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NSWC CRANE
5090.3a

# DEPARTMENT OF THE NAVY

CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE, INDIANA 47522-5000

IN REPLY REFER TO:
12-1-2001
5090
Ser 095/1428
20 DEC 2001

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Illinois, Indiana, and Michigan Section
ATTN: Mr. Peter Ramanauskas (DW-8J)
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center (NSWC Crane) submits the Final Quality Assurance Project Plan (QAPP) for the PCB Capacitor Burial - Pole Yard (PCB-PY, Solid Waste Management Unit 17/04) RCRA Facility Investigation and Verification of Removal. Two copies are presented as enclosure (1). The permit required Certification Statement is provided as enclosure (2).

NSWC Crane point of contact is Mr. Thomas J. Brent, Code 09510, telephone 812-854-6160.

Sincerely,

Thomas J. Brent, acting
James M. Hunsicker
Director, Environmental
Protection Department
By direction of the Commander

Encl:
(1) Final PCB-PY QAPP
(2) Certification Statement

Copy to:
ADMINISTRATIVE RECORD
SOUTHNAVFACENGCOM (Code ES32) (w/o encl)
IDEM (Doug Griffin)
TTNUS (Ralph Basinski) (w/o encl)

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Thomas J. Brent, acting
SIGNATURE

| | |
|---|---|
| Environmental Protection Department Manager | 20 DEC 2001 |
| TITLE | DATE |

Enclosure (2)

# Quality Assurance Project Plan
for
# PCB Capacitor Burial/Pole Yard Solid Waste Management Unit (SWMU) 17/04 Resource Conservation and Recovery Act Facility Investigation and Verification of Removal

## Naval Surface Warfare Center Crane
Crane, Indiana

## Southern Division Naval Facilities Engineering Command

**Contract Number N62467-94-D-0888**

**Contract Task Order 0205**

December 2001

080105/P

# QUALITY ASSURANCE PROJECT PLAN
# FOR
# PCB CAPACITOR BURIAL/POLE YARD
# SOLID WASTE MANAGEMENT UNIT (SWMU) 17/04
# RESOURCE CONSERVATION AND RECOVERY ACT
# FACILITY INVESTIGATION AND VERIFICATION OF REMOVAL

**NAVAL SURFACE WARFARE CENTER, CRANE**
**CRANE, INDIANA**

**COMPREHENSIVE LONG-TERM**
**ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

**Submitted to:**
**Southern Division**
**Naval Facilities Engineering Command**
**2155 Eagle Drive**
**North Charleston, South Carolina 29406**

**Submitted by:**
**Tetra Tech NUS, Inc.**
**661 Andersen Drive**
**Foster Plaza 7**
**Pittsburgh, Pennsylvania 15220**

**CONTRACT NUMBER N62467-94-D-0888**
**CONTRACT TASK ORDER 0205**

**DECEMBER 2001**

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LAUCKS TESTING LABORATORIES, INC.

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## TABLES



## FIGURES

# ACRONYM LIST

| | |
|---|---|
| AB | Ambient Conditions Blank |
| AMSL | Above Mean Sea Level |
| bgs | Below Ground Surface |
| COC | Chain of Custody Form |
| CS | Composite Sample |
| CTO | Contract Task Order |
| DPT | Direct-Push Technology |
| DQO | Data Quality Objectives |
| EM | Electromagnetic |
| FD | Field Duplicate |
| FOL | Field Operations Leader |
| GPS | Global Positioning System |
| GS | Grab Sample |
| HASP | Health and Safety Plan |
| IDEM | Indiana Department of Environmental Management |
| IDW | Investigation Derived Waste |
| MDL | Method Detection Limit |
| MS | Matrix Spike |
| MSD | Matrix Spike Duplicate |
| NFESC | Naval Facilities Engineering Services Center |
| NSWC | Naval Surface Warfare Center |
| OSHA | Occupational Safety and Health Administration |
| PCB | Polychlorinated Biphenyl |
| PID | Photoionization Detector |
| PRG | Preliminary Remedial Goal |
| QA | Quality Assurance |
| QAM | Quality Assurance Manager |
| QAPP | Quality Assurance Project Plan |
| QC | Quality Control |
| RB | Rinsate Blank |
| RCRA | Resource Conservation and Recovery Act |
| RFI | RCRA Facility Investigation |
| RLs | Reporting Limits |

| | |
|---|---|
| SB | Source Water Blank |
| SOP | Standard Operating Procedure |
| SOUTHDIV | Southern Division Naval Facilities Engineering Command |
| SSO | Site Safety Officer |
| SWMU | Solid Waste Management Unit |
| TB | Trip Blank |
| TOM | Task Order Manager |
| TSCA | Toxic Substances Control Act |
| TtNUS | Tetra Tech NUS, Inc. |
| TV | Threshold Value |
| U.S. EPA | U.S. Environmental Protection Agency |
| VOC | Volatile Organic Compound |

# INTRODUCTION

This Quality Assurance Project Plan (QAPP) for the investigation of polychlorinated biphenyls (PCB) contamination of Solid Waste Management Unit (SWMU) 17 PCB Capacitor Burial Pole Yard was developed under the streamlined QAPP preparation procedures. Under this procedure, relevant information from QAPPs previously approved by United States Environmental Protection Agency (U.S. EPA) is incorporated by reference. In this case, information from the previously approved Quality Assurance Project Plan for Ammunition Burning Grounds Little Sulphur Creek and Jeep Trail Resource Conservation and Recovery Act, Phase III RCRA Facility Investigation (Tetra Tech NUS, April 2001) is incorporated by reference. Each section of this QAPP contains a cover sheet describing information incorporated from the referenced QAPP. The referenced QAPP will be referenced as the "approved Jeep Trail/Little Sulphur Creek QAPP." This is done for the reviewer's convenience.

The basic understanding about the level of contamination is based on historical PCB soil samples (Appendix A).

# 1.0 PROJECT DESCRIPTION

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Phase III investigation is being conducted in accordance with applicable RCRA corrective action requirements, including the need for RFIs to be conducted at the Naval Surface Warfare Center (NSWC) Crane, Crane, Indiana. This investigation will provide data on polychlorinated biphenyl (PCB) chemical concentrations in surface soils and subsurface soils at the PCB Capacitor Burial/Pole Yard, which is also known as Solid Waste Management Unit (SWMU) 17. Soils contaminated with PCBs may require removal. Procedures for verification sampling to be conducted in the event soil removal actions are required are also included in this QAPP. The Navy will notify in writing the U.S. EPA Region 5 Administrator and the Director of IDEM 30 days prior to conducting any self-implementing cleanup of PCB remediation waste. This notice will include requirements identified in 40 CFR 761.61(a)(3)(i)(A) through (E) as follows:

(A) Nature of contamination.
(B) Summary of procedures used to sample contaminated and adjacent areas, cleanup site map showing PCB concentrations, and summary of sample collection and analysis dates.
(C) Location and extent of the identified contaminated area, including topographic maps with sample collection sites cross-referenced to the sample identification numbers.
(D) Cleanup plan for the site.
(E) A written signed certification that all sampling plans, sample collection procedures, sample preparation procedures, extraction procedures, and instrumental/chemical analysis procedures used to assess or characterize the PCB contamination are on file and available for EPA inspection.

**PROJECT PROBLEM STATEMENT**

Recent soil sampling at the PCB Capacitor Burial/Pole Yard for PCBs has shown the presence of PCBs in surface and subsurface soil at levels that exceed environmental soil cleanup standards promulgated under the Toxic Substances Control Act (TSCA) in 40 CFR. As a result, workers could be exposed to health risks due to exposure to soils containing PCBs.

## 1.1 INTRODUCTION

NSWC Crane is a U.S. Navy installation located within U.S. Environmental Protection Agency (EPA) Region 5. Tetra Tech NUS, Inc. (TtNUS) has prepared this QAPP on behalf on the U.S. Navy Southern

Division Naval Facilities Engineering Command (SOUTHDIV) and NSWC Crane to be consistent with the approach and content described in Section 1.1 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

This QAPP was prepared under Contract Number N62467-94-D-0888, Contract Task Order (CTO) Number 0205.

### 1.1.1 Project Objectives and Decision Statement

Past sampling, although limited, identified the presence of PCBs at concentrations greater than applicable soil cleanup standards. Previous sampling has not been adequate to delineate the extent of contamination. This investigation is designed to further delineate the nature and extent of PCB contamination in soil for an upcoming removal action. The decision statement that will facilitate attainment of these project objectives is as follows:

> From soil data, determine whether the nature and extent of PCB contaminant concentrations that exceed applicable cleanup levels has been bounded. If the extent of contamination is bounded, then stop sampling and conduct a removal action. If the extent of contamination is not bounded, consider sampling to establish the extent of contamination, then conduct a removal action.

Excavation of buried capacitors and soil contaminated with PCBs in excess of applicable PCB cleanup levels may be required. If excavation is required verification sampling of soils will also be required to determine whether cleanup levels have been achieved. The decision statement that will facilitate achievement of this project objective is as follows:

> From soil data, determine whether soil in excess of cleanup levels has been removed. If cleanup levels have been achieved, then stop the removal action. If cleanup levels have not been achieved at the excavation, then continue the removal action until cleanup levels have been achieved.

### 1.1.2 Project Status/Phase

One round of sampling is expected for this investigation, with additional sampling rounds possible to determine the extent of contamination. The need for additional sampling rounds will depend on whether the extent of contamination is established within prescribed bounds during the first and subsequent sampling rounds. The strategy for all sampling rounds is similar when establishing extent of contamination. PCB concentrations will be compared to appropriate regulatory action levels to determine the adequacy of the delineation.

The data analyses and the approach to reconciling data with project objectives are incorporated by reference from Section 12.4 of the approved Jeep Trail/Little Sulfur Creek QAPP (TtNUS, 2001). Section 4 presents the sampling plan design and rationale for the number of soil samples for this project.

### 1.1.3 QAPP Preparation Guidelines and Requirements

Information on QAPP preparation guidelines and requirements is discussed in Section 1.1.3 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) and is incorporated by reference.

Additional guidance regarding development of this QAPP was obtained through a formal pre-QAPP meeting held on August 29, 2001 via conference call. Representatives from U.S. EPA Region 5, SOUTHIDV, NSWC Crane, Indiana Department of Environmental Management (IDEM), and TtNUS participated in the pre-QAPP conference call to introduce and discuss technical issues associated with QAPP preparation. The analyte lists were discussed, and the overall technical approach was agreed upon between the Navy and the U.S. EPA. U.S. EPA comments have been addressed in this document.

### 1.1.4 Organization of the QAPP

This QAPP follows the U.S. EPA Region 5 model QAPP format with minor exceptions (U.S. EPA, 1998). An effort has been made to ensure that the flow of information from one section to another is logical, while adhering to U.S. EPA Region 5 requirements. The Table of Contents provides an overview of the document organization. Tables and figures are placed at the end of each section in which they are first referenced. As noted in the introduction, information from a previously approved QAPP is incorporated by reference.

## 1.2 SITE/FACILITY DESCRIPTION

This section is a presentation of background information, general site characteristics of the NSWC Crane facility, and physical site characteristics specific to the PCB Capacitor Burial/Pole Yard. A decision has already been made to remediate PCB-contaminated soils at the site. This section contains information on site location, facility size and borders, natural and man-made features, climatology, topography, local hydrology and hydrogeology, surrounding land use, and ecological communities and habitats. This information was obtained from a previously approved QAPP (TtNUS, 2001).

### 1.2.1 Location and Description

Information regarding site location and description of NSWC Crane is incorporated by reference from Section 1.2.1 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

A location map of the NSWC Crane facility is provided as Figure 1-1. The PCB Capacitor Burial/Pole Yard study area is located in the northeastern portion of the installation. Figure 1-1 shows the location of the PCB Capacitor Burial/Pole Yard on the NSWC Crane facility.

### 1.2.2 Land Use Classification

Information regarding land use classification surrounding NSWC Crane is incorporated by reference from Section 1.2.2 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

### 1.2.3 Climatology and Meteorology

Information regarding climatology and meteorology of NSWC Crane is incorporated by reference from Section 1.2.3 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

### 1.2.4 Physiography, Topography and Ground Cover

The topography is generally flat in the vicinity of the PCB Capacitor Burial - Pole Yard site and ranges between 720 ft-above mean sea level (amsl) and 730 ft-amsl. The site sits at a local topographic high with surface elevation decreasing in the north, south and western directions. The topography could be described as steeply rolling hills. The industrialized portion of the site is devoid of vegetation. Woods are along the perimeter of the developed industrialized portion of the site.

### 1.2.5 Geology and Stratigraphy

Since there are no boring logs from the PCB Capacitor Burial/Pole Yard, a discussion of the site specific geology is not possible. The general geology of the Crane site, which is presented in the Jeep Trail/Little Sulphur Creek QAPP, is the limit of knowledge for this site.

### 1.2.6 Hydrology and Hydrogeology

Information regarding the hydrology and hydrogeology at NSWC Crane is incorporated by reference from Section 1.2.6 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

PCBs are not generally soluble in groundwater and are therefore not mobile in groundwater. Groundwater will not be part of this investigation.

## 1.3 FACILITY HISTORY AND BACKGROUND

This section provides an overview of the site operations and summarizes past environmental investigations at the PCB Capacitor Burial/Pole Yard. An evaluation of historical data gathered from past investigations is also provided.

### 1.3.1 Facility Operational History

The facility operational history for NSWC Crane is incorporated by reference from Section 1.3.1 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

### 1.3.2 PCB Capacitor Burial/Pole Yard Operational History

The PCB capacitor Burial/Pole Yard (SWMU 17) has been in use since before 1966. Historically, the site has been used for the following:

- Storage of capacitors, some of which contained PCBs.
- Storage of transformers, some of which contained PCBs.
- Reported burial of capacitors, some of which may have contained PCBs.
- Storage of creosote-impregnated utility poles, some of which may contain PCBs as a result of burst transformers.

Pure PCBs have never been found in transformers or capacitors at NSWC Crane. The greatest concentrations of PCBs have been in the range of 10,000 ppm PCBs. Therefore, any releases of capacitor or transformer oil at SWMU 17 would be expected to exhibit concentration, in the range of 10,000 ppm PCBs. It is known that capacitors were buried at SWMU 17 in the early to mid 1970s. However, it is not known whether any capacitors were buried prior to the early 1970s or after mid-1970.

Figure 1-2 shows the SWMU 17, including areas where activities have historically occurred.

### 1.3.3 Evaluation of Historical Data

The following sections describe the available historical soil data for the PCB Capacitor Burial/Pole Yard. This data was obtained from samples collected and analyzed in March 2001.

#### 1.3.3.1 Soil

NSWC Crane intends to utilize the SWMU 17 area in the future for different purposes than the use described in Section 1.3.2. As part of the investigation to determine the suitability of the site soils, samples were collected and analyzed for PCBs. Figure 1-2 includes information on the results of the soils investigation for PCBs. The results show that PCBs are present at concentrations exceeding criteria for industrial soils. Table 1-1 lists the soil data and Table 1-2 is a presentation of applicable TSCA regulatory limits plus other pertinent information. The "GS" and "CS" descriptions are for grab samples and composite sample respectively.

Historical data are presented in Appendix A. These data show that PCB 1260 is the primary contaminant. The field test kit selected for use in the verification sampling was based on its selectivity for PCB 1260.

The presence of PCBs correlates with information regarding historical activities at the PCB Capacitor Burial/Pole Yard. PCBs were found at locations where capacitors are reportedly buried, transformers were stored, and creosote-impregnated utility poles were stored. PCBs were also found at a drainage area receiving runoff from the transformer storage and capacitor burial areas.

## 1.4 INTENDED DATA USES

This section provides a description of the project target parameters and intended data uses.

### 1.4.1 Project Target Parameters and Rationale for Selection

PCBs are the key target parameters for the investigation at SWMU 17. Capacitors and transformers stored at the PCB Capacitor Burial Pole Yard may have contained PCBs, which may have leaked onto the ground. Capacitors reportedly buried at SWMU 17 also may have contained PCBs. PCBs that may have been on poles from burst transformers may have leaked onto the ground.

### 1.4.2 Laboratory Parameter

Fixed-base laboratory analyses will be used to estimate PCB concentrations in surface and subsurface soils because the laboratory analysis allows for the lowest detection limit and allows for verifying the PCB aroclors of interest at each area of interest. Test kits, which are PCB aroclor specific, and fixed-base laboratory analysis will be used for verification sampling during remediation activities. However, a fixed-base laboratory will be used for final verification analysis of "clean" samples. The overall verification strategy assumes that PCBs will be present that yield a positive response with the test kit.

The data will be compared to

- IDEM default residential and industrial soil closure levels (1.8 mg/kg for residential and 5.3 mg/kg for industrial) (RISC Technical Guidance, July 2001).

- Self-implementing on-site cleanup and disposal of PCB remediation waste cleanup levels (1 mg/kg) without further conditions for high occupancy areas [40 CFR 761.61(a)(4)(i)(A)].

- Self-implementing on-site cleanup and disposal of PCB remediation waste cleanup levels (25 mg/kg) for low occupancy areas [40 CFR 761.61(a)(4)(i)(B)].

Table 1-2 lists the laboratory parameters, analytical methods detection and reporting limits, and the target levels. Threshold values (TVs) based on statistically derived, matrix specific method detection limits (MDLs) will be the lowest limit that is reported as detected by the laboratory.

### 1.4.3 Decision Rules

The understanding of the site as described above and the data quality objective (DQO) process outputs to this point are consolidated in this section into a succinct description of how the data will be used for the PCB Capacitor Burial/Pole Yard.

#### 1.4.3.1 Definition

The decision rule is a statement that integrates DQO planning process outputs into a concise summary of how data will be interpreted when making decisions about the site being investigated. The decision rules form a basis for establishing a sampling plan design that will enable data of the correct type, quantity, and quality to be collected for attaining project objectives.

#### 1.4.3.2 Decision Rule

The decision rule applies to each area within the PCB Capacitor Burial/Pole Yard that is under investigation.

If, in the first round of sampling, the contamination boundary associated with SWMU 17 is not attained (i.e., the PCB concentration is not less than the action level), then collect another round of samples or consider proceeding to a removal action and defining the contamination boundary through the verification sampling and analysis process. If the contamination boundary is reached (i.e., measured total PCB concentration is less than the action level concentration) within "n" sampling rounds, stop sampling and write a report with appropriate recommendations.

**TABLE 1-1**

**HISTORICAL PCB CONCENTRATIONS
PCB CAPACITOR BURIAL/POLE YARD
NSWC CRANE, CRANE, INDIANA**

| Label | Surface (mg/kg) | Subsurface (mg/kg) |
|---|---|---|
| GSS01 | <0.05 | <0.05 |
| GSS02 | 0.650 | 0.200 |
| GSS03 | 1.700 | 1.500 |
| GSS04 | 180.000 | 3.000 |
| GSS05 | 96.00 | 210.000 |
| GSS06 | 170.000 | 0.350 |
| GSS07 | 0.120 | 0.084 |
| GSS08 | <0.05 | <0.05 |
| CSS01 | 17.000 | 9.300 |
| CSS01 | 17.000 | 9.300 |
| CSS01 | 17.000 | 9.300 |
| CSS02 | 7.300 | 37.000 |
| CSS02 | 7.300 | 37.000 |
| CSS02 | 7.300 | 37.000 |
| CSS03 | <0.05 | <0.05 |
| CSS03 | <0.05 | <0.05 |
| CSS03 | <0.05 | <0.05 |
| CSS04 | <0.05 | <0.05 |
| CSS04 | <0.05 | <0.05 |
| CS004 | <0.05 | <0.05 |
| CSS05 | 11.000 | 67.000 |
| CSS05 | 11.000 | 67.000 |
| CSS05 | 11.000 | 67.000 |
| CSS06 | 0.830 | 0.290 |
| CSS06 | 0.830 | 0.290 |
| CSS06 | 0.830 | 0.290 |

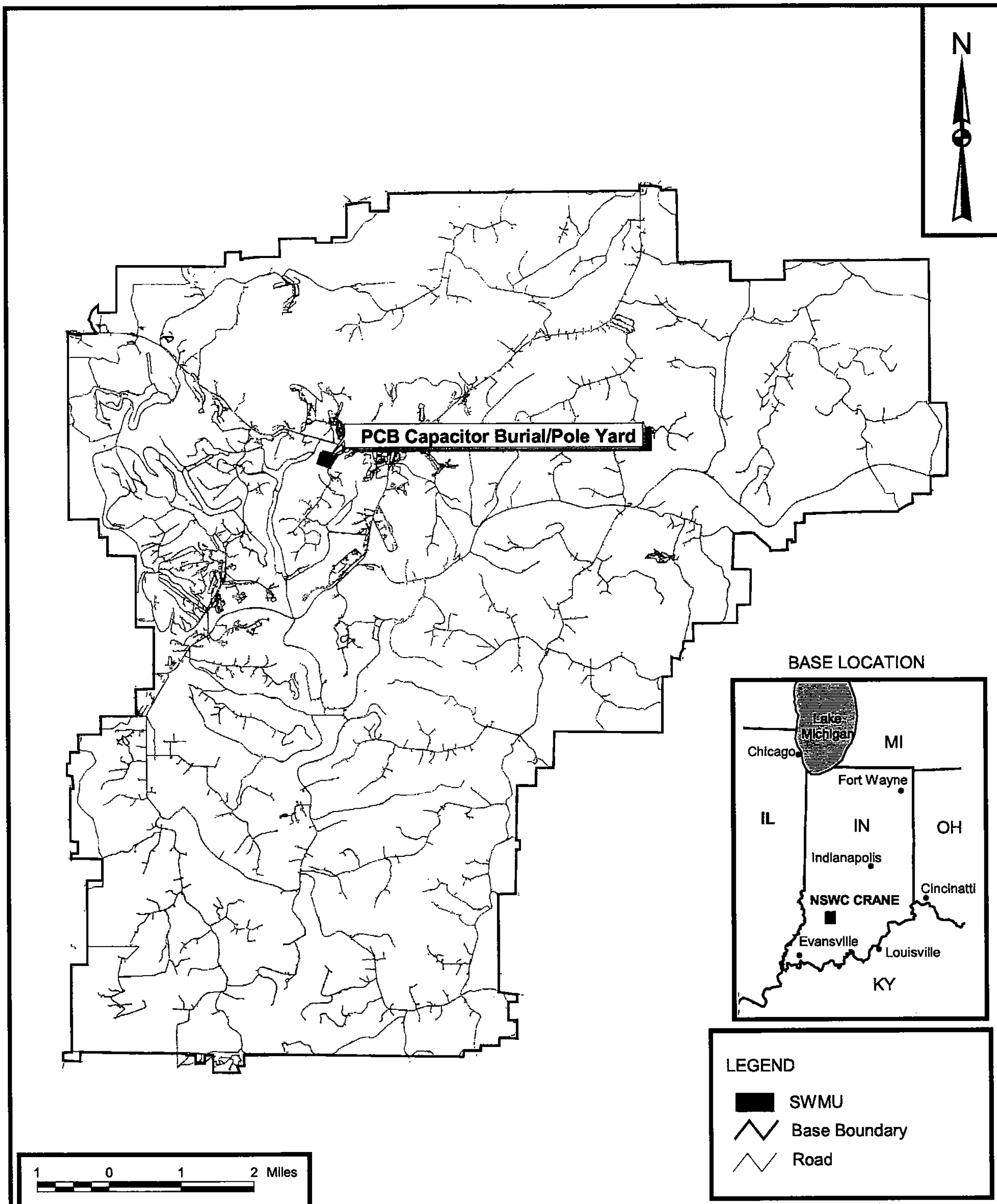
## TABLE 1-2

## DETCTION LIMITS VERSUS CLEANUP CRITERIA FOR SOILS
## PCB CAPACITOR BURIAL/POLE YARD
## NSWC CRANE, CRANE, INDIANA

| Parameter | CAS NUMBER | Aqueous Matrix Laboratory TV(1) (ug/L) | Aqueous Matrix Laboratory RL(1) (ug/L) | Solid Matrix Laboratory TV(1) (mg/kg) | Solid Matrix Laboratory RL(1) (mg/kg) | Solid Matrix TSCA High Occupancy(2)(3) (mg/kg) | Solid Matrix TSCA Low Occupancy(2)(4) (mg/kg) | Solid Matrix IDEM Residential(2)(5) (mg/kg) | Solid Matrix IDEM Industrial(2)(5) (mg/kg) |
|---|---|---|---|---|---|---|---|---|---|
| **PCBs SW-846 METHOD 8082** | | | | | | | | | |
| Aroclor-1016 | 12674-11-2 | 0.25 | 0.5 | 0.017 | 0.033 | 1.0 | 25 | 1.8 | 5.3 |
| Aroclor-1221 | 11104-28-2 | 0.25 | 0.5 | 0.034 | 0.067 | 1.0 | 25 | 1.8 | 5.3 |
| Aroclor-1232 | 11141-16-5 | 0.25 | 0.5 | 0.017 | 0.033 | 1.0 | 25 | 1.8 | 5.3 |
| Aroclor-1242 | 53469-21-9 | 0.25 | 0.5 | 0.017 | 0.033 | 1.0 | 25 | 1.8 | 5.3 |
| Aroclor-1248 | 12672-29-6 | 0.25 | 0.5 | 0.017 | 0.033 | 1.0 | 25 | 1.8 | 5.3 |
| Aroclor-1254 | 11097-69-1 | 0.25 | 0.5 | 0.017 | 0.033 | 1.0 | 25 | 1.8 | 5.3 |
| Aroclor-1260 | 11096-82-5 | 0.25 | 0.5 | 0.017 | 0.033 | 1.0 | 25 | 1.8 | 5.3 |

TV = threshold value.
RL = reporting limit.
µg/L = micrograms per liter.
mg/kg = milligrams per kilogram.

