

ATTACHMENT 9A

**SURFACE WATER
SAMPLING AND ANALYSIS PLAN**

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SURFACE WATER SAMPLING AND ANALYSIS PLAN

1.0 Introduction

This Sampling and Analysis Plan (SAP) describes the surface water sampling and analysis methodology for the Thermal Treatment Unit (TTU) located at the Utah Test and Training Range (UTTR). Figure 1 shows the location of the TTU. This SAP satisfies the requirement specified in Module III Section G.4 of the Resource Conservation and Recovery Act (RCRA) Part B Permit for the UTTR (the Permit). This SAP was developed to ensure that samples are collected in an efficient manner that allows for accurate characterization of surface water samples as identified by Air Force or State of Utah personnel. Where applicable, the procedures and quality assurance/quality control (QA/QC) techniques in the current version of the *UTTR Basewide Quality Assurance Project Plan (BQAPP)*¹, which is based on the United States Environmental Protection Agency (EPA) Test Methods for Evaluating Groundwater Contamination, are used.

1.1 Thermal Treatment Unit Description

1.1.1 Site History

The TTU has been treating solid pyrotechnic, energetic, and propellant items for more than 30 years using both open burn (OB) and open detonation (OD) thermal treatment processes. Historically and currently, materials treated at the TTU have included excess solid propellant and missile motors, unserviceable or excess munitions, and explosive scrap and residues generated from Hill AFB and other DOD testing facilities and laboratories. The frequency of treatment varies according to the quantity of munitions declared unserviceable or excess during any given time period. However, over the course of the last 10 years, greater than 95 percent of the treatment has been the disposal of Class 1.1 and 1.3 propellants.

1.1.2 Site Description

The TTU occupies approximately 2 square miles within the North Range of the UTTR. The TTU area is located approximately 5 miles northeast of the UTTR-North support facility (Oasis) and 20 miles north of Utah Exit 62 on Interstate 80. Access to the TTU is provided via Box Elder County Road 02230, which runs from Interstate 80 northward to the Union Pacific Railroad work site at Lakeside. The locations of the UTTR North Range and TTU are presented in Figure 1.

