

**REPORT
for
VARIOUS INVESTIGATIONS**

**NAVY AND MARINE CORPS
RESERVE CENTER
READING, PENNSYLVANIA**



**Naval Facilities Engineering Command
Mid-Atlantic**

Contract No. N62467-04-D-0055
Contract Task Order 490

AUGUST 2008



TETRA TECH

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VARIOUS INVESTIGATIONS

NAVY AND MARINE CORPS
RESERVE CENTER
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COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

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1.0 INTRODUCTION

Tetra Tech NUS, Inc. (Tetra Tech) has prepared this Report for Various Investigations at the Navy and Marine Corps Reserve Center (NMCRC) Reading, Pennsylvania. This Report was prepared under Contract Task Order No. 490 under Contract N62467-04-D-0055, Comprehensive Long-Term Environmental Action-Navy (CLEAN).

This Report addresses the sampling methodology and analytical results from four investigation areas at NMCRC Reading: the former location of an 8,000-gallon fuel oil underground storage tank (UST), the vehicle maintenance facility (Motor T Garage), the property boundary downgradient from a historical release of fuel oil on a neighboring property, and the former indoor rifle range. These investigations were conducted in accordance with applicable Pennsylvania Department of Environmental Protection (PADEP) guidelines and requirements.

1.1 GENERAL INFORMATION

In 2005, NMCRC Reading was designated for closure under the authority of the Defense Base Closure and Realignment Act (BRAC) of 1990, Public Law 101-510, as amended. BRAC legislation requires that the base closure be in full compliance with the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). An identification of uncontaminated property was performed at NMCRC Reading in accordance with CERCLA, as amended by the Community Environmental Response Facilitation Act (CERFA) (Tetra Tech, 2007). A visual site inspection of the property conducted as part of the CERFA investigation identified no releases to the environment or other undocumented environmental issues. Based on the findings of the report, the following four potential areas of concern were identified:

- Former location of an 8000-gallon fuel oil UST.
The tank was removed in 1994; however, there is no record that a site assessment was performed to document proper closure, as required by the Pennsylvania Department of Environmental Protection (PADEP).
- Former location of an indoor rifle range.
There is no record that decontamination or sampling was performed when the range was decommissioned.
- Motor T Garage (Vehicle maintenance facility).
Soils may have been impacted due to the facility operations.

- Potentially contaminated groundwater migrating onto the property from a UST release on a neighboring property.

A petroleum release was reported in 1989 from a UST on the hydraulically upgradient neighboring property at 600 Kenhorst Boulevard, a Pennsylvania State Police Barracks. There is no documentation of assessment or cleanup of the release. This release may have impacted groundwater beneath NMCRC Reading.

1.2 INVESTIGATION OBJECTIVES

Site investigations were proposed to address the data gaps identified at the four potential areas of concern. The specific objectives and proposed actions for each investigation were as follows:

Former UST Location - To perform a Site Assessment in accordance with the Pennsylvania Department of Environmental Protection (PADEP) Technical Guidance Document "Closure Requirements for Underground Storage Tank Systems" through the installation and sampling of soil borings.

Former Indoor Rifle Range - To determine if residual lead contamination is present at unacceptable concentrations through the collection of wipe samples.

Motor T Garage - To determine if a release of hazardous substances has occurred through the installation and sampling of soil borings.

Groundwater Investigation at the Western Property Boundary - To determine if on-site groundwater has been impacted by the UST release at 600 Kenhorst Boulevard through the installation and sampling of temporary well points.

Supporting documentation, attached as appendices to this investigation report, include copies of soil boring logs, sample log sheets, photographs of sample locations, and laboratory analytical data. Maps are provided that show the locations of all soil and groundwater samples and the analytical results, including any exceedances of the relevant regulatory screening criteria.

1.3 REPORT ORGANIZATION

Section 1.0 presents a brief overview of the project and the project objective. Section 2.0 summarizes the historical information available for the site. Section 3.0 presents a description of the field

investigation, as scoped in the Work Plan for Various Investigations, Navy and Marine Corps reserve Center, Reading Pennsylvania (Tetra Tech, December 2007). Section 4.0 discusses the findings of the investigation. Section 5.0 presents a summary of the investigation findings.

