Attachment 22

Quality Assurance Program Plan (QAPP)

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1.0 Program Organization and Responsibility

1.1 The Tooele Army Depot (TEAD) is a U.S. Army Depot under the Army Material Command. The TEAD is commanded locally by a Colonel who has overall responsibility for the operation of the depot.

1.2 The TEAD's Environmental Management Division (EMD) is responsible for ensuring that data provided to the state and federal regulatory agencies meets the requirements of this Permit, its attachments and R315 of the Utah Code Annotated.

1.3 The on-site Quality Assurance (QA) Manager is an independent person who reports directly to the EMD Chief. All data produced, both sampling and analytical will be reviewed by the QA manager and personnel reporting the results. All quality control data will be approved by the on-site QA manager prior to submission to the regulatory agencies.

1.4 The TEAD Safety Chief is the site safety officer and Industrial Hygiene Supervisor is the site health officer.

2.0 Background

2.1 The principal work activities at TEAD are the shipping, receiving, and demilitarization of conventional munitions, and the testing and development of ammunition peculiar equipment and related demilitarization testing.

3.0 Program Objective

3.1 The overall objective for the Quality Assurance Program Plan is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, data validation and reporting. Minimum requirements for development of individual SAPs are outlined in this QAPP. Quality control measures are required to prevent, identify and correct errors that may occur at any point in process. The generated data is intended to support regulated activities.

3.2 Specific details to be used for the above referenced activities are described in other sections of this QAPP. The quality requirements for sampling are provided in Appendix 1.

3.3 This plan provides procedures for sampling activities performed by TEAD and contract personnel.

3.4 Specific sampling processes and data objectives will be detailed in the individual quality assurance project plans.

3.5 Test procedures and methods performed by laboratories are described in the following documents:

1. Test Methods for Evaluating Solid Waste (SW-846), current edition.
2. Standard Methods for the Examination of Water and Wastewater, current edition.
3. Guidelines Establishing Test Procedures for the Analysis of Pollutants under the Clean Water Act.

4. Guidelines Establishing Test Procedures for the Analysis of Contaminates under the Safe Drinking Water Act.

3.6 The TEAD EMD will verify the minimum requirements of this QAPP are met for all sampling and analysis events. Minimum quality requirements for all laboratory analyses are specified in this document. The quality requirements for sampling are provided in Appendix 1.

4.0 Data Usage

4.1 Data collected, analyzed and validated is used to support the waste management programs. The project lead reviews sampling and analytical data submitted to the regulatory agencies to meet the project goals and objectives.

5.0 Sampling Responsibility and Type

5.1 The nature and extent of sampling will be done in accordance with Attachment 2, Waste Analysis Plan (WAP) or will be determined by a project specific SAP. Types of sampling include:

a. Identification of waste streams to determine whether or not the waste is a listed or characteristic hazardous waste.

b. Closure Activities to determine whether or not all hazardous waste has been removed.

c. Environmental Samples to determine whether or not the environment has been contaminated as a result of a spill or other activity.

d. Groundwater monitoring to ensure that the TEAD detects any impact to groundwater by regulated activities.

e. Other projects including but not limited to trial burns, Subpart X processes and site assessments.

6.0 Sampling Procedures

6.1 Sampling should be conducted following the protocols established in A Guide for Field Samplers (EPA Region VIII, 2004 or current version), Standard Operating Procedures for Hazardous Waste Streams (EPA Document 600/80-018), EPA Contract Laboratory Program Guidance for Field Samplers (EPA 540-R-09-03 January 2011), Standard Methods for the Examination of Water and Wastewater, 22nd Edition December 16, 2013, the WAP and other applicable guidance or procedures approved by the TEAD EMD.

6.2 Samples will be preserved if applicable and returned to the designated laboratory for analysis. If waste characterization is unknown or personnel are unfamiliar with processes that created the wastes to be sampled and/or a determination is made that there may be a safety problem by preserving samples, then no sample preservation will occur and a shorter holding time will

be considered. The sample label will note any preservation including cold preservation or that the sample has not been preserved. Additional container, volume and preservation requirements are located in Appendix 2. Any problems which arise during sampling will be corrected on the spot before sampling is completed.

