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December 30, 1998

Project Number N5278

Mr. James Shafer
Remedial Project Manager
Northern Division, Naval Facilities Engineering Command
10 Industrial Highway, Mail Stop 82
Lester, Pennsylvania 19113

Reference: CLEAN Contract No. N62472-90-D-1298
Contract Task Order 0218

Subject: Summary Work Plan – Surface Soil Sampling
Site 09 – OFFTA, Naval Station Newport

Dear Mr. Shafer:

Enclosed are three copies of the Summary Work Plan that Tetra Tech NUS, Inc prepared in November to carry out the surface soil sampling at the Old Fire Fighting Training Area site at Naval Station Newport on November 18 through 20, 1998. The work plan was prepared with input from representatives of the Navy, EPA, RIDEM, and ATSDR provided during a meeting at Naval Station Newport on November 10, 1998. Pursuant to your request, I am forwarding copies of the work plan to the interested parties listed at the bottom of this letter.

If you have any questions or comments on the data, please contact me at 978-658-7899.

Sincerely,

Diane K McKenna

Diane K. McKenna
Project Manager

DM:rt

Enclosures

c: M. Griffin, NSN (w/enc. - 4)
K. Keckler, EPA (w/enc. -3)
P. Kulpa, RIDEM (w/enc. -4)
J. Stump, Gannet Fleming (w/enc.)
C. Hossom, ATSDR (w/enc.)
B. Timm, ATSDR (w/enc.)
D. Egan, TAG (w/enc.)
B. Horne, RAB (w/enc. -4)
G. Glenn, TtNUS (w/enc.)
File 5278-2.2 (w/enc.) File 5278-3.2 (w/o enc.)

bc: K. Jalkut

Summary Work Plan
Surface Soil Sampling
Site 09 – Old Fire Fighting Training Area
Naval Station - Newport
Newport, Rhode Island

1.0 INTRODUCTION

This work plan has been prepared to provide a brief overview of a sampling and analysis program and associated human health risk evaluation proposed for the Old Fire Fighting Training Area (also known as Katy Field) at the Naval Station - Newport, in Newport, Rhode Island. This effort will be performed to fill data gaps for surficial soils and re-assess the risk posed by contaminants in surficial soil to children and adults using the site for recreation.

This work plan includes four sections: The Introduction; Site Background including existing data and the sampling and analysis program design; the Field Sampling Plan; and the Quality Assurance/Quality Control Plan.

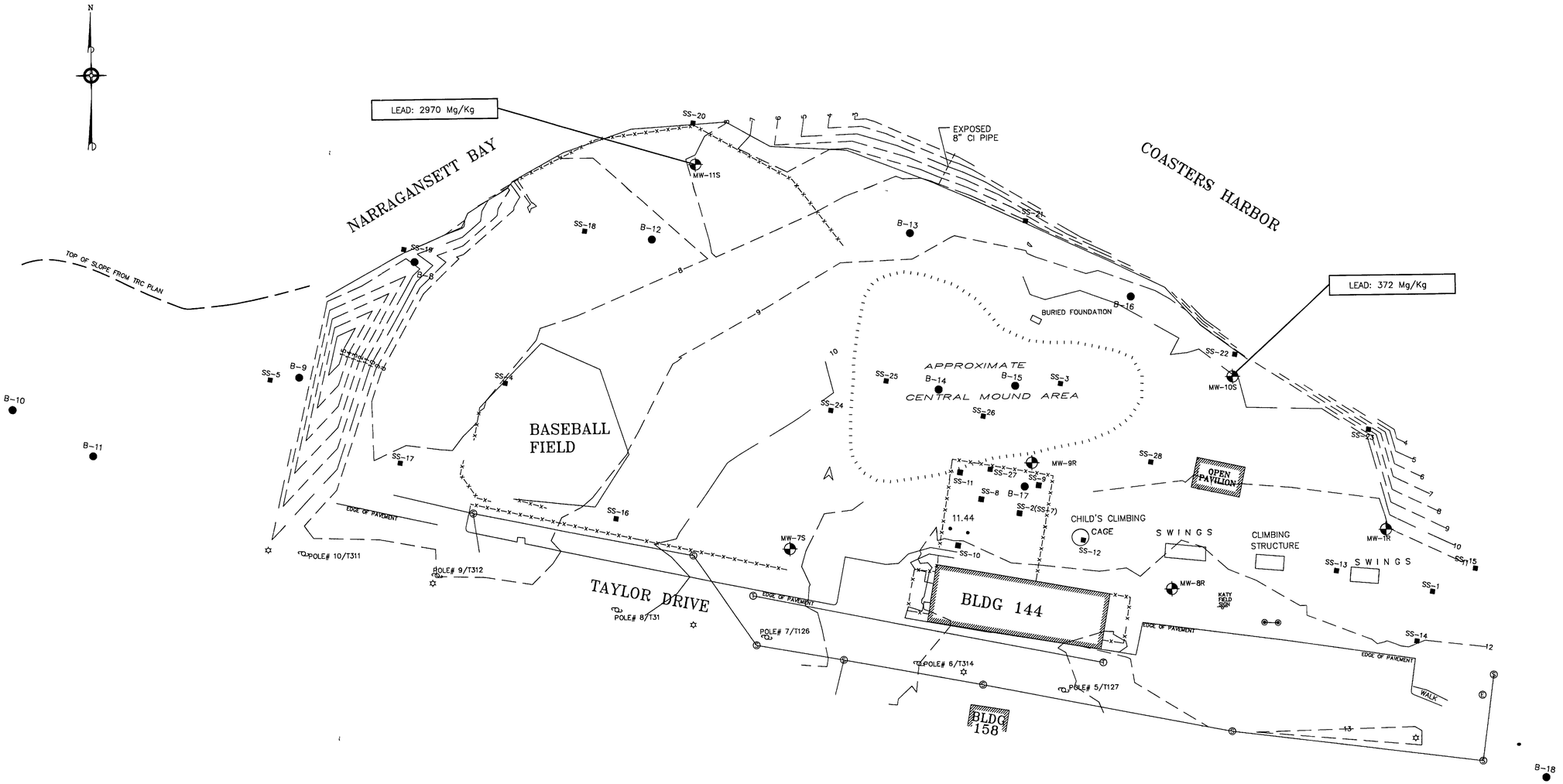
2.0 SITE BACKGROUND

This section summarizes the existing surface soil data and the sampling and analysis program design.