2.0 BACKGROUND INFORMATION

2.1 LOCATION

NMCRC Reading is located at 615 Kenhorst Boulevard in Reading, Berks County, Pennsylvania. The site can be found on the United States Geological Survey (U.S.G.S.) Reading, Pennsylvania quadrangle, 7.5 minute series topographic map (Figure 2-1).

Figure 2-2 shows the locations of the four areas of investigation. The former location of the 8,000-gallon UST is in the courtyard formed by Building 1, in the southwestern quadrant of the facility. The former location of the indoor rifle range is in the southeastern portion of Building 1. The Motor T garage is located in the southeastern quadrant of the facility. The neighboring UST release occurred at 600 Kenhorst Boulevard, which is immediately west of the facility, across Kenhorst Boulevard.

2.2 SITE HISTORY

Prior to the Navy's acquisition of the property in 1956, it was developed for residential use. A Sanborn Fire Insurance Map from 1950 shows a one-story dwelling and two small sheds on the property. A Sanborn Map from 1963 shows most of the present structures were in place, including the main office building, the Motor Repair Garage, the Grounds Keeping Storage Garage, and the Paint Shed. The Motor T Garage is labeled as a "Gun Shed". The southeastern interior of Building 1 is labeled as a "Drill Hall" and a "Rifle Range", including an interior ammunition storage room (Tetra Tech, 2007).

There are limited records concerning the history and disposition of the 8000-gallon heating oil UST. A 1957 Layout Plan for the lower level of Building 1 shows an 8,000-gallon fuel oil UST in the courtyard east of Building 1 with a fill cap located directly over the tank. The UST was removed in October 1994 because the facility was converted to natural gas heat in approximately 1993. There is no information concerning the condition of the tank at the time of removal or whether the soils were impacted by petroleum (Tetra Tech, 2007).

The exact dates of operation of the Rifle Range are not known. A 1957 Layout Plan for the lower level of Building 1 shows a rifle range in the southeast corridor of the building, with sand and 5-inch gravel fill in the walls. The range is also indicated on a 1963 Sanborn Fire Insurance Map. It is not known what steps were taken to decontaminate the area upon closure of the range (Tetra Tech, 2007).

On August 5, 1989, a petroleum release was reported at the State Police property located at 600 Kenhorst Boulevard, which is across the street to the west of NMCRC Reading. PADEP does not have any reports that document assessment or cleanup of this release. The Director of Facilities of the Pennsylvania Facilities Management Division was interviewed as part of the CERFA investigation to obtain additional information about the release. He stated that the release involved No. 2 fuel oil and that the UST was removed in 1989. He also stated that the impacted soils were excavated and removed down to bedrock and that groundwater was not impacted. Documentation of the UST removal and cleanup was requested by Tetra Tech during the CERFA Investigation, but was not received (Tetra Tech, 2007).

2.3 PHYSICAL SETTING

2.3.1 Surface Features

NMCRC Reading occupies about 7 acres and contains five buildings, three paved parking areas, paved roadways, and landscaped lawn areas (Figure 2-2). The buildings consist of a two-story brick administrative/office building (Building 1), a one-story brick shed (Building 2), a one-story vehicle maintenance garage (Building 3, "Motor T Garage"), a one story storage garage (Building 4), and a one-story warehouse style building (Building 8, "Howitzer Shed").

The property is bounded by Kenhorst Boulevard to the west, Pershing Boulevard to the south, residential properties to the north, and an apartment complex to the east. The elevation of the property is approximately 320 feet above mean sea level. The regional slope is to the east-northeast, towards the Schuylkill River.

The former UST location is in a paved courtyard that is used as a parking lot. It is bordered by Building 1 to the north, south, and west, and by a paved access road to the east. The courtyard area is flat, but the ground slopes to the east at its eastern (open) end.

The Motor T Garage is bordered by a large paved area to the northwest (in front of the building), a grassy slope to the southeast, a small grassy area and a paved road to the southwest, and a vegetated area to the northeast. The ground surface in the immediate vicinity of the Motor T Garage slopes to the northwest. At the eastern end of the garage building, on the paved area, are a portable hazardous materials storage trailer and temporary storage area for waste oil and used batteries (on wooden pallets).

