DEPARTMENT OF THE NAVY
CRANE DIVISION
NAVAL SURFACE WARFARE CENTER
300 HIGHWAY 361
CRANE INDIANA 47522-5001

IN REPLY REFER TO:
5090/S4.7.3
Ser PRCR4/6242
4 AUG 2006
11-1-2006

U.S. Environmental Protection Agency, Region V
Waste, Pesticides, & Toxics Division
Waste Management Branch
Corrective Action Section
77 West Jackson Blvd.
Chicago, IL 60604

Dear Mr. Ramanauskas:

Crane Division, Naval Surface Warfare Center submits Addendum No. 1 to the Quality Assurance Project Plan (QAPP) for Solid Waste Management Units (SWMUs) 8, 15, 18, 19, 20, and the Old Gun Tub Storage Lot for Interim Measures at SWMUs 7, 8, 13, and 17 (Old Rifle Range, Building 106 Pond, Mine Fill B, and the PCB Capacitor Burial-Pole Yard, respectively). One copy is presented for your review as enclosure (1). The permit required Certification Statement is provided as enclosure (2).

If you require any further information, my point of contact is Mr. Thomas J. Brent, Code PRCR4-TB, at 812-854-6160, mail thomas.brent@navy.mil.

Sincerely,

J. M. Hunsicker

J. M. HUNSICKER
Environmental Site Manager
By direction of the Commanding Officer

Enclosures: 1. QAPP Addendum No. 1 for IM Projects
2. Certification Statement

Copy to:
ADMINISTRATIVE RECORD
NAVFAC SE (Code OPGEVR) (w/o encl)
TTNUS (Ralph Basinski) (w/o encl)
NAVFAC MW (Howard Hickey)

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.

SIGNATURE

Manager, Environmental Protection — 8/4/06

TITLE — DATE

Comprehensive Long-term Environmental Action Navy

CONTRACT NUMBER N62467-04-D-0055

Resource Conservation and Recovery Act Addendum No. 1 to the Quality Assurance Project Plan for SWMUs 8, 15, 18, 19, 20 and The Old Gun Tub Storage Lot for Interim Measures at SWMU 7 (Old Rifle Range), SWMU 8 (Building 106 Pond), SWMU 13 (Mine Fill B) and SWMU 17 (PCB Burial/Pole Yard)

Naval Surface Warfare Center
Crane Division
Crane, Indiana

Contract Task Order 0020

November 2006

NAVFAC
Naval Facilities Engineering Command
Southeast
2155 Eagle Drive
North Charleston, South Carolina 29406

TETRA TECH NUS, Inc.

REVISION 0
JULY 2006

RESOURCE CONSERVATION AND RECOVERY ACT ADDENDUM NO. 1 TO THE QUALITY ASSURANCE PROJECT PLAN FOR SWMUs 8, 15, 18, 19, 20, AND THE OLD GUN TUB STORAGE LOT FOR INTERIM MEASURES AT SWMU 7 (OLD RIFLE RANGE), SWMU 8 (BUILDING 106 POND), SWMU 13, (MINE FILL B), AND SWMU 17 (PCB BURIAL/POLE YARD)

NAVAL SURFACE WARFARE CENTER
CRANE DIVISION
CRANE, INDIANA

COMPREHENSIVE LONG-TERM
ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT

Submitted to:
Naval Facilities Engineering Command
Southeast
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 N62467-04-D-0055
CONTRACT TASK ORDER 0020

JULY 2006

PREPARED UNDER THE SUPERVISION OF:

RALPH BASINSKI
TASK ORDER MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

APPROVED FOR SUBMITTAL BY:

RICHARD NINESTEEL, PE
QUALITY ASSURANCE MANAGER
TETRA TECH NUS, INC.
PITTSBURGH, PENNSYLVANIA

NAME TBD
PROJECT MANAGER
EMAC

ALLEN DEBUS
QUALITY ASSURANCE COORDINATOR
U.S. EPA REGION 5

HAK CHO
CORRECTIVE ACTION SECTION CHIEF
U.S. EPA REIGON 5

~~BILL GATES~~ Howard Hickey
REMEDIAL PROJECT MANAGER
NAVY SOUTHERN DIVISION
NAVAL FACILITIES ENGINEERING COMMAND SE

HARRY ROMBERG
LABORATORY QUALITY ASSURANCE OFFICER
LAUCKS TESTING LABORATORIES, INC.

DOUG GRIFFIN
CORRECTIVE ACTION PROJECT MANAGER
IDEM OFFICE OF LAND QUALITY

NAME TBD
QUALITY ASSURANCE MANAGER
EMAC

PETER RAMANAUSKAS
PERMITTING PROJECT MANAGER
U.S. EPA REGION 5

JOSE CISNEROS
WASTE MANAGEMENT BRANCH CHIEF
U.S. EPA REGION 5

TOM BRENT
SITE MANAGER
NSWC CRANE

HUGH PRENTICE
LABORATORY DIRECTOR
LAUCKS TESTING LABORATORIES, INC.

~~CRAIG RENDER~~
~~PROJECT CHEMIST~~
~~IDEM OFFICE OF LAND QUALITY~~

CORY REITER
PROJECT MANAGER - SWMU 7
D&T ENVIRONMENTAL, LLC

KAREN CAMPBELL
QUALITY ASSURANCE MANAGER
D&T ENVIRONMENTAL, LLC

GARY RESIDES
PROJECT MANAGER - SWMU 7
TOLTEST INC.

BILL WEBSTER
QUALITY ASSURANCE MANAGER
TOLTEST INC.

NAME TBD
PROJECT MANAGER - SWMU 13
SWMU 13 EMAC

NAME TBD
QUALITY ASSURANCE MANAGER
SWMU 13 EMAC

NAME TBD
PROJECT MANAGER - SWMU 17
SWVU 17 EMAC

NAME TBD
QUALITY ASSURANCE MANAGER
SWMU 17 EMAC

TABLE OF CONTENTS

SECTION **PAGE NO.**

1.0 PROJECT DESCRIPTION 1-1
1.1 DESCRIPTION OF QAPP ADDENDUM NO. 1 1-2
1.2 SCOPES OF WORK 1-2
1.2.1 SWMU 7, Old Pistol Range (OPR) at the Old Rifle Range (ORR) 1-2
1.2.2 SWMU 8, Building 106 Pond 1-3
1.2.3 SWMU 13 PCB Contamination Areas 1-5
1.2.4 SWMU 17, PCB Pole Yard 1-6
1.2 PROJECT TARGET PARAMETERS AND RATIONALE FOR SELECTION 1-7
1.2.1 Overall Analysis Summary 1-7

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES 2-1
2.1 MANAGEMENT 2-1
2.1.1 Indiana Department of Environmental Management Corrective Action Project Manager 2-2
2.1.2 U.S. EPA Oversight 2-2
2.1.3 Navy Project Manager 2-2
2.1.4 TtNUS Program and Project Management 2-2
2.1.5 EMAC Project Management 2-4
2.2 QUALITY ASSURANCE 2-6
2.2.1 Indiana Department of Environmental Management and U.S. EPA 2-6
2.2.2 TtNUS QA Manager 2-7
2.2.3 TtNUS Project QA Advisor 2-7
2.2.4 Laboratory Responsibilities 2-7
2.3 FIELD INVESTIGATION 2-9
2.3.1 Field Operations Leaders 2-10
2.3.2 Site QA/QC Advisor 2-11
2.3.3 Site Safety Officer 2-11
2.3.4 Technical Staff 2-11
2.4 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATIONS 2-12

3.0 FIELD OPERATIONS - SAMPLING AND ANALYSIS 3-1
3.1 GENERAL APPROACH 3-1
3.2 SAMPLE IDENTIFICATION SYSTEM 3-1
3.3 SAMPLE CUSTODY PROCEDURES 3-2
3.4 FIELD INSTRUMENT CALIBRATION PROCEDURES AND FREQUENCIES 3-2
3.5 SAMPLING LOCATIONS, ANALYSES, AND RATIONALES 3-3
3.5.1 General Sampling Requirements and Considerations 3-4
3.5.2 Field Instrument Calibration 3-5
3.5.3 SWMU 7 Sampling and Analyses 3-5
3.5.4 SWMU 8 Sampling and Analyses 3-9
3.5.5 SWMU 13 Sampling and Analysis 3-14
3.5.6 SWMU 17 Sampling and Analysis 3-16
3.6 QUALITY CONTROL REQUIREMENTS 3-19
3.7 DATA REDUCTION, VALIDATION, ASSESSMENT, AND REPORTING 3-20
3.7.1 Confirmation Analysis Data 3-20
3.7.2 Waste Characterization Data 3-21
3.8 MANAGEMENT OF INVESTIGATION-DERIVED WASTE 3-21

TABLE OF CONTENTS

SECTION **PAGE NO.**

3.9 SAFETY 3-22
3.9.1 Health and Safety Plan 3-22
3.9.2 Health and Safety Training 3-22
3.9.3 Medical Approval and Personal Protective Clothing and Equipment 3-22
3.9.4 Safety Meetings 3-22
3.10 PERFORMANCE AND SYSTEM AUDITS 3-22
3.11 INSPECTION AND MAINTENANCE 3-23
3.12 FIELD CORRECTIVE ACTIONS 3-23
3.13 QUALITY ASSURANCE REPORTS TO MANAGEMENT 3-24

4.0 LABORATORY OPERATIONS AND DATA REDUCTION, REVIEW, AND MANAGEMENT 4-1
4.1 SAMPLE CUSTODY PROCEDURES 4-1
4.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES AND FREQUENCIES 4-1
4.3 LABORATORY ANALYTICAL AND MEASUREMENT PROCEDURES 4-1
4.3.1 Confirmation Sample Analyses 4-1
4.3.2 Waste Characterization Analyses 4-1
4.3.3 List of Project Target Compounds and Detection Limits 4-1
4.4 LABORATORY QUALITY CONTROL CHECKS 4-2
4.5 DATA REDUCTION, VALIDATION, ASSESSMENT, AND REPORTING 4-2
4.6 LABORATORY PERFORMANCE AND SYSTEM AUDITS 4-2
4.6.1 Confirmation Analyses 4-2
4.6.2 Waste Characterization 4-2
4.7 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE 4-2
4.7.1 Confirmation Analysis 4-2
4.7.2 Waste Characterization 4-3
4.8 LABORATORY CORRECTIVE ACTION 4-3
4.8.1 Corrective Action Documentation 4-3
4.9.2 Corrective Action During Data Validation and Data Assessment 4-4
4.10 QUALITY ASSURANCE REPORTS TO MANAGEMENT 4-4
4.11 FINAL EVIDENCE FILES 4-5

5.0 REFERENCES 5-1

APPENDICES

A FIELD STANDARD OPERATING PROCEDURES
A.1 TETRA TECH NUS, INC. STANDARD OPERATING PROCEDURES
A.2 D&T ENVIRONMENTAL, LLC STANDARD OPERATING PRACTICES
A.3 TOLTEST INC. STANDARD OPERATING PROCEDURES

B LABORATORY STANDARD OPERATING PROCEDURES

TABLES

NUMBER

2-1 Key Project Personnel, SWMU 7 Interim Measures, Names, Phone Numbers, and Addresses
2-2 Key Project Personnel, SWMU 8 Interim Measures, Names, Phone Numbers, and Addresses
2-3 Key Project Personnel, SWMU 13 Interim Measures, Names, Phone Numbers, and Addresses
2-4 Key Project Personnel, SWMU 17 Interim Measures, Names, Phone Numbers, and Addresses
3-1 Summary of Sample Analyses, Container Types and Volumes, Preservation Requirements, and Holding Times for Field Analysis and Laboratory Confirmation Analysis of Soils and Sediments
3-2 Summary of Sample Analyses, Container Types and Volumes, Preservation Requirements, and Holding Times for Field Analysis and Laboratory Analysis of Aqueous Samples
3-3 Verification Sample Locations for SWMU 7 Excavation Floor and Side Wall Samples
4-1 Non-Calibration QC Sample Usage Frequencies, Acceptance limits, and Corrective Actions

FIGURES

NUMBER

1-1 Old Pistol Range Location Map, SWMU 7 - Old Rifle Range
1-2 Excavation and Demolition Plan, SWMU 8 - Building 106 Pond
1-3 Excavation Areas, SWMU 13 - Mine Fill B
1-4 Excavation Areas, SWMU 17 - PCB Capacitor Burial/Pole Yard
2-1 Project Organization Chart, SWMU 7 Interim Measures
2-2 Project Organization Chart, SWMU 8 Interim Measures
2-3 Project Organization Chart, SWMU 13 Interim Measures
2-4 Project Organization Chart, SWMU 17 Interim Measures
3-1 SWMU 7 Support Facilities
3-2 SWMU 7 Excavation Verification Sample Locations Example
3-3 SWMU 7 Interim Measures Support Facility Composite Sampling Example
3-4 SWMU 8 Verification Sampling - Excavation Areas and Support Facilities
3-5 SWMU 8 Interim Measures Excavation Sidewall Verification Sample Locations
3-6 SWMU 8 Interim Measures Support Facility Composite Sampling Example
3-7 SWMU 13 Verification Sampling - Excavation Areas and Support Facilities
3-8 SWMU 13 Interim Measures Excavation Verification Sample Locations Example
3-9 SWMU 17 Verification Sampling - Excavation Areas and Support Facilities
3-10 SWMU 17 Surface Soil Excavation Area Verification Sample Locations
3-11 SWMU 17 Stream and Drainage Channel Verification Sample Locations
3-12 Field Task Modification Request Form

ACRONYMS

%R	Percent Recovery
°C	Degrees Celsius
CAAA	Crane Army Ammunition Activity
CFR	Code of Federal Regulations
CLEAN	Comprehensive Long-Term Environmental Action Navy
CTO	Contract Task Order
DNAPL	Dense Nonaqueous Phase Liquid
DQI	Data Quality Indicator
DQO	Data Quality Objectives
EDD	Electronic Data Deliverable
EDE	Electronic Data Exchange
EI	Environmental Indicator
EMAC	Environmental Multi-Award Contractor
ESM	Environmental Site Manager
FOL	Field Operations Leader
FTMR	Field Task Modification Request
GC/MS	Gas Chromatography/Mass Spectrometry
HASP	Health and Safety Plan
HPLC	High Performance Liquid Chromatography
HSM	Health and Safety Manager
IDEM	Indiana Department of Environmental Management
IDL	Instrument Detection Limit
IDW	Investigation Derived Waste
IM	Interim Measure
IWTP	Industrial Wastewater Treatment Plant
MDL	Method Detection Limit
mL	Milliliters
MS	Matrix Spike
MSD	MS Duplicate
NAVFAC SE	Naval Facilities Engineering Command Southeast
NFESC	Naval Facilities Engineering Service Center
NSWC	Naval Surface Warfare Center
OGTSL	Old Gun Tub Storage Lot

OPR	Old Pistol Range
ORR	Old Rifle Range
OSHA	Occupational Safety and Health Administration
PCB	Polychlorinated biphenyls
PE	Performance Evaluation
PM	Project Manager
PPE	Personal Protective Equipment
ProgMan	Program Manager
PTA	Pyrotechnic Test Area
QA	Quality Assurance
QAM	Quality Assurance Manager
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RCRIS	Resource Conservation and Recovery Act Information System
RFI	RCRA Facility Investigation
RL	Reporting Limit
RPD	Relative Percent Difference
RPM	Remedial Project manager
SOP	Standard Operating procedureP
SOW	Statement of Work
SSO	Site Safety Officer
SWMU	Solid Waste Management Unit
TCE	Trichloroethene
TOM	Task Order Manager
TtNUS	Tetra Tech NUS, Inc.
TV	Threshold Value
U.S. EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
VOCs	Volatile Organic Chemicals
WP	Work Plan

1.0 PROJECT DESCRIPTION

The Naval Surface Warfare Center (NSWC) Crane prepared a Quality Assurance Project Plan (QAPP) [Tetra Tech NUS, Inc. (TtNUS), 2004] for a Phase III Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at the following Solid Waste Management Units (SWMUs):

- SWMU 8, Building 106 Pond
- SWMU 15, Roads and Grounds Area

That QAPP also governed data collection for completion of the United States Environmental Protection Agency (U.S. EPA) Region 5 RCRA Conservation and Recovery Information System (RCRIS) code Environmental Indicators (EIs) Forms (Form CA725) for the following SWMUs:

- 18, Load and Fill Area Buildings
- 19. Pyrotechnic Test Area (PTA)
- 20, Crane Army Ammunition Activity (CAAA) Quality Assurance (QA)/Quality Control (QC) Test Area
- Old Gun Tub Storage Lot (OGTSL)

That QAPP was approved by U.S. EPA Region 5, and the required field work was conducted in accordance with the QAPP.

More recently, Interim Measures (IMs) Work Plans (IMWPs) were developed to govern IMs to be conducted at the following Crane SWMUs:

- Old Pistol Range (OPR) at SWMU 7, Old Rifle Range (ORR)
- SWMU 8, Building 106 Pond Area
- SMWU 13, Mine Fill B
- SWMU 17, PCB Pole Yard

The focus of the IMWPs is excavation of contaminated soil and sediment or other IMs that are designed to reduce or eliminate the extent and magnitude of contamination at each of these four sites.

The role of this QAPP Addendum No. 1 is explained in the next section.

1.1 DESCRIPTION OF QAPP ADDENDUM NO. 1

This QAPP Addendum No. 1 governs sampling and analyses for the purposes of remediation and waste disposal of materials removed from the four SWMUs listed above (7, 8, 13, and 17). Specifically, the following objectives will be achieved:

- Confirming that cleanup goals have been met.
- Provide data on residual contaminant concentrations in soils.

It is a supplement to the IMWPs (TtNUS, 2006a, 2006b, 2006c, and 2006d).

This QAPP Addendum No. 1 was prepared for the NSWC Crane facility, located in Crane, Indiana, through the Naval Facilities Engineering Command Southeast (NAFVAC SE) under Contract Task Order (CTO) 0020 for the Comprehensive Long-Term Environmental Action Navy (CLEAN) IV, Contract Number N62467-04-D-0055. For any work to be conducted under this QAPP Addendum No. 1 that is unique to this project, the appropriate information is presented in this document or references are provided to other documents containing the required information.

Site physical conditions are summarized in the IMWPs (TtNUS, 2006a; TtNUS, 2006b; TtNUS, 2006c; TtNUS, 2006d) for these four sites. Descriptions of the IMs to be conducted, except details of confirmation sampling and analyses and waste disposal sampling and analyses, are described in Section 3.0 of these four references. Additional details of the IMs are provided in the remaining sections of these four references. Therefore, only very brief descriptions of the sites are provided below.

1.2 SCOPES OF WORK

1.2.1 SWMU 7, OPR at the ORR

SWMU 7 consists of two separate areas, the ORR and the adjacent OPR. The IMWP for SWMU 7 was prepared for the OPR portion of SWMU 7. The OPR is approximately 10 acres in size and is located immediately adjacent to the northern end of the ORR. The OPR is immediately west of NSWC Crane Highway 8 and is bisected by unnamed intermittent tributaries to Turkey Creek. The ORR and OPR are inactive.

Historical operations conducted at the OPR consisted of small arms firing within two discrete areas (see Figure 1-1). The first area, referred to as Range 1, consists of an open field and an adjoining hillside. Reportedly, small arms shooters positioned themselves and fired westward toward metal-framed targets.

The hillside on the western side of one of the unnamed tributaries served as the backstop for the bullets. The second area, referred to as Range 2, is located immediately north of Range 1. Range 2 is also relatively flat and is currently overgrown with volunteer shrubs and native trees. The direction of firing was to the north, and a manmade earthen berm served as the backstop for the bullets.

The known nature and extent of contamination and the associated risks at the OPR site at SWMU 7 were established based on the results of investigations and studies conducted by the United States Army Corps of Engineers (USACE) and TtNUS. The results of these investigations identified two areas from which lead-contaminated soils are to be excavated, as described in the IMWP for SWMU 7 (TtNUS, 2006a). Soil will be excavated from the two berms used as backstops for bullets and lead shot fired during target practice.

Confirmation Sampling

Following soil excavation, samples will be collected from the soil remaining on the excavation floors and sidewalls to verify that residual lead concentrations in the exposed soils are acceptable (less than 400 mg/kg). Following completion of soil removal, TtNUS will also collect samples from beneath Environmental Multi-Award Contractor (EMAC) support facilities (decontamination pads, materials storage areas, and temporary access roads), if needed (samples to be analyzed for lead), to verify that surface soils below these facilities were not inadvertently contaminated during construction activities. Proposed excavation areas are identified on Figure 1-1. Details on the samples to be collected by TtNUS, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

Waste Characterization

In addition to the samples collected by TtNUS, the EMAC performing the excavations will collect waste characterization samples to satisfy the selected disposal facility permit requirements. Sampling requirements for waste characterization will be determined when the EMAC contractor selects a disposal facility. Details about the samples to be collected, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

1.2.2 SWMU 8, Building 106 Pond

SWMU 8 includes a surface pond located east and southeast of Buildings 106 and 107, respectively (Building 106 Pond). The Building 106 Pond occupies an area of approximately 2,550 square feet within the 5.8-acre area of SWMU 8. Currently the pond is surrounded by trees and a fence. The area east and northeast of the pond is wooded. South of the pond is an open grass area. In addition to these site

features, an electrical sub-station, overhead electrical lines, former industrial wastewater treatment facility, and monitoring wells are located within the Building 106 Pond site.

Historically the Building 106 Pond received process waters from Buildings 106 and 107. These buildings have historically been involved in the overhaul of projectile casings. Building 106 housed a cleaning process consisting of a caustic wash, a trichloroethene (TCE) degreaser, and a hydrochloric acid wash. Building 107 activities included refinishing of metal and wooden boxes. In the early 1970s, an industrial wastewater facility was constructed south of the Building 106 Pond, and the pond discharge was routed to this treatment facility. Following treatment in the industrial wastewater treatment facility, water was directed to the NSWC sanitary system. Prior to the construction of the industrial wastewater treatment facility, water was discharged from the pond through a scum rack to an unnamed drainage channel east of the pond.

The pond and the area immediately adjacent to the pond have been studied extensively, and the nature and extent of contamination and associated risks at the pond are based on the results of these investigations. As indicated in the IMWP for SWMU 8, the Building 106 Pond has been identified as the source of continuing contamination to the underlying groundwater (TtNUS, 2006b). Therefore, the IMWP for SWMU 8 requires excavation of the pond sediment and requires soils beneath the sediment to the depth of bedrock be excavated and transported to an off-site disposal facility. The former industrial wastewater treatment facility will be removed.

Confirmation Sampling

In addition to soil excavation, SWMU 8 IMWP activities include demolition of the former industrial wastewater treatment facility, dewatering of the SWMU 8 Building 106 Pond, treatment of the pond water, and discharge of the treated water to the NSWC Industrial Waste Treatment Plan (IWTP). Following soil excavation, TtNUS will sample any soil remaining on the excavation floors and sidewalls [samples to be analyzed for volatile organic compounds (VOCs)] to determine residual contamination levels. Following completion of the IMWP activities, samples will be collected from beneath EMAC contractor support facilities (decontamination pads, dewatering pad, water treatment system, materials storage areas, and temporary access roads), if needed (samples to be analyzed for VOCs), to verify that surface soils below these facilities were not inadvertently contaminated during remedial activities. A site layout map of the Building 106 Pond Area, including proposed excavation and demolition areas is provided as Figure 1-2. Details of the samples to be collected by TtNUS, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

Waste Characterization Sampling

In addition to the samples collected by TtNUS, the EMAC contractor will collect waste characterization samples to satisfy the selected disposal facility permit requirements (excavated soil samples) and to satisfy NSWC IWTP Requirements (treated water samples). Sampling requirements for excavated soil characterization sampling will be determined when the EMAC contractor selects a disposal facility. Sample requirements for the treated water samples will be determined by NSWC Crane. Details about the samples to be collected, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

1.2.3 SWMU 13 PCB Contamination Areas

PCBs were evidently released to soils in conjunction with use of Therminol boilers. These boilers heated a PCB heat transfer fluid that was used to melt explosives.

It is assumed that polychlorinated biphenyl (PCB) oils were heated in therminol boilers and then transferred to the SWMU 13 melt buildings (Buildings 166 and 171) where the oil was used as a heat-transfer medium in the melting of explosive mixtures. Some of the oil was evidently spilled in the vicinity of the boilers because PCB contamination was detected at relatively high concentrations in soils, primarily in shallow soils (TtNUS, 2005). Excavation will be conducted to remove PCB-contaminated soil, as described in the SWMU 13 IMWP (TtNUS, 2006c); sediments will be evaluated for the extent of contamination.

Confirmation Sampling

The excavation floors and sidewalls will be sampled (See Figure 1-3) and analyzed for PCBs to verify that the residual PCB concentrations in soil are acceptable. Acceptable concentrations are 25 mg/kg for soils deeper than 2 feet below ground surface (bgs) and 1 mg/kg for surface soils (i.e., soils within 2 feet of ground surface) and sediment in drainageways. Excavations will continue until acceptable concentrations of PCBs are achieved in the residual soils. Details about the samples to be collected by TtNUS, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

Waste Characterization Sampling

In addition to the samples collected by TtNUS, the EMAC contractor will collect waste characterization samples to satisfy the selected disposal facility requirements. Sampling requirements will be determined when the EMAC selects a disposal facility. Details about the samples to be collected, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

1.2.4 SWMU 17, PCB Pole Yard

SWMU 17 consists of three separate areas, the capacitor burial area, the pole storage yard, and the drainage ditch below the former transformer maintenance building (2721). SWMU 17 is approximately 17 acres in size and is located adjacent to Building 357. The area around Building 357 is currently active.

Historically, SWMU 17 has been used for storage of electrical capacitors, some of which contained PCBs, storage of electrical transformers, some of which contained PCBs, burial of capacitors, some of which may have contained PCBs, and storage of creosote-impregnated utility poles, some of which may have been contaminated with PCBs as a result of leaking transformers. It is known that capacitors were buried at SWMU 17 in the early to mid-1970s, but it is not known whether any capacitors were buried before the early 1970s or after the mid-1970s. The soil at the pole storage yard at SWMU 17 has been investigated extensively, and a previous IM to remove most of the contaminated soil was conducted in September 2004.

The nature and extent of contamination and the associated risks at SWMU 17 were determined based on the results of investigations and studies conducted by SAIC and TtNUS. The results of these investigations identified PCB contamination (Aroclor-1260) in surface soils and subsurface soils at SWMU 17. As indicated in the IMWP for SWMU 17, an IM was performed at SWMU 17 in 2004 by TolTest Inc. to remove the contaminated surface and subsurface soils associated with SWMU 17. However, verification samples collected following the excavation identified additional risk-causing PCB concentrations (Aroclor-1260) in surface soil and drainage channel sediments. Supplemental investigations performed by TtNUS (beginning in 2005) identified elevated PCB concentrations (Aroclor-1260) in several drainage channels and streams. As indicated in the IMWP, PCB-contaminated surface soils will be excavated and transported to an off-site disposal facility; sediments will be evaluated for the extent of contamination.

Confirmation Sampling

Following surface soil and sediment excavation, TtNUS will sample the soils and sediments remaining on the excavation floors and sidewalls to verify that the residual PCB concentrations in the exposed soils and sediments are acceptable. Following completion of soil removal, samples will also be collected from beneath EMAC contractor support facilities (decontamination pads, dewatering pad, materials storage areas, and temporary access trails), if needed (samples to be analyzed for PCBs), to verify that surface soils below these facilities were not inadvertently contaminated during construction activities. A site layout map of SWMU 17, including proposed excavation areas is provided as Figure 1-4. Details about

the samples to be collected, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

Waste Characterization Sampling

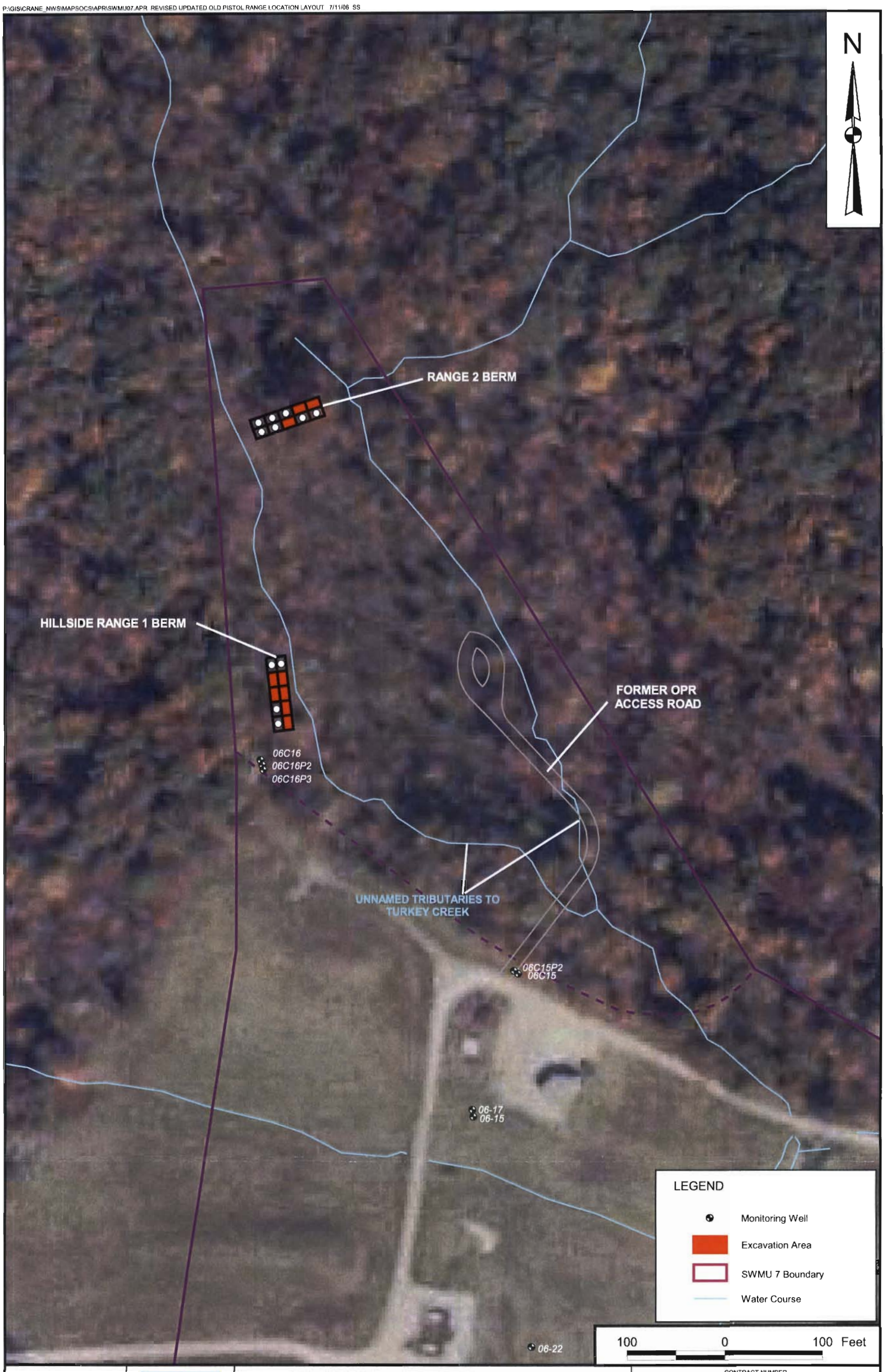
In addition to the samples collected by TtNUS, the EMAC contractor will collect soil characterization samples to satisfy the selected disposal facility permit requirements. Sampling requirements for soil characterization sampling will be determined when the EMAC contractor selects a disposal facility. Details about the samples to be collected, including descriptions of the sampling plan designs, are provided in Section 3.0 of this report.

1.2 PROJECT TARGET PARAMETERS AND RATIONALE FOR SELECTION

1.2.1 Overall Analysis Summary

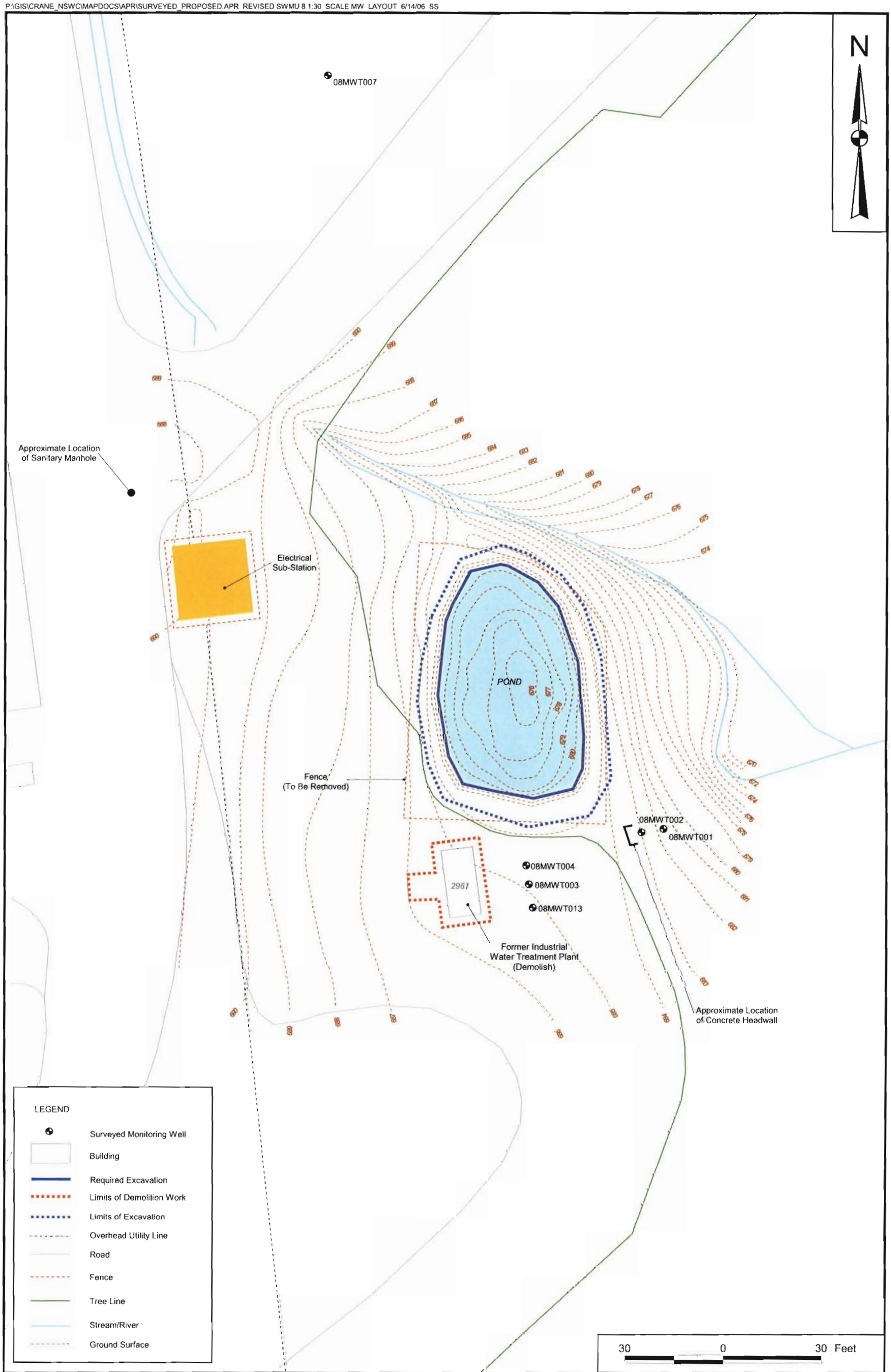
Tables 3-1 and 3-2 present summaries of scheduled analyses and rationales for IM sampling. Specific compound lists corresponding to the analytical fractions listed in those tables are provided in Table 1-5 of the SWMU 8 and 15 QAPP (TtNUS, 2004).