2.1 SUMMARY OF EXISTING SURFACE SOIL DATA

Samples of surface soils were collected by TRC in 1990 and 1993 and reported in the Draft Final Remedial Investigation report (TRC, August 1994). The term surface soils, for the purposes of the TRC report, included soils in the 0-12 inch interval. A summary figure depicting these stations is presented as Figure 1 (map pocket).

These data were used to prepare a human health risk assessment (TRC Corporation, August 1994). This risk assessment found that cancer risks for both the recreational and day care scenarios were at the low end of the EPA's target risk range of 1E-4 to 1E-6. The only risks that exceeded 1E-6 for exposure to surface soil (as opposed to sediment) were for the adult receptor under the reasonable maximum exposure scenario. Primary contributors to this risk



LEGEND

SS-28 ■	SURFACE SOIL SAMPLE LOCATIONS (TRC – PHASE I – 4/90 FOR SS-1 THROUGH SS-5 ONLY AND FOR PHASE II – 11/93)
B-16 ●	SOIL BORING LOCATIONS WHERE SURFACE SOILS (0-1') WERE COLLECTED (TRC PHASE II, 11/93)
MW-8R ◈	MONITORING WELL LOCATIONS WHERE SURFACE SOILS (0-1') WERE COLLECTED (TRC PHASE II, 11/93)

NOTES:

1. SURFACE SOIL SAMPLE LOCATIONS AND DASHED TOP OF SLOPE FROM A PLAN BY TRC ENVIRONMENTAL CORPORATION, ENTITLED: "FIGURE 2-7 PHASE I AND II SURFACE SOIL SAMPLES", DATED 3/94, DRAWING NO.: 01043-0060-0040.
2. LOCATIONS OF SWING SETS AND CHILD'S CLIMBING STRUCTURE ARE BASED ON FIELD OBSERVATIONS AND ARE APPROXIMATE.
3. ALL OTHER LOCATIONS (EXCEPT FOR SOIL SAMPLE LOCATIONS) FROM A PLAN BY GUERRIERE & HALNON, INC., JULY 1997, WITH COORDINATES BASED ON NORTH AMERICAN 1927 DATUM, RHODE ISLAND STATE PLANE COORDINATE COORDINATES, TRAVERSE MERCATOR PROJECTION (NAD 27).
4. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
5. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

40' 0' 40' 80'

1 INCH = 40 FEET

DRAWN BY: R.G. DEWSNAP	TITLE: EXISTING SURFACE SOIL SAMPLE LOCATIONS OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND
PREPARED BY: D. McKENNA	
CHECKED BY: S. PARKER	
	SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., JULY 1997
	SCALE: 1" = 40' / DATE: NOVEMBER 13, 1998 / PROJ. NO: 5278 CTO: 218
PROJECT MANAGER: D. McKENNA	DRAWING NO: 1 / ACFILE NAME: \DWG\NETC\FIREFITE\SS_PH1-2.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

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were several PAH compounds, and arsenic. Non-cancer hazard indices were below 1 for all scenarios and all receptors. This assessment did not address lead in surface soil.

Recently, an evaluation of the available soil data was performed by the Navy to assess risk to humans from lead in the surface soil at the site. The evaluation, using EPA's integrated Exposure Uptake Biokinetic Model (IEUBK), predicted no likely adverse effects to children or adults from exposure to lead in surface soil at the site, based on the whole sample data set used. However, one of the samples showed an elevated concentration of lead, and this prompted concern for other, unsampled areas.

The data available indicate that lead concentrations across the site are present at between non-detected levels and 350 mg/kg, with one hot spot showing a concentration of 2970 mg/kg. A summary figure showing previous surface soil sample stations and locations where elevated concentrations of lead was measured (concentrations of lead 150 mg/kg or greater) is presented on Figure 1 (map pocket).

2.2 SAMPLING AND ANALYSIS PROGRAM DESIGN

The plan for sampling and analysis of soil has been developed to provide data for areas where samples were not collected during the previous studies. As shown on Figure 1, two areas appear to have sample densities that may be considered insufficient. These include the baseball field and the pavilion area.

In addition, the two locations where data from previous samples shows high concentrations of lead (MW-11S and MW-10S) will be sampled again to confirm the presence of those contaminants at those concentrations.

New sample stations were selected to ensure spatial coverage of the site, and to confirm and define the extent of hotspots previously identified. In addition, samples will be targeted to locations identified in the field as those areas where soil is exposed and there is perceived to be high traffic, allowing a higher than usual possibility for receptors, direct exposure to soils through normal play activities. This approach will provide a total sample size and distribution of data points that can be used for a statistical evaluation of data and assessment of risk from surface soils at the site as a whole.

3.0 FIELD SAMPLING PLAN

This section presents a description of the field investigation activities that are planned for the Old Fire Fighting Training Area site at the Naval Station-Newport in Newport, Rhode Island.

