CO-011-72090/8

FINAL SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION REPORT

FORMER EAGLEPICHER SMELTER
GALENA, KANSAS

Prepared for:

EP CUSTODIAL TRUST

CEC Project 061-825.0020

July 26, 2010

FINAL

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EXECUTIVE SUMMARY

Historically, the EaglePicher facility operated as a smelter from 1878 to 1971. Smelting operations included processing lead, zinc and cadmium ores. On April 11, 2005, EaglePicher Holdings, Inc. declared bankruptcy under Chapter 11 of Title 11 of the United States Code. The bankruptcy settlement established an EP Custodial Trust (Trust) and Custodial Trustee (Trustee) pursuant to the July 31, 2006 Custodial Trust Agreement. A Settlement Agreement was subsequently established that defined the role of the Trustee and the plans for remediation of the various Trust sites.

The former EaglePicher smelter site in Galena, Kansas is comprised of ±148 acres of land northeast of the town of Galena. The property is further subdivided into the Smelter Plant Area and five outparcels labeled Outparcel A through E. The Smelter Plant Area is ±48.8 acres in size and is bounded by Short Creek to the north and Clark Street to the south. For purposes of site characterization, CEC has further divided into two sub-areas, inside the fence (approximately 10 acres) and outside the fence (approximately 39 acres). The fenced area includes all the remaining office and production buildings at the Smelter Plant Area. The area outside of the fence includes a historic slag dump, a former Acid Plant, and a former enriched ore stockpile known as the Finished Product Storage Area.

Outparcel A consists of approximately 40 acres and is located northeast of the Smelter Plant Area on the northeastern portion of the property. Outparcel B consists of approximately 5 acres and is located north of the Smelter Plant Area on the north-central portion of the property. Outparcel C consists of approximately 12 acres and is located south of the Smelter Plant Area and old U.S. Highway 66 on the south-central portion of the property. Outparcel D consists of approximately 26 acres and is located north to northwest of the Smelter Plant Area on the northwestern portion of the property. Outparcel E consists of approximately 23 acres and is located south of the Smelter Plant Area and old U.S. Highway 66 on the southwestern portion of the property. Outparcel E is comprised of multiple residential lots and paper streets known

collectively as the Brinkerhoff Addition. The Trust owns the residential lots that total 16 acres, but does not own the paper streets that separate the lots that total the remaining 7 acres.

Exhibit B of the Settlement Agreement defined the area requiring remediation as ±68 acres, which includes the Smelter Plant Area (±48.8 acres), portions of Outparcel D (±17 acres north of Short Creek and south of the abandoned St. Louis and San Francisco Railroad grade to the north), and portions of Outparcel B (±2.5 acres south of Short Creek and contiguous to the Smelter Plant Area). For the purposes of this report, CEC refers to the area requiring remediation as the Area of Concern (AOC).

In 2006, the Kansas Department of Health and Environment (KDHE) conducted an investigation on surface and subsurface soils within the Smelter Plant Area and sediment and surface water along Short Creek. In addition, KDHE collected a limited amount of samples outside of the Smelter Plant Area.

KDHE presented their findings in a 2007 report titled *Integrated Removal Site Evaluation/Preliminary Assessment Report.* The report indicated that soils on the Smelter Site contain arsenic, mercury and lead concentrations exceeding the KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards).

In 2007 and 2008, Civil & Environmental Consultants, Inc. (CEC) conducted an Extent of Contamination (EOC) focusing on the surface and subsurface soils on the Smelter Plant Area and surface soils on the five outparcels (Outparcel A through E). CEC presented their findings in a report titled *Extent of Contamination Investigation, Former EaglePicher Smelter, Galena, Kansas, October 2008.* Lead concentrations exceeded the RSK standard at 69% of the soil samples collected from the Smelter Plant Area. Surface lead concentrations exceeded the RSK standard at 44% of the surface soil samples collected on the outparcels. Other metals exceeded the RSK standards; however, those occurrences were coincident with lead exceedances. Short Creek sediment concentrations of arsenic, cadmium, chromium, lead, mercury, and zinc exceeded the Threshold Effect Concentrations (TEC). KDHE provided a response letter titled

RE: Extent of Contamination Report, Former EaglePicher Smelter Site; Galena, Kansas, dated January 30, 2009, conveying their general acceptance of the report with consideration of comments.

In 2009, CEC conducted a Supplemental Extent of Contamination (SEOC) investigation at the Smelter Plant Area and five outparcels to address the KDHE's general comments to the EOC and to provide additional delineation of metals contamination.

Arsenic, lead, and mercury are the most-prevalent contaminants in the Smelter Plant Area soils. Arsenic concentrations exceeded the RSK standard at 60% of the soil samples collected from the Smelter Plant Area. Lead concentrations exceeded the RSK standard at 67% of the soil samples collected from the Smelter Plant Area. Mercury concentrations exceeded the RSK standard at 23% of the soil samples collected from the Smelter Plant Area.

Contaminated fill material generally extends to 2 to 5 feet bgs in the former settling ponds, with deeper contaminated fill material extending to 5 to 15 feet bgs in the central portion of the ponds. Toxicity Characteristic Leaching Procedure (TCLP) cadmium and lead concentrations exceeded the regulatory limit.

Contaminated fill material generally extends to 2 to 7 feet below the ground surface (bgs) in the former Acid Plant area located between the Finished Product Storage area and the Manganese Sulfate Building, with deeper contaminated fill material extending to 11 feet bgs in the center of the Acid Plant area. TCLP cadmium and lead concentrations exceeded the regulatory limit.

Contaminated fill material generally extends to 3 to 10 feet bgs between Short Creek and the fence line north of the West Warehouse Building and the Office-Laboratory Building, with contaminated fill material extending to 10 to 15 feet bgs between Short Creek and the West Warehouse Building. TCLP cadmium and lead concentrations exceeded the regulatory limit.

Contaminated fill material in the fenced-in portion of the Smelter Plant Area generally extends up to 8 to 10 feet bgs west and north of the Warehouse Building, up to 6 feet bgs west of the Office-Laboratory Building, up to 4 feet bgs north of the Manganese Dioxide Building, and up to 7 to 15 feet bgs south of the Manganese Dioxide Building and south and east of the Manganese Sulfate Building. TCLP lead concentrations exceeded the regulatory limit.

Concentrations of lead contamination exceeding RSK standards were identified on the outparcels, but the exceedances were not pervasive across all of the outparcels and were generally limited in depth to surface soils.

Concentrations of arsenic, cadmium, chromium, lead, and zinc in sediments in the Spring Branch of Short Creek exceeded the TECs.

Lead speciation analyses indicate that the dominant form of lead present on the Smelter Plant Area consists of Anglesite in the Finished Product Storage Area sample and Anglesite with tin in the Slag Dump Area sample.

The speciation results from Outparcels A, C and D indicate a large portion of those samples are comprised of lead-bearing materials not detected on the Smelter Plant Area, suggesting a foreign, possibly, regional source. The speciation results from the Outparcel B sample indicate that a large portion of the sample is comprised of lead-bearing materials, mainly anglesite, also detected on the Smelter Plant Area. The dominant form of lead present on Outparcel E is Galena with lesser amounts of Anglesite and Cerrusite. It appears that the lead at Outparcel E may be naturally-occurring and weathering of Galena has contributed to the production of Anglesite and Cerrusite at this location.

Approximately 102,200 cubic yards (cy) of soil on the ±68-acre AOC (including Short Creek sediment) exceed the RSK standards or TECs for all metals of concern, with approximately 31,900 cy of this volume exceeding the RSK standard or TEC for mercury. Contaminated soil

inside the fenced-in portion of the Smelter Plant Area and the proposed disposal cell footprint was not included in the total AOC volume calculations.

Approximately 15,600 cy of soil on Outparcel A exceed the RSK standards for all metals of concern, with approximately 1,000 cy of this volume exceeding the RSK standard for mercury. Approximately 3,600 cy of soil on Outparcel B exceed the RSK standards for all metals of concern, with approximately 800 cy of this volume exceeding the RSK standard for mercury. Approximately 4,800 cy of soil on Outparcel C exceed the RSK standards for all metals of concern. Outparcel C soils do not exceed the mercury RSK standard. Approximately 20,400 cy of soil on Outparcel D exceed the RSK standards for all metals of concern, with approximately 1,000 cy of this volume exceeding the RSK standard for mercury. Approximately 12,100 cy of soil on Outparcel E exceed the RSK standards for all metals of concern, with approximately 600 cy of this volume exceeding the RSK standard for mercury.

1.0 INTRODUCTION

CEC submitted a report entitled *Extent of Contamination Investigation, Former EaglePicher Smelter, Galena, Kansas, October 2008* to KDHE. KDHE provided a response letter titled *RE: Extent of Contamination Report, Former EaglePicher Smelter Site; Galena, Kansas,* dated January 30, 2009, conveying their general acceptance of the report with consideration of comments. A supplemental site investigation was needed to address KDHE's general comments to the aforementioned report. This report presents the findings of the 2009 SEOC investigation conducted at the former EaglePicher Smelter Site located in Galena, Cherokee County, Kansas (Figure 1).

Mr. William L. West, Trustee, retained CEC to prepare and implement the 2009 SEOC investigation pursuant to the Kansas Settlement Agreement between the Parties.

1.1 PREVIOUS SITE OPERATIONS

According to *Final Report, Phase I Environmental Site Assessment, Former Smelter Site, Galena, Kansas*, prepared by Environ International Corporation (Environ) and dated January 2006, the site was originally used for farming. Lead was identified at the site in 1876 and a smelter was constructed in late 1878. EaglePicher purchased the facility in 1912. Mining in the region ended in the 1920's, but smelting continued until 1971.

Historically, the facility operated as a smelter from 1878 to 1971. Smelting operations included processing lead, zinc and cadmium ores. The facility constructed an acid plant in 1954 to generate sulfuric acid from molten sulfur from the smelter. The Acid Plant operated until 1971. Other historic production activities included: zinc oxide, zinc sulfate, manganese sulfate, and manganese dioxide production and copper and manganese ore roasting. The facility most recently produced manganese dioxide and ferrous sulfate. The major raw materials stored at the facility included manganese oxide, sulfuric acid, sodium hydroxide and ferrous sulfate. Environ

(2006) reported that no operations have been performed at the site since 2004, according to facility personnel.

Previous site use was also evaluated by CEC by obtaining and reviewing historical Sanborn Fire Insurance Company maps and aerial photographs of the site. The Sanborn maps depicted furnaces, a refining house, a bag house, and coal and mineral storage areas on the site. CEC also reviewed historical aerial photographs of the site to check site layout and usage. None of the photos show any industrial activity to the north across Short Creek or to the south across Clark Street. Historic aerial photographs from 1944 and 1958 are provided in Appendix A.

1.2 SUPERFUND DETERMINATION

The EaglePicher Smelter Site is part of the larger Tri-State Mining District (an approximately 2,500 square mile area that includes Cherokee County in southeast Kansas). EaglePicher conducted mining operations in the Tri-State Mining District from the 1840s to the 1950s. During this time, mining activities released metals into the environment by a number of pathways, especially mine waste piles (bull-rock, chat and tailings). According to the Third *Five-Year Review Report, Cherokee County Superfund Site, Cherokee County, Kansas,* dated September 2005, natural or residual metal sulfides are present in abandoned mine workings and chat piles due to previous mining and smelting activities. Acidic mine drainage results as precipitation, surface water, and groundwater percolate through the residual sulfides and are oxidized. The acidic mine drainage dissolves metals within the mine waste and underlying bedrock resulting in high metals concentrations in surface water and groundwater.

In 1983, the U.S. Environmental Protection Agency's (USEPA) Superfund Program included Cherokee County on the National Priorities List (NPL) of hazardous waste sites due to contamination from historic mining operations. The USEPA further divided the Cherokee County Superfund Site into seven subsites that correspond to seven general mining locations: Galena; Baxter Springs; Treece; Badger; Lawton; Waco; and Crestline. The USEPA has released five Record of Decisions (RODs) and one ROD amendment for various subsites of the Cherokee

County Superfund Site providing the justification for the remedial action chosen and additional information relating to the site background. The EaglePicher Smelter Site is part of the overall Cherokee County Superfund Site.

The ROD for the Galena Subsite indicates that surface water and shallow groundwater will continue to exceed ambient water quality criteria and equivalent standards set by the state of Kansas following implementation of remedial action. The USEPA has issued a technical-impracticability decision indicating that implementation of the remedial action necessary to meet the surface water and shallow groundwater standards would present a greater risk to the environment.

1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

1.3.1 KDHE Investigation Summary

A subsurface investigation of the former EaglePicher Smelter Site was completed by KDHE and documented in a report entitled *Integrated Removal Site Evaluation/Preliminary Assessment Report* dated January 2007.

KDHE focused their investigation on surface and subsurface soils within the Smelter Plant Area and sediment and surface water along Short Creek. In addition, KDHE collected a limited amount of samples outside of the Smelter Plant Area. All soil samples were screened in the field for metals content using x-ray fluorescence spectroscopy (XRF) with selected samples also analyzed using standard USEPA SW-846 methods.

In addition to the surface soil samples, KDHE also installed 19 borings at the site to collect subsurface samples and preliminarily evaluate waste thicknesses. Ten background soil samples were also collected in the vicinity of the site. In addition, surface water samples were collected from Short Creek at upstream, adjacent, and downstream Smelter Plant Area locations.

Background levels from KDHE investigation were then compared to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). KDHE reported that mean background levels of the following metals were detected:

	Background	RSK Standards
Arsenic	6.9 mg/kg	38 mg/kg
Cadmium	15.9 mg/kg	1,000 mg/kg
Chromium	31.7 mg/kg	4,000 mg/kg
Copper	53.7 mg/kg	76,000 mg/kg
Lead	631 mg/kg	1,000 mg/kg
Mercury	<0.05 mg/kg	20 mg/kg
Zinc	2392 mg/kg	610,000 mg/kg

Surface water samples from Short Creek showed that arsenic, chromium, lead, and mercury were not detected. Cadmium was detected, but the highest concentration was in the upstream sample. Zinc concentrations showed significant increases in adjacent and downstream locations compared to upstream locations. Stream sediment results show steady concentration increases in arsenic, chromium and lead moving upstream to downstream. Cadmium was detected at the highest concentration in the upstream sample, while copper and zinc were detected, but did not show any concentration trend.

An arsenic isoconcentration map produced by KDHE indicated that most of the Smelter Plant Area is covered with materials with arsenic levels above the RSK standard. The cadmium isoconcentration map indicated that much of the site meets the RSK standard with the exception of an area to the northwest of the West Warehouse and an area at the east end of the site. The lead isoconcentration map indicated that very few areas of the site meet the RSK standard. The mercury isoconcentration map indicated the presence of two areas where the mercury levels exceed the RSK standard. The zinc isoconcentration map indicated that there are no areas where the zinc concentrations exceed the RSK standard.

The soil boring sample results produced by KDHE show that arsenic is present at levels exceeding the RSK standard in every sample collected except one deep sample. Lead was present at levels exceeding the RSK standard in every sample collected except in one soil boring. The mercury RSK standard was exceeded in three soil borings. No samples contained cadmium or zinc at levels exceeding the RSK standards.

KDHE also evaluated the vertical extent of slag at the site and determined that it appeared to be surficial in nature at the east end of the site, but extended to depths of over 12 feet in the western portions of the site. However, the information is somewhat limited in utility due to the horizontal discontinuity of the borings. In addition, based on KDHE data, contamination in excess of cleanup criteria appears to extend to depths greater than the extent of visible slag. However, this conclusion is tempered by the fact that the samples were collected from auger cuttings rather than split-spoon samplers. As a result of these limitations, it was CEC's opinion that additional horizontal coverage was needed with better depth discrimination of samples.

1.3.2 CEC Extent of Contamination Investigation (2007)

With approval of KDHE, CEC began implementation of the EOC investigation in November 2007. Investigations included use of a hand-held XRF to collect field and onsite laboratory readings of select metals (arsenic, cadmium, chromium, copper, lead, mercury, and zinc) in soil. The accuracy of field XRF results was verified by submitting 5% of soil samples screened with the XRF for laboratory analysis of RCRA metals plus zinc using USEPA SW-846 Method 6010.

Surface soil was assessed for the Smelter Plant Area and the five outparcels (Outparcels A through E) owned by the Trust beyond the Smelter Plant Area (Figure 1). Within the Smelter Plant Area and on portions of Outparcels A, B and D, 198 test pits were excavated to determine the horizontal and vertical limits of waste. Test pits were completed to native soil (if visually evident), bedrock, or obstructions. For the outparcel characterization, surface soil readings were collected at a rate of approximately 10 per acre.

CEC compared the analytical findings (XRF and laboratory results) to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). Smelter Plant Area test pit XRF sample results were used to create a depth of waste figure and isoconcentration maps of arsenic, cadmium, lead, mercury, and zinc. Lead concentrations exceeded the RSK standard in 89% of the Smelter Plant Area surface soil samples and 59% of the Smelter Plant Area subsurface soil samples.

The eastern section of the Smelter Plant Area was previously used as the Finished Product Storage Area and generally consists of up to about 1 foot of fill material with lead concentrations exceeding 179,000 mg/kg. The area between Short Creek and the fence line north of the Manganese Sulfate and Dioxide Buildings generally consists of 1 to 2 feet of waste material. Historic Sanborn maps and the 1958 aerial photograph indicate that a pair of settling ponds, covering approximately 2.5 acres, was present between Short Creek and the former Acid Plant Area. The settling ponds consisted of up to 11 to 14 feet of debris and banded gray/white, fine to medium grained material with mercury concentrations exceeding 16,000 mg/kg and lead concentrations exceeding 260,000 mg/kg. Thick deposits (10 to 16 feet) of contaminated material were also found between the West Warehouse and Short Creek. Additionally, the slag piles located on the western portions of the Plant Area contain waste exceeding 12 feet thick.

Outparcel XRF surface soil results were used to create isoconcentration maps of arsenic, cadmium, lead, mercury, and zinc. Based on XRF screening, surface concentrations of lead exceeded 1,000 mg/kg at 44% of the nearly 1,100 sample locations on the five outparcels. On outparcels that border Short Creek, the lead concentration exceedances were encountered at depths of 1 to 3 feet bgs. While there were exceedances of concentrations of other parameters of concern, those locations coincide with areas also impacted by lead.

Fifty-one sediment samples were collected at 100-foot intervals beginning downstream beyond where Short Creek leaves the property to a point upstream where Short Creek enters the property. Sediment samples were submitted for laboratory analysis of RCRA metals, plus zinc, by using USEPA SW-846 Method 6010.

CEC compared sediment analytical data to the TECs listed in the article *Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems.* In general, concentrations of metals decrease upstream of the Smelter Plant Area. Arsenic concentrations exceeded the TEC at 18 of the 51 sample locations. All but two locations of elevated arsenic concentrations are located adjacent to the Smelter Plant Area. Cadmium, lead, and zinc concentrations at all sample locations exceeded the TEC. Mercury concentrations exceeded the TEC at twenty-three of the fifty-one sample locations. All but two locations of elevated mercury concentrations are located adjacent to the Smelter Plant Area.

Three Short Creek surface water samples were collected: two at the property boundaries and one approximately at the midpoint between the two. Surface water samples were submitted for laboratory analysis of total and dissolved RCRA metals plus zinc. CEC compared surface water analytical data to the Public Health Standard found in the document *Kansas Surface Water Quality Standards – Tables of Numeric Criteria*, KDHE, December 6, 2004. Cadmium concentrations exceeded the Public Health Standard at each location. Concentrations of the detected metals in Short Creek increased moving upstream to downstream. KDHE requested in the comments letter dated January 30, 2009 that the 2007 EOC surface water analytical data be compared to the acute and chronic Aquatic Life Support Criteria (ALWQC) listed in the document "*Kansas Surface Water Quality Standards, Tables of Numeric Criteria*". Surface water concentrations exceeding the ALWQC prior to entering the AOC indicate that upstream sources contribute concentrations of cadmium and zinc to Short Creek that exceed the criteria. In general, concentrations of metals decrease upstream of the AOC indicating that the AOC is contributing concentrations of metals to the surface water of Short Creek.

Data tables presented in the 2007 EOC report are provided in Appendix B.

1.4 SUMMARY OF PREVIOUS CLEANUPS

CEC submitted a report titled *Completion of Building Cleanout, Former EaglePicher Smelter, Galena, Kansas* in May of 2009. The services were completed in general accordance with our *Building Cleanout Plan* dated February 28, 2008 and subsequent KDHE approval letter dated March 7, 2008. CEC was retained to monitor the cleanout services for the West Warehouse, Manganese Dioxide Building, Manganese Sulfate Building and Transformer Building. Cleanout efforts were conducted between March and April 2008. KDHE formally conveyed their general acceptance of the report in a letter dated January 13, 2010. KDHE acceptance letter is provided in Appendix C.

In the West Warehouse, the remaining lead ore was removed and placed in super-sacs, labeled, and stored onsite. Fine ore residue was removed from the purlins and mezzanines using a Spencer Turbine HEPA vacuum and mechanized street sweeper and also containerized in super-sacs. Containerized ore residues from the West Warehouse are staged onsite and will be encapsulated onsite when contaminated soil is addressed.

The Manganese Dioxide Building was cleared of debris, the sludge-filled sumps were evacuated, cleaned, and the sump material was containerized in super-sacs for offsite disposal. The evacuated sumps were filled to grade with clean gravel and concrete. Air-dispersed residues were removed from structural steel, process equipment, walls, and the building floor using a Spencer Turbine HEPA vacuum and mechanized street sweeper and containerized in super-sacs. The super-sacs were labeled as hazardous waste and transported offsite. A total of 17,400 pounds of non-hazardous materials were transported to the Prairie View Landfill in Lamar, Missouri. A total of 25,000 pounds of hazardous material was transported to Clean Harbors Lone Mountain, LLC in Waynoka, Oklahoma.

Deposits of waste were removed from the purlins and mezzanines and the building floor in the Manganese Sulfate Building. Large crusted deposits were removed manually using tools while the fine-particulate material on the purlins and the building floor was removed using a Spencer

Turbine HEPA vacuum and mechanized street sweeper. Spent filters, as well as waste removed from the purlins and building floor, were containerized in super-sacs, labeled as hazardous waste, and transported offsite. A total of 2,641 pounds of hazardous material was transported to Clean Harbors PPM, LLC in Coffeyville, Kansas.

The west wall of the Electrical Building was removed and the polychlorinated biphenyl (PCB) transformer and associated electrical switch gear were removed. Deposits of bird guano from the purlins and mezzanines were removed and final demolition of the transformer building was completed. The remaining brick was transported to an approved construction and demolition waste disposal facility. A total of 8,909 pounds of PCB liquid and 11,336 pounds of non-DOT regulated debris and bird guano were transported to Clean Harbors PPM, LLC in Coffeyville, Kansas.

The Office, Shower and Laundry and Laboratory Building was not addressed during the building cleanout.

2.0 PROPERTY DESCRIPTION

2.1 PHYSICAL SETTING

The approximate 148-acre site is located on land owned by the Trust and is located on Clark Street northeast of the town of Galena, Kansas. The site is north and south of old U.S. Route 66 near the Kansas-Missouri border (Figure 1).

The site is bounded to the north by undeveloped property beyond which are residential properties approximately 2,000 feet north of the Smelter Plant Area; south by undeveloped reclaimed mining areas and the Galena Demolition Landfill; east by undeveloped property and American Disposal (waste hauling truck service facility) beyond which is the Missouri-Kansas state line; and west by undeveloped, presumed reclaimed mining areas (tailings piles were formerly located west of the Smelter Plant Area which are not currently present).

Hydrologic features within the site include Short Creek, the Spring Branch of Short Creek, one perennial unnamed tributary to Short Creek, and three intermittent and/or ephemeral tributaries to Short Creek. Surface drainage within the site is variable and includes flow from north to south, south to north, and east to west. Short Creek flows from the northeast to the southwest transecting the property.

2.2 SMELTER PLANT AREA

The Smelter Plant Area is ±48.8 acres in size and is bounded by Short Creek to the north and Clark Street to the south (Figure 2). It is divided into two sub areas, inside the fence (approximately 10 acres) and outside the fence (approximately 39 acres). The fenced area includes all the remaining office and production buildings at the Smelter Plant Area. The area outside of the fence includes a historic slag dump, a former Acid Plant, and a former enriched ore stockpile known as the Finished Product Storage Area (Figure 2).

The Smelter Plant Area is currently developed with four buildings described from east to west as:

- Manganese Sulfate Building: approximately (29,000 square feet)
- Manganese Dioxide Building: approximately (10,500 square feet)
- Office, Shower and Laundry and Laboratory Building: (5,700 square feet)
- West Warehouse: approximately (29,000 square feet)

The areas immediately surrounding the buildings are covered with gravel and crushed demolition debris (concrete and gravel). The concrete pads of the historical demolished buildings are also present.

2.3 OUTPARCELS

Approximately 99 acres of the property owned by the Trust are beyond the limits of the former Smelter Plant Area. These outparcels are divided into five areas labeled Outparcel A through Outparcel E (Figure 2), and briefly described in the following sections.

2.3.1 Outparcel A

Outparcel A consists of approximately 40 acres and is located northeast of the Smelter Plant Area on the northeastern portion of the property. The outparcel is rectangular in shape and measures approximately 650 feet wide by 2,800 feet long. Approximately 800 feet of Short Creek and 200 feet of the Spring Branch of Short Creek flow east to west through the southern portion of the outparcel. Topographically the outparcel slopes north to south towards Short Creek and consists primarily of prairie grass and first-stage growth trees. A riparian scrub-shrub plant community is present along the banks of Short Creek and the Spring Branch of Short Creek on Outparcel A.

2.3.2 Outparcel B

Outparcel B consists of approximately 5 acres and is located north of the Smelter Plant Area on the north-central portion of the property. The outparcel is triangular in shape and measures approximately 850 feet by 700 feet by 500 feet. Approximately 700 feet of Short Creek flows east to west through the center portion of the outparcel. Topographically the northern and southern portions of the outparcel slope toward Short Creek. Prairie grass and first-stage growth trees exist north of Short Creek and chert fragments and alluvium consisting of little vegetation primarily covers the area south of Short Creek. A riparian scrub-shrub plant community is present along the banks of Short Creek on Outparcel B.

2.3.3 Outparcel C

Outparcel C consists of approximately 12 acres and is located south of the Smelter Plant Area and old U.S. Highway 66 on the south-central portion of the property. The outparcel is triangular in shape and measures approximately 1,400 feet by 100 feet by 460 feet. Topographically the outparcel generally slopes slightly east to west and consists primarily of prairie grass and first-stage growth trees. The eastern section of Outparcel C is covered by broad-leaf deciduous forest and slopes west to east.

2.3.4 Outparcel D

Outparcel D consists of approximately 26 acres and is located north to northwest of the Smelter Plant Area on the northwestern portion of the property. The outparcel is triangular in shape and measures approximately 2,400 feet by 1,400 feet by 1,300 feet. Approximately 2,500 feet of Short Creek flows east to west through the southern portion of the outparcel. The abandoned St. Louis and San Francisco Railroad grade bisects the outparcel along an approximate northeast to southwest alignment. Remnants of a railroad spur and trestle that crossed Short Creek and entered the Smelter Plant Area are present on the southwestern portion of the outparcel. Topographically the outparcel slopes southeast towards Short Creek and consists primarily of

prairie grass and first-stage growth trees. Chert fragments and alluvium consisting of little vegetation cover the southern perimeter of the outparcel near Short Creek. A riparian scrub-shrub plant community is present along the banks of Short Creek on Outparcel D.

2.3.5 Outparcel E

Outparcel E consists of approximately 23 acres and is located south of the Smelter Plant Area and old U.S. Highway 66 on the southwestern portion of the property. The outparcel is comprised of multiple residential lots and paper streets known collectively as the Brinkerhoff Addition. The Trust owns the residential lots that total 16 acres but does not own the paper streets that separate the lots that total the remaining 7 acres. The outparcel is elongated in shape and measures approximately 120 to 800 feet wide by 2,250 feet long. Approximately 600 feet of an unnamed tributary to Short Creek flows south to north through the western portion of the outparcel. Topographically the parcel slopes east to west and consists primarily of prairie grass and first-stage growth trees.

2.4 AREA OF CONCERN (AOC)

The Settlement Agreement defines the AOC requiring remediation as ±68 acres, which includes the Smelter Plant Area (±48.8 acres) and portions of Outparcel D (±17 acres north of Short Creek and south of the abandoned St. Louis and San Francisco Railroad grade to the north) and portions of Outparcel B (±2.5 acres south of Short Creek and contiguous to the Smelter Plant Area) (Figure 2).

2.5 GEOLOGIC SETTING

The Ozark Plateau Province is developed on cherty limestones of Mississippian age. These are the oldest exposed rocks in Kansas and contained the deposits of lead and zinc with commercial value. The Mississippian limestones consist of Warsaw Limestone, Keokuk Limestone and Fern

Glen Limestone. Beneath the Mississippian formations is a thick sequence of Devonian Chattanooga Shale overlying the Cambro-Ordovician Roubidoux Formation. Soil in the area is the Clarksville very cherty silt loam, which is described as thin and rocky containing residual cherty gravel that has resulted from the weathering of the Mississippian limestones.

According to the 2007 KDHE report, groundwater at the site is encountered in two basic aquifer zones, shallow and deep. The shallow aquifer consists of limited alluvium deposits near the Short Creek valley and associated terraces. The shallow aquifer has been impacted by previous mining and smelting operations and is subject to the USEPA technical impracticability ruling for remediation. The shallow aquifer also includes shallow Mississippian bedrock of the Warsaw, Burlington-Keokuk and Fern Glen Limestone formations. The deeper aquifer may be over 1,000 feet bgs and is associated with the Roubidoux Formation. The Roubidoux Formation and shallow aquifers are separated by the Chattanooga Shale which prevents vertical migration of groundwater between the two aquifer units.

3.0 SUPPLEMENTAL EXTENT OF CONTAMINATION (SEOC) WORK PLAN

On behalf of the Trust, CEC submitted a Work Plan entitled *Supplemental Extent of Contamination Work Plan, Former EaglePicher Smelter, Galena, Kansas, October 2008* to KDHE for review. KDHE approved the work plan in a letter dated June 23, 2009 and CEC.

CEC implemented the Work Plan in September 2009. As part of the 2009 SEOC work, additional test pits were excavated within the Smelter Plant Area and on the Outparcels to further delineate the horizontal and vertical limits of waste identified by the 2007 EOC work. In total, CEC screened 968 soil samples with the XRF and submitted 57 soil samples for laboratory analysis of RCRA metals plus zinc during the 2009 SEOC work. CEC also collected and submitted the following samples for laboratory analysis:

- 34 soil samples for hazardous material characterization analysis, of which 18 soil samples were grab samples analyzed for TCLP volatile organic compounds (VOCs) and 16 soil samples were composite samples analyzed for TCLP semi-volatile organic compounds (SVOCs) and TCLP metals, total RCRA metals plus zinc, PCBs and pesticides, corrosivity/pH, reactive cyanide and sulfide, ignitability, and paint filter liquids test.
- 9 sediment samples for laboratory analysis of RCRA metals plus zinc.
- 5 surface water samples for laboratory analysis of total and dissolved RCRA metals plus zinc, and total hardness.
- 11 soil samples for lead speciation analysis.
- 19 soil samples for geotechnical analysis.
- 9 soil samples for agricultural analysis.

Surface and subsurface soil sample locations collected from both KDHE and CEC investigations are presented on Figure 3.

3.1 METHODOLOGY

Investigations included use of a hand-held XRF to collect field readings of soil in conjunction with collection of soil samples for laboratory analysis. Soil screening with the XRF was performed in general accordance with USEPA Method 6200. CEC used a calibrated Innov-X Model XT-2605 XRF to measure concentrations of select metals (arsenic, cadmium, chromium, copper, lead, mercury, and zinc) in soil. A Trimble GeoXT global positioning satellite receiver (GPS) was used to determine the latitude and longitude of each sample location. CEC used a soil moisture probe to verify that ambient moisture levels at locations selected for XRF testing were less than 10%. If soil moisture content was 10% or less, rocks and vegetation were removed from the soil surface prior to screening the soil in situ. If soil moisture content exceeded 10%, the sample locations were recorded with the GPS and samples were manually collected using a dedicated scoop. The samples were then dried in an onsite oven at 150° C for four to eight hours; the moisture content was verified less than 10% utilizing the soil moisture probe. After drying, the samples were prepared for analysis by removing rocks, debris, and organic matter from the sample. The samples were placed upon the XRF analyzer window for analysis at a minimum of 45-second periods.

3.2 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC)

CEC assessed XRF accuracy by a combination of standardization (energy calibration) checks, blank, and NIST standards analysis, precision measurements, and laboratory split samples. Standardization checks were performed in accordance with the manufactures' user guidance manual each time the XRF was restarted, or every 4 hours of continuous use. Blank sample (pure silica) analysis was performed at the beginning of each day and once per 20 samples screened. The High NIST standard (2710) was analyzed at the beginning of each day and every 20 samples to ensure that concentrations were within 20% of the certified values. Instrument precision was measured once daily by analyzing a representative sample seven to ten times in replicate. The objective of the precision check was to achieve a relative standard deviation (RSD) of less than 20%.

5% of collected soil samples were sent to Pace Analytical (Pace) in Lenexa, Kansas to assess the accuracy of XRF field data. Laboratory analysis of the samples was conducted for RCRA metals plus zinc. Statistical correlations and relative percent differences (RPD) were utilized to assess the accuracy. Laboratory precision was assessed by performing duplicate, matrix spike (MS), and matrix spike duplicate (MSD) analysis for each 100 laboratory samples (20%). Split samples for laboratory analysis were prepared by homogenizing the soil in a Ziploc bag and pouring a portion of the soil into a laboratory-supplied 4-ounce glass jar. The remaining sample was analyzed with the XRF as described above.

All XRF screened samples were labeled, cataloged, and stored onsite. Stored samples will be disposed onsite once the disposal area is constructed.

3.3 ADDITIONAL SMELTER PLANT AREA SOIL DELINEATION

CEC contracted with Oglesby and Associates (Oglesby) who excavated the 2007 EOC test pits to excavate 60 new test pits and re-excavate eleven 2007 EOC test pits. Test pit locations are presented on Figure 4 and test pit logs are provided in Appendix D. CEC monitored the excavations and performed XRF screening to further characterize the horizontal and vertical extent of metals contamination on the Smelter Plant Area.

Each test pit was excavated to native soil (if visually evident), bedrock, or impossible obstruction. A CEC scientist was onsite to log and photograph the test pits and perform field screening using the XRF to develop a vertical profile of metals concentrations. If the material appeared visually dissimilar, the CEC field scientist collected grab samples from the test pit using a dedicated scoop. CEC generally performed XRF readings at a rate of no less than one per three vertical feet in each test pit, or from obvious changes in soil type. Each test pit was backfilled after excavation and the location was recorded using the GPS.

3.4 SMELTER PLANT AREA HAZARDOUS MATERIAL CHARACTERIZATION

During the 2007 EOC and 2009 SEOC investigation, CEC encountered possibly hazardous material in test pits at several locations on the Smelter Plant Area. KDHE requested that CEC properly characterize these unknown materials to aid in disposal options as described in KDHE comments letter dated January 30, 2009. CEC relocated these areas using the GPS and requested Oglesby to re-excavate the test pits. If suspect material was encountered during the excavation of the 60 new SEOC test pits, additional hazardous material characterization samples were collected. Test pit locations are presented on Figures 4 and 5 and test pit logs are provided in Appendix D.

Each test pit was excavated to native soil (if visually evident), bedrock, or impossible obstruction. A CEC scientist was onsite to log and photograph the test pits. If the material appeared visually dissimilar, the CEC field scientist collected grab samples from the test pit using a dedicated scoop. The number of grab samples were determined in the field based on field observations. Each test pit was backfilled after excavation.

CEC submitted grab samples to Pace for hazardous material characterization analysis of TCLP VOCs (USEPA Method 1311). The grab samples from each test pit were composited to create one composite sample at each test pit location. CEC submitted the composite samples to Pace for hazardous material characterization analysis of TCLP SVOCs and TCLP metals (USEPA Method 1311), total RCRA metals plus zinc (USEPA Method 6010, SW-846, and 7471A), PCBs and pesticides (USEPA Method 608), corrosivity/pH (USEPA Method 9045), reactive cyanide and sulfide (USEPA Methods 7.3.3.2 and 7.3.4.2), ignitability (USEPA Method 1010 or 1030), and paint filter liquids test (USEPA Method 9095).

The following sections detail the additional assessment performed at each of the suspect locations identified during the 2007 EOC and 2009 SEOC investigations.

3.4.1 Settling Pond Material Characterization

CEC encountered remnants of two settling ponds located between Short Creek and the former Acid Plant Area during the 2007 EOC investigation (Figure 2).

CEC requested Oglesby to excavate or re-excavate test pits in settling pond areas to bedrock or impossible obstruction using a track-mounted excavator. TP-17C, TP-17F, and TP-155 were excavated in the western pond and TP-51, TP-131, and TP-134 were excavated in the eastern pond (Figures 4 and 5). CEC collected grab samples from the sidewalls of each test pit where the material appeared visually dissimilar by using a dedicated scoop. At each test pit location, CEC submitted one grab sample for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above for laboratory analysis. CEC submitted a second grab sample from TP-155 and TP-131 for laboratory analysis of TCLP VOCs.

A representative from KDHE was present during the pond and debris pit soil characterization to observe field activities and collect additional samples.

3.4.2 Pipeline Material Characterization

A 6 to 8-inch metal pipeline, oriented north to south, was unearthed near the western settling pond between Short Creek and the former Acid Plant Area during the 2007 EOC investigation.

During the 2009 SEOC, CEC performed a frequency-induction geophysical survey at the site in an attempt to trace metallic utilities and/or plastic utilities with tracer wires from a known location. This survey was performed by inducing a current into the utility from the ground surface. Oglesby unearthed the pipeline at TP-17E, TP-17G, TP-17H, TP-93, and TP-17I (Figure 4). During the excavation, CEC observed a 12-inch concrete pipeline adjacent to the metal pipeline at TP-93 and TP-17H. Once the pipelines were accurately traced and unearthed, CEC requested Oglesby to expose the pipe interiors at several locations. Using a dedicated scoop, CEC collected samples of the concrete pipeline material (TP-93 CPM) and the metal

pipeline material (TP-17I MPM) (Figure 5). From each pipeline, CEC submitted one grab sample for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above for laboratory analysis.

In addition to the pipeline in TP-93, CEC observed an unknown white powder during the 2007 EOC. Oglesby re-excavated TP-93 to bedrock and CEC collected grab samples from the sidewalls of the test pit where the material appeared visually dissimilar by using a dedicated scoop. CEC submitted one grab sample for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above for laboratory analysis.

A representative from KDHE was present during the pipeline investigation to observe field activities and collect additional samples.

3.4.3 Acid Plant Area Material Characterization

CEC monitored the excavation of test pits in the Acid Plant Area during the additional Smelter Plant Area soil delineation and the pipeline investigation discussed in Sections 3.3 and 3.4.2 above (Figure 2). CEC encountered additional unknown material with elevated metals concentrations throughout the Acid Plant Area. CEC collected samples at TP-164A and TP-173 (Figure 5). CEC collected one duplicate sample, labeled TP-173 DUP, in the Acid Plant Area. CEC collected grab samples from the sidewalls of each test pit where the material appeared visually dissimilar by using a dedicated scoop. At each test pit location, CEC submitted one grab sample for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above for laboratory analysis.

3.4.4 Suspect Material Located Between Short Creek and the West Warehouse

During the 2007 EOC, CEC encountered demolition debris and unknown white to yellow material with elevated metals concentration at TP-138 and a 3 foot by 5 foot section of suspect yellow material with elevated metals concentrations at TP-139B (Figure 5).

CEC requested Oglesby to re-excavate TP-138 and TP-139B to bedrock or impossible obstruction using a track-mounted excavator. CEC collected grab samples from the sidewalls of each test pit where the material visually appeared visually dissimilar by using a dedicated scoop. At each test pit location, CEC submitted two grab samples for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above for laboratory analysis.

3.4.5 Petroleum Contaminated Soil – Smelter Plant Area (Fenced Portion)

During the 2007 EOC, CEC encountered petroleum and chemical odors, staining, and elevated photo-ionization detector readings (PID) at TP-111 located south of the Manganese Dioxide Building (Figures 4 and 5). CEC monitored the excavation of 11 additional test pits, labeled TP-111A through TP-111K to delineate the vertical and horizontal extent of the contaminated soil. CEC collected samples at TP-111A and TP-111J (Figure 5). CEC collected grab samples from the sidewalls of each test pit where the material appeared visually dissimilar by using a dedicated scoop. At each test pit location, CEC submitted one grab sample for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above for laboratory analysis.

3.5 ADDITIONAL OUTPARCEL SOIL DELINEATION

KDHE requested that CEC provide additional outparcel vertical delineation of lead and mercury impacted soils as described in KDHE comments letter dated January 30, 2009. Two transects and proposed test pit locations were located on outparcel A, B, C, D, and E. The transects and test pit sample locations were chosen to provide representative data from varying land surface slope, aspect, soil thickness, and possible disturbed areas. Locations were distributed to provide maximum coverage. Nomenclature for the soil samples was as follows: A-T1-01 (0.5') where A designates the outparcel, T1 designates the transect number, and (0.5') designates the depth the sample was collected.

Prior to the additional outparcel characterization, CEC pre-loaded the property boundaries, the transects, and the proposed sample locations for all five outparcels into the GPS receiver. CEC requested Oglesby to excavate 125 test pits along the outparcel transects and performed XRF screening to characterize the vertical extent of metals. Test pit locations are presented on Figures 6 through 10 and test pit logs are provided in Appendix D. An additional 20 test pits were excavated at random locations to provide more representation on the outparcels. An additional two test pits were excavated on and near the buried waste pile on the southern portion of Outparcel A and are discussed in further detail in Section 3.6 of this report. Several of the proposed test pits locations were moved minimally due to access issues. Each test pit was backfilled after excavation and the location was recorded using the GPS.

During the 2009 SEOC, CEC monitored the excavation of:

- 33 test pits and collected and screened 159 subsurface soil samples from Outparcel A (Figure 6)
- 14 test pits and collected and screened a total of 74 subsurface soil samples from Outparcel B (Figure 7)
- 31 test pits and collected and screened 146 subsurface soil samples from Outparcel C (Figure 8)
- 26 test pits and collected and screened 120 subsurface soil samples from Outparcel D (Figure 9)
- 43 test pits and collected and screened a total of 219 subsurface soil samples from Outparcel E (Figure 10)

CEC collected and screened soil samples at 0.5 foot depth intervals until the metals concentrations were shown to be less than their respective RSK standards or bedrock was encountered. CEC scientists were onsite to log and photograph the test pits and perform field and laboratory XRF screening to develop a vertical profile of metals concentrations. The scientists used a dedicated scoop to collect discrete samples at specified intervals by scraping the

test pit sidewall. At select locations where bedrock was encountered (and where applicable), CEC screened with the XRF to measure metals concentrations in native rock. CEC screened a total of 28 bedrock samples.

3.6 OUTPARCEL HAZARDOUS MATERIAL CHARACTERIZATION

Fifteen test pits, labeled EP-1 through EP-15, were excavated during the 2007 EOC to identify the location of a buried waste pile on the southern portion of Outparcel A near the abandoned St. Louis & San Francisco Railroad bed (Figure 6). The waste pile consisted of gray and turquoise blue silt, clay, and rock fragments with elevated metals concentrations. Surface soil contained an elevated XRF mercury concentration exceeding 6,000 mg/kg at EP-6. The 2007 EOC determined that the pile was approximately 4 feet high by 12 feet wide at the base, extended vertically to 7 feet bgs, and was underlain by residual reddish brown silty clay with chert fragments.

KDHE requested that CEC properly characterize unknown materials to aid in disposal options as described in KDHE comments letter dated January 30, 2009. To further delineate the vertical extent of the buried waste pile and characterize the material encountered, CEC monitored the excavation of two test pits, labeled EP-06A and EP-06B, on and adjacent to the waste pile during the 2009 SEOC (Figure 6). The test pits were excavated to native soil (if visually evident), bedrock, or impossible obstruction. CEC collected grab samples from the sidewalls of EP-06A where the material appeared visually dissimilar by using a dedicated scoop. CEC submitted one grab sample for TCLP VOCs and one composite sample for the remaining analytes discussed in Section 3.4 above to Pace for laboratory analysis (Figure 5).