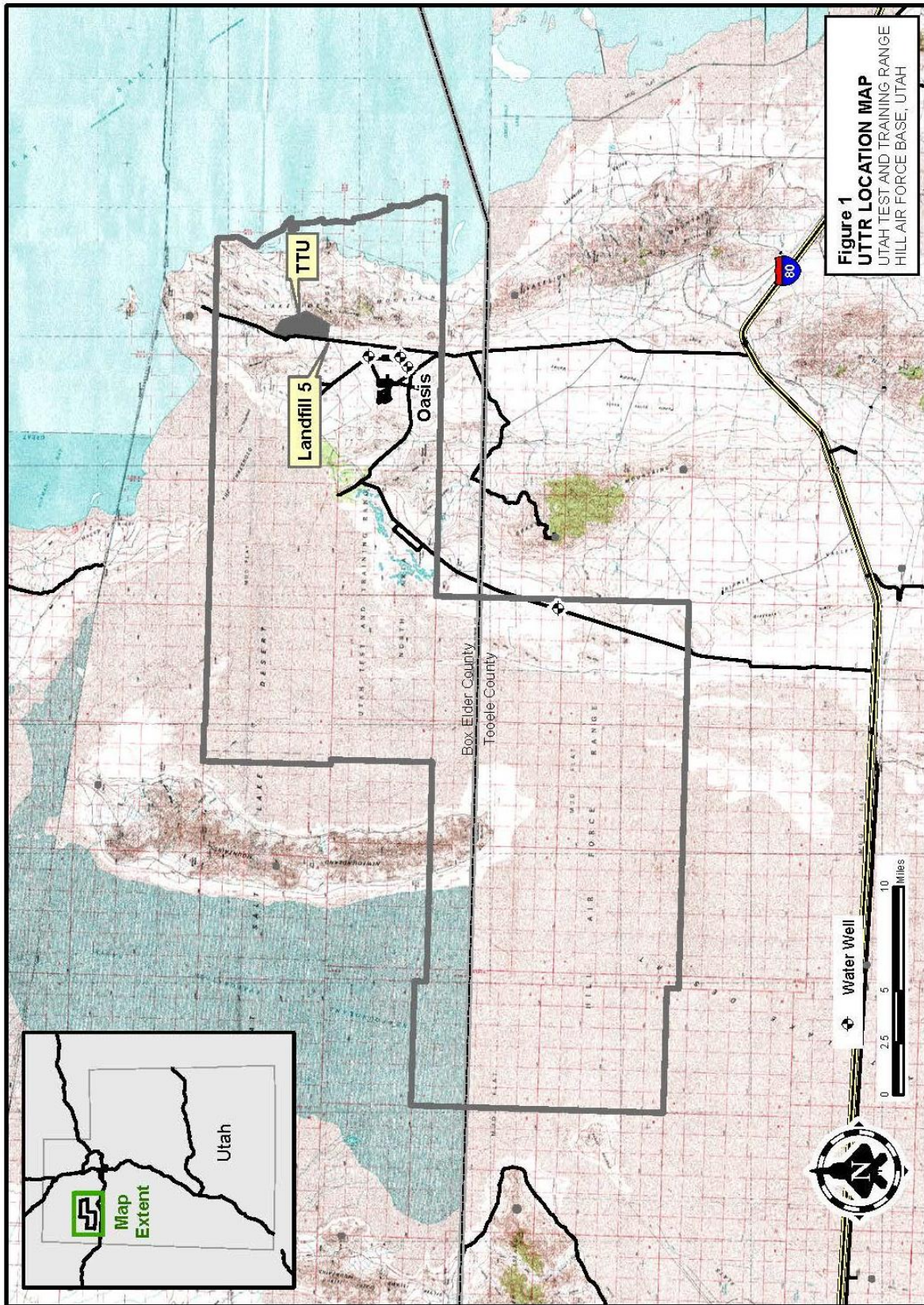
Figure 2 shows the layout of features within the TTU. The TTU contains four manmade OB/OD sites used for treating waste energetics and ordnance. Sites 1 and 4 are the solid rocket propellant and whole motor OB pads. Site 2 is the solid rocket propellant and whole motor OD pad. Site 3 is the location of the former munitions burn pan where small arms

