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LOCK REPLACEMENT PROJECT
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Saucer Marine Mixed-Waste Mounds

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Saucer Marine Mixed-Waste Mounds Report

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IHNC New Lock and Connecting Channels

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1 INTRODUCTION

This Mixed-Waste Mounds Report is one of three reports per the Environmental Support to the IHNC New Lock and Connecting Channels, Demolition Design Memorandum. The purpose of this document is to identify the materials in the mixed-waste mounds that are subject to environmental and safety regulations.

The report was completed in accordance with the final scope of work provided by the U.S. Army Corps of Engineers (USACE), dated April 3, 1998. The specific tasks that were completed during the course of this investigation on the waste mounds included:

- A geophysical survey of the waste mounds to detect and assess buried anomalies for various metallic debris (e.g., 55-gallon drums, 1 and 5 gallon paint cans, tanks, barges, etc.);
- A limited site investigation of the geophysical anomalies for verification purposes; and
- Collection of representative environmental samples of soil and sand for chemical laboratory testing.

This report provides the following:

- Summary of the geophysical data;
- Summary of the limited site investigation data;
- Inventory and classification of regulated materials at the site;
- Regulatory review;
- Detailed cost data;
- Waste handling and management;
- Disposal requirements.

1.1 Site Location

The former Saucer Marine facility is located on the east bank of the Inner Harbor Navigation Canal in an industrial area south of Florida Avenue and along Surekote Road in New Orleans, La. Figure 1, Site Location Map, presents a generalized map of the project area.

1.2 Site Description

Approximately 10,000 square feet of mixed waste has been identified within the project area. The mounds are located on the north side of the project area with an average height of approximately seven feet. Each mound is composed of fine sand mixed and metal debris and timbers.

2 MIXED-WASTE MOUND INVESTIGATION

2.1 GEOPHYSICAL INVESTIGATION

The geophysical investigation was performed to assess whether containerized wastes (e.g., 55-gallon drums, 1- and 5-gallon paint cans, etc) are buried in the waste mounds. The geophysical survey was conducted utilizing two different electromagnetic (EM) instruments; a Geonics EM31 electromagnetic ground conductivity meter and a Geonics EM61 time-domain metal detector. The EM31 radiates an electromagnetic field (primary field) which induces an alternating circular current flow in the ground. The current flow, which is determined by the conductivity of the ground, produces a secondary EM field which is linearly related to ground conductivity. The instrument senses both the primary (inphase component) and the secondary (quadrature-phase component) EM fields. The inphase component of the measured field is sensitive to large metallic objects, while the quadrature-phase component is a direct measure of ground conductivity. The conductivity data is recorded in millimhos per meter and the inphase data is recorded in parts per thousand (ppt) of the primary field. With an intercoil spacing of 3.7 meters, the instrument has an effective depth of exploration of approximately 6 meters.

The EM61 is a coincident time-domain transmitter and receiver that induces secondary EM fields in the ground by generating 150 EM pulses per second and measuring the secondary field between pulses. The two antenna coils are arranged in a vertically stacked configuration with the antenna dipoles oriented vertically. The secondary fields are induced in both the earth materials and metallic objects. Between each pulse, the EM61 waits for the induced field from the earth to dissipate, and then measures the prolonged field generated by buried metallic objects. The instrument measures the strength of the generated EM field in millivolts. By sensing only the response from the buried metal, the EM61 can detect targets that may otherwise have been masked by the ground conductivity. The EM61 can detect a single 45-gallon drum to a depth of up to 12 feet.

The EM31 was selected because of its ability to detect changes in total ground conductivity that may be related to past excavation/disposal activities, its ability to simultaneously detect nonmetallic debris and operate as a bulk metal detector, and its greater survey width/depth compared to the EM61. The EM61 was selected because of its ability to detect smaller metallic targets (higher resolution) and model their depth.

2.2 SITE LAYOUT

Prior to initiating the geophysical survey, a site walkover of the investigation area was performed to assess surface conditions and establish the survey grid. The survey grid was established along the approximate north and east axes, with the position on the grid being determined by the distance in feet north and east of the southeast corner of the grid origin. The survey grid was tied to a pump station located in the northeast corner of the subject property as shown on Figure 3. The grid numbering system starts with zero in the southeast corner and increases to 390 feet north and 132 feet west. The location of large metallic objects observed on the surface during the site walkover and detected during the geophysical surveying was noted on the site map and in the field notes collected by Dames & Moore. A survey plot plan is presented as Figure 2, Survey Plot Plan.

2.3 GEOPHYSICAL SURVEYS

2.3.1 EM31 Survey

The EM31 survey proceeded as follows:

- East-west survey lines spaced 6 feet apart were established in the investigation area. The eastern end of the southern most survey line was the grid origin. Each line was identified by its distance in feet north of the grid origin. Using this system, the first (southern most) line would be designated Line 0, the next line 6 feet to the north would be designated Line 6, etc.
- The survey was conducted along the established east-west survey lines at 6 feet intervals. Each data point was identified by its distance in feet north and west of the grid origin.

The survey began at Line 0 and proceeded line by line to the north, with data collected at 6 feet intervals along each line. Readings were obtained with the instrument in the vertical dipole position (instrument dial facing up) and set to automatically record both the inphase and quadrature-phase component of the EM field. A measurement was made at each location with the boom of the instrument aligned in an east-west direction (parallel to line). The instrument was then rotated 90 degrees in a horizontal plane, where a second reading was taken with the boom of the instrument aligned in a north-south direction (perpendicular to line).

The EM31 was field tested daily prior to data collection activities. The EM31 data were recorded on an Omnidata Polycorder 700 series data logger. The data stored in the data logger were retrieved at the end of each day and transferred to a portable computer.

2.3.2 EM61 Survey

The EM61 survey proceeded as follows:

- East-west survey lines spaced 3 feet apart were established in the investigation area. Each line was identified by its distance in feet north of the grid origin. Using this system, the sixth line north of the grid origin would be designated Line 18, the next line 3 feet to the north would be designated Line 21, etc.
- The survey was conducted along the established east-west survey lines at 3 feet intervals. Each data point was identified by its distance in feet north and west of the grid origin.

The survey began at the southern most survey line and proceeded line by line to the north, with data collected at 3 feet intervals along each line.

The EM61 was field tested daily prior to data collection activities. The EM61 data were recorded on an Omnidata Polycorder 700 series data logger. The data stored in the data logger were retrieved at the end of each day and transferred to a portable computer.

2.4 DATA REDUCTION AND ANALYSIS

2.4.1 Data Reduction

Data reduction refers to the process of transforming raw field data into a format suitable for data analysis and presentation. This process was accomplished using a series of computer programs which included Geonic's DAT31 and DAT61, and Golden Software SURFER®.

Data reduction included downloading data from the data logger to a personal computer using DAT31 or DAT61; review, validation, and editing of the data files using SURFER®; and generation of contour maps of the data using SURFER®.

The EM31 data files contained the inphase and quadrature-phase data for both north-south and east-west boom orientations for each grid location. SURFER® was used to generate contour maps of the average north-south and east-west orientations of conductivity and inphase data. The EM31 quadrature average and inphase average contour maps are presented in Figure 4 and Figure 5, respectively.

The EM61 data files contained field strength measurements for the upper coil (channel 1), the lower coil (channel 2), and the difference (differential) between channels 1 and 2. SURFER® was used to generate contour maps of the channel 2 and normalized differential data for the site (Figures 6 and 7, respectively).

2.4.2 Data Analysis

2.4.2.1 EM31 Survey Data

The EM31 quadrature-phase contour map was evaluated for changes in ground conductivity due possibly to blast sands or buried nonmetallic debris. The inphase contour map was used to assess the presence of large buried metallic objects and bulk metallic debris.

Numerous conductivity anomalies are evident on the quadrature average contour map (Figure 4). The gray area of the map represents the general site background conductivity. The yellow and green plots represent areas where conductivity is less than background and generally corresponds to areas of observed blast sands and small metallic debris. Orange, red, and blue plots represent areas with large amounts of buried and surficial metallic objects and debris.

The inphase average contour map also depicts anomalous areas (Figure 5). The gray area of the map is void of or has insignificant amounts of large buried or surficial bulk metallic debris. Yellow, orange, red, and blue plots represent areas with large amounts of buried and surficial metallic objects or debris.

2.4.2.2 EM61 Survey Data

The EM61 contour map was used to identify anomalies which may indicate the presence of buried metallic targets such as 55-gallon drums, cans, underground storage tanks or utilities. The channel 2 data contour maps show the response of all targets (near surface and deeper) within the range of the instrument. The differential data contour maps show primarily deeper targets with near surface targets subdued. Targets at or very near the surface may appear as negative anomalies on the differential data contour map.

The channel 2 contour (Figure 6) map shows anomalous areas similar to those in the EM31 data contour maps. The anomalies are more numerous and better defined as a result of the higher lateral resolution of the EM61. The complexity of the data is likely due to the sensitivity of the instrument to variations in metallic content of the blast sand and debris underlying the site.

The differential contour map (Figure 7) depicts smaller and more distinct anomalies as a result of filtered out or minimized instrument response to small surficial metallic debris.

3 LIMITED SITE INVESTIGATION

A limited site investigation was performed to assess the geophysical anomalies identified at the site. Prior to initiating on-site activities, a Site Safety and Health Plan (SSHP) briefing was conducted and a site walkover was performed to assess surface conditions and establish test pit locations.

Several geophysical anomalies were identified as metal debris exposed across the mixed-waste mounds and were not investigated further. The metal debris was identified as of wire rope, metal plates, and metal flanges. Anomalies not associated with an apparent surface feature, or surface features which indicated a possible buried structure or container, were investigated by excavating shallow test pits.

3.1 SITE LAYOUT

Prior to initiating the limited site investigation, a site walkover of the project area was performed to assess surface conditions and to identify surficial metal debris that could have influenced the geophysical surveys. Test pits were located in areas along the survey grid with anomalies indicative of buried metal debris (e.g. drums, underground storage tanks, buried barges, etc.). The test pit numbering system is associated with the survey grid numbering system and starts with zero in the southeast corner and increases to 390 feet north and 132 feet west. The location of large surficial metallic objects observed during the site walkover and a corresponding geophysical response was noted on the site map and in the field notes. A site plot plan is presented as Figure 2.

3.2 LIMITED SITE INVESTIGATION

The limited site investigation activities were conducted by Dames & Moore personnel from November 9 through 13, 1998. Excavation equipment was mobilized to the site on November 10, 1998. A Bobcat mini-trackhoe was utilized to excavate the test pits during the course of this limited site investigation. Excavations were initiated in the southwest corner of the geophysical survey area and proceeded to the north along the survey line identified in Figure 3 as Line 120 west. A Test Pit Location Map is presented as Figure 9. A description of each test pit is discussed in the following subsections.

3.2.1 TEST PIT TP-120-60-1

Test Pit TP-120-60-1 was excavated southeast of a small mixed-waste mound and north of an aboveground storage tank. The pit measured 5 feet in length, 4 feet in width, and 6 feet in depth. The material excavated was primarily blast sand and metal debris, underlain by a blue gray to dark gray clay. It should be noted that this test pit is in the vicinity of documented petroleum impacted soils. During excavation, the following items were removed from the pit: two metal pipes, a large metal plate, and several small metal flanges. Photographs of the trench and its content can be seen in Appendix C (Photos 1,2,7,24-26, 33-35, 45).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.2 TEST PIT TP-120-190-1

Test Pit TP-120-190-1 was excavated north of Test Pit TP-120-60-1 on a large mixed-waste mound located in the northwest corner of the grid. The pit measured 5 feet in length, 3 feet in width, and 4 feet in depth. The material excavated was primarily blast sand and metal debris, underlain by asphalt. During excavation, the following items were removed from the pit: wire rope, a metal plate, and a small metal flange. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Photographs of the trench and its content can be seen in Appendix C (Photo 36).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.3 TEST PIT TP-120-260-1

Test Pit TP-120-260-1 was excavated north of Test Pit TP-120-190-1 on a large mixed-waste mound. The pit measured 5 feet in length, 3 feet in width, and 5 feet in depth. The material excavated was primarily blast sand and metal debris underlain by asphalt. A shell base and a blue gray to dark gray clay underlay the asphalt. During excavation, the following items were removed from the pit: wire rope, several metal pipes, and several metal bolts/nuts. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photo 13).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.4 TEST PIT TP-120-340-1

Test Pit TP-120-340-1 was excavated north of Test Pit TP-120-260-1 on a large mixed-waste mound. The pit measured 5 feet in length, 3 feet in width, and 4 feet in depth. The material excavated was primarily blast sand and metal debris underlain by asphalt. During excavation, the following items were removed from the pit: metal pipes, a metal plate, and a metal strap. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photos 12, 15-17, 19).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.5 TEST PIT TP-120-390-1

Test Pit TP-120-390-1 was excavated in the northwest corner of the geophysical survey area. The pit measured 5 feet in length, 3 feet in width, and 3 feet in depth. The material excavated was primarily blast sand and metal debris, underlain by a blue gray to dark gray clay. During excavation, the following items were removed from the pit: large metal plates, and several small metal flanges. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C.

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.6 TEST PIT TP-75-390-1

Test Pit TP-75-390-1 was excavated east of Test Pit TP-120-390-1 along the north line of the survey area. The pit measured 10 feet in length, 6 feet in width, and 4 feet in depth. The material excavated was primarily blast sand and metal debris underlain by asphalt. A shell base and a blue gray to dark gray clay underlay the asphalt. During excavation, the following items were removed from the pit: large metal plates, and several small metal flanges. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photos 43-44).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.7 TEST PIT TP-75-380-1

Test Pit TP-75-380-1 was excavated just south of Test Pit TP-75-390-1 on a large mixed-waste mound. The pit measured 5 feet in length, 4 feet in width, and 6 feet in depth. The material excavated was primarily blast sand and metal debris underlain by asphalt. A shell base and a blue gray to dark gray clay underlay the asphalt. During excavation, the following items were removed from the pit: a metal pipe, large metal plates, and several small metal bolts and nuts. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C.

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.8 TEST PIT TP-75-360-1

Test Pit TP-75-360-1 was excavated south of Test Pit TP-75-380-1. The pit measured 8 feet in length, 8 feet in width, and 6 feet in depth. The material excavated was primarily blast sand and metal debris, underlain by asphalt and a blue gray to dark gray clay. During excavation, the following items were removed from the pit: wire rope, large metal plates, and several metal straps. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photo 42).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.9 TEST PIT TP-75-320-1

Test Pit TP-75-320-1 was excavated south of Test Pit TP-75-380-1 on a large mixed-waste mound. The pit measured 6 feet in length, 7 feet in width, and 5 feet in depth. The material excavated was primarily blast sand and metal debris, underlain by asphalt and a blue gray to dark gray clay. During excavation, the following items were removed from the pit: a metal plate and wire rope. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photos 18, 20).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.10 TEST PIT TP-75-250-1

Test Pit TP-75-250-1 was excavated south of Test Pit TP-75-320-1 and north of a large concrete pad. The pit measured 5 feet in length, 4 feet in width, and 4 feet in depth. The material excavated was primarily blast sand and metal debris, underlain by asphalt. During excavation, the following items were removed from the pit: wire rope, a large metal plate, and several small metal flanges. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photos 5, 11, 40, 41).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.11 TEST PIT TP-75-120-1

Test Pit TP-75-120-1 was excavated to the northeast of Test Pit TP-120-60-1 and centered on a large waste mound. The pit measures 5 feet in length, 4 feet in width, and 4 feet in depth. The material excavated was primarily metal plates and debris mixed with blast sand. Photographs of the trench and its content can be seen in Appendix C.

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.12 TEST PIT TP-0-15-1

Test Pit TP-0-15-1 was excavated in the southeast corner of the survey area in the vicinity of a large linear anomaly. The pit measured 12 feet in length, 9 feet in width, and 4 feet in depth. The material excavated was primarily shell with trace amounts of blast sand. The shells were underlain by a blue gray to dark gray clay. It should be noted that this test pit is in the vicinity of documented petroleum impacted soils. During excavation, the following items were removed from the pit: a metal ladder, some metal pipes, and a large metal plate. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was detected at this location. This soil is associated with past operations and the fuel line which runs along the west side of the property near the canal. The volume of petroleum impacted soil in the vicinity of this test pit is approximately 250 cubic yards (360 tons). Photographs of the trench and its content can be seen in Appendix C (Photos 28, 29-32).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.13 TEST PIT TP-0-210-1

Test Pit TP-0-210-1 was excavated north of Test Pit TP-0-15-1 and east of a large mixed-waste mound. The pit measured 5 feet in length, 3 feet in width, and 4 feet in depth. The material excavated was blast sand and shells and metal debris, underlain by shells and a blue gray to dark gray clay. During excavation, the following items were removed from the pit: metal straps, wire rope, and several small metal flanges. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C.

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.14 TEST PIT TP-0-220-1

Test Pit TP-0-220-1 was excavated north of Test Pit TP-0-210-1 and east of a large mixed-waste mound. The pit measured 8 feet in length, 3 feet in width, and 4 feet in depth. The material excavated was blast sand and shells and metal debris, underlain by a blue gray to dark gray clay. During excavation, the following items were removed from the pit: a metal strap, wire rope, and several small metal flanges. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photo 9).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.15 TEST PIT TP-0-395-1

Test Pit TP-0-395-1 was excavated near the northeast corner of the geophysical survey area in an area covered with timbers. The pit measured 6 feet in length, 3 feet in width, and 4 feet in depth. The material excavated was blast sand and shells and metal debris, underlain by a blue gray to dark gray clay. During excavation, the following items were removed from the pit: a metal plate, a metal strap, and several small metal flanges and bolts. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was not detected at this location. Photographs of the trench and its content can be seen in Appendix C.

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.2.16 TEST PIT TP-75-25-1

Test Pit TP-75-25-1 was excavated on the west side of the switch shed along the south line of the geophysical survey area. The pit measured 5 feet in length, 6 feet in width, and 3 feet in depth. The material excavated was primarily shell and metal debris, which was underlain by a blue gray to dark gray clay. It should be noted that this test pit is in the vicinity of documented petroleum impacted soils. During excavation, the following items were exposed in the pit: a 4" metal pipe and several small metal flanges. The pipe ran from the former shed to the west toward the canal. No buried drums or materials associated with underground storage tanks were observed in the materials removed from the test pit. Petroleum impacted soil was detected at this location. Photographs of the trench and its content can be seen in Appendix C (Photos 3, 8).

Dames & Moore concluded that the metal items uncovered were likely the source of the geophysical data anomaly. Soil samples were collected from the trench for possible laboratory analysis and the trench was backfilled with the excavated soils.

3.3 SAMPLING AND ANALYSIS

The soil samples collected from each test pit were screened in the field using an Hnu (10.6 eV lamp) Photoionization Detector (PID). Each soil sample was identified by test pit number and location. Soil samples exhibiting the highest headspace concentration or visual/olfactory impact were selected for off-site laboratory analysis. A total of nine samples, four soil samples, two blast sand samples, and three QA/QC samples were submitted to Southwest Laboratories of Oklahoma, Inc. in Broken Arrow, Oklahoma for analysis. Southwest Laboratories is a USACE and a State of Oklahoma certified laboratory and maintains several other federal and state agency certifications. Currently, Louisiana does not have a state certification for laboratories. A complete set of the laboratory reports including the sample Chain of Custody and cooler receipt/sample log-in sheet provided by Southwest Laboratories can be viewed in Appendix B and a summary of analytical results can be found in Table 1.

3.3.1 Blast Sand Samples

One sample from each waste mound was collected and analyzed for Volatile Organic Compounds by SW-846, Method 8260; Semi-Volatile Organic Compounds by SW-846, Method 8270; RCRA metals by SW-846, Method 7470 for mercury and Method 6010 for all others; and Herbicides/Pesticides by SW-846, Methods 8151/8081A, respectively. These samples were labeled SP for the South mound and NP for the North mound.

To determine if a material was a characteristic hazardous waste, a Toxicity Characteristic Leaching Procedure (TCLP) was also completed on the samples submitted. A material would be considered hazardous waste if the TCLP leachate concentrations exceeded the following regulatory levels (RLs) presented below.

Regulatory Levels for Volatile Organic Compounds (mg/L)			
Benzene	0.5	1,1-Dichloroethylene	0.7
Carbon Tetrachloride	0.5	Methyl ethyl ketone	200.0
Chloroform	0.6	Tetrachloroethylene	0.7
Chlorobenzene	100.0	Trichloroethylene	0.5
1,2-Dichloroethane	0.5	Vinyl Chloride	0.2
Regulatory Levels for Semi-Volatile Organic Compounds (mg/L)			
o-Cresol	200.0	Hexachloroethane	3.0
m-Cresol	200.0	Nitrobenzene	2.0
p-Cresol	200.0	Pentachlorophenol	100.0
1,4-Dichlorobenzene	7.5	Pyridine	5.0
2,4-Dinitrotoluene	0.13	2,4,5-Trichlorophenol	400.0
Hexachlorobenzene	0.13	2,4,6-Trichlorophenol	2.0
Hexachlorobutadiene	0.5		
Regulatory Levels for Pesticides/Herbicides (mg/L)			
Chlordane	0.03	Methoxychlor	10.0
Endrin	0.02	Lindane	0.4
Heptachlor	0.008	2,4- D	10.0
Toxaphene	0.5	2,4,5-TP (Silvex)	1.0
Regulatory Levels for Metals (mg/L)			
Arsenic	5.0	Lead	5.0
Barium	100.0	Mercury	0.2
Cadmium	1.0	Selenium	1.0
Chromium	5.0	Silver	5.0

3.3.1.1 Volatile Organic Compounds by TCLP

Volatile organic compounds by TCLP were reported below the laboratory detection limit of 0.025 mg/L. Therefore, as a result of the limited sampling on the mixed-waste mounds, the blast sands would not be considered as a hazardous waste for volatile organic compounds.

3.3.1.2 Semi-Volatile Organic Compounds by TCLP

Semi-volatile organic compounds by TCLP were reported below the laboratory detection limits of 0.01 and 0.02 mg/L. Therefore, as a result of the limited sampling on the mixed-waste mounds, the blast sands would not be considered as a hazardous waste for semi-volatile compounds.

3.3.1.3 RCRA 8 Metals by TCLP

In the sample collected from the south mound (SP-Sand), Barium (Ba), chromium (Cr), and Lead (Pb) were detected at concentrations of 1.90, 0.01, and 0.38 mg/L, respectively. Barium (Ba) at 1.5 mg/L was the only metal detected in the sample collected from the north mound (NP-Sand). The other metals included in the RCRA 8 metal scan were reported below laboratory detection limits. Concentrations of metal detected in both samples, was below the regulatory limits of 100 mg/L for barium, 5 mg/L for chromium, and 5 mg/L for lead. Therefore, as a result of the limited sampling on the mixed-waste mounds, the blast sands would not be considered as a hazardous waste for metals.

3.3.1.4 Herbicides and Pesticides by TCLP

Herbicides and pesticides by TCLP were reported below laboratory detection limits. Therefore, as a result of the limited sampling on the mixed-waste mounds, the blast sands would not be considered as a hazardous waste for herbicides and pesticides.

3.4 SOIL SAMPLES

Four soil samples were collected and analyzed for PCBs by SW-846, Method 8081; Total Extractable Hydrocarbons by SW-846, Method 8015 (modified); and Total Organics by SW-9020, Method 5320B. These soil samples were collected from test pits TP-0-15, TP-120-60, TP-75-25, and TP-120-0.

3.4.1 PCBs

PCBs (Aroclor-1260) were detected at a concentration of 240 ug/kg in sample TP-0-15. According to the Louisiana Department of Environmental Quality (LDEQ), the regulatory levels for PCBs in industrial settings is 1.1 ppm (1.1mg/kg). Therefore, TP-0-15 would not require any special handling. In the other soil samples collected, PCBs were below the laboratory detection limits.

3.4.2 Total Extractable Hydrocarbons

Diesel range hydrocarbons were detected in soil samples TP-0-15, TP-75-25, TP120-0, andTP-120-60 at 1,220 mg/kg, 16,300 mg/kg, 1,950 mg/kg, and 6.6 mg/kg, respectively. The analysis reported several peaks that could not be identified as any specific hydrocarbon pattern. The response factor for the nearest hydrocarbon standard was diesel (C10 – C13). It should be noted that the handling and management of soils impacted with petroleum hydrocarbons will be addressed in greater detail in a separate document. Removal of petroleum impacted soils will be conducted after the demolition and removal of the mixed-waste mounds.

3.4.3 Total Organics

Lab results of Total Organics in the soil samples were reported below laboratory detection limits of 14.1 and 18.1 mg/kg.

3.5 WASTE INVENTORY

As a result of the limited investigation and the analysis of soil samples collected from the mixed-waste mounds, it appears that the material which represent the bulk of the mounds is blast sand which contains metal debris (i.e., steel plates, wire rope, cables, and flanges), timbers, and general trash. Dames & Moore has estimated that approximately 2,600 cubic yards (4200 tons) of blast sand is present in the mounds at Saucer Marine. At this time the volume of metal debris, timbers and general trash associated with each mound has not been calculated.

4 REGULATORY REVIEW

4.1 HAZARDOUS AND INDUSTRIAL SOLID WASTE

Industrial Solid Waste is defined as solid waste generated by a manufacturing, industrial, or mining process, or which is contaminated by solid waste generated by such a process. Such waste may include, but is not limited to, waste resulting from the following manufacturing processes: electric power generation; fertilizer/agricultural chemicals; food and related products; by-products; inorganic chemicals; iron and steel manufacturing; leather and leather products; nonferrous metals manufacturing/foundries; organic chemicals; plastics and resins manufacturing; pulp and paper industry; rubber and miscellaneous plastic products; stone; glass, clay and concrete products; textile manufacturing; and transportation equipment. This does not include hazardous waste regulated under the Louisiana Hazardous Waste Regulations or under federal law, or waste which is subject to regulation under the Office of Conservation's Statewide Order No. 29-B, or by other agencies (LAC 33:VII.115).

Persons who generate industrial solid waste or persons who transport, process, or dispose of solid waste must, within 30 days after becoming subject to the solid waste regulations, notify the administrative authority (Louisiana Department of Environmental Quality) in writing of this activity (LAC 33:VII.503.A1). Generators must also submit annual reports to the administrative authority listing the types and quantities, in wet-weight tons per year, of industrial solid waste they have disposed of off site. This report must include the name of the transporter(s) who removed the industrial solid waste from the site and the permitted solid waste processing or disposal facility or facilities that processed or disposed of the waste. This form may be obtained from the Solid Waste Division and must be submitted by August 1 of each reporting year. Generators must maintain, for two years, all records concerning the types and quantities of industrial solid waste disposed of off site (LAC 33:VII.701).

No solid waste shall be stored or allowed to be stored long enough to cause a nuisance, health hazard, or detriment to the environment as determined by the administrative authority (LAC 33:VII.703.A1).

A solid waste that exhibits the characteristic of toxicity, but is not listed as a hazardous waste in LAC 33:V.4901, has the Hazardous Waste Number that corresponds to the toxic contaminant causing it to be hazardous. The Hazardous Waste Number can be found in Table 5 of the LAC 33:V.4901 document. The maximum concentration of lead in soil that has undergone TCLP is 5.0 mg/L. Any amount of contaminant below that threshold does not have to be treated as hazardous waste (LAC 33:V.4903). It should be noted that the sand in the mounds at Saucer Marine are below the 5.0 mg/L threshold level for lead and therefore should not be considered as hazardous waste.

If a categorically hazardous waste is discharged without authorization and threatens or results in an emergency condition (that causes danger to public health and safety, causes significant adverse impact to the land, water or air, or severe property damage), the discharger must notify the Department of Public Safety 24-hour Louisiana Hazardous Materials Hotline at 504-925-6595 within one hour of the discharge and in accordance with other provisions of the LAC 33:I.Chapter 39. For all other non-emergency conditions, notification to Louisiana Hazardous Materials Hotline must be given within 24 hours of the discharge (LAC 33:V.105.J).

Samples which are collected for the sole purpose of testing to determine its characteristics or composition, are not subject to any requirements of LAC 33:V.Subpart I or to the notification requirements of LAC 33:V.Subpart I, Subsection A, when the sample is being transported to a laboratory for the purpose of testing or the sample is being stored by the sample collector before transport to a laboratory for testing (LAC 33:V.105.D.4a). In order to be eligible for the above referenced exemption, a sample collector shipping samples to a laboratory must comply with the Louisiana Department of Public Safety (LDPS), U.S. Postal Service (USPS) or any other applicable shipping requirements (LAC 33:V.105.D.4b).

A generator who transports, or offers for transportation, hazardous waste for off-site treatment, storage, or disposal must prepare a manifest before transporting the waste off-site pursuant to the requirements of LAC 33:V.1107 – 1111. All generators must comply with the requirements of LAC 33:V.1511. Each generator shall prepare a contingency plan. The contingency plan must include the information as specified in LAC 33:V.1513.A, B, C, D.2, and F. The contingency plan shall include a section describing emergency response procedure as specified in LAC 33:V.1513.F.

5 WASTE MANAGEMENT and DISPOSAL PROCEDURES

This section describes the procedures that the contractor shall employ to remove and segregate the materials identified in the mixed-waste mounds at Saucer Marine. The primary focus of the following procedures will be directed toward the segregation and removal of blast sand and metal debris at Saucer Marine. The metal debris removed from the waste mounds will be stockpiled on site and transported for recycling during the demolition of the above ground structures.

All safety and health protocols shall be detailed in a Site Safety and Health Plan (SSHP) submitted for approval prior to site work. The SSHP shall include an Accident Prevention Plan with Activity Hazard Analysis (AHAs) detailing material handling procedures.

The Contractor shall maintain a project log at the Contractor Field Office. This log shall be updated at the conclusion of each workday to indicate:

- The quantity of blast sand that has been segregated and removed, and
- The quantity of metal debris that has been removed and staged for recycling.

The mixed-waste mounds consist of blast sand containing large and small pieces of metal debris, wire rope, wire cables, timbers with metal bolts and nuts, and general trash. The above mentioned metal debris must be removed from the blast sand prior to disposal. See Appendix C for photographs of the waste mounds and the various types of metal debris observed. The following table presents the inventory of the two mixed-waste mounds at Saucer Marine:

Mixed-Waste Mound Inventory – Saucer Marine

No.	DESCRIPTION	BASELINE STATION	SIZE Ft^2	HEIGHT Feet	DETAILS	LATEST LESSEE, OWNER & ACTIVITY
84	NORTH MOUND	54+00	7000	5' – 6'	Spent Blast Sand and metal Debris	Saucer Marine/ Dock Board Inactive
84A	SOUTH MOUND	54+00	3000	6' – 7'	Spent Blast Sand and metal Debris	Saucer Marine/ Dock Board Inactive

The table below presents the excavation methods and equipment requirements for the removal of the mixed-waste mounds. Also shown are the waste materials to be encountered and the associated recycling and disposal options:

Waste Material	Volumetric Summary (Tons)	Excavation Methods / Equipment Needed	Special Requirements	Recycle Options	Disposal Sites
Blast Sand	4,200	Track hoe loaders and front-end loaders	Segregated in order to remove metal debris	Clean sand may be sent to an aggregate/concrete recycler	Not recycled must be sent to a facility licensed to accept industrial solid waste
Metal Debris	75	Grapple claws, front end loaders and cranes	None	Metal debris may be sold as scrap to a metal recycler	Not recycled must be sent to a facility licensed to accept construction / demolition debris

Waste Material	Volumetric Summary (Tons)	Excavation Methods / Equipment Needed	Special Requirements	Recycle Options	Disposal Sites
Wood and Timbers	25	Grapple claws, excavators and loaders	Timbers treated with creosote must be tested by TCLP methods. IF the timbers pass TCLP, thy can be disposed as construction debris.	None	Must be sent to a facility licensed to accept construction/demolition debris
Impacted Soil and Aggregate	500	Excavators and front-end loaders	Must be handled transported and loaded in accordance with OSHA and DOT regulations	None	Must be sent to a facility licensed to accept industrial solid waste
General Trash	10	Grapple claws, excavators and loaders	None	None	Must be sent to a facility licensed to accept solid waste

5.1 Mixed-waste Mounds

Prior to removing any blast sand, surficial vegetation and debris (metal debris and timbers) must be cleared from the mounds and stockpiled for proper disposal by the Contractor. Each mound will be raked by a tractor equipped with a plow rake to dislodge large metal debris and timbers from the blast sand. Debris accumulated in the rake will be removed, segregated and stockpiled for recycling or disposal.

After the removal of surficial debris from each mound, the blast sand will be placed in tandem dump trucks using front-end loaders. Each mound area will be cleared to the existing grade of the facility with no intrusive excavating. **It should be noted that the area under the mixed-waste mounds will not be plowed to a depth of five feet after the mounds have been removed.**

5.2 Removal Sequence

The removal of the mounds from Saucer Marine will be as follows:

- Utility companies cut off service to the site and insure that all hazardous material is evacuated from the utility lines.
- Remove all trees and shrubs.
- Remove all metal debris and timbers from the surface of each mound.
- Rake each mound in order to expose any buried metal debris and timbers.
- Segregate all raked materials for disposal or recycling.
- Load blast sand in either single or tandem axle dump trucks for disposal as industrial solid waste. (Note: Blast sand may also be loaded in a barge and transported to a staging area for transfer to dump trucks)
- Load metal debris in roll-off boxes for recycling.
- Load general trash in roll-off boxes for disposal as general solid waste.

5.3 Waste Disposal

5.3.1 Quantity by Type

See the detailed estimate in Appendix D for the quantity and type of material generated during the course of this project.

5.3.2 Disposal Sites.

Material not recycled will be disposed of at approved disposal. The following is a list of sites currently in use:

Debris Type	Disposal Facility
Construction/Demolition Debris	Johnny Smith 310 Howze Beach Road Slidell, LA (504) 641-7330 E & J Landfill 9710 Almonaster New Orleans, LA (504) 242-7481
Industrial Solid Waste	Colonial Landfill Sorento, LA (504) 837-8989
General Trash	Colonial Landfill Sorento, LA (504) 837-8989

5.4 Transportation

Debris will be removed from the Saucer Marine site by barges or trucks. Debris removed by barge will eventually be off-loaded onto trucks, as there is no water access to the disposal facilities. Blast sand will likely be hauled by barge due to the expected cost savings trucking. The metal debris and general trash will be transported by truck. It should be noted that land transportation will be strictly regulated to routes that cross the Florida Avenue Bridge to the west bank due to the residential neighborhood on the east side of the IHNC flood wall. Material transported by barges will be staged in an area around the IHNC and U.S. Highway 90 (Chef Menteur Highway). There, the material requiring land transportation to disposal or recycling sites will be off-loaded from the barges on to single or tandem axle dump trucks.

5.5 Residential Considerations in Excavation and Transportation

Excavation and removal of the mixed-waste mounds has the potential to be disturbing to the residential neighborhood adjacent to the east side of the IHNC. The two potential problems are noise and air borne dust. Loading of material into empty steel barges or dump trucks could be a prime source of noise. Therefore, the specifications should require that all barges and trucks receive a layer of granular debris or dirt to cushion the impact of the material and dampen the noise during loading. No ingress or egress from the site will be allowed from the east side of the subject property except from Florida Avenue to Surekote Road. Air borne dirt and dust will be controlled by ordinary dust abatement in accordance with current laws and regulations for the site of work.

5.6 Construction Contracts and Contract Duration

- The excavation and removal of the mixed-waste mounds will be accomplished by one construction contract.
- The estimated construction duration for this project is 30 calendar days.

6 COST ESTIMATION

The scope of work outlined for this project was determined from existing reports, geophysical data, and the limited site investigation completed on the mixed-waste mounds. The cost to remove the mixed-waste mounds at Saucer Marine is estimated to be $229,114.72. Detailed cost estimates are included in Appendix D.

7 CONCLUSION

7.1 Recapitulation

- Geophysical Investigation

Two geophysical surveys were completed on the subject property, the EM31 survey and the EM61 survey. The survey grid was spaced over the area of the mixed waste mounds on six feet and three feet intervals, respectively. The raw data from the surveys was then processed and used to plot contour maps. Several anomalies were mapped at the surface and subsurface in the vicinity of the mixed waste mounds. These anomalies were indicative of surficial and buried metallic debris.

- Test Pitting/Anomaly Verification

As a result of the anomalies discovered during the above geophysical survey, a limited site investigation was conducted to determine the source of the anomalies reported. Prior to the completion of any test pits, a visual inspection of the mixed waste mound area was conducted. Several large metallic objects were observed and documented at the surface, which corresponded to various anomalies reported in the survey. Anomalies which did not correspond to surficial metallic objects were excavated. These shallow test pits were excavated to determine if buried metallic debris such as drums or barges were mixed with the blast sand. Several large pieces of metal debris were observed. The metallic debris documented in the test pits was associated with various plates and cables. No drums or buried barges were observed.

- Sampling and Testing

In order to characterize the blast sands at Saucer Marine, samples were collected and analyzed for volatile organic compounds, semi-volatile organic compounds, 8 RCRA metals, and herbicides/pesticides. To determine if the blast sand was a hazardous waste, a Toxicity Characteristic Leaching Procedure (TCLP) was also completed. As a result of the limited sampling on the waste mounds, the blast sands were found not to be a hazardous waste for volatile organic compounds, semi-volatile organic compounds, 8 RCRA metals and herbicides/pesticides.

Soil samples collected from the test pits were analyzed for PCBs, total extractable hydrocarbons, and total organics. PCBs and total extractable hydrocarbons were detected in some of the soil samples collected. PCBs were detected at concentrations below LDEQ regulatory levels. Extractable hydrocarbons were detected at concentrations above LDEQ action levels. The extractable hydrocarbons were found to be in the range of diesel fuel (C10 through C13).

- Removal and Disposal

The bulk of the material to be removed from the mixed-waste mounds consists mainly of blast sand, with lesser amounts of metal debris (i.e., steel plates, wire rope, cables, and flanges), timbers and general trash. Approximately 4200 tons of blast sand will be removed and transported to a facility licensed to accept industrial solid waste, and the 75 tons of metal debris that may be scattered or buried in the vicinity of the waste mounds will be sold as scrap to a metal recycler. The 25 tons of wood and timbers estimated to be at Saucer Marine may be transported to a facility licensed to accept construction/demolition debris. For the 500 tons of impacted soil and aggregate estimated on the subject property, this material will be removed and transported to a facility licensed to accept industrial solid waste.

The segregation and removal of the mixed-waste mounds can be accomplished with ordinary construction equipment.

Intrusive excavating in the area of the mixed-waste mounds will not occur under this construction contract.

7.2 Conclusions

- The removal of the mixed-waste mounds can be economically performed with land based equipment using mainly water access and limited land access from the west and north.

Tables

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number
12/16/98

Client: Dames and Moore

Project: IHNC

Matrix: Soil	Sample Point:	SP-SAND	NP-SAND	NP-SAND	TP-0-15	TP-0-15D	TP-120-60
	Sample Date:	11/12/98	11/12/98	11/12/98	11/12/98	11/12/98	11/12/98
Parameters:	LAB#:	36418.01	36418.02	36418.02 RE	36418.03	36418.04	36418.05
	Units:						
TCLP VOLATILES:							
BENZENE	mg/L	0.025 U	0.025 U	-	-	-	-
CARBON TETRACHLORIDE	mg/L	0.025 U	0.025 U	-	-	-	-
CHLOROBENZENE	mg/L	0.025 U	0.025 U	-	-	-	-
CHLOROFORM	mg/L	0.025 U	0.025 U	-	-	-	-
1,2-DICHLOROETHME	mg/L	0.025 U	0.025 U	-	-	-	-
1,1-DICHLOROETHENE	mg/L	0.025 U	0.025 U	-	-	-	-
TETRACHLOROETHENE	mg/L	0.025 U	0.025 U	-	-	-	-
TRICHLOROETHENE	mg/L	0.025 U	0.025 U	-	-	-	-
VINYL CHLORIDE	mg/L	0.025 U	0.025 U	-	-	-	-
2-BUTANONE	mg/L	0.025 U	0.025 U	-	-	-	-
TCLP SEMIVOLATILES:							
2-METHYLPHENOL	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
4-METHYLPHENOL	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
TOTAL CRESOL'S	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
1,4-DICHLOROBENZENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
2,4-DINITROTOLUENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
HEXACHLOROBENZENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
NITROBENZENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
PENTACHLOROPHENOL	mg/l	0.1 U	0.1 U	0.1 U	-	-	-
2,4,5-TRICHLOROPHENOL	mg/l	0.1 U	0.1 U	0.1 U	-	-	-
2,4,6-TRICHLOROPHENOL	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
HEXACHLOROBUTADIENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
HEXACHLOROMETHANE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
PYRIDINE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
TPH BY GC/FID MODIFIED 8015:							
GASOLINE C6-C10	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
DIESEL C10-C22	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
KEROSENE C9-C18	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
JP-4 C6-C14	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
NAPHTHA C6-C12	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
#6 FUEL OIL C12-C24	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U

U: Analyzed But Not Detected
-: Not Tested
P: Greater Than a 25% Difference Between the GC Columns
J: Estimated Value Below MDL and Reporting Limit

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number

Client: Dames and Moore | 12/16/98 | Project: IHNC

Matrix: Soil	Sample Point:	SP-SAND	NP-SAND	NP-SAND	TP-0-15	TP-0-15D	TP-120-60
	Sample Date:	11/12/98	11/12/98	11/12/98	11/12/98	11/12/98	11/12/98
Parameters:	LAB#:	36418.01	36418.02	36418.02 RE	36418.03	36418.04	36418.05
	Units:						
MISCELLANEOUS:	mg/kg	-	-	-	1220	5.1	16300
TCLP HERBICIDES:							
2,4-D	mg/l	1000 U	1000 U	-	-	-	-
2,4,5-TP (SILVEX)	mg/l	100 U	100 U	-	-	-	-
PCBS:							
AROCLOR-1016	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1221	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1232	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1242 U	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1248	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1254	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1260	ug/kg	-	-	-	240	-	42 U
TCLP PESTICIDE:							
HEPTACHLOR	ug/l	0.14 PJ	0.8 U	-	-	-	-
ENDRIN	ug/l	8 U	2 U	-	-	-	-
HEPTACHLOR EPOXIDE	ug/l	3.2 U	0.8 U	-	-	-	-
CHLORDANE	ug/l	0.003 U	0.003 U	-	-	-	-
METHOXYCHLOR	ug/l	4000 U	10 U	-	-	-	-
TOXAPHENE	ug/l	200 U	50 U	-	-	-	-
TCLP METALS:							
HG TOXICITY	mg/l	0.002 U	0.002 U	-	-	-	-
ARSENIC TOXICITY	mg/l	0.01 U	0.01 U	-	-	-	-
BARIUM TOXICITY	mg/l	1.9	1.5	-	-	-	-
CADMIUM TOXICITY	mg/l	0.003 U	0.003 U	-	-	-	-
CHROMIUM TOXICITY	mg/l	0.01	0.005 U	-	-	-	-
LEAD TOXICITY	mg/l	0.38	0.003 U	-	-	-	-
SILVER TOXICITY	mg/l	0.007 U	0.007 U	-	-	-	-
SELENIUM TOXICITY	mg/l	0.005 U	0.005 U	-	-	-	-

U: Analyzed But Not Detected
-: Not Tested
P: Greater Than 25% Difference in GC Columns
J: Estimated Value Below MDL and Reporting Limit

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number

Client: Dames and Moore

12/16/98

Project: IHNC

Matrix: Soil	Sample Point:	SP-SAND	NP-SAND	NP-SAND	TP-0-15	TP-0-15D	TP-120-60
	Sample Date:	11/12/98	11/12/98	11/12/98	11/12/98	11/12/98	11/12/98
Parameters:	LAB#:	36418.01	36418.02	36418.02 RE	36418.03	36418.04	36418.05
	Units:						
MISCELLANEOUS:							
ORG. CL (TOX)	mg/kg	-	-	-	14.1 U	-	18.1
REACTIVE CYANIDE	mg/kg	0.025 U	0.025 U	-	-	-	-
REACTIVE SULFIDE	mg/kg	20 U	20 U	-	-	-	-
HAZARDOUS WASTE CHARACTERIZATION:							
CORROSIVITY PH	Su	7.5	8.2	-	-	-	-
IGNITABILITY	F	167	170	-	-	-	-
MISCELLANEOUS:							
BTU	btu	-	-	-	1 U	-	9530
% ASH	%	-	-	-	59.5	-	51.2

U: Analyzed But Not Detected
-: Not Tested
P: Greater Than 25% Difference Between the GC Columns
J: Estimated Value Below MDL and Reporting Limit

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number
12/16/98

Client: Dames and Moore

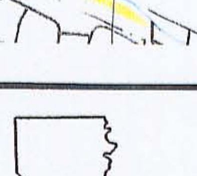
Project: IHNC

Matrix: Soil	Sample Point:	TP-120-60	TP-120-60	TP-75-25	TP-120-0		
	Sample Date:	11/12/98	11/12/98	11/12/98	11/12/98		
Parameters:	LAB#:	36418.06 MS	36418.07 MSD	36418.08	36418.09		
	Units:						
TPH BY GC/FID MODIFIED 8015:							
GASOLINE C6-C10	mg/kg	-	-	14.3 U	2.7 U		
DIESEL C10-C22	mg/kg	-	-	14.3 U	2.7 U		
KEROSENE C9-C18	mg/kg	-	-	14.3 U	2.7 U		
JP-4 C6-C14	mg/kg	-	-	14.3 U	2.7 U		
NAPHTRA C6-C12	mg/kg	-	-	14.3 U	2.7 U		
#6 FUEL OIL C12-C24	mg/kg	-	-	14.3 U	2.7 U		
MISCELLANEOUS	mg/kg	-	-	1950	6.6		
PCBS:							
AROCLOR-1016	ug/kg	220 P	210 P	51 U	46 U		
AROCLOR-1221	ug/kg	42 U	42 U	51 U	46 U		
AROCLOR-1232	ug/kg	42 U	42 U	51 U	46 U		
AROCLOR-1242	ug/kg	42 U	42 U	51 U	46 U		
AROCLOR-1248	ug/kg	42 U	42 U	51 U	46 U		
AROCLOR-1254	ug/kg	42 U	42 U	51 U	46 U		
AROCLOR-1260	ug/kg	260 P	240 P	150 P	46 U		
MISCELLANEOUS:							
ORG. CL (TOX)	mg/kg	-	-	17.4	14.2 U		
BTU	btu	-	-	136	1 U		
% ASH	%	-	-	56.7	67.1		

U: Analyzed But Not Detected
-: Not Tested
P: Greater Than a 25% Difference Between the GC Columns
J: Estimated Value Below MDL and Reporting Limit

Figures

Adapted from U.S. Geological Survey
NEW ORLEANS EAST
QUADRANGLE
7.5 Minute Series (Topographic)
1992



LOUISIANA

MN
GN
1°28'
20 MILS
2°
36 MILS

Figure 1
SITE LOCATION MAP

Inner Harbor Navigation Canal
New Orleans, Louisiana

Scale: 1:24 000

Contour Interval: 10'

DAMES & MOORE

FIGURE 2
SITE PLOT PLAN
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

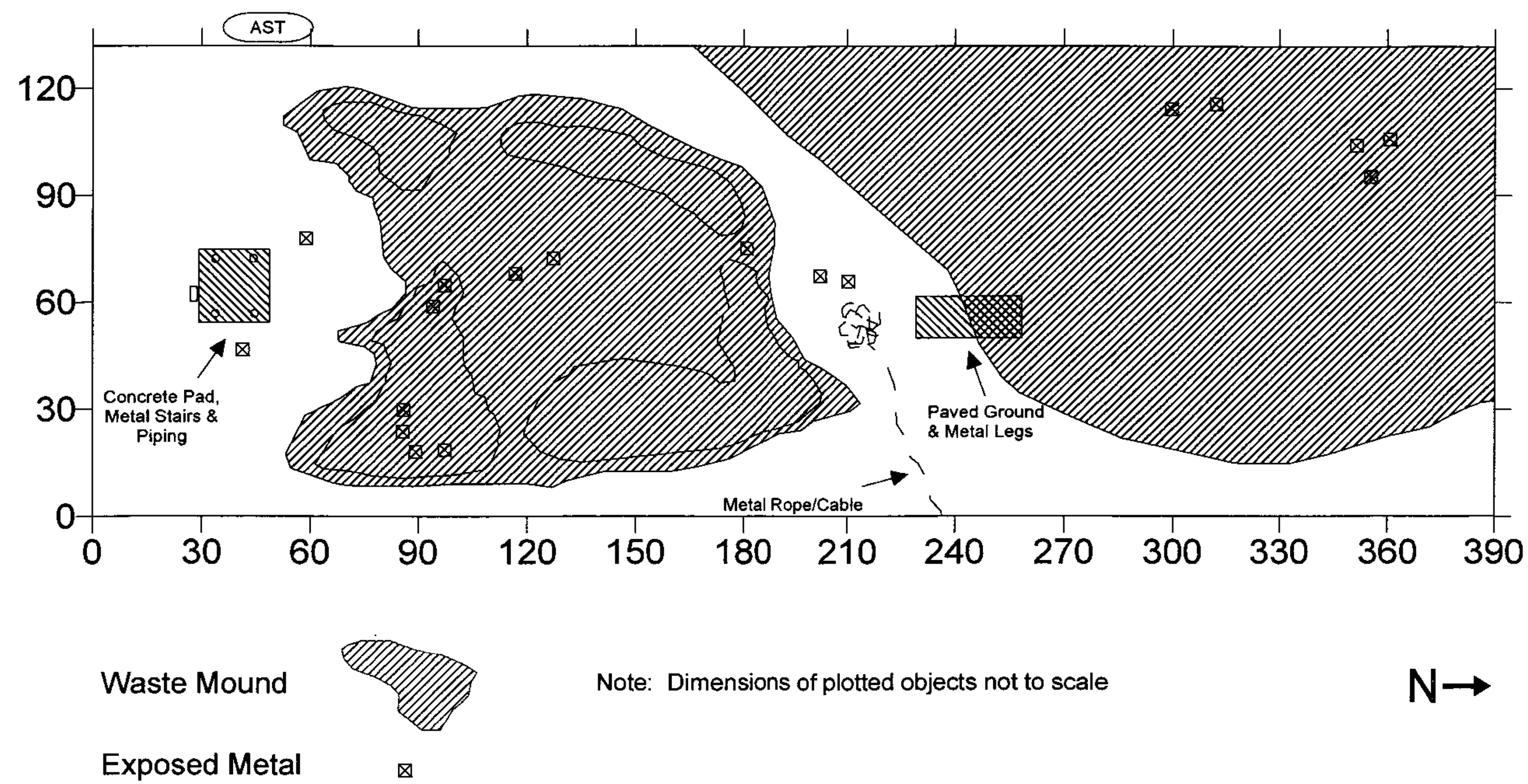


FIGURE 3
INNER HARBOR NAVIGATIONAL CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

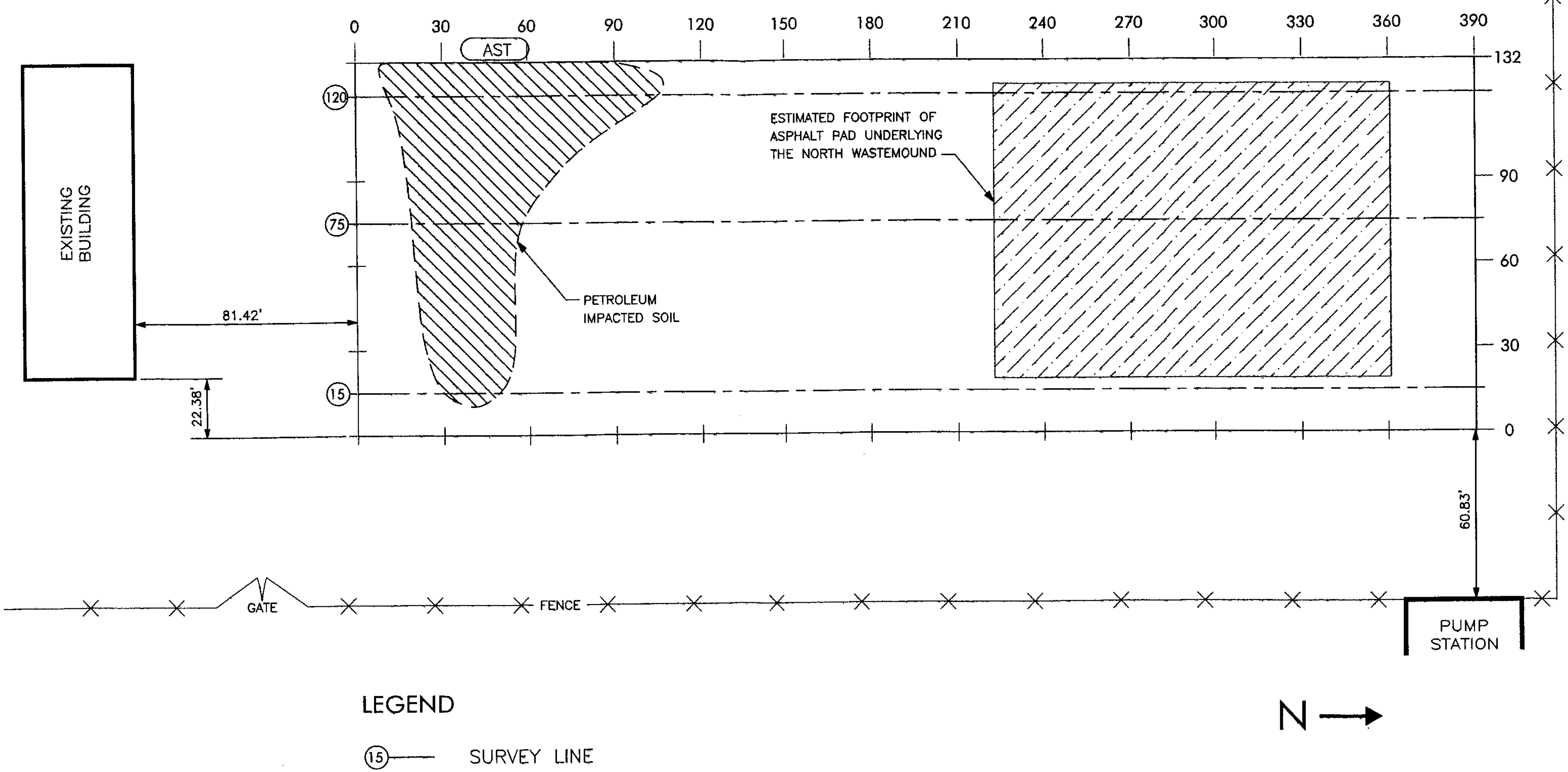


FIGURE 4
EM31 QUADRATURE AVERAGE DATE
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

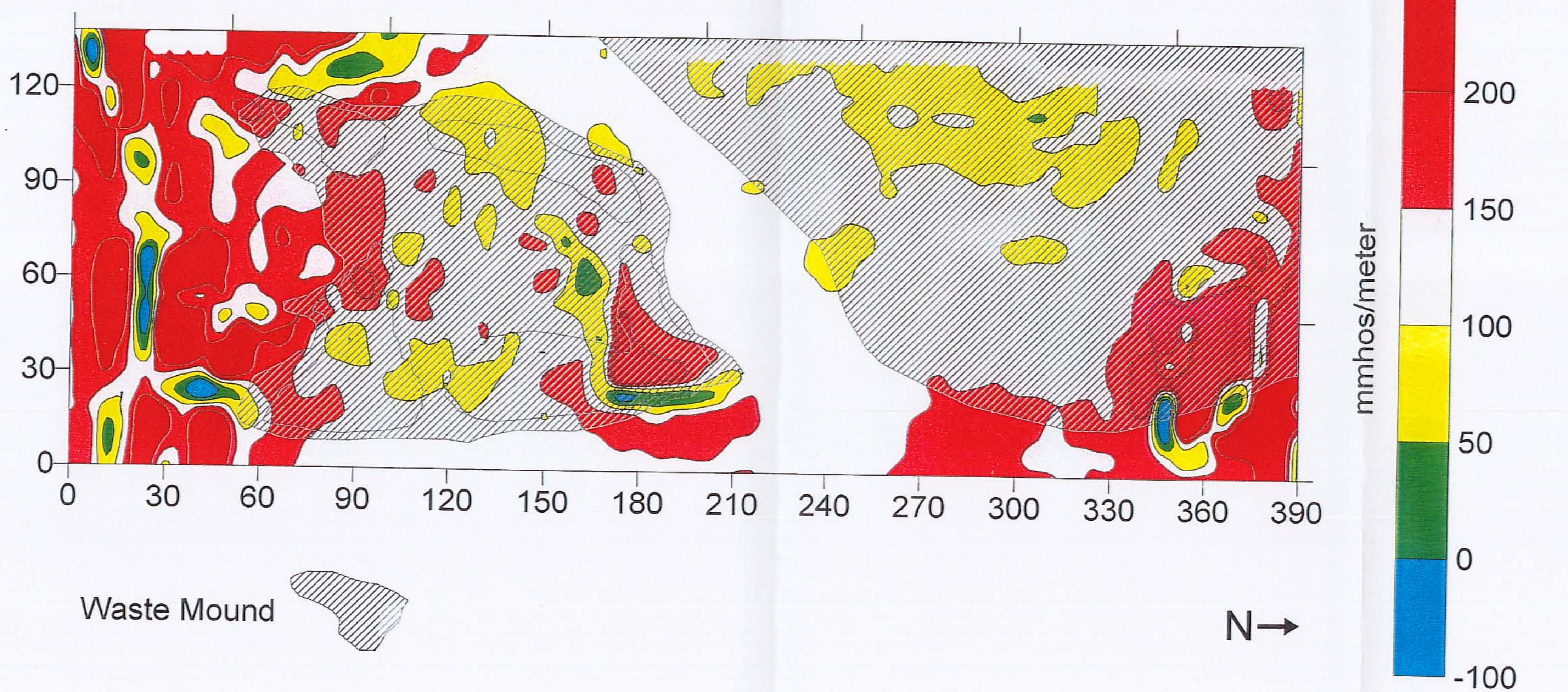


FIGURE 5
EM31 INPHASE AVERAGE DATA
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

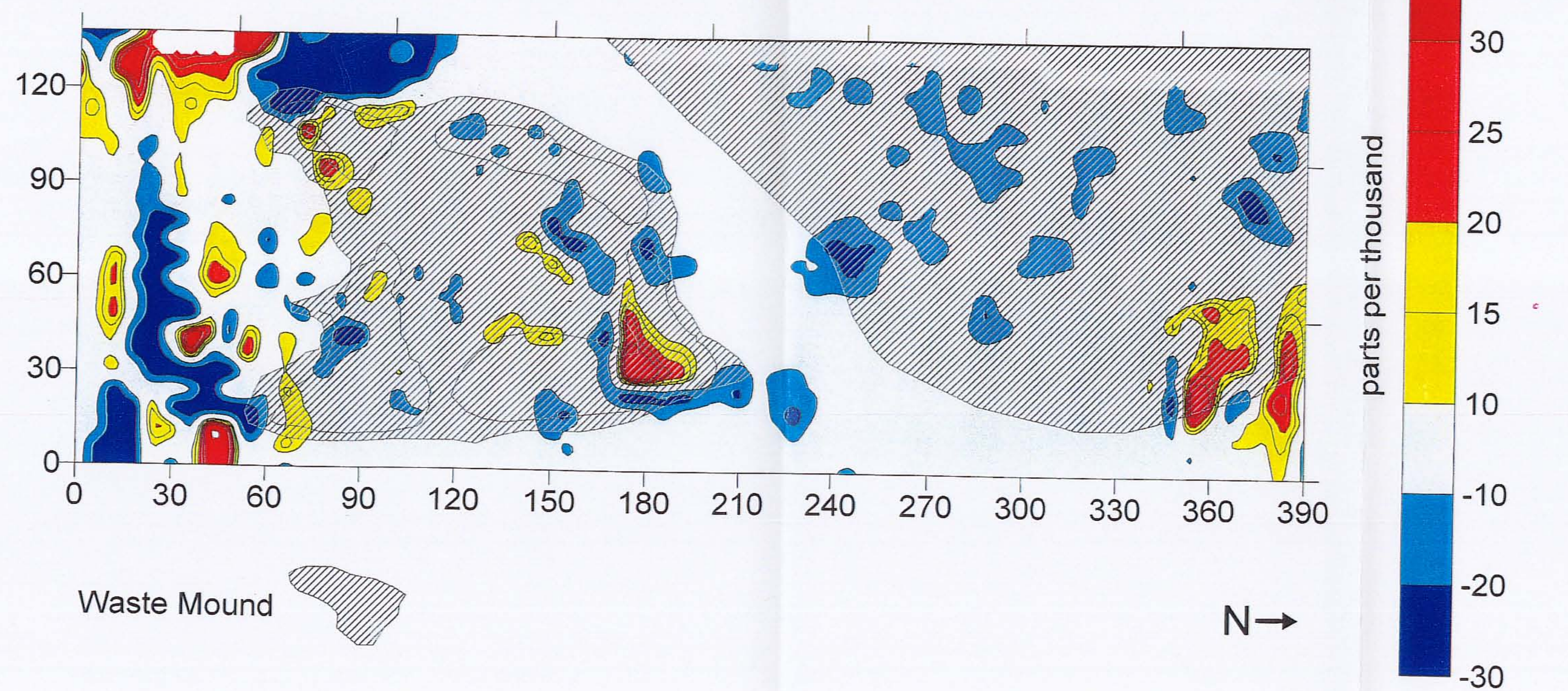


FIGURE 6
EM61 CHANNEL 2 DATA
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

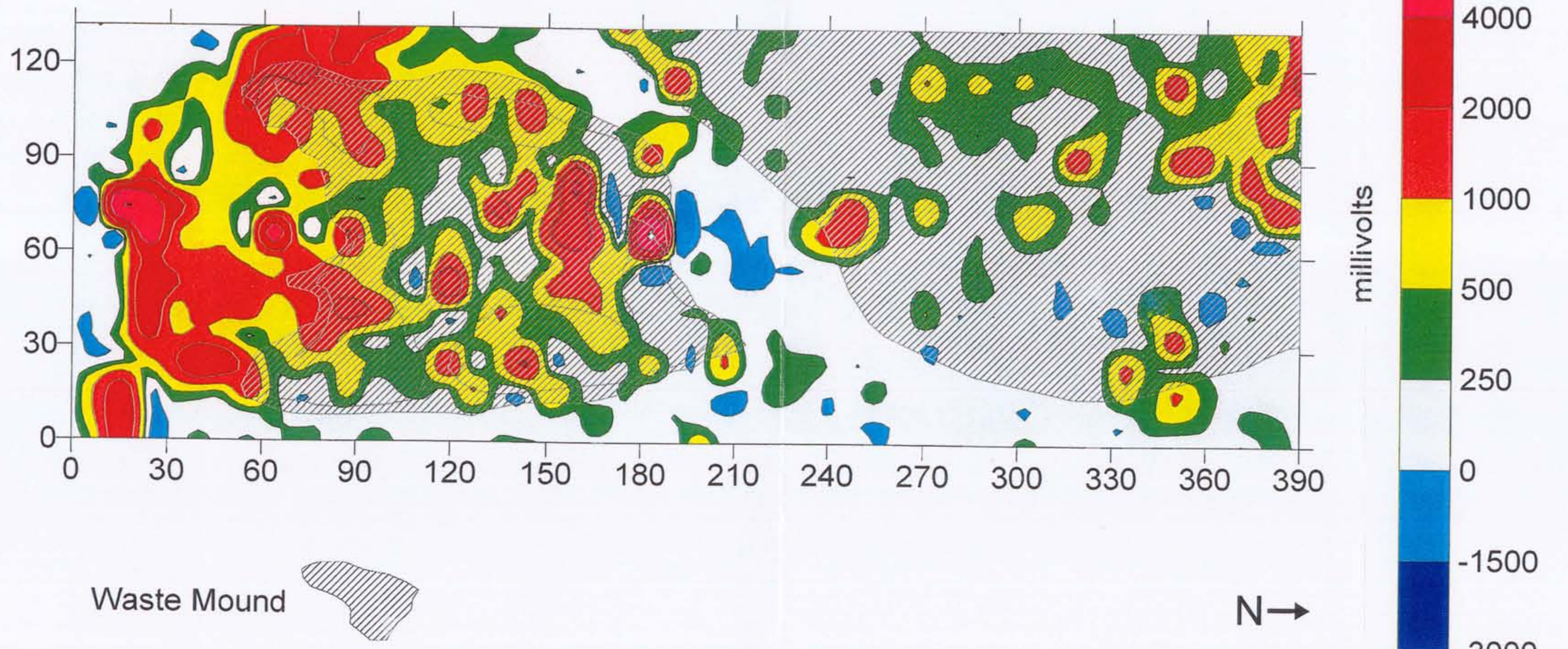


FIGURE 7
EM61 NORMALIZED DIFFERENTIAL DATA
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