3.7 SHORT CREEK AND SPRING BRANCH CHARACTERIZATION

The USEPA and KDHE are conducting a large Tri-State Mining District (Kansas, Missouri, and Oklahoma) watershed study of the Spring River and Tar Creek basins. This work will characterize the stream sediments and surface water quality with the end result being the

recommendation of sediment clean-up criteria. As a result of the watershed study, CEC did not conduct additional downstream Short Creek investigations on property not owned by the Trust. During the 2009 SEOC, CEC collected sediment and surface water samples along the Spring Branch of Short Creek and additional surface water samples along Short Creek. Sediment sampling locations are presented on Figure 11.

3.7.1 Sediment

KDHE requested that CEC conduct additional sampling along the Spring Branch of Short Creek as described in KDHE comments letter dated January 30, 2009. CEC investigated approximately 800 linear feet of the Spring Branch of Short Creek during the 2009 SEOC. CEC collected nine sediment samples, labeled SBSC SED-01 through SBSC SED-09, at 100-foot intervals beginning upstream from the point where the Spring Branch of Short Creek enters Outparcel A to a point before it flows into a larger branch of Short Creek. CEC collected one duplicate sample, labeled SBSC-DUP, at the SBSC SED-01 sampling location.

The CEC scientist collected sediment samples at locations of obvious deposition along stream banks and on point bars or islands moving in an upstream direction so that sediment disturbance did not impact downstream sample locations. The sample locations were recorded in the field using the GPS. CEC submitted sediment samples to Pace for laboratory analysis of for RCRA metals plus zinc (USEPA Method 6010).

3.7.2 Surface Water

CEC collected three Short Creek surface water samples labeled SC-Downstream, SC-Midstream, and SC-Upstream. Surface water sampling locations are presented on Figure 11. Two samples were collected at the property boundaries (east and west) and one was collected approximately midway between the two. KDHE also requested that CEC conduct additional sampling along the Spring Branch of Short Creek as described in KDHE comments letter dated January 30, 2009. CEC collected two Spring Branch surface water samples labeled SBSC-Downstream and SBSC-

Upstream. The upstream sample was collected at the point prior to the Spring Branch of Short Creek entering Outparcel A and the downstream sample was collected before the Spring Branch flows into Short Creek.

Samples were collected moving in an upstream direction so that sediment disturbance did not impact downstream sample locations. The samples were collected by carefully dipping the laboratory supplied containers into the water to allow water to enter, but not to allow any preservatives to exit the bottles. CEC placed the samples in iced coolers immediately after collection. Surface water samples were submitted to Pace for laboratory analysis of total and dissolved RCRA metals plus zinc (USEPA Methods 200.7 and 245.1), pH (field) and total hardness. A representative from KDHE was present to observe the surface water sampling activities.

3.8 LEAD SPECIATION

As part of the supplemental characterization activities, KDHE recommended samples be collected and analyzed for lead speciation. Within the outparcels, lead species in soils contaminated by the smelting activities is thought to be due to long-term atmospheric stack emissions. These lead species may have differing phases and forms associated with them than lead species from tailings, slags, and other smelting wastes. Lead speciation sampling was conducted in an attempt to evaluate if the lead-contaminated materials on the outparcels (i.e., outfall) are the same species as the lead-contaminated materials on the Smelter Plant Area (i.e., slag).

CEC collected a total of 11 surface soil speciation samples, labeled SPEC-01 through SPEC-11, in areas of known elevated lead impacts in order to assess the possibility of different sources of lead contamination at the site. Lead speciation sampling locations are presented on Figure 12. CEC collected two Smelter Plant Area speciation samples during the investigation. One Smelter Plant Area sample was collected from the Finished Product Storage Area (SPEC-01) and the second sample was collected from the Slag Dump (SPEC-03). CEC also collected one

speciation sample from Outparcel A (SPEC-07), Outparcel B (SPEC-06), Outparcel C (SPEC-09), Outparcel D (SPEC-05), and Outparcel E (SPEC-08). CEC collected Short Creek sediment speciation samples at an upstream location (SPEC-02) and a downstream location (SPEC-04). In addition, CEC collected two offsite speciation samples (SPEC-10 and SPEC-11) included in the Cherokee County Superfund, Galena Subsite.

At each location, the CEC scientist collected a grab sample by using a disposable scoop. Samples were submitted for lead speciation to the Laboratory for Environmental and Geologic Studies (LEGS) administered by the Department of Geological Sciences at the University of Colorado, Boulder. Lead speciation samples were analyzed using an electron microprobe (EMPA) technique by Dr. John Drexler. Parameters characterized during the speciation analyses included particle size, associations, stoichiometry, frequency of occurrence of metal-bearing forms and relative mass of metal bearing-forms.

3.9 MINE VOID INVESTIGATION

During the 2007 EOC investigation, CEC observed a mine shaft opening located between test pits OPD TP-18 and OPD TP-22 on Outparcel D. Prior to 2009 SEOC field activities, CEC reviewed local abandoned mine maps in an attempt to locate information pertaining to the mine shaft on Outparcel D. Review of historic mine maps show no mine workings in this area, although a mine shaft opening appears at this location on more than one historic map. The mine maps also indicated one mine shaft on Outparcel C, four mine shafts on Outparcel D, and eight mine shafts on Outparcel E. In order to reach bodies of ore throughout the Tri-State mining district, early miners and mining companies excavated hundreds of working and prospective mine shafts.

CEC conducted a limited subsurface investigation to gain further understanding of the presence, or lack thereof, of mine workings in the immediate vicinity of the mine shafts indicated on the mine maps and observed in the field during the 2007 EOC and 2009 SEOC activities. The purpose of the investigation was to attempt to evaluate the potential for mine roof collapse

during future remedial efforts associated with heavy equipment operation. CEC contracted Dykon Blasting Corp (Dykon) to perform the exploratory boring work. Dykon advanced six borings on Outparcel A labeled A-B-01 through A-B-06; one boring on Outparcel C labeled C-B-07; six borings on Outparcel D labeled D-B-01 through D-B-06; and six borings on Outparcel E labeled E-B-01 through E-B-06. Boring locations are presented on Figure 13. Borings were advanced using 3-inch diameter, air-operated, rotary-percussive drilling equipment and were plugged with bentonite chips upon completion. No samples were obtained during boring advancement. A CEC field scientist was present to monitor the drilling, visually observe the materials encountered, and make modifications to the drilling program.

Dykon also advanced two borings, labeled SM-B-01 and SM-B-02, through the basement floor slab of the former White Lead Plant to evaluate the possibility of basement voids underneath the proposed disposal cell. The borehole locations were surveyed using the GPS.

3.10 GRADATION AND GEOTECHNICAL SOIL ANALYSIS

CEC collected 19 soil samples for gradational and geotechnical analysis to assist in erosion and sedimentation calculations and to confirm soil classification from county soil maps. Geotechnical soil sampling locations are presented on Figure 13. CEC collected seven soil samples from the Smelter Plant Area, four soil samples from Outparcel A, one soil sample from Outparcel B, two soil samples from Outparcel C, three soil samples from Outparcel D, and two soil samples from Outparcel E. The samples were submitted to Palmerton & Parrish, Inc. in Springfield, MO for geotechnical analysis.

In addition, CEC collected nine soil samples for agricultural laboratory testing to assist with seeding and revegetation of remediated areas. CEC collected natural soil samples that will be representative of the soil that will remain on the Smelter Plant Area and outparcels post remediation. CEC collected four soil samples from the Smelter Plant Area, two soil samples from Outparcel A, and one soil sample from Outparcels B, C, and D. The samples were

submitted to A & L Great Lakes Laboratories, Inc. in Fort Wayne, IN for agricultural testing analysis.

3.11 BACKGROUND SOIL ANALYSIS

KDHE collected 10 background samples in the prevailing upwind direction (south to southwest) during their 2006 investigation. CEC collected an additional 20 background samples from ten locations surrounding the site to support the background data collected by KDHE. KDHE and CEC background sampling locations are presented on Figure 14. At each sample location, CEC collected one soil sample from the surface and one soil sample at 0.5 feet bgs. The samples were collected similarly to the samples collected on the Smelter Plant Area and outparcels.

4.0 DATA ANALYSIS AND FINDINGS

4.1 SMELTER PLANT AREA SOIL DELINEATION

In accordance with Section 2.3(c) of the Custodial Trust Agreement, both XRF and fixed-lab analytical results were compared to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). Raw XRF data is provided in Appendix E and the complete laboratory data package is provided in Appendix F.

4.1.1 Surface Soil Samples

XRF surface soil results were collected from a total of 193 Smelter Plant Area locations during the 2007 EOC and 2009 SEOC. However, for completeness, surface soil results from both KDHE and CEC investigations were used to create isoconcentration maps of arsenic, cadmium, chromium, copper, lead, mercury, and zinc and are presented on Figures 15 through 21.

Arsenic: The maximum surface soil XRF arsenic concentration detected during the EOC and SEOC on the Smelter Plant Area was 21,295 mg/kg at TP-138. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples collected is listed below:

- 0-38 mg/kg (RSK standard) – 40 samples (20.73%)
- 39-1,000 mg/kg – 89 samples (46.11%)
- 1,001-5,000 mg/kg – 49 samples (25.39%)
- 5,001-15,000 mg/kg – 14 samples (7.25%)
- >15,000 mg/kg – 1 sample (0.52%)

Cadmium: Cadmium concentrations did not exceed the RSK standards on the Smelter Plant Area surface soils collected during the 2007 EOC and 2009 SEOC.

Chromium: The maximum surface soil XRF chromium concentration detected during the EOC and SEOC on the Smelter Plant Area was 5,143 mg/kg at TP-69. TP-69 was the only surface soil sample collected by CEC that exceeded the RSK standard.

Copper: Copper concentrations did not exceed the RSK standards on the Smelter Plant Area surface soils collected during the EOC and SEOC or by KDHE.

Lead: The maximum surface soil XRF lead concentration detected during the EOC and SEOC on the Smelter Plant Area was 198,940 mg/kg at TP-138. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 16 samples (8.29%)
- 1,001-5,000 mg/kg – 38 samples (19.69%)
- 5,001-50,000 mg/kg – 112 samples (58.03%)
- 50,001-100,000 mg/kg – 15 samples (7.77%)
- 100,001-150,000 mg/kg - 6 samples (3.11%)
- >150,000 - 6 samples (3.11%)

Mercury: The maximum surface soil XRF mercury concentration detected during the EOC and SEOC on the Smelter Plant Area was 15,806 mg/kg at TP-138. The general distribution of XRF mercury samples is listed below:

- 0-20 mg/kg (RSK standard) – 156 samples (80.83%)
- 21-1,000 mg/kg – 25 samples (12.95%)
- 1,001-10,000 mg/kg – 11 samples (5.70%)
- >10,000 mg/kg – 1 sample (0.52%)

Zinc: Zinc concentrations did not exceed the RSK standards on the Smelter Plant Area surface soils collected during the EOC and SEOC or by KDHE.

4.1.2 Subsurface Soil Samples

XRF results were collected from a total of 439 subsurface soil samples on the Smelter Plant Area during the 2007 EOC and 2009 SEOC investigations. However, for completeness, XRF surface and subsurface soil sample results collected by both KDHE and CEC investigations were used to create a figure that presents the total depth of soil that exceeds the RSK standards for either arsenic, cadmium, chromium, copper, lead, mercury, or zinc (Figure 22). A separate figure was created that presents the total depth of soil that exceeds the RSK standards for mercury only (Figure 23). The following paragraphs discuss the subsurface soil data collected during the 2007 EOC and 2009 SEOC.

Arsenic: The maximum subsurface soil XRF arsenic concentration detected during the EOC and SEOC on the Smelter Plant Area was 32,449 mg/kg at TP-164F at 1 foot bgs. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples is listed below:

- 0-38 mg/kg (RSK standard) – 216 samples (49.20%)
- 39-1,000 mg/kg – 146 samples (33.26%)
- 1,001-5,000 mg/kg – 59 samples (13.44%)
- 5,001-15,000 mg/kg – 14 samples (3.19%)
- >15,000 mg/kg – 4 samples (0.91%)

Cadmium: The maximum subsurface soil XRF cadmium concentration detected during the EOC and SEOC on the Smelter Plant Area was 4,254 mg/kg at TP-17C at 7 feet bgs. The general distribution of XRF cadmium samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 427 samples (97.27%)
- 1,000-4,000 mg/kg – 11 samples (2.51%)
- >4,000 mg/kg – 1 samples (0.23%)

Chromium: The maximum subsurface soil XRF chromium concentration detected during the EOC and SEOC on the Smelter Plant Area was 4,194 mg/kg at TP-76 at 5 feet bgs. TP-76 at 5 feet bgs was the only subsurface soil sample that exceeded the RSK standard. The general distribution of XRF chromium samples is listed below:

- 0-4,000 mg/kg (RSK standard) – 438 samples (99.77%)
- >4,000 mg/kg – 1 sample (0.23%)

Copper: The maximum subsurface soil XRF copper concentration detected during the EOC and SEOC on the Smelter Plant Area was 251,094 mg/kg at TP-134 at 2 feet bgs. The general distribution of XRF copper samples is listed below:

- 0-76,000 mg/kg (RSK standard) – 437 samples (99.54%)
- >76,000 mg/kg – 2 samples (0.46%)

Lead: The maximum subsurface soil XRF lead concentration detected during the EOC and SEOC on the Smelter Plant Area was 286,047 mg/kg at TP-164F at 1 foot bgs. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 193 samples (43.96%)
- 1,001-5,000 mg/kg – 83 samples (18.91%)
- 5,001-50,000 mg/kg – 121 samples (27.56%)
- 50,001-100,000 mg/kg – 26 samples (5.92%)
- 100,001-200,000 mg/kg – 7 samples (1.59%)
- > 200,000 mg/kg – 9 samples (2.05%)

Mercury: The maximum subsurface soil XRF mercury concentration detected during the EOC and SEOC on the Smelter Plant Area was 24,912 mg/kg at TP-164A at 3.5 feet bgs. The general distribution of XRF mercury samples is listed below:

- 0-20 mg/kg (RSK standard) – 331 samples (75.40%)
- 21-1,000 mg/kg – 68 samples (15.49%)
- 1,001-10,000 mg/kg – 33 samples (7.52%)
- >10,000 mg/kg – 7 samples (1.59%)

Zinc: The maximum subsurface soil XRF zinc concentration detected during the EOC and SEOC on the Smelter Plant Area was 631,000 mg/kg at TP-76 at 5 feet bgs. The general distribution of XRF zinc samples is listed below:

- 0-610,000 mg/kg (RSK standard) – 437 samples (99.54%)
- >610,000 mg/kg – 2 samples (0.46%)

4.2 SMELTER PLANT AREA HAZARDOUS MATERIAL CHARACTERIZATION

Analytical results were compared to the regulatory limits for contaminants set by 40 CFR 261.4 for TCLP metals, TCLP VOCs, TCLP SVOCs, corrosivity/pH, and ignitability. Total metals, PCB's, and pesticides were compared to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). Reactive sulfide and cyanide were compared to the 1985 EPA guidance criteria for reactive cyanide and sulfide included in EPA Method SW-846. The EPA has determined that the analytical method for reactive sulfide and cyanide is not reliable and no longer approves the method. Material characterization analytical results are summarized on Tables 1 through 3 and the complete laboratory data package is provided in Appendix G.

4.2.1 Settling Pond Material Characterization

During the 2007 EOC, CEC encountered a pair of settling ponds between Short Creek and the former Acid Plant Area. The ponds are located adjacent to and south of Short Creek and consist of banded white and gray clays, metallic gray sandy clays, demolition debris, white sock filters, several empty plastic and metal drums, and turquoise blue silt and fragments in brown paper bags. CEC observed similar material during the excavation and sampling of TP-17C, TP-17F, TP-155, TP-51, TP-131, and TP-134. Material characterization analysis results are presented below and are summarized on Table 1.

- TCLP arsenic and chromium concentrations were below the laboratory detection limits. Total arsenic concentrations exceeded the RSK standard at TP-17C, TP-51, TP-131, TP-155.
- The maximum TCLP cadmium detection (TP-17C - 27.7 mg/l) exceeded the TCLP threshold of 1 mg/l. The corresponding total cadmium concentration (3,260 mg/kg) exceeded the RSK standard. Cadmium concentrations at TP-131, TP-134, and TP-155 exceeded the TCLP threshold and did not exceed the RSK standard.
- The maximum TCLP lead detection (TP-51 - 429 mg/l) exceeded the TCLP threshold of 5 mg/l. The corresponding total lead concentration (38,400 mg/kg) exceeded the RSK standard. The TCLP and total lead concentrations in all six samples exceeded the TCLP threshold and the RSK standard.
- The only TCLP mercury detection (TP-131 – 0.0492 mg/l) did not exceed the TCLP threshold of 0.2 mg/l. The corresponding total mercury concentration (1,250 mg/kg) exceeded the RSK standard. Mercury concentrations at TP-17C, TP-17F, TP-155, TP-51 exceeded the RSK standard.
- The total zinc concentrations did not exceed the RSK standard.
- TCLP VOCs and TCLP SVOCs concentrations were below the laboratory detection limits.

- PCB-1254 (Arochlor 1254) was detected at concentrations not exceeding the RSK standard at each sample location and was the only PCB detected.
- Pesticides alpha-BHC, beta-BHC, 4,4'-DDE, 4,4'-DDT, dieldrin, endrin aldehyde were detected at TP-51. Pesticides 4,4'-DDE, dieldrin, endrin aldehyde, and heptachlor epoxide were detected at TP-155. Pesticide 4,4'-DDE was detected at TP-17C. Pesticide concentrations did not exceed the RSK standards.
- Reactive sulfide was detected at TP-17C at a concentration of 230 mg/kg, not exceeding the 1985 EPA guidance criteria of 250 mg/kg.
- Reactive cyanide concentrations were below the laboratory detection limits.
- Each sampling location was within the acceptable corrosivity/pH range of 2 to 12.5 standard units and exceeded the ignitability (flashpoint) RCRA limit of 140° Fahrenheit.
- TP-17C was the only sample that tested positive for Paint Filter Liquids.

4.2.2 Pipeline Material Characterization

During the 2007 EOC, CEC determined that a 6 to 8-inch metal pipeline terminated in the western settling pond at TP-17F. The pipeline was also observed at TP-93, and TP-17E. During the 2009 SEOC, CEC traced the pipeline from north to south where it originated in the location of the Acid Plant Area at TP-17I. A 12-inch concrete pipeline was unearthed adjacent and parallel to the metal pipeline during the investigation and also terminated in the location of the Acid Plant. Each pipeline contained limited residue similar to the material observed in the settling ponds and appeared to transfer the waste material from the Acid Plant to the western settling pond. CEC collected a material characterization sample from each pipeline labeled TP-93 CPM and TP-17I MPM. CEC did not observe any pipelines that transported waste material to the eastern settling pond. Material characterization analysis results are presented below and are summarized on Table 2.

- TCLP arsenic, chromium, and mercury concentrations were below the laboratory detection limits. Total arsenic and mercury concentrations exceeded the RSK standards at TP-93 CPM.
- The maximum TCLP cadmium detection (TP-17I MPM - 4.6 mg/l) exceeded the TCLP threshold of 1 mg/l. The corresponding total cadmium concentration (530 mg/kg) did not exceed the RSK standard. The cadmium concentration at TP-93 CPM also exceeded the TCLP threshold, but did not exceed the RSK standard.
- The maximum TCLP lead detection (TP-93 CPM - 282 mg/l) exceeded the TCLP threshold of 5 mg/l. The corresponding total lead concentration (30,700 mg/kg) exceeded the RSK standard. The lead concentration at TP-17I MPM did not exceed the TCLP threshold, but exceeded the RSK standard.
- The total zinc concentrations did not exceed the RSK standard.
- TCLP VOCs, TCLP SVOCs, and reactive sulfide and cyanide concentrations were below the laboratory detection limits.
- PCB-1254 (Arochlor 1254) was detected at concentrations not exceeding the RSK standard at each sampling location and was the only PCB detected.
- Dieldrin and heptachlor epoxide were detected at concentrations not exceeding the RSK standard at TP-17I MPM and were the only pesticides detected.
- Each sampling location was within the acceptable corrosivity/pH range of 2 to 12.5 standard units and exceeded the ignitability (flashpoint) RCRA limit of 140° Fahrenheit.
- Each sampling location tested positive for Paint Filter Liquids.

In addition to the pipeline in TP-93, CEC observed an unknown white powder during the 2007 EOC. During the re-excavation and sampling of TP-93, CEC observed similar material. Material characterization analysis results for TP-93 are presented below and are summarized on Table 2.

- TCLP concentrations for arsenic, chromium, and mercury were below the laboratory detection limits. The total arsenic and mercury concentrations exceeded the RSK standards, but chromium did not.
- The TCLP cadmium concentration (10.6 mg/l) exceeded the TCLP threshold limit of 1 mg/l. The corresponding total cadmium concentration (1,100 mg/kg) exceeded the RSK standard.
- The TCLP lead concentration (110 mg/l) exceeded the TCLP threshold limit of 5 mg/l. The corresponding total lead concentration (35,500 mg/kg) exceeded the RSK standard.
- The total zinc concentration did not exceed the RSK standard.
- TCLP VOCs, TCLP SVOCs, pesticides, and reactive sulfide and cyanide concentrations were below the laboratory detection limits.
- PCB-1254 (Arochlor 1254) was detected at a concentration not exceeding the RSK standard and was the only PCB detected.
- TP-93 was within the acceptable corrosivity/pH range of 2 to 12.5 standard units and exceeded the ignitability (flashpoint) RCRA limit of 140° Fahrenheit.
- TP-93 tested positive for Paint Filter Liquids.

4.2.3 Acid Plant Material Characterization

CEC encountered additional pipelines, pipeline fill material, unknown pinkish gray material, unknown hardened yellow material, and demolition debris with elevated metals concentrations in the Acid Plant Area. CEC collected a material characterization sample at TP-164A and TP-173. Material characterization analysis results are presented below and are summarized on Table 2.

- TCLP arsenic and chromium concentrations were below the laboratory detection limits.
- The maximum TCLP cadmium detection (TP-173 - 1.3 mg/l) was the only detection that exceeded the TCLP threshold of 1 mg/l. The corresponding total cadmium concentration (150 mg/kg) did not exceed the RSK standard.

- The maximum TCLP lead detection (TP-164A - 326 mg/l) exceeded the TCLP threshold of 5 mg/l. The corresponding total lead concentration (14,600 mg/kg) exceeded the RSK standard. The lead concentration at TP-173 also exceeded the TCLP threshold and RSK standard.
- The TCLP mercury detection at TP-164A (0.0097 mg/l) did not exceed the TCLP threshold of 0.2 mg/l and was the only TCLP mercury detection in the Acid Plant Area samples. The corresponding total mercury concentration (4,270 mg/kg) exceeded the RSK standard.
- The total zinc concentrations did not exceed the RSK standard.
- TCLP VOCs, TCLP SVOCs, and reactive sulfide and cyanide concentrations were below the laboratory detection limits.
- PCB-1254 (Arochlor 1254) was detected at 14,100 ug/kg, exceeding the RSK standard at TP-164A and was the only PCB detected. Arochlor 1254 was detected at concentrations not exceeding the RSK standard at TP-173.
- Pesticides 4,4'-DDE, dieldrin, and heptachlor epoxide were detected at concentrations not exceeding the RSK standards at TP-164A and were the only pesticides detected.
- Each sampling location was within the acceptable corrosivity/pH range of 2 to 12.5 standard units, exceeding the ignitability (flashpoint) RCRA limit of 140° Fahrenheit, and tested negative for Paint Filter Liquids.

4.2.4 Suspect Material Located Between Short Creek and the West Warehouse

During the 2007 EOC, CEC encountered demolition debris and white to yellow mottled material with elevated metals concentration at TP-138 and a 3 foot by 5 foot section of suspect yellow material with elevated metals concentrations at TP-139B. During the re-excavation and sampling of TP-138 and TP-139B, CEC observed similar material. Material characterization analysis results are presented below and are summarized on Table 3.

- TCLP arsenic, chromium, and mercury concentrations were below the laboratory detection limits. Total arsenic concentrations exceeded the RSK standard in each sample.
- The maximum TCLP cadmium detection (TP-138 - 2.9 mg/l) was the only detection that exceeded the TCLP threshold of 1 mg/l. The corresponding total cadmium concentration (103 mg/kg) did not exceed the RSK standard.
- The maximum TCLP lead detection (TP-138 - 462 mg/l) exceeding the TCLP threshold of 5 mg/l. The corresponding total lead concentration (18,300 mg/kg) exceeded the RSK standard. The lead concentration at TP-139B also exceeded the TCLP threshold and RSK standard.
- The total zinc concentrations did not exceed the RSK standard.
- TCLP VOCs, TCLP SVOCs, PCBs, pesticides, and reactive sulfide and cyanide concentrations were below the laboratory detection limits at each sampling location.
- Each sample was within the acceptable corrosivity/pH range of 2 to 12.5 standard units, and exceeded the ignitability (flashpoint) RCRA limit of 140° Fahrenheit.
- TP-139B tested positive for Paint Filter Liquids.

4.2.5 Petroleum Contaminated Soil – Smelter Plant Area (Fenced Portion)

During the 2007 EOC, CEC encountered petroleum and chemical odors, staining, and elevated PID readings at TP-111 located south of the Manganese Dioxide Building. During the re-excavation of TP-111, labeled TP-111A, CEC observed similar staining and chemical and decaying petroleum odors. CEC collected material characterization samples at TP-111A and TP-111J. Material characterization analysis results are presented below and are summarized on Table 3.

- TCLP concentrations for arsenic, chromium, and mercury were below the laboratory detection limits at each sample location. The total arsenic concentration exceeded the RSK standard at TP-111A.

- The maximum TCLP cadmium detection (TP-111A – 0.19 mg/l) did not exceed the TCLP threshold of 1 mg/l. The corresponding total cadmium concentration (88.7 mg/kg) did not exceed the RSK standard.
- The maximum TCLP lead detection (TP-111A - 207 mg/l) was the only detection that exceeded the TCLP threshold of 5 mg/l. The corresponding total lead concentration (27,400 mg/kg) exceeded the RSK standard. The total lead concentration also exceeded the RSK standard at TP-111J.
- The total zinc concentrations did not exceed the RSK standard.
- TCLP VOCs, TCLP SVOCs, PCB's, pesticides, and reactive sulfide and cyanide were below the laboratory detection limits at each sampling location.
- Each sample was within the acceptable corrosivity/pH range of 2 to 12.5 standard units, exceeding the ignitability (flashpoint) RCRA limit of 140° Fahrenheit, and tested negative for Paint Filter Liquids.

4.3 OUTPARCEL SOIL DELINEATION

In accordance with Section 2.3(c) of the Custodial Trust Agreement, both XRF and fixed-lab analytical results were compared to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). Raw XRF data is provided in Appendix E and the complete laboratory data package is provided in Appendix F.

4.3.1 Surface Soil Samples

Outparcel XRF results were collected from a total of 1,107 surface soil samples during the 2007 EOC and 2009 SEOC investigations. However, for completeness, surface soil results from both KDHE and CEC investigations were used to create isoconcentration maps of arsenic, cadmium, chromium, copper, lead, mercury, and zinc. Surface soil isoconcentration maps are presented on Figures 15 through 21.

4.3.1.1 Outparcel A

XRF results were collected from 416 surface soil samples on Outparcel A as part of the 2007 EOC and 2009 SEOC.

Arsenic: The maximum surface soil XRF arsenic concentration detected during the EOC and SEOC on Outparcel A was 8,234 mg/kg at EP-6. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples and percentage of exceedance on Outparcel A is listed below:

- 0-38 mg/kg (RSK standard) – 335 samples (80.53%)
- 39-500 mg/kg – 77 samples (18.51%)
- >500 mg/kg – 4 samples (0.96%)

Lead: The maximum surface soil XRF lead concentration detected during the EOC and SEOC on Outparcel A was 122,013 mg/kg at EP-6. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 255 samples (61.30%)
- 1,001-5,000 mg/kg – 154 samples (37.02%)
- 5,001-50,000 mg/kg – 3 samples (0.72%)
- >50,000 mg/kg – 4 samples (0.96%)

Mercury: The maximum surface soil XRF mercury concentration detected during the EOC and SEOC on Outparcel A was 6,694 mg/kg at EP-6. The general distribution of XRF mercury samples is listed below:

- 0-20 mg/kg (RSK standard) – 395 samples (94.95%)
- 21-300 mg/kg – 19 samples (4.57%)

- >300 mg/kg – 2 sample (0.48%)

Cadmium, chromium, copper, and zinc concentrations did not exceed the RSK standards for the Outparcel A surface soils during the EOC and/or SEOC.

4.3.1.2 Outparcel B

XRF results were collected from 56 surface soil samples on Outparcel B as part of the 2007 EOC and 2009 SEOC.

Arsenic: The maximum surface soil XRF arsenic concentration detected during the EOC and SEOC on Outparcel B was 2,071 mg/kg at B3-04. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples is listed below:

- 0-38 mg/kg (RSK standard) – 41 samples (73.21%)
- 39-300 mg/kg – 11 samples (19.64%)
- >300 mg/kg – 4 samples (7.14%)

Lead: The maximum surface soil XRF lead concentration detected during the EOC and SEOC on Outparcel B was 44,685 mg/kg at B3-04. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 40 samples (71.43%)
- 1,001-5,000 mg/kg – 10 samples (17.85%)
- >5,000 mg/kg – 6 samples (10.71%)

Cadmium, chromium, copper, mercury, and zinc concentrations did not exceed the RSK standards for the Outparcel B surface soils during the EOC and SEOC.

4.3.1.3 Outparcel C

XRF results were collected from 124 surface soil samples on Outparcel C as part of the 2007 EOC and 2009 SEOC.

Arsenic: The maximum surface soil XRF arsenic concentration detected during the EOC and SEOC on Outparcel C was 267 mg/kg at C8-05. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples is listed below:

- 0-38 mg/kg (RSK standard) – 102 samples (82.26%)
- 39-300 mg/kg – 22 samples (17.74%)

Lead: The maximum surface soil XRF lead concentration detected during the EOC and SEOC on Outparcel C was 5,829 mg/kg at C11-11. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 60 samples (48.39%)
- 1,001-5,000 mg/kg – 61 samples (49.19%)
- >5,000 mg/kg – 3 samples (2.42%)

Cadmium, chromium, copper, mercury, and zinc concentrations did not exceed the RSK standards for the Outparcel C surface soils during the EOC and SEOC.

4.3.1.4 Outparcel D

XRF results were collected from 282 surface soil samples on Outparcel D as part of the 2007 EOC and 2009 SEOC.

Arsenic: The maximum surface soil XRF arsenic concentration detected during the EOC and SEOC on Outparcel D was 1,100 mg/kg at D18-02. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples is listed below:

- 0-38 mg/kg (RSK standard) – 154 samples (54.61%)
- 39-1,000 mg/kg – 126 samples (44.68%)
- >1,000 mg/kg – 2 samples (0.71%)

Lead: The maximum surface soil XRF lead concentration detected during the EOC and SEOC on Outparcel D was 20,583 mg/kg at D18-02. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK standard) – 117 samples (41.49%)
- 1,001-5,000 mg/kg – 127 samples (45.04%)
- >5,000 mg/kg – 38 samples (13.48%)

Mercury: The maximum surface soil XRF mercury concentration detected during the EOC and SEOC on Outparcel D was 463 mg/kg at RRS-10. The general distribution of XRF mercury samples is listed below:

- 0-20 mg/kg (RSK standard) –278 samples (98.58%)
- 21-500 mg/kg – 4 samples (1.42%)

Cadmium, chromium, copper, and zinc concentrations did not exceed the RSK standards for the Outparcel D surface soils during the EOC and SEOC.

4.3.1.5 Outparcel E

XRF results were collected from 229 surface soils on Outparcel E as part of the 2007 EOC and 2009 SEOC.

Arsenic: The maximum surface soil XRF arsenic concentration detected during the EOC and SEOC on Outparcel E was 1,101 mg/kg at E14-06. The maximum arsenic levels generally correspond with the maximum lead detections. The general distribution of XRF arsenic samples is listed below:

- 0-38 mg/kg (RSK standard) – 161 samples (70.31%)
- 39-600 mg/kg – 67 samples (29.26%)
- >600 mg/kg – 1 sample (0.44%)

Lead: The maximum surface soil XRF lead concentration detected during the EOC and SEOC on Outparcel E was 20,811 mg/kg at E1-16. The general distribution of XRF lead samples is listed below:

- 0-1,000 mg/kg (RSK non residential standard) – 106 samples (46.29%)
- 1,001-5,000 mg/kg – 108 samples (47.16%)
- >5,000 mg/kg – 15 samples (6.55%)

Mercury: The maximum surface soil XRF mercury concentration detected during the EOC and SEOC on Outparcel E was 65 mg/kg at E17-07. The general distribution of XRF mercury samples is listed below:

- 0-20 mg/kg (RSK standard) – 226 samples (98.69%)
- 21-100 mg/kg – 3 samples (1.31%)

Cadmium, chromium, copper, and zinc concentrations did not exceed the RSK standards for the Outparcel D surface soils during the EOC and SEOC.

4.3.2 Subsurface Soil Samples

Outparcel XRF results were collected from a total of 736 subsurface soil samples during the 2007 EOC and 2009 SEOC investigation. However, for completeness, XRF surface and subsurface soil sample results from both KDHE and CEC investigations were used to create a figure that presents the total depth of soil that exceeds the RSK standards for either arsenic, cadmium, chromium, copper, lead, mercury, or zinc (Figure 22). A separate figure was created that presents the total depth of soil that exceeds the RSK standard for mercury only (Figure 23).

4.3.2.1 Outparcel A

XRF results were collected from 161 subsurface soil samples on Outparcel A as part of the 2007 EOC and 2009 SEOC. The number and percentage of exceedances on Outparcel A is listed below:

- Seven subsurface soil samples (4.35%) exceeded the arsenic RSK standard at three sampling locations. The maximum arsenic levels generally correspond with the maximum lead detections.
- Eight subsurface soil samples (4.97%) exceeded the lead RSK standard at four sampling locations.
- One subsurface soil sample (0.62%) exceeded the cadmium RSK standard.
- Chromium, copper, mercury, and zinc were below the RSK standards at each subsurface location.

4.3.2.2 Outparcel B

XRF results were collected from 78 subsurface soils on Outparcel B as part of the 2007 EOC and 2009 SEOC. The number and percentage of exceedances on Outparcel B is listed below:

- Twenty-one subsurface soil samples (26.92%) on Outparcel B exceeded the arsenic RSK standard at six sampling locations. The maximum arsenic levels generally correspond with the maximum lead detections.
- Nineteen subsurface soil samples (24.36%) exceeded the lead RSK standard at six sampling locations.
- Two subsurface soil samples (2.56%) exceeded the mercury RSK standard at two sampling locations.

Cadmium, chromium, copper, and zinc were below the RSK standards at each subsurface location.

4.3.2.3 Outparcel C

XRF results were collected from 146 subsurface soils on Outparcel C as part of the 2007 EOC and 2009 SEOC.

- Arsenic, cadmium, chromium, copper, lead, mercury, and zinc were below the RSK standards at each subsurface location.

4.3.2.4 Outparcel D

XRF results were collected from 124 subsurface soils on Outparcel D as part of the 2007 EOC and 2009 SEOC. The number and percentage of exceedances on Outparcel D is listed below:

- Six subsurface soil samples (4.84%) on Outparcel D exceeded the arsenic RSK standard at four sampling locations. The maximum arsenic levels generally correspond with the maximum lead detections.
- Fourteen subsurface soil samples (11.29%) exceeded the lead RSK standard at eight sampling locations.
- Two subsurface soil samples (D6-03 and D18-02; 1.61%) exceeded the mercury RSK standard.
- Cadmium, chromium, copper, and zinc were below the RSK standards at each subsurface location.

4.3.2.5 Outparcel E

XRF results were collected from 227 subsurface soils on Outparcel E as part of the 2007 EOC and 2009 SEOC. The number and percentage of exceedances on Outparcel E is listed below:

- Thirty subsurface soil samples (13.22%) on Outparcel E exceeded the arsenic RSK standard at eleven sampling locations. The maximum arsenic levels generally correspond with the maximum lead detections.
- Thirty-eight subsurface soil samples (16.74%) exceeded the lead RSK standard at twelve sampling locations.
- Two subsurface soil samples (E14-06 and E-T1-08; 0.88%) exceeded the mercury RSK standard.
- Cadmium, chromium, copper, and zinc were below the RSK standards at each subsurface location.

4.4 OUTPARCEL HAZARDOUS MATERIAL CHARACTERIZATION

To further delineate the vertical extent of the buried waste pile on the southern portion of Outparcel A, CEC excavated two test pits, labeled EP-06A and EP-06B, during the 2009 SEOC.

Fill material extended vertically to 4 feet bgs at EP-06A and 8 feet bgs at EP-06B. Fill material exceeding the RSK standards extended to 5 feet bgs. During the 2007 EOC, an elevated XRF mercury concentration (6,229 mg/kg) was detected on the surface of the waste pile. Subsurface XRF data, collected during the SEOC, indicates that mercury concentrations do not exceed the RSK standards.

CEC collected a hazardous material characterization sample of the waste pile, labeled EP-06A, during the 2009 SEOC. Analytical results were compared to the standards discussed in Section 4.2 of this report. Material characterization analytical results are summarized on Table 3 and the complete material characterization laboratory data package is provided in Appendix G. Material characterization analysis results are presented below.

- TCLP arsenic, chromium, and mercury concentrations were below the laboratory detection limits. The total arsenic concentration exceeded the RSK standard.
- TCLP cadmium was detected at 18.6 mg/l, exceeding the TCLP threshold of 1 mg/l. The corresponding total cadmium concentration was 3,780mg/kg, exceeding the RSK standard.
- TCLP lead was detected at 126 mg/l, exceeding the TCLP threshold of 5 mg/l. The corresponding total lead concentration was 40,400 mg/kg, exceeding the RSK standard.
- The zinc concentration did not exceed the RSK standard.
- TCLP VOCs, TCLP SVOCs, and reactive sulfide and cyanide concentrations were below the laboratory detection limits.
- PCB-1254 (Arochlor 1254) was detected at a concentration not exceeding the RSK standard and was the only PCB detected.
- Pesticide beta BHC was detected at a concentration not exceeding the RSK standard and was the only pesticide detected.
- EP-06A was within the acceptable corrosivity/pH range of 2 to 12.5 standard units, exceeded the ignitability (flashpoint) RCRA limit of 140° Fahrenheit, and tested negative for Paint Filter Liquids.

4.5 OUTPARCEL BEDROCK ANALYSIS

Bedrock XRF results were compared to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). XRF results are summarized on Table 4 and raw XRF data is provided in Appendix E.

- Lead concentrations only exceeded the RSK standard at A-T1-13 and E-T1-03.
- Arsenic, cadmium, chromium, copper, mercury, and zinc concentrations did not exceed the RSK standards.

4.6 SEDIMENT

As stipulated in KDHE Sediment Policy (BER-ARS-045), CEC compared sediment analytical data to the TECS listed in the article "*Development and Evaluation of Consensus-Based Sediment Quality Guidelines for Freshwater Ecosystems*." These standards include:

- Arsenic – 9.79 mg/kg
- Cadmium – 0.99 mg/kg
- Chromium – 43.4 mg/kg
- Lead – 35.8 mg/kg
- Mercury – 0.18 mg/kg
- Zinc – 121 mg/kg

4.6.1 Short Creek Sediment

Sediment was not collected from Short Creek during the 2009 SEOC. CEC collected 51 sediment samples during the 2007 EOC (Figure 11). Sediment sampling locations SED-04 and SED-38 through SED-51 are considered upstream of the AOC. Sediment analytical results were

summarized on Table 5 in the 2007 EOC report which is provided in Appendix B. EOC (2007) sediment analysis is presented below.

- Arsenic concentrations exceeded the TEC at 18 of the 51 sample locations. The maximum arsenic concentration was 77.1 mg/kg at SED-20. Arsenic concentrations did not exceed the TEC in the upstream sediment samples. The average upstream sediment arsenic concentration was 6.4 mg/kg and the average downstream arsenic concentration was 13.1 mg/kg.
- Cadmium concentrations exceeded the TEC at each sampling location. The maximum cadmium concentration was 156 mg/kg collected at upstream sediment sample SED-43. The average upstream sediment cadmium concentration was 47.9 mg/kg and the average downstream cadmium concentration was 45.8 mg/kg.
- Chromium concentrations exceeded the TEC at 7 of the 51 sample locations. The maximum chromium concentration was 132 mg/kg collected at SED-36. Chromium concentrations did not exceed the TEC in the upstream sediment samples. The average upstream chromium concentration was 24.6 mg/kg and the average downstream chromium concentration was 36.6 mg/kg.
- Lead concentrations exceeded the TEC at each sampling location. The maximum lead concentration was 19,400 mg/kg collected at SED-20. The average upstream lead concentration was 106.1 mg/kg and the average downstream lead concentration was 3,011.3 mg/kg.
- Mercury concentrations exceeded the TEC at 23 of the 51 sample locations. The maximum mercury concentration was 18.5 mg/kg collected at SED-20. Two of the upstream sediment samples exceeded the TEC.
- Zinc concentrations exceeded the TEC at each sampling location. The maximum zinc concentration was 27,900 mg/kg collected at SED-20. The average upstream zinc concentration was 6,737 mg/kg and the average downstream arsenic concentration was 6,614.7 mg/kg.

4.6.2 Spring Branch of Short Creek Sediment

Sediment analytical results are summarized on Table 5 and the complete laboratory data package is provided in Appendix H. Sediment results from the Spring Branch of Short Creek are also displayed on Figures 24 through 29. Sediment sampling locations SBSC SED-07 through SBSC SED-09 are considered upstream of the AOC and sediment sampling locations SBSC SED-04 through SBSC SED-06 abut the AOC.

- Arsenic concentrations exceeded the TEC at two (SBSC SED-02 and SBSC SED-06) of the nine sample locations (Figure 24). The maximum arsenic concentration was 13.1 mg/kg collected at SBSC SED-02. Arsenic concentrations did not exceed the TEC in the upstream samples. The average upstream arsenic concentration was 7.7 mg/kg and the average downstream arsenic concentration was 8.4 mg/kg.
- Cadmium concentrations exceeded the TEC at each sampling location (Figure 25). The maximum cadmium concentration was 33.9 mg/kg collected at SBSC SED-04. The average upstream cadmium concentration was 7.5 mg/kg and the average downstream cadmium concentration was 17.2 mg/kg.
- Chromium concentrations exceeded the TEC at seven (SBSC SED-02 through SBSC SED-08) of the nine sample locations (Figure 26). The maximum chromium concentration was 115 mg/kg collected at SBSC SED-02. The average upstream chromium concentration was 45.1 mg/kg and the average downstream chromium concentration was 66.9 mg/kg.
- Lead concentrations exceeded the TEC at each sample location (Figure 27). The maximum lead concentration was 473 mg/kg collected at SBSC SED-02. The average upstream lead concentration was 112.2 mg/kg and the average downstream lead concentration was 190.2 mg/kg.
- Mercury concentrations did not exceed the TEC at any of the sediment sample locations (Figure 28). Mercury concentrations were only present above the laboratory minimum detection limits in one of the upstream samples (SBSC SED-09) and one of the

downstream samples (SBSC SED-04) only. The maximum mercury concentration was 0.063 mg/kg collected at SBSC SED-04.

- Zinc concentrations exceeded the TEC at each sample location (Figure 29). The maximum zinc concentration was 4,040 mg/kg collected at SBSC SED-02. The average upstream zinc concentration was 884 mg/kg and the average downstream zinc concentration was 1733 mg/kg.

4.7 SURFACE WATER

As requested in KDHE comments letter dated January 30, 2009, CEC compared the 2009 SEOC surface water analytical data to the acute and chronic Aquatic Life Support Criteria (ALWQC) listed in the document "*Kansas Surface Water Quality Standards, Tables of Numeric Criteria*". These standards are a function of total hardness. Total hardness results were used to determine the ALWQC for cadmium, lead, and zinc. Surface water sample locations are shown on Figure 11. Surface water analytical results are summarized on Table 6 and the complete laboratory data package is provided in Appendix I.

4.7.1 Short Creek Surface Water

Surface water sampling location SC-Upstream is considered upstream of the AOC.

- Total and dissolved arsenic, chromium, and mercury concentrations were not present above the laboratory minimum detection limits in the three Short Creek surface water samples.
- Total and dissolved cadmium concentrations were not present above the laboratory minimum detection limits in the upstream or midstream samples. Total and dissolved cadmium concentrations exceeded the acute and chronic ALWQC in the downstream sample (47.5 ug/l and 48.1 ug/l).