3.1 INTRODUCTION

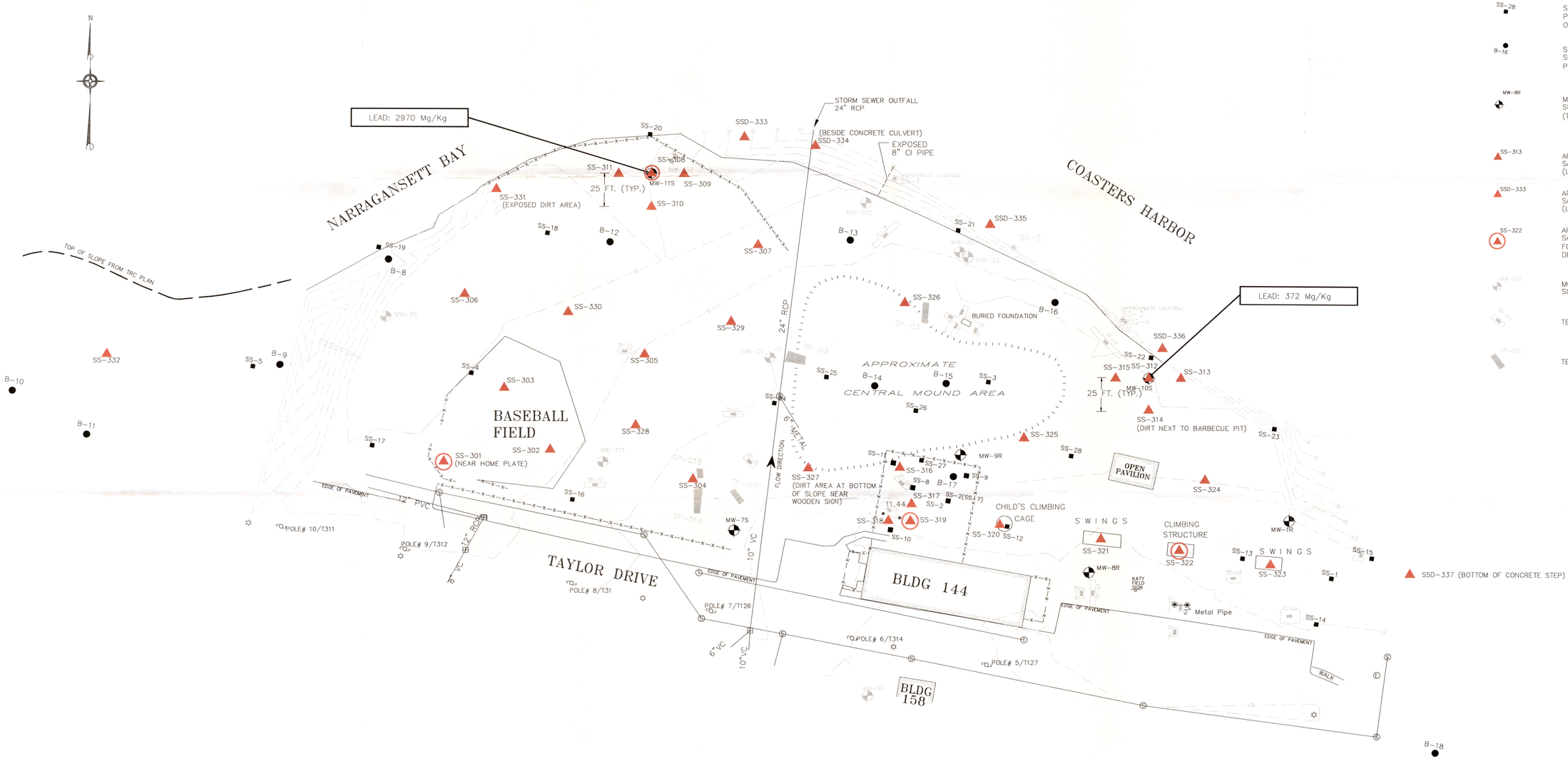
The objective of the surface soil sampling activity is to assess the presence and nature of contamination in areas where samples have not been collected previously. The findings and results of these data will be used to re-assess the risk posed by contaminants in surficial soil to children and adults using the site for recreation. The following section details the field sampling activities to be performed during this investigation. Figure 2 (map pocket) depicts the proposed sample stations (in red) that will be investigated through this effort. This drawing also shows the surface soil stations sampled during previous investigations.

3.2 SOIL SAMPLING

Surface soil samples (including shoreline sediment) will be collected from 37 locations and analyzed for the target compound list (TCL) volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs), and target analyte list (TAL) inorganics. Additionally, samples from four locations will be analyzed for dioxin. Tables 1 and 2 present the laboratory methods that will be required for analysis and a summary of samples to be collected.

Field samples will be collected using decontaminated, non-disposable, steel sampling equipment (augers, trowels, shovels), sterile disposable equipment (scoopulas), and disposable volumetric sampling devices (Encore Samplers). All soil samples, with the exception of shoreline sediment, will be collected within the 0 to 1-foot horizon consistent with USEPA risk assessment protocol. Samples at the shoreline will be collected from the 0 to 6-inch interval below ground surface due to the rocky nature of the shoreline. All samples will be collected from the side walls of the sample hole. The procedures to be followed during sample collection are summarized in the following bullets.