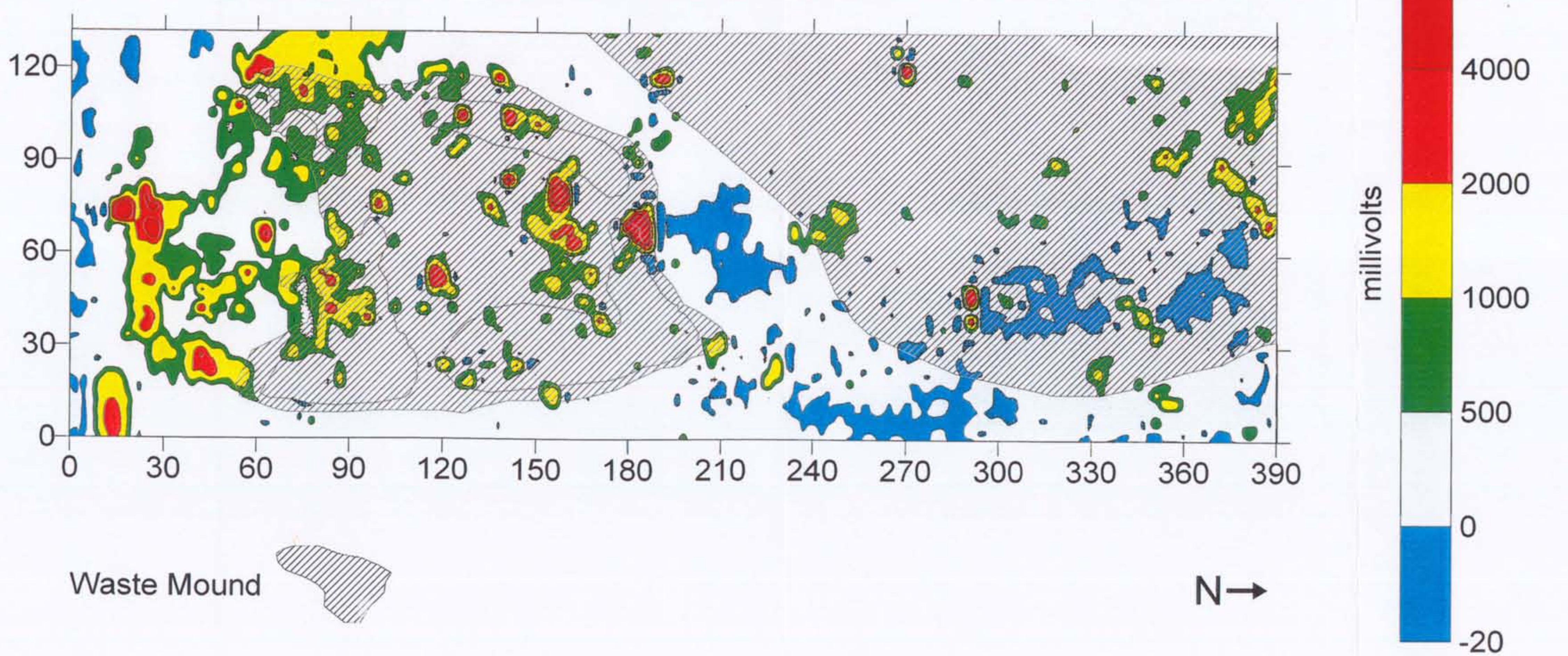


FIGURE 8
PHOTOGRAPHIC LOG
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA

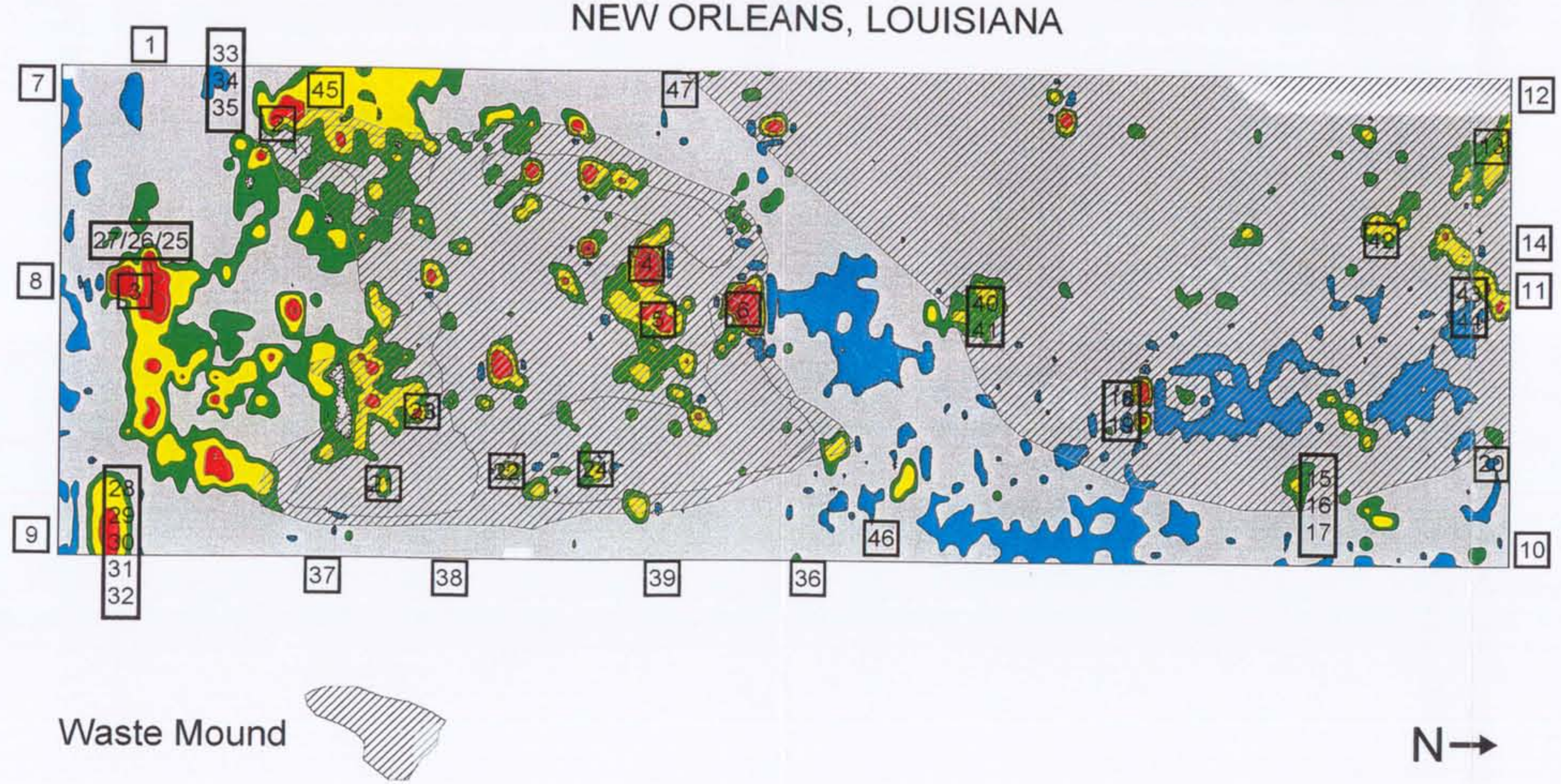
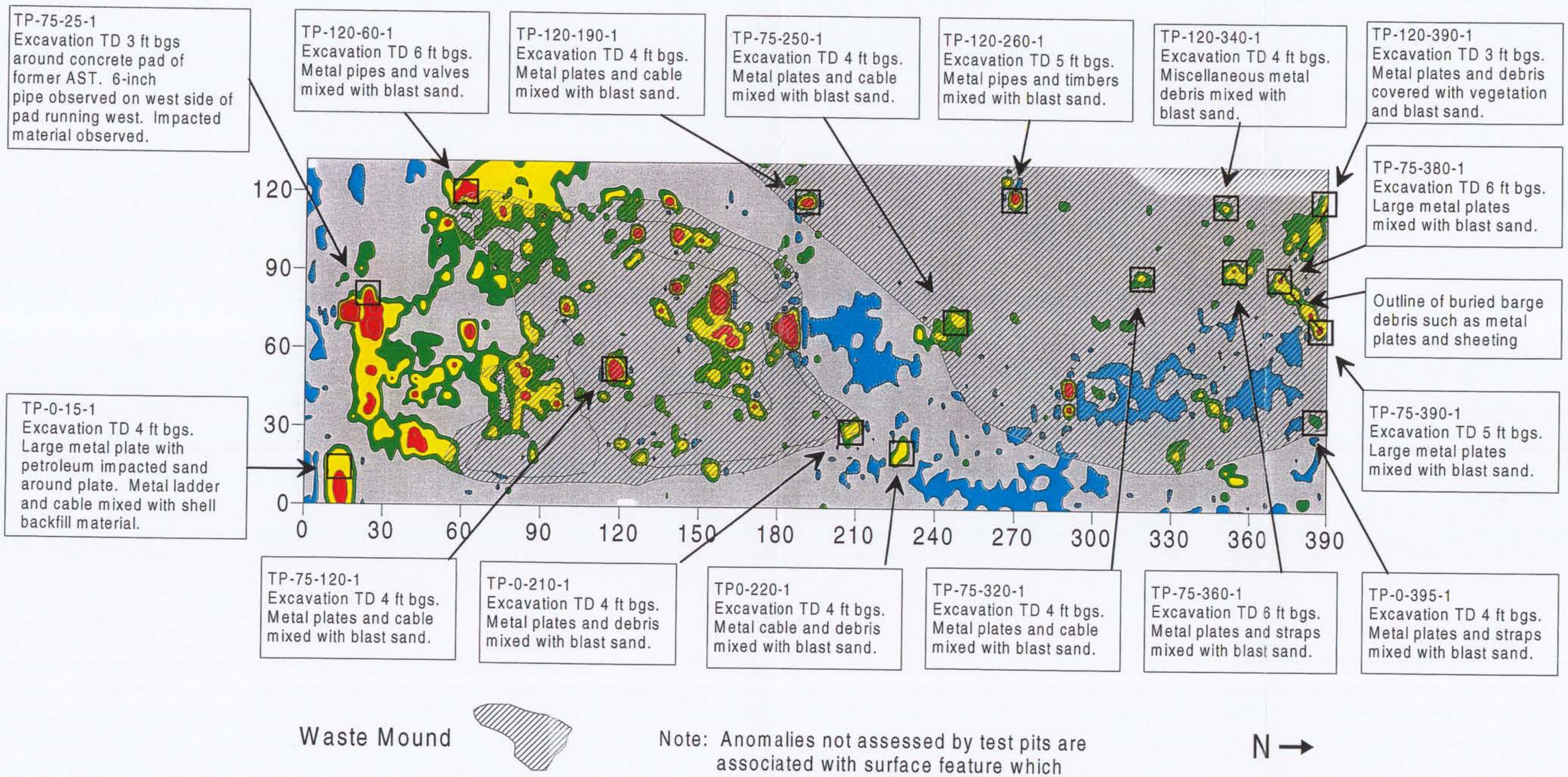
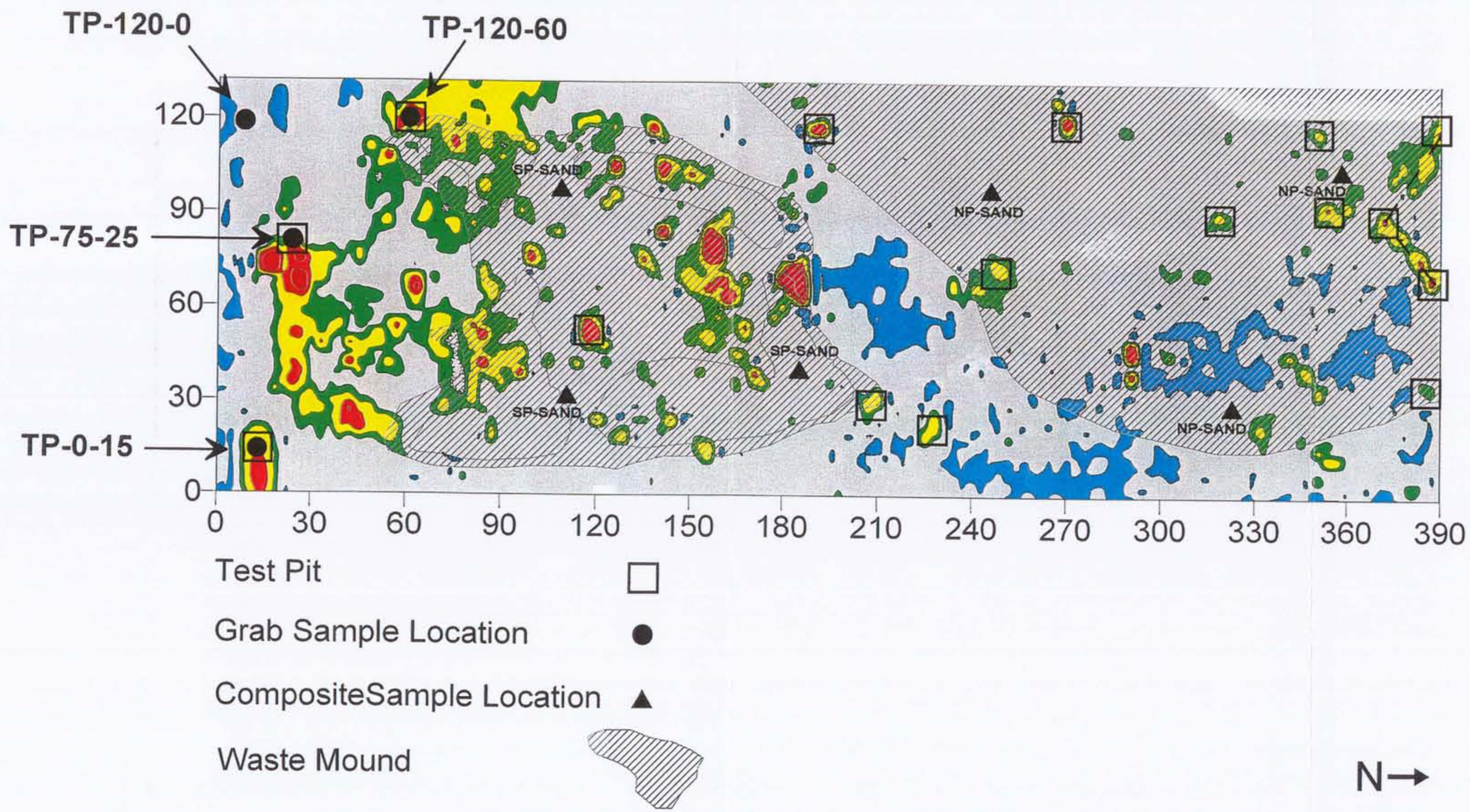


FIGURE 9
TEST PIT LOCATIONS
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA



Note: Anomalies not assessed by test pits are associated with surface feature which have been photographed (See Figure 8)

FIGURE 10
SAMPLE LOCATIONS
MIXED-WASTE MOUNDS
INNER HARBOR NAVIGATION CANAL - SAUCER MARINE PROPERTY
NEW ORLEANS, LOUISIANA



Appendix A
Limited Site Investigation
Field Notes

DAILY FIELD REPORT

Job. No.	08768-027
Page	1 of 1
Report Sequence No.	
Date	11-9-98
Day of Week	MON
Job Engineer	DEK
HRS Charged	
Assistants	
HRS Charged	

IHNC
New Orleans, LA
Former Saucer Marine Facility

Arrive onsite at 1300 hours
- Locate Test pits
- Wait for equipment

Survey the survey area and stake out test pit locations in areas of potential buried metals. Looking for buried drums. Identify 16 sites for Test pits. The other anomalies observed are metal debris at the surface.

Equipment arrives onsite at 1635.

Depart the site at 1645.

4 hours

DAILY FIELD REPORT

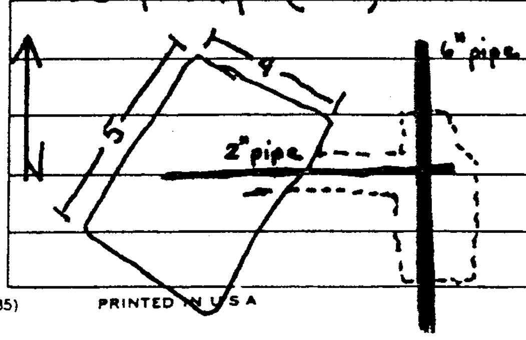
Job. No.	08768-027
Page	1 of 4
Report Sequence No.	
Date	11-10-98
Day of Week	Tues
Job Engineer	DEK
HRS Charged	
Assistants	
HRS Charged	

IHNC
New Orleans, LA
Former Saucer Marine Facility

Scope of Work
- Review the geophysical data for anomalies (potential buried metal) and identify potential test pit locations
- Excavate test pits and field screen samples for volatile organics. Log test pits for soil type and evidence of environmental impact (odors and stained soil).
- Collect soil samples and blast sand samples from the waste piles identified on the subject property.

Field activities will start in the southwest corner of the survey area and proceed to the north along Line 132 (120).

Test Pit (TP) 120-60-1



0-4' reddish brown fine sand (blasting sand) mixed with metal debris
4-6' dark gray to blue gray clay with wood debris strong petro odors

DAILY FIELD REPORT

Job. No.	
08768-027	
Page 2 of 4	
Report Sequence No.	
Date: 11-10-98	Day of Week: Tues
Job Engineer: DEK	HRS Charged:
Assistants:	HRS Charged:

IHNC

Former Saucer Marine Facility

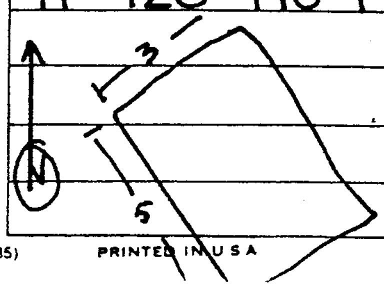
TP-120-60-1

strong petroleum odor and staining along the pipe runs. The piping appears to be associated with a fuel distribution system (AST and piping). HNu - background 9-10 ppm
headspace 25 ppm

Test pit was extended to the east along the 2" piping. Encountered more piping and valves. Strong petroleum odor and staining.

NOTE: Southwest Corner of the survey area. AST with associated pumps and piping running north-south. (In the vicinity of Test pit 120-60-1) The area is comprised of blast sand which contains metal piping, metal plates, wire rope, etc. The blast sand and metal debris is underlain by a blue gray to dark gray fat clay. The area in the vicinity of the AST and associated piping appears to be impacted with petroleum hydrocarbons (diesel).

TP-120-190-1



0-3 reddish brown fine sand mixed with metal debris and timbers

3-4 asphalt underlain by shells

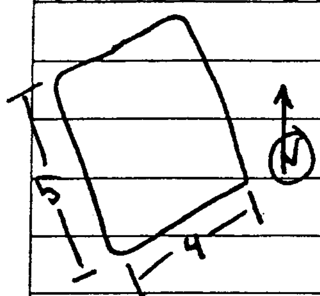
DAILY FIELD REPORT

Job. No.	
08768-027	
Page 3 of 4	
Report Sequence No.	
Date: 1-10-98	Day of Week: Tues
Job Engineer: DEK	HRS Charged:
Assistants:	HRS Charged:

TP-120-190-1

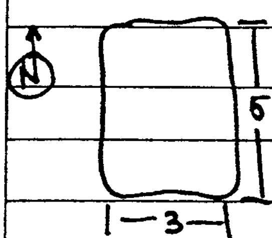
No evidence of petroleum impact, no staining or odor, no drums.
HNu - < 5 ppm (background)
- 8ppm (headspace)

TP-120-260-1



0-3 reddish brwn fine sand mixed with metal debris (pipe, wire rope, etc) & timbers.
3-4 asphalt with shell base
5-6 blue gray to dark gray fat clay with wood debris (Native Material)
No evidence of petroleum impact, no staining or odor, no drums.
HNu - < 5ppm (background)
- 6ppm (headspace)

TP-120-340-1



0-3 reddish brwn fine sand mixed with misc. metal debris (pipes, straps, etc)
3-4 asphalt with shell base.
No evidence of petroleum impact, no staining or odor, no drums.
HNu - < 5 ppm (background)
- 5 ppm (headspace)

DAILY FIELD REPORT

Job. No.	08768-027
Page 1 of 1	
Report Sequence No.	
Date 11/13/98	Day of Week Fri
Job Engineer DEK	HRS Charged
Assistants	HRS Charged

IHNC
New Orleans, LA
Former Saucer Marine Facility

0730 Arrive onsite.
Collect soil samples along the 6" pipe running from the concrete pad of the former AST.

0820 Start to backfill the excavation running from the concrete pad of the former AST.

0935 Prep soil samples for shipment to the laboratory.

1100 Move equipment outside the fence and all RSC for pick up. Will leave the keys under the seat.

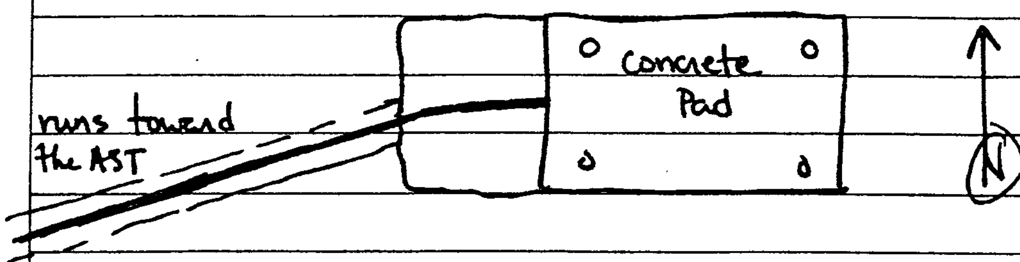
1130 Depart the site for the airport to drop off soil samples.

DAILY FIELD REPORT

Job. No.	08768-027
Page	4 of 4
Report Sequence No.	
Date	11-12-98
Day of Week	Thu
Job Engineer	DEK
HRS Charged	
Assistants	
HRS Charged	

1450 RSC onsite to replace bucket on the excavator.

1510 Start excavation around the pad of the former AST.
TP-75-25-1



0-1 gray brown silty sand / shells
1-2 shells
2-3 blue gray fat clay
Evidence of environmental impact - strong petroleum odor along the pipe and around the concrete pad.
Soil sample collected along the pipe run.

1630 Depart the site

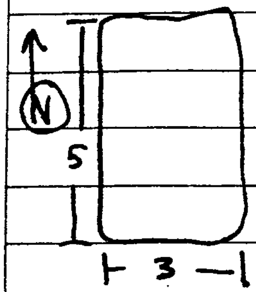
Hours: 0750 Arrived onsite
1245-1350 Lunch
1630 Depart site

8 hrs

DAILY FIELD REPORT

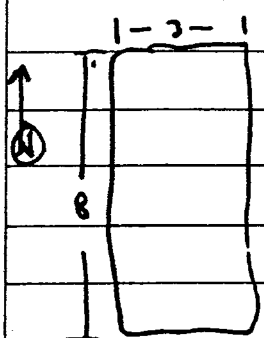
Job. No. 08768-027	
Page 3 of 4	
Report Sequence No.	
Date 11-12-98	Day of Week Thru
Job Engineer DEK	HRS Charged
Assistants	HRS Charged

1350 Start Excavating Test Pit
TP-O-210-1



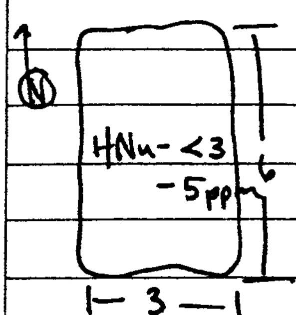
0-2 reddish brwn fine sand to silty sand/sandy silt with metal straps and wire rope.
2-3 shells
3-4 blue gray to dark gray fat clay
HNu - bg - <3ppm
- HS - 5ppm
No evidence of environmental impact, No drums.

1410 Start excavating Test pit TP-O-220-1



0-2 reddish brwn fine sand to sandy silt with metal debris (straps/wire rope).
2-3 shells
3-4 blue gray to dark gray fat clay
HNu - bg - <3ppm
HS - 5ppm
No evidence of environmental impact, no drums.

1430 Start excavation of TP-O-395-1

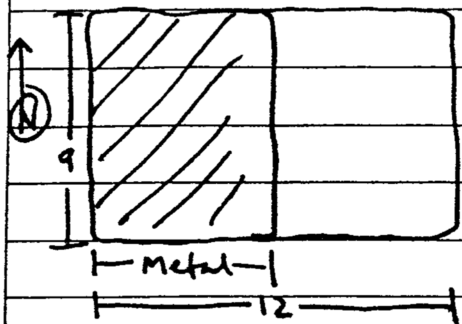


0-1 reddish brwn fine sand/gray brwn silty sand with metal debris (metal plate and straps).
1-2 Shells
2-4 bluegray to dark gray fat clay
No evidence of environmental impact.
no drums.

DAILY FIELD REPORT

Job. No. 08768-027	
Page 2 of 4	
Report Sequence No.	
Date 11-12-98	Day of Week Thu
Job Engineer DEK	HRS Charged
Assistants	HRS Charged

TP-0-15-1



0-1 reddish brown fine sand/shell mix with metal debris such as plates, ladder, etc. Large metal plate on the west side of the excavation

1-2 shells

2-4 black to dark gray fat clay
No drums but evidence of environmental impact - strong petro odor & staining

HNu- background <5ppm
headspace 35ppm

Soil samples collected from the east side of the metal plate

1143 New excavator arrives onsite - need to switch out the buckets - will resume after lunch.

NOTE: Water trapped under the metal plate in TP-0-15-1 fills the excavation. No free-phase liquids observed on the water entering the excavation. The metal plate has a thickness of approx. 6".

1220 Continue to backfill TP-0-15-1 and will also backfill TP-120-60-1

1245 Break for lunch

DAILY FIELD REPORT

Job. No.	
08768-027	
Page 1 of 4	
Report Sequence No.	
Date: 11-12-98	Day of Week: Thru
Job Engineer: DEK	HRS Charged
Assistants	HRS Charged

IHNC
New Orleans, LA
FORMER SAUCER MARINE FACILITY

0750 Arrived onsite
RSC Service Technician not onsite to repair the track on the equipment.

0815 RSC Service not onsite - need to call for service. REMINDER

0930 RSC Service Tech onsite - Equipment has a defective part. Will bring out a new ~~excavation~~ excavator. Tech will repair the equipment onsite and walk it to the next test pit location (southeast corner of the survey area). The new equipment will be onsite after lunch.

DEK 11/12/98

Complete sampling of the blast sand stockpiles (north & south waste piles)

1005 Start excavating in the southeast corner of the survey area (TP-0-15-1). The anomaly detected by the EM-61 survey appears to be a large metal plate (thin tank).

DAILY FIELD REPORT

Job. No.	08768-027
Page 4 of 4	
Report Sequence No.	
Date: 11-11-98	Day of Week: Wed
Job Engineer: DEK	HRS Charged
Assistants	HRS Charged

Note: Appears that the waste pile on the north side of the survey area rest on asphalt which is underlain by a shell base and blue gray to dark gray fat clay (Native Soil).

1630 Start backfilling TP-75-250-1
Several large metal plates found in the blast sand. No drums or evidence of environmental impact.

1635 Track on the excavation equipment comes off. RSC called and will have someone out tomorrow.

1700 Depart the site.

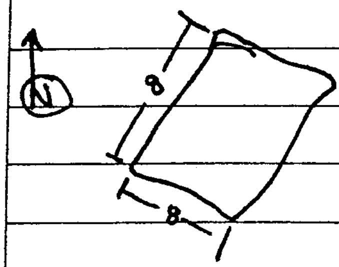
Hours:
0745 - Arrive onsite
1015 - 1415 Equipment down / Lunch
1700 - Depart the site

10 hours (3 hrs down due to equipment)

DAILY FIELD REPORT

Job. No. 08768-027	
Page 3 of 4	
Report Sequence No.	
Date 11-11-98	Day of Week Wed
Job Engineer DEK	HRS Charged
Assistants	HRS Charged

1415 RSC Service Technician onsite to repair the track on the equipment. Will start at TP-75-360-1



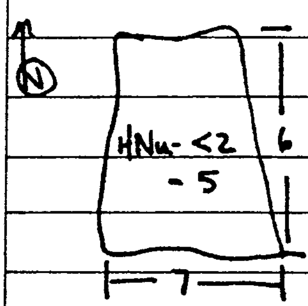
0-2 reddish brwn fine sand to silty sand/sandy silt mixed with metal debris (metal plates, wire rope, metal straps)
2-3 asphalt underlain by shell base
3-6 blue gray to dark grey fat clay with wood debris (Native Soil)

HNu - background <2ppm
- headspace 5ppm

No evidence of environmental impact
No drums and staining (No odor).

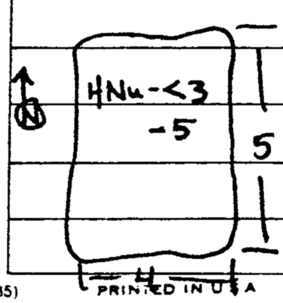
1446 Stop excavating at TP-75-360-1

1500 Start excavating at TP-75-320-1



0-4 reddish brwn fine sand to silty sand/sandy silt mixed with metal debris (metal plates, wire rope)
4-5 asphalt underlain by shell base
5+ blue gray to dark grey fat clay

1547 Start excavating at TP-75-250-1

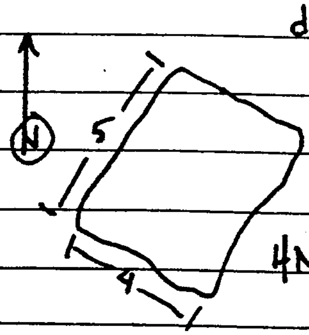


0-3 reddish brwn fine sand to silty sand/sandy silt mixed with large metal plates
3-4 asphalt underlain by shell base
4+ blue gray to dark grey fat clay

DAILY FIELD REPORT

Job. No.	08768-027
Page 2 of 4	Report Sequence No.
Date 11-11-98	Day of Week Wed
Job Engineer DEK	HRS Charged
Assistants	HRS Charged

1000 Complete TP-75-380-1
Several large plates of metal and
misc. metal debris near the surface
No drums or evidence of environmental
Impact (no staining/no odors)
0-2 reddish brown to gray brown fine sand to
silty sand/sandy silt mixed with metal
2-3 asphalt underlain by shells
3-6 blue gray to dark gray fat clay with wood
debris (Native Soil)



Start backfilling the excavation - prep
to move to TP-75-360-1
HNu - background < 2 ppm
- headspace 5ppm

1015 Rubber traction slipped off the excavator.
Call RSC Service Center - they will have a service
technician out today.

1215 Equipment still down.
Photograph surface anomalies which will not
be excavated.

Depart site for lunch - will leave the gate open
for the RSC Service Technician.

1315 Return from lunch - Equipment still down - call
RSC.

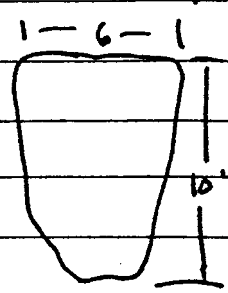
DAILY FIELD REPORT

Job. No.	08768-027
Page	1 of 4
Report Sequence No.	
Date	11-11-98
Day of Week	Wed
Job Engineer	DEK
HRS Charged	
Assistants	
HRS Charged	

IHNC
New Orleans, LA
Former Saucer Marine Facility

0745 Arrive on site
Start work on the north end of the survey area (Line 75). The area of a potential buried barge.

Test Pit 75-390-1
Several large plates and wire rope - near the surface. 1" and 2" metal piping.



0 - 2 reddish brown fine sand to sandy silt mixed with metal debris
2 - 3 asphalt underlain by shells
3 - 5 blue gray to dark gray fat clay with wood debris (Native)

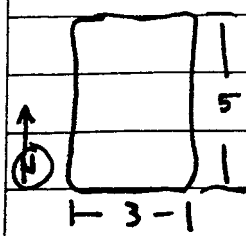
No evidence of environmental impact.
No drums.

0900 Complete TP-75-390-1
Start backfilling the excavation
No evidence of environmental impact
HNu - background < 2 ppm
- headspace 5ppm

DAILY FIELD REPORT

Job. No.	08768-027
Page 4 of 4	
Report Sequence No.	
Date: 11-10-98	Day of Week: Tues
Job Engineer: DEK	HRS Charged
Assistants	HRS Charged

TP-120-390-1



0-3 reddish brown fine sand with brown silty sand mixed with metal debris (large metal plates, strapping, etc.) Possible barge. Area covered with a dense vegetation.

No evidence of petroleum impact, no staining or odor. No drums

HNu - < 5 ppm (background)
- 6 ppm (headspace)

Hours:

0730 - Arrive onsite
1200 - 1300 Break for lunch
1530 - Stop work do to lightning and heavy rainfall.

7 hours

DAMES & MOORE

Appendix B
Analytical Data

CHAIN OF CUSTODY RECORD

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. Albany • Broken Arrow, Oklahoma 74012-1421
Office: 918-251-2858 • Fax 918-251-2599

SAMPLING FIRM	CLIENT CONTACT	PHONE NUMBER
Dames & Moore	Jon Sc. Kin.	

P.O. or PROPOSAL NUMBER	PROJECT NAME
D.O. 0011	IHNC - New Orleans

SAMPLER (Signature)

ANALYTICAL TESTS REQUESTED

SAMPLE ID	DATE	TIME	COMP	GRAB	LOCATION	MATRIX	NUMBER OF CONTAINERS	TCLP-VOC	TCLP-SVOC	TCLP-Metal	TCLP-Pest	TCLP Herb	R/C/I	PCB	EFP	TPH	BTEX	REMARKS
SP-SAND	11/12/98	0830		✓	IHNC - South WASTE PILE	Sd	5	✓	✓	✓	✓	✓	✓					
NP-SAND	11/12/98	0920		✓	IHNC - North WASTE PILE	Sd	5	✓	✓	✓	✓	✓	✓					
TP-0-15	11/12/98	1045		✓	IHNC - South Waste Pile	Soil	4						✓	✓	✓	✓		
TP-0-15D	11/12/98	1045		✓	IHNC - South Waste Pile	Soil	1							✓				Duplicate
TP-120-60	11/12/98	1230		✓	IHNC - South Waste Pile	Soil	4						✓	✓	✓	✓		
TP-120-60MS		1230		✓	"	"	1							✓				Matrix Spike
TP-120-60MSD		1230		✓	"	"	1							✓				Matrix Spike duplicate
TP-75-75	11/12	1600		✓	IHNC - West AST	"	4						✓	✓	✓	✓		
TP-120-0	11/13	0745		✓	IHNC - Fuel Line	"	4						✓	✓	✓	✓		

R/C/I - Reactivity/Corrosivity/Ignitability

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)
	11/13/98	1309	Federal Express 8xxxx79881				

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY (Signature)
					11-14-98	9:50	

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)

REMARKS: No Temp blanks or Trip blanks furnished by client.

[SR012-1192 01]

COOLER RECEIPT / SAMPLE LOG-IN SHEET

COOLER RECEIPT / SAMPLE LOG-IN SHEET (115-ATT2.WB1) / SWL-GA-115 REV 5.0 / GA-115-CRLOGIN-F

LAB NAME: SOUTHWEST LABORATORY OF OKLAHOMA/AMERICAN ANALYTICAL & TECH SRVS

PAGE 1 OF 1

RECEIVED BY (PRINT NAME): SUE HALL

RECEIVED BY (SIGNATURE): Sue Hall

LOGGED IN BY (SIGNATURE): E. Macintosh

REC'D DATE 11/16/98

TIME REC'D 09:50

LOG-IN DATE 1998-11-16 14:29

PROJECT: LAB DECOM

EPISODE: 36418

SAMPLE DELIVERY GROUP: 36418

Client Sample #	Sample Fraction @	Assigned LAB#	Cooler I.D.	pH Check:	ACID/ BASE LOT#	REMARKS: CONDITION OF SAMPLE SHIPMENT, ETC.
SP-SAND	I,P,H,V, B,M	36418.01	11/16/98-1	N		5.0 DEG C
NP-SAND	↓	36418.02				
TP-0-15	B,I	36418.03				
TP-0-15D	B	36418.04				
TP-120-60	B,I	36418.05				
TP-120-60 MS	B	36418.06				
TP-120-60 MSD	B	36418.07				
TP-75-25	B,I	36418.08				
TP-120-0	↓	36418.09				

Remarks

1. CUSTODY SEAL(S): Present/Absent; Intact/ Broken
2. CUSTODY SEALS NOS.: NA
3. CHAIN-OF CUSTODY. Present/Absent
   - Sealed In Plastic? Yes/ No
   - Taped To Lid? Yes/ No
   - Properly Filled Out (Ink, Signed, ETC.)? Yes/ No
4. AIRBILL: AirBill/ Sticker; Present/Absent
5. AIRBILL NO: 80695298813
6. COOLER CONDITIONS
   - Enough Ice? Yes/ No
   - Type of Ice? Wet
   - Type of Packing? Air
7. SAMPLE TAGS: Present/Absent
8. SAMPLE CONDITION: Intact/ Broken*/ Leaking
   - Bottles Sealed In Separate Plastic Bags? Yes/ No
   - Correct Containers Used For Tests Indicated? Yes/ No
   - Correct Preservative? Yes/ No
   - Sufficient Sample? Yes/ No
   - Labels Complete (I.D., Date, Time, Signature, Preservative)? Yes/ No
   - VOA Samples Without Bubbles? Yes/ No~
9. Does Information on Custody Records, Labels, Tags Agree? Yes/ No*
10. RAD SCREEN WITH GIEGER COUNTER? Yes/ No
11. P.O. Called? Yes/ No

* Contact PO and attach record of resolution

@ Sample Fractions: B=SV GC/MS, V= VOA GC/MS or GC, P=Pesticide, H=Herbicide, D=Dioxin, A=Air, I=Inorganics, C=Cyanide, M=Metals, R=Radiochemistry

~ Note samples with bubbles under remarks section.

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

December 16, 1998

Mr. Jon Seekins
DAMES & MOORE
2021 South Lewis
Tulsa, OK 74104

Project: **IHNC**
SWLO ID: 36418.01 – 36418.09

Dear Mr. Seekins:

Enclosed please find the standard tabular report and DMOL for your samples received in our laboratory on October 16, 1998, for the above captioned project.

SEMIVOLATILES: Sample 36418.02 had 5 out of 6 surrogates outside QC recovery limits (low). This sample was re-TCLP extracted outside the 14 day TCLP holding time and reanalyzed. The re-analysis had all surrogates within QC recovery limits.

Thank you for choosing Southwest Labs. If, in your review, you should have any questions or require additional information, do not hesitate to call.

Sincerely,

Keith Sims
Project Officer

KS/hg
Enclosures

cc. Doug Kuhn
Dames & Moore
6310 Lamar, Suite 135
Overland Park, KS 66202

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number

DATE: 12/16/98
PAGE: 1

Client: DAMES & MOORE

Project: IHNC

Matrix: SOIL / Sample Point-> / Sample Date-> / LAB#->		SP-SAND 11/12/98 36418.01	NP-SAND 11/12/98 36418.02	NP-SAND 11/12/98 36418.02 RE	TP-0-15 11/12/98 36418.03	TP-0-15D 11/12/98 36418.04	TP-120-60 11/12/98 36418.05
Parameters	Units						
TCLP VOLATILES							
BENZENE	mg/L	0.025 U	0.025 U	-	-	-	-
CARBON TETRACHLORIDE	mg/L	0.025 U	0.025 U	-	-	-	-
CHLOROBENZENE	mg/L	0.025 U	0.025 U	-	-	-	-
CHLOROFORM	mg/L	0.025 U	0.025 U	-	-	-	-
1,2-DICHLOROETHANE	mg/L	0.025 U	0.025 U	-	-	-	-
1,1-DICHLOROETHENE	mg/L	0.025 U	0.025 U	-	-	-	-
TETRACHLOROETHENE	mg/L	0.025 U	0.025 U	-	-	-	-
TRICHLOROETHENE	mg/L	0.025 U	0.025 U	-	-	-	-
VINYL CHLORIDE	mg/L	0.025 U	0.025 U	-	-	-	-
2-BUTANONE	mg/L	0.025 U	0.025 U	-	-	-	-
TCLP SEMIVOLATILES							
2-METHYLPHENOL	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
4-METHYLPHENOL	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
TOTAL CRESOL'S	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
1,4-DICHLOROBENZENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
2,4-DINITROTOLUENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
HEXACHLOROBENZENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
NITROBENZENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
PENTACHLOROPHENOL	mg/l	0.1 U	0.1 U	0.1 U	-	-	-
2,4,5-TRICHLOROPHENOL	mg/l	0.1 U	0.1 U	0.1 U	-	-	-
2,4,6-TRICHLOROPHENOL	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
HEXACHLOROBUTADIENE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
HEXACHLOROETHANE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
PYRIDINE	mg/l	0.02 U	0.02 U	0.02 U	-	-	-
TPH BY GC/FID MODIFIED 8015							
GASOLINE C6-C10	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
DIESEL C10-C22	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
KEROSENE C9-C18	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
JP-4 C6-C14	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
NAPHTHA C6-C12	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U
#6 FUEL OIL C12-C24	mg/kg	-	-	-	13.3 U	2.7 U	63.8 U

U: ANALYZED BUT NOT DETECTED
See enclosure for additional qualifiers

L3.9-00.100.0

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number

DATE: 12/16/98
PAGE: 2

Client: DAMES & MOORE

Project: IHNC

Matrix: SOIL	Sample Point-> / Sample Date-> / LAB#->	SP-SAND 11/12/98 36418.01	NP-SAND 11/12/98 36418.02	NP-SAND 11/12/98 36418.02 RE	TP-0-15 11/12/98 36418.03	TP-0-15D 11/12/98 36418.04	TP-120-60 11/12/98 36418.05
Parameters	Units						
MISCELLANEOUS	mg/kg	-	-	-	1220	5.1	16300
TCLP HERBICIDES							
2,4-D	mg/l	1000 U	1000 U	-	-	-	-
2,4,5-TP (SILVEX)	mg/l	100 U	100 U	-	-	-	-
PCBS							
AROCLOR-1016	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1221	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1232	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1242	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1248	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1254	ug/kg	-	-	-	46 U	-	42 U
AROCLOR-1260	ug/kg	-	-	-	240	-	42 U
TCLP PESTICIDE							
HEPTACHLOR	ug/l	0.14 PJ	0.8 U	-	-	-	-
ENDRIN	ug/l	8 U	2 U	-	-	-	-
HEPTACHLOR EPOXIDE	ug/l	3.2 U	0.8 U	-	-	-	-
CHLORDANE	ug/l	0.003 U	0.003 U	-	-	-	-
METHOXYCHLOR	ug/l	4000 U	10 U	-	-	-	-
TOXAPHENE	ug/l	200 U	50 U	-	-	-	-
TCLP METALS							
HG TOXICITY	mg/l	0.002 U	0.002 U	-	-	-	-
ARSENIC TOXICITY	mg/l	0.01 U	0.01 U	-	-	-	-
BARIUM TOXICITY	mg/l	1.9	1.5	-	-	-	-
CADMIUM TOXICITY	mg/l	0.003 U	0.003 U	-	-	-	-
CHROMIUM TOXICITY	mg/l	0.01	0.005 U	-	-	-	-
LEAD TOXICITY	mg/l	0.38	0.003 U	-	-	-	-
SILVER TOXICITY	mg/l	0.007 U	0.007 U	-	-	-	-
SELENIUM TOXICITY	mg/l	0.005 U	0.005 U	-	-	-	-

U: ANALYZED BUT NOT DETECTED
See enclosure for additional qualifiers

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number

Client: DAMES & MOORE

Project: IHNC

Matrix: SOIL	Sample Point-> Sample Date-> LAB#->	SP-SAND 11/12/98 36418.01	NP-SAND 11/12/98 36418.02	NP-SAND 11/12/98 36418.02 RE	TP-0-15 11/12/98 36418.03	TP-0-15D 11/12/98 36418.04	TP-120-60 11/12/98 36418.05
Parameters	Units						
MISCELLANEOUS							
ORG. CL (TOX)	mg/kg	-	-	-	14.1 U	-	18.1
REACTIVE CYANIDE	mg/kg	0.025 U	0.025 U	-	-	-	-
REACTIVE SULFIDE	mg/kg	20 U	20 U	-	-	-	-
HAZARDOUS WASTE CHARACTERIZATION							
CORROSIVITY PH	su	7.5	8.2	-	-	-	-
IGNITABILITY	F	167	170	-	-	-	-
MISCELLANEOUS							
BTU	btu	-	-	-	1 U	-	9530
% ASH	%	-	-	-	59.5	-	51.2

U: ANALYZED BUT NOT DETECTED
See enclosure for additional qualifiers

Southwest Laboratory of Oklahoma, Inc.
Data Summary Report
By Lab Number

Client: DAMES & MOORE

Project: IHNC

Matrix: SOIL	Sample Point-> / Sample Date-> / LAB#->	TP-120-60 11/12/98 36418.06 MS		TP-120-60 11/12/98 36418.07 MSD		TP-75-25 11/12/98 36418.08		TP-120-0 11/13/98 36418.09			
Parameters	Units										
TPH BY GC/FID MODIFIED 8015											
GASOLINE C6-C10	mg/kg	-		-		14.3	U	2.7	U		
DIESEL C10-C22	mg/kg	-		-		14.3	U	2.7	U		
KEROSENE C9-C18	mg/kg	-		-		14.3	U	2.7	U		
JP-4 C6-C14	mg/kg	-		-		14.3	U	2.7	U		
NAPHTHA C6-C12	mg/kg	-		-		14.3	U	2.7	U		
#6 FUEL OIL C12-C24	mg/kg	-		-		14.3	U	2.7	U		
MISCELLANEOUS	mg/kg	-		-		1950		6.6			
PCBS											
AROCLOR-1016	ug/kg	220	P	210	P	51	U	46	U		
AROCLOR-1221	ug/kg	42	U	42	U	51	U	46	U		
AROCLOR-1232	ug/kg	42	U	42	U	51	U	46	U		
AROCLOR-1242	ug/kg	42	U	42	U	51	U	46	U		
AROCLOR-1248	ug/kg	42	U	42	U	51	U	46	U		
AROCLOR-1254	ug/kg	42	U	42	U	51	U	46	U		
AROCLOR-1260	ug/kg	260	P	240	P	150	P	46	U		
MISCELLANEOUS											
ORG. CL (TOX)	mg/kg	-		-		17.4		14.2	U		
BTU	btu	-		-		136		1	U		
% ASH	%	-		-		56.7		67.1			

U: ANALYZED BUT NOT DETECTED
See enclosure for additional qualifiers

COOLER RECEIPT / SAMPLE LOG-IN SHEET

COOLER RECEIPT / SAMPLE LOG-IN SHEET (115-ATT2.WB1) / SWL-GA-115 REV 5.0 / GA-115-CRLOGIN-F

LAB NAME: SOUTHWEST LABORATORY OF OKLAHOMA/AMERICAN ANALYTICAL & TECH SRVS

PAGE 1 OF 1

REC'D DATE 11/16/98

TIME REC'D 09:50

LOG-IN DATE 1998-11-16 14:29

RECEIVED BY (PRINT NAME): SUE HALL

RECEIVED BY (SIGNATURE): Sue Hall

LOGGED IN BY (SIGNATURE): E Macintocua

PROJECT: LAB DECOM

EPISODE: 36418

SAMPLE DELIVERY GROUP: 36418

Client Sample #	Sample Fraction @	Assigned LAB#	Cooler I.D.	pH Check:	ACID/ BASE LOT#	REMARKS: CONDITION OF SAMPLE SHIPMENT, ETC.
SP-SAND	I,P,H,V, B,M	36418.01	11/16/98-1	N		5.0 DEG C
NP-SAND	↓	36418.02				
TP-0-15	B, I	36418.03				
TP-0-15D	B	36418.04				
TP-120-60	B, I	36418.05				
TP-120-60 MS	B	36418.06				
TP-120-60 MSD	B	36418.07				
TP-75-25	B, I	36418.08	↓			↓
TP-120-0	↓	36418.09				

Remarks

1. CUSTODY SEAL(S): Present/Absent — Intact/ Broken
2. CUSTODY SEALS NOS.: NA
3. CHAIN-OF CUSTODY. Present/Absent
   - Sealed In Plastic? Yes/ No
   - Taped To Lid? Yes/ No
   - Properly Filled Out (Ink, Signed, ETC.)? Yes/ No
4. AIRBILL — AirBill/ Sticker — Present/Absent
5. AIRBILL NO: 80695298813
6. COOLER CONDITIONS
   - Enough Ice? Yes/ No
   - Type of Ice? Wet
   - Type of Packing? Air
7. SAMPLE TAGS Present/Absent
8. SAMPLE CONDITION: Intact/ Broken*/ Leaking
   - Bottles Sealed In Separate Plastic Bags? Yes/ No
   - Correct Containers Used For Tests Indicated? Yes/ No
   - Correct Preservative? Yes/ No
   - Sufficient Sample? Yes/ No
   - Labels Complete (I.D., Date, Time, Signature, Preservative? Yes/ No
   - VOA Samples Without Bubbles? Yes/ No~
9. Does Information on Custody Records, Labels, Tags Agree? Yes/ No*
10. RAD SCREEN WITH GIEGER COUNTER? Yes/ No
11. P.O. Called? Yes/ No

* Contact PO and attach record of resolution

@ Sample Fractions: B=SV GC/MS, V= VOA GC/MS or GC, P=Pesticide, H=Herbicide, D=Dioxin, A=Air, I=Inorganics, C=Cyanide, M=Metals, R=Radiochemistry

~ Note samples with bubbles under remarks section.

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.01

DATE: 12/16/98

SWLO # : 36418.01
SAMPLE #: SP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW-846/8260B

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED :
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 5.00

TCLP VOLATILES
RESULTS REPORT IN mg/L

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
BENZENE	0.025	U	1,1-DICHLOROETHENE	0.025	U
CARBON TETRACHLORIDE	0.025	U	TETRACHLOROETHENE	0.025	U
CHLOROBENZENE	0.025	U	TRICHLOROETHENE	0.025	U
CHLOROFORM	0.025	U	VINYL CHLORIDE	0.025	U
1,2-DICHLOROETHANE	0.025	U	2-BUTANONE	0.025	U

**RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW-846/8260B

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED :
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 5.00

TCLP VOLATILES
RESULTS REPORT IN mg/L

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
BENZENE	0.025	U	1,1-DICHLOROETHENE	0.025	U
CARBON TETRACHLORIDE	0.025	U	TETRACHLOROETHENE	0.025	U
CHLOROBENZENE	0.025	U	TRICHLOROETHENE	0.025	U
CHLOROFORM	0.025	U	VINYL CHLORIDE	0.025	U
1,2-DICHLOROETHANE	0.025	U	2-BUTANONE	0.025	U

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA

QUALITY CONTROL SECTION

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

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Client Name:
Client Sample ID: VBLKX
Sample Location:
Lab Sample ID: K981119A
Sample Type: WATER
Analysis Type: VOA
Data Type: MS DATA
Misc Info: MS326**INST:K*SWLO*K981119A*5ML

Client SDG: 36383
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
74-87-3	CHLOROMETHANE	5.00	U
75-01-4	VINYL CHLORIDE	5.00	U
74-83-9	BROMOMETHANE	5.00	U
75-00-3	CHLOROETHANE	5.00	U
75-35-4	1 1-DICHLOROETHENE	5.00	U
67-64-1	ACETONE	5.00	U
75-15-0	CARBON DISULFIDE	5.00	U
75-09-2	METHYLENE CHLORIDE	5.00	U
156-60-5	trans-1 2-DICHLOROETHENE	5.00	U
75-34-3	1 1-DICHLOROETHANE	5.00	U
108-05-4	VINYL ACETATE	5.00	U
156-59-2	cis-1 2-DICHLOROETHENE	5.00	U
78-93-3	2-BUTANONE	5.00	U
67-66-3	CHLOROFORM	5.00	U
71-55-6	1 1 1-TRICHLOROETHANE	5.00	U
56-23-5	CARBON TETRACHLORIDE	5.00	U
71-43-2	BENZENE	5.00	U
107-06-2	1 2-DICHLOROETHANE	5.00	U
79-01-6	TRICHLOROETHENE	5.00	U
78-87-5	1 2-DICHLOROPROPANE	5.00	U
110-75-8	2-CHLOROETHYL VINYL ETHER	5.00	U
10061-01-5	cis-1,3-Dichloropropene	5.00	U
108-10-1	4-METHYL-2-PENTANONE	5.00	U
108-88-3	TOLUENE	5.00	U
10061-02-6	trans-1,3-Dichloropropene	5.00	U
79-00-5	1 1 2-TRICHLOROETHANE	5.00	U
127-18-4	TETRACHLOROETHENE	5.00	U
591-78-6	2-HEXANONE	5.00	U
124-48-1	DIBROMOCHLOROMETHANE	5.00	U
108-90-7	CHLOROBENZENE	5.00	U
100-41-4	ETHYL BENZENE	5.00	U
13-302-07	m,p-XYLENES	5.00	U
95-47-6	o-XYLENE	5.00	U
100-42-5	STYRENE	5.00	U
75-25-2	BROMOFORM	5.00	U
79-34-5	1 1 2 2-TETRACHLOROETHANE	5.00	U
1330-20-7	Xylene (Total)	5.00	U
75-27-4	BROMODICHLOROMETHANE	5.00	U
540-59-0	1,2-Dichloroethene (total)	5.00	U

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

Client Name:
Client Sample ID: VBLK2
Sample Location:
Lab Sample ID: K981119A
Sample Type: WATER
Analysis Type: VOA
Data Type: MS DATA
Misc Info: MS326**INST:K*SWLO*K981119A*5ML

Client SDG: 36383
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
1634-04-4	Methyl-tert-Butyl Ether	5.00	U
1868-53-7	DIBROMOFLUOROMETHANE	52.22	
2037-26-5	TOLUENE-d8	50.21	
460-00-4	4-BROMOFLUOROBENZENE	51.85	
17060-07-0	1,2-DICHLOROETHANE-d4	51.89	

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
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RECOVERY REPORT

Client Name:
Sample Matrix: LIQUID
Client ID: VBLK|
Data Type: MS DATA
SpikeList File: SOIL_ALL.spk
Method File: /chem/k.i/k981119a.b/5ml8260k.m
Misc Info: MS326**INST:K*SWLO*K981119A*5ML

Client SDG: k981119a.b
Fraction: VOA
Level: LOW
SampleType: BLANK
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 33 DIBROMOFLUOROMETHA	50.00	52.22	104.46	86-118
$ 38 1,2-DICHLOROETHANE	50.00	51.89	103.78	80-120
$ 53 TOLUENE-d8	50.00	50.21	100.44	88-110
$ 76 4-BROMOFLUOROBENZE	50.00	51.85	103.71	86-115

* - Values outside of QC limits
Spike Recovery: 0 out of 4 outside limits
0 out of 4 not found

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
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Lab Name: SWOK\AATS Matrix: WATER

Instrument: k Analyst: rebecca

LCS Analysis Date: 19-NOV-98 11:58 LCS File id: k25234.d

LCSD Analysis Date: 19-NOV-98 12:25 LCSD File id: k25235.d

Units: Water ug/L Soil ug/Kg Air ppbv

COMPOUND	SPIKE ADDED	LCS CONCENTRATION	LCS % REC #	QC LIMITS REC
DICHLORODIFLUOROMETHANE	50.00	47.49	95	10-182
CHLOROMETHANE	50.00	44.30	89	38-130
VINYL CHLORIDE	50.00	41.22	82	34-153
BROMOMETHANE	50.00	37.70	75	16-188
CHLOROETHANE	50.00	39.10	78	28-181
TRICHLOROFLUOROMETHANE	50.00	44.75	90	46-155
ACROLEIN	500.00	562.15	112	10-185
1 1-DICHLOROETHENE	50.00	49.92	100	61-152
ACETONE	50.00	79.83	160*	55-152
CARBON DISULFIDE	50.00	47.88	96	35-183
METHYLENE CHLORIDE	50.00	51.51	103	16-200
ACRYLONITRILE	500.00	573.60	115	10-219
trans-1 2-DICHLOROETHENE	50.00	50.06	100	30-177
Methyl-tert-Butyl Ether	50.00	45.07	90	53-111
1 1-DICHLOROETHANE	50.00	49.81	100	48-149
VINYL ACETATE	50.00	58.17	116	43-141
2 2-DICHLOROPROPANE	50.00	50.58	101	44-135
cis-1 2-DICHLOROETHENE	50.00	50.36	101	57-139
2-BUTANONE	50.00	61.21	122	20-180
BROMOCHLOROMETHANE	50.00	53.00	106	65-140
CHLOROFORM	50.00	48.46	97	62-125
1 1 1-TRICHLOROETHANE	50.00	49.37	99	68-120
1 1-DICHLOROPROPENE	50.00	53.55	107	50-141
CARBON TETRACHLORIDE	50.00	54.03	108	48-140
BENZENE	50.00	53.88	108	58-133
1 2-DICHLOROETHANE	50.00	58.01	116	66-126
TRICHLOROETHENE	50.00	53.17	106	63-129
1 2-DICHLOROPROPANE	50.00	53.59	107	67-126
DIBROMOMETHANE	50.00	62.10	124	75-124
BROMODICHLOROMETHANE	50.00	56.72	113	78-116
2-CHLOROETHYL VINYL ETHER	50.00	41.04	82	39-134
cis-1,3-Dichloropropene	50.00	54.57	109	73-125
4-METHYL-2-PENTANONE	50.00	71.48	143	45-151
TOLUENE	50.00	52.14	104	71-119
trans-1,3-Dichloropropene	50.00	57.72	115	70-129
1 1 2-TRICHLOROETHANE	50.00	61.29	122	54-146
TETRACHLOROETHENE	50.00	51.07	102	47-153
1 3-DICHLOROPROPANE	50.00	58.07	116	82-123
2-HEXANONE	50.00	75.11	150	38-155
DIBROMOCHLOROMETHANE	50.00	60.40	121	85-121
1 2-DIBROMOETHANE	50.00	63.89	128	72-143
CHLOROBENZENE	50.00	52.98	106	81-114
1-CHLOROHEXANE	50.00	40.01	80	22-151

Column to be used to flag recovery with an asterisk

* Value outside of QC limits

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COMPOUND	SPIKE ADDED	LCS CONCENTRATION	LCS % REC #	QC LIMITS REC
1 1 1 2-TETRACHLOROETHANE	50.00	53.07	106	87-117
ETHYL BENZENE	50.00	50.53	101	74-115
m,p-XYLENES	100.00	105.71	106	71-128
o-XYLENE	50.00	52.19	104	76-120
STYRENE	50.00	52.24	104	81-118
BROMOFORM	50.00	63.17	126*	77-125
ISOPROPYLBENZENE	50.00	51.45	103	73-114
BROMOBENZENE	50.00	52.23	104	81-112
1 1 2 2-TETRACHLOROETHANE	50.00	66.52	133	52-145
1 2 3-TRICHLOROPROPANE	50.00	62.03	124	73-135
n-PROPYLBENZENE	50.00	50.56	101	80-115
2-CHLOROTOLUENE	50.00	47.76	96	79-115
4-CHLOROTOLUENE	50.00	50.79	102	77-106
1 3 5-TRIMETHYLBENZENE	50.00	50.97	102	78-113
tert-BUTYLBENZENE	50.00	52.08	104	80-112
1 2 4-TRIMETHYLBENZENE	50.00	50.35	101	76-112
sec-BUTYLBENZENE	50.00	51.20	102	72-112
1 3-DICHLOROBENZENE	50.00	51.22	102	79-113
p-ISOPROPYLTOLUENE	50.00	53.17	106	78-115
1 4-DICHLOROBENZENE	50.00	53.54	107	78-111
1 2-DICHLOROBENZENE	50.00	54.49	109	83-113
n-BUTYLBENZENE	50.00	50.62	101	73-118
1 2-DIBROMO-3-CHLOROPROPANE	50.00	73.96	148	52-162
1 2 4-TRICHLOROBENZENE	50.00	54.07	108	32-155
HEXACHLOROBUTADIENE	50.00	61.42	123*	70-121
NAPHTHALENE	50.00	62.17	124	27-181
1 2 3-TRICHLOROBENZENE	50.00	57.33	115	68-127

Column to be used to flag recovery with an asterisk

* Value outside of QC limits

LCS Recovery: 3 out of 70 outside limits

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RECOVERY REPORT

Client Name:
Sample Matrix: LIQUID
Client ID: LCS1
Data Type: MS DATA
SpikeList File: SOIL_ALL.spk
Method File: /chem/k.i/k981119a.b/5ml8260k.m
Misc Info: MS326**INST:K*SWLO*LCS*5ML

Client SDG: k981119a.b
Fraction: VOA
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 33 DIBROMOFLUOROMETHA	50.00	53.01	106.02	86-118
$ 38 1,2-DICHLOROETHANE	50.00	57.76	115.53	80-120
$ 53 TOLUENE-d8	50.00	50.61	101.24	88-110
$ 76 4-BROMOFLUOROBENZE	50.00	51.36	102.73	86-115

* - Values outside of QC limits
Spike Recovery: 0 out of 4 outside limits
0 out of 4 not found

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Lab Name: SWOK\AATS   Matrix: WATER

Instrument: k   Analyst: rebecca

LCS Analysis Date: 19-NOV-98 11:58   LCS File id: k25234.d

LCSD Analysis Date: 19-NOV-98 12:25   LCSD File id: k25235.d

Units: Water ug/L Soil ug/Kg Air ppbv

COMPOUND	SPIKE ADDED	LCSD CONC.	LCSD % REC #	% RPD	QC LIMITS REC
DICHLORODIFLUOROMETHANE	50.00	61.93	124	26	10-182
CHLOROMETHANE	50.00	44.65	89	0	38-130
VINYL CHLORIDE	50.00	41.33	83	1	34-153
BROMOMETHANE	50.00	33.51	67	11	16-188
CHLOROETHANE	50.00	36.55	73	7	28-181
TRICHLOROFLUOROMETHANE	50.00	44.48	89	1	46-155
ACROLEIN	500.00	713.63	143	24	10-185
1 1-DICHLOROETHENE	50.00	49.08	98	2	61-152
ACETONE	50.00	87.78	176*	10	55-152
CARBON DISULFIDE	50.00	46.80	94	2	35-183
METHYLENE CHLORIDE	50.00	50.61	101	2	16-200
ACRYLONITRILE	500.00	718.50	144	22	10-219
trans-1 2-DICHLOROETHENE	50.00	49.06	98	2	30-177
Methyl-tert-Butyl Ether	50.00	56.75	114*	24	53-111
1 1-DICHLOROETHANE	50.00	47.95	96	4	48-149
VINYL ACETATE	50.00	59.29	118	2	43-141
2 2-DICHLOROPROPANE	50.00	48.93	98	3	44-135
cis-1 2-DICHLOROETHENE	50.00	49.41	99	2	57-139
2-BUTANONE	50.00	74.05	148	19	20-180
BROMOCHLOROMETHANE	50.00	51.60	103	3	65-140
CHLOROFORM	50.00	48.15	96	1	62-125
1 1 1-TRICHLOROETHANE	50.00	49.15	98	1	68-120
1 1-DICHLOROPROPENE	50.00	52.36	105	2	50-141
CARBON TETRACHLORIDE	50.00	52.78	106	2	48-140
BENZENE	50.00	51.73	103	5	58-133
1 2-DICHLOROETHANE	50.00	56.89	114	2	66-126
TRICHLOROETHENE	50.00	52.85	106	0	63-129
1 2-DICHLOROPROPANE	50.00	52.82	106	1	67-126
DIBROMOMETHANE	50.00	61.37	123	1	75-124
BROMODICHLOROMETHANE	50.00	55.62	111	2	78-116
2-CHLOROETHYL VINYL ETHER	50.00	39.30	79	4	39-134
cis-1,3-Dichloropropene	50.00	53.75	108	1	73-125
4-METHYL-2-PENTANONE	50.00	72.98	146	2	45-151
TOLUENE	50.00	51.79	104	0	71-119
trans-1,3-Dichloropropene	50.00	57.40	115	0	70-129
1 1 2-TRICHLOROETHANE	50.00	61.38	123	1	54-146
TETRACHLOROETHENE	50.00	49.86	100	2	47-153
1 3-DICHLOROPROPANE	50.00	57.37	115	1	82-123
2-HEXANONE	50.00	75.54	151	1	38-155
DIBROMOCHLOROMETHANE	50.00	61.45	123*	2	85-121
1 2-DIBROMOETHANE	50.00	63.57	127	1	72-143
CHLOROBENZENE	50.00	51.72	103	3	81-114
1-CHLOROHEXANE	50.00	50.78	102	24	22-151

