was at or near 0 ppt. There appears to be little to no direct correlation between the in-phase anomalies and ground conductivity response, but the location of the magnetic susceptibility anomaly (Figure 4.8.2-1D) is consistent with the EM-61 anomaly (Figure 4.8.2-1B).

Ground Penetrating Radar
Radar signal penetration was limited to approximately 3 feet bgs using two-way travel time to depth conversion of 6 ns/ft. Signal attenuation is believed to be due to differences in soil characteristics such as moisture and clay content. Figure 4.8.2-2 shows two intersecting GPR profiles attained within the survey area. There are labeled subsurface anomalies on Lines 7 and 16 that exhibit high amplitude responses in relation to the surrounding material.

4.8.3 Summary

Results of the geophysical findings indicated the presence of an anomaly within the footprint of AOC 11. During the test pit excavation the presence of steel rebar material imbedded in concrete was discovered at that location and no indication of any buried USTs or piping lines were discovered.

Soil sampling results for AOC 11 indicate that relatively low concentrations of SVOCs, metals and PCBs that exceed the screening criteria are present in the test pit samples. Slightly elevated concentrations of chromium were observed in samples AOC11TP1BN, AOC11TP1EWN, and AOC11TP1NW. The overall distribution of soil contamination does not appear to indicate a specific source, and the contaminants observed do not appear related to the former gasoline UST.

4.8.4 Recommendations

No further investigation of AOC11 is recommended.

4.9 AOC 12 – Former waste water settling ponds

4.9.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 12, the former waste water settling ponds, located in the southern portion of the southern parcel of the Site. A total of 6 soil borings were completed and were identified as AOC12SB1 through AOC12SB6. Surface samples from 0 to 2 ft bgs were collected from the six soil borings. One subsurface soil sample from 2 to 10 ft bgs was collected at AOC12SB2, AOC12SB3, AOC12SB4, and AOC12SB6. One or more subsurface soil samples from greater than 10 ft bgs were collected from the six soil borings. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values.

The analytical results for each constituent were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.9-1** through **Table 4.9-5**, respectively. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**.. Local background concentrations are also shown in each table for reference purposes. Results of comparison to screening criteria are discussed in the following sections.

4.9.1.1 Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 12 investigation. VOCs detected within AOC 12 surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs within surface soil were compared to the available screening criteria, and the results are presented as **Table 4.9-1**. The distribution of VOCs is provided as **Figure 4.0.1-1**. Surface soil detects of VOCs were below both the PRG and DAF 10 SSL. Benzene, 2-butanone, acetone (a common laboratory artifact), and methylcyclohexane were detected within each surface soil sample collected. The detected concentrations of VOCs within surface soils were, however, below the available screening criteria.

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 12 investigation. SVOCs detected within AOC 12 surface soils included various PAHs and other SVOCs, including thirteen PAHs that were detected in the six surface soil sampling locations. Detected concentrations of SVOCs within surface soil were compared to the available screening criteria, and the results are presented as **Table 4.9-2**. The distribution of SVOCs is provided as **Figure 4.0.1-4**.The concentrations of three PAHs exceeded the PRG [benzo(k)fluoranthene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene], three PAHs exceeded both the PRG and the DAF 10 SSL [benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene], and one SVOC (carbazole) exceeded the DAF 10 SSL. Benzo(a)pyrene concentrations exceeded the PRG in six soil borings, and also exceeded the DAF 10 SSL in soil borings AOC12SB1 and AOC12SB2. Also within soil borings AOC12SB1 and AOC12SB2, the PRG and DAF 10 SSL were exceeded for benzo(a)anthracene benzo(b)fluoranthene; and carbazole concentrations exceeded the DAF 10 SSL. In general, the highest concentrations of SVOCs were detected within soil borings AOC12SB1 and AOC12SB2.

Metals

Metals were detected in surface soil samples collected for the AOC 12 investigation. Detected concentrations of metals within surface soil were compared to the available screening criteria and the results are presented as **Table 4.9-3**. The distribution of metals is provided as **Figure 4.0.1-7**. The concentrations of three metals (arsenic, iron, and manganese) exceeded the PRG, one metal (chromium) exceeded both the PRG and the DAF 10 SSL, and one metal (selenium) exceeded only the DAF 10 SSL. Arsenic concentrations exceeded the PRG at each surface sample location, with the highest concentration observed at AOC12SB4. Chromium concentrations exceeded the PRG and DAF 10 SSL at soil borings AOC12SB3 and AOC12SB4. Iron concentrations exceeded the PRG at four sample locations, with the highest concentration observed at AOC12SB4. Manganese concentrations exceeded the PRG and selenium concentrations exceeded the DAF10 SSL in soil boring AOC12SB4.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both PCB and total PCB concentrations were compared to the available screening criteria, and the results are presented as **Table 4.9-4**. The distribution of total PCBs is provided as **Figure 4.0.1-10**. Aroclor 1260 was detected in six surface soil samples, and aroclor 1248 was detected in three surface soil samples. The PRG for total PCBs was exceeded within soil borings AOC12SB1, AOC12SB2, and AOC12SB4.

Dioxins

Dioxins were detected in the surface soil samples collected from AOC12SB1 and AOC12SB5. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH values within the surface soil were compared to the Region 9 PRG, and the results are presented as **Table 4.9-5**. The distribution of dioxin detections is provided as **Figure 4.0.1-13**. The dioxin TEQ-HH concentrations were below the PRG, but above the ESL. Several individual dioxin compounds were also detected above the ESL within each sample.

Cyanide

Surface soil samples collected for the AOC 12 investigation were laboratory analyzed for cyanide. Detected concentrations of cyanide were compared to the Region 9 PRG, and the results are presented as **Table 4.9-3**. Cyanide was detected in the surface soil samples collected from AOC12SB1, AOC12SB3, AOC12SB4, and AOC12SB6. Surface soil detects of cyanide were below the PRG but above the ESL.

4.9.1.2 Subsurface soil

VOCs

VOCs were detected in subsurface soil samples collected for the AOC 10 investigation. VOCs detected within AOC 10 subsurface soils included primarily petroleum VOCs as well as chlorinated and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.9-1**. The distribution of the VOCs is provided as **Figure 4.0.1-2** and **Figure 4.0.1-3**. Subsurface soil detects of VOCs from 2 to 10 ft bgs were below the PRG and DAF 10 SSL with the exception of benzene, which exceeded the residential PRG, DAF 10 SSL, and ESL within soil boring AOC12SB4. Subsurface soil detects of VOCs from greater than 10 ft bgs were below the DAF 10 SSL. The highest concentration of benzene was observed within poorly sorted sand and gravel materials from 4 to 5.1 ft bgs located in soil boring AOC12SB4 at the southern edge of AOC 12.

SVOCs

SVOCs were detected in subsurface soil samples collected for the AOC 12 investigation with the exception of AOC12SB3 from 2 to 10 ft bgs and AOC12SB4 from greater than 10 ft bgs. SVOCs detected within AOC 12 subsurface soils included various PAHs and other SVOCs. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.9-2**. The distribution of the SVOCs is provided as **Figure 4.0.1-5** and **Figure 4.0.1-6**. The concentrations of four PAHs exceeded the PRG within subsurface soils from 2 to 10 ft bgs: benzo(a)anthracene exceeded the PRG in AOC12SB6; benzo(a)pyrene exceeded the PRG in soil

borings AOC12SB2, AOC12SB4, and AOC12SB6; and benzo(k)fluoranthene and dibenz(a,h)anthracene exceeded the PRG in AOC12SB4 and AOC12SB6. Subsurface soil detects of SVOCs from greater than 10 ft bgs were below the DAF 10 SSL. The highest concentrations of benzo(a)pyrene were observed within silty clay with some gravel located in soil borings AOC12SB2, AOC12SB4, and AOC12SB6.