- Total and dissolved lead concentrations were not present above the laboratory minimum detection limits in the upstream and midstream samples. The total lead concentration exceeded the acute and chronic ALWQC in the downstream sample (10.3 ug/l). Dissolved lead was not present above the laboratory minimum detection limits in the downstream sample.
- Total and dissolved zinc concentrations exceeded the acute and chronic ALWQC in the upstream sample (594 ug/l and 448 ug/l), midstream sample (681 ug/l and 611 ug/l), and downstream sample (3,050 ug/l and 2,990 ug/l).
- The surface water pH results ranged between 6.19 and 6.75 standard units (su) and was outside the ALWQC range of 6.5-8.5 su in the downstream sample location only (SC-Downstream - 6.19).

4.7.2 Spring Branch of Short Creek Surface Water

Surface water sampling location SC-Upstream is considered upstream of the AOC.

- Total and dissolved arsenic, chromium, lead, and mercury concentrations were not present above the laboratory minimum detection limits in the upstream or downstream samples.
- Total and dissolved cadmium concentrations exceeded the acute and chronic ALWQC in the upstream sample (5.5 ug/l and 5.2 ug/l). Total and dissolved cadmium concentrations were not present above the laboratory minimum detection limits in the downstream sample.
- Total and dissolved zinc concentrations exceeded the acute and chronic ALWQC in the upstream sample (1,020 ug/l and 943 ug/l) and in the downstream sample (826 ug/l and 789 ug/l).
- The surface water pH results ranged between 6.84 and 7.35 standard units and were within the ALWQC range of 6.5-8.5 standard units.

4.8 LEAD SPECIATION

The lead speciation laboratory report is provided in Appendix J. Lead speciation data was summarized using two methods. The first method is the determination of Frequency of Occurrence (F), the most commonly observed form. The data generated thus illustrates which lead-bearing phases are the most-commonly observed in the sample. The second method determines the Relative Mass Lead (RM_{Pb}) in a phase. The RM_{Pb} determinations provide information as to which metal-bearing phases in a sample are likely to control the total bulk concentration for lead. A final calculation, bioaccessible lead mass, was made by removing any particle that is considered non-bioaccessible from the RM_{Pb} calculation. These values provide information on the present bioaccessibility (physical and chemical characteristics of a toxin that may impact bioavailability (i.e., particle size, morphology, speciation)) of the material.

The results of the lead speciation RM_{Pb} analyses are graphically illustrated on Figure 12. Sixteen different lead phases were detected in the speciation samples collected. RM_{Pb} is predominately found in two phases in the Smelter Plant Area speciation samples; Anglesite in sample SPEC-01 (Finished Product Storage) and Anglesite plus tin in sample SPEC-03 (Slag Dump). Anglesite was the most-frequently occurring phase and contributed the total bulk RM_{Pb} in sample SPEC-01(98%). Galena, anglesite plus tin, and iron sulfate ($FeSO_4$) contributed to <2% of the RM_{Pb} in the sample. Anglesite plus tin was the most-frequently occurring phase and contributed the total bulk RM_{Pb} in sample SPEC-03 (85%). Cerrusite and anglesite contributed to 8% and 6%, respectively, of the RM_{Pb} in the sample. Iron oxide (FeOOH) contributed to minor amounts (<1%) of the lead in the sample. According to the analytical report, sample SPEC-03 predominately contained an uncommon lead sulfate that was rich in tin and occurred in large clusters and appears to be a waste or by-product. The total XRF lead concentration detected at SPEC-01 (Finished Product Storage) was 179,507 mg/kg and the total XRF lead concentration detected at SPEC-03 (Slag Dump) was 117,544 mg/kg.

Review of the information portrayed in Figure 12 suggests that outparcel samples SPEC-05, SPEC-07 and SPEC-09 display similar characteristics in that they contain significant amounts of

lead-bearing phases not detected at the Smelter Plant Area, as indicated by the orange-colored segment, compared to the results for SPEC-01 and SPEC-03.

Of the lead-bearing phases detected in sample SPEC-02, collected from an upstream Short Creek location, Anglesite contributed 100% of the RM_{Pb}. However, the XRF lead concentration detected in the upstream sample was very low (77 mg/kg). The lead speciation laboratory report indicated that the upstream sample had very few particles of lead, confirming the low XRF lead concentration. Of the lead-bearing phases detected in sample SPEC-04, collected from a downstream Short Creek location, Anglesite contributed 48% and Cerrusite contributed 39% of the RM_{Pb}. Only minor amounts of other lead-bearing phases were detected in the downstream sample. The XRF lead concentration detected in the downstream sample was 1,890 mg/kg.

Of the lead-bearing phases detected in sample SPEC-06, collected north of the Smelter Plant Area on Outparcel B, Anglesite contributed 52% of the RM_{Pb}. SPEC-06 also contained varying amounts of other lead-bearing phases, including phases not detected at the Smelter Plant Area, as indicated by the orange-colored segment. The XRF lead concentration detected at SPEC-06 was 2,074 mg/kg.

Of the lead-bearing phases detected in sample SPEC-08, collected south of the Smelter Plant Area on Outparcel E, Galena contributed 40% of the RM_{Pb}. SPEC-08 contained the largest amount of Galena of all the speciation samples. Anglesite and Cerrusite contributed 31% and 18%, respectively, of the RM_{Pb}. SPEC-08 also contained varying amounts of other lead-bearing phases, including phases not detected at the Smelter Plant Area, as indicated by the orange-colored segment. The XRF lead concentration detected at SPEC-08 was 5,394 mg/kg.

Of the lead-bearing phases detected in samples SPEC-10 and SPEC-11, collected from a location in the town of Galena and a location southwest of town, Anglesite contributed significant amounts of the RM_{Pb}. Sample SPEC-11 also contained a significant amount of Cerrusite, while sample SPEC-10 contained no Cerrusite. The sample did, however, contain lead bound to FeOOH, which was not found at any other location at significant amounts except possibly SPEC-

06. The XRF lead concentration detected at SPEC-10 was 958 mg/kg and the XRF lead concentration detected at SPEC-11 was 1,392 mg/kg.

4.9 MINE VOID INVESTIGATION

Significant voids indicating the presence of underlying mine voids were not encountered during the outparcel investigation. Voids indicating a basement underneath of the former White Lead Plant on the western portion of the Smelter Plant Area were not encountered. Drilling observations are presented below.

4.9.1 Outparcel A

- A-B-01 and A-B-02- Dykon advanced each boring to 62 feet bgs. Loosely-consolidated material was encountered throughout each of the borings and no competent bedrock was observed. Dykon noted that a small void from 58 to 61 feet bgs was encountered and was likely caused by groundwater piping.

- A-B-03- Dykon advanced the boring to 86 feet bgs. Loosely-consolidated material was encountered from 0 to 3 feet bgs and was underlain by competent bedrock from 3 to 9 feet bgs. Softer, less-competent bedrock was encountered from 9 to 38 feet bgs and was underlain by competent bedrock from 38 feet to boring termination at 86 feet.

- A-B-04- Dykon advanced the boring to 62 feet bgs. Loosely-consolidated material was encountered from 0 to 6 feet bgs and was underlain by competent bedrock from 6 to 24 feet bgs. Softer, less-competent bedrock was encountered from 24 to 33 feet bgs and was underlain by competent bedrock from 33 feet to boring termination at 62 feet.

- A-B-05- Dykon advanced the boring to 86 feet bgs. Loosely-consolidated material was encountered from 0 to 3.5 feet bgs and was underlain by competent bedrock from 3.5 to

42 feet bgs. Softer less-competent bedrock was encountered from 42 to 59 feet bgs and was underlain by competent bedrock from 59 to 69 feet and softer, less-competent bedrock from 69 feet to boring termination at 86 feet.

- A-B-06- Dykon advanced the boring to 60 feet bgs. Loosely-consolidated material was encountered from 0 to 3 feet bgs and was underlain competent bedrock from 3 feet bgs to boring termination at 60 feet bgs.

4.9.2 Outparcel C

- C-B-01- Dykon advanced the boring to 62 feet bgs. Loosely-consolidated material was encountered from 0 to 6 feet bgs and was underlain by competent bedrock from 6 feet bgs to boring termination at 62 feet bgs.

4.9.3 Outparcel D

- D-B-01, D-B-02, D-B-03- Dykon advanced each boring to approximately 62 feet bgs. Loosely-consolidated material was encountered from 0 to 11 feet bgs and was underlain by competent bedrock from 11 feet bgs to boring termination at 62 feet bgs.

- D-B-04, D-B-05, and D-B-06- Dykon advanced each boring to 27 feet bgs. Very loosely-consolidated material was encountered throughout each of the borings and no competent bedrock was observed. The drillers noted that very loosely-consolidated material with small voids was encountered at D-B-04 between 11 and 27 feet bgs and was likely caused by surface water infiltration piping. The borings were terminated at 27 feet bgs due to the instability of the steep slopes in the area and the poor consolidation of the overburden.

4.9.4 Outparcel E

- E-B-01 - Dykon advanced the boring to 40 feet bgs. Loosely-consolidated material was encountered from 0 to 8 feet bgs. Competent bedrock was encountered from 8 to 21 feet bgs and was underlain by softer, less-competent bedrock to boring termination at 40 feet bgs.

- E-B-02 - Dykon advanced the boring to 26 feet bgs. Very loosely-consolidated material was encountered throughout the boring and no competent bedrock was observed.

- E-B-03 - Dykon advanced the boring to 21 feet bgs. Loosely-consolidated material was encountered from 0 to 10 feet bgs and was underlain by soft bedrock from 10 feet bgs to boring termination at 21 feet bgs.

- E-B-04 - Dykon advanced the boring to 62 feet bgs. Loosely-consolidated material was encountered from 0 to 33 feet bgs and was underlain by competent bedrock from 33 feet bgs to boring termination at 62 feet bgs.

- E-B-05 - Dykon advanced the boring to 62 feet bgs. Loosely-consolidated material was encountered from 0 to 16 feet bgs. The drillers noted that a small void from 16 to 20 feet bgs was encountered and was likely due to surface water infiltration piping. Competent bedrock was encountered from 20 feet bgs to boring termination at 62 feet bgs.

- E-B-06 - Dykon advanced the boring to 24 feet bgs. Loosely-consolidated material was encountered from 0 to 21 feet bgs and was underlain by competent bedrock from 21 feet bgs to boring termination at 24 feet bgs.

4.9.5 Smelter Plant Area

- SM-SB-01- Dykon advanced the boring to 62 feet bgs. Approximately 1 foot of concrete was encountered at the surface and was underlain by loosely consolidated overburden from to 13 feet bgs. Competent bedrock was encountered from 13 to boring termination at 62 feet bgs.

- SM-SB-02- Dykon advanced the boring to 40 feet bgs. Approximately 1 foot of concrete was encountered at the surface and was underlain by loosely-consolidated overburden to 15 feet bgs. Competent bedrock was encountered from 15 feet bgs to boring termination at 40 feet bgs.

4.10 GRADATION AND GEOTECHNICAL SOIL ANALYSIS

Geotechnical and agricultural data will be presented and utilized during the remedial design phase of the project.

4.11 BACKGROUND SOIL ANALYSIS

Background XRF results were compared to KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards). XRF results are summarized on Table 7 and raw XRF data is provided in Appendix E. Sample locations are shown on Figure 14.

- Arsenic concentrations only exceeded the RSK standard in the 0.5 foot sample at Background #8.
- Lead concentrations only exceeded the RSK standard in the surface soil sample and the 0.5 foot sample at Background #8.
- Cadmium, chromium, copper, mercury, and zinc concentrations did not exceed the RSK standards at each sampling location.

5.0 SOIL VOLUME CALCULATIONS

KDHE requested that CEC include calculated waste volumes on each outparcel as described in KDHE comments letter dated January 30, 2009. KDHE also requested that the waste volumes of mercury-contaminated material should be addressed separately in the 2009 SEOC report. Soil volumes exceeding the KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards) were calculated by two methods, average end areas and prismoidal.

The depth of soil exceeding the RSK standards was applied to each sample location to generate a triangulated, irregular network (TIN) surface with a *natural neighbor* smoothing applied to create the depth ranges as shown on Figures 22 and 23. Plan areas were determined for each depth range and multiplied by their respective average depth to produce a volume for each range. For the 0-0.5 feet range, 0.5 feet was used instead of the average due to the impractical nature of removing less than 0.5 feet of soil. The TIN surface was also compared to a *zero* surface, using a prismoidal calculation, as applied by Civil 3D software.

Total soil volumes generated from the average end areas method and the prismoidal method were compared. The two methods resulted in a 4% difference in the volume of soils that exceed the RSK standards for all metals of concern and a 2.8% difference in the volume of soils that exceed the RSK standard for mercury.

The Short Creek sediment volume that exceeds the TECs was calculated by a single method. The method used an assumed depth of sediment (1 foot) that exceeds the TECs and applied it to a surface area of Short Creek. Each of the Short Creek sediment samples that abut the AOC and are included in Outparcel A exceed one or more of the TECs. The surface area of the reaches of Short Creek that are on property owned by the Trust were used to calculate the sediment volumes that exceed the TECs for all metals of concern. Mercury concentrations exceed the TEC in most of the sediment samples that abut the Smelter Plant Area, but don't exceed the TEC in the sediment samples collected in the AOC on Outparcel B. Mercury concentrations also exceeded the TEC in two sediment samples collected on Outparcel A. The surface area of Short Creek that

abuts the Smelter Plant Area, less outparcel B, and the surface area of Short Creek that transects Outparcel A were used to calculate the sediment volumes that exceed the TEC for mercury.

5.1 AREA OF CONCERN (AOC) SOIL VOLUMES

Soil volumes exceeding the RSK standards were calculated for the entire AOC which includes the Smelter Plant Area (±48.8 acres) and portions of Outparcel B (±2.5 acres) and Outparcel D (±17 acres). Short Creek sediment included in the Smelter Plant Area and Short Creek sediment on Outparcel B that exceeds the TECs were included in the AOC volume calculations. AOC soil and sediment volumes exceeding the RSK standards and TECs are presented below.

AOC SOIL VOLUMES EXCEEDING THE RSK NON-RESIDENTIAL STANDARDS AND AOC SEDIMENT EXCEEDING THE TECs

Portion of the AOC	Total Volume (cubic yards)	
	All Metals	Mercury Only
Smelter Plant Area	81,100	28,300
Outparcel B (South of Short Creek)	3,400	800
Outparcel D (Between Short Creek and Former Railroad Grade)	15,100	900
Subtotal	99,600	30,000
Short Creek Sediment	2,600	1,900
Total Volume	102,200	31,900

Approximately 102,200 cy of soil on the AOC (including Short Creek sediment) exceed the RSK standards or TECs for all metals of concern, with approximately 31,900 cy of this volume exceeding the RSK standard or TEC for mercury.

A separate volume of soil exceeding the RSK standards for the fenced-in portion of the Smelter Plant Area was calculated and resulted in a total volume of 29,600 cy, with approximately 9,900 cy of this volume exceeding the RSK standard for mercury. Soil exceeding the RSK standards inside the fenced-in portion of the Smelter Plant Area and the proposed disposal cell footprint was not included in the Total AOC volume calculations.

5.1.1 AOC Soil Volume Above the Groundwater Table

Using groundwater depth information observed during test pit excavations, a hypothetical groundwater potentiometric surface map was created for the AOC. Using the potentiometric surface map and the volume calculation methods discussed in Section 5.0 of this report, the volume of soil that exceeds the RSK standards below the potentiometric surface was calculated. The amount of soil that exceeds the RSK standards above the potentiometric surface was then calculated by subtraction. AOC total volume calculations for soil above the potentiometric surface (including Short Creek Sediment) that exceeds the RSK standards or TECs for all metals of concern results in approximately 93,000 cy. Approximately 29,000 cy of this material is soil that exceeds the RSK standard or TEC for mercury.

5.2 OUTPARCEL SOIL VOLUMES

Outparcel soil volumes exceeding the RSK standards are presented below.

OUTPARCEL SOIL VOLUMES EXCEEDING THE RSK NON-RESIDENTIAL STANDARDS

Outparcel	Volume Inside AOC (cubic yards)		Volume Outside AOC (cubic yards)		Total Volume (cubic yards)	
	All Metals	Mercury Only	All Metals	Mercury Only	All Metals	Mercury Only
Outparcel A	--	--	15,600	1,000	15,600	1,000
Outparcel B	3,400	800	200	0	3,600	800
Outparcel C	--	--	4,800	0	4,800	0
Outparcel D	15,100	900	5,300	100	20,400	1,000
Outparcel E	--	--	12,100	600	12,100	600
Total Volume	18,500	1,700	38,000	1,700	56,500	3,400

5.2.1 Outparcel A Soil Volumes

Outparcel A is not located inside the AOC. Approximately 15,600 cy of soil on Outparcel A exceed the RSK standards for all metals of concern with approximately 1,000 cy of this volume exceeding the RSK standard for mercury.

5.2.2 Outparcel B Soil Volumes

Approximately 3,400 cy of Outparcel B soils located inside the AOC exceed the RSK standards for all metals of concern, with approximately 800 cy of this volume exceeding the RSK standard for mercury. Approximately 200 cy of Outparcel B soils located outside of the AOC exceed the RSK standards for all metals of concern. Outparcel B soils located outside of the AOC do not exceed the RSK standard for mercury.

In total, approximately 3,600 cy of soil on Outparcel B exceed the RSK standards for all metals of concern, with approximately 800 cy of this volume exceeding the RSK standard for mercury.

5.2.3 Outparcel C Soil Volumes

Outparcel C is not located inside the AOC. Approximately 4,800 cy of soil on Outparcel C exceed the RSK standards for all metals of concern. Outparcel C soils do not exceed the RSK standard for mercury.

5.2.4 Outparcel D Soil Volumes

Approximately 15,100 cy of Outparcel D soils located inside of the AOC exceed the RSK standards for all metals of concern, with approximately 900 cy of this volume exceeding the RSK standard for mercury. Approximately 5,300 cy of Outparcel D soils located outside of the AOC exceed the RSK standards for all metals of concern, with approximately 100 cy of this volume exceeding the RSK standard for mercury.

In total, approximately 20,400 cy of soil on Outparcel D exceed the RSK standards for all metals of concern, with approximately 1,000 cy of this volume exceeding the RSK standard for mercury.

5.2.5 Outparcel E Soil Volumes

Outparcel E is not located inside the AOC. Approximately 12,100 cy of soil on Outparcel E exceed the RSK standards for all metals of concern, with approximately 600 cy of this volume exceeding the RSK standard for mercury.

5.3 SEDIMENT VOLUMES

5.3.1 Short Creek Sediment

As presented in Section 5.1 above, approximately 2,600 cy of Short Creek sediment located inside of the AOC exceed the TECs for all metals of concern, with approximately 1,900 cy of this volume exceeding the TEC for mercury. Additional sediment volumes exceeding the TECs are presented below.

ADDITIONAL SEDIMENT VOLUMES EXCEEDING THE TECs

Parcel	Volume Outside AOC (cubic yards)		Total Volume (cubic yards)	
	All Metals	Mercury Only	All Metals	Mercury Only
Short Creek Sediment on Outparcel A	600	600	600	600
Spring Branch of Short Creek Sediment on Outparcel A	100	0	100	0

Short Creek sediment and the Spring Branch of Short Creek sediment located on Outparcel A is not located inside the AOC. Approximately 600 cy of Short Creek sediment located on Outparcel A exceed the TECs for all metals of concern including mercury. Approximately 100 cy of the Spring Branch of Short Creek sediment located on Outparcel A exceed the TECs for all

metals of concern. The Spring Branch of Short Creek sediment does not exceed the TEC for mercury.

5.4 AREAS OF SIGNIFICANT MERCURY CONTAMINATION

KDHE has expressed concern over the discovery of areas of significant mercury contamination not previously anticipated. Although mercury was detected in soils on the Smelter Plant Area and the outparcels, CEC has identified four areas at the site that contain significantly-elevated levels of mercury. These areas include the east and west settling ponds north of the Finished Product Storage Area, the former Acid Plant Area, and an area of apparent demolition debris between Short Creek and the fence line north of the West Warehouse and the Office-Laboratory Building.

As described in KDHE comments letter dated January 30, 2009, CEC concentrated delineation efforts in these areas in order to better quantify the horizontal and vertical extent and the volume of the material. A summary of the volume of impacted materials in each of the four areas is presented below.

MERCURY VOLUMES EXCEEDING THE RISK
NON-RESIDENTIAL STANDARD

Area	Total Volume (cubic yards)
Eastern Settling Pond	4,200
Western Settling Pond	5,700
Acid Plant	9,300
North of the West Warehouse and Office-Laboratory Building	8,300

The volume estimated for the former Acid Plant area includes soil both inside and outside of the fenced-in portion of the Smelter Plant Area. In addition, the material in the former Acid Plant Area is interspersed among various foundations and floor slabs from historical buildings which would make its excavation problematic. The volume estimated for the area north of the West Warehouse and Office-Laboratory Building includes soil outside of the fenced-in portion of the

Smelter Plant Area only. TCLP testing indicates that the material encountered in these four areas exceeds the regulatory limits for cadmium and lead.

6.0 QUALITY ASSURANCE/QUALITY CONTROL RESULTS (QA/QC)

6.1 XRF QUALITY CONTROL

The QA/QC utilized for sample collection, and analysis was conducted in accordance with Section 3.2 of this report. The results of the energy calibration checks during the 2009 SEOC were satisfactory, indicating the instrument was operating within resolution and stability tolerances. Blank and NIST standards were consistently within acceptance ranges for lead, a primary contaminant of concern. Precision measurements were performed on a total of eight samples during the 2009 SEOC. Cadmium and zinc analysis were within the 20% RSD requirement; chromium and mercury analytical results were below the detection limit and therefore a RSD was not calculated; arsenic and lead analysis exceeded 20% RSD on two samples each. The arsenic RSD exceedances can be attributed to energy spectrum interferences that occur when the lead to arsenic ratios exceed 10:1. The lead RSD exceedances can be attributed to a low ratio of the calculated mean to standard deviation, resultant of a low concentration of lead in the sample. The assessment of the field and laboratory data correlation, as well as the laboratory precision analysis is discussed in the following Sections.

6.2 XRF AND LABORATORY CORRELATION SAMPLE RESULTS

Analytical results of the XRF and laboratory correlation samples are provided in Appendix F. The XRF data and the laboratory results were compared from the five outparcel areas as well as the onsite test pit locations during the 2009 SEOC to verify the quality of the XRF data.

Least squares linear regression analysis and matched-pairs t-test were utilized as the primary statistical tools for comparison of XRF and laboratory data. These analysis were conducted referencing U.S. EPA's Environmental Technology Verification Report for the Field Portable X-ray Fluorescence Analyzer. Four linear regression parameters, y-intercept, slope of the regression line, correlation coefficient (r), and coefficient of determination (r^2), were considered for assessing the level of data quality. The correlation coefficient provides a measure of the

strength of the correlation between the XRF and the lab results; while, the coefficient of determination provides a measure of how well the linear regression equation can predict a value. If the data correlation was considered high quality, as described in the following paragraph, the matched-pairs t-test was used to determine equivalence at a 99% confidence level. In addition to the correlation analysis, the RPD between the laboratory analysis and the field screened data was calculated and is summarized on Tables 8 through 13

57 XRF and laboratory confirmatory sample results were analyzed during the 2009 SEOC in accordance with Method 6200 of U.S. EPA's publication SW-846, Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. Non-detections in either the XRF or laboratory results were omitted from the analysis. If the measured concentration of either the XRF or the laboratory results ranged over one order of magnitude, the results were log-transformed to standardize the variance. The correlation coefficient was then evaluated for each parameter. If the correlation coefficient was greater than 0.7 and less than 0.9, the parameter's data quality was characterized as quantitative screening-level. If the correlation coefficient was 0.9 or greater and the matched-pairs t-test indicated statistical equivalence at a 99 percent confidence level, the data was characterized as definitive-level data. If the correlation coefficient was less than 0.7 the data was characterized as qualitative screening-level data. A parameter at the qualitative-screening level would represent the presence or lack of the parameter, but is not considered suitable for reporting of concentrations.

Arsenic, cadmium, chromium, lead, mercury, and zinc XRF and Laboratory results were compared. Chromium was not detected in either the XRF or laboratory results, so there was insufficient data for a quality evaluation. Cadmium had measured concentrations spanning less than one order of magnitude and its data was not log-transformed.

Data for arsenic was characterized as qualitative screening-level based on a correlation coefficient of 0.63 for 19 samples. As described in U.S. EPA SW-846 Method 6200, this data quality is consistent with the expected interferences of lead on arsenic with a lead to arsenic concentration of 10:1 or more. Cadmium and mercury data was characterized as quantitative

screening-level with correlation coefficients of 0.75 and 0.81, respectively. Lead and zinc data qualified as definitive-level data with correlation coefficients of 0.99 and 0.91, respectively. The result of the matched-pairs t-test indicated that the P-values (0.303 and 0.518) for the difference of mean for lead and zinc, respectively, were greater than the significance level (0.01) and therefore statistically equivalent. The matched pair t-test analysis is included as in Appendix K to this report.

6.3 DUPLICATES

Nine duplicate samples, splits of the original samples collected for laboratory analysis, were compared to the original samples during the 2009 SEOC by calculating the RPD for arsenic, cadmium, chromium, lead, mercury, and zinc. RPD values are presented on Table 14.

RPD ranges for duplicate laboratory analysis are as follows:

- Arsenic: 1 – 34% (one sample greater than 25%)
- Cadmium: 0 – 132% (one sample greater than 25%)
- Chromium 2 – 66% (three samples greater than 25%)
- Lead: 3 – 113% (three samples greater than 25%)
- Mercury: 10 – 94% (two samples greater than 25%)
- Zinc: 1 – 104% (two samples greater than 25%)

With the exception of TP-164A, RPD values exceeding 25% are limited to relatively low concentrations where a small difference in concentration results in a larger RPD.

6.4 MATRIX SPIKE/MATRIX SPIKE DUPLICATES (MS/MSD)

MS/MSD values reported by Pace during the 2009 SEOC were outside of the recovery limits in part due to high element concentrations and matrix interferences. All results reported with

recovery limits outside of QC limits are qualified in the Report of Quality Control sections of the respective analytical reports, included as Appendix G of this Report.

7.0 CONCLUSIONS

7.1 SMELTER PLANT AREA SOILS

XRF data collected during the 2007 Extent of Contamination (EOC) and the 2009 Supplemental Extent of Contamination (SEOC) indicates that arsenic, lead, and mercury are the most-prevalent contaminants in the Smelter Plant Area surface and subsurface soils. Arsenic concentrations exceeded KDHE Risk-Based Standards for Kansas for non-residential use (RSK standard) in 60% of the Smelter Plant Area soil samples. Lead concentrations exceeded the RSK standard in 67% of the Smelter Plant Area soil samples. Mercury concentrations exceeded the RSK standard in 23% of the Smelter Plant Area soil samples. Cadmium, chromium, copper, and zinc concentrations only exceeded the RSK standards at a few sampling locations.

7.1.1 Finished Product Storage Area

The eastern section of the Smelter Plant Area was previously used for finished product storage. Fill material exceeding the RSK standards generally extends to 1 foot below ground surface (bgs) with XRF lead concentrations exceeding 270,000 mg/kg (Figures 22 and 23). The fill in this area is underlain by residual soil consisting of reddish brown silt, clay, and chert fragments. Bedrock underlies the residual soil at approximately 2 to 4 feet bgs. Deeper soil exceeding the RSK standards extends up to 1 to 4 feet bgs on the southern portion of the Finished Product Storage Area. The area between the Finished Product Storage Area and the eastern property boundary generally consists of up to 0.5 feet of fill material. This fill material exceeds the RSK standards in the southeastern portion of this area only. Residual soil consisting of reddish brown silt, clay, and chert fragments underlies the fill and bedrock underlies the residual soil at approximately 2 to 6 feet bgs. Groundwater was not encountered during the Finished Product Storage Area excavations.

7.1.2 Settling Ponds

Deeper fill material, with XRF mercury concentrations exceeding 15,000 mg/kg and lead concentrations exceeding 266,000 mg/kg, was observed in the two settling ponds located between Short Creek and the former Acid Plant Area (Figures 22 and 23). The western settling pond contained banded white and gray clays, metallic gray sandy clays, demolition debris, and weathered bedrock cobbles and boulders. The eastern settling pond contained similar material and included white sock filters, empty plastic and metal drums, and turquoise blue silt and fragments in brown paper bags. TCLP testing indicates that the material exceeds the regulatory limit for cadmium and lead. In addition, one of the material samples tested positive for paint filter liquids.

Fill material exceeding the RSK standards generally extends up to 2 to 5 feet bgs. Deeper fill material exceeding the RSK standards extends up to 5 to 15 feet bgs in the central portion of the settling ponds. Residual soil underlying the fill material was generally not encountered in the center of the settling ponds, however, residual soil was encountered near the perimeters. Bedrock underlies the fill material at approximately 4 feet bgs near the perimeters and at approximately 11 to 14 feet bgs in the central portion of the settling ponds. It appears that both settling ponds were excavated to bedrock with sloping sides excavated in residual soil. During excavation, groundwater was encountered between 3 to 5 feet bgs in the northern section of the settling ponds near Short Creek and between 5 to 10 feet bgs in the central portions. Groundwater was not encountered in the far southern portion of the settling ponds.

7.1.3 Acid Plant

The Acid Plant was formerly located between the Finished Product Storage Area and the Manganese Sulfate Building. Fill material in the Acid Plant Area contained XRF lead concentrations exceeding 285,000 mg/kg and mercury concentrations exceeding 24,000 mg/kg (Figures 22 and 23). TCLP testing indicates that the material exceeds the regulatory limit for

cadmium and lead. In addition, (PCB-Arochlor 1254) exceeded the RSK standard in one of the Acid Plant samples.

Numerous concrete pads are present and are partially covered with approximately 0.5 feet of fill material that exceeds the RSK standards. Soil exceeding the RSK standards is also present outside of the perimeter of the concrete pads and generally extends up to 2 to 7 feet bgs. Deeper fill material exceeding the RSK standards extends to 11 feet bgs in the center of the Acid Plant Area. Residual soil consisting of reddish brown silt, clay, and chert fragments underlies the fill and bedrock underlies the residual soil. Groundwater was not encountered during the Acid Plant Area excavations.

During the 2007 EOC and 2009 SEOC, CEC discovered two pipelines in the Acid Plant Area that appeared to transfer waste material from the Acid Plant to the western settling pond. Each pipeline contained limited residue similar to the material observed in the settling ponds. TCLP testing indicates that the material exceeds the regulatory limit for cadmium and lead. In addition, both pipeline material samples tested positive for paint filter liquids. CEC did not observe any pipelines to the eastern settling pond.

7.1.4 Area Between Short Creek and the West Warehouse and the Office-Laboratory Building

Fill material with XRF lead concentrations exceeding 240,000 mg/kg and mercury concentrations exceeding 15,000 mg/kg was observed between Short Creek and the fence line north of the West Warehouse and the Office-Laboratory Building (Figures 22 and 23). TCLP testing indicates that the material exceeds the regulatory limit for cadmium and lead. In addition, one of the material samples tested positive for paint filter liquids.

Fill material exceeding the RSK standards generally extends up to 3 to 10 feet bgs. Deeper fill material exceeding the RSK standards extends up to 10 to 15 feet bgs between Short Creek and the West Warehouse. Bedrock underlies the deeper fill at approximately 11 to 15 feet bgs. Historic 1944 and 1958 aerial photographs indicate that the large amount of fill in this area was

not present at that time. It is believed that regrading of the site after building demolition is the source of the fill.

7.1.5 Fenced-in Portion of the Smelter Plant Area

Fill material exceeding the RSK standards inside the fence and immediately to the west and north of the West Warehouse extends up to 8 to 10 feet bgs (Figures 22 and 23). Fill material exceeding the RSK standards west of the Office-Laboratory Building extends to 6 feet bgs. Fill material exceeding the RSK standards north of the Manganese Dioxide Building extends up to 4 feet bgs. Petroleum-contaminated fill material exceeds the RSK standards south of the Manganese Dioxide Building and south and east of the Manganese Sulfate Building. Petroleum-contaminated soils were generally encountered at a depth between 2 to 9 feet bgs and ranged up to 4 to 7 feet thick. Bedrock was encountered below the fill material at approximately 9 to 15 feet bgs. TCLP testing indicates that the material exceeds the regulatory limit for lead. Up to 7 feet of fill material east of the Manganese Dioxide Building contained material exceeding the RSK standards. This area contained the western section of the former Acid Plant.

7.1.6 Slag Dump

A historic slag dump is located to the west of the fenced-in portion of the Smelter Plant Area and abuts Short Creek to the north. CEC did not investigate the Slag Dump during the 2007 EOC or 2009 SEOC investigations. Subsurface sampling conducted by KDHE in the Slag dump area in 2006 indicated that material exceeding the RSK standards extends to greater than 12 feet bgs.

7.1.7 Alluvium

Cherty gravels and clay alluvial deposits line the banks and several floodplains along Short Creek. Alluvium that is south of Short Creek and is included in the AOC exceeds the RSK standards and ranges up to 0.5 to 7 feet bgs. Groundwater was encountered near the surface along the banks of Short Creek.

7.2 OUTPARCEL SOILS

7.2.1 Outparcel A

The 2007 EOC and 2009 SEOC XRF data indicates that arsenic and lead are the most-prevalent contaminants in the Outparcel A soils. Most of the soils that exceed KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards) are surface soils (Figures 22 and 23). Arsenic concentrations exceeded the RSK standard at 20% of the surface and 4% of the subsurface soil samples. Lead concentrations exceeded the RSK standard at 39% of the surface and 5% of the subsurface soil samples. Mercury concentrations exceeded the RSK standard at 5% of the surface soil samples. No subsurface soil samples exceeded the RSK standard for mercury. Cadmium only exceeded the RSK standard in one soil sample from Outparcel A. Chromium, copper, and zinc concentrations did not exceed the RSK standards in the Outparcel A soils.

Each of the maximum surface soil RSK exceedances are associated with the buried waste pile on the southern portion of Outparcel A (Figure 22). In addition, fourteen of the sixteen subsurface soil sample RSK exceedances were collected from the buried waste pile. One surface soil sample collected from the waste pile contained an XRF mercury concentration exceeding 6,000 mg/kg. Subsurface mercury concentrations did not exceed the RSK standard (Figure 23). TCLP testing indicates that the material exceeds the regulatory limit for cadmium and lead. The buried waste pile is approximately 4 feet high by 12 feet wide at the base and generally extends to 3 to 8 feet bgs. Fill material exceeding the RSK standards was detected up to 5 feet bgs.

The remaining two subsurface exceedances were from A-T1-08 and A-T1-13 (Figure 22). The test pit log for A-T1-08 indicates that fill material was present and appears to be the source of the exceedance. Bedrock XRF lead concentrations at A-T1-13 exceed the RSK standard. Natural lead concentrations in bedrock appear to be a possible source of the exceedance.

CEC observed approximately 40 surface piles consisting of slag and cinders along Clark Street on the southeastern portion of Outparcel A with lead and arsenic concentrations exceeding the RSK standards (Figure 22). The piles were approximately 3 feet tall by 15 feet wide at the base.

7.2.2 Outparcel B

The 2007 EOC and 2009 SEOC XRF data indicates that arsenic and lead are the most-prevalent contaminants in the Outparcel B soils. Most of the soils that exceed the RSK standards are surface soils (Figures 22 and 23). Arsenic concentrations exceeded the RSK standard at 27% of the surface and 27% of the subsurface soil samples. Lead concentrations exceeded the RSK standard at 29% of the surface and 24% of the subsurface soil samples. Mercury concentrations exceeded the RSK standard at <3% of the subsurface soil samples. No surface soil samples exceeded the RSK standard for mercury. Cadmium, chromium, copper, and zinc concentrations did not exceed the RSK standards in the Outparcel B soils.

Each of the subsurface exceedances were collected from twelve test pit locations located south of Short Creek on the southern portion of Outparcel B. The southern portion of Outparcel B (±2.5 acres) is included in the AOC (Figures 22 and 23).

7.2.3 Outparcel C

The 2007 EOC and 2009 SEOC XRF data indicates that arsenic and lead are the most-prevalent contaminants in the Outparcel C surface soils. All of the Outparcel C soil samples that exceeded the RSK standards are surface soils (Figures 22 and 23). Arsenic concentrations exceeded the RSK standard at 18% of the surface soil samples. Lead concentrations exceeded the RSK standard at 52% of the surface soil samples. Cadmium, chromium, copper, mercury, and zinc concentrations did not exceed the RSK standards in the Outparcel C soils.

7.2.4 Outparcel D

The 2007 EOC and 2009 SEOC XRF data indicates that arsenic and lead are the most-prevalent contaminants in the Outparcel D soils. Most of the soils that exceed the RSK standards are surface soils (Figures 22 and 23). Arsenic concentrations exceeded the RSK standard at 45% of the surface and 5% of the subsurface soil samples. Lead concentrations exceeded the RSK standard at 59% of the surface and 11% of the subsurface soil samples. Mercury concentrations exceeded the RSK standard at <2% of the surface and <2% of the subsurface soil samples. Cadmium, chromium, copper, and zinc concentrations did not exceed the RSK standards in the Outparcel D soils.

Nineteen of the twenty-two subsurface exceedances were collected from nine test pits located on the southern portion of Outparcel D. The southern portion of Outparcel D (approximately 17 acres north of Short Creek and south of the abandoned St. Louis and San Francisco Railroad grade to the north) is included in the AOC (Figures 22 and 23).

Fill material used to construct the railroad spur and trestle that connected the St. Louis and San Francisco Railroad to the Smelter Plant Area is present on the southwestern portion of Outparcel D and contains XRF arsenic, lead, and mercury concentrations that exceed the RSK standards (Figures 22 and 23).

The remaining three subsurface exceedances were from D-T1-05 located outside of the AOC (Figure 22). The test pit log indicates that railroad fill material was present and appears to be the source of the contamination.

7.2.5 Outparcel E

The 2007 EOC and 2009 SEOC XRF data indicates that arsenic and lead are the most-prevalent contaminants in the Outparcel E soils. Most of the soils that exceed the RSK standards are surface soils (Figures 22 and 23). Arsenic concentrations exceeded the RSK standard at 30% of

the surface and 13% of the subsurface soil samples. Lead concentrations exceeded the RSK standard at 54% of the surface and 17% of the subsurface soil samples. Mercury concentrations exceeded the RSK standard at <2% of the surface and <1% of the subsurface soil samples. Cadmium, chromium, copper, and zinc concentrations did not exceed the RSK standards in the Outparcel E soils.

Each of the subsurface soil arsenic and lead exceedances are located on the far western portion of outparcel E, except for the exceedance at E14-06 (Figures 22 and 23). Test pit logs indicate that railroad fill material was present in these portions of Outparcel E. Bedrock XRF lead concentrations at E-T1-03 exceed the RSK standard. Natural lead concentrations in bedrock appear to be a possible source of the exceedance. In addition, historic mining maps indicate that former mine shafts were located in the western portion of Outparcel E and near the location of E14-06. Railroad fill material and previous mining activities appear to be the source of the contamination in these areas.

7.3 SEDIMENT

7.3.1 Short Creek Sediment

In the 3,300-foot reach of the main stem of Short Creek that is included in the AOC, sediment concentrations of arsenic, cadmium, chromium, lead, mercury, and zinc exceeded the Threshold Effect Concentrations (TEC). However, concentrations of cadmium, lead, mercury, and zinc exceeded the TECs in the upstream samples prior to Short Creek entering the AOC, indicating that sediment is impacted from upstream sources. In general, concentrations of metals are lower upstream of the AOC indicating that the AOC is contributing concentrations of metals to the sediments along Short Creek.

7.3.2 Spring Branch of Short Creek Sediment

In the 800-foot reach of the Spring Branch of Short Creek investigated, sediment concentrations of arsenic, cadmium, chromium, lead, and zinc exceeded the TECs. However, concentrations of cadmium, chromium, lead, and zinc exceeded the TECs in the upstream samples prior to the Spring Branch of Short Creek abutting the AOC, indicating that sediment is impacted from upstream sources. In general, concentrations of metals are lower upstream of the AOC, indicating that the AOC is contributing concentrations of metals to the sediments along the Spring Branch of Short Creek.

7.4 LEAD SPECIATION

Of the lead-bearing phases detected in the Finished Product Storage sample (SPEC-01), Anglesite dominates. Of the lead-bearing phases detected in the Slag Dump sample on the Smelter Plant Area (SPEC-03), Anglesite with tin dominates. The speciation report indicates that the material in the Slag Dump sample occurs in large clusters and appears to be a waste or by-product, which the slag is. The downstream Short Creek sediment sample (SPEC-04) contains a relatively small amount of Anglesite with tin and is mostly comprised of Anglesite without tin and Cerrusite. Lead speciation analysis concluded that lead phases found in the Smelter Plant Area samples contributed the total bulk concentration of lead in the downstream Short Creek sediment sample (95%). The speciation results suggest that the onsite smelting activities and erosion of contaminated sediments on the Smelter Plant Area contributed the bulk concentration of lead in the Short Creek downstream sediment sample. This is not unexpected given their relative locations. Analysis of the upstream sediment sample (SPEC-02) was inconclusive due to the few particles of lead detected and low XRF lead concentration.

The speciation results from Outparcels A, C and D, samples SPEC-07, 09 and 05 respectively, indicate a large portion of those samples are comprised of lead-bearing materials not detected on the Smelter Plant Area, suggesting a foreign, possibly, regional source. The speciation results

from the Outparcel B sample (SPEC-06) indicate that a large portion of the sample is comprised of lead-bearing materials, mainly anglesite, also detected on the Smelter Plant Area.

According to the meteorological data collected at the Joplin, Missouri Regional Airport, prevailing winds in Galena, Kansas are generally from the south to southwest for a majority of the year. Speciation samples from Outparcel C (SPEC-09), Outparcel E (SPEC-08), and the two offsite speciation samples (SPEC-10 and SPEC-11) were collected in the prevailing upwind direction (south to southwest) of the Smelter Plant Area. Speciation samples from Outparcel A (SPEC-07), Outparcel B (SPEC-06), and Outparcel D (SPEC-05) were collected in the prevailing downwind direction (north to northeast) of the Smelter Plant Area.

Anglesite (lead sulfate) and Cerrusite (lead carbonate) are products of the weathering of Galena (lead sulfide). The only speciation sample collected by CEC that contained appreciable Galena was sample SPEC-08, collected from Outparcel E south of the Smelter Plant Area. Based on this information, it appears that the lead at Outparcel E may be naturally-occurring and weathering of Galena has contributed to the production of Anglesite and Cerrusite at this location.

7.5 SURFACE WATER

According to the Third *Five-Year Review Report, Cherokee County Superfund Site, Cherokee County, Kansas,* dated September 2005, natural or residual metal sulfides are present in abandoned mine workings and chat piles due to previous mining and smelting activities. Acidic mine drainage results as precipitation, surface water, and groundwater percolate through the residual sulfides and are oxidized. The acidic mine drainage has dissolved metals within the mine waste and underlying bedrock, resulting in high metals concentrations in surface water and groundwater.

The USEPA has released a Record of Decision (ROD) for the Galena Subsite indicating that surface water and shallow groundwater will continue to exceed ambient water quality criteria and equivalent standards set by the state of Kansas following implementation of remedial action.

The USEPA has issued a technical-impracticability decision indicating that implementation of the remedial action necessary to meet the surface water and shallow groundwater standards would present a greater risk to the environment.

7.5.1 Short Creek Surface Water

Short Creek is listed on the Kansas Surface Water Register as a classified surface water segment and has a designated use of Aquatic Life Use. During the 2007 EOC, Short Creek surface water concentrations of cadmium and zinc exceeded the acute and chronic Aquatic Life Support Criteria (ALWQC) at each sampling location. Surface water concentrations exceeding the criteria prior to entering the AOC indicate that upstream sources contribute concentrations of cadmium and zinc to Short Creek that exceed the ALWQC. In general, concentrations of metals are lower upstream of the AOC, indicating that the AOC is contributing concentrations of metals to the surface water of Short Creek.

On February 26, 2009, KDHE collected five Short Creek surface water samples at upstream, adjacent, and downstream locations to confirm mercury results collected by CEC during the 2009 EOC. KDHE reported that mercury concentrations were not present above the laboratory minimum detection limits in each of the Short Creek surface water samples and therefore do not exceed the ALWQC.

During the 2009 SEOC, Short Creek surface water concentrations of cadmium and lead exceeded the ALWQC at the downstream sampling location only and concentrations of zinc exceeded the ALWQC at each sampling location. Surface water arsenic, chromium, and mercury concentrations did not exceed the ALWQC during the 2007 EOC and 2009 SEOC investigations. Surface water concentrations exceeding the criteria prior to entering the AOC indicate that upstream sources contribute concentrations of zinc to Short Creek that exceed the ALWQC. In general, concentrations of metals are lower upstream of the AOC, indicating that the AOC is contributing concentrations of metals to the surface water of Short Creek. Surface water pH

decreases as Short Creek flows through the investigated reaches. The downstream surface water pH (6.19 standard units) was the only result outside the ALWQC range.