P:\GIS\CRANE_NWS\MAPSOCS\APR\SWMU07.APR REVISED UPDATED OLD PISTOL RANGE LOCATION LAYOUT 7/11/06 SS



DRAWN BY S. STROZ	DATE 6/15/06	OLD PISTOL RANGE LOCATION MAP SWMU 7 - OLD RIFLE RANGE INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0020
CHECKED BY T. JOHNSTON	DATE 7/11/06		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 1 - 1 REV 0

P:\GIS\CRANE_NSWC\MAPDOCS\APR\SURVEYED_PROPOSED.APR REVISED SWMU 8 1:30 SCALE MW LAYOUT 6/14/06 SS



DRAWN BY	DATE
S. STROZ	6/14/06
CHECKED BY	DATE
T. SMITH	6/14/06
COST/SCHEDULE-AREA	
SCALE	AS NOTED

NAVFAC

EXCAVATION AND DEMOLITION PLAN
SWMU 8 - BUILDING 106 POND
INTERIM MEASURES QAPP ADDENDUM NO. 1
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
CTO 0020	
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APPROVED BY	DATE
DRAWING NO. FIGURE 1 - 2	REV 0

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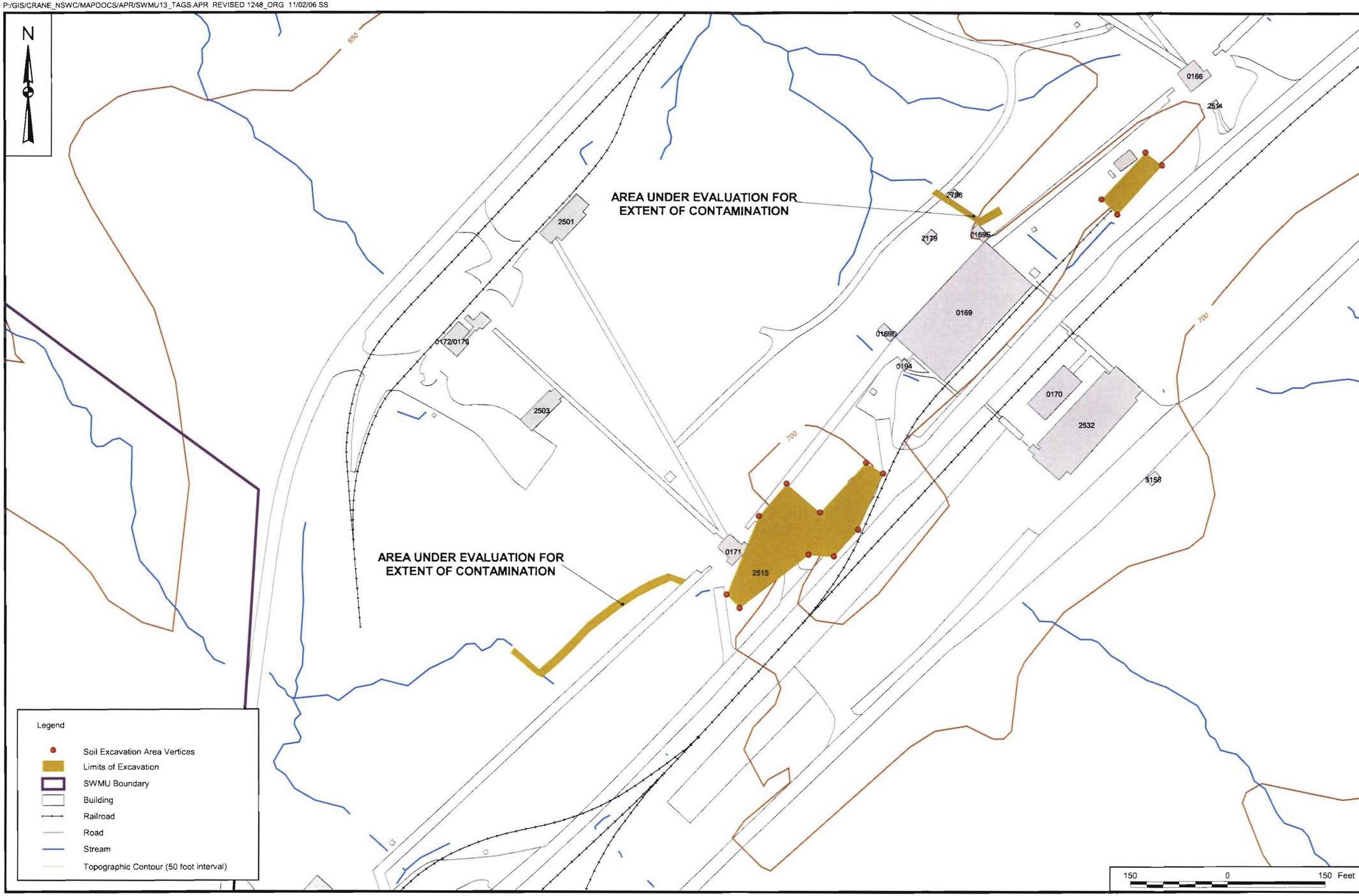


CONTRACT NO. 112G00352

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 1 - 3

REV 0

EXCAVATION AREAS
SWMU 13 - MINE FILL B
INTERIM MEASURES QAPP ADDENDUM NO. 1
NSWC CRANE
CRANE, INDIANA

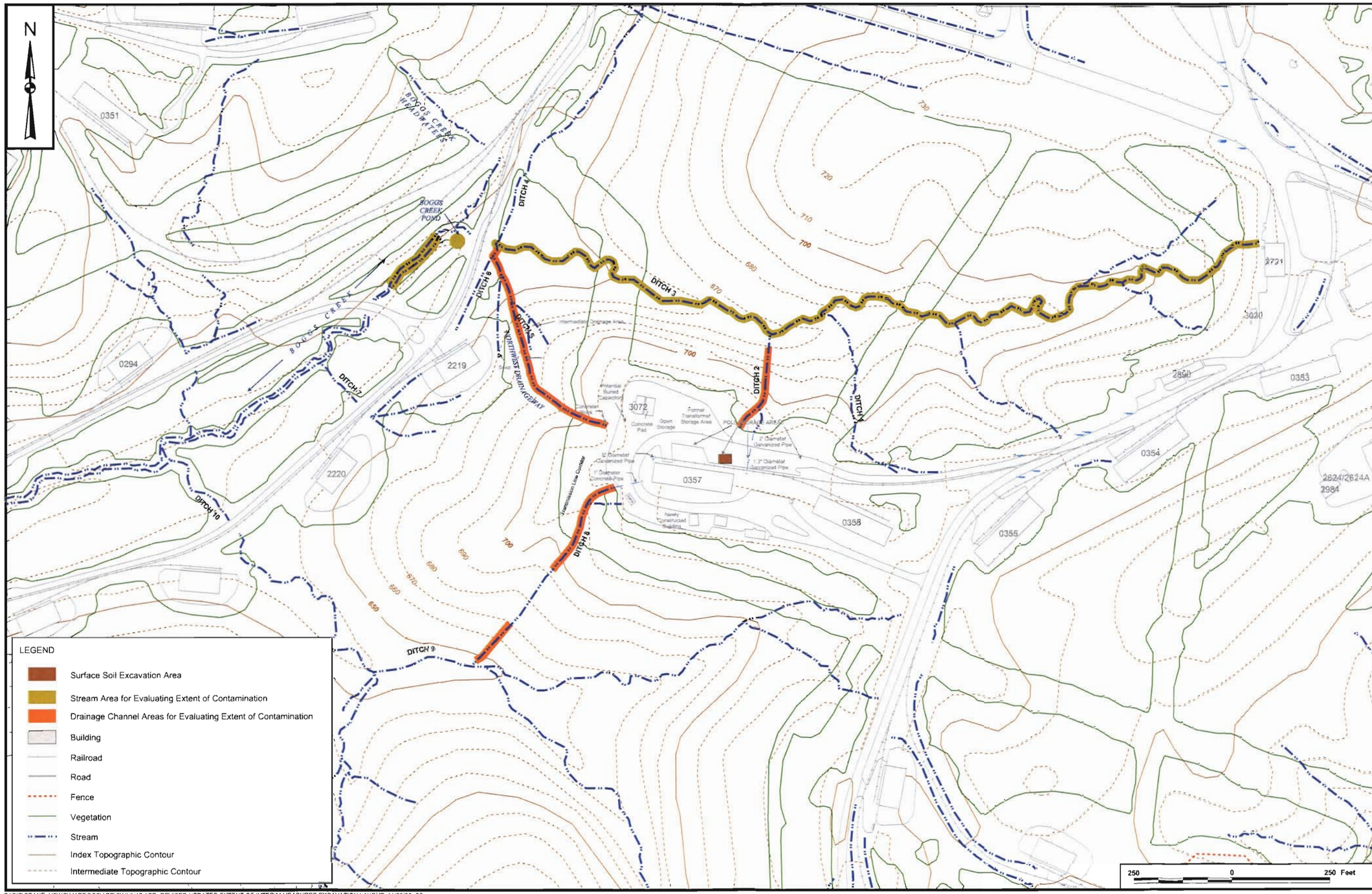
NAVFAC

DRAWN BY S. STROZ DATE 7/11/06

CHECKED BY V. PLACHY DATE 11/02/06

COST/SCHED-AREA

SCALE AS NOTED



P:\GIS\CRANE_NSWC\MAPDOCS\APR\SWMU17.APR REVISED UPDATED EXTENT OF INTERIM MEASURES EXCAVATION LAYOUT 11/02/06 SS

CONTRACT NO. 0020

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 1 - 4

REV 0

EXCAVATION AREAS
SWMU 17 - PCB CAPACITOR BURIAL/POLE YARD
INTERIM MEASURES QAPP ADDENDUM NO. 1
NSWC, CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY S. STROZ DATE 6/15/06

CHECKED BY V. PLACHY DATE 11/02/06

COST/SCHED-AREA

SCALE AS NOTED

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section describes the project management, organization, and responsibilities of key personnel for IMs designed to remove contamination described in Section 1.0 at NSWC Crane SWMUs 7, 8, 13, and 17. Project organizational structure is the same for the four IMs, with flexibility to accommodate multiple remediation contractors (EMACs) and waste characterization laboratories.

TtNUS, on behalf of the United States Navy, is responsible for the preparation for this document and for oversight of IMs to ensure that they are completed satisfactorily at each of the four SWMUs. This will include confirmation sampling and analyses. The remedial contractor(s) are responsible for implementing the IMs for the contamination removal and associated waste disposal. This will include waste sampling and analyses.

The subcontracted laboratory for each SMWU is responsible for analyzing all confirmation samples in accordance with the analytical methods and additional requirements specified in this document. It also will be the responsibility of the analytical laboratory to properly dispose of unused sample aliquots.

2.1 MANAGEMENT

The roles and responsibilities described in this section are identified separately for TtNUS and the remediation contractors (EMACs). Because the roles and responsibilities of the EMACs are similar for each IM, the generic term EMAC is used when referring to those roles and responsibilities. Individual key persons responsible for work to be conducted under this QAPP Addendum No. 1 are identified in Figures 2-1 through 2-4 for SWMUs 7, 8, 13, and 17, respectively. Corresponding addresses and telephone numbers of key personnel are listed by organization in Tables 2-1 through 2-4. Each table of a given sequential number corresponds to the figure of the similar number (e.g., Table 2-3 corresponds to Figure 2-3). Indiana Department of Environmental Management (IDEM), U.S. EPA, Navy, TtNUS, and EMAC personnel specific to each IM are identified in the corresponding tables and figures.

TtNUS and EMACs will report directly to NAVFAC SE. TtNUS and the EMACs will maintain open channels of communication during field activities to facilitate resolution of problems as efficiently as possible. Personnel from the Navy will be actively involved and will coordinate with TtNUS and EMAC personnel as necessary. Responsibilities for program management, project management, field operations, and laboratory operations are discussed in the following sections, as appropriate. It is

intended that the individuals named will assume the designated responsibilities to the extent that the specific person is available to perform the stated activities.

2.1.1 Indiana Department of Environmental Management Corrective Action Project Manager

The IDEM Corrective Action Project Manager (PM), Mr. Doug Griffin, will oversee the implementation of the IMs at SWMUs 8 and 17. The IDEM PM represents IDEM's interests and will provide input from this perspective and lend general technical assistance to NSWC Crane field activities.

2.1.2 U.S. EPA Oversight

The U.S. EPA Region 5 PM, Peter Ramanauskas, will oversee the implementation of corrective measures at SWMUs 7 and 13. He will also represent U.S. EPA's interests and will provide input from this perspective and lend general historical and technical assistance to NSWC Crane field activities. U.S. EPA has delegated the RCRA program to IDEM.

2.1.3 Navy Project Manager

The Navy Remedial Project Manager (RPM), Mr. Bill Gates, acts as the focal representative for the United States Navy, providing management, technical direction, and oversight for all NSWC Crane project activities performed by contractors (e.g., TtNUS and EMACs) and their subcontractors. The Navy RPM will is responsible for ensuring that EMACs and their subcontractors receive a copy of this QAPP Addendum No. 1. In matters such as facilitation of site access, oversight, etc., the Navy RPM is assisted by the NSWC Environmental Site Manager (ESM), Mr. Tom Brent.

2.1.4 TtNUS Program and Project Management

TtNUS Program Manager

The TtNUS NAVFAC SE CLEAN Program Manager (ProgMan), Ms. Debra Humbert, provides operations, technical, and administrative leadership and oversees and supports quality policies. The ProgMan assigns project Task Order Managers (TOMs) and oversees their performance. The ProgMan also ensures the availability of technical and support resources for program operations, and maintains consistency in procedures and projects among CTO assignments. In these matters, the ProgMan is assisted by the TOM.

TtNUS Task Order Manager

The TtNUS TOM, Mr. Ralph Basinski, has overall responsibility for ensuring that the project meets U.S. EPA and IDEM objectives and Navy and TtNUS quality standards associated with IM oversight, sample collection, sample analyses, and data interpretation to determine whether IMs are completed satisfactorily. The TOM is responsible for the preparation and distribution of the QAPP, at the direction of the Navy RPM, to all parties (except EMACs and their subcontractors) connected with the project. The Navy RPM is responsible for distributing the QAPP Addendum to the EMACs and EMAC subcontractors. The TOM will report to the Navy RPM and is responsible for technical QC and project oversight. Additional responsibilities of the TOM are as follows:

- Ensuring timely resolution of project-related technical, quality, and safety questions associated with TtNUS operations.
- Functioning as the primary TtNUS interface with the Navy RPM, the NSWC Crane ESM, TtNUS field and office personnel, and laboratory and EMAC points-of-contact.
- Ensuring that TtNUS health and safety issues related to this project are communicated effectively to all personnel and off-site laboratories.
- Monitoring and evaluating all TtNUS subcontractor performance.
- Coordinating and overseeing work performed by TtNUS field and office technical staff (including data validation, data interpretation, and report preparation).
- Coordinating and overseeing maintenance of all TtNUS project records.
- Coordinating and overseeing review of TtNUS project deliverables.
- Preparing and issuing final TtNUS deliverables to the Navy.
- Approving the implementation of corrective actions associated with the TtNUS portion of project quality.

TtNUS Project Chemist

The TtNUS Project Chemist, Mr. Edward Sedlmyer, has overall responsibility for ensuring that the project meets objectives from the standpoint of laboratory performance. The Project Chemist is responsible for the technical preparation of laboratory statements of work (SOWs) and work releases. Project Managers (PMs) of all subcontractor laboratories conducting confirmation sample analyses will report to the TtNUS Project Chemist. The Project Chemist will report to the TOM. Additional responsibilities of the Project Chemist are as follows:

- Providing technical advice to the TtNUS team on matters of project chemistry.
- Monitoring and evaluating subcontractor laboratory performance.
- Ensuring timely resolution of laboratory-related technical, quality, or other issues effecting project goals.
- Functioning as the primary interface with all subcontracted laboratories and the TOM.
- Coordinating and overseeing work performed by all subcontracted laboratories.
- Coordinating and overseeing review of laboratory deliverables.
- Recommending appropriate laboratory corrective actions.

TtNUS Health and Safety Manager

The TtNUS Health and Safety Manager (HSM), Mr. Matt Soltis, is responsible for the following:

- Providing technical advice to the TOM on matters of health and safety
- Overseeing the development and review of the Health and Safety Plan (HASP)
- Conducting health and safety audits
- Preparing health and safety reports for management

Each field event will have the support of a health and safety officer that will be assigned by the HSM.

2.1.5 EMAC Project Management

EMAC Project Managers

The EMAC PMs (see Figures 2-1 through 2-4 and Tables 2-1 through 2-4) have overall responsibility for ensuring that their SWMU-specific projects meet U.S. EPA and IDEM objectives and Navy and EMAC quality standards to ensure that IMs are completed satisfactorily. The EMAC PMs will report to the Navy

RPM and are responsible for technical QC and project oversight. Additional responsibilities of the EMAC PMs are as follows:

- Ensuring timely resolution of project-related technical, quality, and safety associated with EMAC operations.
- Functioning as the primary EMAC interface with the Navy RPM, the NSWC Crane ESM, TtNUS field personnel, and waste disposal facility points of contact.
- Ensuring that EMAC health and safety issues related to this project are communicated effectively to all personnel and off-site laboratories.
- Monitoring and evaluating all EMAC subcontractor performance.
- Coordinating and overseeing work performed by EMAC field staff (including excavation, waste segregation, sludge dewatering, and sampling to determine hazardous status of wastes prior to disposal).
- Coordinating and overseeing maintenance of all EMAC project records.
- Coordinating and overseeing review of EMAC project deliverables.
- Preparing and issuing final EMAC deliverables to the Navy.
- Approving the implementation of corrective actions associated with the SWMU-specific EMAC portion of project quality.

EMAC Field Operations Leaders

The EMAC Field Operations Leaders (FOLs), one for each IM, have overall responsibility for ensuring that the SWMU-specific IMs meet objectives from the standpoint of adequate removal of contaminated media and appropriate disposal of wastes. Each EMAC FOL will have autonomy with regard to deciding how best to implement the field portion of the IM, but completion of the IM will be determined by TtNUS on behalf of the Navy through confirmation sampling and analysis. The EMAC FOLs will report to the EMAC PMs. Additional responsibilities of the EMAC FOL are as follows:

- Providing technical advice to the field team on matters of remediation goals and implementation of IMWPs.

- Ensuring that wastes are sampled representatively to determine their status for waste disposal.

- Ensuring timely resolution of technical, quality, or other issues effecting project goals.

- Functioning as the primary interface with all SWMU-specific EMAC subcontractors and the EMAC PM.

- Recommending appropriate field corrective actions.

EMAC Health and Safety Managers

The EMAC HSMs are responsible for the following:

- Providing technical advice to the EMAC PMs on matters of health and safety.
- Overseeing the development and review of the HASP.
- Conducting health and safety audits.
- Preparing health and safety reports for management.

2.2 QUALITY ASSURANCE

This section identifies the QA responsibilities for the IMs. Responsibilities of IDEM, TtNUS, EMACs, and the analytical laboratories are discussed.

2.2.1 Indiana Department of Environmental Management and U.S. EPA

The IDEM chemist, Mr. Craig Pender, and U.S. EPA chemist, Mr. Allen Debus, have the responsibility to review and approve chemistry aspects of the QAPP Addendum No. 1 and to provide overall QA support and review. Mr. Pender is responsible for SWMUs 8 and 17: Mr. Debus is responsible for SWMUs 7 and 13. Additional responsibilities may include the following:

- Coordinating external performance and system audits of the contracted laboratories
- Reviewing and evaluating analytical field and laboratory procedures

2.2.2 TtNUS QA Manager

The TtNUS Quality Assurance Manager (QAM), Mr. Paul Frank, is responsible for overall QA for the TtNUS portion of the project. He reports directly to the TtNUS ProgMan. He acts on behalf of the United States Navy for project QA. The QAM is responsible for the following:

- Developing, maintaining, and monitoring QA policies and procedures.
- Providing training to TtNUS staff in QA/QC policies and procedures.
- Conducting systems and performance audits to monitor compliance with environmental regulations, contractual requirements, QAPP requirements, and corporate policies and procedures.
- Auditing project records.
- Monitoring subcontractor quality controls and records.
- Assisting in the development of corrective action plans and ensuring correction of nonconformances reported in internal or external audits.
- Ensuring that this QAPP Addendum meets TtNUS, Navy, and IDEM requirements.
- Overseeing the responsibilities of the TtNUS Project QA/QC Advisor.
- Preparing QA reports for management.

2.2.3 TtNUS Project QA Advisor

The TtNUS Project QA Advisor, Dr. Tom Johnston, supports the TOM in preparing and reviewing the QAPP and in conducting data assessments. The Project QA Advisor communicates directly with the QAM on matters of QA/QC.

2.2.4 Laboratory Responsibilities

The subcontracted laboratory for each IM is responsible for analyzing all samples in accordance with the analytical methods and additional requirements specified in this QAPP Addendum No. 1. It will also be

the analytical laboratory's responsibility to properly dispose of unused sample aliquots. Responsibilities of key laboratory personnel are outlined in the following paragraphs.

Laboratory Project Managers

The Laboratory PMs will interface directly with the TtNUS Project Chemist, TtNUS TOM, and TtNUS QA Advisor and will perform the following tasks:

- Ensure that method and project-specific requirements are properly communicated and understood by laboratory personnel.
- Ensure that all laboratory resources are available on an as-required basis.
- Ensure compliance with analytical and project QA requirements.
- Review data packages for completeness, clarity, and compliance with project requirements.
- Inform the TtNUS TOM of project status and any sample receipt or analytical problems.
- Oversee the preparation of and approving final analytical reports before submittal to TtNUS.

Laboratory Operations Manager

Responsibilities of the Laboratory Operations Manager include the following:

- Supporting the QA program within the laboratory
- Providing management overview of both production- and quality-related laboratory activities
- Maintaining adequate staffing to meet project analytical and quality objectives
- Approving all laboratory Standard Operating Procedures (SOPs) and QA documents
- Supervising in-house chain-of-custody documentation

Laboratory Quality Assurance Officer

The Laboratory QA Officer (QAO) will report directly to the Laboratory Operations Manager. The Laboratory QAO will be independent of laboratory production management to ensure that laboratory quality performance is assessed without schedule and cost considerations. Responsibilities of the Laboratory QAO include the following:

- Defining appropriate laboratory QA procedures and monitoring overall laboratory QA.

- Stopping work if a condition adverse to the quality of work is encountered, if QA or QC procedures are not followed, or if analytical out-of-control events are encountered that have not been corrected.

- Approving and maintaining document control of all QA documents and SOPs.

- Performing and/or implementing internal system and performance audits and verifying completion of corrective actions cited in audits.

- Directing laboratory participation in laboratory accreditation and certification programs.

Laboratory Sample Custodian

The Laboratory Sample Custodian will report to the Laboratory Operations Manager. Responsibilities of the Laboratory Sample Custodian include the following:

- Receiving and inspecting the incoming sample containers.
- Recording the conditions of the incoming sample containers.
- Signing appropriate documents.
- Verifying chain-of-custody records.
- Notifying the Laboratory PM of sample receipt and inspection.
- Assigning a unique identification number and customer number and entering each into the sample receiving log.
- With the help of the Laboratory PM, initiating transfer of the samples to appropriate lab sections.
- Controlling and monitoring access/storage of samples and extracts.

Laboratory Technical Staff

The laboratory technical staff will be responsible for sample analyses based on the analytical methods and requirements specified in this QAPP Addendum No. 1.

2.3 FIELD INVESTIGATION

TtNUS will be responsible for all field sampling and analysis activities related to confirming that the IMs are completed satisfactorily. The EMACs will be responsible for safely conducting the IMs and ensuring

that wastes are disposed properly. The TtNUS and EMAC field teams will be organized according to the activities planned. Field team members will be selected based on the type and extent of effort required. All team members will be appropriately skilled and trained for the tasks they are assigned to perform

2.3.1 Field Operations Leaders

The TtNUS and EMAC FOLs are responsible for coordinating all on-site personnel and for providing technical assistance, when required. The EMAC FOL, or designee, will coordinate and lead all excavations, dewatering, and waste removal operations. The EMAC FOL has authority to complete the field work in the most efficient manner while adhering to the requirements of this QAPP Addendum No. 1 and the HASP. The TtNUS FOL will conduct confirmation sampling activities. Each TtNUS and EMAC FOL will ensure the availability and maintenance of all sampling materials and equipment pertinent to their function. The TtNUS FOL is responsible for completing all sampling, field, and chain-of-custody documentation, will assume custody of all samples sent to the confirmation sampling laboratory, and will ensure the proper handling and shipping of samples. The TtNUS FOL will report directly to the TtNUS TOM but will have authority to guide field operations to efficiently conclude the scheduled work. Specific TtNUS and EMAC FOL responsibilities include the following:

- Ensuring that all health and safety requirements unique to these IMs are implemented.
- Functioning as the on-site communications link between field staff members, Site Safety Officer (SSO), the NSWC Crane ESM, and the TtNUS TOM or EMAC PM.
- Alerting off-site analytical laboratories of any special health and safety hazards associated with environmental samples.
- Overseeing the mobilization and demobilization of all field equipment and subcontractors.
- Coordinating and managing the field technical staff.
- Adhering to the work schedules provided by the TtNUS TOM and EMAC PM, as applicable.
- Ensuring the proper maintenance of site logbooks, field logbooks, and field recordkeeping.
- Initiating field task modification requests (field change orders) when necessary.

- Identifying and resolving problems in the field, resolving difficulties via consultation with the NSWC Crane ESM, implementing and documenting corrective action procedures, and providing communication between the field team and project management.

2.3.2 Site QA/QC Advisor

The FOLs (or designees) will act as the Site QA/QC Advisors and will be responsible for ensuring adherence to all QA/QC requirements as defined in this QAPP Addendum No. 1. Strict adherence to these procedures is critical to the collection of acceptable and representative data. The following is a summary of the Site QA/QC Advisor's responsibilities:

- Ensuring that field QC samples are collected at the proper frequencies.
- Ensuring that additional volumes of sample are supplied to the analytical laboratories with the proper frequency to accommodate laboratory QA/QC analyses.
- Ensuring that measuring and test equipment are calibrated, used, and maintained in accordance with applicable procedures and technical standards.
- Acting as liaison between site personnel, laboratory personnel, and the QAM.
- Managing bottleware shipments and overseeing field preservation.

2.3.3 Site Safety Officer

The FOL (or designee) will also serve as the SSO. The duties of the TtNUS SSO are detailed in the TtNUS HASP; the duties of the EMAC SSO are detailed in the applicable EMAC HASP. The SSOs have stop-work authority, which can be executed upon the determination of an imminent safety hazard.

2.3.4 Technical Staff

The technical staff for this project will be drawn from pools of qualified personnel. All of the designated team members will be experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

Field staff members are responsible for complying with field-related requirements as presented in the QAPP Addendum and the HASP.

2.4 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATIONS

All field personnel will have appropriate training to conduct the field activities to which they are assigned. Additionally, each site worker will be required to have completed a 40-hour course (and 8-hour refresher, if applicable) in Health and Safety Training as described under Occupational Safety and Health Administration (OSHA), 29 Code of Federal Regulations (CFR) 1910.120(b)(4).

Users of the X-ray fluorescence instrument must be properly trained to correctly operate the instrument by a certified user of the instrument or the instrument manufacturer.

TABLE 2-1

KEY PROJECT PERSONNEL
SWMU 7 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 1 OF 2

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Peter Ramanauskas U.S. EPA Oversight U.S. EPA Region 5	EPA Region 5 77 West Jackson Blvd. Chicago, Illinois 60604	Phone: (312) 886-7890 FAX: (312) 353-4788
Howard Hickey Remedial Project Manager U.S. Navy NAVFAC ES	Department of the Navy Building 1A, Cod3e 45313 201 Decatur Avenue Great Lakes, IL 60080	Phone: (847) 688-5999 FAX: (847) 688-2319
Tom Brent Environmental Site Manager NSWC Crane	NSWC Crane Code RP3-TB B-3245 300 Highway 361 Crane, Indiana 47522-5009	Phone: (812) 854-6160 FAX: (812) 854-4177
Debbie Dills Officer in Charge of Construction NSWC Crane	NAVFAC MW PWD Crane Naval Support Activity Building 2516 Code PRCR22 300 Highway 361 Crane, Indiana 47522-5009	Phone (812) 854-3234 FAX: (812) 854-3800
Debra Humbert Program Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8968 FAX: (412) 921-4040
Richard Ninesteel Quality Assurance Coordinator Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8746 FAX: (412) 921-4040
Matt Soltis Health and Safety Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8912 FAX: (412) 921-4040
Ralph Basinski Task Order Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8308 FAX: (412) 921-4040
Dave Hickey Field Operations Leader Tetra Tech NUS	Tetra Tech NUS 800 Oak Ridge Turnpike, Suite 6000 Oak Ridge, TN 37830	Phone: (865) 220-4778 FAX: (865) 483-2014
Joseph Samchuck Data Validation Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8510 FAX: (412) 921-4040
Edward Sedlmyer Project Chemist Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8704 FAX: (412) 921-4040

TABLE 2-1

KEY PROJECT PERSONNEL
SWMU 7 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Tom Johnston Quality Assurance Advisor Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8615 FAX: (412) 921-4040
Ann Ho Project Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 957-2428 FAX: (206) 767-5063
Harry Romberg Lab QA Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 767-5060 FAX: (206) 767-5063
Drew Votaw Waste Characterization Laboratory Project Manager	Pace Analytical Services, Inc. 7726 Moller Road Indianapolis, IN 56268	Phone: (317) 875-5894 x105 FAX: (317) 872-6189
Cory Reiter Project Manager D&T Environmental, LLC	D&T Environmental 7008 Remington Ct. Edwardsville, IL 62025	Phone: (618) 659-4095 Cell: (314) 220-9369 FAX: (618) 659-4483
Todd Porter Health and Safety Officer D&T Environmental, LLC	D&T Environmental 7008 Remington Ct. Edwardsville, IL 62025	Ceel: (314) 220-9339
Karen Campbell Quality Assurance Manager D&T Environmental, LLC	D&T Environmental 7008 Remington Ct. Edwardsville, IL 62025	Phone: (317) 313-1136 FAX: (317) 867-4378

TABLE 2-2

KEY PROJECT PERSONNEL
SWMU 8 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 1 OF 2

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Doug Griffin Corrective Action Project Manager Office of Land Quality Hazardous Waste Permits IDEM	Corrective Action Section Office of Land Quality Hazardous Waste Permits 100 N. Senate Avenue P. O. Box 6015 Indianapolis, Indiana 46206-6015	Phone: (313) 233-2710
Craig Pender Project Chemist Office of Land Quality IDEM	Office of Land Quality Hazardous Waste Permits 100 N. Senate Avenue P. O. Box 6015 Indianapolis, Indiana 46206-6015	Phone: (313) 234-0941
Howard Hickey Remedial Project Manager U.S. Navy NAVFAC ES	Department of the Navy Building 1A, Cod3e 45313 201 Decatur Avenue Great Lakes, IL 60080	Phone: (847) 688-5999 FAX: (847) 688-2319
Tom Brent Environmental Site Manager NSWC Crane	NSWC Crane Code RP3-TB B-3245 300 Highway 361 Crane, Indiana 47522-5009	Phone: (812) 854-6160 FAX: (812) 854-4177
Debbie Dills Officer in Charge of Construction NSWC Crane	NAVFAC MW PWD Crane Naval Support Activity Building 2516 Code PRCR22 300 Highway 361 Crane, Indiana 47522-5009	Phone (812) 854-3234 FAX: (812) 854-3800
Debra Humbert Program Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8968 FAX: (412) 921-4040
Richard Ninesteel Quality Assurance Coordinator Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8746 FAX: (412) 921-4040
Matt Soltis Health and Safety Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8912 FAX: (412) 921-4040
Ralph Basinski Task Order Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8308 FAX: (412) 921-4040
Dave Hickey Field Operations Leader Tetra Tech NUS	Tetra Tech NUS 800 Oak Ridge Turnpike, Suite 6000 Oak Ridge, TN 37830	Phone: (865) 220-4778 FAX: (865) 483-2014

TABLE 2-2

KEY PROJECT PERSONNEL
SWMU 8 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Joseph Samchuck Data Validation Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8510 FAX: (412) 921-4040
Edward Sedlmyer Project Chemist Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8704 FAX: (412) 921-4040
Tom Johnston Quality Assurance Advisor Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8615 FAX: (412) 921-4040
Ann Ho Project Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 957-2428 FAX: (206) 767-5063
Harry Romberg Lab QA Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 767-5060 FAX: (206) 767-5063
Nancy McDonalt Waste Characterization Laboratory Project Manager	STL Chicago 2417 Bond Street University Park, IL 60466	Phone: (708) 34-5200 FAX: (708) 534-5211
Gary Resides Project Manager TolTest Inc.	TolTest Inc. 5201 Jewell Lane Paducah, KY 42001	Phone: (270) 554-0880 Cell: (812) 709-1220
Bill Webster Health and Safety Officer TolTest Inc.	TolTest Inc. 508 W. Elnora Street Odon, IN 47526	Phone: (812) 636-8501 FAX: (812) 636-7572
Bill Webster Quality Assurance Manager TolTest Inc.	TolTest Inc. 508 W. Elnora Street Odon, IN 47526	Phone: (812) 636-8501 FAX: (812) 636-7572

TABLE 2-3

KEY PROJECT PERSONNEL
SWMU 13 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 1 OF 2

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Peter Ramanauskas U.S. EPA Oversight U.S. EPA Region 5	EPA Region 5 77 West Jackson Blvd. Chicago, Illinois 60604	Phone: (312) 886-7890 FAX: (312) 353-4788
Bill Gates Remedial Project Manager U.S. Navy NAVFAC ES	Department of Navy NAVFAC SE Code OPGEVR 2155 Eagle Drive Charleston, South Carolina 29406	Phone: (843) 820-7360 FAX: (843) 820-7465
Tom Brent Environmental Site Manager NSWC Crane	NSWC Crane Code RP3-TB B-3245 300 Highway 361 Crane, Indiana 47522-5009	Phone: (812) 854-6160 FAX: (812) 854-4177
TBD Officer In Charge of Construction NSWC Crane	NSWC Crane Code **TBD** **TBD** 300 Highway 361 Crane, Indiana 47522-5009	Phone **TBD** FAX: **TBD**
Debra Humbert Program Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8968 FAX: (412) 921-4040
Richard Ninesteel Quality Assurance Coordinator Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8746 FAX: (412) 921-4040
Matt Soltis Health and Safety Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8912 FAX: (412) 921-4040
Ralph Basinski Task Order Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8308 FAX: (412) 921-4040
TBD Field Operations Leader Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: **TBD** FAX: **TBD**
Joseph Samchuck Data Validation Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8510 FAX: (412) 921-4040
Edward Sedlmyer Project Chemist Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8704 FAX: (412) 921-4040

TABLE 2-3

KEY PROJECT PERSONNEL
SWMU 13 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 2 OF 2

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Tom Johnston Quality Assurance Advisor Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8615 FAX: (412) 921-4040
Ann Ho Project Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 957-2428 FAX: (206) 767-5063
Harry Romberg Lab QA Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 767-5060 FAX: (206) 767-5063
TBD Waste Characterization Laboratory **Project Manager**	**TBD**	Phone: **TBD** FAX: **TBD**
TBD Project Manager EMAC **TBD**	**TBD**	Phone: **TBD** FAX: **TBD**
TBD Health and Safety Officer EMAC **TBD**	**TBD**	Phone: **TBD** FAX: **TBD**
TBD Quality Assurance Manager EMAC **TBD**	**TBD**	Phone: **TBD** FAX: **TBD**

EMAC = Environmental Multi-award Contractor
TBD = To be determined

TABLE 2-4

KEY PROJECT PERSONNEL
SWMU 17 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Doug Griffin Corrective Action Project Manager Office of Land Quality Hazardous Waste Permits IDEM	Corrective Action Section Office of Land Quality Hazardous Waste Permits 100 N. Senate Avenue P. O. Box 6015 Indianapolis, Indiana 46206-6015	Phone: (317) 233-2710
Craig Pender Project Chemist Office of Land Quality IDEM	Office of Land Quality Hazardous Waste Permits 100 N. Senate Avenue P. O. Box 6015 Indianapolis, Indiana 46206-6015	Phone: (317) 234-0941 FAX: **TBD**
Bill Gates Remedial Project Manager U.S. Navy NAVFAC SE	Department of Navy NAVFAC SE Code OPGEVR 2155 Eagle Drive Charleston, South Carolina 29406	Phone: (843) 820-7360 FAX: (843) 820-7465
Tom Brent Environmental Site Manager NSWC Crane	NSWC Crane Code RP3-TB B-3245 300 Highway 361 Crane, Indiana 47522-5009	Phone: (812) 854-6160 FAX: (812) 854-4177
TBD Officer In Charge of Construction NSWC Crane	NSWC Crane Code **TBD** **TBD** 300 Highway 361 Crane, Indiana 47522-5009	Phone **TBD** FAX: **TBD**
Debra Humbert Program Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8968 FAX: (412) 921-4040
Richard Ninesteel Quality Assurance Coordinator Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8746 FAX: (412) 921-4040
Matt Soltis Health and Safety Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8912 FAX: (412) 921-4040
Ralph Basinski Task Order Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8308 FAX: (412) 921-4040
TBD Field Operations Leader Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: **TBD** FAX: **TBD**

TABLE 2-4

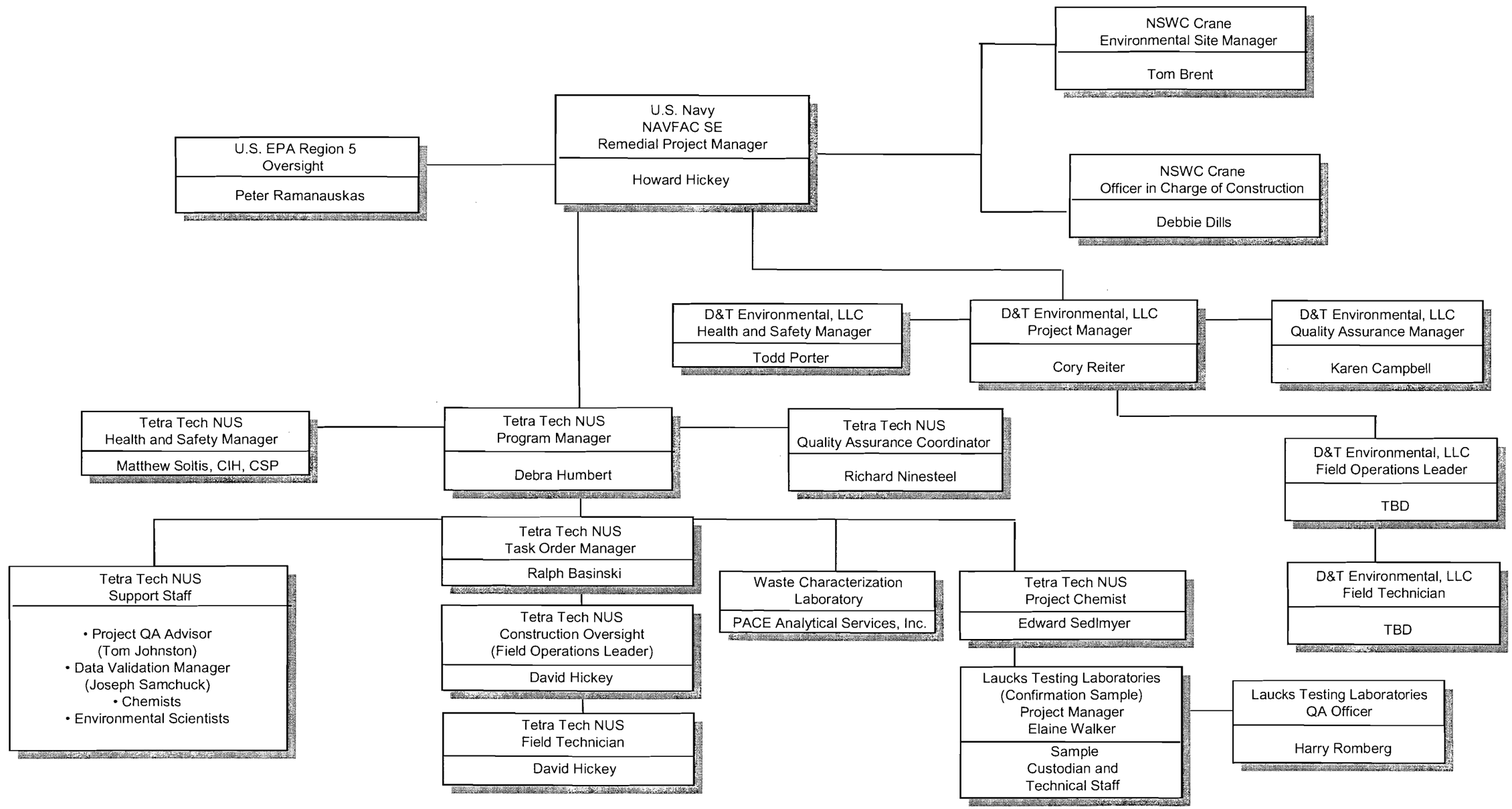
KEY PROJECT PERSONNEL
SWMU 17 INTERIM MEASURES
NAMES, PHONE NUMBERS, AND ADDRESSES
NSWC CRANE, CRANE, INDIANA
PAGE 2 OF 2

PERSON / TITLE / ORGANIZATION	ADDRESS	TELEPHONE
Joseph Samchuck Data Validation Manager Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8510 FAX: (412) 921-4040
Edward Sedlmyer Project Chemist Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8704 FAX: (412) 921-4040
Tom Johnston Quality Assurance Advisor Tetra Tech NUS	Tetra Tech NUS 661 Andersen Drive Pittsburgh, Pennsylvania 15220-2745	Phone: (412) 921-8615 FAX: (412) 921-4040
Ann Ho Project Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 957-2428 FAX: (206) 767-5063
Harry Romberg Lab QA Manager Laucks Testing Laboratories, Inc.	Laucks Testing Laboratories, Inc. 940 South Harney Street Seattle, WA 98108	Phone: (206) 767-5060 FAX: (206) 767-5063
TBD Project Manager EMAC **TBD**	**TBD**	Phone: **TBD** FAX: **TBD**
TBD Waste Characterization Laboratory **Project Manager**	**TBD**	Phone: **TBD** FAX: **TBD**
TBD Health and Safety Officer EMAC **TBD**	**TBD**	Phone: **TBD** FAX: **TBD**
TBD Quality Assurance Manager EMAC **TBD**	**TBD**	Phone: **TBD** FAX: **TBD**