Metals

Metals were detected in subsurface soil samples collected for the AOC 12 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.9-3**. The distribution of metals are provided as **Figure 4.0.1-8** and **Figure 4.0.1-9**, respectively. Arsenic concentrations exceeded the PRG within four subsurface soil samples from 2 to 10 ft bgs, and iron concentrations exceeded the PRG within subsurface soils from 2 to 10 ft bgs within soil borings AOC12SB3, AOC12SB4, and AOC12SB6. The only DAF 10 SSL exceedances for soils greater than 10 ft bgs were for chromium in soil boring AOC12SB5, and for selenium in soil borings AOC12SB1, AOC12SB2, and AOC12SB5. Arsenic was detected within subsurface soils at relatively uniform concentrations generally ranging from 5 to 15 mg/kg, with the highest concentration of 15.4 mg/kg observed within soil boring AOC12SB5 from 20 to 22 ft bgs. Selenium was not detected within the subsurface soils from 2 to 10 ft bgs but did exceed the DAF 10 SSL within the soils greater than 10 ft bgs, with the highest concentration observed within soil boring AOC12SB1 from 18 to 20 ft bgs.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for subsurface soil samples. Detected concentrations of PCBs and total PCBs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.9-4**. The distribution of total PCBs is provided as **Figure 4.0.1-11** and **Figure 4.0.1-12**. Aroclor 1248, aroclor 1254, and aroclor 1260 were detected in multiple subsurface soil samples. Total PCB detections were above the residential PRG in three subsurface soil samples (AOC12SB2, AOC12SB3, and AOC12SB6) analyzed from the 2 to 10 ft bgs interval.

Dioxins

Dioxins were detected in subsurface soil samples AOC12SB2, AOC12SB3, and AOC12SB6. Dioxin concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.9-5**. The distribution of dioxins is provided as **Figure 4.0.1-14** and **Figure 4.0.1-15**. Subsurface soil detects of dioxins were below the PRG for those dioxins which have screening values. Several dioxin compounds were detected above the ESL within two of the three samples which were analyzed from the 2 to 10 ft bgs interval. The remaining sample (AOC12SB3), collected from a deeper depth (22 – 23 ft bgs), contained no detectable dioxin concentrations.

Cyanide

Subsurface soil samples collected for the AOC 12 investigation were laboratory analyzed for cyanide. Detected concentrations of cyanide for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.9-5**. The distribution of cyanide detections are provided as **Figure 4.0.1-8** and **Figure 4.0.1-9**, respectively. Cyanide was detected in the subsurface soil from 2 to 10 ft bgs

sample collected from AOC12SB3 and AOC12SB4 but did not exceed the PRG. Cyanide was also detected in subsurface soil samples greater than 10 ft bgs collected from AOC12SB1, AOC12SB2, AOC12SB3, and AOC12SB5. No Region 9 DAF 10 SSL has been established for cyanide.

4.9.2 Summary

Surface soil sampling results for AOC 12 indicate that lower concentrations of PCBs that exceed the screening criteria are present in surface soil samples collected west and south of AOC 12 at soil borings AOC12SB1, AOC12SB2, and AOC12SB4. Relatively low concentrations of SVOCs exceeding the screening criteria are also present in surface soils throughout AOC 12, with slightly elevated concentrations to the west and southwest in AOC12SB1 and AOC12SB2. The soil saturation limit for chrysene was exceeded in borings SB1, SB2 and SB3, in the 0-2 foot sample interval. Field observations indicate the presence of some slag within AOC12SB2 surface soils. Low concentrations of metals that exceed the screening criteria are present throughout the surface soils of AOC 12, with slightly elevated concentrations detected toward the south in AOC12SB4. Chromium concentrations were also slightly elevated within the southern portion of AOC12 in AOCSB3.

Subsurface soil sampling results indicate that benzene exceeding the screening criteria was detected within the southern portion of AOC 12 in the subsurface soils of AOC12SB4 from 4 to 5.1 ft bgs. Low concentrations of SVOCs and metals that exceed the screening criteria are also present within the subsurface soils from 2 to 10 ft bgs but generally do not extend to soils greater than 10 ft bgs, with the exception of selenium and chromium. Selenium concentrations exceed the DAF in subsurface soils greater than 10 ft bgs within the central and southwestern portions of AOC12 in AOC12SB1, AOC12SB2, and AOC12SB5, and chromium exceeded the DAF within AOC12SB5 at a depth of 20 to 22 ft bgs.

Surface and subsurface soils throughout AOC 12 were observed to be relatively uniform, generally consisting of silty clay intermixed with some gravel to a depth of approximately 18 ft bgs, underlain by sand and gravel with intermittent clay lenses. Low concentrations of SVOCs, metals and VOCs were detected within the south, west and southwest portions of AOC 12. The extent of impacts appears to be vertically defined to soils less than 10 ft bgs, with the exception of selenium. Selenium concentrations slightly higher than the DAF were observed in soils greater than 10 ft bgs, extending to a depth of 22 to 24 ft bgs in AOC12SB1, AOC12SB2, and AOC12SB5 within the central and southwestern portions of AOC12. However, selenium was not detected in subsurface soils to the south of AOC 12 in monitoring well MW-2S at a depth of 24 ft bgs. Furthermore, selenium has not been detected in groundwater above the MCL within monitoring wells in the vicinity of AOC 12.

4.9.3 Recommendations

No further investigation of AOC 12 is recommended.

4.10 AOC 13 – Former by-products area

4.10.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 13, the former by-products area, located in the southern parcel of the Site. A total of 56 soil

borings were completed during the initial RI and were identified as AOC13SB1 through AOC13SB56. In addition, four shallow and four intermediate monitoring wells were installed during the initial RI and identified as MW-8S, MW-9S, MW-20S, MW-21S, MW-8M, MW-9M, MW-20M and MW-21M. During the initial RI, twenty-one soil samples were collected from 0 to 2 ft bgs, 48 soil samples from 2 to 10 ft bgs, and 46 soil samples from greater than 10 ft bgs. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values. A geophysical survey was also performed in AOC 13. The purpose of the geophysical survey was to identify subsurface anomalies that may represent buried structures and/or preferential migration pathways. Based on the geophysical results, additional borings were added to the investigation or proposed sampling locations were altered to take into consideration the subsurface anomalies or preferential pathways.

Based on the results of the initial RI, additional soil borings were recommended for completion in the northern, central and southern sections of AOC 13, to further evaluate field observations of petroleum and tar-like material in collected soil samples. Five additional shallow monitoring wells (MW-25S, MW-27S, MW-28S, MW-29S, MW-31S), one intermediate monitoring well (MW-27M), and one additional soil boring (AOC13SB57) were completed during the supplemental RI conducted in 2008.

In the northern section of AOC 13, one soil boring, converted to MW-29S, was installed to investigate the former motor fuel tank area. One additional well (MW-31S) was installed north of AOC 13 to provide water quality data north of MW-9S. A soil boring (AOC13SB57) and shallow monitoring well (MW-28S) were installed midway between MW-9S and MW-21S to further delineate field observations along the northeastern perimeter of AOC 13.

In the central portion of AOC 13, one soil boring/shallow monitoring well (MW-27S) was completed to further evaluate field observations of tar-like material observed in soil borings AOC13SB37 and AOC13SB39. This boring/well was intended to determine if LNAPL is present and further delineate groundwater quality in this area. A "product" material was observed on drilling rods during completion of this boring at an approximate depth of 16 feet bgs. The shallow well was installed with a screened depth of 8 to 18 feet bgs at this location. As a result of the observed product, an intermediate depth well (MW-27M) was also installed during the supplemental RI adjacent to the shallow well, screened from 25 to 35 feet bgs.

In the southern portion of AOC 13, one soil boring/shallow monitoring well (MW-25S) was completed to further evaluate field observations of product observed in soil borings AOC13SB14 and AOC13SB15. This boring/shallow well was intended to determine if LNAPL is present on the water table at this location.

The analytical results for each constituent detected in soil samples from both investigations were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.10-1** through **Table 4.10-4**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections. Local background concentrations are also shown in each analytical data summary table for reference purposes.

Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 13 investigation. VOCs detected within surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria, and the results are presented as **Table 4.10-1**. The distribution of the VOC exceedances in soil is provided as **Figure 4.0.1-1**. Detected concentrations of VOCs within surface soils were below the available screening criteria.

SVOCs

SVOCs were detected in several surface soil samples collected for the AOC 13 investigation. Detected concentrations of SVOCs were compared to the available screening criteria, and the results are presented as **Table 4.10-2**. The concentrations of nine SVOCs exceeded the PRG, and eight SVOCs exceeded the DAF 10 SSL. The distributions of PRG and DAF10 SSL exceedances for SVOCs are provided as **Figure 4.0.1-4**. Benzo(a)pyrene concentrations exceeded the PRG in all soil borings except AOC13SB4. The DAF 10 SSL for benzo(a)pyrene was also exceeded in soil borings AOC13SB1, AOC13SB8, AOC13SB53, and MW-20S, located in the southern portion of AOC 13.