7.5.2 Spring Branch of Short Creek Surface Water

Spring Branch of Short Creek surface water concentrations of zinc (total and dissolved) exceeded the ALWQC at each sampling location. Surface water concentrations of cadmium (total and dissolved) exceeded the ALWQC at the upstream sampling location only. Surface water concentrations exceeding the criteria prior to abutting the AOC indicate that upstream sources contribute concentrations of cadmium and zinc to the Spring Branch of Short Creek that exceed the ALWQC. In general, concentrations of metals are higher upstream of the AOC, indicating that the AOC is not contributing concentrations of metals to the surface water of the Spring Branch of Short Creek. The surface water pH results were within the acceptable ALWQC range.

7.6 GROUNDWATER

Groundwater was not investigated during the 2007 EOC and 2009 SEOC. As discussed in Section 7.5 above, abandoned mine drainage in the Cherokee County Superfund Site has dissolved metals within mine waste and underlying bedrock resulting in high metals concentrations in shallow groundwater. The ROD for the Galena Subsite indicates that surface water and shallow groundwater will continue to exceed ambient water quality criteria and equivalent standards set by the state of Kansas following implementation of remedial action. The USEPA has issued a technical-impracticability decision indicating that implementation of the remedial action necessary to meet the surface water and shallow groundwater standards would present a greater risk to the environment.

7.7 PRODUCTION WELLS

A letter from Eagle-Picher Industries, Inc. dated November 18, 1980 to KDHE indicated that five water wells, labeled Well #1 through Well #5, were present on the Smelter Plant Area. The letter discusses Eagle-Picher's intent to abandon Well #1 through Well #3 immediately and abandon Well #4 one to two years later pending a Kansas Geological Survey's hydrological investigation. Layne-Western (Professional Services for Water Systems) provided well abandonment forms indicating that Well #1 through Well #3 were abandoned in 1981. Federal and state environmental databases, provided by Environmental Data Resources Inc. (EDR), were reviewed by Environ during the Phase I investigation. The *EDR Radius Map Report with Geocheck* provided by EDR, and the Phase I report, confirmed that Well #1 through Well #3 were abandoned.

The letter from Eagle-Picher Industries, Inc. indicated that Well #4 is located on the far east end of the property and that Well #5 is located approximately 55 feet south of the south wall of the east substation. A letter from KDHE dated November 20, 1980 to Eagle-Picher Industries, Inc. indicates that Well # 4 is located on the eastern portion of the property and extends to 1185 feet bgs. The letter discusses leaving Well #4 unplugged for a duration of one year for hydrological investigations. The letter also indicates that Well #5 is located southeast of the southeast corner of the plant's storage and pug system and extends to 870 feet bgs. The EDR report and the Phase I report indicate that a production well, extending to 1150 feet bgs, existed onsite and was abandoned in 1987. It is possible that Well #4 is the well discussed in the reports. The Phase I report also determined that four wells, ranging from 110 to 959 feet bgs, were formerly located on or near the western portion of the property and were abandoned in 1993. Eagle-Picher Industries, Inc. and KDHE correspondence letters are provided in Appendix L and the *EDR Radius Map Report with Geocheck* is provided in Appendix M.

CEC performed a subsurface investigation to determine the locations of potential production Well #4 and Well #5 on the Smelter Plant Area. CEC observed a framed pit on the east end of the property during the EOC test pit investigation. A 1.5-foot diameter concrete pipe oriented

north to south was unearthed during the excavation around the framed pit. No evidence of a production well (vertical pipe) was encountered. CEC also conducted a test pit investigation south of the south wall of the east substation as indicated in the Eagle-Picher letter to KDHE. Numerous test pits and trenches were excavated to natural material using the backhoe. Piping and conduit was unearthed during the excavation south of the east substation, however, no evidence of a production well (vertical pipe) was encountered. Based on the metal concentration in soils and the amount of iron/steel debris unearthed during the investigations, CEC determined that using geophysical methods for production well locating would be impractical.

7.8 AREA OF CONCERN (AOC) SOIL VOLUMES

Soil volumes exceeding the KDHE Risk-Based Standards for Kansas for non-residential use (RSK standards) were calculated for the entire AOC which includes the Smelter Plant Area (±48.8 acres) and portions of Outparcel B (±2.5 acres) and Outparcel D (±17 acres). Short Creek sediment included in the Smelter Plant Area and Short Creek sediment on Outparcel B that exceeds the TECs were included in the AOC volume calculations.

Approximately 102,200 cubic yards (cy) of soil on the AOC (including Short Creek sediment) exceed the RSK standards or TECs for all metals of concern, with approximately 31,900 cy of this volume exceeding the RSK standard or TEC for mercury. A separate volume of soil exceeding the RSK standards for the fenced-in portion of the Smelter Plant Area was calculated and resulted in a total volume of 29,600 cy, with approximately 9,900 cy of this volume exceeding the RSK standard or TEC for mercury. Soil exceeding the RSK standards inside the fenced-in portion of the Smelter Plant Area and the proposed disposal cell footprint was not included in the total AOC volume calculations.

7.8.1 AOC Soil Volume Above the Groundwater Table

AOC total volume calculations for soil above the potentiometric surface (including Short Creek Sediment) that exceeds the RSK standards or TECs for all metals of concern results in

approximately 93,000 cy. Approximately 29,000 cy of this material is soil that exceeds the RSK standard or TEC for mercury.

7.9 OUTPARCEL SOIL VOLUMES

7.9.1 Outparcel A

Approximately 15,600 cy of soil on Outparcel A exceed the RSK standards for all metals of concern, with approximately 1,000 cy of this volume exceeding the RSK standard for mercury. Outparcel A is not located inside the AOC.

7.9.2 Outparcel B

Approximately 3,400 cy of Outparcel B soils located inside the AOC exceed the RSK standards for all metals of concern, with approximately 800 cy of this volume exceeding the RSK standard for mercury. Approximately 200 cy of Outparcel B soils located outside of the AOC exceed the RSK standards for all metals of concern. Outparcel B soils located outside of the AOC do not exceed the RSK standard for mercury.

Approximately 3,600 cy of soil on Outparcel B exceed the RSK standards for all metals of concern, with approximately 800 cy of this volume exceeding the RSK standard for mercury.

7.9.3 Outparcel C

Approximately 4,800 cy of soil on Outparcel C exceed the RSK standards for all metals of concern. Outparcel C soils do not exceed the mercury RSK standard. Outparcel C is not located inside the AOC.

7.9.4 Outparcel D

Approximately 15,100 cy of Outparcel D soils located inside the AOC exceed the RSK standards for all metals of concern, with approximately 900 cy of this volume exceeding the RSK standard for mercury. Approximately 5,300 cy of Outparcel D soils located outside of the AOC exceed the RSK standards for all metals of concern, with approximately 100 cy of this volume exceeding the RSK standard for mercury.

Approximately 20,400 cy of soil on Outparcel D exceed the RSK standards for all metals of concern, with approximately 1,000 cy of this volume exceeding the RSK standard for mercury.

7.9.5 Outparcel E

Approximately 12,100 cy of soil on Outparcel E exceed the RSK standards for all metals of concern, with approximately 600 cy of this volume exceeding the RSK standard for mercury. Outparcel E is not located inside the AOC.

7.10 SEDIMENT VOLUMES

Approximately 2,600 cy of Short Creek sediment located inside of the AOC exceed the TECs for all metals of concern, with approximately 1,900 cy of this volume exceeding the TEC for mercury.

Short Creek sediment and the Spring Branch of Short Creek sediment located on Outparcel A is not located inside the AOC. Approximately 600 cy of Short Creek sediment located on Outparcel A exceed the TECs for all metals of concern including mercury. Approximately 100 cy of the Spring Branch of Short Creek sediment located on Outparcel A exceed the TECs for all metals of concern. The Spring Branch of Short Creek sediment does not exceed the TEC for mercury.

8.0 LIMITATIONS

This report presents CEC's field observations, results and opinions as they existed on the dates of the site assessment.

The test pit logs and related information presented in this report depict subsurface conditions at the test pit locations and at the time of excavation. Soil conditions at other locations may differ. Actual conditions between test pits may differ.

The water levels presented in this report are applicable to the location and time of measurement. Water levels may fluctuate through time. Actual static water levels at locations between the monitoring points may differ from those depicted.

Chemical data presented in this report are applicable to the location, time of sample collection, and the parameters analyzed. Chemical conditions may change with time. Reported conditions may not represent current or future conditions. Chemical concentrations between sampling points may differ.

The soil volumes calculated are based on available data and using standard engineering techniques for volumetric calculations. Since the calculations rely on interpolation between sample points, the volume calculations provide estimated volumes only and are subject to change based on actual field conditions. No warranties, either expressed or implied, are applicable.

9.0 REFERENCES

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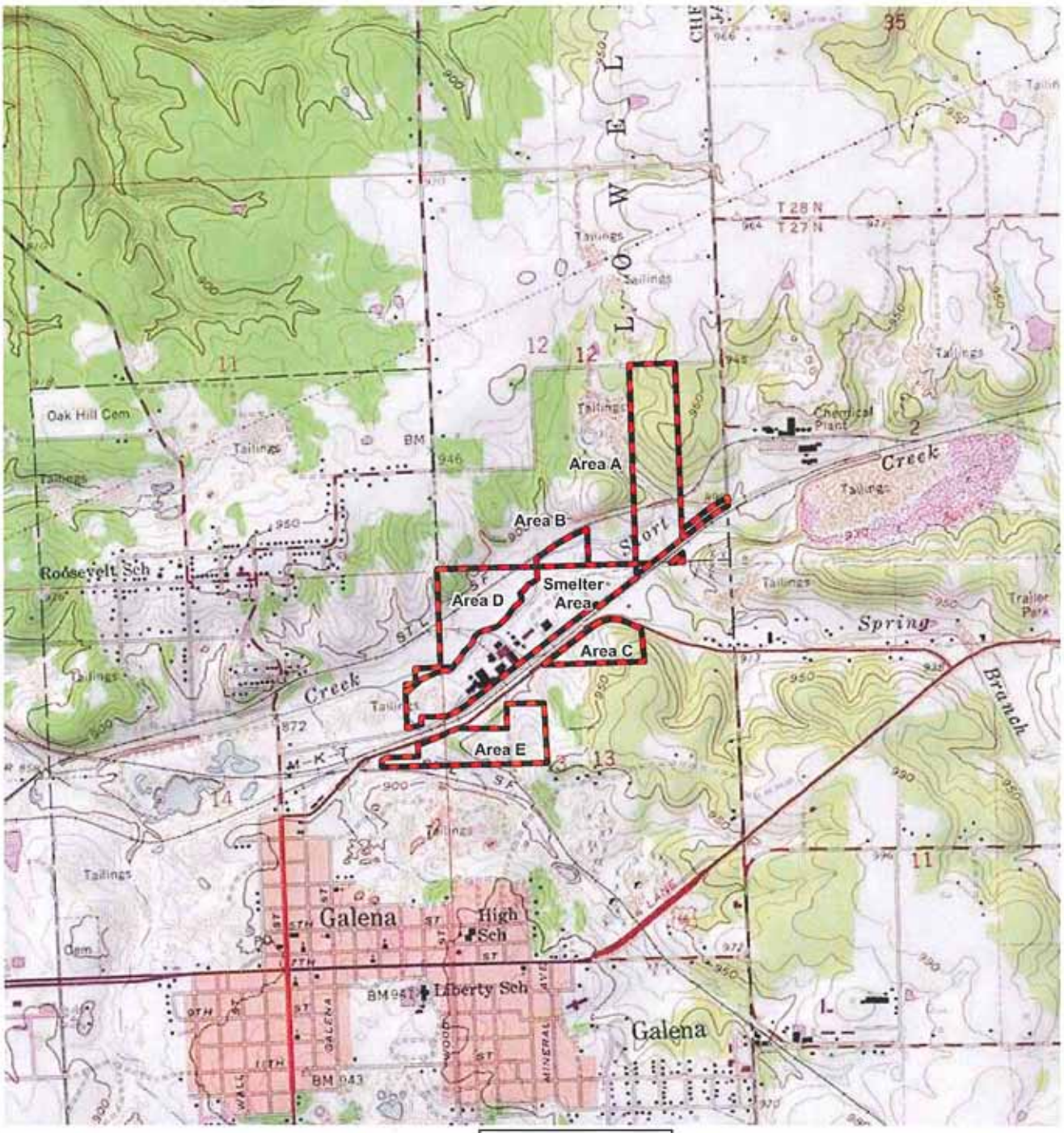
FIGURES



SOURCE: USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE MAP - BAXTER SPRINGS, KANSAS - 1979; JOPLIN WEST, MISSOURI - 1982.

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Chicago, IL Cincinnati, OH Cleveland, OH Columbus, OH Detroit, MI
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Site Location Map
EP CUSTODIAL TRUST
Supplemental Extent of Contamination Investigation
Former EaglePicher Smelter Site
Galena, Cherokee County, Kansas

DWN. BY: MJB	SCALE: 1 " equals 2,000 '	DATE: January 2010	PROJECT NO: 061-825	FIGURE NO: 1
CHKD. BY: TEM				

J:\Projects\2006\061825\Maps\SEOC_Work_Plan\20100113\061825_SEOC_WP_Fig_1.mxd - 1/28/2010 @ 9:23:43 AM

NOTE: AERIAL IMAGERY - Prepared by: Aerial Data Services, INC. Date of Photograph: December 14,2006

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Site Layout
Supplemental Extent Of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
- Areas of Investigation
- Smelter Plant Area (48.8 acres)
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 400'
Dwn By: MJB
Chk By: TEM
App By: *

No.	Date	
		Hand Signature on File

Figure No.: 2
Project No.: 061-825

NOTE: AERIAL IMAGERY - Prepared by: Aerial Data Services, INC. Date of Photograph: December 14,2006

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Columbus, OH * Cincinnati, OH * Indianapolis, IN * Nashville, TN *
Chicago, IL * St. Louis, MO * Export, PA * Detroit, MI

Figure No.: 3 | Project No.: 061-825

Smelter Site and Outparcel Sampling Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former Galena Smelter
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sampling Locations (2009)
- Extent of Contamination and Legacy KDHE Sample Locations
- Areas of Investigation
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 400'
Dwn By: MJB
Chk By: TEM
App By: *

No.	Date	
		Hand Signature on File

S:\Projects\2006\061825\Maps\SEOC_Work_Plan\20060128061825_SEOC_WP_Fig_3.mxd - 1/28/2010 @ 8:44:16 AM

0 0 0 0 Feet

NOTE: Topographic Survey provided by TriState Engineering, INC., January 07, 2003
Prepared by: Aerial Data Services, INC.
Date of Photograph: December 14,2006

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Figure No.: 4 | Project No.: 051-823

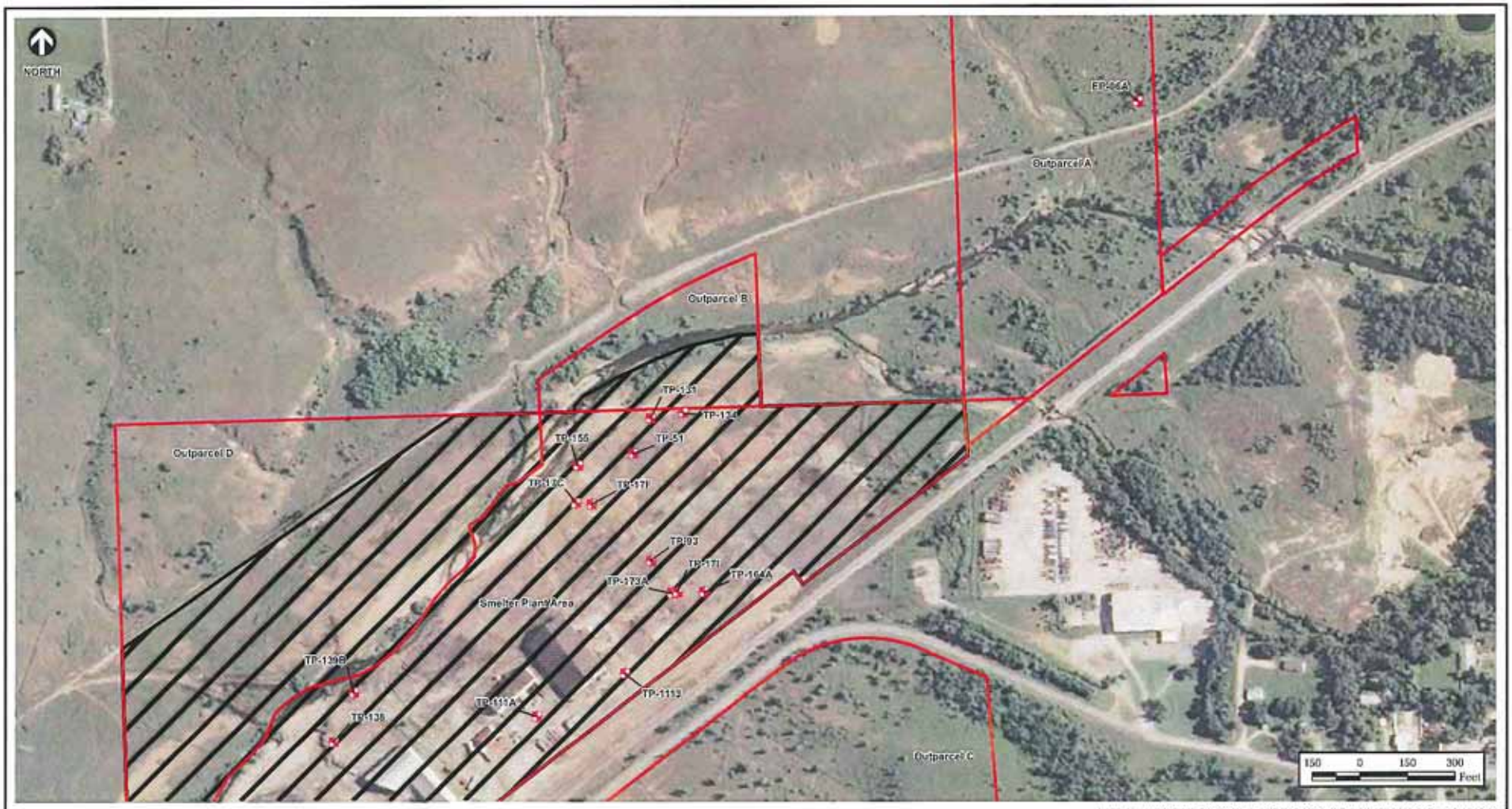
Smelter Plant Area - Sample Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former Eagle-Picher Smelter Site
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sample Locations (2009)
- Extent of Contamination Investigation Sample Locations (2007)
- Test Pit Location
- Legacy XRMS Sample Locations (2008)
- Areas of Investigation - Smelter Site (48.8 acres)
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 120'
Drn By: MJS
Chk By: TEM
App By:

Revision Record

No.	Date



NOTE: AERIAL IMAGERY - Prepared by: Aerial Data Services, INC. Date of Photograph: December 14,2005

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Figure No.: 5 | Project No.: 061-825

Unknown Material Characterization Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
- Material Characterization Sample Locations
- Areas of Investigation
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 300'
Dwn By: MJB
Chk By: TEM
App By: *

Revision Record

No.	Date	
		Hand Signature on File

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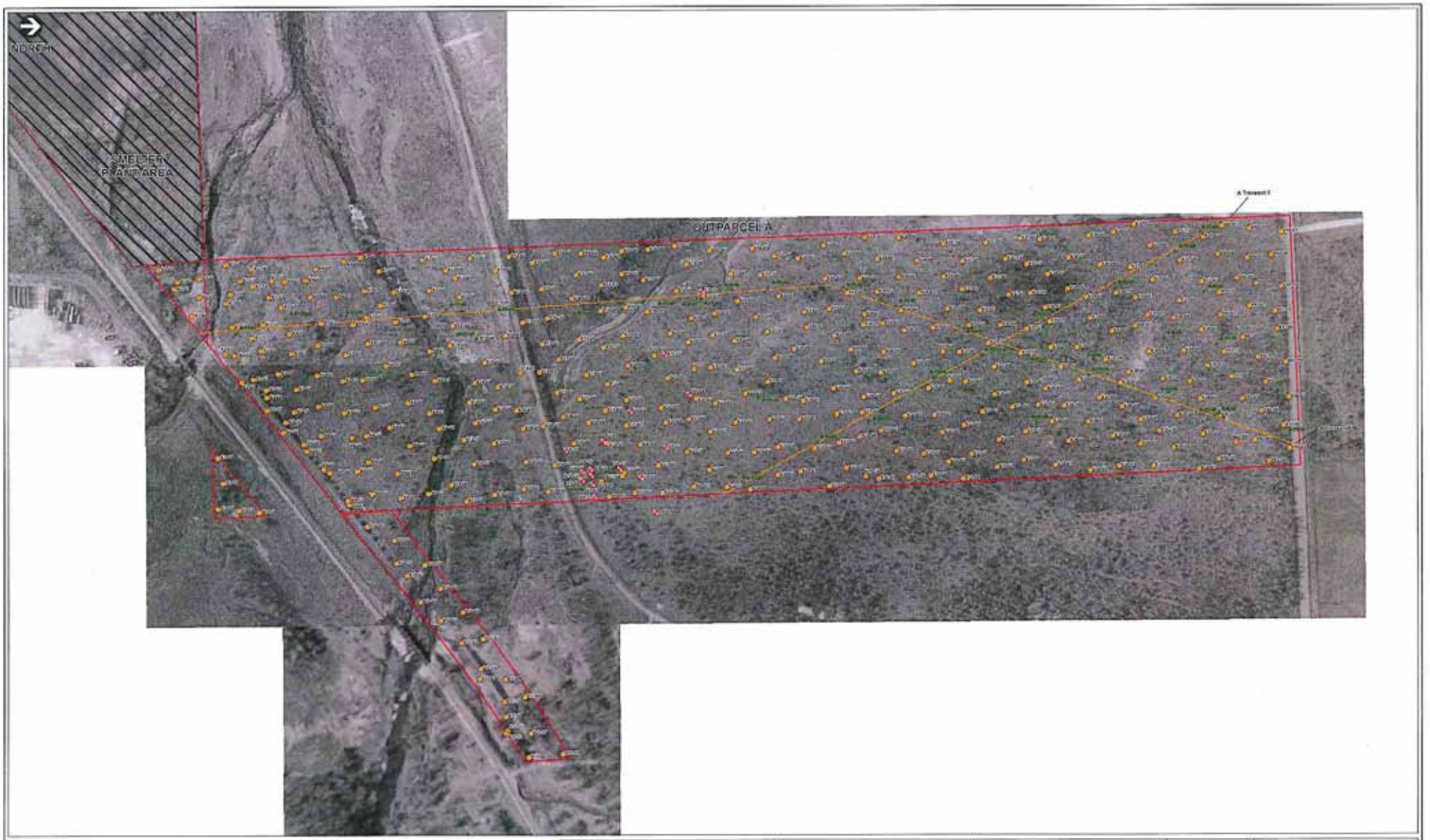

50 0 50 100
Feet

NOTE: Topographic Survey provided by Tri-State Engineering, INC., January 17, 2007
Prepared by: Aerial Data Services, INC.
Date of Photograph: December 14,2006

CIEC
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Figure No.: 6 | Project No.: 061-825

Outparcel A - Sample Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former Eagle Picher Smelter Site
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sample Locations (0306)
- Sampling Transect
- Extent of Contamination Investigation Sample Locations (0307)
- Test Pit Location
- Surface Sample Location
- Area of Investigation - Outparcel A (30.4 acres)
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 100'
Dwn By: MJB
Chk By: TEM
App By:

Revision Record

No.	Date	

NOTE: Topographic Survey provided by Tri-State Engineering, INC., January 17, 2007
Prepared by: Aerial Data Services, INC.
Date of Photograph: December 14,2006

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Figure No.: 7 | Project No.: 061-825

Outparcel B - Sample Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Satellite Site
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sample Locations (2010)
- Sampling Transect
- Extent of Contamination Investigation Sample Locations (2007)
- Surface Sample Location
- Test Pit Location
- Legacy KDHE Sample Locations (2006)
- Areas of Investigation - Outparcel B (5.0 acres)
- Area of Concern (10 acres)

Date: January 2010
Scale: 1" = 400'
Dwn By: MJB
Chk By: TEM
App By:

Revision Record		
No.	Date	

0 0 300 600
Feet

NOTE: Topographic Survey provided by Tri-State Engineering, INC., January 17, 2007
Prepared by: Aerial Data Services, INC.
Date of Photograph: December 14,2006

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Figure No.: 8 | Project No.: 061-825

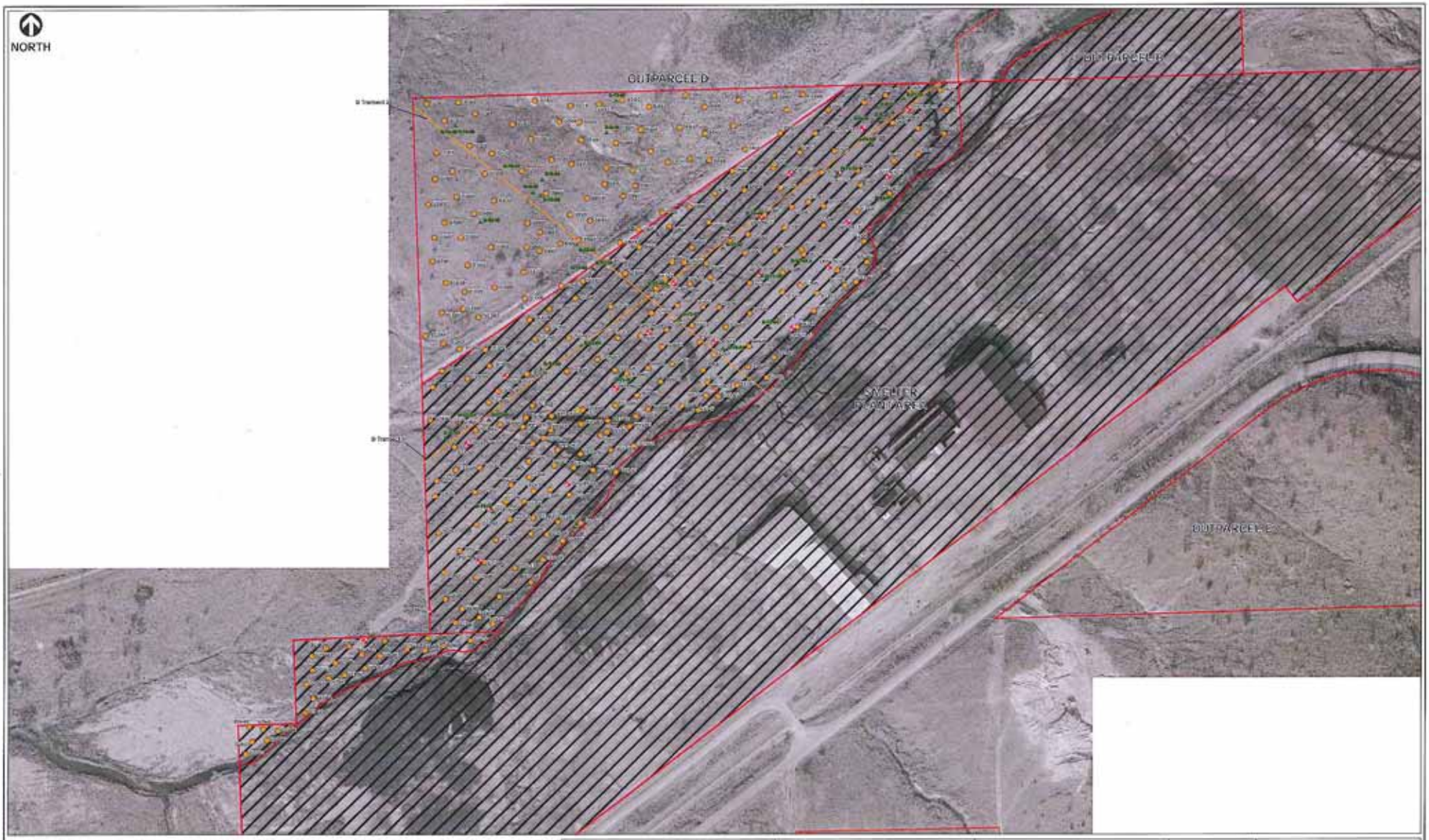
Outparcel C - Sample Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former Eagle/Picher Smelter Site
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sample Locations (2008)
- Sampling Transect

Extent of Contamination Investigation Sample Locations (2007)
- Surface Sample Location
- Areas of Investigation - Outparcel C (12.5 acres)
- Area of Concern (10 acres)

Date: January 2008
Scale: 1" = 100'
Dwn By: MJD
Chk By: TEH
App By:

Revision Record		
No.	Date	



50 0 50 100
Feet

NOTE: Topographic Survey provided by Tri-State Engineering, INC., January 17, 2007
Prepared by: Aerial Data Services, INC.
Date of Photograph: December 14,2006

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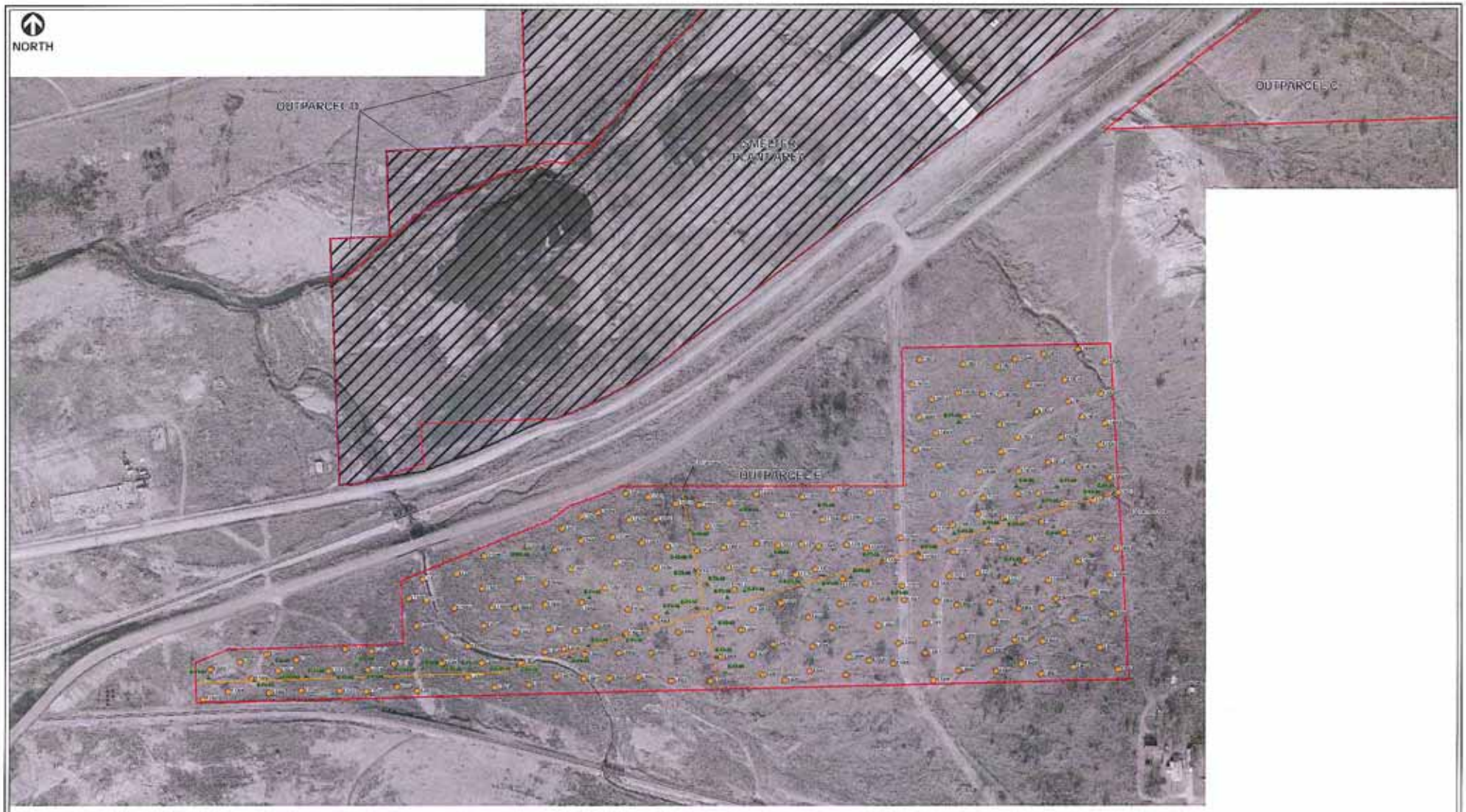
Figure No.: 8 | Project No.: 061-025

Outparcel D - Sample Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former Eagle/Picher Smelter Site
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sample Locations (2008)
- Sampling Transect
- Extent of Contamination Investigation Sample Locations (2007)
- Surface Sample Location
- Test Pit Location
- Legacy KDHE Sample Locations (2006)
- Areas of Investigation - Outparcel D (20.4 acres)
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 400'
Dwn By: MJR
Chk By: TSM
App By:

Revision Record		
No.	Date	



50 0 50 100
Feet

NOTE: Topographic Survey provided by 56-State Engineering, INC., January 17, 2007
Prepared by: Aerial Data Services, INC.
Date of Photograph: December 14,2006

CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
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Figure No.: 10 | Project No.: 061-825

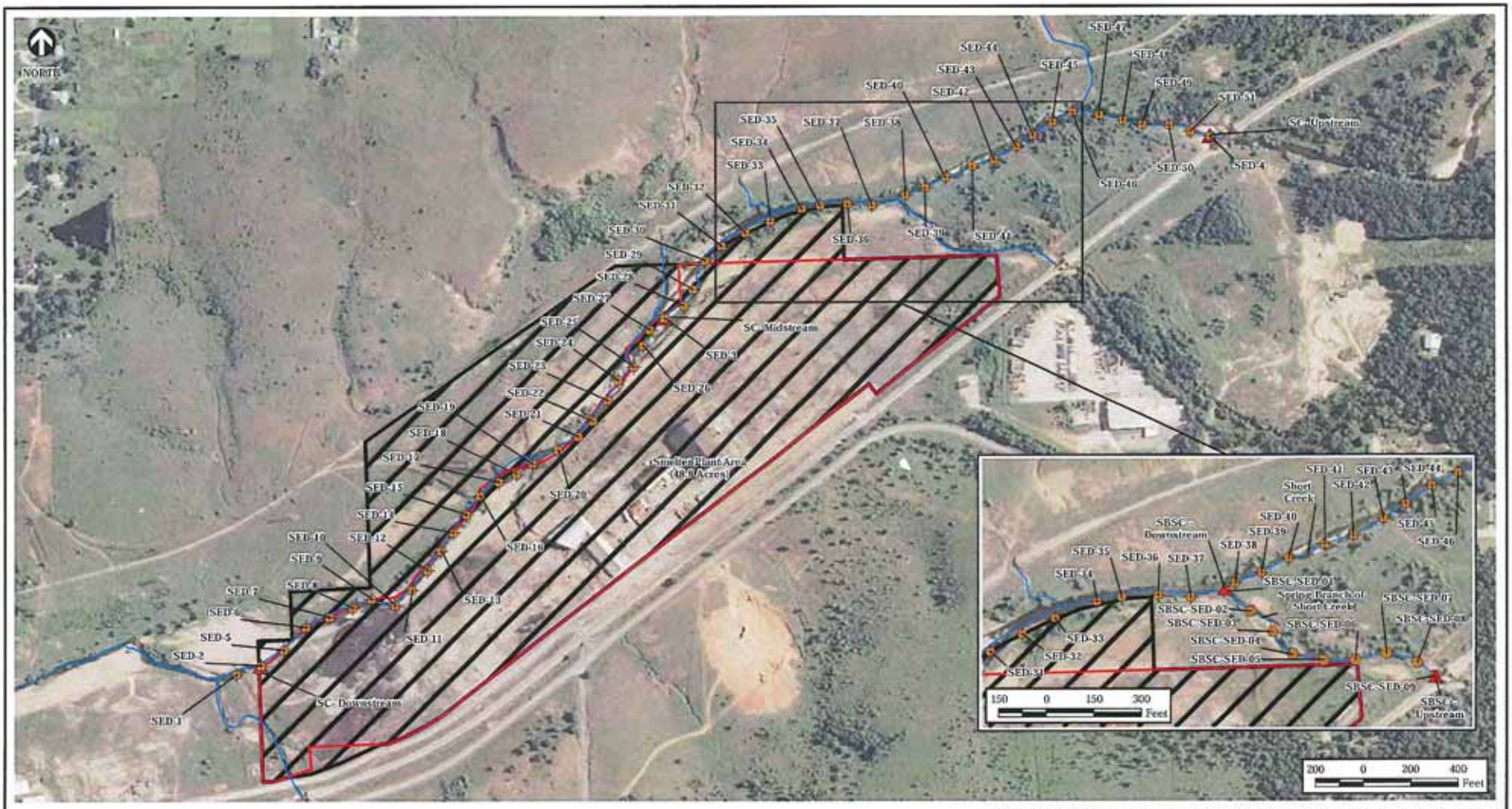
Outparcel E - Sample Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former Eagle-Picher Smelter Site
Galena, Kansas

Legend
- Supplemental Extent of Contamination Investigation Sample Locations (2008)
- Sampling Transect
- Extent of Contamination Investigation Sample Locations (2007)
- Surface Sample Location
- Areas of Investigation - Outparcel E (11.8 acres)
- Area of Concern (33 acres)

Date: January 2010	
Scale: 1" = 400'	
Dwn By: SLH	
Chk By: TEM	
App By:	

Revision Record

No.	Date



NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 11 | Project No.: 061-825

Sediment/Surface Water Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
- Extent of Contamination Sediment Sample Location (2007)
- Supplemental Extent of Contamination Investigation Sediment Sample Location (2009)
- Surface Water Sample Location
- Smelter Plant Area (48.8 acres)
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 400'
Dwn By: MJB
Chk By: TEM
App By: *

Revision Record

No.	Date	
		Hand Signature on File

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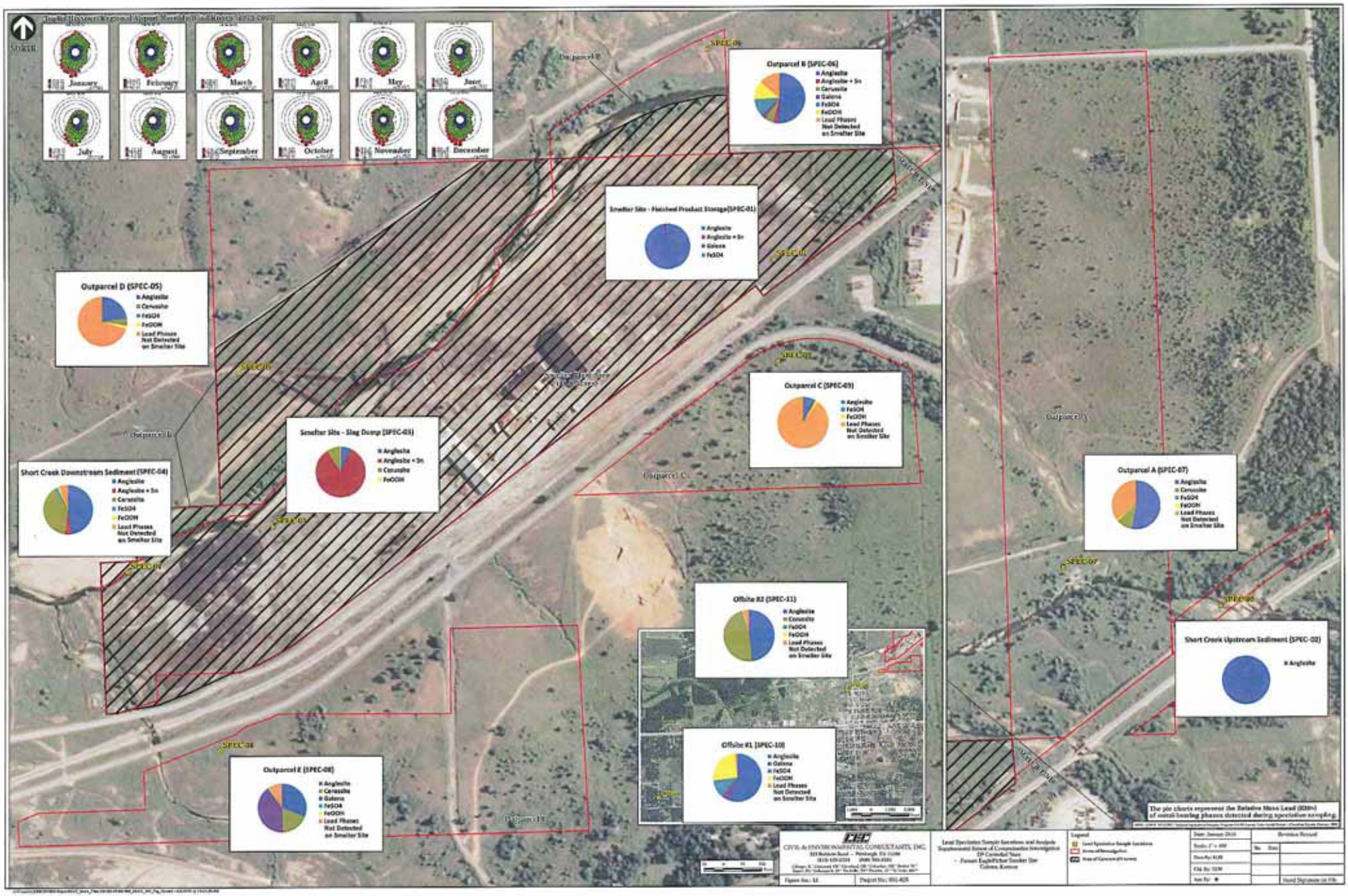
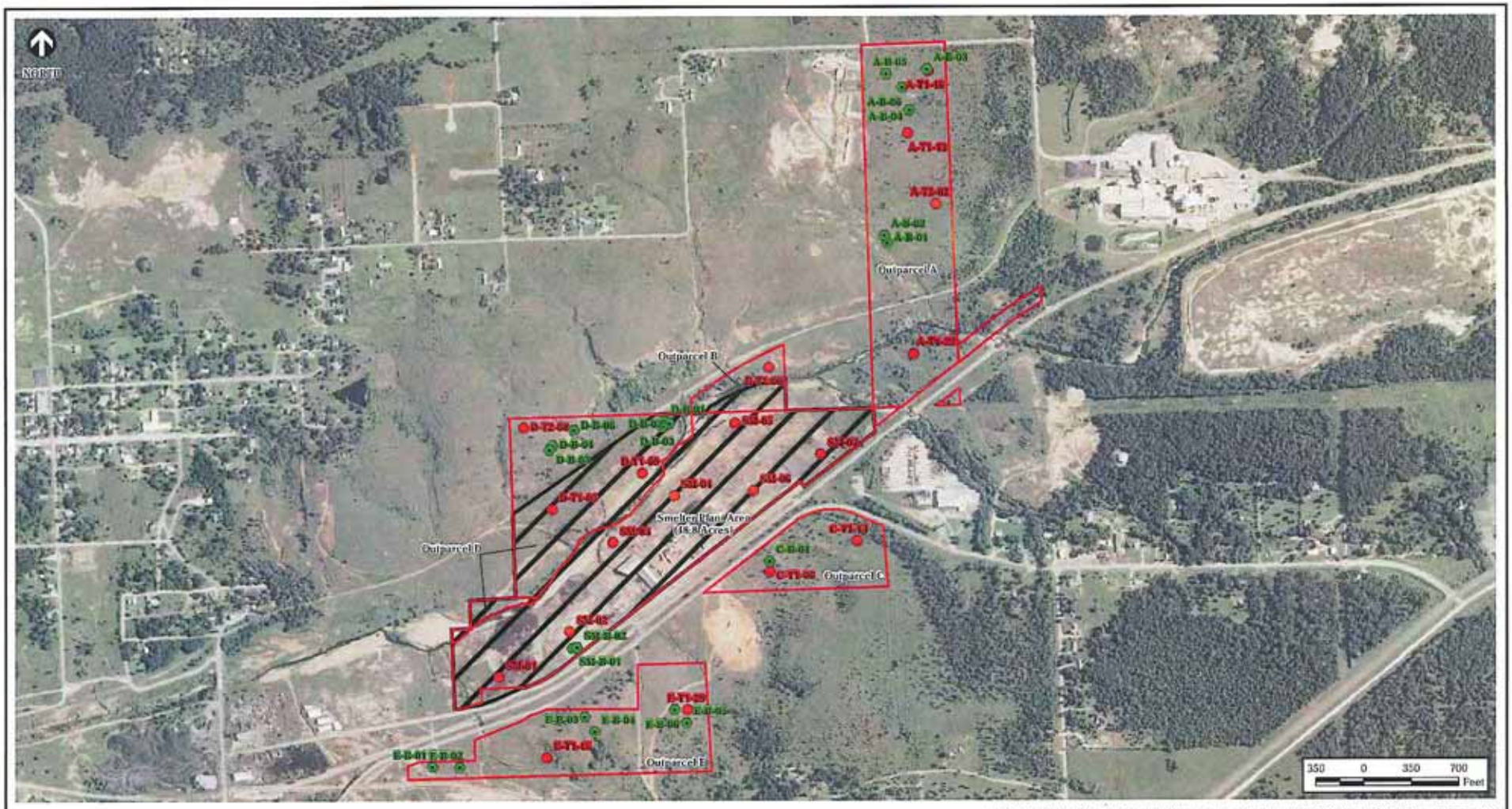

January
February
March
April
May
June
July
August
September
October
November
December
Outparcel B [SPEC-06]
Anglesite
Anglesite + Sn
Cerussite
Galena
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Smelter Site - Finished Product Storage[SPEC-01]
Anglesite
Anglesite + Sn
Galena
FeSO4
Outparcel D (SPEC-05)
Anglesite
Cerussite
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Outparcel C [SPEC-03]
Anglesite
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Smelter Site - Slag Dump [SPEC-03]
Anglesite
Anglesite + Sn
Cerussite
FeOOH
Short Creek Downstream Sediment (SPEC-04)
Anglesite
Anglesite + Sn
Cerussite
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Outparcel A (SPEC-07)
Anglesite
Cerussite
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Offsite #2 (SPEC-11)
Anglesite
Cerussite
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Short Creek Upstream Sediment (SPEC-02)
Anglesite
Offsite #1 (SPEC-10)
Anglesite
Galena
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Outparcel E (SPEC-08)
Anglesite
Cerussite
Galena
FeSO4
FeOOH
Lead Phases Not Detected on Smelter Site
Outparcel B
Outparcel C
Outparcel A
Outparcel E
SPEC-01
SPEC-02
SPEC-03
SPEC-04
SPEC-05
SPEC-06
SPEC-07
SPEC-08
SPEC-10
SPEC-11
The pie charts represent the Relative Mass Lead (RBBm) of metal-bearing phases detected during speciation sampling.
CEC
CIVIL & ENVIRONMENTAL CONSULTANTS, INC.
Lead Speciation Sample Locations and Analysis
Supplemental Interim Corrective Measures Investigation
DP Cannelton Tract
- Former Eagle/Pelton Smelter Site
Colona, Kansas
Legend
Lead Speciation Sample Locations
Areas of Investigation
Areas of Concern (49 acres)
Date: January 2010
Revision Record
No.
Date



NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2006.