The area of the facility nearest to the neighboring historical UST release at 600 Kenhorst Boulevard, the western property boundary, consists of a grass lawn with a concrete sidewalk.

The location of the former indoor rifle range is in the southeastern portion of Building 1. According to facility personnel, the area originally occupied by the rifle range probably consists of four smaller areas: the armory, the laser rifle range room, the fire direction control (FDC) room, and a hallway between the virtual rifle range and the FDC room (Figure 2-3).

2.3.2 Geology

The site is situated in the Great Valley Section of the Valley and Ridge Physiographic Province. Immediately underlying the site is the Cambrian age Buffalo Springs Formation. The Geologic Map of Northern Berks County describes this formation as consisting of interbedded light gray limestone and dolomite, often somewhat shaly. The thickness is probably between 500 feet and 1000 feet in the vicinity of the site (Pennsylvania Topographic and Geologic Survey, 1978).

The borings completed during the present investigation encountered bedrock at depths ranging from 4 feet to 28.5 feet below ground surface (bgs).

2.3.3 Soils

The Soil Survey of Berks County (United States Department of Agriculture, 1970) indicates that the property is underlain by Duffield and Hagerstown soils, undifferentiated, 8 to 15 percent slopes, severely eroded. This soil type has lost more than three-fourths of its original surface layer due to erosion. Duffield silt loam consists of deep, well-drained soil formed from material weathered from impure limestone. Hagerstown silt loam consists of deep, well-drained soil that formed from material weathered from relatively pure limestone. Because the site is located in an urbanized area, it is likely that development activities have disturbed the natural soil profile. The borings completed during the present investigation encountered silt with varying amounts of sand and clay. Fill consisting of gravel and silty clay was encountered in the former UST location.

2.3.4 Hydrogeology

The aquifer immediately underlying the site is the Buffalo Springs Formation. The median yield of nondomestic wells drilled in this unit is 60 gpm. About 25 percent of the wells yield greater than 200 gpm (Pennsylvania Topographic and Geologic Survey, 1978).

There are no permanent wells at NMCRC Reading. Four temporary overburden wells were installed along the western property boundary as part of the present investigation; all of these wells were dry. These wells were installed to the top of bedrock, which ranged from 22 feet to 23.5 feet bgs.

Based on area topography and the location of the Schuylkill River, the direction of regional groundwater flow is assumed to be to the east-northeast.

2.4 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Other than the CERFA Identification of Uncontaminated Property (TETRA TECH, 2007), there have been no environmental investigations performed at the facility. There are no records of soil sampling during the removal of the 8000 gallon UST or of sampling of indoor surfaces for lead in the former indoor rifle range.

2.5 APPLICABLE REGULATIONS

2.5.1 Pennsylvania Storage Tank Regulations

The Pennsylvania Department of Environmental Protection (PADEP) is the regulatory agency that has overall jurisdiction on tank (AST and UST) closures and spill response. Petroleum storage tanks are regulated by the Commonwealth of Pennsylvania under the Storage Tank and Spill Prevention Act (Act 32 of 1989, as amended, P.L. 169), Title 25 Pa. Code, Chapter 245, Sections 245.561-562. Closure requirements for underground tanks are outlined in PADEP Technical Document 253-4500-601, "Closure Requirements for Underground Storage Tank Systems" (effective August 1, 1996; revised April 1, 1998).

2.5.2 PADEP Cleanup Levels

On May 19, 1995 the Pennsylvania Land Recycling and Environmental Remediation Standards Act (Act 2) was signed into law. The law became effective on July 18, 1995 and established cleanup levels and liability protection for releases from storage tanks regulated under Act 32. As noted in Section 904(c) of Act 2, the environmental remediation standards established under Act 2 shall be used in corrective actions undertaken pursuant to the 1989 Storage Tank and Spill Prevention Act.

For the former UST location, the action levels specified in PADEP Technical Document 253-4500-601, "Closure Requirements for Underground Storage Tank Systems" were used to screen soil samples, and for the Motor T Garage, Medium Specific Concentrations (MSCs) for residential direct contact were used.