Metals

Metals were detected in surface soil samples collected for the AOC 13 investigation. Detected concentrations of metals were compared to the available screening criteria and the results are presented as **Table 4.10-3**. The concentrations of several metals exceeded the PRG, and three metals (arsenic, cadmium, selenium) exceeded the DAF 10 SSL. The distributions of PRG and DA10 SSL exceedances for the preliminary indicator compounds arsenic and selenium are provided as **Figure 4.0.1-7**. Arsenic concentrations exceeded the PRG and/or the DAF 10 SSL at each surface sample location. Cadmium exceeded the DAF10 SSL in only two surface soil samples. Chromium (total), iron, lead and manganese concentrations also exceeded the PRG at one or more soil sample locations. Selenium concentrations exceeded the DAF10 SSL in monitoring well boring surface soil samples from MW-20S and MW-31S.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both PCB and total PCB concentrations were compared to the available screening criteria and the results are presented as **Table 4.10-4**. The distribution of total PCB exceedances is provided as **Figure 4.0.1-10**. Aroclor 1248, aroclor 1254, and aroclor 1260 were detected in surface soil samples. Total PCB concentrations exceeded the residential PRG for total PCB concentration at soil boring locations AOC13SB1, AOC13SB8, AOC13SB10, AOC13SB53, and MW-20S, located in the southern portion of AOC 13.

Dioxins

Dioxins were detected in surface soil samples AOC13SB3, AOC13SB5, and AOC13SB8. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.10-5**. The distribution of dioxin detections is provided as **Figure 4.0.1-13**. The dioxin TEQ-HH concentrations were above the ESL within each of the seven surface soil samples.

Cyanide
Cyanide was detected in surface soil samples AOC13SB6, AOC13SB10, AOC13SB12, AOC13SB49, and MW-20S. Detected concentrations of cyanide were compared to the available screening criteria, and the results are presented as **Table 4.10-3**. Surface soil detects of cyanide were below the PRG. Three cyanide detections were above the ESL (AOC13SB6, AOC13SB10, MW-20S).

4.10.1.1 Subsurface soil

VOCs
VOCs were detected in subsurface soil samples collected for the AOC 13 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.10-1**. The distribution of VOC exceedances in soils is provided as **Figure 4.0.1-2** (2 to 10 ft bgs) and **Figure 4.0.1-3** (greater than 10 ft bgs). Subsurface soil concentrations of benzene exceeded both the PRG and DAF 10 SSL at AOC13SB2, AOC13SB39, and MW-20S from 2 to 10 feet bgs. In addition, concentrations of toluene exceeded the PRG and DAF10 in AOC13SB2 from 2 to 10 ft bgs and toluene and total xylenes exceeded the PRG and DAF10 in MW-20S from 2 to 10 ft bgs. Elevated concentrations of VOCs from 2 to 10 ft bgs were primarily detected in mixed slag and silt fill material.

Subsurface soil concentrations of benzene exceeded both the DAF 10 SSL in various soil borings in soils at greater than 10 ft bgs. Exceedances were primarily located in the northeastern, eastern, and center portions of AOC13. The highest concentrations of VOCs in soils greater than 10 ft bgs were observed in soil borings AOC13SB56, MW-8M, MW-9S, MW-21S, and MW-21M. Field observations at these locations included a petroleum odor in AOC13SB56, staining and tar-like odors in MW-8S, and tar-like odors and a sheen in MW-8M and MW-9S, and tar-like odors in MW-20M.

SVOCs
SVOCs were detected in subsurface soil samples collected for the AOC 13 investigation. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.10-2**. The distribution of benzo(a)pyrene and naphthalene exceedances is provided as **Figure 4.0.1-5** (2 to 10 ft bgs) and **Figure 4.0.1-6** (greater than 10 ft bgs). Subsurface soil concentrations of benzo(a)pyrene, selected as an indicator compound, exceeded the PRG in 26 samples from 2 to 10 ft bgs. Benzo(a)pyrene concentrations also exceeded the DAF 10 SSL at soil borings AOC13SB1, AOC13SB2, AOC13SB10, AOC13SB30, AOC13SB39, AOC13SB52, and MW-20S. Subsurface soil concentrations of naphthalene exceeded both the PRG and DAF 10 SSL at soil borings AOC13SB2 , MW-8S and MW-20S from 2 to 10 ft bgs.

Subsurface soil concentrations of benzo(a)pyrene exceeded the DAF 10 SSL in five samples from greater than 10 ft bgs at soil borings AOC13SB14, AOC13SB29, AOC13SB53, MW-8S, and MW-8M. Subsurface soil concentrations of naphthalene exceeded the DAF at soil borings AOC13SB4, AOC13SB12, AOC13SB37, AOC13SB56, MW-8S and MW-8M in soils at greater than 10 ft bgs.

Field observations at these locations included a sheen at AOC13SB4, petroleum odors and phased product at AOC13SB14, a sheen at AOC13SB37, tar-like material and a sheen at AOC13SB52, petroleum odors at AOC13SB56, staining and tar-like odors in MW-8S, petroleum and tar-like odors and a sheen in MW-8M, and a tar-like material with tar-like odors in MW-20S. An apparent product was also observed on drilling rods during installation of MW-27S.

Metals

Metals were detected in subsurface soil samples collected for the AOC 13 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.10-3**.. The distribution of arsenic and selenium exceedances is provided as **Figure 4.0.1-8** (2 to 10 ft bgs) and **Figure 4.0.1-9** (greater than 10 ft bgs). Subsurface soil concentrations of arsenic from 2 to 10 ft bgs exceeded the PRG in every sample. Arsenic concentrations also exceeded the DAF 10 SSL in multiple subsurface (2 to 10ft bgs) samples. Other metals detected above the PRG from 2 to 10 ft bgs include chromium (total), iron, manganese, and thallium. Additional metals detected above the DAF 10 SSL from 2 to 10 ft bgs include cadmium, chromium (total) and selenium. Soil samples collected from greater than 10 ft bgs were below the DAF 10 SSL, except for arsenic in several samples, and selenium at AOC13SB4, MW-8S, and MW-27M.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for subsurface soil samples. Detected concentrations of PCBs and total PCBs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.10-4**. The distribution of total PCBs is provided as **Figure 4.0.1-11** (2 to 10 ft bgs) and **Figure 4.0.1-12** (greater than 10 ft bgs). Aroclor 1248 and aroclor 1260 were detected in multiple subsurface soil samples. Total PCB concentrations exceeded the PRG in soils from 2 to 10 ft bgs at soil borings AOC13SB10,, AOC13SB16, AOC13SB24, AOC13SB30, AOC13SB38, AOC13SB39, AOC13SB49, AOC13SB52, AOC13SB55 and MW-20S. Total PCB concentrations exceeded the PRG in soils from greater than 10 ft bgs at soil borings AOC13SB11, AOC13SB14, and AOC13SB37.

Dioxins

Dioxins were detected in subsurface soil samples collected for the AOC13 investigation. Dioxin concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.10-5**. The distribution of dioxins is provided as **Figure 4.0.1-14** and **Figure 4.0.1-15**. Several dioxin compounds were detected above the ESL within the samples analyzed from the 2 to 10 ft bgs and greater than 10 ft bgs intervals.

Cyanide

Cyanide was detected in subsurface soil samples collected for the AOC 13 investigation. Cyanide concentrations for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.10-3**. Subsurface soil detects of cyanide were below the PRG. Several cyanide detections were above the ESL.

4.10.1.2 Soil saturation assessment

Concentrations of the initial RI data for AOC 13 VOCs and SVOCs were compared to Region 9 C_{SAT} values. One or more PAHs were detected above C_{SAT} values in soil borings AOC13SB1, AOC13SB2, AOC13SB4, AOC13SB8, AOC13SB10, AOC13SB14, AOC13SB29, AOC13SB30, AOC13SB37, AOC13SB39, AOC13SB52, AOC13SB53, AOC13SB56, MW-8S, MW-8M, and MW-20S. In addition, the concentration of total xylenes in soil boring MW-8M was detected above C_{SAT} values. Various observations of odors (tar-like and petroleum), staining, sheen, separate phase product, and tar-like material were noted in samples collected from borings AOC13SB4, SB6, SB7,SB8, SB14, SB15, SB37, SB46 and SB52, as well as MW-8S, MW-8M, MW-9S, MW-20S, MW-20M, and MW-27S (see Table 8.1-1 for additional information). These observations occurred primarily below a depth of 10 feet, with the exception of tar-like material observed in SB52 at a depth of 4 to 6 feet, odors, staining and tar-like material observed in MW-8S and -9S at a depth of 6 to 8 feet, and tar odor observed in MW-20S at 8-9.2 feet. Separate phased product (LNAPL or DNAPL) was not observed in any of the monitoring wells installed in AOC 13.