7.0 Data Quality Objectives

7.1 The objective of the QAPP is to develop and implement procedures for field sampling, chain-of-custody, laboratory analyses and reporting that are technically and legally defensible. Specific procedures to be used for sampling, chain-of-custody, calibration, laboratory analyses, reporting, internal quality control, audits, preventative maintenance, and corrective actions are described in other sections of the QAPP. The purpose of this section is to define goals for completeness, accuracy, precision, representativeness, and comparability. The use of EPA's User's Guide to the Contract Laboratory Program, (EPA 540-R-08-01, June 2008 and EPA 540-R-04-004, October 2004, EPA 540-R-10-011, January 2010)) Organic and Inorganic Validation Functional Guidelines may be used for determining data usability.

7.2 Test methods are determined by sample matrix, detection limit requirements and data usage. The TEAD WAP provides a list of approved sample methods.

8.0 Data Completeness

8.1 Completeness is defined as the amount of valid data obtained from a measurement system compared to the amount that is expected to be obtained. A goal of at least 95% completeness should be obtained.

9.0 Data Accuracy

9.1 Accuracy is the degree of agreement between a measurement and an accepted reference or true value. The accuracy is determined from analyses of samples spiked with a known concentration. The number of spiked samples and the spiking levels will be taken from the respective methods.

The formula used to assess the accuracy of a laboratory control spike (LCS) is:

$$\%R = (Q_{LCS}/ Q_{KC}) \times 100$$

Where: %R = Percent Recovery
Q_{LCS} = Quantity of Analyte Found in the Spiked Sample
Q_{KC} = Known Concentration of the LCS

The formula used to assess the accuracy of the matrix spike/matrix spike duplicate (MS/MSD) samples is:

$$\%R = ((Q_{ss} - Q_{us})/ Q_s \times 100$$

Where: %R = Percent Recovery
Q_{ss} = Quantity of Analyte Found in the Spiked Sample

Q_{us}= Quantity of Analyte Found in the Unspiked Sample
Q_s = Quantity of Added Spike

9.2 Calculation of the accuracy for each analysis will be based on different criteria as discussed in this Quality Assurance Project Plan and the analytical methods. The matrix spike default values for water and soil are 75-125% and 60-140%, respectively. Project specific requirements may vary from the default values due to other considerations. The TEAD EMD will review data and determine if project goals and data quality have been met, if not, the TEAD EMD may discuss with the Division of Waste Management and Radiation Control (DWMRC) the impact to the data and if data is useable.

9.3 A matrix spike (MS) and matrix spike duplicate (MSD) sample shall be prepared and analyzed for every 20 samples of the same matrix type or once per day whichever is more frequent.

9.4 A laboratory control spike (LCS) and laboratory control spike duplicate (LCSD) will be performed per analytical batch. The default values for water and soil are 80-120% and 75-125%.

10.0 Data Precision and Bias

10.1 Precision is defined as the degree of mutual agreement among individual measurements made under prescribed conditions. Precision will use two different measurements depending on the number of data points being considered. Two data points will have the relative percent difference (RPD) calculated. Three or more data points will use the relative standard deviation (RSD) as a measure of the precision. External precision audits may be conducted by submitting blind duplicates to the laboratory and comparing the results with the acceptance criteria. The number of blind duplicates required will usually be 20 percent of all samples taken. Precision will be calculated for laboratory or field samples using the following equations:

$$\%RPD = \{(X_1 - X_2) / [(X_1 + X_2)/2]\} \times 100$$

Where: RPD = Relative Percent Difference
X_1 = Highest Analytical Result of Sample
X_2 = Lowest Analytical Result of Sample

RSD = (standard deviation/average value) x 100

10.2 Calculation of the precision for each analysis will be based on different criteria as discussed in the project specific plans and the analytical methods used. The default values for precision for water and soil are <20%, < 40%, respectively. Project specific requirements may vary due to other considerations.

10.3 Bias is a measure of systematic error. When a sample of known concentration is tested repeatedly, the Bias is determined by how close the average test value is coming to the actual, known value.