EMAC = Environmental Multi-award Contractor
TBD = To be determined

FIGURE 2-1

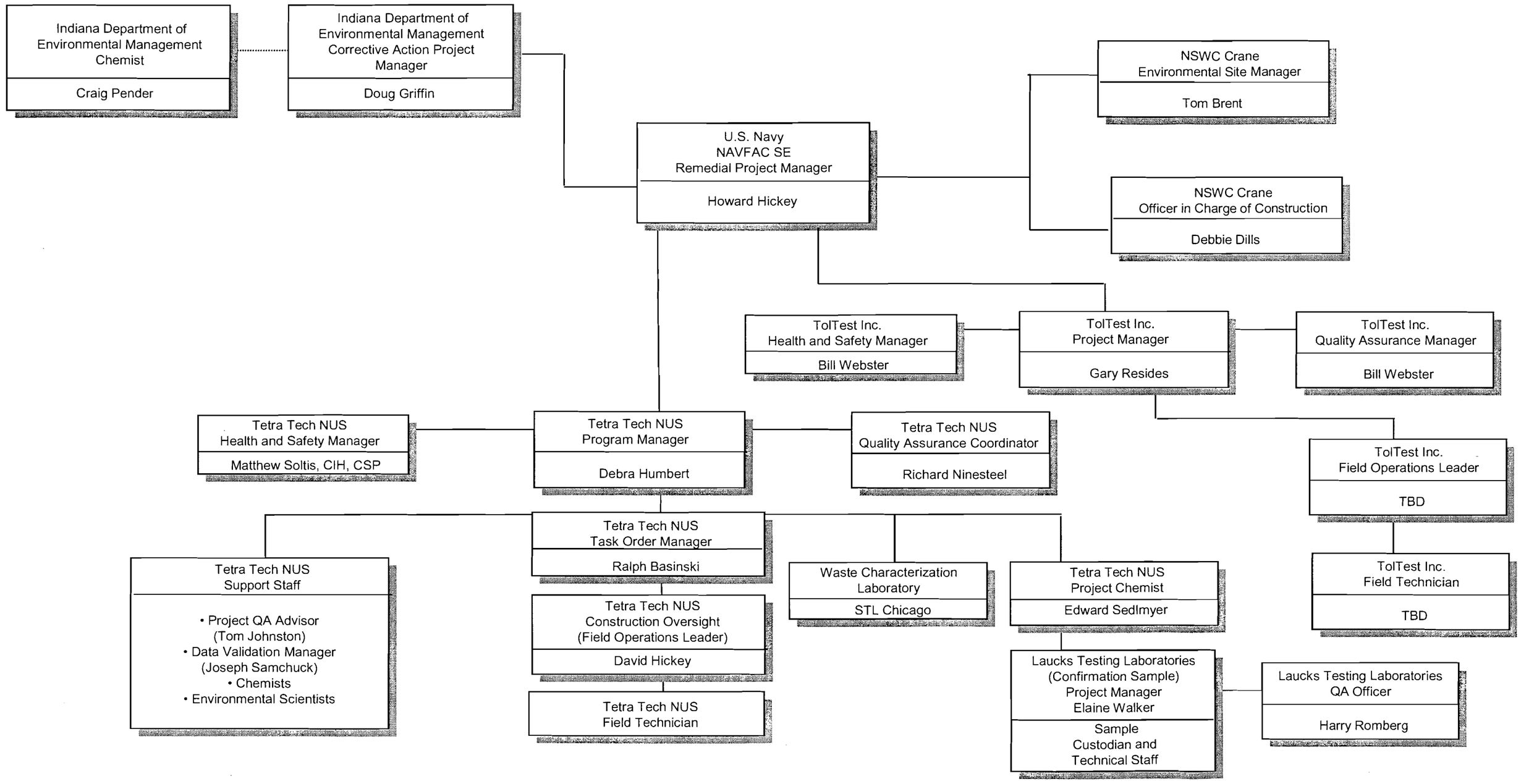
PROJECT ORGANIZATION CHART
SWMU 7 INTERIM MEASURES
NSWC CRANE, CRANE, INDIANA



TBD – To be determined

FIGURE 2-2

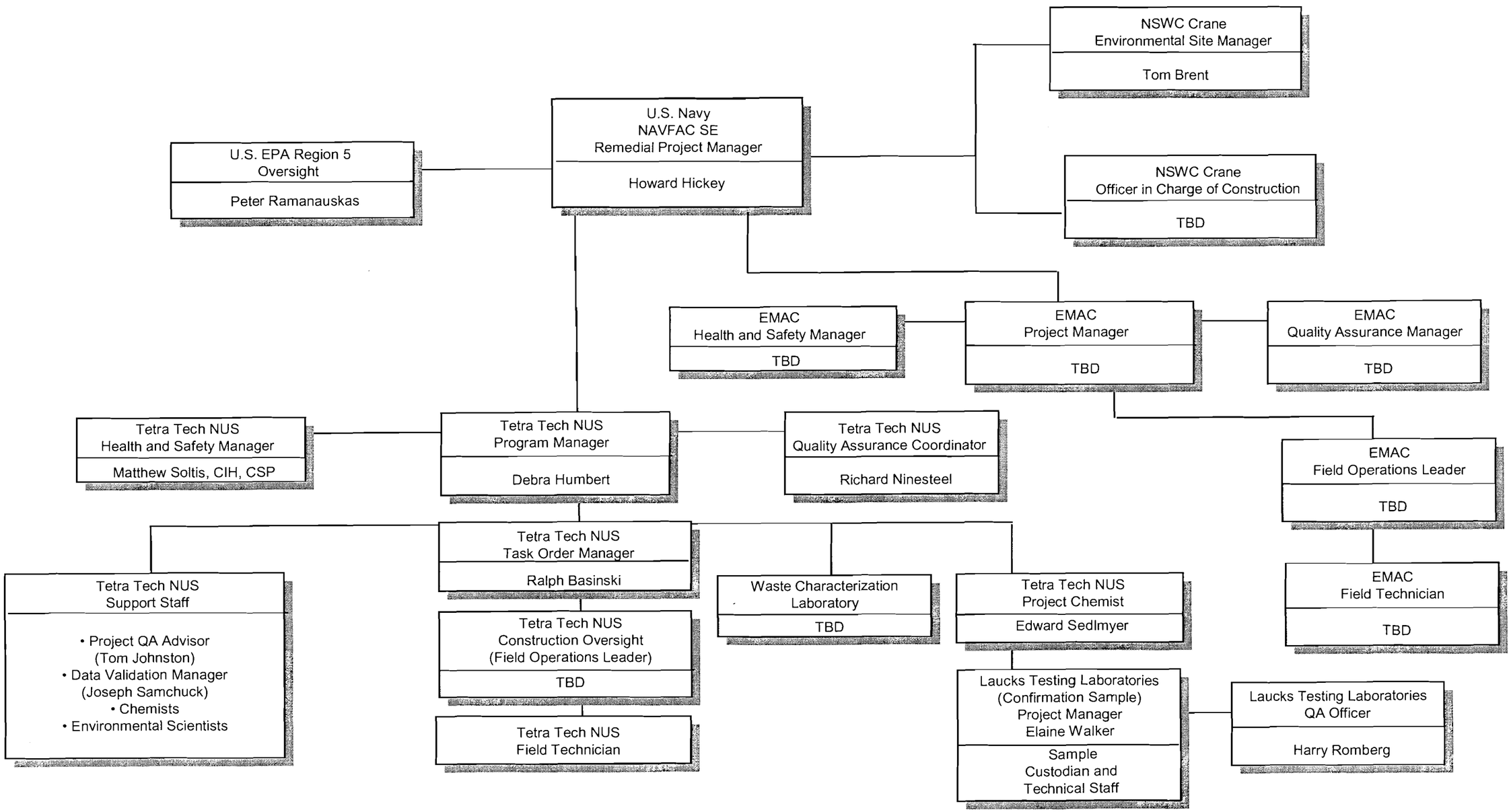
PROJECT ORGANIZATION CHART
SWMU 8 INTERIM MEASURES
NSWC CRANE, CRANE, INDIANA



TBD – To be determined

FIGURE 2-3

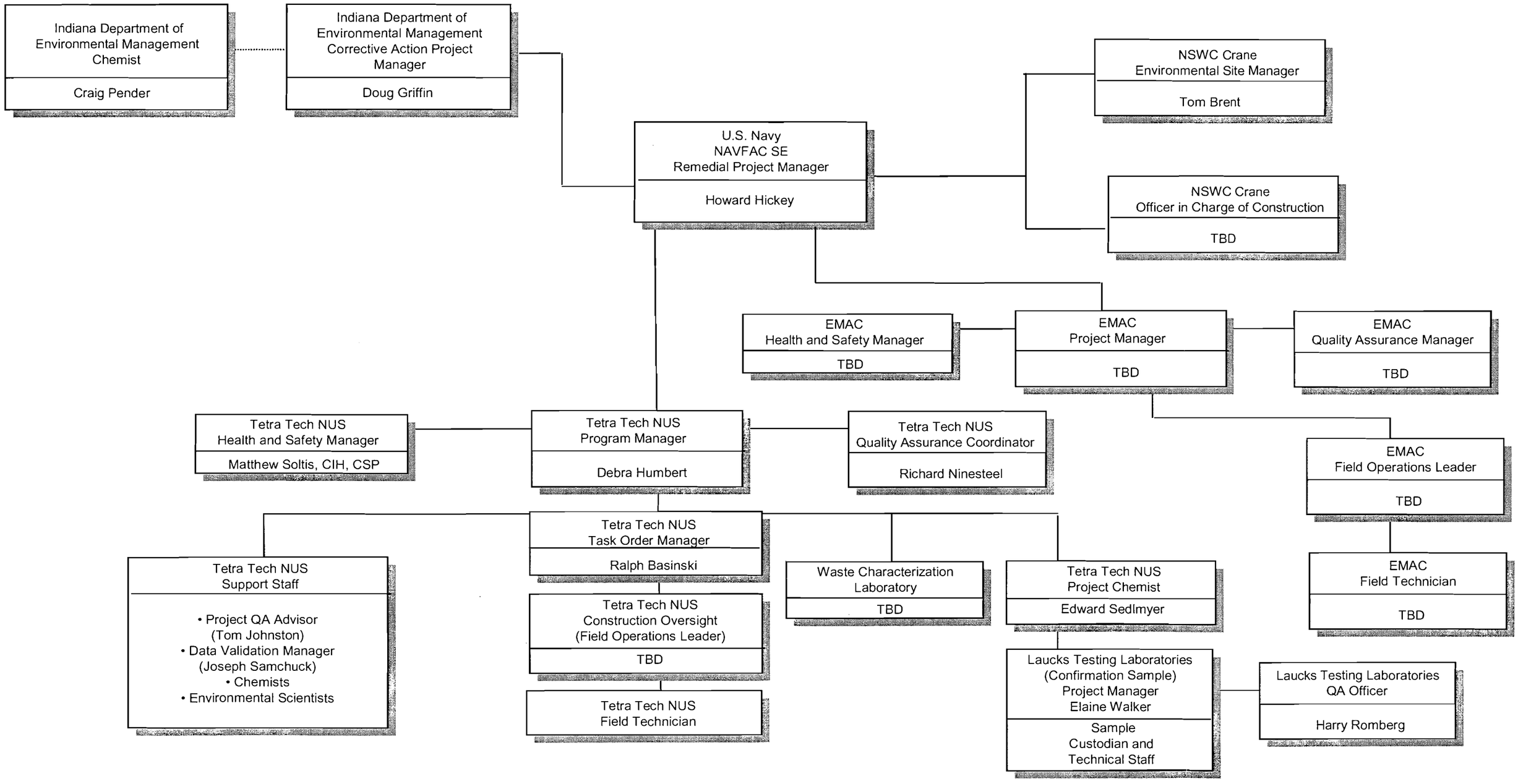
PROJECT ORGANIZATION CHART
SWMU 13 INTERIM MEASURES
NSWC CRANE, CRANE, INDIANA



EMAC – Environmental Multi-Award Contractor
TBD – To be determined

FIGURE 2-4

PROJECT ORGANIZATION CHART
SWMU 17 INTERIM MEASURES
NSWC CRANE, CRANE, INDIANA



EMAC – Environmental Multi-Award Contractor
TBD – To be determined

3.0 FIELD OPERATIONS - SAMPLING AND ANALYSIS

3.1 GENERAL APPROACH

This section describes sampling locations, methods, and rationales for the sampling activities to be conducted in support of the IMs to be conducted at SWMUs 7, 8, 13, and 17. Because this QAPP Addendum No. 1 is based on the existing SWMU 8 and 15 QAPP (TtNUS, 2004), the requirements regarding field operations as presented in TtNUS (2004) will be met during the four IMs, except if the information contained in this QAPP Addendum No. 1 conflicts with the existing QAPP. In those cases, this QAPP Addendum No. 1 shall take precedence over TtNUS (2004).

The equipment and procedures to be used for collecting, handling, preserving, recording, logging, and shipping samples to an analytical laboratory are presented in this QAPP Addendum No. 1. Corresponding SOPs can be found in Appendix A.1. Soil sampling will generally be performed using trowels and buckets.

Prior to any field activities, the TtNUS TOM and the EMAC PM will ensure that all field personnel read and understand this QAPP Addendum No. 1 and associated HASPs. TtNUS and the EMAC will each have organization-specific HASPs. Each worker or visitor to the site must sign an acknowledgment that he or she has read and understands the HASPs, as applicable.

The FOLs will ensure that all required field equipment for non-health-and-safety-related operations is available and operational, and the SSOs will ensure that all health-and-safety-related equipment is available and operational.

3.2 SAMPLE IDENTIFICATION SYSTEM

Confirmation Sampling

All samples collected for fixed-base laboratory analyses will be properly labeled with an adhesive-backed sample label affixed to each sample container in accordance with SOP CTO020-01 (Appendix A.1). The sample labels 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 name of the analytical laboratory to which the sample will be submitted.

Soil and sediment composite confirmation samples will be composited from multiple aliquots (discrete samples) collected to represent a specific area of an excavation floor or sidewall for all analyses except VOCs. Individual aliquots will be collected from 0 to 6 inches bgs for VOCs. For non-VOC analyses, composite samples will be formed by blending the aliquots together (blending is described in Section 3.5), where applicable, and the composite samples will be labeled in accordance with SOP CTO020-02 (Appendix A.1). Individual aliquots will be labeled as "A", "B", "C", or "D" to indicate sequential aliquots collected for compositing. The locations where the aliquots are acquired will be noted in the field log using a simple, hand-draw diagram. Individual soil and wastewater grab samples analyzed for VOCs will also be labeled in accordance with SOP CTO020-02 (Appendix A.1). Aqueous wastewater samples collected to determine disposal requirements will be individual grab samples.

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). Samples to be used as matrix spike (MS) and matrix spike duplicate (MSD) samples must be identified on the field documentation and chain-of-custody forms (see SOP CTO022-03 in Appendix A.1).

Waste Characterization Sampling

See Sections 3.5.3, 3.5.4, 3.5.5, and 3.5.6 for a detailed discussion.

3.3 SAMPLE CUSTODY PROCEDURES

Confirmation Sampling

The SOP governing sample custody, CTO0020-03 (Appendix A.1) of this QAPP Addendum No. 1.

Waste Characterization Sampling

See Sections 3.5.3, 3.5.4, 3.5.5, and 3.5.6 for a detailed discussion.

3.4 FIELD INSTRUMENT CALIBRATION PROCEDURES AND FREQUENCIES

Confirmation Sampling

Field instrument calibration requirements are specific to the instruments and chemical test kits. These requirements are governed by SOPs in Appendix A.1 or, in the case of PCB test kits, the calibration or

standardization instructions that accompany each test kit. It is important that the instructions in each PCB kit be followed accurately to ensure that the QC requirements specific to each kit are satisfied.

Waste Characterization Sampling

Field instruments are not expected to be used during waste characterization sampling.

3.5 SAMPLING LOCATIONS, ANALYSES, AND RATIONALES

Confirmation Sampling

This section presents sampling rationales, locations, QA/QC samples to be collected, and analyses to be performed for the sampling and analytical program. 24-hour turnaround times will be requested for all fixed-base laboratory analyses so as to minimize excavation equipment and field personnel down time while samples are analyzed. Field instruments and test kits will be used to guide the field activities, but fixed-base laboratory analyses will be considered the definitive data for determining whether IMs have been completed satisfactorily.

The overall rationale for confirmatory sampling is to ensure that remedial measures have been extensive enough that soil and sediments that are contaminated at concentrations above the media cleanup standard (MCS) have been removed from SWMUs 7, 13, and 17. In the case of SWMU 8, no MCS has been established for soils. The intent of confirmation sampling at SWMU 8 is to document residual concentrations in soils for the Navy to determine whether additional soils should be removed during this interim measure and also to provide information for use in the RFI and to determine whether further corrective measures are required. Confirmatory samples collected from excavations will be collected as surface soils at the exposed surface, but they will not represent surface soil depths when compared to the original ground elevations at the same locations. Limited depth information will be preserved in the sample numbers to convey to data users the depths bgs represented by the samples. However, continued excavation in a particular area may expose a yet deeper soil surface. The continued excavation at a particular location will be encoded in sample numbers (see SOP CTO020-02 in Appendix A.1), but it may be necessary to consult the field notes to estimate the depth below original ground elevation represented by any particular sample. This is not anticipated to be a problem because the goal of this project is to excavate until clean material is encountered, in which case the unacceptably contaminated material is assumed to have been removed.

If QC sampling and analysis is required by the off-site disposal facility, the facility's requirements for QC sample collection will be followed.

Tables 3-1 (solid samples) and 3-2 (aqueous samples) present summaries of the sample analyses, container types and volumes, preservation requirements, and holding times for the samples to be collected under this QAPP Addendum No. 1. The total number of samples to be collected is unknown; however, the samples to be collected are described below and in the IMWPs (TtNUS, 2006a through TtNUS, 2006d).

Waste Characterization Sampling

See Sections 3.5.3, 3.5.4, 3.5.5, and 3.5.6 for a detailed discussion.

3.5.1 General Sampling Requirements and Considerations

Confirmation Sampling

This section describes requirements and considerations that apply to sampling during IMs to be conducted at SWMUs 7, 8, 13, and 17.

Sample collectors have the option to use disposable equipment or reusable equipment for sampling. Disposable sampling equipment will not require decontamination. Reusable sampling equipment must be decontaminated between samples in accordance with SOP CTO020-04 (Appendix A.1). Equipment rinsate blanks and decontamination source water blanks, however, will not be collected because the chance of carryover from sample to sample (based on previous data from SWMUs 7, 8, 13, and 17) at the concentrations governing excavation is low. Furthermore, results from analysis of field blanks are not expected to influence the course of excavation. All sample collection must be recorded in accordance with the sampling procedures (SOPs CTO020-05 for soil in Appendix A.1 and Section 3.5.3 of this QAPP Addendum No. 1, "Waste Water Characterization," for aqueous samples).

Sample packaging and shipping for off-site laboratory analyses shall be conducted under chain of custody (see SOP CTO020-03 in Appendix A.1) in accordance with SOP CTO020-06 (Appendix A.1). One-day quick turnaround analyses shall be requested from the analytical laboratory. The request for quick turnaround analyses must be noted on each chain of custody.

Uniform random numbers were generated on the interval of 0 to 1 with Microsoft Excel 2003 (11.6560.6568) SP2 and converted to percentages for Table 3-3. This table indicates relative positions from where confirmation grab samples and composite samples will be collected in excavations. The use of Table 3-3 is described later for each SWMU. Example sample numbers are presented in the text

below to demonstrate how samples are to be numbered for the first samples to be collected for each environmental medium at each SWMU. See text below for SWMU-specific explanations and references to the tables.

Waste Characterization Sampling

See Sections 3.5.3, 3.5.4, 3.5.5, and 3.5.6 for a detailed discussion.

3.5.2 Field Instrument Calibration

Confirmation Sampling

Calibration checks of the field-portable XRF shall be conducted on each day of analyses in accordance with SOP CTO020-07 (Appendix A.1). The calibration checks shall occur at the beginning of analyses, every 4 hours thereafter or more frequently, and at the end of the analyses.

The Color-Tec apparatus will not be calibrated in the field because the color tubes are pre-calibrated by the manufacturer.

Calibration checks of the PCB test kits shall be conducted in accordance with the test kit instructions.

Waste Characterization Sampling

Field instruments are not expected to be used during waste characterization sampling.

3.5.3 SWMU 7 Sampling and Analyses

Confirmation Sampling and Analysis

The sizes and shapes of the excavations will be determined in the field, as described in Section 5.0 of the applicable IMWP (TtNUS, 2006a). Although the intent is to generally sample every 10-foot by 15-foot area of excavation floor (and corresponding excavation side walls in 1-foot depth intervals), the overall approach to collecting and analyzing composite soil samples is independent of the size and shape of the excavations. The goal of confirmation sampling will be to obtain samples that are representative of residual soils at the boundaries of the excavations. The sequence of sampling is described in the applicable IMWP (TtNUS, 2006a through 2006d). Figure 3-1 shows the areas to be excavated and hence where confirmation samples will be collected.

Table 3-3, Sets #1 and #2, present randomly selected coordinates for determining the locations where aliquots are to be collected to form composite samples in terms of the percentage of distance from one end of a rectangular excavation to the other end for both X- and Y-directions. The coordinates in Table 3-3 will be used as follows to identify the locations from which to obtain individual aliquots that will then be combined to form a composite sample:

1. If collecting aliquots from excavation floors or support facility, select Set #1.

2. If collecting aliquots from an excavation wall, select Set #2.

3. Select the next sequential sample number in the list of composite samples in the appropriate Table 3-3 set (e.g., the first sample selected for work conducted at the SWMU will be Sample 1).

Note 1: The sample numbers in Table 3-3 are essentially indices that help to identify sequential sets of coordinates, and they do not represent actual sample numbers.

4. Collect a soil or sediment aliquot from each of the four pairs (floors) or two pairs (side walls) of indicated X- and Y- coordinates for the selected composite sample.

Note 2: If the end of Table 3-3 is reached (e.g., Sample 20 for excavation floors), return to the beginning of the table and continue again to the bottom of the table in sequential order for each additional composite sample.

Note 3: Each aliquot should have the same volume.

Figure 3-2 shows a schematic diagram of how to measure the coordinates for each of the four (or two) sample aliquots that are to be composited from excavation floors (or side walls). Figure 3-3 (similar to Figure 3-2) shows a schematic diagram of how to measure the coordinates for each of the four sample aliquots that are to be composited from support facilities and the access road.

Excavated areas are not likely to be exactly rectangular. The sample collector will use professional judgment to measure the aliquot coordinates in the actual excavation while keeping as close as possible to the prescribed sampling scheme. After coordinates have been selected, the soil aliquots will be collected in accordance with SOP CTO020-05 (Appendix A.1). Individual aliquots for a particular composite sample will be labeled as "A," "B," "C," or "D" and shall be cross-referenced to the corresponding composite sample number on the Soil and Sediment Sampling Log Sheet. Each

composite sample must be labeled in accordance with SOP CTO0020-01 and CTO0020-02 in Appendix A.1). The first composite soil sample collected from an excavation floor will be labeled as follows (assuming it will be analyzed only for lead by field XRF): 07SOCF001A. The second composite soil sample to be collected (presumably from another sample grid location) and analyzed for lead by field XRF will be labeled as: 07SOCF002A. If the excavator returns to dig deeper at the first sampling grid location, the corresponding composite soil sample analyzed for lead by XRF would be 07SOCF001B. If excavation would continue at this same location to go yet deeper, the corresponding composite sample number will be: 07SOCF001C. Samples submitted for laboratory analysis that were splits of samples analyzed in the field will have the same number as the samples analyzed in the field.

After the aliquots are collected, they will be composited as follows:

1. Place the aliquots into a stainless steel bowl.

2. Mix soil or sediment aliquots of approximately equal volume (determined by visual observation) in the stainless steel bowl until the mixture is homogeneous in texture and color.

3. During mixing, inspect the mixture visually for evidence of lead shot, bullet fragments, and other debris associated with lead contamination. If lead shot, bullet fragments, or other SWMU 7-related contamination is visible, the Navy may decide to continue excavating without conducting any field or fixed-base laboratory analyses. Record the observation in field notes and consult the Navy.

4. Remove stones the size of a small pea or larger, sticks, root fragments, leaves, twigs, or other naturally occurring debris to ensure that the sample represents primarily soil.

The composite samples will be analyzed in accordance with SOP CTO020-07 (Field XRF Analysis of Soil and Sediment in Appendix A.1). As long as samples are being produced with field XRF lead concentrations greater than 400 mg/kg, 1 of 10 composite samples will be sent for laboratory verification of lead concentrations. If any sample at the limit of excavation has a lead concentration less than 400 mg/kg, the sample will be sent for laboratory verification. This will ensure that all final results supporting the conclusion to terminate excavation are verified with laboratory results. Each laboratory sample to be analyzed for lead shall be numbered in accordance with SOP CTO0020-02 (Appendix A.1). An example of how to number such a sample (assuming it was collected from the first composite sample collected from the excavation wall) is: 01SOCW001A. If excavation requires continued digging in that same location, the sample number, if submitted for laboratory analysis, will be: 01SOCLCW001B.

Soil Waste Characterization

The goal of waste characterization sampling is to characterize soils that will be disposed at an off-site disposal facility to determine whether the waste soils meet the facility's waste acceptance criteria. The remedial contractor (D&T Environmental, LLC) will utilize the following facility for disposal of waste material as a hazardous or non-hazardous waste:

S&S Grading of IL, Inc.
Rt. 3 Box 892
Sumner, IL 62466
(618) 936-9400

The hazardous designation will be determined based on whether the soil passes or fails the Toxicity Characteristic (TC) requirements for lead. The determination for passing or failing the TC requirements will be based on soil sampling from the Hillside Range 1 Berm and Range 2 Berm areas as described below.

Surface soil sampling will be accomplished by collecting a composite soil sample, from the three grid locations to be excavated from Range 2 Berm and the six grid locations to be excavated throughout from Hillside Range 1 Berm. Each grid sample will be collected from each of the areas designated for remediation in the SWMU 7 IMWP Figure 3-1 (TtNUS, 2006a). Each amount collected from each grid location will be of approximately equal volume and mass and will be collected in as unbiased a manner as practicable. This composite sample will be collected in accordance with SOP TNFLD006B (Appendix A.2). The sample shall be labeled and field records maintained in accordance with SOPs TNFLD010C and TNFLD002A (Appendix A.2).

The composite sample will be labeled and field records maintained in accordance with SOPs TNFLD010C and TNFLD002A (Appendix A.2). The soil quantities will be composited by mixing them in the field in accordance with SOP TNFLD006B (Appendix A.2) to obtain a uniform texture and color. A portion of this composite sample will be shipped to the following laboratory in accordance with SOP TNFLD010C (Appendix A.2):

Pace Analytical Services, Inc.
7726 Moller Road
Indianapolis, IN 46268
(317) 875-5894

The laboratory will leach the sample using the Toxicity Characteristic Leaching Procedure (TCLP) (SW-836 Method 1311) and will analyze the leachate for lead concentration using SW-846 Method 8260B.

If the reported lead concentration for the leachate is less than or equal to 5 milligrams per liter (mg/L), the soil will be shipped to a non-hazardous waste facility for disposal. If the reported leachate concentration is greater than 5 mg/L, the excavated soil will be shipped to a hazardous waste facility for disposal.

Laboratory results will be used to complete the waste profile form that will be provided to the disposal facility to document the classification of the waste as hazardous or non-hazardous.

3.5.4 SWMU 8 Sampling and Analyses

Soil and Sediment Confirmation Sampling and Analysis

The pond will be dewatered, sediment removed, any soil underlying the sediment removed to bedrock, and 1 foot of sidewall soil excavated to bedrock. Samples will be collected from the sidewall soils to provide information on residual VOC contamination. The Navy may elect to direct the EMAC to excavate additional sidewall soils based on the results of the analysis of the soils. Bedrock will not be sampled. Typical depth to bedrock is about 8 feet bgs but is expected to be deeper in some areas.

The intent of soil sampling along the pond wall is to represent every 20-foot interval around the pond perimeter with one grab sample that will be analyzed for VOCs. At least 10 samples will be collected for VOC analysis. VOCs are relatively mobile and volatile, so this relatively sparse sampling pattern is expected to be adequate for identifying areas that are unacceptably contaminated and subject to continued excavation. This will be verified with duplicate sample collection as described later. The goal will be to obtain samples that are representative of residual soils at the boundaries of the excavations. The sequence of sampling is described in the applicable IMWP (TtNUS, 2006b). Sampling will also occur under the support facilities to ensure that contamination has not been spread to those areas during remediation. Figure 3-4 shows the areas to be excavated and hence where confirmation samples will be collected. Notes on Figure 3-4 link the areas to be sampled to Figures 3-5 and 3-6. These latter figures are described later.

Table 3-3, Set #3, presents random coordinates for selecting grab samples in terms of the percentage of distance from one end of a rectangular excavation to the other end for both X- and Y-directions. The

coordinates in Table 3-3 will be used as follows to identify the locations from which to obtain each sample:

1. Select the next sequential sample number in the list of samples in Table 3-3 (the first sample selected for work conducted at the SWMU will be Sample 1). Ensure that coordinates from Set #3 are used.

Note 4: The sample numbers in Table 3-3 do not represent the sample numbers to be assigned to the composite samples. The Table 3-3 sample numbers should be viewed as index numbers used to distinguish one set of random coordinates from another.

2. Collect three aliquots of soil at the identified coordinates using Encore samplers in accordance with SOP CTO020-04 (Appendix A.1). Hold these three aliquots in a cooler of ice for shipment to fixed base laboratory. The fixed-base laboratory will extract and hold these samples pending instructions from the Navy.

3. Collect at least 50 grams of additional soil from the same location by scooping a portion of the sample into a glass jar. Cap the jar tightly, place it in a cooler of ice, and submit this sample for Color-Tec field analysis within 3 hours of collecting the sample. Color-Tec Analysis shall be conducted in accordance with SOP CTO020-08 (Appendix A.1). Label the Encores and glass jar with the same sample number in accordance with SOP CTO0020-2 (Appendix A.1).

Note 5: If the end of Table 3-3 Set #3 is reached for a given set of coordinates, return to the beginning of Set #3 in the table and continue to the end of the set in sequential order for each additional composite sample.

Figure 3-5 is a schematic diagram showing how to use the coordinates in Table 3-3, Set #3, to locate the place where each grab sample will be collected for VOC analyses along the pond banks. Similarly, Figure 3-6 shows how to use the coordinates to collect random samples from the IM support facilities and access road. The sample collector will use professional judgment to measure sampling coordinates in the excavation in a way that keeps as close as possible to the prescribed sampling scheme while accounting for the uneven surfaces of the areas to be sampled.

Record the total chlorinated VOC concentrations from the Color-Tec analyses in the field log.

Pond excavation will stop after a pre-defined volume of soil and sediment has been removed from the pond. At that point, the Navy will determine, based on the results of the Color-Tec analysis, whether additional excavation is required as described in Section 5.0 of the SWMU 8 IMWP (TtNUS, 2006b). If the Color-Tec analysis results are acceptable to the Navy and no further excavation is required, the fixed-base laboratory will be instructed to analyze the samples that represent where no further excavation is required. If further excavation is required, the fixed-base laboratory will be instructed to discard the previous samples and new samples will be collected at the boundary of the excavation for field and fixed-base laboratory analysis.

For every fifth pond sidewall sample collected, an additional sample will be randomly selected from the same 20-foot long section of pond bank using the coordinates in Table 3-3, Set #3. This sample will be considered a check sample whose results will be compared to the corresponding original sample to estimate the validity of collecting samples in a relatively sparse sampling pattern. It shall be labeled in accordance with the requirements of SOPs CTO0020-01 and CTO0020-02 in Appendix A.1. If the relative percent difference (RPD) of check sample field analyses exceed 70 percent, the sampling frequency will be increased to two randomly selected samples per 25-foot length of pond bank. RPDs shall be computed in accordance with Section 8.0 of the SWMU 8 and 15 QAPP (TtNUS, 2004) and shall be recorded in the field log.

Waste Sediment and Soil Characterization

The goal of waste characterization sampling is to characterize sediment that will be disposed at an off-site disposal facility to determine whether the waste sediments meet the facility's waste acceptance criteria. The remedial contractor (TolTest, Inc.) will utilize the following facilities for disposal of waste material as a hazardous or non-hazardous waste:

Non-Hazardous Waste Disposal:

Republic Services Sycamore Ridge Landfill
5621 E. Cottom Drive
Pimento, IN 47866
Phone: (317) 921-1667

Hazardous Waste Disposal:

Wayne Disposal, Inc.
49350 North I-94 Service Drive
Belleville, Michigan 48111
Phone: (800) 592-5489

Soils parameters and test methods are as listed in the following table:

Parameter	Analytical Method
SVOC	SW-846 8270C
TPH	SW-846 9071B
PCB	SW-846 8082
Total Metals	SW-846 6010B
Mercury	SW-846 7471
VOC	SW-846 8260B

This information will be used to complete the waste profile form and to determine whether the waste is toxicity characteristic hazardous.

The determination for passing or failing the TC requirements will be based on sampling from soils and sediments as described below.

At the time of waste sediment sampling, the sediment will have been dewatered and stockpiled so that sediment sampling points will be freely accessible and will not be covered with water. Therefore, TolTest, Inc. will accomplish both soil and sediment sampling by collecting the samples in accordance with TolTest Inc. SOP 8-3 (see Appendix A.3). The samples shall be labeled and field records maintained in accordance with TolTest Inc. SOPs 1-4, and 8-16 (Appendix A.3).

The sample shipments to the following laboratory for testing as listed previously listed will be in accordance with TolTest Inc. SOP 8-10 (Appendix A.3):

STL Chicago
2417 Bond Street
University Park, IL 60466
(708) 534-5200

Laboratory results will be used to complete the waste profile form that will be provided to the disposal facility to document the classification of the waste as hazardous or non-hazardous.

Wastewater Characterization

The goal of waste water characterization sampling is to characterize each tank of pre-treated wastewater accumulated from dewatering the pond to determine whether the wastewater meets the NSWC Crane criteria for transfer NSWC Crane Wastewater Treatment Plan (WWTP).

Once a tank has been filled, a single wastewater sample will be collected by TolTest personnel. It is assumed that mechanical mixing within the tank from the act of filling the tank will be sufficient to generate a homogeneous VOC concentration throughout the tank. If a dense non-aqueous phase liquid (DNAPL) is present, it will sink to the bottom of the tank, thus increasing DNAPL concentrations at the tank bottom. Collect a sample as follows:

1. Open the discharge valve (located at the bottom of the tank) and collect in a waste container at least three volumes of wastewater representing the volume of the sampling line between the tank and the exit point for the discharge. The estimated volume of the discharge line will be the line radius (not diameter) multiplied by itself, then multiplied by 3.14, then multiplied by the length of the line being sampled.

2. After purging this volume of wastewater, collect a sample by directly filling a 40-milliliter (mL) vial with minimal agitation or entrainment of air until there is a concave meniscus rising slightly above the top of the vial.

3. Place the Teflon®-line rubber septum, Teflon® side down, on the vial so as not to entrain any air, and screw the cap tightly over the septum.

4. Repeat this process two more times to yield three full VOC vials per sample, without air bubbles greater than ¼-inch diameter.

5. Immediately label the VOC vials in accordance with SOP 8-10 (Appendix A.3) and place them in a cooler with ice.

6. Return the excess purge water to the tank.

7. Submit the samples for 24-hour turnaround laboratory analysis for VOCs in accordance with Table 3-2 and SOP CTO020-03 (Appendix A.3).

Each wastewater characterization will be provided to the NSWC Crane WWTP personnel. For each tank accumulated, the NSWC WWTP personnel will determine whether the wastewater is suitable for transfer to the NSWC Crane WWTP surge tank.

3.5.5 SWMU 13 Sampling and Analysis

Soil Confirmation Sampling and Analysis

The sizes and shapes of the excavations at SWMU 13 will be determined in the field, as described in Section 5.0 of the applicable IMWP (TtNUS, 2006c). Although the intent is to sample every nominal 30-foot by 30-foot area of excavation floor and corresponding excavation side walls in 1-foot depth intervals, the overall approach to collecting and analyzing composite soil samples is independent of the size and shape of the excavations. The goal of confirmation sampling is to obtain samples that are representative of residual soils at the boundaries of the excavation. The sequence of sampling is described in the applicable IMWP (TtNUS, 2006c). Figure 3-7 shows the areas to be excavated and hence where confirmation samples will be collected. The drainage channel in the figure is currently being evaluated for extent of PCB contamination and remedial actions and the extent of remedial actions are not determined at this time.

Table 3-3, Sets #1 and #2, present random coordinates for composite soil sample aliquots in terms of the percentage of distance from one end of a rectangular excavation to the other end for both X- and Y-directions. The coordinates in Table 3-3 will be used as follows to identify the locations from which to obtain individual aliquots that will then be combined to form a composite sample:

1. If collecting aliquots from an excavation floor or support facility, select Set #1.

2. If collecting aliquots from an excavation wall or drainage channel bank, select Set #2.

3. Select the next sequential composite sample number in the list of composite samples in Table 3-3 (the first sample selected for work conducted at the SWMU will be Sample 1).

Note 6: The sample numbers in Table 3-3 do not represent the sample numbers to be assigned to the composite samples. The Table 3-3 sample numbers should be viewed as index numbers used to distinguish one set of random coordinates from another.

4. Collect a soil aliquot from each of the four pairs (floors and support facilities) or two pairs (side walls) of indicated X- and Y- coordinates for the selected composite sample.

Note 7: If the end of Table 3-3 is reached for a given set of coordinates (e.g., Sample 20 in Set #1 for excavation floors), return to the beginning of that set in the table and continue again to the end of the set in sequential order for each additional composite sample.

Figure 3-8 shows a schematic diagram of how to measure the coordinates for each of the four (or two) sample aliquots that are to be composited from excavation floors (or side walls).

Excavated areas are not likely to be exactly rectangular. The sample collector will use professional judgment to measure the aliquot coordinates in the actual excavation while keeping as close as possible to the prescribed sampling scheme. After coordinates have been selected, collect the soil aliquots in accordance with SOP CTO020-05 (Appendix A.1) and composite them as follows:

1. Mix soil aliquots of approximately equal volume (determined by visual observation) in a stainless steel bowl until the mixture is homogeneous in texture and color.

2. Remove stones the size of a small pea or larger, sticks, root fragments, leaves, twigs, or other naturally occurring debris to ensure that the sample represents primarily soil.

Analyze the composite samples in accordance with the instructions included in the PCB test kit identified in Table 3-1 and the instructions in SOP CTO0020-10 (Appendix A.1). Perform at least one calibration/standardization check daily. Record the total PCB concentration in the field log. QC checks for field analyses shall be conducted at the frequencies indicated in the test kit instructions. The information to be recorded includes but is not limited to the following:

- Analyst's name
- Date/time of analysis
- Test kit identifier, including serial number, if provided
- Reference to corresponding calibration/standardization check
- Sample number
- Measured concentration, including the measurement units

Report the total PCB concentration to the EMAC and the Navy RPM so a decision can be made concerning the need for continued excavation.

As long as samples are being produced with field PCB concentrations greater than 1 mg/kg in surface samples or 25 mg/kg in subsurface samples, send 1 of 10 composite samples will be sent for laboratory verification of PCB concentrations (as Aroclors). In this case, surface soil samples are samples collected within 2 feet of original grade as estimated through visual observation and simple field measurement with a tape measure or other suitable measuring device. If any sample at the limit of excavation has a total PCB concentration less than 1 mg/kg (surface soil) or 25 mg/kg (subsurface soil), that sample will be sent for laboratory verification of PCBs as Aroclors. This will ensure that a minimum of 10 percent or more of field analyses and all final results supporting the conclusion to terminate excavation are verified with laboratory results. For any sample that is analyzed in the field and the fixed-base laboratory, both the field and the laboratory analyzed portions will have the same sample number (see SOP CTP0020-02 in Appendix A.1).

Soil Waste Characterization

The goal of waste characterization sampling is to characterize soils that will be disposed at an off-site disposal facility to determine whether the waste soils meet the facility's waste acceptance criteria. **Details of soil waste characterization are being resolved by Navy and TtNUS and will be incorporated after they have been finalized.**

3.5.6 SWMU 17 Sampling and Analysis

Sediment Confirmation Sampling and Analysis

The sizes and shapes of the excavation areas and the soil and sediment volumes to be excavated will be determined in the field, as described in Section 5.0 of the applicable IMWP (TtNUS, 2006d). Although the intent is to sample 30-foot by 30-foot soil area and every 100-foot reach of drainage channel, the overall approach to collecting and analyzing composite soil or sediment samples is independent of the size and shape of the excavations. The goal will be to obtain samples that are representative of residual soils and sediments at the boundaries of the excavation. The sequence of sampling is described in the applicable IMWP (TtNUS, 2006d). Figure 3-9 shows the areas to be excavated and hence where confirmation samples will be collected.

Table 3-3, Sets #1 and #2, present random coordinates for composite sample aliquots in terms of the percentage of distance from one end of an excavation to the other end for both X- and Y-directions. The coordinates in Table 3-3 will be used as follows to identify the locations from which to obtain individual aliquots that will then be combined to form a composite sample:

1. If collecting aliquots from an excavation floor or support facility, select Set #1.

2. If collecting aliquots from an excavation wall or drainage channel bank, select Set #2.

3. Select the next sequential composite sample number in the list of composite samples in Table 3-3 (the first sample selected for work conducted at the SWMU will be Sample 1).

Note 8: The sample numbers in Table 3-3 do not represent the sample numbers to be assigned to the composite samples. The Table 3-3 sample numbers should be viewed as index numbers used to distinguish one set of random coordinates from another.