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Figure No.: 13 | Project No.: 061-825

Geotechnical and Mine Void Boring Locations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

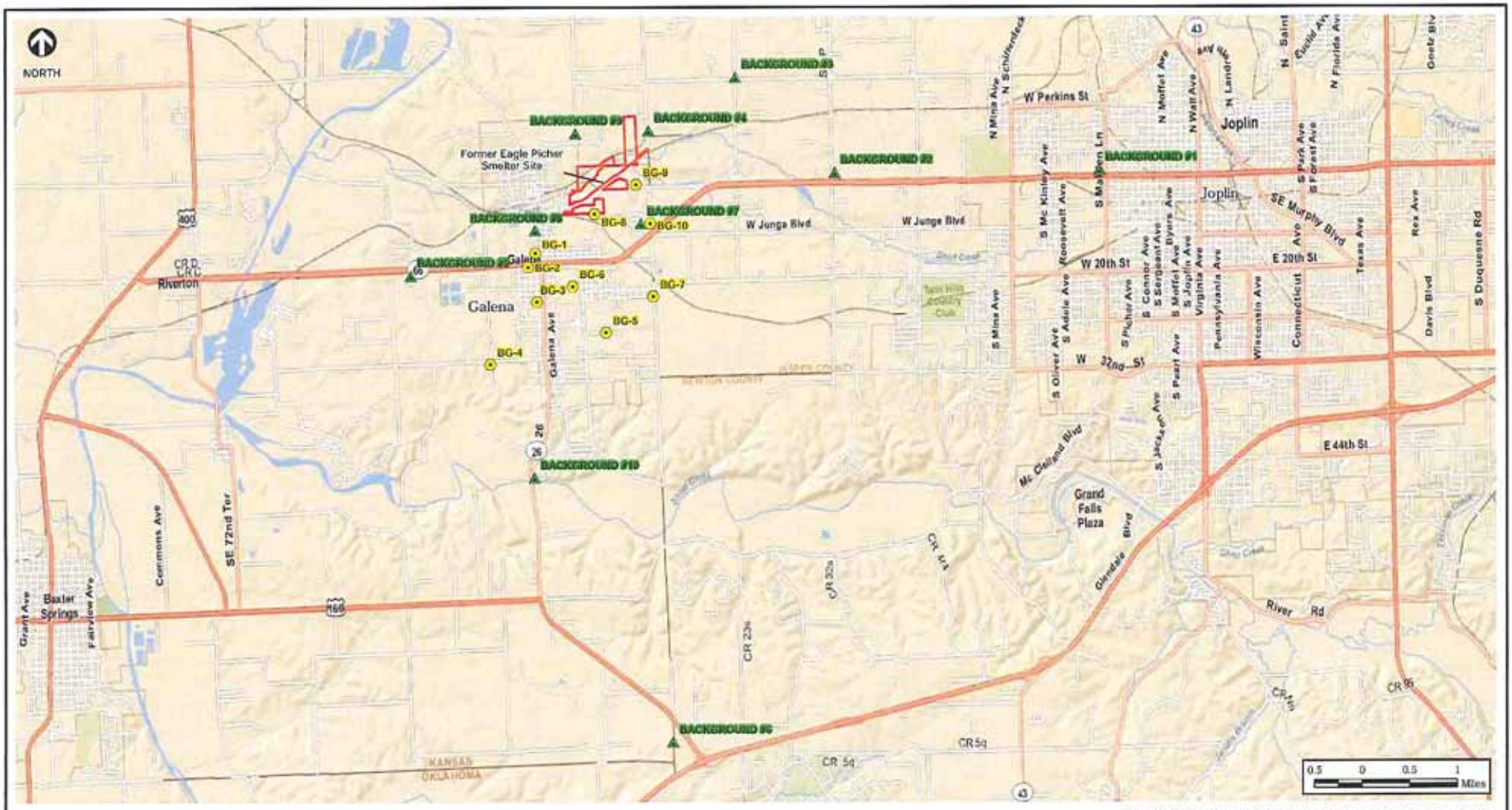
Legend
- Geotechnical and Mine Void Boring Locations
- Mine Void Boring Locations
- Areas of Investigation
- Area of Concern (70 acres)

Date: January 2010
Scale: 1" = 700'
Dwn By: MJB
Chk By: TEM
App By:

Revision Record

No.	Date	
		Hand Signature on File

J:\Projects\2006\061825\Maps\SEOC_Work_Plan\20100128\061825_SEOC_WP_Fig_13.mxd - 2/1/2010 @ 10:04:45 AM



NOTE: PORTION OF ESRI ARCGIS ONLINE MAP SERVICE "ESRI_STREETMAP_WORLD_2D", 2009.

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Figure No.: 14	Project No.: 061-825			

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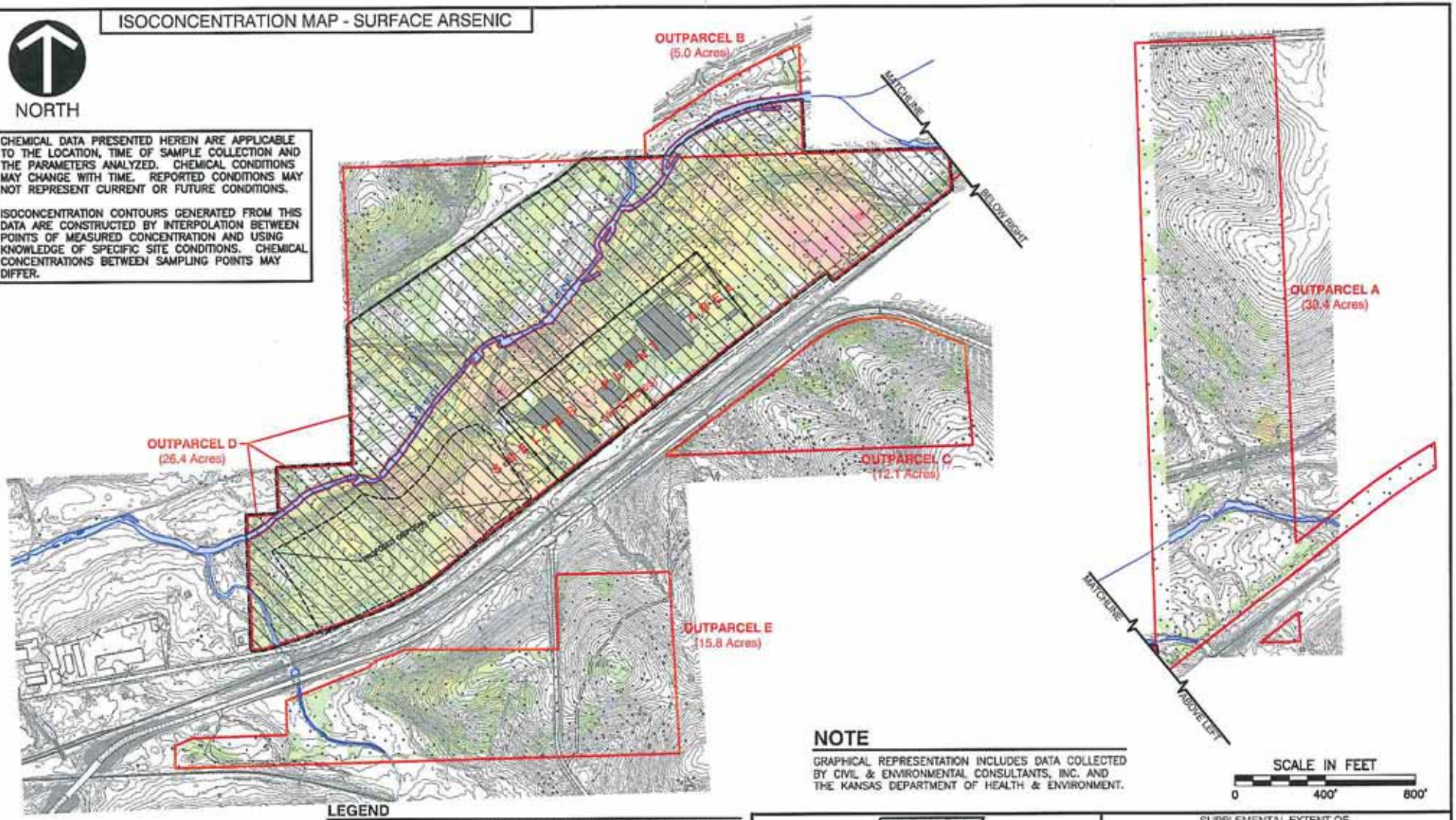
ISOCONCENTRATION MAP - SURFACE ARSENIC



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

ISOCONCENTRATION CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF MEASURED CONCENTRATION AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. CHEMICAL CONCENTRATIONS BETWEEN SAMPLING POINTS MAY DIFFER.

NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE ARSENIC CONCENTRATIONS (mg/kg)

0	–	38	(Below Non-Residential Std.)*
39	–	100	
101	–	500	
501	–	1,000	
1,001	–	5,000	
5,001	–	10,000	
10,001	–	15,000	
> 15,000			

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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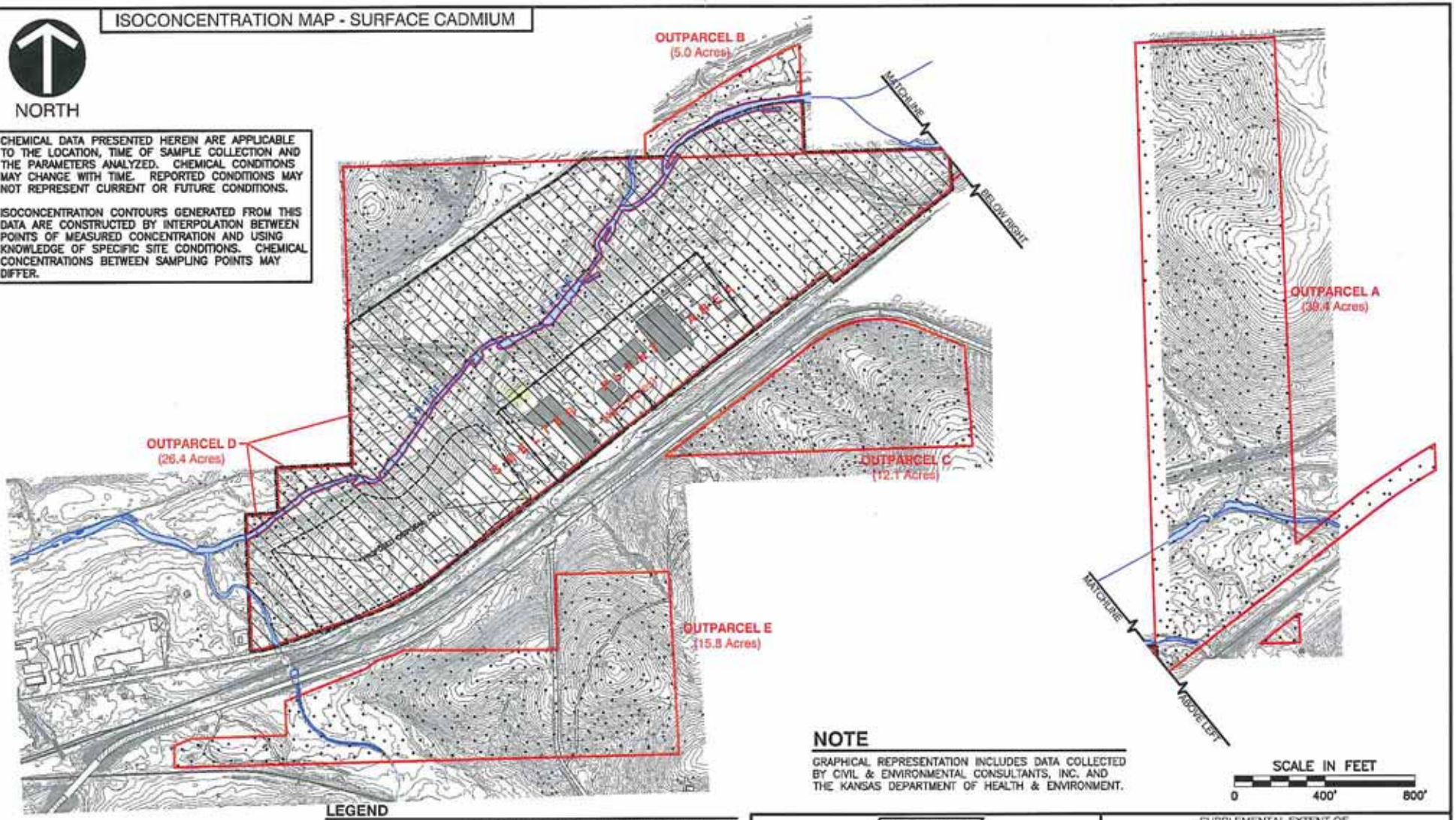
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE ARSENIC

DRAWN BY:	TLD	CHECKED BY:	TEM	APPROVED BY:	*MK	DRAWING NO.:	15
DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020		

ISOCONCENTRATION MAP - SURFACE CADMIUM



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

ISOCONCENTRATION CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF MEASURED CONCENTRATION AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. CHEMICAL CONCENTRATIONS BETWEEN SAMPLING POINTS MAY DIFFER.

NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

SCALE IN FEET
0 400' 800'

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE CADMIUM CONCENTRATIONS (mg/kg)

0	–	1,000	(Below Non-Residential Std.)*
1,001	–	3,000	
3,001	–	5,000	
>		5,000	

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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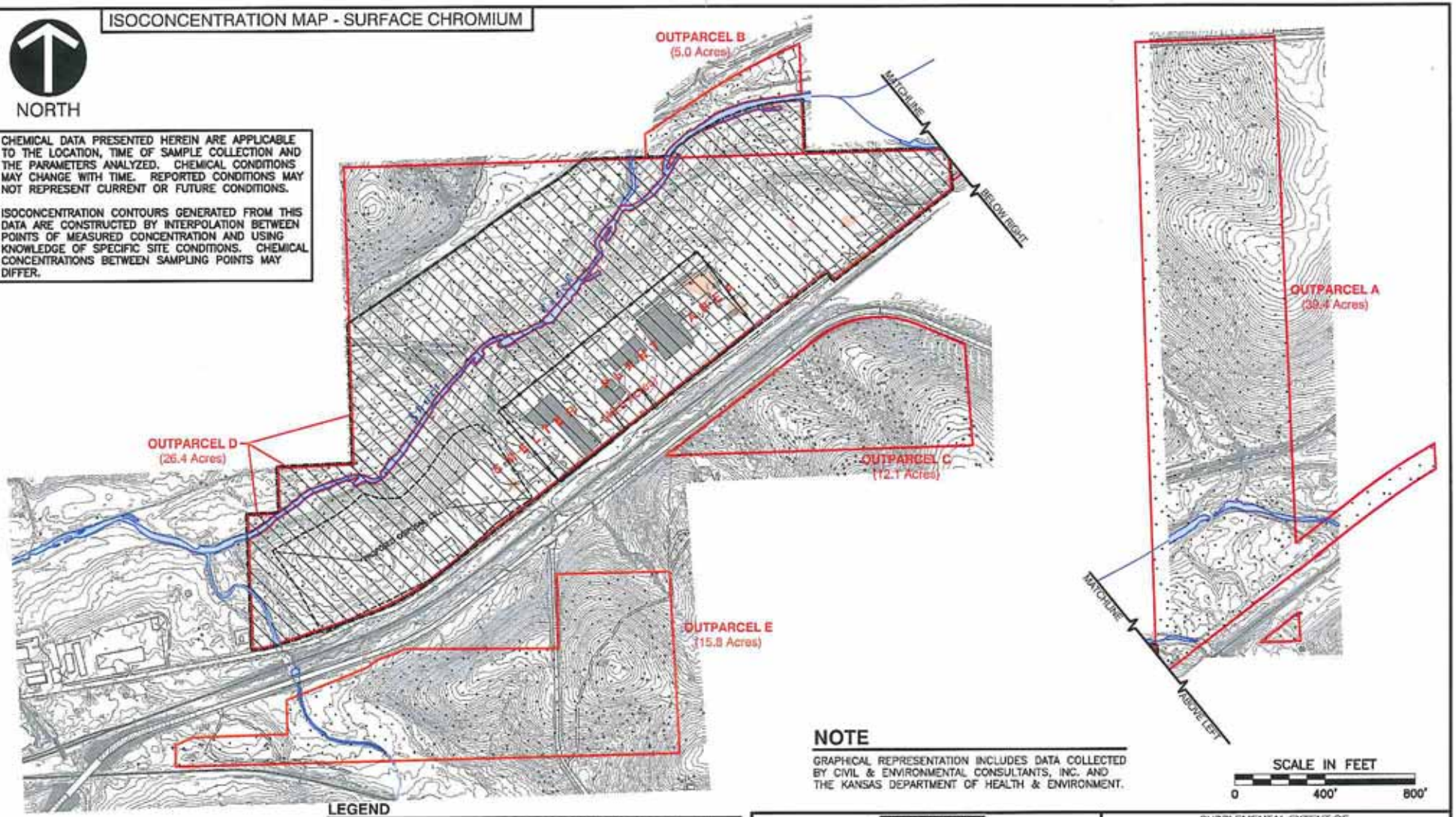
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE CADMIUM

DRAWN BY:	TLD	CHECKED BY:	TEM	APPROVED BY:	*MK	DRAWING NO.:	16
DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020		

ISOCONCENTRATION MAP - SURFACE CHROMIUM



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

ISOCONCENTRATION CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF MEASURED CONCENTRATION AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. CHEMICAL CONCENTRATIONS BETWEEN SAMPLING POINTS MAY DIFFER.

NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

SCALE IN FEET
0 400' 800'

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE CHROMIUM CONCENTRATIONS (mg/kg)

0	–	4,000 (Below Non-Residential Std.)*
4,001	–	6,000
>		6,000

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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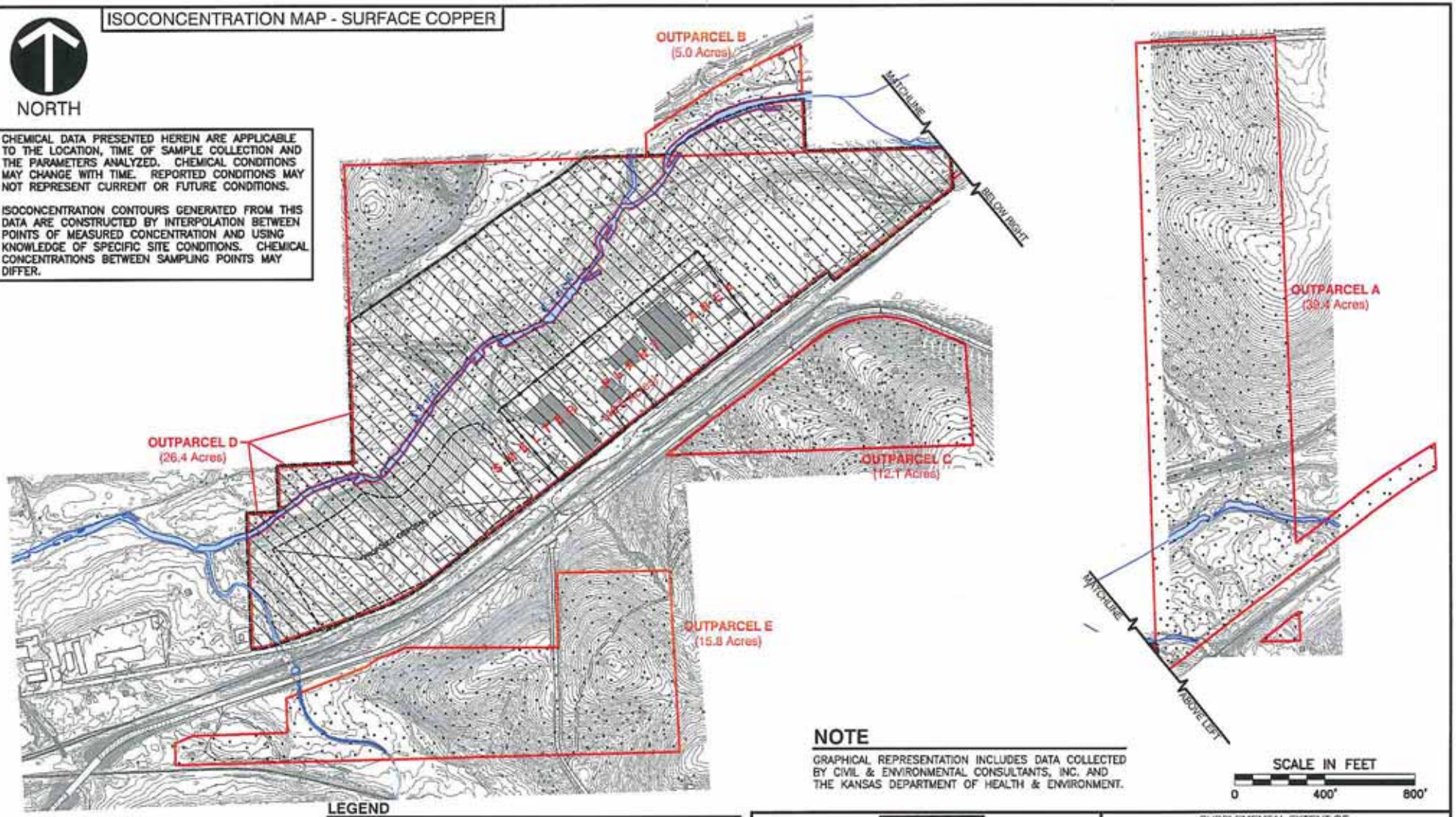
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE CHROMIUM

DRAWN BY:	TLD	CHECKED BY:	TEM	APPROVED BY:	*MK	DRAWING NO.:	17
DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020		

G:\PROJECTS\2006\061-825\DWG\ASK 0020 - SP11\061825-SP11-07 SURFACE CHROMIUM.DWG[17 SP11-07] (DOMBLE) - JAN 28, 2010 - 11:38:3

ISOCONCENTRATION MAP - SURFACE COPPER



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

ISOCONCENTRATION CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF MEASURED CONCENTRATION AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. CHEMICAL CONCENTRATIONS BETWEEN SAMPLING POINTS MAY DIFFER.

NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE COPPER CONCENTRATIONS (mg/kg)

- 0 – 76,000 (Below Non-Residential Std.)*
- > 76,000

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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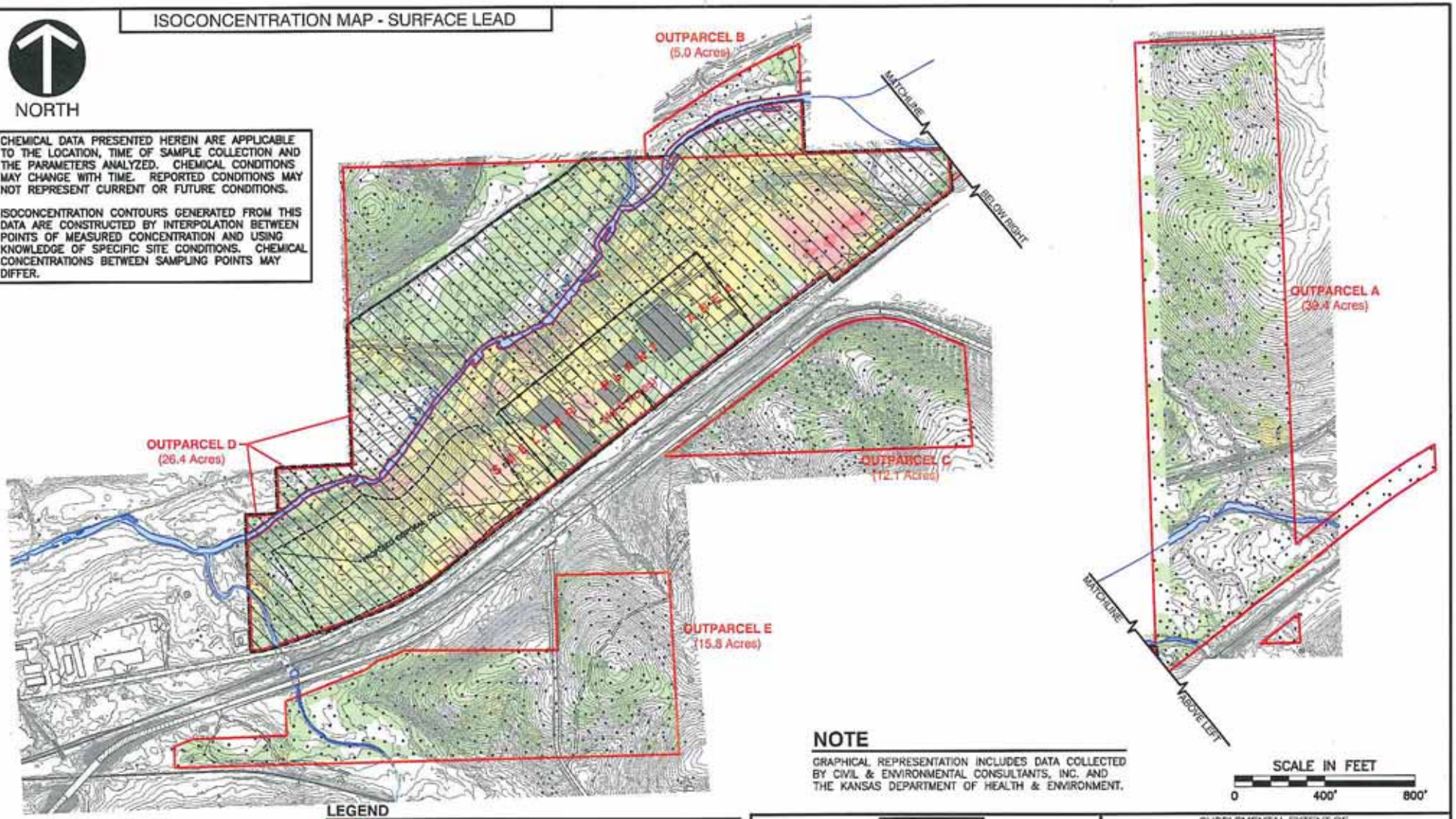
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE COPPER

DRAWN BY:	TLD	CHECKED BY:	TEM	APPROVED BY:	*MK	DRAWING NO.:
DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020	18

G:\PROJECTS\2006\061-825\DWG\TASK 0020 - SP11\061825-SP11-08 SURFACE COPPER.DWG[18 SP11-08] (DSHAW) - JAN 29, 2010 - 11:38:51

ISOCONCENTRATION MAP - SURFACE LEAD



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

ISOCONCENTRATION CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF MEASURED CONCENTRATION AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. CHEMICAL CONCENTRATIONS BETWEEN SAMPLING POINTS MAY DIFFER.

NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE LEAD CONCENTRATIONS (mg/kg)

0 – 1,000	(Below Non-Residential Std.)*
1,001 – 5,000	
5,001 – 10,000	
10,001 – 50,000	
50,001 – 100,000	
100,001 – 150,000	
150,001 – 200,000	
> 200,000	

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020		

SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE LEAD

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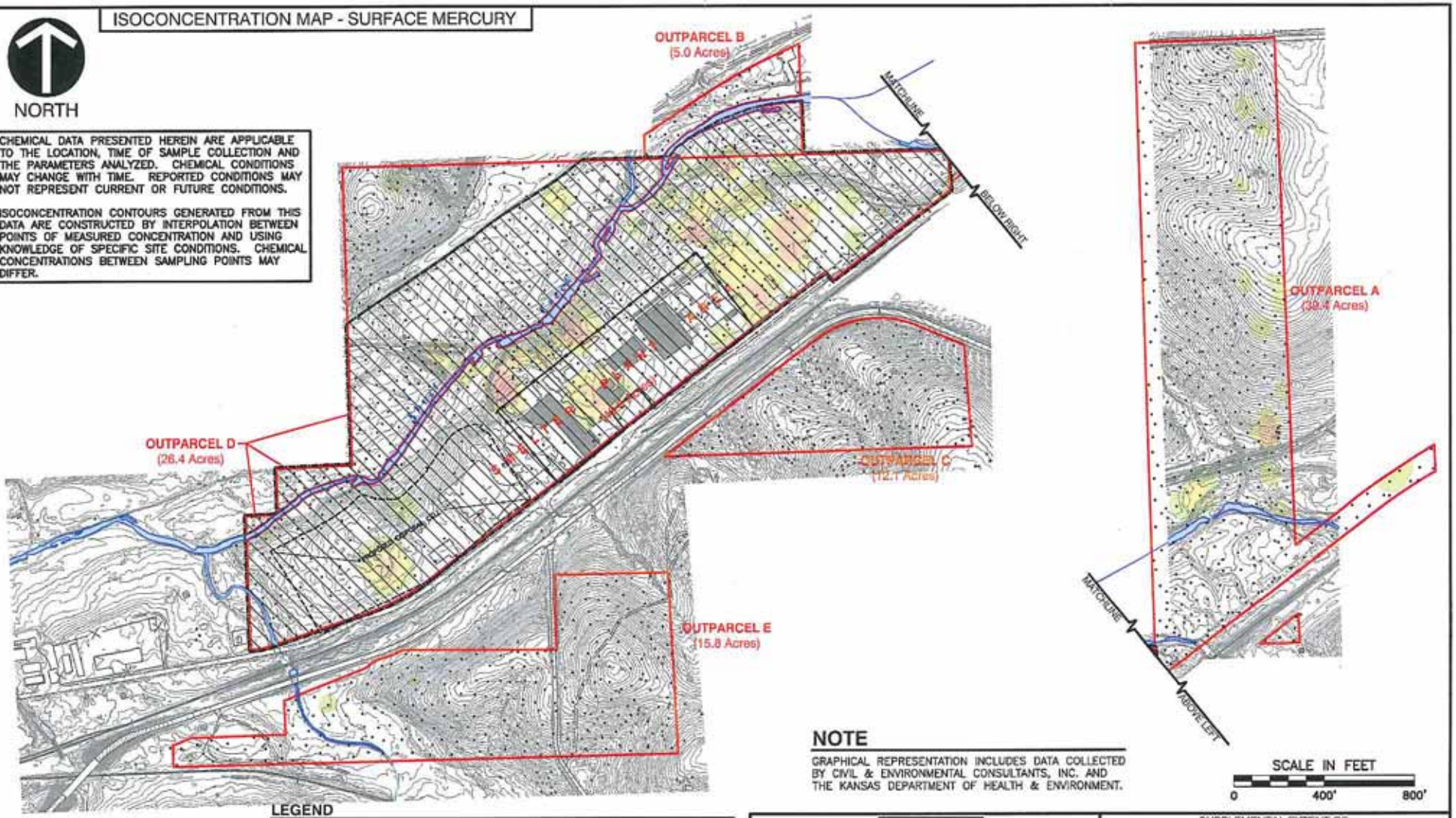
ISOCONCENTRATION MAP - SURFACE MERCURY



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

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NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE MERCURY CONCENTRATIONS (mg/kg)

0	–	20	(Below Non-Residential Std.)*
21	–	100	
101	–	500	
501	–	1,000	
1,001	–	5,000	
5,001	–	15,000	
> 15,000			

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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DRAWN BY:	TLD	CHECKED BY:	TEM	APPROVED BY:	*MK	DRAWING NO.:	20
DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020		

SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE MERCURY

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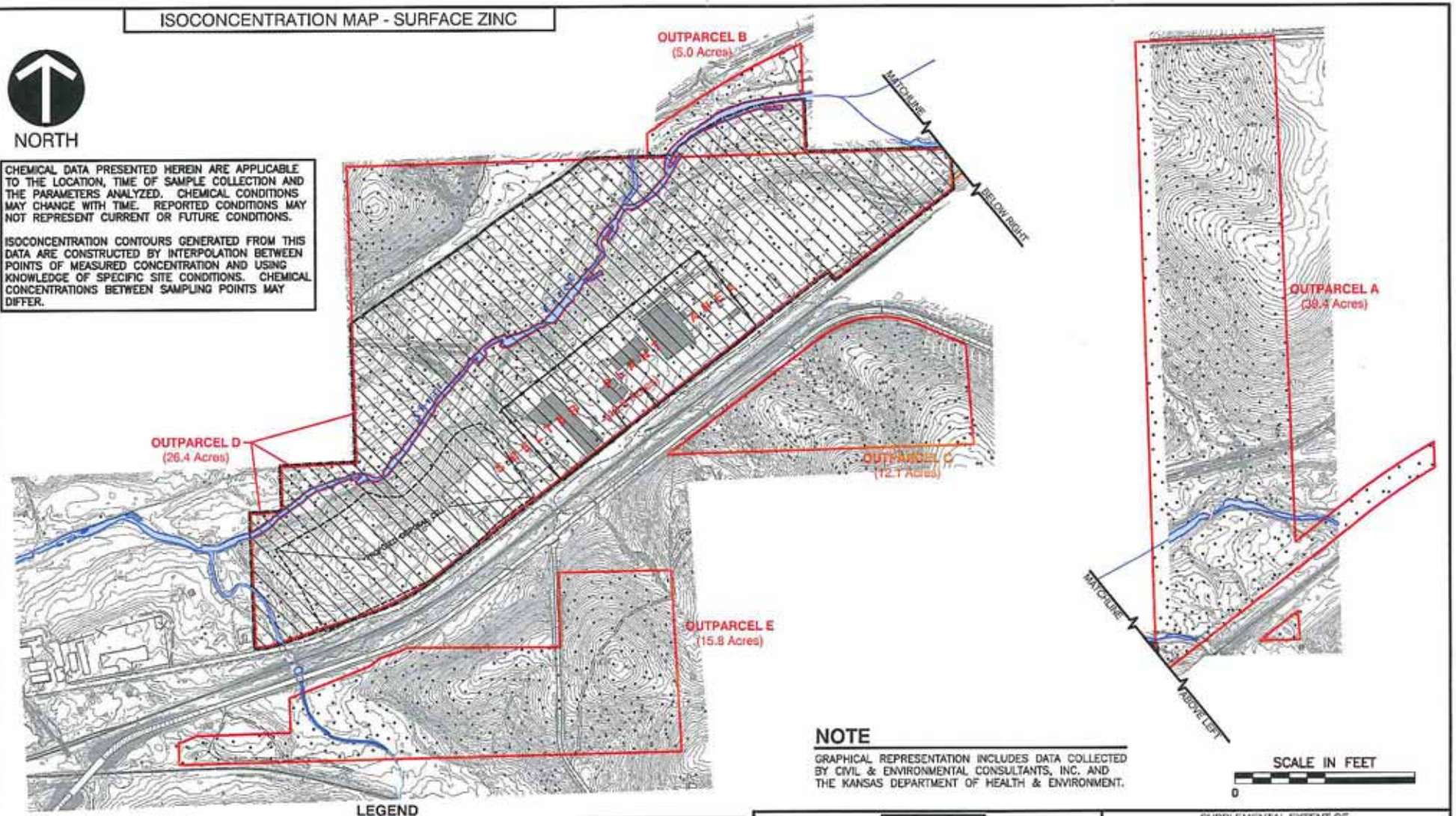
ISOCONCENTRATION MAP - SURFACE ZINC



CHEMICAL DATA PRESENTED HEREIN ARE APPLICABLE TO THE LOCATION, TIME OF SAMPLE COLLECTION AND THE PARAMETERS ANALYZED. CHEMICAL CONDITIONS MAY CHANGE WITH TIME. REPORTED CONDITIONS MAY NOT REPRESENT CURRENT OR FUTURE CONDITIONS.

ISOCONCENTRATION CONTOURS GENERATED FROM THIS DATA ARE CONSTRUCTED BY INTERPOLATION BETWEEN POINTS OF MEASURED CONCENTRATION AND USING KNOWLEDGE OF SPECIFIC SITE CONDITIONS. CHEMICAL CONCENTRATIONS BETWEEN SAMPLING POINTS MAY DIFFER.

NOTE

GRAPHICAL REPRESENTATION INCLUDES DATA COLLECTED BY CIVIL & ENVIRONMENTAL CONSULTANTS, INC. AND THE KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT.

LEGEND

- AREAS OF INVESTIGATION
- AREA OF CONCERN (70 Acres)
- SAMPLE LOCATION
- FENCED IN PORTION OF SMELTER SITE
- EXISTING BUILDINGS

SURFACE SAMPLE ZINC CONCENTRATIONS (mg/kg)

- 0 – 610,000 (Below Non-Residential Std.)*
- > 610,000

*KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, BUREAU OF ENVIRONMENTAL REMEDIATION – RISK-BASED NON-RESIDENTIAL STANDARDS FOR KANSAS (RSK), JUNE, 2007.

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHY: 12-14-2006, DRAWING DATED 01-04-2007.

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SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

ISOCONCENTRATION MAP
SURFACE ZINC

DRAWN BY:	TLD	CHECKED BY:	TEM	APPROVED BY:	*MK	DRAWING NO.:	21
DATE:	1/19/10	DWG SCALE:	1" = 400'	PROJECT NO:	061-825.0020		

TOTAL DEPTH OF SOIL EXCEEDING THE RSK NON-RESIDENTIAL STANDARD FOR ALL METALS

NORTH

OUTPARCEL B
(5.0 Acres)

OUTPARCEL A
(39.4 Acres)

OUTPARCEL C
(12.1 Acres)

OUTPARCEL D
(26.4 Acres)

OUTPARCEL E
(15.8 Acres)

AREA BETWEEN SHORT CREEK AND WAREHOUSS BUILDING

SETTLING POND AND DEBRIS PITS

MAIN RAILROAD

RAILROAD SPUR AND TRESTLE

FINISHED PRODUCT STORAGE

FORMER ACID PLANT

PETROLEUM CONTAMINATED SOIL

BURIED WASTE PILE

SLAG DUMP

RAILROAD FILL MATERIAL

SHORT CREEK

LEGEND

NOTE

SCALE IN FEET

REFERENCE

1. TOPOGRAPHIC INFORMATION PREPARED BY AERIAL DATA SERVICE, INC., TULSA, OK, DATE OF PHOTOGRAPHS: 12-14-2000, DRAWING DATED 01-04-2001.

REVISION RECORD

SUBMITTAL RECORD

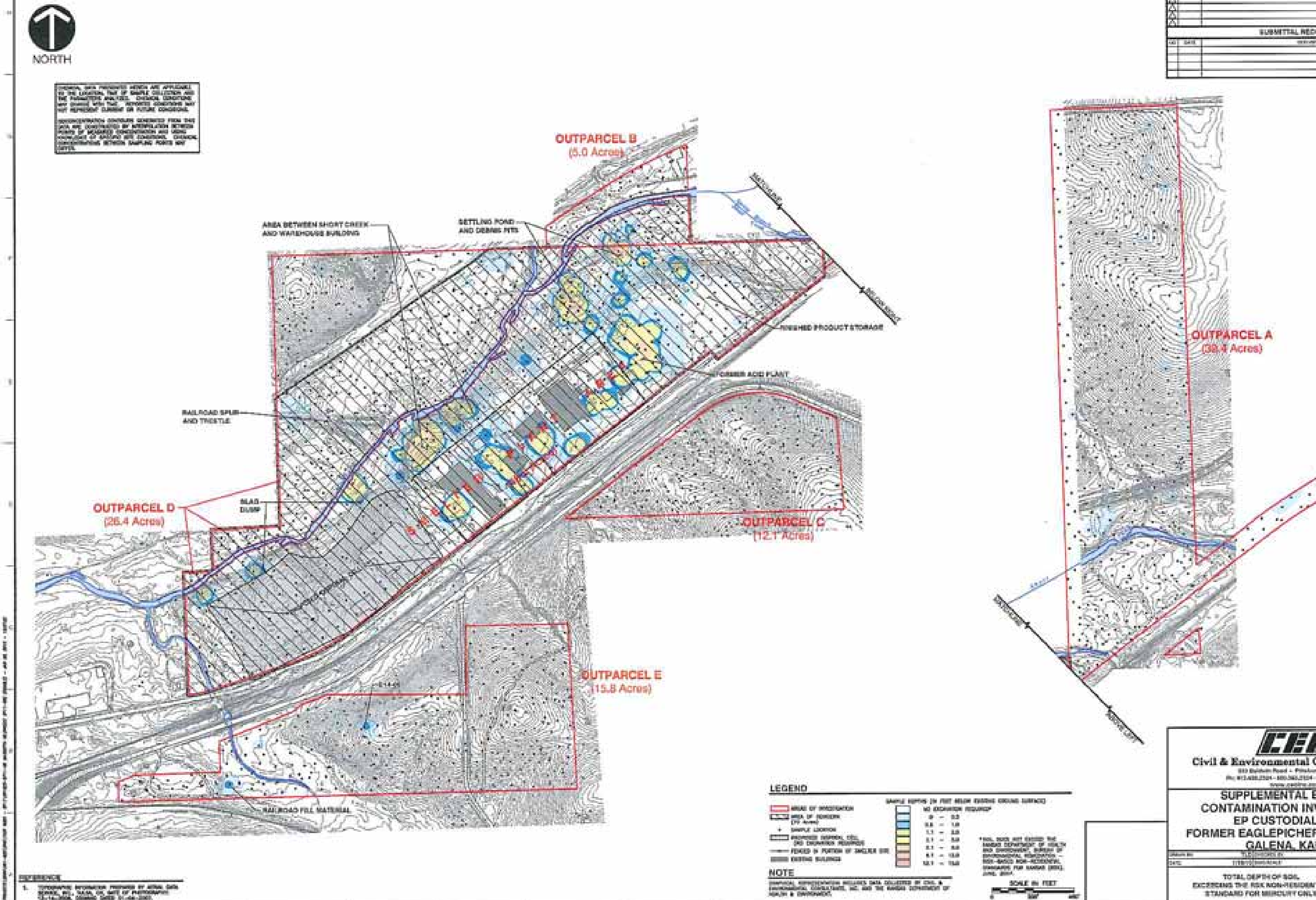
Civil & Environmental Consultants, Inc.

SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

TOTAL DEPTH OF SOIL EXCEEDING THE RSK NON-RESIDENTIAL STANDARD FOR ALL METALS

22

TOTAL DEPTH OF SOIL EXCEEDING THE RSK NON-RESIDENTIAL STANDARD FOR MERCURY ONLY

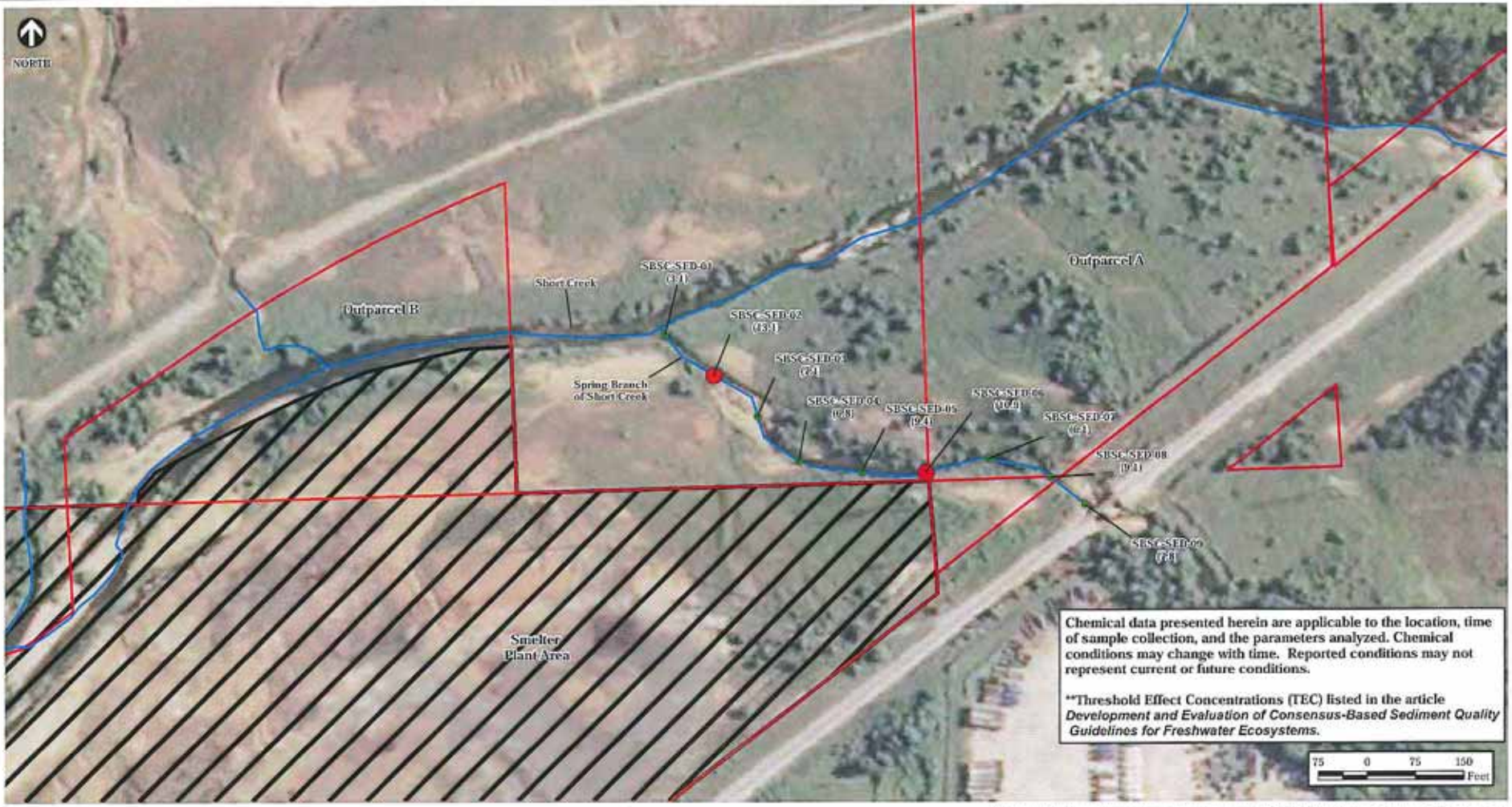


Civil & Environmental Consultants, Inc.

SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
EP CUSTODIAL TRUST
FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

TOTAL DEPTH OF SOIL EXCEEDING THE RSK NON-RESIDENTIAL STANDARD FOR MERCURY ONLY

23



NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 24 | Project No.: 061-825

Sediment Sample Location Map - Arsenic Concentrations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
Sediment Sample Location
- Below TEC (9.79 mg/kg)**
- Above TEC (9.79 mg/kg)**
- Area of Investigation
- Area of Concern (70 acres)

Results shown in Milligrams per Kilogram (mg/kg)

Date: January 2010
Scale: 1" = 150'
Drn By: MJB
Chk By: TEM
App By: *

Revision Record

No.	Date	

Hand Signature on File

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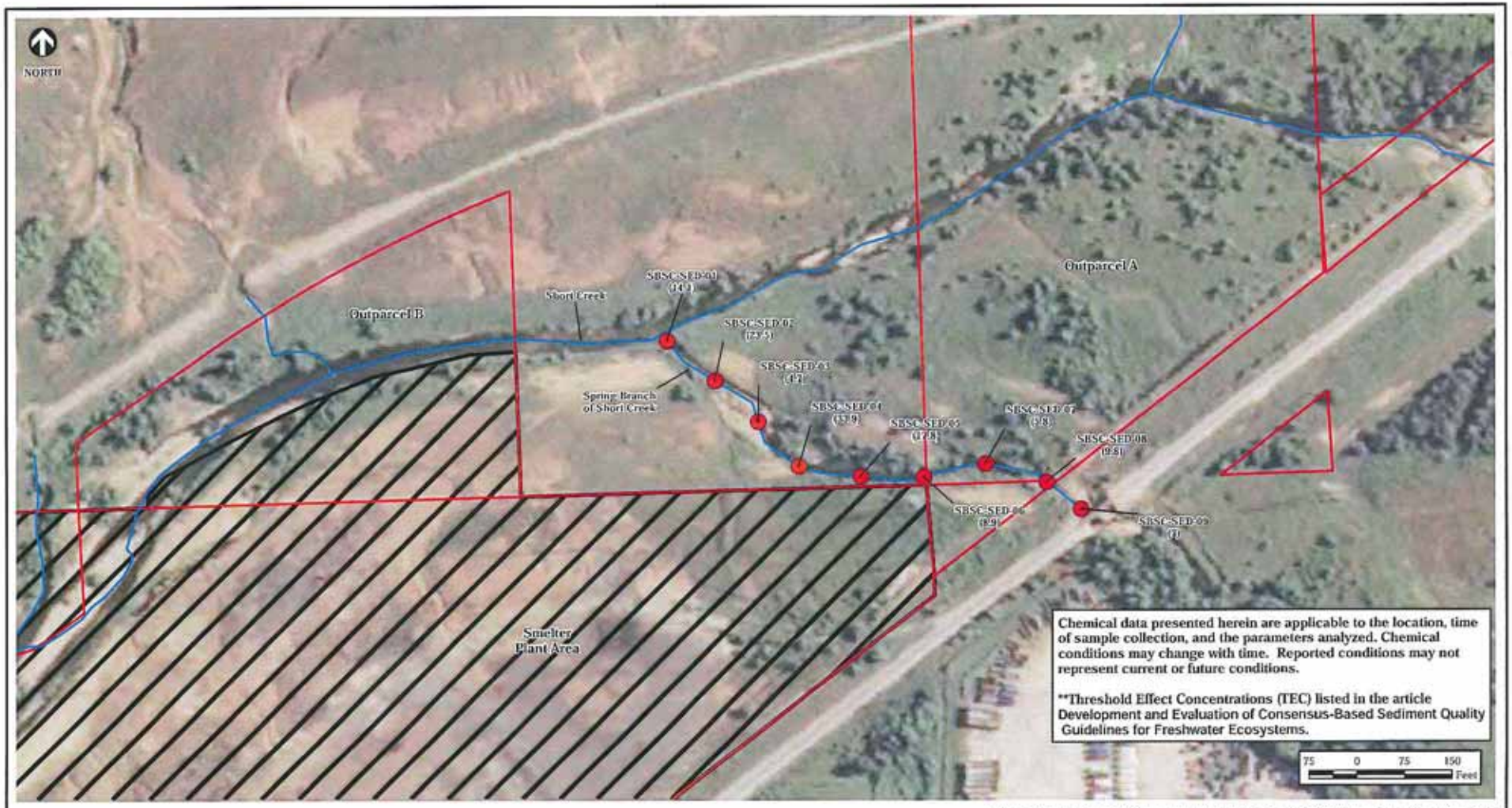

NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 25 | Project No.: 061-825

Sediment Sample Location Map - Cadmium Concentrations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
Sediment Sample Location
- Below TEC (0.99 mg/kg)**
- Above TEC (0.99 mg/kg)**
- Area of Investigation
- Area of Concern (70 acres)

Results shown in Milligrams per Kilogram (mg/kg)

Date: January 2010	Revision Record
Scale: 1" = 150'	No. Date
Dwn By: MJB	
Chk By: TEM	
App By: *	Hand Signature on File

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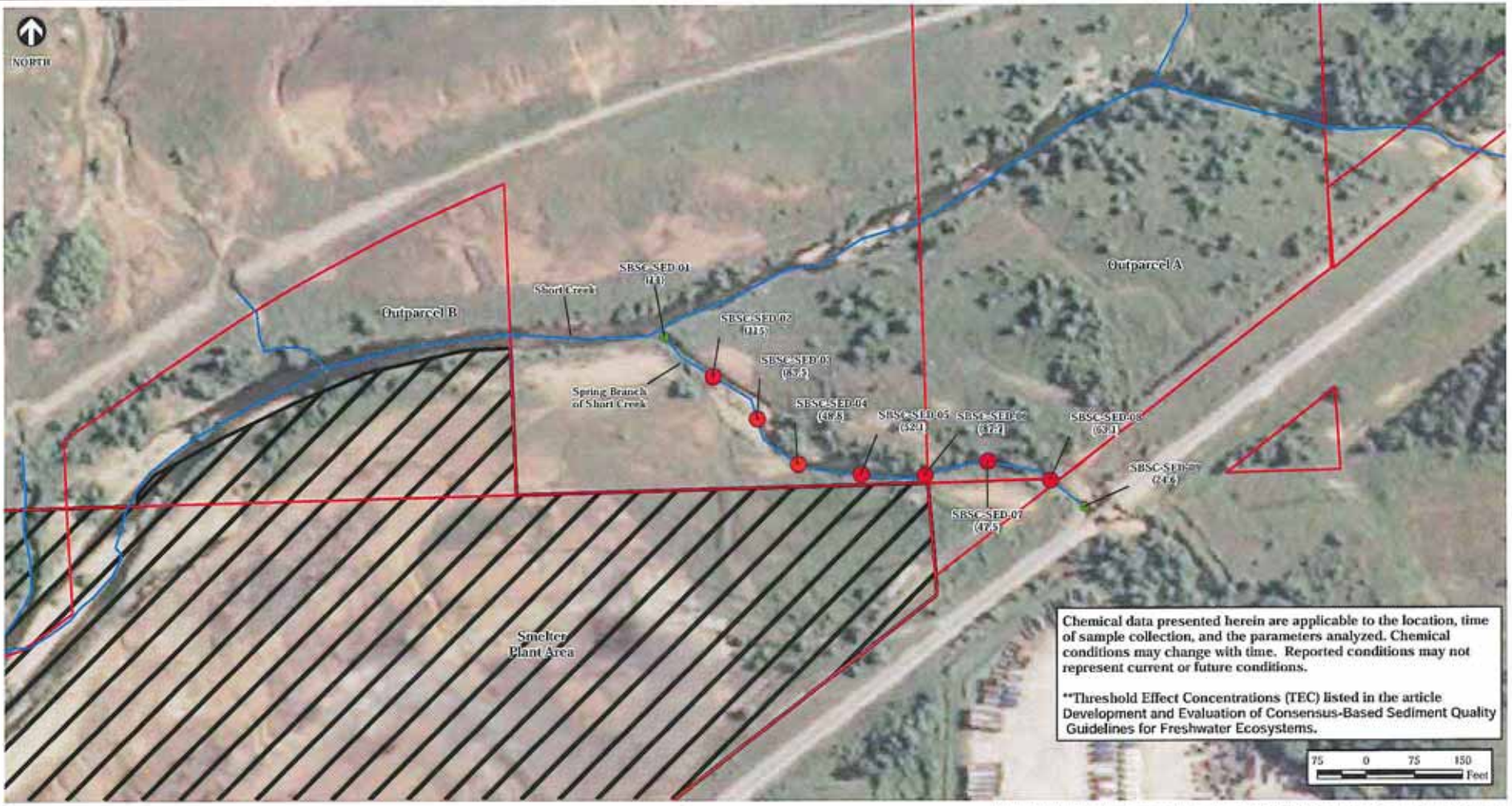

NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 26 | Project No.: 061-825

Sediment Sample Location Map - Chromium Concentrations
Supplemental Extent Of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
Sediment Sample Location
- Below TEC (43.4 mg/kg)**
- Above TEC (43.4 mg/kg)**
- Area of investigation
- Area of Concern (70 acres)

Results shown in Milligrams per Kilogram (mg/kg)

Date: January 2010
Scale: 1" = 150'
Dwn By: MJB
Chk By: TEM
App By: *

Revision Record

No.	Date	

Hand Signature on File

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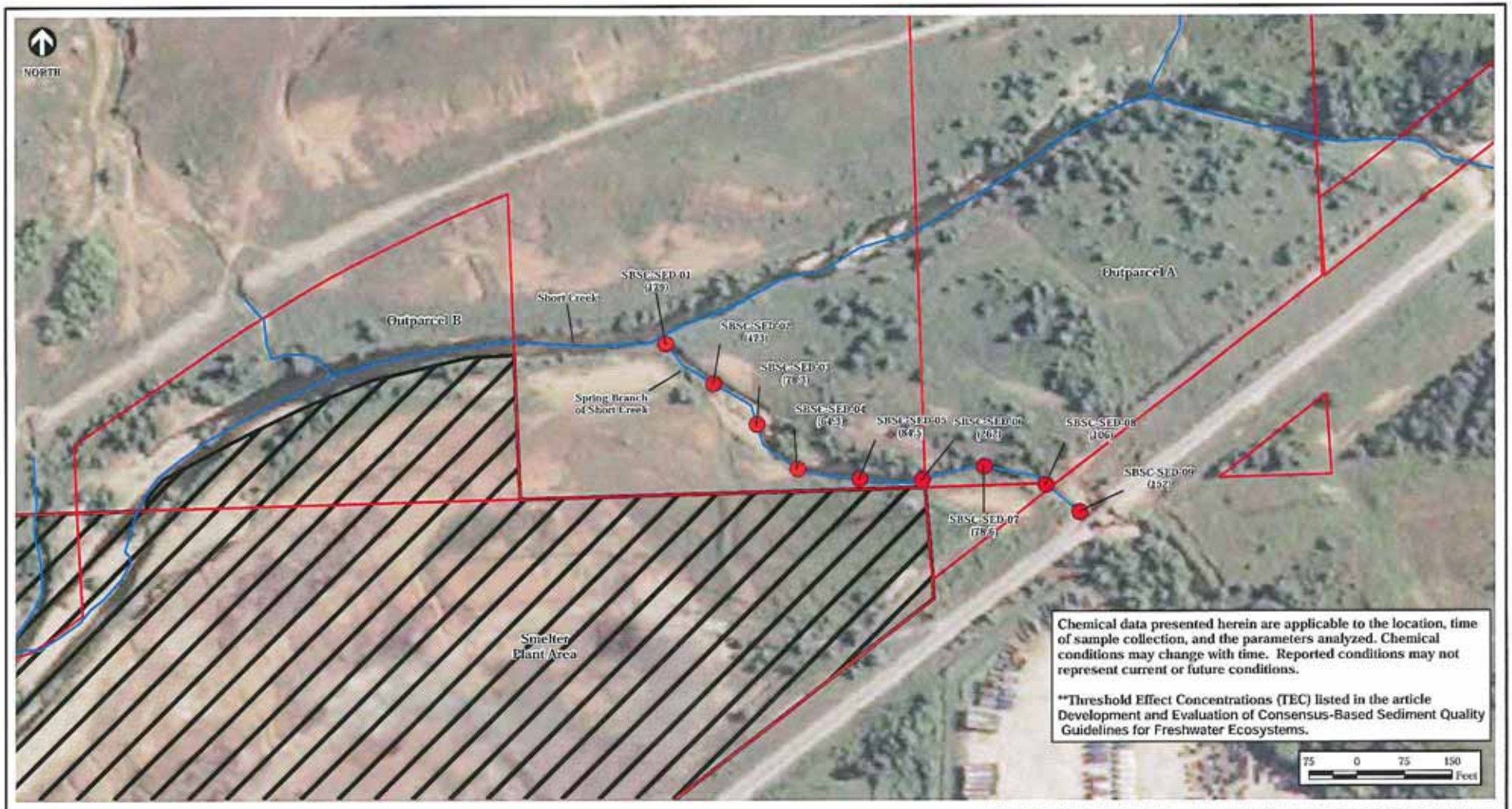

NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 27 | Project No.: 061-825

Sediment Sample Location Map - Lead Concentrations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
Sediment Sample Location
- Below TEC (35.8 mg/kg)**
- Above TEC (35.8 mg/kg)**
- Area of Investigation
- Area of Concern (70 acres)

Results shown in Milligrams per Kilogram (mg/kg)

Date: January 2010	Revision Record
Scale: 1" = 150'	No. Date
Dwn By: MJB	
Chk By: TEM	
App By: *	Hand Signature on File

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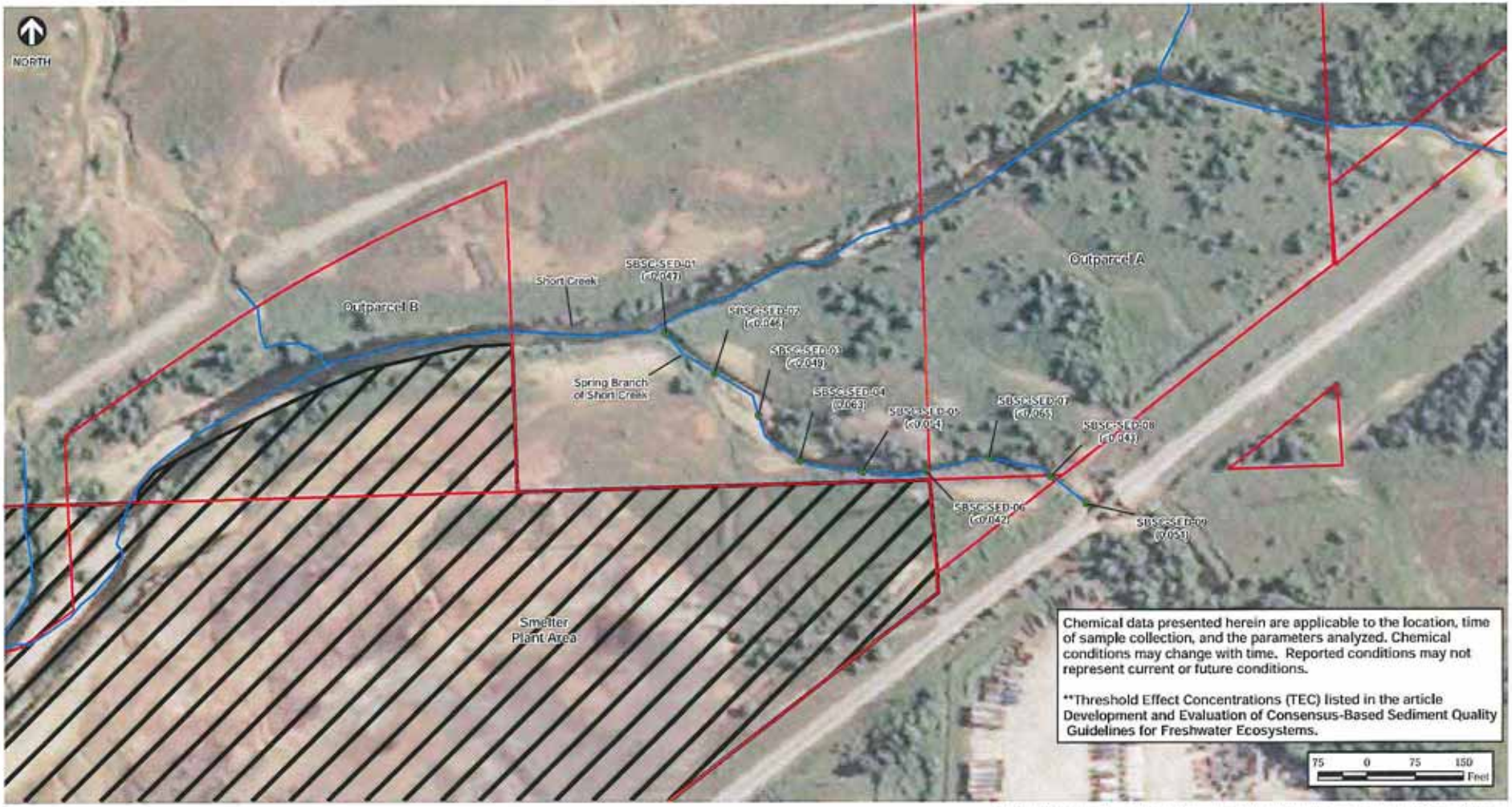

NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 28 | Project No.: 061-825

Sediment Sample Location Map - Mercury Concentrations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
Sediment Sample Location
- Below TEC (0.18 mg/kg)
- Above TEC (0.18 mg/kg)
- Outparcel Boundary
- Area of Concern (70 acres)

Results shown in Milligrams per Kilogram (mg/kg)

Date: January 2010
Scale: 1" = 150'
Dwn By: MJB
Chk By: TEM
App By: *

Revision Record

No.	Date

Hand Signature on File

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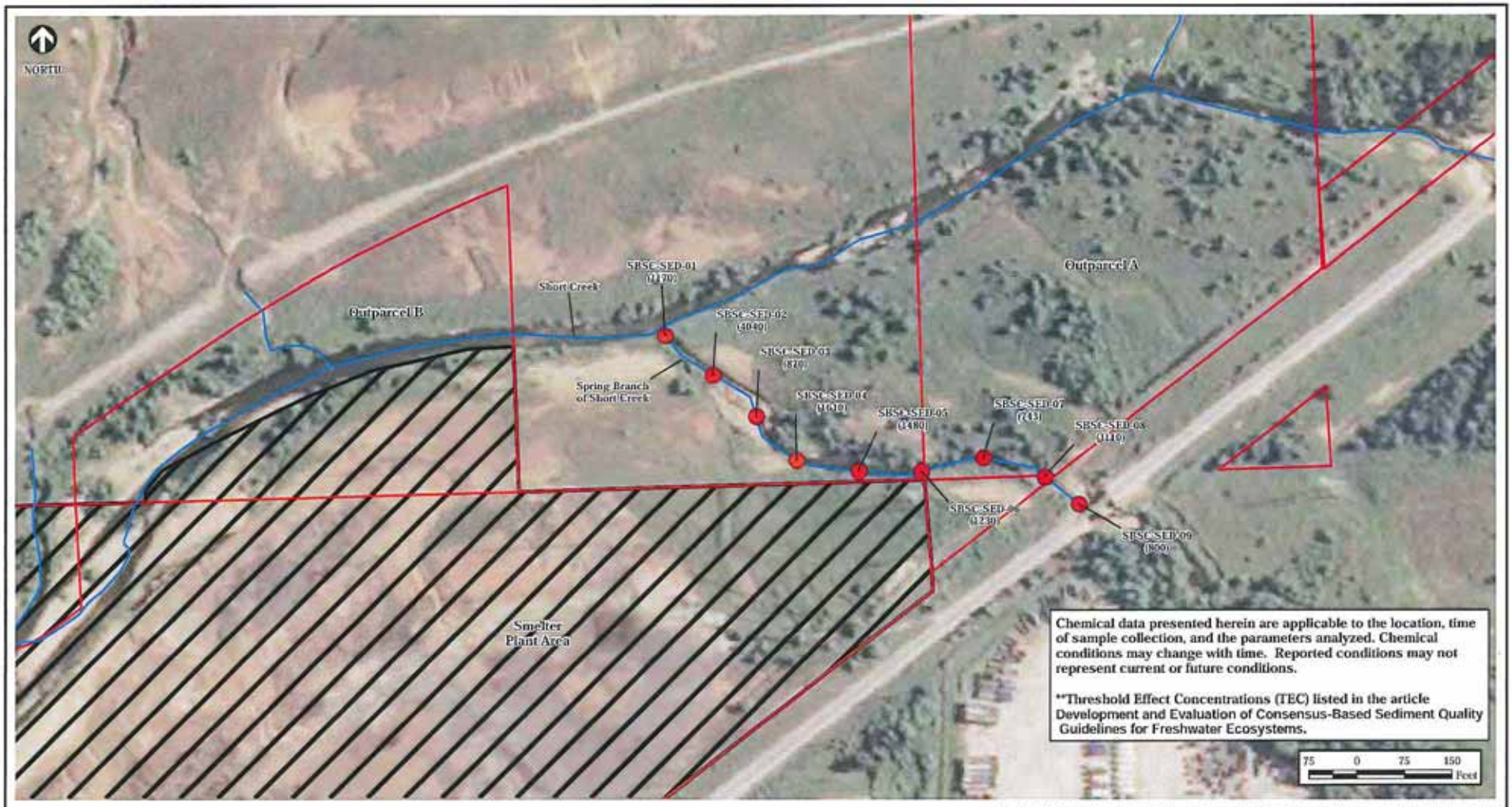

NOTE: AERIAL IMAGERY - National Agricultural Imagery Program (NAIP) County Color Aerial Mosaic - Cherokee County, Kansas, 2008.

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Figure No.: 29 | Project No.: 061-825

Sediment Sample Location Map - Zinc Concentrations
Supplemental Extent of Contamination Investigation
EP Custodial Trust
Former EaglePicher Smelter Site
Galena, Kansas

Legend
Sediment Sample Location
- Below TEC (121 mg/kg)**
- Above TEC (121 mg/kg)**
- Area of Investigation
- Area of Concern (70 acres)

Results shown in Milligrams per Kilogram (mg/kg)

Date: January 2010
Scale: 1" = 150'
Dwn By: MJB
Chk By: TEM
App By: *

Revision Record

No.	Date	

Hand Signature on File

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TABLES

TABLE 1
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
HAZARDOUS MATERIAL CHARACTERIZATION LABORATORY DATA
SETTLING PONDS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Location:	Western Settling Pond							Eastern Settling Pond - Debris Area								
Sample ID/Depth:	TP-17 C COMP	TP-17 C (4')	TP-17 F COMP	TP-17 F (2')	TP-155 COMP	TP-155 (1.0')	TP-155 (5.0')	TP-51 COMP	TP-51 (4.0')	TP-131 COMP	TP-131 (2')	TP-131 (6')	TP-134 COMP	TP-134 (2')		
Date Collected:	8/20/2009	8/20/2009	8/20/2009	8/20/2009	8/27/2009	8/27/2009	8/27/2009	8/27/2009	8/27/2009	8/21/2009	8/21/2009	8/21/2009	8/21/2009	8/21/2009	**Toxicity (1)**	**RSK-Based (2)**
Total Metals (mg/kg)																
Arsenic	111		22.3		66.9			143		107			25.3		NS	38
Cadmium	3,260		125		350			136		450			98.5		NS	1,000
Chromium	30.7	NA	16.2	NA	33.7	NA	NA	119	NA	49.5	NA	NA	45.2	NA	NS	4,000
Mercury	497		272		397			59		1,250			2.9		NS	20
Lead	53,600		29,200		26,900			38,400		45,900			10,700		NS	1,000
Zinc	53,900		26,500		193,000			22,000		49,400			31,200		NS	610,000
TCLP Metals (mg/l)																
Arsenic	ND		ND		ND			ND		ND			ND		5	NS
Cadmium	27.7		0.88		2.9			1		11.6			2.4		1	NS
Chromium	ND	NA	ND	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND	NA	5	NS
Mercury	ND		ND		ND			ND		0.0492			ND		0.2	NS
Lead	152		352		172			429		132			174		5	NS
TCLP Semivolatile Organic Compounds (ug/l)*	ND	NA	ND	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND	NA		
TCLP Volatile Organic Compounds (ug/l)*	NA	ND	NA	ND	NA	ND	ND	NA	ND	NA	ND	ND	NA	ND		
Polychlorinated Biphenyls (ug/kg)*																
PCB-1254 (Aroclor 1254)	5,210	NA	1,990	NA	1,760	NA	NA	2,350	NA	3,060	NA	NA	498	NA	NS	9,500
Pesticides (ug/kg)*																
alpha-BHC	ND		ND		ND			13.8		ND			ND		NS	NS
beta-BHC	ND		ND		ND			61.7		ND			ND		NS	NS
4,4'-DDE	56.4		ND		28.7			28.5		ND			ND		NS	56,000
4,4'-DDT	ND	NA	ND	NA	ND	NA	NA	87.1	NA	ND	NA	NA	ND	NA	NS	56,000
Dieldrin	ND		ND		60.5			50.3		ND			ND		NS	1,200
Endrin aldehyde	ND		ND		6.64			29.3		ND			ND		NS	30,000
Heptachlor epoxide	ND		ND		33.4			ND		ND			ND		NS	2,100
Reactivity (mg/kg)																
Cyanide, Reactive	ND	NA	ND	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND	NA	250	NS
Sulfide, Reactive	230	NA	ND	NA	ND	NA	NA	ND	NA	ND	NA	NA	ND	NA	500	NS
pH Soil (Std. Units)																
pH	6.1	NA	9.3	NA	6.2	NA	NA	6.1	NA	6	NA	NA	6	NA	<2 or >12.5	NS
Paint Filter Liquids																
Free Liquids	Positive	NA	Negative	NA	Negative	NA	NA	Negative	NA	Negative	NA	NA	Negative	NA	Positive	NS
Flashpoint (°F)																
Flashpoint	210	NA	210	NA	210	NA	NA	210	NA	210	NA	NA	210	NA	<140	NS

Notes:
* Only those compounds detected in one or more samples are listed.
(1) Maximum concentration of contaminants for toxicity characteristic set by 40 CFR 261.4.
(2) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential use - June 2007
Indicates that the standard was exceeded
NA Not Analyzed
ND Non-Detection
NS No Standard

TABLE 2
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
HAZARDOUS MATERIAL CHARACTERIZATION LABORATORY DATA
PIPELINE AND ACID PLANT SAMPLES
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Location:	Pipeline Investigation				Acid Plant Area					Toxicity (1)	RSK-Based (2)
Sample ID/Depth:	TP-93 COMP	TP-93 (0.1)	TP-93 CPM	TP-17I MPM	TP-164A COMP	TP-164A (4.0')	TP-173 COMP	TP-173 (3.0')	TP-173 DUP		
Date Collected:	8/21/2009	8/21/2009	8/21/2009	8/21/2009	8/28/2009	8/28/2009	8/29/2009	8/29/2009	8/29/2009		
Total Metals (mg/kg)											
Arsenic	601		186	31.7	12.4		27.4		15.9	NS	38
Cadmium	1,100		238	530	209		150		54.9	NS	1000
Chromium	23.7	NA	28.3	38.9	10	NA	19.8	NA	21.4	NS	4,000
Mercury	73.6		1,010	575	4,270		10.3		5.3	NS	20
Lead	35,500		30,700	8,410	14,600		8,400		7,280	NS	1000
Zinc	56,600		32,600	61,800	5,850		26,600		11,200	NS	610,000
TCLP Metals (mg/l)											
Arsenic	ND		ND	ND	ND		ND		ND	5	NS
Cadmium	10.6		2.7	4.6	0.49		1.3		1.2	1	NS
Chromium	ND	NA	ND	ND	ND	NA	ND	NA	ND	5	NS
Mercury	ND		ND	ND	0.0097		ND		ND	0.2	NS
Lead	110		282	4.5	326		97.4		91.3	5	NS
TCLP Semivolatile Organic Compounds (ug/l)*	ND	NA	ND	ND	ND	NA	ND	NA	ND		
TCLP Volatile Organic Compounds (ug/l)*	NA	ND	ND	ND	NA	ND	NA	ND	ND		
Polychlorinated Biphenyls (ug/kg)*											
PCB-1254 (Aroclor 1254)	244	NA	532	1,810	14,100	NA	1,250	NA	1,270	NS	9,500
Pesticides (ug/kg)*											
alpha-BHC	ND		ND	ND	ND		ND		ND	NS	NS
beta-BHC	ND		ND	ND	ND		ND		ND	NS	NS
4,4'-DDE	ND		ND	ND	18.9		ND		ND	NS	56,000
4,4'-DDT	ND	NA	ND	ND	ND	NA	ND	NA	ND	NS	56,000
Dieldrin	ND		ND	20.9	43.4		ND		ND	NS	1,200
Endrin aldehyde	ND		ND	ND	ND		ND		ND	NS	30,000
Heptachlor epoxide	ND		ND	12.1	22.5		ND		ND	NS	2,100
Reactivity (mg/kg)											
Cyanide, Reactive	ND	NA	ND	ND	ND	NA	ND	NA	ND	250	NS
Sulfide, Reactive	ND	NA	ND	ND	ND	NA	ND	NA	ND	500	NS
pH Soil (Std. Units)											
pH	6.5	NA	6.2	7.1	6	NA	7.4	NA	5.3	<2 or >12.5	NS
Paint Filter Liquids											
Free Liquids	Positive	NA	Positive	Positive	Negative	NA	Negative	NA	Negative	Positive	NS
Flashpoint (°F)											
Flashpoint	210	NA	210	210	210	NA	210	NA	210	<140	NS

Notes:
* Only those compounds detected in one or more samples are listed.
(1) Maximum concentration of contaminants for toxicity characteristic set by 40 CFR 261.4.
(2) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential use - June 2007
Indicates that the standard was exceeded
NA Not Analyzed
ND Non-Detection
NS No Standard

TABLE 3
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
HAZARDOUS MATERIAL CHARACTERIZATION LABORATORY DATA
ADDITIONAL MATERIAL CHARACTERIZATION
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Location:	Area Between Short Creek and the Warehouse Building						Petroleum Contamined Soil - Smelter Site (Fenced Portion)				Buried Waste Pile - Outparcel A			
Sample ID/Depth:	TP-138 COMP	TP-138 (1')	TP-138 (10')	TP-139 B COMP	TP-139 B (1')	TP-139 B (10')	TP-111 A COMP	TP-111 A (5')	TP-111 J COMP	TP-111 J (6')	EP-06A COMP	EP-06A (-2.5')		
Date Collected:	8/24/2009	8/24/2009	8/24/2009	8/24/2009	8/24/2009	8/24/2009	8/19/2009	8/19/2009	8/19/2009	8/19/2009	8/26/2009	8/26/2009	**Toxicity (1)**	**RSK-Based (2)**
Total Metals (mg/kg)														
Arsenic	129			52.9			44.9		5.7		118		NS	38
Cadmium	103			59.4			88.7		3.2		3,780		NS	1,000
Chromium	10.9	NA	NA	11	NA	NA	45.9	NA	28.4	NA	83.3	NA	NS	4,000
Mercury	6			0.2			1.4		0.29		16.7		NS	20
Lead	18,300			41,000			27,400		29,400		40,400		NS	1,000
Zinc	4,440			33,500			30,900		1,140		140,000		NS	610,000
TCLP Metals (mg/l)														
Arsenic	ND			ND			ND		ND		ND		5	NS
Cadmium	2.9			0.71			0.19		ND		18.6		1	NS
Chromium	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	ND	NA	5	NS
Mercury	ND			ND			ND		ND		ND		0.2	NS
Lead	462			108			207		2.4		126		5	NS
TCLP Semivolatile Organic Compounds (ug/l)*	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	ND	NA		
TCLP Volatile Organic Compounds (ug/l)*	NA	ND	ND	NA	ND	ND	NA	ND	NA	ND	NA	ND		
Polychlorinated Biphenyls (ug/kg)*														
PCB-1254 (Aroclor 1254)	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	499	NA	NS	9,500
Pesticides (ug/kg)*														
alpha-BHC	ND			ND			ND		ND		ND		NS	NS
beta-BHC	ND			ND			ND		ND		5.76		NS	NS
4,4'-DDE	ND			ND			ND		ND		ND		NS	56,000
4,4'-DDT	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	ND	NA	NS	56,000
Dieldrin	ND			ND			ND		ND		ND		NS	1,200
Endrin aldehyde	ND			ND			ND		ND		ND		NS	30,000
Heptachlor epoxide	ND			ND			ND		ND		ND		NS	2,100
Reactivity (mg/kg)														
Cyanide, Reactive	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	ND	NA	250	NS
Sulfide, Reactive	ND	NA	NA	ND	NA	NA	ND	NA	ND	NA	ND	NA	500	NS
pH Soil (Std. Units)														
pH	6.5	NA	NA	6.1	NA	NA	6.1	NA	6.6	NA	6.4	NA	<2 or >12.5	NS
Paint Filter Liquids														
Free Liquids	Negative	NA	NA	Positive	NA	NA	Negative	NA	Negative	NA	Negative	NA	Positive	NS
Flashpoint (°F)														
Flashpoint	210	NA	NA	210	NA	NA	210	NA	210	NA	210	NA	<140	NS

Notes:
* Only those compounds detected in one or more samples are listed.
(1) Maximum concentration of contaminants for toxicity characteristic set by 40 CFR 261.4.
(2) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential use - June 2007
Indicates that the standard was exceeded
NA Not Analyzed
ND Non-Detection
NS No Standard

TABLE 4
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
BEDROCK XRF ANALYSIS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID:	A-T1-05	A-T1-09	A-T1-10	A-T1-11	A-T1-12	A-T1-13	A-T1-14	A-T1-15	A-T1-16	A-T1-17	A-T1-18	A-T1-19	RSK Non-Residential Criteria (1)
Depth:	(2.0)	(2.5)	(2.5)	(3.0)	(2.5)	(2.8)	(2.8)	(2.8)	(3.0)	(2.8)	(3.0)	(2.5)	
Total Metals (mg/kg)													
Arsenic	17	12	<LOD	9	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	38
Cadmium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	1,000
Chromium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	4,000
Copper	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	76,000
Lead	37	22	27	13	12	1,350	22	245	<LOD	21	85	21	1,000
Mercury	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20
Zinc	657	538	219	194	742	116	200	133	197	254	231	133	610,000

Sample ID:	A-T1-20	A-T2-01	A-T2-02	A-T2-03	A-T2-04	A-T2-05	A-T2-06	A-T2-07	A-T2-08	A-T2-09	E-T1-01	E-T1-02	RSK Non-Residential Criteria (1)
Depth:	(2.5)	(3.0)	(3.0)	(3.0)	(3.0)	(3.3)	(2.9)	(2.5)	(2.2)	(3.0)	(2.5)	(3.0)	
Total Metals (mg/kg)													
Arsenic	<LOD	<LOD	<LOD	<LOD	12	<LOD	<LOD	<LOD	10	<LOD	<LOD	<LOD	38
Cadmium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	1,000
Chromium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	4,000
Copper	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	76,000
Lead	14	11	<LOD	<LOD	23	27	52	71	24	43	272	221	1,000
Mercury	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20
Zinc	515	135	77	171	567	45	332	106	201	154	510	1,230	610,000

Sample ID:	E-T1-03	E-T1-04	E-T1-05	E-T1-18	RSK Non-Residential Criteria (1)
Depth:	(4.0)	(3.0)	(3.0)	(3.0)	
Total Metals (mg/kg)					
Arsenic	<LOD	<LOD	<LOD	<LOD	38
Cadmium	<LOD	<LOD	<LOD	<LOD	1,000
Chromium	<LOD	<LOD	<LOD	<LOD	4,000
Copper	<LOD	<LOD	<LOD	<LOD	76,000
Lead	2,664	146	288	49	1,000
Mercury	<LOD	<LOD	<LOD	<LOD	20
Zinc	436	161	268	207	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
Indicates that the RSK Non-Residential Criteria was exceeded
LOD Limit of Detection

TABLE 5
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
SEDIMENT LABORATORY DATA
FORMER EAGLEPICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID:	SBSC-SED-01	SBSC-SED-01 DUP	SBSC-SED-02	SBSC-SED-03	SBSC-SED-04	Threshold Effect
Date Collected:	8/25/2009	8/25/2009	8/25/2009	8/25/2009	8/25/2009	Concentration (1)
Total Metals (mg/kg)						
Arsenic	3.1	6.5	13.1	7.1	6.8	9.79
Cadmium	14.1	10.5	23.5	4.7	33.9	0.99
Chromium	14	41.5	115	83.5	48.8	43.4
Lead	179	153	473	78.3	64.3	35.8
Mercury	<0.047	<0.05	<0.046	<0.049	0.063	0.18
Zinc	1,170	1,290	4,040	870	1,610	121

Sample ID:	SBSC-SED-05	SBSC-SED-06	SBSC-SED-07	SBSC-SED-08	SBSC-SED-09	Threshold Effect
Date Collected:	8/25/2009	8/25/2009	8/25/2009	8/25/2009	8/25/2009	Concentration (1)
Total Metals (mg/kg)						
Arsenic	9.4	10.9	6.1	9.1	7.8	9.79
Cadmium	17.8	8.9	5.8	9.8	7	0.99
Chromium	52.1	87.7	47.5	66.1	24.6	43.4
Lead	84.5	262	78.6	106	182	35.8
Mercury	<0.054	<0.042	<0.065	<0.043	0.051	0.18
Zinc	1,480	1,230	743	1,110	800	121

(1) Threshold Effect Concentration (mg/kg) - "Development and Evaluation of Concensus-Based Sediment Quality Guidelines for Freshwater Ecosystems" (January 13, 2000)
Indicates Upgradient (Background) Sampling Location
Threshold Effect Concentration exceeded

TABLE 6
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
SURFACE WATER LABORATORY DATA
FORMER EAGLEPICHER SMELTER SITE
CEC PROJECT NO. 061-825

Short Creek Surface Water Samples

Sample ID:	SC-DOWNSTREAM	Aquatic Life Water Quality	
Date Collected:	8/25/2009	Acute	Chronic
Total Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	47.5	3.8	0.4
Chromium	<5	NA	40.0
Lead	10.3	167.7	6.5
Mercury	<0.2	1.40	0.77
Zinc	3,050	193.4	193.4
Dissolved Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	48.1	3.8	0.4
Chromium	<5	NA	40.0
Lead	<5	167.7	6.5
Mercury	<0.2	1.40	0.77
Zinc	2,990	193.4	193.4
Total Hardness (mg/l)	176	NS	NS
pH (std. units)	6.19	6.5-8.5	

Sample ID:	SC-DOWNSTREAM DUP	Aquatic Life Water Quality	
Date Collected:	8/25/2009	Acute	Chronic
Total Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	48.3	3.6	0.4
Chromium	<5	NA	40.0
Lead	9.7	156.8	6.1
Mercury	<0.2	1.40	0.77
Zinc	3,110	185.0	185.0
Dissolved Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	46.9	3.6	0.4
Chromium	<5	NA	40.0
Lead	<5	156.8	6.1
Mercury	<0.2	1.40	0.77
Zinc	2,890	185.0	185.0
Total Hardness (mg/l)	167	NS	NS
pH (std. units)	6.19	6.5-8.5	

Sample ID:	SC-MIDSTREAM	Aquatic Life Water Quality	
Date Collected:	8/25/2009	Acute	Chronic
Total Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	<5	3.5	0.4
Chromium	<5	NA	40.0
Lead	<5	152.1	5.9
Mercury	<0.2	1.40	0.77
Zinc	681	181.3	181.3
Dissolved Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	<5	3.5	0.4
Chromium	<5	NA	40.0
Lead	<5	152.1	5.9
Mercury	<0.2	1.40	0.77
Zinc	611	181.3	181.3
Total Hardness (mg/l)	163	NS	NS
pH (std. units)	6.50	6.5-8.5	

Sample ID:	SC-UPSTREAM	Aquatic Life Water Quality	
Date Collected:	8/25/2009	Acute	Chronic
Total Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	<5	4.2	0.4
Chromium	<5	NA	40.0
Lead	<5	192.3	7.5
Mercury	<0.2	1.40	0.77
Zinc	594	211.9	211.9
Dissolved Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	<5	4.2	0.4
Chromium	<5	NA	40.0
Lead	<5	192.3	7.5
Mercury	<0.2	1.40	0.77
Zinc	448	211.9	211.9
Total Hardness (mg/l)	196	NS	NS
pH (std. units)	6.75	6.5-8.5	