- The sampling holes (borings) will be advanced to a depth of 1 foot using shovels or augers. Where applicable, the upper few inches of organic leaf, grass, and root



LEGEND

- SS-28 — SURFACE SOIL SAMPLE LOCATIONS (TRC – PHASE I – 4/90 FOR SS-1 THROUGH SS-5 ONLY AND FOR PHASE II – 11/93)
- B-16 — SOIL BORING LOCATIONS WHERE SURFACE SOILS (0–1') WERE COLLECTED (TRC PHASE II, 11/93)
- MW-8R — MONITORING WELL LOCATIONS WHERE SURFACE SOILS (0–1') WERE COLLECTED (TRC PHASE II, 11/93)
- SS-313 — APPROXIMATE PROPOSED SURFACE SOIL SAMPLE LOCATIONS WITH IDENTIFIER (LOCATIONS TO BE DETERMINED IN FIELD)
- SSD-333 — APPROXIMATE PROPOSED SHORELINE SEDIMENT SAMPLE LOCATIONS WITH IDENTIFIER (LOCATIONS TO BE DETERMINED IN FIELD)
- SS-322 — APPROXIMATE PROPOSED SURFACE SOIL SAMPLE LOCATIONS WITH IDENTIFIER FOR DIOXIN ANALYSIS (LOCATIONS TO BE DETERMINED IN FIELD)
- MW-19S — MONITORING WELL LOCATIONS WHERE SURFACE SOILS WERE NOT COLLECTED
- TP-12 — TEST PIT LOCATIONS (B&RE, JUNE 1997)
- TP-01C — TEST PIT LOCATIONS (TRC, JANUARY 1994)

NOTES:

1. SURFACE SOIL SAMPLE LOCATIONS AND DASHED TOP OF SLOPE FROM A PLAN BY TRC ENVIRONMENTAL CORPORATION, ENTITLED: "FIGURE 2–7 PHASE I AND II SURFACE SOIL SAMPLES", DATED 3/94, DRAWING NO.: 01043–0060–0040.
2. LOCATIONS OF SWING SETS, CHILD'S CLIMBING STRUCTURE, AND PICNIC TABLES ARE BASED ON FIELD OBSERVATIONS AND ARE APPROXIMATE.
3. ALL OTHER LOCATIONS (EXCEPT FOR SOIL SAMPLE LOCATIONS) FROM A PLAN BY GUERRIERE & HALNON, INC., JULY 1997, WITH COORDINATES BASED ON NORTH AMERICAN 1927 DATUM, RHODE ISLAND STATE PLANE COORDINATE COORDINATES, TRAVERSE MERCATOR PROJECTION (NAD 27).
4. ALL LOCATIONS TO BE CONSIDERED APPROXIMATE.
5. PLAN NOT TO BE USED FOR DESIGN.

GRAPHIC SCALE

40′ 0′ 40′ 80′

1 INCH = 40 FEET

DRAWN BY: R.G. DEWSNAP	TITLE: PROPOSED SURFACE SOIL SAMPLE LOCATIONS OLD FIRE FIGHTING TRAINING AREA NETC, NEWPORT, RHODE ISLAND
PREPARED BY: D. McKENNA	
CHECKED BY: S. PARKER	
	SOURCE: BASE PLAN BY GUERRIERE & HALNON, INC., JULY 1997
	SCALE: 1" = 40' / DATE: NOVEMBER 23, 1998 / PROJ. NO: 5278 CTO: 218
PROJECT MANAGER: D. McKENNA	DRAWING NO: 2 / ACFILE NAME: \DWG\NETC\FIREFITE\SS_PROP.DWG / REV: 0
PROGRAM MANAGER: J. TREPANOWSKI	

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TABLE 1
SAMPLE CONTAINER, PRESERVATIVE, AND HOLDING TIME REQUIREMENTS
HUMAN HEALTH RISK ASSESSMENT
SITE 09-OFFTA
NEWPORT, RHODE ISLAND

SAMPLE MEDIUM	ANALYSIS	SAMPLE CONTAINER	PRESERVATIVE	HOLDING TIME	DQO LEVEL
Surface Soil	TCL SVOCS (CLP SOW OLM03.0)	8 oz. Wide mouth jar	Cool to 4°C	7 Days (Extraction)	IV
	TAL Metals (CLP SOW ILM04.0)	4 oz. Wide mouth jar	Cool to 4°C	Hg 28 Days, Others 6 months	IV
	TCL VOCs (SW846, Update III)	Encore Samplers	Cool to 4°C	24 hours	IV
	Dioxin (EPA Method 1613A)	8 oz. Amber	Cool to 4°C	None specified by method	IV

TABLE 2
FIELD QUALITY CONTROL SAMPLE SUMMARY
HUMAN HEALTH RISK ASSESSMENT
SITE 09-OFFTA
NEWPORT, RHODE ISLAND

MEDIA	ANALYSIS	FIELD SAMPLES	FIELD DUPLICATES (1 PER 10 FIELD SAMPLES)	RINSATE BLANKS (1 PER DAY)	FIELD BLANKS (1 PER WATER SOURCE PER EVENT)	TRIP BLANKS	TOTAL QUANTITY
Surface Soil	TCL SVOCs	37	4	3	1	0	45
	TAL Metals	37	4	3	1	0	45
	TCL VOCs	37	4	3	1	3	48
	Dioxin	4	1	1	0	0	6

matter will be removed from the sample and set aside. Soils and grass removed from the ground to allow for sampling will be temporarily stored on plastic sheeting. Upon completion of sample collection, soil and grass will be placed back into the hole and tamped in-place. All surface soil sample locations will be identified by a wooden stake and measured to the two closest permanent features on site.

- If refusal is encountered before a depth of 1 foot is achieved, several additional attempts to reach 1 foot will be made in the immediate vicinity of the selected location. If a depth of 1 foot cannot be achieved, the borehole will be advanced to the point of refusal and samples will be collected. Samples will be collected as described below for a typical 1 foot hole (VOC samples will be collected from 6 inches below ground surface (bgs); unless refusal is encountered at less than 6 inches bgs, in which case the VOC sample would be collected from the bottom of the borehole.)

- Samples from locations proposed beneath play equipment will be collected from depressions in the sand cushion, i.e., from under swings and at the base of the slide. The sample will include the cushioning sand and other soil from the 0 to 1-foot interval.

