



TETRA TECH EM INC.

March 15, 2006

Mr. Roy Crossland  
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**Subject: Removal Site Evaluation Report  
Des Moines (ex) Ordnance Plant Site, Ankeny, Iowa  
CERCLIS ID No.: IA8210890028  
U.S. EPA Region 7 START 2, Contract No. 68-S7-01-41, Task Order No. 0237  
Task Monitor: Dan Garvey, On-Scene Coordinator**

Dear Mr. Crossland:

Tetra Tech EM Inc. is submitting the attached Removal Site Evaluation Report for the Des Moines (ex) Ordnance Plant site in Ankeny, Iowa. If you have any questions or comments, please contact the project manager at (314) 921-4297.

Sincerely,

G. David Kinroth, CHMM  
START Project Manager

Hieu Q. Vu, PE, CHMM  
START Program Manager

Enclosures

**REMOVAL SITE EVALUATION REPORT**

**DES MOINES (ex) ORDNANCE PLANT SITE - ANKENY, IOWA**

**CERCLIS ID No.: IA8210890028**

**Superfund Technical Assessment and Response Team (START)**

**Contract No. 68-S7-01-41, Task Order No. 0237**

Prepared For:

U.S. Environmental Protection Agency  
Region 7  
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March 15, 2006

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## 1.0 INTRODUCTION

The Tetra Tech EM Inc. (Tetra Tech), Superfund Technical Assessment and Response Team (START) was tasked by the U.S. Environmental Protection Agency (EPA) Region 7 Superfund Division to conduct a removal site evaluation (RSE) for the Des Moines (ex) Ordnance Plant (DMOP) site in Ankeny, Iowa. The purpose of this RSE was to determine whether any threats to human health or the environment exist as a result of releases to soil, groundwater, or surface water at the Sewage Lagoon/Landfill Complex portion of the site. Specific elements of this task included: preparation of a Quality Assurance Project Plan (QAPP) for field activities; sampling of soil, groundwater, sediment, and surface water for analyses of selected hazardous waste constituents; and preparation of a summary report documenting the findings of the RSE. Dave Kinroth was the Tetra Tech START project manager for these activities. The EPA on-scene coordinator (OSC) for the project was Dan Garvey.

The site is located approximately 5 miles north of Des Moines, Iowa, and adjoins the southwestern city limits of Ankeny, Iowa. The DMOP site is composed of two non-contiguous properties that served distinctly different functions when the plant was in operation. One property, the former Accuracy Range, covers an area of 2,029 acres and was used primarily for testing the ballistics and accuracy of ammunition produced at the plant. The other portion of the site encompasses approximately 2,420 acres used for the former Manufacturing Facility and its support structures.

The former DMOP Manufacturing Facility was located in parts of Sections 22, 23, 26, 27, 34, and 35, Township 80 North, Range 24 West, in north-central Polk County, Iowa (see Appendix A, Figure 1). The Manufacturing Facility portion of the site is currently bounded by Southwest 3<sup>rd</sup> Street and Ordnance Road to the north, Highway 69 to the east, and Highway 415 to the south and west. The former Accuracy Range area is located approximately 1 mile west of the Manufacturing Facility property. The 38-acre Sewage Lagoon/Landfill Complex addressed by this RSE is located on the former DMOP Manufacturing Facility property. The geographic coordinates recorded by a handheld Global Positioning System (GPS) unit near the center of this area (near an entrance gate to the landfill portion of the site) were 41° 42' 31.2" north latitude and 93° 37' 29.4" west longitude.

The subject property is owned by the City of Ankeny. Surrounding land use is currently primarily agricultural; however, the entire area is slated for residential housing development in the near future. The Sewage Lagoon/Landfill property itself is planned for development as a "greenspace" or city park.

Structures and other features remaining on site include a dilapidated barn, six former sewage treatment plant lagoons/ponds and associated piping/structures, and the closed landfill complex.

Soils of the Webster Series cover much of the area around the Sewage Lagoon/Landfill Complex. These dark-colored, poorly drained soils developed from glacial till and are composed of calcareous, loamy till about 50 to 175 feet thick (U.S. Department of Agriculture [USDA] 2000).

Surface runoff from the Sewage Lagoon/Landfill Complex is generally to the south to Saylor Creek. Saylor Creek runs along the southern perimeter of the site, flowing in a southeasterly direction. Most residences in the site vicinity use water provided by municipal systems for their drinking water and other domestic needs.

## 2.0 BACKGROUND

This RSE was performed by Tetra Tech START to address imminent concerns that could potentially impact human health and/or the environment at the Sewage Lagoon/Landfill Complex portion of the DMOP site in Ankeny, Iowa (site).

The DMOP manufactured ammunition from 1941 to 1947, when 586 acres of the 4,400-acre property was purchased by John Deere Corporation, which operates the John Deere Des Moines Works Plant on the property. This purchase included the 38-acre sewage treatment lagoon/landfill complex, which was used by the John Deere Corporation until 1965, when the property was deeded to the City of Ankeny. Under the operation of the City of Ankeny, the lagoon/landfill facility (hereafter referred to as the Ankeny Lagoon/Landfill Complex) continued to receive wastes from the John Deere plant, as well as wastes from the City of Ankeny. In 1971, the landfill was closed; however, the sewage treatment lagoon complex remained in operation until 1991.

From 1941 to 1991, the lagoons received many types of wastes from the DMOP and/or the John Deere plant, including stormwater, sanitary sewage, and industrial wastewater. Wastes from the DMOP were derived from the production of explosives, smokeless powders, priming compositions, and bullet casings. Wastes from the John Deere plant included coolants and oils, alkaline and acid wash solutions, and plating waste waters. The lagoon complex also received municipal waste from the City of Ankeny from 1965 to 1991.

Wastes were deposited at the landfill area adjacent to the lagoon complex by the DMOP, the John Deere plant, and the City of Ankeny until 1971, when the landfill was closed. The DMOP deposited wastes associated with the manufacture of small caliber ammunition, which may have included brass bullet casings, smokeless powders, and priming compositions. Most wastes originating from the John Deere plant included paper and wood-type trash, paint wastes, and grinding, heat-treating, and plating sludges. From 1965 to 1971, the landfill also received municipal wastes from the City of Ankeny. Open burning was routinely practiced at the landfill until it closed in 1971.