Spring Branch of Short Creek Surface Water Samples

Sample ID:	SBSC-DOWNSTREAM	Aquatic Life Water Quality	
Date Collected:	8/25/2009	Acute	Chronic
Total Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	<5	2.0	0.3
Chromium	<5	NA	40.0
Lead	<5	75.4	2.9
Mercury	<0.2	1.40	0.77
Zinc	826	113.6	113.6
Dissolved Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	<5	2.0	0.3
Chromium	<5	NA	40.0
Lead	<5	75.4	2.9
Mercury	<0.2	1.40	0.77
Zinc	789	113.6	113.6
Total Hardness (mg/l)	94	NS	NS
pH (std. units)	6.84	6.5-8.5	

Sample ID:	SBSC-UPSTREAM	Aquatic Life Water Quality	
Date Collected:	8/25/2009	Acute	Chronic
Total Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	5.5	2.4	0.3
Chromium	<5	NA	40.0
Lead	<5	92.2	3.6
Mercury	<0.2	1.40	0.77
Zinc	1,020	129.9	129.9
Dissolved Metals (ug/l)			
Arsenic	<10	340.0	150.0
Cadmium	5.2	2.4	0.3
Chromium	<5	NA	40.0
Lead	<5	92.2	3.6
Mercury	<0.2	1.40	0.77
Zinc	943	129.9	129.9
Total Hardness (mg/l)	110	NS	NS
pH (std. units)	7.35	6.5-8.5	

(1) Kansas Surface Water Quality - Hardness Dependent Aquatic Life Support Criteria - December 6, 2004
Indicates Upgradient (Background) Sampling Location
Indicates that the standard was exceeded
NA - Criterion not available

TABLE 7
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
BACKGROUND XRF ANALYSIS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID:	Background #01		Background #02		Background #03		Background #04		Background #05		RSK Non-Residential Criteria (1)
Depth:	(0')	(0.5')	(0')	(0.5')	(0')	(0.5')	(0')	(0.5')	(0')	(0.5')	
Date Collected:	08/28/09		08/28/09		08/28/09		08/28/09		08/28/09		
Total Metals (mg/kg)											
Arsenic	<LOD	21	<LOD	<LOD	<LOD	23	<LOD	<LOD	<LOD	<LOD	38
Cadmium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	1,000
Chromium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	4,000
Copper	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	76,000
Lead	291	205	193	58	70	301	81	104	57	50	1,000
Mercury	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20
Zinc	5,318	6,376	1,571	773	481	452	1,107	1,353	342	191	610,000

Sample ID:	Background #06		Background #07		Background #08		Background #09		Background #10		RSK Non-Residential Criteria (1)
Depth:	(0')	(0.5')	(0')	(0.5')	(0')	(0.5')	(0')	(0.5')	(0')	(0.5')	
Date Collected:	08/28/09		08/28/09		08/28/09		08/28/09		08/28/09		
Total Metals (mg/kg)											
Arsenic	<LOD	<LOD	<LOD	<LOD	<LOD	71	<LOD	<LOD	<LOD	<LOD	38
Cadmium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	1,000
Chromium	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	4,000
Copper	<LOD	<LOD	<LOD	<LOD	136	156	<LOD	<LOD	<LOD	<LOD	76,000
Lead	87	19	128	174	1,378	1,392	105	80	302	202	1,000
Mercury	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	20
Zinc	365	90	594	234	2,470	1,589	409	360	2,287	3,544	610,000

Notes:
(1) Kansas Department of Health and Environmental Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
Indicates that the RSK Non-Residential Criteria was exceeded
LOD Limit of Detection

TABLE 8
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
LABORATORY AND XRF CORRELATION OF SMELTER PLANT AREA SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	TP-17H (0.0)			TP-143 (3)			TP-145 (6)			TP-150 (0)			TP-155 (0)			RSK Non-Residential Criteria (1)
Date Collected:	8/28/2009			8/24/2009			8/24/2009			8/26/2009			8/26/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	829	1.9	199.09%	517	14.5	189.09%	1,134	27.6	190.50%	1,114	42.9	185.17%	1,463	313	129.50%	38
Cadmium	106	3.8	186.16%	<LOD	39.8	NA	63	78	21.28%	87	36.4	82.01%	164	199	19.28%	1,000
Chromium	<LOD	7.1	NA	<LOD	15.7	NA	<LOD	37.7	NA	<LOD	19.9	NA	<LOD	92.7	NA	4,000
Lead	18,785	29,300	43.74%	14,412	23,100	46.32%	12,691	34,200	91.74%	41,204	43,200	4.73%	25,735	28,500	10.20%	1,000
Mercury	<LOD	5.7	NA	<LOD	0.26	NA	99	1.7	193.25%	<LOD	1.6	NA	379	154	84.43%	20
Zinc	43,879	578	194.80%	3,606	4,780	22.69%	8,923	12,900	36.45%	41,639	54,600	26.94%	25,575	34,000	28.28%	610,000

Sample ID/Depth:	TP-156A (0)			TP-157 (0)			TP-157 (0) DUP			TP-161 (2)			TP-164A (0)			RSK Non-Residential Criteria (1)
Date Collected:	8/27/2009			8/27/2009			8/27/2009			8/29/2009			8/28/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	116	12.4	161.37%	917	76.9	169.05%	917	76.2	169.31%	<LOD	6.2	NA	554	49.7	167.07%	38
Cadmium	<LOD	11.1	NA	81	27.9	97.52%	81	27.8	97.79%	<LOD	10.6	NA	<LOD	30.6	NA	1,000
Chromium	<LOD	52.3	NA	<LOD	45.4	NA	<LOD	46.4	NA	<LOD	14.3	NA	<LOD	33.3	NA	4,000
Lead	2,098	1,140	59.17%	10,703	9,430	12.65%	10,703	10,100	5.80%	236	448	61.99%	20,786	17,400	17.73%	1,000
Mercury	<LOD	0.7	NA	<LOD	3.8	NA	<LOD	3.8	NA	<LOD	0.079	NA	311	890	96.42%	20
Zinc	2,788	1,480	61.29%	8,312	4,950	50.70%	8,312	4,730	54.93%	694	506	31.33%	15,663	11,000	34.98%	610,000

Sample ID/Depth:	TP-164A (0) DUP			TP-164B (2.5)			TP-164E (0.5-10.0)			TP-173 (0.5)			TP-173 (3.0)			RSK Non-Residential Criteria (1)
Date Collected:	8/28/2009			8/28/2009			8/28/2009			8/29/2009			8/29/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	554	35.3	176.04%	<LOD	2.1	NA	369	93.7	129.17%	38	29	26.87%	<LOD	30.9	NA	38
Cadmium	<LOD	150	NA	<LOD	1.9	NA	<LOD	71.7	NA	<LOD	10.9	NA	<LOD	47.3	NA	1,000
Chromium	<LOD	26.5	NA	<LOD	<LOD	NA	<LOD	29.2	NA	<LOD	9.3	NA	<LOD	32.5	NA	4,000
Lead	20,785	16,200	24.79%	166	341	69.03%	8,068	15,700	64.22%	779	1,670	72.76%	1,319	2,040	42.93%	1,000
Mercury	311	2,460	155.11%	71	35.9	65.67%	451	9,050	181.01%	<LOD	8.2	NA	<LOD	9.2	NA	20
Zinc	15,663	34,900	76.09%	148	78.5	61.37%	6,525	9,460	36.72%	1,000	3,260	106.10%	2,732	2,140	24.30%	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the RSK Non-Residential Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 9
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL A SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	A-T1-02 (1.0-1.5)			A-T1-02 (1.0-1.5) DUP			A-T1-03 (2.0-2.5)			A-T1-06 (0.5-1.0)			RSK Non-Residential Criteria (1)
Date Collected:	8/19/2009			8/19/2009			8/19/2009			8/26/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	3.6	NA	<LOD	3.4	NA	11	6	58.82%	<LOD	2.7	NA	38
Cadmium	<LOD	1.4	NA	<LOD	1.3	NA	<LOD	1.3	NA	<LOD	0.95	NA	1,000
Chromium	<LOD	14.2	NA	<LOD	13	NA	<LOD	30.8	NA	<LOD	16.7	NA	4,000
Lead	28	24.3	14.15%	28	21.8	24.90%	30	25.4	16.61%	14	14.5	3.51%	1,000
Mercury	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	511	582	12.99%	511	515	0.78%	309	227	30.60%	135	133	1.49%	610,000

Sample ID/Depth:	A-T1-12 (1.0-1.5)			A-T1-15 (2.0-2.8)			A-T2-03 (0.5-1.0)			A-T2-09 (1.0-1.5)			RSK Non-Residential Criteria (1)
Date Collected:	8/18/2009			8/18/2009			8/19/2009			8/18/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	3.8	NA	<LOD	2.6	NA	<LOD	2.7	NA	<LOD	7.6	NA	38
Cadmium	1.1	<LOD	NA	0.55	<LOD	NA	3.3	<LOD	NA	1.3	<LOD	NA	1,000
Chromium	33.5	<LOD	NA	12.3	<LOD	NA	18.4	<LOD	NA	22.8	<LOD	NA	4,000
Lead	13.7	<LOD	NA	215	245	13.04%	36.2	39	7.45%	26.8	31	14.53%	1,000
Mercury	<LOD	<LOD	NA	0.066	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	165	143	14.29%	113	133	16.26%	265	297	11.39%	166	217	26.63%	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the RSK Non-Residential Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 10
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL B SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	B-T1-04 (0.5-1.0)			B-T1-06 (0.5-1.0)			B-T1-06 (0.5-1.0) DUP			B-T2-06 (2.0-2.5)			RSK Non-Residential Criteria (1)
Date Collected:	8/27/2009			8/26/2009			8/26/2009			8/26/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	8.2	NA	<LOD	1.7	NA	<LOD	1.6	NA	<LOD	2.7	NA	38
Cadmium	<LOD	23.2	NA	<LOD	3.4	NA	<LOD	3.1	NA	<LOD	1	NA	1,000
Chromium	<LOD	37.6	NA	<LOD	6.8	NA	<LOD	6.4	NA	<LOD	11.1	NA	4,000
Lead	578	767	28.10%	18	17.6	2.25%	18	22.8	23.53%	37	23	46.67%	1,000
Mercury	<LOD	0.4	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	2,072	4,080	65.28%	463	525	12.55%	463	478	3.19%	419	343	19.95%	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the RSK Non-Residential Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 11
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL C SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	C-T1-04 (2.5-3.0)			C-T1-06 (2.5-3.0)			C-T1-10 (2.0-2.5)			C-T1-10 (2.0-2.5) DUP			RSK Non-Residential Criteria (1)
Date Collected:	8/24/2009			8/24/2009			8/25/2009			8/25/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	3.8	NA	<LOD	3.1	NA	<LOD	4.7	NA	<LOD	4.1	NA	38
Cadmium	<LOD	2	NA	<LOD	2.4	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	1,000
Chromium	<LOD	13.7	NA	<LOD	7.6	NA	<LOD	12.7	NA	<LOD	10.1	NA	4,000
Lead	13	8.5	41.86%	11	12	8.70%	10	12.1	19.00%	10	11.7	15.67%	1,000
Mercury	<LOD	0.078	NA	<LOD	0.047	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	297	345	14.95%	376	393	4.42%	160	211	27.49%	160	140	13.33%	610,000

Sample ID/Depth:	C-T1-11 (0.5-1.0)			C-T1-14 (1.0-1.5)			C-T1-20 (0.5-1.0)			C-T2-04 (0.5-1.0)			RSK Non-Residential Criteria (1)
Date Collected:	8/29/2009			8/25/2009			8/25/2009			8/25/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	1.7	NA	<LOD	3.5	NA	<LOD	3.7	NA	<LOD	3.9	NA	38
Cadmium	<LOD	1.6	NA	<LOD	5.7	NA	<LOD	1.5	NA	<LOD	2.3	NA	1,000
Chromium	<LOD	8.7	NA	<LOD	16.2	NA	<LOD	11.2	NA	<LOD	12.3	NA	4,000
Lead	24	12.3	64.46%	90	65.2	31.96%	65	40.9	45.51%	31	36.3	15.75%	1,000
Mercury	<LOD	<LOD	NA	<LOD	0.057	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	229	191	18.10%	566	390	36.82%	189	119	45.45%	226	189	17.83%	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the RSK Non-Residential Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 12
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL D SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	D-T1-09 (2.0-2.5)			D-T1-10 (2.0-2.5)			D-T1-10 (2.5-3.0)			D-T1-10 (2.5-3.0) DUP			RSK Non-Residential Criteria (1)
Date Collected:	8/20/2009			8/20/2009			8/20/2009			8/20/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	2.9	NA	<LOD	2.6	NA	<LOD	2.4	NA	<LOD	2.5	NA	38
Cadmium	<LOD	8.5	NA	<LOD	14.8	NA	<LOD	4.5	NA	<LOD	4.5	NA	1,000
Chromium	<LOD	23.1	NA	<LOD	12.8	NA	<LOD	13.3	NA	<LOD	9.9	NA	4,000
Lead	19	19.1	0.52%	22	22.4	1.80%	25	58.8	80.67%	25	16.3	42.13%	1,000
Mercury	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	1,034	888	15.19%	1,131	1,100	2.78%	480	474	1.26%	480	470	2.11%	610,000

Sample ID/Depth:	D-T1-15 (1.5-2.0)			D-T2-02 (2.5-3.0)			D-T2-05 (0.5-1.0)			D-T2-05 (0.5-1.0) DUP			RSK Non-Residential Criteria (1)
Date Collected:	8/26/2009			8/20/2009			8/26/2009			8/26/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	5.7	NA	50	6.6	159.76%	<LOD	4.8	NA	<LOD	4.2	NA	38
Cadmium	<LOD	26.6	NA	<LOD	14.3	NA	<LOD	4.1	NA	<LOD	4.2	NA	1,000
Chromium	<LOD	22.7	NA	<LOD	47.5	NA	<LOD	15.9	NA	<LOD	17.1	NA	4,000
Lead	719	670	7.06%	1,673	1,300	25.09%	327	534	48.08%	327	649	65.98%	1,000
Mercury	<LOD	0.066	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	0.094	NA	20
Zinc	5,374	5,020	6.81%	2,418	1,660	37.18%	245	435	55.88%	245	362	38.55%	610,000

Sample ID/Depth:	D-T2-07 (0.5-1.0)			RSK Non-Residential Criteria (1)
Date Collected:	8/26/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)				
Arsenic	<LOD	2.8	NA	38
Cadmium	<LOD	14.1	NA	1,000
Chromium	<LOD	8.1	NA	4,000
Lead	217	166	26.63%	1,000
Mercury	<LOD	<LOD	NA	20
Zinc	928	765	19.26%	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the RSK Non-Residential Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 13
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL E SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	E-T1-03 (2.5-3.0)			E-T1-06 (2.0-2.5)			E-T1-06 (2.0-2.5) DUP			E-T1-08 (3.0-3.5)			E-T1-11 (1.5-2.0)			RSK Non-Residential Criteria (1)
Date Collected:	8/21/2009			8/21/2009			8/21/2009			8/21/2009			8/21/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	<LOD	18.7	NA	19	6	104.00%	19	5.7	107.69%	96	8.7	166.76%	<LOD	5.7	NA	38
Cadmium	<LOD	<LOD	NA	<LOD	2.7	NA	<LOD	2.8	NA	<LOD	6	NA	<LOD	27.3	NA	1,000
Chromium	<LOD	71.5	NA	<LOD	39.6	NA	<LOD	19.9	NA	<LOD	25.5	NA	<LOD	8.1	NA	4,000
Lead	1,812	2,360	26.27%	160	116	31.88%	160	170	6.06%	2,923	4,870	49.97%	8,829	20,000	77.50%	1,000
Mercury	<LOD	0.042	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	0.57	NA	<LOD	0.45	NA	20
Zinc	375	234	46.31%	394	482	20.09%	394	519	27.38%	2,171	1,130	63.07%	5,689	8,110	35.09%	610,000

Sample ID/Depth:	E-T1-14 (0.5-1.0)			E-T1-14 (0.5-1.0) DUP			E-T1-17 (0.5-1.0)			E-T1-21 (1.0-1.5)			E-T1-25 (2.0-2.5)			RSK Non-Residential Criteria (1)
Date Collected:	8/24/2009			8/24/2009			8/29/2009			8/22/2009			8/22/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	45	8	139.62%	45	8.5	136.45%	<LOD	2.7	NA	<LOD	3.4	NA	<LOD	5.6	NA	38
Cadmium	<LOD	18.7	NA	<LOD	17.4	NA	<LOD	1.3	NA	<LOD	1.8	NA	<LOD	<LOD	NA	1,000
Chromium	<LOD	24.7	NA	<LOD	18.2	NA	<LOD	8.5	NA	<LOD	13.1	NA	<LOD	44.7	NA	4,000
Lead	1,267	1,680	28.03%	1,267	1,570	21.36%	32	29.3	8.81%	39	24	47.62%	14	15.2	8.22%	1,000
Mercury	<LOD	0.19	NA	<LOD	0.21	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	1,741	2,680	42.48%	1,741	3,100	56.15%	111	117	5.26%	208	140	39.08%	131	105	22.03%	610,000

Sample ID/Depth:	E-T1-31 (2.5-3.0)			E-T1-36 (2.5-3.0)			E-T2-02 (0.5-1.0)			RSK Non-Residential Criteria (1)
Date Collected:	8/22/2009			8/24/2009			8/22/2009			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)										
Arsenic	<LOD	7.5	NA	<LOD	3.5	NA	<LOD	4.1	NA	38
Cadmium	<LOD	1.9	NA	<LOD	0.73	NA	<LOD	2.9	NA	1,000
Chromium	<LOD	20.4	NA	<LOD	10.7	NA	<LOD	13.1	NA	4,000
Lead	46	21.6	72.19%	<LOD	8.5	NA	665	267	85.41%	1,000
Mercury	<LOD	<LOD	NA	<LOD	<LOD	NA	<LOD	<LOD	NA	20
Zinc	226	275	19.56%	113	108	4.52%	165	222	29.46%	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the RSK Non-Residential Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 14
SUPPLEMENTAL EXTENT OF CONTAMINATION INVESTIGATION
QA/QC ANALYTICAL RESULTS
FORMER EAGLEPICHER SMELTER
CEC PROJECT NO. 061-825.0006

Sample ID/Depth:	A-T1-02 1.0-1.5									
Date Collected:	8/19/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	3.6	3.4	6	48.4	48.7	37.5	38	70	71	75-125
Cadmium	1.4	1.3	7	48.4	48.7	39.5	39.6	73	72	75-125
Chromium	14.2	13	9	48.4	48.7	54.6	54.8	84	83	75-125
Lead	24.3	21.8	11	48.4	48.7	53.8	54.1	61	61	75-125
Mercury	<0.057	<0.043	NA	0.52	0.56	0.46	0.5	84	87	75-125
Zinc	582	515	12	48.4	48.7	593	604	23	46	75-125

Sample ID/Depth:	B-T1-06 0.5-1.0									
Date Collected:	8/26/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	1.7	1.6	6	50.9	51.2	45.2	47	86	88	75-125
Cadmium	3.4	3.1	9	50.9	51.2	47.8	49.6	87	90	75-125
Chromium	6.8	6.4	6	50.9	51.2	55.6	58.4	97	101	75-125
Lead	17.6	22.8	26	50.9	51.2	61.5	62.6	86	88	75-125
Mercury	<0.047	<0.06	NA	0.49	0.46	0.46	0.45	95	95	75-125
Zinc	525	478	9	50.9	51.2	536	555	22	58	75-125

Sample ID/Depth:	C-T1-10 2.0-2.5									
Date Collected:	8/25/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	4.7	4.1	14	60.6	59.5	54.9	54	83	83	75-125
Cadmium	<0.6	<0.54	NA	60.6	59.5	51.5	50.7	84	85	75-125
Chromium	12.7	10.1	23	60.6	59.5	67.9	68.1	91	93	75-125
Lead	12.1	11.7	3	60.6	59.5	60.5	59.1	80	79	75-125
Mercury	<0.059	<0.051	NA	0.56	0.59	0.52	0.54	89	89	75-125
Zinc	211	140	40	60.6	59.5	236	252	42	76	75-125

Sample ID/Depth:	D-T1-10 2.5-3.0									
Date Collected:	8/20/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	2.4	2.5	4	45.9	46.3	39.8	39.7	81	81	75-125
Cadmium	4.5	4.5	0	45.9	46.3	43.4	43.4	85	84	75-125
Chromium	13.3	9.9	29	45.9	46.3	69.6	54.9	122	90	75-125
Lead	58.8	16.3	113	45.9	46.3	82.5	52.7	51	-13	75-125
Mercury	<0.048	<0.048	NA	0.48	0.48	0.42	0.44	87	93	75-125
Zinc	474	470	1	45.9	46.3	531	489	125	32	75-125

Sample ID/Depth:	D-T2-05 0.5-1.0									
Date Collected:	8/26/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	4.8	4.2	13	54.7	54.2	54.4	54.3	91	91	75-125
Cadmium	4.1	4.2	2	54.7	54.2	51.7	53.3	105	91	75-125
Chromium	15.9	17.1	7	54.7	54.2	70.8	72.2	100	104	75-125
Lead	534	649	19	54.7	54.2	562	559	52	45	75-125
Mercury	<0.043	0.094	NA	0.43	0.46	0.46	0.61	101	124	75-125
Zinc	435	362	18	54.7	54.2	1,920	456	2,718	39	75-125

Sample ID/Depth:	E-T1-06 2.0-2.5									
Date Collected:	8/21/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	6	5.7	5	12.2	NA	18.3	NA	100	NA	75-125
Cadmium	2.7	2.8	4	12.2	NA	14.3	NA	95	NA	75-125
Chromium	39.6	19.9	66	98.3	NA	133	NA	96	NA	75-125
Lead	116	170	38	98.3	NA	207	NA	93	NA	75-125
Mercury	<0.052	<0.055	NA	0.52	0.52	0.47	0.47	90	90	75-125
Zinc	482	519	7	98.3	NA	628	NA	149	NA	75-125

Sample ID/Depth:	E-T1-14 0.5-1.0									
Date Collected:	8/24/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	8	8.5	6	54.3	54.3	57	55.2	90	87	75-125
Cadmium	18.7	17.4	7	54.3	54.3	69.4	59.8	94	94	75-125
Chromium	24.7	18.2	30	54.3	54.3	86.6	73.4	116	90	75-125
Lead	1,680	1,570	7	54.3	54.3	2,030	1,680	647	18	75-125
Mercury	0.19	0.21	10	0.53	0.49	0.69	0.63	93	92	75-125
Zinc	2,680	3,100	15	54.3	54.3	2,930	3,340	447	1,203	75-125

Sample ID/Depth:	TP-157 0									
Date Collected:	8/27/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	76.9	76.2	1	47.8	45.1	113	111	78	77	75-125
Cadmium	27.9	27.8	0	47.8	45.1	72.6	69.5	93	92	75-125
Chromium	45.4	46.4	2	47.8	45.1	95.4	110	105	144	75-125
Lead	9,430	10,100	7	47.8	45.1	9,360	9,140	149	-645	75-125
Mercury	4.9	3.8	25	0.53	0.51	4.8	5.6	-24	138	75-125
Zinc	4,950	4,730	5	47.8	45.1	4,970	4,950	30	-5	75-125

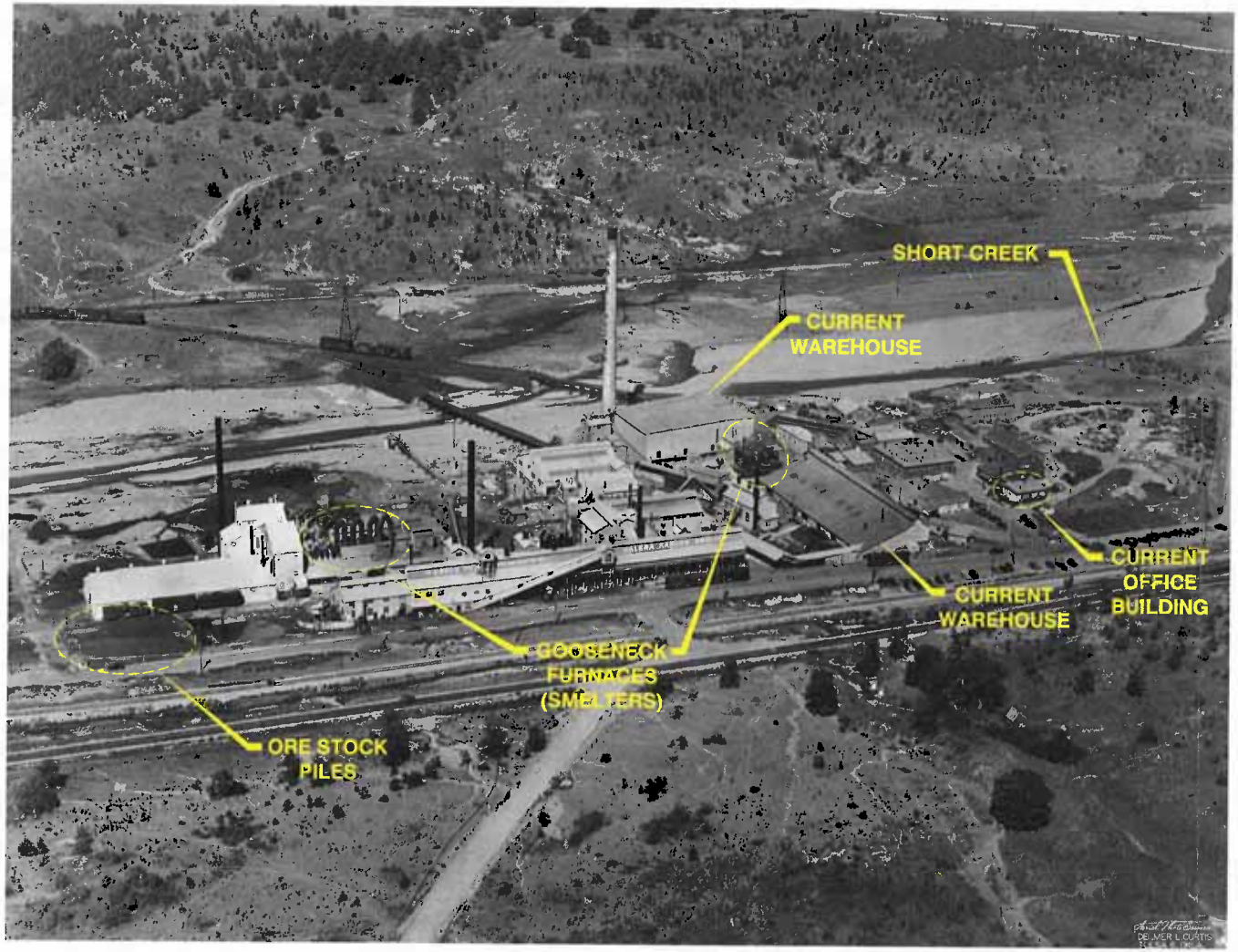
Sample ID/Depth:	TP-164A 0									
Date Collected:	8/28/2009									
SampleType:	ORIGINAL CONCENTRATION	DUPLICATE CONCENTRATION	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	49.7	35.3	34	48.7	47.9	91.8	87.5	86	79	75-125
Cadmium	30.6	150	132	48.7	47.9	72.6	85.5	86	115	75-125
Chromium	33.3	26.5	23	48.7	47.9	74.5	68	85	73	75-125
Lead	17,400	16,200	7	48.7	47.9	17,500	17,400	309	-14	75-125
Mercury	890	2,460	94	0.47	0.47	628	589	5,445	-425.96	75-125
Zinc	11,000	34,900	104	48.7	47.9	10,800	12,500	-383	3,173	75-125

Notes:
MS Matrix Spike
MSD Matrix Spike Duplicate
Indicates that the % Recovery Limits were exceeded
NA Not Applicable

APPENDIX A

HISTORIC AERIAL PHOTOGRAPHS

1944 AERIAL PHOTOGRAPHY



REVISION RECORD

NO	DATE	DESCRIPTION
1		
2		
3		

SUBMITTAL RECORD

NO	DATE	DESCRIPTION

* HARD SIGNATURE ON FILE

CEC
Civil & Environmental Consultants, Inc.
333 Baldwin Road · Pittsburgh, PA 15205-9702
PH: 412.429.2324 · 800.365.2324 · Fax: 412.429.2114
WWW.CECPC.COM

FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

DRAWN BY:	DWG	CHECKED BY:	CLE	APPROVED BY:	SCALE: A
DATE:	7/11/08	SCALE:	N.T.S.	PROJECT NO:	061-696
					DRAWING NO:

1944 AERIAL PHOTOGRAPHY

NORTH

1958 AERIAL PHOTOGRAPHY

REVISION RECORD

NO.	DATE	DESCRIPTION

SUBMITTAL RECORD

NO.	DATE	DESCRIPTION

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CEC
Civil & Environmental Consultants, Inc.
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Ph: 412.429.2324 800.365.2324 Fax: 412.429.2114
www.cecinc.com

FORMER EAGLEPICHER SMELTER SITE
GALENA, KANSAS

DRAWN BY:	DMD	CHECKED BY:	C.S.	APPROVED BY:	*MDK
DATE:	7/17/08	DWG SCALE:	N.T.S.	PROJECT NO:	061-025

DRAWING NO:

1958 AERIAL PHOTOGRAPHY

APPENDIX B

EXTENT OF CONTAMINATION TABLES (2007)

TABLE 2
EXTENT OF CONTAMINATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL A SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	A25-04			A25-04 DUP			A29-04			A32-05			A33-08			RSK Non-Residential Criteria (1)
Date Collected:	11/29/2007			11/29/2007			11/29/2007			11/29/2007			11/30/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	<LOD	0.81	NA	<LOD	3.2	NA	<LOD	5	NA	<LOD	5.6	NA	<LOD	5.9	NA	38
Cadmium	<LOD	9.7	NA	<LOD	40	NA	<LOD	16.6	NA	<LOD	32.4	NA	<LOD	14.5	NA	1,000
Lead	411	98.6	122.6	411	384	6.8	2,056	1,890	8.4	1,966	2,110	7	493	535	8.3	1,000
Mercury	<LOD	0.33	NA	<LOD	0.53	NA	<LOD	0.53	NA	<LOD	0.72	NA	<LOD	0.095	NA	20
Zinc	1,188	1,140	4.1	1,188	4,350	114.2	1,102	1,010	8.7	1,489	1,610	7.8	552	524	5.2	610,000

Sample ID/Depth:	A35-01			A39-09			A39-09 DUP			A41-04			A42-10			RSK Non-Residential Criteria (1)
Date Collected:	11/29/2007			11/30/2007			11/29/2007			11/29/2007			11/30/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	49	3.9	170.6	29	1.6	179	29	<2.3	NA	<LOD	4.2	NA	75	5.5	172.7	38
Cadmium	<LOD	37.7	NA	<LOD	4.5	NA	<LOD	7.6	NA	<LOD	1.6	NA	<LOD	19.8	NA	1,000
Lead	1,086	1,390	24.5	236	103	78.6	236	144	48.6	42	40.1	5.7	762	825	7.9	1,000
Mercury	<LOD	0.55	NA	<LOD	0.48	NA	<LOD	0.4	NA	<LOD	<0.048	NA	<LOD	0.14	NA	20
Zinc	2,152	2,010	6.8	1,744	571	101.4	1,744	919	62	121	138	13	1,229	1,050	15.7	610,000

(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the Site Cleanup Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 3
EXTENT OF CONTAMINATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL B SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	B3-03			B5-02			RSK Non-Residential Criteria (1)
Date Collected:	11/7/2007			11/7/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)							
Arsenic	<LOD	**506.0**	NA	<LOD	5.8	NA	**38**
Cadmium	<LOD	178.0	NA	<LOD	3.9	NA	1,000
Lead	**3,316**	**25,600.0**	154.1	79	89.2	12.1	**1,000**
Mercury	<LOD	**21.700**	NA	<LOD	<0.038	NA	**20**
Zinc	7,817	30,100.0	117.5	640	482.0	28.2	610,000

(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the Site Cleanup Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 4
EXTENT OF CONTAMINATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL C SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	C1-01			C3-09			C4-01			C4-01 DUP			RSK Non-Residential Criteria (1)
Date Collected:	11/6/2007			11/27/2007			11/27/2007			11/6/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	<LOD	3.6	NA	<LOD	13.0	NA	<LOD	9.0	NA	<LOD	7.6	NA	38
Cadmium	<LOD	6.6	NA	72	129.0	57.2	75	96.6	24.8	75	83.8	10.7	1,000
Lead	73	80.1	8.8	**2,310**	**3,140.0**	30.5	**1,674**	**2,010.0**	18.2	**1,674**	**1,740.0**	3.8	**1,000**
Mercury	<LOD	<0.049	NA	<LOD	0.450	NA	<LOD	0.430	NA	<LOD	0.560	NA	20
Zinc	581	784.0	29.8	11,532	11,600.0	0.6	8,075	8,010.0	0.8	8,075	8,320.0	3.0	610,000

Sample ID/Depth:	C5-01			C7-04			C8-04			C10-03			RSK Non-Residential Criteria (1)
Date Collected:	11/27/2007			11/27/2007			11/27/2007			11/27/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)													
Arsenic	**76**	8.4	160.2	<LOD	7.4	NA	<LOD	3.0	NA	**86**	4.4	180.6	**38**
Cadmium	65	52.1	21.8	<LOD	35.2	NA	<LOD	13.4	NA	61	63.9	4.5	1,000
Lead	**3,348**	**3,630.0**	8.1	**1,549**	**1,340.0**	14.4	172	221.0	24.9	**1,502**	**1,080.0**	32.7	**1,000**
Mercury	<LOD	0.360	NA	<LOD	0.630	NA	<LOD	0.210	NA	<LOD	0.260	NA	20
Zinc	2,752	2,690.0	2.3	3,569	4,170.0	15.5	1,046	1,450.0	32.4	8,782	9,190.0	4.5	610,000

(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the Site Cleanup Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 5
EXTENT OF CONTAMINATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL D SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	D2-03			D4-02			D6-10			D7-02			D9-03			RSK Non-Residential Criteria (1)
Date Collected:	11/6/2007			11/27/2007			11/27/2007			11/6/2007			11/27/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	<LOD	<1.9	NA	<LOD	5.9	NA	<LOD	5.4	NA	<LOD	4.4	NA	<LOD	8.3	NA	38
Cadmium	<LOD	<0.94	NA	<LOD	20.3	NA	<LOD	31.2	NA	<LOD	3.9	NA	<LOD	7.3	NA	1,000
Lead	1,078.2	190.0	140.1	304.4	438.0	36.0	1,768.1	1,650.0	8.0	530.1	447.0	17.0	509.2	1,010.0	65.9	1,000
Mercury	<LOD	<0.047	NA	<LOD	<0.054	NA	<LOD	0.1	NA	<LOD	<0.046	NA	<LOD	<0.048	NA	20
Zinc	1,010.5	206.0	132.3	1,272.1	1,490.0	15.8	6,509.2	6,190.0	5.0	405.8	312.0	26.1	426.0	594.0	32.9	610,000

Sample ID/Depth:	D10-03			D10-03 DUP			D17-04			D18-02			D19-01			RSK Non-Residential Criteria (1)
Date Collected:	11/27/2007			11/27/2007			11/27/2007			11/8/2007			11/9/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	<LOD	7.5	NA	<LOD	7.2	NA	<LOD	8.6	NA	1,100	21.2	192.4	516	129.0	120.0	38
Cadmium	<LOD	6.4	NA	<LOD	7.1	NA	<LOD	27.3	NA	<LOD	41.1	NA	<LOD	44.6	NA	1,000
Lead	2,072.8	2,010.0	3.1	2,072.8	2,060.0	0.6	406.4	465.0	13.5	20,583	17,500.0	16.2	4,669	4,450.0	4.8	1,000
Mercury	<LOD	0.1	NA	<LOD	<0.048	NA	<LOD	<0.041	NA	<LOD	0.870	NA	<LOD	0.110	NA	20
Zinc	1,536.3	1,400.0	9.3	1,536.3	1,540.0	0.2	2,668.2	3,730.0	33.2	73,194	18,800.0	118.3	14,675	11,000.0	28.6	610,000

Sample ID/Depth:	D19-01 DUP			D20-05			D23-06			D24-02			D25-02			RSK Non-Residential Criteria (1)
Date Collected:	11/9/2007			11/9/2007			11/8/2007			11/14/2007			11/8/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	516	105.0	132.4	<LOD	20.6	NA	55	12.9	124.1	<LOD	10.2	NA	<LOD	11.7	NA	38
Cadmium	<LOD	46.1	NA	<LOD	20.6	NA	<LOD	106.0	NA	69	77.7	11.8	<LOD	68.3	NA	1,000
Lead	4,669	4,390.0	6.2	8,448	10,000.0	16.8	534	1,600.0	99.8	989	1,340.0	30.2	1,184	1,850.0	43.9	1,000
Mercury	<LOD	0.150	NA	<LOD	0.220	NA	<LOD	0.130	NA	<LOD	0.390	NA	<LOD	0.620	NA	20
Zinc	14,675	12,200.0	18.4	18,981	19,900.0	4.7	4,260	17,900.0	123.1	6,002	8,830.0	38.1	3,712	11,800.0	104.3	610,000

Sample ID/Depth:	D27-03			RRS-12			RSK Non-Residential Criteria (1)
Date Collected:	11/8/2007			12/5/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)							
Arsenic	<LOD	10.6	NA	232	29.4	155.0	38
Cadmium	<LOD	71.1	NA	<LOD	22.5	NA	1,000
Lead	1,916	2,170.0	12.4	6,521	5,920.0	9.7	1,000
Mercury	<LOD	0.890	NA	<LOD	0.150	NA	20
Zinc	5,050	6,820.0	29.8	9,202	13,700.0	39.3	610,000

(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the Site Cleanup Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 6
EXTENT OF CONTAMINATION
LABORATORY AND XRF CORRELATION OF OUTPARCEL E SOILS
FORMER EAGLE PICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	E3-01			E3-02			E7-10			E10-03			E11-08			RSK Non-Residential Criteria (1)
Date Collected:	11/15/2007			11/15/2007			11/15/2007			11/15/2007			11/16/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	<LOD	5.0	NA	<LOD	5.6	NA	128	6.8	179.9	<LOD	32.0	NA	<LOD	5.9	NA	38
Cadmium	<LOD	5.2	NA	<LOD	15.8	NA	<LOD	20.3	NA	51	39.0	27.5	<LOD	12.0	NA	1,000
Lead	449	305.0	38.3	680	792.0	15.3	1,532	1,490.0	2.8	1,455	2,270.0	43.7	1,960	1,390.0	34.0	1,000
Mercury	<LOD	<0.043	NA	<LOD	0.070	NA	<LOD	0.071	NA	<LOD	0.220	NA	<LOD	0.120	NA	20
Zinc	979	716.0	31.0	1,909	1,600.0	17.6	1,358	1,460.0	7.3	2,762	2,650.0	4.1	1,963	1,150.0	52.3	610,000

Sample ID/Depth:	E13-02			E13-05			E13-05 DUP			E14-10			E17-01			RSK Non-Residential Criteria (1)
Date Collected:	11/15/2007			11/15/2007			11/15/2007			11/15/2007			11/15/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)																
Arsenic	162	22.7	150.8	<LOD	5.1	NA	<LOD	5.7	NA	<LOD	3.9	NA	<LOD	3.9	NA	38
Cadmium	<LOD	36.0	NA	<LOD	11.1	NA	<LOD	11.3	NA	<LOD	8.0	NA	<LOD	12.3	NA	1,000
Lead	5,022	6,160.0	20.3	1,127	1,310.0	15.0	1,127	1,640.0	37.0	477	539.0	12.2	2,024	1,480.0	31.1	1,000
Mercury	<LOD	0.320	NA	<LOD	0.064	NA	<LOD	0.250	NA	<LOD	0.063	NA	<LOD	0.290	NA	20
Zinc	2,765	2,360.0	15.8	1,016	1,120.0	9.7	1,016	1,200.0	16.6	561	491.0	13.3	2,493	2,890.0	14.7	610,000

Sample ID/Depth:	E17-01 DUP			E18-03			E19-04			RSK Non-Residential Criteria (1)
Date Collected:	11/15/2007			11/27/2007			11/16/2007			
Data Type:	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	XRF DATA	LAB DATA	RPD (2)	
Total Metals (mg/kg)										
Arsenic	<LOD	4.1	NA	<LOD	7.1	NA	<LOD	8.5	NA	38
Cadmium	<LOD	11.8	NA	<LOD	37.4	NA	<LOD	13.2	NA	1,000
Lead	2,024	1,630.0	21.6	502	1,200.0	82.0	726	666.0	NA	1,000
Mercury	<LOD	0.250	NA	<LOD	0.210	NA	<LOD	0.350	NA	20
Zinc	2,493	2,100.0	17.1	4,335	12,000.0	93.8	1,277	1,720.0	29.6	610,000

(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
(2) Relative Percent Difference
Indicates that the Site Cleanup Criteria was exceeded
NA Not Applicable
LOD Limit of Detection

TABLE 7
EXTENT OF CONTAMINATION
OUTPARCEL SUBSURFACE DATA
FORMER EAGLEPICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	A18-10			B2-04			B3-04			OPB TP-01	OPB TP-02	OPB TP-03	OPB TP-04	OPB TP-05	OPB TP-06	OPB TP-07	OPB TP-08	OPB TP-09	OPB TP-10	RSK Non-Residential Criteria (1)
Depth	(0')	(0.5')	(1')	(0')	(0.5')	(1')	(0')	(0.5')	(1')	(1')	(1')	(1')	(1')	(1')	(1')	(1')	(1')	(1')	(1')	
Total Metals (mg/kg)																				
Arsenic	<LOD	<LOD	<LOD	1,590	627	485	2,071	183	<LOD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38
Cadmium	198	<LOD	<LOD	<LOD	<LOD	<LOD	94	<LOD	<LOD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000
Lead	11,701	44	98	15,877	9,725	10,962	44,685	7,404	1,226	332	191	124	119	361	38.7	29,300	42,000	51.7	570	1,000
Mercury	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20
Zinc	19,269	580	421	7,485	5,572	8,637	33,335	4,051	1,315	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	610,000

Sample ID/Depth:	D6-03			D18-02			OPD TP-01		OPD TP-02		OPD TP-03		OPD TP-04		OPD TP-05	OPD TP-06	OPD TP-07		RSK Non-Residential Criteria (1)
Depth	(0')	(0.5')	(1')	(0')	(0.5')	(1')	(1')	(2.5')	(1')	(3')	(1')	(3')	(1')	(2')	(1')	(1')	(1')	(3')	
Total Metals (mg/kg)																			
Arsenic	279	<LOD	<LOD	1,100	1,388	<LOD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38
Cadmium	234	<LOD	<LOD	<LOD	<LOD	<LOD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000
Lead	11,594	143	75	20,583	29,564	1,115	588	1,780	1,140	960	30.6	30.6	457	789	9,870	15.4	14.6	11.1	1,000
Mercury	<LOD	71	<LOD	<LOD	1,348	<LOD	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20
Zinc	79,997	1,776	1,947	73,194	29,628	750	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	610,000

Sample ID/Depth:	OPD TP-08		OPD TP-09		OPD TP-10		OPD TP-11	OPD TP-12	OPD TP-13	OPD TP-14		OPD TP-15	OPD TP-16	OPD TP-17		OPD TP-18		OPD TP-19		RSK Non-Residential Criteria (1)
Depth	(1')	(3.5')	(1')	(3')	(1')	(2.5')	(1')	(1')	(1')	(1')	(3')	(1')	(1')	(1')	(3')	(1')	(3')	(1')	(3')	
Total Metals (mg/kg)																				
Arsenic	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	38
Cadmium	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1,000
Lead	49.9	25.1	926	19.5	34.9	21.7	2,200	184	116	30.1	18.4	35.6	138	83.7	27.8	164	64.4	22.2	9	1,000
Mercury	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	20
Zinc	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	610,000

Sample ID/Depth:	OPD TP-20		OPD TP-21		OPD TP-22		E1-16			E14-01			E14-06			E15-14			RSK Non-Residential Criteria (1)
Depth	(1')	(3')	(1')	(3')	(1')	(3')	(0')	(0.5')	(1')	(0')	(0.5')	(1')	(0')	(0.5')	(1')	(0')	(0.5')	(1')	
Total Metals (mg/kg)																			
Arsenic	NA	NA	NA	NA	NA	NA	<LOD	219	<LOD	514	<LOD	<LOD	1,101	<LOD	<LOD	<LOD	<LOD	<LOD	38
Cadmium	NA	NA	NA	NA	NA	NA	<LOD	<LOD	<LOD	166	<LOD	80	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	1,000
Lead	16.5	15.5	29.1	23	27.1	15.4	20,811	9,186	4,701	19,279	311	573	12,151	1,421	339	11,332	122	99	1,000
Mercury	NA	NA	NA	NA	NA	NA	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	<LOD	80	<LOD	<LOD	<LOD	20
Zinc	NA	NA	NA	NA	NA	NA	3,281	1,952	813	16,186	1,447	2,330	1,899	819	343	2,243	946	1,327	610,000

Notes:
(1) Kansas Department of Health and Environment Risk-Based Standards for Kansas (RSK) for Non-Residential Use - June 2007
Indicates that the Site Cleanup Criteria was exceeded
LOD Limit of Detection
NA Not Analyzed
Samples Designated OPB or OPD analyzed by ICP, others analyzed by XRF.