- Samples from locations in the baseball infield will be taken from the ground surface, without removing the imported infield soil. The sample will include the infield soil and other soil from the 0 to 1-foot interval.

- Immediately after each surface soil sample location is advanced, the face of the hole will be screened with a Flame Ionization Detector (FID) to preferentially locate the area from which the sample for VOC analysis should be collected.

- If a "hot zone" (identified by visible contamination or a sustained response on the FID that is greater than 25 parts per million (ppm)) is not identified, one sample set will be collected from that location. The VOC fraction of the sample will be collected with an Encore sampling device at the midpoint of the interval, approximately 6 inches bgs. Soil for the remaining analytical fractions (TCL SVOCs, TAL Metals, and dioxin (if applicable)) will be composited across the 0 to 1-foot vertical interval, homogenized, and transferred to appropriate sample containers. The SVOC and

metals fraction of the sample will be placed together in one sample container. The dioxin sample (if applicable) will be placed in a separate container.

- If a "hot zone" is observed, two sample sets will be collected: one complete set collected from the "hot zone", and one set consisting of samples for TCL SVOCs, TAL Metals, and dioxin (if applicable) composited across the 0 to 1-foot vertical interval (a second VOC sample would not be collected). The VOC fraction of the surface soil samples will be collected from the "hot zone" using an Encore sampling device. Soil for the remaining analytical fractions (SVOCs, metals, and dioxins (if applicable)) will be collected from the area immediately surrounding the "hot zone" and will be homogenized in a stainless steel bowl prior to being placed in appropriate sample containers. The composite samples would be collected and handled as described above for locations where no hot zone is identified.

- Immediately after each shoreline sediment sample location is advanced, the face of the hole will be screened with a Photo Ionization Detector (PID) to preferentially locate the area from which the sample for VOC analysis should be collected. The procedures described above for surface soils will be followed for shoreline sediment locations if possible, except that samples will be collected from the 0 to 6-inch vertical interval. If collapse of the sidewalls of the hole prevents use of the procedure described above, the approximate location of a sustained elevated PID reading will be noted on the sample log sheet and the following sampling procedure will be used: The VOC sample will be collected from the "hot zone" to the extent possible. Shoreline sediment for the remaining analytical fractions (TCL SVOCs, TAL Metals) will be composited across the 0 to 6-inch vertical interval, homogenized, and transferred to appropriate sample containers. The SVOC and metals fraction of the sample will be placed together in one sample container.

- Field data will be recorded on the appropriate field data forms and in the field logbook. Recorded data may include a soil description (color, consistency, moisture content, or evidence of stains or odors, etc.).

- In addition to the field samples collected, standard quality control samples including: matrix spike samples, blind duplicate samples, rinsate (equipment) blanks, and field blanks will be required. Table 2 presents a summary of the quality control samples that will be required for this effort.

- All samples will be shipped to or picked up by the laboratory on a daily basis. The Encore soil sampler is effective for storing soil for up to 48 hours. Use of the sampler eliminates the need for methanol or sodium bisulfate preservation.

Decontamination fluids will be contained in 5-gallon plastic buckets and removed off site on a daily basis for temporary staging with existing drums stored near Building 7. These fluids will be taken off base for appropriate disposal together with the investigation-derived wastes (IDW) generated by investigation activities at Building 7.

Appropriate chain-of-custody procedures will be followed (see Section 4.3.3) and samples will be labeled, packaged, and shipped according to TtNUS SOP SA-6.1. Table 1 presents a summary of the analytical parameters, sample preservation requirements, required sample containers, and data quality objectives levels to be met. A summary of the environmental and quality control samples to be collected is provided in Table 2.

The analytical laboratory will provide data within 21 days of sample receipt. Data will be validated using a procedure equivalent to EPA Tier III validation, which is appropriate for chemical data that are to be used for a quantitative risk assessment. Validation memoranda will be provided to the project manager for review, and the data will be supplied to the risk assessment personnel in database format for statistical analysis and risk assessment.

3.3 DECONTAMINATION PROCEDURES

All non-disposable sampling equipment that comes in contact with the sample medium will be decontaminated to prevent cross contamination between sampling points. This includes equipment such as soil sampling shovels, hand auger buckets, trowels, etc. The following decontamination sequence will be employed.

- Remove gross contamination by scrubbing with potable water.
- Scrub with potable water/liquinox.
- Rinse with potable water.
- Rinse with 2-propanol (Laboratory Grade)
- Rinse with deionized water.
- Air-dry (to extent possible).
- Wrap with aluminum foil, dull side toward equipment.

4.0 QUALITY ASSURANCE/QUALITY CONTROL PLAN

This section provides technical guidelines and procedures for maintaining an appropriate level of quality for data collected during fieldwork performed. This section references the TtNUS Standard Operating Procedures (SOPs) for specific protocols for procedures discussed in Section 3.0.

Pertinent SOPs are included in this work plan as Appendix A. These SOPs include, but are not limited to:

SOP	DESCRIPTION
GH-1.5	Borehole and Sample Logging
ME-15	Photovac MicroFID Handheld Flame Ionization Detector
SA-1.3	Soil Sampling
SA-6.1	Non-Radiological Sample Handling
SA-6.3	Field Documentation
SA-7.1	Decontamination of Field Equipment and Waste Handling

4.1 QUALITY ASSURANCE OBJECTIVES

The objective of the environmental sampling is to provide sufficient data, when evaluated with existing data, to re-assess the risk posed by contaminants in surficial soil to children and adults using the site for recreation.