4.10.2 Geophysical results

AOC 13 consists of a former byproducts area located within the south parcel of the Site approximately 1,200 ft south of Augspurger Road. The survey area was approximately 10.5 acres in size and was surveyed, due to proximity, to include AOCs 11, 14, 15, and 18 (see Figure 4.10.2-1A). The purpose of the geophysical survey was to identify subsurface anomalies that may represent buried structures and/or preferential migration pathways. Based on the geophysical results, additional borings were added to the investigation or proposed sampling locations were altered to take into consideration the subsurface anomalies or preferential pathways. The ground conditions consisted of grass-covered terrain with moderate (<10ft) relief. Several small (approximately 0.1 acre) vegetated mounds were located within the area of investigation. These mounds were cleared of brush and traversed during data collection. The eastern limits of the survey area were bordered by dense vegetation and chain link perimeter fencing. There were visible signs of above-ground metallic interference to include razed/cut steel beam supports, conduit, steel reinforcing mesh, and utility manway covers.

EM-61 Differential Response

A total of 23,158 EM-61 data points were collected on August 26-27, 2005. Data points were collected along profiles oriented along the length of AOC 13 in a northeast-southwest direction spaced approximately 5-ft apart. Differential response values, measured in mV, were calculated by taking the difference between the time-decay response values of the top and bottom coils of the instrument. Differential response values ranged from -500 to 2,500 mV.

The Kriged differential response data were contoured and output is shown in Figure 4.10.2-1B. Color shading was applied to contoured output to highlight negative (dark blue shading; <0 mV) and positive (red shading; >200 mV) differential response as a means of visualizing metallic anomalies. Elevated differential responses with respect to background response (green shading) are located throughout the survey area. Most rectangular anomalies are attributed to metallic interference from field observed concrete foundations and razed structures located at the surface. Linear anomalies are distributed throughout AOC 13 and are most commonly aligned between the rectangular building foundations and concrete pads illustrated on Figure 4.10.2-1B. The "ring" structure located in the southern one quarter of the survey area correlates to the foundation location of the former coke oven gas holder. There was limited interference in data collected

adjacent to the perimeter fencing, but signal penetration loss due to topography resulted in the instrument not sensing numerous structures that were formerly located in northern one-half of site interior.

EM-31 Response

A total of 24,615 EM-31 data points were collected on August 26-27, 2005. Similar to EM-61, data points were collected along profiles oriented along the length of AOC 13 in a northeast-southwest direction spaced approximately 5-ft apart. EM-31 readings collected at each location included both ground conductivity (mS/m) and magnetic susceptibility (ppt) data. The Kriged ground conductivity and magnetic susceptibility data were contoured and color enhanced output is presented in Figures 4.10.2-1C and 4.10.2-1D. As with the magnetic gradient data, color shading was applied to the output to highlight EM-31 anomalous response.

Ground Conductivity

Relative ground conductivity values ranged from -400 to 1,200 mS/m. Both lower relative ground conductivity (<0 mS/m; light orange-to-red shading) anomalies and peak positive ground conductivity responses correlate to EM-61 anomalies. There are several NE-to-SW and NW-to-SE trending linear anomalies located throughout AOC 13, coincident with those illustrated in the EM-61 differential response contour map (Figure 4.10.2-1B). Higher relative ground conductivity response (>100 mS/m; light-to-dark blue shading) was generally restricted to the north and south lateral limits of the survey area and corresponds to areas of lower topography, and similar to EM-61 response, the areas of higher topography resulted in a reduced signal response.

Magnetic Susceptibility

Magnetic susceptibility values ranged from -35 to 30 ppt. Negative magnetic susceptibility (light orange-to-red shading) values were coincident with negative relative ground conductivity response illustrated in Figure 4.10.2-1C. Area background response was at or near 0 ppt (green shading). There are a limited number of high magnetic susceptibility (light-to-dark blue shading) anomalies located within AOC 13. Both linear and rectangular-shaped anomalies are present within AOCs 13 and 15, and coincide with those illustrated on the ground conductivity and differential response contour maps.

Ground Penetrating Radar

A series of GPR profiles were collected in AOC 13, 18 and 15, oriented mainly in the NW-SE direction and transverse to long axis of EM-61 anomalies. Total linear footage collected was approximately 4,200 ft. Radar signal penetration was limited to approximately 20 ns two-way travel time. Using a 6 ns/ft for travel time to depth conversion this equals to approximately 3 ft bgs. Signal attenuation is believed to be due to elevated soil conductivities estimated at >50 ms/m differences in soil characteristics such as moisture and clay content. Additionally, topographic relief coupled with limited signal penetration, greatly diminished imaging capabilities of GPR. Figure 4.10.2-2 shows six GPR profiles collected within the survey area and a trackline map indicating location of these radar profiles. There are labeled locations of known surface features such as roads, concrete foundations and former building slabs on the radar profiles. Point-source reflections identified on the radar profiles (arrows) are subsurface targets that exhibit high-amplitude responses in relation to the surrounding material within the zone of effective depth of penetration. Laterally continuous reflections (e.g., Lines 10, 16, and 19) are generally not flat-lying but sloping and irregular (see green highlighting). Many of these radar anomalies correlate to EM-31 anomalies (Figure 4.10.2-1 for example).

4.10.3 Summary

Surface soil sampling results for AOC 13 indicate relatively low concentrations of metals and dioxins that exceed the screening criteria are present in surface soils. Higher concentrations of SVOCs and PCBs were detected within surface soils at AOC13. Elevated concentrations of SVOCs and PCB were generally found at the same locations and were primarily observed at AOC13SB1, AOC13SB2, AOC13SB8, AOC13SB10, AOC13SB53 and MW-20S. Observations of staining, odors or phased product was not detected in surface soils at these locations, sampled material was similar to other soils observed in AOC13. Surface soils consisted of topsoil and fine grained fill materials with intermixed slag. The overall distribution of SVOC and PCB surface soil contamination appears to be concentrated in the southeastern and central portions of AOC 13.

Subsurface soil sampling results for soil from 2 to 10 ft bgs indicate that relatively low concentrations of dioxins that exceed the screening criteria are present in subsurface soils. Higher concentrations of VOCs, SVOCs, metals, and PCBs were detected in subsurface soils between 2 to 10 feet bgs. Elevated concentrations of contaminants were generally found at the same locations and were observed at AOC13SB1, AOC13SB2, AOC13SB10, AOC13SB30, AOC13SB38, AOC13SB39, AOC13SB52 and MW-20S. Exceedances of the screening criteria were primarily observed in the southeastern and central portions of AOC13. Constituents detected above the screening criteria in the southeastern and central portions of AOC13 are located in mixed slag and silt fill material that overlies native soils. The highest concentrations of detected constituents correspond to observations of a tar-like odor at MW-20S from 8 to 10.5 ft bgs. A tar like residue was also observed in a split spoon without recovery in the central portion of AOC 13 at AOC13SB52 from 4 to 6 ft bgs.

Subsurface soil sampling results for soil from greater than 10 ft bgs indicate that relatively low concentrations of metals that exceed the screening criteria are present in subsurface soils. Higher concentrations of VOCs and SVOCs were detected in subsurface soils greater than 10 feet bgs. Concentrations of constituents that exceeded the screening criteria were from samples in the southern, central and northern portions of AOC 13 (i.e., AOC13SB4, AOC13SB6, AOC13SB12, AOC13SB13, AOC13SB14, AOC13SB29, AOC13SB37, AOC13SB40, AOC13SB53, AOC13SB56, MW-8S, MW-8M, MW-9S, MW-20S, MW-21S, and MW-21M).

High concentrations of VOCs observed in the northern portion of the Site were predominantly petroleum related compounds (BTEX). However, high concentrations of naphthalene were also observed in soil borings AOC13SB12 and AOC13SB56. VOCs in the northern portion of AOC 13 appear to be located in both native and fill materials. Elevated concentrations of VOCs corresponded to observations of a separate phased product in AOC13SB6 from 18 to 21 ft bgs, petroleum odors in AOC13SB12 from 19 to 20 ft bgs, petroleum odors in AOC13SB13 from 16 to 17 ft bgs, petroleum odors in AOC13SB56 from 15 to 20 ft bgs, petroleum and tar-like odors, and a sheen in the boring for MW-9S from 16 to 31 ft bgs. To the north of AOC 13, a sheen and odor in AOC15SB1 from 16 to 18 ft bgs and staining and petroleum odor in AOC15SB3 from 18 to 20 ft bgs were observed. Evidence of petroleum impacts were generally observed in these borings at depths located at the interface of coarse grained and fine grained materials, and in soils adjacent to the water table.