Column to be used to flag recovery with an asterisk

* Value outside of QC limits

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COMPOUND	SPIKE ADDED	LCSD CONC.	LCSD % REC #	% RPD	QC LIMITS REC
1 1 1 2-TETRACHLOROETHANE	50.00	52.28	104	2	87-117
ETHYL BENZENE	50.00	47.19	94	7	74-115
m,p-XYLENES	100.00	98.84	99	7	71-128
o-XYLENE	50.00	50.99	102	2	76-120
STYRENE	50.00	52.05	104	0	81-118
BROMOFORM	50.00	60.39	121	4	77-125
ISOPROPYLBENZENE	50.00	51.18	102	1	73-114
BROMOBENZENE	50.00	52.02	104	0	81-112
1 1 2 2-TETRACHLOROETHANE	50.00	66.26	132	1	52-145
1 2 3-TRICHLOROPROPANE	50.00	70.58	141*	13	73-135
n-PROPYLBENZENE	50.00	51.01	102	1	80-115
2-CHLOROTOLUENE	50.00	47.95	96	0	79-115
4-CHLOROTOLUENE	50.00	49.61	99	3	77-106
1 3 5-TRIMETHYLBENZENE	50.00	51.33	103	1	78-113
tert-BUTYLBENZENE	50.00	49.37	99	5	80-112
1 2 4-TRIMETHYLBENZENE	50.00	49.19	98	3	76-112
sec-BUTYLBENZENE	50.00	50.21	100	2	72-112
1 3-DICHLOROBENZENE	50.00	50.58	101	1	79-113
p-ISOPROPYLTOLUENE	50.00	52.01	104	2	78-115
1 4-DICHLOROBENZENE	50.00	51.90	104	3	78-111
1 2-DICHLOROBENZENE	50.00	53.17	106	3	83-113
n-BUTYLBENZENE	50.00	49.80	100	1	73-118
1 2-DIBROMO-3-CHLOROPROPANE	50.00	79.45	159	7	52-162
1 2 4-TRICHLOROBENZENE	50.00	53.99	108	0	32-155
HEXACHLOROBUTADIENE	50.00	58.28	116	6	70-121
NAPHTHALENE	50.00	64.09	128	3	27-181
1 2 3-TRICHLOROBENZENE	50.00	55.03	110	4	68-127

Column to be used to flag recovery with an asterisk

* Value outside of QC limits

LCSD Recovery: 4 out of 70 outside limits

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RECOVERY REPORT

Client Name:
Sample Matrix: LIQUID
Client ID: LCSD
Data Type: MS DATA
SpikeList File: SOIL_ALL.spk
Method File: /chem/k.i/k981119a.b/5ml8260k.m
Misc Info: MS326**INST:K*SWLO*LCSD*5ML

Client SDG: k981119a.b
Fraction: VOA
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 33 DIBROMOFLUOROMETHA	50.00	52.00	104.02	86-118
$ 38 1,2-DICHLOROETHANE	50.00	56.57	113.15	80-120
$ 53 TOLUENE-d8	50.00	50.58	101.16	88-110
$ 76 4-BROMOFLUOROBENZE	50.00	51.26	102.52	86-115

* - Values outside of QC limits
Spike Recovery: 0 out of 4 outside limits
0 out of 4 not found

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Client Name:
Client Sample ID: TCLP PREP BLANK
Sample Location:
Lab Sample ID: TB981117B1
Sample Type: WATER
Analysis Type: VOA
Data Type: MS DATA
Misc Info: MS340*TB981117B1*INST:K*SWLO*TB981117B1*5ML

Client SDG: k981119a.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
75-01-4	VINYL CHLORIDE	5.00	U
75-35-4	1 1-DICHLOROETHENE	5.00	U
78-93-3	2-BUTANONE	5.00	U
67-66-3	CHLOROFORM	5.00	U
56-23-5	CARBON TETRACHLORIDE	5.00	U
71-43-2	BENZENE	5.00	U
107-06-2	1 2-DICHLOROETHANE	5.00	U
79-01-6	TRICHLOROETHENE	5.00	U
127-18-4	TETRACHLOROETHENE	5.00	U
108-90-7	CHLOROBENZENE	5.00	U
1868-53-7	DIBROMOFLUOROMETHANE	52.60	
17060-07-0	1,2-DICHLOROETHANE-d4	56.88	
2037-26-5	TOLUENE-d8	51.19	
460-00-4	4-BROMOFLUOROBENZENE	51.79	

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RECOVERY REPORT

Client Name:
Sample Matrix: LIQUID
Client ID: TCLP PREP BLANK
Data Type: MS DATA
SpikeList File: SOIL_ALL.spk
Method File: /chem/k.i/k981119a.b/5ml8260k.m
Misc Info: MS340*TB981117B1*INST:K*SWLO*TB981117B1*5ML

Client SDG: k981119a.b
Fraction: VOA
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 33 DIBROMOFLUOROMETHA	50.00	52.60	105.21	86-118
$ 38 1,2-DICHLOROETHANE	50.00	56.88	113.76	80-120
$ 53 TOLUENE-d8	50.00	51.19	102.39	88-110
$ 76 4-BROMOFLUOROBENZE	50.00	51.79	103.58	86-115

* - Values outside of QC limits
Spike Recovery: 0 out of 4 outside limits
0 out of 4 not found

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.01

DATE: 12/16/98

SWLO # : 36418.01
SAMPLE #: SP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8270

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED :
DATE ANALYZED : 12/05/98
DILUTION FACTOR: 2.00

TCLP SEMIVOLATILES
RESULTS REPORT IN mg/l

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
2-METHYLPHENOL	0.02	U	PENTACHLOROPHENOL	0.1	U
4-METHYLPHENOL	0.02	U	2,4,5-TRICHLOROPHENOL	0.1	U
TOTAL CRESOL'S	0.02	U	2,4,6-TRICHLOROPHENOL	0.02	U
1,4-DICHLOROBENZENE	0.02	U	HEXACHLOROBUTADIENE	0.02	U
2,4-DINITROTOLUENE	0.02	U	HEXACHLOROETHANE	0.02	U
HEXACHLOROBENZENE	0.02	U	PYRIDINE	0.02	U
:TROBENZENE	0.02	U			

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8270

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED :
DATE ANALYZED : 12/05/98
DILUTION FACTOR: 2.00

TCLP SEMIVOLATILES
RESULTS REPORT IN mg/l

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
2-METHYLPHENOL	0.02	U	PENTACHLOROPHENOL	0.1	U
4-METHYLPHENOL	0.02	U	2,4,5-TRICHLOROPHENOL	0.1	U
TOTAL CRESOL'S	0.02	U	2,4,6-TRICHLOROPHENOL	0.02	U
1,4-DICHLOROBENZENE	0.02	U	HEXACHLOROBUTADIENE	0.02	U
2,4-DINITROTOLUENE	0.02	U	HEXACHLOROETHANE	0.02	U
HEXACHLOROBENZENE	0.02	U	PYRIDINE	0.02	U
NITROBENZENE	0.02	U			

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8270

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 12/08/98
DATE ANALYZED : 12/09/98
DILUTION FACTOR: 2.00

MS Re-Analysis

TCLP SEMIVOLATILES
RESULTS REPORT IN mg/l

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
2-METHYLPHENOL	0.02	U	PENTACHLOROPHENOL	0.1	U
4-METHYLPHENOL	0.02	U	2,4,5-TRICHLOROPHENOL	0.1	U
TOTAL CRESOL'S	0.02	U	2,4,6-TRICHLOROPHENOL	0.02	U
1,4-DICHLOROBENZENE	0.02	U	HEXACHLOROBUTADIENE	0.02	U
2,4-DINITROTOLUENE	0.02	U	HEXACHLOROETHANE	0.02	U
HEXACHLOROBENZENE	0.02	U	PYRIDINE	0.02	U
ITROBENZENE	0.02	U			

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA

QUALITY CONTROL SECTION

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

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Client Name: DAMESNE
Client Sample ID: SBLK
Sample Location:
Lab Sample ID: BL1119WE
Sample Type: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info: MS540*TB981117A1*INSTP*DAMESNE*BL1119WE*1000ML/1ML/1UL*

Client SDG: p981204b.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CONCENTRATION UNITS: (ug/L or ug/KG) ug/L

CAS NO.	COMPOUND	ug/L	Q
110-86-1	Pyridine	10.00	U
106-46-7	1,4-Dichlorobenzene	10.00	U
95-48-7	2-Methylphenol	10.00	U
106-44-5	4-Methylphenol	10.00	U
67-72-1	Hexachloroethane	10.00	U
98-95-3	Nitrobenzene	10.00	U
87-68-3	Hexachlorobutadiene	10.00	U
88-06-2	2,4,6-Trichlorophenol	10.00	U
95-95-4	2,4,5-Trichlorophenol	50.00	U
121-14-2	2,4-Dinitrotoluene	10.00	U
118-74-1	Hexachlorobenzene	10.00	U
87-86-5	Pentachlorophenol	50.00	U
367-12-4	2-Fluorophenol	119.36	E
4165-62-2	Phenol-d5	117.23	E
4165-60-0	Nitrobenzene-d5	61.95	
321-60-8	2-Fluorobiphenyl	58.70	
118-79-6	2,4,6-Tribromophenol	114.62	E
98904-43-9	Terphenyl-d14	75.85	

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RECOVERY REPORT

Client Name: DAMESNE
Sample Matrix: LIQUID
Client ID: SBLK
Data Type: MS DATA
SpikeList File: tclpmsd.spk
Method File: /chem/p.i/p981204b.b/SW846.m
Misc Info: MS540*TB981117A1*INSTP*DAMESNE*BL1119WE*1000ML/1ML/1UL*

Client SDG: p981204b.b
Fraction: SV
Level: LOW
SampleType: BLANK
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 3 2-Fluorophenol	200.00	119.36	59.68	21-100
$ 4 Phenol-d5	200.00	117.23	58.62	10-94
$ 20 Nitrobenzene-d5	100.00	61.95	61.95	35-114
$ 40 2-Fluorobiphenyl	100.00	58.70	58.71	43-116
$ 61 2,4,6-Tribromophen	200.00	114.62	57.31	10-123
$ 74 Terphenyl-d14	100.00	75.85	75.85	33-141

* Values outside of QC limits
Spike Recovery: 0 out of 6 outside limits
0 out of 6 not found

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
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RECOVERY REPORT

Client Name: DAMESNE
Sample Matrix: LIQUID
Client ID: LCS
Data Type: MS DATA
SpikeList File: tclpmsd.spk
Method File: /chem/p.i/p981204b.b/SW846.m
Misc Info: MS540*TB981117A1*INSTP*DAMESNE*LC1119WE*1000ML/1ML/1UL*

Client SDG: p981204b.b
Fraction: SV
Level: LOW
SampleType: MS
Quant Type: ISTD

SPIKE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
2 Pyridine	100.00	36.85	36.85	7-87
11 1,4-Dichlorobenzen	100.00	39.97	39.98	34-98
14 2-Methylphenol	100.00	45.55	45.55 *	66-105
16 4-Methylphenol	200.00	94.17	47.09 *	54-105
18 Hexachloroethane	100.00	36.01	36.01 *	40-104
21 Nitrobenzene	100.00	51.36	51.36	49-110
32 Hexachlorobutadien	100.00	38.48	38.49	36-104
38 2,4,6-Trichlorophe	100.00	47.22	47.23 *	56-110
39 2,4,5-Trichlorophe	100.00	49.07	49.07 *	51-109
63 Hexachlorobenzene	100.00	51.42	51.42	17-139
64 Pentachlorophenol	100.00	44.47	44.48	33-143
52 2,4-Dinitrotoluene	100.00	17.84	17.85 *	51-112

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 3 2-Fluorophenol	200.00	97.98	48.99	21-100
$ 4 Phenol-d5	200.00	100.37	50.18	10-94
$ 20 Nitrobenzene-d5	100.00	50.00	50.01	35-114
$ 40 2-Fluorobiphenyl	100.00	45.79	45.80	43-116
$ 61 2,4,6-Tribromophen	200.00	100.28	50.14	10-123
$ 74 Terphenyl-d14	100.00	58.87	58.87	33-141

* - Values outside of QC limits
Spike Recovery: 6 out of 18 outside limits
0 out of 18 not found

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RECOVERY REPORT

Client Name: DAMESNE
Sample Matrix: LIQUID
Client ID: LCSD
Data Type: MS DATA
SpikeList File: tclpmsd.spk
Method File: /chem/p.i/p981204b.b/SW846.m
Misc Info: MS540*TB981117A1*INSTP*DAMESNE*LD1119WE*1000ML/1ML/1UL*

Client SDG: p981204b.b
Fraction: SV
Level: LOW
SampleType: MSD
Quant Type: ISTD

SPIKE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
2 Pyridine	100.00	46.49	46.50	7-87
11 1,4-Dichlorobenzen	100.00	53.08	53.08	34-98
14 2-Methylphenol	100.00	56.29	56.29 *	66-105
16 4-Methylphenol	200.00	115.77	57.89	54-105
18 Hexachloroethane	100.00	46.86	46.87	40-104
21 Nitrobenzene	100.00	58.55	58.55	49-110
32 Hexachlorobutadien	100.00	50.07	50.08	36-104
38 2,4,6-Trichlorophe	100.00	61.12	61.12	56-110
39 2,4,5-Trichlorophe	100.00	64.27	64.27	51-109
63 Hexachlorobenzene	100.00	66.37	66.37	17-139
64 Pentachlorophenol	100.00	63.05	63.05	33-143
52 2,4-Dinitrotoluene	100.00	22.32	22.33 *	51-112

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 3 2-Fluorophenol	200.00	129.60	64.80	21-100
$ 4 Phenol-d5	200.00	121.03	60.52	10-94
$ 20 Nitrobenzene-d5	100.00	64.95	64.95	35-114
$ 40 2-Fluorobiphenyl	100.00	61.12	61.13	43-116
$ 61 2,4,6-Tribromophen	200.00	133.50	66.75	10-123
$ 74 Terphenyl-d14	100.00	78.43	78.44	33-141

* - Values outside of QC limits
Spike Recovery: 2 out of 18 outside limits
0 out of 18 not found

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LCS\LCSD RECOVERY REPORT

Lab Name: SWOK\AATS

Matrix: WATER

Instrument: p

Analyst: Joseph

LCS Analysis Date: 05-DEC-98 05:15

LCS File id: p18202.d

LCSD Analysis Date: 05-DEC-98 05:45

LCSD File id: p18203.d

Units: Water ug/L Soil ug/Kg

COMPOUND	SPIKE ADDED	LCSD CONC.	LCSD % REC #	% RPD	QC LIMITS REC
1,4-Dichlorobenzene	100.0	53.1	53	28	34- 98
2-Methylphenol	100.0	56.3	56*	20	66-105
4-Methylphenol	200.0	115.8	58	21	54-105
Hexachloroethane	100.0	46.9	47	27	40-104
Nitrobenzene	100.0	58.5	58	13	49-110
Hexachlorobutadiene	100.0	50.1	50	27	36-104
2,4,6-Trichlorophenol	100.0	61.1	61	26	56-110
2,4,5-Trichlorophenol	100.0	64.3	64	27	51-109
2,4-Dinitrotoluene	100.0	22.3	22*	20	51-112
Hexachlorobenzene	100.0	66.4	66	26	17-139
Pentachlorophenol	100.0	63.0	63	36	33-143
Pyridine	100.0	46.5	46	22	7- 87

Column to be used to flag recovery with an asterisk

* Value outside of QC limits

LCSD Recovery: 2 out of 12 outside limits

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Client Name: DAMESNE
Client Sample ID: SBLK
Sample Location:
Lab Sample ID: BL1208WB
Sample Type: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info: MS540**INSTP*DAMESNE*BL1208WB*1000ML/1ML/1UL*

Client SDG: p981209a.b
Sample Date:
Sample Point:
Date Received:
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
110-86-1	Pyridine	10.00	U
106-46-7	1,4-Dichlorobenzene	10.00	U
95-48-7	2-Methylphenol	10.00	U
106-44-5	4-Methylphenol	10.00	U
67-72-1	Hexachloroethane	10.00	U
98-95-3	Nitrobenzene	10.00	U
87-68-3	Hexachlorobutadiene	10.00	U
88-06-2	2,4,6-Trichlorophenol	10.00	U
95-95-4	2,4,5-Trichlorophenol	50.00	U
121-14-2	2,4-Dinitrotoluene	10.00	U
118-74-1	Hexachlorobenzene	10.00	U
87-86-5	Pentachlorophenol	50.00	U
367-12-4	2-Fluorophenol	101.74	E
4165-62-2	Phenol-d5	84.13	
4165-60-0	Nitrobenzene-d5	86.90	
321-60-8	2-Fluorobiphenyl	84.68	
118-79-6	2,4,6-Tribromophenol	104.36	E
98904-43-9	Terphenyl-d14	98.49	

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RECOVERY REPORT

Client Name: DAMESNE
Sample Matrix: LIQUID
Client ID: SBLK
Data Type: MS DATA
SpikeList File: tclpmsd.spk
Method File: /chem/p.i/p981209a.b/SW846.m
Misc Info: MS540**INSTP*DAMESNE*BL1208WB*1000ML/1ML/1UL*

Client SDG: p981209a.b
Fraction: SV
Level: LOW
SampleType: BLANK
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 3 2-Fluorophenol	200.00	101.74	50.87	21-100
$ 4 Phenol-d5	200.00	84.13	42.07	10-94
$ 20 Nitrobenzene-d5	100.00	86.90	86.91	35-114
$ 40 2-Fluorobiphenyl	100.00	84.68	84.69	43-116
$ 61 2,4,6-Tribromophen	200.00	104.36	52.18	10-123
$ 74 Terphenyl-d14	100.00	98.49	98.49	33-141

Values outside of QC limits
Spike Recovery: 0 out of 6 outside limits
0 out of 6 not found

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Client Name: DAMESNE
Client Sample ID: TCLP BLANK
Sample Location:
Lab Sample ID: TB981117A1
Sample Type: WATER
Analysis Type: SV
Data Type: MS DATA
Client SDG: p981204b.b
Sample Date:
Sample Point:
Date Received: 11/16/98
Quant Type: ISTD
Level: LOW
Misc Info: MS540*TB981117A1*INSTP*DAMESNE*TB981117A1*500ML/1ML/1UL*

CAS NO. COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
110-86-1--------Pyridine	20.00	U
106-46-7--------1,4-Dichlorobenzene	20.00	U
95-48-7---------2-Methylphenol	20.00	U
106-44-5--------4-Methylphenol	20.00	U
67-72-1---------Hexachloroethane	20.00	U
98-95-3---------Nitrobenzene	20.00	U
87-68-3---------Hexachlorobutadiene	20.00	U
88-06-2---------2,4,6-Trichlorophenol	20.00	U
95-95-4---------2,4,5-Trichlorophenol	100.00	U
121-14-2--------2,4-Dinitrotoluene	20.00	U
118-74-1--------Hexachlorobenzene	20.00	U
87-86-5---------Pentachlorophenol	100.00	U
367-12-4--------2-Fluorophenol	208.82	E
4165-62-2-------Phenol-d5	226.76	E
4165-60-0-------Nitrobenzene-d5	110.53	
321-60-8--------2-Fluorobiphenyl	97.51	
118-79-6--------2,4,6-Tribromophenol	212.08	E
98904-43-9------Terphenyl-d14	130.40	

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RECOVERY REPORT

Client Name: DAMESNE
Sample Matrix: LIQUID
Client ID: TCLP BLANK
Data Type: MS DATA
SpikeList File: tclpmsd.spk
Method File: /chem/p.i/p981204b.b/SW846.m
Misc Info: MS540*TB981117A1*INSTP*DAMESNE*TB981117A1*500ML/1ML/1UL*

Client SDG: p981204b.b
Fraction: SV
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 3 2-Fluorophenol	400.00	208.82	52.20	21-100
$ 4 Phenol-d5	400.00	226.76	56.69	10-94
$ 20 Nitrobenzene-d5	200.00	110.53	55.27	35-114
$ 40 2-Fluorobiphenyl	200.00	97.51	48.76	43-116
$ 61 2,4,6-Tribromophen	400.00	212.08	53.02	10-123
$ 74 Terphenyl-d14	200.00	130.40	65.20	33-141

* - Values outside of QC limits
Spike Recovery: 0 out of 6 outside limits
0 out of 6 not found

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TARGET COMPOUNDS

Client Name: DAMESNE
Client Sample ID: TCLP BLANK
Sample Location:
Lab Sample ID: TB981207A1
Sample Type: WATER
Analysis Type: SV
Data Type: MS DATA
Misc Info: MS540*TB981297A1*INSTP*DAMESNE*TB981207A1*500ML/1ML/1UL*

Client SDG: p981209a.b
Sample Date:
Sample Point:
Date Received: 12/16/98
Quant Type: ISTD
Level: LOW

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/KG) ug/L	Q
110-86-1	Pyridine	20.00	U
106-46-7	1,4-Dichlorobenzene	20.00	U
95-48-7	2-Methylphenol	20.00	U
106-44-5	4-Methylphenol	20.00	U
67-72-1	Hexachloroethane	20.00	U
98-95-3	Nitrobenzene	20.00	U
87-68-3	Hexachlorobutadiene	20.00	U
88-06-2	2,4,6-Trichlorophenol	20.00	U
95-95-4	2,4,5-Trichlorophenol	100.00	U
121-14-2	2,4-Dinitrotoluene	20.00	U
118-74-1	Hexachlorobenzene	20.00	U
87-86-5	Pentachlorophenol	100.00	U
367-12-4	2-Fluorophenol	314.03	E
4165-62-2	Phenol-d5	264.01	E
4165-60-0	Nitrobenzene-d5	167.50	
321-60-8	2-Fluorobiphenyl	162.14	
118-79-6	2,4,6-Tribromophenol	325.65	E
98904-43-9	Terphenyl-d14	184.10	

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RECOVERY REPORT

Client Name: DAMESNE
Sample Matrix: LIQUID
Client ID: TCLP BLANK
Data Type: MS DATA
SpikeList File: tclpmsd.spk
Method File: /chem/p.i/p981209a.b/SW846.m
Misc Info: MS540*TB981297A1*INSTP*DAMESNE*TB981207A1*500ML/1ML/1UL*

Client SDG: p981209a.b
Fraction: SV
Level: LOW
SampleType: SAMPLE
Quant Type: ISTD

SURROGATE COMPOUND	AMOUNT ADDED ug/L	AMOUNT RECOVERED ug/L	% RECOVERED	LIMITS
$ 3 2-Fluorophenol	400.00	314.03	78.51	21-100
$ 4 Phenol-d5	400.00	264.01	66.00	10-94
$ 20 Nitrobenzene-d5	200.00	167.50	83.75	35-114
$ 40 2-Fluorobiphenyl	200.00	162.14	81.07	43-116
$ 61 2,4,6-Tribromophen	400.00	325.65	81.41	10-123
$ 74 Terphenyl-d14	200.00	184.10	92.05	33-141

* - Values outside of QC limits
ke Recovery: 0 out of 6 outside limits
0 out of 6 not found

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	TP-0-15
Lab Sample ID:	36418.03
Filename:	17_03913
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	21.2 g
% Moisture:	29.2
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	5
Date Received:	11/16/98
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 1049
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	13.3	13.3	U
Diesel (C10-C22)	13.3	13.3	U
Kerosene (C9-C18)	13.3	13.3	U
JP-4 (C6-C14)	13.3	13.3	U
Naphtha (C6-C12)	13.3	13.3	U
#6 Fuel Oil (C12-C24)	13.3	13.3	U
Miscellaneous (C10-C13)	13.3	1218.3	

SURROGATE RECOVERY: 164% SPIKE ADDED: 16.69
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both original and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS: U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by: [signature]

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	TP-0-15D
Lab Sample ID:	36418.04
Filename:	17_03907
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	21.9 g
% Moisture:	33.65
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	1
Date Received:	11/16/98
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0726
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	2.7	2.7	U
Diesel (C10-C22)	2.7	2.7	U
Kerosene (C9-C18)	2.7	2.7	U
JP-4 (C6-C14)	2.7	2.7	U
Naphtha (C6-C12)	2.7	2.7	U
#6 Fuel Oil (C12-C24)	2.7	2.7	U
Miscellaneous (C8-C36)	2.7	5.1	

SURROGATE RECOVERY: 116% SPIKE ADDED: 17.17
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both origninal and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS: U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	TP-120-60
Lab Sample ID:	36418.05
Filename:	17_03908
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	20.3 g
% Moisture:	22.72
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	25
Date Received:	11/16/98
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0759
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	63.8	63.8	U
Diesel (C10-C22)	63.8	63.8	U
Kerosene (C9-C18)	63.8	63.8	U
JP-4 (C6-C14)	63.8	63.8	U
Naphtha (C6-C12)	63.8	63.8	U
#6 Fuel Oil (C12-C24)	63.8	63.8	U
Miscellaneous (C7-C16)	63.8	16300.0	

SURROGATE RECOVERY: 1009% SPIKE ADDED: 15.96
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both original and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS: U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	TP-75-25
Lab Sample ID:	36418.08
Filename:	17_03909
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	22.1 g
% Moisture:	36.62
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	5
Date Received:	11/16/98
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0833
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	14.3	14.3	U
Diesel (C10-C22)	14.3	14.3	U
Kerosene (C9-C18)	14.3	14.3	U
JP-4 (C6-C14)	14.3	14.3	U
Naphtha (C6-C12)	14.3	14.3	U
#6 Fuel Oil (C12-C24)	14.3	14.3	U
Miscellaneous (C7-C16)	14.3	1954.2	

SURROGATE RECOVERY: 186% SPIKE ADDED: 17.86
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both origninal and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS: U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	TP-120-0
Lab Sample ID:	36418.09
Filename:	17_03910
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	21.3 g
% Moisture:	29.61
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	1
Date Received:	11/16/98
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0907
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	2.7	2.7	U
Diesel (C10-C22)	2.7	2.7	U
Kerosene (C9-C18)	2.7	2.7	U
JP-4 (C6-C14)	2.7	2.7	U
Naphtha (C6-C12)	2.7	2.7	U
#6 Fuel Oil (C12-C24)	2.7	2.7	U
Miscellaneous (C7-C16)	2.7	6.6	

SURROGATE RECOVERY: 91% SPIKE ADDED: 16.70
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both origninal and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS:
U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	BL1118SA
Lab Sample ID:	BL1118SA
Filename:	17_03903
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	20.0 g
% Moisture:	0
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	1
Date Received:	
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0510
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	2.0	2.0	U
Diesel (C10-C22)	2.0	2.0	U
Kerosene (C9-C18)	2.0	2.0	U
JP-4 (C6-C14)	2.0	2.0	U
Naphtha (C6-C12)	2.0	2.0	U
#6 Fuel Oil (C12-C24)	2.0	2.0	U
Miscellaneous (C7-C16)	2.0	2.0	U

SURROGATE RECOVERY: 100% SPIKE ADDED: 12.50
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both origninal and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS:
U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	LC1118SA
Lab Sample ID:	LC1118SA
Filename:	17_03904
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	20.0 g
% Moisture:	0
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	1
Date Received:	
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0544
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	2.0	2.0	U
Diesel (C10-C22)	2.0	145.7	
Kerosene (C9-C18)	2.0	2.0	U
JP-4 (C6-C14)	2.0	2.0	U
Naphtha (C6-C12)	2.0	2.0	U
#6 Fuel Oil (C12-C24)	2.0	2.0	U
Miscellaneous (C7-C16)	2.0	2.0	U

SURROGATE RECOVERY: 106% SPIKE ADDED: 12.50
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both origninal and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS: U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Client:	DAMESNE
Client ID:	LD1118SA
Lab Sample ID:	LD1118SA
Filename:	17_03905
Sample Matrix:	SOIL
Extraction method:	SONC.
Amt. Extd. (sample):	20.0 g
% Moisture:	0
Extraction Solvent:	Methylene Chloride
Final Extract Voume:	5
Dilution Factor:	1
Date Received:	
Date Extracted:	11/18/98
Date Analyzed:	11/21/98 0618
Date Reported:	11/21/98

TOTAL EXTRACTABLE HYDROCARBONS	Quant. Limit (mg/Kg)	Amount Found (mg/Kg)	Flag
Gasoline (C6-C10)	2.0	2.0	U
Diesel (C10-C22)	2.0	140.5	
Kerosene (C9-C18)	2.0	2.0	U
JP-4 (C6-C14)	2.0	2.0	U
Naphtha (C6-C12)	2.0	2.0	U
#6 Fuel Oil (C12-C24)	2.0	2.0	U
Miscellaneous (C7-C16)	2.0	2.0	U

SURROGATE RECOVERY: 105% SPIKE ADDED: 12.50
LIMIT: p-TERPHENYL (59-134)

* Outside of QC limits.
** Outside of QC limits on both orignal and rerun.
(1) Analysis shows miscellaneous peaks which cannot be identified as any specific hydrocarbon pattern. The reponse factor for the nearest eluting hydrocarbon standard, DIESEL , was used to calculate the concentration of the miscellaneous peaks. Numbers indicate the approximate carbon chain length.
(2) Pattern is similar to, but not identical to the standard.

FLAG DEFINITIONS:
U -- Not detected above quantitation limit.
J -- Estimated Value (below quantitation limit).
B -- Compound found in blank
D -- Surrogate or matrix spike diluted out (in secondary dilution).
E -- Estimated Value (above linear range).
I -- Not quantifiable due to matrix interference.

Approved by:

Southwest Laboratory of Oklahoma, Inc.
Gas Chromatography Laboratory

Method:	Modified 8015
Sample Matrix:	SOIL
Client:	DAMESNE
Client ID:	LC/LD1118SA
Lab Sample ID:	LC/LD1118SA
Date Received:	----
Date Extracted:	11\18\98
Date/time Analyzed:	11\21\98 544
Date Reported:	11/21/98

COMPOUND	SPIKE ADDED (mg/kg)		LCS CONC. (mg/kg)		LCS % REC #	QC LIMITS REC
Diesel (C10-C22)	125.0		145.7		117	72-153

COMPOUND	SPIKE ADDED (mg/kg)	LCSD CONC. (mg/kg)	LCSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
Diesel (C10-C22)	125.0	140.5	112	3.6	21	72-153

* VALUES OUTSIDE OF QC LIMITS

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1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

SP-SAND

Lab Name: SWL-TULSA

Lab Code: SWOK   Case No.: DAMESNE   SDG No.: 36418

Matrix: (soil/water) WATER   Lab Sample ID: 36418.01

Sample wt/vol: 100 (g/mL) ML   Lab File ID: ____

% Moisture: ____ decanted: (Y/N) __   Date Received: 11/16/98

Extraction: (SepF/Cont/Sonc) SEPF   Date Extracted: 11/21/98

Concentrated Extract Volume: 10000(uL)   Date Analyzed: 11/25/98

Injection Volume: 0.5(uL)   Dilution Factor: 1.0

GPC Cleanup: (Y/N) N   pH: 6.9   Sulfur Cleanup: (Y/N) N

CAS NO. / COMPOUND	CONCENTRATION UNITS: UG/L	Q
94-75-7---------2,4-D	1000	U
93-72-1---------2,4,5-TP(Silvex)	100	U
Surrogate amount spiked	75.00	

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1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

NP-SAND

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMESNE SDG No.: 36418

Matrix: (soil/water) WATER Lab Sample ID: 36418.02

Sample wt/vol: 100 (g/mL) ML Lab File ID: ____________

% Moisture: ____ decanted: (Y/N) __ Date Received: 11/16/98

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 11/21/98

Concentrated Extract Volume: 10000(uL) Date Analyzed: 11/25/98

Injection Volume: 0.5(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 8.8 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: UG/L	Q
94-75-7	2,4-D	1000	U
93-72-1	2,4,5-TP(Silvex)	100	U
Surrogate amount spiked		75.00	

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1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

BL1121WB

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMESNE SDG No.: 36418

Matrix: (soil/water) WATER Lab Sample ID: BL1121WB

Sample wt/vol: 100 (g/mL) ML Lab File ID: ____

% Moisture: ____ decanted: (Y/N) ____ Date Received: ____

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 11/21/98

Concentrated Extract Volume: 10000(uL) Date Analyzed: 11/25/98

Injection Volume: 0.5(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: UG/L	Q
94-75-7	2,4-D	1000	U
93-72-1	2,4,5-TP(Silvex)	100	U
Surrogate amount spiked		75.00	

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1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

LC1121WB

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMESNE SDG No.: 36418

Matrix: (soil/water) WATER Lab Sample ID: LC1121WB

Sample wt/vol: 100 (g/mL) ML Lab File ID: ______

% Moisture: ____ decanted: (Y/N) ___ Date Received: ______

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 11/21/98

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 11/25/98

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO. COMPOUND	CONCENTRATION UNITS: UG/L	Q
94-75-7---------2,4-D	59	J
93-72-1---------2,4,5-TP(Silvex)	12	J
Surrogate amount spiked	75.00	

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1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

LD1121WB

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMESNE SDG No.: 36418

Matrix: (soil/water) WATER Lab Sample ID: LD1121WB

Sample wt/vol: 100 (g/mL) ML Lab File ID: ________

% Moisture: ______ decanted: (Y/N) ___ Date Received: ________

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 11/21/98

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 11/25/98

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO. COMPOUND	CONCENTRATION UNITS: UG/L	Q
94-75-7---------2,4-D	63	J
93-72-1---------2,4,5-TP(Silvex)	13	J
Surrogate amount spiked	75.00	

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1D
HERBICIDE ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

TB981117A1

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMESNE SDG No.: 36418

Matrix: (soil/water) WATER Lab Sample ID: TB981117A1

Sample wt/vol: 100 (g/mL) ML Lab File ID: ____________

% Moisture: ____ decanted: (Y/N) __ Date Received:

Extraction: (SepF/Cont/Sonc) SEPF Date Extracted: 11/21/98

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 11/25/98

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 4.8 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: UG/L	Q
94-75-7	2,4-D	1000	U
93-72-1	2,4,5-TP (Silvex)	100	U
Surrogate amount spiked		75.00	

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3G
WATER HERBICIDE LABORATORY CONTROL SPIKE RECOVERY

Lab Name: SWL-TULSA   Case No.: DAMES   SDG No.: 36418

LCS Sample NO.: LC1121WB

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC. LIMITS REC.
2,4-D	75.0	59.1	79	54-119
2,4,5-TP(Silvex)	15.0	12.0	80	54-112

Column to be used to flag recovery values

* Values outside of QC limits

Spike Recovery: 0 out of 2 outside limits

omments: ______

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3G
WATER HERBICIDE LABORATORY CONTROL SPIKE RECOVERY

Lab Name: SWL-TULSA   Case No.: DAMES   SDG No.: 36418

LCS Sample NO.: LD1121WB

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	LCS % REC #	QC. LIMITS REC.
2,4-D	75.0	63.4	84	54-119
2,4,5-TP(Silvex)	15.0	12.9	86	54-112

Column to be used to flag recovery values

* Values outside of QC limits

Spike Recovery: 0 out of 2 outside limits

'omments: ______

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2E
WATER HERBICIDE SURROGATE RECOVERY

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMESNE SDG No.: 36418

GC Column(1): DB-17MS ID: 0.32(mm) GC Column(2): DB-XLB ID: 0.32(mm)

	CLIENT SAMPLE NO.	S1 1 %REC #	S1 2 %REC #	TOT OUT
01	BL1121WB	84	95	0
02	LC1121WB	90	92	0
03	LD1121WB	97	98	0
04	TB981117A1	92	102	0
05	SP-SAND	88	97	0
06	NP-SAND	90	97	0
07	NP-SANDMS	75	80	0
08	NP-SANDMSD	82	89	0
09				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

S1 = DCAA QC LIMITS (68-110)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.01

DATE: 12/16/98

SWLO # : 36418.01
SAMPLE #: SP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081A

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/19/98
DATE ANALYZED : 11/20/98
DILUTION FACTOR: 0.00

GC PARAMETERS
RESULTS REPORT IN ug/l

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
HEPTACHLOR	0.14	PJ	CHLORDANE	0.003	U
ENDRIN	8	U	METHOXYCHLOR	4000	U
HEPTACHLOR EPOXIDE	3.2	U	TOXAPHENE	200	U

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
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TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081A

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/19/98
DATE ANALYZED : 11/20/98
DILUTION FACTOR: 0.00

GC PARAMETERS
RESULTS REPORT IN ug/l

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
HEPTACHLOR	0.8	U	CHLORDANE	0.003	U
ENDRIN	2	U	METHOXYCHLOR	10	U
HEPTACHLOR EPOXIDE	0.8	U	TOXAPHENE	50	U

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.03

DATE: 12/16/98

SWLO # : 36418.03
SAMPLE #: TP-0-15
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/17/98
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 0.00

PCBS
RESULTS REPORT IN ug/kg ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
AROCLOR-1016	46	U	AROCLOR-1248	46	U
AROCLOR-1221	46	U	AROCLOR-1254	46	U
AROCLOR-1232	46	U	AROCLOR-1260	240	
AROCLOR-1242	46	U			

QA/QC SURROGATE RECOVERIES

TETRACHLORO-M-XYLENE (47-103) 68% DECACHLOROBIPHENYL (31-143) 68%

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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Attn: JON SEEKINS

REPORT: 36418.05

DATE: 12/16/98

SWLO # : 36418.05
SAMPLE #: TP-120-60
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/17/98
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 0.00

PCBS
RESULTS REPORT IN ug/kg ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
AROCLOR-1016	42	U	AROCLOR-1248	42	U
AROCLOR-1221	42	U	AROCLOR-1254	42	U
AROCLOR-1232	42	U	AROCLOR-1260	42	U
AROCLOR-1242	42	U			

QA/QC SURROGATE RECOVERIES

TETRACHLORO-M-XYLENE	(47-103)	63%	DECACHLOROBIPHENYL	(31-143)	86%

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.06

DATE: 12/16/98

SWLO # : 36418.06 MS
SAMPLE #: TP-120-60
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/17/98
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 0.00

PCBS
RESULTS REPORT IN ug/kg ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
AROCLOR-1016	220	P	AROCLOR-1248	42	U
AROCLOR-1221	42	U	AROCLOR-1254	42	U
AROCLOR-1232	42	U	AROCLOR-1260	260	P
AROCLOR-1242	42	U			

QA/QC SURROGATE RECOVERIES

TETRACHLORO-M-XYLENE	(47-103)	72%	DECACHLOROBIPHENYL	(31-143)	90%

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.07

DATE: 12/16/98

SWLO # : 36418.07 MSD
SAMPLE #: TP-120-60
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/17/98
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 0.00

PCBS
RESULTS REPORT IN ug/kg ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
AROCLOR-1016	210	P	AROCLOR-1248	42	U
AROCLOR-1221	42	U	AROCLOR-1254	42	U
AROCLOR-1232	42	U	AROCLOR-1260	240	P
AROCLOR-1242	42	U			

QA/QC SURROGATE RECOVERIES

TETRACHLORO-M-XYLENE	(47-103)	71%	DECACHLOROBIPHENYL	(31-143)	71%

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.08

DATE: 12/16/98

SWLO # : 36418.08
SAMPLE #: TP-75-25
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/17/98
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 0.00

PCBS
RESULTS REPORT IN ug/kg ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
AROCLOR-1016	51	U	AROCLOR-1248	51	U
AROCLOR-1221	51	U	AROCLOR-1254	51	U
AROCLOR-1232	51	U	AROCLOR-1260	150	P
AROCLOR-1242	51	U			

QA/QC SURROGATE RECOVERIES

TETRACHLORO-M-XYLENE	(47-103)	54%	DECACHLOROBIPHENYL	(31-143)	86%

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.09

DATE: 12/16/98

SWLO # : 36418.09
SAMPLE #: TP-120-0
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:
METHOD REFERENCE: SW 8081

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/13/98
DATE RECEIVED : 11/16/98
DATE PREPARED : 11/17/98
DATE ANALYZED : 11/19/98
DILUTION FACTOR: 0.00

PCBS
RESULTS REPORT IN ug/kg ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		PARAMETER	RESULTS**	
AROCLOR-1016	46	U	AROCLOR-1248	46	U
AROCLOR-1221	46	U	AROCLOR-1254	46	U
AROCLOR-1232	46	U	AROCLOR-1260	46	U
AROCLOR-1242	46	U			

QA/QC SURROGATE RECOVERIES

TETRACHLORO-M-XYLENE	(47-103)	64%	DECACHLOROBIPHENYL	(31-143)	60%

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA

QUALITY CONTROL SECTION

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. Albany • Broken Arrow, Oklahoma 74012-1421 • 918-251-2858 • FAX: 918-251-2599

1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

BL1117SS

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMES SDG No.: 36418

Matrix: (soil/water) SOIL Lab Sample ID: BL1117SS

Sample wt/vol: 31.7 (g/mL) G Lab File ID: ____

% Moisture: ____ decanted: (Y/N) ___ Date Received: ____

Extraction: (SepF/Cont/Sonc) SONC Date Extracted: 11/17/98

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 11/19/98

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) Y

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
12674-11-2	Aroclor-1016	31	U
11104-28-2	Aroclor-1221	31	U
11141-16-5	Aroclor-1232	31	U
53469-21-9	Aroclor-1242	31	U
12672-29-6	Aroclor-1248	31	U
11097-69-1	Aroclor-1254	31	U
11096-82-5	Aroclor-1260	31	U
Surrogate amount spiked		6.31	

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

BL1117SI

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMES SDG No.: 36418

Matrix: (soil/water) SOIL Lab Sample ID: BL1117SI

Sample wt/vol: 31.7 (g/mL) G Lab File ID: ____

% Moisture: ____ decanted: (Y/N) ___ Date Received: ____

Extraction: (SepF/Cont/Sonc) SONC Date Extracted: 11/17/98

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 11/19/98

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
12674-11-2	Aroclor-1016	31	U
11104-28-2	Aroclor-1221	31	U
11141-16-5	Aroclor-1232	31	U
53469-21-9	Aroclor-1242	31	U
12672-29-6	Aroclor-1248	31	U
11097-69-1	Aroclor-1254	31	U
11096-82-5	Aroclor-1260	31	U
Surrogate amount spiked		6.31	

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

LC1117SI

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMES SDG No.: 36418

Matrix: (soil/water) SOIL Lab Sample ID: LC1117SI

Sample wt/vol: 30.1 (g/mL) G Lab File ID: ___________

% Moisture: 0 decanted: (Y/N) N Date Received:

Extraction: (SepF/Cont/Sonc) SONC Date Extracted: 11/17/98

Concentrated Extract Volume: 10000 (uL) Date Analyzed: 11/19/98

Injection Volume: 0.5 (uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
12674-11-2	Aroclor-1016	250	
11104-28-2	Aroclor-1221	33	U
11141-16-5	Aroclor-1232	33	U
53469-21-9	Aroclor-1242	33	U
12672-29-6	Aroclor-1248	33	U
11097-69-1	Aroclor-1254	33	U
11096-82-5	Aroclor-1260	240	P
Surrogate amount spiked		6.64	

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1D
PESTICIDE ORGANICS ANALYSIS DATA SHEET

CLIENT SAMPLE NO.

LD1117SI

Lab Name: SWL-TULSA

Lab Code: SWOK Case No.: DAMES SDG No.: 36418

Matrix: (soil/water) SOIL Lab Sample ID: LD1117SI

Sample wt/vol: 31.2 (g/mL) G Lab File ID:

% Moisture: 0 decanted: (Y/N) N Date Received:

Extraction: (SepF/Cont/Sonc) SONC Date Extracted: 11/17/98

Concentrated Extract Volume: 10000(uL) Date Analyzed: 11/19/98

Injection Volume: 0.5(uL) Dilution Factor: 1.0

GPC Cleanup: (Y/N) N pH: 7.0 Sulfur Cleanup: (Y/N) N

CAS NO.	COMPOUND	CONCENTRATION UNITS: (ug/L or ug/Kg) UG/KG	Q
12674-11-2	Aroclor-1016	260	
11104-28-2	Aroclor-1221	32	U
11141-16-5	Aroclor-1232	32	U
53469-21-9	Aroclor-1242	32	U
12672-29-6	Aroclor-1248	32	U
11097-69-1	Aroclor-1254	32	U
11096-82-5	Aroclor-1260	240	P
Surrogate amount spiked		6.41	

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3H

SOIL PESTICIDE LABORATORY CONTROL SPIKE/ DUPLICATE RECOVERY

Lab Name: SWL-TULSA   Case No.: DAMES   SDG No.: 36418

LCS Sample NO.: LC1117SI

COMPOUND	SPIKE ADDED (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC. LIMITS REC.
Aroclor-1016	299	255	85	49- 87
Aroclor-1260	299	242	81	65-101

Column to be used to flag recovery values

* Values outside of QC limits

Spike Recovery: 0 out of 2 outside limits

Comments: ______________________________

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3H
SOIL PESTICIDE LABORATORY CONTROL SPIKE/ DUPLICATE RECOVERY

Lab Name: SWL-TULSA Case No.: DAMES SDG No.: 36418

LCS Sample NO.: LD1117SI

COMPOUND	SPIKE ADDED (ug/Kg)	LCS CONCENTRATION (ug/Kg)	LCS % REC #	QC. LIMITS REC.
Aroclor-1016	288	256	89 *	49- 87
Aroclor-1260	288	239	83	65-101

Column to be used to flag recovery values

* Values outside of QC limits

Spike Recovery: 1 out of 2 outside limits

Comments: ____________________

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2F
SOIL PESTICIDE SURROGATE RECOVERY

Lab Name: SWL-TULSA

Lab Code: SWOK   Case No.: DAMES   SDG No.: 36418

GC Column(1): RTX-PEST   ID: 0.32(mm)   GC Column(2): RTX-PEST 2 ID: 0.32(mm)

	CLIENT SAMPLE NO.	TCX 1 %REC #	TCX 2 %REC #	DCB 1 %REC #	DCB 2 %REC #	OTHER (1)	OTHER (2)	TOT OUT
01	BL1117SI	75	72	107	90			0
02	BL1117SS	96	89	97	76			0
03	LC1117SI	97	77	108	90			0
04	LD1117SI	100	81	11[illegible]	92			0
05	TP-0-15	97	89	96	76			0
06	TP-120-60	81	66	110	69			0
07	TP-120-60MS	93	67	119	70			0
08	TP-120-60MSD	91	66	93	72			0
09	TP-75-25	86	71	132	97			0
10	TP-120-0	91	82	85	70			0
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								

	ADVISORY QC LIMITS
TCX = Tetrachloro-m-xylene	(47-103)
DCB = Decachlorobiphenyl	(31-143)

Column to be used to flag recovery values
* Values outside of QC limits
D Surrogate diluted out

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.01

DATE: 12/16/98

SWLO # : 36418.01
SAMPLE #: SP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

TCLP METALS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
HG TOXICITY	0.002	U	mg/l	/ /	11/19/98	SW 7470A
ARSENIC TOXICITY	0.01	U	mg/l	/ /	11/24/98	SW 6010A
BARIUM TOXICITY	1.9		mg/l	/ /	11/24/98	SW 6010A
CADMIUM TOXICITY	0.003	U	mg/l	/ /	11/24/98	SW 6010A
CHROMIUM TOXICITY	0.01		mg/l	/ /	11/24/98	SW 6010A
LEAD TOXICITY	0.38		mg/l	/ /	11/24/98	SW 6010A
SILVER TOXICITY	0.007	U	mg/l	/ /	11/24/98	SW 6010A
SELENIUM TOXICITY	0.005	U	mg/l	/ /	11/24/98	SW 6010A

RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

TCLP METALS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
HG TOXICITY	0.002	U	mg/l	/ /	11/19/98	SW 7470A
ARSENIC TOXICITY	0.01	U	mg/l	/ /	11/24/98	SW 6010A
BARIUM TOXICITY	1.5		mg/l	/ /	11/24/98	SW 6010A
CADMIUM TOXICITY	0.003	U	mg/l	/ /	11/24/98	SW 6010A
CHROMIUM TOXICITY	0.005	U	mg/l	/ /	11/24/98	SW 6010A
LEAD TOXICITY	0.003	U	mg/l	/ /	11/24/98	SW 6010A
SILVER TOXICITY	0.007	U	mg/l	/ /	11/24/98	SW 6010A
SELENIUM TOXICITY	0.005	U	mg/l	/ /	11/24/98	SW 6010A

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.01

DATE: 12/16/98

SWLO # : 36418.01
SAMPLE #: SP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
REACTIVE CYANIDE	0.025	U	mg/kg	11/20/98	12/01/98	SW 7.3.3.2
REACTIVE SULFIDE	20	U	mg/kg	/ /	11/20/98	SW 7.3.4.2

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
REACTIVE CYANIDE	0.025	U	mg/kg	11/20/98	12/01/98	SW 7.3.3.2
REACTIVE SULFIDE	20	U	mg/kg	/ /	11/20/98	SW 7.3.4.2

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.03

DATE: 12/16/98

SWLO # : 36418.03
SAMPLE #: TP-0-15
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
ORG. CL (TOX)	14.1	U	mg/kg	/ /	11/24/98	SW 9020B

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.05

DATE: 12/16/98

SWLO # : 36418.05
SAMPLE #: TP-120-60
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**	UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
ORG. CL (TOX)	18.1	mg/kg	/ /	11/24/98	SW 9020B

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.08

DATE: 12/16/98

SWLO # : 36418.08
SAMPLE #: TP-75-25
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**	UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
ORG. CL (TOX)	17.4	mg/kg	/ /	11/24/98	SW 9020B

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.09

DATE: 12/16/98

SWLO # : 36418.09
SAMPLE #: TP-120-0
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/13/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
ORG. CL (TOX)	14.2	U	mg/kg	/ /	11/24/98	SW 9020B

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.01

DATE: 12/16/98

SWLO # : 36418.01
SAMPLE #: SP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

HAZARDOUS WASTE CHARACTERIZATION

PARAMETER	RESULTS**	UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
CORROSIVITY PH	7.5	su	/ /	11/17/98	SW 9045
IGNITABILITY	167	F	/ /	12/01/98	PMCC

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

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DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.02

DATE: 12/16/98

SWLO # : 36418.02
SAMPLE #: NP-SAND
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

HAZARDOUS WASTE CHARACTERIZATION

PARAMETER	RESULTS**	UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
CORROSIVITY PH	8.2	su	/ /	11/17/98	SW 9045
IGNITABILITY	170	F	/ /	12/01/98	PMCC

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA

QUALITY CONTROL
SECTION

/07-11-97

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

TCLP METALS
INORGANICS QUALITY CONTROL DATA SHEET

LCS/LCSD

RIX TCLP

ODE 36418
NT DAMESNE

BATCHID-ICP 9811231̲2
BATCHID-CV 981119T1

UNITS mg/l
SAMPLE # METHOD BLANK
SPIKE # LCS
DUP # LCSD

METER	TEST CODE	METHOD BLANK PBW-DI AMT.FOUND	METHOD BLANK PBW-T AMT. FOUND	DET. LIMIT	REGULATORY LIMIT	KNOWN CONC.	LCS AMT. FOUND	LCS % REC	LCS %REC. LIMITS		LCS FLAG	LCS DUPLICATE AMT. FOUND	LCS DUPLICATE %REC.	LCS DUPLICATE FLAG	RPD	RPD LIMITS	RPD FLAG	DATE ANALYZED	Analyst Initials	INSTR.
ic	MT054	<0.16	<0.16	0.16	5.0	2.0	1.80	90	80	120		1.77	89		1.7	20		24-Nov-98	JB	TJA#1
m	MT064	<0.01	<0.01	0.01	100	0.3	0.24	96	80	120		0.23	92		4.3	20		24-Nov-98	JB	TJA#1
ium	MT124	<0.005	<0.005	0.005	1.0	0.05	0.05	96	80	120		0.05	94		2.1	20		24-Nov-98	JB	TJA#1
nium	MT164	<0.01	<0.01	0.01	5.0	0.2	0.19	95	80	120		0.19	95		0.0	20		24-Nov-98	JB	TJA#1
	MT244	<0.1	<0.1	0.10	5.0	0.5	0.46	92	80	120		0.45	90		2.2	20		24-Nov-98	JB	TJA#1
ury	MT314	<0.002	<0.002	0.002	0.2	0.010	0.01	94	80	120		0.01	97		3.1	20		19-Nov-98	SR	PS200B
ium	MT384	<0.25	<0.25	0.25	1.0	2.0	1.80	90	80	120		1.77	89		1.7	20		24-Nov-98	JB	TJA#1
r	MT404	<0.01	<0.01	0.01	5.0	0.05	0.05	100	80	120		0.05	94		6.2	20		24-Nov-98	JB	TJA#1

RATIVE:
UTSIDE QC LIMITS

36418
/TLCSW REV 4.2
07-Dec-98

IN121/07-11-97

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

GENERAL CHEMISTRY
INORGANICS QUALITY CONTROL DATA SHEET
LABORATORY CONTROL SAMPLE

MATRIX **SOIL**

EPISODE 36418
CLIENT DAMESNE

PARAMETER	TEST CODE	UNITS	STANDARD READING	LCS READING	% DIFF.	LIMIT	FLAG	BATCHID	DATE ANALYZED	ANA-LYST
pH	HW200	su	7.00	6.97	0.4	1		9811172001	17-Nov-98	JDL
IGNITABILITY	HW350	F	77.0000	79.0000	2.6	10		9812013501	01-Dec-98	SMS

NARRATIVE:
* = OUTSIDE QC LIMITS

36418
/GWCOND\PH REV 4.2
07-Dec-98

3/07-11-97

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

GENERAL CHEMISTRY
INORGANICS QUALITY CONTROL DATA SHEET
LCS/LCSD

RIX SOIL

;ODE 36418
:NT DAMESNE

\METER	TEST CODE	UNITS	METHOD BLANK AMT. FOUND	METHOD BLANK DET. LIMIT	KNOWN CONC.	LCS AMT. FOUND	LCS % REC	LCS %REC LIMITS		LCS FLAG	LCS DUPLICATE AMT. FOUND	LCS DUPLICATE %REC.	LCS DUPLICATE FLAG	RPD	RPD LIMIT	RPD FLAG	BATCHID	DATE ANALYZED	ANA-LYST INI.
:tive Cyanide	IN125	ug/l	<3.0	3.0	NA												9811241203	01-Dec-98	PHP
:tive Sulfide	IN305	mg/kg	<20.0	20.0	534.0	517.0	97	50	150		541.0	101		4.5	20		9811203051	20-Nov-98	DSF
	IN060	mg/kg	<0.01	0.01	10.0	9.9	99	80	120		9.7	97		2.0	20		9811240601	24-Nov-98	JC

:RATIVE:
)UTSIDE QC LIMITS

36418
/GLCSS REV 4.2
07-Dec-98

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1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.03

DATE: 12/16/98

SWLO # : 36418.03
SAMPLE #: TP-0-15
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
BTU	1	U	btu	/ /	11/24/98	ASTMD-240
% ASH	59.5		%	/ /	11/23/98	ASTM D 482

**RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.05

DATE: 12/16/98

SWLO # : 36418.05
SAMPLE #: TP-120-60
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**	UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
BTU	9530	btu	/ /	11/24/98	ASTMD-240
% ASH	51.2	%	/ /	11/30/98	ASTM D 482

RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.08

DATE: 12/16/98

SWLO # : 36418.08
SAMPLE #: TP-75-25
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/12/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**	UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
BTU	136	btu	/ /	11/24/98	ASTMD-240
% ASH	56.7	%	/ /	11/30/98	ASTM D 482

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA, INC.

1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

DAMES & MOORE
2021 S. LEWIS
TULSA, OK 74104
Attn: JON SEEKINS

REPORT: 36418.09

DATE: 12/16/98

SWLO # : 36418.09
SAMPLE #: TP-120-0
SAMPLE MATRIX : SOIL
PROJECT : IHNC
LOCATION:

DEPTH FROM : 0.00
DEPTH TO : 0.00
DATE SAMPLED : 11/13/98
DATE RECEIVED : 11/16/98

MISCELLANEOUS ON A DRY WEIGHT BASIS

PARAMETER	RESULTS**		UNITS	DATE PREPARED	DATE ANALYZED	REFERENCE METHOD
BTU	1	U	btu	/ /	11/24/98	ASTMD-240
% ASH	67.1		%	/ /	11/30/98	ASTM D 482

*RESULTS REPORTED TO A MAXIMUM OF 3 SIGNIFICANT FIGURES

SOUTHWEST LABORATORY OF OKLAHOMA

QUALITY CONTROL SECTION

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 West Albany • Broken Arrow, Oklahoma 74012 • Office (918) 251-2858 • Fax (918) 251-2599

ANALYTICAL REPORT

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. ALBANY SUITE C
BROKEN ARROW, OK 74012-1421

REPORT: 31342

DATE: 12-05-98

AATSLA IDENTIFICATION

SAMPLE NO.: 31342.01
DATE RECEIVED: 11/19/98

QA/QC

DESCRIPTION	PARAMETER	RESULTS	
METHOD BLANK 11-24-98	BRITISH THERMAL UNIT	< 300	BTU/lb
BLANK SPIKE 11-24-98	BRITISH THERMAL UNIT	100%	RECOVERY

Appendix C
Photographic Log

PHOTOGRAPHIC LOG
SURFACE ANOMALIES
IHNC - NEW ORLEANS

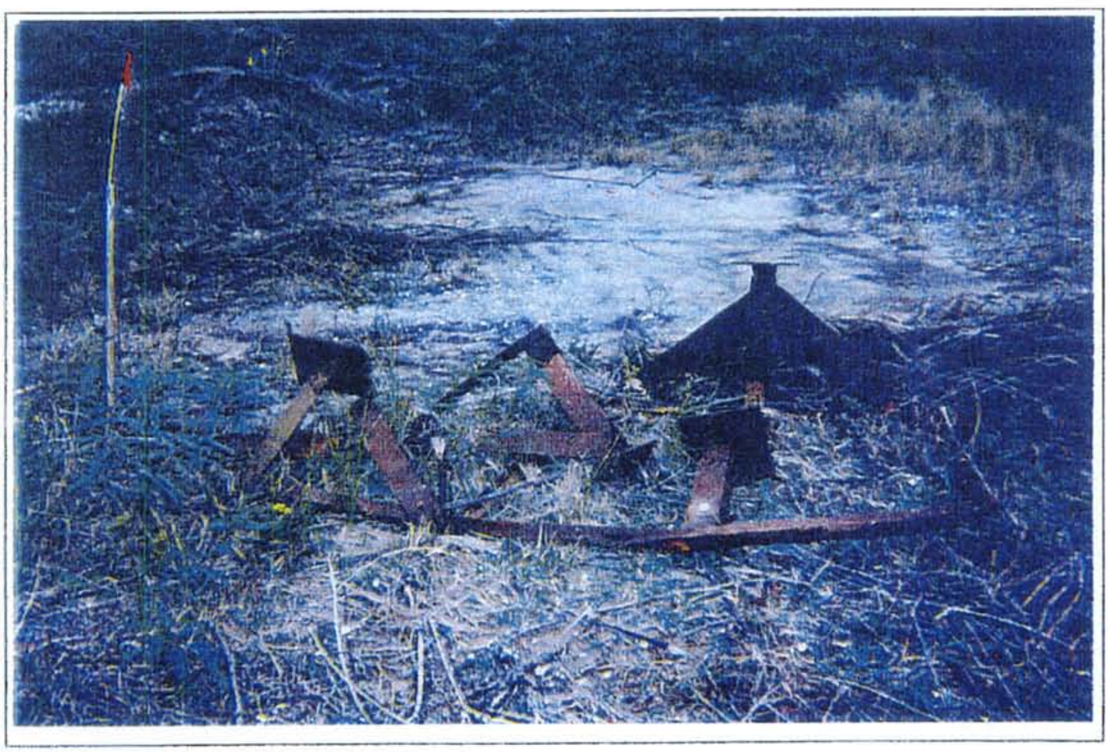
1. View to the west of an aboveground storage tank (AST) with associated pump house. The area along the canal is covered with dense vegetation. Piping observed in TP-120-60 may be associated with this fuel dispensing system

2. View to the south from TP 120-60 toward the AST. Six inch fuel line observed at approximately 1-2'bgs. Soil around the line appears to be impacted.

3 View to the south of a concrete pad and metal support footings. Appears to be associated with a former AST.

4 View to the south of a large metal plate observed on the north side of the small blast sand stockpile (south side of the property.

5 View to the south of a tangled wire rope observed on the north side of the small blast sand stockpile.



6 View to the north of metal footings located on an asphalt/concrete pad.

7. View to the north along Survey Line 132.

8. View to the north along Survey Line 75.

9. View to the north along Survey Line 0.

10. View to the south along Survey Line 0.

11. View to the south along Survey Line 75.

12. View to the south along Survey Line 132.

13. View to the northwest of a large metal plate. This plate may be associated with a partially buried barge.

14. View to the north of a metal structure covered with dense vegetation.

5 View to the northwest of a large stockpile of timbers which contain metal spikes and bolts.

16. View to the northwest of a large stockpile of timbers which contain metal spikes and bolts.

17 View to the northwest of a large stockpile of timbers which contain metal spikes and bolts.

18. View to the east/northeast of a large metal plate and grate (barge debris) associated with the large blast sand stockpile located on the north side of the survey area.

19. View to the east/northeast of a large metal plate and grate (barge debris) associated with the large blast sar stockpile located on the north side of the survey area.