2.5.3 Federal Lead Dust Standards

The Toxic Substances Control Act (TSCA) Section 403 (January 5, 2001 Federal Register) presents the following residential clean-up standards for lead dust:

- 40 ug/sq. ft. on floors
- 250 ug/sq. ft. on interior window sills

Federal regulations require that a lead inspector/risk assessor recommend abatement, standard treatment, and other essential maintenance when the above lead dust levels in a residential or child-occupied facility are met or exceeded.

3.0 SITE INVESTIGATION ACTIVITIES

This section describes field investigation techniques, quality control, and data evaluation procedures that were utilized during the site investigations performed at NMCRC Reading. Enviroscan, Inc. was subcontracted to provide utility clearance services before any intrusive work was conducted. The utility clearance survey was conducted on January 23, 2008. The direct push investigation of the Motor T Garage and the western property boundary were conducted on January 24, 2008. The direct push investigation of the former UST location was conducted on February 21, 2008. Drilling services, including temporary well installation, were provided by Environmental Probing Investigations, Inc. All drilling was done using a truck mounted direct push drill rig. Field activities were conducted in accordance with procedures outlined in the December 2007 Work Plan and health and safety procedures established in the site Health and Safety Plan (HASP).

3.1 FIELD INVESTIGATION

The subsections that follow detail the general procedures and methodologies employed during the implementation of the field program. Field tasks included: a utility survey, soil boring advancement for soil sample collection and temporary monitoring well installation, and wipe sample collection.

3.1.1 Utility Survey

On January 21, 2008, Enviroscan, Inc., under supervision of Tetra Tech, conducted a utility survey of the three proposed subsurface investigation areas: the former UST location, the Motor T Garage, and the western property boundary. This survey was done to supplement the Pennsylvania One Call notification, to identify any utilities installed and owned by the Navy that would not be covered by Pennsylvania One Call. The following equipment was used:

- Fisher TW-6 electromagnetic pipe and cable locator
- Fisher magnetic locator
- Radiodetection Cable Avoidance Tool and Genny pipe and cable locator
- Radiodetection RD4000 Multi-Frequency pipe and cable tracer
- GSSI SIR-2000 ground penetrating radar (GPR) system

All metallic and non-metallic utilities within the investigation areas were located and marked out with paint.

The report of the findings is included in Appendix E.

At the former UST location, an attempt was made to locate the backfilled excavation area and any piping that may have been left in place following the tank removal. Two abandoned product lines and the tank vent line were located (see Figure 3-1). The product lines are visible in the boiler room, which is in the basement of Building 1 adjacent to the former UST location. The product lines extend underground from the boiler room, perpendicular to the southwest wall of the building, and terminate approximately 20 feet from the building. The depth of the lines could not be determined due to the weak instrument signal. The end of the vent line is visible on the exterior wall of Building 1 on the northern side of the courtyard. The vent line extends underground from this point at an oblique angle for approximately 45 feet and terminates. The attempt to locate the boundaries of the tank excavation using GPR was unsuccessful.

3.1.2 Direct Push Soil Borings

All soil borings were completed using the direct push drilling method. The direct push method consisted of driving hollow metal rods into the ground to a specified depth. The soil sample interval was contained within a 4-foot-long acetate sleeve that was removed from the rods and split open. Continuous soil samples were collected from the ground surface to the bottom of the boring for organic vapor screening with a photoionization detector (PID) and soil classification. In boreholes where temporary wells were installed, 3/4-inch diameter PVC screen and riser was inserted into the open boreholes.

A log of each boring was maintained by the field geologist. The logs describe the soil types encountered, depths of geologic contacts, water levels, sample depths, and other pertinent observations made during drilling, including the presence of fill material. The soil samples were described using the Unified Soil Classification System (U.S.C.S.). The borehole itself was periodically monitored for organic vapors, in accordance with the Health and Safety Plan.

Soil samples were collected by filling the sample containers directly from the acetate sleeve with a disposable trowel, except for that portion of the sample that was to be analyzed for volatile organic compounds. This sample was collected using the Encore® sampling device, following the manufacturer's instructions. Following the collection of each sample and placement into the appropriate sample jar, the samples were labeled and placed on ice for shipment to Analytical Laboratory Services, Inc., Middletown, PA. The direct-push sampling rods were decontaminated following each use according to the procedure described in the work plan.

All soil borings were field located by measuring from fixed points with a tape measure.