Previous environmental investigations conducted at the DMOP site have included the following:

- A Phase I Site Investigation was performed for EPA by the Ecology and Environment, Inc., Field Investigation Team (E&E/FIT) in January 1985 (E&E 1986).
- In July 1987, a Phase II Site Investigation of the Ankeny Lagoon/Landfill Complex was conducted by E&E/FIT to assess whether contamination had migrated to the shallow drinking water aquifer (E&E 1988).
- E&E conducted a groundwater monitoring investigation in 1998 and 1999. This investigation involved collecting quarterly samples from four monitoring wells installed during the 1987 Phase II Site Investigation (E&E 1998, E&E 1999a, E&E 1999b, E&E 1999c).
- Tetra Tech START submitted a report to EPA in January 2002 that summarized all previous site investigations and data for the site; it also identified data gaps. Additionally, a Hazard Ranking System (HRS) Scoring Report was prepared (Tetra Tech 2002).
- In June 2003, Black and Veatch Special Projects Corp. completed sampling for an Expanded Site Inspection (ESI) report, which was submitted to EPA in March 2004. The objectives of this ESI were to further determine the nature and extent of contaminants present at the site, and to establish attribution to the site for those contaminants (B&V 2004).

Various contaminants were detected in environmental samples collected at the Ankeny Lagoon/Landfill Complex during these previous sampling efforts. Surface water and stream sediment samples have contained elevated concentrations of metals, volatile organic compounds (VOC), and semivolatile organic compounds (SVOC). Samples of groundwater from monitoring wells installed around the site have also contained elevated concentrations of metals (chromium, copper, lead, iron, manganese, arsenic, and selenium), VOCs, and SVOCs. Residues of explosive compounds—including nitrobenzene, nitrocellulose, and 2,6-dinitrotoluene—have also been detected in groundwater samples collected at the Ankeny Lagoon/Landfill Complex.

With the known history of contamination at the Ankeny Lagoon/Landfill Complex—and considering the City of Ankeny's plans for development of the property as a city park or "greenspace" and plans for residential housing development in the surrounding area—EPA subsequently tasked Tetra Tech START to assist with additional targeted RSE activities. These activities included sampling environmental media for field screening and laboratory analysis of hazardous constituents to determine if a removal action would be warranted. The hazardous constituents to be sought in analysis were metals, VOCs, SVOCs, and selected explosive residues that included 2,6-dinitrotoluene (DNT), nitrobenzene, pentaerythritoltetranitrate (PETN), and 2,4,6-trinitrotoluene (TNT).

### **3.0 SITE ACTIVITIES**

A site reconnaissance was conducted by EPA and Tetra Tech START on April 1, 2005, and a QAPP was subsequently developed and approved by EPA in May 2005. Field activities were conducted by EPA and START in two phases. The first phase was conducted from May 16 through 19, 2005, with follow-up sampling activities conducted from October 31 to November 3, 2005, as summarized in the following sections of this report.

#### **3.1 GENERAL SITE RECONNAISSANCE OBSERVATIONS**

General observations of site conditions recorded by START during the RSE are described as follows. Six open sewage treatment lagoons/ponds containing water remain on site (see Appendix A, Figure 2), including the following:

- Two ponds at the northwest corner of the site near the entrance gate that are identified as the North Intake Area Pond and the South Entrance Gate Area Pond (a.k.a., Sewage Disposal Pond)
- The concrete-lined former Trickling Filter Unit
- The Equalization Lagoon (a.k.a., Oil Skimming Pond)
- Two larger lagoons identified as the North and South Sedimentation Ponds.

Green-stained soils/lagoon sediments were observed inside the south perimeter of the Equalization Lagoon near a concrete standpipe. Also, black, oily sediment with a strong petroleum odor was collected from the Equalization Lagoon at a depth of 2 feet below the bottom of the lagoon.



Other structures located on the sewage treatment lagoon portion of the site included a dilapidated barn, which was presumably the control facility for the former treatment plant; a number of interconnected pipes, concrete conduits, and brick-lined flume structures between the lagoons; and a sump pit in a drainage ditch leading to Saylor Creek. In addition, a large area of "Soil Waste Piles" was located northwest of the Equalization Lagoon. The origin of these Soil Waste Piles is unknown, but the piles have also been referred to as "Chromium Waste Piles" during other site investigations.

In the landfill portion of the site, scrap metal pieces, pipes, concrete demolition materials, and other general debris were scattered over much of the area. A grayish/green powder, which appeared to be some type of plating sludge material, was observed sloughing from the east hillside ("toe") of the landfill area.

Other noteworthy findings inside the perimeter fence of the landfill area included approximately 20 55-gallon drums of roofing tar or mastic in deteriorating condition that had leaked onto the soil surface. This material had solidified, preventing START from collecting a representative sample for field screening or laboratory analysis. However, speculation was that this material would not likely meet any criteria for a characteristic hazardous waste and could probably be disposed of as non-hazardous construction debris. Also, a 1-gallon container of pentachlorophenol (Penta) wood preservative was found on the site and overpacked into a 5-gallon plastic bucket, which was placed inside the barn for temporary storage pending proper disposal arrangements.

### 3.2 SOIL SAMPLING

Soil sampling was conducted at 13 borehole locations specified in the QAPP, including a systematic grid covering most of the former landfill area, selected locations in the lagoon area, and an off-site background location. During the sampling, two additional locations were added, for a total of 15 soil sampling locations (see Appendix A, Figure 3). Also, the background sample was relocated to a city park (Westside Park) approximately 1 mile north of the site.

Each borehole sample was collected using a Geoprobe® with a Macro-Core® soil sampler fitted with a disposable polyvinyl chloride (PVC) liner. At each borehole, a sample was collected from the ground surface to 2 feet below ground surface (bgs). The boring was then advanced to the soil-groundwater interface, and an additional soil sample was collected 2 to 4 feet above the water table, or from an interval based on field screening results obtained with a photoionization detector (PID) and/or x-ray fluorescence

(XRF) analyzer, or by the best professional judgment of the field team if field screening failed to identify any potentially impacted zones. At a number of locations, refusal was encountered where the core sampler could not be advanced further into the soil column due to obstruction prior to reaching the water table. In these cases, soil samples were obtained immediately above the depth of refusal.

The soil cores were sampled following EPA Method 5035 guidelines for VOCs. The remaining soil was then removed from the PVC liner and placed in a disposable aluminum pie pan for homogenization and then transferred to three 8-ounce jars. These containers were submitted for analyses of SVOCs, metals, and selected explosive residues (2,6-DNT, nitrobenzene, PETN, and 2,4,6-TNT). A sample documentation field sheet was completed for each sample. All samples were stored in coolers with ice at temperatures at or below 4 degrees Celsius (° C) prior to submittal to the EPA Region 7 laboratory. A summary of the soil samples is in Table 1.