20. View to the northwest of timbers with large metal bolts.

21. View to the southwest of metal debris at the surface. (North side of the south waste stockpile)

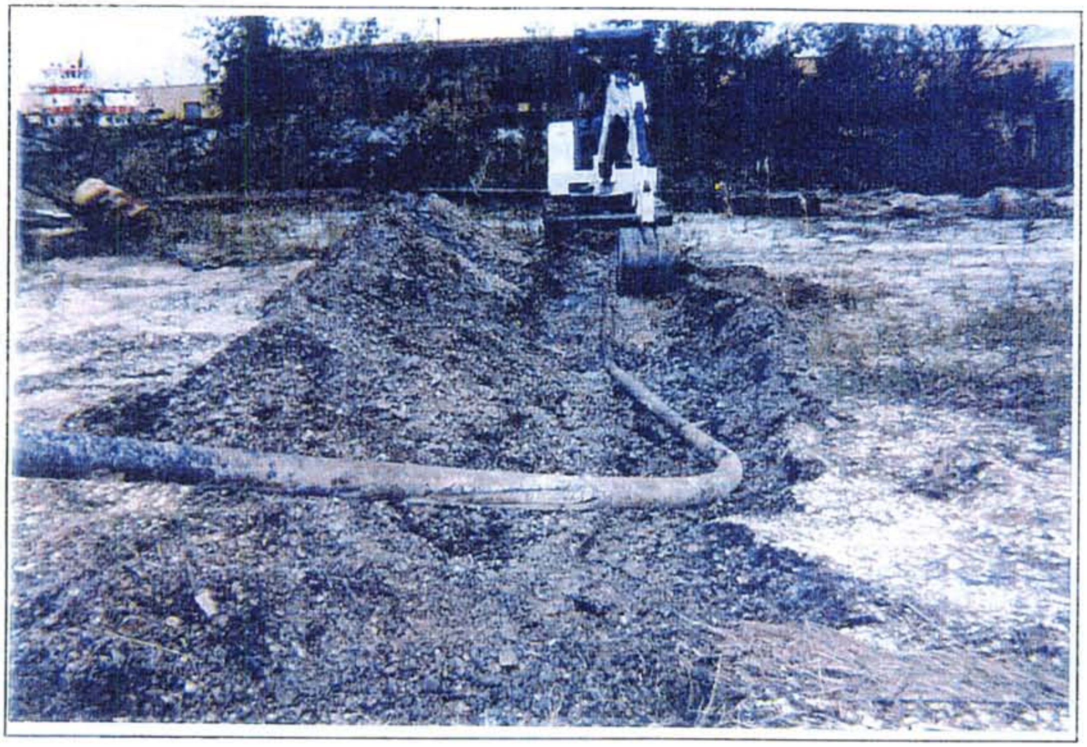
22. View to the west of metal sheeting at the surface. (North side of the south waste stockpile).

23. View to the west of metal sheeting at the surface (North side of the south waste stockpile).

24 View to the west of metal piping at the surface along the O Line.

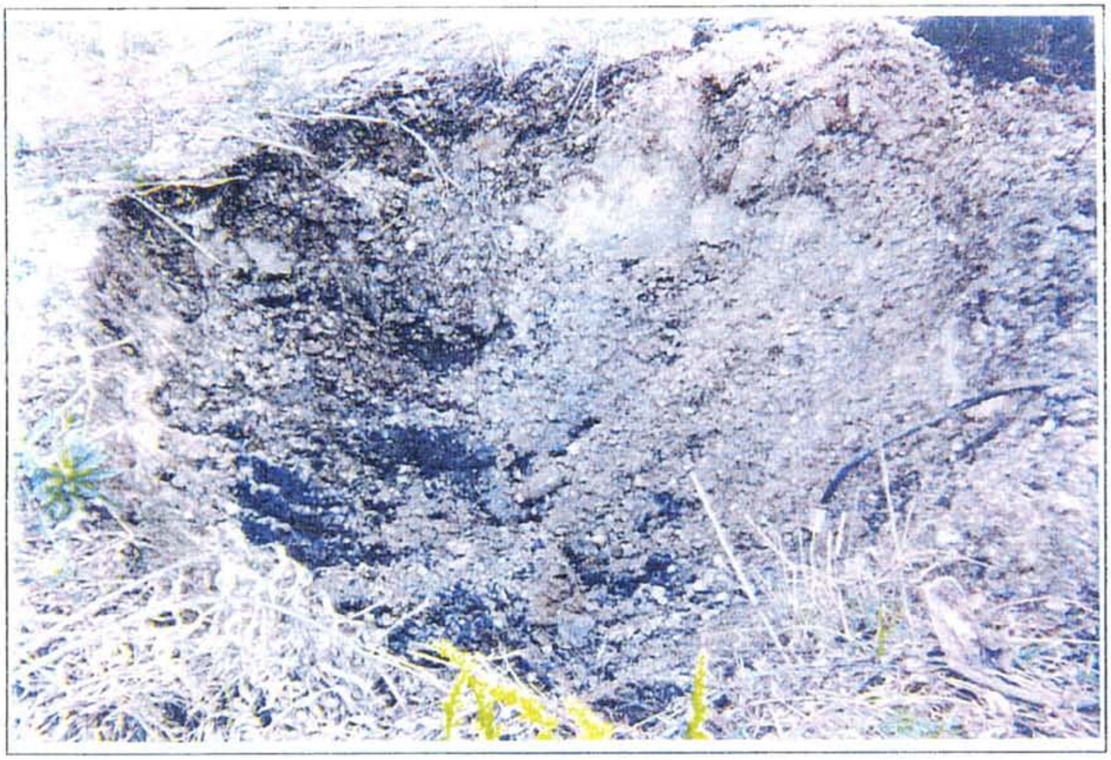
25 View to the north of the west end of the concrete pad (former AST pad). Four inch metal piping on the west end of the pad runs to the west toward the piping observed at Test Pit 120-60-1

26 Metal debris and stained shells observed at approx. 1-2 feet bgs.

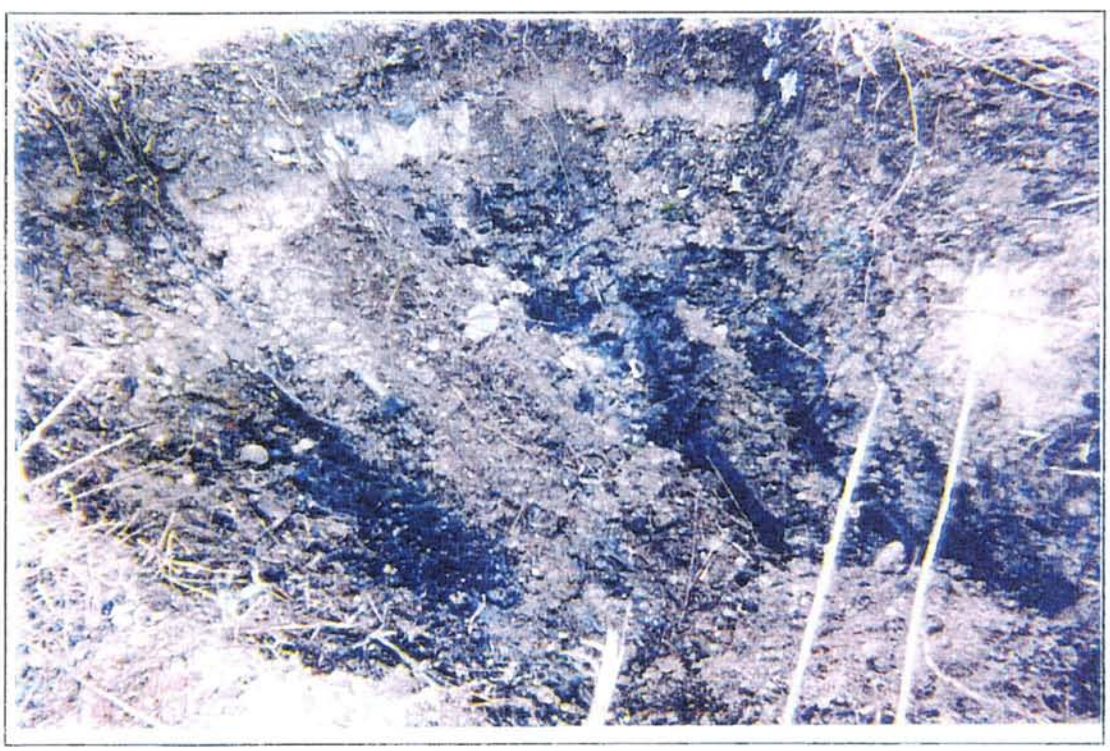


27 View to the west/southwest along the 6" line from the former AST pad area

28. View to the north/northeast of a metal ladder removed from Test Pit TP 0-15-1



29 View to the north of Test Pit TP-0-15-1



30 View to the north of Test Pit TP-0-15-1

31. View to the northwest of TP-0-15-1 backfilled with water trapped under the large metal plate observed in test pit.

32. View to the west of the large metal plate observed in Test Pit TP 0-15-1.

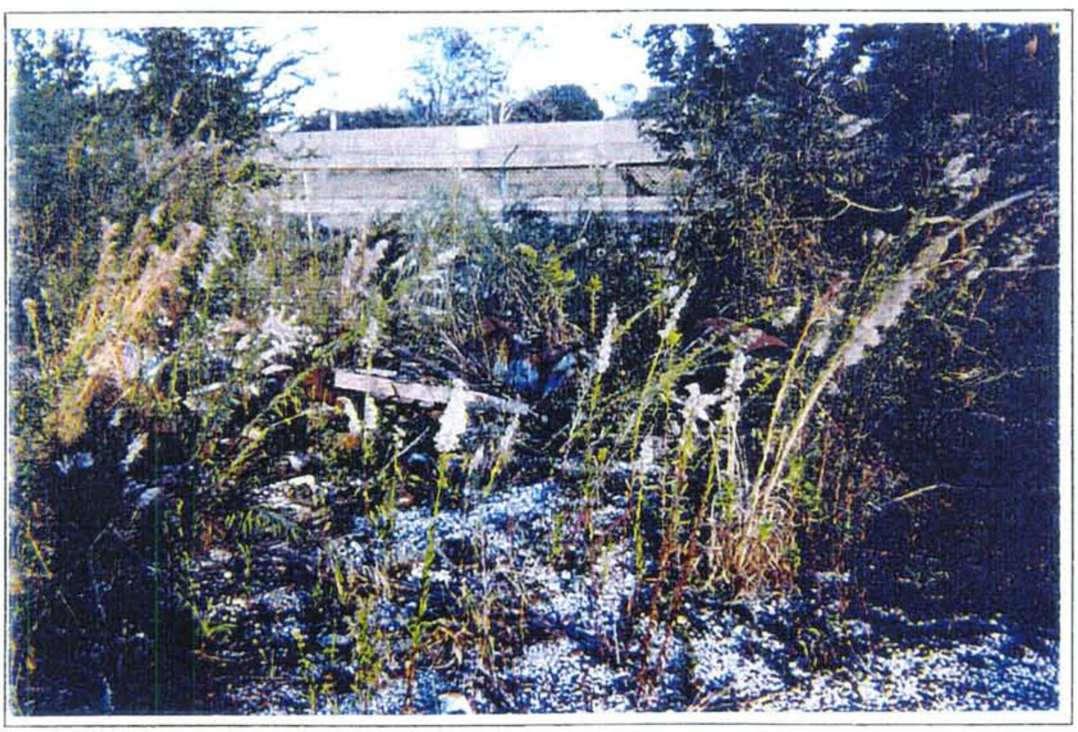
33 View to the southwest of petroleum impacted soil observed along the six-inch piping running in the vicinity of Test Pit TP-120-60-1/

34 View to the southwest of petroleum impacted soil observed along the six-inch piping running in the vicinity of Test Pit TP-120-60-1.

35 View to the northwest of petroleum impacted soil observed along the six-inch piping observed in the Vicinity of Test Pit TP-120-60-17

36 View to the north of a wire rope in the vicinity of Line O between 180 and 210.

37 View to the east of various cans and drums which have been stockpiled along the east side of the survey area.



38. View to the east of metal debris located along the east side of the survey area.

39. View to the east of metal debris (old car frame) located along the east side of the survey area.

40. View to the north of a large metal plate being extracted from Test Pit TP-75-250-1

41 View of the metal plate in Test Pit TP-75-250-1.

42. View of the metal plates removed from Test Pit TP-75-360-1.

43 View of the metal plates and metal piping removed from Test Pit TP-75-390-1.

44. View of the metal plates and metal piping removed from Test Pit TP-75-390-1.

45 View of the metal debris removed from Test Pit TP-120-60-1

46. View to the northwest of the large blast sand stockpile located on the north side of the survey area.

47. View to the northeast of the blast sand stockpile located on the north side of the survey area.

Appendix D
Detailed Cost Estimates

ESTIMATED COST TO REMOVE AND DISPOSE 4200 TONS OF BLAST SAND
SAUCER MARINE
IHNC DEMOLITION DESIGN MEMORANDUM

Equiptment	QTY	HOURLY RATE	NO. OF HOURS	Totals
Tractor with Plow Rake	1	$39.75	56	$2,226.00
Loader Front-End, 2.00 CY Bucket	1	$39.75	96	$3,816.00
9.0 CY Grapplpe	1	$9.03	56	$505.68
Bobcat	1	$33.25	56	$1,862.00
Trackhoe	1	$112.08	40	$4,483.20
50 Ton Lifting Crane, 40' Boom	1	$51.29	40	$2,051.60
6.25 CY Bucket	1	$9.83	40	$393.20
*Single or Tandum Axle Dump Truck	5	$25.00	56	$1,400.00
Tug Boat	1	$215.00	16	$3,440.00
Barge (monthy Rental)	1	$7,500.00	1	$7,500.00
		Total Equipment Cost ($)		$27,677.68

Labor	QTY	HOURLY RATE	NO. OF HOURS	Totals
Field Super	1	$40.00	120	$4,800.00
Equiptment Operators	1			
Tractor	1	$28.00	56	$1,568.00
Front End Loader	1	$28.00	96	$2,688.00
Bobcat	1	$28.00	56	$1,568.00
Trackhoe	1	$28.00	40	$1,120.00
Crane	1	$28.00	40	$1,120.00
*Drivers	5	$25.00	56	$1,400.00
*Laborers	3	$15.00	96	$1,440.00
		Total Labor Cost ($)		$15,704.00

Miscellaneous Expenses	QTY	MONTHLY RATE	NO. OF MONTHS	Totals
Field Trailer	1	$500.00	1	$500
Port-o-Potty	1	$50.00	1	$50
		Total Miscellaneous Cost ($)		$550

Sub-Total	$43,931.68
15% Overhead & Profit	$6,589.75
20 % Contigency	$10,104.29
Total Removal Cost	$60,625.72
Disposal Cost	$96,600.00
Engineering & Design	$8,500.00
Trucking Cost	$56,389.00
Construction Management	$7,000.00
Total Estimated Project Cost	**$229,114.72**

* Misellaneous not included in detailed cost:

Single axle dump truck equiptment
Drivers
Laborers

MIXED-WASTE MOUND REMOVAL-SAUCER MARINE
IHNC DEMOLITION DESIGN MEMORANDUM
ESTIMATED PRODUCTION RATE

ASSUMPTIONS[1]	
STIMATED UNIT WEIGHT FOR SHIPPING (LB/CU FT)	120
1 TON (LB) =	2,000
TRUCKING COST FOR BLAST SAND ($/LOAD) =	435
TRUCKING LOAD FOR BLAST SAND (CY/LOAD) =	20
DISPOSAL COST ($/TON) =	23
BARGE LOAD (TONS) =	1,100
BARGE (LOADS/MONTH) =	4
BARGE ($/MONTH) =	7,500
TUG BOAT ($/HR) =	215
TUG BOAT (HR/NO. OF LOADS) =	4

NO.	DESCRIPTION	BASELINE STATION	SIZE (SQ FT)	HEIGHT (FT)	VOLUME (CU FT)	VOLUME (CU YD)	ESTIMATED WEIGHT (TON) SAND (120 PCF)	ESTIMATED SEGREGATION RATES SAND	COST/SQ FT =	1.15	ESTIMATED REMOVAL RATES SAND	COST/SQ FT =	1.19
84A	SAND & DEBRIS WASTE PILE	54 + 00	7,000	7	49,000	1,815	2940		8,067			8,315	
84B	SAND & DEBRIS WASTE PILE	54 + 00	3,000	7	21,000	778	1260		3,457			3,563	
		TOTAL	10,000	TOTAL	70,000	2,593	4,200	TOTAL	11,524		TOTAL	11,878	

TRUCKING DISPOSAL COSTS						
DESCRIPTION	TOTAL WEIGHT (TONS)	TOTAL VOLUME (CU YD)	NO. OF TRUCK LOADS	TRUCKING COST ($)	DISPOSAL COST ($)	TOTAL TRUCKING & DISPOSAL COST ($)
SAND	4,200	2,593	130	56,389	96,600	152,989

BARGING & DISPOSAL COSTS									
DESCRIPTION	TOTAL WEIGHT (TONS)	TOTAL VOLUME (CU YD)	NO. OF BARGE LOADS	BARGING COST ($)	TUG BOAT COST ($)	NO. OF TRUCK LOADS	TRUCKING COST ($)	DISPOSAL COST ($)	TOTAL BARGING & DISPOSAL COST ($)
SAND	4,200	2,593	4	7,500	3,440	130	56,389	96,600	163,929

[1] US Army Corps of Engineers, EP1110-1-8, Vol 3, Sept 1997

MIXED-WASTE MOUND REMOVAL-SAUCER MARINE
IHNC DEMOLITION DESIGN MEMORANDUM
ESTIMATED PRODUCTION RATE

Case	Area (SQ FT)	DESCRIPTION	ID. NO.[1]	QTY	UNIT HOURLY RATE ($/HR)[1]	TOTAL HOURLY RATE ($/HR)	NO. OF HRS[2]	EQUIPMENT TOTAL ($)	NO. OF OPERATORS	UNIT HOURLY RATE ($/HR)	TOTAL HOURLY RATE ($/HR)	NO. OF HRS	LABOR TOTAL ($)	TOTAL ($)
		EQUIPMENT							LABOR					
SEGREGATION OF MATERIAL	10,000	TRACTOR WITH PLOW RAKE		1	39.75	39.75	56	2,226.00	1	28.00	28.00	56	1,568.00	3,794.00
		LOADER FRONT-END, 2.00 CY BUCKET	L35CA005	1	39.75	39.75	56	2,226.00	1	28.00	28.00	56	1,568.00	3,794.00
		9.0 CY GRAPPLE	H25LU028	1	9.03	9.03	56	505.68	0	0.00	0.00	0	0.00	505.68
		BOBCAT		1	33.25	33.25	56	1,862.00	1	28.00	28.00	56	1,568.00	3,430.00
							TOTAL	6,819.68	3				TOTAL	11,523.68
													COST/SQ FT	1.15

Case	Area (SQ FT)	DESCRIPTION	ID. NO.[1]	QTY	UNIT HOURLY RATE ($/HR)[1]	TOTAL HOURLY RATE ($/HR)	NO. OF HRS[2]	EQUIPMENT TOTAL ($)	NO. OF WORKERS	UNIT HOURLY RATE ($/HR)	TOTAL HOURLY RATE ($/HR)	NO. OF HRS	LABOR TOTAL ($)	TOTAL ($)
		EQUIPMENT							LABOR					
REMOVAL OF BLAST SAND	10,000	TRACKHOE	H250K001	1	112.08	112.08	40	4,483.20	1	28.00	28.00	40	1,120.00	5,603.20
		50 TON LIFTING CRANE, 40' BOOM	C85LB003	1	51.29	51.29	40	2,051.60	1	28.00	28.00	40	1,120.00	3,171.60
		6.25 CY BUCKET	B25ES051	1	9.83	9.83	40	393.20	0	0.00	0.00	0	0.00	393.20
		LOADER FRONT-END, 2.00 CY BUCKET	L35CA005	1	39.75	39.75	40	1,590.00	1	28.00	28.00	40	1,120.00	2,710.00
							TOTAL	8,518.00	3.00				TOTAL	11,878.00
													COST/SQ FT	1.19

(1) US Army Corps of Engineers, EP1110-1-8, Vol 3, Sept 1997
(2) Based on 8-hr days

Comme 1:
Dames an. .oore's
Sampling and Analysis Plan (SAP)
Site Safety and Health Plan (SSHP)
WASTE MOUNDS
Contract No. DACW29-97-D-0019
Environmental Support to
Inner Harbor Navigation Canal New Lock and Connecting Channels
New Orleans, Louisiana

Reviewer: Reuben Mabry, George Bacuta, Jean Spadaro: ED-GE, New Orleans District, U.S. Army Corps of Engineers (23 July 1998)
Respondent: Jon Seekins and John Plevniak: Dames & Moore (August 28, 1998)

1. Respondent concurs (C), Does not Concur (D), or takes Exception (E).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/Page	Paragraph/ Line	Comment	C, D, E[1]	Response	A or D[2]
SAMPLING AND ANALYSIS PLAN						
1 SAP	General		For consistency, attach a cover page with signature blocks as provided in the SAP for tanks.	C	Signature Block will be added.	
2 SAP	Section 1.0, Page 1	Paragraph 2, 3rd bullet	Replace "soil samples" with "soil samples and/or contaminated / waste material". In cases where buried drums / containers are discovered and exposed, and their contents are accessible for sampling, it will be prudent to sample these materials / wastes.	C	Concur only if contents are readily accessible. No drums/containers will be opened during this phase of the project.	
3 SAP	Section 3.1, Page 2	2nd Paragraph, 2nd sentence	Change "DOQs" to" DQOs"	C	Change will be made.	
4 SAP	Section 3.2 Page 2; Section 4.4.4, Page 18		In addition to QC samples, it is prudent to add QA samples to increase confidence in the data.	D	A total of six soil/waste samples, one field replicate sample, one matrix spike/matrix spike duplicate sample, one trip blank, and a temperature blank will be submitted for this site. Based on the limited scope of this initial site assessment, the benefit of an additional QA sample may not be worth the cost. A split sample can be collected and submitted to a laboratory designated by the Corps, however, the cost for this analysis is not within the current scope of this project.	

5 SAP	on 3.3.3, Page 9; Section 4.4, Page 15		Identify the off-site laboratory (ies nes & Moore intend to use for chemical analysis of samples taken from the mounds. Selected laboratory (ies) should possess government certification.	C	The off-site laboratory is Southwest Laborat Oklahoma, Inc. The laboratory will be identified in the work plan.	
6 SAP	Section 4.4.3, Page 15		Attach a sample of Chain-Of-Custody form from either EM-200-1-3 or supplied by the laboratory performing the chemical analysis **OR** indicate that the chemical laboratory will supply the form.	C	A sample chain-of-custody will be attached.	
7 SAP	Section 4.1; Section 4.5; Appendix A		To be consistent with all other engineering drawings on IHNC, the corners of the geophysical survey grid as well as the sample locations should be consistent with the State Plane coordinates in site maps prepared by Waldemar S. Nelson and Company.	C	We will have a surveyor set the corners of the grid for geophysical investigation.	
8 SAP	Section 4.3; Section 4.6; Appendix A		Attach a sketch map or plan of the work zones and identify excavation zones (trenching area), decontamination zone, exclusion zone, support zone, etc. to provide visual illustration of activities described in these discussions.	D	The excavation areas will be limited to small test pits. The test pit locations will not be identified until completion of the geophysical survey. The location of each test pit will be coordinated the USACE project manager prior to initiation excavation activities.	
SITE SAFETY AND HEALTH PLAN						
9 SSHP	Page 2	EMERGENCY CONTACTS	Local police contact is New Orleans 5th District Police, 3900 N. Claiborne Avenue, (504) 941-4400 fax 3023	C		
10 SSHP	Page 10		Identify backhoe operator when available. Make sure field personnel possess health or hazwoper certification.	C	Dames & Moore will provide a certified backhoe operator with training. (Mr. Emmett Dunn)	
11 SSHP	Appendix D		USACE Accident Reporting Form should be available from the USACE New Orleans District Safety Office (504-862-2207). Refer to USACE's Safety and Health Requirements Manual, EM385-1-1, for guidelines on accident prevention in USACE's activities and operations.	C		

APPROVAL PAGE

Site-Specific Sampling & Analysis Plan
for
Waste Mounds

Environmental Support to
IHNC New Lock and Connecting Channels

Contract No. DACW29-97-D-0019
Delivery Order No: 0011
New Orleans COE

Approved by:

Dennis W Day CIH 6553	11/5/98
Dames & Moore Certified Industrial Hygienist, Dennis W. Day	Date
David Henney for John E. Plevniak	11/5/98
Dames & Moore QA Director, John E. Plevniak	Date
Martha Bore for Jon W. Seekins	11/5/98
Dames & Moore Project Manager, Jon W. Seekins	Date
Brett H Herr	11/5/98
New Orleans COE Contracting Officers Representative, Brett Herr	Date
[illegible]	11/5/98
New Orleans COE Technical Representative (TR), Mr. George Bacuta and/or Ms. Jean Spadaro	Date

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Waste Mounds Survey Grid

APPENDICES

A Operational Plan, Mixed-Waste Mounds

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) presents the requirements and procedures for field operations to be conducted in the investigation of two mixed-waste mounds located at the Saucer Marine site, New Orleans, Louisiana. This task specific SAP has been prepared to ensure (1) data quality objectives are met, (2) the field investigation and sampling protocols are documented and reviewed in a consistent manner, and (3) the data collected are scientifically valid and defensible.

This SAP was developed in accordance with the final scope of work provided by the U.S. Army Corps of Engineers (USACE), dated 3 April 1998, for the environmental work on the Inner Harbor Navigation Canal Lock replacement project.[1] The specific tasks to be performed in investigating the waste mounds include:

- A geophysical survey of the waste mounds to detect and assess anomalies that may indicate containerized wastes (e.g., 55-gallon drums, 1- and 5-gallon paint cans, etc.) buried at the site;
- Verification of the geophysical anomalies by minor excavation or probing; and
- Collection of representative soil samples and or contaminated / waste material for chemical laboratory testing.

The Operation Plan for conducting this investigation is presented in Appendix A.

2.0 BACKGROUND

The project is located at the Saucer Marine site on the east bank of the Inner Harbor Navigation Canal north of Claiborne Avenue. Figure 1 presents a generalized map of the project area.

Two mixed-waste mounds, approximately 90 by 120 feet and 160 by 250 feet are located at the Saucer Marine site. The mounds are reported to have piled up to about 6 feet high and have settled through the years. Drums and other containerized wastes may be buried in these mounds, as well as used and unused sandblasting materials, trash, and wood products.

3.0 PROJECT SCOPE AND OBJECTIVES

3.1 OBJECTIVES

The purpose of this field investigation is to delineate the location of the waste mounds at the Saucer Marine site; locate and assess suspected containerized wastes (e.g., 55-gallon drums, 1- and 5-gallon paint cans, etc.) buried at the site; and collect representative soil samples for chemical laboratory testing to assess potential impact to the environment. This information will be used to develop the environmental and safety requirements for the excavation, segregation or bulking, temporary storage, and testing for disposal of the containerized wastes as well as the remaining components of the mounds.

The primary method for achieving the goals of this project is through the establishment of Data Quality Objectives (DQO). DQOs specify the data type, quality, quantity, and uses and are the basis for determining the data collection activities required by the project. The categories of data to be collected during this field investigation include (1) geophysical data, (2) screening data, and (3) definitive laboratory data.

Geophysical data are produced using instruments that measure variations in the natural (background) gravitimetric or magnetic fields, natural or induced electromagnetic fields, and induced seismic waves. For this project, instruments that detect variations in an inducted electromagnetic field will be used to map variations in ground conductivities due to buried metallic and nonmetallic debris.

Screening data includes data produced by rapid field screening methods and are generally less precise than standard analytical methods. Screening level methods produce analyte or class of analyte identification at generally elevated detection levels. This type of data will be generated during screening of soil sample headspace with a Photo-Ionization Detector (PID). Screening data will be used to make a preliminary assessment of the extent of contamination and in the selection of confirmatory samples.

Definitive laboratory data are produced using standard U.S. EPA or other reference methods, usually in an off-site laboratory. The data are analyte-specific and have the standardized Quality Control (QC) and documentation requirements necessary to verify all results. Definitive data are not restricted in their use unless quality control problems are encountered which require the data to be qualified. This type of data will be generated to identify the type and concentration of contaminants at the site.

A Quality Assurance/Quality Control (QA/QC) program will be implemented to ensure that the above objectives are met. Sample collection data quality will be controlled through the use of standard collection methods and field logbooks. Selected field procedures are discussed in Section 4.0 of this SAP. Adherence to these field procedures will ensure sample representativeness and minimal potential for sample contamination.

3.2 SAMPLE ANALYSIS SUMMARY

Soil samples will be collected from each of the waste mounds to assess environmental impact from buried containerized wastes and used and unused sandblasting materials. A total of four soil samples (two from each waste-mound area) and two waste sandblasting material samples will be collected for off-site laboratory analysis. Collected soil samples will be submitted to an off-site laboratory for fuel finger print, total organic halides (TOX), BTU and ash, and polychlorinated biphenyl (PCB) analyses. Samples of waste sandblasting materials will be submitted for reactivity/corrosivity/ignitability analysis and Toxicity Characteristic Leaching Procedure (TCLP) analysis for volatile compounds, semivolatile compounds, pesticides/herbicides, and metals.

Assessment of field sampling precision and bias will be made by collecting one field replicate sample for laboratory analysis. A matrix spike/matrix spike duplicate sample will also be collected and submitted to the laboratory. One trip blank will accompany every cooler of samples sent to the laboratory for volatile organic analyses (VOA). A temperature blank (a VOA sampling vial filled with water) shall be included in every cooler and used to determine the internal temperature of the cooler upon receipt of the cooler at the laboratory.

3.3 FIELD ACTIVITIES

The following subsections briefly describe the methods selected for the field investigation. Factors influencing the selection of the methods are discussed.

3.3.1 Geophysical Methods

The waste mounds are suspected to contain buried drums and other containerized wastes, as well as used and unused sandblasting materials, trash, and wood products. Geophysical methods capable of locating these materials include the magnetic, electromagnetic, and ground penetrating radar methods. The following sections provide a brief overview of these geophysical methods and discuss their sensitivity and limitations with regard to the objectives of this project.

3.3.1.1 Magnetic Method

Theory

The earth possesses a magnetic field that exhibits characteristics similar to a dipole magnet, with the ends of the dipole in the Polar Regions. The intensity of the magnetic field is measured in nanoTeslas (nT), also commonly referred to as gammas. The field varies from a low of about 25,000 nT in equatorial regions to over 65,000 nT in polar areas. In the region of the site, the field has an average intensity of about 52,000 nT. The natural magnetic field of the earth, when measured at any specific location will show time varying changes referred to as drift. This drift may be caused by a number of factors including atmospherics, storms, and solar flare eruptions.

The magnetic field intensity at any given location may deviate from the expected normal field due to the presence of geologic or man-made features. The shape and magnitude of magnetic anomalies is dependent on the magnetic susceptibility, mass, shape, orientation, and depth of burial of these features. Geologic structures such as faults may be evidenced by magnetic measurements because of the presence of magnetic minerals in earth materials. Man-made features are evidenced because of the presence of iron bearing objects. Objects such as drums, tanks, or pipelines produce magnetic anomalies that may be quite pronounced as a result of the high magnetic susceptibility of iron or steel.

The magnetic signature of an anomaly is the combined result of both remnant and induced magnetism. Remnant magnetism is a property that is fixed in a material at some specific point in its past history. It results from the parallel alignment of magnetically susceptible crystals or grains in the material to the lines of force of the earth's magnetic field at the time the remnant magnetism was fixed. Remnant magnetism may result from such things as the cooling of molten metals or magma, heat firing, or the settling of fine particles. This property remains unchanged unless the material is altered. Induced magnetism is a property that results from interaction of magnetically susceptible materials with the present magnetic field of the earth. Generally, in the search for buried metallic debris, it is sufficient to consider only the induced field as the source for anomalies.

Magnetic field measurements often obtain both the total magnetic field intensity and the vertical magnetic gradient data. Total field measurements show responses in the magnetic field, which have both deep-seated (large area) and near surface (local) sources. The vertical magnetic gradient, which is obtained by taking two readings of the total field intensity at two different heights above the ground surface at the same location, represents the change in the total field strength between those two heights. The vertical gradient is typically expressed as nT/meter or nT/foot. An advantage which the vertical magnetic gradient offers is that because the strength of anomalies is in part controlled by the distance between the source and the reading sensor (depth of burial), shallow source anomalies tend to be more pronounced with vertical magnetic gradient data than with total field data.

Magnetic drift can interfere with the continuity of measurements and obscure the targets of more sensitive surveys. Drift values may equal or exceed the threshold of anomalies that are created by the presence of target objects. For that reason, and to permit ties between data taken over periods of time, it is advisable to apply drift corrections to data collected during a magnetic survey. The use of a separate recording magnetometer at a fixed base station will provide a record of the natural drift that occurs. Subtraction of that drift from data collected by roving field units will eliminate the problems that arise due to drift. In cases where more than one magnetometer is in use in a survey area, the same base station data may be applied to all of the roving field units. Drift correction is not necessary for vertical gradient measurements on systems where reading of both sensors is performed concurrently.

Data is typically collected in a magnetic survey by obtaining readings along profiles or on a rectangular grid system, with the gridded data then contoured in map form. The spacing of the lines of traverse and the reading points along each line are varied according to the objective of the survey. Large-scale reconnaissance work to evaluate features with large dimensions may use line and station spacings of 50 feet or more. Detailed searches for isolated small objects may require that data be collected at spacings as close as 1 to 3 feet. That is because smaller objects contain less magnetically susceptible material and thus produce smaller deviations from the normal magnetic field. These anomalies are both smaller in intensity and are smaller in the area over which they occur. In order to detect their presence, readings must be made at close spacings.

Similarly, the depth at which an object can be detected will vary with the size of the object. Smaller objects must lie closer to the ground surface to be detected, while larger objects or clusters of objects may lie at greater depth and still be detectable. As an example, one pound of iron will produce an anomaly of 10 nT at a distance of approximately 5 feet, whereas 1,000 pounds of iron will yield a 10 nT anomaly at a distance of about 50 feet.

Instrumentation

Two commonly available types of magnetometers are the proton precession and fluxgate magnetometer. These magnetometers include both those systems that provide quantitative measurement of the total field intensity and vertical gradient (gradiometer) of the magnetic field, and those which provide a qualitative response to changes in the magnetic field (metal locators).

Currently, proton precession magnetometers can measure the total field intensity and vertical magnetic gradient to a resolution of 0.01 nT. Fluxgate magnetometers have a resolution of 0.1 nT. With these sensitivities, interference from buildings, steel fencing, culvert pipes, and drain tiles, buried utilities and pipes, and other cultural sources can degrade the ability to detect target objects. At locations where cultural interference does not occur, anomalies on the order of 5 to 10 nT can be readily detected. This intensity of anomaly equates to that produced by a one pound ferrous object buried at a depth of approximately 5 feet.

3.3.1.2 Electromagnetic Method

Theory

Conductivity (the reciprocal of resistivity) is the parameter measured by the electromagnetic method. In most earth materials, the conductivity is determined more by the porosity of the material and the chemical content of the water filling the pore spaces, than by the conductivity of the mineral grains of which the material itself is composed. Disturbance of the natural soils, such as those caused by the excavation and backfilling, tends to cause a change in the ground conductivity which often can be measured at the surface. The high conductivity of buried metallic objects (e.g. drums) also creates an anomaly in the ground conductivity that can be measured.

Electromagnetic (EM) instruments operate by inducing alternating circular current flow in the ground. This is done through a transmitter coil that emits a low frequency alternating current. The current flow, which is determined by the conductivity of the ground, produces a secondary EM field that is detected by a receiver coil. There are two components of the induced magnetic field that can be measured by EM instruments: the quadrature-phase, which is linearly related to ground conductivity; and the inphase, which is sensitive to metallic objects. Depending upon the type of instrument and method of survey, a receiver coil may be used to measure the inducted magnetic field for its strength, phase, or time decay.

The depth of material that effectively contributes to the instrument reading changes depending upon the orientation of the antenna coil dipoles, and the spacing between the transmitting and receiving coils. For vertical dipoles, the effective depth of investigation is 1.5 times the intercoil spacing. For horizontal dipoles, the effective depth of investigation is 0.75 times the intercoil spacing.

Instrumentation

Two EM instruments commonly used to investigate buried waste sites are the Geonics EM31 electromagnetic ground conductivity meter and Geonics EM61 time-domain metal detector. The EM31 consists of a control console located at the center of a nonconductive boon. A transmitter coil located at one end of the boom radiates an electromagnetic field (primary field), which induces alternating eddy current loops (secondary field) in the earth beneath the instrument. A receiver coil located at the opposite end of the boom senses both the primary field and the secondary field. The instrument measures the ratio of the strength of the secondary field produced by the eddy currents to the strength of the primary magnetic field. Measurement is taken immediately following a transmission cycle and simultaneously measures both the quadrature phase and inphase component of the induced magnetic field. The measurements can be read directly from the instrument display or digitally recorded using a data logger attached to the instrument. The normal orientation of the dipoles when the EM31 is carried by its shoulder strap is vertical. With an intercoil spacing fixed at approximately 12 feet, its effective depth of investigation is about 18 feet.

The terrain conductivity measured with the EM31 represents a "bulk" conductivity value for the earth underlying the instrument, with most of the contribution to this reading being from the interval above the effective depth of investigation. The measured terrain conductivity is expressed in milliSeimens/meter (mS/m). The readings that are obtained are values that are valid at low induction numbers. In cases where the constraint of low induction is exceeded, the linear relationship of readings to true values no longer holds true. With the EM31, this condition is reached at approximately 300 mS/m. Above that, reading values fall off rapidly, and can even become negative. High terrain conductivities may, among other causes, be indicative of the presence of disturbed ground, the occurrence of bulk waste burial, elevated saturation levels, or the occurrence of buried metallic waste.

With the inphase component of the EM31, the system performs as a sophisticated and sensitive metal locator. Readings obtained from the inphase component are expressed in parts per thousand (ppt). Higher values represent stronger responses. EM31 responses, unlike those of a magnetometer, do not require that the metal be iron or steel. Because of its potential to provide data on both the occurrence of buried metal objects and disturbed ground, the EM31 is an excellent general-purpose reconnaissance unit.

Data collected in an EM survey may be obtained in profile form or on a gridded station basis. One advantageous method of obtaining and evaluating data is to obtain readings in two perpendicular directions at each reading station. Maps may then be generated showing both the average of the two readings and the difference of the two readings. In cases where the absolute value of the differences increases, it is often indicative of the presence of a buried feature or object. Modeling software may be used to estimate the depth of an interface and conductivity values for a two layer system, if readings are obtained with both vertical and horizontal dipole configurations and at multiple heights above the ground surface.
The EM31 is sensitive to interference by cultural sources such as fences, pipelines and utilities, and power lines. Because of this, readings made near objects such as fences may be difficult to interpret for the presence of target features and objects.

The EM61 is a coincident time-domain transmitter and receiver which induces secondary EM fields in the ground by generating 150 EM pulses per second and measuring the secondary field between pulses. The secondary fields are induced in both the earth materials and metallic objects. The secondary field formed in earth materials decays rapidly following the completion of the energizing cycle while the field produced in metallic objects persists much longer. Between each pulse, the EM61 waits for the induced field from the earth to dissipate, and then measures the prolonged field generated by buried metallic objects. By sensing only the response from the buried metal, the EM61 can detect targets that may otherwise have been missed.

The EM61 consists of a control console and two antenna coils. The antenna coils are arranged in a vertically stacked configuration with the antenna dipoles oriented vertically. The system can be operated while being carried using a shoulder harness system or can be mounted on a wheeled cart which is towed over the survey area by hand. Data from the EM61 can be input to a data logger which is programmed to store reading values along with corresponding reading locations. The EM61 provides readout in units of millivolts (mV).

The EM61 has several distinct advantages over the EM31 or conventional metal locators in the search for buried metallic objects. As with the EM31, the response of the EM61 does not require that buried metal be iron or steel. However, unlike the EM31, the EM61 permits modeling calculation of the depth of targets identified during the survey. Compared with conventional metal locating devices, the EM61 provides a quantitative measure of response and has much greater sensitivity. The increased sensitivity allows for detection of targets at greater depth. As with other geophysical instruments, the depth to which the EM61 can detect buried metallic objects is a function of the size of the object. Smaller targets can be located to lesser depths than can larger targets. The EM61 can detect a single 45-gallon drum to a depth of up to 12 feet.

The EM61 has an extremely high lateral resolution that permits it to resolve closely spaced anomalies. For optimum resolution of closely spaced targets, data should be collected at an interval of eight inches. In general, a separation between survey points of approximately two to six feet will provide good results. Where six-foot spacing is used, large buried metallic targets will be detected, but smaller near surface targets could be missed.

Data collected during an EM61 surveys is typically collected in profile form or on a gridded station basis. Data are contoured in map form. Modeling calculation can be performed on individual anomalies to estimate the depth of the target.

3.3.1.3 Ground Penetrating Radar Method

Theory

Ground penetrating radar (GPR) produces a subsurface profile using high frequency radio waves (radar) emitted by a transmitter. The impulse signal that is emitted from the transmitter is in the megahertz range. When this signal is broadcast from the transmitter in impulse form, it propagates radially into the subsurface. At points along the wavefront where contrasts in electrical properties are encountered, a portion of the signal is reflected back towards the earth's surface and the remaining signal penetrates further, encountering more interfaces and producing more reflections. A receiving antenna is used to capture the returning signals that may then be displayed in various formats after processing by the system electronics.

The depth of penetration and resolution of impulse GPR systems are a function of both the frequency of the signal which is used and of the electrical conductivity of the ground over which the survey is run. High frequency signals provide less penetration than do lower frequency signals. Typical ranges for antenna frequencies are between 80 MHZ and 1,000 MHZ. For a given signal frequency, electrically resistive ground yields greater depth penetration than does electrically conductive ground. At the extremes, dry sandy soil or dry bedrock would be considered electrically resistive. Wet clay soils would be considered electrically conductive. Depths of penetration may range from less than 1 foot to tens of feet depending on site-specific conditions.

Target resolution is a function of antenna frequency. That is, high frequency signals permit resolution of smaller objects, while lower frequencies require that objects be larger to be resolved. For detection of reinforcing bar, a 1,000 MHZ unit might be employed, while for locating trench boundaries, an 80 MHZ unit might be used.

Metallic targets give characteristically sharp reflections, though diffractions from irregular or inclined surfaces may diminish the sharp response. Trench limits are often defined from the reflection pattern difference seen between horizontally layered native ground and the disturbed soil within the trench limits.

Under most circumstances, the radar antenna must be directly coupled to the ground, but may be towed either by hand or with a vehicle. Data is collected along lines of traverse, with the reflections representing conditions directly below the transducer, with a limited "side-looking" capacity. Thus, detailed examination of the subsurface with full coverage over an area requires that lines of traverse be located at closely spaced intervals.

Instrumentation

GPR units generally consists of a processor unit, a control and display module, an antenna/transducer system, and optionally a graphic recorder or plotter. Data may be archived on diskette or on mass tape storage. The systems offer selectable signal filtering, color monitor display, real time processing and signal enhancement, and a choice of display formats (including color linescan or wiggle trace). PC driven computer software may be used to post-process data.

3.3.1.4 Comparison of Methods

The geophysical methods discussed in the proceeding sections were selected based on the project objective of locating buried metallic and nonmetallic waste. After review of the requirements and conditions at the site, the electromagnetic/ground conductivity method was selected for the geophysical investigation. GPR was not selected because it is generally not a good method for general site reconnaissance because hyperbolic reflections from buried containers may not be distinguished from reflections caused by rocks and other nonmetallic debris. In addition, if saturated clayey soils are present at the site, high signal attenuation is likely and the depth of investigation would be limited.

The EM31 and EM61 will be used to conduct the geophysical surveys. The EM31 was selected because of its ability to detect changes in total ground conductivity that may be related to past excavation/disposal activities, its ability to simultaneously detect nonmetallic debris and operate as a bulk metal detector, and its greater survey width/depth compared to the EM61. The EM61 was selected because of its ability detect smaller metallic targets and to model their depth. The combination of these two instruments will provide a delineation of the waste mounds and an estimate of the number and depth of metallic targets.

3.3.2 Test Pit Excavation

Test pits will be excavated with a backhoe to investigate anomalies identified during the geophysical surveys. Subsurface exploration of the geophysical anomalies using a backhoe rather than a hand auger was selected because it provides a better assessment of the anomalies and associated shallow subsurface contamination.

3.3.3 Environmental Sampling

Soil samples will be collected from each of the waste mounds to assess environmental impact from buried containerized wastes and used and unused sandblasting materials, and to characterize the waste for disposal. Collected soil samples will be submitted to an off-site laboratory for fuel finger print, TOX, BTU and ash, and PCB analyses. Samples of waste sandblasting materials will be collected for reactivity/corrosivity/ignitability analysis and TCLP analysis for volatile compounds, semivolatile compounds, pesticides/herbicides, and metals. Samples will be sent to Southwest Laboratory of Oklahoma, Inc..

4.0 FIELD OPERATIONS

4.1 SITE RECONNAISSANCE, PREPARATION AND RESTORATION PROCEDURES

Prior to initiating the geophysical survey, a site walkover of the investigation area will be performed to assess surface conditions, clear metallic debris, and establish the survey grid. A 250 by 400-foot survey grid, which encompasses both waste mounds, will be established at the site (see Figure 2). The survey grid will be establish with approximate west and north axes. The corners of the survey area will be marked with flagged stakes so as to be readily visible and referenced to State Plane Coordinates. East-west survey lines spaced 2 feet apart will then be established within the survey area using stakes or flags. Positions on a grid will be determined by the distance in feet west and north of the southeast corner of the grid (grid origin). Each survey line will be number according to its distance in feet north of the grid origin. Areas of tall vegetation may be cleared to facilitate establishment of the survey grids.

4.2 GEOPHYSICAL SURVEYS

4.2.1 EM31 Survey

The EM31 survey will proceed as follows:

1. The survey will be conducted on 4- by 4-foot grid along the established east-west survey lines. Nonmetallic survey tapes will be laid out along the survey lines as a guide in pacing off each interval. Each data point will be identified by its distance in feet west and north of the grid origin. Using this designation the third data point west along Line 20 would be W12N20.

   The survey will begin at Line 0 and proceed line by line to the north, with data collected from east to west along each line. If the survey of the grid is not completed in one run, the adjacent areas surveyed will overlap by one survey line as a quality control check.

2. Readings will be obtained with the instrument in the vertical dipole position (instrument dial facing up) and set to automatically record both the inphase and quadrature-phase component of the EM field with each reading. A measurement will be made at each location with the boom of the instrument aligned in a north-south direction. The instrument will then be rotated 90 degrees in a horizontal plane, where a second reading will be taken. During the survey, the location of surface metallic debris, equipment, or structures that might interfere with instrument readings will be recorded in the field notes.

   The EM31 will be field tested daily prior to beginning data collection. The field test will be performed as described in Section 4.2.3.

Data Validation will be performed daily to assess data quality and integrity. If the data validation determines that a portion of the data is not adequate to meet project goals, survey lines or nodes may be resurveyed. The data validation process is described in Section 4.2.5.2.

4.2.2 EM61 Survey

The EM61 survey will proceed as follows:

The survey will be conducted on 2- by 2-foot grid along the established east-west survey lines. Nonmetallic survey tapes will be laid out along the survey lines as a guide in pacing off each interval. Each data point will be identified by its distance in feet west and north of the grid origin. Using this designation the third data point west along Line 20 would be W3N20.

The survey will begin at Line 0 and proceed line by line to the north, with data collected from east to west along each line. If the survey of the grid is not completed in one run, the adjacent areas surveyed will overlap by one survey line as a quality control check.

Readings will be obtained at each grid location. During the survey, the location of surface metallic debris, equipment, or structures that might interfere with instrument readings will be recorded in the field notes.

The EM61 will be field tested daily prior to beginning data collection. The field test will be performed as described in Section 4.2.3.

Data Validation will be performed daily to assess data quality and integrity. If the data validation determines that a portion of the data is not adequate to meet project goals, survey lines or nodes may be resurveyed. The data validation process is described in Section 4.2.5.2.

4.2.3 EQUIPMENT FIELD TEST

4.2.3.1 Geonics EM31

The EM31 will be field tested daily prior to beginning data collection. The field test will consist of an equipment function check and calibration check and will be performed at the same location each day. The test site will be located in an area with no known subsurface utilities or structures, and no known history of waste disposal.

The equipment function check, which is used to assess whether the equipment is operating properly, will be performed as outlined in the EM31 operating manual. If the instrument is not functioning properly and it can not be repaired at the site, the instrument will be returned to the manufacturer for repair and a replacement obtained. The results of the daily equipment field test will be record in the operators field logbook.

4.2.3.2 Geonics EM61

The EM61 will be field tested daily prior to beginning data collection. The field test will be performed by checking and recording the response of the instrument to steel pipe or equivalent target buried at a depth of one foot. The test site will be located in an area with no known subsurface utilities or structures, and no known history of waste disposal. This test will be repeated daily prior to initiating survey activities and the response compared to the standard recorded on the first day. If the instrument response varies significantly from the standard, the cable connections and the battery will be checked and the test repeated. If the response is still significantly different from the standard and can not be corrected, the instrument will be returned to the manufacturer for repair and a replacement obtained. The results of the daily equipment field test will be record in the operators field logbook.

4.2.4 Site Documentation

4.2.4.1 Field Log Book

Each field team member will maintain a personal field log book while on the site. Information recorded in the logbook will be written in an objective, factual manner so that persons reading the entries will be able to determine the sequence of events as they occurred in the field. If someone makes notes in a logbook other than the owner of the book, the writer's signature and date will indicate this. The field notes shall include, but not be limited to daily equipment field test data; the position and instrument reading for selected grid nodes as a quality control check; the location of surface metallic debris, equipment, or structures which might interfere with instrument readings; and data acquisition problems and steps taken to remedy them. Errors or mistakes entered in the field logbook will be crossed out with a single line and initialed by the person making the correction.

4.2.4.2 Data Files

The instrument readings and position will be recorded using a data logger. As a minimum, the data will be transferred to a computer at the completion of a survey area and at the end of the survey day. Two backup copies of each day's data will be made. One copy will remain at the site and the second copy will be sent to the Dames & Moore Kansas City office.

4.2.5 Data Reduction and Validation

4.2.5.1 Date Reduction

Data reduction refers to the process of transforming raw data into final sample data. This process will be accomplish using a series of computer programs which will include, but not be limited to DAT31 and DAT61 from Geonics, Microsoft Excel, and Golden Software's SURFER.

Data reduction will proceed as follows: download data from the data logger to a personal computer in ASCII format using DAT31/DAT61; review, validate, and edit data files using Excel; and grid the data and produce contour maps for data analysis using SURFER.

4.2.5.2 Date Validation

The validation process is essentially a review of the data to assess data quality and integrity. Data validation will include, but not be limited to, comparison of quality control data recorded in the field notes with the data recorded by the data loggers; review of equipment field test data; and comparison of duplicate (overlap) data where applicable. The results of the data validation will be used to correct the data when possible. If portions of the data can not be correct and the remaining data is not adequate to meet project goals, grid lines or nodes may be reoccupied.

4.2.6 Data Analysis

Preliminary data analysis will be performed in the field to verify the integrity of the data and to evaluate whether the quality of the data is adequate to meet project goals. If instrument data or recorded positions are incorrect, the grid lines or stations may be reoccupied. Following completion of the field activities, office analysis will be performed as describe below.

4.2.6.1 EM31 Data Analysis

The EM31 data files contain the inphase and quadrature-phase data for both the north-south and east-west boom orientations. Data gridding and the generation of color contour maps will be performed using Surfer. Eight contour maps will be generated for the survey site: north-south and east-west orientations of the quadrature and inphase data; average of the north-south and east-west orientations of the quadrature and inphase data; and absolute value of the difference between the north-south and east-west orientations of the quadrature and inphase data;

The quadrature-phase contour maps will be used to evaluate changes in ground conductivity that may be due to disturbed ground (e.g. trenches) and buried nonmetallic debris. The inphase contour maps will be used to assess the presence of buried metallic objects.

4.2.6.2 EM61 Data Analysis

The EM61 data files contained the field strength measurements for the upper coil (channel 1), the lower coil (channel 2), and the difference (differential) between channel 1 and channel 2. SURFER will be used to generate contour maps of the channel 2 and the differential data generated for the site.

The EM61 contour maps will be used to identify anomalies that may indicate the presence of buried metallic targets such as drums and paint cans. The channel 2 data shows the response to all targets (near surface and deeper) within the range of the instrument. The differential data shows the instrument response to primarily the deeper targets, with the near surface targets subdued. Targets at or very near the surface may appear as negative anomalies on the differential data contour map. A generalized model of the anomalies will then be developed to estimate the depth to the target.

4.3 TEST PIT EXCAVATION

The location of each test pit shall be coordinated the USACE project manager prior to initiation excavation activities. Excavation of the test pits will be perform in accordance with Occupational Safety and Health Administration (OSHA) rules for excavation and confined space entry and the Site Specific Safety and Health Plan. The excavated material shall be screened for hazardous properties. No test pit shall be left open overnight unless adequate safety precautions are employed. The following information shall be recorded for each test pit: (1) the total depth, length, and width; (2) the depth and thickness of distinct soil or lithologic units; (3) a lithologic description of each unit; and (4) a description of any man-made materials or apparent contamination encountered.

A backhoe will be used to excavate the test pits. The equipment will be decontaminated using the procedures described in Section 4.6. Any shoring that is required shall be described and documented.

Each excavation will be advanced to a maximum depth of 8 feet, or until buried debris or groundwater is encountered. The excavation material will be placed on Visqueen to minimize the potential for contaminating clean soils. If buried materials are not encountered, and there does not appear to be subsurface contamination based on visible observations, the excavation will be backfilled. However, if buried materials are encountered, or if apparent subsurface contamination is observed, soil samples will be collected for possible laboratory analysis. During excavation activities, the field engineer/geologist will record a soil description on the basis of visual observations in accordance with the Unified Soil Classification System. The nature and characteristics of any debris encountered will be documented based on visual observations. After completion of the soil sampling the excavation will be backfilled with the excavated material.

4.4 ENVIRONMENTAL SAMPLING

All of the following environmental samples will be submitted for analysis to Southwest Laboratory of Oklahoma, Inc.

4.4.1 Subsurface Soil Sampling

If buried materials are encountered or subsurface contamination is observed in a test pit, soil samples will be obtained from the walls and floor of the excavation using a stainless steel hand trowel or scoop, and placed into appropriate containers supplied by the laboratory. Portions of the excavations that can not be accessed safely will be sampled using the backhoe and a stainless steel hand trowel will be used to obtain samples from the backhoe bucket. To prevent cross-contamination, sampling team members will don a new pair of disposable gloves prior to collecting each soil sample. We anticipate two samples will be collected from each test pit. In addition, one samples of waste sandblasting material will be collected from each test where it is encountered.

The collected soil samples will be divided into a field split and an archive split. The archive splits will be placed in laboratory-provided glass jars, uniquely identified, and immediately placed in a chilled cooler for storage. The field splits will be placed into resealable plastic bags, placed in warm location for a minimum of 15 minutes, and then the sample headspace screened for volatile organic compounds utilizing a photoionization detector (PID). The two soil samples from each waste mound and two samples of waste sandblasting material with the highest PID readings will be submitted for laboratory analysis. If elevated PID readings are not detected in the samples, selection will be based on odors, discoloration or other visual indications of contamination. One replicate sample will also be submitted for laboratory analysis.

4.4.2 Sample Handling

After sample collection in the field, the exterior of the sample containers will be decontaminated if gross contamination is present. The sample containers will be handled with gloves until decontaminated with a water rinse and wiped dry. Care will be taken to avoid damaging any temporary labeling during decontamination. After decontamination, permanent labels will be placed on clean sample container exteriors. All samples shall be uniquely identified, labeled, and documented in the field at the time of collection.

The sample containers will be well cushioned with packing materials when they are placed in the insulated cooling chests for transportation to the laboratory. Care will be taken to seal bottle caps tightly. The samples will be shipped via overnight carrier to the laboratory to arrive no later than 48 hours after the time sampled. The sample containers will be labeled appropriately and placed in a sample cooler containing ice or ice packs. Samples will be stored at approximately 4 C during storage and shipment to the laboratory. A temperature blank (a VOA sampling vial filled with water) shall be included in every cooler and used to determine the internal temperature of the cooler upon receipt at the laboratory.

All sample containers shall be sealed in a manner that shall prevent or detect tampering if it occurs. In no case shall tape be used to seal sample containers. Samples shall not be packaged with activated carbon unless prior approval is obtained from the USACE.

4.4.2.1 Sample Containers

Sample containers will be provided by the analytical laboratory. The containers will be either high-density polyethylene or glass with Teflon®-lined lids and will be pretreated with preservatives as applicable. Sample containers are purchased precleaned and treated according to EPA specifications for the methods. Containers will be stored in clean areas to prevent exposure to fuels, solvents, and other contaminants.

4.4.2.2 Sample Volumes, Container Types, and Preservation Requirements

Sample volumes, container types, preservation requirements, and holding times for the analytical methods to be performed on the samples are listed in the following table.

TABLE 1
REQUIRED CONTAINERS, PRESERVATION TECHNIQUES, AND HOLDING TIMES

ANALYTICAL PARAMETER	CONTAINER VOLUMES	CONTAINER	PRESERVATION	MAXIMUM HOLDING TIME
TCLP	8 ounces	G, Teflon-lined septum	Cool to 4 C	**Volatiles** -14 days to TCLP extraction; 14 days after extraction **Semivolatiles** - 14 days to TCLP extraction; 40 days after extraction **Mercury** -28 days to TCLP extraction; 28 days after extraction **Metals** -180 days to TCLP extraction; 180 days after extraction
Fuel Finger Print	8 ounces	G. Teflon-lined amber	Cool to 4 C	14 days
Total Organic Halides (TOX)	8 ounces	G, Teflon-lined septum	Cool to 4 C	14 days
PCBs	8 ounces	G, Teflon-lined amber	Cool to 4 C	14 days pre-extraction 30 days post extraction
Reactivity/Corrosivity/Ignitability	8 ounces	G, Teflon-lined septum	Cool to 4 C	14 days
BTU & Ash	8 ounces	P or G	Cool to 4 C	NA

P = Polyethylene; G = Glass

4.5 Sample Custody

Procedures to ensure the custody and integrity of the samples begin at the time of sampling and continue through transport, sample receipt, preparation, analysis and storage, data generation and reporting, and sample disposal. Records concerning the custody and condition of the samples are maintained in field and laboratory records.

Chain-of-custody records will be maintained for all field and field QC samples. Chain-of-custody forms will be supplied by Southwest Laboratory of Oklahoma, Inc.. A sample copy of the chain-of-custody is attached. A sample is defined as being under a person's custody if any of the following conditions exist: (1) it is in their possession, (2) it is in their view, after being in their possession, (3) it was in their possession and they locked it up or, (4) it is in a designated secure area.
The following minimum information concerning the sample shall be documented on the chain-of-custody form.

- Unique sample identification
- Date and time of sample collection
- Source of sample (including name, location, and sample type)
- Designation of matrix spike/matrix spike duplicate (MS/MSD)
- Preservative used
- Analyses required
- Name of collector(s)
- Pertinent field data (PID screening)
- Serial numbers of custody seals and transportation cases (if used)
- Custody transfer signatures and dates and times of sample transfer from the field to transporters and to the laboratory or laboratories
- Bill of lading or transporter tracking number (if applicable)

4.5.1Field Quality Control Samples

4.5.1.1 Temperature Blank

A temperature blank is a VOA sampling vial filled with water. Temperature blanks are included in every sample cooler shipped to the laboratory and used to determine the internal temperature of the cooler upon receipt at the laboratory.

4.5.1.2 Trip Blank

The trip blank consists of a VOA sample vial filled in the laboratory with ASTM Type II reagent grade water, transported to the sampling site, handled like an environmental sample and returned to the laboratory for analysis. Trip blanks are not opened in the field. Trip blanks are prepared only when VOA samples are to be submitted for analysis. Trip blanks are used to assess the potential introduction of contaminants from sample containers or during the transportation and storage procedures. One trip blank shall accompany each cooler of samples sent to the laboratory for analysis of volatiles.

4.5.1.3 Field Replicates

A field replicate sample, also called a split, is a single sample divided into two equal parts for analysis. The sample containers are assigned an identification number in the field such that they cannot be identified as replicate samples by laboratory personnel performing the analysis. Specific locations are designated for collection of field replicate samples prior to the beginning of sample collection. Replicate sample results are used to assess precision.

4.5.1.4 Matrix Spike/Matrix Spike Duplicate

A matrix spike/matrix spike duplicate pair (MS/MSD) is two aliquots of an environmental sample to which known concentrations of all analytes being determined by the method have been added. The exception is with tests such as pH and flashpoint for which spikes have no meaning. In these instances no MS/MSD will be conducted. The MS/MSD pair is carried through the entire analytical procedure in order to measure the effect of the environmental matrix on the analysis.

4.6 SURVEYING

A survey will be performed upon completion of the geophysical survey to obtain the location of the corners of the survey area. The survey will be performed to an accuracy of 0.1 foot horizontally and will reference the State Plane coordinates.

4.7 DECONTAMINATION

Persons working on the site shall undergo decontamination before leaving the site. In most instances, removal of protective clothing will suffice for decontamination. Facilities for storage of reusable protective clothing and for the disposal of clothing contaminated beyond reuse will be constructed or placed on site. Also, facilities for decontaminating hands, boots, and gloves will be provided. These facilities will consist of detergent wash and rinse. Decontamination of personnel and miscellaneous small tools will be in accordance with the Site-Specific Safety and Health Plan.

Precautions will be taken to prevent the potential transfer of contamination from test pit location to another during field activities. Equipment used to excavate and sample test pits will be decontaminated prior to use at each location. All equipment that may directly or indirectly contact samples shall be decontaminated in a designated decontamination area. Any equipment used to collect the soil samples (trowels, bucket augers, bowls, etc.) will be decontaminated prior to each use according to the following procedure:

Wash with non-phosphate detergent (Alconox) and potable water;
Rinse with distilled water;
Rinse with hexane;
Triple rinse with distilled water;

Air dry; and
Wrap in aluminum foil until use.

The backhoe bucket will be decontaminated prior to use as a sampling tool using a high pressure wash and will be hand scrubbed with a brush and detergent to remove oil, grease, and hydraulic fluid (as necessary).

Decontamination fluids will be contained and transferred to a holding tank pending analysis, treatment, and disposal.

4.8 WASTE HANDLING

Waste may be classified as noninvestigative waste or investigative waste. Noninvestigative waste, such as litter and household garbage, shall be collected on an as-needed basis to maintain the site in a clean and orderly manner. This waste shall be containerized and transported to the designated sanitary landfill or collection bin. Acceptable containers shall be sealed boxes or plastic garbage bags.

Investigation derived waste shall be properly containerized and temporarily stored at each site prior to disposal. Depending on the constituents of concern, fencing or other special marking may be required. The number of containers shall be estimated on an as-needed basis. Acceptable containers shall be sealed U.S. Department of Transportation (DOT) -approved steel 55-gallon drums or small dumping bins with lids. The containers shall be transported in such a manner to prevent spillage or particulate loss to the atmosphere.

To facilitate handling, the containers shall be no more than half full when moved. The investigative derived waste shall be segregated at the site according to matrix (solid or liquid) and as to how it was derived (excavation, decontamination fluids, etc.). Each container shall be properly labeled with site identification, sampling point, depth, matrix, constituents of concern, and other pertinent information for handling.

Following the above guidelines, the waste materials generated during the excavation of the test pits will be managed to control potential releases of contaminated materials. In general, excavated material will be used to backfill the test pits.