Former UST Location

The purpose of the investigation at the former UST location was to perform a Site Assessment in accordance with the PADEP Technical Guidance Document "Closure Requirements for Underground Storage Tank Systems," and to document the results of the investigation in the PADEP "Underground Storage Tank System Closure Report Form." Tetra Tech subcontracted Tank Compliance, Inc., of Shillington, PA, to provide a UST inspector with PADEP IUM certification to supervise the field investigation activities, review the sample results, and to complete the closure report form.

Five borings were drilled and sampled at the former UST location. The soil samples were analyzed for PADEP No. 2 Fuel Oil VOCs and SVOCs. The locations of the borings are shown on Figure 3-1. Table 3-1 summarizes the samples collected. The boring logs are included in Appendix A and the soil sample logs are included in Appendix B.

The boring locations were determined in the field in consultation with the UST inspector. The locations were based on the results of the utility survey, which showed the location of abandoned product lines, and on a historical blueprint drawing (date unknown) in the NMCRC Reading files. Since the product and vent line locations determined by the utility survey corresponded with their locations on the blueprint, the blueprint was used to determine the approximate former location of the tank, which is shown on Figure 3-1. The size of the tank as shown on the drawing is approximately 8 feet in diameter by approximately 22 feet long.

Two borings, UST-SB01 and UST-SB03, were completed directly within the former UST location (tank grave). These borings encountered a concrete slab and boring refusal at a depth of 12 feet bgs. This slab is assumed to be the anchor slab for the former UST. The material above the concrete slab consisted of a mixture of silt, clay and gravel, which is interpreted to be the backfill material used following the tank removal. Immediately above the slab was a distinct 0.5 foot to 1 foot layer of relatively undisturbed light brown to brown silty clay, which is interpreted to be material that was possibly in-place during the tank lifetime. No PID readings and no visual evidence of waste or staining was observed in either of the borings. The soils were moist to a depth of about 11 feet bgs, and wet from about 11 feet to 12 feet bgs. One soil sample was collected from each of these borings from a depth of 11 feet to 12 feet bgs, from the silty clay immediately above the concrete slab. Due to the presence of the concrete slab, it was not possible to collect a sample at the soil/bedrock interface, as specified in the work plan.

Two borings, UST-SB02 and UST-SB04, were completed adjacent to the abandoned product lines. UST-SB02 was located at the terminus of the product lines near the former tank location, and UST-SB04 was located at the midpoint of the lines. UST-SB02 encountered a layer of gravel to a depth of about 3.5 feet bgs, and silt with varying amounts of clay and sand from 3.5 feet to boring refusal at a depth of 28.5 feet bgs. The gravel layer is interpreted to be backfill used after the removal of the section of pipe that attached to the tank. UST-SB04 encountered silt with varying amounts of sand and clay from the surface to boring refusal at a depth of 28.5 feet bgs. No PID readings and no visual evidence of waste or staining was observed in either of the borings. Two soil samples were collected from each boring. The first sample from each boring was collected from a depth of 4 feet to 5 feet bgs, immediately below the interpreted depth of the product lines, and the second sample was collected from a depth of 28 feet to 28.5 feet bgs, immediately above the soil/bedrock interface.

The fifth soil boring, UST-SB05, was completed adjacent to the concrete slab. The purpose of this boring was to test for contamination that may have seeped over the edge of the slab. This boring encountered silt to silty clay to its total depth of 16 feet bgs. No PID readings and no visual evidence of waste or staining was observed in the boring. One sample was collected from the boring from a depth of 14 feet to 15 feet bgs.

Since no evidence of contamination was encountered in the borings, the boreholes were backfilled with soil cuttings and topped off with bentonite chips. Excess cuttings were spread on the ground.

Motor T Garage

Five borings were drilled and sampled at the Motor T Garage. The soil samples were analyzed for TCL VOCs, TCL SVOCs, and TAL metals. The locations of the borings are shown on Figure 3-2. Table 3-2 summarizes the samples collected. The boring logs are included in Appendix A and the soil sample logs are included in Appendix B.

Boring MTG-SB01 was completed at the eastern end of the building, between the portable hazardous materials storage trailer and the used battery and waste oil storage area. Borings MTG-SB02, SB03, and SB04 were completed in the front of the building, immediately outside the garage bay doors. MTG-SB05 was completed in the grassy area on the southwestern side of the building.