4. Collect a soil or sediment aliquot from each of the four pairs (floors and support facilities) or two pairs (side walls and banks) of indicated X- and Y- coordinates for the selected composite sample.

Note 9: If the end of Table 3-3 is reached for a given set of coordinates (e.g., Sample 20 in Set #1 for excavation floors), return to the beginning of that set in the table and continue again to the end of the set in sequential order for each additional composite sample.

Note 10: Each aliquot should have the same volume.

Figures 3-10 (excavation floors and side walls) and 3-11 (drainage channel beds and banks) show schematic diagrams of how to measure the coordinates for each of the four sample aliquots that are to be composited from excavation floors and drainage channel beds, and each of the two aliquots to be composited for excavation side walls and drainage channel banks.

Excavated areas are not likely to be exactly rectangular, especially those along stream channels. The sample collector will use professional judgment to measure the aliquot coordinates in the actual excavation while keeping as close as possible to the prescribed sampling scheme. Stream channel coordinates will be adjusted to follow the stream channel contour as though a rectangular grid was placed over the channel and allowed to conform to the channel surface. After coordinates have been selected, soil and sediment aliquots will be collected in accordance with SOP CTO020-05 (Appendix A.1) and composited as follows:

1. Mix soil or sediment aliquots of approximately equal volume (determined by visual observation) in a stainless steel bowl until the mixture is homogeneous in texture and color.

2. Remove stones the size of a small pea or larger, sticks, root fragments, leaves, twigs, or other naturally occurring debris to ensure that the sample represents primarily soil.

Analyze the composite samples in accordance with the instructions included in the PCB test kit identified in Table 3-1 and the instructions contained in SOP CTO0020-010 (Appendix A.1). Perform at least one calibration/standardization check daily. Record the total PCB concentration in the field log. QC checks for field analyses shall be conducted at the frequencies indicated in the test kit instructions and shall meet the specifications of the test kit. The information to be recorded includes but is not limited to the following:

- Analyst's name
- Date/time of analysis
- Test kit identifier, including serial number, if provided
- Reference to corresponding calibration/standardization check
- Sample number
- Measured concentration, including the measurement units

Report the total PCB concentration to the EMAC and the Navy so a decision can be made concerning the need for continued excavation.

As long as confirmation samples are being produced with field-measured total PCB concentrations greater than 1 mg/kg in surface samples or 25 mg/kg in subsurface samples, 1 of 10 composite samples will be sent for laboratory verification of PCB concentrations (as Aroclors). In this case, surface soil samples are samples collected within 2 feet of original grade as estimated through visual observation and simple field measurement with a tape measure or other suitable device. If any sample at the limit of excavation has a total PCB lead concentration less 1 mg/kg (surface soils) or 25 mg/kg (subsurface soils), the sample will be sent to the laboratory for verification of PCBs. This will ensure that a minimum of 10 percent or more of field analyses and all final results supporting the conclusion to terminate excavation are verified with laboratory results. For any sample analyzed in the field and in the fixed-base laboratory, both the field and the laboratory analyzed portions will be labeled with the same number in accordance with SOP COP0020-02 (Appendix A.1).

Sediment Waste Characterization

The goal of waste characterization sampling is to characterize sediments that will be disposed at an off-site disposal facility to determine whether the waste sediments meet the facility's waste acceptance criteria. Details of sediment waste characterization are being resolved by Navy and TtNUS and **will** be incorporated after they have been finalized.

Wastewater Characterization

Wastewater characterization requirements are being finalized by the Navy and TtNUS but a draft approach is presented here.

There are no waste water characterization requirements because PCBs are assumed to be entrained in sediments. Sediments from water collection tanks must be drained from the tanks and combined with other waste sediments for disposal.

3.6 QUALITY CONTROL REQUIREMENTS

Refer to TtNUS (2004) for generic QC requirements. Project-specific requirements are provided in this section.

In addition to instrument- or test kit-specific calibration requirements (see Section 3.4), the following field QA/QC samples will be collected at the indicated frequencies to support confirmation sampling and analyses.

- In general, duplicate confirmation samples will be collected at a rate of one for every 20 regular samples and analyzed for the same analytes as the corresponding regular samples. For SWMU 8, every fifth pond bank sample will be analyzed in duplicate for VOCs.

- When fixed-base laboratory analyses are used, enough additional sample volume will be collected to support MS/MSD sample analyses (organic chemical analyses only). The rate of MS/MSD analysis will be one for every 20 regular samples.

- Trip blanks must be included in each cooler containing samples submitted for laboratory confirmation of VOC analyses.

- A temperature blank will be added to each cooler that contain samples which must be kept cooled as a preservation requirement.

Definitions of each of these QC sample types are presented in TtNUS (2004). Collection of QC samples will not be required for waste characterization sampling and analyses unless required by the off-site disposal facility.

Equipment rinsate blanks (rinsate blanks) will not be collected because cross-contamination of confirmation samples or waste disposal samples is not a concern for this project. Source water blanks will not be collected because cross-contamination from source water is not a concern.

3.7 DATA REDUCTION, VALIDATION, ASSESSMENT, AND REPORTING

Generic data reduction, validation, assessment and reporting requirements are provided in Section 8.0 of TtNUS (2004). Project-specific instructions are provided below for this project.

3.7.1 Confirmation Analysis Data

Data from field analyses and other field measurements must be recorded at the time of generation in the field log book or, when provided in the governing SOP, on the SOP-specific data forms. Confirmation sampling results will be entered into the TtNUS electronic database soon enough after the data collection to prevent loss of data and to support the generation of reports to the Navy. The data entry process will make use of a dual entry system whereby two independent data entry clerks enter the data and compare the results. Discrepancies, if detected, will be investigated to determine the correct values, and the correct values will be entered into the database. Non-discrepant results will be considered accurate unless subsequent data review or use indicates otherwise.

The data will be transferred to the Navy in accordance with requirements to be found at the following web site:

https://www.sdirport.com/customer/ttnus/irgateway.nsf/MAINLOADER?OpenFrameSet

The password required to access this site may be obtained through the Navy RPM. The information at this link provides detailed instructions for reporting environmental data. The intent is to standardize reporting formats to improve how environmental data are acquired, managed, and transmitted. The

following items are available at this link and the Electronic Data Exchange (EDE) Examples button located at the link:

- SOP
- Electronic Data Deliverable (EDD) spreadsheets and databases
- Electronic data processor
- Example electronic data submittal

Fixed-base laboratory verification data may be compared to field analytical data to determine whether there is a reasonable correlation between the field and fixed-base laboratory data. This will be done by plotting the laboratory data versus field data in a correlation plot. A correlation coefficient of 0.65 or greater and an apparent linear relationship (determined through visual inspection of the plotted data) will be considered a reasonably strong correlation. If a correlation of this degree is obtained, the field data may be used to estimate the equivalent laboratory concentration. However, fixed-base laboratory data shall be used as the definitive data to judge whether IMs have been completed satisfactorily.

3.7.2 Waste Characterization Data

Waste characterization analyses will be provided to the waste disposal facility and NAVFAC SE in the form of hard copies of laboratory data packages as well as data summaries. The data summaries shall identify each sample analyzed, the laboratory conducting the analysis, the results of analysis, and any qualifying notes indicating limitations on data use. At the Navy's discretion, data may also be provided in electronic format in accordance with the specifications identified in Section 3.7.1.

3.8 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

It is anticipated that this investigation could generate the following types of potentially contaminated residues or investigation-derived waste (IDW):

- Personal protective equipment (PPE)
- Equipment decontamination fluids
- Waste soil from sampling activities

IDW will be handled as described in SOP CTO0020-09 (Appendix A.1).

3.9 SAFETY

The health and safety activities described in the following sections will ensure that field activities are performed at a high level of safety.

3.9.1 Health and Safety Plan

Separate HASPs will be prepared by TtNUS and each EMAC. These HASPs describe specific health and safety requirements, concerns, and information related to the site activities. These documents will 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.

3.9.2 Health and Safety Training

All workers involved with the site investigations shall have successfully completed the OSHA-mandated 40-hour health and safety training and the current annual 8-hour refresher courses when appropriate.

3.9.3 Medical Approval and Personal Protective Clothing and Equipment

TtNUS 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.

3.9.4 Safety Meetings

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

3.10 PERFORMANCE AND SYSTEM AUDITS

Section 9.1 of the SWMU 8 and 15 QAPP (TtNUS, 2004) presents generic requirements for field operations performance and system audits. No special requirements are anticipated for this project.

3.11 INSPECTION AND MAINTENANCE

Sections 10.1 and 10.3 of TtNUS (2004) present generic inspection and maintenance requirements to ensure that field consumables and equipment are in proper working order and available when needed. In addition, project-specific requirements are provided below.

Chemical Test Kits - PCBs

The receipt date and the expiration date of receipts (i.e., purchase date plus 1 year) shall be written on the test kit (receipt date) and the reagents (expiration date) on each reagent bottle and the kit if the expiration date is not already indicated. Follow manufacturer instructions for storage and handling of the kits. Do not use kits on kit components past their expiration dates.

XRF Instrument

Ensure that the lead calibration coupon (calibration check standard) is available for routine calibration checks that must be conducted periodically on each day of use. The operability of the instrument should be checked the day before the beginning of use.

Color-Tec Apparatus

Ensure that the color tubes have been stored in accordance with manufacturer directions and that enough tubes are available for each day of use. There should be more than one tube for each sample to be analyzed for each anticipated concentration level expected to be encountered at the SWMU. Inspect the vacuum apparatus prior to use to ensure that it there are no visible leaks in the vacuum line.

3.12 FIELD CORRECTIVE ACTIONS

Field nonconformances or conditions adverse to quality must be identified and corrected as quickly as possible so that work integrity or product quality is not compromised. The need for corrective action may arise based on deviations from project plans and procedures, adverse field conditions, or other unforeseen circumstances. Corrective action needs may become apparent during the performance of daily work tasks or as a consequence of internal or external field audits.

Corrective action may include resampling, re-excavation or other rework and may involve amending previously approved field procedures. Minor modifications to field activities, such as the collection of additional samples, will be initiated at the discretion of the FOL, subject to on-site approval by NSWC

Crane personnel. Major modifications or situations that affect compliance with or achievement of Data Quality Objectives (DQOs) must be approved and documented via a Field Task Modification Request (FTMR). An example FTMR is provided as Figure 3-12. Approval of the corrective action will be obtained by the United States Navy (in conjunction with IDEM). The TtNUS or EMAC FOL is responsible for initiating FTMRs. An FTMR will be prepared for all deviations from the project plan documents, as applicable. Copies of all FTMRs will be maintained with the on-site project planning documents and will be placed in the final evidence file.

3.13 QUALITY ASSURANCE REPORTS TO MANAGEMENT

The TtNUS FOL will provide the TOM with daily verbal field progress reports during the course of the IMs. The EMAC FOL will provide daily verbal reports to the EMAC PM during the course of IMs. These reports will explain accomplishments, deviations from the QAPP, and upcoming activities, and will provide a QA summary. The TtNUS TOM and EMAC PM will provide monthly progress reports to the Navy that address the project budget, schedule, accomplishments, planned activities, and QA/QC issues and intended corrective actions.

TABLE 3-1

SUMMARY OF SAMPLE ANALYSES, CONTAINER TYPES AND VOLUMES, PRESERVATION REQUIREMENTS, AND HOLDING TIMES FOR FIELD ANALYSIS AND LABORATORY CONFIRMATION ANALYSIS OF SOILS AND SEDIMENTS SWMUS 7, 8, 13, AND 17 INTERIM MEASURES NSWC CRANE, CRANE, INDIANA

Parameter	Applicability	Analyte/Methodology/ SOP	Sample Container	Container Volume	Preservation	Maximum Holding Time[1]
Field Analyses						
Total Lead	SWMU 7 only	Field XRF (SOP CTO020-07)	Thin-walled plastic sandwich bag	8-ounce	NA	Analysis within 180 days
PCBs	SMWUs 13 and 17	RaPID Assay Test Kit (0.5 to 10 ppm) with SDI Sample Extraction Kit	Wide-mouth jar, Teflon-lined plastic cap	8-ounce	NA	Analysis within 14 days
Volatile Organic Compounds	SMWU 8 only	Color-Tec Apparatus with GasTech color tubes (SOP CTO020-08)	Wide-mouth jar, Teflon-lined plastic cap	Three 5-gram	Cool to 4 °C	3 Hours to analysis
Laboratory Analyses [2]						
Total Lead	SWMU 7 only	SW-846 3050B/6020 LTL-7015/ LTL-7202	Wide-mouth jar, Teflon-lined plastic cap	8-ounce	NA	Analysis within 180 days
PCBs	SMWUs 13 and 17	SW-846 8082 LTL-3302 / LTL-8084	Wide-mouth jar, Teflon-lined plastic cap	8-ounce	Cool to 4 °C	Extraction within 14 days; analysis within 40 days of extraction.
Volatile Organic Compounds	SMWU 8 only	SW-846 8260B (5-gram purge) LTL-8265	3 Encore™ samplers [3]	Three 5-gram	Cool to 4 °C	48 hours to preservation; 14 days to analysis.

1 All holding times are from date of collection. Laboratory analysis will be 1-day turnaround.

2 For parameter lists for PCBs and VOCs, see the SWMU 8 and 15 QAPP, Table 1-5. That table also has target detection and quantitation (reporting) limits.

3 One Encore™ extruded into 5 mL water and frozen. Second Encore™ frozen as received. Third Encore™ preserved with methanol for medium-level analysis.

°C - Degrees Centigrade.

LTL - Laucks Testing Laboratories, Inc.

TABLE 3-1

SUMMARY OF SAMPLE ANALYSES, CONTAINER TYPES AND VOLUMES, PRESERVATION REQUIREMENTS, AND HOLDING TIMES FOR FIELD ANALYSIS AND LABORATORY CONFIRMATION ANALYSIS OF SOILS AND SEDIMENTS SWMUS 7, 8, 13, AND 17 INTERIM MEASURES NSWC CRANE, CRANE, INDIANA

PCBs - Polychlorinated biphenyls.

ppm - Parts per million.

SOP - Standard operating procedure

SW-846 - U.S. EPA, 1986. Test methods for Evaluating Solid Wastes, Physical/Chemical Methods. SW-846, Third Edition and subsequent updates.

XRF - X-ray flourescence spectroscopy.

VOCs - Volatile organic compounds.

TABLE 3-2

SUMMARY OF SAMPLE ANALYSES, CONTAINER TYPES AND VOLUMES, PRESERVATION REQUIREMENTS, AND HOLDING TIMES FOR FIELD ANALYSIS AND LABORATORY ANALYSIS OF AQUEOUS SAMPLES SWMUs 7, 8, 13, AND 17 INTERIM MEASURES NSWC CRANE, CRANE, INDIANA

Parameter	Applicability	Analyte/Methodology	Sample Container	Container Volume	Preservation	Maximum Holding Time[2]
Field Analysis						
Volatile Organic Compounds	SMWU 8 only™	Color-Tec Apparatus with GasTech color tubes (CTO0020-08)	Glass, black phenolic plastic screw cap, Teflon-lined septum	Three 40 mL	Cool to 4 °C, zero headspace; **DO NOT USE HYDROCHLORIC ACID**	3 Hours to analysis
Laboratory Analysis [1]						
Volatile Organic Compounds	SMWU 8 only	SW-846 8260B (25 mL purge) LTL-8265 (low level)	Glass, black phenolic plastic screw cap, Teflon-lined septum	Three 40 mL	Cool to 4 °C, dark, zero headspace, HCl to pH <2	14 days to analysis.

1 For parameter lists for PCBs and VOCs, see the SWMU 8 and 15 QAPP, Table 1-5. That table also has target detection and quantitation limits.

2 All laboratory holding times are from date of collection; field analysis holding times are from time of collection. Laboratory anlaysis will be 1-day turnaround.

°C - Degrees Celsius
HCl - Hydrochloric acid.
LTL - Laucks Testing Laboratories, Inc.
mL - Milliliter.
PCBs - Polychlorinated biphenyls.
SW-846 - U.S. EPA, 1986. Test methods for Evaluating Solid Wastes, Physical/Chemical Methods. SW-846, Third Edition and subsequent updates.

TABLE 3-3

VERIFICATION SAMPLE LOCATIONS FOR SWMU 7 EXCAVATION FLOOR AND SIDE WALL SAMPLES
SWMUs 7, 8, 13, AND 17 INTERIM MEASURES
NSWC CRANE, CRANE, INDIANA

Set #1 - Excavation Floor and Interim Measures Support Facility Composite Samples for SWMUs 7, 13, and 17

Sample Rotation	Grid Location		Sample Rotation	Grid Location		Sample Rotation	Grid Location		Sample Rotation	Grid Location	
	X %	Y %		X %	Y %		X %	Y %		X %	Y %
Sample 1	93	80	Sample 6	19	61	Sample 11	5	62	Sample 16	28	53
	80	27		93	93		21	33		76	43
	61	69		76	13		57	17		6	56
	7	66		52	20		48	90		53	91
Sample 2	89	69	Sample 7	99	4	Sample 12	13	2	Sample 17	43	85
	67	53		35	5		78	62		16	91
	38	34		51	3		88	78		73	92
	63	67		92	22		53	96		37	5
Sample 3	30	70	Sample 8	39	65	Sample 13	92	54	Sample 18	34	34
	74	70		12	10		90	97		49	2
	23	30		83	56		41	57		45	18
	36	40		73	73		26	88		5	18
Sample 4	66	98	Sample 9	35	87	Sample 14	34	5	Sample 19	29	42
	70	92		34	64		35	5		46	88
	25	42		42	25		82	68		86	64
	69	40		51	29		54	95		35	21
Sample 5	76	44	Sample 10	59	1	Sample 15	82	79	Sample 20	28	42
	96	49		52	63		2	40		17	8
	0	14		18	20		50	91		19	27
	69	73		50	58		11	68		56	1

Notes: 1) For SWMU 17, where excavtion floor is bedrock, no verification sample will be collected.
2) One verification sample will be collected for every 100 feet of access road/trail length.

Set #2 - Excavation Wall / Bank Composite Samples for SWMUs 7, 13, and 17

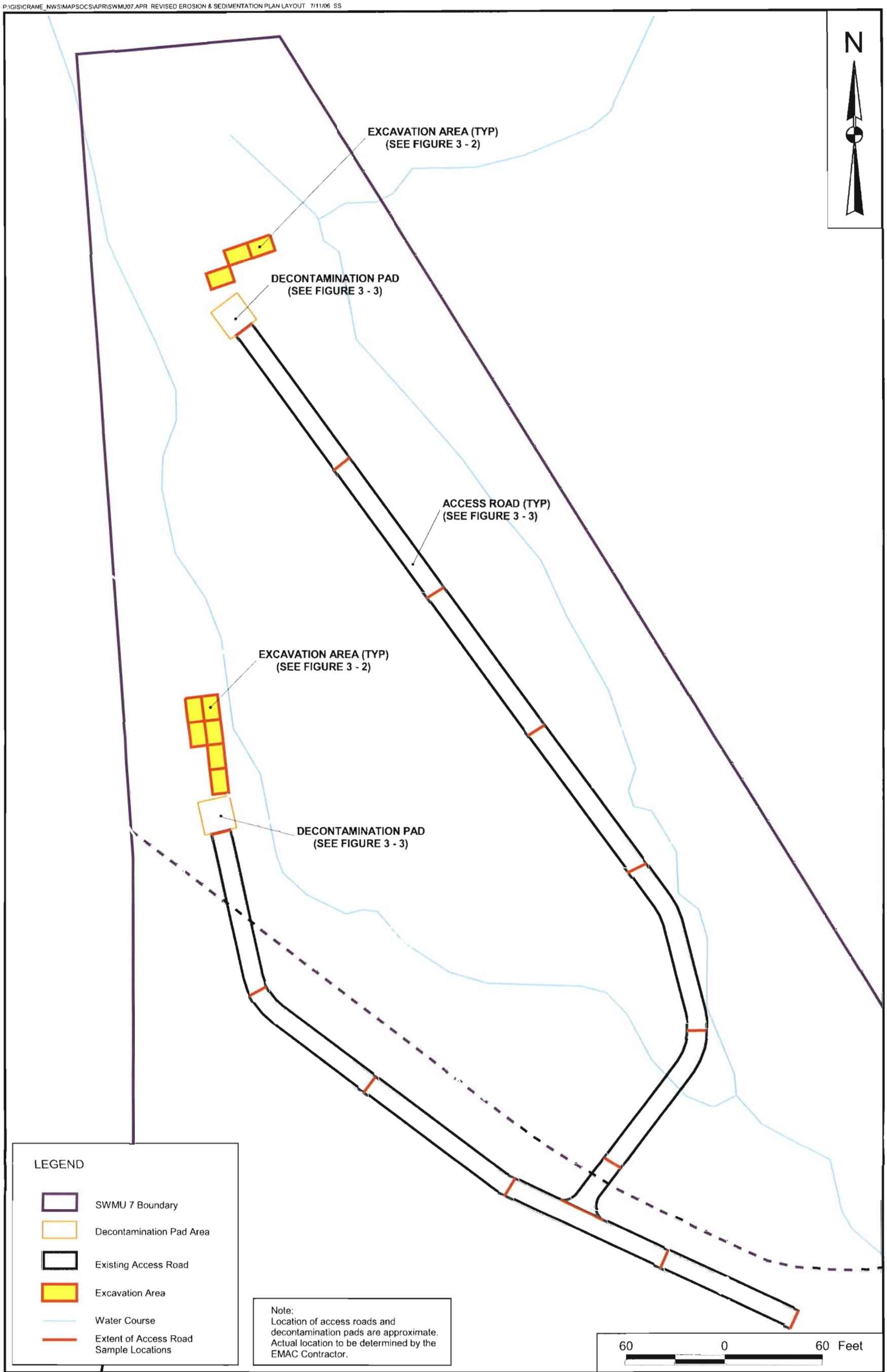
Sample Rotation	Grid Location		Sample Rotation	Grid Location		Sample Rotation	Grid Location		Sample Rotation	Grid Location	
	X %	Y %		X %	Y %		X %	Y %		X %	Y %
Sample 1	17	8	Sample 6	23	30	Sample 11	46	85	Sample 16	90	25
	5	15		90	19		9	32		56	76
Sample 2	67	83	Sample 7	83	51	Sample 12	26	52	Sample 17	85	62
	30	58		67	12		66	52		16	82
Sample 3	55	12	Sample 8	87	23	Sample 13	63	81	Sample 18	48	96
	89	77		66	29		66	74		23	74
Sample 4	51	8	Sample 9	82	95	Sample 14	51	92	Sample 19	48	92
	66	57		64	36		53	9		89	13
Sample 5	17	64	Sample 10	1	2	Sample 15	93	79	Sample 20	17	91
	45	56		30	98		81	41		63	71

Set #3 - Excavation Wall and Interim Measures Support Facility Grab Samples for SWMU 8

Sample Rotation	Grid Location		Sample Rotation	Grid Location		Sample Rotation	Grid Location		Sample Rotation	Grid Location	
	X %	Y %		X %	Y %		X %	Y %		X %	Y %
Sample 1	19	86	Sample 6	10	97	Sample 11	48	76	Sample 16	74	41
Sample 2	72	73	Sample 7	91	64	Sample 12	83	28	Sample 17	31	37
Sample 3	16	61	Sample 8	72	21	Sample 13	45	10	Sample 18	15	0
Sample 4	77	61	Sample 9	95	19	Sample 14	48	97	Sample 19	64	95
Sample 5	32	8	Sample 10	16	45	Sample 15	6	19	Sample 20	87	63

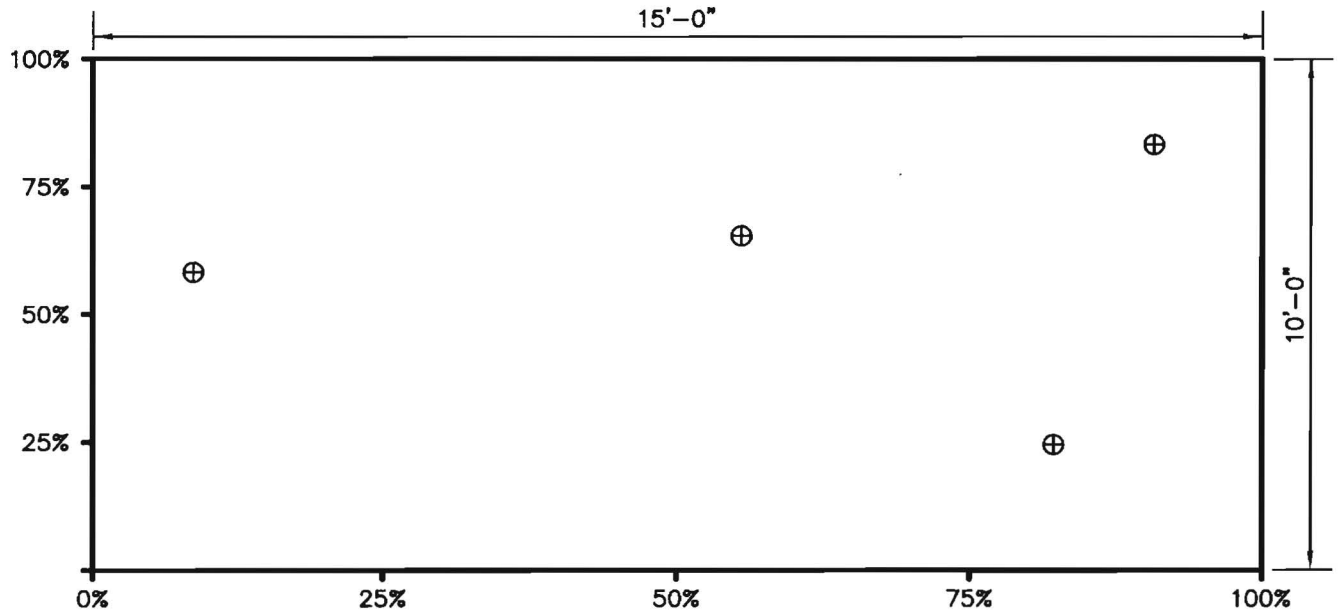
Notes: 1) For SWMU 8, because excavtion floor will be bedrock, no verification sample will be collected on the excavation floor.
2) One verification sample will be collected at a rate of one verification samples per 500 square feet of support facility eatablised, and at a rate of one verification sample per 25 feet of access road.

P:\GIS\CRANE_NWS\MAPSOCS\APR\SWMU07.APR REVISED EROSION & SEDIMENTATION PLAN LAYOUT 7/11/06 SS

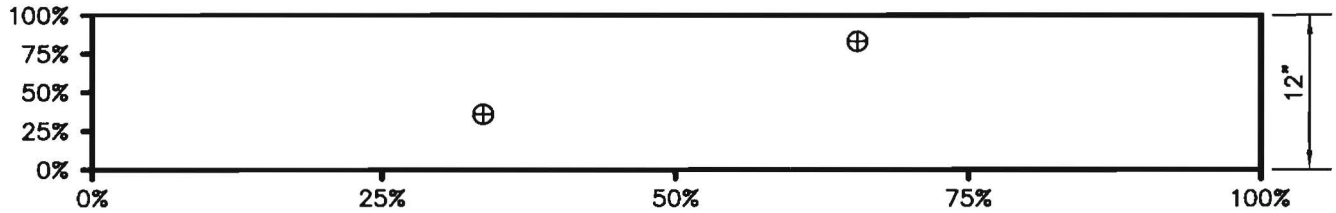


DRAWN BY S. STROZ	DATE 6/15/06	SWMU 7 - VERIFICATION SAMPLING - EXCAVATION AREAS AND SUPPORT FACILITIES INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NUMBER CTO 0020
CHECKED BY T. SMITH	DATE 7/11/06		APPROVED BY — DATE —
COST/SCHEDULE-AREA			APPROVED BY — DATE —
SCALE AS NOTED	NAVFAC		DRAWING NO. FIGURE 3 - 1 / REV 0

ACAD: 0352CP01.dwg 07/12/06 DT PIT



TYPICAL SWMU 7 EXCAVATION FLOOR
LOCATIONS REPRESENT SAMPLE 1, SET 1, ON TABLE 3-3



TYPICAL SWMU 7 EXCAVATION SIDE WALL
LOCATIONS REPRESENT SAMPLE 2, SET 2, ON TABLE 3-3

LEGEND:

⊕ ALIQUOT SAMPLE LOCATION

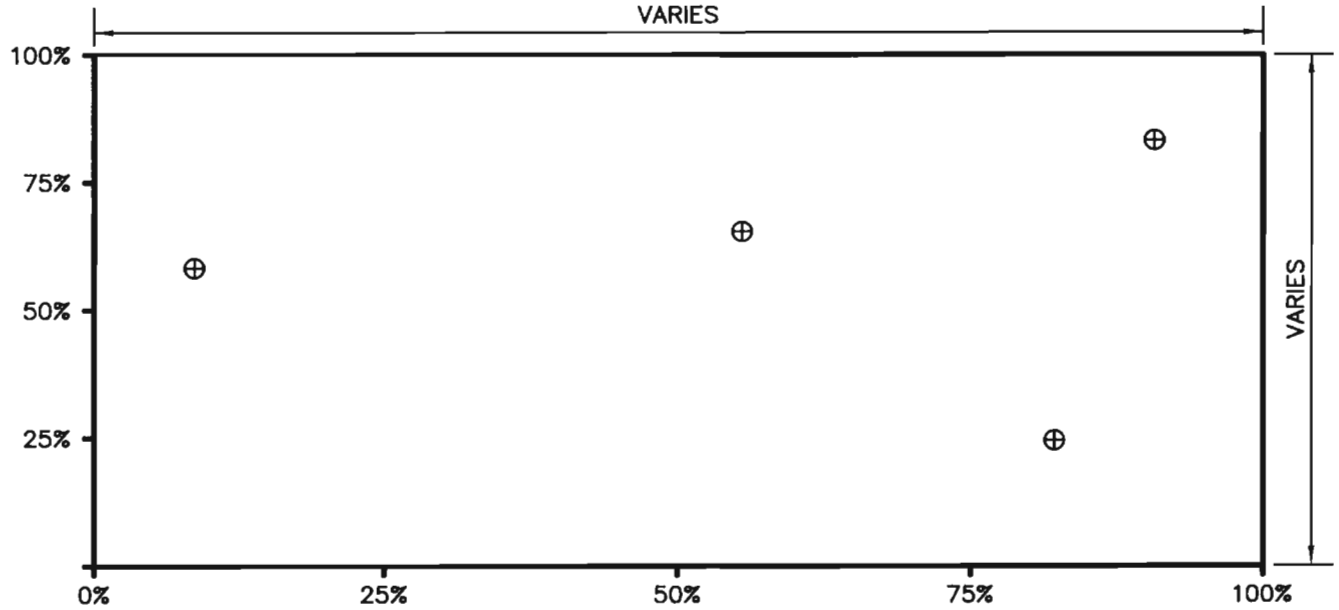
0% PERCENT DISTANCE ALONG EXPOSED SURFACE

DRAWN BY MF	DATE 6/6/06	SWMU 7 EXCAVATION VERIFICATION SAMPLE LOCATIONS EXAMPLE INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-2 / REV. 0

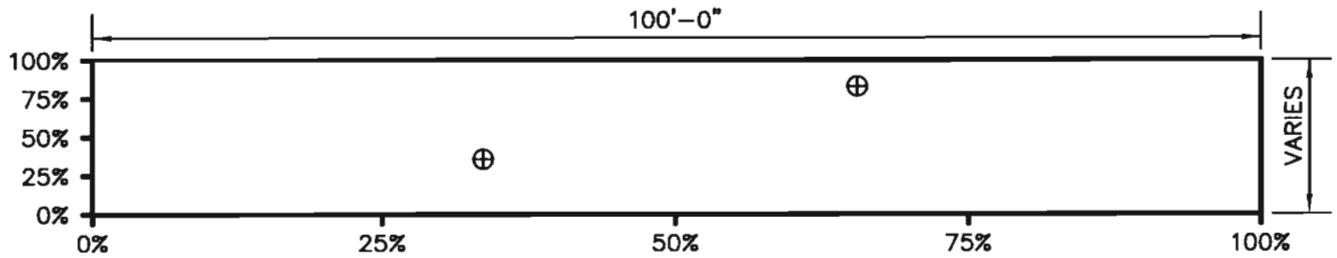
NAVFAC

FORM CADD NO. SDIV-AH.DWG - REV 1 - 9/10/98

ACAD: 0352CP02.dwg 07/12/06 DT PIT



TYPICAL SUPPORT FACILITY (DECON PAD, MATERIALS STORAGE AREA, DEWATERING PAD)
LOCATIONS REPRESENT SAMPLE 1, SET 1, ON TABLE 3-3



TYPICAL SITE ACCESS ROAD/TRAIL
LOCATIONS REPRESENT SAMPLE 2, SET 2, ON TABLE 3-3

LEGEND:

⊕ ALIQUOT SAMPLE LOCATION

0% PERCENT DISTANCE ALONG EXPOSED SURFACE

DRAWN BY MF	DATE 6/6/06	SWMU 7 INTERIM MEASURES SUPPORT FACILITY COMPOSITE SAMPLING EXAMPLE INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-3 / REV. 0

NAVFAC

FORM CADD NO. SDIV-AH.DWG – REV 1 – 9/10/98

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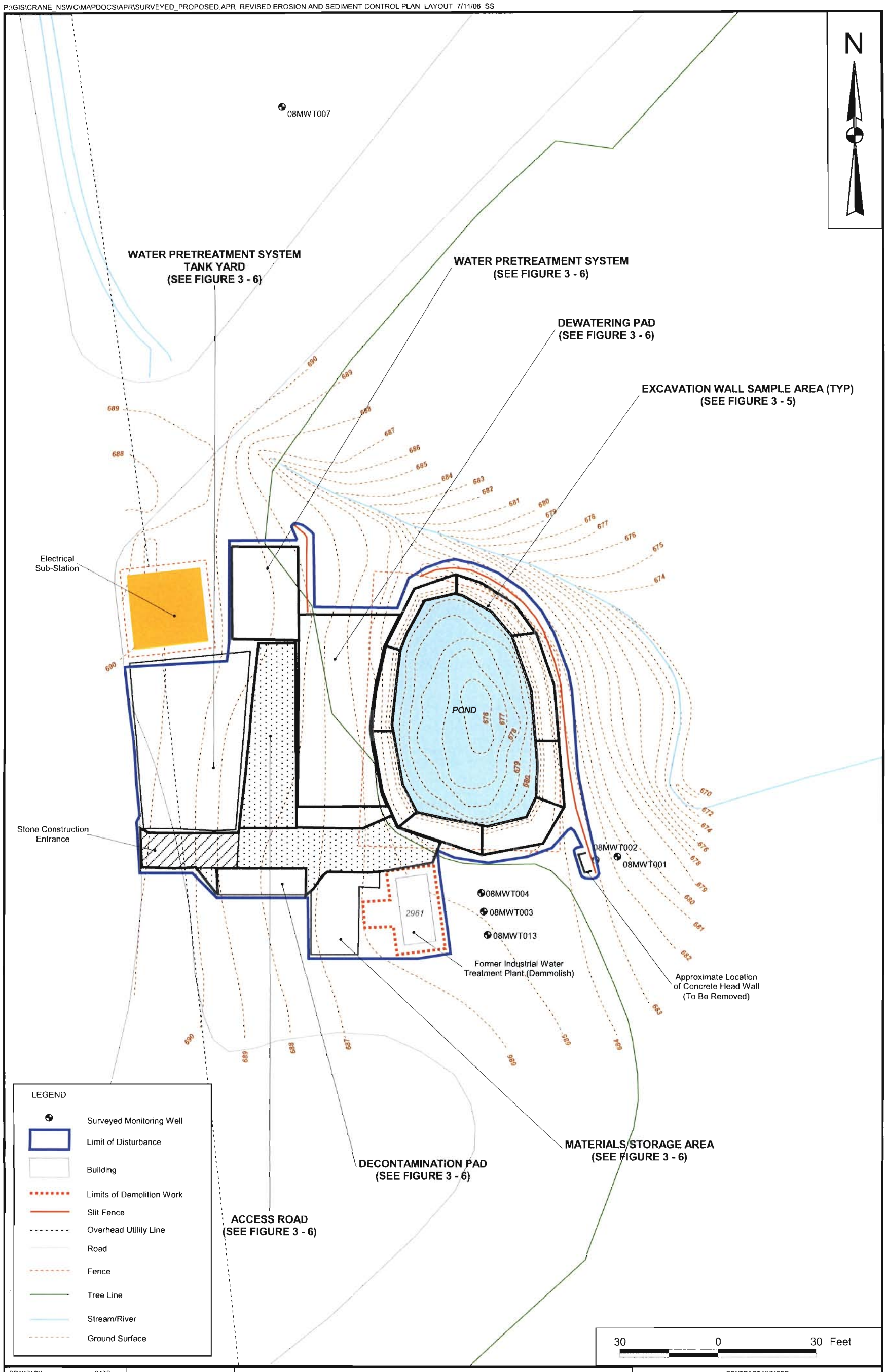


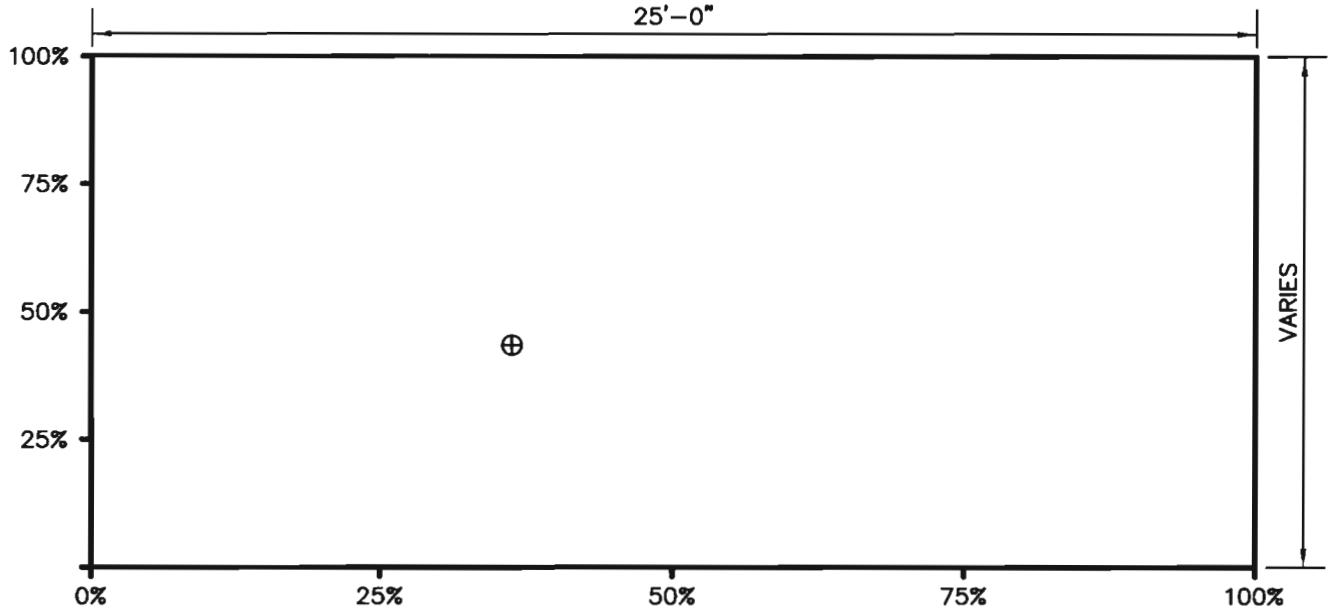
DRAWN BY	DATE
S. STROZ	6/14/06
CHECKED BY	DATE
T. JOHNSTON	7/11/06
COST/SCHEDULE-AREA	
SCALE AS NOTED	

NAVFAC

SWMU 8 VERIFICATION SAMPLING - EXCAVATION
AREAS AND SUPPORT FACILITIES
INTERIM MEASURES QAPP ADDENDUM NO. 1
NSWC CRANE
CRANE, INDIANA

CONTRACT NUMBER	
CTO 0020	
APPROVED BY	DATE
APPROVED BY	DATE
DRAWING NO. FIGURE 3 - 4	REV 0

ACAD: 0352CP03.dwg 06/12/06 MF PIT



SWMU 8 POND EXCAVATION WALL
(TYPICAL)

LEGEND:

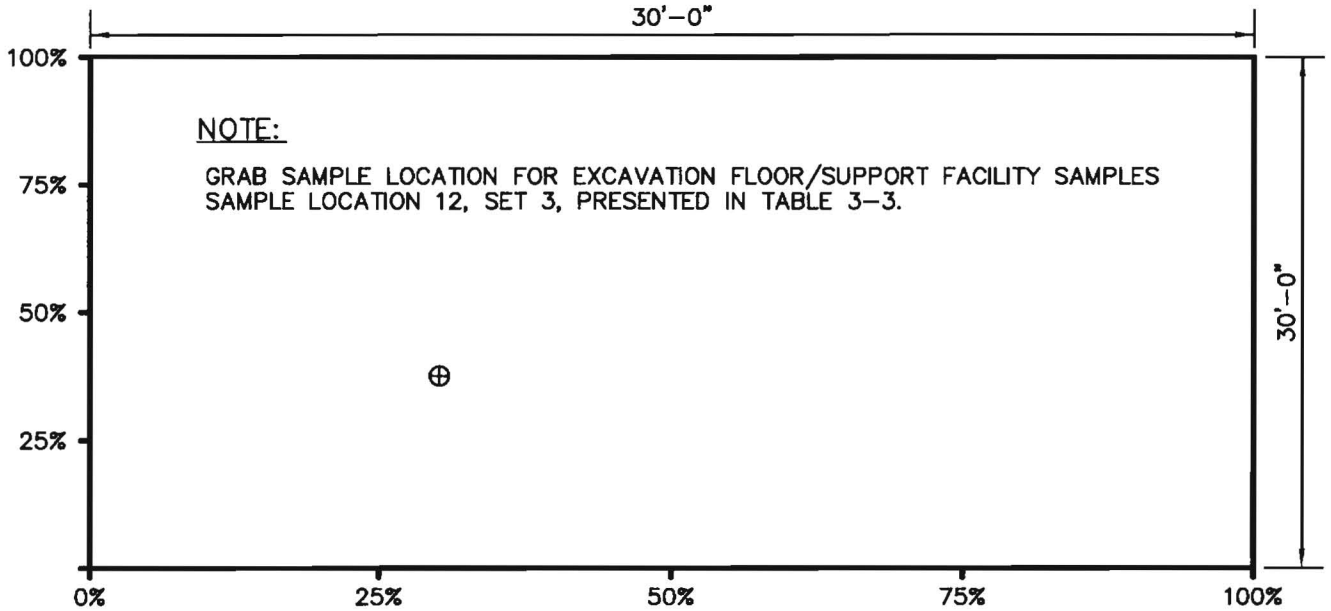
⊕ GRAB SAMPLE LOCATION. LOCATIONS PRESENTED IDENTIFY THE SAMPLE LOCATIONS FOR EXCAVATION WALL SAMPLE LOCATION 17, SET 3, PRESENTED IN TABLE 3-3

0% PERCENT DISTANCE ALONG EXPOSED SURFACE.