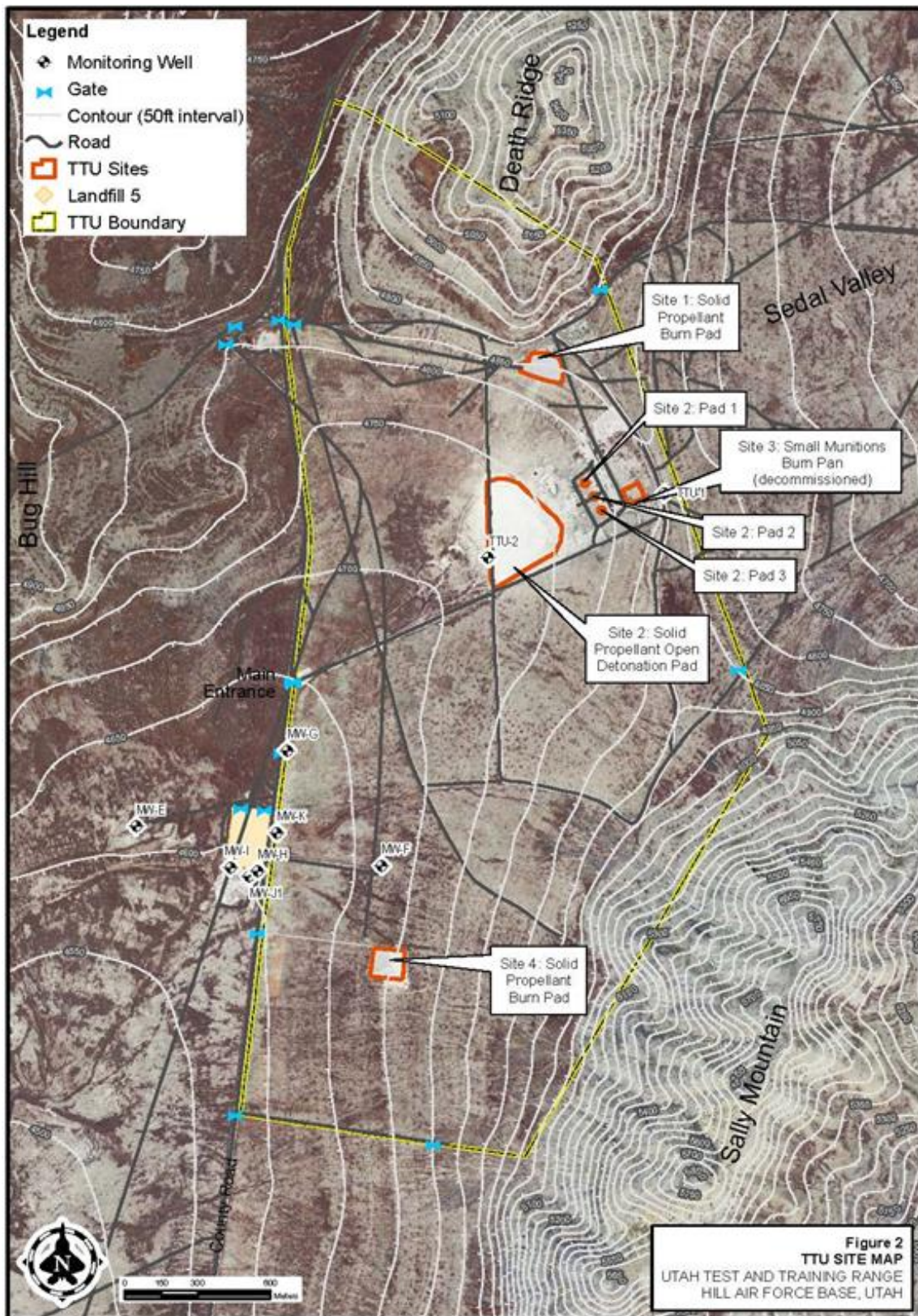
¹ The most current version of the UTTR Basewide Quality Assurance Project Plan can be found on the AFCEC Administrative Record Website (<https://ar.afcec-cloud.af.mil/>). It can be found by going to the website, choosing Hill AFB from the Installation List, and searching "UTTR Basewide Quality Assurance Project Plan" in the Subject or Title.

ammunition, flares, cartridge-actuated devices, and propellant-actuated devices were demilitarized by OB.

All OB and/or OD operations performed at Sites 1, 2, and 4 are conducted by placing waste munitions items on the ground and initiating the detonation or burn of the materials to be treated. There are no engineered structures or containment facilities in place at these three sites. Site 3 was decommissioned and partially closed in 2018

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2.0 Objective

The objective of this surface water SAP is to specify sampling protocols, analytical methods, and appropriate QA/QC procedures for characterizing surface water that may be identified by USAF or State of Utah personnel. This plan will be implemented within 24 hours of the discovery of significant surface water for the analysis of compounds listed in Section 3.1.

Surface water conditions vary, and no universal sampling procedure can be recommended for all conditions. The techniques described in this plan will allow for the collection of representative samples from the majority of surface waters that shall be encountered at the TTU.

3.0 Sampling Program

3.1 Scope and Application

Surface water samples are collected using a grab sampling technique. The principle of the grab technique is to fill a sample bottle by rapid immersion in water and capping to minimize exposure to airborne particulate matter. This can be accomplished by direct sampling or with the use of a grab sampling device.

This SAP is for the collection of surface water samples within the TTU and subsequent analysis of selected compounds as listed in Table 1.

TABLE 1
Selected Compounds

Analyte	Abbreviation	Analytical Method ^a
Perchlorate	--	SW-846 6850
Mercury	Hg	SW-846 7470A
Anions	--	SW-846 9056
Aluminum	Al	SW-846 6010B
Arsenic	As	SW-846 6020
Barium	Ba	SW-846 6010B
Iron	Fe	SW-846 6010B
Lead	Pb	SW-846 6010B
Nickel	Ni	SW-846 6010B
Silver	Ag	SW-846 6020
Selenium	Se	SW-846 6020
Vanadium	V	SW-846 6010B
Zinc	Zn	SW-846 6010B
Energetics	--	SW-846 8330

^aAlternative equivalent methods may be substituted by the laboratory once approved by the Director.