Achieving this objective requires that the data collected from the field conform to an appropriate level of quality. The quality of a data set is measured by certain characteristics of the data, namely the precision and accuracy, representativeness, completeness, and comparability (PARCC) parameters. Some of the parameters are expressed quantitatively, while others are expressed qualitatively. The PARCC goals for a particular project are determined by the intended use of the data, defined as a part of the Data Quality Objectives (DQOs). DQOs are discussed in Section 4.1.1; the PARCC parameters are discussed in Section 4.1.2.

4.1.1 Data Quality Objectives

The intended use of the data resulting from a field investigation is a determining factor in defining the Data Quality Objective (DQO) for these data. As described by the Naval Energy and Environmental Support Activity (NEESA), in the guidance document entitled "Sampling and Chemical Analysis Quality Assurance Requirements for the Naval Installation Restoration Program" (NEESA, June 1988), the Navy has adopted three analytical quality levels (C, D, and E) corresponding to EPA quality levels III, IV, and V, respectively as described in the EPA document "Data Quality Objectives for Remedial Response Activities Development Process" (EPA/540/G-87/003, March 1987). The analytical data reports to be generated for those samples that undergo laboratory analysis will conform with NEESA data quality Level C requirements.

4.1.2 PARCC Parameters

The PARCC goals for the work covered by this quality assurance plan are discussed in the following sections.

4.1.2.1 Precision and Accuracy

Field and laboratory precision and accuracy performance can affect the attainment of project objectives, particularly when compliance with established criteria is based on laboratory analysis of environmental samples.

Analytical precision and accuracy will be evaluated upon receipt of the analytical data. Analytical precision will be measured as the relative percent difference from duplicate measurements and relative standard deviation from three or more replicates. Analytical accuracy measures the bias as the percent recovery from matrix spike and matrix spike duplicate samples.

Field sampling precision and accuracy are not easily measured. Field contamination, sample preservation, and sample handling will affect precision and accuracy. By following the appropriate TtNUS SOP, precision and accuracy errors associated with field activities can be minimized. Field duplicates and blanks (field and rinsate) will be used to estimate field sampling precision and accuracy for soil samples submitted for laboratory analysis.

Field duplicate and field quality control blank analyses results will be used to review the laboratory-analyzed results and determine the usability of the data with respect to its intended use. In general, results that are rejected by the data review process will be disqualified from application to the intended use. Qualified data will be used to the greatest extent practicable.

4.1.2.2 Representativeness

Representativeness describes the degree to which analytical data accurately and precisely define the population being measured. Several elements of the sampling and sample handling process must be controlled to maximize the representativeness of the analytical data (appropriate number of samples collected, physical state of the samples, site-specific factors, sampling equipment, containers, sample preservation and storage, holding times, sample identity, and chain of custody will be defined to ensure that the samples analyzed represent the population being measured). The sampling program is designed to provide analytical data that are representative of the existing contaminant levels.

Representativeness of data is also affected by sampling techniques. Errors or cross contamination during the sampling could affect the laboratory analytical results. However, every effort will be made during sample collection to minimize the introduction of errors or cross contamination by following the sample techniques described in Section 3.0, and in the TtNUS Standard Operating Procedures (SOPs) included in Appendix A.

4.1.2.3 Completeness

Completeness describes the amount of data generated that meets the objectives f r precision, accuracy, and representativeness versus the amount of data expected to be obtained. For relatively clean, homogeneous matrices, 100 percent completeness is expected. However, as matrix complexity and heterogeneity increase, completeness may decrease. Where analysis is precluded or where data quality objectives are compromised, effects on the overall investigation must be considered. Whether or not any particular sample is critical to the investigation will be evaluated in terms of the sample location, the parameter in question, the intended data use, and the risk associated with the error.

The sampling and analysis program for the site is sufficiently broad in scope to prevent a single data point or parameter from jeopardizing attainment of the studies objectives.

Critical data points may not be evaluated until all the analytical results are evaluated. Additionally, several sampling points, in aggregate, may be considered to be critical either by location or by analysis. A subsequent sampling event may be necessary if it becomes apparent that the data for a specific medium are of insufficient quality, either with respect to the number of samples or based on an individual analysis.

For the purposes of this effort, a data point will be determined to contribute to the completeness of the data set if the information provided is meaningful, useful, and contributes to the project objectives.

4.1.2.4 Comparability

One of the objectives of the sampling effort is to provide analytical data that are characterized by a level of quality that is comparable between sampling points. By specifying the use of standard analytical procedures (as well as standardizing field sampling procedures by employing TtNUS and others SOPs), the potential for variables to affect the final data quality will be effectively minimized. Analytical methods for this work are presented in Table 1; SOPs appear in Appendix A.

4.1.3 Quality Control Samples

QC samples to be used during the sampling effort are identified below, and include field duplicates or replicates, laboratory duplicates or replicates, rinsate blanks, and field blanks. Each type of field quality control sample defined below will undergo the same preservation, holding times, etc., as the field samples. Table 2 presents a summary of the QC samples to be collected during this field-sampling event.

4.1.3.1 Field Duplicates

Field duplicates will be submitted at the rate of one for every ten samples per matrix, or at a rate greater than one per ten samples if fewer than ten are shipped to the laboratory on a given day. Field personnel will note on the sample summary form and in the logbook which samples are field duplicates. Duplicate samples will be shipped blind to the laboratories, and shipping paperwork will be completed accordingly.

Field personnel will note in the remarks block on the chain-of-custody form which of the

samples is to be used for internal laboratory matrix spike/matrix spike duplicate analysis. Field duplicates and multiple sample aliquots are collected by mixing a double portion of the required volume of sample and dividing it into two sample containers. Field duplicates provide precision information regarding homogeneity, handling, shipping, storing, preparation, and analysis.