1. Threshold values (TVs) and reporting limits (RLs) as provided by Laucks Testing Laboratories, Inc. The values may change prior to the SWMU investigations as laboratory MDLs are updated.
2. The levels apply to total PCBs. Total PCBs represent the total of all aroclors. For example, the limit for an individual aroclor would be either 1 mg/kg or 25 mg/kg for high or low occupancy respectively only if no other aroclors were detected.
3. 40 CFR 761.61(a)(4)(i)(A)
4. 40 CFR 761.61(a)(4)(i)(B)
5. RISC Technical Guidance, July 2001




| DRAWN BY J. LAMEY | DATE 8/24/01 | Tetra Tech NUS, Inc. | CONTRACT NUMBER 4070 | OWNER NO. CTO 0205 |
|---|---|---|---|---|
| CHECKED BY — | DATE — | SITE LOCATION MAP<br>PCB CAPACITOR BURIAL/POLE YARD<br>NAVAL SURFACE WARFARE CENTER<br>CRANE, INDIANA | APPROVED BY — | DATE — |
| COST/SCHEDULE-AREA | | | APPROVED BY — | DATE — |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 1-1 | REV — |

P:\GIS\NSWC_CRANE\POLE_YARD.APR SITE LOCATION 8/27/01 JAL

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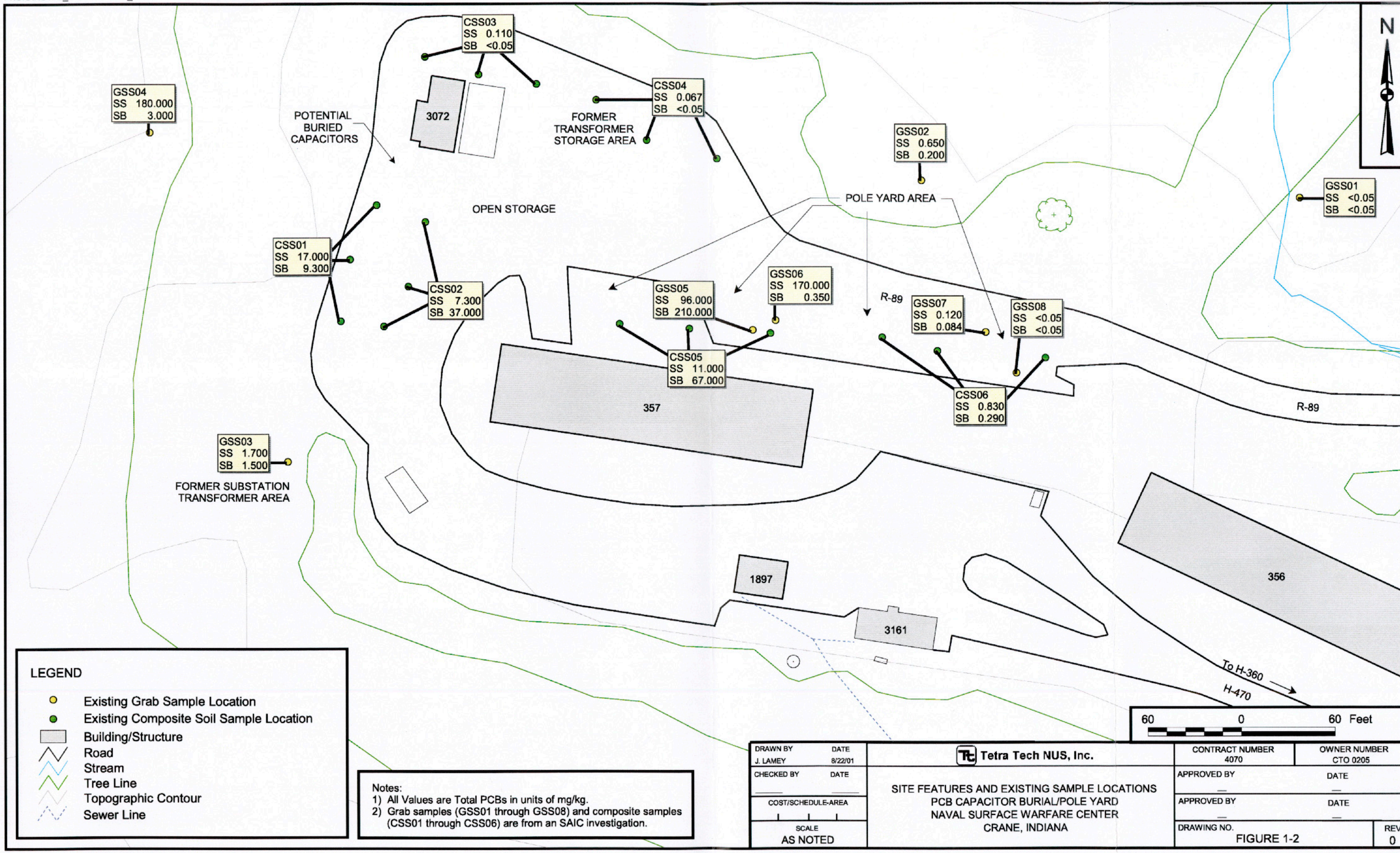
P:\GIS\NSWC_CRANE\POLE_YARD.APR SITE FEATURES AND EXISTING SAMPLE LOCATIONS 12/18/01 AJ



# 2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section presents the project management and organization for conducting field operations at the PCB Capacitor Burial/Pole Yard (SWMU 17/04) at NSWC Crane. Staffing and coordination requirements are described in Section 2.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001). Table 2-1 and Figure 2-1 were updated to include the most current contact information for the involved parties and are included in this section.

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**TABLE 2-1**

**KEY PROJECT PERSONNEL FOR PCB CAPACITOR BURIAL/POLE YARD
NAMES, PHONE NUMBERS AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 1 OF 2**

| PERSON / TITLE / ORGANIZATION | ADDRESS | TELEPHONE |
|---|---|---|
| Peter Ramanauskas<br>Project Manager<br>U.S. EPA Region 5 | EPA Region 5<br>77 West Jackson Blvd.<br>Chicago, Illinois 60604 | Phone: (312) 886-7890<br>FAX: (312) 353-4788 |
| Allen Debus<br>QA Coordinator<br>U.S. EPA Region 5 | EPA Region 5<br>77 West Jackson Blvd.<br>Chicago, Illinois 60604 | Phone: (312) 886-6186 |
| Marty Harmless<br>Office of Solid and Hazardous Waste Management<br>IDEM | Office of Solid and Hazardous Waste Management<br>100 N. Senate Avenue<br>Indianapolis, Indiana 46206-6015 | Phone: (317) 234-0597 |
| Doug Griffin<br>Corrective Action Section<br>Office of Land Quality<br>Hazardous Waste Permits<br>IDEM | Corrective Action Section<br>Office of Land Quality<br>Hazardous Waste Permits<br>100 N. Senate Avenue<br>P. O. Box 6015<br>Indianapolis, Indiana 46206-6015 | Phone: (317) 233-2710 |
| Bill Gates<br>Remedial Project Manager<br>U.S. Navy<br>SOUTHNAVFACENGCOM | Department of Navy<br>SOUTHNAVFACENGCOM<br>Code 1864<br>2155 Eagle Drive<br>Charleston, South Carolina 29406 | Phone: (843) 820-7360<br>FAX: (843) 820-7465 |
| Tom Brent<br>Environmental Site Manager<br>NSWC Crane | NSWC Crane<br>Code 095<br>B-3245<br>300 Highway 361<br>Crane, Indiana 47522-5009 | Phone:(812) 854-6160<br>FAX: (812) 854-3981 |
| Debbie Wroblewski<br>Program Manager<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-8968<br>FAX: (412) 921-4040 |
| Paul Frank<br>Quality Assurance Manager<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-8950<br>FAX: (412) 921-4040 |
| Matt Soltis<br>Health and Safety Manager<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-8912<br>FAX: (412) 921-4040 |
| Ralph Basinski<br>Task Order Manager<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-8308<br>FAX: (412) 921-4040 |
| Keith Simpson<br>Field Operations Leader<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-8131<br>FAX: (412) 921-4040 |

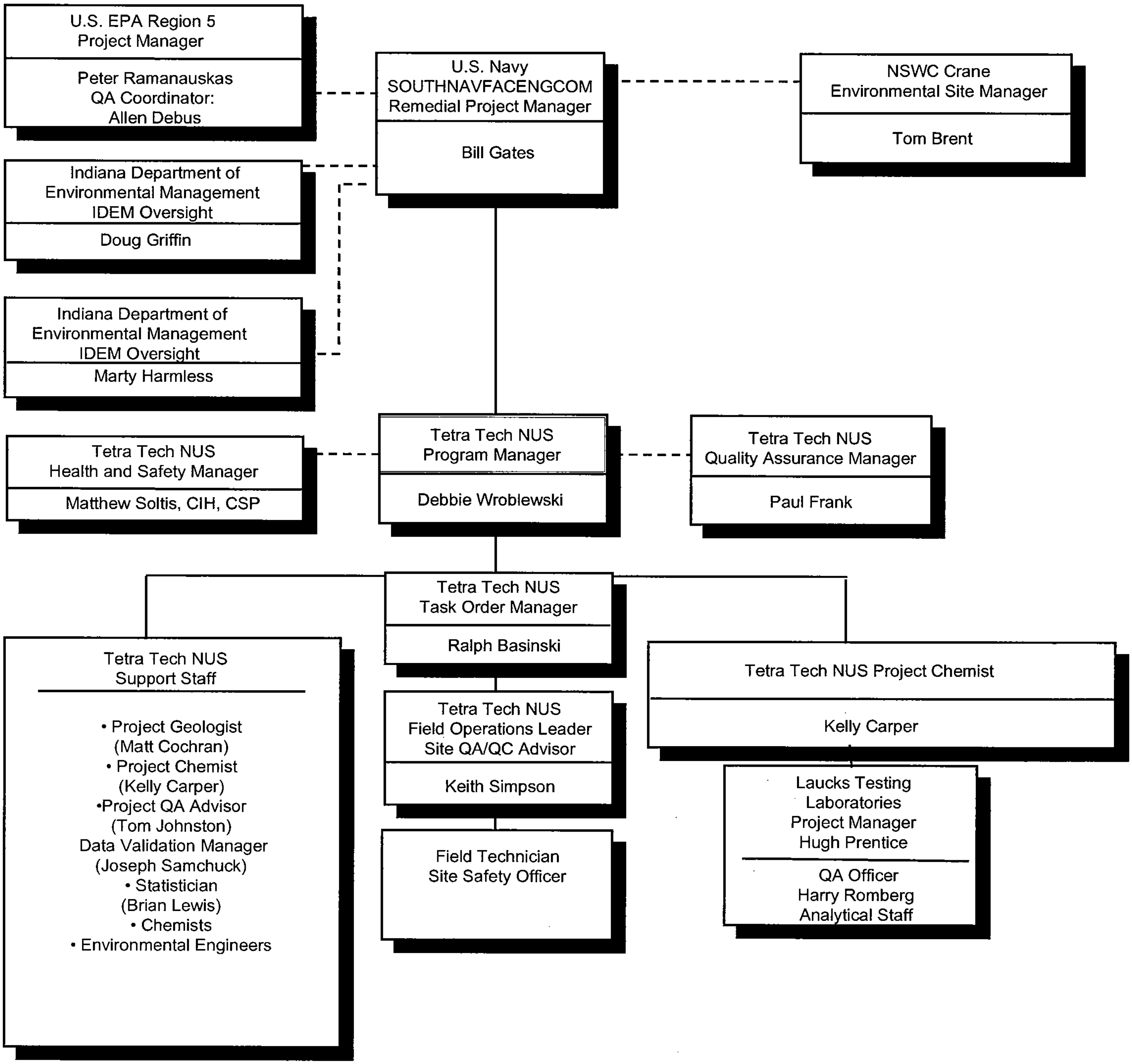
**TABLE 2-1**

**KEY PROJECT PERSONNEL FOR PCB CAPACITOR BURIAL/POLE YARD
NAMES, PHONE NUMBERS AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 2 OF 2**

| PERSON / TITLE / ORGANIZATION | ADDRESS | TELEPHONE |
|---|---|---|
| Joseph Samchuck<br>Data Validation Manager<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Anderson Drive<br>Pittsburgh, Pennsylvania 15220 | Phone: (412) 921-8510<br>FAX: (412) 921-4040 |
| Keith Henn<br>Program Geologist<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-8146<br>FAX: (412) 921-4040 |
| Kelly Carper<br>Project Chemist<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Andersen Drive<br>Pittsburgh, Pennsylvania 15220-2745 | Phone: (412) 921-7273<br>FAX: (412) 921-4040 |
| Dr. Tom Johnston<br>Quality Assurance Advisor<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Anderson Drive<br>Pittsburgh, Pennsylvania 15220 | Phone: (412) 921-8615<br>FAX: (412) 921-4040 |
| Brian Lewis<br>Statistician<br>Tetra Tech NUS | Tetra Tech NUS<br>661 Anderson Drive<br>Pittsburgh, Pennsylvania 15220 | Phone: (412) 921-8714<br>Fax: (412) 921-4040 |
| Hugh Prentice<br>Project Manager<br>Laucks Testing | Laucks Testing<br>940 South Harney Street<br>Seattle, Washington 98108 | Phone: (206) 767-5060<br>FAX: (206)767-5063 |
| Harry Romberg<br>Lab QA Manager<br>Laucks Testing | Laucks Testing<br>940 South Harney Street<br>Seattle, Washington 98108 | Phone: (206) 767-5060<br>FAX: (206)767-5063 |
| Kathy Krepps<br>Lab Operations Manager<br>Laucks Testing | Laucks Testing<br>940 South Harney Street<br>Seattle, Washington 98108 | Phone: (206) 767-5060<br>FAX: (206)767-5063 |
| Mike Baxter/Ted Matts<br>Lab Sample Custodian<br>Laucks Testing | Laucks Testing<br>940 South Harney Street<br>Seattle, Washington 98108 | Phone: (206) 767-5060<br>FAX: (206)767-5063 |

**FIGURE 2-1**

**PROJECT ORGANIZATION CHART
PCB CAPACITOR BURIAL/POLE YARD
NSWC CRANE, CRANE, INDIANA**



# 3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for this project is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, data management, and reporting that will yield results sufficient to support the attainment of the project objectives specified in Section 1.0. Intended data uses, including the list of project target parameters, are described in Section 1.4 of this QAPP. The manner in which decision making will be based on data comparisons is described in Section 1.4.3 and is incorporated by reference from Section 12.4 of the approved Jeep Trail/Little Sulfur Creek QAPP (TtNUS, 2001). Specific procedures for sampling, chain-of-custody, laboratory instrument calibration, laboratory analysis, internal quality control (QC), reporting of data, audits, preventive maintenance of field and laboratory equipment, data management, corrective action, and reporting to management are described in the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001). Project-specific quality control limits are listed in Tables 3-1, 3-2, and 3-3.

## 3.1 FIELD TEST KITS

Field test kits for PCBs will be used during removal activities. The kits will indicate whether additional removal of contaminated material is required. A result indicating PCB concentrations greater than 25 ppm will result in further removal of soil from the location. A result of less than 25 ppm will result in a verification sample being sent to the fixed-base analytical laboratory.

## 3.2 VERIFICATION SAMPLING

Ten percent of samples with less than 25 ppm of PCBs as indicated by the field analysis will be sent to Lauck's Testing Laboratory for analysis.

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## TABLE 3-1

## NON-CALIBRATION QC SAMPLE COLLECTION FREQUENCIES, ACCEPTANCE LIMITS AND CORRECTIVE ACTIONS PCB CAPICITOR BURIAL/POLE YARD NSWC CRANE, CRANE, INDIANA PAGE 1 OF 2

| QC Sample Type | Collection Frequency | Acceptance Limits | Corrective Action |
|---|---|---|---|
| Field Duplicate | 1 per 10 investigative samples collected. | Aqueous = 20% RPD<br>Soil/Sediment = 50% RPD | Qualify data according to data validation requirements. |
| Equipment Rinsate Blank | 1 per 10 investigative samples collected, with a minimum of one per day of sampling, per non-disposable sampling device/instrument.<br><br>For pre-cleaned, dedicated, and/or disposable equipment (i.e., disposable plastic trowels, etc.), one rinsate blank will be collected and analyzed at a frequency of one per lot or "batch blank" for a specific equipment type. | < RL (soil and water) | Identify source of contamination, if possible. Qualify data according to validation criteria. Qualify use of data if contamination appears to have adversely affected its usability. |
| Source Water Blank | 1 per each source of water used for sampling equipment decontamination. | < RL (soil and water) | Identify source of contamination, if possible. Qualify data according to validation criteria. Qualify use of data if contamination appears to have adversely affected its usability. |
| Ambient Condition Blanks | At discretion of FOL | < RL (soil and water) | Identify source of contamination, if possible. Qualify data according to validation criteria. Qualify use of data if contamination appears to have adversely affected its usability. |
| Laboratory Control Sample | 1 per 20 environmental samples per matrix | See Table 3-3 | Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 12.4. |
| Laboratory Method Blank | 1 per 20 environmental samples or per preparation batch, whichever is more frequent | < RL (soil and water) | Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 12.4. |
| Matrix Spike* | 1 per 20 environmental samples | See Table 3-2 | Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 12.4. |

## TABLE 3-1

## NON-CALIBRATION QC SAMPLE COLLECTION FREQUENCIES, ACCEPTANCE LIMITS AND CORRECTIVE ACTIONS PCB CAPICITOR BURIAL/POLE YARD NSWC CRANE, CRANE, INDIANA PAGE 2 OF 2

| QC Sample Type | Collection Frequency | Acceptance Limits | Corrective Action |
|---|---|---|---|
| Matrix Spike Duplicate* | 1 per 20 environmental samples analyzed for organic target analytes | See Table 3-2 | Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 12.4. |
| Surrogate | At least one per sample for organic chromatographic analyses | See Table 3-2 | Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 12.4. |
| Temperature Blank | One blank per sample cooler. | 4 ± 2 °C | Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 12.4. |

* Matrix spike and matrix spike duplicates are not analyzed in the field, but additional sample material must be collected in the field to ensure that the laboratory has enough material for spiking and duplicate analysis.

## TABLE 3-2

## QUALITY CONTROL LIMITS[1]
## MATRIX SPIKE/MATRIX SPIKE DUPLICATE SAMPLES AND SURROGATE SPIKES
## PCB ANALYSES
## PCB CAPACITOR BURIAL/POLE YARD
## NSWC CRANE, CRANE, INDIANA

| Chemical | Solid Matrix | | Aqueous Matrix | |
|---|---|---|---|---|
| | Accuracy (%R) | Precision (RPD) | Accuracy (%R) | Precision (RPD) |
| **PCBs BY SW-846 METHOD 8082** | | | | |
| Aroclor-1260 | 31-136 | 50 | 40-126 | 30 |
| Decachlorobiphenyl (surrogate) | 20-160 | NA | 30-160 | NA |
| Tetrachloro-m-xylene (surrogate) | 20-150 | NA | 25-139 | NA |

1 In-house QC limits provided by Laucks Testing Laboratories, Inc.

%R = Percent recovery.
RPD = Relative percent difference.
NA = Not applicable.

## TABLE 3-3

## QUALITY CONTROL LIMITS[1]
## LABORATORY CONTROL SAMPLES
## PCB ANALYSES
## PCB CAPACITOR BURIAL/POLE YARD
## NSWC CRANE, CRANE, INDIANA

| Chemical | Solid Matrix Accuracy (%R) | Aqueous Matrix Accuracy (%R) |
|---|---|---|
| **PCBs BY SW-846 METHOD 8082** | | |
| Aroclor-1260 | 20-160 | 39-149 |

1 In-house QC limits provided by Laucks Testing Laboratories, Inc.

%R = Percent recovery.

# 4.0 SAMPLING AND ANALYSIS PLAN

## 4.1 GENERAL APPROACH

This section describes sampling locations and sampling rationales. This section also describes the equipment and procedures to be used for collecting, handling, preserving, and shipping the samples to the analytical laboratories. The text references Standard Operating Procedures (SOPs) and the Health and Safety Plan (HASP), when applicable.

Sampling and analysis for site characterization is expected to be performed in one mobilization. The scope of site characterization work includes conducting an electromagnetic survey of the site and collecting both surface and subsurface soil samples (Table 4-1) to determine the nature and extent of PCB contamination.

Verification sampling will be conducted as part of the interim remedial effort.

Prior to sampling, the Task Order Manager (TOM) will ensure that all field personnel read and understand the QAPP and HASP, the Field Operations Leader (FOL) will ensure that all required field equipment for non-health-and-safety operations is available and operational, and the Site Safety Officer (SSO) will ensure that all health-and-safety-related equipment is available and operational.

## 4.2 SITE SURVEYING

In order to properly locate the corners of the geophysical and historical sampling points, it will be necessary to locate all points in the field using either a licensed surveyor or a Global Positioning System (GPS) capable of accuracy within 5 feet. If a surveyor is used, they must be Indiana-licensed. The surveyor will locate the site characterization soil sampling points at the conclusion of the field work.

## 4.3 SAMPLE IDENTIFICATION SYSTEM

All samples will be properly labeled with an adhesive-backed sample label affixed to, and a tag tied to, each sample container in accordance with SOP CTO205-01. The sample labels and tags will include the following information: project name, project location, sample tracking number, sampling date, sampling time, type of analysis required, matrix type, preservative, initials of sampler, and the name of the analytical laboratory to which the sample will be submitted.

Each sample will be assigned a unique sample tracking number. The sample tracking number for soil and sediment samples is a four-segment, alphanumeric code beginning with the site identification (17 represents the SWMU number) and followed by codes for the sample type, sample location, and sample depth. This numbering scheme is described in SOP CTO205-02. Any other pertinent information regarding sample identification will be recorded in the field logbooks and sample log sheets.

The sampling time recorded on the chain-of-custody form and labels for duplicate samples will be 0000 so that the duplicate samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded on the sample log sheets and will document the location of the duplicate sample (sample log sheets are not provided to the laboratory).

Matrix spike and matrix spike duplicate (MS/MSD) samples will be designated on the field documentation forms and chain-of-custody form (see SOP CTO205-04).

## 4.4 GEOPHYSICAL TESTING

Prior to the initiation of the soil sampling a geophysical survey of the area where capacitors may have been buried will be conducted to determine potential burial locations. A Geonics® EM31 Terrain Conductivity meter (EM31) or equivalent will be used. The instrument will be calibrated and used in accordance with the manufacturer's instructions. A trained and experienced geophysicist will conduct the survey. Either the surveyor or the geophysical field team will lay out sets of survey lines across the area to be surveyed. All magnetic anomalies will be mapped on a grid overlying the site map (Figure 4-1). The spacing on the lines will be 10 feet. Upon completing this initial survey, the geophysicist should refine the survey grid (reduce the distance between parallel survey lines) based on field observations from the initial survey. At the completion of the electromagnetic survey, the field team will assess a digital rendering of the field data to determine the locations of the buried objects, assumed to be capacitors. The locations of the capacitors determined by geophysics will be marked with 2-inch by 2-inch survey stakes for mapping.

### 4.4.1 Field Operations Summary

The field investigation to be performed consists of the following activities:

- Performance of an electromagnetic (EM) or magnetometer geophysical survey
- Identification of anomalies in the field
- Performance of data reduction and presentation

The following sections discuss the general field operations, procedures, and proper documentation for the operations to be performed at the site.