5.0 RECORD KEEPING

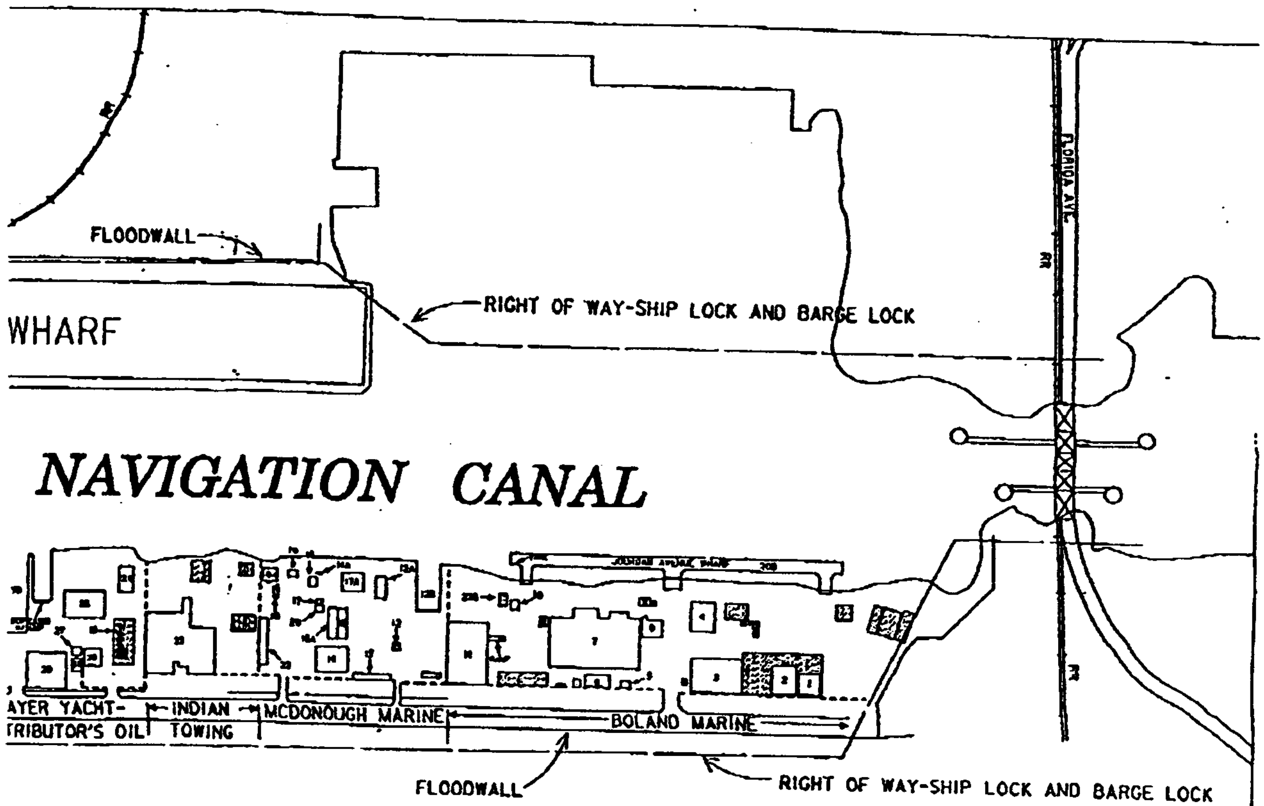
Field records sufficient to recreate all sampling and measurement activities will be maintained. The information shall be recorded with indelible ink in a permanently bound notebook with sequentially numbered pages. These records shall be archived in an easily accessible form and made available to the USACE upon request.

The on-site project engineer and/or the field engineer/geologist will maintain complete records of the soil sampling activities in a field logbook. The logbook will be bound, and all entries will be made in ink and signed by the sampler. At a minimum, the following information will be recorded in the field log book;

Date and time;
Weather conditions:
Personnel on site;
Date/time of sampling or other field activities;
Sample coding protocol;
Sample description/location;
Description of sampling methodology;
Sample device decontamination; and
General field observations.

Since site conditions may vary from one sampling location to another, the extent of information entered into the logbook may vary; however, sufficient information will be recorded to permit reconstruction of the sampling program.

In addition to the field logbook, the project engineer will retain copies of the chain-of-custody form for all samples collected and submitted for analysis.



ON
bldg
bldg

Bldg.	U.S. COAST GUARD STATION
19	AST w/containment
20	Sandblast booth
21	Ship storage bldg

Bldg.	PORT OF NEW ORLEANS
22	Storehouse

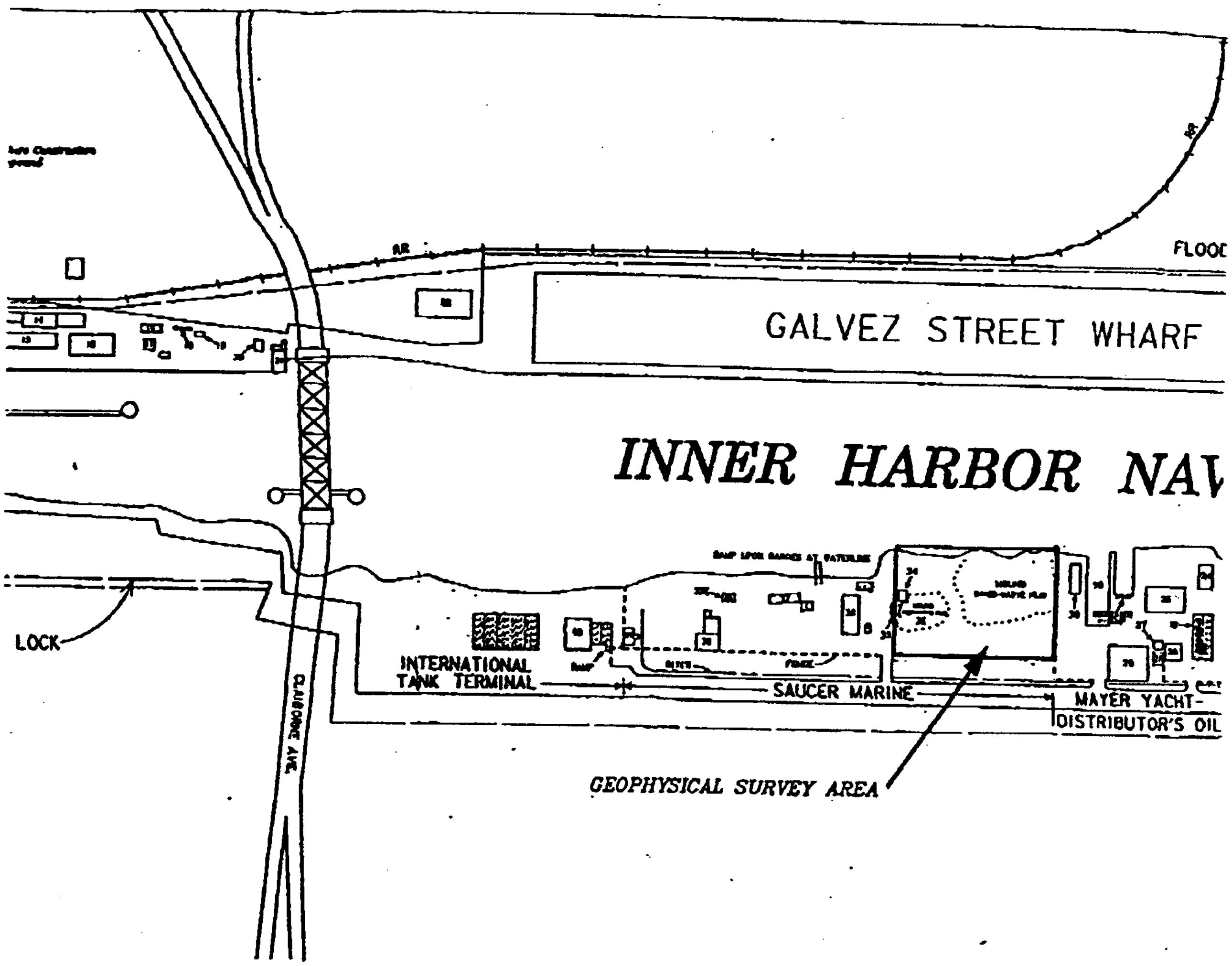
Bldg.	USACE - IHNC LOCK
5	USACE workshop
6	Lock Control House

CONCRETE SLAB

FIGURE 2
Generalized Map of IHNC
New Lock Project Site

U.S. ARMY ENGINEER DISTRICT, NEW ORLEANS
CORPS OF ENGINEERS
NEW ORLEANS, LOUISIANA

DESIGNED BY: T. CREASY DRAWN BY: T. CREASY CHECKED BY: G. BACUTA	PLOT SCALE:	PLOT DATE:	CADD FILE: IHNCsite.dgn
	DATE: 3 March 1998		FILE NO.



YING
-sty cinder block
-sty steel framed
-sty steel framed

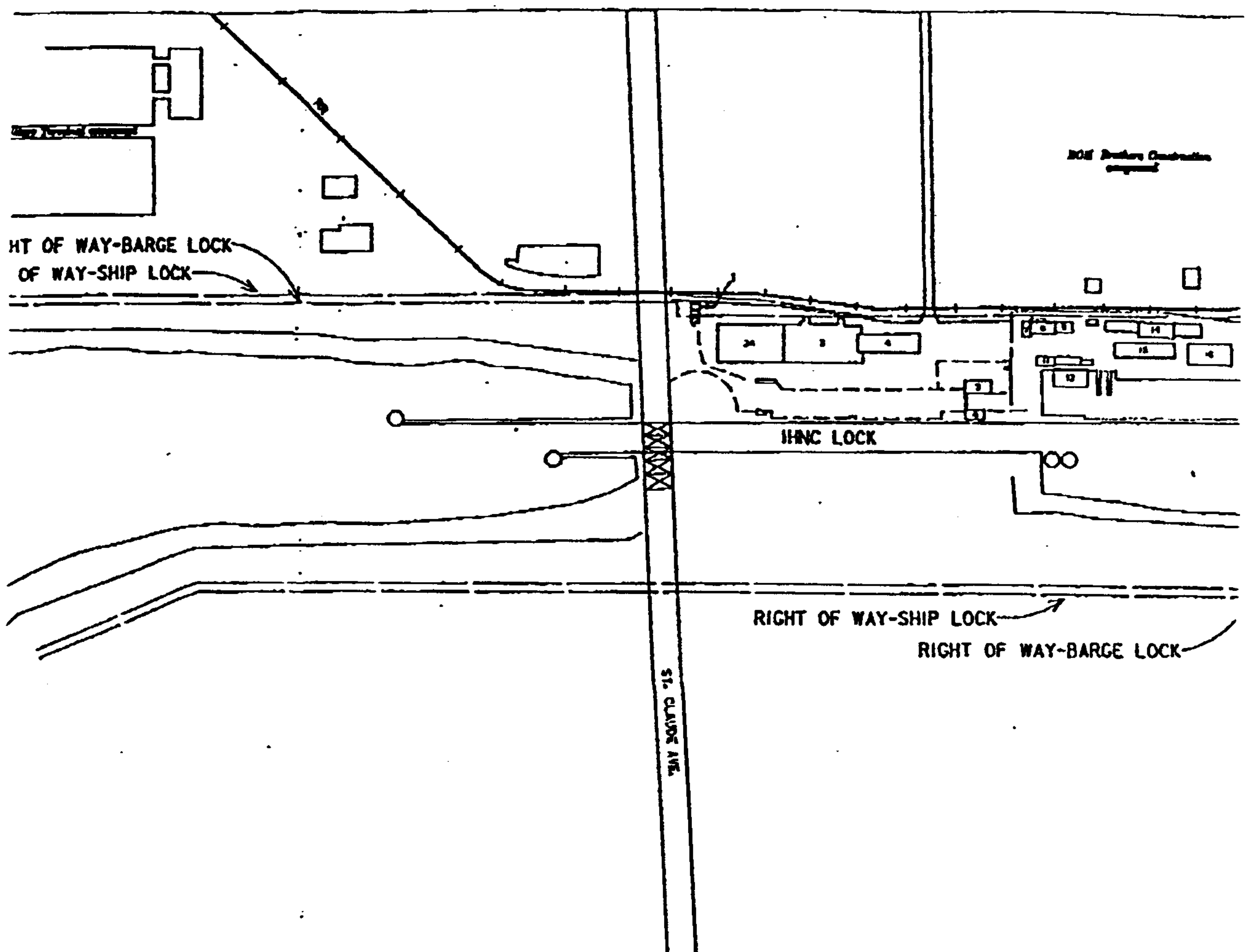
/ DISTRIBUTOR'S OIL
rthen ring
slip
dg
op
g
me restroom
op bldg
dg

Bldg.	SAUCER MARINE
3E	Mound mixed-waste pile
23E	AST (vertical) - sandblast
33	Switch shed
34	Light steel frame shed
35	Warehouse
37	Office bldg
38	Machine shop w/ steel canopy
39	Horse shed

Bldg.	INTERNATIONAL TANK TERMINAL
40	1-sty steel mill bldg

WEST BANK:

Bldg.	U.S. COAST GUARD STATION
1	Flammable storage house
3A	2-sty Dormitory bldg
3B	1-sty Command /Dining/Rec bldg
4	4-sty Dental/Health/Office bldg
7	Shop
8	Workshop
9	Trailer shop / shed
11	Boat storage / workhouse
12	Boat dock shed
13	Carpenter/electrical shop
14	Mech'l/machine/paint shops
15	Industrial Support Activity
16	Workshop
17	Storehouse
18	Hazardous waste shed



r buildings:

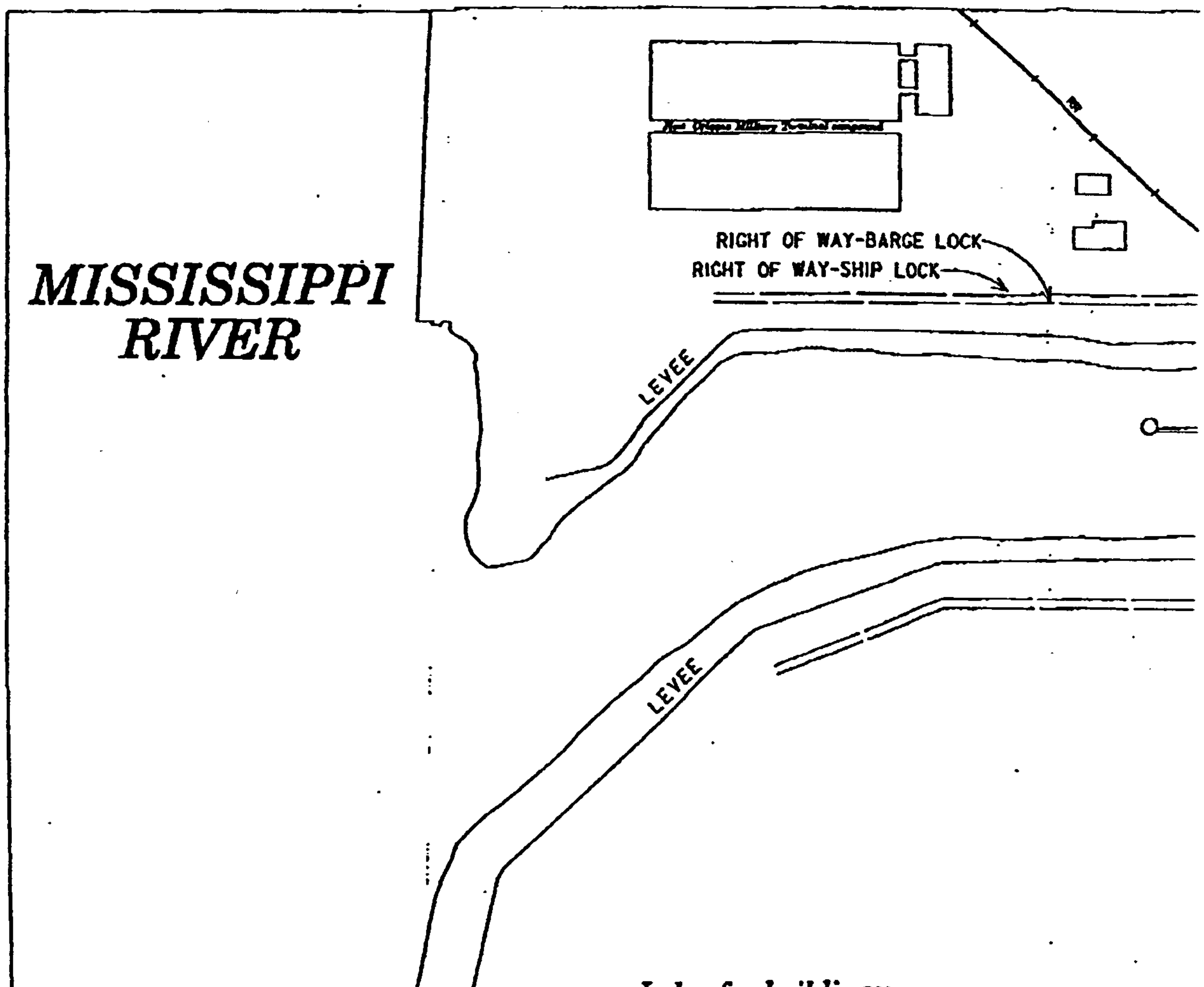
X:

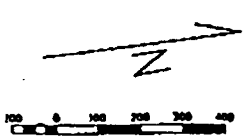
BOLAND MARINE
teel mill bldg
-story (sty) Quonset hut
teel mill bldg
-sty steel column bldg (US Navy)
-sty steel canopy
2-sty steel mill bldg
2-sty welding / fabricating bldg
-sty structure
2-sty steel bldg
ressor bldg
mill bldg
Jourdan Ave. Wharf
Transformers on 12"-conc. slab

Bldg.	MCDONOUGH MARINE
11A	AST- Propane
12	AST-Oxygen
12A	1-sty steel frame machine shop
12B	1-sty warehouse / shop
13	1-sty parking garage
14	2-sty administration bldg
15	1-sty parking garage
15A	Slip
16	1-sty tank shed
16A	Steel racks
17	1-sty paint house
17A	Steel racks
18	1-sty rest room bldg
19	1-sty tank shed
20	1-sty tank shed
22	1-sty steel parking garage

Bldg.	INDIAN TOWING
23	North bldg: 2-sty cinde
	South bldg: 2-sty steel
	Paint shed: 1-sty steel

Bldg.	MAYER YACHT / DISTRIBU
10	Six ASTs in earthen rinc
90	Covered boat slip
24	1-sty office bldg
25	2-sty steel shop
26	1-sty shop bldg
27	1-sty wood-frame restro
28	1-sty steel frame
29	2-sty steel shop bldg
30	2-sty office bldg





Index for buildings:

EASTBANK:

Bldg.	BOLAND MARINE
1	Steel mill bldg
2	1-story (sty) Quonset hut
3	Steel mill bldg
4	2-sty steel column bldg (US Navy)
5	1-sty steel canopy
6	2-sty steel mill bldg
7	2-sty welding / fabricating bldg
8	1-sty structure
9	2-sty steel bldg
10	Compressor bldg
11	Steel mill bldg
20B	Jourdan Ave. Wharf
22B	Transformers on 12"-conc. slab

Appendix A

APPENDIX A

OPERATIONAL PLAN
MIXED-WASTE MOUNDS

1.0 MOBILIZATION AND SITE PREPARATION

Dames & Moore personnel will begin mobilization activities for the mixed-waste mounds investigation within one week after approval of the Work Plan and receipt of authorization to proceed. Initial mobilization activities will include scheduling personnel and the geophysical and excavation equipment. Site work will begin approximately two weeks after notice to proceed.

Upon arrival at the site and prior to initiating the geophysical survey, a site walkover of the investigation area will be performed to assess surface conditions, clear metallic debris, and establish the survey grid. A 250 by 400 foot survey grid, which encompasses both waste mounds, will be established at the site (see Figure 1). The survey grid will be established with approximate west and north axes. The corners of the survey area will be marked with flagged stakes so as to be readily visible and referenced to State Plane Coordinates. East-west survey lines spaced 2 feet apart will then be established within the survey area using stakes or flags. Positions on a grid will be determined by the distance in feet west and north of the southeast corner of the grid (grid origin). Each survey line will be number according to its distance in feet north of the grid origin. Areas of tall vegetation may be cleared to facilitate establishment of the survey grids.

Clearing the site and establishing the survey grid will require one day to complete.

2.0 GEOPHYSICAL SURVEYS

The geophysical surveys will be conducted after the site has been cleared and the survey grid established. Each of the geophysical instruments (EM31 and EM61) will be field tested each day prior to beginning data collection. The geophysical surveys will be conducted in accordance with the work plan.

The instrument readings and position will be recorded using a data logger. As a minimum, the data will be transferred to a computer at the completion of a survey area and at the end of the survey day. Two backup copies of each day's data will be made. One copy will remain at the site and the second copy will be sent to the Dames & Moore Kansas City office.

Preliminary data analysis will be performed in the field to verify the integrity of the data and to evaluate whether the quality of the data is adequate to meet project goals. If instrument data or recorded positions are incorrect, the grid lines or stations may be reoccupied. Following completion of the field activities, office analysis will be performed and draft anomaly maps prepared. The draft anomaly maps will be used to select the test pit locations.

The geophysical surveys, preliminary data analysis, and draft anomaly maps will require approximately four days to complete.

3.0 TEST PIT EXCAVATION

The location of each test pit shall be coordinated the USACE project manager prior to initiation excavation activities. Excavation of the test pits will be perform in accordance with Occupational Safety and Health Administration (OSHA) rules for excavation and confined space entry and the Site Specific Safety and Health Plan (SSHP). The excavated material shall be screened for hazardous properties. No test pit shall be left open overnight unless adequate safety precautions are employed. After completion of the soil sampling the excavation will be backfilled with the excavated material.

Excavation of the test pits will be completed in three days

4.0 ENVIRONMENTAL SAMPLING LABORATORY ANALYSIS

If buried materials are encountered or subsurface contamination is observed in a test pit, soil samples will be obtained from the walls and floor of the excavation using a stainless steel hand trowel or scoop, and placed into appropriate containers supplied by the laboratory. Portions of the excavations that can not be accessed safely will be sampled using the backhoe and a stainless steel hand trowel will be used to obtain samples from the backhoe bucket. To prevent cross-contamination, sampling team members will don a new pair of disposable gloves prior to collecting each soil sample. We anticipate two samples will be collected from each test pit. In addition, one samples of waste sandblasting material will be collected from each test where it is encountered. The samples will be collected, handled, and shipped in accordance with the Work Plan.

Collected soil and sandblasting material samples will be submitted to an off-site laboratory for analysis on a standard turn-around basis. Analytical results will be available three weeks after receipt by the laboratory.

5.0 REPORT PREPARATION

A draft report on waste mounds investigation will be submitted two weeks following receipt of the laboratory data. A final report will be submitted two weeks after receipt of USACE comments on the draft report.

CHAIN OF CUSTODY RECORD

SOUTHWEST LABORATORY OF OKLAHOMA, INC.
1700 W. Albany • Broken Arrow, Oklahoma 74012-1421
Office 918-251-2858 • Fax 918-251-2599

TM

SAMPLING FIRM	CLIENT CONTACT	PHONE NUMBER

P.O or PROPOSAL NUMBER	PROJECT NAME

SAMPLER: (Signature)

SAMPLE ID	DATE	TIME	COMP	GRAB	LOCATION	MATRIX	NUMBER OF CONTAINERS	ANALYTICAL TESTS REQUESTED								REMARKS

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY (Signature)	RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED FOR LABORATORY BY: (Signature)

RELINQUISHED BY: (Signature)	DATE	TIME	RECEIVED BY: (Signature)	REMARKS:

APPROVAL PAGE

Site-Specific Safety and Health Plan
for
Waste Mounds

Environmental Support to
IHNC New Lock and Connecting Channels

Contract No. DACW29-97-D-0019
Delivery Order No: 0011
New Orleans COE

Approved by:

CIH 6553 11/5/98

Dames & Moore Senior Industrial Hygienist, Dennis W. Day — Date

David A. Kenney for John E. Plevniak 11/5/98

Dames & Moore QA Director, John E. Plevniak — Date

Martha Bose for Jon W. Seekins 11/5/98

Dames & Moore Project Manager, Jon W. Seekins — Date

Brett H. Herr 11/5/98

New Orleans COE Contracting Officers Representative, Brett Herr — Date

11/5/98

New Orleans COE Technical Representative (TR),
Mr. George Bacuta and/or Ms. Jean Spadaro — Date

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TITLE **PAGE**

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Hazardous Material Summary Page 5
Task Description Page 10
Description of Responsibilities 11
PPE By Task Page 12
Air Monitoring By Task Page 13
Decontamination Page 14
Work Zone Page 15
Signature Page 16

APPENDICES

- **A** **Toxicological Assessment and Decision Logic for Major Potential Contaminants On-Site**
- **B** **Site Records; Contingency Plan Visitors Log, Daily Safety Inspection Log, Daily Instrument Calibration Check Sheet, Air Monitoring Readings**
- **C** **ACTIVITY HAZARD ANALYSIS Forms**
- **D** **USACE Accident Reporting Section**
- **E** **Respiratory Protection Program**
- **F** **Medical Surveillance Requirements and Sample Physician's Certification Form**
- **G** **Training Requirements and Sample On-site Training Certification Form**
- **H** **Contingency Evacuation Plan Outline**
- **I** **Excavation/Trenching**

SITE SPECIFIC HEALTH AND SAFETY PLAN
TITLE PAGE - Waste Mounds
Dames & Moore

PROJECT NAME: Inner Harbor Navigation Canal, **Waste Mounds**	**CONTRACT NO:** DACW29-97-D-0019 **Delivery Order No:** 0011
JOBSITE ADDRESS: Between Florida Avenue and the Mississippi River on the east and west side of the Inner Harbor Navigation Canal in New Orleans LA.	**PROJECT NO:** 08768-027-161
PROJECT MANAGER: Jon Seekins	**PHONE NO:** (918) 744-5886
SITE CONTACT: John Plevniak	**PHONE NO:** (913) 677-1490

OBJECTIVES OF FIELD WORK: Conduct a geophysical survey of the waste mounds at the Saucer Marine and assess any anomalies that would indicate any containerized wastes buried in the mounds.

SITE TYPE: Check as many as applicable

( ) Active	( ) Landfill	( ) Natural
(X) Inactive	( ) Uncontrolled	(X) Municipal
( ) Secure	(X) Industrial	
(X) Unsecure	( ) Residential	
( ) Enclosed space	( ) Well Field	

DESCRIPTION AND FEATURES: Summarize below. Include principal operations and unusual features (containers, buildings, dikes, power lines, hills, slopes, river). The project is located on the east banks of the Inner Harbor Navigation Canal (IHNC) and consists of an inactive site commonly referred to as Saucer Marine.

SURROUNDING POPULATION: (X) Residential (X) Industrial ( ) Rural (X) Urban (X) Commercial: ( ) Other:

SITE SPECIFIC SAFETY AND HEALTH PLAN

EMERGENCY CONTACTS & APPROVAL PAGE - Waste Mounds

Dames & Moore

EMERGENCY CONTACTS

Project Site Manager	**John E. Plevniak**	(913) 677-1490
Site Safety & Health Officer	**Dennis W. Day**	(402) 596-1356
Alternate SSHO	**Doug Kuhn**	(913) 677-1490
Maintenance	Yes – Site control	
EPA Release Report No.		(800)-424-8802
National Meteorological Center, NOAA/NWS	5200 Auth Road Camp Spring, MD	(301) 763-8016
Local/Regional Airport		

EMERGENCY CONTACTS	Contact/PHONE	24-Hour Hotline
Project Manager	**Jon W. Seekins**	(918)-744-5886
Safety and Health Manager	**Dennis W. Day**	(402)-596-1356
Industrial Hygienist	**Dennis W. Day**	(402)-596-1356
First Aid/CPR on-site responder (2 required)	**Doug Kuhn**	(913) 677-1490
First Aid/CPR on-site responder	**Brian Weidower**	(913) 677-1490
EPA Region 6 Compliance Assurance and Enforcement Division	Main Branch Phone: (214)665-6468 Fax: (214)665-2168	24 Hour Noncompliance Hotline: (214)665-6595
LA HAZARDOUS WASTE DIVISION	James H. Brent, Ph.D.	(504) 765-0232 fax 0617
New Orleans Fire Department 317 Decatur Street	(504) 565-7800 fax 7848	**911**
New Orleans 5th District Police, 3900 N. Claiborne Avenue	(504) 941-4400 fax3023	**911**
LA State Police Troop B **2101 I-10 SERVICE ROAD KENNER, LOUISIANA**	Captain Mel Ryan, Troop B Commander	(504)471-2775 fax 2784
LA OFFICE OF PUBLIC HEALTH PUBLIC HEALTH STATISTIC	Joan Borstell	(504) 568-7401 fax 8297
Poison Control Center Tulane Medical Center Emergency	(504) 588-5711 fax 7429	911
Medical Surveillance, Dames & Moore	Nita Drolet	(303) 299-7827

CONTINGENCY PLANS

Anomaly investigation may continue with either Modified Level D or Level C Personal Protective Equipment (PPE). In the event that exposure levels to Benzene exceed 50 ppm, or other chemical physical hazards ensue (fire, injury, criminal activity), the site will be evacuated with response delegated to local New Orleans and Louisiana State authorities.

All personnel listed herein should be notified in the event of site evacuation that corresponds to their office's authority.
This sheet is to be copied, laminated and posted on-site.

MEDICAL EMERGENCY

Hospital Name:	**Saint Claude Medical Center**	(504) 948-8245
Hospital Address:	**3419 Saint Claude Avenue**	(504) 948-8245
Name of Contact at Hospital:	**Mr. Rusty Foster**	
Name of 24-Hour Ambulance:		Phone: 911
Route to Hospital: - See attached map.		

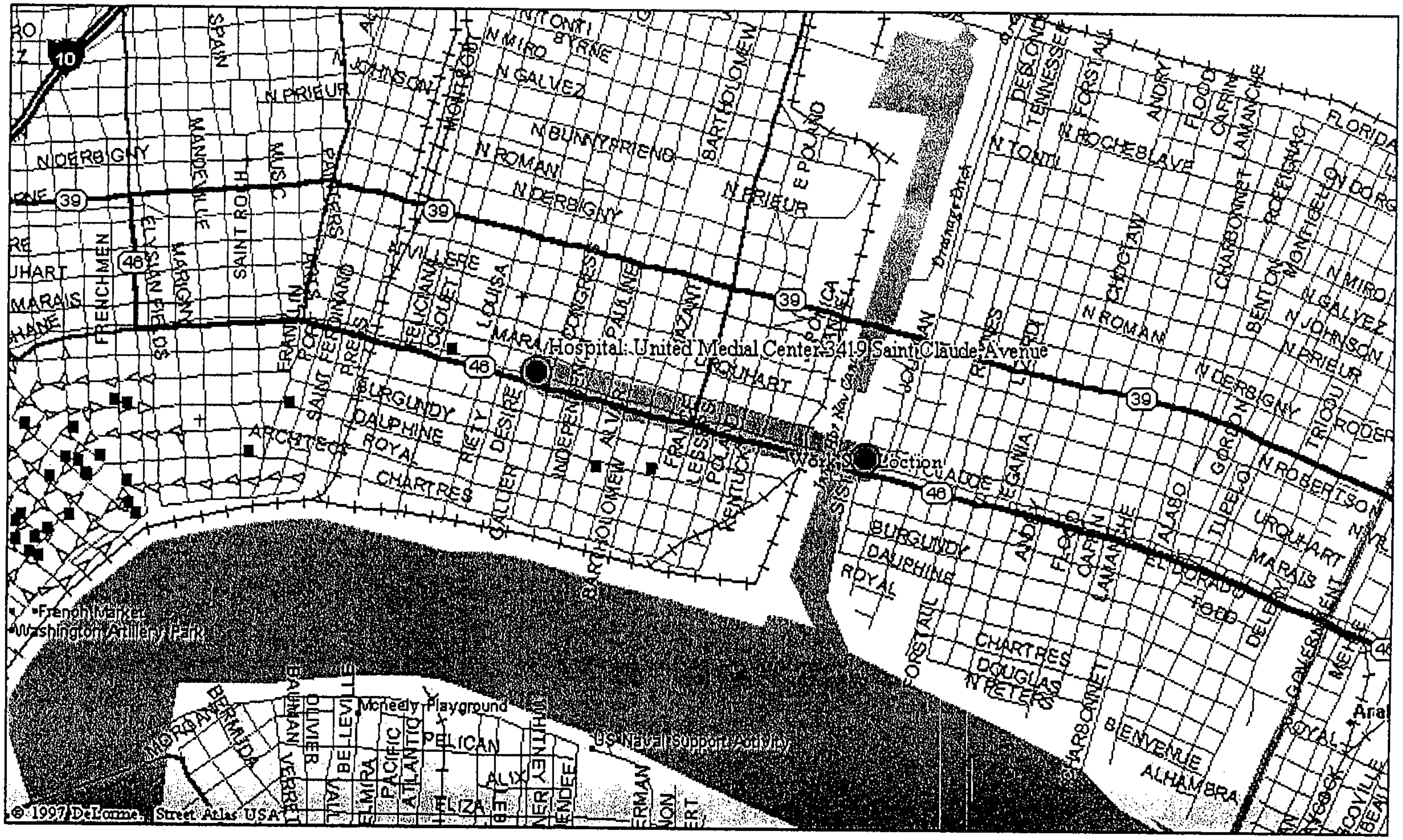
HEALTH AND SAFETY PLAN APPROVALS

Prepared by: Dennis Day	Date: June 26, 1998
Reviewed by: Jon Seekins	Date: July 2, 1998
Project Manager: Jon Seekins	Date: July 3, 1998

SITE SPECIFIC SAFETY AND HEALTH PLAN

HOSPITAL MAP ROUTE - Waste Mounds

Dames & Moore



SITE SPECIFIC SAFETY AND HEALTH PLAN
HISTORY AND WASTE CHARACTERIZATION PAGE - WASTE MOUNDS
Dames & Moore

HISTORY: According to the land use studies the IHNC location has had several businesses/activities including: warehousing, marine manufacturing, paint manufacturing equipment, marine repair, petroleum distributors, marine repair, fiberglass manufacturing occupy various facilities over the years. A detailed historical account is available from the Project Site Manager.

Two mixed-waste mounds, approximately 90' by 120' and 160' x 250', are located at the Saucer Maine site. The mounds are reported to have piled up to 6 feet high and have settled through the years. Drums and other containerized wastes may be buried in these mounds, as well as used and unused sandblasting materials, trash and wood products.

WASTE TYPES: (X) Liquid (X) Solid (X) Sludge ( ) Gas (X) Unknown ( ) Other **specify:**

WASTE CHARACTERISTICS: Check as many as applicable.

( ) Corrosive (X) Flammable ( ) Radioactive

(X) Toxic (X) Volatile ( ) Reactive

( ) Inert Gas (X) Unknown

WORK ZONES: Work zones will be shown on "WORK ZONE MAP PAGE."

Work Zones around the sampling locations during sampling will include:

- EZ: Within 15 feet of invasive work activities.
- CRZ: Immediately outside the EZ.
- SZ: All other areas.

HAZARDS OF CONCERN: Check as many as applicable.

(X) Heat Stress
( ) Cold Stress
(X) Explosive/Flammable
(X) Oxygen Deficient
( ) Radiological
(X) Biological
(X) Other **specify:**

( ) Noise
(X) Inorganic Chemicals
(X) Organic Chemicals
( ) Motorized Traffic
( ) Heavy Machinery
(X) Slips, Trips & Falls

Confined Spaces will be entered. Confined spaces are defined as trench entry when trench is greater than 4 feet in depth or contains volatile organic vapors that must be assessed. If hydrocarbon vapors are present, monitoring for benzene must be accomplished prior to entry. Benzene at 1 ppm levels will require respiratory protection and the use of a confined space entry permit.

Hazards associated with trench entry.

PRINCIPAL DISPOSAL METHODS AND PRACTICES:

Disposable equipment and PPE will be bagged and retained until the results of sampling are received. PPE that may be contaminated will be considered as potential Investigative Derived Waste; and be subject to waste profile testing in order to determine disposal options.

Provide steel sack disposal bags labeled: Dames & Moore Investigation _/ /98 potential IDW

SITE SPECIFIC SAFETY AND HEALTH PLAN
HAZARDOUS MATERIAL SUMMARY PAGE - Waste Mounds
Dames & Moore

HAZARDOUS MATERIAL SUMMARY: BOLD waste type

CHEMICALS Amounts/Units:	SOLIDS Amounts/Units:	SLUDGES Amounts/Units:	SOLVENTS Amounts/Units:	OILS Amounts/Units:	OTHER Amounts/Units:
	Sandblast Media	Residuals in Oil/Water	**Benzene** **Ethylbenzene** **Xylene** **Toluene** Hydrocarbons	Gasoline Diesel Oils	

OVERALL HAZARD EVALUATION: ( ) High (X) Medium ( ) Low ( ) Unknown (Where tasks have different hazards, evaluate each. Attach additional sheets if necessary)

JUSTIFICATION: **Majority of work accomplished in well ventilated outdoor areas. Confined space entry <u>will</u> occur.**

FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (X) Low ( ) Unknown

BACKGROUND REVIEW: (X) COMPLETE ( ) INCOMPLETE

TABLE 1
EXPOSURE LIMITS AND SELECTED PHYSICAL CHARACTERISTICS

COMPOUND	EXPOSURE VALUE[a] PEL/TLV	IDLH[b] LEVEL	LEL[c]	UEL[d]	IP[e]	VP[f]	CARCINOGEN
Gasoline	300 ppm- (TWA)-PEL/TLV 500 ppm (STEL)-PEL/TLV		1.4%	7.6%			IARC-2B NIOSH-X
Benzene	1 ppm-(TWA) PEL 5 ppm (STEL)-PEL	3000 ppm	1.3%	7.9%	9.24 eV	75 mm	EPA-A IARC-1 NIOSH-X NTP-1 OSHA-X TLV-A2
Ethyl benzene	100 ppm (TWA)-PEL/TLV 125 ppm (STEL)-PEL/TLV	2,000 ppm	1.0%	6.7%	8.76 eV	(79°F): 10 mm	EPA-D
Xylenes (o-, m-, p-isomers)	100 ppm (TWA)-PEL/TLV 150 ppm (STEL)-PEL/TLV	1,000 ppm	1.1/1.0/1.0%	7.0/7.0/7.0%	8.56/8.56/8.44eV	7/9/9 mm	EPA-D IARC-3
Naphtha	100 ppm-PEL	10,000 ppm	-- --	-- --		<5 mm	-- --
Toluene	50 ppm (TWA)-TLV 150 ppm(STEL)-PEL	2,000 ppm	1.2%	7.1%	8.82 eV	(65°F):20 mm)	EPA-D IARC-3
Hexane (n-Hexane)	50 ppm (TWA)-PEL/TLV	5000 ppm	1.1%	7.5%	10.18 eV	(77°F):150 mm	
Tetraethyl lead	0.075 mg/m^3 (TWA)-PEL	40 mg/m^3	1.8%		11.10 eV	0.2 mm	IARC-3
Tetramethyl lead	0.075 mg/m^3 (TWA)-PEL	40 mg/m^3			8.50 eV	23 mm	IARC-3
Ethylene dibromide	20 ppm (TWA)-PEL 30 ppm (Ceiling)-PEL 50* ppm (STEL)-PEL *5 min peak per 8-hr shift	400 ppm			9.45 eV	12 mm	EPA-B2 IARC-2A NIOSH-X NTP-2 TLV-A2
Ethylene dichloride	1 ppm (TWA)-PEL 2 ppm (STEL)-PEL	1000 ppm	6.2%	16%	11.05 eV	64 mm	EPA-B2 IARC-2B NIOSH-X NTP-2
Diesel	-----	-----	1.3%	6.0%-		----	See MSDS
Lead	0.050 mg/m^3	100 mg/m^3	NA	NA	NA	0	
Chromium	See Appendix E						
Cadmium	See Appendix E						

(Attachment 7)

(a) Permissi posure Limit (OSHA) or Threshold Limit Value (ACGIH).
More Co. ative Value Utilized.
(b) Immediately Dangerous to Life and Health
(c) Lower Explosive Limit
(d) Upper Explosive Limit
(e) Ionization Potential
(f) Vapor Pressure

ing - The concentration that shall not be exceeded during any part of the working exp

-- U.S. Environmental Protection Agency

IARC - International Agency for Research on Cancer

NTP - National Toxicology Program

STEL - Short-Term Exposure Limit. Usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hour TWA is within the TLV-TWA, or PEL-TWA.

TWA - Time-weighted average exposure concentration for a normal 8-hour (TLV, PEL) workday and a 40-hour workweek.

Carcinogen Designations:

EPA-A:	Human Carcinogen: sufficient evidence from epidemiological studies to support a causal association between exposure and cancer.
-B:	Probable Human Carcinogen: weight of evidence of human carcinogenicity based on epidemiological studies is limited: agents for which weight of evidence of carcinogenicity based on animal studies is sufficient.
-B2:	Sufficient evidence from animal studies: inadequate evidence or no data from epidemiological studies.
-D:	Not Classifiable as to Human Carcinogenicity: Inadequate human and animal evidence of carcinogenicity or no data are available.
IARC-1:	Carcinogenic to Humans: sufficient evidence of carcinogenicity
-2A:	Probably Carcinogenic to Humans: limited human evidence. sufficient evidence in experimental animals
-2B:	Possibly Carcinogenic to Humans: limited evidence in humans in the absence of sufficient evidence in experimental animals
-3:	Not Classifiable as to Carcinogenicity to Humans
NIOSH-X:	Carcinogen defined with no further categorization
NTP-1:	Known to be carcinogenic: sufficient evidence from human studies
-2:	Reasonably anticipated to be a carcinogen: limited evidence from studies in humans or sufficient evidence from studies in experimental animals
OSHA-X:	Carcinogen defined with no further categorization
TLV-A2:	Suspected Human Carcinogen: Agent is carcinogenic in experimental animals at dose levels, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. Available epidemiological studies are conflicting or insufficient to confirm an increased risk of cancer in exposed humans.

TAB

ROUTES OF ENTRY, SYMPTOMS OF EXPOSURE, ST AID TREATMENT, AND TARGET ORGANS

COMPOUND	ROUTES OF ENTRY	SYMPTOMS OF EXPOSURE	GENERAL FIRST AID TREATMENT	TARGET ORGANS
Benzene	Inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation of eyes, nose, respiratory system, giddiness, headache, nausea, staggered gait, fatigue, anorexia, lassitude, dermatitis, bone marrow depressant	eye: irrigate immediately skin: soap wash promptly breath: respiratory support swallow: medical attention immediately	blood, central nervous system, skin, eyes, bone marrow respiratory system
Ethylbenzene	Inhalation, ingestion skin and/or eye contact	Irritation of eyes, mucous membrane, headache, dermatitis, narcosis, coma	eye: irrigate immediately skin: water flush promptly breath: respiratory support swallow: medical attention immediately	eyes, upper respiratory system, skin, central nervous system
Hexane (n-Hexane)	Inhalation, ingestion skin and/or eye contact	Lightheadedness, nausea, headache, numbness of extremities, muscle weakness, irritation of eyes, nose, dermatitis, chemical pneumonia, giddiness	eye: irrigate immediately skin: soap wash immediately breath: respiratory support swallow: medical attention immediately	eyes, skin, respiratory system
Tetraethyl lead	Inhalation, skin absorption, ingestion, skin and/or eye contact	Insomnia, lassitude, anxiety, tremor, hyper-reflexia, spastic, bradycardia, hypotension, hypothermia, pallor, nausea, anorexia, low-weight, disorientation, hallucinations, psychosis, mania, coma, convulsions, eye irritation	eye: irrigate immediately skin: soap wash immediately breath: respiratory support swallow: medical attention immediately	central nervous system cardiovascular system, kidneys, eyes
Tetramethyl lead	Inhalation, skin absorption ingestion, skin and/or eye contact	Insomnia, bad dreams, restless, anxious, hypotension, nausea, anorexia, delirium, mania, convulsions, coma	eye: irrigate immediately skin: soap wash immediately breath: respiratory support swallow: medical attention immediately	central nervous system cardiovascular system, kidneys, eyes
Ethylene dibromide	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation of respiratory system, eyes, dermatitis with vesiculation	eye: irrigate immediately skin: soap wash immediately breath: respiratory support swallow: medical attention immediately	respiratory system, liver, kidneys, skin, eyes
Ethylene dichloride	Inhalation, skin absorption, ingestion, skin and/or eye contact	Central nervous system, depression, nausea, vomiting, dermatitis, irritation of eyes, corneal opacity	eye: irrigate immediately skin: soap wash promptly breath: respiratory support swallow: medical attention immediately	kidneys, liver, eyes, skin, central nervous system
Xylenes (o-, m-, p- isomers)	Inhalation, ingestion, skin absorption, skin and/or eye contact	Dizziness, excitement, drowsiness, incoherence, staggering gait, irritation, of eyes, nose, throat, corneal vacuolization, nausea, vomiting, abdominal pain, dermatitis	eye: irrigate immediately skin: soap wash promptly breath: respiratory support swallow: medical attention immediately	central nervous system, eyes, gastrointestinal tract, blood, liver kidneys, skin

COMPOUND	ROUTES OF ENTRY	SYMPTOMS OF EXPOSURE	GENERAL FIRST AID TREATMENT	TARGET ORGANS
Naphtha	Inhalation, ingestion, skin and/or eye contact	Light headedness, drowsiness, irritation eyes, nose, skin, dermatitis	eye: irrigate immediately skin: soap wash promptly breath: respiratory support swallow: medical attention immediately	respiratory system, eyes, skin
Diesel	See Attachment 7			
Toluene	Inhalation, ingestion skin absorption, skin and/or eye contact	Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, lacrimation, nervousness, muscle fatigue, insomnia, paresthesia, dermatitis	eye: irrigate immediately skin: soap wash promptly breath: respiratory support swallow: medical attention immediately	central nervous system, liver, kidneys, skin
Motor Oil (waste)	Inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation of eyes, mucous membranes and respiratory system, central nervous system depression and/or excitation, headache, nausea, drowsiness, dizziness, insomnia, confusion, tremors, dry and red skin upon contact.	Move victim to fresh air and call emergency medical care; if not breathing, give artificial respiration; if breathing is difficult, give oxygen. In case of contact with material, immediately flush eyes with running water for at least 15 minutes. Wash skin with soap and water. Remove and isolate contaminated clothing and shoes at the site.	------
Lead	See Appendix E			
Calcium	See Appendix E			
Chromium	See Appendix E			

General First Aid Treatment

EYE irrigate immediately -	If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.
SKIN soap wash immediately-	If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing, wash the skin with soap and water and get medical attention promptly.
soap wash promptly -	If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates through the clothing, promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly.
water flush immediately-	If this chemical contacts the skin, flush the contaminated skin with water promptly. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water promptly. If irritation persists after washing, get medical attention.
BREATH respiratory support-	If a person breathes large amount of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth to mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible.
SWALLOW medical attention-immediately	If this chemical has been swallowed, get medical attention immediately.

SITE SPECIFIC SAFETY AND HEALTH PLAN
TASK DESCRIPTION PAGE - Waste Mounds
Dames & Moore

FIELD ACTIVITIES COVERED UNDER THIS PLAN - ATTACH ACTIVITY HAZARD ANALYSIS FOR EACH TASK — HAZARD

TASK DESCRIPTION/SPECIFIC TECHNIQUE-STANDARD OPERATING PROCEDURES/SITE LOCATION (Attach additional sheets as necessary)	Type	Primary	Contingency	SCHEDULE		
1 Mobilization & Demobilization	Intrusive	A B C <u>D</u>	A B <u>C</u> D or	Hi	Med	<u>Low</u>
	<u>Non-intrusive</u>	<u>Modified</u>	<u>Exit Area</u>			
2 Trenching and Excavation, no entry just backhoe work	Intrusive	A B C <u>D</u>	A B <u>C</u> D or	Hi	<u>Med</u>	Low
	<u>Non-intrusive</u>	<u>Modified</u>	<u>Exit Area</u>	Physical Hazard		
3 Initial Monitoring of Trench for Volatile Organic (VOC) vapors, remote monitoring with probe lowered in to the trench	Intrusive	A B C <u>D</u>	A B <u>C</u> D or	Hi	Med	<u>Low</u>
	<u>Non-intrusive</u>	<u>Modified</u>	<u>Exit Area</u>			
4 Entry into trench with continued monitoring and visual assessment of trench and exposed drums	<u>Intrusive</u>	A B C <u>D</u>	A B <u>C</u> D or	Hi	Med	<u>Low</u>
	Non-intrusive	<u>Modified</u>	<u>Exit Area</u>			
	Intrusive	A B C D	A B C D	Hi	Med	Low
	Non-intrusive	Modified	Exit Area			

PERSONNEL* AND RESPONSIBILITIES (Include subcontractors) Responsibilities are described on the following page.

NAME	OFFICE SYMBOL	HEALTH CLEARANCE?	RESPONSIBILITIES	ONSITE?
Name	Backhoe Operator	Y	Install Trench	Y
Jon W. Seekins	Project Manager	Y	MANAGER/Alternate SSHO	Y
Doug Kuhn	Sampler	Y	OVERSIGHT/MONITORING/SAMPLING	Y
Brian Weidower	Sampler	Y	Sampling	Y
Doug Kuhn	SSHO Alternate	Y	SSHO alternate	Y
Dennis Day	Safety Manager	Y	SSHO	Y

DESCRIP' I OF RESPONSIBILITIES

Site Safety and Health Personnel. The Site Safety and Health Officer (SSHO) in conjunction with the Site Supervisor ensures that the provisions of this SSHP are adequate and implemented in the field. Project Managers and Technical Managers are to take all necessary actions to guarantee site safety. Changing field conditions may require decisions to be made concerning adequate protection programs. Personnel assigned as SSHO must be experienced and meet the additional training requirements specified by OSHA in 29 CFR 1910.120 and this SSHP. The SSHO is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this plan.

Organizational Responsibility

Project Manager
- Overall responsibility for project schedule;
- Manage and schedule and coordinate changes;
- Develop cost estimates for work identified.
- Identify scope of work;
- Estimate schedule for work;
- Request that a technical team be appointed;
- Identify resources needed (specialized expertise);
- Suggest schedule or contingencies.
- Enforce disciplinary action when unsafe acts or practices occur;
- Grant permission for site access;
- Designate site security;
- Enforce the buddy system.

Safety Manager
- Keep safety and health records;
- Prepare safety and health reports;
- Confirm an employee's suitability for work based on the physician's recommendation;
- Enforce site control;
- Designate signs.

Site Safety and Health Officer (SSHO)
- Conduct safety meetings.
- Monitor on-site hazards and conditions;
- Audit compliance with the Site Safety and Health Plan (SSHP);
- Enforce safety procedures;
- Designate facilities, and equipment for health and safety;
- Select, dispense, and ensure availability of Personal Protective Equipment (PPE);
- Periodically inspect PPE and ensure proper storage and maintenance;
- Monitor for heat and cold stress;
- Set up decontamination lines, control decontamination, prepare decontamination solutions, and monitor;
- Notify and serve as liaison with emergency response personnel;
- Train employees on emergency procedures and evacuation routes;

Sampler (Project or Field)
- Conduct sampling;
- Package and ship samples off site;
- Dispose of contaminated materials (Re: Work Plan).

SITE SPECIFIC SAFETY AND HEALTH PLAN
PPE BY TASK PAGE - Waste Mounds
Dames & Moore

PROTECTIVE EQUIPMENT: Specify by task. Indicate type and/or material as necessary. Use copies of this sheet if needed.

TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - **D - Modified**
(X) Primary
( ) Contingency

Respiratory: (X) Not Needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
(X) Safety Glasses:
( ) Face Shield:
(X) Goggles*
(X) Hard Hat:
*Either safety glasses or over-goggles

Boots: ( ) Not Needed
(X) Boots: Leather steel-toed & shank work boots
( ) Overboots:Latex or Nitrile
( ) Rubber:

Prot. Clothing: (X) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
( ) Tyvek Coverall:
( ) Saranex Coverall:
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
(X) Gloves: Nitrile
(X) Overgloves*: optional
*Cotton to preclude abrasion of Nitrile
( ) Other - specify below:

TASKS: 1 - 2 - 3 - 4
LEVEL: A - B - C - D - Modified
( ) Primary *
(X) Contingency or Back-off and wait for natural ventilation

Respiratory: ( ) Not Needed
( ) SCBA, Airline:
(X) APR:Full Face MSA Advantage 1000
(X) Cartridge: OV
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
(X) Other:Incl w Respirator full-face

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed & shank work boots
( ) Overboots:
(X) Rubber:

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
(X) Tyvek Coverall:
( ) Saranex Coverall:
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
(X) Gloves: Nitrile
(X) Overgloves: optional

( ) Other - specify below:

TASKS: 1 - 2 - 3 - 4 - 5 -
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed & shank work boots
( ) Overboots:
( ) Rubber:

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
( ) Tyvek Coverall:
( ) Saranex Coverall:
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

( ) Other - specify below:

TASKS: 1 - 2 - 3 - 4 - 5 -
LEVEL: A - B - C - D - Modified
( ) Primary
( ) Contingency

Respiratory: ( ) Not Needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not Needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: ( ) Not Needed
( ) Boots: Leather steel-toed & shank work boots ( ) Overboots:
( ) Rubber:

Prot. Clothing: ( ) Not Needed
( ) Encapsulated Suit:
( ) Splash Suit:
( ) Apron
( ) Tyvek Coverall:
( ) Saranex Coverall:
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not Needed
( ) Undergloves:
( ) Gloves:
( ) Overgloves:

( ) Other - specify below:

SITE SPECIFIC SAFETY AND HEALTH PLAN
AIR MONITORING BY TASK PAGE - Waste Mounds
Dames & Moore

MONITORING EQUIPMENT: Specify by task. Indicate type as necessary. Attach additional sheets as necessary.

INSTRUMENT	TASK	ACTION GUIDELINES		COMMENTS (includes schedules of use)
Combustible Gas Indicator	1 - 2 - 3 - 4	0-10% LEL 10% **>10% LEL** 21.0% 02 <19.5% 02 **>22.5% 02**	No explosion hazard Proceed w/caution, continuous monitoring **Explosion hazard; interrupt task/evacuate, reassess** Oxygen normal Oxygen deficient; notify SSHO. **Interrupt task/evacuate**	Monitor prior to any intrusive work in the general area to establish a baseline; monitor during intrusive work continuously and while doing any trench entry. Monitor every FIVE minutes during initial trench excavation.
Radiation Survey Meter	1 - 2 - 3 - 4 - 5 -__	3X Background **>2mR/hr**	Notify SSHO **Interrupt task/evacuate**	(X) Not Needed
Photoionization Detector Type __OVM__ ( ) 11.7 ev (X) 10.2 ev ( ) 9.8 ev ( ) __ ev	1 - 2 - 3 - 4 -__	**Specify: Hnu** >5ppm; sustained >1 minute, depart site upwind, monitor with Benzene detector tubes.		Monitor prior to any intrusive work in the general area to establish a baseline; monitor during intrusive work continuously and while doing any trench entry. Monitor every FIVE minutes during initial trench excavation.
Flame Ionization Detector Type ______	1 - 2 - 3 - 4 - 5 -__	**Specify:**		(X) Not Needed
Detector Tubes Type : Benzene Type ______	1 - 2 - 3 - 4 -__	**Specify:**		Use whenever Hnu readings exceed 1 ppm for 5 minutes
Respirable Dust Monitor Type ______ Type ______	1 - 2 - 3 - 4 - 5 -__	**Specify:**		(X) Not Needed
Other **Specify**	1 - 2 - 3 - 4 - 5 -__	**Specify:**		(X) Not Needed

SITE SPECIFIC SAFETY AND HEALTH PLAN
DECONTAMINATION PAGE - Waste Mounds
Dames & Moore

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, AND SUPPORT ZONES AS PAGE TWO

Personnel Decontamination	Sampling Equipment Decontamination	Heavy Equipment Decontamination
Level D decon will be used. Wipe down leather boots with wet wipes. Wipe off exterior of safety glasses or goggles with wet wipes. Wipe off exterior of gloves with wet wipes and bag for disposal as sanitary waste. Wash hands and face as soon as practical. Summarize below and/or attach diagram of decon area.	All small equipment will be bagged for later decon. Bags are to be labeled Dames & Moore investigation and dated. Later decon will be soap and water wash using Alconox. All personnel deconning equipment will wear latex gloves. See: Sampling Plan for details as to sample container decon. Summarize below and/or attach diagram of decon area.	Heavy equipment will be deconned on-site using water and Alconox. Water use will be minimized. Work Plan includes equipment decontamination procedures.
Containment and Disposal Method Note: Segregate clean and dirty equipment throughout site work using labeled Hefty@ Steel sacks	**Containment and Disposal Method**	**Containment and Disposal Method**

SITE SPECIFIC SAFETY AND HEALTH PLAN

WORK ZONE PAGE - Waste Mounds

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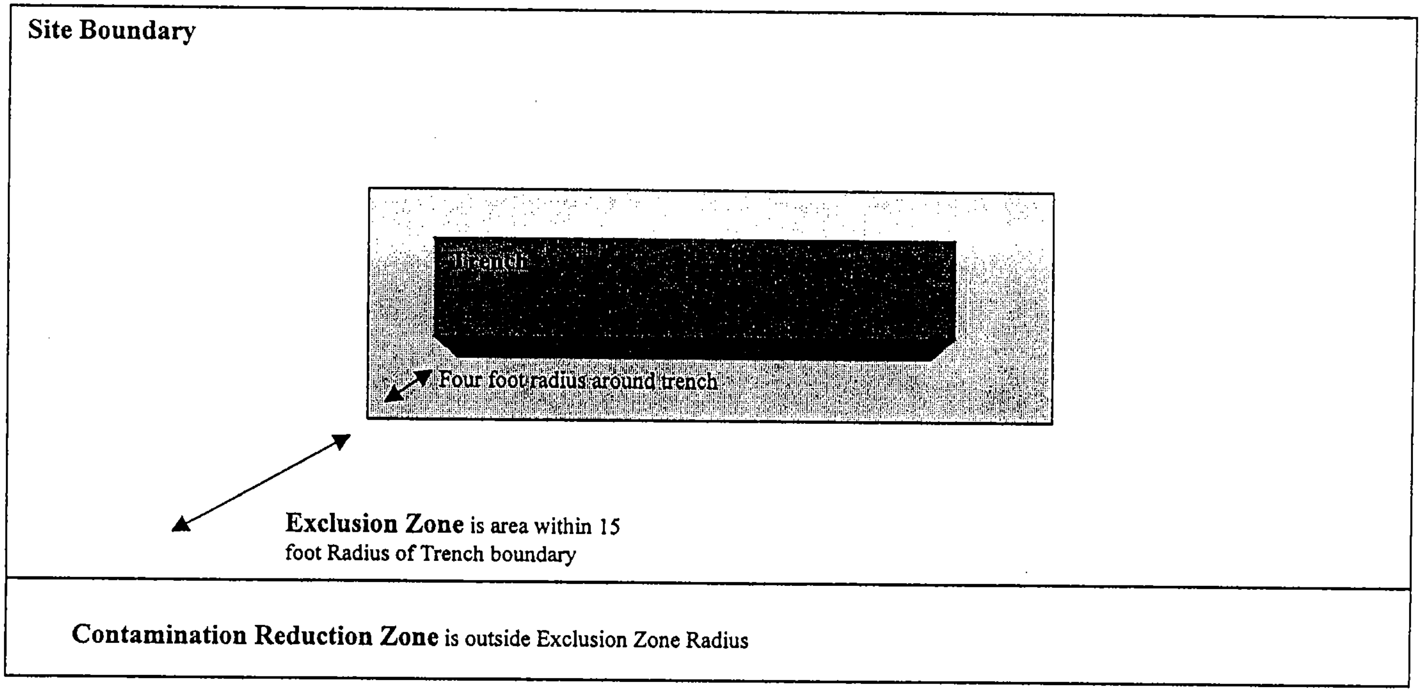
THIS PAGE RESERVED FOR MAP (Show Exclusion, Contamination Reduction, and Support Zones. Indicate evacuation and reassembly points.)



SITE SPECIFIC SAFETY AND HEALTH PLAN

SIGNATURE PAGE - Waste Mounds

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The following personnel have read and fully understand the contents of this Site Safety and Health Plan and referenced appendices and further agree to all requirements contained herein. Further more the individuals are fully trained and have required clearances. Attach copies of current HTRW and first aid training, medical clearance, and respiratory fit test records.

Name	Affiliation	Date	Signature

Appendix I

EXCAVATION &TRENCHING

EXCAVATIONS:

- Excavation projects vary in complexity.

The major occupational hazards of excavation work result from cave-ins, from exposure to underground utilities, and from material or equipment falling into the excavation. Precautions to protect against cave-ins include bracing, sloping, benching, using shields, or freezing. However, the proper use of these techniques requires an understanding of the importance of such factors as excavation depth and width, soil type, hydraulic pressure, and other specific conditions present at the worksite

Trenching:

- In addition, the standard provides several new appendices. One appendix provides a consistent method of soil classification. Others provide sloping and benching requirements, pictorial examples of shoring and shielding devices, timber tables, hydraulic shoring tables, and selection charts that provide a graphic summary of the requirements contained in the standard.

- Trenching and excavation work presents serious risks to all workers involved. The greater risk, and one of primary concern, is that of a cave-in. **Furthermore, when cave-in accidents occur, they are much more likely to result in worker fatalities than other excavation-related accidents.** Strict compliance, however, with all sections of the standard will prevent or greatly reduce the risk of cave-ins as well as other excavation-related accidents.

Scope and Application:

- OSHA's revised rule applies to all open excavations made in the earth's surface, which includes trenches.

- According to the OSHA construction and health standards, a trench is referred to as a narrow excavation made below the surface of the ground in which the depth is greater than the width-- the width not exceeding 15 feet. An excavation is any man-made cut, cavity, trench, or depression in the earth's surface formed by earth removal.

Planning for Safety

- Before any excavation actually begins, the standard requires a determination of the estimated location of utility installations--sewer, telephone, fuel, electric, water lines, or any other underground installations--that may be encountered during digging.

- Also, before starting the excavation, the utility companies or owners involved must be contacted and informed, within established or customary local response times, of the proposed work. The utility companies or owners must also be asked to find the exact location of the underground installations. If they cannot respond within 24 hours (unless the period required by state or local law is longer), or if they cannot find the exact location of the utility installations, proceed with caution. To find the exact location of underground installations, workers must use safe and acceptable means. **If underground installations are exposed, OSHA regulations also require that they be removed, protected, or properly supported.**

On-the-Job Evaluation:

- The standard requires that **a competent person inspect, on a daily basis,** excavations and the adjacent areas for possible cave-ins, failures of protective systems and equipment, hazardous atmospheres, or other hazardous conditions.
- If these conditions are encountered, exposed employees must be removed from the hazardous area until the necessary safety precautions have been taken.
- Inspections are also required after natural (e.g., heavy rains) or man-made events such as blasting that may increase the potential for hazards.

CAVE-INS AND PROTECTIVE SUPPORT SYSTEMS:

Support Systems:

- Excavation workers are exposed to many hazards, but the chief hazard is danger of cave-ins. OSHA requires that in all excavations employees exposed to potential cave-ins must be protected by sloping, or benching the sides of the excavation; supporting the sides of the excavation, or placing a shield between the side of the excavation and the work area.

- Designing a protective system can be complex because of the number of factors involved--soil classification, depth of cut, water content of soil, changes due to weather and climate, or other operations in the vicinity.
- The standard, however, provides several different methods and approaches (four for sloping and four for shoring, including the use of shields)* for designing protective systems that can be used

to provide the required level of protection against cave-ins.

- One method of ensuring the safety and health of workers in an excavation is to slope the sides to an angle not steeper than one and one-half horizontal to one vertical (34 degrees measured from the horizontal). These slopes must be excavated to form configurations that are in accordance with those for *Type C soil found in Appendix B of the standard*. A slope of this gradation or less is considered safe for any type of soil.

- A second design method, which can be applied for both sloping and shoring, involves using tabulated data, such as tables and charts, approved by a registered professional engineer. These data must be in writing and must include sufficient explanatory information to enable the user to make a selection, including the criteria for determining the selection and the limits on the use of the data.

- At least one copy of the information, including the identity of the registered professional engineer who approved the data, must be kept at the worksite during construction of the protective system. Upon completion of the system, the data may be stored away from the job site, but a copy must be made available, upon request, to the Assistant Secretary of Labor for OSHA.

- A trench box or shield may also be used that is either designed or approved by a registered professional engineer or is based on tabulated data prepared or approved by a registered professional engineer. Timber, aluminum, or other suitable materials may also be used. OSHA standards permit the use of a trench shield (also known as a welder's hut) as long as the protection it provides is equal to or greater than the protection that would be provided by the appropriate shoring system.

- The employer is free to choose the most practical design approach for any particular circumstance. Once an approach has been selected, however, the required performance criteria must be met by that system.