**TABLE 1  
SUMMARY OF SOIL SAMPLES COLLECTED IN MAY 2005  
DES MOINES (ex) ORDNANCE PLANT SITE  
ANKENY, IOWA**

EPA Sample # and ID	Sample Depth	Comments and Field Screening Results	Geographic Coordinates
2617-1, BH-12-01 2617-2, BH-12-02	0-2 feet bgs 10-12 feet bgs		41° 42' 33.3" N lat 93° 37' 35.0" W long
2617-3, BH-11-01 2617-4, BH-11-02	0-2 feet bgs 6-8 feet bgs		41° 42' 32.6" N lat 93° 37' 29.7" W long
2617-5, BH-10-01 2617-6, BH-10-02	0-2 feet bgs 5-7 feet bgs		41° 42' 34.0" N lat 93° 37' 27.4" W long
2617-7, BH-09-01 2617-8, BH-09-02	0-2 feet bgs 9-11 feet bgs		41° 42' 32.7" N lat 93° 37' 28.5" W long
2617-9, BH-08-01 2617-10, BH-08-02	0-2 feet bgs 7-9 feet bgs		41° 42' 31.1" N lat 93° 37' 29.7" W long
2617-11, BH-06-01 2617-12, BH-06-02	0-2 feet bgs 7-9 feet bgs	PID-15 ppm	41° 42' 31.0" N lat 93° 37' 27.3" W long
2617-13, BH-05-01 2617-14, BH-05-02	0-2 feet bgs 3-5 feet bgs		41° 42' 29.7" N lat 93° 37' 27.8" W long
2617-15, BH-07-01 2617-16, BH-07-02	0-2 feet bgs 4-6 feet bgs	Pb-1,999 mg/kg, Cr-508 mg/kg Pb-2,049 mg/kg, Cr-446 mg/kg	41° 42' 29.5" N lat 93° 37' 31.0" W long
2617-17, BH-04-01 2617-18, BH-04-02	0-2 feet bgs 6-8 feet bgs	Pb-1,551 mg/kg, Cr-298 mg/kg	41° 42' 29.2" N lat 93° 37' 29.0" W long
2617-19, BH-03-01 2617-20, BH-03-02	0-2 feet bgs 9-11 feet bgs	Strong sewage smell	41° 42' 29.7" N lat 93° 37' 25.5" W long

**TABLE 1 (Continued)**  
**SUMMARY OF SOIL SAMPLES COLLECTED IN MAY 2005**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

EPA Sample # and ID	Sample Depth	Comments and Field Screening Results*	Geographic Coordinates
2617-21, BH-01-01	0-2 feet bgs		41° 42' 27.7" N lat
2617-22, BH-01-02	8-12 feet bgs		93° 37' 26.6" W long
2617-23, BH-13-01	0-2 feet bgs		41° 42' 33.9" N lat
2617-24, BH-13-02	6-8 feet bgs	Pb-474 mg/kg, Cr-372 mg/kg	93° 37' 30.9" W long
2617-25, BH-02-01	0-2 feet bgs		41° 42' 28.6" N lat
2617-26, BH-02-02	9-11 feet bgs		93° 37' 25.9" W long
2617-27, BH-14-01	0-2 feet bgs		41° 42' 34.4" N lat
2617-28, BH-14-02	6-8 feet bgs		93° 37' 28.7" W long
2617-35, BH-BG-01	0-2 feet bgs		41° 43' 36.0" N lat
2617-36, BH-BG-02	8-12 feet bgs	Background location	93° 37' 23.7" W long

Notes:

\* Field screening results were obtained using a PID and x-ray fluorescence (XRF) analyzer.

bgs Below ground surface  
 Cr Chromium  
 EPA United States Environmental Protection Agency  
 ID Identification  
 mg/kg Milligrams per kilogram  
 N lat North latitude  
 Pb Lead  
 PID Photoionization detector  
 ppm Parts per million  
 W long West longitude

### 3.3 GROUNDWATER SAMPLING

Groundwater samples were collected from three temporary wells installed with a Geoprobe<sup>®</sup>, four existing monitoring wells, and two existing piezometers at the site (see Appendix A, Figure 4), and from an existing off-site piezometer approximately 1 mile north of the site (background). The temporary Geoprobe<sup>®</sup> wells were placed in locations on the site where no existing monitoring wells or piezometers were located. The samples from these temporary wells were collected with a Geoprobe<sup>®</sup> Screen Point 15 sampling apparatus containing a disposable 4-foot-long PVC screen. At these locations, the screen was deployed below the water table, and a sample was collected through disposable polyethylene tubing with a peristaltic pump. Samples from the existing monitoring wells and piezometers were also collected with a peristaltic pump. According to the QAPP, the existing wells/piezometers were supposed to be purged

prior to sampling to remove an equivalent of three casing volumes of water and/or until water quality parameters had stabilized.

However, the groundwater recharge rate was so slow in the three piezometers and one temporary Geoprobe® well, samples were collected after purging only one volume at these locations (piezometers 6, 7, and 14; and temporary Geoprobe® well 14). In addition, the required sample volume for all of the requested analyses could not be obtained from piezometers 6 and 7 and temporary Geoprobe® well 14, as indicated in Table 2 below.

A sample documentation field sheet was completed for each groundwater sample. The samples were submitted to the EPA Region 7 laboratory for analyses of low detection limit (LDL) VOCs, SVOCs, total and dissolved metals, and explosive residues. Samples submitted for analysis of dissolved metals were filtered in the field. Water samples for analyses of both dissolved and total metals were collected in 1-liter containers and preserved with nitric acid (HNO<sub>3</sub>) to a pH <2. Water samples submitted for analysis of VOCs were collected in four 40-milliliter vials and preserved with hydrochloric acid (HCl) to a pH <2. Water samples submitted for analysis of SVOCs and explosive residues (2,6-DNT, nitrobenzene, PETN, and 2,4,6-TNT) were collected in 128-ounce amber glass jugs (two per sample). All samples were stored in coolers maintained at or below 4° C pending submittal to the EPA Region 7 laboratory. A summary of all the groundwater samples is in Table 2.