### 4.4.2 Geophysical Survey

A geophysical survey will be conducted, in the site areas identified in Section 1, using a Geonics® EM31 Terrain Conductivity meter (EM31). The EM-31 measures and records the quadrature component (ground conductivity) and the in-phase component of the electromagnetic field along the survey lines. The EM-31 measures terrain conductivity by imparting a current to the transmitter coil. The current passing through this coil produces a magnetic field, which in turn induces small currents in the underlying strata. Currents produced within the underlying strata are sensed by a receiver coil. The ratio of the magnetic field detected by the receiver coil to that field produced by the transmitter coil is directly proportional to terrain conductivity. Terrain conductivity, or apparent ground conductivity, is therefore read directly from the EM-31 in milliSiemens per meter. The in-phase response, expressed in parts per thousand, is significantly more sensitive to buried metallic objects. These values will represent the average response of the EM-31 over the effective depth of the survey; the effective depth is a function of the distance between the transmitting and receiving coils. The EM-31 has a fixed coil spacing to 12 feet, yielding an effective depth of survey of approximately 12 to 15 feet, in the absence of features (fences, buildings, etc.) that may interfere with the detection of survey targets.

A reference grid will be installed using a transit and tape measure by placing pin flags, survey stakes, and/or flagging as appropriate. Grid coordinates will be assigned northing and easting locations in feet. Geophysical survey lines will be spaced and marked a maximum of 10 feet apart. Lines may be spaced closer in small grid areas where better resolution is desired. Stakes, flagging, and/or pin flags will also be placed at regular intervals along the geophysical lines in the direction of the survey at a frequency (typically every 100 feet) that maintains a line of sight and provides adequate distance references along the lines, depending on the terrain, obstacles along survey lines, and line length. Terrain conductivity and in-phase responses will be measured simultaneously and continuously at one-second intervals (approximately every 3.2 feet) along these geophysical lines and automatically stored in a digital data logger. The measurements will also be observed by the instrument operator as the survey is conducted to allow for immediate marking of anomalies in the field, if they are discernible during the survey. Data stored in the data logger will be downloaded to a portable computer on site at the completion of the survey.

To log the geophysical data, the field geophysicist will record the data continuously with time and adjust the positions of the lines at the completion of the survey. A grid will be established by the field team and the positions of the grid corners will be surveyed by a licensed surveyor. This method will result in a higher resolution survey, assuming that the walking pace is constant. The final data processing will be performed in the office and the results will be interfaced to available CADD and GIS data for the survey site.

### 4.4.3 Data Reduction and Presentation

As stated in Section 4.4.2, data stored in the data logger will be downloaded to a portable computer on site at the completion of the survey. The geophysical data will be characterized to the extent that they produce recognizable responses when compared to background or surrounding data. The geophysical data will be presented in text form, as well as graphically in profile and/or in contour format. These formats allow for an illustration of anomalies associated with conductive fills, buried metallic material, changes in soil texture, or a change in moisture content. A summary report will be prepared describing survey methods and results.

## 4.5 SAMPLING LOCATIONS, ANALYSES, AND RATIONALES

This section presents sampling locations, QA samples to be collected, analyses to be performed, and rationale for the sampling and analytical program. Details regarding the equipment and procedures for collecting, preserving, packaging, and shipping the samples are included in Section 4.8. Proposed sampling locations to determine the extent of PCB contamination are shown on Figure 4-1.

### 4.5.1 Surface and Subsurface Soils

Surface and subsurface soil samples will be collected in and around the transformer burial site. The following surface and subsurface soil sampling activities are intended to determine the extent of contamination and to characterize the source area concentrations in the surrounding soils.

A total of 44 soil borings will be drilled as part of the site investigation. All drilling locations will be used to determine the extent of PCB soil contamination (Table 4-1). Samples at the surface [0 to 2 feet below ground surface (bgs)] and the subsurface (2 to 4 feet bgs) will be collected and shipped to the laboratory for analysis. Four feet is the maximum depth of the borings. The surface soil samples will provide information on the horizontal extent of soil contamination. The subsurface soil samples will provide information on the depth of soil PCB contamination.

QA/QC samples will be collected at the following frequencies:

- Duplicate samples and rinsate blanks will be collected at a rate of one for every 10 soil samples and analyzed.

- Matrix spike/matrix spike duplicate (MS/MSD) samples will be collected and analyzed in the fixed laboratory at a rate of one per every 20 soil samples.

This information is summarized in Table 4-2.

Surface and subsurface soil sampling will be performed using direct-push technology (DPT) soil sampling or hollow-stem auger drilling with split-spoon sampling. Split-spoon sampling will be used only if DPT soil sampling does not give good recovery. All soil samples will be collected immediately after the split-spoon or DPT sampler is opened. Details regarding soil sampling equipment and procedures are included in Section 4.6 and SOP CTO205-04.

### 4.5.2 Post-Remediation Verification Sampling

An interim removal action may be required if soils are contaminated with PCBs above low occupancy criteria. Verification sampling would be required. The goal of verification sampling is to ensure that cleanup has occurred based on the guidelines described in the Toxic Substances Control Act (TSCA) regulations (40 CFR 761 Subpart 0). Two excavation scenarios are addressed with this verification sampling. The surficial excavation scenario pertains to a situation where the width of the excavation is greater than the depth. The pit excavation scenario will be for excavations that are deeper than 1 meter.

The sequence of events for the remediation project is as follows:

1) Obtain additional site characterization samples described in Section 4.5.1.

2) Delineate and excavate initial excavation area based on results of 1.

3) Perform real-time field screening of excavated area with Envirogard or equivalent PCB field screening kit (SOP CTO 205-12). (See Section 4.5.2.1 "Selection of Sample Locations" for the sample grid layout.) Collect enough sample volume for both the field screening test and the laboratory analytical test.

4) For areas that failed field screening, excavate additional soils and perform testing and excavation until the area passes screening.

5) After field screening results show that the area meets the cleanup level, the "clean" samples will be submitted to the laboratory for analysis (See Section 4.5.2.1 "Selection of Sample Locations").

6) Evaluate results of laboratory analysis to ensure that the cleanup standard is achieved. In instances where the cleanup standard is not achieved, go to step 4.

The rules for verification sampling grid are:

1) The verification grid must be aligned with magnetic north.

2) A composite sample must be composed of nine or less sample aliquots.

3) Individual sample aliquots represent no more than 25 square feet of exposed excavation area each.

4) A minimum of three composite samples are required to assess an individual, discreet excavation.

5) Only one composite sample can represent a given area. Composite samples should not have overlapping areas.

#### 4.5.2.1 Selection of Sample Locations – Surficial Excavations

<u>Excavation Bottom Samples</u>

**Due to the detailed nature of PCB compositing requirements it is imperative that Figures 4-1 through 4-4 be observed concurrently with the text.**

For excavation areas larger than 225 square feet (20 square meters), a square-based grid system will overlay the area to be sampled (See Figure 4-2). The grid axes will be oriented on a magnetic north-south line centered in the area and an east-west axis perpendicular to the magnetic north-south axis also centered in the area. The distance between grid lines in both the north-south direction and the east-west direction will be 5 feet (approximately 1.5 meters) (Figure 4-3). Nine samples will be selected from contiguous grid points (see Figure 4-4) and samples will be combined from the nine contiguous grid points into one composite sample (SOP CTO 205-10). A composite sample should not consist of grid points represented in other composite samples. The composite sampling will be continued until the entire remediation area is characterized by the sampling effort and the results show that cleanup standards have been achieved.

For excavation areas smaller than 675 square feet, less than 9 sample aliquots can be collected for composite samples. As with the larger excavation described in the preceding paragraph, any one composite sample should not represent more than 225 square feet (20 square meters) of excavated area.

Excavation Sidewall Sampling

The sample density on excavation sidewalls varies somewhat from the excavation bottom samples. This is because sidewall sampling is expected to be from walls that are no higher than 3 feet (one meter). The determination of sample quantities assumes that one composite sample is taken for each 225 square feet (20 square meters) of exposed sidewall. The following table should be used to determine the number of samples to be combined for one sidewall composite samples.

**DETERMINATION OF NUMBER OF SAMPLES FOR ONE SIDEWALL COMPOSITE SAMPLE**

| Wall Height (feet) | Wall Length (feet) | Number of Sample Aliquots Combined into One Sidewall Composite Sample |
|---|---|---|
| 1.25 | 1-85 | 3 |
| 1.25 | 85-177 | 6 |
| 1.25 | 177-266 | 9 |
| 2.5 | 1-85 | 6 |
| 2.5 | 85-177 | 9 |
| 2.5 | 177-266 | 9 |

### 4.5.2.2 Selection of Sample Locations – Pit Excavations

The following describe the likely sampling scenario for pits created from the excavation and removal of PCB capacitors.

Pits that are deeper than they are wide are likely for PCB capacitor burial sites. Verification samples will be collected from both excavation sidewalls and excavation floors.

For very small pits with less than 675 square feet of sidewall, a minimum of three composite samples will be taken. Each aliquot should represent a 25 square feet area.

For pits with greater than 675 square feet of sidewall area, the nine-sample aliquot procedure discussed in 4.5.2.1 applies. In these larger test pits, the composite samples should come from only one or two sidewalls.

## 4.6 INVESTIGATION EQUIPMENT AND PROCEDURES

### 4.6.1 Clearance of Drilling Sites

Prior to drilling, the field team members will lay out the sampling point system. The Navy will be requested to clear utilities and issue a digging permit. The drilling will commence when the requirements of the Navy and the TtNUS FOL are satisfied.

### 4.6.2 DPT Sampling for Surface and Subsurface Soil

DPT (e.g., Geoprobe®) will be used to collect surface and subsurface soil samples from the unconsolidated overburden. The procedure for soil sampling using DPT is included in SOP CTO205-04. A new acetate liner will be used for each 2-foot section of soil core. Each removed soil core will be scanned for volatile organic compounds (VOCs). The soil core will be visually inspected and logged by the field geologist, noting the soil texture, grain size (sand, silt or clay), color (and any unusual discoloration), moisture content, and classification according to the Unified Soil Classification System (USCS). The soil depositional environment will be identified by the field geologist.

After slicing the soil core liner open with a Geoprobe® MC Liner Kit, the soils will be scanned to determine if significant VOC concentrations are present in the soils (see SOP CTO205-05). The measurements will be recorded on the boring log form (see SOP CTO205-06). A new form will be used for each boring.

For the first sampling interval in each boring, the photoionization detector (PID) will be used to scan the soil core for the presence of VOCs. The soil core will then be placed in a decontaminated stainless-steel mixing bowl; rocks, gravel, and other coarse debris will be removed; the sample will be mixed with a decontaminated stainless-steel spoon; and appropriate jars will be filled and properly labeled. The bowl and spoon will be decontaminated between each sample following procedures in SOP CTO205-09. Details regarding the collection and labeling of soil samples are included in SOPs CTO205-01 and CTO209-07.

When the soil cores for deeper samples have been brought to the surface, they will be scanned for VOCs in the same manner as the surface sample. The soil cores will be logged by a geologist (see SOP CTO205-06). The remainder of the soil core will be mixed together in a decontaminated stainless-steel mixing bowl; rocks, gravel, and other coarse debris will be removed; and the soil will be thoroughly mixed with a decontaminated stainless-steel spoon. The bowl and spoon will be decontaminated between each sample. Other sample jars will be filled as appropriate and properly labeled.

For each Geoprobe® boring, two soil samples will be collected. The samples will be containerized, labeled, tagged, and bagged (see SOP CTO205-07); they will be placed in a cooler containing ice until the samples can be properly packaged and prepared for shipment (Section 4.8). As samples are added to a cooler, the chain-of-custody form will be updated to include each new sample container (per SOP CTO205-03).

When a boring has been sampled and backfilled with soil, it will be identified by a tall wooden lathe driven into the soil near the boring; a 2- by 2-inch inch wooden stake will be driven into the center of the backfilled boring. The stake and the lathe will both have brightly colored flagging attached to them to increase visibility, and both will be labeled by a waterproof marker with a unique soil boring number, corresponding to the boring log containing the survey data for the boring.

## 4.7 QUALITY CONTROL SAMPLES

This section focuses on field QC samples that will be collected as part of this environmental investigation. Field QC samples include field duplicates, source water blanks, and equipment rinsate blanks. Section 8.1 of the "approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) provides definitions and details for these and all other QC checks to be used during this investigation. Field QC sample requirements for field duplicates, source water blanks, equipment rinsate blanks, and trip blanks required for this project are described below. Table 4-2 summarizes field QC requirements for this project.

Field Duplicates. Field duplicates are obtained during a single act of sampling and are used to assess the overall precision of the sampling and analysis program. Duplicate samples will be collected at a rate of one for every 10 environmental samples of each type of environmental medium. All duplicate samples will be analyzed for the same parameters in the laboratory as their environmental sample counterparts. Duplicate samples will be preferentially collected where field evidence (staining) indicates that contamination is likely to be present in the environmental sample. The duplicate samples will be given unique QC sample IDs (see SOP CTO 205-02).

Equipment Rinsate Blanks. Equipment rinsate blanks will be obtained under representative field conditions by running analyte-free water through sample collection equipment after decontamination and placing it in the appropriate sample containers for analysis. Equipment rinsate blanks will be collected for non-dedicated equipment for all sampling rounds. For surface and subsurface soil sampling activities, rinsate blanks will be collected by running analyte-free water over a decontaminated stainless-steel bowl and mixing spoon; these items are used to mix soil before it is placed in sample jars. One rinsate blank will be collected every ten samples.

Source Water Blanks. Source water blanks will be obtained by sampling each water source (e.g., potable water and distilled water) used for decontamination activities during the field investigation. Source water blanks will be used to determine whether the water or the laboratory bottles are contributing to sample contamination. Source water blanks will be collected for each type of water used for decontamination and will be submitted at a frequency of one per sampling event. Source water blanks, as applicable, will be analyzed for the entire suite of parameters under investigation. It is anticipated that two source water blanks will be collected during the field investigation: one potable water sample and one sample of distilled water used for decontamination.

## 4.8 SAMPLE HANDLING, PACKAGING, AND SHIPPING

### 4.8.1 Sample Preservation

All soil and sediment samples need only be cooled to 4°C ± 2°C; no chemical preservatives are necessary. All samples will be promptly chilled with ice to 4°C ± 2°C and packaged in an insulated cooler. Procedures in SOP CTO205-11 should be followed. Table 4-3 summarizes sample preservation requirements.

### 4.8.2 Sample Labeling

Before samples are packaged, the sample labels and tags will be checked to ensure that all information on the label and tag is complete and correct (see SOP CTO205-01). This information should be checked to ensure that it matches the information placed on the sample collection log sheets and the chain-of-custody form.

### 4.8.3 Sample Packaging

Sample packaging procedures are discussed in SOP CTO205-11.

### 4.8.4 Sample Shipping

Sample shipping procedures are discussed in SOP CTO205-11.

### 4.8.5 Sample Custody

Custody of samples must be maintained and documented at all times in accordance with SOP CTO205-03, beginning with the collection of samples in the field. Sample custody procedures are addressed in Section 5.0.

## 4.9 RECORDKEEPING

Standard forms, field notebooks, and a field logbook will be used to record all sample collection activities, field measurements, observations concerning site conditions, and other project-related information. These records include sample log sheets, daily activity records, field logbooks, drilling and well completion log sheets, and field instrument calibration log sheets, among others. More details regarding recordkeeping are included in SOP CTO205-03.

### 4.9.1 Field Logbooks

Bound, weatherproof field notebooks will be maintained by sampling personnel. All information related to sampling and other field activities will be recorded in field notebooks. This information will include, but is not limited to, sampling time, weather conditions, unusual events, field measurements, and descriptions of photographs.

A bound, weatherproof logbook will be maintained by the FOL. This book will contain a summary of each day's activities and will reference the field notebooks when applicable.

### 4.9.2 Drilling Logs

A drilling log will be completed for every boring that occurs during these field activities. A trained technician will complete the boring log, which will include information regarding date, time, personnel, drilling and sampling equipment, geologic materials encountered, fracture locations and density in bedrock (where appropriate), color, texture, odors, and readings made with the screening instruments (see SOPs CTO205-05 and CTO205-06).

#### 4.9.4 Equipment Calibration Logs

An equipment calibration log sheet will be used to record each time an instrument is calibrated or recalibrated or when calibration is checked against a standard or background. The procedures and standards to be used for instrument calibration are discussed in Section 6.1, and each instrument's SOP is contained in Appendix B.

#### 4.9.5 Sample Collection Logs

One sample collection log sheet will be completed for every environmental sample, every duplicate sample, and every field blank sample collected during the field activities. Only the MS and MSD samples do not require their own individual sample collection log sheet.

#### 4.9.6 Chain-of-Custody Forms

A chain-of-custody form will be completed for every cooler that contains samples being shipped to an off-site laboratory for analyses. These forms are a record of the people that have custody of the samples from the time the samples are collected to the time they are analyzed and disposed (see SOP CTO205-03). The completed field chain-of-custody document will be signed, placed in a sealed plastic envelope, and taped to the top inside cover of the shipping container before it is shipped. A copy of the document will be retained by the FOL.

#### 4.9.7 Shipping Forms/Air Bills

Copies of all forms and/or air bills related to the shipment of coolers will be retained by the FOL in order to trace the shipment, if necessary, and to communicate with the receiving laboratory.

#### 4.9.8 Permanent Record File

At completion of the field activities, the FOL will submit to the TOM all field records, data, field notebooks, logbooks, COC records, sample log sheets, daily activity logs, and other records concerning the project, including all the forms and log sheets listed above. The FOL will check these records for legibility and completeness prior to submitting them to the TOM. These forms, data, and field notes will become part of the permanent project record.

## 4.10 SURVEYING

The location of every soil boring will be marked with a wooden lathe and flagging, and a hole number will be marked on the lathe. In addition, a 2- by 2-inch wooden stake, 6 inches long, will be driven into the ground at the center of the backfilled boring. This stake will have a piece of brightly-colored flagging tacked onto its top, and the hole number will be indelibly marked on the side of the stake.

The horizontal location will be surveyed by an Indiana-licensed surveyor for all locations to the Indiana State Plane Coordinates within the nearest foot and referenced to the 1983 North American Datum (NAD83). The vertical elevations of the ground surface for the borings will be measured to the nearest 0.01 foot.

## 4.11 EQUIPMENT DECONTAMINATION

All equipment used to collect soil samples will be decontaminated in accordance with SOP CTO205-09.

## 4.12 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Refer to SOP CTO205-08 for details explaining the procedure for disposal of investigation-derived waste.

## 4.13 SAFETY

Health and safety issues and concerns are critically important during any field investigation involving drilling and hazardous wastes. Sampling team members working at the site must be fully aware of the potential dangers involved with sampling activities, must be trained and prepared to deal with problems or health-related issues as they arise, and should minimize to the greatest possible extent the potential for exposure to harmful chemicals or accidents. To ensure that field activities are performed at a high level of safety, the following are included in the health and safety activities related to the sampling program.

### 4.13.1 Health and Safety Plan

A separate HASP has been prepared describing specific health and safety requirements, concerns, and information related to the site activities. This document must be read and understood by each person working at the site. Each worker or visitor to the site must sign an acknowledgment that he or she has read and understands the HASP.

### 4.13.2 Health and Safety Training

All workers involved with the site investigations will have successfully completed the Occupational Safety and Health Administration (OSHA)-mandated, 40-hour health and safety training and follow-up annual 8-hour refresher courses when appropriate.

TtNUS and subcontractor personnel must supply OSHA documentation prior to beginning work.

### 4.13.3 Personal Protective Clothing and Equipment

Workers at the site must be part of a medical monitoring program and must be medically approved to perform their duties without physical limitations. Protective clothing and equipment, as specified in the HASP, will be worn while performing site activities.

### 4.13.4 Safety Meetings

Safety meetings will be held among on-site workers whenever the SSO feels it is appropriate. The SSO will discuss safety issues related to activities being performed and will ensure site workers are aware of any new conditions that could potentially affect health or safety.

## 4.14 ORGANIZATION AND LOGISTICS OF FIELD INVESTIGATIONS

### 4.14.1 Personnel

The duties, responsibilities, and line of command for each person working on the project are described in Section 2.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) and displayed on Figure 2-1. Persons working on the project should be intimately familiar with their roles and responsibilities. In addition, they should be familiar with the mechanisms and procedures for coordinating tasks, improving communications, and reporting incidences or irregularities. The FOL is responsible for coordinating all on-site personnel and activities. The SSO is responsible for health and safety monitoring and ensures that the HASP is adhered to during all field activities. The SSO has the authority to stop work if an imminent safety hazard is encountered.

### 4.14.2 Subcontractors

Subcontractors will perform site activities involving drilling and surveying. The FOL will direct all subcontractor activities.

#### 4.14.3 Mobilization and Demobilization

Following approval of the QAPP, mobilization activities will begin. All field team members will review the QAPP (including the HASP) prior to mobilization. In addition, a field team orientation meeting will be held to familiarize personnel with the scope of the field activities. Items to be presented during that meeting include

- Identification of the QAPP, including the HASP and applicable field SOPs (Appendix B).
- Site-specific safety concerns and requirements.
- Project objectives.
- Sampling designs and strategies for soil.
- Site-specific particulars of field operations (e.g., locations of utilities, physical access to sampling locations, communication mechanisms, lines of authority and responsibility, scheduling requirements, sample shipping concerns, etc.).
- Laboratory and other subcontractor coordination.
- Site access requirements.
- Travel requirements.

The FOL will coordinate the mobilization activities for this project. The equipment required for the field activities will be mobilized from the subcontractor home office or a third-party vendor. If electricity is not available on site, power for electric pumps and all other electric-powered equipment will be supplied from portable gas-powered generators. It is presently anticipated that no portable gas-powered equipment will be used during field operations but, if conditions arise that require such equipment, an application for their use will be made to the NSWC Crane Fire Department.

The FOL and crew will demobilize from the site upon completion of the field operations and transport field equipment back to the TtNUS Pittsburgh office, as necessary. All areas will be thoroughly checked; trash will be removed and disposed. All drums containing IDW will be checked to ensure that lids are secured and proper labels have been attached to the drums.

#### 4.14.4 Time Schedule

Roughly 6 working days have been scheduled to perform the field activities at the site for the initial investigation. The schedule for verification sampling during any interim remedial action will depend upon the results of the investigation phase.