11.0 Data Representativeness

11.1 To assure representativeness, all samples should be taken following protocols as set forth Section 6.0 of this QAPP. Also, site descriptions, site photo documentation, and sampling conditions and techniques should be documented in bound field notebooks as necessary.

12.0 Data Comparability

12.1 Comparability is a quantitative characteristic, which may be considered in planning sampling activities. The TEAD EMD should work closely with any laboratory to ensure all data generated are consistent with and expressed in the same units as the data generated by other laboratories reporting similar analyses. This will allow for comparison of the data among different organizations.

12.2 Similarly, the TEAD EMD should ensure that all data generated by field measurements are expressed in units that are consistent with standard practices. In addition to units, comparability should be assured in terms of sampling plans, analytical methodology, quality control and data reporting.

12.3 Proper preservatives, appropriate containers, and holding times for samples and analyses are given in Appendix 2.

12.4 Unless specifically outlined in a project specific plan, all soil/solids data will be reported on a dry weight basis.

13.0 Method Sensitivity

13.1 The methods specified must meet or exceed the regulatory requirements and method sensitivity specified by the project or risk requirements.

14.0 Uncertainty

14.1 Any data not meeting the required Data Quality Objectives (DQOs) will be discussed with the laboratory and the DWMRC to determine usability of the data. Any qualified data will be discussed in the analytical report.

15.0 Chain-of-Custody and Sample Tracking

15.1 Samplers may use either a legal chain-of-custody or sample tracking form to enable tracking the possession and handling of a sample during transfer (from sample collection through laboratory analysis and final disposal) so that its physical possession is known at all steps in the process.

15.2 A sample is under legal chain-of-custody if:

1. It is in the person's possession, or
2. It is in the person's view at all times, or
3. It is locked in a secure location.

16.0 Analytical Procedures

16.1 Utah-certified laboratories will provide analytical data for compliance with R444 of Utah Annotated Code (UAC). All methods associated with data results (sampling, preparation, analytical) will be based on whether or not the method provides comparable, representative, complete, precise, sensitive and accurate data for the sample matrix and the range of expected values for the constituents for which the samples are being analyzed. EPA analytical methods will be used for analyses. If EPA does not have a method, e.g., chemical agents, then the TEAD EMD will contact the DWMRC to discuss which method would be the most appropriate.

17.0 Calibration Procedures and Frequency

17.1 Laboratory equipment calibration procedures will be in accordance with the method and manufacturer specification. Any equipment used for field measurements will be calibrated according to manufacturer's specifications prior to use. Documentation of the calibration is required. The TEAD EMD will maintain documentation on all field equipment calibrations. The laboratory will maintain their calibrations and maintenance documents. Any problems associated with field equipment, will be identified to the TEAD EMD and a corrective action will be implemented.

18.0 Data Analysis, Validation and Reporting

18.1 The primary data analysis, validation and reporting is performed by the laboratory that analyzes the samples. Internal validation is performed by a qualified TEAD EMD or by a contractor. Upon completion of the sample analyses, the laboratory will submit the results to the TEAD EMD for review and project validation. Utah certified laboratories will retain the sample analysis records according to UAC R444-14.

18.1.1Any qualified data shall have an associated case narrative

18.2 Laboratory Analysis, Validation and Reporting

18.2.1 The Tooele Army Depot (TEAD) shall use a Utah-certified laboratory to perform sample preparation and analyses. Subcontracted laboratories must also be Utah certified.

18.2.2 Each laboratory analyst will ascertain if the analytical data are within prescribed control limits before the data is entered into the Laboratory Information Management System (LIMS). Data is then reviewed for quality assessment.

18.2.3 100% of all final analytical data will be cross-checked before the results are forwarded by the laboratory to the TEAD EMD.

18.4 Data Validation Package Level shall be submitted by the laboratory based on the project specific plan i.e., risk assessment requires a Level IV validation package.

18.3 Laboratory Quality Control Procedures

18.3.1 The laboratory internal quality control procedures shall be in accordance with EPA guidelines. Internal quality control procedures include the use of duplicate analyses, spikes, calibration

standards, internal standard, blanks, quality control charts, standard reference materials, reagent checks, and sample splits. Laboratories must be Utah-certified for all parameters being reported.