**TABLE 2  
SUMMARY OF GROUNDWATER SAMPLES  
DES MOINES (ex) ORDNANCE PLANT SITE  
ANKENY, IOWA**

EPA Sample # and ID	Sample Description	Comments	Geographic Coordinates
2617-101, GW-13-01	Temporary Geoprobe® Well 13		41° 42' 33.9" N lat 93° 37' 30.9" W long
2617-102, PZ-07-01	Piezometer 7	No samples collected for analysis of SVOCs or explosive residues due to slow recharge of well	41° 42' 31.0" N lat 93° 37' 30.0" W long
2617-103, GW-14-01	Temporary Geoprobe® Well 14	No samples collected for analysis of SVOCs or explosive residues due to slow recharge of well	41° 42' 34.4" N lat 93° 37' 28.7" W long

**TABLE 2 (Continued)**  
**SUMMARY OF GROUNDWATER SAMPLES**  
**DES MOINES (EX) ORDANCE PLANT SITE**  
**ANKENY, IOWA**

EPA Sample # and ID	Sample Description	Comments	Geographic Coordinates
2617-104, GW-15-01	Temporary Geoprobe® Well 15	Sample had petroleum odor	41° 42' 28.5" N lat 93° 37' 24.9" W long
2617-105, PZ-06-01	Piezometer 6	Sampled only for analysis of total metals due to slow recharge of well	41° 42' 35.1" N lat 93° 37' 37.3" W long
2617-106, GW-PZ-14	Piezometer 14 (background, in Westside Park)		41° 43' 36.0" N lat 93° 37' 23.7" W long
2617-107, GW-MW-02	Monitoring Well MW-02	Sample container for analysis of SVOCs was broken (no analysis conducted)	41° 42' 33.1" N lat 93° 37' 23.7" W long
2617-108, GW-MW-01	Monitoring Well MW-01		41° 42' 25.3" N lat 93° 37' 27.4" W long
2617-109, GW-MW-04	Monitoring Well MW-04		41° 42' 25.8" N lat 93° 37' 30.6" W long
2617-118, GW-MW-05	Monitoring Well MW-05		41° 42' 28.4" N lat 93° 37' 33.1" W long

Notes:

EPA United States Environmental Protection Agency  
 ID Identification  
 N lat North latitude  
 SVOC Semivolatile organic compound  
 W long West longitude

**3.4 SURFACE WATER AND SEDIMENT SAMPLING**

Collocated surface water and sediment samples were collected from five sewage lagoons/ponds and three locations along Saylor Creek, as shown on Figures 4 and 5 in Appendix A, and as summarized in Table 3. At each location, a surface water sample was collected prior to collection of the sediment sample.

Surface water samples were submitted to the EPA Region 7 laboratory for analyses of LDL VOCs, SVOCs, total metals, and explosive residues. Water samples submitted for analysis of LDL VOCs were collected by immersing the sample containers (four 40-milliliter vials) directly into the water. Those samples were preserved with HCl to a pH <2. Water samples submitted for analyses of SVOCs and explosive residues were collected in 128-ounce amber glass jugs (two per sample). Water samples for

analysis of metals were collected in 1-liter containers and preserved with HNO<sub>3</sub> to a pH <2. Sediment samples were collected with a hand auger or similar apparatus from the top 6 inches of sediment. Grab samples were collected for VOCs and placed in four 40-milliliter glass vials. The remaining sediment was placed in a disposable aluminum pie pan for homogenization, and then transferred to three 8-ounce jars. These containers were submitted for analyses of SVOCs, metals, and explosive residues.

A sample documentation field sheet was completed for each surface water and sediment sample. All surface water and sediment samples were stored in coolers maintained at or below 4° C pending submittal to the EPA Region 7 laboratory.

**TABLE 3  
SUMMARY OF SURFACE WATER AND SEDIMENT SAMPLES  
DES MOINES (ex) ORDNANCE PLANT SITE  
ANKENY, IOWA**

EPA Sample # and ID	Description of Sample Location	Field Screening Results*	Geographic Coordinates
2617-29, SED-US-01 2617-114, SW-US-01	Saylor Creek upstream from site		41° 42' 36.5" N lat 93° 37' 43.9" W long
2617-30, SED-MS-01 2617-113, SW-MS-01	Saylor Creek at PPE		41° 42' 28.0" N lat 93° 37' 31.3" W long
2617-31, SED-DS-01 2617-112, SW-DS-01	Saylor Creek downstream from site		41° 42' 23.9" N lat 93° 37' 24.0" W long
2617-32, SED-02 2617-111, SW-02	North Sedimentation Lagoon		41° 42' 33.0" N lat 93° 37' 31.7" W long
2617-33, SED-03 2617-115, SW-03	South Sedimentation Lagoon		41° 42' 31.0" N lat 93° 37' 31.1" W long
2617-34, SED-01 2617-110, SW-01	Equalization Lagoon (Oil Skimming Pond)	Pb-33,900 mg/kg, Cr-26,400 mg/kg	41° 42' 34.2" N lat 93° 37' 31.3" W long
2617-37, SED-04 2617-116, SW-04	South entrance gate to Sewage Disposal Pond		41° 42' 35.4" N lat 93° 37' 39.9" W long
2617-38, SED-05 2617-117, SW-05	North Intake Area Pond		41° 42' 35.7" N lat 93° 37' 38.6" W long

Notes:

\* Field screening results were obtained using an x-ray fluorescence (XRF) analyzer.

Cr	Chromium	N lat	North latitude
EPA	United States Environmental Protection Agency	Pb	Lead
ID	Identification	PPE	Probable point of entry
mg/kg	Milligrams per kilogram	W long	West longitude

#### 4.0 FOLLOWUP SITE ACTIVITIES

Three areas with elevated concentrations of metals in surface soil/sediment were identified on site by XRF field screening and/or laboratory confirmation analysis during the initial RSE sampling phase. These areas included: (1) perimeter sediments collected from the Equalization Lagoon impoundment, where chromium and lead were detected by laboratory analysis at concentrations of 27,500 milligrams per kilogram (mg/kg) and 26,900 mg/kg, respectively; (2) influent ditch sediments near the North Intake Area Pond and piles of soil west of the Equalization Lagoon, where field screening with an XRF analyzer indicated concentrations of chromium and lead as high as 1,782 mg/kg and 2,088 mg/kg, respectively, and (3) surface soils near sampling point BH-06 in the landfill area, where slightly elevated levels of chromium and lead were indicated by laboratory analysis.

Based on this information, an addendum to the QAPP was drafted in September 2005 that outlined additional sampling activities to further determine the areal extent of metals contamination (primarily lead and chromium) in soils and lagoon sediments at the three aforementioned locations identified during the initial RSE sampling in May 2005. The follow-up sampling activities were conducted by EPA and START from October 31 through November 3, 2005.

#### 4.1 FOLLOWUP SAMPLING OF SURFACE SOIL AND LAGOON SEDIMENT

To further assess the areal extent of metals contamination across the three areas identified above, sampling grids with 50-foot node spacings were established in the northwest corner of the site between the North Intake Pond and the Equalization Lagoon, and near sampling point BH-06. Also, a grid system with 25-foot node spacings was established in and around the perimeter of the Equalization Lagoon to assess the contamination in the pond sediments. Specifically, the three gridded areas encompassed the following: (1) the northwest portion of the site between the Equalization Lagoon and the North Intake Pond, roughly bounded by a gravel driveway (approximately 1,000 feet by 300 feet, consisting of 71 grid cells); (2) within 100 feet in each cardinal direction of sampling point BH-06 (approximately 200 feet by 200 feet, consisting of 16 grid cells); and (3) inside and around the Equalization Lagoon (approximately 200 feet by 200 feet, consisting of 64 grid cells). See Appendix A, Figure 6 for a depiction of the sampling grids.