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## TABLE 4-1

## PROPOSED SOIL SAMPLES AND LABORATORY ANALYSIS
## PCB CAPACITOR BURIAL/POLE YARD
## NSWC CRANE, CRANE, INDIANA
## PAGE 1 OF 3

| Sample No.(1) | DEPTH (FT-BGS) | PCBs |
|---|---|---|
| 17SS01 0002 | 0-2 | X |
| 17SB01 0204 | 2-4 | X |
| 17SS02 0002 | 0-2 | X |
| 17SB02 0204 | 2-4 | X |
| 17SS03 0002 | 0-2 | X |
| 17SB03 0204 | 2-4 | X |
| 17SS04 0002 | 0-2 | X |
| 17SB04 0204 | 2-4 | X |
| 17SS05 0002 | 0-2 | X |
| 17SB05 0204 | 2-4 | X |
| 17SS06 0002 | 0-2 | X |
| 17SB06 0204 | 2-4 | X |
| 17SS07 0002 | 0-2 | X |
| 17SB07 0204 | 2-4 | X |
| 17SS08 0002 | 0-2 | X |
| 17SB08 0204 | 2-4 | X |
| 17SS09 0002 | 0-2 | X |
| 17SB09 0204 | 2-4 | X |
| 17SS10 0002 | 0-2 | X |
| 17SB10 0204 | 2-4 | X |
| 17SS11 0002 | 0-2 | X |
| 17SB11 0204 | 2-4 | X |
| 17SS12 0002 | 0-2 | X |
| 17SB12 0204 | 2-4 | X |
| 17SS13 0002 | 0-2 | X |
| 17SB13 0204 | 2-4 | X |
| 17SS14 0002 | 0-2 | X |
| 17SB14 0204 | 2-4 | X |
| 17SS15 0002 | 0-2 | X |
| 17SB15 0204 | 2-4 | X |
| 17SS16 0002 | 0-2 | X |
| 17SB16 0204 | 2-4 | X |
| 17SS17 0002 | 0-2 | X |
| 17SB17 0204 | 2-4 | X |
| 17SS18 0002 | 0-2 | X |
| 17SB18 0204 | 2-4 | X |
| 17SS19 0002 | 0-2 | X |

## TABLE 4-1

## PROPOSED SOIL SAMPLES AND LABORATORY ANALYSIS
## PCB CAPACITOR BURIAL/POLE YARD
## NSWC CRANE, CRANE, INDIANA
## PAGE 2 OF 3

| Sample No.(1) | DEPTH (FT-BGS) | PCBs |
|---|---|---|
| 17SB19 0204 | 2-4 | X |
| 17SS20 0002 | 0-2 | X |
| 17SB20 0204 | 2-4 | X |
| 17SS21 0002 | 0-2 | X |
| 17SB21 0204 | 2-4 | X |
| 17SS22-0002 | 0-2 | X |
| 17SB22-0204 | 2-4 | X |
| 17SS23-0002 | 0-2 | X |
| 17SB23-0204 | 2-4 | X |
| 17SS24-0002 | 0-2 | X |
| 17SB24-0204 | 2-4 | X |
| 17SS25-0002 | 0-2 | X |
| 17SB25-0002 | 2-4 | X |
| 17SS26-0002 | 0-2 | X |
| 17SB26-0204 | 2-4 | X |
| 17SS27-0002 | 0-2 | X |
| 17SB27-0204 | 2-4 | X |
| 17SS28-0002 | 0-2 | X |
| 17SB28-0204 | 2-4 | X |
| 17SS29-0002 | 0-2 | X |
| 17SB29-0204 | 2-4 | X |
| 17SS30-0002 | 0-2 | X |
| 17SB30-0204 | 2-4 | X |
| 17SS31-0002 | 0-2 | X |
| 17SB31-0204 | 2-4 | X |
| 17SS32-0002 | 0-2 | X |
| 17SB32-0204 | 2-4 | X |
| 17SS33-0002 | 0-2 | X |
| 17SB33-0204 | 2-4 | X |
| 17SS34-0002 | 0-2 | X |
| 17SB34-0204 | 2-4 | X |
| 17SS35-0002 | 0-2 | X |
| 17SB35-0204 | 2-4 | X |
| 17SS36 0002 | 0-2 | X |
| 17SB36 0204 | 2-4 | X |
| 17SS37 0002 | 0-2 | X |
| 17SB37 0204 | 2-4 | X |

## TABLE 4-1

## PROPOSED SOIL SAMPLES AND LABORATORY ANALYSIS
## PCB CAPACITOR BURIAL/POLE YARD
## NSWC CRANE, CRANE, INDIANA
## PAGE 3 OF 3

| Sample No.(1) | DEPTH (FT-BGS) | PCBs |
|---|---|---|
| 17SS38 0002 | 0-2 | X |
| 17SB38 0204 | 2-4 | X |
| 17SS39 0002 | 0-2 | X |
| 17SB39 0204 | 2-4 | X |
| 17SS40 0002 | 0-2 | X |
| 17SB40 0204 | 2-4 | X |
| 17SS41 0002 | 0-2 | X |
| 17SB41 0204 | 2-4 | X |
| 17SS42 0002 | 0-2 | X |
| 17SB42 0204 | 2-4 | X |
| 17SS43 0002 | 0-2 | X |
| 17SB43 0204 | 2-4 | X |
| 17SS44 0002 | 0-2 | X |
| 17SB44 0204 | 2-4 | X |

Notes:
1) Map locations on Figure 4-1 are designated as the surface soil sample location (e.g. 17SS14).

# TABLE 4-2

## SUMMARY OF SOIL ANALYSES AND QUALITY CONTROL SAMPLES
## PCB CAPACITOR BURIAL/POLE YARD STUDY AREA
## NSWC CRANE, CRANE, INDIANA

| Parameter(1) | Samples | Field Duplicates(1) | Rinsate Blanks(2) | Matrix Spike/ Matrix Spike Duplicates(3) | Total |
|---|---|---|---|---|---|
| PCBs | 88 | 9 | 9 | 5/5 | 106 |

1 Field duplicates will be collected at a frequency of one per every 10 samples.

2 Rinsate blanks will be collected at a frequency of one per every 10 samples, with a minimum of one per day of sampling, per sampling device/instrument. These amounts are estimates and may vary.

3 Matrix spike (MS) and matrix spike duplicate (MSD) samples will be collected at a frequency of one per every 20 samples. MS/MSDs are not applicable (NA) for field analyses. MS/MSD are not considered in the total number of analyses.

## TABLE 4-3

## SUMMARY OF SAMPLE ANALYSES, CONTAINER TYPES AND VOLUMES, PRESERVATION REQUIREMENTS, HOLDING TIMES AND ANALYTICAL LABORATORY FOR SOILS AND SEDIMENTS ABG STUDY AREA NSWC CRANE, CRANE, INDIANA

| Parameter | Sample Container | Container Volume | Preservation | Maximum Holding Time(1) | Analytical Laboratory |
|---|---|---|---|---|---|
| PCBs | Wide-mouth jar, Teflon-lined plastic cap | 8 ounce | Cool to 4 °C | Extraction 14 days; analysis within 40 days of extraction | Laucks |

1 All holding times are from date of collection.

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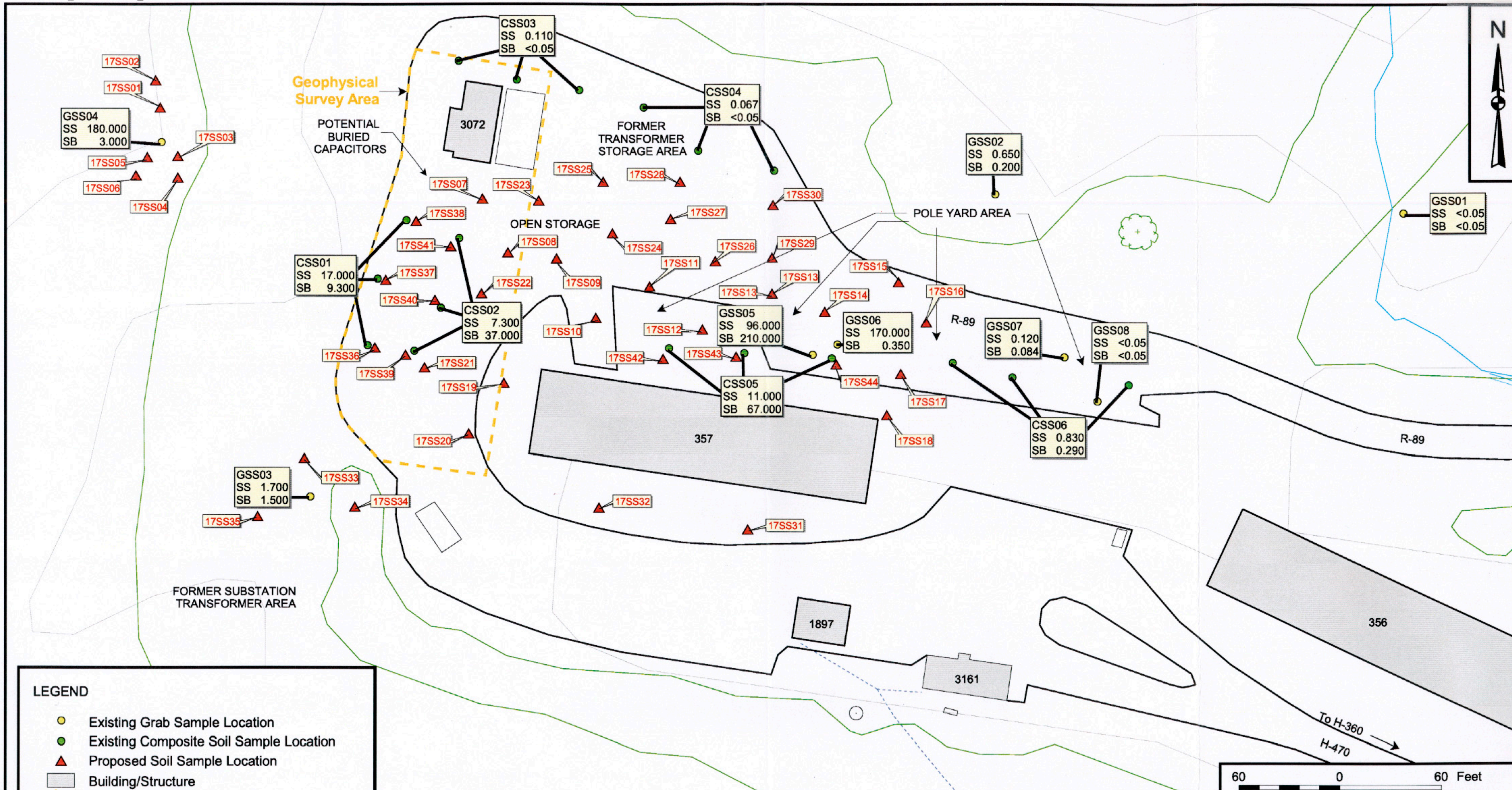
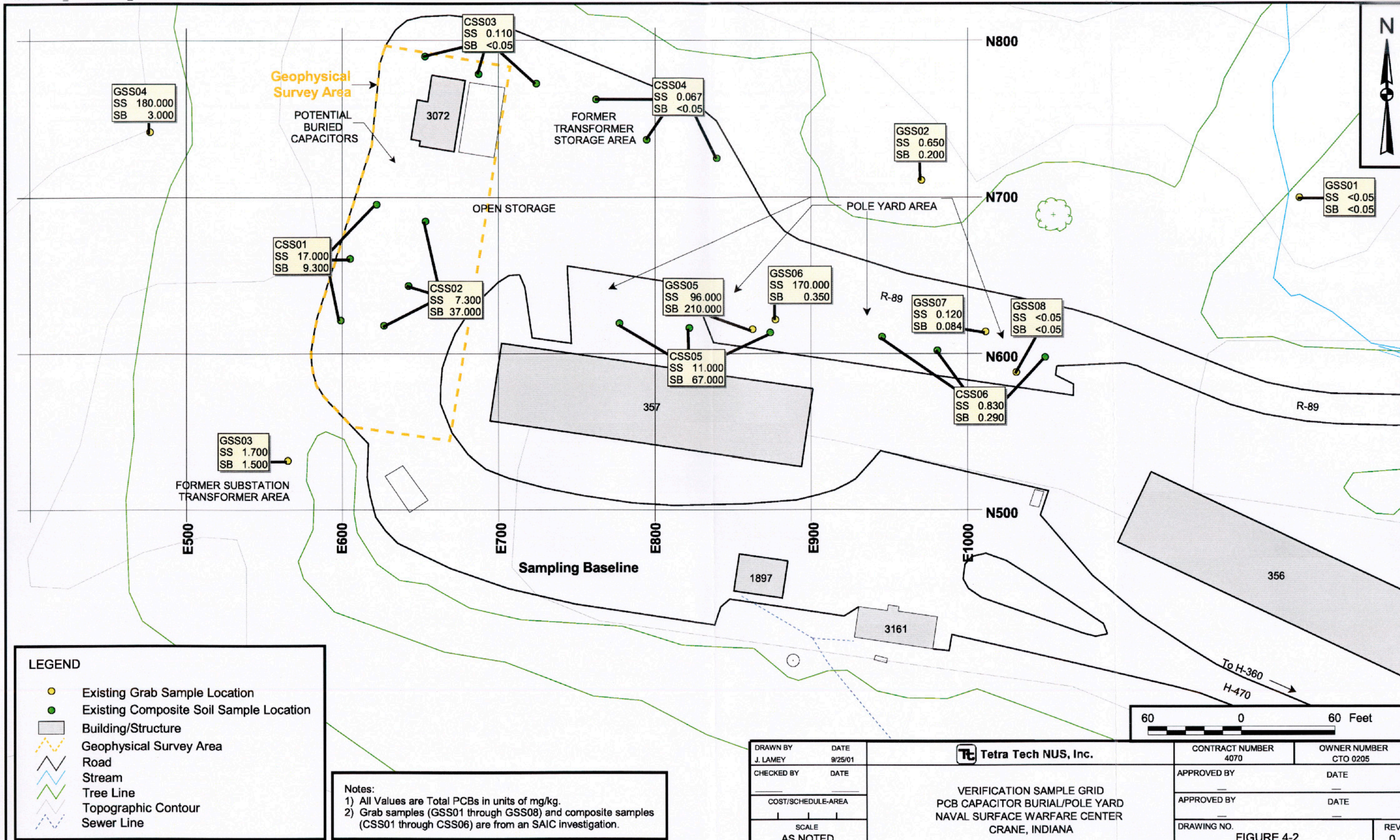
P:\GIS\NSWC_CRANE\POLE_YARD.APR SITE CHARACTERIZATION SAMPLE LOCATIONS 12/18/01 AJ




Notes:
1) All Values are Total PCBs in units of mg/kg.
2) Grab samples (GSS01 through GSS08) and composite samples (CSS01 through CSS06) are from an SAIC investigation.
3) Subsurface samples (SB) from 2-4 ft-bgs should also be collected at soil sampling locations.
4) See Table 4-1 for a listing of site characterization samples.

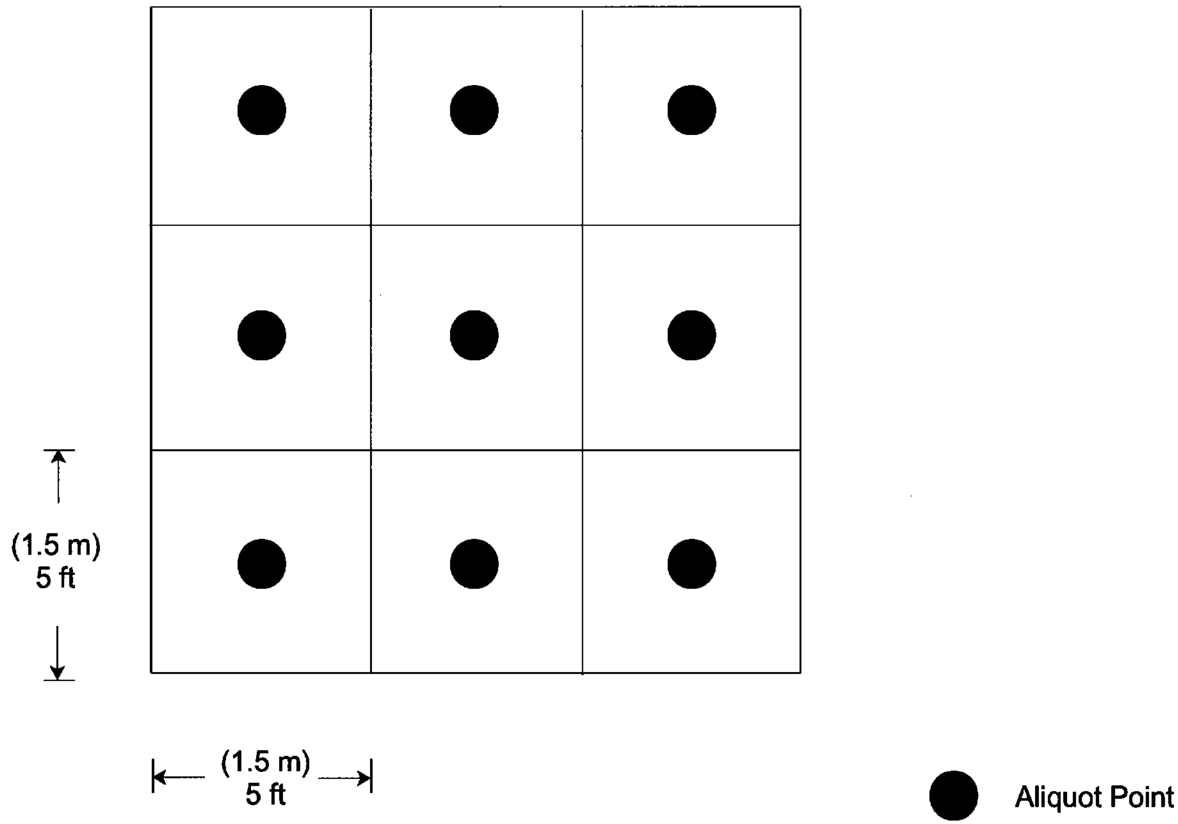
| DRAWN BY | DATE | | CONTRACT NUMBER | OWNER NUMBER |
|---|---|---|---|---|
| J. LAMEY | 9/25/01 | Tetra Tech NUS, Inc. | 4070 | CTO 0205 |
| CHECKED BY | DATE | SITE CHARACTERIZATION SAMPLE LOCATIONS<br>PCB CAPACITOR BURIAL/POLE YARD<br>NAVAL SURFACE WARFARE CENTER<br>CRANE, INDIANA | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE<br>AS NOTED | | | DRAWING NO.<br>FIGURE 4-1 | REV<br>0 |

P:\GIS\NSWC_CRANE\POLE_YARD.APR VERIFICATION SAMPLE GRID 12/18/01 AJ



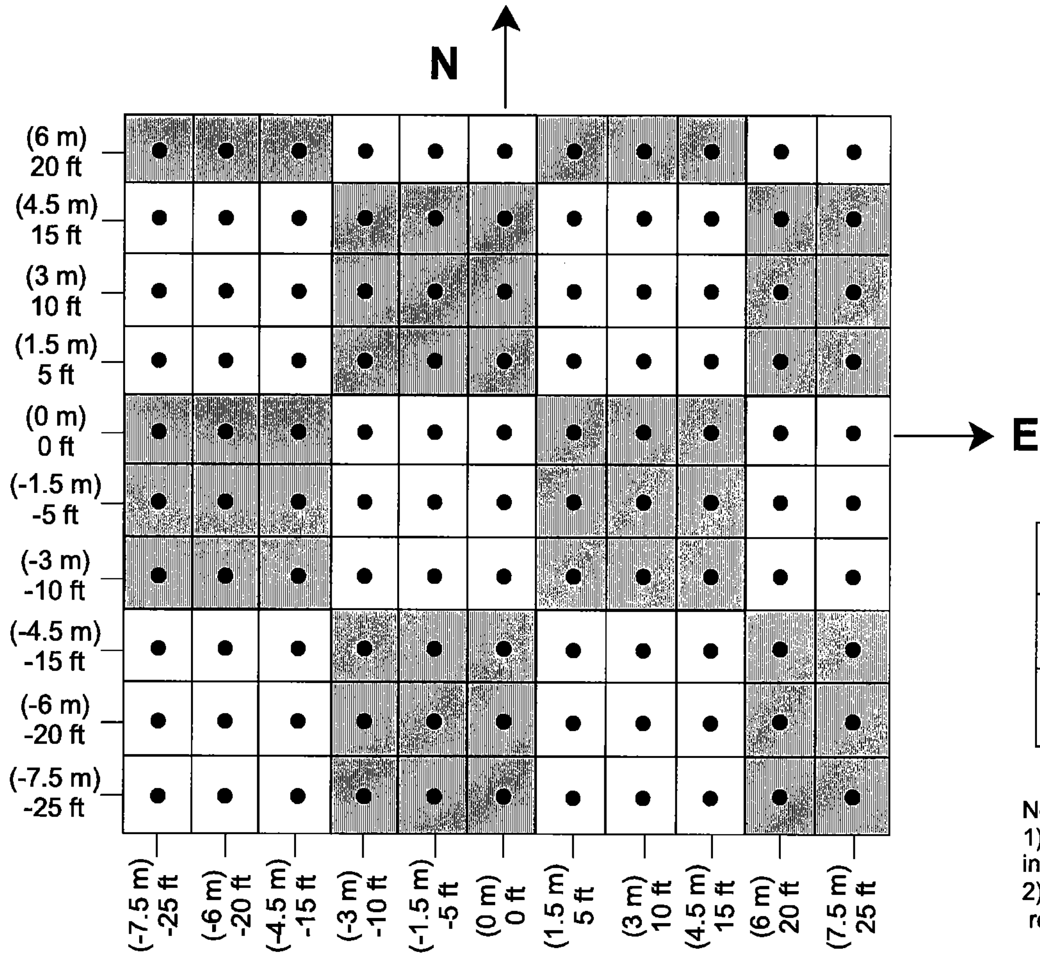

Notes:
1) All Values are Total PCBs in units of mg/kg.
2) Grab samples (GSS01 through GSS08) and composite samples (CSS01 through CSS06) are from an SAIC investigation.

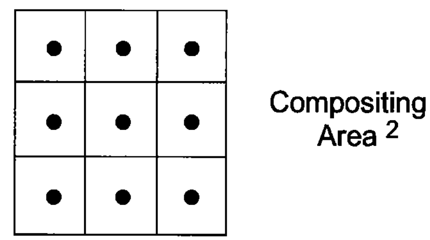
| DRAWN BY | DATE | Tetra Tech NUS, Inc. | CONTRACT NUMBER | OWNER NUMBER |
|---|---|---|---|---|
| J. LAMEY | 9/25/01 | | 4070 | CTO 0205 |
| CHECKED BY | DATE | VERIFICATION SAMPLE GRID PCB CAPACITOR BURIAL/POLE YARD NAVAL SURFACE WARFARE CENTER CRANE, INDIANA | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE AS NOTED | | | DRAWING NO. FIGURE 4-2 | REV 0 |




| DRAWN BY | DATE | Tetra Tech NUS, Inc. | CONTRACT NUMBER | OWNER NUMBER |
|---|---|---|---|---|
| J. LAMEY | 9/25/01 | | 4070 | CTO 0205 |
| CHECKED BY | DATE | SPACING BETWEEN SAMPLE ALIQUOTS<br>USED IN MAKING COMPOSITE SAMPLES<br>PCB CAPACITOR BURIAL/POLE YARD<br>NSWC CRANE, INDIANA | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | | APPROVED BY | DATE |
| SCALE<br>AS NOTED | | | DRAWING NO.<br>FIGURE 4-3 | REV<br>0 |

P:\GIS\NSWC_CRANE\POLE_YARD.APR SPACING BETWEEN SAMPLES 10/23/01 JAL




Notes:
1) As many as nine aliquots can be mixed into one composite sample.
2) Each square on the checker-board pattern represents a unique composite sample.

| | | | |
|---|---|---|---|
| DRAWN BY J. LAMEY — DATE 9/25/01 | Tetra Tech NUS, Inc. | CONTRACT NUMBER 4070 | OWNER NUMBER CTO 0205 |
| CHECKED BY — DATE | EXAMPLE OF COMPOSITING SCHEME FOR PCB CAPACITOR BURIAL/POLE YARD NSWC CRANE, INDIANA | APPROVED BY | DATE |
| COST/SCHEDULE-AREA | | APPROVED BY | DATE |
| SCALE AS NOTED | | DRAWING NO. FIGURE 4-4 | REV 0 |

P:\GIS\NSWC_CRANE\POLE_YARD.APR COMPOSITING AREAS-NON-POINT SOURCE 10/23/01 JAL

# 5.0 CUSTODY PROCEDURES

Documented sample custody is one of several factors necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in Section 5.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001). Laucks Testing Laboratory will be the only laboratory used to support activities at the PCB Capacitor Burial/Pole Yard.

# 6.0 CALIBRATION PROCEDURES AND FREQUENCY

All instrumentation used to perform chemical measurements must be properly calibrated prior to use in order to obtain valid and usable results. Instruments used in the field and in the laboratory will be calibrated in accordance with the procedures governing the use of the instruments. Calibration procedures and frequency are described in Section 6.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001). Use of the field test kits for PCB analysis is described in SOPCTO 205-12.

# 7.0 ANALYTICAL AND MEASUREMENT PROCEDURES

Field measurements and laboratory analytical procedures are presented in this section.

## 7.1 FIELD MEASUREMENT PROCEDURES

Physical parameters to be measured using field instrumentation include sample depth and sample location. Measurement of field parameters is described in detail in Section 4.

## 7.2 LABORATORY ANALYTICAL AND MEASUREMENT PROCEDURES

The laboratory analytical procedures will be performed by Laucks Testing Laboratories, Inc., [940 South Harney Street, Seattle, Washington 98108; (206) 767-5060; FAX (206) 767-5063]. Laucks has successfully completed the laboratory evaluation process required as part of the Naval Facilities Engineering Service Center (NFESC) QA Program and described in the Naval Facilities Engineering Services Center Guide (NFESC, September 1999). Table 7-1 provides a summary of the laboratory analytical methods and associated laboratory SOPs to be used during this investigation. Laboratory SOPs are included in Appendix I of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

### 7.2.1 List of Project Target Compounds and Detection Limits

A list of the laboratory target analytes, project-specific risk-based target levels, and reporting limits (RLs) is provided in Table 1-2. All environmental data will be reported to the analyte's laboratory-specific and matrix-specific RL. RLs will be adjusted on a sample-by-sample basis, as necessary, based on dilutions, sample volume, and for soil samples, percent moisture.

### 7.2.2 List of Associated Quality Control Samples

Field and laboratory QC samples to be analyzed in support of this project are identified in Section 8.0. The analytical SOPs included in Appendix I of the approved Jeep Trail/Little Sulphur Creek QAPP address minimum QC requirements for each associated analytical method. The SOPs include calibration QC requirements. Details on QC sample usage are provided in Section 8.0.