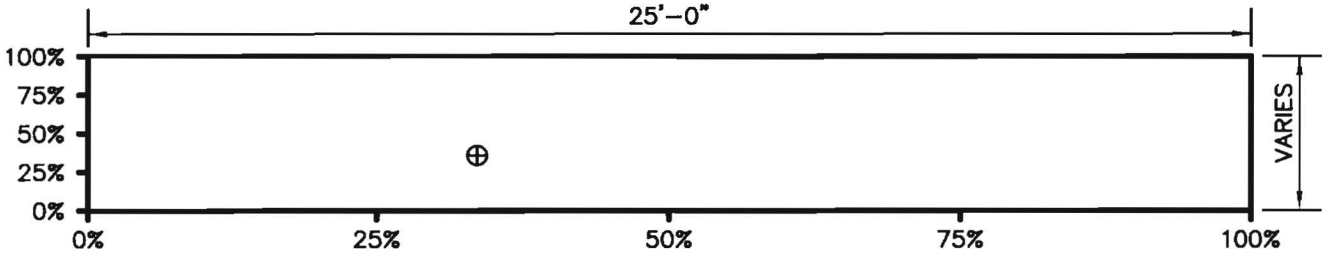
DRAWN BY MF	DATE 6/6/06	SWMU 8 INTERIM MEASURES EXCAVATION SIDEWALL VERIFICATION SAMPLE LOCATIONS INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-5 / REV. 0

FORM CADD NO. SDIV-AH.DWG – REV 1 – 9/10/98

ACAD: 0352CP04.dwg 07/12/06 DT PIT



TYPICAL SUPPORT FACILITY (DECON PAD, MATERIALS STORAGE AREA, DEWATERING PAD OR WATER PRETREATMENT
(ONE GRAB FOR EVERY 500 FT^2)



TYPICAL SIGHT ACCESS ROAD

LEGEND:

⊕ GRAB SAMPLE LOCATION (SEE NOTE)

0% PERCENT DISTANCE ALONG EXPOSED SURFACE

DRAWN BY MF	DATE 6/6/06	SWMU 8 INTERIM MEASURES SUPPORT FACILITY COMPOSITE SAMPLING EXAMPLE INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-6 / REV. 0

FORM CADD NO. SDIV-AH.DWG – REV 1 – 9/10/98

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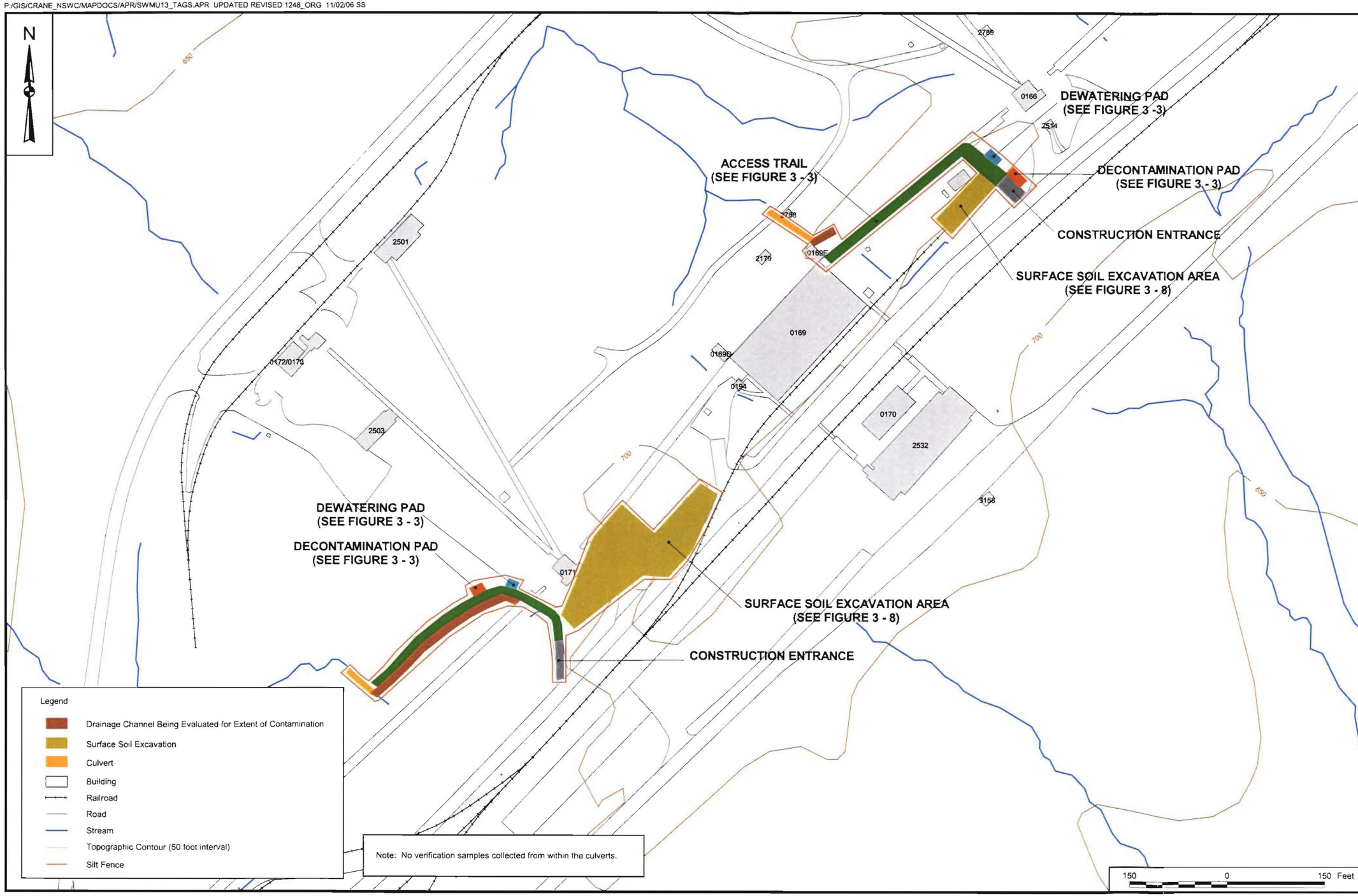


CONTRACT NO. 0020

APPROVED BY ___ DATE ___

APPROVED BY ___ DATE ___

DRAWING NO. FIGURE 3 - 7

REV 0

VERIFICATION SAMPLING - EXCAVATION AREAS AND SUPPORT FACILITIES
SWMU 13 - MINE FILL B
INTERIM MEASURES QAPP ADDENDUM NO. 1
NSWC CRANE
CRANE, INDIANA

NAVFAC

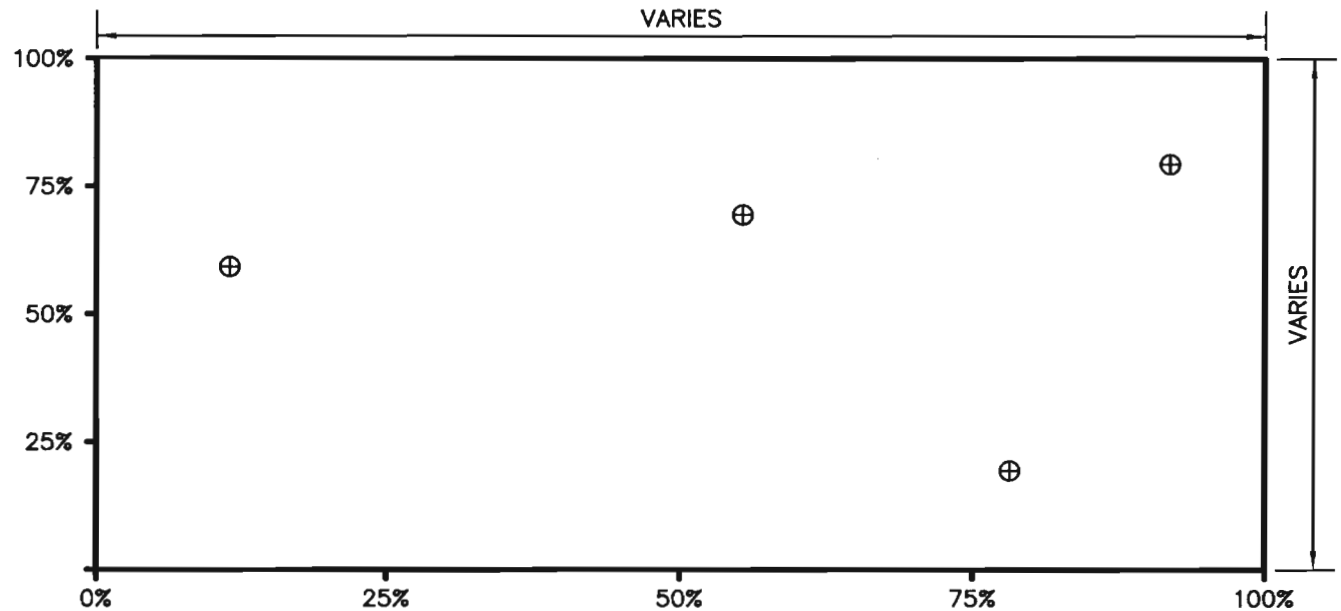
DRAWN BY S. STROZ DATE 7/12/06

CHECKED BY V. PLACHY DATE 11/02/06

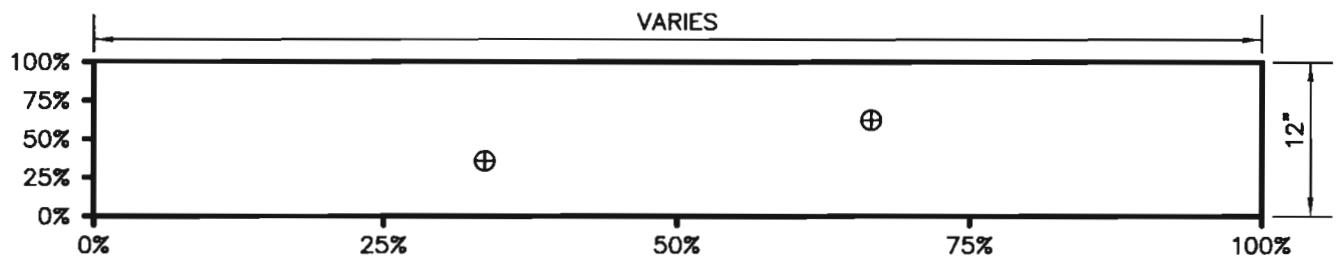
COST/SCHED-AREA

SCALE AS NOTED

ACAD: 0352CP05.dwg 06/12/06 MF PIT



TYPICAL SWMU 13 EXCAVATION FLOOR
LOCATION REPRESENTS SAMPLE 1, SET 1, ON TABLE 3-3



TYPICAL SWMU 13 EXCAVATION SIDEWALL
LOCATION REPRESENTS SAMPLE 2, SET 2, ON TABLE 3-3

LEGEND:

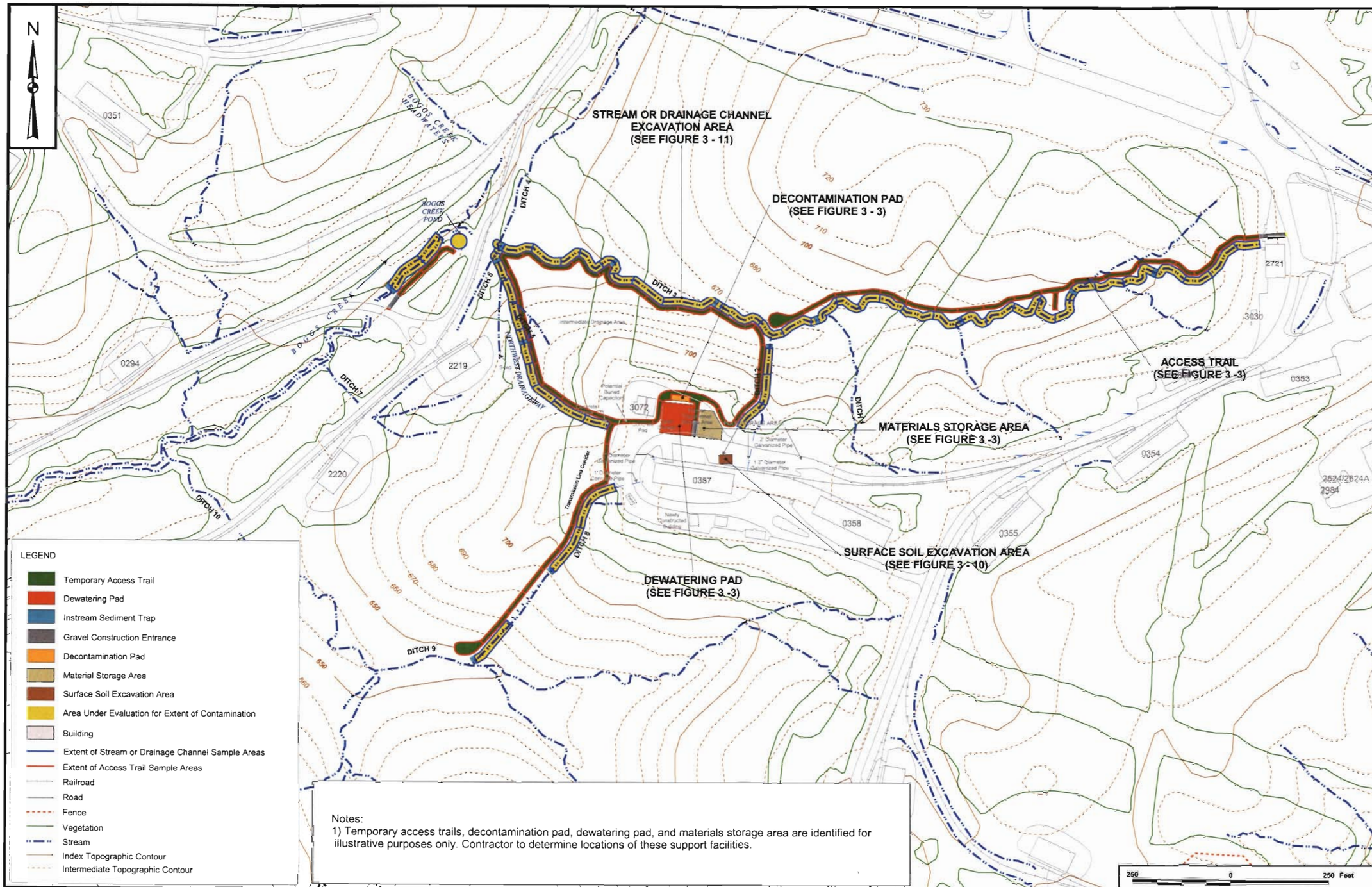
⊕ ALIQUOT SAMPLE LOCATION

0% PERCENT DISTANCE ALONG EXPOSED SURFACE

DRAWN BY MF	DATE 6/6/06	SWMU 13 INTERIM MEASURES EXCAVATION VERIFICATION SAMPLE LOCATIONS EXAMPLE INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-8 / REV. 0

NAVFAC

FORM CADD NO. SDIV-AH.DWG - REV 1 - 9/10/98



Notes:
1) Temporary access trails, decontamination pad, dewatering pad, and materials storage area are identified for illustrative purposes only. Contractor to determine locations of these support facilities.

CONTRACT NO. 0020

APPROVED BY ____ DATE ____

APPROVED BY ____ DATE ____

DRAWING NO. FIGURE 3 - 9 REV 0

SWMU 17 VERIFICATION SAMPLING - EXCAVATION AREAS AND SUPPORT FACILITIES
INTERIM MEASURES QAPP ADDENDUM NO. 1
NSWC, CRANE
CRANE, INDIANA

NAVFAC

DRAWN BY S. STROZ DATE 6/19/06

CHECKED BY V. PLACHY DATE 11/02/06

COST/SCHED-AREA

SCALE AS NOTED

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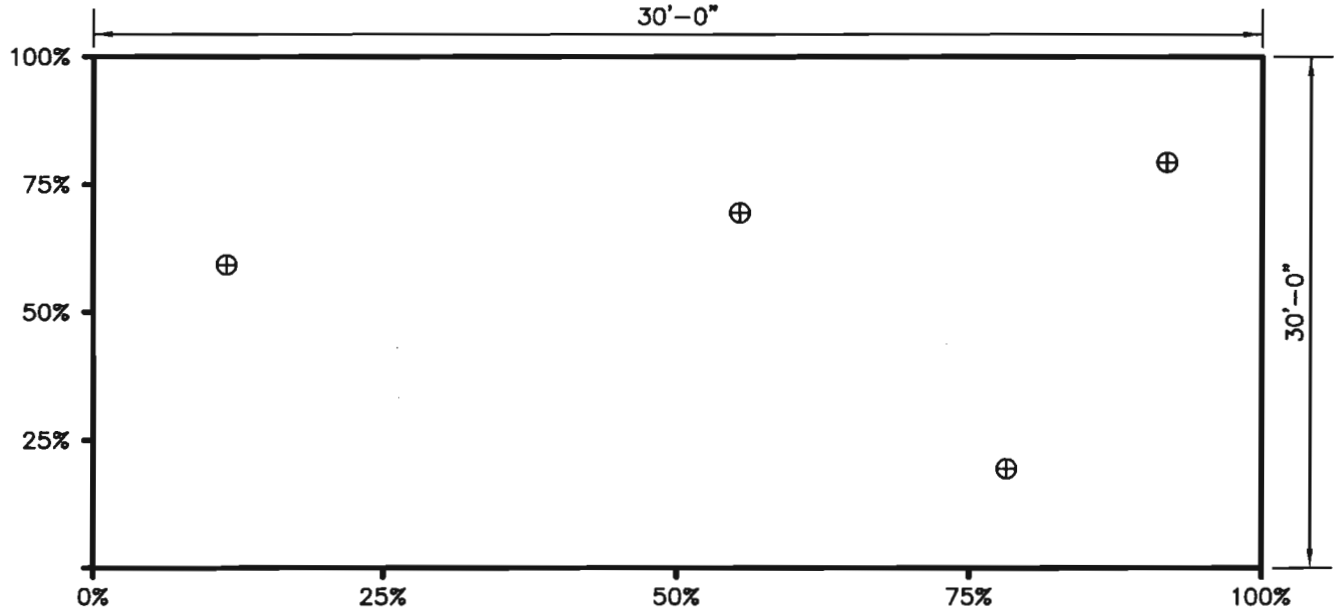
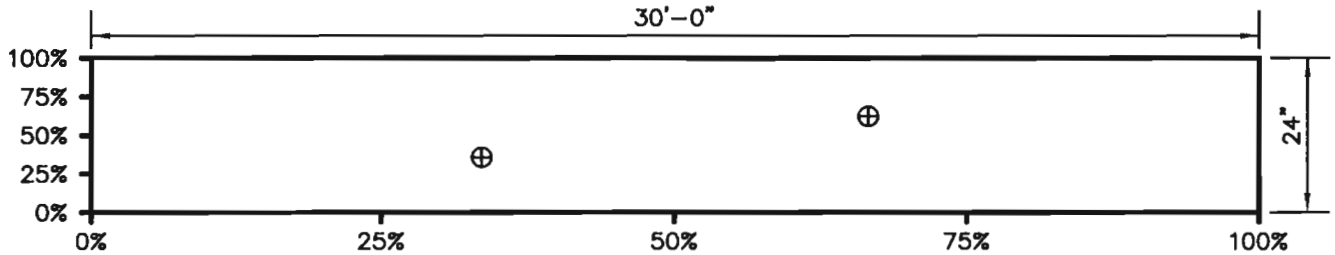
ACAD: 0352CP06.dwg 06/12/06 MF PIT



SWMU 17 SURFACE SOIL EXCAVATION AREA EXCAVATION FLOOR
LOCATION REPRESENTS SAMPLE 1, SET 1, ON TABLE 3-3



SWMU 17 SURFACE SOIL EXCAVATION AREA EXCAVATION SIDEWALL
LOCATION REPRESENTS SAMPLE 2, SET 2, ON TABLE 3-3

LEGEND:

⊕ ALIQUOT SAMPLE LOCATION

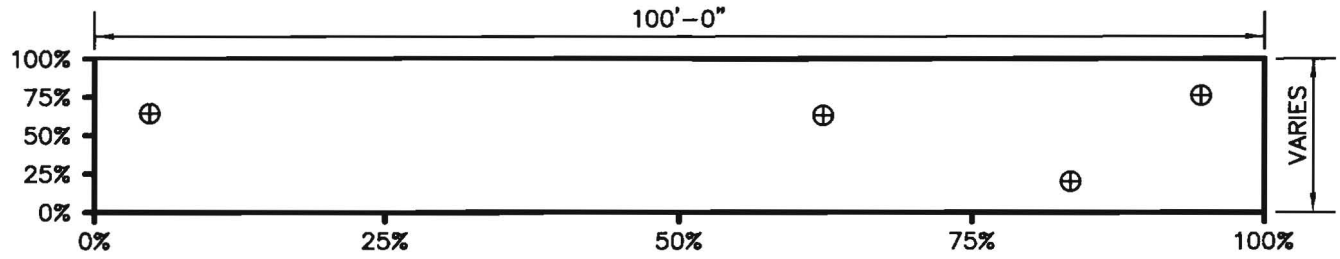
0% PERCENT DISTANCE ALONG EXPOSED SURFACE

DRAWN BY MF	DATE 6/6/06	SWMU 17 SURFACE SOIL EXCAVATION AREA VERIFICATION SAMPLE LOCATIONS INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-10 / REV. 0

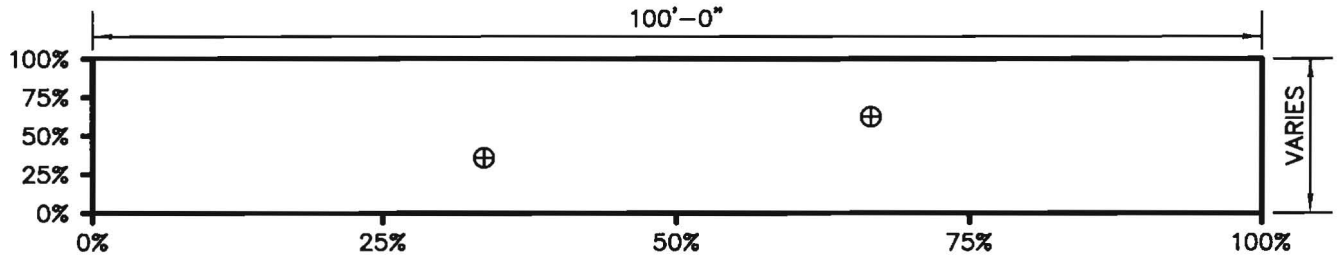
NAVFAC

FORM CADD NO. SDIV-AH.DWG - REV 1 - 9/10/98

ACAD: 0352CP07.dwg 06/12/06 MF PIT



SWMU 17 STREAM OR DRAINAGE CHANNEL BED
LOCATION REPRESENTS SAMPLE 1, SET 1, ON TABLE 3-3



SWMU 17 STREAM OR DRAINAGE CHANNEL BANK
LOCATION REPRESENTS SAMPLE 2, SET 2, ON TABLE 3-3

LEGEND:

⊕ ALIQUOT SAMPLE LOCATION

0% PERCENT DISTANCE ALONG EXPOSED SURFACE

DRAWN BY MF	DATE 6/6/06	SWMU 17 STREAM AND DRAINAGE CHANNEL VERIFICATION SAMPLE LOCATIONS INTERIM MEASURES QAPP ADDENDUM NO. 1 NSWC CRANE CRANE, INDIANA	CONTRACT NO. 0352
CHECKED BY	DATE		OWNER NO.
REVISED BY	DATE		APPROVED BY / DATE
SCALE NONE			DRAWING NO. FIGURE 3-11 / REV. 0

NAVFAC

FORM CADD NO. SDIV-AH.DWG – REV 1 – 9/10/98

FIGURE 3-12

FIELD TASK MODIFICATION REQUEST FORM

Project/Installation Name _____ CTO & Project Number _____ Task Mod. Number _____

Modification To (e.g. Work Plan) _____ Site/Sample Location _____ Date _____

Activity Description: _____

Reason for Change: _____

Recommended Disposition: _____

Field Operations Leader (Signature) _____ Date _____

Approved Disposition:

Project/Task Order Manager (Signature) _____ Date _____

Distribution:

Program/Project File –
Project/Task Order Manager –
Field Operations Leader –

Other: _____

4.0 LABORATORY OPERATIONS AND DATA REDUCTION, REVIEW, AND MANAGEMENT

4.1 SAMPLE CUSTODY PROCEDURES

Samples will be labeled and shipped to the analytical laboratory in accordance with Section 3.0 of this document. Laboratory-specific custody procedures are governed by Section 4.0 of the SWMUs 8 and 15 QAPP (TtNUS, 2004).

4.2 LABORATORY INSTRUMENT CALIBRATION PROCEDURES AND FREQUENCIES

Refer to Section 5.2 of the SWMUs 8 and 15 QAPP (TtNUS, 2004) for laboratory calibration requirements. Only requirements for lead, PCB (as Aroclors) and VOC analyses will be applicable.

4.3 LABORATORY ANALYTICAL AND MEASUREMENT PROCEDURES

4.3.1 Confirmation Sample Analyses

The laboratory analyses of confirmation samples will be performed by Laucks Testing Laboratories. Laucks Testing Laboratories has successfully completed the laboratory evaluation process required as part of the Naval Facilities Engineering Services Command (NFESC) QA Program and described in the Navy Installation Restoration Laboratory Quality Assurance Guide (NFESC, 1996). Tables 3-1 and 3-2 provide a summary of the laboratory analytical methods and associated laboratory SOPs to be used during this investigation. Laboratory SOPs are included in Appendix B.

4.3.2 Waste Characterization Analyses

Waste characterization analysis requirements will be established when the waste disposal facility is identified.

4.3.3 List of Project Target Compounds and Detection Limits

A list of the laboratory target analytes and laboratory-specific target values (TVs) for organic compounds, instrument detection limits (IDLs) for metals, and reporting limits (RLs) for all applicable analytes is provided in Table 1-5 of the SWMUs 8 and 15 QAPP (TtNUS, 2004). Tables 3-1 and 3-2 of this QAPP Addendum No. 1 identify the analyses to be conducted. The analytical fractions (i.e., VOCs, PCBs) and lead correspond to the same entries in Table 1-5 of TtNUS (2004).

4.4 LABORATORY QUALITY CONTROL CHECKS

Descriptions of various data quality indicators and the types of laboratory QC samples used to measure or verify data quality indicators (DQIs) are presented in Sections 7.0 through 7.5 of SWMUs 8 and 15 QAPP (TtNUS, 2004). Requirements for laboratory QC checks are presented in Section 7.8 of TtNUS (2004). A list of the applicable non-calibration QC requirements for confirmation sample analyses is presented in Table 4-1 of this QAPP Addendum No. 1.

4.5 DATA REDUCTION, VALIDATION, ASSESSMENT, AND REPORTING

Refer to Section 8.0 of the SWMU 8 and 15 QAPP (TtNUS, 2004) for laboratory-specific requirements. Section 8.0 of TtNUS (2004) also identifies requirements for reconciling data against DQOs.

4.6 LABORATORY PERFORMANCE AND SYSTEM AUDITS

4.6.1 Confirmation Analyses

Laboratory performance and system audit requirements are presented in Section 9.2 of the SMWUs 8 and 15 QAPP (TtNUS, 2004) for confirmation analyses.

4.6.2 Waste Characterization

These requirements will be established when the waste disposal facility is identified.

4.7 LABORATORY INSTRUMENT PREVENTIVE MAINTENANCE

Proper maintenance of laboratory instruments and equipment is essential. Depending on manufacturers' recommendations, maintenance intervals are established for each instrument. All instruments will be labeled with a model number and serial number, and a maintenance logbook will be maintained for each instrument. Personnel will be alert to the maintenance status of the equipment they are using at all times.

4.7.1 Confirmation Analysis

Refer to Section 10.2 of TtNUS (2004) for specific preventive maintenance requirements related to confirmation sampling.

4.7.2 Waste Characterization

Preventive maintenance requirements for waste characterization sampling will be particular to the laboratory performing those analyses and shall be designed to ensure that laboratory equipment is operating correctly and available for conducting the required analyses within the required time frames. These requirements will be established when the waste disposal characterization requirements are established.

4.8 LABORATORY CORRECTIVE ACTION

In general, laboratory corrective actions are warranted whenever an out-of-control event or potential out-of-control event is noted. The specific corrective action taken depends on the specific analysis and the nature of the event. Generally, the following occurrences alert laboratory personnel that corrective action may be necessary:

- QC data are outside established warning or control limits
- Method blank analyses yield concentrations of target analytes greater than acceptable levels
- Undesirable trends are detected in spike percent recoveries (%Rs) or in duplicate RPDs
- There is an unexplained change in compound detection capability
- Inquiries concerning data quality are received
- Deficiencies are detected by laboratory QA staff during audits or from performance evaluation (PE) sample test results

4.8.1 Corrective Action Documentation

Specific procedures for laboratory corrective actions are specified in the associated laboratory SOPs. Any corrective action taken above the analyst level that cannot be performed immediately at the instrument will be documented.

Laboratory corrective actions must be documented and included as part of the final evidence file. The TtNUS TOM will be informed of all major corrective actions that do not bring DQO-related nonconformances into conformance with project DQOs. The TtNUS TOM will advise all levels of project management in accordance with Section 12.0 of the SWMU 8s and 15 QAPP (TtNUS, 2004).

4.9.2 Corrective Action During Data Validation and Data Assessment

The need for corrective action may become apparent during data validation, interpretation, or presentation activities. Rework (i.e., resampling or reanalysis), a change in work procedures, or additional or refresher training are possible corrective actions relevant to data evaluation activities. The TOM will be responsible for approving the implementation of a corrective action and ensuring that it is documented appropriately for all deficiencies except those that are internal to the EMAC. The EMAC PM will be responsible for the latter corrective actions. Analytical data may be qualified during data validation to alert data users of the potential that particular analytical results are potentially deficient relative to expected performance standards. Such validation practices are described in Section 8.0 of the SWMUs 8 and 15 QAPP (TtNUS, 2004). When conducting data assessment for project decision making, a number of situation-dependent qualifications of data or decisions are possible. The number of possible situations or conditions precludes enumeration of all possible corrective actions; however, the approach used to identify and impose such qualifications is described in Section 8.0 of TtNUS (2004).

4.10 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 Table 12-1 of the SWMUs 8 and 15 QAPP (TtNUS, 2004). In that table, actions associated with the FOL will also apply to the EMAC PM, except for data validation, which will not be done on waste characterization samples.

Data validation reports for confirmation samples will address all major and minor laboratory noncompliances, as well as noted sample matrix effects. In the event that major problems occur with the analytical laboratory (e.g., repeated or extreme holding time exceedances or calibration noncompliances, etc.), the data validation manager will notify the TOM, QAM, PM, technical coordinator, and laboratory services coordinator. Such notifications (if necessary) are typically provided via internal memoranda and are placed in the project file. These reports contain a summary of the noncompliance, a synopsis of the impact on individual projects, and recommendations regarding corrective action and compensation adjustments. Corrective actions for major noncompliances are initiated at the program level.

The TtNUS FOL will provide the TtNUS TOM and the EMAC FOL will provide the EMAC PM with daily verbal field progress reports during the course of the sampling events. These reports will explain accomplishments, deviations from the QAPP, and upcoming activities, and will provide a QA summary.

The TOM and EMAC PM will provide a monthly progress report to the Navy that addresses the project budget, schedule, accomplishments, planned activities, and QA/QC issues and intended corrective actions.

The analytical laboratory for confirmation analyses will provide QA reports to TtNUS if QC limits are updated or if other significant plan deviations result from unanticipated circumstances. Because method detection limits (MDLs) will be included in the analytical data packages for confirmation and waste characterization samples, it is not necessary for the laboratories to include updated MDLs in their QA reports unless the updates result in MDLs that exceed cleanup levels or waste acceptance criteria applicable to this project. Cleanup levels are provided in the applicable IMWPs (TtNUS 2006a through 2006d); waste acceptance criteria will be provided by the waste disposal facility.

4.11 FINAL EVIDENCE FILES

Refer to Section 4.3 of the SWMUs 8 and 15 QAPP (TtNUS, 2004) for requirements governing the management of project records up to and including final disposition.

TABLE 4-1

NON-CALIBRATION QC SAMPLE USAGE FREQUENCIES, ACCEPTANCE LIMITS, AND CORRECTIVE ACTIONS INTERIM MEASURES FOR SWMUs 7, 8, 13, AND 17 NSWC CRANE, CRANE, INDIANA

QC Sample Type	Collection Frequency	Acceptance Limits	Corrective Action
Field Duplicate	One per 20 investigative samples collected.	Aqueous = NA Soil/Sediment = 70% RPD	Qualify data according to data validation requirements.
Equipment Rinsate Blank	NA	NA	NA
Source Water Blank	NA	NA	NA
Ambient Condition Blank	NA	NA	NA
Trip Blank	One per cooler containing samples shipped to laboratory for volatile organics analysis.	< RL (soil and water)	Identify source of volatiles contamination, if possible. Qualify data according to validation requirements. Qualify use of data if contamination appears to have adversely affected its usability.
Internal Standard	At least one internal standard per sample for GC/MS analyses	Retention times stable to ±30 seconds; area counts stable to within factor of 2	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols, and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).
Laboratory Control Sample	One per 20 environmental samples per matrix per analytical fraction	See Tables 7-1 and 7-2 of TtNUS (2004)	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).
Laboratory Duplicate	One per 20 environmental samples analyzed for inorganic target analytes	See Table 7-1 of TtNUS (2004)	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).
Laboratory Method Blank	One 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 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).
Matrix Spike(1)	One per analytical fraction per 20 environmental samples for organic target analytes	See Table 7-2 of TtNUS (2004)	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).

TABLE 4-1

NON-CALIBRATION QC SAMPLE USAGE FREQUENCIES, ACCEPTANCE LIMITS, AND CORRECTIVE ACTIONS
INTERIM MEASURES FOR SWMUs 7, 8, 13, AND 17
NSWC CRANE, CRANE, INDIANA

QC Sample Type	Collection Frequency	Acceptance Limits	Corrective Action
Matrix Spike Duplicate(1)	One per analytical fraction per 20 environmental samples analyzed for organic target analytes	See Table 7-1 of TtNUS (2004)	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).
Surrogate	At least one per sample for organic chromatographic analyses (GC, GC/MS, and HPLC)	See Table 7-2 of TtNUS (2004)	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).
Temperature Blank	One blank per sample cooler.	4 ± 2 °C	Laboratory action taken per LTL-1008. TtNUS action taken per validation protocols and Section 11.3 of SWMUs 8 and 15 QAPP (TtNUS, 2004).

1 Matrix spikes 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.

GC/MS - Gas chromatography/mass spectrometry.
°C - Degrees Celsius.
HPCL - High-performance liquid chromatography.
NA - Not applicable.
RL - Reporting limit.
RPD Relative percent difference.

5.0 REFERENCES

NFESC (Naval Facilities Engineering Services Center), 1996. Navy Installation Restoration Laboratory Quality Assurance Guide.

TtNUS, 2004. Quality Assurance Project Plan for RCRA Facility Investigation at Building 106 Pond (SWMU 8) Roads and Grounds Area (SWMU 15) and Environmental Indicator Investigation for SWMU 18 (Load and Fill Area Buildings), SWMU 19 (Pyrotechnic Test Area), SWMU 20 (Crane Army Ammunition Activity Quality Assurance/Quality Control Test Area), and the Old Gun Tub Storage Lot, September.

TtNUS, 2005. Resource Conservation and Recovery Act Facility Investigation Report for Mine Fill B (SWMU 13) Naval Surface Warfare CenterCrane, Crane, Indiana Southern DivisionNaval Facilities Engineering Command, July.

TtNUS, 2006a. Interim Measures Work Plan for SWMU 7 - Old Rifle Range Old Pistol Range Site, Naval Surface Warfare Center Crane, Crane, Indiana, April.

TtNUS, 2006b. Interim Measures Work Plan for SWMU 8 - Building 106 Pond Naval Surface Warfare Center Crane Crane, Indiana, May.

TtNUS, 2006c. Interim Measures Work Plan for SWMU 13 - Mine Fill B Naval Surface Warfare Center Crane Crane, Indiana

TtNUS, 2006d. Interim Measures Work Plan for SWMU 17 - PCB Capacitor Burial/Pole Yard Naval Surface Warfare Center Crane Crane, Indiana, May.