A nine-aliquot composite sample of surface soils was collected from each of the 50-foot cells. Two cells were omitted from sampling because they fell almost entirely within the perimeter of one of the lagoons (i.e. cells 5 and 6). Also, a single composite sample was collected from cells 55 and 56, since much of

these two cells also fell within the perimeter of a lagoon. Sixteen 50-foot cells (cells 151 to 166) were added at the southeast corner of the site ("toe" area of the landfill) due to the discovery of a grayish/green powder, which appeared to be some type of plating sludge material, sloughing from the east hillside of the landfill area. This material yielded elevated XRF readings for metals and was observed at a number of other locations along the length of the east "toe" area of the landfill.

Nine-*aliquot* composite samples were also collected from most of the 25-foot sampling cells near the Equalization Lagoon, except for cells located within the lagoon. The lagoon itself was divided into four quadrants (NE, NW, SE, and SW), and one multi-*aliquot* sediment sample was collected from each quadrant. Each quadrant encompassed approximately three or four of the sampling cells.

All of these samples were air dried and processed with a number 10 sieve prior to field screening for metals with an XRF analyzer. Approximately 15 percent of the samples (26 samples) were selected for laboratory confirmation analysis of total metals at the EPA Region 7 laboratory in Kansas City, Kansas.

#### **4.2 FOLLOWUP SAMPLING OF SUBSURFACE SEDIMENT**

Follow-up sampling also included collection of subsurface sediment samples from the former wastewater treatment plant lagoons to a depth of 2 feet below the sediment surface. The previous sampling of the lagoon sediments had been limited to a depth of 6 inches. These deeper samples were collected using either a soil auger or "slambar" apparatus. A portion of each of these samples was oven dried and sieved prior to XRF screening for metals. Remaining portions of some of the samples were packaged for shipment to the EPA Region 7 laboratory for analysis of total metals, leachable metals according to the Toxicity Characteristic Leaching Procedure (TCLP), and/or polynuclear aromatic hydrocarbons (PAH).

A summary of XRF results obtained during these follow-up activities is included as Appendix B to this report. For this second phase of RSE sampling, 36 samples were selected for laboratory confirmation analysis of total metals, six were subjected to TCLP analysis of metals, and 12 were analyzed for PAHs. The samples for laboratory analysis were placed in a cooler maintained at or below 4° C for shipment to the laboratory. All chain-of-custody requirements addressed in the original QAPP were followed for collection and shipment of these samples. A discussion of the XRF screening results and laboratory data is included in the following sections of this report.



## 5.0 ANALYTICAL RESULTS

The complete data transmittal for the initial sampling activity conducted in May 2005 (Analytical Services Request [ASR] #2617), including sample field sheets and chain-of-custody records, is included as Appendix C to this report. The laboratory data package for the samples submitted under ASR #2786 for the follow-up activity is included as Appendix D. Appendix E includes the XRF results compared to corresponding laboratory data for samples analyzed for total metals. The following sections of this report summarize and discuss the laboratory results and XRF screening data generated during this RSE.

Analytical results for soils and sediments were compared to U.S. EPA Region 9 Preliminary Remediation Goals (PRG) for residential soil and Iowa Statewide Standards for Soil. Groundwater results were compared to EPA Maximum Contaminant Levels (MCL) and Secondary Drinking Water Regulations (SDWR). Surface water sample results were compared to National Water Quality Criteria (NWQC) standards recommended by EPA. Only the data exceeding these benchmark levels are discussed in the following sections.

### 5.1 ANALYTICAL RESULTS OF SOIL SAMPLES COLLECTED IN MAY 2005

#### Metals

Table 4 summarizes the XRF screening results for metals and corresponding laboratory confirmation data generated for the May 2005 sampling effort. Only data exceeding site screening benchmark levels (whether XRF results, lab data, or both) are presented in Table 4 with the exception of arsenic, which was detected in some samples at low concentrations (above site screening benchmark levels) believed to represent background levels. Consequently, only significantly elevated concentrations of arsenic are included in Table 4. Three of the initial soil samples collected from depths of 0 to 2 feet bgs contained laboratory concentrations of chromium and lead exceeding EPA Region 9 PRGs (210 mg/kg for total chromium and 400 mg/kg for lead). These included: sample 2617-11 (BH-06), with a total chromium concentration of 621 mg/kg and lead at 516 mg/kg; sample 2617-23 (BH-13), with an estimated (J-coded) total chromium concentration of 267 mg/kg and lead at 469 mg/kg; and sample 2617-19 (BH-03), with a total chromium concentration of 234 mg/kg.

Deeper soil samples from three borings (BH-01, BH-04, and BH-07) also contained concentrations of metals (primarily lead) exceeding EPA Region 9 PRGs. The remaining samples reported in Table 4 yielded elevated XRF readings (above EPA Region 9 PRGs) that were not verified by laboratory analysis.

In situ XRF screening of soil from the wastewater influent ditch at the northwest corner of the site (near the North Intake Pond) and of soil waste piles west of the Equalization Lagoon indicated chromium and lead concentrations in the 1,000 to 2,000 mg/kg range. However, these areas were not sampled for laboratory confirmation analysis during the initial RSE in May 2005. They were later targeted for additional sampling during the follow-up RSE sampling activities discussed in following sections of this report.

**TABLE 4**  
**SUMMARY OF METALS IN SOIL SAMPLES COLLECTED IN MAY 2005**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

EPA Sample# & Borehole ID	Sample Depth	XRF Screening Results (mg/kg)	Laboratory Concentrations (mg/kg)
2617-11, BH-06	0-2 feet bgs	None at levels of concern	Cr - 621 Pb - 516
2617-15, BH-07	0-2 feet bgs	Cd - 123 Cr - 508 Pb - 1,999	None at levels of concern
2617-16, BH-07	4-6 feet bgs	Cr - 446 Pb - 2,049	As - 37 Cr - 252 Pb - 1,990
2617-17, BH-07	0-2 feet bgs	Cd - 193	None at levels of concern
2617-18, BH-04	6-8 feet bgs	Cr - 298 Pb - 1,551	Cr - 212 Pb - 1,430
2617-19, BH-03	0-2 feet bgs	Cd - 97 Cr - 245	Cr - 234
2617-22, BH-01	8-12 feet bgs	None at levels of concern	Pb - 2,030
2617-23, BH-13	0-2 feet bgs	As - 85 Cd - 100 Cr - 372 Pb - 474	Cr - 267 J Pb - 469
2617-24, BH-13	6-8 feet bgs	Cd - 117	None at levels of concern
2617-25, BH-02	0-2 feet bgs	Cd - 137	None at levels of concern
2617-26, BH-02	9-11 feet bgs	Cd - 65	None at levels of concern
2617-28, BH-14	6-8 feet bgs	Cd - 77	None at levels of concern
2617-35, BH-BG	0-2 feet bgs	Cd - 123	None at levels of concern
None	Site Influent Ditch	Cr - 1,782 Pb - 2,088	In situ XRF screening only
None	Soil Piles west of Equalization Lagoon	Cd - 114 Cr - 1,403 Pb - 1,684	In situ XRF screening only