All of the borings encountered silt with varying amounts of sand and clay to their total depths. There was no fill encountered in any of the borings. No PID readings and no visual evidence of waste or staining was observed in any of the borings. All of the borings were advanced to the top of bedrock, the depth of

which increased from east to west, from 4 feet bgs at MTG-SB01 to 23 feet bgs at MTG-SB04 and MTG-SB05. None of the borings encountered groundwater.

Two subsurface soil samples were collected from each of the borings except MTG-SB01. The samples were collected from the boring midpoints and from immediately above the soil/bedrock interface. Only one sample (from immediately above the soil/bedrock interface) was collected from MTG-SB01 due to its shallow total depth (4 feet bgs).

Since no evidence of contamination was encountered in the borings, the boreholes were backfilled with soil cuttings and topped off with bentonite chips. Excess cuttings were spread on the ground.

Western Property Boundary

Four borings (WPB-SB01 through 04) were drilled along the western property boundary and temporary monitoring wells (WPB-TW01 through 04) were installed in each. Figure 3-3 shows the temporary well locations. The boring logs are included in Appendix A. Table 3-3 summarizes the well construction details. The wells were approximately equally spaced along a 350 foot length of the western property boundary, across the street from 600 Kenhorst Boulevard.

The borings encountered silt with varying amounts of sand and clay for their entire lengths. All of the borings were advanced to the top of bedrock, which was encountered at depths ranging from 22 feet to 23.5 feet bgs. None of the borings encountered fill, elevated PID readings, or visual evidence of waste or staining. The soil was moist with occasional wet layers. None of the temporary wells contained groundwater upon installation or at the end of the day (several hours later), as determined using an electronic water level indicator. Because the fine-grained nature of the soils would tend to restrict groundwater movement, the wells were left in place overnight to allow as much time as possible for any groundwater present within the soils to collect in the wells. When the wells were still dry the following morning, they were pulled. Since no evidence of contamination was encountered in the borings, the boreholes were backfilled with soil cuttings and topped off with bentonite chips. Excess cuttings were spread on the ground.

3.1.3 Wipe Samples

Ten wipe samples were collected at the former indoor rifle range. The sample locations are shown in Figure 3-4. Table 3-4 summarizes the samples collected. The samples were collected using Ghost Wipes following the procedures specified in OSHA Method ID-125G and analyzed for lead using method

SW-846 6010B. To collect a sample, the Ghost Wipe was removed from its package and unfolded. The Ghost Wipe was then folded in half and a 10-centimeter-square area was wiped by starting at the outside and making concentric squares of decreasing size. This process was repeated two more times. Each time the wipe was folded with the contaminant side in. When the sampling was completed, the wipe was folded in half with the contaminant side in and transferred to a laboratory-supplied vial. The vial was sealed, labeled, and packaged for shipment to the laboratory. A plastic template was used to demark the area to be wiped. The template was decontaminated between samples by spraying it with distilled water and drying it with a paper towel. Photographs were taken of each sample location and are included in Appendix D.

Four wipe samples were collected from the laser rifle range room. Sample IRR-WP01 was collected from the floor near the front left corner of the room, IRR-WP02 was collected from an open area of the floor between the firing area and the target area, IRR-WP03 was collected from the floor in the corner of the room near the doorway, and IRR-WP10 was collected from the back wall of the room at a height of approximately five feet. The floor of the room mainly consisted of bare concrete, although the area containing the firing equipment in the rear of the room was carpeted. All of the floor samples were collected from concrete areas. The walls consisted of painted cinder block. The room appeared to be fairly clean, particularly the walls. Minor dust accumulation was noted in the corner floor areas, where samples IRR-WP03 and IRR-WP01 were collected.

Three wipe samples were collected from the FDC room. Sample IRR-WP04 was collected from a fairly typical area of the floor near the wall opposite the doorway; IRR-WP05 was collected from the floor adjacent to the wall containing the doorway, in an area where noticeable dust accumulation was present; and IRRWP07 was collected from the wall of the room opposite the doorway at a height of approximately four feet, in an area which had black discoloration. The floor of the room was concrete.