APPENDIX A

FIELD STANDARD OPERATING PROCEDURES

A.1 TETRA TECH NUS, INC. STANDARD OPERATING PROCEDURES

APPENDIX A.1
FIELD SOP TABLE OF CONTENTS

CTO0020-01	Sample Labeling
CTO0020-02	Sample Identification Nomenclature
CTO0020-03	Sample Custody and Documentation of Field Activities
CTO0020-04	Decontamination of Field Sampling Equipment
CTO0020-05	Soil and Sediment Sampling
CTO0020-06	Sample Preservation, Packaging, and Shipping
CTO0020-07	Field-Portable X-Ray Fluorescence of soil and Sediment Samples
CTO0020-08	Analysis of Total Chlorinated Ethenes in Soil and Groundwater Using the Color-Tec Screening Method
CTO0020-09	Management of Investigation-Derived Waste
CTO0020-10	Field Analysis for PCB by Test Kit

STANDARD OPERATING PROCEDURE
NUMBER CTO0020-09

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 NSWC Crane facility. The following types of IDW will be generated during this investigation:

- Decontamination solutions
- Personal protective equipment and clothing (PPE)
- 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
Wastewater 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 SWMU 8 pond water and decontamination solutions from excavation and sampling equipment. These wastes will be collected and managed in accordance with the IMWPs (TtNUS, 2006 a through 2006d).

3.2 PPE and Incidental Trash

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

STANDARD OPERATING PROCEDURE
NUMBER CTO0020-01

SAMPLE LABELING

1.0 PURPOSE

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

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 prior to field activities.

- Project number (CTO 0020)
- Project location (NSWC Crane)
- Sample ID
- Preservative
- Analysis to be performed

- Matrix type
- Laboratory name

3.2 Preprinted sample labels will be prepared before the team mobilizes to the field. Check to determine if

- One sample label exists for each sample container that is to be collected for all media during the field activities.
- The information printed on each label is correct.
- Extra blank labels 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 should also be brought to the site in case a sample container is broken or some of the preprinted labels are accidentally lost before they are 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 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

ATTACHMENT 1

SAMPLE LABEL

Tetra Tech NUS, Inc. 661 Andersen Drive Pittsburgh, 15220 (412)921-7090	**Project:** **Location:** **CTO:**	
Sample No:		**Matrix:**
Date:	**Time:**	**Preserve:**
Analysis:		
Sampled by:	**Laboratory**	

STANDARD OPERATING PROCEDURE
NUMBER CTO0020-02

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 sample identification

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 Confirmation Samples

All confirmation samples will be properly labeled with a sample label affixed to the sample container. Each sample will be assigned a unique sample tracking number.

3.1.1 Confirmation Sample numbering Scheme

The sample tracking number will consist of an seven-segment alpha-numeric code that identifies the sample's associated solid waste management unit (SWMU), matrix, sample type, location type, location number, a round number for aqueous samples or a depth interval for solid samples and, for aqueous samples, where applicable, whether a sample is filtered. Filtered samples are not expected to be collected for this project but this filtered/unfiltered segment is included in the sample nomenclature to accommodate that need, should it arise.

The alphanumeric coding to be used is explained in the following diagram and subsequent definitions:

NN	**AA**	**AA (indicates sample type)**	**A (Location type)**	**NNN**	**NN Aqueous only**	**A (Soils and Sediment only)**
SWMU Number	Matrix code	Sample Type (C for composite; G for Grab)	F for excavation floor; W for excavation wall, T for tank outlet	Location number	Round Identifier and/or Filtered	Sequential depth interval from freshly exposed surface

IM = interim measures

Character Type:

A = Alpha
N = Numeric

SWMU Number (NN):

07 = Old Pistol Range
08 = Building 106 Pond
13 = Mine Fill B
17 = PCB Pole Yard

Matrix code (AA):

SO = Soil Sample
SD = Sediment Sample
WS = Waste Soil or Sediment
WW = Waste water

Individual aliquots used to form composite samples will be labeled as "A", "B", "C", or "D". Each of the aliquots for a given sample will be recorded in the field log. The number of aliquots combined to form a composite and the locations of the aliquots within the sampled area must be recorded in the "OBSERVATONS/NOTES" section of the Soil and Sediment Sample Log Sheet.

Sample type (AA):

C	=	Composite sample consisting of multiple aliquots blended to form a single mixture
G	=	Grab sample

Location Type (A):

The sample location code is the soil sample location, sediment sample location, or the tank sample location for water samples.

F	=	Excavation floor
T	=	Wastewater collection tank outlet
W	=	Excavation wall

Location number (NNN):

Sequential number beginning with "001" for each type of location (see Location Type).

Round Identifier and/or Filtered:

This code section will be used for aqueous samples only.

Round Identifier:

A two-digit round identifier will be used to track the number of aqueous samples taken from a particular aqueous sample location (i.e., tank outlet). The first sample collected from a location will be assigned round identifier 01, the second 02, etc. This applies to both existing and proposed monitoring wells and surface water locations.

Filtered:

Water samples that are field filtered (dissolved analysis) will be identified with an "F" in the last code section. No entry in this segment signifies an unfiltered (total) sample.

Depth Interval:

This code section will be used for soil and sediment samples only.

The depth code is used to denote sampling at a particular x-y location. Because continued excavation at a location could expose new ground surface with each lift of material removed from the excavations, single alphabetic character will be used to designate sequential samples from increasing depths below original grade. The letter "A" will represent the first sample collected from a particular x-y location, "B" will be used for the next sample taken from the same x-y location, but at a deeper depth than the "A" sample, etc. In this case, because samples are composite samples, "location" refers to a particular sampling grid represented by a composite sample. Each composite samples will be comprised of aliquots collected from the first six inches below the exposed surface. The "A". "B", etc. depth indicators should not be confused with the "A", "B", "C", and "D" labels used to identify individual aliquots associated with a particular sample.

3.1.2 Examples of Confirmation Sample Nomenclature

A composite soil sample collected from an excavation floor at SWMU 13, sampling grid 003, for PCB test kit analysis would be labeled as "13SOCF003A". The individual aliquots should be identified as Aliquots "A", "B", "C", and "D" for sample 13SOCF003A. If excavation continued in the same area to expose deeper surface, the next sample at that location would be labeled "13SOCF003B". The individual aliquots should be identified as Aliquots "A", "B", "C", and "D" for sample 13SOCF003B.

A composite soil sample collected from an excavation side wall at SWMU 07, sampling grid 006, for field XRF analysis would be labeled as "07SOCW006A". The individual aliquots should be identified as Aliquots "A", and "B" for sample 07SOCW006A. If excavation continued to expand the excavated area, the sample number for that next area would be labeled "07SOCW007A". Note that the sequential number "006" has been incremented to "007." The individual aliquots should be identified as Aliquots "A", and "B" for sample 07SOCW007A.

3.2 <u>Waste Characterization Samples</u>

Wastewater characterization samples will be numbered with unique identifiers.

3.2.1 Waste Characterization Sample Numbering Scheme

The numbering scheme for waste characterization samples will be the same as the scheme used for numbering Confirmation Samples, with the following exceptions:

- The matrix code will be "WS" or "WW" instead of "SS" or "SO".
- There will be no depth interval codes for aqueous waste water samples but depth intervals may be required for soil/sediment samples collected from roll-off boxes, waste piles, etc.

See Section 3.1 for details.

3.2.2 Examples of Waste Characterization Sample Numbers

The first wastewater grab sample collected for laboratory analysis from Tank 001 at the Building 106 Pond (SWMU 08) would be numbered as "08WWGT00101" for an unfiltered sample. A filtered sample from the same location would be labeled "08WWGT00101-F" if it corresponded to the first sample collected from that location. The next filtered and unfiltered samples collected from that location would be "08WWGT00102" and "07WWGT00102-F," respectively.

3.3 Field Quality Assurance/Quality Control (QA/QC) Sample Nomenclature

Field QA/QC samples are described in the IMWP (TtNUS, 2006a through 2006d) and this QAPP Addendum No. 1. They will be designated using a different coding system than the one used for regular field samples.

3.3.1 QC Sample Numbering

The QC code will consist of a three- to four-segment alpha-numeric 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	F
QC Type	Date	Sequence Number (per day)	Filtered (aqueous only, if needed)

The QC types are identified as:

TB = Trip Blank

FD = Field Duplicate

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).

3.3.2 Examples of Field QA/QC Sample Nomenclature

The first duplicate of the day for a filtered wastewater water sample collected on June 3, 2000 would be designated as FD06030001F.

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

The first trip blank associated with samples collected on October 12, 2000 would be designated as TB10120001.

STANDARD OPERATING PROCEDURE
NUMBER CT020-03

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 hard-bound, paginated, controlled-distribution record book in which all major on-site activities are documented. At a minimum, the following activities and events will 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 COC form is attached at the end of this SOP.

The FOL or 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 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 checks 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) or EMAC project manager (PM). 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 TtNUS TOM or EMAC PM if evidence of tampering is observed.

3.6 Equipment Calibration Log

The Equipment Calibration Log is used to document calibration of measuring equipment 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.

3.12 Soil and Sediment Sample Log Sheet

The Soil and Sediment Sample Log Sheets are used to document the sampling of soils and sediments (see SOP CTO0020-05).

4.0 ATTACHMENTS

1. Chain-of-Custody Record

ATTACHMENT 1
CHAIN-OF-CUSTODY RECORD

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 ☐
RUSH TAT ☐
☐ 24 hr. ☐ 48 hr. ☐ 72 hr. ☐ 7 day ☐ 14 day

DATE YEAR ____	TIME	SAMPLE ID	MATRIX	GRAB (G) COMP (C)	No. OF CONTAINERS	CONTAINER TYPE PLASTIC (P) or GLASS (G)	PRESERVATIVE USED	TYPE OF ANALYSIS							COMMENTS

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. TINUS-001

STANDARD OPERATING PROCEDURE
NUMBER CTO0020-04

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 NSWC Crane facility.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Waterproof pens
Non-latex rubber or plastic gloves
Cotton gloves
Field logbook
Potable water
Deionized water
LiquiNox detergent
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 by 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 CTO0020-09 and the QAPP Addendum No. 1.

STANDARD OPERATING PROCEDURE
NUMBER CTO0020-05

SOIL AND SEDIMENT SAMPLING

1.0 PURPOSE

This Standard Operating Procedure (SOP) establishes the procedure for soil and sediment sampling to support Interim Measures at SWMUs 7, 8, 13, and 16 in accordance with the requrieemnts of this QAPP Addendum No. 1.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

The following field forms and equipment are required for sediment sampling.

Sediment Sample Log Forms: A copy of this form is attached at the end of this SOP.
Bound field logbook
Disposable plastic trowels
Labeled sample containers: See SOPs CTO0020-01 and CTO0020-02 for sample identification procedures. Sample containers are certified clean by the laboratory supplying the containers.
Plastic storage bags
Shipping containers (containing ice)
Surgical gloves
Indelible marker
Chain-of-Custody Form

3.0 SEDIMENT SAMPLE LOCATION SELECTION

The sampling personnel will determine specific sampling locations with the goal of providing a representative sample of the excavated areas.

4.0 SAMPLING PROCEDURES

The sampler will wear clean, disposable, surgical gloves. Clear vegetative matter or debris, if present, from the each sample location using a disposable sampling trowel or spoon.

4.1 Soil or sediment samples collected for volatile organics analysis in a fixed base laboratory will be obtained directly from soil or sediment surfaces using three EnCore samplers for each VOC sample. These samples are to be collected by pushing the EnCore samplers directly into the soil or sediment. All three EnCore sample containers will be collected as close to each other as possible. Make sure that all caps are securely fastened to the samplers and locked in place with both clips (see instructions that come with samplers). Write the sample identification on the strip labels that come with the samplers and place a label on each of the four samplers.

4.2 Place the three EnCore samplers for a particular sample in the ziplock pouches that come with the samplers and fill in appropriate information, including sample identification, date, time, and other information on the label. Place the four pouches in a plastic bag and place the tag on the bag, identifying the sample identification and other necessary information (see SOP CTO020-01).

4.3 Once the Encore samples are properly labeled and bagged, place the sample into the cooler containing ice and a trip blank. The cooler should be kept at 4°C and shipped to the analytical laboratory for preservation or extraction within 48 hours.

4.4 Fill in the required information on the Soil Sample Log Sheet (attached at the end of this SOP) and fill in the required information on the Chain-of-Custody (COC) Form.

4.5 For samples requiring non-VOC analyses use the trowel to dig up and homogenize the soil or sediment in an 10-inch-diameter circular area that is 6 inches deep at each aliquot location. Note the location of each aliquot in the "OBSERVATIONS/NOTES" section of the Soil and Sediment Sample Log Sheet. Stir the soil or sediment within the circular area; do not move the soil or sediment outside the circle. Also, do not dig or stir soil or sediment that is deeper than 6 inches below the ground surface.

4.6 Combine all required aliquots in the bowl in approximately equal proportions by volume. Mix the material to a uniform consistency or until the consistency does not change visibly. Use the same trowel to scoop the homogenized soil or sediment into the requisite labeled sample containers for field analysis. All sample containers will be filled in the following sequence:

- Non-VOC organics
- Inorganics (e.g., lead)

4.7 Record the sample time (using military time) on the Soil and Sediment Sample Log sheet and sample container labels. Record all other required information on the labels as specified by SOP CTO0020-01.

4.8 For field analysis, remove a portion of the sample from the container. Retain the remainder of the sample for submittal for laboratory analysis, as appropriate.

4.9 For samples that are to be submitted for laboratory analysis place the labeled sample container into a plastic storage bag and then place the plastic storage bag holding the sample container into a cooler containing ice.

4.10 Record the date, sampling site, site conditions, location map, and other information on the Soil and Sediment Sample Log Sheet. Enter the sample information onto the Chain-of-Custody Form in accordance with SOP CTO0020-03.

5.0 ATTACHMENTS

1. Soil and Sediment Sample Log Sheet

ATTACHMENT 1

SOIL AND SEDIMENT SAMPLE LOG SHEET

SOIL & SEDIMENT SAMPLE LOG SHEET

Page___ of ___

Project Site Name: _____
Project No.: _____

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

Sample ID No.: _____
Sample Location: _____
Sampled By: _____
C.O.C. No.: _____

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

GRAB SAMPLE DATA:

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

COMPOSITE SAMPLE DATA:

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

SAMPLE COLLECTION INFORMATION:

Analysis	Container Requirements	Collected	Other

OBSERVATIONS / NOTES:

MAP:

Circle if Applicable:

MS/MSD	Duplicate ID No.:

Signature(s):

STANDARD OPERATING PROCEDURE
NUMBER CTO020-06

SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

1.0 PURPOSE

This Standard Operating Procedure (SOP) describes the procedures for sample preservation, packaging, and shipping to be used in handling aqueous samples water soils, and sediments collected at the NSWC Crane.

2.0 REQUIRED FIELD FORMS AND EQUIPMENT

Shipping labels

Custody seals

Chain-of-custody (COC) form(s)

Sample containers with preservatives: All sample containers for analysis by fixed-base laboratories will be supplied, with preservatives added (if required) 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.

3.0 PROCEDURES FOR SAMPLE PRESERVATION, PACKAGING, AND SHIPPING

3.1 The laboratory provides sample containers with preservative already included (as required) for the analytical parameter for which the sample is to be analyzed. All samples will be held, stored, and shipped at 4°C. This will be accomplished through refrigeration (used to hold samples prior to shipment) and/or ice.

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

3.3 Check that each sample container is properly labeled, the container lid is securely fastened, and the container is sealed in a ZipLoc® bag.

3.4 If the container is glass, place the sample container into a bubble-out 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, both inside and outside of the cooler. If the cooler is questionable for shipping, the cooler must be discarded.

3.6 Put ice into ZipLoc® bags and place a layer of the sealed bags on the bottom of the cooler. Place the sample containers into the shipping cooler on top of the ice in an upright position (containers will be upright, with the exception of the 40-ml vials). Place ZipLoc® bags of ice flat against the sides of the cooler. Continue filling the cooler with samples until the cooler is nearly full and the movement of the sample containers is limited.

3.7 Place a temperature blank in the cooler. Make sure that all samples identified for VOC analysis and their associated trip blank are packed in the same cooler (i.e., VOC samples and trip blank that were stored together during sampling activities can not be separated into different coolers for shipping purposes).

3.8 Add a final layer of ice sealed in ZipLoc® bags to the top of the samples just before the cooler is closed and sealed.

3.9 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 that contains the samples for VOC analysis.

3.10 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, numbered, and dated custody seal to each side of the cooler (one per side). Cover the custody seal with the last wrap of tape. This will provide a tamper evident custody seal system for the sample shipment.

3.11 Affix a shipping label to the top of the cooler containing samples for VOC analysis, ensuring all of the shipping information is filled in properly. Overnight (e.g., FedEx Priority Overnight) courier services will be used for all sample shipments.

3.12 All samples will be shipped to the laboratory no more than 72 hours after collection. Under no circumstances will sample hold times be exceeded.

STANDARD OPERATING PROCEDURE
NUMBER CTO0020-07

FIELD PORTABLE X-RAY FLUORESCENCE ANALYSIS OF SOIL AND SEDIMENT SAMPLES USING THE INNOV-X ALPHA SERIES INSTRUMENT

1.0 PURPOSE

This procedure is for the semiquantitative analysis of metallic lead particles and chemical compounds of lead in soil using a field portable x-ray fluorescence (FPXRF) spectrometer. This method is a screening method to be used with confirmatory lead analysis using United States Environmental Protection Agency (USEPA)-approved methods.

2.0 SCOPE, APPLICATION, AND LIMITATIONS

2.1 Scope of Procedure

Analysis of any other elements beside lead using FPXRF may require changes to this Standard Operating Procedure (SOP), and are therefore outside the scope of this SOP.

Although it is possible to use FPXRF to measure analytes in situ, this SOP requires removal of a soil or sediment sample from its native environment prior to analysis. By removing, drying, and homogenizing the sample prior to analysis, more precise and accurate results are obtained.

2.2 Analyst Training

Use of this method is restricted to personnel both trained and knowledgeable in the operation of the Innov-X alpha series XRF instrument or under the supervision of a trained and knowledgeable individual. Proper training for the safe operation of the instrument should be completed by the analyst prior to analysis. This training may be obtained directly from INNOV-X, an INNOV-X instrument distributor or lessor, or another trained Tetra Tech NUS, Inc. person.

3.0 ACRONYMS AND ABBREVIATIONS

FPXRF: Field portable x-ray fluorescence.

mg/kg: milligrams per kilogram.

MDL: Method detection limit.

PQL: Practical quantitation limit.

QC: Quality control.

RPD: Relative percent difference.

USGS: United States Geological Survey.

XRF: X-ray fluorescence.

4.0 RESPONSIBILITIES

Analyst/Chemist - Responsible for all aspects of sample preparation and analysis including equipment maintenance. Also responsible for maintaining chain-of-custody of samples after receipt from sampling personnel.

5.0 PROCEDURES

5.1 Safety

5.1.1 Radiation Safety

Radiation safety practices for the INNOV-X instrument can be found in the operator's manual. Protective shielding should never be removed by the analyst or any personnel other than the manufacturer.

An additional hazard present with x-ray tubes is the danger of electric shock from the high voltage supply. The danger of electric shock is as substantial as the danger from radiation but is often overlooked because of its familiarity.

5.1.2 Protective Equipment

Analysts must wear disposable plastic gloves whenever sample aliquots are being transferred from one vessel to another. Consult the health and safety plan for other protection requirements.

5.2 Apparatus and Materials

Apparatus and materials consist of the following:

INNOV-X Alpha Series FPXRF spectrometer with data processing unit (iPAQ) pocket personnel computer):

INNOV-X Alpha Series XRF instrument manual to match the INNOV-X Alpha Series instrument.

Aluminum drying pans or aluminum foil: Sized suitably to hold as much as 50 grams of sample and fit into the drying oven.

Calibration verification check sample: A National Institute of Standards and Technology (NIST) or other Standard reference material (SRM) that contains lead in a concentrations range that is compatible with the project objectives to verify the accuracy of the instrument. SRMs can be obtained from the NIST, the U.S. Geological Survey (USGS), the Canadian National Research Council, and the national bureau of standards in foreign nations. Pertinent NIST SRMs for FPXRF analysis include 2704, Buffalo River Sediment; 2709, San Joaquin Soil; and 2710 and 2711, Montana Soil. These SRMs contain soil or sediment from actual sites that has been analyzed using independent inorganic analytical methods by many different laboratories. Acceptable limits for SRM percent recoveries are usually provided with the SRM. In their absence, a limit of ± 30 percent will be used as a guideline.

Instrument Blank: May be silicon dioxide, a Teflon block, a quartz block, "clean" sand, or lithium carbonate.

Lead calibration check standard: Supplied by the FPXRF manufacturer.

Method blank material for performing method blank checks: May be lead-free silica sand or lithium carbonate that undergoes the same preparation procedure as the samples.

Battery charger.

Polyethylene sample cups: 31 millimeters (mm) to 40 mm in diameter with collar, or equivalent (appropriate for FPXRF instrument).

X-ray window film: Mylar™, Kapton™, Spectrolene™, polypropylene, or equivalent; 2.5 to 6.0 micrometers (μm) thick.

Sample containers: glass or plastic to store samples.

Sieves: 60-mesh Stainless steel, Nylon, or equivalent for preparing soil and sediment samples if necessary.

Trowels: for collecting soil samples.

Plastic bags: used for collection and homogenization of soil samples. May also be used as sample presentation device.

Drying oven: standard convection or toaster oven, for soil samples that require drying.

Rolling pin (optional): Wooden rolling pin for crushing samples.

5.3 Sample Collection, Preservation, and Handling

Samples shall be provided to the FPXRF analyst in plastic bags. The analyst is responsible for maintaining chain-of-custody of all samples until all analyses have been successfully completed. No sample preservation is necessary. All samples shall be handled in accordance with sample handling SOPs in effect for the field event.

5.4 Preventive Maintenance

Refer to the instrument manual for specific manufacturer's recommendations.

5.5 Instrument Start-Up

5.5.1 Ensure the pocket PC (iPAQ) is plugged into the FPXRF instrument body and install a fully charged battery into the instrument.

5.5.2 Press the ON/OFF button on the base of the pistol grip of the instrument. If the iPAQ does not automatically power up, press the Power button in the to right corner of the iPAQ.

5.5.3 Tap the Microsoft icon at the upper left corner of the iPAQ.

5.5.4 Chose START.

5.5.5 Tap "Soil Mode" on the menu or choose Mode (bottom of screen) and then choose Soil Mode from the drop down menu.

5.5.6 Allow the instrument to warm up (approximately 3 minutes).

5.5.7 Release the manual trigger lock.

5.5.8 Standardize the instrument in accordance with Section 5.6.

5.6 Standardization/Calibration Check

It is not possible to start an analysis if the instrument has not been standardized. To verify proper calibration of the instrument it is necessary to periodically standardize it using the automated standardization procedure. This must be done anytime the instrument is restarted and every 4 hours of operation, although re-standardization may be done at any other time (e.g., when instrument drift is suspected).

5.6.1 Click the standardization piece (supplied with the instrument) on the front of the instrument, verifying that the solid portion of the standard completely covers the analysis window.

5.6.2 Select "Tap here to Standardize" or select *File → Standardize.* The red light on top of the instrument will blink indicating that the instrument is producing x-rays and the shutter is open. The amber light on the rear of the instrument will also be illuminated and a status bar will appear to display the progress of the standardization.

5.6.3 Upon successful standardization the message "Successful Standardization" will appear along with the instrument resolution. In this case tap "ok" to dismiss the completion message. If problems are encountered, either follow the prompts that appear and/or repeat the standardization. Contact the FOL if problems persist. Take note of any error messages that appear as they may be useful if the instrument manufacturer must be contacted. Additional assistance is also available in the manufacturer's instrument manual.

5.7 Quality Control

The quality control (QC) program includes analysis of blanks calibration verification checks, duplicate analyses, and field duplicate samples. For all the above areas, any identified problems and corrective

action must be documented in the instrument run log, analysis narrative report, and instrument maintenance log or standards log (as applicable). Identical operating conditions will be used for each sample.

5.7.1 Laboratory Blanks

Two types of blank samples shall be analyzed for FPXRF analysis: instrument blanks and method blanks.

5.7.1.1 At the beginning of each day, at the end of each day, and after every 20th sample or when potential contamination of the instrument is suspected, analyze an instrument blank to verify that no contamination exists in the spectrometer or on the probe window.

If the lead concentration in the blank exceeds the method detection limit (MDL), see Section 5.9.3) check the probe window and other potentially contaminated instrument components for contamination. If contamination is not causing the elevated blank readings, "zero" the instrument according to manufacturer's instructions.

5.7.1.2 After every 20th sample analyze a method blank. If the method blank lead concentration exceeds the practical quantitation limit (PQL, see Section 5.9.4), identify the cause of the elevated lead concentration and reanalyze all samples since the last acceptable method blank.

5.7.2 Calibration Verification Checks

5.7.2.1 After performing each blank check (Section 5.7.2), analyze a calibration verification check sample to check the accuracy of the instrument and to assess the stability and consistency of the analysis for the analytes of interest.

5.7.2.2 If the measured lead percent recovery (See Section 5.9.1) is less than 60 percent or greater than 135 percent, reanalyze the check sample. If the value continues to fall outside this acceptance range, the instrument should be recalibrated, or restandardized according to the manufacture instructions and the batch of samples analyzed before the unacceptable calibration verification check must be reanalyzed.

5.7.3 XRF Duplicate Samples

XRF duplicate samples are two portions of the same sample that have been prepared and homogenized together, and then split and analyzed in the same manner by the XRF analyst.

5.7.3.1 Analyze an XRF duplicate at a frequency of 1 per 20 or once per day, whichever is more frequent.

5.7.3.2 If the computed RPD (See Section 5.9.2) exceeds 50 percent reanalyze both samples. If the RPD again exceeds 50 percent RPD consider whether the high degree of imprecision is caused by sample heterogeneity or other causes. This assessment may be aided by repeating the analysis of a sample that was analyzed previously. If the observed imprecision is attributed to sample heterogeneity, increase the number of readings made per sample to try to limit the imprecision and repeat the analyses. If this does not correct the problem notify the FOL.

5.8 Sample Analysis

Note:

This section provides sample analysis instructions, assuming that appropriate instrument start-up and calibration checks have been completed. The longer the instrument count time, the lower the detection limits and the less uncertainty there is with a recorded result. Count time is user-selectable through the instrument's software. Because the XRF data will be used in a screening capacity to make preliminary decisions concerning the soil concentrations relative to 400 mg/kg, it is not necessary to obtain a high degree of accuracy or precision with the instrument. Therefore, count times should be limited to less than 180 seconds unless an usually high degree of precision is expected. To change the count time, select Options → Setup Testing and enter the same value (in seconds) to minimum and maximum count times.

Note:

Section 5.7 identifies the appropriate frequencies for conducting various QC sample analyses and the associated acceptance limits and corrective actions for potentially unsuitable conditions. The specified QC analysis frequencies are minimum frequencies. More frequent QC sample analyses are permitted, especially when diagnosing quality problems.

5.8.1 Ensure that calibration checks and blanks have been analyzed according to Sections 5.6, 5.7.1, and 5.7.2. Count times shall be at least 60 seconds but generally less than 180 seconds.

5.8.2 Acquire enough soil sample to fill an 8-ounce jar and separate from it all particles greater than the size of a pea.

5.8.3 Homogenize the remaining finer grained portion of the sample by simple mixing until it appears as uniform in texture and composition as practicable. Mixing may be done in a beaker or other suitable lead-free container. If the sample is moist and has high clay content, it may be kneaded in a plastic bag. Mixing shall continue for at least two minutes to ensure that the sample is well mixed. To aid mixing, the sample may be placed into a thick-walled (3 mil or thicker) gallon-sized freezer bag (e.g., Zip-Loc) and rolled flat with a rolling pin to break up large chunks of dirt.

5.8.4 Place approximately 20 to 50 grams (one U.S. nickel weighs about 5 grams) in a suitable container (e.g., aluminum drying pan) for drying.

5.8.5 Dry the homogenized sample from Step 5.9.4 for approximately 2 to 4 hours in the toaster oven at a temperature not greater than 150°C (a setting of approximately 300 F).

5.8.6 Re-homogenize the dried sample aliquot in a beaker or other suitable lead-free container to obtain a well mixed soil sample. Mixing shall continue for at least one minute.

5.8.7 Place a portion (approximately 1.5 cubic inches) of the dried, homogenized sample aliquot into the instrument manufacturer's recommended sample cup (e.g., a 31.0-mm polyethylene sample cup (or equivalent) or place it in a thin-walled (1 mil or thinner) plastic sandwich bag (e.g., Zip-Loc).

5.8.8 If using a disposable plastic sample cup, ensure the cup is at least three-quarters full and cover with mylar (or other) film per the manufacturer's recommendations.

5.8.9 Present the sample to the instrument in Soil Mode.

5.8.10 Perform a single pull of the trigger to start the count. The count time shall be the same as was used for the calibrations, calibration checks, and blank analyses. The message "Test in progress" will appear on the instrument and the red light on top of the instrument and will illuminate.

5.8.11 When the predetermined count period has expired the message "Test complete" will appear on the instrument. A slight delay may also be incurred during which time the message "calculating" may appear to indicate that results are being computed.

5.8.12 Record the displayed results for lead concentration in mg/kg and the associated error on Figure 1.

CAUTION

Inconsistent positioning of samples in front of the probe window is a potential source of error because the x-ray signal decreases by the square of the distance from the radioactive source. This error is minimized by maintaining the same distance between the window and each sample. For the best results, the window of the probe should be in direct contact with the sample, which means that the sample surface should be flat and smooth to provide a good contact surface.

5.8.13 Remix the sample in the plastic bag (or rotate the sample cup approximately one-third of a turn) then acquire another measurement by repeating Steps 5.8.10 and 5.8.11. Record the result and associated error on Figure 1.

5.8.14 Repeat Steps 5.8.10 and 5.8.11. Record the result and associated error on Figure 1 (XRF Field Form).

5.8.15 Based on the degree of precision demonstrated by the three individual measurements, determine whether additional readings should be acquired on the sample. This determination shall be based on professional judgment of the FPXRF analyst and shall consider the degree of precision observed during calibration checks and previous sample analyses. The objective will be to ensure that the average reading reported for each sample is representative of the true sample concentration. If the analyst feels that non-representative readings are being obtained the analyst shall correct the analytical system or notify the FOL prior to continuing with analyses.

5.8.16 Ensure that measured results are reported to the following standards

- Results < 1000 mg/kg (or parts per million) are reported to two significant figures and results > 1000 mg/Kg are reported to three significant figures.
- All values < MDL shall be reported as the MDL and flagged with the letter "U".
- All values > MDL and < PQL shall be reported as is and flagged with the letter "B".

5.9 Calculations

5.9.1 Percent Recovery: The equation for determining percent recovery of calibration verification check standards and standard reference materials is:

$$\%R = \frac{\text{Experimental Concentration}}{\text{Certified or Known Concentration}} \text{ X } 100\,\%$$

5.9.2 Relative Percent Difference: The equation for determining relative percent difference for laboratory and field duplicate samples is:

$$RPD = \frac{|\text{Amount in Sample 1} - \text{Amount in Sample 2}|}{0.5\,(\text{Amount in Sample 1} + \text{Amount in Sample 2})} \text{ X } 100\,\%$$

5.9.3 Method Detection Limit (MDL): Because the analyses governed by this SOP are semi-quantitative, the manufacturer-specified detection limit will be reported as the MDL unless the specified detection limit is less than 20 mg/kg. Care will taken to ensure that the appropriate count time is consistent with the reported detection limit. However, no value less than 20 mg/kg will be reported as an MDL.

5.9.4 Practical Quantitation Limit (PQL): Multiply the MDL by 3 to obtain the PQL: PQL = MDL*3

6.0 REFERENCES

Innov-X Systems, Inc. Innov-X Systems X-Ray Fluorescence Spectrometers Instruction Manual. Woburn, MA. June 2002.

Stephen Shefsky, NITON Corporation. Comparing Field Portable X-Ray Fluorescence (XRF) To Laboratory Analysis of Heavy Metals In Soil. Presented at the International Symposium of Field Screening Methods for Hazardous Wastes and Toxic Chemicals. Las Vegas, Nevada. January 29-31, 1997.

USEPA (U.S. Environmental Protection Agency), Method 6200: Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment, Office of Solid Waste, Washington, D.C. January 1998.

USEPA, Region I, Northeast Waste Management Officials' Association (NEWMOA) Technology Review Committee Advisory Opinion. Innovative Technology: X-Ray Fluorescence Field Analysis. September 21, 1999.

FIGURE 1

FIELD PORTABLE XRF SAMPLE ANALYSIS LOG SHEET

Page___ of ___

Project Site Name:	______________	Run Length/Duration:	______________
Project No.:	______________	Measurement Units:	______________
Analyzed By:	______________	Reference/Calibration:	______________

SAMPLING AND FIELD PORTABLE XRF RESULTS DATA:

SAMPLE ID	ANALYSIS DATE	ANALYSIS TIME	ELEMENT ANALYSIS	RESULT RUN 1	RESULT RUN 2	RESULT RUN 3	RESULTS AVERAGE	ERROR RUN 1	ERROR RUN 2	ERROR RUN 3	ERROR AVERAGE

STANDARD OPERATING PROCEDURE
NUMBER SOP CTO020-08

ANALYSIS OF TOTAL CHLORINATED ETHENES IN SOIL AND GROUNDWATER USING THE COLOR-TEC SCREENING METHOD

1.0 PURPOSE

This SOP describes a field screening method for determining total chlorinated ethene concentrations in the headspace above soil and groundwater samples. The method employs colorimetric gas detector tubes to analyze the headspace gases using the Color-Tec apparatus (see Figure 1, excerpted from Color-Tec Method Standard operating Procedures Manual, Ecology and the Environment, Inc.)

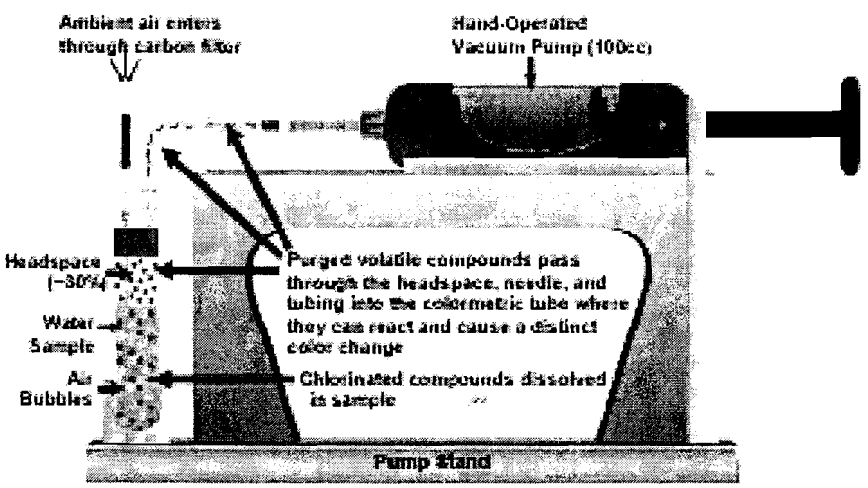


Figure 1. Color-Tec Apparatus.

2.0 DESCRIPTION

To conduct the method, groundwater or a soil and water mixture are placed in a standard 40 mL VOA vial and capped. The sample vial is then agitated vigorously for 20 seconds. Using a manual vacuum pump, two hollow needles, and Tygon® tubing, the headspace vapor is purged from the vial through the colorimetric gas detector tube. The tips of the needles are positioned so that one is in the headspace area and one is submerged at the bottom of the vial. As air is drawn from the headspace through one

needle, ambient air is allowed into the bottom of the vial through the other needle. This process purges the VOCs from the water so no headspace calculation using Henry's Constant is required.

Each colorimetric tube contains a catalyst that decomposes the chlorinated ethene, releasing hydrogen chloride, which discolors the reagent (4-phenylazodiphenylamine) in the tube. Any color change within the detector tube indicates the presence of a chlorinated ethene. The detector tubes are constructed of glass and printed with calibration scales to facilitate measurement of the linear extent of the reaction within the tube. The manufacturer of the tubes (Gastec®) provides tubes for a variety of concentration ranges. The lowest concentration range tube is used initially to screen the sample. When a positive result is observed, the concentration level is obtained by matching the linear extent of the discolored reagent inside the tube to the calibration scale printed on the outside of the tube. If the calibrated range of the tube is exceeded by the reaction, a tube with a higher concentration range is used to screen a duplicate sample. This procedure is repeated until the approximate concentration is determined.

3.0 LIMITATIONS

The color change indicated by a sample containing less than 10 µg/L PCE or less than 30 µg/L vinyl chloride is very subtle and could be missed by an inexperienced operator. The solution to this problem is practice and careful examination of each tube after pumping.

Introduction of water vapor into the tube past the catalyst stage could indicate a low level false positive to an inexperienced operator. However, water-induced false positives are easily recognized by an experienced operator and are avoidable through proper placement of the extraction needle in the VOA vial.

If chlorinated tap water is used in the soil sample screening procedure, the free chlorine in the tap water could (theoretically) indicate a low-level false positive in the soil sample. The potential for producing a false reading in this manner can be avoided by using ultrapure deionized water during the soil sample screening procedure.

Do not use hydrochloric acid as a preservative when using this method.

4.0 SAFETY PRECAUTIONS

Safety glasses should be worn whenever handling potentially contaminated soil or water.

5.0 REQUIRED EQUIPMENT

- Gastec® hand pump or equivalent
- Extra low, low, medium, and high range Gastec® colorimetric tubes
- Plastic male luer lock threaded fitting with ⅛-in hose barb
- Plastic male luer non-threaded fitting with ⅛-in hose barb
- Tygon® lab tubing ⅛-in ID x ¾-inch OD
- Deflected noncoring septum penetration needle (18G x 4)
- Hot plate
- Electrical source for hot plate
- Test tube rack
- Vortex mixer
- Charcoal prefilter tubes
- 40 mL clear VOA with Teflon-silicon septa Kimwipes™
- For soil samples, 20 mL ultra-pure deionized water per sample Chlorinated ethene QC
- standard Decontamination materials

6.0 PROCEDURE

6.1 Aqueous Samples

6.1.1 Fill 40 mL VOA vial with 24 mL (about 60 percent of volume) of groundwater sample and cap.

6.1.2 Shake the sample vigorously for 20 seconds.

6.1.3 Penetrate the septum with a needle equipped with the charcoal pre-filter tube and position the needle point near the bottom of the vial.

6.1.4 Penetrate the septum with the extraction needle attached to the Tygon® tubing. Ensure that the needle tip is well clear of the water surface.

6.1.5 Break one end of the detection tube and attach it to the Tygon® tubing.

6.1.6 Break the other end of the detection tube and attach it to the hand pump.

6.1.7 Begin drawing air from the vial and observe any change in color in the tube.

6.1.8 Record the concentration reached by the change in color on the scale marked on the tube.

6.2 Soil Samples

6.2.1 Fill 40-mL VOA vial with approximately 10 cc of soil and 10 mL of ultrapure deionized water (about 50-70 percent of volume) and cap.

6.2.2 Shake the sample vigorously for 20 seconds.

6.2.3 Penetrate the septum with a needle equipped with a charcoal pre-filter tube and position the needle point near the top of the soil.

6.2.4 Penetrate the septum with a needle attached to the Tygon® tubing. Ensure that the needle tip is well clear of the water surface.

6.2.5 Break one end of the detection tube and attach it to the Tygon® tubing.

6.2.6 Break the other end of the detection tube and attach it to the hand pump.

6.2.7 Begin drawing air from the vial and observe any change in color in the tube.

6.2.8 Record the concentration reached by the change in color on the scale marked on the tube.

7.0 QUANTITATION LIMITS

The practical quantitation limit for PCE is 5-10 ppb as measured in the headspace. This method does not employ Henry's Constant or other partitioning methods to back calculate the actual concentrations in the soil or water sample. Samples containing only trans-1,2-dichloroethene, 1,1-dichloroethene, or vinyl chloride are generally not detectable with ColorTec at concentrations below 25 µg/L.

8.0 GENERAL INTERFERENCES

Other compounds including bromine, free chlorine, and hydrogen chloride can also indicate a positive reaction within the detector tube.

The Gastec® tubes are sold to detect specific chlorinated alkenes. However, if there are other chlorinated ethenes present in a sample, the identification of a specific chlorinated compound is not possible using

the ColorTec method. The developers of the ColorTec method recommend using the Gastec® tetrachloroethene tubes for all sampling.