3.2 Sample Preservation, Containers, and Holding Time

The requirements for sample containers, preservatives, and sample holding times for individual analytical methods and media to be sampled are summarized below. Complete analytical methods can be found in one or more of the following sources:

- SW-846 Test Methods for the Evaluation of Solid Waste (U.S. EPA(a))
- EPA Standard Methods for the Examination of Water and Wastewater (U.S. EPA(b))
- Code of Federal Regulations (40 CFR as revised July 1, 2002)

Table 2 lists analytical parameters, methods, holding times and container requirements.

TABLE 2
Analytical Method, Holding Time, and Container Requirements for Surface Water Samples

Analyte	Method	Container	Preservative	Holding Time
Metals	SW-6010/6020	500 mL HDPE ^a	HNO ₃ , pH<2, 4°C	6 months
Mercury	SW-7470A	500 mL glass	HNO ₃ , pH<2, 4°C	28 days
Perchlorate	EPA 314.0	125 mL HDPE	None	28 days
Anions	SW9056	1-L HDPE	4°C	28 days
Explosives	SW-8330	1-L amber glass	4°C	7 days/40 days ^b

^a HDPE – High density polyethylene bottles

^b 7 days until *extraction*, 40 days until *analysis*

Pre-preserved containers are not recommended. Field preservation is not necessary for metals, except for trivalent and hexavalent chromium, provided the sample is preserved in the laboratory and allowed to stand for at least 2 days to allow the metals adsorbed to the container walls to redissolve. Field preservation is advised for hexavalent chromium in order to provide sample stability for up to 30 days.

Mercury samples should be shipped by overnight courier and preserved when received at the laboratory.

If samples are to be preserved in the field, the preservative will be added to the container after sample collection and the resulting pH verified and documented.

3.2.1 Interferences

There are two primary interferences or potential problems with surface water sampling. These include cross contamination of samples and improper sample collection.

Cross-contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If dedicated sampling equipment is not possible, the following decontamination procedures should be followed:

- Wash and scrub equipment with phosphate-free, laboratory-grade detergent (for example, Alconox™ or equivalent); steam cleaning may also be performed if possible.
- Rinse with distilled water.
- Triple-rinse with distilled water.

Personnel involved in decontamination activities will wear appropriate protective clothing as defined in their onsite health and safety plan.

When not in use, sampling equipment should be covered with clean plastic wrap, stored in a plastic box or bagged in clean colorless zip-type bags.

Improper sample collection can involve using contaminated equipment, disturbance of the sampling area, and exposure to airborne particulate matter. Care must be taken during all sampling operations to minimize exposure of the sample to human, atmospheric, and other sources of contamination.

Samplers must pay strict attention to the work being performed. Sampling personnel must wear clean, non-talc gloves during all sampling operations and be familiar with the collection of surface water samples.

Sampling equipment should be constructed of polytetrafluoroethylene (PTFE), stainless steel, or glass that has been properly precleaned. PTFE or glass is preferred since trace metals are a concern.

3.3 Equipment

3.3.1 Sample Collection

Samples may be collected manually by direct submersion of the bottle into the water or by using a grab sampling device. For a standing liquid, samples should be collected just below the surface or at mid-depth. Factors that can contribute to the selection of a surface water sampler include the width, depth, and flow of the surface water body. In some cases of shallow water, the only way to obtain a sample may be to dig into the sediment with a decontaminated trowel to create a pooled area where the liquid will accumulate. However, this method is not recommended since the sample is likely to be highly turbid.

The grab sampling device shown in Figure 3 consists of an adjustable clamp attached to the end of a two- or three-piece telescoping aluminum or fiberglass pole that serves as the handle. The clamp is used to secure a sampling beaker.

Alternative grab sampling devices may be used, provided neither samples nor blanks are contaminated through their use, and they have been proved free of any analytes of interest as listed in Section 3.1.