- The standard does not require the installation and use of a protective system when an excavation (1) is made entirely in stable rock, or (2) is less than 5 feet deep and a competent person has examined the ground and found no indication of a potential cave-in.

Safety Precautions:

- The standard requires supports systems such as shoring, bracing, or underpinning to ensure the stability of adjacent structures such as buildings, walls, sidewalks, or pavements.

- The standard prohibits excavation below the level of the base or footing of any foundation or retaining wall unless :

1. A support system such as underpinning is provided,
2. The excavation is in stable rock, or
3. A registered professional engineer determines that the structure is sufficiently removed from the excavation and that excavation will not pose a hazard to employees.

- Excavations under sidewalks and pavements are also prohibited unless an appropriately designed support system is provided or another effective method is used.

Installation and Removal of Protective Systems:

- The standard requires the following procedures for the protection of employees when installing support systems:

1. Securely connect members of support systems,
2. Safely install support systems,
3. Never overload members of support systems, and
4. Install other structural members to carry loads imposed on the support system when temporary removal of individual members is necessary.

- In addition, the standard permits excavation of 2 feet or less below the bottom of the members of a support or shield system of a trench if

1. The system is designed to resist the forces calculated for the full depth of the trench, and (
2. There are no indications, while the trench is open, of a possible cave-in below the bottom of the support system. Also, the installation of support systems must be closely coordinated with the excavation of trenches.

- As soon as work is completed, the excavation should be backfilled as the protective system is dismantled. After the excavation has been cleared, workers should slowly remove the protective system from the bottom up, taking care to release members slowly.

Materials and Equipment:

- The employer is responsible for the safe condition of materials and equipment used for protective systems. Defective and damaged materials and equipment can result in the failure of a protective system and cause excavation hazards.

- To avoid possible failure of a protective system, assurance must be made so that

1. Materials and equipment are free from damage or defects,
2. Manufactured materials and equipment are used and maintained in a manner consistent with the recommendations of the manufacturer and in a way that will prevent employee exposure to hazards, and
3. While in operation, damaged materials and equipment are examined by a competent person to determine if they are suitable for continued use. If materials and equipment are not safe for use, they must be removed from service. These materials cannot be returned to service without the evaluation and approval of a registered professional engineer.

OTHER HAZARDS:

Falls and Equipment:

- In addition to cave-in hazards and secondary hazards related to cave-ins, there are other hazards from which workers must be protected during excavation-related work. These hazards include exposure to falls, falling loads, and mobile equipment. To protect employees from these hazards, OSHA requires the following precautions:

1. **Keep materials or equipment that might fall or roll into an excavation at least 2 feet from the edge of excavations, or have retaining devices, or both.**

2. **Provide warning systems such as mobile equipment, barricades,** hand or mechanical signals, or **stop logs**, to alert operators of the edge of an excavation. If possible, keep the grade away from the excavation.

3. Provide scaling to remove loose rock or soil or install protective barricades and other equivalent protection to protect employees against falling rock, soil, or materials.

4. **Prohibit employees from working on faces of sloped or benched excavations at levels above other employees unless employees at lower levels are adequately protected from the hazard of falling, rolling, or sliding material or equipment.**

5. Prohibit employees under loads that are handled by lifting or digging equipment. To avoid being struck by any spilling or falling materials, require employees to stand away from vehicles being loaded or unloaded. If cabs of vehicles provide adequate protection from falling loads during loading and unloading operations, the operators may remain in them.

Water Accumulation:

- The standard prohibits employees from working in excavations where water has accumulated or is accumulating unless adequate protection has been taken. If water removal equipment is used to control or prevent water from accumulating, the equipment and operations of the equipment must be monitored by a competent person to ensure proper use.

- OSHA standards also require that diversion ditches, dikes, or other suitable means be used to prevent surface water from entering an excavation and to provide adequate drainage of the area adjacent to the excavation. Also, a competent person must inspect excavations subject to runoffs from heavy rains.

Hazardous Atmospheres:

- Under this provision, a competent person must test excavations greater than ***4 feet in depth*** as well as ones where oxygen deficiency or a hazardous atmosphere exists or could reasonably be expected to exist, before an employee enters the excavation. If hazardous conditions exist, controls such as proper respiratory protection or ventilation must be provided. Also, controls used to reduce atmospheric contaminants to acceptable levels must be tested regularly.

- Where adverse atmospheric conditions may exist or develop in an excavation, the employer also must provide and ensure that emergency also must provide and ensure that emergency rescue equipment, (e.g, breathing apparatus, a safety harness and line, basket stretcher, etc.) is readily available. This equipment must be attended when used.

Access and Egress:

- Under the standard, safe access and egress to all excavations must be provided. **According to OSHA regulations, when employees are required to be in trench excavations 4-feet deep or more, adequate means of exist, such as ladders, steps, ramps, or other safe means of egress, must be provided and be within 25 feet of lateral travel.** If structural ramps are used as a means of access or egress, they must be designed by a competent person if used for employee access or egress, or a competent person qualified in structural design if used by vehicles. Also, structural members used for ramps or runways must be uniform in thickness and joined in a manner to prevent tripping or displacement.

GENERAL:

- The estimated location of utility installations, such as sewer, telephone, fuel, electric, water lines, or any other underground installations that reasonably may be expected to be encountered during excavation work, shall be determined prior to opening an excavation.

- Utility companies or owners shall be contacted within established or customary local response times, advised of the proposed work, and asked to establish the location of the utility underground installations prior to the start of actual excavation. When utility companies or owners cannot respond to a request to locate underground utility installations within 24 hours (unless a longer period is required by state or local law), or cannot establish the exact location of these installations, the employer may proceed, provided the employer does so with caution, and provided detection equipment or other acceptable means to locate utility installations are used.
- When excavation operations approach the estimated location of underground installations, the exact location of the installations shall be determined by safe and acceptable means. While the excavation is open, underground installations shall be protected, supported, or removed as necessary to safeguard employees.

- Each employee in an excavation shall be protected from cave-ins by an adequate protective system designed in accordance with 29 CFR Part 1926 Subpart P-Excavations except when:

1. **Excavations are made entirely in stable rock;**
2. **Or excavations are less than 5 feet (1.52 m) in depth**
3. **And examination of the ground by a competent person provides no indication of a potential cave-in.**

- Protective systems shall have the capacity to resist without failure all loads that are intended or could reasonably be expected to be applied or transmitted to the system.

- Employees shall be protected from excavated or other materials or equipment that could pose a hazard by falling or rolling into excavations. Protection shall be provided by placing and keeping such materials or equipment at least 2 feet (.61 m) from the edge of excavations, or by the use of retaining devices that are sufficient to prevent materials or equipment from falling or rolling into excavations, or by a combination of both if necessary.

- Daily inspections of excavations, the adjacent areas, and protective systems shall be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection shall be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections shall also be made after every rainstorm or other hazard increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.

- Where a competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees shall be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.

- A stairway, ladder, ramp, or other safe means of egress shall be located in trench excavations that are 4 feet (1.22 m) or more in depth so as to require no more than 25 feet (7.82 m) of lateral travel for employees.

ALL EXCAVATION WORK SHALL BE CONDUCTED IN ACCORDANCE WITH 29 CFR PART 1926 SUBPART P-EXCAVATIONS

DEFINITIONS

Competent Person:

One who is capable of identifying existing and predictable hazards in the surroundings, or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them. Note: The competent person must have specific training in, and be knowledgeable about soil analysis, the use of protective systems, and the requirements of the standard.

Excavation:

Any man-made cut, cavity, trench, or depression in an earth surface, formed by earth removal.

Protective System:

A method of protecting employees from cave-ins, from material that could fall or roll from an excavation face or into an excavation, or from the collapse of adjacent structures. Protective systems include support systems, sloping and benching systems, shield systems, and other systems that provide the necessary protection.

Trench:

A narrow excavation (in relation to its length) made below the surface of the ground. In general, the depth is greater than the width, but the width of a trench (measured at the bottom) is not greater than 15 feet (4.6 m). If forms or other structures are installed or constructed in an excavation so as to reduce the dimension measured from the forms or structure to the side of the excavation to 15 feet (4.6 m) or less (measured at the bottom of the excavation), the excavation is also considered to be a trench.

APPENDICES

Site Safety and Health Plan

Appendix A

Major Potential PAH Contaminants at the Site.

Creosote contains Polynuclear Aromatic Hydrocarbons (PAHs). Often the creosote treatment involved the use of contaminated waste oils and petroleum hydrocarbons. Sites where creosote is a present must, thus, be assessed for PAHs and hydrocarbons.

Chemical and Toxicological characteristics of the Contaminants of Concern.

Note: The toxicological effects (i.e. effects that result in toxic effects in the body) listed here range from those that are simply annoying to serious health effects. These effects are discussed in this section without regard to actual potential exposure risk at this site.

Asbestos. Asbestos hazards are associated with the crystalline form(s) of asbestos. The fibers given off during sampling events are respirable. Asbestos is not easily removed from the body and does not dissolve or change chemically within the body.
Once in the body, asbestos moves through soft tissue, causes soft tissue scarring and encystment, and can initiate cancers. Asbestos is an A1 carcinogen, and this effect is not dose dependant -- for this reason Asbestos exposure must be kept to a minimum.
OSHA: The legal airborne Permissible Exposure Limit (PEL) for Asbestos is **1 f/cc** averaged over an 8-hour workshift.
The EPA limit for releases of Asbestos offsite is .01f/cc above background levels.

Total PAHs. PAHs can be formed in any hydrocarbon combustion process and may be released from oil spills. The less efficient the combustion process, the higher the PAHs emission factor is likely to be. The major sources are stationary sources, such as heat and power generation, refuse burning, industrial activity, such as coke ovens, and coal refuse heaps. Because of the large number of sources, most people are exposed to very low levels of PAHs. The PAHs tend to adsorb on particulate matter. In the environment, PAHs are photo-oxidized, and react with oxidants and oxides of sulfur.

Exposure to PAH's will be based on the concept of Additive Effect of Threshold Limit Values for Mixtures as defined by the American Conference of Industrial Hygienists (ACGIH). Since PAH's have the same target organ effects and environmental dispersion pathway, the assumption will be that the total amount of PAH component present will be affecting the work force.

PAH's can be expected as adsorbed contaminant on soils that are obviously stained and/or exuding an aromatic odor indicative of generalized volatile contaminant spillage. Exposure to a work force would be expected via the inhalation of soil particulate.

OSHA: The legal airborne Permissible Exposure Limit (PEL) for the a typical PAH compound (floranthene) is **20 ug/m^3 (.02 mg/m^3)** averaged over an 8-hour workshift. When compared to the visible dust limit, **500 to 1000 ug/m^3 (5 to 10 mg/m^3)**, you can see that visible dust is not a good means of determining PAH exposure.

Since most PAH contaminated sites where creosote has been used, are also contaminated with hydrocarbons, the relative amount of hydrocarbon contamination is a good indication of PAH contaminant concentration associated with creosote. In areas where the soil is stained, both misting and slow, deliberate sampling methods must be used to minimize airborne dusts. If visible dust is observed, workers must move to Level C contingency PPE.

Lead. Heavy, soft gray metal. Lead exposure can cause a variety of health problems. The earliest symptoms may be tiredness, trouble sleeping, stomach problems, constipation, headaches, irritability, and depression. Higher levels may cause aching and weakness in the arms and legs, trouble concentrating and remembering things, and may cause a low blood count (anemia). Lead exposure increases the risk of high blood pressure.

Repeated exposure can result in the build-up of lead in the body. This build-up results in lead being deposited in the bones. When referring to the amount of lead in the bones, the term "body burden" is often used. Body burden implies that the body is storing lead rather than excreting the lead through waste products or carrying the lead in the blood. Because this lead is not being excreted in urine or carried in the blood, urine and blood samples will not be an indicator of the total lead present in the body. Blood samples are an indication of lead exposure for approximately 2-4 weeks after the exposure incident. Then as the body begins to deposit lead in the bone, blood samples become a less accurate indication of lead exposure.

The lead in the bone may be released from the bone tissue when certain processes within the body occur. One of these processes is be when the body begins to use the calcium stored in the bone as a substitute for calcium lacking in the diet. When the calcium is removed from the bone, the lead held in the bone tissue, also, begins to enter the blood stream. This process is one of the reasons why women of childbearing age are cautioned to avoid exposure to lead. Lead is a probable terratogen, that means that a developing fetus can be severely injured by exposure to lead.

Lead can cause serious permanent kidney or brain damage when exposures are high.

Lead exposure can occur by inhalation or ingestion.

OSHA: The legal airborne Permissible Exposure Limit (PEL) for Lead is **50 ug/m^3 (.05 mg/m^3)** averaged over an 8-hour workshift.

Benzene. Colorless to light-yellow liquid with an aromatic odor. Exposure can cause symptoms of dizziness, lightheadedness, headaches, and vomiting. High exposures may cause convulsions and coma, and irregular heartbeat. Repeated exposure can damage the blood forming organs causing anemia (aplastic). Long term exposure can cause drying and scaling of the skin. Benzene is an A1 carcinogen proven to cause leukemia in humans.

Benzene is the primary contaminant of concern in hydrocarbon spills due to is classification as a A1 carcinogen.

OSHA: The legal airborne Permissible Exposure Limit (PEL) for Benzene is **1ppm** averaged over an 8-hour workshift.

Cadmium. Cadmium compounds have low volatility and exist in air primarily as suspensions of fine particulate matter.

- When inhaled, a fraction of this particulate matter is deposited in the airway.
- Large particles (e.g., 10 um) tend to be deposited in the upper airway, while small particles (e.g., 0.1 um) tend to penetrate to the alveoli.
- While some soluble cadmium compounds may undergo limited absorption in the upper respiratory tree, the major site of absorption is the alveoli.

Cadmium can affect you when breathed in. Cadmium is a CARCINOGEN, a TERATOGEN, and may cause REPRODUCTIVE DAMAGE. HANDLE WITH EXTREME CAUTION. Breathing Cadmium can irritate the lungs causing coughing and/or shortness of breath. Higher exposures can cause a build-up of fluid in the lungs (pulmonary edema), a medical emergency, with severe shortness of breath.

Repeated low exposures can cause permanent kidney and lung damage, anemia, and loss of smell. High exposure to Cadmium may cause nausea, salivation, vomiting, cramps, and diarrhea. Cadmium can cause a flu-like illness with chills, headache, aching and/or fever.

OSHA: The legal airborne Permissible Exposure Limit (PEL) for Cadmium is **5 ug/m^3 (.005 mg/m^3)** averaged over an 8-hour workshift.

Chromium
Chromium powder can affect you when breathed in.
Chromium fumes can cause "metal fume fever," a flu-like illness lasting about 24 hours with chills, aches, cough and fever.

OSHA: The legal airborne Permissible Exposure Limit (PEL) is **1 mg/m3** averaged over an 8-hour workshift.

PCBs. Polychlorinated biphenyls (PCBs) are synthetic chemical compounds consisting of chlorine, carbon and hydrogen. First synthesized in 1881, PCBs are relatively fire-resistant, very stable, do not conduct electricity and have low volatility at normal temperatures. These and other properties have made them desirable components in a wide range of industrial and consumer products. Some of these same properties make PCBs environmentally hazardous especially their extreme resistance to chemical and biological breakdown by natural processes in the environment. PCBs are also known by their various brand names which include Aroclor, Pyranol, Interteen, and Hyvol.

PCB mixtures are usually light coloured liquids that feel like thick, oily molasses. However, some PCB compounds form sticky, yellow liquids or a brittle gum ranging in colour from amber to black. PCBs are soluble in most organic solvents but are almost insoluble in water, so when added to it they sink to the bottom. Most PCBs are non-volatile at normal temperatures (i.e., below 40 C).

While there have been many laboratory experiments and other studies that have tried to determine the full health effects of PCBs on humans, none has been definitive. As a result, even expert opinion varies significantly on this subject. Scientists generally agree it is unlikely that serious injury would result from short-term low-level exposure to PCBs. However, most are concerned about possible adverse health effects of long-term exposure to even low concentrations of these substances. PCBs can enter the body through skin contact, by the inhalation of vapours or by ingestion of food containing PCB residues.

The most commonly observed health effect from extensive exposure to PCBs is chloracne, a painful and disfiguring skin condition, similar to adolescent acne. Liver damage can also result. People who might be exposed to PCBs include those servicing some types of electrical equipment, maintenance workers who clean up spills or leaks of PCB fluids, employees of scrap metal or salvage companies, and waste collection workers.

OSHA: The PEL is 0.5 mg/m^3 (for PCB mixes with 54 percent chlorine) or 1 mg/m^3 (for PCB mixes with 42 percent chlorine) for an 8-hour workday to protect workers from noncancer harmful health effects.

Hazard Evaluation and Initial Sampling Efforts.

This site has not been fully characterized. Site history indicates that hydrocarbons and lumber treating chemicals (creosote) were used on the site.

The first step should soil or water contamination be suspected is to assume that exposure during sampling will be occurring. Samplers will done HEPA-OV Cartridge equipped Air Purifying Respirators (APRs) and take soil samples. These samples will be analyzed for PAHs, PCBs and lead. In lieu of laboratory analysis, immunoassay field methods may be used.

If analysis indicates that any of these chemicals are present, contact the site Industrial Hygiene staff for air dispersion calculations and specific routines to assess exposure.

PAH and lead levels will be considered predicative of Chromium and Cadmium relative contamination for initial sampling. As results for soils sampled are obtained this assumption will be reevaluated.

All asbestos samplers will be required to wear HEPA equipped APRs.

Environmental Fate.

PAHs have K_{oc} values that are characteristic of chemicals that tend to readily adsorb to the soil particulate or any other particulate present. PAH's are expected to bind strongly to soil and to not leach extensively to ground water through volatilization.

Photolysis and hydrolysis do not appear to be significant PAH breakdown processes in soil. However while little volatilization will occur from the soil, leaching to groundwater is possible. PAH's released to the water will dissolve at ambient pH's. The dissociated form will degrade (hours to days).

Photolysis is expected to occur near the water surface and biodegradation in the water column is expected. Biodegradation probably becomes significant after acclimation (may take several weeks). PAH's with 4 or less aromatic rings are degraded by microbes. Transport of PAH biodegradation products to groundwater has been documented in some cases.

Lead. If released or deposited in the soil, lead will be retained in the upper 2-5 cm. of soil, especially in soils with at least 5% organic matter or a pH of 5 or above. Leaching is not a significant process under most circumstances. Lead enters water from runoff or wastewater. Lead is effectively removed from the water column to the sediment by adsorption to organic matter and clay minerals. When released to the atmosphere, lead will generally be in a dust or adsorbed to particulate matter.

Benzene. Benzene released into the soil is subject to rapid volatilization near the surface. That does not evaporate, will be highly to very highly mobile in the soil and may leach to groundwater. Benzene uniformly distributed to 1 and 10 cm through the soil has a half-life of 7.2 to 38.4 days. If benzene is released to the water, rapid volatilization may occur. Benzene will not adsorb to particulates. Biodegradation may occur. Benzene released to the atmosphere will exist in the vapor phase. Benzene is fairly soluble in water and is removed from the atmosphere by rains.

PCBs . Enter air as solid or liquid aerosols or vapor and can stay in air more than 10 days.

- When in air, can travel long distances in the wind.
- Move from air to soil and water during snows or rain events.
- Most stick tightly to soil particles; a small amount dissolves in water.
- Take several years to break down in soil.

Chromium and Cadmium. If released or deposited in the soil, lead will be retained in the upper 2-5 cm. of soil, especially in soils with at least 5% organic matter or a pH of 5 or above. Leaching is not a significant process under most circumstances. When released to the atmosphere, lead will generally be in a dust or adsorbed to particulate matter.

Asbestos. Asbestos does not degrade in the soil or water, and remains chemically intact.

Initial Sampling Toxicological Exposure Limitations

PAH's

Onsite contaminant concentrations could exceed inhalation exposure maximum limits for PAH's and lead if all the contaminants were airborne as dust particles. However, even under worst case scenarios, dust generation would not cause all the soils on the site to suddenly become airborne, only a portion of the chemicals of concern would adsorb to dust particulates; and only approximately 60 per cent of the airborne dust particulates would be of respirable size.

Usually 5 mg/m^3 is assumed to be the airborne particulate concentration necessary to have visible dust. Since many PAH dust exposure maximum levels are below 5 mg/m^3; visible dust cannot be used as an indicator of acceptable exposure limits. Consequently, High Efficiency Particulate (HEPA) cartridge equipped respirators will be required for all personnel in the Exclusion Zone during sampling activities where PAH contamination is suspected or confirmed. This precaution is needed because PAH's being semi-volatile can enter the body as inhaled dust or soil particulate. Once in the body, the higher core temperature in the body or metabolic activity make the PAH's available and potentially cause a dose-response pathway to be completed internally.

Since complete suspension of these contaminates on site is 1) not physically probable and 2) misting of the sampling area will continually remove particulates from the air; HEPA cartridges will be used and the PID will be continually monitored. If the PID records a sustained deflection of 1 PPM, the workers will evacuate the Exclusion Zone. The assumption will be that newly exposed PAH's will be in areas where volatile organics are also present. The presence of volatile organics as evidenced by sustained PID readings will require that the site be further evaluated as to PAH potential exposure.

Evaluation for potential exposures to PAH's will require soil sampling and attendant air dispersion calculations and air monitoring for particulates. Unfortunately we do not have instrumentation to monitor real time for PAH's. PAH sampling will require that laboratory analyticals or immunoassay be accomplished. Therefor until results are obtained and interpreted, HEPA-OV cartridge full-face air purifying respirators will be required. On-site monitoring sequence is as follows:

- Visible dust: 2 L/min flow rate personal air sampling pumps will be used to draw air through filter cassettes. Cassettes will be packaged and sent to contract laboratory for analysis.
- On-going site work will continue with dust suppression engineering controls required. Personnel will don HEPA cartridge air purifying respirators.
- If organic vapors are also present (See below), HEPA-OV combo cartridges will be donned.

Volatile Organics

In order to detect if any chemicals are being volatilized a Photo-Ionization Detector (PID) will be used to scan the sampling sites. Any deflection (defined as needle deflection that indicates one reading over 1 ppm) of the PID will initiate the use of benzene colorimetric tubes. In the event that either the benzene colorimetric tubes show benzene at 5 ppm, sampling activities will cease and the Industrial Hygiene staff will be notified. On-site monitoring sequence is as follows:

- Any sustained deflection of the PID: benzene colorimetric tubes will be used;
- Benzene in excess of 5 ppm detected: work will cease and Exclusion Zone will be allowed to ventilate. Retesting and assigning of respirator protection will commence after a 30-minute ventilation interval.
- Industrial Hygiene staff will be notified of both sampling efforts and will provide further protocols.

Lead & Tetraethyl Lead.

Dust levels of 5 mg/m^3 (100 times .05 mg/m^3) Lead, would necessitate the use of supplied air respirators. In all areas where visible dust is present and soil staining or other obvious signs of contamination (drum fragments, intact drums, chemical containers, buried treated wood), lead contamination will be suspected. Testing for both lead and PAH soil adsorbed components will ensue. This testing will be done using 2 L/min flow rate through filter loaded cassettes. Filter analyticals for both lead and PAH's will be requested of the testing laboratory.

The OSHA PEL is 50ug/m^3 (.050 mg/m^3); the action level (AL) is 30 ug/m^3 (.030 mg/m^3). Onsite work may expose workers above the PEL. Biological monitoring of exposure is necessary if the airborne concentration exceeds 30 ug/m3 (.030 mg/m3) for 30 days in 12 consecutive months.

Onsite contaminant concentrations could exceed inhalation exposure maximum limits for lead. Consequently, High Efficiency Particulate (HEPA) cartridge equipped respirators will be required for all personnel in any lead

Contaminant area during sampling activities. Air monitoring will be performed to assess the degree of exposure to lead particulates during on-site investigative work and to confirm the adequacy of the level of personal protective equipment being used.

- Employee exposure is that exposure which would occur if the employee were not using a respirator.
- **Full shift (for at least 7 continuous hours) personal samples including at least one sample for each shift for each job classification in each work area will be conducted in areas where lead contaminated soil is expected.**
  - Full shift personal samples will be representative of the monitored employee's regular, daily exposure to lead.
  - Monitoring for the initial determination may be limited to a representative sample of the exposed employees who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.

Chromium and Cadmium are normally determined through off-site laboratory analysis. PAH and lead levels will be considered predicative of Chromium and Cadmium relative contamination for initial sampling. As results for soils sampled are obtained this assumption will be reevaluated.

ASBESTOS (29 CFR 1910.1001 and 29 CFR 1926.1101)

Employee exposure **means that exposure to airborne asbestos that would occur if the employee were not using respiratory protective equipment. All personnel sampling asbestos will be monitored as described herein.**

Exposure monitoring - How:
Employee exposure shall be determined using **breathing zone air samples** (8-hour TWA and 30-minute short-term exposures)
Representative 8-hour TWA employee exposures: One or more samples representing full-shift exposures

- For:
  - **Each shift**
  - **Each employee**
  - **Each job classification**
- **In each work area**

Representative 30-minute short-term employee: One or more samples representing 30 minute exposures (operations that are most likely to produce exposures above the excursion limit) for:

- For:
  - **Each shift**
  - **Each job classification**
- **In each work area**

Initial monitoring.

- **Immediately before/at the initiation** of the operation (1926.1101)
- When **employees** <u>**may reasonably be expected to be**</u> **exposed to airborne concentrations at or above the action level and/or excursion limit** (1910.1001)
- Made from breathing zone air samples that are representative of the 8-hour TWA and 30-minute short-term exposures of each employee.
- Representative 8-hour TWA employee exposure shall be determined on the basis of **one or more** samples representing full-shift exposure for employees in each work area.
- Representative 30-minute short-term employee exposures shall be determined on the basis of **one or more** samples representing 30-minute exposures associated with operations that are most likely to produce exposures above the excursion limit for employees in each work area.

Historical Documentation for Initial monitoring - May be used when:

- Employer has monitored:
  - **After December 20, 1985** (for the TWA) and
  - After March 14, 1988, (for the excursion limit)
- Monitoring satisfies all the above requirements and the analytical requirements listed in 29 CFR 1910.1001/1926.1101

- Documentation has occurred within the past calendar year (12 months)

Objective Data for Initial monitoring - May be used when such data relates that:
"asbestos is **not capable of being released** in airborne concentrations at or above the action level and/or excursion limit **under the expected conditions** of processing, use, or handling" - then no initial monitoring is required

LEAD (29 CFR 1910.1025 and 29 CFR 1926.62)

Exposure monitoring-General 29 CFR 1910.1025:

- Employer shall collect full shift (for at least 7 continuous hours) personal samples including at least one sample for each shift for each job classification in each work area.
- Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead

Exposure monitoring-General 29 CFR 1926.62:

- Each employer who has a workplace or operation covered by this standard **shall initially determine** if any employee may be exposed to lead at or above the action level. Such workplaces are:
    - Where lead containing coatings or paint are present: **Manual demolition of structures (e.g., dry wall), manual scraping**, manual sanding, heat gun applications, and power tool cleaning with dust collection systems;
    - Where the employee has any reason to believe that an employee performing the task may be exposed to lead in excess of the PEL, until the employer performs an employee exposure assessment
- Employee exposure is that exposure which would occur **if the employee were not using a respirator**
- **Until the employer performs an employee exposure assessment and documents that the employee is not exposed above the PEL**, the employer shall treat the employee as if the employee were exposed above the PEL and shall:
    - Implement employee protective measures:
        - Appropriate respiratory protection
        - Appropriate personal protective clothing and equipment
        - Change areas
        - Hand washing facilities
        - Biological monitoring, to consist of blood sampling and analysis for lead and zinc protoporphyrin levels
    - Employer shall collect personal samples representative of a full shift
        - Including at least one sample for each job classification in each work area either for each shift or for the shift with the highest exposure level
        - Full shift personal samples shall be representative of the monitored employee's regular, daily exposure to lead

Initial determination.

- **Each employer who has a workplace or work operation covered by this standard shall monitor employee exposures and shall base initial determinations on the employee exposure monitoring results and any of the following, relevant considerations:**
    - Any information, observations, or calculations which would indicate employee exposure to lead;
    - Any previous measurements of airborne lead; and
    - Any employee complaints of symptoms which may be attributable to exposure to lead
- Monitoring for the initial determination may be limited to a **representative sample of the exposed employees** who the employer reasonably believes are exposed to the greatest airborne concentrations of lead in the workplace.
- Measurements of airborne lead made in the preceding 12 months may be used to satisfy the requirement during work operations conducted under workplace conditions closely resembling, used, and prevailing in the employer's current operations. These workplace conditions include:
    - Equipment
    - Production
    - Process
    - Control equipment

- Work practices

Negative initial determination

(No employee is exposed to airborne concentrations of lead at or above the action level):
The employer shall make a written record of such determination, including:

- Date of determination
- Location within the worksite
- Name and social security number of each employee monitored
- All initial determination exposure monitoring results

Frequency

- **Below the action level:** Measurements need not be repeated
- **At or above the action level and below the permissible exposure limit:**
  - Repeat monitoring every 6 months
  - Continue monitoring until at least two consecutive measurements, taken at least 7 days apart, are below the action level at which time the employer may discontinue monitoring for that employee
- **Above the permissible exposure limit:**
  - Repeat monitoring quarterly.
  - Continue monitoring at the required frequency until at least two consecutive measurements, taken at least 7 days apart, are below the PEL but at or above the action level at which time the employer may discontinue monitoring for that employee

Additional monitoring:

- Whenever
  - Employer has **any reason** to suspect that a change may result in new or additional exposures above the action level and/or excursion limit
  - Change has occurred in the following:
    - Equipment
    - Production
    - Process
    - Control equipment
    - Work practices
  - Personnel change
- *Exception*: When all employees within a regulated area are equipped with **supplied-air respirators operated in the positive-pressure mode**, the employer may dispense with the monitoring

Employee notification.

- Within 5 working days after the receipt of monitoring results, the employer shall notify each employee in writing of the results which represent that employee's exposure
- Whenever the results indicate that the representative employee exposure, **without regard to respirators**, exceeds the permissible exposure limit, the employer shall include in the written notice:
  - Statement that the permissible exposure limit was exceeded
  - Description of the corrective action(s)

Medical examinations and consultations-1910.1025

- At least annually for each employee for whom a blood sampling test conducted at any time during the preceding 12 months indicated a **blood lead level at or above 40 ↑µ↑g/100 g;**
- **Prior to assignment for each employee being assigned for the first time to an area in which airborne concentrations of lead are at or above the action level**
- As soon as possible, upon notification by an employee either that the employee has developed signs or symptoms commonly associated with **lead intoxication, that the employee desires medical advice concerning the effects of current or past exposure to lead on the employee's ability to procreate a healthy child, or that the employee has demonstrated difficulty in breathing during a respirator fitting test or during use**

Medical examinations and consultations-1926.62

- Initial medical surveillance to employees occupationally exposed **on any day to lead at or above the action level. Initial medical surveillance consists of biological monitoring in the form of blood sampling and analysis for lead and zinc protoporphyrin levels**
- Medical surveillance program for all employees who are or may be exposed by the employer **at or above the action level for more than 30 days in any consecutive 12 months**

Medical examinations: Content

- A detailed work history and a medical history, with particular attention to past lead exposure (occupational and non-occupational), personal habits (smoking, hygiene), and past gastrointestinal, hematologic, renal, cardiovascular, reproductive and neurological problems;
- A thorough physical examination, with particular attention to teeth, gums, hematologic, gastrointestinal, renal, cardiovascular, and neurological systems. Pulmonary status should be evaluated if respiratory protection will be used;
- A blood pressure measurement;
- A blood sample and analysis which determines:
  - Blood lead level;
  - Hemoglobin and hematocrit determinations, red cell indices, and examination of peripheral smear morphology;
  - Zinc protoporphyrin;
  - Blood urea nitrogen; and,
  - Serum creatinine;
- A routine urinalysis with microscopic examination; and
- Any laboratory or other test which the examining physician deems necessary by sound medical practice.
- The content of medical examinations made available to the employee and, if requested by an employee, shall include pregnancy testing or laboratory evaluation of male fertility.

Information provided to examining and consulting physicians.

The employer shall provide an initial physician with the following information:

- A copy of 29 CFR 1910.1025 and/or 29 CFR 1926.62, including all Appendices;
- A description of the affected employee's duties as they relate to the employee's exposure;
- The employee's exposure level or anticipated exposure level to lead and to any other toxic substance (if applicable);
- A description of any personal protective equipment used or to be used;
- Prior blood lead determinations; and
- All prior written medical opinions concerning the employee in the employer's possession or control.

Written medical opinions:

The employer shall obtain and furnish the employee with a copy of a written medical opinion from each examining or consulting physician which contains the following information:

- The physician's opinion as to whether the employee has any detected medical condition which would place the employee at increased risk of material impairment of the employee's health from exposure to lead;
- Any recommended special protective measures to be provided to the employee, or limitations to be placed upon the employee's exposure to lead;
- Any recommended limitation upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative pressure respirator; and
- The results of the blood lead determinations.

The employer shall instruct each examining and consulting physician to:

- Not reveal either in the written opinion, or in any other means of communication with the employer, findings, including laboratory results, or diagnoses unrelated to an employee's occupational exposure to lead; and
- Advise the employee of any medical condition, occupational or nonoccupational, which dictates further medical examination or treatment.

Recordkeeping-Exposure assessment:

Exposure monitoring records shall include:

- Date(s), number, duration, location and results of each of the samples taken if any, including a description of the sampling procedure used to determine representative employee exposure where applicable;
- Description of the sampling and analytical methods used and evidence of their accuracy;
- Type of respiratory protective devices worn, if any;
- Name, social security number, and job classification of the employee monitored **and of all other employees whose exposure the measurement is intended to represent; and**
- Environmental variables that could affect the measurement of employee exposure.
  In accordance with the provisions of 29 CFR 1910.20.
- Name, social security number, and description of the duties of the employee;
- Copy of the physician's written opinions;
- Results of any airborne exposure monitoring done on or for that employee and provided to the physician; and
- Any employee medical complaints related to exposure to lead.
- The employer shall keep, or assure that the **examining physician keeps,** the following medical records:
- Copy of the medical examination results including medical and work history
- A description of the laboratory procedures and a copy of any standards or guidelines used to interpret the test results or references to that information;
- A copy of the results of biological monitoring.

The employer shall maintain or **assure that the physician maintains** medical records in accordance with the provisions of 29 CFR 1910.20.

Appendix B

Contingency Plan Visitors Log

Date	Name	ime N	ime UT	PPE Used	Training Date	Meds Date	RPP Fit Test Dates

Daily Safety Inspection Log

The SSHO will develop a code for each Work Area, PPE, and Work Equipment

Date	Work Area Checked	mployees Present	PPE Used	Work Equipment Used	Safety & Health Issues

Preparers Signature

DAILY INSTRUMENT CALIBRATION CHECK SHEET

Instrument ____________________

Serial # ____________________

Date	Battery Check Ok?	Zero Adjust Ok?	Calibration Gas (ppm)	Reading (ppm)	Calibrated By

AIR MONITORING READINGS

Air Monitor's Name(s)	
Date	
Project Name	
Project Number	
Site Conditions	
Barometric Pressure	
Humidity	
Temperature	
Estimated Wind Direction	
Estimated Wind Speed (i.e., calm, moderate, strong)	
Weather Conditions	
Comments	

Site Diagram Showing Monitoring Locations

Readings

Time	Location	Instrument Type	Reading % ppm/other	Survey Type	Work Activity

- **Survey Type**
  - **BZ = Breathing Zone**
  - **A = General Area, Perimeter**
  - **C = Contact (1"-2" from source)**
  - **BS = Borehole Space**
  - **TS = Trench Space**

Appendix C

ACTIVITY HAZARD ANALYSIS SECTION

The following section contains Activity Hazard Analysis (AHAs). Chose the Activity Hazard Analysis that describe site activities and attach to the current SSHP. Should tasks change, go back and attach the needed AHA's for the new tasks. For items in the AHA's that are not applicable to the current site, have the Safety Manager or Site Safety and Health Officer strike through and initial deletions.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: REMEDIAL INVESTIGATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Staging equipment	Slip, trip, and fall hazards	• Determine best access route before transporting equipment. • Good housekeeping, keep work area picked up and clean as feasible. • Continually inspect the work area for slip, trip, and fall hazards. • Look before you step, ensure safe and secure footing.
	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 lbs require assistance or mechanical equipment.
	Falling objects	• Stay alert and clear of materials suspended overhead, wear hard hat and steel-toed boots.
	Flying debris, dirt, dust, etc.	• Wear safety glasses/goggles, ensure that eye wash is in proper working condition.
	Pinch points	• Keep hands, fingers, and feet clear of moving/ suspended materials and equipment. • Beware of contact points. • Stay alert at all times!
	Bees, spiders, and snakes	• Inspect work area carefully and avoid placing hands and feet into concealed areas.
	Fire	• Fire extinguishers shall be suitably placed, distinctly marked, readily accessible, and maintained in a fully charged and operable condition.
	Contact with moving equipment/vehicles	• Work area will be barricaded/demarcated. • Equipment will be laid out in an area free of traffic flow.
	Hazard communication	• Label all containers as to contents and dispose of properly.
	Noise	• Sound levels above 85 dBA mandates hearing protection.
Drilling and installation of monitoring wells	Faulty or damaged equipment being utilized to perform work	• All machinery or mechanized equipment will be inspected by a competent mechanic and be certified to be in safe operating condition. • Equipment will be inspected before being put to use and at the beginning of each shift. • Faulty/unsafe equipment will be tagged and if possible locked out.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: REMEDIAL INVESTIGATION

Analyzed By/Date Drilling not anticipated therefor this AHA is not needed at this time____________

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drilling and installation of monitoring wells (cont'd)	Uneven terrain, poor ground support, inadequate clearances, contact with utilities	• Inspections or determinations of road conditions and structures shall be made in advance to assure that clearances and load capacities are safe for the passage or placing of any machinery or equipment. • Above and below ground utilities will be located prior to staging equipment. • Whenever the equipment is parked, the parking brake shall be set. • Equipment parked on inclines will have the wheels chocked. • Inspect brakes and tire pressure on drill rig before staging for work. • Obtain trenching/drilling permit prior to operation.
	Inexperienced operator	• Machinery and mechanized equipment shall be operated only be designated personnel.
	Jacks/outriggers	• Ensure proper footing and cribbing.
	Falling objects	• Remove unsecured tools and materials before raising or lowering the derrick. • Stay alert and clear of materials suspended overhead.
	Pinch points	• Keep feet and hands clear of moving/suspended materials and equipment. • Stay alert at all times!!!
	Fire	• Keep areas adjacent to derricks reasonably free from accumulation of oil, fuel, or other materials (good housekeeping). • Have fire extinguishers inspected and readily available.
	Fall hazards	• Use safety belts and lifeline when working above 6 ft.
	Noise	• Hearing protection is mandatory above 85 dBA.
	Contact with rotating or reciprocating machine parts	• Machine guards, use long-handled shovels to remove auger cuttings. • Safe lockout procedures for maintenance work.
	Heavy lifting	• Use proper lifting techniques. Lift greater than 60 lbs require assistance or mechanical equipment; size-up the lift.
	Slip, trip and fall hazards	• Good housekeeping, keep work area picked up and clean as feasible.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: REMEDIAL INVESTIGATION

Analyzed By/Date Drilling not anticipated therefor this AHA is not needed at this time__________

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drilling and installation of monitoring wells (cont'd)	Contact with potentially contaminated materials	• Continually inspect the work area for slip, trip and fall hazards. • Real time air monitoring will take place. • If necessary, proper personal protective clothing and equipment will be utilized.
Split spoon sampling	Cross-contamination and contact with potentially contaminated materials	• Sampling technicians will wear proper protective clothing and equipment to safeguard against potential contamination.
		• Only essential personnel will be in the work area. • Initial real time air monitoring will take place before and during sampling activities. • All personnel will follow good hygiene practices. • Proper decontamination procedures will be followed. • All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Cut hazards	• Use care when handling glassware. • Wear adequate hand protection.
	Hazard communication	• Label all containers as to contents.
	Strains/sprains	• Use the proper tool for the job being performed. • Get assistance if needed. • Avoid twisting/turning while pulling on tools, moving equipment, etc.
	Spills/residual materials	• Absorbent material and containers will be kept available where leaks or spills may occur.
	Lighting	• Adequate lighting will be provided to ensure a safe working environment.
	Unattended worker	• "Buddy System" - visual contact will be maintained with the sampling technician during sampling activities.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: REMEDIAL INVESTIGATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Moving and shipping collected samples	Heavy lifting	• Use proper lifting techniques. Lifts greater than 60 lbs require assistance or mechanical equipment; size-up the lift.
	Pinch points	• Keep hands, fingers, and feet clear of moving/suspended materials and equipment. • Beware of contact points. • Stay alert at all times!!!
	Cut hazards	• Wear adequate hand protection. Use care when handling glassware.
	Hazard communication	• Label all containers as to contents and associated hazards.
Material storage	Flammable and combustible liquids	• Store in NO SMOKING AREA. • Fire extinguisher readily available. • Transfer only when properly grounded and bonded.
	Round stock	• Secure from rolling, do not climb or stand on the stack.
	Slip, trip, and fall hazards	• Good housekeeping
	Sprains and strains	• Safe lifting procedures.
	Pinch points/cuts	• Adequate hand protection and observation of contact points.
	Hazard communication	• Proper labeling/MSDS.
Measuring water levels	Bees, spiders, and snakes	• Inspect work areas carefully and avoid placing hands and feet into concealed areas.
	Cross-contamination and contact with potentially contaminated materials	• Employees will wear proper protective clothing and equipment to safeguard against potential contamination. • Only essential personnel will be in the work area. • Initial real-time air monitoring will take place before and during activities. • All personnel will follow good hygiene practices. • Proper decontamination procedures will be followed. • All liquids and materials used for decontamination will be contained and disposed of in accordance with federal, state, and local regulations.
	Hazard communication	• Label all containers as to contents.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: REMEDIAL INVESTIGATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Measuring water levels (cont'd)	Sprains/strains	• Use the proper tool for the job being performed. • Get assistance if needed. • Avoid twisting/turning while inserting and removing water probe.
	Spills/residual materials	• Absorbent material will be kept available where leaks or spills may occur.
	Lighting	• Adequate lighting will be provided to ensure a safe working environment.
	Unattended worker	• "Buddy System" - visual contact will be maintained during sampling activities.
	Slip, trip, and falls	• Avoid walking on wet surfaces.
	Splash hazards	• Splash hazards will be controlled by employees engaged in this task.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: MOBILIZATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Mobilization of equipment/supplies	Heavy lifting	• Use proper lifting techniques, size up the load, use teamwork, never twist or turn when lifting. • Wear appropriate personal protective equipment. • Objects greater than 60 lbs require assistance or use of a mechanical lifting device.
	Slip, trip, fall	• Hazards will be identified and remedied by implementation of engineering controls. • Good housekeeping procedures. • Continual inspection of work areas.
	Faulty/damaged equipment	• Equipment will be inspected upon arrival and at the beginning of each shift. • Equipment to be inspected by competent mechanic and certified to be in safe operating condition.
Installation of temporary support facilities	Equipment operators	• Equipment will be operated by trained/experienced personnel only. • Self-propelled equipment shall have an audible backup alarm. • All equipment operations will be performed in accordance with Section 18 of EM385-1-1.
	Noise	• Implement engineering controls to required sound levels. • Utilize hearing protection devices above 85 decibels.
	Hand/power tools	• Hand/power tools shall be inspected before each use. • Use proper tools designed for the activity.
	Cold stress	• Wear layered insulated clothing. • Remove wet clothing as soon as possible. • Take breaks in warm area.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SOIL BOREHOLE DRILLING

Analyzed By/Date Drilling not anticipated therefor this AHA is not needed at this time___________

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drill rig staging	Uneven terrain	• Inspection or determination of road conditions and structures shall be made in advance to assure that clearances and load capacities are safe for passage or placing of any machinery or equipment. • Whenever the equipment is parked, parking brake will be set. Equipment parked on inclines will have wheels chocked. • Above and below ground utilities will be located prior to staging equipment.
	Inadequate clearances	• Equipment shall maintain minimum safety clearances of 15' from overhead power lines. • Drill rig will not be moved with mast in upright position.
Drill rig operation	Faulty/damaged equipment	• Equipment will be inspected at beginning and during each shift. • Equipment found to be unsafe will be tagged and locked out.
	Falling objects	• Hard hat, remove unsecured tools and materials before raising or lowering derrick. • Do not pass under materials suspended overhead. • Do not pass under materials suspended overhead.
	Pinch/contact points	• Keep feet and hands clear of moving/suspended materials and equipment. • Machine guards shall be in place. • Use long handle shovel to remove auger cuttings. • Safe lockout procedures for maintenance work.
	Fire hazards	• Equipment will be shut down prior to fueling. • Use good housekeeping procedures. • Have adequate fire protection devices available. • Monitor borehole area for LEL/O_2 concentrations.
	Equipment operations	• Make eye contact with operator before approaching. • Do not exceed load limits or speeds specified by manufacturers. • Never walk behind moving equipment. • Equipment requiring an operator shall not be permitted to run unattended.
	Fall hazards	• Use safety belts and lifeline at unprotected elevations above 6 feet.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SOIL BOREHOLE DRILLING

Analyzed By/Date Drilling not anticipated therefor this AHA is not needed at this time____________

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drill rig operation (cont'd)	Noise	• Implement engineering controls to reduce sound levels. • Utilize hearing protection above 85 decibels.
	Heavy lifting	• Use proper lifting techniques. • Use mechanized equipment for large heavy lifts. • Do not overload drums with soil.
	Slip, trip, and fall	• Use good housekeeping procedures. • Inspect work area continuously.
	Hand power tools	• Inspect tools before each use. • Throwing tools or materials is forbidden.
	Cold stress	• Take breaks in warm areas. • Follow cold stress procedures outlined in Appendix C of the SSHP.
Soil sampling	Sharp hand tools	• Use adequate hand protection. • Use proper tool designed for the activity.
	Contact with potentially contaminated soils	• Keep contact with soil to a minimum. • Use good personal hygiene procedures. • Level B personal protective equipment will be utilized for borehole drilling/sampling operations.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: DEMOBILIZATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Removal of temporary support facility/supplies	Truck traffic	• Signal person will be provided when truck drivers view is partially obstructed. • The signal person will wear an orange safety vest to identify themselves. • Trucks will have an audible backup alarm.
	Heavy lifting	• Use proper lifting techniques. • Objects greater than 60 lbs require assistance or use of a mechanical lifting device.
	Slip, trip, and fall	• Keep walkway clear of debris and obstructions. • Use good housekeeping procedures.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SITE PREPARATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Set up trailers and hook up utilities • Install utility poles • Move trailers onto site • Secure and tie down trailers • Place aggregate in support zone • Place frac tanks and fuel tanks	• Safety hazards from use of heavy equipment • Electrical hazards during hook-up of wiring • Pouring aggregate in support zone • Contact to contaminated media while on site • Handling of heavy materials • Fire, explosion, or spills from fuel tanks	• Ensure that all workers are clear of area when moving trailers. • Use only trained, qualified electrician to install wiring. • Keep non-essential personnel out of area while pouring and spreading rock. • Survey site for hazardous materials prior to work in this area. • Inspect tanks for spills, have fire extinguishers on site, train personnel in use and recognition of problems with fuel storage and transfer.
Clearing and grubbing • Driving heavy equipment onto site • Scraping and piling vegetation and debris	• Driving over workers • Injury to workers while loading or moving materials • Exposure to contaminated soils • Creation and inhalation of dust • Discovery of UXO	• Train all site workers to avoid moving equipment. • Load materials with equipment and not by hand. • Survey area prior to work on site. • Monitor the air during this operation for discovery of contaminated soils. • Use dust suppression techniques specified in DCP. • If UXO are discovered, immediately cease operations, evacuate site, and SSHO shall contact FPPB.
Install fencing around work zones • Drive equipment around perimeter of site • Drive fence posts into ground • Hang fabric onto posts and secure	• Tripping on materials on the site • Safety hazards from use of post driving equipment • Injury from handling of heavy fencing materials • Exposure to contaminated media on the site	• Clear site of tripping and slipping hazards. • Use caution while operating post driving equipment. • Use equipment to haul heavy materials. • Be alert for the presence of contaminated areas. • Wear PPE specified in Section ______. • Brief all workers on the hazards to be anticipated.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: WELL ABANDONMENT

Analyzed By/Date Drilling not anticipated therefor this AHA is not needed at this time____________

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Open well casing	Exposure to chemical vapors in well casing	• Wear respiratory protection specified in ________Section.
Measure water level	Splashing and contact to contaminated waters	• Wear splash protection on eyes and face.
Pour in sand to top of water level Fill in clay to top of grade	Breathing of dust from sand and clay project	• Use particulate filters in respirator.
Remove casing	Injury from equipment or chains while pulling casing	• Stay clear of equipment while pulling casing.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: TRENCHING/BACKHOE OPERATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Trenching/backhoe equipment	Utilities	• A thorough underground utilities search should be conducted before the commencement of a trenching project.
	Fumes	• Review contaminants suspected to be on-site and perform air monitoring as required. Shut down backhoe and/or divert exhaust fumes.
	Noise	• Sound levels above 85 dBA mandates hearing protection.
	High pressure lines	• All high pressure lines should be checked prior to and during use.
	Moving parts	• Hard hats should be worn at all times when working around a drilling • Secure loose clothing • Check boom prior to approaching backhoe • All chains, lines, cables should be inspected daily for weak spots, frays, etc.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SITE WALK THROUGH, SITE SURVEYS, AND SAMPLING GRID LAYOUT

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Site walk-through, surveys, and sampling grid layout	Exposure to irritant and toxic plants	• Wear long sleeved clothing and slacks to minimize contact. • Appropriate first aid for personnel's' known allergic reactions.
	Slip, trip, and fall	• Be alert at all times. • Wear steel toed boots. • Good housekeeping.
	Sprains and strains	• Safe lifting techniques.
	Wildlife	• Avoid wildlife when possible. In case of an animal bite, perform first aid. Perform a tick check after leaving a wooded or vegetated area.
	Terrain	• Inspection or determination of road conditions and structures shall be made in advance to assure that clearances and load of any machinery or equipment is safe.
	Equipment	• Ensure all maintenance is performed on vehicles before going to the field.
	Fallen power lines	• Ensure fallen power lines are not energized.
	Structures	• Avoid buildings which are not structurally sound.
	Heat stress	• Shift work hours. • Sufficient fluid intake. • Monitor employees.
	Cold stress	• Wear layered insulated clothing. • Remove wet clothing as soon as possible. • Take breaks in warm area.
	Contact with potentially contaminated materials	• Continually inspect the work area for slip, trip and fall hazards. • Real time air monitoring will take place. • If necessary, proper personal protective clothing and equipment will be utilized.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SURFACE SOIL SAMPLING

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Surface soil sampling will be considered any soil sampling completed by hand using a trowel, split spoon, shovel, auger, or other type of hand-held tool.	Contact with contaminants	• A thorough review of suspected contaminants should be completed and implementation of an adequate protection program.
	Sprains/strains	• Use of slow easy motions when shoveling, auguring, and digging to decrease muscle strain. • Use proper lifting techniques.
	Contact of decontamination solutions	• Material Safety Data Sheets for all decon solutions should be included with each Site Health and Safety Plan. • First aid equipment should be available based on MSDS requirements.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SOIL AND TEST PIT EXCAVATION

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Soil and test pit excavation	Airborne contaminants	• Monitor for airborne contaminants • Allow test pits to purge and/or use personal protective equipment
	Sides of excavation	• Provide adequate shoring or sloping of sides • Regularly inspect trenches for changing conditions • Solid rock, cemented sand or gravel = 90 degrees • Compact angular gravel = 63 degrees 26 ft deep • Compacted sharp sand = 33 degrees 4 ft deep • Rounded loose sand = 26 degrees 4 ft deep
	Slip, trip, fall	• Provide ramps or ladders to trenches to allow safe access and egress • Provide an adequate barrier around open pits • Material from pit must be placed away from edge to prevent cave-ins and instability of pit • Stay alert and clear of materials suspended overhead, wear hard hat and steel-toed boots
	Congested work area	• Maintain ample work room between workers

ACTIVITY HAZARD ANALYSIS

ACTIVITY: DRUM HANDLING

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drum Handling	Explosive or shock-sensitive waste	• If a drum is suspected to contain explosive or shock-sensitive waste, or is a bulging drum under pressure, special assistance might be required before handling. • Use a grappler unit constructed for explosive containment for initial handlings of drums. • Maintain continuous communication during handling and have siren signals for the commencement and completion of explosive waste handling activities. • Ensure all unnecessary personnel are kept a safe distance away from all activities. • Use shock resistant shields as necessary. • Personnel should be wearing all appropriate personal protective equipment.
	Transport of drums	• Pelletize and secure drums prior to transport. • Vehicles used should have a clear view of the roadway when carrying drums. • Where necessary, have ground workers available to guide the operator motion. • Staging area should be provided with adequate access and egress routes.
	Leakage or disintegration	• Leaking drums should be properly containerized before moving. • In areas where spills may occur, a containment berm adequate to contain the entire volume in drums should be constructed.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: DRUM SAMPLING

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Drum sampling	Deterioration of drums /containers	• Visually inspect all drums and containers for physical condition such as rusting, swelling, and risk of structural failure; symbols or other markings that may indicate the contents such as DOT labels and manufacturer's labels; note drum type such as stainless steel, plastic, or metal; and note configuration of drum head such as open headed or bung.
	Contact with potentially contaminated wastes	• Prior to any sampling, a sampling plan should be developed. • Plan should include background information on the waste. • A determination of which drums should be sampled, and selection of the appropriate sampling devices and containers. • Health and safety personnel should determine the appropriate personal protective equipment to be used during sampling, decontamination, and packaging of the samples.
	Manual sampling	• Keep personnel at a safe distance while drums are being opened. • Sample only after opening operations are complete. • Do not lean over other drums to reach the drum being samples, unless absolutely necessary. • Cover drum tops with plastic sheeting or other suitable monocontaminated materials to avoid excessive contact with the drum tops. • Never stand on drums. • Use mobile steps or another platform to achieve the height necessary to safely sample from the drums. • Obtain samples with either glass rods or vacuum pumps. • Do not use contaminated items when sampling, as these may contaminate the sample and may not be compatible with the waste in the drum. • Glass rods should be removed prior to pumping to minimize damage to pumps.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SURFACE SOIL SAMPLING

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Surface soil sampling	Exposure	• To minimize exposure to chemical contaminants, a thorough review of suspected contaminants should be completed and implementation of an adequate protection program.
	Strains/sprains	• Use proper lifting techniques. • Use slow easy motions when shoveling, auguring, and digging to decrease muscle strain. • Lifts greater than 60 lbs require assistance or mechanical equipment.
	Decontamination solutions	• Material Safety Data Sheets for all decon solutions should be included with each Site Safety and Health Plan. • First aid equipment should be available based on MSDS requirements.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Safety program and procedures	General practices	• At least one copy of this plan shall be available at the project site, in a location readily available to all personnel, including visitors. • As practical, personnel should practice contamination avoidance. All solid and liquid samples should be collected in such a manner as to minimize contact with the material. • Contaminated protective equipment, such as respirators, hoses, boots, etc., shall not be removed from the area of potential contamination until it has been cleaned or properly packaged and labeled. • Legible and understandable precautionary labels which comply with the hazard communication standard shall be affixed prominently to all containers of contaminated scrap, waste, debris, and clothing. • Removal of contaminated solids from protective clothing or equipment by blowing, shaking, or any other means that disperse contaminants into the air is prohibited. • No food or beverages shall be present or consumed in the regulated area. • No tobacco products shall be present or used in the regulated area. • Cosmetics shall not be applied within the regulated area. • Contaminated materials shall be stored in tightly closed containers, in well-ventilated areas. • Emergency equipment shall be located outside storage areas in readily accessible locations that will remain minimally contaminated in an emergency. • All areas that have been determined as uncontaminated inside the regulated area will be clearly marked as such. No personnel, equipment, etc., shall be in these areas until they have been decontaminated. • Ensure that no one is required to lift more than 60 pounds. • All crew personnel on site shall use the buddy system (working in pairs or teams). If protective equipment or noise levels impair communications, then prearranged hand signals shall be used for communication. Visual contact shall be maintained between crew members at all times, and crew members must observe each other for signs of toxic exposure.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Safety program and procedures (cont'd)	General practices (cont'd)	Indication of adverse effects include, but are not limited to: changes in complexion and skin coloration; changes in coordination; changes in demeanor; excessive salivation and pupillary response and changes in speech pattern. • Employees shall inform their partners or fellow team members of nonvisible effects of overexposure to toxic materials. The symptoms of such overexposure may include: Headaches; dizziness; nausea; blurred vision; cramps; irritation of eyes, skin, or respiratory tract. • Visitors to the site shall abide by the following: All visitors shall be instructed to stay outside the exclusion and contamination reduction zones and remain within the support zone during the extent of their stay. Visitors shall be cautioned to avoid skin contact with contaminated or potentially contaminated surfaces; Visitors requesting to observe work conducted in the exclusion zone (EZ) must wear all appropriate PPE prior to entry into that zone. If respiratory protective devices are necessary, visitors who wish to enter the exclusion zone must produce evidence that they have had a complete physical examination, respirator training, and have been fit tested for the respirator to be used within the past 12 months.
Operating procedures	Drilling equipment operations	• Specific elements of this section may not be applicable depending on the type of drilling equipment used and/or for the anticipated scope of this project. Prior to the start of site work, the drilling subcontractor will inspect all drilling equipment in the presence of the Site Supervisor.
	General drilling practices	• The departing driller shall inform the oncoming driller of any special hazards or ongoing work that may affect the safety of the crew. • Fire fighting equipment shall not be tampered with and shall not be removed for other than the intended fire fighting purposes or for servicing.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Operating procedures (cont'd)	General drilling practices (cont'd)	• If lubrication fittings are not accessible with guards in place, machinery shall be stopped for oil and greasing. • Rigging material equipment for material handling shall be checked prior to use on each shift and as often as necessary to ensure it is safe. Defective rigging shall be removed from service. • The area around the derrick ladder shall be kept clear to provide unimpeded access to the ladder. • Work areas and walkways shall not be obstructed. • The rotary table of the rig floor shall be kept free of obstructions and free of undue accumulation of oil, water, ice, or circulating fluids.
	Hoisting operations	• The derrick must not be raised until the rig has been blocked, leveled, and chocked. • Drillers shall never engage the rotary clutch without watching the rotary table and ensuring it is clear of personnel and equipment. • Unless the draw works is equipped with an automatic feed control, the brake shall not be left unattended without first being tied down. • Drill pipe or casing shall not be picked up suddenly. • Drill pipe shall not be hoisted until the driller is sure that the pipe is latched in the elevator, or the derrick man has signaled that he may safely hoist the pipe. • During instances of unusual loading of the derrick or mast, such as when making an unusually hard pull, only the driller should be on the rig floor and no one shall be on the rig or derrick. • The brakes on the draw works of every drilling rig shall be tested by each driller, when he comes on shift, to determine whether they are in good order.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Operating procedures (cont'd)	Hoisting operations (cont'd)	• The brakes shall be thoroughly inspected by a competent individual each week. • A hoisting line with a load imposed shall not be permitted to be in direct contact with any derrick member or stationary equipment, unless it has been specifically designed for line contact. • Workers shall never stand near the well bore whenever any wire line device is being run. • Hoisting control stations shall be kept clean and controls labeled as to their functions.
	Riding hoisting equipment	• Under no circumstances will personnel be permitted to ride the traveling block or elevators, nor will the cat line be used as a personnel carrier.
	Cat line operations	• Only experienced workers will be allowed to operate the cat head controls. The kill switch must be clearly labeled and operational prior to operation of the cat line. • The cat head area must be kept free of obstructions and entanglements. • The operator shall not use more wraps than necessary to pick up the load. More than one layer of wrapping is not permitted. • Personnel shall not stand near, step over, or go under a cable or cat line which is under tension. • Employees rigging loads on cat lines shall: keep out from under the load; keep fingers and feet where they will not be crushed; be sure to signal clearly when the load is being picked up; use standard visual signals only and not depend on shouting to coworkers; and make sure the load is properly rigged, since a sudden jerk in the cat line will shift or drop the load.
	Pipe handling	• Pipe shall be loaded and unloaded, layer by layer, with the bottom layer pinned or blocked securely on all four corners. Each successive layer should be effectively blocked or chocked. • Workers shall not be permitted on top of the load during loading, unloading, or transferring of pipe or rolling stock.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARD	RECOMMENDED CONTROLS
Operating procedures (cont'd)	Pipe handling (cont'd)	• Employees shall be instructed never to try to stop rolling pipe or casing; they should be instructed to stand clear of rolling pipe. • Slip handles shall be used to lift and move slips. Employees should not be permitted to kick slips into position. • When pipe is being hoisted, personnel shall not stand where the bottom end of the pipe could whip and strike them. • Pipe stored in racks, catwalks, or on flatbed trucks shall be chocked to prevent rolling.
	Derrick operations	• The derrick climber shall be used whenever climbing the derrick should be tied off, or otherwise protected from falling when working in an unguarded elevated position. • All stands of pipe and drill collars racked in a derrick shall be secured with rope or otherwise adequately secured. • Tools, derrick parts, or materials of any kind shall not be thrown from the derrick. • The elevators must be properly clamped onto all pipe joints prior to the driller engaging the load.
	Making and breaking joints	• Tongs shall be used for the initial making up and breaking of the joint. The rotary table should not be used for the initial breaking of a joint. • Employees making or breaking joints shall not be permitted to stand within the arc of the tong handles when the tong pull line is under tension. Employees should handle the tongs only by the appropriate handles. • Employees shall be trained in the safe use of spinning chains. Spinning chains should not be handled near the rotary table while it is in motion.
	Excavation safety	• If excavation activities must be performed, a SSHP addenda shall be prepared and approved prior to work start.
	Confined-space entry	• If confined-space entry must be performed, a SSHP addenda shall be prepared and approved prior to work start.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Heat illness prevention	Heat stress	• One or more of the following control measures can be used to help control heat stress and are mandatory if any site worker has a heart rate in excess of 110 beats per minute (measured immediately prior to rest period): Site workers will be encouraged to drink plenty of water throughout the day. They will be advised to slightly increase their salt intake by lightly salting their food; on-site drinking water will be kept cool (50 to 60°F) to encourage personnel to drink frequently; a work regimen that will provide adequate rest periods for cooling down will be established, as required; all personnel will be advised of the dangers and symptoms of heat stroke, heat exhaustion, and heat cramps; cooling devices such as vortex tubes or cooling vests should be used when personnel must wear impermeable clothing in conditions of extreme heat; employees should be instructed to monitor themselves and coworkers for signs of heat stress and to take additional breaks as necessary; a shaded rest area must be provided. All breaks should take place in the shaded rest area; employees shall not be assigned to other tasks during breaks; employees shall remove impermeable garments during rest periods. This includes white Tyvek-type garments; and all employees shall be informed of the importance of adequate rest, acclimation, and proper diet in the prevention of heat stress disorders. • The signs of heat stress disorders are as follows: Heat Cramps - Heat cramps are caused by heavy sweating and inadequate electrolyte replacement. Signs and symptoms include muscle spasms and pain in the hands, feet, and abdomen; Heat Exhaustion - Heat exhaustion occurs from increased stress on various body organs. Signs and symptoms include; pale, cool, moist skin; heavy sweating; dizziness, nausea; and fainting; and Heat Stroke - Heat stroke is the most serious form of heat stress and should always be treated as a medical emergency. The body's temperature regulation system fails, and the body temperature rapidly rises to critical levels. Immediate action must be taken to cool the body before serious death or injury occurs. Signs and symptoms of heat stroke include red, hot, usually dry skin; lack of, or reduced perspiration; nausea; dizziness and confusion; strong, rapid pulse and confusion; and coma.