Elevated concentrations of VOCs and SVOCs were observed in the central portion of AOC13 and appear to be located in both native and fill materials. Elevated concentrations corresponded to

observations of a sheen in AOC13SB4 from 15 to 18 ft bgs, slag, wood and odors in AOC13SB37 from 6 ft to 26 ft bgs, staining and tar-like odors in the boring for MW-8S from 10 to 28 ft bgs, and petroleum and tar-like odors in MW-8M from 22 to 28 ft bgs. Other observations in the central area included a sheen and odors in AOC13SB39 from 10 to 16 ft bgs, and tar-like materials and a sheen in AOC13SB52 from 14 to 18 ft bgs. Evidence of petroleum impacts were generally observed in these borings at depths located at the interface of coarse grained and fine grained materials, and in soils adjacent to the water table.

Soil impacts observed in the southern portion of AOC 13 were predominantly VOCs. However, concentrations of VOCs observed in the southern portion of AOC 13 were generally lower than in the central and northern portions of AOC 13. Impacts in the southern portion of AOC 13 appear to be located in both native and fill materials. Elevated concentrations of VOCs corresponded to observations of a petroleum odor, sheen and phased product in AOC13SB14 from 10 to 18 ft bgs. Other observations of soil impacts in the southern portion of AOC 13 included phased product in AOC13SB15 from 15 to 18 ft bgs.

Multiple borings in the northern portion of AOC13 with high concentrations of BTEX also had relatively low concentrations of SVOCs and may be related to the former motor fuel storage area. Impacts observed in the central and southern portions of AOC13 may be related to the historical storage and processing of coke oven by-products.

Observations of a product sheen on drilling rods during completion of supplemental RI monitoring well MW-27S, resulted in installation of intermediate well MW-27M. As of the date of this report, no NAPL has been indicated to be present in either well. Soil samples collected from these two supplemental investigation borings yielded only low concentration BTEX constituent detections in subsurface soil samples, and detections of various SVOC and metals detections in surface samples.

Detailed figures of AOC 13 were prepared to further evaluate the elevated soil and groundwater detections. Figure 4.10.3-1 depicts all AOC 13 soil sample detections that exceed one or more of the four screening criteria for specific potential COCs determined in the Site HHRA to pose potential risk above the most conservative USEPA threshold of $1x10^{-6}$. Figure 4.10.3-1 provides tabulated concentrations of laboratory analytical detections for benzene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)flouranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, naphthalene, and total PCBs, with relevant sample depths noted in the data as tabulated on the figure. These parameters were selected based upon Tables 9-3, 9-4 and 9-5 of the Site Baseline HHRA, which present a summary of potential chemicals of concern in soil at AOC 13 for each calculated risk level in the USEPA CERCLA risk range required to be evaluated (10E-4 to 10E-6). This figure provides an overview of the presence of these potential chemicals of concern throughout AOC 13. Please note that this figure only presents soil analytical results within AOC 13.

The data for AOC 13 were further evaluated by depth intervals of 0-2', 2-10' and greater than 10', with evaluation focused on exceedances of Industrial PRG and DAG 10 screening values. This data evaluation is illustrated in Figure 4.10.3-2. Residential PRGs were not included in this focused figure set, due to the determination that a future residential use of the property is not reasonably anticipated. Further, ecological screening levels were not carried forward to Figure 4.10.3-2, as this portion of the site has been determined to not have ecological risk drivers.

As residential PRG and ecological screening levels are removed from the data set, PCB exceedances no longer are included in the data set. Groundwater data were included in Figure 4.10.3-2 to allow visual and sample location-specific evaluation of the relationship between soil and groundwater data. Groundwater data are displayed only on the portion of the figure that illustrates soil analytical concentrations at depths >10', since all groundwater monitoring wells are completed at depths >10' below grade. The groundwater data presented is limited to the 2008 sitewide sample results. A complete set of groundwater data is provided in Tables 4.29-1 through 4-29-5.

Cyanide was added to the multi-depth evaluation figure, based upon this parameter being a key analyte regarding AOC 13 groundwater results. Please note that not all SVOCs and VOCs included in the HHRA Tables 9-3 through 9-5 are displayed on Figure 4.10.3-2, but only those that are common with soil detections and that also illustrate key or frequent detections. For example, benzene is the only VOC displayed on this figure, though toluene is included as a potential COC for AOC 13 groundwater in the HHRA. However, all detections of toluene in groundwater at AOC 13 occur in conjunction with detections of benzene. Also, SVOC groupings generally are represented by the subset of SVOCs displayed on the figure. Complete data tables for all soil detections for all parameters at AOC 13 are provided in Tables 4.10-1 through 4.10-5.

Figure 4.10.3-2 assists in interpretation of potential soil to groundwater subsurface interaction at AOC 13. Soil results displayed as green boxes on the figure indicate an exceedance of one or more DAF 10 and/or industrial PRG screening values for the select parameters. A grey dot indicates that a soil sample was not collected/submitted for analysis at the displayed depth interval at a given boring location. A blue diamond illustrates locations where soil concentrations exceeded neither a DAF 10 nor an Industrial PRG for any of the select parameters tabulated.
This figure demonstrates that most soil samples collected at >10' below grade exceed one or more analyte DAF 10 screening values and/or an Industrial PRG. When groundwater data are displayed in conjunction with these deeper samples, it becomes clear that despite elevated soil concentrations in the southern portion of AOC 13 (see soil boring location AOC13SB14), groundwater has not been impacted at MW-7S or MW-7M. Low to non-detectable concentrations of these select parameters at MW-31S, MW-30S, MW-6S, MW-6M and MW-25S also clearly demonstrate that groundwater impacts at AOC 13 have been fully delineated. Detections in groundwater at MW-27S and MW-27M are generally consistent with deeper soil analytical results at proximal borings AOC13SB40 and AOC13SB37.

Groundwater data relevant to AOC 13 is summarized in Section 4.29 of this report.

4.10.4 Recommendations

No further remedial investigation of AOC 13 is recommended, as the nature and extent of COCs have been adequately delineated for purposes of the RI. Additional groundwater monitoring is anticipated to occur as the CERCLA process moves into the conduct of a Feasibility Study for the Site. However, the nature and extent of AOC 13 contaminants have been adequately delineated for purposes of the RI.

4.11 AOC 14 – Former transformer and compressor area

4.11.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 14, the former transformer and compressor area, located in the southern parcel of the Site. A total of 4 soil borings were completed and were identified as AOC14SB1 through AOC14SB4. Surface samples were collected at AOC14SB1 through AOC14SB4 from 0 to 2 ft bgs. Subsurface soil samples were collected at each boring from 2 to 10 ft bgs. One or more subsurface soil samples were collected at each soil boring from greater than 10 ft bgs. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values. A geophysical survey was also performed in AOC 14 and is discussed in Section 4.10.2 above. The purpose of the geophysical survey was to identify subsurface anomalies that may represent buried structures and/or preferential migration pathways in AOC 14 and ensure borings in AOC 14 were properly located.

The analytical results for each constituent were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.11-1** through **Table 4.11-5**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections.

4.11.1.1 Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 14 investigation. VOCs detected within surface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria, and the results are presented as **Table 4.11-1**. The distribution of VOCs is provided as **Figure 4.0.1-1**. Detected concentrations of VOCs, including benzene within surface soils were below the PRG and DAF 10 SSL.

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 14 investigation. Detected concentrations of SVOCs were compared to the Region 9 PRG and DAF 10 SSL, and the results are presented as **Table 4.11-2**. The distribution of SVOCs is provided as **Figure 4.0.1-4**. The concentrations of six SVOCs exceeded the PRG. Benzo(a)anthracene, benzo(a)pyrene and benzo(k)fluoranthene concentrations exceeded the PRG in three of four surface soil samples. In addition, benzo(a)anthracene concentration exceeded the DAF10 SSL in soil boring AOC14SB1, AOC14SB2, and AOC14SB3.