19.0 Internal Quality Control Procedures

19.1 Field quality control samples will be submitted to the laboratory as appropriate and as often as practical during field investigations. Such quality control check samples may consist of:

1. One or more "blind" duplicate samples;
2. One or more field blanks;
3. One or more duplicate samples, or
4. Spiked" samples prepared with known amounts of constituents or standard reference samples.

19.2 TEAD EMD will determine sampling source(s), parameters to be audited and the appropriate field quality control samples in accordance with the project plan. Field quality control samples will be collected or prepared in accordance Section 6.0 of this QAPP.

19.3 Quality control samples, as identified above, may be collected or prepared for each sample event. The TEAD EMD will determine the number and type of quality control samples to be collected prior to going to the field. The quality control samples will be handled in the same manner as all other samples being analyzed for the same parameter. Sample identification labeling will be consistent with the identification of actual samples. Project records concerning quality control check samples and results of their analyses will be maintained by the TEAD EMD.

20.0 Preventive Maintenance

20.1 The TEAD EMD will assess field equipment for proper operation and maintenance prior to use. Records of preventive maintenance performed will be maintained in a logbook with the equipment.

20.2 All contractors working for the TEAD will be responsible for preventative maintenance of their equipment.

20.3 Preventive maintenance procedures for laboratory equipment are the responsibility of the laboratory.

21.0 Data Assessment Procedures

21.1 Data quality will be evaluated using the accuracy, precision, representativeness and completeness criteria spelled out in Section 2.0 of this QAPP. The TEAD EMD will evaluate field quality control sample results and analytical results submitted by to determine if goals were achieved.

21.2 If the quality control samples meet the TEAD criteria, the reported data will be accepted. If not, the laboratory will be consulted to determine what laboratory quality control/quality assurance samples were included with the sample batch. These samples will be included with

the field set and reevaluated. If the combined set meets the acceptance criteria, the reported data may be accepted. If not, the data from analyzing the sample set may be used as a basis for a data corrective action referral.

22.0 Corrective Action Procedures

22.1 If a quality control audit results in detection of unacceptable conditions or data, as defined by the criteria presented above, the TEAD EMD will be responsible for developing and initiating corrective action. Corrective action may include:

1. Re-analysis of the sample batch.
2. Re-sampling and analysis.
3. Evaluation and amendment of sampling and analytical procedures.
4. Acceptance of data, with an acknowledgement of the level of uncertainty surrounding the analytical results.

References

Test Methods for Evaluating Solid Waste (SW-846, Second Edition and subsequent revisions.), EPA

Rules for Certification of Environmental Laboratories, R444. Utah State Rules

A Guide for Field Samplers, current version, EPA Region VIII

Standard Operating Procedures for Field Samplers, EPA Region VIIII

Samplers and Sampling Procedures for Hazardous Waste Streams, EPA 600/2-80-018

Annual Book of ASTM Standards, ASTM

Contract Laboratory Program Guidance for Field Samplers (EPA-540-R-09-03, January 2011)

USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, (EPA-540-R-08-01, June 2008)

USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, OSWER 9240.1-45, (EPA 540-R-04-004, October 2004)

USEPA Contract Laboratory Program National Functional Guidelines for Chlorinated Dioxin/Furan Data Review, (EPA-540-R-05-001), September 2005

Guide to Environmental Analytical Methods, 5th edition, Genium Publishing Corporation, March 2003.

QA/QC Data Validation for Organics, EPA

QA/QC Data Validation for Inorganic, EPA

Standard Methods for the Examination of Water and Wastewater, 22th Edition, 2013, American Public Health Association, American Water Works Association, Water Environment Federation Washington, D.C. p. 1-7

United States Environmental Protection Agency, 2002. USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA 540-R-01-008. Washington, D.C. July 2002 (Final) p. 25.