One wipe sample, IRR-WP06, was collected from the hallway between the FDC room and the laser rifle range room. This sample was collected from the concrete floor adjacent to the FDC room wall where moderate dust accumulation was evident.

Two wipe samples were collected from the armory. IRR-WP08 was collected from the floor near the wall opposite the doorway and IRR-WP09 from the floor near a corner of the room. Dust accumulation was evident at both locations, particularly at IRR-WP09.

3.2 QUALITY CONTROL SAMPLE COLLECTION

Quality control samples were collected to ensure that procedures followed were adequate to protect sample integrity. For the soil samples, these included:

- Rinsate blanks - laboratory-grade water run across decontaminated sampling devices to evaluate decontamination procedures.
- Trip blanks - laboratory-grade water in sealed sample containers that accompany each shipping container to identify potential cross-contamination between sealed sample containers.
- Duplicates - split samples shipped "blind" to the laboratory to assess laboratory precision.

For the wipe samples, the following quality control sample was collected:

- Field blank – An unused wipe sample was packaged and shipped for laboratory analysis.

3.3 DATA REVIEW

The analytical data were reviewed by a senior quality control chemist. The review process consisted of the following tasks:

- The analytical data were checked for completeness to determine if all the samples were analyzed and all the parameters requested in the chain-of custody were reported. The laboratory was contacted regarding any missing information.
- The data report was checked for the accuracy of the sample identifications, the sample locations, the dates of sample collection, and the concentration units.
- The data tables were organized by sample matrix and sample location. The average of field duplicate results was calculated and reported, and the results of two sample dilutions were consolidated into one set of results.
- Summary forms were checked for blank contamination and field/laboratory precision. Any findings

were summarized in an internal memorandum.

- Large positive hits were checked against the raw data to avoid false positive results.

The data review indicated that all samples and analytes were successfully analyzed. For one sample group (SDG TCK-001), the initial calibration response factors for acetone and 2-butanone were less than the 0.05 lower quality control limit, and this was identified as a major problem. The non-detected results for these compounds were therefore qualified as unusable. No other major problems were identified.

4.0 INVESTIGATION FINDINGS

Section 4.0 presents a summary of the findings of the various investigations. The following subsections summarize the geological, hydrogeological, and analytical results of the site investigation activities described in Section 3.0 of this report. The data review reports including analytical results are presented in Appendix C.

4.1 GEOLOGY

The overburden at the site consists chiefly of silt, with varying amounts of sand and clay. At the former UST location, the depth to bedrock was 28.5 feet. At the Motor T Garage, the depth to bedrock increased from 4 feet bgs at the eastern end of the building to 23 feet bgs at the western end. At the western property boundary, the depth to bedrock ranged from 22 feet bgs to 23.5 feet bgs.

Fill was encountered in the borings at the former UST location. In the borings completed in the tank grave, the fill consisted of silty clay and gravel. A concrete anchor slab was encountered in these borings at a depth of 12 feet bgs. The borings outside the tank grave encountered fill consisting of clayey silt/silty clay to a depth of approximately 14 feet bgs.

4.2 HYDROGEOLOGY

Groundwater was not encountered in any of the soil borings, and the four temporary wells installed at the western property boundary were dry. Since the temporary wells and most of the borings were installed to the depth of bedrock, these results indicate that the water table occurs within the bedrock.

4.3 ANALYTICAL DATA SUMMARY

The following subsections describe the analytical results from the investigation activities. The complete analytical data reports are included in Appendix C.

4.3.1 Former UST Investigation

Seven subsurface soil samples and one duplicate sample were collected from five soil borings at the former 8,000-gallon UST location on February 21, 2008. Figure 3-1 presents the soil boring locations. The soil samples were submitted to Analytical Laboratory Services, Inc., Middletown, PA, for the following analyses: PADEP No. 2 Fuel Oil List VOCs and PADEP No. 2 Fuel Oil List SVOCs.

A summary of the surface soil analytical results is presented in Table 4-1. There were no detections in any of the samples. The completed Underground Storage Tank System Closure Report Form is included in Appendix F.

4.3.2 Motor T Garage

Nine subsurface soil samples and one duplicate sample were collected from five soil borings at the former 8,000-gallon UST location on January 24, 2008. Figure 3-2 presents the soil boring locations. The soil samples were submitted to Analytical Laboratory Services, Inc., Middletown, PA, for the following analyses: TCL VOCs and TCL SVOCs, and TAL Metals.