Metals

Metals were detected in surface soil samples collected for the AOC 14 investigation. Detected concentrations of metals were compared to the Region 9 PRGs and DAF 10 SSLs, and the results are presented as **Table 4.11-3**. The distribution of metals is provided as **Figure 4.0.1-7**. The concentrations of three metals exceeded the PRG, and one metal exceeded both the PRG and the DAF 10 SSL. Arsenic concentrations exceeded the PRG at each surface sample

location. Iron and manganese concentrations also exceeded the PRG at one or more soil sample locations. Chromium (total) concentrations exceeded both the PRG and the DAF10 SSL in soil boring AOC14SB2. Selenium concentrations exceeded the DAF 10 SSL in two surface samples from AOC14SB1 and AOC14SB3. In addition, several metals (barium, cadmium, copper, lead, manganese, mercury, selenium, and vanadium) exceeded the ESL in one or more surface soil samples.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both PCB and total PCB concentrations were compared to the Region 9 PRG and the results are presented as **Table 4.11-4**. The distribution of total PCB is provided as **Figure 4.0.1-10.** Aroclor 1260 was detected in each of the four surface soil samples. Total PCB concentrations exceeded the PRG in soil boring AOC14SB2 and AOC14SB3.

Dioxins

Dioxins were detected in surface soil samples AOC14SB1, AOC14SB3, and AOC14SB4. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.11-5**. The distribution of dioxin TEQ-HH is provided as **Figure 4.0.1-13**. The dioxin TEQ-HH concentrations for AOC14SB1 and AOC14SB3 exceeded the PRG and the ESL. Several individual constituent concentrations also exceeded the ESL.

Cyanide

Cyanide was detected in the surface soil sample collected from boring AOC14SB3. The detected concentration of cyanide was compared to the Region 9 PRG, and the result is presented in **Table 4.11-3**. The surface soil detect of cyanide was below the PRG and the ESL.

4.11.1.2 Subsurface soil

VOCs

VOCs were detected in subsurface soil samples collected for the AOC 14 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.11-1**. The distribution of benzene, selected as an indicator compound is provided as **Figures 4.0.1-2** and **4.0.1-3**. Subsurface soil detects of VOCs from 2 to 10 ft bgs and greater than 10 ft bgs were below the PRG. However, subsurface soil detections of benzene exceeded the DAF10 SSL in two soil samples; AOC14SB1 and AOC14SB3 from greater than 10 ft bgs.

SVOCs

SVOCs were detected in subsurface soil samples collected from AOC14SB2, AOC14SB3, and AOC14SB4. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.11-2**. The distribution of SVOCs is provided as **Figure 4.0.1-5 and 4.0.1-6**. Subsurface soil detects of several SVOCs from 2 to 10 ft bgs exceeded the PRG primarily in one sample (AOC14SB2). Soil samples exceeding the PRG were collected from soil boring locations

AOC14SB2 and AOC14SB4. Subsurface soil detects of SVOCs from greater than 10 ft bgs were below the DAF 10 SSL.

Metals

Metals were detected in subsurface soil samples collected for the AOC 14 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.11-3.** The distribution of metals is provided as **Figure 4.0.1-8 and 4.0.1-9**. At one or more soil boring locations arsenic, iron, and manganese concentrations exceeded the PRG, and selenium concentrations exceeded the DAF 10 SSL from 2 to 10 ft bgs. No metal concentrations in soil at depths greater than 10 ft bgs were above the DAF 10 SSL.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for subsurface soil samples. Detected concentrations of PCBs and total PCBs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.11-4.** The distribution of PCBs is provided as **Figure 4.0.1-11 and 4.0.1-12**. Aroclor 1260 was detected in two of eight subsurface soil samples (AOC14SB2 and AOC14SB4). Total PCB concentrations were above the PRG in one sample (AOC14SB2).

Dioxins

Dioxins were not analyzed from subsurface soil samples collected for the AOC 14 investigation.

Cyanide

Cyanide was detected in one subsurface soil sample (AOC14SB4) collected for the AOC 14 investigation. Cyanide concentrations for subsurface soil from 2 to 10 ft bgs were compared to the Region 9 PRG, and the results are presented as **Table 4.11-3**. The subsurface soil detect of cyanide was below the PRG but above the ESL.

4.11.2 Summary

Surface soil sampling results for AOC 14 indicate that low concentrations of metals, SVOCs, PCBs and dioxins that exceed the screening criteria are present in surface soils and occurs in both native and fill materials.

Subsurface soil sampling results indicate that relatively low concentrations of metals and dioxins that exceed the screening criteria are present in surface and/or subsurface soils. Higher concentration of chromium (total) was detected in soil boring AOC14SB2 and relatively high concentrations of manganese were detected in each soil boring.

Observations of product/sheen and diesel odors were observed in the field at AOC14SB4 from 16 to 21 ft bgs. However, subsurface petroleum impacts are limited as these field observations were not observed in any adjacent borings and may be associated with AOC 13, the former by products area. In addition, there appears to be limited vertical migration of COCs, as the concentration of VOCs and SVOCs at AOC14SB4 were below the DAF 10 SSL in soils from 20 to 22 ft bgs.

4.11.3 Recommendations

No further investigation of AOC 14 is recommended.

4.12 AOC 15 – Former transformer area

4.12.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 15, former transformer area, located in the southern parcel of the Site. A total of 4 soil borings were completed and were identified as AOC15SB1 through AOC15SB4. Surface samples were collected at all borings from 0 to 2 ft bgs. Subsurface soil samples were collected at AOC15SB1 and AOC15SB2 from 2 to 10 ft bgs. One or more subsurface soil samples were collected at all soil borings from greater than 10 ft bgs. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values. A geophysical survey was also performed in AOC 15 and is discussed in Section 4.10.2 above. The purpose of the geophysical survey was to identify subsurface anomalies that may represent buried structures and/or preferential migration pathways in AOC 15 and ensure borings in AOC 15 were properly located.

The analytical results for each contaminant were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.12-1** through **Table 4.12-5**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections.

4.12.1.1 Surface soil

VOCs

VOCs were detected in surface soil samples collected for the AOC 15 investigation. VOCs detected within surface soils included petroleum and other non-chlorinated VOCs. Detected concentrations of VOCs were compared to the available screening criteria, and the results are presented as **Table 4.12-1**. The distribution of VOCs is provided as **Figure 4.0.1-1**. Benzene and several other VOCs (acetone, carbon disulfide, bromomethane, cyclohexane, ethylbenzene, toluene, xylenes) were detected in low concentrations within each surface soil sample collected. All detected concentrations of VOCs within surface soils were below the available screening criteria.

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 15 investigation. Detected concentrations of SVOCs were compared to the available screening criteria, and the results are presented as **Table 4.12-2**. The concentrations of six SVOCs exceeded the PRG (benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene), three SVOC exceeded both the PRG and the DAF 10 SSL (benzo(a)anthracene, benzo(b)fluoranthene, dibenz(a,h)anthracene), and one SVOC (naphthalene) was found to exceed the ESL in surface soil samples. The distribution of SVOCs is provided as **Figure 4.0.1-2**. Benzo(a)pyrene concentrations exceeded the PRG in each surface

soil sample. In addition, benzo(a)anthracene concentration exceeded both the PRG and DAF10 SSL in soil boring AOC15SB1.

Metals

Metals were detected in surface soil samples collected for the AOC 15 investigation. Detected concentrations of metals were compared to the available screening criteria, and the results are presented as **Table 4.12-3**. The concentrations of six metals (arsenic, cadmium, chromium, iron, lead, manganese)exceeded the PRG, three metals exceeded both the PRG and the DAF 10 SSL. (arsenic, cadmium, chromium), and nine metals exceeded the ESL (cadmium, chromium, copper, lead, manganese, selenium, silver, vanadium, zinc). The distribution of metals is provided as **Figure 4.0.1-3**. Arsenic concentrations exceeded the PRG at each surface sample location. Cadmium, chromium, iron, lead and manganese concentrations also exceeded the PRG at one or more soil sample locations. One or more metals exceeded the DAF 10 SSL in soil borings AOC15SB1, AOC15SB2, and AOC15SB3. Arsenic, cadmium and chromium (total) concentrations exceeded both the PRG and the DAF10 SSL in soil boring AOC15SB1 , arsenic and chromium in AOC15SB2, and chromium only in AOC15SB3. ESL exceedances were noted for several metals in each of the four soil borings from which surface samples were analyzed.

PCBs

Statistical analysis was performed on analytical data for PCBs to calculate representative total PCB concentrations for surface soil samples. Both PCB and total PCB concentrations were compared to the available screening criteria and the results are presented as **Table 4.12-4**. The distribution of PCBs is provided as **Figure 4.0.1-4.** Aroclor 1260 was detected in each of the four surface soil samples; Aroclor 1248 was detected in one surface soil sample at AOC15SB4. Total PCB concentrations exceeded the PRG at soil sampling locations AOC15SB1, AOC15SB2 and AOC15SB3. Total PCB concentrations did not exceed the PRG at soil sampling location AOC15SB4.