ACTIVITY HAZARD ANALYSIS

ACTIVITY: SAFETY PROGRAM AND PROCEDURES

Analyzed By/Date____

Reviewed By/Date____

ACTIVITY	POTENTIAL HAZARDS	RECOMMENDED CONTROLS
Heat illness prevention (cont'd)	Hearing conservation	• All on-site personnel shall wear hearing protection with a Noise Reduction Rating (NRR) of at least 20 when noise levels exceed 85 dBA. All site personnel who may be exposed to noise shall also receive baseline and annual audiograms and training as to the causes and prevention of hearing loss. Whenever possible, equipment that does not generate excessive noise levels will be selected for this project. If the use of noisy equipment is unavoidable, wherever possible, barriers, or increased distance will be used to minimize worker exposure to noise.
Sanitation	Potable water	• The following rules apply for all project field operations: an adequate supply of potable water will be provided at each work site; portable containers used to dispense drinking water shall be capable of being tightly closed, and shall be equipped with a tap dispenser. Water shall not be drunk directly from the container; containers used for drinking water shall be clearly marked and not used for any other purpose; and disposable cups will be supplied; both a sanitary container for unused cups and a receptacle for disposing of used cups shall be provided.
	Non-potable water	• Outlets for non-potable water shall be identified to clearly indicate that the water is unsafe and is not to be used for drinking, washing, or cooking purposes. There shall be no cross connection (open or potential) between potable and non-potable water systems. Non-potable and potable water systems shall be separated so as to minimize confusion and possible cross contamination.
	Toilet facilities	• Toilet facilities shall be available for employees. If permanent toilet facilities are not available, i.e., the work site is more than 500 feet from a building with an accessible toilet, than a portable chemical toilet(s) will be provided.
	Trash collection	• Trash collection from the contamination reduction zone (CRZ) will be separated as routine hazardous waste. Trash collected in the support and break areas will be disposed of as non-hazardous waste. Labeled trash receptacles will be set up in the CRZ and in support zone.

Appendix D

(For Safety Staff only)	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT *(For Use of this Form See Help Menu and USACE Suppl to AR 385-40)*	REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)

1. ACCIDENT CLASSIFICATION

PERSONNEL CLASSIFICATION	INJURY/ILLNESS/FATAL	PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED	DIVING
GOVERNMENT ☐ CIVILIAN ☐ MILITARY	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ CONTRACTOR	☐	☐ FIRE INVOLVED ☐ OTHER	☐	☐
☐ PUBLIC	☐ FATAL ☐ OTHER		☐	

2. PERSONAL DATA

a. Name *(Last, First, MI)*	b. AGE	c. SEX ☐ MALE ☐ FEMALE	d. SOCIAL SECURITY NUMBER	e. GRADE

f. JOB SERIES/TITLE	g. DUTY STATUS AT TIME OF ACCIDENT	h. EMPLOYMENT STATUS AT TIME OF ACCIDENT
	☐ ON DUTY ☐ TDY ☐ OFF DUTY	☐ ARMY ACTIVE ☐ ARMY RESERVE ☐ VOLUNTEER ☐ PERMANENT ☐ FOREIGN NATIONAL ☐ SEASONAL ☐ TEMPORARY ☐ STUDENT ☐ OTHER *(Specify)*

3. GENERAL INFORMATION

a. DATE OF ACCIDENT *(month/day/year)*	b. TIME OF ACCIDENT *(Military time)*	c. EXACT LOCATION OF ACCIDENT	d. CONTRACTOR'S NAME
	hrs		(1) PRIME:

e. CONTRACT NUMBER	f. TYPE OF CONTRACT	g. HAZARDOUS/TOXIC WASTE ACTIVITY	
☐ CIVIL WORKS ☐ MILITARY ☐ OTHER *(Specify)*	☐ CONSTRUCTION ☐ SERVICE ☐ A/E ☐ DREDGE ☐ OTHER *(Specify)*	☐ SUPERFUND ☐ DERP ☐ IRP ☐ OTHER *(Specify)*	(2) SUBCONTRACTOR:

4. CONSTRUCTION ACTIVITIES ONLY *(Fill in line and corresponding code number in box from list - see help menu)*

a. CONSTRUCTION ACTIVITY	(CODE) #	b. TYPE OF CONSTRUCTION EQUIPMENT	(CODE) #

5. INJURY/ILLNESS INFORMATION *(Include name on line and corresponding code number in box for items e, f & g - see help menu)*

a. SEVERITY OF ILLNESS/INJURY	(CODE) #	B. ESTIMATED DAYS LOST	C. ESTIMATED DAYS HOSPIT-ALIZED	D. ESTIMATED DAYS RESTRICTED DUTY

e. BODY PART AFFECTED	(CODE)	g. TYPE AND SOURCE OF INJURY/ILLNESS	(CODE)
PRIMARY	#	TYPE	#
SECONDARY	#	SOURCE	#
f. NATURE OF ILLNESS / INJURY	(CODE) #		

6. PUBLIC FATALITY *(Fill in line and correspondence code number in box - see help menu)*

a. ACTIVITY AT TIME OF ACCIDENT	(CODE) #	b. PERSONAL FLOATATION DEVICE USED? ☐ YES ☐ NO ☐ N/A

7. MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE	b. TYPE OF COLLISION
☐☐ PICKUP/VAN ☐☐ AUTOMOBILE ☐☐ TRUCK ☐☐ OTHER *(Specify)*	☐ SIDE SWIPE ☐ HEAD ON ☐ REAR END ☐ BROADSIDE ☐ ROLL OVER ☐ BACKING ☐ OTHER *(Specify)*

c. SEAT BELTS	USED	NOT USED	NOT AVAILABLE
(1) FRONT SEAT			
(2) REAR SEAT			

8. PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM	B. OWNERSHIP	C. $ AMOUNT OF DAMAGE
(1)		
(2)		
(3)		

9. VESSEL/FLOATING PLANT ACCIDENT *(Fill in line and correspondence code number in box from list - see help menu)*

a. TYPE OF VESSEl/FLOATING PLANT	(CODE) #	b. TYPE OF COLLISION/MISHAP	(CODE) #

10. ACCIDENT DESCRIPTION *(Use additional paper, if necessary)*

See attached page.

11. CAUSAL FACTOR(S) *(Read Instruction Before Completing)*

a. (Explain YES answers in item 13)

	YES	NO
DESIGN: Was design of facility, workplace or equipment a factor?	☐	☐
INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor?	☐	☐
PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor?	☐	☐
OPERATING PROCEDURES: Were operating procedures a factor?	☐	☐
JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred?	☐	☐
HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident?	☐	☐
ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident?	☐	☐

a. *(CONTINUED)*

	YES	NO
CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident?	☐	☐
OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident?	☐	☐
SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task?	☐	☐
PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident?	☐	☐
DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident	☐	☐

b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT?

☐ YES *(If yes, attach a copy.)* ☐ NO

12. TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? ☐ YES ☐ NO

b. TYPE OF TRAINING. ☐ CLASSROOM ☐ ON JOB

c. DATE OF MOST RECENT FORMAL TRAINING. (Month) (Day) (Year)

13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES *(See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)*

a. DIRECT CAUSE

See attached page.

b. INDIRECT CAUSE(S)

See attached page.

14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).

DESCRIBE FULLY:

See attached page.

15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.

a. BEGINNING (Month/Day/Year)

b. ANTICIPATED COMPLETION (Month/Day/Year)

c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT

CORPS ______

CONTRACTOR ______

d. DATE *(Mo/Da/Yr)*

e. ORGANIZATION IDENTIFIER *(Div, Br, Sect)*

f. OFFICE SYMBOL

16. MANAGEMENT REVIEW *(1st)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE | TITLE | DATE

17. MANAGEMENT REVIEW *(2nd - Chief Operations, Construction, Engineering, etc.)*

a. ☐ CONCUR b. ☐ NON CONCUR c. COMMENTS

SIGNATURE | TITLE | DATE

18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW

a. ☐ CONCUR b. ☐ NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS

SIGNATURE | TITLE | DATE

19. COMMAND APPROVAL

COMMENTS

COMMANDER SIGNATURE

DATE

*U.S. GOVERNMENT PRINTING OFFICE: 1993-0-791-757

10. ACCIDENT DESCRIPTION *(Continuation)*

13a. DIRECT CAUSE *(Continuation)*

13b. INDIRECT CAUSES *(Continuation)*

14. ACTION(S) TAKEN, ANTICIPATED, OR RECOMMENDED TO ELIMINATE CAUSE(S) *(Continuation)*

GENERAL. Complete a separate report for each person who was *injured, caused, or contributed* to the accident (excluding uninjured personnel and witnesses). Use of this form for reporting USACE employee first-aid type injuries not submitted to the Office of Workers' Compensation Programs (OWCP) shall be at the descretion of the FOA commander. Please type or print legibly. Appropriate items shall be marked with an "X" in box(es). If additional space is needed, provide the information on a separate sheet and attach to the completed form. Ensure that these instructions are forwarded with the completed report to the designated management reviewers indicated in sections 16. and 17.

INSTRUCTIONS FOR SECTION 1 — ACCIDENT CLASSIFICATION. *(Mark All Boxes That Are Applicable.)*

a. GOVERNMENT. Mark "CIVILIAN" box if accident involved government civilian employee; mark "MILITARY" box if accident involved U.S. military personnel.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any government civilian employee injury, illness, or fatality that requires the submission of OWCP Forms CA-1 (injury), CA-2 (illness), or CA-6 (fatality) to OWCP; mark if accident resulted in military personnel lost-time or fatal injury or illness.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to government property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved an in-house USACE diving activity.

b. CONTRACTOR.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in any contractor lost-time injury/illness or fatality.

(2) PROPERTY DAMAGE — Mark the appropriate box if accident resulted in any damage of $1000 or more to contractor property (including motor vehicles).

(3) VEHICLE INVOLVED — Mark if accident involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" or "PROPERTY DAMAGE" are marked.

(4) DIVING ACTIVITY — Mark if the accident involved a USACE Contractor diving activity.

c. PUBLIC.

(1) INJURY/ILLNESS/FATALITY — Mark if accident resulted in public fatality or permanent total disability. (The "OTHER" box will be marked when requested by the FOA to report an unusual non-fatal public accident that could result in claims against the government or as otherwise directed by the FOA Commander).

(2) VOID SPACE — Make no entry.

(3) VEHICLE INVOLVED — Mark if accident resulted in a fatality to a member of the public and involved a motor vehicle, *regardless* of whether "INJURY/ILLNESS/FATALITY" is marked.

(4) VOID SPACE — Make no entry.

INSTRUCTIONS FOR SECTION 2 — PERSONAL DATA

a. NAME — (MANDATORY FOR GOVERNMENT ACCIDENTS. OPTIONAL AT THE DISCRETION OF THE FOA COMMANDER FOR CONTRACTOR AND PUBLIC ACCIDENTS). Enter last name, first name, middle initial of person involved.

b. AGE — Enter age.

c. SEX — Mark appropriate box.

d. SOCIAL SECURITY NUMBER — (FOR GOVERNMENT PERSONNEL ONLY) Enter the social security number (or other personal identification number if no social security number issued).

e. GRADE — (FOR GOVERNMENT PERSONNEL ONLY) Enter pay grade. Example: O-6; E-7; WG-8; WS-12; GS-11; etc.

f. JOB SERIES/TITLE — For *government civilian employees* enter the pay plan, full series number, and job title, e.g. GS-0810/Civil Engineer. For *military personnel* enter the primary military occupational specialty (PMOS), e.g., 15A30 or 11G50. For *contractor employees* enter the job title assigned to the injured person, e.g. carpenter, laborer, surveyor, etc.,

g. DUTY STATUS — Mark the appropriate box.

(1) ON DUTY — Person was at duty station during duty hours or person was away from duty station during duty hours but on official business at time of the accident.

(2) TDY - Person was on official business, away from the duty station and with travel orders at time of accident. Line-of-duty investigation required.

(3) OFF DUTY - Person was not on official business at time of accident

h. EMPLOYMENT STATUS — (FOR GOVERNMENT PERSONNEL ONLY) Mark the most appropriate box. If "OTHER" is marked, specify the employment status of the person.

INSTRUCTION FOR SECTION 3 — GENERAL INFORMATION

a. DATE OF ACCIDENT — Enter the month, day, and year of accident.

b. TIME OF ACCIDENT — Enter the local time of accident in military time. Example: 1430 hrs (not 2:30 p.m.).

c. EXACT LOCATION OF ACCIDENT — Enter facts needed to locate the accident scene. (installation/project name, building number, street, direction and distance from closest landmark, etc.,).

d. CONTRACTOR NAME

(1) PRIME — Enter the exact name (title of firm) of the prime contractor.

(2) SUBCONTRACTOR — Enter the name of any subcontractor involved in the accident.

e. CONTRACT NUMBER — Mark the appropriate box to identify if contract is civil works, military, or other: if "OTHER" is marked, specify contract appropriation on line provided. Enter complete contract number of prime contract, e.g., DACW 09-85-C-0100.

f. TYPE OF CONTRACT — Mark appropriate box. A/E means architect/engineer. If "OTHER" is marked, specify type of contract on line provided.

g. HAZARDOUS/TOXIC WASTE ACTIVITY (HTW) — Mark the box to identify the HTW activity being performed at the time of the accident. For Superfund, DERP, and Installation Restoration Program (IRP) HTW activities include accidents that occurred during inventory, predesign, design, and construction. For the purpose of accident reporting, DERP Formerly Used DoD Site (FUDS) activities and IRP activities will be treated separately. For Civil Works O&M HTW activities mark the "OTHER" box.

INSTRUCTIONS FOR SECTION 4 — CONSTRUCTION ACTIVITIES

a. CONSTRUCTION ACTIVITY — Select the *most appropriate* construction activity being performed at time of accident from the list below. Enter the activity name and place the corresponding code number identified in the box.

CONSTRUCTION ACTIVITY LIST

1. MOBILIZATION	14. ELECTRICAL
2. SITE PREPARATION	15. SCAFFOLDING/ACCESS
3. EXCAVATION/TRENCHING	16. MECHANICAL
4. GRADING (EARTHWORK)	17. PAINTING
5. PIPING/UTILITIES	18. EQUIPMENT/MAINTENANCE
6. FOUNDATION	19. TUNNELING
7. FORMING	20. WAREHOUSING/STORAGE
8. CONCRETE PLACEMENT	21. PAVING
9. STEEL ERECTION	22. FENCING
10. ROOFING	23. SIGNING
11. FRAMING	24. LANDSCAPING/IRRIGATION
12. MASONRY	25. INSULATION
13. CARPENTRY	26. DEMOLITION

INSTRUCTIONS FOR SECTION 13 – CAUSES

a. DIRECT CAUSES – The direct cause is that single factor which most directly lead to the accident. See examples below.

b. INDIRECT CAUSES – Indirect causes are those factors which contributed to but did not directly initiate the occurrence of the accident.

Examples for section 13:

a. Employee was dismantling scaffold and fell 12 feet from unguarded opening.
Direct cause: failure to provide fall protection at elevation.
Indirect causes: failure to enforce USACE safety requirements; improper training/motivation of employee (possibility that employee was not knowledgeable of USACE fall protection requirements or was lax in his attitude towards safety); failure to ensure provision of positive fall protection whenever elevated; failure to address fall protection during scaffold dismantling in phase hazard analysis.

b. Private citizen had stopped his vehicle at intersection for red light when vehicle was struck in rear by USACE vehicle. (note USACE vehicle was in proper/safe working condition).
Direct cause: failure of USACE driver to maintain control of and stop USACE vehicle within safe distance.
Indirect cause: Failure of employee to pay attention to driving (defensive driving).

INSTRUCTIONS FOR SECTION 14 – ACTION TO ELIMINATE CAUSE(S)

DESCRIPTION – Fully describe all the actions taken, anticipated, and recommended to eliminate the cause(s) and prevent reoccurrence of similar accidents/illnesses. Continue on blank sheets of paper if necessary to fully explain and attach to the completed report form.

INSTRUCTIONS FOR SECTION 15 – DATES FOR ACTION

a. BEGIN DATE – Enter the date when the corrective action(s) identified in Section 14 will begin.

b. COMPLETE DATE – Enter the date when the corrective action(s) identified in Section 14 will be completed.

c. TITLE AND SIGNATURE – Enter the title and signature of supervisor completing the accident report. For a GOVERNMENT employee accident/illness the immediate supervisor will complete and sign the report. For PUBLIC accidents the USACE Project Manager/Area Engineer responsible for the USACE property where the accident happened shall complete and sign the report. For CONTRACTOR accidents the Contractor's project manager shall complete and sign the report and provide to the USACE supervisor responsible for oversight of that contractor activity. This USACE Supervisor shall also sign the report. Upon entering the information required in 15.d, 15.e and 15.f below, the responsible USACE supervisor shall forward the report for management review as indicated in Section 16.

d. DATE SIGNED – Enter the month, day, and year that the report was signed by the responsible supervisor.

e. ORGANIZATION NAME – For GOVERNMENT employee accidents enter the USACE organization name (Division, Branch, Section, etc.) of the injured employee. For PUBLIC accidents enter the USACE organization name for the person identified in block 15.c. For CONTRACTOR accidents enter the USACE organization name for the USACE office responsible for providing contract administration oversight.

f. OFFICE SYMBOL – Enter the latest complete USACE Office Symbol for the USACE organization identified in block 15.e.

INSTRUCTIONS FOR SECTION 16 – MANAGEMENT REVIEW (1st)

1ST REVIEW – Each USACE FOA shall determine who will provide 1st management review. The responsible USACE supervisor in section 15.c shall forward the completed report to the USACE office designated as the 1st Reviewer by the FOA. Upon receipt, the Chief of the Office shall review the completed report, mark the appropriate box, provide substantive comments, sign, date, and forward to the FOA Staff Chief (2nd review) for review and comment.

INSTRUCTIONS FOR SECTION 17 – MANAGEMENT REVIEW (2nd)

2ND REVIEW – The FOA Staff Chief (i.e., FOA Chief of Construction, Operations, Engineering, Planning, etc.) shall mark the appropriate box, review the completed report, provide substantive comments, sign, date, and return to the FOA Safety and Occupational Health Office.

INSTRUCTIONS FOR SECTION 18 – SAFETY AND OCCUPATIONAL HEALTH REVIEW

3RD REVIEW – The FOA Safety and Occupational Health Office shall review the completed report, mark the appropriate box, ensure that any inadequacies, discrepancies, etc, are rectified by the responsible supervisor and management reviewers, provide substantive comments, sign, date and forward to the FOA Commander for review, comment, and signature.

INSTRUCTION FOR SECTION 19 – COMMAND APPROVAL

4TH REVIEW – The FOA Commander shall (to include the person designated Acting Commander in his absence) review the completed report, comment if required, sign, date, and forward the report to the FOA Safety and Occupational Health Office. Signature authority shall not be delegated.

b. TYPE OF CONSTRUCTION EQUIPMENT—Select the equipment involved in the accident from the list below. Enter the name and place the corresponding code number identified in the box. If equipment is not included below, use code 24, "OTHER", and write in specific type of equipment.

CONSTRUCTION EQUIPMENT

1. GRADER
2. DRAGLINE
3. CRANE (ON VESSEL/BARGE)
4. CRANE (TRACKED)
5. CRANE (RUBBER TIRE)
6. CRANE (VEHICLE MOUNTED)
7. CRANE (TOWER)
8. SHOVEL
9. SCRAPER
10. PUMP TRUCK (CONCRETE)
11. TRUCK (CONCRETE/TRANSIT MIXER)
12. DUMP TRUCK (HIGHWAY)
13. DUMP TRUCK (OFF HIGHWAY)
14. TRUCK (OTHER)
15. FORKLIFT
16. BACKHOE
17. FRONT-END LOADER
18. PILE DRIVER
19. TRACTOR (UTILITY)
20. MANLIFT
21. DOZER
22. DRILL RIG
23. COMPACTOR/VIBRATORY ROLLER
24. OTHER

INSTRUCTIONS FOR SECTION 5—INJURY/ILLNESS INFORMATION

a. SEVERITY OF INJURY / ILLNESS - Reference para 2-10 of USACE Suppl 1 to AR 385-40 and enter code and description from list below.

NOI	NO INJURY
FAT	FATALITY
PTL	PERMANENT TOTAL DISABILITY
PPR	PERMANENT PARTIAL DISABILITY
LWD	LOST WORKDAY CASE INVOLVING DAYS AWAY FROM WORK
NLW	RECORDABLE CASE WITHOUT LOST WORKDAYS
RFA	RECORDABLE FIRST AID CASE
NRI	NON-RECORDABLE INJURY

b. ESTIMATED DAYS LOST—Enter the estimated number of workdays the person will lose from work.

c. ESTIMATED DAYS HOSPITALIZED—Enter the estimated number of workdays the person will be hospitalized.

d. ESTIMATED DAYS RESTRICTED DUTY—Enter the estimated number of workdays the person, as a result of the accident, will not be able to perform all of their regular duties.

e. BODY PART AFFECTED—Select the most appropriate primary and when applicable, secondary body part affected from the list below. Enter body part name on line and place the corresponding code letters identifying that body part in the box.

GENERAL BODY AREA	CODE	BODY PART NAME
ARM/WRIST	AB	ARM AND WRIST
	AS	ARM OR WRIST
TRUNK, EXTERNAL MUSCULATURE	B1	SINGLE BREAST
	B2	BOTH BREASTS
	B3	SINGLE TESTICLE
	B4	BOTH TESTICLES
	BA	ABDOMEN
	BC	CHEST
	BL	LOWER BACK
	BP	PENIS
	BS	SIDE
	BU	UPPER BACK
	BW	WAIST
	BZ	TRUNK OTHER
HEAD, INTERNAL	C1	SINGLE EAR INTERNAL
	C2	BOTH EARS INTERNAL
	C3	SINGLE EYE INTERNAL
	C4	BOTH EYES INTERNAL
	CB	BRAIN
	CC	CRANIAL BONES
	CD	TEETH
	CJ	JAW
	CL	THROAT, LARYNX
	CM	MOUTH
	CN	NOSE
	CR	THROAT, OTHER
	CT	TONGUE
	CZ	HEAD OTHER INTERNAL
ELBOW	EB	BOTH ELBOWS
	ES	SINGLE ELBOW
FINGER	F1	FIRST FINGER
	F2	BOTH FIRST FINGERS
	F3	SECOND FINGER
	F4	BOTH SECOND FINGERS
	F5	THIRD FINGER
	F6	BOTH THIRD FINGERS
	F7	FOURTH FINGER
	F8	BOTH FOURTH FINGERS
TOE	G1	GREAT TOE
	G2	BOTH GREAT TOES
	G3	TOE OTHER
	G4	TOES OTHER
HEAD, EXTERNAL	H1	EYE EXTERNAL
	H2	BOTH EYES EXTERNAL
	H3	EAR EXTERNAL
	H4	BOTH EARS EXTERNAL
	HC	CHIN
	HF	FACE
	HK	NECK/THROAT
	HM	MOUTH/LIPS
	HN	NOSE
	HS	SCALP
KNEE	KB	BOTH KNEES
	KS	KNEE
LEG, HIP, ANKLE, BUTTOCK	LB	BOTH LEGS/HIPS/ ANKLES/BUTTOCKS
	LS	SINGLE LEG/HIP ANKLE/BUTTOCK
HAND	MB	BOTH HANDS
	MS	SINGLE HAND
FOOT	PB	BOTH FEET
	PS	SINGLE FOOT
TRUNK, BONES	R1	SINGLE COLLAR BONE
	R2	BOTH COLLAR BONES
	R3	SHOULDER BLADE
	R4	BOTH SHOULDER BLADES
	RB	RIB
	RS	STERNUM (BREAST BONE)
	RV	VERTEBRAE (SPINE; DISC)
	RZ	TRUNK BONES OTHER
SHOULDER	SB	BOTH SHOULDERS
	SS	SINGLE SHOULDER
THUMB	TB	BOTH THUMBS
	TS	SINGLE THUMB
TRUNK, INTERNAL ORGANS	V1	LUNG, SINGLE
	V2	LUNGS, BOTH
	V3	KIDNEY, SINGLE
	V4	KIDNEYS, BOTH
	VH	HEART
	VL	LIVER
	VR	REPRODUCTIVE ORGANS
	VS	STOMACH
	VV	INTESTINES
	VZ	TRUNK, INTERNAL; OTHER

f. NATURE OF INJURY/ILLNESS - Select the most appropriate nature of injury / illness from the list below. This nature of injury / illness shall correspond to the primary body part selected in 5e, above. Enter the nature of injury / illness name on the line and place the corresponding CODE letters in the box provided.

* The injury or condition selected below must be caused by a specific incident or event which occurred during a single work day or shift.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
*TRAUMATIC INJURY OR DISABILITY	TA	AMPUTATION
	TB	BACK STRAIN
	TC	CONTUSION; BRUISE; ABRASION
	TD	DISLOCATION
	TF	FRACTURE
	TH	HERNIA
	TK	CONCUSSION
	TL	LACERATION, CUT
	TP	PUNCTURE
	TS	STRAIN, MULTIPLE
	TU	BURN, SCALD, SUNBURN
	TI	TRAUMATIC SKIN DISEASES/ CONDITIONS INCLUDING DERMATITIS
	TR	TRAUMATIC RESPIRATORY DISEASE
	TQ	TRAUMATIC FOOD POISONING
	TW	TRAUMATIC TUBERCULOSIS
	TX	TRAUMATIC VIROLOGICAL/ INFECTIVE/PARASITIC DISEASE
	T1	TRAUMATIC CEREBRAL VASCULAR CONDITION/STROKE
	T2	TRAUMATIC HEARING LOSS
	T3	TRAUMATIC HEART CONDITION
	T4	TRAUMATIC MENTAL DISORDER; STRESS; NERVOUS CONDITION
	T8	TRAUMATIC INJURY — OTHER (EXCEPT DISEASE, ILLNESS)

**A nontraumatic physiological harm or loss of capacity produced by systemic infection; continued or repeated stress or strain; exposure to toxins, poisons, fumes, etc.; or other continued and repeated exposures to conditions of the work environment over a long period of time. For practical purposes, an occupational illness/disease or disability is any reported condition which doses not meet the definition of traumatic injury or disability as described above.

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
**NON-TRAUMATIC ILLNESS/DISEASE OR DISABILITY		
RESPIRATORY DISEASE	RA	ASBESTOSIS
	RB	BRONCHITIS
	RE	EMPHYSEMA
	RP	PNEUMOCONIOSIS
	RS	SILICOSIS
	R9	RESPIRATORY DISEASE, OTHER
VIROLOGICAL, INFECTIVE & PARASITIC DISEASES	VB	BRUCELLOSIS
	VC	COCCIDIOMYCOSIS
	VF	FOOD POISONING
	VH	HEPATITIS
	VM	MALARIA
	VS	STAPHYLOCOCCUS
	VT	TUBERCULOSIS
	V9	VIROLOGICAL/INFECTIVE/ PARASITIC—OTHER
DISABILITY, OCCUPATIONAL	DA	ARTHRITIS, BURSITIS
	DB	BACK STRAIN, BACK SPRAIN
	DC	CEREBRAL VASCULAR CONDITION; STROKE
	DO	ENDEMIC DISEASE (OTHER THAN CODE TYPES R&S)
	DE	EFFECT OF ENVIRONMENTAL CONDITION
	DH	HEARING LOSS
	DK	HEART CONDITION
	DM	MENTAL DISORDER, EMOTIONAL STRESS NERVOUS CONDITION
	DR	RADIATION
	DS	STRAIN, MULTIPLE
	DU	ULCER
	DV	OTHER VASCULAR CONDITIONS
	D9	DISABILITY, OTHER

GENERAL NATURE CATEGORY	CODE	NATURE OF INJURY NAME
SKIN DISEASE OR CONDITION	SB	BIOLOGICAL
	SC	CHEMICAL
	S9	DERMATITIS, UNCLASSIFIED

g. TYPE AND SOURCE OF INJURY/ILLNESS (CAUSE) - Type and Source Codes are used to describe what caused the incident. The Type Code stands for an ACTION and the Source Code for an OBJECT or SUBSTANCE. Together, they form a brief description of how the incident occurred. Where there are two different sources, code the initiating source of the incident (see example 1, below). Examples:

(1) An employee tripped on carpet and struck his head on a desk.
TYPE: 210 (fell on same level) SOURCE: 0110 (walking/working surface)

NOTE: This example would NOT be coded 120 (struck against) and 0140 (furniture).

(2) A Park Ranger contracted dermatitis from contact with poison ivy/oak.
TYPE: 510 (contact) SOURCE: 0920 (plant)

(3) A lock and dam mechanic punctured his finger with a metal sliver while grinding a turbine blade.
TYPE: 410 (punctured by) SOURCE: 0830 (metal)

(4) An employee was driving a government vehicle when it was struck by another vehicle..
TYPE: 800 (traveling in) SOURCE: 0421 (government-owned vehicle, as driver)

NOTE: The Type Code 800, "Traveling In" is different from the other type codes in that its function is not to identify factors contributing to the injury or fatality, but rather to collect data on the type of vehicle the employee was operating or traveling in at the time of the incident.

Select the most appropriate TYPE and SOURCE identifier from the list below and enter the name on the line and the corresponding code in the appropriate box.

CODE	TYPE OF INJURY NAME
	STRUCK
0110	STRUCK BY
0111	STRUCK BY FALLING OBJECT
0120	STRUCK AGAINST
	FELL, SLIPPED, TRIPPED
0210	FELL ON SAME LEVEL
0220	FELL ON DIFFERENT LEVEL
0230	SLIPPED, TRIPPED (NO FALL)
	CAUGHT
0310	CAUGHT ON
0320	CAUGHT IN
0330	CAUGHT BETWEEN
	PUNCTURED, LACERATED
0410	PUNCTURED BY
0420	CUT BY
0430	STUNG BY
0440	BITTEN BY
	CONTACTED
0510	CONTACTED WITH (INJURED PERSON MOVING)
0520	CONTACTED BY (OBJECT WAS MOVING)
	EXERTED
0610	LIFTED, STRAINED BY (SINGLE ACTION)
0620	STRESSED BY (REPEATED ACTION)
	EXPOSED
0710	INHALED
0720	INGESTED
0730	ABSORBED
0740	EXPOSED TO
0800	TRAVELING IN

CODE	SOURCE OF INJURY NAME
0100	BUILDING OR WORKING AREA
0110	WALKING/WORKING SURFACE (FLOOR, STREET, SIDEWALKS, ETC)
0120	STAIRS, STEPS
0130	LADDER
0140	FURNITURE, FURNISHINGS, OFFICE EQUIPMENT
0150	BOILER, PRESSURE VESSEL
0160	EQUIPMENT LAYOUT (ERGONOMIC)
0170	WINDOWS, DOORS
0180	ELECTRICITY

CODE	SOURCE OF INJURY NAME
0200	ENVIRONMENTAL CONDITION
0210	TEMPERATURE EXTREME (INDOOR)
0220	WEATHER (ICE, RAIN, HEAT, ETC.)
0230	FIRE, FLAME, SMOKE (NOT TOBACCO)
0240	NOISE
0250	RADIATION
0260	LIGHT
0270	VENTILATION
0271	TOBACCO SMOKE
0280	STRESS (EMOTIONAL)
0290	CONFINED SPACE
0300	MACHINE OR TOOL
0310	HAND TOOL (POWERED: SAW, GRINDER, ETC.)
0320	HAND TOOL (NONPOWERED)
0330	MECHANICAL POWER TRANSMISSION APPARATUS
0340	GUARD, SHIELD (FIXED, MOVEABLE, INTERLOCK)
0350	VIDEO DISPLAY TERMINAL
0360	PUMP, COMPRESSOR, AIR PRESSURE TOOL
0370	HEATING EQUIPMENT
0380	WELDING EQUIPMENT
0400	VEHICLE
0411	AS DRIVER OF PRIVATELY OWNED/RENTAL VEHICLE
0412	AS PASSENGER OF PRIVATELY OWNED/RENTAL VEHICLE
0421	DRIVER OF GOVERNMENT VEHICLE
0422	PASSENGER OF GOVERNMENT VEHICLE
0430	COMMON CARRIER (AIRLINE, BUS, ETC.)
0440	AIRCRAFT (NOT COMMERCIAL)
0450	BOAT, SHIP, BARGE
0500	MATERIAL HANDLING EQUIPMENT
0510	EARTHMOVER (TRACTOR, BACKHOE, ETC.)
0520	CONVEYOR (FOR MATERIAL AND EQUIPMENT)
0530	ELEVATOR, ESCALATOR, PERSONNEL HOIST
0540	HOIST, SLING CHAIN, JACK
0550	CRANE
0551	FORKLIFT
0560	HANDTRUCK, DOLLY
0600	DUST, VAPOR, ETC.
0610	DUST (SILICA, COAL, ETC.)
0620	FIBERS
0621	ASBESTOS
0630	GASES
0631	CARBON MONOXIDE
0640	MIST, STEAM, VAPOR, FUME
0641	WELDING FUMES
0650	PARTICLES (UNIDENTIFIED)
0700	CHEMICAL, PLASTIC, ETC.
0711	DRY CHEMICAL—CORROSIVE
0712	DRY CHEMICAL—TOXIC
0713	DRY CHEMICAL—EXPLOSIVE
0714	DRY CHEMICAL—FLAMMABLE
0721	LIQUID CHEMICAL—CORROSIVE
0722	LIQUID CHEMICAL—TOXIC
0723	LIQUID CHEMICAL—EXPLOSIVE
0724	LIQUID CHEMICAL—FLAMMABLE
0730	PLASTIC
0740	WATER
0750	MEDICINE
0800	INANIMATE OBJECT
0810	BOX, BARREL, ETC.
0820	PAPER
0830	METAL ITEM, MINERAL
0831	NEEDLE
0840	GLASS
0850	SCRAP, TRASH
0860	WOOD
0870	FOOD
0880	CLOTHING, APPAREL, SHOES
0900	ANIMATE OBJECT
0911	DOG
0912	OTHER ANIMAL
0920	PLANT
0930	INSECT
0940	HUMAN (VIOLENCE)
0950	HUMAN (COMMUNICABLE DISEASE)
0960	BACTERIA, VIRUS (NOT HUMAN CONTACT)

CODE	SOURCE OF INJURY NAME
1000	PERSONAL PROTECTIVE EQUIPMENT
1010	PROTECTIVE CLOTHING, SHOES, GLASSES, GOGGLES
1020	RESPIRATOR, MASK
1021	DIVING EQUIPMENT
1030	SAFETY BELT, HARNESS
1040	PARACHUTE

INSTRUCTIONS FOR SECTION 6 — PUBLIC FATALITY

a. ACTIVITY AT TIME OF ACCIDENT—Select the activity being performed at the time of the accident from the list below. Enter the activity name on the line and the corresponding number in the box. If the activity performed is not identified on the list, select from the *most* appropriate primary activity area (water related, non-water related or other activity), the code number for "Other", and write in the activity being performed at the time of the accident.

WATER RELATED RECREATION

1. Sailing
2. Boating—powered
3. Boating—unpowered
4. Water skiing
5. Fishing from boat
6. Fishing from bank dock or pier
7. Fishing while wading
8. Swimming/supervised area
9. Swimming/designated area
10. Swimming/other area
11. Underwater activities (skin diving, scuba, etc.)
12. Wading
13. Attempted rescue
14. Hunting from boat
15. Other

NON-WATER RELATED RECREATION

16. Hiking and walking
17. Climbing (general)
18. Camping/picnicking authorized area
19. Camping/picnicking unauthorized area
20. Guided tours
21. Hunting
22. Playground equipment
23. Sports/summer (baseball, football, etc.)
24. Sports/winter (skiing, sledding, snowmobiling etc.)
25. Cycling (bicycle, motorcycle, scooter)
26. Gliding
27. Parachuting
28. Other non-water related

OTHER ACTIVITIES

29. Unlawful acts (fights, riots, vandalism, etc.)
30. Food preparation/serving
31. Food consumption
32. Housekeeping
33. Sleeping
34. Pedestrian struck by vehicle
35. Pedestrian other acts
36. Suicide
37. "Other" activities

b. PERSONAL FLOTATION DEVICE USED—If fatality was water-related was the victim wearing a person flotation device? Mark the appropriate box.

INSTRUCTIONS FOR SECTION 7—MOTOR VEHICLE ACCIDENT

a. TYPE OF VEHICLE—Mark appropriate box for each vehicle involved. If more than one vehicle of the same type is involved, mark both halves of the appropriate box. USACE vehicle(s) involved shall be marked in left half of appropriate box.

b. TYPE OF COLLISION—Mark appropriate box.

c. SEAT BELT—Mark appropriate box.

INSTRUCTIONS FOR SECTION 8—PROPERTY/MATERIAL INVOLVED

a. NAME OF ITEM—Describe all property involved in accident. Property/material involved means material which is damaged or whose use or misuse contributed to the accident. Include the name, type, model; also include the National Stock Number (NSN) whenever applicable.

b. OWNERSHIP—Enter ownership for each item listed. (Enter one of the following: *USACE; OTHER GOVERNMENT; CONTRACTOR; PRIVATE*)

c. $ AMOUNT OF DAMAGE—Enter the total estimated dollar amount of damage (parts and labor), if any.

INSTRUCTIONS FOR SECTION 9—VESSEL/FLOATING PLANT ACCIDENT

a. TYPE OF VESSEL/FLOATING PLANT—Select the most appropriate vessel/floating plant from list below. Enter name and place corresponding number in box. If item is not listed below, enter item number for "OTHER" and write in specific type of vessel/floating plant.

VESSEL/FLOATING PLANTS

1. ROW BOAT	7. DREDGE/DIPPER
2. SAIL BOAT	8. DREDGE/CLAMSHELL BUCKET
3. MOTOR BOAT	9. DREDGE/PIPE LINE
4. BARGE	10. DREDGE/DUST PAN
5. DREDGE/HOPPER	11. TUG BOAT
6. DREDGE/SIDE CASTING	12. OTHER

b. COLLISION/MISHAP—Select from the list below the object(s) that contributed to the accident or were damaged in the accident.

COLLISION/MISHAP

1. COLLISION W/OTHER VESSEL	7. HAULAGE UNIT
2. UPPER GUIDE WALL	8. BREAKING TOW
3. UPPER LOCK GATES	9. TOW BREAKING UP
4. LOCK WALL	10. SWEPT DOWN ON DAM
5. LOWER LOCK GATES	11. BUOY/DOLPHIN/CELL
6. LOWER GUIDE WALL	12. WHARF OR DOCK
	13. OTHER

INSTRUCTIONS FOR SECTION 10—ACCIDENT DESCRIPTION

DESCRIBE ACCIDENT—Fully describe the accident. Give the sequence of events that describe what happened leading up to and including the accident. Fully identify personnel and equipment involved and their role(s) in the accident. Ensure that relationships between personnel and equipment are clearly specified. Continue on blank sheets if necessary and attach to this report.

INSTRUCTIONS FOR SECTION 11—CAUSAL FACTORS

a. Review thoroughly. Answer each question by marking the appropriate block. If any answer is yes, explain in item 13 below. Consider, as a minimum, the following:

(1) DESIGN—Did inadequacies associated with the building or work site play a role? Would an improved design or layout of the equipment or facilities reduce the likelihood of similar accidents? Were the tools or other equipment designed and intended for the task at hand?

(2) INSPECTION/MAINTENANCE—Did inadequately or improperly maintained equipment, tools, workplace, etc. create or worsen any hazards that contributed to the accident? Would better equipment, facility, work site or work activity inspections have helped avoid the accident?

(3) PERSON'S PHYSICAL CONDITION—Do you feel that the accident would probably not have occurred if the employee was in "good" physical condition? If the person involved in the accident had been in better physical condition, would the accident have been less severe or avoided altogether? Was over exertion a factor?

(4) OPERATING PROCEDURES—Did a lack of or inadequacy within established operating procedures contribute to the accident? Did any aspect of the procedures introduce any hazard to, or increase the risk associated with the work process? Would establishment or improvement of operating procedures reduce the likelihood of similar accidents?

(5) JOB PRACTICES—Were any of the provisions of the Safety and Health Requirements Manual (EM 385-1-1) violated? Was the task being accomplished in a manner which was not in compliance with an established job hazard analysis or activity hazard analysis? Did any established job practice (including EM 385-1-1) fail to adequately address the task or work process? Would better job practices improve the safety of the task?

(6) HUMAN FACTORS—Was the person under undue stress (either internal or external to the job)? Did the task tend toward overloading the capabilities of the person; i.e., did the job require tracking and reacting to many external inputs such as displays, alarms, or signals? Did the arrangement of the workplace tend to interfere with efficient task performance? Did the task require reach, strength, endurance, agility, etc., at or beyond the capabilities of the employee? Was the work environment ill-adapted to the person? Did the person need more training, experience, or practice in doing the task? Was the person inadequately rested to perform safely?

(7) ENVIRONMENTAL FACTORS—Did any factors such as moisture, humidity, rain, snow, sleet, hail, ice, fog, cold, heat, sun, temperature changes, wind, tides, floods, currents, dust, mud, glare, pressure changes, lightning, etc., play a part in the accident?

(8) CHEMICAL AND PHYSICAL AGENT FACTORS—Did exposure to chemical agents (either single shift exposure or long-term exposure) such as dusts, fibers (asbestos, etc.), silica, gases (carbon monoxide, chlorine, etc.,), mists, steam, vapors, fumes, smoke, other particulates, liquid or dry chemicals that are corrosive, toxic, explosive or flammable, by-products of combustion or physical agents such as noise, ionizing radiation, non-ionizing radiation (UV radiation created during welding, etc.) contribute to the accident/incident?

(9) OFFICE FACTORS—Did the fact that the accident occurred in an office setting or to an office worker have a bearing on its cause? For example, office workers tend to have less experience and training in performing tasks such as lifting office furniture. Did physical hazards within the office environment contribute to the hazard?

(10) SUPPORT FACTORS—Was the person using an improper tool for the job? Was inadequate time available or utilized to safely accomplish the task? Were less than adequate personnel resources (in terms of employee skills, number of workers, and adequate supervision) available to get the job done properly? Was funding available, utilized, and adequate to provide proper tools, equipment, personnel, site preparation, etc?

(11) PERSONAL PROTECTIVE EQUIPMENT—Did the person fail to use appropriate personal protective equipment (gloves, eye protection, hard-toed shoes, respirator, etc.) for the task or environment? Did protective equipment provided or worn fail to provide adequate protection from the hazard(s)? Did lack of or inadequate maintenance of protective gear contribute to the accident?

(12) DRUGS/ALCOHOL—Is there any reason to believe the person's mental or physical capabilities, judgement, etc., were impaired or altered by the use of drugs or alcohol? Consider the effects of prescription medicine and over the counter medications as well as illicit drug use. Consider the effect of drug or alcohol induced "hangovers".

b. WRITTEN JOB/ACTIVITY HAZARD ANALYSIS—Was a written Job/Activity Hazard Analysis completed for the task being performed at the time of the accident? Mark the appropriate box. *If one was performed, attach a copy of the analysis to the report.*

INSTRUCTIONS FOR SECTION 12—TRAINING

a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK?—For the purpose of this section "trained" means the person has been provided the necessary information (either formal and/or on-the-job (OJT) training) to competently perform the activity/task in a safe and healthful manner.

b. TYPE OF TRAINING—Mark the appropriate box that best indicates the type of training; (classroom or on-the-job) that the injured person received before the accident happened.

c. DATE OF MOST RECENT TRAINING—Enter the month, day, and year of the last *formal* training completed that covered the activity/task being performed at the time of the accident.

Appendix E

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150 Date: July 1, 1990 Supercedes: Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM	

This Procedure establishes the Dames & Moore Respiratory Protection Program. It establishes responsibilities and basic requirements for Dames & Moore personnel who are required to work in situations where respiratory hazards may be present. This Procedure was developed in accordance with the Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), the American National Standards Institute (ANSI) Practices for Respiratory Protection (Z88.2), and the NIOSH Guide to Respiratory Protection.

This Respiratory Protection Program addresses both field and fixed facility (laboratory) operations. As a result, some portions of the Program will have two different procedures for the same task, such as in the Hazard Evaluation/Respirator Selection section.

Dames & Moore will provide approved and certified respirators and component parts to employees at no cost to the individual. Employees will use this respiratory protective equipment in accordance with this Procedure, and the instructions and training that are provided.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.1 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD

Subject: RESPIRATORY PROTECTION PROGRAM: PROGRAM ADMINISTRATION AND RESPONSIBILITIES

The Respiratory Protection Program is administered by the Dames & Moore Division Health and Safety Manager (DHSM) with assistance from the Office Safety Coordinators (OSC). The DHSM will:

- Oversee the implementation of the Respiratory Protection Program in the Division;
- Periodically audit and evaluate the Program implementation at Division offices;
- Evaluate this Procedure on an on-going basis to see that it reflects current practice and regulations;
- Evaluate various makes and types of respirators to determine their suitability for Division use;
- Provide qualitative and, as appropriate, quantitative fit tests to staff;
- Assist OSCs in their implementation of this Procedure;
- Develop and provide training programs as described in Procedure HS 110;
- Maintain records of Employee Fit-Testing and Training; and
- Coordinate with the Firmwide Medical Director in the evaluation of the medical qualifications of wearers (see HS 120.2).

The OSCs are responsible for assisting the DHSM in the implementation of the Respiratory Protection Program by:

- Providing guidance to staff regarding the use of respiratory protective equipment that is approved under this procedure;

- Under certain circumstances, providing qualitative fit tests to staff;

- Providing feedback to the DHSM regarding program effectiveness. Project Managers (PM) and Site Safety Officers (SSO) are responsible for:

- Implementing this Procedure, as described in the site-specific health and safety plan, in all field operations; and

- Providing feedback to the DHSM regarding program effectiveness.

Laboratory managers and supervisors are responsible for:

- Implementing this Procedure in all applicable laboratory operations; and

- Providing feedback to the DHSM regarding program effectiveness.

Staff members are responsible for:

- Complying with this Procedure as it applies to their activities; and

- Providing feedback to their supervisor regarding program effectiveness.

The Firmwide Health and Safety Director, or his designee, is responsible for undertaking, on a periodic basis, a formal evaluation of the effectiveness of the Dames & Moore Respiratory Protection Program.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.2 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: TYPES OF RESPIRATORS	

Only respirators approved and certified by the National Institute for Occupational Safety and Health (NIOSH) or the Mine Safety and Health Administration (MSHA) under 30 CFR Part 11 shall be used by Dames & Moore personnel. Such respirators are listed in the NIOSH Certified Equipment List, which is issued in December of each year.

Respirators can be divided into two categories, negative pressure and positive pressure. Within these categories, the following types of respirators are approved for use by Dames & Moore personnel:

- Negative pressure:
  - half-face air purifying respirators;
  - full-face air purifying respirators.

- Positive pressure:
  - powered air purifying respirators;
  - pressure-demand self-contained breathing apparatus (2215 psi only);
  - airline/supplied air respirator with escape bottle.

Dames & Moore will provide employees with an opportunity to fit test negative pressure air purifying respirators from several manufacturers in order that an employee will get the appropriate fit. For the purposes of uniformity and availability, the following hierarchy will be followed when fit-testing negative pressure air purifying respirators:

- Half-face:
  1 - Mine Safety Appliances;
  2 - American Optical;
  3 - Scott;
  4 - Any other certified half-face respirator.

- Full-face:
  1 - Mine Safety Appliances;
  2 - American Optical;
  3 - Scott;
  4 - Any other certified full-face respirator.

Descriptions of these types of respirators and their capabilities are provided in the Respiratory Protection Training course.

Dames & Moore personnel will not alter any respirator from its approved configuration for any reason. Respirator components and cartridges/filters from one manufacturer cannot be interchanged with those from another manufacturer; to do so voids the NIOSH/MSHA approval and compromises the effectiveness of the respirator. Any question in this regard should be directed to the DHSM.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.3 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD

Subject: RESPIRATORY PROTECTION PROGRAM:
HAZARD EVALUATION FOR RESPIRATOR SELECTION

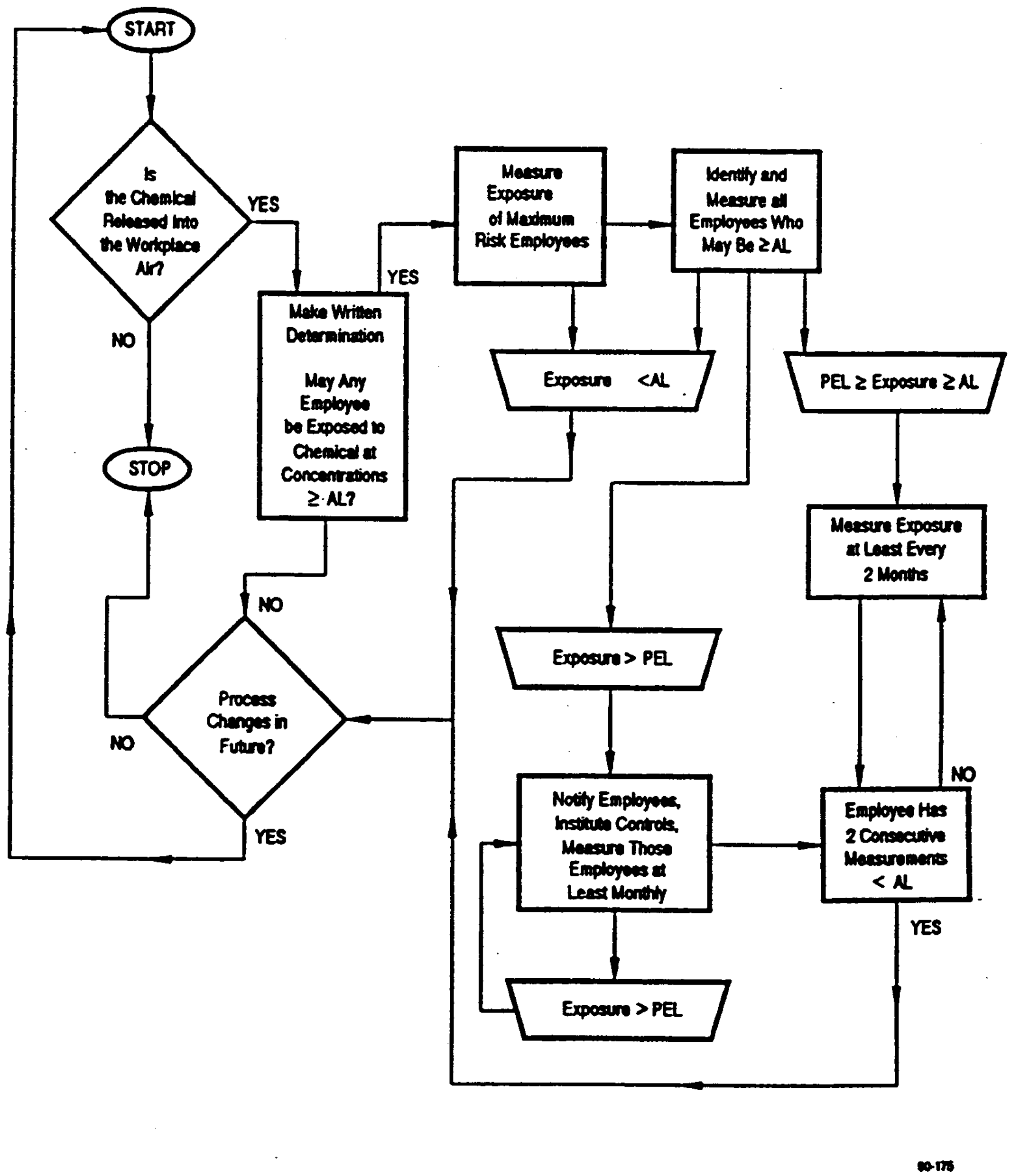
This procedure is for facilities whose operations and exposures can be characterized by traditional industrial hygiene survey methods. For example, a chemist performing extractions can wear a personal sampler during the course of a day's operation; the chemist's exposure to the chemicals used in the extraction process can be evaluated using NIOSH methods. It can then be determined if the chemist is over-exposed; if so, engineering (i.e., ventilation system) or administrative controls can be considered. As a last resort, respiratory protection will be used.

It may not be feasible to use this hazard evaluation procedure for field operations. Instead, the procedures of the Exposure Monitoring Program in HS 180 should be integrated with the Respirator Selection guidance in HS 150.4. Site-specific procedures will be presented in each site-specific health and safety plan.

To initiate the hazard evaluation process, an industrial hygienist, under the direction of a Certified Industrial Hygienist (CIH), will evaluate the operation, noting the chemicals present and the manner in which they are used. The industrial hygienist will determine the health hazards associated with the chemicals and establish an exposure sampling strategy. The accompanying chart illustrates the steps in the determination of employee's exposures to chemicals in the workplace.

The industrial hygienist will use area sampling, personal sampling, or a combination of these to determine the level of exposure. If employees are exposed above the action level, the industrial hygienist will notify the DHSM, who will work with the industrial hygienist and location management to determine the feasibility of initiating the use of engineering controls, such as local exhaust ventilation, or administrative controls to reduce exposures. For further information on this process, reference Chapter 17 in Fundamentals of Industrial Hygiene, 3rd ed., National Safety Council, Chicago, IL, 1989.

If engineering controls cannot be used, or if they must be augmented with personal protective equipment, this Respiratory Protection Program will be established at the facility.



The NIOSH-recommended employee exposure determination and measurement strategy. The health standard for each individual substance should be consulted for detailed requirements. In the flow chart, AL–Action Level and PEL–Permissible Exposure Limit.

The industrial hygienist or the DHSM will determine the appropriate type of respirator for a specific hazard. The selection of respiratory protective equipment will be based upon these five basic steps:

- Identification of the hazard;
- Evaluation of the hazard level;
- Consideration of the user's personal characteristics;
- Consideration of the conditions of use;
- Use of an approved respirator.

The accompanying Respirator Decision Flow Diagram outlines the decision process typically used at Dames & Moore.

IDENTIFICATION OF THE HAZARD

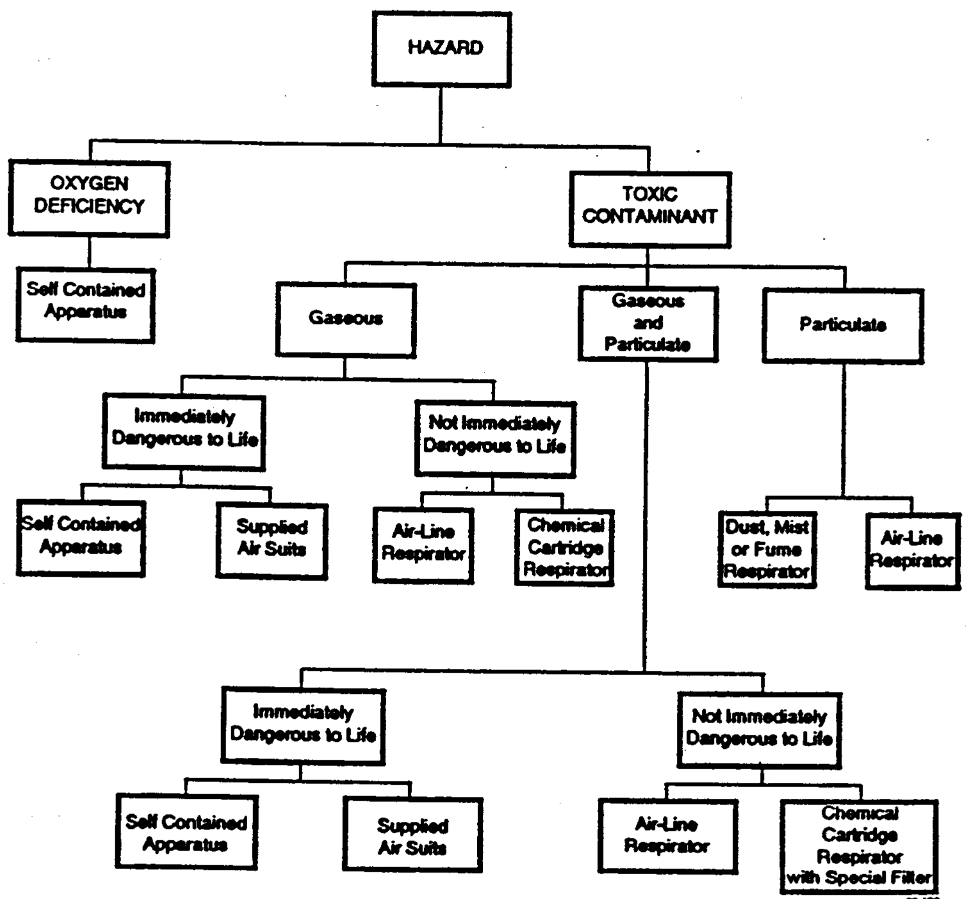
Identification of the type of hazard is the first step in the selection of a respirator. Although the number of hazardous conditions which might require a respirator are virtually limitless, they will generally fall into one of the following five categories:

Gas or Vapor Contaminant

Gases are substances which normally exist as such at ordinary temperature and pressure; e.g., carbon monoxide or sulfur dioxide, where as vapors are the gaseous state of substances that would be solid or liquid at ordinary temperature and pressure; e.g., acetone or benzene vapors.

Most gases and vapors are colorless but may have a distinctive odor which helps in hazard identification. The odor threshold of many gases and vapors are below the Permissible Exposure Limit (PEL) or Threshold Limit Value (TLV) and odor therefore can be used as an indication of a hazard. A few gases and vapors, however, have odor thresholds above their respective PEL's and the perception of their odor indicates that a

RESPIRATOR DECISION FLOW DIAGRAM



hazardous concentration has already been exceeded. The DHSM can provide information regarding odor thresholds for specific chemicals. Regardless of the relationship between the odor threshold and PEL, the perception of contaminant odor is an indication of respirator leakage or cartridge breakthrough and the respirator wearer should exit the area immediately.

Particulate Contaminants

Particulate contaminants are made up of tiny particulates or droplets of a substance. Many of these particles are so small (less than 50 microns in diameter) they cannot be seen and those less than 10 microns in diameter can be easily inhaled. Particles less than 5 microns in diameter are small enough to reach deep into the lungs or into the alveoli.

Particulates are produced by mechanical means through the disintegration processes such as grinding, crushing, drilling, blasting or spraying; or by physiochemical reactions such as combustion, vaporization, distillation, sublimation, calcination or condensation.

Combination of Contaminants

Gaseous and particulate contaminants frequently occur together. Paint spraying, for example, produces both paint mist (particulate) and solvent vapors (gaseous). Smoke also contains particulates and gases.

Oxygen Deficient Atmospheres

In an oxygen deficient atmosphere, the problem is not the presence of something harmful but the absence of something essential. Such atmospheres are most commonly found in confined and usually poorly ventilated spaces; such as silos, petrochemical tanks, and the holds of ships. Oxygen deficient atmospheres are classified as immediately dangerous to life or health (IDLH).

An accurate description of an oxygen deficient atmosphere is important for proper respirator selection, but no one definition has been universally accepted. For Dames & Moore and OSHA compliance purposes, an oxygen-deficient atmosphere contains less than 19.5 percent oxygen.

IDLH Atmospheres

This is an atmosphere where employee exposure can:

- Cause serious injury or death within a short period of time (e.g., high concentrations of carbon monoxide or hydrogen sulfide);
- Cause serious delayed effects (e.g., airborne radioactive materials or cancer-causing agents);
- Prevent exposed personnel from escaping the environment within 30 minutes.

Once a hazardous situation has been categorized as one of the hazards above (i.e., gas, vapor, particulate, oxygen deficient, IDLH), an initial decision can be made concerning the general type of respirator that may be selected. HS 150.11 describes general types of respirators available and a decision logic chart for respirator selection based on these five hazard types is presented in this procedure.

EVALUATION OF THE HAZARD LEVEL

The second consideration in selecting a respirator is the level or concentration of the hazard requiring the respirator. The concentration of the air contaminant and how it compares to the TLV or PEL for that substance must be known in order to determine the "protection factor" which the respirator must provide, which is the ratio of the concentration of the contaminant outside the respirator to that inside the respirator under conditions of use. Respirators should be selected so that the concentration inside the respirator will not exceed the TLV or PEL.

$$MUC = PF \times TLV$$
$$PF = MUC/TLV$$

Where MUC = maximum use concentration
PF = protection factor
TLV = threshold limit value (or use PEL-permissible exposure limit).

Respirator protection factors tend to vary depending upon the specific standard cited. The list below presents protection factors that are generally accepted in the absence of standards that indicate otherwise.

Half-face filter or chemical cartridge respirator	10
Full-face filter or chemical cartridge respirator	50
Powered air-purifying respirator	100
Self-contained breathing apparatus, pressure-demand (SCBA)	10,000 +

CONSIDERATION OF THE USER'S PERSONAL CHARACTERISTICS

Medical Condition

The use of any type of respirator will impose some physiological stress on the user. For example:

- Air-purifying respirators make breathing more difficult because the filter or cartridge impedes the flow of air;
- The special exhalation valve on an open circuit pressure demand respirator requires the wearer to exhale against some resistance;
- The bulk and weight of an SCBA can be a burden;
- If the wearer is using an airline respirator, they might have to drag up to 300 feet of hose around.

All these factors can significantly increase the employee's workload and wearers shall have medical examinations to determine if they are medically able to wear respiratory protective equipment without aggravating preexisting medical problems.

In order for the Firmwide Medical Director to render a qualified opinion on employee respirator usage, the examining physician should be provided with the following information:

- The type of respiratory protection equipment to be used, and its modes of operation;
- The tasks an employee will perform while wearing the respirator;
- The length of time that the employee might wear the equipment; and
- Any substance to which the employee could be exposed, and related toxicity.

Emotional and Mental Factors

Emotional and mental factors must also be considered when employees wear respirators. Some individuals feel claustrophobic when wearing them, especially with protective clothing. If there are indications that an individual suffers from chronic claustrophobia, that individual should not be placed in such a situation.

Physical Characteristics

Scars, hollow temples, very prominent cheekbones, deep skin creases, and lack of teeth or dentures may cause respirator facepiece sealing problems. Full dentures should be retained when wearing a respirator, but partial dentures may or may not have to be removed, depending upon the possibility of swallowing them under duress.

Corrective Lenses

If glasses or goggles are required, they shall be worn so as not to effect the respirator.

If a full facepiece respirator is worn, a proper seal cannot be established due to eyeglasses temple bars extending through the sealing edge of the facepiece. Wearing contact lenses with any type of respirator is not permitted.

Systems have been developed for mounting corrective lenses inside full facepieces; and when a person must wear corrective lenses, the proper facepiece and lenses must be obtained to provide good vision, comfort, and a gas-tight seal. Dames & Moore will arrange, at no cost to the employee, for such systems to be provided to those personnel who need them. The DHSM can provide assistance in this area.

CONSIDERATION OF THE CONDITIONS OF USE

Eye Irritation

If the air contaminant can cause eye irritation a full facepiece respirator should be used.

Skin Irritation or Absorption Through the Skin

Some airborne contaminants are extremely irritating to the skin (ammonia or hydrochloric acid) while others are capable of being absorbed through the skin and into the bloodstream with serious and possibly fatal results (hydrocyanic acid or organophosphate pesticides such as parathion, malathion or tetraethyl pyrophosphate).

Rubber facepiece material can cause skin irritation dermatitis for some individuals; the use of non-allergenic silicone facepieces can help alleviate this condition.

Communication

Speech communication may be necessary in jobs where a respirator is required. Conventional respirators, however, distort the human voice to some extent and shouting can cause facepiece or component leakage.

Mechanical speech transmission devices called speaking diaphragms are available as an integral part of some respirators. These consist of a resonant cavity and diaphragm which amplify sound in the frequency range most important to speech intelligibility. The diaphragm acts as a barrier to entry of ambient atmospheres and should be carefully handled and protected by a cover to prevent puncture or breakage.

Methods of electronically transmitting speech from the respirator utilize microphones connected to a telephone, facepiece, or earlobe while the amplifier, power pack and speaker or transmitter are attached to the exterior of the mask, are carried on the body or are remotely located.