3.3.2 Sampling Kit

A sampling kit will be picked up from the analytical laboratory prior to sampling. The following items will be collected:

- Powder-free gloves, various sizes
- Plastic sheeting
- Deionized water, 1 L
- Carboy or similar jug for decontamination waste
- Sampling bottles:
 - (2) HDPE, 500 mL
 - (2) HDPE, 500 mL, preserved with HNO₃, pH<2
 - (2) Glass, 500 mL
 - (2) Glass, 500 mL, preserved with HNO₃, pH<2
 - (2) HDPE, 125 mL
 - (2) HDPE, 1L
 - (2) Glass, amber, 1L
- HNO₃
- pH test strips
- Eye droppers (10)
- Trowel (2)
- Sample labels
- Storage bags, clean, zip-type, non-vented, colorless
- Chain-of-custody forms
- Field book
- Pens
- Cooler, clean nonmetallic

3.4 Schedule

Significant surface water requiring sampling may be determined at any time by USAF or State of Utah Department of Environmental Quality (DEQ) personnel. An Explosive Ordnance Disposal (EOD) escort will be arranged for all individuals associated with the field sampling team. Samples will be taken within 24 hours of the discovery of significant surface water and analyzed for the compounds listed in Section 3.1, unless EOD or safety issues prevent the collection of samples. Extension of the 24-hour limit for sample collection necessitated by logistical or safety issues will be coordinated with the Utah DEQ Division of Waste Management and Radiation Control.

3.5 Procedures

3.5.1 Sample Location

Samples will be collected from any accumulated surface water within the TTU. A global positioning system (GPS) device will be used to identify and indicate the actual location of sample collection.

3.5.2 Sample Collection

Manual collection of samples directly into the sample bottle.

1. Spread new plastic sheeting on the ground at each sampling location to keep sampling equipment decontaminated and to prevent cross-contamination.
2. Put on clean gloves and remove the sample bottle. Label the bottle with the sample number.
3. Remove the cap, slowly submerge the sample bottle, hold the bottle under the water and fill with sample. After the bottle has filled (when no more bubbles appear), and while the bottle is still inverted, replace the cap.
4. Preserve the sample as necessary and verify pH.
5. Place the bottle inside a clean bag.
6. After each sample is collected, the sample number is documented on the chain-of-custody (COC) and any unusual observations are noted in the field logbook.

Sample collection with grab sampling device.

1. Spread new plastic sheeting on the ground at each sampling location to keep sampling equipment decontaminated and to prevent cross-contamination.
2. Put on clean gloves and remove the sample bottle. Label the bottle with the sample number. Assemble the grab sampling device as in Figure 3.
3. Slowly submerge the precleaned dipper or pond sampler with minimal surface disturbance. Remove the cap from the bottle and slightly tilt the mouth of the bottle below

the edge of the dipper. Empty the sampler slowly, allowing the sample stream to flow gently down the side of the bottle with minimal turbulence.

4. Preserve the sample as necessary and verify pH.
5. Place the bottle inside a clean bag.
6. After each sample is collected, the sample number is documented on the COC and any unusual observations are noted in the field logbook.

3.5.3 Chain-of-Custody

Chain-of-custody procedures allow for the tracking of possession and handling of individual samples from the time of field collection through laboratory analysis. A properly completed COC form will accompany samples to the laboratory. The unique sample IDs and descriptive identification information (site location, date, time, etc.) will be listed on the COC form. A sample is considered in custody if it is:

- In a person's possession; or
- In view after being in physical possession; or
- Locked or sealed to prevent tampering after being in physical possession; or
- In a secured area, restricted to authorized personnel.

When transferring possession of samples, the individuals relinquishing and receiving custody will sign and date the COC. Custody seals will be used on each shipping container to ensure custody. Custody seals consisting of security tape with the initials of the sampler and the date will be placed over the lid of each cooler containing samples. The tape will be affixed such that the seal must be broken to gain access to the contents. Custody seals will be placed on coolers prior to the sampling team's release to a second or third party (for example, shipment to the laboratory).

3.5.4 Documentation and Field Logbooks

Field documentation serves as the primary foundation for all field data collected for site evaluation. All field documentation will be accurate, legible, and written in indelible ink. The field logbook will be a bound, weatherproof book with numbered pages, and will serve primarily as a daily log of the activities carried out during sampling. The logbook will serve as a diary of the events of the day.

3.5.5 Shipping/Sample Delivery

Procedures for packaging and transporting samples to the laboratory are based on the actual chemical, physical, and hazard properties of the material. The procedures may also be based on an estimation of contaminant concentrations/properties in the samples to be shipped. Water samples collected from the TTU are identified as environmental samples collected for chemical analysis and do not require stamped or certified containers.