4.1.3.2 Rinsate Blanks

Rinsate blanks are obtained under representative field conditions by running analyte-free deionized water through sample collection equipment after decontamination, immediately before sampling and placing it in the appropriate sample containers for analysis. These samples are used to assess the effectiveness of decontamination procedures. Rinsate blanks will be prepared at the rate of one per day during the sampling event. All rinsate samples will be sent to the laboratory.

4.1.3.3 Field Blanks

Field blanks will consist of the source water used in decontamination (includes analyte-free deionized water, potable water from each source, and other waters used in decontamination operations). Field blanks will be prepared at the rate of one per source of water per sampling event.

4.1.3.4 Trip Blanks

Trip blanks consist of aqueous VOC-free samples prepared by the laboratories. One trip blank sample will accompany each shipment of VOC samples to the laboratories. If more than 10 VOC samples are in one shipment, one trip blank sample will be provided for each 10 field samples. If less than 10 VOC samples are in one shipment, one trip blank will be provided. If there are multiple sampling crews out at one time, trip blanks will accompany each sampling team. If the samples are "pooled" in a single cooler for shipment, then the trip blanks accompanying each respective sampling team will be submitted for VOC analysis.

4.1.3.5 Matrix Spike/Matrix Spike Duplicates

A matrix spike sample will be identified by field teams at a frequency of 1 in 20 field samples (per matrix) collected. Samples for matrix spike analyses and laboratory duplicate

analysis are collected in triplicate volumes for aque us organics (three containers for each analyte group), and duplicate volumes for aqueous metals (two containers). Soil matrix spikes will be collected in double volumes.

4.2 SAMPLING PROCEDURES

Field sampling will be conducted in accordance with Section 3.0 of this document and the TtNUS SOPs presented in Appendix A. Allowable sample holding times and preservation requirements are shown in Table 1.

4.3 SAMPLE DESIGNATION AND CUSTODY

This section describes the sample designation and Chain-of-Custody requirements for all environmental and quality control samples.

4.3.1 Environmental Samples

Each sample collected will be assigned a unique sample tracking number. The sample tracking number will consist of alphanumeric characters identifying the site, sample medium, location, depth (soil samples only), and sample round identifier (groundwater samples only, if applicable). Any other pertinent information regarding sample identification will be recorded in the field logbooks.

The alphanumeric coding to be used in the sample system is detailed below and in the subsequent definitions.

AAA	-	AA	-	(NNN)	-	(NNNN)	-	A
(Site ID)	-	(Medium)	-	(Location)	-	(Depth)	-	(Hot Zone Only)

The site identifier for OFFTA – Site 09 is OFF. "SS" will indicate medium for surface soil sample or SSD for shoreline sediment sample. Sample locations will be noted as the location number from Figure 2.

- Sample depth for surface soil intervals with FID responses less than 25 parts per million (ppm) will be described as 0001 (indicating the 0 to 1-foot interval) for designation purposes only. Specify the actual sample depth (in units of feet bgs) and the total FID

response on the Chain-of-Custody (COC) Form under the Remarks or Comment column, as well as on the field data form.

- Sample depth for surface soil intervals with sustained FID responses greater than 25 ppm, will be described as 0001-H (indicating that a "hot zone" was encountered in the 0 to 1-foot interval). The specific "hot zone" (in units of feet bgs) and registered total concentration will be described on the COC Form under Remarks or Comments, as well as on the field data form to be used for future database tabulation.

- Sample depth for shoreline sediment sample intervals will be described as 00005 (indicating the 0 to 0.5-foot interval) for designation purposes only. If the actual sampling depth is less than or greater than 0.5 feet bgs, specify the actual depth (in units of feet bgs) and any FID responses on the COC Form under the Remarks or Comment column, as well as on the field data form.

For example, a surface soil sample collected from location 325 at a depth of 0 to 1-feet will be identified as OFF-SS-325-0001, providing FID responses less than 25 ppm are detected in the sample interval. A surface soil sample collected from location 316 at a depth of 0 to 1-feet will be identified as OFF-SS-316-0001-H, if sustained FID responses greater than 25 ppm are detected in the sample interval.

A shoreline sediment sample collected from location 335 at a depth of 0.5 feet bgs will be identified as OFF-SSD-335-00005. Screen all shoreline sediment locations with a PID to rule out readings associated with natural organic material. If readings greater than 25 ppm are still registered with a PID, designate that sample as OFF-SSD-335-00005-H, and report the total concentration on the COC Form.

4.3.2 Quality Control (QC) Samples

Field quality control (QC) samples will use the same coding system as for environmental samples. Field QC sample types are described in Section 4.1.3.

Blind duplicate samples will be designated such that the location designation will be replaced with a chronological number:

Duplicates: OFF-DUP##

Field blanks will be designated such that they can clearly be identified as field blanks. The designation must be able to be referenced to the source, i.e. DIUF water, potable water (PTW), etc., using the field sample data forms.

Field Blanks: OFF-DIUF-FB##
OFF-PTW-FB##

Rinsate blanks will be identified using the code for the sample for which the sampling device or tool was last used, the identifier (RB), and its chronological number.

Rinsate Blanks: OFF-SS-316-RB##

Matrix spike samples are simply marked as such on the sample containers and on the chain-of-custody record.

4.3.3 Sample Chain of Custody

Custody of samples must be maintained and documented at all times. To ensure the integrity of a sample from collection through analysis, an accurate written record is necessary to trace the possession and handling of the sample. This documentation is referred to as the "chain of custody". Chain of custody begins when samples are collected in the field, and is maintained by storing the samples in secure areas until custody can be passed on. A chain-of-custody form that will describe the analytical parameters and the persons who are responsible for their integrity will accompany all samples.

Samples will be placed on ice and attended by TtNUS personnel or placed in locked vehicles or designated storage areas until analysis or shipment to an off-site laboratory. Chain-of-Custody procedures are described in further detail in the SOPs.