Respirators with electric or electronic speech transmission devices having an integral or body-attached battery power supply should be used with caution in explosive atmospheres, and connecting cables from microphones inside the facepiece must have gas-tight seals were they emerge from the facepiece. When the loudspeaker diaphragm is part of the barrier between the respirator wearer and the ambient atmosphere, it should be inspected frequently for leakage and protected from puncture or breakage.

Location of Hazardous Work Area

The location of the contaminated area with respect to a possible source of respirable air requires special consideration. When using an airline respirator, the distance that the wearer can travel into a contaminated atmosphere is limited by the length of hose connected to the source of respirable air. The hose also requires that the user must enter and leave the area by the same route unless the device is equipped with an auxiliary air cylinder appropriate for use in withdrawal. While wearing an SCBA or filter respirator, a person may leave the contaminated area by any approved exit, but one must make certain that the device will afford protection until reaching respirable air, taking into account possible delays.

Duration of Task

Work time usually determines the period for which respiratory protection is needed, including time necessary to enter and leave a contaminated area. A self-contained breathing apparatus or chemical cartridge respirator provides respiratory protection for relatively short periods, whereas an airline respirator provides protection for as long as the facepiece is supplied with adequate respirable air. Particulate-filter respirators can provide protection for long periods, without need for filter replacement, but only if the atmospheric particulate loading is low. Therefore, for protracted periods of use, an airline respirator offers definite advantages over a filter respirator. Some respirators have a means for indicating remaining service life. Some type of warning is available for all self-contained breathing apparatus. This may be a pressure gauge, timer or an audible or physical alarm. The user must understand the operation and limitations of each type of warning device. Most chemical-cartridge respirators have no indicator of remaining service life. Canisters and cartridges should be changed according to the manufacturer's directions, or as specified in a site-specific health and safety plan.

Activity Required

The work area to be covered, work rate, and mobility of the wearer in carrying out the work should be considered in respirator selection. Air-purifying respirators present minimal interference with the wearer's movement. Supplied air respirators with trailing hoses severely restrict the area the wearer can cover and present a potential hazard if the hose comes in contact with machinery or other objects. SCBA presents a size and weight penalty which may restrict climbing and movement in tight places.

The wearer's work rate determines his respiratory minute volume, maximum inspiratory flow rate, and inhalation and exhalation breathing resistance. The respiratory minute volume is of great significance in self-contained and airline respirators operated from cylinders since it determines their operating life; it is also a factor in cartridge service life on air-purifying respirators. Useful life under moderate work conditions may be one-third of that under rest conditions.

The high breathing resistance of air-purifying respirators under conditions of heavy work can result in distressed breathing.

Work in Low Temperatures

The major problem in the use of respirators at low temperatures is freezing of exhalation valves, and for full facepieces, poor visibility.

Full facepieces are designed so that the incoming fresh air sweeps over the inside of the lens to reduce fogging. Otherwise, it would be impossible to wear a full facepiece even at ordinary room temperature without severe fogging. Anti-fog compounds may be used to coat the inside of the lens to prevent fogging at room temperatures and down to temperatures approaching 32 degrees Fahrenheit (°F). However, below 0°F, anti-fog compounds will not prevent severe fogging.

Full facepieces are available with nose cups that direct moist exhaled air through the exhalation valve. A properly fitted nose cup should, in theory, allow adequate visibility at temperatures down to -30° F.

At very low temperatures, the exhalation valve may collect moisture and freeze open, allowing the wearer to breathe contaminated air, or freeze closed, which prevents normal exhalation.

High-pressure connections on SCBA may leak because of metal contracting at low temperatures. The connections should not be overtightened since they may break when the temperature returns to normal.

Work in High Temperatures

A person working in areas of high ambient or radiant temperature is already under stress, and any additional stress resulting from use of respirators should be minimized. This can be done by selecting and using respirators having minimum weight and breathing resistance. Supplied-air respirators and hoods and suits having an adequate supply of cool breathing air are recommended. Also, a simple Venturi valve, operated by compressed breathing air, is available for cooling purposes.

USE OF AN APPROVED RESPIRATOR

Having considered the type of hazard, the level of the hazard, user characteristics, and the conditions of use, a decision may be made concerning the appropriate type of respirator. HS 150.4 presents a decision logic diagram for selecting the types of respirator, and certain other guides are useful as well; for example the NIOSH Respirator Decision Logic, DHHS (NIOSH) Publication No. 87-108. HS 150.10 provides a description of various types of respirators.

As important as selecting the right type of respirator is the selection of an approved respirator. The National Institute for Occupational Safety and Health (NIOSH) provides a testing, approval, and certification program for respiratory protective devices. Approved devices are listed in the NIOSH Publication, NIOSH Certified Equipment List. This publication is updated periodically with the addition of newly approved equipment and deletion of equipment which has lost its approval.

All approved devices have a "TC" (Tested and Certified) number permanently printed on each item; this number is referenced in the NIOSH Certified Equipment list described above.

Only NIOSH/MSHA approved respiratory protective equipment will be issued to and worn by Dames & Moore employees.

No employee will be assigned to a task that requires the use of a respirator unless it has been determined that the person is physically able to perform the task using an appropriate respirator. This determination will be made on an annual basis by the Dames & Moore Firmwide Medical Director. All Dames & Moore personnel who will be using respiratory protective equipment must also be participants in the Dames & Moore Medical Surveillance Program (see HS 120). In baseline and subsequent medical examinations, participants will undergo, among others, a pulmonary function test; the results of this exam will be reviewed by the Firmwide Medical Director to determine the participant's fitness for use of respiratory protective equipment. The components of the various examinations are described in HS 120.2.

Periodic exposure monitoring of respirator users will be conducted in accordance with the parameters set forth in HS 180.

Dames & Moore uses available resources available to screen each employee required to wear respiratory protective equipment before they perform their work task. Some factors that may impose hardships on an employee required to wear respiratory protective equipment are described below:

<u>Physiological Factors</u>

Wearing any type of respirator imposes some physiological stress on the wearer. With air-purifying devices, resistance to inhalation is always experienced because the filter or chemical cartridge restricts airflow; in addition, the wearer must work against the exhalation valve upon expiration. Similar breathing resistance is encountered when using pressure-demand type airline respirators or SCBA because the spring-loaded exhalation valve used is designed to always maintain positive pressure within the mask; this feature requires an additional 1.5 to 3.0 psi of exhalation pressure to open this type of exhalation valve. The bulk and weight of SCBAs (up to 35 lbs.) is of some concern, especially when an employee must perform strenuous work. Airline respirator units require that the wearer drag around the hose or airline, which provides additional physiological stress.

Pulmonary Factors

In the physical exam, respirator wearers are examined for any evidence of respiratory impairment such as emphysema, obstructive lung disease or bronchial asthma. Historical and clinical evidence of impairment of pulmonary function, including x-ray findings or a reduction in vital capacity or forced expiratory volume, may justify a restriction from wearing a respirator that restricts inhalation and exhalation, even though the individual may be able to perform adequately in a continuous-flow supplied air device.

Cardiovascular Consideration

The use of air-purifying demand or pressure-demand supplied air devices may pose a serious problem for employees with cardiovascular disease, but they may be able to use continuous flow devices. As always, the physician must make a final determination.

If an employee has cardiovascular disease, serious consideration should be given to assigning him where he need not require the use of respiratory protection and also where he need not respond to an emergency situation or escape from a contaminated area with respiratory protective devices.

Health Conditions

Conditions that may prevent an employee from wearing a respirator, and thus from working in a contaminated area, include:

- Diabetes;
- Epilepsy;
- Alcoholism;
- Use of certain medication;
- Punctured ear drum;
- Skin sensitivities;
- Impaired or non-existent sense of smell;
- Any other condition that the physician determines to place the employee at added physical risk.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.6 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: RESPIRATOR FIT TESTING	

Respirator fit testing is required by OSHA and ANSI. Fit testing is required at least annually for Class 1 employees, however, OSHA requires it every 6 months for asbestos workers. Dames & Moore provides each respirator user a fit test in order to select the specific type, make, and model of negative pressure respirator for use by the wearer.

The following policies are observed in the fitting and use of the respirator:

- Fit testing for positive pressure respirators (see HS 150.11) is not required;

- Personnel shall be allowed to use only the specific make(s) and model(s) of air purifying respirators for which the person has obtained a satisfactory fit verified through fit testing procedures;

- An employee is not permitted to use any respirator not previously fit tested or if the results of the fit test indicated that the person was unable to obtain a satisfactory fit;

- No facial hair or glasses are allowed that will interfere with the attainment of a good seal. Facial hair (e.g., some moustaches) that does not interfere with a good facepiece-to-face seal is permissible. However, facial hair, specifically beards, that contacts the sealing surface of the respirator is specifically prohibited;

- Dames & Moore will provide persons requiring glasses with specially mounted glasses inside the full-face respirator. Under no circumstances will contact lenses be worn while using any type of respirator;

- If it is found that an employee cannot obtain a good facepiece-to-face seal because of facial features or medical factors, that equipment shall not be used and they shall not enter an atmosphere requiring the use of that equipment;

- The Division Health and Safety Manager and the Office Safety Coordinators will keep records of the make, model, size, and type of respirator each employee has been fit tested with. The record will include the date and signature of the person performing the test;

- Fit tests will be repeated at least annually; asbestos operations personnel will be fit-tested every six months;

- Specific fit test criteria for asbestos operations personnel are found in Procedure HS 190; and

- Dames & Moore respirator fit testing criteria are found in HS 150.12.

Respirator Fit Considerations

Each make and model of respirator facepiece has a slightly different fit. Although each manufacturer designs their facepieces to fit as broad a cross section of the working population as possible, no respirator fits everyone.

Conditions which may adversely affect a good facepiece fit include:

- growth of beard;
- sideburns;
- a hairline that projects under the facepiece;
- temple pieces on glasses;
- facial scars;
- facial injuries;
- round face shape;
- dentures.

Dames & Moore provides employees with respirators from several manufacturers so that each person can select a respirator that fits properly and is reasonably comfortable. It is in the process of matching the respirator to the individual user that a fit testing procedure is needed.

Dames & Moore personnel who are assigned to field operations in which respiratory protection may be required must be clean shaven at the time of assignment; a neatly-trimmed moustache that does not extend beyond the corners of the mouth and does not otherwise interfere with acceptable respirator fit is permissible. Exceptions to this policy can only be granted by the Firmwide Medical Director.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.7 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: TRAINING	

Although equipment selection is important to the success of a respiratory protection program, the proper use of the equipment is equally important. Proper use can be ensured by carefully training employees in the selection, use and maintenance of the provided respiratory equipment.

Dames & Moore provides initial respiratory protection training for Class 1 personnel in the 40-hour course, and usually includes respiratory protection review in the annual Class 1 refresher training. Training is also provided on an "as needed" basis. Dames & Moore respiratory protection training criteria are described in Procedure HS 110.3.8. The training will cover at least the following topics:

- Dames & Moore Respiratory Protection Program;
- Overview of Respiratory Protection;
- Physiology of the Respiratory System;
- Classification of Respiratory Hazards;
- Air-Purifying Respirators;
- Air-Supplied Respirators;
- Respirator Selection, Use and Limitations;
- Fit testing, maintenance and cleaning.

DAMES & MOORE Firmwide **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.8 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: INSPECTION, MAINTENANCE, CLEANING, AND STORAGE	

Respirator maintenance is a integral part of Dames & Moore's Respiratory Protection Program. Wearing a poorly maintained or malfunctioning respirator is, in one sense, more dangerous than not wearing a respirator at all because workers wearing defective devices think they are protected when in reality they are not. It is the responsibility of the Project Manager and/or Site Safety Officer to see that project personnel comply with inspection, cleaning, maintenance and storage requirements. The program requires at a minimum:

- Inspection for defects, including a leak check;
- Repair as required;
- Cleaning and disinfecting; and
- Proper and sanitary storage of equipment.

The maintenance program should ensure that each worker's respirator remains as effective as when it was new.

<u>Inspection For Defects And Maintenance</u>

If properly performed, inspections will identify damaged or malfunctioning respirators before they can be used. The OSHA standard outlines two types of inspections:

- Before and after use; and
- During cleaning.

All respiratory equipment will be inspected thoroughly during the cleaning process and before the apparatus is used. Any defects will be repaired or the defective part replaced. Proper inspection, maintenance, and cleaning of respiratory equipment is the responsibility of the user of the equipment. Inspection procedures are described in HS 150.9.

Cleaning

Cleaning and sanitizing of the units is accomplished in the following manner:

- The apparatus is broken down into its components as described in the manufacturer's schematic display that accompanies the unit. This step also affords the opportunity to thoroughly inspect each of the components for any defects, excessive wear and tear, etc. Discard any previously used cartridges.

- Thoroughly wash the facepiece and mask components in a cleaning and sanitizing solution, such as one ounce of powdered MSA Cleaner-Sanitizer to 1 gallon of warm water (120°F). The components should be scrubbed with a sponge or soft brush to remove dust, dirt, or other contaminants.

- Thoroughly rinse all component pieces in warm water. This step is important because residuals of cleaning solutions can cause irritation and/or dermatitis for some individuals.

- Air dry all components thoroughly, inspect them again for any defects, reassemble the units, and store properly until the next use.

Storage

Respirators will be stored in a convenient, clean and sanitary location to protect them against dust, sunlight, excessive heat or cold, excessive moisture, damaging chemicals and mechanical damage. They will be stored individually, (e.g., not stacked one upon the other or in cramped spaces) to prevent distortion of rubber or other elastomeric parts. Respirators should be stored in plastic bags, preferably in the cartons in which they came, and readily identifiable as to the individual to whom it has been assigned.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.9 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: RESPIRATOR INSPECTION PROCEDURES	

AIR PURIFYING RESPIRATORS

Air-purifying respirators should be checked as follows before and after each use:

1. Examine the facepiece for:

   - Excessive dirt;
   - Cracks, tears, holes, or physical distortion of shape from improper storage;
   - Inflexibility of rubber facepiece (stretch and knead to restore flexibility);
   - Cracked or badly scratched lenses in full facepieces;
   - Incorrectly mounted full facepiece lenses, or broken or missing mounting clips; and
   - Cracked or broken air-purifying element holder(s), badly worn threads, or missing gasket(s) if required.

2. Examine the head straps or head harness for:

   - Breaks;
   - Loss of elasticity;
   - Broken or malfunctioning buckles and attachments; and
   - Excessively worn serrations on head harness, which might permit slippage (full facepieces only).

3. Examine the inhalation and exhalation valves for the following after removing its cover:

- Foreign material, such as detergent residue, dust particles, or human hair under the valve seat;
- Cracks, tears, or distortion in the value material;
- Improper insertion of the valve body in the facepiece;
- Cracks, breaks, or chips in the valve body, particularly in the sealing surface;
- Missing or defective valve cover; and
- Improper installation of the valve in the valve body.

4. Examine the air-purifying element for:

- Incorrect cartridge, canister, or filter for the hazard;
- Incorrect installation, loose connections, missing or worn gasket, or cross threading in the holder;
- Expired shelf-life date on the cartridge or canister; and
- Cracks or dents in the outside case of the filter, cartridge or canister.

5. If the device has a corrugated breathing tube, examine it for:

- Broken or missing end connectors;
- Missing or loose hose clamps; and
- Deterioration, determined by stretching the tube and looking for cracks.

ATMOSPHERE-SUPPLYING RESPIRATORS

For a routinely used atmosphere-supplying device, use the following procedures:

1. If the device is a tight fitting facepiece, use the procedures outlined under air-purifying respirators, except those pertaining to the air-purifying elements.

2. If the device is a hood, helmet, blouse or full suit, use the following procedures:

   - Examine the hood, blouse, or full suit for rips and tears, seam integrity, etc;

   - Examine the protective headgear, if required, for general condition with emphasis on the suspension inside the headgear.

   - Examine the protective face shield, if any, for cracks or breaks or impaired vision; and

   - Make sure the protective screen is intact and secured correctly over the face shield of abrasive blasting hoods and blouses.

3. Examine air supply systems for:

   - Integrity and good condition of air supply lines and hoses, including attachment and end fittings; and

   - Correct operation and condition of all regulators, or other air flow regulators.

SCBA INSPECTION PROCEDURES

Before a self-contained breathing apparatus can be used, it must be properly inspected to help prevent malfunctions during use. The checklist that follows can help ensure proper inspection.

Checklist: PRESSURE-DEMAND SCBA WITHOUT MODE SELECT LEVER

Prior to starting checklist, make sure that:

- High-pressure-hose connector is tight on cylinder fitting;

- Bypass valve is closed;
- Mainline valve is closed; and
- Regulator outlet is not covered or obstructed.

Back Pack and Harness Assembly Straps

- Visually inspect for complete set; and
- Visually inspect for frayed or damaged straps.

Buckles

- Visually inspect for mating ends;
- Check locking function.

Back plate and cylinder lock

- Visually inspect back plate for cracks and missing rivets or screws; and
- Visually inspect cylinder hold-down strap; physically check strap tightener and lock to assure that it is fully engaged.

Cylinder and Cylinder Valve Assembly

Cylinder

- Physically check to assure that it is tightly fastened to back plate;
- Visually inspect for large dents or gouges in metal;
- Check hydrostatic test date to assure it is current; and
- Check that cylinder is fully charged.

Head and valve assembly

- Visually determine cylinder valve lock is present;

- Visually inspect cylinder gauge for condition of face, needle, and lens; and

- Open cylinder valve; listen or feel for leakage around packing. (If leakage is noted, do not use until repaired.) Note function of valve lock.

Regulator and High-Pressure Hose

High-pressure hose and connector

Listen or feel for leakage in hose or at hose-to-cylinder connector. (Bubble in outer hose covering may be caused by seepage of air through hose when stored under pressure. This does not necessarily indicate a faulty hose.)

Regulator and low-pressure alarm

- Place mouth onto or over regulator outlet and blow. A positive pressure should be created and maintained for 5 to 10 seconds without loss of air. Next, inhale to create a slight negative pressure on regulator; hold for 5 to 10 seconds. Vacuum should remain constant. This tests integrity of the diaphragm. Any loss of pressure or vacuum during this test indicates a leak in the apparatus;

- Ascertain that regulator outlet is not covered or obstructed. Open and close bypass valve momentarily to assure flow of air through by-pass system;

- Cover regulator outlet with palm of hand. Open mainline valve and read regulator gauge (must read at least 1,800 psi and not more than rated cylinder pressure);

- Remove hand from outlet and replace in rapid movement. Repeat twice more. Air should escape when hand is removed each time, indicating a positive pressure in chamber; and

- Close cylinder valve, leaving the main line valve open, and slowly move hand from regulatory outlet to allow air to flow slowly. Gauge should begin to show immediate loss of pressure as air flows. Low-pressure alarm should sound between 520 and 480 psi. Remove hand completely from outlet and close mainline valve.

Facepiece and Corrugated Breathing Tube

Facepiece

- Visually inspect straps and harness for damaged serrations and deteriorated rubber. Visually inspect rubber facepiece body for signs of deterioration or extreme distortion;

- Visually inspect lens for proper seal in rubber facepiece, retaining clamp properly in place, and absence of cracks or large scratches;

- Visually inspect exhalation valve for visible deterioration or buildup of foreign materials; and

- Carry out negative pressure test for overall seal and check of exhalation valve. In monthly inspection, place mask against face and use following procedure; in preparing for use, don back pack, then facepiece, and use following procedure:

  With facepiece held tightly to face (or facepiece properly donned), stretch breathing tube to open corrugations and place thumb or hand over end of connector. Inhale, negative pressure should be created inside mask, causing it to pull tightly to face for 5-10 seconds. If negative pressures drops this indicates a leak in the facepiece or breathing tube.

Breathing tube and connector

- Stretch breathing tube and visually inspect for deterioration and holes;

- Visually inspect connector to assure good condition of threads and for presence and proper condition of rubber gasket seal.

Storage of Units

- Cylinder refilled as necessary and unit cleaned and inspected;

- Cylinder valve closed;
- High-pressure-hose connector tight on cylinder;
- Pressure bled off of high-pressure hose and regulator;
- Bypass valve closed;
- Mainline valve closed;
- All straps completely loosened and laid straight; and
- Facepiece properly stored to protect against dust, direct sunlight, extreme temperatures, excessive moisture, and damaging chemicals.

NOTE: SCBA CYLINDERS ARE NEVER TO BE SHIPPED WITH COMPRESSED AIR IN THEM UNLESS ALL PROVISIONS FOR COMPLYING WITH DOT HAZARDOUS MATERIALS REGULATIONS ARE MET.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.10 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: EVALUATION OF PROGRAM EFFECTIVENESS	

In compliance with 29 CFR 1910.134 and ANSI Z88.2, Dames & Moore will evaluate its Respiratory Protection Program effectiveness regularly so that all persons involved are being provided with appropriate respiratory protection. This will be accomplished through the Dames & Moore Firmwide Health and Safety Director and action will be taken to correct defects in the program.

Project Managers and Site Safety Officers will perform spot inspections of respirator use to see that:

- The proper types of respirators are being used for the job;
- Employees properly perform positive/negative pressure fit tests prior to entering contaminated areas;
- Individuals who are required to wear respirators have received proper training;
- Respirators are inspected and maintained properly;
- Respirator storage is satisfactory;
- Respiratory hazards are monitored;
- The respirators being used are in good operating condition; and
- Medical surveillance of the respirator user is being carried out.

They will also periodically consult with respirator users about respirator comfort, interference to breathing, interference with job performance and their confidence in respirator effectiveness.

To determine the continued need for respiratory protection or a necessity for additional protection, there will be appropriate surveillance of the work area and the degree of employee exposure or stress, including area and personal monitoring of contaminant levels and types.

Data obtained from periodic inspections of respirator use, work area surveillance, medical surveillance, and wearer comments will be reviewed and analyzed to evaluate the continued effectiveness of the program. Any evidence of excessive exposure to a hazardous atmosphere will be investigated and action taken to remedy the problem.

DAMES & MOORE Firmwide **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.11 Date: July 15, 1994 Supercedes: July 1, 1990 Approved: Gary R. Krieger MD GARY R. KRIEGER, MD

Subject: RESPIRATORY PROTECTINO PROGRAM: RESPIRATOR TYPES IN USE AT DAMES & MOORE

AIR PURIFYING RESPIRATORS

These respirators remove contaminants from the air breathed but do not supply oxygen. They cannot be worn in oxygen deficient atmospheres.

Particulate (dust, mist, fume) Removing

These respirators are called "dust", "mist", or "fume" respirators and remove particulates by a filtering action before they can be inhaled. They offer no protection against atmospheres containing contaminant gases or vapors.

The airflow resistance of a particulate-removing respirator filter element increases as the quantity of particles it retains increases, thus increasing the breathing resistance. As a rule of thumb, when comfortable breathing is impaired because of dust build-up, the filter should be replaced. The performance of some filter materials is also affected by open storage in very humid atmospheres and care should be taken in storing filter elements.

NIOSH approves air-purifying and powered air-purifying particulate removing respirators to protect the wearer against one or more of the following hazards:

- Dust exposure, where the OSHA allowable daily exposure for the dust is not less than 0.05 mg/m^3;
- Mist exposure, where the OSHA allowable daily exposure for the mist is not less than 0.05 mg/m^3;
- Metal fume exposure, where the OSHA allowable daily exposure for the fume is not less than 0.05 mg/m^3;
- Dust, fume, and mist exposure, where the OSHA allowable daily exposure for the dust, fume, or mist is less than 0.05 mg/m^3;

- Exposure to radon daughters and radon daughters attached to dusts, fumes, and mist;

- Exposure to asbestos-containing dusts or mists; and

- Exposure to dusts or mists which cause the formation of scar tissue in the lungs (pneumoconiosis and fibrosis-producing materials).

- Dust, Mist, and Fume Half-Face Respirator

  The half-face respirator fits over the nose and under the chin. The half-face usually produces a good facepiece to face seal but not as good a seal as the full facepiece. Depending on the filter used, the half-mask is approved for use against fumes or dusts and mists having a PEL or TLV greater than 0.05 mg/m^3.

- High-Efficiency Half-Face Respirator

  These respirators use a high efficiency filter and can be used against dusts, mists, and fumes with PEL or TLV less than 0.05 mg/m^3.

- Dust, Mist, and Fume Full Facepiece Respirator

  Full facepiece respirators cover the face from the hairline to below the chin. They provide more protection to the face, and give a better seal than do the half- or quarter-masks. These respirators provide protection against dusts, mists, fumes, or any combination of these contaminants depending upon the type of filter used.

- Powered Dust, Mist, and Fume (PAPR) Respirators (Asbestos Operations)

  These respirators use a blower that passes the contaminated air through a filter where the contaminant is removed and passes the purified air into the facepiece. The face covering can be a half-mask, full-face mask, hood, or helmet.

  The advantage of using a powered air-purifying respirator is that it supplies air at a positive pressure within the facepiece, hood, or helmet, so that any leakage is outward. The protection provided depends on the air-purifying element and the type and concentration of the contaminants. Powered respirators must deliver at least 4 cubic feet per minute (cfm) to a tight fitting facepiece such as a mask and at least 7 cfm to a loose fitting helmet or hood. If the powered respirator is battery operated, it should provide the airflows mentioned for at least 4 hours without having to recharge the battery.

Gas and Vapor Removing Respirators

Vapor and gas-removing respirators use cartridges or canisters containing chemicals to absorb or react with specific vapors and gases to remove them from the air breathed. The basic difference between a cartridge and a canister is the volume of the sorbent. Generally a "cartridge" refers to a smaller chemical filtering element which attaches directly to the facepiece, whereas a "canister" refers to a larger chemical filter element held in a harness connected to the facepiece by a corrugated breathing tube. A color code system is used to assist in identifying the approved uses for individual cartridges and canisters. Table 1 lists various air contaminants and their associated colors. Labels on the cartridge and canister will also indicate the maximum concentration in which the element can be used and in some cases, the service life or expiration date of the element. However, it should be emphasized that personnel should not attempt to memorize the color coding. The label should always be reviewed to determine what contaminants the cartridge or canister may be used for.

Cartridges and canisters are available for protection against single chemicals such as ammonia or against entire classes such as organic vapors depending on the cartridge or canister used.

Important note: because a cartridge or canister label indicates it may be useful against a class of contaminants, e.g., organic vapors, it does not ensure that it is useful for all chemicals within that class. If in doubt, contact the OSC or DHSM for specific uses.

These respirators are available in either half-face or full-face models. The full-facepiece canister respirators are also referred to as "gas masks."

Colors Used for Respirator Filters or Canisters

Atmospheric Contaminants	Color
Acid gases	White
Chlorine gas	White with 1/2-inch yellow stripe completely around the canister near the bottom
Organic vapors	Black
Ammonia gas	Green
Acid gases and ammonia gas	Green with 1/2-inch white stripe completely around the canister near the bottom
Carbon monoxide	Blue
Acid gases and organic vapors	Yellow
Acid gases, organic vapors, and ammonia gases	Brown
Radioactive materials, except tritium and noble gases*	Purple (magenta)
Particulates (dusts, fumes, mists, designated fogs, or smokes) in combination with any of the above with gases or vapors	Canister color for contaminant, as above, with 1/2 inch gray stripe around the canister near the top
All of the above atmospheric contaminants	Red with 1/2-inch gray stripe completely around the canister near the top

*Also acceptable for particulates with a TLV less than 0.05 mg/m^3 and asbestos.

ATMOSPHERE SUPPLYING RESPIRATORS

Atmosphere supplying respirators, rather than removing the hazardous material from the air, exclude the workplace air altogether and provide clean air from an independent source. Because of this, they can be used for protection against particulates, gases, or vapors and can also be used in oxygen deficient atmospheres.

Supplied-Air Respirators

A supplied-air respirator uses a central source of breathing air that is delivered through an air supply line or hose. Because the user is completely dependent on the integrity of the air supply line or hose and damage to same might prevent his escape from a contaminated area, a supplied-air respirator cannot be used in atmospheres immediately dangerous to life or health (see combination atmosphere supplying respirator, below).

The trailing air supply hose or line can severely restrict the wearer's mobility, and can become tangled with others' lines if more than one person is using an airline respirator in the exclusion zone. This may make a supplied-air respirator unsuitable for those who must move frequently between widely separated work stations.

A great advantage of the airline respirator is that it can be used for long, continuous periods.

Airline Devices

- The air source for airline devices is either a compressor or air tanks. The following requirements meet the specifications for Grade D breathing air, and apply to air supplied for airline devices:
  - The oxygen content of the compressed air should be between 19.5 to 23.5 percent oxygen and the rest mainly nitrogen;
  - Hydrocarbon concentrations must not exceed 5 mg/m^3;
  - The carbon monoxide concentration must not exceed 20 parts per million;
  - Carbon dioxide concentrations must not exceed 1,000 parts per million; and

- There must not be any pronounced odor present.

To be assured that these conditions are met, the following steps should be taken:

- The air compressor must be located where contaminated air cannot enter the system;

- Alarms indicating compressor failure and overheating must be installed in the system;

- If the compressor is oil-lubricated it must have a high temperature and/or carbon monoxide (CO) alarm. If there is no CO alarm, frequent carbon monoxide tests of the air must be made to ensure that the CO level does not exceed 20 parts per million;

- Bottled compressed air that is obtained from a vendor must be accompanied by a certification attesting that the air meets or exceeds Grade D specifications; and

- All airline couplings must be incompatible with outlets for other gas systems.

<u>Demand Airline Device</u>
In a demand device, the air enters the facepiece only on "demand" of the wearer, i.e., when the person inhales. This is due to the nature of the valve and pressure regulator.

During inhalation there is a negative pressure in the mask, so if there is leakage, contaminated air may enter the mask and be breathed by the user. The leakage problem is a major drawback of the demand device. Demand devices are also available with a full-face mask, which provides a better seal than does the half-mask. DEMAND DEVICES ARE NOT TO BE USED IN DAMES & MOORE OPERATIONS;

<u>Pressure Demand Airline Device</u>
The pressure demand device has a regulator and valve design such that there is a continuous flow (until a fixed static pressure is attained) of air into the facepiece at all times, regardless of the "demand" of the user. The airflow into the mask creates a positive pressure outward. As

such, there is no problem of contaminant leakage into the facepiece. This is a significant advantage of this type of device. ONLY PRESSURE-DEMAND DEVICES ARE TO BE USED IN DAMES & MOORE OPERATIONS.

such, there is no problem of contaminant leakage into the facepiece. This is a significant advantage of this type of device. ONLY PRESSURE-DEMAND DEVICES ARE TO BE USED IN DAMES & MOORE OPERATIONS.

Self-Contained Breathing Apparatus (SCBA)

The self-contained breathing apparatus (SCBA) allows the user to carry a respirable breathing supply with him and does not need a stationary air source such as a compressor to provide breathable air. The SCBAs used by Dames & Moore provide a 30 minute supply of air.

Since SCBA's provide a breathing air supply which is not dependent on a trailing hose or airline, pressure demand SCBA's may be used in atmospheres immediately dangerous to life or health (IDLH). An open circuit demand (not pressure demand) SCBA may have facepiece leakage and cannot be used in IDLH environments. Also, some devices are only approved for "escape from" and not "entry into" a hazardous atmosphere.

Open Circuit SCBA

An open circuit SCBA exhausts the exhaled air to the atmosphere instead of recirculating it. A tank of compressed air carried on the back supplies air via a regulator to the facepiece. Because there is no recirculation of air, the service life of the open circuit SCBA is shorter than a closed circuit system. The air supply is limited to the amount in the cylinder and therefore, the respirator cannot be used for extended periods without recharging or replacing the cylinders. Because these respirators are bulky and heavy, they are often unsuitable for strenuous work or use in confined spaces. Two types of open circuit SCBA are available, "demand" or "pressure demand."

- Demand SCBA - DEMAND SCBAS ARE NOT TO BE USED IN DAMES & MOORE OPERATIONS

- Pressure Demand SCBA
  The pressure demand open circuit SCBA has a regulator and valve design which maintains a positive pressure in the facepiece at all times regardless of "demand" of the user. As such, there is no problem of contaminant leakage into the facepiece. This is a significant advantage of the pressure demand device.

Combination Atmosphere Supplying Respirator: Supplied Air and SCBA

Designed primarily as a long duration device, the respirator combines an airline respirator with an auxiliary air supply (usually compressed air) to protect against the possible failure of the primary air supply (the airline). The additional supply can be approved for 5 to 15 minutes or even longer. The choice depends upon how long it would take to escape from the toxic atmosphere if the primary air supply failed. This type of unit may be used in IDLH environments.

An employee shall be allowed to use only the specific makes(s) and model(s) of air purifying respirators for which the person has obtained a satisfactory fit verified through fit testing procedures. An employee is not permitted to use any respirator not previously fit tested or if the results of the fit test indicated that the person was unable to obtain a satisfactory fit. Fit tests will not be performed on persons with facial hair as described in HS 150.6.

Dames & Moore's qualitative fit test procedures involve two stages of testing. Stage I involves a simple respirator negative and positive pressure sealing check for facepiece fit. Stage II involves the exposure of the respirator wearer to a test atmosphere. This will include two separate atmosphere tests to double check the adequate fit of the respirator to the wearer. The respirator is to be worn for five minutes prior to beginning the fit test.

NOTE: During any fit test, respiratory head straps must be as comfortable as possible. Over tightening the straps can reduce facepiece leakage, but the wearer may not be able to tolerate the mask for any period of time.

Stage I

- Negative Pressure Sealing Checks For Tightly Fitting Air Purifying Respirators

  The wearer performs this test after donning an air purifying respirator. The test consists of closing off the inlets of the cartridge(s), canister or filters by covering them with the palm(s) of the hand(s) so that air cannot pass, inhaling gently, and holding one's breath for at least ten seconds. If a facepiece collapses slightly and no inward leakage of air into the facepiece is detected, it can be reasonably assumed that the fit of the respirator to the wearer is satisfactory.

  This is used only as a gross determination of fit when the respirator is to be worn in relatively toxic atmospheres. None the less, this test shall be used each time prior to entering a toxic atmosphere.

- Positive Pressure Seal Check for Air Purifying Respirators with Inhalation and Exhalation Valves.

  This test is very much like the negative pressure sealing check, above and is conducted by closing off the exhalation valve and exhaling gently. The fit is considered satisfactory if a slight positive pressure can be built up inside the facepiece for at least 10 seconds without detecting any outward leakage of air between the sealing surface of the facepiece and the wearer's face.

  This test is also used only as a gross determination of fit when the respirator is to be worn in relatively toxic atmospheres. This test shall be used each time prior to entering a toxic atmosphere.

NOTE: The positive and negative pressure sealing checks can also be used on SCBA facepieces to determine gross fit characteristics.

Stage II

A person wearing an air purifying respirator will be exposed to two test agents: isoamyl acetate--an odorous vapor--and stannic chloride--an irritant smoke. The respirator will be equipped with a cartridge which effectively removes the test agents from respired air. If the wearer is unable to detect penetration of the test agent into the respirator, the wearer has achieved a satisfactory fit.

The Dames & Moore fit test form (see attached Qualitative Fit Test Worksheet) will be completed by the examiner and signed by the employee subjected to the test, with copies sent to the appropriate locations for recordkeeping after the test has been completed.

The examiner is to brief the employee on the basics of the use and limitations of the respirators. The employee should be able to demonstrate their familiarity with inspection, cleaning, maintenance and storage of the respirator.

Division Health and Safety Managers should note that there are specific fit testing protocols mandated by Federal regulations for respirator use in atmospheres containing the following substances:

- Asbestos - 29 CFR 1910.1001 and 1926.58
- Benzene - 29 CFR 1910.1028
- Lead - 29 CFR 1910.1025 and 1926.62
- Formaldehyde - 29 CFR 1910.1048
- Cadmium - 29 CFR 1910.1027 and 1926.63

Procedures for the Isoamyl Acetate Vapor (Banana Oil) Test--The isoamyl acetate fit test may be conducted by using a plastic bag as a test hood hung from the ceiling over a coat hanger suspended by twine. Inside the plastic bag, a piece of cloth saturated with isoamyl acetate is attached at the top of the bag. Alternatively, an isoamyl acetate ampule may be used. Either method should produce an isoamyl acetate vapor concentration well above the general odor detection range of 1 to 10 ppm. The OSHA Permissible Exposure Limit is 100 ppm.

- The wearer dons the respirator in a normal manner, and waits five minutes. The respirator will be fitted with organic vapor cartridges;

- The wearer enters the test enclosure, so that the head and shoulders are well inside the bag;

- If the wearer smells banana oil, he returns to clean air and readjusts the facepiece and/or adjusts the headstraps without unduly tightening them;

- The wearer repeats the second step. If he does not smell banana oil, he is assumed to have obtained a satisfactory fit. If he smells the vapor, an attempt should be made to find the leakage point. If the leak cannot be located, another brand of respirator with a facepiece of the same type should be tried.

- After a fit is obtained, if the respirator is an air-purifying device, it must be equipped with the correct filter(s), cartridges(s), or canister for the anticipated hazard.

During the test, the subject should make movements that approximate a normal working situation. These may include, but not necessarily be limited to, the following, each for 30 seconds:

- Normal breathing;

- Deep breathing, as during heavy exertion. This should not be done long enough to cause hyperventilation;

- Side-to-side and up-and-down head movements. These movements should be exaggerated, but should approximate those that take place on the job;

- Talking. This is most easily accomplished by reading a prepared test, such as the "Rainbow Passage" (see the accompanying figure), loudly enough to be understood by someone standing nearby;

- Other exercises may be added depending upon the situation. For example, if the wearer is going to spend a significant part of his time bent over at some task, it may desirable to include an exercise simulating this motion. Jogging in place may also be performed by the test subject.

The major drawback of the isoamyl acetate test is that the odor threshold varies widely among individuals. Furthermore, the sense of smell is easily dulled and may deteriorate during the test so that the wearer can detect only high vapor concentrations. Another disadvantage is that isoamyl acetate smells pleasant, even in high concentrations. Therefore, a wearer may say that the respirator fits although it has a large leak. Therefore, check these test results out carefully and move on to the next test atmosphere.

Procedures for the Irritant Smoke (Stannic Chloride) Test--This test is similar to the isoamyl acetate test in concept. It usually involves exposing the respirator wearer to an irritating aerosol produced by commercially available smoke tubes normally used to check the quality of ventilation systems. When the tube ends are broken and air is passed through it, the material inside reacts with the moisture in the air to produce a dense, highly irritating smoke, consisting of hydrochloric acid absorbed on small solid particles. As a qualitative means of determining respirator fit, this test has a distinct advantage in that the wearer usually reacts involuntarily to leakage by coughing or sneezing. The likelihood of this giving a false indication of proper fit is reduced. On the other hand, the aerosol is very irritating and must be used carefully to avoid injury. Also, it is advisable to have exhaust ventilation behind the subject to protect the person doing the testing.

This test can be used for both air-purifying and atmosphere-supplying respirators, but air-purifying respirators must have a high-efficiency filter(s). After the test, it may be necessary to replace the high-efficiency filter(s) on the air-purifying respirator with another type of air-purifying element(s) depending upon the hazard to which the respirator wearer is to be exposed. This test can be used for worker training or respirator selection.

The irritant smoke test will be conducted by using a plastic bag as a test hood. The bag shall be hung from the ceiling over a coat hanger suspended by twine. A small hole is made in the top portion of the bag so that the irritant smoke can be dispensed into the bag when the test subject has entered the bag.

The air purifying respirator to be used in this test must be equipped with a high efficiency filter.

The irritant smoke fit test will be performed as follows:

- The wearer puts on the respirator normally, taking care not to tighten the headstraps uncomfortably. Once the respirator is on, the subject waits five minutes and then enters the suspended bag so that the head and shoulders are well inside the bag;

- Once the subject is inside the bag, the tester shall begin to add the irritant smoke in small quantities at first, pausing between puffs from the applicator;

- Normal breathing;

- Deep breathing, as during heavy exertion. This should not be done long enough to cause hyperventilation;

- Side-to-side and up-and-down head movements. These movements should be exaggerated, but should approximate those that take place on the job;

- Talking. This is most easily accomplished by reading a prepared text, such as the "Rainbow Passage", loudly enough to be understood by someone standing nearby;

- Other exercises may be added depending upon the situation. For example, if the wearer is going to spend a significant part of his time bent over at some task, it may desirable to include an exercise simulating this motion. Jogging in place may also be performed by the test subject. Exercises should be performed for at least 30 seconds.

- If the wearer detects no leakage, the tester may increase the smoke density, still remaining alert to his reaction.

<u>NOTE:</u> When fit testing half-face respirators with irritant smoke, the test subject must keep his eyes tightly closed to avoid irritation. Also, the wearer should be well clear of the test area before removing the respirator.

DAMES & MOORE
RESPIRATORY PROTECTION
QUALITATIVE FIT TEST WORKSHEET

Employee Name ______________________________ Employee No. __________

Office Location ______________________________ SSN __________

Last Medical Exam ______________________________ Corrective Lenses? ____

	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Equipment Type:	________	________	________
Manufacturer:	________	________	________
Model:	________	________	________
Size:	________	________	________
Material:	________	________	________

TEST RESULTS	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
(1) Negative Pressure Test	P__ F__	P__ F__	P__ F__
(2) Positive Pressure Test	P__ F__	P__ F__	P__ F__
(3) Isoamyl Acetate Vapor Test	P__ F__	P__ F__	P__ F__
(4) Irritant Smoke Test	P__ F__	P__ F__	P__ F__

- Briefed on fundamental principles of respiratory protection, use, inspection, cleaning, maintenance and storage of equipment. Yes ___ No ___
- Isoamyl acetate odor recognition. Yes ___ No ___
- Briefed on the procedure for obtaining a lens kit for use with full-face respirators. Yes ___ No ___

I hereby certify that the subject employee has been FIT tested according to procedures specified in the Dames & Moore Respiratory Protection Program. The results of the test indicate that the subject employee attains a satisfactory fit on the above respiratory protective equipment.

______________________ ______________________ __________
Examiner's Name (Print) Examiner's Signature Date

______________________ __________
Employee's Signature Date

THE RAINBOW PASSAGE

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long, round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

DAMES & MOORE **Firmwide** **Health and Safety** **Program and Procedure Manual**	Procedure No.: HS 150.13 Date: July 15, 1994 Supercedes: Approved: Gary R. Krieger MD GARY R. KRIEGER, MD
Subject: RESPIRATORY PROTECTION PROGRAM: QUANTITATIVE FIT TEST PROCEDURES	

OSHA's respiratory protection regulations (29 CFR 1910.134) allow either qualitative or quantitative fit-testing. However, National Institute for Occupational Safety and Health (NIOSH) researchers only endorse quantitative fit-testing. Dames & Moore employees are allowed to use only the specific makes(s) and model(s) of air purifying respirators for which the person has obtained a satisfactory fit verified through fit testing procedures, whether qualitative or quantitative. When made available, employees are encouraged to undergo quantitative fit testing because it is recognized as the more protective method for evaluating fit.

Quantitative fit test procedures involve exposing a person to a challenge chemical while wearing a specially-equipped respirator. The respirator has cartridges which are capable of filtering out the challenge chemical, and is connected to a machine which measures the ratio of the chemical concentrations inside and outside the respirator. While undergoing the fit-test, the wearer conducts a series of movements which simulate the movements that occur during work.

Before a quantitative fit test is conducted, it must be noted that there are specific fit testing protocols mandated by Federal regulations for respirator use in atmospheres containing the following substances, which require specific fit test procedures:

- Asbestos - 29 CFR 1910.1001 and 1926.58
- Benzene - 29 CFR 1910.1028
- Lead - 29 CFR 1910.1025 and 1926.62
- Formaldehyde - 29 CFR 1910.1048
- Cadmium - 29 CFR 1910.1027 and 1926.63

The quantitative fit-testing protocols described in this procedure are for the general use of respirators. Should the wearer(s) be involved in work where there is a potential for exposure to any of the substances listed above, the fit-testing procedures are to be applied in such a manner to comply with the substance-specific regulations that are involved. The fit-test procedures of the above-listed standards vary, so each individual standard should be reviewed to see that the test procedures to be used will comply.

The following procedures are to be used when quantitatively fit-testing individuals for the general use of air-purifying respirators. The following procedures are an agglomerated modification of best available practices, derived under a review of the historical types of Dames & Moore projects, using the professional judgement of a qualified industrial hygienist. Modifications to these procedures can be made, if the conditions under which the respirator is to be worn warrant.

1. Start up the testing apparatus, calibrate it, and make any other preparations necessary, such as creating a data file.

2. Verify that the wearer has been medically qualified to wear a respirator. If so, proceed with the test. If not, they should not be tested.

3. Describe the testing procedure to the wearer, making sure they understand the purpose of the test and the actions expected of them.

4. The fit test shall not be conducted on an individual who exhibits any hair growth in the area of the respirator which may affect the seal, such as stubble, a beard, wide moustache, or long sideburns.

5. Ask the wearer about their familiarity with the principles of respiratory protection, and the limitations, use and care of respirators. If they are unfamiliar with respiratory protection or are in need of a refresher, they are to be trained in accordance with 29 CFR 1910.134 before being allowed to wear a respirator in the field. Dames & Moore procedure HS 150.7 describes the training which must be conducted.

6. The wearer should select a test respirator (a variety of models and sizes are to be offered) that provides the most comfortable fit, or is like one they already have; put it on and wear it for a minimum of three minutes.

<u>NOTE</u>: During any fit test, respiratory head straps must be as comfortable as possible. Over tightening the straps can reduce facepiece leakage, but the wearer may not be able to tolerate the mask for any period of time.

7. After the facepiece probe has been blocked, the wearer is to conduct the negative and positive pressure checks described in HS 150.12, Stage I procedures.

DAMES & MOORE
RESPIRATORY PROTECTION
QUANTITATIVE FIT TEST WORKSHEET

Employee Name ______________________ Employee No. ________

Office Location ______________________ SSN ________

Last Medical Exam ______________________ Corrective Lenses? ____

	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
Equipment Type:	________	________	________
Manufacturer:	________	________	________
Model:	________	________	________
Size:	________	________	________
Material:	________	________	________

TEST RESULTS	RESPIRATOR 1	RESPIRATOR 2	RESPIRATOR 3
(1) Negative Pressure Test	P__ F__	P__ F__	P__ F__
(2) Positive Pressure Test	P__ F__	P__ F__	P__ F__
(3) Overall Fit Factor Achieved	________	________	________
(4) Printout/Strip Chart Attached	________	________	________

- Briefed on fundamental principles of respiratory protection, use, inspection, cleaning, maintenance and storage of equipment. Yes ___ No ___

- Briefed on the procedure for obtaining a lens kit for use with a full-face respirator. Yes ___ No ___

I hereby certify that the subject employee has been FIT tested according to procedures specified in the Dames & Moore Respiratory Protection Program. The results of the test indicate that the subject employee attains a satisfactory fit on the above respiratory protective equipment.

______________________ ______________________ ________
Examiner's Name (Print) Examiner's Signature Date

______________________ ________
Employee's Signature Date

Copies to: (1) DHSM (2) Employee (3) Employee's OSC 3/94

QUANTRES.FRM

Appendix F

MEDICAL SURVEILLANCE REQUIREMENTS

Physician's opinion

The physician's written opinion about employees' ability to perform hazardous remediation work shall contain:

The physician's recommended special protective measures or limitations upon the employee's assigned work

The physician's opinion about any detectable medical condition that would place the employee at increased risk of material impairment of the employees health given the anticipated exposures to hazardous and toxic wastes

Any recommended limitations upon the employee's use of respirators, including a determination of whether the employee can wear a powered air purifying respirator if a physician determines that the employee cannot wear a negative air pressure respirator
A statement that the employee has been informed and advised about the results of the examination. The statement must clarify that the patient understands that given his/her past medical history and anticipated on-site working conditions, the additional qualitative risk to his/her health.

Attach copies of employees' medical certification to this Appendix.

MEDICAL SURVEILLANCE NOTIFICATION
Dames & Moore Health Services Group
Denver, CO

gk

Employee Name: Dennis W. Day

Exam Date: 06/08/98

Company: Dames & Moore

Location: OMA

Job Title: SR IND HYG

Exam Type: Baseline, CXR, ECG

This individual's medical status was reviewed according to 29 CFR 1910.120, 1910.1001, 1910.134 and:

X Is qualified for full participation in hazardous waste or asbestos site work when conducted under the conditions of adequate training and a health and safety plan.

___ Is qualified at this time for participation in hazardous waste or asbestos site work when conducted under the conditions of adequate training and a health and safety plan. These work modifications are required.

___ Is NOT QUALIFIED at this time for full participation in hazardous waste or asbestos work. See below.

X Qualified to use a respirator.

_ NOT QUALIFIED to use a respirator.

___ Follow-up under Dames & Moore account.

___ Follow-up with personal physician under personal health insurance.

___ Qualified for non-hazardous work requiring hearing protection.

JUL 28 1998
Date

Gary R. Krieger MD
Gary R. Krieger, MD, MPH, DABT
Dames & Moore Medical Director

THE INFORMATION PROVIDED ON THIS FORM WILL BE CONSIDERED INVALID ON 06/08/99
For information needed after the expiration date, contact the Dames & Moore Medical Surveillance Group, Denver, Colorado (303) 299-7978

Supervisor: Dave Henney
Manager:
Division Health & Safety Manager:
Office Safety Coordinator:

Appendix G

Hazardous Waste Operations Training Requirements:

Employees (general equipment operators, general laborers and labor supervisory personnel not assigned HAZWASTE supervisory duties) who may be exposed to hazardous materials:

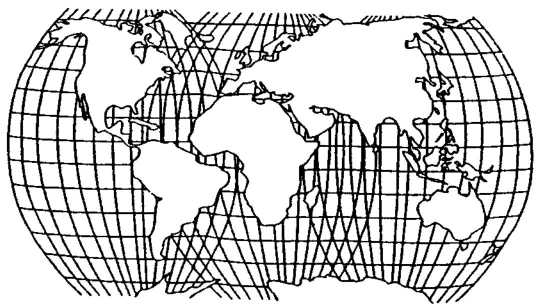
- Receive at least 40 hours of safety and health instruction before engaging in hazardous waste operations
- Receive a minimum of 3 days of actual field experience under the direct supervision of a trained, experienced HAZWASTE Foreman/Supervisor

Employees (ground water monitoring technicians, land survey crews who stay on the site boundary, geo-physical monitoring technicians who monitor only undisturbed surface soil location) who are on site only occasionally for limited periods of time:

- Receive at least 24 hours of safety and health instruction before engaging in hazardous waste operations
- Receive a minimum of 1 day of actual field experience under the direct supervision of a trained, experienced HAZWASTE Foreman/Supervisor

Employees who may be exposed to hazardous materials also receive 8 hours annual refresher training thereafter. Site documentation of training will include the original training certificate and all refresher-training certificates. Personnel will be required to carry on their person to the site, wallet cards showing the latest refresher training certification.

HAZWASTE Foreman/Supervisors directly responsible for, or who supervise employees at this hazardous waste site, will receive at least 8 additional hours of specialized training on managing such operations. (29 CFR 1910.120 Hazardous Waste Operations Supervisor Course).



DOCUMENTATION OF ON-SITE HTRW FIELD EXPERIENCE

NAME:

DATE:

SITE:

ON SITE SUPERVISOR:

DURATION OF SUPERVISED SITE ACTIVITY:

TYPE OF SUPERVISED SITE ACTIVITY:

As a site supervisor trained in accordance with 29 CFR 1910.120 (40 hours of initial training, required annual refreshers, and an additional 8 hours of supervisory training), I supervised the above named individual.

SITE HAZWASTE FOREMAN/SUPERVISOR'S SIGNATURE:

ADDITIONAL INFORMATION RELEVANT TO THIS SUPERVISED FIELD EXPERIENCE (optional entry):

Instructions for use of this form:

The site worker is to enter each of the required queries. (I.e. Date, Site, etc.)
The site supervisor is to sign the above statement and initial each of the query entries.
The worker is responsible for maintaining this form, and all other such forms used to document three days total supervised field experience.

Certificate of Completion

This certifies that

Doug Kuhn

has completed an 8-hour HAZWOPER Refresher Training Course in accordance with 29 CFR 1910.120

Presented by:

Dames & Moore

William M. Berlett, Jr., IHIT
Central Division Health & Safety Manager

DAMES & MOORE
A DAMES & MOORE GROUP COMPANY

Overland Park, Kansas
August 5, 1998

Chairman, American Red Cross

Instructor's Signature

Taleeaabua

Holder's Signature

The American Red Cross recognizes this training as valid for three years from completion date.

Cert. 653207 (Jan. 1993)

American Red Cross

This certifies that

Doug Kuhn

has completed the requirements for

STANDARD FIRST AID

sponsored by

GKC-Shawnee Mission

Date completed

3-6-97

Chairman, American Red Cross

Instructor's Signature

Holder's Signature

The American Red Cross recognizes this training as valid for one year from completion date.

Cert. 653212 (Jan. 1993)

American Red Cross

This certifies that

Doug Kuhn

has completed the requirements for

ADULT CPR

sponsored by

Shawnee Mission

GKC

Date completed

3-6-97

Certificate of Completion

This certifies that

Doug Kuhn

has successfully completed DOT Training
in accordance with HM-126F

Presented by:

Dames & Moore

William M. Berlett, Jr., IHIT
Central Division Health & Safety Manager

DAMES & MOORE

Overland Park, Kansas
August 5, 1998

PHILLIPS ENVIRONMENTAL TRAINING INC.

Certificate of Completion
presented to

Brian C. Wiedower

40 - Hour Initial Training

Hazardous Waste Operation and Emergency Response
29 CFR 1910.120

MAY 16 - 20, 1994
Date of Instruction

Franklin A. Phillips
Certified Environmental Trainer
Certified Hazardous Materials Manager

N.J.K. Associates, Inc.

Certificate of Completion

Presented to

Brian W[illegible]

For Successful Comp[illegible]
Hazardous Waste Operations Re[illegible]
OSHA 29 CFR 1910.120 [illegible]

October 19, 1998

Nanc[illegible] J. [illegible]pko
[illegible]resident

M·E·T·A

Mayhew Environmental Training Associates

I N C O R P O R A T E D

Certificate # 7ME01229801MORI003

This is to certify that

Brian C. Wiedower

has on 01/22/98, in LAWRENCE, KS
successfully completed the

Missouri State Asbestos Exam for Inspectors

held 01/22/98 - 01/22/98
with a score of 70% or better

Instructor

President

Soc. Sec #: 512-88-3427

META - P.O. Box 786 - Lawrence KS 66044 - 800-444-6382

8 HOUR REFRESHER TRAINING

Awarded to

Dennis W. Day

Successfully Completed As Described In
29 CFR 1910.120 and 29 CFR 1926.65.

Presented by

Dames & Moore

May 4 , 1997

Martha J. Boss

Martha J. Boss, CIH, CSP

American Red Cross

This certifies that

BRIAN WIEDOWER

has completed the requirements for

ADULT CPR

sponsored by

GKC/NORTHLAND

Date completed

08/04/97

Chairman, American Red Cross

Instructor's Signature

Holder's Signature

The American Red Cross recognizes this training as valid for one year from completion date.

Cert. 653212 (Jan. 1993)

American Red Cross

This certifies that

BRIAN WIEDOWER

has completed the requirements for

STANDARD FIRST AID

sponsored by

GKC/NORTHLAND

Date completed

08/04/97

Chairman, American Red Cross

Instructor's Signature

Holder's Signature

The American Red Cross recognizes this training as valid for three years from completion date.

Cert. 653207 (Jan. 1993)

Appendix H

EMERGENCY RESPONSE/CONTINGENCY PLAN

Personnel Roles and Lines of Authority

- The SSHO has primary responsibility for responding to and correcting emergency situations involving on site personnel. This includes taking appropriate measure to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and evacuation of adjacent residents.
- The SSHO is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified, and follow-up reports completed when the emergency is directly related to activities on-site.

Pre-Emergency Planning

The SSHO must coordinate an emergency response/contingency plan.

Prior to initiating on-site activities, the appropriate local emergency response teams listed in *EMERGENCY CONTACTS & APPROVAL PAGE*, page 2 of this SSHP will be contacted and informed as to the site location, the activities to be conducted, the anticipated hazards, the levels of personal protection equipment required on-site, and any other pertinent information.

In the event of a worker-related injury; the -Safety Manager will be notified. The associated SSHO responsibilities include the following:

- Establishing site evacuation routes and zones.
- Notifying offsite emergency response teams.
- Assessing emergencies.

Safety equipment will be maintained on site. This safety equipment will include:

- For rescue purposes, two- (2) positive pressure SCBA. These will be dedicated and marked "For Emergency Only". The SCBA will be maintained in the CRZ.
- Emergency eyewashes and showers in compliance with ANSI Z358.1
- Fire Extinguishers with a minimum rating of 20-A: 120-B: C will be maintained on the site and in all vehicles that enter the EZ.

Emergency phone numbers and area maps to nearest medical facilities will be laminated and posted on-site.

Lines of Authority in an Emergency

In the event of an emergency:

- The Contractor SSHO will be in charge, or;
- When an offsite emergency response team is on-site, this team will be lead by an Incident Commander or officer in charge. The -Safety Manager will act as a liaison to Incident Commander or the officer in charge.

Site Security and Control

In cases where an emergency situation does not pose a threat to the public and offsite emergency response teams will not be dispatched to the site, the SSHO will be responsible for coordinating the appropriate emergency response and communicating with the public as necessary.

However, if an emergency arises that presents an immediate threat to the public or otherwise requires additional support, the SSHO may activate the emergency response system in the manner prescribed by the offsite emergency response organization.

In an emergency situation when the police, fire department, or other local emergency response team has been dispatched to the site, the local authorities will mandate site security and control.

Emergency/Accident Recognition and Prevention

All personnel will bring to the attention of the SSHO any unsafe condition, practice, or circumstance associated with or resulting from the on-site activities.

In cases of **immediate hazard** to employees or the public:

- Any employee on the scene will take all practicable steps to eliminate or neutralize the hazard; this may include leaving the site.
- Follow-up consultation with the -Safety Manager must be made at the first opportunity.
- In such circumstances, the SSHO will take the necessary steps to ensure that the investigation can be completed safely. Such steps will include: notification changes in procedures, removal or neutralization of a hazard, consultation with appropriate experts, or the use of a specialist.

In cases where the hazard is **not an immediate danger** to the employees, the SSHO will be consulted regarding appropriate corrective measures.

If a hazard poses an **immediate threat to the public**, the SSHO will be responsible for activating the emergency response system in the manner prescribed by the local fire and police departments.

In the event that any member of the team experiences any **extreme adverse effects or symptoms of chemical exposure** while on-site; the entire team will immediately leave the site and seek appropriate medical aid.

In the event that any member of the work force is **overcome, incapacitated, or traumatically injured** while on-site:

1. The remaining members will immediately call for assistance and make reasonable efforts to rescue the affected person.
2. At least one person will remain outside the problem area until help arrives.
3. Once removed from the problem area the affected person will not be left unattended.
4. If possible, limited personnel decontamination will be conducted, but only if time is not critical to getting the injured person to medical aid.
   Note: In cases where personnel contamination has occurred, those persons involved will make every reasonable effort to **decontaminate themselves**, so minimal spreading of contaminants occur.
5. Medical aid will be acquired either via ambulance or SSHO directed transfer of personnel to the medical facility using site vehicles.
   - The SSHO will determine the fitness of the driver.
   - If the driver's fitness is questioned, medical assistance must be contacted by phone.

INCIDENT/ACCIDENT REPORT

An Incident/Accident Report will be completed by the SSHO following any accident involving on-site personnel. A copy of the report will be attached to this SSHP or filed and referenced from this SSHP. A copy of the report will be submitted to the Safety Manager within 24 hours.

Safety Distances and Places of Refuge

The SSHO will establish safe evacuation distances prior to initiation of field activities.

- An emergency evacuation assembly point will be designated daily by the SSHO based on the current wind direction.
- The emergency evacuation assembly point will be located upwind and will be updated as needed.
- The location of the evacuation points will be recorded in the **Safety & Health Log.**

Evacuation Routes and Procedures

All evacuation routes will be designated to move personnel away from an affected area in a safe and efficient manner and to establish efficient traffic patterns for fire and emergency equipment during an emergency response.

- These evacuation routes will be located at a safe distance upwind of all areas of activities.
- The SSHO will be responsible for personnel accounting at each emergency evacuation assembly point.

Emergency Decontamination

In addition to routine decontamination procedures, emergency decontamination procedures must be established. In an emergency, the primary concern is to prevent the loss of life or severe injury to site personnel.

- If immediate medical treatment is required to save a life; limited decontamination will be performed or the person will be wrapped in a blanket.
- Any person, who is not fully decontaminated and requires transportation to a medical facility, will be wrapped in a blanket to protect the emergency vehicle. As an alternative, the seats of the emergency vehicle will be covered with polyethylene or a blanket.
- If a worker has been contaminated with an extremely toxic or corrosive material that could cause severe injury or loss of life, decontamination will be performed immediately.
- The SSHO will designate personnel who are not directly involved in the emergency to properly dispose of contaminated clothing and equipment.

Emergency Medical Treatment and First Aid

At least two team members will have successfully completed a Red Cross sponsored course in adult first aid and cardiopulmonary resuscitation.

Prior to the start of work, the SSHO will make arrangements for medical facilities, ambulance service, and medical personnel to be available for prompt attention to the injured.

On-site activities will require a first aid kit located within the support zone.

Emergency telephone numbers and reporting instructions for ambulance, hospital, poison control center, fire department, and police will be conspicuously posted or available.

If the SSHO determines that a situation exists that could threaten human health or the environment outside the site area, he/she will immediately notify the local fire department, Safety Manger, and the National Response Center. The telephone report will include:

- Name and telephone number or reporter
- Name and address of facility
- Time and type of incident (e.g., release, fire)
- Name and quantity of material(s) involved, to the extent known, and the location of the discharge within the facility
- The extent of injuries, if any
- The possible hazards to human health, or the environment, outside of the site area
- Actions the person reporting the discharge proposed to take to contain, clean up, and remove the substance

Exclusion Zone Personnel Decontamination.

Any person who becomes ill or injured in the exclusion zone must be decontaminated to the maximum extent possible.

- If the injury or illness is minor, full decontamination must be completed prior to transport.
- If the patient's condition is serious, at least partial decontamination must be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.)

All injuries and illnesses must immediately be reported to the project manager.

Any person being transported to a clinic or hospital for treatment must take with them information on the chemical(s) at the site.

Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

Emergency Response Procedure

All site personnel will be responsible for responding to incipient fires and other minor emergencies.
The SSHO will have ready access to all fire fighting equipment and first-aid supplies during site operations.

In the event of fire, spill, or other emergencies that cannot be controlled, all site personnel will evacuate to a predesignated location. Site personnel will wait in the designated zone for further instructions from the SSHO or emergency response personnel.

During an emergency, the SSHO will direct all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the site. These measures will include, where applicable, collecting and containing release material and removing or isolating containers.

Critique of Response and Follow-up

A follow-up meeting will be held after any emergency situation to assess the actions taken.
The Safety Manager, the SSHO, and other individuals as appropriate will attend the meeting.

- A record of the meeting will be kept by the SSHO.
- Recommendations from the meeting will be incorporated into the future responses to emergency situations.

The SSHO will ensure that all emergency equipment listed in this contingency plan is cleaned and fit for use before operations are resumed.

Emergency Response Briefings and Review

- During the site briefings, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes.
- The plan will be reviewed and revised if necessary, on a regular basis by the SSHO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

Evacuation Alarm Procedures

In the event of an emergency which necessitates an evacuation of the site; the following alarm procedures may be implemented:

- Verbal notification of other employees.
- Personnel will be expected to proceed to the Support Zone with their buddy.
- Personnel will remain at the SZ until the SSHO provides further instructions.

Fire or Explosion

The -SSHO will advise the fire commander of the location, nature, and identification of the hazardous materials onsite.

Spill or Leaks

In the event of a spill or a leak caused by activities on-site; site personnel will:

- Inform the SSHO immediately;
- Locate the source of the spillage and stop the flow if this can be done safely; and,
- Begin containment and recovery of the spilled materials.