A summary of the positive analytical results for the Motor T Garage is presented in Table 4-2. The detected concentrations were screened against the PADEP Residential Direct Contact MSCs. There were no detections above PADEP action levels in any of the samples. Several VOCs were detected at very low concentrations in all of the samples collected. Acetone was detected in all of the samples at concentrations ranging from 13.1J ug/kg (MTG-SB04-1112) to 158J ug/kg (MTG-SB01-0304). 2-Butanone was detected in one sample (MTG-SB01-0304) at 18.2J ug/kg. Methylene chloride was detected in all but two of the samples at concentrations up to 7 ug/kg (MTG-SB02-0304). TCE was detected in all of the samples at concentrations ranging from 3.1 ug/l (MTG-SB05-1011) to 26 ug/kg (MTG-SB04-2223). Low concentrations of SVOCs (fluoranthene, 51 ug/kg; phenanthrene, 48 ug/kg; and pyrene, 34 ug/kg) were detected in one sample, MTG-SB-03-0506. The inorganic analyses indicate that metals concentrations were generally low.

4.3.3 Former Indoor Rifle Range

Ten lead dust wipe samples were collected from the floor and wall surfaces of the former indoor rifle range. The samples were submitted to Analytical Laboratory Services, Inc., Middletown, PA, for lead analysis.

A summary of the positive analytical results for the Indoor Rifle Range is presented in Table 4-3. Lead was detected in the eight floor wipe samples at concentrations ranging from 28.9 ug/ft² to 187 ug/ft², and in the two wall wipe samples at concentrations of 8.2J ug/ft² and 3.7J ug/ft². A blank wipe was found to contain no detectable quantities of lead; this served as a quality control check on the wipe material itself. Figure 4-3 shows the locations of the samples and the corresponding lead concentrations. Six of the floor wipe samples showed lead concentrations that exceeded the federal residential lead dust clean-up

standard for floors (40 ug/ft²): IRR-WP01 (41.9 ug/ft²), IRR-WP03 (69.9 ug/ft²), IRR-WP05 (187 ug/ft²), IRR-WP06 (68.7 ug/ft²), IRR-WP08 (67.5 ug/ft²), and IRR-WP09 (157 ug/ft²). Samples WP01 and WP03 were collected from corners of the laser rifle range room, sample WP05 was collected from the FDC room, sample WP06 was collected from the hallway between the FDC room and the laser rifle range, and samples WP08 and WP09 were collected from the armory. All of these sample locations correspond to areas where dust accumulation was evident.

4.3.4 Western Property Boundary

No analytical data were acquired at this location because groundwater was not present in the soils.

5.0 SUMMARY OF FINDINGS

The following subsections summarize the findings of each investigation.

5.1 FORMER UST LOCATION

The investigation found no evidence of soil contamination at the former UST location. Groundwater was not encountered in the borings. The product lines and vent line associated with the removed UST have been abandoned in place. The concrete anchor slab for the removed UST is present at a depth of 12 feet bgs. The tank excavation backfill consists of a mixture of gravel and silty clay.

5.2 MOTOR T GARAGE

The investigation found no evidence of significant soil contamination at the Motor T Garage. Low concentrations of several organic compounds were detected that are well below the corresponding regulatory PADEP MSCs for residential soil. Metals concentrations were well below action levels. No groundwater was encountered in the borings.

5.3 WESTERN PROPERTY BOUNDARY

The investigation found no evidence that the historical UST release on the neighboring property at 600 Kenhorst Boulevard is affecting the facility property above the bedrock. There was no groundwater present in the overburden at the western property boundary, and no evidence of contamination was observed in the soil. Conditions within the bedrock are not known.

5.4 FORMER INDOOR RIFLE RANGE

Six of the ten lead dust wipe samples collected showed exceedances of the federal residential clean-up standard for lead dust on floors (40 ug/ft²). The concentrations ranged from 41.9 ug/ft² to 187 ug/ft². All of the samples that showed exceedances were collected from floor surfaces in areas where dust was visible. Exceedances were noted in all three of the rooms sampled (the armory, laser rifle range, and FDC room) and in the hallway outside the FDC room.

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