**TABLE 4 (Continued)**  
**SUMMARY OF METALS IN SOIL SAMPLES COLLECTED IN MAY 2005**  
**DES MOINES (ex) ORDANCE PLANT SITE**  
**ANKENY, IOWA**

Notes:

Only field screening results and laboratory data above EPA Region 9 Preliminary Remediation Goals (PRG) for residential soil are included in this table, with the exception of arsenic, for which only significantly elevated concentrations above background are listed.

EPA Region 9 Residential Soil PRGs for metals of interest: As=0.39 mg/kg, Cd=37 mg/kg, Cr=210 mg/kg, Pb=400 mg/kg.

As	Arsenic
bgs	Below ground surface
Cd	Cadmium
Cr	Chromium
EPA	United States Environmental Protection Agency
ID	Identification
J	Estimated value
mg/kg	Milligrams per kilogram
Pb	Lead
XRF	X-ray fluorescence

**VOCs and SVOCs**

Refer to Table 5 below for a summary of VOCs and SVOCs detected in the May 2005 soil samples above their respective EPA Region 9 PRGs for residential soil. Benzo-a-pyrene was detected in one soil sample (sample 2617-7 [BH-09]) at 0.42 mg/kg, above its EPA Region 9 PRG of 0.21 mg/kg. Another sample (sample 2617-16 [BH-07]) contained concentrations of benzo-a-anthracene, benzo-b-fluoranthene, and trichloroethene above their respective EPA Region 9 PRGs. None of the other soil samples collected in May 2005 contained any VOCs or SVOCs at validated concentrations above their respective EPA Region 9 PRGs for residential soils.

**TABLE 5**  
**SUMMARY OF VOCs AND SVOCs IN SOIL SAMPLES COLLECTED IN MAY 2005**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

EPA Sample # & Borehole ID	Sample Depth	Laboratory Concentrations (mg/kg)
2617-7, BH-09	0-2 feet bgs	Benzo-a-pyrene – 0.42
2617-16, BH-07	4-6 feet bgs	Benzo-a-anthracene – 4.2 Benzo-b-fluoranthene – 5.6 Trichloroethene – 0.56 J

Notes:

Only laboratory results above EPA Region 9 PRGs for residential soil are included in this table.

EPA Region 9 Residential Soil PRGs for SVOCs of interest: benzo-a-pyrene=0.21 mg/kg, benzo-a-anthracene=2.1 mg/kg, benzo-b-fluoranthene=5.6 mg/kg.

EPA Region 9 Residential Soil PRGs for VOCs of interest: trichloroethene=0.11 mg/kg.

- bgs Below ground surface
- EPA United States Environmental Protection Agency
- ID Identification
- J Estimated value
- mg/kg Milligrams per kilogram
- PRG Preliminary Remediation Goal
- SVOC Semi-volatile organic compound
- VOC Volatile organic compound

**Explosive Residues**

All soil samples analyzed for explosive residues (2,6-DNT, nitrobenzene, PETN, and 2,4,6-TNT) were non-detect for all compounds of concern.

**5.2 ANALYTICAL RESULTS OF GROUNDWATER SAMPLES COLLECTED IN MAY 2005**

**Metals**

Six groundwater samples collected from various locations on and around the site perimeter contained concentrations of metals above EPA MCLs and SDWRs. However, it should be noted that groundwater in the site vicinity is not used for drinking water. Table 6 summarizes these concentrations compared to the benchmark levels.

**TABLE 6**  
**SUMMARY OF METALS IN GROUNDWATER SAMPLES**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

EPA Sample # & ID	Sample Description	Compounds above MCLs or SDWRs (mg/L)
2617-101, GW-13-01	Temporary Geoprobe® Well 13, outside south perimeter of Equalization Lagoon at 9 feet bgs	Al – 27.3 As – 0.0932 Fe – 44.9 Mn – 1.63 Se – 0.141
2617-102, PZ-07-01	Piezometer 7, at 15 feet bgs	Fe – 8.85 Mn – 1.11
2617-103, GW-14-01	Temporary Geoprobe® Well 14, at former Grease Lagoon Area at 13-19 feet bgs	Al – 224 As – 0.728 Ba – 3.63 Cd – 0.0076 Cr – 1.1 Cu – 1.36 Fe – 377 Pb – 1.18 Mn – 13.2 Se – 1.02
2617-104, GW-15-01	Temporary Geoprobe® Well 15, at southeast edge of landfill area at 10-20 feet bgs	Al – 15.5 As – 0.048 Fe – 45.6 Mn – 1.25 Se – 0.147
2617-108, GW-MW-01	Monitoring well MW-01, at 51 feet bgs	Al – 1.84 As – 0.13 Fe – 3.76 Mn – 1.35
2617-118, GW-MW-05	Monitoring well MW-05, at 40 feet bgs	Al – 50.8 As – 0.3 Ba – 2.04 Fe – 107 Pb – 0.39 Mn – 2.71 Se – 0.306

Notes:

Only laboratory results above MCLs or SDWRs are included in this table.

MCLs for metals of interest (mg/L): As=0.01, Ba=2.0, Cd=0.005, Cr=0.1, Pb=0.015 (action level), and Se=0.05.

SDWRs for metals of interest (mg/L): Al=0.2, Cu=1.0, Fe=0.3, and Mn=0.05.