Dioxins

Dioxins were detected in surface soil samples at AOC15SB1 for two sampling events. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG, and the results are presented as **Table 4.12-5**. The distribution of dioxin TEQ-HH is provided as **Figure 4.0.1-5**. The dioxin TEQ-HH concentration for AOC12SB1 and AOC15SB1 exceeded the residential PRG for the TEQ-HH value. Several individual constituent detections exceeded their corresponding ESL.

Cyanide

Cyanide was detected in three of four surface soil samples (AOC15SB1, AOC15SB2 and AOC15SB3) collected for the AOC 15 investigation. Detected concentrations of cyanide were compared to the available screening criteria, and the results are presented as **Table 4.12-3**. Surface soil detects of cyanide were below the PRG but above the ESL in each of the three samples.

4.12.1.2 Subsurface soil

VOCs

VOCs were detected in subsurface soil samples collected for the AOC 15 investigation. VOCs detected within subsurface soils included chlorinated, petroleum, and other non-chlorinated VOCs. Detected concentrations of VOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.12-1**. The distribution of VOCs is provided as **Figure 4.0.1-2 and 4.0.1-3**. Benzene and several other VOCs (acetone, carbon disulfide, bromomethane, cyclohexane, ethylbenzene, toluene, xylenes) were detected in low concentrations within each of the eight soil samples collected. Subsurface soil detects of VOCs from 2 to 10 ft bgs exceeded the DAF 10 SSL. for benzene in one soil sample (AOC15SB1). Subsurface soil detects of benzene exceeded the DAF 10 SSL in three soil samples from greater than 10 ft bgs (AOC15SB1, AOC15SB3 and AOC15SB4). The ESL for benzene was also exceeded in AOC15SB4.

SVOCs

SVOCs were detected in subsurface soil samples collected from AOC15SB1, AOC15SB3 and AOC15SB4. Detected concentrations of SVOCs for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.12-2**. The distribution of SVOCs is provided as **Figure 4.0.1-5 and 4.0.1-6.** Benzo(a)pyrene and naphthalene were the only two SVOC found to exceed the available screening criteria. Detections of benzo(a)pyrene exceeded the residential PRG in one sample (AOC15SB1). Detections of naphthalene exceeded the ESL in two samples (AOC15SB1 and AOC15SB3).

Metals

Metals were detected in subsurface soil samples collected for the AOC 15 investigation. Detected concentrations of metals for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.12-3**. The distribution of metals is provided as **Figure 4.0.1-8 and 4.0.1-9.** Concentrations of arsenic exceeded the residential PRG in six of seven samples, and the DAF 10 SSL in one sample. Selenium was found to exceed the DAF 10 SSL in one sample, and the ESL in five samples. Vanadium was found to exceed the ESL in six samples.

PCBs

Soil PCB results for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.12-4**. The distribution of PCBs is provided as **Figure 4.0.1-11 and 4.0.1-12.** PCBs were not detected in subsurface soils during the AOC 15 investigation.

Dioxins

Dioxins were detected in subsurface soil samples from AOC15SB2 and AOC15SB3. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for subsurface soil samples. Dioxin and dioxin TEQ-HH concentrations for subsurface soil from greater than 10 ft bgs are presented as **Table 4.12-5**. The distribution of dioxin TEQ-HH is provided as **Figure 4.0.1-14 and 4.0.1-15**. Detected dioxin concentrations were below the screening criteria in one sample (AOC15SB2). Several individual constituent detections were above the ESL in the remaining sample (AOC15SB3).

Cyanide

Cyanide was detected in subsurface soil samples collected for the AOC 15 investigation. Concentrations of cyanide for subsurface soil from 2 to 10 ft bgs and from greater than 10 ft bgs were compared to the available screening criteria, and the results are presented as **Table 4.12-3**. Subsurface soil detects of cyanide were below the PRG. Cyanide detections were above the ESL in two soil samples (AOC15SB1 and AOC15SB4).

4.12.2 Summary

Surface soil sampling results for AOC 15 contained low concentrations of VOCs, SVOCs, metals and dioxins that exceed one or more of the screening criteria. Concentrations of metals and total PCBs were observed in soil borings AOC15SB1 through AOC15SB3. Slag fill materials were observed in surface soils throughout AOC 15. Subsurface soil sampling results indicate that low concentrations of arsenic that exceed the screening criteria are present in subsurface soils. Detectable concentrations of benzene were detected in soil borings AOC15SB1, AOC15SB3, and AOC15SB4 and correspond to field observations of a sheen, petroleum odor and/or staining observed at 18 to 20 ft bgs in soil borings AOC15SB1 and AOC15SB3, and at 16.5 to 18 ft bgs in soil boring AOC15SB4. VOCs were also detected in groundwater samples taken at MW-9S and MW-9M which are located downgradient from AOC 15. No separate phase product has been observed in these monitoring wells. The subsurface field observations of petroleum staining and odors may be associated with AOC 13, the former by-products area.

4.12.3 Recommendations

No further investigation of AOC 15 is recommended.

4.13 AOC 16 – Off-site concerns (southern parcel)

AOC 16 included, in general, the western boundary of the Southern Parcel where potential impacts from adjoining properties, historic and current (e.g., the former Otto Coke Company, the active railroad tracks and the New Miami Maintenance Department) may have affected the environmental conditions at the Site.

4.13.1 Soil sampling and analysis

The evaluation of potential off-site impacts to the western property boundary included a comparison of 6 on-site soil borings or composite sampling areas to 4 off-site background samples collected in areas representative of potential off-site sources. These on-site borings/composite areas were identified as BBSB2, AOC20CA1, AOC20CA2, AOC20CA3, MW-6S, and AOC20SB41. Surface sample data from these locations were compared with the 4 background samples collected in the off-site concern adjacent to the southern parcel and included borings BGPRK5, BGRR2, BGVNW7, and BGRR3. Background borings BGRR2 and BGRR3 were collected west of the railroad tracks and BGVNW7 was collected near the former Otto Coke facility. Only background surface samples (0-2 feet) were included in the comparison since the most likely routes for off-site impacts to Site is through fugitive dust, air emissions, or surface water runoff. The evaluation only included TAL metals, PAHs and dioxins as the background samples were only analyzed for these parameters.

The analytical results for relevant constituents were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table**

4.13.1-1 through **Table 4.13.1-6**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections.

Constituent detections indicate that benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene arsenic, lead, iron, chromium, dioxin TEQ-HH (AOC20CA1 only) iron and manganese were found in the surface soils in the on-site borings above the Region 9 residential PRGs. Only total chromium exceeded the Region 9 DAF 10 SSL in the selected on site borings.

The off-site samples had similar exceedances of the PRGs for benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, arsenic, chromium, dioxin TEQ-HH, iron and manganese.

4.13.1.1 Surface soil

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 16 investigation on and off-site except the samples from MW-6S and AOC20SB41. SVOCs detected within AOC 16 surface soils included various PAHs and other SVOCs. Detected concentrations of SVOCs were compared to the Region 9 PRG and DAF 10 SSL and the results are presented as Table 4.13.1-2. The distribution of SVOCs both on and off-site and is provided as **Figure 4.13.1-4**. Benzo(a)pyrene was detected above the PRG in AOC20CA1, AOC20CA2,and AOC20CO3 in the on-site samples and above PRGs in BGPRK5, BGRR2,and BGRR3 in the nearby offsite samples., Benzo(b)fluoranthene was detected above the PRG in AOC20CO3 in the on-site samples and above PRGs and in BGRR2 and BGRR3 in the nearby off-site samples. Benzo(k)fluoranthene was detected above the PRG in AOC20CO3 in the on-site samples and above PRGs and in BGVNW7, BGRR2 and BGRR3 in the nearby off-site samples. Dibenz(a,h)anthracene was detected above the PRG in AOC20CO3 in the on-site samples and above PRGs and in BGVNW7, BGRR2 and BGRR3 in the nearby off-site samples. Benzo(a)anthracene was detected above the PRG and the DAF 10 in the off-site samples collected at BGRR2, BGRR3, and BGVNW7.