TABLE 8
EXTENT OF CONTAMINATION
SEDIMENT LABORATORY DATA
FORMER EAGLEPICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID/Depth:	SED-1	SED-2	SED-3	SED-4	SED-5	SED-6	SED-7	SED-8	SED-9	SED-10	SED-11	SED-12	SED-13	SED-14	SED-15	TEC (1)
Date Collected:	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	
Total Metals (mg/kg)																
Arsenic	7.4	8.1	13.8	6.0	12.2	14.1	19.4	12.1	21.3	14	27.7	6	4.8	5.7	6.5	9.79
Cadmium	27.5	74.7	22.1	21.9	46.4	48	94.1	47.1	113	54	71.7	49.6	19.2	11.4	17.4	0.99
Chromium	25.1	33	49.4	27.5	41.4	73.5	24.2	48.3	58.4	8.2	37.3	5.3	6.3	6.6	7	43.40
Lead	1,290	2,070	414	67.5	2,620	804	8,800	2,050	4,420	11,800	6,200	1,760	1,900	1,310	12,900	35.8
Mercury	0.11	0.32	0.22	<0.046	0.21	0.13	1.8	0.32	0.84	0.18	1.3	1.9	2.2	1.5	3.1	0.18
Zinc	5,440	7,550	1,280	2,080	8,390	5,160	10,000	5,540	12,100	26,800	7,810	3,270	2,360	1,570	2,080	121

Sample ID/Depth:	SED-16	SED-17	SED-18	SED-19	SED-20	SED-21	SED-22	SED-23	SED-24	SED-25	SED-26	SED-27	SED-28	SED-29	SED-30	TEC (1)
Date Collected:	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	
Total Metals (mg/kg)																
Arsenic	4.5	11.4	16.3	25.5	77.1	30.3	11.5	8.9	5.9	8.7	10.6	7.8	11.2	5	8.1	9.79
Cadmium	16.2	29.4	31.4	51.8	77.1	91.7	45.1	41.6	32.4	98.8	136	86.1	33.7	19.1	21	0.99
Chromium	11.8	40.4	62.4	36.5	36.4	51	33.1	52.8	27.9	31	25.7	22.8	75.8	22.7	39.6	43.40
Lead	1,060	1,610	1,850	12,100	19,400	8,980	1,490	205	97.9	352	597	508	351	123	104	35.8
Mercury	0.75	0.22	0.19	5.6	18.5	2.1	0.45	0.074	<0.056	0.32	0.54	0.66	0.13	<0.067	<0.06	0.18
Zinc	1,740	4,720	5,210	8,760	27,900	19,700	3,620	6,910	1,980	4,890	13,300	8,240	6,820	2,280	3,080	121

Sample ID/Depth:	SED-31	SED-32	SED-33	SED-34	SED-35	SED-36	SED-37	SED-38	SED-39	SED-40	SED-41	SED-42	SED-43	SED-44	SED-45	TEC (1)
Date Collected:	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	
Total Metals (mg/kg)																
Arsenic	8.6	8.1	6.3	3.9	6.6	12.6	10.3	3.9	4	5.6	5.1	<6.3	8	8.1	7.3	9.79
Cadmium	34.2	18.1	12.4	9	20.8	31.8	14.5	8.9	11.3	59.1	27.2	46.2	156	65.5	12.9	0.99
Chromium	45.2	35.5	49.4	17	34.5	102	41.1	26.9	15.7	21.3	21.8	20.3	18.9	26.2	25.4	43.40
Lead	151	118	81.4	99.4	55	660	76.8	46.8	158	112	96.9	128	160	92.4	104	35.8
Mercury	<0.056	<0.051	<0.054	<0.059	<0.053	<0.041	<0.038	<0.049	<0.064	<0.053	<0.041	0.093	0.12	0.066	<0.053	0.18
Zinc	3,720	2,280	1,850	1,060	3,210	5,800	1,700	1,000	1,070	10,300	5,370	5,910	13,100	12,800	1,390	121

Sample ID/Depth:	SED-46	SED-47	SED-48	SED-49	SED-50	SED-51	SED-DUP 1	SED-DUP 2	TEC (1)	Average Background Concentration
Date Collected:	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008	1/29/2008		
Total Metals (mg/kg)										
Arsenic	5.7	5.3	9	7.4	7.6	6.3	67.2	5.8	9.79	6.4
Cadmium	32.4	12	30.9	141	22.1	70.7	93.6	46.3	0.99	47.9
Chromium	23.8	25.8	24.9	34.8	34.5	21.7	44.1	23.3	43.40	24.6
Lead	133	51.3	70.1	183	78.1	110	66,400	166	35.8	106.1
Mercury	0.057	<0.05	<0.044	0.77	<0.047	0.33	10.4	<0.055	0.18	0.2
Zinc	3,380	838	3,430	26,200	1,980	12,200	32,400	7,060	121	6,736.5

(1) Threshold Effect Concentration (mg/kg) - "Development and Evaluation of Concensus-Based Sediment Quality Guidelines for Freshwater Ecosystems" (January 13, 2000)
Indicates Upstream (Background) location
Threshold Effect Concentration exceeded

TABLE 9
EXTENT OF CONTAMINATION
SURFACE WATER LABORATORY DATA
FORMER EAGLEPICHER SMELTER SITE
CEC PROJECT NO. 061-825

Sample ID:	SC-DOWNSTREAM	Aquatic Life Water Quality Criterion (1)		SC-MIDSTREAM	Aquatic Life Water Quality Criterion (1)		SC-UPSTREAM	Aquatic Life Water Quality Criterion (1)	
Date Collected:	1/29/2008	Acute	Chronic	1/29/2008	Acute	Chronic	1/29/2008	Acute	Chronic
Total Metals (ug/l)									
Arsenic	<10	340.0	150.0	<10	340.0	150.0	<10	340.0	150.0
Cadmium	49.3	4.1	0.4	7.1	4.1	0.4	5.5	4.1	0.4
Chromium	<5	NA	40.0	<5	NA	40.0	<5	NA	40.0
Lead	<5	184.8	7.2	<5	184.8	7.2	<5	184.8	7.2
Mercury	<0.2	1.40	0.77	<0.2	1.40	0.77	<0.2	1.40	0.77
Zinc	3,690	206.4	206.4	1,160	206.4	206.4	914	206.4	206.4
Dissolved Metals (ug/l)									
Arsenic	<10	340.0	150.0	<10	340.0	150.0	<10	340.0	150.0
Cadmium	50.7	4.1	0.4	6.2	4.1	0.4	<5	4.1	0.4
Chromium	<5	NA	40.0	<5	NA	40.0	<5	NA	40.0
Lead	<5	184.8	7.2	<5	184.8	7.2	<5	184.8	7.2
Mercury	<0.2	1.40	0.77	<0.2	1.40	0.77	<0.2	1.40	0.77
Zinc	3,840	206.4	206.4	1,030	206.4	206.4	743	206.4	206.4

(1) Kansas Surface Water Quality - Hardness Dependent Aquatic Life Support Criteria - December 6, 2004
Indicates Upgradient (Background) Sampling Location
Indicates that the standard was exceeded
NA - Criterion not available

TABLE 10
EXTENT OF CONTAMINATION
QA/QC ANALYTICAL RESULTS
FORMER EAGLEPICHER SMELTER
CEC PROJECT NO. 061-825.0006

Sample ID/Depth:		A10-04								
Date Collected:		11/31/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	6	6.4	3	45.4	46.2	41.6	41.4	78	76	75-125
Cadmium	50	46.1	9	45.4	46.2	70.3	70.9	44	45	75-125
Lead	153	164	7	45.4	46.2	152	148	-1	-10	75-125
Mercury	0	0.073	1	0.48	0.48	0.43	0.43	76	74	75-125
Zinc	5,880	6,020	2	45.4	46.2	4,000	4,190	-4,143	-3,673	75-125

Sample ID/Depth:		A22-03								
Date Collected:		11/29/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	8	8.2	5	53.3	54.3	55.5	53.9	89	85	75-125
Cadmium	3	2.7	7	53.3	54.3	50.2	48.8	89	85	75-125
Lead	143	134	6	53.3	54.3	192	187	92	81	75-125
Mercury	0	<0.048	NA	0.47	0.48	0.53	0.54	102	101	75-125
Zinc	589	569	5	53.3	54.3	619	617	56	51	75-125

Sample ID/Depth:		A25-04								
Date Collected:		11/29/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	1	3.2	119	36.2	36.7	50.5	44.6	137	119	75-125
Cadmium	10	40	122	36.2	36.7	67	65.9	158	153	75-125
Lead	99	384	118	36.2	36.7	403	329	842	627	75-125
Mercury	0	0.53	47	0.39	0.36	0.67	0.62	86	80	75-125
Zinc	1,140	4,350	117	36.2	36.7	2,670	3,240	4,224	5,714	75-125

Sample ID/Depth:		A39-09								
Date Collected:		11/30/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	2	<2.3	NA	47.3	46.9	29.4	28.7	59	58	75-125
Cadmium	5	7.6	51	47.3	46.9	29	28.6	52	51	75-125
Lead	103	144	33	47.3	46.9	132	132	61	62	75-125
Mercury	0	0.4	18	0.44	0.41	0.66	0.85	87	89	75-125
Zinc	571	919	47	47.3	46.9	586	602	33	67	75-125

Sample ID/Depth:		C4-01								
Date Collected:		11/27/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	9	7.6	17	52	51.1	61.4	60.1	101	100	75-125
Cadmium	97	83.8	14	52	51.1	150	140	103	85	75-125
Lead	2,010	1,740	14	52	51.1	2,040	1,830	52	-351	75-125
Mercury	0	0.56	26	0.49	0.45	0.85	0.74	89	70	75-125
Zinc	8,010	8,320	4	52	51.1	8,490	7,740	917	-535	75-125

Sample ID/Depth:		D10-03								
Date Collected:		11/27/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	8	7.2	4	51.1	50.7	46.6	46.4	76	77	75-125
Cadmium	6	7.1	10	51.1	50.7	46.9	46.9	79	80	75-125
Lead	2,010	2,060	2	51.1	50.7	1,880	2,040	-247	76	75-125
Mercury	0	<0.048	NA	0.46	0.47	0.48	0.5	90	92	75-125
Zinc	1,400	1,540	10	51.1	50.7	1,350	1,360	-85	-73	75-125

Sample ID/Depth:		D19-01								
Date Collected:		11/9/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	129	105	21	51.8	52.8	153	159	47	58	75-125
Cadmium	45	46.1	3	51.8	52.8	83.6	83.5	75	74	75-125
Lead	4,450	4,390	1	51.8	52.8	4,380	4,630	-143	329	75-125
Mercury	0	0.15	31	0.45	0.43	0.56	0.52	99	92	75-125
Zinc	11,000	12,200	10	51.8	52.8	11,100	9,990	52	-1,971	75-125

Sample ID/Depth:		E13-05								
Date Collected:		11/15/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	5	5.7	11							75-125
Cadmium	11	11.3	2							75-125
Lead	1,310	1,640	22							75-125
Mercury	0	0.25	118	0.43	0.43	0.47	0.49	97	101	75-125
Zinc	1,120	1,200	7							75-125

Sample ID/Depth:		E17-01								
Date Collected:		11/15/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS SPIKE CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	4	4.1	5	41	44.5	36.1	40.8	79	83	75-125
Cadmium	12	11.8	4	41	44.5	44.9	51	79	87	75-125
Lead	1,480	1,630	10	41	44.5	1,720	2,000	594	1,176	75-125
Mercury	0	0.25	15	0.45	0.5	0.61	0.78	72	97	75-125
Zinc	2,890	2,100	32	41	44.5	3,080	3,440	474	1,246	75-125

TABLE 10
EXTENT OF CONTAMINATION
QA/QC ANALYTICAL RESULTS
FORMER EAGLEPICHER SMELTER
CEC PROJECT NO. 061-825.0006

Sample ID/Depth:		TP-26 (0')								
Date Collected:		11/14/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	7	8.8	23	49	49	62.3	59.5	113	107	75-125
Cadmium	76	80.2	6	49	49	127	140	103	131	75-125
Lead	2,340	3,010	25	49	49	2,260	2,720	-172	768	75-125
Mercury	1	1.2	49	0.42	0.41	1.4	1.2	164	116	75-125
Zinc	18,300	18,000	2	49	49	16,900	21,800	-2,896	7,124	75-125

Sample ID/Depth:		TP-97 (0')								
Date Collected:		12/5/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	153	111	32	45.3	43.2	176	189	53	85	75-125
Cadmium	80	50.9	44	45.3	43.2	122	134	94	125	75-125
Lead	46,300	44,200	5	45.3	43.2	47,400	52,000	2,282	13,038	75-125
Mercury	34	25	30	0.46	0.45	23.1	33.1	-2,303	-179	75-125
Zinc	11,200	7,910	34	45.3	43.2	10,700	12,100	-961	2,074	75-125

Sample ID/Depth:		TP-109 (0.5')								
Date Collected:		12/5/2007								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	50	56.4	13	50.8	50.8	104	84.3	108	68	75-125
Cadmium	246	290	16	50.8	50.8	332	203	168	-86	75-125
Lead	10,200	12,000	16	50.8	50.8	9,780	7,430	-789	-5419	75-125
Mercury	18	20.6	13	0.58	0.61	32	18.8	2,414	129	75-125
Zinc	31,600	16,800	61	50.8	50.8	26,100	22,100	-10,954	-18,764	75-125

Sample ID/Depth:		TP-135 (0')								
Date Collected:		1/24/2008								
SampleType:	ORIGINAL CONCENTRATION	LAB SPLIT	RELATIVE % DIFFERENCE	MS CONCENTRATION	MSD CONCENTRATION	MS RESULT	MSD RESULT	MS % RECOVERY	MSD % RECOVERY	% RECOVERY LIMITS
Total Metals (mg/kg)										
Arsenic	6	4.7	24	43.6	44.2	49.6	50.8	100	101	75-125
Cadmium	17	16.4	2	43.6	44.2	59	59.5	97	97	75-125
Lead	35	32.6	8	43.6	44.2	77.6	75	97	90	75-125
Mercury	<0.050	<0.041	NA	0.46	0.49	0.46	0.49	97	98	75-125
Zinc	925	901	3	43.6	44.2	989	956	146	70	75-125

MS Matrix Spike
MSD Matrix Spike Duplicate
Indicates that the% Recovery Limits were exceeded.
NA Not Applicable

APPENDIX C

KDHE BUILDING CLEANOUT ACCEPTANCE LETTER

KANSAS
DEPARTMENT OF HEALTH
AND ENVIRONMENT
Division of Environment

Mark Parkinson, Governor
Roderick L. Bremby, Secretary

www.kdheks.gov

January 13, 2010

Mr. Martin Knuth, P.G., Vice President
Mr. Timothy Moberg, Assistant Project Manager
Civil & Environmental Consultants, Inc.
333 Baldwin Road
Pittsburgh, PA 15205

RE: Completion of Building Cleanout Report
Former Eagle Picher Smelter Site, Galena, Kansas, April 2009

Dear Sirs:

The Kansas Department of Health and Environment/Bureau of Environmental Remediation (KDHE/BER) has reviewed the report titled *Completion of Building Cleanout, Former Eagle Picher Smelter*, dated May 4, 2009, which was prepared and submitted by Civil And Environmental Consultants, Inc. (CEC). The purpose of this letter is to formally convey our acceptance of the report. No written response to this letter is necessary. Please call me at 785-296-1673 or email: rbean@kdhe.state.ks.us if you have any questions.

Sincerely,

Rick L. Bean, L.G.
Chief, Remedial Section
Bureau of Environmental Remediation

RLB:mlm

C: William West, Custodial Trustee
Deanna Ross → Maura O'Halloran → Eagle Picher Smelter, (C3-011-72090)
David Drake, USEPA Region 7
Jane Kloeckner, USEPA Region 7, Office of Regional Counsel
Maria I. Cintron-Silva USEPA Chief, Environmental & Natural Resources, Div.
M. Colette Gibbons, Esa., Schottenstein, Zox and Dunn Co. LPA
Stephen P. Samuels, Esq., Schottenstein, Zox and Dunn Co. LPA

JAN 19 2010

APPENDIX L

EAGLE-PICHER INDUSTRIES INC. AND KDHE CORRESPONDENCE LETTERS

Fax Transmission

Layne Western
a division of Layne Christensen Company
620 South 38th Street
Kansas City, KS 66106
(913) 321-5000
Fax: (913) 321-5012

To: Martin Knuth
Date: 3-2-07
Fax #: 412-429-2114
Pages: 5
From: John VonHolt
Subject:

Professional Services for Water Systems

John C. Von Holt
Operations Manager

LAYNE-WESTERN
a division of Layne Christensen Company
620 South 38th Street
P.O. Box 8126
Kansas City, Kansas 66106

Office: 913-321-5000
Fax: 913-321-5012
Cell: 816-797-1446
Home: 816-246-8682
jvonholt@laynechristensen.com

Please call ~~Susan~~ or ~~Melissa~~ at (913) 321-5000 if you do not receive all pages of this fax. Thank you. John VonHolt

Agricultural Chemicals Division Eagle-Picher Industries, Inc. P.O. Box 83 Joplin, Missouri 64801
417-782-1922

November 18, 1980

Mr. Dwight W. Brinkley
Department of Health & Environment
Oil Field & Environmental Geology Section
Forbes Field
Topeka, Kansas 66620

Dear Mr. Brinkley:

This letter is to confirm our phone conversation of a few weeks ago with you, myself and P. Allen MacFarlene of the Kansas Geological Survey, about the five water wells at the Galena plant site.

Well #1, located north of the zinc oxide furnace building
Well #2, located at our multi-products building, near our Mno calciner
Well #3, located south of our pug building
Well #4, located at far east end of property
Well #5, located approximately 55' south of the south wall of the east sub-station

Well #5, is currently under a survey by the Division of Water Resources and we plan to maintain the same status. Mr. MacFarlene of Kansas Geological Survey plans to study the groundwater aquifers in southeast Kansas and they need access to well #4 for a period of one to two years and we are agreeable to this.

We plan to plug water wells #1, #2 and #3. At your convenience you are sending us the plugging details and procedures for these wells. We also need the names and addresses of licensed water well contractors.

After we obtain a few bids, we can prepare a timetable for the plugging of the three wells. We will also need to know if a department representative plans to be present during the plugging.

Thank you for your continuing cooperation.

Sincerely,

Michael L. Barry /AR

Michael L. Barry
Division Engineer

cc: Don Leggett

EAGLE EP PICHER

WATER WELL RECORD TO: WWC 5 KSA 82a-1212

LOCATION OF WATER WELL	Fraction	Section Number	Township Number	Range Number
unty: Cherokee	SE ¼ SW ¼ NW ¼	13	34 S	R 25 (E)W

and direction from nearest town or city? 2mi. North of Galena Ks. | Street address of well if located within city?

WATER WELL OWNER: Eagle Picher Industries Well #2
#, St. Address, Box # : P.O. Box 83
/, State, ZIP Code : Joplin, Mo. 64801
Board of Agriculture, Division of Water Resource
Application Number: 3531

DEPTH OF COMPLETED WELL 1155 ft. Bore Hole Diameter 8" in. to 1155 ft., and ..... in. to ..... ft

ll Water to be used as: 5 Public water supply 8 Air conditioning 11 Injection well
1 Domestic 3 Feedlot 6 Oil field water supply 9 Dewatering 12 Other (Specify below)
2 Irrigation (4) Industrial 7 Lawn and garden only 10 Observation well .....

ll's static water level 100 ft. below land surface measured on 4 month 9 day 81 yea
mp Test Data : Well water was ..... ft. after ..... hours pumping ..... gpm
. Yield gpm: Well water was ..... ft. after ..... hours pumping ..... gpm

TYPE OF BLANK CASING USED: 5 Wrought iron 8 Concrete tile Casing Joints: Glued ..... Clamped .....
(1) Steel 3 RMP (SR) 6 Asbestos-Cement 9 Other (specify below) Welded ? ?
2 PVC 4 ABS 7 Fiberglass ..... Threaded .....

nk casing dia 8" in. to 356 ft., Dia ..... in. to ..... ft., Dia ..... in. to .....
sing height above land surface ..... 0' in., weight ? lbs./ft. Wall thickness or gauge No ?

PE OF SCREEN OR PERFORATION MATERIAL: 7 PVC 10 Asbestos-cement
1 Steel 3 Stainless steel 5 Fiberglass 8 RMP (SR) 11 Other (specify) .....
2 Brass 4 Galvanized steel 6 Concrete tile 9 ABS 12 None used (open hole)

'een or Perforation Openings Are: 5 Gauzed wrapped 8 Saw cut 11 None (open hole)
1 Continuous slot 3 Mill slot 6 Wire wrapped 9 Drilled holes
2 Louvered shutter 4 Key punched 7 Torch cut 10 Other (specify) .....

'een-Perforation Dia ..... in. to ..... ft., Dia ..... in. to ..... ft., Dia ..... in to .....
'een-Perforated Intervals: From ..... ft. to ..... ft., From ..... ft. to .....
From ..... ft. to ..... ft., From ..... ft. to .....
avel Pack Intervals: From ..... ft. to ..... ft., From ..... ft. to .....
From ..... ft. to ..... ft., From ..... ft. to .....

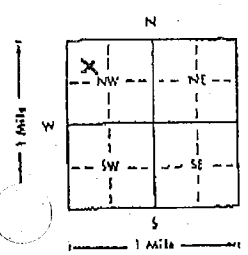
OUT MATERIAL: (1) Neat cement 2 Cement grout 3 Bentonite 4 Other .....
outed Intervals: From 1155 ft. to Surface ft., From 350 bags ft. to ..... ft., From ..... ft. to .....
with Cement in a 1 bag to 6 gal water ratio

hat is the nearest source of possible contamination: 10 Fuel storage 14 Abandoned water well
1 Septic tank 4 Cess pool 7 Sewage lagoon 11 Fertilizer storage 15 Oil well/Gas well
2 Sewer lines 5 Seepage pit 8 Feed yard 12 Insecticide storage (16) Other (specify below)
3 Lateral lines 6 Pit privy 9 Livestock pens 13 Watertight sewer lines Mined Area

ection from well ..... How many feet ..... ? Water Well Disinfected? Yes ..... No ✓
as a chemical/bacteriological sample submitted to Department? Yes ..... No X ..... If yes, date sample
s submitted ..... month ..... day ..... year: Pump Pulled installed? Yes X ..... No .....
Yes: Pump Manufacturer's name Peerless ..... Model No. ? ..... HP ? ..... Volts .....
pth of Pump Intake ≈ 280' ..... ft. Pumps Capacity rated at ? ..... gal./mir
pe of pump: 1 Submersible (2) Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and wa
mpleted on 4 month 14 day 1981 yea
d this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. .....
is Water Well Record was completed on 4 month 28 day 81 year under the busine
me of Layne-Western Co. Inc. by (signature) Curtis Sherman

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



EVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
		Note: We successfully pulled the lodged pump from the well. Then tremied 350 bags of neat cement to the surface.			
		Please find a copy of the well log.			

epth(s) Groundwater Encountered 1. ..... ft. 2. ..... ft. 3. ..... ft. 4. ..... ft. (Use a second sheet if needed)

STRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top three pies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER and tain one for your records.

LOCATION OF WATER WELL	Fraction	Section Number	Township Number	Range Number
County: Cherokee	SE NW ¼ NW ¼	13	T 34 S	R 25 E

Distance and direction from nearest town or city? 2 mi North of Galena, Ks

Street address of well if located within city?

WATER WELL OWNER: Eagle Picher Industries Well #1

RR#, St. Address, Box # : P.O. Box 83

City, State, ZIP Code : Joplin, Mo. 64801

Board of Agriculture, Division of Water Res. Application Number: 6212

DEPTH OF COMPLETED WELL: ≈ 105 ft. Bore Hole Diameter: ≈ 15" in. to ..... ft., and ..... in. to .....

Well Water to be used as: 1 Domestic 3 Feedlot 5 Public water supply 6 Oil field water supply 7 Lawn and garden only 8 Air conditioning 9 Dewatering 10 Observation well 11 Injection well 12 Other (Specify below) 2 Irrigation (4) Industrial

Well's static water level 20' ft. below land surface measured on 4 month 15 day 81

Pump Test Data : Well water was ..... ft. after ..... hours pumping .....

Est. Yield ..... gpm: Well water was ..... ft. after ..... hours pumping

TYPE OF BLANK CASING USED: (1) Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below) Casing Joints: Glued ..... Clamped ..... Welded ..... Threaded .....

Blank casing dia 16" in. to 17' ft., Dia ..... in. to ..... ft., Dia ..... in. to .....

Casing height above land surface 24" in., weight ? lbs./ft. Wall thickness or gauge No. ?

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) ..... 12 None used (open hole)

Screen or Perforation Openings Are: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) ..... 11 None (open hole)

Screen-Perforation Dia ..... in. to ..... ft., Dia ..... in. to ..... ft., Dia ..... in to .....

Screen-Perforated Intervals: From ..... ft. to ..... ft., From ..... ft. to .....

From ..... ft. to ..... ft., From ..... ft. to .....

Gravel Pack Intervals: From ..... ft. to ..... ft., From ..... ft. to .....

From ..... ft. to ..... ft., From ..... ft. to .....

GROUT MATERIAL: (1) Neat cement 2 Cement grout 3 Bentonite 4 Other with 210 bags cement in a 1 bag to 6 gal water ratio

Grouted Intervals: From 105' ft. to Surface ft. From ..... ft. to ..... ft., From ..... ft. to .....

What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Lateral lines 4 Cess pool 5 Seepage pit 6 Pit privy 7 Sewage lagoon 8 Feed yard 9 Livestock pens 10 Fuel storage 11 Fertilizer storage 12 Insecticide storage 13 Watertight sewer lines 14 Abandoned water well 15 Oil well/Gas well (16) Other (specify below) Mined Area

Direction from well ..... How many feet ..... ? Water Well Disinfected? Yes ..... No ✓

Was a chemical/bacteriological sample submitted to Department? Yes ..... No ..... If yes, date sa

as submitted ..... month ..... day ..... year: Pump Installed? Yes ..... No X

If Yes: Pump Manufacturer's name ..... Model No. ..... HP ..... Volts .....

Depth of Pump Intake ..... ft. Pumps Capacity rated at ..... gal

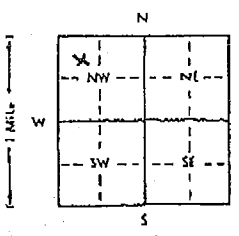
Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and completed on 4 month 16 day 1981 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. .....

This Water Well Record was completed on 4 month 28 day 1981 year under the bus

name of Layne-Western Co. Inc. by (signature) Keith Sherman

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



ELEVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
		Note: Well was open to T.D. before cementing. Tremied 210 bags of cement in a 6 gal to 1 bag ratio to surface.			
		Please find attached copy of original driller's log			

Depth(s) Groundwater Encountered 1 ..... ft. 2 ..... ft. 3 ..... ft. 4 ..... ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top t copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER plain one for your records.

WATER WELL RECORD

LOCATION OF WATER WELL: County: Cherokee | Fraction: NE ¼ SW ¼ NW ¼ | Section Number: 13 | Township Number: T 34 S | Range Number: R 25 E

Distance and direction from nearest town or city? 2 mi North of Galena, Ks. | Street address of well if located within city?

WATER WELL OWNER: Eagle Picher Industries Well #3

RR#, St. Address, Box # : P.O. Box 83

City, State, ZIP Code : Joplin, Mo. 64801

Board of Agriculture, Division of Water Resources Application Number: 3531

DEPTH OF COMPLETED WELL 104 ft. Bore Hole Diameter ≈15" to 9" in. to ..... ft., and ..... in. to .....

Well Water to be used as: 1 Domestic 3 Feedlot 5 Public water supply 6 Oil field water supply 7 Lawn and garden only 8 Air conditioning 9 Dewatering 10 Observation well 11 Injection well 12 Other (Specify below) 4 Industrial

Well's static water level 17 ft. below land surface measured on 12 month 29 day 80

Pump Test Data: Well water was ..... ft. after ..... hours pumping ..... gpm: Well water was ..... ft. after ..... hours pumping .....

TYPE OF BLANK CASING USED: 1 Steel 2 PVC 3 RMP (SR) 4 ABS 5 Wrought iron 6 Asbestos-Cement 7 Fiberglass 8 Concrete tile 9 Other (specify below) ..... Casing Joints: Glued ..... Clamped ..... Welded ..... Threaded .....

Blank casing dia 15 in. to 85' ft., Dia ..... in. to ..... ft., Dia ..... in. to .....

Casing height above land surface 2' in., weight ? lbs./ft. Wall thickness or gauge No ?

TYPE OF SCREEN OR PERFORATION MATERIAL: 1 Steel 2 Brass 3 Stainless steel 4 Galvanized steel 5 Fiberglass 6 Concrete tile 7 PVC 8 RMP (SR) 9 ABS 10 Asbestos-cement 11 Other (specify) ..... 12 None used (open hole)

Screen or Perforation Openings Are: 1 Continuous slot 2 Louvered shutter 3 Mill slot 4 Key punched 5 Gauzed wrapped 6 Wire wrapped 7 Torch cut 8 Saw cut 9 Drilled holes 10 Other (specify) ..... 11 None (open hole)

Screen-Perforation Dia ..... in. to ..... ft., Dia ..... in. to ..... ft., Dia ..... in to .....

Screen-Perforated Intervals: From ..... ft. to ..... ft., From ..... ft. to .....

From ..... ft. to ..... ft., From ..... ft. to .....

Gravel Pack Intervals: From ..... ft. to ..... ft., From ..... ft. to .....

From ..... ft. to ..... ft., From ..... ft. to .....

GROUT MATERIAL: 1 Neat cement 2 Cement grout 3 Bentonite 4 Other With 200 bags cement in a 1 bag to 6 gal water ratio

Grouted Intervals: From 104 ft. to 4 Below Surface ft., From ..... ft. to ..... ft., From ..... ft. to .....

What is the nearest source of possible contamination: 1 Septic tank 2 Sewer lines 3 Lateral lines 4 Cess pool 5 Seepage pit 6 Pit privy 7 Sewage lagoon 8 Feed yard 9 Livestock pens 10 Fuel storage 11 Fertilizer storage 12 Insecticide storage 13 Watertight sewer lines 14 Abandoned water well 15 Oil well/Gas well 16 Other (specify below) Mined Area

Direction from well ..... How many feet ..... ? Water Well Disinfected? Yes ..... No .....

Was a chemical/bacteriological sample submitted to Department? Yes ..... No ..... If yes, date sam

was submitted ..... month ..... day ..... year: Pump Installed? Yes ..... No .....

If Yes: Pump Manufacturer's name ..... Model No. ..... HP ..... Volts .....

Depth of Pump Intake ..... ft. Pumps Capacity rated at ..... gal.

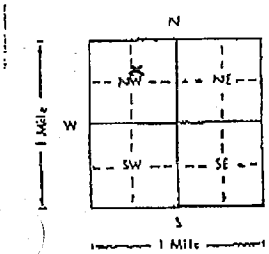
Type of pump: 1 Submersible 2 Turbine 3 Jet 4 Centrifugal 5 Reciprocating 6 Other

CONTRACTOR'S OR LANDOWNER'S CERTIFICATION: This water well was (1) constructed, (2) reconstructed, or (3) plugged under my jurisdiction and completed on 4 month 16 day 1981 and this record is true to the best of my knowledge and belief. Kansas Water Well Contractor's License No. .....

This Water Well Record was completed on 4 month 28 day 1981 year under the bus.

Name of Layne-Western Co. Inc. by (signature) Keith Sherman

LOCATE WELL'S LOCATION WITH AN "X" IN SECTION BOX:



ELEVATION:

FROM	TO	LITHOLOGIC LOG	FROM	TO	LITHOLOGIC LOG
		Note: Well was open to T.D. before cementing			
		Tremied 200 bags cement in a 6 gal to 1 bag ratio.			
		No log of this well was available.			

Depth(s) Groundwater Encountered 1 ..... ft. 2 ..... ft. 3 ..... ft. 4 ..... ft. (Use a second sheet if needed)

INSTRUCTIONS: Use typewriter or ball point pen, *please press firmly* and *PRINT* clearly. Please fill in blanks, underline or circle the correct answers. Send top th copies to Kansas Department of Health and Environment, Division of Environment, Water Well Contractors, Topeka, KS 66620. Send one to WATER WELL OWNER. Retain one for your records.

Fax Transmission

Layne Western
a division of Layne Christensen Company
620 South 38th Street
Kansas City, KS 66106
(913) 321-5000
Fax: (913) 321-5012

To: Martin Knuth
Fax #: 412-429-2114
From: John VonHolt

Date: 3-2-07
Pages: 8
Subject:

Layne
Professional Services for Water Systems

John C. Von Holt
Operations Manager

LAYNE-WESTERN
a division of Layne Christensen Company
620 South 38th Street
P.O. Box 8126
Kansas City, Kansas 66106

Office: 913-321-5000
Fax: 913-321-5012
Cell: 816-797-1446
Home: 816-246-8682
jvonholt@laynechristensen.com

Please call ~~Susan~~ or ~~Melissa~~ at (913) 321-5000 if you do not receive all pages of this fax. Thank you. John VonHolt

Agricultural Chemicals Division Eagle-Picher Industries, Inc. P.O. Box 83 Joplin, Missouri 64801
417-782-1922

April 24, 1980

Mr. Dwight W. Brinkley
Department of Health & Environment
Oil Field & Environmental Geology Section
Forbes Field
Topeka, Kansas 66620

Subject: Your letter dated 4-18-80

Dear Mr. Brinkley:

We would first like to address the other wells you asked about which are not located at the Galena Plant property. These are:

a.) Well #P-54, Lot #16,566, Jarrett lease
Well No. KX-P-54, Log #22,145, (relog of #16,566)
b.) Well #P-34, Log #21,408, Wilbur farm
c.) Well #P-53, Log #16,122, Jarrett lease
d.) Well #87B, Log #23,239, Webber farm
e.) Well #P-1, Log #21,406, King Brand farm

We do not know the status of these five wells. These are not associated with the Agricultural Chemicals Division of Eagle-Picher and because of such, we have no records available. It might be these wells were drilled by our now non-existent Mining Department. We would suggest that you contact our corporate office at the following address about these five wells.

Eagle-Picher Industries, Inc.
580 Walnut (P.O. Box 779)
Cincinnati, OH 45201

(513) 721-7010

The five water wells located on the Galena Plant site are shown on the following maps. I mentioned in one of our

telephone conversations that there was some confusion about the location of the five wells. Through some error, there appears to have been conveyed to your office the belief that a well exists under the asphalt parking lot in front of our main office. All our records show that we have had only five wells on our plant site. We know the location of these five wells and have numbered them on the map. The confusion may have been the result of ground water flowing out of this area during certain times of the year during heavy rains. Also, somewhere in the area there is a small pit, from probably the late 1800's to the early 1900's, which the original office sat nearby. They supposedly pulled cool air from the pit to air condition the office. This should explain how perhaps the confusion developed. This certainly cannot be called a water well. Reference 82a-1203 (a).

We would be receptive to a survey by the Kansas Geological Survey for geological and hydrological studies of the ground water aquifers in southwest Kansas. We should be able to provide access to all five wells for as long as the survey may run. We have tried to contact P. Allen MacFarlene to discuss this but he has been out of his office. Assuming all five of the wells remain unplugged until the study ends, our preliminary plan is as follows:

After the survey we would like your approval to plug our water well #1. As I mentioned this well is artesian part of the time and we would like to arrive at its final disposition. Well #5 is currently a water measurement station for the Geological Survey and they have our approval to maintain the same status. We are studying wells 2, 3 and 4 and are thinking about our future water needs. It may be that we wish to take them out of use only temporarily. We may wish to appeal the plugging of these three wells as set forth in Ref. 28-30-9. We want to work closely with you on all five wells and would appreciate your help in complying with Article 30.

The following is the history we have found to date on the five wells. We will discuss each well one at a time and will tie these in with the strip logs. If we find anymore information we will forward it to you as it becomes available.

WELL #1

North of the zinc oxide furnace building.

We have found very few records on this well. We believe it to be only a few hundred feet deep or less. The pump is still sitting in the well and the pump house is still intact. We believe the pump is Byron Jackson OKHC 9 stage LAW-HZ 94025, head 185 ft.-200 gpm.

9 ea. 10 ft. sections shaft
1 ea. 10 ft. sections 5" discharge pipe
1 ea. 30 in. " "
1 ea. 30 in. sections, 5" below runners

WELL #2

Located at our multi-products building, near our MnO calciner.

The strip log from the Missouri Geological Survey for this well is: Log #2676, their Well #1, well driller, Roy Blosser, date November, 1932. The pump is still sitting in the well and we believe the pump is a 6" Peerless. We show 27 joints, each casing 10' in length. The last record we have found, so far, of pump rebuilding was October 7, 1952.

WELL #3

Located south of our pug building

The only records we have to date on this well show at one time it had a Byron Jackson pump model OOBK 8" type UMT S/N 294211

State of Kansas . . . John Carlin, *Governor*

DEPARTMENT OF HEALTH AND ENVIRONMENT

Joseph F. Harkins, *Secretary*

Forbes Field
Topeka, Kansas 66620
913-862-9360

November 20, 1980

Michael L. Barry
Division Engineer
Agricultural Chemicals Division
Eagle-Picher Industries, Incorporated
P.O. Box 83
Joplin, Missouri 64801

Re: Your letters dated April 24 and August 4, 1980 and our telephone conversation concerning the plugging of 5 wells located on Eagle-Picher properties in Cherokee County, Kansas, NW¼, Section 13, T34S, R2E.

Dear Mr. Barry:

Thank you for your patience and for the additional information about your wells construction. We acknowledge no well exists below the parking lot in front of the plant's main office. (Reference your April 24, 1980 letter.)

The following is a listing of logging companys which would more than likely have caliper logging capabilities to log well number 3 because of a dearth of historical records on this well. A caliper log will show you the diameter of the casing, the casing depth setting, the diameter of the open hole below the casing and the total depth of the well. The caliper log information would be needed for plugging methods other than plugging the whole well with grout. (Reference 28-30-7(c)(1)).

Gene Cornish, Cornish Wireline Service, Inc., Box 260-Rt. 3, Chanute, KS 66720, Ph: 316-431-9308

Bud Adams, Adams Jetwell Service, Inc., 205 West Main Street, Chanute, KS 66720, Ph: 316-431-2120

Wesley Karns, Earth Sciences Limited, 806 Hickman, Coffeyville, KS 67337, Ph: 316-251-1900

We have also enclosed a listing of currently licensed water well contractor's in Kansas for your reference files.

Using Article 30. - Water Well Contractor's License, Water Well Construction and Abandonment rules and regulations (copy enclosed), specifically K.A.R. 28-30-7 as a reference you have two options for plugging each of the wells.

OPTION 1 on Well 1

(NOTE: Your information on well 1 shows the well to be 105 feet in total depth having 16 inch O.D. casing to 17 feet.)

Either perforate or remove the 17 feet of 16 inch O.D. casing because the record does not show this casing as being cemented in when the well was constructed. Reference 28-30-7(c)(3).

If perforation of the casing in chosen over removal of the casing follow 28-30-7(a)(1). Then proceed with 28-30-7(c)(2) and after the emplaced grout has set for at least 24 hours follow 82-30-7(a)(5).

OPTION 2 on WELL 1

Use 28-30-7(c)(3) to take care of the well's casing.

Place washed chat (free of any clays or silt) from the bottom of the well up to 75 feet (the depth where groundwater was first encountered). We will accept chat that has been washed as a substitute for the sand and gravel.

From 75 feet to 65 feet place a 10 foot long grout plug by using a grout tremie pipe. Reference 28-30-7(c)(2).

From 65 feet to 27 feet use 28-30-7(c)(2)(A).

From 27 feet to 3 feet use 28-30-7(c)(2)(B) and also 28-30-7(a)(4).

From 3 feet to ground surface use 28-30-7(a)(5).

OPTION 1 on Well 2

(NOTE: Well 2 located on west side of the multipurpose (?) production building and strip logs (2676) show well's depth to be anywhere from 1103 to 1155 feet. Contains 386 feet of 8.25 inch I.D. casing but no record as being cemented in when the well was constructed. The diamater of the open hole below the well casing is unknown.

Use the same procedures and materials to the plug this well as in Option 1 on WELL 1.

OPTION 2 on Well 2

Use 28-30-7(c)(3) to take care of the top of the well before plugging begins.

Place washed chat from the bottom of the well up to 396 feet below ground level. This procedure has to be done very slowly to prevent the chat from bridging across the open hole below the well casing and in the well casing itself. We suggest using a 3 inch tremie pipe placed to within 20 feet of the bottom of the well through which the washed chat is conducted. Alternately remove 20-to-40 foot lengths of the 3 inch tremie pipe until the well is filled with chat from the bottom to the 396 foot level below ground surface. Reference 28-30-7(c)(2)(A).

From 396 to 376 feet below ground level place 20 foot long grout column using the tremie pipe. Pump the premixed grout through the tremie pipe so a volume of grout is placed into the 396-to-376 interval. Reference 28-30-7(c)(2)(B).

Wait at least 24 hours to allow the grout to set up before using a bailer or other means to remove any groundwaters of off the top of the grout plug. Reference 28-30-7(a)(4).

From 376 to 13 feet below ground level place clays, silts, chat or grout in such a manner so bridging does not occur. Reference 28-39-7(c)(2)(A).

From 13 feet to the top of the cut off casing (3 feet below ground surface) place a 10 foot long grout plug. Reference 28-39-7(c)(3).

Then follow 28-30-7(a)(5) to cover over the plugged well.

WELL 3

For well number 3 located south of your plant storage and pug system you would follow the same plugging procedures as for well number 2 Option 1 or 2. However, the caliper log information will establish to what depths and lengths the plug materials will be placed. We offer our assistance to interpret the log for you to determine plugging depths.

WELL 4

Well 4 located on the east side of your plant's property has 300 feet of 12 inch I.D. cemented casing and is 1185 feet deep. This well can be left unplugged for a duration of one year for the Kansas Geological Survey to conduct geological and hydrological studies if it is agreeable by your company. (Reference our telephone communication 27 October, 1980 between myself, yourself and P. Allen MacFarlane with the KGS.)

We do want the well head to be sealed to prevent insects, vermine and other debris from going down the well.

One factor your company may want to consider is the cost involved to plug well 4 at present time as opposed to a year later.

When Well 4 has been terminated from any useful purpose by the KGS it will have to be plugged in the same manner as Option 1 and 2 for Well 2 except for placement of the materials which is dictated by the 300 feet of cemented casing.

WELL 5

Well Number 5 located southeast of the southeast corner of your plant's storage and pug system has 10 inch I.D. steel casing placed to 365 feet and a 10 inch bore hole from 365 to 870 feet.

Agricultural Chemicals Division Eagle-Picher Industries, Inc. P.O. Box 83 Joplin, Missouri 64801
417-782-1922

November 18, 1980

Mr. Dwight W. Brinkley
Department of Health & Environment
Oil Field & Environmental Geology Section
Forbes Field
Topeka, Kansas 66620

Dear Mr. Brinkley:

This letter is to confirm our phone conversation of a few weeks ago with you, myself and P. Allen MacFarlene of the Kansas Geological Survey, about the five water wells at the Galena plant site.

Well #1, located north of the zinc oxide furnace building
Well #2, located at our multi-products building, near our Mno calciner
Well #3, located south of our pug building
Well #4, located at far east end of property
Well #5, located approximately 55' south of the south wall of the east sub-station

Well #5, is currently under a survey by the Division of Water Resources and we plan to maintain the same status. Mr. MacFarlene of Kansas Geological Survey plans to study the groundwater aquifers in southeast Kansas and they need access to well #4 for a period of one to two years and we are agreeable to this.

We plan to plug water wells #1, #2 and #3. At your convenience you are sending us the plugging details and procedures for these wells. We also need the names and addresses of licensed water well contractors.

After we obtain a few bids, we can prepare a timetable for the plugging of the three wells. We will also need to know if a department representative plans to be present during the plugging.

Thank you for your continuing cooperation.

Sincerely,

Michael L. Barry /AR

Michael L. Barry
Division Engineer

cc: Don Leggett

EAGLE PICHER