**TABLE 6 (Continued)**  
**SUMMARY OF METALS IN GROUNDWATER SAMPLES**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

Al	Aluminum
As	Arsenic
Ba	Barium
bgs	Below ground surface
Cd	Cadmium
Cr	Chromium
Cu	Copper
EPA	United States Environmental Protection Agency
Fe	Iron
ID	Identification
MCL	Maximum Contaminant Level
mg/L	Milligrams per liter
Mn	Manganese
Pb	Lead
SDWR	Secondary Drinking Water Regulation
Se	Selenium

#### **VOCs and SVOCs**

Benzene was the only VOC detected in any groundwater sample above a health-based benchmark. It was reported in sample 2617-104 at 0.010 milligrams per liter (mg/L), above its MCL of 0.005 mg/L. This sample was from temporary Geoprobe<sup>®</sup> well location GW-15 located on the southeast perimeter of the former landfill area on site. It should be noted that some of the groundwater samples submitted for SVOC analysis were analyzed past their 7-day holding time for extraction, and their results were coded to indicate estimated values. Also, the container for sample 2617-107, collected from monitoring well MW-02 for analysis of SVOCs, was broken.

#### **Explosive Residues**

All groundwater samples analyzed for explosive residues (2,6-DNT, nitrobenzene, PETN, and 2,4,6-TNT) were non-detect for all compounds of concern.

### 5.3 ANALYTICAL RESULTS OF SURFACE WATER AND SEDIMENT SAMPLES COLLECTED IN MAY 2005

#### *Surface Water Samples*

##### **Metals**

Three of the surface water samples (location SW-01, sample 2617-110; location SW-04, sample 2617-116; and location SW-05, sample 2617-117) were found to contain concentrations of metals above their respective NWQC Criteria Maximum Concentrations (CMC). The CMC is an estimate of the highest concentration of a contaminant in surface water to which an aquatic community can be exposed briefly without resulting in an unacceptable effect. In particular, lead and zinc were the metals determined to exceed their respective NWQC CMCs. Samples 2617-110 and 2617-116 contained lead at 0.0776 mg/L and 0.0869 mg/L, respectively. Sample 2617-110 contained zinc at 3.770 mg/L. The NWQC CMC for lead and zinc are 0.065 mg/L and 0.120 mg/L, respectively.

##### **VOCs and SVOCs**

None of the surface water samples contained any VOCs or SVOCs above benchmark levels. It should be noted that five of the surface water samples submitted for SVOC analysis were analyzed past their 7-day holding time prior to extraction, and no SVOC analysis of field duplicate sample 2617-115FD was conducted due to breakage of the sample container.

##### **Explosive Residues**

The surface water samples analyzed for explosive residues (2,6-DNT, nitrobenzene, PETN, and 2,4,6-TNT) were non-detect for all compounds of concern.

#### *Sediment Samples*

##### **Metals**

Elevated levels of chromium (27,500 mg/kg) and lead (26,900 mg/kg) were detected in the laboratory sample of sediment collected from the south perimeter of the Equalization Lagoon (location SED-01; sample 2617-34). This correlated well with XRF readings in that area. Elevated levels of arsenic were also indicated by the XRF; however, this was not confirmed by laboratory results (see Table 7). This

discrepancy was likely due to spectral interference caused by the elevated lead, resulting in erroneous arsenic readings with the XRF. Green-stained sediment was observed in this area, inside the south perimeter of the Equalization Lagoon near a concrete standpipe.

None of the other sediment samples contained concentrations of metals exceeding their respective EPA Region 9 PRGs for residential soil. Currently, no federal or state benchmarks for sediment samples have been established; however, for the purpose of this report, the sediment results were compared to EPA Region 9 PRGs for residential soil, to serve as a general indication of contamination, and because future residential development is planned where the lagoons are located.

**TABLE 7  
SUMMARY OF METALS IN SEDIMENT SAMPLES  
DES MOINES (ex) ORDNANCE PLANT SITE  
ANKENY, IOWA**

EPA Sample # & ID	Sample Description	XRF Screening Results (mg/kg)	Laboratory Concentrations (mg/kg)
2617-34, SED-01	Equalization Lagoon perimeter sediments	As - 4,585 Cr - 26,400 Cu - 39,000 Pb - 33,900	Cr - 27,500 Cu - 3,630 Pb - 26,900

Notes:

Only XRF screening results and laboratory data above EPA Region 9 PRGs for residential soil are included in this table, with the exception of arsenic, for which only significantly elevated concentrations above background are listed.

EPA Region 9 Residential Soil PRGs for metals of interest: As=0.39 mg/kg, Cr=210 mg/kg, Cu=3,100 mg/kg, Pb=400 mg/kg.

- As     Arsenic
- Cr     Chromium
- Cu     Copper
- EPA    United States Environmental Protection Agency
- ID     Identification
- mg/kg  Milligrams per kilogram
- Pb     Lead
- PRG    Preliminary Remediation Goal
- XRF    X-ray fluorescence

**VOCs and SVOCs**

None of the sediment samples contained any VOCs or SVOCs above their respective EPA Region 9 PRGs for residential soil.



## **Explosive Residues**

All sediment samples analyzed for explosive residues (2,6-DNT, nitrobenzene, PETN, and 2,4,6-TNT) were non-detect for all compounds of concern.

### **5.4 XRF SCREENING RESULTS AND ANALYTICAL DATA FOR FOLLOWUP SOIL AND SEDIMENT SAMPLES**

For follow-up activities conducted in the fall of 2005, potential areas of concern identified during the May 2005 sampling effort were gridded into 50- by 50-foot sampling cells, except in the vicinity of the Equalization Lagoon, where a tighter 25-foot grid was used to more thoroughly define the extent of metals contamination (see Appendix A, Figure 6). A new area of concern was also identified during this follow-up activity, where metal plating sludge or foundry sand was observed on the ground surface along the "toe" of the landfill at the southeast corner of the site. This dry, sludge-like, powdery material was observed scattered on the ground at a number of locations in this area. Sampling cells 151 to 166 were added here.

All soil samples collected for XRF screening during this follow-up effort were dried and processed with a number 10 sieve according to the QAPP. A total of 158 samples were screened with the XRF during this effort, and 36 of the samples were submitted for laboratory confirmation analysis of total metals. Six of the samples were also selected for analysis of TCLP metals, and twelve samples were also submitted for analysis of PAHs.

#### **Metals**

Concentrations of metals in the follow-up soil and sediment samples were compared to Iowa Statewide Standards for Soil, in addition to EPA Region 9 PRGs for residential soil, to identify contaminated areas where removal activities may be warranted. Table 8 lists the site screening action levels for the metals of interest. Primarily of concern were elevated levels of lead, chromium, and copper detected near the Equalization Lagoon. Arsenic also exceeded established standards in several locations.