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**TABLE 7-1**

**SUMMARY OF ANALYTICAL PROCEDURES
SOLID AND AQUEOUS SAMPLES
PCB CAPACITOR BURIAL/POLE YARD
NSWC CRANE, CRANE, INDIANA**

| Analytical Parameter | Preparation Method | Analytical Method | Preparation/Analytical SOP(s) (1) |
|---|---|---|---|
| Appendix IX PCBs | SW-846 Method 8082 (2) | SW-846 Method 8082 | Aqueous<br>LTL-3202 / LTL-8084<br><br>Solid<br>LTL-3302 / LTL-8084 |

1 Pertinent laboratory SOPs are included in Appendix I of the approved Jeep Trail/Little Sulphur Creek QAPP.
2 U.S. EPA, 1986a. Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods. SW-846, 3rd Ed. and subsequent updates.

# 8.0 INTERNAL QUALITY CONTROL CHECKS

Field and laboratory QC samples will be analyzed routinely to evaluate overall data quality. Table 3-1 of this QAPP summarizes analysis frequencies and associated corrective actions for the routine field and laboratory non-calibration QC samples. Table 4-2 of this QAPP presents the numbers of QC samples that are anticipated to be collected in the field. Section 3.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) addresses field and laboratory QC sample types and level of effort; Section 6.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) addresses instrument calibrations; and Section 8.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) addresses non-calibration analytical QC of the laboratories.

# 9.0 DATA REDUCTION, VALIDATION, AND REPORTING

Section 9.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) describes the procedures to be used for data reduction, validation, and reporting. Data generated during the course of the field investigations will be maintained in hard-copy form in the Administrative Record at NSWC Crane.

# 10.0 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits will be conducted periodically to ensure that work is being implemented in accordance with the approved QAPP and in an overall satisfactory manner. Section 10.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001) provides examples of pertinent audits.

# 11.0 PREVENTIVE MAINTENANCE PROCEDURES

Equipment used to collect samples will be maintained in accordance with the manufacturers' operation and maintenance manuals. Equipment and instruments will be calibrated in accordance with the procedures and at the frequencies presented in Section 6.0 (Calibration Procedures and Frequency). Preventive maintenance for field and laboratory equipment is addressed in Section 11.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

# 12.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

Compliance with quantitative QC objectives for laboratory accuracy and precision will be evaluated during data validation (Section 9.0). Compliance with completeness objectives for field and laboratory data will be computed. Refer to Section 12.0 of the approved Jeep Trail/Little Sulphur Creek QAPP for specific procedures to evaluate field and laboratory data.

# 13.0 CORRECTIVE ACTION

The TtNUS QA/QC program requires that any and all personnel noting conditions adverse to quality should report these conditions immediately to the TOM and Quality Assurance Manager (QAM). These parties, in turn, are charged with implementing appropriate corrective action in a timely manner. It is ultimately the responsibility of the QAM to document all findings and corrective actions taken and to monitor the effectiveness of the corrective measures performed. Corrective action for field, laboratory, and data validation and reporting nonconformances is described in Section 13.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

# 14.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

QA reports to management will be provided in four primary formats during the course of this investigation: data validation reports, reports summarizing accomplishments and QA/QC issues during the field investigation, project-wide progress reports, and laboratory QA reports. The report frequencies, content, preparers, and recipients are summarized in Section 14.0 of the approved Jeep Trail/Little Sulphur Creek QAPP (TtNUS, 2001).

# REFERENCES

Indiana Department of Environmental Management (IDEM), 2001. RISC Technical Resource Guidance, Indianapolis, Indiana. July 24.

Naval Facilities Engineering Service Center (NFESC), 1999. Navy Installation Restoration Laboratory Quality Assurance Guide, NFESC Interim Guidance Document. Naval Facilities Engineering Services Command, September 1999.

Tetra Tech NUS, Inc. (TtNUS), 2000. Background Soil Report, Naval Surface Warfare Center, Crane, Indiana. March.

Tetra Tech NUS, Inc. (TtNUS), 2001. Quality Assurance Project Plan for Ammunition Burning Grounds Little Sulphur Creek and Jeep Trail Resource and Recovery Act, Phase III RCRA Facility Investigation. April.

United States Environmental Protection Agency (U.S. EPA), 1998. Region 5 QAPP Policy. Waste, Pesticides, and Toxics Division, Chicago, Illinois. April.

United States Environmental Protection Agency (U.S. EPA), 1999. Guidance for the Data Quality Objective Process. EPA/600/R-96/055. September.

# APPENDIX A

# HISTORICAL PCB DATA
# (SWMU 17/04)

| POLE YARD SAMPLING ANALYSIS | | | | BACKGROUND SAMPLES | |
|---|---|---|---|---|---|
| Parameter | Method # | Detection Limit (mg/kg) | State Closure Levels (mg/kg) | PBKG01SS | PBKG01FS |
| **PCB** | EPA 8081 | | | | |
| Aroclor 1016 | | 0.05 | 5.3 | <0.05 | <0.05 |
| Aroclor 1221 | | 0.05 | | <0.05 | <0.05 |
| Aroclor 1232 | | 0.05 | | <0.05 | <0.05 |
| Aroclor 1242 | | 0.05 | | <0.05 | <0.05 |
| Aroclor 1248 | | 0.05 | | <0.05 | <0.05 |
| Aroclor 1254 | | 0.05 | 5.3 | <0.05 | <0.05 |
| Aroclor 1260 | | 0.05 | | <0.05 | <0.05 |

| COMPOSITE SAMPLES | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CSS01 | CSUB01 | CSS02 | CSUB02 | CSS03 | CSUB03 | CSS04 | CSUB04 | CSS04DUP | CSUB04DUP | CSS05 | CSUB05 | CSS06 | CSUB06 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 17 | 9.3 | 7.3 | 37 | 0.11 | <0.05 | 0.067 | <0.05 | 0.054 | <0.05 | 11 | 67 | 0.83 | 0.29 |

| GRAB SAMPLES | | | | | | | |
|---|---|---|---|---|---|---|---|
| GSS05 | GSUB05 | GSS06 | GSUB06 | GSS07 | GSUB07 | GSS08 | GSUB08 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| 96 | 210 | 170 | 0.35 | 0.12 | 0.084 | <0.05 | <0.05 |

| GRAB SAMPLES[1] | | | | | | | |
|---|---|---|---|---|---|---|---|
| GSS01 | GSUB01 | GSS02 | GSUB02 | GSS03 | GSUB03 | GSS04 | GSUB04 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | 15 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| <0.05 | <0.05 | 0.65 | 0.2 | 1.7 | 1.5 | 180 | 3 |

1 Grab samples collected in surface water drainage pathway.

# APPENDIX B

# FIELD STANDARD OPERATING PROCEDURES

## SOP TABLE OF CONTENTS

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-01

# SAMPLE LABELING

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures to be used for labeling and tagging sample containers. Sample labels and tags are used to document the sample ID, date, time, analysis to be performed, preservative, matrix, sampler, and the analytical laboratory. A sample label and a sample tag will be attached to each sample container. The label and tag for each container will contain identical information.

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Writing utensil**
**Disposable medical-grade gloves (e.g. latex, nitrile)**
**Sample logsheets**
**Required sample containers**: All sample containers for analysis by fix-based laboratories will be supplied and deemed certified clean by the laboratory.
**Preprinted sample labels and sample tags**
**Chain-of-custody records**
**Sealable polyethylene bags**
**Heavy-duty cooler**
**Ice**

## 3.0 PROCEDURES

3.1 The following information will be printed on the labels and tags prior to field activities.

- Project number (CTO 205)
- Project Location (NSWC Crane)
- Sample ID
- Preservative

- Analysis to be performed
- Matrix type
- Laboratory name

3.2 Preprinted sample labels and tags will be prepared prior to mobilizing to the field. Check to determine if

- One sample label and tag exists for each sample container that is to be collected for all media during the field activities.

- The information printed on each tag and label are correct.

- Extra blank labels and tags are brought to the site in case additional environmental samples or QA samples are collected that are not anticipated in the QAPP. Additional blank labels and tags should also be brought to the site in case a sample container is broken or some of the preprinted labels or tags are accidentally lost before attached to a container.

3.3 Once at the field site, sample containers should have labels affixed before sampling activities begin.

3.4 Select the labeled containers that are appropriate for a given sample and fill in the date, time, and sampler's initials just before sampling begins. Use a black waterproof marker or pen.

3.5 Fill the appropriate containers with sample material. Securely close the container lids without overtightening.

3.6 Write the same date, time, and sampler's initials on the sample tag as written on the label.

3.7 Place the sample container in a ziplock plastic bag and place in a cooler containing ice.

3.8 Fill in appropriate information on the Sample Collection Log form and the Chain-of-Custody form.

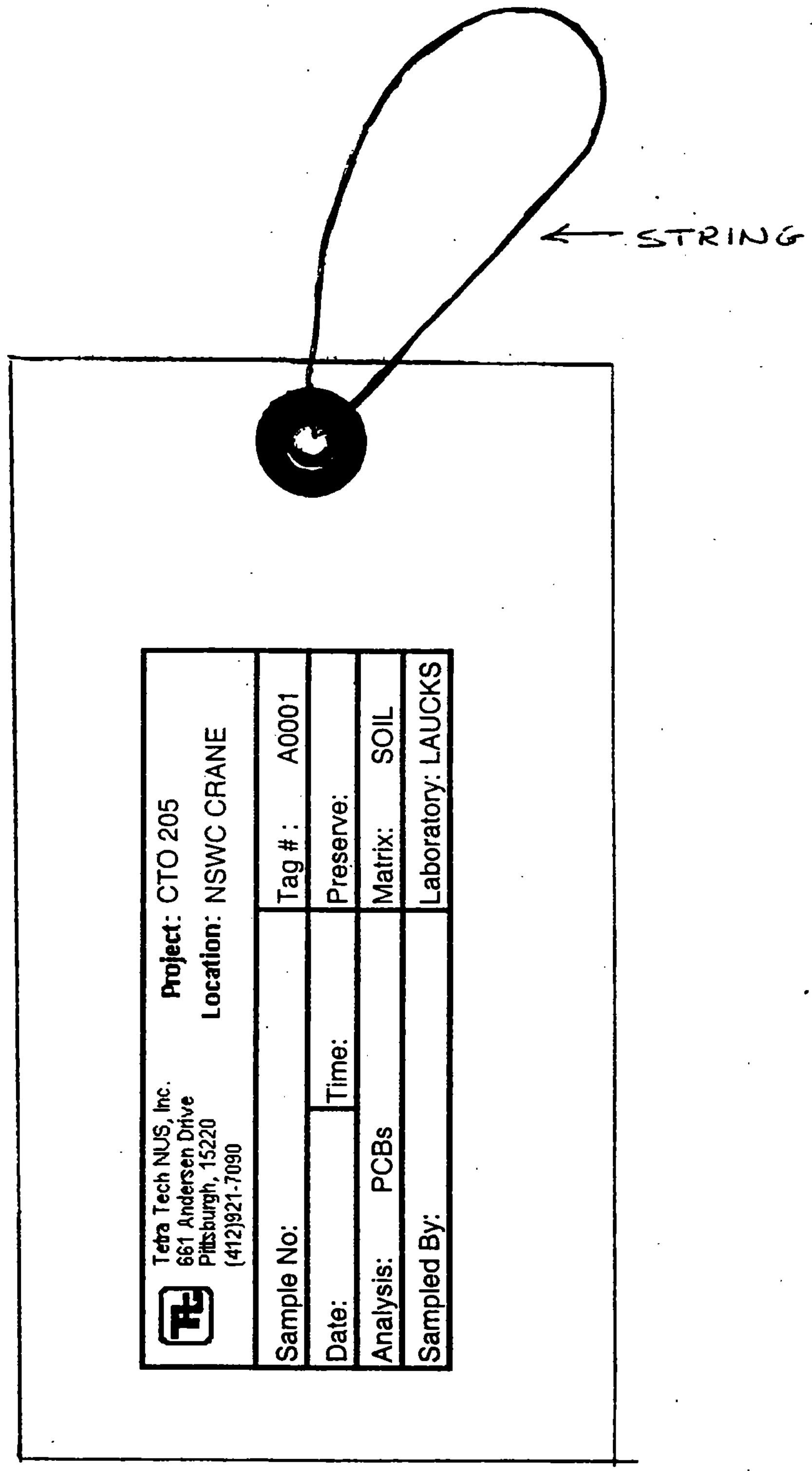
Example sample labels and tags are attached at the end of this SOP.

## 4.0 ATTACHMENTS

1. Sample Label and Tag

## ATTACHMENT 1

## SAMPLE LABEL AND TAG



# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-02

## SAMPLE IDENTIFICATION NOMENCLATURE

### 1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish a consistent sample nomenclature system that will facilitate subsequent data management at the Naval Surface Warfare Center (NSWC). The sample nomenclature system has been devised such that the following objectives can be attained:

- Sorting of data by site, location, or matrix
- Maintenance of consistency (field, laboratory, and database sample numbers)
- Accommodation of all project-specific requirements
- Accommodation of laboratory sample number length constraints
- Ease of identification and direct link to site and year

The NSWC Crane Environmental Protection Department must approve any deviations from this procedure.

### 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Pen with indelible ink**
**Sample tags**
**Sample container labels**

### 3.0 SAMPLE IDENTIFICATION NOMENCLATURE

### 3.1 Monitoring Samples

All site characterization and verification samples collected at NSWC Crane will be properly labeled with a sample label affixed to the sample container and a tag tied around the neck of the sample container. Each sample will be assigned a unique sample tracking number. The sample tracking number will consist of a four-or five-segment alpha-numeric code that identifies the sample's associated solid waste management unit (SWMU) or associated site, sample type, and location. For soil samples, the final four tracking numbers will identify the depth at which the soil or sediment sample was collected.

The alpha-numeric coding to be used in the NSWC Crane sample system is explained in the diagram and the subsequent definitions:

| NN | AA | A or N<br>2 to 7-Characters | NNNN<br>Soils and Sediment only |
|---|---|---|---|
| SWMU or Site Number | Sample Type | Location | Depth Interval |

**Character Type:**

A = Alpha

N = Numeric

**SWMU or Site Number:**

17 = PCB Capacitor Burial/Pole Yard

**Sample Type:**

| | | Site Characterization | Verification Sampling | | |
|---|---|---|---|---|---|
| SB | - | Soil Boring Sample | SW | - | Sidewall Sample |
| SS | - | Surface Soil Sample | FL | - | Floor Sample |

**Location:**

The sample location code is 1) the soil proposed sample location, 2) northing and easting value (N_E_), 3) excavation number (X). The location code for each sample is listed.

**Depth Interval,** Soil and Sediment only:

The depth code is used to note the depth, below ground surface (bgs), at which a soil or sediment sample is collected. The first two numbers of the four-number code specify the top interval and the third and fourth specify the bottom, feet bgs (soil) and inches bgs (sediment) of the sample. The depths will be noted in whole numbers only. Further detail, if needed, will be recorded on the sample log sheet, boring log, logbook, etc.

**Depth (for soils, in feet bgs)**

0002 = soil collected from 0 to 2 feet bgs

0204 = soil collected from 2 to 4 feet bgs

0810 = soil collected from 8 to 10 feet bgs

### 3.1.1 Examples of Sample Nomenclature for Site Characterization Samples

A surface soil sample collected from soil boring 15 at the PCB Capacitor Burial/Pole Yard at the 0- to 2-foot interval would be designated as 17SS150002.

A subsurface soil sample from the same soil boring 15 at an interval of 4 to 5 feet bgs would be designated as 17SB150405.

### 3.1.2 Examples of Sample Nomenclature for Verification Sampling

a) For sites where the width of the excavation in greater than the depth - Surficial

Example 1: 17 FL E 670 N 530 D0002
A floor soil sample (at 2 feet below original grade) taken from sampling grid node E 670 and N 530.

E represents Easting. N represents northing.

b) For sites where the width of the excavation is less than the depth - pit excavating

Example 1: 17 SW x 01 N1 0005
A soil sample taken from the sidewall (SW) of excavation (X) 1's northern wall, 5 feet below original grade. Subsequent samples taken from the northern wall will be N2, N3, N4, etc.

Attachment 1 shows proposed sample nomenclature procedures applied to hypothetical excavations at Site 17. Attachment 2 shows same field notes for documenting PCB verification samples.

## 3.2 <u>Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature</u>

Field QA/QC samples are described in the approved field sampling plan and QAPP. They will be designated using a different coding system. The QC code will consist of a three- to four-segment alphanumeric code that identifies the sample QC type, the date the sample was collected, and the number of this type of QC sample collected on that date.

| AA | NNNNNN | NN |
|---|---|---|
| QC Type | Date | Sequence Number (per day) |

The QC types are identified as

TB = Trip Blank

RB = Rinsate Blank (Equipment Blank)

FD = Field Duplicate

AB = Ambient Conditions Blank

SB = Source Water Blank

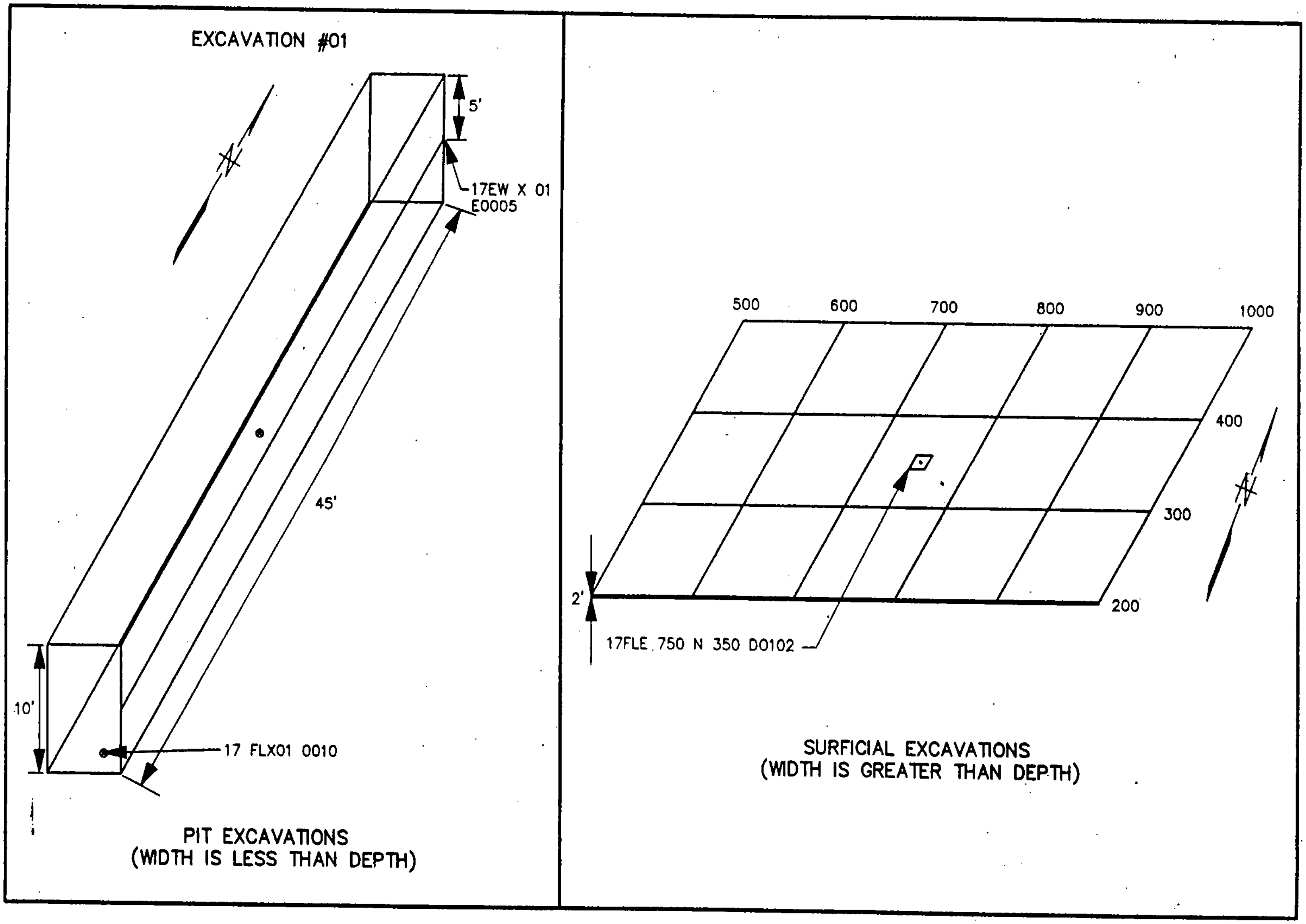
The sampling time recorded on the chain-of-custody form, labels, and tags for duplicate samples will be 0000 so that the samples are "blind" to the laboratory. Notes detailing the sample number, time, date, and type will be recorded on the sample log sheets and will document the location of the duplicate sample (sample log sheets are not provided to the laboratory).

### 3.2.2 Examples of Field QA/QC Sample Nomenclature

The third duplicate of the day taken of a subsurface soil sample collected on November 17, 2003 would be designated as FD11170303.

The only rinsate blank collected on November 17, 2001 would be designated as RB11170101.

**Attachment 1**
**Sample Nomenclature Applied to Hypothetical Excavations at Site 17**
**(Verification Sampling Only)**




ATTACHMENT 1
SAMPLE NOMENCLATURE APPLIED TO HYPOTHETICAL EXCAVATIONS AT SITE 17. (VERIFICATION SAMPLING ONLY)

## Attachment 2

## EXAMPLE FIELD NOTES

Composite Sample 17SWx01 E0005

Sample represents nine sample aliquots evenly spaced over a grid that is from 0 to 5 feet below grade on the eastern side of the pit excavation. The composite sample name was written on survey pin flags and located at ground surface in proximity to the excavation side wall.

Composite Sample 17FLE750 N350 D0102

Sample represents nine sample aliquots evenly spaced over a 225-square- foot (20.25 square meter) grid. The center of the grid is at E75 N350. The sample was taken from 1 to 2 feet below original grade.

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-03

# SAMPLE CUSTODY AND DOCUMENTATION OF FIELD ACTIVITIES

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedures for sample custody and documentation of field sampling and field analyses activities.

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

The following logbooks, forms, and labels, are required.

**Site logbook**
**Field logbook**
**Sample label**
**Chain-of-custody form**
**Custody seals**
**Equipment Calibration Log**
**Monitoring Well Inspection Form**
**Water Level Measurement Form**
**Low-Flow Purge Data Sheet**
**Ground Water Sample Log Sheet**
**Surface Water Sample Log Sheet**

## 3.0 PROCEDURES

This section describes custody and documentation procedures. All entries made into the logbooks, custody documents, logs, and log sheets described in this SOP must be made in indelible ink (black is preferred). No erasures are permitted. If an incorrect entry is made, the entry will be crossed out with a single strike mark, initialed, and dated.

### 3.1 Site Logbook

The site logbook is a hardbound, paginated, controlled-distribution record book in which all major on-site activities are documented. At a minimum, the following activities/events shall be recorded (daily) in the site logbook:

- All field personnel present
- Arrival/departure of site visitors
- Arrival/departure of equipment
- Start or completion of sampling activities
- Daily on-site activities performed each day
- Sample pickup information
- Health and safety issues
- Weather conditions

The site logbook is initiated at the start of the first on-site activity (e.g., site visit or initial reconnaissance survey). Entries are to be made for every day that on-site activities take place.

The following information must be recorded on the cover of each site logbook:

- Project name
- Project number
- Book number
- Start date
- End date

Information recorded daily in the site logbook need not be duplicated in other field notebooks but must summarize the contents of these other notebooks and refer to specific page locations in these notebooks for detailed information (where applicable). At the completion of each day's entries, the site logbook must be signed and dated by the field operations leader (FOL).

### 3.2 Field Logbooks

The field logbook is a separate dedicated notebook used by field personnel to document his or her activities in the field. This notebook is hardbound and paginated.

### 3.3 Sample Labels

Adhesive sample container labels must be completed and applied to every sample container. Information on the label includes the project name, location, sample number, date, time, preservative, analysis, matrix, sampler's initials, and the name of the laboratory performing the analysis.

### 3.4 Chain-of-Custody Form

The Chain-of-Custody Form (COC) is a multi-part form that is initiated as samples are acquired and accompanies a sample (or group of samples) as it is transferred from person to person. Each COC is numbered. This form must accompany any samples collected for laboratory chemical analysis. A copy of a blank chain-of-custody form is attached at the end of this SOP.