Acronyms

CFR	Code of Federal Regulations
CLP	Contract Laboratory Program
COC	Chain of Custody
DQO	Data Quality Objective
DWMRC	Division of Waste Management and Radiation Control
EMD	TEAD Environmental Management Division
EPA	Environmental Protection Agency
HSWA	Hazardous and Solid Waste Amendments
LCS	Laboratory Control Spike
LIMS	Laboratory Information Management System
MS/MSD	Matrix Spike/Matrix Spike Duplicate
OSHA	Occupational, Safety, Health Administration
QA	Quality Assurance
QC	Quality Control
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Program Plan
RCRA	Resource Conservation and Recovery Act
% R	Percent Recovery
% RPD	Relative Percent Difference
SAP	Sampling and Analysis Plan
TEAD	Tooele Army Depot
UAC	Utah Annotated Code
UDEQ	Utah Department of Environmental Quality
WAP	Waste Analysis Plan

Appendix 1

Sampling and Chain-Of-Custody Procedures

The following are the procedures and protocols for management of sample integrity.

Pre-Sampling Procedures

Safety Protection Protocols

The TEAD EMD will evaluate the personnel protection and safety equipment to be used.

Containers and Forms

Once the number, types of samples and parameters to be analyzed are determined, the laboratory will be contacted to insure that capabilities are available to complete the required analyses within the appropriate holding times. The TEAD EMD will insure that the necessary supplies and forms are available, including:

1. Appropriate number and type of sample containers with preservative (if necessary). Sample containers will be prepared in accordance with the method requirements.
2. Sample analysis request forms.
3. Sample tracking or chain-of-custody forms and seals, if applicable.
4. Sample labels, if applicable.
5. Trip blanks, if applicable.
6. Ice chests and ice packs, if applicable.

It is recommended that extra containers and sample request forms be taken to the sampling site. This will insure that the sampling will still be accomplished if breakage occurs or conditions dictate that more samples need to be taken.

Sampling Equipment Provision

Examples of appropriate sampling equipment are contained in Table 1 below.

Table 1
Sampling Equipment

Sampling Point → **Waste Type** ↓	Drum	Sacks & Bags	Open Bed Truck	Closed Bed Truck	Storage Tanks or Bins	Waste Piles	Ponds, Lagoons, and pits	Conveyor Belt	Pipe
Free flowing liquids and slurries	Coliwasa	N/A	N/A	Coliwasa	Weighted bottle	N/A	Dipper	N/A	Dipper
Sludges	Trier (Spoon)	Trier (Spoon)	Trier (Spoon)	Trier	Trier	N/A		N/A	N/A
Moist Powders or Granules	Trier (Spoon)	Trier (Spoon)	Trier (Spoon)	Trier	Trier	Trier	Trier (Bucket*)	Shovel	

Sampling Point → **Waste Type ↓**	Drum	Sacks & Bags	Open Bed Truck	Closed Bed Truck	Storage Tanks or Bins	Waste Piles	Ponds, Lagoons, and pits	Conveyor Belt	Pipe
Dry Powders or Granules	Trier (Spoon)	Trier (Spoon)	Trier	Trier	Trier	Trier (spoon)	Trier (Bucket*)	Shovel	
Sand or packed powders and granules	Auger (Spoon)	Auger (Spoon)	Auger (Spoon)	Auger				N/A	
Large grained solids	Large Trier spoon	Large Trier spoon	Large Trier spoon	Large Trier	Large Trier	Large Trier	Large Trier	Large Trier	Large Trier

Decontamination Supplies

The TEAD EMD will specify decontamination procedures and supplies or will use disposable equipment. Containers for the disposal of waste generated as a result of the sampling will also be supplied.

Chain-of-Custody Procedures

Each person involved in the collection and the handling of samples will know chain-of-custody procedures. Samples collected may be introduced as documentation or evidence into legal proceedings. Chain-of-custody sample integrity will need to be maintained and the possession of samples be traceable from the time samples are collected until results are obtained from the lab. Chain-of-custody starts when the sampling team accepts the sampling containers. Sampling containers should be kept in a secure manner or in the sampler's possession at all times. The TEAD EMD is responsible for coordinating the chain-of-custody.