Whenever possible, samples will be hand delivered to a local laboratory. All sample containers will be placed in a strong shipping container (usually a hard plastic cooler) with

ice for cold storage and preservation to maintain a sample temperature of 4 degrees Celsius or less. The following procedure for packaging will be followed:

1. Secure the drain plug of the cooler with tape to prevent melting ice from leaking out of the cooler and double bag all ice.
2. Place samples into plastic zipper lock bag. Do not place samples from more than one location into the same bag.
3. Secure bottle/containers in cooler using bubble wrap (or equivalent) to prevent breakage. Pack double bagged ice around samples for preservation to 4 degrees Celsius or less.
4. For coolers that must be shipped to an offsite laboratory, double bag ice into large plastic zipper lock bags and place samples and ice into a trash bag lined cooler. Place absorbent material such as vermiculite into the bag and around samples for protection and to absorb any leakage from the double-bagged ice or from sample breakage that may occur.

All samples will be placed in coolers with the appropriate COC forms. All forms will be enclosed in a large plastic bag and affixed to the underside of the cooler lid. Ice used to cool samples will be double sealed in two zipper lock plastic bags and placed on top and around the samples to chill them to the correct temperature. Laboratory personnel will record the temperature inside the cooler upon receipt at the laboratory on the COC form. Each ice chest will be securely taped shut with nylon strapping tape, and custody seals will be affixed to the front and back of each cooler. Section 3.7 provides a detailed description of COC procedures.

3.6 Quality Assurance/Quality Control

3.6.1 Field Quality Assurance/Quality Control

The sampling team shall employ a strict QA/QC program. The minimum requirements include the collection of equipment blanks (if applicable), field blanks, and field duplicates. Trip blanks will not be analyzed since VOC analysis is not required.

Equipment Blanks. Equipment blanks must be run on all equipment that will be used in the field. They are generated in the laboratory by processing reagent water through the equipment and analyzing for the parameters listed in Table 1. Detailed procedures for collecting equipment blanks are provided in the analytical methods referenced in Table 2.

Field Blanks. To demonstrate that sample contamination has not occurred during field sampling and sample processing, at least one field blank must be generated for every ten samples. Field blanks are generated by filling a large carboy or other appropriate container with reagent water, transporting the container to the sampling site, processing the water through each of the sampling steps and equipment, collecting the blank in a sample bottle and shipping the bottle to the laboratory for analysis according to the methods referenced in Table 2.

Field Duplicates. To assess precision of the field sampling and analytical processes, at least one field duplicate must be collected for every ten samples. Field duplicates are collected by splitting a larger volume into two aliquots, or by collecting two samples in rapid succession.

3.6.2 Laboratory Quality Assurance/Quality Control

Laboratory quality control samples including method blanks, laboratory control samples (LCS), and matrix spike/matrix spike duplicate (MS/MSD) samples are analyzed regularly by the laboratory to ensure that the analytical instruments are performing at optimum levels. A summary of the laboratory QA/QC procedures is provided in this document. Method-specific QC requirements are provided in the referenced analytical methods.

Method Blank. Method blanks are used to monitor a system for interferences and contamination from glassware, reagents, etc. The blank is taken through the entire sample preparation process and is included with each analytical batch or every 20 samples, whichever is more frequent.

Laboratory Control Sample. LCSs are defined as reagent water spiked with a known amount of analytes from a source different than that used for the calibration standards. This parameter is used to evaluate the validity of the calibration standards and the standard preparation procedure.

Matrix Spike/Matrix Spike Duplicate Sample. Depending on the method, MS/MSD samples are analyzed with a frequency of 5 percent (1 per 20 samples). Spiked samples that do not meet established criteria will be reanalyzed and evaluated by the laboratory personnel and QA/QC officer.

Surrogate Compounds. Gas chromatography (GC) analyses include the addition, detection, and recovery of surrogate spiking compounds. This parameter evaluates matrix effects and sample preparation technique.

Internal Standards. GC methods utilize internal standards to correct for injection variability and quantitate results. Internal standard criteria can be found in the referenced method.