The FOL must include the name of the laboratory in the "Remarks" section to ensure that the samples are forwarded to the correct location. If more than one COC is necessary for any cooler, the FOL will indicate "Page __ of __" on each COC. The original (top) signed copy of the COC form will be placed inside a large Ziploc-type bag and taped inside the lid of the shipping cooler. Once the samples are received at the laboratory, the sample custodian will check the contents of the cooler(s) against the enclosed COC(s). Any problems are noted on the enclosed COC form (bottle breakage, discrepancies between the sample labels, COC form, etc.) and will be resolved through communication between the laboratory point-of-contact and the task order manager (TOM). The COC form is signed and retained by the laboratory and becomes part of the sample's corresponding analytical data package.

### 3.5 Custody Seal

The Custody Seal is an adhesive-backed label with a number on each seal. It is part of the chain-of-custody process and is used to prevent tampering with samples after they have been collected in the field and sealed in coolers for transit to the laboratory. The Custody Seals are signed and dated by the samplers and affixed across the opening edges of each cooler (two seals per cooler) containing environmental samples. The laboratory sample custodian will examine the Custody Seal for evidence of tampering and will notify the TOM if evidence of tampering is observed.

### 3.6 <u>Equipment Calibration Log</u>

The Equipment Calibration Log is used to document calibration of measuring equipment (e.g., multi-parameter water-quality meter) used in the field. The Equipment Calibration Log documents that the manufacturer's instructions were followed for calibration of the equipment, including frequency and type of standard or calibration device. An Equipment Calibration Log must be maintained for each electronic measuring device requiring calibration. Entries must be made for each day the equipment is used.

### 3.7 <u>Soil Sample Log Sheet</u>

The Soil and Sediment Sample Log Sheets are used to document the sampling of soils. This sheet is used in conjunction with SOP CTO205-07.

## 4.0 ATTACHMENTS

1. Chain-of-Custody Record

# ATTACHMENT 1
## CHAIN-OF-CUSTODY RECORD

**TETRA TECH NUS, INC.** | **CHAIN OF CUSTODY** | **NUMBER** | **PAGE ____ OF ______**

| | | | |
|---|---|---|---|
| **PROJECT NO:** | **SITE NAME:** | **PROJECT MANAGER AND PHONE NUMBER** | **LABORATORY NAME AND CONTACT:** |
| **SAMPLERS (SIGNATURE)** | | **FIELD OPERATIONS LEADER AND PHONE NUMBER** | **ADDRESS** |
| | | **CARRIER/WAYBILL NUMBER** | **CITY, STATE** |
| **STANDARD TAT** ☐<br>**RUSH TAT** ☐<br>☐ **24 hr.** ☐ **48 hr.** ☐ **72 hr.** ☐ **7 day** ☐ **14 day** | | **CONTAINER TYPE PLASTIC (P) or GLASS (G)**<br>**PRESERVATIVE USED** | |

| **DATE YEAR** | **TIME** | **SAMPLE ID** | **MATRIX** | **GRAB (G) COMP (C)** | **No. OF CONTAINERS** | ***TYPE OF ANALYSIS*** | | | | | | | | ***COMMENTS*** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
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|---|---|---|---|---|---|
| 1. RELINQUISHED BY | DATE | TIME | 1. RECEIVED BY | DATE | TIME |
| 2. RELINQUISHED BY | DATE | TIME | 2. RECEIVED BY | DATE | TIME |
| 3. RELINQUISHED BY | DATE | TIME | 3. RECEIVED BY | DATE | TIME |
| COMMENTS | | | | | |

DISTRIBUTION: WHITE (ACCOMPANIES SAMPLE) YELLOW (FIELD COPY) PINK (FILE COPY) 3/99

FORM NO. TtNUS-001

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-04

# BOREHOLE ADVANCEMENT AND SOIL CORING USING DIRECT PUSH TECHNOLOGY

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures for collecting surface and subsurface soil cores from unconsolidated overburden materials using direct-push technology (DPT) for the PCB Capacitor Burial/Pole Yard at the NSWC Crane facility. For this investigation, a Geoprobe® rig with a Macrocore Sampler will be the type of DPT used.

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Cut-resistant non-latex impermeable gloves**
**Cotton gloves**
**Disposable medical-grade gloves (e.g., latex, nitrile)**
**Writing utensil**
**Boring log sheets:** A copy of this form is included in SOP CTO205-06
**Photoionization detector (PID)** (see SOP CTO 205-05)
**Geoprobe® or equivalent DPT equipment**
**Geoprobe® Macrocore Sampler or equivalent**
**Geoprobe® Sampling Kit or equivalent**
**Clear acetate liners:** one new liner for each soil core
**Required decontamination materials** (see SOP CTO205-09)
**Bentonite pellets**

## 3.0 BOREHOLE ADVANCEMENT AND SOIL SAMPLING USING A GEOPROBE®

Direct-push technology (DPT) will be employed to collect soil cores. DPT refers to sampling tools and sensors that are driven directly into the ground without the use of conventional rotary drilling equipment. DPT typically utilizes hydraulic pressure and/or percussion hammers to advance the sampling tools. Geoprobe® is a manufacturer of a hydraulically powered, percussion/probing machine utilizing DPT to collect subsurface environmental samples. This type of rig with a Macrocore Sampler will be used at the PCB Capacitor Burial/Pole Yard to collect soil cores.

3.1 Clear the area to be sampled of any surface debris (herbaceous vegetation, twigs, rocks, litter, etc.).

3.2 Place a new clear acetate liner in the detachable Macrocore core barrel and attach coring device to the Geoprobe® rig.

3.3 Drive macrocore sampler (lined with acetate) into the ground to a depth of 2 feet using hydraulic pressure. The 0- to 2-foot depth soil interval is considered to be the surface soil.

3.4 Retract the sampler from the borehole and remove the acetate liner and the soil core from the Macrocore barrel.

3.5 Attach the metal trough from the Geoprobe® Sampling Kit firmly to the tail gate of a vehicle. If a vehicle with a tailgate is not available, secure the trough on another suitable surface.

3.6 Place the acetate liner containing the soil core in the trough.

3.7 While wearing cut-resistant gloves (constructed of non-latex over cotton), cut the acetate liner through its entire length using the double-bladed knife that accompanies the Geoprobe® Sampling Kit. Then remove the strip of acetate from the trough to gain access to the collected soils. **CAUTION**: Do not attempt to cut the acetate liner while holding it in your hand.

3.8 Scan the entire length of the soil core for volatile organic compounds (VOCs) using the PID. Record the specific depth interval and the associated PID reading on the Boring Log Sheet. Collect a soil VOC sample using Encore samplers from the soil interval that had the highest PID reading. If no above-background PID readings were detected, collect the VOC sample from an interval that is discolored or displays other visual signs of being contaminated. If no visual sign of contamination is evident, collect the soil VOC sample from the center of the core interval (i.e., one foot depth).

3.9 Log the soil core on the Boring Log Sheet (see SOP CTO205-06).

3.10 Place the soil core in a stainless-steel mixing bowl, homogenize, and collect the remainder of the soil sample aliquots, as described in SOP CTO205-07.

3.11 Repeat steps 3.2 through 3.10 for the next depth intervals.

3.12 The depth to bedrock should be recorded on the Boring Log, and the estimated moisture content of the soil and the presence or absence of water in the boring should be noted.

3.13 If readings from the PID are all at background levels below field screening criteria, then excess soil core materials will be returned to the hole and tamped. If insufficient soil is available to fill the hole to the ground surface, then bentonite pellets mixed with the soil will be used to backfill the hole.

3.14 If screening instruments indicate that contaminants may be present in the soil materials, then all excess soil core materials will be placed in a plastic bag (or drum if larger quantities). The bag will be tagged identifying the location and depths from where the soils came and the date. The bag will then be placed in a 55-gallon drum and stored on-site until laboratory analyses of the soil are completed and classification of the soil waste materials can be determined (see SOP CTO205-08).

3.15 If soil materials from the boring are suspected of being contaminated (see 3.14 above), the soil boring will be backfilled with bentonite pellets up to the ground surface.

3.16 Decontaminate all soil sampling equipment in accordance with SOP CTO205-09 prior to collecting the next sample.

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-05

# CALIBRATION AND USE OF PHOTOIONIZATION DETECTOR

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes procedures for the maintenance, calibration, and use of a photoionization detector (PID). The Photovac 2020 Photoionization Air Monitor will be used during the PCB Capacitor Burial/Pole Yard investigation. The procedures for its use are discussed in detail in the following sections.

## 2.0 GLOSSARY

Electron-volt (eV) - A unit of energy equal to the energy acquired by an electron when it passes through a potential difference of 1 volt in a vacuum.

Intrinsically Safe (I.S.) - Based on wiring, configuration, design, operation, gasketing, construction, this instrument may be employed within locations where flammable gases and/or vapors may exist.

Ionization Potential (I.P.) - The energy required to remove an electron from a molecule yielding a positively charged ion and a negatively charged free electron. The instrument measures this energy level.

Photoionization Detector (PID) - PID is employed as the general reference to air monitors of this type. PID's detection method employs ultraviolet (UV) radiation as an energy source. As air and contaminants are drawn through the ionization chamber, the UV light source causes the contaminant with ionization potentials equal to or less than the UV source to break into positive and negatively charge ions. The created ions are subjected to an electrostatic field. The voltage difference is measured in proportion to the calibration reference and the concentration of the contaminant.

Ultraviolet Radiation (UV) Lamp - Ultraviolet radiation is the energy source employed by the instrument to ionize collected sample gas streams. The UV lamp source is required to be equal to or greater than the ionization potential of the substance drawn through the instrument in order to create separate ionized species.

## 3.0 REQUIRED EQUIPMENT

**Pen**
**Equipment Calibration Form**
**Photoionization detector**
**Isobutylene calibration gas (i.e., span gas)**
**Regulator**

## 4.0 PROCEDURES

### 4.1 Principle of Operation

The Photovac portable photoionizer detects many organic (and a few inorganic) species. The basis for detection of this instrument is the ionization of components in gaseous streams. The incoming gas molecules are subjected to UV radiation, which is energetic enough to ionize many compounds associated with industrial activities. Molecules are transformed into charged-ion pairs, creating a current between two electrodes. Each molecule has a characteristic ionization potential, which is the energy required to remove an electron from the molecule, yielding a positively charged ion and a free electron. The instrument measures this energy level.

This instrument measures the concentration of airborne photoionizable gases and vapors and automatically displays and records these concentrations. It does not distinguish between individual substances. Readings that are displayed represent the total concentration of all photoionizable chemicals present in the sample. This instrument is factory-set to display concentration in units of ppm or $mg/m^3$. The meter display updates itself once per second.

The 2020 also performs short-term exposure limit (STEL), time-weighted average (TWA), and peak calculations. The user can view any of these results, but only one mode may be viewed at a time.

The 2020 has six keys for alphanumeric entry and for accessing multiple functions. The keys are used to set up and calibrate 2020. They allow the user to manipulate the concentration data in various ways.

All information entered with the keys and stored in the 2020's memory is retained when the instrument is switched off. The clock and calendar continue to operate and do not need to be set each time the 2020 is turned on.

### 4.1.1 Displays

The 2020 has a meter display for reporting detected concentration and a display used for status/ information to guide the user through configuration options. All functions of the 2020 will be controlled or reported using one of these displays.

#### 4.1.1.1 <u>Meter Display</u>

The meter display is four digits. It will always be used for reporting detected concentration. When the detector and pump are off, the meter display will be blank.

In order to accommodate the range of concentrations the 2020 can detect, the meter reading will be reported using one of two resolutions. A resolution of 0.1 will be used for concentrations below 100 ppm, and a resolution of 1 will be used for concentrations above 100 ppm.

#### 4.1.1.2 <u>Status Display</u>

The status display is a two line by 16-character display. The top line is used to display status/information and prompts the user for inputs. The bottom line is used for soft key names. Up to three names can be displayed for the three soft keys. If a name does not appear for a soft key, then the soft key has no associated function.

### 4.1.2 Keys

#### 4.1.2.1 <u>Fixed Keys</u>

The three round keys below the soft keys each have a fixed function. The first key is the ON/OFF key, the middle key is the EXIT key, and the last key is the ENTER key.

The ON/OFF key is used to both turn power on and off. To turn on the 2020, press the ON/OFF key. To turn the power off, press the ON/OFF key and hold it down for 2 seconds, and then release it. This is done to prevent accidental power off.

The EXIT key provides a way of returning to the default display. In the functional map, the soft keys allow the user to advance and the EXIT key provides a way to go back. If the user is at the initial entry of the menu, EXIT will return to the default display.

The ENTER key has a context sensitive function. When operating or navigating through the function map, the ENTER key is used to exit the functions and return to the default display. When entering data such as a name, number, date, or time, ENTER is used to confirm the entry.

#### 4.1.2.2 Soft Keys

The three soft keys on the 2020 are located directly below the status display. Each key has varying functions for configuring the 2020, editing the data logger, and controlling the display. Because only three soft keys are available, each function is broken down into a path.

#### 4.1.2.3 Entering Text With the Soft Keys

For all information that the user must enter, the left, center, and right soft keys correspond to the up, down, and right arrow.

The up and down arrows are used to change the character highlighted by the cursor. The right arrow is used to advance the cursor to the next character on the right. When the cursor is advanced past the right most character, it wraps around to the first character again. To accept the changes, press the ENTER key. To ignore the change, press EXIT.

Formatting characters, such as the colon (:) in the time, the decimal (.) in a concentration, and the slash (/) in the date, are skipped when advancing the cursor.

All inputs are an eight-character input, which is displayed on the right side of the top line of the status display. The prompt, describing the input, occupies the left half of the top line. The soft keys are defined on the bottom line of the status display.

### 4.2 Default Display

The meter display shows the detected concentration. The resolution of the display changes with the magnitude of the reading. A reading of 0 to 99.9 will be displayed with a resolution of 0.1 ppm. A reading greater than 99.9 will be shown with a resolution of 1 ppm or 1 $mg/m^3$. The meter will display concentrations up to 2,000 ppm or 2(99) $mg/m^3$.

The status display is used to display the instrument status, date, time, units, and active soft keys.

The default display provides the following information: instrument status, current detected concentration, time, date, and measurement units. The status display toggles between showing time and units and then the date.

When the display mode is MAX, the date and time correspond to the date and time the MAX concentration was recorded. In TWA mode, the time represents the number of hours and minutes during which the TWA has been accumulating. For PEAK and STEL monitoring, the date and time correspond to the current date and time.

## 4.3 Monitoring

### 4.3.1 Instrument Status

The instrument status is shown on the left of the first line of the status display and on the Table and Graph outputs. Each status has a priority assigned to it. If more than one status is in effect, then the status with the highest priority is displayed until the condition is corrected or until the option is turned off.

### 4.3.2 Alarms

While operating the instrument, any one of three alarm conditions can occur. To accurately identify the source of the alarm, each type of alarm has been given a unique status.

In addition to the status, the 2020 also has an audible alarm and a visual alarm LED. To conserve power, the 2020 alternates between these two alarm indicators, rather than operating both concurrently. Different alarms are identified by the frequency at which the 2020 alternates, as follows: PEAK alarm - 5 times per second; STEL alarm - 2.5 times per second; and TWA alarm - 1.25 times per second.

The left soft key is used for acknowledging alarms and is labeled "Ack." If no alarm exists, then the "Ack" key is not shown. To clear the alarm, press the "Ack" key. Once acknowledged, the alarm indicators are cleared. The alarm status will remain until the alarm condition clears.

The 2020 updates the peak concentration once every second. Following every update, the peak concentration is compared to the peak alarm level, and, if exceeded, an alarm is triggered.

If a 15-minute average concentration exceeds the selected STEL, a STEL alarm is generated.

The TWA alarm is generated when the current average concentration over an 8-hour period, since the TWA was last cleared, has exceeded the TWA exposure limit.

During calibration, all alarms are disabled. Once the calibration is complete, the alarms are re-enabled.

## 4.4 STEL, TWA, MAX, and PEAK Operation

The 2020's meter display can be configured to show one of four values: STEL, TWA, PEAK, and MAX.

### 4.4.1 Short-Term Exposure Limit Mode

The STEL mode displays the concentration as a 15-minute moving average. The 2020 maintains 15 samples, each representing a 1-minute averaging interval.

Once every minute, the oldest of the 15 samples is replaced with a new 1-minute average. This moving average provides a 15-minute average of the last 15 minutes with a 1-minute update rate. Because the average is calculated using 15 one-minute averages, the meter display will only update once every minute.

The STEL is set to zero each time the instrument is turned on. Because STEL is a 15-minute moving average, there is no need to clear or reset the STEL.

STEL calculations are always being performed by the 2020. The user can display the results of the calculations by selecting “STEL” as the Display mode.

### 4.4.2 Time-Weighted Average (TWA) Mode

The TWA accumulator sums concentrations every second until 8 hours of data have been combined. If this value exceeds the TWA alarm setting, a TWA alarm is generated. The TWA is not calculated using a moving average. Once 8 hours of data have been summed, the accumulation stops. In order to reset the TWA accumulator, press the "Clr" key.

This sum will only be complete after 8 hours, so the meter displays the current sum divided by 8 hours. While in TWA mode, the time on the status display will show the number of minutes and hours of data that TWA has accumulated. When this reaches 8 hours, the 2020 stops accumulating data and the TWA is complete.

TWA calculations are always being performed by the 2020. The user can display the results of the calculations by selecting TWA as the Display mode.

#### 4.4.3 MAX Mode

The MAX mode displays the maximum signal, with the date and time that it was recorded. The 2020 continues to log data according to the selected averaging interval, but only the maximum detected concentration is displayed on the meter display.

The right soft key is used to clear the meter when displaying MAX. The "Clr" key only affects the reading that the meter is displaying. For example, if you display the MAX reading and the user presses "Clr," only the MAX value is cleared. The TWA is still accumulating in the background.

#### 4.4.4 PEAK Mode

The PEAK mode displays the current detected concentration. The reading is updated once a second. In the background, the 2020 data logger is sampling the concentration and measuring minimum, maximum, and average concentrations for the selected averaging interval. At the end of every interval, one entry is placed in the data logger until the data logger is full. For CTO 205, the instrument should be operated in this mode. Operation within the other specialized modes is the responsibility of the SSO.

### 4.5 <u>Set Functions</u>

Set functions are used to set up the 2020. There are three functions that can be set on the 2020: Pump, Clock, and Calibration.

#### 4.5.1 Pump

The Pump function is used to control the pump. After Set Pump is selected, the 2020 responds by displaying the new pump status.

The detector is also turned off when the pump is turned off. This prevents the detector from being damaged when there is no sample flowing through the detector.

When the pump and the detector are off, the meter display will be blank. Turn the pump and detector off when concentration measurements are not necessary, and the 2020 will only be used for reviewing data or generating reports. By operating the instrument with the pump and detector off when they are not needed, the user will conserve the lives of the battery and ultraviolet (UV) lamp.

To set the pump

1. Press the ENTER key. The top line of the status display changes to "Select?" The bottom line displays three soft key names: "Set," "Log," and "Disp."

2. Press the soft key below "Set."

3. The names of the soft keys change to reflect the Set options. The display now shows three devices that can be set: "Clock," "Pump," and "Cal." Press the "Pump" key.

4. The 2020 turns the pump off. If the pump was off, pressing "Pump" will turn the pump on.

5. A message will be displayed to show the status of the pump. The 2020 reverts back to the previous menu after a few seconds.

6. To return to the default display, press the ENTER key.

#### 4.5.2 Clock

The Clock function is used to set both the current date and time.

To set the clock

1. Press the ENTER key.

2. Press the "Set" key.

3. When the names of the soft keys change, press the "Clock" key.

   The up and down arrows are used to change the character underlined by the cursor. The right arrow is used to advance the cursor to the next character on the right. When the cursor is advanced past the right-most character, it wraps around to the first character again.

Formatting characters, such as the colon (:) in the time and the slash (/) in the date, are skipped when advancing the cursor.

4. Use the "arrow keys" to enter the correct time. The time is formatted as Hour:Minute:Second.

5. Press the ENTER key to confirm the time and move to the date option.

6. When setting the date, the 2020 prompts to user for the current date, formatted as Year/Month/Day. Use the "arrow keys" to enter the correct date.

7. Press the ENTER key to confirm the date and return to the Set options. The user can wait for the display to timeout or press ENTER to return to the default display.

### 4.5.3 Calibration (Cal)

“Cal” allows you to setup and calibrate the 2020. There are three options under the Cal function: "Zero," “Span," and "Mem."

A calibration memory consists of a name, a response factor, and PEAK, TWA, and STEL alarm levels.

The "Zero" and "Span" keys are covered in detail in the manufacturer's operations manual for the instrument.

To edit the calibration memory, select "Mem" and then "Chng." The 2020 prompts with two new soft keys: "User" and "Lib."

### 4.5.4 Library (Lib)

Library selections simplify Cal Memory programming and provide standard response factors for approximately 70 applications. "Lib" allows the user to select an entry from a pre-programmed library. The name, response factor, and three alarm levels are all set from the library. To select a library entry to program the selected Cal Memory

1. Select "Set," "Cal," "Mem," "Chng," and "Lib."
2. Use the "Next" and "Prev" keys to scroll through the list. See the manufacturer's manual Appendix 8.7 for a list of the library entries.

## 4.6 Preparing for Field Operation of the Photovac 2020

**Turning The 2020 On**

1. Turn the 2020 on by pressing the ON/OFF key.

2. The 2020 will display the software version number. Wait for the 2020 to proceed to the default display.

3. Allow 10 minutes for the instrument to warm up and stabilize.

4. Press the Enter Key. The default display will provide three soft key selection "Set," "Log," and "Display."

5. Press "Set." From this option, three other soft key selections will be offered: "Pump," "Clock," and "Cal."

6. Press "Cal." This will begin the calibration sequence. The first selection is to Zero the instrument.

7. Press Enter; zeroing will begin. (Note: When employing zero gas, attach and activate zero gas supply at this time.)

8. The next selection offered will be Span. Press Enter, at which time the concentration will be requested. The isobutylene calibration gas employed under general service will be marked on the side of the container. Use the soft keys to toggle into position and to log the concentration. Once the concentration is logged, press "Enter." The direction on the status display will indicate spanning. At this time, hook up the span gas with a regulator to the Photovac 2020 and open it to supply enough flow to elevate the flow rate indicator to the green indicator line (1/8 inch from the rest position).

9. Once spanning is complete, the alarms, which have been disabled during calibration, will activate, indicating that calibration is complete.

10. Document this calibration procedure using a Document of Calibration form (included in Appendix A).

This instrument is ready for general purpose application.

Calibration is to be performed daily or prior to each use in accordance with this section.

## 4.7 Maintenance and Calibration Schedule

| Function | Frequency |
|---|---|
| Routine Calibration | Prior to each use |
| Factory Inspection and Calibration | Once a year, or when malfunctioning |
| Wipe Down the Outer Casing of the Unit | After each use |
| Clean UV Light Source | Every 24 hours of operation |
| Sample Inlet Filter | Change on a weekly basis or as required by level of use |
| Battery charging | After each use |
| Clean ionization chamber | Monthly |

### 4.7.1 Cleaning the UV Light Source Window

1. Turn the FUNCTION switch to the OFF position. Use the 2020 multi-tool and remove the lamp housing cover. CAUTION: The UV lamp is delicate and expensive; handle carefully.

2. Tilt the lamp housing with one hand over the opening, and slide the lamp out of the housing.

3. The lamp window may now be cleaned with any of the following compounds using lens paper:
   a. 11.7 eV lamp - dry aluminum oxide powder (3.0 micron powder)
   b. All other lamps - HPLC grade methanol

4. Following cleaning, reassemble by first sliding the lamp back into the lamp housing. Replace the o-ring as necessary, reinstall the lamp housing cover, and tighten it using the 2020 multi-tool. (Do not over tighten.)

5. Recalibrate the instrument as per Section 4.6.

### 4.7.2 Cleaning the Ionization Chamber

1. Turn the FUNCTION switch to the OFF position and remove the lamp housing cover and lamp as per Section 4.7.1.

2. Using a gentle jet of compressed air, gently blow out any dust or dirt.

3. Following cleaning, reassemble by first sliding the lamp back into the lamp housing. Replace the o-ring as necessary, reinstall the lamp housing cover, and tighten it using the 2020 multi-tool. (Do not over tighten.)

4. Recalibrate the instrument as per Section 4.6.

## 4.8 Instrument Advantages

The Photovac 2020 is easy to use in comparison to many other types of monitoring instrumentation. Its detection limit range is in the low parts-per-million range. Response rapidly reaches 90 percent scale of the indicated concentration (less than 3 seconds for benzene). This instrument's automated performance covers multiple monitoring functions simultaneously, incorporating data logging capabilities.