Metals

Metals were detected in surface soil samples collected for the AOC 16 investigation. Detected concentrations of metals were compared to the Region 9 PRGs and DAF 10 SSLs, and the results are presented as **Table 4.13.1-3**. The distribution of the metals both on and off-site and is provided as **Figure 4.13.1-7**. Arsenic, lead, chromium, iron and manganese were found in the surface soils in the on site borings above the Region 9 residential PRGs. Only total chromium exceeded the Region 9 DAF 10 SSL in the selected on site borings. Arsenic, chromium, iron and manganese were found in the surface soils in the off-site borings above the Region 9 residential PRGs. Arsenic was found above the PRG in each surface sample both on and off-site selected for comparison purposes. Lead was only found above the PRG in AOC20CA1. Chromium was found above the PRG in on-site samples collected at AOC20CA1 and MW-6S. Chromium was also detected above the PRG in off-site sample BGRR2. Iron was found above the PRG in on-site samples collected at AOC20CA1, AOC20CA2, AOC20CA3, and MW-6S. Iron was also found above the PRG in off-site sample BGRR2. Manganese was found above the PRG in on-site samples collected at AOC20CA1, AOC20CA2, AOC20CA3, BBSB2 and MW-6S. Manganese

was also found above the PRG in off-site sample BGRR2. Chromium (total) concentrations exceeded the DAF10 SSL in soil boring MW-6S and composite area AOC20CA1.

Dioxins
Dioxins were detected above the Dioxin TEQ-HH Region 9 residential soil PRG in on-site surface soil sample AOC20CA1 and in off-site samples BGPRK5, BGRR2, and BGRR3. Statistical analysis was performed on analytical data for dioxins to calculate representative dioxin TEQ-HH concentrations for surface soil samples. Dioxin (2,3,7,8-TCDD) and dioxin TEQ-HH concentrations were compared to the Region 9 PRG and the results are presented as **Table 4.13.1-5**. The distribution of dioxin detections both on and off-site and is provided as **Figure 4.13.1-13**.

Cyanide
Cyanide was not detected in any surface soil samples evaluated for the AOC 16 investigation. Detected concentrations of cyanide were compared to the Region 9 PRG, and the results are presented as **Table 4.13.1-7**. The distribution of the metals both on and off-site and is provided as **Figure 4.13.1-7**.

4.13.2 Summary

Similar concentrations of metals, PAHs and dioxins are present in surface soils collected from native and fill materials in AOC 16 when compared to off-site background samples. No apparent relationship appears to exist between the off-site industrial impacts to surface soils and historical Site operations. The overall distribution of constituents detected in the surface soil does not appear to indicate a specific source. Off-site concentrations are consistent with the background concentrations observed elsewhere adjacent to the Site.

4.13.3 Recommendations

No further investigation of off-site impacts to AOC16 is necessary..

4.14 AOC 17 – Off-site concerns (northern parcel)

AOC 17 included, in general, the western boundary of the Northern Parcel where potential impacts from adjoining properties, historic and current (e.g., the active railroad tracks) may have affected the environmental conditions at the Site.

4.14.1 Soil sampling and analysis

The evaluation of potential off-site impacts to the western property boundary of the Northern Parcel included a comparison of 3 on-site soil borings or composite sampling areas to 3 off-site background samples collected in areas representative of potential off-site sources. These on-site borings/composite areas were identified as MW-10S, AOC21SB10, and MW-14S. Surface sample data from these locations were compared with the 3 nearby off-site background samples BGRR4, BGVNW6, and BGSLAG collected in off-site concern adjacent to the Northern Parcel. BGRR4 was collected from the rail yard just to the north of the Site, BGVNW6 was collected from a former industrialized area west of the Site, and BGSLAG was collected from slag just to the west of the Site. Only background surface samples (0-2 feet) were included in the comparison since the most likely routes for off-site impacts to Site is through fugitive dust, air emissions, or

surface water runoff. The evaluation only included TAL metals, PAHs and dioxins as the background samples were only analyzed for these parameters.

The analytical results for relevant constituents were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.14.1-1** through **Table 4.14.1-6**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections.

Constituent detections indicate that selected SVOCs and metals were detected in the on-site and off-site samples above the Region 9 residential PRGs, and only a few SVOCs exceeded the region 9 DAF 10 SSL criteria. The preliminary ranking of chemicals detected indicate that benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, dibenz(a,h)anthracene, indeno(1,2,3-cd)pyrene, arsenic, and manganese were found in the surface soils in the on-site borings above the Region 9 residential PRGs. Only benzo(a)anthracene, benzo(a)pyrene, and benzo(b)fluoranthene exceeded the Region 9 DAF 10 SSL in the selected on-site borings. Identical SVOCs were found above the Residential PRGs in the off-site samples collected from BGVNW6 and but only benzo(a)anthracene exceeded the Region 9 DAF 10 SSL in the off-site samples. BGRR4 had a single exceedance of the region 9 PRG for benzo(a)pyrene.

4.14.1.1 Surface soil

SVOCs

SVOCs were detected in surface soil samples collected for the AOC 17 investigation on and off-site except the samples from MW-14S. SVOCs detected within AOC 17 surface soils included various PAHs and other SVOCs. Detected concentrations of SVOCs were compared to the Region 9 PRG and DAF 10 SSL, and the results are presented as **Table 4.14.1-2**. The distribution of SVOCs both on and off-site is provided as **Figure 4.0.1-4.**

Benzo(a)pyrene benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene were detected above the PRG in MW10S in the on-site samples. Benzo(a)pyrene, benzo(a)anthracene, and benzo(b)fluoranthene were detected in the surface soil in MW-10S above the DAF 10 SSL. Identical SVOCs were found above the Residential PRGs in the off-site samples collected from BGVNW6 but only benzo(a)anthracene exceeded the Region 9 DAF 10 SSL in the off-site samples. BGRR4 had a single exceedance of the region 9 PRG for benzo(a)pyrene.

Metals

Metals were detected in surface soil samples collected for the AOC 17 investigation. Detected concentrations of metals were compared to the Region 9 PRGs and DAF 10 SSLs, and the results are presented as **Table 4.14.1-3**. The distribution of metals both on and off-site is provided as **Figure 4.0.1-7.** Arsenic was found in the surface soils in the on-site borings above the Region 9 residential PRGs in AOC21SB10, MW-10S, and MW-14S. Manganese was found above the Region 9 PRG in soils from MW-10S. No samples exceeded the Region 9 DAF 10 SSL criteria.

Arsenic, iron, lead, selenium, and manganese were found in the surface soils in the off-site borings above the Region 9 residential PRGs. Arsenic was found above the PRG in BGRR4 and BGVNW6. Iron and lead were above the Region 9 PRG in BGVNW6. Manganese was found above the PRG in off-site samples collected at the BGSLAG location.

Dioxins
Dioxins were not detected above the Dioxin TEQ-HH Region 9 residential soil PRG in any AOC 17 on-site or off-site surface soil samples.

4.14.2 Summary

Similar concentrations of metals, PAHs and dioxins are present in surface soils collected from native and fill materials in AOC 17 when compared to off-site background samples. No apparent relationship appears to exist between the off-site industrial impacts to surface soils and historical Site operations. The overall distribution of constituents detected in the surface soil does not appear to indicate a specific source. Off-site concentrations are consistent with the background concentrations observed elsewhere adjacent to the Site.

4.14.3 Recommendations

No further investigation of off-site impacts to AOC17 is necessary.

4.15 AOC 18 – *Former coke oven gas pipeline (on-site)*

4.15.1 Soil sampling and analysis

Soil sampling activities were conducted to assess the nature and extent of constituents at AOC 18, the former coke oven gas pipeline (on-site) located along the western edge of the northern parcel. A total of 6 soil borings were completed and were identified as AOC18SB1 through AOC18SB6. Surface samples from 0 to 2 ft bgs were collected from the six soil borings. Two subsurface soil samples from 2 to 10 ft bgs were collected at AOC18SB1, and one subsurface soil sample from 2 to 10 ft bgs was collected at AOC18SB3, AOC18SB4, AOC18SB5, and AOC18SB6. One subsurface soil sample from greater than 10 ft bgs was collected from AOC18SB2. Soil samples were submitted for analysis of VOCs, SVOCs, metals, PCBs, dioxins, and cyanide. Statistical analysis was performed on dioxin and PCB analytical results to calculate dioxin TEQ-HH and total PCB values.

The analytical results were compared to the available screening criteria that are considered applicable to this investigation: Region 9 PRGs, DAF 10 SSLs, and ESLs. The detection results for soil samples collected during this investigation are provided as **Table 4.15-1** through **Table 4.15-5**. The distribution of analytical results for detectable constituents are indicated on **Figure 4.0.1-1** through **Figure 4.0.1-15**. Results are discussed in the following sections.

4.15.1.1 Surface soil

VOCs
VOCs were detected in the surface soil samples collected from soil borings AOC18SB2, AOC18SB3, AOC18SB5, and AOC18SB6. VOCs detected within AOC 18 surface soils included petroleum VOCs benzene, ethylbenzene, toluene and xylenes. Detected concentrations of VOCs