**TABLE 8**  
**SITE SCREENING ACTION LEVELS FOR METALS IN SOIL/SEDIMENT SAMPLES**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

Metal	Iowa Statewide Standard (mg/kg)	EPA Region 9 PRG for Residential Soil (mg/kg)
Lead	400	400
Chromium	230	210
Copper	2,900	3,100
Arsenic	1.4	0.39

Notes:

EPA     United States Environmental Protection Agency  
mg/kg    Milligrams per kilogram  
PRG     Preliminary Remediation Goal

The complete data summary for the 158 follow-up soil and sediment samples is included in Appendix B of this report. Appendix D includes the associated laboratory results with the sample field sheets and chain-of-custody records for ASR #2786. Appendix E provides a table comparing XRF screening results to corresponding laboratory data for the follow-up sampling activity.

The following 29 sample cells exceeded site screening action levels in both the XRF readings and laboratory results: Cells 34, 36, 39, 45, 48, 68, 70, 73, 75, 77, 78, 82, 93, 94, 99, 101, 102, 106, 113, 115, 116, 135, 145, 148, 153, 157, 158, 160, and 161. The following 16 cells were indicated to exceed site screening action levels by the XRF readings alone: Cells 40, 44, 76, 95, 96, 100, 103, 104, 112, 114, 117, 124, 144, 147, 152, and 156. The following 10 cells were not sampled individually but were inferred to be contaminated based on their proximities to adjoining contaminated cells: Cells 46, 69, 71, 72, 79, 80, 81, 92, 97, and 105. These cells were all either in or around the Equalization Lagoon area. The remaining cells were indicated to be uncontaminated (containing contaminant concentrations below site screening levels) by XRF readings and/or laboratory analysis.

The XRF screening data were validated by comparison with corresponding laboratory data for 36 samples, and regression coefficients ( $r^2$ ) above 0.70 were obtained for lead ( $r^2 = 0.926$  for all 36 data pairs), chromium ( $r^2 = 0.7989$  for 12 data pairs), and copper ( $r^2 = 0.7596$  for 27 data pairs).

## TCLP Metals

Six of the samples with the highest concentrations of metals, as indicated by the XRF, were analyzed for TCLP metals. None of the results was found to exceed TCLP regulatory limits.

## PAHs

PAH compounds in the 12 samples submitted for analysis were intended to be compared to Iowa Statewide Standards for Soil and EPA Region 9 PRGs for residential soil. However, sample extracts for a number of the samples were viscous and therefore analyzed by a different protocol and/or required dilution, which contributed to elevated detection limits. Consequently, the detection limits achievable by the laboratory were higher than the concentrations of interest for a number of the PAH compounds listed below in Table 9. Therefore, it was uncertain whether these compounds were present in the samples at concentrations above levels of concern.

**TABLE 9**  
**SITE SCREENING ACTION LEVELS FOR PAHS IN SOIL/SEDIMENT SAMPLES**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

PAH Compound	Iowa Statewide Standard (mg/kg)	EPA Region 9 PRG for Residential Soil (mg/kg)
Acenaphthene	4,700	3,700
Acenaphthylene	Not Listed	Not Listed
Anthracene	Not Listed	22,000
Benzo(a)anthracene	2.9	0.62
Benzo(a)pyrene	0.29	0.062
Benzo(b)fluoranthene	2.9	0.62
Benzo(g,h,i)perylene	Not Listed	Not Listed
Benzo(k)fluoranthene	29	6.2
2-Chloronaphthalene (β)	6,300	4,900
Chrysene	290	62
Dibenz(ah)anthracene	0.29	620
Fluoranthene	3,100	2,300
Fluorene	3,100	2,700
Indeno(123-cd)pyrene	2.9	0.62
2-Methylnaphthalene	Not Listed	Not Listed
Naphthalene	1,600	56
Phenanthrene	Not Listed	Not Listed
Pyrene	2,300	2,300

**TABLE 9 (Continued)**  
**SITE SCREENING ACTION LEVELS FOR PAHS IN SOIL/SEDIMENT SAMPLES**  
**DES MOINES (ex) ORDNANCE PLANT SITE**  
**ANKENY, IOWA**

Notes:

EPA	United States Environmental Protection Agency
mg/kg	Milligrams per kilogram
PAH	Polycyclic aromatic hydrocarbon
PRG	Preliminary Remediation Goal

**6.0 SUMMARY**

A RSE was conducted by Tetra Tech START and EPA Region 7 personnel at the Des Moines (ex) Ordnance Plant Lagoon/Landfill Complex site in Ankeny, Iowa. RSE activities included sampling of environmental media, XRF field screening of soil and sediment samples, and laboratory analyses of soil, sediment, groundwater, and surface water samples. The RSE was conducted in two phases, during May 2005 and November 2005. Based on the results of the RSE, this site qualifies for removal action consideration per 40 CFR 300.415(b)(2). Specifically these conditions are:

- (i) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants
- (iv) High levels of hazardous substances or pollutants or contaminants in soils, largely at or near the surface, that may migrate
- (v) Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.

These conditions were primarily evidenced by site reconnaissance observations, XRF field screening of surface soils and lagoon sediments on site, and laboratory confirmation analyses of soil and sediment samples.

The analytical results indicated that contaminants of concern (primarily lead, chromium, and copper) have been released to surface soils and lagoon sediments at levels exceeding site screening action levels (EPA Region 9 PRGs and Iowa Statewide Standards for Soil). However, no samples submitted for analysis of TCLP metals yielded results that exceeded regulatory limits.

Six groundwater samples collected from various locations on and around the site perimeter also contained elevated concentrations of metals, as compared to EPA MCLs and SDWRs. However, groundwater in the site vicinity is not used for drinking water. In addition, surface water samples collected from lagoons/ponds at the site contained lead and zinc at concentrations that could impair aquatic life in those water bodies.

Other noteworthy items observed at the landfill area included approximately 20 55-gallon drums of roofing tar or mastic. The drums were in deteriorating condition, and several had ruptured, leaking their contents onto the surrounding surface soils. Although samples of this material could not be collected due to its solidified condition, speculation was that the material would not likely meet any criteria of a characteristic hazardous waste and could probably be disposed of as non-hazardous construction debris. Also, a 1-gallon container of Penta wood preservative was found on site; it was overpacked into a 5-gallon plastic bucket and placed inside the barn for temporary storage pending proper disposal arrangements.

#### **6.1 REMOVAL CONSIDERATIONS**

The DMOP site in Ankeny, Iowa, qualifies for a removal action per 40 CFR 300.415. See Appendix G (Superfund Removal Site Evaluation and Removal Preliminary Assessment Form) for information supporting this conclusion.

#### **6.2 PRE-REMEDIAL CONSIDERATIONS**

Pre-remedial considerations for the DMOP site have been previously addressed by a number of site investigations, including an Expanded Site Inspection (ESI) completed in March 2004 (B&V 2004). Based on findings from those investigations, additional assessment may be warranted to further evaluate the extent and impacts of contaminated environmental media (groundwater, surface water sediment, and soil) associated with the site.

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