## 4.9 Limitations of the Photovac 2020 Photoionization Monitor

- Because the 2020 is a nonspecific total gas/vapor detector, it cannot be used to identify unknown chemicals; it can only quantitate them in relationship to a calibration standard (relative response ratio).

- For appropriate application of the 2020, ionization potentials of suspected contaminants must be known.

- Because the types of compounds that the 2020 can potentially detect are only a fraction of the chemicals possibly present at a hazardous waste site or incident, a background or zero reading on this instrument does not necessarily signify the absence of air contaminants.

- The 2020 instrument can only monitor certain vapors and gases in air. Many nonvolatile liquids, toxic solids, particulates, and other toxic gases and vapors cannot be detected.

- PIDs are generally not specific. Their response to different compounds is relative to the calibration gas used. This is referred to as relative response ratio. Instrument readings may be higher or lower than the true concentration. This can be an especially serious problem when monitoring for total contaminant concentrations if several different compounds are being detected at once.

- The 2020 is a small, portable instrument that cannot be expected to yield results as accurately as laboratory instruments.

#### 4.9.1 Variables Affecting Monitoring Data

Monitoring a hazardous waste site environment can pose a significant challenge in assessing airborne concentrations and the potential threats to site personnel. Several variables may influence both dispersion and the instrument's ability to detect actual concentrations. Some of the variables, which may impact these conditions, are as follows:

- Temperature - Changes in temperature or pressure will influence volatization and affect airborne concentrations. Additionally, an increase or decrease in temperature ranges may have an adverse effect on the instrument's ability to detect airborne concentrations.

- Humidity - Excessive levels of humidity may interfere with the accuracy of monitoring results.

- Rainfall - Through increased barometric pressure and water, rain fall may influence dispersion pathways affecting airborne emissions.

- Electromagnetic interference - High voltage sources, generators, other electrical equipment may interfere with the operation and accuracy of direct-reading monitoring instruments.

## 5.0 TROUBLESHOOTING

### 5.1 <u>Fault Messages</u>

When the "Fault" status is displayed, the 2020's operation is compromised.

**Fault 1: Signal from zero gas is too high.**

Cause: If another fault occurred while the 2020 was setting its zero point, then this fault is displayed.
Action: Ensure no faults are occurring and calibrate the 2020 again.

Cause: Sample line, sample probe, or fittings are contaminated before the detector.

Action: Clean or replace the sample line, sample probe, or the inlet filter.

Cause: Span gas and zero air are switched.

Action: Ensure clean air is used to zero the 2020. If you are using gas bags, mark the calibration and zero gas bags clearly.

Cause: Ambient air is contaminated.

Action: If unsure about the quality of ambient air, use a supply of commercial zero-grade air to zero the 2020.

**Fault 2: Signal from span gas is too small.**

Cause: Operator may have switched the span gas and zero air.

Action: Ensure clean air is used to zero the 2020. If you are using gas bags, mark the calibration and zero gas bags clearly.

Action: Ensure the span gas is of a reliable concentration.

Cause: UV lamp window is dirty.

*Note: Do not remove the detector lamp in a hazardous location.*

Action: Clean the UV lamp window.

Cause: UV lamp is failing.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: Install a new UV lamp.

Cause: Incompatible application.

Action: The concentration and sample gas are incompatible for use with the 2020.

**Fault 3: UV lamp fault. UV lamp has not started.**

Cause: The UV lamp has not started immediately.

Action: This fault may be seen momentarily when 2020 is first turned on. Allow 30 to 60 seconds for the UV lamp to start and the fault to clear.

Cause: The UV lamp serial number label is blocking the photocell.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: If using a UV lamp with a white serial number label, it is possible that the label is blocking the photocell. Rotate the lamp approximately 90 degrees and then try to start the 2020 again. If the fault persists, replace the lamp.

Cause: the UV lamp is not installed.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: Install a UV lamp.

Cause: The UV lamp has failed.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: Install a new UV lamp.

Cause: There is a Electronic problem.

Action: If a new UV lamp still generates this fault, then contact the Photovac Service Department.

**Fault 4: Pump current too low or too high.**

Cause: If the pump sounds labored, then the pump is operating beyond normal operating parameters.

Action: Check for an obstruction in the sample line. Make sure sample line, sample probe, or inlet filter are not plugged.

*Note: Do not replace the inlet filter in a hazardous location.*

Action: Replace the inlet filter.

Action: Ensure the sample outlet, located on the underside of the 2020, is not obstructed.

Cause: The UV lamp is too wide, causing flow to be restricted.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: If using a UV lamp with a white serial number label, it is possible that the lamp is too wide for the lampholder. Contact the TtNUS equipment manager.

Cause: The 2020 has been exposed to a solvent that can pass through the inlet filter and liquid has been aspirated.

Action: Contact the TtNUS equipment manager.

Cause: The pump has failed.

Action: Contact the TtNUS equipment manager.

## 5.2 Specific Problems

**Problem: Very low or no instrument response detected, yet compounds are known to be present.**

Cause: The 2020 has not been calibrated properly.

Action: Ensure the calibration gas is of a reliable concentration and then calibrate the instrument as outlined in Section 4.6 of the User's Manual. After the instrument has been calibrated, sample the bag of calibration gas. A reading equivalent to the calibration gas should be displayed. If not, contact the TtNUS equipment manager.

*Note: Do not remove or recharge the battery pack in a hazardous location.*

Action: Disconnect the battery charger before calibrating the 2020.

Cause: Calibration memories have not been programmed correctly.

Action: Program all the calibration memories required for the application. Use the correct calibration gas and concentration for each Cal Memory.

Cause: The response factor has been set to zero.

Action: Enter the correct response factor. Refer to Appendix 8.6 for a list of response factors. If the compound is not listed in Appendix 8.6 or gas mixtures are being measured, then enter a value of 1.0. See User's Manual provided by the manufacturer.

Cause: The correct Cal Memory is not being used.

Action: Select the correct Cal Memory for the application.

*Note: It does not matter which Cal Memory is selected or which response factor is entered. The 2020's response is not specific to any one compound. The reading displayed represents the total concentration of all ionizable compounds in the sample.*

Cause: Detector is leaking. A decrease in sensitivity may be due to a leak in the detector.

*Note: Do not remove or replace the detection lamp in a hazardous location.*

Action: Ensure the UV lamp has been installed correctly.

Action: Ensure the lamp cover has been tightened down. Do not overtighten the cover.

Action: Ensure the o-ring seal on the lamp cover is positioned correctly.

Cause: The UV lamp is too long, causing flow to be restricted.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: If a UV lamp with a white serial number label is in use, it is possible that the lamp is too long for the lampholder. Replace the lamp and contact the TtNUS equipment manager.

Cause: UV lamp is too wide, causing flow to be restricted.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: If a UV lamp with a white serial number label is in use, it is possible that the lamp is too wide for the lampholder. Contact the TtNUS equipment manager.

Cause: The sampling environment is extremely humid.

Action: Water vapor is not ionized by the PID, but it does scatter and absorb the light and results in a lower reading. The 2020 detector has been designed to operate under high humidity conditions. Under extreme conditions, decreased response due to humidity may be noticed.

Cause: The UV lamp is failing.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: High concentration of non-ionizable compounds. Chemical compounds, such as methane, with IPs greater than the 10.6 eV scatter and absorb the UV light. Sensitivity may be decreased significantly. Application with high backgrounds of such materials may be incompatible with the 2020. Contact the Photovac Applications Group for more information.

**Problem: Erroneously high readings.**

Cause: Sampling environment is extremely humid.

Action: Water vapor may contain mineral salts, which carry a charge. The water vapor becomes an electrolytic solution, which becomes ionized when it enters the detector. Atmospheric water in areas around the sea or stagnant water may produce a response in the absence of contaminants. The same effect may be seen when conducting groundwater investigations in areas where the water is hard because it contains a significant concentration of minerals.

Cause: The 2020 has not been calibrated properly.

Action: Ensure the calibration gas is of a reliable concentration and then calibrate the instrument as outlined in Section 4.6. After the instrument has been calibrated, sample the bag of calibration gas. A reading equivalent to the calibration gas should be displayed. If not, contact the TtNUS equipment manager.

Cause: Cal Memories have not been programmed correctly.

Action: Program all the Cal Memories required for the application. Use the correct calibration gas and concentration for each Cal Memory. See Section 3.4, of the User's Manual.

Cause: The correct Cal Memory is not being used.

Action: Select the correct Cal Memory for the application. See Section 3.2.2 or 3.3.2 of the User's Manual.

Note: It does not matter which Cal Memory is selected or which response factor is entered. The 2020's response is not specific to any one compound. The reading displayed represents the total concentration of all ionizable compounds in the sample.

Cause: The detector has been short circuited by foreign matter in the detector cell.

*Note: Do not service the 2020 in a hazardous location.*

Action: Do not touch the wire grid inside the detector cell. Use a gentle jet of compressed air to remove any dust in the detector cell.

**Warning: Do not insert any object, other than the UV lamp, into the lampholder.**

Cause: There is an undetermined problem.

Action: Contact the TtNUS equipment manager.

**Problem: Date and time settings are not retained.**

Cause: The battery pack was removed before the 2020 was turned off.

*Note: Do not remove or recharge the battery pack in a hazardous location.*

Action: Replace the battery pack and reset the time and date. Ensure that the 2020 has been turned off before removing the battery pack.

Cause: The 2020 has not been used for 3 months or more and the internal battery (not the external battery pack) has discharged.

*Note: Do not remove or recharge the battery pack in a hazardous location.*

Action: Connect the 2020 to the AC adapter and turn the 2020 on. Turn the pump off. While the 2020 is running, the internal battery is charging. Leave the instrument running for approximately 24 hours.

**Problem: Instrument status shows "Over."**

Cause: High concentrations of gases and vapors will cause a rapid change in signal level. The detector and associated electronics may become temporarily saturated.

Action: Wait a few seconds for the status to return to normal. PIDs are designed to detect relatively low concentrations of gases and vapors. Exposure to very high concentrations may result in a very high or maximum response.

Cause: The detector has become saturated.

Action: Move the 2020 to a location where it can sample clean air. Sample clean air until the reading stabilizes around 0.

Cause: Detector has been short circuited by foreign matter in the detector cell.

*Note: Do not service the 2020 in a hazardous location.*

Action: Do not touch the wire grid inside the detector cell. Use a gentle jet of compressed air to remove any dust or dirt in the detector cell.

**Warning: Do not insert any object, other than the UV lamp, into the lampholder.**

Cause: There is an undetermined problem.

Action: Contact the TtNUS equipment manager.

**Problem: Display is blank.**

Cause: Battery pack is critically low.

*Note: Do not remove or recharge the battery pack in a hazardous location.*

Action: Replace the battery pack or connect the 2020 to the AC adapter.

Cause: The battery pack is not connected to the instrument correctly.

Action: Ensure the battery pack connector is securely attached to the connector on the 2020.

Cause: There is an undetermined problem.

Action: Reset the 2020. Leave the instrument on while you disconnect the battery pack. This will reset the instrument. Reconnect the battery pack and close the battery hatch. Turn on the 2020; set the time and date and program all the calibration memories to be used.

Action: Contact the TtNUS equipment manager.

**Problem: Sample flow rate is less than 300 ml/min.**

Cause: The inlet filter is plugged.

*Note: Do not replace the inlet filter in a hazardous location.*

Action: Replace the inlet filter.

Cause: The inlet filter has not been installed properly.

Action: Ensure that the inlet filter has been installed correctly.

Cause: The UV lamp is too long, causing flow to be restricted.

*Note: Do not remove or replace the detector lamp in a hazardous location.*

Action: If a UV lamp with a white serial number label is in use, it is possible that the lamp is too long for the lampholder. Replace the lamp and contact the TtNUS equipment manager.

Cause: The UV lamp is too wide, causing flow to be restricted.

Action: If a UV lamp with a white serial number label is in use, it is possible that the lamp is too wide for the lampholder. Contact the TtNUS equipment manager.

Cause: The 2020 has been exposed to a solvent that can pass through the inlet filter and liquid has been aspirated.

Action: Contact the TtNUS equipment manager.

Cause: Sample outlet is obstructed.

Action: Ensure the sample outlet is not obstructed in any way.

Cause: Pump has been damaged.

Action: Contact the TtNUS equipment manager.

**Problem: Liquid has been aspirated.**

Cause: The 2020 has been exposed to a solvent that can pass through the inlet filter.

Action: Contact the TtNUS equipment manager.

**Problem: Corrosive gases and vapors have been sampled.**

Cause: The 2020 has been exposed to corrosive gases and vapors.

Action: Corrosive gases and vapors can affect the electrodes within the detector, as well as the lamp window. Prolonged exposure to corrosive materials may result in permanent fogging or etching of the window. If the 2020 is exposed to corrosive material, contact the TtNUS equipment manager.

## 6.0 SHIPPING

The Photovac may be shipped as cargo or carried on as luggage if there is no calibration gas cylinder accompanying the kit. When shipping or transporting the calibration gas, a Hazardous Airbill must be completed.

## 7.0 REFERENCES

Photovac 2020 Photoionization Monitor User's Manual, 1995.

## 8.0 ATTACHMENTS

1. Equipment Calibration Log

Tetra Tech NUS, Inc.

# EQUIPMENT CALIBRATION LOG

PROJECT NAME : ______________________ INSTRUMENT NAME/MODEL: ______________________

SITE NAME: ______________________ MANUFACTURER: ______________________

PROJECT No.: ______________________ SERIAL NUMBER: ______________________

| Date of Calibration | Instrument I.D. Number | Person Performing Calibration | Instrument Settings | | Instrument Readings | | Calibration Standard (Lot No.) | Remarks and Comments |
|---|---|---|---|---|---|---|---|---|
| | | | Pre-calibration | Post-calibration | Pre-calibration | Post-calibration | | |
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# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-06

# BOREHOLE AND SOIL SAMPLE LOGGING

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the standard procedures and technical guidance on the logging of soil cores collected at the PCB Capacitor Burial/Pole Yard, at the NSWC Crane facility.

## 2.0 FIELD FORMS AND EQUIPMENT

**Knife**
**Ruler** (marked in tenths and hundredths of feet)
**Boring log:** An example of this form is attached.
**Photoionization detector (PID)** (see SOP CTO205-05)
**Writing utensil**

## 3.0 RESPONSIBILITIES

A field geologist or engineer is responsible for supervising all boring activities and assuring that each borehole is properly and completely logged.

## 4.0 PROCEDURES FOR BOREHOLE AND SAMPLE LOGGING

To maintain a consistent classification of soil, it is imperative that the field geologist understands and accurately uses the field classification system described in this SOP. This identification is based on visual examination and manual tests.

### 4.1 USCS Classification

Soils are to be classified according to the Unified Soil Classification System (USCS). This method of classification is detailed in Figure 1 (attached to this SOP).

This method of classification identifies soil types on the basis of grain size and cohesiveness.

Fine-grained soils, or fines, are smaller than the No. 200 sieve and are of two types: silt (M) and clay (C). Some classification systems define size ranges for these soil particles, but, for field classification purposes, they are identified by their respective behaviors. Organic material (O) is a common component of soil but has no distinguishable size range; it is recognized by its composition. The careful study of the USCS will aid in developing the competence and consistency necessary for the classification of soils.

Coarse-grained soils will be divided into categories: rock fragments, sand, or gravel. The terms "sand" and "gravel" not only refer to the size of the soil particles but also to their depositional history. To insure accuracy in description, the term "rock fragments" will be used to indicate angular granular materials resulting from the breakup of rock. The sharp edges typically observed indicate little or no transport from their source area, and therefore the term provides additional information in reconstructing the depositional environment of the soils encountered. When the term "rock fragments" is used still, it will be followed by a size designation such as "(1/4 inchΦ-1/2 inchΦ)" or "coarse-sand size" either immediately after the entry or in the remarks column. The USCS classification would not be affected by this variation in terms.

## 4.2 Color

Soil colors will be described utilizing a single color descriptor preceded, when necessary, by a modifier to denote variations in shade or color mixtures. A soil could therefore be referred to as "gray" or "light gray" or "blue-gray." Because color can be utilized in correlating units between sampling locations, it is important for color descriptions to be consistent from one boring to another.

Colors must be described while the sample is still moist. Soil samples will be broken or split vertically to describe colors. Samplers tend to smear the sample surface, creating color variations between the sample interior and exterior.

The term "mottled" will be used to indicate soils irregularly marked with spots of different colors. Mottling in soils usually indicates poor aeration and lack of good drainage.

## 4.3 Relative Density and Consistency

To classify the relative density and/or consistency of a soil, the geologist is to first identify the soil type. Granular soils contain predominantly sands and gravels. They are noncohesive (particles do not adhere well when compressed). Finer-grained soils (silts and clays) are cohesive (particles will adhere together when compressed).

Granular soils are given the USCS classifications GW, GP, GM, SW, SP, SM, GC, or SC (see Figure 1).

The consistency of cohesive soils is determined by performing field tests and identifying the consistency as shown in the following table.

**CONSISTENCY FOR COHESIVE SOILS**

| Consistency | Standard Penetration Resistance (Blows per Foot) | Unconfined Compressive Strength (Tons/Sq. Foot by pocket penetration) | Field Identification |
|---|---|---|---|
| Very soft | 0 to 2 | Less than 0.25 | Easily penetrated several inches by fist |
| Soft | 2 to 4 | 0.25 to 0.50 | Easily penetrated several inches by thumb |
| Medium stiff | 4 to 8 | 0.50 to 1.0 | Can be penetrated several inches by thumb with moderate effort |
| Stiff | 8 to 15 | 1.0 to 2.0 | Readily indented by thumb but penetrated only with great effort |
| Very stiff | 15 to 30 | 2.0 to 4.0 | Readily indented by thumbnail |
| Hard | Over 30 | More than 4.0 | Indented with difficulty by thumbnail |

Cohesive soils are given the USCS classifications ML, MH, CL, CH, OL, or OH (see Figure 1).

The consistency of cohesive soils is determined by hand by determining the resistance to penetration by the thumb. The thumb determination methods are conducted on a selected sample of the soil, preferably the lowest 0.5 foot of the sample. The sample will be broken in half and the thumb pushed into the end of the sample to determine the consistency. Do not determine consistency by attempting to penetrate a rock fragment. If the sample is decomposed rock, it is classified as a soft decomposed rock rather than a hard soil. One of the other methods will be used in conjunction with it. The designations used to describe the consistency of cohesive soils are shown in the above-listed table.

## 4.4 Weight Percentages

In nature, soils comprise particles of varying size and shape and are combinations of the various grain types. The following terms are useful in the description of soil:

| Terms of Identifying Proportion of the Component | Defining Range of Percentages by Weight |
|---|---|
| Trace | 0 - 10 percent |
| Some | 11 - 30 percent |
| Adjective form of the soil type (e.g., "sandy") | 31 - 50 percent |

Examples:

- Silty fine sand: 50 to 69 percent fine sand, 31 to 50 percent silt.
- Medium to coarse sand, some silt: 70 to 80 percent medium to coarse sand, 11 to 30 percent silt.
- Fine sandy silt, trace clay: 50 to 68 percent silt, 31 to 49 percent fine sand, 1 to 10 percent clay.
- Clayey silt, some coarse sand: 70 to 89 percent clayey silt, 11 to 30 percent coarse sand.

### 4.5 Moisture

Moisture content is estimated in the field according to four categories: dry, moist, wet, and saturated. In dry soil, there appears to be little or no water. Saturated samples obviously have all the water they can hold. Moist and wet classifications are somewhat subjective and often are determined by the individual's judgment. A suggested parameter for this would be calling a soil wet if rolling it in the gloved hand or on a porous surface liberates water (i.e., dirties or muddies the surface). Whatever method is adopted for describing moisture, it is important that the method used by an individual remains consistent throughout an entire field activity.

### 4.6 Classification of Soil Grain Size for Chemical Analysis

To determine the gross grain size classification (e.g., clay, silt, and sand) from the USCS classification described above, the following table will be used.

| Gross Soil Grain Size Classification | USCS Abbreviation | Description |
|---|---|---|
| Clay | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays, |
| | CH | Inorganic clays of high plasticity, fat clays |
| | OH | Organic clays of medium to high plasticity, organic silts |
| Silt | ML | Inorganic silts and very fine sands, rock four, silty or clayey fine sands with slight plasticity |
| | OL | Organic silts and organic silty clays of low plasticity |
| | MH | Inorganic silts, micaceous or diatomaceous fine sand or silty soils |

| Gross Soil Grain Size Classification | USCS Abbreviation | Description |
|---|---|---|
| Sand | SW | Well graded sands, gravelly sands, little or no fines |
| | SP | Poorly graded sands, gravelly sands, little or no fines |
| | SM | Silty sands, sand-silt mixtures |
| | SC | Clayey sands, sand-clay mixtures |

### 4.7 Summary of Soil Classification

In summary, soils will be classified in a similar manner by each geologist or engineer at a project site. The hierarchy of classification is as follows:

- Density and/or consistency
- Color
- Plasticity (Optional)
- Soil types
- Moisture content
- Other distinguishing features
- Grain size
- Depositional environment

## 4.0 ATTACHMENTS

1. Figure 1 - Unified Soil Classification System
2. Boring Log

## ATTACHMENT 1

### FIGURE 1 - UNIFIED SOIL CLASSIFICATION SYSTEM

Field Guide

# Unified Soil Classification System

| | | | |
|---|---|---|---|
| **Coarse Grained Soils** (more than half of soil > No. 200 sieve) | **Gravels** (More than half of coarse fraction > no. 4 sieve size) | GW | Well graded gravels or gravel-sand mixtures, little or no fines, |
| | | GP | Poorly graded gravels or gravel-sand mixtures, little or no fines |
| | | GM | Sandy gravels, gravel-sand-silt mixtures |
| | | GC | Clayey gravels, gravel-sand-silt mixtures |
| | **Sands** (More than half of coarse fraction < no. 4 sieve size) | SW | Well graded sands or gravelly sands, little or no fines |
| | | SP | Poorly graded sands or gravelly sands, little or no fines |
| | | SM | Silty sands, sand-silt mixtures |
| | | SC | Inorganic silts and very fine sands. rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| **Fine Grained Soils** (more than half of soil < No. 200 sieve) | **Silts and Clays LL = < 50** | ML | Inorganic silts and very fine sands. rock flour, silty fine sands or clayey silts with slight plasticity |
| | | CL | Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, lean clays |
| | | OL | Organic silts and organic silty clays of low plasticity |
| | **Silts and Clays LL = > 50** | MH | Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | CH | Inorganic silts of high plasticity, fat clays |
| | | OH | Organic clays of high plasticity, organic silty clays, organic silts |
| **Highly Organic Soils** | | Pt | Peat and other highly organic soils |

### Grain Size Chart

| Classification | Range of Grain Sizes | |
|---|---|---|
| | U.S. Standard Sieve Size | Grain Size In Millimeters |
| Boulders | Above 12" | Above 305 |
| Cobbles | 12" to 3" | 305 to 76.2 |
| Gravel | 3" to No. 4 | 76.2 to 7.76 |
| coarse | 3" to 3/4" | 76.2 to 4.76 |
| fine | 3/4"to No.4 | 19.1 to 4.76 |
| Sand | No. 4 to No. 200 | 4.76 to 0.074 |
| coarse | No.4 to No. 10 | 4.76 to 2.00 |
| medium | No. 10 to No. 40 | 2.00 to 0.420 |
| fine | No. 40 to No. 200 | 0.420 to 0.074 |
| Silt and Clay | Below No. 200 | Below 0.074 |

### Relative Density (SPT)

| SANDS AND GRAVELS | BLOWS/FOOT |
|---|---|
| VERY LOOSE | 0 – 4 |
| LOOSE | 4 – 10 |
| MEDIUM DENSE | 10 – 30 |
| DENSE | 32 – 50 |
| VERY DENSE | OVER 50 |

### Consistency (SPT)

| SILTS AND CLAYS | BLOWS/FOOT |
|---|---|
| VERY SOFT | 0 – 2 |
| SOFT | 2 – 4 |
| MEDIUM STIFF | 4 – 8 |
| STIFF | 8 – 16 |
| VERY STIFF | 16 – 22 |
| HARD | OVER 32 |