Sample Tracking Procedures

When chain-of-custody is not required, the TEAD EMD will follow a sample tracking procedure. At a minimum, this procedure will include:

1. Sample Identification (e.g., sample number)
2. Sample description (e.g., location and depth, if applicable)
3. Sample date and time
4. Sample matrix (e.g., air, water etc.)
5. Samplers Name
6. Analytes, requested methods, and special instructions if needed
7. Contact information

Sample Seals

The following procedures apply to sample seals if chain-of-custody is required:

1. The sample seals are to be completed for each sample or the entire ice chest and include the Sample Number, date and collector's signature.

2. A sample seal will be placed over the top or around the "neck" of each sample container used. The seal should be around or over the lid of the container. The seal ensures the integrity of the sample. The laboratory analyst will break the seal before analyzing the material collected.

3. The sample seals do not have to be used on each sample container if the samples remain in the custody of the sampler and are delivered directly to the laboratory by the sampler. One seal can be used to seal the ice chest for the trip to the laboratory. The seal should not be broken until the laboratory representative, qualified to accept chain-of-custody samples, arrives.

Sample Tracking Forms

When samples are collected, the appropriate sample tracking forms will need to be completed. The sample tracking forms may be obtained from the TEAD EMD.

Sample Identification

Sample tracking is performed for every sample collected. The method of identification of a sample depends on the type of measurement or analysis performed. When on-site measurements are made, the data are recorded directly in field logbooks, with identifying information. Samples are identified with a unique sample label. Field analyses, such as pH, are documented in a field logbook. The information on the sample label includes, as applicable:

1. Field identifier
2. Date
3. Time
4. Sample location
5. Sampler
6. Type of sample
7. Preservatives
8. Methods

Cleaning of Equipment

At each specific sampling point, the team should:

1. Use new or cleaned equipment.

2. Clean the sample equipment either in the field or laboratory, prior to use or re-use. This may be verified by the use of "rinsate blanks." These will be collected at a minimum rate of one blank per 20 samples. The sampling team should check with the TEAD EMD prior to sampling to determine an acceptable method of "field cleaning" for the equipment to be used. Single use disposable equipment does not need to be cleaned prior to use.

Transporting Samples

The samples shall be transported either by sample personnel or by a commercial carrier with tracking ability, e.g., UPS, FEDEX.

Completion of the Sampling Event

The following are items to consider prior to leaving the sampling location:

1. Verify the number of samples taken.

2. Match the physical samples with the paper work. The team should check for proper samples in the correct containers and that the field sample numbers on the samples correspond with the numbers on the sample request form.

3. Verify the samples are properly preserved.

4. Clean and package all non-disposable equipment.

5. Verify time/date on sample tag, request forms.

6. Bag all disposable items that need to be discarded.

7. Ensure that all sample containers are free of any debris or residue on the outside of the container.

Completion of Laboratory Analysis

Upon completion of the sample analyses, the laboratory will submit the results to the TEAD EMD for review.

The laboratory will retain the sample records according for a minimum of 5 years.

After sample results are accepted, the remaining sample(s) will either be disposed by the laboratory or given back to the sample team for final disposition.

Appendix 2

Sample Container Types/Volumes, Preservation and Holding Time Requirements

Analysis	Soil Sample Container	Water Sample Container	Holding Time	Preservative	Sample Handling
Metals	Wide-mouth glass jar with Teflon-lined lid or 1 kilogram capacity laboratory sample bag	500 mL Plastic	Analyze within 6 months, Mercury analyze within 28 days	none (soil) HNO3 to a pH<2 (water)	cool to 4° C (ice)
Energetics	Wide-mouth glass jar with Teflon-lined lid or 1 kilogram capacity laboratory sample bag	1 Liter amber glass	Extract7 days (water) 14 days (soil); Analyze within	none	≤6° C (ice)
Dioxin/ Furans	Wide-mouth amber glass jar with Teflon-lined lid or 1 kilogram capacity laboratory sample bag	4 Liter amber glass jar with Teflon-lined lid	Extract 30 days; Analyze within 45 days	none	≤6° C (ice)
Perchlorate	Wide-mouth amber glass jar with Teflon-lined lid or 1 kilogram capacity laboratory sample bag	500 mL Plastic	28 days to analysis	none	cool to 4° C (ice)