4.4 CALIBRATION PROCEDURES

Field equipment normally requiring calibration will be calibrated and operated in accordance with the manufacturer's instructions and manuals. A log will be kept on site, documenting the periodic calibration results for each field instrument.

Calibration procedures for laboratory equipment used in the analysis of environmental samples will be performed in accordance with NFESC requirements and contract requirements under the Basic Ordering Agreements (BOA).

4.5 LABORATORY ANALYSIS

Samples collected will be analyzed for various parameters described in previous sections and Table 1.

A laboratory previously approved by the Navy will analyze the environmental samples collected for laboratory analysis during the field investigation. Standard EPA analytical procedures will be employed, as depicted in Table 1.

4.6 DATA REDUCTION, REVIEW, AND REPORTING

Laboratory analytical data will be reviewed by qualified Tetra Tech NUS, Inc. technical staff. A data review memorandum will be prepared and submitted to the project manager as a part of that activity. Data review procedures are described in Section 4.10.

Field data will be periodically reviewed by technical lead personnel and the TtNUS PM to ensure that the data collected are well documented, clearly described, and meet a standard appropriate for the investigation and its ultimate use.

4.7 INTERNAL QUALITY CONTROL

Section 4.1.3 discussed the types and frequency of quality control samples that will be prepared during the field investigation activities for those samples that undergo laboratory analysis. The quantities of various types of QC samples are shown in Table 2. Laboratory analysis will follow the QC criteria described in the analytical procedures.

4.8 PERFORMANCE AND SYSTEM AUDITS

System audits will be performed as appropriate to ensure that the work is being implemented in accordance with the approved project SOPs and in an overall satisfactory manner.

- The FOL will supervise and on a daily basis check to ensure that the equipment is thoroughly decontaminated, samples are collected and handled properly, and the fieldwork is accurately and neatly documented.

- The data reviewer(s) will review the data to ensure they were obtained through the approved methodology, and that the appropriate level of QC effort and reporting were conducted. The data review effort will be supervised by the TtNUS CLEAN Quality Assurance Manager or designee.

- The PM will oversee the FOL and data reviewer, and check that management of the acquired data proceeds in an organized and expeditious manner.

4.9 PREVENTATIVE MAINTENANCE

TtNUS has established a field equipment maintenance program to ensure the availability of equipment in good working order when and where it is needed. This program consists of the following elements:

- The equipment manager maintains an inventory of the equipment by model and serial number, quantity, and condition. Each item of equipment is signed out when in use and its operating condition and cleanliness is checked upon return.

- The equipment manager conducts routine checks on the status of equipment and is responsible for stocking spare parts and equipment readiness.

- The equipment manager maintains the equipment manual library and trains field personnel in the proper use and care of equipment.

- The FOL is responsible for working with the equipment manager to ensure that the equipment is tested, cleaned, charged, and calibrated in accordance with the manufacturer's instructions before being taken to the job site.

- While the equipment is in the field, the FOL is responsible for the equipment, maintains calibration records, and performs maintenance operations and checks.

4.10 DATA ASSESSMENT PROCEDURES

The following paragraphs describe the procedures used to evaluate data prior to inclusion in the deliverable reports described elsewhere in this work plan.

4.10.1 Representativeness, Accuracy, and Precision

All laboratory data generated in the investigation will be assessed for representativeness, accuracy, and precision, as described in Section 4.1. The completeness of the data will also be assessed by comparing the acquired data to the project objectives to see that these objectives are being addressed and met.

Qualified TtNUS personnel will conduct the PARCC parameter assessment. Determining if the data are consistent with known or anticipated chemical conditions and accepted principles will assess the representativeness of the data.

Field measurements will be checked for completeness of procedures and documentation of procedures and results.

Precision and accuracy will be determined using replicate samples, and blank and spiked samples, respectively. PARCC parameters are addressed in more detail in Section 4.1.

4.10.2 Analytical Data Review

An analytical data review process that includes the following tasks will be carried out:

- Check data for completeness to determine if all samples were analyzed and reported for the parameters requested in the chain-of-custody form.

- Check data report for accuracy of sample identification, sample location, collection date, and units.

- Organize the data tables by sample matrix, sample location, and calculate and report the average of field duplicate results. Consolidate results of two sample dilutions into one set of results.

- Check large positive hits against the raw data to avoid false positive results.

- Submit the data review results with a summary of problems and resolutions in writing.

4.11 CORRECTIVE ACTION

The QA program will enable problems to be identified, controlled, and corrected. Potential problems may involve non-conformance with the SOPs and/or analytical procedures established for the project, or other unforeseen difficulties. Any person identifying an unacceptable condition will notify the FOL and the PM. The PM, with the assistance of the Quality Assurance Manager and the project QA/QC officer, will be responsible for developing and initiating appropriate corrective action and verifying that the corrective action has been effective.

Corrective actions may include re-sampling and/or re-analysis of samples or modifying project procedures. If warranted by the severity of the problem (for example, if a change in the approved work plan is required), the Navy will be notified in writing and their approval will be obtained prior to implementing any change. Additional work that depends on a nonconforming activity will not be performed until the source of the problem has been addressed.

4.12 QUALITY ASSURANCE REPORTS/DOCUMENTS

A bound/weatherproof field logbook will be maintained by the FOL. The FOL or designee will record all information related to sampling or field activities. This information may include sampling time, weather conditions, unusual events, field measurements, photograph description, etc. The site logbook maintained by the FOL will contain a summary of the day's activities and will reference the other field logbooks when applicable.

At the completion of field activities, the FOL will submit to the PM all field records, data, field notebooks, logbooks, chain-of-custody receipts, sample log sheets, etc. The PM will ensure that these materials are entered into the project file.