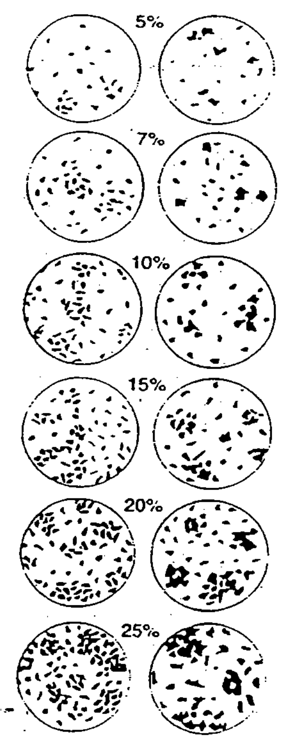
## ATTACHMENT 1

## FIGURE 1 - UNIFIED SOIL CLASSIFICATION SYSTEM

# Group Symbols Chart

| | | | | Group Symbol | | Group Name |
|---|---|---|---|---|---|---|
| GRAVEL % gravel % sand | 5% fines | Well-graded | | GW | <15% sand | Well-graded gravel |
| | | | | | 15% sand | Well-graded gravel with sand |
| | | Poorly-graded | | GP | <15% sand | Poorly graded gravel |
| | | | | | 15% sand | Poorly graded gravel with sand |
| | 10% fines | Well-graded | fines = ML or MH | GW-GM | <15% sand | Well-graded gravel with silt |
| | | | | | 15% sand | Well-graded gravel with silt and sand |
| | | | fines = CL or CH | GW-GC | <15% sand | Well-graded gravel with clay |
| | | | | | 15% sand | Well-graded gravel with clay and sand |
| | | Poorly-graded | fines = ML or MH | GP-GM | <15% sand | Poorly graded gravel with silt |
| | | | | | 15% sand | Poorly graded gravel with silt and sand |
| | | | fines = CL or CH | GP-GC | <15% sand | Poorly graded gravel with clay |
| | | | | | 15% sand | Poorly graded gravel with clay and sand |
| | 15% fines | | fines = ML or MH | GM | <15% sand | Silty gravel |
| | | | | | 15% sand | Silty gravel with sand |
| | | | fines = CL or CH | GC | <15% sand | Clayey gravel |
| | | | | | 15% sand | Clayey gravel with sand |
| SAND % sand % gravel | 5% fines | Well-graded | | SW | <15% gravel | Well-graded sand |
| | | | | | 15% gravel | Well-graded sand with gravel |
| | | Poorly-graded | | SP | <15% gravel | Poorly graded sand |
| | | | | | 15% gravel | Poorly graded sand with gravel |
| | 10% fines | Well-graded | fines = ML or MH | SW-SM | <15% gravel | Well-graded sand with silt |
| | | | | | 15% gravel | Well-graded sand with silt and gravel |
| | | | fines = CL or CH | SW-SC | <15% gravel | Well-graded sand with clay |
| | | | | | 15% gravel | Well-graded sand with clay and gravel |
| | | Poorly-graded | fines = ML or MH | SP-SM | <15% gravel | Poorly graded sand with silt |
| | | | | | 15% gravel | Poorly graded sand with silt and gravel |
| | | | fines = CL or CH | SP-SC | <15% gravel | Poorly graded sand with clay |
| | | | | | 15% gravel | Poorly graded sand with clay and gravel |
| | 15% fines | | fines = ML or MH | SM | <15% gravel | Silty sand |
| | | | | | 15% gravel | Silty sand with gravel |
| | | | fines = CL or CH | SC | <15% gravel | Clayey sand |
| | | | | | 15% gravel | Clayey sand with gravel |

| Group Symbol | | | | Group Name |
|---|---|---|---|---|
| CL | <30% plus No. 200 | <15% plus No. 200 | | Lean clay |
| | | 15-25% plus No. 200 | % sand % of gravel | Lean clay with sand |
| | | | % sand <% of gravel | Lean clay with gravel |
| | 30% plus No. 200 | % sand % of gravel | <15% gravel | Sandy lean clay |
| | | | 15% gravel | Sandy lean clay with gravel |
| | | % sand <% of gravel | <15% sand | Gravelly lean clay |
| | | | 15% sand | Gravelly lean clay with sand |
| ML | <30% plus No. 200 | <15% plus No. 200 | | Silt |
| | | 15-25% plus No. 200 | % sand % of gravel | Silt with sand |
| | | | % sand <% of gravel | Silt with gravel |
| | 30% plus No. 200 | % sand % of gravel | <15% gravel | Sandy Silt |
| | | | 15% gravel | Sandy Silt with gravel |
| | | % sand <% of gravel | <15% sand | Gravelly silt |
| | | | 15% sand | Gravelly silt with sand |
| CH | <30% plus No. 200 | <15% plus No. 200 | | Fat clay |
| | | 15-25% plus No. 200 | % sand % of gravel | Fat clay with sand |
| | | | % sand <% of gravel | Fat clay with gravel |
| | 30% plus No. 200 | % sand % of gravel | <15% gravel | Sandy fat clay |
| | | | 15% gravel | Sandy fat clay with gravel |
| | | % sand <% of gravel | <15% sand | Gravelly fat clay |
| | | | 15% sand | Gravelly fat clay with sand |
| MH | <30% plus No. 200 | <15% plus No. 200 | | Elastic silt |
| | | 15-25% plus No. 200 | % sand % of gravel | Elastic silt with sand |
| | | | % sand <% of gravel | Elastic silt with gravel |
| | 30% plus No. 200 | % sand % of gravel | <15% gravel | elastic silt |
| | | | 15% gravel | elastic silt with gravel |
| | | % sand <% of gravel | <15% sand | elastic silt |
| | | | 15% sand | elastic silt with sand |
| OL/OH | <30% plus No. 200 | <15% plus No. 200 | | Organic soil |
| | | 15-25% plus No. 200 | % sand % of gravel | Organic soil with sand |
| | | | % sand <% of gravel | Organic soil with gravel |
| | 30% plus No. 200 | % sand % of gravel | <15% gravel | Sandy organic soil |
| | | | 15% gravel | Sandy organic soil with gravel |
| | | % sand <% of gravel | <15% sand | Gravelly organic soil |
| | | | 15% sand | Gravelly organic soil with sand |



## ATTACHMENT 2

Tetra Tech NUS, Inc.

# BORING LOG

Page ___ of ___

PROJECT NAME: ____________ BORING No.: ____________
PROJECT NUMBER: ____________ DATE: ____________
DRILLING COMPANY: ____________ GEOLOGIST: ____________
DRILLING RIG: ____________ DRILLER: ____________

| | | | | | MATERIAL DESCRIPTION | | | | | PID/FID Reading (ppm) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sample No. and Type or RQD | Depth (Ft.) or Run No. | Blows / 6" or RQD (%) | Sample Recovery / Sample Length | Lithology Change (Depth/Ft.) or Screened Interval | Soil Density/ Consistency or Rock Hardness | Color | Material Classification | U S C S * | Remarks | Sample | Sampler BZ | Borehole** | Driller BZ** |
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* When rock coring, enter rock brokeness.

** Include monitor reading in 6 foot intervals @ borehole. Increase reading frequency if elevated reponse read.

Remarks: ____________

Drilling Area Background (ppm): [ ]

Converted to Well: Yes ______ No ______ Well I.D. #: ____________

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-07

# SURFACE AND SUBSURFACE SOIL SAMPLING

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures to be used for surface and subsurface soil sampling using direct-push technology (DPT) or split-barrel samplers during field activities at the PCB Capacitor Burial/Pole Yard at the NSWC Crane facility.

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Writing utensil with indelible ink**
**Disposable medical-grade gloves (i.e., latex, nitrile)**
**Boring log**
**Soil sample logsheets**
**Stainless-steel mixing bowls**
**Stainless-steel trowel or soup spoon**
**EnCore handle and samplers**
**Required sample containers**: All sample containers including shipping coolers for analysis by fix-based laboratories will be supplied and deemed certified clean by the laboratory.
**Required decontamination materials**
**Chain-of-custody records**
**Required personnel protective equipment (PPE)**
**Photoionization detector (PID)** (see SOP 205-05)
**Wooden stakes or pin flags**
**Sealable polyethylene bags**
**Heavy-duty cooler**
**Ice**
**Razor knife**
**Geoprobe and sampling equipment**
**Sample labels and tags**

## 3.0 COLLECTION OF OTHER SOIL SAMPLE ALIQUOTS

Note: A surface soil sample is collected from the 0- to 2-feet depth (i.e., one core length). Additional subsurface soil samples each consist of two 2-foot core segments.

3.1 The soil interval will be composited and used to fill the remainder of the sample containers. Any surface debris (e.g., herbaceous vegetation, twigs, rocks, litter, etc.) should first be removed from the top of the surface soil core. For other core intervals, the top 2 inches of each core should be discarded because it often contains material scraped from the side of the borehole and not fresh material from the bottom of the borehole.

3.2 Slide the remaining core material out of the acetate liner and into a clean, decontaminated stainless-steel mixing bowl. Mix the soil thoroughly with a stainless-steel spoon and remove gravel, large pebbles, and other coarse materials.

3.3 Complete all required information on the sample labels (see SOP CTO205-01).

3.4 Fill in all required information on the sample tag and secure the tag to the sample container.

3.5 Place the sample container in a ziplock plastic bag and seal shut. Place the bag in a cooler containing ice and cool to 4 $\pm$ 2°C.

3.6 Record the required information on the Soil Sample Log Sheet and the COC form.

## 4.0 PACKAGING AND SHIPPING OF SAMPLES

Samples will be packaged and shipped according to SOP CTO205-11.

## 5.0 ATTACHMENTS

1. Soil and Sediment Sample Log Sheet

ATTACHMENT 1

Tetra Tech NUS, Inc.

# SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

| | | | |
|---|---|---|---|
| Project Site Name: | ______________ | Sample ID No.: | ______________ |
| Project No.: | ______________ | Sample Location: | ______________ |
| | | Sampled By: | ______________ |
| | | C.O.C. No.: | ______________ |

[] Surface Soil
[] Subsurface Soil
[] Sediment
[] Other: ______________
[] QA Sample Type: ______________

Type of Sample:
[] Low Concentration
[] High Concentration

**GRAB SAMPLE DATA:**

| | Depth | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|
| Date: | | | |
| Time: | | | |
| Method: | | | |
| Monitor Reading (ppm): | | | |

**COMPOSITE SAMPLE DATA:**

| | Time | Depth | Color | Description (Sand, Silt, Clay, Moisture, etc.) |
|---|---|---|---|---|
| Date: | | | | |
| | | | | |
| Method: | | | | |
| | | | | |
| Monitor Readings (Range in ppm): | | | | |
| | | | | |
| | | | | |
| | | | | |

**SAMPLE COLLECTION INFORMATION:**

| Analysis | Container Requirements | Collected | Other |
|---|---|---|---|
| | | | |
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| OBSERVATIONS / NOTES: | MAP: |
|---|---|
| | |

**Circle if Applicable:**

| MS/MSD | Duplicate ID No.: |
|---|---|
| | |

**Signature(s):**

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-08

# MANAGEMENT OF INVESTIGATION-DERIVED WASTE

## 1.0 PURPOSE

This Standard Operating Procedure (SOP) describes how investigation-derived waste (IDW) will be collected, segregated, classified, and managed during the field investigations at the PCB Capacitor Burial/Pole Yard at the NSWC Crane facility. The following types of IDW will be generated during this investigation:

- Excess soil and rock materials remaining from subsurface drilling activities
- Decontamination solutions
- Personal protective equipment (PPE) and clothing
- PCB field test kits
- Miscellaneous trash and incidental items

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Health and safety equipment (with PPE)**
**Decontamination equipment**
**Field logbook and indelible ink pen**
**Plastic sheeting and/or tarps**
**55-gallon drums with sealable lids**
**IDW labels for drums**
**Waste water container tanks**
**Plastic garbage bags**

## 3.0 PROCEDURES

Management of IDW includes the collection, segregation, temporary storage, classification, final disposal, and documentation of the waste-handling activities.

### 3.1 Liquid Wastes

Liquid wastes that will be generated during the site activities include decontamination solutions from drilling and sampling equipment and solutions from PCB test kits. As they are collected, the drilling fluids wastewaters will be placed in a 300-gallon (or smaller) portable container attached to a truck. Whenever the container is full, a sample will be collected and analyzed for total PCBs by a fixed-base laboratory. If the PCB concentration is less than 3 parts per billion (ppb) it will be transported to a central location at NSWC Crane adjacent to a Crane-designated sanitary sewer manhole. The water in the portable container will be discharged to the sewer by gravity draining. If the PCB concentration is not less than 3 ppb the contents of the container will be taken to an off-site wastewater treatment facility for treatment or disposal in accordance with TSCA regulations.

An accurate record will be kept by the FOL of all wastewaters that have been placed in the large holding tank. At a minimum, this information will include

- The location and type of each water that has been placed in the tank (e.g., decon water from rig)
- The quantity of water from each source,
- The date the wastewater was generated,
- The date and time the wastewater was placed in the tank,
- The person(s) present when the wastewaters were discharged to the sewer.

All free liquids from the PCB field test kits will be placed in a disposal vessel and turned over to NSWC Crane personnel for disposal.

### 3.2 Drill Cuttings and Cores

As cuttings are removed from borings, they will be screened for VOCs. If these results do not show above-background levels of VOCs, the cuttings materials will be mixed with bentonite and returned to the borehole when sampling activities in the hole are completed or spread on the ground in the area of the borehole. The backfill materials will be tamped as they are placed in the hole to increase density and reduce permeability of the backfill material.

If any soil materials from a screened borehole interval show evidence of contamination (based on the field screening results), then the soil material from the screened interval will be placed in a plastic trash bag (or directly in a drum if a larger quantity) and the bag will be tagged. Information included on the tag will consist of the hole from which the material came, the depth interval from which the material came, the date, and the name of the person filling out the tag. The bag will then be placed in a 55-gallon drum and sealed (more than one bag may be placed in a drum). The waste drums will be stored on site temporarily until laboratory results have been received concerning the soil samples that were collected from the suspect borehole. If the results indicate that no contamination is present in the soil samples, then the soils will be disposed on site. If the levels of contamination of any of the samples from a borehole exceed Toxicity Characteristics Leaching Procedures (TCLP) limits (using the total soil concentrations), then all excess soil from the borehole will be considered as RCRA-hazardous and disposed off site in accordance with RCRA waste disposal regulations. Alternatively, the toxicity characteristic leaching procedure may be conducted for any constituent that could exceed the toxicity characteristic (TC) limits based on total concentrations. In the event tests show that the soils exceed TC limits, the soil will be considered a hazardous waste and disposed in accordance with RCRA waste disposal regulations.

Cuttings from well borings will be handled in the same manner as soil boring cuttings.

### 3.3 DPT Sample Liners and Incidental Trash

All DPT sample liners and incidental trash materials (e.g., wrapping or packing materials from supply cartons, waste paper, solid wastes from PCB test kits) will be decontaminated (if contaminated), double-bagged, securely tied shut, and placed in a designated waste receptacle at NSWC Crane.

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-09

## DECONTAMINATION OF FIELD SAMPLING EQUIPMENT

### 1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedures to be followed when decontaminating non-dedicated field sampling equipment during the field investigations at the PCB Capacitor Burial/Pole Yard at the NSWC Crane facility.

### 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Waterproof pens**
**Non-latex rubber or plastic gloves**
**Cotton gloves**
**Field log book**
**Potable water**
**Deionized water**
**Liquinox detergent**
**Isopropanol**
**Brushes, spray bottles, paper towels, etc.**
**55-gallon drum or other container to collect and transport decontamination fluids**

### 3.0 DECONTAMINATION PROCEDURES

3.1 Don non-latex and/or cotton gloves and decontaminate sampling equipment (in accordance with the following steps) prior to field sampling and between samples.

3.2 Rinse the equipment with potable water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the potable water rinsate into a container.

3.3 Wash the equipment with a solution of Liquinox detergent. Prepare the Liquinox wash solution in accordance with the instructions on the Liquinox container. Collect the Liquinox wash solution into a container. Use brushes or sprays as appropriate for the equipment. If oily residue has accumulated on the sampling equipment, remove the residue with an isopropanol wash and repeat the Liquinox wash.

3.4 Rinse the equipment with potable water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the potable water rinsate into a container.

3.5 Rinse the equipment with deionized water. Rinsing may be conducted by spraying with water from a spray bottle or by dipping. Collect the deionized water rinsate into a container.

3.6 Remove excess water by air drying, shaking, or wiping with paper towels as necessary.

3.7 Document decontamination by recording it in the field logbook.

3.8 Containerized decontamination solutions will be managed in accordance with the procedures described in SOP CTO205-08.

# STANDARD OPERATING PROCEDURE NUMBER CTO205-10

# SOIL SAMPLE COMPOSITING

## 1.0 PURPOSE

This SOP describes procedures to be followed for the collection of composite soil samples for PCB analysis at CTO 205. The procedures are based on 40 CFR 761.289. Although several methods of composite sampling for cleanup verification are presented in 40 CFR 761.289, this SOP will describe a single method that appears to be most applicable to this project.

### Application

Compositing is a method of combining several samples of a specified bulk PCB remediation waste into a single chemical analysis. Composite sample must be from the same waste material. It is anticipated that the site will be characterized by soil contaminated with PCBs that are not present as oils. It is also anticipated that the soil types encountered at this site will lack variability (e.g., clays versus gravels). If variations to these assumptions are encountered, additional composite samples will be necessary to characterize the materials.

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Writing utensil with indelible ink**
**Disposable medical-grade gloves (i.e. latex, nitrile)**
**Soil sample logsheets**
**Stainless-steel mixing bowls**
**Stainless-steel trowel or soup spoon**
**Required sample containers**: All sample containers including shipping coolers for analysis by fix-based laboratories will be supplied and deemed certified clean by the laboratory.
**Required decontamination materials**
**Chain-of-custody records**
**Required personal protective equipment (PPE)**
**Photoionization detector (PID)** (see SOP 205-05)
**Wooden stakes or pin flags**

**Sealable polyethylene bags**

**Heavy-duty cooler**

**Ice**

**Razor knife**

**Sampling equipment**

**Surveyor's measurement tape**

**Sample labels and tags**

## 3.0 PROCEDURES

The procedures for composite sampling at surficial sites for verification sampling are described below. Sampling of pit locations is addressed exclusively in the work plan because these samples present a physical hazard during sample collection.

1) Across the entire site, map out a sampling grid that is oriented parallel to magnetic north. A minimum of two persons are necessary to lay out this grid, one to operate the theodolite or tranist and one to insert the survey pins. Use a theodolite or transit to ensure that the grid lines are straight. Insert pin flags every 1.5 meters in both the northern and eastern directions (Figure 4-2) to create the sampling grid. This grid spacing will produce numerous cells that are 1.5 meters by 1.5 meters. For each composite sample, a three-cell by three-cell area (20.25 square meters) should be constructed. This will produce a composite sample area with nine cells.

   At a minimum, three composite samples are necessary to characterize a remediation area. The area contained by this sampling grid will need to be large enough to accommodate the collection of three separate composite samples for adequate site characterization. For sites that have too little surface area to collect three composite samples from the grid, the grid spacing should be reduced to less than 1.5 meters to allow for the three-sample minimum.

2) After the measured grid is mapped (laid out) in the field, each sample should be represented by a three- by three-square of cells (i.e., nine cells total). Each of the nine cells will have an aliquot of sample collected from them.

   The composite sample is produced from nine sample aliquots that are collected at equal depths and contain equal soil volumes. Each aliquot must be collected from the same type of remediation waste or soil type. The sample from any of the sampled grids should not be represented in another composite sample. Assure that composite sample areas and individually analyzed samples completely overlie the entire cleanup site.

3) Thoroughly mix equal portions of soil sample from the nine different locations for each sample grid in a decontaminated stainless-steel mixing bowl, following the steps in SOP CTO205-7.

4) Follow procedures in SOP CTO205-11 for shipment of samples.

# STANDARD OPERATING PROCEDURE

# NUMBER CTO205-11

# SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

## 1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to describe the procedure for sample preservation, packaging, and shipping to be used in handling environmental samples obtained for chemical analysis at the PCB Capacitor Burial Pole Yard.

The Naval Surface Warfare Center (NSWC) Crane Environmental Protection Department must approve any deviations from this procedure.

## 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

**Shipping labels**
**Custody seals**
**Chain-of-custody (COC) forms**
**Sample containers with preservatives**: All sample containers for analysis by fixed-base laboratories will be supplied and deemed certified clean by the laboratory.
**Sample shipping containers (coolers)**: All sample shipping containers are supplied by the laboratory.
**Packaging material**: Bubble wrap, Ziploc bags, strapping tape, etc.
**Temperature blank**

## 3.0 PROCEDURES FOR SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

3.1 The laboratory provides sample containers that are certified clean for the analytical parameter for which the sample is to be analyzed. All samples will be held, stored, and shipped at 4°C ±2°C. This will be accomplished through refrigeration (used to hold samples prior to shipment) and/or ice.

3.2 The sampler will maintain custody of the samples until the samples are relinquished to another custodian or to the common carrier.

3.3 Check that the sample container is properly identified on the label and tag, the lid securely fastened, and the container sealed in a Ziploc bag.

3.4 Place the sample container into a bubble wrap shipping bag and seal the bag using the self-sealing, pressure-sensitive tape supplied with the bag.

3.5 Inspect the insulated shipping cooler. Check for any cracks, holes, broken handles, etc. If the cooler has a drain plug, make certain it is sealed shut. If the cooler is questionable for shipping, the cooler must be discarded.

3.6 Place the sample container into a shipping cooler in an upright position (all containers will be upright for shipment). Continue filling the cooler with samples and packing material until the cooler is full and the movement of the sample containers is limited.

3.7 Place a temperature blank in the cooler.

3.8 Fill the voids in between the bubble wrap shipping bags with ice and continue filling the cooler with ice to the top, using a minimum of 8 pounds of ice for a medium-size cooler.

3.9 Complete a chain-of-custody (COC) form. List on the COC form each sample bottle contained in the cooler. Include the air bill number on the COC form. Use a ballpoint pen and make sure that all the carbon forms are legible.

3.10 Place the original (top) signed copy of the COC form inside a large Ziploc bag. Tape the bag to the inside of the lid of the shipping cooler.

3.11 Close the cooler and seal the cooler with approximately four wraps of strapping tape at each end of the cooler. Prior to wrapping the last wrap of strapping tape, apply a signed and dated custody seal to each side of the cooler (a total of four signed custody seals must be used per cooler). Cover the custody seal with the last wrap of tape. This will provide a tamper-evident custody seal system for the sample shipment.

3.12 Affix a shipping label to the top of the cooler containing all of the shipping information. Overnight (e.g., FedEx Priority Overnight) courier services will be used for all sample shipments. Include the air bill number on the COC.

3.13 All samples will be shipped to the laboratory no more than 72 hours after completion of sampling. Under no circumstances will sample holding times be exceeded for hold times.

# STANDARD OPERATING PROCEDURE
# NUMBER CTO205-12

## USE OF IMMUNOASSAY TEST KIT FOR PCBS

### 1.0 PURPOSE

This SOP describes the procedures to be followed for the field analysis of soil samples for PCBs at CTO 205. The rationale for this SOP is to ensure that the field analysis follows good laboratory practices in generating field results.

### 2.0 REQUIRED FIELD FORMS AND EQUIPMENT

- Writing utensil with indelible ink
- Bound and paginated notebook
- PCB EnSys 12T Soil Test Kit, SDI Part # 7020301
- PCB Soil Sample Extraction Kit, SDI Part # 7020301EA
- PCB EnSys 12T Accessory Kit Rental, SDI Part #6997020
- PCB Custom Soil QC Standard for PCB 1260 @ 25 mg/Kg, Environmental Resource Associates

or

- PCB Custom Soil QC Standard for PCB 1260 @ 1 mg/kg, Environmental Resource Associates

### 3.0 PROCEDURES

1) Specific procedures for extraction of PCBs in soils are provided in the Sample Extraction Test Kit.

2) Specific procedures for analysis of PCBs in soils and interpretation of results are provided in the Sample Test Kit.

3) For a clean up standard of 25 mg/kg: In addition to the standard provided with each kit, a standard at 25 mg/kg should also be extracted and analyzed with each analytical batch of up to 20 samples. Samples that develop less color than the 25 mg/kg standard are interpreted as

containing 25 mg/kg or greater of PCBs. Samples that develop more color than the 25 mg/kg standard are interpreted as containing less than 25 mg/kg of PCBs.

or

4) For a clean up standard of 1 mg/kg: In addition to the standard provided with each kit, a standard at 1 mg/kg should also be extracted and analyzed with each analytical batch of up to 20 samples. Samples that develop less color than the 1 mg/kg standard are interpreted as containing 1 mg/kg or greater of PCBs. Samples that develop more color than the 1 mg/kg standard are interpreted as containing less than 1 mg/kg of PCBs.