The detector tubes are designed to be used at temperatures of 0 to 40°C (32 to 104°F) and are calibrated based on a tube temperature (not sample temperature) of 20°C (68°F). There is a significant reduction in sensitivity of the tubes when sustained ambient air temperatures are significantly lower than 20°C while conducting the method. The reduction in the temperature of the reagent decreases the reaction time resulting in a less visible color change within the tube. Conversely, when ambient temperatures are in excess of 20°C, the tubes may be hypersensitive. The following correction factors provided by Gastec® can be applied to the readings to correct for sustained ambient temperatures other than 20°C or 68°F: Because tube/sample temperatures below 20°C significantly reduce the sensitivity of the method, it is recomended that the prepared sample vials and colorimetric tubes (prior to breaking the tips) be heated using a hot water bath prior to screening when ambient temperatures are below 20°C.

TABLE 1. CORRECTION FACTORS.

Temperature	0°C (32°F)	10°C (50°F)	20°C (68°F)	30°C (86°F)	40°C (104°F)
Correction Factor	x 2	x 1.3	x 1	x 0.7	x 0.55

SOP CTO0020-10 - Field Analysis for PCB by Test Kit

Will be provided at a later date

APPENDIX A.2

D&T ENVIRONMENTAL, LLC STANDARD OPERATING PRACTICES

APPENDIX A.2

FIELD SOP TABLE OF CONTENTS

TNFD002A	Field Records and Documentation
TNFD006B	Sampling of Surface Soils and Other Surficial Materials
TNFD010C	Sample Labeling, Control and Shipping

STANDARD OPERATING PRACTICE TNFLD002A

Field Records and Documentation

TABLE OF CONTENTS

Page

1.0 PROCEDURE **2**

1.1 Materials 2
1.2 General Requirements for Field Logbooks 2
1.3 Format for Field Logbook Entries 3
1.4 What to Record in the Field Logbook 4
1.5 Site Safety and Health Logbook 5
1.6 Field Forms 5
1.7 Tracking of Field Records 6
1.8 Filing of Field Records 6

2.0 DAILY QUALITY CONTROL AND PRODUCTION REPORTS **7**

STANDARD OPERATING PRACTICE TNFLD002A

Field Records and Documentation

The objectives of this Standard Operating Practice (SOP) are to provide consistent procedures and formats by which field records will be kept and activities documented, and a methodology by which field records will be managed.

1.0 PROCEDURE

1.1 MATERIALS

Materials to be used include:

- Field logbooks,
- Pens, containing indelible waterproof black ink,
- Field forms, and
- Watch with team-synchronized time (using the military 2400-hour format).

Bound, water-resistant field logbooks will only be used for the maintenance of field records (except for site specific reporting forms when required). The Project Manager prior to use must approve utilization of any other field logs.

1.2 GENERAL REQUIREMENTS FOR FIELD LOGBOOKS

Logbooks will be assigned by activity for the project until the specific activity is completed. The logbook for a specific activity will be used until the logbook is full. If the logbook for a specific activity is not filled completely, the logbook for that specific activity will be used for any future work of a similar nature e.g. quarterly groundwater sampling.

Each page of the logbook will be signed at the bottom, once filled or once field activities are completed. The logbooks will be turned in for copying/filing/tracking to the Project Manager.

The center of the front cover will be labeled with the project name and logbook number. The logbooks for each project will be sequentially numbered starting with the number one. Below the logbook number will be the activity that has been assigned and the date assigned.

All entries will be recorded in indelible, waterproof black ink. If errors are made in any field logbook, field record (form), chain-of-custody record, or any other field record document, corrections will be made by crossing a single line through the error, entering the correct information, initialing, and dating the correction.

A number of field forms have been adopted to facilitate the collection of consistent data. A reference to each specific form used should be noted in the logbook.

Sufficient information will be recorded in the logbooks and on the field forms to permit reconstruction of all field activities conducted. Duplication of information may occur between the logbooks and field forms.

1.3 Format for Field Logbook Entries

Entries in field logbooks will be made in the following format:

The date will be placed in the top right-hand corner of every right page. The time of entry recordings will be in columnar form down the left-hand side of each page. All entries should be dated and the time of entry recorded.

The first two entries in the logbook for each day will record "Personnel, Contractors on Site" and weather conditions. The time of entry onto the site and exit from the site of project personnel, subcontractors, site visitors, deliveries, and pickups will be recorded. Subcontractor problems, corrective actions, down-time (beginning and end, reason), requested field changes or variances, and approvals of requested field changes or variances will be recorded.

At the end of each day's entry or then end of a particular field event or activity, draw a downward left-to-right diagonal line from the conclusion of the entry to the bottom of the page. Sign or initial the line indicating the conclusion of the entry or the day's activity. At the end of the day's entry, record the time of departure from the work site and how the site was secured.

Language should be objective, clear, factual, and free of personal feelings or other terminology that might prove inappropriate, since field records are the basis for later written reports. Field logbooks are legal documents that must be maintained as part of the project files. The TN&A Project Manager should conduct periodic audits of field logbooks to ensure compliance with this SOP.

If not recorded on field forms, all aspects of sample collection and handling, as well as visual observations, will be documented in the field logbooks. All sample collection equipment, field analytical equipment, and equipment used to make physical measurements will be identified in the field logbooks. All calculations, results, and calibration data for field sampling, field analytical, field screening, and field physical measurements will also be recorded in the field logbooks, except where these are referenced as being recorded on approved field forms. All field analyses and measurements must be traceable to the specific piece of field equipment utilized and to the field investigator collecting the sample, making the measurement, or conducting analyses.

1.4 What to Record in the Field Logbook

Each field crew will be issued a field logbook in which detailed descriptions of all activities completed by the crew for each working day will be noted. The field logbooks will contain, at a minimum, the following:

- Name and title of the originator,
- Purpose of the field activity,
- Name, company name, and address of the site contact,
- Names and responsibilities of field crew members,
- Names and company name of all subcontract personnel,
- Names, titles, and association of any site visitors,
- Description of type and manufacturer of all heavy equipment used during field activities,
- Conversations with client representatives, senior TN&A personnel, landowners, regulatory agency representatives, etc.,
- Sample collection method,
- Quantity, location, and volume of sample(s) collected,
- Location, description, and log of photographs,
- References for all maps of the sampling site(s),
- Information regarding sampling changes, scheduling modifications and change orders,
- Information regarding drilling decisions (also recorded on the boring log),
- Information regarding sampling decisions,
- Information regarding access agreements, if applicable,
- Details of the sampling location, including a sketch map illustrating the sampling location (if not on the boring log),
- Equipment used,
- Date and time of sample collection and name of collector,
- Sample identification number(s),
- Information from containers, labels of reagents used, deionized and organic-free water used, etc.,
- Field analyses, conducted by whom, using what instruments or test kits,
- Field observations,
- All calculations and results,
- Extraordinary occurrences,
- Types of field instruments used and purpose of use, including calibration methods and results (if not on instrument calibration log),
- Investigative Derived Waste (IDW) documentation information including:
    - types of containers/drums,
    - contents, type, and approximate volume of waste,
    - type of contamination and predicted level of contamination based on available information,
- Shipping information, and
- Diagonal line with signature at end of logbook entry.

The initial four pages of the logbook will be reserved for compiling a "List of Contents" for the logbook. Information recorded will include the project name and number, duration of involvement, brief description of activities, the page numbers in the logbook, the last page number copied to file, and date copied. The personnel assigned the logbook should update the "List of Contents" on a weekly basis.

1.5 Site Safety and Health Logbook

A separate Site Safety and Health (SSH) logbook may be maintained by the Site Safety and Health Officer (SSHO) to document all daily safety and health activities. If a separate SSH logbook is not required for a project, then the health and safety information should be recorded in the field logbook. The SSHO will be responsible for ensuring the following information is entered into the logbook:

- When the daily health and safety meeting/briefing was conducted (use daily form to record meeting topics and attendees),
- Daily health and safety site inspections,
- Daily inspection of field equipment,
- Weather, including general weather conditions, temperature, wind and direction,
- Major changes in weather conditions,
- Problems associated with field monitoring equipment,
- Detailed record of any health and safety incidents at the site, including any subcontractor incidents,
- Medical problems with any field team member, including anyone taking special medications, and
- Any visitors introduced at the site along with health and/or training records, as appropriate.

1.6 Field Forms

As appropriate, the field forms listed below will be distributed by the Field Team Leader (FTL) or designate team member to field personnel. The Field Team Leader will ensure that the forms are filled out correctly by the field team members:

FORMS:

Drilling Log

Well Construction Log

Well Development Log

Well/Boring Abandonment Log

Groundwater Sampling Log

Groundwater Level Measurement Log

Sampling Logs (by media or as designated in site-specific Sampling and Analysis Plan)

Decontamination Form

Chain-of-Custody Form

Field Equipment/Meter Calibration Form

Site Safety Health Plan (SSHP) Forms:

Air Monitoring Log

Daily Site Safety Briefing Form

Contractor SSHP Acceptance Form

Employee SSHP Acceptance Form

Visitor Sign-In

Project-specific forms should be listed in the project work plan or sampling and analysis plan.

1.7 Tracking of Field Records

Field records (logbooks and forms) tracking is the responsibility of the Field Team Leader during field operations. Following completion of the field event, the FTL will deliver the field records to the TN&A Project Manager.

The FTL shall compile the original field forms in a 3-ring notebook or secure file box during field operations. At the end of the fieldwork or phases of fieldwork, the FTL will send or deliver the field forms to the TN&A Project Manager at the project office. The on-site project personnel throughout the duration of the field program will maintain copies of the field forms.

1.8 Filing of Field Records

When an individual logbook is full or the activity is completed, the logbook will be submitted to the TN&A Project Manager within two working days for final cataloging and filing. The logbooks will be stored in the project file and will only be accessible to the Project Manager.

All non-bound field records (e.g., field forms, drilling logs) will be completed on the day the associated activity occurs and will be turned in to the FTL by the end of the day. The unbound daily field forms should be sent on at least a weekly basis to the Project Manager.

All field data collected using electronic data loggers or computer entry forms will be downloaded to a computer. If possible, the data will be downloaded on a daily basis by the person collecting the data. The Field Team Leader will be responsible for ensuring that all data collected are adequately represented in electronic media and in the project file. A hard copy of the data, and any graphical representation produced by logging software, will also be printed out and filed in the project file.

2.0 DAILY QUALITY CONTROL AND PRODUCTION REPORTS

The U.S. Army Corps of Engineers (USACE) has developed a construction quality control and production reporting protocol that includes a number of forms that are commonly used on federal government projects. The following is a list of the forms applicable to environmental and construction activities such as sampling, well installation, remedial system installation, removal actions, demolition, etc. Generally, a construction quality control plan is prepared to document quality control responsible persons, procedures, and required documentation. Some of the most typical quality control forms are listed below:

- Preparatory Phase (submitted once during planning phase)
- Initial Phase (submitted on first day of project)
- Contractor Quality Control Reports (CQC Daily Report) also called Daily Quality Control Report (DQCRs) (submitted daily during field or construction activities)
- Daily Contractor Production Report (submitted daily during field or construction activities)
- Testing Plan and Log
- QC Completion Inspection (at end of field event or construction activity)
- Variance Forms
- Rework Items List
- Field Change Request
- Log of Submittals

Confirm with the client what the forms are required and who is to receive them (project distribution list). Use established templates for each form. Any changes to the forms should be approved by the client representative ahead of time. The field team leader, construction manager, or other designated project personnel is responsible for timely submittal of forms. Generally, the project manager reviews and maintains a file of the forms.

Daily CQC Reports are completed daily by the field team leader or site manager. The purpose of these reports is to provide a daily report of construction and/or field activities to the client representative, base representative (e.g., Resident Officer in Charge of Construction), and TN&A Project Manager. Information on the CQC Reports should be in a bulleted format (concise and brief). The information will include at minimum:

- Project, contract, and delivery order/task order numbers
- Date (on each page)
- Project name and location
- Temperature range, sun/wind conditions
- Summary of site activities
- Level of health and safety protection used
- Field instruments used, calibrations performed
- Problems encountered, corrective actions taken
- Sampling or testing activities performed (record sample IDs)
- QC samples collected (record QC sample IDs)
- Additional remarks, and

- Signature of person filling out CQC Report.

CQC Reports will be completed and faxed or emailed on a daily basis to the client representative and TN&A Project Manager during field events or construction activities.

Daily Contractor Production Reports are also filled out and submitted on a daily basis along with the CQC Report. The Contractor Production Reports documents work performed, health and safety actions and inspections, equipment and personnel on site, number of hours for equipment and personnel, equipment and material received, and remarks (generally production achieved). The Production Report references specific plan documents or work plan sections for each activity.

STANDARD OPERATING PRACTICE TNFLD006B

Sampling of Surface Soils and Other Surficial Materials

TABLE OF CONTENTS

1.0 INTRODUCTION 2
1.1 Objective 2
1.2 Applicability and Limitations 2
2.0 SAMPLING EQUIPMENT 2
2.1 General Sampling Supplies 2
2.2 Soil Sampling Equipment 3
3.0 PROCEDURES 3
3.1 Preparation 3
3.2 Collection Of Samples 4
3.2.1 Collection of Surface-Soil Samples for Semi-volatile Organic Compounds or Inorganic Analyses 4
3.2.2 Collection of Surface-Soil Samples for Volatile Organic Compounds Analysis 4
3.2.3 Collection and Homogenization of Composite Samples 5
3.3 Sieving Soil Samples 6
3.3.1 Objectives of Sieving Soil Samples 6
3.3.2 Equipment and Supplies 6
3.3.3 Field Procedures 6
4.0 REFERENCES 7

STANDARD OPERATING PRACTICE TNFLD006B

Sampling of Surface Soils for Site Characterization or Risk Assessment

1.0 INTRODUCTION

1.1 OBJECTIVE

The objective of this Standard Operating Practice (SOP) is to define the techniques and requirements for collecting grab surface-soils and other surficial material samples for the purposes of site characterization and/or risk assessment.

1.2 APPLICABILITY AND LIMITATIONS

Surface soil is usually referred to as the soil extending from the ground surface to a depth of approximately 1 foot (ft) below land surface. For human health risk assessment purposes (analysis of potential soil ingestion, inhalation of particulates), surface soil samples are typically collected from the upper six inches of soil. The project Sampling and Analysis Plan (SAP) or comparable document should specify the depth at which surface soil samples are to be collected.

Surface-soil samples are collected to determine the type(s) and level(s) of contamination, to define the area affected by contaminants, and to determine background concentrations. These samples may be collected as part of an investigative plan, site-specific sampling plan, and/or as a screening method for "hot spots" that may require more extensive sampling.

This SOP may also apply to collection of samples from other types of surface materials (fills, sediments, or other relatively dry, non-cemented contaminated media). This SOP does not cover radioactive materials.

2.0 SAMPLING EQUIPMENT

2.1 GENERAL SAMPLING SUPPLIES

Equipment and supplies that are typically needed for sampling surface soils and other surficial materials include:

- site-specific SAP or sampling plan,
- field logbook and/or sampling forms and site map,
- indelible (waterproof) ink pens and markers,
- sample tags/labels and the appropriate forms/documentation (including chain-of-custody forms) as described in TN&A Standard Operating Practice (SOP) 010C,

- appropriate sample containers, insulated cooler, ice for sample preservation (if required),
- latex or nitrile gloves,
- plastic zip-top bags and waterproof sealing tape,
- plastic sheeting
- decontamination equipment (e.g., rinse bottles and pressurized spray tanks) and supplies [e.g., American Society for Testing Materials (ASTM) Type II organic-free water, Alconox®, etc.]. See TN&A SOP 011A for decontamination procedures,
- protective clothing and gear, and
- Site-specific Safety and Health Plan (SSHP).

2.2 Soil Sampling Equipment

The following list provides general guidance to field personnel preparing for a field event including surficial soil sampling:

- Appropriate equipment and field screening instruments (e.g., photoionization detectors, XRF) for obtaining field measurements as specified in the site-specific SAP,
- Distance measuring device (e.g., tape measure),
- Sampling device (e.g., soil auger, slide-hammer sampling assembly, stainless steel trowel). Note: If sampling for volatile organic compounds (VOCs), the sampling device can be Teflon®-lined or constructed of stainless steel, brass, or mild steel. When sampling for metals, the sampling device must be stainless steel or plastic.
- Stainless steel, brass, Lexan® or Teflon inserts for auger sampler (if used),
- Plastic end caps for the sleeves, aluminum foil, and Teflon or silicon tape,
- Stainless steel and/or Teflon-lined pans, trays, or bowls for compositing and mixing sample material,
- Stainless steel and/or disposable plastic scoops, shovels, trowels, spoons, or spatulas,
- Stainless steel tweezers or forceps.

3.0 PROCEDURES

3.1 Preparation

When preparing for sample collection:

1. Personnel will first don appropriate protective clothing and equipment as required by the SSHP.
2. Create a clean work surface for sample collection using plastic sheeting on the ground or a portable table near the sampling area, and place decontaminated sampling equipment, sampling containers, and cooler on it. If equipment is to be decontaminated in the field, place another plastic sheet on the ground for decontamination equipment and supplies.

This will serve as a decontamination area for sampling equipment after sampling is completed.

3. Record all information in the field logbook. Document all deviations from procedure(s) and rationale for changes in the field logbook and on additional forms, as required by the SAP.

3.2 Collection Of Samples

3.2.1 Collection of Surface-Soil Samples for Semi-volatile Organic Compounds or Inorganic Analyses

1. Follow the sampling pattern outlined in the site-specific SAP. When known or suspected contamination exists (e.g., spill area or dumping site), attempt to collect samples starting from the least-contaminated and ending with the most-contaminated locations.
2. Change gloves in between samples and use decontaminated equipment at each site to minimize cross-contamination.
3. Label each container with the appropriate information.
4. Carefully remove or excavate loose debris and exposed material from the top 1 to 2 centimeters (cm) or to the desired sampling depth.
5. Using a clean scoop, trowel, shovel, bucket auger, or trier, place sufficient material into a clean stainless steel or Pyrex® bowl or tray and thoroughly mix the sample with a clean spoon or spatula.
6. Fill the sample container(s) directly from the tray or bowl with the spatula or spoon; remove stones, twigs, grass, etc., from the sample by hand (gloved) or forceps.
7. If the sample is water saturated, carefully decant the water from the container(s) with minimal disturbance to the sample.
8. Immediately wipe any dirt and grit from the threads of sample containers with the gloved hand. Secure and seal the Teflon-lined cap.
9. Rinse the outside of the filled sample container(s) and wipe dry.
10. Wrap the container in bubble pack (if necessary) and seal it into zip-top or other resealable plastic bag.
11. Samples for nonvolatile organics or inorganics can also be collected using liners following the procedures described in Section 3.2.2.
12. Place the sample in the cooler and cool to 4°± 2° Celsius (C). Refer to SOP 010C for the proper shipping procedures.
13. Collect appropriate location, sample-depth, and/or field measurements and record these data in the field logbook.

3.2.2 Collection of Surface-Soil Samples for Volatile Organic Compounds Analysis

1. Follow steps 1 through 5 from Section 3.2.1.

2. Assemble a clean slide-hammer sampling assembly, hand auger, or other sampler with a stainless steel, brass, or Teflon liner. The type and material of the liner will be specified in the SAP.
3. Collect the sample by advancing the sampler into the subsurface.
4. Withdraw the sampler from the subsurface and extract the sleeve (if used).
5. If the sample is water saturated, carefully decant the water from the sleeve with minimal disturbance to the sample.
6. If using sampler liner, place Teflon or aluminum foil (shiny side away from sample) sheet on ends and cap. Secure the caps with inert tape (e.g., silicon or Teflon). Wipe clean, label, and place in re-sealable plastic bag.
7. If not using liner, immediately transfer sample material into proper containers. Add field preservative, if required. Note: Do not composite or homogenize the VOC sample.
8. Place the sample in the cooler and cool to 4°± 2°C. Refer to SOP 010C for the proper shipping procedures.
9. Collect appropriate location, sample-depth, and/or field measurements and record these data in the field logbook.
10. Backfill the sample hole and flag or stake as required.

The procedures outlined above also apply to any other specified sample that can be degraded by aeration.

3.2.3 Collection and Homogenization of Composite Samples

Composite samples consist of a series of discrete grab samples that are mixed together to characterize the average composition of a given material. The discrete samples used to make up a composite sample are of equal volume and are collected in an identical fashion. A composite sample of surface soil, sediment or other surficial material is generally an areal composite. Areal composites are composed from grab samples of equal volume collected in an identical manner. The site-specific SAP should specify the basis (random grid, targeted, etc.) for collection of the grab samples.

It is important that a composite sample be truly representative if the various sample locations making up the composite. Therefore, proper homogenization techniques should be followed to generate a composite sample. In addition, the equipment used to composite the sample must not affect the sample quality. A stainless steel bowl and stainless steel or Teflon® or PFTE spoon, properly decontaminated (SOP 011A), are typically used for field compositing of soil samples.

The following steps must be followed when compositing surface soil, sludge, and sediment samples:

1. Determine where composite sample(s) will be obtained as indicated in the site-specific SAP.

2. VOCs—and in some cases, semivolatile organic compounds—should not be composited as the sample will become aerated and will not be representative of in-situ conditions.
3. Collect a minimum of three equal-volume samples from the specified sample location. The volume of each sample must be at least the amount required for a single sample.
4. Place the samples in an appropriate mixing tray or bowl.
5. Divide the soil in the sample tray or bowl into quarters. Each quarter is mixed individually, then all quarters are mixed into the center of the pan. Follow this procedure several times until the sample is adequately mixed. If a round bowl is used, stir the material in a circular fashion and occasionally turn the material over. The extent of mixing will depend on the nature of the material and should be done to achieve a consistent physical appearance prior to filling sample containers.
6. Once mixing is completed, divide the sample material in half and fill containers by scooping sample material alternately from each half. Transfer subsamples of the composited sample into the appropriate sample containers. Seal, wipe clean, and label sample containers. Use the same care in handling these samples as that used for other samples from the site.

3.3 Sieving Soil Samples

3.3.1 Objectives of Sieving Soil Samples

Field sieving of soil samples may be performed to remove coarse-grained sample material and/or determine grain-size distribution. Soil samples must be processed through multiple sieve sizes to determine grain-size distribution, in accordance with ASTM D422.

3.3.2 Equipment and Supplies

- Stainless steel and/or Teflon-lined pans, trays, or bowls for compositing and mixing sample material,
- Stainless steel and/or disposable plastic scoops, shovels, trowels, spoons, or spatulas,
- Sampling device (e.g., soil auger, slide-hammer sampling assembly, stainless steel trowel). Note: If sampling for metals, the sampling device must be stainless steel or plastic,
- No. 10 mesh (2.0- millimeter [mm]) stainless steel sieve, and other sieve sizes as required for project
- Digital scale

3.3.3 Field Procedures

1. Calibrate and "zero" the scale
2. After collecting a sample as directed in Sections 3.1 and 3.2 .1 above, weigh the total sample and record the information in the logbook.
3. Place the sample into the sieve or sieve series and shake until the separated fraction has been produced from each sieve size. A shaker may be used.

4. Weigh each soil fraction; determine volume of each fraction if needed for determination of mass.
5. Collect desired samples from sieved fraction of the sample; place in sample container, record fraction size on label as well as sample ID. Manage samples following chain-of-custody procedures.
6. Record the weights, volumes, sample descriptions, sample processing methods and equipment in the field logbook.

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STANDARD OPERATING PRACTICE TNFLD010C

Sample Labeling, Control and Shipping

TABLE OF CONTENTS

Page

1.0 INTRODUCTION 2

2.0 SAMPLE LABELING PROCEDURES 2

2.1 Procedures 2

3.0 SAMPLE NOMENCLATURE 3

4.0 CHAIN OF CUSTODY PROCEDURES 3

5.0 SAMPLE HANDLING PROCEDURES 5

5.1 General 5
5.2 Sample Packaging for Shipment 5
5.3 Sample Shipment Considerations (DOT Regulations) 6

6.0 REFERENCES 7

STANDARD OPERATING PRACTICE TNFLD010C

Sample Labeling, Control and Shipping

1.0 INTRODUCTION

The general objective of this SOP is to present procedures for sample identification (ID), sample control and chain-of-custody, and sample handling.

2.0 SAMPLE LABELING PROCEDURES

All sample identification, field records, and chain-of-custody records will be recorded in black waterproof, ballpoint non-erasable ink. Under no circumstances will "Sharpie" markers be used on field forms or chain-of-custody forms. If errors are made on any of these documents, personnel will cross a single line through the error and enter the correct information. All corrections shall be initialed and dated by the person performing the correction. If possible, all corrections should be made by the individual who made the error.

If information is entered using stick-on labels on sample tags, logbooks, or sample containers, subsequent removal of these labels should not be possible without leaving obvious indications of the attempt. Labels should never be placed over previously recorded information. Corrections to information recorded on stick-on labels should be made as stated in the previous paragraph.

2.1 PROCEDURES

All soil, sediment, surface water, groundwater, waste, ambient air, and vapor emission samples collected will be labeled according to the following procedures.

1. Label each sample container with the following information:
    - Date and time,
    - Sample ID number,
    - Project number ,
    - Sampler (name), and
    - Preservative .
2. Enter sample collection information in the field logbook. Begin the sample collection entry with the time at which the sample is collected (or collection is begun). Make the entry chronologically in the logbook (SOP No. 002A).
3. If no map of sampling locations is available prior to sampling, sketch a drawing of the site (not to scale) in the field logbook to provide an illustration of all sampling points. Provide

measured distances from sampling points to a fixed reference point to allow accurate placement of sample locations on figures or maps.

3.0 SAMPLE NOMENCLATURE

The sample numbering scheme used for field samples and quality control (QC) samples is defined in the project-specific Sampling and Analysis Plan, Field Sampling Plan or comparable document.

4.0 CHAIN OF CUSTODY PROCEDURES

Chain-of-custody (COC) is a continuous possession of samples from their origin to completion of analysis and archiving/disposal in the laboratory. This uninterrupted possession is required to maintain integrity of samples. The chain-of-custody record is the documentation of this uninterrupted possession of the samples. The following procedures are recommended for ensuring preservation of chain-of-custody in the field:

- To simplify the chain-of-custody record and eliminate potential litigation problems, as few people as possible should handle the samples during the investigation.
- Each field team member is responsible for the proper handling and custody of the samples collected until they are properly and formally transferred to another person or facility. If the project has a Field Sample Coordinator (FSC), the field team will deliver all samples to the FSC as soon as possible, who then assumes responsibility for completing the chain-of-custody record.
- Prior to or immediately following sample collection, sample labels shall be completed for each sample container, using black waterproof, non-erasable ink, and affixed to the sample container. Labels should be affixed to each sample container and completely covered with a clear waterproof tape to prevent the labels from separating from the sample containers or water damage to the labels.
- Sample containers should be placed in resealable plastic bags before placement on ice to prevent moisture from contacting the sample jars, which could affect the legibility of the sample container labels.
- All samples collected (date, time of collection, sample ID, location and other information as necessary) must be documented in bound field logbook at the time of sample collection.

To complete the chain-of-custody and to maintain an accurate record of sample collection, transport, analysis and disposal, the following methodology will be used:

1. Samples will be accompanied by a chain-of-custody form at all times. A chain-of-custody record will be completed for all samples or materials collected. A separate chain-of-custody record will be utilized for each final destination or laboratory utilized during the inspection or investigation.

2. The chain-of-custody form will be used by personnel responsible for ensuring the integrity of samples from the time of collection until shipment to the laboratory.

3. The chain-of-custody record shall accompany all samples to the final destination. The original of the record will be placed in a sealed plastic bag taped to the inside top cover of the cooler. One copy of the record will be retained by the Field Sample Coordinator, and faxed to the Project Chemist and Project Manager. The original record will be transmitted to the Project Manager after samples are accepted by the laboratory. This copy will become a part of the project file.

4. The chain-of-custody form will be signed by each individual who has the samples in his or her possession.

5. The chain-of-custody form will be initialed in the field by the person collecting the sample, for every sample. If needed, several COC forms or COC continuation forms can be used to group samples under one COC. The continuation forms will reference the original COC number and all pages will be numbered.

6. The chain-of-custody will be completed in the field to indicate project, date, location, sampler, client, etc.

7. If the person collecting the sample does not transport the samples to the laboratory or deliver the sample containers for shipment, the first block for "Relinquished by" and "Received by" will be completed in the field by the sampler and transporter, respectively.

8. The person transporting the samples to the laboratory or delivering them for shipment will sign the record form as "Relinquished by" at the time the samples are handed off to the laboratory (which will sign the "Received by" section).

9. If the samples are transported directly to the laboratory, the chain-of-custody form will be kept in the possession of the person delivering the samples.

10. If the samples are shipped to the laboratory by commercial carrier, the chain-of-custody form will be sealed in a watertight container, taped on the inside lid, and the shipping container sealed with custody seals (two on each shipping container) and tape prior to being given to the carrier.

    a. For samples shipped by commercial carrier, the waybill or air bill will serve as an extension of the chain-of-custody record between the final field custodian and receipt in the laboratory. The sender's copy of the waybill must be stapled to the sender's copy of the chain-of-custody form and filed with the original. The waybill tracking number must be entered into the logbook. Sample sender must sign with date and time as "Relinquished by" just before sealing coolers.

    b. Upon receipt in the laboratory, the sample recipient will open the shipping containers, compare the contents with the chain-of-custody record, ensure that document control

information is accurate and complete, and sign and date the record as "Received by". Any discrepancies will be noted on the chain-of-custody form.

c. In the event of the discrepancies, the samples in question will be segregated from normal sample storage and the Project Chemist immediately notified.

d. The chain-of-custody form is completed upon receipt of the samples by the analytical service laboratory. The completed chain-of-custody form will be returned to the Project Manager and maintained in the project file.

5.0 SAMPLE HANDLING PROCEDURES

5.1 GENERAL

Upon collection, all samples will be immediately placed on ice and taken to a proper location for packing, re-icing, and shipment. At all times, sufficient ice must be in the coolers to maintain a temperature of 4° C. All void spaces in the cooler should be filled with ice. Estimate no more than two to one ratio of samples to ice, except during hot weather when a one to one ratio should be used (e.g., one pound of ice per one pound of sample). This will insure samples are stored at the proper temperature.

5.2 SAMPLE PACKAGING FOR SHIPMENT

When preparing the samples for shipment to the laboratory, the following procedures will be employed:

1. Proper packing is necessary to ensure that samples arrive at the laboratory in good condition. The following protocol will be used for packaging of samples:

    a. Only waterproof metal or equivalent strength plastic ice chests and coolers will be used. Tapes that may emit VOCs will not be used within the container.

    b. Two large garbage bags or drum liners will be placed in the cooler to prevent leakage.

    c. Approximately 2 inches of inert cushioning material (vermiculite or similar absorbent material) will be placed in the bottom of the inner drum liner.

    d. All sample containers will be placed in clear, plastic, resealable (e.g. Ziploc ™) bags. Glass containers should be wrapped in bubble wrap or cushioning material to prevent breakage.

    e. Samples will be packed properly for shipment so that the bottles will not move around and/or break during shipment.

    f. Sufficient ice to maintain 4° C during shipment will be placed beneath, around, and on top of the sample containers. Additional cushioning materials will be added to prevent movement of samples during shipment.

g. The chain-of-custody form will be placed in a resealable plastic bag and attached to the lid of the cooler with clear plastic packing tape. Laboratory name and contact, courier name(s), and other pertinent information will be recorded on the form.

h. If the cooler is equipped with a drain plug, it will be taped shut.

i. The completed shipping label will be attached to the cooler.

j. "This Side Up" arrow labels will be placed on two sides of the cooler, and "Fragile" labels will be placed on all four sides.

k. Numbered and signed custody seals will be placed on the front right and back left of each cooler. These seals will be covered with clear plastic packing tape.

1. Samples will be transported by courier in an approved, cooled shipping container, ensuring that the maximum holding times between sample collection and analysis will not be violated. In general, all samples should be shipped priority overnight.

2. The weight limit of the shipper will be observed.

3. All records pertaining to the shipment of a sample will be retained in the project file (e.g., freight bills, post office receipts, and bills of lading).

5.3 Sample Shipment Considerations (DOT Regulations)

Samples in general can be classified in to hazardous materials/dangerous goods for shipment per DOT regulations. If we believe that the sample does not contain hazardous materials above reportable quantities or above TCLP hazardous characteristics, or above listed concentrations in the 40 CFR hazardous waste table including pH, corrosivity, and ignitability criteria, we can ship them regular, i.e. not under DOT requirements.

If the shipper believes that the sample contains a hazardous substance, for example chromium, then he/she should check reportable quantity (RQ) for chromium, TCLP for chromium, and sample pH (for liquid) and make a simple estimate of actual chromium content in the sample. Then add up all the chromium per cooler and see the requirements under DOT regulations for shipment of hazardous/dangerous goods shipment.

IF YOU ARE NOT DOT-TRAINING CERTIFIED, YOU CANNOT SHIP HAZARDOUS MATERIAL/DANGEROUS GOODS. To do so risks large fines against the individual who signs the shipping bill.

For some chemicals and compressed gases, the quantity, limitations, shipment requirements are all given in 49 CFR 172.101, especially in the Hazardous Materials Table 172.101. Field personnel cannot classify samples based on the source or origin according to these regulations. The shipper is supposed to know something about actual or expected chemical concentrations of the material in the shipping container. Field personnel who are unsure about shipping anything from the field should call a qualified person in the office and have the regulations reviewed for each situation.

6.0 REFERENCES

Department of Transportation, Final National Guidance Package for Compliance with Department of Transportation Regulations in the Shipment of Laboratory Samples, March 1981.

United States Environmental Protection Agency Region 4, Environmental Investigations Standard Operating Procedures and Quality Assurance Manual, May 1996.

APPENDIX A.3

TOLTEST INC. STANDARD OPERATING PROCEDURES

APPENDIX A.3

FIELD SOP TABLE OF CONTENTS

SOP 1-4	Use of Field Notebooks
SOP 8-3	Soil Sampling (Surface Soils, Hard Auger, and Grab Sampling)
SOP 8-10	Packaging and Shipment of Field Samples

1.0 Purpose

The purpose of this procedure is to detail the minimum requirements for the proper use and maintenance of logbooks used during the performance of a field investigation.

2.0 Scope

This procedure applies to the following logbooks, when required to be maintained, during the performance of a field investigation:

- Site Logbook;
- Field Associate Logbook;
- Health and Safety Logbook;
- Field Equipment Logbook;
- Decontamination Logbook;
- Field Logbooks; and
- Photographs.

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3.0 References

None.

4.0 Definitions

Logbook - The logbook is a bound notebook with consecutively numbered pages that cannot be removed. Upon entry of data, the logbook requires signature by the responsible individual.

5.0 Responsibilities

The site logbook is issued by the Project Manager to the Field Operations Leader or other person responsible for the direction of on-site activities (e.g., Reconnaissance Survey Team Leader, Sampling Team Leader). It is the responsibility of this person (or his designee) to keep the site logbook current

while in his possession, and return it to the Project Manager or turn it over to another field team. Following the completion of all fieldwork, the site logbook is returned to the Project Manager for inclusion in the permanent project files.

Field logbooks are issued by the Field Operations Leader to the person responsible for on-site activities. It is the responsibility of this person to keep the logbook current while in his possession and return it to the Field Operations Leader following completion of all fieldwork or when the logbook is full and a replacement logbook is needed.

6.0 Equipment

None specified.

7.0 Procedure

Logbooks are initiated at the start of the first on-site activity (e.g., initial reconnaissance survey). Entries are made each day that on-site activities take place, which involve TolTest or subcontractor personnel. A current logbook is maintained throughout the field effort for each activity.

The site logbook becomes part of the permanent project file. Because information contained in the site logbook may be admitted as evidence in cost recovery or other litigation, it is critical that this document be properly maintained. All logbooks must be secured at the end of each day.

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7.1 General

The cover of each logbook will contain the following information:

- project name;
- project number;
- Project Manager's name;
- sequential book number; and
- start date and end date.

All entries should be made in black pen. No erasures are permitted. If an incorrect entry is made, the data should be crossed out with a single strike mark so as not to be obliterated then initialed and dated. At the completion of entries by any individual, the logbook must be signed at the bottom of every page.

7.2 Site Logbook

The site logbook is a controlled document which records all major on-site activities during a field

investigation. At a minimum, the following activities or events should be recorded in the site logbook:

- arrival and departure of site visitors;
- arrival and departure of equipment;
- sample pick-up (e.g., chain-of-custody form numbers, carrier, time);
- sampling activities and sample logsheet numbers;
- start or completion of borehole, trench or monitoring well installation or sampling activities; and
- health and safety issues.

Daily entries into the logbook may contain a variety of information. At the beginning of each day the following information must be recorded:

- date;
- start time;
- weather;
- all field personnel present; and
- any visitors present.

During the day, a summary of all site activities and level of personal protection should be recorded in the logbook. The information need not duplicate that recorded in other field logbooks (e.g., sample logbook, Site Geologist's logbook, Health and Safety Officer's logbook, etc.), but should summarize the contents of these other logbooks and refer to the page locations in these logbooks for detailed information. An example of a site logbook page is shown in Attachment 1-4A.

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7.3 Field Operations Leader Logbook

The requirements for the field logbooks are the same as for the site logbook, except that the book is kept up to date in real time. In general, these books never leave the site and are sequentially numbered if more than one are used. The front of the logbook lists the project number and name, the name of the contract under which the investigation is being conducted, and the date(s) of use. A field logbook is normally used by the rig geologist or by the Field Associate to record specific details of each task. Although the field logbook contains the specific field information being collected based on a task, the number of the field logbook and page numbers used for a particular day's performance will be referenced in the site logbook to include a brief summary.

7.4 Health and Safety Logbook

The Health and Safety Logbook (HSL) is used to document protection levels, health and safety training sessions and equipment meter readings that substantiate protection levels. The HSL is also used to document any abnormal occurrences or accidents. The HSL is maintained by the Project Health and Safety Officer or his designee.

7.5 Field Equipment Logbook

The purpose of the Field Equipment Logbook (FEL) is to document the proper use, maintenance and calibration of field testing equipment. Before using field equipment, the Field Operations Leader

(supervisor) shall inspect and approve the use of the field testing equipment by initialing the appropriate page in the FEL. A calibration record shall be maintained for each instrument used on site and shall be kept in the FEL. The following items shall be tracked in the FEL:

- equipment calibration status;
- equipment decontamination status;
- equipment nonconformance; and
- equipment inspection and repair records.

The person using, maintaining or calibrating field equipment shall document his or her actions in the FEL. Entries shall contain the following:

- names and signatures of persons making entry;
- date of entry;
- adjustments made during calibration or maintenance;
- name of equipment and its identifying number;
- list or reference of procedure(s) used for calibration or maintenance; and
- standard type, concentration manufacturer, lot number and expiration date of calibration standards.

Entries in the log shall be signed and dated by the person(s) making the entry. Every page in the log will be signed and dated by the field supervisor. This signature reflects his or her review and approval of the entry validity.

7.6 Decontamination Logbook

The decontamination logbook is used to document the proper decontamination of equipment used in the field investigation. The decontamination logbook will contain the following:

- name of person performing decontamination;
- date of entry;
- equipment shall be identified as to type and serial number (where applicable);
- decontamination procedure used;
- name, manufacturer, lot number and expiration of decontamination solutions used; and
- record of organic vapor check (after decontamination).

Entries in the log shall be signed and dated by the person making the entry. Every page of the log must

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be initialed by the Project Manager indicating the validity of the entry.

7.7 Photographs

The record of photographs taken at a site for the purpose of project documentation must be recorded in the site logbook or a field logbook. When movies, slides or photographs are taken of a site or any monitoring location, they are numbered to correspond to logbook entries. The name of the photographer, date, time, site location, site description and weather conditions are entered in the logbook as the photographs are taken. A series entry may be used for rapid-sequence photographs. The photographer is not required to record the aperture settings and shutter speeds for photographs taken within the normal automatic exposure range; however, special lenses, films, filters, and other image-enhancement techniques must be noted in the logbook. Such techniques should be avoided, if possible, as they can adversely affect the admissibility of photographs as evidence. Chain-of-custody procedures depend upon the subject matter, type of film and the processing it requires. Film used for aerial photography, confidential information, or criminal investigations require chain-of-custody procedures. Adequate logbook notations and receipts may be used to account for routine film processing.