3.7 Data Management

Data management tasks associated with this project will include the transfer of electronic data between analytical laboratories and the data manager, the data manager and the data validation staff, and the data manager and Hill Air Force Base data manager. To facilitate smooth data flow, the Air Force Environmental Resources Program Information Management System (ERPIMS) will be used as the basis for data management. The ERPIMS format provides a set of codes and structure for data deliverables. Data management will be performed in the following sequence:

1. The field sampling team will obtain samples.
2. The samples obtained during the day will be continuously logged on a COC form.
3. The COCs will be delivered to the data manager who will enter the data from the COCs to the database. The data manager can then track the status of the analytical samples.

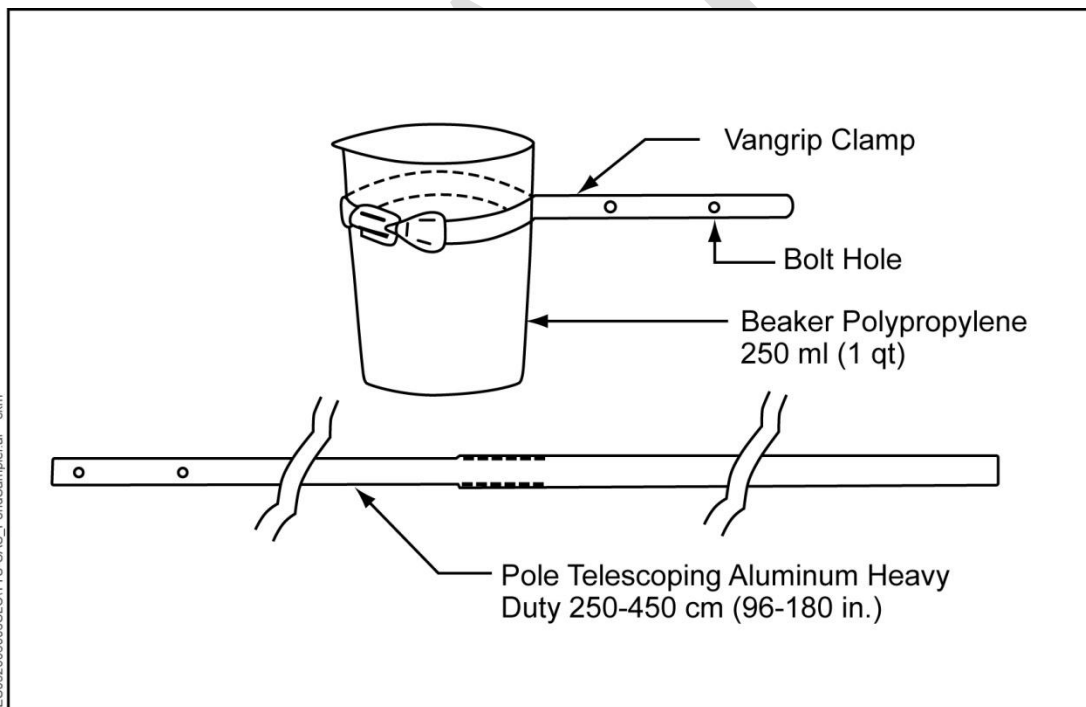
All analytical laboratory data will be validated according to EPA protocols. Validated data will be included in all reports. Upon completion of the validation process, the validated analytical data and reports will be transmitted electronically to the data manager.

3.8 Safety

All samples shall be treated as potential hazards. Appropriate personal protective equipment (i.e., safety glasses and gloves) shall be used by all personnel when performing this procedure.

The personnel performing the sampling procedure shall have a copy of their Health and Safety Manual onsite while sampling.

FIGURE 3
GRAB SAMPLING DEVICE



4.0 References

- UTTR Basewide Quality Assurance Project Plan*. (2015) Available on the AFCEC Administrative Record Website (<https://ar.afcec-cloud.af.mil/>).
- U.S. Environmental Protection Agency (EPA) (a). SW-846 Test Methods for the Evaluation of Solid Waste.
<http://www.epa.gov/osw/hazard/testmethods/sw846/online/index.htm>
- U.S. Environmental Protection Agency (EPA) (b). EPA Standard Methods for the Examination of Water and Wastewater.
<http://water.epa.gov/scitech/methods/cwa/index.cfm>

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