Once processed, the slides of photographic prints shall be serially numbered and labeled according to the logbook descriptions.

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8.0 Attachments

1-4A Typical Site Logbook Entry
1-4B TolTest On-Site Activity Log (Form)

ATTACHMENT 1-4A

TYPICAL SITE LOGBOOK ENTRY

START TIME: DATE:

SITE LEADER:

PERSONNEL:

DRILLER:

WEATHER: Clear, 68°F, 2-5 mph wind from SE

ACTIVITIES:

1. Steam jenny and fire hoses were set up.

2. Drilling activities at well ___ resumed. Rig geologist was _____. See Geologist's logbook Not. 1, page 29-30, for details of drilling activity. Sample No. 123-21-S4 collected; see sample logbook, page 42. Drilling activities completed at 11:50 and a 4" stainless steel well installed. See Geologist's logbook, No. 1, page 31, and well construction details for well ___.

3. Drilling Rig No. 2 steam-cleaned at decontamination pit. Then set up at location of well ___.

4. Well ___ drilled. Rig geologist was _____. See Geologist's logbook, No. 2, page __ for details of drilling activities. Sample numbers 123-22-S1, 123-22-S2, and 123-22-S3 collected; see sample logbook, pages 43, 44, and 45.

5. Well ___ was developed. Seven 55-gallon drums were filled in the flushing stage. The well was then pumped using the pitcher pump for one hour. At the end of the hour, water pumped from well was "sand-freed".

6. OEPA arrives on-site at 14:25 hrs.

7. Large dump truck arrives at 14:45 and is steam-cleaned, Backhoe and dump truck set up over test pit ____.

8. Test pit ___ dug with cuttings placed in dump truck. Rig geologist was _____. See Geologist's logbook No. 1, page 32, for details of test pit activities. Test pit subsequently filled. No samples taken for chemical analysis. Due to shallow ground-water table, filling in of test pit ___ resulted in a very soft and wet area. A mound was developed and the area roped off.

9. Express carrier picked up samples (see Sample Logbook, pages 42 through 45) at 17:50 hrs. Site activities terminated at 18:22 hours. All personnel off-site, gate locked.

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Field Associate Signature

ATTACHMENT 1-4B

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1.0 Purpose

The purpose of this procedure is to outline the requirements for sampling surface soils, hand auger sampling, and grab sampling of soils. Soil sampling for environmental projects is normally conducted to define soil types and geological characteristics present in the subsurface and to determine the nature and extent of soil contamination. Soil samples are collected at individual sampling locations across the surface area of investigation as well as at various depths within each sample location to characterize conditions and features.

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2.0 Scope

Soil sampling is potentially applicable to any hazardous waste site. A variety of sampling techniques is available for collection of soil samples. These include grab sampling, split-spoon sampling, collection of hand augured soil samples, Shelby tube sampling, and continuous coring.

Collection of surface samples may require no special sampling equipment or highly detailed procedures. Samples may be obtained on or in the vicinity of a hazardous waste site and should be representative of the nature of local surface soils or sediment.

3.0 References

- U.S. Environmental Protection Agency (EPA), 1987, *A Compendium of Superfund Field Operation Methods.*

4.0 Definitions

Auger Cuttings - soil brought to the surface by the action of the augers as they are drilled into the ground.

Hazardous Waste Sample - medium to high concentration sample (e.g., source material, sludge, leachate) requiring DOT labelling and off-site laboratory handling as a high hazard sample.

5.0 Responsibilities

5.1 Project Manager

The Project Manager is responsible for overall management of field activities and ensuring that appropriate soil sampling procedures are followed.

5.2 Site Geologist

The Site Geologist directly supervises sampling procedures, classifies soil and rock samples, and directs the packaging and sealing of soil and rock samples for shipment to an off-site laboratory. Such duties may also be performed by the on-site geotechnical engineer or Field Associate as required by an individual project.

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6.0 Equipment

The following pieces of equipment may be needed to collect samples:

- Drilling equipment - capable of collecting depth-specific samples
- Stainless steel hand auger, shovel, AMS sampling equipment or post-hole digger
- Teflon® tape
- Teflon® or stainless steel spatula or short, hand-pushed core tube
- Stainless steel bowl or Teflon® mixing bowl
- Organic vapor monitoring device (photoionization detector or organic vapor analyzer)
- Appropriate sampling containers
- Reclosable plastic bags
- Decontamination supplies as specified in TolTest SOP 3-1 and/or the project work plan or sampling plan.
- Field logbook and field sampling forms

7.0 Procedure

The soil sample collection point in the field should be within two feet horizontally of the pre-determined sample location identified in the proposal or work plan. The final location of the sampling point should be defined by surveying or measuring from previously surveyed points following procedures outlined in TolTest SOP 1-6, Site Surveying and Mapping. The accuracy of the soil sampling point location will be determined by the data quality objectives. Sample collection information should be recorded in the field logbook and in the sampling forms.

Surface/air contact may be minimized by placing the sample in an airtight container immediately after collection.

Sampling and sample preparation equipment will be decontaminated in accordance with TolTest SOP 3-3, Decontamination of Manual Sampling and Drilling Equipment, prior to and after each sample is collected unless disposable equipment is used.

If necessary or required, soil sample locations can be permanently identified using a brass surveyor's pin or equivalent permanent marker inscribed with the boring location identification number and placed in a concrete form. Depth-profile sampling must comply with the above requirements. Care must be taken to prevent cross-contamination and misidentification of samples. Vertical depth control tolerances are specified in the TolTest Quality Assurance/Quality Control Manual.

Sampling equipment should be decontaminated by following TolTest SOP 3-1, Decontamination of Ground-Water and Soil Sampling Equipment.

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7.1 Surface Soils Sampling Methods

Samples of surface soils should be collected from the ground surface to a depth of approximately six inches. Samples may be collected using a short, hand-pushed core tube or a stainless steel or polyethylene scoop or shovel. Disposable equipment is preferred, especially if the materials are heavily contaminated. Reused sampling equipment must be decontaminated between uses as describe in TolTest SOP 3-1.

7.2 Hand Augered Sampling Methods

Decontaminated equipment will be used to collect the soil sample. A hand auger consists of a sample bucket attached to the bottom of a length of steel pipe that has a crossbar (handle) at the top. A hole is drilled by turning this crossbar at the same time the operator presses the auger into the ground. The hand auger is driven to the desired depth, which is usually within a few feet of the surface.

Hand-augured samples can be collected directly from the auger bucket or from liners placed within the auger bucket. Liners can be two, four, or six inches in length. The liner for volatile organic analyses is sealed with Teflon® tape and plastic end caps, labeled and sent for analysis.

Geologic data must be maintained on the TolTest Soil Boring Log (see SOP 6-3). Hand auger buckets normally are 6 inches in length. As a result, four individual sample intervals can be obtained over a two-foot section of a boring. Samples from these intervals can be analyzed individually or composited as required by the work plan.

Soil samples that are not to be analyzed for volatile organics are placed in a stainless steel bowl and homogenized with a stainless steel spoon or Teflon® spatula. Large pebbles and cobbles should be removed from the sample. The composite samples for chemical analyses are placed in appropriate containers.

Place the samples on ice in a cooler maintained at 4° Celsius (°C).

Note the sample identification, sample location (provide sketch), sampling time, and sampling personnel in the Field Logbook.

After auguring and sampling activities are completed, the borehole will be filled using soil cuttings, granulated bentonite or concrete as specified in the work plan or proposal. The ground surface will be restored to its original condition. Sampling equipment should be decontaminated following TolTest SOP 3-1, Field Decontamination of Groundwater and Soil Sampling Equipment.

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7.3 Grab Sampling Methods

Grab samples are usually obtained from auger cuttings as they are brought to the surface by the continuous flight augers during rotary drilling activities. Careful determination of the sample's depth must be made based on the speed of the augers and visual assessment of previous cuttings.

Soil samples that are not to be analyzed for volatile organics are placed in a stainless steel bowl and homogenized with a stainless steel spoon or Teflon® spatula. Large pebbles and cobbles should be removed from the sample. The composite samples for chemical analyses are placed in appropriate containers.

Place the samples on ice in a cooler maintained at 4°C.

Note the sample identification, sample location (provide sketch), sampling time, and sampling personnel in the Field Logbook.

8.0 Attachments

None.

1.0 Purpose

The purpose of this procedure is to define the requirements necessary to properly package environmental samples and provide the necessary chain-of-custody records used in sample transfers.

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2.0 Scope

This procedure applies to the packaging, shipping and documentation of samples being transferred from the field to the laboratory for analysis. Specifically, this document outlines shipping and sample documentation procedures that are in accord with the U.S. Department of Transportation (DOT). This procedure is also applicable to all samples taken from uncontrolled hazardous substance sites for analysis at laboratories away from the site; however, this procedure does not take precedence over region-specific or site-specific requirements for sample transportation and chain-of-custody documentation.

Careful packaging, shipping and documentation are necessary to insure that all samples received are undamaged and authentic. Transportation of environmental samples requires proper selection of shipping method, containerization and container seal materials.

3.0 References

U.S. Department of Transportation, 1983. *Hazardous Materials Regulations,* 49 CFR 171- 177.

4.0 Definitions

Carrier - A person or firm engaged in the transportation of passengers or property.

Chain-of-custody record form - A printed form that accompanies a sample or group of samples as custody of the sample(s) is transferred from one custodian to the subsequent custodian. Attachment 8-10A shows a TolTest chain-of-custody form. The chain-of-custody record form is a controlled document. One copy of the form must be retained in the project file.

Custodian - The person responsible for the custody of samples at a particular time, until custody is transferred to another person (and so documented), who then becomes custodian. A sample is under

your custody if:

- You possess the sample.
- It is in your view after being in your physical possession.
- It was in your physical possession and then you locked it up to prevent tampering.
- You have designated and identified a secure area to store the sample.

Environmental sample - low concentration sample typically collected off site and not requiring DOT hazardous waste labelling as a high hazard sample.

Hazardous waste sample - medium or high concentration sample (e.g., source material, sludge, leachate) requiring DOT labelling and contract lab handling as a high hazard sample.

Hazardous material - A substance or material in a quantity and form which may pose an unreasonable risk to health and safety or property when transported. Defined and regulated by DOT (49 CFR 173.2) and listed in Attachment 8-10B.

Hazardous waste - Any substance listed in 40 CFR Subpart D (261.30 et seq) or 40 CFR otherwise characterized as ignitable, corrosive, reactive, or EP toxic as specified under Subpart C (261.20 et seq) that would be subject to manifest requirements specified in 40 CFR 262. Defined and regulated by the Environmental Protection Agency (EPA).

Marking - Applying the descriptive name, instructions, cautions, weight, or specification marks or combination thereof required to be placed outside containers of hazardous materials.

Packaging - The assembly of one or more containers and any other components necessary to assure compliance with the minimum packaging requirements of 49 CFR 172, including containers (other than freight containers or overpacks), portable tanks, cargo tanks, tank cars, and multi-unit tank car tanks.

Placard - Color-coded, pictorial sign depicting the hazard class symbol and name to be placed on all four sides of a vehicle transporting certain hazardous materials.

Reportable quantity (RQ) - A parenthetical note of the form "(RQ-1000/454)" following an entry in the DOT Hazardous Materials table (49 CFR 172.101) indicates the reportable quantity of the substance in pounds and kilograms. If a spill of that amount or more of the substance occurs during transit or storage, a report must be filed with DOT according to 171.15-17 concerning hazardous material incident reports. If the material spilled is a hazardous waste, a report must always be filed, regardless of the amount, and must include a copy of the manifest. If the RQ notation appears, it must be shown either immediately before or after the proper shipping name on the shipping paper (or manifest). Most shipping papers and manifests will have a column designated "HM" which may be used for this purpose.

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Sample - A sample is physical evidence collected from a facility or the environment, which is representative of conditions at the point and time that it was collected.

5.0 Responsibilities

5.1 Project Manager

The Project Manager is responsible for determining that samples are properly packaged and shipped and for determining that the chain-of-custody procedures are implemented from the time the samples are collected to their release to the shippers.

5.2 Field Associate

The Field Associate is responsible for implementing the packaging and shipping requirements and for initiating the chain-of-custody records until they are relinquished to another custodian, to the shipper, or to the carrier.

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6.0 Equipment

- Coder
- Teflon® and nylon strapping tape
- Vermiculite or styrofoam packaging materials
- Bubble pack
- Sampling gloves
- Poly-net
- Reclosable plastic bags
- Permanent felt tip marker
- Pen, black permanent ink
- Shipping coolers
- Ice or blue ice

7.0 Procedure

7.1 Sample Packaging and Shipping

Samples collected for shipment from a site should be classified as either environmental or hazardous material (or waste) samples. In general, environmental samples are collected off site (for example, from streams, ponds, or wells) and are not expected to be grossly contaminated with high levels of hazardous materials. On-site samples (for example, soil, water, and materials from drums or bulk storage tanks,

obviously contaminated ponds, lagoons, pools, and leachates from hazardous waste sites) are considered hazardous. A distinction must be made between the two types of samples in order to:

1. Determine the appropriate procedures for transportation of samples. If there is any doubt, a sample should be considered hazardous and shipped accordingly.

2. Protect the health and safety of laboratory personnel receiving the samples. Special precautions are used at laboratories when samples other than environmental samples are received.

7.2 Environmental Samples

7.2.1 Packaging

1. Environmental samples may be packaged following the procedures outlined in Section 7.4 for samples classified as "flammable liquids" or "flammable solids". Requirements for marking, labeling, and shipping papers do not apply. Environmental samples may also be packaged without being placed inside metal cans as required for flammable liquids or solids.

2. Place the sample container, properly identified and with a sealed lid, in a polyethylene bag and seal the bag.

3. Place the sample in a fiberboard container or cooler which has been lined with a large polyethylene bag and contains ice, blue ice packs or frozen bottled water.

4. Pack with enough noncombustible, absorbent, cushioning materials to minimize the possibility of the container breaking.

5. Seal the large polyethylene bag.

6. Seal or close the outside container.

7.2.2 Marking/Labeling

Sample containers must have a completed sample identification and the outside container must be marked "Environmental Sample." The appropriate side of the container must be marked "This End Up" and arrows placed appropriately. No DOT markings or labeling are required.

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7.2.3 Shipping Papers

No DOT shipping papers are required. However, the appropriate chain-of-custody forms must be included with the shipment. Core must be taken to obtain and list the correct laboratory address on shipping documents. In addition, the type of shipment method (overnight, second day air, regular mail) must be specified as required by the project.

7.2.4 Transportation

There are no DOT restrictions on mode of transportation.

7.3 Determination of Shipping Classification for Hazardous Material Samples

Samples not determined to be environmental samples, or samples known or expected to contain hazardous materials, must be considered hazardous material samples and transported according to the requirements listed below.

7.3.1 Known Substances

If the substance in the sample is known or can be identified, package, mark label, and ship according to the specific instructions for that material (if it is listed) in the DOT Hazardous Materials Table, 49 CFR 172.101.

The following steps are provided to help in locating a proper shipping name from the Hazardous Materials Table, 48 CFR 172.101.

1. Look first for the chemical or technical name of the material, for example, ethyl alcohol. Note that many chemicals have more than one technical name; for example, perchloroethylene (not listed in 172.101) is also called tetrachloroethylene (listed in 172.101). It may be useful to consult a chemist for all possible technical names a material can have. If your material is not listed by its technical name, then

2. Look for the chemical family name. For example, pentyl alcohol is not listed, but the chemical family name is alcohol, n.o.s. (not otherwise specified). If the chemical family name is not listed, then

3. Look for a generic name based on end use. For example, Paint, n.o.s. or Fireworks, n.o.s. If a generic name based on end use is not listed, then

4. Look for a generic family name based on end use. For example, Drugs, n.o.s. or Cosmetics, n.o.s. Finally if your material is not listed by a generic family name but you suspect or know the material is hazardous because it meets the definition of one or more hazard classes, then

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5. You will have to go to the general hazard class for a proper shipping name. For example, Flammable Liquid, n.o.s., or Oxidizer, n.o.s.

7.3.2 Unknown Substances

For samples of hazardous substances of unknown content, select the appropriate transportation category according to the DOT Hazardous Materials Classification (Attachment 8-10B), a priority system of transportation categories.

The correct shipping classification for an unknown sample is selected through a process of elimination, utilizing Attachment 8-10B. Unless known or demonstrated otherwise (through the use of radiation survey instruments), the sample is considered radioactive and appropriate shipping regulations for "radioactive materials" are followed.

If radioactive material is eliminated, the sample is considered to contain "Poison A" materials (Attachment 8-10C), the next classification on the list. DOT defines "Poison A" as extremely dangerous poisonous gases or liquids of such a nature that a very small amount of gas, or vapor of the liquid, mixed with air is dangerous to life. Most Poison A materials are gases or compressed gases and would not be found in drum-type containers. Liquid Poison A would be found only in closed containers; however, all samples taken from closed drums do not have to be shipped as Poison A, which provides for a "worst case" situation. Based upon information available, a judgement must be made whether a sample from a closed container is a Poison A.

If Poison A is eliminated as a shipment category, the next two classifications are "flammable" or "nonflammable" gases. Since very few gas samples are collected, "flammable liquid" would be the next applicable category. With the elimination of radioactive material, Poison A, flammable gas, and nonflammable gas, the sample can be classified as flammable liquid (or solid) and shipped accordingly. These procedures would also suffice for shipping any other samples classified below flammable liquids in the DOT classification table (Attachment 8-10B). For samples containing unknown materials, categories listed below flammable liquids/solids on Attachment 8-10B are generally not used because showing that these materials are not flammable liquids (or solids) requires flashpoint testing, which may be impractical and possibly dangerous at a site. Thus, unless the sample is known to consist of material listed as less hazardous than flammable liquid (or solid) on Attachment 8-10B, it is considered a flammable liquid (or solid) and shipped as such. For any hazardous material shipment, utilize the shipping checklist as a guideline to ensure that all sample-handling requirements are satisfied.

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7.4 Packaging and Shipping of Samples Classified as Flammable Liquid (or Solid)

7.4.1 Packaging

Applying the word "flammable" to a sample does not imply that it is in fact flammable. The word prescribes the class of packaging according to DOT regulations.

1. Collect the sample in the prescribed container with a nonmetallic, Teflon®-lined screw cap. To prevent leakage, fill container no more than 90% full. If an air space in the sample container would affect sample integrity, place that container within a second container to meet the 90% requirement.

2. Complete the sample label and identification tag and attach it securely to the sample container.

3. Seal the container and place in a 2-ml thick (or thicker) polyethylene bag, one sample per bag. Position identification tag so that it can be read through the bag. Seal the bag.

4. Place the sealed bag inside the metal can and cushion it with enough noncombustible, absorbent material (for example, vermiculite or diatomaceous earth) between the bottom and sides of the can and bag to prevent breakage and absorb any leakage. Pack one bag per can. Use clips, tape, or other positive means to hold can lid securely, tightly and permanently. Mark the can as indicated in Paragraph 1 of Section 7.4.2, below.

5. Place one or more metal cans (or a single 1-gallon bottle) into a strong outside container, such as a cooler or a DOT-approved fiberboard box. Surround the cans with noncombustible, absorbent cushioning material for stability during transport. Mark containers as indicated in Paragraph 2 of Section 7.4.2.

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7.4.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either-hand printed or in label form, on the metal can (or the 1-gallon bottle):

   - Laboratory name and address.
   - "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325".

Not otherwise specified (n.o.s.) is not used if the flammable liquid (or solid) is identified. Then the name of the specific material is listed before the category (for example, Acetone, Flammable Liquid), followed by its appropriate UN number found in the DOT hazardous materials table (49 CFR 172.101).

Place all information on the outside shipping container as on the inner can (or bottle), specifically:

- Proper shipping name.

- UN or NA number.
- Proper label(s).
- Addressee and sender.

Place the following labels on the outside container: "Cargo Aircraft Only" and "Flammable Liquid" (or "Flammable Solid"). "Dangerous When Wet" label should be used if the solid has not been exposed to a wet environment. "Laboratory Samples" and "THIS SIDE UP" or "THIS END UP" should also be marked on the top of the outside container, and upward-pointing arrows should be placed on all sides of the container.

7.4.3 Shipping Papers

1. Use abbreviations only where specified. Complete the carrier-provided bill of lading and sign the certification statement (if the carrier does not provide one then use the standard industry form, see Attachment 8-10D). Provide the following information in the order listed (one form may be used for more than one exterior container).

   - "Flammable Liquid, n.o.s. UN1993" or "Flammable Solid, n.o.s. UN1325).
   - "Limited Quantity" (or "Ltd. Qty.")
   - "Cargo Aircraft Only
   - Net weight (wt) or net volume (vol), just before or just after "Flammable Liquid n.o.s." or "Flammable Solid, n.o.s.," by item, if more than one metal can is inside an exterior container
   - "Laboratory Samples" (if applicable)

2. Include the chain-of-custody record, properly executed in the outside container.

3. "Limited Quantity" or "Flammable Liquid, n.o.s." is limited to one pint per inner container. For "Flammable Solid, n.o.s.", the net weight of the inner container plus the sample should not exceed one pound; total package weight should not exceed 25 pounds.

7.4.4 Transportation

1. Transport unknown hazardous substance samples classified as flammable liquids by rented or common carried truck, railroad, or express overnight package services. Do not transport by any passenger-carrying air transport system, even if they have cargo-only aircraft. DOT regulations permit passenger airline company cargo only aircraft, but difficulties with most of these suggest avoiding them. Instead, ship by airline carriers that only carry cargo.

2. For transport by government-owned vehicle, including aircraft, DOT regulations do not apply. However, procedures described above, with the exception of execution of the bill of lading with certification, should still be used.

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7.5 Packaging and Shipping Of Samples Classified as Poison "A"

This packaging, marking, labeling, and shipping method provides a worst-case procedure for materials classed as Poison A (49 CFR 173.328). In the absence of reliable data that exclude the possibility of the presence of Poison A chemicals or compounds (see Attachment 8-10C), these procedures must be followed.

7.5.1 Packaging

Applying the word "poisonous" to a sample does not imply that it is, in fact, poisonous, or how poisonous. It describes the class of packaging according to DOT regulations.

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1. Collect samples in a polyethylene or glass container with an outer diameter narrower than the valve hole on a DOT specification #3A1800 or #3AA1800 metal cylinder. To prevent leakage, fill the container no more than 90% full. Seal the sample container.

2. Complete the sample label and identification tag and attach it securely to the sample container.

3. Attach a string or flexible wire to the neck of the sample container and lower it into the metal cylinder partially filled with noncombustible, absorbent cushioning material (for example, diatomaceous earth or vermiculite). Place only one container in the metal cylinder. Pack with enough absorbing material between the bottom and sides of the sample container and the metal cylinder to prevent breakage and absorb any leakage. After the cushioning material is in place, drop the end of the string into the cylinder valve hole.

4. Replace the valve, torque to 250 ft-lb (for 1-inch opening), and replace valve protector on the metal cylinder, using Teflon® tape.

5. Mark and label the cylinder as described in Paragraph 1 of Section 8.5.2.

6. Place one or more of the cylinders in a DOT-approved outside container.

7. Mark and label the outside container and complete all shipping papers as described below.

7.5.2 Marking/Labeling

1. Use abbreviations only where specified. Place the following information, either hand-printed or in label form, on the side of the cylinder or on a tag wired to the cylinder valve protector.

- "Poisonous Liquid, n.o.s." or "Poisonous Gas, n.o.s. NA9035".
- Laboratory name and address.
- DOT label "Poisonous Gas" (even if sample is liquid) on the cylinder.

2. Put all information contained on the metal cylinder on the outside container. Print "Laboratory Sample" and "Inside Packages Comply With Prescribed Specifications" on the top and/or front of the outside container. Mark "THIS SIDE UP" on top of the container and place upward-pointing arrows on all four sides.

7.5.3 Shipping Papers

1. Use abbreviations only as specified. Complete a carrier-provided bill of lading and sign the certification statement (if the carrier does not provide one, use a standard industry form, see Attachment 8-10D). Provide the following information in the order listed. One form may be used for more than one exterior container.)
   - "Poisonous Liquid, n.o.s. NA9035."
   - "Limited Quantity" (or "Ltd. Qty.").
   - Net weight (wt) or net volume (vol), just before or after "Poisonous Liquid, n.o.s.", of each cylinder, if more than one is inside the outer container.

2. Include a chain-of-custody record, properly executed, in the container or with the cylinder.

3. Accompany the shipping container to the carrier and, if required, open the outside container(s) for inspection.

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7.5.4 Transportation

Transport any unknown hazardous substance samples classified as Poison A only by ground transport or government-owned aircraft. Do not use air cargo, other common-carrier aircraft, or rented aircraft.

7.6 Transport of Investigation and Remediation Wastes

The packaging, marking, labeling, and other shipping requirements will depend on the particular waste to be transported. Examples of wastes which may be generated during the site investigations are decontamination or cleaning solutions, contaminated disposable items, test pit spoils, drilling cuttings or fluids and contaminated monitoring well discharges. Waste materials from remediation include excavation spoils, overpacked drums and discharges from drained lagoons or tanks.

In many cases, wastes generated during site investigations will be disposed of on site. These relatively small volumes of waste will be dealt with as part of the waste to be cleaned up or isolated during remediation. This avenue should be pursued, if feasible, to avoid the inconvenience of transportation and disposal which are disproportionately expensive for small volumes. If such a solution is approved,

materials should be properly bagged, drummed, covered, buried, or otherwise contained at the end of each day. Those materials which must be transported for treatment, storage, or disposal should be packaged, labeled and marked in accordance with applicable regulations.

Many wastes generated during site investigations and remediation activities will probably be adequately handled under the classification "ORM-E" (i.e., other regulated materials, type E). Types of wastes which would normally fall under this classification are contaminated disposable protective clothing and sampling equipment, spent soapy decontamination solutions and rinses, contaminated drilling cuttings or fluids and contaminated soils excavated during site investigations or remediation.

Spent solvents used for decontamination of sampling equipment (e.g., acetone or methanol) should be referenced by the actual product name. Liquids from drums or tanks should be specified as accurately as possible based on results of lab analysis or reliable records. If the liquid is known to be a solvent, organic liquid, or spent distillation bottoms, it should be referenced by its actual or generic name from the Hazardous Materials Table. In cases requiring emergency actions where the identity of a substance is not accurately know, place the substance in one of the general hazard classes in 49 CFR 173.2. The choice of class should be conservative; that is, use the highest priority class based on available information as described in Section 7.3.2.

The following steps for preparing hazardous materials for shipment were extracted from the "Hazardous Materials Transportation Guide for Shippers" published by the U.S. DOT. References are to CFR Title 49:

1. Determine the Proper Shipping Name

   The shipper must determine the proper shipping name of the materials as listed in the Hazardous Materials Table, 172.101, Column (2).

2. Determine the Hazard Class or Classes

   a. Refer to the Table, 172.101, Column (3) and locate the hazard class of the material or follow the steps described in Section 7.3.2 of this Guideline.

   b. If more than one class is shown for the proper shipping name, determine the proper class by definition.

   c. If the material has more than one hazard, classify the material based on the order of hazards in 173.2.

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3. Select the Proper Identification Number

   a. Refer to the Table, 172.101, Column (3a) and select the Identification Number (ID) that corresponds to the proper shipping name and hazard class.

   b. Enter the ID Number(s) on the shipping papers and display them, as required, on packaging or placards.

4. Determine the Mode(s) of Transport to Ultimate Destination*

   a. As a shipper, you must assure yourself that the shipment complies with the various modal requirements.

   b. The modal requirements may affect the following:
      (1) Packaging
      (2) Quantity per package
      (3) Marking
      (4) Labeling
      (5) Shipping papers
      (6) Certification

   * For example, truck, rail or air.

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5. Select the proper label(s) and apply as required

   Required labels are based on the hazard class of the substance to be shipped. No placards are required on vehicles transporting ORM-E substances or limited quantities of any hazardous materials (e.g., hazardous samples as discussed in Section 8.4).

   a. Refer to the Table, 172.101, Column (4) for required label(s).

   b. For details in labeling refer to:
      (1) Additional Labels, 172.402
      (2) Location of Labels, 172.406
      (3) Packaging (Mixed or Consolidated), 172.404(a) and (b)
      (4) Packages Containing Samples, 172.402(h)
      (5) Radioactive Materials, 172.403
      (6) Authorized Label Modification, 172.405

6. Determine and Select the Proper Packaging

   a. Refer to the Table, 172.101, Column (5a) for exceptions and Column (5b) for authorized Packaging. Consider the following when selecting an authorized container: Quantity per package; Cushioning material, if required; Proper closure and reinforcement.

   b. If packaged by a prior shipper, make sure the packaging is correct and in proper condition for transportation.

7. Mark the Packaging (Including Overpacks)

   a. Apply the required marking (172.300); Proper shipping name and number, when required (172.301); Name and address of Consignee and Consignor (172306).

   b. For details and other required markings, see 172.300 through 172.338.

8. Prepare Shipping Papers

   a. The basic requirements for preparing shipping papers include: proper shipping name; hazard class; ID number; total quantity; shipper's certification.

   b. Make all entries on the shipping papers, using the information required, and in proper sequence 172.202.

   c. For additional requirements, see 172.200 through 172.205.

9. Certification

   a. Each shipper must certify, by printing (manually or mechanically) on the shipping papers, that the materials being offered for shipment are properly classified, described, packaged, marked, and labeled, and are in proper conditions for transportation according to the applicable DOT Regulations (172.204).

10. Loading, Blocking, and Bracing

    When loading hazardous materials into the transport vehicle or freight container, each package must be loaded, blocked, and braced in accordance with the requirements for the mode of transport.

    a. If the shipper loads the freight container or transport vehicle, the shipper is responsible for the proper loading, blocking, and bracing of the materials. The packages must be properly labeled as to the right side up and samples must be packed to avoid damage in case of overturning.

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b. If carrier personnel do the loading, the carrier is responsible.

11. Determine the Proper Placard(s)

Each person who offers hazardous materials for transportation must determine that the placarding requirements have been met.

a. For highway, unless the vehicle is already correctly placarded, the shipper must provide the required placard(s) and required identification number(s) (172.506).

b. For rail, if loaded by the shipper, the shipper must placard the rail car if placards are required. (172.508)

c. For air and water shipments, the shipper has the responsibility to apply the proper placards.

12. Hazardous Waste/Hazardous Substance

a. If the material is classed as a hazardous waste or hazardous substance, most of the above steps will be applicable.
b. Pertinent Environmental Protection Agency Regulations are found in the Code of Federal Regulations, Title 40, Part 262.

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7.7 Chain-of-Custody Guidelines

The term "chain-of-custody" refers to procedures which ensure that evidence presented in a court of law is what it is represented to be. The chain-of-custody procedures track the evidence from the time and place it is first obtained to the courtroom. These procedures also provide an auditable trail for the evidence as it is moved and/or passes from the custody of one individual to another. In addition, procedures for consistent and detailed records facilitate the admission of evidence under Rule 803(b) of the Federal Rules of Evidence (P.L. 93-575).

Chain-of-custody procedures, record keeping, and documentation are an important part of the overall management control of the samples. Regulatory agencies must be able to provide the chain of possession and custody of any samples that are offered for evidence, or that form the basis of analytical test results introduced as evidence. Written procedures must be available and followed whenever evidence samples are collected, transferred, stored, analyzed, or destroyed.

7.7.1 Sample Identification

The following information shall be written in the sample log book when in-situ measurements or samples for laboratory analysis are collected:

- project code;
- station number;
- location of station;
- date and time of measurement;
- samples used (if any);
- field observations (include date and time);
- level of personnel protection (if required);
- equipment used to make physical measurements and collect samples; and
- calibration data for equipment used.

Measurements and observations shall be recorded using black, waterproof ink

7.7.2 Sample Label

Samples, other than in-situ measurements, are removed and transported from the sample location to a laboratory or other location for analysis. Before removal, however, a sample is often divided into portions, depending upon the analyses to be performed. Each portion is preserved in accordance with the project work plan or proposal. Each sample container is identified by a sample label.

Sample labels are provided by the laboratory or container manufacturer. The sampler fills out the following information on the sample label:

- Project number
- Sample number - The unique sample number identifying this sample
- Date - A six-digit number indicating the month, day, and year of sample collection; e.g., 12/21/95
- Time - A four digit number indicating the 24-hour time of collection (for example: 0954 is 9:54 a.m., and 1629 is 4:29 p.m.)
- Medium - Water, Soil, Sediment, Sludge, Leachate, etc.
- Sample type - Grab or Composite
- Preservation - Type, quantity, and concentration of preservative added
- Analysis - Analyses requested as part of the investigation. Both name and method number must be listed (e.g., BTEX/8020)
- Sampled by - Name of the sampler

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- Lab # - The receiving laboratory assigns the lab # to the sample label (this number is not to be used for on-site analyses)

- Remarks - If for contract lab analysis, include the contract lab case of SAS number, and contract lab sample number from the traffic report, SAS Packing List, or Dioxin Shipment Record. Also, pertinent observations of the sampler (e.g., sequence number for sequential samples).

7.7.3 Chain-of Custody Procedures

After collection, separation, identification, and preservation, the sample is maintained under chain-of-custody procedures until it is in the custody of the analytical laboratory and has been stored or disposed.

Field Custody Procedures:

1. Samples are collected as described in the project work plan or proposal. Care must be taken to record precisely the sample location and to ensure that the sample number on the label exactly matches those numbers on the sample log sheet and the chain-of-custody record.

2. The person undertaking the actual sampling in the field is responsible for the care and custody of the samples collected until they are properly transferred or dispatched.

3. When photographs are taken of the sampling as part of the documentation procedure, the name of the photographer, date, time, site location, and site description are entered sequentially in the site logbook as photos are taken. Once developed, the photographic prints shall be serially numbered, corresponding to the logbook descriptions.

4. Sample labels shall be completed for each sample, using waterproof ink unless prohibited by weather conditions, i.e., a logbook notation would explain that a pencil was used to fill out the sample label because a ballpoint pen would not function in freezing weather.

7.7.4 Transfer of Custody and Shipment

Samples are accompanied by the chain-of-custody record form (Attachment 8-10A). When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents sample custody transfer from the sampler, often through another person, to the analyst in the laboratory. The chain-of-custody record is filled out as follows:

1. Enter header information (project number and name, Contract Lab case No. or SAS No.). For each station number, enter date, time, composite/grab, station location, number of containers, analytical parameters.

2. Sign, date, and enter the time under "Relinquished by" entry.

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3. Make sure that the person receiving the sample signs for the "Received by" entry, or enter the name of the carrier (e.g., UPS, Federal Express) under "Received by". Receiving laboratory will sign "Received for Laboratory by" on the lower line and enter the date and time.

4. Enter the bill-of-lading or Federal Express airbill number under "Remarks or Reason for Change of Custody", if appropriate.

5. Place the original (top, signed copy) of the chain-of-custody record form in the appropriate sample shipping package. Retain a copy with field records.

6. Shipping containers should be secured to ensure samples have not been disturbed during transport by using nylon strapping tape and EPA custody seals. The custody seals should be placed on the containers so that they cannot be opened without breaking the seal.

7. Complete other carrier-required shipping papers.

   The custody record is completed using black waterproof ink. Any corrections are made by drawing a line through and initialing and dating the change, then entering the correct information. Erasures are not permitted.

   Common carriers will usually not accept responsibility for handling chain-of-custody record forms; this necessitates packing the record in the sample container (enclosed with the other documentation is a plastic zip-lock bag). As long as custody forms are sealed inside the sample container and the custody seals are intact, commercial carriers are not required to sign off on the custody form.

   The laboratory representative who accepts the incoming sample shipment signs and dates the chain-of-custody record, completing the sample transfer process. It is then the laboratory's responsibility to maintain internal log books and custody records throughout sample preparation and analysis.

7.7.5 Receipt for Samples Form

Whenever samples are split with a private party or government agency, a separate Receipt for Samples Record Form (see Attachment 8-10F) is prepared for those samples and marked to indicate with whom the samples are being split. The person relinquishing the samples to the party or agency shall require the signature of a representative of the appropriate party acknowledging receipt of the samples. If a representative is unavailable or refuses to sign, this is noted in the "Received by" space. When appropriate, as in the case where the representative is unavailable, the custody record should contain a statement that the samples were delivered to the designated location at the designated time. This form must be completed and a copy given to the owner, operator, or agent-in-charge even if the offer for split samples is declined. The original is retained by the Project Manager.

8.0 Attachments

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8-10A Chain-of-Custody Record Form and Chain-of-Custody Seal

8-10B DOT Hazardous Materials Classification (49 CFR 1732)

8-10C DOT List of Class "A" Poison (49 CFR 172.101) and Hazardous Material Shipping Checklist

8-10D Standard Industry Certification Form

8-10E Sample Label

8-10F Receipt For Samples Form

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1.0 Purpose

The purpose of this procedure is to establish a standard procedure for preparation of chain-of-custody forms.

The purpose of document control is to assure that all documents for a specific project are accounted for. Chain-of-custody procedures are an integral part of this document control. The purpose of the chain-of-custody form is to assure that the samples collected in the field are being identified properly and the original integrity of a sample is not destroyed by poor collecting and/or handling techniques.

2.0 Scope

This procedure defines the procedures to prepare and complete the chain-of-custody form.

3.0 References

- U.S. Environmental Protection Agency, 1979. *Methods for Chemical Analyses of Water and Wastes,* EPA 600/4-79-020.
- National Well Water Association, 1986. *RCRA Ground-Water Monitoring Technical Guidance Document,* NWWA/EPA Series.

4.0 Definitions

None

5.0 Responsibilities

5.1 Project Manager

The Project Manager is responsible for ensuring that field personnel know the chain-of-custody

procedures.

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5.2 Field Associate

The Field Associate is responsible for ensuring the chain-of-custody form is properly prepared.

6.0 Equipment

None

7.0 Procedure

To maintain and document sample possession, chain-of-custody procedures are followed. Using these procedures and documentation gives a reasonable assurance that 1) the sample was handled properly and/or 2) if suspected of being improperly handled, witnesses are available who can disclose the information needed to prove or disprove improper handling. Writing chain-of-custody procedures facilitates the admission of evidence under Rule 803(6) of the Federal Rules of Evidence (P.L. 93-575). Evidentiary foundation is recognized by most courts as fulfilling the requirement of sample identification which shows that the original sample:

1. Was not exchanged with another sample
2. Was not contaminated or tampered with
3. Was the one tested?
4. Was the same sample from which the analytical results are derived?

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7.1 Uses of the Chain of Custody Form

Different situations in which the chain-of-custody is used are the following:

- If the person who sampled is transferring the sample(s) to another person; or
- If the laboratory is transferring the sample(s) to another outside laboratory; or
- If the person who sampled is transferring the sample(s) to the laboratory.

7.2 Chain-of-Custody Preparation Procedure

Instructions for preparation of the TolTest, Inc. chain-of-custody form is as follows:

1. Enter the following information in the appropriate sections:
   - TolTest project number or the client's identification number
   - TolTest division or the client's name
   - Purchase order number (not required for TolTest projects)
   - TolTest project manager or the person responsible for the project

- Telephone number where the project manager can be reached
- Turnaround time required in business days (standard is 10 business days)

2. PRINT the sampler's name.

3. Obtain the sampler's signature.

4. Complete the sample information sections. For the type of sample, use the following abbreviations:
   - A = auger cuttings
   - AR = Air rotary cuttings
   - C = composite
   - G = grab
   - S = split-spoon
   - ST = Shelby tube

5. Specify the analysis required and the method number, if known.

6. Note whether preservatives were added to any sample container.

7. Indicate any remarks concerning the samples.

8. Obtain the signature of the person transferring the samples.

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8.0 Attachments

8-16A TolTest Chain-of-Custody Form